

## FCC Test Report

### (PART 22)

**Report No.:** RF180626C09

**FCC ID:** 2AJOTTA-1085

**Test Model:** TA-1085

**Received Date:** Jun. 26, 2018

**Test Date:** Jul. 05, 2018 ~ Jul. 20, 2018

**Issued Date:** Jul. 31, 2018

**Applicant:** HMD Global Oy

**Address:** Karaportti 2, 02610 Espoo, Finland

**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 (1):** No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City  
33383, Taiwan (R.O.C)

**Test Location (2):** No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan,  
R.O.C

**FCC Registration /  
Designation Number:** 427177 / TW0011



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### Release Control Record

| Issue No.   | Description      | Date Issued   |
|-------------|------------------|---------------|
| RF180626C09 | Original Release | Jul. 31, 2018 |

## 1 Certificate of Conformity

**Product:** Smart Phone

**Brand:** NOKIA

**Test Model:** TA-1085

**Sample Status:** Engineering Sample

**Applicant:** HMD Global Oy

**Test Date:** Jul. 05, 2018 ~ Jul. 20, 2018

**Standards:** FCC Part 22, Subpart H

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 RF characteristics under the conditions specified in this report.

**Prepared by :**



**Date:**

Jul. 31, 2018

Ivonne Wu / Supervisor

**Approved by :**



**Date:**

Jul. 31, 2018

Dylan Chiou / Project Engineer

## 2 Summary of Test Results

| Applied Standard: FCC Part 22 & Part 2 |                              |        |                                                                                       |
|----------------------------------------|------------------------------|--------|---------------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                    | Result | Remarks                                                                               |
| 2.1046<br>22.913 (a)                   | Effective Radiated Power     | Pass   | Meet the requirement of limit.                                                        |
| 2.1047                                 | Modulation Characteristics   | Pass   | Meet the requirement.                                                                 |
| ---                                    | Peak to Average Ratio        | Pass   | Meet the requirement of limit.                                                        |
| 2.1055<br>22.355                       | Frequency Stability          | Pass   | Meet the requirement of limit.                                                        |
| 2.1049                                 | Occupied Bandwidth           | Pass   | Meet the requirement of limit.                                                        |
| 22.917                                 | Band Edge Measurements       | Pass   | Meet the requirement of limit.                                                        |
| 2.1051<br>22.917                       | Conducted Spurious Emissions | Pass   | Meet the requirement of limit.                                                        |
| 2.1053<br>22.917                       | Radiated Spurious Emissions  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -24.90 dB at 2509.50 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) (±) |
|--------------------------------|--------------------|--------------------------------|
| Radiated Emissions up to 1 GHz | 30 MHz ~ 200 MHz   | 2.0153 dB                      |
|                                | 200 MHz ~ 1000 MHz | 2.0224 dB                      |
| Radiated Emissions above 1 GHz | 1 GHz ~ 18 GHz     | 1.0121 dB                      |
|                                | 18 GHz ~ 40 GHz    | 1.1508 dB                      |

## 2.2 Test Site and Instruments

| Description & Manufacturer                     | Model No.        | Serial No.                                                        | Date of Calibration | Due Date of Calibration |
|------------------------------------------------|------------------|-------------------------------------------------------------------|---------------------|-------------------------|
| Test Receiver<br>Agilent Technologies          | N9010A           | MY52220314                                                        | Nov. 24, 2017       | Nov. 23, 2018           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ           | FSU43            | 101261                                                            | Jan. 11, 2018       | Jan. 10, 2019           |
| Double Ridge Guide Horn<br>Antenna EMCO        | 3115             | 5619                                                              | Nov. 30, 2017       | Nov. 29, 2018           |
| BILOG Antenna<br>SCHWARZBECK                   | VULB 9168        | 9168-153                                                          | Dec. 06, 2017       | Dec. 05, 2018           |
| HORN Antenna<br>Schwarzbeck                    | BBHA 9120D       | 9120D-969                                                         | Dec. 12, 2017       | Dec. 11, 2018           |
| Fixed Attenuator<br>Woken                      | 00801A1GGAM02Y   | NA                                                                | May 17, 2018        | May 16, 2019            |
| MXG Vector signal<br>generator<br>Agilent      | N5182B           | MY53050430                                                        | Oct. 24, 2017       | Oct. 23, 2018           |
| Preamplifier<br>Agilent                        | 310N             | 187226                                                            | Jun. 19, 2018       | Jun. 18, 2019           |
| Preamplifier<br>Agilent                        | 83017A           | MY39501357                                                        | Jun. 19, 2018       | Jun. 18, 2019           |
| RF signal cable<br>ETS-LINDGREN                | 5D-FB            | Cable-CH1-01(RF<br>C-SMS-100-SMS-<br>120+RFC-SMS-1<br>00-SMS-400) | Jun. 19, 2018       | Jun. 18, 2019           |
| RF signal cable<br>ETS-LINDGREN                | 8D-FB            | Cable-CH1-02(RF<br>C-SMS-100-SMS-<br>24)                          | Jun. 19, 2018       | Jun. 18, 2019           |
| Boresight Antenna Fixture                      | FBA-01           | FBA-SIP01                                                         | NA                  | NA                      |
| Software<br>BV ADT                             | E3<br>8.130425b  | NA                                                                | NA                  | NA                      |
| Antenna Tower<br>MF                            | NA               | NA                                                                | NA                  | NA                      |
| Turn Table<br>MF                               | NA               | NA                                                                | NA                  | NA                      |
| Antenna Tower & Turn<br>Table Controller<br>MF | MF-7802          | NA                                                                | NA                  | NA                      |
| Communications<br>Tester-Wireless<br>Agilent   | 8960 Series 10   | MY53201073                                                        | Jun. 28, 2017       | Jun. 27, 2019           |
| Radio Communication<br>Analyzer<br>Anritsu     | MT8820C          | 6201010284                                                        | Dec. 28, 2017       | Dec. 27, 2018           |
| Temperature & Humidity<br>Chamber              | GTH-120-40-CP-AR | MAA1306-019                                                       | Sep. 08, 2017       | Sep. 07, 2018           |
| DC Power Supply<br>Topward                     | 33010D           | 807748                                                            | Oct. 25, 2016       | Oct. 24, 2018           |
| Digital Multimeter<br>Fluke                    | 87-III           | 70360742                                                          | Jun. 29, 2018       | Jun. 28, 2019           |

- 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 HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450I-1.

### 3 General Information

#### 3.1 General Description of EUT

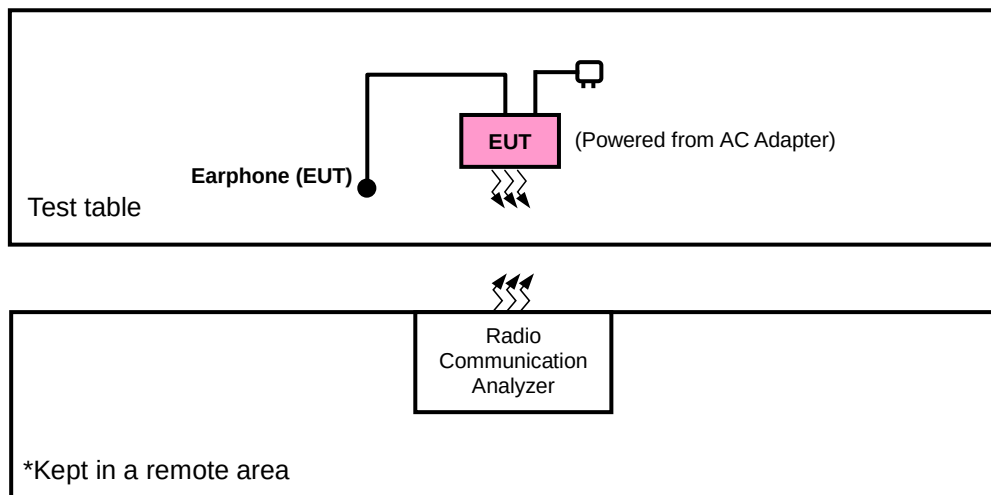
|                            |                                                                                               |                   |
|----------------------------|-----------------------------------------------------------------------------------------------|-------------------|
| <b>Product</b>             | Smart Phone                                                                                   |                   |
| <b>Brand</b>               | NOKIA                                                                                         |                   |
| <b>Test Model</b>          | TA-1085                                                                                       |                   |
| <b>Status of EUT</b>       | Engineering Sample                                                                            |                   |
| <b>Power Supply Rating</b> | 5.0 Vdc or 9 Vdc or 12 Vdc (adapter)<br>5.0 Vdc (host equipment)<br>3.85 Vdc (Li-ion battery) |                   |
| <b>Modulation Type</b>     | GSM/GPRS                                                                                      | GMSK              |
|                            | EDGE                                                                                          | GMSK, 8PSK        |
|                            | WCDMA                                                                                         | QPSK              |
|                            | LTE                                                                                           | QPSK, 16QAM       |
| <b>Frequency Range</b>     | GSM/GPRS/EDGE                                                                                 | 824.2 ~ 848.8 MHz |
|                            | WCDMA                                                                                         | 826.4 ~ 846.6 MHz |
|                            | LTE 5 (Channel Bandwidth: 1.4 MHz)                                                            | 824.7 ~ 848.3 MHz |
|                            | LTE 5 (Channel Bandwidth: 3 MHz)                                                              | 825.5 ~ 847.5 MHz |
|                            | LTE 5 (Channel Bandwidth: 5 MHz)                                                              | 826.5 ~ 846.5 MHz |
|                            | LTE 5 (Channel Bandwidth: 10 MHz)                                                             | 829 ~ 844 MHz     |
| <b>Max. ERP Power</b>      | GSM/GPRS                                                                                      | 727.78 mW         |
|                            | EDGE                                                                                          | 145.21 mW         |
|                            | WCDMA                                                                                         | 81.47 mW          |
|                            | LTE 5 (Channel Bandwidth: 1.4 MHz)                                                            | 80.32 mW          |
|                            | LTE 5 (Channel Bandwidth: 3 MHz)                                                              | 80.87 mW          |
|                            | LTE 5 (Channel Bandwidth: 5 MHz)                                                              | 81.43 mW          |
|                            | LTE 5 (Channel Bandwidth: 10 MHz)                                                             | 82.19 mW          |
| <b>Emission Designator</b> | GSM/GPRS                                                                                      | 245KGXW           |
|                            | EDGE                                                                                          | 248KG7W           |
|                            | WCDMA                                                                                         | 4M16F9W           |
|                            | LTE 5 (Channel Bandwidth: 1.4 MHz)                                                            | 1M09W7D           |
|                            | LTE 5 (Channel Bandwidth: 3 MHz)                                                              | 2M70G7D           |
|                            | LTE 5 (Channel Bandwidth: 5 MHz)                                                              | 4M50W7D           |
|                            | LTE 5 (Channel Bandwidth: 10 MHz)                                                             | 8M98W7D           |
| <b>Antenna Type</b>        | PIFA Antenna with -2.05 dBi gain                                                              |                   |
| <b>Accessory Device</b>    | Refer to Note as below                                                                        |                   |
| <b>Data Cable Supplied</b> | Refer to Note as below                                                                        |                   |

Note:

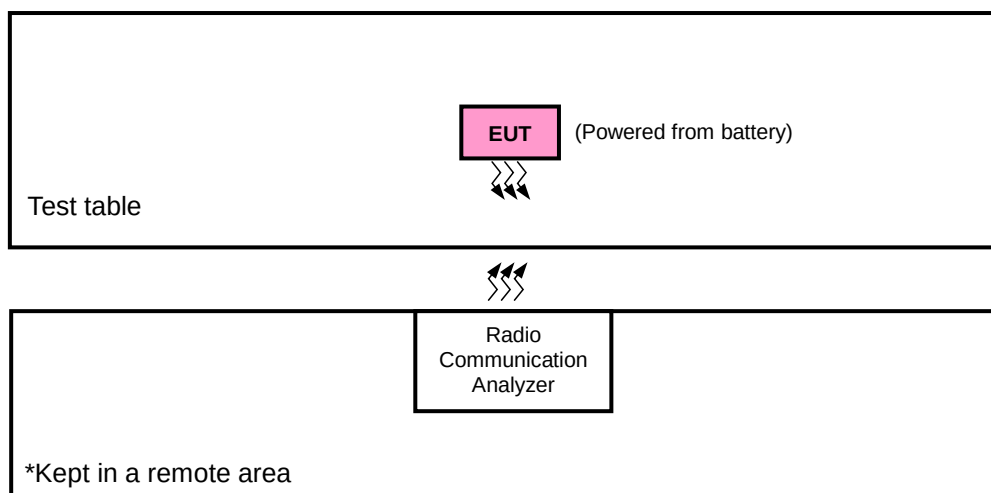
- There're 2 configurations for the EUT listed as below.  
Main Sample: EUT + Battery 1  
2<sup>nd</sup> Sample: EUT + Battery 2  
✧ Only the worst test data was presented in the report.
- The EUT's accessories list refers to Ext. Pho.
- The above EUT information is declared by manufacturer and for more detailed features description, please refers 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:

| EUT Configure Mode | Description            |
|--------------------|------------------------|
| A                  | Main Sample            |
| B                  | 2 <sup>nd</sup> Sample |

| SIM | Band       | ERP     | Radiated Emission |
|-----|------------|---------|-------------------|
| 1   | GSM        | X-plane | X-axis            |
|     | EDGE       | X-plane | X-axis            |
|     | WCDMA      | X-plane | X-axis            |
|     | LTE Band 5 | X-plane | Y-axis            |

#### GSM

| EUT Configure Mode | Test Item                  | Available Channel | Tested Channel | Mode      |
|--------------------|----------------------------|-------------------|----------------|-----------|
| A                  | ERP                        | 128 to 251        | 128, 189, 251  | GSM, EDGE |
| B                  |                            | 128 to 251        | 128, 189, 251  | GSM       |
| A                  | Modulation Characteristics | 128 to 251        | 189            | GSM, EDGE |
| A                  | Frequency Stability        | 128 to 251        | 128, 251       | GSM, EDGE |
| A                  | Occupied Bandwidth         | 128 to 251        | 128, 189, 251  | GSM, EDGE |
| A                  | Band Edge                  | 128 to 251        | 128, 251       | GSM, EDGE |
| A                  | Peak to Average Ratio      | 128 to 251        | 128, 189, 251  | GSM, EDGE |
| A                  | Conducted Emission         | 128 to 251        | 128, 189, 251  | GSM, EDGE |
| A                  | Radiated Emission          | 128 to 251        | 128, 189, 251  | GSM, EDGE |
| B                  |                            | 128 to 251        | 128, 189, 251  | GSM       |

## WCDMA

| EUT<br>Configure<br>Mode | Test Item                     | Available Channel | Tested Channel   | Mode  |
|--------------------------|-------------------------------|-------------------|------------------|-------|
| A                        | ERP                           | 4132 to 4233      | 4132, 4182, 4233 | WCDMA |
| A                        | Modulation<br>Characteristics | 4132 to 4233      | 4182             | WCDMA |
| A                        | Frequency Stability           | 4132 to 4233      | 4132, 4233       | WCDMA |
| A                        | Occupied Bandwidth            | 4132 to 4233      | 4132, 4182, 4233 | WCDMA |
| A                        | Band Edge                     | 4132 to 4233      | 4132, 4233       | WCDMA |
| A                        | Peak to Average Ratio         | 4132 to 4233      | 4132, 4182, 4233 | WCDMA |
| A                        | Conducted Emission            | 4132 to 4233      | 4132, 4182, 4233 | WCDMA |
| A                        | Radiated Emission             | 4132 to 4233      | 4132, 4182, 4233 | WCDMA |

## LTE Band 5

| EUT Configure Mode | Test Item                  | Available Channel | Tested Channel      | Channel Bandwidth | Modulation  | Mode                |
|--------------------|----------------------------|-------------------|---------------------|-------------------|-------------|---------------------|
| A                  | ERP                        | 20407 to 20643    | 20407, 20525, 20643 | 1.4 MHz           | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 20415 to 20635    | 20415, 20525, 20635 | 3 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 20425 to 20625    | 20425, 20525, 20625 | 5 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset  |
| B                  |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset  |
| A                  | Modulation Characteristics | 20450 to 20600    | 20525               | 5 MHz             | QPSK, 16QAM | 25 RB / 0 RB Offset |
| A                  | Frequency Stability        | 20407 to 20643    | 20407, 20643        | 1.4 MHz           | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20415 to 20635    | 20415, 20635        | 3 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20425 to 20625    | 20425, 20625        | 5 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20450 to 20600    | 20450, 20600        | 10 MHz            | QPSK        | 1 RB / 0 RB Offset  |
| A                  | Occupied Bandwidth         | 20407 to 20643    | 20407, 20525, 20643 | 1.4 MHz           | QPSK, 16QAM | 6 RB / 0 RB Offset  |
|                    |                            | 20415 to 20635    | 20415, 20525, 20635 | 3 MHz             | QPSK, 16QAM | 15 RB / 0 RB Offset |
|                    |                            | 20425 to 20625    | 20425, 20525, 20625 | 5 MHz             | QPSK, 16QAM | 25 RB / 0 RB Offset |
|                    |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK, 16QAM | 50 RB / 0 RB Offset |
| A                  | Band Edge                  | 20407 to 20643    | 20407               | 1.4MHz            | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            |                   |                     |                   |             | 6 RB / 0 RB Offset  |
|                    |                            |                   | 20643               | 1.4MHz            | QPSK        | 1 RB / 5 RB Offset  |
|                    |                            |                   |                     |                   |             | 6 RB / 0 RB Offset  |
|                    |                            | 20415 to 20635    | 20415               | 3 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            |                   |                     |                   |             | 15 RB / 0 RB Offset |
|                    |                            |                   | 20635               | 3 MHz             | QPSK        | 1 RB / 14 RB Offset |
|                    |                            |                   |                     |                   |             | 15 RB / 0 RB Offset |
|                    |                            | 20425 to 20625    | 20425               | 5 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            |                   |                     |                   |             | 25 RB / 0 RB Offset |
|                    |                            |                   | 20625               | 5 MHz             | QPSK        | 1 RB / 24 RB Offset |
|                    |                            |                   |                     |                   |             | 25 RB / 0 RB Offset |
| A                  | Peak to Average Ratio      | 20407 to 20643    | 20407, 20525, 20643 | 1.4 MHz           | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 20415 to 20635    | 20415, 20525, 20635 | 3 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 20425 to 20625    | 20425, 20525, 20625 | 5 MHz             | QPSK, 16QAM | 1 RB / 0 RB Offset  |
|                    |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK, 16QAM | 1 RB / 0 RB Offset  |
| A                  | Conducted Emission         | 20407 to 20643    | 20407, 20525, 20643 | 1.4 MHz           | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20415 to 20635    | 20415, 20525, 20635 | 3 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20425 to 20625    | 20425, 20525, 20625 | 5 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK        | 1 RB / 0 RB Offset  |
| A                  | Radiated Emission          | 20407 to 20643    | 20407, 20525, 20643 | 1.4 MHz           | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20425 to 20625    | 20425, 20525, 20625 | 5 MHz             | QPSK        | 1 RB / 0 RB Offset  |
|                    |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK        | 1 RB / 0 RB Offset  |
| B                  |                            | 20450 to 20600    | 20450, 20525, 20600 | 10 MHz            | QPSK        | 1 RB / 0 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       | 3.85 Vdc       | Charles Hsiao            |
| Modulation Characteristics | 25 deg. C, 65 % RH       | 3.85 Vdc       | Wayne Lin                |
| Frequency Stability        | 25 deg. C, 65 % RH       | 3.85 Vdc       | Wayne Lin                |
| Occupied Bandwidth         | 25 deg. C, 65 % RH       | 3.85 Vdc       | Wayne Lin                |
| Band Edge                  | 25 deg. C, 65 % RH       | 3.85 Vdc       | Wayne Lin                |
| Peak to Average Ratio      | 25 deg. C, 65 % RH       | 3.85 Vdc       | Wayne Lin                |
| Conducted Emission         | 25 deg. C, 65 % RH       | 3.85 Vdc       | Wayne Lin                |
| Radiated Emission          | 25 deg. C, 65 % RH       | 120 Vac, 60 Hz | Charles Hsiao / Karl Lee |

### **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 22**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**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 7 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 1 MHz for GSM, GPRS & EDGE, 5 MHz for WCDMA, 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 form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$ .

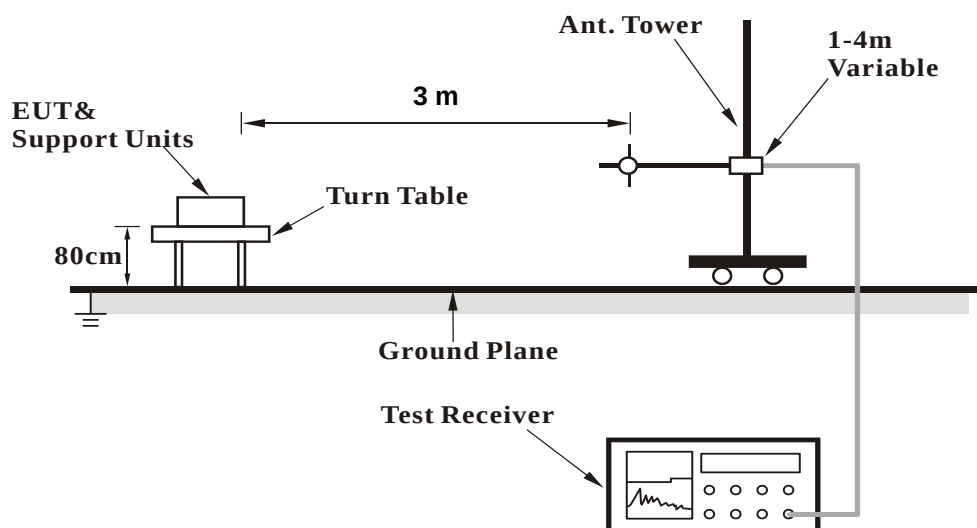
##### **Conducted Power Measurement:**

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

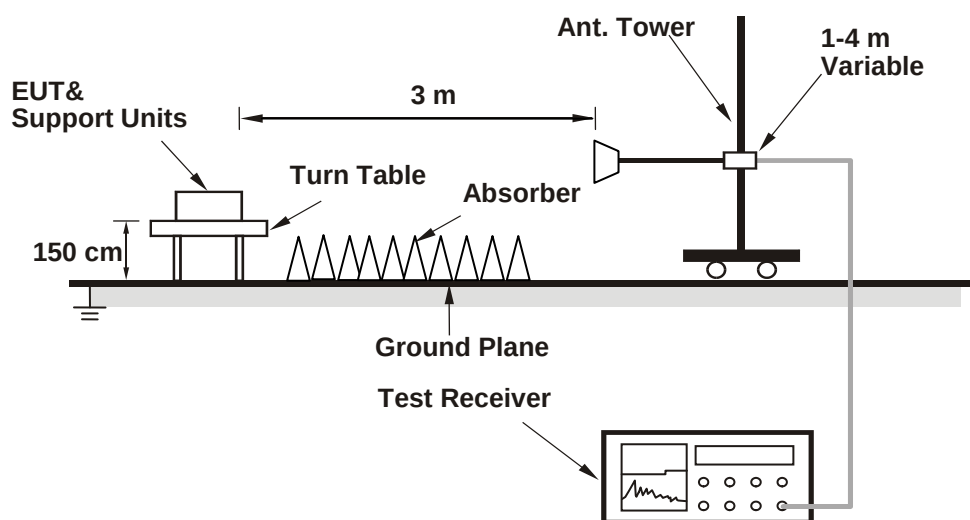
#### 4.1.3 Test Setup

##### EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

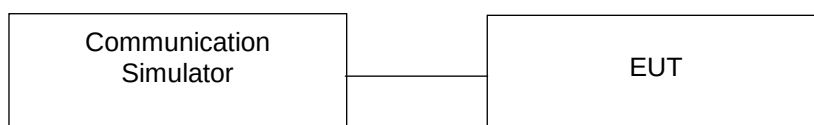


<Radiated Emission above 1 GHz>



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                  | GSM850 |       |       |
|-----------------------|--------|-------|-------|
| Channel               | 128    | 189   | 251   |
| Frequency (MHz)       | 824.2  | 836.4 | 848.8 |
| GSM (GMSK, 1Tx-slot)  | 32.53  | 32.74 | 32.79 |
| GPRS (GMSK, 1Tx-slot) | 32.50  | 32.71 | 32.76 |
| GPRS (GMSK, 2Tx-slot) | 29.07  | 29.28 | 29.33 |
| GPRS (GMSK, 3Tx-slot) | 27.74  | 27.93 | 27.98 |
| GPRS (GMSK, 4Tx-slot) | 27.22  | 27.42 | 27.49 |
| EDGE (8PSK, 1Tx-slot) | 26.46  | 26.67 | 26.72 |
| EDGE (8PSK, 2Tx-slot) | 25.35  | 25.56 | 25.61 |
| EDGE (8PSK, 3Tx-slot) | 24.26  | 24.47 | 24.52 |
| EDGE (8PSK, 4Tx-slot) | 22.10  | 22.31 | 22.36 |

| Band               | WCDMA V |       |       |
|--------------------|---------|-------|-------|
| Channel            | 4132    | 4182  | 4233  |
| Frequency (MHz)    | 826.4   | 836.4 | 846.6 |
| RMC 12.2K          | 23.03   | 23.12 | 23.09 |
| HSDPA Subtest-1    | 22.04   | 22.13 | 22.10 |
| HSDPA Subtest-2    | 22.02   | 22.11 | 22.08 |
| HSDPA Subtest-3    | 21.54   | 21.63 | 21.60 |
| HSDPA Subtest-4    | 21.50   | 21.59 | 21.56 |
| DC-HSDPA Subtest-1 | 21.93   | 22.02 | 21.99 |
| DC-HSDPA Subtest-2 | 21.91   | 22.00 | 21.97 |
| DC-HSDPA Subtest-3 | 21.43   | 21.52 | 21.49 |
| DC-HSDPA Subtest-4 | 21.39   | 21.48 | 21.45 |
| HSUPA Subtest-1    | 21.89   | 21.98 | 21.95 |
| HSUPA Subtest-2    | 19.86   | 19.95 | 19.92 |
| HSUPA Subtest-3    | 20.88   | 20.97 | 20.94 |
| HSUPA Subtest-4    | 19.89   | 19.98 | 19.95 |
| HSUPA Subtest-5    | 21.93   | 22.02 | 21.99 |

| LTE Band 5 |           |                 |           |       |       |       |               |      |           |                 |           |       |       |       |               |
|------------|-----------|-----------------|-----------|-------|-------|-------|---------------|------|-----------|-----------------|-----------|-------|-------|-------|---------------|
| BW         | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  | 3GPP MPR (dB) | BW   | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  | 3GPP MPR (dB) |
|            |           | Channel         |           | 20450 | 20525 | 20600 |               |      |           | Channel         |           | 20425 | 20525 | 20625 |               |
|            |           | Frequency (MHz) |           | 829.0 | 836.5 | 844.0 |               |      |           | Frequency (MHz) |           | 826.5 | 836.5 | 846.5 |               |
| 10M        | QPSK      | 1               | 0         | 23.08 | 23.16 | 23.09 | 0             | 5M   | QPSK      | 1               | 0         | 22.96 | 23.04 | 22.97 | 0             |
|            |           | 1               | 24        | 23.05 | 23.13 | 23.06 | 0             |      |           | 1               | 12        | 22.93 | 23.01 | 22.94 | 0             |
|            |           | 1               | 49        | 23.02 | 23.10 | 23.03 | 0             |      |           | 1               | 24        | 22.90 | 22.98 | 22.91 | 0             |
|            |           | 25              | 0         | 22.11 | 22.19 | 22.12 | 1             |      |           | 12              | 0         | 21.99 | 22.07 | 22.00 | 1             |
|            |           | 25              | 12        | 22.09 | 22.17 | 22.10 | 1             |      |           | 12              | 6         | 21.97 | 22.05 | 21.98 | 1             |
|            |           | 25              | 25        | 22.07 | 22.15 | 22.08 | 1             |      |           | 12              | 13        | 21.95 | 22.03 | 21.96 | 1             |
|            |           | 50              | 0         | 22.08 | 22.16 | 22.09 | 1             |      |           | 25              | 0         | 21.96 | 22.04 | 21.97 | 1             |
|            | 16QAM     | 1               | 0         | 22.04 | 22.12 | 22.05 | 1             |      | 16QAM     | 1               | 0         | 21.92 | 22.00 | 21.93 | 1             |
|            |           | 1               | 24        | 22.01 | 22.09 | 22.02 | 1             |      |           | 1               | 12        | 21.89 | 21.97 | 21.90 | 1             |
|            |           | 1               | 49        | 21.98 | 22.06 | 21.99 | 1             |      |           | 1               | 24        | 21.86 | 21.94 | 21.87 | 1             |
|            |           | 25              | 0         | 21.07 | 21.15 | 21.08 | 2             |      |           | 12              | 0         | 20.95 | 21.03 | 20.96 | 2             |
|            |           | 25              | 12        | 21.05 | 21.13 | 21.06 | 2             |      |           | 12              | 6         | 20.93 | 21.01 | 20.94 | 2             |
|            |           | 25              | 25        | 21.03 | 21.11 | 21.04 | 2             |      |           | 12              | 13        | 20.91 | 20.99 | 20.92 | 2             |
|            |           | 50              | 0         | 21.04 | 21.12 | 21.05 | 2             |      |           | 25              | 0         | 20.92 | 21.00 | 20.93 | 2             |
| BW         | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  | 3GPP MPR (dB) | BW   | MCS Index | RB Size         | RB Offset | Low   | Mid   | High  | 3GPP MPR (dB) |
|            |           | Channel         |           | 20415 | 20525 | 20635 |               |      |           | Channel         |           | 20407 | 20525 | 20643 |               |
|            |           | Frequency (MHz) |           | 825.5 | 836.5 | 847.5 |               |      |           | Frequency (MHz) |           | 824.7 | 836.5 | 848.3 |               |
| 3M         | QPSK      | 1               | 0         | 22.82 | 22.90 | 22.83 | 0             | 1.4M | QPSK      | 1               | 0         | 22.73 | 22.81 | 22.74 | 0             |
|            |           | 1               | 7         | 22.79 | 22.87 | 22.80 | 0             |      |           | 1               | 2         | 22.70 | 22.78 | 22.71 | 0             |
|            |           | 1               | 14        | 22.76 | 22.84 | 22.77 | 0             |      |           | 1               | 5         | 22.67 | 22.75 | 22.68 | 0             |
|            |           | 8               | 0         | 21.85 | 21.93 | 21.86 | 1             |      |           | 3               | 0         | 22.59 | 22.67 | 22.60 | 0             |
|            |           | 8               | 3         | 21.83 | 21.91 | 21.84 | 1             |      |           | 3               | 1         | 22.57 | 22.65 | 22.58 | 0             |
|            |           | 8               | 7         | 21.81 | 21.89 | 21.82 | 1             |      |           | 3               | 3         | 22.55 | 22.63 | 22.56 | 0             |
|            |           | 15              | 0         | 21.82 | 21.90 | 21.83 | 1             |      |           | 6               | 0         | 21.73 | 21.81 | 21.74 | 1             |
|            | 16QAM     | 1               | 0         | 21.78 | 21.86 | 21.79 | 1             |      | 16QAM     | 1               | 0         | 21.69 | 21.77 | 21.70 | 1             |
|            |           | 1               | 7         | 21.75 | 21.83 | 21.76 | 1             |      |           | 1               | 2         | 21.66 | 21.74 | 21.67 | 1             |
|            |           | 1               | 14        | 21.72 | 21.80 | 21.73 | 1             |      |           | 1               | 5         | 21.63 | 21.71 | 21.64 | 1             |
|            |           | 8               | 0         | 20.81 | 20.89 | 20.82 | 2             |      |           | 3               | 0         | 21.55 | 21.63 | 21.56 | 1             |
|            |           | 8               | 3         | 20.79 | 20.87 | 20.80 | 2             |      |           | 3               | 1         | 21.53 | 21.61 | 21.54 | 1             |
|            |           | 8               | 7         | 20.77 | 20.85 | 20.78 | 2             |      |           | 3               | 3         | 21.51 | 21.59 | 21.52 | 1             |
|            |           | 15              | 0         | 20.78 | 20.86 | 20.79 | 2             |      |           | 6               | 0         | 20.69 | 20.77 | 20.70 | 2             |

# ERP Power (dBm)

## Mode A

| GSM   |         |                 |               |                        |           |          |                    |
|-------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Plane | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X     | 128     | 824.2           | -0.52         | 31.208                 | 28.54     | 714.17   | H                  |
|       | 189     | 836.4           | -0.53         | 31.3                   | 28.62     | 727.78   |                    |
|       | 251     | 848.8           | -0.55         | 31.222                 | 28.52     | 711.54   |                    |
|       | 128     | 824.2           | -5.80         | 31.504                 | 23.55     | 226.67   | V                  |
|       | 189     | 836.4           | -5.38         | 31.117                 | 23.59     | 228.40   |                    |
|       | 251     | 848.8           | -6.27         | 31.922                 | 23.50     | 223.98   |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| EDGE  |         |                 |               |                        |           |          |                    |
|-------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Plane | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X     | 128     | 824.2           | -7.50         | 31.208                 | 21.56     | 143.15   | H                  |
|       | 189     | 836.4           | -7.53         | 31.3                   | 21.62     | 145.21   |                    |
|       | 251     | 848.8           | -7.55         | 31.222                 | 21.52     | 141.97   |                    |
|       | 128     | 824.2           | -12.81        | 31.504                 | 16.54     | 45.12    | V                  |
|       | 189     | 836.4           | -12.40        | 31.117                 | 16.57     | 45.36    |                    |
|       | 251     | 848.8           | -13.26        | 31.922                 | 16.51     | 44.79    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| WCDMA |         |                 |               |                        |           |          |                    |
|-------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Plane | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X     | 4132    | 826.4           | -10.01        | 31.208                 | 19.05     | 80.32    | H                  |
|       | 4182    | 836.4           | -10.04        | 31.3                   | 19.11     | 81.47    |                    |
|       | 4233    | 846.6           | -10.06        | 31.222                 | 19.01     | 79.65    |                    |
|       | 4132    | 826.4           | -14.31        | 31.504                 | 15.04     | 31.94    | V                  |
|       | 4182    | 836.4           | -13.89        | 31.117                 | 15.08     | 32.19    |                    |
|       | 4233    | 846.6           | -14.79        | 31.922                 | 14.98     | 31.49    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| LTE Band 5                         |         |                 |               |                        |           |          |                    |
|------------------------------------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 1.4 MHz / QPSK  |         |                 |               |                        |           |          |                    |
| Plane                              | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                  | 20407   | 824.7           | -10.01        | 31.208                 | 19.05     | 80.32    | H                  |
|                                    | 20525   | 836.5           | -10.16        | 31.3                   | 18.99     | 79.25    |                    |
|                                    | 20643   | 848.3           | -10.13        | 31.222                 | 18.94     | 78.38    |                    |
|                                    | 20407   | 824.7           | -15.28        | 31.504                 | 14.07     | 25.55    | V                  |
|                                    | 20525   | 836.5           | -14.92        | 31.117                 | 14.05     | 25.39    |                    |
|                                    | 20643   | 848.3           | -15.79        | 31.922                 | 13.98     | 25.01    |                    |
| Channel Bandwidth: 1.4 MHz / 16QAM |         |                 |               |                        |           |          |                    |
| X                                  | 20407   | 824.7           | -11.04        | 31.208                 | 18.02     | 63.36    | H                  |
|                                    | 20525   | 836.5           | -11.19        | 31.3                   | 17.96     | 62.52    |                    |
|                                    | 20643   | 848.3           | -11.16        | 31.222                 | 17.91     | 61.83    |                    |
|                                    | 20407   | 824.7           | -16.30        | 31.504                 | 13.05     | 20.20    | V                  |
|                                    | 20525   | 836.5           | -15.94        | 31.117                 | 13.03     | 20.08    |                    |
|                                    | 20643   | 848.3           | -16.82        | 31.922                 | 12.95     | 19.73    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| LTE Band 5                       |         |                 |               |                        |           |          |                    |
|----------------------------------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 3 MHz / QPSK  |         |                 |               |                        |           |          |                    |
| Plane                            | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                | 20415   | 825.5           | -9.98         | 31.208                 | 19.08     | 80.87    | H                  |
|                                  | 20525   | 836.5           | -10.12        | 31.3                   | 19.03     | 79.98    |                    |
|                                  | 20635   | 847.5           | -10.10        | 31.222                 | 18.97     | 78.92    |                    |
|                                  | 20415   | 825.5           | -15.26        | 31.504                 | 14.09     | 25.67    | V                  |
|                                  | 20525   | 836.5           | -14.90        | 31.117                 | 14.07     | 25.51    |                    |
|                                  | 20635   | 847.5           | -15.76        | 31.922                 | 14.01     | 25.19    |                    |
| Channel Bandwidth: 3 MHz / 16QAM |         |                 |               |                        |           |          |                    |
| X                                | 20415   | 825.5           | -11.00        | 31.208                 | 18.06     | 63.94    | H                  |
|                                  | 20525   | 836.5           | -11.14        | 31.3                   | 18.01     | 63.24    |                    |
|                                  | 20635   | 847.5           | -11.13        | 31.222                 | 17.94     | 62.26    |                    |
|                                  | 20415   | 825.5           | -16.27        | 31.504                 | 13.08     | 20.34    | V                  |
|                                  | 20525   | 836.5           | -15.92        | 31.117                 | 13.05     | 20.17    |                    |
|                                  | 20635   | 847.5           | -16.77        | 31.922                 | 13.00     | 19.96    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| LTE Band 5                       |         |                 |               |                        |           |          |                    |
|----------------------------------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 5 MHz / QPSK  |         |                 |               |                        |           |          |                    |
| Plane                            | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                | 20425   | 826.5           | -9.95         | 31.208                 | 19.11     | 81.43    | H                  |
|                                  | 20525   | 836.5           | -10.08        | 31.3                   | 19.07     | 80.72    |                    |
|                                  | 20625   | 846.5           | -10.07        | 31.222                 | 19.00     | 79.47    |                    |
|                                  | 20425   | 826.5           | -15.24        | 31.504                 | 14.11     | 25.79    | V                  |
|                                  | 20525   | 836.5           | -14.87        | 31.117                 | 14.10     | 25.69    |                    |
|                                  | 20625   | 846.5           | -15.73        | 31.922                 | 14.04     | 25.36    |                    |
| Channel Bandwidth: 5 MHz / 16QAM |         |                 |               |                        |           |          |                    |
| X                                | 20425   | 826.5           | -10.96        | 31.208                 | 18.10     | 64.54    | H                  |
|                                  | 20525   | 836.5           | -11.08        | 31.3                   | 18.07     | 64.12    |                    |
|                                  | 20625   | 846.5           | -11.09        | 31.222                 | 17.98     | 62.83    |                    |
|                                  | 20425   | 826.5           | -16.25        | 31.504                 | 13.10     | 20.44    | V                  |
|                                  | 20525   | 836.5           | -15.88        | 31.117                 | 13.09     | 20.36    |                    |
|                                  | 20625   | 846.5           | -16.74        | 31.922                 | 13.03     | 20.10    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| LTE Band 5                        |         |                 |               |                        |           |          |                    |
|-----------------------------------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 10 MHz / QPSK  |         |                 |               |                        |           |          |                    |
| Plane                             | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                 | 20450   | 829.0           | -9.91         | 31.208                 | 19.15     | 82.19    | H                  |
|                                   | 20525   | 836.5           | -10.06        | 31.3                   | 19.09     | 81.10    |                    |
|                                   | 20600   | 844.0           | -10.04        | 31.222                 | 19.03     | 80.02    |                    |
|                                   | 20450   | 829.0           | -15.21        | 31.504                 | 14.14     | 25.97    | V                  |
|                                   | 20525   | 836.5           | -14.85        | 31.117                 | 14.12     | 25.80    |                    |
|                                   | 20600   | 844.0           | -15.70        | 31.922                 | 14.07     | 25.54    |                    |
| Channel Bandwidth: 10 MHz / 16QAM |         |                 |               |                        |           |          |                    |
| X                                 | 20425   | 826.5           | -10.92        | 31.208                 | 18.14     | 65.13    | H                  |
|                                   | 20525   | 836.5           | -11.07        | 31.3                   | 18.08     | 64.27    |                    |
|                                   | 20625   | 846.5           | -11.06        | 31.222                 | 18.01     | 63.27    |                    |
|                                   | 20425   | 826.5           | -16.22        | 31.504                 | 13.13     | 20.58    | V                  |
|                                   | 20525   | 836.5           | -15.86        | 31.117                 | 13.11     | 20.45    |                    |
|                                   | 20625   | 846.5           | -16.72        | 31.922                 | 13.05     | 20.19    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

# Mode B

| GSM   |         |                 |               |                        |           |          |                    |
|-------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Plane | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X     | 128     | 824.2           | -1.42         | 31.208                 | 27.64     | 580.50   | H                  |
|       | 189     | 836.4           | -1.62         | 31.3                   | 27.53     | 566.24   |                    |
|       | 251     | 848.8           | -1.25         | 31.222                 | 27.82     | 605.62   |                    |
|       | 128     | 824.2           | -6.85         | 31.504                 | 22.50     | 177.99   | V                  |
|       | 189     | 836.4           | -6.95         | 31.117                 | 22.02     | 159.11   |                    |
|       | 251     | 848.8           | -6.88         | 31.922                 | 22.89     | 194.63   |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

| LTE Band 5                        |         |                 |               |                        |           |          |                    |
|-----------------------------------|---------|-----------------|---------------|------------------------|-----------|----------|--------------------|
| Channel Bandwidth: 10 MHz / QPSK  |         |                 |               |                        |           |          |                    |
| Plane                             | Channel | Frequency (MHz) | Reading (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (mW) | Polarization (H/V) |
| X                                 | 20450   | 829.0           | -10.52        | 31.208                 | 18.54     | 71.42    | H                  |
|                                   | 20525   | 836.5           | -10.84        | 31.3                   | 18.31     | 67.76    |                    |
|                                   | 20600   | 844.0           | -10.76        | 31.222                 | 18.31     | 67.80    |                    |
|                                   | 20450   | 829.0           | -15.86        | 31.504                 | 13.49     | 22.36    | V                  |
|                                   | 20525   | 836.5           | -15.57        | 31.117                 | 13.40     | 21.88    |                    |
|                                   | 20600   | 844.0           | -15.81        | 31.922                 | 13.96     | 24.90    |                    |
| Channel Bandwidth: 10 MHz / 16QAM |         |                 |               |                        |           |          |                    |
| X                                 | 20425   | 826.5           | -11.87        | 31.208                 | 17.19     | 52.34    | H                  |
|                                   | 20525   | 836.5           | -11.86        | 31.3                   | 17.29     | 53.58    |                    |
|                                   | 20625   | 846.5           | -11.81        | 31.222                 | 17.26     | 53.24    |                    |
|                                   | 20425   | 826.5           | -16.96        | 31.504                 | 12.39     | 17.35    | V                  |
|                                   | 20525   | 836.5           | -16.75        | 31.117                 | 12.22     | 16.66    |                    |
|                                   | 20625   | 846.5           | -16.88        | 31.922                 | 12.89     | 19.46    |                    |

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

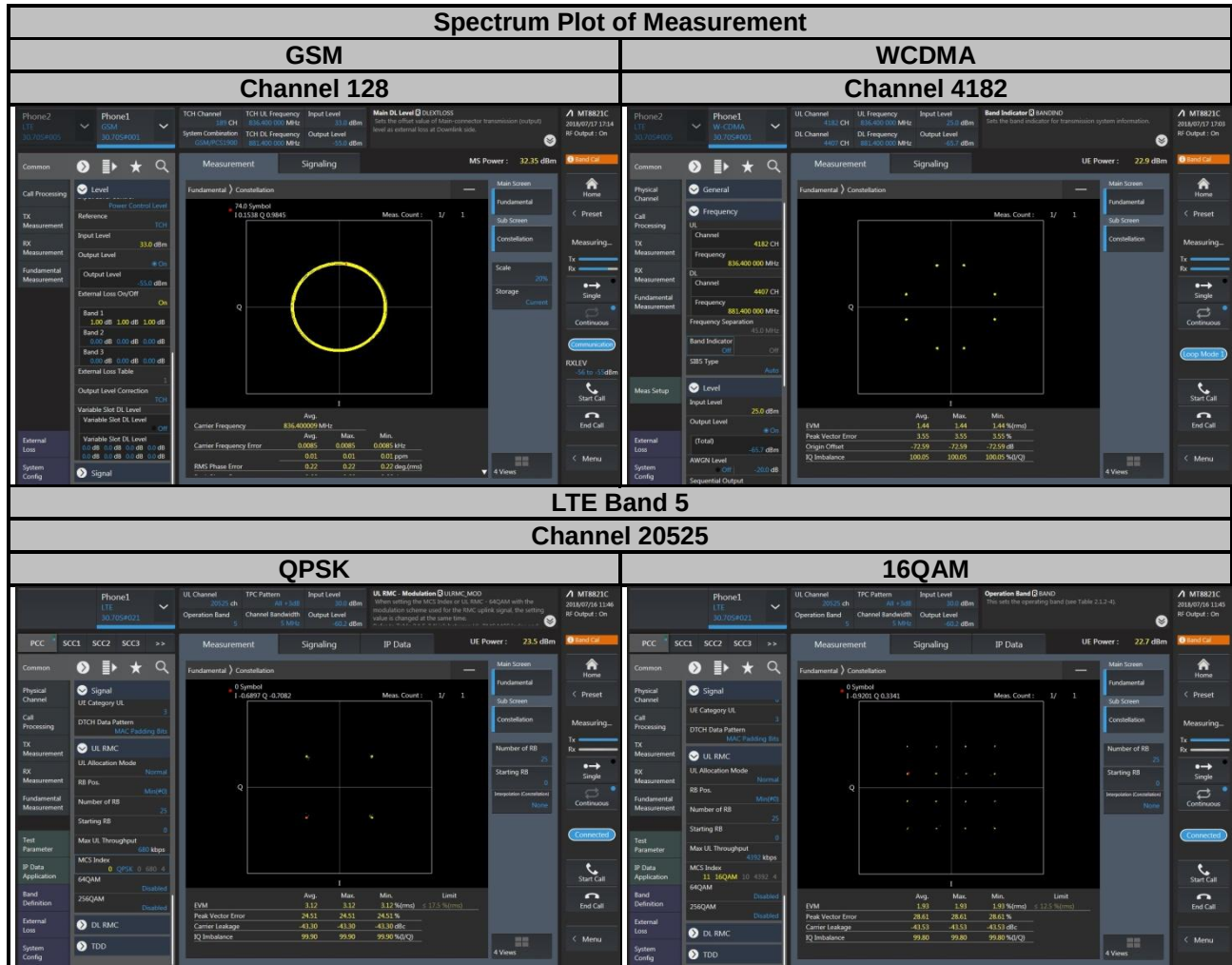
### 4.2.2 Test Setup



### 4.2.3 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

## 4.2.4 Test Results



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

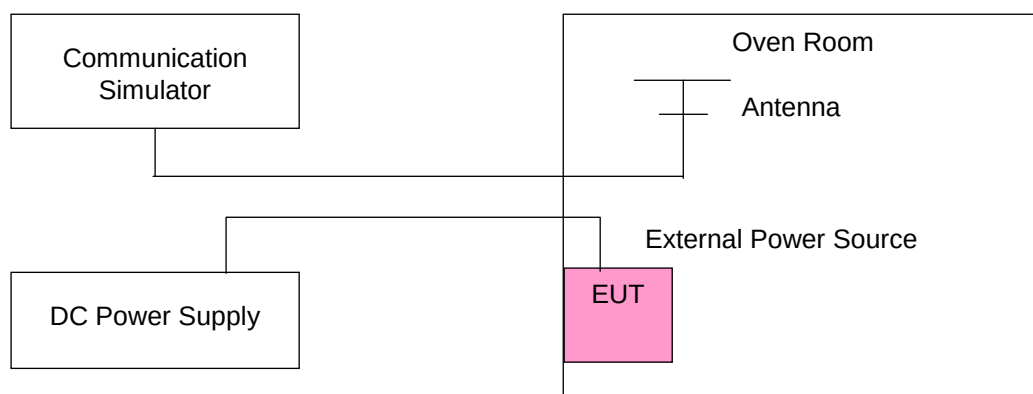
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

#### 4.3.2 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.

#### 4.3.3 Test Setup



#### 4.3.4 Test Results

##### Frequency Error vs. Voltage

| Voltage<br>(Volts) | GSM             |                       |                 |                       | Limit (ppm) |
|--------------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Low Channel     |                       | High Channel    |                       |             |
|                    | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 824.200003      | 0.003                 | 848.800003      | 0.003                 | 2.5         |
| 3.27               | 824.200004      | 0.004                 | 848.800001      | 0.001                 | 2.5         |
| 4.42               | 824.200002      | 0.003                 | 848.800001      | 0.002                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

##### Frequency Error vs. Temperature

| Temp. (°C) | GSM             |                       |                 |                       | Limit (ppm) |
|------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|            | Low Channel     |                       | High Channel    |                       |             |
|            | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 824.200003      | 0.004                 | 848.800002      | 0.003                 | 2.5         |
| -20        | 824.200003      | 0.004                 | 848.800003      | 0.004                 | 2.5         |
| -10        | 824.200004      | 0.004                 | 848.800004      | 0.004                 | 2.5         |
| 0          | 824.200004      | 0.005                 | 848.800004      | 0.004                 | 2.5         |
| 10         | 824.200003      | 0.004                 | 848.800003      | 0.003                 | 2.5         |
| 20         | 824.199996      | -0.004                | 848.799999      | -0.002                | 2.5         |
| 30         | 824.199996      | -0.005                | 848.799997      | -0.004                | 2.5         |
| 40         | 824.199999      | -0.002                | 848.799997      | -0.004                | 2.5         |
| 50         | 824.199998      | -0.003                | 848.799997      | -0.003                | 2.5         |
| 55         | 824.199998      | -0.003                | 848.799998      | -0.002                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | EDGE            |                       |                 |                       | Limit (ppm) |
|--------------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Low Channel     |                       | High Channel    |                       |             |
|                    | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 824.200003      | 0.004                 | 848.800004      | 0.004                 | 2.5         |
| 3.27               | 824.200003      | 0.004                 | 848.800002      | 0.002                 | 2.5         |
| 4.42               | 824.200002      | 0.002                 | 848.800004      | 0.004                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | EDGE            |                       |                 |                       | Limit (ppm) |
|------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|            | Low Channel     |                       | High Channel    |                       |             |
|            | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 824.200004      | 0.004                 | 848.800002      | 0.002                 | 2.5         |
| -20        | 824.200001      | 0.002                 | 848.800002      | 0.002                 | 2.5         |
| -10        | 824.200003      | 0.003                 | 848.800003      | 0.003                 | 2.5         |
| 0          | 824.200003      | 0.004                 | 848.800004      | 0.005                 | 2.5         |
| 10         | 824.200003      | 0.004                 | 848.800001      | 0.001                 | 2.5         |
| 20         | 824.199999      | -0.002                | 848.799997      | -0.003                | 2.5         |
| 30         | 824.199997      | -0.004                | 848.799998      | -0.003                | 2.5         |
| 40         | 824.199998      | -0.003                | 848.799997      | -0.003                | 2.5         |
| 50         | 824.199998      | -0.003                | 848.799997      | -0.004                | 2.5         |
| 55         | 824.199998      | -0.002                | 848.799998      | -0.003                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | WCDMA           |                       |                 |                       | Limit (ppm) |
|--------------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Low Channel     |                       | High Channel    |                       |             |
|                    | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 826.400003      | 0.003                 | 846.600003      | 0.004                 | 2.5         |
| 3.27               | 826.400004      | 0.005                 | 846.600004      | 0.005                 | 2.5         |
| 4.42               | 826.400003      | 0.004                 | 846.600002      | 0.002                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | WCDMA           |                       |                 |                       | Limit (ppm) |
|------------|-----------------|-----------------------|-----------------|-----------------------|-------------|
|            | Low Channel     |                       | High Channel    |                       |             |
|            | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 826.400002      | 0.003                 | 846.600003      | 0.004                 | 2.5         |
| -20        | 826.400002      | 0.003                 | 846.600002      | 0.002                 | 2.5         |
| -10        | 826.400003      | 0.004                 | 846.600002      | 0.002                 | 2.5         |
| 0          | 826.400001      | 0.001                 | 846.600001      | 0.001                 | 2.5         |
| 10         | 826.400002      | 0.003                 | 846.600002      | 0.002                 | 2.5         |
| 20         | 826.399997      | -0.004                | 846.599999      | -0.002                | 2.5         |
| 30         | 826.399998      | -0.002                | 846.599998      | -0.002                | 2.5         |
| 40         | 826.399999      | -0.001                | 846.599996      | -0.004                | 2.5         |
| 50         | 826.399997      | -0.004                | 846.599998      | -0.002                | 2.5         |
| 55         | 826.399997      | -0.004                | 846.599998      | -0.003                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 5                 |                       |                 |                       | Limit (ppm) |
|--------------------|----------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 1.4 MHz |                       |                 |                       |             |
|                    | Low Channel                |                       | High Channel    |                       |             |
|                    | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 824.700003                 | 0.003                 | 848.300001      | 0.001                 | 2.5         |
| 3.27               | 824.700002                 | 0.003                 | 848.300004      | 0.004                 | 2.5         |
| 4.42               | 824.700004                 | 0.004                 | 848.300003      | 0.003                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 5                 |                       |                 |                       | Limit (ppm) |
|------------|----------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 1.4 MHz |                       |                 |                       |             |
|            | Low Channel                |                       | High Channel    |                       |             |
|            | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 824.700003                 | 0.004                 | 848.300002      | 0.002                 | 2.5         |
| -20        | 824.700004                 | 0.005                 | 848.300003      | 0.003                 | 2.5         |
| -10        | 824.700001                 | 0.001                 | 848.300004      | 0.005                 | 2.5         |
| 0          | 824.700003                 | 0.003                 | 848.300003      | 0.004                 | 2.5         |
| 10         | 824.700002                 | 0.002                 | 848.300003      | 0.004                 | 2.5         |
| 20         | 824.699997                 | -0.003                | 848.299997      | -0.003                | 2.5         |
| 30         | 824.699999                 | -0.002                | 848.299997      | -0.004                | 2.5         |
| 40         | 824.699996                 | -0.004                | 848.299999      | -0.002                | 2.5         |
| 50         | 824.699998                 | -0.002                | 848.299999      | -0.002                | 2.5         |
| 55         | 824.699999                 | -0.001                | 848.299999      | -0.002                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 5               |                       |                 |                       | Limit (ppm) |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 3 MHz |                       |                 |                       |             |
|                    | Low Channel              |                       | High Channel    |                       |             |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 825.500002               | 0.002                 | 847.500004      | 0.005                 | 2.5         |
| 3.27               | 825.500004               | 0.004                 | 847.500004      | 0.004                 | 2.5         |
| 4.42               | 825.500004               | 0.005                 | 847.500004      | 0.004                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 5               |                       |                 |                       | Limit (ppm) |
|------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 3 MHz |                       |                 |                       |             |
|            | Low Channel              |                       | High Channel    |                       |             |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 825.500002               | 0.003                 | 847.500001      | 0.002                 | 2.5         |
| -20        | 825.500004               | 0.004                 | 847.500004      | 0.004                 | 2.5         |
| -10        | 825.500003               | 0.003                 | 847.500002      | 0.002                 | 2.5         |
| 0          | 825.500002               | 0.002                 | 847.500002      | 0.002                 | 2.5         |
| 10         | 825.500002               | 0.003                 | 847.500002      | 0.002                 | 2.5         |
| 20         | 825.499998               | -0.002                | 847.499996      | -0.004                | 2.5         |
| 30         | 825.499999               | -0.002                | 847.499999      | -0.002                | 2.5         |
| 40         | 825.499998               | -0.003                | 847.499999      | -0.001                | 2.5         |
| 50         | 825.499998               | -0.003                | 847.499998      | -0.002                | 2.5         |
| 55         | 825.499998               | -0.003                | 847.499999      | -0.002                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 5               |                       |                 |                       | Limit (ppm) |
|--------------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 5 MHz |                       |                 |                       |             |
|                    | Low Channel              |                       | High Channel    |                       |             |
|                    | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 826.500003               | 0.004                 | 846.500002      | 0.002                 | 2.5         |
| 3.27               | 826.500004               | 0.004                 | 846.500002      | 0.003                 | 2.5         |
| 4.42               | 826.500004               | 0.005                 | 846.500003      | 0.004                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

### Frequency Error vs. Temperature

| Temp. (°C) | LTE Band 5               |                       |                 |                       | Limit (ppm) |
|------------|--------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 5 MHz |                       |                 |                       |             |
|            | Low Channel              |                       | High Channel    |                       |             |
|            | Frequency (MHz)          | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 826.500002               | 0.002                 | 846.500003      | 0.004                 | 2.5         |
| -20        | 826.500004               | 0.004                 | 846.500001      | 0.001                 | 2.5         |
| -10        | 826.500002               | 0.002                 | 846.500002      | 0.002                 | 2.5         |
| 0          | 826.500003               | 0.004                 | 846.500001      | 0.002                 | 2.5         |
| 10         | 826.500003               | 0.004                 | 846.500004      | 0.005                 | 2.5         |
| 20         | 826.499996               | -0.005                | 846.499998      | -0.002                | 2.5         |
| 30         | 826.499998               | -0.003                | 846.499997      | -0.003                | 2.5         |
| 40         | 826.499998               | -0.002                | 846.499998      | -0.003                | 2.5         |
| 50         | 826.499999               | -0.001                | 846.499996      | -0.004                | 2.5         |
| 55         | 826.499999               | -0.001                | 846.499997      | -0.004                | 2.5         |

### Frequency Error vs. Voltage

| Voltage<br>(Volts) | LTE Band 5                |                       |                 |                       | Limit (ppm) |
|--------------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|                    | Channel Bandwidth: 10 MHz |                       |                 |                       |             |
|                    | Low Channel               |                       | High Channel    |                       |             |
|                    | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| 3.85               | 829.000002                | 0.003                 | 844.000003      | 0.004                 | 2.5         |
| 3.27               | 829.000003                | 0.004                 | 844.000004      | 0.004                 | 2.5         |
| 4.42               | 829.000003                | 0.004                 | 844.000003      | 0.003                 | 2.5         |

**Note:** The applicant defined the normal working voltage of the battery is from 3.27 Vdc to 4.42 Vdc.

### Frequency Error vs. Temperature

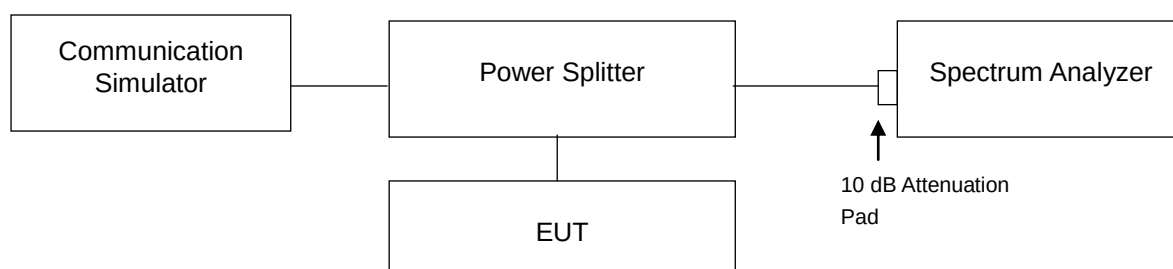
| Temp. (°C) | LTE Band 5                |                       |                 |                       | Limit (ppm) |
|------------|---------------------------|-----------------------|-----------------|-----------------------|-------------|
|            | Channel Bandwidth: 10 MHz |                       |                 |                       |             |
|            | Low Channel               |                       | High Channel    |                       |             |
|            | Frequency (MHz)           | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |             |
| -30        | 829.000001                | 0.002                 | 844.000004      | 0.004                 | 2.5         |
| -20        | 829.000002                | 0.003                 | 844.000003      | 0.004                 | 2.5         |
| -10        | 829.000003                | 0.003                 | 844.000002      | 0.002                 | 2.5         |
| 0          | 829.000001                | 0.001                 | 844.000002      | 0.002                 | 2.5         |
| 10         | 829.000001                | 0.001                 | 844.000004      | 0.005                 | 2.5         |
| 20         | 828.999998                | -0.003                | 843.999998      | -0.002                | 2.5         |
| 30         | 828.999998                | -0.003                | 843.999998      | -0.002                | 2.5         |
| 40         | 828.999996                | -0.005                | 843.999998      | -0.002                | 2.5         |
| 50         | 828.999998                | -0.003                | 843.999998      | -0.002                | 2.5         |
| 55         | 828.999998                | -0.003                | 843.999997      | -0.003                | 2.5         |

## 4.4 Occupied Bandwidth Measurement

### 4.4.1 Test Procedure

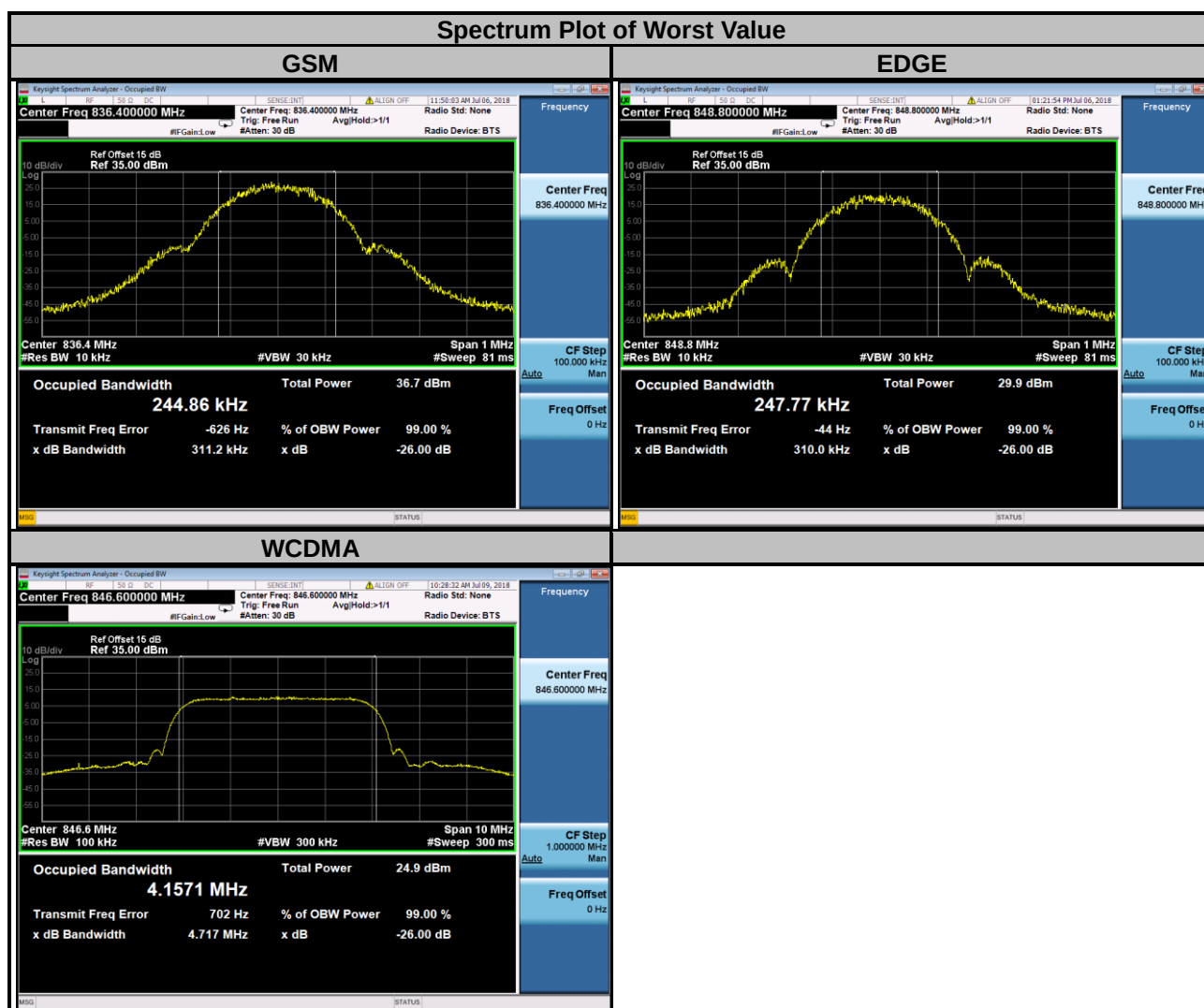
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

### 4.4.2 Test Setup

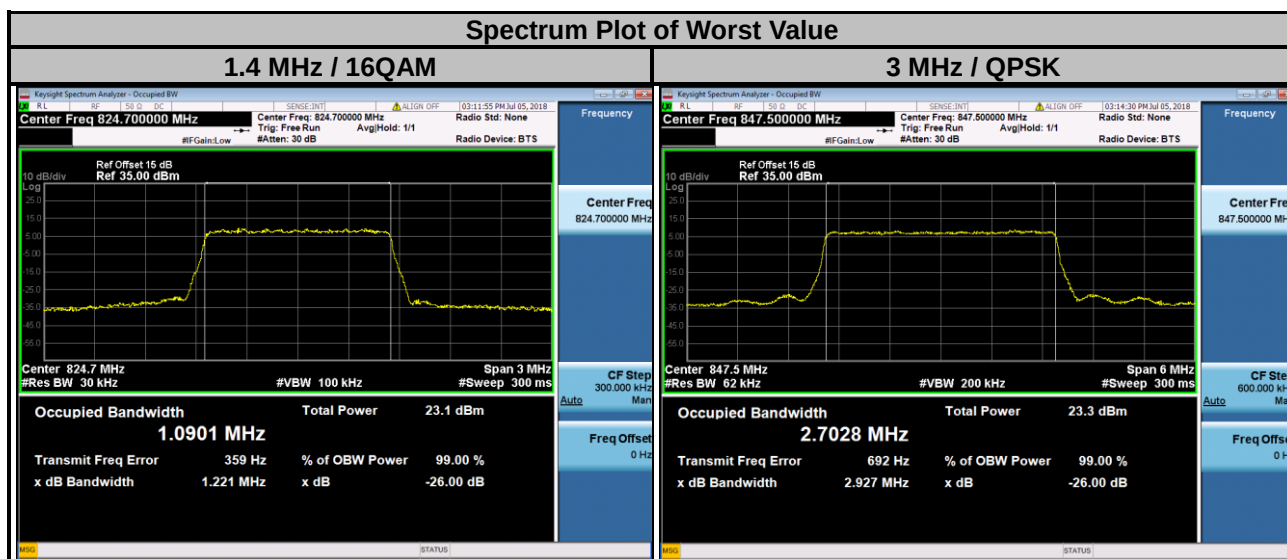


#### 4.4.3 Test Result

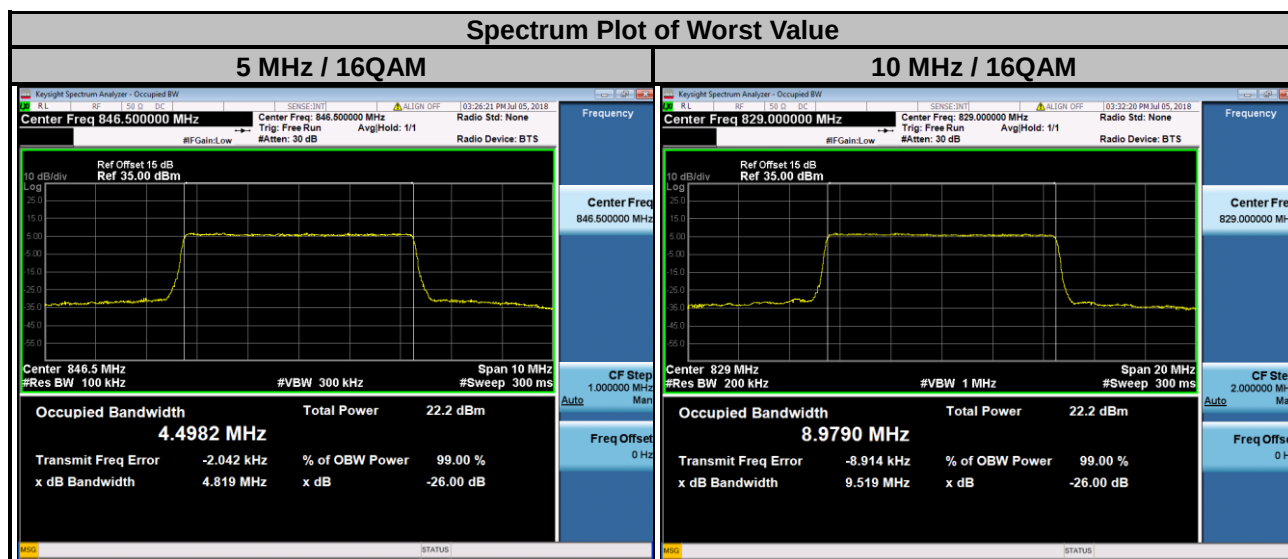
| Channel | Frequency (MHz) | 99 % Occupied Bandwidth (kHz) |        | Channel | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |
|---------|-----------------|-------------------------------|--------|---------|-----------------|-------------------------------|
|         |                 | GSM                           | EDGE   |         |                 |                               |
| 128     | 824.2           | 242.50                        | 246.28 | 4132    | 826.4           | 4.1503                        |
| 189     | 836.4           | 244.86                        | 244.25 | 4182    | 836.4           | 4.1527                        |
| 251     | 848.8           | 243.84                        | 247.77 | 4233    | 846.6           | 4.1571                        |



| LTE Band 5                 |                 |                               |        |                          |                 |                               |        |
|----------------------------|-----------------|-------------------------------|--------|--------------------------|-----------------|-------------------------------|--------|
| 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  |                          |                 | QPSK                          | 16QAM  |
| 20407                      | 824.7           | 1.0882                        | 1.0901 | 20415                    | 825.5           | 2.6994                        | 2.6971 |
| 20525                      | 836.5           | 1.0863                        | 1.0899 | 20525                    | 836.5           | 2.7000                        | 2.6975 |
| 20643                      | 848.3           | 1.0877                        | 1.0889 | 20635                    | 847.5           | 2.7028                        | 2.6986 |



| LTE Band 5               |                 |                               |        |                           |                 |                               |        |
|--------------------------|-----------------|-------------------------------|--------|---------------------------|-----------------|-------------------------------|--------|
| Channel Bandwidth: 5 MHz |                 |                               |        | Channel Bandwidth: 10 MHz |                 |                               |        |
| Channel                  | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |        | Channel                   | Frequency (MHz) | 99 % Occupied Bandwidth (MHz) |        |
|                          |                 | QPSK                          | 16QAM  |                           |                 | QPSK                          | 16QAM  |
| 20425                    | 826.5           | 4.4918                        | 4.4954 | 20450                     | 829.0           | 8.9758                        | 8.9790 |
| 20525                    | 836.5           | 4.4930                        | 4.4948 | 20525                     | 836.5           | 8.9655                        | 8.9698 |
| 20625                    | 846.5           | 4.4974                        | 4.4982 | 20600                     | 844.0           | 8.9728                        | 8.9747 |

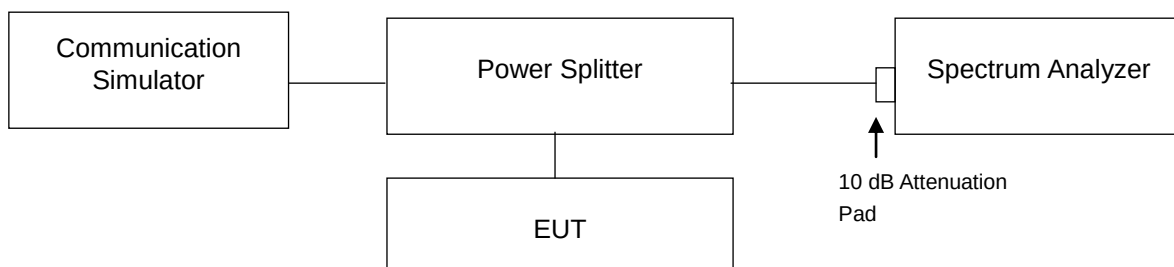


## 4.5 Band Edge Measurement

### 4.5.1 Limits of Band Edge Measurement

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

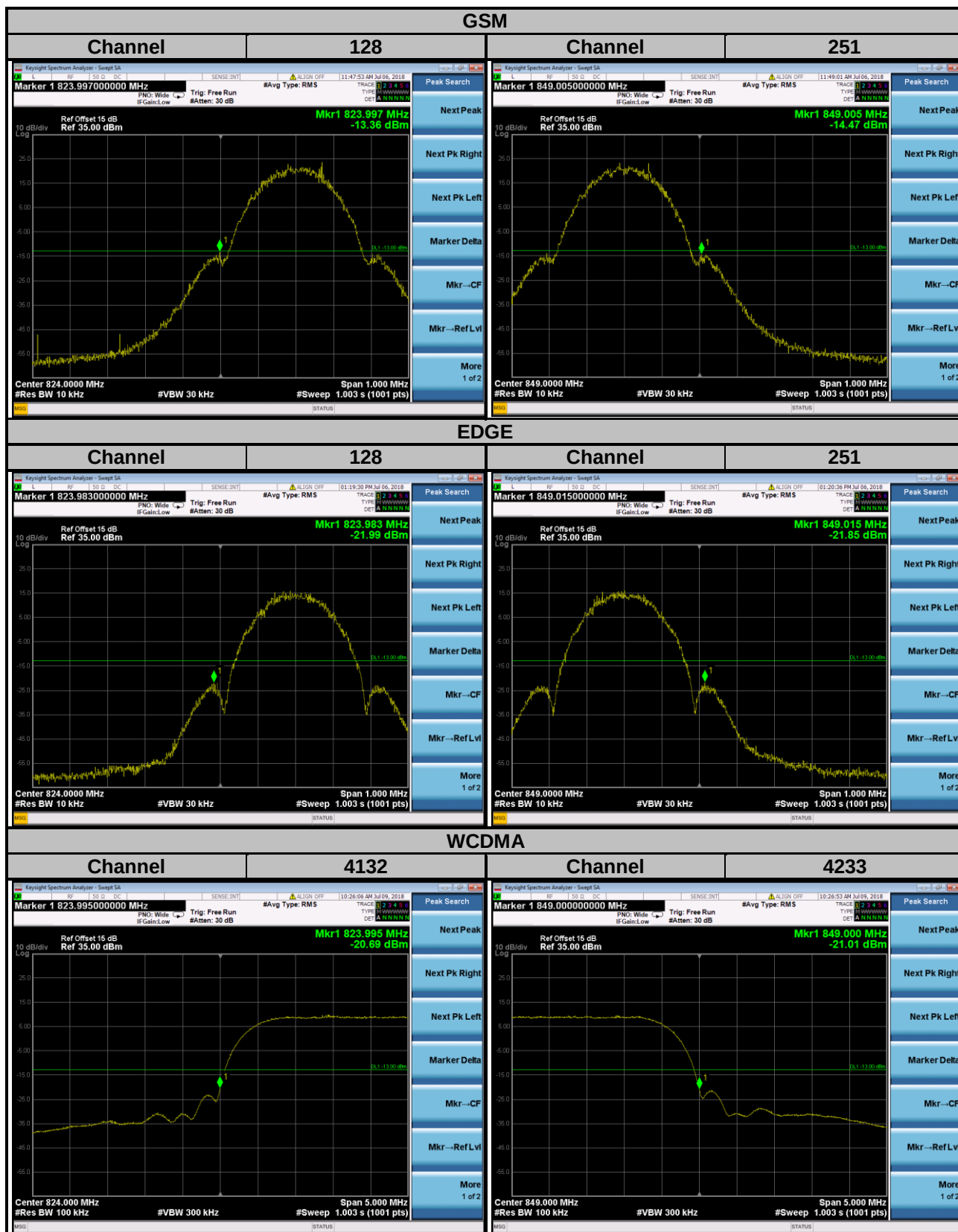
### 4.5.2 Test Setup



### 4.5.3 Test Procedures

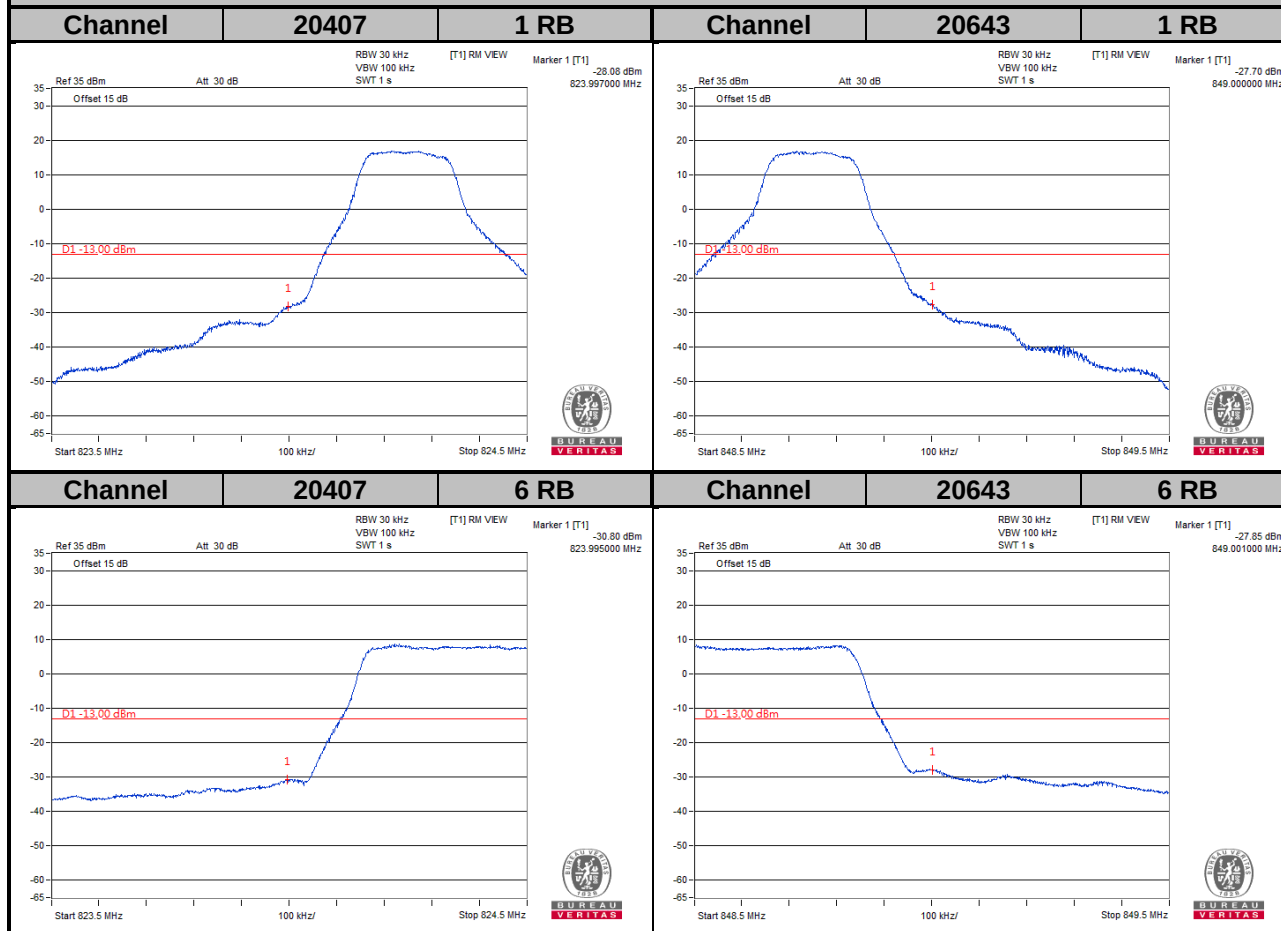
- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 10 kHz and VB of the spectrum is 30 kHz (GSM/GPRS/EDGE).
- The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 1.4 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 62 kHz and VB of the spectrum is 200 kHz (LTE Bandwidth 3 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 5 MHz).
- The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 10 MHz).
- Record the max trace plot into the test report.

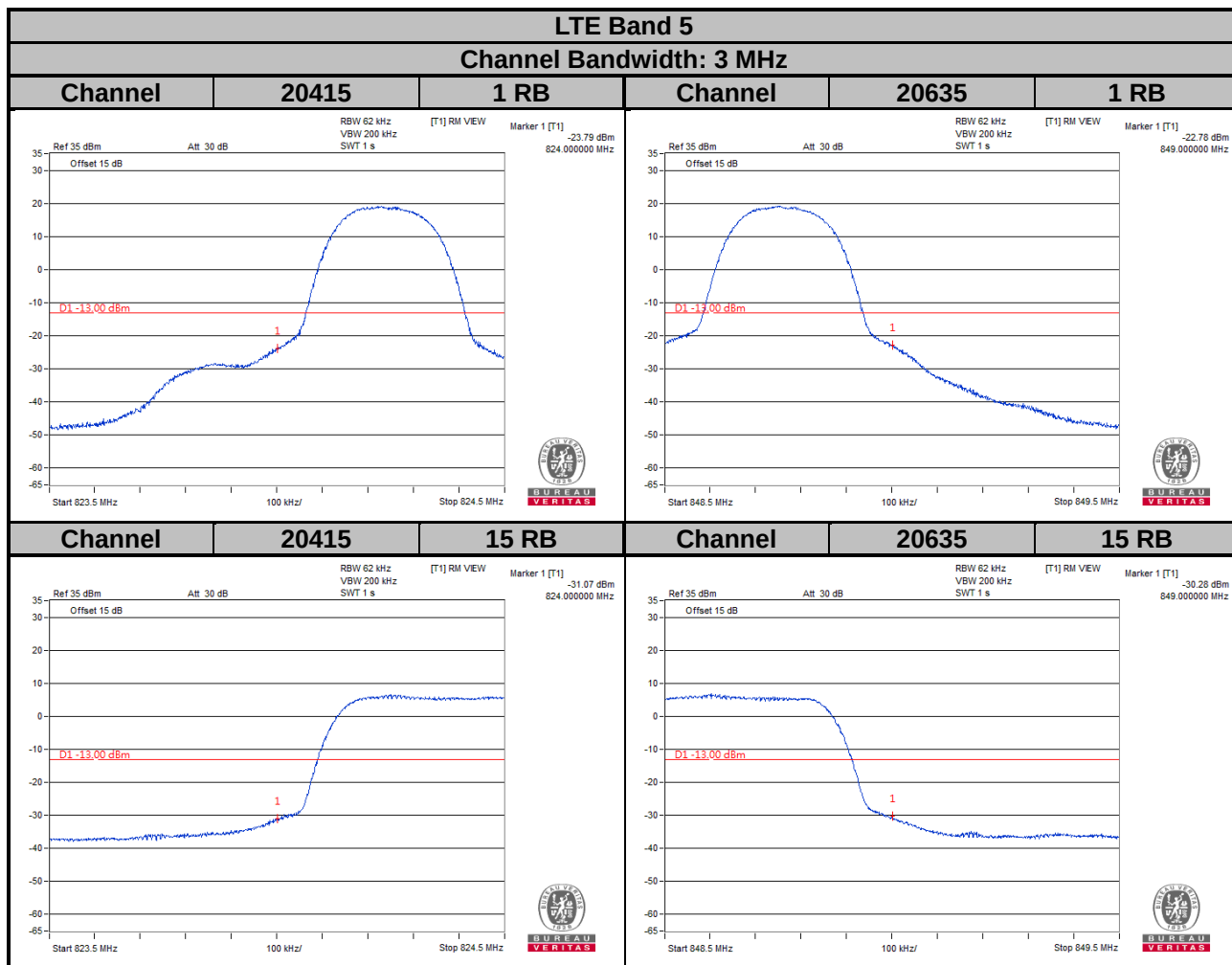
#### 4.5.4 Test Results

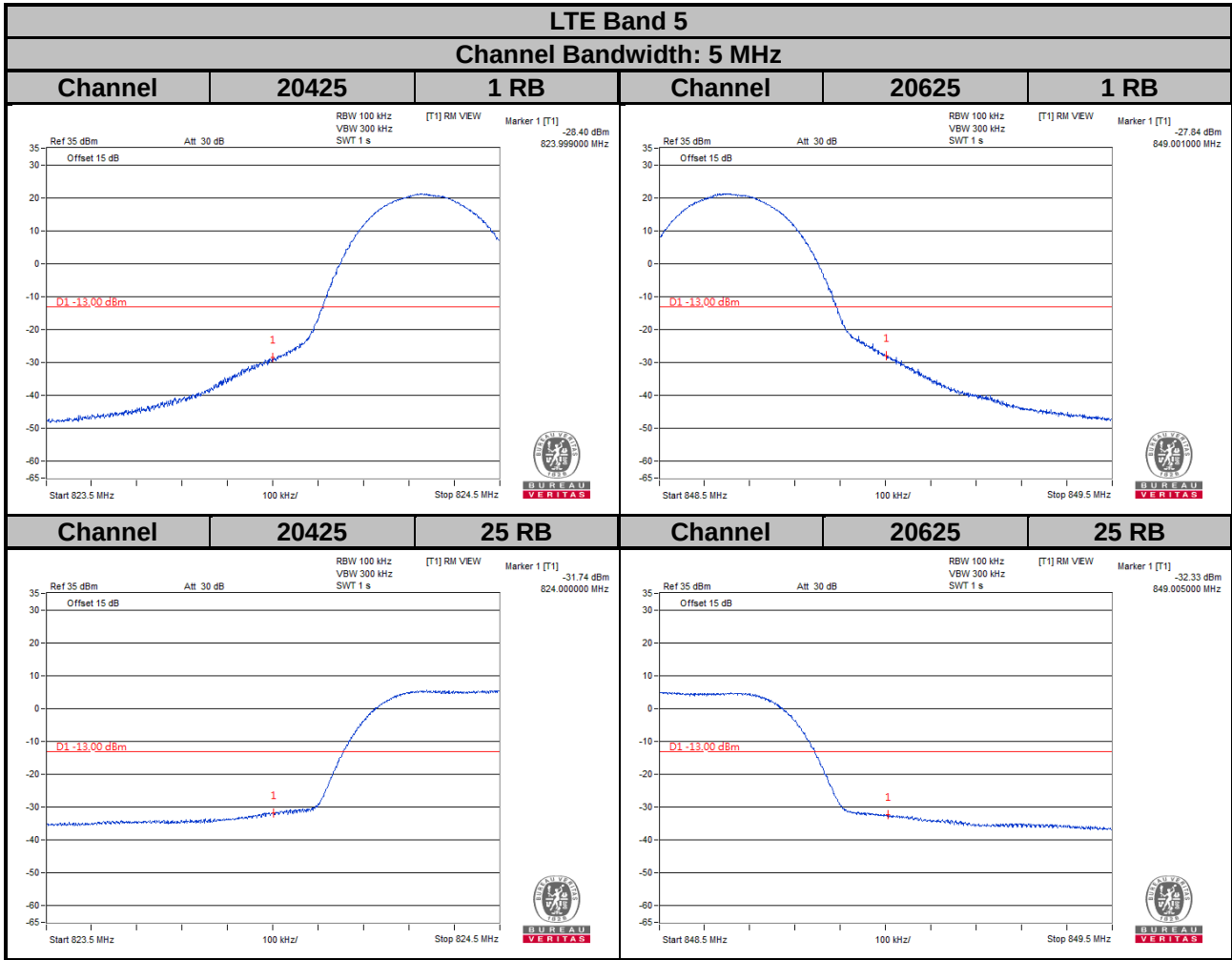


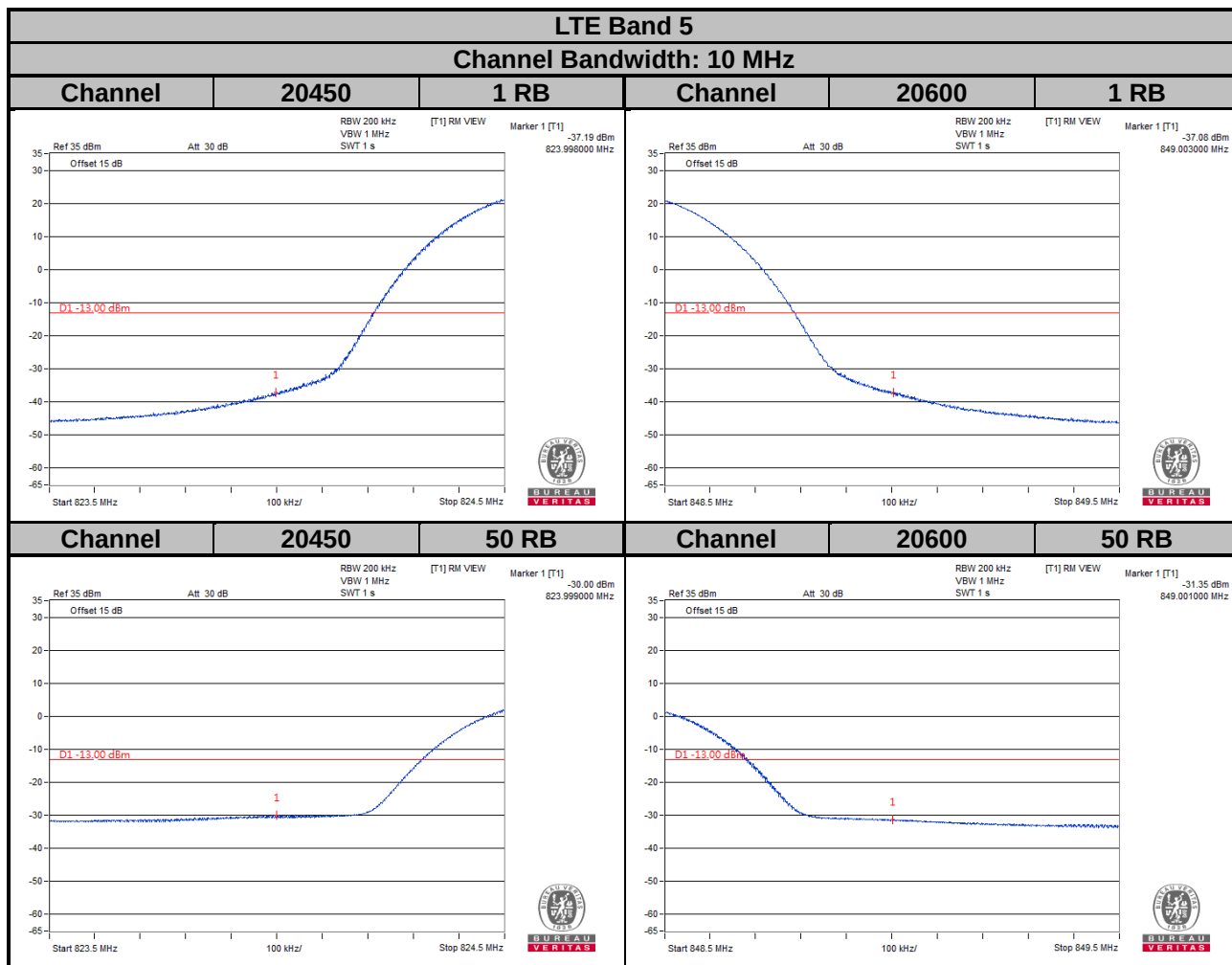
# LTE Band 5

Channel Bandwidth: 1.4 MHz







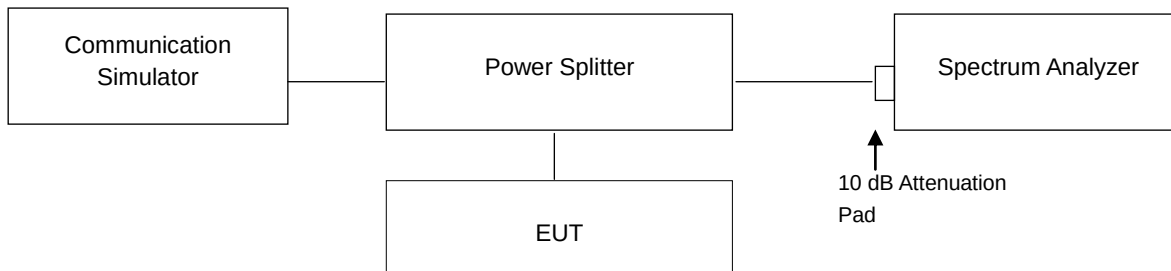


## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 4.6.2 Test Setup

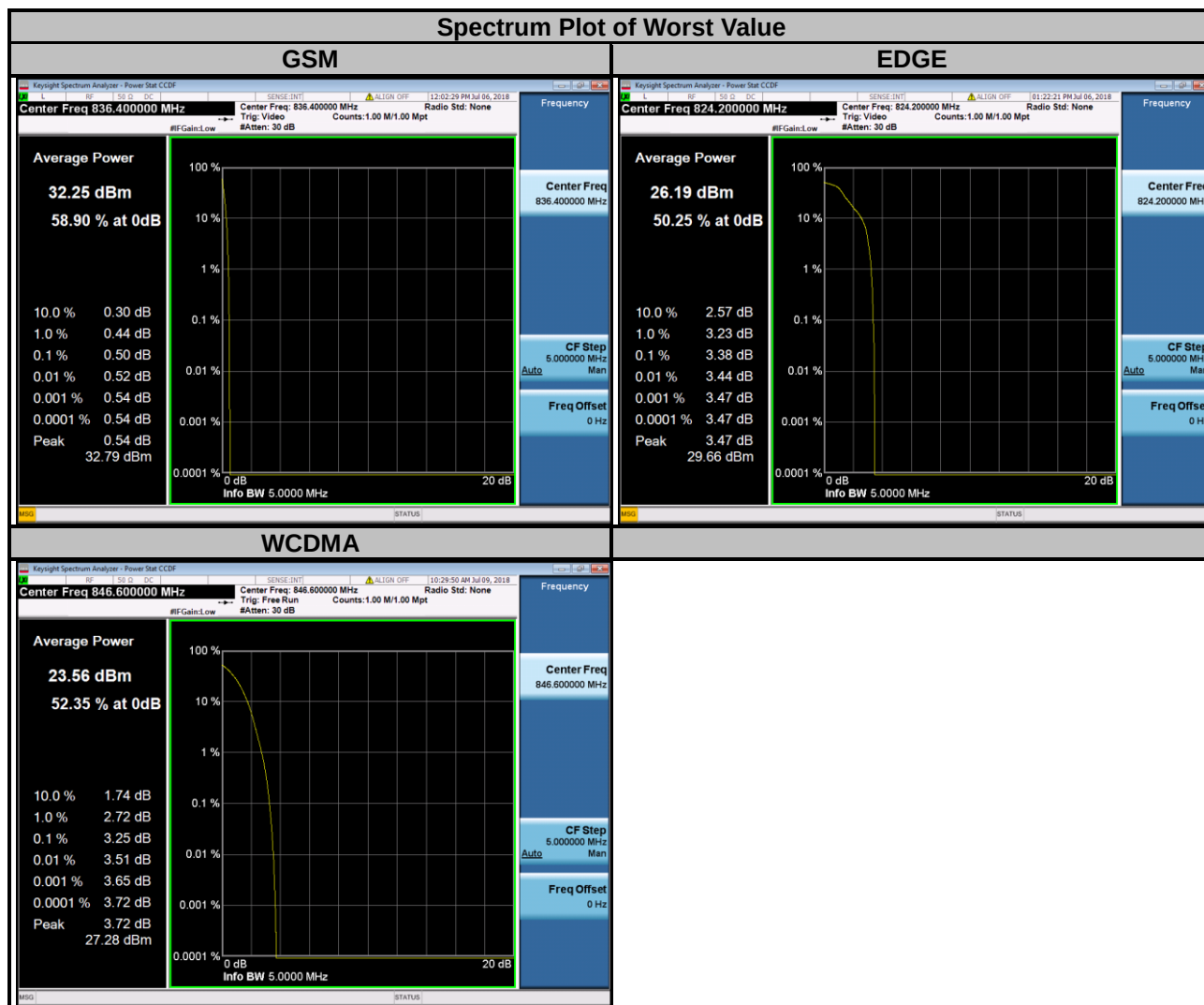


### 4.6.3 Test Procedures

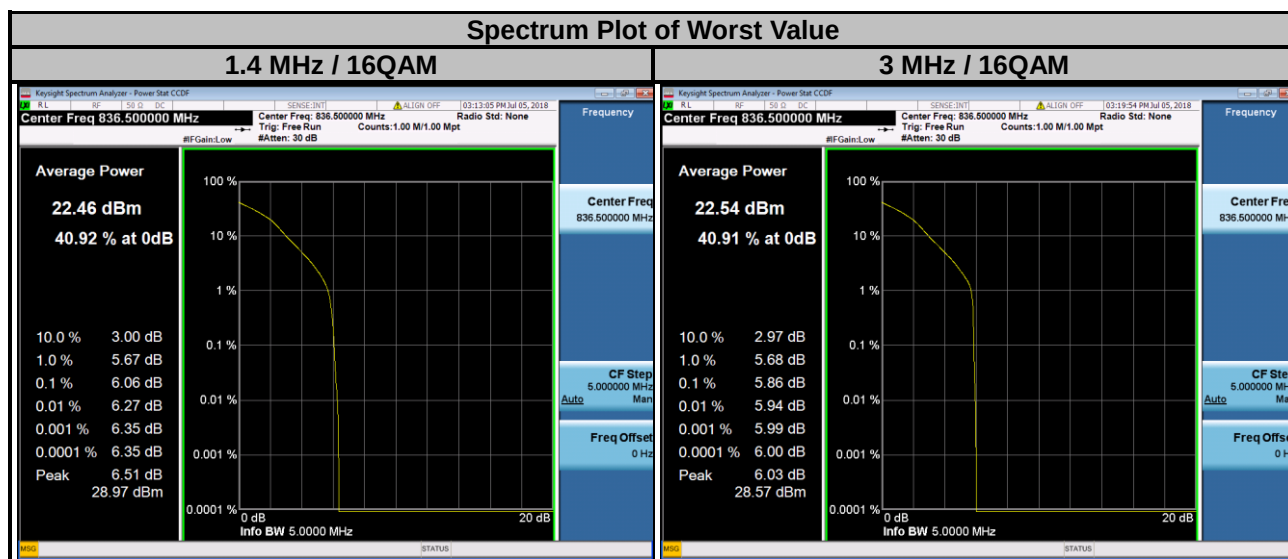
1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

#### 4.6.4 Test Results

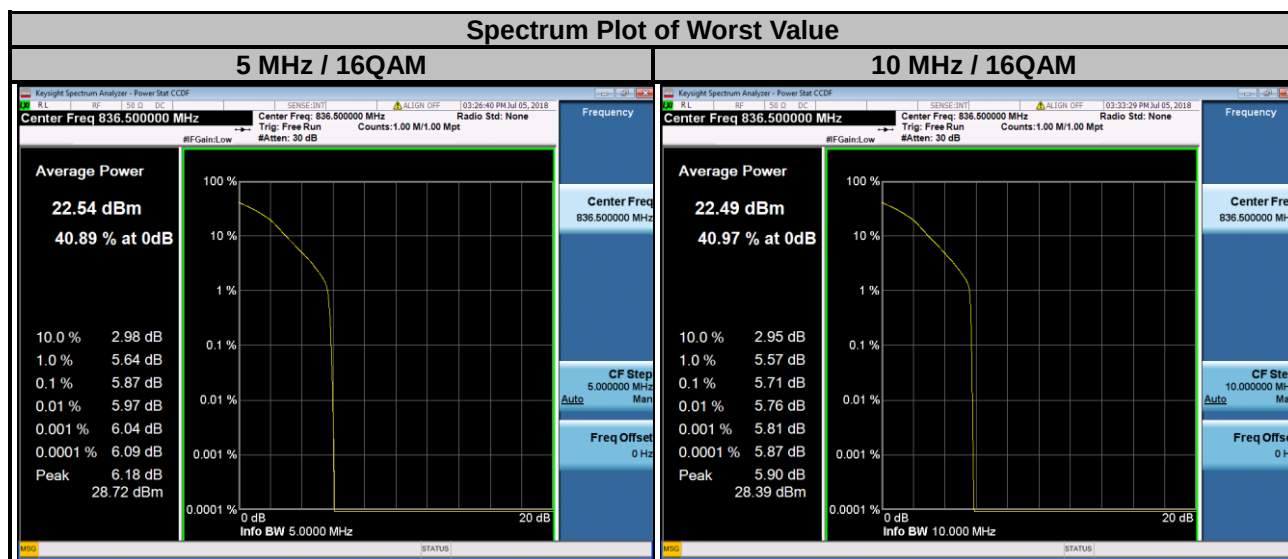
| Channel | Frequency (MHz) | Peak to Average Ratio (dB) |      | Channel | Frequency (MHz) | Peak to Average Ratio (dB) |
|---------|-----------------|----------------------------|------|---------|-----------------|----------------------------|
|         |                 | GSM                        | EDGE |         |                 |                            |
| 128     | 824.2           | 0.48                       | 3.38 | 4132    | 826.4           | 3.16                       |
| 189     | 836.4           | 0.50                       | 3.35 | 4182    | 836.4           | 3.23                       |
| 251     | 848.8           | 0.47                       | 3.33 | 4233    | 846.6           | 3.25                       |



| LTE Band 5                 |                 |                            |       |                          |                 |                            |       |
|----------------------------|-----------------|----------------------------|-------|--------------------------|-----------------|----------------------------|-------|
| Channel Bandwidth: 1.4 MHz |                 |                            |       | Channel Bandwidth: 3 MHz |                 |                            |       |
| Channel                    | Frequency (MHz) | Peak to Average Ratio (dB) |       | Channel                  | Frequency (MHz) | Peak to Average Ratio (dB) |       |
|                            |                 | QPSK                       | 16QAM |                          |                 | QPSK                       | 16QAM |
| 20407                      | 824.7           | 4.01                       | 5.68  | 20415                    | 825.5           | 3.81                       | 5.53  |
| 20525                      | 836.5           | 4.20                       | 6.06  | 20525                    | 836.5           | 3.95                       | 5.86  |
| 20643                      | 848.3           | 4.30                       | 6.05  | 20635                    | 847.5           | 4.03                       | 5.74  |



| LTE Band 5               |                 |                            |       |                           |                 |                            |       |
|--------------------------|-----------------|----------------------------|-------|---------------------------|-----------------|----------------------------|-------|
| Channel Bandwidth: 5 MHz |                 |                            |       | Channel Bandwidth: 10 MHz |                 |                            |       |
| Channel                  | Frequency (MHz) | Peak to Average Ratio (dB) |       | Channel                   | Frequency (MHz) | Peak to Average Ratio (dB) |       |
|                          |                 | QPSK                       | 16QAM |                           |                 | QPSK                       | 16QAM |
| 20425                    | 826.5           | 3.81                       | 5.48  | 20450                     | 829.0           | 3.68                       | 5.44  |
| 20525                    | 836.5           | 3.97                       | 5.87  | 20525                     | 836.5           | 3.87                       | 5.71  |
| 20625                    | 846.5           | 3.84                       | 5.54  | 20600                     | 844.0           | 3.74                       | 5.53  |

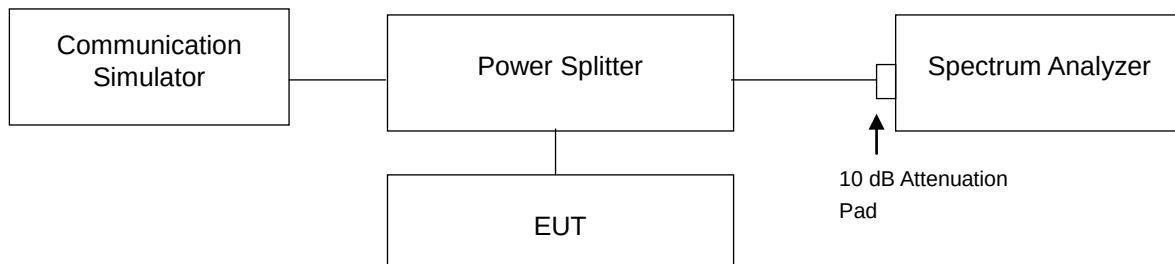


## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

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. The emission limit equal to -13 dBm.

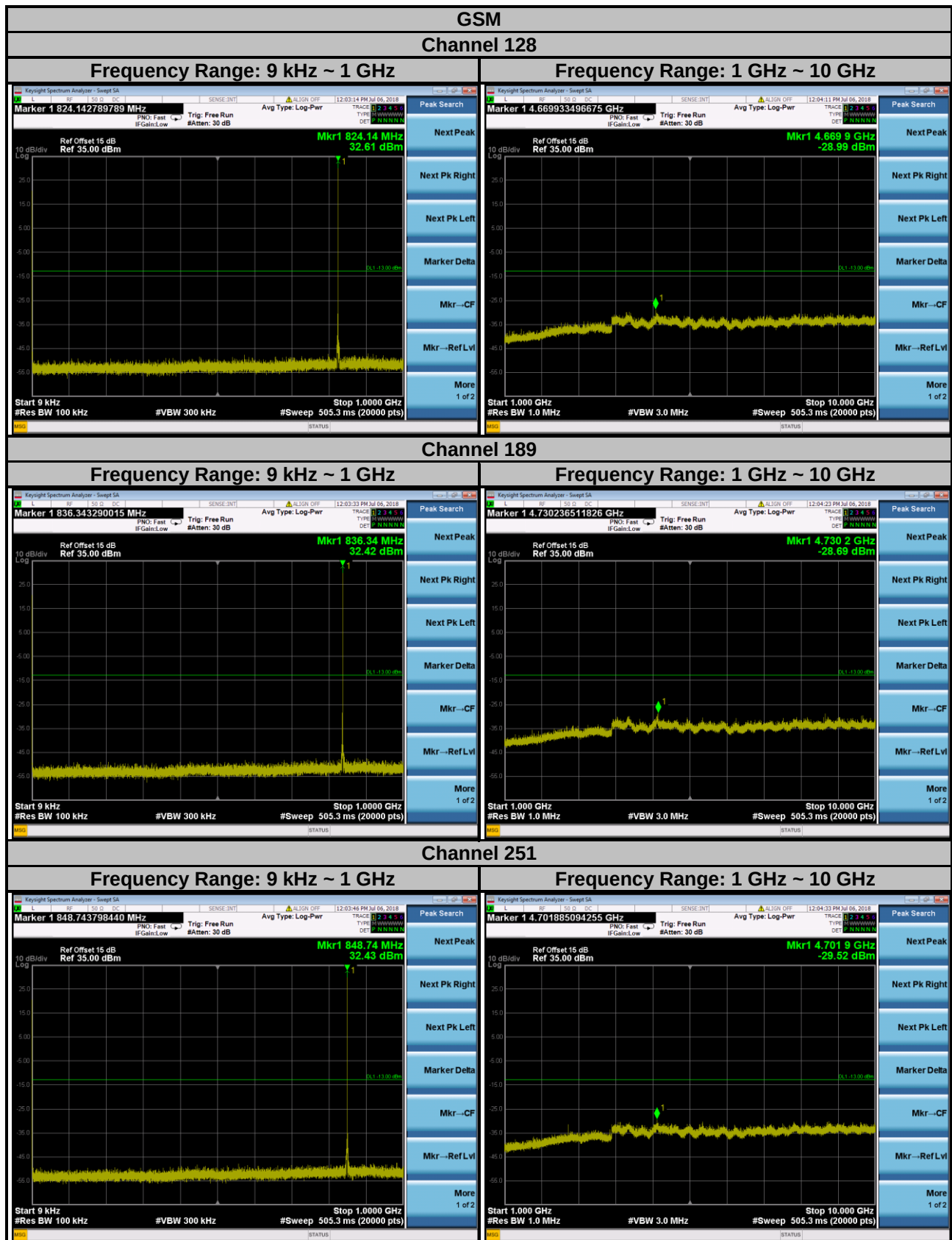
### 4.7.2 Test Setup



### 4.7.3 Test Procedure

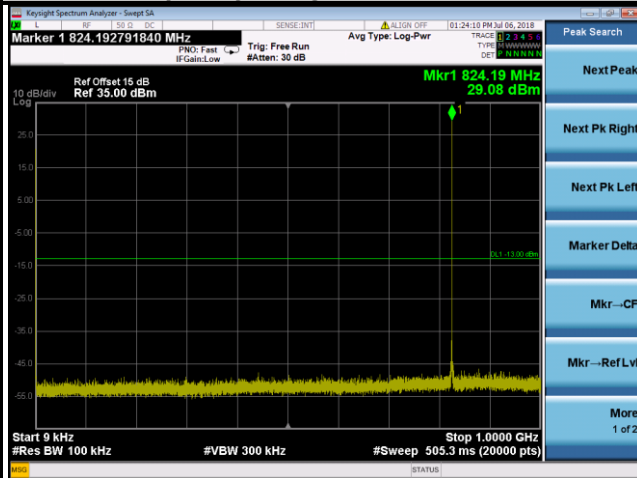
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range from 9 kHz to 1 GHz, 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for conducted emission measurement.
- Measuring frequency range from 1 GHz to 10 GHz, 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

#### 4.7.4 Test Results

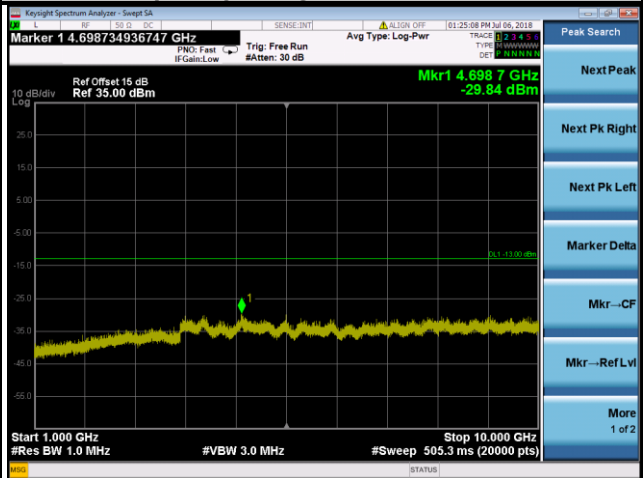


## EDGE Channel 128

Frequency Range: 9 kHz ~ 1 GHz

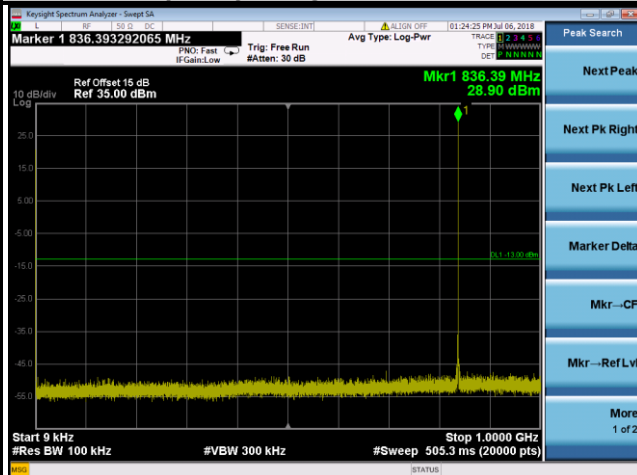


Frequency Range: 1 GHz ~ 10 GHz

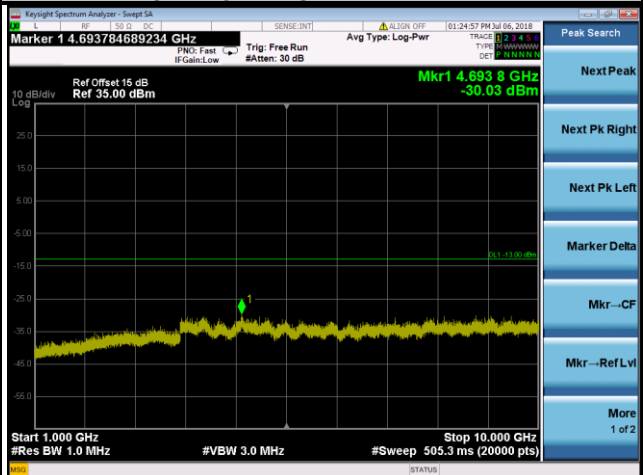


## Channel 189

Frequency Range: 9 kHz ~ 1 GHz

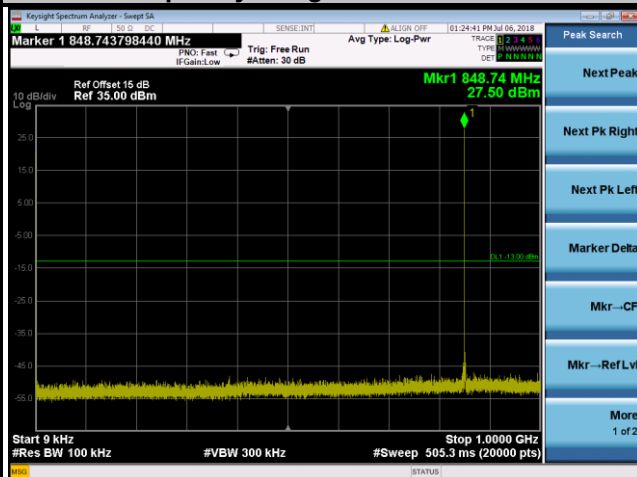


Frequency Range: 1 GHz ~ 10 GHz

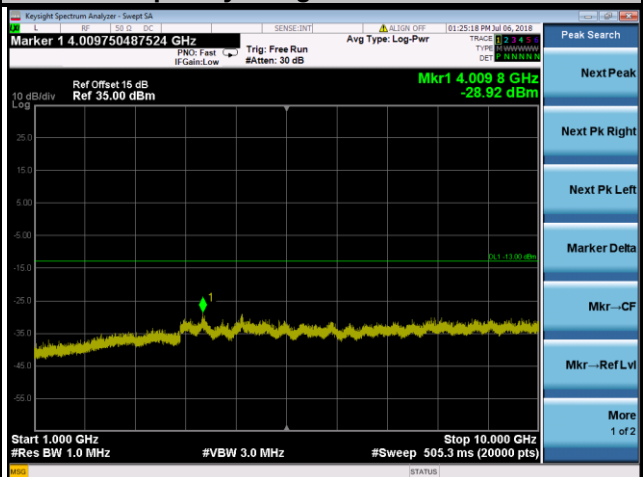


## Channel 251

Frequency Range: 9 kHz ~ 1 GHz

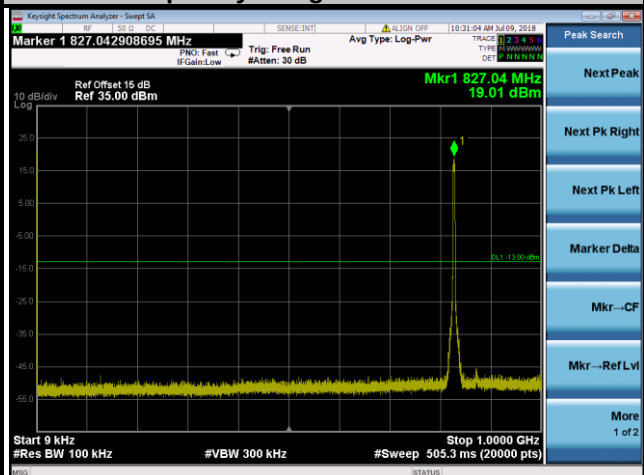


Frequency Range: 1 GHz ~ 10 GHz

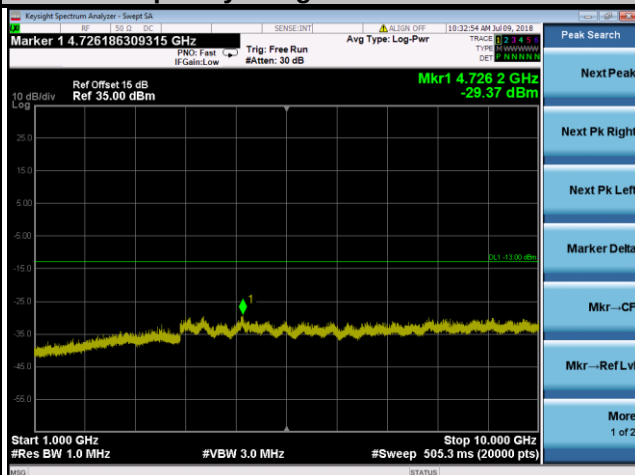


## WCDMA Channel 4132

Frequency Range: 9 kHz ~ 1 GHz

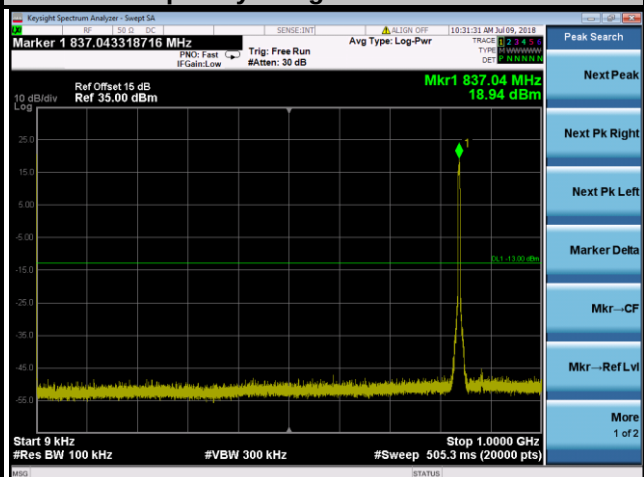


Frequency Range: 1 GHz ~ 10 GHz

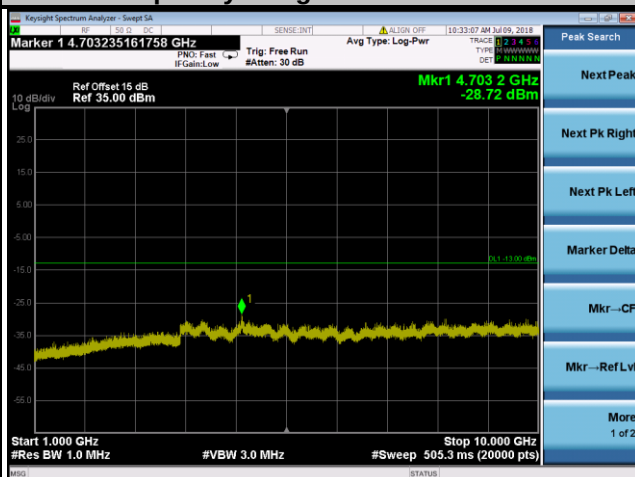


## Channel 4182

Frequency Range: 9 kHz ~ 1 GHz

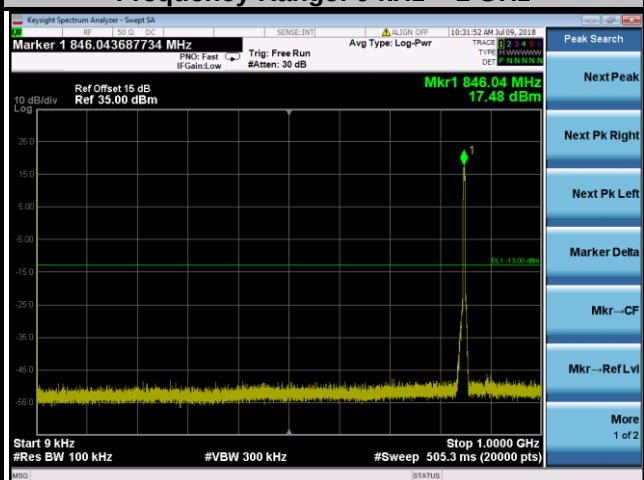


Frequency Range: 1 GHz ~ 10 GHz

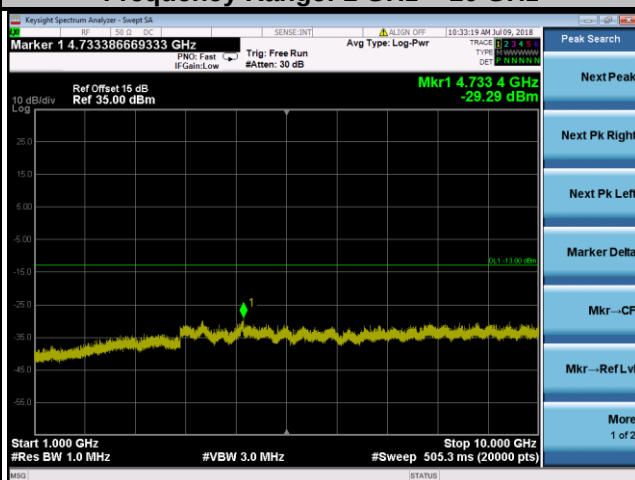


## Channel 4233

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

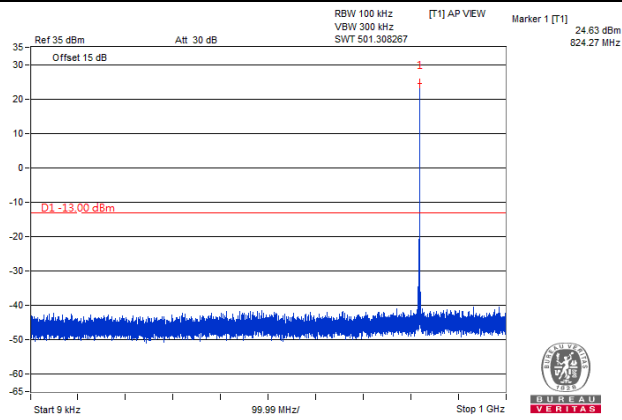


## LTE Band 5

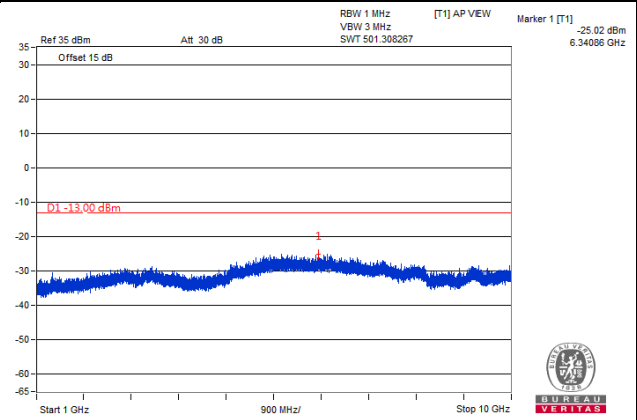
Channel Bandwidth: 1.4 MHz

Channel 20407

Frequency Range: 9 kHz ~ 1 GHz

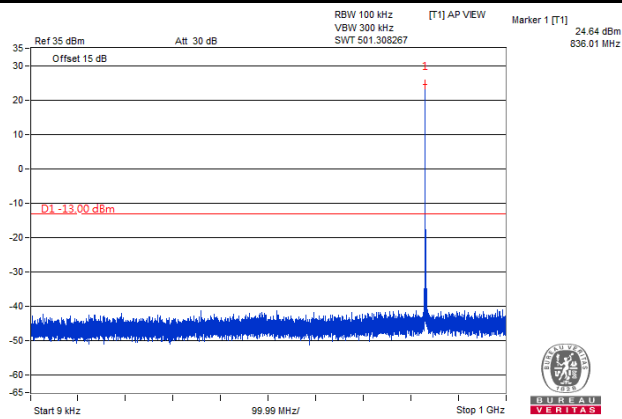


Frequency Range: 1 GHz ~ 10 GHz

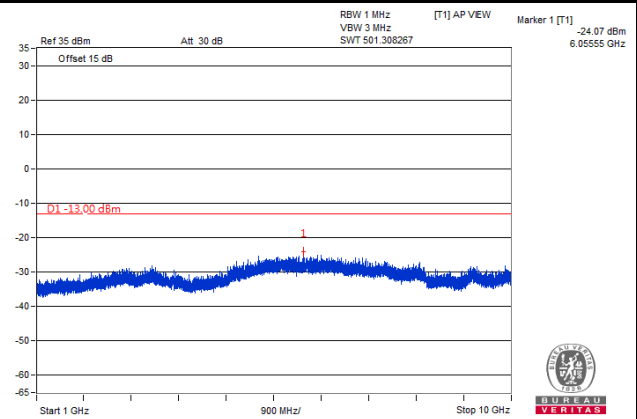


## Channel 20525

Frequency Range: 9 kHz ~ 1 GHz

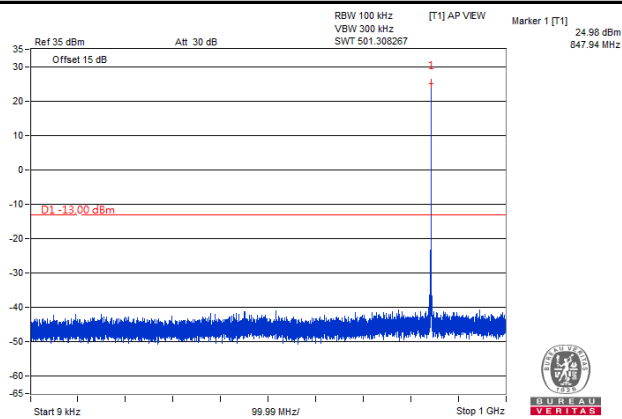


Frequency Range: 1 GHz ~ 10 GHz

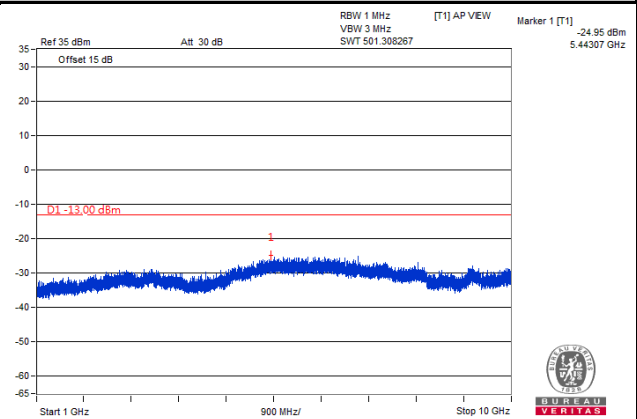


## Channel 20643

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

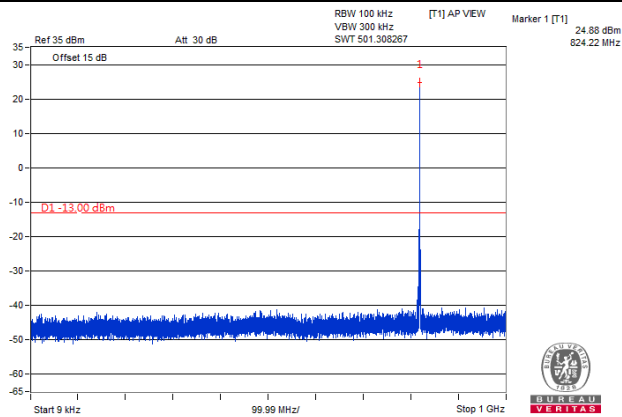


## LTE Band 5

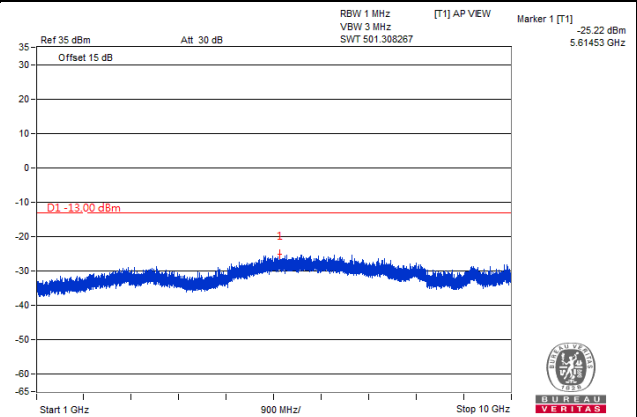
Channel Bandwidth: 3 MHz

Channel 20415

Frequency Range: 9 kHz ~ 1 GHz

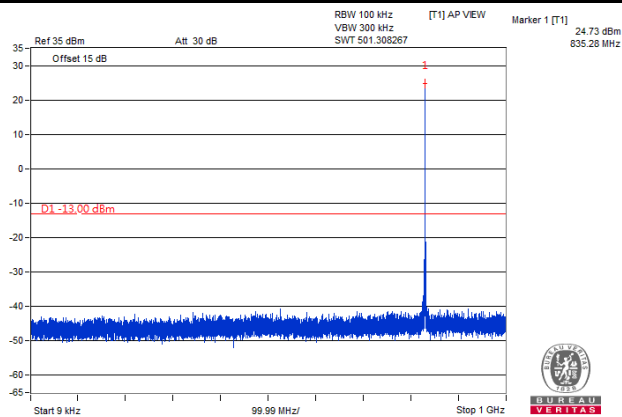


Frequency Range: 1 GHz ~ 10 GHz

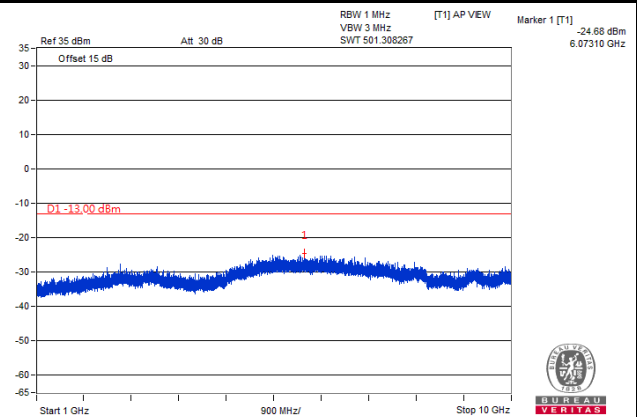


Channel 20525

Frequency Range: 9 kHz ~ 1 GHz

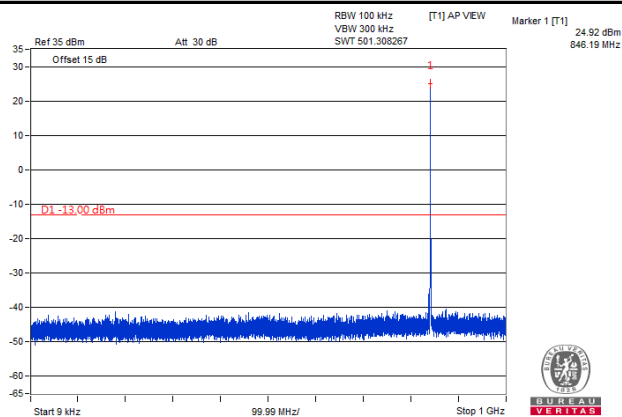


Frequency Range: 1 GHz ~ 10 GHz

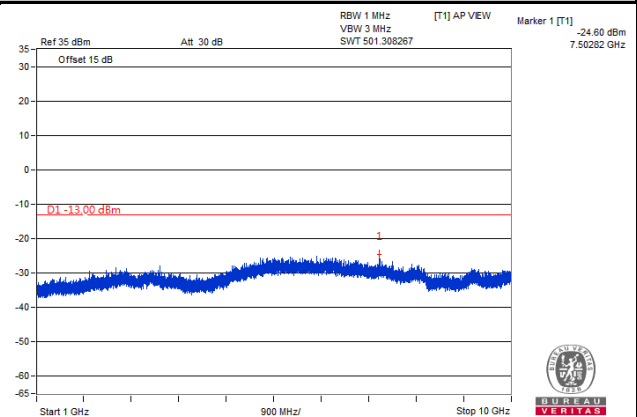


Channel 20635

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz

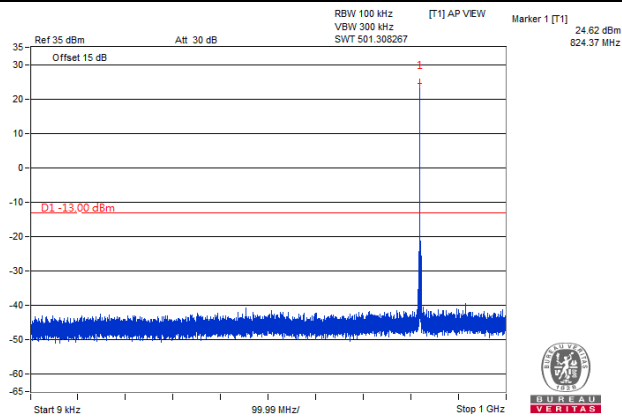


## LTE Band 5

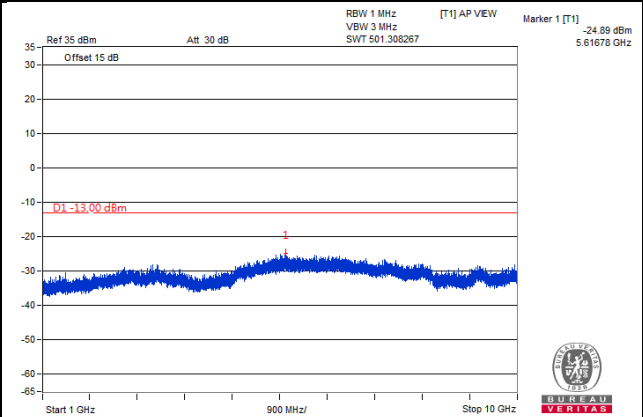
Channel Bandwidth: 5 MHz

Channel 20425

Frequency Range: 9 kHz ~ 1 GHz

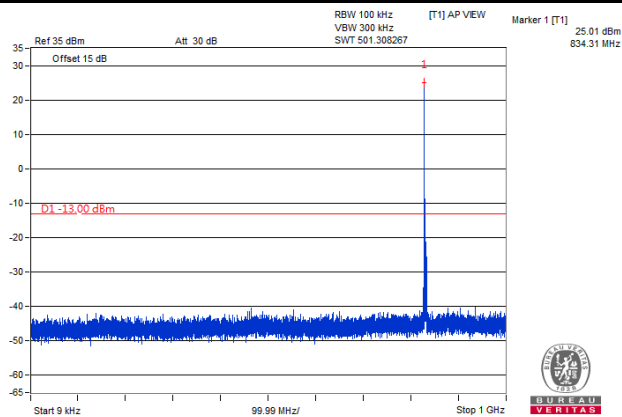


Frequency Range: 1 GHz ~ 10 GHz

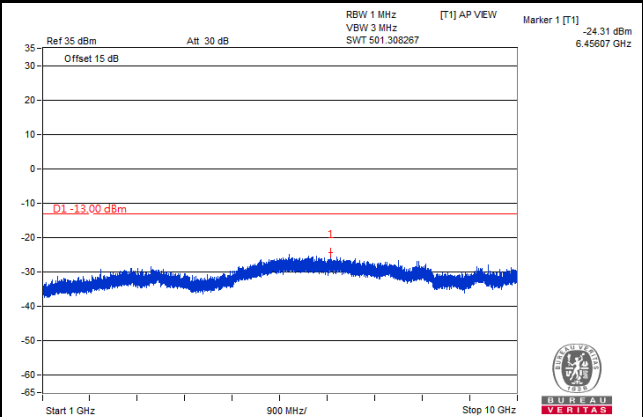


Channel 20525

Frequency Range: 9 kHz ~ 1 GHz

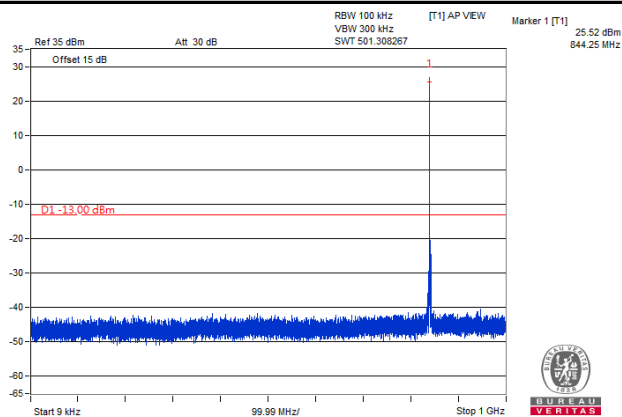


Frequency Range: 1 GHz ~ 10 GHz

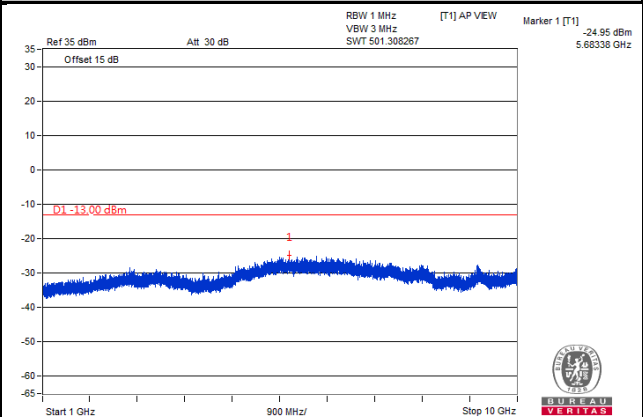


Channel 20625

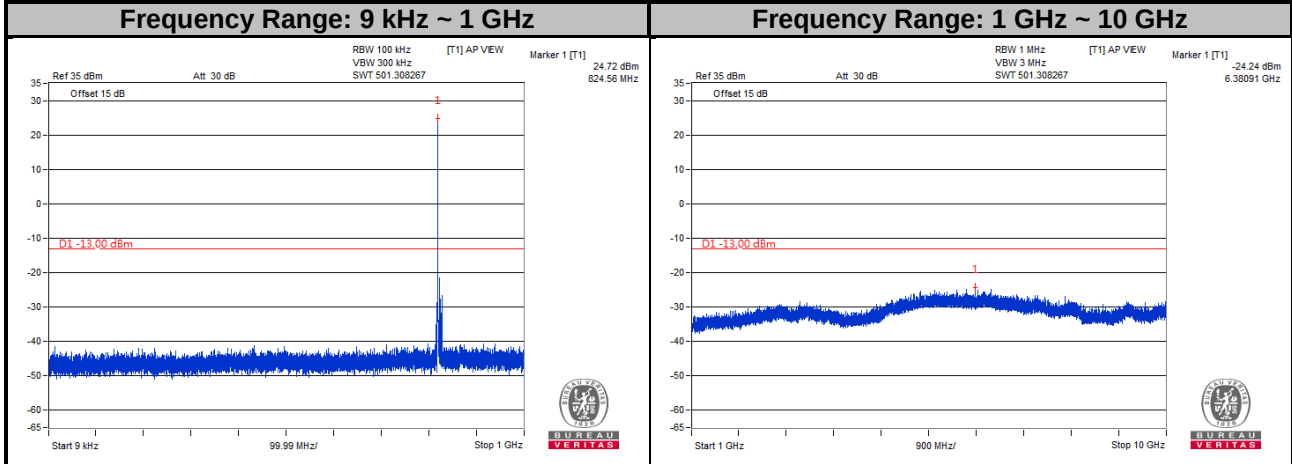
Frequency Range: 9 kHz ~ 1 GHz



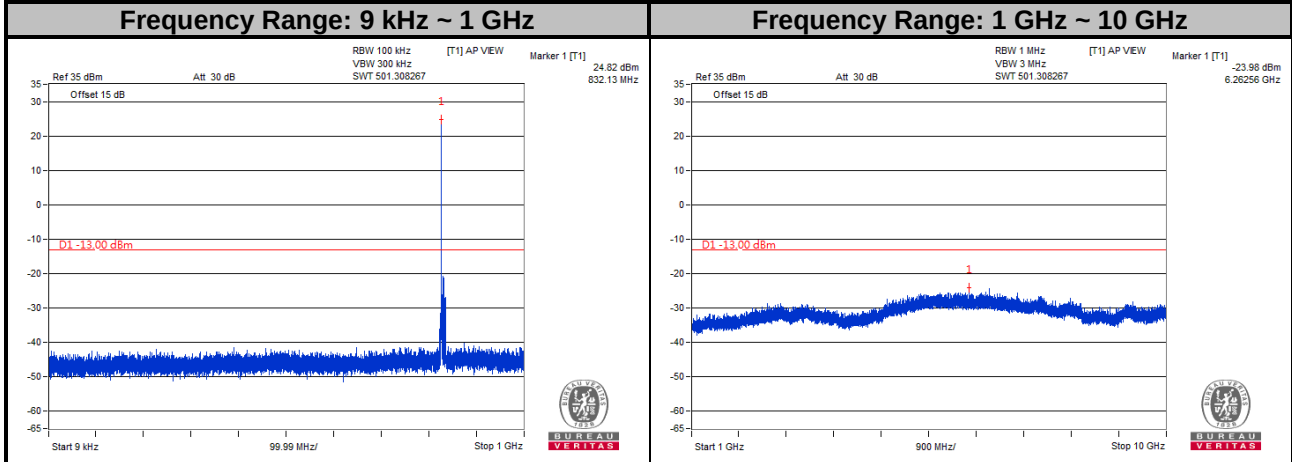
Frequency Range: 1 GHz ~ 10 GHz



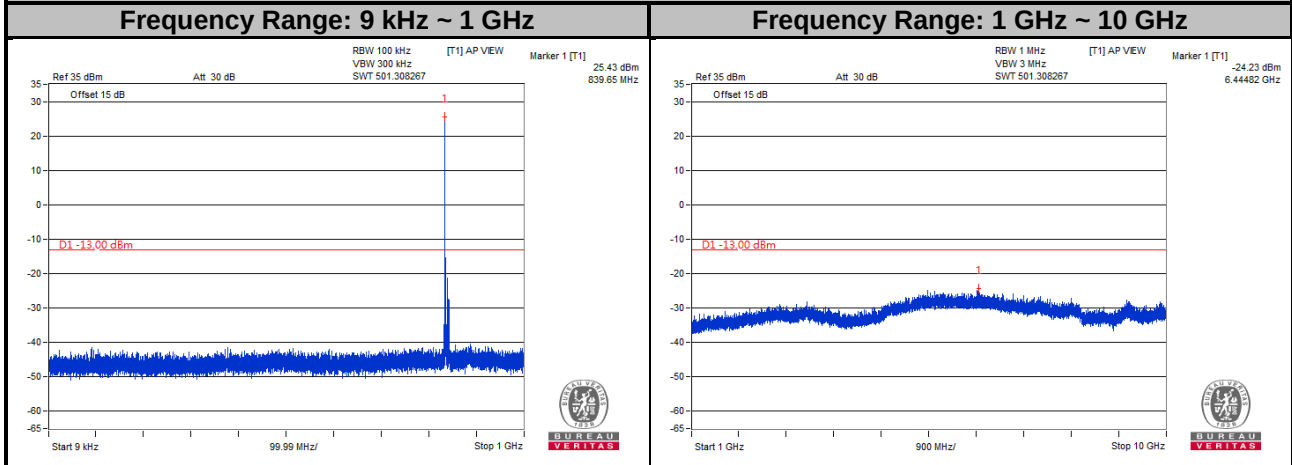
**LTE Band 5**  
**Channel Bandwidth: 10 MHz**  
**Channel 20450**



**Channel 20525**



**Channel 20600**



## 4.8 Radiated Emission Measurement

### 4.8.1 Limits of Radiated Emission Measurement

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. The emission limit is equal to -13 dBm.

### 4.8.2 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,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}.$

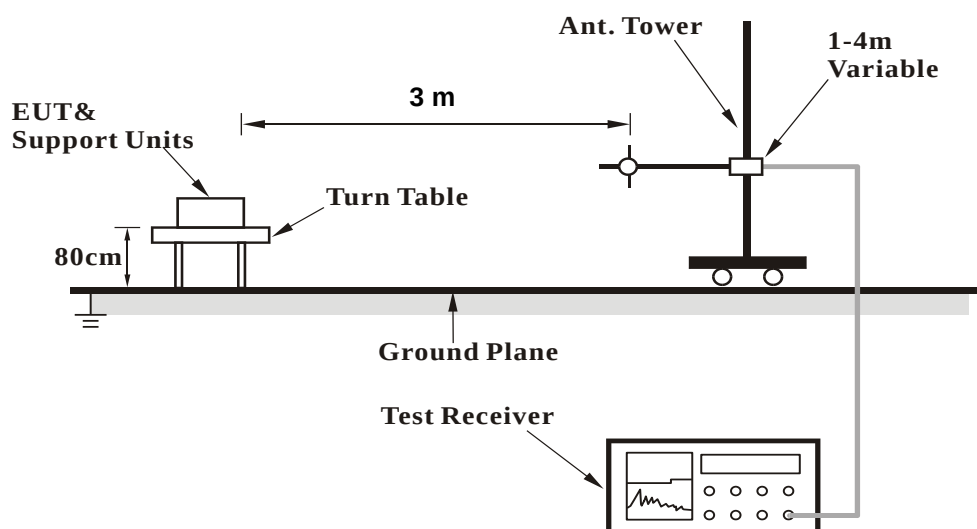
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

### 4.8.3 Deviation from Test Standard

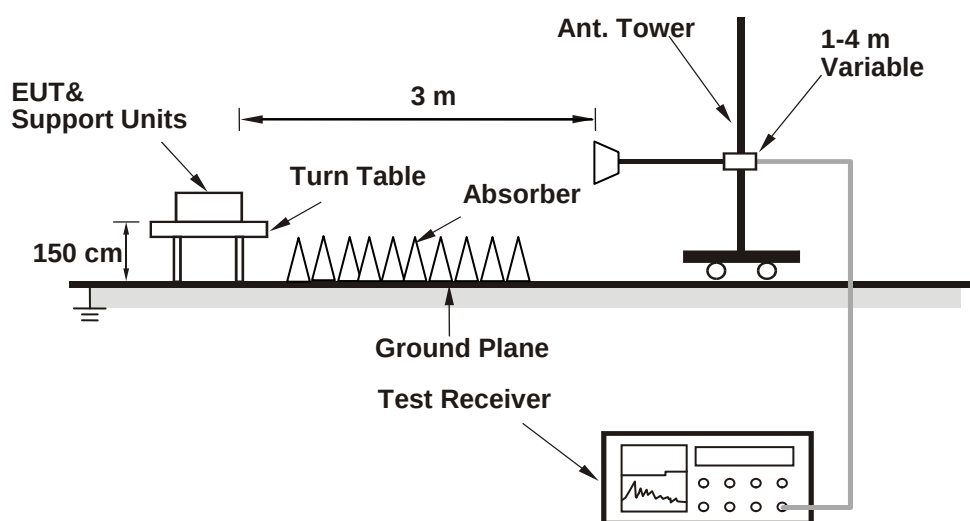
No deviation.

#### 4.8.4 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).

#### 4.8.5 Test Results

Mode A

GSM:

Low Channel

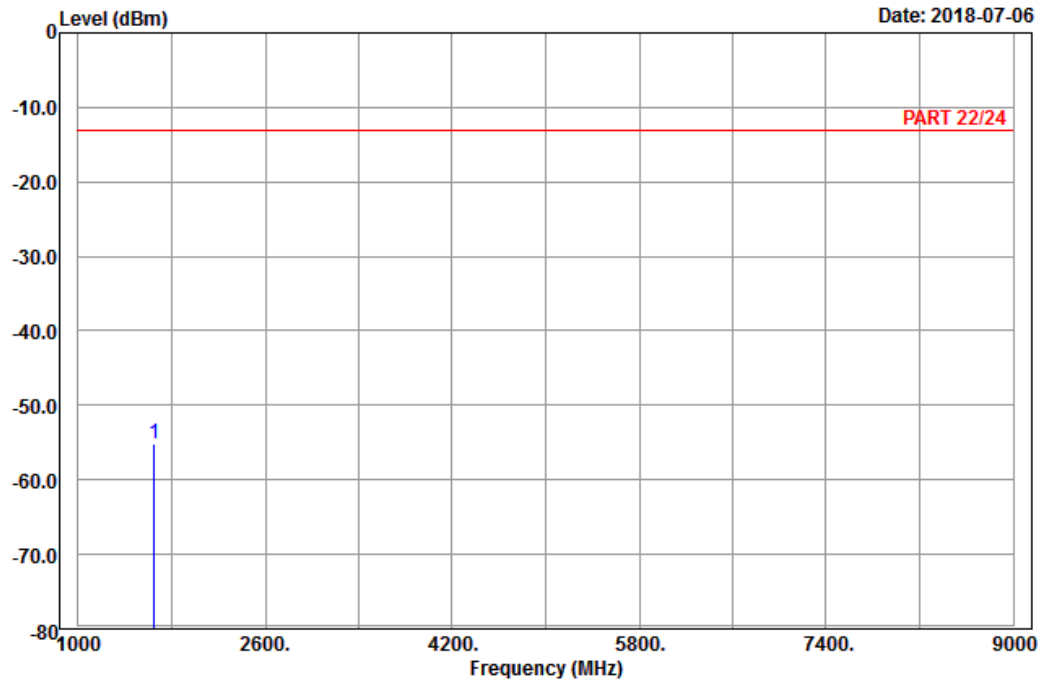


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : GSM 850\_Link\_CH128  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1648.40 | -55.07 | -62.80 | -13.00 | -42.07 | 7.73   | Peak   |

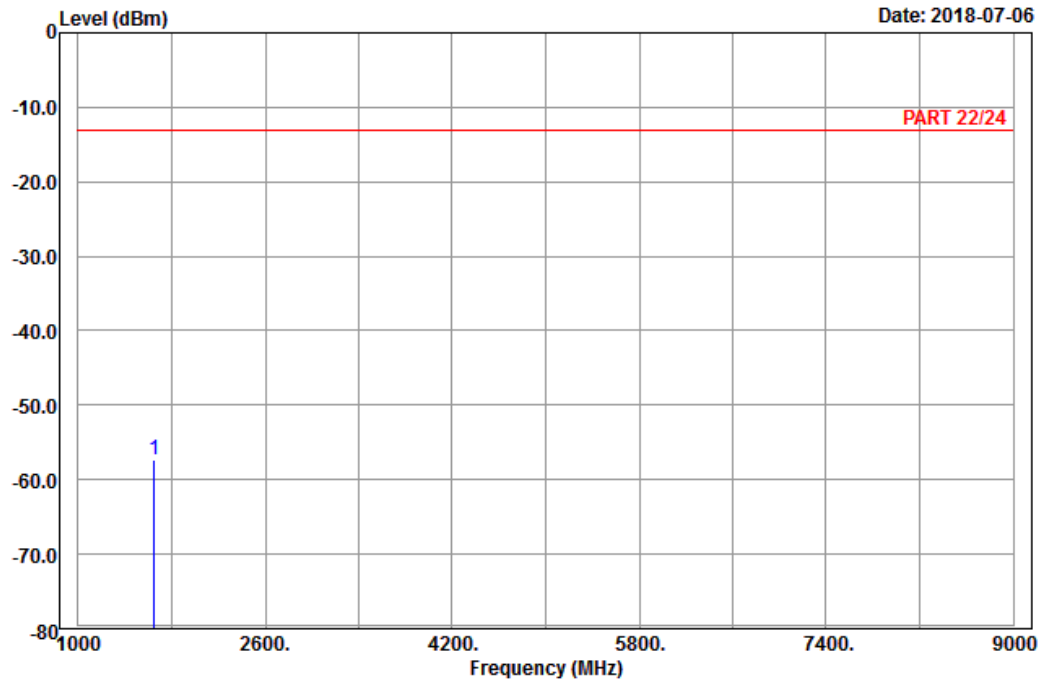


# Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : GSM 850\_Link\_CH128  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1648.40 | -57.37 | -65.10 | -13.00 | -44.37 | 7.73   | Peak   |  |

# Middle Channel

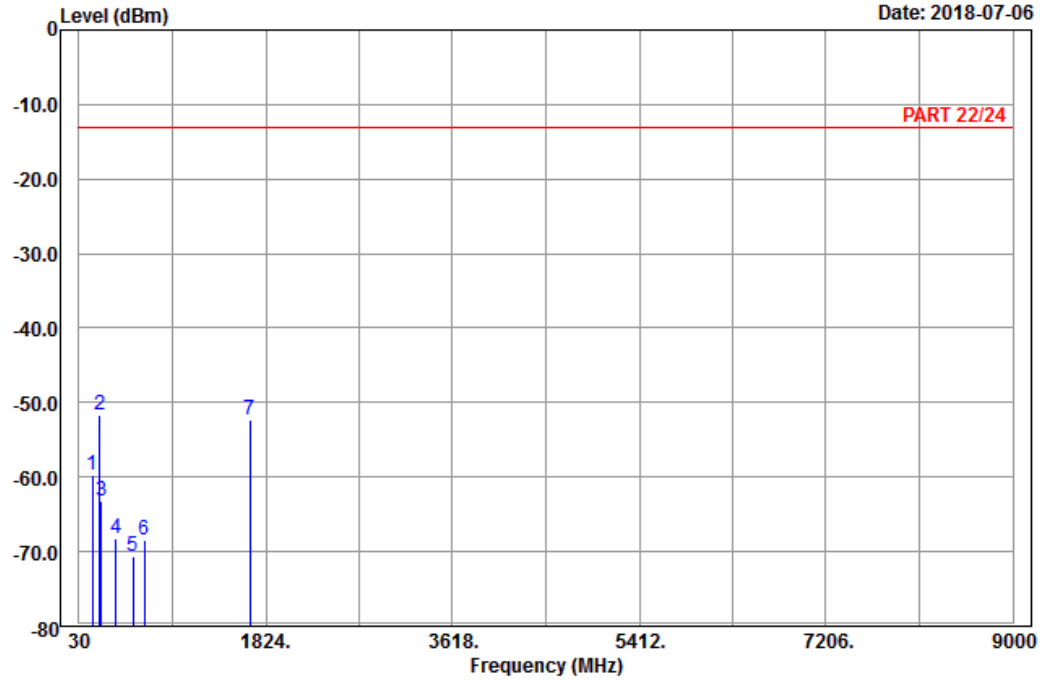


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A D T

Data: 9

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : GSM 850\_Link\_CH189  
Tested by: Charles Hsiao

|   |         | Read   | Limit  | Over   |        |        |        |
|---|---------|--------|--------|--------|--------|--------|--------|
|   | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|   | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 | 158.79  | -59.63 | -51.93 | -13.00 | -46.63 | -7.70  | Peak   |
| 2 | 226.29  | -51.76 | -45.93 | -13.00 | -38.76 | -5.83  | Peak   |
| 3 | 247.35  | -63.21 | -57.66 | -13.00 | -50.21 | -5.55  | Peak   |
| 4 | 385.40  | -68.27 | -64.75 | -13.00 | -55.27 | -3.52  | Peak   |
| 5 | 548.50  | -70.64 | -68.91 | -13.00 | -57.64 | -1.73  | Peak   |
| 6 | 658.40  | -68.44 | -68.26 | -13.00 | -55.44 | -0.18  | Peak   |
| 7 | 1672.80 | -52.33 | -60.24 | -13.00 | -39.33 | 7.91   | Peak   |

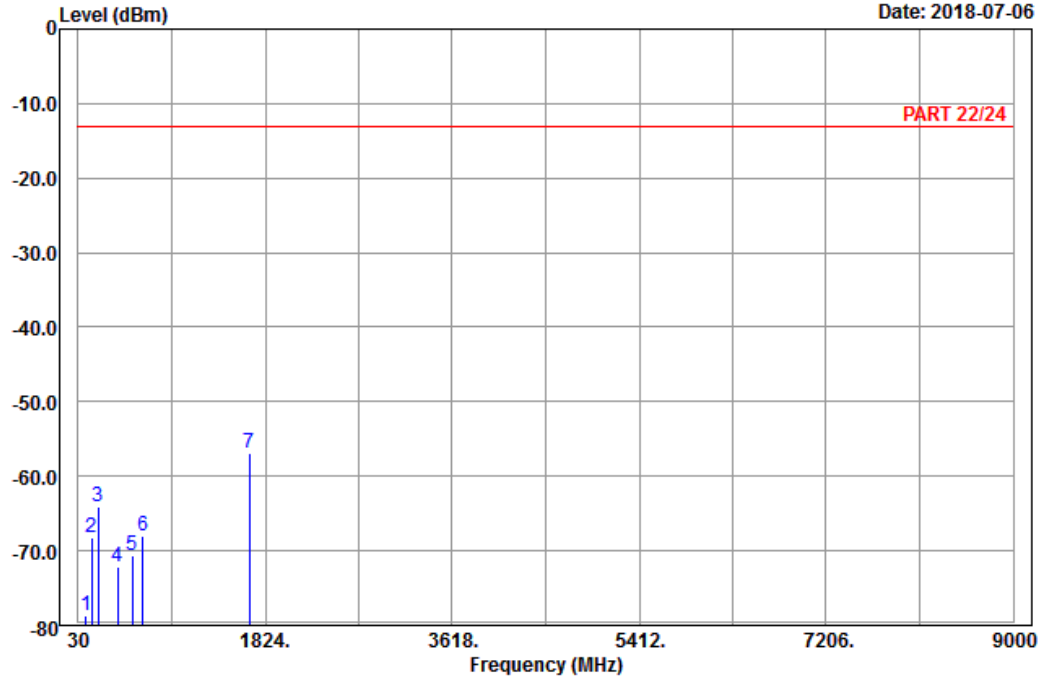


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2018-07-06



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : GSM 850\_Link\_CH189  
 Tested by: Charles Hsiao

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 106.68  | -78.77 | -69.47     | -13.00     | -65.77     | -9.30  | Peak   |
| 2    | 158.79  | -68.14 | -60.44     | -13.00     | -55.14     | -7.70  | Peak   |
| 3    | 224.13  | -64.08 | -58.22     | -13.00     | -51.08     | -5.86  | Peak   |
| 4    | 409.90  | -72.12 | -69.15     | -13.00     | -59.12     | -2.97  | Peak   |
| 5    | 548.50  | -70.68 | -68.95     | -13.00     | -57.68     | -1.73  | Peak   |
| 6    | 652.10  | -68.10 | -67.96     | -13.00     | -55.10     | -0.14  | Peak   |
| 7 pp | 1672.80 | -56.98 | -64.89     | -13.00     | -43.98     | 7.91   | Peak   |

# High Channel

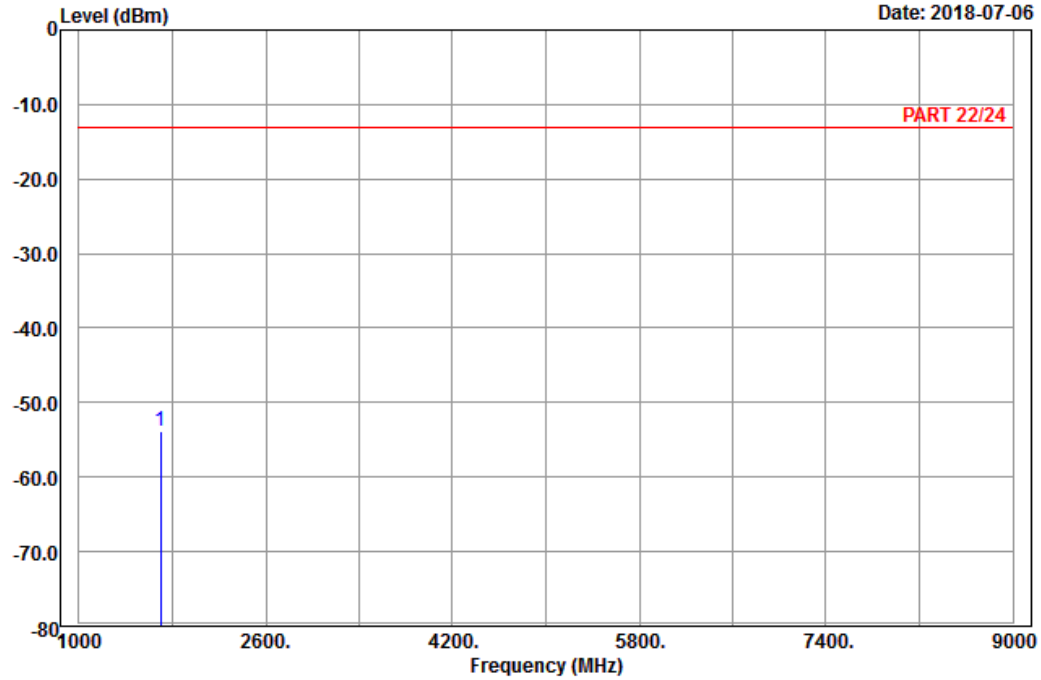


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : GSM 850\_Link\_CH251  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1697.60 | -53.76 | -61.90 | -13.00 | -40.76 | 8.14   | Peak   |

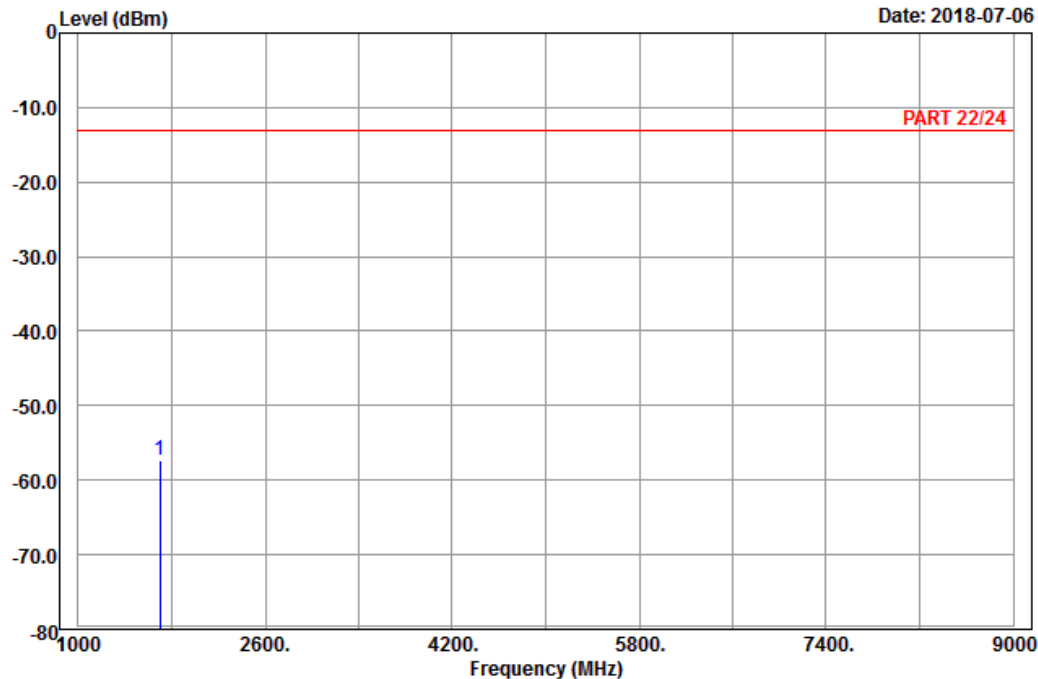


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : GSM 850\_Link\_CH251  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1697.60 | -57.37 | -65.51 | -13.00 | -44.37 | 8.14   | Peak   |  |

EDGE:  
Low Channel

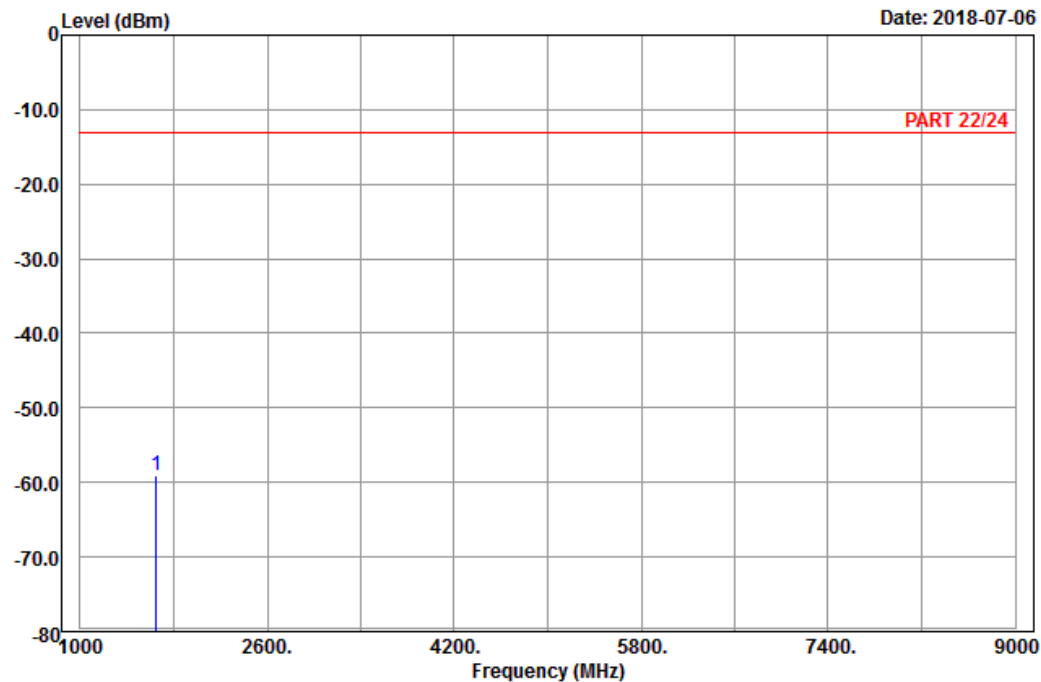


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : EDGE 850\_Link\_CH128  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1648.40 | -58.98 | -66.71 | -13.00 | -45.98 | 7.73   | Peak   |  |

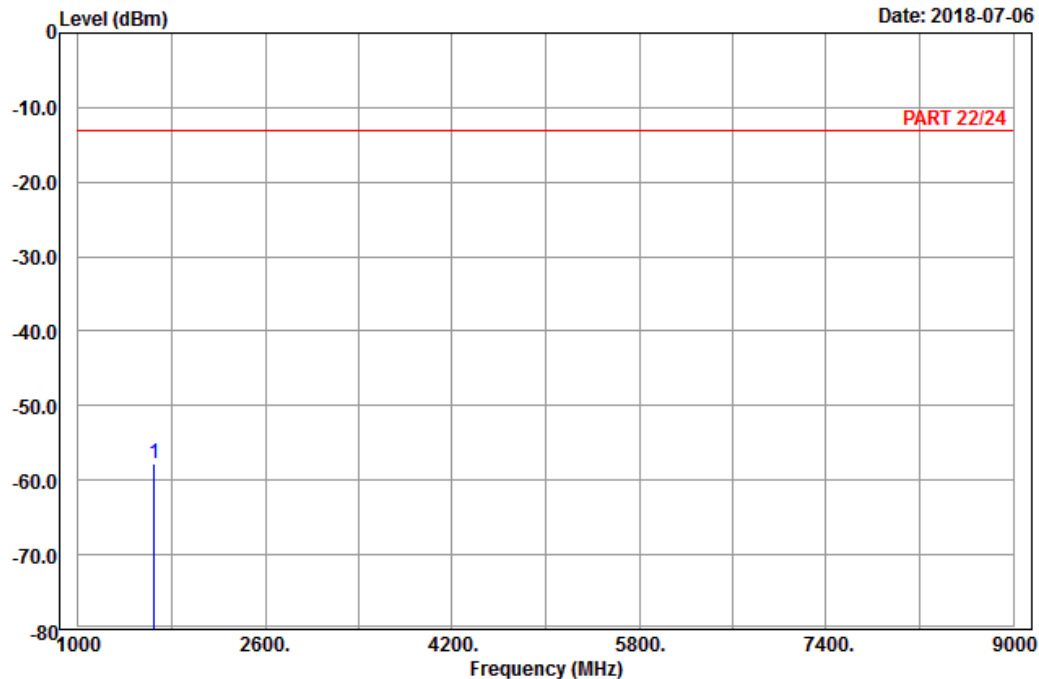


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : EDGE 850\_Link\_CH128  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1648.40 | -57.87 | -65.60 | -13.00 | -44.87 | 7.73   | Peak   |  |

# Middle Channel

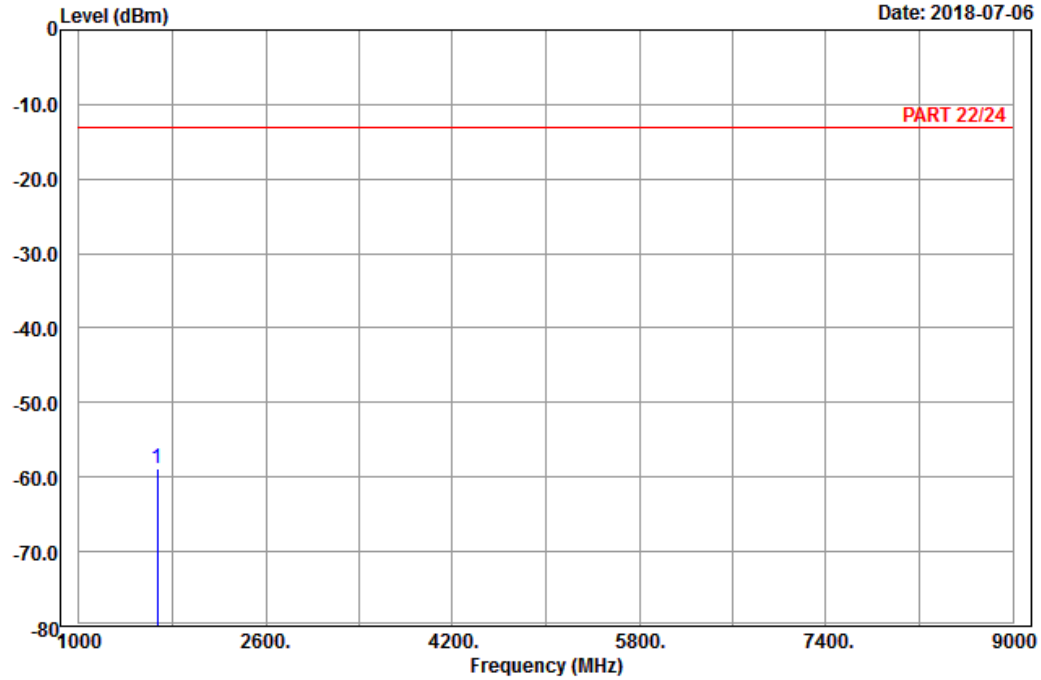


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : EDGE 850\_Link\_CH189  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1672.80 | -58.82 | -66.73 | -13.00 | -45.82 | 7.91   | Peak   |

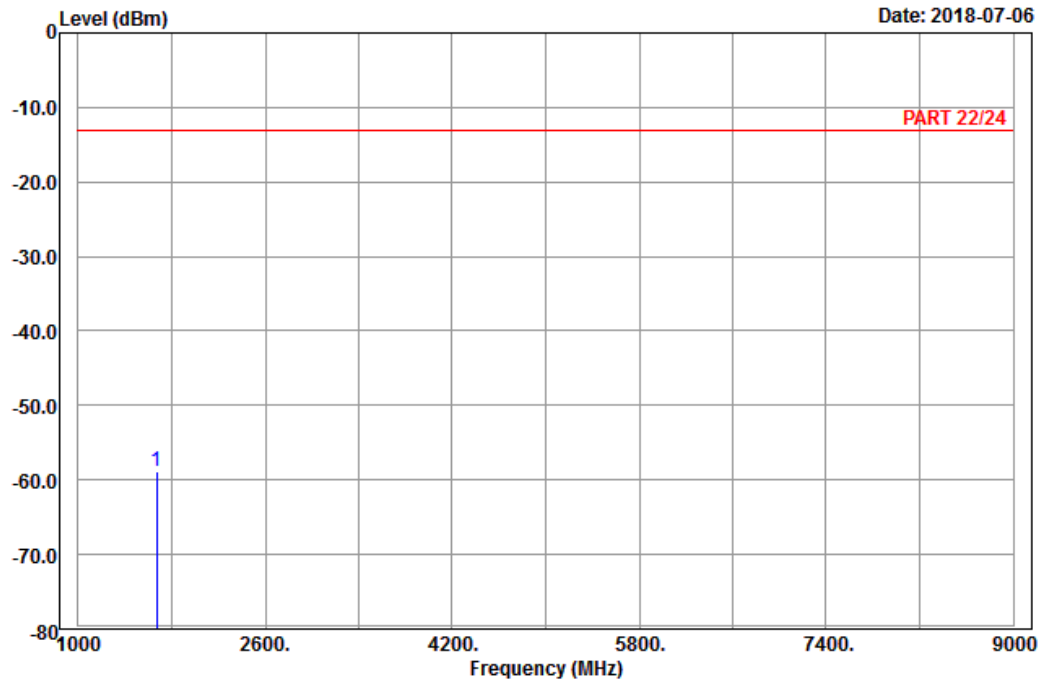


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : EDGE 850\_Link\_CH189  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1672.80 | -58.83 | -66.74 | -13.00 | -45.83 | 7.91   | Peak   |  |

# High Channel

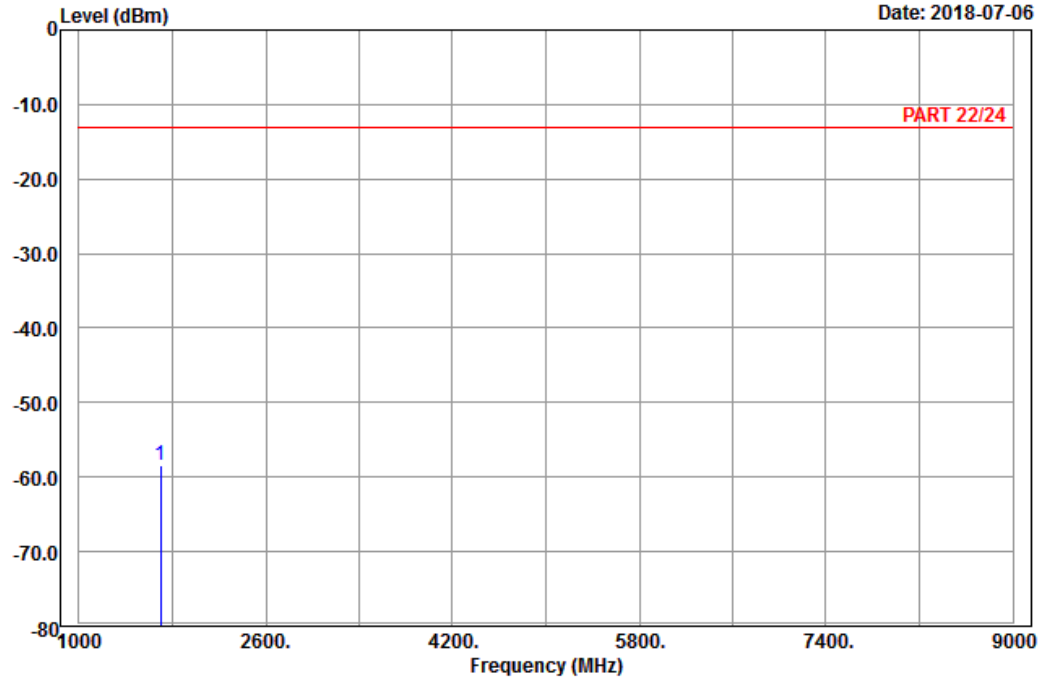


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : EDGE 850\_Link\_CH251  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1697.60 | -58.32 | -66.46 | -13.00 | -45.32 | 8.14   | Peak   |

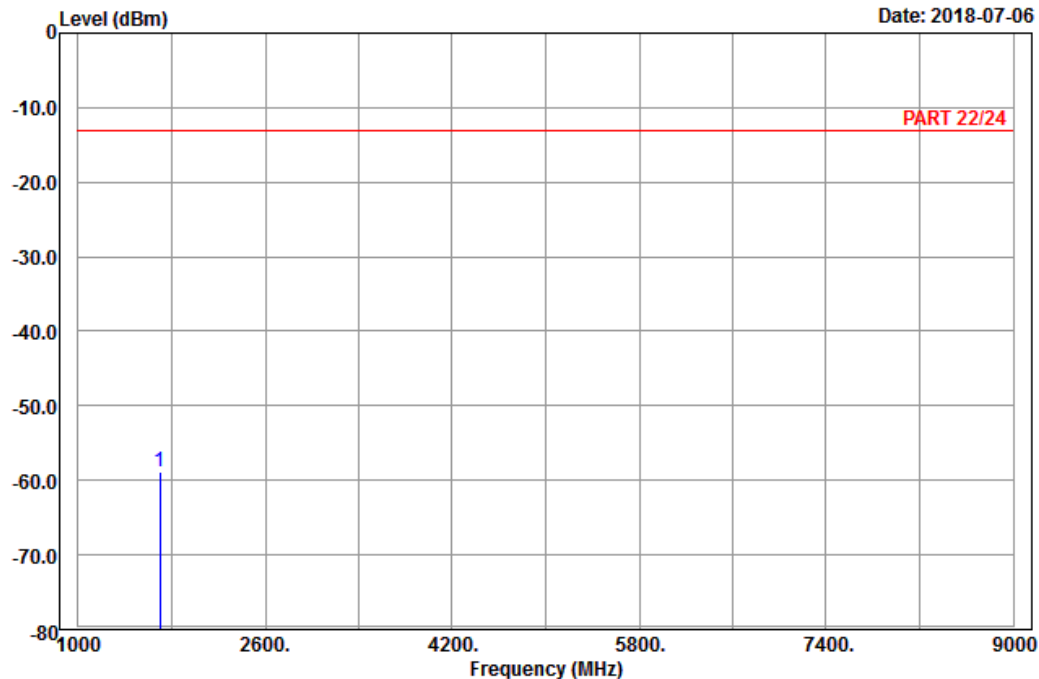


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : EDGE 850\_Link\_CH251  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1697.60 | -58.77 | -66.91 | -13.00 | -45.77 | 8.14   | Peak   |  |

WCDMA:  
Low Channel

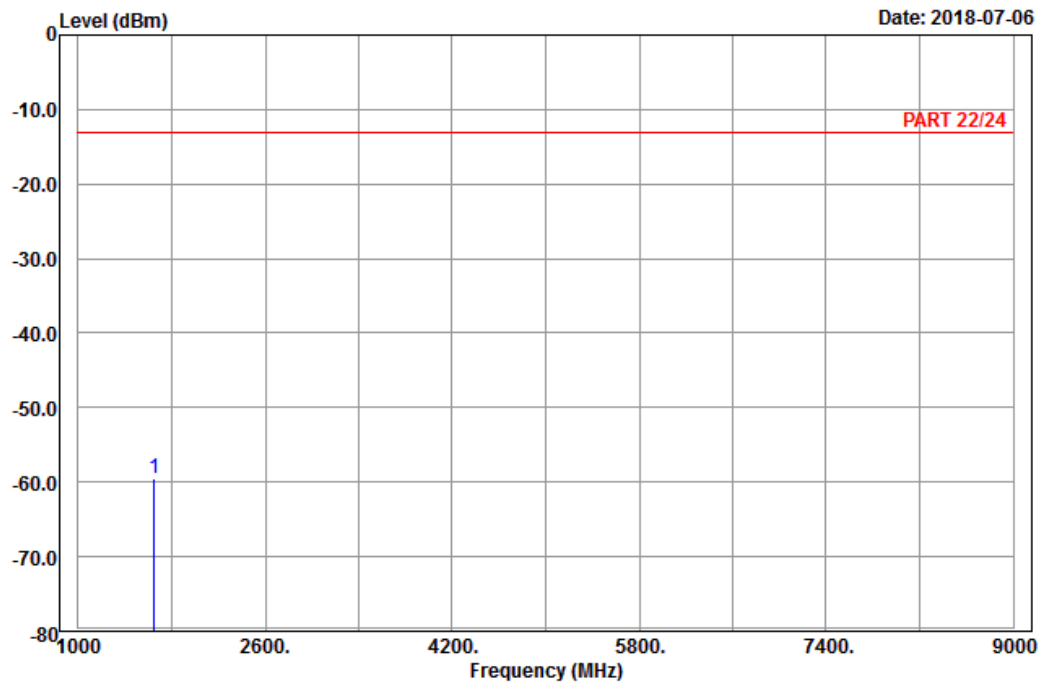


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : Band V\_Link\_CH4132  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1652.80 | -59.47 | -67.20 | -13.00 | -46.47 | 7.73   | Peak   |

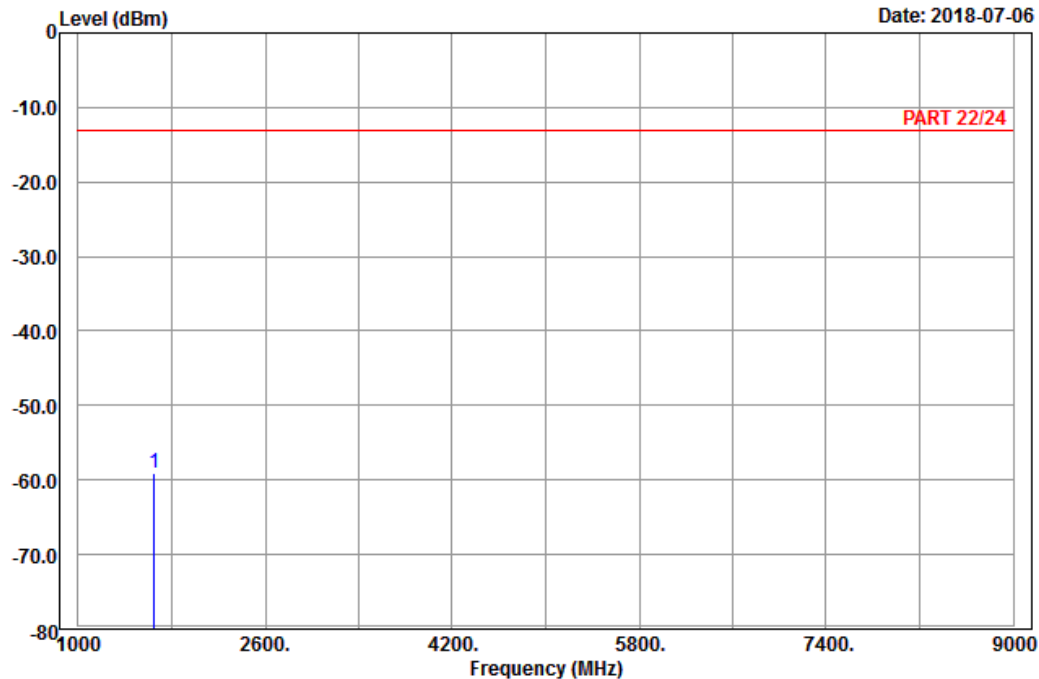


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : Band V\_Link\_CH4132  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1652.80 | -58.98 | -66.71 | -13.00 | -45.98 | 7.73   | Peak   |  |

# Middle Channel

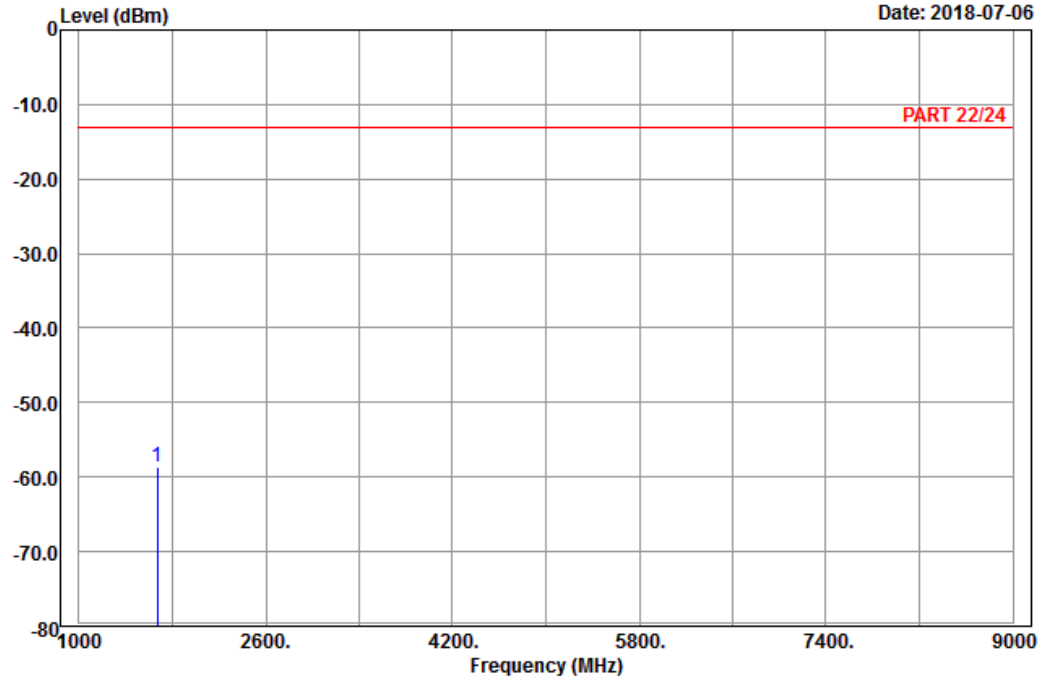


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : Band V\_Link\_CH4182  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1672.80 | -58.74 | -66.65 | -13.00 | -45.74 | 7.91   | Peak   |  |

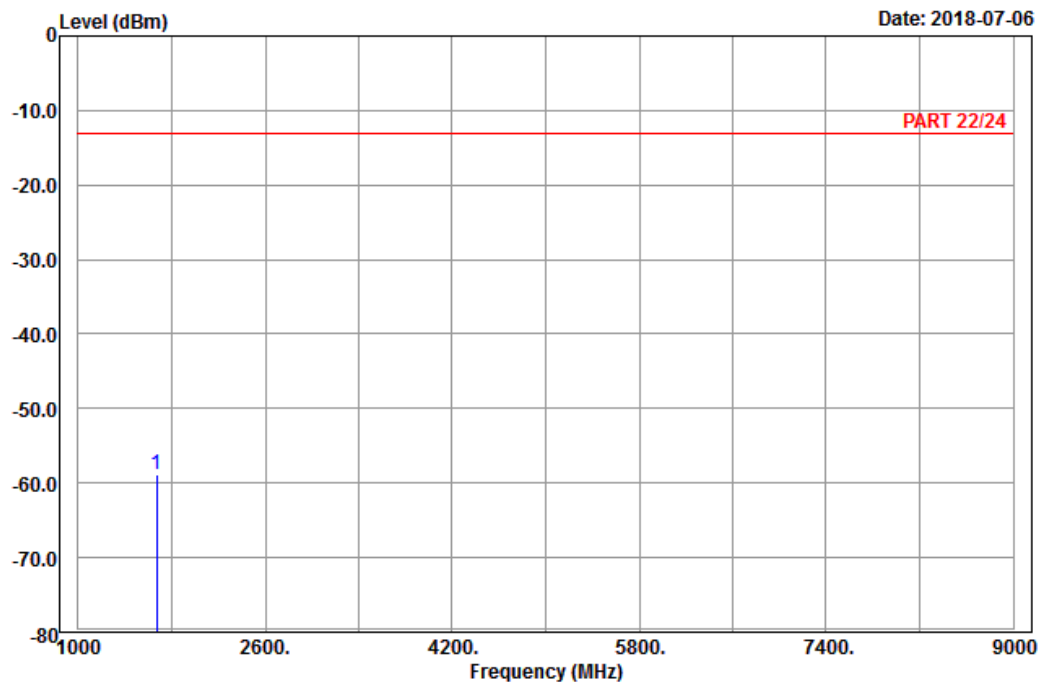


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : Band V\_Link\_CH4182  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1672.80 | -58.77 | -66.68 | -13.00 | -45.77 | 7.91   | Peak   |  |

# High Channel

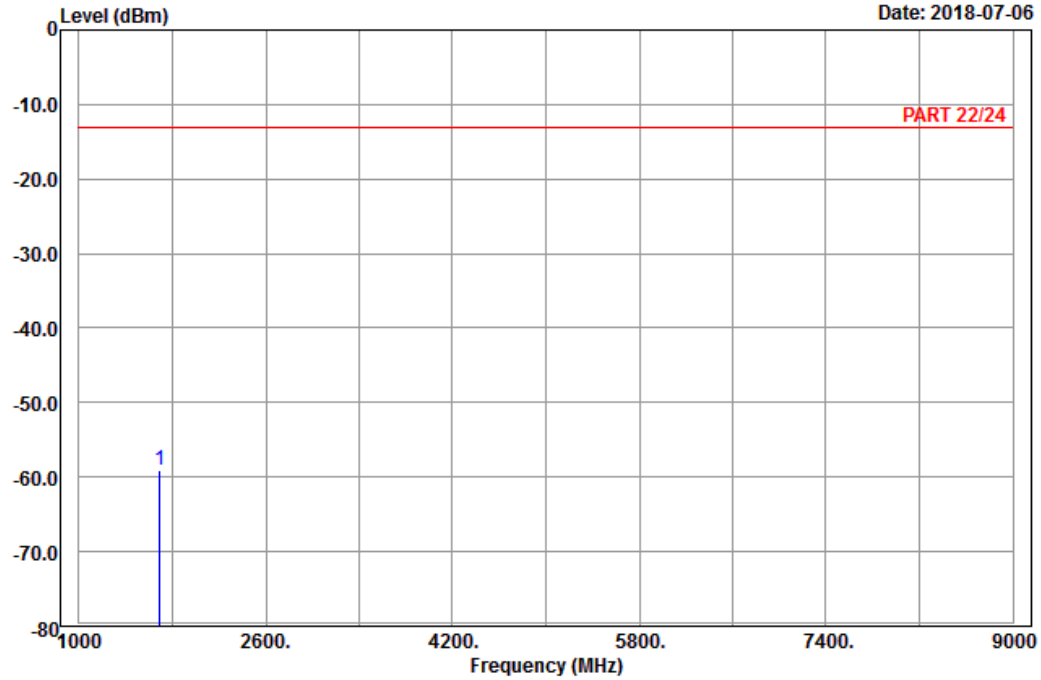


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : Band V\_Link\_CH4233  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1693.20 | -58.98 | -67.12 | -13.00 | -45.98 | 8.14   | Peak   |

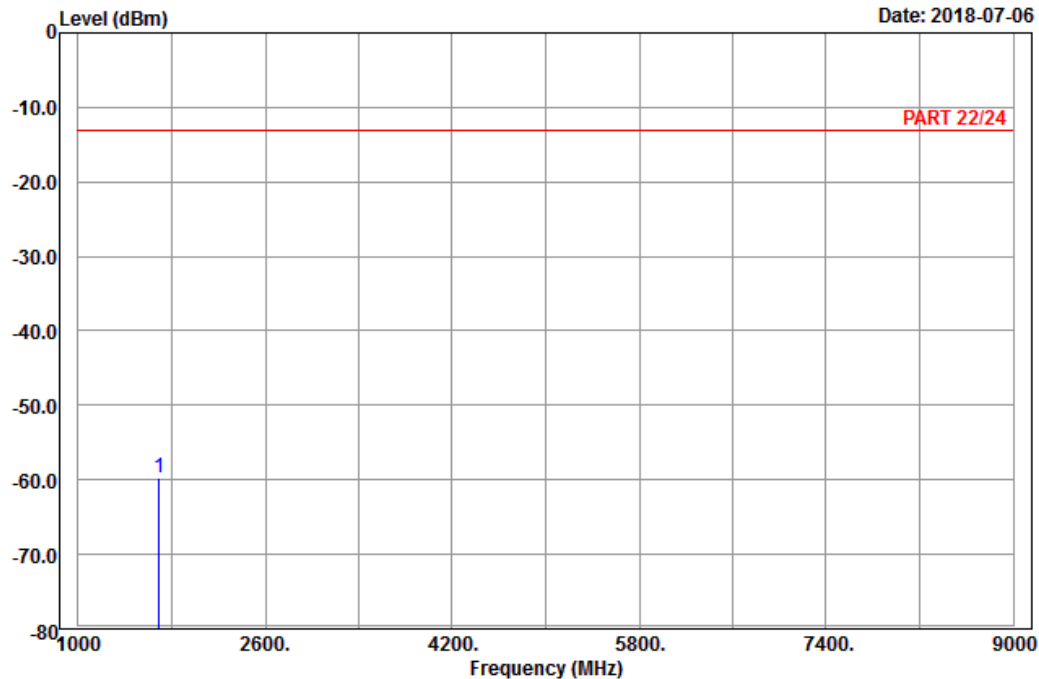


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : Band V\_Link\_CH4233  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1693.20 | -59.78 | -67.92 | -13.00 | -46.78 | 8.14   | Peak   |

LTE Band 5  
Channel Bandwidth: 1.4 MHz / QPSK  
Low Channel

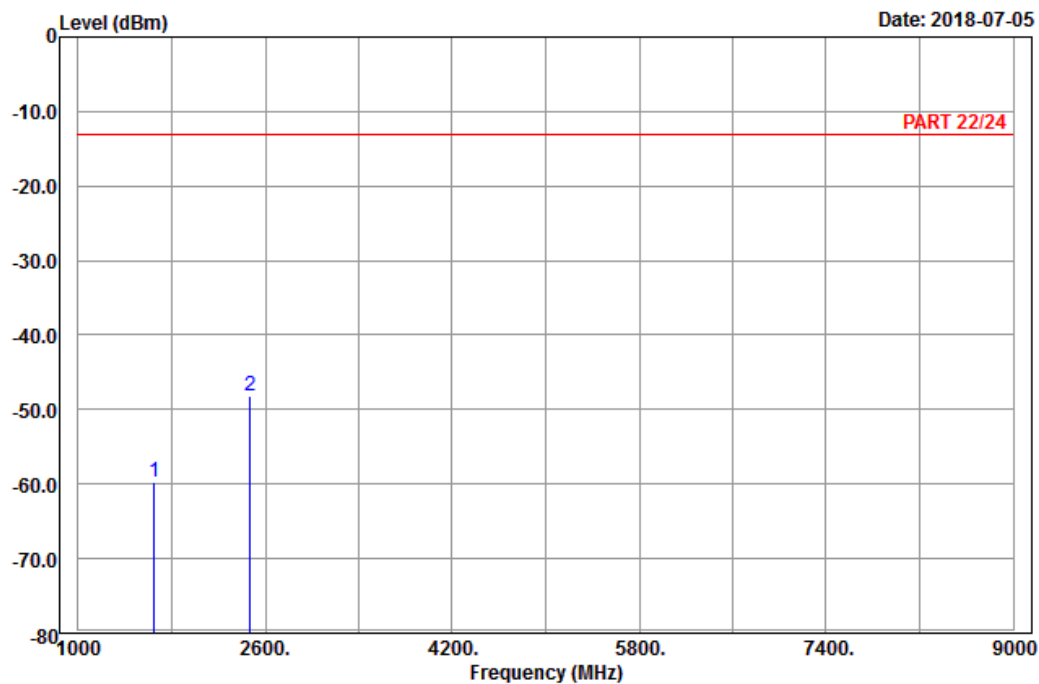


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20407  
Tested by: Karl Lee

|      |         | Read   | Limit  | Over   |        |               |
|------|---------|--------|--------|--------|--------|---------------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB            |
| 1    | 1649.40 | -59.77 | -67.50 | -13.00 | -46.77 | 7.73 Peak     |
| 2 pp | 2474.10 | -48.12 | -59.15 | -13.00 | -35.12 | 11.03 Peak    |

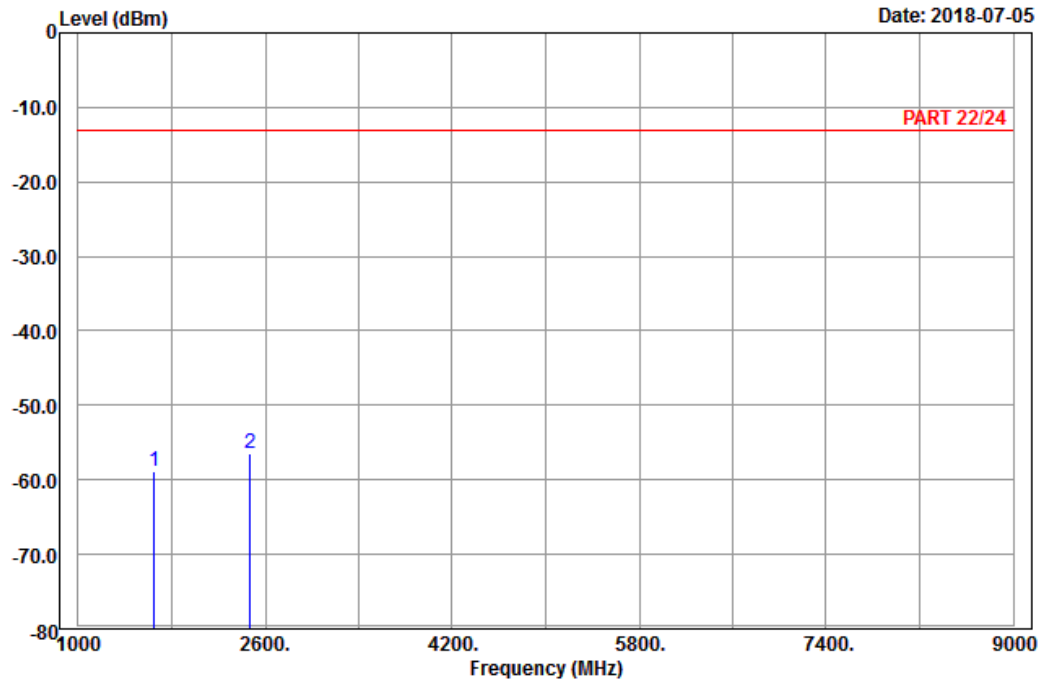


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20407  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1649.40 | -58.78 | -66.51     | -13.00     | -45.78     | 7.73   | Peak   |
| 2 pp | 2474.10 | -56.36 | -67.39     | -13.00     | -43.36     | 11.03  | Peak   |

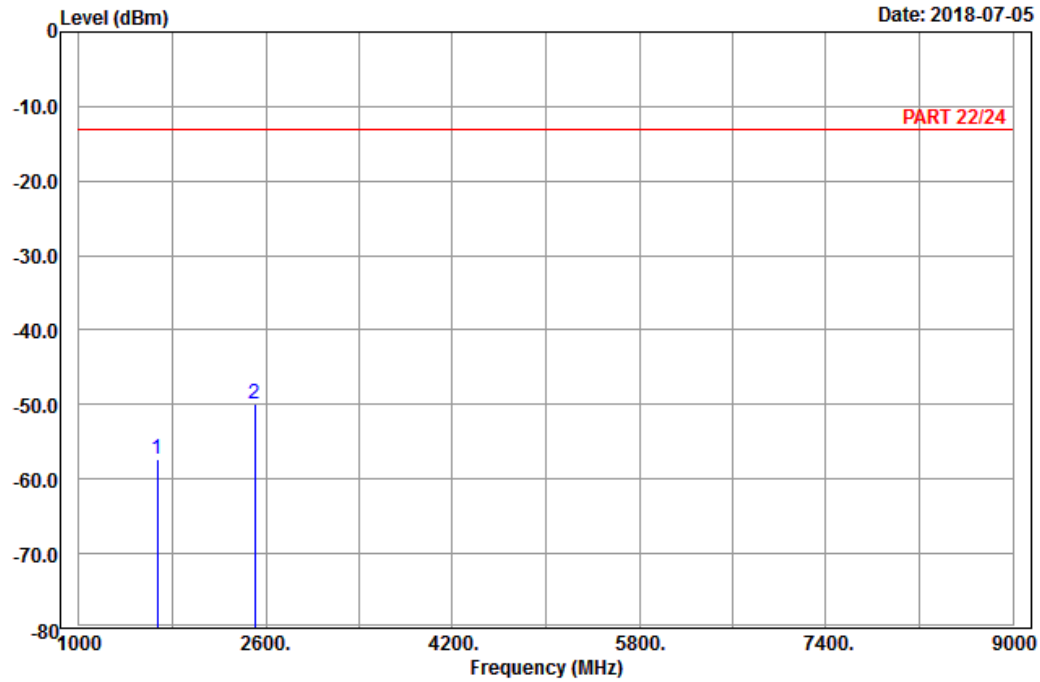
## Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : LTE\_Band 5\_Link\_CH20525  
 Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
| Freq | Level   | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz  | dBm     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 1673.00 | -57.37 | -65.28 | -13.00 | -44.37 | 7.91   | Peak   |
| 2 pp | 2509.50 | -49.99 | -61.27 | -13.00 | -36.99 | 11.28  | Peak   |

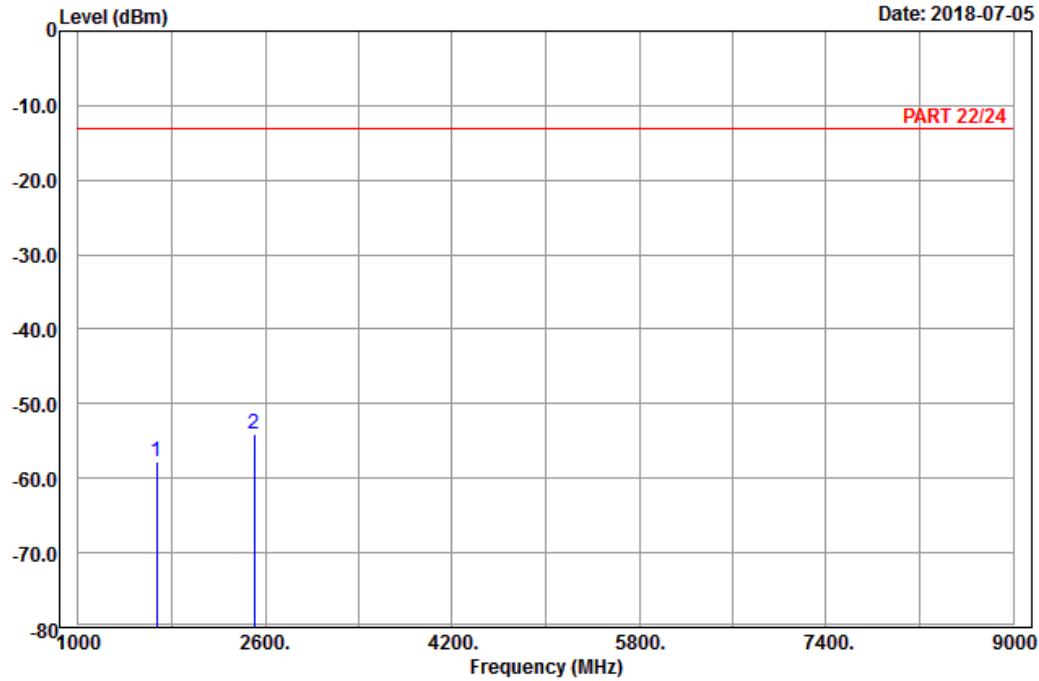


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20525  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1673.00 | -57.82 | -65.73     | -13.00     | -44.82     | 7.91   | Peak   |
| 2 pp | 2509.50 | -54.07 | -65.35     | -13.00     | -41.07     | 11.28  | Peak   |

# High Channel

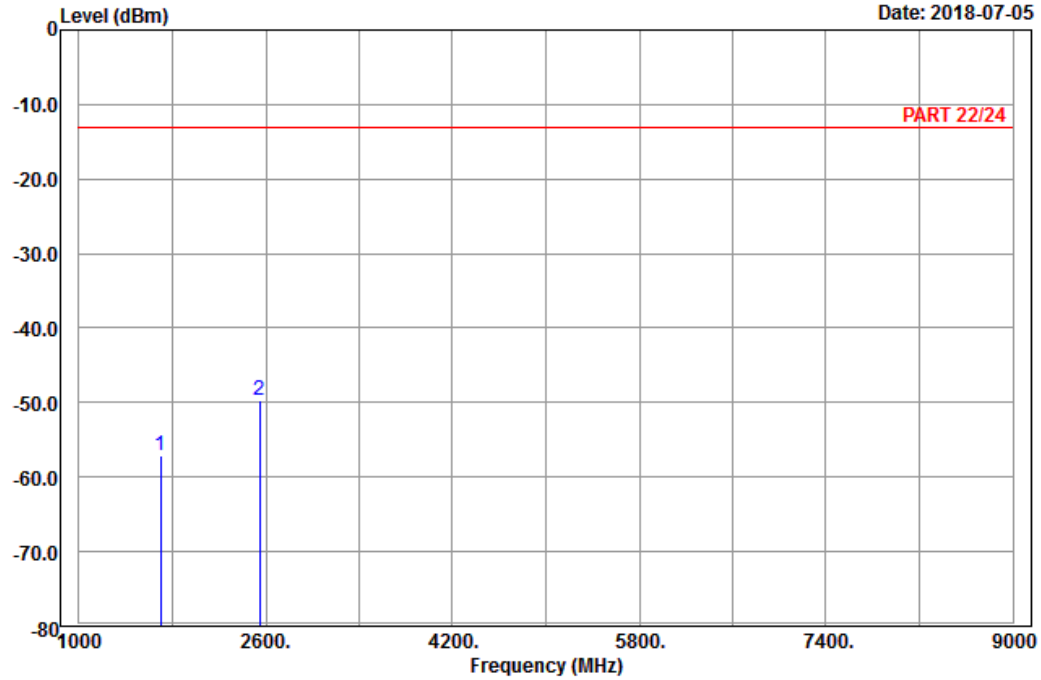


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20643  
Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
| Freq | Level   | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz  | dBm     | dBm    | dBm    | dB     | dB     | dB     |        |
| 1    | 1696.60 | -57.04 | -65.18 | -13.00 | -44.04 | 8.14   | Peak   |
| 2 pp | 2544.90 | -49.68 | -61.15 | -13.00 | -36.68 | 11.47  | Peak   |

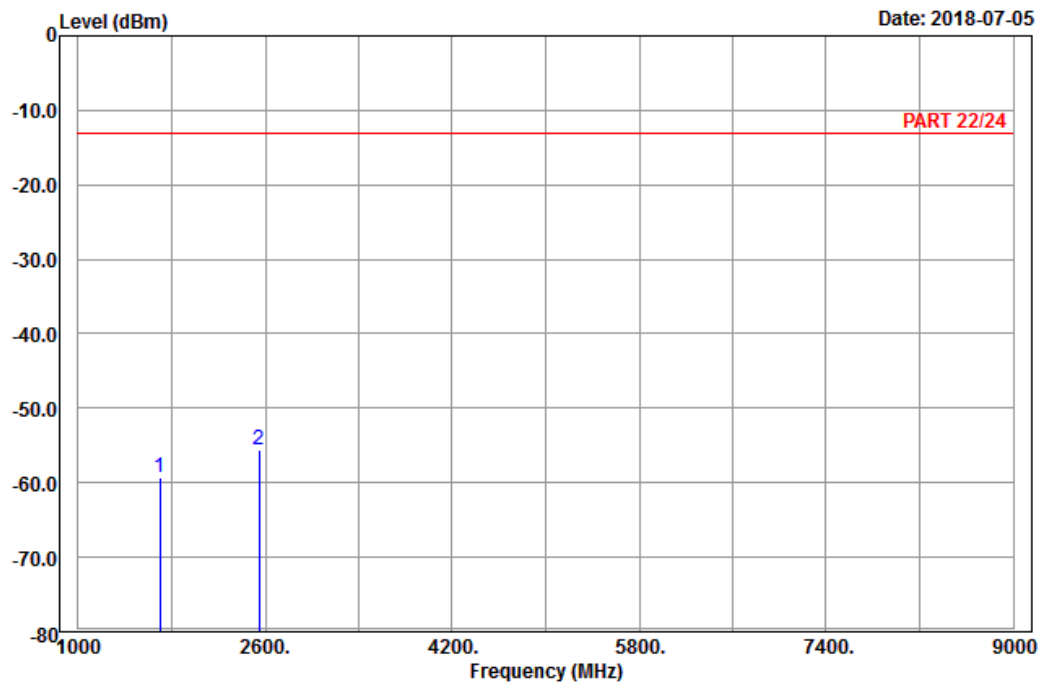


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20643  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1696.60 | -59.22 | -67.36     | -13.00     | -46.22     | 8.14   | Peak   |
| 2 pp | 2544.90 | -55.60 | -67.07     | -13.00     | -42.60     | 11.47  | Peak   |

Channel Bandwidth: 5 MHz / QPSK  
Low Channel

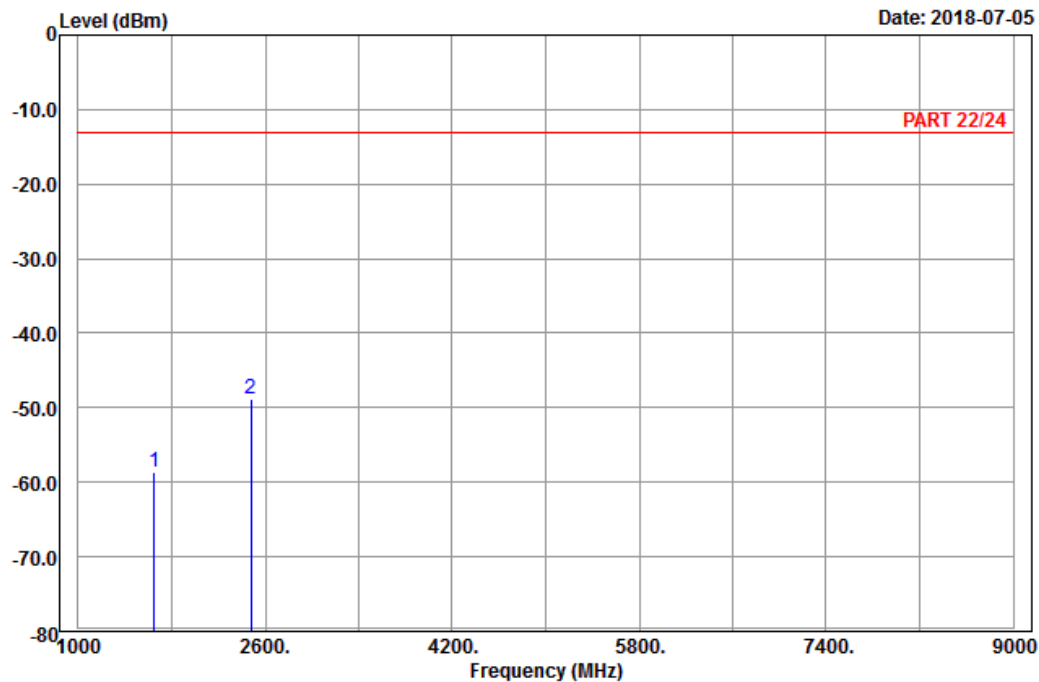


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20425  
Tested by: Karl Lee

|      |         | Read   | Limit  | Over   |        |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 1653.00 | -58.74 | -66.47 | -13.00 | -45.74 | 7.73   | Peak   |
| 2 pp | 2479.50 | -48.73 | -59.76 | -13.00 | -35.73 | 11.03  | Peak   |

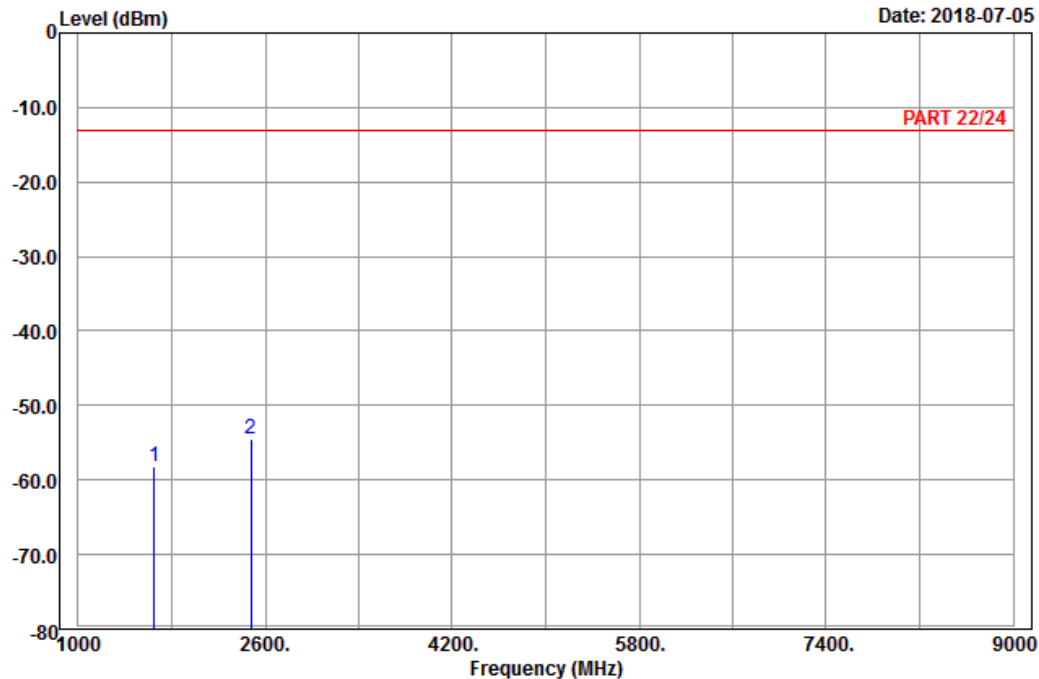


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20425  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1653.00 | -58.22 | -65.95     | -13.00     | -45.22     | 7.73   | Peak   |
| 2 pp | 2479.50 | -54.42 | -65.45     | -13.00     | -41.42     | 11.03  | Peak   |

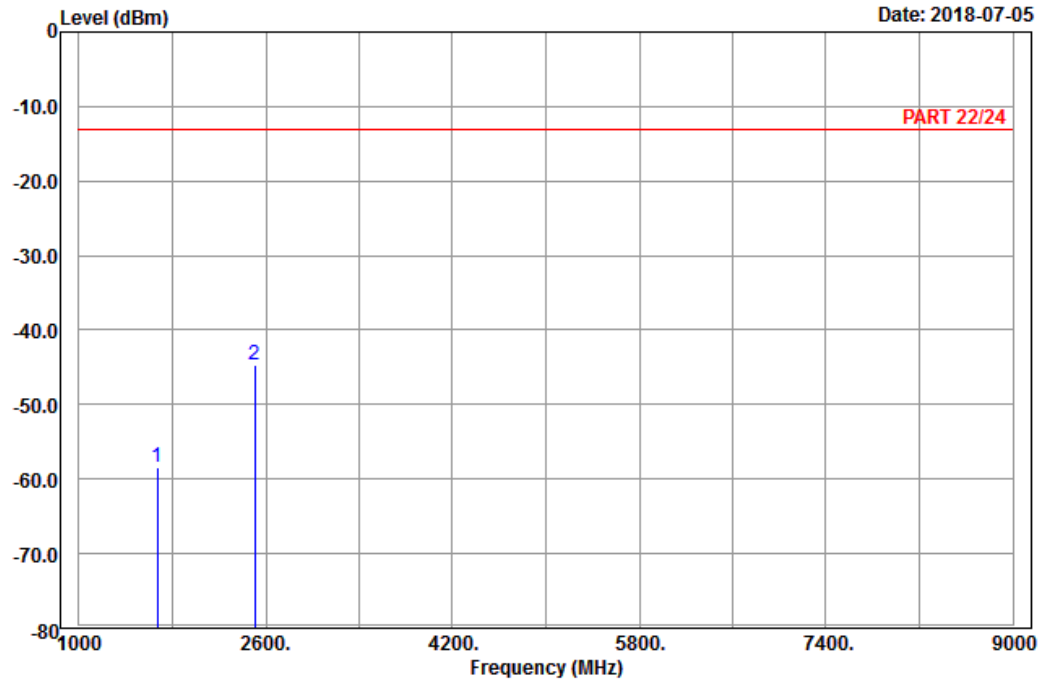
# Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : LTE\_Band 5\_Link\_CH20525  
 Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |      |
|------|---------|--------|--------|--------|--------|--------|------|
| Freq | Level   | Level  | Line   | Limit  | Factor | Remark |      |
| MHz  | dBm     | dBm    | dBm    | dB     | dB     |        |      |
| 1    | 1673.00 | -58.37 | -66.28 | -13.00 | -45.37 | 7.91   | Peak |
| 2 pp | 2509.50 | -44.69 | -55.97 | -13.00 | -31.69 | 11.28  | Peak |

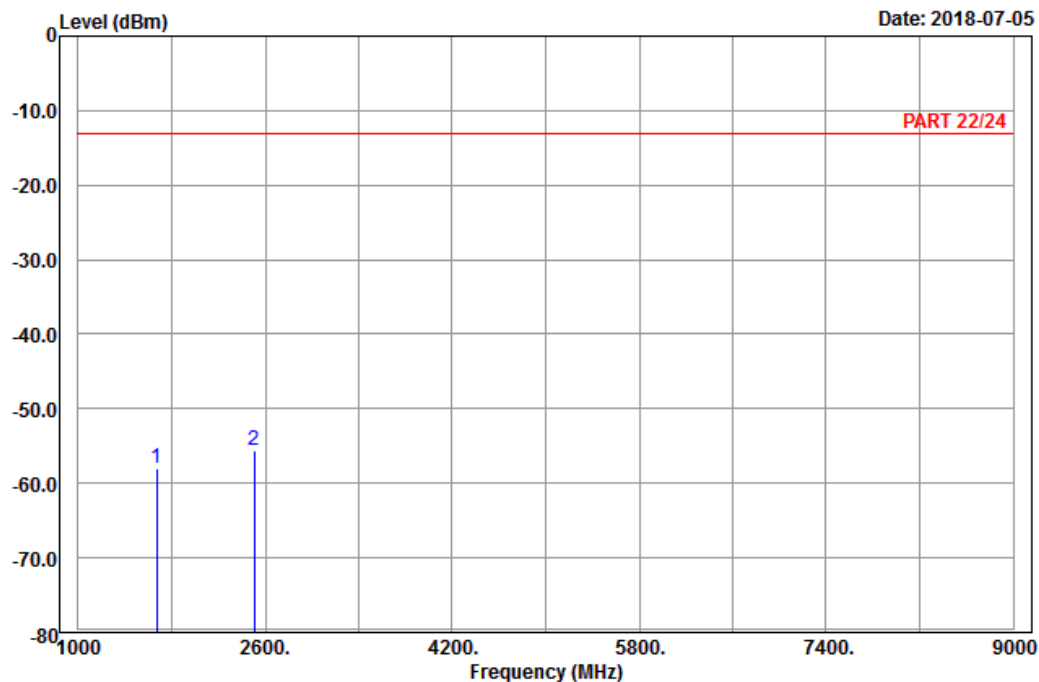


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20525  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1673.00 | -57.88 | -65.79     | -13.00     | -44.88     | 7.91   | Peak   |
| 2 pp | 2509.50 | -55.57 | -66.85     | -13.00     | -42.57     | 11.28  | Peak   |

# High Channel

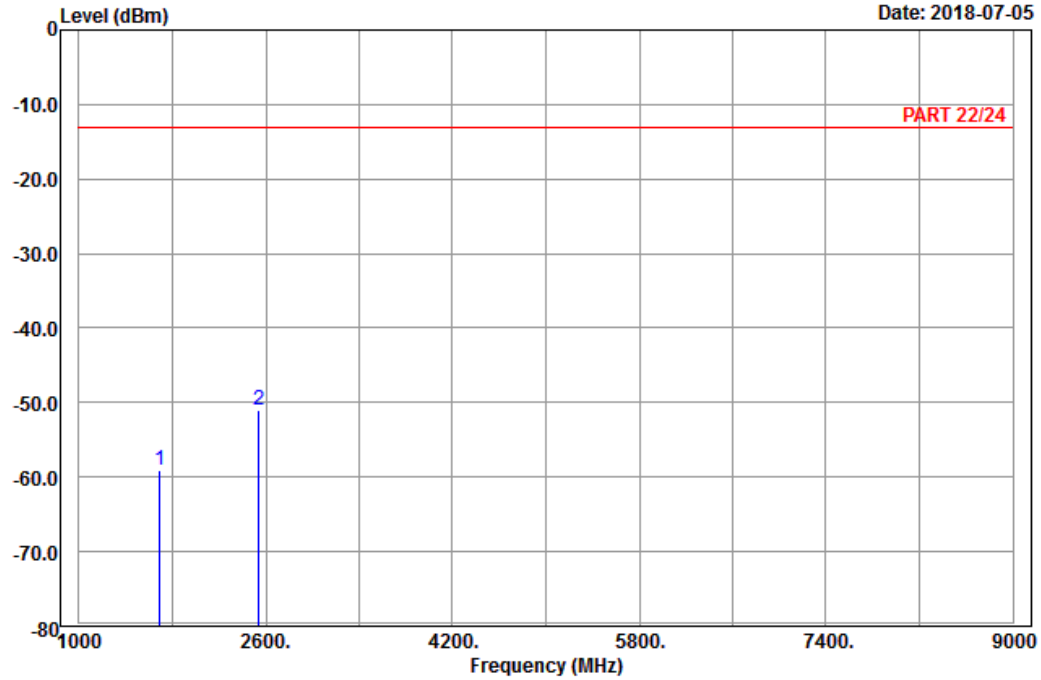


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20625  
Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |      |
|------|---------|--------|--------|--------|--------|--------|------|
| Freq | Level   | Level  | Line   | Limit  | Factor | Remark |      |
| MHz  | dBm     | dBm    | dBm    | dB     | dB     |        |      |
| 1    | 1693.00 | -58.98 | -67.00 | -13.00 | -45.98 | 8.02   | Peak |
| 2 pp | 2539.50 | -51.01 | -62.48 | -13.00 | -38.01 | 11.47  | Peak |

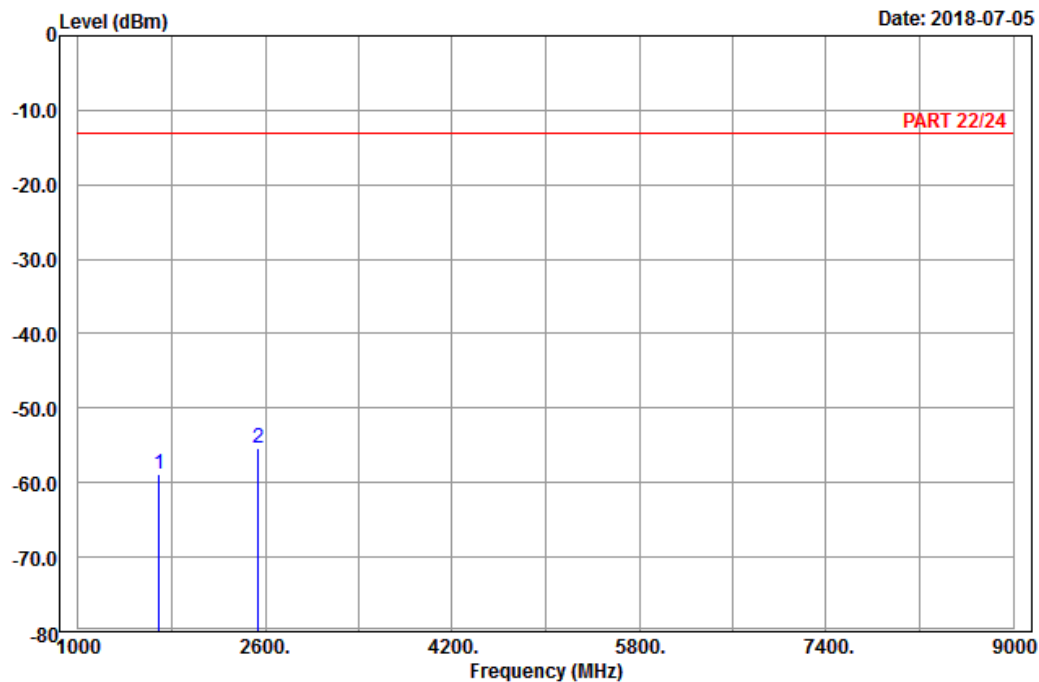


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20625  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1693.00 | -58.82 | -66.84     | -13.00     | -45.82     | 8.02   | Peak   |
| 2 pp | 2539.50 | -55.33 | -66.80     | -13.00     | -42.33     | 11.47  | Peak   |

Channel Bandwidth: 10 MHz / QPSK  
Low Channel

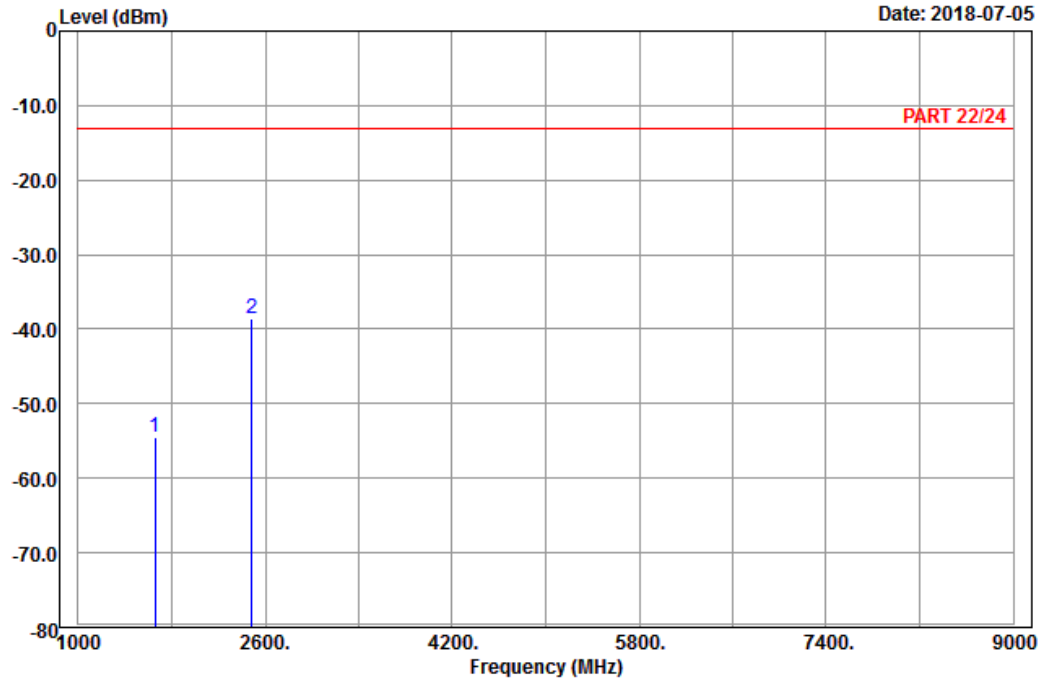


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20450  
Tested by: Karl Lee

|      |         | Read   | Limit  | Over   |        |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 1658.00 | -54.42 | -62.33 | -13.00 | -41.42 | 7.91   | Peak   |
| 2 pp | 2487.00 | -38.57 | -49.61 | -13.00 | -25.57 | 11.04  | Peak   |

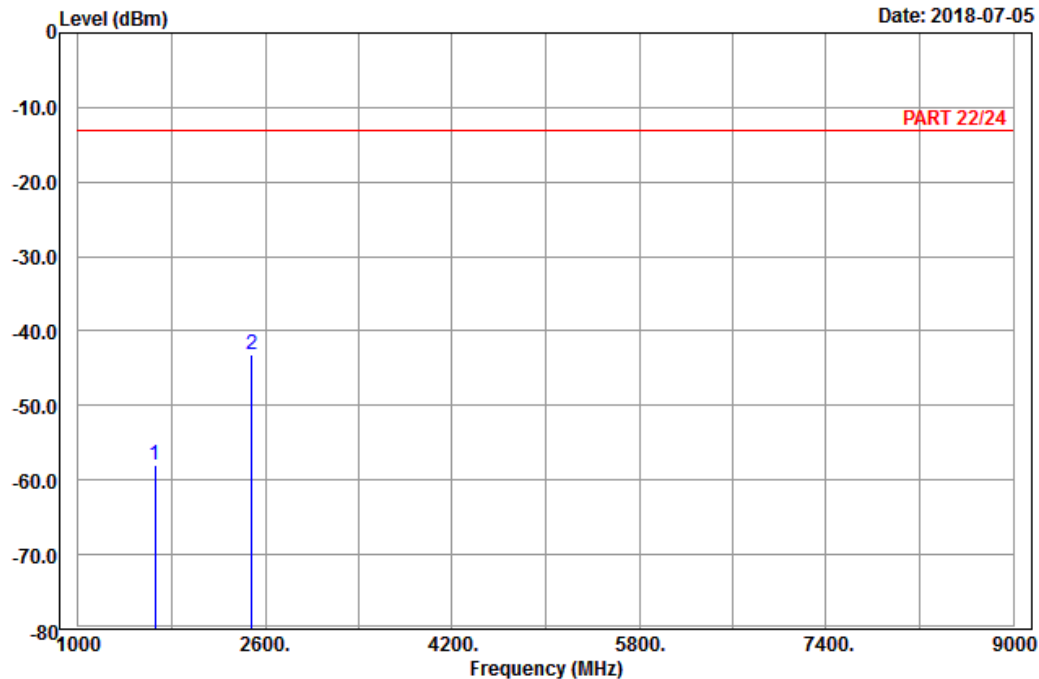


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20450  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1658.00 | -58.07 | -65.98     | -13.00     | -45.07     | 7.91   | Peak   |
| 2 pp | 2487.00 | -43.10 | -54.14     | -13.00     | -30.10     | 11.04  | Peak   |

# Middle Channel

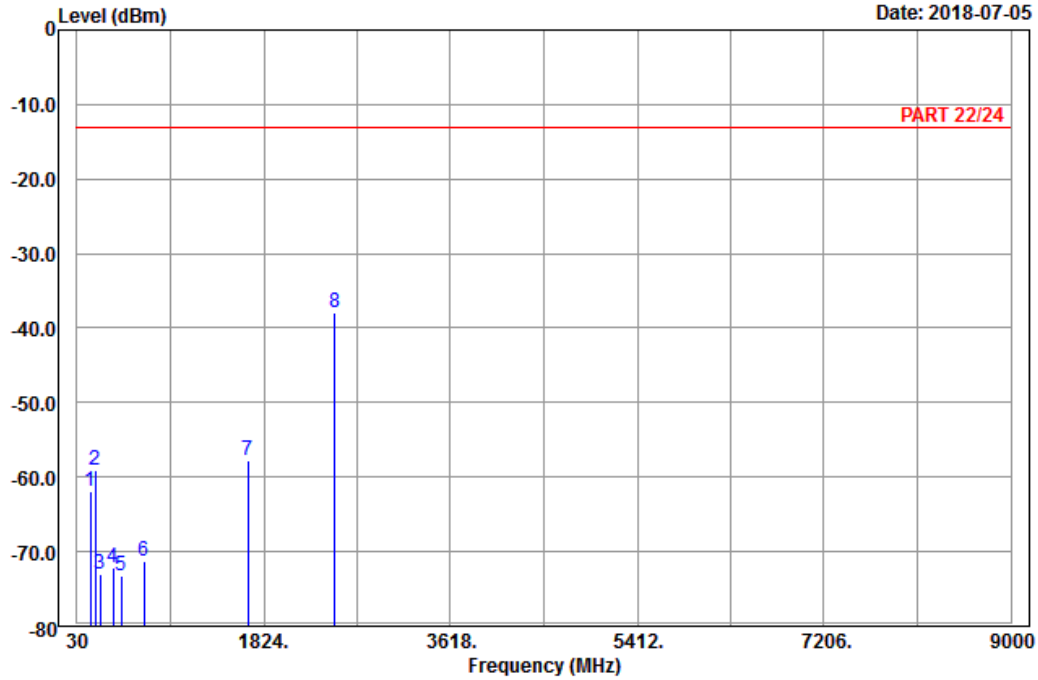


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20525  
Tested by: Karl Lee

|      |         | Read   | Limit  | Over   |        |        |      |
|------|---------|--------|--------|--------|--------|--------|------|
| Freq | Level   | Level  | Line   | Limit  | Factor | Remark |      |
| MHz  | dBm     | dBm    | dBm    | dB     | dB     |        |      |
| 1    | 157.44  | -61.82 | -54.07 | -13.00 | -48.82 | -7.75  | Peak |
| 2    | 205.23  | -59.16 | -53.05 | -13.00 | -46.16 | -6.11  | Peak |
| 3    | 250.86  | -72.97 | -67.45 | -13.00 | -59.97 | -5.52  | Peak |
| 4    | 374.90  | -72.23 | -68.20 | -13.00 | -59.23 | -4.03  | Peak |
| 5    | 451.90  | -73.25 | -69.35 | -13.00 | -60.25 | -3.90  | Peak |
| 6    | 671.00  | -71.31 | -71.07 | -13.00 | -58.31 | -0.24  | Peak |
| 7    | 1673.00 | -57.71 | -65.62 | -13.00 | -44.71 | 7.91   | Peak |
| 8 pp | 2509.50 | -37.90 | -49.18 | -13.00 | -24.90 | 11.28  | Peak |

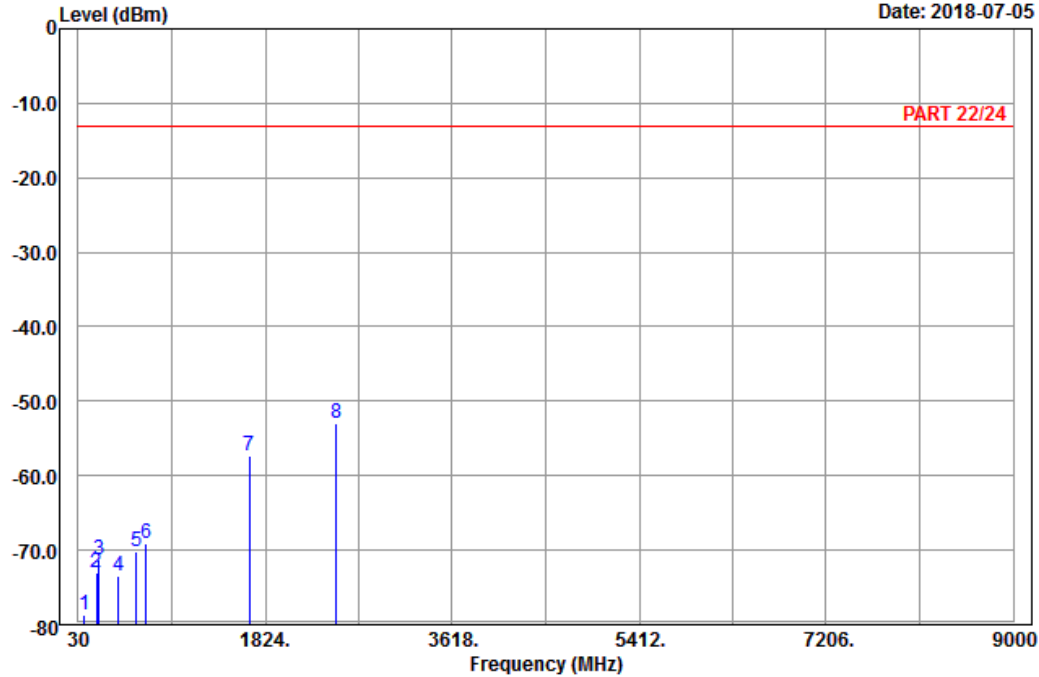


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20525  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 87.78   | -78.63 | -67.74     | -13.00     | -65.63     | -10.89 | Peak   |
| 2    | 208.20  | -73.10 | -67.03     | -13.00     | -60.10     | -6.07  | Peak   |
| 3    | 231.42  | -71.27 | -65.52     | -13.00     | -58.27     | -5.75  | Peak   |
| 4    | 414.10  | -73.43 | -70.37     | -13.00     | -60.43     | -3.06  | Peak   |
| 5    | 589.80  | -70.14 | -70.13     | -13.00     | -57.14     | -0.01  | Peak   |
| 6    | 680.10  | -69.01 | -68.73     | -13.00     | -56.01     | -0.28  | Peak   |
| 7    | 1673.00 | -57.23 | -65.14     | -13.00     | -44.23     | 7.91   | Peak   |
| 8 pp | 2509.50 | -52.92 | -64.20     | -13.00     | -39.92     | 11.28  | Peak   |

# High Channel

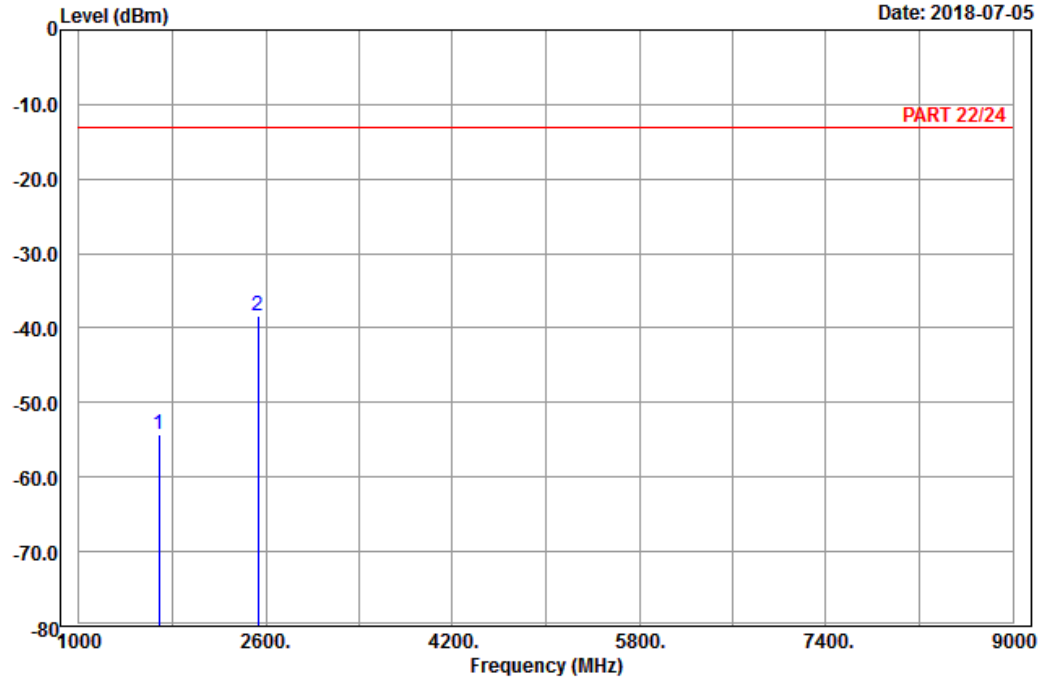


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20600  
Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 1688.00 | -54.32 | -62.34 | -13.00 | -41.32 | 8.02   | Peak   |
| 2 pp | 2532.00 | -38.33 | -49.71 | -13.00 | -25.33 | 11.38  | Peak   |

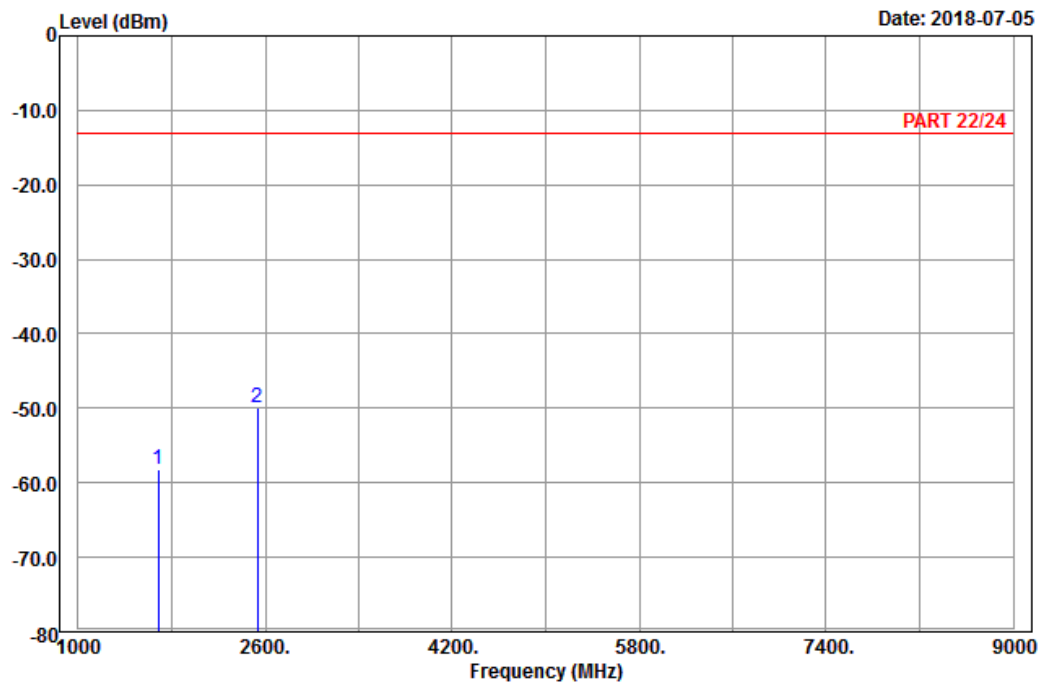


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-05



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20600  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1688.00 | -58.27 | -66.29     | -13.00     | -45.27     | 8.02   | Peak   |
| 2 pp | 2532.00 | -49.83 | -61.21     | -13.00     | -36.83     | 11.38  | Peak   |

Mode B  
GSM:  
Low Channel

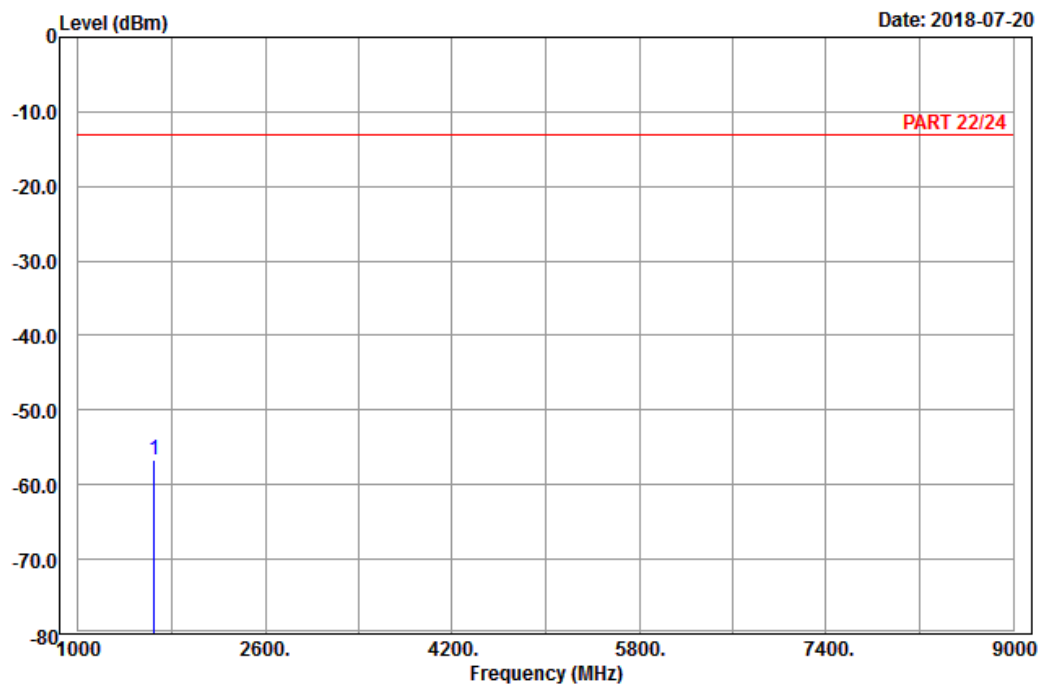


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : GSM 850\_Link\_CH128  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1648.40 | -56.64 | -64.37 | -13.00 | -43.64 | 7.73   | Peak   |

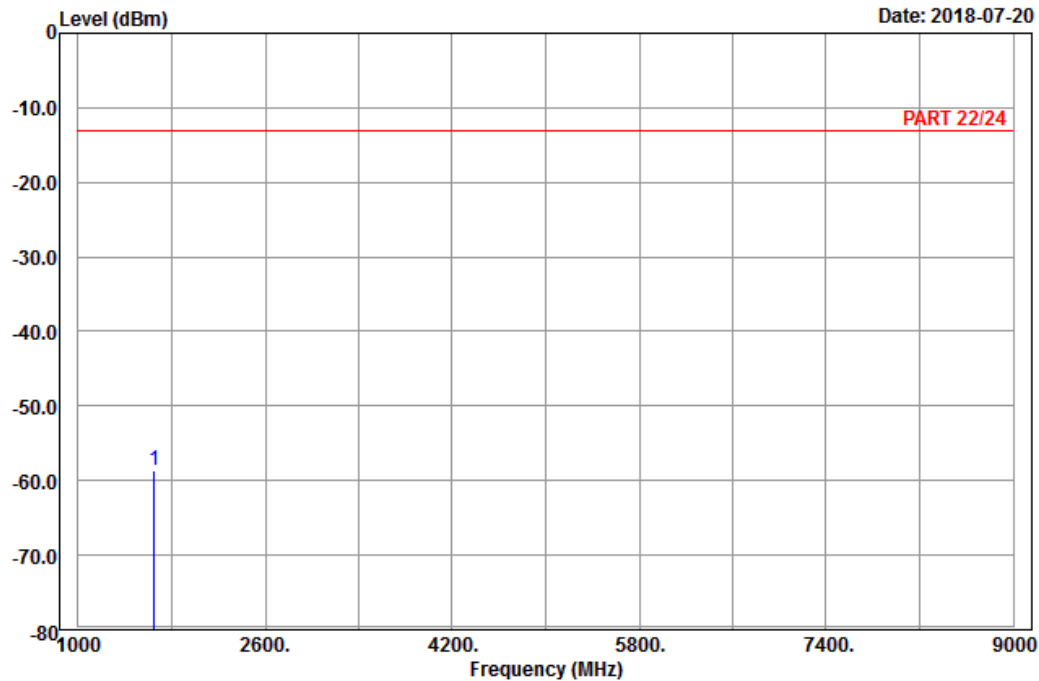


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : GSM 850\_Link\_CH128  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1648.40 | -58.74 | -66.47 | -13.00 | -45.74 | 7.73   | Peak   |  |

## Middle Channel

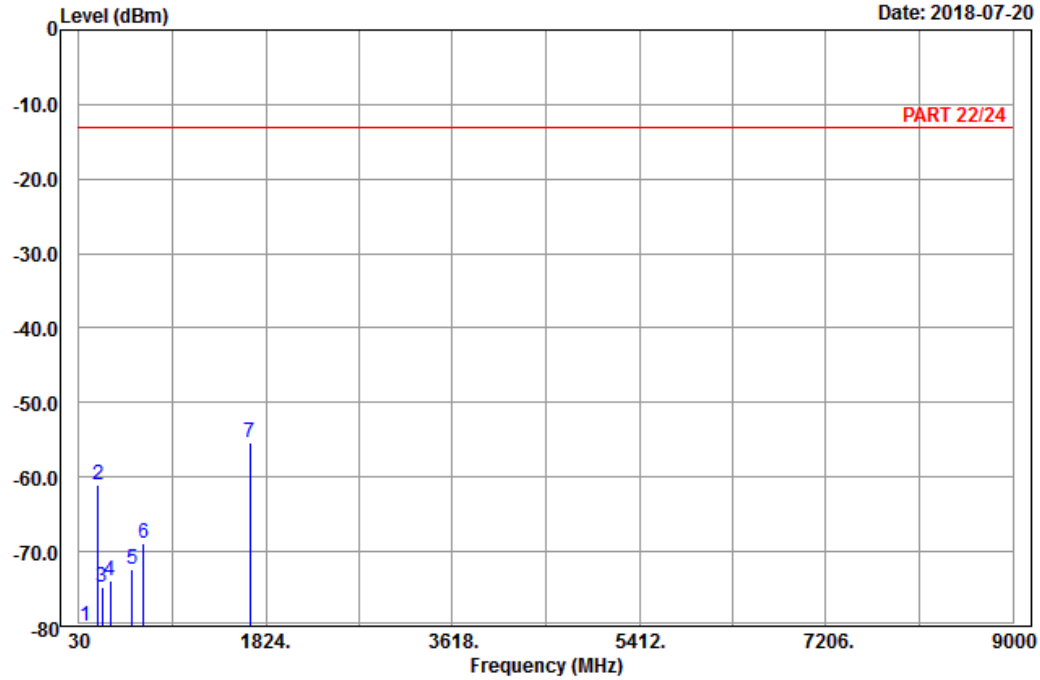


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : GSM 850\_Link\_CH189  
Tested by: Charles Hsiao

|      |         | Read   | Limit  | Over   |        |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 98.31   | -80.08 | -69.85 | -13.00 | -67.08 | -10.23 | Peak   |
| 2    | 210.63  | -60.99 | -54.95 | -13.00 | -47.99 | -6.04  | Peak   |
| 3    | 254.37  | -74.81 | -69.27 | -13.00 | -61.81 | -5.54  | Peak   |
| 4    | 327.30  | -73.83 | -68.18 | -13.00 | -60.83 | -5.65  | Peak   |
| 5    | 542.90  | -72.36 | -70.20 | -13.00 | -59.36 | -2.16  | Peak   |
| 6    | 650.00  | -68.80 | -68.67 | -13.00 | -55.80 | -0.13  | Peak   |
| 7 pp | 1672.80 | -55.38 | -63.29 | -13.00 | -42.38 | 7.91   | Peak   |

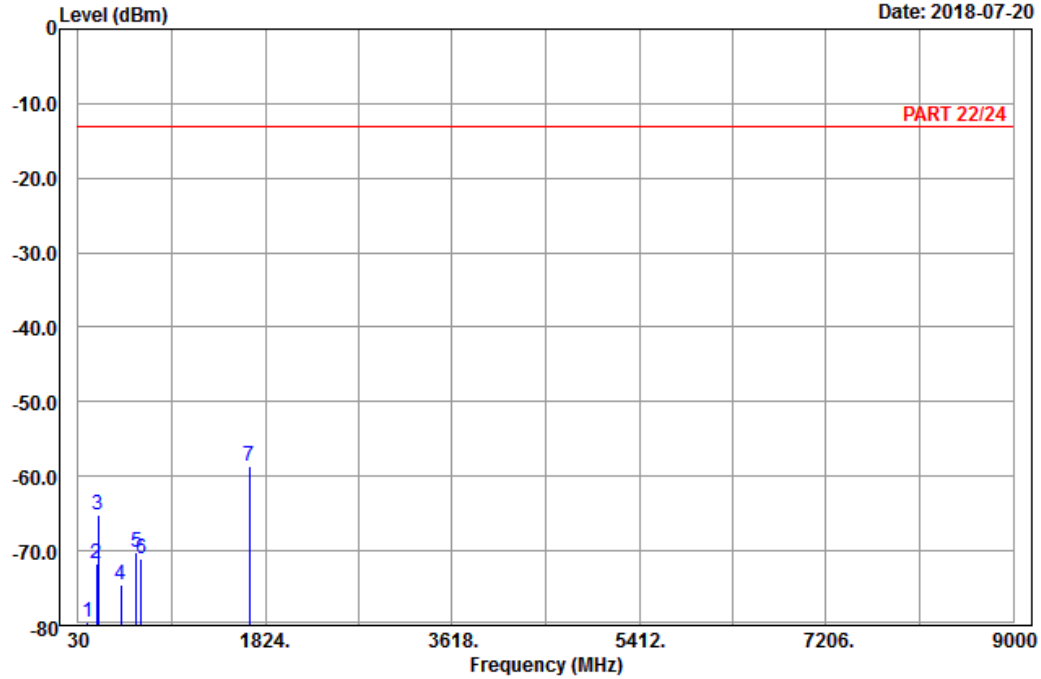


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2018-07-20



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : GSM 850\_Link\_CH189  
 Tested by: Charles Hsiao

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 122.34  | -79.51 | -71.38     | -13.00     | -66.51     | -8.13  | Peak   |
| 2    | 205.77  | -71.74 | -65.63     | -13.00     | -58.74     | -6.11  | Peak   |
| 3    | 220.35  | -65.27 | -59.36     | -13.00     | -52.27     | -5.91  | Peak   |
| 4    | 440.70  | -74.60 | -70.97     | -13.00     | -61.60     | -3.63  | Peak   |
| 5    | 586.30  | -70.12 | -69.98     | -13.00     | -57.12     | -0.14  | Peak   |
| 6    | 632.50  | -71.15 | -71.21     | -13.00     | -58.15     | 0.06   | Peak   |
| 7 pp | 1672.80 | -58.71 | -66.62     | -13.00     | -45.71     | 7.91   | Peak   |

# High Channel

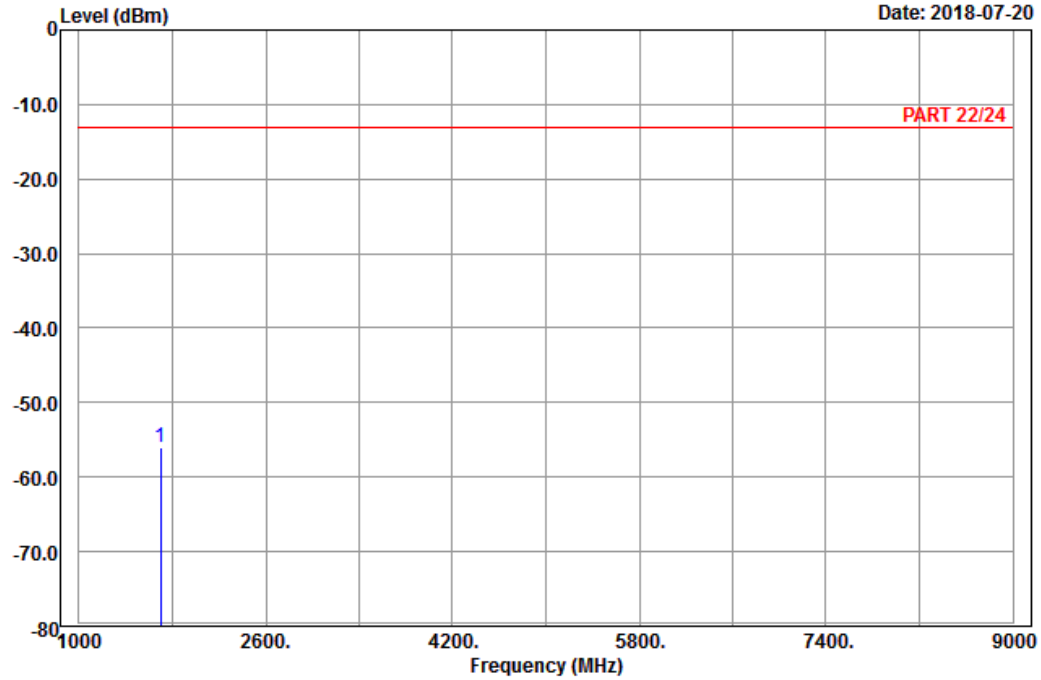


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : GSM 850\_Link\_CH251  
Tested by: Charles Hsiao

|              |        | Read   | Limit  | Over   |        |        |
|--------------|--------|--------|--------|--------|--------|--------|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1 pp 1697.60 | -56.04 | -64.18 | -13.00 | -43.04 | 8.14   | Peak   |

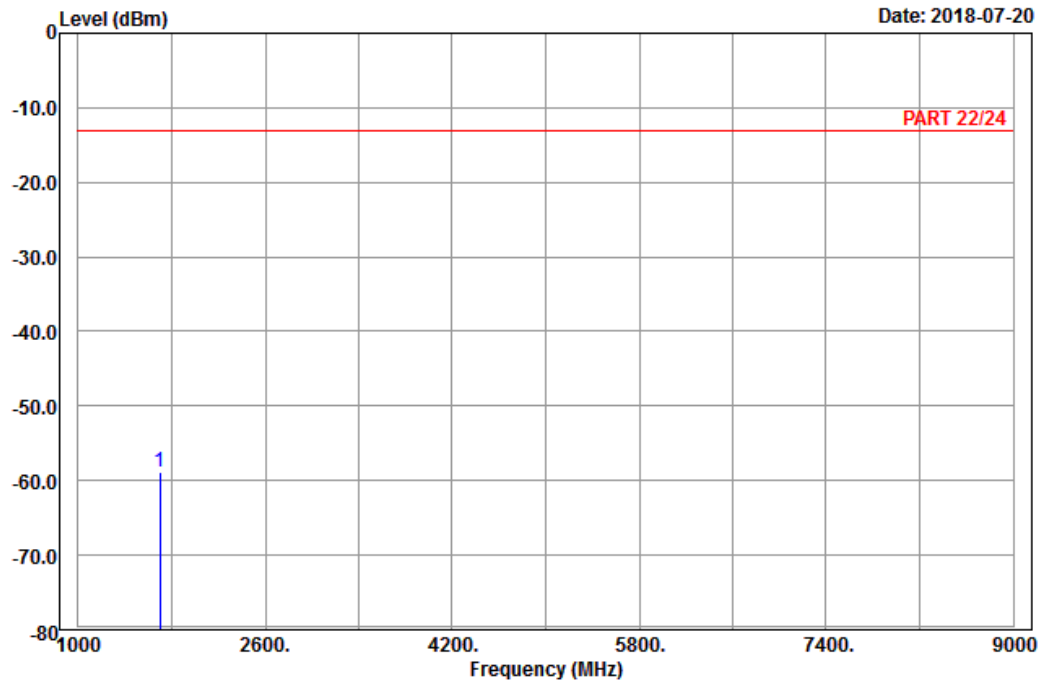


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : GSM 850\_Link\_CH251  
Tested by: Charles Hsiao

|              |        |        | Read   | Limit  | Over   |        |  |
|--------------|--------|--------|--------|--------|--------|--------|--|
| Freq         | Level  | Level  | Line   | Limit  | Factor | Remark |  |
| MHz          | dBm    | dBm    | dBm    | dB     | dB     |        |  |
| 1 pp 1697.60 | -58.90 | -67.04 | -13.00 | -45.90 | 8.14   | Peak   |  |

LTE Band 5  
Channel Bandwidth: 10 MHz / QPSK  
Low Channel

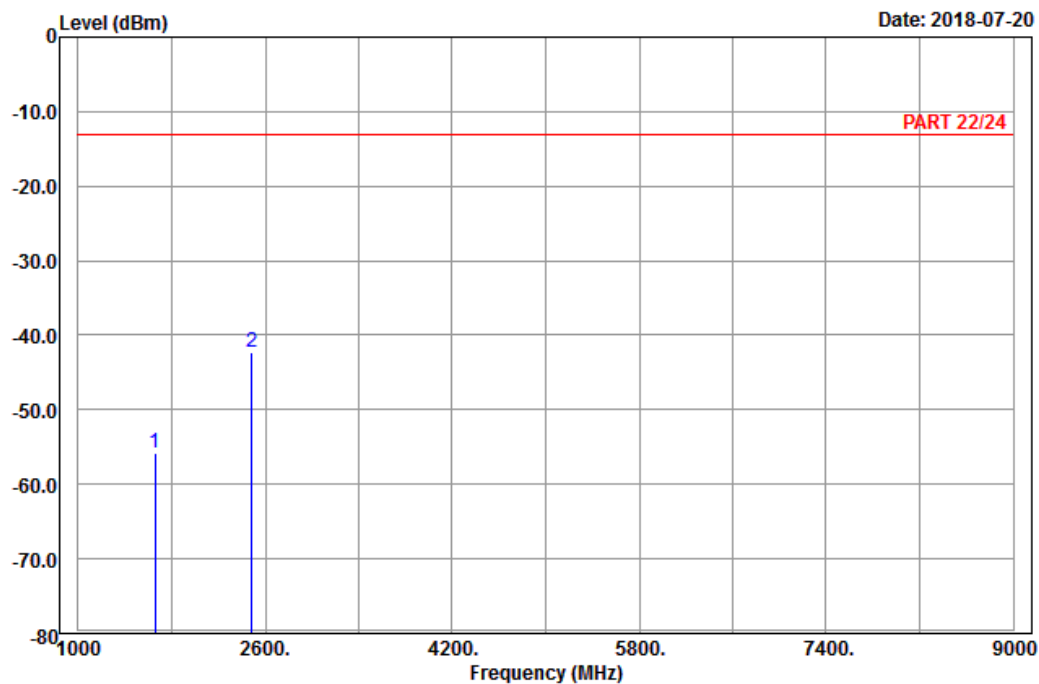


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20450  
Tested by: Karl Lee

|      |         | Read   | Limit  | Over   |        |               |
|------|---------|--------|--------|--------|--------|---------------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB            |
| 1    | 1658.00 | -55.77 | -63.68 | -13.00 | -42.77 | 7.91 Peak     |
| 2 pp | 2487.00 | -42.27 | -53.31 | -13.00 | -29.27 | 11.04 Peak    |

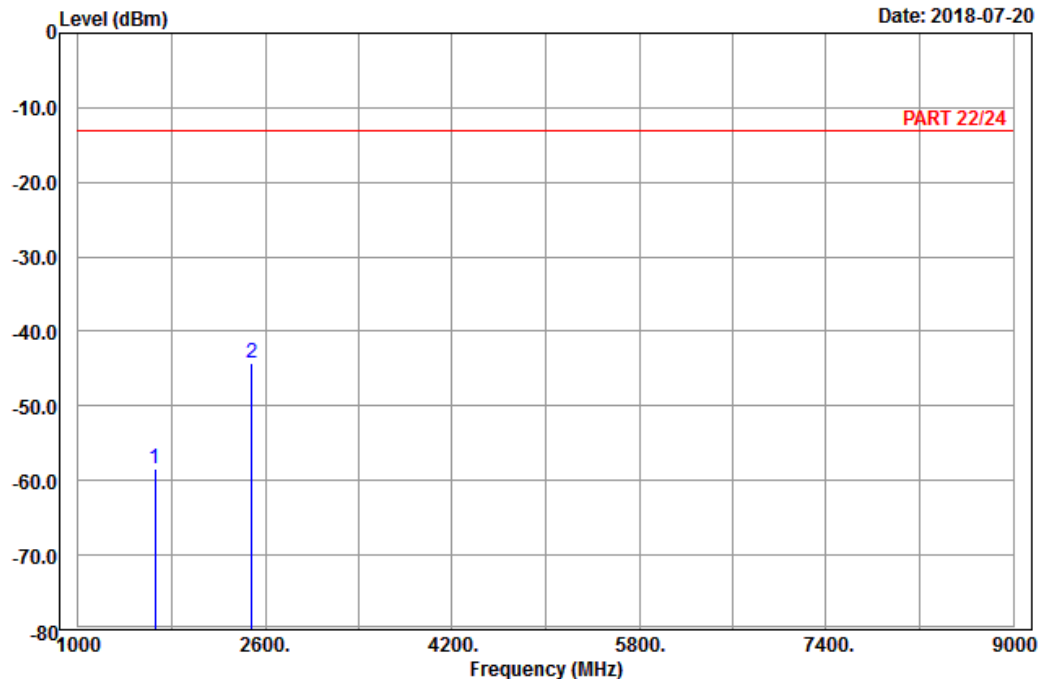


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20450  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1658.00 | -58.45 | -66.36     | -13.00     | -45.45     | 7.91   | Peak   |
| 2 pp | 2487.00 | -44.20 | -55.24     | -13.00     | -31.20     | 11.04  | Peak   |

# Middle Channel

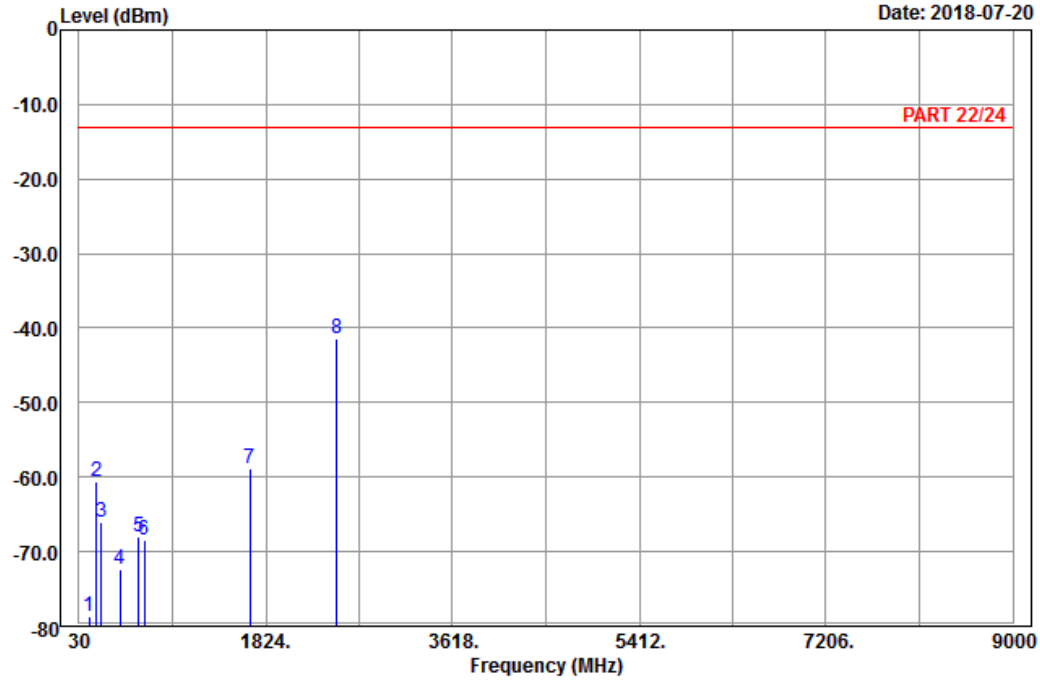


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : LTE\_Band 5\_Link\_CH20525  
Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |        |
|------|---------|--------|--------|--------|--------|--------|--------|
|      | Freq    | Level  | Level  | Line   | Limit  | Factor | Remark |
|      | MHz     | dBm    | dBm    | dBm    | dB     | dB     |        |
| 1    | 126.66  | -78.64 | -70.81 | -13.00 | -65.64 | -7.83  | Peak   |
| 2    | 196.32  | -60.53 | -54.53 | -13.00 | -47.53 | -6.00  | Peak   |
| 3    | 240.87  | -66.15 | -60.51 | -13.00 | -53.15 | -5.64  | Peak   |
| 4    | 424.60  | -72.41 | -69.12 | -13.00 | -59.41 | -3.29  | Peak   |
| 5    | 601.00  | -68.04 | -68.46 | -13.00 | -55.04 | 0.42   | Peak   |
| 6    | 658.40  | -68.44 | -68.26 | -13.00 | -55.44 | -0.18  | Peak   |
| 7    | 1673.00 | -58.84 | -66.75 | -13.00 | -45.84 | 7.91   | Peak   |
| 8 pp | 2509.50 | -41.50 | -52.78 | -13.00 | -28.50 | 11.28  | Peak   |

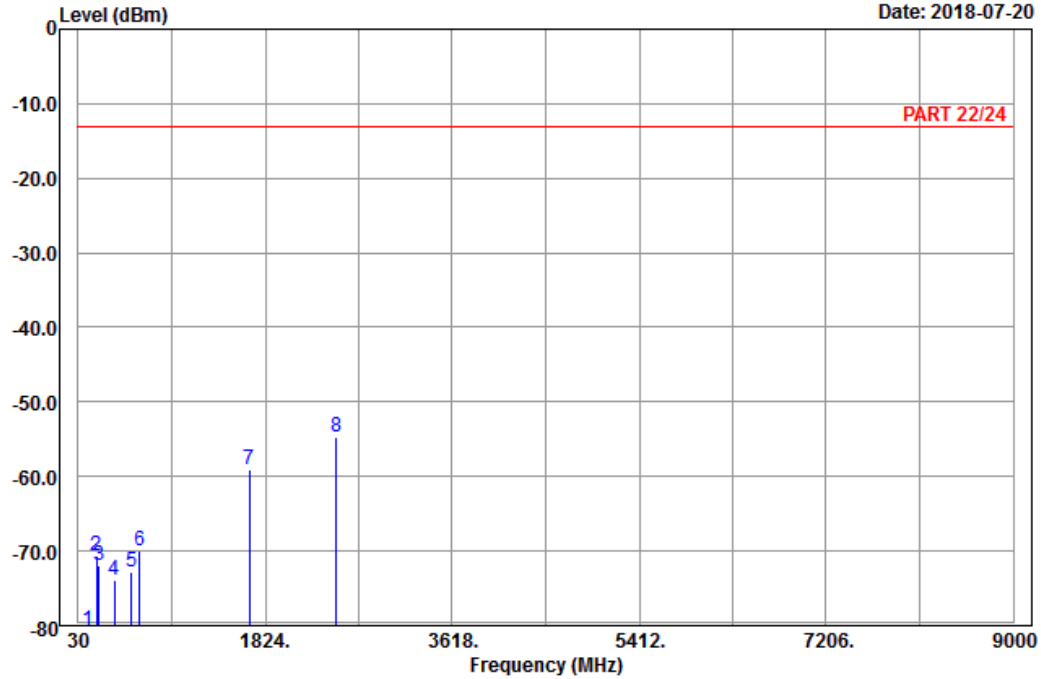


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20525  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 123.69  | -80.69 | -72.68     | -13.00     | -67.69     | -8.01  | Peak   |
| 2    | 204.15  | -70.56 | -64.44     | -13.00     | -57.56     | -6.12  | Peak   |
| 3    | 229.53  | -71.95 | -66.17     | -13.00     | -58.95     | -5.78  | Peak   |
| 4    | 379.10  | -73.82 | -69.99     | -13.00     | -60.82     | -3.83  | Peak   |
| 5    | 538.00  | -72.87 | -70.36     | -13.00     | -59.87     | -2.51  | Peak   |
| 6    | 618.50  | -70.08 | -70.30     | -13.00     | -57.08     | 0.22   | Peak   |
| 7    | 1673.00 | -59.17 | -67.08     | -13.00     | -46.17     | 7.91   | Peak   |
| 8 pp | 2509.50 | -54.65 | -65.93     | -13.00     | -41.65     | 11.28  | Peak   |

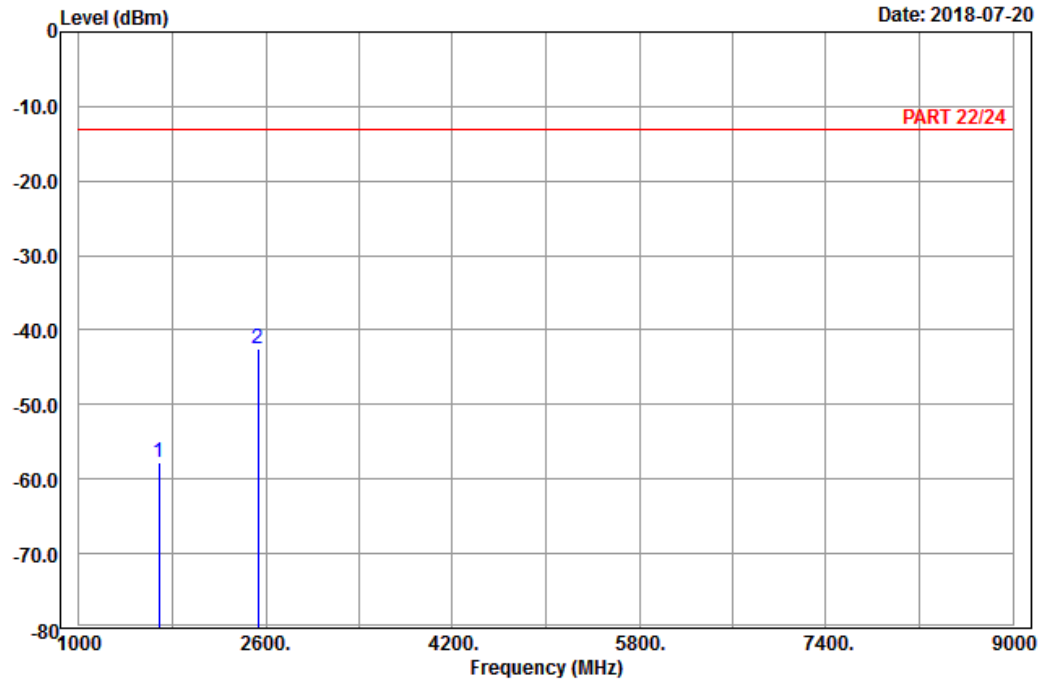
## High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : LTE\_Band 5\_Link\_CH20600  
 Tested by: Karl Lee

|      |         |        | Read   | Limit  | Over   |        |      |
|------|---------|--------|--------|--------|--------|--------|------|
| Freq | Level   | Level  | Line   | Limit  | Factor | Remark |      |
| MHz  | dBm     | dBm    | dBm    | dB     | dB     |        |      |
| 1    | 1688.00 | -57.84 | -65.86 | -13.00 | -44.84 | 8.02   | Peak |
| 2 pp | 2532.00 | -42.41 | -53.79 | -13.00 | -29.41 | 11.38  | Peak |

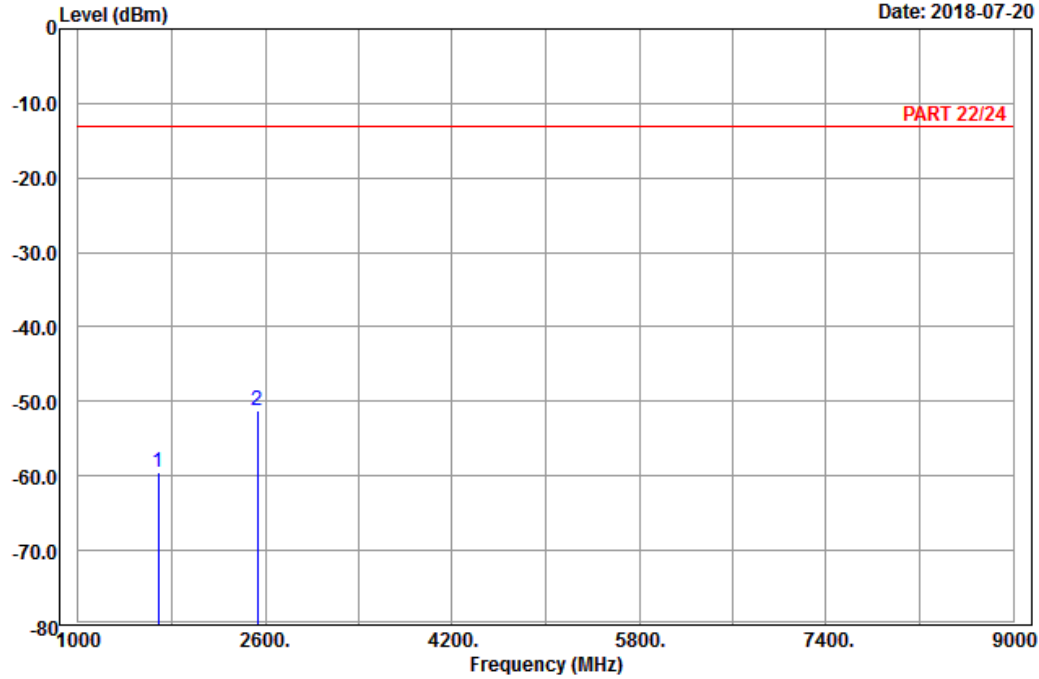


# Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-20



Site : 966 chamber 1  
Condition: PART 22/24 Vertical  
Remark : LTE\_Band 5\_Link\_CH20600  
Tested by: Karl Lee

|      | Freq    | Level  | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
|      | MHz     | dBm    | dBm        | dBm        | dB         | dB     |        |
| 1    | 1688.00 | -59.50 | -67.52     | -13.00     | -46.50     | 8.02   | Peak   |
| 2 pp | 2532.00 | -51.12 | -62.50     | -13.00     | -38.12     | 11.38  | 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:

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

--- END ---