

# FCC Part 22H & 24E Measurement and Test Report

For

**Worldwide telecom limited**

**2F Block C ShenFangbuilding zhenhua lu futian dist, Shenzhen**

**FCC ID: 2AR03-WF03**

**FCC Rules:** FCC Part 22H, FCC Part 24E

**Product Description:** Mobile phone

**Tested Model:** WF03

**Report No.:** WTX19X04023451W-1

**Sample Receipt Date:** 2019-04-17

**Tested Date:** 2019-04-17 to 2019-05-21

**Issued Date:** 2019-05-21

**Tested By:** Jason Su / Engineer



**Reviewed By:** Silin Chen / EMC Manager



**Approved & Authorized By:** Jandy So / PSQ Manager



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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM Test Technology Co., Ltd.

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Worldwide telecom limited  
Address of applicant: 2F Block C ShenFangbuilding zhenhua lu futian dist,  
Shenzhen

Manufacturer: Sichuan Youxinda Technology Co.,Ltd  
Address of manufacturer: No.4(addition No.11), Jin Jing Street,Yutang Town Chuannan  
lingang district,Sichuan Free Trade Zone,Sichuan Province,  
China.

| General Description of EUT:   |   |
|---|---|
| Product Name:   | Mobile phone  |
| Brand Name:   | WOLKI   |
| Model No.:  | WF03  |
| Adding Model(s):  | /   |
| Rated Voltage:  | DC3.7V  |
| Battery:  | /   |
| Adapter Model:  | WCH03<br>Input:AC100-240V 50/60Hz 0.15A<br>Output::DC5V 500mA |
| Software Version:   | /   |
| Hardware Version:   | /   |
| <i>Note: The test data is gathered from a production sample provided by the manufacturer.</i> |   |

| <b>Technical Characteristics of EUT:</b> |   |
|--|---|
| <b>2G</b>                                |   |
| Support Networks:                        | GSM, GPRS,  |
| Support Band:                            | GSM850/PCS1900  |
| Uplink Frequency:                        | GSM/GPRS 850: 824~849MHz<br>GSM/GPRS 1900: 1850~1910MHz |
| Downlink Frequency:                      | GSM/GPRS 850: 869~894MHz<br>GSM/GPRS 1900: 1930~1990MHz |
| Max RF Output Power:                     | GSM850: 32.32dBm, GSM1900: 30.941dBm                    |
| Type of Emission:                        | GSM850: 250KGXW, GSM1900: 252KGXW                       |
| Type of Modulation:                      | GMSK  |
| Type of Antenna:                         | Integral Antenna  |
| Antenna Gain:                            | GSM850: -0.5dBi; GSM1900: -0.8dBi                       |
| GPRS Class:                              | Class 12  |

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 2:** FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

**FCC Rules Part 22:** PRIVATE LAND MOBILE RADIO SERVICES.

**FCC Rules Part 24:** PUBLIC MOBILE SERVICES

**TIA/EIA 603 E March 2016:** Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

**ANSI C63.26-2015:** American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

**KDB 971168 D01 Power Meas License Digital Systems v03r01:** MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with TIA/EIA 603 E/ KDB 971168/ ANSI C63.26. The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 1.4 Test Facility

### **FCC – Registration No.: 125990**

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

## 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

| Test Mode List |             |                            |
|----------------|-------------|----------------------------|
| Test Mode      | Description | Remark                     |
| TM1            | GSM 850     | Low, Middle, High Channels |
| TM2            | GPRS 850    | Low, Middle, High Channels |
| TM3            | GSM 1900    | Low, Middle, High Channels |
| TM4            | GPRS 1900   | Low, Middle, High Channels |

| Testing Configure |                  |                        |                |
|-------------------|------------------|------------------------|----------------|
| Support Band      | Support Standard | Channel Frequency(MHz) | Channel Number |
| GSM 850           | GSM/GPRS         | 824.2                  | 128            |
|                   |                  | 836.6                  | 190            |
|                   |                  | 848.8                  | 251            |
| PCS 1900          | GSM/GPRS         | 1850.2                 | 512            |
|                   |                  | 1880.0                 | 661            |
|                   |                  | 1909.8                 | 810            |

Note: the transmitter has been tested on the communications mode of GSM, GPRS compliance test and record the worst case.

| Test Conditions   |           |
|-------------------|-----------|
| Temperature:      | 22~25 °C  |
| Relative humidity | 50~55 %.  |
| ATM Pressure:     | 1019 mbar |

| EUT Cable List and Details |            |                     |                        |
|----------------------------|------------|---------------------|------------------------|
| Cable Description          | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| DC Cable                   | 0.75       | Unshielded          | Without Ferrite        |
| Earphone Cable             | 0.8        | Unshielded          | Without Ferrite        |

| Special Cable List and Details |            |                     |                        |
|--------------------------------|------------|---------------------|------------------------|
| Cable Description              | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| USB Cable                      | 1.0        | shielded            | Without Ferrite        |

| Auxiliary Equipment List and Details |              |       |               |
|--------------------------------------|--------------|-------|---------------|
| Description                          | Manufacturer | Model | Serial Number |
| /                                    | /            | /     | /             |

## 1.6 Measurement Uncertainty

| Measurement uncertainty        |            |                               |
|--------------------------------|------------|-------------------------------|
| Parameter                      | Conditions | Uncertainty                   |
| RF Output Power                | Conducted  | $\pm 0.42\text{dB}$           |
| Occupied Bandwidth             | Conducted  | $\pm 1.5\%$                   |
| Frequency Stability            | Conducted  | 2.3%                          |
| Transmitter Spurious Emissions | Conducted  | $\pm 0.42\text{dB}$           |
| Transmitter Spurious Emissions | Radiated   | 30-200MHz $\pm 4.52\text{dB}$ |
|                                |            | 0.2-1GHz $\pm 5.56\text{dB}$  |
|                                |            | 1-6GHz $\pm 3.84\text{dB}$    |
|                                |            | 6-18GHz $\pm 3.92\text{dB}$   |

### 1.7 Test Equipment List and Details

| No.       | Description             | Manufacturer           | Model                 | Serial No.  | Cal Date   | Due. Date  |
|-----------|-------------------------|------------------------|-----------------------|-------------|------------|------------|
| SEMT-1075 | Communication Tester    | Rohde & Schwarz        | CMW500                | 148650      | 2018-05-22 | 2019-05-21 |
| SEMT-1063 | GSM Tester              | Rohde & Schwarz        | CMU200                | 114403      | 2018-05-22 | 2019-05-21 |
| SEMT-1072 | Spectrum Analyzer       | Agilent                | E4407B                | MY41440400  | 2018-05-22 | 2019-05-21 |
| SEMT-1079 | Spectrum Analyzer       | Agilent                | N9020A                | US47140102  | 2018-05-22 | 2019-05-21 |
| SEMT-1080 | Signal Generator        | Agilent                | 83752A                | 3610A01453  | 2018-05-22 | 2019-05-21 |
| SEMT-1081 | Vector Signal Generator | Agilent                | N5182A                | MY47070202  | 2018-05-22 | 2019-05-21 |
| SEMT-1028 | Power Divider           | Weinschel              | 1506A                 | PM204       | 2018-05-22 | 2019-05-21 |
| SEMT-1082 | Power Divider           | RF-Lambda              | RFLT4W5M18G           | 14110400027 | 2018-05-22 | 2019-05-21 |
| SEMT-1031 | Spectrum Analyzer       | Rohde & Schwarz        | FSP30                 | 836079/035  | 2018-05-22 | 2019-05-21 |
| SEMT-1007 | EMI Test Receiver       | Rohde & Schwarz        | ESVB                  | 825471/005  | 2018-05-22 | 2019-05-21 |
| SEMT-1008 | Amplifier               | Agilent                | 8447F                 | 3113A06717  | 2018-05-22 | 2019-05-21 |
| SEMT-1043 | Amplifier               | C&D                    | PAP-1G18              | 2002        | 2018-05-22 | 2019-05-21 |
| SEMT-1069 | Loop Antenna            | Schwarz beck           | FMZB 1516             | 9773        | 2017-06-08 | 2020-06-07 |
| SEMT-1068 | Broadband Antenna       | Schwarz beck           | VULB9163              | 9163-333    | 2017-06-08 | 2020-06-07 |
| SEMT-1042 | Horn Antenna            | ETS                    | 3117                  | 00086197    | 2017-06-08 | 2020-06-07 |
| SEMT-1121 | Horn Antenna            | Schwarzbeck            | BBHA 9170             | BBHA9170582 | 2017-06-08 | 2020-06-07 |
| SEMT-1168 | Pre-amplifier           | Direction Systems Inc. | PAP-0126              | 14141-12838 | 2018-05-22 | 2019-05-21 |
| SEMT-1169 | Pre-amplifier           | Direction Systems Inc. | PAP-2640              | 14145-14153 | 2018-05-22 | 2019-05-21 |
| SEMT-1163 | Spectrum Analyzer       | Rohde & Schwarz        | FSP40                 | 100612      | 2018-05-22 | 2019-05-21 |
| SEMT-1170 | DRG Horn Antenna        | A.H. SYSTEMS           | SAS-574               | 571         | 2018-03-19 | 2021-03-18 |
| SEMT-1166 | Power Limiter           | Agilent                | N9356B                | MY45450376  | 2018-05-22 | 2019-05-21 |
| SEMT-1048 | RF Limiter              | ATTEN                  | AT-BSF-2400~2500      | /           | 2018-05-22 | 2019-05-21 |
| SEMT-1076 | RF Switcher             | Top Precision          | RCS03-A2              | /           | 2018-05-22 | 2019-05-21 |
| SEMT-C001 | Cable                   | Zheng DI               | LL142-07-07-10M(A)    | /           | 2019-03-19 | 2020-03-18 |
| SEMT-C002 | Cable                   | Zheng DI               | ZT40-2.92J-2.92J-6M   | /           | 2019-03-19 | 2020-03-18 |
| SEMT-C003 | Cable                   | Zheng DI               | ZT40-2.92J-2.92J-2.5M | /           | 2019-03-19 | 2020-03-18 |
| SEMT-C004 | Cable                   | Zheng DI               | 2M0RFC                | /           | 2019-03-19 | 2020-03-18 |



|           |       |          |        |   |            |            |
|-----------|-------|----------|--------|---|------------|------------|
| SEMT-C005 | Cable | Zheng DI | 1M0RFC | / | 2019-03-19 | 2020-03-18 |
| SEMT-C006 | Cable | Zheng DI | 1M0RFC | / | 2019-03-19 | 2020-03-18 |

| Software List                              |              |          |         |
|--|--------------|----------|---------|
| Description                                | Manufacturer | Model    | Version |
| EMI Test Software<br>(Radiated Emission)*  | CCS          | EZ-EMC   | V1.0    |
| EMI Test Software<br>(Conducted Emission)* | CCS          | EZ-EMC   | V1.0    |
| LTE Test System*                           | Tonscend     | JS1120-1 | V2.5    |

\*Remark: indicates software version used in the compliance certification testing

## 2. SUMMARY OF TEST RESULTS

| FCC Rules                  | Description of Test Item                   | Result    |
|----------------------------|--|-----------|
| § 1.1307, § 2.1093         | RF Exposure                                | Compliant |
| § 22.913 (a), § 24.232 (c) | RF Output Power                            | Compliant |
| § 24.51                    | Peak-to-average Ratio (PAR) of Transmitter | Compliant |
| § 22.917 (b), § 24.238 (b) | Emission Bandwidth                         | Compliant |
| § 22.917 (a), § 24.238 (a) | Spurious Emissions at Antenna Terminal     | Compliant |
| § 22.917 (a), § 24.238 (a) | Spurious Radiation Emissions               | Compliant |
| § 22.917 (a), § 24.238 (a) | Out of Band Emissions                      | Compliant |
| § 22.355, § 24.235         | Frequency Stability                        | Compliant |

### **3. RF Exposure**

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#### **3.1 Standard Applicable**

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

#### **3.2 Test Result**

This product complied with the requirement of the SAR exposure, please see the SAR report.

## 4. RF Output Power

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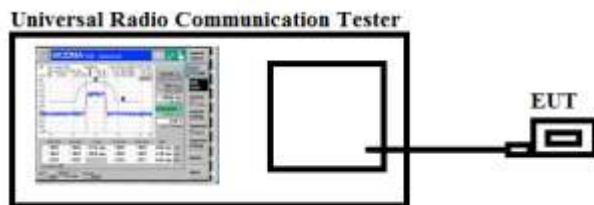
### 4.1 Standard Applicable

According to §22.913(a)(2), The ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

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

### 4.2 Test Procedure

- Conducted output power test method:



- Radiated power test method:

1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

### 4.3 Summary of Test Results/Plots

## &gt; Max. Radiated Power

| Mode    | Channel | Antenna Polar | ERP (dBm) | Limit (dBm) | Result |
|---------|---------|---------------|-----------|-------------|--------|
| GSM850  | 128     | V             | 30.21     | <38.45      | Pass   |
|         |         | H             | 23.29     |             |        |
|         | 190     | V             | 30.58     |             |        |
|         |         | H             | 24.11     |             |        |
|         | 251     | V             | 29.98     |             |        |
|         |         | H             | 23.97     |             |        |
| GPRS850 | 128     | V             | 30.45     | <38.45      | Pass   |
|         |         | H             | 24.11     |             |        |
|         | 190     | V             | 30.12     |             |        |
|         |         | H             | 25.21     |             |        |
|         | 251     | V             | 30.65     |             |        |
|         |         | H             | 25.35     |             |        |

| Mode     | Channel | Antenna Polar | EIRP (dBm) | Limit (dBm) | Result |
|----------|---------|---------------|------------|-------------|--------|
| PCS1900  | 512     | V             | 28.11      | <33.00      | Pass   |
|          |         | H             | 22.65      |             |        |
|          | 661     | V             | 28.65      |             |        |
|          |         | H             | 22.14      |             |        |
|          | 810     | V             | 28.87      |             |        |
|          |         | H             | 23.21      |             |        |
| GPRS1900 | 512     | V             | 28.26      | <33.00      | Pass   |
|          |         | H             | 22.12      |             |        |
|          | 661     | V             | 28.11      |             |        |
|          |         | H             | 23.32      |             |        |
|          | 810     | V             | 27.98      |             |        |
|          |         | H             | 21.47      |             |        |

➤ **Max. Conducted Power (Average power)**

| Conducted Average power (dBm) |        |        |        |         |         |         |
|-------------------------------|--------|--------|--------|---------|---------|---------|
| Band                          | GSM850 |        |        | PCS1900 |         |         |
| Channel                       | 128    | 190    | 251    | 512     | 661     | 810     |
| Frequency(MHz)                | 824.20 | 836.60 | 848.80 | 1850.20 | 1880.00 | 1909.80 |
| GSM                           | 32.25  | 32.32  | 32.22  | 30.79   | 30.51   | 30.29   |
| GPRS(1Slot)                   | 32.16  | 32.19  | 32.16  | 30.94   | 30.70   | 30.44   |

## 5. Peak-to-average Ratio (PAR) of Transmitter

### 5.1 Standard Applicable

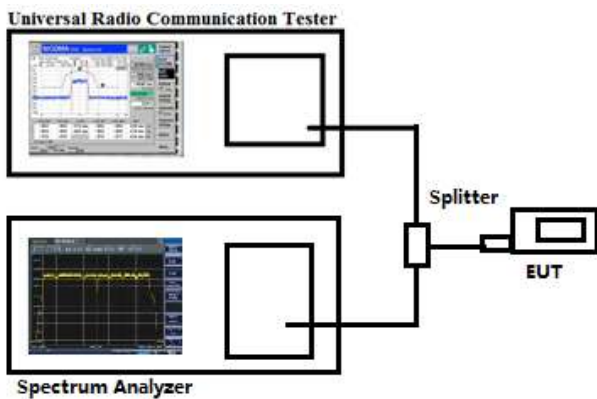
According to §24.232(d), Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 5.2 Test Procedure

According with KDB 971168

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Configuration for the emission bandwidth testing:



### 5.3 Summary of Test Results

| PCS1900      |         |                 |          |            |
|--------------|---------|-----------------|----------|------------|
| Test Mode    | Channel | Frequency (MHz) | PAR (dB) | Limit (dB) |
| GSM          | 661     | 1850.2          | 5.65     | 13         |
| GPRS(1 Slot) | 661     | 1850.2          | 7.11     | 13         |

Note: Only the worst case was selected to record.



## 6. Emission Bandwidth

---

### 6.1 Standard Applicable

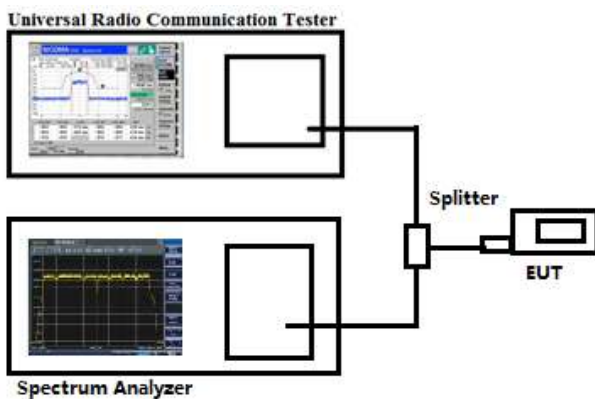
According to §22.917(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §24.238(b), 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.

### 6.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 10kHz for GSM mode and 100kHz for WCDMA mode, VBW shall be at least 3 times the RBW, and the 26dB bandwidth was recorded.

Test Configuration for the emission bandwidth testing:

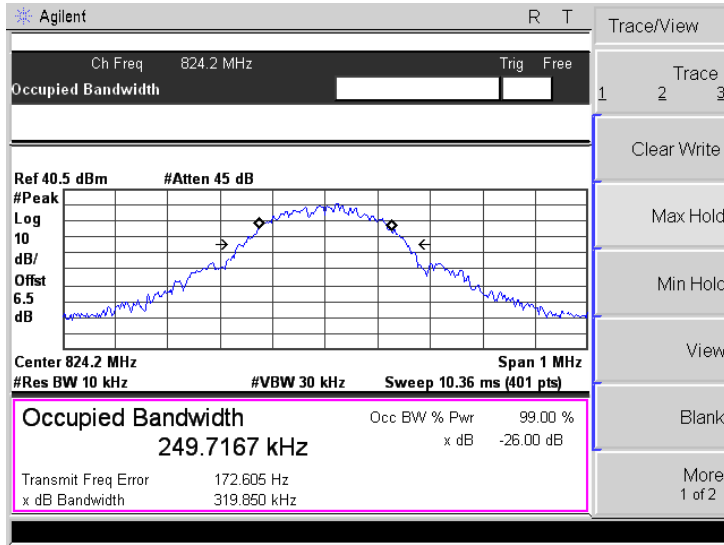


### 6.3 Summary of Test Results/Plots

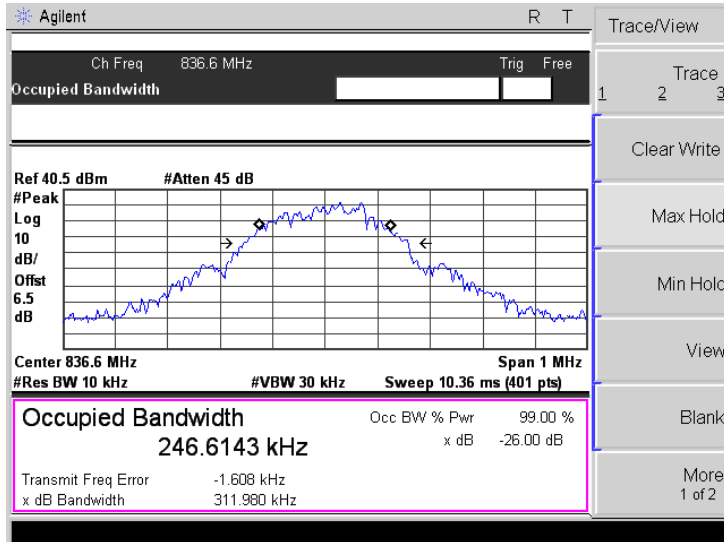
| EUT Mode                 | Channel | Frequency (MHz) | 99% Occupy bandwidth (kHz) | -26dB bandwidth (kHz) |
|--------------------------|---------|-----------------|----------------------------|-----------------------|
| GSM 850<br>(GMSK)        | 128     | 824.20          | 249.7167                   | 319.850               |
|                          | 190     | 836.60          | 246.6143                   | 311.980               |
|                          | 251     | 848.80          | 248.3219                   | 314.053               |
| GPRS850<br>(GMSK,1Slot)  | 128     | 824.20          | 240.5658                   | 315.734               |
|                          | 190     | 836.60          | 249.4745                   | 316.501               |
|                          | 251     | 848.80          | 245.6247                   | 313.389               |
| PCS1900<br>(GMSK)        | 512     | 1850.20         | 252.3561                   | 323.737               |
|                          | 661     | 1880.00         | 250.3250                   | 316.844               |
|                          | 810     | 1909.80         | 244.1208                   | 316.336               |
| GPRS1900<br>(GMSK,1Slot) | 512     | 1850.20         | 238.5396                   | 306.429               |
|                          | 661     | 1880.00         | 236.6614                   | 317.478               |
|                          | 810     | 1909.80         | 244.0796                   | 321.012               |

GSM850

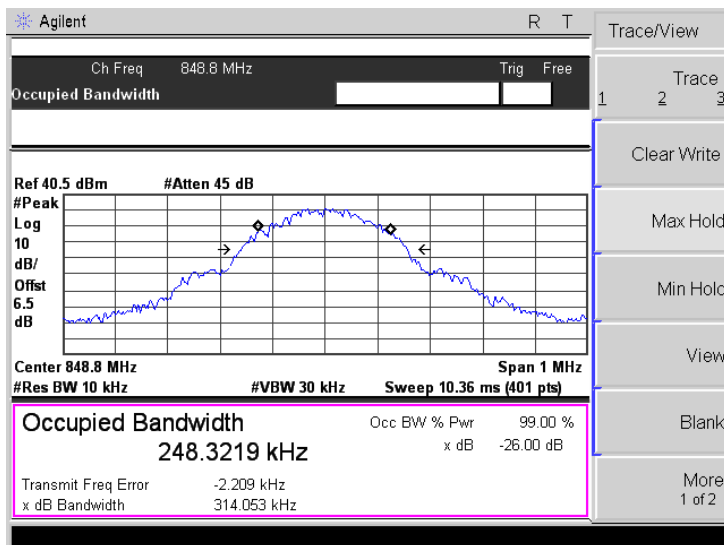
Low Channel



Middle Channel

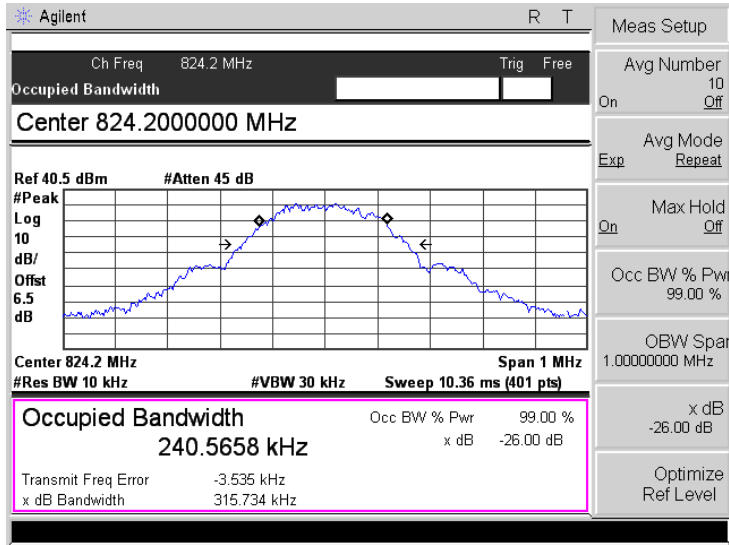


High Channel

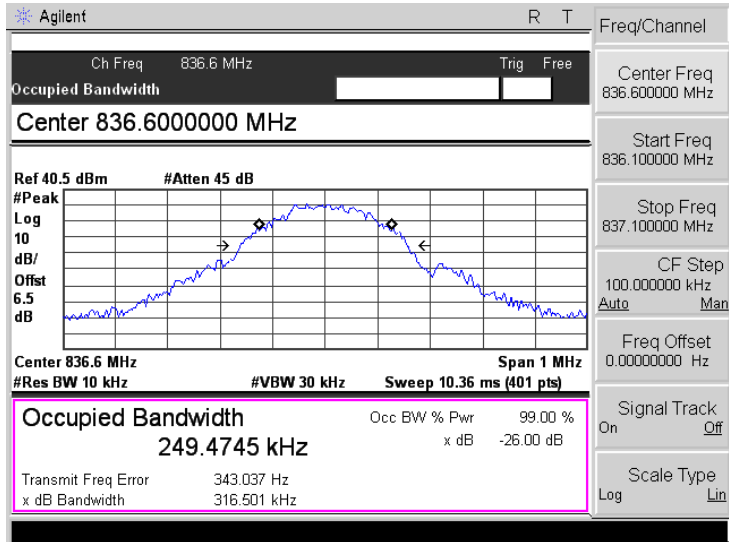


GPRS850

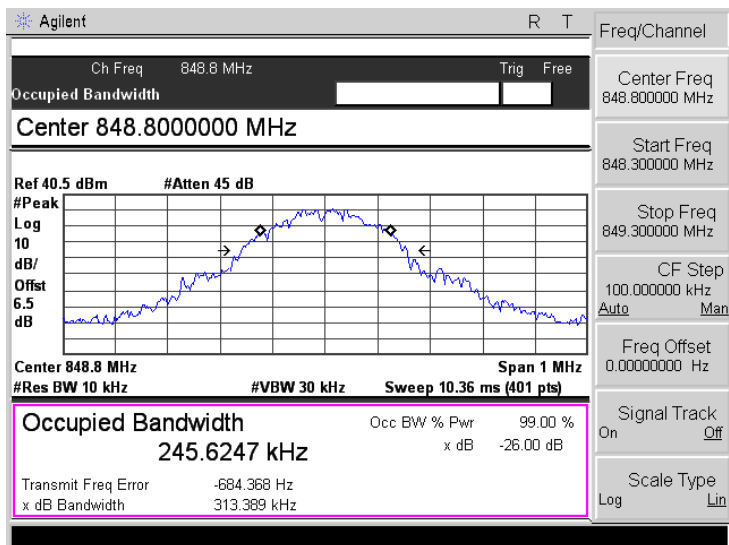
Low Channel



Middle Channel

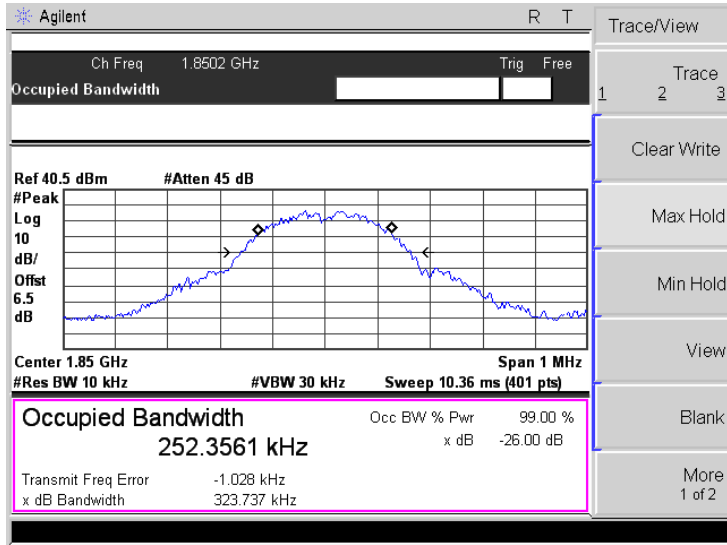


High Channel

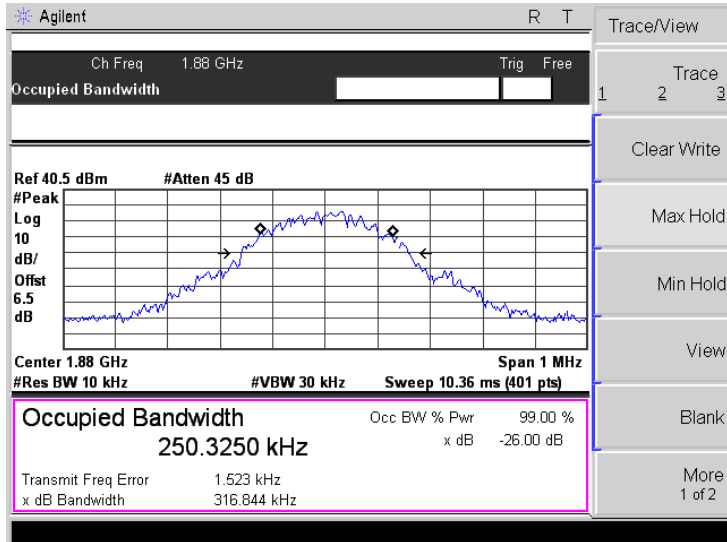


PCS1900

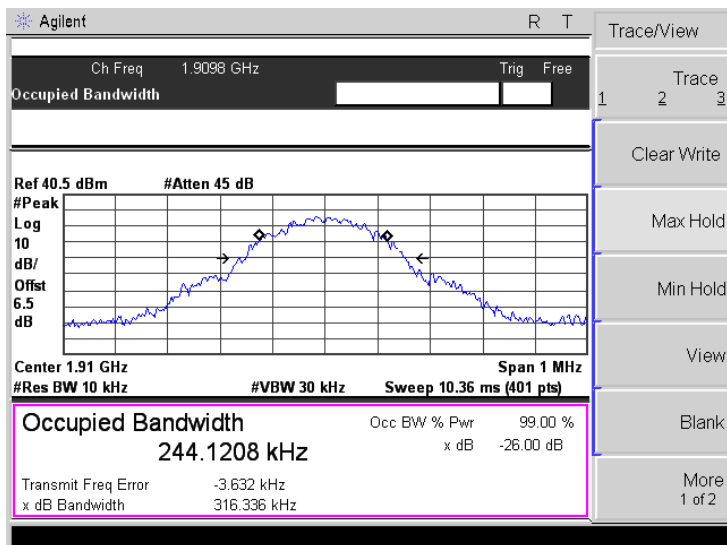
Low Channel



Middle Channel

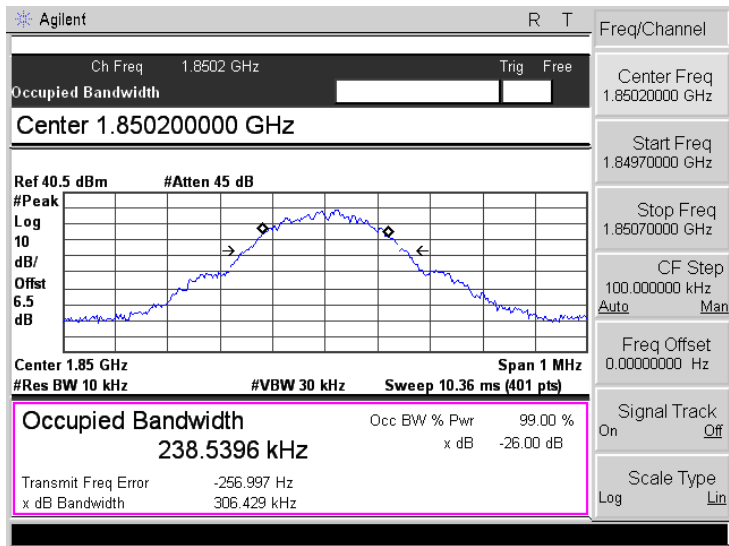


High Channel

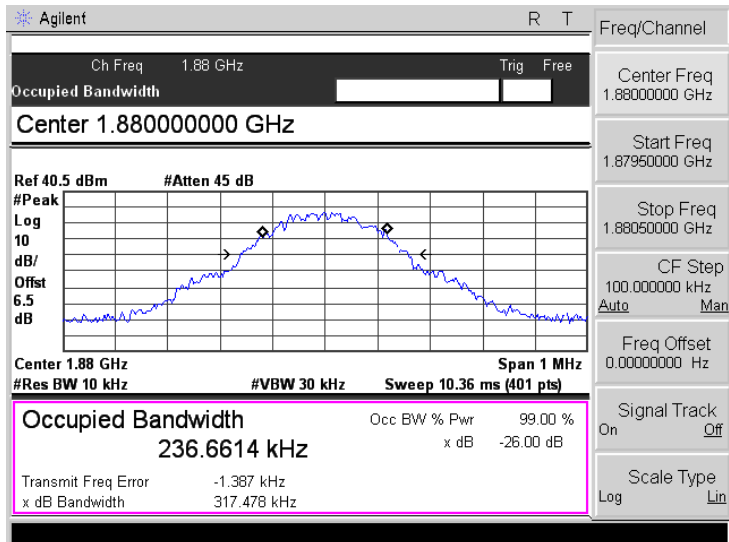


GPRS1900

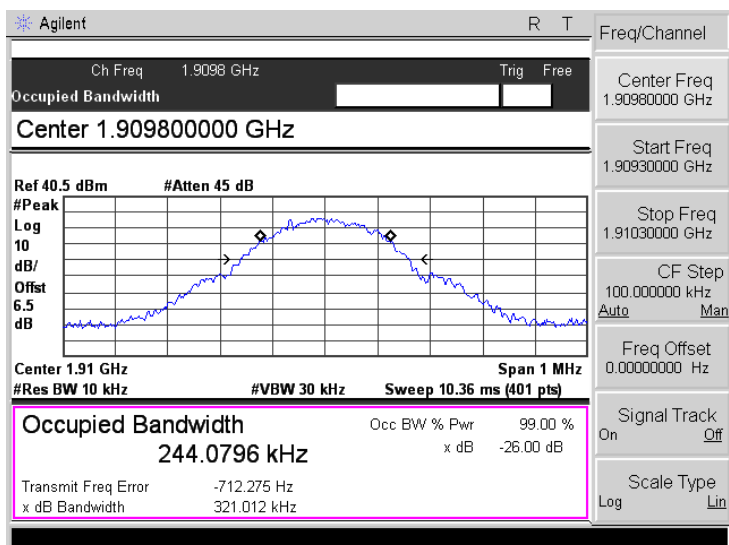
Low Channel



Middle Channel



High Channel



## 7. Out of Band Emissions at Antenna Terminal

### 7.1 Standard Applicable

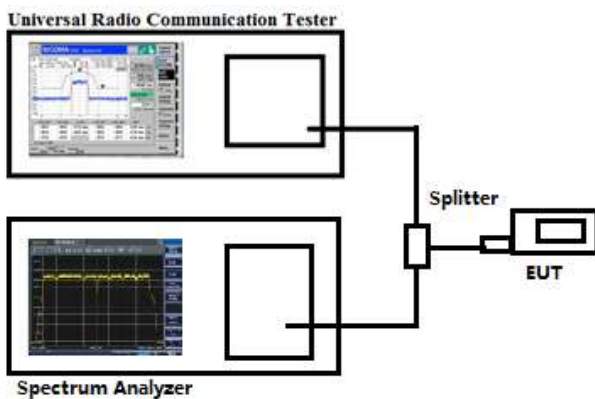
According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 7.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10<sup>th</sup> harmonic.

Test Configuration for the out of band emissions testing:

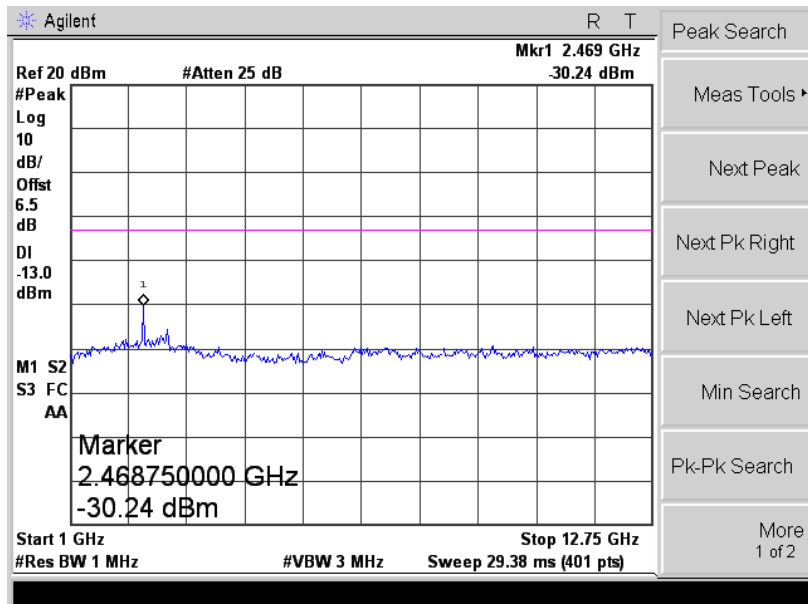
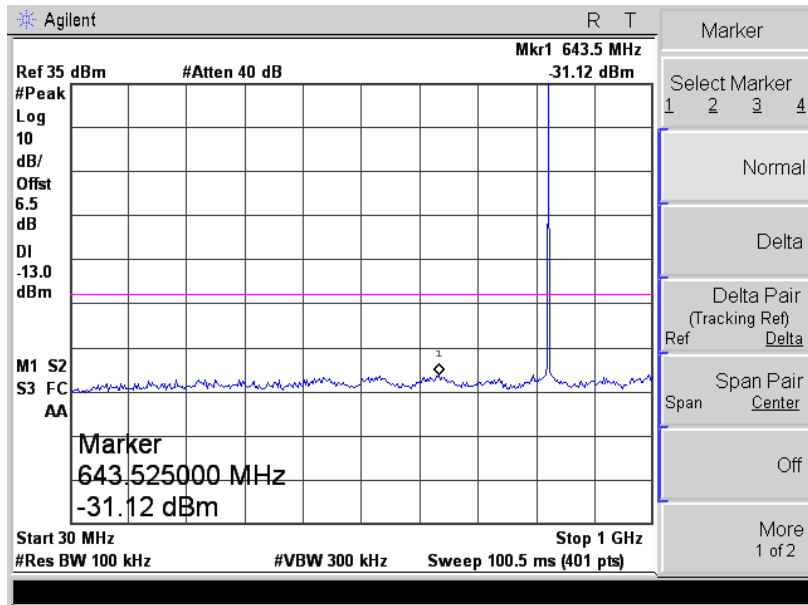


### 7.3 Summary of Test Results/Plots

Please refer to the following test plots

GSM850

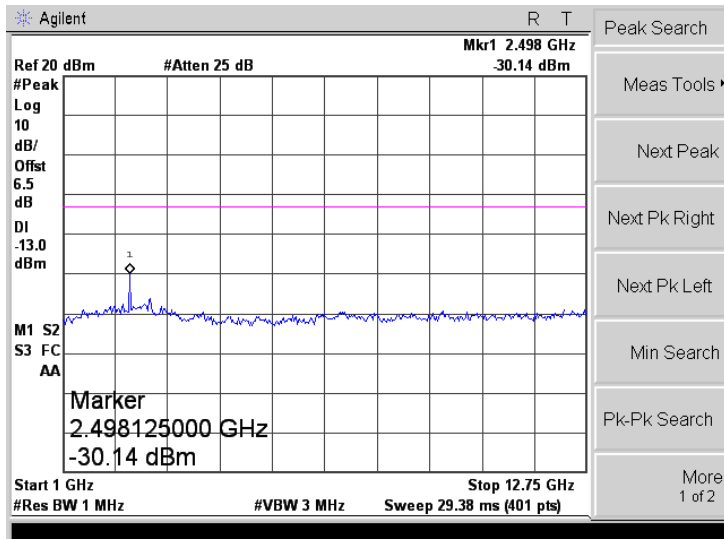
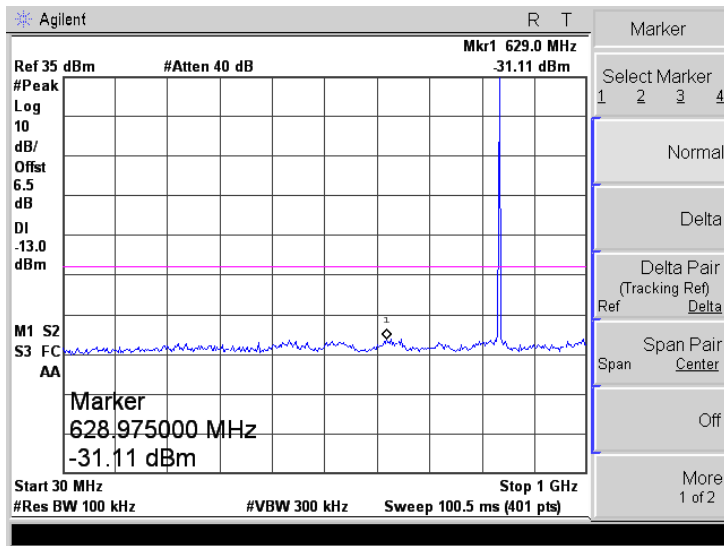
Low Channel





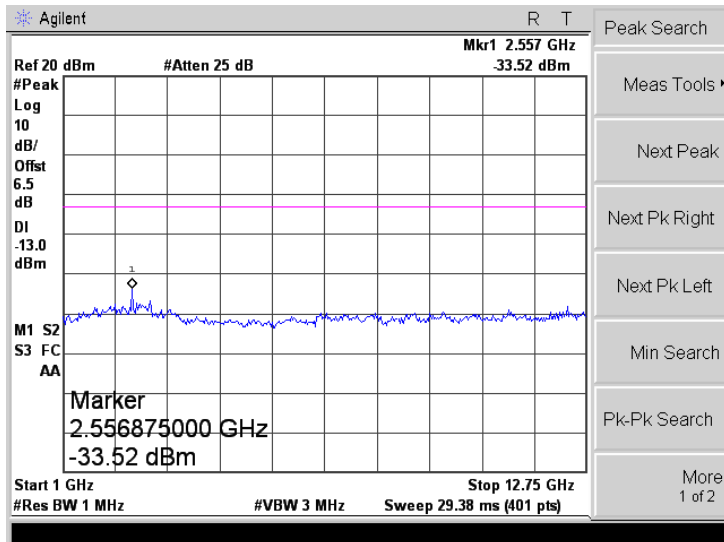
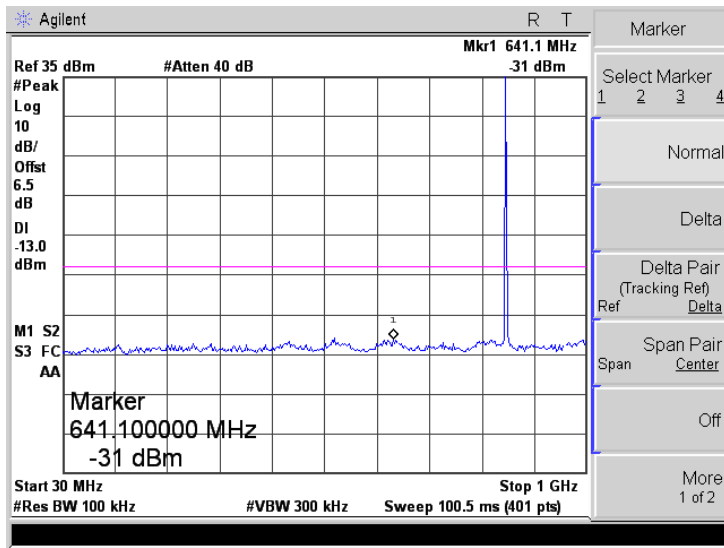
GSM850

Middle Channel



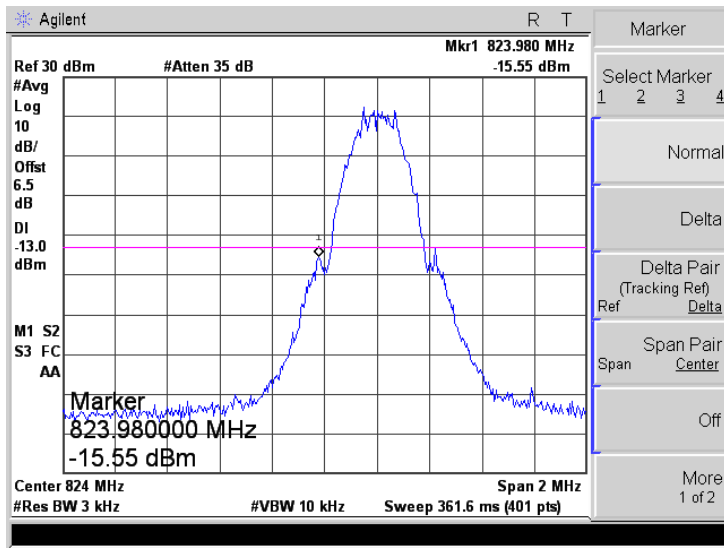
GSM850

High Channel

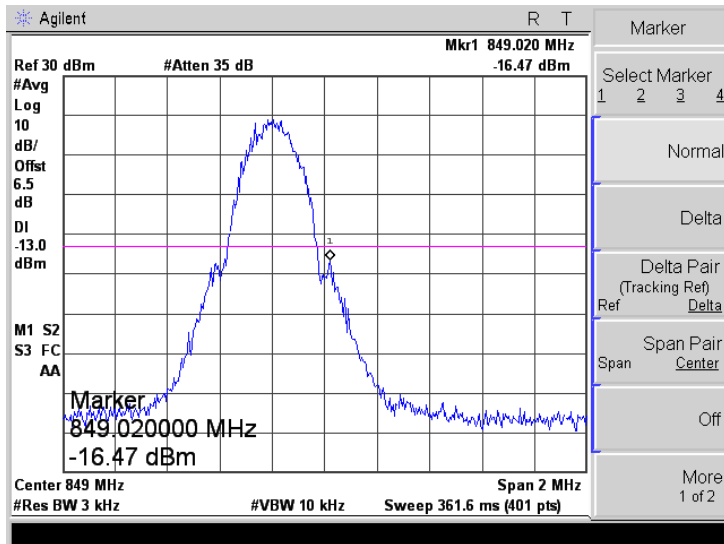


GSM850

Low Band Emission

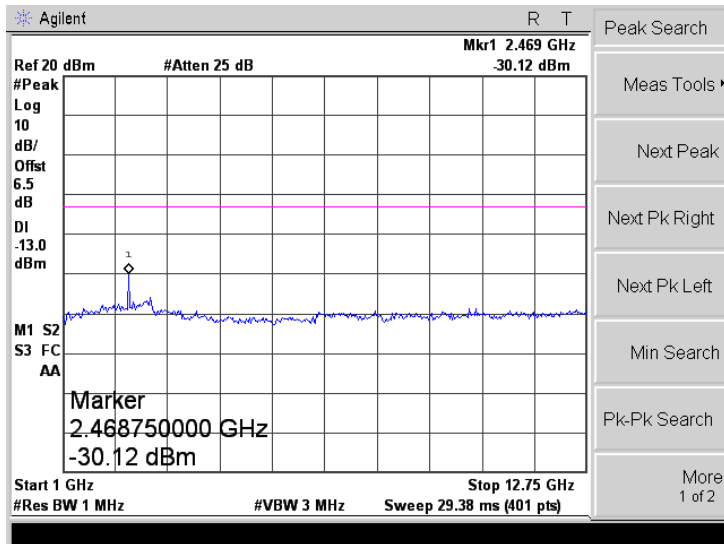
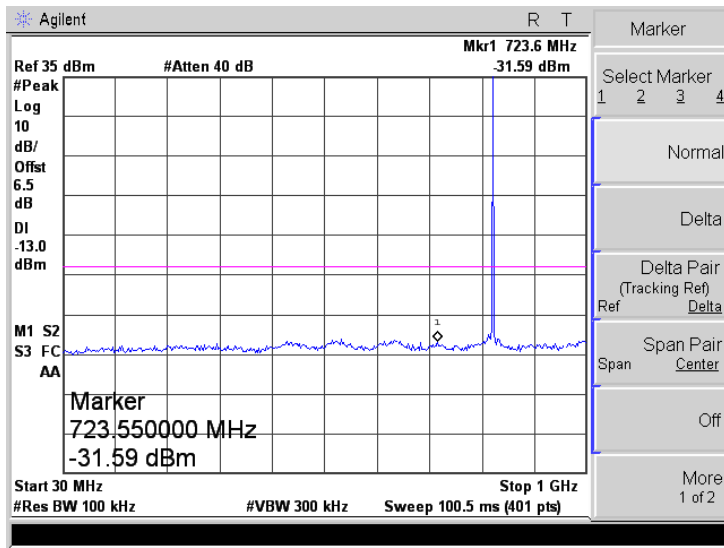


High Band Emission



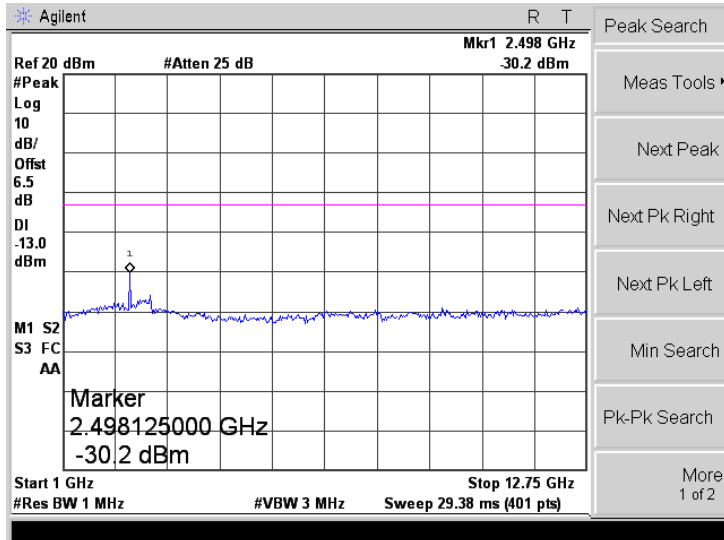
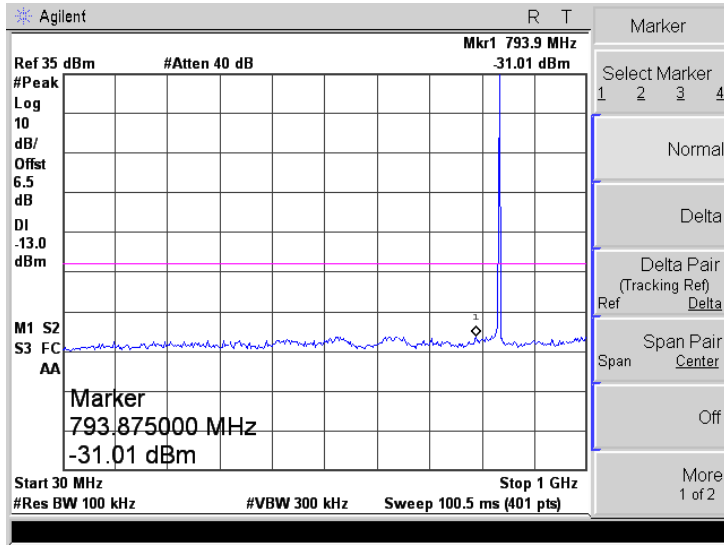
For Cellular Band

GPRS Low Channel



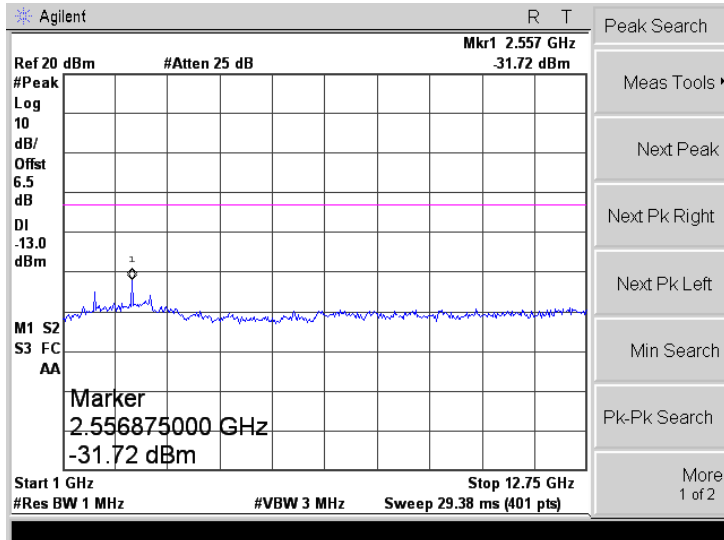
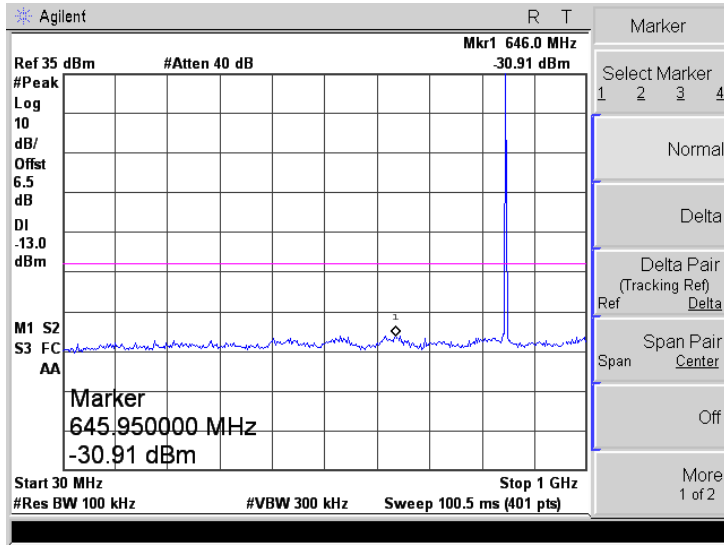
GPRS850

Middle Channel



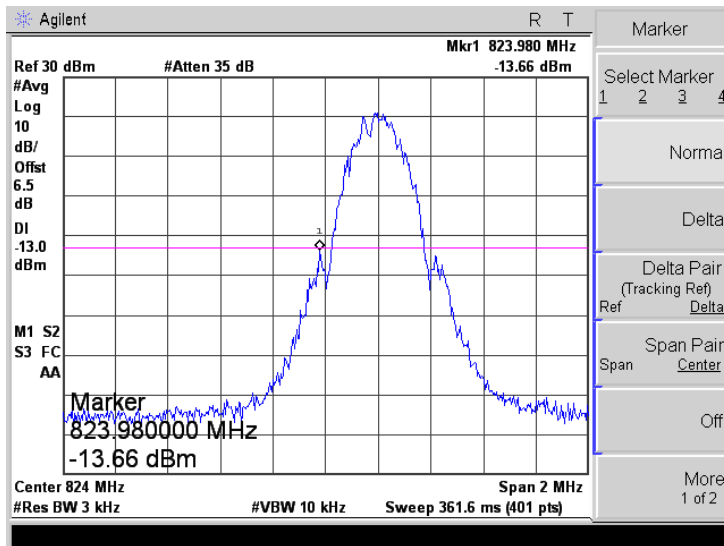
GPRS850

High Channel

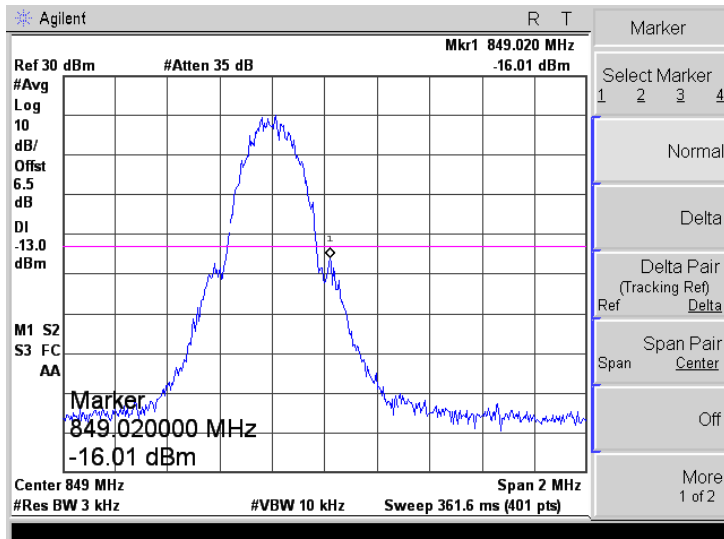


GPRS850

Low Band Emission

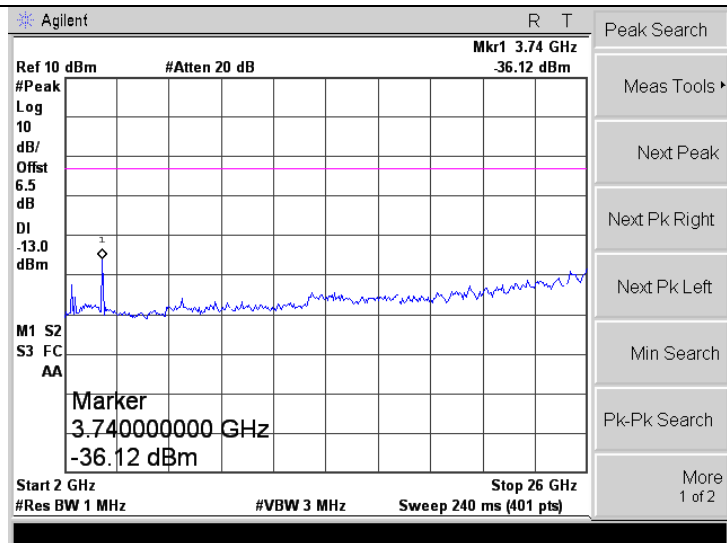
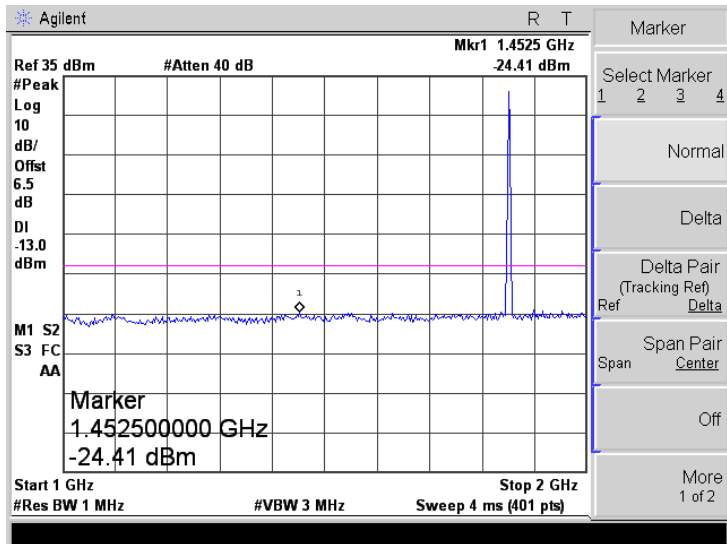
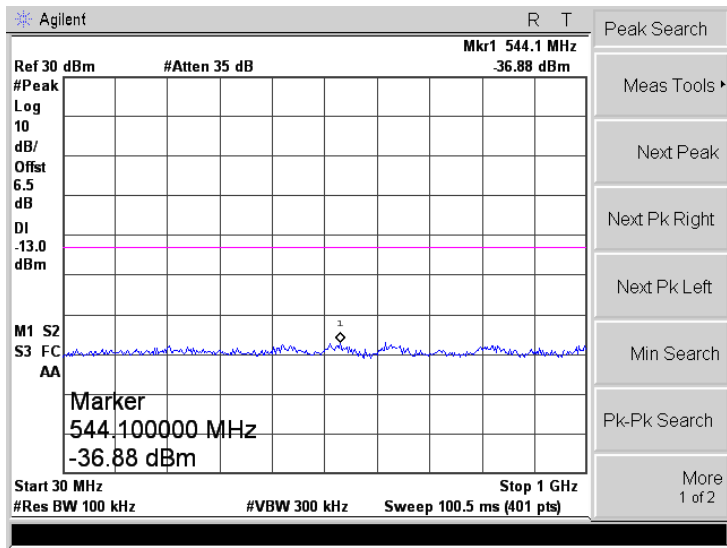


High Band Emission



PCS1900

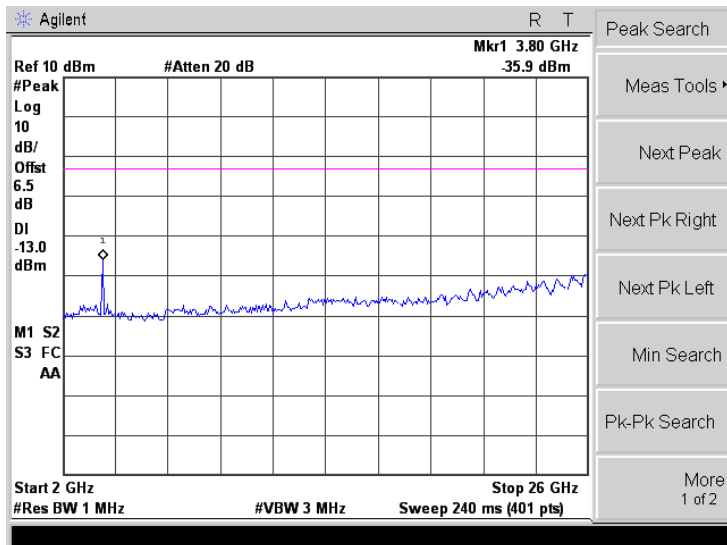
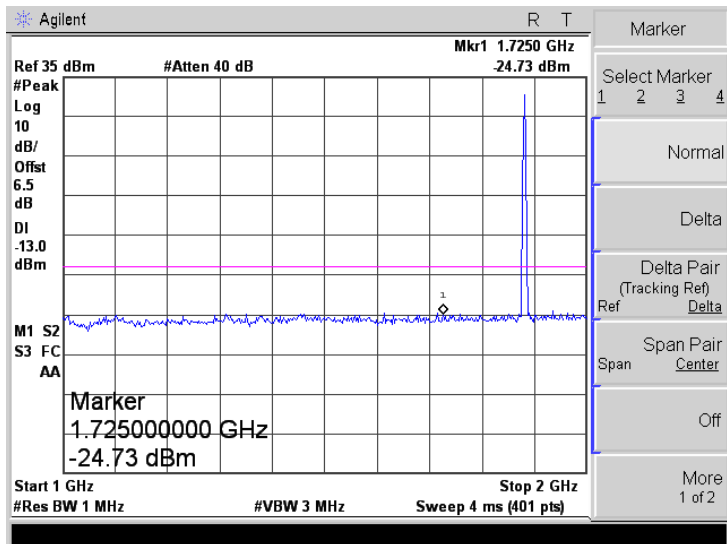
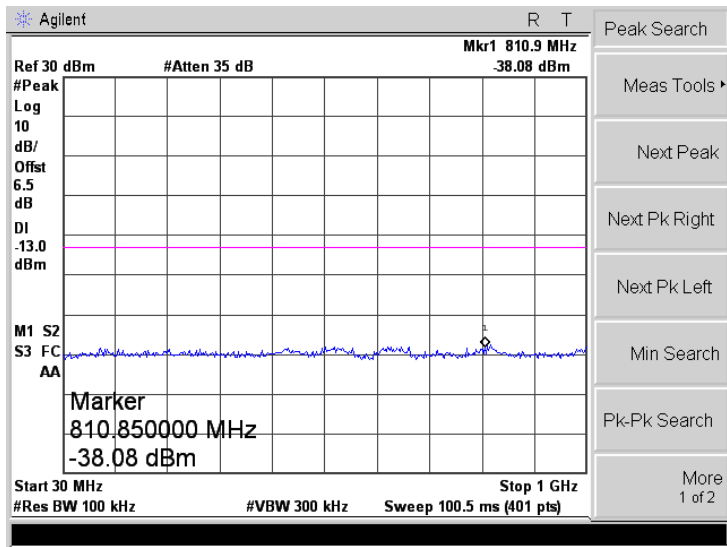
Low Channel





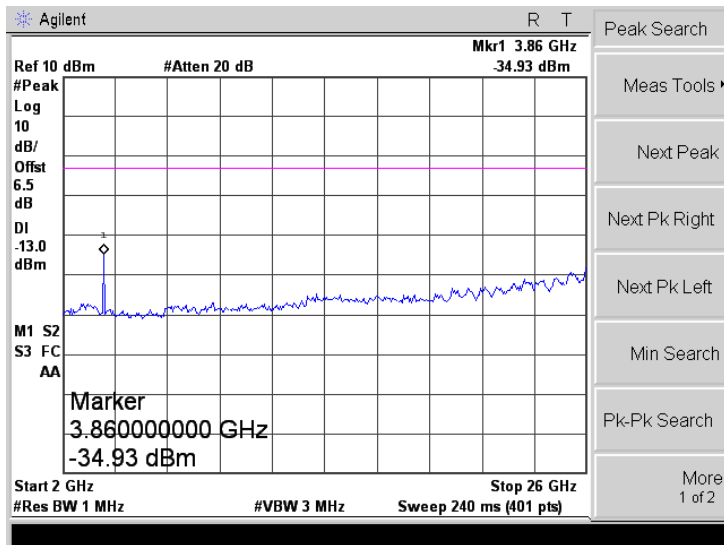
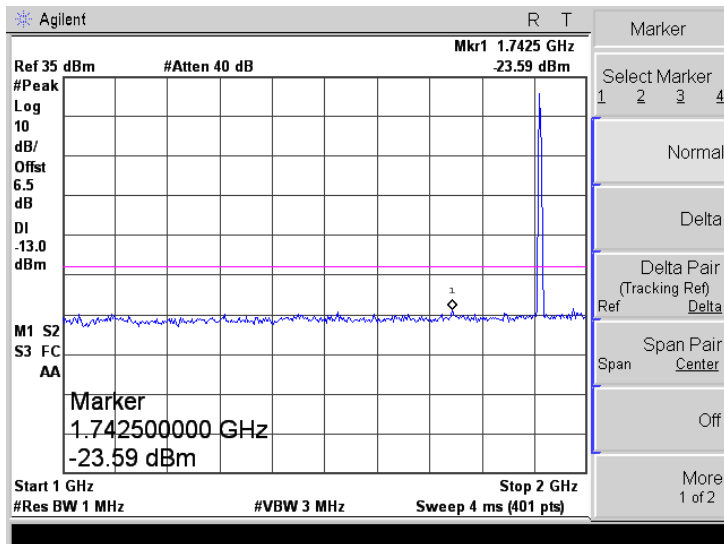
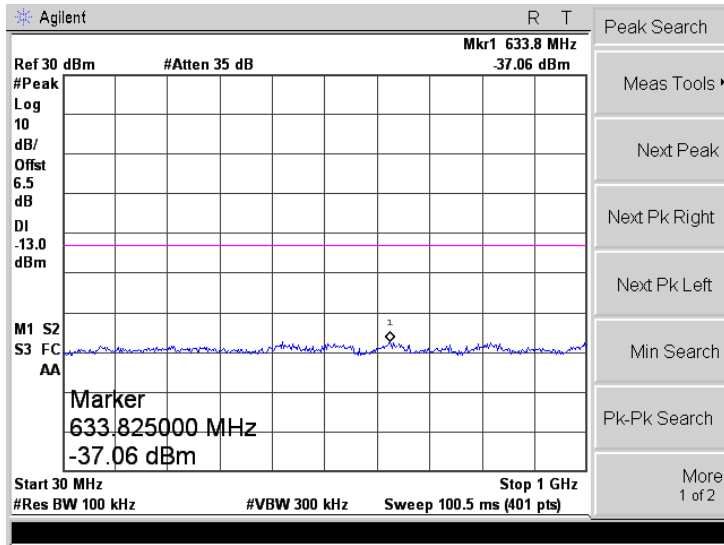
PCS1900

Middle Channel



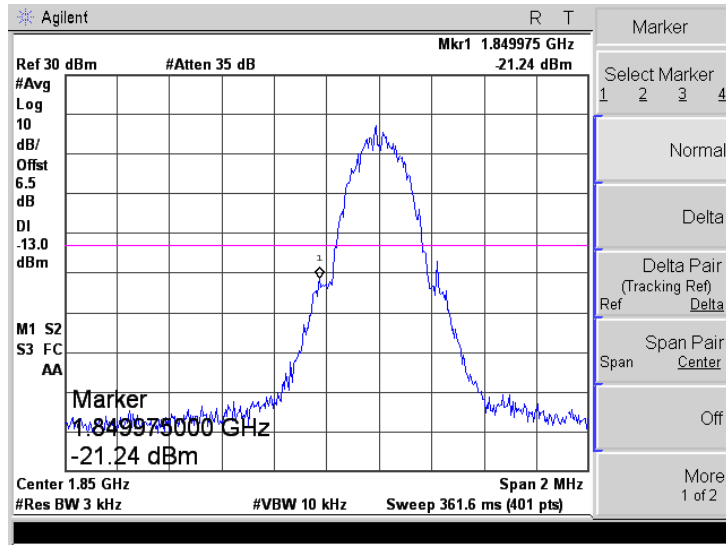
PCS1900

High Channel

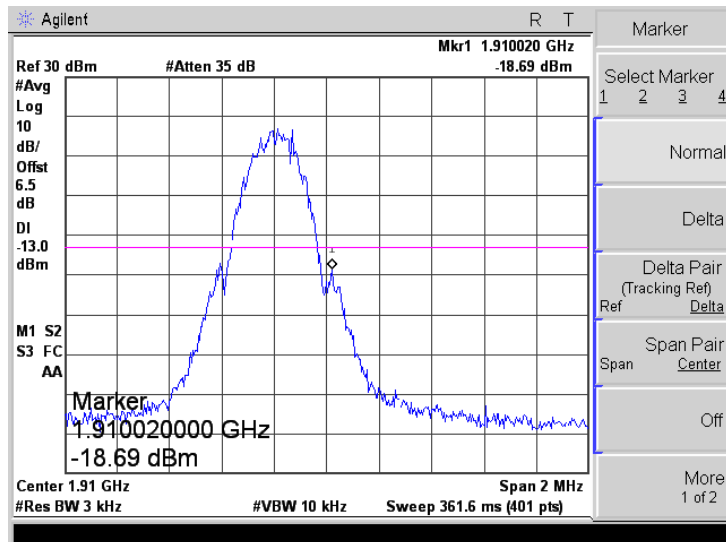


PCS1900

Low Band Emission

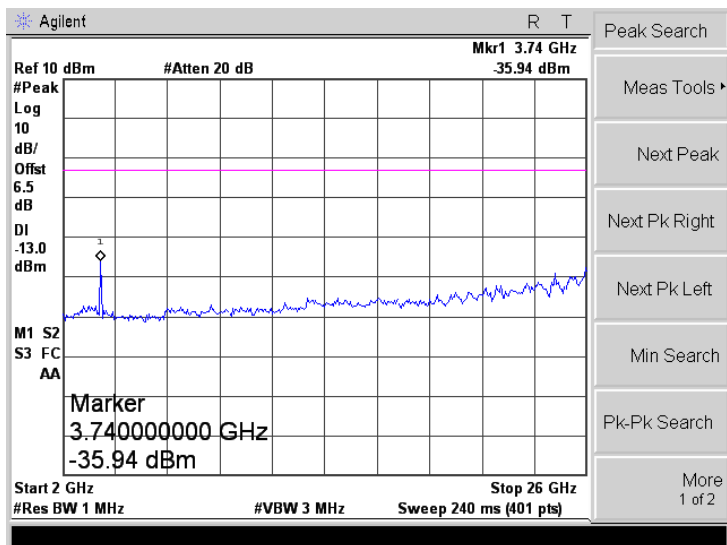
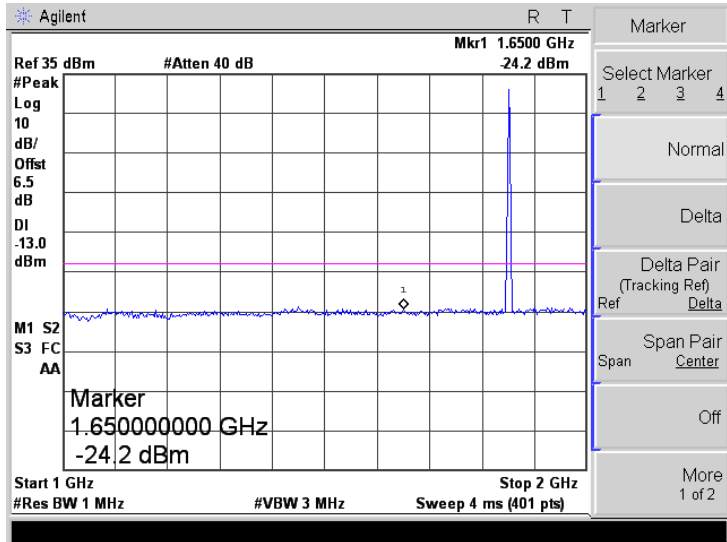
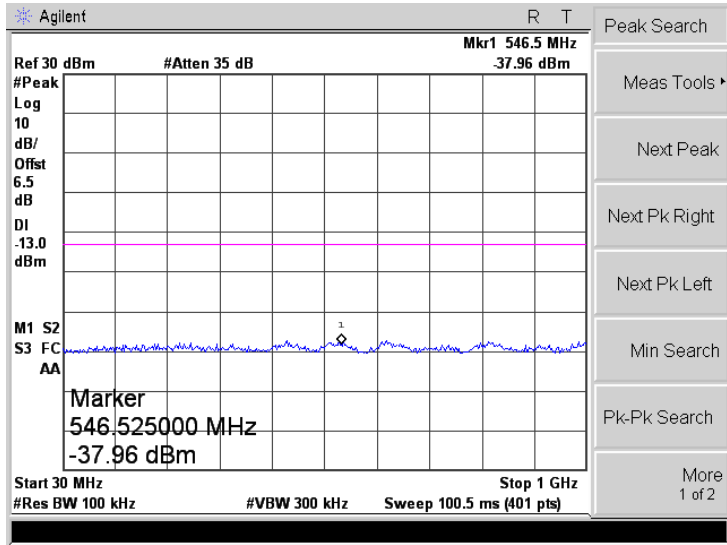


High Band Emission



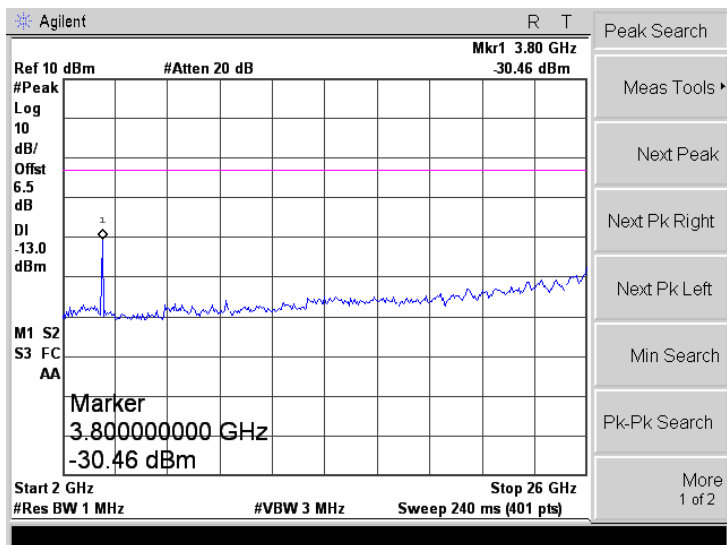
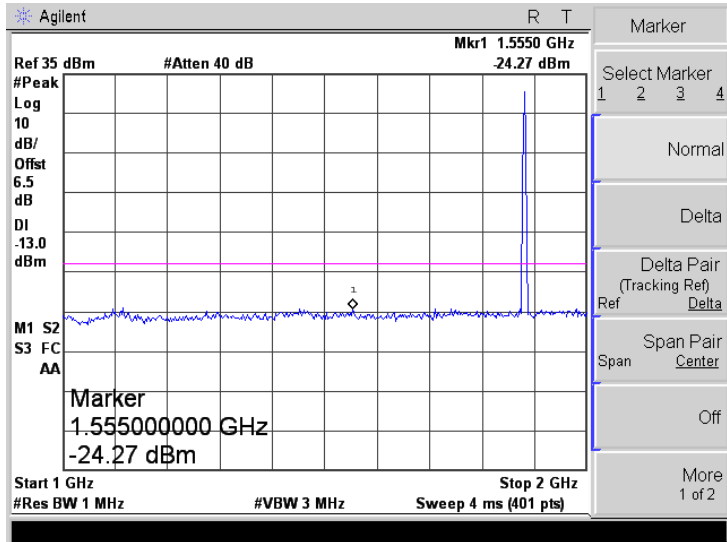
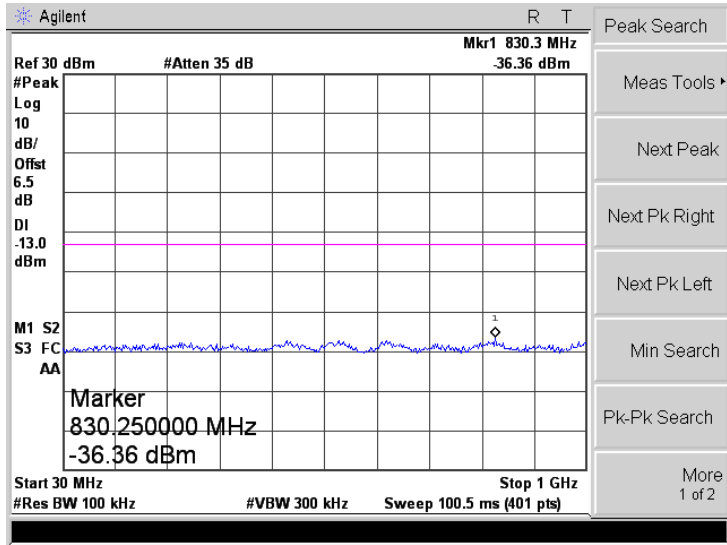
GPRS1900

Low Channel



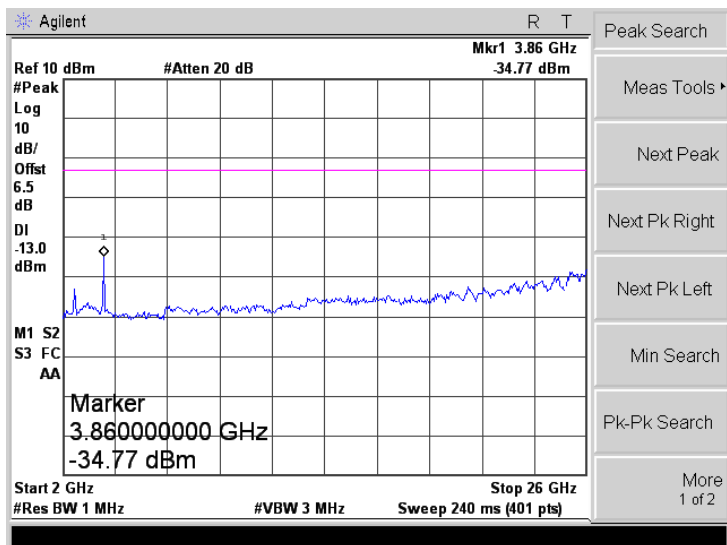
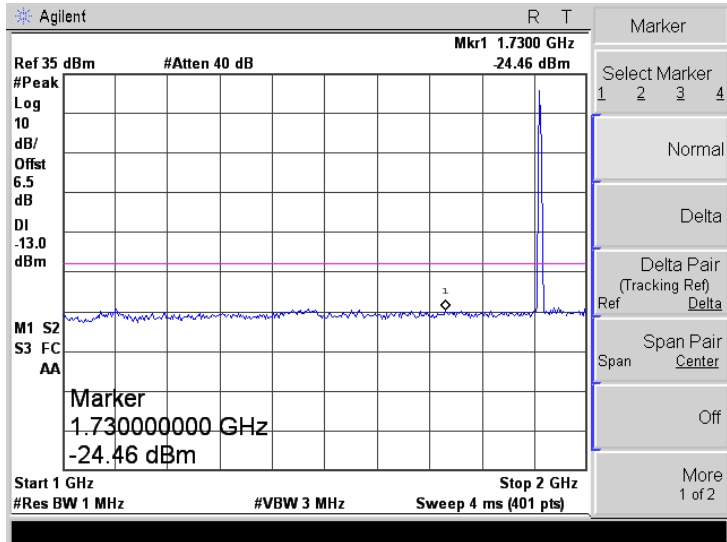
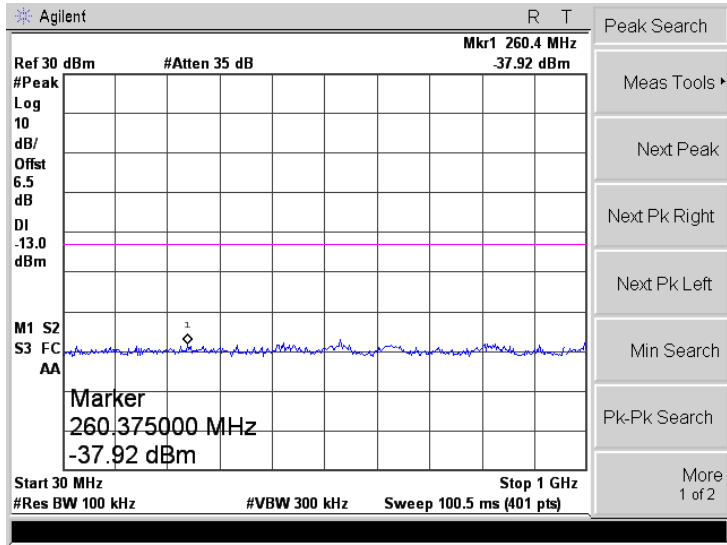
GPRS1900

Middle Channel



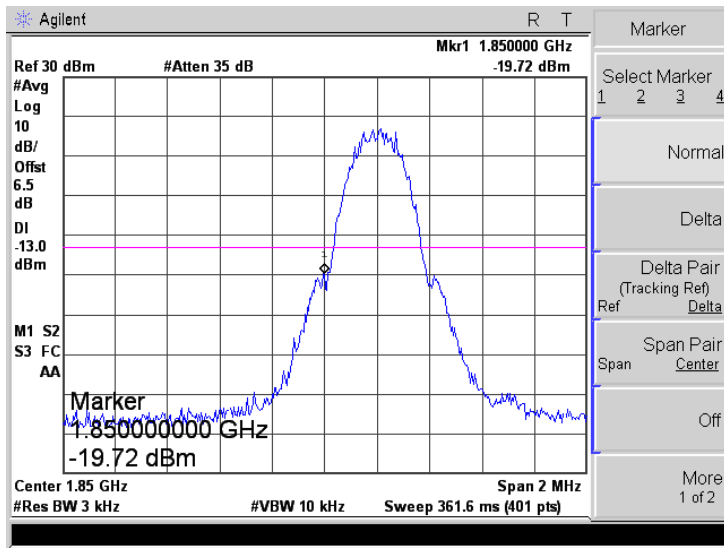
GPRS1900

High Channel

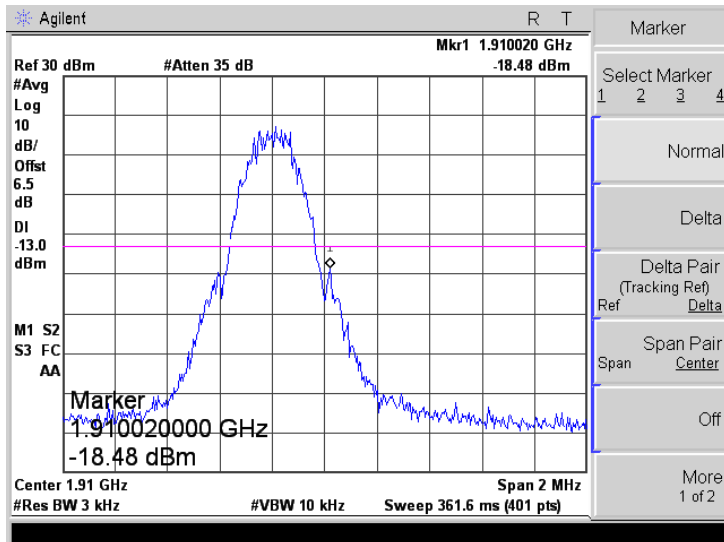


GPRS1900

Low Band Emission



High Band Emission



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## 8. Spurious Radiated Emissions

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### 8.1 Standard Applicable

According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 8.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

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

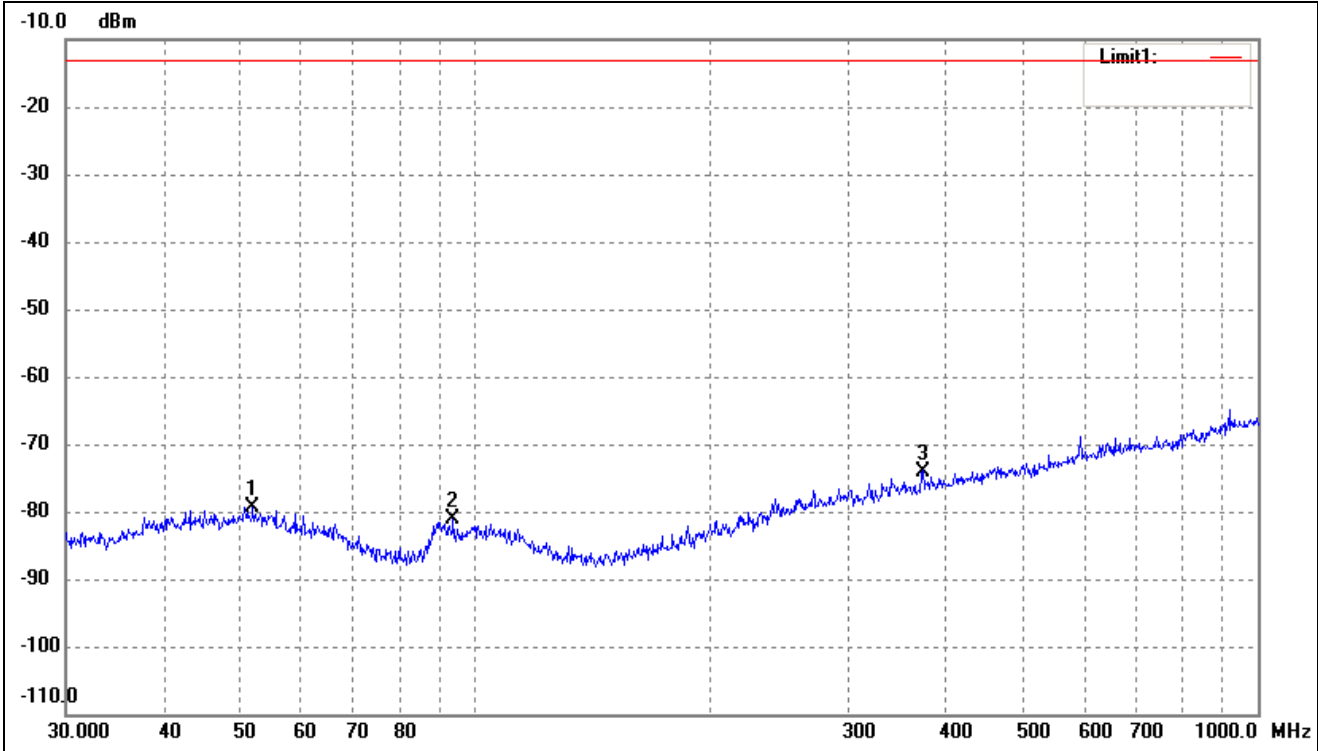
### 8.3 Summary of Test Results/Plots

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*



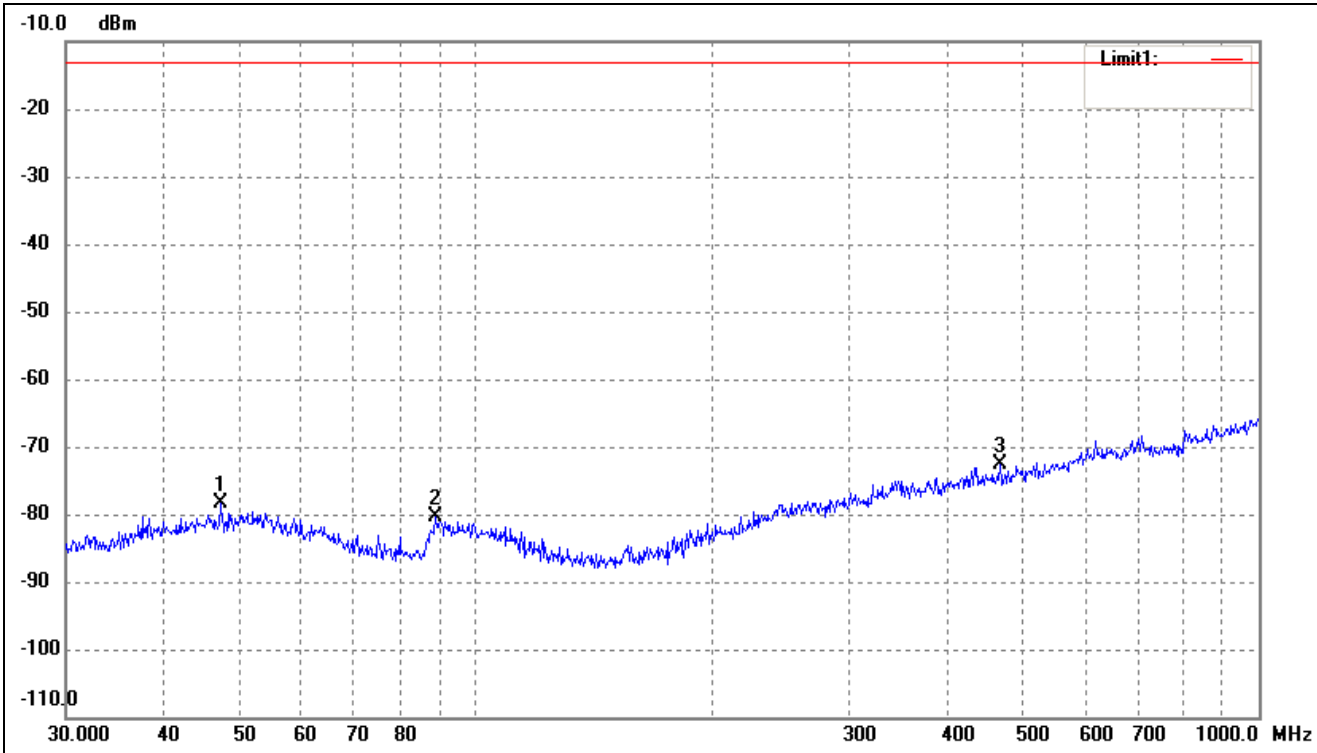
➤ Spurious Emissions Below 1GHz

|                   |        |           |            |
|-------------------|--------|-----------|------------|
| For Cellular Band |        |           |            |
| Test Channel      | GSM850 | Polarity: | Horizontal |



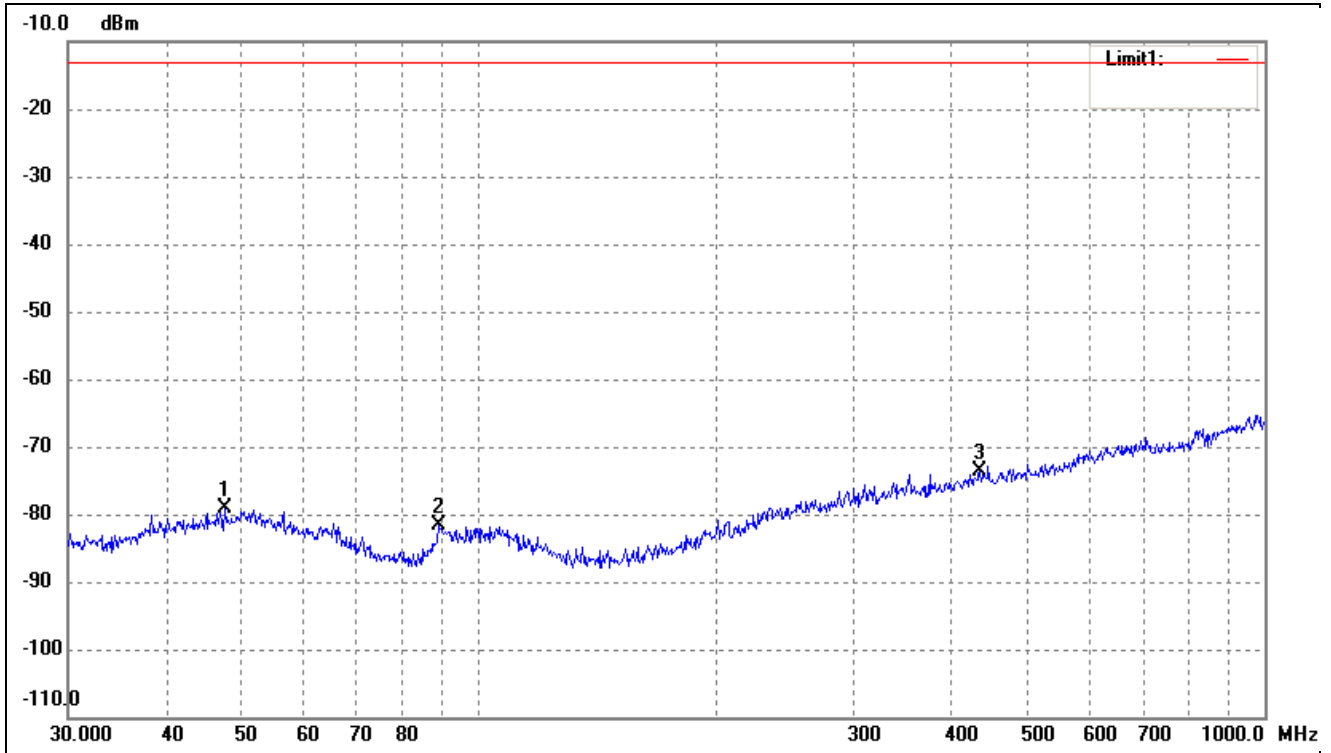
| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Degree ( ) | Height (cm) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|------------|-------------|--------|
| 1   | 52.0251         | -79.59        | 0.21         | -79.38       | -13.00      | -66.38      | 239        | 100         | peak   |
| 2   | 93.7685         | -78.75        | -2.35        | -81.10       | -13.00      | -68.10      | 93         | 100         | peak   |
| 3   | 373.3112        | -78.55        | 4.55         | -74.00       | -13.00      | -61.00      | 221        | 100         | peak   |

|                   |        |           |          |
|-------------------|--------|-----------|----------|
| For Cellular Band |        |           |          |
| Test Channel      | GSM850 | Polarity: | Vertical |



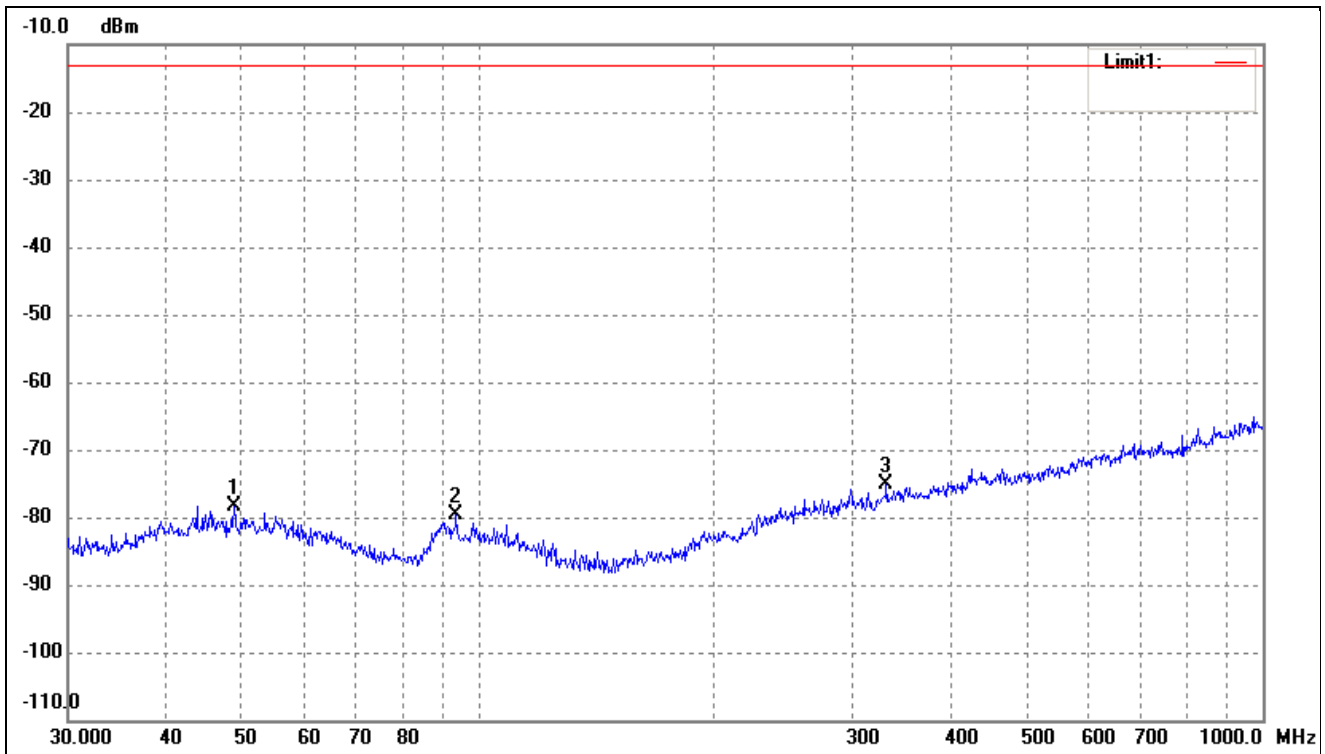
| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Degree ( ) | Height (cm) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|------------|-------------|--------|
| 1   | 47.3255         | -78.55        | 0.10         | -78.45       | -13.00      | -65.45      | 337        | 100         | peak   |
| 2   | 88.9639         | -78.06        | -2.41        | -80.47       | -13.00      | -67.47      | 98         | 100         | peak   |
| 3   | 467.2349        | -78.44        | 5.71         | -72.73       | -13.00      | -59.73      | 243        | 100         | peak   |

|                   |         |           |            |
|-------------------|---------|-----------|------------|
| For Cellular Band |         |           |            |
| Test Channel      | GSM1900 | Polarity: | Horizontal |



| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Degree ( ) | Height (cm) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|------------|-------------|--------|
| 1   | 47.4918         | -79.22        | 0.10         | -79.12       | -13.00      | -66.12      | 267        | 100         | peak   |
| 2   | 88.9639         | -79.12        | -2.41        | -81.53       | -13.00      | -68.53      | 341        | 100         | peak   |
| 3   | 434.0651        | -79.44        | 5.73         | -73.71       | -13.00      | -60.71      | 58         | 100         | peak   |

|                   |         |           |          |
|-------------------|---------|-----------|----------|
| For Cellular Band |         |           |          |
| Test Channel      | GSM1900 | Polarity: | Vertical |



| No. | Frequency<br>(MHz) | Reading<br>(dBm) | Correct<br>dB | Result<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|------------------|---------------|-----------------|----------------|----------------|---------------|----------------|--------|
| 1   | 48.8429            | -78.53           | 0.17          | -78.36          | -13.00         | -65.36         | 263           | 100            | peak   |
| 2   | 93.7685            | -77.30           | -2.35         | -79.65          | -13.00         | -66.65         | 288           | 100            | peak   |
| 3   | 331.3547           | -79.28           | 4.19          | -75.09          | -13.00         | -62.09         | 96            | 100            | peak   |

Note: Margin= (Reading+ Correct)- Limit

- Spurious Emissions Above 1GHz
- For Cellular Band\_GSM850 Mode

| Frequency                 | Reading | Correct | Result | Limit | Margin | Polar |
|---------------------------|---------|---------|--------|-------|--------|-------|
| (MHz)                     | (dBm)   | dB      | (dBm)  | (dBm) | (dB)   | H/V   |
| Low Channel (824.2MHz)    |         |         |        |       |        |       |
| 1648.4                    | -37.66  | 4.94    | -32.72 | -13   | -19.72 | H     |
| 2472.6                    | -41.31  | 8.46    | -32.85 | -13   | -19.85 | H     |
| 1648.4                    | -34.96  | 4.94    | -30.02 | -13   | -17.02 | V     |
| 2472.6                    | -42.82  | 8.46    | -34.36 | -13   | -21.36 | V     |
| Middle Channel (836.6MHz) |         |         |        |       |        |       |
| 1673.2                    | -37.28  | 5.11    | -32.17 | -13   | -19.17 | H     |
| 2509.8                    | -43.07  | 8.54    | -34.53 | -13   | -21.53 | H     |
| 1673.2                    | -34.82  | 5.11    | -29.71 | -13   | -16.71 | V     |
| 2509.8                    | -41.5   | 8.54    | -32.96 | -13   | -19.96 | V     |
| High Channel (848.8MHz)   |         |         |        |       |        |       |
| 1697.6                    | -36.2   | 5.25    | -30.95 | -13   | -17.95 | H     |
| 2546.4                    | -44.18  | 8.57    | -35.61 | -13   | -22.61 | H     |
| 1697.6                    | -35.86  | 5.25    | -30.61 | -13   | -17.61 | V     |
| 2546.4                    | -42.99  | 8.57    | -34.42 | -13   | -21.42 | V     |

- For PCS Band\_GSM1900 Mode

| Frequency                | Reading | Correct | Result | Limit | Margin | Polar |
|--------------------------|---------|---------|--------|-------|--------|-------|
| (MHz)                    | (dBm)   | dB      | (dBm)  | (dBm) | (dB)   | H/V   |
| Low Channel (1850.2MHz)  |         |         |        |       |        |       |
| 3700.4                   | -39.88  | 10.54   | -29.34 | -13   | -16.34 | H     |
| 5550.6                   | -48.87  | 13.37   | -35.5  | -13   | -22.5  | H     |
| 3700.4                   | -41.7   | 10.54   | -31.16 | -13   | -18.16 | V     |
| 5550.6                   | -48.82  | 13.37   | -35.45 | -13   | -22.45 | V     |
| Middle Channel (1880MHz) |         |         |        |       |        |       |
| 3760.0                   | -42.83  | 10.64   | -32.19 | -13   | -19.19 | H     |
| 5640.0                   | -47.45  | 13.54   | -33.91 | -13   | -20.91 | H     |
| 3760.0                   | -42.82  | 10.64   | -32.18 | -13   | -19.18 | V     |
| 5640.0                   | -48.73  | 13.54   | -35.19 | -13   | -22.19 | V     |
| High Channel (1909.8MHz) |         |         |        |       |        |       |
| 3819.6                   | -39.26  | 10.74   | -28.52 | -13   | -15.52 | H     |
| 5729.4                   | -47.9   | 13.71   | -34.19 | -13   | -21.19 | H     |
| 3819.6                   | -39.34  | 10.74   | -28.6  | -13   | -15.6  | V     |
| 5729.4                   | -48.76  | 13.71   | -35.05 | -13   | -22.05 | V     |

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 9. Frequency Stability

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### 9.1 Standard Applicable

According to §22.355, §24.235 the limit is 2.5ppm.

### 9.2 Test Procedure

According to §2.1055, the following test procedure was performed.

The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode

### 9.3 Summary of Test Results/Plots

Note: 1. Worst case at GSM850/PCS1900 middle channel

2. Normal Voltage NV=DC3.7V; Low Voltage LV=DC3.5V;High Voltage HV=DC4.20V

## ➤ Frequency stability V.S. Temperature measurement

| Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz |                   |                 |        |             |        |
|---|-------------------|-----------------|--------|-------------|--------|
| Power supplied (Vdc)  | Temperature ( °C) | Frequency error |        | Limit (ppm) | Result |
|   |                   | Hz              | ppm    |             |        |
| NV  | -30               | 68              | 0.0813 | 2.50        | Pass   |
|   | -20               | 60              | 0.0717 |             |        |
|   | -10               | 49              | 0.0586 |             |        |
|   | 0                 | 42              | 0.0502 |             |        |
|   | 10                | 36              | 0.0430 |             |        |
|   | 20                | 28              | 0.0335 |             |        |
|   | 30                | 34              | 0.0406 |             |        |
|   | 40                | 39              | 0.0466 |             |        |
|   | 50                | 45              | 0.0538 |             |        |
| Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz |                   |                 |        |             |        |
| Power supplied (Vdc)  | Temperature ( °C) | Frequency error |        | Limit (ppm) | Result |
|   |                   | Hz              | ppm    |             |        |
| NV  | -30               | 65              | 0.0346 | 2.50        | Pass   |
|   | -20               | 61              | 0.0324 |             |        |
|   | -10               | 50              | 0.0266 |             |        |
|   | 0                 | 44              | 0.0234 |             |        |
|   | 10                | 38              | 0.0202 |             |        |
|   | 20                | 30              | 0.0160 |             |        |
|   | 30                | 35              | 0.0186 |             |        |
|   | 40                | 41              | 0.0218 |             |        |
|   | 50                | 48              | 0.0255 |             |        |

## ➤ Frequency stability V.S. Voltage measurement

| Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz |                      |                 |        |             |        |
|--|----------------------|-----------------|--------|-------------|--------|
| Temperature ( °C)  | Power supplied (Vdc) | Frequency error |        | Limit (ppm) | Result |
|  |                      | Hz              | ppm    |             |        |
| 25   | HV                   | 55              | 0.0657 | 2.50        | Pass   |
|  | NV                   | 48              | 0.0574 |             |        |
|  | LV                   | 40              | 0.0478 |             |        |
| Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz |                      |                 |        |             |        |
| Temperature ( °C)  | Power supplied (Vdc) | Frequency error |        | Limit (ppm) | Result |
|  |                      | Hz              | ppm    |             |        |
| 25   | HV                   | 53              | 0.0282 | 2.50        | Pass   |
|  | NV                   | 46              | 0.0245 |             |        |
|  | LV                   | 35              | 0.0186 |             |        |



## 10. Modulation characteristics

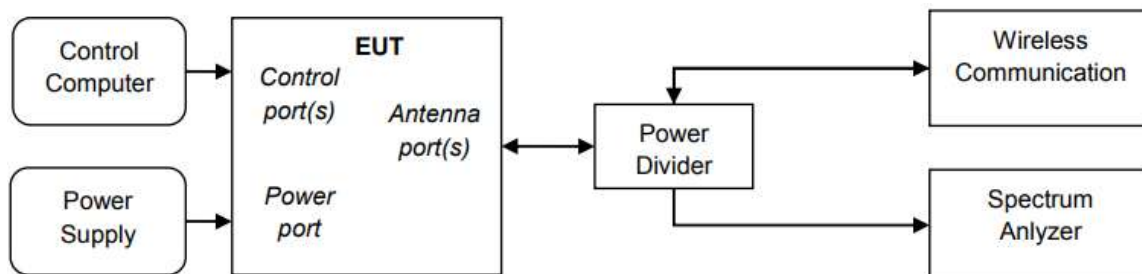
### 10.1 Standard Applicable

According to §2.1047, Measurements required: Modulation characteristics is given below:

- (a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.
- (b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
- (c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.
- (d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

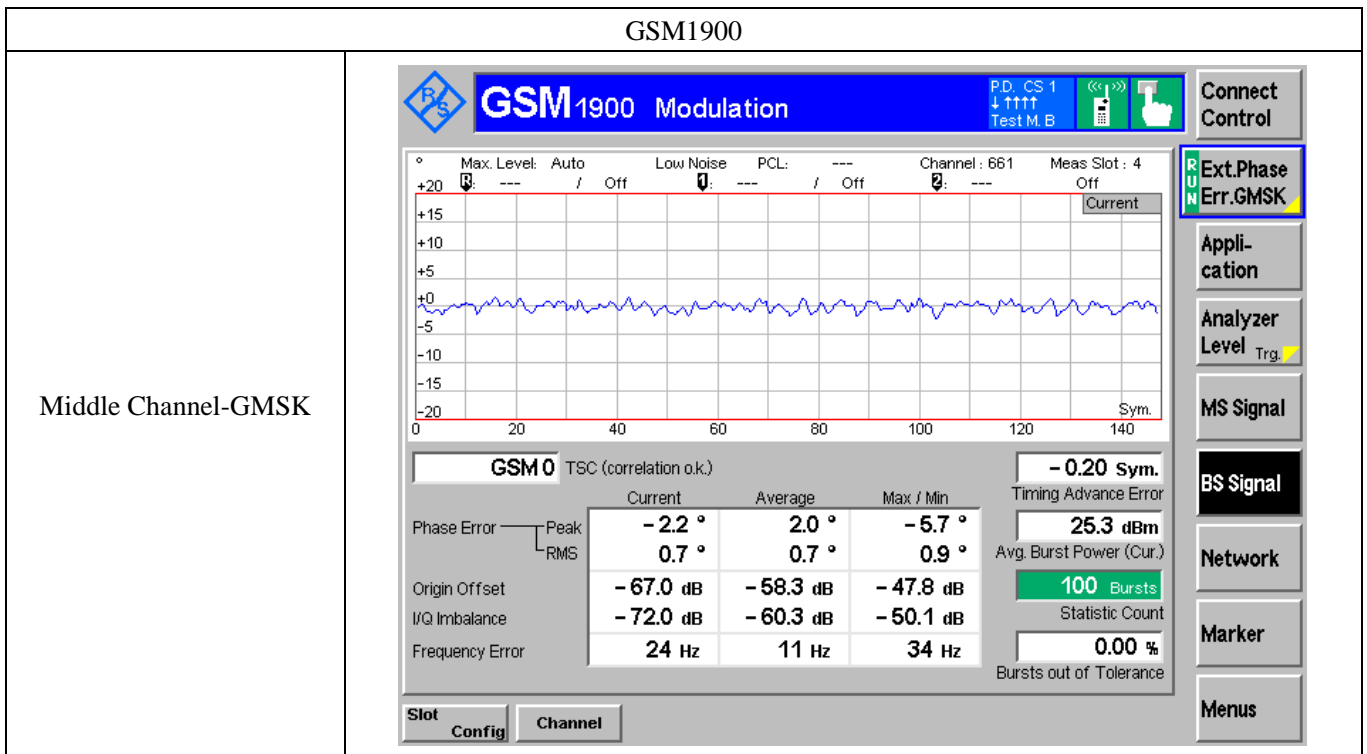
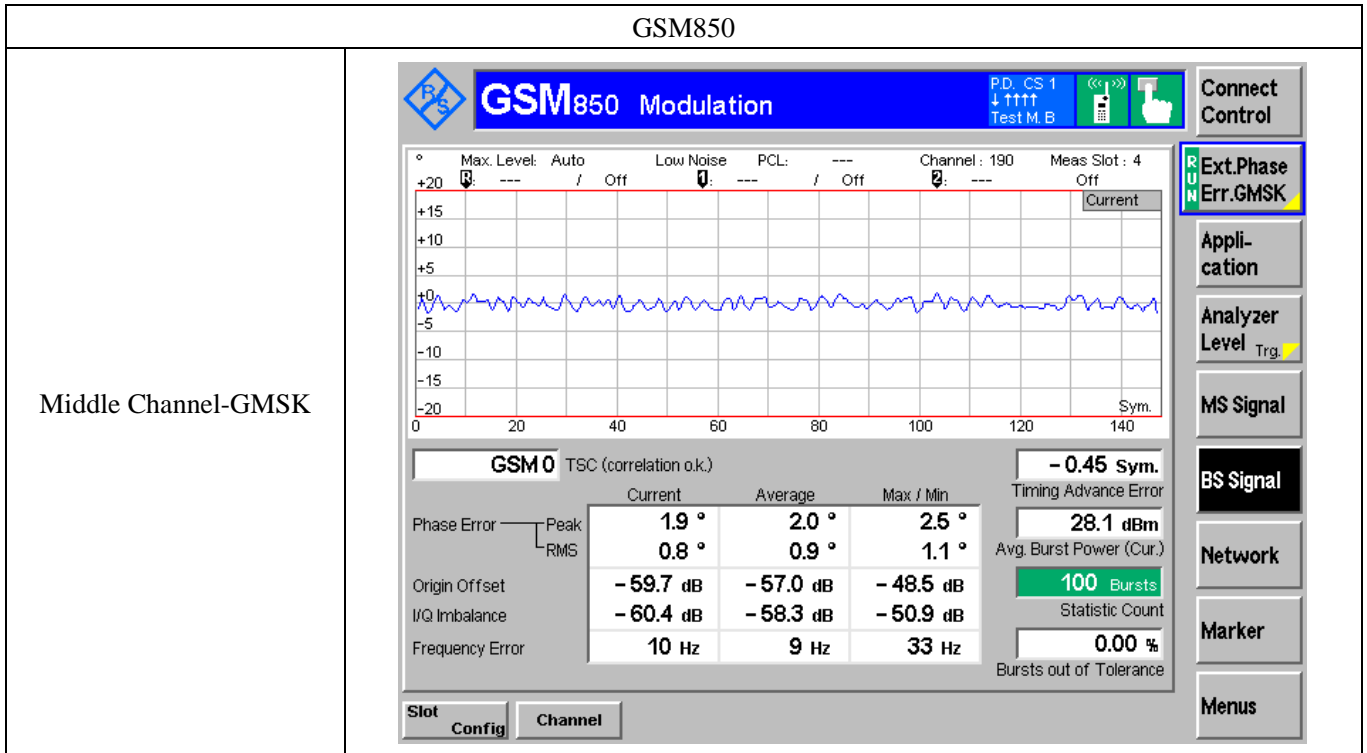
### 10.2 Test Procedure

According to ANSI C63.26-2015 section 5.3.2, the following test setup was performed.



### 10.3 Summary of Test Results/Plots

Only the worst case was selected to record



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