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# Report On

Application for Grant of Equipment Authorization of the  
Panasonic Avionics Corporation  
4G Cell Modem<sub>f</sub>

FCC CFR 47 Part 2, Part 22 and Part 24: 2014  
RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

**Report No. SD72110645-1015A Rev2.0**

**March 2016**



|                           |                                                                                                                                                                                                 |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>REPORT ON</b>          | Radio Testing of the<br>Panasonic Avionics Corporation<br>4G Cell Modem RD-AA8110-02                                                                                                            |
| <b>TEST REPORT NUMBER</b> | SD72110645-1015A Rev2.0                                                                                                                                                                         |
| <b>PREPARED FOR</b>       | Panasonic Avionics Corporation<br>26200 Enterprise Way<br>Lake Forest, CA 92630                                                                                                                 |
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| <b>APPROVED BY</b>        | <br>Juan Manuel Gonzalez<br><b>Name</b><br>Authorized Signatory<br>Title: Commercial/Wireless EMC Lab Manager |
| <b>DATED</b>              | March 23, 2016                                                                                                                                                                                  |





#### Revision History

| SD72110645-1015A Rev2.0<br>Panasonic Avionics Corporation<br>4G Cell Modem RD-AA8110-02 |                 |              |                                |                   |                         |
|-----------------------------------------------------------------------------------------|-----------------|--------------|--------------------------------|-------------------|-------------------------|
| DATE                                                                                    | OLD REVISION    | NEW REVISION | REASON                         | PAGES<br>AFFECTED | APPROVED BY             |
| 01/22/2016                                                                              | Initial Release |              |                                |                   | Juan Manuel<br>Gonzalez |
| 03/17/2016                                                                              | Initial Release | Rev 1        | Add LTE B5                     |                   | Juan Manuel<br>Gonzalez |
| 03/23/2016                                                                              | Rev 1           | Rev 2        | Correct typo in section<br>2.8 | P106, 107         | Juan Manuel<br>Gonzalez |
|                                                                                         |                 |              |                                |                   |                         |



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## **SECTION 1**

### **REPORT SUMMARY**

Radio Testing of the  
Panasonic Avionics Corporation  
4G Cell Modem



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Panasonic Avionics Corporation RD-AA8110-02 to the requirements of the following:

FCC CFR 47 Part 2, Part 22 and Part 24: 2014  
RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

|                               |                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective                     | To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.                                                                                                                                                                                                                                       |
| Manufacturer                  | Panasonic Avionics Corporation                                                                                                                                                                                                                                                                                                                                                              |
| Model Name                    | 4G Cell Modem                                                                                                                                                                                                                                                                                                                                                                               |
| Model Number(s)               | RD-AA8110-02                                                                                                                                                                                                                                                                                                                                                                                |
| FCC ID Number                 | U6Y-RDAA8110                                                                                                                                                                                                                                                                                                                                                                                |
| IC Number                     | 216P-RDAA8110                                                                                                                                                                                                                                                                                                                                                                               |
| Serial Number(s)              | 442964, CM0015                                                                                                                                                                                                                                                                                                                                                                              |
| Number of Samples Tested      | 1                                                                                                                                                                                                                                                                                                                                                                                           |
| Test Specification/Issue/Date | <ul style="list-style-type: none"><li>• FCC CFR 47 Part 2, Part 22 and Part 24: 2014</li><li>• RSS-132 issue 3: 2013; (Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz)</li><li>• RSS-133 issue 6: 2013; (2 GHz Personal Communications Services)</li><li>• RSS-GEN issue 4 November 2014; (General Requirements for Compliance of Radio Apparatus)</li></ul> |
| Start of Test                 | October 26, 2015                                                                                                                                                                                                                                                                                                                                                                            |
| Finish of Test                | March 09, 2016                                                                                                                                                                                                                                                                                                                                                                              |
| Name of Engineer(s)           | Xiaoying Zhang                                                                                                                                                                                                                                                                                                                                                                              |
| Related Document(s)           | <ul style="list-style-type: none"><li>• 971168 D01 Power Meas License Digital Systems v02r02: October 17 2014; (Measurement guidance for certification of licensed digital transmitters)</li><li>• Supporting documents for EUT certification are separate exhibits.</li></ul>                                                                                                              |



## 1.2 BRIEF SUMMARY OF RESULTS

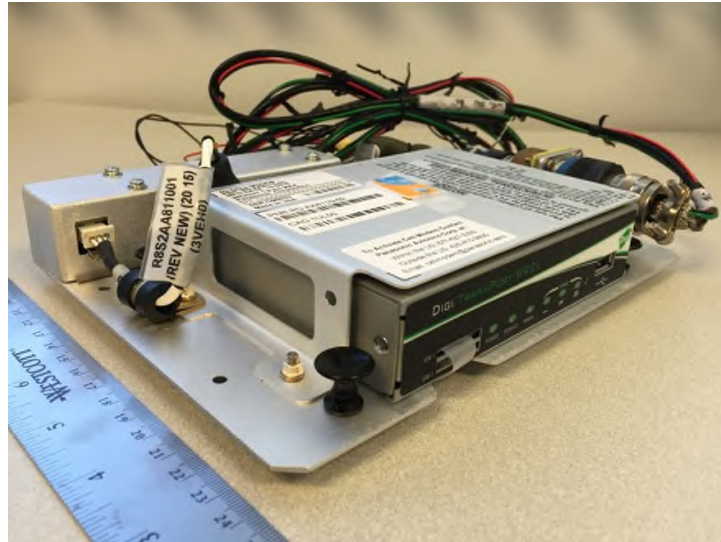
A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, Part 22 and Part 24: 2014 and RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013 standard is shown below.

| Section | FCC Part Sections(s)               | Industry Canada Sections      | Test Description                     | Result    |
|---------|------------------------------------|-------------------------------|--------------------------------------|-----------|
| 2.1     | 2.1046                             | RSS-132: 5.4,<br>RSS-133: 6.4 | Transmitter Conducted Output Power   | Compliant |
| 2.2     | 2.1046,<br>22.913(a)(2)            | -                             | Effective Radiated Power             | Compliant |
| 2.3     | 2.1046,<br>24.232(c)               | RSS-132: 5.4<br>RSS-133: 6.4  | Equivalent Isotropic Radiated Power  | Compliant |
| 2.4     | 24.232(d)                          | RSS-132: 5.4,<br>RSS-133: 6.4 | Peak-Average Ratio                   | Compliant |
| 2.5     | 2.1049,<br>22.917(b),<br>24.238(b) | RSS-GEN 4.6.1                 | Occupied Bandwidth                   | Compliant |
| 2.6     | 2.1051,<br>22.917(a),<br>24.238(a) | RSS-132: 5.5,<br>RSS-133: 6.5 | Band Edge                            | Compliant |
| 2.7     | 2.1051,<br>22.917(a),<br>24.238(a) | RSS-132: 5.5,<br>RSS-133: 6.5 | Conducted Spurious Emissions         | Compliant |
| 2.8     | 2.1053,<br>22.917(a),<br>24.238(a) | RSS-132: 5.5,<br>RSS-133: 6.5 | Field Strength Of Spurious Radiation | Compliant |
| 2.9     | 2.1055, 22.355,<br>24.235          | RSS-132: 5.3,<br>RSS-133: 6.3 | Frequency Stability                  | Compliant |

### 1.3 PRODUCT INFORMATION

#### 1.3.1 EUT General Description

The Equipment Under Test (EUT) was a Panasonic Avionics Corporation 4G Cell Modem as shown in the photograph below. The 4G Cell Modem (CM) is a component of Panasonic IFEC (In-Flight Entertainment and Connectivity) Systems which is provided to airline customers that make use of PAC IFEC services. The UMTS Band II and V, GSM 850 and 1900, and LTE Band II and V functions were verified in this test report.



Equipment Under Test



### 1.3.2 EUT General Description

|                      |                                                                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| EUT Description      | Panasonic Avionics Corporation 4G Cell Modem                                                                                      |
| Model Name           | 4G Cell Modem                                                                                                                     |
| Model Number(s)      | RD-AA8110-02                                                                                                                      |
| FCC Classification   | Mobile Transmitter                                                                                                                |
| Rated Voltage        | 28.0VDC (Nominal)                                                                                                                 |
| Mode Verified        | GSM850/1900, WCDMA Band 2 and Band 5, LTE Band 2 and Band 5                                                                       |
| Capability           | GSM850/1900, WCDMA Band 2 and Band 5, LTE Band 2 and Band 5                                                                       |
| Primary Unit (EUT)   | <input checked="" type="checkbox"/> Production<br><input type="checkbox"/> Pre-Production<br><input type="checkbox"/> Engineering |
| Frequency Tolerance  | $\pm 0.00025\%$ (2.5ppm)                                                                                                          |
| Antenna Type         | Multiband Portable Omnidirectional Blade Antenna                                                                                  |
| Manufacturer         | PCTEL                                                                                                                             |
| Maximum Antenna Gain | 2.5 dBi                                                                                                                           |

### 1.3.3 Transmit Frequency Table

| Technology / Mode                 | Tx Frequency (MHz) | Emission Designator | ERP (Part 22)    | EIRP (RSS-132 and Part 24/RSS-133) |
|-----------------------------------|--------------------|---------------------|------------------|------------------------------------|
|                                   |                    |                     | Max. Power (dBm) | Max. Power (dBm)                   |
| GSM850 (GPRS)<br>Cell Band (BC0)  | 824-849            | 245KGXW             | 33.27            | 35.42                              |
| GSM850 (EGPRS)<br>Cell Band (BC0) | 824-849            | 246KG7W             | 33.26            | 35.41                              |
| GSM1900 (GPRS)<br>PCS Band (BC1)  | 1850-1910          | 243KGXW             | -                | 31.68                              |
| GSM1900 (EGPRS)<br>PCS Band (BC1) | 1850-1910          | 248KG7W             | -                | 31.66                              |
| WCDMA Cell Band 5                 | 824-849            | 4M20F9W             | 22.42            | 24.57                              |
| WCDMA PCS Band 2                  | 1850-1910          | 4M20F9W             | -                | 24.40                              |



| Technology / Mode | Modulation | Bandwidth (MHz) | Tx Frequency (MHz) | Emission Designator | ERP (Part 22)    | EIRP (RSS-132 and Part 24/RSS-133) |
|-------------------|------------|-----------------|--------------------|---------------------|------------------|------------------------------------|
|                   |            |                 |                    |                     | Max. Power (dBm) | Max. Power (dBm)                   |
| LTE Band 2        | QPSK       | 1.4             | 1850-1910          | 1M10G7D             | -                | 26.05                              |
|                   |            | 3               | 1850-1910          | 2M69G7D             | -                | 25.97                              |
|                   |            | 5               | 1850-1910          | 4M49G7D             | -                | 25.97                              |
|                   |            | 10              | 1850-1910          | 8M96G7D             | -                | 25.94                              |
|                   |            | 15              | 1850-1910          | 13M5G7D             | -                | 26.67                              |
|                   |            | 20              | 1850-1910          | 17M9G7D             | -                | 26.02                              |
|                   | 16QAM      | 1.4             | 1850-1910          | 1M09W7D             | -                | 25.03                              |
|                   |            | 3               | 1850-1910          | 2M68W7D             | -                | 25.78                              |
|                   |            | 5               | 1850-1910          | 4M49W7D             | -                | 25.69                              |
|                   |            | 10              | 1850-1910          | 8M94W7D             | -                | 25.86                              |
|                   |            | 15              | 1850-1910          | 13M4W7D             | -                | 25.56                              |
|                   |            | 20              | 1850-1910          | 17M9W7D             | -                | 25.97                              |
| LTE Band 5        | QPSK       | 1.4             | 824-849            | 1M08G7D             | 21.46            | 23.61                              |
|                   |            | 3               | 824-849            | 2M68G7D             | 21.39            | 23.54                              |
|                   |            | 5               | 824-849            | 4M48G7D             | 21.38            | 23.53                              |
|                   |            | 10              | 824-849            | 8M94G7D             | 21.15            | 23.30                              |





## 1.4 EUT TEST CONFIGURATION

### 1.4.1 Test Configuration Description

| Test Configuration | Description                                                      |
|--------------------|------------------------------------------------------------------|
| A                  | Conducted antenna port measurement.                              |
| B                  | Raidated test setup. EUT antenna port terminated with a 50Ω load |

### 1.4.2 EUT Exercise Software

EUT is controlled by a CMW 500 Wideband Radio Communication Tester. There are no other test software used during verification.

### 1.4.3 Support Equipment and I/O cables

| Manufacturer    | Equipment/Cable                             | Description                                                  |
|-----------------|---------------------------------------------|--------------------------------------------------------------|
| Protek          | Laboratory DC Power Supply                  | M/N 35010M S/N D102007S                                      |
| -               | Host Interface cable                        | 0.8 meter, shielded<br>EUT powered via 5 pins wire connected |
| Rhode & Schwarz | Support Wideband Radio Communication Tester | M/N CMW500 S/N 1201.0002k50/103829                           |

### 1.4.4 Worst Case Configuration

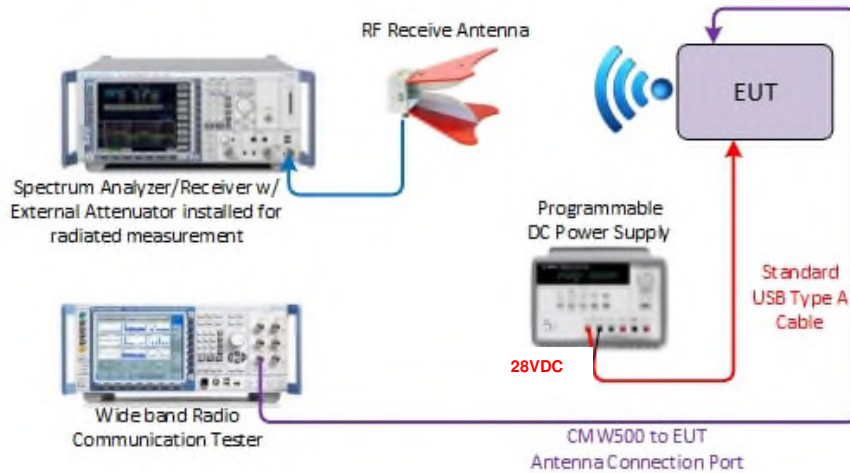
Worst-case configuration used in this test report:

| Technology              | Band          |
|-------------------------|---------------|
| GSM850 / GSM1900 (GPRS) | Cell          |
|                         | PCS           |
| WCDMA                   | Cell (Band 5) |
|                         | PCS (Band 2)  |

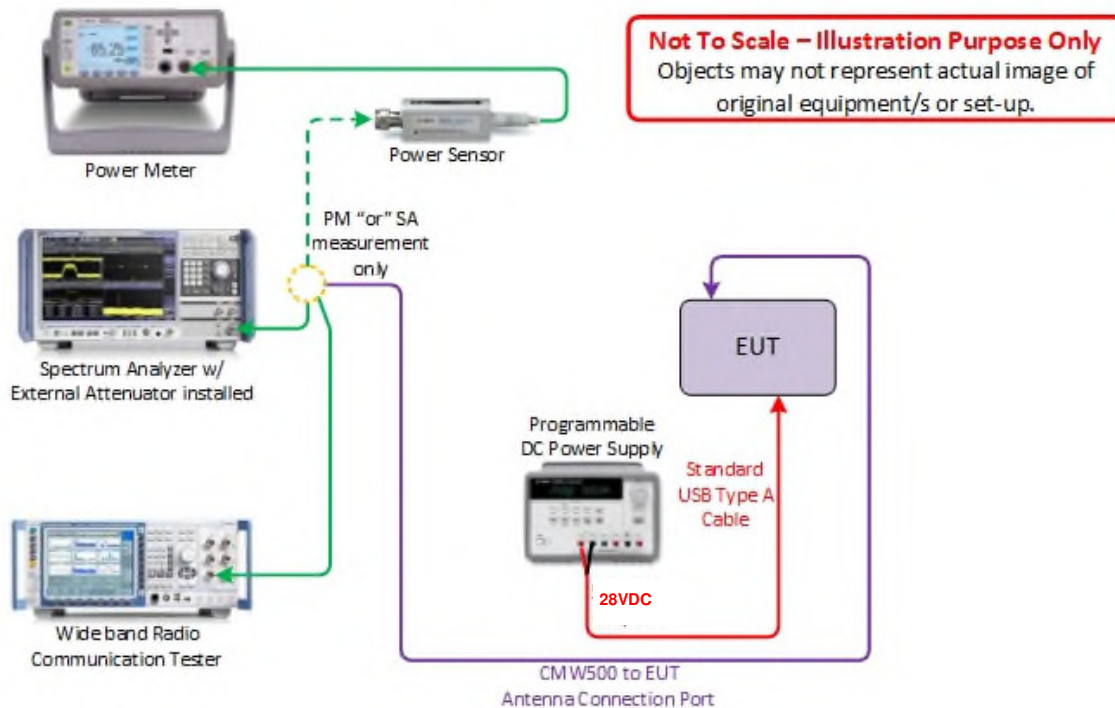
| Technology / Band | Modulation |
|-------------------|------------|
| LTE / Band 2      | QPSK       |
| LTE / Band 5      | QPSK       |

#### 1.4.5 Simplified Test Configuration Diagram

##### Radiated/Conducted Emission Test Configuration via Conducted Port



##### Conducted (Antenna Port) Test Configuration





## 1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

## 1.6 MODIFICATION RECORD

| Description of Modification  | Modification Fitted By | Date Modification Fitted |
|------------------------------|------------------------|--------------------------|
| Serial Number 442964, CM0015 |                        |                          |
| N/A                          | —                      | —                        |

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

## 1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements by Substitution method were conducted according to ANSI/TIA/EIA-603-C-2004, August 17, 2004. Land Mobile FM or PM -Communications Equipment -Measurement and Performance Standards.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2014. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

## 1.8 TEST FACILITY LOCATION

### 1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

### 1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678 1400 Fax: 858 546 0364.



## **1.9 TEST FACILITY REGISTRATION**

### **1.9.1 FCC – Registration No.: US1146**

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

### **1.9.2 Industry Canada (IC) Registration No.: 3067A**

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

## 1.10 SAMPLE CALCULATIONS

### 1.10.1 GSM Emission Designator

Emission Designator = 250KGXW  
 GSM BW = 250 kHz  
 G = Phase Modulation  
 X = Cases not otherwise covered  
 W = Combination (Audio/Data)

### 1.10.2 WCDMA Emission Designator

Emission Designator = 4M15F9W  
 WCDMA BW = 4.15 MHz  
 F = Frequency Modulation  
 9= Composite Digital Info  
 W = Combination (Audio/Data)

### 1.10.3 CDMA Emission Designator

Emission Designator = 1M30F9W  
 F = Frequency Modulation  
 9= Composite Digital Info  
 W = Combination (Audio/Data)

### 1.10.4 LTE Emission Designator (QPSK)

Emission Designator = 4M51G7D  
 G = Phase Modulation  
 7= Quantized/Digital Info  
 D = Combination (Audio/Data)

### 1.10.5 LTE Emission Designator (16QAM)

Emission Designator = 4M52W7D  
 W = Frequency Modulation  
 7= Quantized/Digital Info  
 D = Combination (Audio/Data)

### 1.10.6 Spurious Radiated Emission (below 1GHz)

|                                                       |                            |       |       |
|-------------------------------------------------------|----------------------------|-------|-------|
| Measuring equipment raw measurement (dBμV/m) @ 30 MHz |                            |       | 24.4  |
| Correction Factor (dB)                                | Asset# 1066 (cable)        | 0.3   | -12.6 |
|                                                       | Asset# 1172 (cable)        | 0.3   |       |
|                                                       | Asset# 1016 (preamplifier) | -30.7 |       |
|                                                       | Asset# 1175(cable)         | 0.3   |       |
|                                                       | Asset# 1002 (antenna)      | 17.2  |       |
| Reported QuasiPeak Final Measurement (dBμV/m) @ 30MHz |                            |       | 11.8  |

### 1.10.7 Spurious Radiated Emission – Substitution Method

Example = 84dBμV/m @ 1413 MHz (numerical sample only)



The field strength reading of 84dB $\mu$ V/m @ 1413 MHz (2<sup>nd</sup> Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dB $\mu$ V/m level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is -18dBm, then we have the following for both EIRP and ERP as required:

$$\begin{aligned} P_{\text{EIRP}} &= -18 \text{ dBm} + 7.8 \text{ dBi} - 1 \text{ dB} \\ &= 11.2 \text{ dBm} \\ P_{\text{ERP}} &= P_{\text{EIRP}} - 2.15 \text{ dB} \\ &= 11.2 \text{ dBm} - 2.15 \text{ dB} \\ &= 9.05 \text{ dBm} \end{aligned}$$



## **SECTION 2**

### **TEST DETAILS**

Radio Testing of the  
Panasonic Avionics Corporation  
4G Cell Modem



## **2.1 TRANSMITTER CONDUCTED POWER MEASUREMENTS**

### **2.1.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1046  
RSS-132, Clause 5.4  
RSS-133, Clause 6.4

### **2.1.2 Standard Applicable**

The conducted power measurements were made in accordance to FCC Part 2 Clause 2.1046 and RSS-132 Clause 5.4 and RSS-133 Clause 6.4.

### **2.1.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration A

### **2.1.4 Date of Test/Initial of test personnel who performed the test**

October 27, 2015 and March 07, 2016/ XYZ

### **2.1.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.1.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.2 - 23.6°C   |
| Relative Humidity   | 43.3 – 50.9%    |
| ATM Pressure        | 98.2 - 98.8 kPa |

### **2.1.7 Additional Observations**

- This is a conducted test using a peak/average power meter.
- The path loss for Cell Band (GSM850), PCS Band (GSM1900), WCDMA and LTE Band 2 and 5 was measured and entered as a level offset.
- Only worst case of RB size and RB offset presented and recorded in this test report.





## 2.1.8 Test Results

| GSM850 / GSM1900 (GPRS) |            |                 |                         |
|-------------------------|------------|-----------------|-------------------------|
| Band                    | Channel    | Frequency (MHz) | Max Power Average (dBm) |
| Cell                    | <b>128</b> | <b>824.2</b>    | <b>32.92</b>            |
|                         | 190        | 836.6           | 32.66                   |
|                         | 251        | 848.8           | 32.23                   |
| PCS                     | <b>512</b> | <b>1850.2</b>   | <b>29.18</b>            |
|                         | 661        | 1880.0          | 28.91                   |
|                         | 810        | 1909.8          | 28.82                   |

| GSM850 / GSM1900 (EGPRS) |            |                 |                         |
|--------------------------|------------|-----------------|-------------------------|
| Band                     | Channel    | Frequency (MHz) | Max Power Average (dBm) |
| Cell                     | <b>128</b> | <b>824.2</b>    | <b>32.91</b>            |
|                          | 190        | 836.6           | 32.66                   |
|                          | 251        | 848.8           | 32.20                   |
| PCS                      | <b>512</b> | <b>1850.2</b>   | <b>29.16</b>            |
|                          | 661        | 1880.0          | 28.84                   |
|                          | 810        | 1909.8          | 29.01                   |

| WCDMA       |             |                 |                         |
|-------------|-------------|-----------------|-------------------------|
| Band        | Channel     | Frequency (MHz) | Max Power Average (dBm) |
| Cell Band 5 | <b>4132</b> | <b>826.4</b>    | <b>22.07</b>            |
|             | 4183        | 836.6           | 22.01                   |
|             | 4233        | 846.6           | 22.06                   |
| PCS Band 2  | 9262        | 1852.4          | 21.60                   |
|             | 9400        | 1880.0          | 21.82                   |
|             | <b>9538</b> | <b>1907.6</b>   | <b>21.90</b>            |



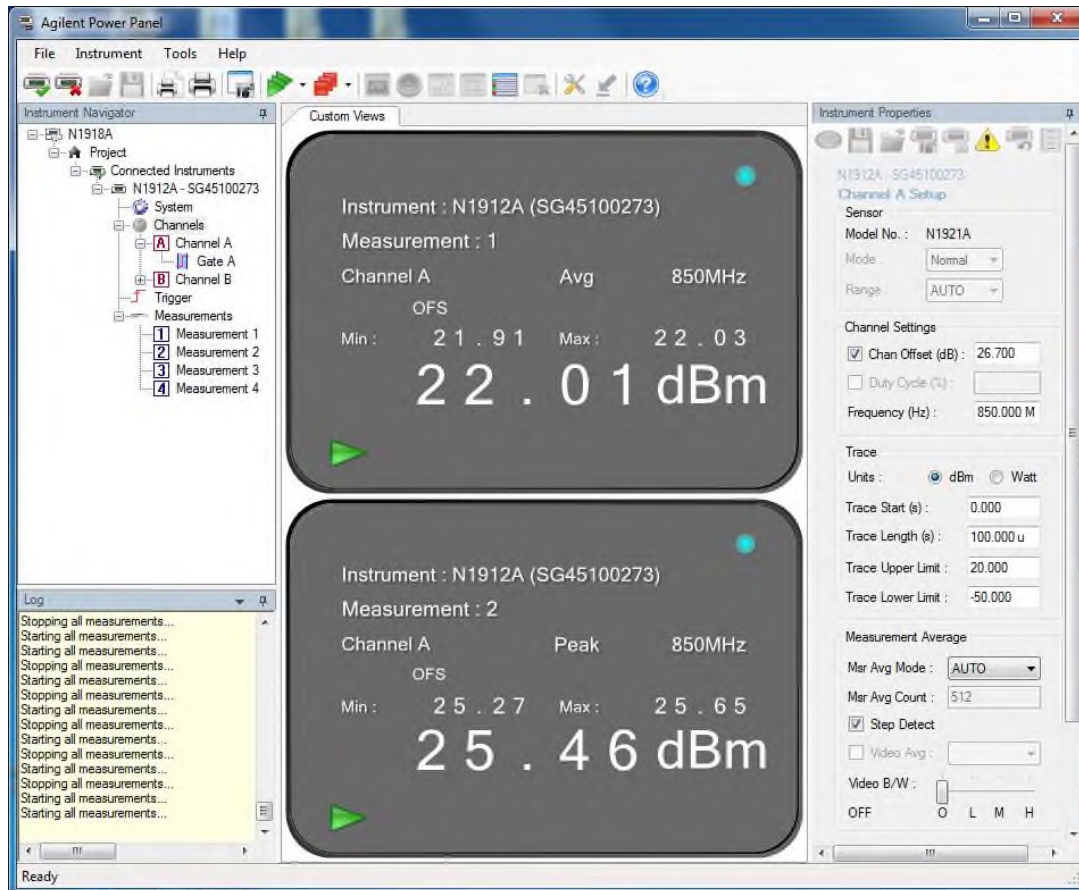
| LTE Band 2 |           |              |               |                  |               |
|------------|-----------|--------------|---------------|------------------|---------------|
| Modulation | Bandwidth | Channels     | Frequency     | Tx Average (dBm) | Tx Peak (dBm) |
| QPSK       | 1.4 MHz   | 18607        | 1850.7        | 23.30            | 29.51         |
|            |           | 18900        | 1880.0        | 23.55            | 29.74         |
|            |           | 19193        | 1909.3        | 23.04            | 29.02         |
|            | 3 MHz     | 18615        | 1851.5        | 23.09            | 29.71         |
|            |           | 18900        | 1880.0        | 23.47            | 29.67         |
|            |           | 19185        | 1908.5        | 23.17            | 29.42         |
|            | 5 MHz     | 18625        | 1852.5        | 22.97            | 29.68         |
|            |           | 18900        | 1880.0        | 23.47            | 29.94         |
|            |           | 19175        | 1907.5        | 22.06            | 28.31         |
|            | 10 MHz    | 18650        | 1855.0        | 23.44            | 29.68         |
|            |           | 18900        | 1880.0        | 23.39            | 29.64         |
|            |           | 19150        | 1905.0        | 23.15            | 29.54         |
|            | 15 MHz    | <b>18675</b> | <b>1857.5</b> | <b>24.17</b>     | <b>30.51</b>  |
|            |           | 18900        | 1880.0        | 23.36            | 29.69         |
|            |           | 19125        | 1902.5        | 23.15            | 29.54         |
|            | 20 MHz    | 18700        | 1860.0        | 23.52            | 30.13         |
|            |           | 18900        | 1880.0        | 23.44            | 29.64         |
|            |           | 19100        | 1900.0        | 23.36            | 29.76         |

| LTE Band 2 |           |              |               |                  |               |
|------------|-----------|--------------|---------------|------------------|---------------|
| Modulation | Bandwidth | Channels     | Frequency     | Tx Average (dBm) | Tx Peak (dBm) |
| 16QAM      | 1.4 MHz   | 18607        | 1850.7        | 22.39            | 29.72         |
|            |           | 18900        | 1880.0        | 22.53            | 29.79         |
|            |           | 19193        | 1909.3        | 22.12            | 29.25         |
|            | 3 MHz     | 18615        | 1851.5        | 22.38            | 29.35         |
|            |           | 18900        | 1880.0        | 23.28            | 30.52         |
|            |           | 19185        | 1908.5        | 22.21            | 29.21         |
|            | 5 MHz     | 18625        | 1852.5        | 21.92            | 29.49         |
|            |           | 18900        | 1880.0        | 23.19            | 30.37         |
|            |           | 19175        | 1907.5        | 21.16            | 28.17         |
|            | 10 MHz    | 18650        | 1855.0        | 23.36            | 29.62         |
|            |           | 18900        | 1880.0        | 23.21            | 30.84         |
|            |           | 19150        | 1905.0        | 22.27            | 29.54         |
|            | 15 MHz    | 18675        | 1857.5        | 22.50            | 29.59         |
|            |           | 18900        | 1880.0        | 23.06            | 29.68         |
|            |           | 19125        | 1902.5        | 22.25            | 29.58         |
|            | 20 MHz    | <b>18700</b> | <b>1860.0</b> | <b>23.47</b>     | <b>29.99</b>  |
|            |           | 18900        | 1880.0        | 23.09            | 30.13         |
|            |           | 19100        | 1900.0        | 22.44            | 29.61         |



| LTE Band 5 |           |              |              |                  |               |
|------------|-----------|--------------|--------------|------------------|---------------|
| Modulation | Bandwidth | Channels     | Frequency    | Tx Average (dBm) | Tx Peak (dBm) |
| QPSK       | 1.4 MHz   | 20407        | 824.7        | 21.01            | 27.42         |
|            |           | <b>20525</b> | <b>836.5</b> | <b>21.11</b>     | <b>28.02</b>  |
|            |           | 20643        | 848.3        | 20.73            | 27.95         |
|            | 3 MHz     | 20415        | 825.5        | 21.04            | 27.26         |
|            |           | 20525        | 836.5        | 20.97            | 27.78         |
|            |           | 20635        | 847.5        | 20.68            | 28.08         |
|            | 5 MHz     | 20425        | 826.5        | 21.03            | 27.72         |
|            |           | 20525        | 836.5        | 20.75            | 27.72         |
|            |           | 20625        | 846.5        | 20.69            | 27.41         |
|            | 10 MHz    | 20450        | 829.0        | 20.80            | 27.25         |
|            |           | 20525        | 836.5        | 20.75            | 27.58         |
|            |           | 20600        | 844.0        | 20.70            | 27.66         |

## 2.1.9 Sample Test Measurement Screen





## **2.2 EFFECTIVE RADIATED POWER**

### **2.2.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1046  
FCC 47 CFR Part 22, Clause 22.913(a)(2)

### **2.2.2 Standard Applicable**

FCC Part 22:  
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

### **2.2.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration (N/A, calculation only)

### **2.2.4 Date of Test/Initial of test personnel who performed the test**

October 27, 2015 and March 07, 2016 / XYZ

### **2.2.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.2.6 Additional Observations**

- ERP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01r01).
- Calculation formula in logarithmic terms:

$$\text{ERP} = P_T + G_T - L_C - 2.15\text{dB}$$

Where:

$P_T$  = transmitter conducted output power dBm (Section 2.1 of this test report)  
 $G_T$  = gain of the transmitting antenna, in dBi (EIRP: the -2.15 in the formula is to convert EIRP to ERP);  
 $L_C$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT configuration during verification is mounted on an interface board with short direct connection to the antenna port. The loss between the EUT and the antenna port is considered negligible).

## 2.2.7 Test Results

| GSM850 (GPRS) Cell Band |                         |                    |       |      |                 |             |
|-------------------------|-------------------------|--------------------|-------|------|-----------------|-------------|
| Frequency (MHz)         | Max Power Average (dBm) | Antenna Gain (dBi) | ERP   |      |                 |             |
|                         |                         |                    | (dBm) | (W)  | ERP Limit (dBm) | Margin (dB) |
| 824.2                   | 32.92                   | 2.50               | 33.27 | 2.12 | 38.45           | 5.18        |
| 836.6                   | 32.66                   | 2.50               | 33.01 | 2.00 | 38.45           | 5.44        |
| 848.8                   | 32.23                   | 2.50               | 32.58 | 1.81 | 38.45           | 5.87        |

| GSM850 (EGPRS) Cell Band |                         |                    |       |      |                 |             |
|--------------------------|-------------------------|--------------------|-------|------|-----------------|-------------|
| Frequency (MHz)          | Max Power Average (dBm) | Antenna Gain (dBi) | ERP   |      |                 |             |
|                          |                         |                    | (dBm) | (W)  | ERP Limit (dBm) | Margin (dB) |
| 824.2                    | 32.91                   | 2.50               | 33.26 | 2.11 | 38.45           | 5.19        |
| 836.6                    | 32.66                   | 2.50               | 33.01 | 2.00 | 38.45           | 5.44        |
| 848.8                    | 32.20                   | 2.50               | 32.55 | 1.80 | 38.45           | 5.90        |

| WCDMA Cell Band 5 |                         |                    |       |      |                 |             |
|-------------------|-------------------------|--------------------|-------|------|-----------------|-------------|
| Frequency (MHz)   | Max Power Average (dBm) | Antenna Gain (dBi) | ERP   |      |                 |             |
|                   |                         |                    | (dBm) | (W)  | ERP Limit (dBm) | Margin (dB) |
| 826.4             | 22.07                   | 2.50               | 22.42 | 0.17 | 38.45           | 16.03       |
| 836.6             | 22.01                   | 2.50               | 22.36 | 0.17 | 38.45           | 16.09       |
| 846.6             | 22.06                   | 2.50               | 22.41 | 0.17 | 38.45           | 16.04       |



| LTE Band 5 |                 |          |                 |                        |                    |           |             |              |
|------------|-----------------|----------|-----------------|------------------------|--------------------|-----------|-------------|--------------|
| Modulation | Bandwidth (MHz) | Channels | Frequency (MHz) | Tx Average Power (dBm) | Antenna Gain (dBi) | ERP (dBm) | Limit (dBm) | Margin (dBm) |
| QPSK       | 1.4             | 20407    | 824.7           | 21.01                  | 2.50               | 21.36     | 38.45       | 17.09        |
|            |                 | 20525    | 836.5           | 21.11                  | 2.50               | 21.46     | 38.45       | 16.99        |
|            |                 | 20643    | 848.3           | 20.73                  | 2.50               | 21.08     | 38.45       | 17.37        |
|            | 3               | 20415    | 825.5           | 21.04                  | 2.50               | 21.39     | 38.45       | 17.06        |
|            |                 | 20525    | 836.5           | 20.97                  | 2.50               | 21.32     | 38.45       | 17.13        |
|            |                 | 20635    | 847.5           | 20.68                  | 2.50               | 21.03     | 38.45       | 17.42        |
|            | 5               | 20425    | 826.5           | 21.03                  | 2.50               | 21.38     | 38.45       | 17.07        |
|            |                 | 20525    | 836.5           | 20.75                  | 2.50               | 21.10     | 38.45       | 17.35        |
|            |                 | 20625    | 846.5           | 20.69                  | 2.50               | 21.04     | 38.45       | 17.41        |
|            | 10              | 20450    | 829.0           | 20.80                  | 2.50               | 21.15     | 38.45       | 17.3         |
|            |                 | 20525    | 836.5           | 20.75                  | 2.50               | 21.1      | 38.45       | 17.35        |
|            |                 | 20600    | 844.0           | 20.70                  | 2.50               | 21.05     | 38.45       | 17.40        |



## **2.3 EQUIVALENT ISOTROPIC RADIATED POWER**

### **2.3.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1046  
RSS-132, Clause 5.4  
FCC 47 CFR Part 24, Clause 24.232 (c)  
RSS-133, Clause 6.4

### **2.3.2 Standard Applicable**

IC RSS-132:  
The EIRP for mobile equipment shall not exceed 11.5 watts

FCC Part 24:  
Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

IC RSS-133:  
The equivalent isotropically radiated power (e.i.r.p.) for Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p.

### **2.3.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration (N/A, calculation only)

### **2.3.4 Date of Test/Initial of test personnel who performed the test**

October 27, 2015 and March 06, 2016 / XYZ

### **2.3.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.3.6 Additional Observations**

- EIRP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\text{EIRP} = P_T + G_T - L_C$$

Where:

$P_T$  = transmitter conducted output power dBm (Section 2.1 of this test report)  
 $G_T$  = gain of the transmitting antenna, in dBi (EIRP);  
 $L_C$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT poses an internal Antenna. The loss between the EUT and the antenna port is considered negligible).



### 2.3.7 Test Results

| GSM850 (GPRS) Cell Band |                         |                    |              |             |                  |             |
|-------------------------|-------------------------|--------------------|--------------|-------------|------------------|-------------|
| Frequency (MHz)         | Max Power Average (dBm) | Antenna Gain (dBi) | EIRP         |             |                  |             |
|                         |                         |                    | (dBm)        | (W)         | EIRP Limit (dBm) | Margin (dB) |
| <b>824.2</b>            | <b>32.92</b>            | <b>2.50</b>        | <b>35.42</b> | <b>3.48</b> | <b>40.61</b>     | <b>5.19</b> |
| 836.6                   | 32.66                   | 2.50               | 35.16        | 3.28        | 40.61            | 5.45        |
| 848.8                   | 32.23                   | 2.50               | 34.73        | 2.97        | 40.61            | 5.87        |

| GSM850 (EGPRS) Cell Band |                         |                    |              |             |                  |             |
|--------------------------|-------------------------|--------------------|--------------|-------------|------------------|-------------|
| Frequency (MHz)          | Max Power Average (dBm) | Antenna Gain (dBi) | EIRP         |             |                  |             |
|                          |                         |                    | (dBm)        | (W)         | EIRP Limit (dBm) | Margin (dB) |
| <b>824.2</b>             | <b>32.91</b>            | <b>2.50</b>        | <b>35.41</b> | <b>3.47</b> | <b>40.61</b>     | <b>5.20</b> |
| 836.6                    | 32.66                   | 2.50               | 35.16        | 3.28        | 40.61            | 5.45        |
| 848.8                    | 32.20                   | 2.50               | 34.70        | 2.95        | 40.61            | 5.91        |

| GSM1900 (GPRS) PCS Band |                         |                    |              |             |             |             |
|-------------------------|-------------------------|--------------------|--------------|-------------|-------------|-------------|
| Frequency (MHz)         | Max Power Average (dBm) | Antenna Gain (dBi) | EIRP         |             |             |             |
|                         |                         |                    | (dBm)        | (W)         | Limit (dBm) | Margin (dB) |
| <b>1850.2</b>           | <b>29.18</b>            | <b>2.50</b>        | <b>31.68</b> | <b>1.47</b> | <b>33</b>   | <b>1.32</b> |
| 1880.0                  | 28.91                   | 2.50               | 31.41        | 1.38        | 33          | 1.59        |
| 1909.8                  | 28.82                   | 2.50               | 31.32        | 1.36        | 33          | 1.68        |

| GSM1900 (EGPRS) PCS Band |                         |                    |              |             |             |             |
|--------------------------|-------------------------|--------------------|--------------|-------------|-------------|-------------|
| Frequency (MHz)          | Max Power Average (dBm) | Antenna Gain (dBi) | EIRP         |             |             |             |
|                          |                         |                    | (dBm)        | (W)         | Limit (dBm) | Margin (dB) |
| <b>1850.2</b>            | <b>29.16</b>            | <b>2.50</b>        | <b>31.66</b> | <b>1.47</b> | <b>33</b>   | <b>1.34</b> |
| 1880.0                   | 28.84                   | 2.50               | 31.34        | 1.36        | 33          | 1.66        |
| 1909.8                   | 29.01                   | 2.50               | 31.51        | 1.42        | 33          | 1.49        |



| WCDMA Cell Band 5 |                         |                    |              |             |                  |              |
|-------------------|-------------------------|--------------------|--------------|-------------|------------------|--------------|
| Frequency (MHz)   | Max Power Average (dBm) | Antenna Gain (dBi) | EIRP         |             |                  |              |
|                   |                         |                    | (dBm)        | (W)         | EIRP Limit (dBm) | Margin (dB)  |
| <b>826.4</b>      | <b>22.07</b>            | <b>2.50</b>        | <b>24.57</b> | <b>0.29</b> | <b>40.61</b>     | <b>16.04</b> |
| 836.6             | 22.01                   | 2.50               | 24.51        | 0.28        | 40.61            | 16.10        |
| 846.6             | 22.06                   | 2.50               | 24.56        | 0.29        | 40.61            | 16.05        |

| WCDMA PCS Band 2 |                         |                    |              |             |             |             |
|------------------|-------------------------|--------------------|--------------|-------------|-------------|-------------|
| Frequency (MHz)  | Max Power Average (dBm) | Antenna Gain (dBi) | EIRP         |             |             |             |
|                  |                         |                    | (dBm)        | (W)         | Limit (dBm) | Margin (dB) |
| 1852.4           | 21.60                   | 2.50               | 24.10        | 0.26        | 33          | 8.90        |
| 1880.0           | 21.82                   | 2.50               | 24.32        | 0.27        | 33          | 8.68        |
| <b>1907.6</b>    | <b>21.90</b>            | <b>2.50</b>        | <b>24.40</b> | <b>0.28</b> | <b>33</b>   | <b>8.60</b> |

| LTE Band 2 |                 |              |                 |                        |                    |              |             |              |
|------------|-----------------|--------------|-----------------|------------------------|--------------------|--------------|-------------|--------------|
| Modulation | Bandwidth (MHz) | Channels     | Frequency (MHz) | Tx Average Power (dBm) | Antenna Gain (dBi) | EIRP (dBm)   | Limit (dBm) | Margin (dBm) |
| QPSK       | 1.4             | 18607        | 1850.7          | 23.30                  | 2.50               | 25.80        | 33          | 7.2          |
|            |                 | 18900        | 1880.0          | 23.55                  | 2.50               | 26.05        | 33          | 6.95         |
|            |                 | 19193        | 1909.3          | 23.04                  | 2.50               | 25.54        | 33          | 7.46         |
|            | 3               | 18615        | 1851.5          | 23.09                  | 2.50               | 25.59        | 33          | 7.41         |
|            |                 | 18900        | 1880.0          | 23.47                  | 2.50               | 25.97        | 33          | 7.03         |
|            |                 | 19185        | 1908.5          | 23.17                  | 2.50               | 25.67        | 33          | 7.33         |
|            | 5               | 18625        | 1852.5          | 22.97                  | 2.50               | 25.47        | 33          | 7.53         |
|            |                 | 18900        | 1880.0          | 23.47                  | 2.50               | 25.97        | 33          | 7.03         |
|            |                 | 19175        | 1907.5          | 22.06                  | 2.50               | 24.56        | 33          | 8.44         |
|            | 10              | 18650        | 1855.0          | 23.44                  | 2.50               | 25.94        | 33          | 7.06         |
|            |                 | 18900        | 1880.0          | 23.39                  | 2.50               | 25.89        | 33          | 7.11         |
|            |                 | 19150        | 1905.0          | 23.15                  | 2.50               | 25.65        | 33          | 7.35         |
|            | 15              | <b>18675</b> | <b>1857.5</b>   | <b>24.17</b>           | <b>2.50</b>        | <b>26.67</b> | <b>33</b>   | <b>6.33</b>  |
|            |                 | 18900        | 1880.0          | 23.36                  | 2.50               | 25.86        | 33          | 7.14         |
|            |                 | 19125        | 1902.5          | 23.15                  | 2.50               | 25.65        | 33          | 7.35         |
|            | 20              | 18700        | 1860.0          | 23.52                  | 2.50               | 26.02        | 33          | 6.98         |
|            |                 | 18900        | 1880.0          | 23.44                  | 2.50               | 25.94        | 33          | 7.06         |
|            |                 | 19100        | 1900.0          | 23.36                  | 2.50               | 25.86        | 33          | 7.14         |



| LTE Band 2 |                 |              |                 |                        |                    |              |             |              |
|------------|-----------------|--------------|-----------------|------------------------|--------------------|--------------|-------------|--------------|
| Modulation | Bandwidth (MHz) | Channels     | Frequency (MHz) | Tx Average Power (dBm) | Antenna Gain (dBi) | EIRP (dBm)   | Limit (dBm) | Margin (dBm) |
| 16QAM      | 1.4             | 18607        | 1850.7          | 22.39                  | 2.50               | 24.89        | 33          | 8.11         |
|            |                 | 18900        | 1880.0          | 22.53                  | 2.50               | 25.03        | 33          | 7.97         |
|            |                 | 19193        | 1909.3          | 22.12                  | 2.50               | 24.89        | 33          | 8.38         |
|            | 3               | 18615        | 1851.5          | 22.38                  | 2.50               | 24.88        | 33          | 8.12         |
|            |                 | 18900        | 1880.0          | 23.28                  | 2.50               | 25.78        | 33          | 7.22         |
|            |                 | 19185        | 1908.5          | 22.21                  | 2.50               | 24.71        | 33          | 8.29         |
|            | 5               | 18625        | 1852.5          | 21.92                  | 2.50               | 24.42        | 33          | 8.58         |
|            |                 | 18900        | 1880.0          | 23.19                  | 2.50               | 25.69        | 33          | 7.31         |
|            |                 | 19175        | 1907.5          | 21.16                  | 2.50               | 23.66        | 33          | 9.34         |
|            | 10              | 18650        | 1855.0          | 23.36                  | 2.50               | 25.86        | 33          | 7.14         |
|            |                 | 18900        | 1880.0          | 23.21                  | 2.50               | 25.71        | 33          | 7.29         |
|            |                 | 19150        | 1905.0          | 22.27                  | 2.50               | 24.77        | 33          | 8.23         |
|            | 15              | 18675        | 1857.5          | 22.50                  | 2.50               | 25.00        | 33          | 8.00         |
|            |                 | 18900        | 1880.0          | 23.06                  | 2.50               | 25.56        | 33          | 7.44         |
|            |                 | 19125        | 1902.5          | 22.25                  | 2.50               | 24.75        | 33          | 8.25         |
|            | 20              | <b>18700</b> | <b>1860.0</b>   | <b>23.47</b>           | <b>2.50</b>        | <b>25.97</b> | <b>33</b>   | <b>7.03</b>  |
|            |                 | 18900        | 1880.0          | 23.09                  | 2.50               | 25.59        | 33          | 7.41         |
|            |                 | 19100        | 1900.0          | 22.44                  | 2.50               | 24.94        | 33          | 8.06         |



| LTE Band 5 |                 |              |                 |                        |                    |              |              |              |
|------------|-----------------|--------------|-----------------|------------------------|--------------------|--------------|--------------|--------------|
| Modulation | Bandwidth (MHz) | Channels     | Frequency (MHz) | Tx Average Power (dBm) | Antenna Gain (dBi) | EIRP (dBm)   | Limit (dBm)  | Margin (dBm) |
| QPSK       | 1.4             | 20407        | 824.7           | 21.01                  | 2.50               | 23.51        | 40.61        | 17.1         |
|            |                 | <b>20525</b> | <b>836.5</b>    | <b>21.11</b>           | <b>2.50</b>        | <b>23.61</b> | <b>40.61</b> | <b>17.0</b>  |
|            |                 | 20643        | 848.3           | 20.73                  | 2.50               | 23.23        | 40.61        | 17.38        |
|            | 3               | 20415        | 825.5           | 21.04                  | 2.50               | 23.54        | 40.61        | 17.07        |
|            |                 | 20525        | 836.5           | 20.97                  | 2.50               | 23.47        | 40.61        | 17.14        |
|            |                 | 20635        | 847.5           | 20.68                  | 2.50               | 23.18        | 40.61        | 17.43        |
|            | 5               | 20425        | 826.5           | 21.03                  | 2.50               | 23.53        | 40.61        | 17.08        |
|            |                 | 20525        | 836.5           | 20.75                  | 2.50               | 23.25        | 40.61        | 17.36        |
|            |                 | 20625        | 846.5           | 20.69                  | 2.50               | 23.19        | 40.61        | 17.42        |
|            | 10              | 20450        | 829.0           | 20.80                  | 2.50               | 23.3         | 40.61        | 17.31        |
|            |                 | 20525        | 836.5           | 20.75                  | 2.50               | 23.25        | 40.61        | 17.36        |
|            |                 | 20600        | 844.0           | 20.70                  | 2.50               | 23.2         | 40.61        | 17.41        |



## **2.4 PEAK-AVERAGE RATIO**

### **2.4.1 Specification Reference**

FCC 47 CFR Part 24, Clause 24.2329 (d)  
RSS-133, Clause 6.4  
RSS-132, Clause 5.4

### **2.4.2 Standard Applicable**

FCC Part 24:

Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB

IC RSS-132 and RSS-133:

The transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

### **2.4.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration A

### **2.4.4 Date of Test/Initial of test personnel who performed the test**

October 28 and 29, 2015 and March 06, 2016 / XYZ

### **2.4.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.4.6 Environmental Conditions/ Test Location**

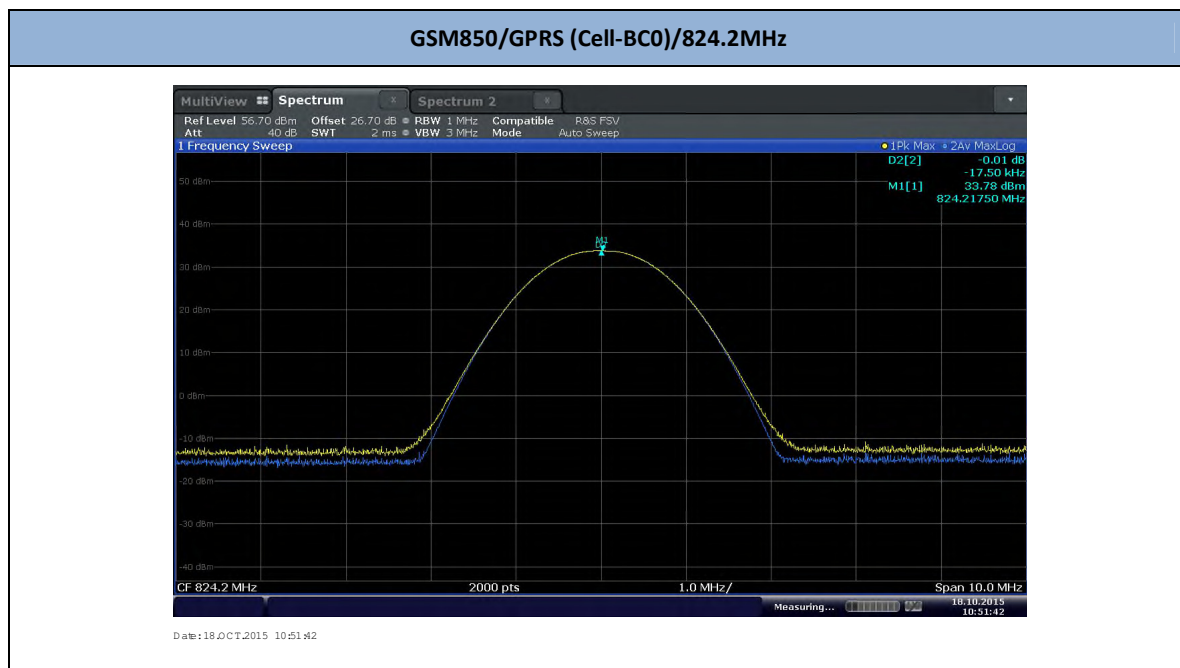
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.4 – 23.6°C   |
| Relative Humidity   | 43.3 - 50.9 %   |
| ATM Pressure        | 98.2 - 98.8 kPa |

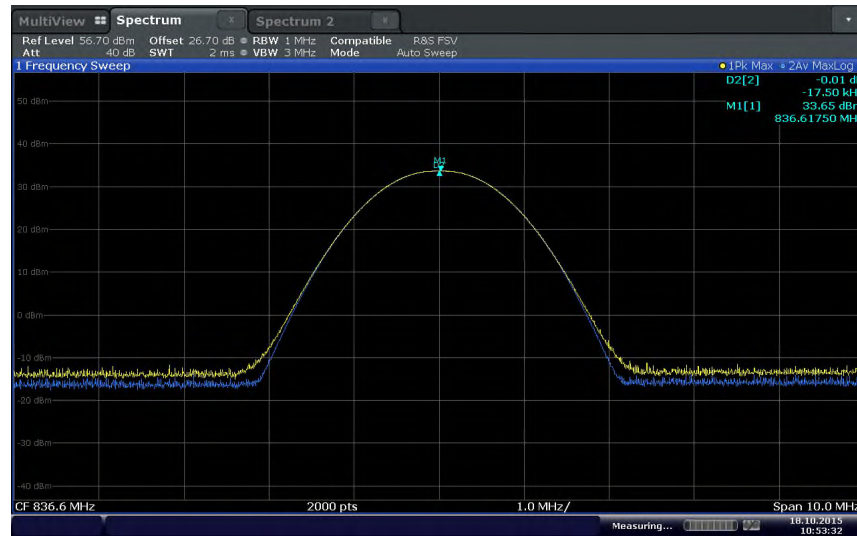
## 2.4.7 Additional Observations

- This is a conducted test. Test procedure is per Section 3.0 of KDB971168 (D01 Power Meas License Digital Systems v01).
- Measurement was done using the Spectrum Analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile. The built-in function is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth (crest factor or peak-to-average ratio) The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signals spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth.
- All channels based from worst case configuration were verified. Only the worst channel and configuration presented.
- The path loss for Cell Band (GSM850), PCS Band (GSM1900), WCDMA and LTE Band 2 and 5 was measured and entered as a level offset.
- There are no measured PAPR levels greater than 13dB. EUT complies.

## 2.4.8 Test Results

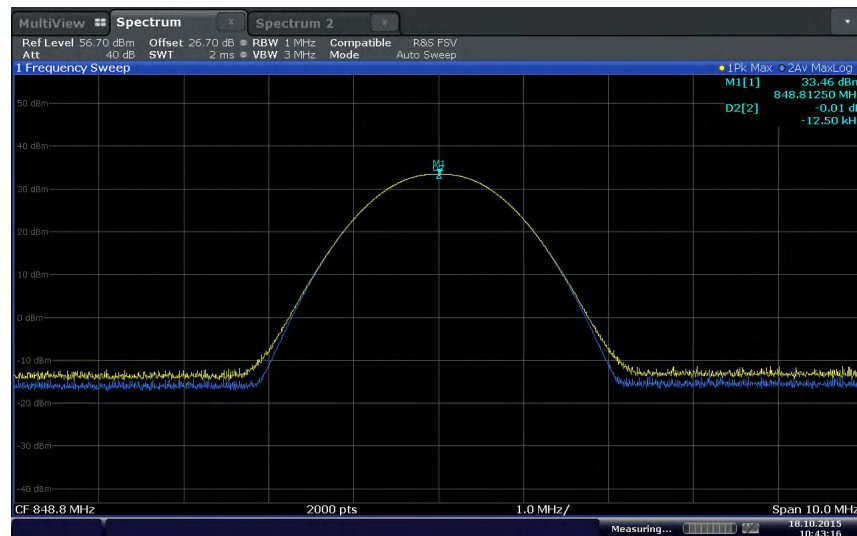


### GSM850/GPRS (Cell-BC0)/836.6MHz



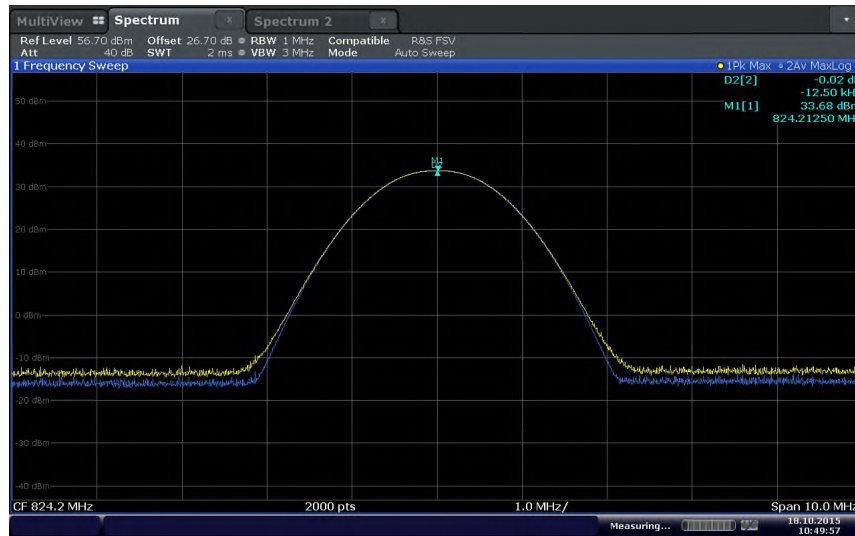
Date: 16.OCT.2015 10:33:33

### GSM850/GPRS (Cell-BC0)/848.8MHz



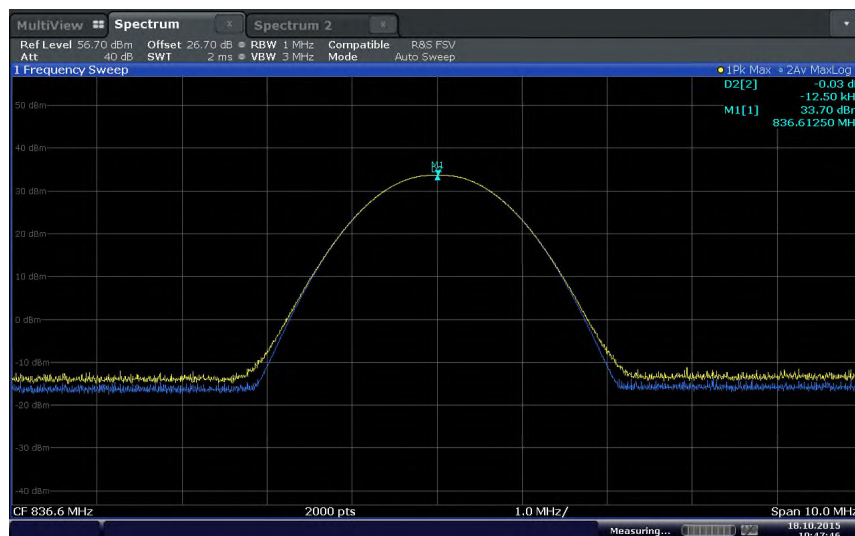
Date: 16.OCT.2015 10:43:16

### GSM850/EGPRS (Cell-BC0)/824.2MHz



Date: 18.OCT.2015 10:49:58

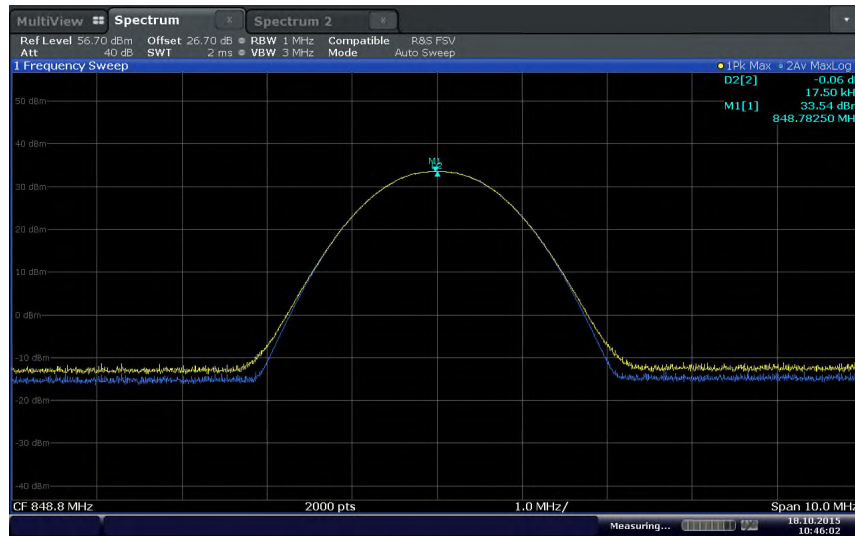
### GSM850/EGPRS (Cell-BC0)/836.6MHz



Date: 18.OCT.2015 10:47:46

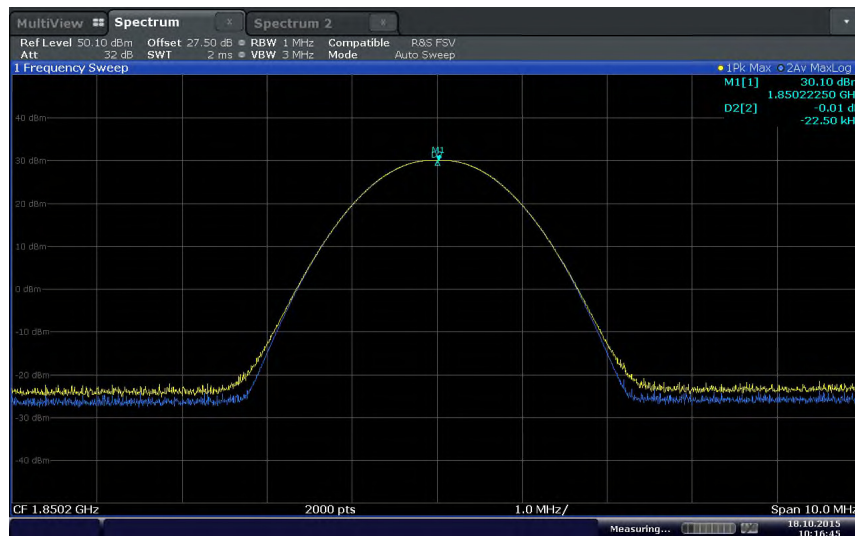


### GSM850/EGPRS (Cell-BC0)/848.8MHz



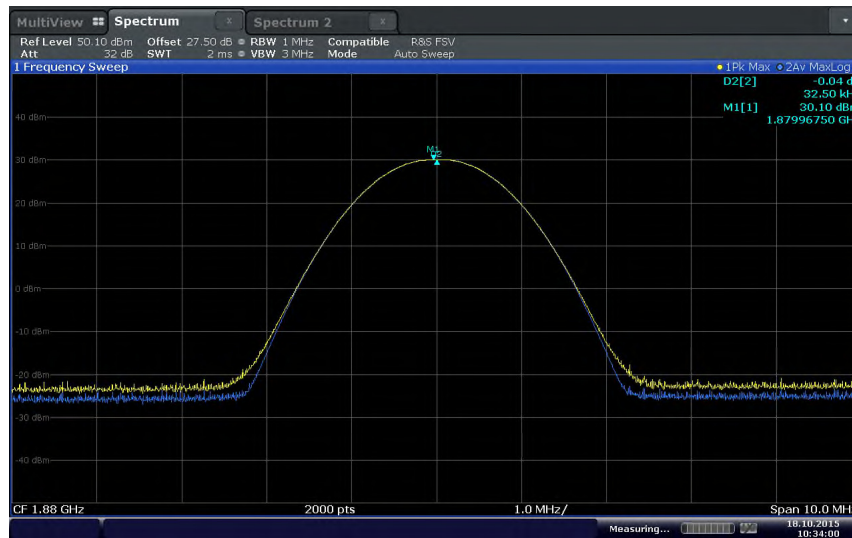
Date: 18.OCT.2015 10:46:03

### GSM1900/GPRS (PCS BC1)/1850.2MHz



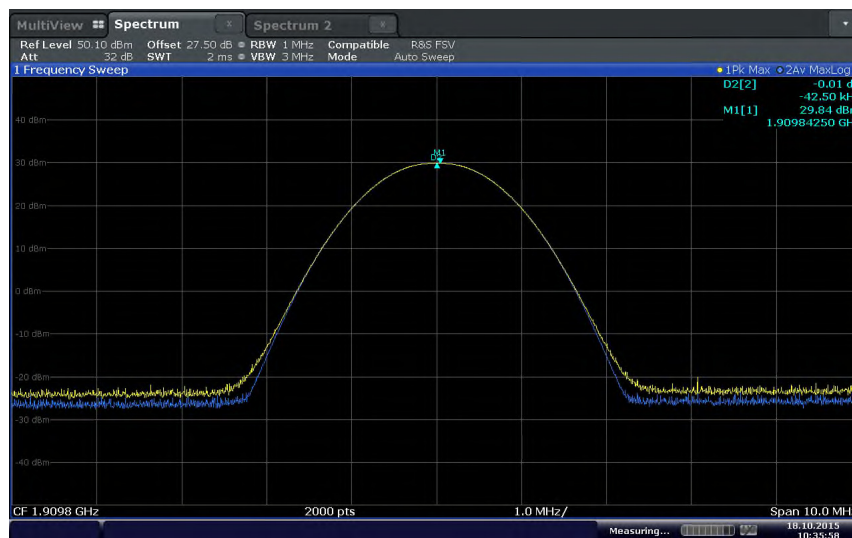
Date: 18.OCT.2015 10:16:45

### GSM1900/GPRS (PCS BC1)/1880.0MHz



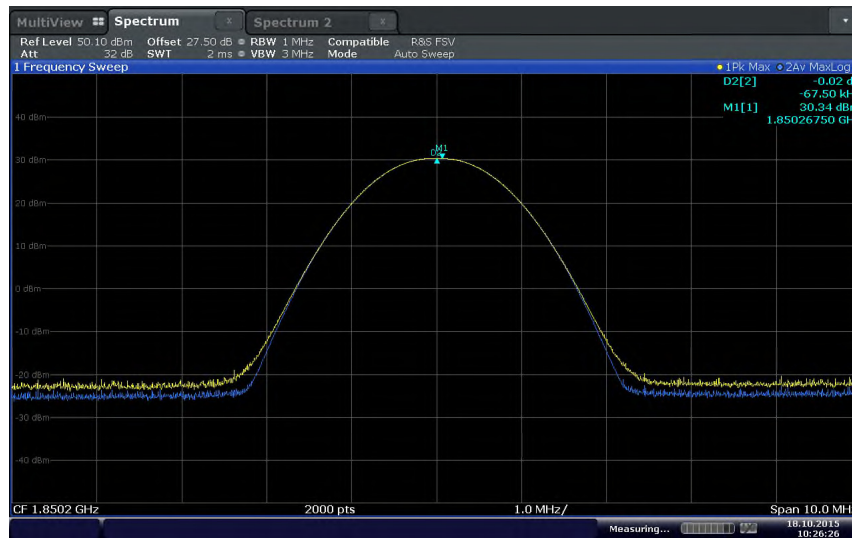
Date: 18.OCT.2015 10:34:00

### GSM1900/GPRS (PCS BC1)/1909.8MHz



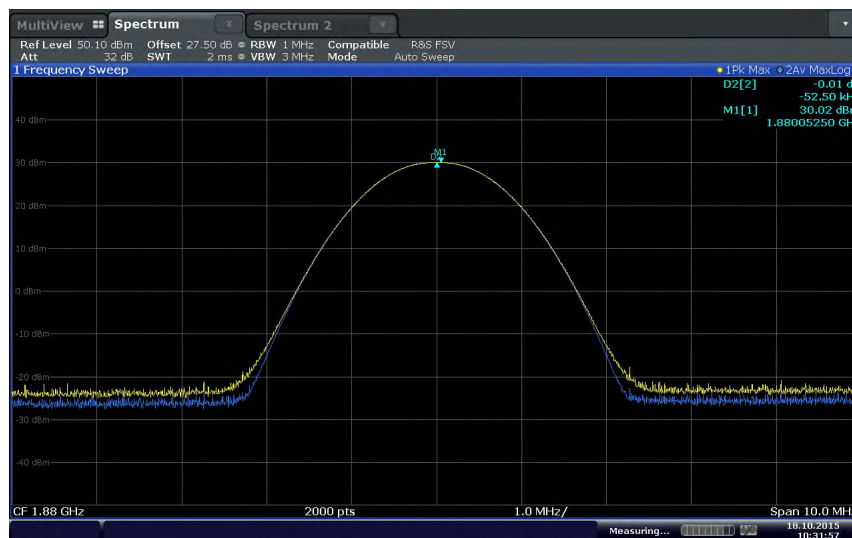
Date: 18.OCT.2015 10:35:58

### GSM1900/EGPRS (PCS BC1)/1850.2MHz



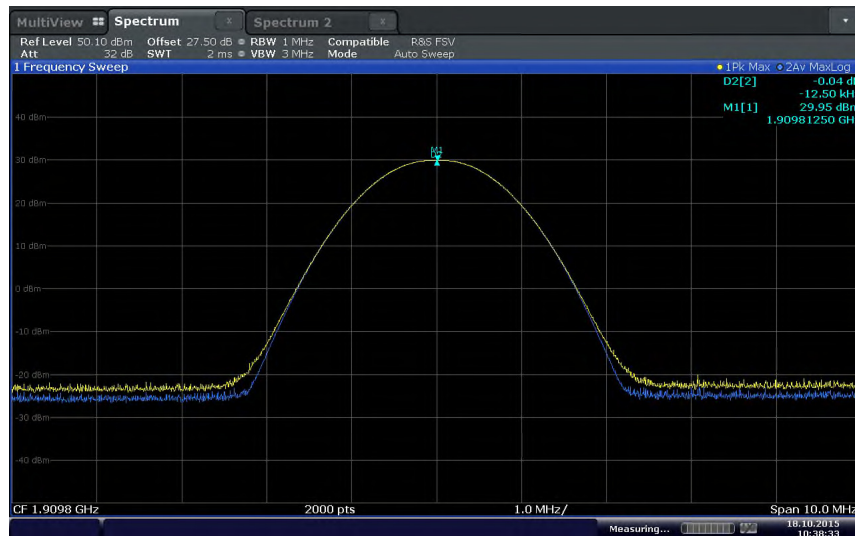
Date: 18.OCT.2015 10:26:26

### GSM1900/EGPRS (PCS BC1)/1880.0MHz



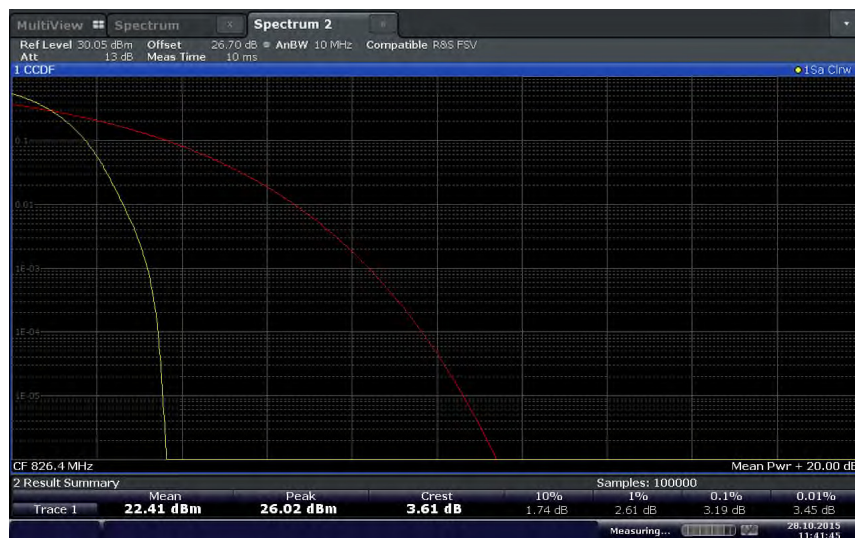
Date: 18.OCT.2015 10:31:57

### GSM1900/EGPRS (PCS BC1)/1909.8MHz



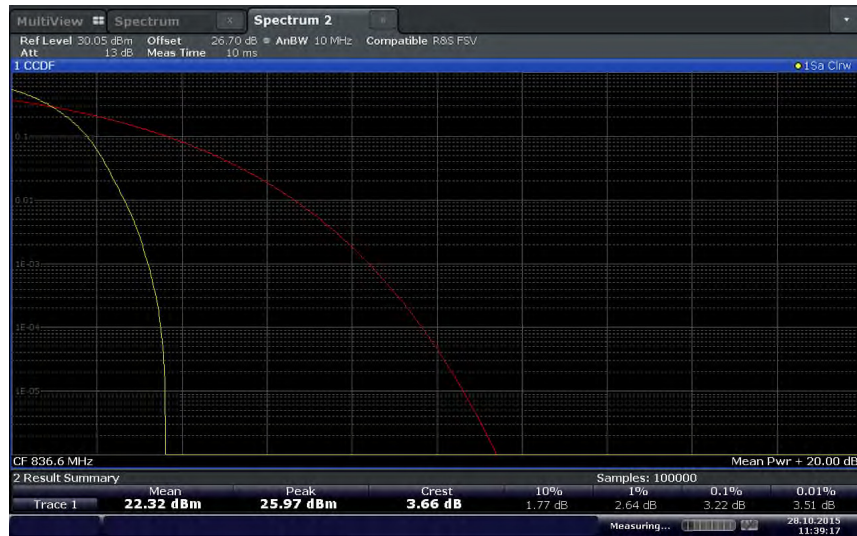
Date: 18.OCT.2015 10:38:33

### WCDMA/Band 5/826.4MHz



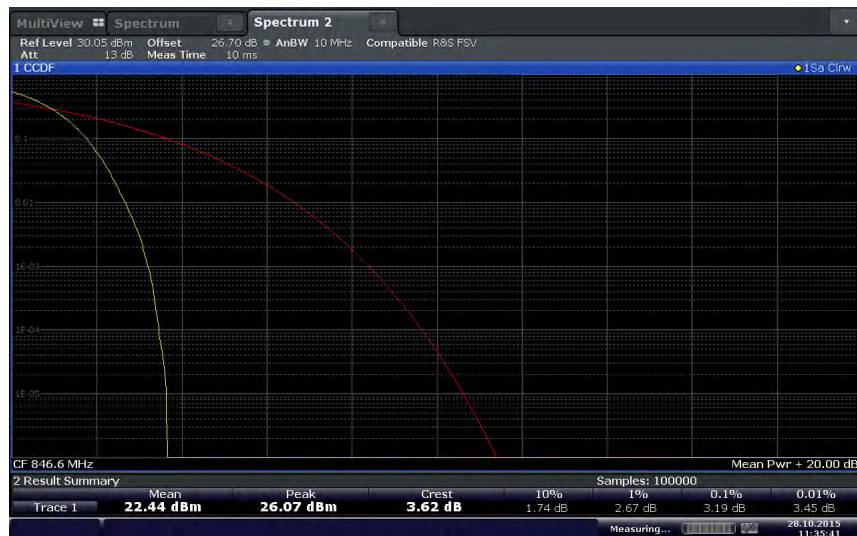
Date: 18.OCT.2015 11:41:45

### WCDMA/Band 5/836.6MHz



Date: 28.OCT.2015 11:39:17

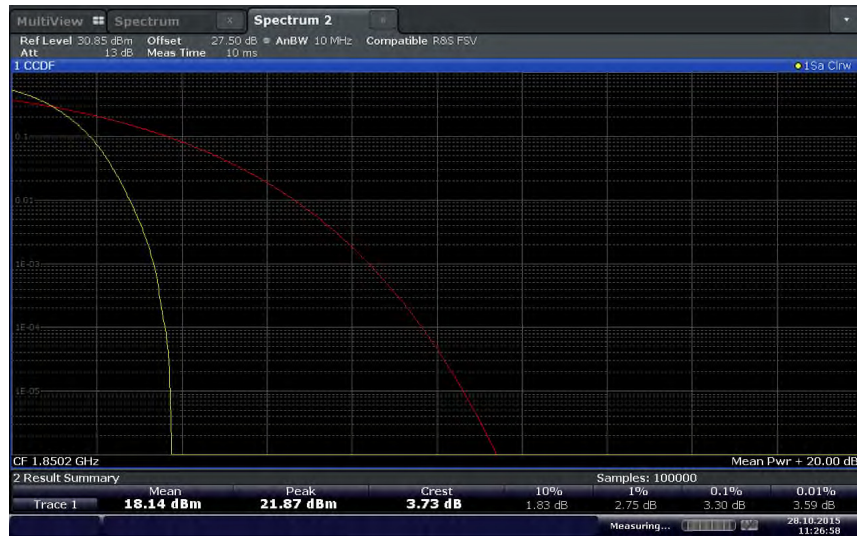
### WCDMA/Band 5/846.6 MHz



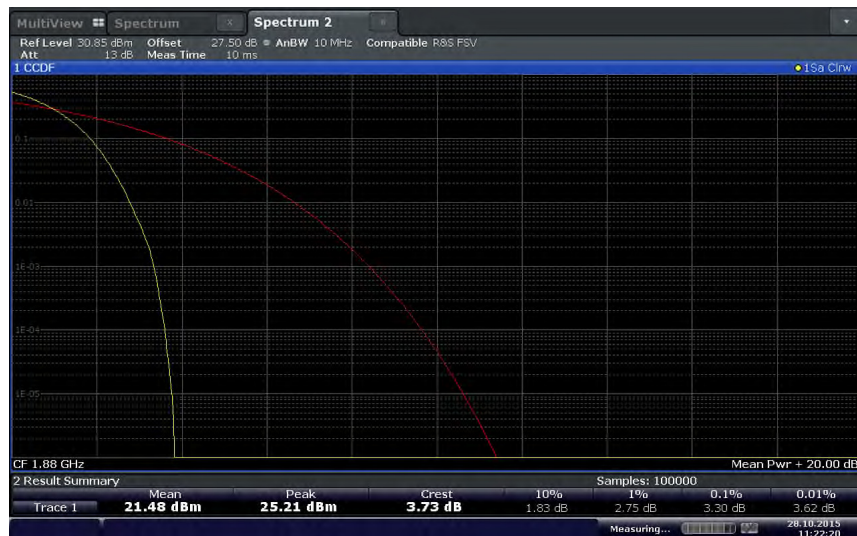
Date: 28.OCT.2015 11:35:41



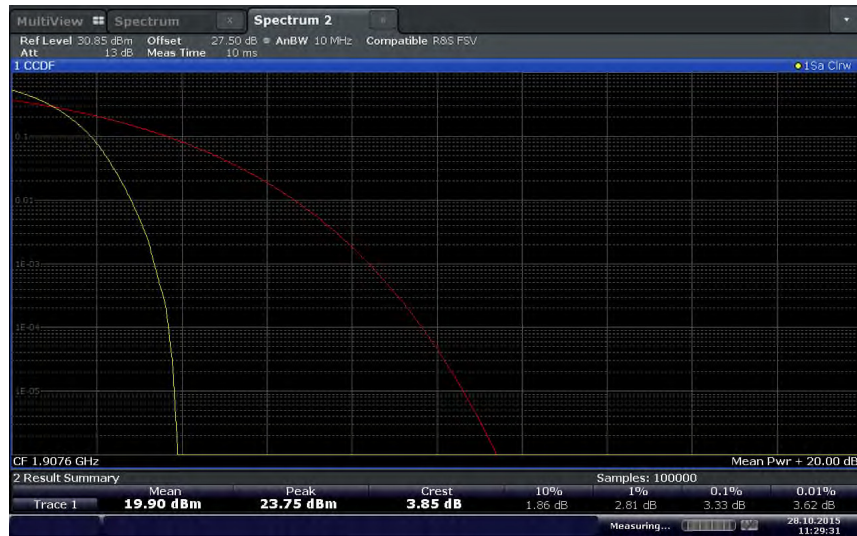
### WCDMA/Band 2/1852.4MHz



### WCDMA/Band 2/1880 MHz



### WCDMA/Band 2/1907.6 MHz



Date: 28.OCT.2015 11:29:32

### LTE Band 2 (1.4 MHz BW)/1850.7 MHz/QPSK



Date: 29.OCT.2015 16:29:40

### LTE Band 2 (1.4 MHz BW)/1880 MHz/QPSK



### LTE Band 2 (1.4 MHz BW)/1909.3 MHz/QPSK





### LTE Band 2 (3 MHz BW)/1851.5 MHz/QPSK



Date: 29.OCT.2015 16:25:15

### LTE Band 2 (3 MHz BW)/1880 MHz/QPSK



Date: 29.OCT.2015 15:31:34

### LTE Band 2 (3 MHz BW)/1908.5 MHz/QPSK



### LTE Band 2 (5 MHz BW)/1852.5 MHz/QPSK



### LTE Band 2 (5 MHz BW)/1880 MHz/QPSK



Date: 29.OCT.2015 15:34:08

### LTE Band 2 (5 MHz BW)/1907.5 MHz/QPSK



Date: 29.OCT.2015 16:10:31



### LTE Band 2 (10 MHz BW)/1855 MHz/QPSK



Date: 29.OCT.2015 16:08:45

### LTE Band 2 (10 MHz BW)/1880 MHz/QPSK



Date: 29.OCT.2015 15:35:20

### LTE Band 2 (10 MHz BW)/1905 MHz/QPSK



Date: 29.OCT.2015 16:04:59

### LTE Band 2 (15 MHz BW)/1857.5 MHz/QPSK



Date: 29.OCT.2015 16:03:06

### LTE Band 2 (15 MHz BW)/1880 MHz/QPSK



Date: 29.OCT.2015 15:38:17

### LTE Band 2 (15 MHz BW)/1902.5 MHz/QPSK



Date: 29.OCT.2015 15:57:17



### LTE Band 2 (20 MHz BW)/1860 MHz/QPSK



Date: 29.OCT.2015 15:52:23

### LTE Band 2 (20 MHz BW)/1880 MHz/QPSK



Date: 29.OCT.2015 15:39:48

### LTE Band 2 (20 MHz BW)/1900 MHz/QPSK



Date: 29.OCT.2015 15:55:48

### LTE Band 5 (1.4 MHz BW)/824.7 MHz/QPSK



Date: 7.MAR.2016 15:15:37



### LTE Band 5 (1.4 MHz BW)/836.5 MHz/QPSK



### LTE Band 5 (1.4 MHz BW)/848.3 MHz/QPSK



MultiView Spectrum 2 Spectrum 3 Spectrum 4 Spectrum 5

Ref Level 36.90 dBm Offset 16.90 dB AnBW 28 MHz Compatible R&S F5V  
Att 30 dB Meas Time 3.571 ms

1 CCDF 1a C1w

CF 825.5 MHz Mean Pwr + 20.00 dB

2 Result Summary Samples: 100000

| Trace 1 | Mean      | Peak      | Crest   | 10%     | 1%      | 0.1%    | 0.01%   |
|---------|-----------|-----------|---------|---------|---------|---------|---------|
|         | 11.11 dBm | 27.73 dBm | 6.62 dB | 2.43 dB | 4.43 dB | 5.54 dB | 6.20 dB |

Measuring... 07/18/2016 15:53:10

1 CCDF

CF 836.5 MHz

Mean Pwr +20.00 dBm

2 Result Summary

| Trace 1 | Mean      | Peak      | Crest   | 10%     | 1%      | 0.1%    | 0.01%   |
|---------|-----------|-----------|---------|---------|---------|---------|---------|
|         | 21.01 dBm | 28.32 dBm | 7.32 dB | 2.46 dB | 4.61 dB | 6.12 dB | 7.04 dB |

Measuring... 07/03/2016 13:33:20

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

### LTE Band 5 (3 MHz BW)/847.5 MHz/QPSK



Date: 7.MAR.2016 15:52:11

### LTE Band 5 (5 MHz BW)/826.5 MHz/QPSK



Date: 7.MAR.2016 15:46:10



### LTE Band 5 (5 MHz BW)/836.5 MHz/QPSK



Date: 7.MAR.2016 15:36:54

### LTE Band 5 (5 MHz BW)/846.5 MHz/QPSK



Date: 7.MAR.2016 15:49:29

### LTE Band 5 (10 MHz BW)/829.0 MHz/QPSK



Date: 7.MAR.2016 15:44:03

### LTE Band 5 (10 MHz BW)/836.5 MHz/QPSK



Date: 7.MAR.2016 15:39:12

LTE Band 5 (10 MHz BW)/844.0 MHz/QPSK



Date: 7.MAR.2016 15:41:14



## **2.5 OCCUPIED BANDWIDTH**

### **2.5.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1049  
FCC 47 CFR Part 22, Clause 22.917(b)  
FCC 47 CFR Part 24, Clause 24.238(b)  
RSS-GEN 4.6.1

### **2.5.2 Standard Applicable**

The transmitted signal bandwidth shall be reported as the 99% emission bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

26dB Bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated by at least 26 dB below the transmitter power.

### **2.5.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration A

### **2.5.4 Date of Test/Initial of test personnel who performed the test**

October 28 and 29, 2015 and March 07, 2016 / XYZ

### **2.5.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.5.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.4 – 23.6°C   |
| Relative Humidity   | 43.3 – 50.9%    |
| ATM Pressure        | 98.2 – 98.8 kPa |

### **2.5.7 Additional Observations**

- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- Using the occupied bandwidth measurement function in the spectrum analyzer, the 99% occupied bandwidth was measured.
- The 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 V0202 Clause 4.1 using the ndB measurement function in the spectrum analyzer.
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.



- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be at least 3x RBW.
- Low, Mid and High channels for all bandwidths and modulations were verified. Test results of Mid channel were presented as representative.

## 2.5.8 Test Results

| GSM850 / GSM1900 (GPRS) |         |           |               |               |
|-------------------------|---------|-----------|---------------|---------------|
| Band                    | Channel | Frequency | 99% OBW (kHz) | 26dB BW (kHz) |
| Cell                    | 190     | 836.6     | 244.6         | 331.4         |
| PCS                     | 661     | 1880.0    | 243.1         | 316.9         |

| GSM850 / GSM1900 (EGPRS) |         |           |               |               |
|--------------------------|---------|-----------|---------------|---------------|
| Band                     | Channel | Frequency | 99% OBW (kHz) | 26dB BW (kHz) |
| Cell                     | 190     | 836.6     | 246.0         | 327.1         |
| PCS                      | 661     | 1880.0    | 247.5         | 321.3         |

| WCDMA       |         |           |               |               |
|-------------|---------|-----------|---------------|---------------|
| Band        | Channel | Frequency | 99% OBW (MHz) | 26dB BW (MHz) |
| Cell Band 5 | 4183    | 836.6     | 4.20          | 4.66          |
| PCS Band 2  | 9400    | 1880.0    | 4.20          | 4.66          |

| LTE (QPSK) |                 |         |           |               |               |
|------------|-----------------|---------|-----------|---------------|---------------|
| Band       | Bandwidth (MHz) | Channel | Frequency | 99% OBW (MHz) | 26dB BW (MHz) |
| 2          | 1.4             | 661     | 1880.0    | 1.10          | 1.35          |
|            | 3               |         |           | 2.69          | 3.05          |
|            | 5               |         |           | 4.49          | 5.05          |
|            | 10              |         |           | 8.96          | 9.88          |
|            | 15              |         |           | 13.47         | 14.78         |
|            | 20              |         |           | 17.88         | 19.51         |

| LTE (16QAM) |                 |         |           |               |               |
|-------------|-----------------|---------|-----------|---------------|---------------|
| Band        | Bandwidth (MHz) | Channel | Frequency | 99% OBW (MHz) | 26dB BW (MHz) |
| 2           | 1.4             | 661     | 1880.0    | 1.09          | 1.35          |
|             | 3               |         |           | 2.68          | 3.05          |
|             | 5               |         |           | 4.49          | 5.07          |
|             | 10              |         |           | 8.94          | 9.81          |
|             | 15              |         |           | 13.44         | 14.87         |
|             | 20              |         |           | 17.88         | 19.51         |

| LTE (QPSK) |                 |         |           |               |               |
|------------|-----------------|---------|-----------|---------------|---------------|
| Band       | Bandwidth (MHz) | Channel | Frequency | 99% OBW (MHz) | 26dB BW (MHz) |
| 5          | 1.4             | 20525   | 836.5     | 1.08          | 1.28          |
|            | 3               |         |           | 2.68          | 2.99          |
|            | 5               |         |           | 4.48          | 4.98          |
|            | 10              |         |           | 8.94          | 9.80          |

## 2.5.9 Example Test Plots

### GSM850 (GPRS)/Cell/Channel 190/99% OBW



Date: 28.OCT.2015 12:57:51

### GSM850 (GPRS)/Cell/Channel 190/26dB BW



Date: 28.OCT.2015 12:59:11

### GSM850 (EGPRS)/Cell/Channel 190/99% OBW



Date: 28.OCT.2015 13:02:33

### GSM850 (EGPRS)/Cell/Channel 190/26dB BW



Date: 28.OCT.2015 13:01:29

### GSM1900 (GPRS)/PCS/Channel 661/99% OBW



Date: 28.OCT.2015 13:14:26

### GSM1900 (GPRS)/PCS/Channel 661/26dB BW



Date: 28.OCT.2015 13:14:46

### GSM1900 (EGPRS)/PCS/Channel 661/99% OBW



Date: 28.OCT.2015 13:10:34

### GSM1900 (EGPRS)/PCS/Channel 661/26dB BW

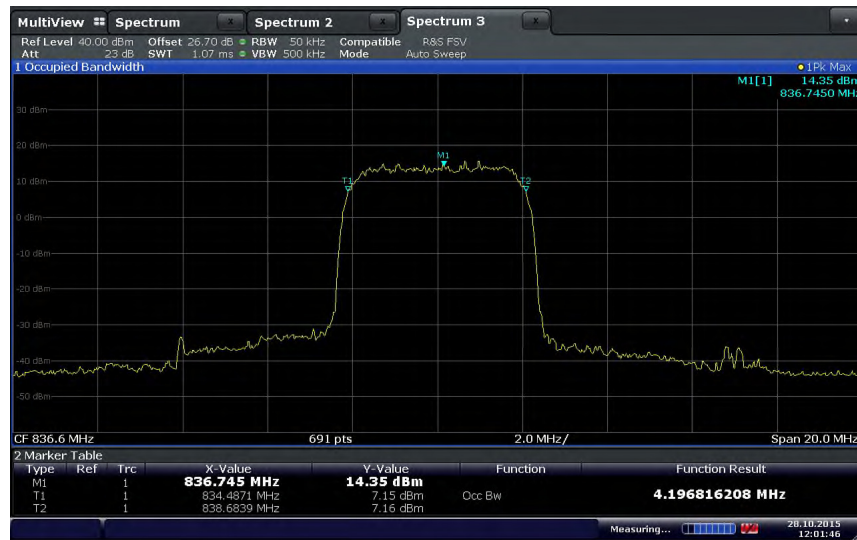


Date: 28.OCT.2015 13:10:10



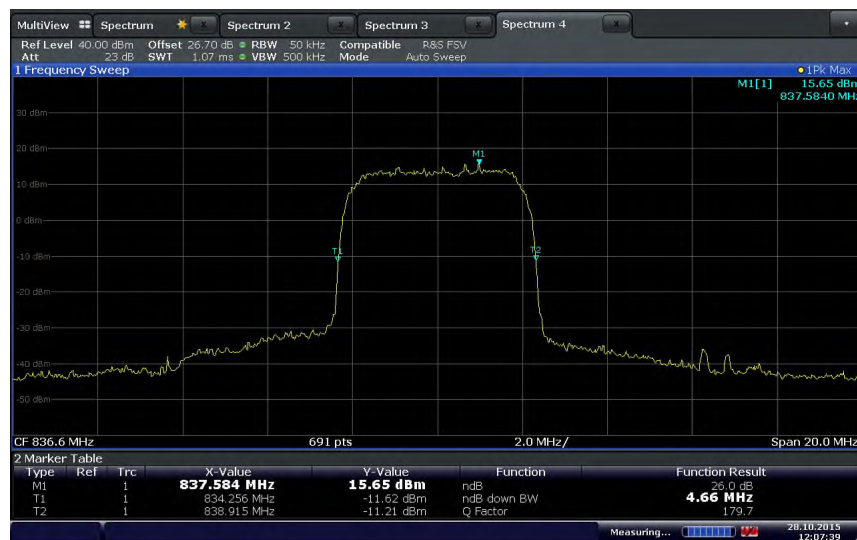


### WCDMA /Cell/Channel 4183/99% OBW



Date: 28.OCT.2015 12:01:46

### WCDMA /Cell/Channel 4183/26dB BW



Date: 28.OCT.2015 12:07:39

### WCDMA /PCS/Channel 9400/99% OBW



Date: 28.OCT.2015 12:17:29

### WCDMA /PCS/Channel 9400/26dB BW



Date: 28.OCT.2015 12:14:57

### LTE Band 2 (1.4 MHz BW)/ Channel 18900/QPSK/99% OBW



Date: 29.OCT.2015 14:39:10

### LTE Band 2 (1.4 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:39:41

### LTE Band 2 (3 MHz BW)/ Channel 18900/QPSK/99% OBW



Date: 29.OCT.2015 14:33:26

### LTE Band 2 (3 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:32:04

### LTE Band 2 (5 MHz BW)/ Channel 18900/QPSK/99% OBW



Date: 29.OCT.2015 14:28:27

### LTE Band 2 (5 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:27:52



### LTE Band 2 (10 MHz BW)/ Channel 18900/QPSK/99% OBW



Date: 29.OCT.2015 14:03:07

### LTE Band 2 (10 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:47:56



### LTE Band 2 (15 MHz BW)/ Channel 18900/QPSK/99% OBW



Date: 29.OCT.2015 14:15:04

### LTE Band 2 (15 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:13:06

### LTE Band 2 (20 MHz BW)/ Channel 18900/QPSK/99% OBW



Date: 29.OCT.2015 14:21:57

### LTE Band 2 (20 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:20:01

### LTE Band 2 (1.4 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:38:30

### LTE Band 2 (1.4 MHz BW)/ Channel 18900/16QAM/26dB BW



Date: 29.OCT.2015 14:39:53

### LTE Band 2 (3 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:33:40

### LTE Band 2 (3 MHz BW)/ Channel 18900/16QAM/26dB BW



Date: 29.OCT.2015 14:32:24

### LTE Band 2 (5 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:28:45

### LTE Band 2 (5 MHz BW)/ Channel 18900/16QAM/26dB BW



Date: 29.OCT.2015 14:28:05





### LTE Band 2 (10 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:03:15

### LTE Band 2 (10 MHz BW)/ Channel 18900/16QAM/26dB BW



Date: 29.OCT.2015 14:48:54



### LTE Band 2 (15 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:15:11

### LTE Band 2 (15 MHz BW)/ Channel 18900/16QAM/26dB BW



Date: 29.OCT.2015 14:13:18

### LTE Band 2 (20 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:22:10

### LTE Band 2 (20 MHz BW)/ Channel 18900/16QAM/26dB BW



Date: 29.OCT.2015 14:20:14

### LTE Band 5 (1.4 MHz BW)/ Channel 20525/QPSK/99% OBW



Date: 7 MAR 2016 15:30:39

### LTE Band 5 (1.4 MHz BW)/ Channel 20525/QPSK/26dB BW



Date: 7 MAR 2016 15:30:04

### LTE Band 5 (3 MHz BW)/ Channel 20525/QPSK/99% OBW



Date: 7. MAR. 2016 15:34:32

### LTE Band 5 (3 MHz BW)/ Channel 20525/QPSK/26dB BW



Date: 7. MAR. 2016 15:34:03

### LTE Band 5 (5 MHz BW)/ Channel 20525/QPSK/99% OBW



Date: 7 MAR. 2016 15:37:50

### LTE Band 5 (5 MHz BW)/ Channel 20525/QPSK/26dB BW



Date: 7 MAR. 2016 15:37:24



### LTE Band 5 (10 MHz BW)/ Channel 20525/QPSK/99% OBW



Date: 7 MAR. 2016 15:40:09

### LTE Band 5 (10 MHz BW)/ Channel 20525/QPSK/26dB BW



Date: 7 MAR. 2016 15:39:43





## **2.6 SPURIOUS EMISSION AT BAND EDGE**

### **2.6.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1051  
FCC 47 CFR Part 22, Clause 22.917(a)  
FCC 47 CFR Part 24, Clause 24.238(a)  
RSS-132, Clause 5.5  
RSS-133, Clause 6.5

### **2.6.2 Standard Applicable**

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least  $43 + 10 \log_{10} P(\text{watts})$ .

### **2.6.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration A

### **2.6.4 Date of Test/Initial of test personnel who performed the test**

October 30 and November 02, 2015 and March 08/ XYZ

### **2.6.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.6.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.2 - 23.9°C   |
| Relative Humidity   | 36.5 - 45.7%    |
| ATM Pressure        | 98.4 - 98.9 kPa |

### **2.6.7 Additional Observations**

- This is a conducted test.
- The path loss for Cell Band (GSM850), PCS Band (GSM1900), WCDMA and LTE Band 2 and 5 was measured and entered as a level offset.
- RBW is set to minimum 1% of EBW and VBW is set to  $>3 \times \text{RBW}$  in the 1 MHz band immediately outside and adjacent to the channel edge.
- Only worst case configuration for all technologies presented in this test report.

## 2.6.8 Test Results

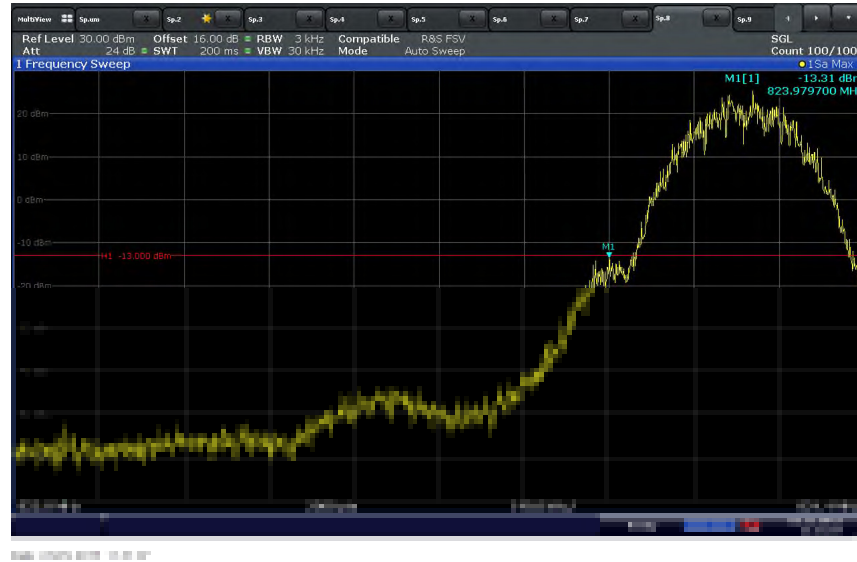
### GSM850/GPRS/Low Channel (128)/Cell BC0 Band Edge @ 824 MHz



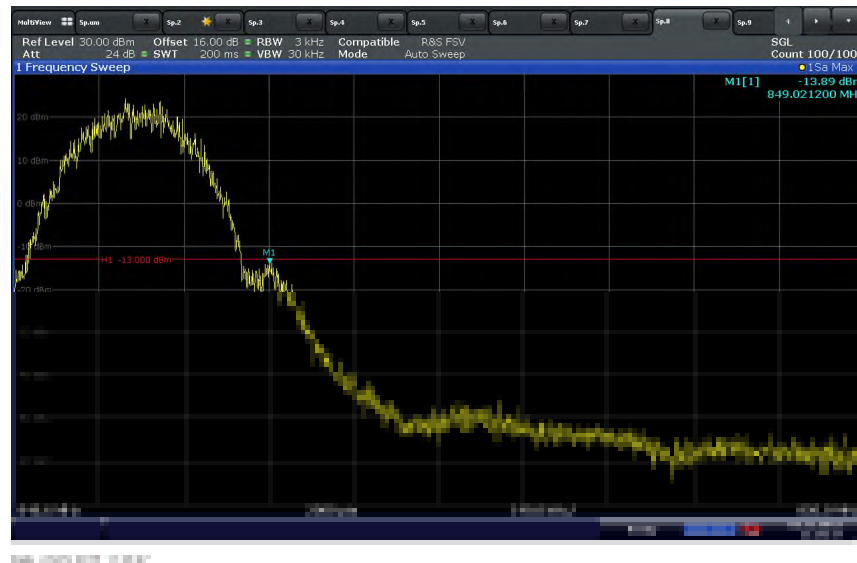
### GSM850/GPRS/High Channel (251)/Cell BC0 Band Edge @ 849 MHz



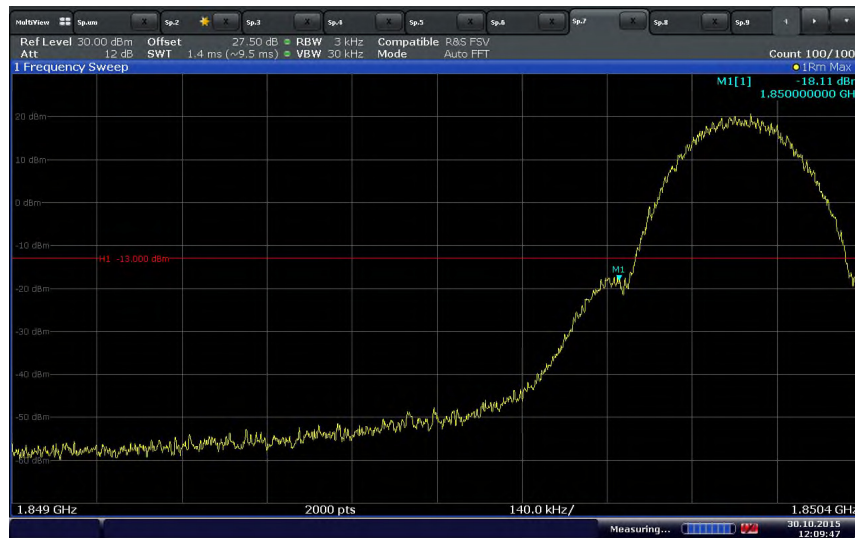
### GSM850/EGPRS/Low Channel (128)/Cell BC0 Band Edge @ 824 MHz



### GSM850/EGPRS/High Channel (251)/Cell BC0 Band Edge @ 849 MHz

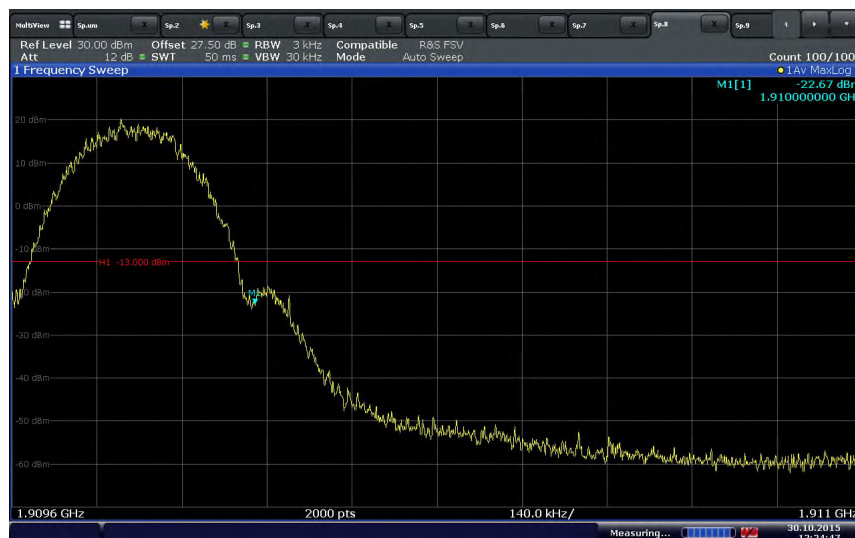


### GSM1900/GPRS/Low Channel (512)/PCS BC1 Band Edge @ 1850 MHz



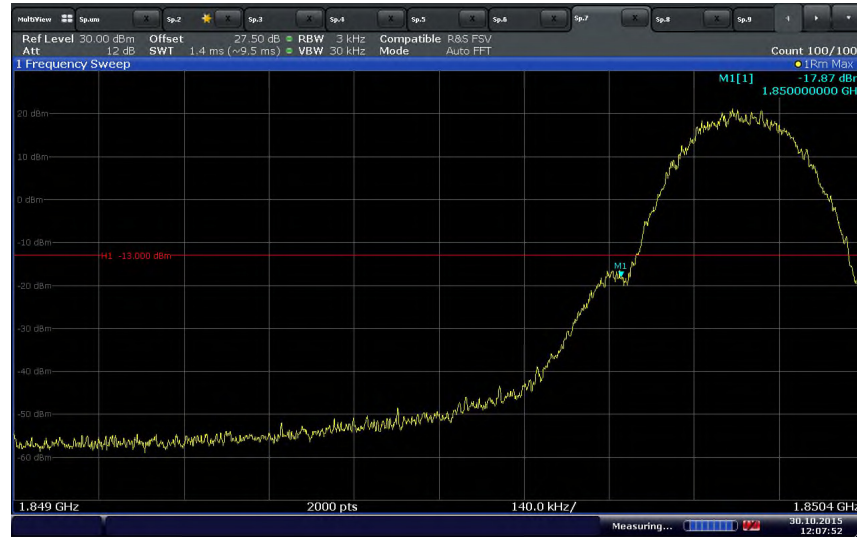
Date: 30.OCT.2015 12:09:47

### GSM1900/GPRS/High Channel (810)/PCS BC1 Band Edge @ 1910 MHz



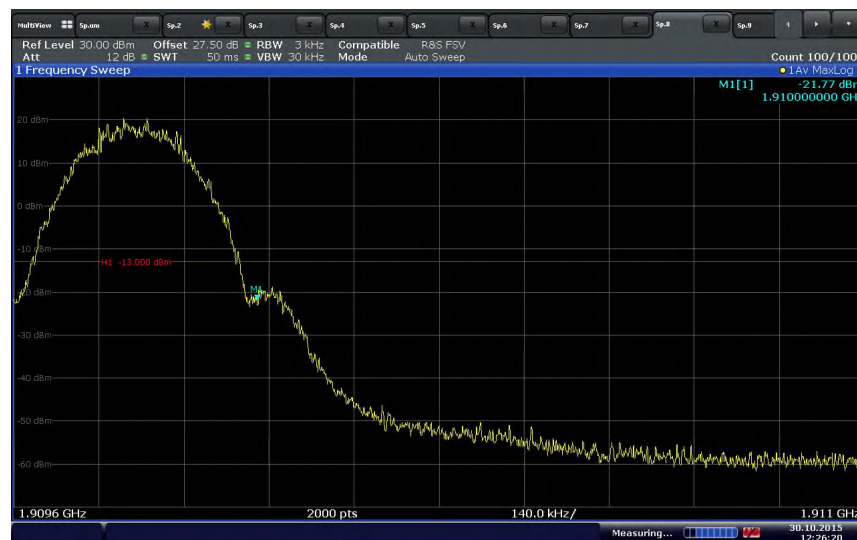
Date: 30.OCT.2015 12:24:48

### GSM1900/EGPRS/Low Channel (512)/PCS BC1 Band Edge @ 1850 MHz



Date: 30.OCT.2015 12:07:53

### GSM1900/EGPRS/High Channel (810)/PCS BC1 Band Edge @ 1910 MHz



Date: 30.OCT.2015 12:26:20

### WCDMA/Low Channel (4132)/Cell Band 5 Band Edge @ 824 MHz



Date: 28.OCT.2015 14:55:19

### WCDMA/High Channel (4233)/Cell Band 5 Band Edge @ 849 MHz



Date: 28.OCT.2015 15:01:30



### WCDMA/Low Channel (9262)/PCS Band 2 Band Edge @ 1850 MHz



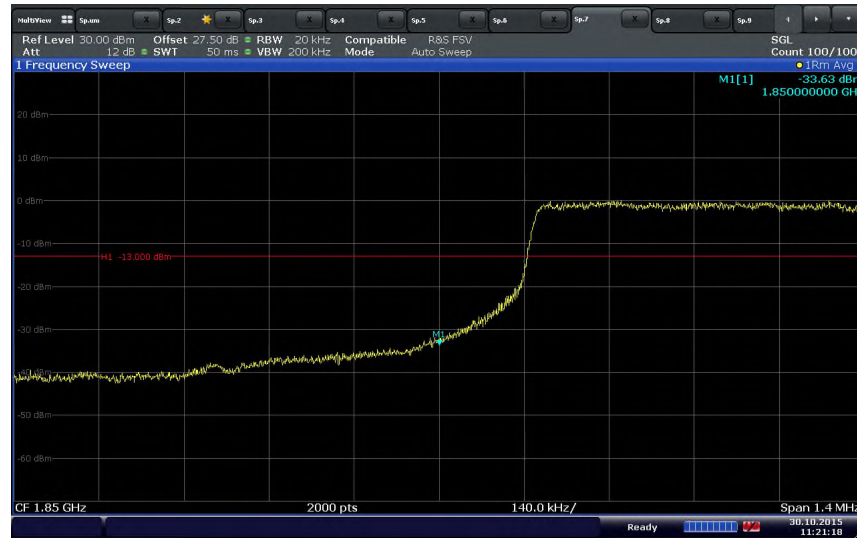
Date: 28.OCT.2015 14:33:06

### WCDMA/High Channel (9538)/PCS Band 2 Band Edge @ 1910 MHz



Date: 28.OCT.2015 14:47:38

### LTE Band 2 (1.4 MHz BW)/QPSK/Low Channel (18607) Band Edge @ 1850 MHz



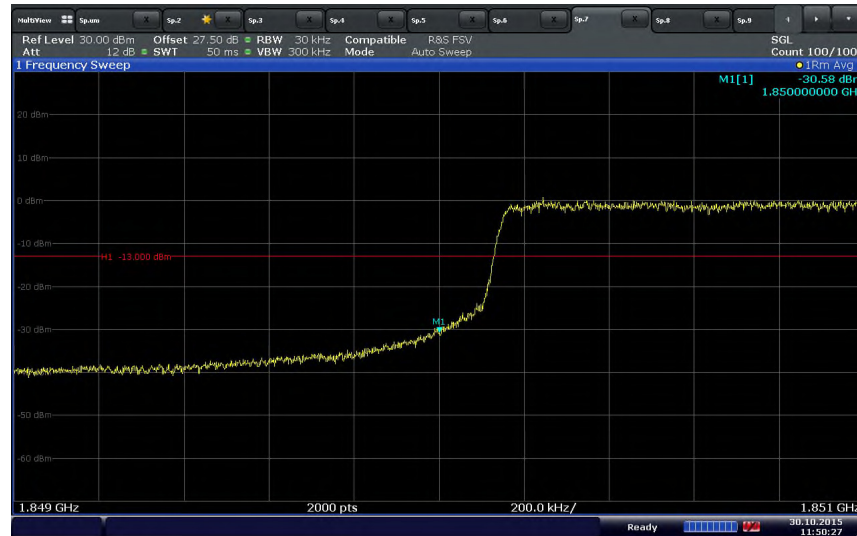
Date: 30.OCT.2015 11:21:18

### LTE Band 2 (1.4 MHz BW)/QPSK/High Channel (19193) Band Edge @ 1910 MHz



Date: 30.OCT.2015 11:35:34

### LTE Band 2 (3 MHz BW)/QPSK/Low Channel (18615) Band Edge @ 1850 MHz



Date: 30.OCT.2015 11:50:27

### LTE Band 2 (3 MHz BW)/QPSK/High Channel (19185) Band Edge @ 1910 MHz



Date: 30.OCT.2015 11:55:53

LTE Band 5 (1.4 MHz BW)/QPSK/Low Channel (20407) Band Edge @ 824 MHz



LTE Band 5 (1.4 MHz BW)/QPSK/High Channel (20643) Band Edge @ 849 MHz



### LTE Band 5 (3 MHz BW)/QPSK/Low Channel (20415) Band Edge @ 824 MHz



Date: 8.MAR.2016 12:36:40

### LTE Band 5 (3 MHz BW)/QPSK/High Channel (20635) Band Edge @ 849 MHz



Date: 8.MAR.2016 12:39:27



## **2.7 CONDUCTED SPURIOUS EMISSIONS**

### **2.7.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1051  
FCC 47 CFR Part 22, Clause 22.917(a)  
FCC 47 CFR Part 24, Clause 24.238(a)  
RSS-132, Clause 5.5  
RSS-133, Clause 6.5

### **2.7.2 Standard Applicable**

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.

### **2.7.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration A

### **2.7.4 Date of Test/Initial of test personnel who performed the test**

October 28 and 29, 2015 and March 08, 2016 / XYZ

### **2.7.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.7.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.4 - 25.7°C   |
| Relative Humidity   | 45.7 - 41.5%    |
| ATM Pressure        | 98.7 - 99.8 kPa |

### **2.7.7 Additional Observations**

- This is a conducted test.
- The spectrum was searched from 9 kHz to the 10<sup>th</sup> harmonic.
- The path loss was measured and entered as a level offset.
- For Cell Band GSM850, WCDMA Band 5, LTE B5, RBW was set to 100 kHz.
- For PCS Band GSM1900, WCDMA and LTE Band 2, RBW was set to 1MHz.
- Only worst case configuration for all technologies presented in this test report.

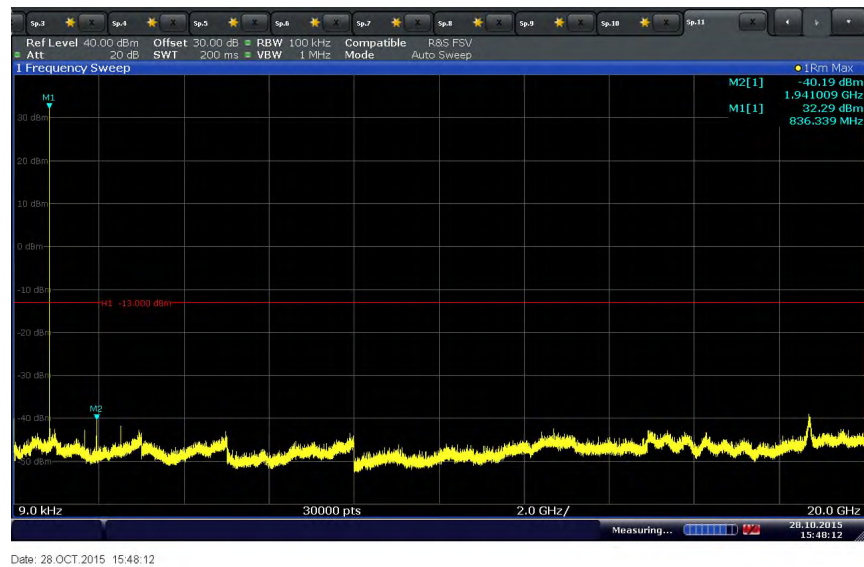


## 2.7.8 Test Results

### GSM850/GPRS/Low Channel (128)/Cell BC0 @ 824.2 MHz



### GSM850/GPRS/Mid Channel (190)/Cell BC0 @ 836.6 MHz



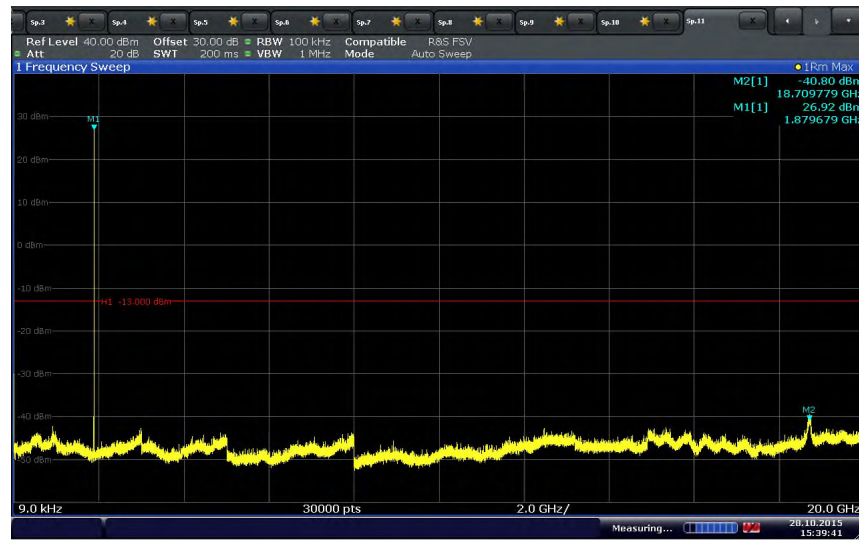
### GSM850/GPRS/High Channel (251)/Cell BC0 @ 848.8 MHz



### GSM1900/GPRS/Low Channel (512)/PCS BC1 @ 1850.2 MHz



**GSM1900/GPRS/Mid Channel (661)/PCS BC1 @ 1880.0 MHz**



**GSM1900/GPRS/High Channel (810)/PCS BC1 @ 1909.8 MHz**

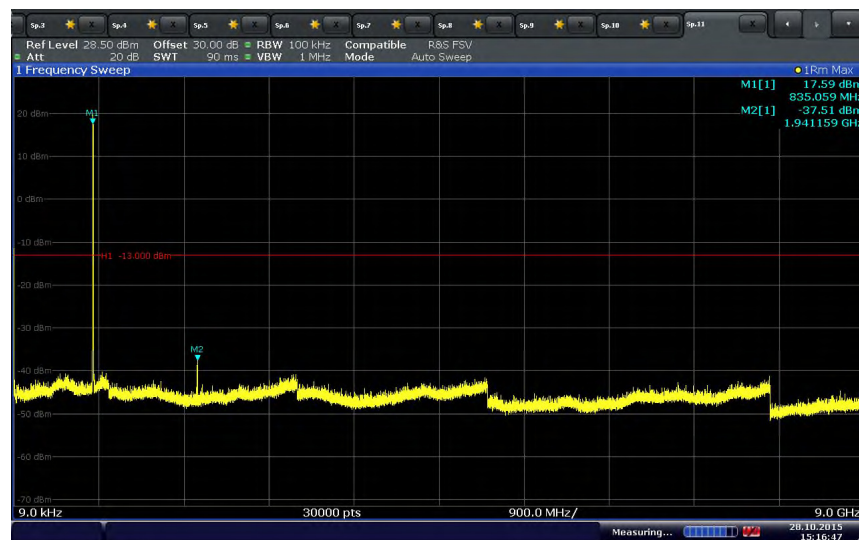


### WCDMA/Low Channel (4132)/Cell Band 5 @ 826.4 MHz



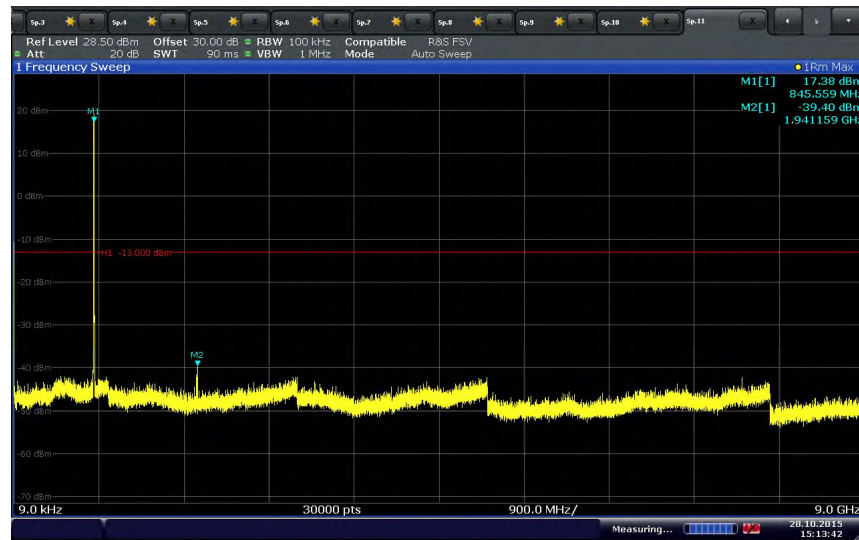
Date: 28.OCT.2015 15:25:40

### WCDMA/Mid Channel (4183)/Cell Band 5 @ 836.6 MHz



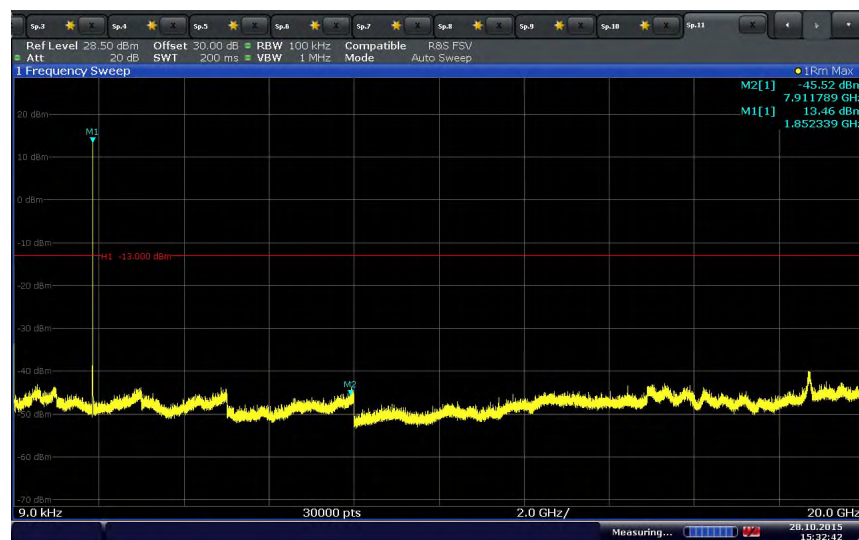
Date: 28.OCT.2015 15:16:47

### WCDMA/High Channel (4233)/Cell Band 5 @ 846.6 MHz



Date: 28.OCT.2015 15:13:42

### WCDMA/Low Channel (9262)/PCS Band 2 @ 1852.4 MHz



Date: 28.OCT.2015 15:13:42



### WCDMA/Mid Channel (9400)/PCS Band 2 @ 1880.0 MHz



### WCDMA/High Channel (9538)/PCS Band 2 @ 1907.6 MHz

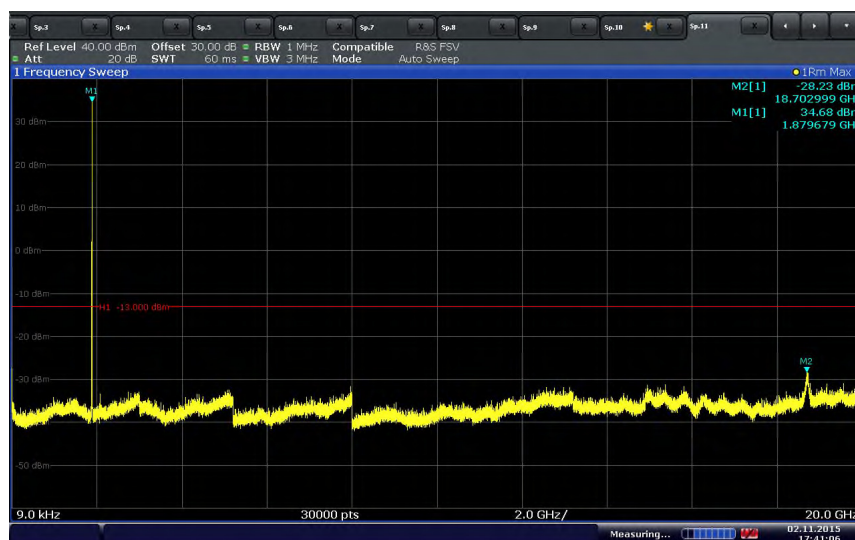




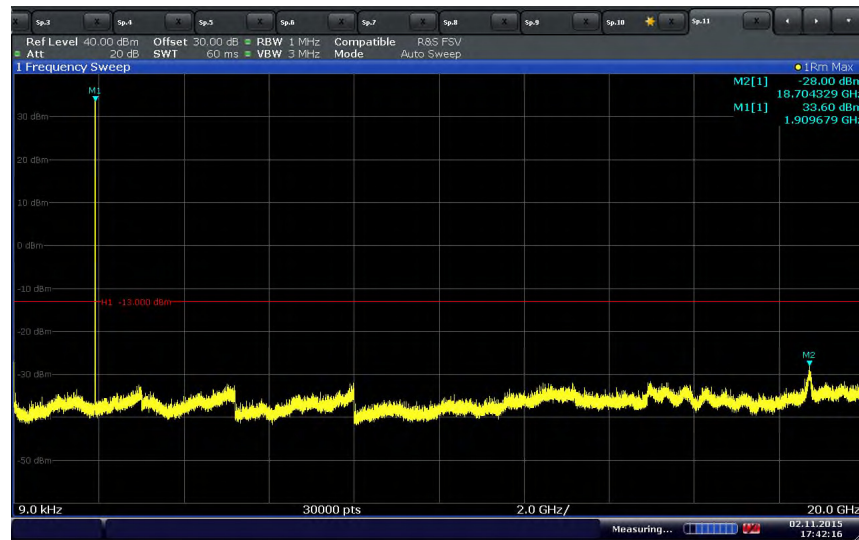
### LTE Band 2 (1.4 MHz BW)/QPSK/Low Channel (18607) @ 1850.7 MHz



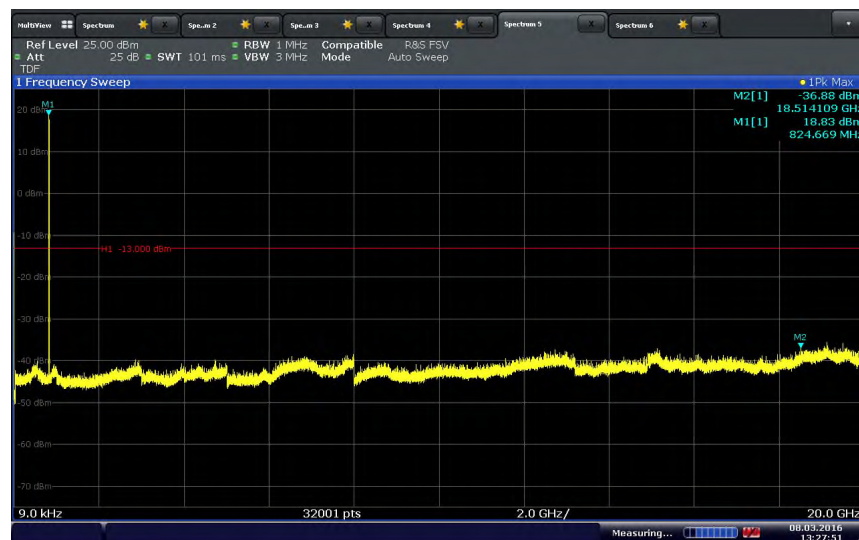
### LTE Band 2 (1.4 MHz BW)/QPSK/Mid Channel (18900) @ 1880.0 MHz



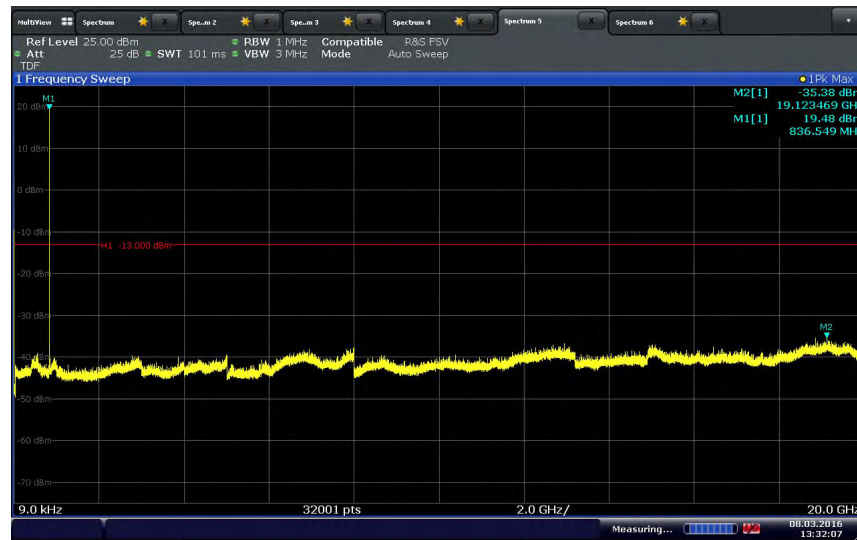
### LTE Band 2 (1.4 MHz BW)/QPSK/High Channel (19193) @ 1909.3 MHz



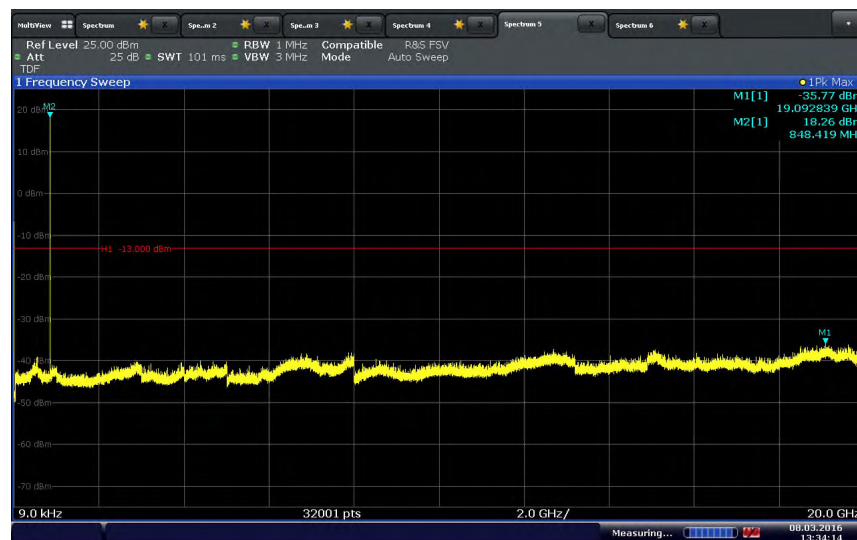
### LTE Band 5 (1.4 MHz BW)/QPSK/Low Channel (20407) @ 824.7 MHz



### LTE Band 5 (1.4 MHz BW)/QPSK/Mid Channel (20525) @ 836.5 MHz



### LTE Band 5 (1.4 MHz BW)/QPSK/High Channel (20643) @ 848.3 MHz





## **2.8 FIELD STRENGTH OF SPURIOUS RADIATION**

### **2.8.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1053  
FCC 47 CFR Part 22, Clause 22.917(a)  
FCC 47 CFR Part 24, Clause 24.238(a)  
RSS-132, Clause 5.5  
RSS-133, Clause 6.5

### **2.8.2 Standard Applicable**

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.

### **2.8.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration B

### **2.8.4 Date of Test/Initial of test personnel who performed the test**

November 04 to 14 , 2015 and March 09, 2016 / XYZ

### **2.8.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.8.6 Environmental Conditions/ Test Location**

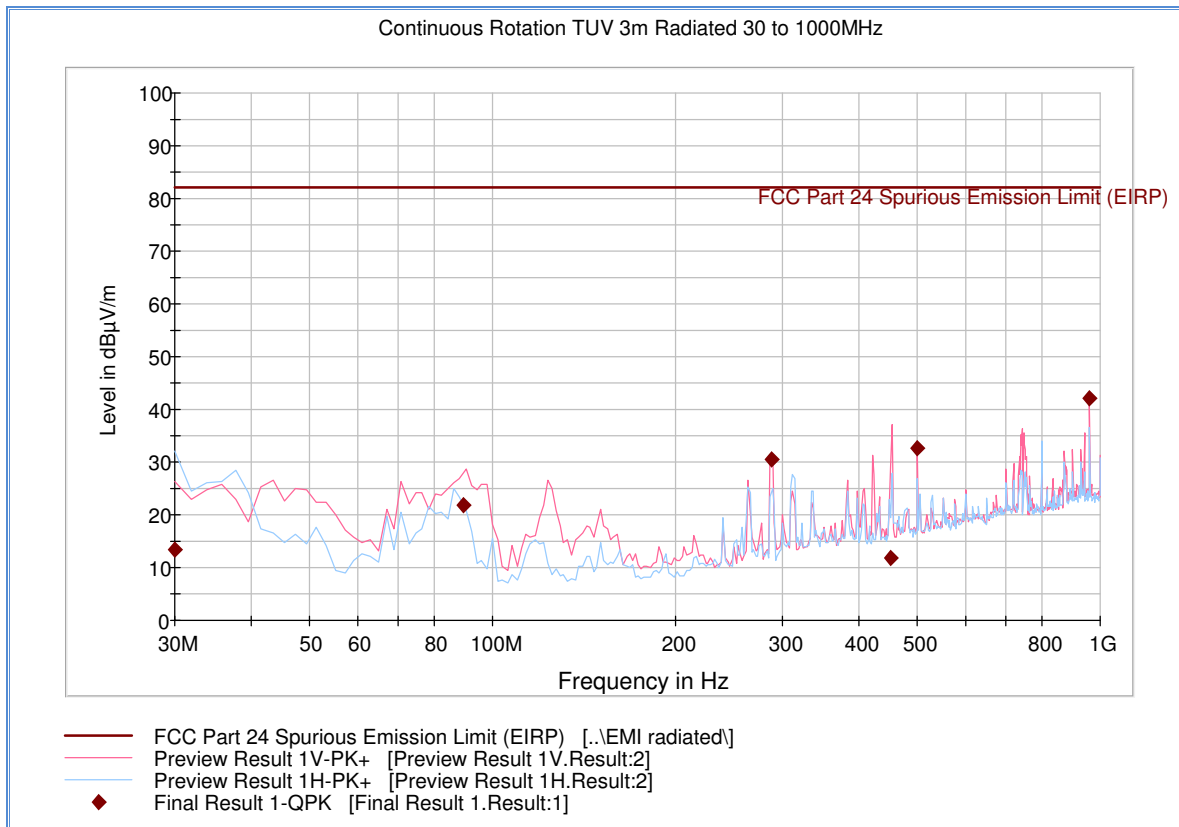
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 23.1 - 24.6°C   |
| Relative Humidity   | 34.12 - 37.8%   |
| ATM Pressure        | 98.7 - 99.4 kPa |

### **2.8.7 Additional Observations**

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.
- Only the worst case configuration presented in this test report.
- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 V8.52 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

## 2.8.8 Test Results Below 1GHz\_Worst Case Configuration\_WCDMA Band 2\_High Channel (9538)

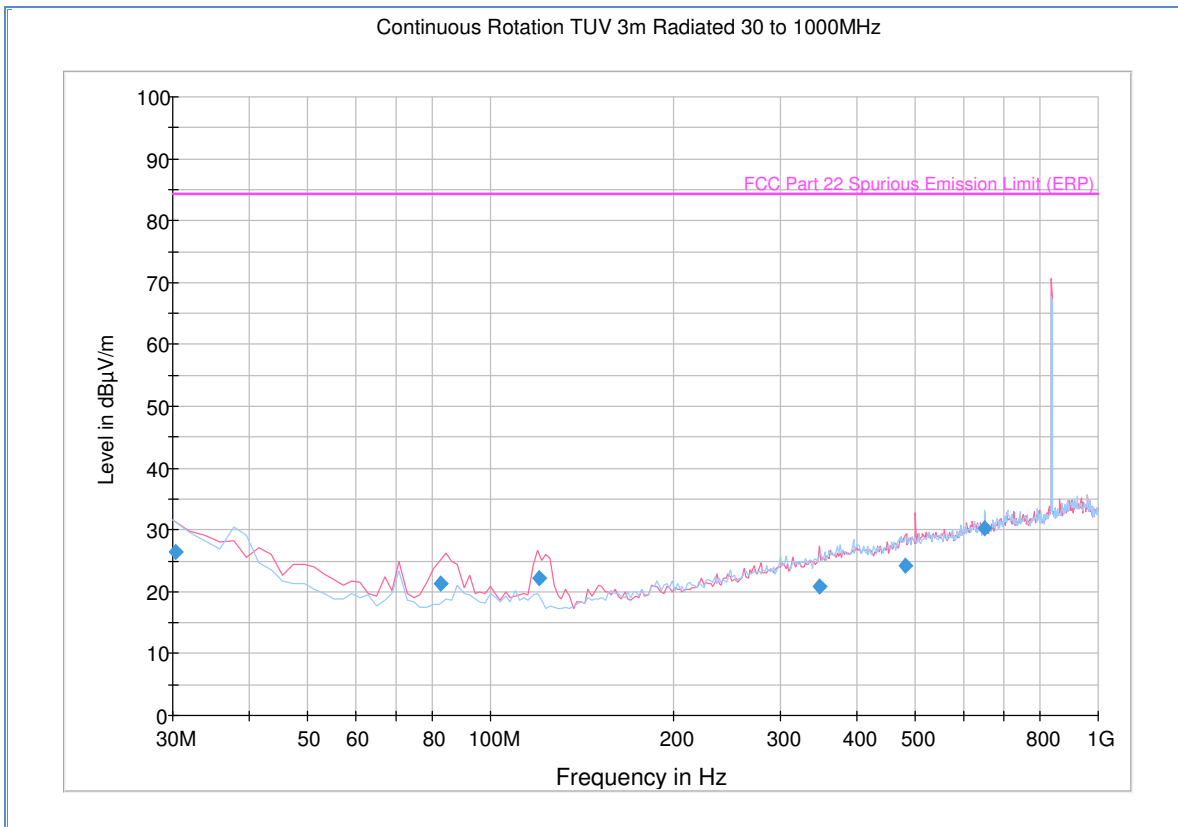


### Quasi Peak Data

| Frequency (MHz) | QuasiPeak (dB $\mu$ V/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V/m) |
|-----------------|--------------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------------|
| 30.040000       | 13.5                     | 1000.0          | 120.000         | 253.0       | H            | 12.0          | -11.6      | 68.8        | 82.2                 |
| 89.460521       | 21.8                     | 1000.0          | 120.000         | 100.0       | V            | 4.0           | -20.9      | 60.4        | 82.2                 |
| 287.537074      | 30.5                     | 1000.0          | 120.000         | 103.0       | V            | 155.0         | -13.4      | 51.7        | 82.2                 |
| 452.727535      | 11.9                     | 1000.0          | 120.000         | 219.0       | V            | 331.0         | -8.1       | 70.3        | 82.2                 |
| 500.020842      | 32.6                     | 1000.0          | 120.000         | 112.0       | V            | -2.0          | -7.1       | 49.7        | 82.2                 |
| 960.082244      | 42.0                     | 1000.0          | 120.000         | 103.0       | V            | 294.0         | 1.4        | 40.2        | 82.2                 |

**Test Notes:** Only worst case presented for spurious emissions below 1GHz.

## 2.8.9 Test Results Below 1GHz\_Worst Case Configuration\_LTE Band 5\_1.4MHz Bandwidth\_Middle Channel (20525)



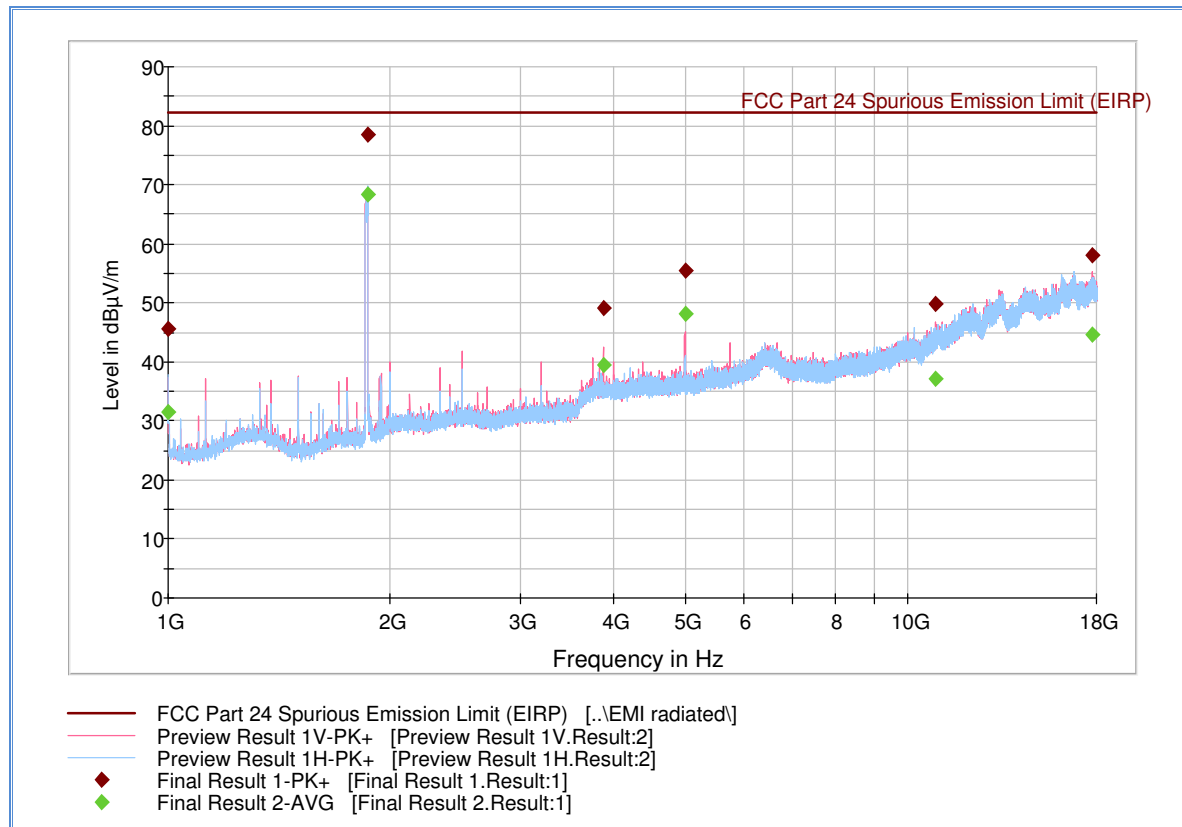
### Quasi Peak Data

| Frequency (MHz) | QuasiPeak (dB $\mu$ V/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dB $\mu$ V/m) |
|-----------------|--------------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------------|
| 30.360000       | 26.4                     | 1000.0          | 120.000         | 100.0       | V            | 19.0          | -5.7       | 58.0        | 84.4                 |
| 82.668858       | 21.3                     | 1000.0          | 120.000         | 100.0       | V            | 13.0          | -16.1      | 63.0        | 84.4                 |
| 120.018838      | 22.2                     | 1000.0          | 120.000         | 100.0       | V            | 15.0          | -15.1      | 62.2        | 84.4                 |
| 346.773707      | 20.9                     | 1000.0          | 120.000         | 314.0       | V            | -8.0          | -5.5       | 63.5        | 84.4                 |
| 481.565852      | 24.3                     | 1000.0          | 120.000         | 140.0       | V            | 55.0          | -1.4       | 60.1        | 84.4                 |
| 650.020200      | 30.2                     | 1000.0          | 120.000         | 100.0       | H            | 128.0         | 1.3        | 54.2        | 84.4                 |

**Test Notes:** Only worst case for LTE B5 presented for spurious emissions below 1GHz.



## 2.8.10 Test Results Above 1GHz\_Worst Case Configuration\_LTE B2\_QPSK\_15MHz OBW\_Low Channel (18675)



### Peak Data

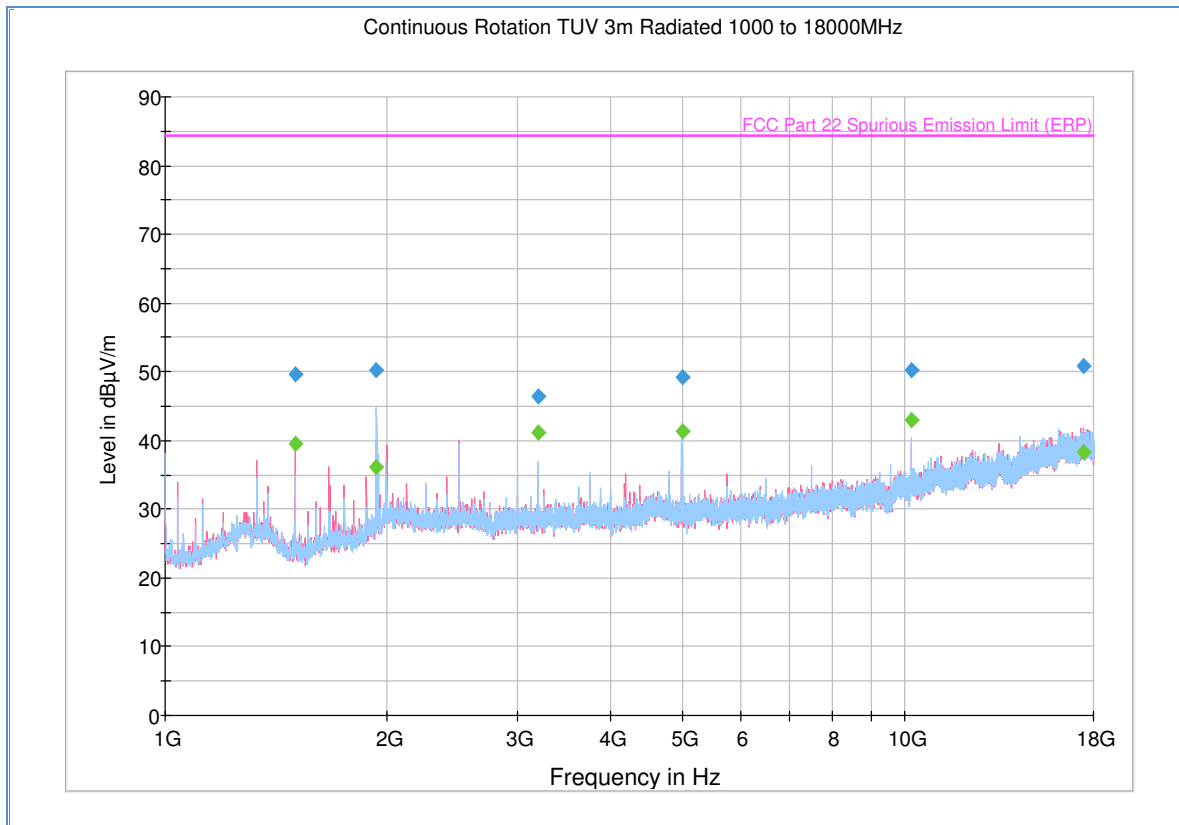
| Frequency (MHz) | MaxPeak (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBμV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1000.400000     | 45.7             | 1000.0          | 1000.000        | 237.4       | H            | 123.0         | -7.2       | 36.6        | 82.2           |
| 1863.600000     | 78.4             | 1000.0          | 1000.000        | 215.5       | H            | 308.0         | -3.0       | 3.8         | 82.2           |
| 3874.900000     | 49.2             | 1000.0          | 1000.000        | 99.7        | V            | -2.0          | 5.1        | 33.1        | 82.2           |
| 4999.900000     | 55.5             | 1000.0          | 1000.000        | 144.7       | V            | 335.0         | 6.6        | 26.7        | 82.2           |
| 10922.133333    | 49.8             | 1000.0          | 1000.000        | 405.6       | V            | 226.0         | 15.2       | 32.5        | 82.2           |
| 17769.333333    | 58.1             | 1000.0          | 1000.000        | 278.3       | V            | 259.0         | 24.0       | 24.1        | 82.2           |

### Average Data

| Frequency (MHz) | Average (dBμV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBμV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1000.400000     | 31.4             | 1000.0          | 1000.000        | 237.4       | H            | 123.0         | -7.2       | 50.8        | 82.2           |
| 1863.600000     | 68.5             | 1000.0          | 1000.000        | 215.5       | H            | 308.0         | -3.0       | 13.7        | 82.2           |
| 3874.900000     | 39.4             | 1000.0          | 1000.000        | 99.7        | V            | -2.0          | 5.1        | 42.8        | 82.2           |
| 4999.900000     | 48.2             | 1000.0          | 1000.000        | 144.7       | V            | 335.0         | 6.6        | 34.0        | 82.2           |
| 10922.133333    | 37.2             | 1000.0          | 1000.000        | 405.6       | V            | 226.0         | 15.2       | 45.0        | 82.2           |
| 17769.333333    | 44.6             | 1000.0          | 1000.000        | 278.3       | V            | 259.0         | 24.0       | 37.6        | 82.2           |

**Test Notes:** Only worst case modulation/bandwidth presented for spurious emissions above 1GHz.

## 2.8.11 Test Results Above 1GHz\_Worst Case Configuration\_LTE B5\_QPSK\_1.4MHz OBW\_Middle Channel (20525)



### Peak Data

| Frequency (MHz) | MaxPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1500.000000     | 49.7             | 1000.0          | 1000.000        | 219.4       | V            | 179.0         | -6.3       | 34.7        | 84.4           |
| 1932.366667     | 50.3             | 1000.0          | 1000.000        | 344.1       | H            | 69.0          | -1.6       | 34.1        | 84.4           |
| 3200.000000     | 46.4             | 1000.0          | 1000.000        | 174.6       | H            | 71.0          | 0.2        | 37.9        | 84.4           |
| 5000.300000     | 49.3             | 1000.0          | 1000.000        | 189.5       | H            | 100.0         | 2.8        | 35.1        | 84.4           |
| 10200.033333    | 50.2             | 1000.0          | 1000.000        | 181.6       | H            | 45.0          | 9.9        | 34.2        | 84.4           |
| 17476.966666    | 50.8             | 1000.0          | 1000.000        | 132.7       | V            | -16.0         | 18.0       | 33.6        | 84.4           |

### Average Data

| Frequency (MHz) | Average (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1500.000000     | 39.6             | 1000.0          | 1000.000        | 219.4       | V            | 179.0         | -6.3       | 44.8        | 84.4           |
| 1932.366667     | 36.0             | 1000.0          | 1000.000        | 344.1       | H            | 69.0          | -1.6       | 48.4        | 84.4           |
| 3200.000000     | 41.1             | 1000.0          | 1000.000        | 174.6       | H            | 71.0          | 0.2        | 43.2        | 84.4           |
| 5000.300000     | 41.4             | 1000.0          | 1000.000        | 189.5       | H            | 100.0         | 2.8        | 43.0        | 84.4           |
| 10200.033333    | 43.0             | 1000.0          | 1000.000        | 181.6       | H            | 45.0          | 9.9        | 41.4        | 84.4           |
| 17476.966666    | 38.3             | 1000.0          | 1000.000        | 132.7       | V            | -16.0         | 18.0       | 46.1        | 84.4           |

**Test Notes:** Only worst case modulation/bandwidth for LTE B5 presented for spurious emissions above 1GHz.



## **2.9 FREQUENCY STABILITY**

### **2.9.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1055  
FCC 47 CFR Part 22, Clause 22.355  
FCC 47 CFR Part 24, Clause 24.235  
RSS-132, Clause 5.3  
RSS-133, Clause 6.3

### **2.9.2 Standard Applicable**

FCC:

Part 22, Clause 22.355: Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

**Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services**

| Frequency range (MHz) | Mobile $\leq 3$ watts (ppm) |
|-----------------------|-----------------------------|
| 821 to 896            | 2.5                         |

Part 24, Clause 24.235: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

IC:

RSS-132 Clause 5.3: The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

RSS-133 Clause 6.3: The carrier frequency shall not depart from the reference frequency, in excess of  $\pm 2.5$  ppm for mobile stations.

### **2.9.3 Equipment Under Test and Modification State**

Serial No: 442964 and CM0015 / Test Configuration A

### **2.9.4 Date of Test/Initial of test personnel who performed the test**

November 02, 2015 and March 08, 2016 / XYZ

### **2.9.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

## 2.9.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 23.2 - 23.7°C  
 Relative Humidity 37.1 - 45.7%  
 ATM Pressure 98.5 - 98.9kPa

## 2.9.7 Additional Observations

- This is a conducted test. The EUT was operated at 28VDC nominal voltage and was placed in the temperature chamber for this evaluation. The EUT was controlled by a CMW500 and the maximum frequency error was monitored through the Wideband Radio Communication Tester Frequency Error measurement function under Tx Measurement and verified by the spectrum analyzer.
- The EUT was tested over the temperature -30°C to +50°C in 10°C steps and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements were then performed.
- Voltage variation was also performed at 85% and 115% of the nominal voltage at 20°C.

## 2.9.8 Test Results

| GSM850 (GPRS) Cell Band Mid Channel 190 @836.6 MHz |                  |                              |
|----------------------------------------------------|------------------|------------------------------|
| Voltage (VDC)                                      | Temperature (°C) | Frequency Deviation (Hz/ppm) |
| 28.0                                               | -30              | 13.20 / 0.016                |
|                                                    | -20              | 14.43 / 0.017                |
|                                                    | -10              | 9.27 / 0.011                 |
|                                                    | 0                | 10.94 / 0.013                |
|                                                    | +10              | -12.20 / 0.015               |
|                                                    | +20              | 11.82 / 0.014                |
|                                                    | +30              | -21.11 / 0.025               |
|                                                    | +40              | 12.14 / 0.015                |
|                                                    | +50              | 14.21 / 0.017                |

| GSM850 (GPRS) Cell Band Mid Channel 190 @836.6 MHz |               |                              |
|----------------------------------------------------|---------------|------------------------------|
| Temperature (°C)                                   | Voltage (VDC) | Frequency Deviation (Hz/ppm) |
| 20                                                 | 23.8          | 12.98 / 0.016                |
|                                                    | 32.2          | 13.11 / 0.016                |

| GSM1900 (GPRS) PCS Band Mid Channel 661 @1880.0 MHz |                         |                                     |
|-----------------------------------------------------|-------------------------|-------------------------------------|
| <i>Voltage (VDC)</i>                                | <i>Temperature (°C)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>28.0</b>                                         | -30                     | -65.83 / 0.037                      |
|                                                     | -20                     | -20.76 / 0.012                      |
|                                                     | -10                     | -19.73 / 0.011                      |
|                                                     | 0                       | -20.99 / 0.012                      |
|                                                     | +10                     | -28.12 / 0.016                      |
|                                                     | +20                     | -22.73 / 0.013                      |
|                                                     | +30                     | -38.10 / 0.021                      |
|                                                     | +40                     | -20.11 / 0.011                      |
|                                                     | +50                     | -20.89 / 0.012                      |

| GSM1900 (GPRS) PCS Band Mid Channel 661 @1880.0 MHz |                      |                                     |
|-----------------------------------------------------|----------------------|-------------------------------------|
| <i>Temperature (°C)</i>                             | <i>Voltage (VDC)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>20</b>                                           | 23.8                 | -24.73 / 0.014                      |
|                                                     | 32.2                 | -24.60 / 0.014                      |

| WCDMA (3GPP Release Version 99) Band 5 Mid Channel 4183 @836.6 MHz |                         |                                     |
|--------------------------------------------------------------------|-------------------------|-------------------------------------|
| <i>Voltage (VDC)</i>                                               | <i>Temperature (°C)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>28.0</b>                                                        | -30                     | -1.70 / 0.002                       |
|                                                                    | -20                     | -2.37 / 0.003                       |
|                                                                    | -10                     | 2.24 / 0.003                        |
|                                                                    | 0                       | 2.98 / 0.004                        |
|                                                                    | +10                     | -2.93 / 0.004                       |
|                                                                    | +20                     | -3.18 / 0.004                       |
|                                                                    | +30                     | 2.30 / 0.003                        |
|                                                                    | +40                     | 2.42 / 0.003                        |
|                                                                    | +50                     | -2.83 / 0.003                       |

| WCDMA (3GPP Release Version 99) Band 5 Mid Channel 4183 @836.6 MHz |                      |                                     |
|--------------------------------------------------------------------|----------------------|-------------------------------------|
| <i>Temperature (°C)</i>                                            | <i>Voltage (VDC)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>20</b>                                                          | 23.8                 | 1.80 / 0.002                        |
|                                                                    | 32.2                 | -2.67 / 0.003                       |

| WCDMA (3GPP Release Version 99) Band 2 Mid Channel 9400 @1880.0 MHz |                         |                                     |
|---------------------------------------------------------------------|-------------------------|-------------------------------------|
| <i>Voltage (VDC)</i>                                                | <i>Temperature (°C)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>28.0</b>                                                         | -30                     | -9.16 / 0.005                       |
|                                                                     | -20                     | -10.96 / 0.006                      |
|                                                                     | -10                     | -12.75 / 0.007                      |
|                                                                     | 0                       | -12.60 / 0.007                      |
|                                                                     | +10                     | -7.40 / 0.004                       |
|                                                                     | +20                     | -11.47 / 0.006                      |
|                                                                     | +30                     | -12.2 / 0.006                       |
|                                                                     | +40                     | -9.78 / 0.005                       |
|                                                                     | +50                     | -9.40 / 0.005                       |

| WCDMA (3GPP Release Version 99) Band 2 Mid Channel 9400 @1880.0 MHz |                      |                                     |
|---------------------------------------------------------------------|----------------------|-------------------------------------|
| <i>Temperature (°C)</i>                                             | <i>Voltage (VDC)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>20</b>                                                           | 23.8                 | -12.42 / 0.007                      |
|                                                                     | 32.2                 | -11.70 / 0.006                      |



| LTE Band 2–QPSK – 5MHz BW-Mid Channel 18900 @1880.0 MHz |                         |                                     |
|---------------------------------------------------------|-------------------------|-------------------------------------|
| <i>Voltage (VDC)</i>                                    | <i>Temperature (°C)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>28.0</b>                                             | -30                     | -12.17 / 0.006                      |
|                                                         | -20                     | -20.41 / 0.011                      |
|                                                         | -10                     | -24.50 / 0.013                      |
|                                                         | 0                       | -19.24 / 0.010                      |
|                                                         | +10                     | -20.33 / 0.011                      |
|                                                         | +20                     | -21.62 / 0.006                      |
|                                                         | +30                     | -20.86 / 0.011                      |
|                                                         | +40                     | -26.88 / 0.014                      |
|                                                         | +50                     | -22.70 / 0.012                      |

| LTE Band 2–QPSK – 5MHz BW-Mid Channel 18900 @1880.0 MHz |                      |                                     |
|---------------------------------------------------------|----------------------|-------------------------------------|
| <i>Temperature (°C)</i>                                 | <i>Voltage (VDC)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>20</b>                                               | 23.8                 | -22.17 / 0.012                      |
|                                                         | 32.2                 | -27.34 / 0.015                      |



| LTE Band 5–QPSK – 5MHz BW-Mid Channel 20525 @836.5 MHz |                         |                                     |
|--------------------------------------------------------|-------------------------|-------------------------------------|
| <i>Voltage (VDC)</i>                                   | <i>Temperature (°C)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>28.0</b>                                            | -30                     | 5.38 / 0.006                        |
|                                                        | -20                     | 6.01 / 0.007                        |
|                                                        | -10                     | -5.24 / 0.006                       |
|                                                        | 0                       | 5.21 / 0.006                        |
|                                                        | +10                     | -5.11 / 0.006                       |
|                                                        | +20                     | -6.29 / 0.007                       |
|                                                        | +30                     | 6.52 / 0.008                        |
|                                                        | +40                     | 7.31 / 0.009                        |
|                                                        | +50                     | -5.54 / 0.007                       |

| LTE Band 5–QPSK – 5MHz BW-Mid Channel 20525 @836.5 MHz |                      |                                     |
|--------------------------------------------------------|----------------------|-------------------------------------|
| <i>Temperature (°C)</i>                                | <i>Voltage (VDC)</i> | <i>Frequency Deviation (Hz/ppm)</i> |
| <b>20</b>                                              | 23.8                 | 5.22 / 0.006                        |
|                                                        | 32.2                 | 5.24 / 0.006                        |



### **SECTION 3**

#### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| ID Number<br>(SDGE/SDR<br>B) | Test Equipment                             | Type            | Serial Number        | Manufacturer               | Cal Date                                   | Cal Due<br>Date |
|------------------------------|--------------------------------------------|-----------------|----------------------|----------------------------|--------------------------------------------|-----------------|
| Conducted Port Setup         |                                            |                 |                      |                            |                                            |                 |
| 7582                         | Signal/Spectrum Analyzer                   | FSW26           | 101614               | Rhode & Schwarz            | 10/05/15                                   | 10/05/16        |
| 7604                         | P-Series Power Meter                       | N1911A          | SG45100273           | Agilent                    | 05/27/15                                   | 05/27/16        |
| 7605                         | 50MHz-18GHz Wideband Power Sensor          | N1921A          | MY51100054           | Agilent                    | 04/10/15                                   | 04/10/16        |
| 7608                         | Vector Signal Generator                    | SMBV100A        | 259021               | Rhode & Schwarz            | 07/29/15                                   | 07/29/16        |
| 7562                         | Wideband Radio Communication Tester        | CMW 500         | 1201.0002k50 /103829 | Rhode & Schwarz            | For signaling purpose and verified by 7582 |                 |
| -                            | Power Divider/Splitter                     | 1506A           | RR003                | Weinschel                  | Verified by 7604 and 7608                  |                 |
| 8825                         | 20dB Attenuator                            | 46-20-34        | BK5773               | Weinschel Corp.            | Verified by 7604 and 7608                  |                 |
| 8773                         | 10dB Attenuator                            | 606-10-1F4/DR   | -                    | Meca                       | Verified by 7604 and 7608                  |                 |
| Radiated Test Setup          |                                            |                 |                      |                            |                                            |                 |
| 1033                         | Bilog Antenna                              | 3142C           | 00044556             | EMCO                       | 09/25/15                                   | 09/25/16        |
| 1040                         | EMI Test Receiver                          | ESIB40          | 100292               | Rhode & Schwarz            | 09/29/15                                   | 09/29/16        |
| 1016                         | Pre-amplifier                              | PAM-0202        | 187                  | PAM                        | 12/15/15                                   | 12/15/16        |
| 7575                         | Double-ridged waveguide horn antenna       | 3117            | 155511               | EMCO                       | 04/27/15                                   | 04/27/16        |
| 1049                         | EMI Test Receiver                          | ESU 40          | 100133               | Rhode & Schwarz            | 03/11/14                                   | 03/11/16        |
| 8628                         | Pre-amplifier                              | QLJ 01182835-JO | 8986002              | QuinStar Technologies Inc. | 03/20/15                                   | 03/20/16        |
| 7562                         | Wideband Radio Communication Tester        | CMW 500         | 1201.0002k50 /103829 | Rhode & Schwarz            | NCR (for signalling purpose only)          |                 |
| 8806                         | 1800 to 2000 Notch                         | BRM50707        | 005                  | Micro-Tronics              | -                                          |                 |
| Miscellaneous                |                                            |                 |                      |                            |                                            |                 |
|                              | Test Software                              | EMC32           | V8.53                | Rhode & Schwarz            | N/A                                        |                 |
| 1072                         | DC Power Supply                            | E3610A          | KR51311519           | Hewlett Packard            | Verified by 6792                           |                 |
| 6792                         | Multimeter                                 | 3478A           | 2911A70964           | Hewlett Packard            | 08/14/15                                   | 08/14/16        |
| 7579                         | Temperature Chamber                        | 115             | 151617               | TestQuity                  | 08/14/15                                   | 08/14/16        |
| 7560                         | Barometer/Temperature/Humidity Transmitter | iBTHX-W         | 1240476              | Omega                      | 10/19/15                                   | 10/19/16        |

### 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

#### 3.2.1 Radiated Measurements (Below 1GHz)

|                                 | Contribution               | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.45                           | 0.26                          | 0.07         |
| 2                               | Cables                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 3                               | Preamp                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 4                               | Antenna                    | Rectangular                   | 0.75                           | 0.43                          | 0.19         |
| 5                               | Site                       | Rectangular                   | 2.70                           | 1.56                          | 2.43         |
| 6                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 1.78         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 3.57         |

#### 3.2.2 Radiated Emission Measurements (Above 1GHz)

|                                 | Contribution               | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.57                           | 0.33                          | 0.11         |
| 2                               | Cables                     | Rectangular                   | 0.70                           | 0.40                          | 0.16         |
| 3                               | Preamp                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 4                               | Antenna                    | Rectangular                   | 0.37                           | 0.21                          | 0.05         |
| 5                               | Site                       | Rectangular                   | 2.70                           | 1.56                          | 2.43         |
| 6                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 1.78         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 3.56         |

#### 3.2.3 Conducted Antenna Port Measurement

|                                 | Contribution               | Probability Distribution Type | Probability Distribution $x_i$ | Standard Uncertainty $u(x_i)$ | $[u(x_i)]^2$ |
|---------------------------------|----------------------------|-------------------------------|--------------------------------|-------------------------------|--------------|
| 1                               | Receiver/Spectrum Analyzer | Rectangular                   | 0.57                           | 0.33                          | 0.11         |
| 2                               | Cables                     | Rectangular                   | 0.50                           | 0.29                          | 0.08         |
| 3                               | EUT Setup                  | Rectangular                   | 1.00                           | 0.58                          | 0.33         |
| Combined Uncertainty ( $u_c$ ): |                            |                               |                                |                               | 0.72         |
| Coverage Factor (k):            |                            |                               |                                |                               | 2            |
| Expanded Uncertainty:           |                            |                               |                                |                               | 1.45         |

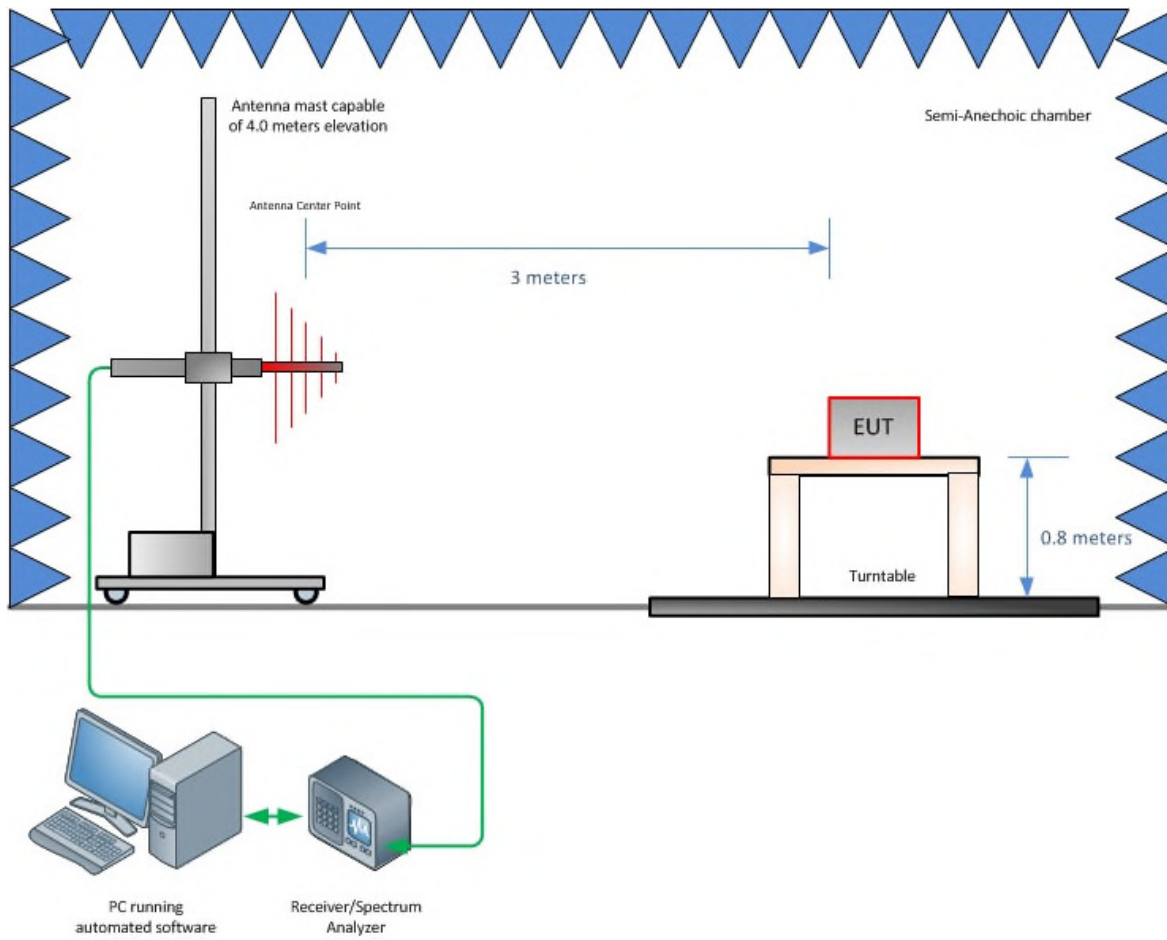


#### **SECTION 4**

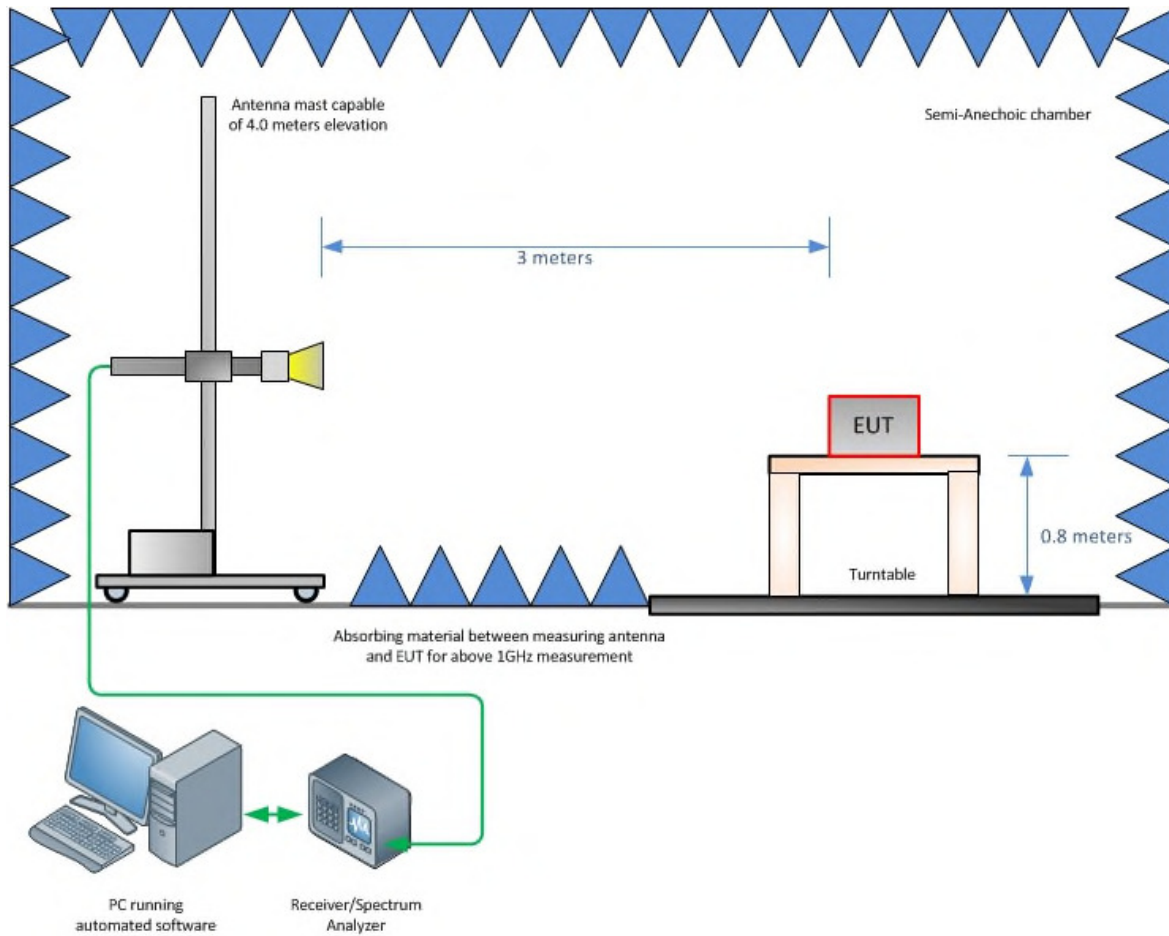
#### **DIAGRAM OF TEST SETUP**



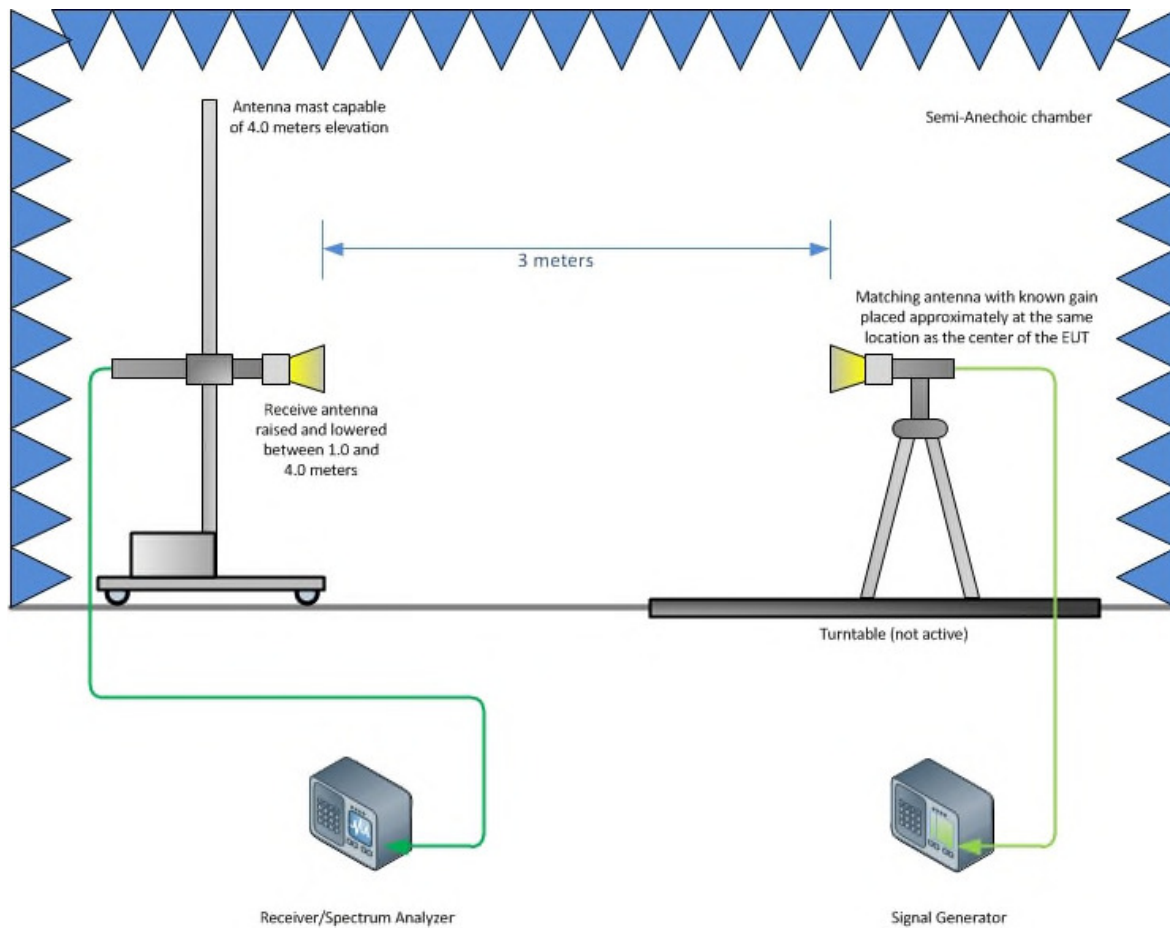
#### 4.1 TEST SETUP DIAGRAM



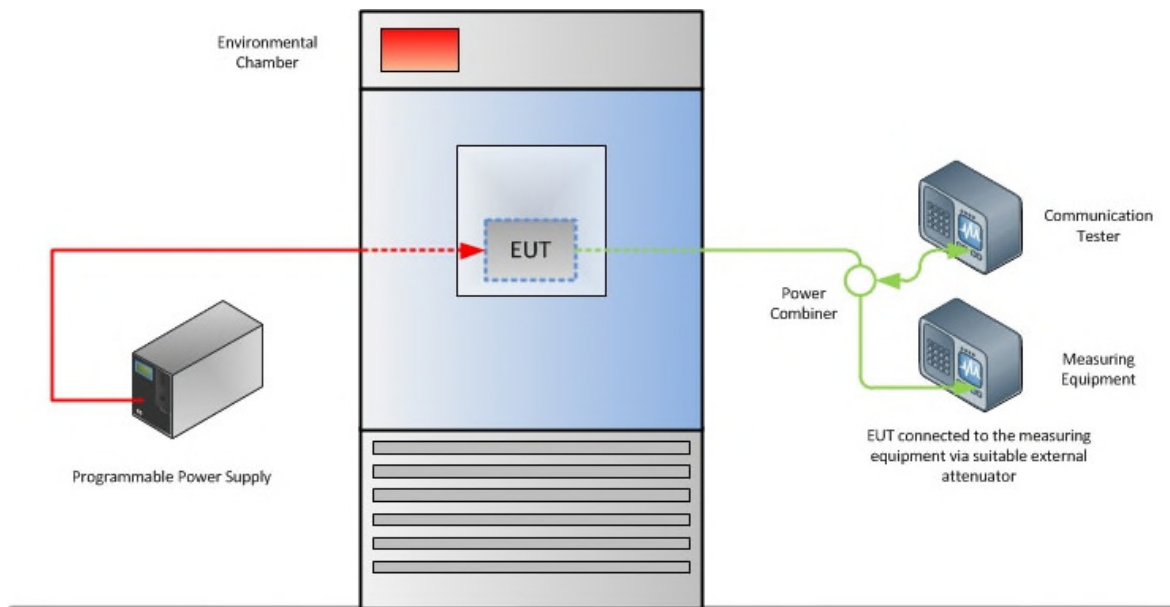
**Radiated Emission Test Setup (Below 1GHz)**



**Radiated Emission Test Setup (Above 1GHz)**



**Substitution Test Method (Above 1GHz)**



**Frequency Stability Test Configuration**



## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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