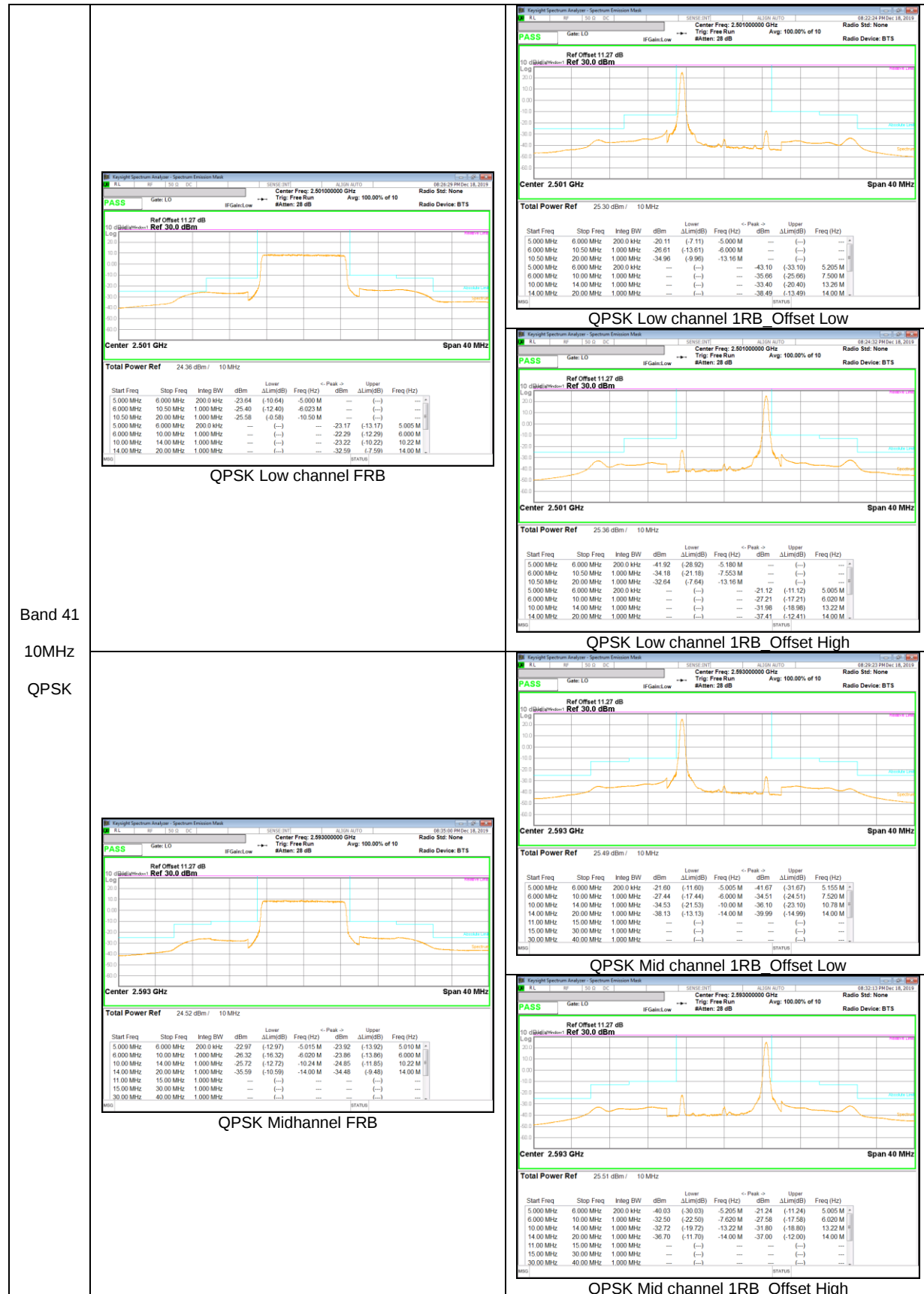
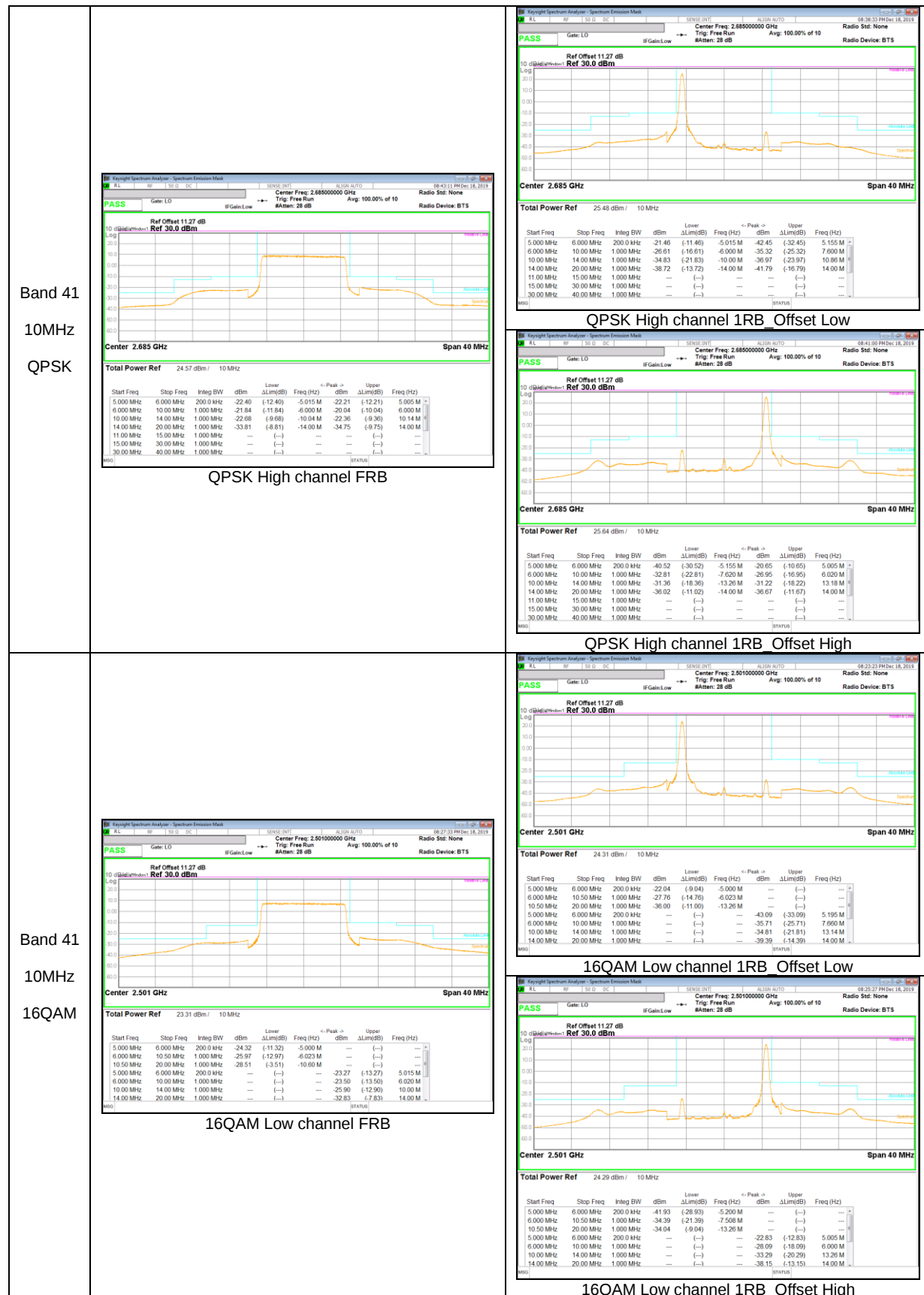
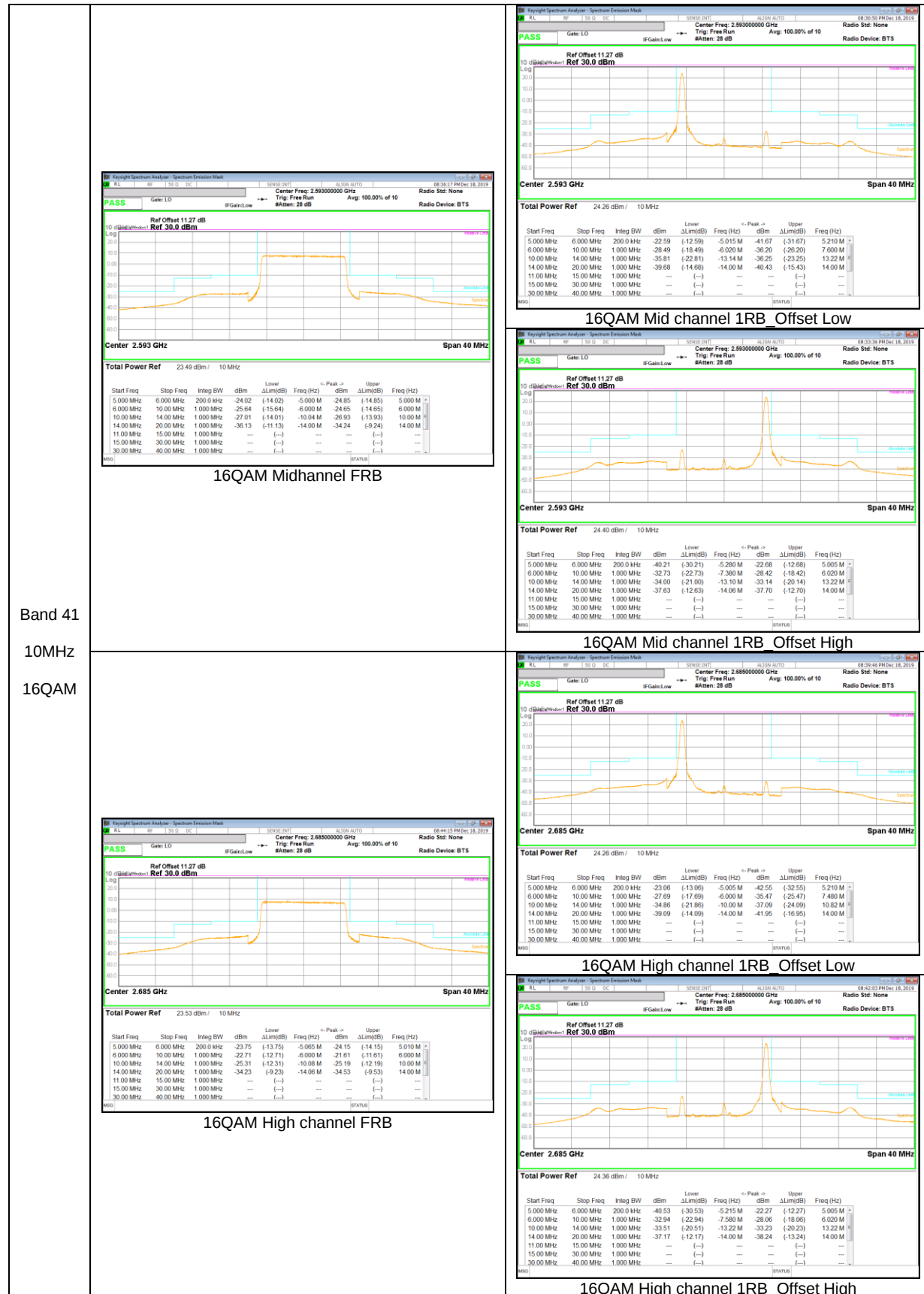
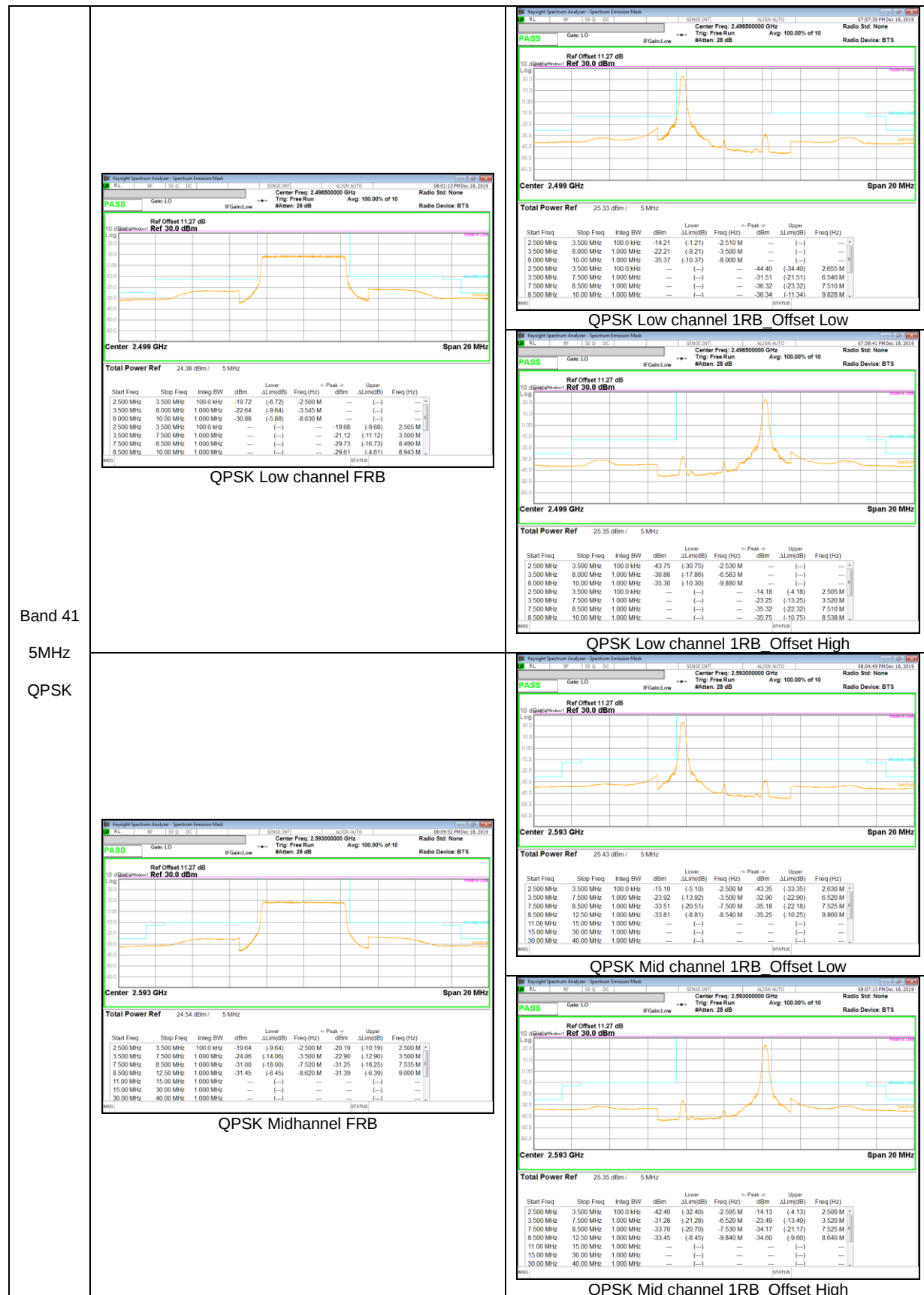
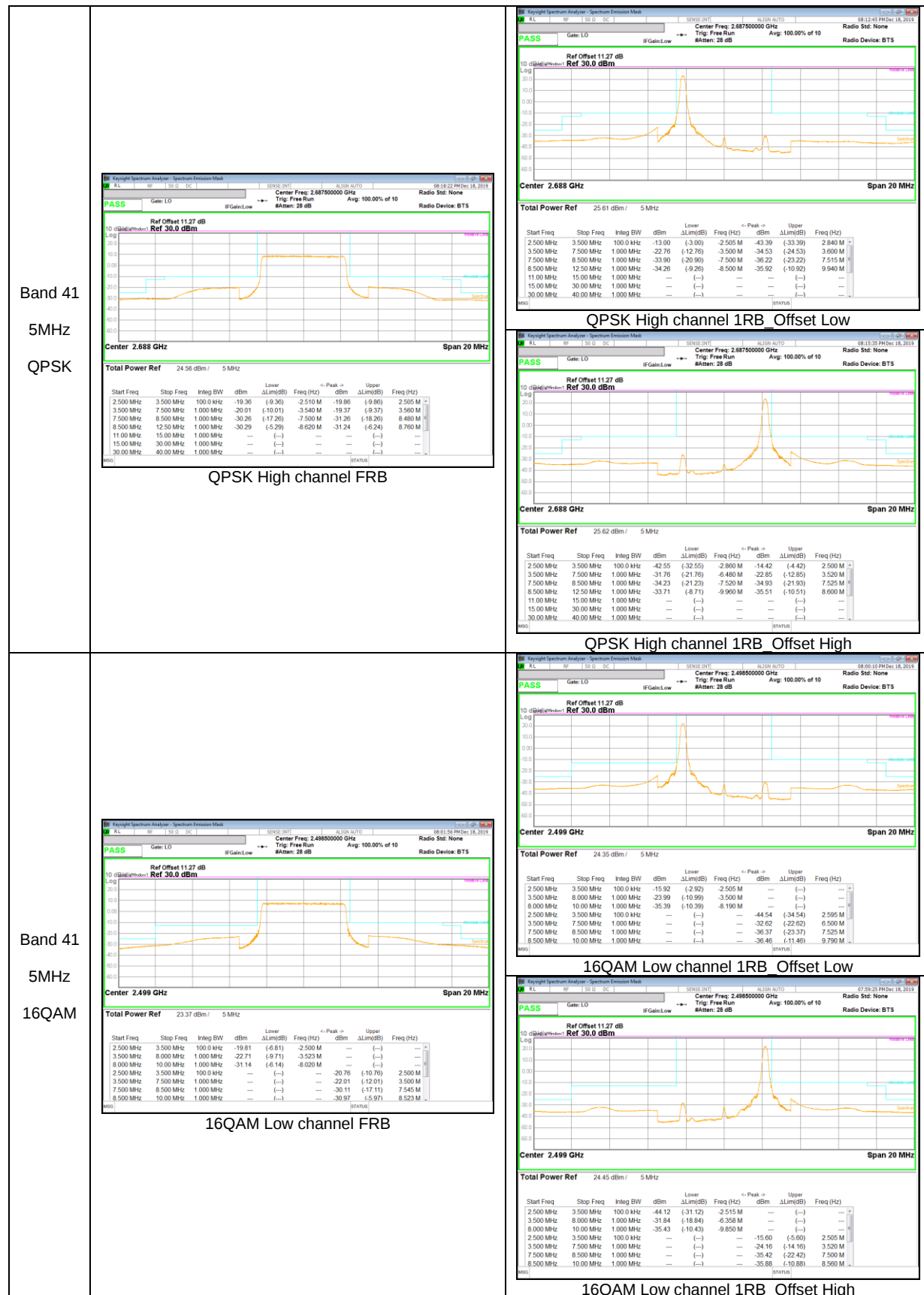


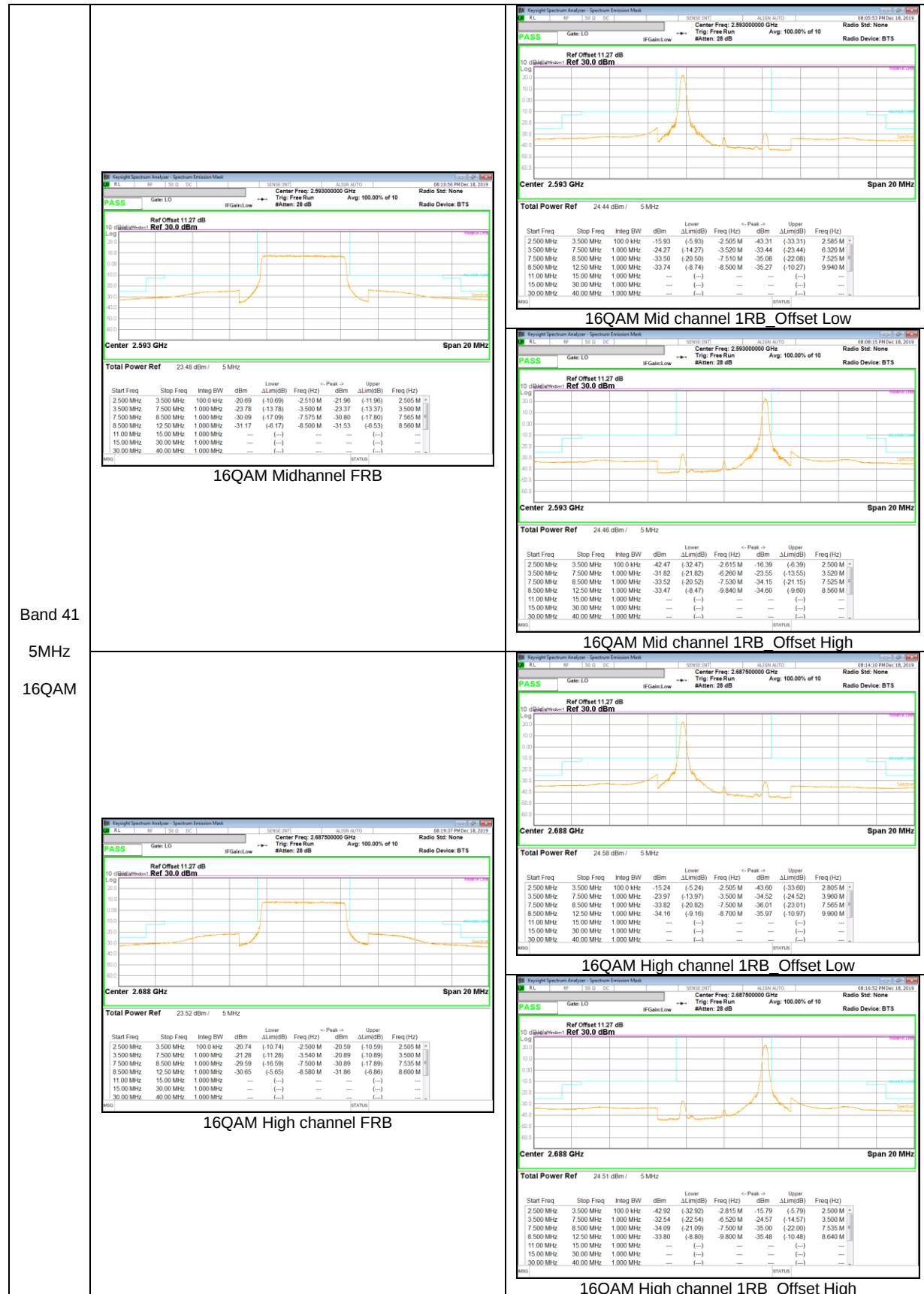












**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

### 9.3. OUT OF BAND EMISSIONS

#### RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §27.53 and 90.691

#### LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Part 27.53:

(c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

(m) (4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 90.691(a):

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz. (NOTE : Use 100kHz reference bandwidth)

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

## **TEST PROCEDURE**

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

- a) Set the RBW = 100KHz for emission below 1GHz and 1MHz for emissions above 1GHz  
(Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);

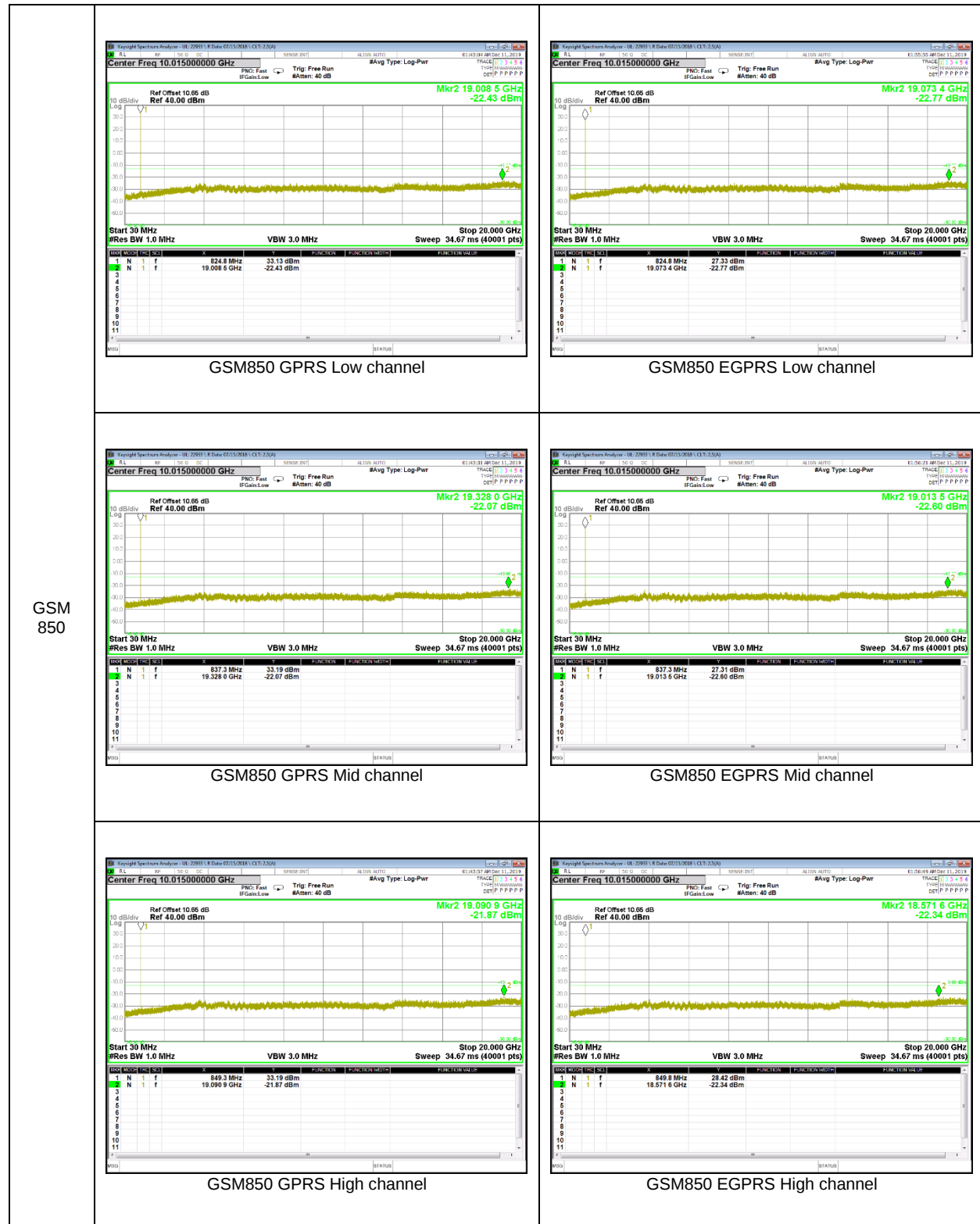
## **RESULTS**

See the following pages.

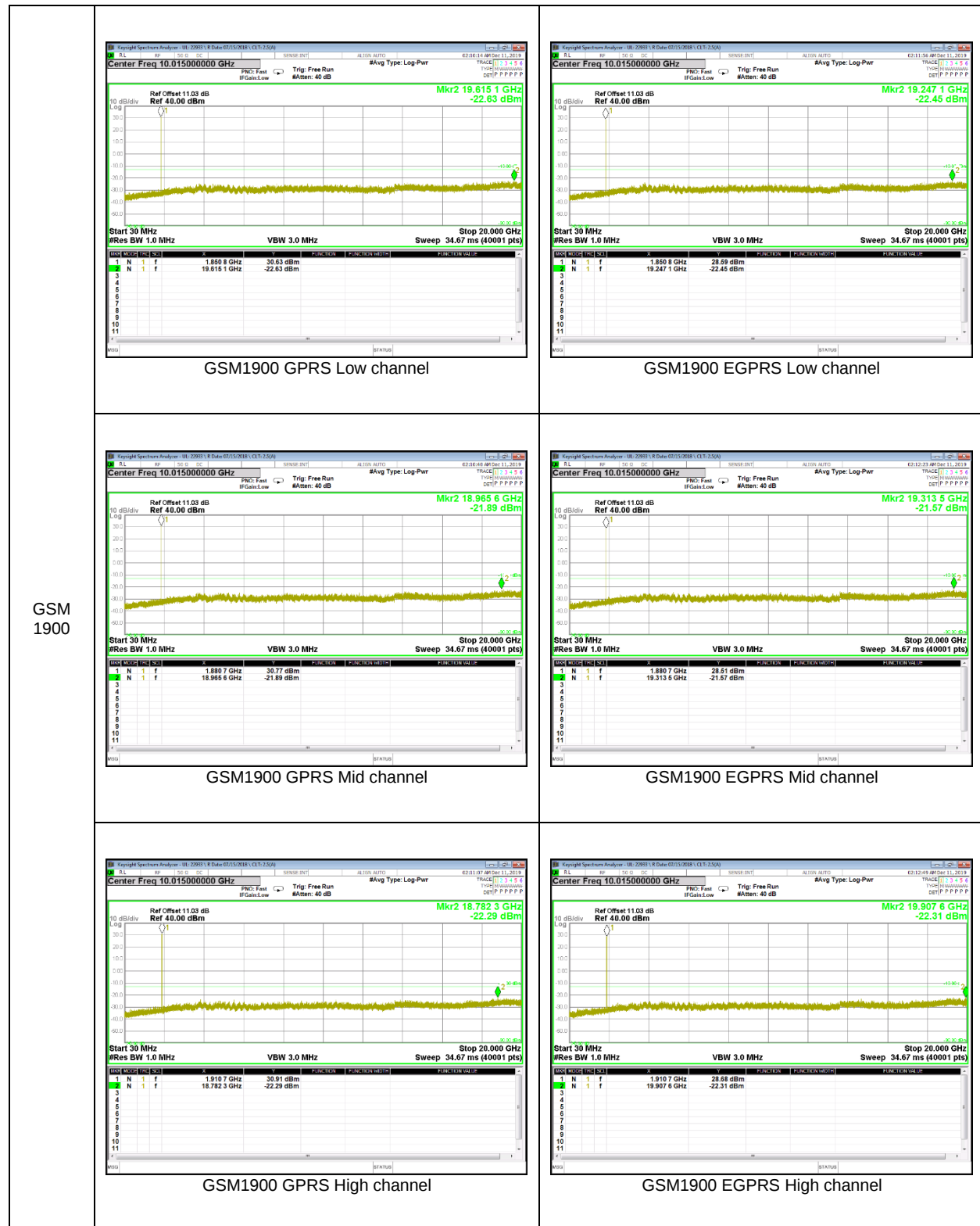
NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

### 9.3.1. OUT OF BAND EMISSIONS RESULT

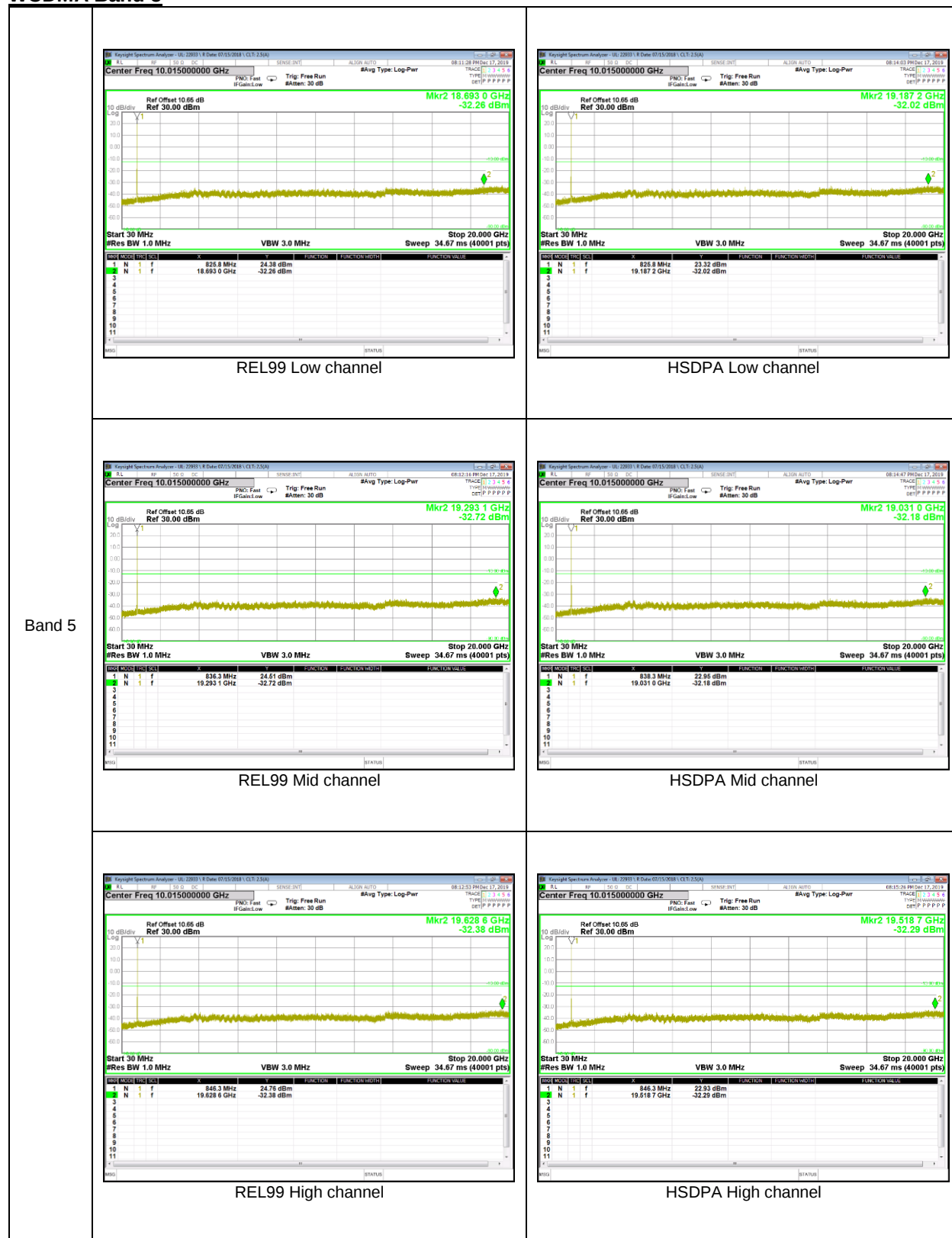
#### GSM 850



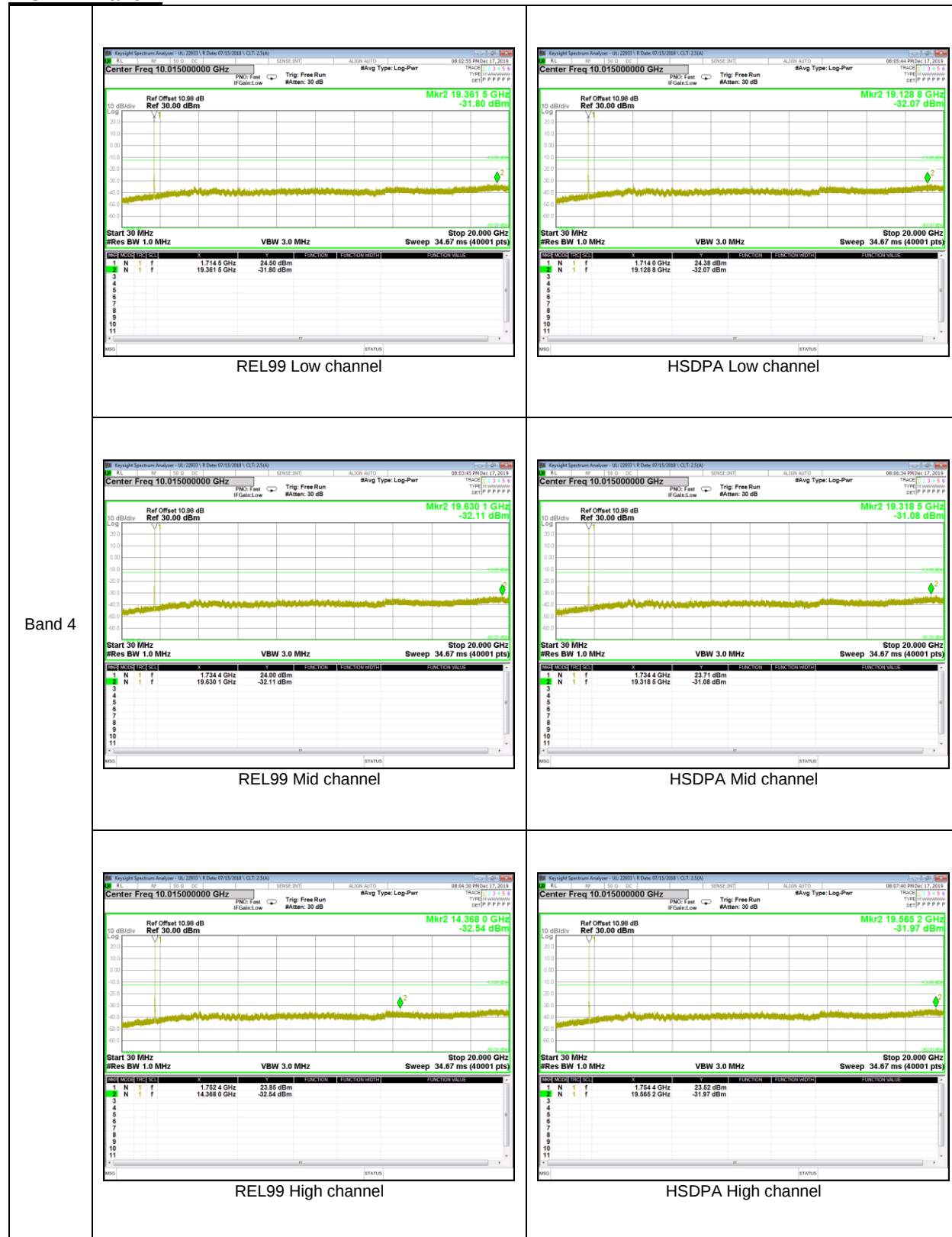
**GSM 1900**



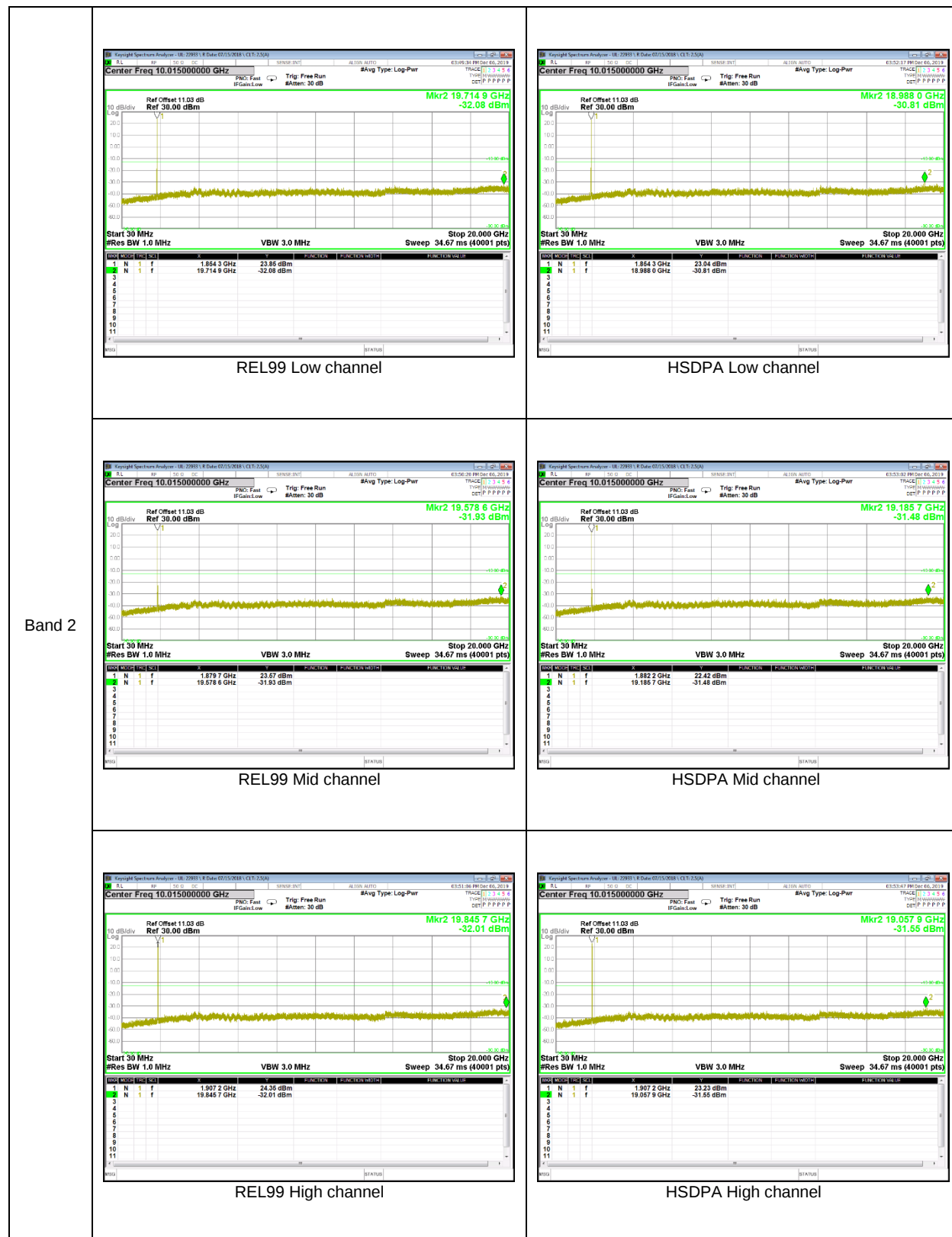
# WCDMA Band 5



# WCDMA Band 4



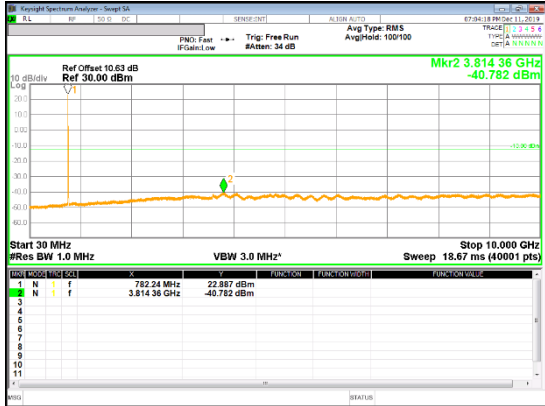
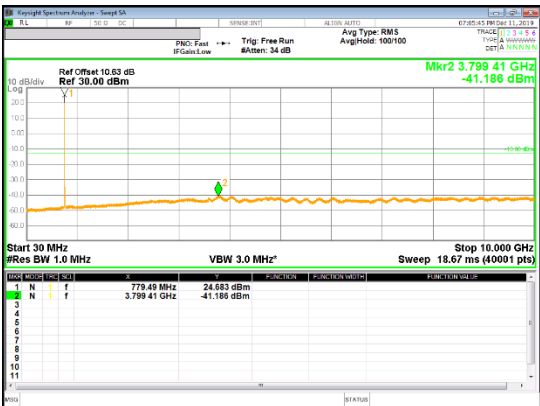
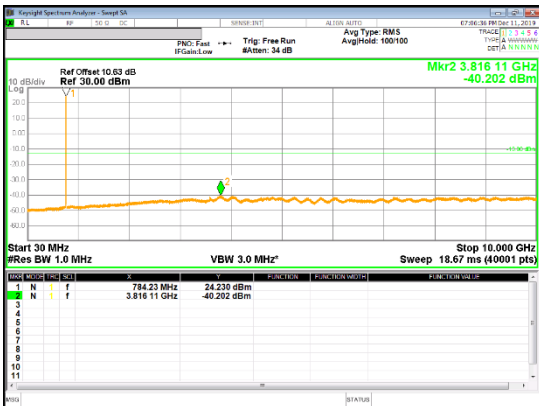
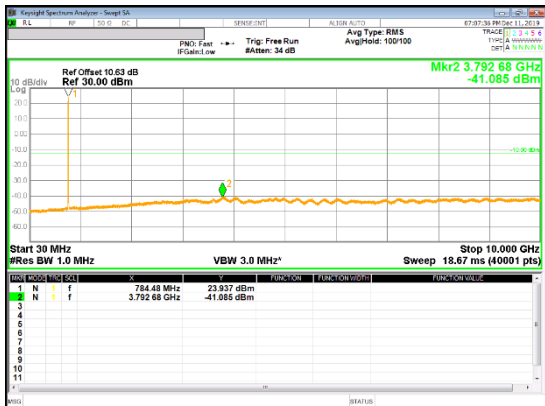
## WCDMA Band 2



# **LTE Band 12**



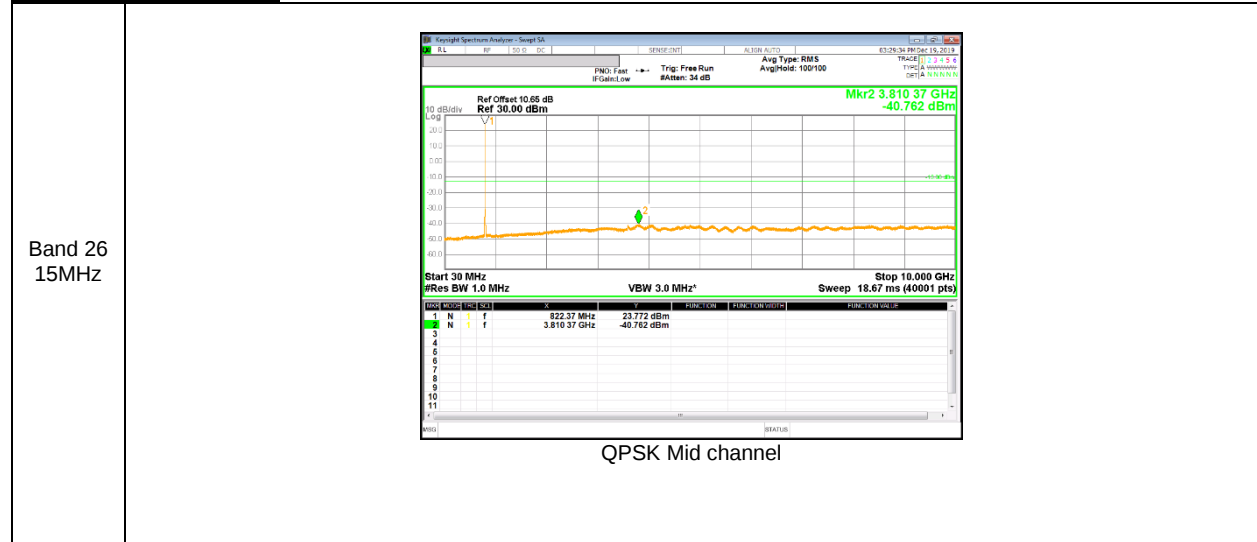
**LTE Band 13**

|                          |                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Band 13<br/>10MHz</p> |  <p>QPSK Mid channel</p>                                                                                                                                                                                                                                                  |
| <p>Band 13<br/>5MHz</p>  | <div style="display: flex; justify-content: space-around;"> <div style="width: 48%;">  <p>QPSK Low channel</p> </div> <div style="width: 48%;">  <p>QPSK Mid channel</p> </div> </div> |
|                          |  <p>QPSK High channel</p>                                                                                                                                                                                                                                               |

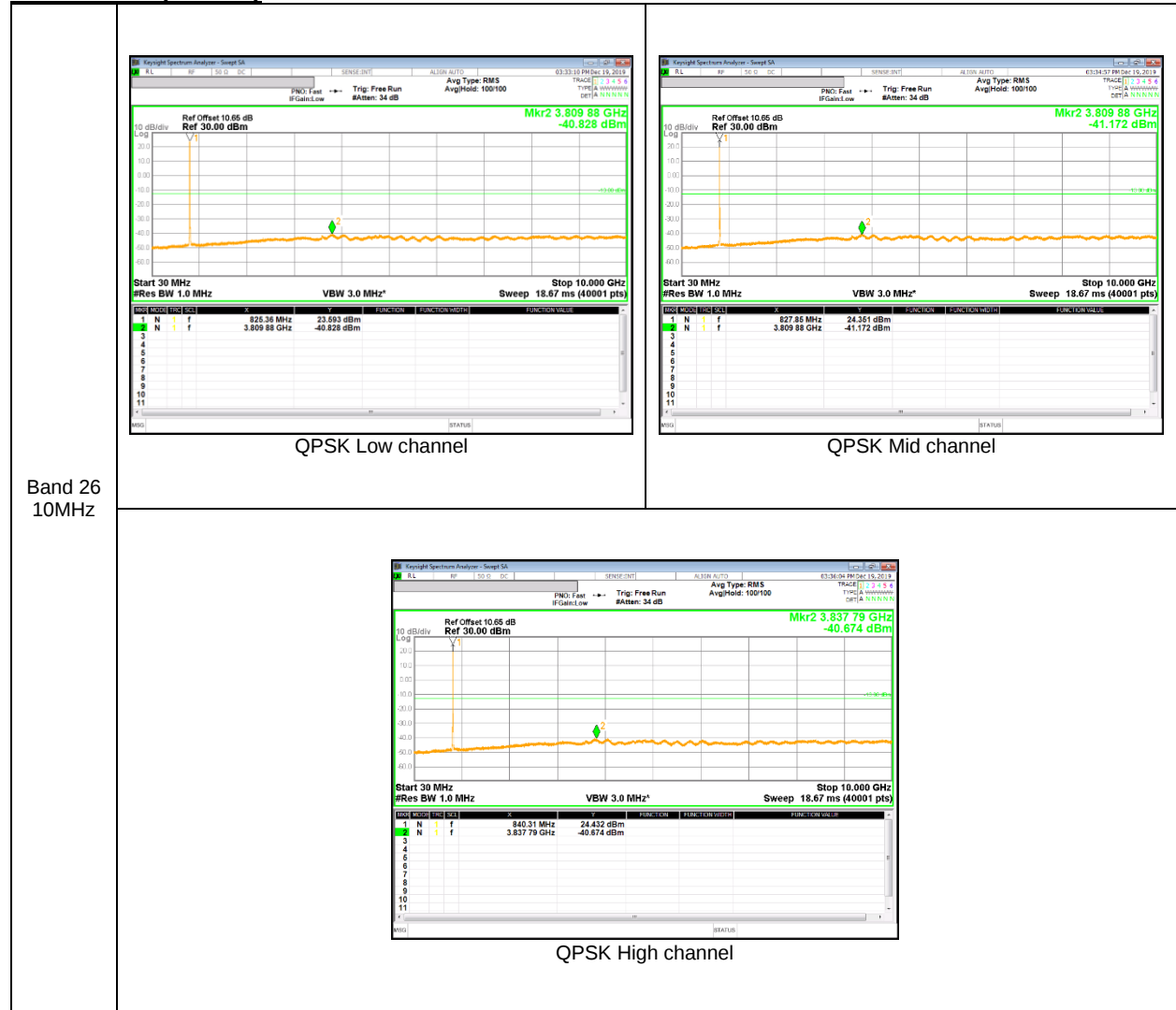
## LTE Band 25



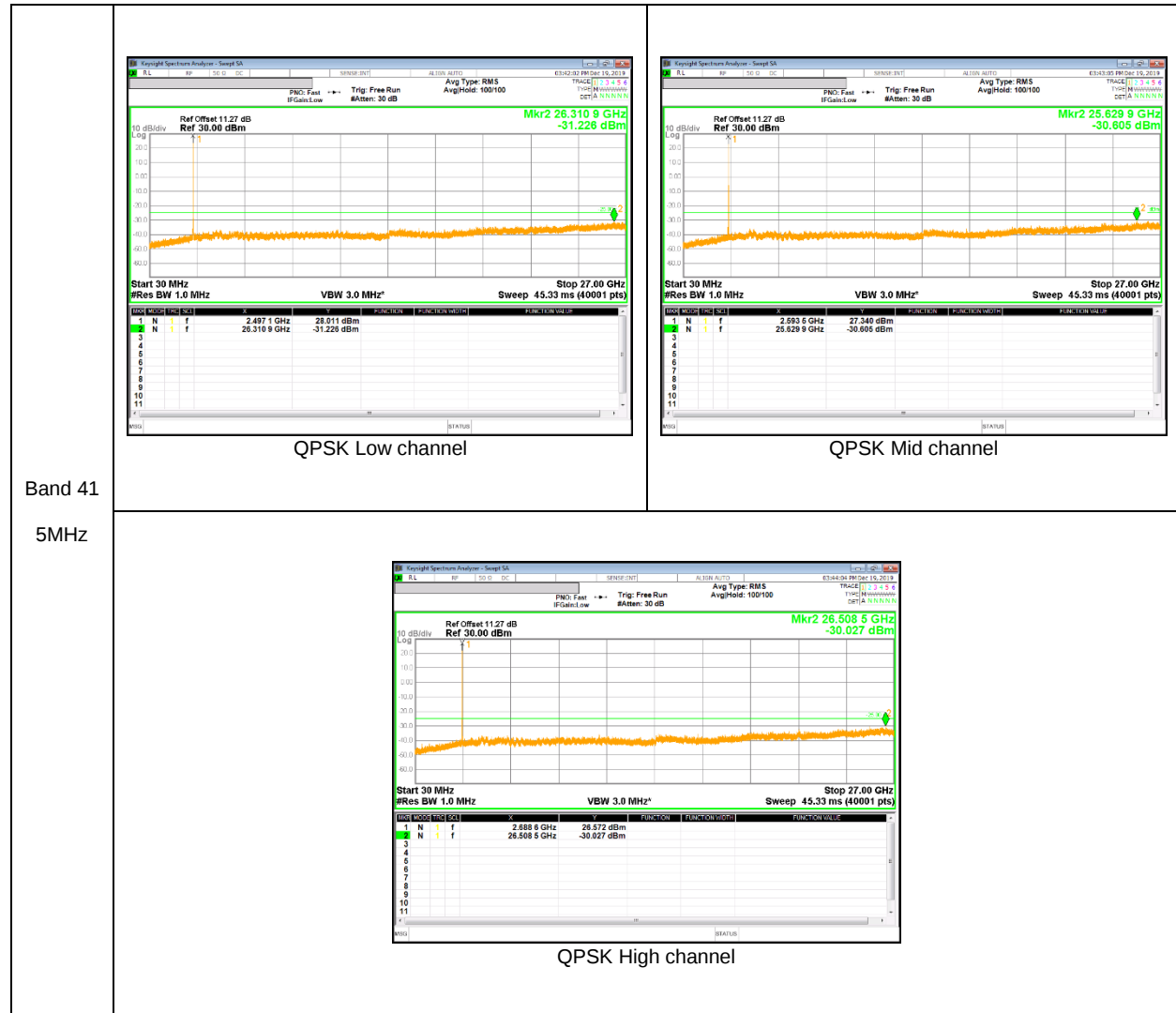
# LTE Band 26(Part 90)



# LTE Band 26(Part 22)



**LTE Band 41(PC2)**



**LTE Band 66**



**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

## 9.4. FREQUENCY STABILITY

### RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54 and §90.213

### LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

§90.213 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

### RESULTS

See the following pages.

**NOTE** : Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth. (Please refer to section 9.1.1 OBW results)

### 9.4.1. FREQUENCY STABILITY RESULTS

#### GSM 850, Channel 128/251, Frequency 824.2/848.8 MHz

| Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20°C |                              |                                               |              |                     |              |             |
|------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|---------------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                               |                              | Low Channel                                   | 2060.500     | Hz                  | High Channel | 2122.000    |
|                                                                                    |                              | Frequency Deviation Measured with Time Elapse |              |                     |              |             |
| Power Supply [Vdc]                                                                 | Environment Temperature [°C] | Low Channel                                   |              | High Channel        |              | Limit [ppm] |
|                                                                                    |                              | [MHz]                                         | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.86                                                                               | 50                           | 824.19998735                                  | 0.007        | 848.79998836        | 0.005        | 2.5         |
| 3.86                                                                               | 40                           | 824.19999113                                  | 0.002        | 848.79999066        | 0.003        | 2.5         |
| 3.86                                                                               | 30                           | 824.19999350                                  | 0.000        | 848.79999229        | 0.001        | 2.5         |
| <b>3.86</b>                                                                        | <b>20</b>                    | <b>824.19999312</b>                           | <b>0.000</b> | <b>848.79999294</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.86                                                                               | 10                           | 824.19999366                                  | -0.001       | 848.79999433        | -0.002       | 2.5         |
| 3.86                                                                               | 0                            | 824.19999850                                  | -0.007       | 848.79999797        | -0.006       | 2.5         |
| 3.86                                                                               | -10                          | 824.19999556                                  | -0.003       | 848.79999419        | -0.001       | 2.5         |
| 3.86                                                                               | -20                          | 824.19999337                                  | 0.000        | 848.79999550        | -0.003       | 2.5         |
| 3.86                                                                               | -30                          | 824.19999181                                  | 0.002        | 848.79999531        | -0.003       | 2.5         |

| Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20°C |                              |                                               |             |              |              |             |
|------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                               |                              | Low Channel                                   | 2060.500    | Hz           | High Channel | 2122.000    |
|                                                                                    |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                 | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                    |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                               | 20                           | 824.19999312                                  | 0           | 848.79999294 | 0            | 2.5         |
| 4.43                                                                               | 20                           | 824.19999261                                  | 0.001       | 848.79999199 | 0.001        | 2.5         |
| 3.60                                                                               | 20                           | 824.19999365                                  | -0.001      | 848.79999303 | 0.000        | 2.5         |

#### GSM 1900, Channel 512/810, Frequency 1850.0/1910.0 MHz (Lowest Frequency:EGPRS / Highest Frequency: EGPRS)

| Limit          |           | 1850               | 1910                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1850.0786          | 1909.9240           |            |                           |
| Extreme (50C)  |           | 1850.0786          | 1909.9240           | 16.9       | 0.009                     |
| Extreme (40C)  |           | 1850.0786          | 1909.9240           | 14.3       | 0.008                     |
| Extreme (30C)  |           | 1850.0786          | 1909.9240           | 18.7       | 0.010                     |
| Extreme (10C)  |           | 1850.0786          | 1909.9240           | 19.3       | 0.010                     |
| Extreme (0C)   |           | 1850.0786          | 1909.9240           | 20.6       | 0.011                     |
| Extreme (-10C) |           | 1850.0786          | 1909.9240           | 16.0       | 0.008                     |
| Extreme (-20C) |           | 1850.0786          | 1909.9240           | 17.7       | 0.009                     |
| Extreme (-30C) |           | 1850.0786          | 1909.9240           | 18.1       | 0.010                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1850.0786          | 1909.9240           | 21.7       | 0.012                     |
|                | -15%      | 1850.0786          | 1909.9240           | 20.5       | 0.011                     |
|                | End Point | 1850.0786          | 1909.9240           | 18.7       | 0.010                     |

## WCDMA Band 5

| Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C |                              |                                               |              |                     |              |             |
|------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|---------------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                     |                              | Low Channel                                   | 2066.000     | Hz                  | High Channel | 2116.500    |
|                                                                                          |                              | Frequency Deviation Measured with Time Elapse |              |                     |              |             |
| Power Supply [Vdc]                                                                       | Environment Temperature [°C] | Low Channel                                   |              | High Channel        |              | Limit [ppm] |
|                                                                                          |                              | [MHz]                                         | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.86                                                                                     | 50                           | 826.39998895                                  | 0.002        | 846.59998764        | 0.004        | 2.5         |
| 3.86                                                                                     | 40                           | 826.39999085                                  | -0.001       | 846.59998926        | 0.002        | 2.5         |
| 3.86                                                                                     | 30                           | 826.39999369                                  | -0.004       | 846.59999470        | -0.004       | 2.5         |
| <b>3.86</b>                                                                              | <b>20</b>                    | <b>826.39999036</b>                           | <b>0.000</b> | <b>846.59999111</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.86                                                                                     | 10                           | 826.39998653                                  | 0.005        | 846.59998988        | 0.001        | 2.5         |
| 3.86                                                                                     | 0                            | 826.39998946                                  | 0.001        | 846.59999137        | 0.000        | 2.5         |
| 3.86                                                                                     | -10                          | 826.39999361                                  | -0.004       | 846.59999303        | -0.002       | 2.5         |
| 3.86                                                                                     | -20                          | 826.39999515                                  | -0.006       | 846.59999594        | -0.006       | 2.5         |
| 3.86                                                                                     | -30                          | 826.39999112                                  | -0.001       | 846.59999046        | 0.001        | 2.5         |

| Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C |                              |                                               |             |              |              |             |
|------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                     |                              | Low Channel                                   | 2066.000    | Hz           | High Channel | 2116.500    |
|                                                                                          |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                       | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                          |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                                     | 20                           | 826.39999036                                  | 0           | 846.59999111 | 0            | 2.5         |
| 4.43                                                                                     | 20                           | 826.39998946                                  | 0.001       | 846.59998864 | 0.003        | 2.5         |
| 3.60                                                                                     | 20                           | 826.39998897                                  | 0.002       | 846.59999066 | 0.001        | 2.5         |

## WCDMA Band 4 (Lowest Frequency:HSDPA / Highest Frequency: Rel99)

| Limit          |           | 1710                  | 1755                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 1710.3120             | 1754.9625              |               |                                 |
| Extreme (50C)  |           | 1710.3120             | 1754.9625              | 16.9          | 0.010                           |
| Extreme (40C)  |           | 1710.3120             | 1754.9625              | 23.5          | 0.014                           |
| Extreme (30C)  |           | 1710.3120             | 1754.9625              | 17.7          | 0.010                           |
| Extreme (10C)  |           | 1710.3120             | 1754.9625              | 18.3          | 0.011                           |
| Extreme (0C)   |           | 1710.3120             | 1754.9625              | 15.6          | 0.009                           |
| Extreme (-10C) |           | 1710.3120             | 1754.9625              | 17.0          | 0.010                           |
| Extreme (-20C) |           | 1710.3120             | 1754.9625              | 17.3          | 0.010                           |
| Extreme (-30C) |           | 1710.3120             | 1754.9625              | 20.6          | 0.012                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 1710.3120             | 1754.9625              | 21.5          | 0.012                           |
|                | -15%      | 1710.3120             | 1754.9625              | 20.3          | 0.012                           |
|                | End Point | 1710.3120             | 1754.9625              | 19.7          | 0.011                           |

**WCDMA Band 2 (HSDPA)**

| Limit          |           | 1850                  | 1910                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 1850.3107             | 1909.6909              |               |                                 |
| Extreme (50C)  |           | 1850.3107             | 1909.6909              | 16.4          | 0.009                           |
| Extreme (40C)  |           | 1850.3107             | 1909.6909              | 18.7          | 0.010                           |
| Extreme (30C)  |           | 1850.3107             | 1909.6909              | 20.7          | 0.011                           |
| Extreme (10C)  |           | 1850.3107             | 1909.6909              | 13.6          | 0.007                           |
| Extreme (0C)   |           | 1850.3107             | 1909.6909              | 15.5          | 0.008                           |
| Extreme (-10C) |           | 1850.3107             | 1909.6909              | 17.1          | 0.009                           |
| Extreme (-20C) |           | 1850.3107             | 1909.6909              | 23.3          | 0.012                           |
| Extreme (-30C) |           | 1850.3107             | 1909.6909              | 19.6          | 0.010                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 1850.3107             | 1909.6909              | 18.9          | 0.010                           |
|                | -15%      | 1850.3107             | 1909.6909              | 20.6          | 0.011                           |
|                | End Point | 1850.3107             | 1909.6909              | 19.2          | 0.010                           |

**LTE Band 12 (Lowest Frequency:16QAM / Highest Frequency: 16QAM)**

| Limit          |           | 699                   | 716                    | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 699.1546              | 715.8444               |               |                                 |
| Extreme (50C)  |           | 699.1546              | 715.8444               | 3.5           | 0.005                           |
| Extreme (40C)  |           | 699.1546              | 715.8444               | 5.8           | 0.008                           |
| Extreme (30C)  |           | 699.1546              | 715.8444               | 1.1           | 0.002                           |
| Extreme (10C)  |           | 699.1546              | 715.8444               | 4.6           | 0.006                           |
| Extreme (0C)   |           | 699.1546              | 715.8444               | 6.1           | 0.009                           |
| Extreme (-10C) |           | 699.1546              | 715.8444               | 3.5           | 0.005                           |
| Extreme (-20C) |           | 699.1546              | 715.8444               | 2.8           | 0.004                           |
| Extreme (-30C) |           | 699.1546              | 715.8444               | 5.6           | 0.008                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 699.1546              | 715.8444               | 3.0           | 0.004                           |
|                | -15%      | 699.1546              | 715.8444               | 4.6           | 0.006                           |
|                | End Point | 699.1546              | 715.8444               | 6.6           | 0.009                           |

**LTE Band 13 (QPSK)**

| Limit          |           | 777                   | 787                    | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 777.2563              | 786.7487               |               |                                 |
| Extreme (50C)  |           | 777.2563              | 786.7487               | 2.3           | 0.003                           |
| Extreme (40C)  |           | 777.2563              | 786.7487               | 2.0           | 0.003                           |
| Extreme (30C)  |           | 777.2563              | 786.7487               | 0.9           | 0.001                           |
| Extreme (10C)  |           | 777.2563              | 786.7487               | 2.1           | 0.003                           |
| Extreme (0C)   |           | 777.2563              | 786.7487               | 1.6           | 0.002                           |
| Extreme (-10C) |           | 777.2563              | 786.7487               | 4.1           | 0.005                           |
| Extreme (-20C) |           | 777.2563              | 786.7487               | 3.3           | 0.004                           |
| Extreme (-30C) |           | 777.2563              | 786.7487               | 1.6           | 0.002                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 777.2563              | 786.7487               | 1.3           | 0.002                           |
|                | -15%      | 777.2563              | 786.7487               | 0.4           | 0.000                           |
|                | End Point | 777.2563              | 786.7487               | 1.8           | 0.002                           |

**LTE Band 25 (Lowest Frequency: QPSK / Highest Frequency: 16QAM)**

| Limit          |           | 1850               | 1915                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1850.1571          | 1914.8446           |            |                           |
| Extreme (50C)  |           | 1850.1571          | 1914.8446           | 9.5        | 0.005                     |
| Extreme (40C)  |           | 1850.1571          | 1914.8446           | 10.7       | 0.006                     |
| Extreme (30C)  |           | 1850.1571          | 1914.8446           | 8.4        | 0.004                     |
| Extreme (10C)  |           | 1850.1571          | 1914.8446           | 12.3       | 0.007                     |
| Extreme (0C)   |           | 1850.1571          | 1914.8446           | 14.8       | 0.008                     |
| Extreme (-10C) |           | 1850.1571          | 1914.8446           | 8.8        | 0.005                     |
| Extreme (-20C) |           | 1850.1571          | 1914.8446           | 6.9        | 0.004                     |
| Extreme (-30C) |           | 1850.1571          | 1914.8446           | 10.3       | 0.005                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1850.1571          | 1914.8446           | 10.7       | 0.006                     |
|                | -15%      | 1850.1571          | 1914.8446           | 6.5        | 0.003                     |
|                | End Point | 1850.1571          | 1914.8446           | 7.4        | 0.004                     |

**LTE Band 26**

| Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20°C |                              |                                               |             |              |              |             |
|-----------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                    |                              | Low Channel                                   | 2036.750    | Hz           | High Channel | 2120.750    |
|                                                                                         |                              | Frequency Deviation Measured with Time Elapse |             |              |              | Hz          |
| Power Supply [Vdc]                                                                      | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                         |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                                    | 50                           | 814.70001034                                  | -0.004      | 848.30000961 | -0.006       | 2.5         |
| 3.86                                                                                    | 40                           | 814.70000564                                  | 0.002       | 848.30000617 | -0.002       | 2.5         |
| 3.86                                                                                    | 30                           | 814.70000485                                  | 0.003       | 848.30000438 | 0.000        | 2.5         |
| 3.86                                                                                    | 20                           | 814.70000695                                  | 0.000       | 848.30000421 | 0.000        | 2.5         |
| 3.86                                                                                    | 10                           | 814.70000705                                  | 0.000       | 848.30000936 | -0.006       | 2.5         |
| 3.86                                                                                    | 0                            | 814.70001133                                  | -0.005      | 848.30001230 | -0.010       | 2.5         |
| 3.86                                                                                    | -10                          | 814.70000485                                  | 0.003       | 848.30000611 | -0.002       | 2.5         |
| 3.86                                                                                    | -20                          | 814.70000659                                  | 0.000       | 848.30000718 | -0.004       | 2.5         |
| 3.86                                                                                    | -30                          | 814.70000834                                  | -0.002      | 848.30000598 | -0.002       | 2.5         |

| Reference Frequency : LTE Band 26 Low Channel 814.7 MHz / High Channel 848.3 MHz @ 20°C |                              |                                               |             |              |              |             |
|-----------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                    |                              | Low Channel                                   | 2036.750    | Hz           | High Channel | 2120.750    |
|                                                                                         |                              | Frequency Deviation Measured with Time Elapse |             |              |              | Hz          |
| Power Supply [Vdc]                                                                      | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                         |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.86                                                                                    | 20                           | 814.70000695                                  | 0           | 848.30000421 | 0            | 2.5         |
| 4.43                                                                                    | 20                           | 814.70000887                                  | -0.002      | 848.30000912 | -0.006       | 2.5         |
| 3.60                                                                                    | 20                           | 814.70000448                                  | 0.003       | 848.30000597 | -0.002       | 2.5         |

**LTE Band 41 PC2 (Lowest Frequency:16QAM / Highest Frequency: QPSK)**

| Limit          |           | 2496                  | 2690                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 2496.2518             | 2689.7506              |               |                                 |
| Extreme (50C)  |           | 2496.2518             | 2689.7506              | 17.5          | 0.007                           |
| Extreme (40C)  |           | 2496.2518             | 2689.7506              | 20.7          | 0.008                           |
| Extreme (30C)  |           | 2496.2518             | 2689.7506              | 18.9          | 0.007                           |
| Extreme (10C)  |           | 2496.2518             | 2689.7506              | 17.6          | 0.007                           |
| Extreme (0C)   |           | 2496.2518             | 2689.7506              | 21.5          | 0.008                           |
| Extreme (-10C) |           | 2496.2518             | 2689.7506              | 20.6          | 0.008                           |
| Extreme (-20C) |           | 2496.2518             | 2689.7506              | 17.7          | 0.007                           |
| Extreme (-30C) |           | 2496.2518             | 2689.7506              | 18.4          | 0.007                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 2496.2518             | 2689.7506              | 18.6          | 0.007                           |
|                | -15%      | 2496.2518             | 2689.7506              | 18.1          | 0.007                           |
|                | End Point | 2496.2518             | 2689.7506              | 17.2          | 0.007                           |

**LTE Band 66 (QPSK)**

| Limit          |           | 1710                  | 1780                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 1710.1552             | 1779.8446              |               |                                 |
| Extreme (50C)  |           | 1710.1552             | 1779.8446              | 7.6           | 0.004                           |
| Extreme (40C)  |           | 1710.1552             | 1779.8446              | 9.6           | 0.006                           |
| Extreme (30C)  |           | 1710.1552             | 1779.8446              | 8.8           | 0.005                           |
| Extreme (10C)  |           | 1710.1552             | 1779.8446              | 10.2          | 0.006                           |
| Extreme (0C)   |           | 1710.1552             | 1779.8446              | 6.3           | 0.004                           |
| Extreme (-10C) |           | 1710.1552             | 1779.8446              | 5.9           | 0.003                           |
| Extreme (-20C) |           | 1710.1552             | 1779.8446              | 5.6           | 0.003                           |
| Extreme (-30C) |           | 1710.1552             | 1779.8446              | 5.7           | 0.003                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 1710.1552             | 1779.8446              | 10.6          | 0.006                           |
|                | -15%      | 1710.1552             | 1779.8446              | 4.6           | 0.003                           |
|                | End Point | 1710.1552             | 1779.8446              | 7.0           | 0.004                           |

**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

## 10. RADIATED TEST RESULTS

### 10.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.50 and §27.53

#### LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50:

(b)(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

(c) (10) - Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d) (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

(h) The following power limits shall apply in the BRS and EBS:

(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

#### TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

a) Set the RBW  $\geq$  OBW; b) Set VBW  $\geq 3 \times$  RBW; c) Set span  $\geq 2 \times$  RBW; d) Sweep time = auto couple; e) Detector = rms; f) Ensure that the number of measurement points  $\geq$  span/RBW; g) Trace mode = max hold(GSM, WCDMA), average(LTE);

#### TEST RESULTS

### 10.1.1. ERP/EIRP Results

#### GSM

| Band    | Mode  | Channel | f [MHz] | ERP / EIRP   |                |
|---------|-------|---------|---------|--------------|----------------|
|         |       |         |         | [dBm]        | [mW]           |
| GSM850  | GPRS  | 512     | 824.2   | 30.59        | 1145.51        |
|         |       | 661     | 836.6   | 30.72        | 1180.32        |
|         |       | 810     | 848.8   | <b>30.85</b> | <b>1216.19</b> |
|         | EGPRS | 512     | 824.2   | 24.97        | 314.05         |
|         |       | 661     | 836.6   | 25.04        | 319.15         |
|         |       | 810     | 848.8   | <b>25.41</b> | <b>347.54</b>  |
| GSM1900 | GPRS  | 512     | 1850.2  | 27.74        | 594.29         |
|         |       | 661     | 1880    | 28.80        | 758.58         |
|         |       | 810     | 1909.8  | <b>29.07</b> | <b>807.24</b>  |
|         | EGPRS | 512     | 1850.2  | 23.83        | 241.55         |
|         |       | 661     | 1880    | 23.98        | 250.03         |
|         |       | 810     | 1909.8  | <b>26.08</b> | <b>405.51</b>  |

#### WCDMA

| Band   | Mode  | Channel | f [MHz] | ERP / EIRP   |               |
|--------|-------|---------|---------|--------------|---------------|
|        |       |         |         | [dBm]        | [mW]          |
| Band 5 | REL99 | 4132    | 826.4   | 17.00        | 50.12         |
|        |       | 4183    | 836.6   | 18.10        | 64.57         |
|        |       | 4233    | 846.6   | <b>18.16</b> | <b>65.46</b>  |
|        | HSDPA | 4132    | 826.4   | 15.51        | 35.56         |
|        |       | 4183    | 836.6   | <b>16.35</b> | <b>43.15</b>  |
|        |       | 4233    | 846.6   | 16.28        | 42.46         |
| Band 4 | REL99 | 1312    | 1712.4  | 24.00        | 251.19        |
|        |       | 1413    | 1732.6  | <b>24.68</b> | <b>293.76</b> |
|        |       | 1513    | 1752.6  | 22.79        | 190.11        |
|        | HSDPA | 1312    | 1712.4  | <b>23.76</b> | <b>237.68</b> |
|        |       | 1413    | 1732.6  | 23.65        | 231.74        |
|        |       | 1513    | 1752.6  | 22.57        | 180.72        |
| Band 2 | REL99 | 9262    | 1852.4  | 22.36        | 172.19        |
|        |       | 9400    | 1880.0  | 23.47        | 222.33        |
|        |       | 9538    | 1907.6  | <b>24.88</b> | <b>307.61</b> |
|        | HSDPA | 9262    | 1852.4  | 21.61        | 144.88        |
|        |       | 9400    | 1880.0  | 22.29        | 169.43        |
|        |       | 9538    | 1907.6  | <b>23.85</b> | <b>242.66</b> |

**LTE Band 12**

| Band    | BW [MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |              |
|---------|----------|-------|-----------------------|---------|--------------|--------------|
|         |          |       |                       |         | [dBm]        | [mW]         |
| Band 12 | 10       | QPSK  | 1 / 0                 | 704.0   | 16.88        | 48.75        |
|         |          |       | 1 / 0                 | 707.5   | 16.98        | 49.89        |
|         |          |       | 1 / 0                 | 711.0   | <b>17.21</b> | <b>52.60</b> |
|         |          | 16QAM | 1 / 0                 | 704.0   | 15.68        | 36.98        |
|         |          |       | 1 / 0                 | 707.5   | 15.92        | 39.08        |
|         |          |       | 1 / 0                 | 711.0   | <b>16.19</b> | <b>41.59</b> |
|         | 5        | QPSK  | 1 / 12                | 701.5   | 16.81        | 47.97        |
|         |          |       | 1 / 12                | 707.5   | 16.96        | 49.66        |
|         |          |       | 1 / 12                | 713.5   | <b>17.70</b> | <b>58.88</b> |
|         |          | 16QAM | 1 / 12                | 701.5   | 15.63        | 36.56        |
|         |          |       | 1 / 12                | 707.5   | 15.78        | 37.84        |
|         |          |       | 1 / 0                 | 713.5   | <b>16.33</b> | <b>42.95</b> |
|         | 3        | QPSK  | 1 / 0                 | 700.5   | 16.52        | 44.87        |
|         |          |       | 1 / 0                 | 707.5   | 16.90        | 48.98        |
|         |          |       | 1 / 8                 | 714.5   | <b>17.26</b> | <b>53.21</b> |
|         |          | 16QAM | 1 / 8                 | 700.5   | 15.53        | 35.73        |
|         |          |       | 1 / 8                 | 707.5   | 15.16        | 32.81        |
|         |          |       | 1 / 8                 | 714.5   | <b>16.26</b> | <b>42.27</b> |
|         | 1.4      | QPSK  | 1 / 0                 | 699.7   | 16.44        | 44.06        |
|         |          |       | 1 / 0                 | 707.5   | 16.97        | 49.77        |
|         |          |       | 1 / 0                 | 715.3   | <b>17.33</b> | <b>54.08</b> |
|         |          | 16QAM | 1 / 0                 | 699.7   | 15.62        | 36.48        |
|         |          |       | 1 / 0                 | 707.5   | 15.84        | 38.37        |
|         |          |       | 1 / 0                 | 715.3   | <b>16.17</b> | <b>41.40</b> |

**LTE Band 13**

| Band    | BW [MHz] | Mode  | RB size /<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|----------|-------|------------------------|---------|--------------|---------------|
|         |          |       |                        |         | [dBm]        | [mW]          |
| Band 13 | 10       | QPSK  | 1 / 25                 | 782.0   | <b>20.44</b> | <b>110.66</b> |
|         |          | 16QAM | 1 / 25                 | 782.0   | 19.80        | 95.50         |
|         | 5        | QPSK  | 1 / 12                 | 779.5   | 20.49        | 111.94        |
|         |          |       | 1 / 24                 | 782.0   | <b>20.73</b> | <b>118.30</b> |
|         |          |       | 1 / 12                 | 784.5   | 20.31        | 107.40        |
|         |          | 16QAM | 1 / 12                 | 779.5   | 19.25        | 84.14         |
|         |          |       | 1 / 24                 | 782.0   | <b>20.06</b> | <b>101.39</b> |
|         |          |       | 1 / 12                 | 784.5   | 19.54        | 89.95         |
|         |          |       |                        |         |              |               |

**LTE Band 25**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 25 | 20          | QPSK  | 1 / 0                 | 1860.0  | 21.48        | 140.60        |
|         |             |       | 1 / 0                 | 1882.5  | 22.13        | 163.31        |
|         |             |       | 1 / 99                | 1905.0  | <b>22.59</b> | <b>181.55</b> |
|         |             | 16QAM | 1 / 0                 | 1860.0  | 20.21        | 104.95        |
|         |             |       | 1 / 0                 | 1882.5  | <b>20.90</b> | <b>123.03</b> |
|         |             |       | 1 / 0                 | 1905.0  | 20.70        | 117.49        |
|         | 15          | QPSK  | 1 / 37                | 1857.5  | 21.52        | 141.91        |
|         |             |       | 1 / 0                 | 1882.5  | 22.21        | 166.34        |
|         |             |       | 1 / 37                | 1907.5  | <b>22.83</b> | <b>191.87</b> |
|         |             | 16QAM | 1 / 37                | 1857.5  | 20.15        | 103.51        |
|         |             |       | 1 / 37                | 1882.5  | 20.67        | 116.68        |
|         |             |       | 1 / 37                | 1907.5  | <b>21.15</b> | <b>130.32</b> |
|         | 10          | QPSK  | 1 / 0                 | 1855.0  | 21.83        | 152.41        |
|         |             |       | 1 / 0                 | 1882.5  | 22.50        | 177.83        |
|         |             |       | 1 / 49                | 1910.0  | <b>22.79</b> | <b>190.11</b> |
|         |             | 16QAM | 1 / 0                 | 1855.0  | 20.31        | 107.40        |
|         |             |       | 1 / 0                 | 1882.5  | 20.82        | 120.78        |
|         |             |       | 1 / 0                 | 1910.0  | <b>21.08</b> | <b>128.23</b> |
|         | 5           | QPSK  | 1 / 12                | 1852.5  | 21.66        | 146.55        |
|         |             |       | 1 / 24                | 1882.5  | 22.02        | 159.22        |
|         |             |       | 1 / 12                | 1912.5  | <b>22.99</b> | <b>199.07</b> |
|         |             | 16QAM | 1 / 12                | 1852.5  | 19.95        | 98.86         |
|         |             |       | 1 / 12                | 1882.5  | 20.59        | 114.55        |
|         |             |       | 1 / 12                | 1912.5  | <b>21.45</b> | <b>139.64</b> |
|         | 3           | QPSK  | 1 / 8                 | 1851.5  | 21.60        | 144.54        |
|         |             |       | 1 / 0                 | 1882.5  | 21.98        | 157.76        |
|         |             |       | 1 / 8                 | 1913.5  | <b>22.40</b> | <b>173.78</b> |
|         |             | 16QAM | 1 / 8                 | 1851.5  | 19.67        | 92.68         |
|         |             |       | 1 / 0                 | 1882.5  | 20.40        | 109.65        |
|         |             |       | 1 / 8                 | 1913.5  | <b>20.76</b> | <b>119.12</b> |
|         | 1.4         | QPSK  | 1 / 5                 | 1850.7  | 20.90        | 123.03        |
|         |             |       | 1 / 5                 | 1882.5  | 22.35        | 171.79        |
|         |             |       | 1 / 5                 | 1914.3  | <b>22.62</b> | <b>182.81</b> |
|         |             | 16QAM | 1 / 0                 | 1850.7  | 20.24        | 105.68        |
|         |             |       | 1 / 0                 | 1882.5  | 20.60        | 114.82        |
|         |             |       | 1 / 0                 | 1914.3  | <b>20.96</b> | <b>124.74</b> |

**LTE Band 26**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP/EIRP     |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 26 | 15          | QPSK  | 1 / 37                | 821.5   | 20.75        | 118.85        |
|         |             |       | 1 / 0                 | 831.5   | 20.83        | 121.06        |
|         |             |       | 1 / 0                 | 841.5   | <b>20.85</b> | <b>121.62</b> |
|         |             | 16QAM | 1 / 37                | 821.5   | 18.20        | 66.07         |
|         |             |       | 1 / 37                | 831.5   | 17.69        | 58.75         |
|         |             |       | 1 / 0                 | 841.5   | <b>18.28</b> | <b>67.30</b>  |
|         | 10          | QPSK  | 1 / 49                | 819.0   | 20.45        | 110.92        |
|         |             |       | 1 / 0                 | 829.0   | 20.61        | 115.08        |
|         |             |       | 1 / 0                 | 831.5   | 20.56        | 113.76        |
|         |             |       | 1 / 0                 | 844.0   | <b>20.82</b> | <b>120.78</b> |
|         |             | 16QAM | 1 / 49                | 819.0   | 18.04        | 63.68         |
|         |             |       | 1 / 0                 | 829.0   | 18.17        | 65.61         |
|         |             |       | 1 / 0                 | 831.5   | 17.94        | 62.23         |
|         |             |       | 1 / 49                | 844.0   | <b>18.25</b> | <b>66.83</b>  |
|         | 5           | QPSK  | 1 / 12                | 816.5   | <b>20.87</b> | <b>122.18</b> |
|         |             |       | 1 / 12                | 821.5   | 20.58        | 114.29        |
|         |             |       | 1 / 12                | 826.5   | 20.24        | 105.68        |
|         |             |       | 1 / 12                | 831.5   | 20.21        | 104.95        |
|         |             |       | 1 / 12                | 846.5   | 20.67        | 116.68        |
|         |             | 16QAM | 1 / 24                | 816.5   | <b>18.47</b> | <b>70.31</b>  |
|         |             |       | 1 / 24                | 821.5   | 18.11        | 64.71         |
|         |             |       | 1 / 24                | 826.5   | 17.65        | 58.21         |
|         |             |       | 1 / 24                | 831.5   | 17.71        | 59.02         |
|         |             |       | 1 / 24                | 846.5   | 18.40        | 69.18         |
|         | 3           | QPSK  | 1 / 8                 | 815.5   | 21.04        | 127.06        |
|         |             |       | 1 / 8                 | 822.5   | <b>21.05</b> | <b>127.35</b> |
|         |             |       | 1 / 14                | 825.5   | 20.33        | 107.89        |
|         |             |       | 1 / 14                | 831.5   | 20.00        | 100.00        |
|         |             |       | 1 / 8                 | 847.5   | 20.44        | 110.66        |
|         |             | 16QAM | 1 / 8                 | 815.5   | <b>18.25</b> | <b>66.83</b>  |
|         |             |       | 1 / 14                | 822.5   | 18.17        | 65.61         |
|         |             |       | 1 / 14                | 825.5   | 17.79        | 60.12         |
|         |             |       | 1 / 0                 | 831.5   | 18.10        | 64.57         |
|         |             |       | 1 / 8                 | 847.5   | 17.88        | 61.38         |
|         | 1.4         | QPSK  | 1 / 0                 | 814.7   | <b>20.95</b> | <b>124.45</b> |
|         |             |       | 1 / 3                 | 823.3   | 20.61        | 115.08        |
|         |             |       | 1 / 0                 | 824.7   | 20.22        | 105.20        |
|         |             |       | 1 / 3                 | 831.5   | 20.35        | 108.39        |
|         |             |       | 1 / 5                 | 848.3   | 20.26        | 106.17        |
|         |             | 16QAM | 1 / 5                 | 814.7   | <b>18.36</b> | <b>68.55</b>  |
|         |             |       | 1 / 5                 | 823.3   | 17.95        | 62.37         |
|         |             |       | 1 / 3                 | 824.7   | 18.14        | 65.16         |
|         |             |       | 1 / 3                 | 831.5   | 17.85        | 60.95         |
|         |             |       | 1 / 0                 | 848.3   | 17.47        | 55.85         |

**LTE Band 41(PC2)**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 41 | 20          | QPSK  | 1 / 99                | 2506.0  | <b>26.74</b> | <b>472.06</b> |
|         |             |       | 1 / 0                 | 2593.0  | 24.58        | 287.08        |
|         |             |       | 1 / 0                 | 2680.0  | 25.53        | 357.27        |
|         |             | 16QAM | 1 / 99                | 2506.0  | <b>26.58</b> | <b>454.99</b> |
|         |             |       | 1 / 0                 | 2593.0  | 24.38        | 274.16        |
|         |             |       | 1 / 0                 | 2680.0  | 23.97        | 249.46        |
|         | 15          | QPSK  | 1 / 37                | 2503.5  | <b>26.34</b> | <b>430.53</b> |
|         |             |       | 1 / 37                | 2593.0  | 24.54        | 284.45        |
|         |             |       | 1 / 0                 | 2682.5  | 24.77        | 299.92        |
|         |             | 16QAM | 1 / 0                 | 2503.5  | <b>26.37</b> | <b>433.51</b> |
|         |             |       | 1 / 37                | 2593.0  | 23.39        | 218.27        |
|         |             |       | 1 / 0                 | 2682.5  | 25.12        | 325.09        |
|         | 10          | QPSK  | 1 / 0                 | 2501.0  | <b>26.60</b> | <b>457.09</b> |
|         |             |       | 1 / 0                 | 2593.0  | 24.03        | 252.93        |
|         |             |       | 1 / 0                 | 2685.0  | 25.21        | 331.89        |
|         |             | 16QAM | 1 / 0                 | 2501.0  | <b>26.81</b> | <b>479.73</b> |
|         |             |       | 1 / 25                | 2593.0  | 23.68        | 233.35        |
|         |             |       | 1 / 0                 | 2685.0  | 24.94        | 311.89        |
|         | 5           | QPSK  | 1 / 12                | 2498.5  | <b>26.03</b> | <b>400.87</b> |
|         |             |       | 1 / 12                | 2593.0  | 24.16        | 260.62        |
|         |             |       | 1 / 12                | 2687.5  | 25.64        | 366.44        |
|         |             | 16QAM | 1 / 0                 | 2498.5  | <b>26.63</b> | <b>460.26</b> |
|         |             |       | 1 / 12                | 2593.0  | 25.95        | 393.55        |
|         |             |       | 1 / 12                | 2687.5  | 25.99        | 397.19        |

**LTE Band 66**

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|---------|-------------|-------|-----------------------|---------|--------------|---------------|
|         |             |       |                       |         | [dBm]        | [mW]          |
| Band 66 | 20          | QPSK  | 1 / 99                | 1720.0  | 22.47        | 176.60        |
|         |             |       | 1 / 0                 | 1745.0  | <b>22.89</b> | <b>194.54</b> |
|         |             |       | 1 / 0                 | 1770.0  | 21.63        | 145.55        |
|         |             | 16QAM | 1 / 99                | 1720.0  | 21.31        | 135.21        |
|         |             |       | 1 / 0                 | 1745.0  | <b>21.73</b> | <b>148.94</b> |
|         |             |       | 1 / 99                | 1770.0  | 19.39        | 86.90         |
|         | 15          | QPSK  | 1 / 37                | 1717.5  | <b>22.20</b> | <b>165.96</b> |
|         |             |       | 1 / 74                | 1747.5  | 21.92        | 155.60        |
|         |             |       | 1 / 37                | 1772.5  | 20.10        | 102.33        |
|         |             | 16QAM | 1 / 37                | 1717.5  | 20.96        | 124.74        |
|         |             |       | 1 / 74                | 1747.5  | <b>21.05</b> | <b>127.35</b> |
|         |             |       | 1 / 37                | 1772.5  | 19.16        | 82.41         |
|         | 10          | QPSK  | 1 / 49                | 1715.0  | <b>22.95</b> | <b>197.24</b> |
|         |             |       | 1 / 0                 | 1745.0  | 22.90        | 194.98        |
|         |             |       | 1 / 49                | 1775.0  | 20.94        | 124.17        |
|         |             | 16QAM | 1 / 49                | 1715.0  | <b>22.03</b> | <b>159.59</b> |
|         |             |       | 1 / 0                 | 1745.0  | 21.85        | 153.11        |
|         |             |       | 1 / 49                | 1775.0  | 19.91        | 97.95         |
|         | 5           | QPSK  | 1 / 24                | 1712.5  | <b>22.06</b> | <b>160.69</b> |
|         |             |       | 1 / 24                | 1745.0  | 21.59        | 144.21        |
|         |             |       | 1 / 12                | 1777.5  | 21.48        | 140.60        |
|         |             | 16QAM | 1 / 12                | 1712.5  | <b>21.06</b> | <b>127.64</b> |
|         |             |       | 1 / 12                | 1745.0  | 20.61        | 115.08        |
|         |             |       | 1 / 24                | 1777.5  | 19.72        | 93.76         |
|         | 3           | QPSK  | 1 / 8                 | 1711.5  | 21.79        | 151.01        |
|         |             |       | 1 / 0                 | 1745.0  | <b>21.97</b> | <b>157.40</b> |
|         |             |       | 1 / 8                 | 1778.5  | 19.45        | 88.10         |
|         |             | 16QAM | 1 / 14                | 1711.5  | <b>20.84</b> | <b>121.34</b> |
|         |             |       | 1 / 0                 | 1745.0  | 20.70        | 117.49        |
|         |             |       | 1 / 8                 | 1778.5  | 18.41        | 69.34         |
|         | 1.4         | QPSK  | 1 / 5                 | 1710.7  | 21.44        | 139.32        |
|         |             |       | 1 / 0                 | 1745.0  | <b>21.67</b> | <b>146.89</b> |
|         |             |       | 1 / 5                 | 1779.3  | 21.61        | 144.88        |
|         |             | 16QAM | 1 / 0                 | 1710.7  | 20.49        | 111.94        |
|         |             |       | 1 / 5                 | 1745.0  | <b>20.60</b> | <b>114.82</b> |
|         |             |       | 1 / 0                 | 1779.3  | 17.77        | 59.84         |

**LTE Band 2**

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 4**

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 5**

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band41(PC3)**

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

## 10.1.2. ERP/EIRP DATA

### GSM850

| GSM850<br><br>GPRS  | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789230288<br/> <b>Date:</b> 2019-11-20<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> GPRS 850 MHz Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: VULB9163-749, and Chamber 2 SMA Cables<br/> Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr> <td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>824.20</td><td>34.55</td><td>V</td><td>3.0</td><td>-1.0</td><td>30.59</td><td>38.5</td><td>-7.9</td><td></td></tr> <tr> <td>824.20</td><td>22.10</td><td>H</td><td>3.0</td><td>-1.0</td><td>18.14</td><td>38.5</td><td>-20.4</td><td></td></tr> <tr> <td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>836.60</td><td>34.66</td><td>V</td><td>3.0</td><td>-0.9</td><td>30.72</td><td>38.5</td><td>-7.8</td><td></td></tr> <tr> <td>836.60</td><td>21.80</td><td>H</td><td>3.0</td><td>-0.9</td><td>17.86</td><td>38.5</td><td>-20.6</td><td></td></tr> <tr> <td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>848.80</td><td>34.76</td><td>V</td><td>3.1</td><td>-0.9</td><td>30.85</td><td>38.5</td><td>-7.6</td><td></td></tr> <tr> <td>848.80</td><td>21.78</td><td>H</td><td>3.1</td><td>-0.9</td><td>17.87</td><td>38.5</td><td>-20.6</td><td></td></tr> </table>     |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 824.20 | 34.55 | V | 3.0 | -1.0 | 30.59 | 38.5 | -7.9  |  | 824.20 | 22.10 | H | 3.0 | -1.0 | 18.14 | 38.5 | -20.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.60 | 34.66 | V | 3.0 | -0.9 | 30.72 | 38.5 | -7.8  |  | 836.60 | 21.80 | H | 3.0 | -0.9 | 17.86 | 38.5 | -20.6 |  | High Ch |  |  |  |  |  |  |  |  | 848.80 | 34.76 | V | 3.1 | -0.9 | 30.85 | 38.5 | -7.6  |  | 848.80 | 21.78 | H | 3.1 | -0.9 | 17.87 | 38.5 | -20.6 |  |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
| f MHz               | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Low Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 34.55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 3.0             | -1.0               | 30.59     | 38.5        | -7.9       |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 22.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 3.0             | -1.0               | 18.14     | 38.5        | -20.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Mid Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 34.66                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 3.0             | -0.9               | 30.72     | 38.5        | -7.8       |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 21.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 3.0             | -0.9               | 17.86     | 38.5        | -20.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| High Ch             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 34.76                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 3.1             | -0.9               | 30.85     | 38.5        | -7.6       |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 21.78                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 3.1             | -0.9               | 17.87     | 38.5        | -20.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| GSM850<br><br>EGPRS | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789230288<br/> <b>Date:</b> 2019-11-20<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT, Z-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> EGPRS 850 MHz Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: VULB9163-749, and Chamber 2 SMA Cables<br/> Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr> <td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>824.20</td><td>28.93</td><td>V</td><td>3.0</td><td>-1.0</td><td>24.97</td><td>38.5</td><td>-13.5</td><td></td></tr> <tr> <td>824.20</td><td>16.00</td><td>H</td><td>3.0</td><td>-1.0</td><td>12.04</td><td>38.5</td><td>-26.5</td><td></td></tr> <tr> <td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>836.60</td><td>28.98</td><td>V</td><td>3.0</td><td>-0.9</td><td>25.04</td><td>38.5</td><td>-13.5</td><td></td></tr> <tr> <td>836.60</td><td>16.11</td><td>H</td><td>3.0</td><td>-0.9</td><td>12.17</td><td>38.5</td><td>-26.3</td><td></td></tr> <tr> <td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>848.80</td><td>29.32</td><td>V</td><td>3.1</td><td>-0.9</td><td>25.41</td><td>38.5</td><td>-13.1</td><td></td></tr> <tr> <td>848.80</td><td>15.93</td><td>H</td><td>3.1</td><td>-0.9</td><td>12.02</td><td>38.5</td><td>-26.5</td><td></td></tr> </table> |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 824.20 | 28.93 | V | 3.0 | -1.0 | 24.97 | 38.5 | -13.5 |  | 824.20 | 16.00 | H | 3.0 | -1.0 | 12.04 | 38.5 | -26.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.60 | 28.98 | V | 3.0 | -0.9 | 25.04 | 38.5 | -13.5 |  | 836.60 | 16.11 | H | 3.0 | -0.9 | 12.17 | 38.5 | -26.3 |  | High Ch |  |  |  |  |  |  |  |  | 848.80 | 29.32 | V | 3.1 | -0.9 | 25.41 | 38.5 | -13.1 |  | 848.80 | 15.93 | H | 3.1 | -0.9 | 12.02 | 38.5 | -26.5 |  |
| f MHz               | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Low Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 28.93                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 3.0             | -1.0               | 24.97     | 38.5        | -13.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 824.20              | 16.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 3.0             | -1.0               | 12.04     | 38.5        | -26.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| Mid Ch              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 28.98                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 3.0             | -0.9               | 25.04     | 38.5        | -13.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.60              | 16.11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 3.0             | -0.9               | 12.17     | 38.5        | -26.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| High Ch             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 29.32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 3.1             | -0.9               | 25.41     | 38.5        | -13.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 848.80              | 15.93                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 3.1             | -0.9               | 12.02     | 38.5        | -26.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |

**GSM1900**

| GSM1900<br>GPRS  | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789230288<br/> <b>Date:</b> 2019-11-19<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT, Z-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> GPRS 1900 MHz Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/> Substitution: Horn 3115[00167211], 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1850.20</td><td>19.85</td><td>V</td><td>4.5</td><td>9.5</td><td>24.86</td><td>33.0</td><td>-8.1</td><td></td></tr> <tr><td>1850.20</td><td>22.73</td><td>H</td><td>4.5</td><td>9.5</td><td>27.74</td><td>33.0</td><td>-5.3</td><td></td></tr> <tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1880.00</td><td>19.48</td><td>V</td><td>4.5</td><td>9.3</td><td>24.25</td><td>33.0</td><td>-8.7</td><td></td></tr> <tr><td>1880.00</td><td>24.03</td><td>H</td><td>4.5</td><td>9.3</td><td>28.80</td><td>33.0</td><td>-4.2</td><td></td></tr> <tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1909.80</td><td>21.90</td><td>V</td><td>4.6</td><td>9.1</td><td>26.39</td><td>33.0</td><td>-6.6</td><td></td></tr> <tr><td>1909.80</td><td>24.59</td><td>H</td><td>4.6</td><td>9.1</td><td>29.07</td><td>33.0</td><td>-3.9</td><td></td></tr> </table>    |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.20 | 19.85 | V | 4.5 | 9.5 | 24.86 | 33.0 | -8.1  |  | 1850.20 | 22.73 | H | 4.5 | 9.5 | 27.74 | 33.0 | -5.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 19.48 | V | 4.5 | 9.3 | 24.25 | 33.0 | -8.7  |  | 1880.00 | 24.03 | H | 4.5 | 9.3 | 28.80 | 33.0 | -4.2 |  | High Ch |  |  |  |  |  |  |  |  | 1909.80 | 21.90 | V | 4.6 | 9.1 | 26.39 | 33.0 | -6.6 |  | 1909.80 | 24.59 | H | 4.6 | 9.1 | 29.07 | 33.0 | -3.9 |  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|--|---------|-------|---|-----|-----|-------|------|------|--|
| f MHz            | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| Low Ch           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1850.20          | 19.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 4.5             | 9.5                | 24.86      | 33.0        | -8.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1850.20          | 22.73                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 4.5             | 9.5                | 27.74      | 33.0        | -5.3       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| Mid Ch           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1880.00          | 19.48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 4.5             | 9.3                | 24.25      | 33.0        | -8.7       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1880.00          | 24.03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 4.5             | 9.3                | 28.80      | 33.0        | -4.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| High Ch          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1909.80          | 21.90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 4.6             | 9.1                | 26.39      | 33.0        | -6.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1909.80          | 24.59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 4.6             | 9.1                | 29.07      | 33.0        | -3.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| GSM1900<br>EGPRS | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789230288<br/> <b>Date:</b> 2019-11-20<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT, Z-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> EGPRS 1900 MHz Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/> Substitution: Horn 3115[00167211], 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1850.20</td><td>16.97</td><td>V</td><td>4.5</td><td>9.5</td><td>21.98</td><td>33.0</td><td>-11.0</td><td></td></tr> <tr><td>1850.20</td><td>18.82</td><td>H</td><td>4.5</td><td>9.5</td><td>23.83</td><td>33.0</td><td>-9.2</td><td></td></tr> <tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1880.00</td><td>15.69</td><td>V</td><td>4.5</td><td>9.3</td><td>20.46</td><td>33.0</td><td>-12.5</td><td></td></tr> <tr><td>1880.00</td><td>19.21</td><td>H</td><td>4.5</td><td>9.3</td><td>23.98</td><td>33.0</td><td>-9.0</td><td></td></tr> <tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>1909.80</td><td>19.20</td><td>V</td><td>4.6</td><td>9.1</td><td>23.69</td><td>33.0</td><td>-9.3</td><td></td></tr> <tr><td>1909.80</td><td>21.60</td><td>H</td><td>4.6</td><td>9.1</td><td>26.08</td><td>33.0</td><td>-6.9</td><td></td></tr> </table> |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.20 | 16.97 | V | 4.5 | 9.5 | 21.98 | 33.0 | -11.0 |  | 1850.20 | 18.82 | H | 4.5 | 9.5 | 23.83 | 33.0 | -9.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 15.69 | V | 4.5 | 9.3 | 20.46 | 33.0 | -12.5 |  | 1880.00 | 19.21 | H | 4.5 | 9.3 | 23.98 | 33.0 | -9.0 |  | High Ch |  |  |  |  |  |  |  |  | 1909.80 | 19.20 | V | 4.6 | 9.1 | 23.69 | 33.0 | -9.3 |  | 1909.80 | 21.60 | H | 4.6 | 9.1 | 26.08 | 33.0 | -6.9 |  |
| f MHz            | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| Low Ch           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1850.20          | 16.97                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 4.5             | 9.5                | 21.98      | 33.0        | -11.0      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1850.20          | 18.82                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 4.5             | 9.5                | 23.83      | 33.0        | -9.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| Mid Ch           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1880.00          | 15.69                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 4.5             | 9.3                | 20.46      | 33.0        | -12.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1880.00          | 19.21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 4.5             | 9.3                | 23.98      | 33.0        | -9.0       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| High Ch          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1909.80          | 19.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | V               | 4.6             | 9.1                | 23.69      | 33.0        | -9.3       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |
| 1909.80          | 21.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H               | 4.6             | 9.1                | 26.08      | 33.0        | -6.9       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |  |         |       |   |     |     |       |      |      |  |

**WCDMA Band 5**

| WCDMA<br><br>Band 5<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-11-20<br/>Test Engineer: 20881<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: Rel99 Band 5 Fundamentals</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.40</td><td>20.96</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.00</td><td>38.5</td><td>-21.5</td></tr><tr><td>826.40</td><td>9.76</td><td>H</td><td>3.0</td><td>-0.9</td><td>5.80</td><td>38.5</td><td>-32.7</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.60</td><td>22.04</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.10</td><td>38.5</td><td>-20.4</td></tr><tr><td>836.60</td><td>11.11</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.17</td><td>38.5</td><td>-31.3</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.60</td><td>22.08</td><td>V</td><td>3.1</td><td>-0.9</td><td>18.16</td><td>38.5</td><td>-20.3</td></tr><tr><td>846.60</td><td>10.69</td><td>H</td><td>3.1</td><td>-0.9</td><td>6.78</td><td>38.5</td><td>-31.7</td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 826.40 | 20.96 | V | 3.0 | -0.9 | 17.00 | 38.5 | -21.5 | 826.40 | 9.76 | H | 3.0 | -0.9 | 5.80 | 38.5 | -32.7 | Mid Ch |  |  |  |  |  |  |  | 836.60 | 22.04 | V | 3.0 | -0.9 | 18.10 | 38.5 | -20.4 | 836.60 | 11.11 | H | 3.0 | -0.9 | 7.17 | 38.5 | -31.3 | High Ch |  |  |  |  |  |  |  | 846.60 | 22.08 | V | 3.1 | -0.9 | 18.16 | 38.5 | -20.3 | 846.60 | 10.69 | H | 3.1 | -0.9 | 6.78 | 38.5 | -31.7 |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|------|---|-----|------|------|------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|-------|---|-----|------|------|------|-------|---------|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--------|-------|---|-----|------|------|------|-------|
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20.96            | V               | 3.0             | -0.9               | 17.00     | 38.5        | -21.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 9.76             | H               | 3.0             | -0.9               | 5.80      | 38.5        | -32.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 22.04            | V               | 3.0             | -0.9               | 18.10     | 38.5        | -20.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11.11            | H               | 3.0             | -0.9               | 7.17      | 38.5        | -31.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 846.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 22.08            | V               | 3.1             | -0.9               | 18.16     | 38.5        | -20.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
| 846.60                       | 10.69                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | H                | 3.1             | -0.9            | 6.78               | 38.5      | -31.7       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
| WCDMA<br><br>Band 5<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-11-20<br/>Test Engineer: 20881<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: HSDPA Band 5 Fundamentals</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.40</td><td>19.47</td><td>V</td><td>3.0</td><td>-0.9</td><td>15.51</td><td>38.5</td><td>-23.0</td></tr><tr><td>826.40</td><td>8.15</td><td>H</td><td>3.0</td><td>-0.9</td><td>4.19</td><td>38.5</td><td>-34.3</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.60</td><td>20.29</td><td>V</td><td>3.0</td><td>-0.9</td><td>16.35</td><td>38.5</td><td>-22.1</td></tr><tr><td>836.60</td><td>8.48</td><td>H</td><td>3.0</td><td>-0.9</td><td>4.54</td><td>38.5</td><td>-34.0</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.60</td><td>20.20</td><td>V</td><td>3.1</td><td>-0.9</td><td>16.28</td><td>38.5</td><td>-22.2</td></tr><tr><td>846.60</td><td>8.83</td><td>H</td><td>3.1</td><td>-0.9</td><td>4.92</td><td>38.5</td><td>-33.6</td></tr></table>   |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 826.40 | 19.47 | V | 3.0 | -0.9 | 15.51 | 38.5 | -23.0 | 826.40 | 8.15 | H | 3.0 | -0.9 | 4.19 | 38.5 | -34.3 | Mid Ch |  |  |  |  |  |  |  | 836.60 | 20.29 | V | 3.0 | -0.9 | 16.35 | 38.5 | -22.1 | 836.60 | 8.48  | H | 3.0 | -0.9 | 4.54 | 38.5 | -34.0 | High Ch |  |  |  |  |  |  |  | 846.60 | 20.20 | V | 3.1 | -0.9 | 16.28 | 38.5 | -22.2 | 846.60 | 8.83  | H | 3.1 | -0.9 | 4.92 | 38.5 | -33.6 |
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 19.47            | V               | 3.0             | -0.9               | 15.51     | 38.5        | -23.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 8.15             | H               | 3.0             | -0.9               | 4.19      | 38.5        | -34.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20.29            | V               | 3.0             | -0.9               | 16.35     | 38.5        | -22.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 8.48             | H               | 3.0             | -0.9               | 4.54      | 38.5        | -34.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
|                              | 846.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20.20            | V               | 3.1             | -0.9               | 16.28     | 38.5        | -22.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |
| 846.60                       | 8.83                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 3.1             | -0.9            | 4.92               | 38.5      | -33.6       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |      |   |     |      |      |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |         |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |        |       |   |     |      |      |      |       |

**WCDMA Band 4**

| WCDMA<br><br>Band 4<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-03<br/>Test Engineer: 20896<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: Rel99 Band 4 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.40</td><td>12.14</td><td>V</td><td>4.3</td><td>9.4</td><td>17.22</td><td>30.0</td><td>-12.8</td></tr><tr><td>1712.40</td><td>18.92</td><td>H</td><td>4.3</td><td>9.4</td><td>24.00</td><td>30.0</td><td>-6.0</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.60</td><td>13.67</td><td>V</td><td>4.3</td><td>9.5</td><td>18.80</td><td>30.0</td><td>-11.2</td></tr><tr><td>1732.60</td><td>19.55</td><td>H</td><td>4.3</td><td>9.5</td><td>24.68</td><td>30.0</td><td>-5.3</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1752.60</td><td>13.48</td><td>V</td><td>4.4</td><td>9.5</td><td>18.66</td><td>30.0</td><td>-11.3</td></tr><tr><td>1752.60</td><td>17.61</td><td>H</td><td>4.4</td><td>9.5</td><td>22.79</td><td>30.0</td><td>-7.2</td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1712.40 | 12.14 | V | 4.3 | 9.4 | 17.22 | 30.0 | -12.8 | 1712.40 | 18.92 | H | 4.3 | 9.4 | 24.00 | 30.0 | -6.0 | Mid Ch |  |  |  |  |  |  |  | 1732.60 | 13.67 | V | 4.3 | 9.5 | 18.80 | 30.0 | -11.2 | 1732.60 | 19.55 | H | 4.3 | 9.5 | 24.68 | 30.0 | -5.3 | High Ch |  |  |  |  |  |  |  | 1752.60 | 13.48 | V | 4.4 | 9.5 | 18.66 | 30.0 | -11.3 | 1752.60 | 17.61 | H | 4.4 | 9.5 | 22.79 | 30.0 | -7.2 |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.14            | V               | 4.3             | 9.4                | 17.22      | 30.0        | -12.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 18.92            | H               | 4.3             | 9.4                | 24.00      | 30.0        | -6.0       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 13.67            | V               | 4.3             | 9.5                | 18.80      | 30.0        | -11.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 19.55            | H               | 4.3             | 9.5                | 24.68      | 30.0        | -5.3       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1752.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 13.48            | V               | 4.4             | 9.5                | 18.66      | 30.0        | -11.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| 1752.60                      | 17.61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                | 4.4             | 9.5             | 22.79              | 30.0       | -7.2        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| WCDMA<br><br>Band 4<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-03<br/>Test Engineer: 20896<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: HSDPA Band 4 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.40</td><td>12.10</td><td>V</td><td>4.3</td><td>9.4</td><td>17.18</td><td>30.0</td><td>-12.8</td></tr><tr><td>1712.40</td><td>18.68</td><td>H</td><td>4.3</td><td>9.4</td><td>23.76</td><td>30.0</td><td>-6.2</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.60</td><td>13.77</td><td>V</td><td>4.3</td><td>9.5</td><td>18.90</td><td>30.0</td><td>-11.1</td></tr><tr><td>1732.60</td><td>18.52</td><td>H</td><td>4.3</td><td>9.5</td><td>23.65</td><td>30.0</td><td>-6.4</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1752.60</td><td>13.60</td><td>V</td><td>4.4</td><td>9.5</td><td>18.78</td><td>30.0</td><td>-11.2</td></tr><tr><td>1752.60</td><td>17.39</td><td>H</td><td>4.4</td><td>9.5</td><td>22.57</td><td>30.0</td><td>-7.4</td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1712.40 | 12.10 | V | 4.3 | 9.4 | 17.18 | 30.0 | -12.8 | 1712.40 | 18.68 | H | 4.3 | 9.4 | 23.76 | 30.0 | -6.2 | Mid Ch |  |  |  |  |  |  |  | 1732.60 | 13.77 | V | 4.3 | 9.5 | 18.90 | 30.0 | -11.1 | 1732.60 | 18.52 | H | 4.3 | 9.5 | 23.65 | 30.0 | -6.4 | High Ch |  |  |  |  |  |  |  | 1752.60 | 13.60 | V | 4.4 | 9.5 | 18.78 | 30.0 | -11.2 | 1752.60 | 17.39 | H | 4.4 | 9.5 | 22.57 | 30.0 | -7.4 |
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.10            | V               | 4.3             | 9.4                | 17.18      | 30.0        | -12.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 18.68            | H               | 4.3             | 9.4                | 23.76      | 30.0        | -6.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 13.77            | V               | 4.3             | 9.5                | 18.90      | 30.0        | -11.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 18.52            | H               | 4.3             | 9.5                | 23.65      | 30.0        | -6.4       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1752.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 13.60            | V               | 4.4             | 9.5                | 18.78      | 30.0        | -11.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| 1752.60                      | 17.39                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                | 4.4             | 9.5             | 22.57              | 30.0       | -7.4        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |

**WCDMA Band 2**

| WCDMA<br>Band 2<br>REL99 | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789230288<br/> <b>Date:</b> 2019-12-03<br/> <b>Test Engineer:</b> 20890<br/> <b>Configuration:</b> EUT, X-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> Rel99 Band 2 Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/> Substitution: Horn 3115[00167211], 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr> <td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>1852.40</td><td>11.41</td><td>V</td><td>4.5</td><td>9.5</td><td>16.40</td><td>33.0</td><td>-16.6</td><td></td></tr> <tr> <td>1852.40</td><td>17.38</td><td>H</td><td>4.5</td><td>9.5</td><td>22.36</td><td>33.0</td><td>-10.6</td><td></td></tr> <tr> <td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>1880.00</td><td>13.19</td><td>V</td><td>4.5</td><td>9.3</td><td>17.96</td><td>33.0</td><td>-15.0</td><td></td></tr> <tr> <td>1880.00</td><td>18.70</td><td>H</td><td>4.5</td><td>9.3</td><td>23.47</td><td>33.0</td><td>-9.5</td><td></td></tr> <tr> <td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>1907.60</td><td>15.00</td><td>V</td><td>4.6</td><td>9.1</td><td>19.52</td><td>33.0</td><td>-13.5</td><td></td></tr> <tr> <td>1907.60</td><td>20.36</td><td>H</td><td>4.6</td><td>9.1</td><td>24.88</td><td>33.0</td><td>-8.1</td><td></td></tr> </table>  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1852.40 | 11.41 | V | 4.5 | 9.5 | 16.40 | 33.0 | -16.6 |  | 1852.40 | 17.38 | H | 4.5 | 9.5 | 22.36 | 33.0 | -10.6 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 13.19 | V | 4.5 | 9.3 | 17.96 | 33.0 | -15.0 |  | 1880.00 | 18.70 | H | 4.5 | 9.3 | 23.47 | 33.0 | -9.5  |  | High Ch |  |  |  |  |  |  |  |  | 1907.60 | 15.00 | V | 4.6 | 9.1 | 19.52 | 33.0 | -13.5 |  | 1907.60 | 20.36 | H | 4.6 | 9.1 | 24.88 | 33.0 | -8.1 |  |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
| f MHz                    | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Low Ch                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1852.40                  | 11.41                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | V               | 4.5             | 9.5                | 16.40      | 33.0        | -16.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1852.40                  | 17.38                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H               | 4.5             | 9.5                | 22.36      | 33.0        | -10.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Mid Ch                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                  | 13.19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | V               | 4.5             | 9.3                | 17.96      | 33.0        | -15.0      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                  | 18.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H               | 4.5             | 9.3                | 23.47      | 33.0        | -9.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| High Ch                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1907.60                  | 15.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | V               | 4.6             | 9.1                | 19.52      | 33.0        | -13.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1907.60                  | 20.36                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H               | 4.6             | 9.1                | 24.88      | 33.0        | -8.1       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| WCDMA<br>Band 2<br>HSDPA | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789230288<br/> <b>Date:</b> 2019-12-03<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT, X-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> HSDPA Band 2 Fundamentals </p> <p> <b>Test Equipment:</b><br/> Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/> Substitution: Horn 3115[00167211], 8.5m SMA-type Cable </p> <table> <tr> <th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr> <tr> <td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>1852.40</td><td>10.23</td><td>V</td><td>4.5</td><td>9.5</td><td>15.22</td><td>33.0</td><td>-17.8</td><td></td></tr> <tr> <td>1852.40</td><td>16.63</td><td>H</td><td>4.5</td><td>9.5</td><td>21.61</td><td>33.0</td><td>-11.4</td><td></td></tr> <tr> <td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>1880.00</td><td>12.55</td><td>V</td><td>4.5</td><td>9.3</td><td>17.32</td><td>33.0</td><td>-15.7</td><td></td></tr> <tr> <td>1880.00</td><td>17.52</td><td>H</td><td>4.5</td><td>9.3</td><td>22.29</td><td>33.0</td><td>-10.7</td><td></td></tr> <tr> <td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>1907.60</td><td>13.01</td><td>V</td><td>4.6</td><td>9.1</td><td>17.53</td><td>33.0</td><td>-15.5</td><td></td></tr> <tr> <td>1907.60</td><td>19.33</td><td>H</td><td>4.6</td><td>9.1</td><td>23.85</td><td>33.0</td><td>-9.2</td><td></td></tr> </table> |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1852.40 | 10.23 | V | 4.5 | 9.5 | 15.22 | 33.0 | -17.8 |  | 1852.40 | 16.63 | H | 4.5 | 9.5 | 21.61 | 33.0 | -11.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 12.55 | V | 4.5 | 9.3 | 17.32 | 33.0 | -15.7 |  | 1880.00 | 17.52 | H | 4.5 | 9.3 | 22.29 | 33.0 | -10.7 |  | High Ch |  |  |  |  |  |  |  |  | 1907.60 | 13.01 | V | 4.6 | 9.1 | 17.53 | 33.0 | -15.5 |  | 1907.60 | 19.33 | H | 4.6 | 9.1 | 23.85 | 33.0 | -9.2 |  |
| f MHz                    | SG reading (dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Low Ch                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1852.40                  | 10.23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | V               | 4.5             | 9.5                | 15.22      | 33.0        | -17.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1852.40                  | 16.63                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H               | 4.5             | 9.5                | 21.61      | 33.0        | -11.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Mid Ch                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                  | 12.55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | V               | 4.5             | 9.3                | 17.32      | 33.0        | -15.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                  | 17.52                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H               | 4.5             | 9.3                | 22.29      | 33.0        | -10.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| High Ch                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1907.60                  | 13.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | V               | 4.6             | 9.1                | 17.53      | 33.0        | -15.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1907.60                  | 19.33                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H               | 4.6             | 9.1                | 23.85      | 33.0        | -9.2       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |

**LTE Band 12**

LTE  
Band 12  
10MHz  
QPSK

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-02  
Test Engineer: 20882  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 12 Fundamentals, 10MHz Bandwidth

Test Equipment:  
Receiving: VULB9163-750, and Chamber 1 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 704.00  | 14.33            | V               | 2.8             | -1.1               | 10.49     | 34.8        | -24.3      |       |
| 704.00  | 20.72            | H               | 2.8             | -1.1               | 16.88     | 34.8        | -17.9      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 14.29            | V               | 2.8             | -1.1               | 10.45     | 34.8        | -24.4      |       |
| 707.50  | 20.83            | H               | 2.8             | -1.1               | 16.98     | 34.8        | -17.8      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 711.00  | 14.71            | V               | 2.8             | -1.1               | 10.85     | 34.8        | -23.9      |       |
| 711.00  | 21.07            | H               | 2.8             | -1.1               | 17.21     | 34.8        | -17.6      |       |

LTE  
Band 12  
10MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-02  
Test Engineer: 20882  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 12 Fundamentals, 10MHz Bandwidth

Test Equipment:  
Receiving: VULB9163-750, and Chamber 1 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 704.00  | 13.23            | V               | 2.8             | -1.1               | 9.39      | 34.8        | -25.4      |       |
| 704.00  | 19.52            | H               | 2.8             | -1.1               | 15.68     | 34.8        | -19.1      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 13.54            | V               | 2.8             | -1.1               | 9.70      | 34.8        | -25.1      |       |
| 707.50  | 19.77            | H               | 2.8             | -1.1               | 15.92     | 34.8        | -18.9      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 711.00  | 13.76            | V               | 2.8             | -1.1               | 9.90      | 34.8        | -24.9      |       |
| 711.00  | 20.05            | H               | 2.8             | -1.1               | 16.19     | 34.8        | -18.6      |       |

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789230288

2019-12-02

20882

EUT, X-Position

Chamber 1

LTE\_QPSK Band 12 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 701.50  | 14.54            | V               | 2.8             | -1.1               | 10.71     | 34.8        | -24.1      |       |
| 701.50  | 20.65            | H               | 2.8             | -1.1               | 16.81     | 34.8        | -18.0      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 14.63            | V               | 2.8             | -1.1               | 10.79     | 34.8        | -24.0      |       |
| 707.50  | 20.81            | H               | 2.8             | -1.1               | 16.96     | 34.8        | -17.8      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 713.50  | 14.83            | V               | 2.8             | -1.1               | 10.96     | 34.8        | -23.8      |       |
| 713.50  | 21.56            | H               | 2.8             | -1.1               | 17.70     | 34.8        | -17.1      |       |

LTE

Band 12

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789230288

2019-12-02

20882

EUT, X-Position

Chamber 1

LTE\_16QAM Band 12 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 701.50  | 13.25            | V               | 2.8             | -1.1               | 9.42      | 34.8        | -25.4      |       |
| 701.50  | 19.47            | H               | 2.8             | -1.1               | 15.63     | 34.8        | -19.2      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 13.20            | V               | 2.8             | -1.1               | 9.36      | 34.8        | -25.4      |       |
| 707.50  | 19.63            | H               | 2.8             | -1.1               | 15.78     | 34.8        | -19.0      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 713.50  | 13.74            | V               | 2.8             | -1.1               | 9.87      | 34.8        | -24.9      |       |
| 713.50  | 20.19            | H               | 2.8             | -1.1               | 16.33     | 34.8        | -18.5      |       |

| LTE<br>Band 12<br><br>3MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-02<br/>Test Engineer: 20882<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>700.50</td><td>14.13</td><td>V</td><td>2.8</td><td>-1.1</td><td>10.30</td><td>34.8</td><td>-24.5</td><td></td></tr><tr><td>700.50</td><td>20.35</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.52</td><td>34.8</td><td>-18.3</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>14.00</td><td>V</td><td>2.8</td><td>-1.1</td><td>10.16</td><td>34.8</td><td>-24.6</td><td></td></tr><tr><td>707.50</td><td>20.75</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.90</td><td>34.8</td><td>-17.9</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>714.50</td><td>14.20</td><td>V</td><td>2.8</td><td>-1.1</td><td>10.34</td><td>34.8</td><td>-24.5</td><td></td></tr><tr><td>714.50</td><td>21.12</td><td>H</td><td>2.8</td><td>-1.1</td><td>17.26</td><td>34.8</td><td>-17.5</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 700.50 | 14.13 | V | 2.8 | -1.1 | 10.30 | 34.8 | -24.5 |  | 700.50 | 20.35 | H | 2.8 | -1.1 | 16.52 | 34.8 | -18.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 14.00 | V | 2.8 | -1.1 | 10.16 | 34.8 | -24.6 |  | 707.50 | 20.75 | H | 2.8 | -1.1 | 16.90 | 34.8 | -17.9 |  | High Ch |  |  |  |  |  |  |  |  | 714.50 | 14.20 | V | 2.8 | -1.1 | 10.34 | 34.8 | -24.5 |  | 714.50 | 21.12 | H | 2.8 | -1.1 | 17.26 | 34.8 | -17.5 |  |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 14.13            | V               | 2.8             | -1.1               | 10.30     | 34.8        | -24.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.35            | H               | 2.8             | -1.1               | 16.52     | 34.8        | -18.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 14.00            | V               | 2.8             | -1.1               | 10.16     | 34.8        | -24.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.75            | H               | 2.8             | -1.1               | 16.90     | 34.8        | -17.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 714.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 14.20            | V               | 2.8             | -1.1               | 10.34     | 34.8        | -24.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 714.50                                  | 21.12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                | 2.8             | -1.1            | 17.26              | 34.8      | -17.5       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| LTE<br>Band 12<br><br>3MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-02<br/>Test Engineer: 20882<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>700.50</td><td>13.00</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.17</td><td>34.8</td><td>-25.6</td><td></td></tr><tr><td>700.50</td><td>19.36</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.53</td><td>34.8</td><td>-19.3</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>13.46</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.62</td><td>34.8</td><td>-25.2</td><td></td></tr><tr><td>707.50</td><td>19.01</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.16</td><td>34.8</td><td>-19.6</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>714.50</td><td>13.12</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.26</td><td>34.8</td><td>-25.5</td><td></td></tr><tr><td>714.50</td><td>20.12</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.26</td><td>34.8</td><td>-18.5</td><td></td></tr></table>   |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 700.50 | 13.00 | V | 2.8 | -1.1 | 9.17  | 34.8 | -25.6 |  | 700.50 | 19.36 | H | 2.8 | -1.1 | 15.53 | 34.8 | -19.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 13.46 | V | 2.8 | -1.1 | 9.62  | 34.8 | -25.2 |  | 707.50 | 19.01 | H | 2.8 | -1.1 | 15.16 | 34.8 | -19.6 |  | High Ch |  |  |  |  |  |  |  |  | 714.50 | 13.12 | V | 2.8 | -1.1 | 9.26  | 34.8 | -25.5 |  | 714.50 | 20.12 | H | 2.8 | -1.1 | 16.26 | 34.8 | -18.5 |  |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13.00            | V               | 2.8             | -1.1               | 9.17      | 34.8        | -25.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 19.36            | H               | 2.8             | -1.1               | 15.53     | 34.8        | -19.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13.46            | V               | 2.8             | -1.1               | 9.62      | 34.8        | -25.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 19.01            | H               | 2.8             | -1.1               | 15.16     | 34.8        | -19.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 714.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13.12            | V               | 2.8             | -1.1               | 9.26      | 34.8        | -25.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 714.50                                  | 20.12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                | 2.8             | -1.1            | 16.26              | 34.8      | -18.5       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |

| LTE<br>Band 12<br>1.4MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-02<br/>Test Engineer: 20882<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>699.70</td><td>14.15</td><td>V</td><td>2.8</td><td>-1.1</td><td>10.32</td><td>34.8</td><td>-24.5</td><td></td></tr><tr><td>699.70</td><td>20.28</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.44</td><td>34.8</td><td>-18.4</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>14.55</td><td>V</td><td>2.8</td><td>-1.1</td><td>10.71</td><td>34.8</td><td>-24.1</td><td></td></tr><tr><td>707.50</td><td>20.82</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.97</td><td>34.8</td><td>-17.8</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>715.30</td><td>14.44</td><td>V</td><td>2.8</td><td>-1.1</td><td>10.58</td><td>34.8</td><td>-24.2</td><td></td></tr><tr><td>715.30</td><td>21.19</td><td>H</td><td>2.8</td><td>-1.1</td><td>17.33</td><td>34.8</td><td>-17.5</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 699.70 | 14.15 | V | 2.8 | -1.1 | 10.32 | 34.8 | -24.5 |  | 699.70 | 20.28 | H | 2.8 | -1.1 | 16.44 | 34.8 | -18.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 14.55 | V | 2.8 | -1.1 | 10.71 | 34.8 | -24.1 |  | 707.50 | 20.82 | H | 2.8 | -1.1 | 16.97 | 34.8 | -17.8 |  | High Ch |  |  |  |  |  |  |  |  | 715.30 | 14.44 | V | 2.8 | -1.1 | 10.58 | 34.8 | -24.2 |  | 715.30 | 21.19 | H | 2.8 | -1.1 | 17.33 | 34.8 | -17.5 |  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 14.15            | V               | 2.8             | -1.1               | 10.32     | 34.8        | -24.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 20.28            | H               | 2.8             | -1.1               | 16.44     | 34.8        | -18.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 14.55            | V               | 2.8             | -1.1               | 10.71     | 34.8        | -24.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 20.82            | H               | 2.8             | -1.1               | 16.97     | 34.8        | -17.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 715.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 14.44            | V               | 2.8             | -1.1               | 10.58     | 34.8        | -24.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 715.30                            | 21.19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 2.8             | -1.1            | 17.33              | 34.8      | -17.5       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| LTE<br>Band 12<br>1.4MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-02<br/>Test Engineer: 20882<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>699.70</td><td>12.86</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.03</td><td>34.8</td><td>-25.8</td><td></td></tr><tr><td>699.70</td><td>19.46</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.62</td><td>34.8</td><td>-19.2</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>13.50</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.66</td><td>34.8</td><td>-25.1</td><td></td></tr><tr><td>707.50</td><td>19.69</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.84</td><td>34.8</td><td>-19.0</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>715.30</td><td>13.00</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.14</td><td>34.8</td><td>-25.7</td><td></td></tr><tr><td>715.30</td><td>20.03</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.17</td><td>34.8</td><td>-18.6</td><td></td></tr></table>   |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 699.70 | 12.86 | V | 2.8 | -1.1 | 9.03  | 34.8 | -25.8 |  | 699.70 | 19.46 | H | 2.8 | -1.1 | 15.62 | 34.8 | -19.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 13.50 | V | 2.8 | -1.1 | 9.66  | 34.8 | -25.1 |  | 707.50 | 19.69 | H | 2.8 | -1.1 | 15.84 | 34.8 | -19.0 |  | High Ch |  |  |  |  |  |  |  |  | 715.30 | 13.00 | V | 2.8 | -1.1 | 9.14  | 34.8 | -25.7 |  | 715.30 | 20.03 | H | 2.8 | -1.1 | 16.17 | 34.8 | -18.6 |  |
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.86            | V               | 2.8             | -1.1               | 9.03      | 34.8        | -25.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 19.46            | H               | 2.8             | -1.1               | 15.62     | 34.8        | -19.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13.50            | V               | 2.8             | -1.1               | 9.66      | 34.8        | -25.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 19.69            | H               | 2.8             | -1.1               | 15.84     | 34.8        | -19.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 715.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13.00            | V               | 2.8             | -1.1               | 9.14      | 34.8        | -25.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |
| 715.30                            | 20.03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 2.8             | -1.1            | 16.17              | 34.8      | -18.6       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |       |      |       |  |

**LTE Band 13**

| LTE<br>Band 13<br>10MHz<br>QPSK  | <div><div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div><div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-03<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 13 Fundamentals, 10MHz Bandwidth</div><div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div><table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBd)</th><th>ERP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>782.00</td><td>24.43</td><td>V</td><td>2.9</td><td>-1.1</td><td>20.44</td><td>34.8</td><td>-14.3</td><td></td></tr><tr><td>782.00</td><td>10.31</td><td>H</td><td>2.9</td><td>-1.1</td><td>6.32</td><td>34.8</td><td>-28.5</td><td></td></tr></table></div> | f<br>MHz           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)    | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm)  | Limit<br>(dBm) | Delta<br>(dB) | Notes | Mid Ch |  |  |  |  |  |  |  |  | 782.00 | 24.43 | V | 2.9 | -1.1 | 20.44 | 34.8 | -14.3 |  | 782.00 | 10.31 | H | 2.9 | -1.1 | 6.32 | 34.8 | -28.5 |  |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------|-----------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|
| f<br>MHz                         | SG reading<br>(dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)  | Antenna Gain<br>(dBd) | ERP<br>(dBm)       | Limit<br>(dBm)        | Delta<br>(dB) | Notes          |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Mid Ch                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                     |                       |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 782.00                           | 24.43                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V                  | 2.9                 | -1.1                  | 20.44              | 34.8                  | -14.3         |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 782.00                           | 10.31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 2.9                 | -1.1                  | 6.32               | 34.8                  | -28.5         |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| LTE<br>Band 13<br>10MHz<br>16QAM | <div><div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div><div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-03<br/>Test Engineer: 20882<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 13 Fundamentals, 10MHz Bandwidth</div><div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div><table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBd)</th><th>ERP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>782.00</td><td>23.79</td><td>V</td><td>2.9</td><td>-1.1</td><td>19.80</td><td>34.8</td><td>-15.0</td><td></td></tr><tr><td>782.00</td><td>9.38</td><td>H</td><td>2.9</td><td>-1.1</td><td>5.39</td><td>34.8</td><td>-29.4</td><td></td></tr></table></div> | f<br>MHz           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)    | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm)  | Limit<br>(dBm) | Delta<br>(dB) | Notes | Mid Ch |  |  |  |  |  |  |  |  | 782.00 | 23.79 | V | 2.9 | -1.1 | 19.80 | 34.8 | -15.0 |  | 782.00 | 9.38  | H | 2.9 | -1.1 | 5.39 | 34.8 | -29.4 |  |
| f<br>MHz                         | SG reading<br>(dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)  | Antenna Gain<br>(dBd) | ERP<br>(dBm)       | Limit<br>(dBm)        | Delta<br>(dB) | Notes          |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Mid Ch                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                     |                       |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 782.00                           | 23.79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V                  | 2.9                 | -1.1                  | 19.80              | 34.8                  | -15.0         |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 782.00                           | 9.38                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                  | 2.9                 | -1.1                  | 5.39               | 34.8                  | -29.4         |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |

LTE

Band 13

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789230288

2019-12-03

20882

EUT, Z-Position

Chamber 1

LTE\_QPSK Band 13 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 779.50  | 24.47            | V               | 2.9             | -1.1               | 20.49     | 34.8        | -14.3      |       |
| 779.50  | 10.23            | H               | 2.9             | -1.1               | 6.25      | 34.8        | -28.5      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 782.00  | 24.72            | V               | 2.9             | -1.1               | 20.73     | 34.8        | -14.0      |       |
| 782.00  | 9.91             | H               | 2.9             | -1.1               | 5.92      | 34.8        | -28.9      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 784.50  | 24.30            | V               | 2.9             | -1.1               | 20.31     | 34.8        | -14.5      |       |
| 784.50  | 10.52            | H               | 2.9             | -1.1               | 6.53      | 34.8        | -28.2      |       |

LTE

Band 13

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789230288

2019-12-03

20882

EUT, Z-Position

Chamber 1

LTE\_16QAM Band 13 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 779.50  | 23.23            | V               | 2.9             | -1.1               | 19.25     | 34.8        | -15.5      |       |
| 779.50  | 9.25             | H               | 2.9             | -1.1               | 5.27      | 34.8        | -29.5      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 782.00  | 24.05            | V               | 2.9             | -1.1               | 20.06     | 34.8        | -14.7      |       |
| 782.00  | 8.94             | H               | 2.9             | -1.1               | 4.95      | 34.8        | -29.8      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 784.50  | 23.53            | V               | 2.9             | -1.1               | 19.54     | 34.8        | -15.2      |       |
| 784.50  | 9.54             | H               | 2.9             | -1.1               | 5.55      | 34.8        | -29.2      |       |

**LTE Band 25**

LTE

Band 25

20MHz

QPSK

8.83

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-20  
Test Engineer: 20890  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 25 Fundamentals, 20MHz Bandwidth

Test Equipment:  
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1860.00 | 10.21            | V               | 4.5             | 9.4                | 15.14      | 33.0        | -17.9      |       |
| 1860.00 | 16.56            | H               | 4.5             | 9.4                | 21.48      | 33.0        | -11.5      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 11.02            | V               | 4.5             | 9.3                | 15.77      | 33.0        | -17.2      |       |
| 1882.50 | 17.38            | H               | 4.5             | 9.3                | 22.13      | 33.0        | -10.9      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1905.00 | 8.18             | V               | 4.6             | 9.1                | 12.73      | 33.0        | -20.3      |       |
| 1905.00 | 18.04            | H               | 4.6             | 9.1                | 22.59      | 33.0        | -10.4      |       |

LTE

Band 25

20MHz

16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-20  
Test Engineer: 20890  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 25 Fundamentals, 20MHz Bandwidth

Test Equipment:  
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1860.00 | 9.12             | V               | 4.5             | 9.4                | 14.05      | 33.0        | -19.0      |       |
| 1860.00 | 15.29            | H               | 4.5             | 9.4                | 20.21      | 33.0        | -12.8      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 10.00            | V               | 4.5             | 9.3                | 14.75      | 33.0        | -18.2      |       |
| 1882.50 | 16.15            | H               | 4.5             | 9.3                | 20.90      | 33.0        | -12.1      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1905.00 | 11.58            | V               | 4.6             | 9.1                | 16.13      | 33.0        | -16.9      |       |
| 1905.00 | 16.15            | H               | 4.6             | 9.1                | 20.70      | 33.0        | -12.3      |       |

LTE  
Band 25  
15MHz  
QPSK

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-20  
Test Engineer: 20890  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 25 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1857.50 | 10.07            | V               | 4.5             | 9.5                | 15.02      | 33.0        | -18.0      |       |
| 1857.50 | 16.57            | H               | 4.5             | 9.5                | 21.52      | 33.0        | -11.5      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 10.67            | V               | 4.5             | 9.3                | 15.42      | 33.0        | -17.6      |       |
| 1882.50 | 17.46            | H               | 4.5             | 9.3                | 22.21      | 33.0        | -10.8      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1907.50 | 7.39             | V               | 4.6             | 9.1                | 11.91      | 33.0        | -21.1      |       |
| 1907.50 | 18.31            | H               | 4.6             | 9.1                | 22.83      | 33.0        | -10.2      |       |

LTE  
Band 25  
15MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-20  
Test Engineer: 20890  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 25 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1857.50 | 8.61             | V               | 4.5             | 9.5                | 13.56      | 33.0        | -19.4      |       |
| 1857.50 | 15.20            | H               | 4.5             | 9.5                | 20.15      | 33.0        | -12.9      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1882.50 | 11.53            | V               | 4.5             | 9.3                | 16.28      | 33.0        | -16.7      |       |
| 1882.50 | 15.92            | H               | 4.5             | 9.3                | 20.67      | 33.0        | -12.3      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1907.50 | 6.02             | V               | 4.6             | 9.1                | 10.54      | 33.0        | -22.5      |       |
| 1907.50 | 16.63            | H               | 4.6             | 9.1                | 21.15      | 33.0        | -11.9      |       |

| LTE<br>Band 25<br><br>10MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-20<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1855.00</td><td>12.12</td><td>V</td><td>4.5</td><td>9.5</td><td>17.09</td><td>33.0</td><td>-15.9</td><td></td></tr><tr><td>1855.00</td><td>16.86</td><td>H</td><td>4.5</td><td>9.5</td><td>21.83</td><td>33.0</td><td>-11.2</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>12.60</td><td>V</td><td>4.5</td><td>9.3</td><td>17.35</td><td>33.0</td><td>-15.6</td><td></td></tr><tr><td>1882.50</td><td>17.75</td><td>H</td><td>4.5</td><td>9.3</td><td>22.50</td><td>33.0</td><td>-10.5</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1910.00</td><td>12.15</td><td>V</td><td>4.6</td><td>9.1</td><td>16.63</td><td>33.0</td><td>-16.4</td><td></td></tr><tr><td>1910.00</td><td>18.30</td><td>H</td><td>4.6</td><td>9.1</td><td>22.79</td><td>33.0</td><td>-10.2</td><td></td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1855.00 | 12.12 | V | 4.5 | 9.5 | 17.09 | 33.0 | -15.9 |  | 1855.00 | 16.86 | H | 4.5 | 9.5 | 21.83 | 33.0 | -11.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 12.60 | V | 4.5 | 9.3 | 17.35 | 33.0 | -15.6 |  | 1882.50 | 17.75 | H | 4.5 | 9.3 | 22.50 | 33.0 | -10.5 |  | High Ch |  |  |  |  |  |  |  |  | 1910.00 | 12.15 | V | 4.6 | 9.1 | 16.63 | 33.0 | -16.4 |  | 1910.00 | 18.30 | H | 4.6 | 9.1 | 22.79 | 33.0 | -10.2 |  |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.12               | V                  | 4.5                | 9.5                   | 17.09         | 33.0           | -15.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 16.86               | H                  | 4.5                | 9.5                   | 21.83         | 33.0           | -11.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.60               | V                  | 4.5                | 9.3                   | 17.35         | 33.0           | -15.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 17.75               | H                  | 4.5                | 9.3                   | 22.50         | 33.0           | -10.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1910.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.15               | V                  | 4.6                | 9.1                   | 16.63         | 33.0           | -16.4         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1910.00                                  | 18.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                   | 4.6                | 9.1                | 22.79                 | 33.0          | -10.2          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| LTE<br>Band 25<br><br>10MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-20<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1855.00</td><td>10.45</td><td>V</td><td>4.5</td><td>9.5</td><td>15.42</td><td>33.0</td><td>-17.6</td><td></td></tr><tr><td>1855.00</td><td>15.34</td><td>H</td><td>4.5</td><td>9.5</td><td>20.31</td><td>33.0</td><td>-12.7</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>10.83</td><td>V</td><td>4.5</td><td>9.3</td><td>15.58</td><td>33.0</td><td>-17.4</td><td></td></tr><tr><td>1882.50</td><td>16.07</td><td>H</td><td>4.5</td><td>9.3</td><td>20.82</td><td>33.0</td><td>-12.2</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1910.00</td><td>9.74</td><td>V</td><td>4.6</td><td>9.1</td><td>14.22</td><td>33.0</td><td>-18.8</td><td></td></tr><tr><td>1910.00</td><td>16.59</td><td>H</td><td>4.6</td><td>9.1</td><td>21.08</td><td>33.0</td><td>-11.9</td><td></td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1855.00 | 10.45 | V | 4.5 | 9.5 | 15.42 | 33.0 | -17.6 |  | 1855.00 | 15.34 | H | 4.5 | 9.5 | 20.31 | 33.0 | -12.7 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 10.83 | V | 4.5 | 9.3 | 15.58 | 33.0 | -17.4 |  | 1882.50 | 16.07 | H | 4.5 | 9.3 | 20.82 | 33.0 | -12.2 |  | High Ch |  |  |  |  |  |  |  |  | 1910.00 | 9.74  | V | 4.6 | 9.1 | 14.22 | 33.0 | -18.8 |  | 1910.00 | 16.59 | H | 4.6 | 9.1 | 21.08 | 33.0 | -11.9 |  |
|                                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.45               | V                  | 4.5                | 9.5                   | 15.42         | 33.0           | -17.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15.34               | H                  | 4.5                | 9.5                   | 20.31         | 33.0           | -12.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.83               | V                  | 4.5                | 9.3                   | 15.58         | 33.0           | -17.4         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 16.07               | H                  | 4.5                | 9.3                   | 20.82         | 33.0           | -12.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                          | 1910.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 9.74                | V                  | 4.6                | 9.1                   | 14.22         | 33.0           | -18.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1910.00                                  | 16.59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                   | 4.6                | 9.1                | 21.08                 | 33.0          | -11.9          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

| LTE<br>Band 25<br><br>5MHz<br><br>QPSK | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-20<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1852.50</td><td>10.20</td><td>V</td><td>4.5</td><td>9.5</td><td>15.19</td><td>33.0</td><td>-17.8</td></tr><tr><td>1852.50</td><td>16.67</td><td>H</td><td>4.5</td><td>9.5</td><td>21.66</td><td>33.0</td><td>-11.3</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1882.50</td><td>10.82</td><td>V</td><td>4.5</td><td>9.3</td><td>15.57</td><td>33.0</td><td>-17.4</td></tr><tr><td>1882.50</td><td>17.27</td><td>H</td><td>4.5</td><td>9.3</td><td>22.02</td><td>33.0</td><td>-11.0</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1912.50</td><td>7.33</td><td>V</td><td>4.6</td><td>9.0</td><td>11.79</td><td>33.0</td><td>-21.2</td></tr><tr><td>1912.50</td><td>18.53</td><td>H</td><td>4.6</td><td>9.0</td><td>22.99</td><td>33.0</td><td>-10.0</td></tr></table> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)  | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm)         | Limit<br>(dBm) | Delta<br>(dB)  | Notes         | Low Ch |        |  |  |  |  |  |  | 1852.50 | 10.20   | V    | 4.5 | 9.5 | 15.19 | 33.0  | -17.8 | 1852.50 | 16.67   | H     | 4.5 | 9.5 | 21.66 | 33.0  | -11.3 | Mid Ch |        |  |  |  |  |  |  | 1882.50 | 10.82   | V     | 4.5 | 9.3 | 15.57 | 33.0  | -17.4 | 1882.50 | 17.27   | H     | 4.5 | 9.3 | 22.02 | 33.0  | -11.0 | High Ch |         |  |  |  |  |  |  | 1912.50 | 7.33    | V    | 4.6 | 9.0 | 11.79 | 33.0  | -21.2 | 1912.50 | 18.53   | H     | 4.6 | 9.0 | 22.99 | 33.0  | -10.0 |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|---------------------|--------------------|-----------------------|-----------------------|----------------|----------------|---------------|--------|--------|--|--|--|--|--|--|---------|---------|------|-----|-----|-------|-------|-------|---------|---------|-------|-----|-----|-------|-------|-------|--------|--------|--|--|--|--|--|--|---------|---------|-------|-----|-----|-------|-------|-------|---------|---------|-------|-----|-----|-------|-------|-------|---------|---------|--|--|--|--|--|--|---------|---------|------|-----|-----|-------|-------|-------|---------|---------|-------|-----|-----|-------|-------|-------|
|                                        | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading<br>(dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | 1852.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V                  | 4.5                | 9.5                   | 15.19         | 33.0           | -17.8         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | 1852.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 16.67                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 4.5                | 9.5                   | 21.66         | 33.0           | -11.3         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10.82                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V                  | 4.5                | 9.3                   | 15.57         | 33.0           | -17.4         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 4.5                | 9.3                   | 22.02         | 33.0           | -11.0         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | 1912.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 7.33                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | V                  | 4.6                | 9.0                   | 11.79         | 33.0           | -21.2         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | 1912.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18.53                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 4.6                | 9.0                   | 22.99         | 33.0           | -10.0         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
|                                        | LTE<br>Band 25<br><br>5MHz<br><br>16QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-20<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1852.50</td><td>8.32</td><td>V</td><td>4.5</td><td>9.5</td><td>13.31</td><td>33.0</td><td>-19.7</td></tr><tr><td>1852.50</td><td>14.96</td><td>H</td><td>4.5</td><td>9.5</td><td>19.95</td><td>33.0</td><td>-13.1</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1882.50</td><td>11.39</td><td>V</td><td>4.5</td><td>9.3</td><td>16.14</td><td>33.0</td><td>-16.9</td></tr><tr><td>1882.50</td><td>15.84</td><td>H</td><td>4.5</td><td>9.3</td><td>20.59</td><td>33.0</td><td>-12.4</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1912.50</td><td>5.81</td><td>V</td><td>4.6</td><td>9.0</td><td>10.27</td><td>33.0</td><td>-22.7</td></tr><tr><td>1912.50</td><td>16.99</td><td>H</td><td>4.6</td><td>9.0</td><td>21.45</td><td>33.0</td><td>-11.6</td></tr></table> |                    |                    |                       |               |                |               |       |          | f<br>MHz            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)    | Antenna Gain<br>(dBi) | EIRP<br>(dBm)  | Limit<br>(dBm) | Delta<br>(dB) | Notes  | Low Ch |  |  |  |  |  |  |         | 1852.50 | 8.32 | V   | 4.5 | 9.5   | 13.31 | 33.0  | -19.7   | 1852.50 | 14.96 | H   | 4.5 | 9.5   | 19.95 | 33.0  | -13.1  | Mid Ch |  |  |  |  |  |  |         | 1882.50 | 11.39 | V   | 4.5 | 9.3   | 16.14 | 33.0  | -16.9   | 1882.50 | 15.84 | H   | 4.5 | 9.3   | 20.59 | 33.0  | -12.4   | High Ch |  |  |  |  |  |  |         | 1912.50 | 5.81 | V   | 4.6 | 9.0   | 10.27 | 33.0  | -22.7   | 1912.50 | 16.99 | H   | 4.6 | 9.0   | 21.45 | 33.0  |
| f<br>MHz                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SG reading<br>(dBm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| Low Ch                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| 1852.50                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 8.32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | V                  | 4.5                | 9.5                   | 13.31         | 33.0           | -19.7         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| 1852.50                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 14.96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 4.5                | 9.5                   | 19.95         | 33.0           | -13.1         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| Mid Ch                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| 1882.50                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11.39                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V                  | 4.5                | 9.3                   | 16.14         | 33.0           | -16.9         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| 1882.50                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15.84                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 4.5                | 9.3                   | 20.59         | 33.0           | -12.4         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| High Ch                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                    |                       |               |                |               |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| 1912.50                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5.81                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | V                  | 4.6                | 9.0                   | 10.27         | 33.0           | -22.7         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |
| 1912.50                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 16.99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                  | 4.6                | 9.0                   | 21.45         | 33.0           | -11.6         |       |          |                     |                     |                    |                       |                       |                |                |               |        |        |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |        |        |  |  |  |  |  |  |         |         |       |     |     |       |       |       |         |         |       |     |     |       |       |       |         |         |  |  |  |  |  |  |         |         |      |     |     |       |       |       |         |         |       |     |     |       |       |       |

| LTE<br>Band 25<br><br>3MHz<br><br>QPSK  | <div><div><div>UL Verification Services, Inc.</div><div>High Frequency Substitution Measurement</div></div><div><div>Company: Samsung</div><div>Project #: 4789230288</div><div>Date: 2019-12-20</div><div>Test Engineer: 20890</div><div>Configuration: EUT / X-Position</div><div>Location: Chamber 1</div><div>Mode: LTE_QPSK Band 25 Fundamentals, 3MHz Bandwidth</div></div><div><div>Test Equipment:</div><div>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables</div><div>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div></div><table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1851.50</td><td>11.51</td><td>V</td><td>4.5</td><td>9.5</td><td>16.51</td><td>33.0</td><td>-16.5</td><td></td></tr><tr><td>1851.50</td><td>16.60</td><td>H</td><td>4.5</td><td>9.5</td><td>21.60</td><td>33.0</td><td>-11.4</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>12.89</td><td>V</td><td>4.5</td><td>9.3</td><td>17.64</td><td>33.0</td><td>-15.4</td><td></td></tr><tr><td>1882.50</td><td>17.23</td><td>H</td><td>4.5</td><td>9.3</td><td>21.98</td><td>33.0</td><td>-11.0</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1913.50</td><td>11.72</td><td>V</td><td>4.6</td><td>9.0</td><td>16.16</td><td>33.0</td><td>-16.8</td><td></td></tr><tr><td>1913.50</td><td>17.96</td><td>H</td><td>4.6</td><td>9.0</td><td>22.40</td><td>33.0</td><td>-10.6</td><td></td></tr></table></div> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1851.50 | 11.51 | V | 4.5 | 9.5 | 16.51 | 33.0 | -16.5 |  | 1851.50 | 16.60 | H | 4.5 | 9.5 | 21.60 | 33.0 | -11.4 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 12.89 | V | 4.5 | 9.3 | 17.64 | 33.0 | -15.4 |  | 1882.50 | 17.23 | H | 4.5 | 9.3 | 21.98 | 33.0 | -11.0 |  | High Ch |  |  |  |  |  |  |  |  | 1913.50 | 11.72 | V | 4.6 | 9.0 | 16.16 | 33.0 | -16.8 |  | 1913.50 | 17.96 | H | 4.6 | 9.0 | 22.40 | 33.0 | -10.6 |  |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11.51            | V               | 4.5             | 9.5                | 16.51      | 33.0        | -16.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 16.60            | H               | 4.5             | 9.5                | 21.60      | 33.0        | -11.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12.89            | V               | 4.5             | 9.3                | 17.64      | 33.0        | -15.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 17.23            | H               | 4.5             | 9.3                | 21.98      | 33.0        | -11.0      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1913.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11.72            | V               | 4.6             | 9.0                | 16.16      | 33.0        | -16.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1913.50                                 | 17.96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 4.6             | 9.0             | 22.40              | 33.0       | -10.6       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| LTE<br>Band 25<br><br>3MHz<br><br>16QAM | <div><div><div>UL Verification Services, Inc.</div><div>High Frequency Substitution Measurement</div></div><div><div>Company: Samsung</div><div>Project #: 4789230288</div><div>Date: 2019-12-20</div><div>Test Engineer: 20890</div><div>Configuration: EUT / X-Position</div><div>Location: Chamber 1</div><div>Mode: LTE_16QAM Band 25 Fundamentals, 3MHz Bandwidth</div></div><div><div>Test Equipment:</div><div>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables</div><div>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div></div><table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1851.50</td><td>9.93</td><td>V</td><td>4.5</td><td>9.5</td><td>14.93</td><td>33.0</td><td>-18.1</td><td></td></tr><tr><td>1851.50</td><td>14.67</td><td>H</td><td>4.5</td><td>9.5</td><td>19.67</td><td>33.0</td><td>-13.3</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>11.20</td><td>V</td><td>4.5</td><td>9.3</td><td>15.95</td><td>33.0</td><td>-17.0</td><td></td></tr><tr><td>1882.50</td><td>15.65</td><td>H</td><td>4.5</td><td>9.3</td><td>20.40</td><td>33.0</td><td>-12.6</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1913.50</td><td>9.96</td><td>V</td><td>4.6</td><td>9.0</td><td>14.40</td><td>33.0</td><td>-18.6</td><td></td></tr><tr><td>1913.50</td><td>16.32</td><td>H</td><td>4.6</td><td>9.0</td><td>20.76</td><td>33.0</td><td>-12.2</td><td></td></tr></table></div>  |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1851.50 | 9.93  | V | 4.5 | 9.5 | 14.93 | 33.0 | -18.1 |  | 1851.50 | 14.67 | H | 4.5 | 9.5 | 19.67 | 33.0 | -13.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 11.20 | V | 4.5 | 9.3 | 15.95 | 33.0 | -17.0 |  | 1882.50 | 15.65 | H | 4.5 | 9.3 | 20.40 | 33.0 | -12.6 |  | High Ch |  |  |  |  |  |  |  |  | 1913.50 | 9.96  | V | 4.6 | 9.0 | 14.40 | 33.0 | -18.6 |  | 1913.50 | 16.32 | H | 4.6 | 9.0 | 20.76 | 33.0 | -12.2 |  |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 9.93             | V               | 4.5             | 9.5                | 14.93      | 33.0        | -18.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1851.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 14.67            | H               | 4.5             | 9.5                | 19.67      | 33.0        | -13.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11.20            | V               | 4.5             | 9.3                | 15.95      | 33.0        | -17.0      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15.65            | H               | 4.5             | 9.3                | 20.40      | 33.0        | -12.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                         | 1913.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 9.96             | V               | 4.6             | 9.0                | 14.40      | 33.0        | -18.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1913.50                                 | 16.32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 4.6             | 9.0             | 20.76              | 33.0       | -12.2       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

| LTE<br>Band 25<br>1.4MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-20<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 25 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1850.70</td><td>9.91</td><td>V</td><td>4.5</td><td>9.5</td><td>14.91</td><td>33.0</td><td>-18.1</td><td></td></tr><tr><td>1850.70</td><td>15.90</td><td>H</td><td>4.5</td><td>9.5</td><td>20.90</td><td>33.0</td><td>-12.1</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>13.53</td><td>V</td><td>4.5</td><td>9.3</td><td>18.28</td><td>33.0</td><td>-14.7</td><td></td></tr><tr><td>1882.50</td><td>17.60</td><td>H</td><td>4.5</td><td>9.3</td><td>22.35</td><td>33.0</td><td>-10.7</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1914.30</td><td>12.14</td><td>V</td><td>4.6</td><td>9.0</td><td>16.57</td><td>33.0</td><td>-16.4</td><td></td></tr><tr><td>1914.30</td><td>18.19</td><td>H</td><td>4.6</td><td>9.0</td><td>22.62</td><td>33.0</td><td>-10.4</td><td></td></tr></table>  |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.70 | 9.91 | V | 4.5 | 9.5 | 14.91 | 33.0 | -18.1 |  | 1850.70 | 15.90 | H | 4.5 | 9.5 | 20.90 | 33.0 | -12.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 13.53 | V | 4.5 | 9.3 | 18.28 | 33.0 | -14.7 |  | 1882.50 | 17.60 | H | 4.5 | 9.3 | 22.35 | 33.0 | -10.7 |  | High Ch |  |  |  |  |  |  |  |  | 1914.30 | 12.14 | V | 4.6 | 9.0 | 16.57 | 33.0 | -16.4 |  | 1914.30 | 18.19 | H | 4.6 | 9.0 | 22.62 | 33.0 | -10.4 |  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.91             | V               | 4.5             | 9.5                | 14.91      | 33.0        | -18.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 15.90            | H               | 4.5             | 9.5                | 20.90      | 33.0        | -12.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 13.53            | V               | 4.5             | 9.3                | 18.28      | 33.0        | -14.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 17.60            | H               | 4.5             | 9.3                | 22.35      | 33.0        | -10.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1914.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.14            | V               | 4.6             | 9.0                | 16.57      | 33.0        | -16.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1914.30                           | 18.19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.6             | 9.0             | 22.62              | 33.0       | -10.4       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| LTE<br>Band 25<br>1.4MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789230288<br/>Date: 2019-12-20<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 25 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br/>Substitution: Horn 3115[00167211], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1850.70</td><td>8.49</td><td>V</td><td>4.5</td><td>9.5</td><td>13.49</td><td>33.0</td><td>-19.5</td><td></td></tr><tr><td>1850.70</td><td>15.24</td><td>H</td><td>4.5</td><td>9.5</td><td>20.24</td><td>33.0</td><td>-12.8</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1882.50</td><td>11.66</td><td>V</td><td>4.5</td><td>9.3</td><td>16.41</td><td>33.0</td><td>-16.6</td><td></td></tr><tr><td>1882.50</td><td>15.85</td><td>H</td><td>4.5</td><td>9.3</td><td>20.60</td><td>33.0</td><td>-12.4</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1914.30</td><td>10.48</td><td>V</td><td>4.6</td><td>9.0</td><td>14.91</td><td>33.0</td><td>-18.1</td><td></td></tr><tr><td>1914.30</td><td>16.53</td><td>H</td><td>4.6</td><td>9.0</td><td>20.96</td><td>33.0</td><td>-12.0</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.70 | 8.49 | V | 4.5 | 9.5 | 13.49 | 33.0 | -19.5 |  | 1850.70 | 15.24 | H | 4.5 | 9.5 | 20.24 | 33.0 | -12.8 |  | Mid Ch |  |  |  |  |  |  |  |  | 1882.50 | 11.66 | V | 4.5 | 9.3 | 16.41 | 33.0 | -16.6 |  | 1882.50 | 15.85 | H | 4.5 | 9.3 | 20.60 | 33.0 | -12.4 |  | High Ch |  |  |  |  |  |  |  |  | 1914.30 | 10.48 | V | 4.6 | 9.0 | 14.91 | 33.0 | -18.1 |  | 1914.30 | 16.53 | H | 4.6 | 9.0 | 20.96 | 33.0 | -12.0 |  |
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 8.49             | V               | 4.5             | 9.5                | 13.49      | 33.0        | -19.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1850.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 15.24            | H               | 4.5             | 9.5                | 20.24      | 33.0        | -12.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.66            | V               | 4.5             | 9.3                | 16.41      | 33.0        | -16.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1882.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 15.85            | H               | 4.5             | 9.3                | 20.60      | 33.0        | -12.4      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                   | 1914.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10.48            | V               | 4.6             | 9.0                | 14.91      | 33.0        | -18.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1914.30                           | 16.53                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H                | 4.6             | 9.0             | 20.96              | 33.0       | -12.0       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |      |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

**LTE Band 26**

|                                 |                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|
| LTE<br>Band 26<br>15MHz<br>QPSK | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Company:</b> Samsung<br><b>Project #:</b> 4789230288<br><b>Date:</b> 2019-12-17<br><b>Test Engineer:</b> 20881<br><b>Configuration:</b> EUT, Z-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 26 Fundamentals, 15MHz Bandwidth |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Test Equipment:</b><br>Receiving: VULB9163-749, and Chamber 2 SMA Cables<br>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>f</b>                                                                                                                                                                                                                                                | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>ERP</b>   | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                 | <b>MHz</b>                                                                                                                                                                                                                                              | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBd)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                 | Low Ch                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | 821.50                                                                                                                                                                                                                                                  | 24.72             | V                | 3.0               | -1.0                | 20.75        | 50.0         | -29.3        | Part 90      |
|                                 | 821.50                                                                                                                                                                                                                                                  | 13.98             | H                | 3.0               | -1.0                | 10.01        | 50.0         | -40.0        | Part 90      |
|                                 |                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Company:</b> Samsung<br><b>Project #:</b> 4789230288<br><b>Date:</b> 2019-12-17<br><b>Test Engineer:</b> 20881<br><b>Configuration:</b> EUT, Z-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 26 Fundamentals, 15MHz Bandwidth |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Test Equipment:</b><br>Receiving: VULB9163-749, and Chamber 2 SMA Cables<br>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>f</b>                                                                                                                                                                                                                                                | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>ERP</b>   | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                 | <b>MHz</b>                                                                                                                                                                                                                                              | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBd)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                 | Mid Ch                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | 831.50                                                                                                                                                                                                                                                  | 24.78             | V                | 3.0               | -0.9                | 20.83        | 38.5         | -17.7        |              |
|                                 | 831.50                                                                                                                                                                                                                                                  | 14.12             | H                | 3.0               | -0.9                | 10.17        | 38.5         | -28.3        |              |
|                                 | High Ch                                                                                                                                                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
|                                 | 841.50                                                                                                                                                                                                                                                  | 24.78             | V                | 3.0               | -0.9                | 20.85        | 38.5         | -17.6        |              |
|                                 | 841.50                                                                                                                                                                                                                                                  | 13.99             | H                | 3.0               | -0.9                | 10.07        | 38.5         | -28.4        |              |

LTE  
Band 26  
15MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-17  
Test Engineer: 20881  
Configuration: EUT, Z-Position  
Location: Chamber 2  
Mode: LTE\_16QAM Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:  
Receiving: VULB9163-749, and Chamber 2 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 821.50 | 22.17            | V               | 3.0             | -1.0               | 18.20     | 50.0        | -31.8      | Part 90 |
| 821.50 | 11.32            | H               | 3.0             | -1.0               | 7.35      | 50.0        | -42.7      | Part 90 |

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789230288  
Date: 2019-12-17  
Test Engineer: 20881  
Configuration: EUT, Z-Position  
Location: Chamber 2  
Mode: LTE\_16QAM Band 26 Fundamentals, 15MHz Bandwidth

Test Equipment:  
Receiving: VULB9163-749, and Chamber 2 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 21.64            | V               | 3.0             | -0.9               | 17.69     | 38.5        | -20.8      |       |
| 831.50  | 11.26            | H               | 3.0             | -0.9               | 7.31      | 38.5        | -31.2      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 841.50  | 22.21            | V               | 3.0             | -0.9               | 18.28     | 38.5        | -20.2      |       |
| 841.50  | 11.77            | H               | 3.0             | -0.9               | 7.85      | 38.5        | -30.7      |       |

LTE

Band 26

10MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: VULB9163-749, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes   |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|---------|
| Low Ch   |                     |                    |                    |                       |              |                |               |         |
| 819.00   | 24.43               | V                  | 3.0                | -1.0                  | 20.45        | 50.0           | -29.5         | Part 90 |
| 819.00   | 13.95               | H                  | 3.0                | -1.0                  | 9.97         | 50.0           | -40.0         | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: VULB9163-749, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |               |       |
| 829.00   | 24.57               | V                  | 3.0                | -0.9                  | 20.61        | 38.5           | -17.9         |       |
| 829.00   | 14.09               | H                  | 3.0                | -0.9                  | 10.14        | 38.5           | -28.4         |       |
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 831.50   | 24.51               | V                  | 3.0                | -0.9                  | 20.56        | 38.5           | -17.9         |       |
| 831.50   | 13.98               | H                  | 3.0                | -0.9                  | 10.03        | 38.5           | -28.5         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 844.00   | 24.74               | V                  | 3.0                | -0.9                  | 20.82        | 38.5           | -17.7         |       |
| 844.00   | 13.83               | H                  | 3.0                | -0.9                  | 9.91         | 38.5           | -28.6         |       |



LTE

Band 26

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789230288

2019-12-17

20881

EUT, Z-Position

Chamber 2

LTE\_QPSK Band 26 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-749, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 816.50 | 24.85            | V               | 3.0             | -1.0               | 20.87     | 50.0        | -29.1      | Part 90 |
| 816.50 | 13.64            | H               | 3.0             | -1.0               | 9.66      | 50.0        | -40.3      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 821.50 | 24.55            | V               | 3.0             | -1.0               | 20.58     | 50.0        | -29.4      | Part 90 |
| 821.50 | 13.96            | H               | 3.0             | -1.0               | 9.99      | 50.0        | -40.0      | Part 90 |

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789230288

2019-12-17

20881

EUT, Z-Position

Chamber 2

LTE\_QPSK Band 26 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-749, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 826.50  | 24.20            | V               | 3.0             | -0.9               | 20.24     | 38.5        | -18.3      |       |
| 826.50  | 13.99            | H               | 3.0             | -0.9               | 10.03     | 38.5        | -28.5      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 24.16            | V               | 3.0             | -0.9               | 20.21     | 38.5        | -18.3      |       |
| 831.50  | 13.94            | H               | 3.0             | -0.9               | 9.99      | 38.5        | -28.5      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 846.50  | 24.58            | V               | 3.0             | -0.9               | 20.67     | 38.5        | -17.8      |       |
| 846.50  | 13.64            | H               | 3.0             | -0.9               | 9.72      | 38.5        | -28.8      |       |

| LTE<br><br>Band 26<br><br>5MHz<br><br>16QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|--------------------|-----------|-------------|------------|---------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|---------|--------|-------|---|-----|------|------|------|-------|---------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|---------|--------|-------|---|-----|------|------|------|-------|---------|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Company:                                                                  |                                                | Samsung                                        |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Project #:                                                                |                                                | 4789230288                                     |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Date:                                                                     |                                                | 2019-12-17                                     |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Test Engineer:                                                            |                                                | 20881                                          |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Configuration:                                                            |                                                | EUT, Z-Position                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Location:                                                                 |                                                | Chamber 2                                      |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mode:                                                                     |                                                | LTE_16QAM Band 26 Fundamentals, 5MHz Bandwidth |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <u>Test Equipment:</u>                                                    |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Receiving: VULB9163-749, and Chamber 2 SMA Cables                         |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>816.50</td><td>22.45</td><td>V</td><td>3.0</td><td>-1.0</td><td>18.47</td><td>50.0</td><td>-31.5</td><td>Part 90</td></tr><tr><td>816.50</td><td>11.47</td><td>H</td><td>3.0</td><td>-1.0</td><td>7.49</td><td>50.0</td><td>-42.5</td><td>Part 90</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>821.50</td><td>22.08</td><td>V</td><td>3.0</td><td>-1.0</td><td>18.11</td><td>50.0</td><td>-31.9</td><td>Part 90</td></tr><tr><td>821.50</td><td>11.48</td><td>H</td><td>3.0</td><td>-1.0</td><td>7.51</td><td>50.0</td><td>-42.5</td><td>Part 90</td></tr></table>                                                                                                                                                                                                                                                                                                                           |                                                                           |                                                |                                                |                    |           |             |            |         | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 816.50 | 22.45 | V | 3.0 | -1.0 | 18.47 | 50.0 | -31.5 | Part 90 | 816.50 | 11.47 | H | 3.0 | -1.0 | 7.49 | 50.0 | -42.5 | Part 90 | Mid Ch |  |  |  |  |  |  |  |  | 821.50 | 22.08 | V | 3.0 | -1.0 | 18.11 | 50.0 | -31.9 | Part 90 | 821.50 | 11.48 | H | 3.0 | -1.0 | 7.51 | 50.0 | -42.5 | Part 90 |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm)                                                          | Ant. Pol. (H/V)                                | Cable Loss (dB)                                | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 816.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.45                                                                     | V                                              | 3.0                                            | -1.0               | 18.47     | 50.0        | -31.5      | Part 90 |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 816.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.47                                                                     | H                                              | 3.0                                            | -1.0               | 7.49      | 50.0        | -42.5      | Part 90 |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 821.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.08                                                                     | V                                              | 3.0                                            | -1.0               | 18.11     | 50.0        | -31.9      | Part 90 |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 821.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.48                                                                     | H                                              | 3.0                                            | -1.0               | 7.51      | 50.0        | -42.5      | Part 90 |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Company:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                           | Samsung                                        |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Project #:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           | 4789230288                                     |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                           | 2019-12-17                                     |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Test Engineer:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           | 20881                                          |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Configuration:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           | EUT, Z-Position                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Location:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                           | Chamber 2                                      |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Mode:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                           | LTE_16QAM Band 26 Fundamentals, 5MHz Bandwidth |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| <u>Test Equipment:</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Receiving: VULB9163-749, and Chamber 2 SMA Cables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.50</td><td>21.61</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.65</td><td>38.5</td><td>-20.8</td><td></td></tr><tr><td>826.50</td><td>11.63</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.67</td><td>38.5</td><td>-30.8</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>831.50</td><td>21.66</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.71</td><td>38.5</td><td>-20.8</td><td></td></tr><tr><td>831.50</td><td>11.18</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.23</td><td>38.5</td><td>-31.3</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.50</td><td>22.31</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.40</td><td>38.5</td><td>-20.1</td><td></td></tr><tr><td>846.50</td><td>11.14</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.22</td><td>38.5</td><td>-31.3</td><td></td></tr></table> |                                                                           |                                                |                                                |                    |           |             |            |         | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 826.50 | 21.61 | V | 3.0 | -0.9 | 17.65 | 38.5 | -20.8 |         | 826.50 | 11.63 | H | 3.0 | -0.9 | 7.67 | 38.5 | -30.8 |         | Mid Ch |  |  |  |  |  |  |  |  | 831.50 | 21.66 | V | 3.0 | -0.9 | 17.71 | 38.5 | -20.8 |         | 831.50 | 11.18 | H | 3.0 | -0.9 | 7.23 | 38.5 | -31.3 |         | High Ch |  |  |  |  |  |  |  |  | 846.50 | 22.31 | V | 3.0 | -0.9 | 18.40 | 38.5 | -20.1 |  | 846.50 | 11.14 | H | 3.0 | -0.9 | 7.22 | 38.5 | -31.3 |  |
| f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm)                                                          | Ant. Pol. (H/V)                                | Cable Loss (dB)                                | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 826.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.61                                                                     | V                                              | 3.0                                            | -0.9               | 17.65     | 38.5        | -20.8      |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 826.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.63                                                                     | H                                              | 3.0                                            | -0.9               | 7.67      | 38.5        | -30.8      |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 831.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.66                                                                     | V                                              | 3.0                                            | -0.9               | 17.71     | 38.5        | -20.8      |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 831.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.18                                                                     | H                                              | 3.0                                            | -0.9               | 7.23      | 38.5        | -31.3      |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                           |                                                |                                                |                    |           |             |            |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 846.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.31                                                                     | V                                              | 3.0                                            | -0.9               | 18.40     | 38.5        | -20.1      |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 846.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.14                                                                     | H                                              | 3.0                                            | -0.9               | 7.22      | 38.5        | -31.3      |         |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |         |        |       |   |     |      |      |      |       |         |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |

|                                |                                                                                                                                                                                                                                            |                            |                           |                           |                              |                     |                       |                      |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|---------------------------|------------------------------|---------------------|-----------------------|----------------------|
| LTE<br>Band 26<br>3MHz<br>QPSK | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                    |                            |                           |                           |                              |                     |                       |                      |
|                                | <b>Company:</b> Samsung<br><b>Project #:</b> 4789230288<br><b>Date:</b> 2019-12-18<br><b>Test Engineer:</b> 20896<br><b>Configuration:</b> EUT<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 26 Fundamentals, 3MHz Bandwidth |                            |                           |                           |                              |                     |                       |                      |
|                                | <b>Test Equipment:</b><br>Receiving: VULB9163-749, and Chamber 2 SMA Cables<br>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                                                                                                          |                            |                           |                           |                              |                     |                       |                      |
|                                | <b>f</b><br>MHz                                                                                                                                                                                                                            | <b>SG reading</b><br>(dBm) | <b>Ant. Pol.</b><br>(H/V) | <b>Cable Loss</b><br>(dB) | <b>Antenna Gain</b><br>(dBd) | <b>ERP</b><br>(dBm) | <b>Limit</b><br>(dBm) | <b>Delta</b><br>(dB) |
|                                | Low Ch                                                                                                                                                                                                                                     |                            |                           |                           |                              |                     |                       |                      |
|                                | 815.50                                                                                                                                                                                                                                     | 25.03                      | V                         | 3.0                       | -1.0                         | 21.04               | 50.0                  | -29.0                |
|                                | 815.50                                                                                                                                                                                                                                     | 13.21                      | H                         | 3.0                       | -1.0                         | 9.22                | 50.0                  | -40.8                |
|                                | Mid Ch                                                                                                                                                                                                                                     |                            |                           |                           |                              |                     |                       |                      |
|                                | 822.50                                                                                                                                                                                                                                     | 25.01                      | V                         | 3.0                       | -1.0                         | 21.05               | 50.0                  | -29.0                |
|                                | 822.50                                                                                                                                                                                                                                     | 13.65                      | H                         | 3.0                       | -1.0                         | 9.69                | 50.0                  | -40.3                |
|                                | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                    |                            |                           |                           |                              |                     |                       |                      |
|                                | <b>Company:</b> Samsung<br><b>Project #:</b> 4789230288<br><b>Date:</b> 2019-12-18<br><b>Test Engineer:</b> 20896<br><b>Configuration:</b> EUT<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 26 Fundamentals, 3MHz Bandwidth |                            |                           |                           |                              |                     |                       |                      |
|                                | <b>Test Equipment:</b><br>Receiving: VULB9163-749, and Chamber 2 SMA Cables<br>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable                                                                                                          |                            |                           |                           |                              |                     |                       |                      |
|                                | <b>f</b><br>MHz                                                                                                                                                                                                                            | <b>SG reading</b><br>(dBm) | <b>Ant. Pol.</b><br>(H/V) | <b>Cable Loss</b><br>(dB) | <b>Antenna Gain</b><br>(dBd) | <b>ERP</b><br>(dBm) | <b>Limit</b><br>(dBm) | <b>Delta</b><br>(dB) |
|                                | Low Ch                                                                                                                                                                                                                                     |                            |                           |                           |                              |                     |                       |                      |
|                                | 825.50                                                                                                                                                                                                                                     | 24.29                      | V                         | 3.0                       | -0.9                         | 20.33               | 38.5                  | -18.2                |
|                                | 825.50                                                                                                                                                                                                                                     | 13.90                      | H                         | 3.0                       | -0.9                         | 9.94                | 38.5                  | -28.6                |
|                                | Mid Ch                                                                                                                                                                                                                                     |                            |                           |                           |                              |                     |                       |                      |
|                                | 831.50                                                                                                                                                                                                                                     | 23.95                      | V                         | 3.0                       | -0.9                         | 20.00               | 38.5                  | -18.5                |
|                                | 831.50                                                                                                                                                                                                                                     | 13.77                      | H                         | 3.0                       | -0.9                         | 9.82                | 38.5                  | -28.7                |
|                                | High Ch                                                                                                                                                                                                                                    |                            |                           |                           |                              |                     |                       |                      |
|                                | 847.50                                                                                                                                                                                                                                     | 24.36                      | V                         | 3.1                       | -0.9                         | 20.44               | 38.5                  | -18.1                |
|                                | 847.50                                                                                                                                                                                                                                     | 13.73                      | H                         | 3.1                       | -0.9                         | 9.81                | 38.5                  | -28.7                |

LTE  
Band 26  
3MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789230288

Date: 2019-12-18

Test Engineer: 20896

Configuration: EUT

Location: Chamber 2

Mode: LTE\_16QAM Band 26 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: VULB9163-749, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz  | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes   |
|--------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|---------|
| Low Ch |                  |                 |                 |                    |           |             |            |         |
| 815.50 | 22.24            | V               | 3.0             | -1.0               | 18.25     | 50.0        | -31.7      | Part 90 |
| 815.50 | 10.82            | H               | 3.0             | -1.0               | 6.83      | 50.0        | -43.2      | Part 90 |
| Mid Ch |                  |                 |                 |                    |           |             |            |         |
| 822.50 | 22.13            | V               | 3.0             | -1.0               | 18.17     | 50.0        | -31.8      | Part 90 |
| 822.50 | 11.18            | H               | 3.0             | -1.0               | 7.22      | 50.0        | -42.8      | Part 90 |

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung

Project #: 4789230288

Date: 2019-12-18

Test Engineer: 20896

Configuration: EUT

Location: Chamber 2

Mode: LTE\_16QAM Band 26 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: VULB9163-749, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 825.50  | 21.75            | V               | 3.0             | -0.9               | 17.79     | 38.5        | -20.7      |       |
| 825.50  | 11.49            | H               | 3.0             | -0.9               | 7.53      | 38.5        | -31.0      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 831.50  | 22.05            | V               | 3.0             | -0.9               | 18.10     | 38.5        | -20.4      |       |
| 831.50  | 11.71            | H               | 3.0             | -0.9               | 7.76      | 38.5        | -30.7      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 847.50  | 21.80            | V               | 3.1             | -0.9               | 17.88     | 38.5        | -20.6      |       |
| 847.50  | 11.01            | H               | 3.1             | -0.9               | 7.09      | 38.5        | -31.4      |       |