



**FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E**

**TEST REPORT**

for

**GSM/WLAN Wireless data terminal**

**MODEL: BPC010**

**Brand: ProVista Care**

**Test Report Number:**

**C170525Z04-RP1-1**

**Issued Date: November 30, 2017**

Issued for

**Protronic (Far East) LTD.**

**Unit J,33F,COS Centre,56 Tsun Yip Street ,Kwun Tong,Kowloon,Hong Kong**

Issued by:

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Revision History

| Rev. | Issue Date        | Revisions     | Effect Page | Revised By  |
|------|-------------------|---------------|-------------|-------------|
| 00   | November 30, 2017 | Initial Issue | ALL         | Amzula Chen |
|      |                   |               |             |             |
|      |                   |               |             |             |
|      |                   |               |             |             |



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## 1 TEST CERTIFICATION

|                     |                                                                                                           |
|---------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | GSM/WLAN Wireless data terminal                                                                           |
| <b>Model</b>        | BPC010                                                                                                    |
| <b>Brand</b>        | ProVista Care                                                                                             |
| <b>Tested</b>       | May 25~November 30, 2017                                                                                  |
| <b>Applicant</b>    | <b>Protronic (Far East) LTD.</b><br>Unit J,33F,COS Centre,56 Tsun Yip Street ,Kwun Tong,Kowloon,Hong Kong |
| <b>Manufacturer</b> | <b>Dongguan Protronic Electronics Ltd.</b><br>XiangXi Village,Shipai Town,Dongguan City                   |

| APPLICABLE STANDARDS                                  |                         |
|-------------------------------------------------------|-------------------------|
| STANDARD                                              | TEST RESULT             |
| FCC 47 CFR PART 22 SUBPART H AND<br>PART 24 SUBPART E | No non-compliance noted |

### We hereby certify that:

Compliance Certification Services (Shenzhen) Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The test results of this report relate only to the tested sample identified in this report.

**Approved by:**

Sunday Hu  
Supervisor of RF Dept.  
Compliance Certification Service (Shenzhen) Inc.

**Reviewed by:**

Ruby Zhang  
Supervisor of Report Dept.  
Compliance Certification Service (Shenzhen) Inc.



## 2 EUT DESCRIPTION

|                                              |                                                                                      |
|----------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Product</b>                               | GSM/WLAN Wireless data terminal                                                      |
| <b>Model</b>                                 | BPC010                                                                               |
| <b>IMEI number</b>                           | 862016120100888                                                                      |
| <b>Brand</b>                                 | ProVista Care                                                                        |
| <b>Model Discrepancy</b>                     | N/A                                                                                  |
| <b>Identify Number</b>                       | C170525Z04-RP1-1                                                                     |
| <b>Received Date</b>                         | May 25, 2017                                                                         |
| <b>Power Supply</b>                          | DC 5V supplied by the Notebook or DC 3.7V supplied by the battery                    |
| <b>Battery specification</b>                 | Model: MYD 502830<br>Rating: 3.7V, 400mAh, 1.48Wh                                    |
| <b>Frequency Range</b>                       | GPRS / GSM 850MHz: 824 ~ 849 MHz<br>GPRS / GSM 1900MHz: 1850 ~ 1910 MHz              |
| <b>Transmit Power (ERP &amp; EIRP Power)</b> | GPRS 850: 25.53dBm<br>GPRS 1900: 26.59dBm<br>GSM 850: 25.49dBm<br>GSM 1900: 26.56dBm |
| <b>Modulation Technique</b>                  | GPRS / GSM: GMSK                                                                     |
| <b>Type of Emission</b>                      | GPRS 850: 251KGXW<br>GPRS 1900: 250KGXW<br>GSM 850: 244GXW<br>GSM 1900: 251GXW       |
| <b>Antenna Specification</b>                 | Internal antenna with 0.8dBi gain (Max)                                              |
| <b>Temperature Range</b>                     | 0°C ~ +45°C                                                                          |
| <b>Hardware Version</b>                      | E008-B_MB_V1.2                                                                       |
| <b>Software Version</b>                      | E008B_2503A_11C_CTA_20170901.bin                                                     |

**Remark:** The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.



### **3 TEST METHODOLOGY**

Both conducted and radiated testing were performed according to the procedures document on chapter 13 of ANSI C63.4: 2014, TIA/EIA-603-D: 2010 and FCC CFR 47, Part 2 and Part 22 Subpart H & Part 24 Subpart E.

The tests documented in this report were performed in accordance with IC RSS-132, SPSR503, RSS-133, SPSR510 and ANSI C63.4 and TIA/EIA-603-D.

#### **3.1. EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2. EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

#### **3.3. GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2014.



### 3.4. DESCRIPTION OF TEST MODES

The EUT (model: BPC010) had been tested under operating condition.

EUT staying in continuous transmitting mode was programmed.

After verification, all tests carried out are with the worst-case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode and receiving radiated spurious emission above 1GHz, which worst case was in CH Mid mode only.

#### ***For GSM/GSM***

| Test Mode | Test Modes Description            |
|-----------|-----------------------------------|
| GSM/TM1   | GSM system, GPRS, GMSK modulation |
| GSM/TM2   | GSM system, GSM, GMSK modulation  |

#### ***Note:***

1. As GSM and GPRS with the same emission designator, test result recorded in this report at the worst case GSM/TM1 only after exploratory scan.

#### ***Test frequency list***

| Test Mode | RF Channel  |             |             |
|-----------|-------------|-------------|-------------|
|           | Low(L)      | Middle (M)  | High (H)    |
| GSM850    | Channel 128 | Channel 190 | Channel 251 |
|           | 824.2 MHz   | 836.6 MHz   | 848.8 MHz   |
| Test Mode | RF Channel  |             |             |
|           | Low(L)      | Middle (M)  | High (H)    |
| GSM1900   | Channel 512 | Channel 661 | Channel 810 |
|           | 1850.2 MHz  | 1880.0 MHz  | 1909.8 MHz  |



### 3.5. Summary Results

#### 3.5.1. Cellular Band (824-849MHz paired with 869-894MHz)

| Test Item                                                                                     | FCC Rule No.        | Requirements                                                                                          | Verdict |
|-----------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Output Power                                                    | §2.1046,<br>§22.913 | FCC: ERP $\leq$ 7W<br>IC: ERP $\leq$ 11.5W                                                            | Pass    |
| Peak-Average Ratio                                                                            | N/A                 | Limit $\leq$ 13dB                                                                                     | Pass    |
| Modulation Characteristics                                                                    | §2.1047             | Digital modulation                                                                                    | N/A     |
| Bandwidth                                                                                     | §2.1049             | OBW: No limit.<br>EBW: No limit.                                                                      | Pass    |
| Band Edges Compliance                                                                         | §2.1051,<br>§22.917 | $\leq$ -13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block.          | Pass    |
| Spurious Emission at Antenna Terminals                                                        | §2.1051,<br>§22.917 | $\leq$ -13dBm/1MHz,<br>From 1MHz to 10th harmonics but outside authorized operating frequency ranges. | Pass    |
| Field Strength of Spurious Radiation                                                          | §2.1053,<br>§22.917 | $\leq$ -13dBm/1MHz.                                                                                   | Pass    |
| Frequency Stability                                                                           | §2.1055,<br>§22.355 | $\leq \pm 2.5$ ppm.                                                                                   | Pass    |
| Receiver Spurious Emissions                                                                   | N/A                 | Meet RSS-Gen Class B Emission Limit                                                                   | Pass    |
| NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” de notes “not tested”. |                     |                                                                                                       |         |

**3.5.2. PCS Band (1850-1915MHz paired with 1930-1995MHz)**

| Test Item                                  | FCC Rule No.        | Requirements                                                                                          | Verdict |
|--------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Output Power | §2.1046,<br>§24.232 | FCC: EIRP $\leq$ 2W<br>IC: EIRP $\leq$ 2W                                                             | Pass    |
| Peak-Average Ratio                         | §2.1046,<br>§24.232 | Limit $\leq$ 13dB                                                                                     | Pass    |
| Modulation Characteristics                 | §2.1047             | Digital modulation                                                                                    | N/A     |
| Bandwidth                                  | §2.1049             | OBW: No limit.<br>EBW: No limit.                                                                      | Pass    |
| Band Edges Compliance                      | §2.1051,<br>§24.238 | $\leq$ -13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block.          | Pass    |
| Spurious Emission at Antenna Terminals     | §2.1051,<br>§24.238 | $\leq$ -13dBm/1MHz,<br>From 1MHz to 10th harmonics but outside authorized operating frequency ranges. | Pass    |
| Field Strength of Spurious Radiation       | §2.1053,<br>§22.917 | $\leq$ -13dBm/1MHz.                                                                                   | Pass    |
| Frequency Stability                        | §2.1055,<br>§24.235 | $\leq \pm 2.5$ ppm.                                                                                   | Pass    |
| Receiver Spurious Emissions                | N/A                 | Meet RSS-Gen Class B Emission Limit                                                                   | Pass    |

NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” de notes “not tested”.



## 4 FACILITIES AND ACCREDITATIONS

### 4.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

**No.10-1 Mingkeda Logistics park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China**

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4: 2014 and CISPR Publication 22.

### 4.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

|              |             |
|--------------|-------------|
| <b>USA</b>   | <b>A2LA</b> |
| <b>China</b> | <b>CNAS</b> |

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

|               |                                             |
|---------------|---------------------------------------------|
| <b>USA</b>    | <b>FCC</b>                                  |
| <b>Japan</b>  | <b>VCCI (C-4815,R-4320,T-2317, G-10624)</b> |
| <b>Canada</b> | <b>INDUSTRY CANADA</b>                      |

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccssz.com>

### 4.3. MEASUREMENT UNCERTAINTY

| <b>Parameter</b>                      | <b>Uncertainty</b> |
|---------------------------------------|--------------------|
| Powerline Conducted Emission          | +/- 1.2575         |
| 3M Semi Anechoic Chamber / 30M~200M   | +/- 4.0138         |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 3.9483         |
| 3M Semi Anechoic Chamber / 1G~8G      | +/- 2.5975         |
| 3M Semi Anechoic Chamber / 8G~18G     | +/- 2.6112         |
| 3M Semi Anechoic Chamber / 18G~26G    | +/- 2.7389         |
| 3M Semi Anechoic Chamber / 26G~40G    | +/- 2.9683         |

**Remark:** This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



## 5 SETUP OF EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

### 5.2. SUPPORT EQUIPMENT

| No. | Equipment                                     | Model No.   | Serial No. | FCC | Brand             | Data Cable                               | Power Cord                                                               |
|-----|-----------------------------------------------|-------------|------------|-----|-------------------|------------------------------------------|--------------------------------------------------------------------------|
| 1   | Notebook                                      | THINKPAD S2 | N/A        | DoC | LENOVO            | N/A                                      | Unshielded:<br>1.00m<br>(AC Cable)<br>Unshielded:<br>1.50m<br>(DC Cable) |
| 2   | Wideband<br>radio<br>communicatio<br>n tester | CMW500      | N/A        | DoC | ROHDE&S<br>CHWARZ | Shielded:<br>3.00m<br>(Coaxial<br>Cable) | Unshielded:<br>1.50m<br>(AC Cable)                                       |



## 6 FCC PART 22 & 24 REQUIREMENTS

### 6.1. 26DB BANDWIDTH

#### .6.1.1. LIMIT

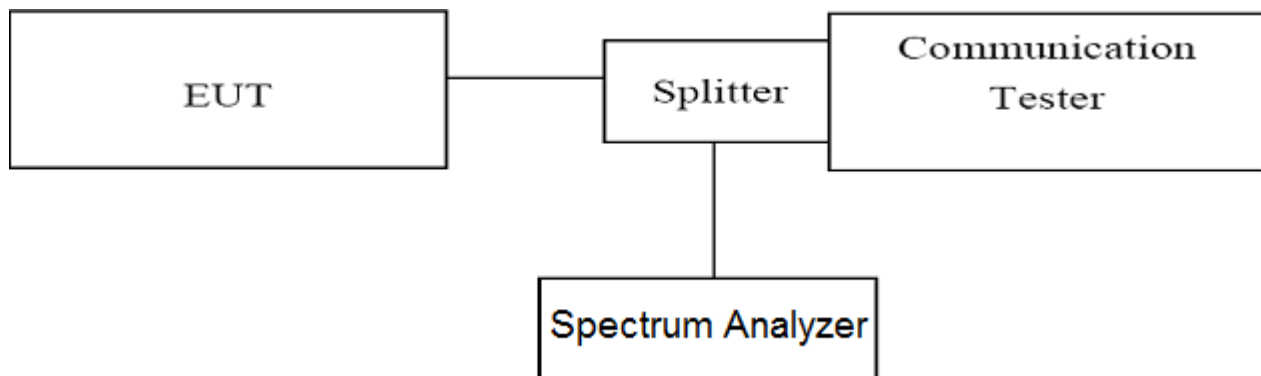
None; for reporting purposes only.

#### .6.1.2. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model  | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|--------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A | MY55370330    | 02/21/2017       | 02/20/2018      |
| Universal Radio Communication Tester | Agilent      | 8960   | GB44400261    | 02/21/2017       | 02/20/2018      |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

#### .6.1.3. TEST CONFIGURATION



#### .6.1.4. TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The Occupied bandwidth and Emission Bandwidth were measured with Agilent Spectrum Analyzer N9010A (peak);
3. Set RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW
4. Set SPA Max hold and View, Set 99% Occupied Bandwidth/ Set -26dBc Occupied Bandwidth
5. These measurements were done at 3 frequencies (Low, middle and high of operational frequency range)

#### .6.1.5. TEST RESULTS

No non-compliance noted.

**TEST DATA**

| Test Mode                    | Channel | Frequency<br>(MHz) | Occupied Bandwidth<br>(99% BW)<br>( kHz) | Emission Bandwidth<br>(-26 dB BW)<br>( kHz) | Verdict |
|------------------------------|---------|--------------------|------------------------------------------|---------------------------------------------|---------|
| <b>GSM/TM1<br/>/GPRS850</b>  | 128     | 824.2              | 250.88                                   | 308.10                                      | PASS    |
|                              | 190     | 836.6              | 245.03                                   | 300.80                                      | PASS    |
|                              | 251     | 848.8              | 247.06                                   | 309.50                                      | PASS    |
| <b>GSM/TM2<br/>/GSM850</b>   | 128     | 824.2              | 243.77                                   | 316.90                                      | PASS    |
|                              | 190     | 836.6              | 243.49                                   | 306.20                                      | PASS    |
|                              | 251     | 848.8              | 243.06                                   | 309.90                                      | PASS    |
| <b>GSM/TM1<br/>/GPRS1900</b> | 512     | 1850.2             | 245.80                                   | 306.30                                      | PASS    |
|                              | 661     | 1880.0             | 246.91                                   | 314.50                                      | PASS    |
|                              | 810     | 1908.8             | 250.10                                   | 314.40                                      | PASS    |
| <b>GSM/TM2<br/>/GSM1900</b>  | 512     | 1850.2             | 246.10                                   | 309.30                                      | PASS    |
|                              | 661     | 1880.0             | 249.18                                   | 312.00                                      | PASS    |
|                              | 810     | 1908.8             | 250.73                                   | 311.40                                      | PASS    |

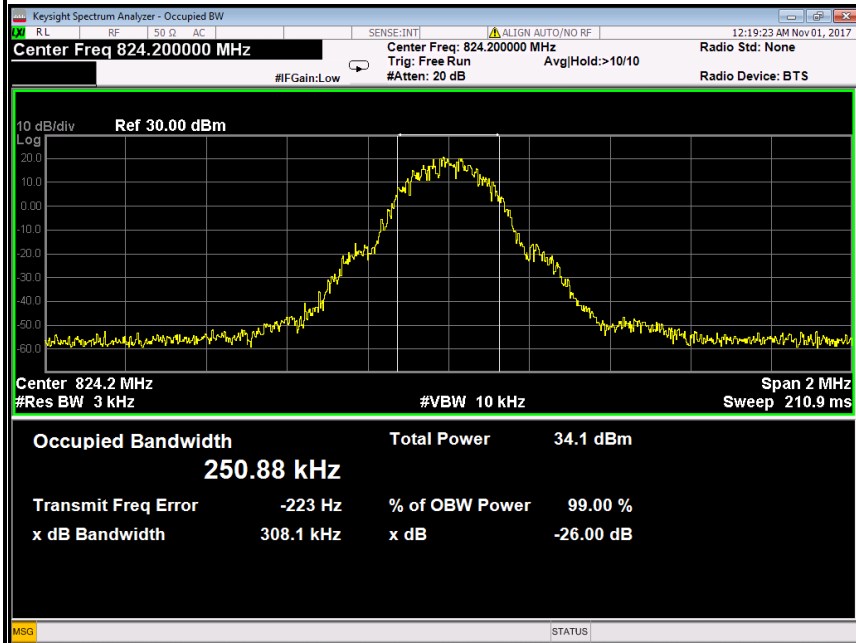
*Remark:*

1. Test results including cable loss;
2. please refer to following plots;

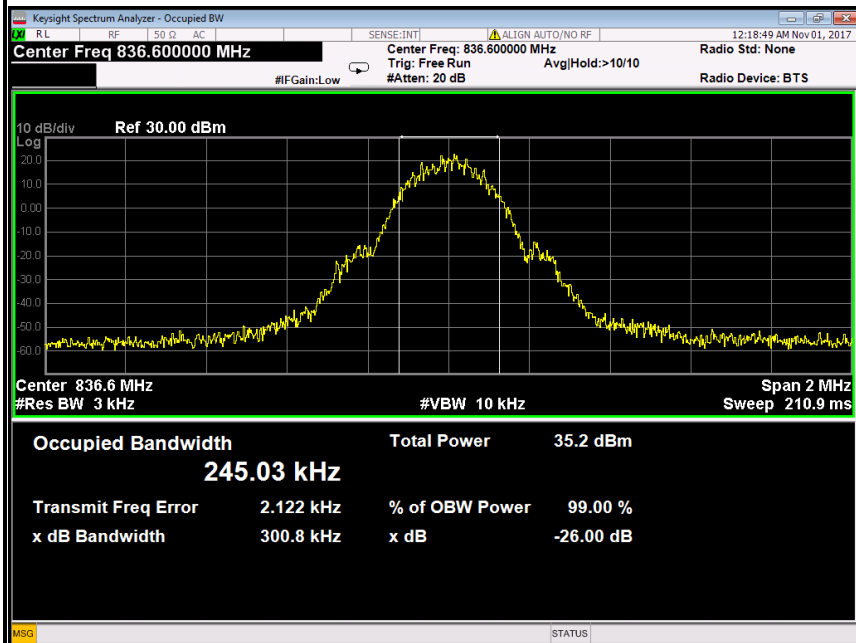


## TEST PLOT

### GPRS 850 (CH Low)

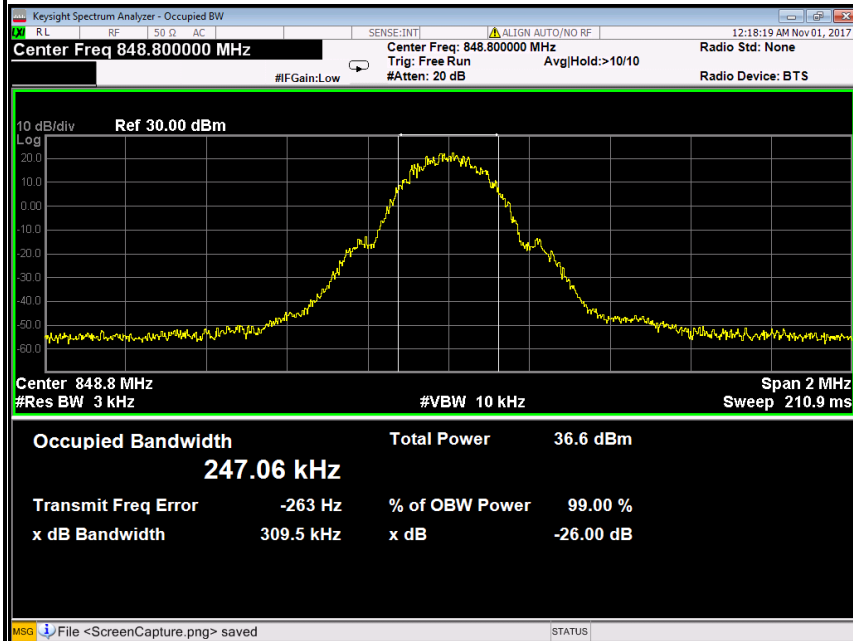


### GPRS 850 (CH Mid)

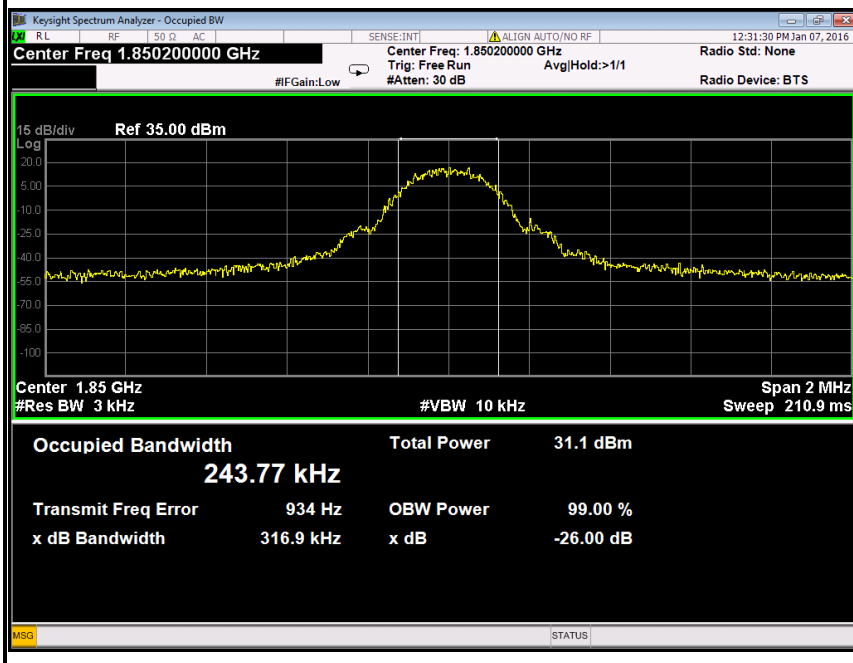




### GPRS 850 (CH High)

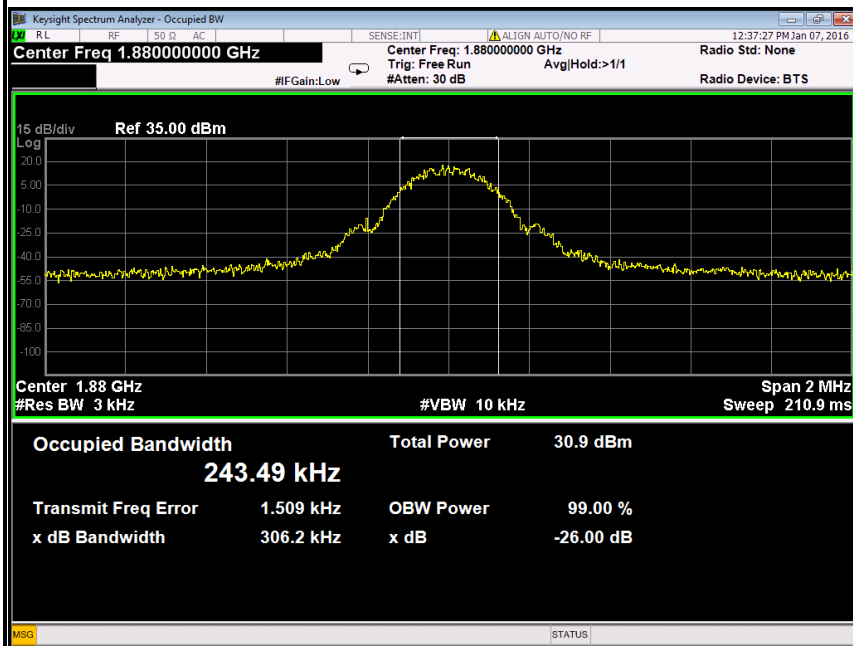


### GPRS 1900 (CH Low)

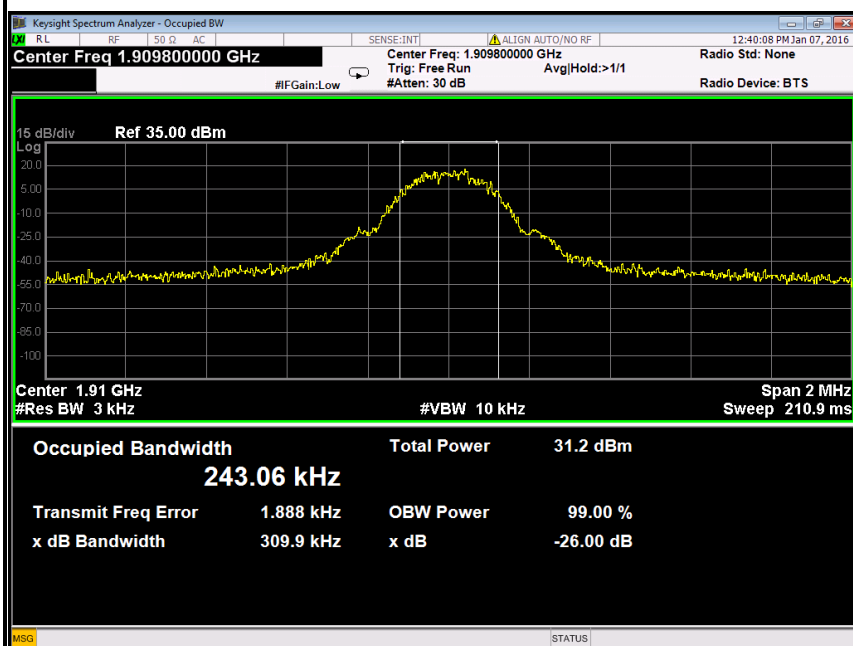




### GPRS 1900 (CH Mid)

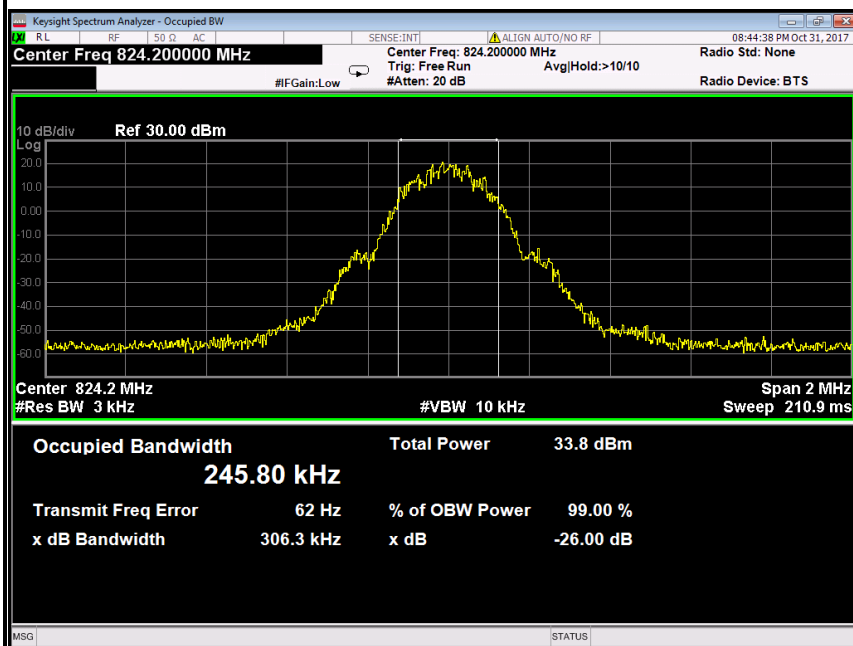


### GPRS 1900 (CH High)

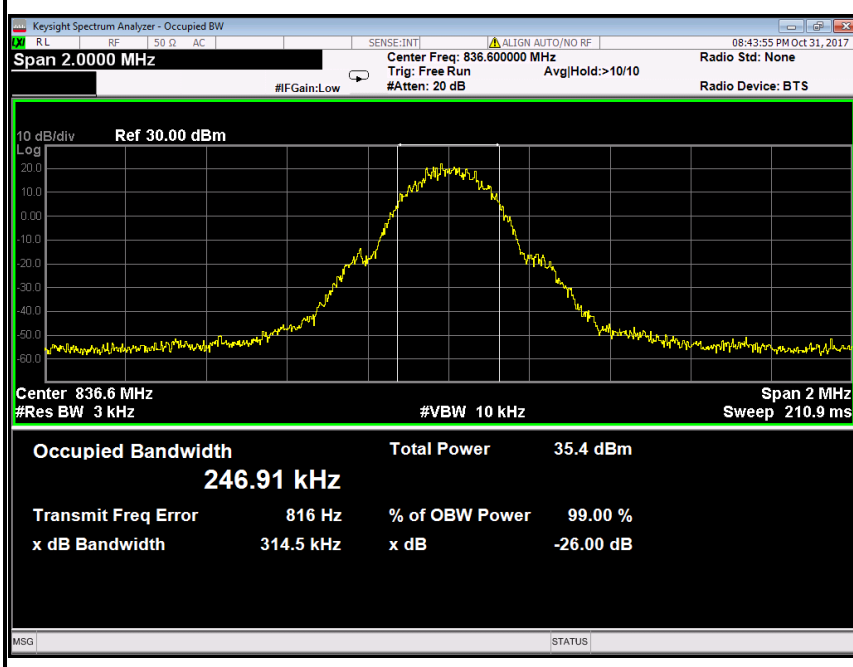




### GSM 850 (CH Low)

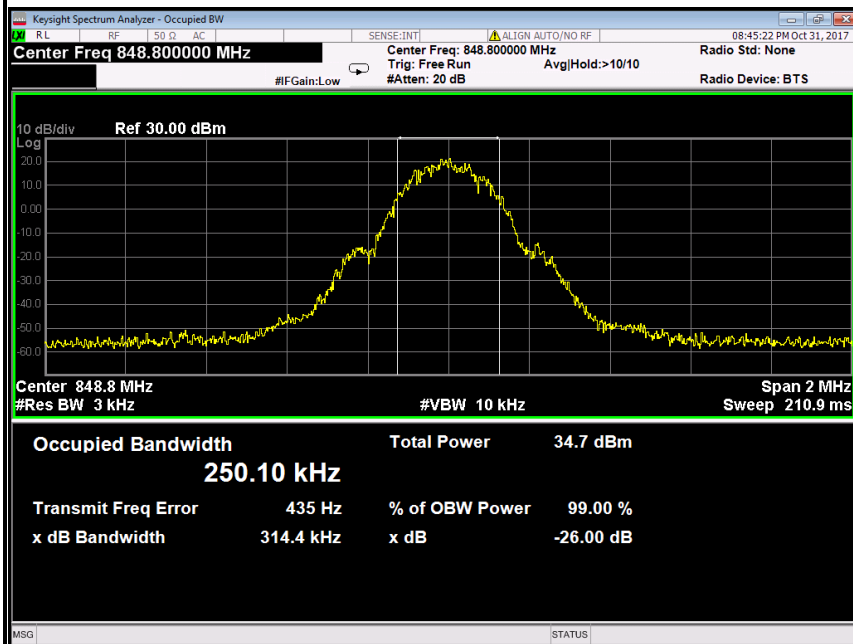


### GSM 850 (CH Mid)

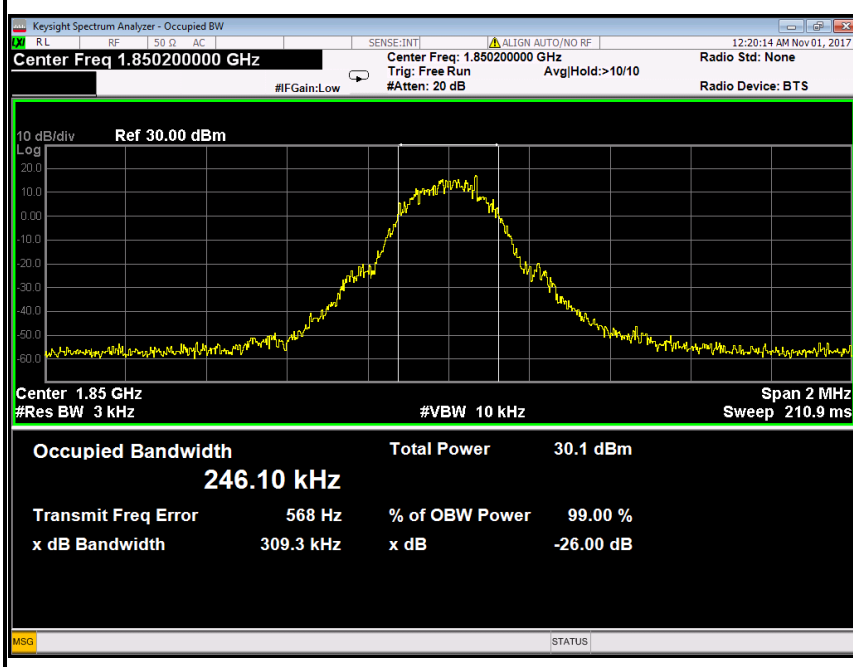




### GSM 850 (CH High)

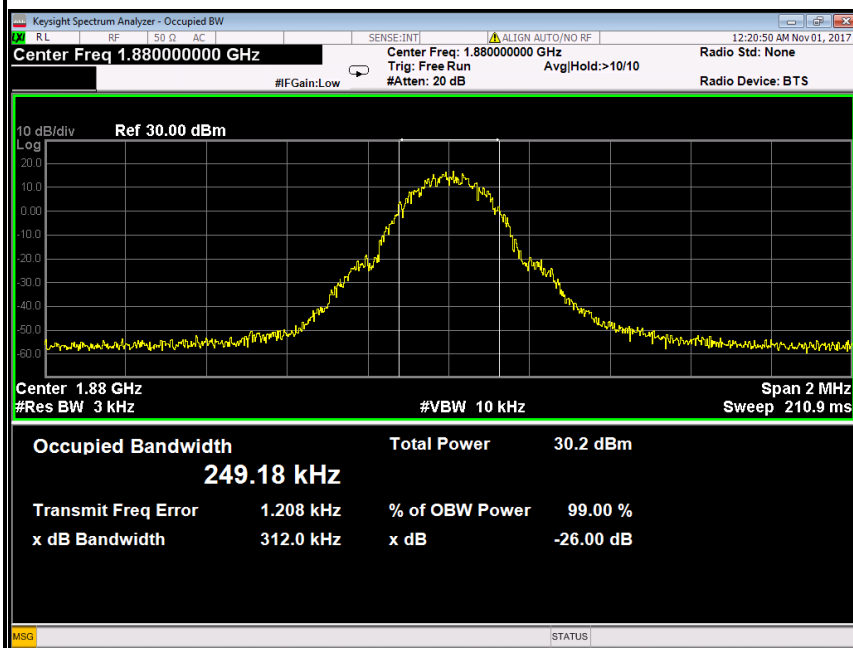


### GSM 1900 (CH Low)

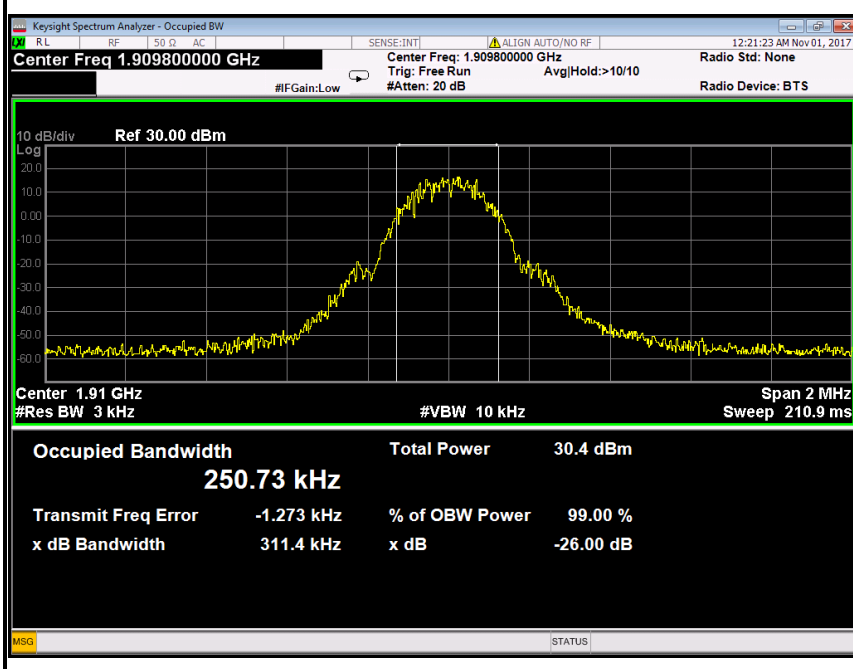




### GSM 1900 (CH Mid)



### GSM 1900 (CH High)





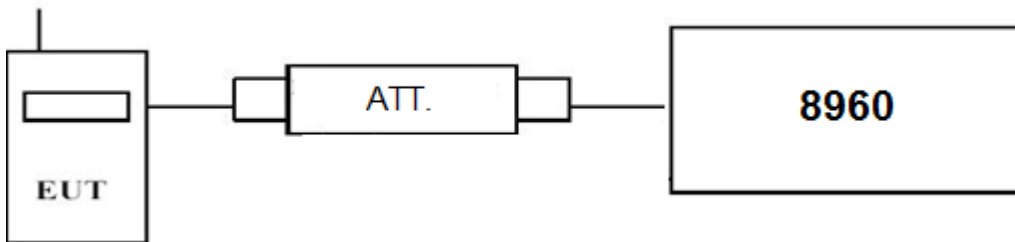
## 6.2. BURST AVERAGE POWER

### .6.2.1. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|-------|---------------|------------------|-----------------|
| Universal Radio Communication Tester | Agilent      | 8960  | GB44400261    | 02/21/2017       | 02/20/2018      |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

### .6.2.2. TEST CONFIGURATION



### .6.2.3. TEST PROCEDURE

Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a 8960 by an Att.
- EUT Communicate with 8960 then selects a channel for testing.
- Add a correction factor to the display 8960, and then test.

### .6.2.4. TEST RESULTS

No non-compliance noted.



TEST DATA

| Test Mode | Channel | Frequency (MHz) | Burst Average Power (dBm) | Results |
|-----------|---------|-----------------|---------------------------|---------|
| GPRS 850  | 128     | 824.20          | 24.65                     | PASS    |
|           | 190     | 836.60          | 24.07                     | PASS    |
|           | 251     | 848.80          | 25.53                     | PASS    |
| GPRS 1900 | 512     | 1850.20         | 25.63                     | PASS    |
|           | 661     | 1880.00         | 25.02                     | PASS    |
|           | 810     | 1909.80         | 26.59                     | PASS    |

| Test Mode | Channel | Frequency (MHz) | Burst Average Power (dBm) | Results |
|-----------|---------|-----------------|---------------------------|---------|
| GSM 850   | 128     | 824.20          | 24.60                     | PASS    |
|           | 190     | 836.60          | 24.18                     | PASS    |
|           | 251     | 848.80          | 25.49                     | PASS    |
| GSM 1900  | 512     | 1850.20         | 25.52                     | PASS    |
|           | 661     | 1880.00         | 25.14                     | PASS    |
|           | 810     | 1909.80         | 26.56                     | PASS    |

Remark: The value of factor includes both the loss of cable and external attenuator



### 6.3. PEAK TO AVERAGE RATIO

#### 6.3.1. LIMIT

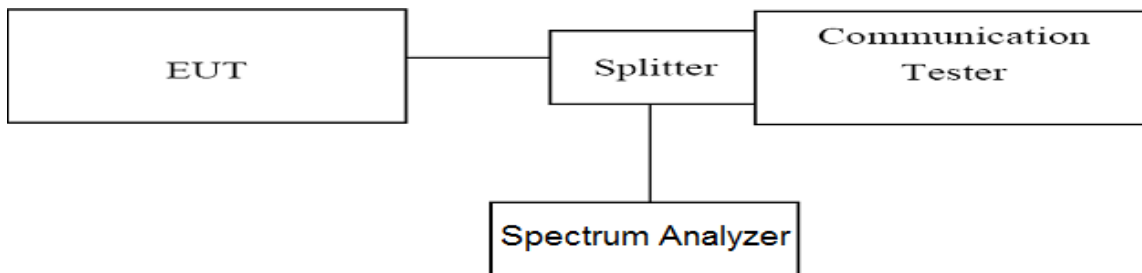
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

#### 6.3.2. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model  | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|--------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A | MY52221469    | 02/21/2017       | 02/20/2018      |
| Universal Radio Communication Tester | Agilent      | 8960   | GB44400261    | 02/21/2017       | 02/20/2018      |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

#### 6.3.3. TEST CONFIGURATION



#### 6.3.4. TEST PROCEDURE

##### For GPRS/GSM

Use spectrum to measure the total peak power and record as  $P_{Pk}$ . Use spectrum to measure the total average power and record as  $P_{Avg}$ . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm).

Determine the PAPR from:

$$PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).$$

##### For UMTS

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
  - 1). for continuous transmissions, set to 1 ms,
  - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.



### 6.3.5. TEST RESULTS

*No non-compliance noted.*

| Test Mode         | Channel | Frequency (MHz) | PAPR Value (dB) | Limits (dB) | Verdict |
|-------------------|---------|-----------------|-----------------|-------------|---------|
| GPRS /TM1/GRPS850 | 128     | 824.20          | 0.42            | 13.0        | PASS    |
|                   | 190     | 836.60          | 0.51            | 13.0        |         |
|                   | 251     | 848.80          | 0.44            | 13.0        |         |
| GSM/TM2/GSM850    | 128     | 824.20          | 0.51            | 13.0        | PASS    |
|                   | 190     | 836.60          | 0.60            | 13.0        |         |
|                   | 251     | 848.80          | 0.59            | 13.0        |         |
| GPRS/TM1/GPRS1900 | 512     | 1850.2          | 0.53            | 13.0        | PASS    |
|                   | 661     | 1880.0          | 0.48            | 13.0        |         |
|                   | 810     | 1908.8          | 0.45            | 13.0        |         |
| GSM/TM2/GSM1900   | 512     | 1850.2          | 0.53            | 13.0        | PASS    |
|                   | 661     | 1880.0          | 0.51            | 13.0        |         |
|                   | 810     | 1908.8          | 0.57            | 13.0        |         |



## 6.4. ERP & EIRP MEASUREMENT

### 6.4.1. LIMIT

According to FCC §2.1046

FCC 22.913(b): The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.

RSS-132 § 4.4 the maximum (ERP) shall be 6.3 Watts for mobile stations.

FCC 24.232(b): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

RSS133 § 6.4: Mobile stations and hand-held portables are limited to 2 watts maximum (EIRP).

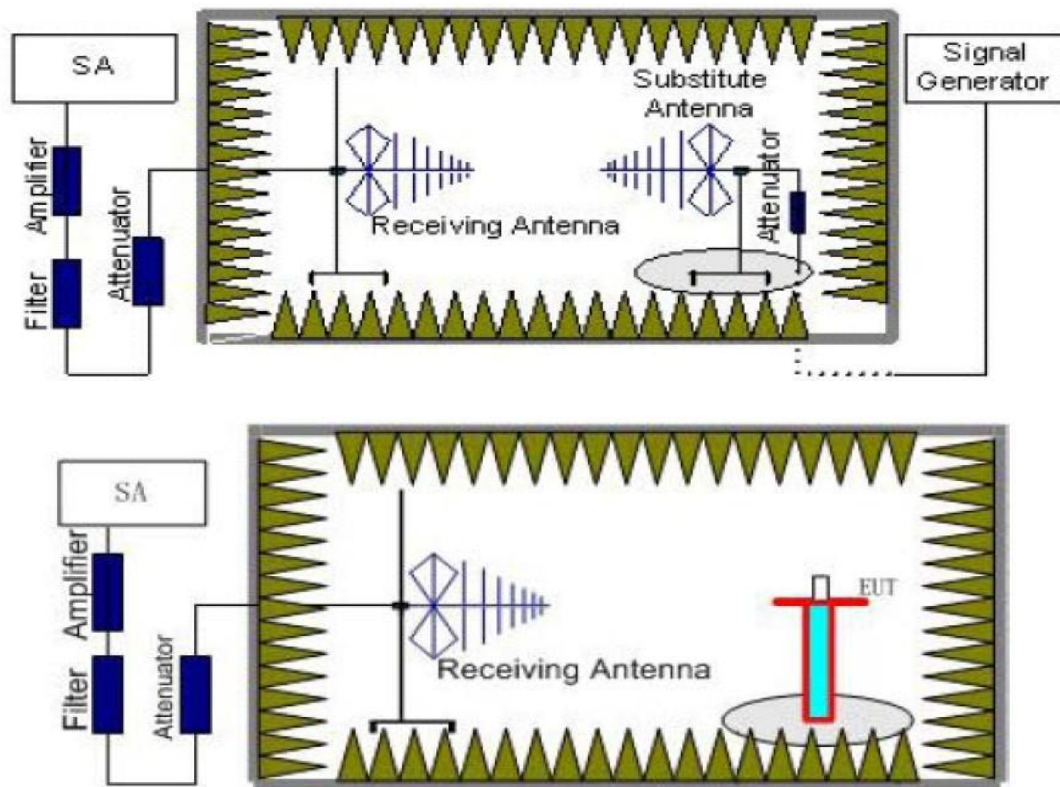
### 6.4.2. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model Number       | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|--------------------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A             | MY52221469    | 02/21/2017       | 02/20/2018      |
| Universal Radio Communication Tester | Agilent      | 8960               | GB44400261    | 02/21/2017       | 02/20/2018      |
| Amplifier                            | EMEC         | EM330              | 060661        | 02/21/2017       | 02/20/2018      |
| High Noise Amplifier                 | Agilent      | 8449B              | 3008A01838    | 02/21/2017       | 02/20/2018      |
| Bilog Antenna                        | Schwarzbeck  | VULB 9160          | 9160-3401     | 02/28/2017       | 02/27/2018      |
| Horn Antenna                         | TRC          | HA0301             | N/A           | 02/28/2017       | 02/27/2018      |
| Bilog Antenna                        | SCHAFFNER    | CBL6143            | 5063          | 02/21/2017       | 02/20/2018      |
| Horn Antenna                         | SCHWARZBECK  | BBHA9120           | D286          | 02/28/2017       | 02/27/2018      |
| Signal Generator                     | Anritsu      | MG3694A            | #050125       | 02/28/2017       | 02/27/2018      |
| Power Meter                          | Anritsu      | ML2495A            | 1204003       | 02/21/2017       | 02/20/2018      |
| Power Sensor                         | Anritsu      | MA2411B            | 1126150       | 02/21/2017       | 02/20/2018      |
| Turn Table                           | N/A          | N/A                | N/A           | N.C.R            | N.C.R           |
| Controller                           | CT           | N/A                | N/A           | N.C.R            | N.C.R           |
| Temp. / Humidity Meter               | Anymetre     | JR913              | N/A           | 02/21/2017       | 02/20/2018      |
| Antenna Tower                        | SUNOL        | TLT2               | N/A           | N.C.R            | N.C.R           |
| Test SW                              | FARAD        | LZ-RF / CCS-SZ-3A2 |               |                  |                 |

*Remark: Each piece of equipment is scheduled for calibration once a year.*



#### 6.4.3. TEST CONFIGURATION



#### 6.4.4. TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, and the maximum value of the receiver should be recorded as ( $P_r$ ).
4. The EUT shall be replaced by a substitution antenna. In the chamber, a substitution



antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. An amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{Mea} - P_{Ag} - P_{cl} + G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

#### 6.4.5. TEST RESULTS

No non-compliance noted.

#### GPRS 850 Test Data

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{Ag}$ (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|-----------------|---------------|------------------------|-----------------|---------------|-----------|-------------|-------------|--------------|
| 824.20          | -12.54          | 4.10          | 7.26                   | 2.15            | 33.11         | 21.58     | 38.45       | -16.87      | V            |
| 836.60          | -13.57          | 4.14          | 7.26                   | 2.15            | 33.11         | 20.51     | 38.45       | -17.94      | V            |
| 848.80          | -11.84          | 3.90          | 7.26                   | 2.15            | 33.12         | 22.49     | 38.45       | -15.96      | V            |
| 824.20          | -11.01          | 4.10          | 7.26                   | 2.15            | 33.11         | 23.11     | 38.45       | -15.34      | H            |
| 836.60          | -11.84          | 4.14          | 7.26                   | 2.15            | 33.11         | 22.24     | 38.45       | -16.21      | H            |
| 848.80          | -10.37          | 3.90          | 7.26                   | 2.15            | 33.12         | 23.96     | 38.45       | -14.49      | H            |



### GPRS 1900 Test Data

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1850.20         | -12.79                 | 6.04                 | 7.98                            | 34.74                | 23.89      | 33.01       | -9.12       | V            |
| 1880.00         | -14.48                 | 5.20                 | 8.05                            | 34.78                | 23.15      | 33.01       | -9.86       | V            |
| 1909.80         | -12.65                 | 5.88                 | 8.12                            | 34.78                | 24.37      | 33.01       | -8.64       | V            |
| 1850.20         | -10.39                 | 6.04                 | 7.98                            | 34.74                | 26.29      | 33.01       | -6.72       | H            |
| 1880.00         | -12.06                 | 5.20                 | 8.05                            | 34.78                | 25.57      | 33.01       | -7.44       | H            |
| 1909.80         | -10.04                 | 5.88                 | 8.12                            | 34.78                | 26.98      | 33.01       | -6.03       | H            |

### GSM 850 Test Data

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Ag</sub> (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|-----------|-------------|-------------|--------------|
| 824.20          | -13.18                 | 4.10                 | 7.26                            | 2.15            | 33.11                | 20.94     | 38.45       | -17.51      | V            |
| 836.60          | -13.34                 | 4.14                 | 7.26                            | 2.15            | 33.11                | 20.74     | 38.45       | -17.71      | V            |
| 848.80          | -12.58                 | 3.90                 | 7.26                            | 2.15            | 33.12                | 21.75     | 38.45       | -16.70      | V            |
| 824.20          | -11.17                 | 4.10                 | 7.26                            | 2.15            | 33.11                | 22.95     | 38.45       | -15.50      | H            |
| 836.60          | -11.72                 | 4.14                 | 7.26                            | 2.15            | 33.11                | 22.36     | 38.45       | -16.09      | H            |
| 848.80          | -10.47                 | 3.90                 | 7.26                            | 2.15            | 33.12                | 23.86     | 38.45       | -14.59      | H            |

### GSM 1900 Test Data

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Ag</sub> (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|------------|-------------|-------------|--------------|
| 1850.20         | -13.07                 | 6.04                 | 7.98                            | 34.74                | 23.61      | 33.01       | -9.40       | V            |
| 1880.00         | -14.72                 | 5.20                 | 8.05                            | 34.78                | 22.91      | 33.01       | -10.10      | V            |
| 1909.80         | -12.63                 | 5.88                 | 8.12                            | 34.78                | 24.39      | 33.01       | -8.62       | V            |
| 1850.20         | -10.56                 | 6.04                 | 7.98                            | 34.74                | 26.12      | 33.01       | -6.89       | H            |
| 1880.00         | -12.20                 | 5.20                 | 8.05                            | 34.78                | 25.43      | 33.01       | -7.58       | H            |
| 1909.80         | -10.08                 | 5.88                 | 8.12                            | 34.78                | 26.94      | 33.01       | -6.07       | H            |



## 6.5. OUT OF BAND EMISSION AT ANTENNA TERMINALS

### 6.5.1. LIMIT

According to FCC §2.1051, FCC §22.917, FCC §24.238(a). RSS-132 (4.5.2), RSS-133 (6.6).

**Out of Band Emissions:** The mean power of emission must be attenuated below the mean power of the non-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least  $43 + 10 \log P$  dB.

**Mobile Emissions in Base Frequency Range:** The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not exceed  $-80$  dBm at the transmit antenna connector.

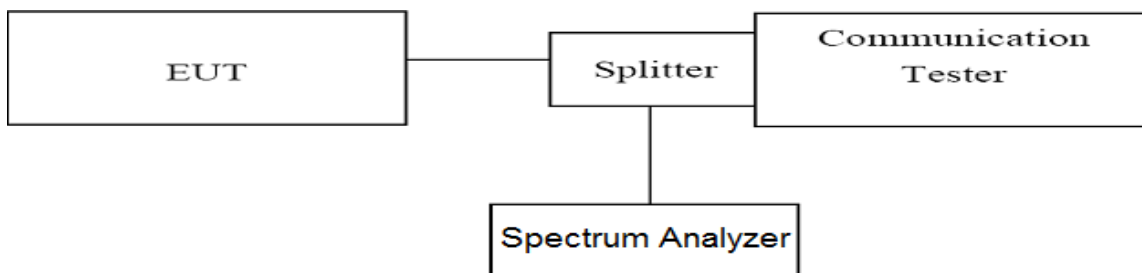
**Band Edge Requirements:** In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the Out of band Emission

### 6.5.2. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model  | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|--------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A | MY52221469    | 02/21/2017       | 02/20/2018      |
| Universal Radio Communication Tester | Agilent      | 8960   | GB44400261    | 02/21/2017       | 02/20/2018      |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

### 6.5.3. TEST CONFIGURATION





#### **6.5.4. TEST PROCEDURE**

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10 th harmonic. Limit = -13dBm

Band Edge Requirements (824 MHz and 849 MHz /1850MHz and 1910MHz): In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.



## 6.5.5. TEST RESULTS

No non-compliance noted.

### Test Data

| Mode      | CH  | Location   | Description                                 |
|-----------|-----|------------|---------------------------------------------|
| GPRS 850  | 128 | Figure 1-1 | Conducted spurious emissions, 1MHz - 30MHz  |
|           |     | Figure 1-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|           |     | Figure 1-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|           |     | Figure 1-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|           |     | Figure 1-5 | Conducted spurious emissions, 10GHz - 20GHz |
|           | 190 | Figure 2-1 | Conducted spurious emissions, 1MHz - 30MHz  |
|           |     | Figure 2-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|           |     | Figure 2-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|           |     | Figure 2-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|           |     | Figure 2-5 | Conducted spurious emissions, 10GHz - 20GHz |
|           | 251 | Figure 3-1 | Conducted spurious emissions, 1MHz - 30MHz  |
|           |     | Figure 3-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|           |     | Figure 3-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|           |     | Figure 3-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|           |     | Figure 3-5 | Conducted spurious emissions, 10GHz - 20GHz |
| GPRS 1900 | 512 | Figure 4-1 | Conducted spurious emissions, 1MHz – 30MHz  |
|           |     | Figure 4-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|           |     | Figure 4-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|           |     | Figure 4-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|           |     | Figure 4-5 | Conducted spurious emissions, 10GHz - 20GHz |
|           | 661 | Figure 5-1 | Conducted spurious emissions, 1MHz – 30MHz  |
|           |     | Figure 5-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|           |     | Figure 5-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|           |     | Figure 5-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|           |     | Figure 5-5 | Conducted spurious emissions, 10GHz - 20GHz |
|           | 810 | Figure 6-1 | Conducted spurious emissions, 1MHz – 30MHz  |
|           |     | Figure 6-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|           |     | Figure 6-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|           |     | Figure 6-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|           |     | Figure 6-5 | Conducted spurious emissions, 10GHz - 20GHz |



| Mode      | CH  | Location   | Description         |
|-----------|-----|------------|---------------------|
| GPRS 850  | 128 | Figure 7-1 | Band Edge emissions |
|           | 251 | Figure 7-2 | Band Edge emissions |
| GPRS 1900 | 512 | Figure 8-1 | Band Edge emissions |
|           | 810 | Figure 8-2 | Band Edge emissions |

| Mode     | CH  | Location    | Description                                 |
|----------|-----|-------------|---------------------------------------------|
| GSM 850  | 128 | Figure 9-1  | Conducted spurious emissions, 1MHz - 30MHz  |
|          |     | Figure 9-2  | Conducted spurious emissions, 30MHz - 1GHz  |
|          |     | Figure 9-3  | Conducted spurious emissions, 1GHz - 5GHz   |
|          |     | Figure 9-4  | Conducted spurious emissions, 5GHz - 10GHz  |
|          |     | Figure 9-5  | Conducted spurious emissions, 10GHz - 20GHz |
|          | 190 | Figure 10-1 | Conducted spurious emissions, 1MHz - 30MHz  |
|          |     | Figure 10-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|          |     | Figure 10-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|          |     | Figure 10-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|          |     | Figure 10-5 | Conducted spurious emissions, 10GHz - 20GHz |
|          | 251 | Figure 11-1 | Conducted spurious emissions, 1MHz - 30MHz  |
|          |     | Figure 11-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|          |     | Figure 11-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|          |     | Figure 11-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|          |     | Figure 11-5 | Conducted spurious emissions, 10GHz - 20GHz |
| GSM 1900 | 512 | Figure 12-1 | Conducted spurious emissions, 1MHz – 30MHz  |
|          |     | Figure 12-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|          |     | Figure 12-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|          |     | Figure 12-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|          |     | Figure 12-5 | Conducted spurious emissions, 10GHz - 20GHz |
|          | 661 | Figure 13-1 | Conducted spurious emissions, 1MHz – 30MHz  |
|          |     | Figure 13-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|          |     | Figure 13-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|          |     | Figure 13-4 | Conducted spurious emissions, 5GHz - 10GHz  |
|          |     | Figure 13-5 | Conducted spurious emissions, 10GHz - 20GHz |
|          | 810 | Figure 14-1 | Conducted spurious emissions, 1MHz – 30MHz  |
|          |     | Figure 14-2 | Conducted spurious emissions, 30MHz - 1GHz  |
|          |     | Figure 14-3 | Conducted spurious emissions, 1GHz - 5GHz   |
|          |     | Figure 14-4 | Conducted spurious emissions, 5GHz - 10GHz  |



|         |     | Figure 14-5 | Conducted spurious emissions, 10GHz - 20GHz |
|---------|-----|-------------|---------------------------------------------|
| Mode    | CH  | Location    | Description                                 |
| GSM 850 | 128 | Figure 15-1 | Band Edge emissions                         |
|         | 251 | Figure 15-2 | Band Edge emissions                         |
| GSM1900 | 512 | Figure 16-1 | Band Edge emissions                         |
|         | 810 | Figure 16-2 | Band Edge emissions                         |



## Test Plot

### GPRS 850

Figure 1-1: Out of Band emission at antenna terminals – GPRS CH Low

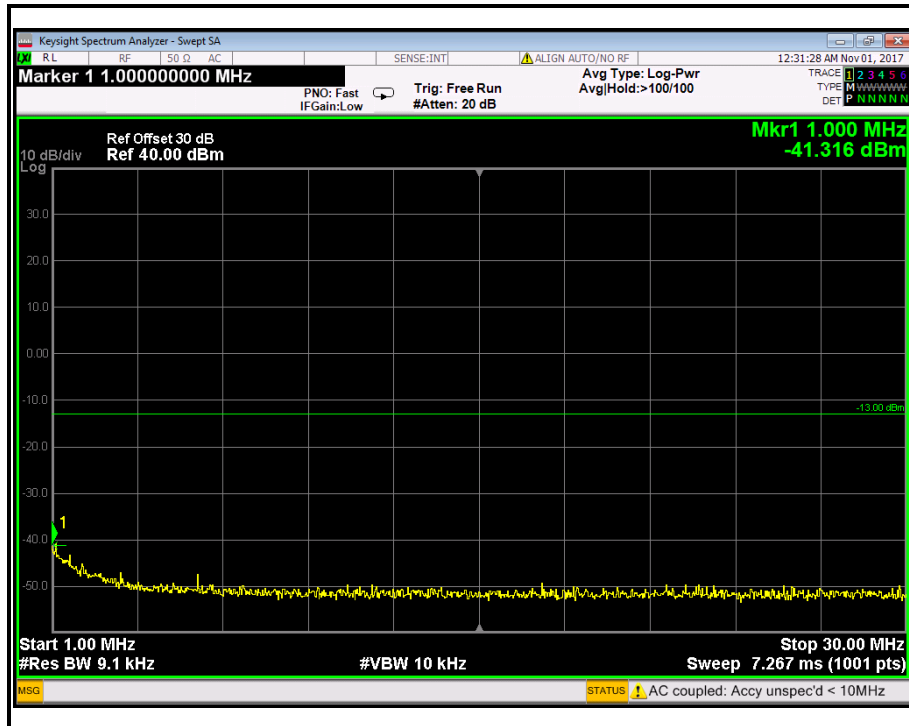


Figure 1-2: Out of Band emission at antenna terminals – GPRS CH Low

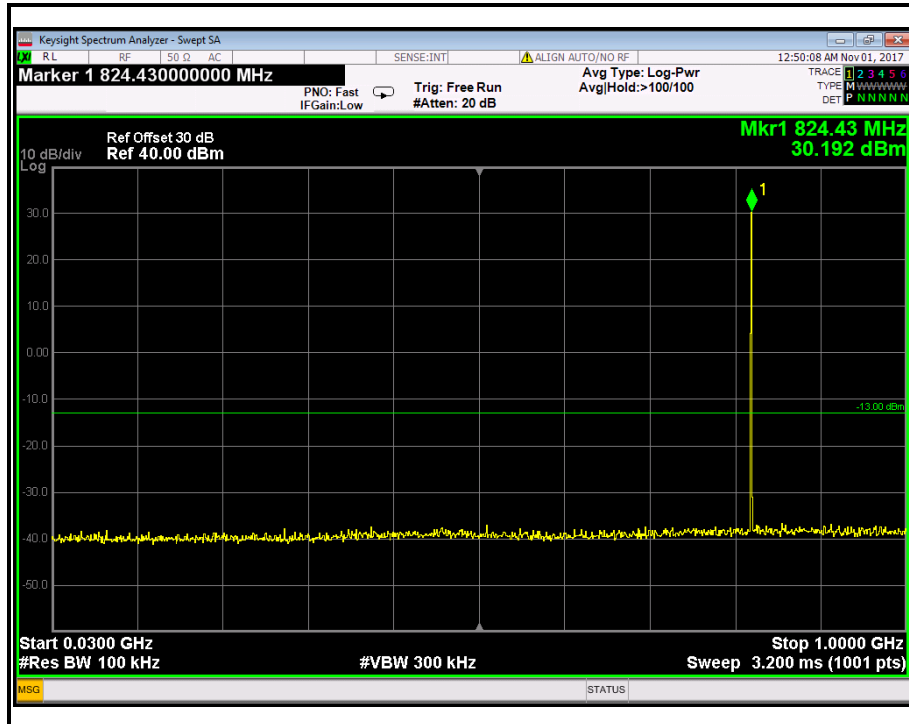




Figure 1-3: Out of Band emission at antenna terminals – GPRS CH Low

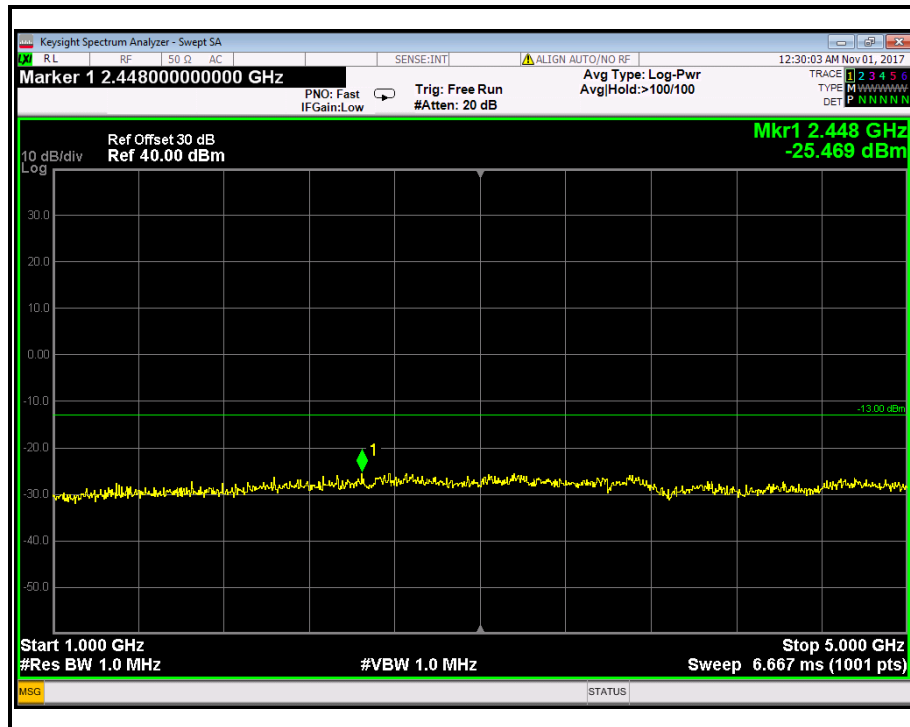


Figure 1-4: Out of Band emission at antenna terminals – GPRS CH Low

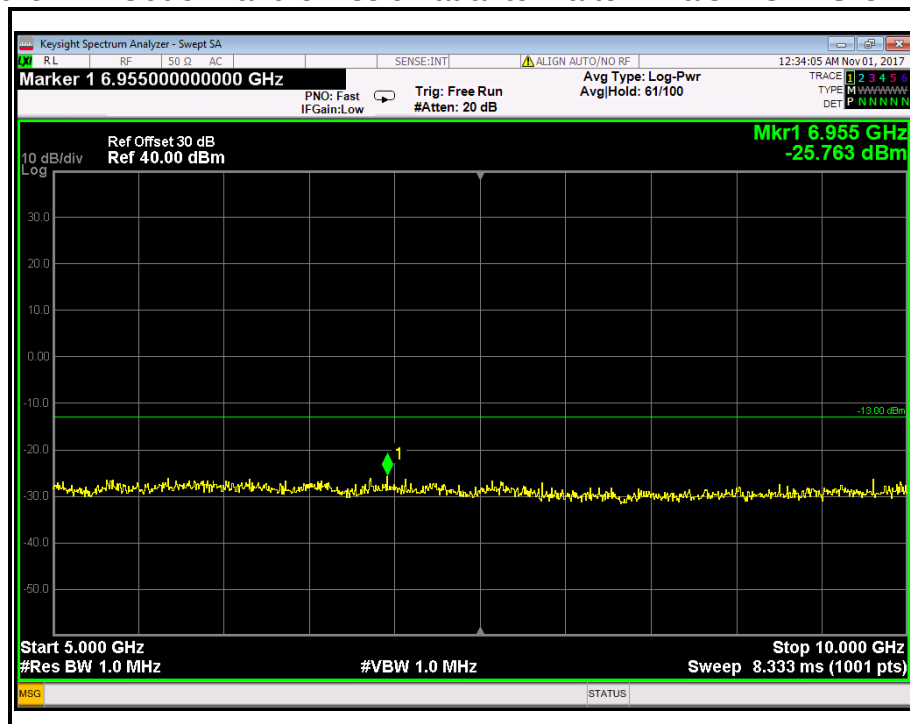




Figure 1-5: Out of Band emission at antenna terminals – GPRS CH Low

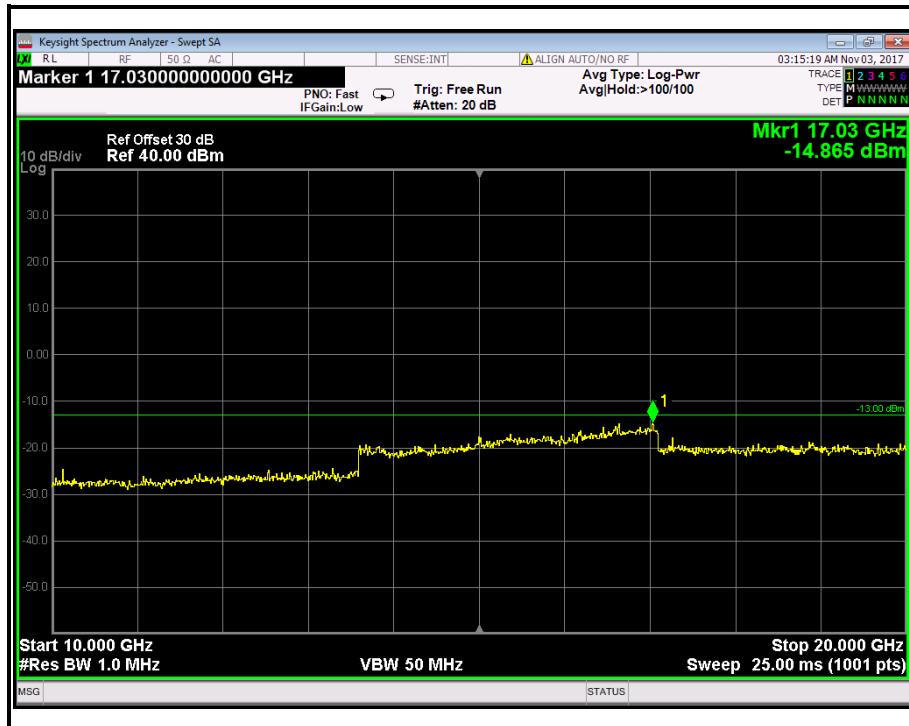


Figure 2-1: Out of Band emission at antenna terminals – GPRS CH Mid

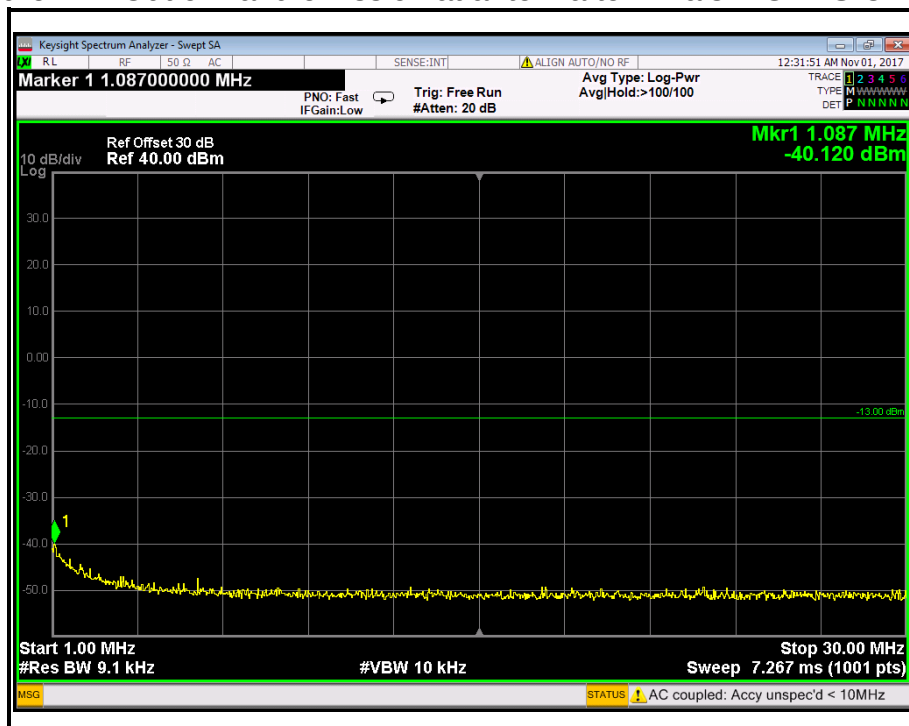




Figure 2-2: Out of Band emission at antenna terminals – GPRS CH Mid

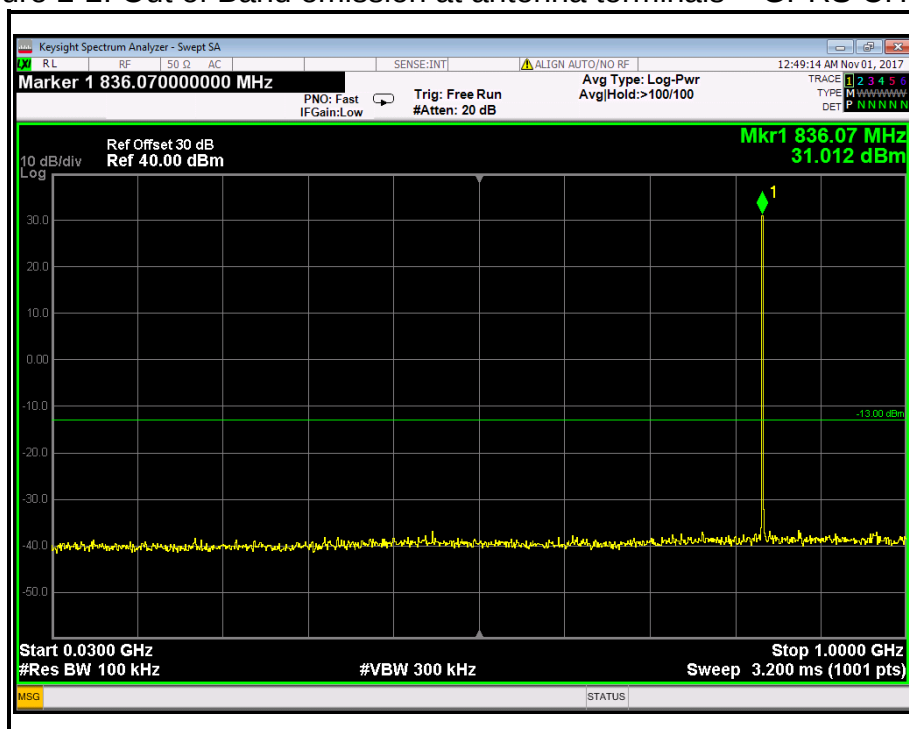


Figure 2-3: Out of Band emission at antenna terminals – GPRS CH Mid

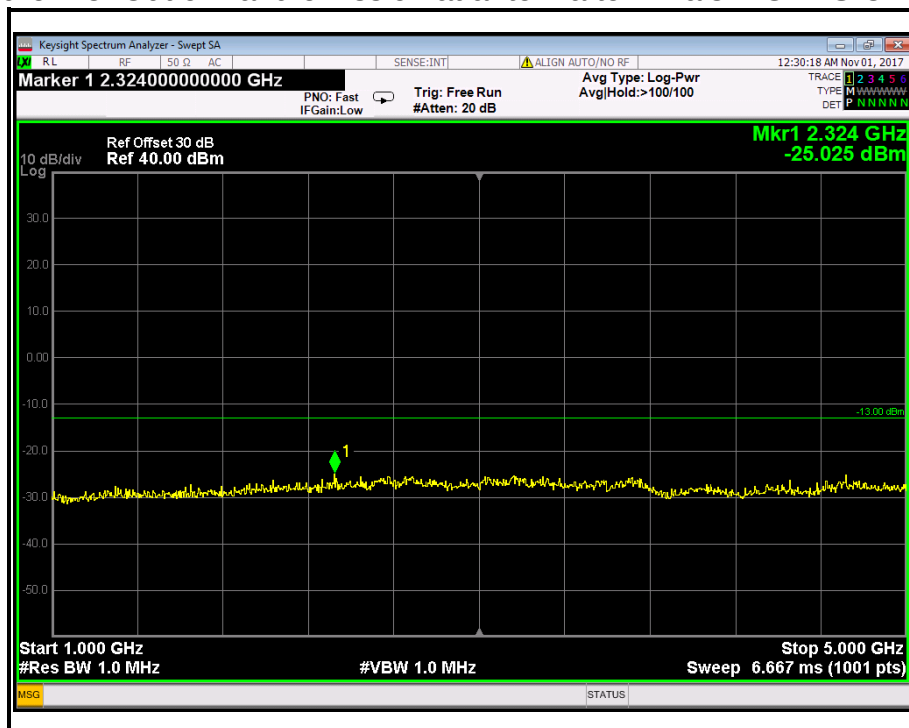




Figure 2-4: Out of Band emission at antenna terminals – GPRS CH Mid

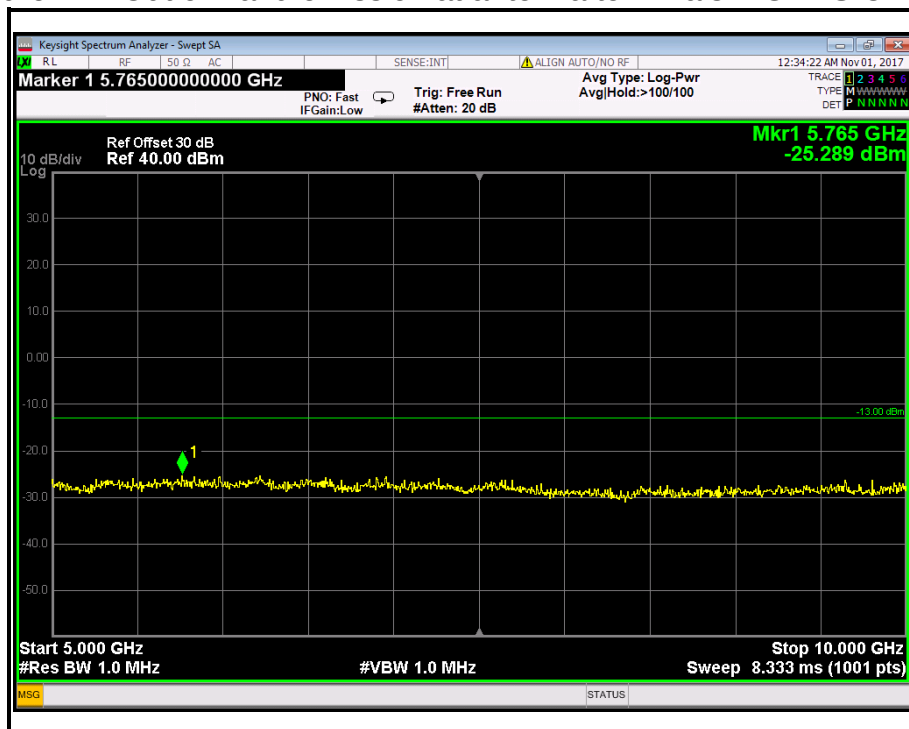


Figure 2-5: Out of Band emission at antenna terminals – GPRS CH High

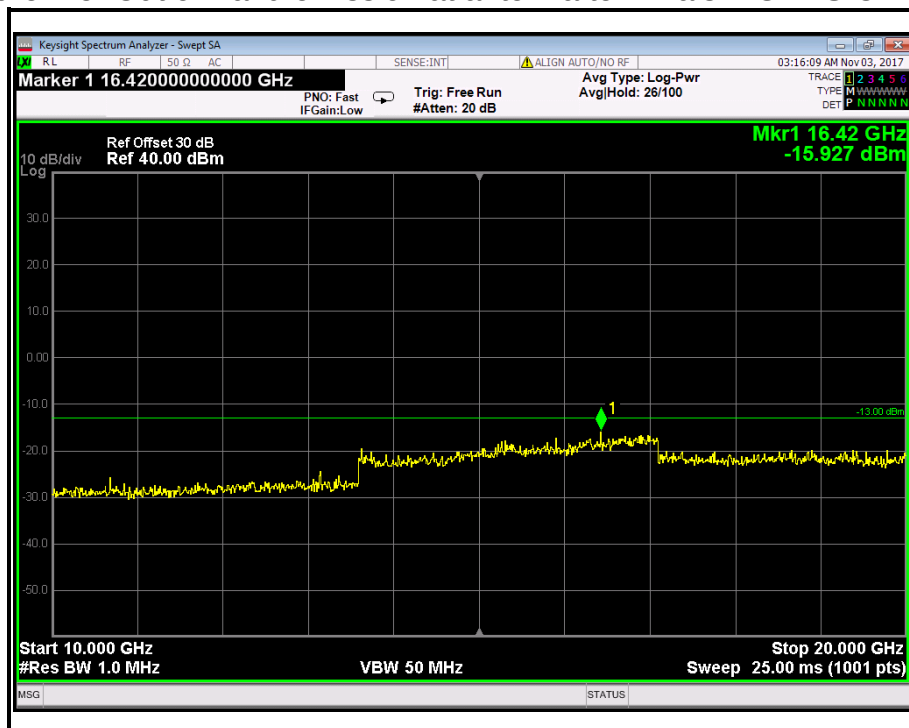




Figure 3-1: Out of Band emission at antenna terminals – GPRS CH High

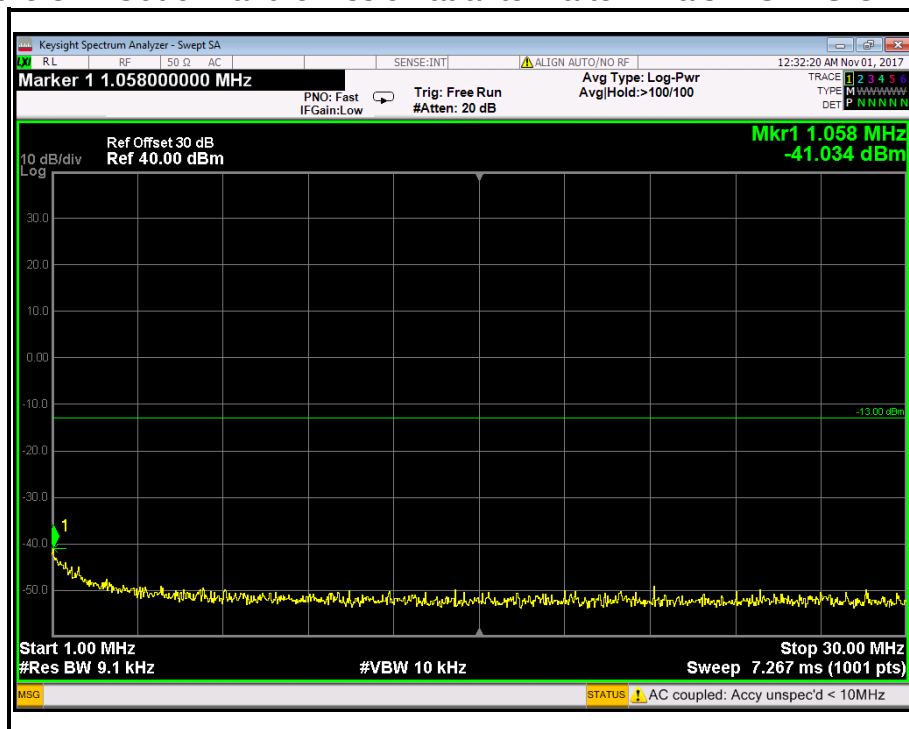


Figure 3-2: Out of Band emission at antenna terminals – GPRS CH High

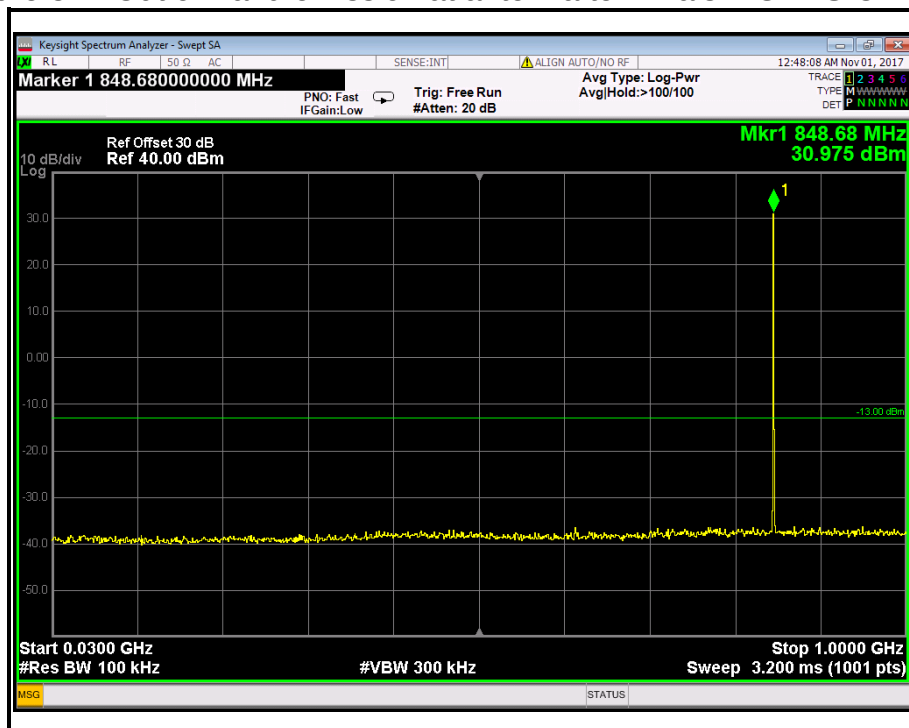




Figure 3-3: Out of Band emission at antenna terminals – GPRS CH High

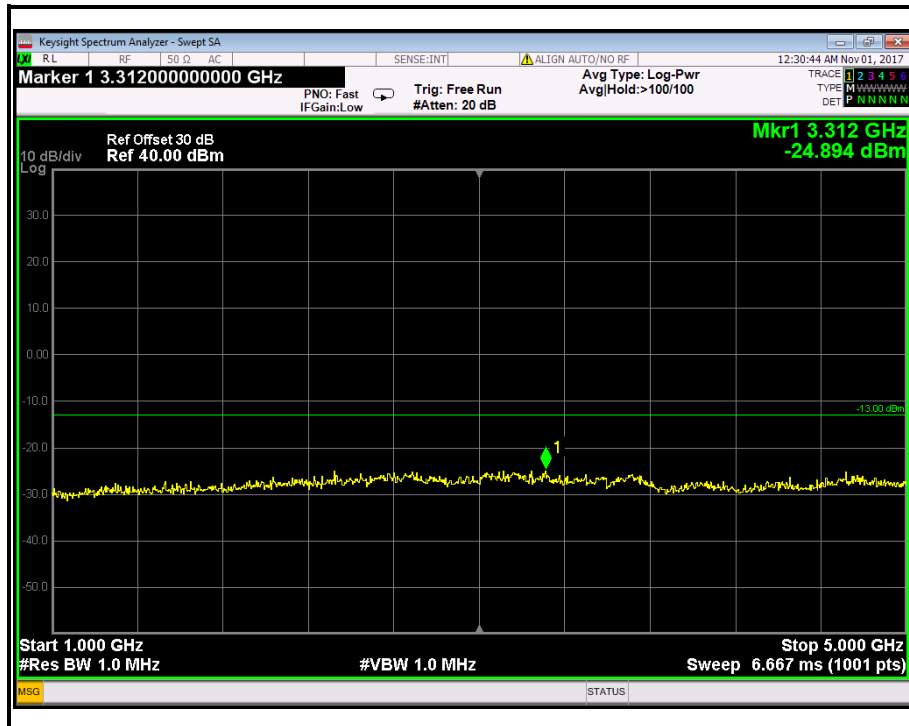


Figure 3-4: Out of Band emission at antenna terminals – GPRS CH High

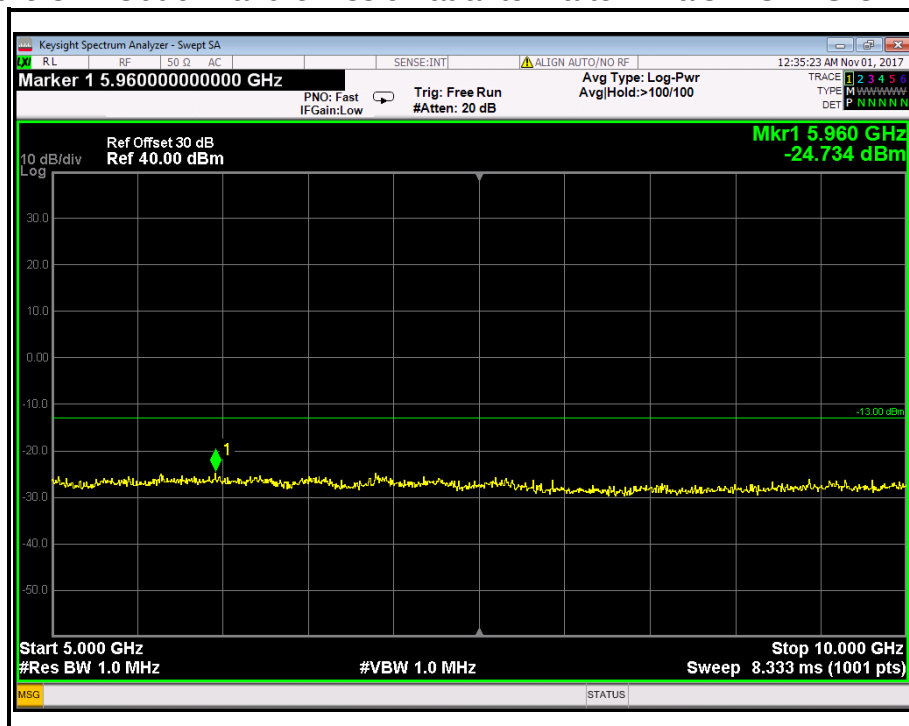
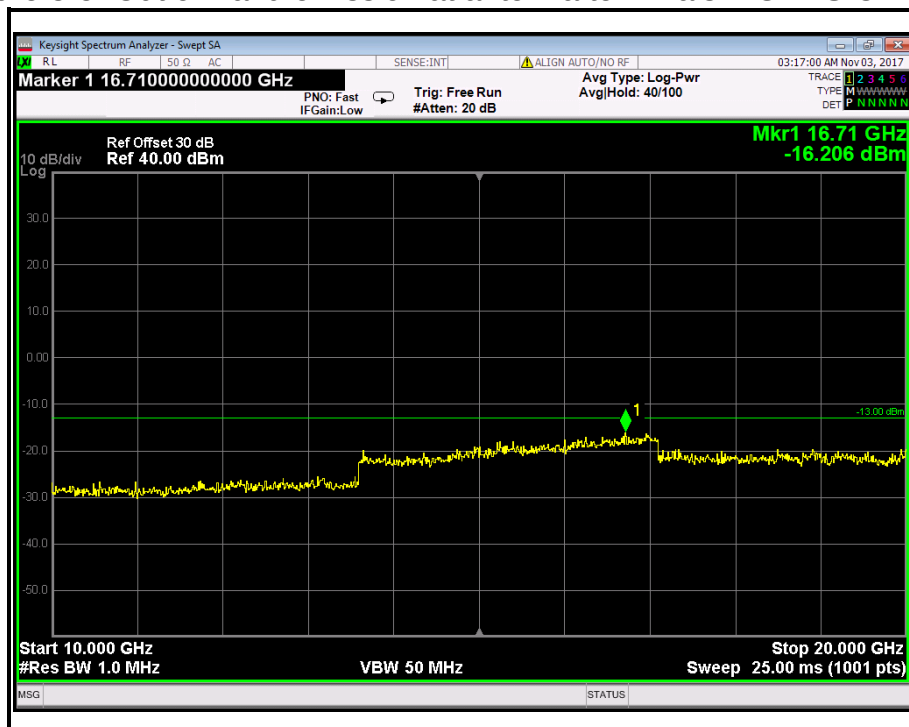




Figure 3-5: Out of Band emission at antenna terminals – GPRS CH High



## GPRS 1900

Figure 4-1: Out of Band emission at antenna terminals – GPRS CH Low

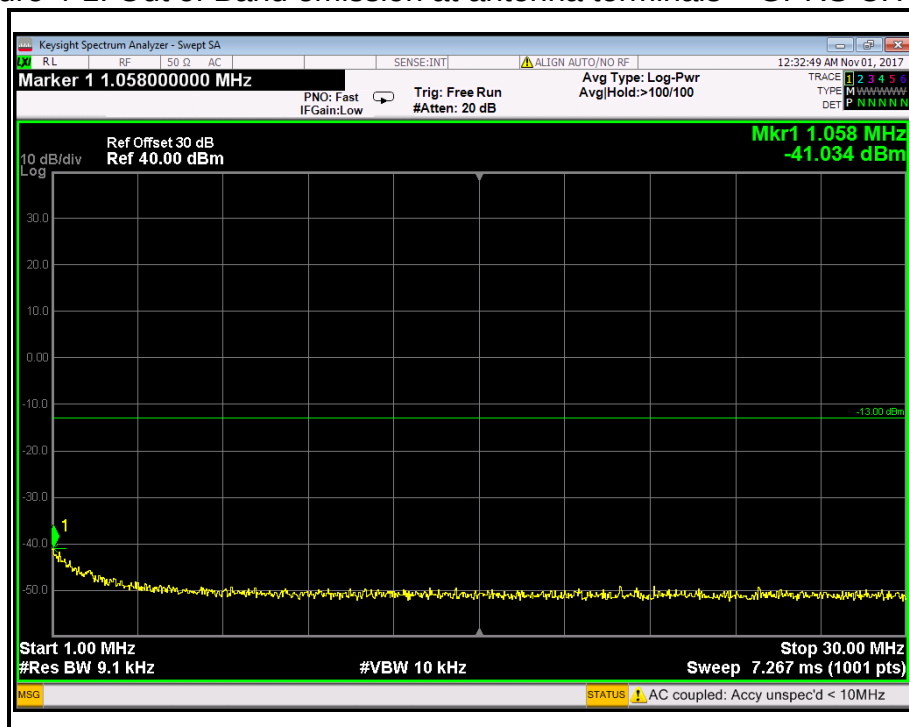




Figure 4-2: Out of Band emission at antenna terminals – GPRS CH Low

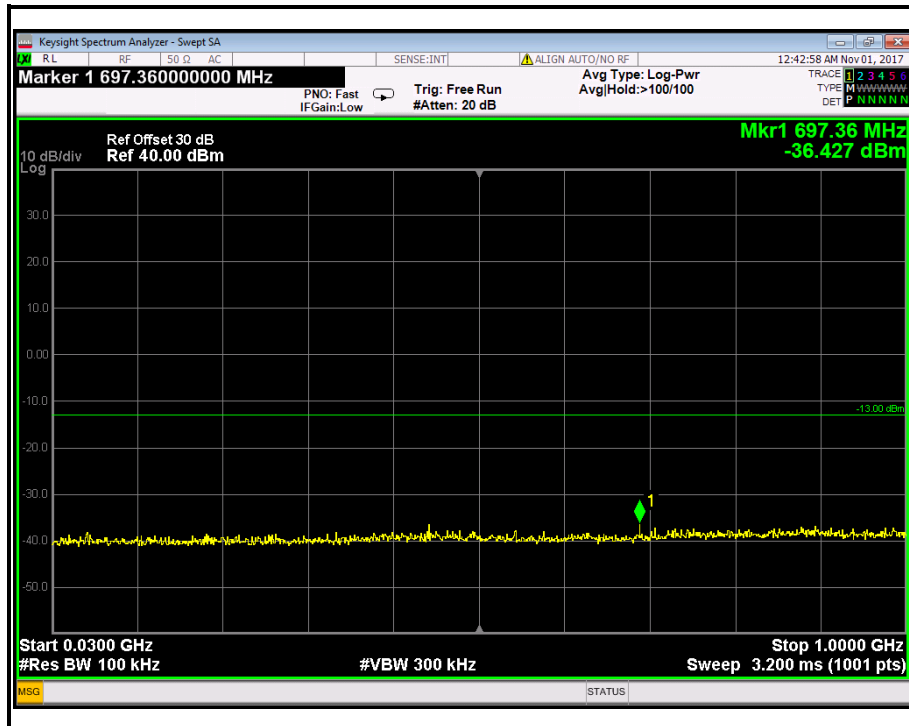


Figure 4-3: Out of Band emission at antenna terminals –GPRS CH Low

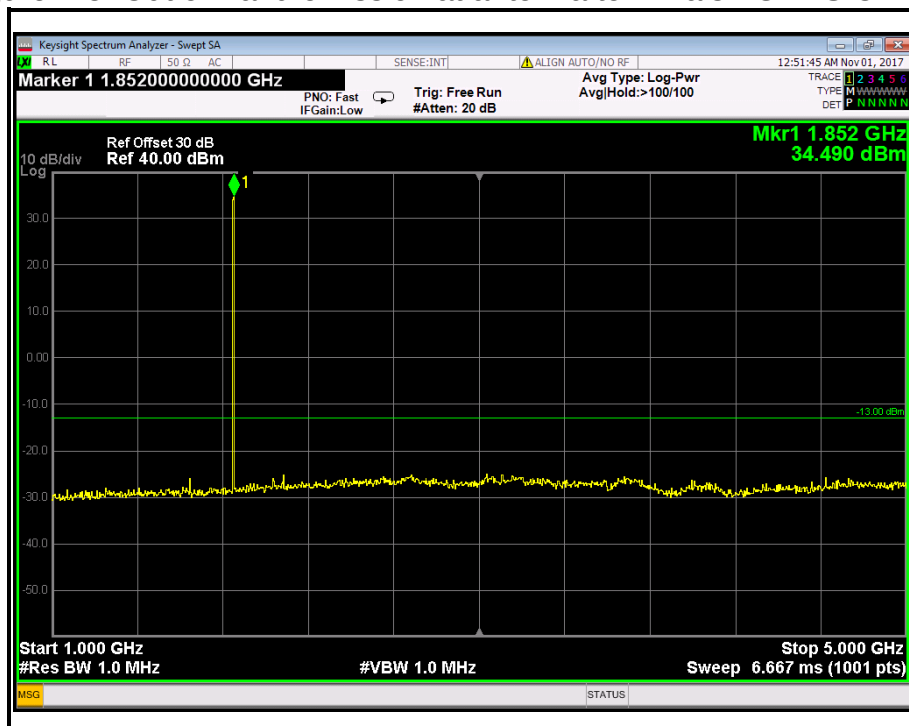




Figure 4-4: Out of Band emission at antenna terminals –GPRS CH Low

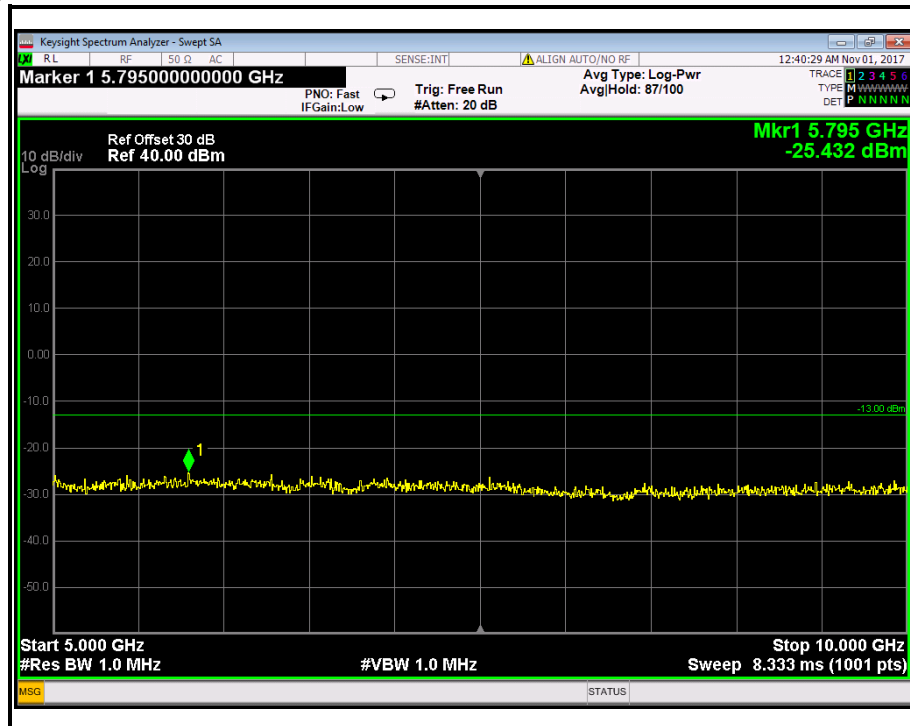


Figure 4-5: Out of Band emission at antenna terminals –GPRS CH Low

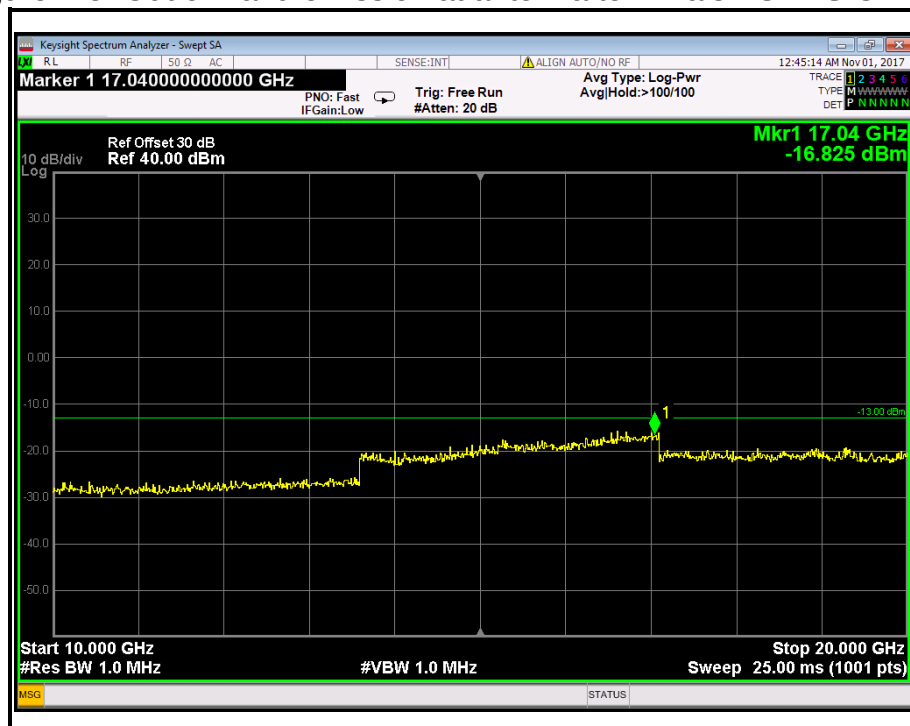




Figure 5-1: Out of Band emission at antenna terminals –GPRS CH Mid

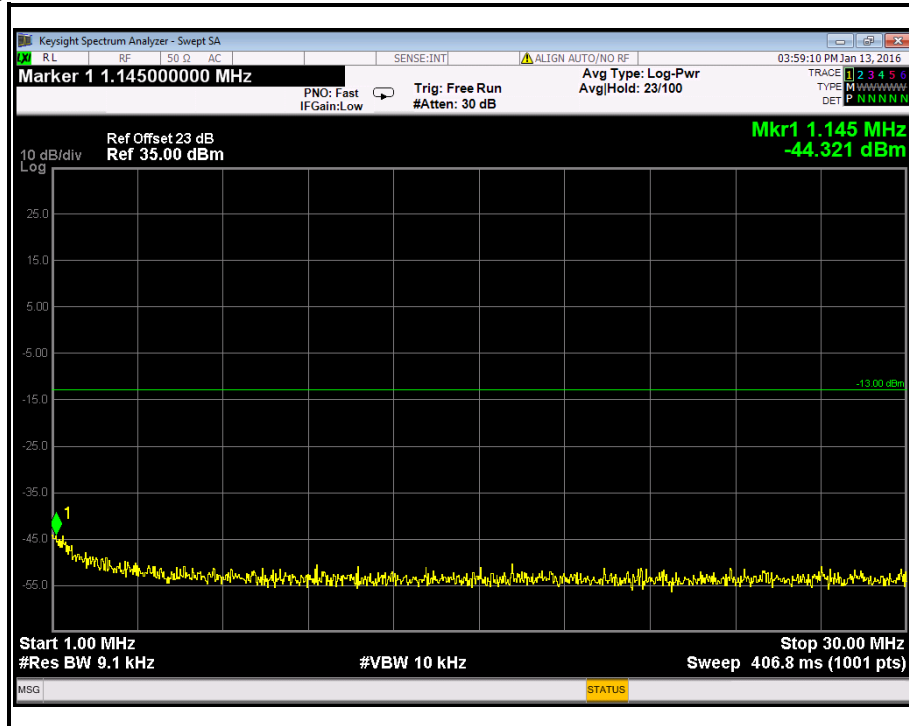


Figure 5-2: Out of Band emission at antenna terminals –GPRS CH Mid

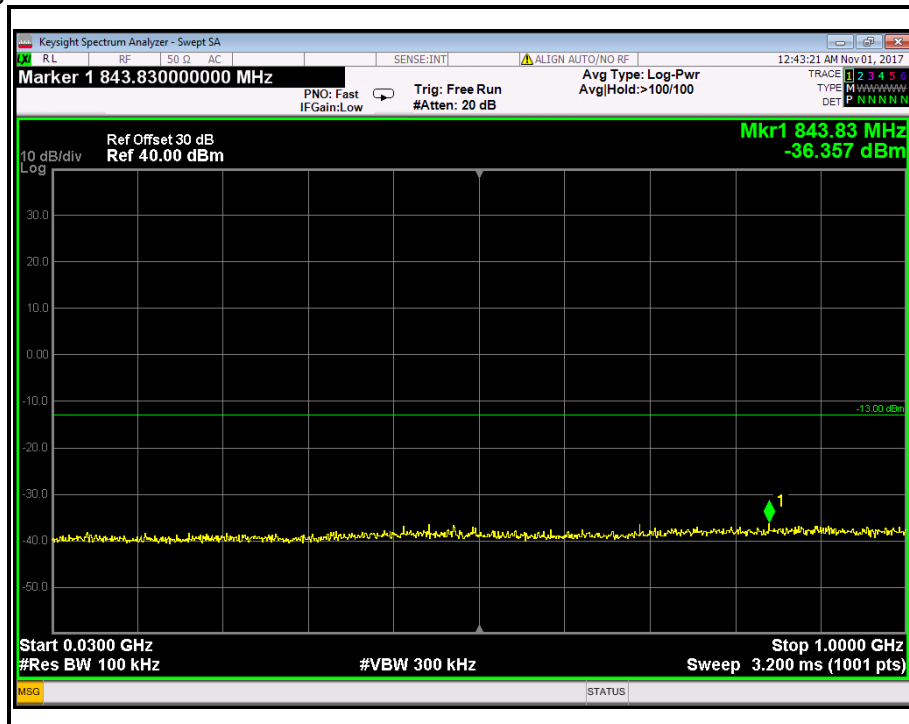




Figure 5-3: Out of Band emission at antenna terminals –GPRS CH Mid

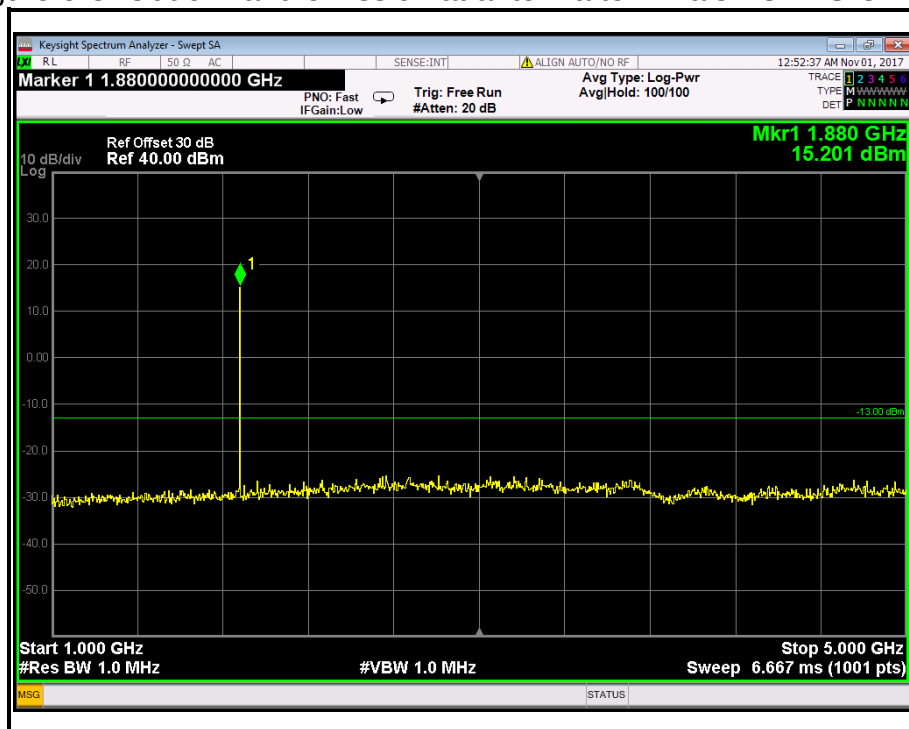


Figure 5-4: Out of Band emission at antenna terminals –GPRS CH Mid

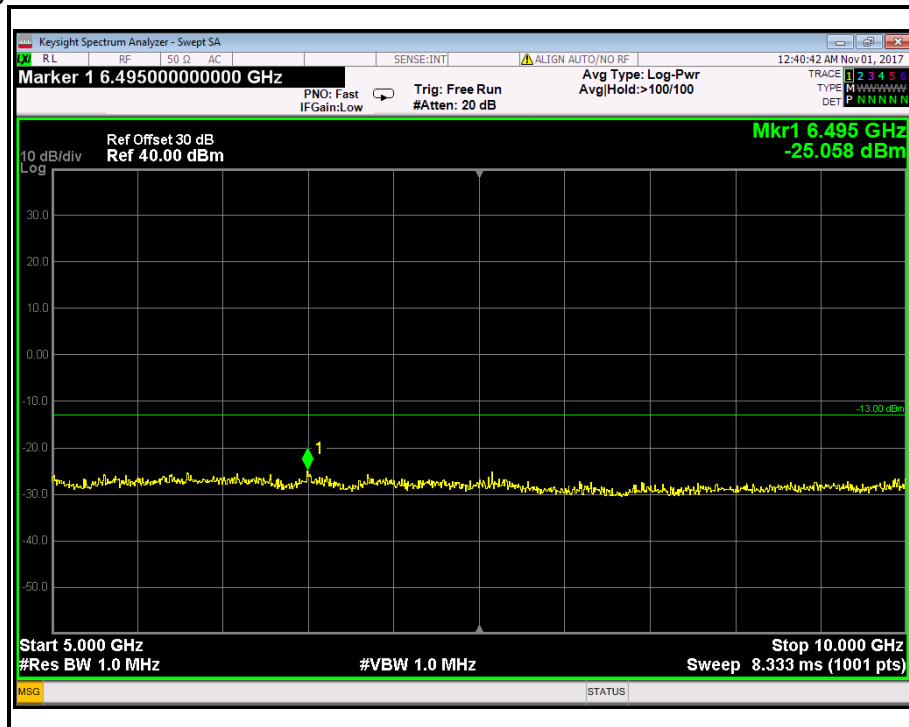




Figure 5-5: Out of Band emission at antenna terminals –GPRS CH Mid

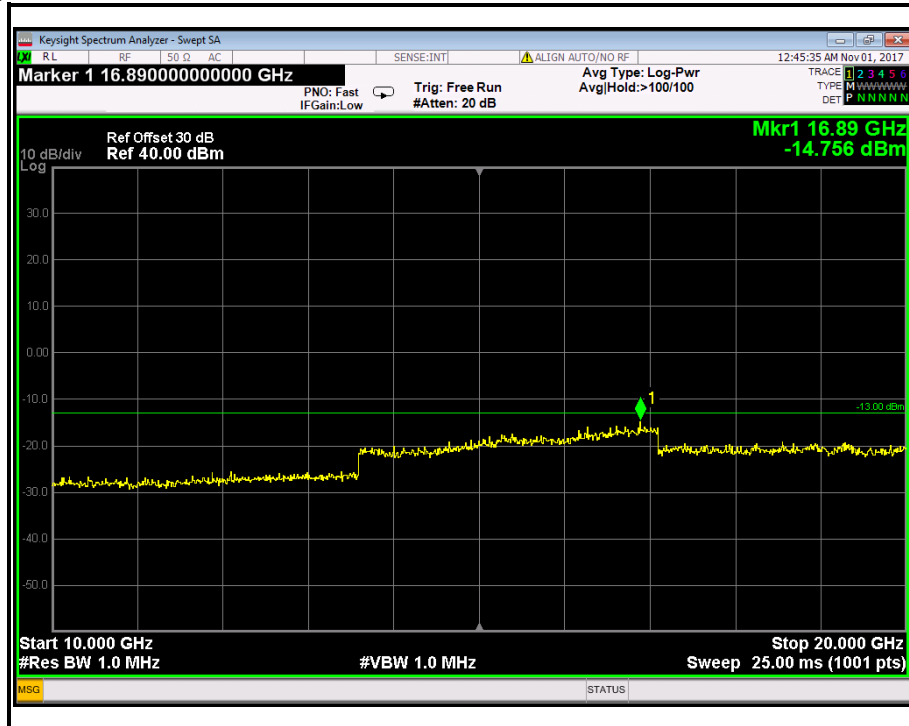


Figure 6-1: Out of Band emission at antenna terminals –GPRS CH High

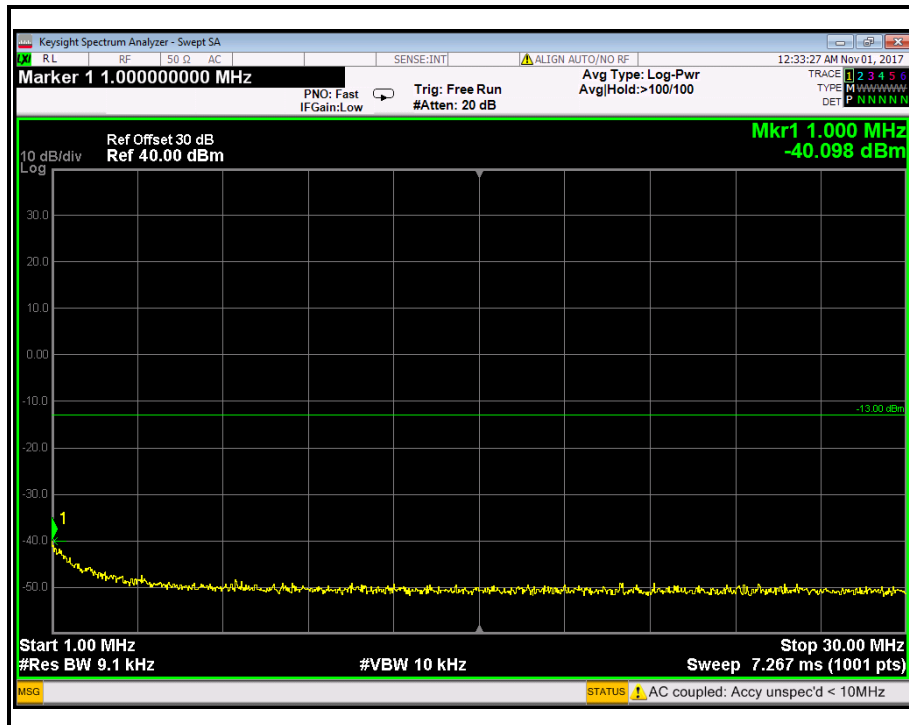




Figure 6-2: Out of Band emission at antenna terminals –GPRS CH High

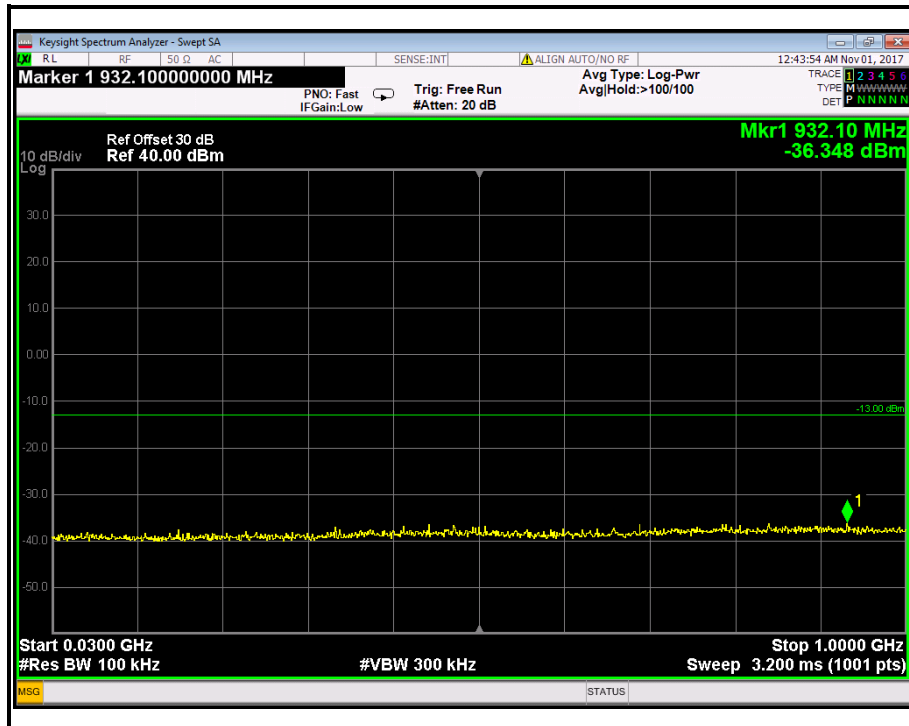


Figure 6-3: Out of Band emission at antenna terminals –GPRS CH High

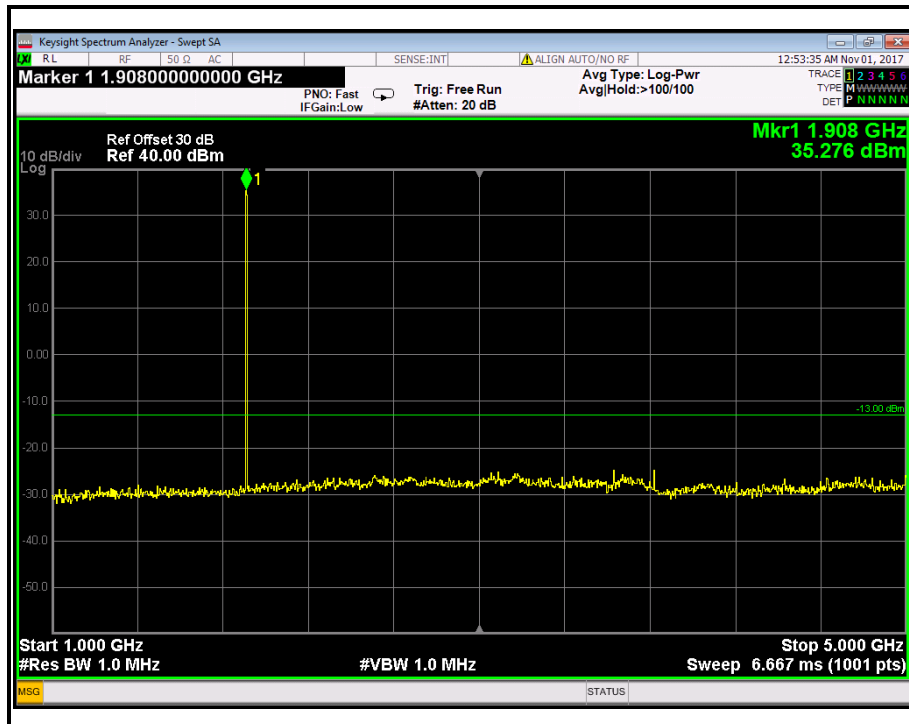




Figure 6-4: Out of Band emission at antenna terminals –GPRS CH High

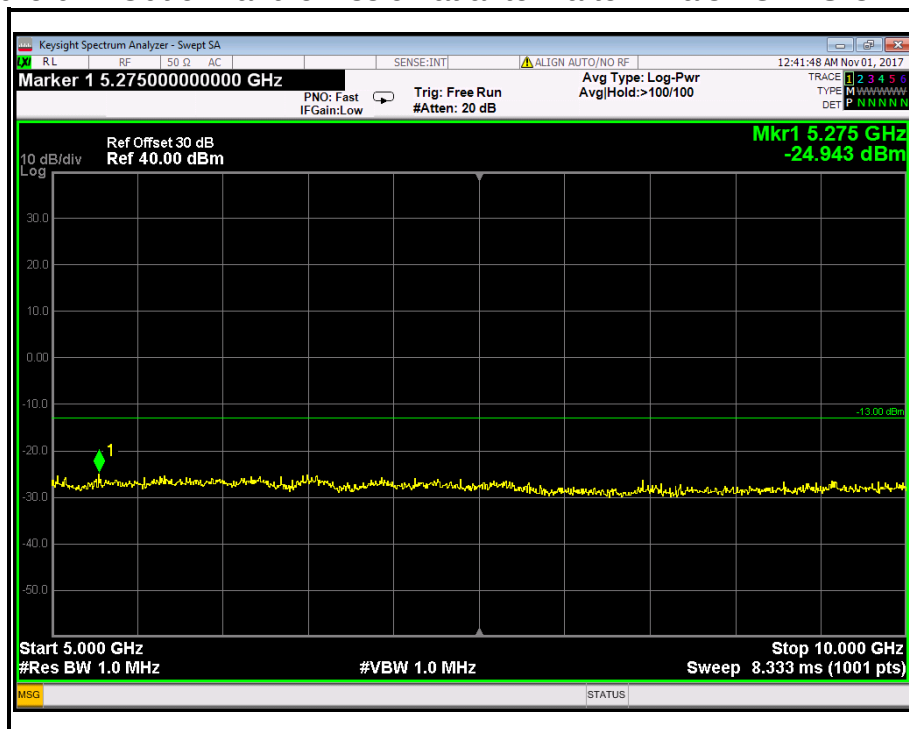
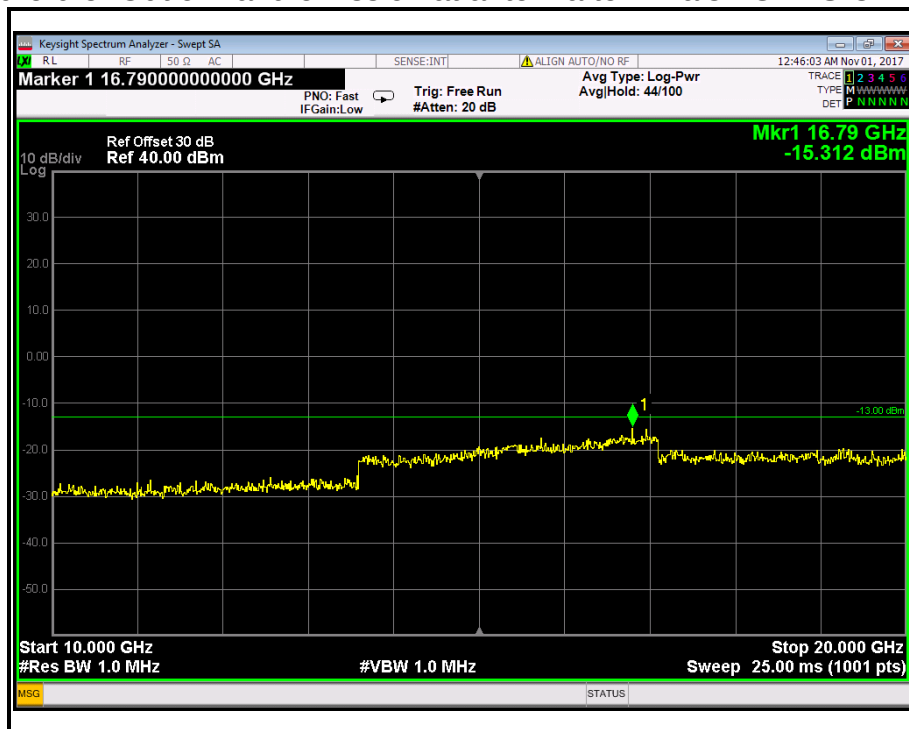


Figure 6-5: Out of Band emission at antenna terminals –GPRS CH High





## GPRS 850

Figure 7-1: Band Edge emissions – GPRS CH Low

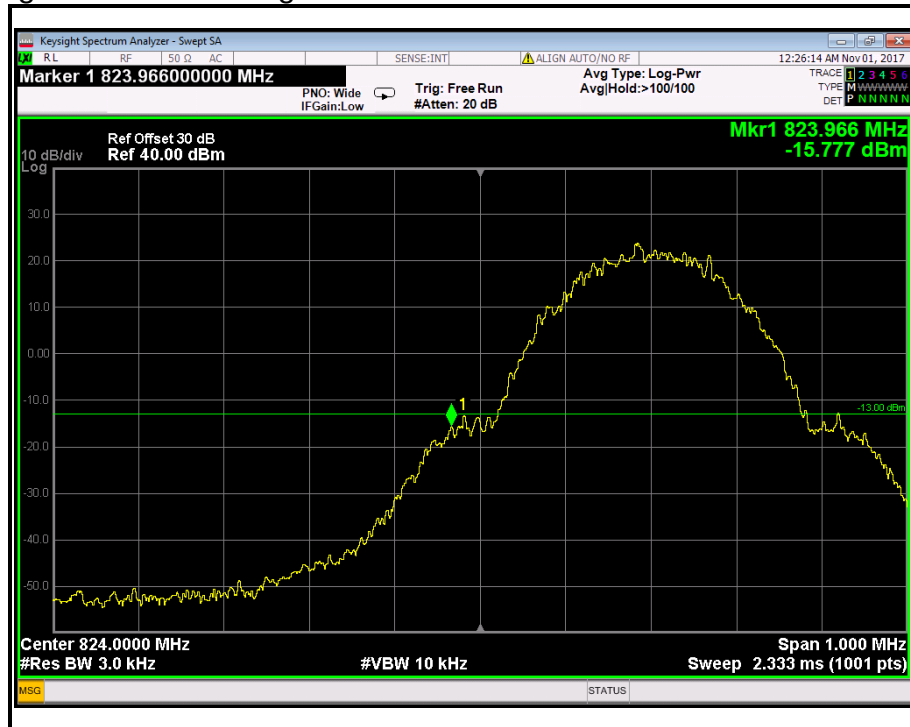


Figure 7-2: Band Edge emissions –GPRS CH High





## GPRS 1900

Figure 8-1: Band Edge emissions – GPRS CH Low

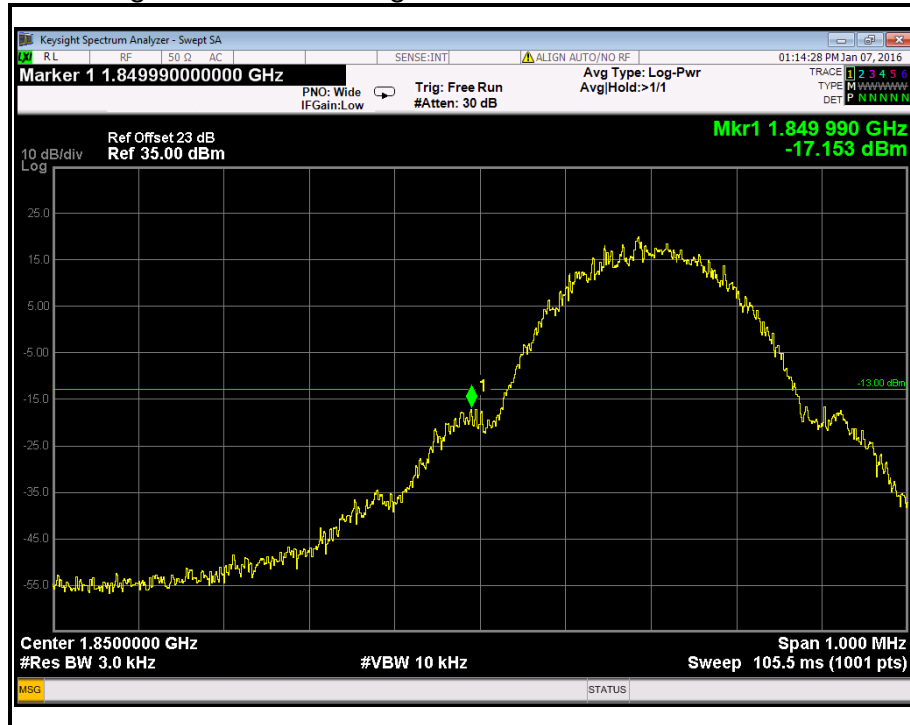
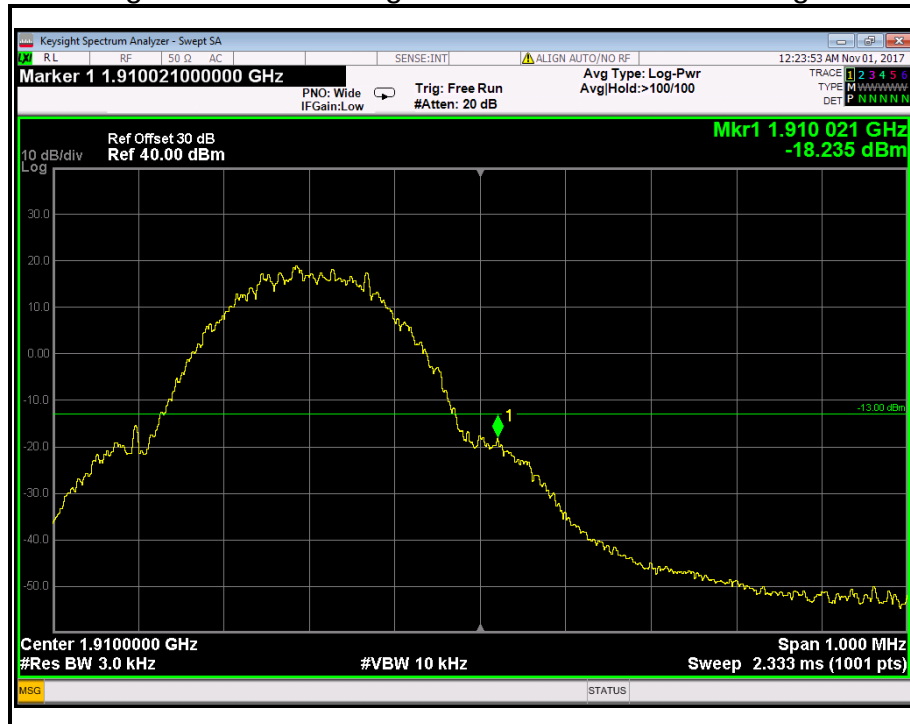


Figure 8-2: Band Edge emissions – GPRS CH High





## GSM 850

Figure 9-1: Out of Band emission at antenna terminals – GPRS CH Low

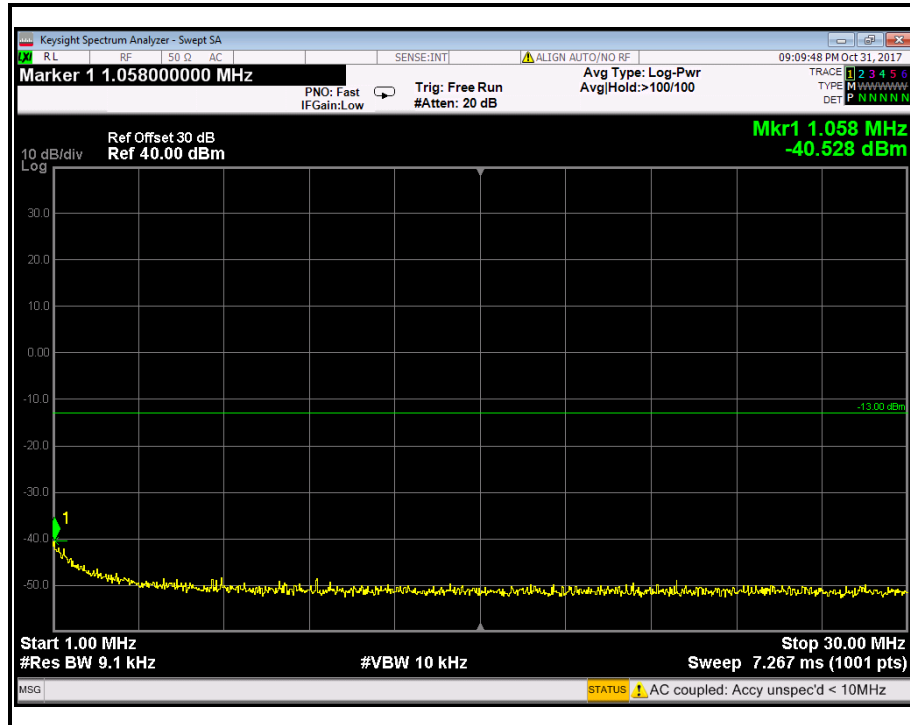


Figure 9-2: Out of Band emission at antenna terminals – GPRS CH Low

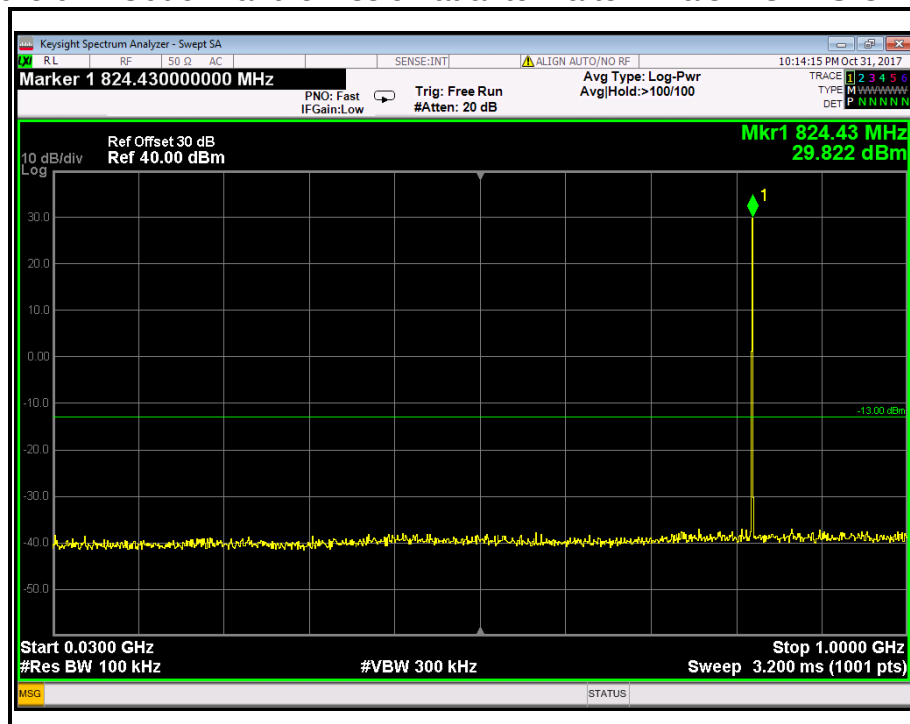




Figure 9-3: Out of Band emission at antenna terminals – GPRS CH Low

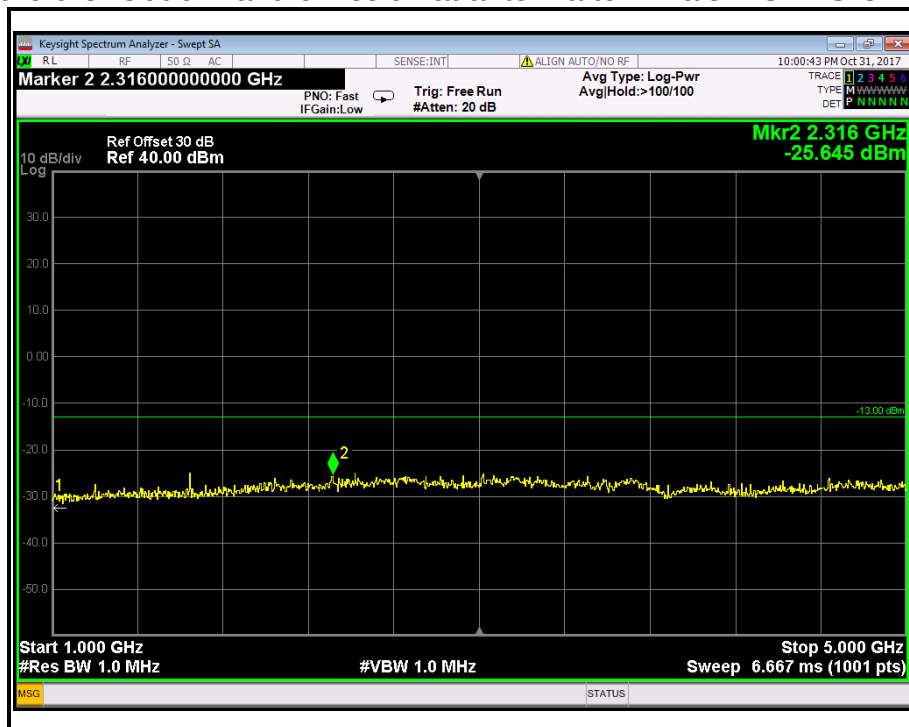


Figure 9-4: Out of Band emission at antenna terminals – GPRS CH Low

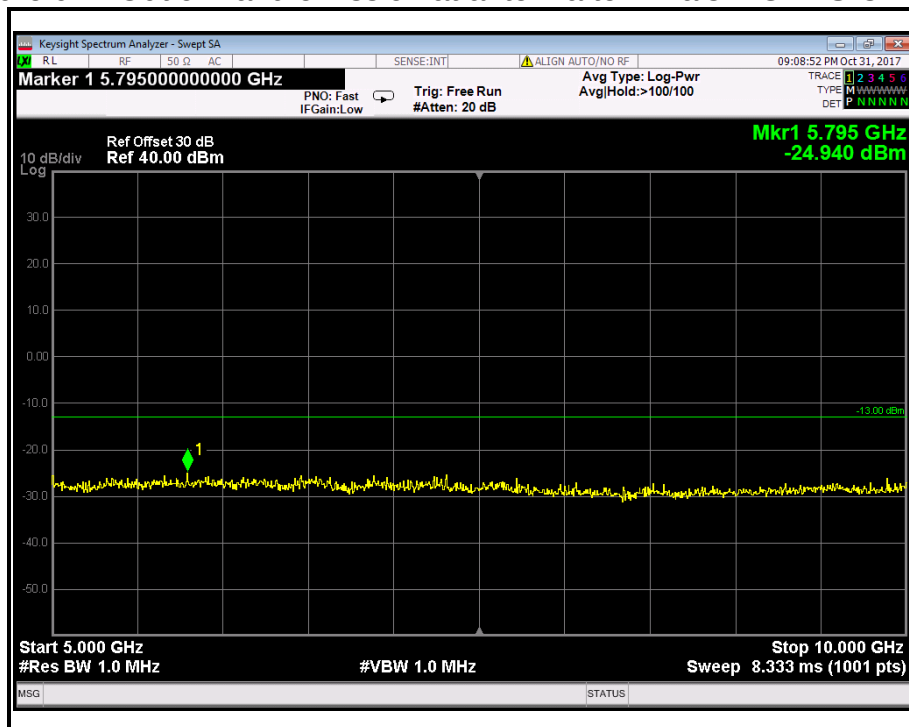




Figure 9-5: Out of Band emission at antenna terminals – GPRS CH Low

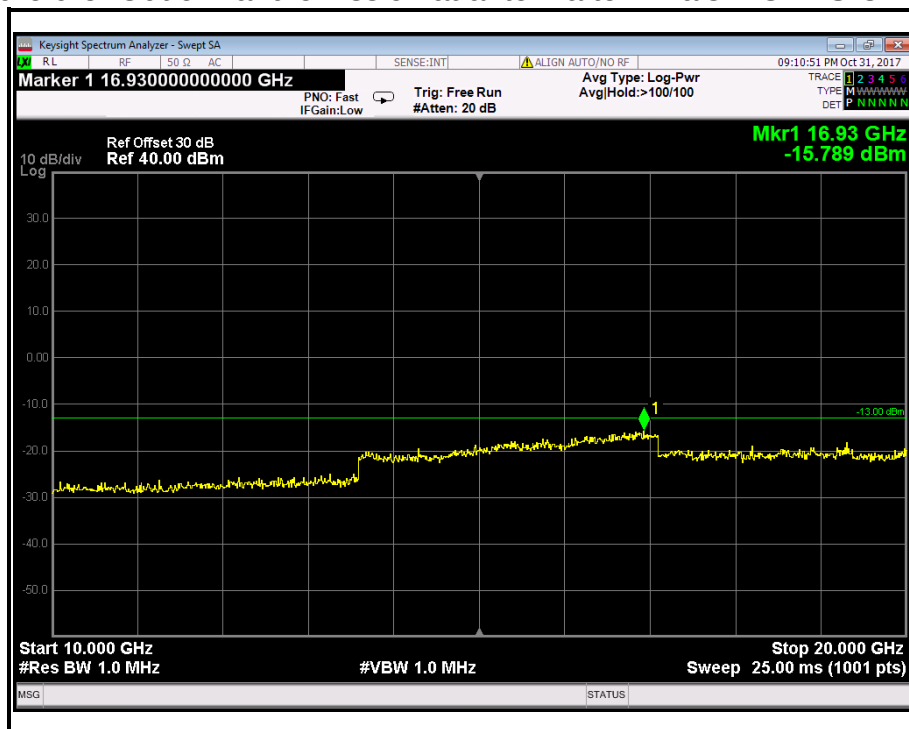


Figure 10-1: Out of Band emission at antenna terminals – GPRS CH Mid

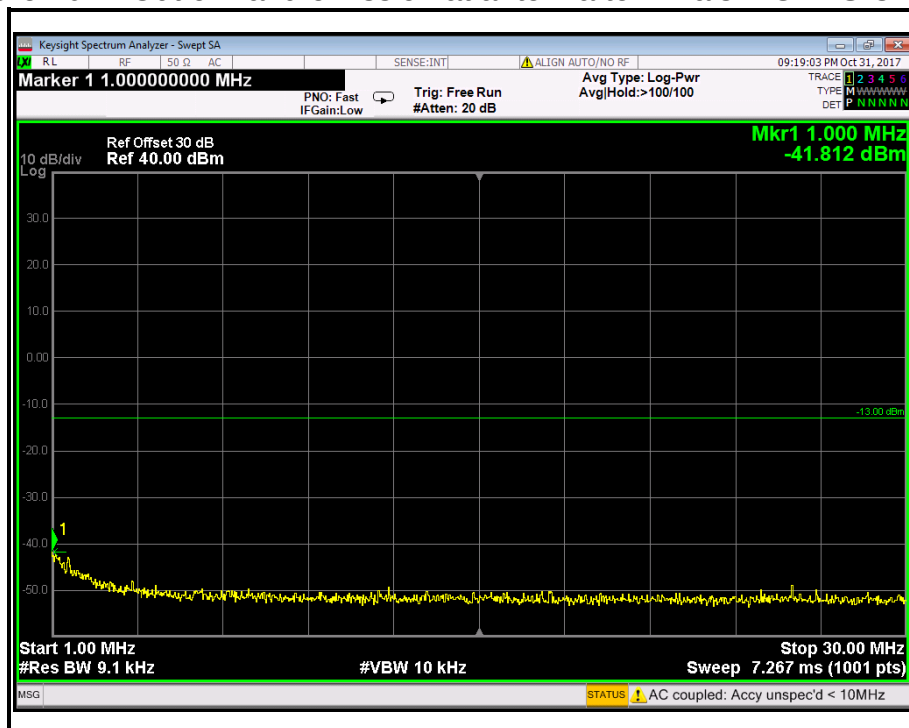




Figure 10-2: Out of Band emission at antenna terminals – GPRS CH Mid

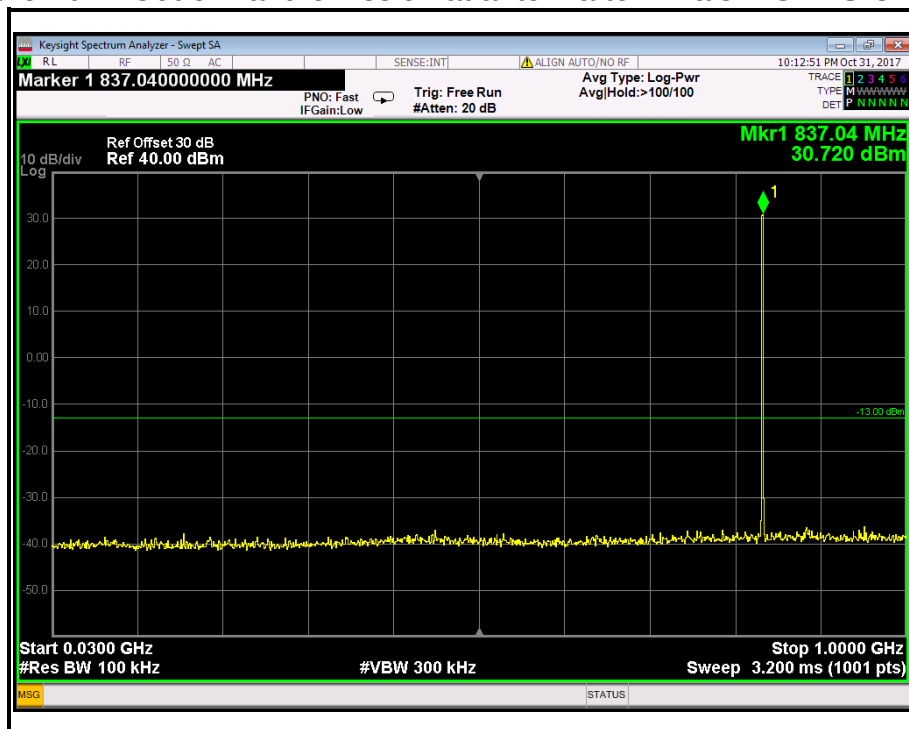


Figure 10-3: Out of Band emission at antenna terminals – GPRS CH Mid

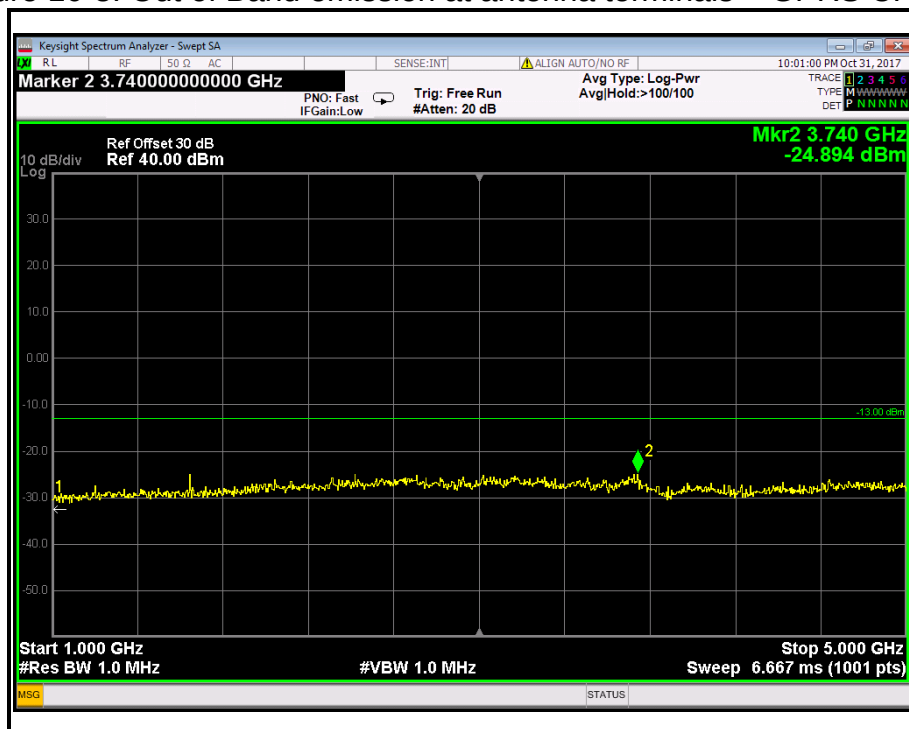




Figure 10-4: Out of Band emission at antenna terminals – GPRS CH Mid

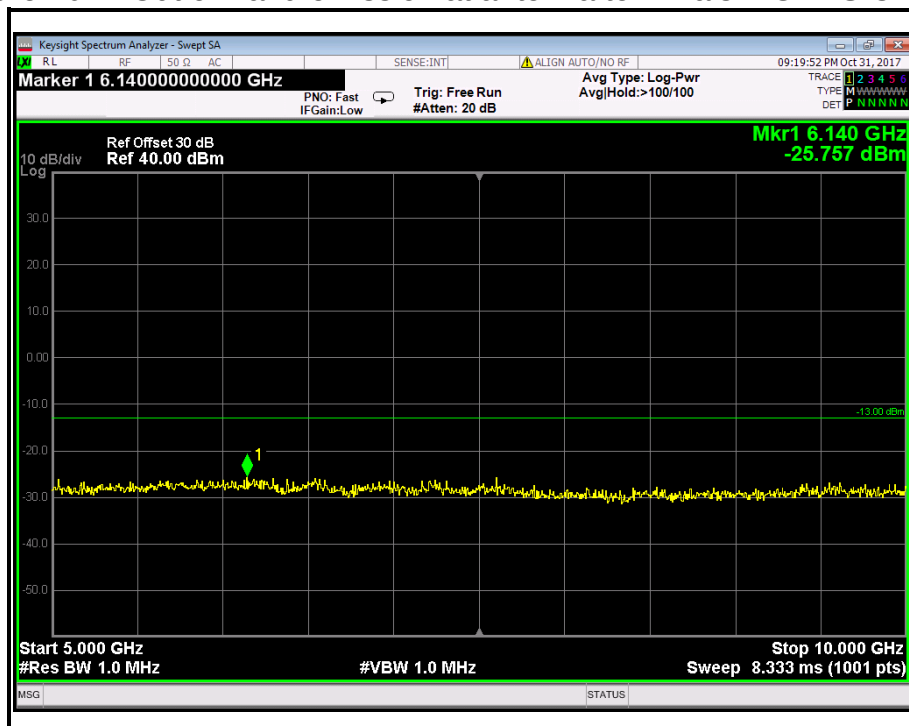


Figure 10-5: Out of Band emission at antenna terminals – GPRS CH High

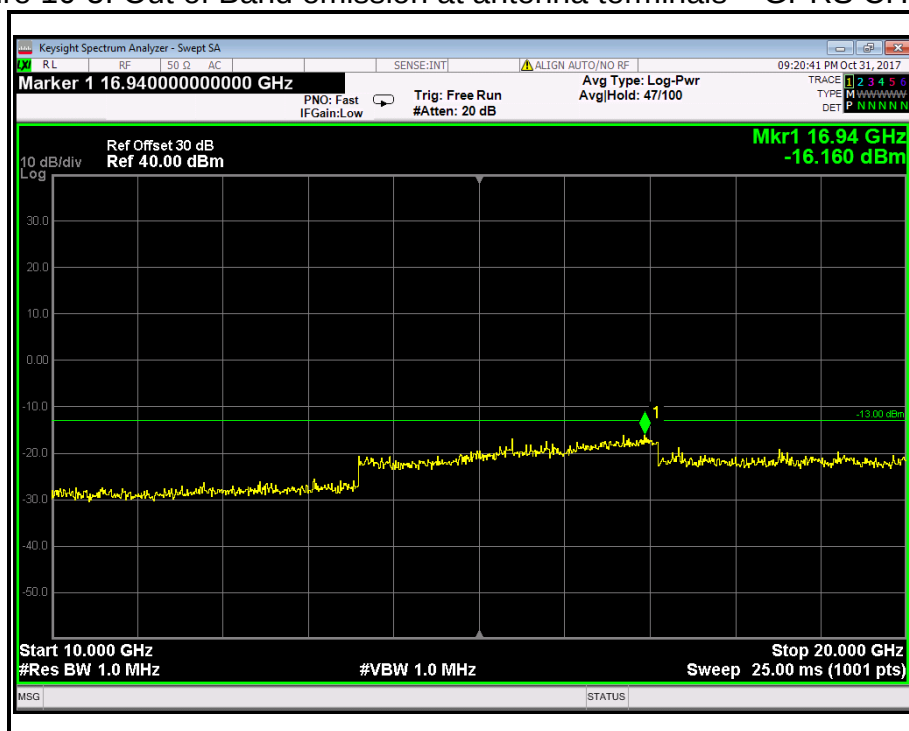




Figure 11-1: Out of Band emission at antenna terminals – GPRS CH High

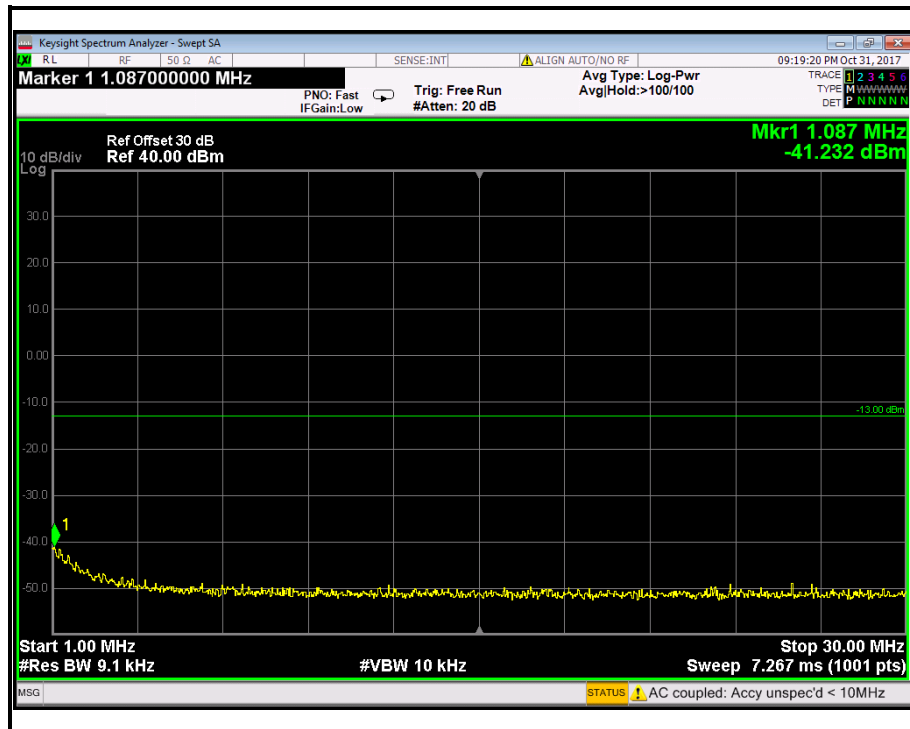


Figure 11-2: Out of Band emission at antenna terminals – GPRS CH High

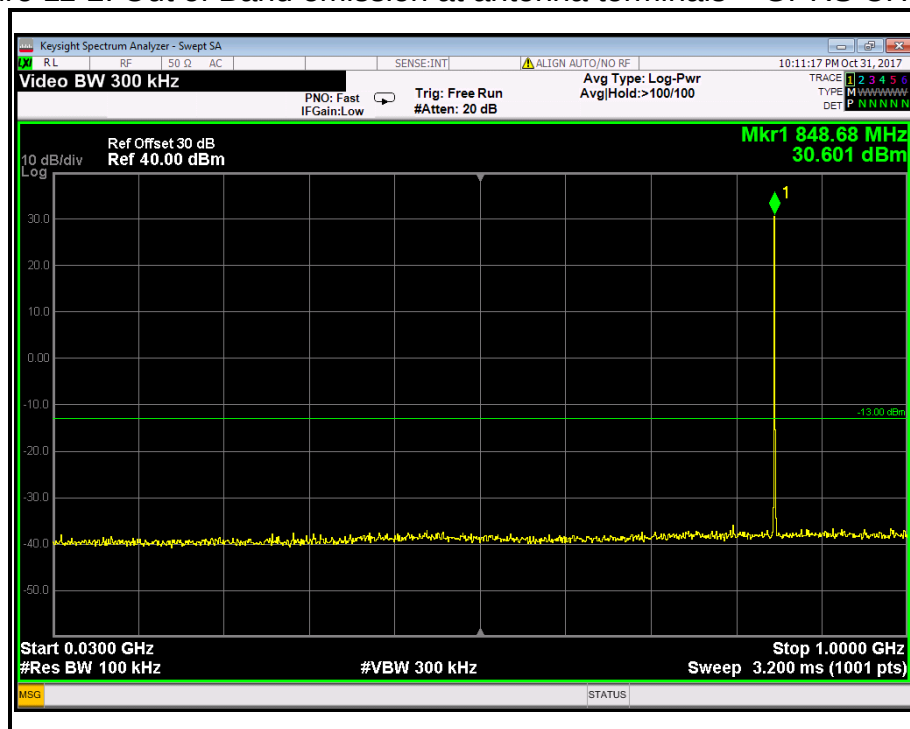




Figure 11-3: Out of Band emission at antenna terminals – GPRS CH High

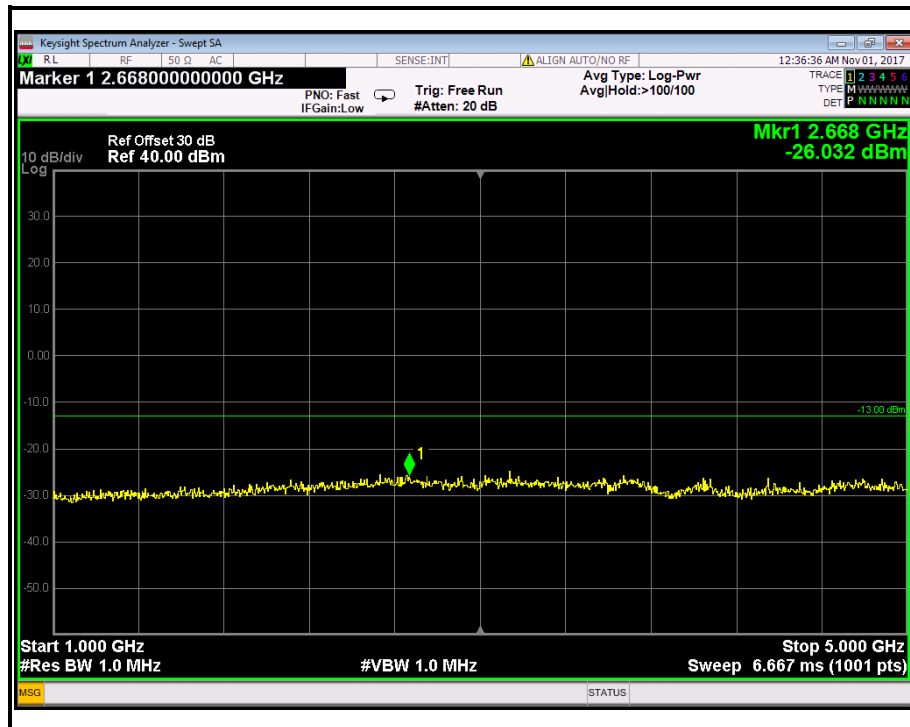


Figure 11-4: Out of Band emission at antenna terminals – GPRS CH High

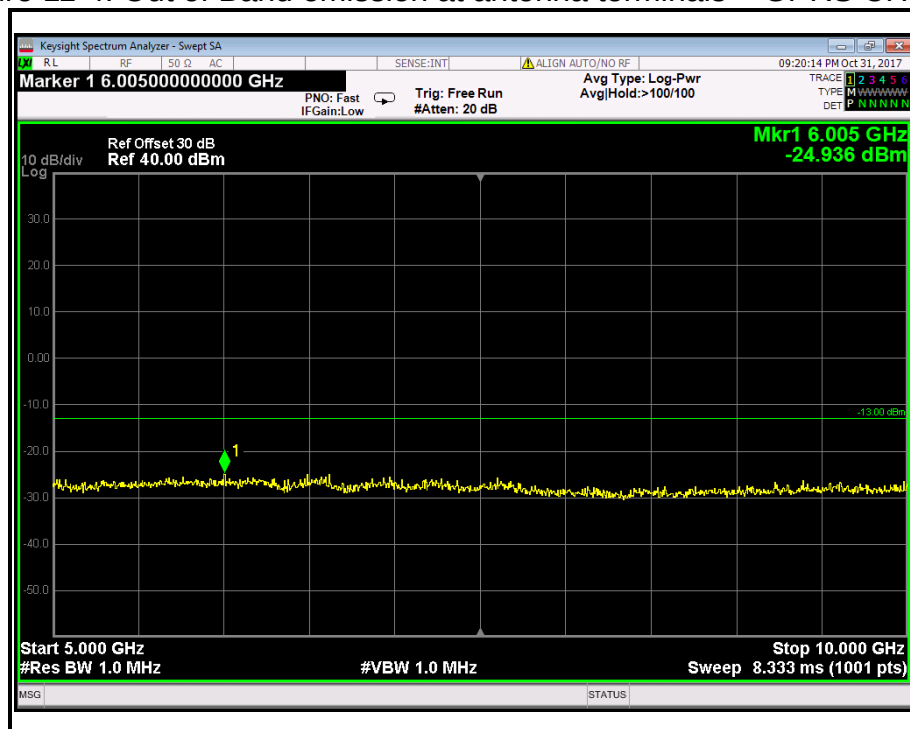
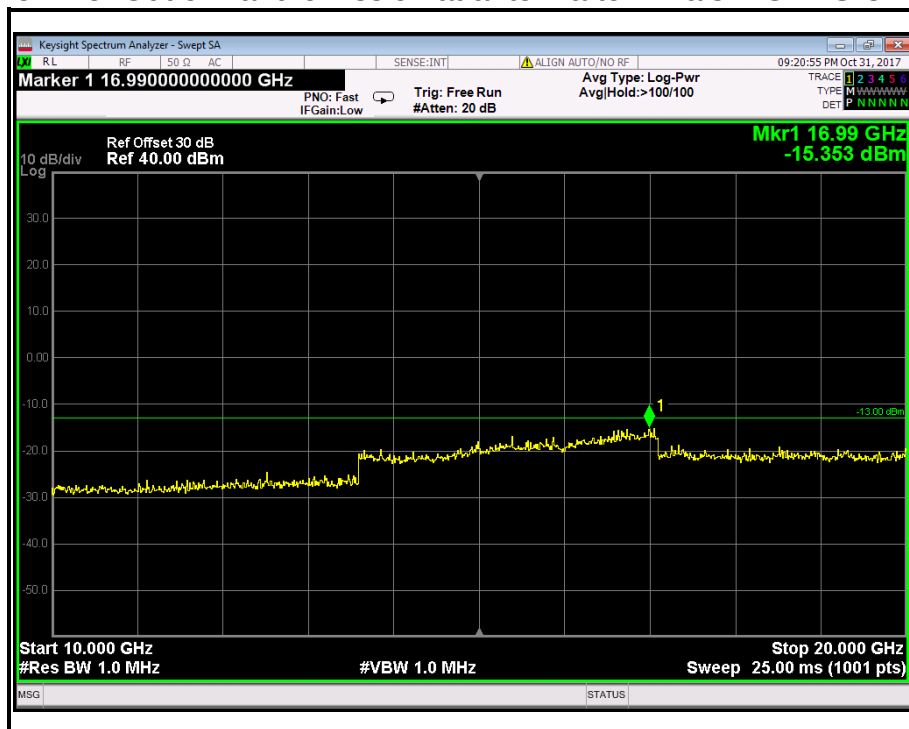




Figure 11-5: Out of Band emission at antenna terminals – GPRS CH High



## GSM 1900

Figure 12-1: Out of Band emission at antenna terminals – GPRS CH Low

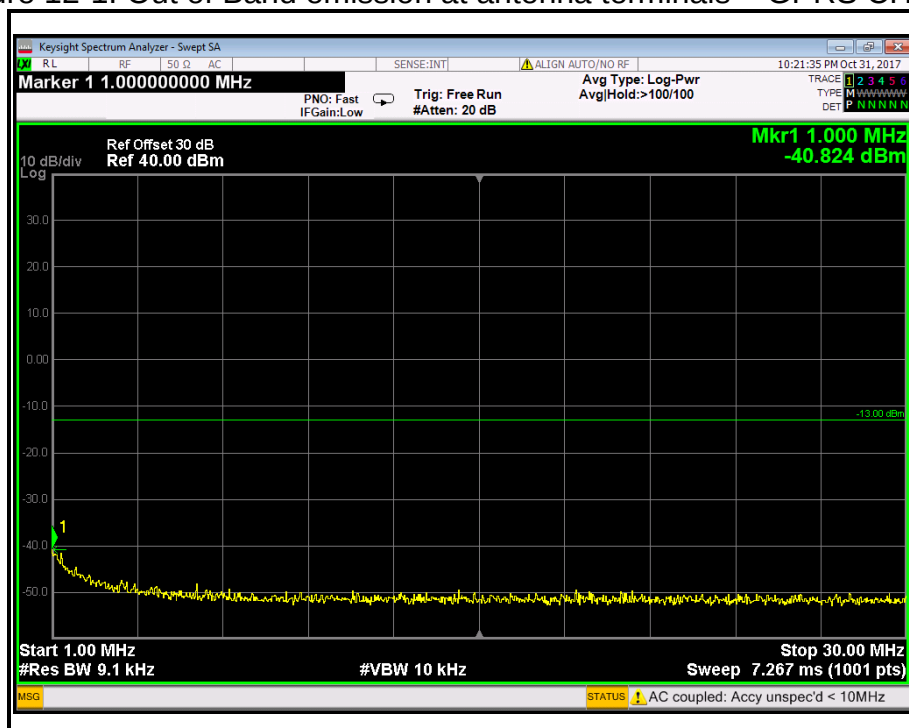




Figure 12-2: Out of Band emission at antenna terminals – GPRS CH Low

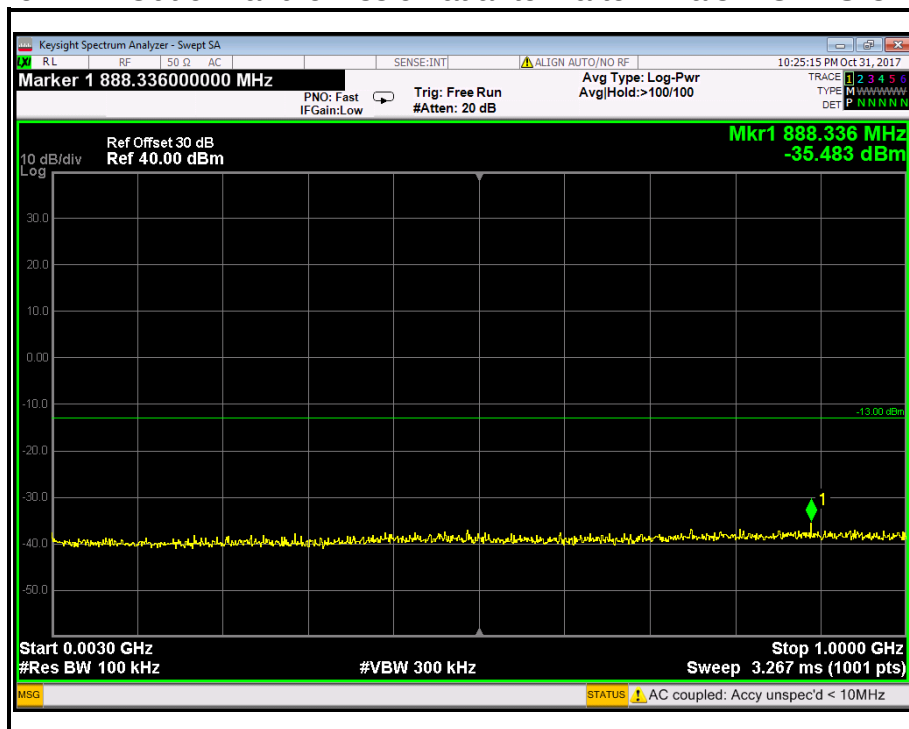


Figure 12-3: Out of Band emission at antenna terminals –GPRS CH Low

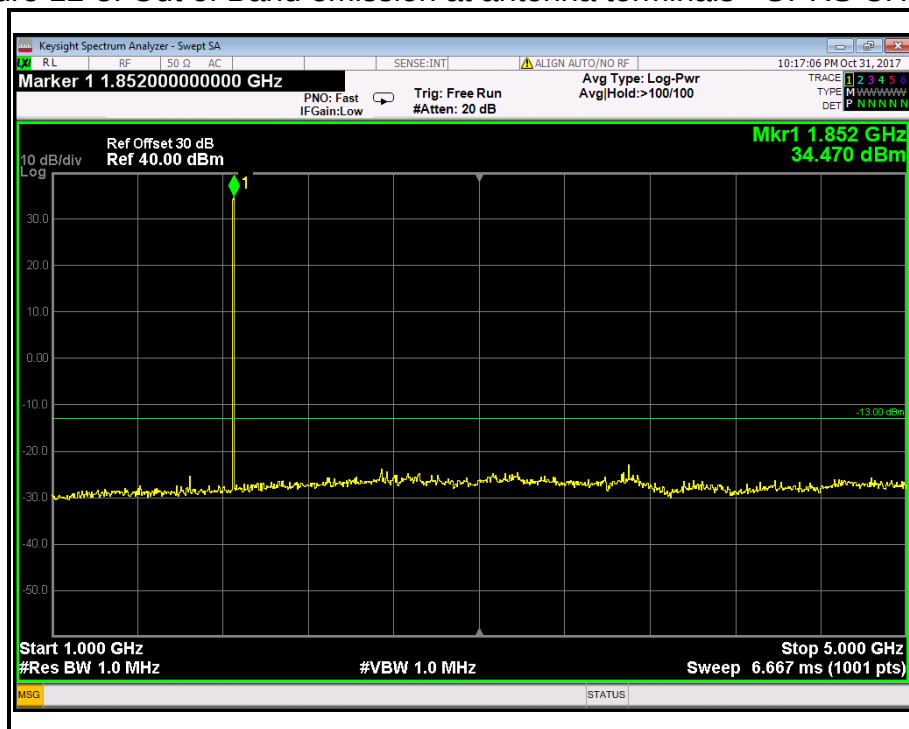




Figure 12-4: Out of Band emission at antenna terminals –GPRS CH Low

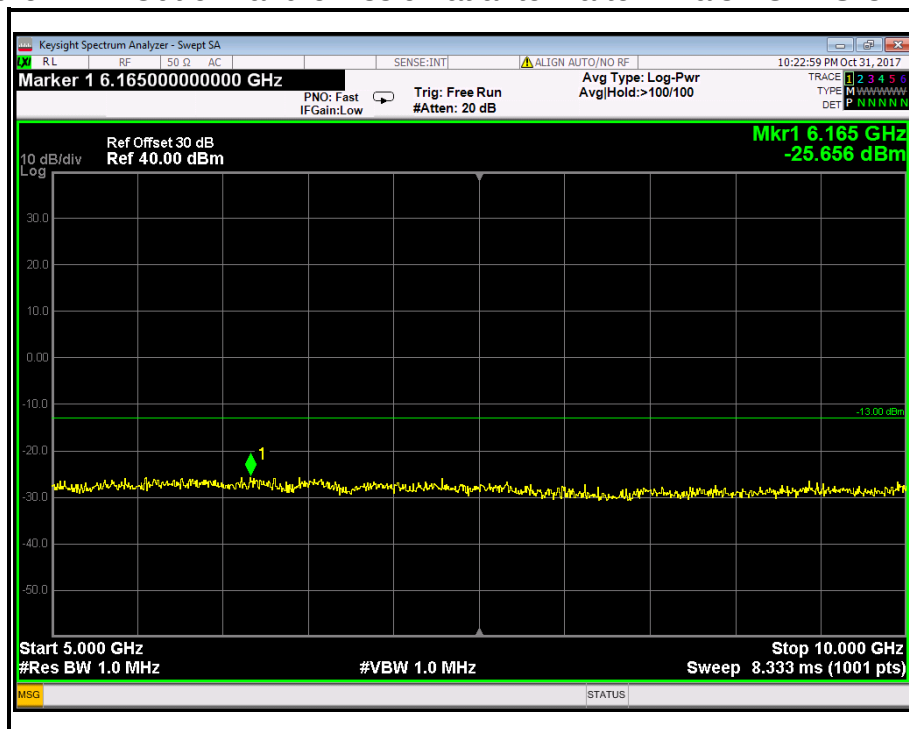


Figure 12-5: Out of Band emission at antenna terminals –GPRS CH Low

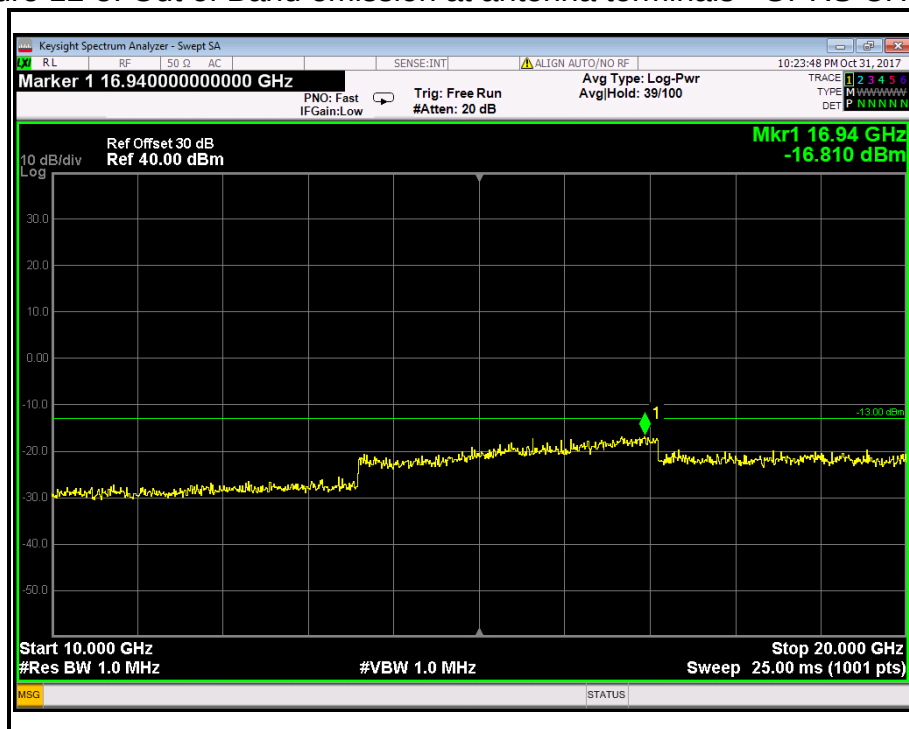




Figure 13-1: Out of Band emission at antenna terminals –GPRS CH Mid

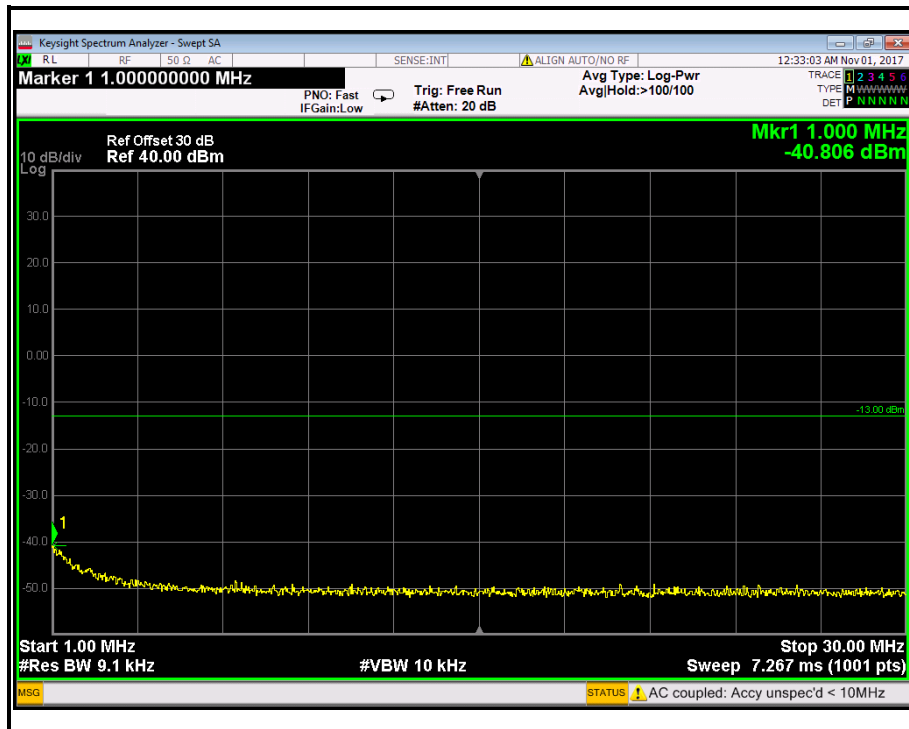


Figure 13-2: Out of Band emission at antenna terminals –GPRS CH Mid

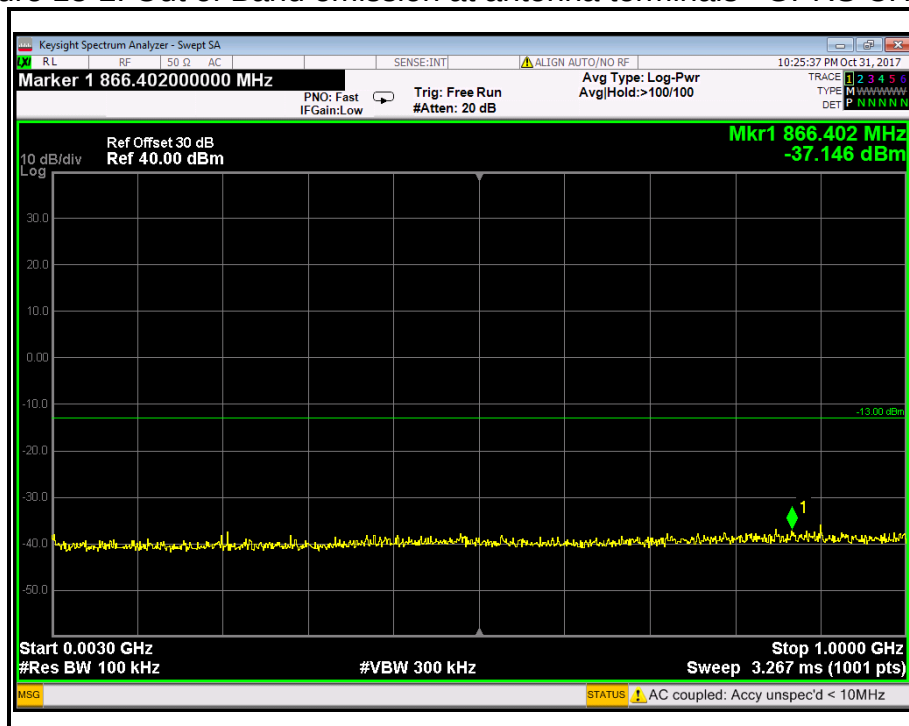




Figure 13-3: Out of Band emission at antenna terminals –GPRS CH Mid

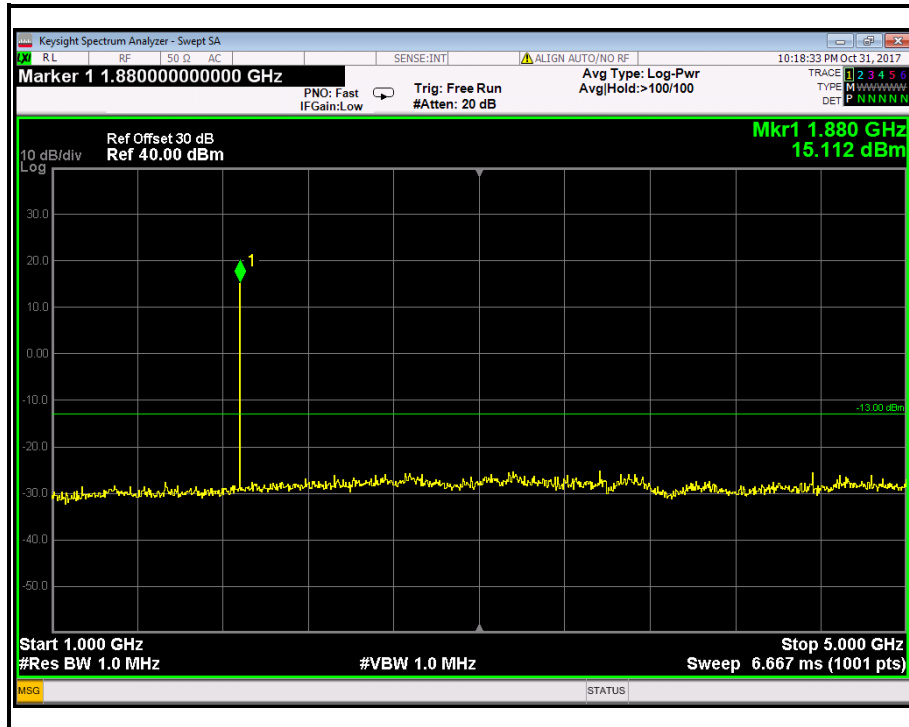


Figure 13-4: Out of Band emission at antenna terminals –GPRS CH Mid

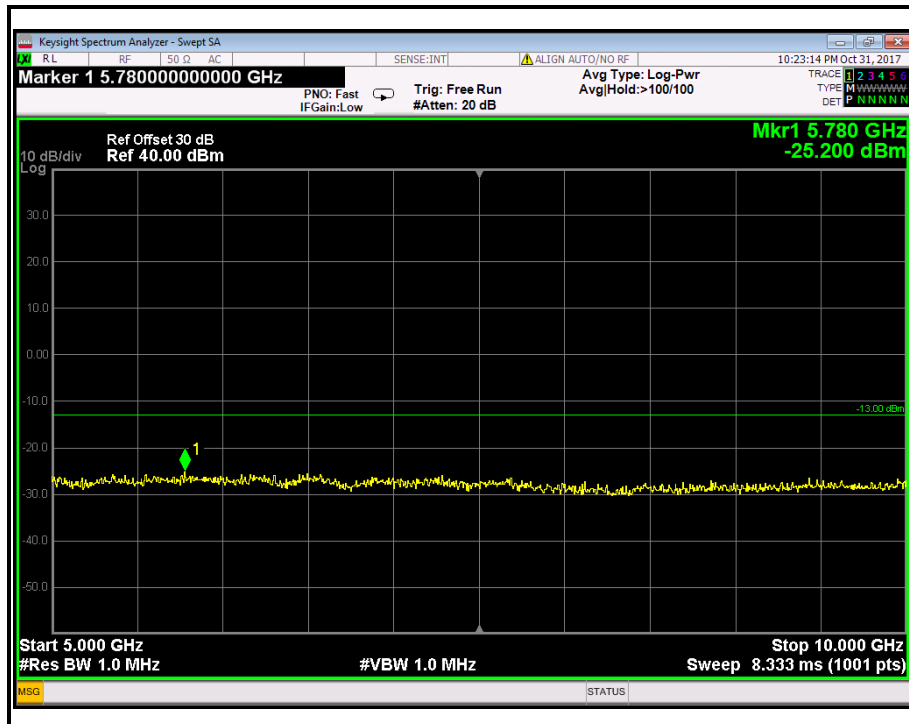




Figure 13-5: Out of Band emission at antenna terminals –GPRS CH Mid

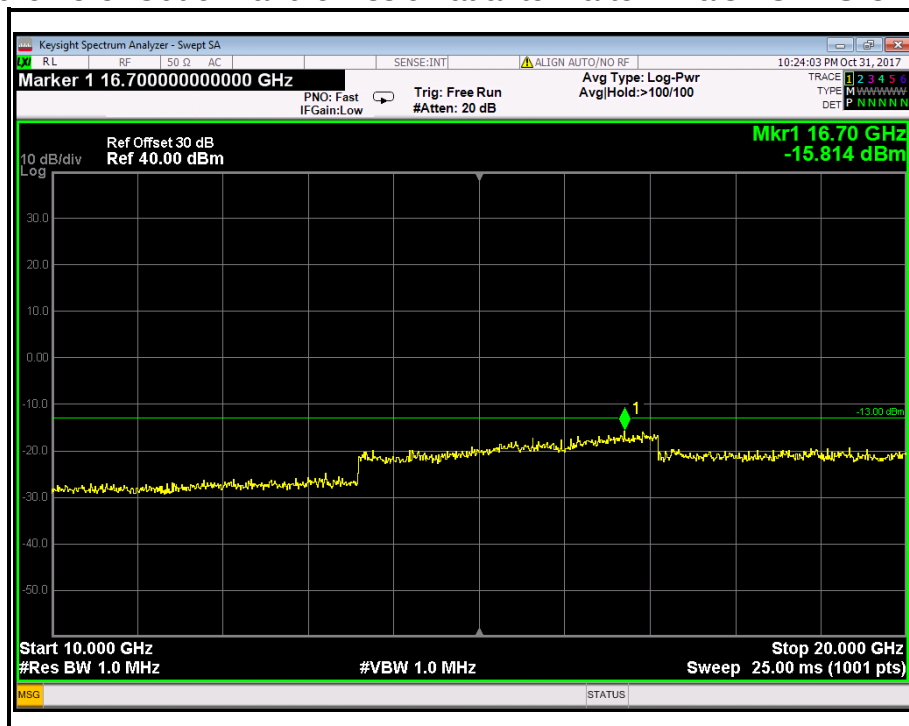


Figure 14-1: Out of Band emission at antenna terminals –GPRS CH High

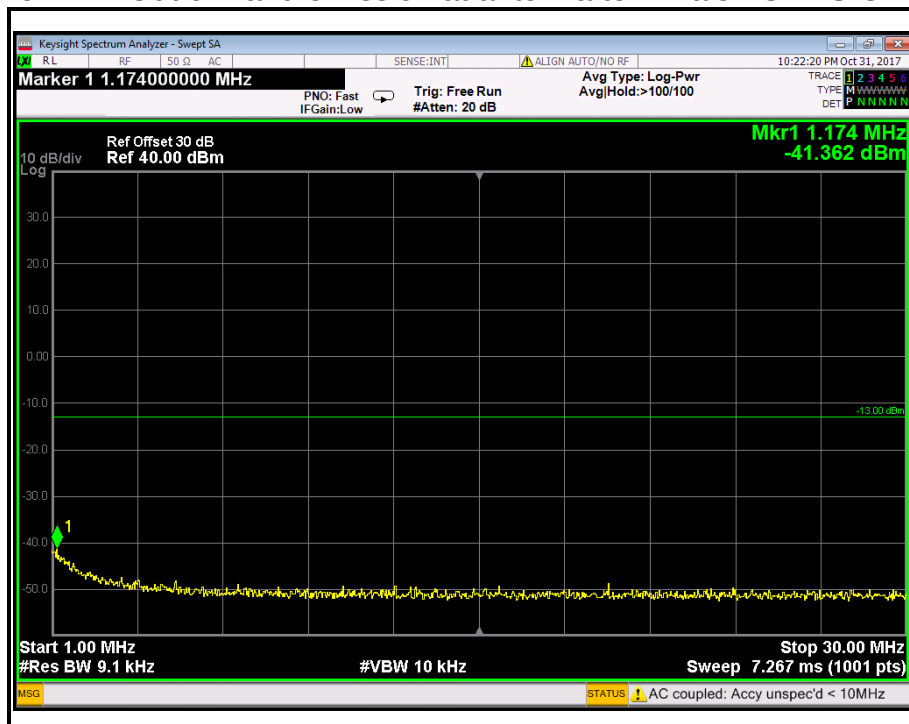




Figure 14-2: Out of Band emission at antenna terminals –GPRS CH High

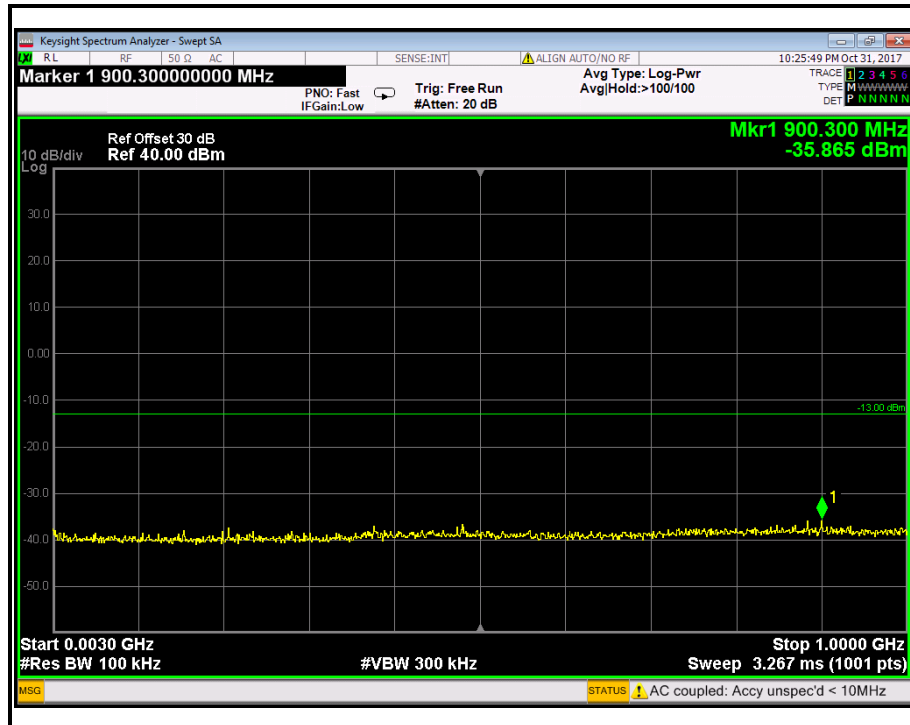


Figure 14-3: Out of Band emission at antenna terminals –GPRS CH High

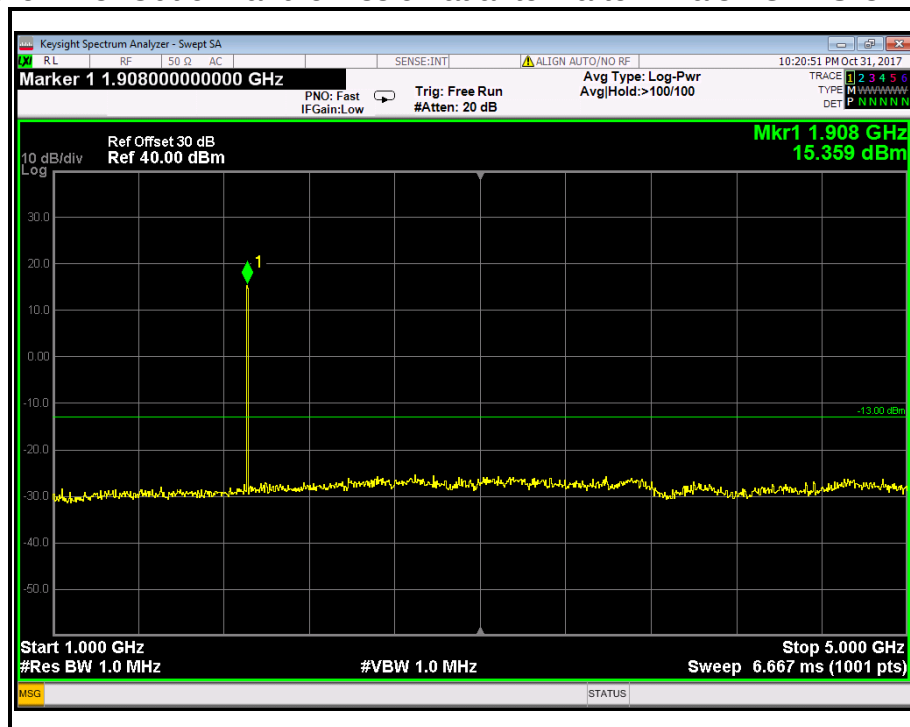




Figure 14-4: Out of Band emission at antenna terminals –GPRS CH High

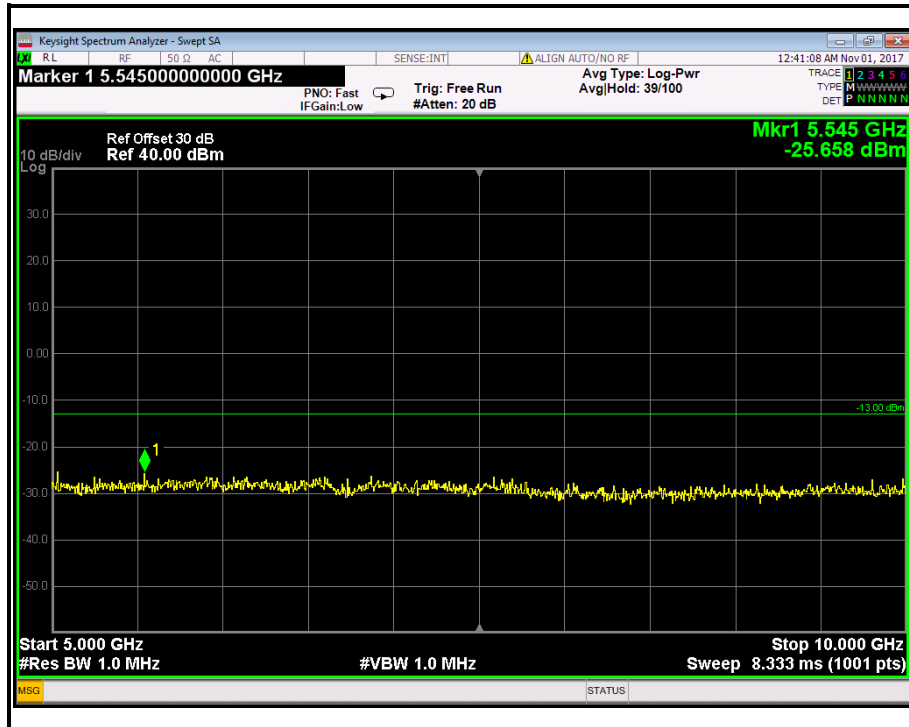
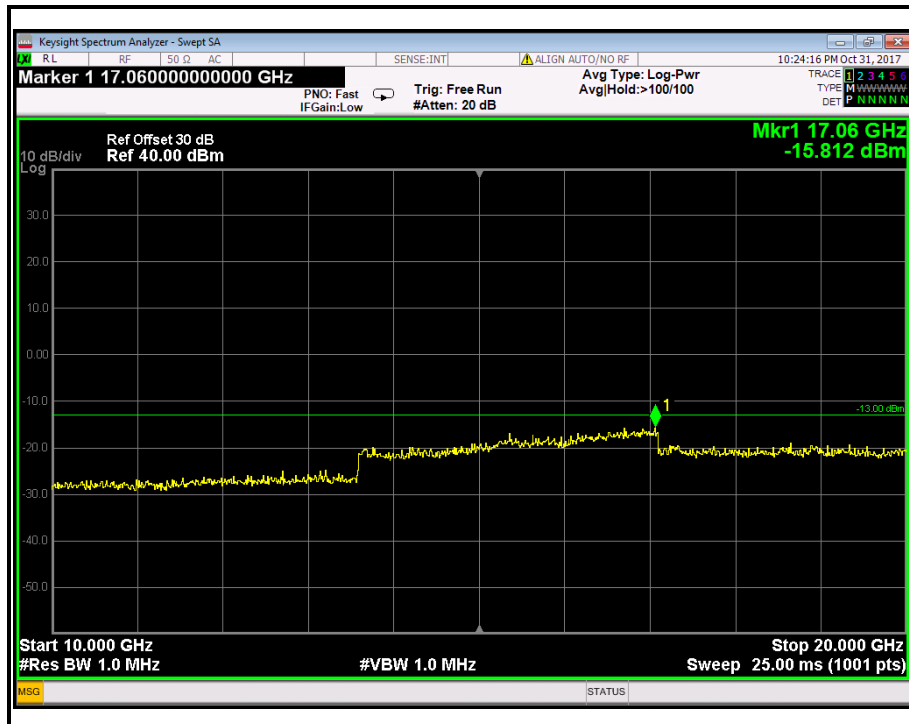


Figure 14-5: Out of Band emission at antenna terminals –GPRS CH High





## GSM 850

Figure 15-1: Band Edge emissions – GPRS CH Low

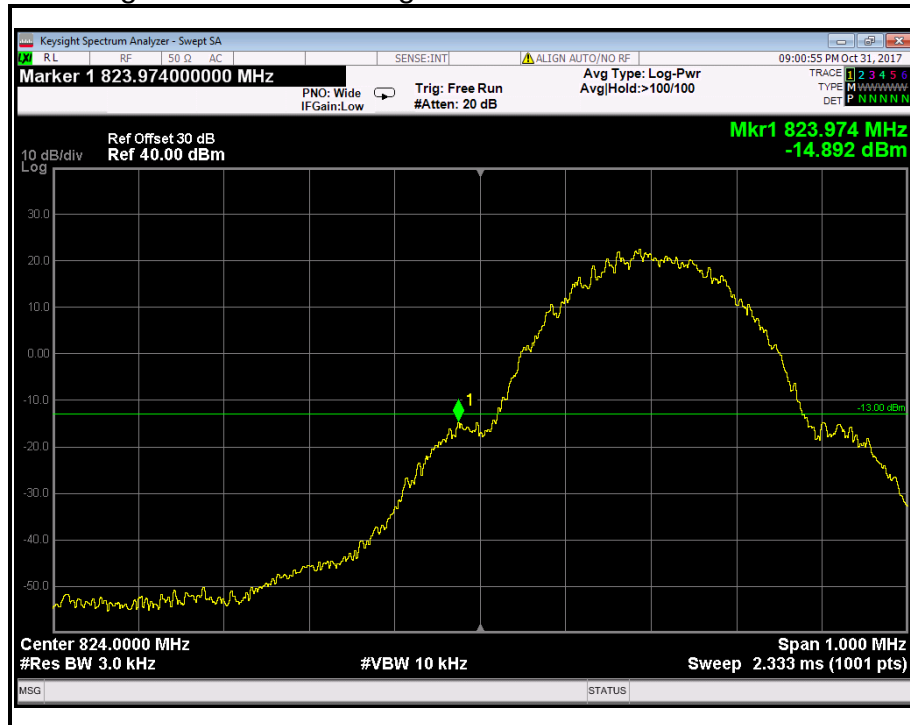


Figure 15-2: Band Edge emissions – GPRS CH High

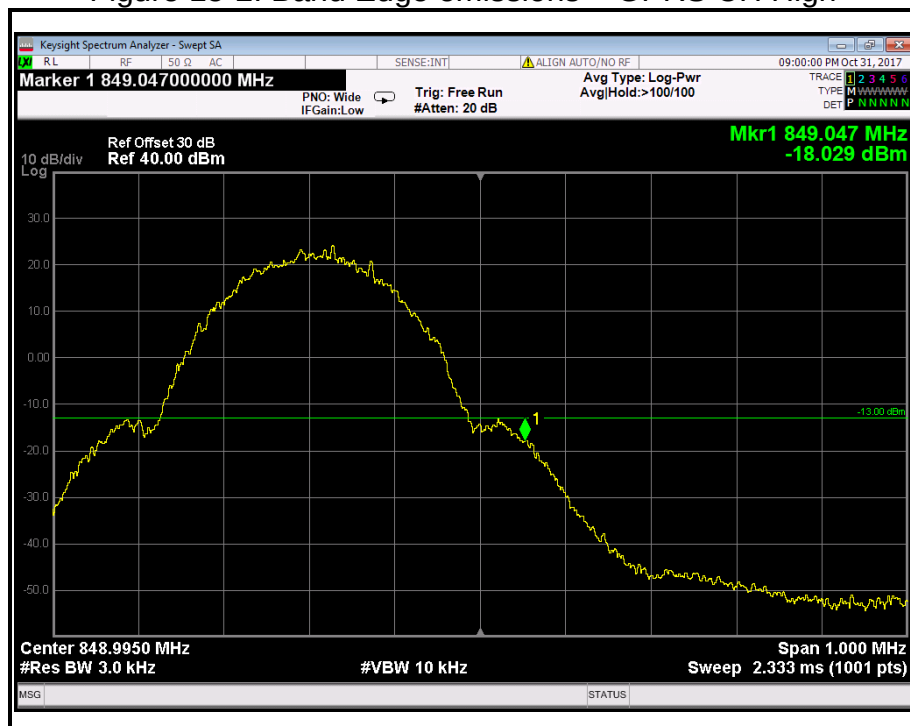
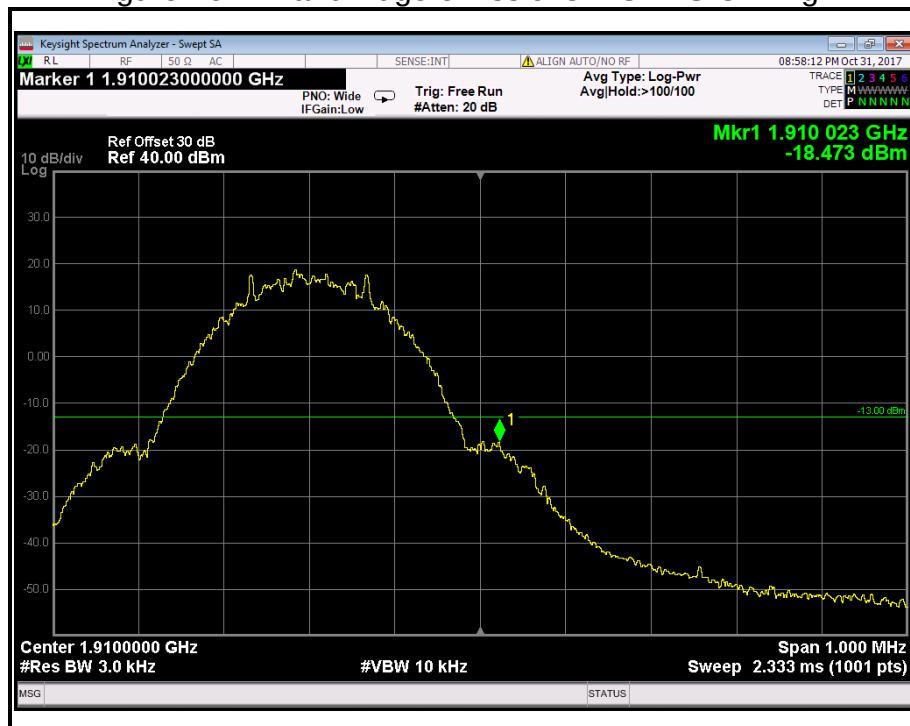
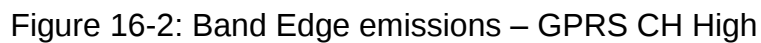




Figure 16-1: Band Edge emissions – GPRS CH Low





## 6.6. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

### 6.6.1 LIMIT

According to FCC §2.1053, RSS-132 (4.6) & RSS-133 (6.5).

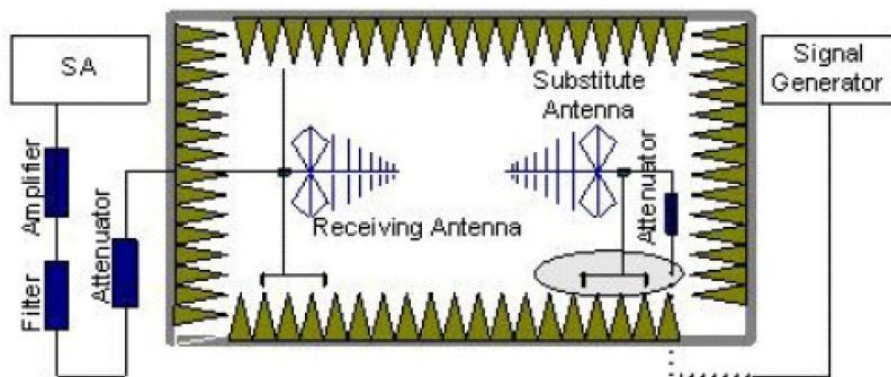
### 6.6.2 MEASUREMENT EQUIPMENT USED

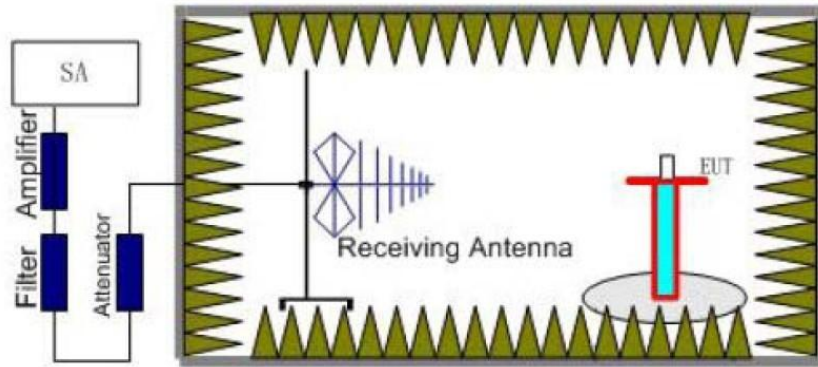
| Name of Equipment                    | Manufacturer | Model Number       | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|--------------------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A             | MY52221469    | 02/21/2017       | 02/20/2018      |
| Universal Radio Communication Tester | Agilent      | 8960               | GB44400261    | 02/21/2017       | 02/20/2018      |
| Amplifier                            | EMEC         | EM330              | 060661        | 02/21/2017       | 02/20/2018      |
| High Noise Amplifier                 | Agilent      | 8449B              | 3008A01838    | 02/21/2017       | 02/20/2018      |
| Bilog Antenna                        | Schwarzbeck  | VULB 9160          | 9160-3401     | 02/28/2017       | 02/27/2018      |
| Horn Antenna                         | TRC          | HA0301             | N/A           | 02/28/2017       | 02/27/2018      |
| Bilog Antenna                        | SCHAFFNER    | CBL6143            | 5063          | 02/21/2017       | 02/20/2018      |
| Horn Antenna                         | SCHWARZBECK  | BBHA9120           | D286          | 02/28/2017       | 02/27/2018      |
| Signal Generator                     | Anritsu      | MG3694A            | #050125       | 02/28/2017       | 02/27/2018      |
| Power Meter                          | Anritsu      | ML2495A            | 1204003       | 02/21/2017       | 02/20/2018      |
| Power Sensor                         | Anritsu      | MA2411B            | 1126150       | 02/21/2017       | 02/20/2018      |
| Turn Table                           | N/A          | N/A                | N/A           | N.C.R            | N.C.R           |
| Controller                           | CT           | N/A                | N/A           | N.C.R            | N.C.R           |
| Temp. / Humidity Meter               | Anymetre     | JR913              | N/A           | 02/21/2017       | 02/20/2018      |
| Antenna Tower                        | SUNOL        | TLT2               | N/A           | N.C.R            | N.C.R           |
| Test S/W                             | FARAD        | LZ-RF / CCS-SZ-3A2 |               |                  |                 |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

### 6.6.3 TEST CONFIGURATION

Below 1GHz





#### 6.6.4 TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:



$$\text{Power (EIRP)} = P_{\text{Mea}} - P_{\text{Ag}} - P_{\text{cl}} + G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .
8. In order to make sure test results more clearly, we set frequency range and sweep time for difference frequency range as follows table:

| Working Frequency | Subrange (GHz) | RBW    | VBW    | Sweep time (s) |
|-------------------|----------------|--------|--------|----------------|
| TM1/GPRS850       | 0.00009~0.15   | 1KHz   | 3KHz   | 30             |
|                   | 0.00015~0.03   | 10KHz  | 30KHz  | 10             |
|                   | 0.03~1         | 100KHz | 300KHz | 10             |
|                   | 1~2            | 1 MHz  | 3 MHz  | 2              |
|                   | 2~5            | 1 MHz  | 3 MHz  | 3              |
|                   | 5~8            | 1 MHz  | 3 MHz  | 3              |
|                   | 8~10           | 1 MHz  | 3 MHz  | 3              |
| TM1/GPRS190<br>0  | 0.00009~0.15   | 1KHz   | 3KHz   | 30             |
|                   | 0.00015~0.03   | 10KHz  | 30KHz  | 10             |
|                   | 0.03~1         | 100KHz | 300KHz | 10             |
|                   | 1~2            | 1 MHz  | 3 MHz  | 2              |
|                   | 2~5            | 1 MHz  | 3 MHz  | 3              |
|                   | 5~8            | 1 MHz  | 3 MHz  | 3              |
|                   | 8~11           | 1 MHz  | 3 MHz  | 3              |
|                   | 11~14          | 1 MHz  | 3 MHz  | 3              |
|                   | 14~18          | 1 MHz  | 3 MHz  | 3              |
|                   | 18~20          | 1 MHz  | 3 MHz  | 2              |

## 6.6.5 TEST RESULTS

Refer to the attached tabular data sheets.

Remark:

1. We were tested all refer 3GPP TS151 010 for GSM, 3GPP TS 134 121
2.  $\text{EIRP} = P_{\text{Mea}}(\text{dBm}) - P_{\text{cl}}(\text{dB}) + G_a(\text{dBi})$
3. We were not recorded other points as values lower than limits.
4.  $\text{Margin} = \text{EIRP} - \text{Limit}$



**Radiated Spurious Emission Measurement Result**

*GSM/TM1/GPRS850\_ Low Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 1648.40            | -40.91                    | 5.92                    | 3.00     | 7.66                                  | -39.17                | -13.00         | -26.17         | H            |
| 2472.60            | -47.81                    | 6.88                    | 3.00     | 10.13                                 | -44.56                | -13.00         | -31.56         | H            |
| 1648.40            | -36.56                    | 5.92                    | 3.00     | 7.66                                  | -34.82                | -13.00         | -21.82         | V            |
| 2472.60            | -43.24                    | 6.88                    | 3.00     | 10.13                                 | -39.99                | -13.00         | -26.99         | V            |

*GSM/TM1/GPRS850\_ Middle Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 1673.20            | -38.48                    | 5.97                    | 3.00     | 7.79                                  | -36.66                | -13.00         | -23.66         | H            |
| 2509.80            | -43.71                    | 6.95                    | 3.00     | 10.38                                 | -40.28                | -13.00         | -27.28         | H            |
| 1673.20            | -34.15                    | 5.97                    | 3.00     | 7.79                                  | -32.33                | -13.00         | -19.33         | V            |
| 2509.80            | -39.00                    | 6.95                    | 3.00     | 10.38                                 | -35.57                | -13.00         | -22.57         | V            |

*GSM/TM1/GPRS850\_ High Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 1697.60            | -44.90                    | 6.01                    | 3.00     | 7.83                                  | -43.08                | -13.00         | -30.08         | H            |
| 2546.40            | -51.16                    | 7.00                    | 3.00     | 10.42                                 | -47.74                | -13.00         | -34.74         | H            |
| 1697.60            | -40.61                    | 6.01                    | 3.00     | 7.83                                  | -38.79                | -13.00         | -25.79         | V            |
| 2546.40            | -46.85                    | 7.00                    | 3.00     | 10.42                                 | -43.43                | -13.00         | -30.43         | V            |

*GSM/TM2/GSM850\_ Low Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 1648.40            | -46.51                    | 5.92                    | 3.00     | 7.66                                  | -44.77                | -13.00         | -31.77         | H            |
| 2472.60            | -54.42                    | 6.88                    | 3.00     | 10.13                                 | -51.17                | -13.00         | -38.17         | H            |
| 1648.40            | -42.12                    | 5.92                    | 3.00     | 7.66                                  | -40.38                | -13.00         | -27.38         | V            |
| 2472.60            | -52.10                    | 6.88                    | 3.00     | 10.13                                 | -48.85                | -13.00         | -35.85         | V            |



*GSM/TM2/GSM850\_ Middle Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 1673.20            | -44.40                    | 5.97                    | 3.00     | 7.79                                  | -42.58                | -13.00         | -29.58         | H            |
| 2509.80            | -53.78                    | 6.95                    | 3.00     | 10.38                                 | -50.35                | -13.00         | -37.35         | H            |
| 1673.20            | -39.58                    | 5.97                    | 3.00     | 7.79                                  | -37.76                | -13.00         | -24.76         | V            |
| 2509.80            | -50.27                    | 6.95                    | 3.00     | 10.38                                 | -46.84                | -13.00         | -33.84         | V            |

*GSM/TM2/GSM850\_ High Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 1697.60            | -51.01                    | 6.01                    | 3.00     | 7.83                                  | -49.19                | -13.00         | -36.19         | H            |
| 2546.40            | -56.73                    | 7.00                    | 3.00     | 10.42                                 | -53.31                | -13.00         | -40.31         | H            |
| 1697.60            | -48.49                    | 6.01                    | 3.00     | 7.83                                  | -46.67                | -13.00         | -33.67         | V            |
| 2546.40            | -53.30                    | 7.00                    | 3.00     | 10.42                                 | -49.88                | -13.00         | -36.88         | V            |

*GSM/TM1/GPRS1900\_ Low Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 3700.40            | -39.60                    | 8.18                    | 3.00     | 10.06                                 | -37.72                | -13.00         | -24.72         | H            |
| 5550.60            | -32.42                    | 10.26                   | 3.00     | 11.55                                 | -31.13                | -13.00         | -18.13         | H            |
| 3700.40            | -40.36                    | 8.18                    | 3.00     | 10.06                                 | -38.48                | -13.00         | -25.48         | V            |
| 5550.60            | -32.15                    | 10.26                   | 3.00     | 11.55                                 | -30.86                | -13.00         | -17.86         | V            |

*GSM/TM1/GPRS1900\_ Middle Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 3760.00            | -36.51                    | 8.19                    | 3.00     | 10.09                                 | -34.61                | -13.00         | -21.61         | H            |
| 5640.00            | -26.70                    | 10.32                   | 3.00     | 11.58                                 | -25.44                | -13.00         | -12.44         | H            |
| 3760.00            | -42.33                    | 8.19                    | 3.00     | 10.09                                 | -40.43                | -13.00         | -27.43         | V            |
| 5640.00            | -33.54                    | 10.32                   | 3.00     | 11.58                                 | -32.28                | -13.00         | -19.28         | V            |



*GSM/TM1/GPRS1900\_ High Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 3819.60            | -37.13                    | 8.25                    | 3.00     | 10.13                                 | -35.25                | -13.00         | -22.25         | H            |
| 5729.40            | -29.74                    | 10.39                   | 3.00     | 11.65                                 | -28.48                | -13.00         | -15.48         | H            |
| 3819.60            | -38.26                    | 8.25                    | 3.00     | 10.13                                 | -36.38                | -13.00         | -23.38         | V            |
| 5729.40            | -30.73                    | 10.39                   | 3.00     | 11.65                                 | -29.47                | -13.00         | -16.47         | V            |

*GSM/TM2/GSM1900\_ Low Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 3700.40            | -49.05                    | 8.18                    | 3.00     | 10.06                                 | -47.17                | -13.00         | -34.17         | H            |
| 5550.60            | -67.79                    | 10.26                   | 3.00     | 11.55                                 | -66.50                | -13.00         | -53.50         | H            |
| 3700.40            | -40.68                    | 8.18                    | 3.00     | 10.06                                 | -38.80                | -13.00         | -25.80         | V            |
| 5550.60            | -65.49                    | 10.26                   | 3.00     | 11.55                                 | -64.20                | -13.00         | -51.20         | V            |

*GSM/TM2/GSM1900\_ Middle Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 3760.00            | -35.62                    | 8.19                    | 3.00     | 10.09                                 | -33.72                | -13.00         | -20.72         | H            |
| 5640.00            | -68.76                    | 10.32                   | 3.00     | 11.58                                 | -67.50                | -13.00         | -54.50         | H            |
| 3760.00            | -37.99                    | 8.19                    | 3.00     | 10.09                                 | -36.09                | -13.00         | -23.09         | V            |
| 5640.00            | -65.49                    | 10.32                   | 3.00     | 11.58                                 | -64.23                | -13.00         | -51.23         | V            |

*GSM/TM2/GSM1900\_ High Channel*

| Frequency<br>(MHz) | P <sub>Mea</sub><br>(dBm) | P <sub>cl</sub><br>(dB) | Diatance | G <sub>a</sub><br>Antenna<br>Gain(dB) | Peak<br>EIRP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Polarization |
|--------------------|---------------------------|-------------------------|----------|---------------------------------------|-----------------------|----------------|----------------|--------------|
| 3819.60            | -33.07                    | 8.25                    | 3.00     | 10.13                                 | -31.19                | -13.00         | -18.19         | H            |
| 5729.40            | -65.90                    | 10.39                   | 3.00     | 11.65                                 | -64.64                | -13.00         | -51.64         | H            |
| 3819.60            | -32.38                    | 8.25                    | 3.00     | 10.13                                 | -30.50                | -13.00         | -17.50         | V            |
| 5729.40            | -66.12                    | 10.39                   | 3.00     | 11.65                                 | -64.86                | -13.00         | -51.86         | V            |



## 6.7. FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

### 6.7.1. LIMIT

According to FCC §2.1055, FCC §24.235, RSS-132 (4.3) & RSS-133 (6.3).

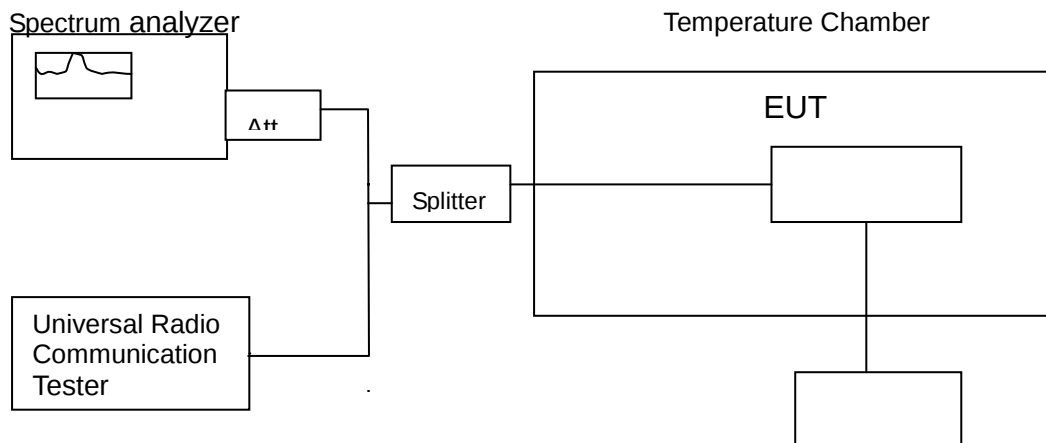
Frequency Tolerance: 2.5 ppm

### 6.7.2. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model    | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|----------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A   | MY52221469    | 02/21/2017       | 02/20/2018      |
| Temperature Chamber                  | YOUNG CHENN  | QA-LP-10 | 200302001     | 09/17/2017       | 09/16/2018      |
| DC POWER                             | QJE          | QJ3003XE | 018398        | N/A              | N/A             |
| Universal Radio Communication Tester | Agilent      | 8960     | GB44400261    | 02/21/2017       | 02/20/2018      |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

### 6.7.3. TEST CONFIGURATION



**Remark:** Measurement setup for testing on Antenna connector. Variable Power Supply

### 6.7.4. TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -25°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +55°C reached.



#### 6.7.5. TEST RESULTS

No non-compliance noted.

| Reference Frequency: GPRS Mid Channel 836.6 MHz @ 20°C |                                 |                   |               |               |
|--------------------------------------------------------|---------------------------------|-------------------|---------------|---------------|
| Limit: +/- 2.5 ppm = 2090 Hz                           |                                 |                   |               |               |
| Power Supply<br>Vac                                    | Environment<br>Temperature (°C) | Frequency<br>(Hz) | Delta<br>(Hz) | Limit<br>(Hz) |
| 3.7                                                    | 55                              | 83599979          | -13           | 2090          |
|                                                        | 50                              | 83599973          | -19           |               |
|                                                        | 40                              | 83599969          | -23           |               |
|                                                        | 30                              | 83599980          | -12           |               |
|                                                        | 20                              | 83599992          | 0             |               |
|                                                        | 10                              | 83599969          | -23           |               |
|                                                        | 0                               | 83599980          | -12           |               |
|                                                        | -10                             | 83599968          | -24           |               |
|                                                        | -20                             | 83599979          | -13           |               |
|                                                        | -25                             | 83599985          | -7            |               |

| Reference Frequency: GPRS Mid Channel 1880 MHz @ 20°C |                                 |                   |               |               |
|-------------------------------------------------------|---------------------------------|-------------------|---------------|---------------|
| Limit: ± 2.5 ppm = 4700Hz                             |                                 |                   |               |               |
| Power Supply<br>Vac                                   | Environment<br>Temperature (°C) | Frequency<br>(Hz) | Delta<br>(Hz) | Limit<br>(Hz) |
| 3.7                                                   | 55                              | 1879999979        | 4             | 4700          |
|                                                       | 50                              | 1879999977        | 2             |               |
|                                                       | 40                              | 1879999974        | -1            |               |
|                                                       | 30                              | 1879999980        | 5             |               |
|                                                       | 20                              | 1879999975        | 0             |               |
|                                                       | 10                              | 1879999984        | 9             |               |
|                                                       | 0                               | 1879999980        | 5             |               |
|                                                       | -10                             | 1879999975        | 0             |               |
|                                                       | -20                             | 1879999969        | -6            |               |
|                                                       | -25                             | 1879999972        | -3            |               |



| Reference Frequency: GSM Mid Channel 836.6 MHz @ 20°C |                                 |                   |               |               |
|-------------------------------------------------------|---------------------------------|-------------------|---------------|---------------|
| Limit: +/- 2.5 ppm = 2090 Hz                          |                                 |                   |               |               |
| Power Supply<br>Vdc                                   | Environment<br>Temperature (°C) | Frequency<br>(Hz) | Delta<br>(Hz) | Limit<br>(Hz) |
| 3.7                                                   | 55                              | 83599959          | -45           | 2090          |
|                                                       | 50                              | 83599962          | -42           |               |
|                                                       | 40                              | 83599965          | -39           |               |
|                                                       | 30                              | 83599964          | -40           |               |
|                                                       | 20                              | 83600004          | 0             |               |
|                                                       | 10                              | 83599980          | -24           |               |
|                                                       | 0                               | 83599972          | -32           |               |
|                                                       | -10                             | 83599969          | -35           |               |
|                                                       | -20                             | 83599974          | -30           |               |
|                                                       | -25                             | 83599985          | -19           |               |

| Reference Frequency: GSM Mid Channel 1880 MHz @ 20°C |                                 |                   |               |               |
|------------------------------------------------------|---------------------------------|-------------------|---------------|---------------|
| Limit: ± 2.5 ppm = 4700Hz                            |                                 |                   |               |               |
| Power Supply<br>Vdc                                  | Environment<br>Temperature (°C) | Frequency<br>(Hz) | Delta<br>(Hz) | Limit<br>(Hz) |
| 3.7                                                  | 55                              | 1879999985        | -3            | 4700          |
|                                                      | 50                              | 1879999986        | -2            |               |
|                                                      | 40                              | 1879999987        | -1            |               |
|                                                      | 30                              | 1879999979        | -9            |               |
|                                                      | 20                              | 1879999988        | 0             |               |
|                                                      | 10                              | 1879999978        | -10           |               |
|                                                      | 0                               | 1879999969        | -19           |               |
|                                                      | -10                             | 1879999986        | -2            |               |
|                                                      | -20                             | 1879999979        | -9            |               |
|                                                      | -25                             | 1879999986        | -2            |               |



## 6.8. FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

### 6.8.1. LIMIT

According to FCC §2.1055, FCC §24.235,  
Frequency Tolerance: 2.5 ppm.

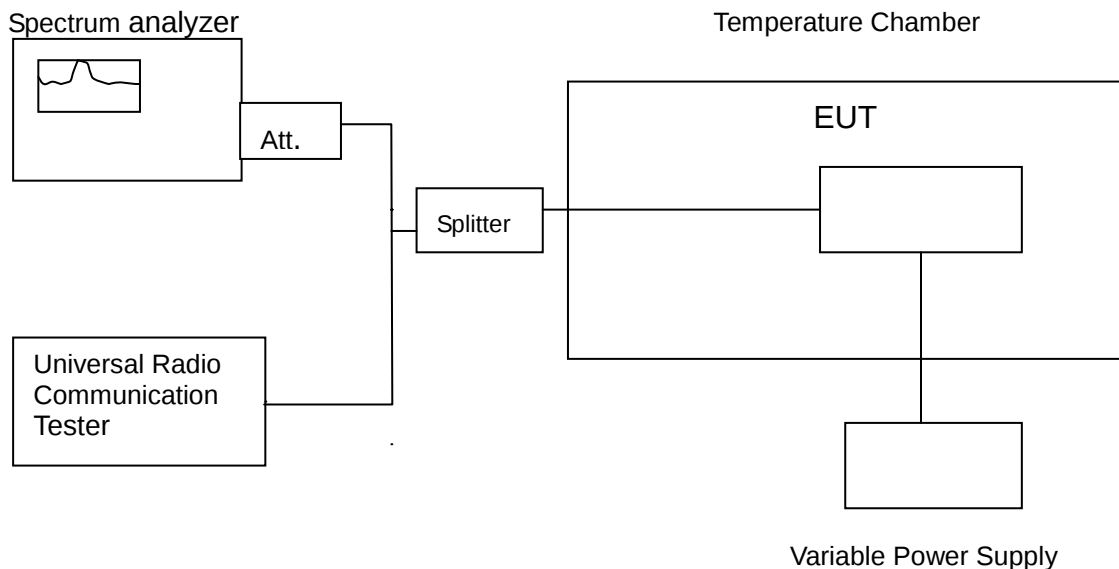
According to RSS-132 (4.3) & RSS-133 (6.3).

The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations and  $\pm 1.0$  ppm for base stations.

### 6.8.2. MEASUREMENT EQUIPMENT USED

| Name of Equipment                    | Manufacturer | Model    | Serial Number | Last Calibration | Due Calibration |
|--------------------------------------|--------------|----------|---------------|------------------|-----------------|
| Spectrum Analyzer                    | Agilent      | N9010A   | MY52221469    | 02/21/2017       | 02/20/2018      |
| Temperature Chamber                  | YOUNG CHENN  | QA-LP-10 | 200302001     | 09/17/2017       | 09/16/2018      |
| DC POWER                             | QJE          | QJ3003XE | 018398        | N/A              | N/A             |
| Universal Radio Communication Tester | Agilent      | 8960     | GB44400261    | 02/21/2017       | 02/20/2018      |

### 6.8.3. TEST CONFIGURATION



**Remark:** Measurement setup for testing on Antenna connector.



#### 6.8.4. TEST PROCEDURE

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

#### 6.8.5. TEST RESULTS

No non-compliance noted.

| Reference Frequency: GPRS Mid Channel 836.6 MHz @ 20°C |                              |                |            |            |
|--------------------------------------------------------|------------------------------|----------------|------------|------------|
| Limit: $\pm 2.5$ ppm = 2090Hz                          |                              |                |            |            |
| Power Supply Vac                                       | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 4.07                                                   | 20                           | 83599988       | -4         | 2090       |
| 3.70                                                   |                              | 83599992       | 0          |            |
| 3.33                                                   |                              | 83600008       | 16         |            |

| Reference Frequency: GPRS Mid Channel 1880 MHz @ 20°C |                              |                |            |            |
|-------------------------------------------------------|------------------------------|----------------|------------|------------|
| Limit: $\pm 2.5$ ppm = 4700Hz                         |                              |                |            |            |
| Power Supply Vac                                      | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 4.07                                                  | 20                           | 1879999960     | -11        | 4700       |
| 3.70                                                  |                              | 1879999971     | 0          |            |
| 3.33                                                  |                              | 1879999966     | -5         |            |

| Reference Frequency: GSM Mid Channel 836.6 MHz @ 20°C |                              |                |            |            |
|-------------------------------------------------------|------------------------------|----------------|------------|------------|
| Limit: $\pm 2.5$ ppm = 2090Hz                         |                              |                |            |            |
| Power Supply Vdc                                      | Environment Temperature (°C) | Frequency (Hz) | Delta (Hz) | Limit (Hz) |
| 4.07                                                  | 20                           | 83600009       | 5          | 2090       |
| 3.70                                                  |                              | 83600004       | 0          |            |
| 3.33                                                  |                              | 83600003       | -1         |            |



| Reference Frequency: GSM Mid Channel 1880 MHz @ 20°C |                                 |                   |               |               |
|------------------------------------------------------|---------------------------------|-------------------|---------------|---------------|
| Limit: $\pm 2.5$ ppm = 4700Hz                        |                                 |                   |               |               |
| Power Supply<br>Vdc                                  | Environment<br>Temperature (°C) | Frequency<br>(Hz) | Delta<br>(Hz) | Limit<br>(Hz) |
| 4.07                                                 | 20                              | 1879999990        | 2             | 4700          |
| 3.70                                                 |                                 | 1879999988        | 0             |               |
| 3.33                                                 |                                 | 1879999947        | -41           |               |