

## FCC Test Report

### (PART 90S)

**Report No.:** RF171122C17-4

**FCC ID:** HD5-CT60L1N

**Test Model:** CT60L1N

**Received Date:** Nov. 22, 2017

**Test Date:** Dec. 05, 2017 ~ Dec. 24, 2017

**Issued Date:** Jan. 08, 2017

**Applicant:** Honeywell International Inc.

**Address:** 9680 Old Bailes Road, Fort Mill, SC 29707 USA

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan  
( R.O.C )

**Test Location:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan  
Hsien 333, Taiwan, R.O.C.

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

| Issue No.     | Description      | Date Issued   |
|---------------|------------------|---------------|
| RF171122C17-4 | Original Release | Jan. 08, 2017 |

## 1 Certificate of Conformity

**Product:** Dolphin CT60

**Brand:** Honeywell

**Test Model:** CT60L1N

**Sample Status:** Engineering sample

**Applicant:** Honeywell International Inc.

**Test Date:** Dec. 05, 2017 ~ Dec. 24, 2017

**Standards:** FCC Part 90, Subpart S

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Evonne Liu, **Date:** Jan. 08, 2017  
Evonne Liu / Specialist

**Approved by :** Dylan Chiou, **Date:** Jan. 08, 2017  
Dylan Chiou / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 90 & Part 2 |                              |        |                                                                                      |
|----------------------------------------|------------------------------|--------|--------------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                    | Result | Remarks                                                                              |
| 2.1046<br>90.635 (b)                   | Effective Radiated Power     | Pass   | Meet the requirement of limit.                                                       |
| 2.1055<br>90.213                       | Frequency Stability          | Pass   | Meet the requirement of limit.                                                       |
| 2.1049<br>90.209                       | Occupied Bandwidth (*)       | Pass   | Meet the requirement of limit.                                                       |
| 2.1051<br>90.209                       | Emission Masks               | Pass   | Meet the requirement of limit.                                                       |
| 2.1051<br>90.691                       | Conducted Spurious Emissions | Pass   | Meet the requirement of limit.                                                       |
| 2.1053<br>90.691                       | Radiated Spurious Emissions  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -28.23 dB at 2469.3 MHz. |

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement                        | Frequency          | Expanded Uncertainty (k=2) (±) |
|------------------------------------|--------------------|--------------------------------|
| Conducted Emissions at mains ports | 150 kHz ~ 30 MHz   | 2.44 dB                        |
| Radiated Emissions up to 1 GHz     | 30 MHz ~ 200 MHz   | 2.93 dB                        |
|                                    | 200 MHz ~ 1000 MHz | 2.95 dB                        |
| Radiated Emissions above 1 GHz     | 1 GHz ~ 18 GHz     | 2.26 dB                        |
|                                    | 18 GHz ~ 40 GHz    | 1.94 dB                        |

## 2.2 Test Site and Instruments

| Description & Manufacturer                | Model No.   | Serial No.                                                        | Date of Calibration | Due Date of Calibration |
|-------------------------------------------|-------------|-------------------------------------------------------------------|---------------------|-------------------------|
| Test Receiver<br>Agilent                  | N9038A      | MY51210203                                                        | Feb. 17, 2017       | Feb. 16, 2018           |
| Spectrum Analyzer<br>Agilent              | N9010A      | MY52220314                                                        | Dec. 16, 2016       | Dec. 15, 2017           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ      | FSU43       | 100115                                                            | Nov. 23, 2017       | Nov. 22, 2018           |
| BILOG Antenna<br>SCHWARZBECK              | VULB9168    | 9168-472                                                          | Dec. 13, 2016       | Dec. 12, 2017           |
|                                           |             |                                                                   | Dec. 06, 2017       | Dec. 05, 2018           |
| HORN Antenna<br>SCHWARZBECK               | BBHA 9120 D | 9120D-969                                                         | Dec. 27, 2016       | Dec. 26, 2017           |
| Double Ridge Guide Horn<br>Antenna EMCO   | 3115        | 5619                                                              | Dec. 15, 2016       | Dec. 14, 2017           |
| BILOG Antenna<br>SCHWARZBECK              | VULB 9168   | 9168-153                                                          | Dec. 13, 2016       | Dec. 12, 2017           |
|                                           |             |                                                                   | Dec. 06, 2017       | Dec. 05, 2018           |
| HORN Antenna<br>SCHWARZBECK               | BBHA 9170   | 9170-480                                                          | Dec. 14, 2016       | Dec. 13, 2017           |
|                                           |             |                                                                   | Dec. 01, 2017       | Nov. 30, 2018           |
| RF signal cable<br>ETS-LINDGREN           | 5D-FB       | Cable-CH1-01(R<br>FC-SMS-100-SM<br>S-120+RFC-SMS<br>-100-SMS-400) | Jun. 23, 2017       | Jun. 22, 2018           |
| MXG Vector signal<br>generator<br>Agilent | N5182B      | MY53050430                                                        | Oct. 24, 2017       | Oct. 23, 2018           |
| Loop Antenna                              | EM-6879     | 269                                                               | Aug. 11, 2017       | Aug. 10, 2018           |
| Preamplifier<br>EMCI                      | EMC001340   | 980201                                                            | Nov. 01, 2017       | Oct. 30, 2018           |
| Bluetooth Tester                          | CBT         | 100946                                                            | Jul. 29, 2016       | Jul. 28, 2018           |
| Preamplifier<br>EMCI                      | EMC 012645  | 980115                                                            | Oct. 20, 2017       | Oct. 19, 2018           |
| Preamplifier<br>EMCI                      | EMC 184045  | 980116                                                            | Oct. 20, 2017       | Oct. 19, 2018           |
| Preamplifier<br>EMCI                      | EMC 330H    | 980112                                                            | Oct. 13, 2017       | Oct. 12, 2018           |
| Power Meter<br>Anritsu                    | ML2495A     | 1012010                                                           | Aug. 15, 2017       | Aug. 14, 2018           |
| Power Sensor<br>Anritsu                   | MA2411B     | 1315050                                                           | Aug. 15, 2017       | Aug. 14, 2018           |

| Description & Manufacturer                     | Model No.                  | Serial No.                    | Date of Calibration | Due Date of Calibration |
|------------------------------------------------|----------------------------|-------------------------------|---------------------|-------------------------|
| RF Coaxial Cable<br>HUBER+SUHNNER              | EMC104-SM-SM-8<br>000&3000 | 140811+170717                 | Oct. 20, 2017       | Oct. 19, 2018           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | SUCOFLEX 104               | EMC104-SM-SM-<br>1000(140807) | Oct. 20, 2017       | Oct. 19, 2018           |
| RF Coaxial Cable<br>Worken                     | 8D-FB                      | Cable-Ch10-01                 | Oct. 20, 2017       | Oct. 19, 2018           |
| Software<br>BV ADT                             | E3<br>6.120103             | NA                            | NA                  | NA                      |
| Antenna Tower<br>MF                            | MFA-440H                   | NA                            | NA                  | NA                      |
| Turn Table<br>MF                               | MFT-201SS                  | NA                            | NA                  | NA                      |
| Antenna Tower & Turn<br>Table Controller<br>MF | MF-7802                    | NA                            | NA                  | NA                      |

- Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

### 3 General Information

#### 3.1 General Description of EUT

|                            |                                          |                    |
|----------------------------|------------------------------------------|--------------------|
| <b>Product</b>             | Dolphin CT60                             |                    |
| <b>Brand</b>               | Honeywell                                |                    |
| <b>Test Model</b>          | CT60L1N                                  |                    |
| <b>Status of EUT</b>       | Engineering sample                       |                    |
| <b>HW Version</b>          | V1.0                                     |                    |
| <b>HW P/N</b>              | DVT3                                     |                    |
| <b>SW Version</b>          | OS.01.001-HON.01.003                     |                    |
| <b>SW P/N</b>              | 329D                                     |                    |
| <b>Power Supply Rating</b> | 3.6 Vdc (Li-ion battery)                 |                    |
| <b>Modulation Type</b>     | CDMA                                     | QPSK, OQPSK, HPSK  |
|                            | LTE                                      | QPSK, 16QAM, 64QAM |
| <b>Frequency Range</b>     | CDMA BC10                                | 817.9 ~ 823.1 MHz  |
|                            | LTE Band 26 (Channel Bandwidth: 1.4 MHz) | 814.7 ~ 823.3 MHz  |
|                            | LTE Band 26 (Channel Bandwidth: 3 MHz)   | 815.5 ~ 822.5 MHz  |
|                            | LTE Band 26 (Channel Bandwidth: 5 MHz)   | 816.5 ~ 821.5 MHz  |
|                            | LTE Band 26 (Channel Bandwidth: 10 MHz)  | 819 MHz            |
| <b>Emission Designator</b> | CDMA BC10                                | 1M28F9W            |
|                            | LTE Band 26 (Channel Bandwidth: 1.4 MHz) | 1M09W7D            |
|                            | LTE Band 26 (Channel Bandwidth: 3 MHz)   | 2M70G7D            |
|                            | LTE Band 26 (Channel Bandwidth: 5 MHz)   | 4M50W7D            |
|                            | LTE Band 26 (Channel Bandwidth: 10 MHz)  | 8M98W7D            |
| <b>Max. ERP Power</b>      | CDMA BC10                                | 69.98 mW           |
|                            | LTE Band 26 (Channel Bandwidth: 1.4 MHz) | 102.80 mW          |
|                            | LTE Band 26 (Channel Bandwidth: 3 MHz)   | 109.40 mW          |
|                            | LTE Band 26 (Channel Bandwidth: 5 MHz)   | 119.67 mW          |
|                            | LTE Band 26 (Channel Bandwidth: 10 MHz)  | 124.17 mW          |
| <b>Antenna Type</b>        | PIFA Antenna                             |                    |
| <b>Accessory Device</b>    | Refer to Note as below                   |                    |
| <b>Data Cable Supplied</b> | Refer to Note as below                   |                    |

Note:

1. The EUT contains following accessory devices.

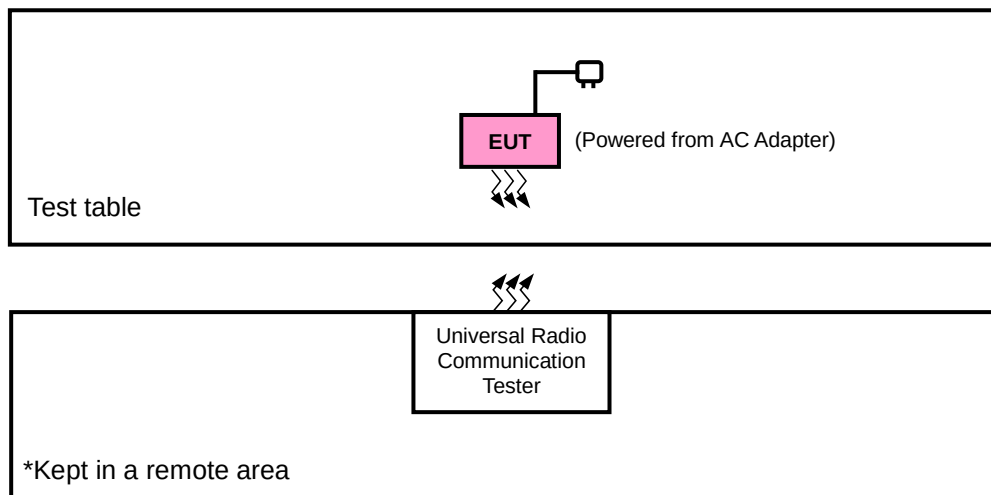
| Product | Brand    | Model     | Description               |
|---------|----------|-----------|---------------------------|
| Battery | Inventus | CT50-BTSC | 3.6 Vdc, 4040 mAh, 14.6Wh |

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

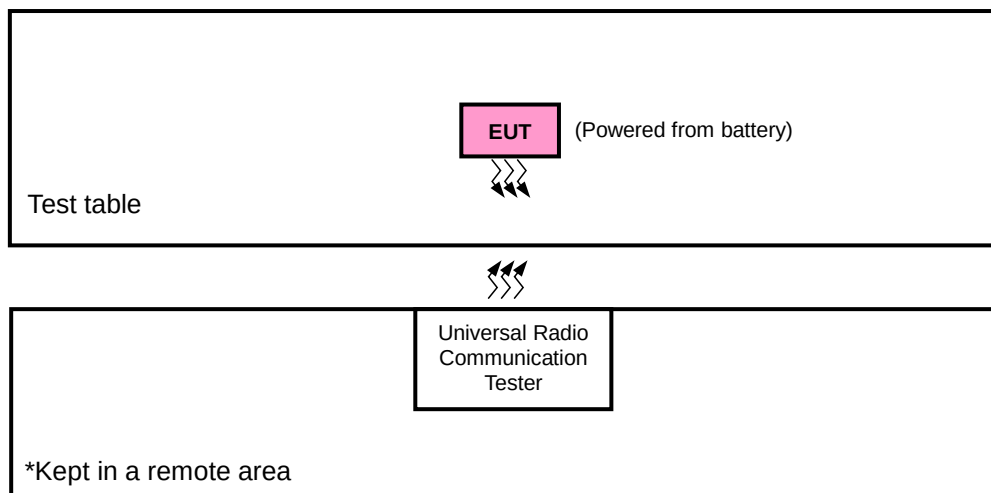


### 3.2 Configuration of System under Test

#### <Radiated Emission Test>



#### <E.R.P. Test>



#### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

| Band        | ERP     | Radiated Emission |
|-------------|---------|-------------------|
| CDMA        | Y-plane | Z-axis            |
| LTE Band 26 | X-plane | Z-axis            |

#### CDMA

| EUT Configure Mode | Test Item           | Available Channel | Tested Channel | Mode  |
|--------------------|---------------------|-------------------|----------------|-------|
| -                  | ERP                 | 476 to 684        | 476, 580, 684  | 1xRTT |
| -                  | Frequency Stability | 476 to 684        | 476, 684       | 1xRTT |
| -                  | Occupied Bandwidth  | 476 to 684        | 476, 580, 684  | 1xRTT |
| -                  | Emission Mask       | 476 to 684        | 476, 580, 684  | 1xRTT |
| -                  | Conducted Emission  | 476 to 684        | 476, 580, 684  | 1xRTT |
| -                  | Radiated Emission   | 476 to 684        | 476, 580, 684  | 1xRTT |

## LTE Band 26

| EUT Configure Mode | Test Item           | Available Channel | Tested Channel      | Channel Bandwidth | Modulation         | Mode                |
|--------------------|---------------------|-------------------|---------------------|-------------------|--------------------|---------------------|
| -                  | ERP                 | 26697 to 26783    | 26697, 26740, 26783 | 1.4 MHz           | QPSK, 16QAM, 64QAM | 1 RB / 2 RB Offset  |
|                    |                     | 26705 to 26775    | 26705, 26740, 26775 | 3 MHz             | QPSK, 16QAM, 64QAM | 1 RB / 7 RB Offset  |
|                    |                     | 26715 to 26765    | 26715, 26740, 26765 | 5 MHz             | QPSK, 16QAM, 64QAM | 1 RB / 12 RB Offset |
|                    |                     | 26740             | 26740               | 10 MHz            | QPSK, 16QAM, 64QAM | 1 RB / 49 RB Offset |
| -                  | Frequency Stability | 26697 to 26783    | 26697, 26783        | 1.4 MHz           | QPSK               | 1 RB / 2 RB Offset  |
|                    |                     | 26705 to 26775    | 26705, 26775        | 3 MHz             | QPSK               | 1 RB / 7 RB Offset  |
|                    |                     | 26715 to 26765    | 26715, 26765        | 5 MHz             | QPSK               | 1 RB / 12 RB Offset |
|                    |                     | 26740             | 26740               | 10 MHz            | QPSK               | 1 RB / 49 RB Offset |
| -                  | Occupied Bandwidth  | 26697 to 26783    | 26697, 26740, 26783 | 1.4 MHz           | QPSK, 16QAM, 64QAM | 6 RB / 0 RB Offset  |
|                    |                     | 26705 to 26775    | 26705, 26740, 26775 | 3 MHz             | QPSK, 16QAM, 64QAM | 15 RB / 0 RB Offset |
|                    |                     | 26715 to 26765    | 26715, 26740, 26765 | 5 MHz             | QPSK, 16QAM, 64QAM | 25 RB / 0 RB Offset |
|                    |                     | 26740             | 26740               | 10 MHz            | QPSK, 16QAM, 64QAM | 50 RB / 0 RB Offset |
| -                  | Emission Mask       | 26697 to 26783    | 26697, 26740, 26783 | 1.4 MHz           | QPSK, 16QAM, 64QAM | 6 RB / 0 RB Offset  |
|                    |                     | 26705 to 26775    | 26705, 26740, 26775 | 3 MHz             | QPSK, 16QAM, 64QAM | 15 RB / 0 RB Offset |
|                    |                     | 26715 to 26765    | 26715, 26740, 26765 | 5 MHz             | QPSK, 16QAM, 64QAM | 25 RB / 0 RB Offset |
|                    |                     | 26740             | 26740               | 10 MHz            | QPSK, 16QAM, 64QAM | 50 RB / 0 RB Offset |
| -                  | Conducted Emission  | 26697 to 26783    | 26697, 26740, 26783 | 1.4 MHz           | QPSK               | 1 RB / 0 RB Offset  |
|                    |                     | 26705 to 26775    | 26705, 26740, 26775 | 3 MHz             | QPSK               | 1 RB / 0 RB Offset  |
|                    |                     | 26715 to 26765    | 26715, 26740, 26765 | 5 MHz             | QPSK               | 1 RB / 0 RB Offset  |
|                    |                     | 26740             | 26740               | 10 MHz            | QPSK               | 1 RB / 0 RB Offset  |
| -                  | Radiated Emission   | 26740             | 26740               | 10 MHz            | QPSK               | 1 RB / 49 RB Offset |

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

### Test Condition:

| Test Item             | Environmental Conditions | Input Power | Tested By |
|-----------------------|--------------------------|-------------|-----------|
| ERP                   | 25 deg. C, 65 % RH       | 3.6 Vdc     | Wayne Lin |
| Frequency Stability   | 25 deg. C, 65 % RH       | 3.6 Vdc     | Wayne Lin |
| Occupied Bandwidth    | 25 deg. C, 65 % RH       | 3.6 Vdc     | Wayne Lin |
| Peak to Average Ratio | 25 deg. C, 65 % RH       | 3.6 Vdc     | Wayne Lin |
| Emission Mask         | 25 deg. C, 65 % RH       | 3.6 Vdc     | Wayne Lin |
| Condcudeted Emission  | 25 deg. C, 65 % RH       | 3.6 Vdc     | Wayne Lin |

|                   |                    |                |                              |
|-------------------|--------------------|----------------|------------------------------|
| Radiated Emission | 25 deg. C, 65 % RH | 120 Vac, 60 Hz | Getaz Yang /<br>Jisyong Wang |
|-------------------|--------------------|----------------|------------------------------|

### 3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

### 3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 90**

**ANSI/TIA/EIA-603-E 2016**

**ANSI 63.26-2015**

**Note:** All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 100 watts e.r.p.

#### 4.1.2 Test Procedures

##### **EIRP / ERP Measurement:**

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5 MHz for CDMA and 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ . E.R.P power can be calculated from E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15 \text{ dBi}$ .

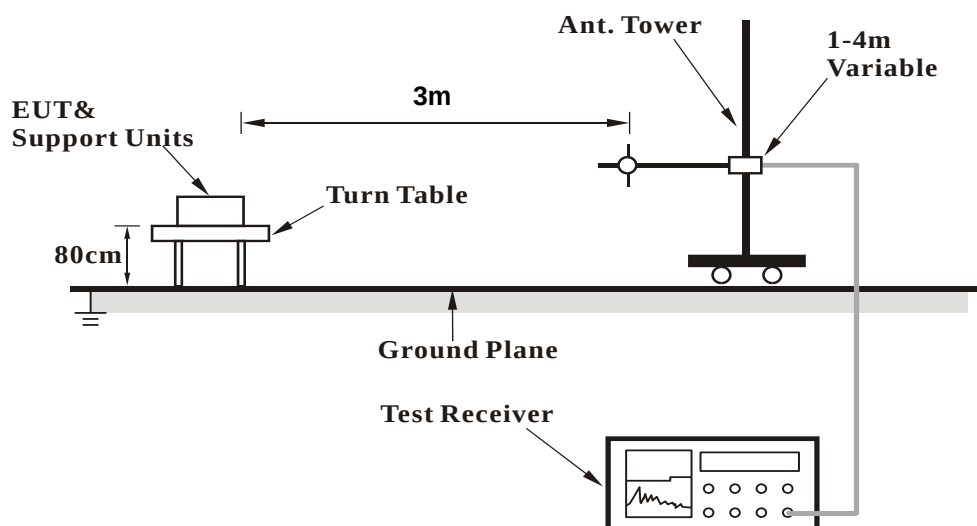
##### **Conducted Power Measurement:**

- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

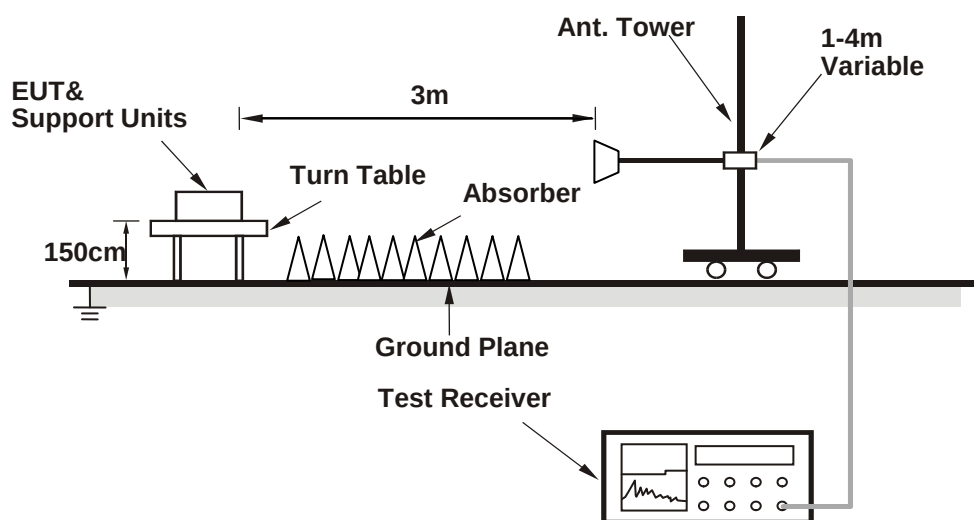
#### 4.1.3 Test Setup

##### EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

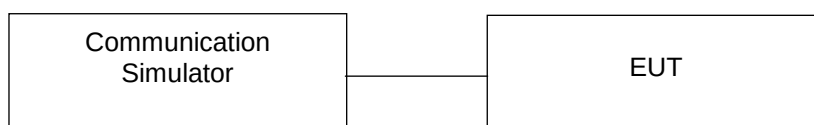


<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

##### Conducted Power Measurement:



#### 4.1.4 Test Results

##### Conducted Output Power (dBm)

| Band              | CDMA  |       |       |
|-------------------|-------|-------|-------|
| Channel           | 476   | 580   | 684   |
| Frequency (MHz)   | 817.9 | 820.5 | 823.1 |
| RC1+SO55          | 24.16 | 24.13 | 24.21 |
| RC3+SO55          | 24.18 | 24.15 | 24.23 |
| RC3+SO32(+ F-SCH) | 24.16 | 24.13 | 24.21 |
| RC3+SO32(+SCH)    | 24.17 | 24.14 | 24.22 |
| RTAP 153.6        | 24.26 | 24.34 | 24.32 |
| RETAP 4096        | 24.16 | 24.14 | 24.22 |

| LTE Band 26     |           |                 |           |           |       |                 |               |       |               |                 |           |         |           |       |               |
|-----------------|-----------|-----------------|-----------|-----------|-------|-----------------|---------------|-------|---------------|-----------------|-----------|---------|-----------|-------|---------------|
| BW              | MCS Index | RB Size         | RB Offset |           | Mid   |                 | 3GPP MPR (dB) | BW    | MCS Index     | RB Size         | RB Offset | Low     | Mid       | High  | 3GPP MPR (dB) |
|                 |           | Channel         |           |           | 26740 |                 |               |       |               | Channel         |           | 26715   | 26740     | 26765 |               |
|                 |           | Frequency (MHz) |           |           | 819.0 |                 |               |       |               | Frequency (MHz) |           | 816.5   | 819.0     | 821.5 |               |
| 10M             | QPSK      | 1               | 0         |           | 23.74 |                 | 0             | 5M    | QPSK          | 1               | 0         | 23.66   | 23.63     | 23.66 | 0             |
|                 |           | 1               | 24        |           | 23.64 |                 | 0             |       |               | 1               | 12        | 23.56   | 23.74     | 23.56 | 0             |
|                 |           | 1               | 49        |           | 23.53 |                 | 0             |       |               | 1               | 24        | 23.45   | 23.58     | 23.45 | 0             |
|                 |           | 25              | 0         |           | 22.74 |                 | 1             |       |               | 12              | 0         | 22.66   | 22.70     | 22.66 | 1             |
|                 |           | 25              | 12        |           | 22.74 |                 | 1             |       |               | 12              | 6         | 22.66   | 22.79     | 22.66 | 1             |
|                 |           | 25              | 25        |           | 22.79 |                 | 1             |       |               | 12              | 13        | 22.71   | 22.81     | 22.71 | 1             |
|                 |           | 50              | 0         |           | 22.63 |                 | 1             |       |               | 25              | 0         | 22.55   | 22.75     | 22.55 | 1             |
|                 | 16QAM     | 1               | 0         |           | 23.07 |                 | 1             |       | 16QAM         | 1               | 0         | 22.99   | 23.23     | 22.99 | 1             |
|                 |           | 1               | 24        |           | 23.31 |                 | 1             |       |               | 1               | 12        | 23.23   | 23.18     | 23.23 | 1             |
|                 |           | 1               | 49        |           | 23.20 |                 | 1             |       |               | 1               | 24        | 23.12   | 23.10     | 23.12 | 1             |
|                 |           | 25              | 0         |           | 21.84 |                 | 2             |       |               | 12              | 0         | 21.76   | 21.69     | 21.76 | 2             |
|                 |           | 25              | 12        |           | 21.70 |                 | 2             |       |               | 12              | 6         | 21.62   | 21.73     | 21.62 | 2             |
|                 |           | 25              | 25        |           | 21.68 |                 | 2             |       |               | 12              | 13        | 21.60   | 21.76     | 21.60 | 2             |
|                 |           | 50              | 0         |           | 21.73 |                 | 2             |       |               | 25              | 0         | 21.65   | 21.63     | 21.65 | 2             |
|                 | 64QAM     | 1               | 0         |           | 21.98 |                 | 2             |       | 64QAM         | 1               | 0         | 21.90   | 21.88     | 21.90 | 2             |
|                 |           | 1               | 24        |           | 21.81 |                 | 2             |       |               | 1               | 12        | 21.73   | 21.71     | 21.73 | 2             |
|                 |           | 1               | 49        |           | 21.82 |                 | 2             |       |               | 1               | 24        | 21.74   | 21.72     | 21.74 | 2             |
|                 |           | 25              | 0         |           | 20.72 |                 | 3             |       |               | 12              | 0         | 20.64   | 20.62     | 20.64 | 3             |
|                 |           | 25              | 12        |           | 20.70 |                 | 3             |       |               | 12              | 6         | 20.62   | 20.60     | 20.62 | 3             |
|                 |           | 25              | 25        |           | 20.68 |                 | 3             |       |               | 12              | 13        | 20.60   | 20.58     | 20.60 | 3             |
|                 |           | 50              | 0         |           | 20.64 |                 | 3             |       |               | 25              | 0         | 20.56   | 20.54     | 20.56 | 3             |
|                 | BW        | MCS Index       | RB Size   | RB Offset | Low   | Mid             | High          |       | 3GPP MPR (dB) | BW              | MCS Index | RB Size | RB Offset | Low   | Mid           |
| Channel         |           |                 | 26705     | 26740     | 26775 | Channel         |               | 26697 |               |                 |           | 26740   | 26783     |       |               |
| Frequency (MHz) |           |                 | 815.5     | 819.0     | 822.5 | Frequency (MHz) |               | 814.7 |               |                 |           | 819.0   | 823.3     |       |               |
| 5M              | QPSK      | 1               | 0         | 23.60     | 23.56 | 23.59           | 0             | 3M    | QPSK          | 1               | 0         | 23.55   | 23.48     | 23.51 | 0             |
|                 |           | 1               | 7         | 23.50     | 23.67 | 23.49           | 0             |       |               | 1               | 2         | 23.45   | 23.59     | 23.41 | 0             |
|                 |           | 1               | 14        | 23.39     | 23.51 | 23.38           | 0             |       |               | 1               | 5         | 23.34   | 23.43     | 23.30 | 0             |
|                 |           | 8               | 0         | 22.60     | 22.63 | 22.59           | 1             |       |               | 3               | 0         | 22.72   | 22.65     | 22.63 | 0             |
|                 |           | 8               | 3         | 22.60     | 22.72 | 22.59           | 1             |       |               | 3               | 1         | 22.68   | 22.64     | 22.62 | 0             |
|                 |           | 8               | 7         | 22.65     | 22.74 | 22.64           | 1             |       |               | 3               | 3         | 22.65   | 22.66     | 22.62 | 0             |
|                 |           | 15              | 0         | 22.49     | 22.68 | 22.48           | 1             |       |               | 6               | 0         | 22.44   | 22.60     | 22.40 | 1             |
|                 | 16QAM     | 1               | 0         | 22.93     | 23.16 | 22.92           | 1             |       | 16QAM         | 1               | 0         | 22.88   | 23.08     | 22.84 | 1             |
|                 |           | 1               | 7         | 23.17     | 23.11 | 23.16           | 1             |       |               | 1               | 2         | 23.12   | 23.03     | 23.08 | 1             |
|                 |           | 1               | 14        | 23.06     | 23.03 | 23.05           | 1             |       |               | 1               | 5         | 23.01   | 22.95     | 22.97 | 1             |
|                 |           | 8               | 0         | 21.70     | 21.62 | 21.69           | 2             |       |               | 3               | 0         | 21.65   | 21.61     | 21.61 | 1             |
|                 |           | 8               | 3         | 21.56     | 21.66 | 21.55           | 2             |       |               | 3               | 1         | 21.62   | 21.61     | 21.63 | 1             |
|                 |           | 8               | 7         | 21.54     | 21.69 | 21.53           | 2             |       |               | 3               | 3         | 21.61   | 21.61     | 21.62 | 1             |
|                 |           | 15              | 0         | 21.59     | 21.56 | 21.58           | 2             |       |               | 6               | 0         | 21.54   | 21.48     | 21.50 | 2             |
|                 | 64QAM     | 1               | 0         | 21.84     | 21.81 | 21.83           | 2             |       | 64QAM         | 1               | 0         | 21.79   | 21.73     | 21.75 | 2             |
|                 |           | 1               | 7         | 21.67     | 21.64 | 21.66           | 2             |       |               | 1               | 2         | 21.62   | 21.56     | 21.58 | 2             |
|                 |           | 1               | 14        | 21.68     | 21.65 | 21.67           | 2             |       |               | 1               | 5         | 21.63   | 21.57     | 21.59 | 2             |
|                 |           | 8               | 0         | 20.58     | 20.55 | 20.57           | 3             |       |               | 3               | 0         | 20.68   | 21.53     | 21.55 | 2             |
|                 |           | 8               | 3         | 20.56     | 20.53 | 20.55           | 3             |       |               | 3               | 1         | 20.65   | 21.51     | 21.53 | 2             |
|                 |           | 8               | 7         | 20.54     | 20.51 | 20.53           | 3             |       |               | 3               | 3         | 20.61   | 21.45     | 21.47 | 2             |
|                 |           | 15              | 0         | 20.50     | 20.47 | 20.49           | 3             |       |               | 6               | 0         | 20.45   | 20.39     | 20.41 | 3             |



**ERP Power (dBm)**

| CDMA  |         |                 |           |                        |           |          |                    |
|-------|---------|-----------------|-----------|------------------------|-----------|----------|--------------------|
| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| Y     | 476     | 817.9           | -10.65    | 31.208                 | 18.41     | 69.31    | H                  |
|       | 580     | 820.5           | -10.70    | 31.3                   | 18.45     | 69.98    |                    |
|       | 684     | 823.1           | -10.85    | 31.222                 | 18.22     | 66.40    |                    |
|       | 476     | 817.9           | -14.33    | 31.504                 | 15.02     | 31.80    | V                  |
|       | 580     | 820.5           | -13.85    | 31.117                 | 15.12     | 32.49    |                    |
|       | 684     | 823.1           | -14.96    | 31.922                 | 14.81     | 30.28    |                    |

| LTE Band 26                        |         |                 |           |                        |           |          |                    |
|------------------------------------|---------|-----------------|-----------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 1.4 MHz / QPSK  |         |                 |           |                        |           |          |                    |
| Plane                              | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                  | 26697   | 814.7           | -9.98     | 32.01                  | 19.88     | 97.27    | H                  |
|                                    | 26740   | 819.0           | -9.84     | 32.11                  | 20.12     | 102.80   |                    |
|                                    | 26783   | 823.3           | -10.34    | 32.32                  | 19.83     | 96.16    |                    |
|                                    | 26697   | 814.7           | -17.97    | 32.54                  | 12.42     | 17.46    | V                  |
|                                    | 26740   | 819.0           | -17.84    | 32.51                  | 12.52     | 17.86    |                    |
|                                    | 26783   | 823.3           | -18.02    | 32.51                  | 12.34     | 17.14    |                    |
| Channel Bandwidth: 1.4 MHz / 16QAM |         |                 |           |                        |           |          |                    |
| X                                  | 26697   | 814.7           | -11.77    | 32.01                  | 18.09     | 64.42    | H                  |
|                                    | 26740   | 819.0           | -11.66    | 32.11                  | 18.30     | 67.61    |                    |
|                                    | 26783   | 823.3           | -12.36    | 32.32                  | 17.81     | 60.39    |                    |
|                                    | 26697   | 814.7           | -19.91    | 32.54                  | 10.48     | 11.17    | V                  |
|                                    | 26740   | 819.0           | -19.83    | 32.51                  | 10.53     | 11.30    |                    |
|                                    | 26783   | 823.3           | -20.07    | 32.51                  | 10.29     | 10.69    |                    |
| Channel Bandwidth: 1.4 MHz / 64QAM |         |                 |           |                        |           |          |                    |
| X                                  | 26697   | 814.7           | -12.77    | 32.01                  | 17.09     | 51.17    | H                  |
|                                    | 26740   | 819.0           | -12.66    | 32.11                  | 17.30     | 53.70    |                    |
|                                    | 26783   | 823.3           | -13.66    | 32.32                  | 16.51     | 44.77    |                    |
|                                    | 26697   | 814.7           | -20.91    | 32.54                  | 9.48      | 8.87     | V                  |
|                                    | 26740   | 819.0           | -20.83    | 32.51                  | 9.53      | 8.97     |                    |
|                                    | 26783   | 823.3           | -20.52    | 32.51                  | 9.84      | 9.64     |                    |

| LTE Band 26                      |         |                 |           |                        |           |          |                    |
|----------------------------------|---------|-----------------|-----------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 3 MHz / QPSK  |         |                 |           |                        |           |          |                    |
| Plane                            | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                | 26705   | 815.5           | -9.67     | 32.02                  | 20.20     | 104.71   | H                  |
|                                  | 26740   | 819.0           | -9.57     | 32.11                  | 20.39     | 109.40   |                    |
|                                  | 26775   | 822.5           | -9.98     | 32.18                  | 20.05     | 101.16   |                    |
|                                  | 26705   | 815.5           | -17.77    | 32.5                   | 12.58     | 18.11    | V                  |
|                                  | 26740   | 819.0           | -17.67    | 32.51                  | 12.69     | 18.58    |                    |
|                                  | 26775   | 822.5           | -17.83    | 32.47                  | 12.49     | 17.74    |                    |
| Channel Bandwidth: 3 MHz / 16QAM |         |                 |           |                        |           |          |                    |
| X                                | 26705   | 815.5           | -11.68    | 32.02                  | 18.19     | 65.92    | H                  |
|                                  | 26740   | 819.0           | -11.54    | 32.11                  | 18.42     | 69.50    |                    |
|                                  | 26775   | 822.5           | -11.94    | 32.18                  | 18.09     | 64.42    |                    |
|                                  | 26705   | 815.5           | -19.77    | 32.5                   | 10.58     | 11.43    | V                  |
|                                  | 26740   | 819.0           | -19.64    | 32.51                  | 10.72     | 11.80    |                    |
|                                  | 26775   | 822.5           | -19.83    | 32.47                  | 10.49     | 11.19    |                    |
| Channel Bandwidth: 3 MHz / 64QAM |         |                 |           |                        |           |          |                    |
| X                                | 26705   | 815.5           | -12.58    | 32.02                  | 17.29     | 53.58    | H                  |
|                                  | 26740   | 819.0           | -12.34    | 32.11                  | 17.62     | 57.81    |                    |
|                                  | 26775   | 822.5           | -12.88    | 32.18                  | 17.15     | 51.88    |                    |
|                                  | 26705   | 815.5           | -20.17    | 32.5                   | 10.18     | 10.42    | V                  |
|                                  | 26740   | 819.0           | -20.24    | 32.51                  | 10.12     | 10.28    |                    |
|                                  | 26775   | 822.5           | -20.33    | 32.47                  | 9.99      | 9.98     |                    |

| LTE Band 26                      |         |                 |           |                        |           |          |                    |
|----------------------------------|---------|-----------------|-----------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 5 MHz / QPSK  |         |                 |           |                        |           |          |                    |
| Plane                            | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                | 26715   | 816.5           | -9.34     | 32.04                  | 20.55     | 113.50   | H                  |
|                                  | 26740   | 819.0           | -9.18     | 32.11                  | 20.78     | 119.67   |                    |
|                                  | 26765   | 821.5           | -9.42     | 31.79                  | 20.22     | 105.20   |                    |
|                                  | 26715   | 816.5           | -17.46    | 32.52                  | 12.91     | 19.54    | V                  |
|                                  | 26740   | 819.0           | -17.23    | 32.51                  | 13.13     | 20.56    |                    |
|                                  | 26765   | 821.5           | -17.52    | 32.17                  | 12.50     | 17.78    |                    |
| Channel Bandwidth: 5 MHz / 16QAM |         |                 |           |                        |           |          |                    |
| X                                | 26715   | 816.5           | -11.38    | 32.04                  | 18.51     | 70.96    | H                  |
|                                  | 26740   | 819.0           | -11.21    | 32.11                  | 18.75     | 74.99    |                    |
|                                  | 26765   | 821.5           | -11.70    | 31.79                  | 17.94     | 62.23    |                    |
|                                  | 26715   | 816.5           | -19.45    | 32.52                  | 10.92     | 12.36    | V                  |
|                                  | 26740   | 819.0           | -19.37    | 32.51                  | 10.99     | 12.56    |                    |
|                                  | 26765   | 821.5           | -19.51    | 32.17                  | 10.51     | 11.25    |                    |
| Channel Bandwidth: 5 MHz / 64QAM |         |                 |           |                        |           |          |                    |
| X                                | 26715   | 816.5           | -12.37    | 32.04                  | 17.52     | 56.49    | H                  |
|                                  | 26740   | 819.0           | -12.11    | 32.11                  | 17.85     | 60.95    |                    |
|                                  | 26765   | 821.5           | -12.10    | 31.79                  | 17.54     | 56.75    |                    |
|                                  | 26715   | 816.5           | -20.15    | 32.52                  | 10.22     | 10.52    | V                  |
|                                  | 26740   | 819.0           | -20.22    | 32.51                  | 10.14     | 10.33    |                    |
|                                  | 26765   | 821.5           | -20.01    | 32.17                  | 10.01     | 10.02    |                    |

| LTE Band 26                       |         |                 |           |                        |           |          |                    |
|-----------------------------------|---------|-----------------|-----------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 10 MHz / QPSK  |         |                 |           |                        |           |          |                    |
| Plane                             | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                 | 26740   | 819.0           | -9.02     | 32.11                  | 20.94     | 124.17   | H                  |
|                                   | 26740   | 819.0           | -16.84    | 32.51                  | 13.52     | 22.49    | V                  |
| Channel Bandwidth: 10 MHz / 16QAM |         |                 |           |                        |           |          |                    |
| X                                 | 26740   | 819.0           | -10.25    | 32.11                  | 19.71     | 93.54    | H                  |
|                                   | 26740   | 819.0           | -17.92    | 32.51                  | 12.44     | 17.54    | V                  |
| Channel Bandwidth: 10 MHz / 64QAM |         |                 |           |                        |           |          |                    |
| X                                 | 26740   | 819.0           | -11.25    | 32.11                  | 18.71     | 74.30    | H                  |
|                                   | 26740   | 819.0           | -18.92    | 32.51                  | 11.44     | 13.93    | V                  |

## 4.2 Frequency Stability Measurement

### 4.2.1 Limits of Frequency Stability Measurement

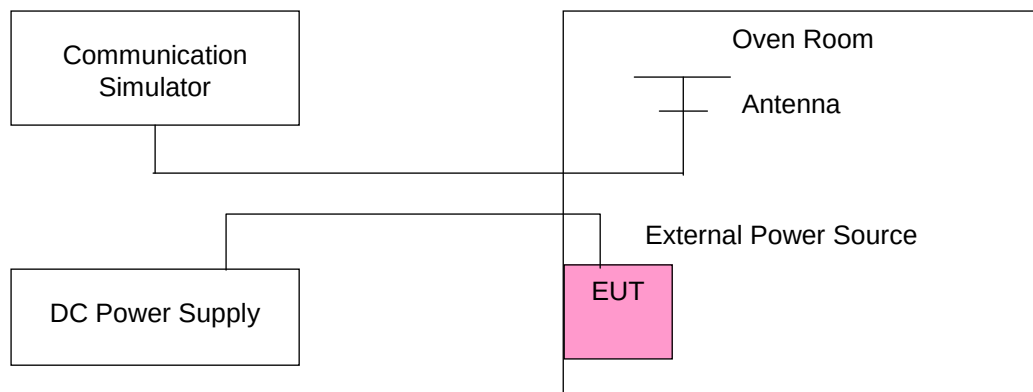
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

### 4.2.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5$  °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

### 4.2.3 Test Setup



#### 4.2.4 Test Results

##### Frequency Error vs. Voltage

| Voltage<br>(Volts) | CDMA            |                       |                 |                       | Limit (ppm) |
|--------------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Low Channel     |                       | High Channel    |                       |             |
|                    | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.6                | 817.900004      | 0.005                 | 822.750004      | 0.004                 | 2.5         |
| 3.3                | 817.900001      | 0.001                 | 822.750004      | 0.005                 | 2.5         |
| 4.2                | 817.900004      | 0.004                 | 822.750004      | 0.005                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

##### Frequency Error vs. Temperature

| Temp. (°C) | CDMA            |                       |                 |                       | Limit (ppm) |
|------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|            | Low Channel     |                       | High Channel    |                       |             |
|            | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 817.900002      | 0.002                 | 822.750002      | 0.002                 | 2.5         |
| -20        | 817.900002      | 0.002                 | 822.750004      | 0.004                 | 2.5         |
| -10        | 817.900004      | 0.005                 | 822.750002      | 0.002                 | 2.5         |
| 0          | 817.900002      | 0.002                 | 822.750001      | 0.001                 | 2.5         |
| 10         | 817.900003      | 0.003                 | 822.750003      | 0.004                 | 2.5         |
| 20         | 817.899998      | -0.002                | 822.749998      | -0.003                | 2.5         |
| 30         | 817.899998      | -0.003                | 822.749998      | -0.003                | 2.5         |
| 40         | 817.899999      | -0.001                | 822.749997      | -0.004                | 2.5         |
| 50         | 817.899996      | -0.005                | 822.749998      | -0.002                | 2.5         |
| 55         | 817.899998      | -0.003                | 822.749997      | -0.004                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 26                |                       |                 |                       | Limit (ppm) |
|--------------------|----------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 1.4 MHz |                       |                 |                       |             |
|                    | Low Channel                |                       | High Channel    |                       |             |
|                    | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.6                | 814.700002                 | 0.002                 | 823.300003      | 0.004                 | 2.5         |
| 3.3                | 814.700002                 | 0.003                 | 823.300001      | 0.002                 | 2.5         |
| 4.2                | 814.700003                 | 0.004                 | 823.300004      | 0.005                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26                |                       |                 |                       | Limit (ppm) |
|------------|----------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 1.4 MHz |                       |                 |                       |             |
|            | Low Channel                |                       | High Channel    |                       |             |
|            | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 814.700002                 | 0.003                 | 823.300002      | 0.003                 | 2.5         |
| -20        | 814.700002                 | 0.002                 | 823.300003      | 0.004                 | 2.5         |
| -10        | 814.700003                 | 0.003                 | 823.300003      | 0.004                 | 2.5         |
| 0          | 814.700003                 | 0.004                 | 823.300002      | 0.003                 | 2.5         |
| 10         | 814.700002                 | 0.002                 | 823.300002      | 0.002                 | 2.5         |
| 20         | 814.699998                 | -0.002                | 823.299998      | -0.003                | 2.5         |
| 30         | 814.699998                 | -0.002                | 823.299999      | -0.001                | 2.5         |
| 40         | 814.699999                 | -0.002                | 823.299999      | -0.002                | 2.5         |
| 50         | 814.699997                 | -0.004                | 823.299999      | -0.002                | 2.5         |
| 55         | 814.699999                 | -0.001                | 823.299997      | -0.004                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 26              |                       |                 |                       | Limit (ppm) |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 3 MHz |                       |                 |                       |             |
|                    | Low Channel              |                       | High Channel    |                       |             |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.6                | 815.500002               | 0.003                 | 822.500003      | 0.004                 | 2.5         |
| 3.3                | 815.500004               | 0.005                 | 822.500003      | 0.003                 | 2.5         |
| 4.2                | 815.500004               | 0.005                 | 822.500002      | 0.003                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26              |                       |                 |                       | Limit (ppm) |
|------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 3 MHz |                       |                 |                       |             |
|            | Low Channel              |                       | High Channel    |                       |             |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 815.500001               | 0.001                 | 822.500003      | 0.004                 | 2.5         |
| -20        | 815.500003               | 0.003                 | 822.500001      | 0.002                 | 2.5         |
| -10        | 815.500003               | 0.004                 | 822.500002      | 0.003                 | 2.5         |
| 0          | 815.500002               | 0.002                 | 822.500004      | 0.005                 | 2.5         |
| 10         | 815.500002               | 0.002                 | 822.500003      | 0.004                 | 2.5         |
| 20         | 815.499996               | -0.004                | 822.499997      | -0.003                | 2.5         |
| 30         | 815.499997               | -0.004                | 822.499999      | -0.001                | 2.5         |
| 40         | 815.499997               | -0.003                | 822.499997      | -0.004                | 2.5         |
| 50         | 815.499996               | -0.005                | 822.499996      | -0.004                | 2.5         |
| 55         | 815.499997               | -0.004                | 822.499998      | -0.003                | 2.5         |



### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 26              |                       |                 |                       | Limit (ppm) |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 5 MHz |                       |                 |                       |             |
|                    | Low Channel              |                       | High Channel    |                       |             |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.6                | 816.500004               | 0.005                 | 821.500002      | 0.002                 | 2.5         |
| 3.3                | 816.500002               | 0.003                 | 821.500003      | 0.004                 | 2.5         |
| 4.2                | 816.500003               | 0.004                 | 821.500003      | 0.004                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 26              |                       |                 |                       | Limit (ppm) |
|------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 5 MHz |                       |                 |                       |             |
|            | Low Channel              |                       | High Channel    |                       |             |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 816.500003               | 0.003                 | 821.500002      | 0.003                 | 2.5         |
| -20        | 816.500003               | 0.004                 | 821.500004      | 0.004                 | 2.5         |
| -10        | 816.500003               | 0.004                 | 821.500001      | 0.001                 | 2.5         |
| 0          | 816.500003               | 0.004                 | 821.500003      | 0.004                 | 2.5         |
| 10         | 816.500003               | 0.004                 | 821.500002      | 0.002                 | 2.5         |
| 20         | 816.499998               | -0.002                | 821.499997      | -0.004                | 2.5         |
| 30         | 816.499998               | -0.003                | 821.499997      | -0.004                | 2.5         |
| 40         | 816.499996               | -0.005                | 821.499997      | -0.004                | 2.5         |
| 50         | 816.499997               | -0.004                | 821.499997      | -0.004                | 2.5         |
| 55         | 816.499998               | -0.003                | 821.499997      | -0.004                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 26               |                       | Limit (ppm) |
|--------------------|---------------------------|-----------------------|-------------|
|                    | Channel Bandwidth: 10 MHz |                       |             |
|                    | Frequency (MHz)           | Frequency Error (ppm) |             |
| 3.6                | 819.000003                | 0.003                 | 2.5         |
| 3.3                | 819.000001                | 0.001                 | 2.5         |
| 4.2                | 819.000003                | 0.003                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.3 Vdc to 4.2 Vdc.

### Frequency Error vs. Temperature

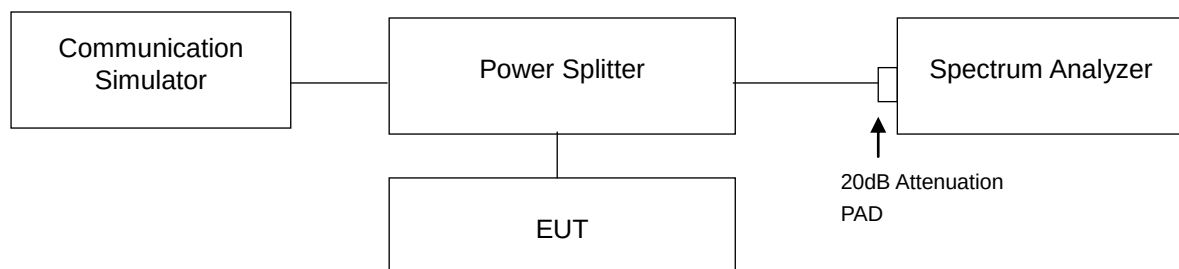
| Temp. (°C) | LTE Band 26               |                       | Limit (ppm) |
|------------|---------------------------|-----------------------|-------------|
|            | Channel Bandwidth: 10 MHz |                       |             |
|            | Frequency (MHz)           | Frequency Error (ppm) |             |
| -30        | 819.000002                | 0.003                 | 2.5         |
| -20        | 819.000002                | 0.002                 | 2.5         |
| -10        | 819.000002                | 0.002                 | 2.5         |
| 0          | 819.000003                | 0.004                 | 2.5         |
| 10         | 819.000003                | 0.003                 | 2.5         |
| 20         | 818.999996                | -0.005                | 2.5         |
| 30         | 818.999997                | -0.004                | 2.5         |
| 40         | 818.999996                | -0.005                | 2.5         |
| 50         | 818.999996                | -0.005                | 2.5         |
| 55         | 818.999998                | -0.002                | 2.5         |

### 4.3 Occupied Bandwidth Measurement

#### 4.3.1 Test Procedure

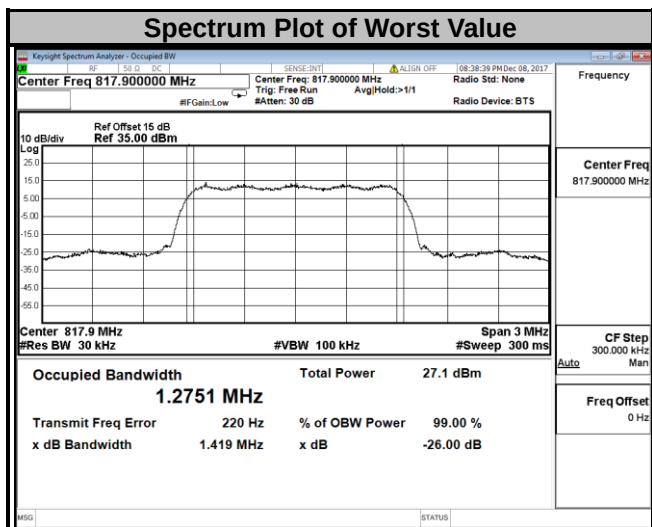
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

#### 4.3.2 Test Setup

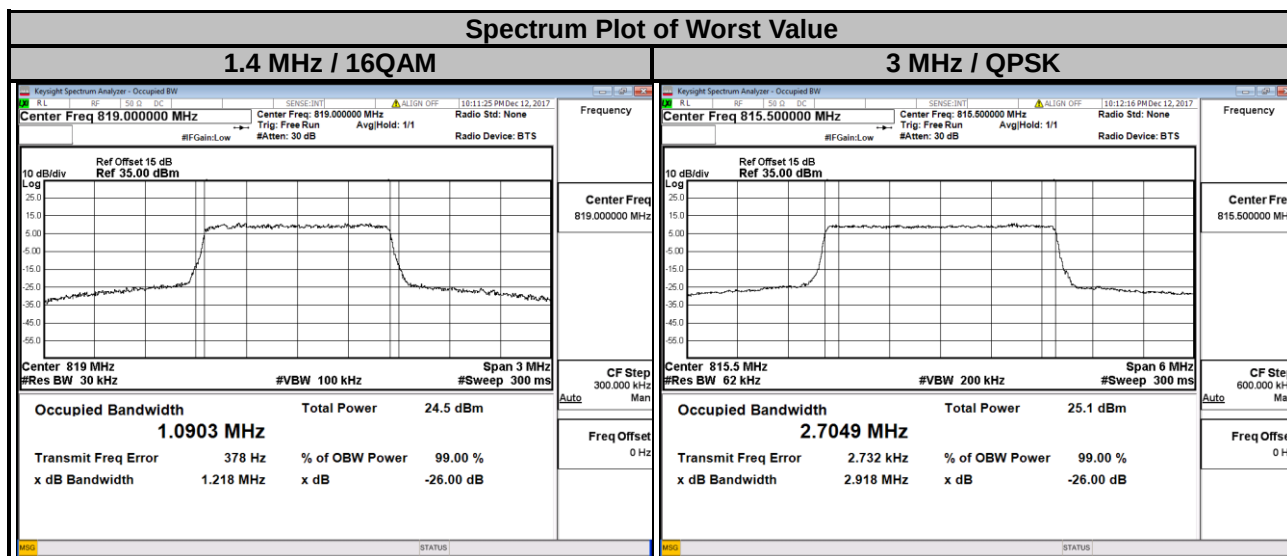


#### 4.3.3 Test Result

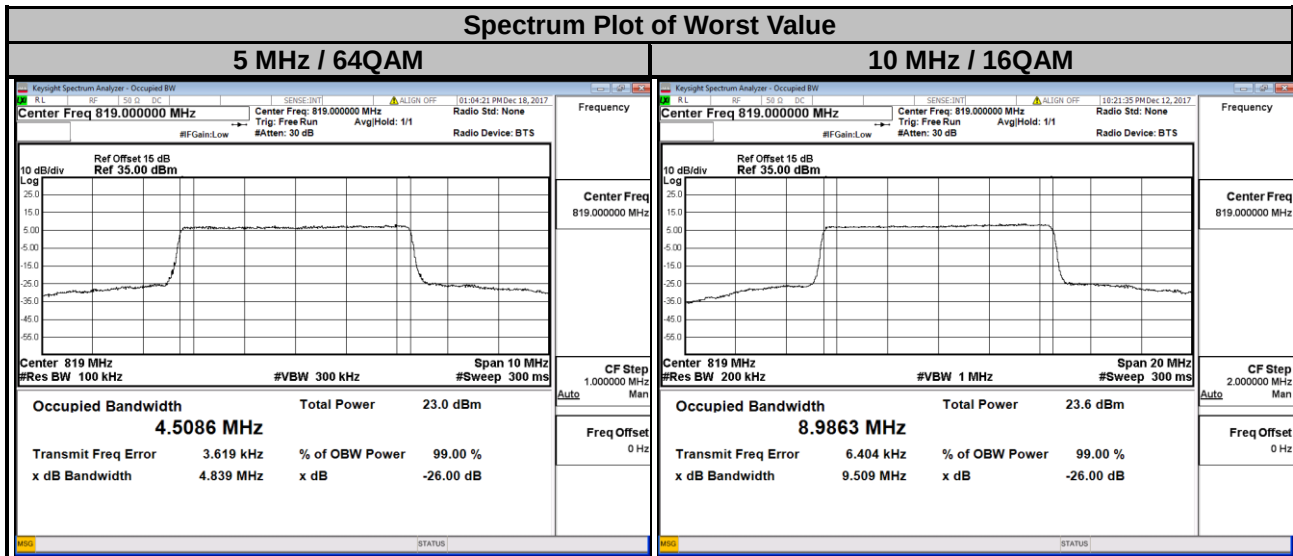
| CDMA    |                 |                               |
|---------|-----------------|-------------------------------|
| Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |
| 476     | 817.9           | 1.2751                        |
| 580     | 820.5           | 1.2745                        |
| 684     | 823.1           | 1.2749                        |



| LTE Band 26                |                 |                               |        |        |                          |                 |                               |        |        |
|----------------------------|-----------------|-------------------------------|--------|--------|--------------------------|-----------------|-------------------------------|--------|--------|
| Channel Bandwidth: 1.4 MHz |                 |                               |        |        | Channel Bandwidth: 3 MHz |                 |                               |        |        |
| Channel                    | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |        |        | Channel                  | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |        |        |
|                            |                 | QPSK                          | 16QAM  | 64QAM  |                          |                 | QPSK                          | 16QAM  | 64QAM  |
| 26697                      | 814.7           | 1.0875                        | 1.0880 | 1.0896 | 26705                    | 815.5           | 2.7049                        | 2.7001 | 2.6996 |
| 26740                      | 819.0           | 1.0883                        | 1.0903 | 1.0887 | 26740                    | 819.0           | 2.7027                        | 2.7003 | 2.7001 |
| 26783                      | 823.3           | 1.0863                        | 1.0892 | 1.0885 | 26775                    | 822.5           | 2.7016                        | 2.6977 | 2.6992 |



| LTE Band 26              |                 |                               |        |        |                           |                 |                               |        |       |
|--------------------------|-----------------|-------------------------------|--------|--------|---------------------------|-----------------|-------------------------------|--------|-------|
| Channel Bandwidth: 5 MHz |                 |                               |        |        | Channel Bandwidth: 10 MHz |                 |                               |        |       |
| Channel                  | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |        |        | Channel                   | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |        |       |
|                          |                 | QPSK                          | 16QAM  | 64QAM  |                           |                 | QPSK                          | 16QAM  | 64QAM |
| 26715                    | 816.5           | 4.4977                        | 4.4973 | 4.5077 | 26740                     | 819.0           | 8.9779                        | 8.9863 | 8.913 |
| 26740                    | 819.0           | 4.4964                        | 4.4989 | 4.5086 |                           |                 |                               |        |       |
| 26765                    | 821.5           | 4.4918                        | 4.4925 | 4.5018 |                           |                 |                               |        |       |

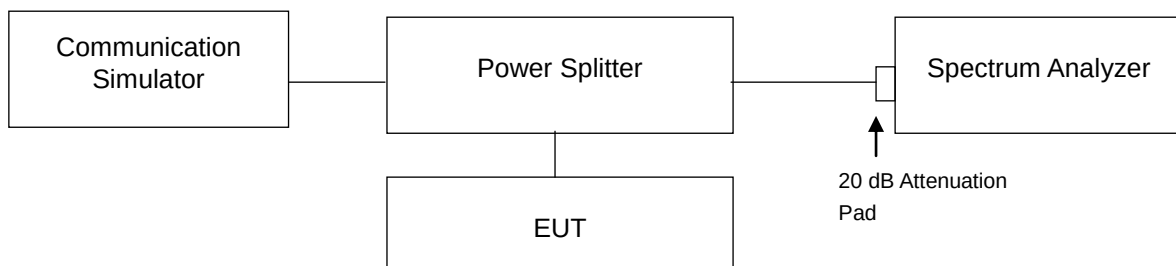


## 4.4 Emission Mask Measurement

### 4.4.1 Limits of Band Edge Measurement

According to FCC part 90.691 shall be tested the emission mask. 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.

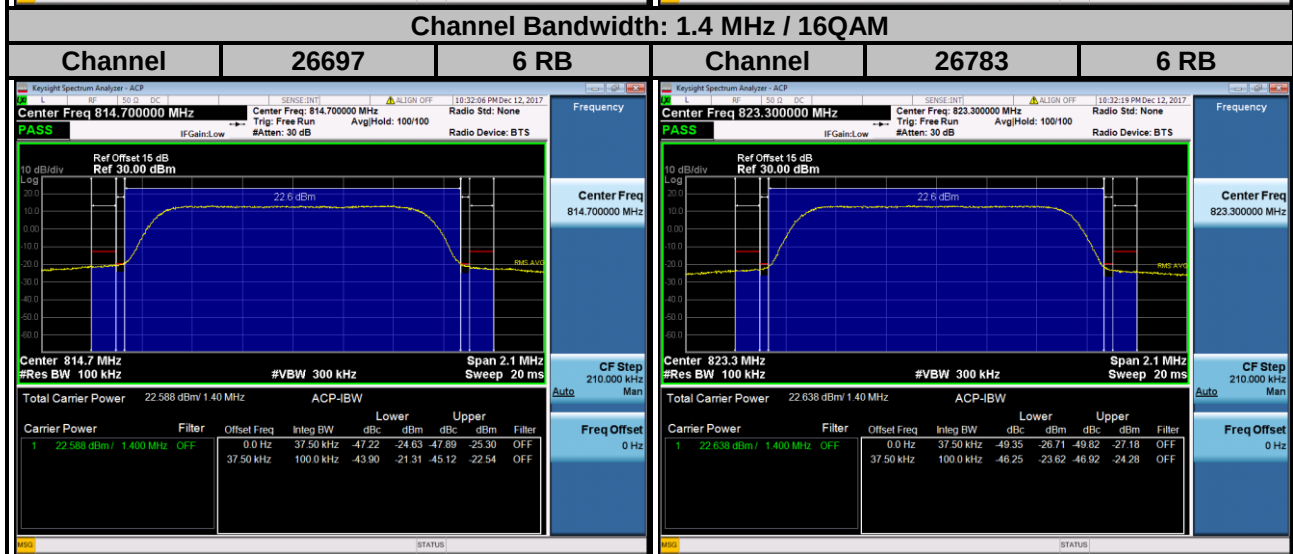
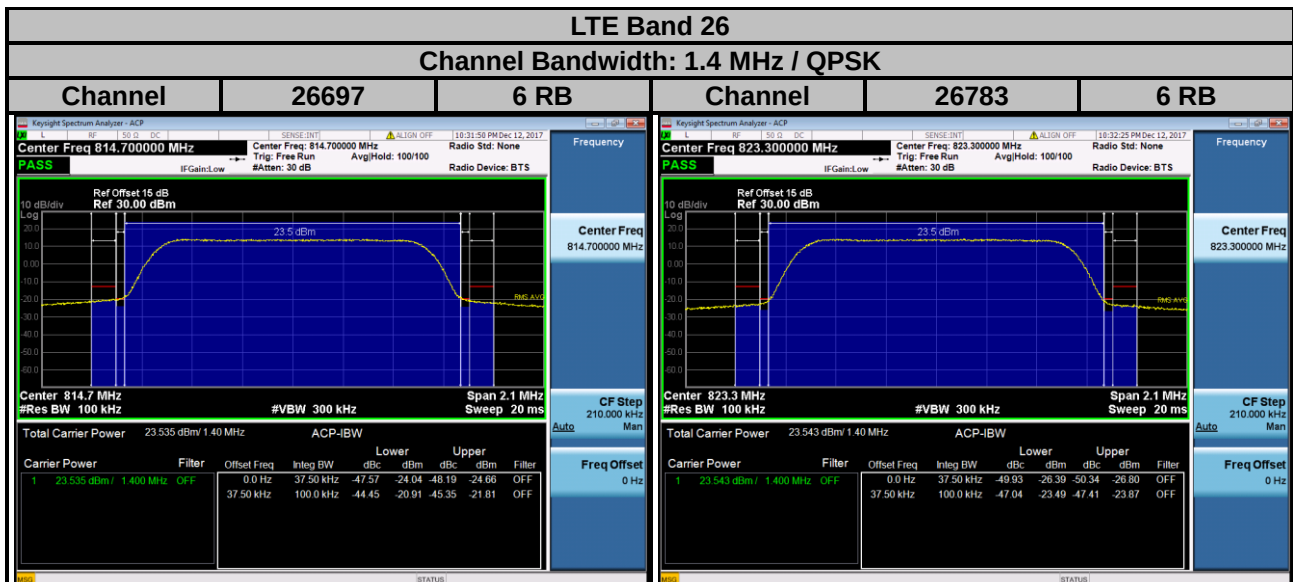
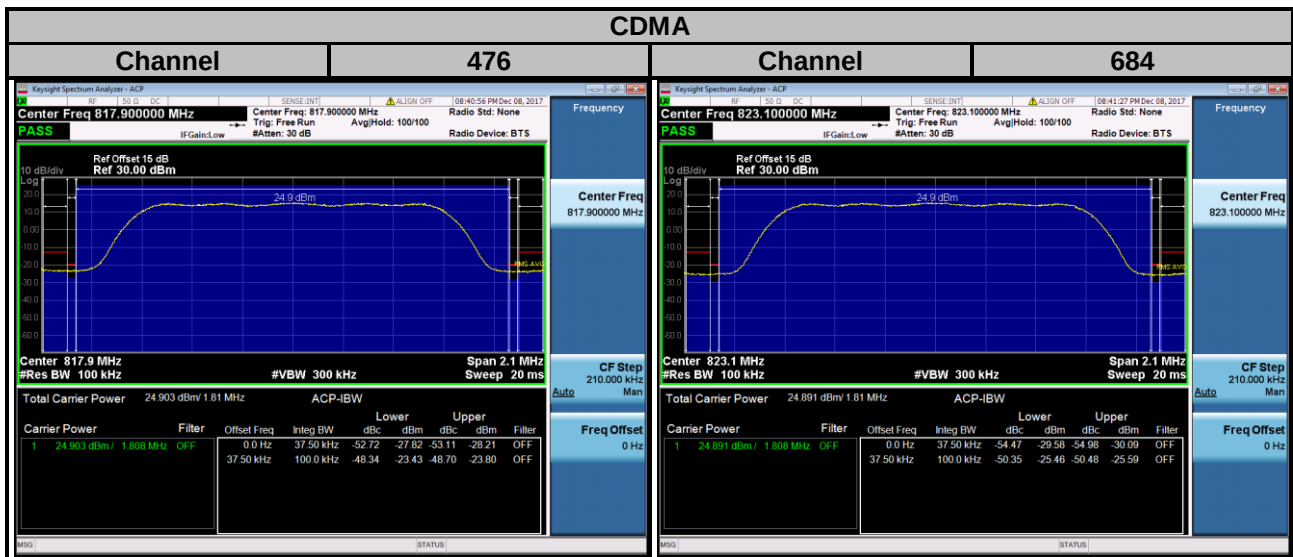
### 4.4.2 Test Setup



### 4.4.3 Test Procedures

- The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Record the test plot.

#### 4.4.4 Test Results



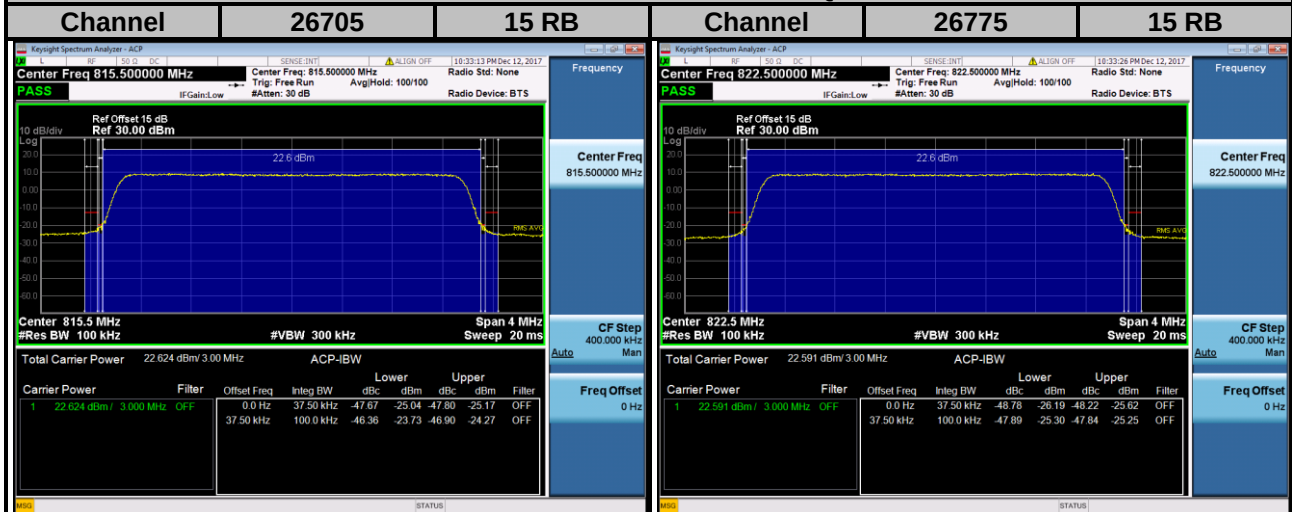


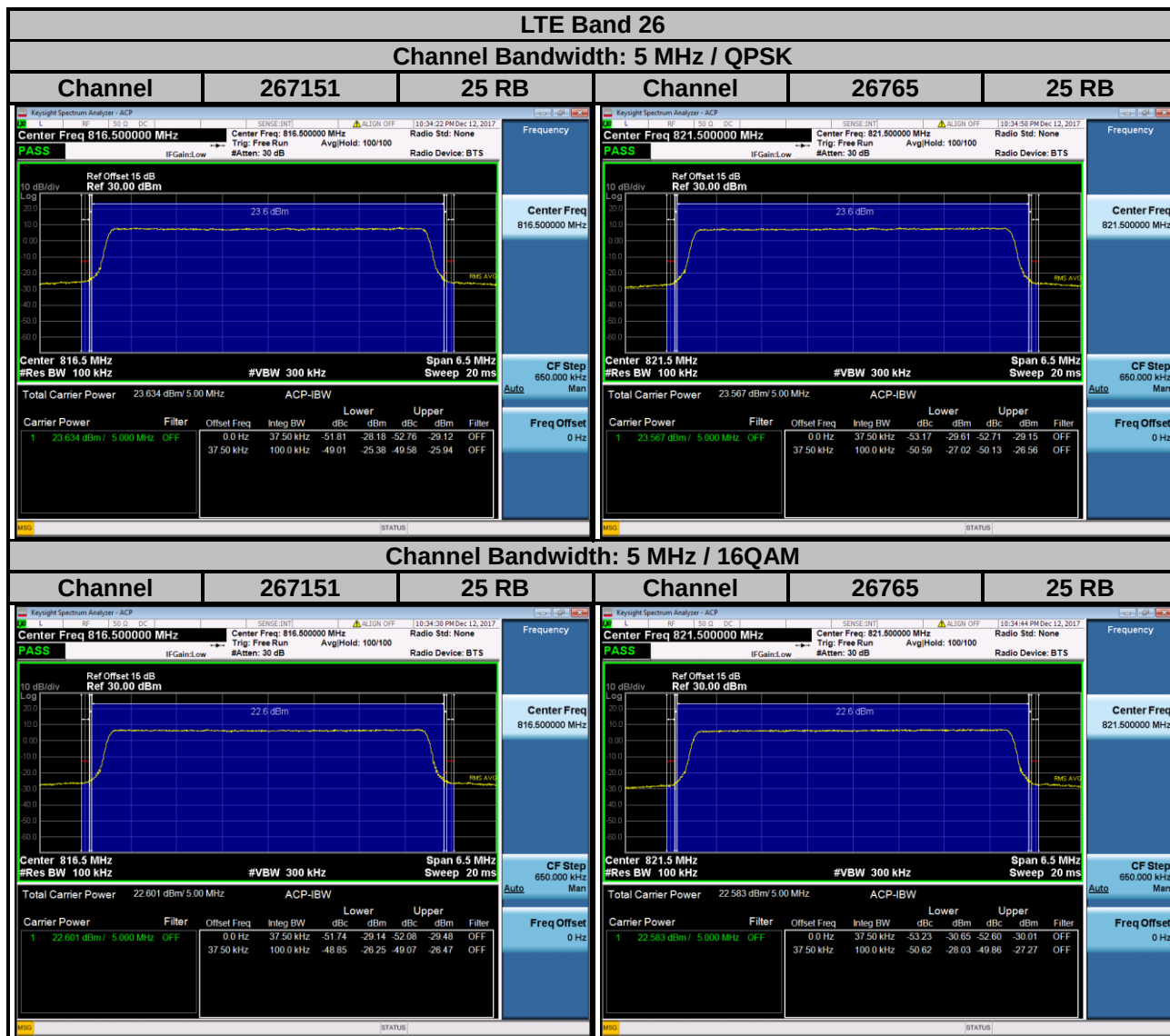
## LTE Band 26

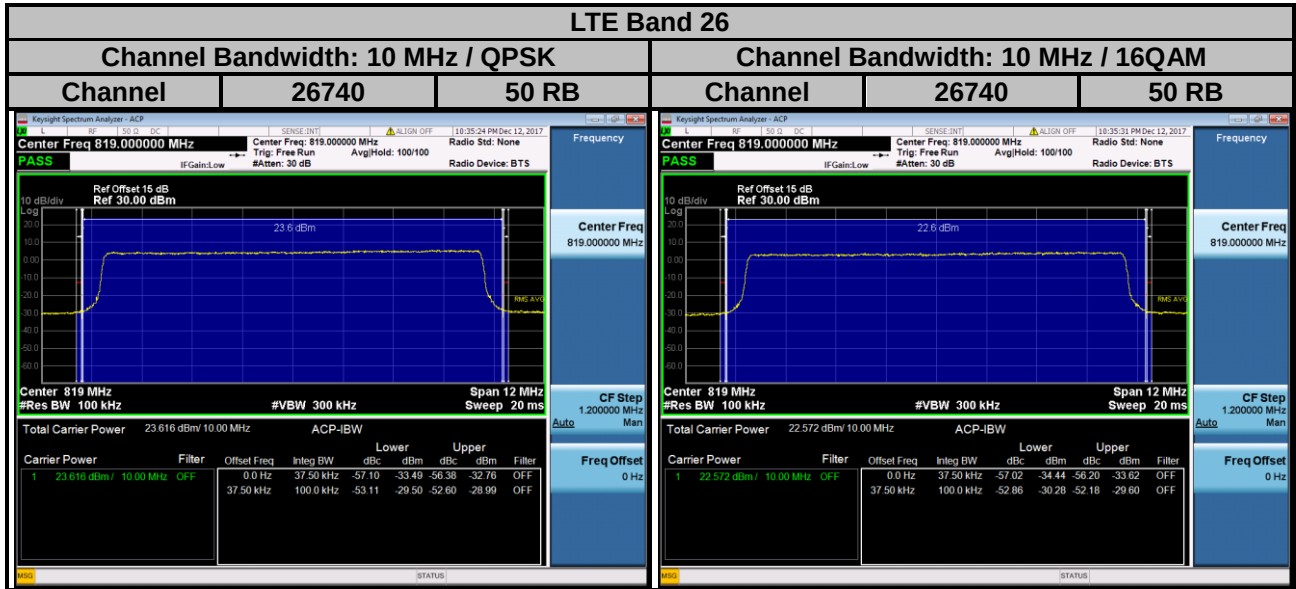
Channel Bandwidth: 3 MHz / QPSK



Channel Bandwidth: 3 MHz / 16QAM





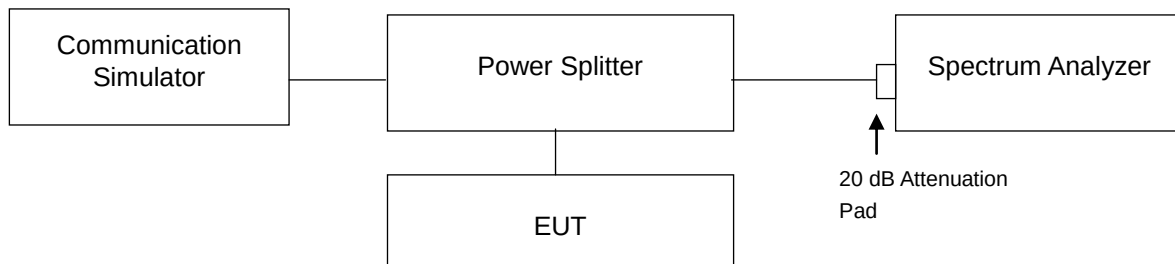


## 4.5 Conducted Spurious Emissions

### 4.5.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission is equal to -13 dBm.

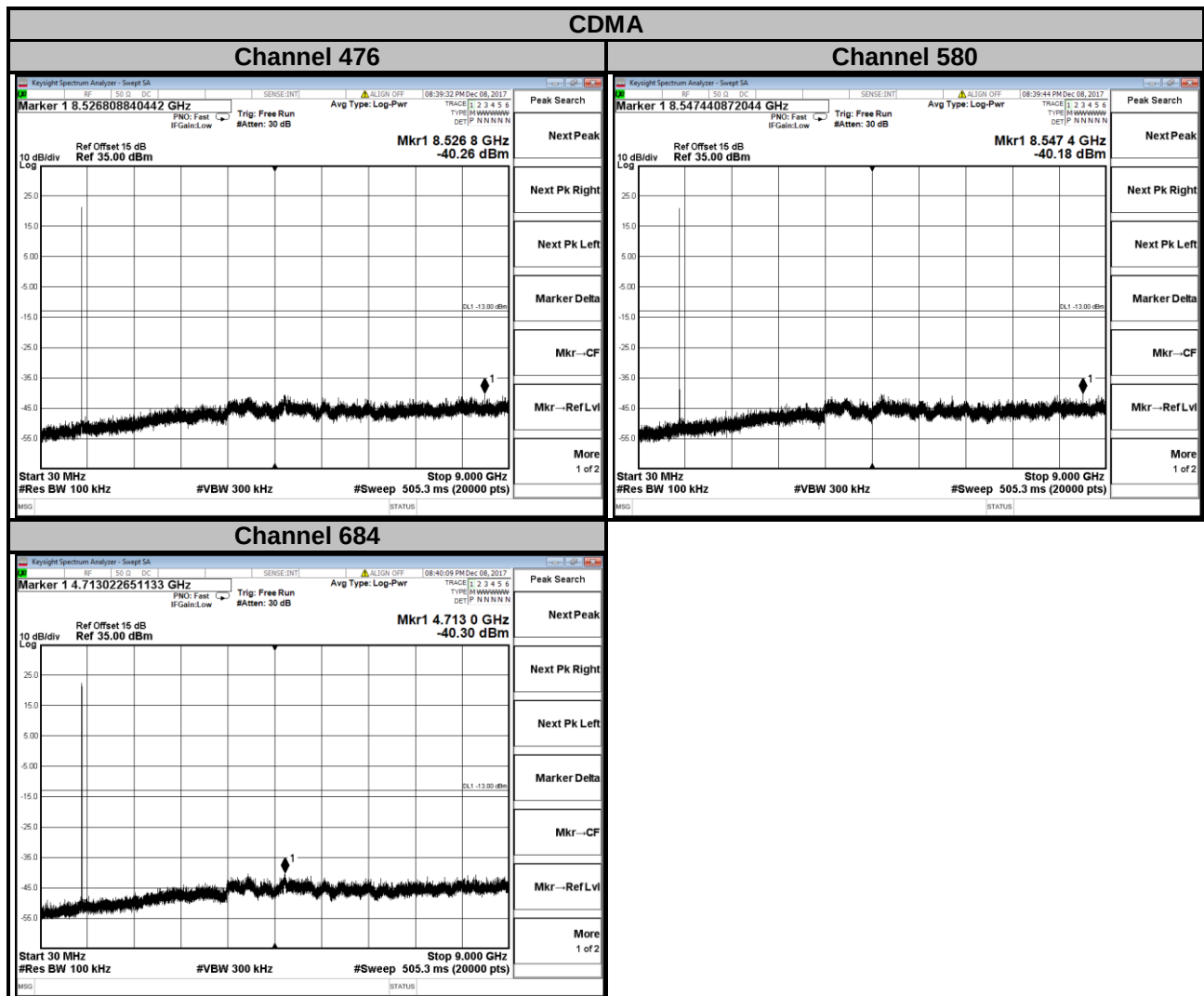
### 4.5.2 Test Setup

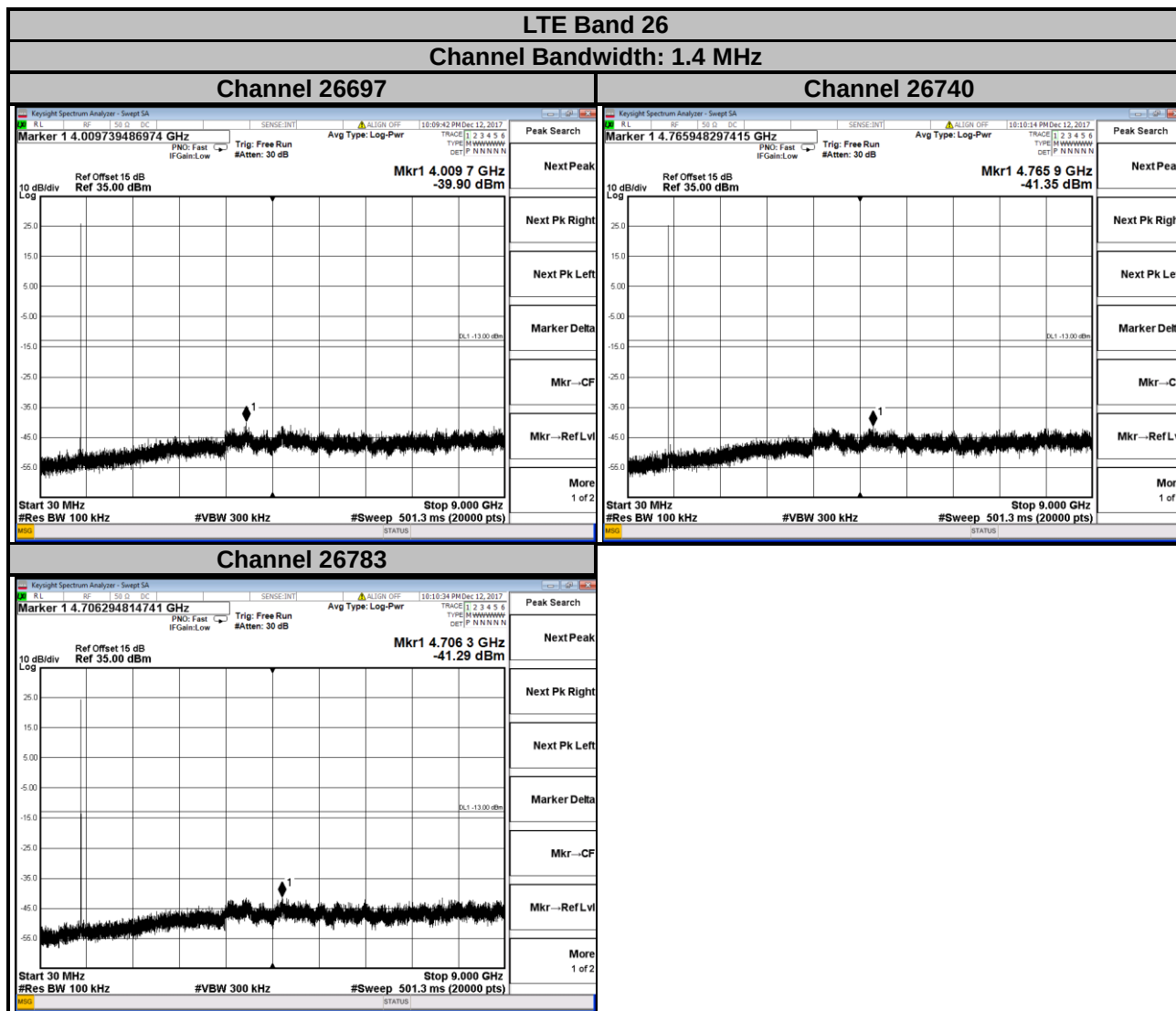


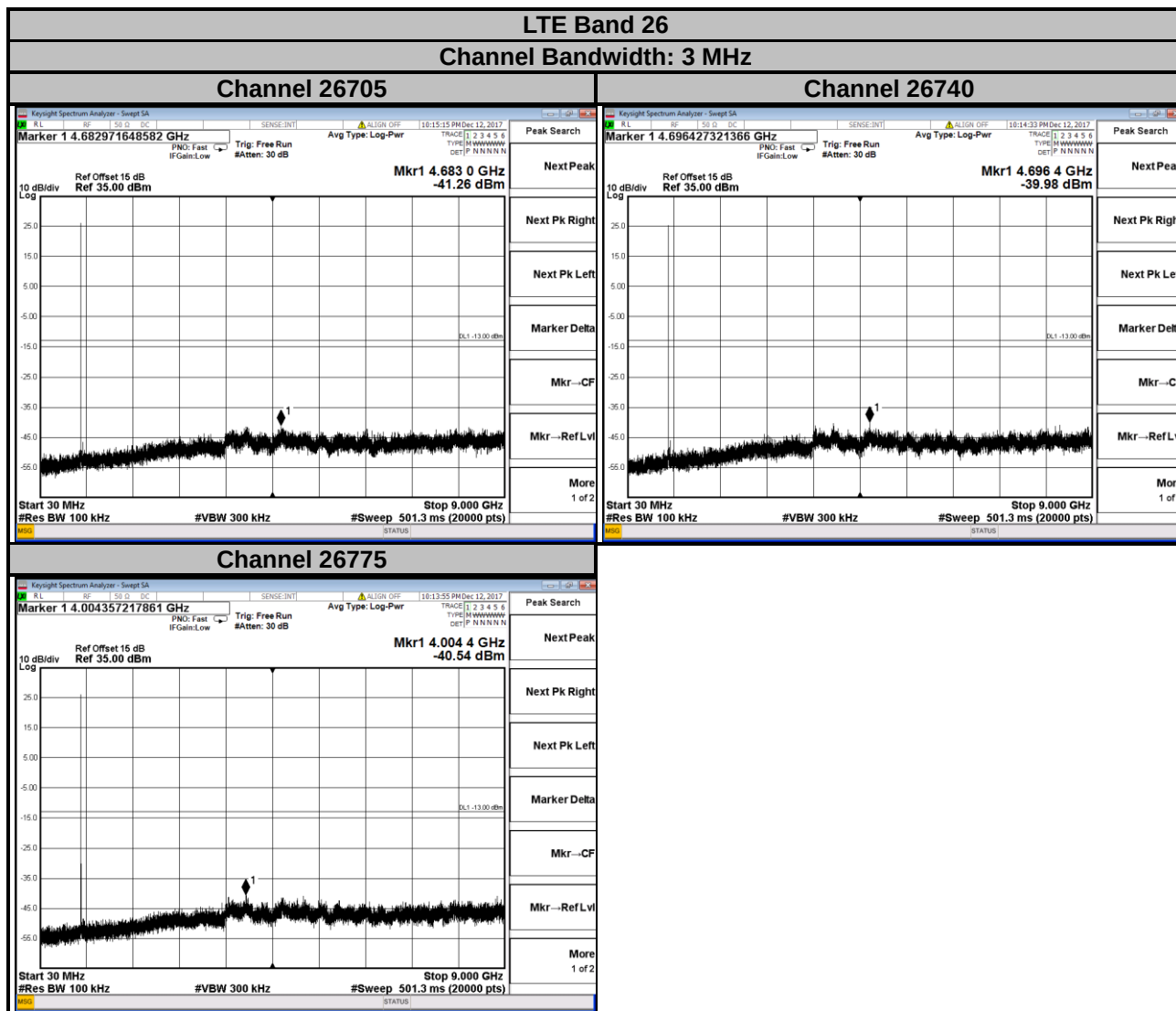
### 4.5.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 30 MHz to 9 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz are used for conducted emission measurement.

#### 4.5.4 Test Results

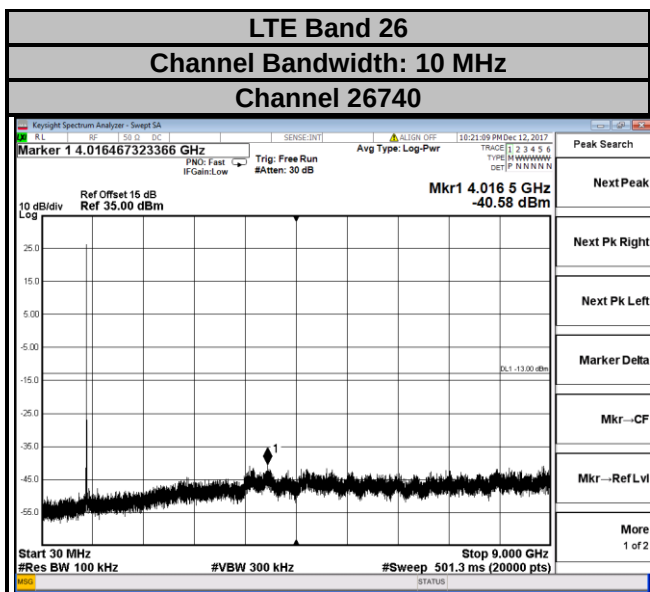
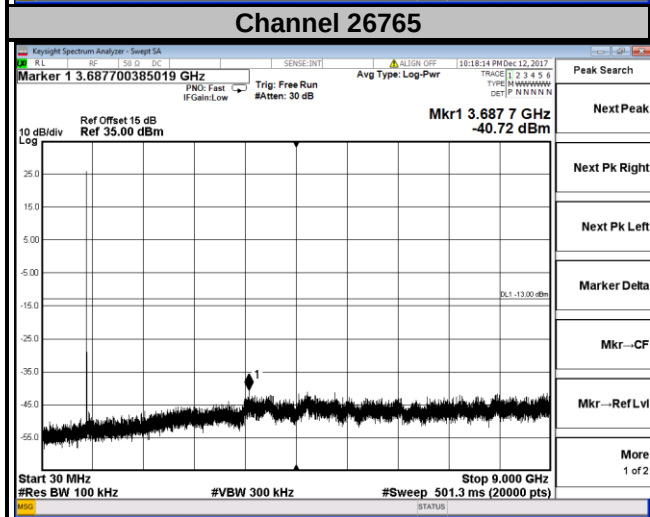
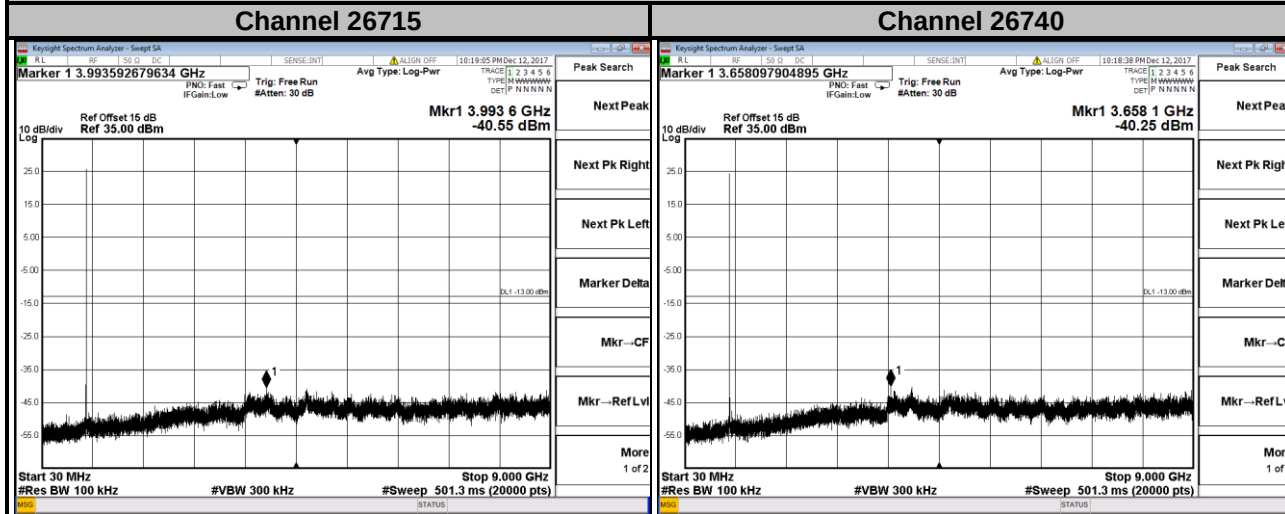






# LTE Band 26

## Channel Bandwidth: 5 MHz





## 4.6 Radiated Emission Measurement

### 4.6.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission is equal to -13 dBm.

### 4.6.2 Test Procedure

- Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15 \text{ dBi}.$

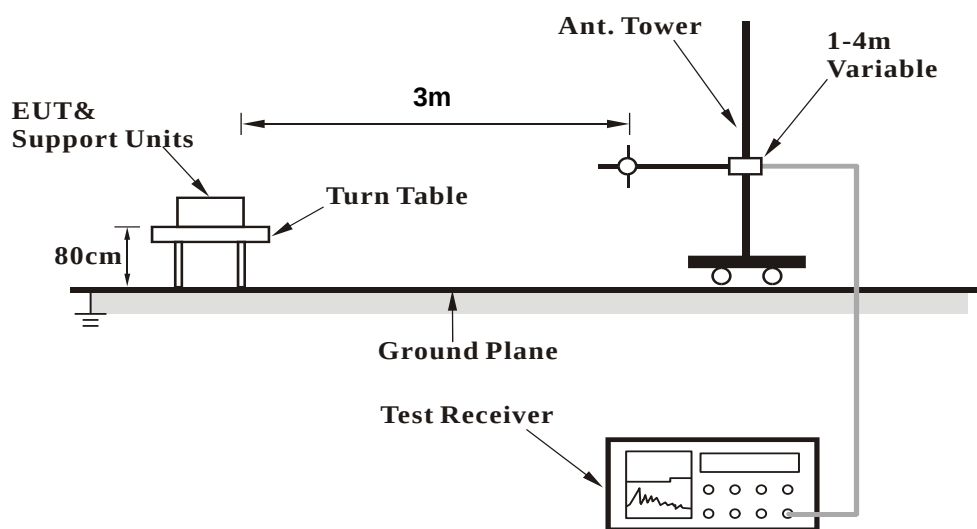
**Note:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

### 4.6.3 Deviation from Test Standard

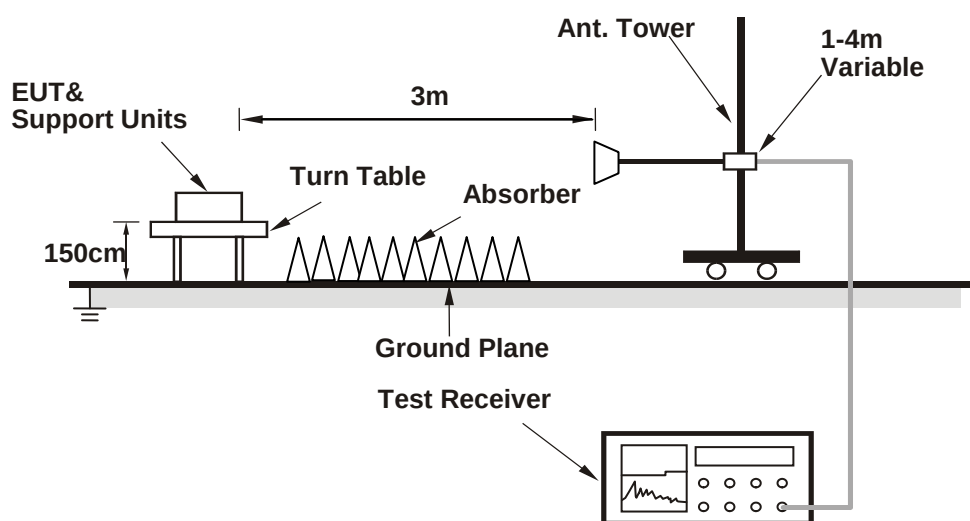
No deviation.

#### 4.6.4 Test Setup

##### <Radiated Emission below or equal 1 GHz>



##### <Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.6.5 Test Results

CDMA:

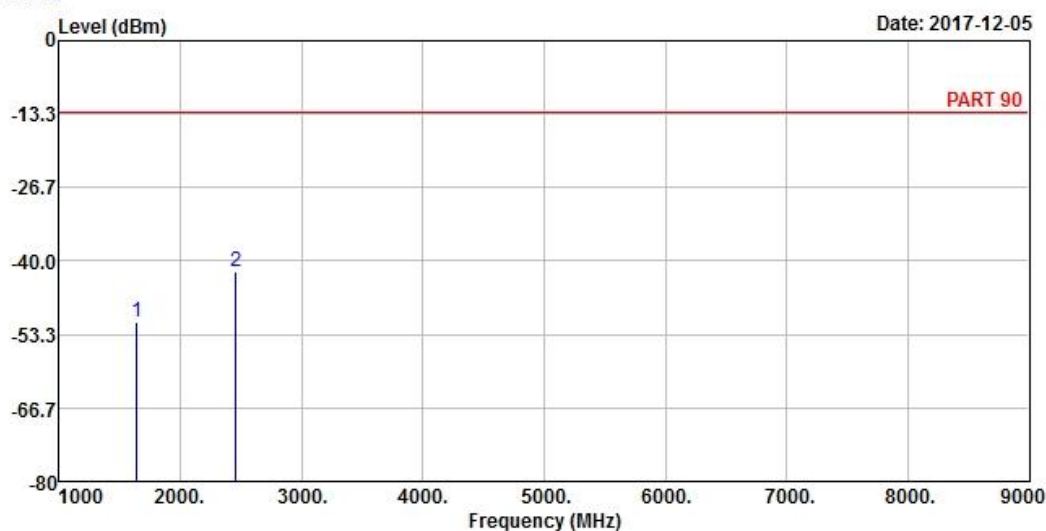
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART 90 HORIZONTAL

Remark : CDMA BC10 Link\_L-CH

Tested by: Getaz Yang

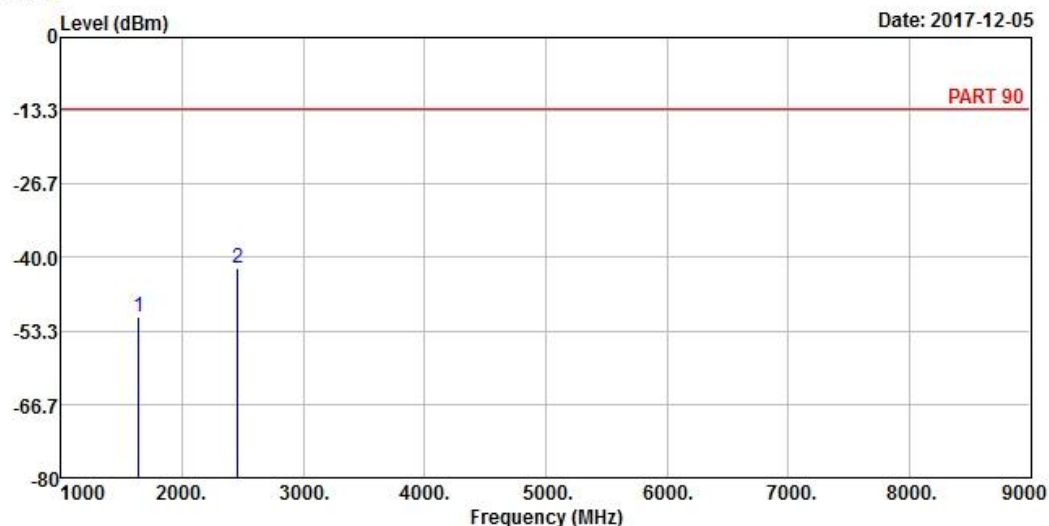
|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1635.80 | -51.00 | -36.21     | -13.00     | -38.00     | -14.79 | Peak   |
| 2 pp | 2453.70 | -41.91 | -31.47     | -13.00     | -28.91     | -10.44 | Peak   |



# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5

Condition: PART 90 VERTICAL

Remark : CDMA BC10 Link\_L-CH

Tested by: Getaz Yang

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1635.80 | -50.90 | -36.11     | -13.00     | -37.90     | -14.79 | Peak   |
| 2 pp | 2453.70 | -41.89 | -31.45     | -13.00     | -28.89     | -10.44 | Peak   |

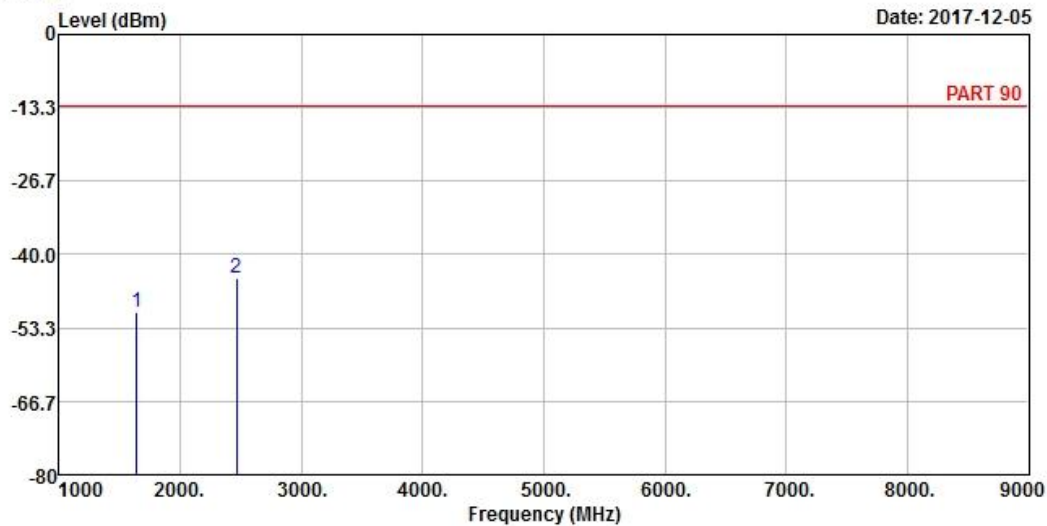
## Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5

Condition: PART 90 HORIZONTAL

Remark : CDMA BC10 Link\_M-CH

Tested by: Getaz Yang

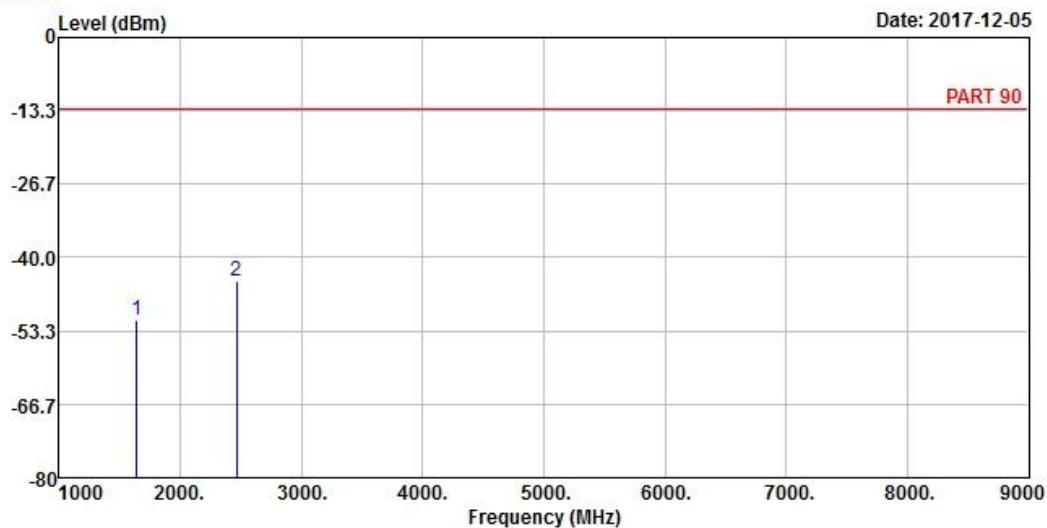
|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 1641.00 | -50.50 | -35.77 | -13.00 | -37.50 | -14.73 | Peak   |
| 2 pp | 2461.50 | -44.32 | -33.88 | -13.00 | -31.32 | -10.44 | Peak   |



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5

Condition: PART 90 VERTICAL

Remark : CDMA BC10 Link\_M-CH

Tested by: Getaz Yang

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1641.00 | -51.27 | -36.54     | -13.00     | -38.27     | -14.73 | Peak   |
| 2 pp | 2461.50 | -44.28 | -33.84     | -13.00     | -31.28     | -10.44 | Peak   |

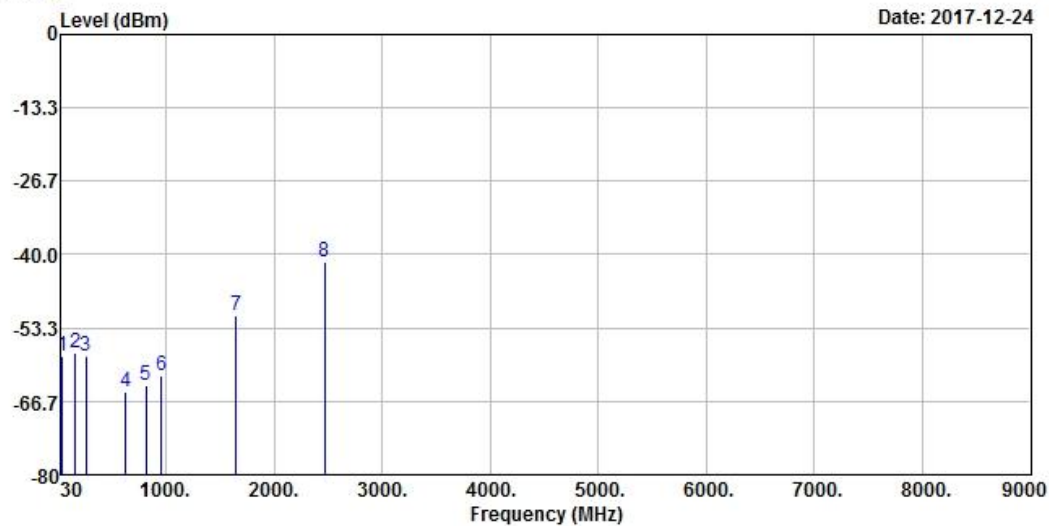
## High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 Chamber 5  
 Condition: PART90 HORIZONTAL  
 Remark : CDMA BC10 Link\_H-CH  
 Tested by: Getaz Yang

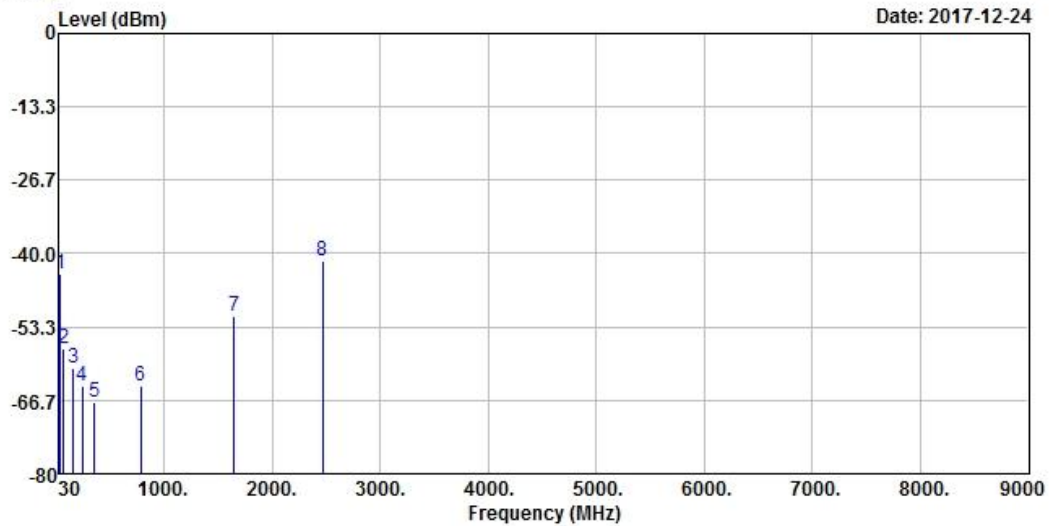
|      |         |        | Read   | Limit         | Over   |        |        |
|------|---------|--------|--------|---------------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line          | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm           | dB     | dB     |        |
| 1    | 42.61   | -58.58 | -57.64 | 393.01-451.59 | -0.94  |        | Peak   |
| 2    | 161.92  | -57.95 | -52.97 | 393.01-450.96 | -4.98  |        | Peak   |
| 3    | 254.07  | -58.45 | -52.38 | 393.01-451.46 | -6.07  |        | Peak   |
| 4    | 626.55  | -65.00 | -64.18 | 393.01-458.01 | -0.82  |        | Peak   |
| 5    | 816.67  | -63.65 | -64.24 | 393.01-456.66 | 0.59   |        | Peak   |
| 6    | 953.44  | -61.96 | -63.90 | 393.01-454.97 | 1.94   |        | Peak   |
| 7    | 1646.20 | -51.01 | -36.28 | -13.00 -38.01 | -14.73 |        | Peak   |
| 8 pp | 2469.30 | -41.38 | -30.94 | -13.00 -28.38 | -10.44 |        | Peak   |



# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6



Site : 966 Chamber 5  
Condition: PART90 VERTICAL  
Remark : CDMA BC10 Link\_H-CH  
Tested by: Getaz Yang

|      | Freq    | Level  | Read Level | Limit Line    | Over Limit | Factor | Remark |
|------|---------|--------|------------|---------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm           | dB         | dB     |        |
| 1    | 42.61   | -43.62 | -42.68     | 393.01-436.63 | -0.94      |        | Peak   |
| 2    | 67.83   | -57.37 | -49.12     | 393.01-450.38 | -8.25      |        | Peak   |
| 3    | 161.92  | -60.95 | -55.97     | 393.01-453.96 | -4.98      |        | Peak   |
| 4    | 244.37  | -64.00 | -57.77     | 393.01-457.01 | -6.23      |        | Peak   |
| 5    | 358.83  | -66.94 | -60.75     | 393.01-459.95 | -6.19      |        | Peak   |
| 6    | 785.63  | -64.03 | -64.81     | 393.01-457.04 | 0.78       |        | Peak   |
| 7    | 1646.20 | -51.50 | -36.77     | -13.00 -38.50 | -14.73     |        | Peak   |
| 8 pp | 2469.30 | -41.23 | -30.79     | -13.00 -28.23 | -10.44     |        | Peak   |



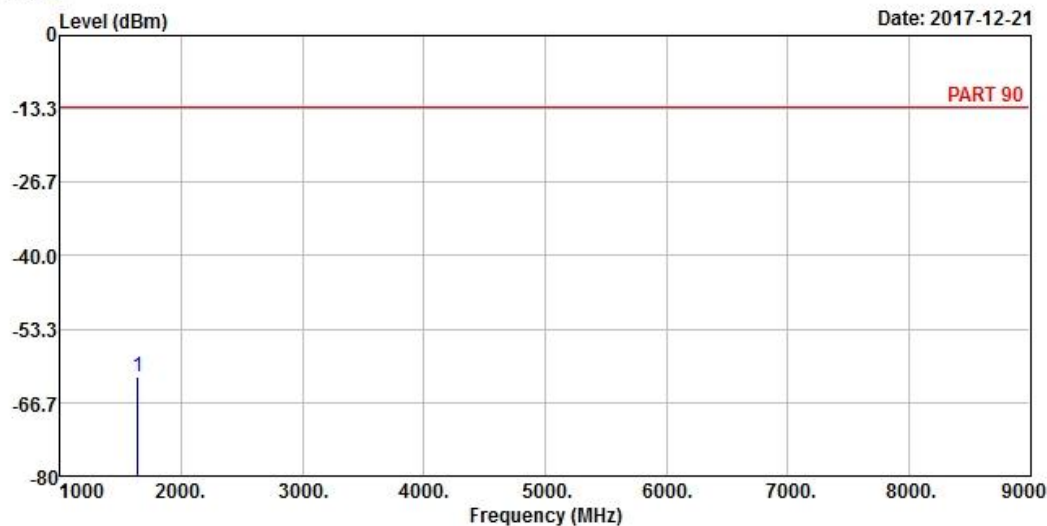
LTE Band 26  
Channel Bandwidth: 10 MHz / QPSK



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5  
Condition: PART 90 HORIZONTAL  
Remak : LTE Band 26 QPSK\_5M\_M-CH Link  
Tested by: Jisyong Wang

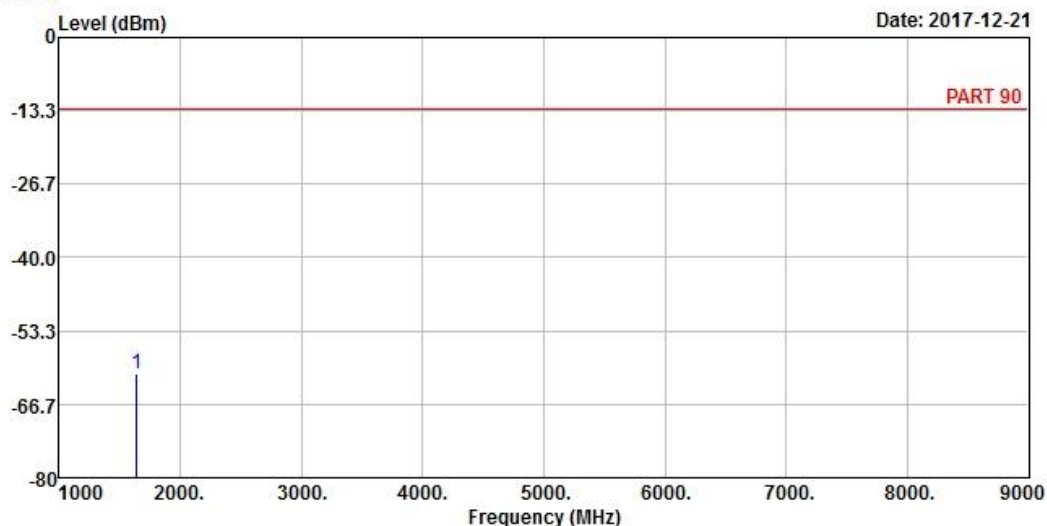
| Freq         | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|--------------|--------|------------|------------|------------|--------|--------|
| MHz          | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1 pp 1638.00 | -61.85 | -47.06     | -13.00     | -48.85     | -14.79 | Peak   |



# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5

Condition: PART 90 VERTICAL

Remak : LTE Band 26 QPSK\_5M\_M-CH Link

Tested by: Jisyong Wang

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1638.00 | -61.23 | -46.44 | -13.00 | -48.23 | -14.79 | Peak   |

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

--- END ---