





## 8.5. CONDUCTED SPURIOUS EMISSIONS

### RULE PART(S)

FCC: §2.1051, §22.901, §22.917 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 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 = 100 kHz for emission below 1 GHz ;  
(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, 5G NR), Max hold(GSM);

### NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s\_OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

### NOTE2

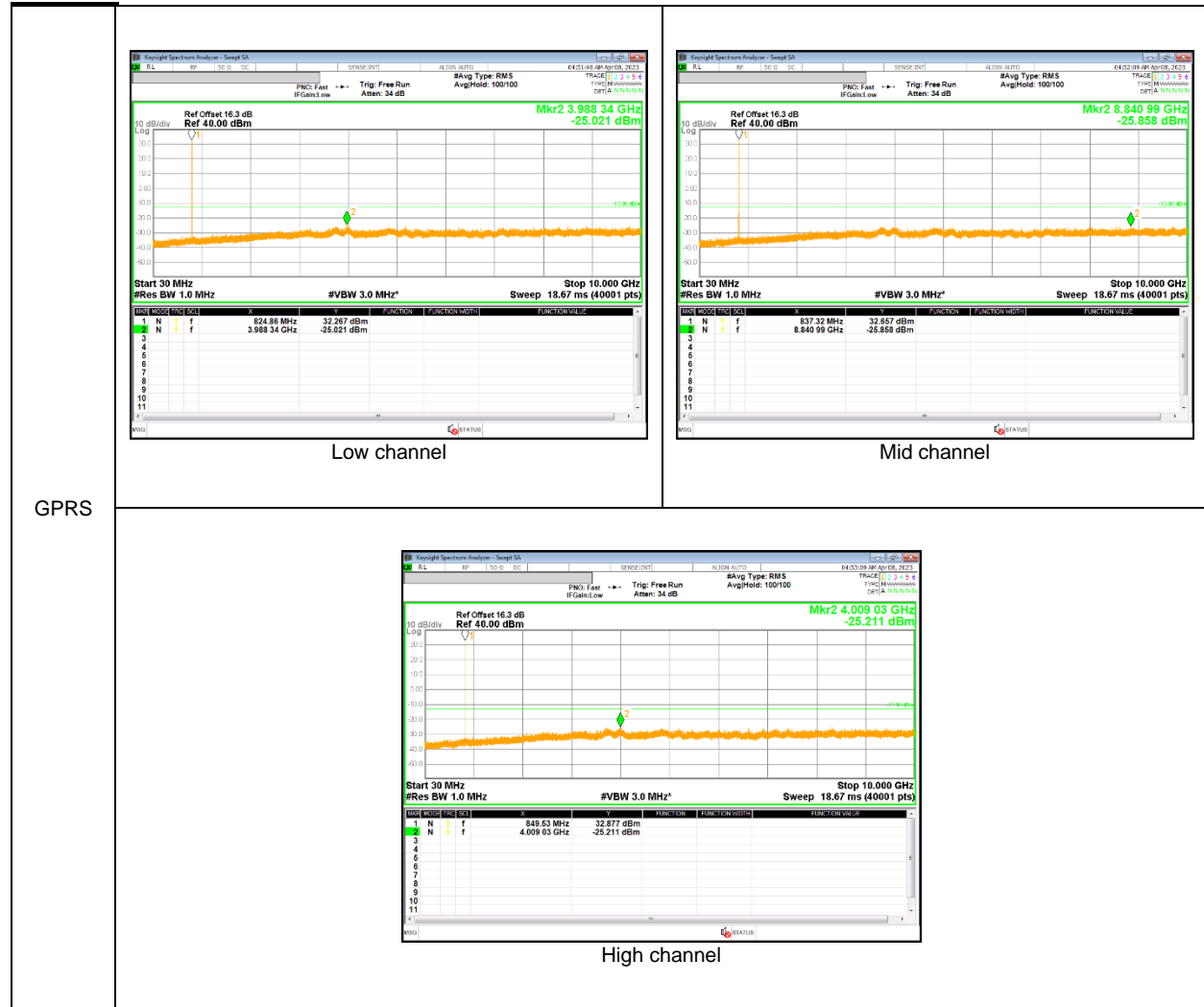
Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.

### RESULTS

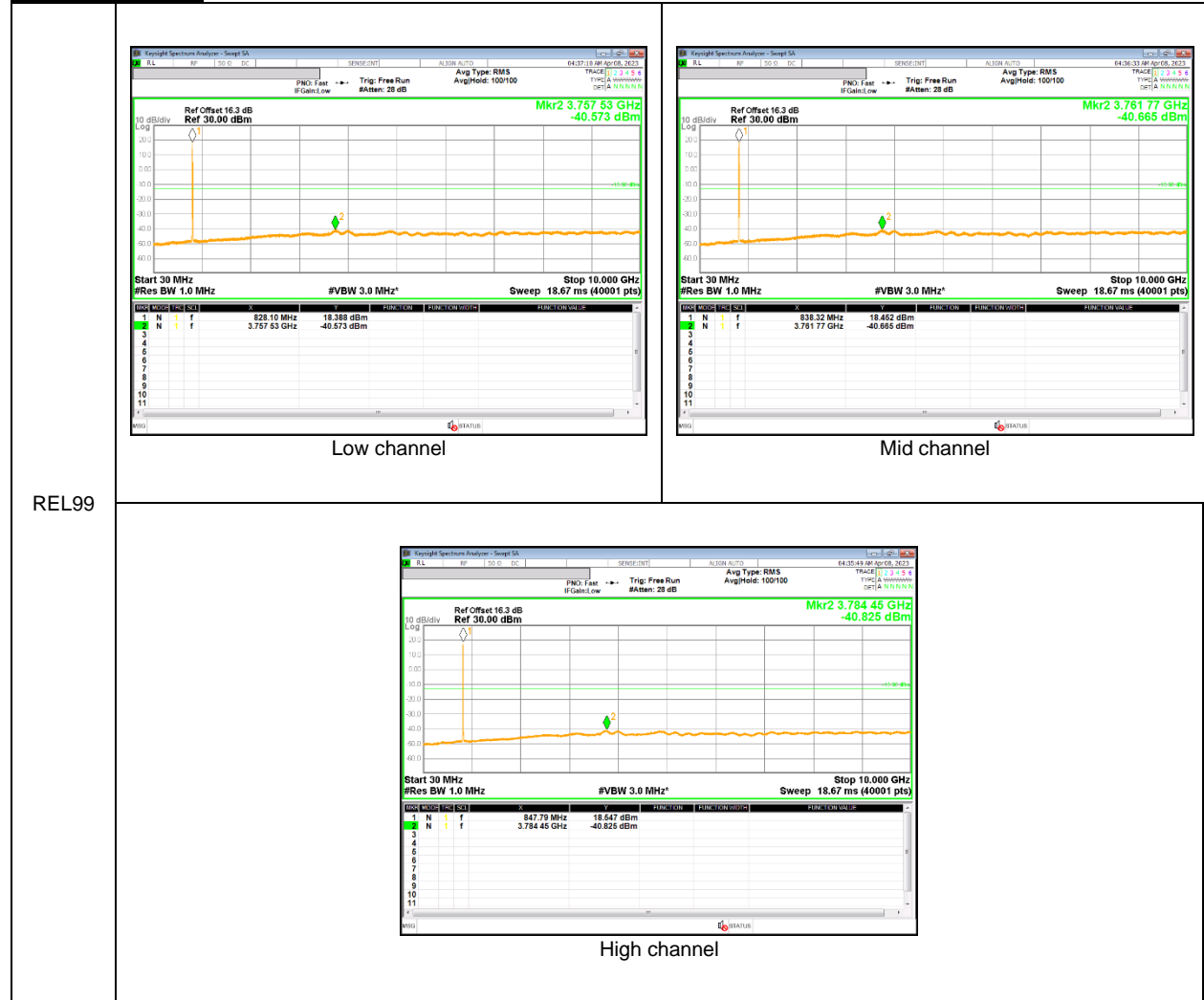
See the following pages.

### 8.5.1. OUT OF BAND EMISSIONS RESULT

#### GSM 850



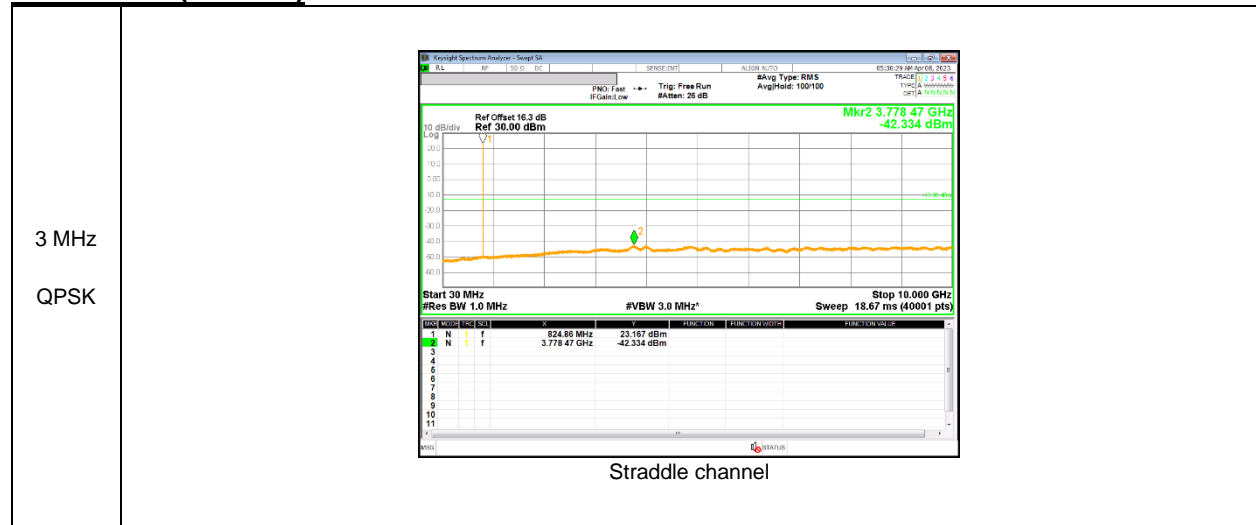
WCDMA Band 5



**LTE Band 26(Part 90)**



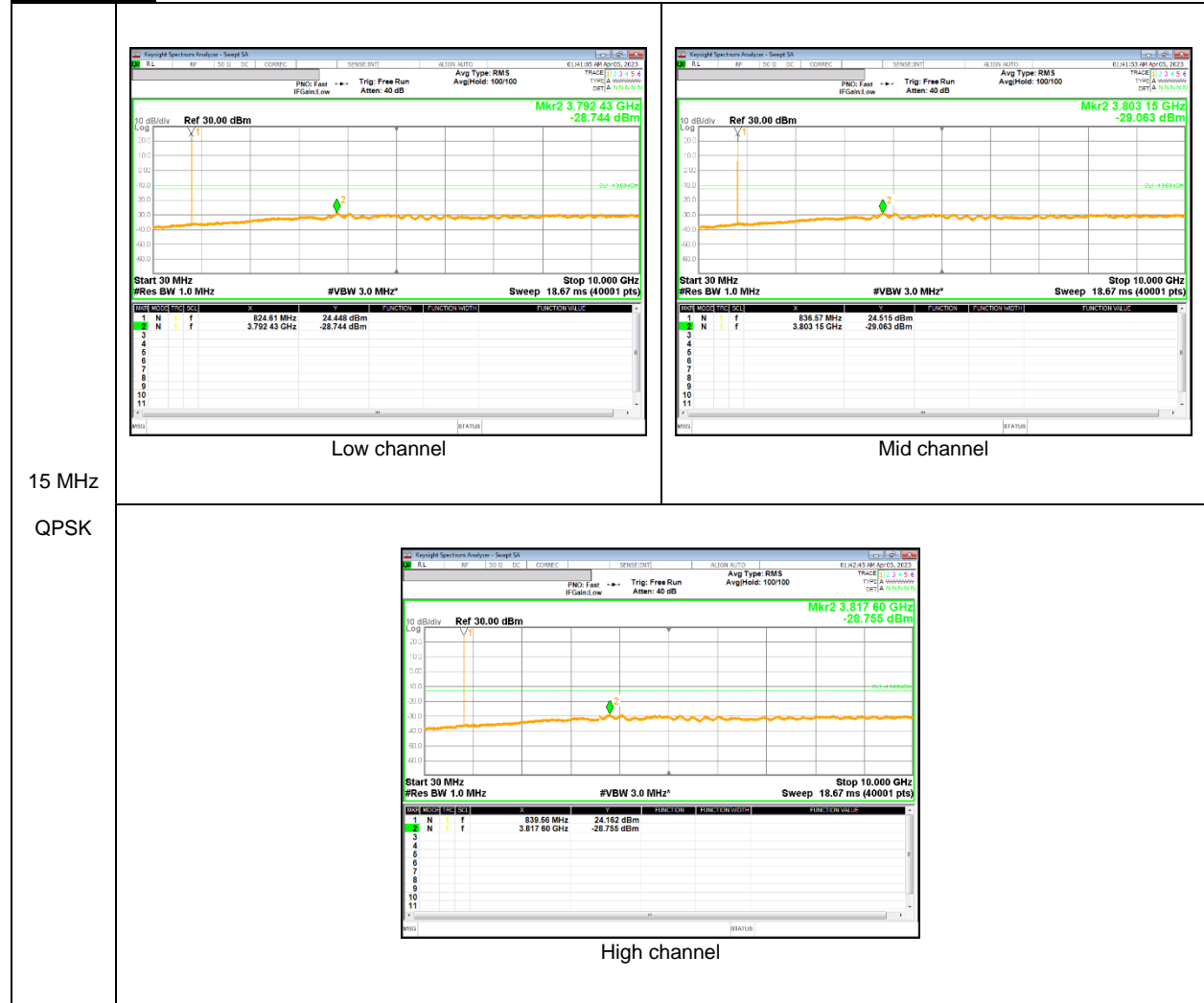
**LTE Band 26 (Straddle)**



**LTE Band 26 (Part 22)**



NR Band n5





## **8.6. FREQUENCY STABILITY**

### **RULE PART(S)**

FCC: §2.1055, §22.355 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.

§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

### **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)

### **RESULTS**

See the following pages.

### 8.6.1. FREQUENCY STABILITY RESULTS

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

|               |            |
|---------------|------------|
| Test Date     | 2023-04-05 |
| Test Engineer | 47989      |

| 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     | Hz          |
| Power Supply [Vdc]   | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |              |                     |              | Limit [ppm] |
|  |                              | Low Channel                                   |              | High Channel        |              |             |
|  |                              | [MHz]   | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.70   | 50                           | 824.20003050                                  | -0.006       | 848.80003127        | -0.006       | 2.5         |
| 3.70   | 40                           | 824.20002925                                  | -0.004       | 848.80003324        | -0.008       | 2.5         |
| 3.70   | 30                           | 824.20002780                                  | -0.002       | 848.80003428        | -0.009       | 2.5         |
| <b>3.70</b>  | <b>20</b>                    | <b>824.20002587</b>                           | <b>0.000</b> | <b>848.80002629</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.70   | 10                           | 824.20002825                                  | -0.003       | 848.80002545        | 0.001        | 2.5         |
| 3.70   | 0                            | 824.20002707                                  | -0.001       | 848.80002646        | 0.000        | 2.5         |
| 3.70   | -10                          | 824.20002455                                  | 0.002        | 848.80002566        | 0.001        | 2.5         |
| 3.70   | -20                          | 824.20002762                                  | -0.002       | 848.80002855        | -0.003       | 2.5         |
| 3.70   | -30                          | 824.20003111                                  | -0.006       | 848.80003306        | -0.008       | 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    | Hz          |
| Power Supply [Vdc]   | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |              |             | Limit [ppm] |
|  |                              | Low Channel                                   |             | High Channel |             |             |
|  |                              | [MHz]   | Delta [ppm] | [MHz]        | Delta [ppm] |             |
| 3.70   | 20                           | 824.20002587                                  | 0           | 848.80002629 | 0           | 2.5         |
| 4.40   | 20                           | 824.20003763                                  | -0.014      | 848.80003605 | -0.011      | 2.5         |
| 3.88   | 20                           | 824.20003778                                  | -0.014      | 848.80003658 | -0.012      | 2.5         |

#### WCDMA Band 5

|               |            |
|---------------|------------|
| Test Date     | 2023-04-14 |
| Test Engineer | 47989      |

| 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     | Hz          |
| Power Supply [Vdc]   | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |              |                     |              | Limit [ppm] |
|  |                              | Low Channel                                   |              | High Channel        |              |             |
|  |                              | [MHz]   | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.70   | 50                           | 826.40000436                                  | 0.001        | 846.60000561        | -0.001       | 2.5         |
| 3.70   | 40                           | 826.40000425                                  | 0.002        | 846.60000526        | 0.000        | 2.5         |
| 3.70   | 30                           | 826.40000413                                  | 0.002        | 846.60000461        | 0.001        | 2.5         |
| <b>3.70</b>  | <b>20</b>                    | <b>826.40000559</b>                           | <b>0.000</b> | <b>846.60000514</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.70   | 10                           | 826.40000418                                  | 0.002        | 846.60000303        | 0.002        | 2.5         |
| 3.70   | 0                            | 826.40000405                                  | 0.002        | 846.60000550        | 0.000        | 2.5         |
| 3.70   | -10                          | 826.40000435                                  | 0.002        | 846.60000511        | 0.000        | 2.5         |
| 3.70   | -20                          | 826.40000448                                  | 0.001        | 846.60000707        | -0.002       | 2.5         |
| 3.70   | -30                          | 826.40000651                                  | -0.001       | 846.60000472        | 0.000        | 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    | Hz          |
| Power Supply [Vdc]   | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |              |             | Limit [ppm] |
|  |                              | Low Channel                                   |             | High Channel |             |             |
|  |                              | [MHz]   | Delta [ppm] | [MHz]        | Delta [ppm] |             |
| 3.70   | 20                           | 826.40000559                                  | 0           | 846.60000514 | 0           | 2.5         |
| 4.40   | 20                           | 826.40000510                                  | 0.001       | 846.60000408 | 0.001       | 2.5         |
| 3.88   | 20                           | 826.40000419                                  | 0.002       | 846.60000411 | 0.001       | 2.5         |

**LTE Band 26**

|               |            |
|---------------|------------|
| Test Date     | 2023-04-17 |
| Test Engineer | 47989      |

| Reference Frequency : 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   | Hz          |
| Power Supply [Vdc]  | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |              |                     |              |            | Limit [ppm] |
|   |                              | Low Channel                                   |              | High Channel        |              |            |             |
|   |                              | [MHz]   | Delta [ppm]  | [MHz]               | Delta [ppm]  |            |             |
| 3.70  | 50                           | 814.70002949                                  | -0.010       | 848.30002212        | -0.003       | 2.5        |             |
| 3.70  | 40                           | 814.70002620                                  | -0.006       | 848.30002899        | -0.011       | 2.5        |             |
| 3.70  | 30                           | 814.70002483                                  | -0.004       | 848.30002123        | -0.002       | 2.5        |             |
| <b>3.70</b>   | <b>20</b>                    | <b>814.70002170</b>                           | <b>0.000</b> | <b>848.30001959</b> | <b>0.000</b> | <b>2.5</b> |             |
| 3.70  | 10                           | 814.70002911                                  | -0.009       | 848.30002142        | -0.002       | 2.5        |             |
| 3.70  | 0                            | 814.70002706                                  | -0.007       | 848.30002637        | -0.008       | 2.5        |             |
| 3.70  | -10                          | 814.70001794                                  | 0.005        | 848.30002260        | -0.004       | 2.5        |             |
| 3.70  | -20                          | 814.70002247                                  | -0.001       | 848.30001810        | 0.002        | 2.5        |             |
| 3.70  | -30                          | 814.70002531                                  | -0.004       | 848.30002740        | -0.009       | 2.5        |             |

| Reference Frequency : 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 | Hz          |
| Power Supply [Vdc]  | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |              |              |          | Limit [ppm] |
|   |                              | Low Channel                                   |             | High Channel |              |          |             |
|   |                              | [MHz]   | Delta [ppm] | [MHz]        | Delta [ppm]  |          |             |
| 3.70  | 20                           | 814.70002170                                  | 0           | 848.30001959 | 0            | 2.5      |             |
| 4.40  | 20                           | 814.70000598                                  | 0.019       | 848.30000869 | 0.013        | 2.5      |             |
| 3.88  | 20                           | 814.70000613                                  | 0.019       | 848.30000710 | 0.015        | 2.5      |             |

**NR Band n5**

|               |            |
|---------------|------------|
| Test Date     | 2023-04-19 |
| Test Engineer | 47989      |

| Reference Frequency : Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20°C |                              |   |              |                     |              |            |             |
|---|------------------------------|---|--------------|---------------------|--------------|------------|-------------|
| Limit: +- 2.5 ppm =   |                              | Low Channel                                   | 2066.250     | Hz                  | High Channel | 2116.250   | Hz          |
| Power Supply [Vdc]  | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |              |                     |              |            | Limit [ppm] |
|   |                              | Low Channel                                   |              | High Channel        |              |            |             |
|   |                              | [MHz]   | Delta [ppm]  | [MHz]               | Delta [ppm]  |            |             |
| 3.70  | 50                           | 826.50000269                                  | 0.004        | 846.50000264        | -0.001       | 2.5        |             |
| 3.70  | 40                           | 826.50000256                                  | 0.004        | 846.50000282        | -0.001       | 2.5        |             |
| 3.70  | 30                           | 826.50000419                                  | 0.002        | 846.50000431        | -0.003       | 2.5        |             |
| <b>3.70</b>   | <b>20</b>                    | <b>826.50000598</b>                           | <b>0.000</b> | <b>846.50000191</b> | <b>0.000</b> | <b>2.5</b> |             |
| 3.70  | 10                           | 826.50000424                                  | 0.002        | 846.50000404        | -0.003       | 2.5        |             |
| 3.70  | 0                            | 826.50000502                                  | 0.001        | 846.50000304        | -0.001       | 2.5        |             |
| 3.70  | -10                          | 826.50000449                                  | 0.002        | 846.50000124        | 0.001        | 2.5        |             |
| 3.70  | -20                          | 826.50000424                                  | 0.002        | 846.50000221        | 0.000        | 2.5        |             |
| 3.70  | -30                          | 826.50000515                                  | 0.001        | 846.50000295        | -0.001       | 2.5        |             |

| Reference Frequency : Low Channel 826.5 MHz / High Channel 846.5 MHz @ 20°C |                              |   |             |              |              |          |             |
|---|------------------------------|---|-------------|--------------|--------------|----------|-------------|
| Limit: +- 2.5 ppm =   |                              | Low Channel                                   | 2066.250    | Hz           | High Channel | 2116.250 | Hz          |
| Power Supply [Vdc]  | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |              |              |          | Limit [ppm] |
|   |                              | Low Channel                                   |             | High Channel |              |          |             |
|   |                              | [MHz]   | Delta [ppm] | [MHz]        | Delta [ppm]  |          |             |
| 3.70  | 20                           | 826.50000598                                  | 0           | 846.50000191 | 0            | 2.5      |             |
| 4.40  | 20                           | 826.50000197                                  | 0.005       | 846.50000159 | 0.000        | 2.5      |             |
| 3.88  | 20                           | 826.50000301                                  | 0.004       | 846.50000279 | -0.001       | 2.5      |             |

## 9. RADIATED RESULTS

### 9.1. RADIATED POWER (ERP)

#### RULE PART(S)

FCC: §2.1046, §22.913, and §90.635

#### LIMITS

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

90.635(b) The maximum output power of the transmitter for mobile stations is 100 watts (20dBw).

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 or 1 second;
- e) Detector = rms;
- f) Ensure that the number of measurement points  $\geq$  span/RBW;
- g) Trace mode = max hold(GSM, WCDMA), average(LTE, 5G NR);

#### TEST RESULTS

See the following pages.

### 9.1.1. ERP Results

#### GSM

| Band    | Mode  | f (MHz) | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | ERP (mW) | Limit (dBm) | Delta (dB) |
|---------|-------|---------|------------------|-----------------|-----------------|--------------------|-----------|----------|-------------|------------|
| GSM 850 | GPRS  | 824.20  | 34.89            | V               | 3.01            | -1.03              | 30.86     | 1218.99  | 38.50       | -7.64      |
|         |       | 836.60  | 37.31            | V               | 3.03            | -0.97              | 33.31     | 2142.89  | 38.50       | -5.19      |
|         |       | 848.80  | 36.53            | V               | 3.05            | -0.91              | 32.57     | 1807.17  | 38.50       | -5.93      |
|         | EGPRS | 824.20  | 30.87            | V               | 3.01            | -1.03              | 26.84     | 483.06   | 38.50       | -11.66     |
|         |       | 836.60  | 32.40            | V               | 3.03            | -0.97              | 28.40     | 691.83   | 38.50       | -10.10     |
|         |       | 848.80  | 32.03            | V               | 3.05            | -0.91              | 28.07     | 641.21   | 38.50       | -10.43     |

#### WCDMA

| Band   | Mode  | f (MHz) | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | ERP (mW) | Limit (dBm) | Delta (dB) |
|--------|-------|---------|------------------|-----------------|-----------------|--------------------|-----------|----------|-------------|------------|
| Band 5 | REL99 | 826.40  | 26.56            | V               | 3.01            | -1.02              | 22.53     | 179.06   | 38.50       | -15.97     |
|        |       | 836.60  | 27.38            | V               | 3.03            | -0.97              | 23.38     | 217.77   | 38.50       | -15.12     |
|        |       | 846.60  | 27.27            | V               | 3.05            | -0.92              | 23.30     | 213.80   | 38.50       | -15.20     |
|        | HSDPA | 826.40  | 25.50            | V               | 3.01            | -1.02              | 21.47     | 140.28   | 38.50       | -17.03     |
|        |       | 836.60  | 26.39            | V               | 3.03            | -0.97              | 22.39     | 173.38   | 38.50       | -16.11     |
|        |       | 846.60  | 26.19            | V               | 3.05            | -0.92              | 22.22     | 166.72   | 38.50       | -16.28     |

**LTE Band 26**

| BW (MHz) | Modulation | f (MHz) | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | ERP (mW) | Limit (dBm) | Delta (dB) | RB    |        |      |
|----------|------------|---------|------------------|-----------------|-----------------|--------------------|-----------|----------|-------------|------------|-------|--------|------|
| 1.4      | QPSK       | 814.70  | 22.82            | V               | 2.99            | -1.08              | 18.75     | 74.99    | 50.00       | -19.75     | 1/3   |        |      |
|          |            | 823.30  | 24.69            | V               | 3.01            | -1.03              | 20.65     | 116.14   | 50.00       | -17.85     | 1/3   |        |      |
|          |            | 824.70  | 25.64            | V               | 3.01            | -1.03              | 21.60     | 144.54   | 38.50       | -16.90     | 1/5   |        |      |
|          |            | 831.50  | 26.72            | V               | 3.02            | -0.99              | 22.70     | 186.21   | 38.50       | -15.80     | 1/3   |        |      |
|          |            | 848.30  | 26.62            | V               | 3.05            | -0.91              | 22.66     | 184.50   | 38.50       | -15.84     | 1/0   |        |      |
|          | 16-QAM     | 814.70  | 21.77            | V               | 2.99            | -1.08              | 17.70     | 58.88    | 50.00       | -20.80     | 1/0   |        |      |
|          |            | 823.30  | 23.51            | V               | 3.01            | -1.03              | 19.47     | 88.51    | 50.00       | -19.03     | 1/3   |        |      |
|          |            | 824.70  | 24.35            | V               | 3.01            | -1.03              | 20.31     | 107.40   | 38.50       | -18.19     | 1/5   |        |      |
|          |            | 831.50  | 25.43            | V               | 3.02            | -0.99              | 21.41     | 138.36   | 38.50       | -17.09     | 1/3   |        |      |
|          |            | 848.30  | 25.52            | V               | 3.05            | -0.91              | 21.56     | 143.22   | 38.50       | -16.94     | 1/0   |        |      |
| 3        | QPSK       | 815.50  | 22.99            | V               | 2.99            | -1.07              | 18.92     | 77.98    | 50.00       | -19.58     | 1/8   |        |      |
|          |            | 822.50  | 24.70            | V               | 3.01            | -1.04              | 20.65     | 116.14   | 50.00       | -17.85     | 1/8   |        |      |
|          |            | 825.50  | 25.76            | V               | 3.01            | -1.02              | 21.72     | 148.59   | 38.50       | -16.78     | 1/8   |        |      |
|          |            | 831.50  | 27.57            | V               | 3.02            | -0.99              | 23.55     | 226.46   | 38.50       | -14.95     | 1/8   |        |      |
|          |            | 847.50  | 26.67            | V               | 3.05            | -0.91              | 22.71     | 186.64   | 38.50       | -15.79     | 1/8   |        |      |
|          | 16-QAM     | 815.50  | 21.61            | V               | 2.99            | -1.07              | 17.54     | 56.75    | 50.00       | -20.96     | 1/0   |        |      |
|          |            | 822.50  | 23.31            | V               | 3.01            | -1.04              | 19.26     | 84.33    | 50.00       | -19.24     | 1/0   |        |      |
|          |            | 825.50  | 25.16            | V               | 3.01            | -1.02              | 21.12     | 129.42   | 38.50       | -17.38     | 1/14  |        |      |
|          |            | 831.50  | 25.64            | V               | 3.02            | -0.99              | 21.62     | 145.21   | 38.50       | -16.88     | 1/8   |        |      |
|          |            | 847.50  | 25.64            | V               | 3.05            | -0.91              | 21.68     | 147.23   | 38.50       | -16.82     | 1/8   |        |      |
| 5        | QPSK       | 816.50  | 23.54            | V               | 3.00            | -1.07              | 19.47     | 88.51    | 50.00       | -19.03     | 1/12  |        |      |
|          |            | 821.50  | 26.52            | V               | 3.01            | -1.04              | 22.47     | 176.60   | 50.00       | -16.03     | 1/12  |        |      |
|          |            | 826.50  | 25.92            | V               | 3.01            | -1.02              | 21.89     | 154.53   | 38.50       | -16.61     | 1/12  |        |      |
|          |            | 831.50  | 26.75            | V               | 3.02            | -0.99              | 22.73     | 187.50   | 38.50       | -15.77     | 1/12  |        |      |
|          |            | 846.50  | 26.57            | V               | 3.05            | -0.92              | 22.60     | 181.97   | 38.50       | -15.90     | 1/0   |        |      |
|          | 16-QAM     | 816.50  | 22.34            | V               | 3.00            | -1.07              | 18.27     | 67.14    | 50.00       | -20.23     | 1/12  |        |      |
|          |            | 821.50  | 25.46            | V               | 3.01            | -1.04              | 21.41     | 138.36   | 50.00       | -17.09     | 1/12  |        |      |
|          |            | 826.50  | 24.84            | V               | 3.01            | -1.02              | 20.81     | 120.50   | 38.50       | -17.69     | 1/12  |        |      |
|          |            | 831.50  | 25.74            | V               | 3.02            | -0.99              | 21.72     | 148.59   | 38.50       | -16.78     | 1/12  |        |      |
|          |            | 846.50  | 25.74            | V               | 3.05            | -0.92              | 21.77     | 150.31   | 38.50       | -16.73     | 1/12  |        |      |
| 10       | QPSK       | 819.00  | 23.04            | V               | 3.00            | -1.06              | 18.99     | 79.25    | 50.00       | -19.51     | 1/25  |        |      |
|          |            | 829.00  | 26.30            | V               | 3.02            | -1.01              | 22.27     | 168.66   | 38.50       | -16.23     | 1/25  |        |      |
|          |            | 831.50  | 26.67            | V               | 3.02            | -0.99              | 22.65     | 184.08   | 38.50       | -15.85     | 1/25  |        |      |
|          |            | 844.00  | 26.35            | V               | 3.04            | -0.93              | 22.37     | 172.58   | 38.50       | -16.13     | 1/0   |        |      |
|          |            | 819.00  | 22.10            | V               | 3.00            | -1.06              | 18.05     | 63.83    | 50.00       | -20.45     | 1/49  |        |      |
|          | 16-QAM     | 829.00  | 25.48            | V               | 3.02            | -1.01              | 21.45     | 139.64   | 38.50       | -17.05     | 1/49  |        |      |
|          |            | 831.50  | 25.76            | V               | 3.02            | -0.99              | 21.74     | 149.28   | 38.50       | -16.76     | 1/25  |        |      |
|          |            | 844.00  | 25.74            | V               | 3.04            | -0.93              | 21.76     | 149.97   | 38.50       | -16.74     | 1/25  |        |      |
|          |            | 15      | QPSK             | 821.50          | 24.68           | V                  | 3.01      | -1.04    | 20.63       | 115.61     | 50.00 | -17.87 | 1/37 |
|          |            |         |                  | 831.50          | 26.31           | V                  | 3.02      | -0.99    | 22.29       | 169.43     | 38.50 | -16.21 | 1/37 |
| 841.50   | 26.40      |         |                  | V               | 3.04            | -0.94              | 22.42     | 174.58   | 38.50       | -16.08     | 1/0   |        |      |
| 16-QAM   | 821.50     |         | 23.66            | V               | 3.01            | -1.04              | 19.61     | 91.41    | 50.00       | -18.89     | 1/37  |        |      |
|          | 831.50     |         | 25.89            | V               | 3.02            | -0.99              | 21.87     | 153.82   | 38.50       | -16.63     | 1/37  |        |      |
| 841.50   | 25.26      | V       | 3.04             | -0.94           | 21.28           | 134.28             | 38.50     | -17.22   | 1/0         |            |       |        |      |

| BW (MHz) | Modulation | f (MHz) | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | ERP (mW) | Limit (dBm) | Delta (dB) | RB   |
|----------|------------|---------|------------------|-----------------|-----------------|--------------------|-----------|----------|-------------|------------|------|
| 1.4      | QPSK       | 824.00  | 24.86            | V               | 3.01            | -1.03              | 20.82     | 120.78   | 38.50       | -17.68     | 1/3  |
|          | 16-QAM     |         | 23.96            | V               | 3.01            | -1.03              | 19.92     | 98.17    | 38.50       | -18.58     | 1/3  |
| 3        | QPSK       |         | 25.04            | V               | 3.01            | -1.03              | 21.00     | 125.89   | 38.50       | -17.50     | 1/8  |
| 5        | 16-QAM     |         | 23.94            | V               | 3.01            | -1.03              | 19.90     | 97.72    | 38.50       | -18.60     | 1/8  |
|          | QPSK       |         | 25.21            | V               | 3.01            | -1.03              | 21.17     | 130.92   | 38.50       | -17.33     | 1/24 |
| 10       | 16-QAM     |         | 23.93            | V               | 3.01            | -1.03              | 19.89     | 97.50    | 38.50       | -18.61     | 1/24 |
|          | QPSK       |         | 25.31            | V               | 3.01            | -1.03              | 21.27     | 133.97   | 38.50       | -17.23     | 1/49 |
| 15       | 16-QAM     |         | 23.75            | V               | 3.01            | -1.03              | 19.71     | 93.54    | 38.50       | -18.79     | 1/0  |
|          | QPSK       |         | 25.62            | V               | 3.01            | -1.03              | 21.58     | 143.88   | 38.50       | -16.92     | 1/74 |
| 15       | 16-QAM     |         | 23.80            | V               | 3.01            | -1.03              | 19.76     | 94.62    | 38.50       | -18.74     | 1/37 |

**NR Band n5**

| BW (MHz) | Modulation | f (MHz) | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | ERP (mW) | Limit (dBm) | Delta (dB) | RB   |
|----------|------------|---------|------------------|-----------------|-----------------|--------------------|-----------|----------|-------------|------------|------|
| 5        | QPSK       | 826.50  | 26.20            | V               | 3.01            | -1.02              | 22.17     | 164.82   | 38.50       | -16.33     | 1/1  |
|          |            | 836.50  | 27.58            | V               | 3.03            | -0.97              | 23.59     | 228.56   | 38.50       | -14.91     | 1/13 |
|          |            | 846.50  | 28.02            | V               | 3.05            | -0.92              | 24.05     | 254.10   | 38.50       | -14.45     | 1/1  |
|          | 16-QAM     | 826.50  | 25.07            | V               | 3.01            | -1.02              | 21.04     | 127.06   | 38.50       | -17.46     | 1/1  |
|          |            | 836.50  | 26.44            | V               | 3.03            | -0.97              | 22.45     | 175.79   | 38.50       | -16.05     | 1/13 |
|          |            | 846.50  | 26.97            | V               | 3.05            | -0.92              | 23.00     | 199.53   | 38.50       | -15.50     | 1/1  |
| 10       | QPSK       | 829.00  | 26.36            | V               | 3.02            | -1.01              | 22.33     | 171.00   | 38.50       | -16.17     | 1/1  |
|          |            | 836.50  | 27.68            | V               | 3.03            | -0.97              | 23.69     | 233.88   | 38.50       | -14.81     | 1/26 |
|          |            | 844.00  | 27.83            | V               | 3.04            | -0.93              | 23.85     | 242.66   | 38.50       | -14.65     | 1/1  |
|          | 16-QAM     | 829.00  | 25.08            | V               | 3.02            | -1.01              | 21.05     | 127.35   | 38.50       | -17.45     | 1/1  |
|          |            | 836.50  | 26.55            | V               | 3.03            | -0.97              | 22.56     | 180.30   | 38.50       | -15.94     | 1/26 |
|          |            | 844.00  | 26.76            | V               | 3.04            | -0.93              | 22.78     | 189.67   | 38.50       | -15.72     | 1/1  |
| 15       | QPSK       | 831.50  | 27.48            | V               | 3.02            | -0.99              | 23.46     | 221.82   | 38.50       | -15.04     | 1/40 |
|          |            | 836.50  | 27.17            | V               | 3.03            | -0.97              | 23.18     | 207.97   | 38.50       | -15.32     | 1/1  |
|          |            | 841.50  | 27.63            | V               | 3.04            | -0.94              | 23.65     | 231.74   | 38.50       | -14.85     | 1/1  |
|          | 16-QAM     | 831.50  | 26.39            | V               | 3.02            | -0.99              | 22.37     | 172.58   | 38.50       | -16.13     | 1/40 |
|          |            | 836.50  | 26.25            | V               | 3.03            | -0.97              | 22.26     | 168.27   | 38.50       | -16.24     | 1/1  |
|          |            | 841.50  | 26.50            | V               | 3.04            | -0.94              | 22.52     | 178.65   | 38.50       | -15.98     | 1/1  |
| 20       | QPSK       | 834.00  | 27.86            | V               | 3.03            | -0.98              | 23.85     | 242.66   | 38.50       | -14.65     | 1/53 |
|          |            | 836.50  | 27.80            | V               | 3.03            | -0.97              | 23.81     | 240.44   | 38.50       | -14.69     | 1/53 |
|          |            | 839.00  | 27.74            | V               | 3.03            | -0.96              | 23.75     | 237.14   | 38.50       | -14.75     | 1/53 |
|          | 16-QAM     | 834.00  | 26.80            | V               | 3.03            | -0.98              | 22.79     | 190.11   | 38.50       | -15.71     | 1/53 |
|          |            | 836.50  | 26.67            | V               | 3.03            | -0.97              | 22.68     | 185.35   | 38.50       | -15.82     | 1/53 |
|          |            | 839.00  | 26.70            | V               | 3.03            | -0.96              | 22.71     | 186.64   | 38.50       | -15.79     | 1/53 |

## 9.2. RADIATED SPURIOUS EMISSION

### RULE PART(S)

FCC: §2.1053, §22.917 and §90.691

### LIMIT

Part 22.917(a)

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 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

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:

- a) Set the RBW = 100 kHz for emission below 1 GHz ;
- 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  $\geq$  span/RBW;
- g) Trace mode = average(WCDMA, LTE, 5G NR), Maxhold(GSM);

### NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s\_OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

### NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.



### 9.2.1. SPURIOUS RADIATION PLOTS

#### GSM850

| UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                  |                              |              |             |             |            |             |            |       |
|--|------------------|------------------------------|--------------|-------------|-------------|------------|-------------|------------|-------|
| Company:   |                  | Samsung                      |              |             |             |            |             |            |       |
| Project #:   |                  | 4790776103                   |              |             |             |            |             |            |       |
| Date:  |                  | 2023-04-11                   |              |             |             |            |             |            |       |
| Test Engineer:   |                  | 24542                        |              |             |             |            |             |            |       |
| Configuration:   |                  | EUT / AC Adapter, X-Position |              |             |             |            |             |            |       |
| Location:  |                  | Chamber 1                    |              |             |             |            |             |            |       |
| Mode:  |                  | GPRS 850 MHz Harmonics       |              |             |             |            |             |            |       |
| Test Votage:   |                  | AC 120 V, 60 Hz              |              |             |             |            |             |            |       |
| f MHz  | SG reading (dBm) | Ant. Pol. (H/V)              | Distance (m) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
| Low Ch, 824.2MHz   |                  |                              |              |             |             |            |             |            |       |
| 1648.40  | -4.3             | V                            | 3.0          | 46.4        | 1.0         | -49.7      | -13.0       | -36.7      |       |
| 2472.60  | 11.0             | V                            | 3.0          | 46.9        | 1.0         | -34.8      | -13.0       | -21.8      |       |
| 3296.80  | -8.2             | V                            | 3.0          | 46.6        | 1.0         | -53.8      | -13.0       | -40.8      |       |
| 4121.00  | -6.4             | V                            | 3.0          | 45.7        | 1.0         | -51.1      | -13.0       | -38.1      |       |
| 1648.40  | -4.6             | H                            | 3.0          | 46.4        | 1.0         | -50.0      | -13.0       | -37.0      |       |
| 2472.60  | 11.1             | H                            | 3.0          | 46.9        | 1.0         | -34.8      | -13.0       | -21.8      |       |
| 3296.80  | -8.2             | H                            | 3.0          | 46.6        | 1.0         | -53.8      | -13.0       | -40.8      |       |
| 4121.00  | -5.8             | H                            | 3.0          | 45.7        | 1.0         | -50.5      | -13.0       | -37.5      |       |
| Mid Ch, 836.6MHz   |                  |                              |              |             |             |            |             |            |       |
| 1673.20  | -13.1            | V                            | 3.0          | 46.4        | 1.0         | -58.6      | -13.0       | -45.6      |       |
| 2509.80  | 6.4              | V                            | 3.0          | 46.9        | 1.0         | -39.5      | -13.0       | -26.5      |       |
| 3346.40  | -8.2             | V                            | 3.0          | 46.6        | 1.0         | -53.7      | -13.0       | -40.7      |       |
| 1673.20  | -14.2            | H                            | 3.0          | 46.4        | 1.0         | -59.6      | -13.0       | -46.6      |       |
| 2509.80  | 8.5              | H                            | 3.0          | 46.9        | 1.0         | -37.4      | -13.0       | -24.4      |       |
| 3346.40  | -8.0             | H                            | 3.0          | 46.6        | 1.0         | -53.5      | -13.0       | -40.5      |       |
| High Ch, 848.8MHz  |                  |                              |              |             |             |            |             |            |       |
| 1697.60  | -9.7             | V                            | 3.0          | 46.5        | 1.0         | -55.2      | -13.0       | -42.2      |       |
| 2546.40  | 0.5              | V                            | 3.0          | 46.9        | 1.0         | -45.5      | -13.0       | -32.5      |       |
| 3395.20  | 9.4              | V                            | 3.0          | 46.5        | 1.0         | -36.1      | -13.0       | -23.1      |       |
| 1697.60  | -14.1            | H                            | 3.0          | 46.5        | 1.0         | -59.5      | -13.0       | -46.5      |       |
| 2546.40  | 1.3              | H                            | 3.0          | 46.9        | 1.0         | -44.6      | -13.0       | -31.6      |       |
| 3395.20  | 9.6              | H                            | 3.0          | 46.5        | 1.0         | -35.9      | -13.0       | -22.9      |       |

GPRS

**WCDMA Band 5**

| UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                  |                              |              |             |             |            |             |            |       |
|--|------------------|------------------------------|--------------|-------------|-------------|------------|-------------|------------|-------|
| <b>Company:</b>  |                  | Samsung                      |              |             |             |            |             |            |       |
| <b>Project #:</b>  |                  | 4790776103                   |              |             |             |            |             |            |       |
| <b>Date:</b>   |                  | 2023-04-11                   |              |             |             |            |             |            |       |
| <b>Test Engineer:</b>  |                  | 24542                        |              |             |             |            |             |            |       |
| <b>Configuration:</b>  |                  | EUT / AC Adapter, Y-Position |              |             |             |            |             |            |       |
| <b>Location:</b>   |                  | Chamber 1                    |              |             |             |            |             |            |       |
| <b>Mode:</b>   |                  | Rel99 Band 5 Harmonics       |              |             |             |            |             |            |       |
| <b>Test Voltage:</b>   |                  | AC 120 V, 60 Hz              |              |             |             |            |             |            |       |
| f MHz  | SG reading (dBm) | Ant. Pol. (H/V)              | Distance (m) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
| <b>Low Ch, 826.4MHz</b>  |                  |                              |              |             |             |            |             |            |       |
| 1652.80  | -14.4            | V                            | 3.0          | 46.4        | 1.0         | -59.8      | -13.0       | -46.8      |       |
| 2479.20  | -11.7            | V                            | 3.0          | 46.9        | 1.0         | -57.6      | -13.0       | -44.6      |       |
| 3305.60  | -9.6             | V                            | 3.0          | 46.6        | 1.0         | -55.2      | -13.0       | -42.2      |       |
| 1652.80  | -15.6            | H                            | 3.0          | 46.4        | 1.0         | -61.0      | -13.0       | -48.0      |       |
| 2479.20  | -12.0            | H                            | 3.0          | 46.9        | 1.0         | -57.9      | -13.0       | -44.9      |       |
| 3305.60  | -9.5             | H                            | 3.0          | 46.6        | 1.0         | -55.1      | -13.0       | -42.1      |       |
| <b>Mid Ch, 836.6MHz</b>  |                  |                              |              |             |             |            |             |            |       |
| 1673.20  | -14.4            | V                            | 3.0          | 46.4        | 1.0         | -59.9      | -13.0       | -46.9      |       |
| 2509.80  | -11.6            | V                            | 3.0          | 46.9        | 1.0         | -57.5      | -13.0       | -44.5      |       |
| 3346.40  | -9.5             | V                            | 3.0          | 46.6        | 1.0         | -55.1      | -13.0       | -42.1      |       |
| 1673.20  | -15.5            | H                            | 3.0          | 46.4        | 1.0         | -60.9      | -13.0       | -47.9      |       |
| 2509.80  | -11.9            | H                            | 3.0          | 46.9        | 1.0         | -57.8      | -13.0       | -44.8      |       |
| 3346.40  | -9.4             | H                            | 3.0          | 46.6        | 1.0         | -54.9      | -13.0       | -41.9      |       |
| <b>High Ch, 846.6MHz</b>   |                  |                              |              |             |             |            |             |            |       |
| 1693.20  | -14.4            | V                            | 3.0          | 46.5        | 1.0         | -59.9      | -13.0       | -46.9      |       |
| 2539.80  | -11.5            | V                            | 3.0          | 46.9        | 1.0         | -57.4      | -13.0       | -44.4      |       |
| 3386.40  | -9.2             | V                            | 3.0          | 46.5        | 1.0         | -54.7      | -13.0       | -41.7      |       |
| 1693.20  | -15.3            | H                            | 3.0          | 46.5        | 1.0         | -60.8      | -13.0       | -47.8      |       |
| 2539.80  | -11.8            | H                            | 3.0          | 46.9        | 1.0         | -57.7      | -13.0       | -44.7      |       |
| 3386.40  | -9.0             | H                            | 3.0          | 46.5        | 1.0         | -54.5      | -13.0       | -41.5      |       |

REL99

**LTE Band 26 (Part 90)**

|                   |                  | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |  |                 |                |                |               |                |               |       |  |
|-------------------|------------------|--|--|-----------------|----------------|----------------|---------------|----------------|---------------|-------|--|
|                   |                  | <b>Company:</b>  | Samsung                                    |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Project #:</b>  | 4790776103                                 |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Date:</b>   | 2023-04-14                                 |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Test Engineer:</b>  | 24542                                      |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Configuration:</b>  | EUT / AC Adapter, Z-Position               |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Location:</b>   | Chamber 1                                  |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Mode:</b>   | LTE_QPSK Band 26 Harmonics, 5MHz Bandwidth |                 |                |                |               |                |               |       |  |
|                   |                  | <b>Test Voltage:</b>   | AC 120 V, 60 Hz                            |                 |                |                |               |                |               |       |  |
| 5 MHz<br><br>QPSK | f<br>MHz         | SG reading<br>(dBm)  | Ant. Pol.<br>(H/V)                         | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |  |
|                   | Low Ch, 816.5MHz |  |  |                 |                |                |               |                |               |       |  |
|                   |                  | 1633.00  | -7.6                                       | V               | 3.0            | 46.4           | 1.0           | -53.0          | -13.0         | -40.0 |  |
|                   |                  | 2449.50  | -6.4                                       | V               | 3.0            | 46.9           | 1.0           | -52.3          | -13.0         | -39.3 |  |
|                   |                  | 3266.00  | -9.4                                       | V               | 3.0            | 46.7           | 1.0           | -55.0          | -13.0         | -42.0 |  |
|                   |                  | 1633.00  | -7.2                                       | H               | 3.0            | 46.4           | 1.0           | -52.6          | -13.0         | -39.6 |  |
|                   |                  | 2449.50  | -8.9                                       | H               | 3.0            | 46.9           | 1.0           | -54.7          | -13.0         | -41.7 |  |
|                   |                  | 3266.00  | -9.3                                       | H               | 3.0            | 46.7           | 1.0           | -55.0          | -13.0         | -42.0 |  |
|                   | Mid Ch, 821.5MHz |  |  |                 |                |                |               |                |               |       |  |
|                   |                  | 1643.00  | -9.1                                       | V               | 3.0            | 46.4           | 1.0           | -54.5          | -13.0         | -41.5 |  |
|                   |                  | 2464.50  | -6.4                                       | V               | 3.0            | 46.9           | 1.0           | -52.3          | -13.0         | -39.3 |  |
|                   |                  | 3286.00  | -9.5                                       | V               | 3.0            | 46.6           | 1.0           | -55.1          | -13.0         | -42.1 |  |
|                   |                  | 1643.00  | -8.3                                       | H               | 3.0            | 46.4           | 1.0           | -53.7          | -13.0         | -40.7 |  |
|                   |                  | 2464.50  | -8.4                                       | H               | 3.0            | 46.9           | 1.0           | -54.3          | -13.0         | -41.3 |  |
|                   |                  | 3286.00  | -9.3                                       | H               | 3.0            | 46.6           | 1.0           | -55.0          | -13.0         | -42.0 |  |

**LTE Band 26 (Straddle)**

|                    |                     | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |   |                 |                |                |               |                |               |       |  |
|--------------------|---------------------|--|---|-----------------|----------------|----------------|---------------|----------------|---------------|-------|--|
|                    |                     | <b>Company:</b>  | Samsung                                     |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Project #:</b>  | 4790776103                                  |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Date:</b>   | 2023-04-14                                  |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Test Engineer:</b>  | 24542                                       |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Configuration:</b>  | EUT / AC Adapter, Z-Position                |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Location:</b>   | Chamber 1                                   |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Mode:</b>   | LTE_QPSK Band 26 Harmonics, 15MHz Bandwidth |                 |                |                |               |                |               |       |  |
|                    |                     | <b>Test Voltage:</b>   | AC 120 V, 60 Hz                             |                 |                |                |               |                |               |       |  |
| 15 MHz<br><br>QPSK | f<br>MHz            | SG reading<br>(dBm)  | Ant. Pol.<br>(H/V)                          | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |  |
|                    | Straddle Ch, 824MHz |  |   |                 |                |                |               |                |               |       |  |
|                    |                     | 1648.00  | -11.1                                       | V               | 3.0            | 46.4           | 1.0           | -56.5          | -13.0         | -43.5 |  |
|                    |                     | 2472.00  | -8.7  | V               | 3.0            | 46.9           | 1.0           | -54.6          | -13.0         | -41.6 |  |
|                    |                     | 3296.00  | -9.4  | V               | 3.0            | 46.6           | 1.0           | -55.0          | -13.0         | -42.0 |  |
|                    |                     | 1648.00  | -11.3                                       | H               | 3.0            | 46.4           | 1.0           | -56.7          | -13.0         | -43.7 |  |
|                    |                     | 2472.00  | -9.5  | H               | 3.0            | 46.9           | 1.0           | -55.4          | -13.0         | -42.4 |  |
|                    |                     | 3296.00  | -9.3  | H               | 3.0            | 46.6           | 1.0           | -54.9          | -13.0         | -41.9 |  |

**LTE Band 26 (Part 22)**

| UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                  |  |              |             |             |            |             |            |       |
|--|------------------|--|--------------|-------------|-------------|------------|-------------|------------|-------|
| <b>Company:</b>  |                  | Samsung                                    |              |             |             |            |             |            |       |
| <b>Project #:</b>  |                  | 4790776103                                 |              |             |             |            |             |            |       |
| <b>Date:</b>   |                  | 2023-04-13                                 |              |             |             |            |             |            |       |
| <b>Test Engineer:</b>  |                  | 24542                                      |              |             |             |            |             |            |       |
| <b>Configuration:</b>  |                  | EUT / AC Adapter, Z-Position               |              |             |             |            |             |            |       |
| <b>Location:</b>   |                  | Chamber 1                                  |              |             |             |            |             |            |       |
| <b>Mode:</b>   |                  | LTE_QPSK Band 26 Harmonics, 3MHz Bandwidth |              |             |             |            |             |            |       |
| <b>Test Votage:</b>  |                  | AC 120 V, 60 Hz                            |              |             |             |            |             |            |       |
| f MHz  | SG reading (dBm) | Ant. Pol. (H/V)                            | Distance (m) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
| <b>Low Ch, 825.5MHz</b>  |                  |  |              |             |             |            |             |            |       |
| 1651.00  | -12.5            | V  | 3.0          | 46.4        | 1.0         | -57.9      | -13.0       | -44.9      |       |
| 2476.50  | -7.6             | V  | 3.0          | 46.9        | 1.0         | -53.5      | -13.0       | -40.5      |       |
| 3302.00  | -9.5             | V  | 3.0          | 46.6        | 1.0         | -55.1      | -13.0       | -42.1      |       |
| 1651.00  | -12.8            | H  | 3.0          | 46.4        | 1.0         | -58.3      | -13.0       | -45.3      |       |
| 2476.50  | -11.2            | H  | 3.0          | 46.9        | 1.0         | -57.1      | -13.0       | -44.1      |       |
| 3302.00  | -9.3             | H  | 3.0          | 46.6        | 1.0         | -54.9      | -13.0       | -41.9      |       |
| <b>Mid Ch, 831.5MHz</b>  |                  |  |              |             |             |            |             |            |       |
| 1663.00  | -9.8             | V  | 3.0          | 46.4        | 1.0         | -55.3      | -13.0       | -42.3      |       |
| 2494.50  | -8.3             | V  | 3.0          | 46.9        | 1.0         | -54.1      | -13.0       | -41.1      |       |
| 3326.00  | -9.3             | V  | 3.0          | 46.6        | 1.0         | -54.9      | -13.0       | -41.9      |       |
| 1663.00  | -10.8            | H  | 3.0          | 46.4        | 1.0         | -56.3      | -13.0       | -43.3      |       |
| 2494.50  | -8.7             | H  | 3.0          | 46.9        | 1.0         | -54.6      | -13.0       | -41.6      |       |
| 3326.00  | -12.3            | H  | 3.0          | 46.6        | 1.0         | -57.9      | -13.0       | -44.9      |       |
| <b>High Ch, 847.5MHz</b>   |                  |  |              |             |             |            |             |            |       |
| 1695.00  | -14.2            | V  | 3.0          | 46.5        | 1.0         | -59.7      | -13.0       | -46.7      |       |
| 2542.50  | -11.2            | V  | 3.0          | 46.9        | 1.0         | -57.1      | -13.0       | -44.1      |       |
| 3390.00  | -9.0             | V  | 3.0          | 46.5        | 1.0         | -54.5      | -13.0       | -41.5      |       |
| 1695.00  | -15.1            | H  | 3.0          | 46.5        | 1.0         | -60.6      | -13.0       | -47.6      |       |
| 2542.50  | -11.5            | H  | 3.0          | 46.9        | 1.0         | -57.4      | -13.0       | -44.4      |       |
| 3390.00  | -8.8             | H  | 3.0          | 46.5        | 1.0         | -54.3      | -13.0       | -41.3      |       |

3 MHz  
QPSK

**NR Band n5**

| UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                  |  |              |             |             |            |             |            |       |
|--|------------------|--|--------------|-------------|-------------|------------|-------------|------------|-------|
| <b>Company:</b>  |                  | Samsung                                    |              |             |             |            |             |            |       |
| <b>Project #:</b>  |                  | 4790776103                                 |              |             |             |            |             |            |       |
| <b>Date:</b>   |                  | 2023-04-14                                 |              |             |             |            |             |            |       |
| <b>Test Engineer:</b>  |                  | 26087                                      |              |             |             |            |             |            |       |
| <b>Configuration:</b>  |                  | EUT / AC Adapter, Y-Position               |              |             |             |            |             |            |       |
| <b>Location:</b>   |                  | Chamber 1                                  |              |             |             |            |             |            |       |
| <b>Mode:</b>   |                  | 5G_NR_QPSK_NR_n5_Harmonics, 5MHz Bandwidth |              |             |             |            |             |            |       |
| <b>Test Votage:</b>  |                  | AC 120 V, 60 Hz                            |              |             |             |            |             |            |       |
| f MHz  | SG reading (dBm) | Ant. Pol. (H/V)                            | Distance (m) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
| <b>Low Ch, 826.5MHz</b>  |                  |  |              |             |             |            |             |            |       |
| 1653.00  | -14.4            | V  | 3.0          | 46.4        | 1.0         | -59.8      | -13.0       | -46.8      |       |
| 2479.50  | -11.4            | V  | 3.0          | 46.9        | 1.0         | -57.3      | -13.0       | -44.3      |       |
| 3306.00  | -9.2             | V  | 3.0          | 46.6        | 1.0         | -54.8      | -13.0       | -41.8      |       |
| 1653.00  | -15.1            | H  | 3.0          | 46.4        | 1.0         | -60.5      | -13.0       | -47.5      |       |
| 2479.50  | -11.7            | H  | 3.0          | 46.9        | 1.0         | -57.5      | -13.0       | -44.5      |       |
| 3306.00  | -9.2             | H  | 3.0          | 46.6        | 1.0         | -54.8      | -13.0       | -41.8      |       |
| <b>Mid Ch, 836.5MHz</b>  |                  |  |              |             |             |            |             |            |       |
| 1673.00  | -14.3            | V  | 3.0          | 46.4        | 1.0         | -59.8      | -13.0       | -46.8      |       |
| 2509.50  | -11.4            | V  | 3.0          | 46.9        | 1.0         | -57.3      | -13.0       | -44.3      |       |
| 3346.00  | -9.3             | V  | 3.0          | 46.6        | 1.0         | -54.8      | -13.0       | -41.8      |       |
| 1673.00  | -15.3            | H  | 3.0          | 46.4        | 1.0         | -60.7      | -13.0       | -47.7      |       |
| 2509.50  | -11.8            | H  | 3.0          | 46.9        | 1.0         | -57.7      | -13.0       | -44.7      |       |
| 3346.00  | -8.9             | H  | 3.0          | 46.6        | 1.0         | -54.5      | -13.0       | -41.5      |       |
| <b>High Ch, 846.5MHz</b>   |                  |  |              |             |             |            |             |            |       |
| 1693.00  | -14.2            | V  | 3.0          | 46.5        | 1.0         | -59.6      | -13.0       | -46.6      |       |
| 2539.50  | -11.4            | V  | 3.0          | 46.9        | 1.0         | -57.3      | -13.0       | -44.3      |       |
| 3386.00  | -8.8             | V  | 3.0          | 46.5        | 1.0         | -54.3      | -13.0       | -41.3      |       |
| 1693.00  | -15.2            | H  | 3.0          | 46.5        | 1.0         | -60.7      | -13.0       | -47.7      |       |
| 2539.50  | -11.7            | H  | 3.0          | 46.9        | 1.0         | -57.6      | -13.0       | -44.6      |       |
| 3386.00  | -8.8             | H  | 3.0          | 46.5        | 1.0         | -54.3      | -13.0       | -41.3      |       |

5 MHz  
QPSK

**END OF REPORT**