

FCC PART 27  
FCC PART 22H, PART 24E  
MEASUREMENT AND TEST REPORT

For

**ROKIT Corp Limited**

ROK House, Kingswood Business Park, Holyhead Road, Albrighton, Wolverhampton, United Kingdom  
WV7 3AU

**FCC ID: 2AQNZ-IOLIGHT**

|                                                                                                                                                                                                                                                |                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                                                                                                                         | <b>Product Type:</b><br>3G Smart Phone |
| <b>Test Engineer:</b> Mark Yu <i>Mark Yu</i>                                                                                                                                                                                                   |                                        |
| <b>Report Number:</b> RSHA180620003-00C                                                                                                                                                                                                        |                                        |
| <b>Report Date:</b> 2018-08-16                                                                                                                                                                                                                 |                                        |
| <b>Reviewed By:</b>                                                                                                                                                                                                                            | Oscar Ye <i>Oscar Ye</i><br>RF Leader  |
| <b>Prepared By:</b> Bay Area Compliance Laboratories Corp. (Kunshan)<br>No.248 Chenghu Road,Kunshan,Jiangsu province,China<br>Tel: +86-0512-86175000<br>Fax: +86-0512-88934268<br><a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a> |                                        |

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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|               |                                                        |
|---------------|--------------------------------------------------------|
| Applicant:    | ROKIT Corp Limited                                     |
| Tested Model: | IO Light                                               |
| Product Type: | 3G Smart Phone                                         |
| Dimension:    | 143mm (L)*73.5mm (W)*10.15mm(H)                        |
| Power Supply: | DC 3.8V from battery and DC 5.0V charging from adapter |

#### Adapter information:

Model: A31A-050055U-US1

Input: AC 100-240V, 50/60Hz, 0.2A

Output: DC 5.0V, 550mA

*\*All measurement and test data in this report was gathered from production sample serial number: 20180620003.  
(Assigned by the BACL. The EUT supplied by the applicant was received on 2018-06-20)*

### Objective

This type approval report is prepared on behalf of ROKIT Corp Limited in accordance with Part 2, Part 22-Subpart H and Part 24-Subpart E and Part 27 of the Federal Communication Commission's rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

### Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS and DTS submissions with FCC ID: 2AQNZ-IOLIGHT.

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services

Part 24 Subpart E - Personal Communication Services

Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

**Measurement Uncertainty**

| Item                               |             | Uncertainty |
|------------------------------------|-------------|-------------|
| AC Power Lines Conducted Emissions |             | 3.19dB      |
| RF conducted test with spectrum    |             | 0.9dB       |
| RF Output Power with Power meter   |             | 0.5dB       |
| Radiated emission                  | 30MHz~1GHz  | 5.91dB      |
|                                    | 1GHz~6GHz   | 4.68dB      |
|                                    | 6GHz~18GHz  | 4.92dB      |
|                                    | 18GHz~40GHz | 5.21dB      |
| Occupied Bandwidth                 |             | 0.5kHz      |
| Temperature                        |             | 1.0℃        |
| Humidity                           |             | 6%          |

**Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

## SYSTEM TEST CONFIGURATION

### Justification

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

### Channel List

| Mode          | Channel |      | Frequency (MHz) |
|---------------|---------|------|-----------------|
| GSM/GPRS 850  | Low     | 128  | 824.2           |
|               | Middle  | 190  | 836.6           |
|               | High    | 251  | 848.8           |
| GSM/GPRS 1900 | Low     | 512  | 1850.2          |
|               | Middle  | 661  | 1880.0          |
|               | High    | 810  | 1909.8          |
| WCDMA Band II | Low     | 9262 | 1852.4          |
|               | Middle  | 9400 | 1880.0          |
|               | High    | 9538 | 1907.6          |
| WCDMA Band IV | Low     | 1312 | 1712.4          |
|               | Middle  | 1413 | 1732.6          |
|               | High    | 1513 | 1752.6          |
| WCDMA Band V  | Low     | 4132 | 826.4           |
|               | Middle  | 4183 | 836.6           |
|               | High    | 4233 | 846.6           |

### Equipment Modifications

No modifications were made to the EUT.

### Support Equipment List and Details

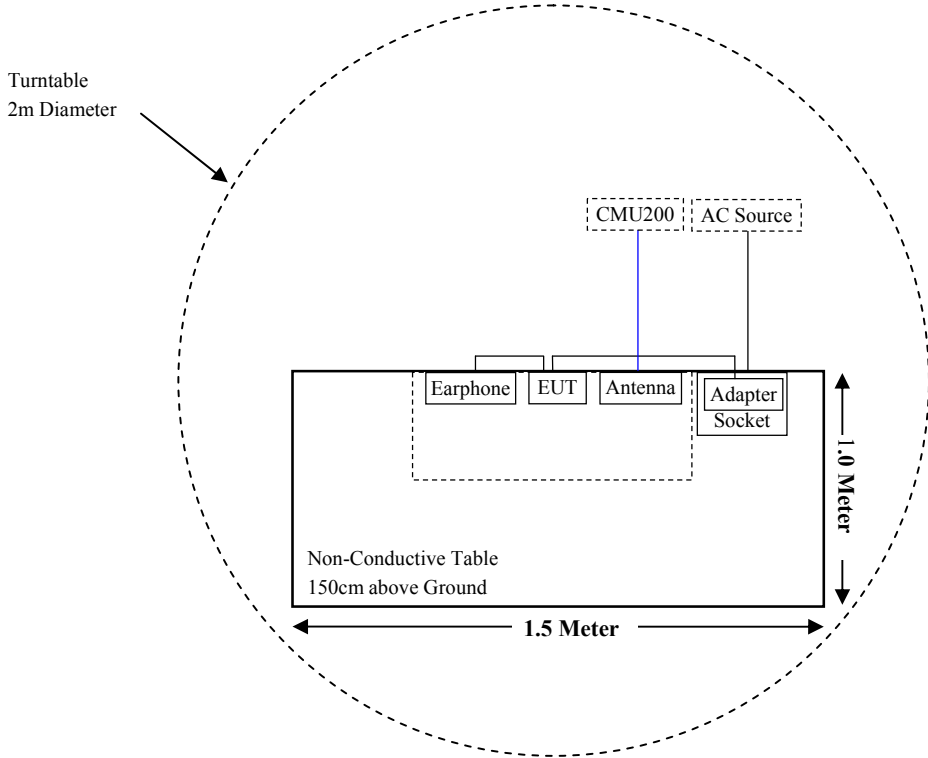
| Manufacturer    | Description                          | Model     | Serial Number |
|-----------------|--------------------------------------|-----------|---------------|
| Rohde & Schwarz | UNIVERSAL RADIO COMMUNICATION TESTER | CMU200    | 110605        |
| Audio-technica  | Earphone                             | ATH-FC707 | /             |
| TE CONNECTIVITY | Antenna                              | /         | /             |

External Cable List and Details

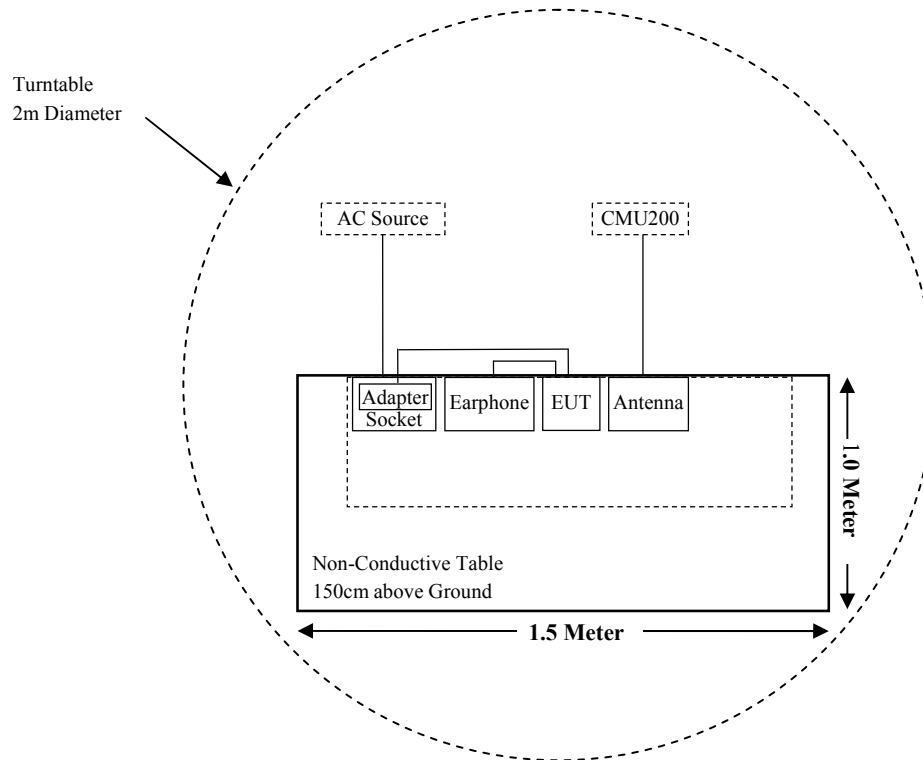
| Cable Description | Length (m) | From Port | To      |
|-------------------|------------|-----------|---------|
| USB Cable         | 0.8        | EUT       | Adapter |

Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz)



For Radiated Emissions(Above 1GHz):



**SUMMARY OF TEST RESULTS**

| <b>FCC Rules</b>                                        | <b>Description of Test</b>             | <b>Result</b>  |
|---------------------------------------------------------|----------------------------------------|----------------|
| §1.1307(b)(1)& §2.1093                                  | RF Exposure Information                | Compliance     |
| §2.1046; § 22.913 (a);§ 24.232 (c);<br>§ 27.50 (d)      | RF Output Power                        | Compliant      |
| § 2.1047                                                | Modulation Characteristics             | Not Applicable |
| § 2.1049; § 22.905;<br>§ 22.917; § 24.238; §27.53       | Occupied Bandwidth                     | Compliant      |
| § 2.1051; § 22.917 (a);<br>§ 24.238 (a); §27.53         | Spurious Emissions at Antenna Terminal | Compliant      |
| § 2.1053; § 22.917 (a);<br>§ 24.238 (a); §27.53 (h) (m) | Spurious Radiated Emissions            | Compliant      |
| § 22.917 (a);<br>§ 24.238 (a); §27.53 (h) (m)           | Band Edge                              | Compliant      |
| § 2.1055; § 22.355;<br>§ 24.235; §27.54                 | Frequency stability                    | Compliant      |

**TEST EQUIPMENT LIST**

| Manufacturer                               | Description                          | Model          | Serial Number | Calibration Date | Calibration Due Date |
|--------------------------------------------|--------------------------------------|----------------|---------------|------------------|----------------------|
| <b>Radiated Emission Test (Chamber 1#)</b> |                                      |                |               |                  |                      |
| Rohde & Schwarz                            | EMI Test Receiver                    | ESCI           | 100195        | 2017-11-12       | 2018-11-11           |
| HP                                         | Signal Generator                     | HP 8341B       | 2624A00116    | 2017-08-29       | 2018-08-28           |
| Sunol Sciences                             | Broadband Antenna                    | JB3            | A090413-1     | 2016-12-26       | 2019-12-25           |
| Sunol Sciences                             | Broadband Antenna                    | JB3            | A090314-2     | 2016-01-09       | 2019-01-08           |
| Sonoma Instrunent                          | Pre-amplifier                        | 310N           | 171205        | 2017-08-15       | 2018-08-14           |
| Rohde & Schwarz                            | Auto test Software                   | EMC32          | 100361        | /                | /                    |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-6        | 006           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-8        | 008           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-9        | 009           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-10       | 010           | 2017-08-15       | 2018-08-14           |
| Rohde & Schwarz                            | UNIVERSAL RADIO COMMUNICATION TESTER | CMU200         | 110605        | 2017-11-12       | 2018-11-11           |
| <b>Radiated Emission Test (Chamber 2#)</b> |                                      |                |               |                  |                      |
| HP                                         | Signal Generator                     | HP 8341B       | 2624A00116    | 2017-08-29       | 2018-08-28           |
| Rohde & Schwarz                            | EMI Test Receiver                    | ESU40          | 100207        | 2017-08-27       | 2018-08-26           |
| ETS-LINDGREN                               | Horn Antenna                         | 3115           | 9311-4159     | 2016-01-11       | 2019-01-10           |
| ETS-LINDGREN                               | Horn Antenna                         | 3115           | 6229          | 2016-01-11       | 2019-01-10           |
| ETS-LINDGREN                               | Horn Antenna                         | 3116           | 00084159      | 2016-10-18       | 2019-10-17           |
| ETS-LINDGREN                               | Horn Antenna                         | 3116           | 2516          | 2016-12-12       | 2019-12-12           |
| Narda                                      | Pre-amplifier                        | AFS42-00101800 | 2001270       | 2017-12-12       | 2018-12-11           |
| EM Electronics Corporation                 | Amplifier                            | EM18G40G       | 060726        | 2018-03-22       | 2019-03-21           |
| Rohde & Schwarz                            | Auto test Software                   | EMC32          | 100361        | /                | /                    |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-6        | 006           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-11       | 011           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-12       | 012           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-13       | 013           | 2017-08-15       | 2018-08-14           |
| MICRO-COAX                                 | Coaxial Cable                        | Cable-16       | 016           | 2017-08-15       | 2018-08-14           |
| Rohde & Schwarz                            | UNIVERSAL RADIO COMMUNICATION TESTER | CMU200         | 110605        | 2017-11-12       | 2018-11-11           |

| Manufacturer             | Description                          | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------------------|--------------------------------------|-------------|---------------|------------------|----------------------|
| <b>RF Conducted Test</b> |                                      |             |               |                  |                      |
| Rohde & Schwarz          | Signal Analyzer                      | FSIQ26      | 836131/009    | 2017-09-21       | 2018-09-20           |
| Rohde & Schwarz          | UNIVERSAL RADIO COMMUNICATION TESTER | CMU200      | 110605        | 2017-11-12       | 2018-11-11           |
| BACL                     | Temperature & Humidity Chamber       | BTH-150     | 30023         | 2017-10-10       | 2018-10-09           |
| EAST                     | Regulated DC Power Supply            | MCH-303D-II | 14070562      | 2017-10-10       | 2018-10-09           |
| MOBIWIRE                 | RF Cable                             | /           | /             | Each Time        | /                    |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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## **FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION**

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### **Applicable Standard**

FCC §1.1307, §2.1093.

### **Test Result**

Compliance, please refer to the SAR report: RSH180621050-20A.

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## **FCC §2.1047 - MODULATION CHARACTERISTIC**

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According to FCC § 2.1047(d), Part 22H & 24E, Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

**FCC §2.1046; § 22.913 (a); § 24.232 (c); §27.50 (d) - RF OUTPUT POWER****Applicable Standards**

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts (38.45dBm).

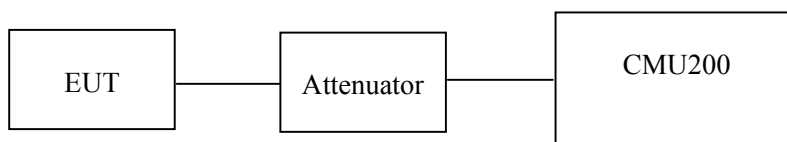
According to FCC §2.1046 and §24.232 (c), mobile and portable stations are limited to 2 watts (33dBm) EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

**Test Procedure*****Conducted method:***

The RF output of the transmitter was connected to the CMU200 through sufficient attenuation.

***Radiated Output Power:***

The measurements procedures specified in ANSI/TIA-603-D were applied.

- a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
- b) Key the transmitter, then rotate the EUT 360o azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
- c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
- d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.  $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:

$$\text{ERP (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$$

f) The maximum ERP is the maximum value determined in the preceding step.

(Note: Effective Isotropic Radiated Power (EIRP) can be computed using the following:

$$\text{EIRP (dBm)} = \text{ERP (dBm)} + 2.15 \text{ (dB)}$$

## Test Data

### Environmental Conditions

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 23.2℃    |
| <b>Relative Humidity:</b> | 51 %     |
| <b>ATM Pressure:</b>      | 101.3kPa |

The testing was performed by Mark Yu on 2018-06-26 & 2018-07-24.

### Conducted Power:

#### GSM 850 Band

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) | Limit (dBm) |
|------|---------|-----------------|----------------------------|-------------|
| GSM  | 128     | 824.2           | 31.89                      | 38.45       |
|      | 190     | 836.6           | 31.97                      | 38.45       |
|      | 251     | 848.8           | 31.76                      | 38.45       |

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) |         |         |         | Limit (dBm) |
|------|---------|-----------------|----------------------------|---------|---------|---------|-------------|
|      |         |                 | 1 slot                     | 2 slots | 3 slots | 4 slots |             |
| GPRS | 128     | 824.2           | 32.02                      | 31.30   | 29.38   | 28.13   | 38.45       |
|      | 190     | 836.6           | 32.05                      | 31.44   | 29.52   | 28.24   | 38.45       |
|      | 251     | 848.8           | 32.13                      | 31.54   | 29.61   | 28.44   | 38.45       |

**WCDMA Band V**

| Mode           | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) |                  |                |
|----------------|----------------|-----------|---------------|----------------------------|------------------|----------------|
|                |                |           |               | Low Frequency              | Middle Frequency | High Frequency |
| WCDMA (Band V) | Normal         | Rel 99    | 1             | 22.58                      | 22.61            | 22.54          |
|                |                | HSDPA     | 1             | 22.01                      | 22.39            | 22.17          |
|                |                |           | 2             | 22.13                      | 22.16            | 22.18          |
|                |                |           | 3             | 22.09                      | 22.15            | 22.12          |
|                |                |           | 4             | 22.07                      | 22.08            | 22.07          |
|                |                | HSUPA     | 1             | 22.27                      | 22.51            | 22.46          |
|                |                |           | 2             | 22.15                      | 22.29            | 22.18          |
|                |                |           | 3             | 22.17                      | 22.15            | 22.24          |
|                |                |           | 4             | 22.23                      | 22.38            | 22.29          |
|                |                |           | 5             | 22.16                      | 22.35            | 22.34          |
|                |                | HSPA+     | 1             | 22.16                      | 22.15            | 22.14          |

**PCS 1900 Band**

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) | Limit (dBm) |
|------|---------|-----------------|----------------------------|-------------|
| GSM  | 512     | 1850.2          | 29.09                      | 33          |
|      | 661     | 1880.0          | 29.24                      | 33          |
|      | 810     | 1909.8          | 29.16                      | 33          |

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) |         |         |         | Limit (dBm) |
|------|---------|-----------------|----------------------------|---------|---------|---------|-------------|
|      |         |                 | 1 slot                     | 2 slots | 3 slots | 4 slots |             |
| GPRS | 512     | 1850.2          | 29.26                      | 28.46   | 27.19   | 26.59   | 33          |
|      | 661     | 1880.0          | 29.15                      | 28.62   | 27.24   | 26.14   | 33          |
|      | 810     | 1909.8          | 29.03                      | 28.97   | 27.34   | 26.68   | 33          |

**WCDMA Band II**

| Mode            | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) |                  |                |
|-----------------|----------------|-----------|---------------|----------------------------|------------------|----------------|
|                 |                |           |               | Low Frequency              | Middle Frequency | High Frequency |
| WCDMA (Band II) | Normal         | Rel 99    | 1             | 22.56                      | 22.37            | 22.47          |
|                 |                | HSDPA     | 1             | 22.35                      | 22.06            | 21.70          |
|                 |                |           | 2             | 22.17                      | 22.09            | 22.01          |
|                 |                |           | 3             | 22.21                      | 22.13            | 22.06          |
|                 |                |           | 4             | 22.04                      | 22.07            | 22.12          |
|                 |                | HSUPA     | 1             | 22.38                      | 22.27            | 22.32          |
|                 |                |           | 2             | 21.87                      | 21.96            | 22.01          |
|                 |                |           | 3             | 21.96                      | 21.92            | 21.73          |
|                 |                |           | 4             | 21.87                      | 21.84            | 21.69          |
|                 |                |           | 5             | 21.92                      | 21.76            | 21.65          |
|                 |                | HSPA+     | 1             | 21.86                      | 21.82            | 21.95          |

**WCDMA Band IV**

| Mode            | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) |                  |                |
|-----------------|----------------|-----------|---------------|----------------------------|------------------|----------------|
|                 |                |           |               | Low Frequency              | Middle Frequency | High Frequency |
| WCDMA (Band IV) | Normal         | Rel 99    | 1             | 22.67                      | 22.36            | 22.46          |
|                 |                | HSDPA     | 1             | 22.38                      | 22.28            | 22.32          |
|                 |                |           | 2             | 22.23                      | 22.06            | 22.24          |
|                 |                |           | 3             | 22.15                      | 22.27            | 22.12          |
|                 |                |           | 4             | 22.16                      | 22.28            | 22.07          |
|                 |                | HSUPA     | 1             | 22.37                      | 22.42            | 22.42          |
|                 |                |           | 2             | 22.26                      | 22.23            | 22.28          |
|                 |                |           | 3             | 22.17                      | 22.31            | 22.29          |
|                 |                |           | 4             | 21.57                      | 22.19            | 22.28          |
|                 |                |           | 5             | 22.19                      | 22.12            | 22.25          |
|                 |                | HSPA+     | 1             | 22.16                      | 22.17            | 22.21          |

**Peak-to-average ratio (PAR):****PCS 1900 Band**

| Mode | Channel | PAR (dB) | Limit (dB) |
|------|---------|----------|------------|
| GSM  | Low     | 2.31     | 13         |
|      | Middle  | 2.22     | 13         |
|      | High    | 2.30     | 13         |

| Mode | Channel | PAR (dB) | Limit (dB) |
|------|---------|----------|------------|
| GPRS | Low     | 2.30     | 13         |
|      | Middle  | 2.27     | 13         |
|      | High    | 2.41     | 13         |

**WCDMA Band II**

| Mode          | Channel | PAR (dB) | Limit (dB) |
|---------------|---------|----------|------------|
| WCDMA (Rel99) | Low     | 2.61     | 13         |
|               | Middle  | 2.54     | 13         |
|               | High    | 2.63     | 13         |
| WCDMA (HSDPA) | Low     | 2.24     | 13         |
|               | Middle  | 2.30     | 13         |
|               | High    | 2.31     | 13         |
| WCDMA (HSUPA) | Low     | 2.33     | 13         |
|               | Middle  | 2.42     | 13         |
|               | High    | 2.44     | 13         |
| WCDMA (HSPA+) | Low     | 2.35     | 13         |
|               | Middle  | 2.42     | 13         |
|               | High    | 2.39     | 13         |

**WCDMA Band IV**

| Mode          | Channel | PAR (dB) | Limit (dB) |
|---------------|---------|----------|------------|
| WCDMA (Rel99) | Low     | 2.58     | 13         |
|               | Middle  | 2.59     | 13         |
|               | High    | 2.55     | 13         |
| WCDMA (HSDPA) | Low     | 2.34     | 13         |
|               | Middle  | 2.28     | 13         |
|               | High    | 2.26     | 13         |
| WCDMA (HSUPA) | Low     | 2.30     | 13         |
|               | Middle  | 2.41     | 13         |
|               | High    | 2.43     | 13         |
| WCDMA (HSPA+) | Low     | 2.33     | 13         |
|               | Middle  | 2.45     | 13         |
|               | High    | 2.37     | 13         |

**Radiated Power:****GSM Mode**

| Frequency<br>(MHz)                   | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                                      |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| GSM 850 Band, Middle Channel (ERP)   |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 836.60                               | 96.87                         | 185                          | 160            | H              | 33.18                       | 0.63                  | -1.14                        | 31.41                      | 38.45          | 7.04           |
| 836.60                               | 97.95                         | 209                          | 107            | V              | 30.80                       | 0.63                  | -1.14                        | 29.03                      | 38.45          | 9.42           |
| PCS 1900 Band, Middle Channel (EIRP) |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 1880.00                              | 93.24                         | 237                          | 220            | H              | 19.71                       | 0.85                  | 8.81                         | 27.67                      | 33             | 5.33           |
| 1880.00                              | 94.59                         | 154                          | 179            | V              | 20.63                       | 0.85                  | 8.81                         | 28.59                      | 33             | 4.41           |

**WCDMA Mode**

| Frequency<br>(MHz)                  | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|-------------------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                                     |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| WCDMA Band V, Middle Channel(ERP)   |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 836.60                              | 86.25                         | 149                          | 112            | H              | 22.56                       | 0.63                  | -1.14                        | 20.79                      | 38.45          | 17.66          |
| 836.60                              | 90.17                         | 164                          | 228            | V              | 23.02                       | 0.63                  | -1.14                        | 21.25                      | 38.45          | 17.20          |
| WCDMA Band II, Middle Channel(EIRP) |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 1880.00                             | 84.27                         | 156                          | 200            | H              | 10.74                       | 0.85                  | 8.81                         | 18.70                      | 33             | 14.30          |
| 1880.00                             | 86.53                         | 111                          | 237            | V              | 12.57                       | 0.85                  | 8.81                         | 20.53                      | 33             | 12.47          |
| WCDMA Band IV, Middle Channel(EIRP) |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 1732.60                             | 85.56                         | 157                          | 168            | H              | 11.13                       | 0.84                  | 8.57                         | 18.86                      | 30             | 11.14          |
| 1732.60                             | 87.74                         | 67                           | 199            | V              | 12.83                       | 0.84                  | 8.57                         | 20.56                      | 30             | 9.44           |

**Note:**

All above data were tested without amplifier.

Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)

Margin (dB) = Limit (dBm) - Absolute Level (dBm)

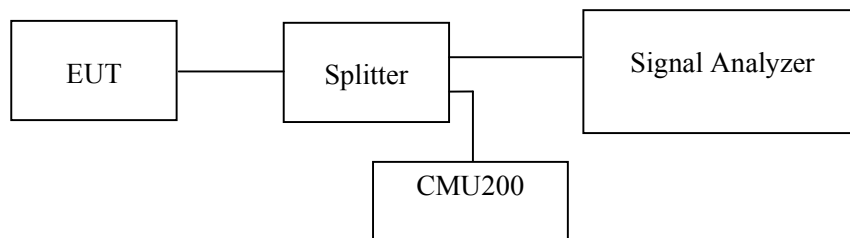
**FCC §2.1049, §22.917, §22.905 & §24.238; §27.53- OCCUPIED BANDWIDTH****Applicable Standards**

FCC 47 §2.1049, §22.917, §22.905 & §24.238 and §27.53.

**Test Procedure**

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) & 100 kHz (WCDMA), and the 26 dB & 99% bandwidth was recorded.

**Test Data****Environmental Conditions**

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 23.2℃    |
| <b>Relative Humidity:</b> | 51 %     |
| <b>ATM Pressure:</b>      | 101.3kPa |

The testing was performed by Mark Yu from 2018-06-26 to 2018-08-16.

EUT operation mode: Transmitting

Test Result: Compliance.

**GSM 850 Band**

| Mode        | Frequency (MHz) | 26 dB Emission Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|-------------|-----------------|--------------------------------|------------------------------|
| GSM (GMSK)  | 836.6           | 0.317                          | 0.246                        |
| GPRS (GMSK) | 836.6           | 0.323                          | 0.244                        |

**WCDMA Band V**

| <b>Mode</b>    | <b>Frequency (MHz)</b> | <b>26 dB Emission Bandwidth (MHz)</b> | <b>99% Occupied Bandwidth (MHz)</b> |
|----------------|------------------------|---------------------------------------|-------------------------------------|
| WCDMA (Rel 99) | 836.6                  | 4.709                                 | 4.148                               |
| WCDMA (HSDPA)  | 836.6                  | 4.729                                 | 4.148                               |
| WCDMA (HSUPA)  | 836.6                  | 4.709                                 | 4.148                               |
| WCDMA (HSPA+)  | 836.6                  | 4.709                                 | 4.148                               |

**PCS 1900 Band**

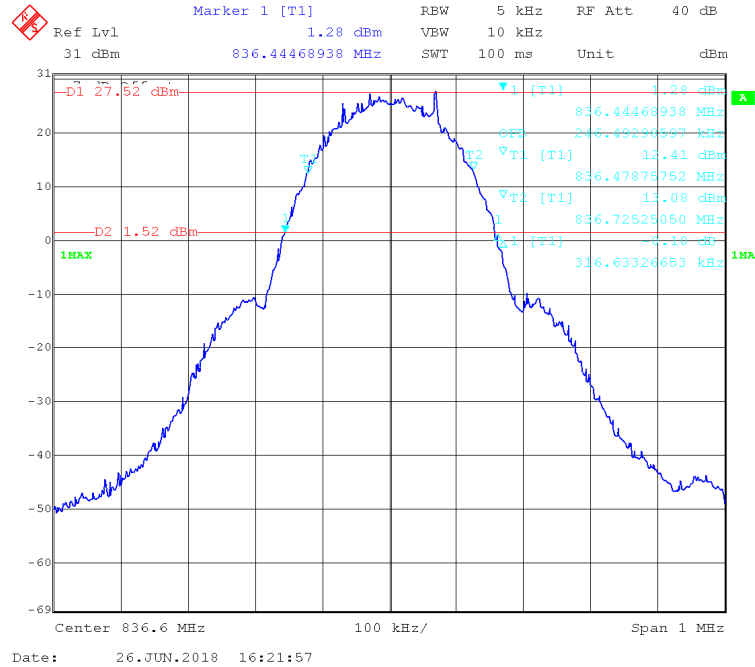
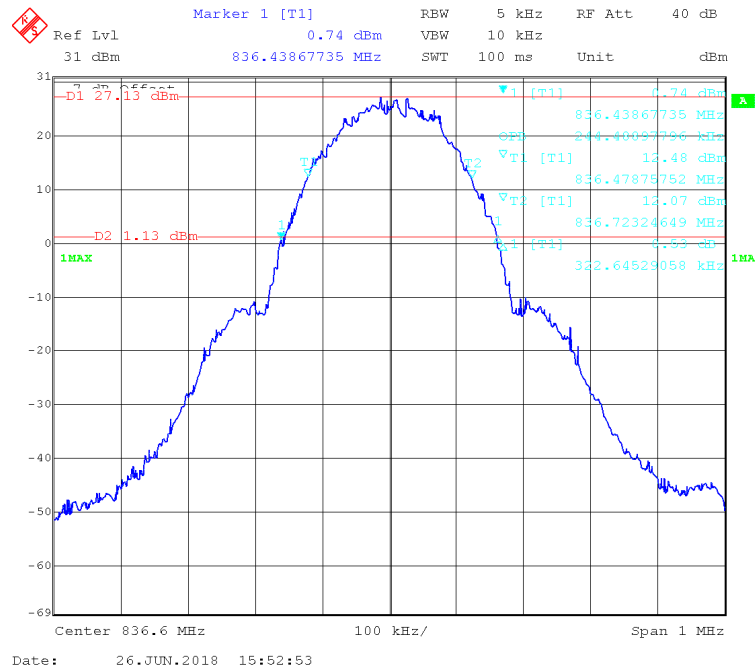
| <b>Mode</b> | <b>Frequency (MHz)</b> | <b>26 dB Emission Bandwidth (MHz)</b> | <b>99% Occupied Bandwidth (MHz)</b> |
|-------------|------------------------|---------------------------------------|-------------------------------------|
| GSM (GMSK)  | 1880.0                 | 0.317                                 | 0.244                               |
| GPRS (GMSK) | 1880.0                 | 0.317                                 | 0.242                               |

**WCDMA Band II**

| <b>Mode</b>    | <b>Frequency (MHz)</b> | <b>26 dB Emission Bandwidth (MHz)</b> | <b>99% Occupied Bandwidth (MHz)</b> |
|----------------|------------------------|---------------------------------------|-------------------------------------|
| WCDMA (Rel 99) | 1880.0                 | 4.729                                 | 4.168                               |
| WCDMA (HSDPA)  | 1880.0                 | 4.749                                 | 4.168                               |
| WCDMA (HSUPA)  | 1880.0                 | 4.709                                 | 4.188                               |
| WCDMA (HSPA+)  | 1880.0                 | 4.749                                 | 4.188                               |

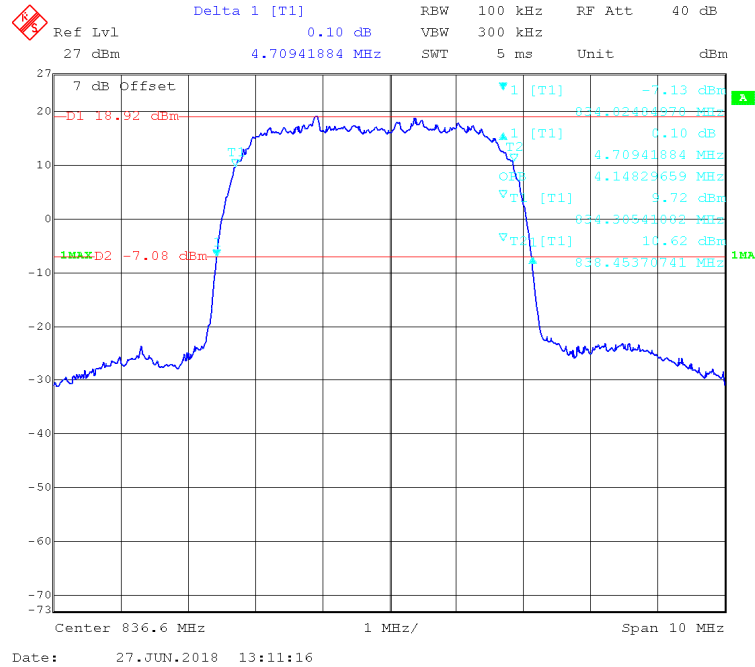
**WCDMA Band IV**

| <b>Mode</b>    | <b>Frequency (MHz)</b> | <b>26 dB Emission Bandwidth (MHz)</b> | <b>99% Occupied Bandwidth (MHz)</b> |
|----------------|------------------------|---------------------------------------|-------------------------------------|
| WCDMA (Rel 99) | 1732.6                 | 4.729                                 | 4.168                               |
| WCDMA (HSDPA)  | 1732.6                 | 4.749                                 | 4.168                               |
| WCDMA (HSUPA)  | 1732.6                 | 4.749                                 | 4.168                               |
| WCDMA (HSPA+)  | 1732.6                 | 4.749                                 | 4.188                               |

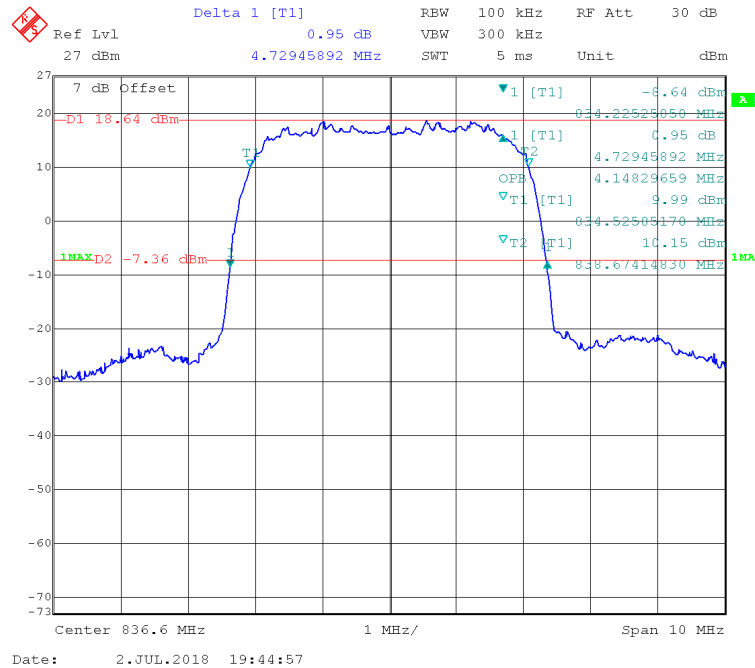
**GSM 850 Band****99% Occupied & 26 dB Emissions Bandwidth for GSM (GMSK) Mode****99% Occupied & 26 dB Emissions Bandwidth for GPRS (GMSK) Mode**

## WCDMA Band V

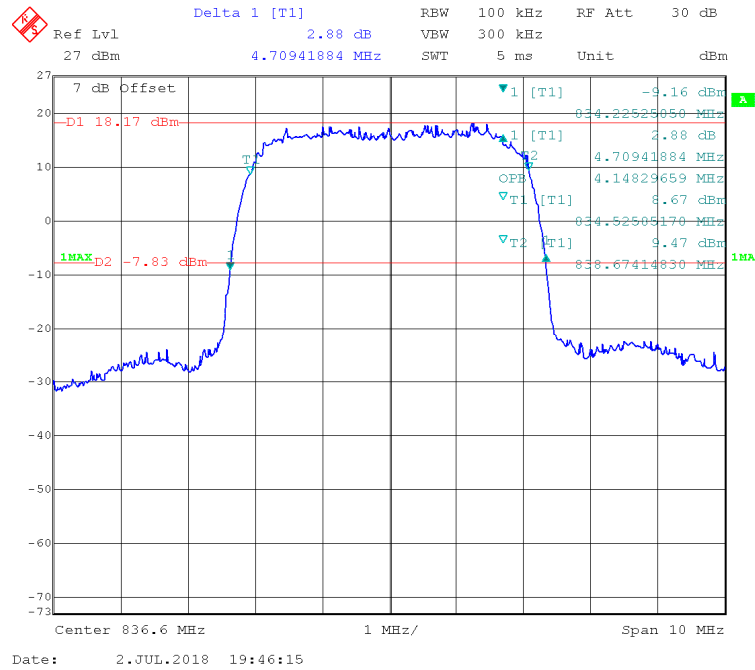
## 99% Occupied &amp; 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



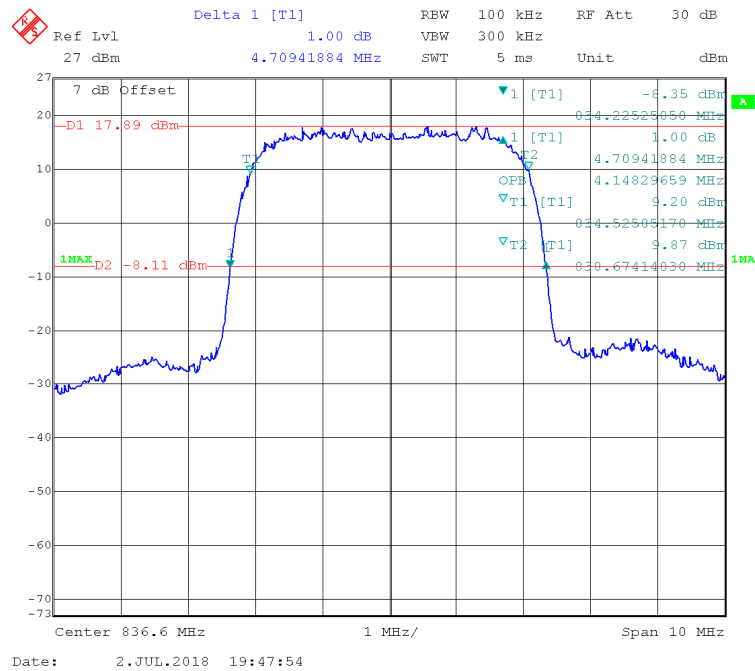
## 99% Occupied &amp; 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode



### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSUPA) Mode

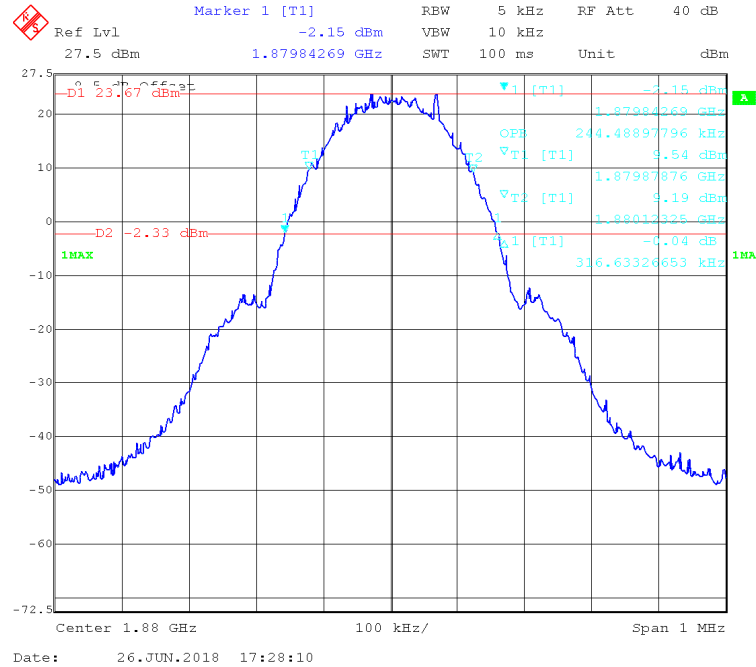


### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode

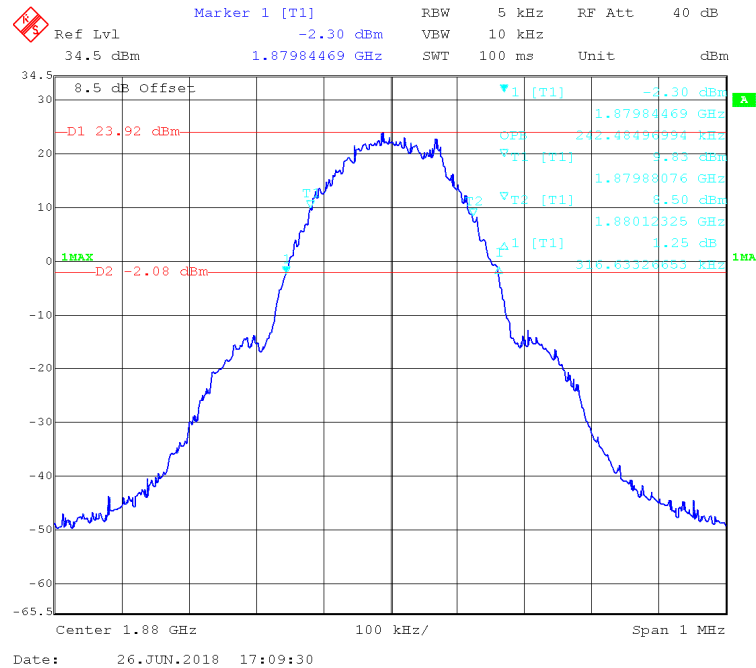


PCS 1900 Band

99% Occupied & 26 dB Emissions Bandwidth for GSM (GMSK) Mode

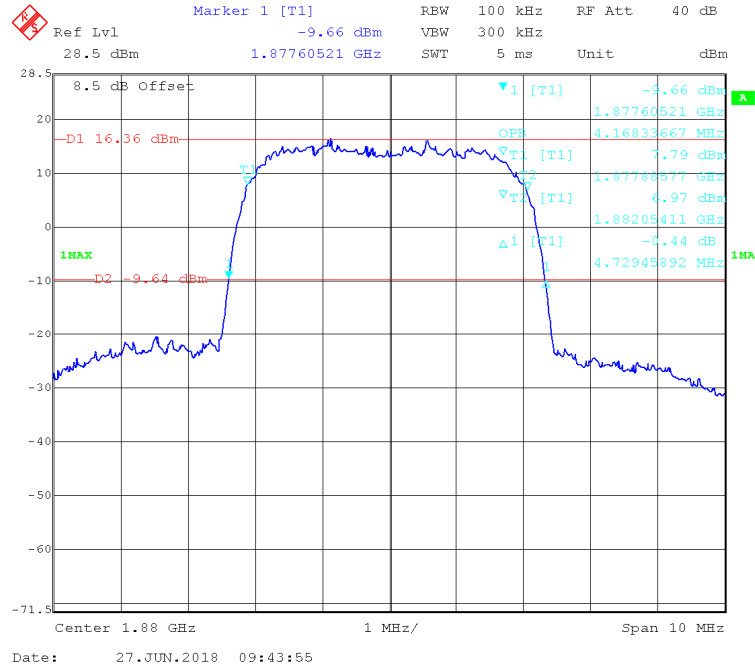


99% Occupied & 26 dB Emissions Bandwidth for GPRS (GMSK) Mode

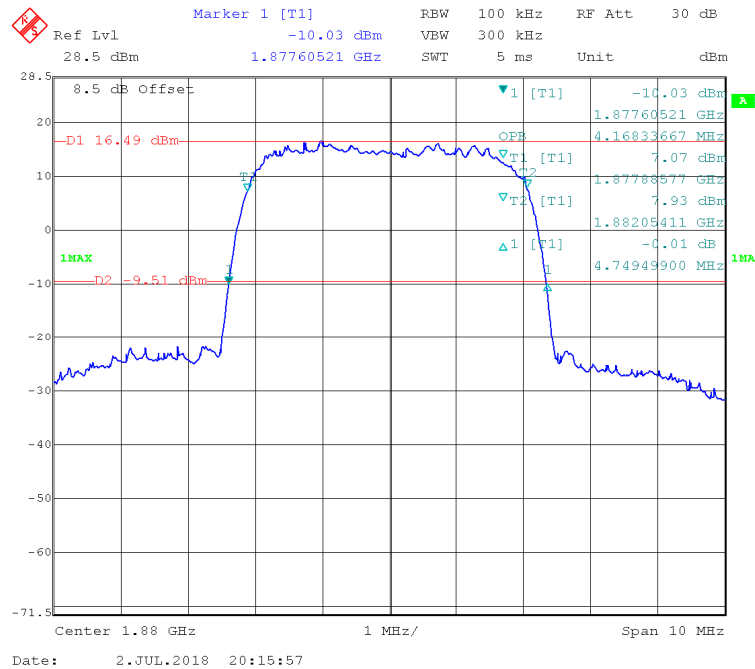


# WCDMA Band II

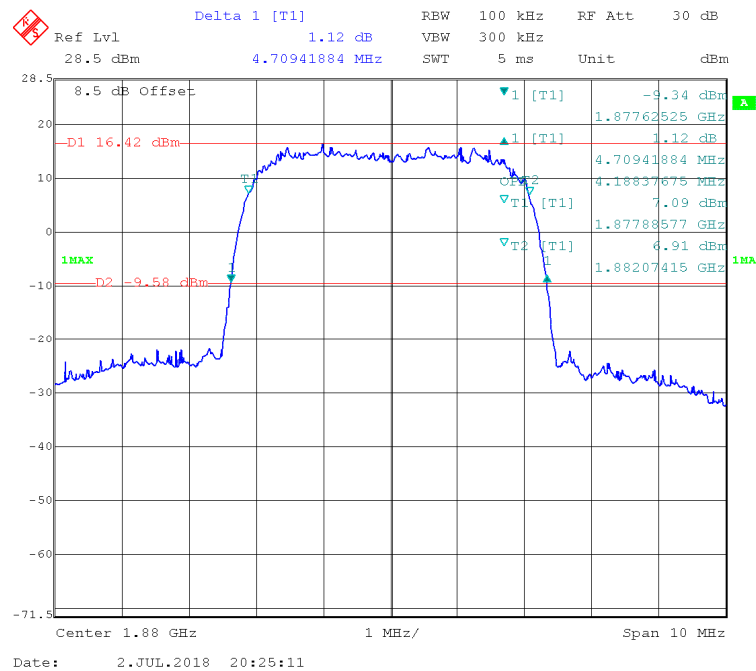
## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



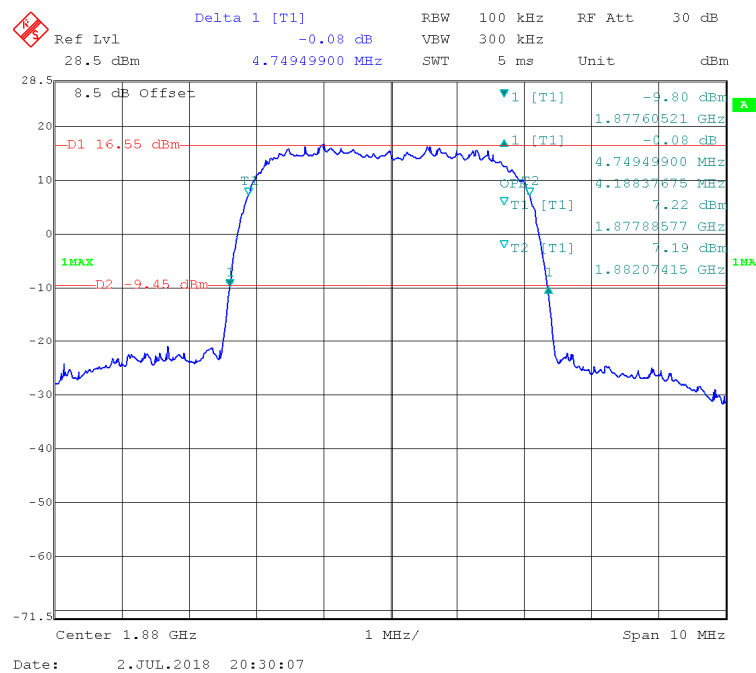
## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode



### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSUPA) Mode

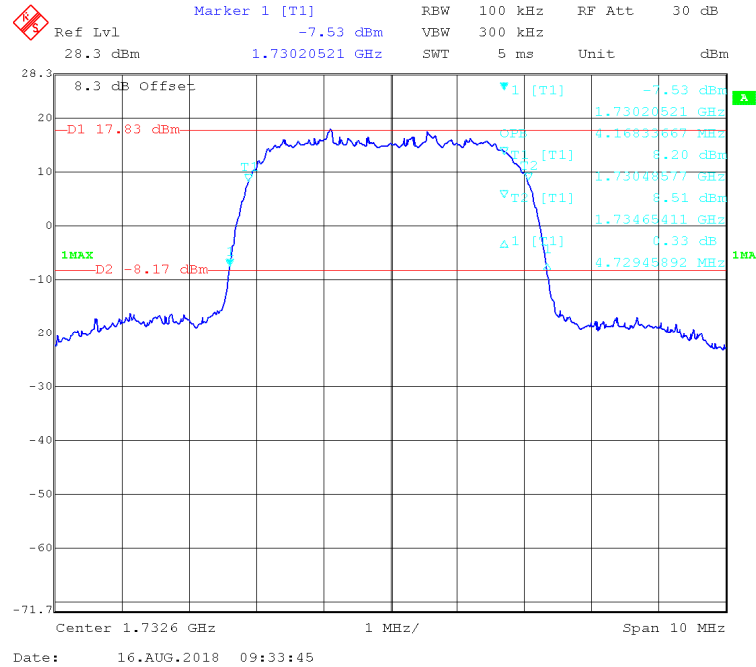


### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode

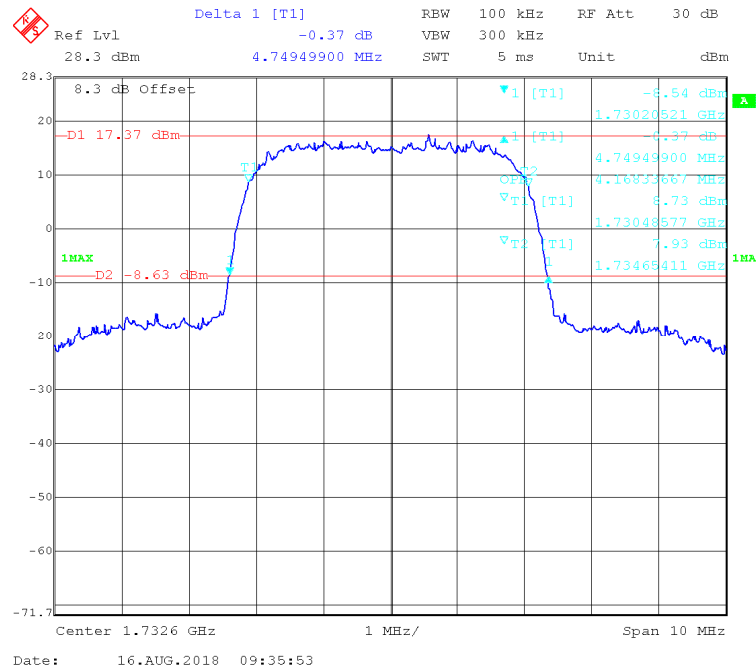


# WCDMA Band IV

## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode



**Marker 1 [T1]**  
 Ref Lvl -8.24 dBm  
 28.3 dBm  
 1.73020521 GHz

RBW 100 kHz  
 VBW 300 kHz  
 SWT 5 ms  
 RF Att 30 dB  
 Unit dBm

8.3 dB Offset  
 D1 17.76 dBm  
 D2 -8.24 dBm  
 1MAX  
 1.7326 GHz  
 1 MHz/  
 Span 10 MHz

-8.24 dBm  
 1.73020521 GHz  
 4.16833667 MHz  
 8.25 dBm  
 1.73048577 GHz  
 8.13 dBm  
 1.73465411 GHz  
 -0.01 dB  
 4.74949900 MHz

Delta 1 [T1] 0.33 dB RBW 100 kHz RF Att 30 dB  
 Ref Lvl 28.3 dBm 4.74949900 MHz SWT 5 ms Unit dBm

8.3 dB Offset  
 -D1 17.33 dBm  
 1MAX -8.67 dBm  
 T1  
 T2  
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## FCC § 2.1051; § 22.917 (a); § 24.238 (a); §27.53 (h) (m) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

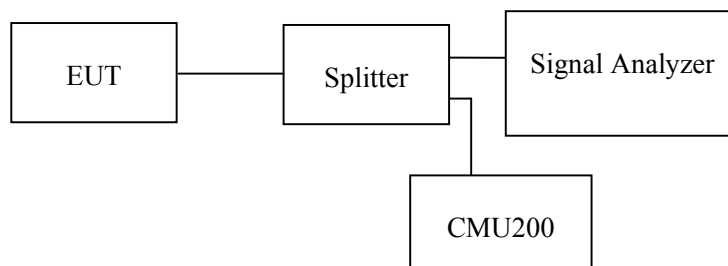
### Applicable Standards

FCC §2.1051, §22.917(a) and §24.238(a) and §27.53(h) (m).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

### Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz & 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.



### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 23.2°C   |
| Relative Humidity: | 51 %     |
| ATM Pressure:      | 101.3kPa |

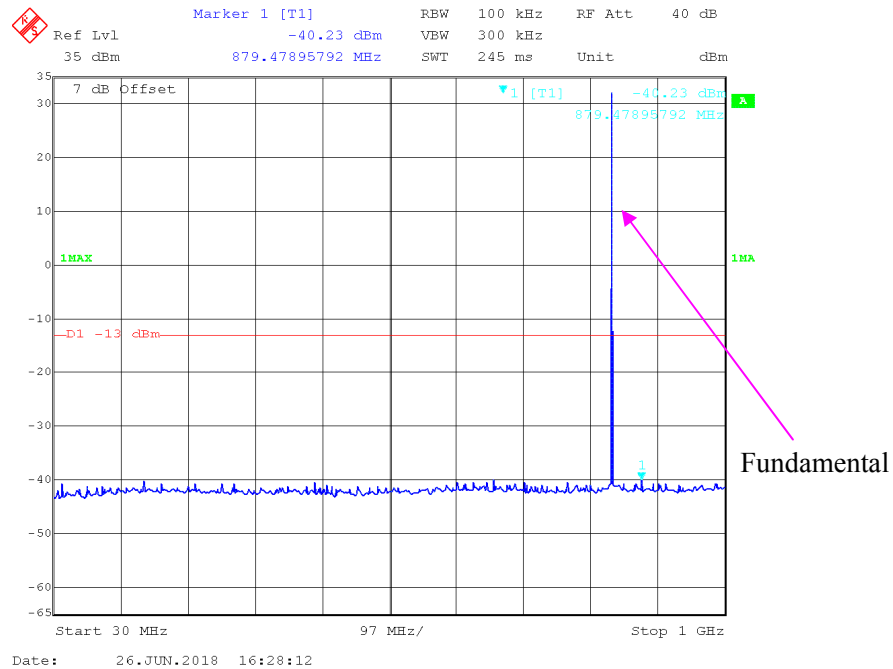
The testing was performed by Mark Yu from 2018-06-26 to 2018-07-21.

EUT operation mode: Transmitting

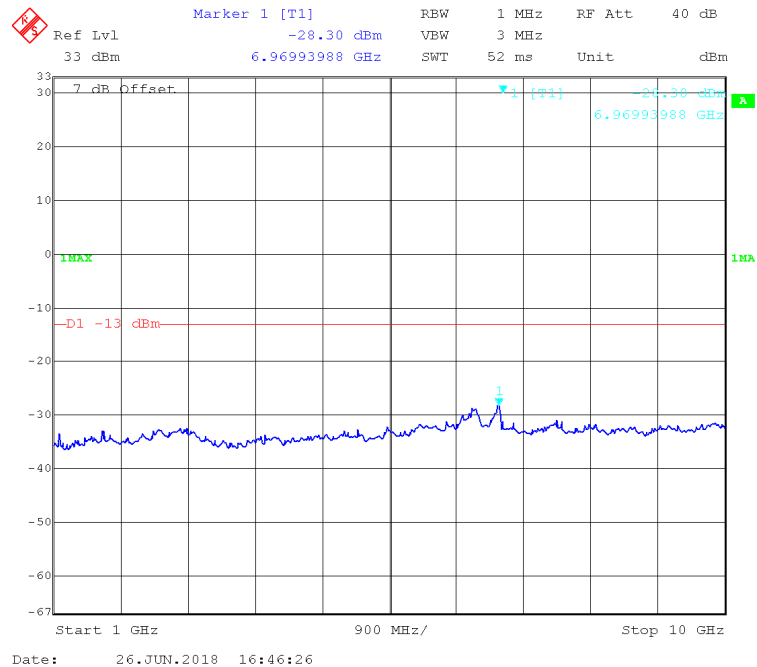
Test Result: Compliance.

**GSM 850 Band:**

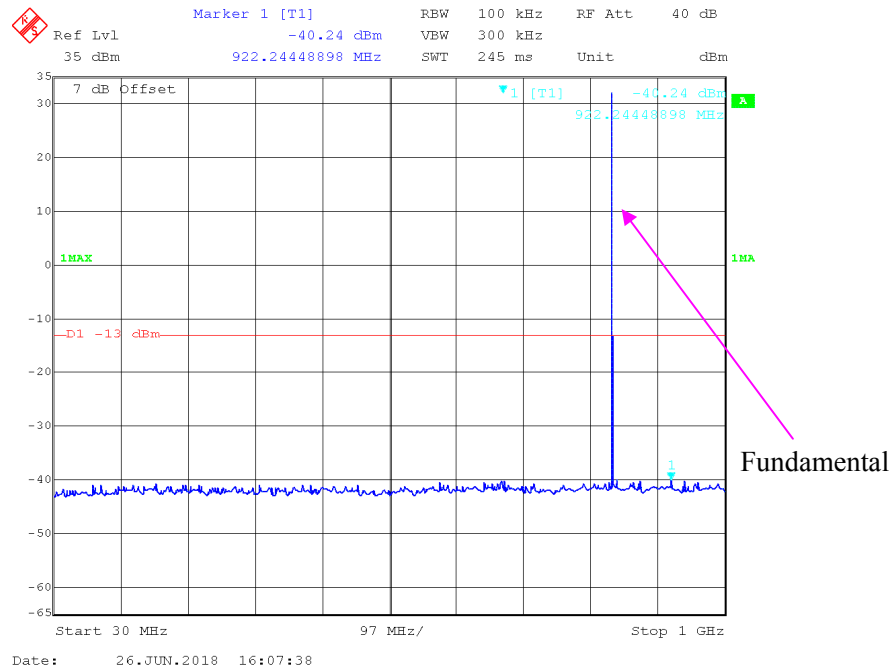
**30 MHz – 1GHz(GSM Mode)**



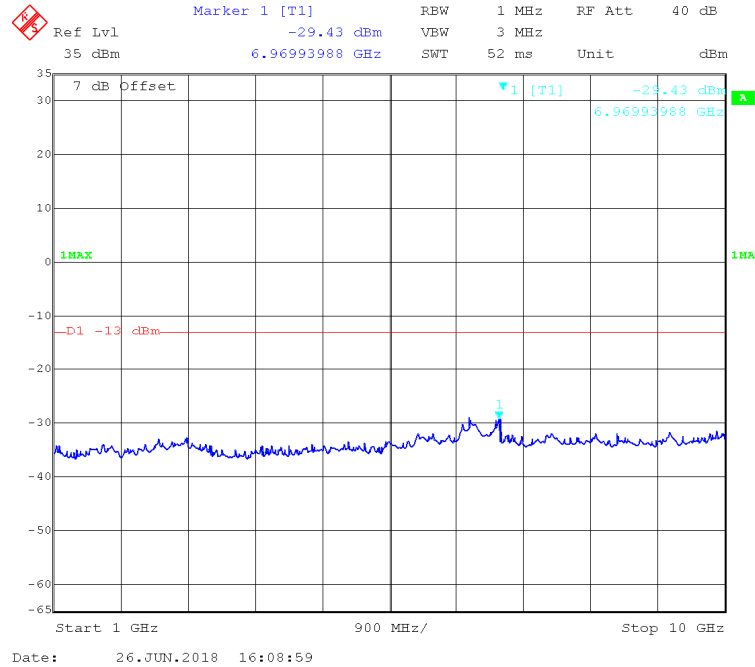
**1 GHz – 10 GHz (GSM Mode)**



### 30 MHz – 1GHz(GPRS Mode)

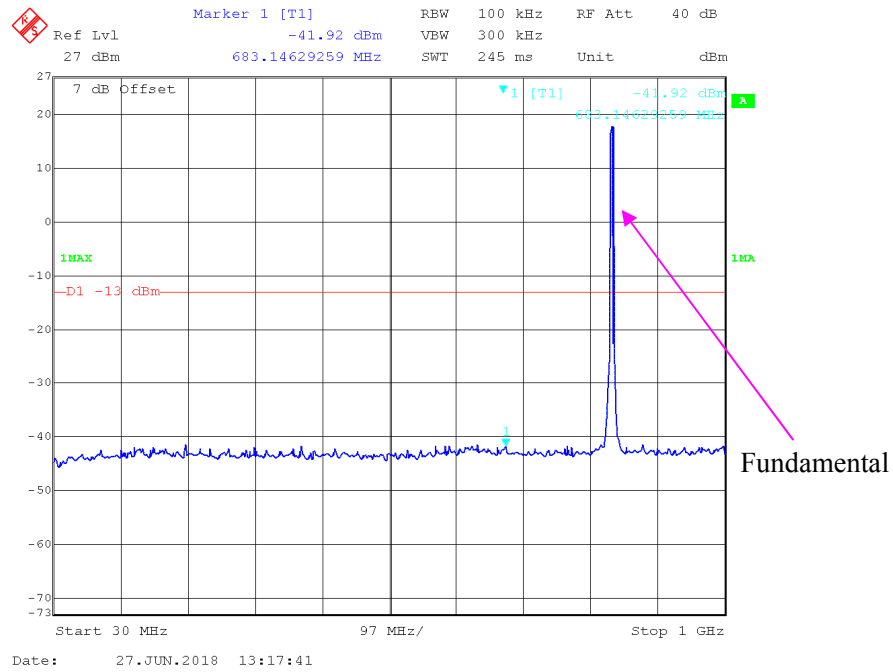


### 1 GHz – 10 GHz (GPRS Mode)

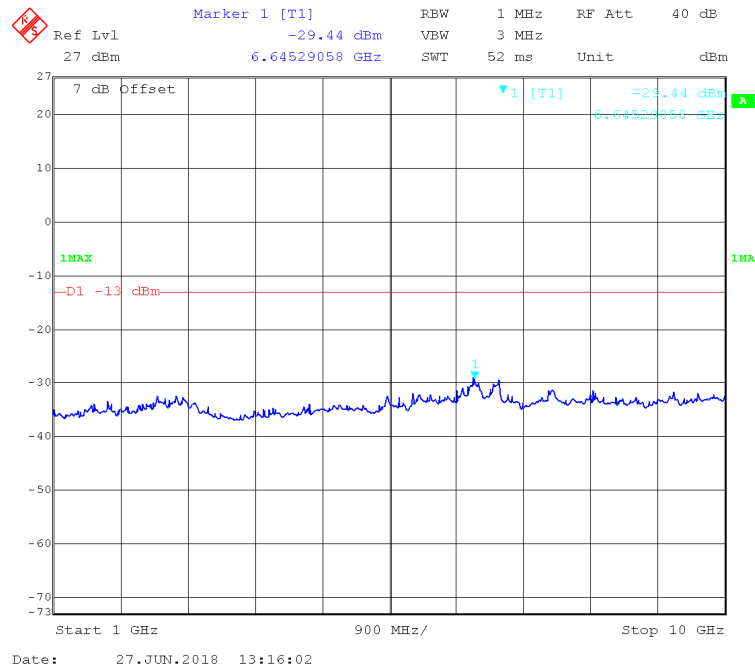


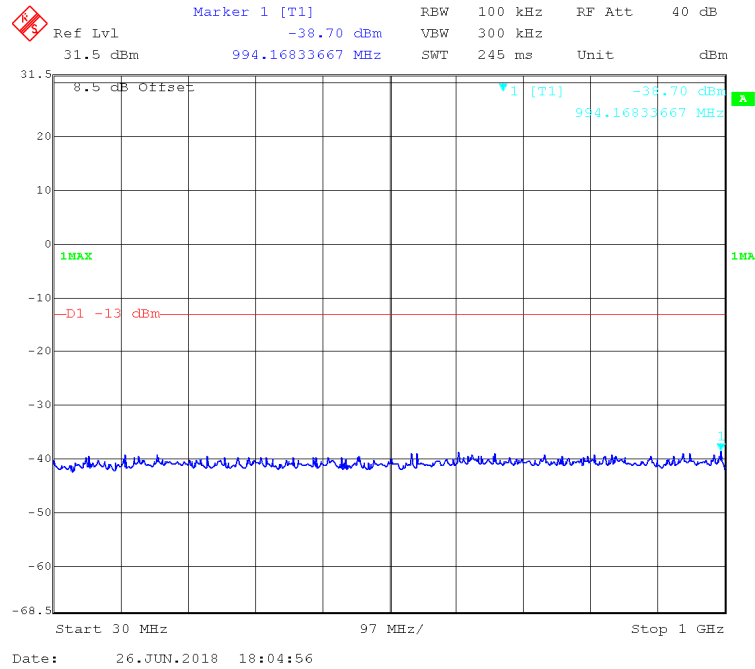
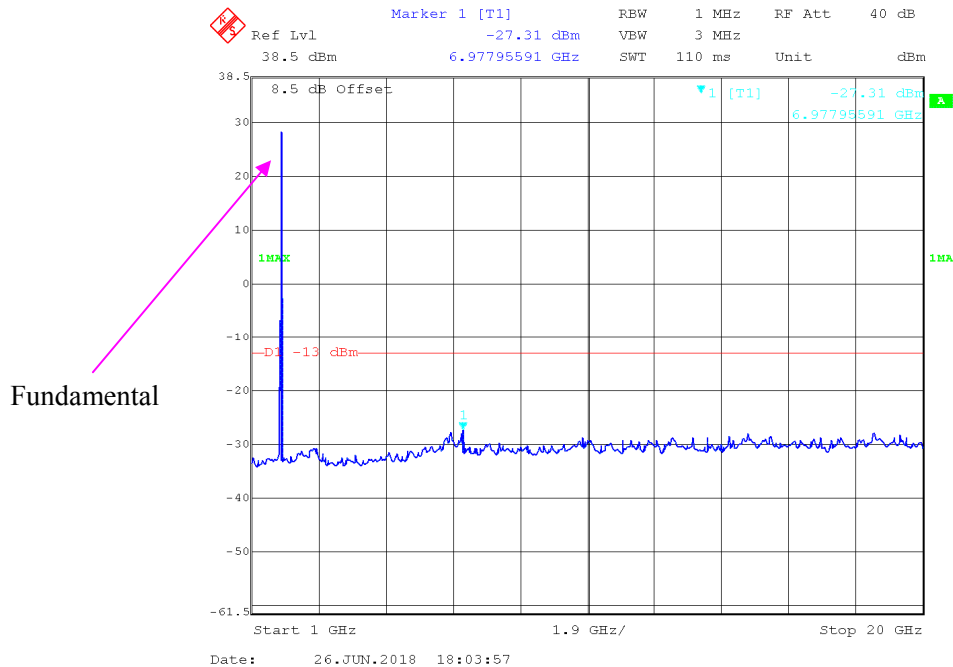
**WCDMA Band V:**

**30 MHz – 1GHz(WCDMA Mode)**

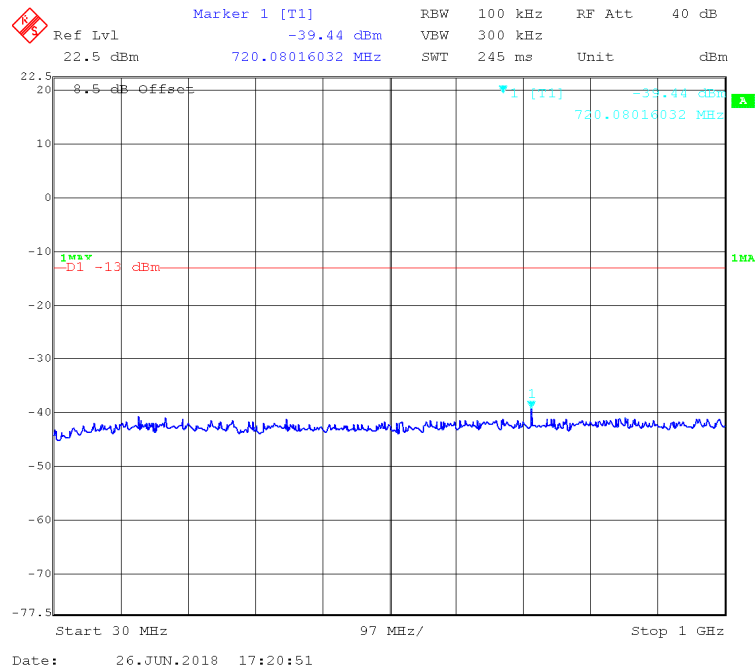


**1 GHz – 10 GHz (WCDMA Mode)**

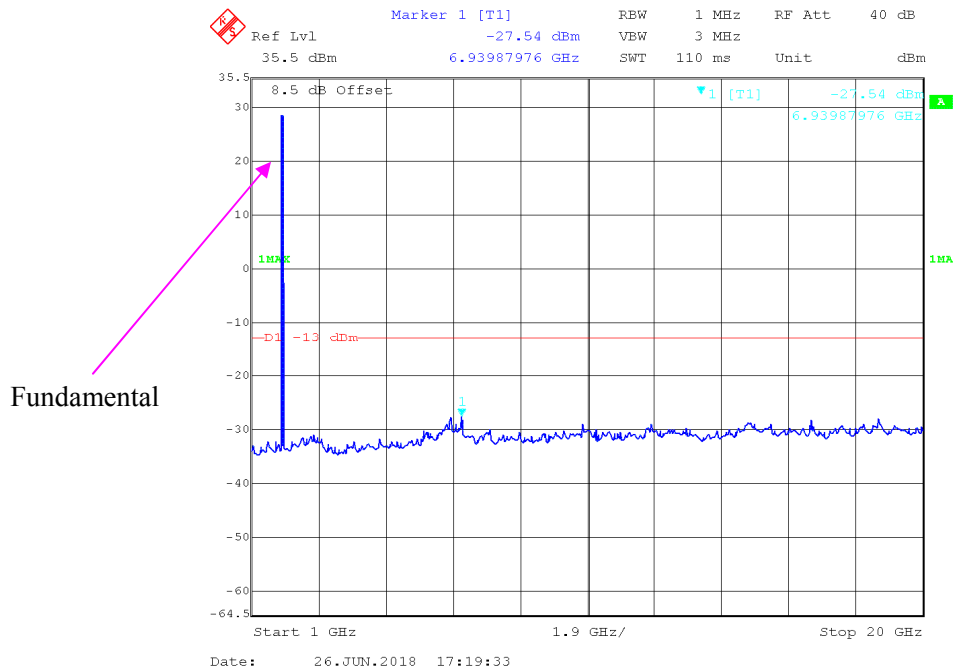


**PCS 1900 Band:****30 MHz – 1GHz(GSM Mode)****1 GHz – 20 GHz (GSM Mode)**

### 30 MHz – 1GHz(GPRS Mode)

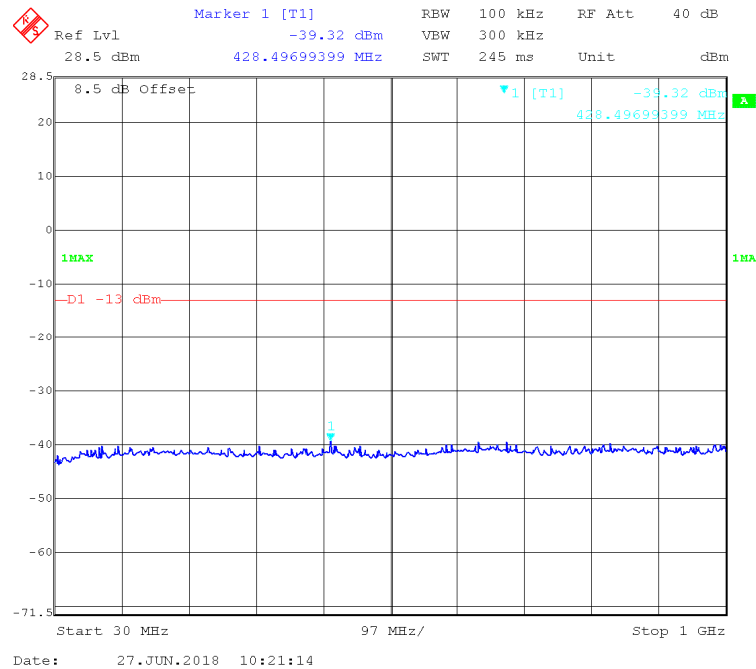


### 1 GHz – 20 GHz (GPRS Mode)

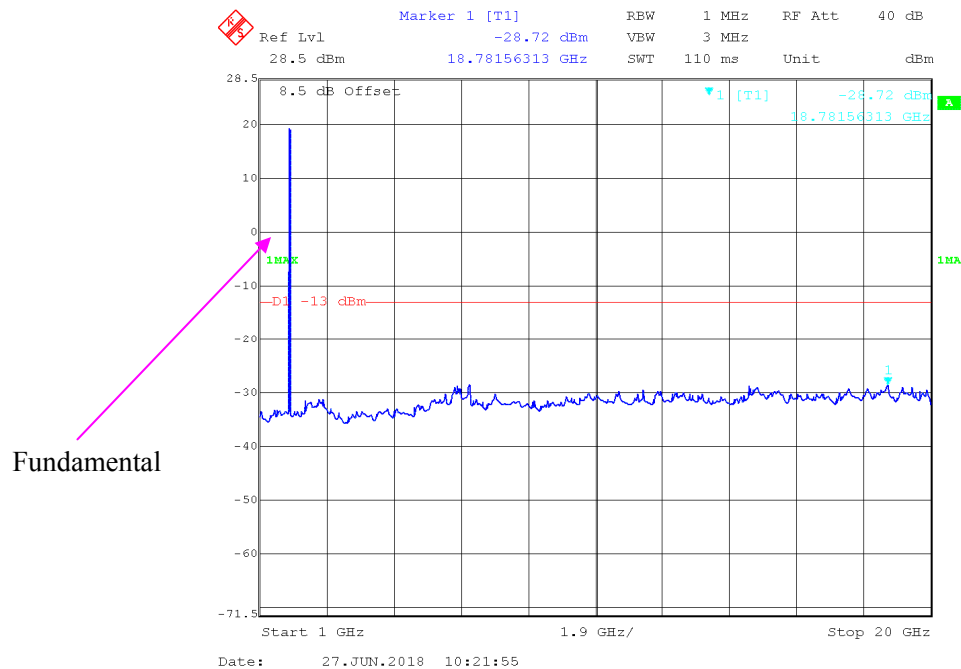


## WCDMA Band II:

### 30 MHz – 1GHz(WCDMA Mode)

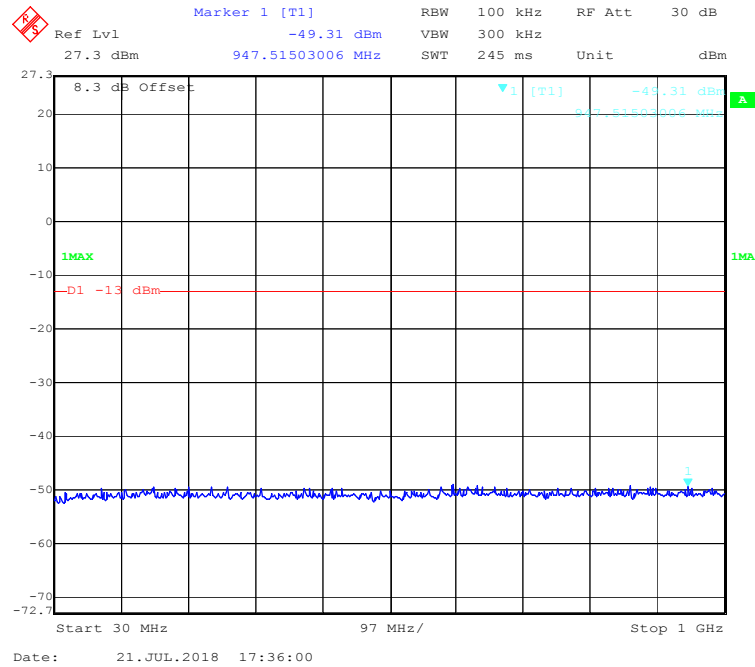


### 1 GHz – 20 GHz (WCDMA Mode)

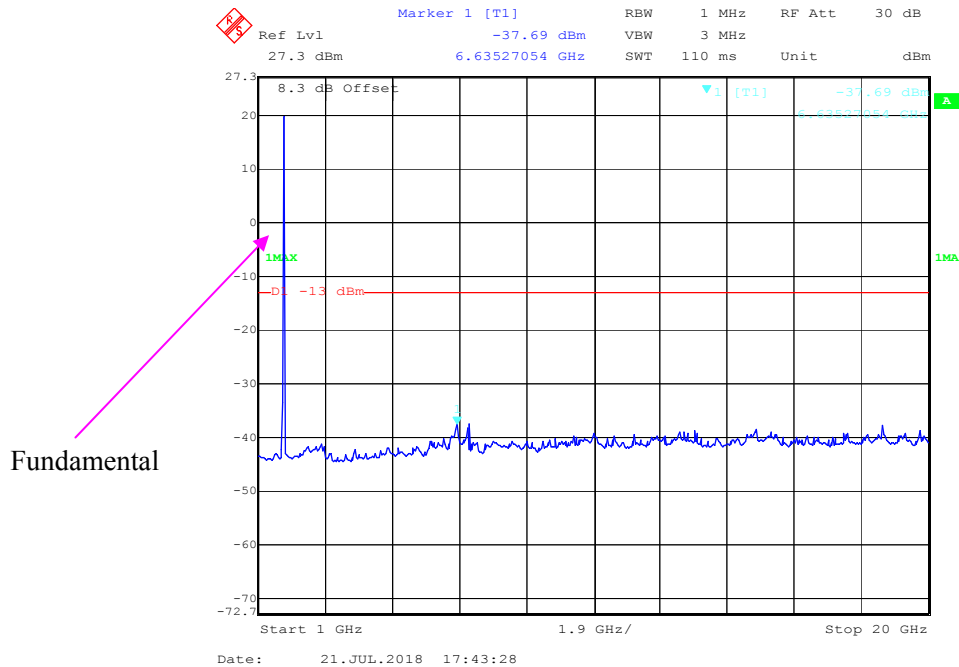


**WCDMA Band IV:**

**30 MHz – 1GHz(WCDMA Mode)**



**1 GHz – 20 GHz (WCDMA Mode)**



## **FCC § 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (h) (m) - SPURIOUS RADIATED EMISSIONS**

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### **Applicable Standards**

FCC § 2.1053, §22.917(a) and § 24.238(a) and § 27.53(h) (m)

22.917 (a) Out of band emissions. 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.

24.238 (a) Out of band emissions. 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.

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

### **Test Procedure**

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg (\text{TX pwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \text{Log}_{10} (\text{power out in Watts})$

**Test Data****Environmental Conditions**

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 23.2°C   |
| <b>Relative Humidity:</b> | 51 %     |
| <b>ATM Pressure:</b>      | 101.3kPa |

The testing was performed by Mark Yu on 2018-06-26 & 2018-07-24.

Test mode: Transmitting (Pre-scan with low, middle and high channels, and the worse case data as below)

**30 MHz ~ 10 GHz:****GSM 850 Band**

| Frequency<br>(MHz)       | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                          |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| GSM Mode, Middle channel |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 479.21                   | 49.25                         | 337                          | 243            | H              | -51.93                      | 0.56                  | -1.83                        | -54.32                     | -13            | 41.32          |
| 479.21                   | 51.25                         | 255                          | 225            | V              | -51.67                      | 0.56                  | -1.83                        | -54.06                     | -13            | 41.06          |
| 1673.20                  | 53.28                         | 3                            | 232            | H              | -50.11                      | 0.84                  | 8.48                         | -42.47                     | -13            | 29.47          |
| 1673.20                  | 56.49                         | 72                           | 247            | V              | -46.07                      | 0.84                  | 8.48                         | -38.43                     | -13            | 25.43          |
| 2509.80                  | 58.26                         | 19                           | 244            | H              | -42.68                      | 0.89                  | 10.09                        | -33.48                     | -13            | 20.48          |
| 2509.80                  | 61.28                         | 21                           | 219            | V              | -39.66                      | 0.89                  | 10.09                        | -30.46                     | -13            | 17.46          |

**WCDMA Band V**

| Frequency<br>(MHz)         | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|----------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                            |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| WCDMA Mode, Middle channel |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 478.19                     | 50.11                         | 180                          | 229            | H              | -50.98                      | 0.56                  | -1.82                        | -53.36                     | -13            | 40.36          |
| 478.19                     | 53.45                         | 81                           | 222            | V              | -49.51                      | 0.56                  | -1.82                        | -51.89                     | -13            | 38.89          |
| 1673.20                    | 54.83                         | 63                           | 156            | H              | -48.56                      | 0.84                  | 8.48                         | -40.92                     | -13            | 27.92          |
| 1673.20                    | 56.19                         | 1                            | 204            | V              | -46.37                      | 0.84                  | 8.48                         | -38.73                     | -13            | 25.73          |
| 2509.80                    | 62.46                         | 317                          | 166            | H              | -38.48                      | 0.89                  | 10.09                        | -29.28                     | -13            | 16.28          |
| 2509.80                    | 64.79                         | 97                           | 199            | V              | -36.15                      | 0.89                  | 10.09                        | -26.95                     | -13            | 13.95          |

**30 MHz ~ 20 GHz:****PCS 1900 Band**

| Frequency<br>(MHz)       | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                          |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| GSM Mode, Middle channel |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 480.57                   | 46.24                         | 11                           | 198            | H              | -55.07                      | 0.56                  | -1.83                        | -57.46                     | -13            | 44.46          |
| 480.57                   | 49.77                         | 227                          | 224            | V              | -53.09                      | 0.56                  | -1.83                        | -55.48                     | -13            | 42.48          |
| 3760.00                  | 51.19                         | 308                          | 170            | H              | -52.50                      | 0.95                  | 9.74                         | -43.71                     | -13            | 30.71          |
| 3760.00                  | 53.83                         | 138                          | 204            | V              | -50.18                      | 0.95                  | 9.74                         | -41.39                     | -13            | 28.39          |
| 5640.00                  | 56.41                         | 112                          | 178            | H              | -44.10                      | 1.15                  | 10.47                        | -34.78                     | -13            | 21.78          |
| 5640.00                  | 59.28                         | 211                          | 238            | V              | -41.53                      | 1.15                  | 10.47                        | -32.21                     | -13            | 19.21          |

**WCDMA Band II**

| Frequency<br>(MHz)         | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|----------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                            |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| WCDMA Mode, Middle channel |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 479.87                     | 47.56                         | 18                           | 165            | H              | -53.68                      | 0.56                  | -1.83                        | -56.07                     | -13            | 43.07          |
| 479.87                     | 48.13                         | 205                          | 160            | V              | -54.76                      | 0.56                  | -1.83                        | -57.15                     | -13            | 44.15          |
| 3760.00                    | 50.36                         | 242                          | 137            | H              | -53.33                      | 0.95                  | 9.74                         | -44.54                     | -13            | 31.54          |
| 3760.00                    | 54.57                         | 12                           | 182            | V              | -49.44                      | 0.95                  | 9.74                         | -40.65                     | -13            | 27.65          |
| 5640.00                    | 55.76                         | 239                          | 227            | H              | -44.75                      | 1.15                  | 10.47                        | -35.43                     | -13            | 22.43          |
| 5640.00                    | 56.49                         | 352                          | 110            | V              | -44.32                      | 1.15                  | 10.47                        | -35.00                     | -13            | 22.00          |

**WCDMA Band IV**

| Frequency<br>(MHz)         | Receiver<br>Reading<br>(dBμV) | Turntable<br>Angle<br>Degree | Rx Antenna     |                | Substituted                 |                       |                              | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|----------------------------|-------------------------------|------------------------------|----------------|----------------|-----------------------------|-----------------------|------------------------------|----------------------------|----------------|----------------|
|                            |                               |                              | Height<br>(cm) | Polar<br>(H/V) | Submitted<br>Level<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd/dBi) |                            |                |                |
| WCDMA Mode, Middle channel |                               |                              |                |                |                             |                       |                              |                            |                |                |
| 479.75                     | 47.69                         | 174                          | 215            | H              | -53.55                      | 0.56                  | -1.83                        | -55.94                     | -13            | 42.94          |
| 479.75                     | 48.42                         | 194                          | 185            | V              | -54.47                      | 0.56                  | -1.83                        | -56.86                     | -13            | 43.86          |
| 3465.20                    | 50.55                         | 64                           | 243            | H              | -54.24                      | 0.93                  | 9.87                         | -45.30                     | -13            | 32.30          |
| 3465.20                    | 54.37                         | 259                          | 228            | V              | -50.85                      | 0.93                  | 9.87                         | -41.91                     | -13            | 28.91          |
| 5197.80                    | 55.58                         | 221                          | 196            | H              | -46.50                      | 1.10                  | 10.30                        | -37.30                     | -13            | 24.30          |
| 5197.80                    | 56.63                         | 152                          | 102            | V              | -45.65                      | 1.10                  | 10.30                        | -36.45                     | -13            | 23.45          |

**Note:**

- 1) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
- 2) Margin (dB) = Limit (dBm) - Absolute Level (dBm)

**FCC § 22.917 (a); § 24.238 (a); §27.53 (h) (m) - BAND EDGES****Applicable Standards**

According to § 22.917(a), the power of any emissions 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.

According to §24.238(a), the power of any emissions 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.

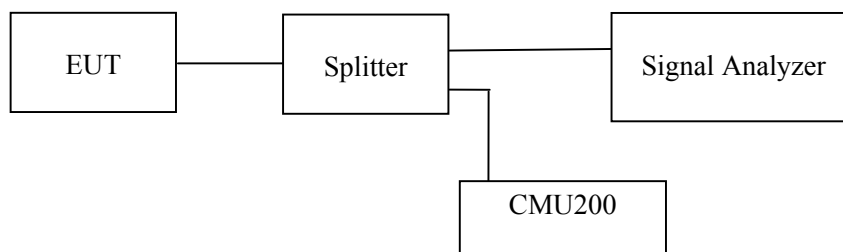
According to FCC §27.53 (h) (m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

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

**Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.



**Test Data****Environmental Conditions**

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 23.2℃    |
| <b>Relative Humidity:</b> | 51 %     |
| <b>ATM Pressure:</b>      | 101.3kPa |

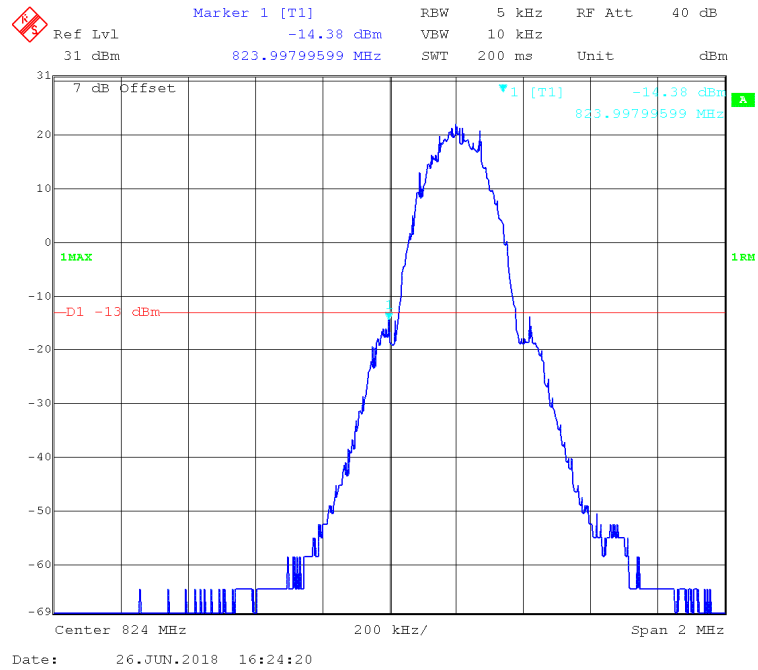
*The testing was performed by Mark Yu from 2018-06-26 to 2018-07-21.*

*EUT operation mode: Transmitting*

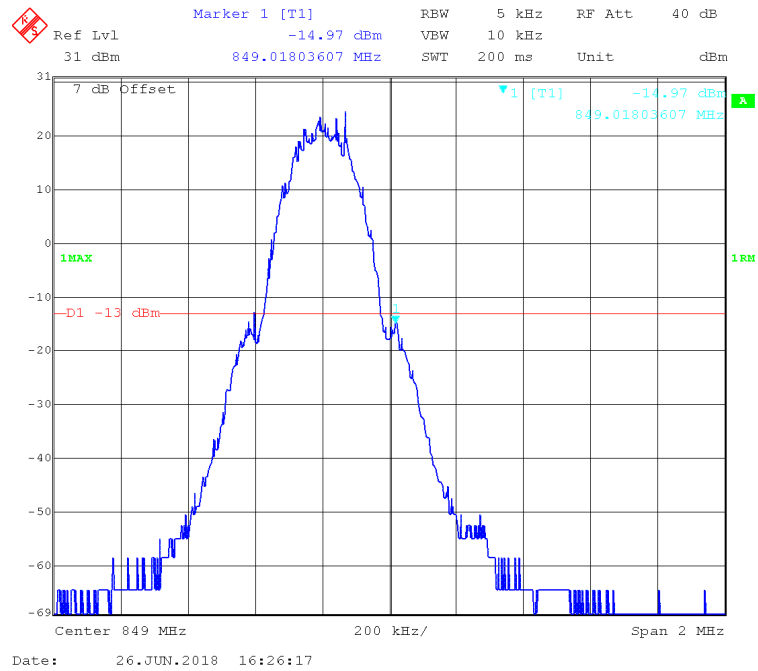
Test Result: Compliance.

## GSM 850 Band:

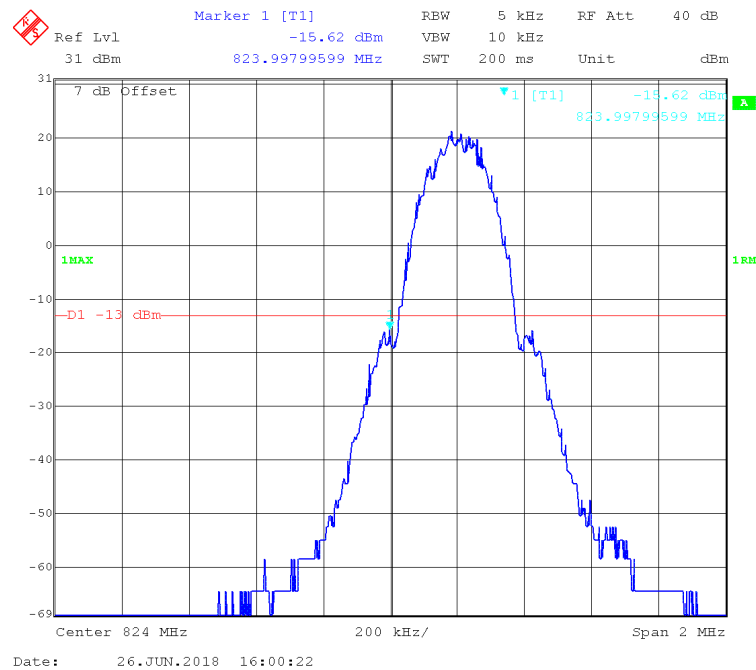
### GSM Mode, Left Band Edge



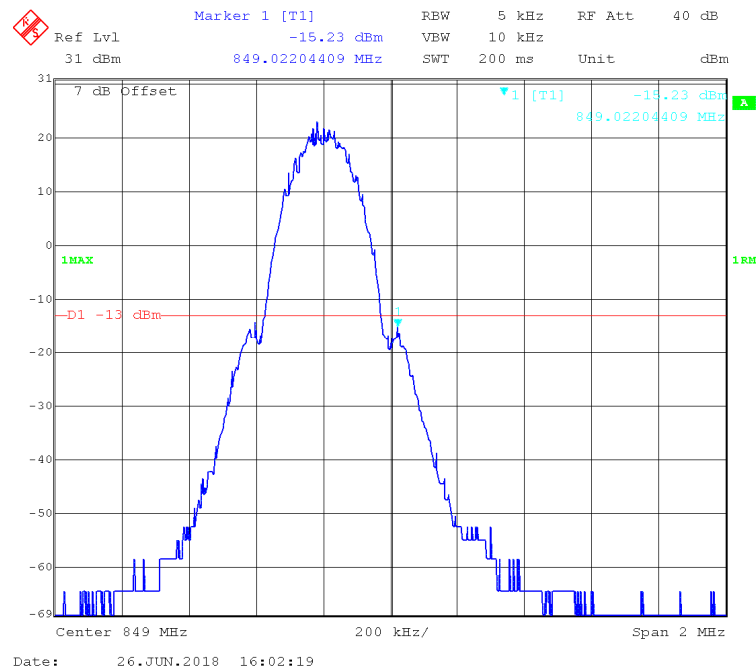
### GSM Mode, Right Band Edge



### GPRS Mode, Left Band Edge

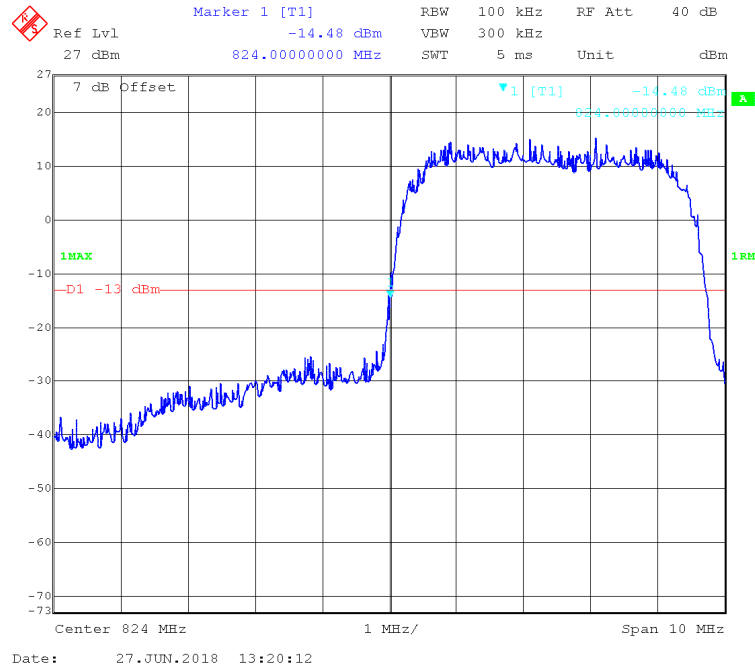


### GPRS Mode, Right Band Edge

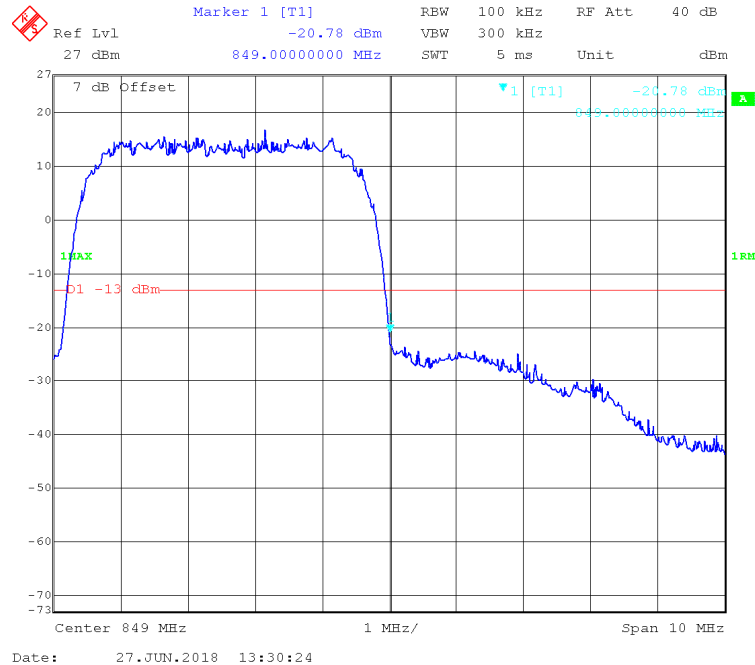


# WCDMA Band V

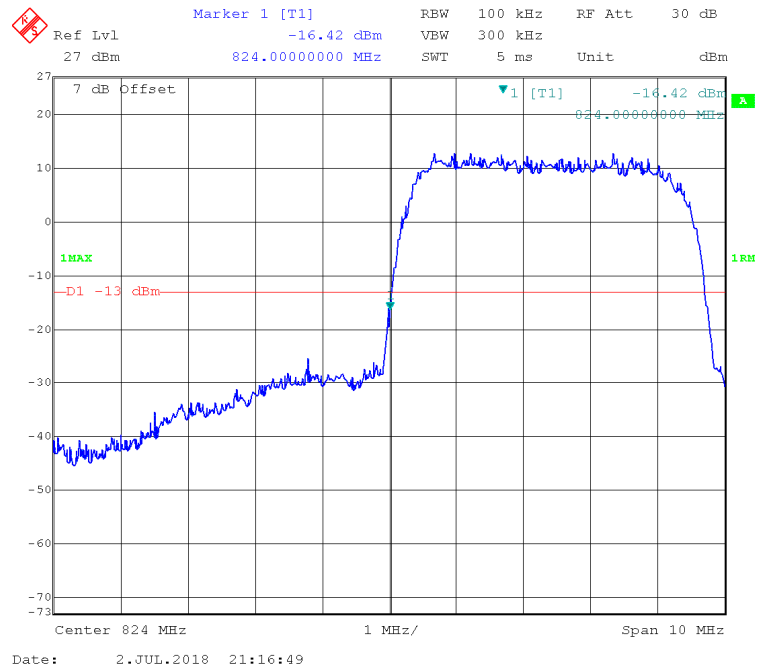
## WCDMA (Rel 99) Mode, Left Band Edge



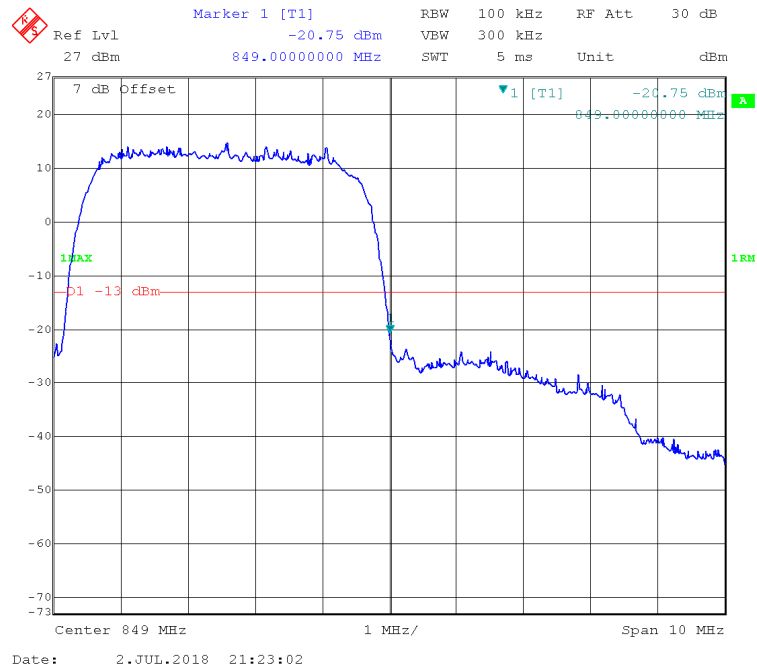
## WCDMA (Rel 99) Mode, Right Band Edge



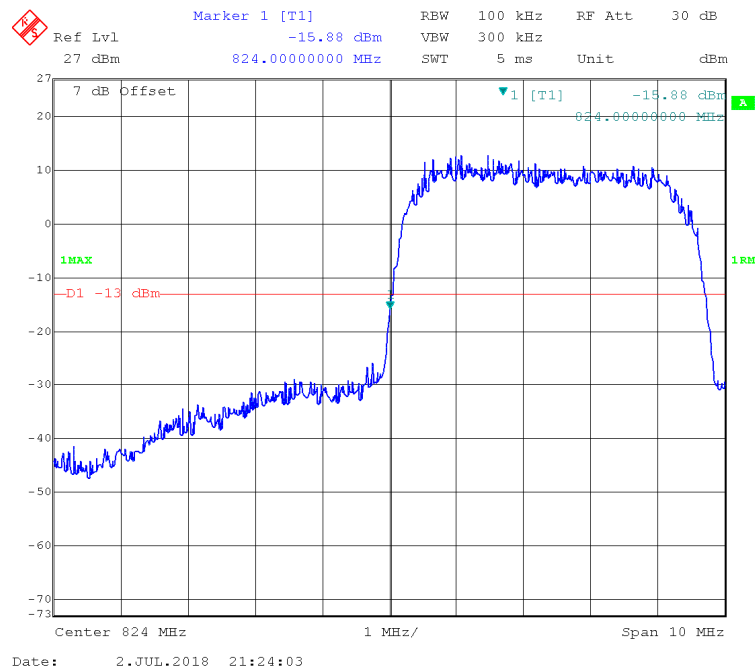
### WCDMA (HSDPA) Mode, Left Band Edge



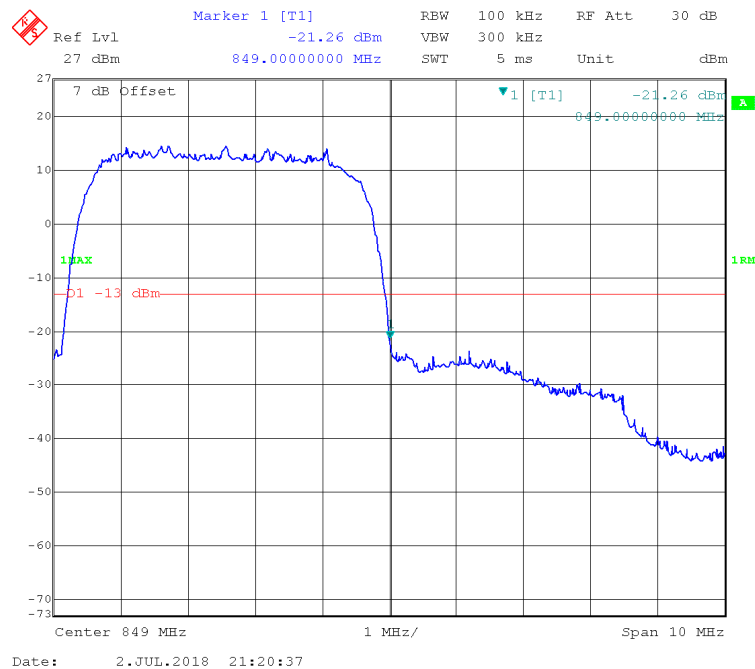
### WCDMA (HSDPA) Mode, Right Band Edge



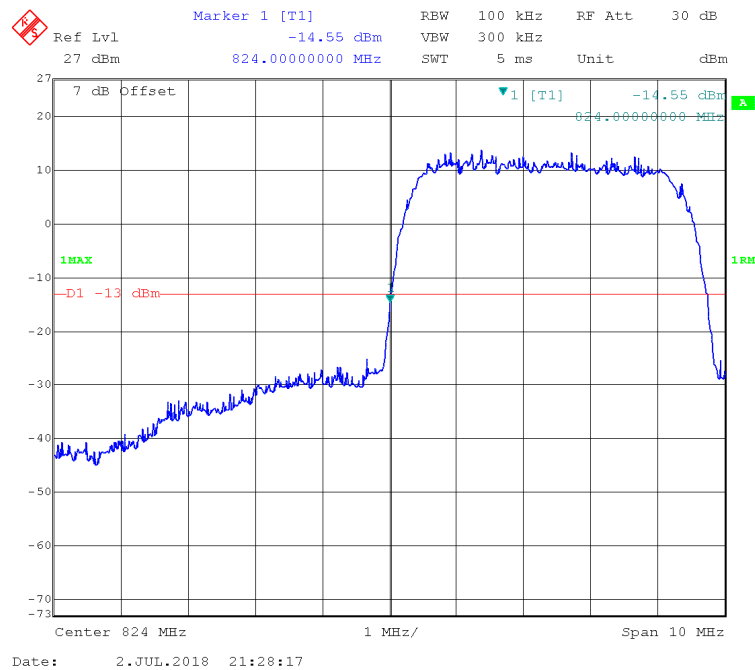
### WCDMA (HSUPA) Mode, Left Band Edge



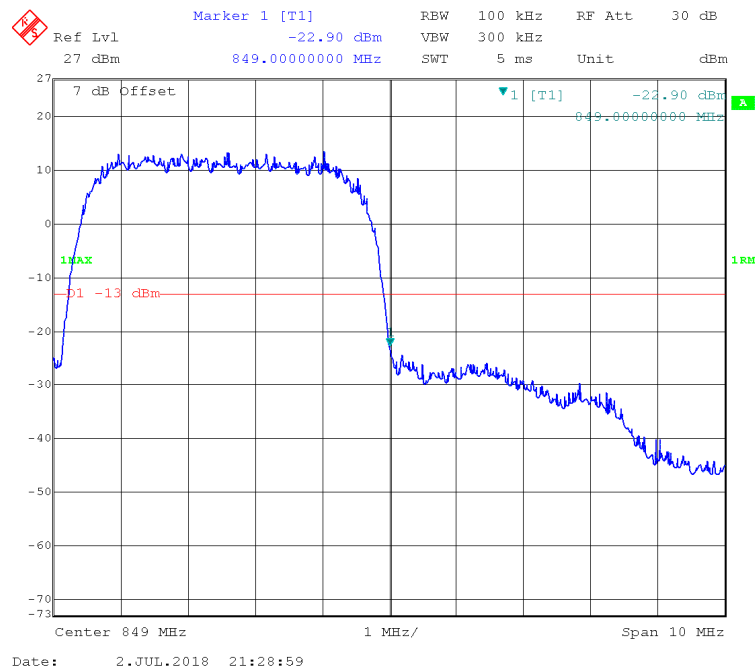
### WCDMA (HSUPA) Mode, Right Band Edge



### WCDMA (HSPA+) Mode, Left Band Edge

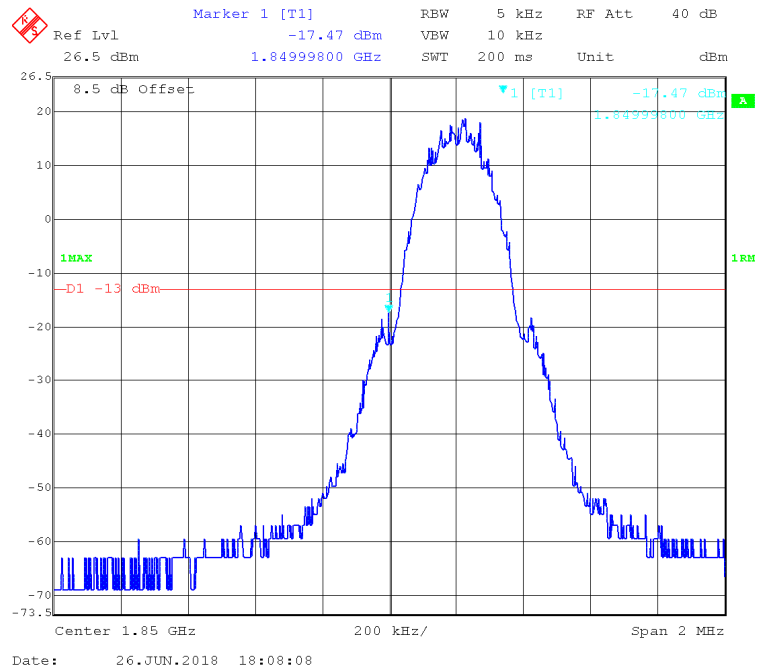


### WCDMA (HSPA+) Mode, Right Band Edge

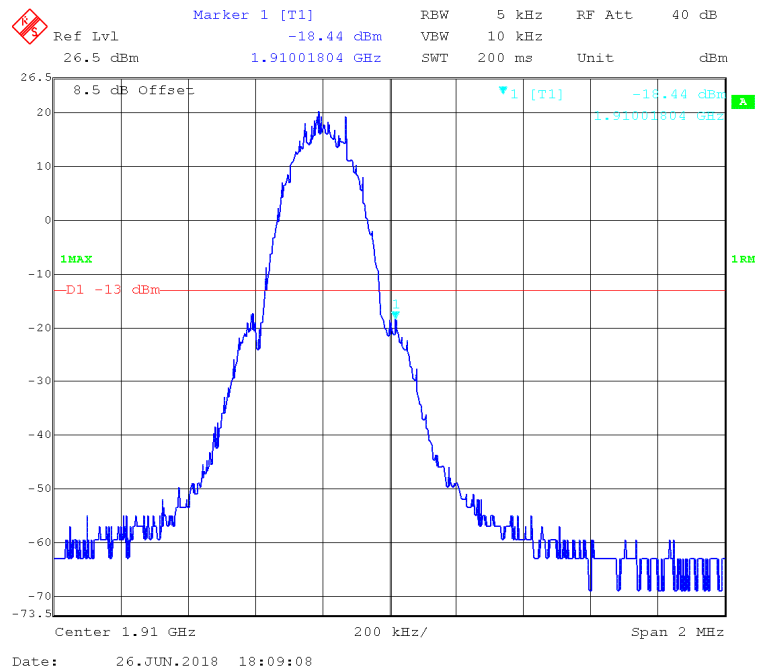


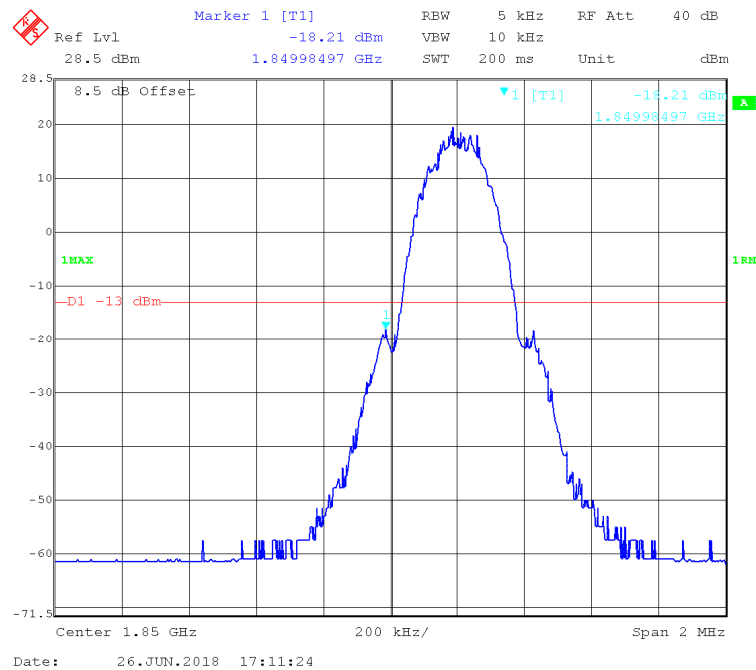
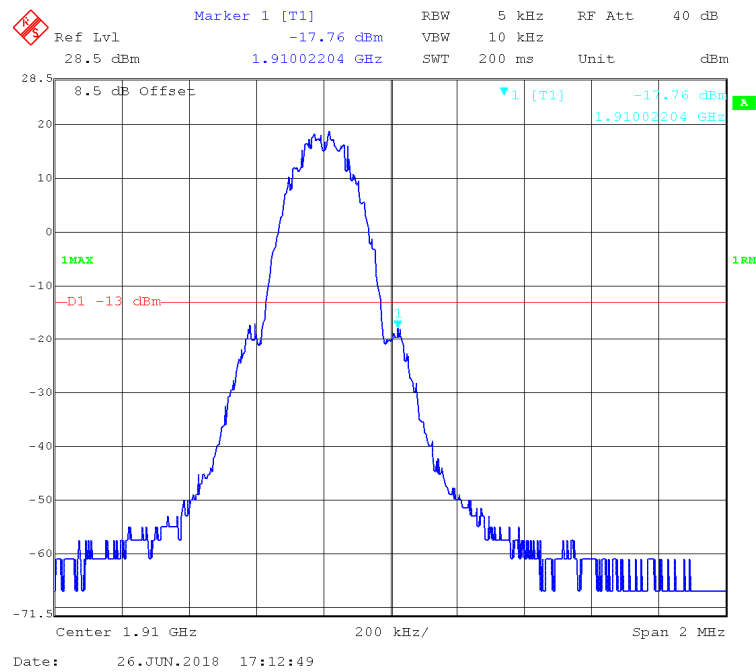
**PCS 1900 Band:**

**GSM Mode, Left Band Edge**



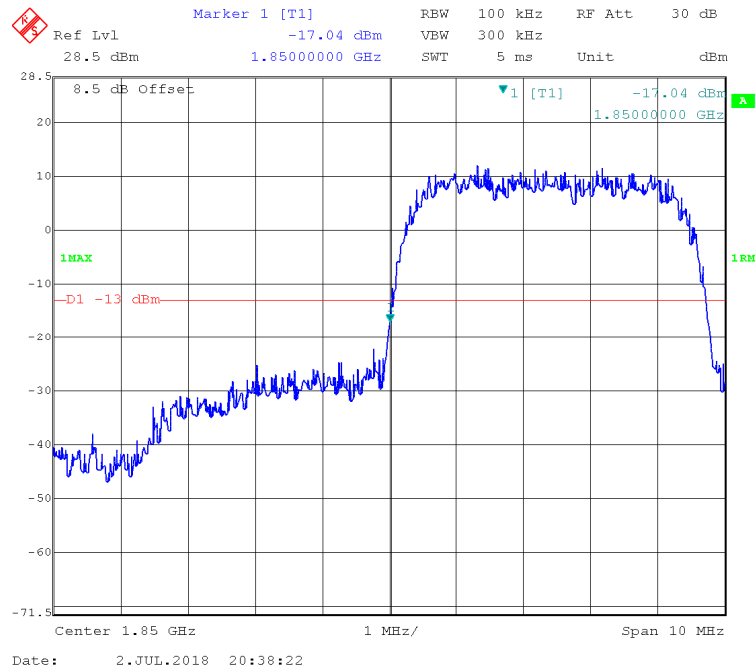
**GSM Mode, Right Band Edge**



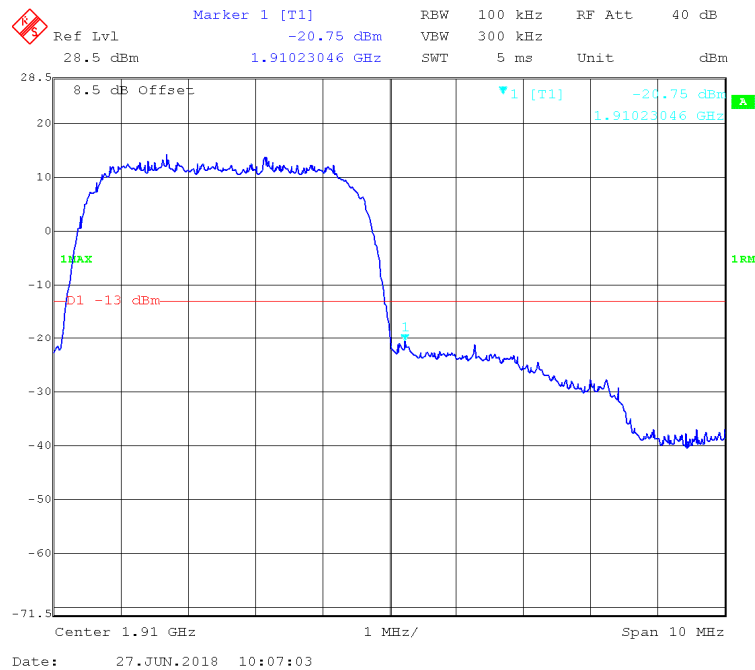
**GPRS Mode, Left Band Edge****GPRS Mode, Right Band Edge**

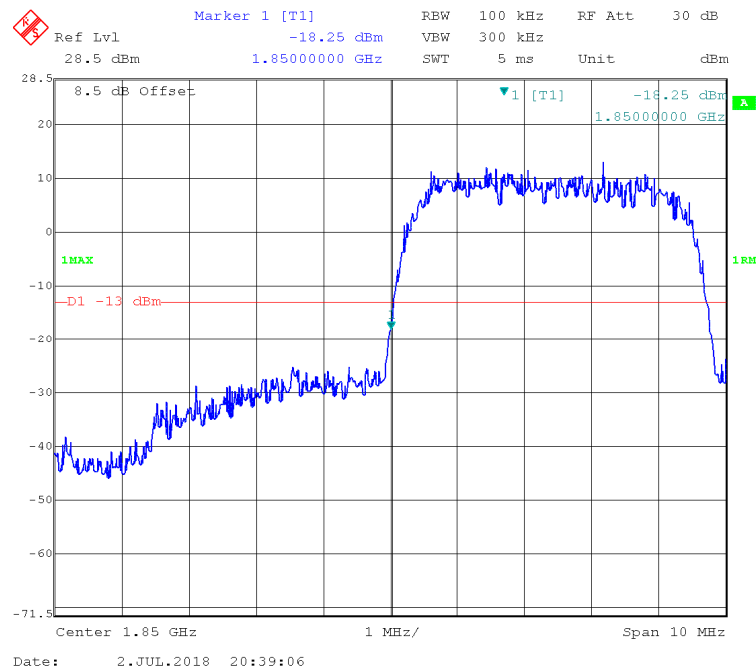
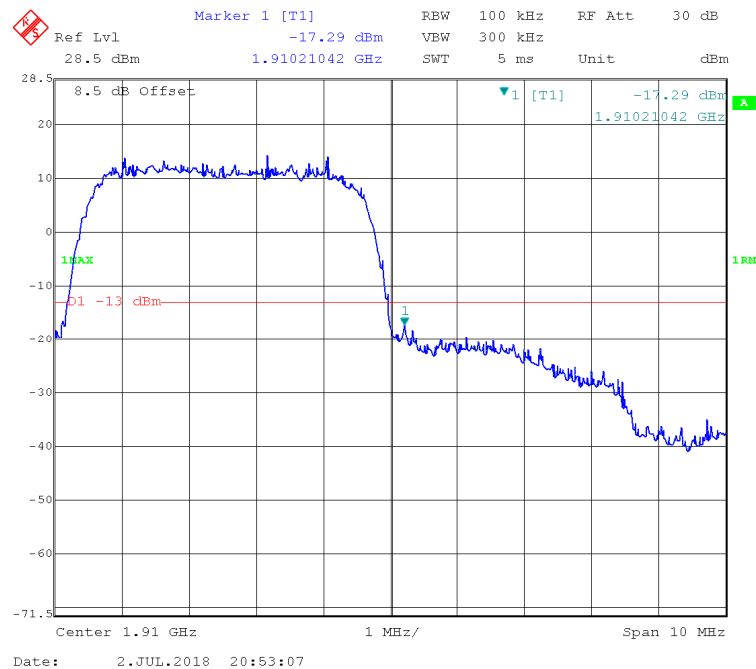
## WCDMA Band II

### WCDMA (Rel99) Mode, Left Band Edge

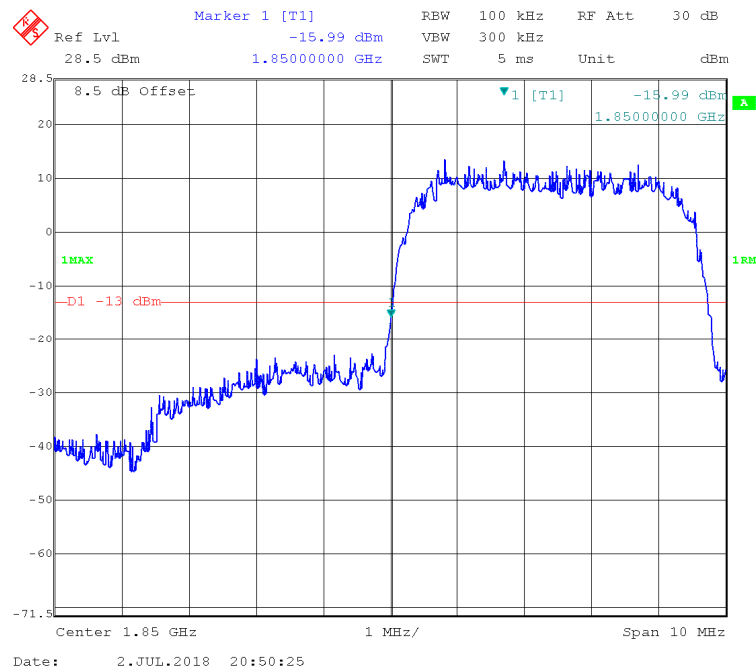


### WCDMA (Rel99) Mode, Right Band Edge

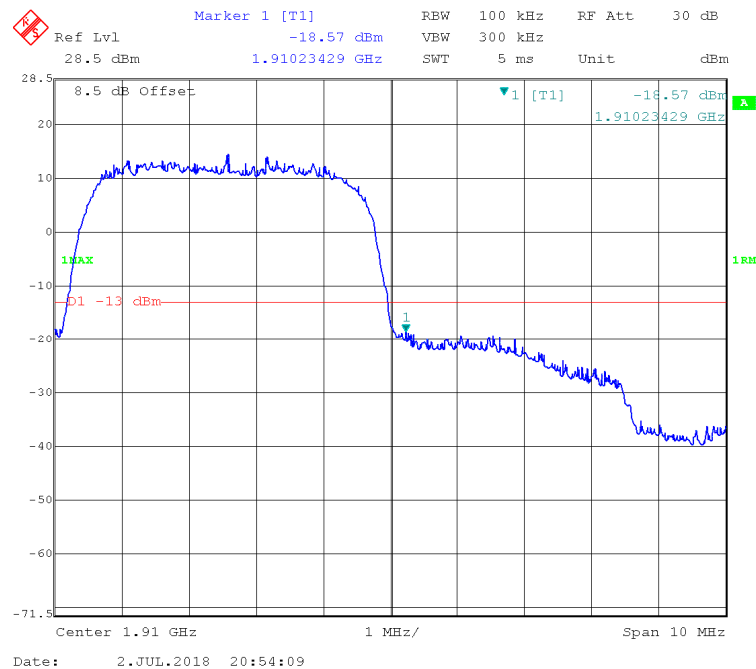


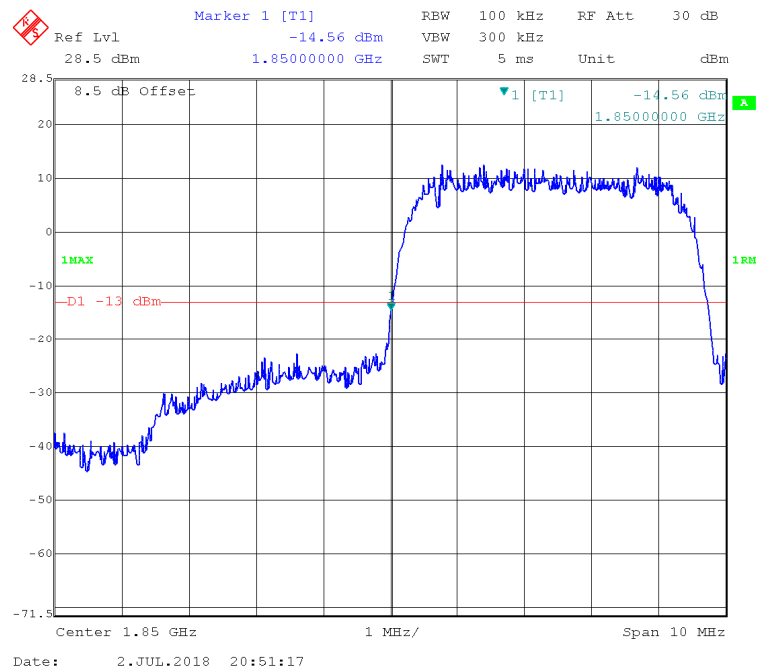
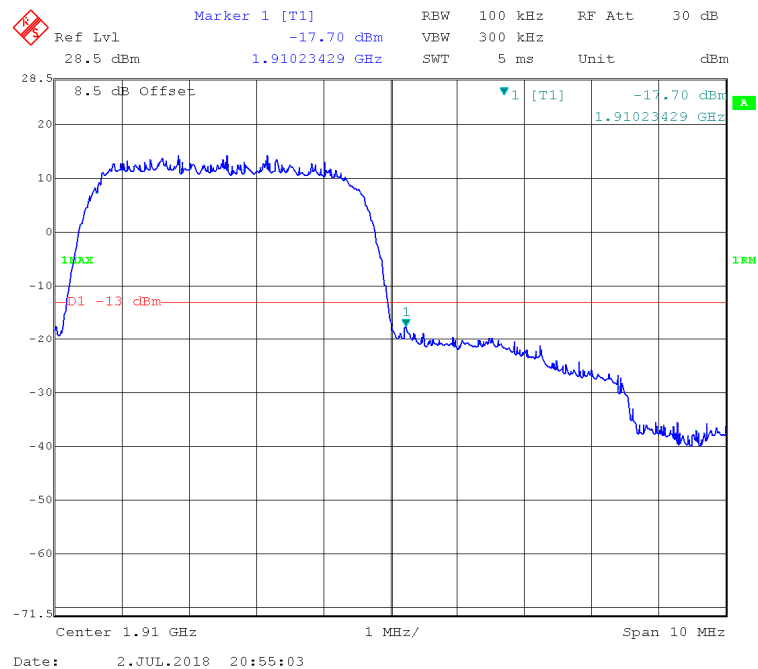
**WCDMA (HSDPA) Mode, Left Band Edge****WCDMA (HSDPA) Mode, Right Band Edge**

### WCDMA (HSUPA) Mode, Left Band Edge



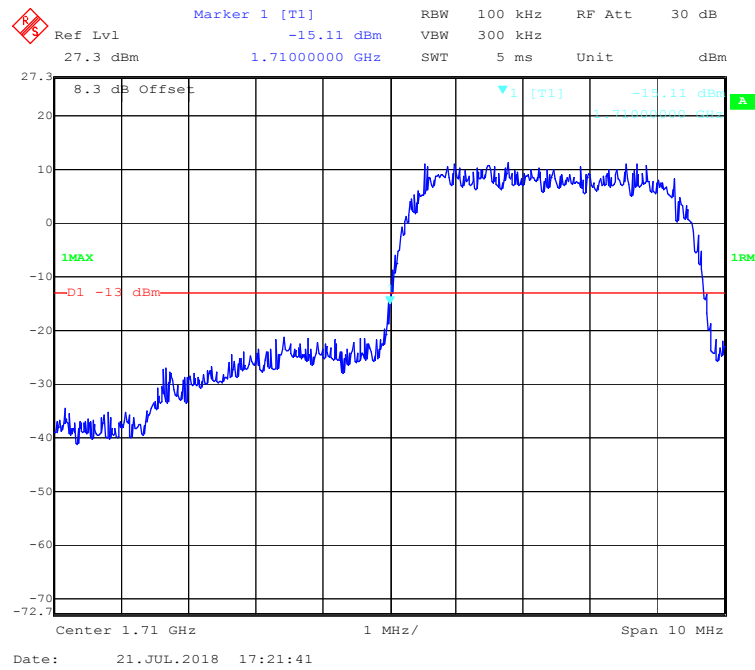
### WCDMA (HSUPA) Mode, Right Band Edge



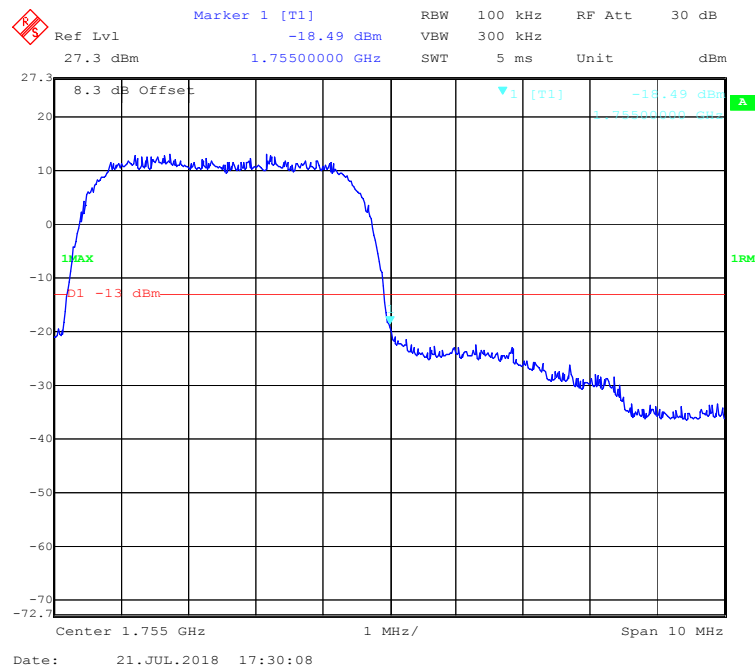
**WCDMA (HSPA+) Mode, Left Band Edge****WCDMA (HSPA+) Mode, Right Band Edge**

# WCDMA Band IV

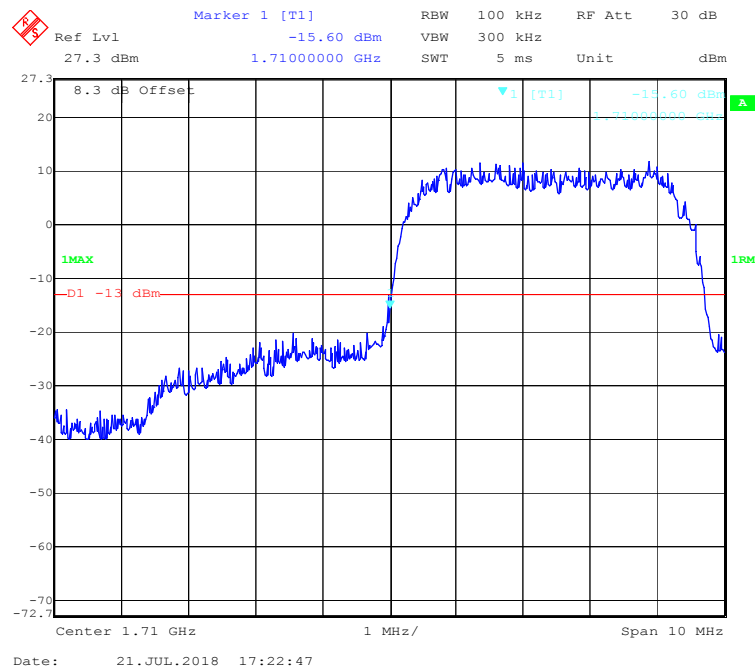
## WCDMA (Rel99) Mode, Left Band Edge



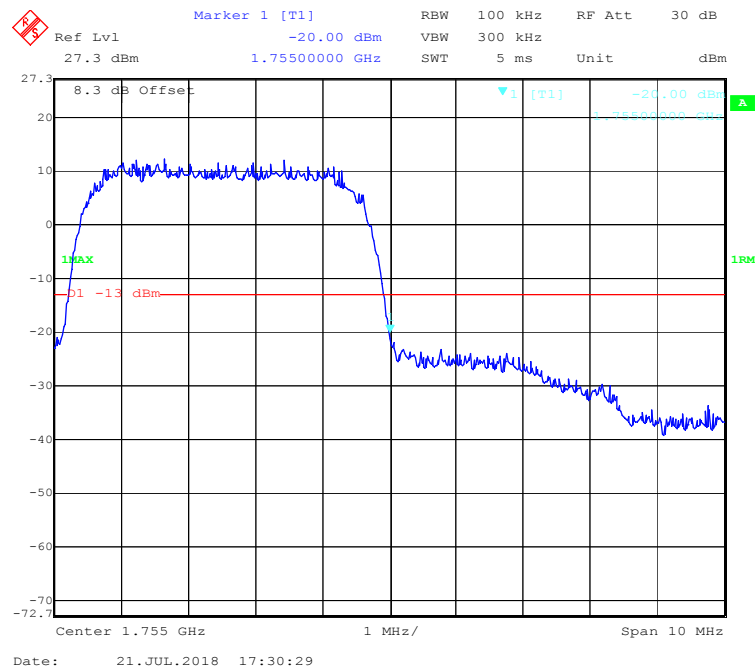
## WCDMA (Rel99) Mode, Right Band Edge



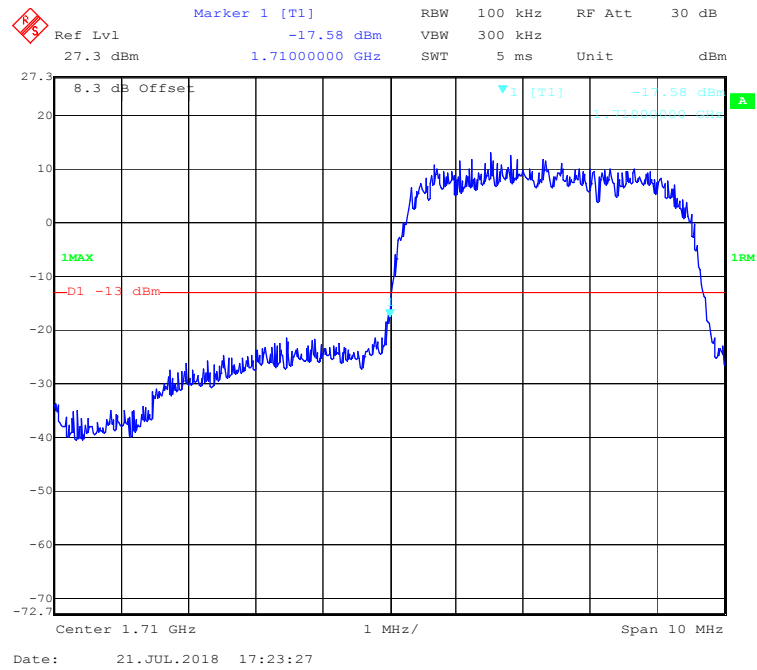
### WCDMA (HSDPA) Mode, Left Band Edge



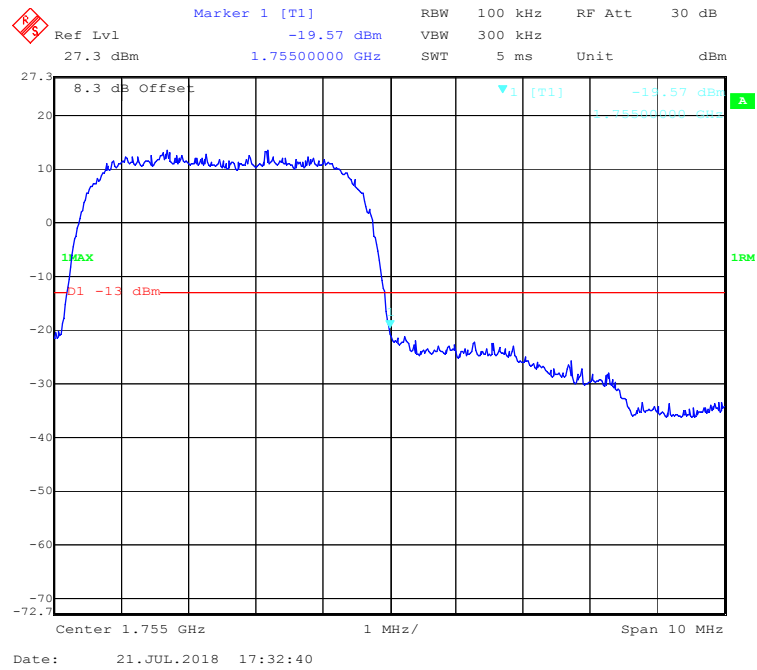
### WCDMA (HSDPA) Mode, Right Band Edge



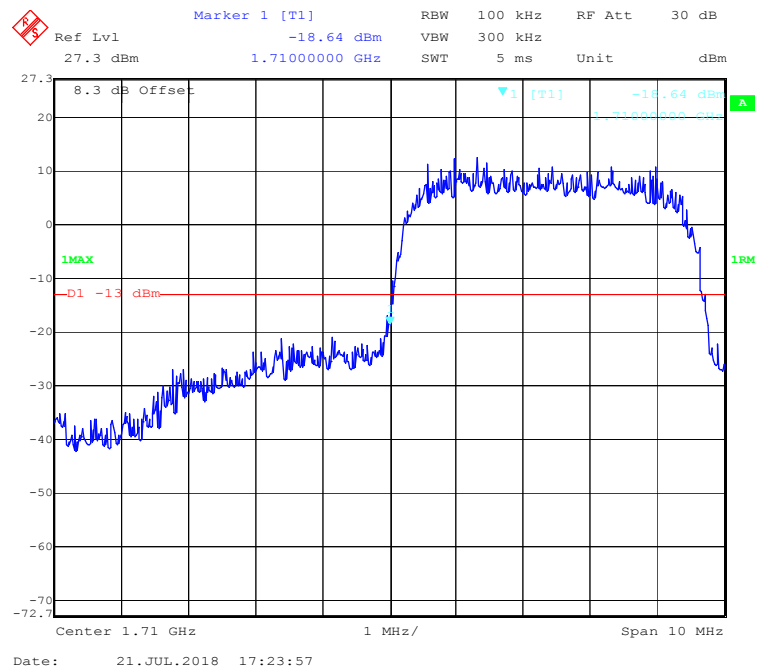
### WCDMA (HSUPA) Mode, Left Band Edge



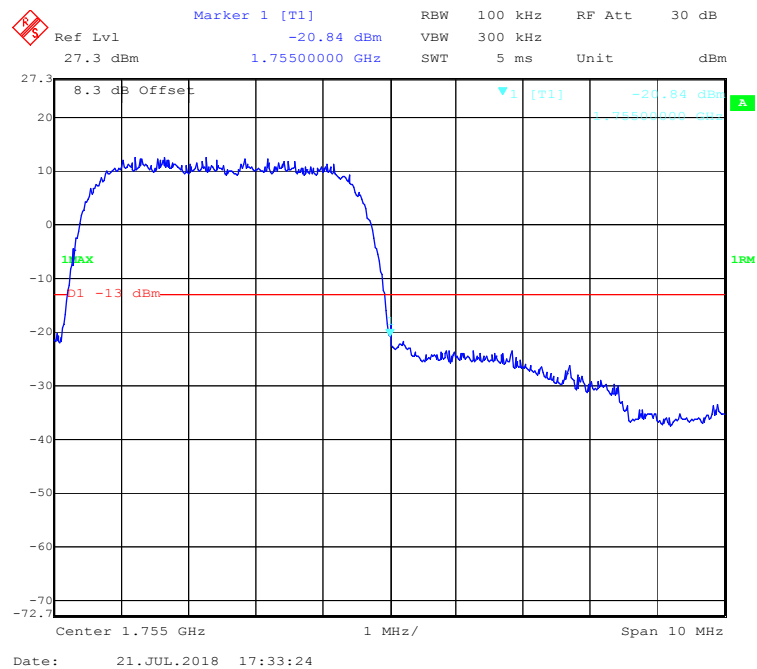
### WCDMA (HSUPA) Mode, Right Band Edge



### WCDMA (HSPA+) Mode, Left Band Edge



### WCDMA (HSPA+) Mode, Right Band Edge



## **FCC § 2.1055; § 22.355; § 24.235; §27.54- FREQUENCY STABILITY**

### **Applicable Standards**

FCC § 2.1055, §22.355, §24.235 and §27.54.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

**Frequency Tolerance for Transmitters in the Public Mobile Services**

| <b>Frequency Range<br/>(MHz)</b> | <b>Base, fixed<br/>(ppm)</b> | <b>Mobile &gt; 3 watts<br/>(ppm)</b> | <b>Mobile ≤ 3 watts<br/>(ppm)</b> |
|----------------------------------|------------------------------|--------------------------------------|-----------------------------------|
| 25 to 50                         | 20.0                         | 20.0                                 | 50.0                              |
| 50 to 450                        | 5.0                          | 5.0                                  | 50.0                              |
| 450 to 512                       | 2.5                          | 5.0                                  | 5.0                               |
| 821 to 896                       | 1.5                          | 2.5                                  | 2.5                               |
| 928 to 929.                      | 5.0                          | N/A                                  | N/A                               |
| 929 to 960.                      | 1.5                          | N/A                                  | N/A                               |
| 2110 to 2220                     | 10.0                         | N/A                                  | N/A                               |

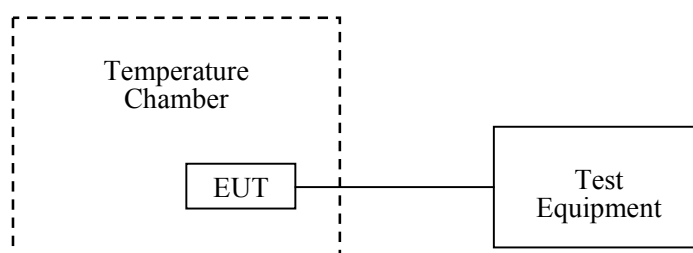
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

### **Test Procedure**

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



**Test Data****Environmental Conditions**

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 23.2°C   |
| <b>Relative Humidity:</b> | 51 %     |
| <b>ATM Pressure:</b>      | 101.3kPa |

The testing was performed by Mark Yu from 2018-06-26 to 2018-07-21.

EUT operation mode: Transmitting

Test Result: Compliance.

**GSM 850 Band:**

| GSM Mode, Middle Channel, $f_o = 836.6$ MHz |                                   |                      |                       |             |
|---------------------------------------------|-----------------------------------|----------------------|-----------------------|-------------|
| Temperature (°C)                            | Power Supplied (V <sub>DC</sub> ) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -30                                         | 3.8                               | 11                   | 0.01315               | 2.5         |
| -20                                         |                                   | 9                    | 0.01076               | 2.5         |
| -10                                         |                                   | 14                   | 0.01673               | 2.5         |
| 0                                           |                                   | 9                    | 0.01076               | 2.5         |
| 10                                          |                                   | 10                   | 0.01195               | 2.5         |
| 20                                          |                                   | 14                   | 0.01673               | 2.5         |
| 30                                          |                                   | 12                   | 0.01434               | 2.5         |
| 40                                          |                                   | 10                   | 0.01195               | 2.5         |
| 50                                          |                                   | 13                   | 0.01554               | 2.5         |
| 25                                          | V min.= 3.4                       | 9                    | 0.01076               | 2.5         |
| 25                                          | V max.= 4.2                       | 12                   | 0.01434               | 2.5         |

| GPRS Mode, Middle Channel, $f_0=836.6$ MHz |                             |                      |                       |             |
|--------------------------------------------|-----------------------------|----------------------|-----------------------|-------------|
| Temperature (°C)                           | Power Supplied ( $V_{DC}$ ) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -30                                        | 3.8                         | 10                   | 0.01195               | 2.5         |
| -20                                        |                             | 11                   | 0.01315               | 2.5         |
| -10                                        |                             | 13                   | 0.01554               | 2.5         |
| 0                                          |                             | 9                    | 0.01076               | 2.5         |
| 10                                         |                             | 14                   | 0.01673               | 2.5         |
| 20                                         |                             | 8                    | 0.00956               | 2.5         |
| 30                                         |                             | 10                   | 0.01195               | 2.5         |
| 40                                         |                             | 11                   | 0.01315               | 2.5         |
| 50                                         |                             | 13                   | 0.01554               | 2.5         |
| 25                                         | V min.= 3.4                 | 14                   | 0.01673               | 2.5         |
| 25                                         | V max.= 4.2                 | 12                   | 0.01434               | 2.5         |

**WCDMA Band V:**

| Middle Channel, $f_0=836.6$ MHz |                             |                      |                       |             |
|---------------------------------|-----------------------------|----------------------|-----------------------|-------------|
| Temperature (°C)                | Power Supplied ( $V_{DC}$ ) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -30                             | 3.8                         | -4                   | -0.00478              | 2.5         |
| -20                             |                             | -2                   | -0.00239              | 2.5         |
| -10                             |                             | 0                    | 0.00000               | 2.5         |
| 0                               |                             | -3                   | -0.00359              | 2.5         |
| 10                              |                             | -6                   | -0.00717              | 2.5         |
| 20                              |                             | -5                   | -0.00598              | 2.5         |
| 30                              |                             | -1                   | -0.00120              | 2.5         |
| 40                              |                             | -5                   | -0.00598              | 2.5         |
| 50                              |                             | -3                   | -0.00359              | 2.5         |
| 25                              | V min.= 3.4                 | -5                   | -0.00598              | 2.5         |
| 25                              | V max.= 4.2                 | -6                   | -0.00717              | 2.5         |

**PCS 1900 Band:**

| GSM Mode, Middle Channel, $f_0=1880.0$ MHz |                                   |                      |                       |        |
|--------------------------------------------|-----------------------------------|----------------------|-----------------------|--------|
| Temperature (°C)                           | Power Supplied (V <sub>DC</sub> ) | Frequency Error (Hz) | Frequency Error (ppm) | Result |
| -30                                        | 3.8                               | -5                   | -0.00266              | pass   |
| -20                                        |                                   | -7                   | -0.00372              | pass   |
| -10                                        |                                   | -8                   | -0.00426              | pass   |
| 0                                          |                                   | 1                    | 0.00053               | pass   |
| 10                                         |                                   | 2                    | 0.00106               | pass   |
| 20                                         |                                   | -2                   | -0.00106              | pass   |
| 30                                         |                                   | -3                   | -0.00160              | pass   |
| 40                                         |                                   | -4                   | -0.00213              | pass   |
| 50                                         |                                   | -10                  | -0.00532              | pass   |
| 25                                         | V min.= 3.4                       | -6                   | -0.00319              | pass   |
| 25                                         | V max.= 4.2                       | -7                   | -0.00372              | pass   |

| GPRS Mode, Middle Channel, $f_0=1880.0$ MHz |                                   |                      |                       |        |
|---------------------------------------------|-----------------------------------|----------------------|-----------------------|--------|
| Temperature (°C)                            | Power Supplied (V <sub>DC</sub> ) | Frequency Error (Hz) | Frequency Error (ppm) | Result |
| -30                                         | 3.8                               | -3                   | -0.00160              | pass   |
| -20                                         |                                   | 1                    | 0.00053               | pass   |
| -10                                         |                                   | -4                   | -0.00213              | pass   |
| 0                                           |                                   | -2                   | -0.00106              | pass   |
| 10                                          |                                   | 2                    | 0.00106               | pass   |
| 20                                          |                                   | 1                    | 0.00053               | pass   |
| 30                                          |                                   | -3                   | -0.00160              | pass   |
| 40                                          |                                   | 5                    | 0.00266               | pass   |
| 50                                          |                                   | 3                    | 0.00160               | pass   |
| 25                                          | V min.= 3.4                       | 4                    | 0.00213               | pass   |
| 25                                          | V max.= 4.2                       | 2                    | 0.00106               | pass   |

**WCDMA Band II:**

| <b>WCDMA Mode, Middle Channel, <math>f_0=1880.0</math> MHz</b> |                                             |                             |                              |               |
|----------------------------------------------------------------|---------------------------------------------|-----------------------------|------------------------------|---------------|
| <b>Temperature (°C)</b>                                        | <b>Power Supplied (<math>V_{DC}</math>)</b> | <b>Frequency Error (Hz)</b> | <b>Frequency Error (ppm)</b> | <b>Result</b> |
| -30                                                            | 3.8                                         | -5                          | -0.00266                     | pass          |
| -20                                                            |                                             | -2                          | -0.00106                     | pass          |
| -10                                                            |                                             | -4                          | -0.00213                     | pass          |
| 0                                                              |                                             | -1                          | -0.00053                     | pass          |
| 10                                                             |                                             | -7                          | -0.00372                     | pass          |
| 20                                                             |                                             | -2                          | -0.00106                     | pass          |
| 30                                                             |                                             | -4                          | -0.00213                     | pass          |
| 40                                                             |                                             | -6                          | -0.00319                     | pass          |
| 50                                                             |                                             | -5                          | -0.00266                     | pass          |
| 25                                                             | V min.= 3.4                                 | -1                          | -0.00053                     | pass          |
| 25                                                             | V max.= 4.2                                 | -3                          | -0.00160                     | pass          |

**WCDMA Band IV:**

| <b>WCDMA Mode, Middle Channel, <math>f_0=1732.6</math> MHz</b> |                                             |                             |                              |               |
|----------------------------------------------------------------|---------------------------------------------|-----------------------------|------------------------------|---------------|
| <b>Temperature (°C)</b>                                        | <b>Power Supplied (<math>V_{DC}</math>)</b> | <b>Frequency Error (Hz)</b> | <b>Frequency Error (ppm)</b> | <b>Result</b> |
| -30                                                            | 3.8                                         | -9                          | -0.00519                     | pass          |
| -20                                                            |                                             | -7                          | -0.00404                     | pass          |
| -10                                                            |                                             | -6                          | -0.00346                     | pass          |
| 0                                                              |                                             | -2                          | -0.00115                     | pass          |
| 10                                                             |                                             | 0                           | 0.00000                      | pass          |
| 20                                                             |                                             | -4                          | -0.00231                     | pass          |
| 30                                                             |                                             | 1                           | 0.00058                      | pass          |
| 40                                                             |                                             | -7                          | -0.00404                     | pass          |
| 50                                                             |                                             | -8                          | -0.00462                     | pass          |
| 25                                                             | V min.= 3.4                                 | -3                          | -0.00173                     | pass          |
| 25                                                             | V max.= 4.2                                 | -5                          | -0.00289                     | pass          |

**\*\*\*\*\* END OF REPORT \*\*\*\*\***