

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 22 SUBPART H, PART 24 SUBPART E REQUIREMENT OF

**Product Name:** Smart Tracker  
**Brand Name:** Athentek  
**Model No.:** AT502  
**Model Difference:** N/A  
**FCC ID:** 2AHNY-AT502  
**Report No.:** E2/2016/20033  
**Issue Date:** Mar. 11, 2016  
**FCC Rule Part:** 2 , 22H & 24E  
**Prepared for:** Athentek Corp.  
7F., No.10, Ln. 360, Sec. 1, Neihu Rd, Neihu  
Dist., Taipei City 114, Taiwan  
**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No.2, Keji 1st Rd., Guishan District, Taoyuan  
City, Taiwan 333

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## VERIFICATION OF COMPLIANCE

**Applicant:** Athentek Corp.  
7F., No.10, Ln. 360, Sec. 1, Neihu Rd, Neihu Dist., Taipei City  
114, Taiwan

**Product Name:** Smart Tracker

**Brand Name:** Athentek

**Model No.:** AT502

**Model Difference:** N/A

**FCC ID:** 2AHNY-AT502

**File Number:** E2/2016/20033

**Date of test:** Feb. 24, 2016 ~ Mar. 10, 2016

**Date of EUT Received:** Feb. 24, 2016

**We hereby certify that:**

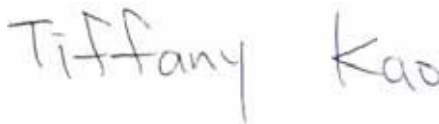
The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA-603-C-2004 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

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

**Test By:****Date**

Mar. 11, 2016

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**Aken Huang / Engineer****Prepared By:****Date**

Mar. 11, 2016

---

**Tiffany Kao / Clerk****Approved By:****Date**

Mar. 11, 2016

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**Jim Chang / Asst. Manager**

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## Revision History

| Report Number | Revision | Description                  | Issue Date    |
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| E2/2016/20033 | Rev.00   | Initial creation of document | Mar. 11, 2016 |
|               |          |                              |               |
|               |          |                              |               |
|               |          |                              |               |

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## 1. GENERAL PRODUCT INFORMATION

### 1.1. Product Description

General:

|                   |                                         |                               |
|-------------------|-----------------------------------------|-------------------------------|
| Product Name:     | Smart Tracker                           |                               |
| Brand Name:       | Athentek                                |                               |
| Model No.:        | AT502                                   |                               |
| Model difference: | N/A                                     |                               |
| Hardware Version: | DVT                                     |                               |
| Software Version: | 0.5.13                                  |                               |
| Power Supply:     | 3.7Vdc from Rechargeable Li-ion Battery |                               |
|                   | Battery:                                | Model No.: N/A; Supplier: N/A |

GPRS / WCDMA:

| Cellular Phone Standards Frequency Range and Power | Operating Frequency |                       | Rated Power |
|----------------------------------------------------|---------------------|-----------------------|-------------|
|                                                    | GPRS 850            | 824.2 MHz– 848.8 MHz  | 33dBm       |
|                                                    | GPRS 1900           | 1850.2MHz – 1909.8MHz | 30dBm       |
| Type of Emission:                                  | GPRS 850            | 248KGXW               |             |
|                                                    | GPRS 1900           | 250KGXW               |             |

Max ERP/EIRP measurement result:

|                | dBm   |      | W     |
|----------------|-------|------|-------|
| GPRS 850 Band  | 27.76 | ERP  | 0.597 |
| GPRS 1900 Band | 28.82 | EIRP | 0.762 |

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## 1.2. Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting, GSM, Wi-Fi and Bluetooth features, and below is details of information.

| Product Feature       |                          |
|-----------------------|--------------------------|
| Product Name:         | Smart Tracker            |
| Brand Name:           | Athentek                 |
| Model No.:            | AT502                    |
| Model Difference:     | N/A                      |
| FCC ID:               | 2AHNY-AT502              |
| GSM Operating Band(s) | GSM 850/1900MHz          |
| GPRS Multi Slot Class | GPRS Class 12 / Class 12 |
| Wi-Fi Specification   | 802.11b/g/n              |
| Bluetooth Version     | V4.0 dual mode           |

**Note:** The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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### 1.3. Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22, 24

ANSI / TIA / EIA 603C-C-2004

KDB971168 D01 Power Meas license Digital System v02r02

TS 151 010-1 is used to set, and measure the output power.

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.

### 1.4. Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd.,  
Guishan District, Taoyuan City, Taiwan 333. (TAF code 0513)

FCC Registration Numbers are: 628985

Canada Registration Number: 4620A-5.

### 1.5. Special Accessories

No special accessories were used during testing.

### 1.6. Equipment Modifications

There were no modifications incorporated into the EUT.

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## 2. SYSTEM TEST CONFIGURATION

### 2.1. EUT Configuration

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

### 2.2. EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

### 2.3. Test Procedure

#### 2.3.1 Conducted Measurement at Antenna Port

According to measurement procured TIA/EIA 603C, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

#### 2.3.2 Radiated Emissions (ERP/EIRP)

According to measurement procured TIA/EIA 603C, The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

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## 2.4. Measurement Results Explanation Example

### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

### Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation example with cable loss and attenuator.

Low Band: Offset = RF cable loss (dB) + attenuation factor (dB) = 14.8 (dB)

High Band: Offset = RF cable loss (dB) + attenuation factor (dB) = 14.8 (dB)

## 2.5. Final Amplifier Voltage and Current Information:

| Test Mode | DC voltage (V) | DC current (mA) |
|-----------|----------------|-----------------|
| GPRS 850  | 3.7            | 180             |
| GPRS 1900 | 3.7            | 72              |

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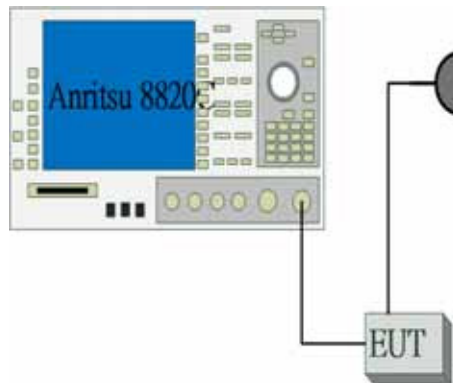
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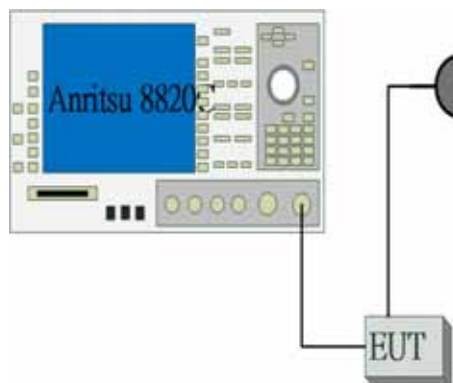
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## 2.6. Configuration of Tested System

**Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)**



**Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)**



**Table 2-1 Equipment Used in**

| Item | Equipment                    | Mfr/Brand | Model/<br>Type No. | Series No. | Data Cable | Power<br>Cord |
|------|------------------------------|-----------|--------------------|------------|------------|---------------|
| 1.   | Radio Communication Analyzer | Anritsu   | 8820C              | 6201107337 | shielded   | Un-shielded   |
| 2.   | Test Software                | DRTU      | N/A                | N/A        | N/A        | N/A           |

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### 3. SUMMARY OF TEST RESULTS

| FCC Rules                                 | Description Of Test                                         | Result    |
|-------------------------------------------|-------------------------------------------------------------|-----------|
| §2.1046(a)                                | RF Power Output                                             | Compliant |
| §2.1046(a)<br>§22.913(a)(2)<br>§24.232(c) | ERP/ EIRP measurement                                       | Compliant |
| §2.1049(h)                                | Occupied Bandwidth                                          | Compliant |
| §2.1051<br>§22.917(a)<br>§24.238(a)       | Out of Band Emissions at Antenna<br>Terminals and Band Edge | Compliant |
| §2.1053<br>§22.917(a)<br>§24.238(a)       | Field Strength of Spurious Radiation                        | Compliant |
| §24.232(d)                                | Peak to Average Ratio                                       | Compliant |
| §2.1055(a)(1)<br>§22.355<br>§24.235       | Frequency Stability                                         | Compliant |

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## 4. DESCRIPTION OF TEST MODES

### 4.1. The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found as listed below. Following channel(s) was (were) selected for the final test as listed below:

| BAND      | ERP/EIRP | RADIATED EMISSION |
|-----------|----------|-------------------|
| GPRS 850  | E2-plan  | E2-plan           |
| GPRS 1900 | E2-plan  | E2-plan           |

### GSM/GPRS/EDGE MODE

| TEST ITEM             | AVAILABLE CHANNEL        | TESTED CHANNEL                 | MODE                  |
|-----------------------|--------------------------|--------------------------------|-----------------------|
| ERP                   | 128 to 251               | 128, 190, 251                  | GPRS 850              |
| EIRP                  | 512 to 810               | 512, 661, 810                  | GPRS 1900             |
| FREQUENCY STABILITY   | 128 to 251<br>512 to 810 | 190<br>661                     | GPRS 850<br>GPRS 1900 |
| OCCUPIED BANDWIDTH    | 128 to 251<br>512 to 810 | 128, 190, 251<br>512, 661, 810 | GPRS 850<br>GPRS 1900 |
| PEAK TO AVERAGE RATIO | 128 to 251<br>512 to 810 | 128, 190, 251<br>512, 661, 810 | GPRS 850<br>GPRS 1900 |
| BAND EDGE             | 128 to 251<br>512 to 810 | 128, 251<br>512, 810           | GPRS 850<br>GPRS 1900 |
| CONDUCTED EMISSION    | 128 to 251<br>512 to 810 | 128, 190, 251<br>512, 661, 810 | GPRS 850<br>GPRS 1900 |
| RADIATED EMISSION     | 128 to 251<br>512 to 810 | 128, 190, 251<br>512, 661, 810 | GPRS 850<br>GPRS 1900 |

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## 5. MEASUREMENT UNCERTAINTY

| Test Items                                                  | Uncertainty                                                                |
|-------------------------------------------------------------|----------------------------------------------------------------------------|
| RF Power Output                                             | +/- 1.10 dB                                                                |
| ERP/ EIRP measurement                                       | Vertical Polarization = +/- 4.74dB<br>Horizontal Polarization = +/- 4.62dB |
| 99% Occupied Bandwidth                                      | +/- 5.19 Hz                                                                |
| Out of Band Emissions at Antenna<br>Terminals and Band Edge | +/- 0.70 dB                                                                |
| Peak to Average Ratio                                       | +/- 0.70 dB                                                                |
| Frequency Stability vs. Temperature                         | +/- 5.19 Hz                                                                |
| Frequency Stability vs. Voltage                             | +/- 5.19 Hz                                                                |
| Temperature                                                 | +/- 0.65 °C                                                                |
| Humidity                                                    | +/- 4.6 %                                                                  |
| DC / AC Power Source                                        | DC= +/- 0.13%, AC= +/- 0.2%                                                |

### Radiated Spurious Emission:

|                                                              |                            |
|--------------------------------------------------------------|----------------------------|
| Measurement uncertainty<br>(Polarization : <b>Vertical</b> ) | 30MHz - 180MHz: +/- 3.37dB |
|                                                              | 180MHz -417MHz: +/- 3.19dB |
|                                                              | 0.417GHz-1GHz: +/- 3.19dB  |
|                                                              | 1GHz - 18GHz: +/- 4.04dB   |
|                                                              | 18GHz - 40GHz: +/- 4.04dB  |

|                                                                |                            |
|----------------------------------------------------------------|----------------------------|
| Measurement uncertainty<br>(Polarization : <b>Horizontal</b> ) | 30MHz - 167MHz: +/- 4.22dB |
|                                                                | 167MHz -500MHz: +/- 3.44dB |
|                                                                | 0.5GHz-1GHz: +/- 3.39dB    |
|                                                                | 1GHz - 18GHz: +/- 4.08dB   |
|                                                                | 18GHz - 40GHz: +/- 4.08dB  |

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

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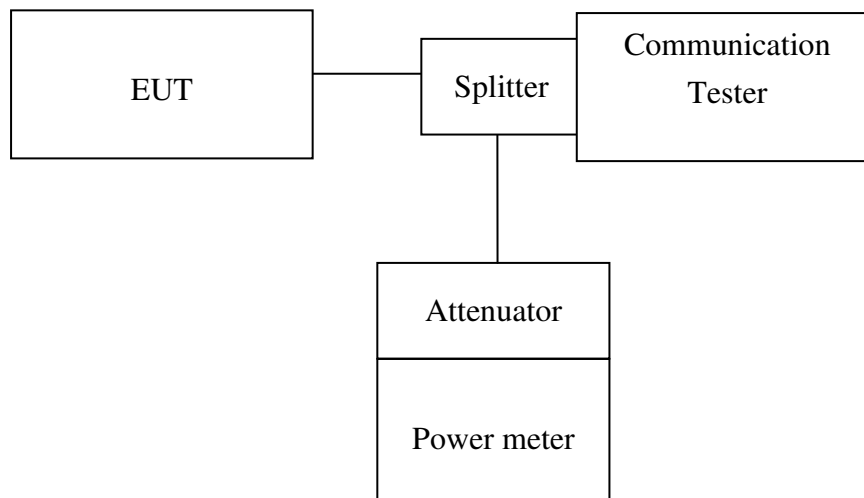
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## 6. RF CONDUCTED OUTPUT POWER MEASUREMENT

### 6.1. Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

### 6.2. Test Set-up



**Note:** Measurement setup for testing on Antenna connector

### 6.3. Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the test measurement of output power.

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#### 6.4. Measurement Equipment Used

| Conducted Emission Test Site |           |                    |               |            |            |
|------------------------------|-----------|--------------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER       | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer            | KEYSIGHT  | N9010A             | MY54510568    | 04/14/2015 | 04/13/2016 |
| Power Meter                  | Anritsu   | ML2496A            | 1326001       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315048       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315049       | 06/23/2015 | 06/22/2016 |
| Coaxial Cable 30cm           | WOKEN     | 00100A1F1A1<br>95C | RF01          | 12/12/2015 | 12/11/2016 |
| DC Block                     | PASTERNAK | PE8210             | RF29          | 12/12/2015 | 12/11/2016 |
| Splitter                     | RF-LAMBDA | RFLT2W1G18<br>G    | RF35          | 12/12/2015 | 12/11/2016 |
| Attenuator                   | WOKEN     | 218FS-10           | RF23          | 12/12/2015 | 12/11/2016 |
| Temperature Chamber          | TERCHY    | MHK-120LK          | 1020582       | 06/23/2015 | 06/22/2016 |
| Communication Tester         | Anritsu   | MT8820C            | 6201107337    | 05/27/2015 | 05/26/2016 |

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## 6.5. Measurement Result

### RF Conducted Output Power

#### GPRS/EDGE (GMSK; 8-PSK) Result:

| EUT Mode  | Frequency (MHz) | CH  | Peak Power (1DN 1UP) Class 8 (dBm) | Average Burst Power (1DN 1UP) Class 8 (dBm) | Peak Power (1DN 2UP) Class 10 (dBm) | Average Burst Power (1DN 2UP) Class 10 (dBm) | Peak Power (1DN 3UP) Class 12 (dBm) | Average Burst Power (1DN 3UP) Class 12 (dBm) | Peak Power (1DN 4UP) Class 12 (dBm) | Average Burst Power (1DN 4UP) Class 12 (dBm) |
|-----------|-----------------|-----|------------------------------------|---------------------------------------------|-------------------------------------|----------------------------------------------|-------------------------------------|----------------------------------------------|-------------------------------------|----------------------------------------------|
| GPRS 850  | 824.2           | 128 | 32.00                              | 31.70                                       | 29.70                               | 29.50                                        | 28.20                               | 28.00                                        | 27.00                               | 26.80                                        |
|           | 836.6           | 190 | <b>31.90</b>                       | 31.70                                       | 29.60                               | 29.50                                        | 28.20                               | 28.00                                        | 27.00                               | 26.70                                        |
|           | 848.8           | 251 | 31.80                              | 31.60                                       | 29.60                               | 29.40                                        | 28.20                               | 28.00                                        | 26.90                               | 26.70                                        |
| GPRS 1900 | 1850.2          | 512 | 28.50                              | 28.30                                       | 27.10                               | 26.80                                        | 25.80                               | 25.60                                        | 24.50                               | 24.30                                        |
|           | 1880.0          | 661 | 28.80                              | 28.50                                       | 27.20                               | 27.00                                        | 25.70                               | 25.50                                        | 24.40                               | 24.20                                        |
|           | 1909.8          | 810 | <b>28.90</b>                       | 28.70                                       | 26.90                               | 26.70                                        | 25.30                               | 25.20                                        | 24.00                               | 23.80                                        |

## Minimum Communications Power Measurement

### PCS 1900 band

| PCL                | 0    | 1    | 2    | 3    | 4    | 5    | 6  | 7  | 8    |
|--------------------|------|------|------|------|------|------|----|----|------|
| Output power (dBm) | 28.8 | 28.6 | 28.6 | 28.6 | 27.4 | 25.9 | 24 | 22 | 20.1 |

| PCL                | 9    | 10   | 11   | 12   | 13   | 14  | 15  |
|--------------------|------|------|------|------|------|-----|-----|
| Output power (dBm) | 18.1 | 16.2 | 14.2 | 12.3 | 10.3 | 8.4 | 6.6 |

Note: The EUT output power was controlled by simulator. Set Communication Tester CMU200 PCL as above, and get the mobile phone output power reading.

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## 7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT

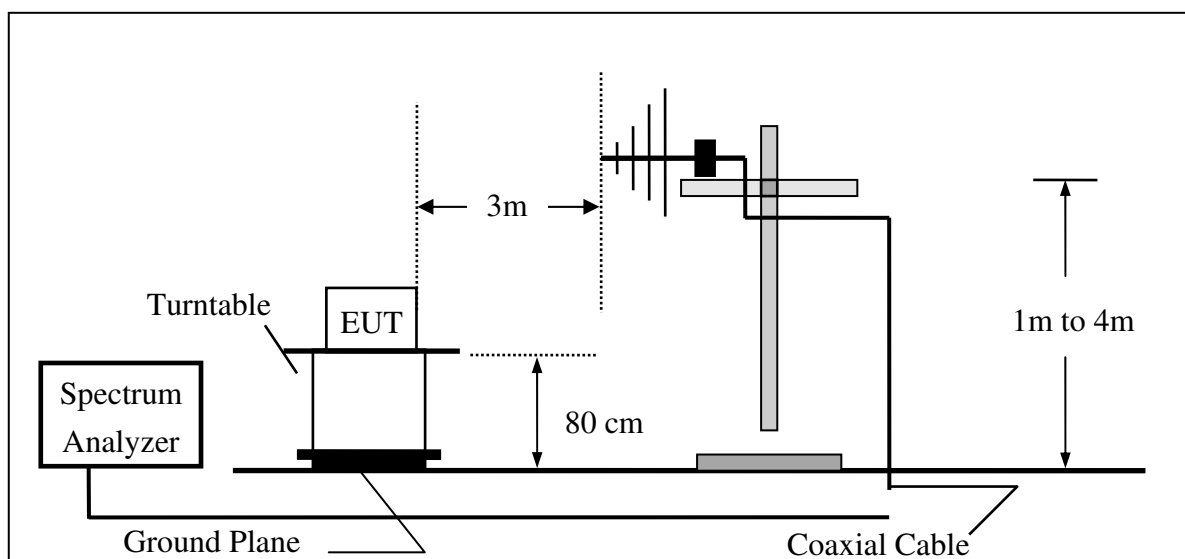
### 7.1. Standard Applicable

FCC 22.913(a) Mobile station is limited to 7W.

FCC 24.232(b) Mobile station is limited to 2W.

### 7.2. Test SET-UP

(A) Radiated Power Test Set-Up, Frequency Below 1000MHz



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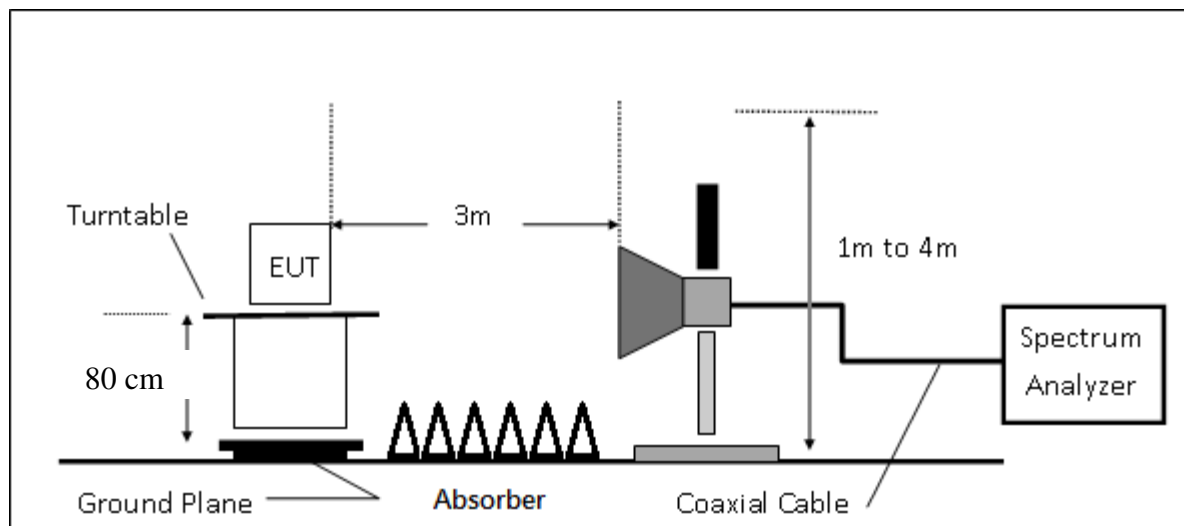
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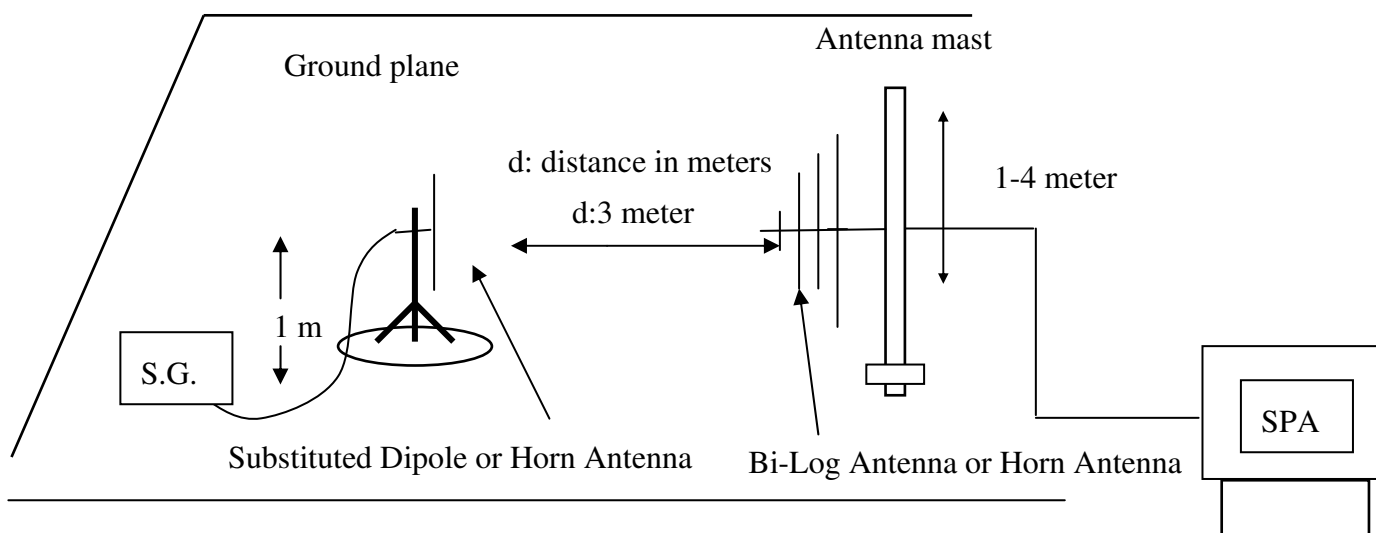
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## (B) Radiated Power Test Set-UP Frequency Over 1 GHz



## (C) Substituted Method Test Set-UP



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### 7.3. Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 971168 D01
2. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
3. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated
4. The testing follows the Measurement Procedure of FCC KDB 971168 D01
5. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
6.  $ERP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$
7.  $ERP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$
8. Spectrum setting:
  - (1) Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and  $VBW > 3 \times RBW$ .
  - (2) KDB 971168 D01 is adopted, and the procedure as lists under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.

Set frequency = nominal signal center frequency;  
 Set span = 2 X occupied BW;  
 Set RBW  $\approx$  1~5% of the span, not to exceed 1 MHz  
 Set VBW = 3 x RBW;  
 Select average power (RMS) detector  
 Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt  
 integration time (ex. Point = 601points, then sweep time =  $601 \times 10^{-3} = 6s$ .)

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Activate trace averaging routine over a minimum of 100 sweeps;  
Activate marker/span pair and set span = signal or channel bandwidth;  
Activate the band/interval power marker function;  
Record the band power level;

Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

The proper adjustment due to limitation of spectrum capability is given compensated to spectrum with conversion factor of  $10 \cdot \log(TBW/RBW)$ , where TBW is the transmission of UE exceeding the maximum BW UE can extends, and RBW is the resolution BW in UE.

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## 7.4. Measurement Equipment Used

| SGS 966 Chamber No.C |                 |                                 |                  |                  |                 |
|----------------------|-----------------|---------------------------------|------------------|------------------|-----------------|
| Name of Equipment    | Manufacturer    | Model                           | Serial Number    | Calibration Date | Calibration Due |
| EMI Test Receiver    | R&S             | ESU 40                          | 100363           | 04/09/2015       | 04/08/2016      |
| Loop Antenna         | ETS-Lindgren    | 6502                            | 143303           | 12/23/2015       | 12/22/2016      |
| Broadband Antenna    | TESEQ           | CBL 6112D                       | 35240            | 10/28/2015       | 10/27/2016      |
| Horn Antenna         | ETS-Lindgren    | 3117                            | 143272           | 12/16/2015       | 12/15/2016      |
| Horn Antenna         | Schwarzbeck     | BBHA9170                        | 185              | 07/24/2015       | 07/23/2016      |
| Pre Amplifier        | EMC Instruments | EMC330                          | 980096           | 12/12/2015       | 12/11/2016      |
| Pre Amplifier        | EMC Instruments | EMC0011830                      | 980199           | 12/12/2015       | 12/11/2016      |
| Pre Amplifier        | EMC Instruments | EMC184045B                      | 980135           | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | RG 214/U                        | 966Rx 9K-30M     | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | RG<br>214/U+SUCOFLE<br>X 104    | 966Rx 30M-3G     | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | SUCOFLEX 104                    | 966Rx 1G-18G     | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | SUCOFLEX 104                    | 966Tx<br>30M-18G | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | SUCOFLEX 102                    | 966Tx<br>18G-40G | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | mini<br>141-12+SUCOFL<br>EX 104 | 966Rx<br>18G-40G | 12/12/2015       | 12/11/2016      |
| Attenuator           | WOKEN           | 218FS-10                        | RF27             | 12/12/2015       | 12/11/2016      |
| Site NSA             | SGS             | 966 Chamber C                   | SAC-C            | 03/04/2015       | 03/03/2016      |
| Site VSWR            | SGS             | 966 Chamber C                   | SAC-C            | 03/04/2015       | 03/03/2016      |
| Controller           | MF              | MF-7802                         | N/A              | N.C.R.           | N.C.R.          |
| Antenna Master       | MF              | N/A                             | N/A              | N.C.R.           | N.C.R.          |
| Turn Table           | MF              | N/A                             | N/A              | N.C.R.           | N.C.R.          |
| Test Software        | World-Pallas    | Dr. E                           | V 3.0 Lite       | N.C.R.           | N.C.R.          |
| Communication Tester | Anritsu         | MT8820C                         | 6201107337       | 05/27/2015       | 05/26/2016      |

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## 7.5. Measurement Result: (Peak) –using option of peak measurement

| EUT            |                       |    | Measurement  |             |              |            |     |       |
|----------------|-----------------------|----|--------------|-------------|--------------|------------|-----|-------|
| Operation Band | Fundamental Frequency | CH | Antenna Pol. | S.G. Output | Antenna Gain | Cable Loss | ERP | Limit |

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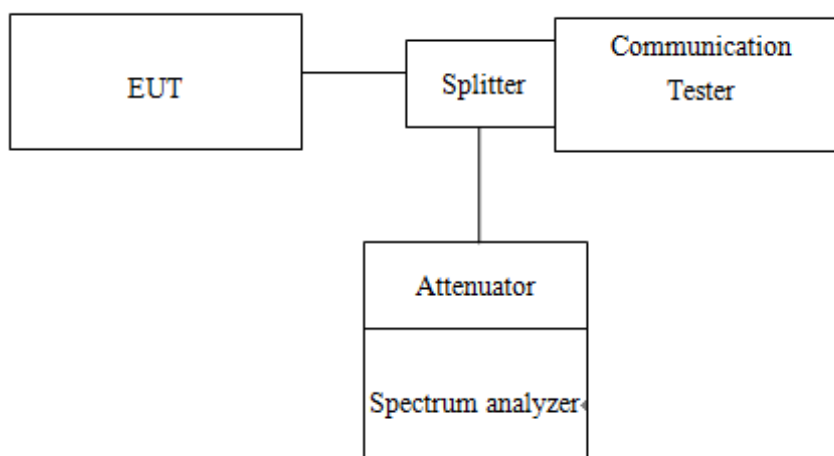
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## 8. OCCUPIED BANDWIDTH MEASUREMENT

### 8.1. Standard Applicable

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

### 8.2. Test Set-up



### 8.3. Measurement Procedure

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 \* Signal BW, set % Power = 99%.

**NOTE: For the plot of bandwidth measurement, the marker of the 99% bandwidth is diamond-shape while the marker of the 26dB BW is arrow-mark**

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#### 8.4. Measurement Equipment Used

| Conducted Emission Test Site |           |                    |               |            |            |
|------------------------------|-----------|--------------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER       | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer            | KEYSIGHT  | N9010A             | MY54510568    | 04/14/2015 | 04/13/2016 |
| Power Meter                  | Anritsu   | ML2496A            | 1326001       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315048       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315049       | 06/23/2015 | 06/22/2016 |
| Coaxial Cable 30cm           | WOKEN     | 00100A1F1A1<br>95C | RF01          | 12/12/2015 | 12/11/2016 |
| DC Block                     | PASTERNAK | PE8210             | RF29          | 12/12/2015 | 12/11/2016 |
| Splitter                     | RF-LAMBDA | RFLT2W1G18<br>G    | RF35          | 12/12/2015 | 12/11/2016 |
| Attenuator                   | WOKEN     | 218FS-10           | RF23          | 12/12/2015 | 12/11/2016 |
| Temperature Chamber          | TERCHY    | MHK-120LK          | 1020582       | 06/23/2015 | 06/22/2016 |
| Communication Tester         | Anritsu   | MT8820C            | 6201107337    | 05/27/2015 | 05/26/2016 |

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## 8.5. Measurement Result

### 99% Bandwidth

| Frequency<br>(MHz) | CH  | 99% Bandwidth<br>(kHz) |
|--------------------|-----|------------------------|
|                    |     | GPRS 850               |
| 824.20             | 128 | <b>248.48</b>          |
| 836.60             | 190 | 246.71                 |
| 848.80             | 251 | 246.66                 |

| Frequency<br>(MHz) | CH  | 99% Bandwidth<br>(kHz) |
|--------------------|-----|------------------------|
|                    |     | GPRS 1900              |
| 1850.20            | 512 | 244.64                 |
| 1880.00            | 661 | <b>249.72</b>          |
| 1909.80            | 810 | 245.66                 |

### 26dB Bandwidth

| Frequency<br>(MHz) | CH  | 26dB Bandwidth<br>(kHz) |
|--------------------|-----|-------------------------|
|                    |     | GPRS 850                |
| 824.20             | 128 | 316.30                  |
| 836.60             | 190 | <b>320.50</b>           |
| 848.80             | 251 | 320.40                  |

| Frequency<br>(MHz) | CH  | 26dB Bandwidth<br>(kHz) |
|--------------------|-----|-------------------------|
|                    |     | GPRS 1900               |
| 1850.20            | 512 | 311.30                  |
| 1880.00            | 661 | <b>320.60</b>           |
| 1909.80            | 810 | 306.10                  |

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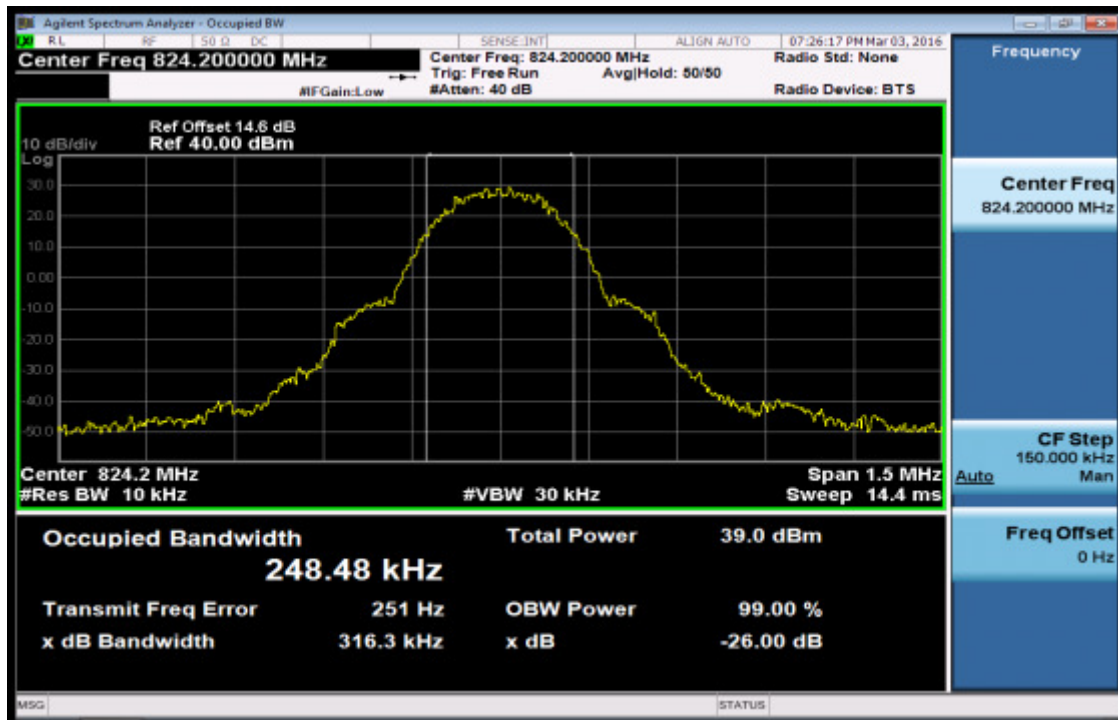
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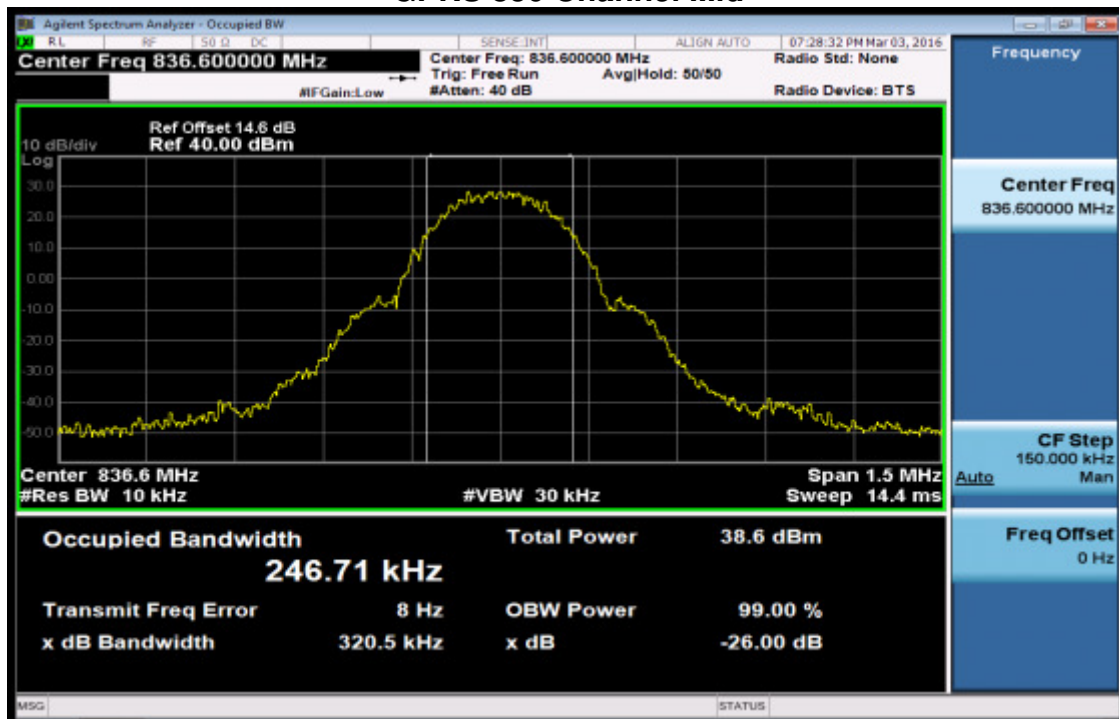
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## 99% Bandwidth Test Data

### GPRS 850 Channel Low



### GPRS 850 Channel Mid



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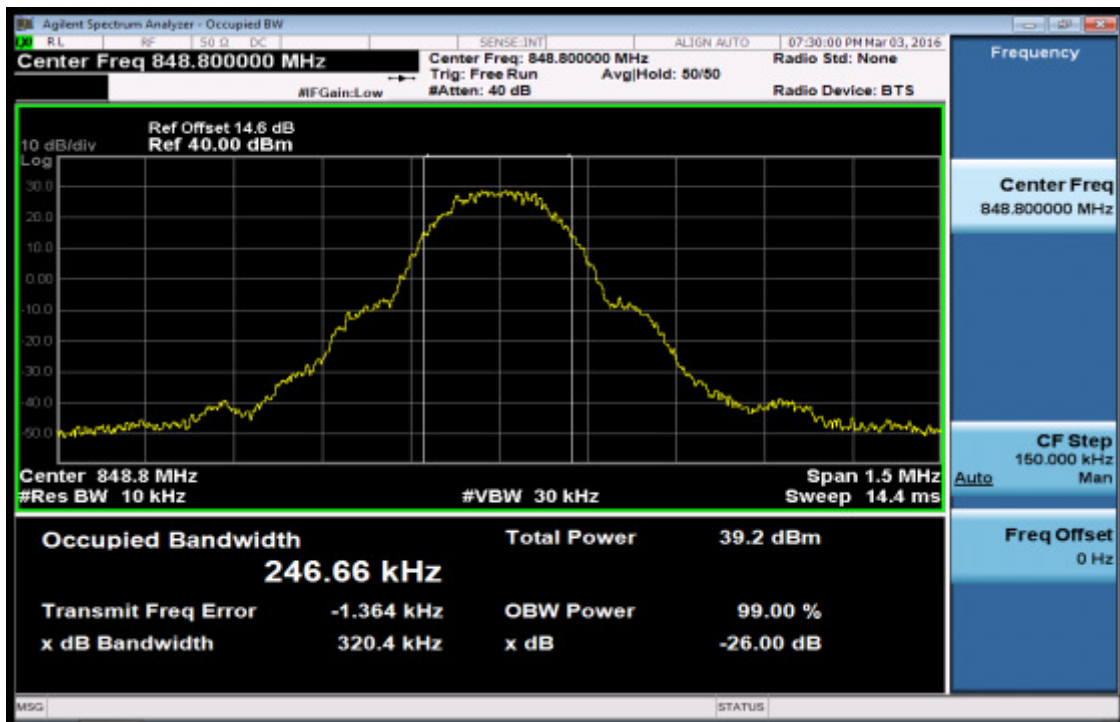
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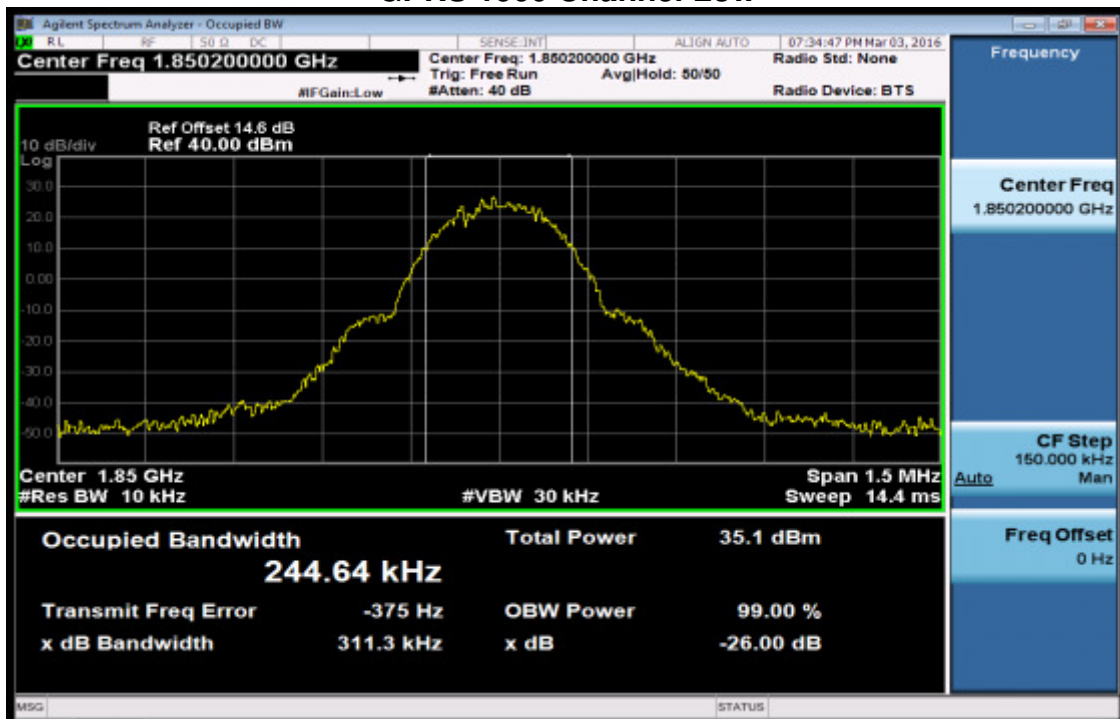
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## GPRS 850 Channel High



## GPRS 1900 Channel Low



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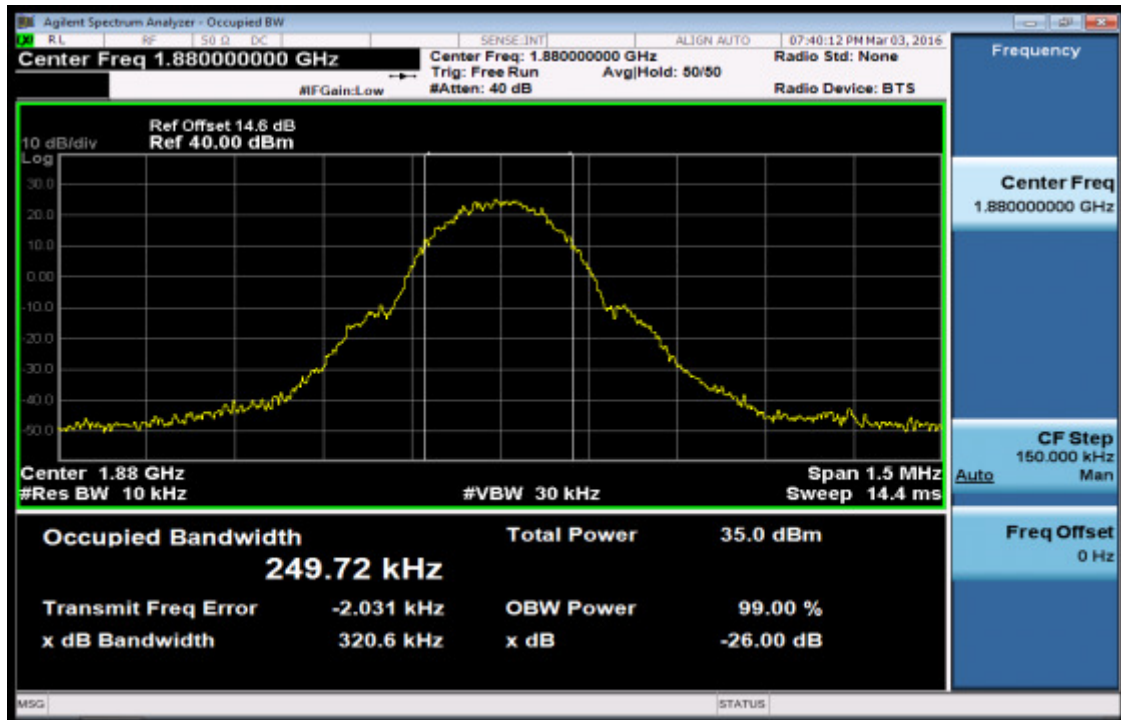
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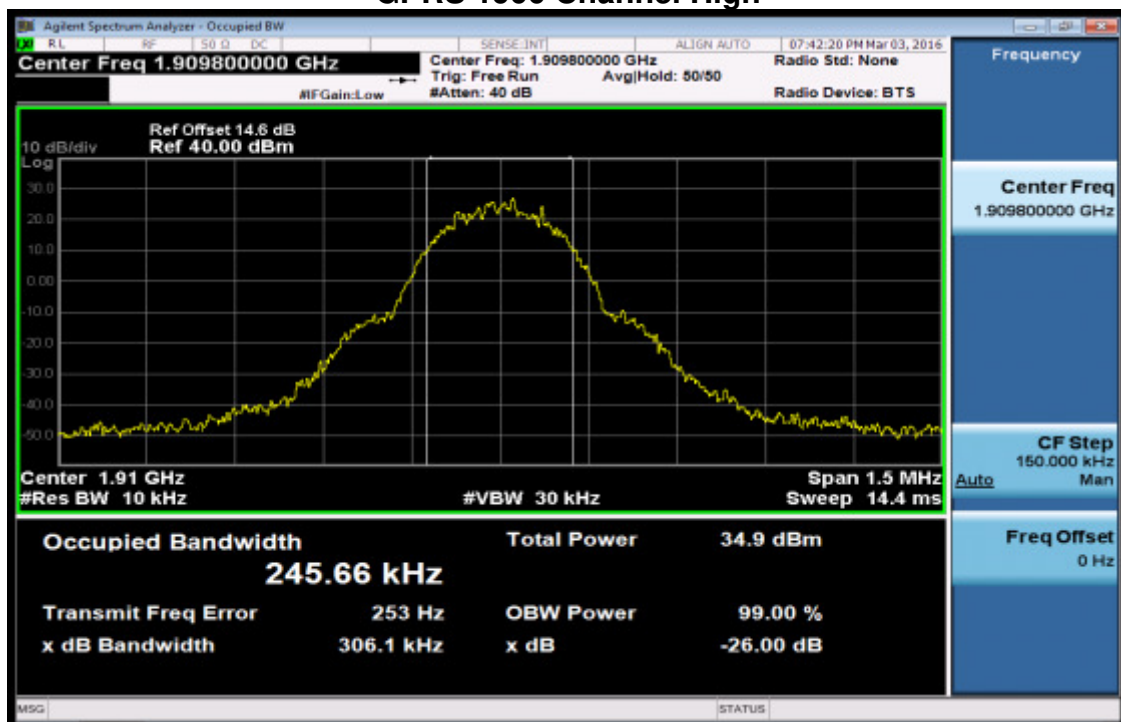
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### GPRS 1900 Channel Mid



### GPRS 1900 Channel High



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## 9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

### 9.1. Standard Applicable

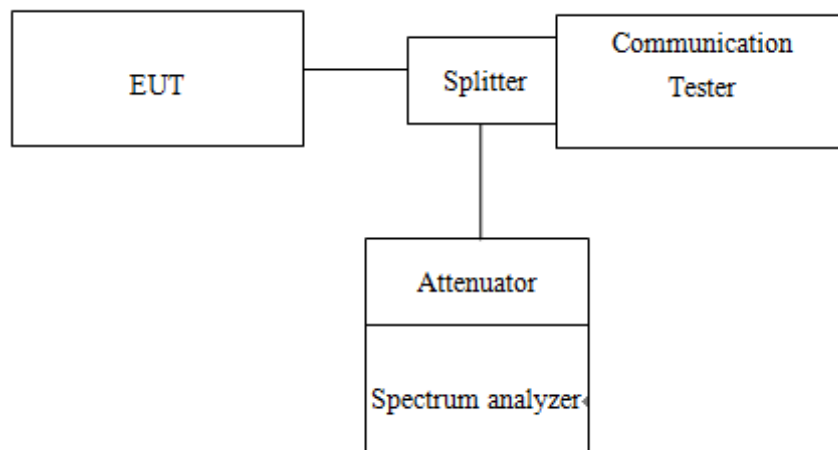
FCC §22.917(a), §24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than  $43 + 10 \log$  (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

#### Band Edge Measurement:

FCC §27.53(h)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

### 9.2. Test SET-UP



### 9.3. Measurement Procedure

#### Conducted Emission

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.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.

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3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

### Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting RBW  $\geq$  1% EBW.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

## 9.4. Measurement Equipment Used

| Conducted Emission Test Site |           |                |               |            |            |
|------------------------------|-----------|----------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER   | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer            | KEYSIGHT  | N9010A         | MY54510568    | 04/14/2015 | 04/13/2016 |
| Power Meter                  | Anritsu   | ML2496A        | 1326001       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B        | 1315048       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B        | 1315049       | 06/23/2015 | 06/22/2016 |
| Coaxial Cable 30cm           | WOKEN     | 00100A1F1A195C | RF01          | 12/12/2015 | 12/11/2016 |
| DC Block                     | PASTERNAK | PE8210         | RF29          | 12/12/2015 | 12/11/2016 |
| Splitter                     | RF-LAMBDA | RFLT2W1G18G    | RF35          | 12/12/2015 | 12/11/2016 |
| Attenuator                   | WOKEN     | 218FS-10       | RF23          | 12/12/2015 | 12/11/2016 |
| Temperature Chamber          | TERCHY    | MHK-120LK      | 1020582       | 06/23/2015 | 06/22/2016 |
| Communication Tester         | Anritsu   | MT8820C        | 6201107337    | 05/27/2015 | 05/26/2016 |

## 9.5. Measurement Result:

Refer to next pages.

**NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.**

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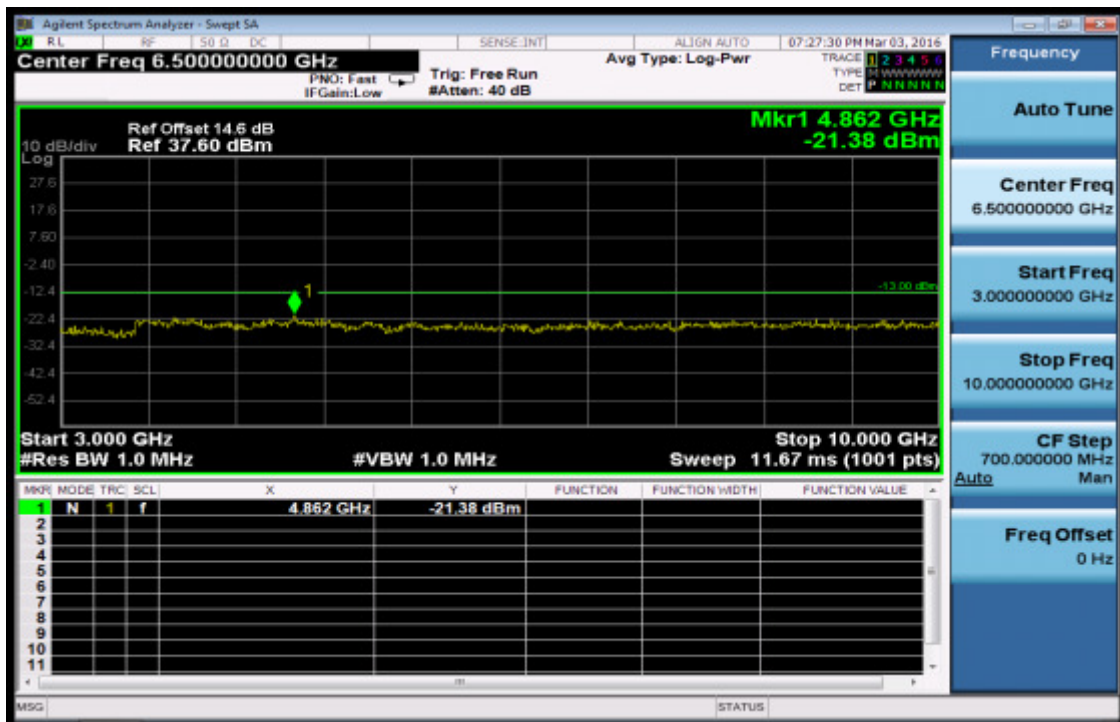
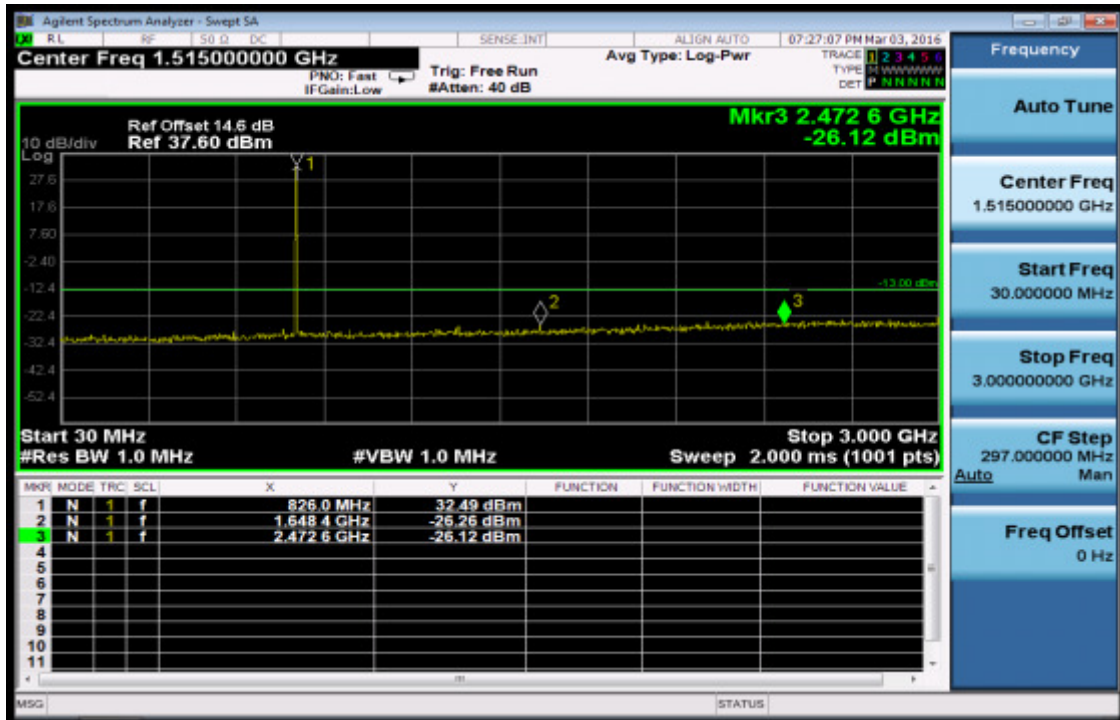
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## Out of Band emission at antenna terminals – GPRS 850 Channel Lowest



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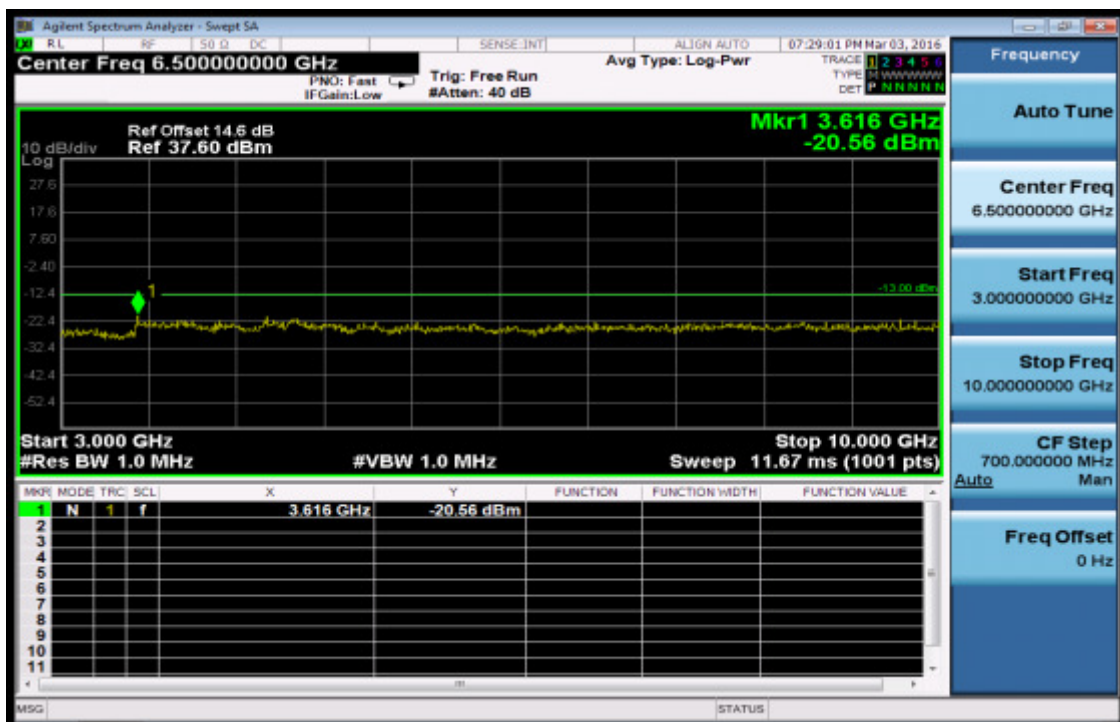
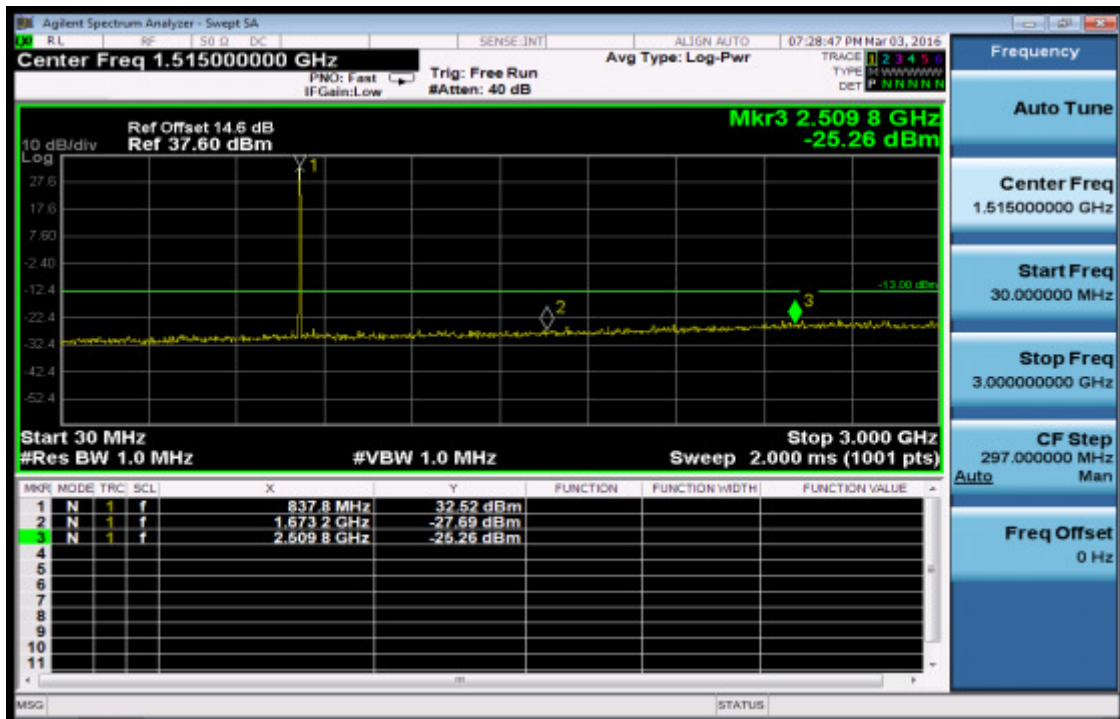
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## Out of Band emission at antenna terminals – GPRS 850 Channel Mid



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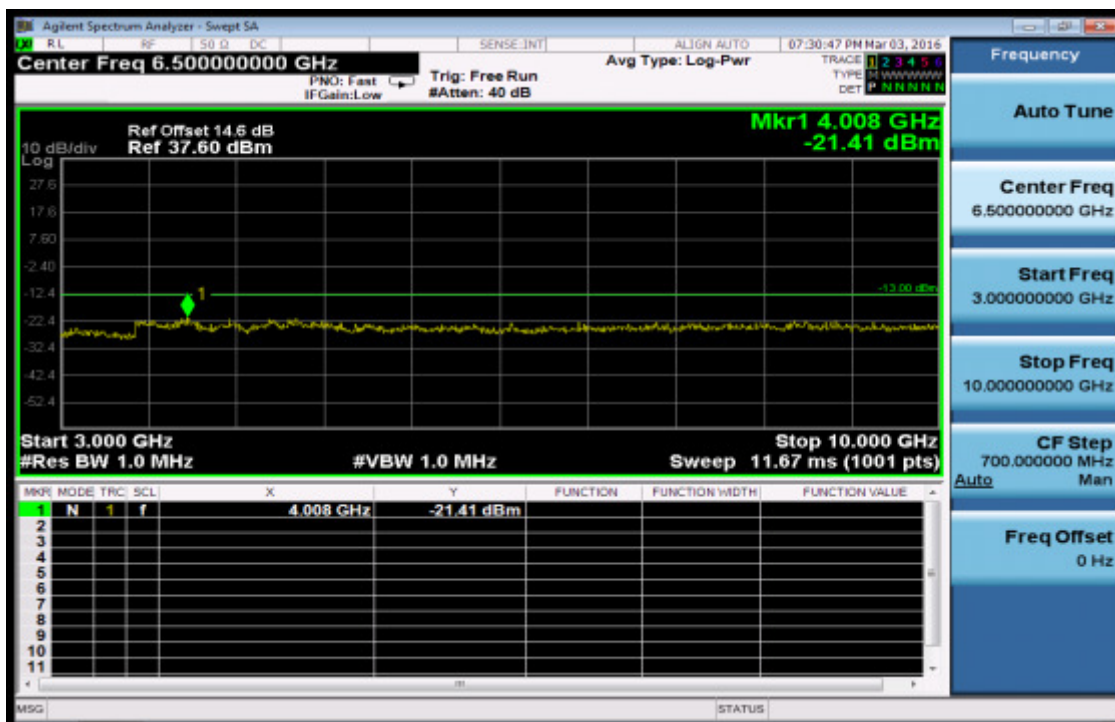
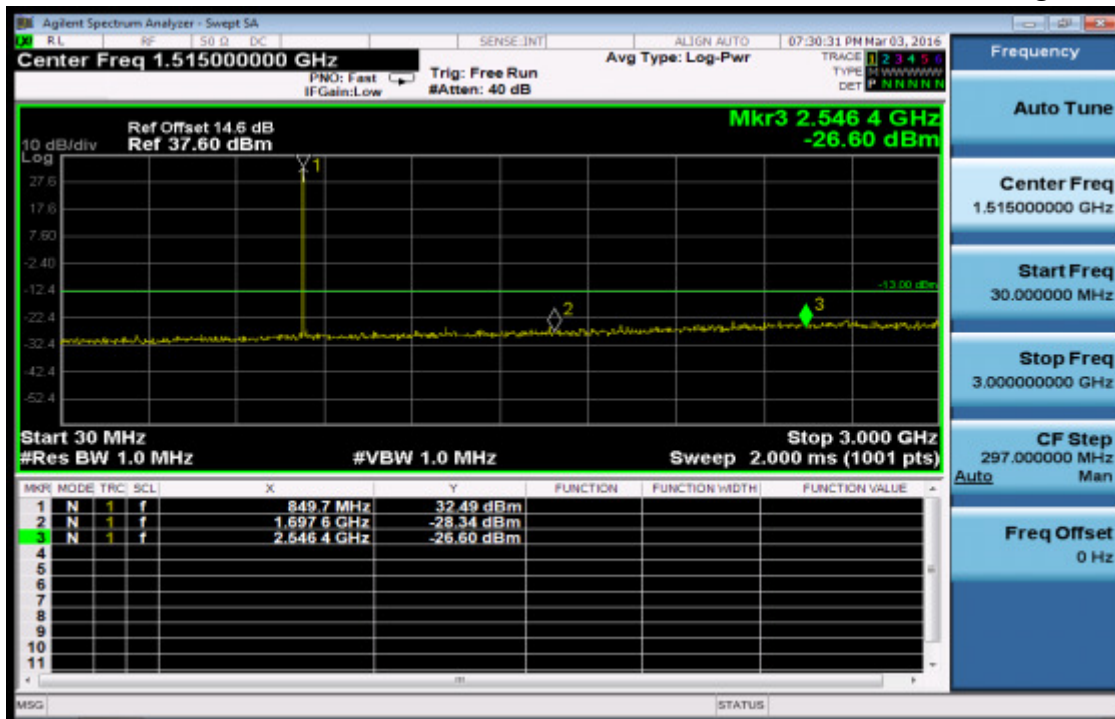
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## Out of Band emission at antenna terminals – GPRS 850 Channel Highest



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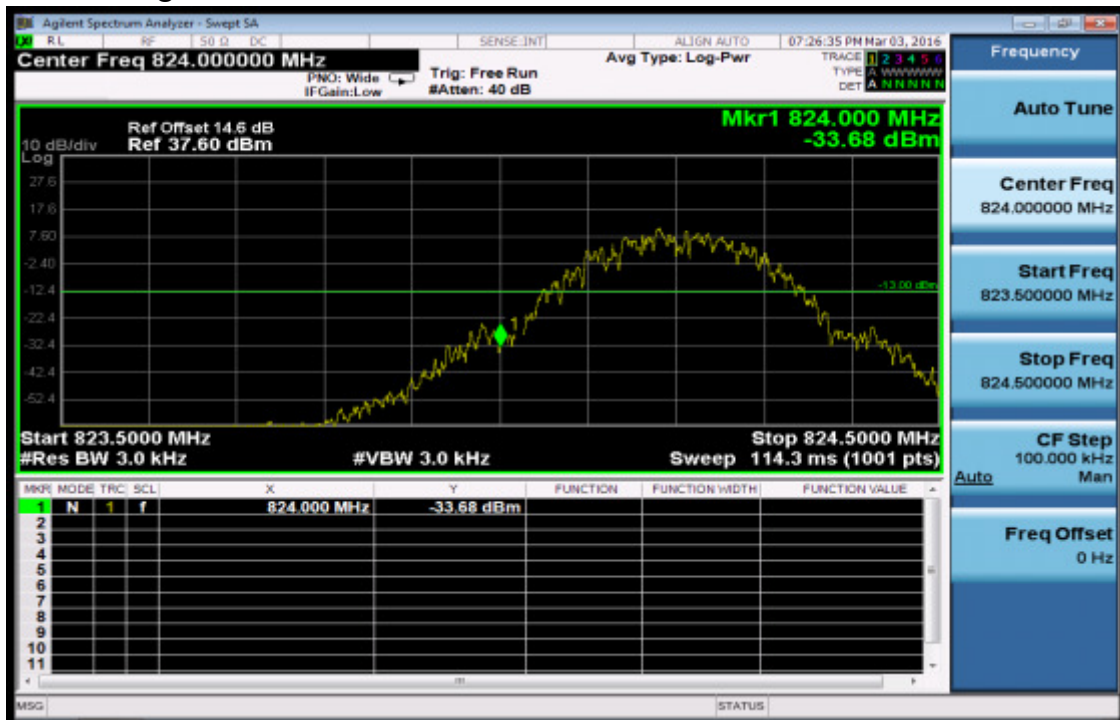
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## Band edge emission at antenna terminals – GPRS 850 Channel Lowest



## Band edge emission at antenna terminals – GPRS 850 Channel Highest



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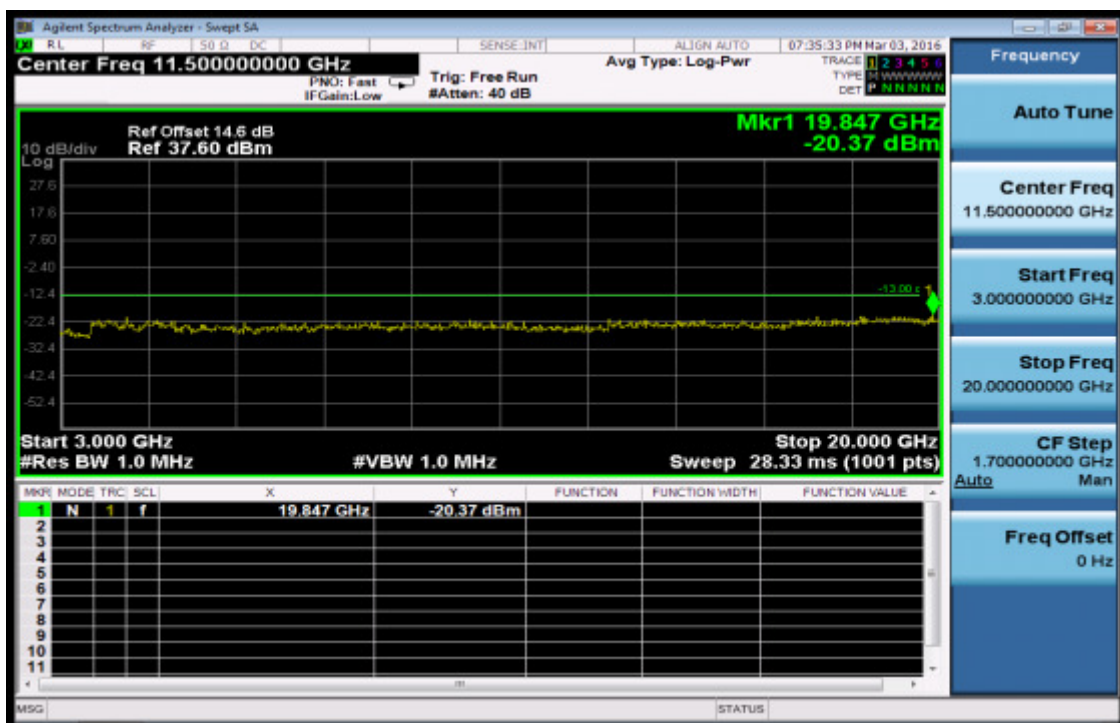
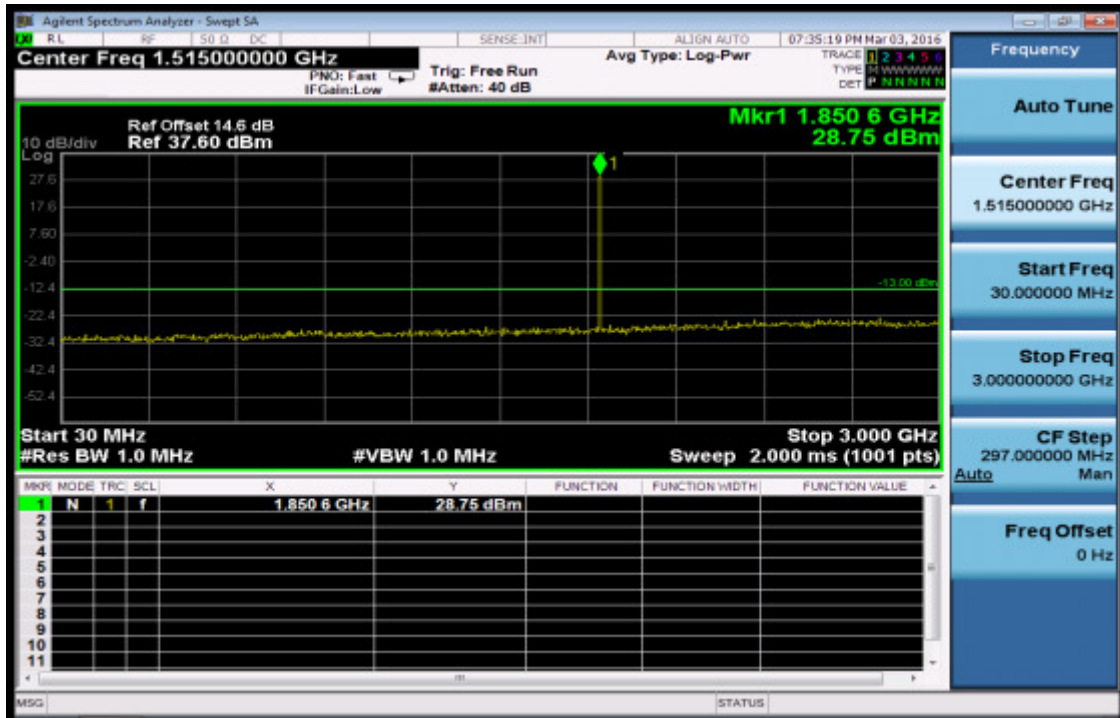
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## Out of Band emission at antenna terminals – GPRS 1900 Channel Lowest



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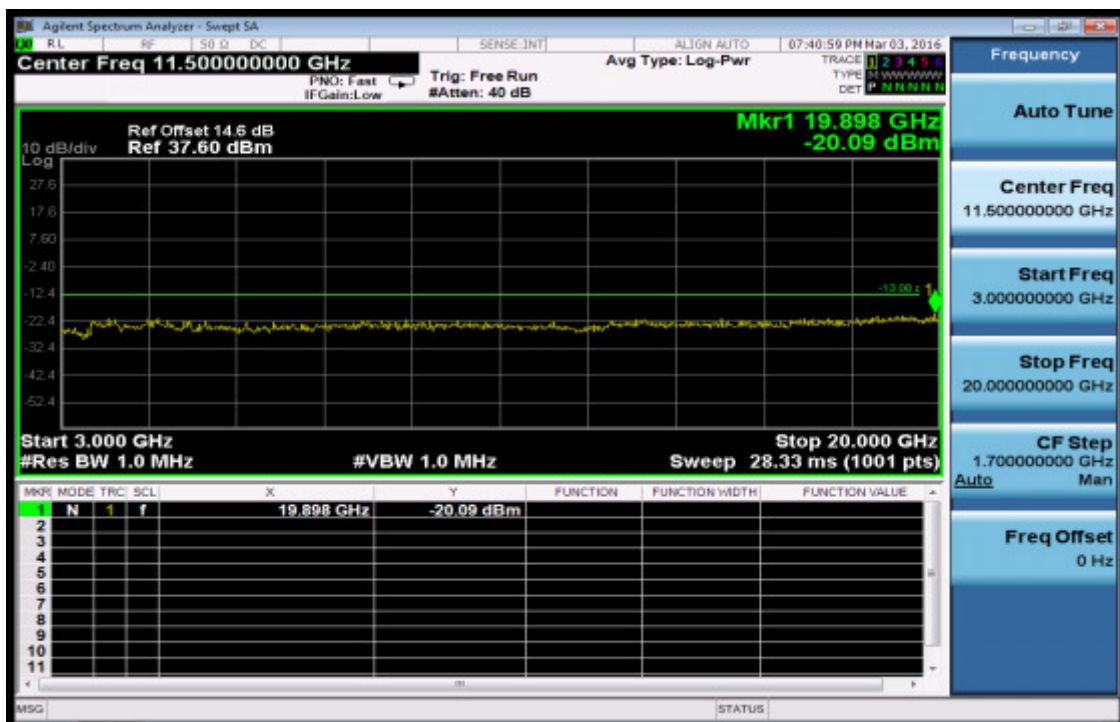
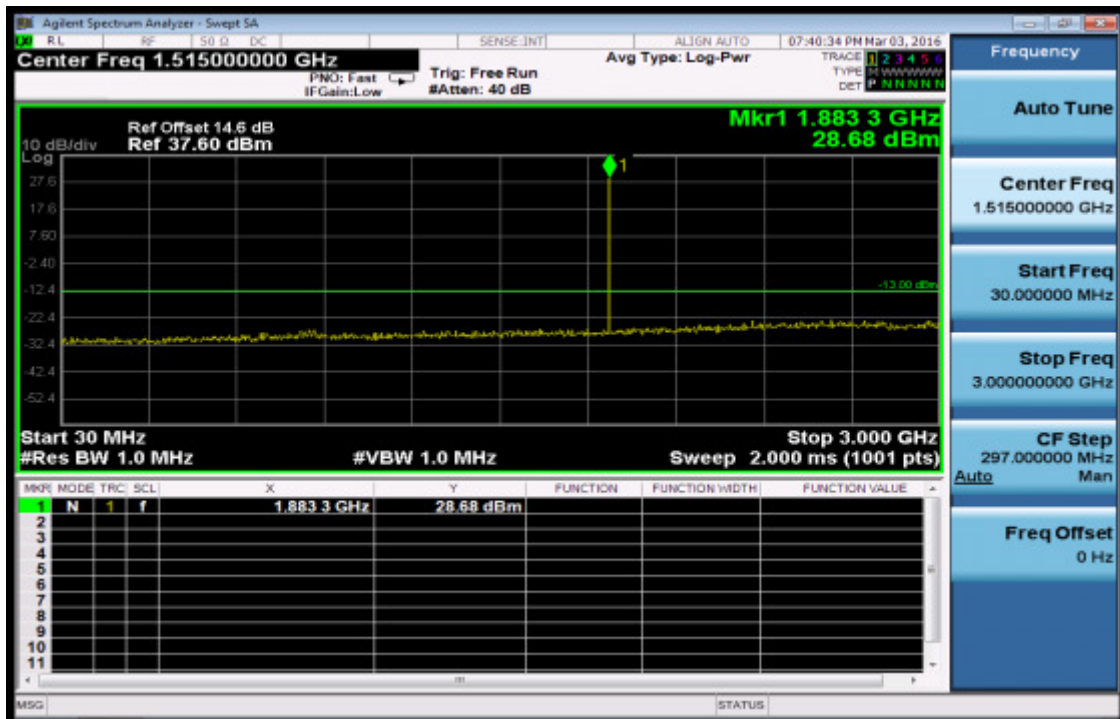
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## Out of Band emission at antenna terminals – GPRS 1900 Channel Mid



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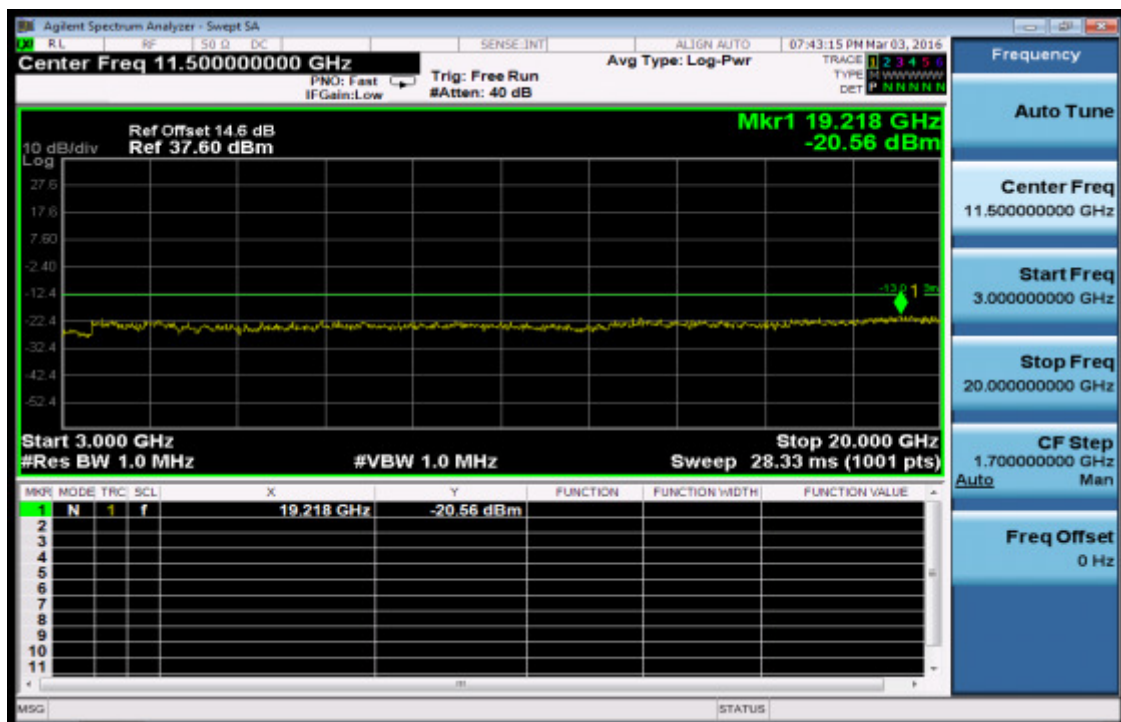
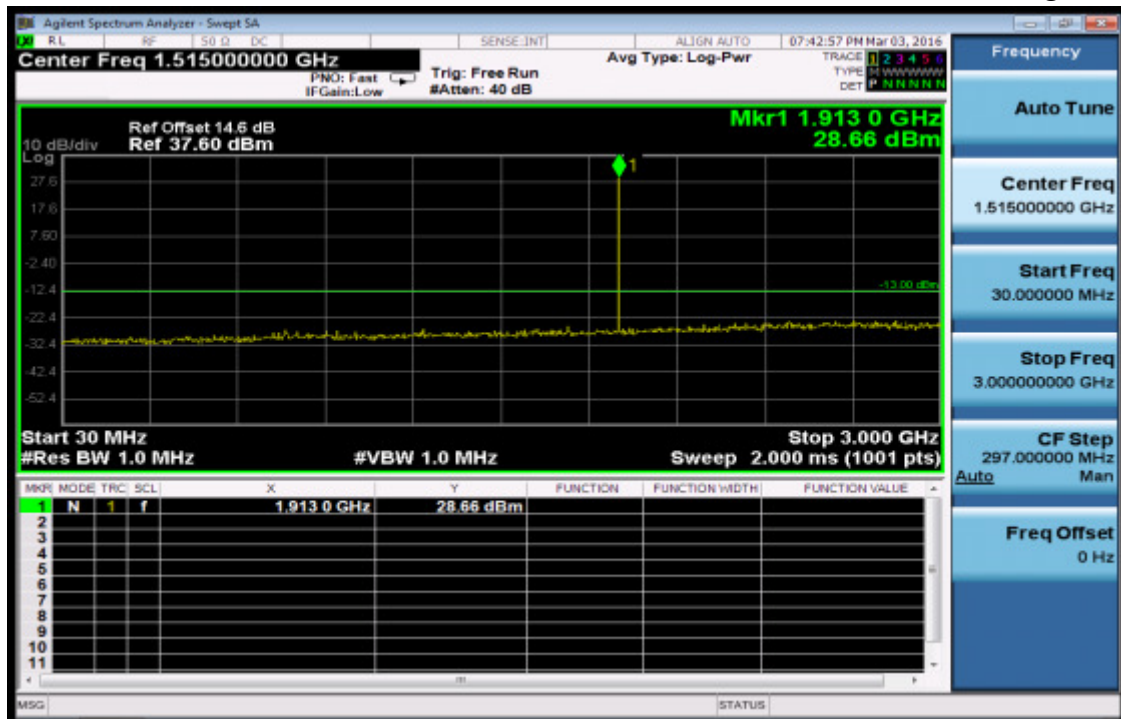
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## Out of Band emission at antenna terminals – GPRS 1900 Channel Highest



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## Band edge emission at antenna terminals – GPRS 1900 Channel Lowest



## Band edge emission at antenna terminals – GPRS 1900 Channel Highest



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## 10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

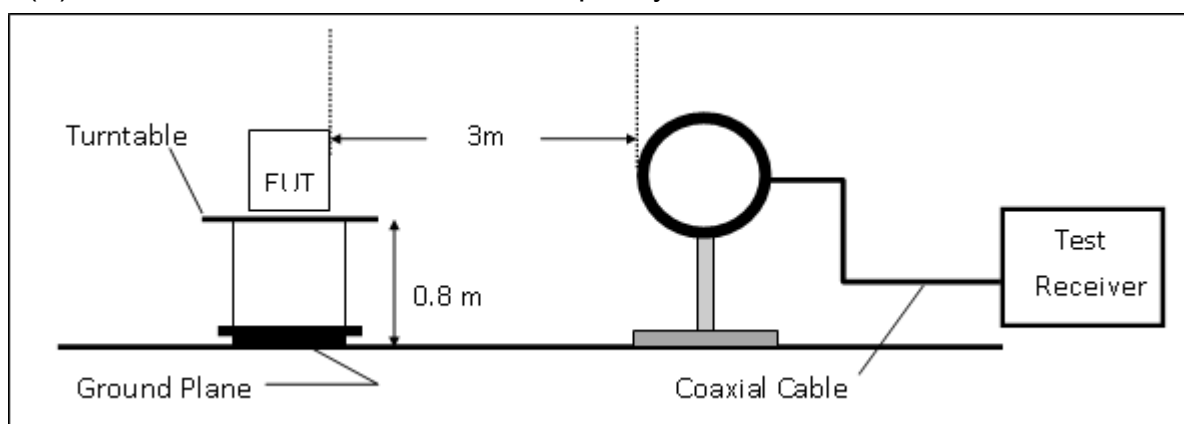
### 10.1. Standard Applicable

According to FCC §2.1053,

FCC §22.917(a) , §24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than  $43 + 10 \log$  (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

### 10.2. EUT Setup

(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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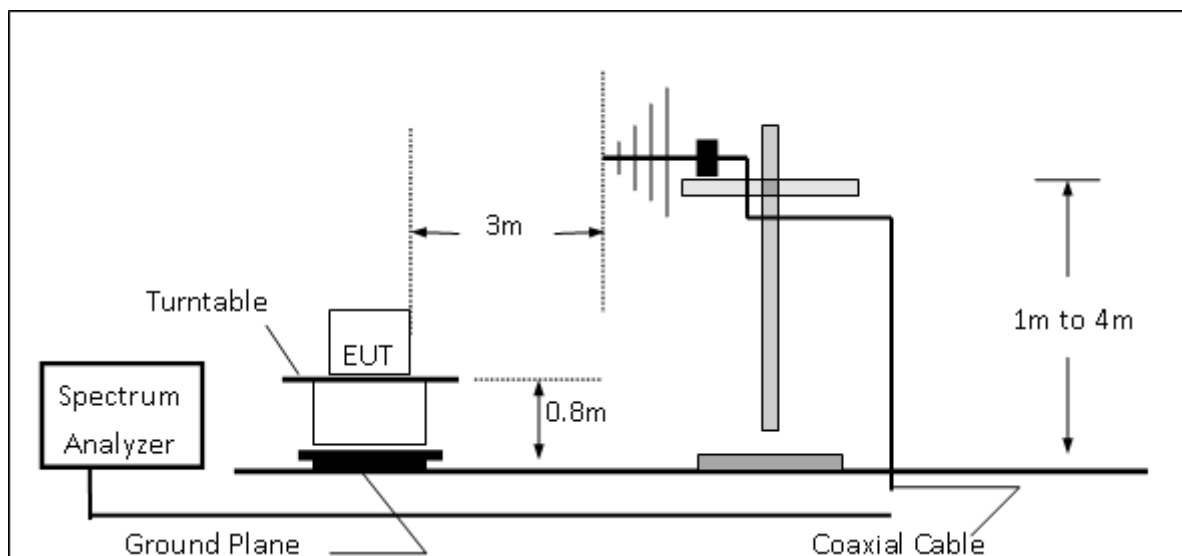
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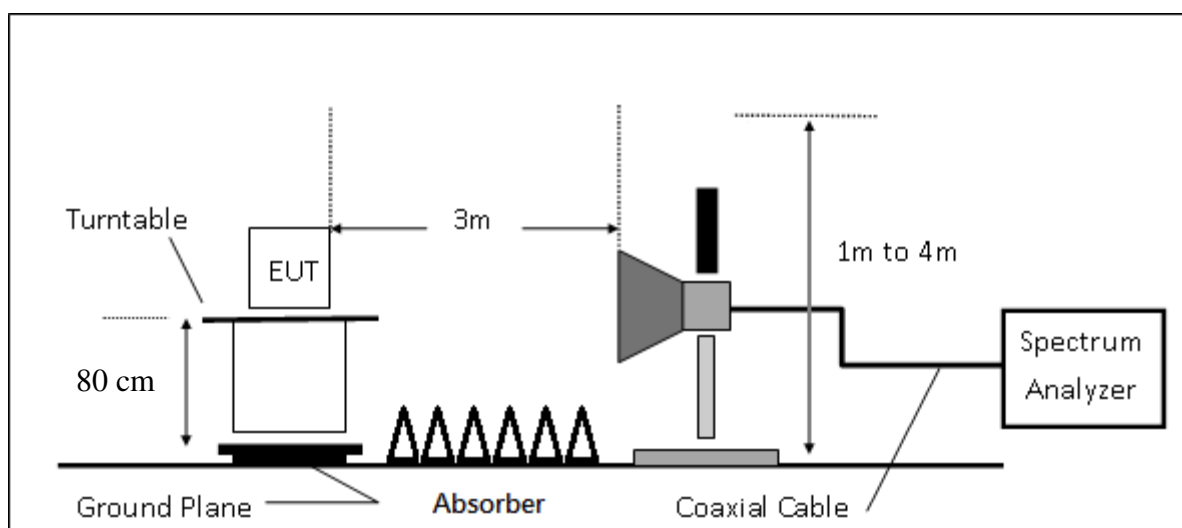
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## (B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



## (C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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### 10.3. Measurement Procedure:

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP= S.G. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB)

EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB)

EIRP (dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

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## 10.4. Measurement Equipment Used:

| SGS 966 Chamber No.C |                 |                                 |               |                  |                 |
|----------------------|-----------------|---------------------------------|---------------|------------------|-----------------|
| Name of Equipment    | Manufacturer    | Model                           | Serial Number | Calibration Date | Calibration Due |
| EMI Test Receiver    | R&S             | ESU 40                          | 100363        | 04/09/2015       | 04/08/2016      |
| Loop Antenna         | ETS-Lindgren    | 6502                            | 143303        | 12/23/2015       | 12/22/2016      |
| Broadband Antenna    | TESEQ           | CBL 6112D                       | 35240         | 10/28/2015       | 10/27/2016      |
| Horn Antenna         | ETS-Lindgren    | 3117                            | 143272        | 12/16/2015       | 12/15/2016      |
| Horn Antenna         | Schwarzbeck     | BBHA9170                        | 185           | 07/24/2015       | 07/23/2016      |
| Pre Amplifier        | EMC Instruments | EMC330                          | 980096        | 12/12/2015       | 12/11/2016      |
| Pre Amplifier        | EMC Instruments | EMC0011830                      | 980199        | 12/12/2015       | 12/11/2016      |
| Pre Amplifier        | EMC Instruments | EMC184045B                      | 980135        | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | RG 214/U                        | 966Rx 9K-30M  | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | RG<br>214/U+SUCOFL<br>EX 104    | 966Rx 30M-3G  | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | SUCOFLEX 104                    | 966Rx 1G-18G  | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | SUCOFLEX 104                    | 966Tx 30M-18G | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | SUCOFLEX 102                    | 966Tx 18G-40G | 12/12/2015       | 12/11/2016      |
| Coaxial Cable        | Huber+Suhner    | mini<br>141-12+SUCOF<br>LEX 104 | 966Rx 18G-40G | 12/12/2015       | 12/11/2016      |
| Attenuator           | WOKEN           | 218FS-10                        | RF27          | 12/12/2015       | 12/11/2016      |
| Site NSA             | SGS             | 966 Chamber C                   | SAC-C         | 03/04/2015       | 03/03/2016      |
| Site VSWR            | SGS             | 966 Chamber C                   | SAC-C         | 03/04/2015       | 03/03/2016      |
| Controller           | MF              | MF-7802                         | N/A           | N.C.R.           | N.C.R.          |
| Antenna Master       | MF              | N/A                             | N/A           | N.C.R.           | N.C.R.          |
| Turn Table           | MF              | N/A                             | N/A           | N.C.R.           | N.C.R.          |
| Test Software        | World-Pallas    | Dr. E                           | V 3.0 Lite    | N.C.R.           | N.C.R.          |
| Communication Tester | Anritsu         | MT8820C                         | 6201107337    | 05/27/2015       | 05/26/2016      |

*Note: N.C.R refers to Not Calibrated Required*

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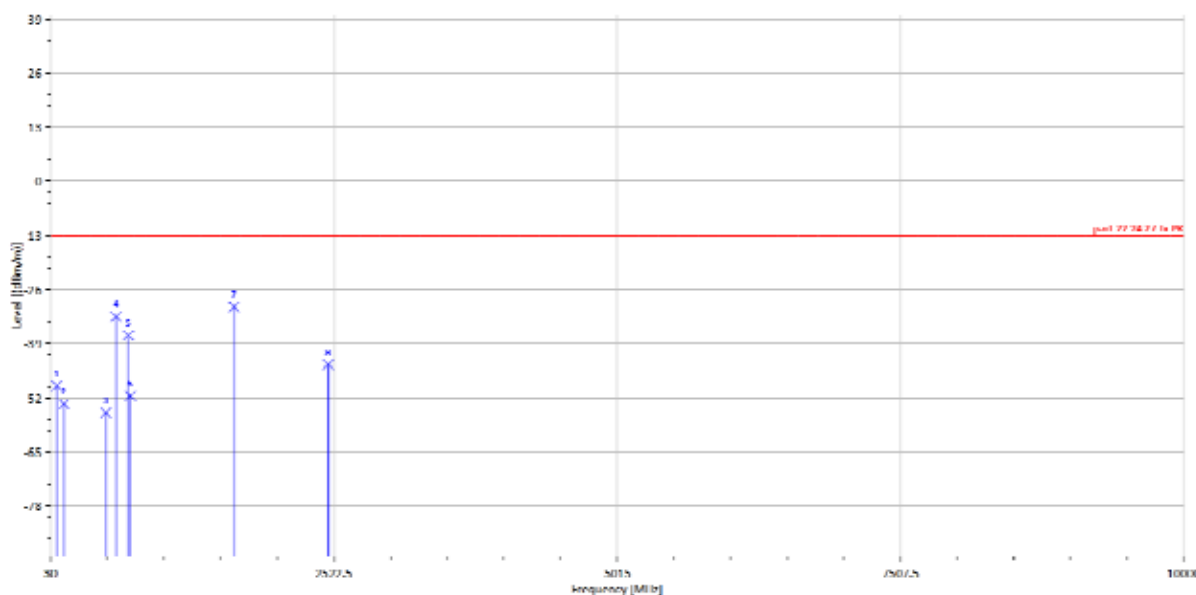
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## 10.5. Measurement Result :

### Radiated Spurious Emission Measurement Result: GPRS 850 Mode

|                         |           |                            |                |
|-------------------------|-----------|----------------------------|----------------|
| Operation Mode :        | GPRS_850  | Test Date :                | 2016/3/2       |
| Fundamental Frequency : | 824.2 MHz | Temp. / Humi. :            | 22.7deg_C/57RH |
| Operation Band :        | Tx CH Low | Test Engineer :            | Pony           |
| EUT Pol. :              | H         | Measurement Antenna Pol. : | Vertical       |



| Freq.   | Note    | ERP    | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBd | Loss<br>dB | dBm    | dB     |
| 83.44   | S       | -49.09 | -46.30              | -1.71       | -1.08      | -13.01 | -36.08 |
| 146.59  | S       | -53.45 | -51.90              | -0.09       | -1.45      | -13.01 | -40.44 |
| 517.43  | S       | -55.53 | -57.27              | 4.25        | -2.50      | -13.01 | -42.52 |
| 604.87  | S       | -32.49 | -34.18              | 4.74        | -3.05      | -13.01 | -19.48 |
| 714.99  | S       | -36.95 | -39.45              | 5.46        | -2.97      | -13.01 | -23.94 |
| 731.19  | S       | -51.50 | -53.79              | 5.46        | -3.17      | -13.01 | -38.49 |
| 1642.74 | H       | -30.13 | -32.15              | 6.74        | -4.71      | -13.01 | -17.12 |
| 2472.45 | H       | -43.92 | -46.31              | 8.23        | -5.84      | -13.01 | -30.91 |

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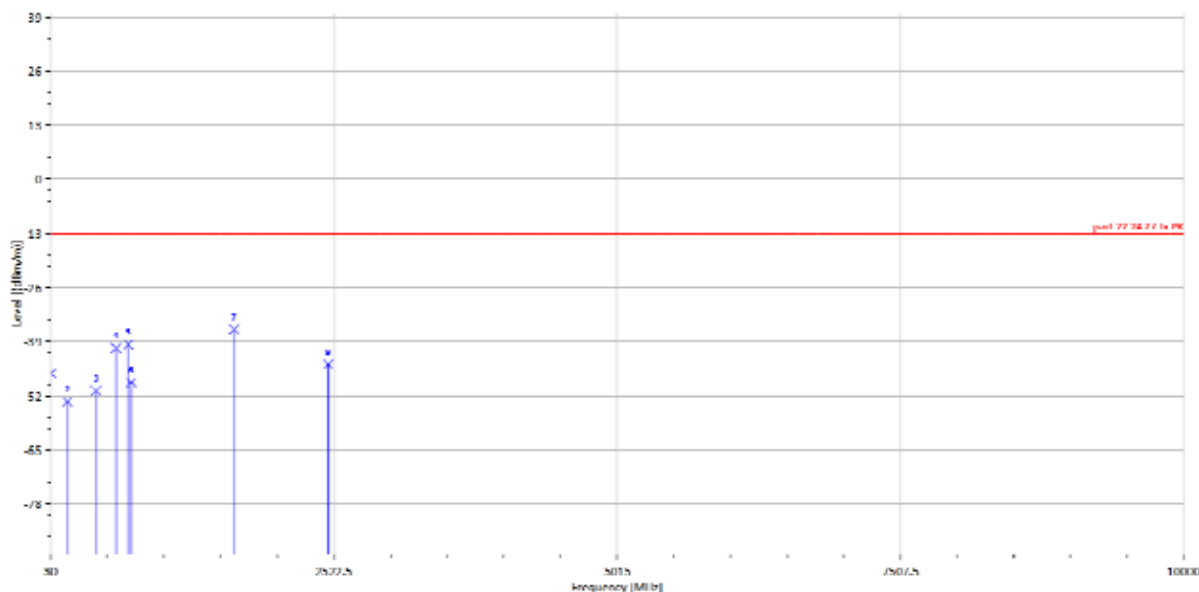
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Operation Mode : GPRS\_850  
Fundamental Frequency : 824.2 MHz  
Operation Band : Tx CH Low  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Horizontal



| Freq.<br>MHz | Note<br>F/H/E/S | ERP<br>dBm | SG<br>Output Level<br>dBm | Antenna<br>Gain<br>dBd | Cable<br>Loss<br>dB | Limit<br>dBm | Margin<br>dB |
|--------------|-----------------|------------|---------------------------|------------------------|---------------------|--------------|--------------|
| 33.24        | S               | -46.55     | -26.29                    | -19.59                 | -0.68               | -13.01       | -33.54       |
| 178.98       | S               | -53.41     | -55.38                    | 3.46                   | -1.50               | -13.01       | -40.40       |
| 428.36       | S               | -50.74     | -52.16                    | 3.90                   | -2.48               | -13.01       | -37.73       |
| 604.87       | S               | -40.52     | -42.21                    | 4.74                   | -3.05               | -13.01       | -27.51       |
| 714.99       | S               | -39.61     | -42.11                    | 5.46                   | -2.97               | -13.01       | -26.60       |
| 739.28       | S               | -48.80     | -50.88                    | 5.46                   | -3.38               | -13.01       | -35.79       |
| 1642.74      | H               | -35.99     | -38.01                    | 6.74                   | -4.71               | -13.01       | -22.98       |
| 2472.45      | H               | -44.39     | -46.78                    | 8.23                   | -5.84               | -13.01       | -31.38       |

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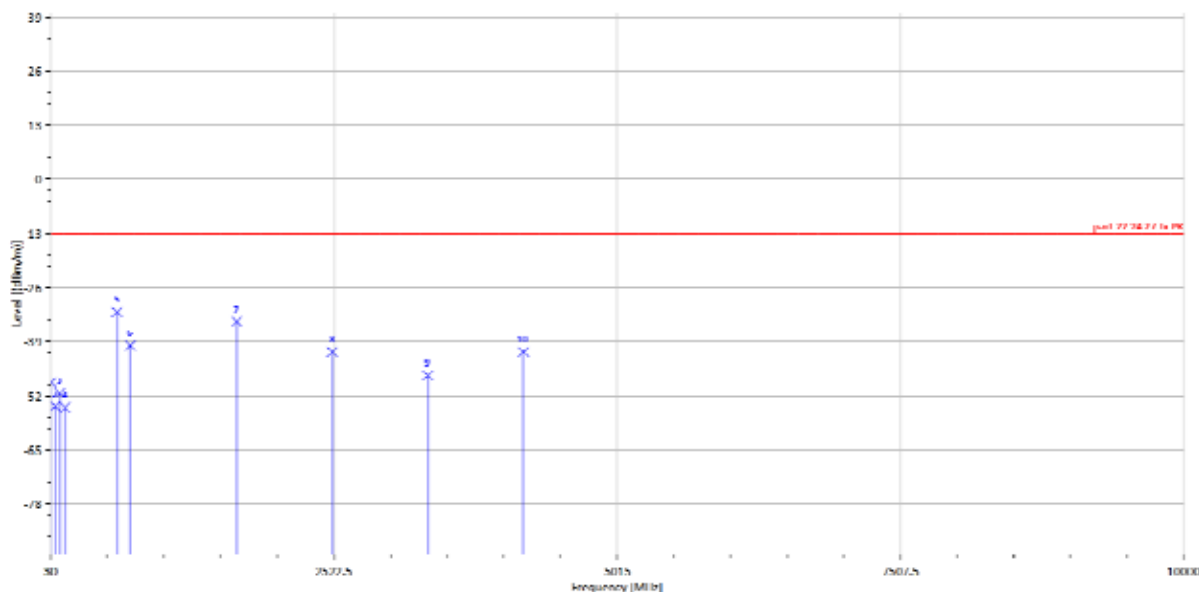
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Operation Mode : GPRS\_850  
Fundamental Frequency : 836.6 MHz  
Operation Band : Tx CH Mid  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Vertical



| Freq.<br>MHz | Note<br>F/H/E/S | ERP<br>dBm | SG<br>Output Level<br>dBm | Antenna<br>Gain<br>dBd | Cable<br>Loss<br>dB | Limit<br>dBm | Margin<br>dB |
|--------------|-----------------|------------|---------------------------|------------------------|---------------------|--------------|--------------|
| 34.86        | S               | -48.77     | -29.88                    | -18.18                 | -0.71               | -13.01       | -35.76       |
| 70.48        | S               | -54.50     | -51.75                    | -1.73                  | -1.02               | -13.01       | -41.49       |
| 109.35       | S               | -51.35     | -46.73                    | -3.39                  | -1.23               | -13.01       | -38.34       |
| 157.93       | S               | -54.83     | -54.54                    | 1.22                   | -1.51               | -13.01       | -41.82       |
| 612.97       | S               | -31.85     | -33.72                    | 4.77                   | -2.90               | -13.01       | -18.84       |
| 731.19       | S               | -39.89     | -42.18                    | 5.46                   | -3.17               | -13.01       | -26.88       |
| 1666.11      | H               | -34.18     | -36.23                    | 6.81                   | -4.76               | -13.01       | -21.17       |
| 2507.51      | H               | -41.40     | -43.77                    | 8.26                   | -5.89               | -13.01       | -28.39       |
| 3348.92      | H               | -47.08     | -50.00                    | 9.85                   | -6.92               | -13.01       | -34.07       |
| 4190.32      | H               | -41.41     | -44.05                    | 10.23                  | -7.59               | -13.01       | -28.40       |

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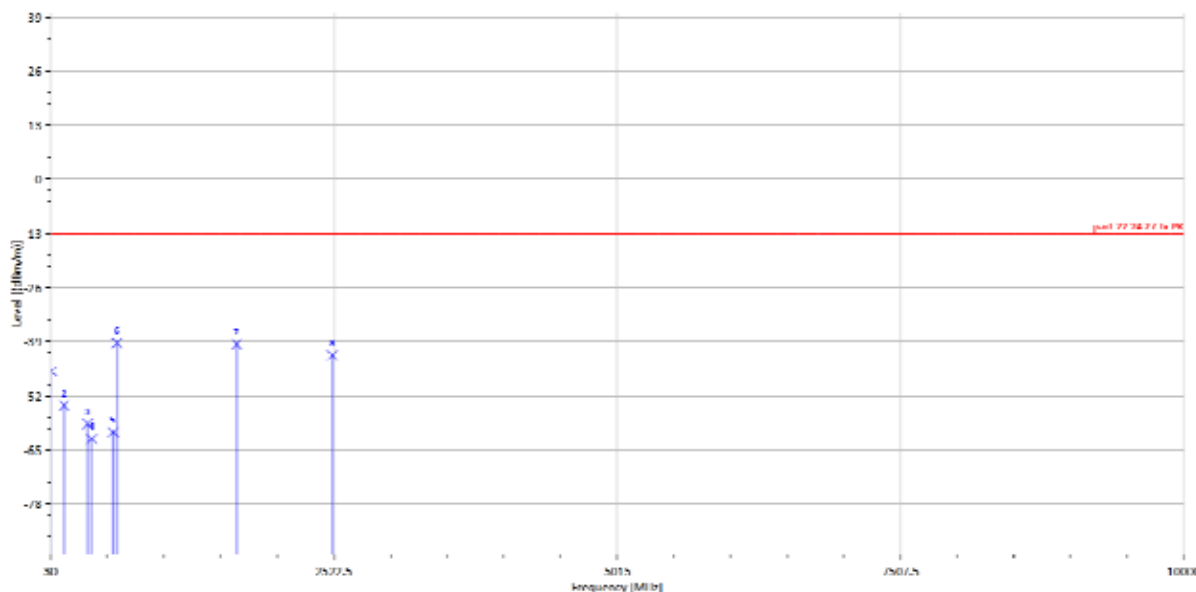
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Operation Mode : GPRS\_850  
Fundamental Frequency : 836.6 MHz  
Operation Band : Tx CH Mid  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Horizontal



| Freq.   | Note    | ERP    | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBd | Loss<br>dB | dBm    | dB     |
| 34.86   | S       | -46.03 | -27.14              | -18.18      | -0.71      | -13.01 | -33.02 |
| 148.21  | S       | -54.31 | -53.04              | 0.13        | -1.41      | -13.01 | -41.30 |
| 355.49  | S       | -58.70 | -60.19              | 3.73        | -2.24      | -13.01 | -45.69 |
| 391.12  | S       | -62.35 | -63.70              | 3.63        | -2.28      | -13.01 | -49.34 |
| 580.58  | S       | -60.68 | -62.53              | 4.55        | -2.69      | -13.01 | -47.67 |
| 612.97  | S       | -39.26 | -41.14              | 4.77        | -2.90      | -13.01 | -26.25 |
| 1666.11 | H       | -39.57 | -41.62              | 6.81        | -4.76      | -13.01 | -26.56 |
| 2507.51 | H       | -42.28 | -44.65              | 8.26        | -5.89      | -13.01 | -29.27 |

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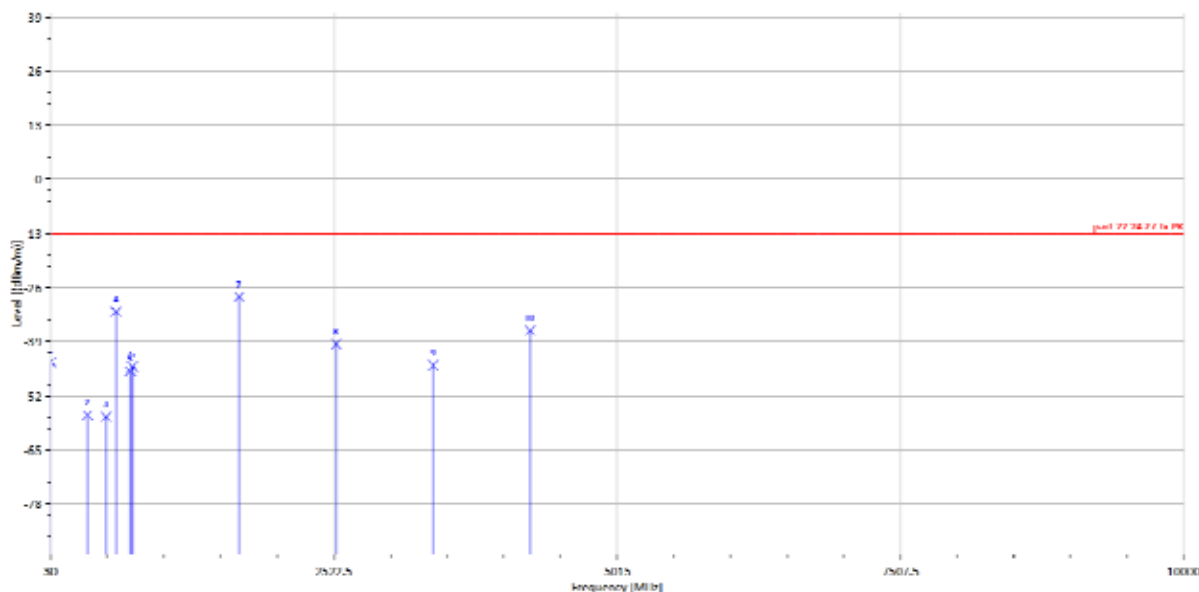
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Operation Mode : GPRS\_850  
Fundamental Frequency : 848.8 MHz  
Operation Band : Tx CH High  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Vertical



| Freq.<br>MHz | Note<br>F/H/E/S | ERP<br>dBm | SG<br>Output Level<br>dBm | Antenna<br>Gain<br>dBd | Cable<br>Loss<br>dB | Limit<br>dBm | Margin<br>dB |
|--------------|-----------------|------------|---------------------------|------------------------|---------------------|--------------|--------------|
| 31.62        | S               | -43.87     | -22.22                    | -20.99                 | -0.66               | -13.01       | -30.86       |
| 355.49       | S               | -56.58     | -58.07                    | 3.73                   | -2.24               | -13.01       | -43.57       |
| 519.05       | S               | -57.03     | -58.50                    | 4.25                   | -2.78               | -13.01       | -44.02       |
| 604.87       | S               | -31.77     | -33.46                    | 4.74                   | -3.05               | -13.01       | -18.76       |
| 731.19       | S               | -46.06     | -48.35                    | 5.46                   | -3.17               | -13.01       | -33.05       |
| 749.00       | S               | -44.95     | -46.99                    | 5.46                   | -3.42               | -13.01       | -31.94       |
| 1689.48      | H               | -28.20     | -30.30                    | 6.89                   | -4.80               | -13.01       | -15.19       |
| 2542.57      | H               | -39.52     | -41.94                    | 8.33                   | -5.91               | -13.01       | -26.51       |
| 3395.66      | H               | -44.66     | -47.68                    | 9.94                   | -6.92               | -13.01       | -31.65       |
| 4248.75      | H               | -36.29     | -38.91                    | 10.25                  | -7.63               | -13.01       | -23.28       |

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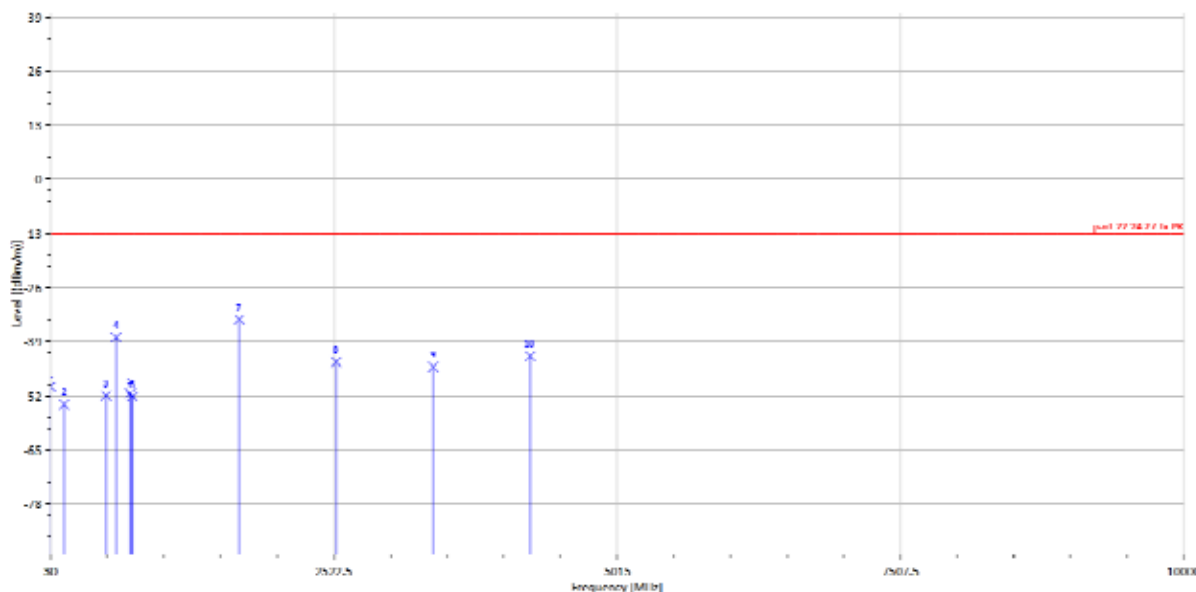
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Operation Mode : GPRS\_850  
Fundamental Frequency : 848.8 MHz  
Operation Band : Tx CH High  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Horizontal



| Freq.   | Note    | ERP    | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBd | Loss<br>dB | dBm    | dB     |
| 31.62   | S       | -49.81 | -28.15              | -20.99      | -0.66      | -13.01 | -36.80 |
| 148.21  | S       | -54.05 | -52.78              | 0.13        | -1.41      | -13.01 | -41.04 |
| 519.05  | S       | -51.92 | -53.39              | 4.25        | -2.78      | -13.01 | -38.91 |
| 604.87  | S       | -37.98 | -39.67              | 4.74        | -3.05      | -13.01 | -24.97 |
| 731.19  | S       | -51.40 | -53.68              | 5.46        | -3.17      | -13.01 | -38.39 |
| 747.38  | S       | -52.21 | -54.54              | 5.46        | -3.13      | -13.01 | -39.20 |
| 1689.48 | H       | -33.69 | -35.79              | 6.89        | -4.80      | -13.01 | -20.68 |
| 2542.57 | H       | -43.84 | -46.26              | 8.33        | -5.91      | -13.01 | -30.83 |
| 3395.66 | H       | -45.04 | -48.06              | 9.94        | -6.92      | -13.01 | -32.03 |
| 4248.75 | H       | -42.43 | -45.05              | 10.25       | -7.63      | -13.01 | -29.42 |

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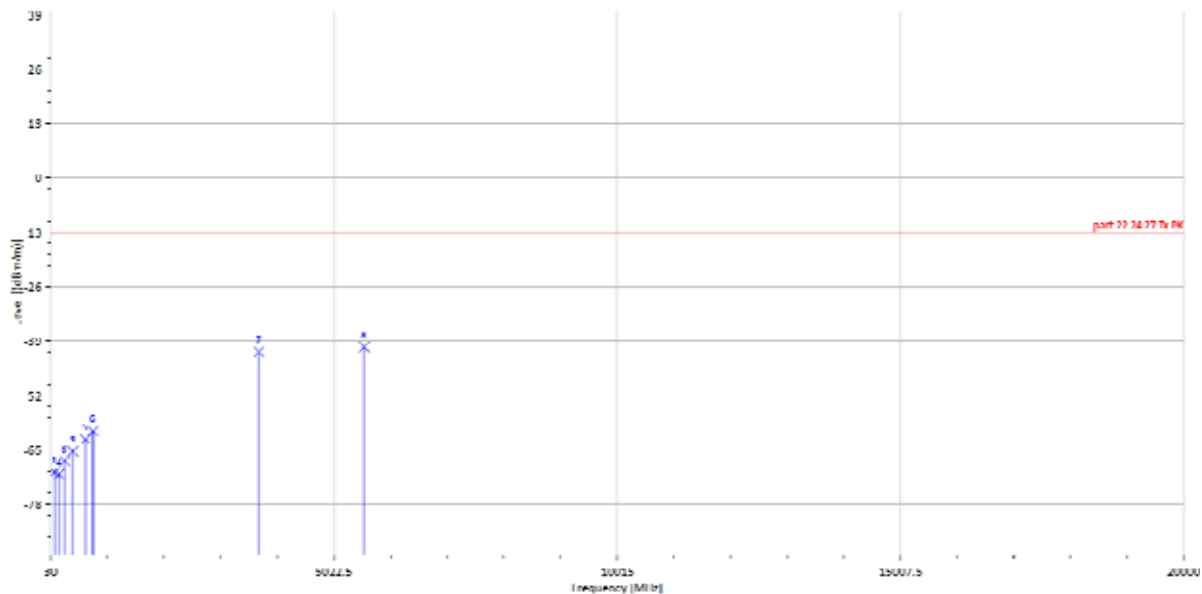
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## Radiated Spurious Emission Measurement Result: GPRS 1900 Mode

|                         |            |                            |                |
|-------------------------|------------|----------------------------|----------------|
| Operation Mode :        | GPRS_1900  | Test Date :                | 2016/3/2       |
| Fundamental Frequency : | 1850.2 MHz | Temp. / Humi. :            | 22.7deg_C/57RH |
| Operation Band :        | Tx CH Low  | Test Engineer :            | Pony           |
| EUT Pol. :              | H          | Measurement Antenna Pol. : | Vertical       |



| Freq.   | Note    | EIRP   | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBi | Loss<br>dB | dBm    | dB     |
| 99.63   | S       | -70.40 | -68.37              | -0.86       | -1.17      | -13.01 | -57.39 |
| 175.74  | S       | -70.76 | -74.44              | 5.29        | -1.61      | -13.01 | -57.75 |
| 277.76  | S       | -67.64 | -71.35              | 5.68        | -1.98      | -13.01 | -54.63 |
| 418.65  | S       | -65.33 | -68.76              | 5.95        | -2.51      | -13.01 | -52.32 |
| 645.36  | S       | -62.49 | -66.53              | 7.05        | -3.02      | -13.01 | -49.48 |
| 774.91  | S       | -60.49 | -65.19              | 7.64        | -2.94      | -13.01 | -47.48 |
| 3699.50 | H       | -41.53 | -46.68              | 12.30       | -7.15      | -13.01 | -28.52 |
| 5557.60 | H       | -40.36 | -44.32              | 12.62       | -8.67      | -13.01 | -27.35 |

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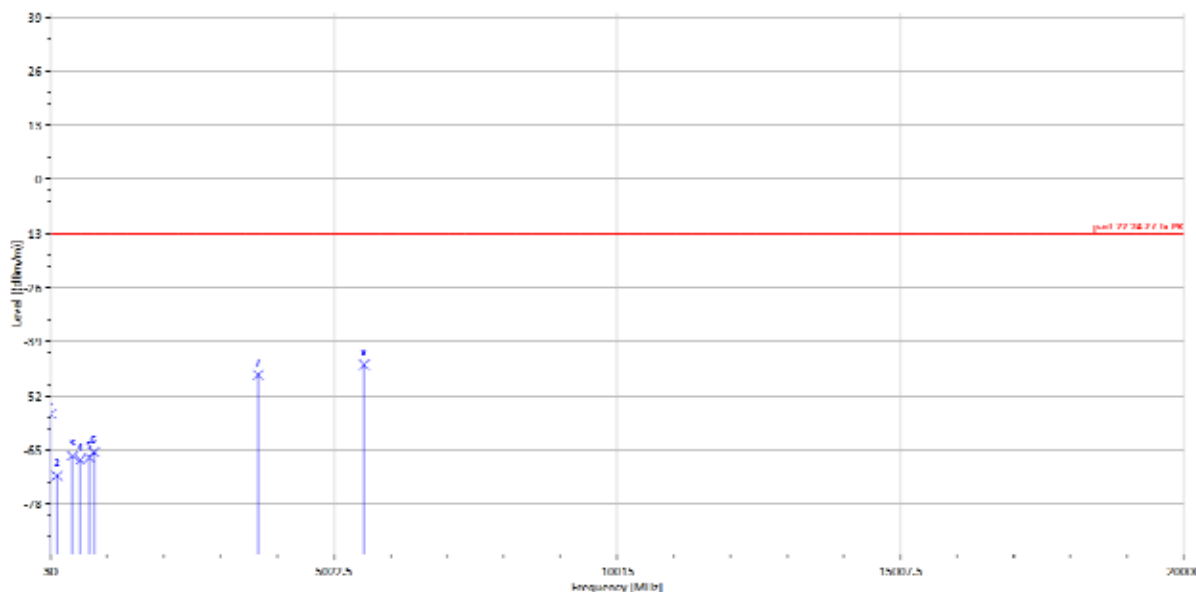
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Operation Mode : GPRS\_1900  
Fundamental Frequency : 1850.2 MHz  
Operation Band : Tx CH Low  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Horizontal



| Freq.<br>MHz | Note<br>F/H/E/S | EIRP<br>dBm | SG<br>Output Level<br>dBm | Antenna<br>Gain<br>dBi | Cable<br>Loss<br>dB | Limit<br>dBm | Margin<br>dB |
|--------------|-----------------|-------------|---------------------------|------------------------|---------------------|--------------|--------------|
| 31.62        | S               | -56.32      | -36.81                    | -18.84                 | -0.66               | -13.01       | -43.31       |
| 141.74       | S               | -71.18      | -71.21                    | 1.38                   | -1.34               | -13.01       | -58.17       |
| 415.41       | S               | -66.37      | -70.00                    | 5.91                   | -2.29               | -13.01       | -53.36       |
| 548.20       | S               | -67.38      | -71.31                    | 6.42                   | -2.49               | -13.01       | -54.37       |
| 716.61       | S               | -66.85      | -71.24                    | 7.61                   | -3.22               | -13.01       | -53.84       |
| 792.72       | S               | -65.49      | -69.88                    | 7.66                   | -3.27               | -13.01       | -52.48       |
| 3687.81      | H               | -46.95      | -52.08                    | 12.30                  | -7.17               | -13.01       | -33.94       |
| 5557.60      | H               | -44.50      | -48.46                    | 12.62                  | -8.67               | -13.01       | -31.49       |

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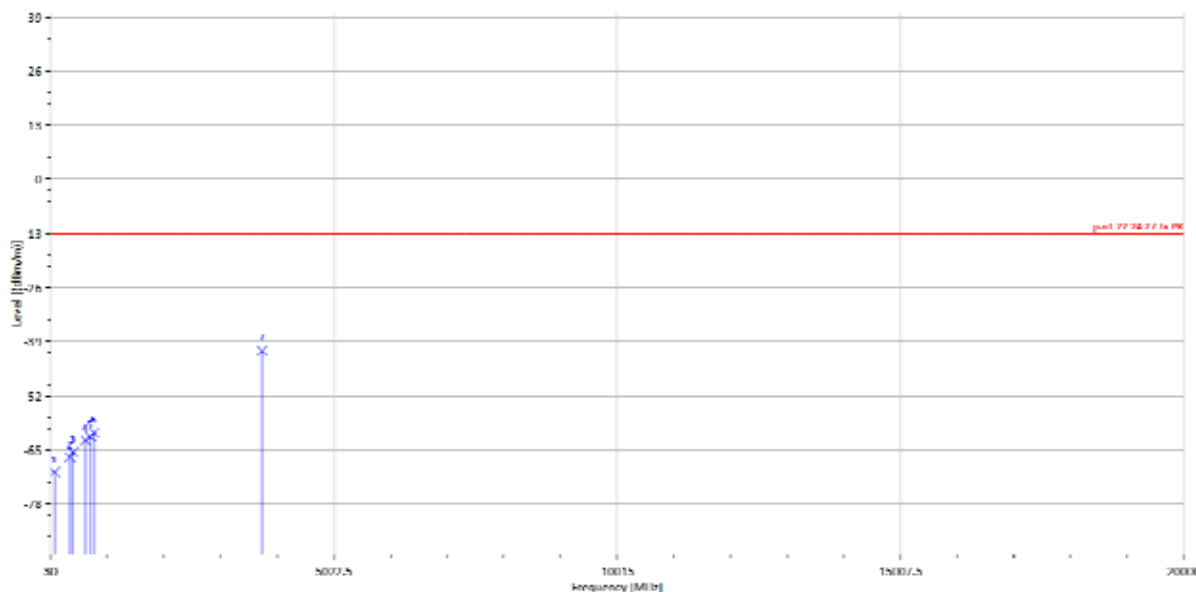
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|                         |            |                            |                |
|-------------------------|------------|----------------------------|----------------|
| Operation Mode :        | GPRS_1900  | Test Date :                | 2016/3/2       |
| Fundamental Frequency : | 1880.0 MHz | Temp. / Humi. :            | 22.7deg_C/57RH |
| Operation Band :        | Tx CH Mid  | Test Engineer :            | Pony           |
| EUT Pol. :              | H          | Measurement Antenna Pol. : | Vertical       |



| Freq.   | Note    | EIRP   | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBi | Loss<br>dB | dBm    | dB     |
| 99.63   | S       | -70.29 | -68.26              | -0.86       | -1.17      | -13.01 | -57.28 |
| 370.07  | S       | -66.71 | -70.33              | 5.84        | -2.22      | -13.01 | -53.70 |
| 421.89  | S       | -65.48 | -69.13              | 5.98        | -2.33      | -13.01 | -52.47 |
| 643.74  | S       | -62.65 | -66.71              | 7.04        | -2.99      | -13.01 | -49.64 |
| 734.42  | S       | -61.83 | -66.42              | 7.61        | -3.03      | -13.01 | -48.82 |
| 791.10  | S       | -60.79 | -65.00              | 7.66        | -3.46      | -13.01 | -47.78 |
| 3757.93 | H       | -41.11 | -46.21              | 12.30       | -7.20      | -13.01 | -28.10 |

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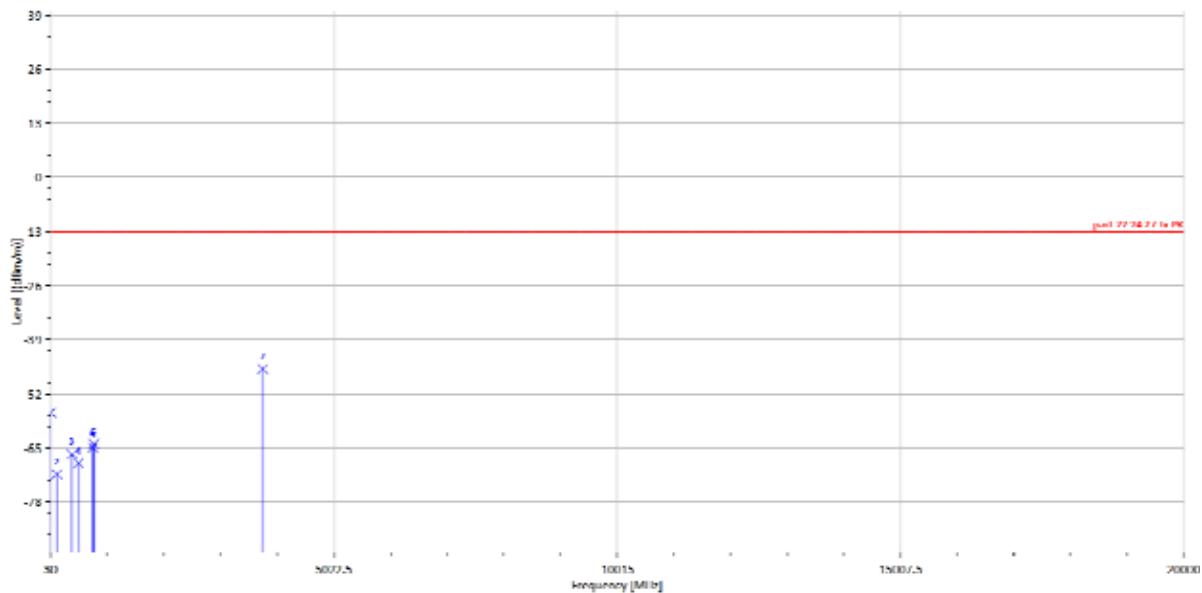
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Operation Mode : GPRS\_1900  
Fundamental Frequency : 1880.0 MHz  
Operation Band : Tx CH Mid  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Horizontal



| Freq.   | Note    | EIRP   | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBi | Loss<br>dB | dBm    | dB     |
| 31.62   | S       | -56.48 | -36.98              | -18.84      | -0.66      | -13.01 | -43.47 |
| 140.12  | S       | -71.28 | -71.04              | 1.15        | -1.39      | -13.01 | -58.27 |
| 407.31  | S       | -66.52 | -69.89              | 5.83        | -2.45      | -13.01 | -53.51 |
| 519.05  | S       | -68.64 | -72.26              | 6.40        | -2.78      | -13.01 | -55.63 |
| 774.91  | S       | -64.88 | -69.58              | 7.64        | -2.94      | -13.01 | -51.87 |
| 792.72  | S       | -64.04 | -68.43              | 7.66        | -3.27      | -13.01 | -51.03 |
| 3769.62 | H       | -45.97 | -51.05              | 12.30       | -7.22      | -13.01 | -32.96 |

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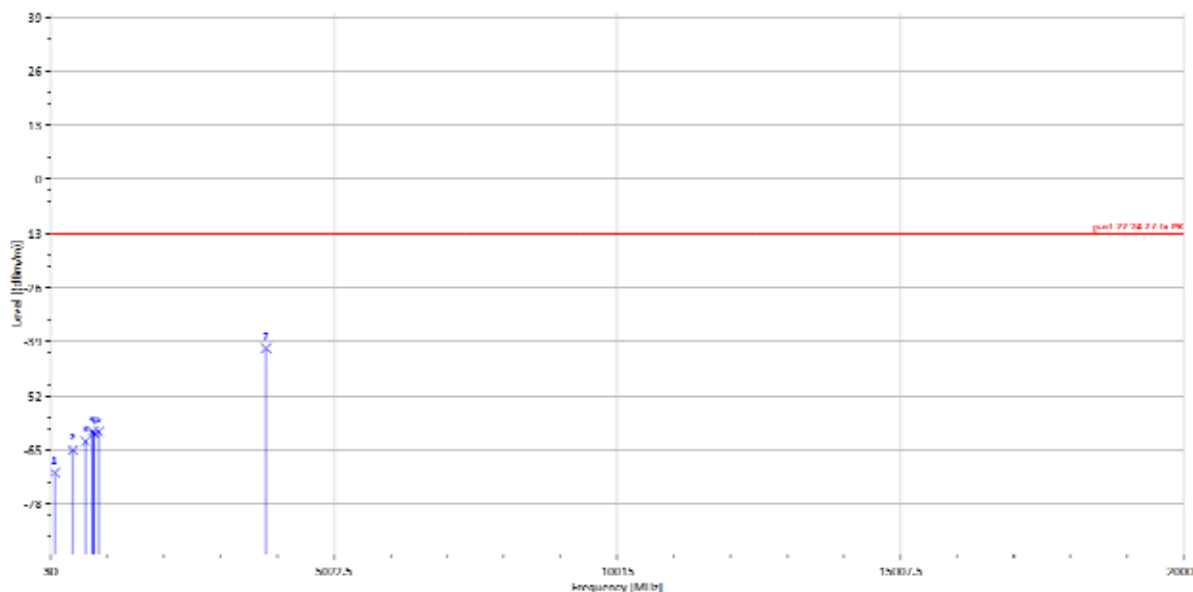
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Operation Mode : GPRS\_1900  
Fundamental Frequency : 1909.8 MHz  
Operation Band : Tx CH High  
EUT Pol. : H

Test Date : 2016/3/2  
Temp. / Humi. : 22.7deg\_C/57RH  
Test Engineer : Pony  
Measurement Antenna Pol. : Vertical



| Freq.<br>MHz | Note<br>F/H/E/S | EIRP<br>dBm | SG<br>Output Level<br>dBm | Antenna<br>Gain<br>dBi | Cable<br>Loss<br>dB | Limit<br>dBm | Margin<br>dB |
|--------------|-----------------|-------------|---------------------------|------------------------|---------------------|--------------|--------------|
| 101.25       | S               | -70.41      | -68.29                    | -0.94                  | -1.18               | -13.01       | -57.40       |
| 421.89       | S               | -64.97      | -68.62                    | 5.98                   | -2.33               | -13.01       | -51.96       |
| 648.60       | S               | -63.00      | -67.07                    | 7.06                   | -2.99               | -13.01       | -49.99       |
| 773.29       | S               | -60.54      | -65.11                    | 7.64                   | -3.06               | -13.01       | -47.53       |
| 791.10       | S               | -61.07      | -65.28                    | 7.66                   | -3.46               | -13.01       | -48.06       |
| 875.31       | S               | -60.58      | -64.89                    | 7.70                   | -3.39               | -13.01       | -47.57       |
| 3828.05      | H               | -40.54      | -45.58                    | 12.30                  | -7.27               | -13.01       | -27.53       |

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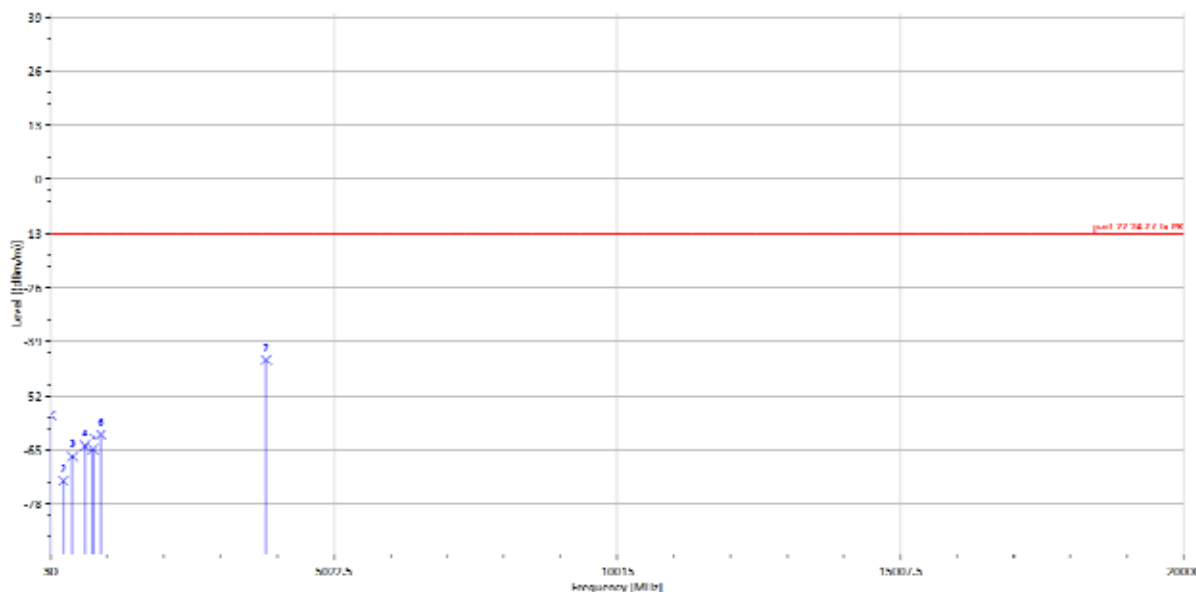
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|                         |            |                            |                |
|-------------------------|------------|----------------------------|----------------|
| Operation Mode :        | GPRS_1900  | Test Date :                | 2016/3/2       |
| Fundamental Frequency : | 1909.8 MHz | Temp. / Humi. :            | 22.7deg_C/57RH |
| Operation Band :        | Tx CH High | Test Engineer :            | Pony           |
| EUT Pol. :              | H          | Measurement Antenna Pol. : | Horizontal     |



| Freq.   | Note    | EIRP   | SG                  | Antenna     | Cable      | Limit  | Margin |
|---------|---------|--------|---------------------|-------------|------------|--------|--------|
| MHz     | F/H/E/S | dBm    | Output Level<br>dBm | Gain<br>dBi | Loss<br>dB | dBm    | dB     |
| 31.62   | S       | -56.65 | -37.15              | -18.84      | -0.66      | -13.01 | -43.64 |
| 253.47  | S       | -72.44 | -75.66              | 5.04        | -1.82      | -13.01 | -59.43 |
| 413.79  | S       | -66.57 | -70.21              | 5.90        | -2.26      | -13.01 | -53.56 |
| 637.26  | S       | -63.98 | -68.00              | 7.02        | -3.00      | -13.01 | -50.97 |
| 776.53  | S       | -64.75 | -69.30              | 7.64        | -3.09      | -13.01 | -51.74 |
| 914.17  | S       | -61.26 | -65.51              | 7.81        | -3.56      | -13.01 | -48.25 |
| 3828.05 | H       | -43.38 | -48.41              | 12.30       | -7.27      | -13.01 | -30.37 |

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## 11. FREQUENCY STABILITY MEASUREMENT

### 11.1. Standard Applicable:

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 11.2. Test Set-up:

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

### 11.3. Measurement 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 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°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 +50°C reached.

Set chamber temperature to 25 . Use a variable AC power supply / DC power source to power

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#### 11.4. Measurement Equipment Used:

| Conducted Emission Test Site |           |                    |               |            |            |
|------------------------------|-----------|--------------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER       | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer            | KEYSIGHT  | N9010A             | MY54510568    | 04/14/2015 | 04/13/2016 |
| Power Meter                  | Anritsu   | ML2496A            | 1326001       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315048       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315049       | 06/23/2015 | 06/22/2016 |
| Coaxial Cable 30cm           | WOKEN     | 00100A1F1A1<br>95C | RF01          | 12/12/2015 | 12/11/2016 |
| DC Block                     | PASTERNAK | PE8210             | RF29          | 12/12/2015 | 12/11/2016 |
| Splitter                     | RF-LAMBAD | RFLT2W1G18<br>G    | RF35          | 12/12/2015 | 12/11/2016 |
| Attenuator                   | WOKEN     | 218FS-10           | RF23          | 12/12/2015 | 12/11/2016 |
| Temperature Chamber          | TERCHY    | MHK-120LK          | 1020582       | 06/23/2015 | 06/22/2016 |
| Communication Tester         | Anritsu   | MT8820C            | 6201107337    | 05/27/2015 | 05/26/2016 |

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## 11.5. Measurement Result:

### FREQUENCY ERROR vs. VOLTAGE

| Reference Frequency: GPRS 850 Mid Channel 836.6 MHz |                  |           |            |            |
|-----------------------------------------------------|------------------|-----------|------------|------------|
| Limit: +/- 2.5 ppm                                  |                  |           |            |            |
| Power Supply                                        | Environment      | Frequency |            |            |
| Vdc                                                 | Temperature<br>( |           | Delta (Hz) | Limit (Hz) |

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## FREQUENCY ERROR vs. VOLTAGE

| Reference Frequency: GPRS 1900 Mid Channel 1880 MHz |                  |           |            |            |
|-----------------------------------------------------|------------------|-----------|------------|------------|
| Limit: +/- 2.5 ppm                                  |                  |           |            |            |
| Power Supply                                        | Environment      | Frequency | Delta (Hz) | Limit (Hz) |
| Vdc                                                 | Temperature<br>( |           |            |            |

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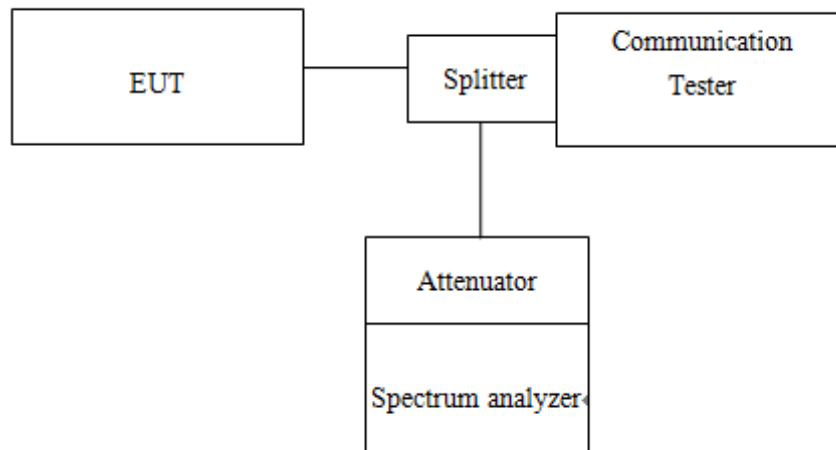
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## 12. PEAK TO AVERAGE RATIO

### 12.1. Standard Applicable

The peak-to-average ration (PAR) of the transmission may not exceed 13dB.

### 12.2. Test SET-UP



### 12.3. Measurement Procedure

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
2. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth; & internal = 1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

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## 12.4. Measurement Equipment Used

| Conducted Emission Test Site |           |                    |               |            |            |
|------------------------------|-----------|--------------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER       | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer            | KEYSIGHT  | N9010A             | MY54510568    | 04/14/2015 | 04/13/2016 |
| Power Meter                  | Anritsu   | ML2496A            | 1326001       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315048       | 06/23/2015 | 06/22/2016 |
| Power Sensor                 | Anritsu   | MA2411B            | 1315049       | 06/23/2015 | 06/22/2016 |
| Coaxial Cable 30cm           | WOKEN     | 00100A1F1A1<br>95C | RF01          | 12/12/2015 | 12/11/2016 |
| DC Block                     | PASTERNAK | PE8210             | RF29          | 12/12/2015 | 12/11/2016 |
| Splitter                     | RF-LAMBDA | RFLT2W1G18<br>G    | RF35          | 12/12/2015 | 12/11/2016 |
| Attenuator                   | WOKEN     | 218FS-10           | RF23          | 12/12/2015 | 12/11/2016 |
| Temperature Chamber          | TERCHY    | MHK-120LK          | 1020582       | 06/23/2015 | 06/22/2016 |
| Communication Tester         | Anritsu   | MT8820C            | 6201107337    | 05/27/2015 | 05/26/2016 |

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## 12.5. Measurement Result

### Tabular Results:

| Frequency<br>(MHz) | CH  | Peak-to-Average Ratio<br>(dB) |
|--------------------|-----|-------------------------------|
|                    |     | GPRS                          |
| 1850.20            | 512 | 10.02                         |
| 1880.00            | 661 | 8.31                          |
| 1909.80            | 810 | 10.01                         |

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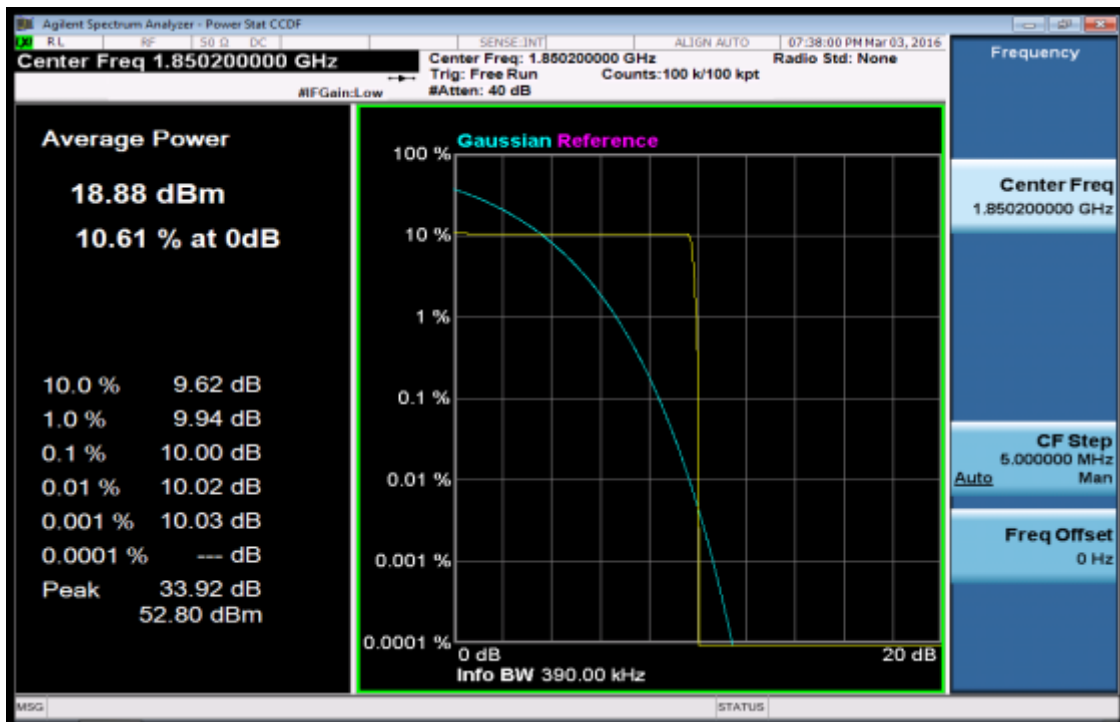
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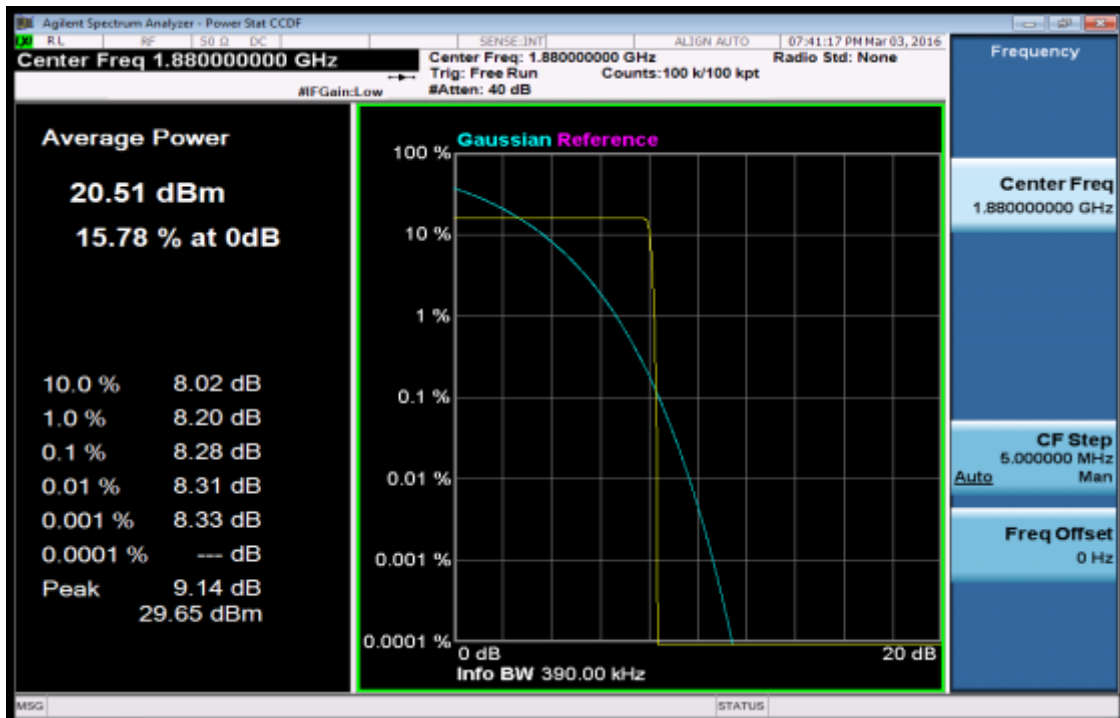
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## Measurement Results:

### GPRS 1900 Channel Low



### GPRS 1900 Channel Mid



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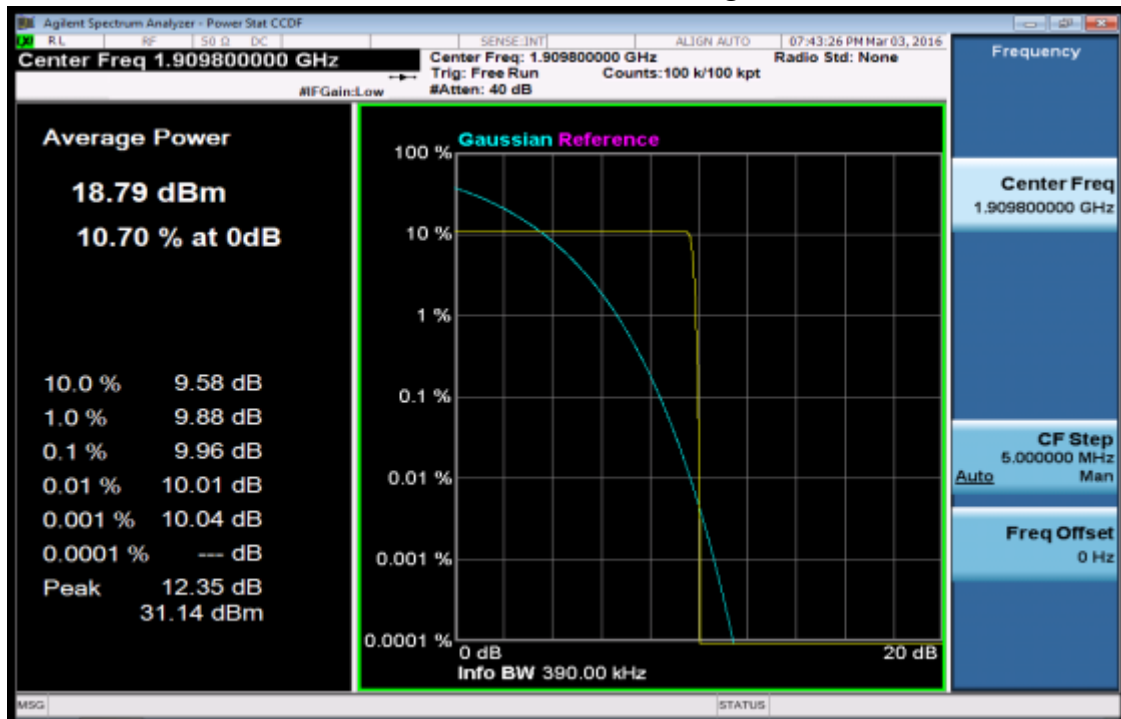
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## GPRS 1900 Channel High



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