



RADIO TEST REPORT

Report No: STS1911255W01

Issued for

SIMCom Wireless Solutions Limited

No.633, Jinzhong Road, Shanghai, China

|                |                      |
|----------------|----------------------|
| Product Name:  | NB/GSM/GNSS MODULE   |
| Brand Name:    | SIMCom               |
| Model Name:    | SIM7070G             |
| Series Model:  | SIM7070G-PCIE        |
| FCC ID:        | 2AJYU-8VC0001        |
| Test Standard: | FCC Part 22H and 24E |

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**TEST RESULT CERTIFICATION**

Applicant's Name .....: SIMCom Wireless Solutions Limited  
Address.....: No.633, Jinzhong Road, Shanghai, China  
Manufacture's Name .....: SIMCom Wireless Solutions Limited  
Address.....: No.633, Jinzhong Road, Shanghai, China

**Product Description**

Product Name .....: NB/GSM/GNSS MODULE  
Brand Name .....: SIMCom  
Model Name.....: SIM7070G  
Series Model .....: SIM7070G-PCIE  
Test Standards .....: FCC Part 22H and 24E  
Test Procedure .....: KDB 971168 D01 v03r01, ANSI C63.26( 2015)

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test.....:   
Date of receipt of test item.....: 20 Nov. 2019  
Date (s) of performance of tests : 20 Nov. 2019 ~ 24 Dec. 2019  
Date of Issue .....: 24 Dec. 2019  
Test Result .....: Pass

Testing Engineer :

(Chris Chen)

Technical Manager :

(Sunday Hu)

Authorized Signatory :

(Vita Li)





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**Revision History**

| Rev. | Issue Date   | Report NO.    | Effect Page | Contents      |
|------|--------------|---------------|-------------|---------------|
| 00   | 24 Dec. 2019 | STS1911255W01 | ALL         | Initial Issue |
|      |              |               |             |               |





## SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

The radiated emission testing was performed according to the procedures of KDB 971168 D01 v03r01 and ANSI C63.26( 2015)

| FCC Rules                  | Test Description                                                   | Test Limit                                                       | Test Result | Reference |
|----------------------------|--------------------------------------------------------------------|------------------------------------------------------------------|-------------|-----------|
| 2.1049                     | Conducted OutputPower                                              | Reporting Only                                                   | PASS        |           |
| 2.0146<br>24.232           | Peak-to-AverageRatio                                               | < 13 dB                                                          | PASS        |           |
| 2.1046<br>22.913<br>24.232 | Effective Radiated<br>Power/Equivalent Isotropic<br>Radiated Power | < 7 Watts max. ERP(Part 22)<br>< 2 Watts max. EIRP(Part 24)      | PASS        |           |
| 2.1049<br>22.917<br>24.238 | Occupied Bandwidth                                                 | Reporting Only                                                   | PASS        |           |
| 2.1055<br>22.355<br>24.235 | Frequency Stability                                                | < 2.5 ppm (Part 22)<br>Emission must remain in band<br>(Part 24) | PASS        |           |
| 2.1051<br>22.917<br>24.238 | Spurious Emission at<br>Antenna Terminals                          | < 43+10log10(P[Watts])                                           | PASS        |           |
| 2.1053<br>22.917<br>24.238 | Field Strength of Spurious<br>Radiation                            | < 43+10log10(P[Watts])                                           | PASS        |           |
| 2.1051<br>22.917<br>24.238 | Band Edge                                                          | < 43+10log10(P[Watts])                                           | PASS        |           |



## 1 INTRODUCTION

### 1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

### 1.2 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement data shown herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| No. | Item                              | Uncertainty          |
|-----|-----------------------------------|----------------------|
| 1   | RF output power, conducted        | $\pm 0.68\text{dB}$  |
| 2   | Unwanted Emissions, conducted     | $\pm 2.988\text{dB}$ |
| 3   | All emissions, radiated 30-1GHz   | $\pm 6.7\text{dB}$   |
| 4   | All emissions, radiated 1G-6GHz   | $\pm 5.5\text{dB}$   |
| 5   | All emissions, radiated >6G       | $\pm 5.8\text{dB}$   |
| 6   | Conducted Emission (9KHz-150KHz)  | $\pm 4.43\text{dB}$  |
| 7   | Conducted Emission (150KHz-30MHz) | $\pm 5\text{dB}$     |



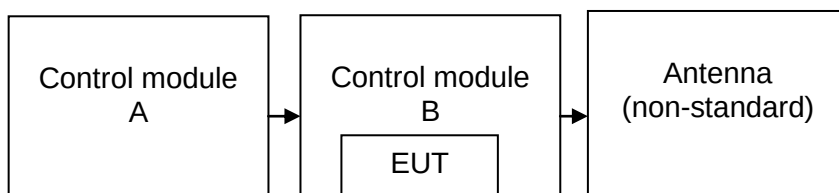
## 2 PRODUCT INFORMATION

|                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name                                                                                                                                                | NB/GSM/GNSS MODULE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Trade Name                                                                                                                                                  | SIMCom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Model Name                                                                                                                                                  | SIM7070G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Series Model                                                                                                                                                | SIM7070G-PCIE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Model Difference                                                                                                                                            | Only different in model name and appearance                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Tx Frequency:                                                                                                                                               | GSM/GPRS/EDGE:<br>850: 824 MHz ~ 849MHz<br>1900: 1850 MHz ~ 1910MHz                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Rx Frequency:                                                                                                                                               | GSM/GPRS/EDGE:<br>850: 869 MHz ~ 894 MHz<br>1900: 1930 MHz ~ 1990MHz                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Max RF Output Power:                                                                                                                                        | GSM 850:30.34dBm, GSM 1900:30.38dBm<br>GPRS850(1-Slot):29.72dBm, GPRS1900(1-Slot):29.85dBm<br>GPRS850(2-Slot):29.26dBm, GPRS1900(2-Slot):29.43dBm<br>GPRS850(3-Slot):28.81dBm, GPRS1900(3-Slot):28.98dBm<br>GPRS850(4-Slot):28.36dBm, GPRS1900(4-Slot):28.58dBm<br>EDGE 850(1-Slot):28.71dBm, EDGE 1900(1-Slot):29.80dBm<br>EDGE 850(2-Slot):27.98dBm, EDGE 1900(2-Slot):29.03dBm<br>EDGE 850(3-Slot):27.23dBm, EDGE 1900(3-Slot):28.25dBm<br>EDGE 850(4-Slot):26.48dBm, EDGE 1900(4-Slot):27.48dBm |
| Type of Emission:                                                                                                                                           | GSM(850): 306KGXW; GSM(1900): 305KGXW<br>GPRS(850): 323KGXW; GPRS(1900): 319KGXW<br>EDGE(850): 318KG7W; EDGE(1900): 316KG7W                                                                                                                                                                                                                                                                                                                                                                         |
| SIM Card:                                                                                                                                                   | SIM 1 and SIM 2 is a chipset unit and tested as single chipset, SIM 1 is used to tested.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Antenna:                                                                                                                                                    | External Antenna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Antenna gain:                                                                                                                                               | GSM 850: 2dBi ,PCS 1900:3dBi                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Power Rating:                                                                                                                                               | Input: DC 3.8V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| GPRS/EDGE Class:                                                                                                                                            | Multi-Class12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Extreme Vol. Limits:                                                                                                                                        | DC 3.0 V to 4.6 V (Nominal DC3.8V )                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Extreme Temp. Tolerance:                                                                                                                                    | -30℃ to +50℃                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Hardware version number:                                                                                                                                    | V1.03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Software version number:                                                                                                                                    | R1951.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>** Note: The High Voltage 4.6V and Low Voltage 3.0V was declared by manufacturer, The EUT couldn't be operate normally with higher or lower voltage.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



## 2.1 CONFIGURATION OF EUT SYSTEM

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



As shown in figure

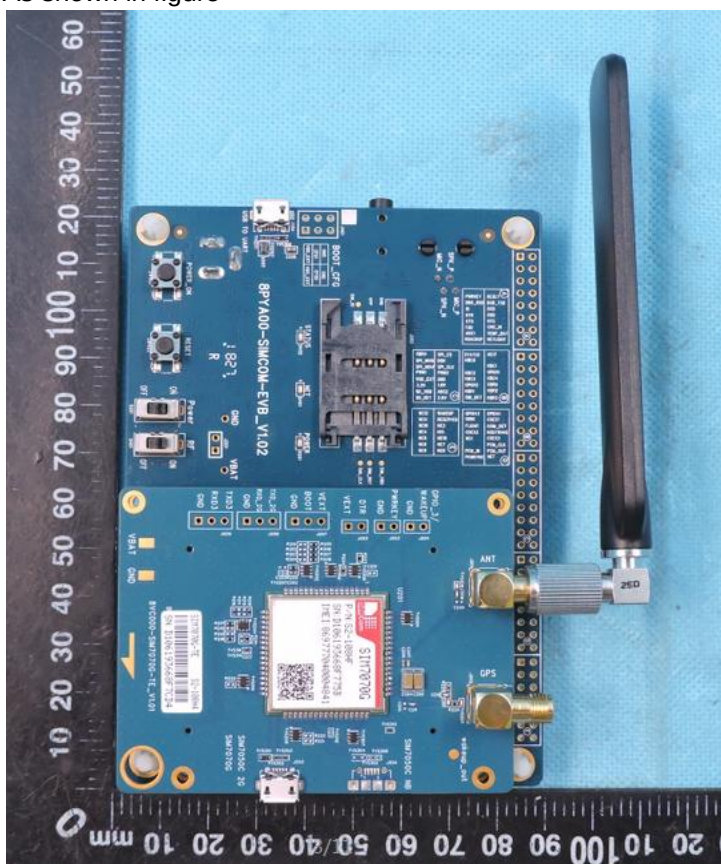


Table 2-1 Equipment Used in EUT System

| Item | Equipment        | Model No.                | Serial No. | Note |
|------|------------------|--------------------------|------------|------|
| 1    | Control module A | 8PYA00-SIMCOM-EVB_V1.02  | N/A        | N/A  |
| 2    | Control module B | 8VC000-SIM7070G-TE_V1.01 | N/A        | N/A  |

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.





### 3 TEST CONFIGURATION OF EQUIPMENT UNDER TEST

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 and ANSI C63.26 2015 Power Meas. License Digital Systems with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 10th harmonic for GSM850.
2. 30 MHz to 10th harmonic for GSM1900.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

|          | TEST MODES                          |                                     |
|----------|-------------------------------------|-------------------------------------|
|          | RADIATED TCS                        | CONDUCTED TCS                       |
| BAND     |                                     |                                     |
| GSM 850  | GSM LINK<br>GPRS/EDGE CLASS 12 LINK | GSM LINK<br>GPRS/EDGE CLASS 12 LINK |
| GSM 1900 | GSM LINK<br>GPRS/EDGE CLASS 12 LINK | GSM LINK<br>GPRS/EDGE CLASS 12 LINK |



## 4 MEASUREMENT INSTRUMENTS

## Radiation Test equipment

| Kind of Equipment                | Manufacturer | Type No.         | Serial No.   | Last calibration | Calibrated until |
|----------------------------------|--------------|------------------|--------------|------------------|------------------|
| Test Receiver                    | R&S          | ESCI             | 101427       | 2019.7.29        | 2020.7.28        |
| Signal Analyzer                  | Agilent      | N9020A           | MY51110105   | 2019.03.02       | 2020.03.01       |
| Wireless Communications Test Set | R&S          | CMW 500          | 133884       | 2019.03.02       | 2020.03.01       |
| Bilog Antenna                    | TESEQ        | CBL6111D         | 34678        | 2017.11.02       | 2020.11.1        |
| Horn Antenna                     | SCHWARZBECK  | BBHA 9120D(1201) | 9120D-1343   | 2018.10.19       | 2021.10.18       |
| SHF-EHF Horn Antenna (18G-40GHz) | A-INFO       | LB-180400-KF     | J211020657   | 2018.03.11       | 2021.03.10       |
| Pre-Amplifier (0.1M-3GHz)        | EM           | EM330            | 060665       | 2019.10.9        | 2020.10.8        |
| Pre-Amplifier (1G-18GHz)         | SKET         | LNPA-01018G-45   | SK2018080901 | 2019.10.12       | 2020.10.11       |
| Turn table                       | EM           | SC100_1          | 60531        | N/A              | N/A              |
| Antenna mast                     | EM           | SC100            | N/A          | N/A              | N/A              |
| Temperature & Humidity           | HH660        | Mieo             | N/A          | 2019.10.12       | 2020.10.11       |
| Test SW                          | BULUN        | BL410-E/18.905   |              |                  |                  |

## RF Connected Test

| Kind of Equipment                    | Manufacturer | Type No.        | Serial No. | Last calibration | Calibrated until |
|--------------------------------------|--------------|-----------------|------------|------------------|------------------|
| Universal Radio communication tester | R&S          | CMU200          | 11764      | 2019.10.11       | 2020.10.10       |
| Wireless Communications Test Set     | R&S          | CMW 500         | 133884     | 2019.03.02       | 2020.03.01       |
| Signal Analyzer                      | Agilent      | N9020A          | MY49100060 | 2019.10.9        | 2020.10.8        |
| Temperature & Humidity               | HH660        | Mieo            | N/A        | 2019.10.12       | 2020.10.11       |
| Test SW                              | FARAD        | LZ-RF /LzRf-3A3 |            |                  |                  |

Equipment with a calibration date of "NCR" shown in this list was not used to make direct calibrated measurements.

## 5 TEST ITEMS

### 5.1 CONDUCTED OUTPUT POWER

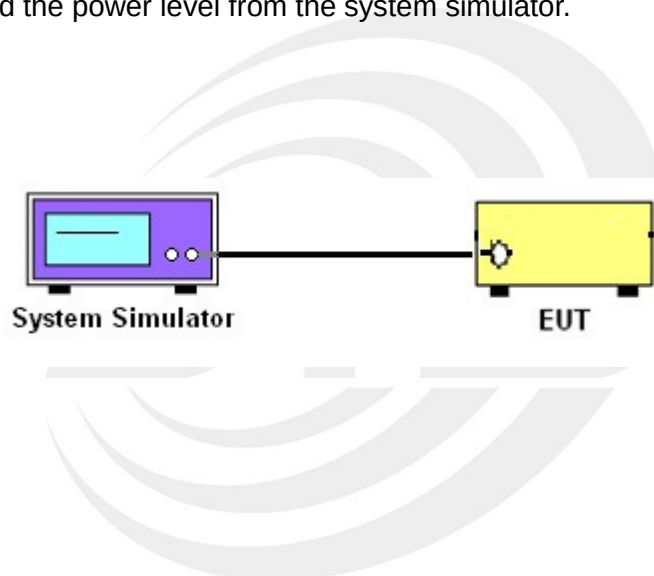
#### Test overview

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

#### Test procedures

1. The transmitter output port was connected to the system simulator.
2. Set eut at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

#### Test setup



## 5.2 PEAK TO AVERAGE RATIO

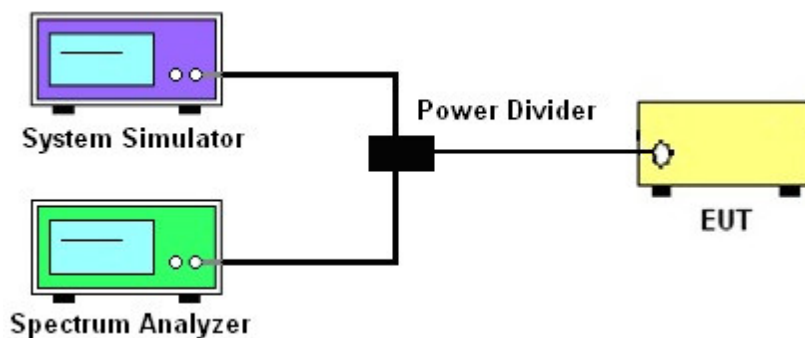
### TEST OVERVIEW

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.

### TEST PROCEDURES

1. The testing follows fccfdb 971168 v03r01 section.
2. The eut was connected to the and peak and av system simulator& spectrum analysis reads.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Set the test probe and measure average power of the spectrum analysis.

### TEST SETUP





### 5.3 TRANSMITTER RADIATED POWER (EIRP/ERP)

#### TEST OVERVIEW

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI C63.26 2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

#### TEST PROCEDURE

1. The testing follows FCC KDB 971168 D01 Section 5.2.2 (for GSM/GPRS/EDGE) and ANSI C63.26-2015 Section 5.2.
2. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.
3. 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.
4. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
5. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a nonradiating cable. The absolute levels of the spurious emissions were measured by the substitution.
6. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to ANSI C63.26-2015. The EUT was replaced by the substitution antenna at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP/ERP was calculated with the correction factor,  
$$\text{ERP/EIRP} = \text{P.SG} + \text{GT} - \text{LC}$$
  
ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P<sub>Meas</sub> as, typically dBW or dBm);  
P<sub>Meas</sub>(PK) = measured transmitter output power or PSD, in dBm or dBW;  
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);  
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

## 5.4 OCCUPIED BANDWIDTH

### TEST OVERVIEW

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

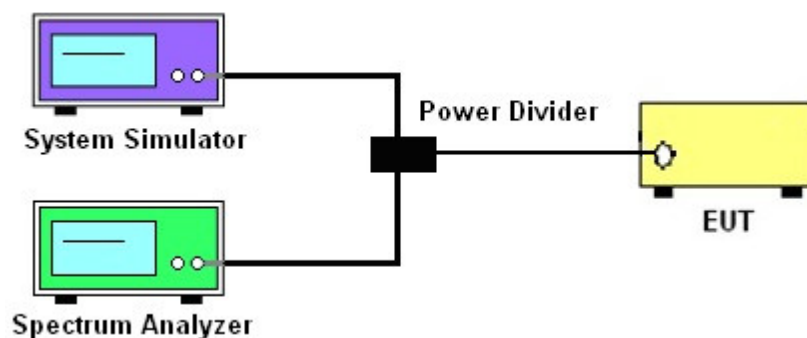
The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

All modes of operation were investigated and the worst case configuration results are reported in this section.

### TEST PROCEDURE

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2.  $RBW = 1 - 5\%$  of the expected OBW
3.  $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### TEST SETUP





## 5.5 FREQUENCY STABILITY

### Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26 2015. The frequency stability of the transmitter is measured by:

- a.) Temperature: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency. For Part 24 the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### Test Procedure

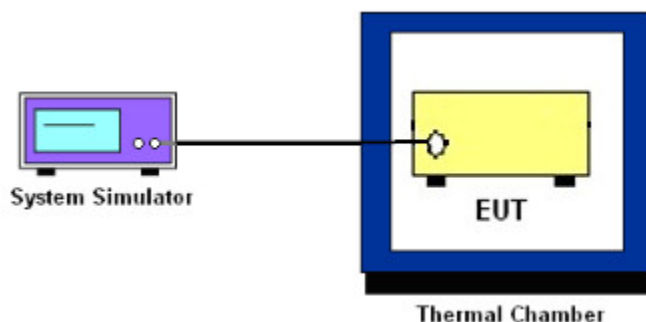
#### Temperature Variation

1. The testing follows fccfdb 971168 D01 section 9.0
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

#### Voltage Variation

1. The testing follows FCC KDB 971168 D01 Section 9.0.
2. The EUT was placed in a temperature chamber at  $25 \pm 5^\circ \text{C}$  and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

### TEST SETUP



## 5.6 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Test Overview

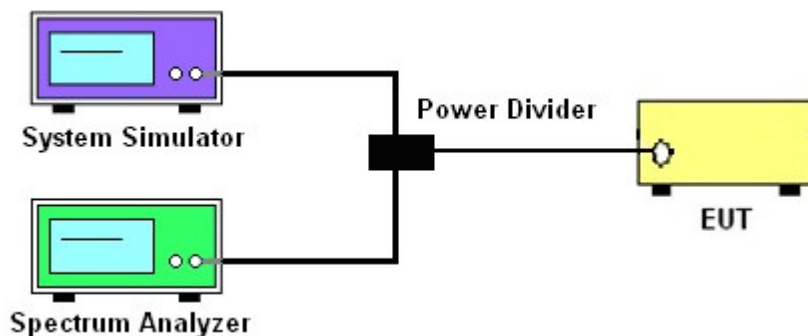
The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

### Test procedure

1. The testing FCC KDB 971168 D01 v03r01 Section 6.0. and ANSI C63.26-2015-Section 5.5
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)]$  (dB)  
 $= [30 + 10\log(P)]$  (dBm) -  $[43 + 10\log(P)]$  (dB)  
 $= -13\text{dBm}$ .

### Test Setup



## 5.7 BAND EDGE

### OVERVIEW

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

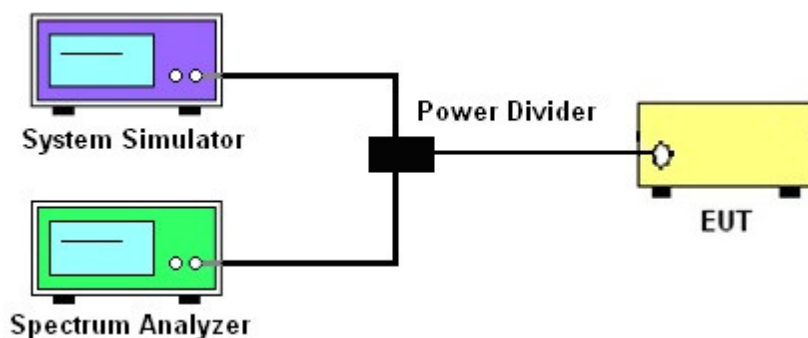
The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10}(P[\text{Watts}])$ , where P is the transmitter power in Watts.

### TEST PROCEDURE

1. The testing FCC KDB 971168 D01 v03r01 Section 6.0. and ANSI C63.26-2015-Section 5.7
2. Start and stop frequency were set such that the band edge would be placed in the center of the Plot.
3. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
4. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
5. The band edges of low and high channels for the highest RF powers were measured.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

7. The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)] \text{ (dB)}$   
 $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$   
 $= -13\text{dBm}.$

### TEST SETUP





## 5.8 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

### Test overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power and at the appropriate frequencies.

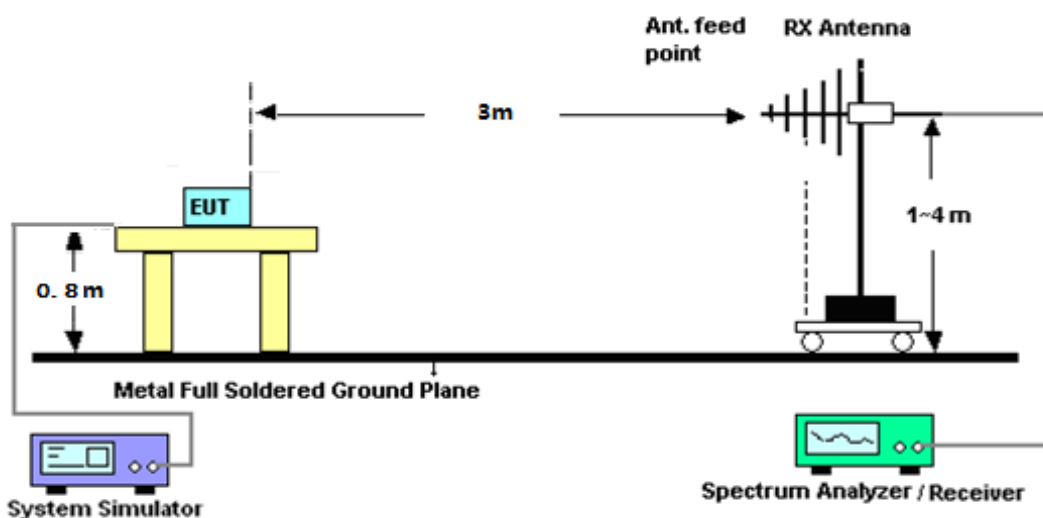
It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

### Test procedure

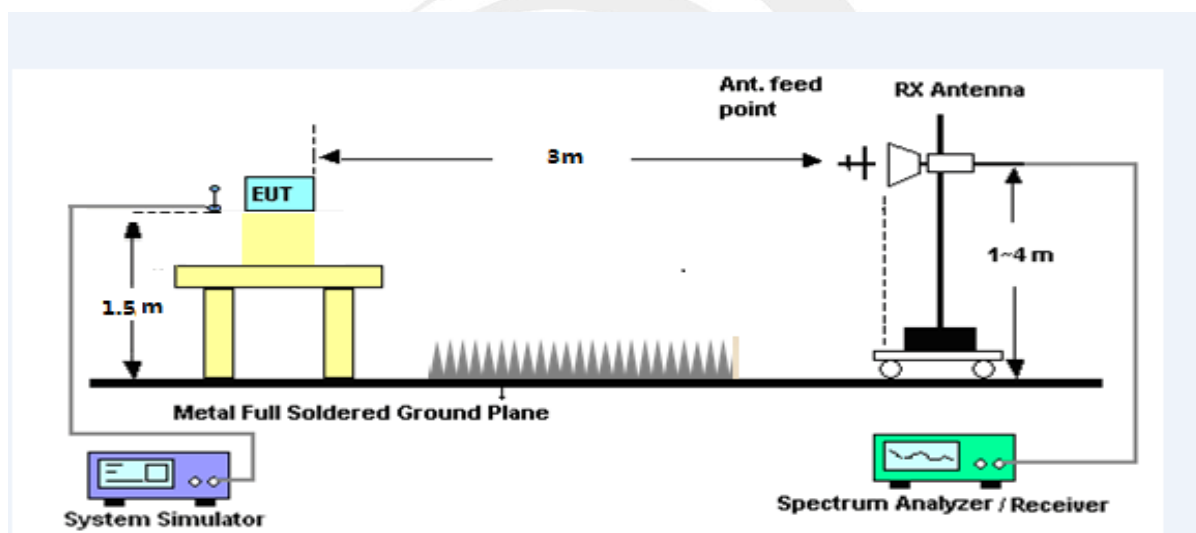
1. The testing FCC KDB 971168 D01 Section 5.8 and ANSI C63.26-2015-Section 5.5.
2. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
3. VBW  $\geq 3 \times$  RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $> 2 \times$  span/RBW
6. Detector = Peak
7. Trace mode = max hold
8. The trace was allowed to stabilize
9. Effective Isotropic Spurious Radiation was measured by substitution method according to TIA/EIA-603-D. The EUT was replaced by the substitution antenna at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP/ERP was calculated with the correction factor,  
$$\text{ERP/EIRP} = \text{P.SG} + \text{GT} - \text{LC}$$
  
ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P<sub>Meas</sub>, typically dBW or dBm);  
P.SG = measured transmitter output power or PSD, in dBm or dBW;  
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);  
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

## TEST SETUP

For radiated test from 30MHz to 1GHz



For radiated test from above 1GHz





## APPENDIX A.TESTRESULT

## A1.CONDUCTED OUTPUT POWER

GSM 850:

| GSM 850                |                 |                |
|------------------------|-----------------|----------------|
| Mode                   | Frequency (MHz) | AVG Power(dBm) |
| GSM<br>(GMSK,1-Slot)   | 824.2           | 30.19          |
|                        | 836.6           | 30.27          |
|                        | 848.8           | 30.34          |
| GPRS<br>(GMSK,1-Slot)  | 824.2           | 29.72          |
|                        | 836.6           | 29.62          |
|                        | 848.8           | 29.68          |
| GPRS<br>(GMSK,2-Slot)  | 824.2           | 29.26          |
|                        | 836.6           | 29.12          |
|                        | 848.8           | 29.26          |
| GPRS<br>(GMSK,3-Slot)  | 824.2           | 28.79          |
|                        | 836.6           | 28.67          |
|                        | 848.8           | 28.81          |
| GPRS<br>(GMSK,4-Slot)  | 824.2           | 28.36          |
|                        | 836.6           | 28.25          |
|                        | 848.8           | 28.34          |
| EGPRS<br>(8PSK,1-Slot) | 824.2           | 28.59          |
|                        | 836.6           | 28.64          |
|                        | 848.8           | 28.71          |
| EGPRS<br>(8PSK,2-Slot) | 824.2           | 27.80          |
|                        | 836.6           | 27.87          |
|                        | 848.8           | 27.98          |
| EGPRS<br>(8PSK,3-Slot) | 824.2           | 27.07          |
|                        | 836.6           | 27.11          |
|                        | 848.8           | 27.23          |
| EGPRS<br>(8PSK,4-Slot) | 824.2           | 26.27          |
|                        | 836.6           | 26.37          |
|                        | 848.8           | 26.48          |



PCS 1900:

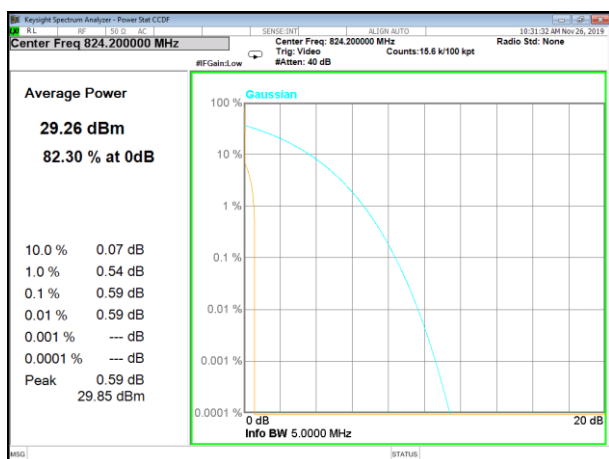
| PCS 1900               |                 |                |
|------------------------|-----------------|----------------|
| Mode                   | Frequency (MHz) | AVG Power(dBm) |
| GSM<br>(GMSK,1-Slot)   | 1850.2          | 30.33          |
|                        | 1880.0          | 30.25          |
|                        | 1909.8          | 30.38          |
| GPRS<br>(GMSK,1-Slot)  | 1850.2          | 29.76          |
|                        | 1880.0          | 29.85          |
|                        | 1909.8          | 29.81          |
| GPRS<br>(GMSK,2-Slot)  | 1850.2          | 29.34          |
|                        | 1880.0          | 29.43          |
|                        | 1909.8          | 29.36          |
| GPRS<br>(GMSK,3-Slot)  | 1850.2          | 28.86          |
|                        | 1880.0          | 28.98          |
|                        | 1909.8          | 28.96          |
| GPRS<br>(GMSK,4-Slot)  | 1850.2          | 28.36          |
|                        | 1880.0          | 28.58          |
|                        | 1909.8          | 28.51          |
| EGPRS<br>(8PSK,1-Slot) | 1850.2          | 29.80          |
|                        | 1880.0          | 29.64          |
|                        | 1909.8          | 29.72          |
| EGPRS<br>(8PSK,2-Slot) | 1850.2          | 29.03          |
|                        | 1880.0          | 28.92          |
|                        | 1909.8          | 28.99          |
| EGPRS<br>(8PSK,3-Slot) | 1850.2          | 28.24          |
|                        | 1880.0          | 28.17          |
|                        | 1909.8          | 28.25          |
| EGPRS<br>(8PSK,4-Slot) | 1850.2          | 27.47          |
|                        | 1880.0          | 27.42          |
|                        | 1909.8          | 27.48          |



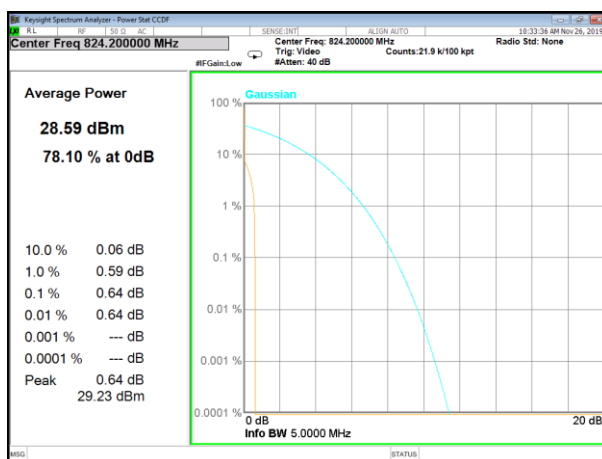


## A2. PEAK-TO-AVERAGE RADIO

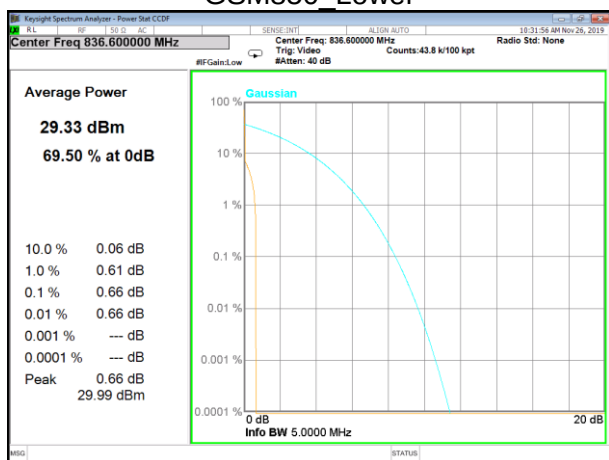
| GSM 850   |                 |      |
|-----------|-----------------|------|
| Mode      | Frequency (MHz) | PAR  |
| GSM 850   | 824.2           | 0.59 |
|           | 836.6           | 0.66 |
|           | 848.8           | 0.72 |
| GPRS 850  | 824.2           | 0.64 |
|           | 836.6           | 0.72 |
|           | 848.8           | 0.74 |
| EGPRS 850 | 824.2           | 2.95 |
|           | 836.6           | 3.28 |
|           | 848.8           | 3.38 |
| PCS 1900  |                 |      |
| Mode      | Frequency (MHz) | PAR  |
| PCS1900   | 1850.2          | 0.40 |
|           | 1880            | 0.39 |
|           | 1909.8          | 0.47 |
| GPRS1900  | 1850.2          | 0.41 |
|           | 1880            | 0.71 |
|           | 1909.8          | 0.52 |
| EGPRS1900 | 1850.2          | 3.05 |
|           | 1880            | 3.22 |
|           | 1909.8          | 3.24 |



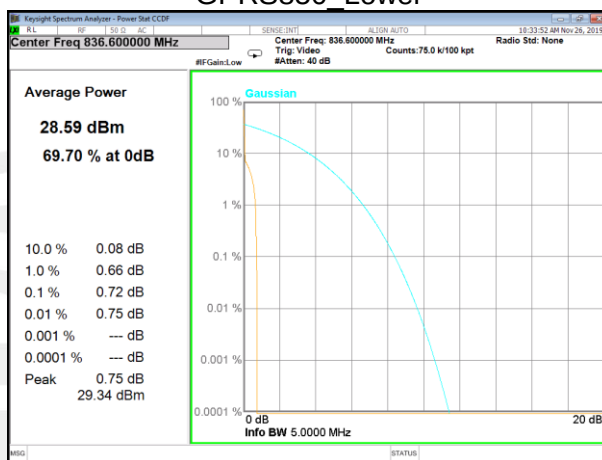
GSM850\_Lower



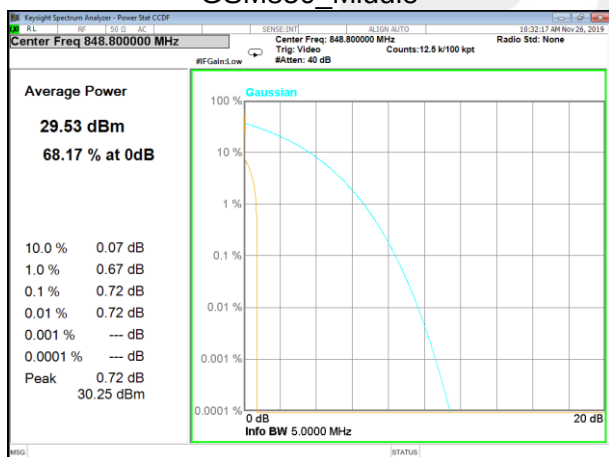
GPRS850\_Lower



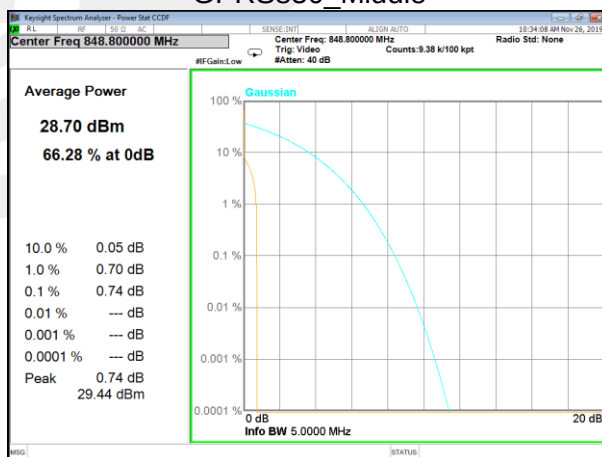
GSM850\_Middle



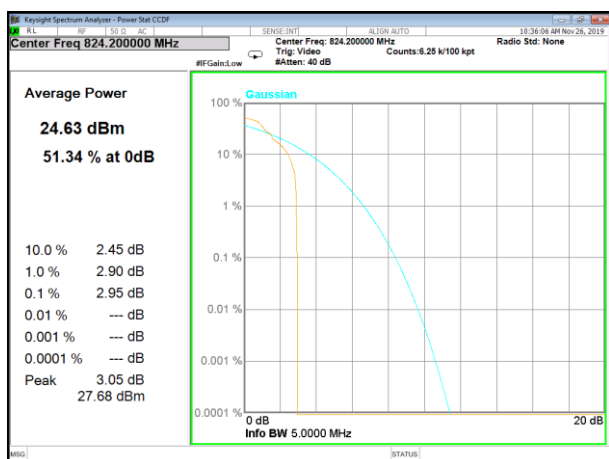
GPRS850\_Middle



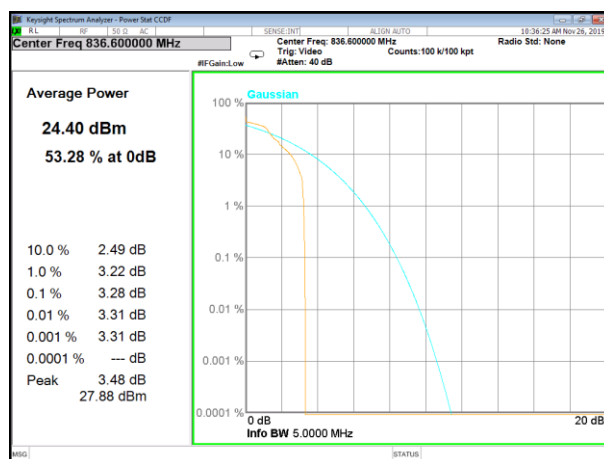
GSM850\_Higher



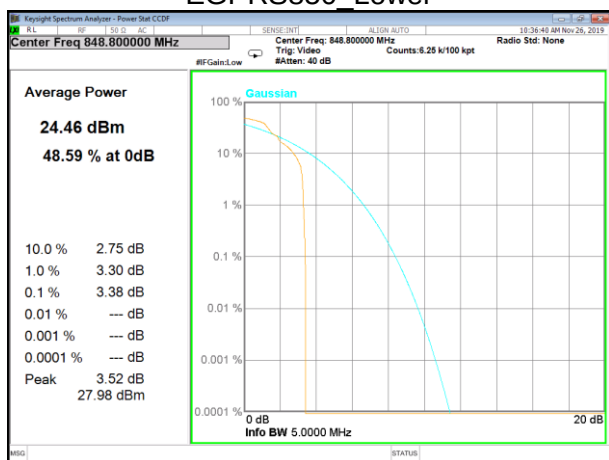
GPRS850\_Higher



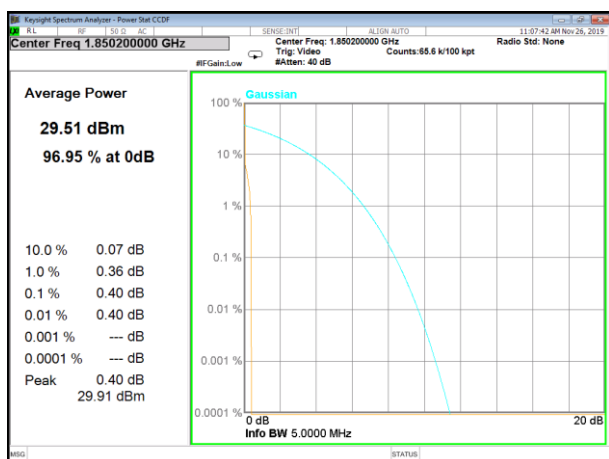
EGPRS850\_Lower



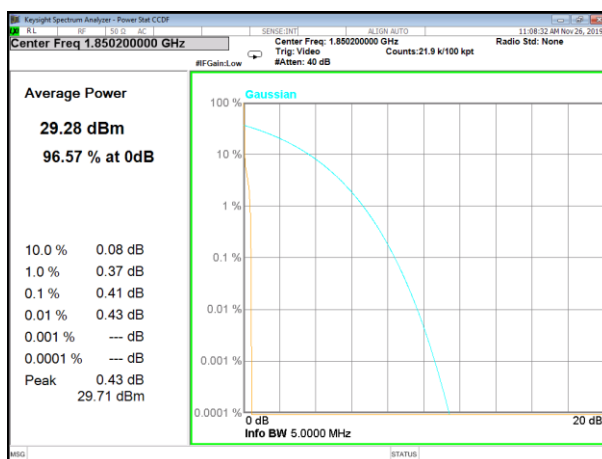
EGPRS850\_Middle



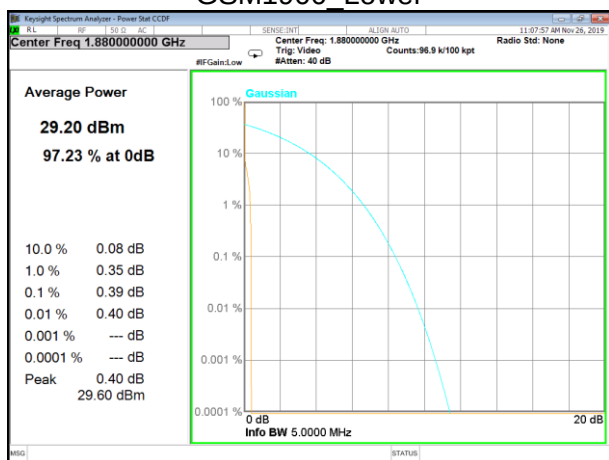
EGPRS850\_Higher



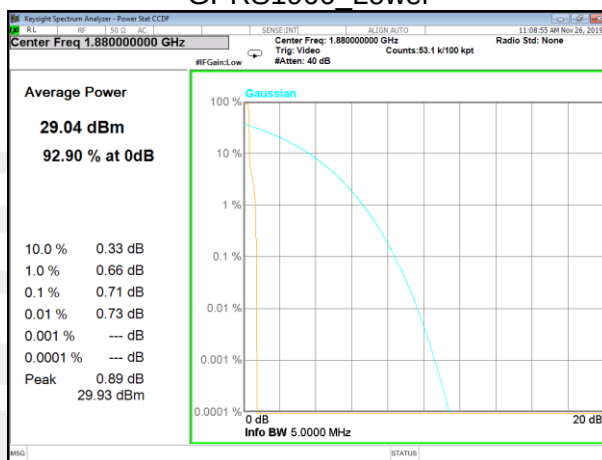
GSM1900\_Lower



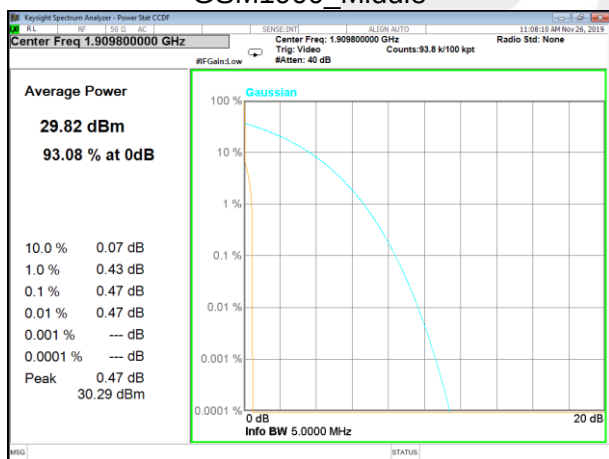
GPRS1900\_Lower



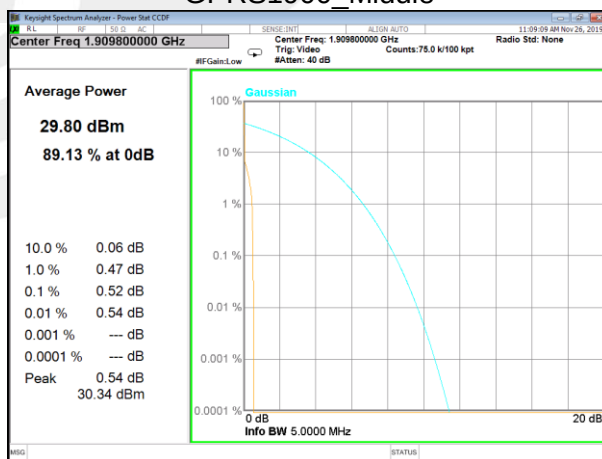
GSM1900\_Middle



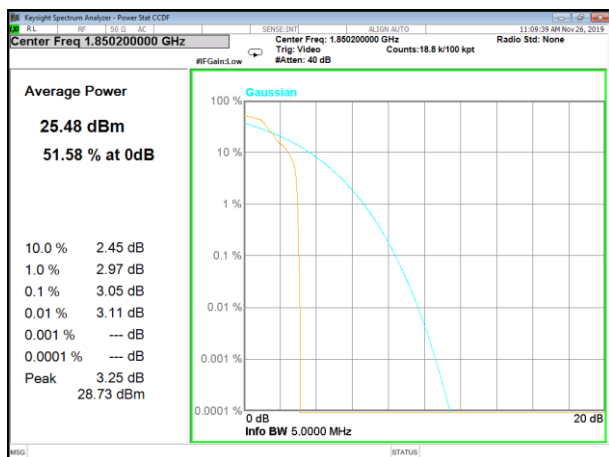
GPRS1900\_Middle



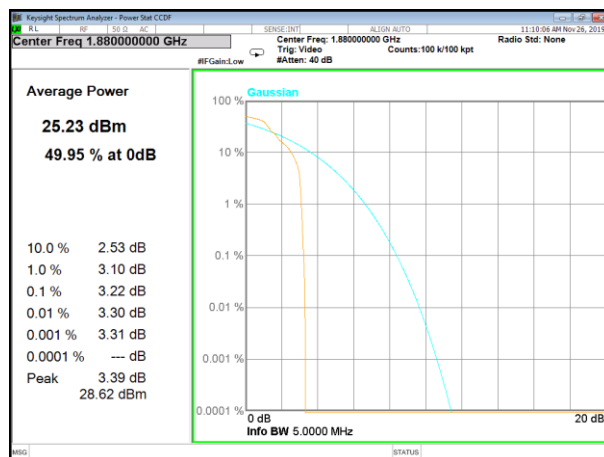
GSM1900\_Higher



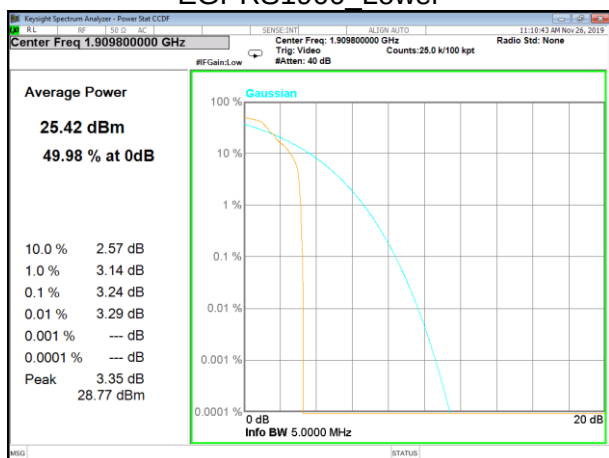
GPRS1900\_Higher



EGPRS1900\_Lower



EGPRS1900\_Middle



EGPRS1900\_Higher



## A3. TRANSMITTER RADIATED POWER (EIRP/ERP)

Note: Test is divided into three directions, X/Y/Z. X pattern for the worst

| Radiated Power (ERP) for GSM 850 MHZ |                 |                       |               |           |                     |                                |            |
|--------------------------------------|-----------------|-----------------------|---------------|-----------|---------------------|--------------------------------|------------|
| Mode                                 | Frequency       | Result                |               |           |                     |                                | Conclusion |
|                                      |                 | S<br>G.Level<br>(dBm) | Cable<br>loss | Gain(dBi) | PMeas<br>E.R.P(dBm) | Polarization<br>Of Max.<br>ERP |            |
| GSM850                               | 824.2           | 21.40                 | 0.44          | 6.5       | 27.46               | Horizontal                     | Pass       |
|                                      | 824.2           | 23.36                 | 0.44          | 6.5       | 29.42               | Vertical                       | Pass       |
|                                      | 836.6           | 21.40                 | 0.45          | 6.5       | 27.45               | Horizontal                     | Pass       |
|                                      | 836.6           | 23.40                 | 0.45          | 6.5       | 29.45               | Vertical                       | Pass       |
|                                      | 848.8           | 21.88                 | 0.46          | 6.5       | 27.92               | Horizontal                     | Pass       |
|                                      | 848.8           | 23.61                 | 0.46          | 6.5       | 29.65               | Vertical                       | Pass       |
| GPRS850                              | 824.2           | 20.72                 | 0.44          | 6.5       | 26.78               | Horizontal                     | Pass       |
|                                      | 824.2           | 23.12                 | 0.44          | 6.5       | 29.18               | Vertical                       | Pass       |
|                                      | 836.6           | 20.62                 | 0.45          | 6.5       | 26.67               | Horizontal                     | Pass       |
|                                      | 836.6           | 22.92                 | 0.45          | 6.5       | 28.97               | Vertical                       | Pass       |
|                                      | 848.8           | 20.67                 | 0.46          | 6.5       | 26.71               | Horizontal                     | Pass       |
|                                      | 848.8           | 23.06                 | 0.46          | 6.5       | 29.10               | Vertical                       | Pass       |
| EGPRS850                             | 824.2           | 19.81                 | 0.44          | 6.5       | 25.87               | Horizontal                     | Pass       |
|                                      | 824.2           | 21.95                 | 0.44          | 6.5       | 28.01               | Vertical                       | Pass       |
|                                      | 836.6           | 19.81                 | 0.45          | 6.5       | 25.86               | Horizontal                     | Pass       |
|                                      | 836.6           | 21.92                 | 0.45          | 6.5       | 27.97               | Vertical                       | Pass       |
|                                      | 848.8           | 19.88                 | 0.46          | 6.5       | 25.92               | Horizontal                     | Pass       |
|                                      | 848.8           | 22.02                 | 0.46          | 6.5       | 28.06               | Vertical                       | Pass       |
| Limit                                | ERP<7W=38.45dBm |                       |               |           |                     |                                |            |

| Radiated Power (EIRP) for PCS 1900 MHZ |               |                       |               |               |                        |                                |            |
|----------------------------------------|---------------|-----------------------|---------------|---------------|------------------------|--------------------------------|------------|
| Mode                                   | Frequency     | Result                |               |               |                        |                                | Conclusion |
|                                        |               | S<br>G.Level<br>(dBm) | Cable<br>loss | Gain<br>(dBi) | PMeas<br>E.I.R.P.(dBm) | Polarization<br>Of Max.<br>ERP |            |
| PCS1900                                | 1850.2        | 19.71                 | 2.41          | 10.35         | 27.65                  | Horizontal                     | Pass       |
|                                        | 1850.2        | 21.56                 | 2.41          | 10.35         | 29.50                  | Vertical                       | Pass       |
|                                        | 1880          | 19.75                 | 2.42          | 10.35         | 27.68                  | Horizontal                     | Pass       |
|                                        | 1880          | 21.6                  | 2.42          | 10.35         | 29.53                  | Vertical                       | Pass       |
|                                        | 1909.8        | 20.01                 | 2.43          | 10.35         | 27.93                  | Horizontal                     | Pass       |
|                                        | 1909.8        | 21.81                 | 2.43          | 10.35         | 29.73                  | Vertical                       | Pass       |
| GPRS1900                               | 1850.2        | 18.31                 | 2.41          | 10.35         | 26.25                  | Horizontal                     | Pass       |
|                                        | 1850.2        | 20.65                 | 2.41          | 10.35         | 28.59                  | Vertical                       | Pass       |
|                                        | 1880          | 18.75                 | 2.42          | 10.35         | 26.68                  | Horizontal                     | Pass       |
|                                        | 1880          | 20.97                 | 2.42          | 10.35         | 28.90                  | Vertical                       | Pass       |
|                                        | 1909.8        | 18.18                 | 2.43          | 10.35         | 26.10                  | Horizontal                     | Pass       |
|                                        | 1909.8        | 20.68                 | 2.43          | 10.35         | 28.60                  | Vertical                       | Pass       |
| EGPRS1900                              | 1850.2        | 19.17                 | 2.41          | 10.35         | 27.11                  | Horizontal                     | Pass       |
|                                        | 1850.2        | 21.3                  | 2.41          | 10.35         | 29.24                  | Vertical                       | Pass       |
|                                        | 1880          | 18.73                 | 2.42          | 10.35         | 26.66                  | Horizontal                     | Pass       |
|                                        | 1880          | 21.18                 | 2.42          | 10.35         | 29.11                  | Vertical                       | Pass       |
|                                        | 1909.8        | 18.66                 | 2.43          | 10.35         | 26.58                  | Horizontal                     | Pass       |
|                                        | 1909.8        | 21.13                 | 2.43          | 10.35         | 29.05                  | Vertical                       | Pass       |
| Limit                                  | EIRP<2W=33dBm |                       |               |               |                        |                                |            |



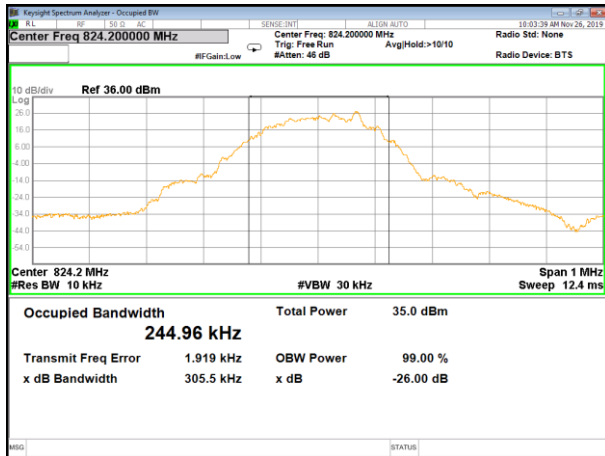
## A4. OCCUPIED BANDWIDTH (99% OCCUPIED BANDWIDTH/26dB BANDWIDTH)

| GSM Bandwidth [KHz] |        |         |        |         |         |         |
|---------------------|--------|---------|--------|---------|---------|---------|
| Mode                | Lowest |         | Middle |         | Highest |         |
|                     | 99% BW | 26dB BW | 99% BW | 26dB BW | 99% BW  | 26dB BW |
| GSM850              | 244.96 | 305.5   | 244.39 | 305.1   | 245.81  | 306     |
| GPRS850             | 245.22 | 323.1   | 243.48 | 318.2   | 245.11  | 314.6   |
| EGPRS850            | 247.35 | 318     | 249.53 | 313.1   | 247.84  | 314     |

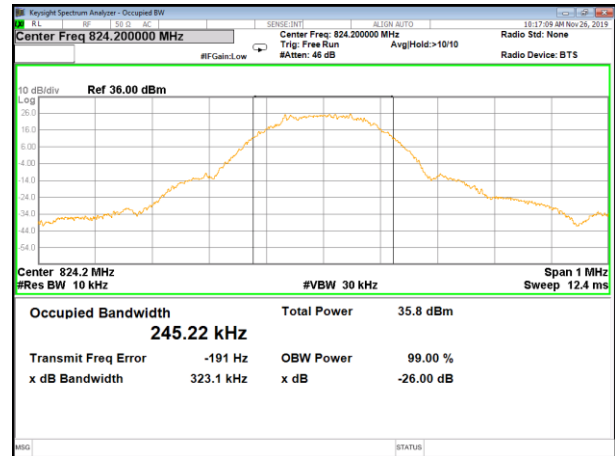
| GSM Bandwidth [KHz] |        |         |        |         |         |         |
|---------------------|--------|---------|--------|---------|---------|---------|
| Mode                | Lowest |         | Middle |         | Highest |         |
|                     | 99% BW | 26dB BW | 99% BW | 26dB BW | 99% BW  | 26dB BW |
| GSM1900             | 241.12 | 305.2   | 240.44 | 304.9   | 243.01  | 301.7   |
| GPRS1900            | 245.61 | 317.1   | 244.97 | 318.5   | 246.77  | 319     |
| EGPRS1900           | 243.91 | 315.6   | 240.82 | 309.6   | 247.31  | 315     |



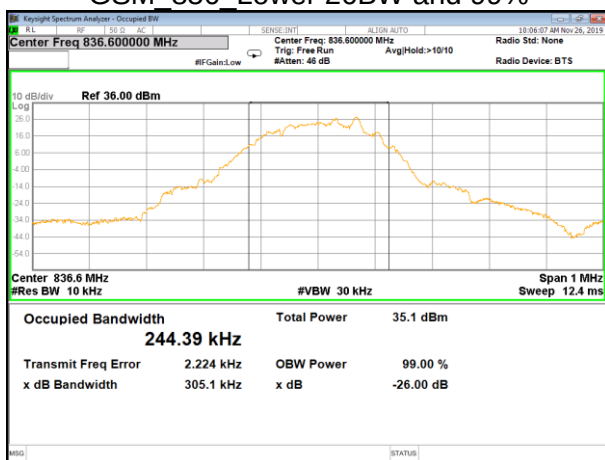




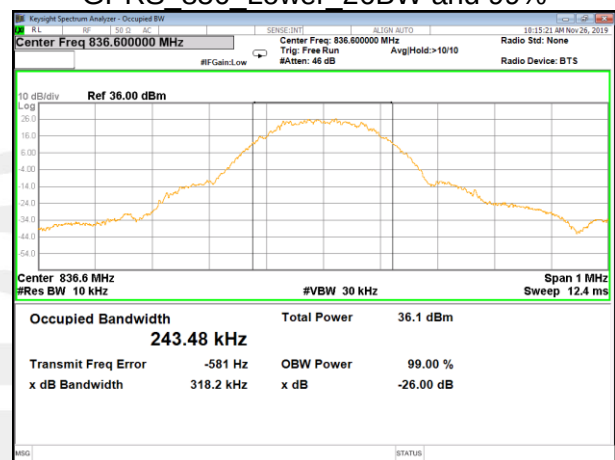
GSM\_850\_Lower\_26BW and 99%



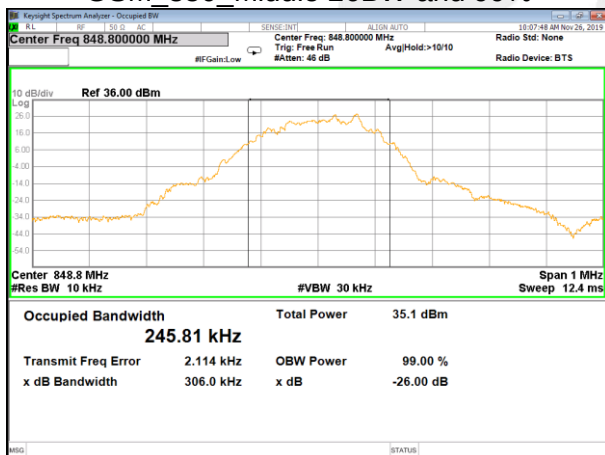
GPRS\_850\_Lower\_26BW and 99%



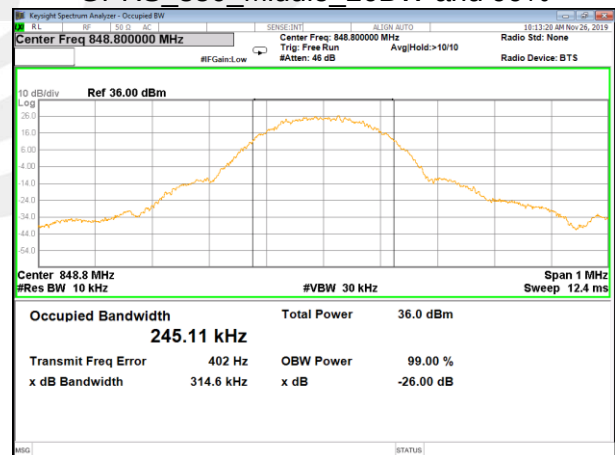
GSM\_850\_Middle\_26BW and 99%



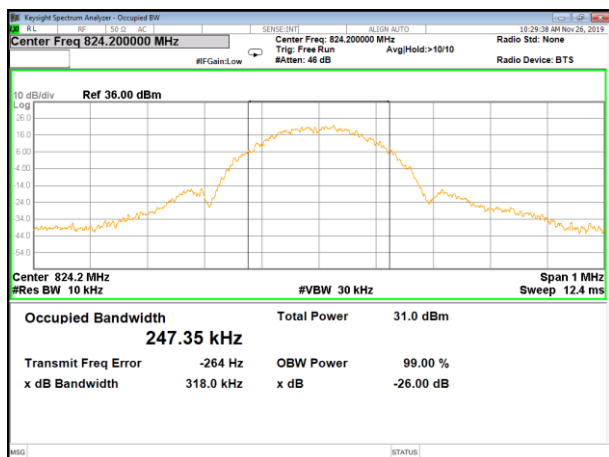
GPRS\_850\_Middle\_26BW and 99%



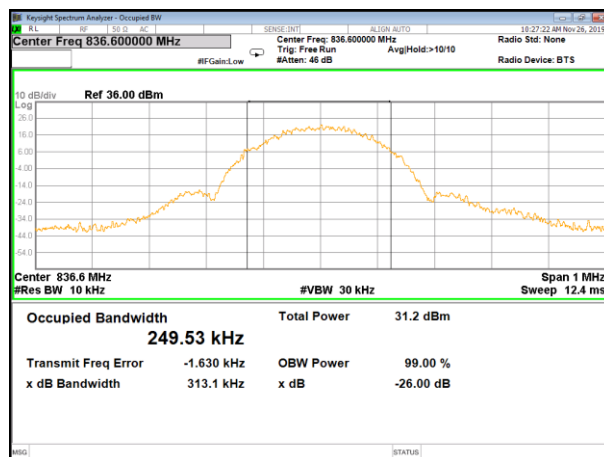
GSM\_850\_Higher\_26BW and 99%



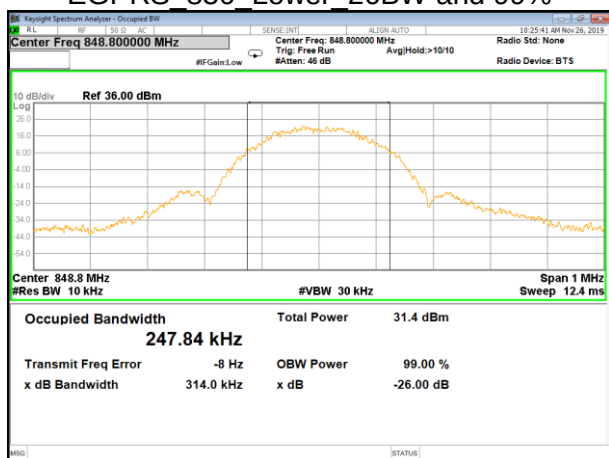
GPRS\_850\_Higher\_26BW and 99%



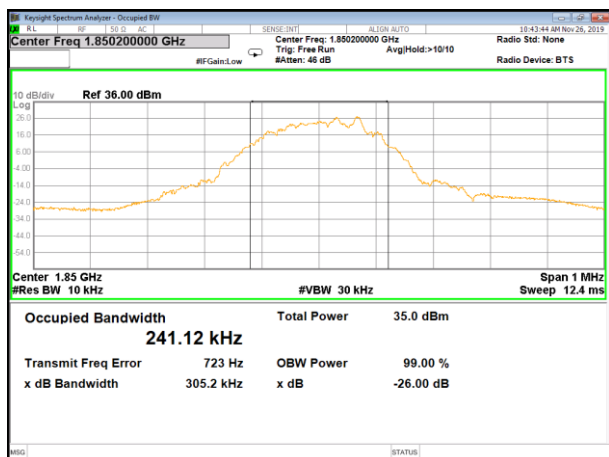
EGPRS 850 Lower 26BW and 99%



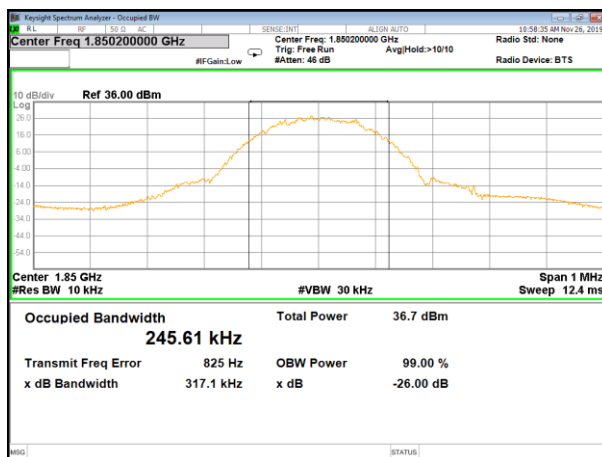
EGPRS\_850\_Middle\_26BW and 99%



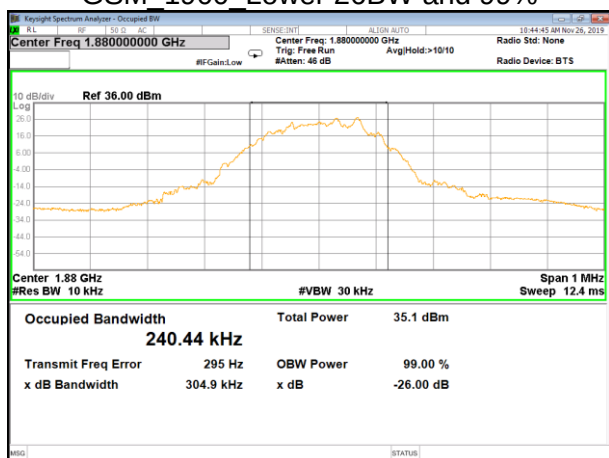
EGPRS\_850\_Higher\_26BW and 99%



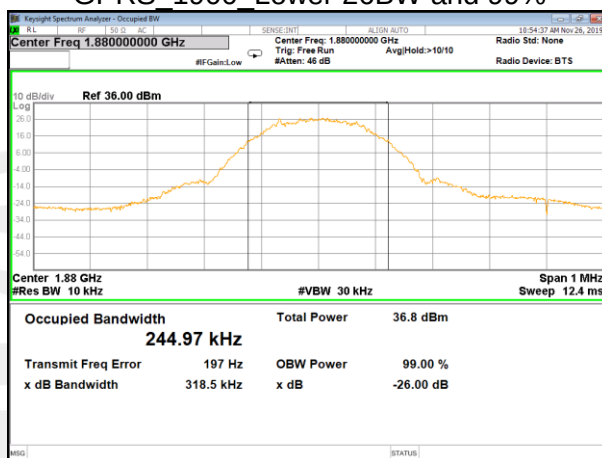
GSM\_1900\_Lower 26BW and 99%



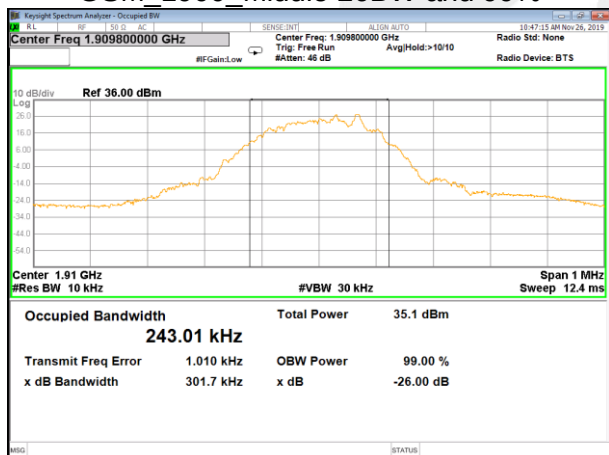
GPRS\_1900\_Lower 26BW and 99%



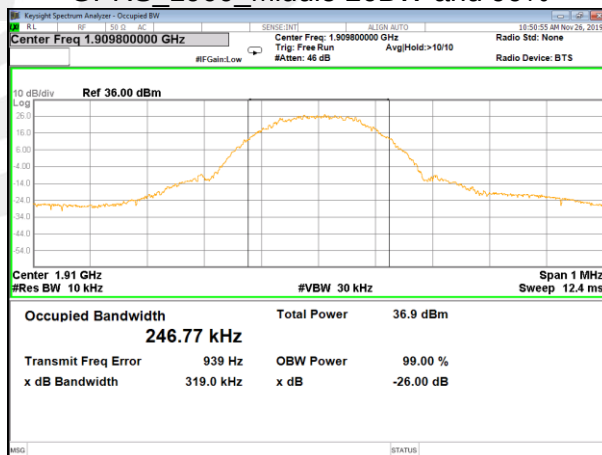
GSM\_1900\_Middle 26BW and 99%



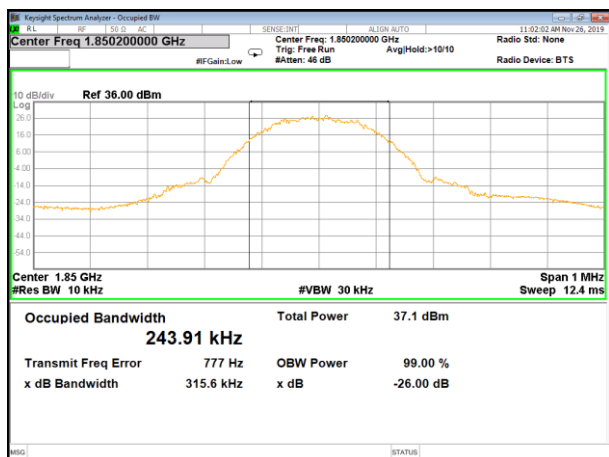
GPRS\_1900\_Middle 26BW and 99%



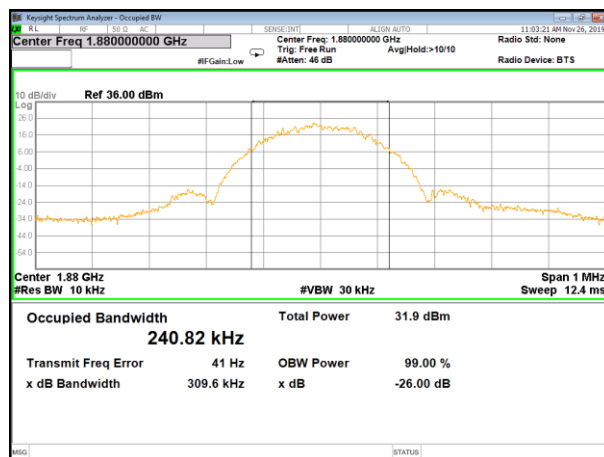
GSM\_1900\_Higher 26BW and 99%



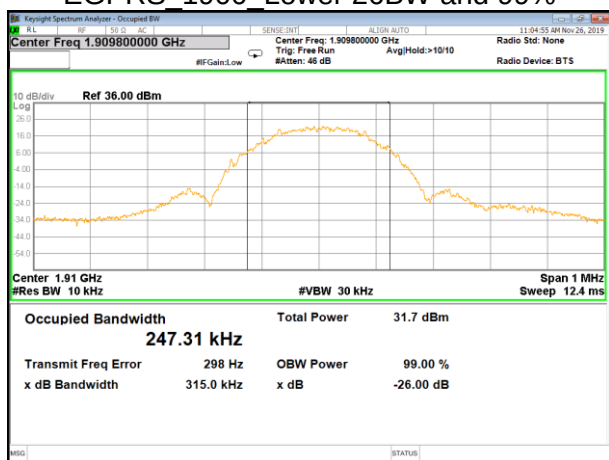
GPRS\_1900\_Higher 26BW and 99%



EGPRS\_1900\_Lower\_26BW and 99%



EGPRS\_1900\_Middle\_26BW and 99%



EGPRS\_1900\_Higher\_26BW and 99%



## A5. FREQUENCY STABILITY

Normal Voltage = 3.8V; Battery End Point (BEP) = 3.0V; Maximum Voltage = 4.6V

| GSM 850 /836.6MHz |                   |                    |                     |        |        |
|-------------------|-------------------|--------------------|---------------------|--------|--------|
| Temperature (°C)  | Voltage<br>(Volt) | Freq. Dev.<br>(Hz) | Freq. Dev.<br>(ppm) | Limit  | Result |
| 50                | Normal Voltage    | 21.12              | 0.025               | 2.5ppm | PASS   |
| 40                |                   | 14.49              | 0.017               |        |        |
| 30                |                   | 28.79              | 0.034               |        |        |
| 20                |                   | 22.18              | 0.027               |        |        |
| 10                |                   | 12.50              | 0.015               |        |        |
| 0                 |                   | 23.97              | 0.029               |        |        |
| -10               |                   | 19.24              | 0.023               |        |        |
| -20               |                   | 30.81              | 0.037               |        |        |
| -30               |                   | 24.45              | 0.029               |        |        |
| 25                | Maximum Voltage   | 19.80              | 0.024               |        |        |
| 25                | BEP               | 21.39              | 0.026               |        |        |

| GPRS 850 /836.6MHz |                   |                    |                     |        |        |
|--------------------|-------------------|--------------------|---------------------|--------|--------|
| Temperature (°C)   | Voltage<br>(Volt) | Freq. Dev.<br>(Hz) | Freq. Dev.<br>(ppm) | Limit  | Result |
| 50                 | Normal Voltage    | 35.01              | 0.042               | 2.5ppm | PASS   |
| 40                 |                   | 23.61              | 0.028               |        |        |
| 30                 |                   | 19.84              | 0.024               |        |        |
| 20                 |                   | 27.42              | 0.033               |        |        |
| 10                 |                   | 22.15              | 0.026               |        |        |
| 0                  |                   | 26.23              | 0.031               |        |        |
| -10                |                   | 21.55              | 0.026               |        |        |
| -20                |                   | 22.98              | 0.027               |        |        |
| -30                |                   | 22.11              | 0.026               |        |        |
| 25                 | Maximum Voltage   | 25.91              | 0.031               |        |        |
| 25                 | BEP               | 27.97              | 0.033               |        |        |

| EGPRS 850 /836.6MHz |                   |                    |                     |        |        |
|---------------------|-------------------|--------------------|---------------------|--------|--------|
| Temperature (°C)    | Voltage<br>(Volt) | Freq. Dev.<br>(Hz) | Freq. Dev.<br>(ppm) | Limit  | Result |
| 50                  | Normal Voltage    | 24.38              | 0.029               | 2.5ppm | PASS   |
| 40                  |                   | 27.26              | 0.033               |        |        |
| 30                  |                   | 31.96              | 0.038               |        |        |
| 20                  |                   | 32.98              | 0.039               |        |        |
| 10                  |                   | 25.37              | 0.030               |        |        |
| 0                   |                   | 23.78              | 0.028               |        |        |
| -10                 |                   | 23.74              | 0.028               |        |        |
| -20                 |                   | 28.33              | 0.034               |        |        |
| -30                 |                   | 30.35              | 0.036               |        |        |
| 25                  | Maximum Voltage   | 27.42              | 0.033               |        |        |
| 25                  | BEP               | 14.49              | 0.017               |        |        |



| GSM 1900 / 1880MHz  |                    |               |               |                           |        |
|---------------------|--------------------|---------------|---------------|---------------------------|--------|
| Temperature<br>(°C) | Voltage            | Freq.<br>Dev. | Freq.<br>Dev. | Limit                     | Result |
|                     | (Volt)             | (Hz)          | (ppm)         |                           |        |
| 50                  | Normal Voltage     | 25.27         | 0.013         | Within Authorized<br>Band | PASS   |
| 40                  |                    | 29.27         | 0.016         |                           |        |
| 30                  |                    | 17.72         | 0.009         |                           |        |
| 20                  |                    | 31.38         | 0.017         |                           |        |
| 10                  |                    | 24.89         | 0.013         |                           |        |
| 0                   |                    | 21.65         | 0.012         |                           |        |
| -10                 |                    | 31.43         | 0.017         |                           |        |
| -20                 |                    | 21.59         | 0.011         |                           |        |
| -30                 |                    | 27.15         | 0.014         |                           |        |
| 25                  | Maximum<br>Voltage | 29.38         | 0.016         |                           |        |
| 25                  | BEP                | 34.24         | 0.018         |                           |        |

| GPRS 1900 / 1880MHz |                    |               |               |                           |        |
|---------------------|--------------------|---------------|---------------|---------------------------|--------|
| Temperature<br>(°C) | Voltage            | Freq.<br>Dev. | Freq.<br>Dev. | Limit                     | Result |
|                     | (Volt)             | (Hz)          | (ppm)         |                           |        |
| 50                  | Normal Voltage     | 34.14         | 0.018         | Within Authorized<br>Band | PASS   |
| 40                  |                    | 32.76         | 0.017         |                           |        |
| 30                  |                    | 28.73         | 0.015         |                           |        |
| 20                  |                    | 35.46         | 0.019         |                           |        |
| 10                  |                    | 17.92         | 0.010         |                           |        |
| 0                   |                    | 18.82         | 0.010         |                           |        |
| -10                 |                    | 19.41         | 0.010         |                           |        |
| -20                 |                    | 26.27         | 0.014         |                           |        |
| -30                 |                    | 17.67         | 0.009         |                           |        |
| 25                  | Maximum<br>Voltage | 19.20         | 0.010         |                           |        |
| 25                  | BEP                | 14.24         | 0.008         |                           |        |

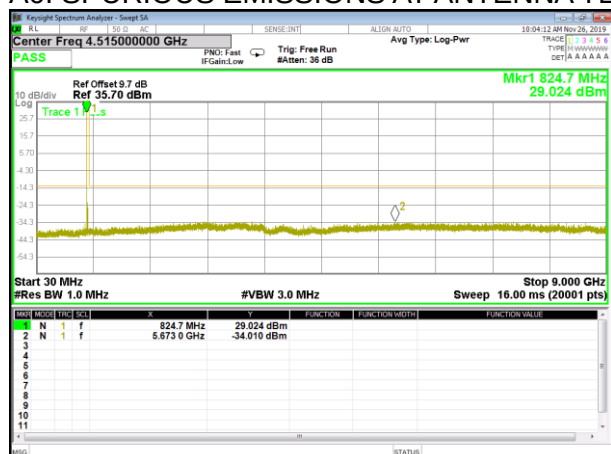
| EGPRS 1900 / 1880MHz |                    |               |               |                           |        |
|----------------------|--------------------|---------------|---------------|---------------------------|--------|
| Temperature<br>(°C)  | Voltage            | Freq.<br>Dev. | Freq.<br>Dev. | Limit                     | Result |
|                      | (Volt)             | (Hz)          | (ppm)         |                           |        |
| 50                   | Normal Voltage     | 34.72         | 0.018         | Within Authorized<br>Band | PASS   |
| 40                   |                    | 22.10         | 0.012         |                           |        |
| 30                   |                    | 27.70         | 0.015         |                           |        |
| 20                   |                    | 31.12         | 0.017         |                           |        |
| 10                   |                    | 31.91         | 0.017         |                           |        |
| 0                    |                    | 14.10         | 0.008         |                           |        |
| -10                  |                    | 20.38         | 0.011         |                           |        |
| -20                  |                    | 24.95         | 0.013         |                           |        |
| -30                  |                    | 31.57         | 0.017         |                           |        |
| 25                   | Maximum<br>Voltage | 24.24         | 0.013         |                           |        |
| 25                   | BEP                | 12.50         | 0.007         |                           |        |

1. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

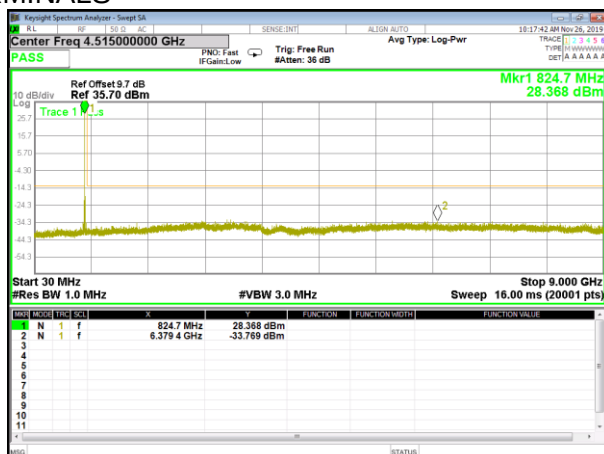




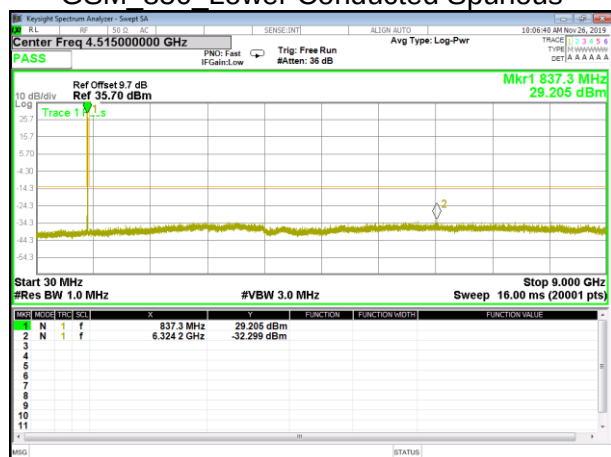
## A6. SPURIOUS EMISSIONS AT ANTENNA TERMINALS



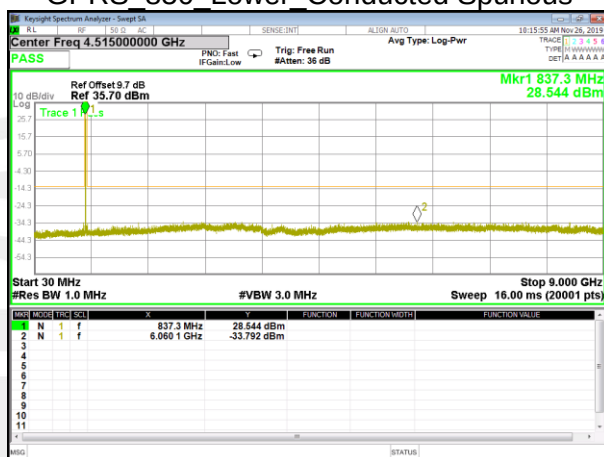
GSM 850 Lower Conducted Spurious



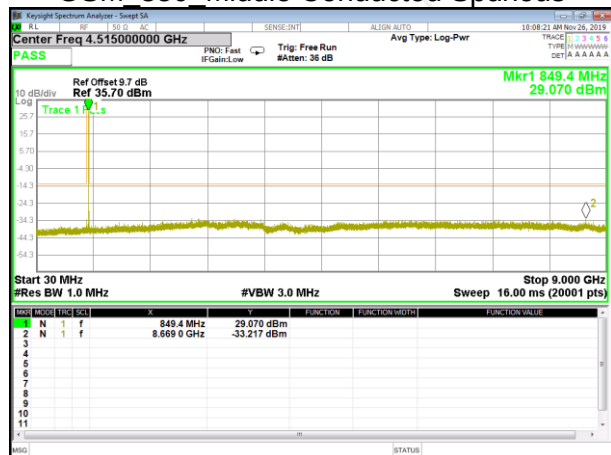
GPRS 850 Lower Conducted Spurious



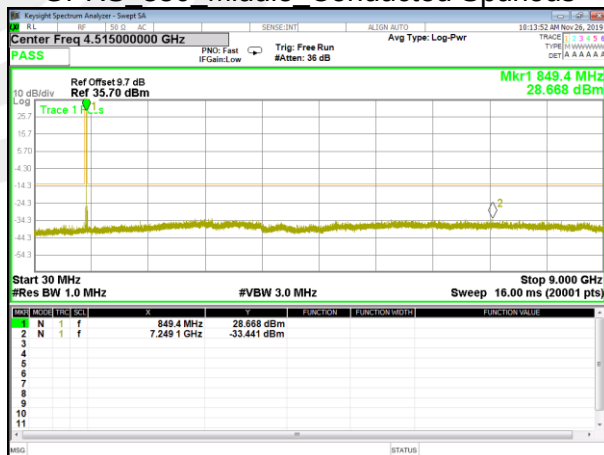
GSM 850 Middle Conducted Spurious



GPRS 850 Middle Conducted Spurious

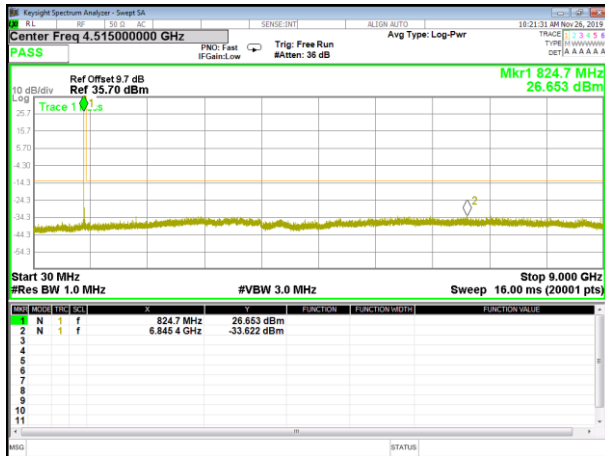


GSM 850 Higher Conducted Spurious

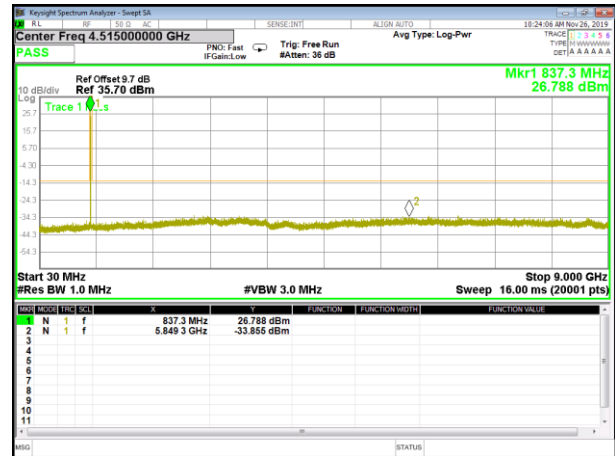


GPRS 850 Higher Conducted Spurious

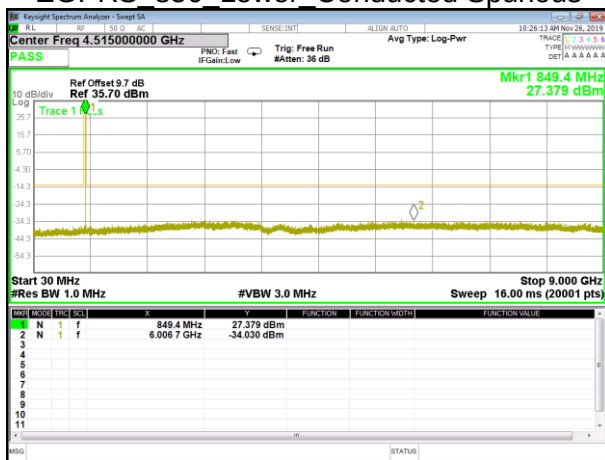




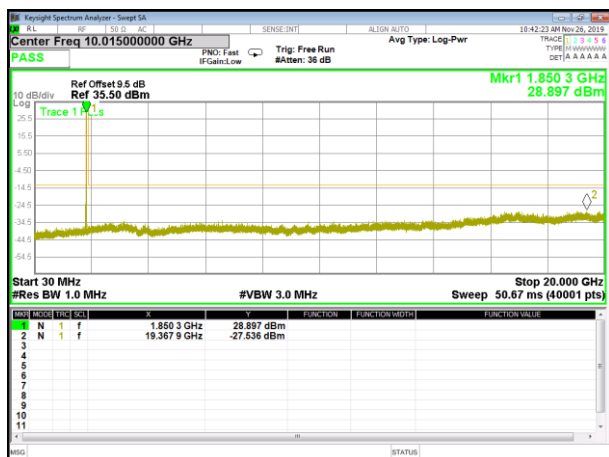
EGPRS 850 Lower Conducted Spurious



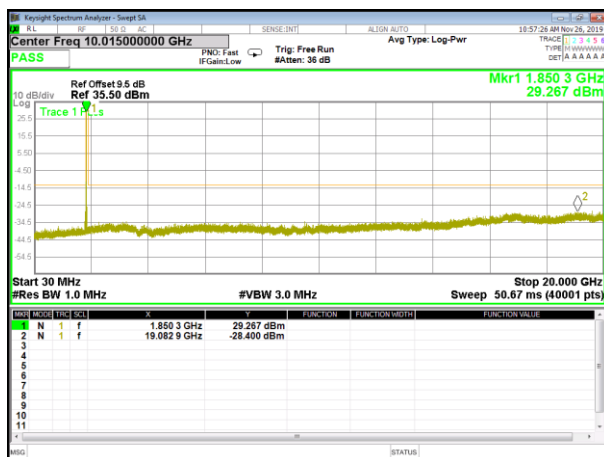
EGPRS\_850\_Middle Conducted Spurious



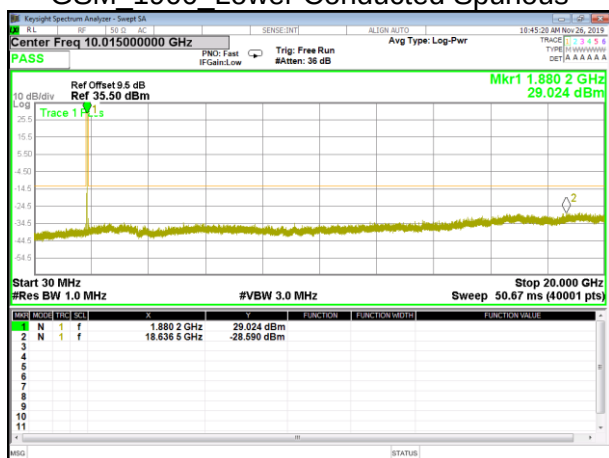
EGPRS\_850\_Higher Conducted Spurious



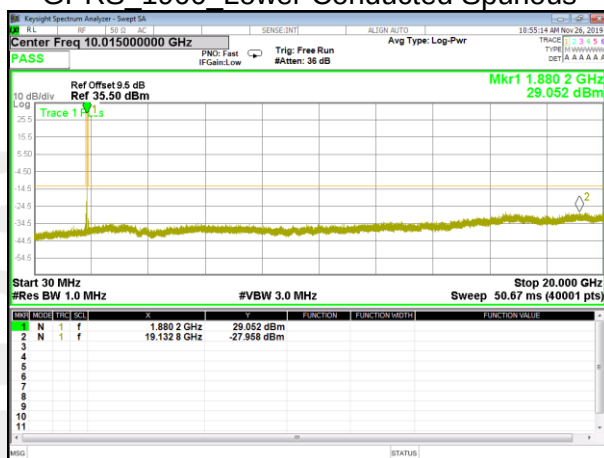
GSM\_1900\_Lower Conducted Spurious



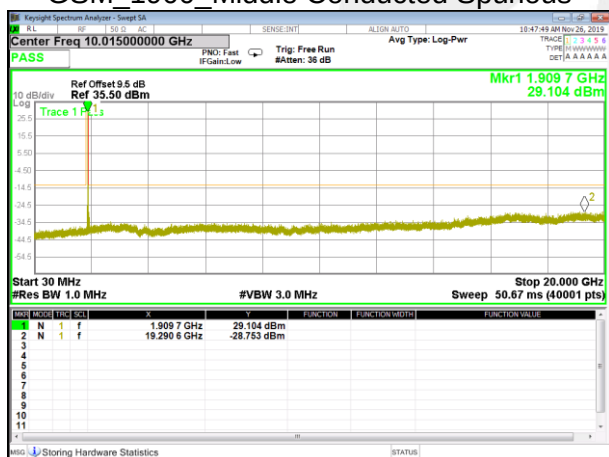
GPRS\_1900\_Lower Conducted Spurious



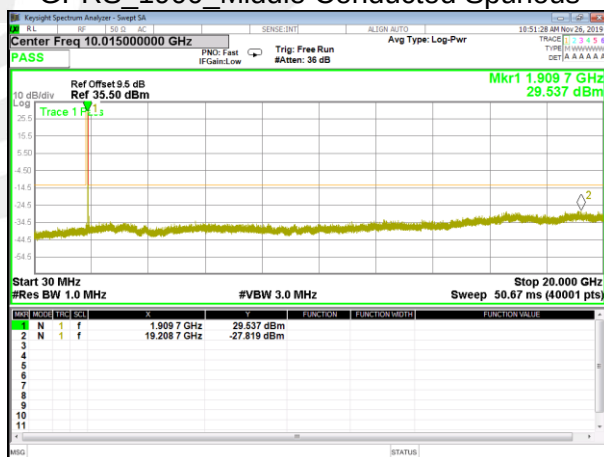
GSM\_1900\_Middle Conducted Spurious



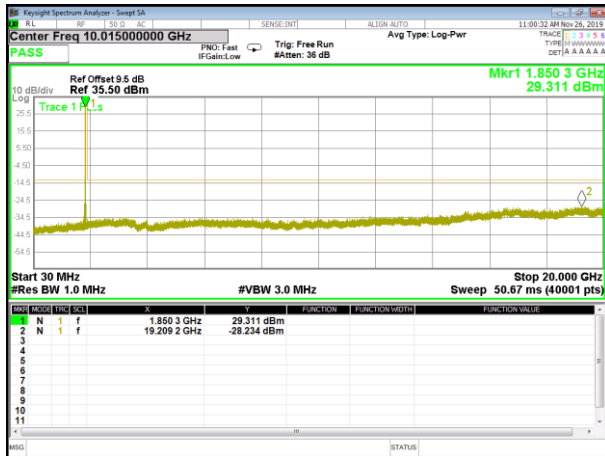
GPRS\_1900\_Middle Conducted Spurious



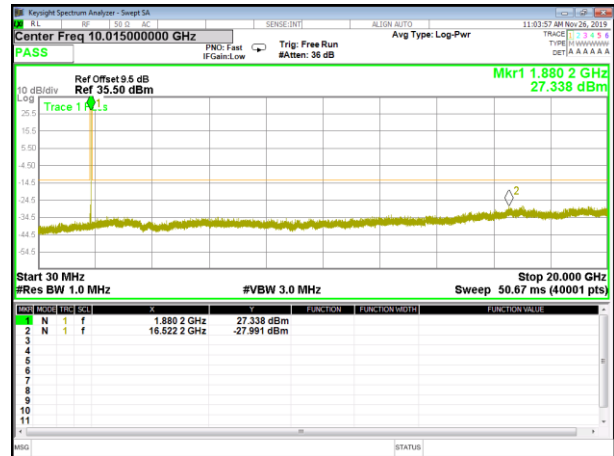
GSM\_1900\_Higher Conducted Spurious



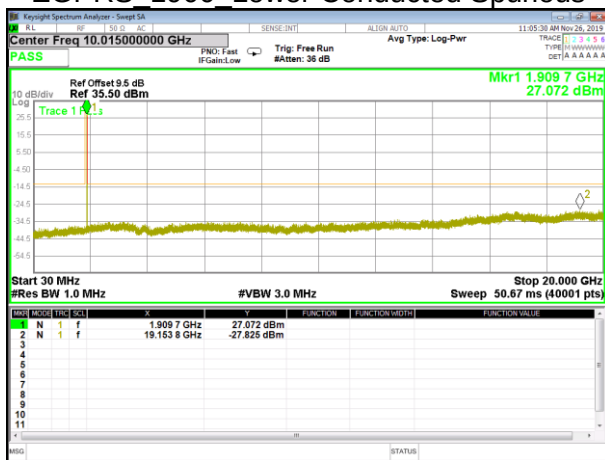
GPRS\_1900\_Higher Conducted Spurious



EGPRS\_1900\_Lower Conducted Spurious



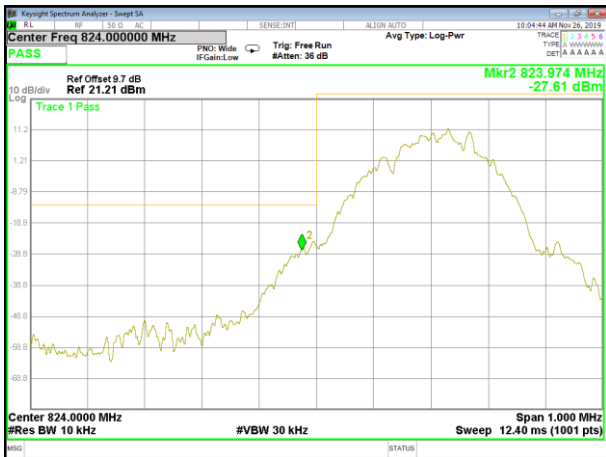
EGPRS\_1900\_Middle Conducted Spurious



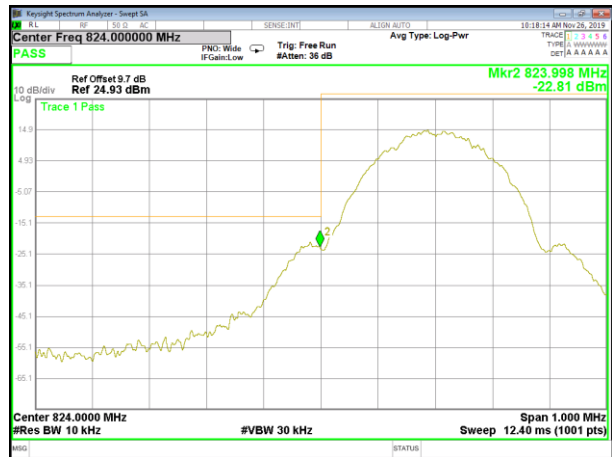
EGPRS\_1900\_Higher Conducted Spurious



## A7. BAND EDGE



GSM 850 Lower Band edge



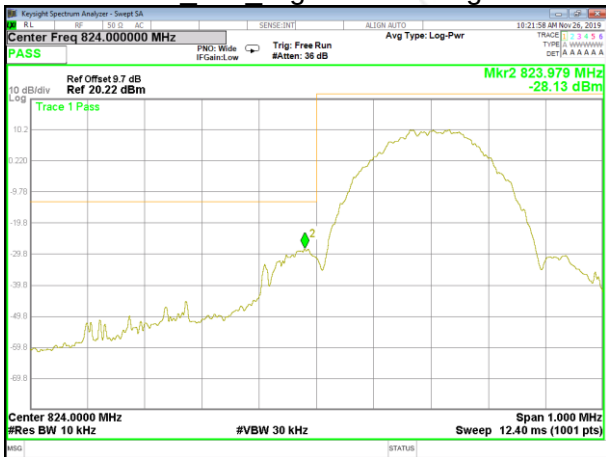
GPRS 850 Lower Band edge



GSM 850 Higher Band edge



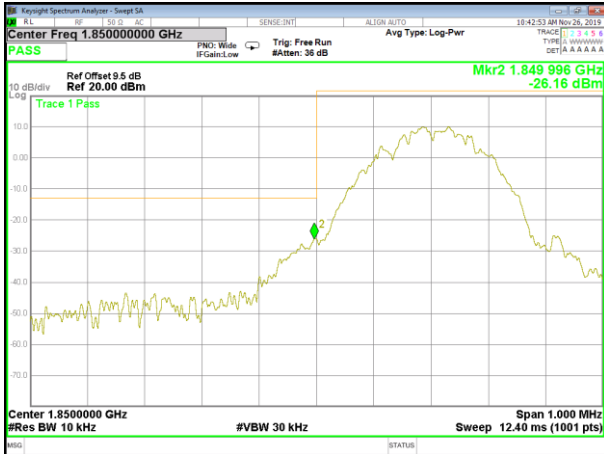
GPRS 850 Higher Band edge



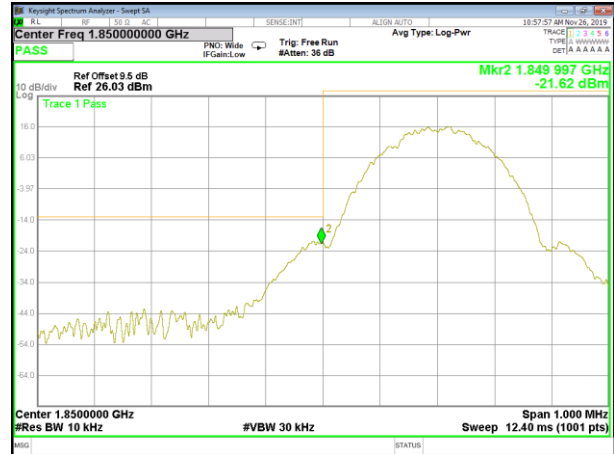
EGPRS\_850\_Lower\_Band edge



EGPRS\_850\_Higher\_Band edge



GSM\_1900\_Lower Band edge



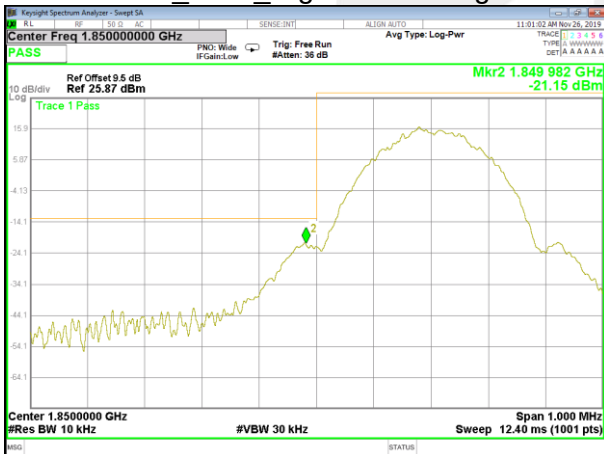
GPRS\_1900\_Lower Band edge



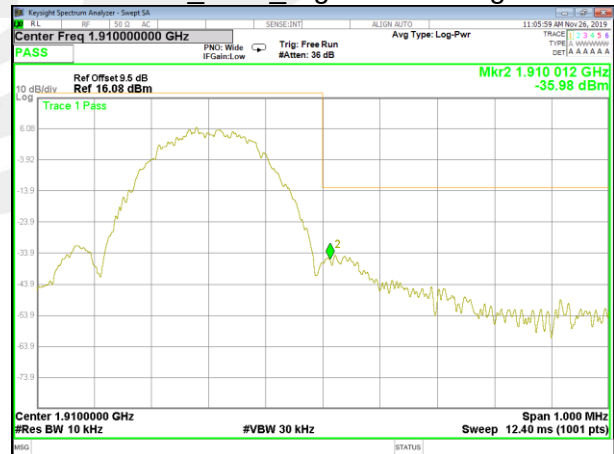
GSM\_1900\_Higher Band edge



GPRS\_1900\_Higher Band edge



EGPRS\_1900\_Lower Band edge



EGPRS\_1900\_Higher Band edge



## A8. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

**Note:** (1) Below 30MHz no Spurious found is the worst condition.

(2) Above 3.5GHz amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value

(3) Test is divided into three directions, X/Y/Z. X pattern for the worst.

| GSM 850: (30-9000)MHz                        |                     |          |       |               |                |                 |          |
|----------------------------------------------|---------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results Channel 128/824.2 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1648.49                                      | -40.30              | 9.40     | 4.75  | -35.65        | -13.00         | -22.65          | H        |
| 2472.69                                      | -40.59              | 10.60    | 8.39  | -38.38        | -13.00         | -25.38          | H        |
| 3296.56                                      | -30.90              | 12.00    | 11.79 | -30.69        | -13.00         | -17.69          | H        |
| 1648.20                                      | -44.43              | 9.40     | 4.75  | -39.78        | -13.00         | -26.78          | V        |
| 2472.68                                      | -44.44              | 10.60    | 8.39  | -42.23        | -13.00         | -29.23          | V        |
| 3296.86                                      | -42.97              | 12.00    | 11.79 | -42.76        | -13.00         | -29.76          | V        |
| The Worst Test Results Channel 190/836.6 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1673.15                                      | -40.52              | 9.50     | 4.76  | -35.78        | -13.00         | -22.78          | H        |
| 2509.74                                      | -39.46              | 10.70    | 8.40  | -37.16        | -13.00         | -24.16          | H        |
| 3346.06                                      | -32.24              | 12.20    | 11.80 | -31.84        | -13.00         | -18.84          | H        |
| 1672.99                                      | -43.46              | 9.40     | 4.75  | -38.81        | -13.00         | -25.81          | V        |
| 2509.90                                      | -45.12              | 10.60    | 8.39  | -42.91        | -13.00         | -29.91          | V        |
| 3346.19                                      | -43.07              | 12.20    | 11.82 | -42.69        | -13.00         | -29.69          | V        |
| The Worst Test Results Channel 251/848.8 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1697.38                                      | -41.25              | 9.60     | 4.77  | -36.42        | -13.00         | -23.42          | H        |
| 2546.36                                      | -40.10              | 10.80    | 8.50  | -37.80        | -13.00         | -24.80          | H        |
| 3395.31                                      | -31.03              | 12.50    | 11.90 | -30.43        | -13.00         | -17.43          | H        |
| 1697.39                                      | -44.16              | 9.60     | 4.77  | -39.33        | -13.00         | -26.33          | V        |
| 2546.26                                      | -44.66              | 10.80    | 8.50  | -42.36        | -13.00         | -29.36          | V        |
| 3394.89                                      | -42.71              | 12.50    | 11.90 | -42.11        | -13.00         | -29.11          | V        |





| GPRS 850: (30-9000)MHz                       |                     |          |       |               |                |                 |          |
|----------------------------------------------|---------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results Channel 128/824.2 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1648.08                                      | -41.10              | 9.40     | 4.75  | -36.45        | -13.00         | -23.45          | H        |
| 2472.39                                      | -39.34              | 10.60    | 8.39  | -37.13        | -13.00         | -24.13          | H        |
| 3296.67                                      | -31.92              | 12.00    | 11.79 | -31.71        | -13.00         | -18.71          | H        |
| 1648.21                                      | -44.49              | 9.40     | 4.75  | -39.84        | -13.00         | -26.84          | V        |
| 2472.32                                      | -44.17              | 10.60    | 8.39  | -41.96        | -13.00         | -28.96          | V        |
| 3296.82                                      | -43.43              | 12.00    | 11.79 | -43.22        | -13.00         | -30.22          | V        |
| The Worst Test Results Channel 190/836.6 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1673.16                                      | -40.16              | 9.50     | 4.76  | -35.42        | -13.00         | -22.42          | H        |
| 2509.71                                      | -39.50              | 10.70    | 8.40  | -37.20        | -13.00         | -24.20          | H        |
| 3346.44                                      | -32.07              | 12.20    | 11.80 | -31.67        | -13.00         | -18.67          | H        |
| 1672.88                                      | -43.18              | 9.40     | 4.75  | -38.53        | -13.00         | -25.53          | V        |
| 2509.53                                      | -44.95              | 10.60    | 8.39  | -42.74        | -13.00         | -29.74          | V        |
| 3345.99                                      | -43.44              | 12.20    | 11.82 | -43.06        | -13.00         | -30.06          | V        |
| The Worst Test Results Channel 251/848.8 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1697.21                                      | -40.21              | 9.60     | 4.77  | -35.38        | -13.00         | -22.38          | H        |
| 2546.35                                      | -39.92              | 10.80    | 8.50  | -37.62        | -13.00         | -24.62          | H        |
| 3395.20                                      | -32.08              | 12.50    | 11.90 | -31.48        | -13.00         | -18.48          | H        |
| 1697.41                                      | -44.37              | 9.60     | 4.77  | -39.54        | -13.00         | -26.54          | V        |
| 2546.42                                      | -44.82              | 10.80    | 8.50  | -42.52        | -13.00         | -29.52          | V        |
| 3395.16                                      | -42.84              | 12.50    | 11.90 | -42.24        | -13.00         | -29.24          | V        |





| EGPRS 850: (30-9000)MHz                      |                     |          |       |               |                |                 |          |
|----------------------------------------------|---------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results Channel 128/824.2 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1648.27                                      | -41.48              | 9.40     | 4.75  | -36.83        | -13.00         | -23.83          | H        |
| 2472.43                                      | -40.14              | 10.60    | 8.39  | -37.93        | -13.00         | -24.93          | H        |
| 3296.85                                      | -32.01              | 12.00    | 11.79 | -31.80        | -13.00         | -18.80          | H        |
| 1648.47                                      | -43.33              | 9.40     | 4.75  | -38.68        | -13.00         | -25.68          | V        |
| 2472.23                                      | -44.77              | 10.60    | 8.39  | -42.56        | -13.00         | -29.56          | V        |
| 3296.80                                      | -42.69              | 12.00    | 11.79 | -42.48        | -13.00         | -29.48          | V        |
| The Worst Test Results Channel 190/836.6 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1673.02                                      | -41.15              | 9.50     | 4.76  | -36.41        | -13.00         | -23.41          | H        |
| 2509.43                                      | -39.84              | 10.70    | 8.40  | -37.54        | -13.00         | -24.54          | H        |
| 3346.25                                      | -31.98              | 12.20    | 11.80 | -31.58        | -13.00         | -18.58          | H        |
| 1672.85                                      | -43.96              | 9.40     | 4.75  | -39.31        | -13.00         | -26.31          | V        |
| 2509.80                                      | -44.22              | 10.60    | 8.39  | -42.01        | -13.00         | -29.01          | V        |
| 3346.23                                      | -42.99              | 12.20    | 11.82 | -42.61        | -13.00         | -29.61          | V        |
| The Worst Test Results Channel 251/848.8 MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                               | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1697.28                                      | -41.48              | 9.60     | 4.77  | -36.65        | -13.00         | -23.65          | H        |
| 2546.18                                      | -40.44              | 10.80    | 8.50  | -38.14        | -13.00         | -25.14          | H        |
| 3394.87                                      | -31.55              | 12.50    | 11.90 | -30.95        | -13.00         | -17.95          | H        |
| 1697.20                                      | -44.16              | 9.60     | 4.77  | -39.33        | -13.00         | -26.33          | V        |
| 2546.35                                      | -44.03              | 10.80    | 8.50  | -41.73        | -13.00         | -28.73          | V        |
| 3394.93                                      | -43.29              | 12.50    | 11.90 | -42.69        | -13.00         | -29.69          | V        |



| DCS 1900: (30-20000)MHz                          |                     |          |       |               |                |                 |          |
|--------------------------------------------------|---------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results for Channel 512/1850.2MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3700.26                                          | -34.54              | 12.60    | 12.93 | -34.87        | -13.00         | -21.87          | H        |
| 5550.63                                          | -35.32              | 13.10    | 17.11 | -39.33        | -13.00         | -26.33          | H        |
| 7400.55                                          | -32.17              | 11.50    | 22.20 | -42.87        | -13.00         | -29.87          | H        |
| 3700.42                                          | -35.70              | 12.60    | 12.93 | -36.03        | -13.00         | -23.03          | V        |
| 5550.38                                          | -34.96              | 13.10    | 17.11 | -38.97        | -13.00         | -25.97          | V        |
| 7400.53                                          | -31.84              | 11.50    | 22.20 | -42.54        | -13.00         | -29.54          | V        |
| The Worst Test Results for Channel 661/1880.0MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3760.10                                          | -33.54              | 12.60    | 12.93 | -33.87        | -13.00         | -20.87          | H        |
| 5640.17                                          | -34.13              | 13.10    | 17.11 | -38.14        | -13.00         | -25.14          | H        |
| 7519.98                                          | -33.59              | 11.50    | 22.20 | -44.29        | -13.00         | -31.29          | H        |
| 3759.98                                          | -34.82              | 12.60    | 12.93 | -35.15        | -13.00         | -22.15          | V        |
| 5639.99                                          | -34.86              | 13.10    | 17.11 | -38.87        | -13.00         | -25.87          | V        |
| 7520.27                                          | -32.49              | 11.50    | 22.20 | -43.19        | -13.00         | -30.19          | V        |
| The Worst Test Results for Channel 810/1909.8MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3819.73                                          | -34.42              | 12.60    | 12.93 | -34.75        | -13.00         | -21.75          | H        |
| 5729.04                                          | -35.42              | 13.10    | 17.11 | -39.43        | -13.00         | -26.43          | H        |
| 7639.32                                          | -32.26              | 11.50    | 22.20 | -42.96        | -13.00         | -29.96          | H        |
| 3819.56                                          | -34.90              | 12.60    | 12.93 | -35.23        | -13.00         | -22.23          | V        |
| 5729.51                                          | -34.32              | 13.10    | 17.11 | -38.33        | -13.00         | -25.33          | V        |
| 7639.03                                          | -33.16              | 11.50    | 22.20 | -43.86        | -13.00         | -30.86          | V        |



| GPRS1900: (30-20000)MHz                          |                     |          |       |               |                |                 |          |
|--------------------------------------------------|---------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results for Channel 512/1850.2MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3700.01                                          | -34.27              | 12.60    | 12.93 | -34.60        | -13.00         | -21.60          | H        |
| 5550.36                                          | -34.00              | 13.10    | 17.11 | -38.01        | -13.00         | -25.01          | H        |
| 7400.59                                          | -32.19              | 11.50    | 22.20 | -42.89        | -13.00         | -29.89          | H        |
| 3700.13                                          | -35.97              | 12.60    | 12.93 | -36.30        | -13.00         | -23.30          | V        |
| 5550.67                                          | -34.70              | 13.10    | 17.11 | -38.71        | -13.00         | -25.71          | V        |
| 7400.78                                          | -33.08              | 11.50    | 22.20 | -43.78        | -13.00         | -30.78          | V        |
| The Worst Test Results for Channel 661/1880.0MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3759.79                                          | -34.15              | 12.60    | 12.93 | -34.48        | -13.00         | -21.48          | H        |
| 5639.94                                          | -34.22              | 13.10    | 17.11 | -38.23        | -13.00         | -25.23          | H        |
| 7520.02                                          | -32.20              | 11.50    | 22.20 | -42.90        | -13.00         | -29.90          | H        |
| 3760.34                                          | -35.00              | 12.60    | 12.93 | -35.33        | -13.00         | -22.33          | V        |
| 5640.05                                          | -34.25              | 13.10    | 17.11 | -38.26        | -13.00         | -25.26          | V        |
| 7520.05                                          | -32.64              | 11.50    | 22.20 | -43.34        | -13.00         | -30.34          | V        |
| The Worst Test Results for Channel 810/1909.8MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3819.28                                          | -33.78              | 12.60    | 12.93 | -34.11        | -13.00         | -21.11          | H        |
| 5729.23                                          | -34.65              | 13.10    | 17.11 | -38.66        | -13.00         | -25.66          | H        |
| 7638.96                                          | -32.79              | 11.50    | 22.20 | -43.49        | -13.00         | -30.49          | H        |
| 3819.33                                          | -35.95              | 12.60    | 12.93 | -36.28        | -13.00         | -23.28          | V        |
| 5729.25                                          | -34.86              | 13.10    | 17.11 | -38.87        | -13.00         | -25.87          | V        |
| 7639.14                                          | -32.34              | 11.50    | 22.20 | -43.04        | -13.00         | -30.04          | V        |



| EGPRS 1900: (30-20000)MHz                        |                     |          |       |               |                |                 |          |
|--------------------------------------------------|---------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results for Channel 512/1850.2MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3700.40                                          | -33.53              | 12.60    | 12.93 | -33.86        | -13.00         | -20.86          | H        |
| 5550.20                                          | -34.71              | 13.10    | 17.11 | -38.72        | -13.00         | -25.72          | H        |
| 7400.73                                          | -32.26              | 11.50    | 22.20 | -42.96        | -13.00         | -29.96          | H        |
| 3700.13                                          | -35.97              | 12.60    | 12.93 | -36.30        | -13.00         | -23.30          | V        |
| 5550.27                                          | -35.08              | 13.10    | 17.11 | -39.09        | -13.00         | -26.09          | V        |
| 7400.81                                          | -31.82              | 11.50    | 22.20 | -42.52        | -13.00         | -29.52          | V        |
| The Worst Test Results for Channel 661/1880.0MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3760.11                                          | -33.72              | 12.60    | 12.93 | -34.05        | -13.00         | -21.05          | H        |
| 5639.85                                          | -34.25              | 13.10    | 17.11 | -38.26        | -13.00         | -25.26          | H        |
| 7520.26                                          | -33.25              | 11.50    | 22.20 | -43.95        | -13.00         | -30.95          | H        |
| 3759.87                                          | -35.37              | 12.60    | 12.93 | -35.70        | -13.00         | -22.70          | V        |
| 5639.86                                          | -33.90              | 13.10    | 17.11 | -37.91        | -13.00         | -24.91          | V        |
| 7519.91                                          | -32.33              | 11.50    | 22.20 | -43.03        | -13.00         | -30.03          | V        |
| The Worst Test Results for Channel 810/1909.8MHz |                     |          |       |               |                |                 |          |
| Frequency(MHz)                                   | S<br>G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 3819.27                                          | -33.81              | 12.60    | 12.93 | -34.14        | -13.00         | -21.14          | H        |
| 5729.11                                          | -35.14              | 13.10    | 17.11 | -39.15        | -13.00         | -26.15          | H        |
| 7638.91                                          | -32.67              | 11.50    | 22.20 | -43.37        | -13.00         | -30.37          | H        |
| 3819.71                                          | -34.72              | 12.60    | 12.93 | -35.05        | -13.00         | -22.05          | V        |
| 5729.08                                          | -34.59              | 13.10    | 17.11 | -38.60        | -13.00         | -25.60          | V        |
| 7639.21                                          | -31.94              | 11.50    | 22.20 | -42.64        | -13.00         | -29.64          | V        |



#### APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

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

