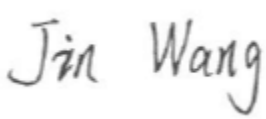
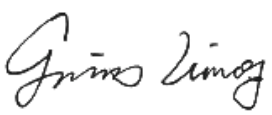
# FCC TEST REPORT

## FCC Part 22 /Part 24

| | |
|---|---|
| **Report Reference No. ..... :** | **LCS200221009AEG** |
| **FCC ID. ..... :** | **2ADVABRIOX31** |
| **Date of Issue. ..... :** | **March 13, 2020** |
| **Testing Laboratory Name** .....: | **Shenzhen LCS Compliance Testing Laboratory Ltd.** |
| Address.....: | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| **Applicant's name**.....: | **XTRATECH COMPUTERS S.A.** |
| Address.....: | Ciudadela Profesor Aguirre Abad, solar 40, manzana 118, Guayaquil, Ecuador. |
| **Test specification** ..... **:** | |
| Standard .....: | **FCC Part 22: Public Mobile Services**<br>**FCC Part 24: Personal Communication Services** |
| Test Report Form No .....: | LCSEMC-1.0 |
| TRF Originator.....: | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Master TRF.....: | Dated 2011-03 |



| | |
|---|---|
| **Test item description ..... :** | **Smart Phone** |
| Trade Mark .....: | XTRATECH |
| Test Model.....: | BRIO X31 |
| Listed Models .....: | / |
| Ratings.....: | DC 3.8V by Rechargeable Li-Polymer Battery(3500mAh)<br>Recharged by DC 5V/2A adapter |
| Hardware version .....: | V2 |
| Software version .....: | BRIO_X31_V1.0_20200303 |
| Frequency..... | GSM 850MHz; PCS 1900MHz |
| Result.....: | **PASS** |

| **Compiled by:** | **Supervised by:** | **Approved by:** |
|---|---|---|
|  |  |  |
| Linda He / Administrators | Jin Wang / Technique principal | Gavin Liang/ Manager |

# T E S T R E P O R T

| **Test Report No. :** **LCS200221009AEG** | March 13, 2020<br>Date of issue |
|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Smart Phone |
| Test Model | : | BRIO X31 |
| Listed Models | : | / |
| Model Declaration | : | / |
| **Applicant** | : | **XTRATECH COMPUTERS S.A.** |
| Address | : | Ciudadela Profesor Aguirre Abad, solar 40, manzana 118, Guayaquil, Ecuador. |
| **Manufacturer** | : | **Shenzhen Chengfong Digital-Tech Ltd** |
| Address | : | Building A, Weihua Industrial Area, Huaxing Rd, Dalang. Longhua, Shenzhen, China |
| **Factory** | : | **Shenzhen Chengfong Digital-Tech Ltd** |
| Address | : | Building A, Weihua Industrial Area, Huaxing Rd, Dalang. Longhua, Shenzhen, China |

| **Test Result**: | **PASS** |
|---|---|

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# Revison History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 000 | March 13, 2020 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

# Contents

# 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 22: Private Land Mobile Radio Services.
FCC Part 24: Public Mobile Services.
TIA-603-E March 2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
47 CFR FCC Part 15 Subpart B: Unintentional Radiators.
FCC Part 2: Frequency Allocations And Radio Treaty Matters: General Rules And Regulations.
ANSI C63.4:2014: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

# 2 SUMMARY

## 2.1 General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | March 02, 2020 |
| | | |
| Testing commenced on | : | March 02, 2020 |
| | | |
| Testing concluded on | : | March 13, 2020 |

## 2.2 Product Description

The **XTRATECH COMPUTERS S.A.**'s Model: BRIO X31 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

| | | |
|---|---|---|
| EUT | : | Smart Phone |
| Test Model | : | Brio X31 |
| Power Supply | : | DC 3.8V by Rechargeable Li-Polymer Battery(3500mAh)<br>Recharged by DC 5V/2A adapter |
| Hardware version | : | V2 |
| Software version | : | BRIO_X31_V1.0_20200303 |
| Bluetooth | | |
| Frequency Range | : | 2402MHz-2480MHz |
| Bluetooth Version | : | V4.1 |
| Bluetooth Channel Number | : | 79 channels for Bluetooth V4.1 (BT Classics)<br>40 channels for Bluetooth V4.1 (BT LE) |
| Bluetooth Channel Spacing | : | 1MHz for Bluetooth V4.1 (BT Classics)<br>2MHz for Bluetooth V4.1 (BT LE) |
| Bluetooth Modulation Type | : | GFSK, π/4-DQPSK, 8DPSK for Bluetooth V4.1 (BT Classics)<br>GFSK for Bluetooth V4.1 (BT LE) |
| Antenna Description | : | FPC Antenna, 0.11dBi(Max.) |
| 2.4G WLAN | | |
| Frequency Range | : | 2412 – 2462 MHz |
| Channel Number | : | 11 Channels for 20MHz bandwidth (2412~2462MHz)<br>7 Channels for 40MHz bandwidth (2422~2452MHz) |
| Channel Spacing | : | 5MHz |
| Modulation Type | : | IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK) |
| Antenna Description | : | FPC Antenna, 0.12dBi(Max.) |
| WIFI 5GWLAN Band 1 | | |
| Frequency Range | : | 5180 – 5240 MHz |
| Channel Number | : | 4 channels for 20MHz bandwidth (5180-5240MHz)<br>2 channels for 40MHz bandwidth (5190~5230MHz)<br>1 channels for 80MHz bandwidth(5210MHz) |
| Modulation Type | : | IEEE 802.11a/n/ac: OFDM (64QAM, 16QAM, QPSK, BPSK) |
| WIFI(5.8G Band) | | |
| Frequency Range | : | 5745 – 5825 MHz |
| Channel Number | : | 5 channels for 20MHz bandwidth (5745-5825MHz)<br>2 channels for 40MHz bandwidth (5755~5795MHz)<br>1 channels for 80MHz bandwidth(5775MHz) |
| Modulation Type | : | IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK) |

| | | |
|---|---|---|
| Antenna Description | : | FPC Antenna, -0.31dBi (Max.)<br>The 5.2GWIFI and 5.8G WIFI shares the same antenna. |
| GSM | : | |
| GSM/EDGE/GPRS Operation Frequency Band | : | GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900 |
| GSM/EDGE/GPRS | | Supported GSM/GPRS/EDGE |
| GSM Release Version | : | R7 |
| GSM/EDGE/GPRS Power Class | : | GSM850:Power Class 4/ PCS1900:Power Class 1 |
| GPRS/EDGE Multislot Class | : | GPRS/EDGE: Multi-slot Class 12 |
| GPRS operation mode | : | Class B |
| Modulation Type | : | GMSK for GSM/GPRS, 8-PSK for EDGE |
| Antenna Gain | : | FPC Antenna<br>1.09dBi (max.) for GSM 850; -1.17dBi (max.) for GSM 900;<br>-0.31dBi (max.) for DCS 1800; -0.33dBi (max.) for PCS 1900; |
| WCDMA | : | |
| UMTS Operation Frequency Band | : | UMTS FDD Band II /V |
| WCDMA Release Version | : | R8 |
| HSDPA Release Version | : | Release 8 |
| HSUPA Release Version | : | Release 6 |
| DC-HSUPA Release Version | : | Not Supported |
| Modulation Type | : | QPSK for UMTS |
| Antenna Gain | : | FPC Antenna<br>0.37dBi (max.) for WCDMA Band II;<br>-1.07dBi (max.) for WCDMA Band V; |
| LTE | : | |
| LTE Operation Frequency Band | : | LTE Band 2, 4, 5, 7 |
| LTE Release Version | : | Release 9 |
| LTE/UMTS Power Class | : | Class 3 |
| Modulation Type | : | QPSK, 16QAM for LTE |
| Antenna Gain | : | FPC Antenna<br>-0.37dBi (max.) for LTE Band 2; -0.41dBi (max.) for LTE Band 4;<br>-1.12dBi (max.) for LTE Band 5; 0.07dBi (max.) for LTE Band 7; |
| GPS function | : | Support and only RX |
| FM function | : | Support and only RX |
| Extreme temp. Tolerance | | -10°C to +50°C |
| Extreme vol. Limits | | 3.23VDC to 4.37VDC (nominal: 3.8VDC) |

## 2.3 Equipment under Test

**Power supply system utilised**

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 120V / 60 Hz | ○ | 115V / 60Hz |
| | | ○ | 12 V DC | ○ | 24 V DC |
| | | ● | Other (specified in blank below) | | |

DC 3.8V

**Test frequency list**

| Test Mode | TX/RX | RF Channel | | |
|---|---|---|---|---|
| | | Low(L) | Middle (M) | High (H) |
| GSM850 | TX | Channel 128 | Channel 190 | Channel 251 |
| | | 824.2 MHz | 836.6 MHz | 848.8 MHz |
| | RX | Channel 128 | Channel 190 | Channel 251 |
| | | 869.2 MHz | 881.6 MHz | 893.8 MHz |
| Test Mode | TX/RX | RF Channel | | |
| | | Low(L) | Middle (M) | High (H) |
| GSM1900 | TX | Channel 512 | Channel 661 | Channel 810 |
| | | 1850.2 MHz | 1880.0 MHz | 1909.8 MHz |
| | RX | Channel 512 | Channel 661 | Channel 810 |
| | | 1930.2 MHz | 1960.0 MHz | 1989.8 MHz |

## 2.4 Short description of the Equipment under Test (EUT)

### 2.4.1 General Description

BRIO X31 is subscriber equipment in the WCDMA/GSM/LTE system. The GSM/GPRS/EDGE frequency band includes GSM850, GSM900, DCS1800 and PCS1900. The HSPA/UMTS frequency band is Band II/V. LTE frequency band is band 2, band 4, band 5, and band 7. The GSM/GPRS/EDGE frequency band includes GSM850, GSM900, DCS1800 and PCS1900 bands but only the GSM850 and PCS1900 band test data included in this report. The Smart Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS/LTE and GSM/GPRS/EDGE protocol processing, voice, video MMS service and etc. Externally it provides SIM card interface.

## 2.5 Internal Identification of AE used during the test

| AE ID* | Description |
|---|---|
| AE1 | Rechargeable Li-Polymer Battery |
| AE2 | Switching Adapter |

AE2
Model: YHD-1790
INPUT: AC 100-240V, 50/60Hz 0.35A Max
OUTPUT: DC 5V/2A
*AE ID: is used to identify the test sample in the lab internally.

## 2.6 Normal Accessory setting

Fully charged battery was used during the test.

## 2.7 EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - supplied by the lab

| | | | |
|---|---|---|---|
| ○ | Power Cable | Length (m) : | / |
| | | Shield : | / |
| | | Detachable : | / |
| ○ | Multimeter | Manufacturer : | / |
| | | Model No. : | / |

## 2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2ADVABRIOX31** filing to comply with FCC Part 22 and Part 24 Rules.

## 2.9 Modifications

No modifications were implemented to meet testing criteria.

## 2.10 General Test Conditions/Configurations

### 2.10.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

| Test Mode | Test Modes Description |
|---|---|
| GSM/TM1 | GSM system, GSM,GMSK modulation |
| GSM/TM2 | GSM system, GPRS, GMSK modulation |
| GSM/TM3 | GSM system, EDGE, 8PSK modulation |

Note:

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

### 2.10.2 Test Environment

| Environment Parameter | Selected Values During Tests | |
|---|---|---|
| Relative Humidity | Ambient | |
| Temperature | TN | Ambient |
| Voltage | VL | 3.23V |
| | VN | 3.8V |
| | VH | 4.37V |

NOTE: VL=lower extreme test voltage VN=nominal voltage
VH=upper extreme test voltage TN=normal temperature

# 3 TEST ENVIRONMENT

## 3.1 Address of the test laboratory

**Shenzhen LCS Compliance Testing Laboratory Ltd**

1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
The sites are constructed in conformance with the requirements of ANSI C63.4 (2014) and CISPR Publication 22.

## 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC Registration Number is 254912.
Industry Canada Registration Number is 9642A.
EMSD Registration Number is ARCB0108.
UL Registration Number is 100571-492.
TUV SUD Registration Number is SCN1081.
TUV RH Registration Number is UA 50296516-001.
NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier: CN0071

## 3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 15-35 ° C |
| | |
| Humidity: | 30-60 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

## 3.4 Test Description

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

| Test Item | FCC Rule No. | Requirements | Verdict |
|---|---|---|---|
| Effective(Isotropic) Radiated Output Power | §2.1046, §22.913 | FCC: ERP ≤ 7W.<br>ISED: ERP ≤ 11.5W. | Pass |
| Modulation Characteristics | §2.1047 | Digital modulation | N/A |
| Bandwidth | §2.1049 | OBW: No limit.<br>EBW: No limit. | Pass |
| Band Edges Compliance | §2.1051, §22.917 | ≤-13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block. | Pass |
| Spurious Emission at Antenna Terminals | §2.1051, §22.917 | ≤ -13dBm/100kHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges. | Pass |
| Field Strength of Spurious Radiation | §2.1053, §22.917 | ≤ -13dBm/100kHz. | Pass |
| Frequency Stability | §2.1055, §22.355 | ≤ ±2.5ppm. | Pass |
| Peak-Average Ratio | §24.232 | IC:Limit≤13dB | Pass |
| NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” de notes “not tested”. | | | |

### 3.4.2 PCS Band (1850-1910MHz paired with 1930-1990MHz)

| Test Item | FCC Rule No. | Requirements | Verdict |
|---|---|---|---|
| Effective(Isotropic) Radiated Output Power | §2.1046, §24.232 | EIRP ≤ 2W | Pass |
| Peak-Average Ratio | §2.1046, §24.232 | ≤13dB | Pass |
| Modulation Characteristics | §2.1047 | Digital modulation | N/A |
| Bandwidth | §2.1049 | OBW: No limit.<br>EBW: No limit. | Pass |
| Band Edges Compliance | §2.1051, §24.238 | ≤ -13dBm/1%*EBW, In 1MHz bands immediately outside and adjacent to The frequency block. | Pass |
| Spurious Emission at Antenna Terminals | §2.1051, §24.238 | ≤-13dBm/1MHz, from 9kHz to10th harmonics but outside authorized Operating frequency ranges. | Pass |
| Field Strength of Spurious Radiation | §2.1053, §24.238 | ≤ -13dBm/1MHz. | Pass |
| Frequency Stability | §2.1055, §24.235 | ≤ ±2.5ppm. | Pass |
| NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” de notes “not tested”. | | | |

Remark: 1. The measurement uncertainty is not included in the test result.

## 3.5 Equipments Used during the Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 1 | Power Meter | R&S | NRVS | 100444 | 2019-06-11 | 2020-06-10 |
| 2 | Power Sensor | R&S | NRV-Z81 | 100458 | 2019-06-11 | 2020-06-10 |
| 3 | Power Sensor | R&S | NRV-Z32 | 10057 | 2019-06-11 | 2020-06-10 |
| 4 | LTE Test Software | Tonscend | JS1120-1 | N/A | N/A | N/A |
| 5 | RF Control Unit | Tonscend | JS0806 | 158060009 | 2019-06-11 | 2020-06-10 |
| 6 | MXA Signal Analyzer | Agilent | N9020A | MY51250905 | 2019-11-15 | 2020-11-14 |
| 7 | WIDEBAND RADIO COMMUNICATION TESTER | R&S | CMW 500 | 103818 | 2019-06-11 | 2020-06-10 |
| 8 | DC Power Supply | Agilent | E3642A | N/A | 2019-11-15 | 2020-11-14 |
| 9 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 10 | 3m Fully Anechoic Chamber | MRDIANZI | FAC-3M | MR009 | 2019-09-27 | 2020-09-26 |
| 11 | Positioning Controller | MF | MF-7082 | N/A | 2019-06-12 | 2020-06-11 |
| 12 | Active Loop Antenna | SCHWARZBECK | FMZB 1519B | 00005 | 2019-07-25 | 2020-07-24 |
| 13 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 2019-07-25 | 2020-07-24 |
| 14 | Horn Antenna | SCHWARZBECK | BBHA 9120D | 9120D-1925 | 2019-07-01 | 2020-06-30 |
| 15 | Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | 791 | 2019-09-19 | 2020-09-18 |
| 16 | Broadband Preamplifier | SCHWARZBECK | BBV 9719 | 9719-025 | 2019-09-19 | 2020-09-18 |
| 17 | EMI Test Receiver | R&S | ESR 7 | 101181 | 2019-06-12 | 2020-06-11 |
| 18 | RS SPECTRUM ANALYZER | R&S | FSP40 | 100503 | 2019-11-15 | 2020-11-14 |
| 19 | Broadband Preamplifier | phx | BP-01M18G | P190501 | 2019-07-01 | 2020-06-30 |
| 20 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 2019-06-12 | 2020-06-11 |
| 21 | RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 2019-06-12 | 2020-06-11 |
| 22 | 6dB Attenuator | / | 100W/6dB | 1172040 | 2019-06-11 | 2020-06-10 |
| 23 | 3dB Attenuator | / | 2N-3dB | / | 2019-06-11 | 2020-06-10 |
| 24 | Temperature & Humidity Chamber | GUANGZHOU GOGNWEN | GDS-100 | 70932 | 2019-10-09 | 2020-10-08 |
| 25 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-498 | 2019-07-25 | 2020-07-24 |
| 26 | Horn Antenna | SCHWARZBECK | BBHA 9120D | 9120D-1945 | 2019-07-01 | 2020-06-30 |
| Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD. | | | | | | |

## 3.6 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of Smart Phone equipment characteristics" and is documented in the Shenzhen LCS Compliance Testing Laboratory Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen LCS Compliance Testing Laboratory Ltd. is reported:

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 3.10 dB | (1) |
| Radiated Emission | 1~18GHz | 3.80 dB | (1) |
| Radiated Emission | 18-40GHz | 3.90 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 1.63 dB | (1) |
| Conducted Power | 9KHz~18GHz | 0.61 dB | (1) |
| Spurious RF Conducted Emission | 9KHz~40GHz | 1.22 dB | (1) |
| Band Edge Compliance of RF Emission | 9KHz~40GHz | 1.22 dB | (1) |
| Occuiped Bandwidth | 9KHz~40GHz | - | (1) |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

# 4 TEST CONDITIONS AND RESULTS

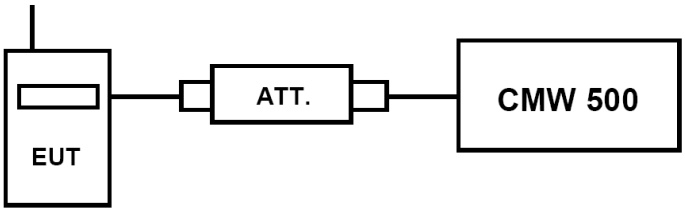
## 4.1 Output Power

**TEST APPLICABLE**

During the process of testing, the EUT was controlled via R&S WIDEBAND RADIO COMMUNICATION TESTER (CMW 500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

### 4.1.1 Conducted Output Power

**TEST CONFIGURATION**




**TEST PROCEDURE**

**Conducted Power Measurement:**

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a CMW 500 by an Att.
c) EUT Communicate with CMW 500 then selects a channel for testing.
d) Add a correction factor to the display CMW 500, and then test.

**TEST RESULTS**

| GSM 850 | | Burst Average Conducted power (dBm) | | |
|---|---|---|---|---|
| | | Channel/Frequency(MHz) | | |
| | | 128/824.2 | 190/836.6 | 251/848.8 |
| GSM | | 32.40 | 32.42 | 32.41 |
| GPRS (GMSK) | 1TX slot | 32.29 | 32.29 | 32.33 |
| | 2TX slot | 30.98 | 31.03 | 31.00 |
| | 3TX slot | 29.47 | 29.51 | 29.50 |
| | 4TX slot | 27.98 | 27.98 | 28.01 |
| EDGE (8PSK) | 1TX slot | 25.98 | 26.00 | 26.01 |
| | 2TX slot | 24.52 | 24.48 | 24.47 |
| | 3TX slot | 23.00 | 23.03 | 23.03 |
| | 4TX slot | 21.53 | 21.50 | 21.50 |

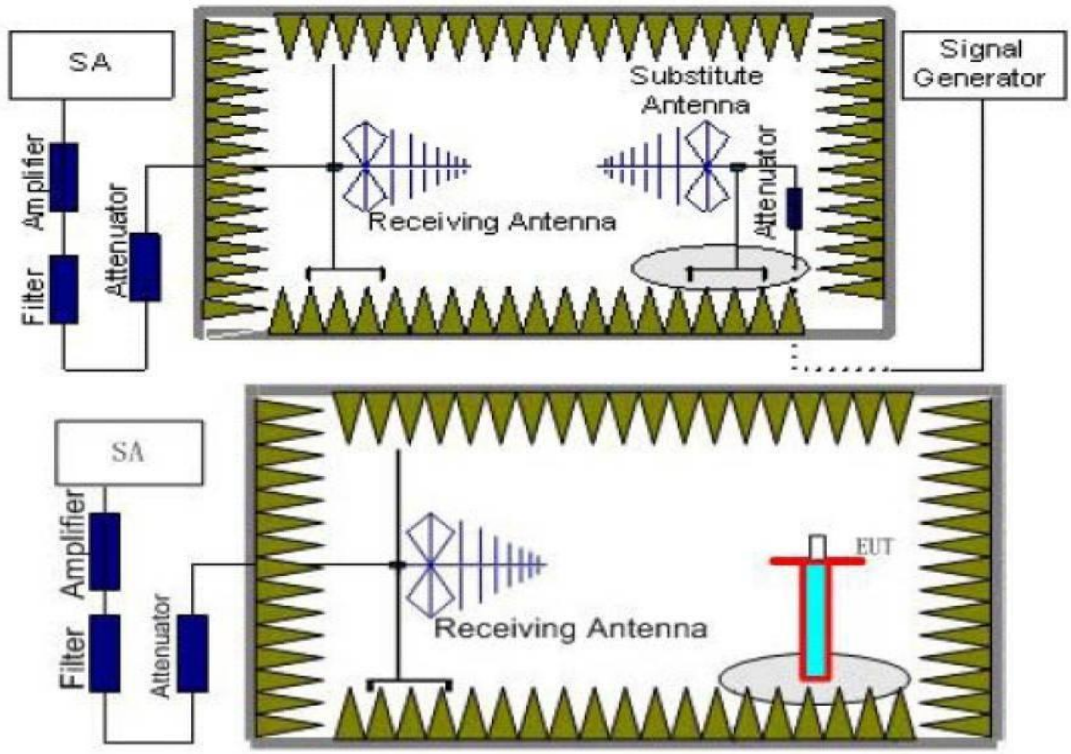
| GSM 1900 | | Burst Average Conducted power (dBm) | | |
|---|---|---|---|---|
| | | Channel/Frequency(MHz) | | |
| | | 512/1850.2 | 661/1880 | 810/1909.8 |
| GSM | | 29.47 | 29.47 | 29.43 |
| GPRS (GMSK) | 1TX slot | 29.38 | 29.41 | 29.42 |
| | 2TX slot | 27.99 | 28.01 | 28.00 |
| | 3TX slot | 26.49 | 26.51 | 26.48 |
| | 4TX slot | 24.98 | 25.03 | 24.97 |
| EDGE (8PSK) | 1TX slot | 25.53 | 25.49 | 25.51 |
| | 2TX slot | 24.01 | 24.02 | 24.00 |
| | 3TX slot | 22.47 | 22.48 | 22.52 |
| | 4TX slot | 20.97 | 21.02 | 21.01 |

## 4.1.2 Radiated Output Power

**TEST DESCRIPTION**

This is the test for the maximum radiated power from the EUT.
Per rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(e) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."
Per rule Part 22.913(a) specifies ” The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.”

**TEST CONFIGURATION**




**TEST PROCEDURE**

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

previously recorded ($P_r$). The power of signal source ($P_{Mea}$) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ($P_{cl}$) ,the Substitution Antenna Gain ($G_a$) and the Amplifier Gain ($P_{Ag}$) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=$P_{Mea}$+ $P_{Ag}$ - $P_{cl}$ + $G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

**TEST LIMIT**

According to 22.913(a), 24.232(c) , the ERP should be not exceed following table limits:

| GSM850(GPRS850,EDGE850) | | |
|---|---|---|
| Function | Power Step | Burst Peak ERP (dBm) |
| GSM | 5 | FCC: ≤38.45dBm (7W) |
| GPRS | 3 | FCC: ≤38.45dBm (7W) |
| EDGE | 8 | FCC: ≤38.45dBm (7W) |

| PCS1900(GPRS1900,EDGE1900) | | |
|---|---|---|
| Function | Power Step | Burst Peak EIRP (dBm) |
| GSM | 0 | ≤33.01dBm (2W) |
| GPRS | 3 | ≤33.01dBm (2W) |
| EDGE | 2 | ≤33.01dBm (2W) |

**TEST RESULTS**

*Remark:*

1. *We were tested all Configuration refer 3GPP TS151 010.*
2. *EIRP=$P_{Mea}$(dBm)-$P_{cl}$(dB)+$P_{Ag}$(dB)+$G_a$(dBi)*
3. *ERP = EIRP – 2.15dBi as EIRP by subtracting the gain of the dipole.*
4. *Margin = Emission Level - Limit*
5. *We test the H direction and V direction recorded worst case.*

*GSM/TM1/GSM850*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{Ag}$ (dB) | Burst Average ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|---|
| 824.20 | -6.92 | 3.45 | 8.45 | 2.15 | 33.79 | **29.72** | 38.45 | -8.73 | V |
| 836.60 | -6.93 | 3.49 | 8.45 | 2.15 | 33.85 | **29.73** | 38.45 | -8.72 | V |
| 848.80 | -7.05 | 3.55 | 8.36 | 2.15 | 33.88 | **29.49** | 38.45 | -8.96 | V |

*GSM/TM3/EDGE850*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | Correction (dB) | $P_{Ag}$ (dB) | Burst Average ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|---|
| 824.20 | -11.93 | 3.45 | 8.45 | 2.15 | 33.79 | **24.71** | 38.45 | -13.74 | V |
| 836.60 | -12.09 | 3.49 | 8.45 | 2.15 | 33.85 | **24.57** | 38.45 | -13.88 | V |
| 848.80 | -11.98 | 3.55 | 8.36 | 2.15 | 33.88 | **24.56** | 38.45 | -13.89 | V |

*GSM/TM1/GSM1900*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | $P_{Ag}$ (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1850.20 | -12.28 | 4.03 | 8.38 | 35.51 | **27.58** | 33.01 | -5.43 | V |
| 1880.00 | -12.13 | 4.08 | 8.33 | 35.56 | **27.68** | 33.01 | -5.33 | V |
| 1909.80 | -12.16 | 4.14 | 8.26 | 35.63 | **27.59** | 33.01 | -5.42 | V |

*GSM/TM3/EDGE1900*

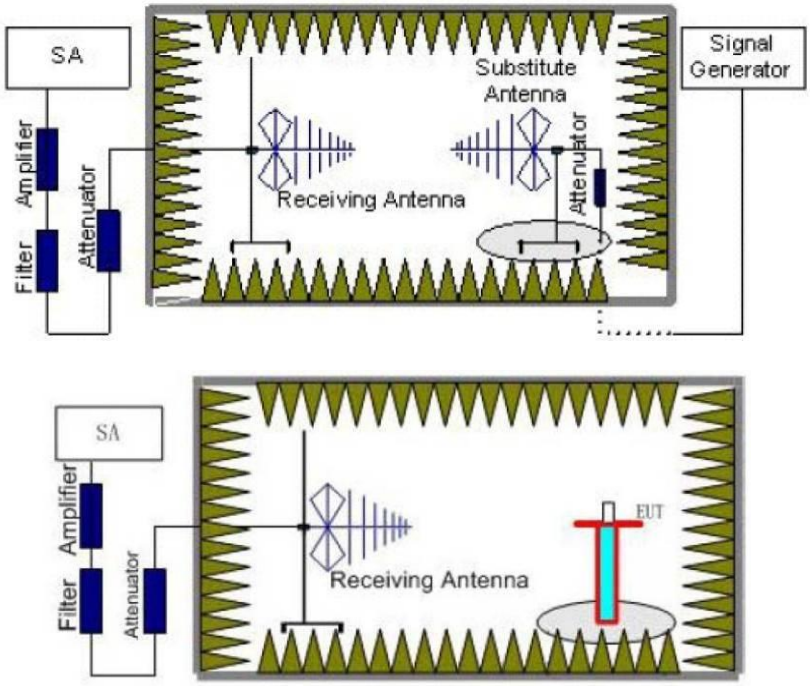
| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | $P_{Aq}$ (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1850.20 | -17.02 | 4.03 | 8.38 | 35.51 | **22.84** | 33.01 | -10.17 | V |
| 1880.00 | -16.92 | 4.08 | 8.33 | 35.56 | **22.89** | 33.01 | -10.12 | V |
| 1909.80 | -16.95 | 4.14 | 8.26 | 35.63 | **22.80** | 33.01 | -10.21 | V |

## 4.2 Radiated Spurious Emssion

**TEST APPLICABLE**

According to the TIA-603-E:2016 and FCC Part 2.1033 test method, The Receiver or Spectrum was scanned from lowest frequency frequency generated within the equipment to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238, Part 22.917, RSS-132 §5.5 and RSS-133 §6.5. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

**TEST CONFIGURATION**




**TEST PROCEDURE**

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

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ($P_{cl}$) ,the Substitution Antenna Gain ($G_a$) and the Amplifier Gain ($P_{Ag}$) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=$P_{Mea}$+ $P_{Ag}$ - $P_{cl}$ + $G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
8. In order to make sure test results more clearly,we set frequency range and sweep time for difference frequency range as follows table:

| Working Frequency | Subrange (GHz) | RBW | VBW | Sweep time (s) |
|---|---|---|---|---|
| TM1/GSM 850 | 0.00009~0.15 | 1KHz | 3KHz | 30 |
| | 0.00015~0.03 | 10KHz | 30KHz | 10 |
| | 0.03~1 | 100KHz | 300KHz | 10 |
| | 1~2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~10 | 1 MHz | 3 MHz | 3 |
| TM1/GSM 1900 | 0.00009~0.15 | 1KHz | 3KHz | 30 |
| | 0.00015~0.03 | 10KHz | 30KHz | 10 |
| | 0.03~1 | 100KHz | 300KHz | 10 |
| | 1~2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~11 | 1 MHz | 3 MHz | 3 |
| | 11~14 | 1 MHz | 3 MHz | 3 |
| | 14~18 | 1 MHz | 3 MHz | 3 |
| | 18~20 | 1 MHz | 3 MHz | 2 |

**TEST LIMITS**

According to 24.238 and 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

| Frequency | Channel | Frequency Range | Verdict |
|---|---|---|---|
| TM1/GSM 850 | Low | 9KHz -10GHz | PASS |
| | Middle | 9KHz -10GHz | PASS |
| | High | 9KHz -10GHz | PASS |
| TM1/GSM 1900 | Low | 9KHz -20GHz | PASS |
| | Middle | 9KHz -20GHz | PASS |
| | High | 9KHz -20GHz | PASS |

**TEST RESULTS**

*Remark:*
1. *We were tested all refer 3GPP TS151 010.*
2. *EIRP=$P_{Mea}$(dBm)-$P_{cl}$(dB) +$G_a$(dBi)*
3. *We were not recorded other points as values lower than limits.*
4. *Margin = EIRP - Limit*

*GSM/TM1/GSM850_ Low Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1648.40 | -43.09 | 3.86 | 3.00 | 8.56 | -38.39 | -13.00 | -25.39 | H |
| 2472.60 | -44.58 | 4.29 | 3.00 | 6.98 | -41.89 | -13.00 | -28.89 | H |
| 1648.40 | -40.08 | 3.86 | 3.00 | 8.56 | -35.38 | -13.00 | -22.38 | V |
| 2472.60 | -41.87 | 4.29 | 3.00 | 6.98 | -39.18 | -13.00 | -26.18 | V |

*GSM/TM1/GSM850_ Middle Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1673.20 | -41.56 | 3.9 | 3.00 | 8.58 | -36.88 | -13.00 | -23.88 | H |
| 2509.80 | -46.57 | 4.32 | 3.00 | 6.8 | -44.09 | -13.00 | -31.09 | H |
| 1673.20 | -37.47 | 3.9 | 3.00 | 8.58 | -32.79 | -13.00 | -19.79 | V |
| 2509.80 | -42.82 | 4.32 | 3.00 | 6.8 | -40.34 | -13.00 | -27.34 | V |

*GSM/TM1/GSM850_ High Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1697.60 | -47.10 | 3.91 | 3.00 | 9.06 | -41.95 | -13.00 | -28.95 | H |
| 2546.40 | -49.18 | 4.32 | 3.00 | 6.65 | -46.85 | -13.00 | -33.85 | H |
| 1697.60 | -43.22 | 3.91 | 3.00 | 9.06 | -38.07 | -13.00 | -25.07 | V |
| 2546.40 | -44.76 | 4.32 | 3.00 | 6.65 | -42.43 | -13.00 | -29.43 | V |

*GSM/TM3/GSM850_ Low Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1648.40 | -45.67 | 3.86 | 3.00 | 8.56 | -40.97 | -13.00 | -27.97 | H |
| 2472.60 | -46.21 | 4.29 | 3.00 | 6.98 | -43.52 | -13.00 | -30.52 | H |
| 1648.40 | -41.61 | 3.86 | 3.00 | 8.56 | -36.91 | -13.00 | -23.91 | V |
| 2472.60 | -43.83 | 4.29 | 3.00 | 6.98 | -41.14 | -13.00 | -28.14 | V |

*GSM/TM3/GSM850_ Middle Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1673.20 | -43.84 | 3.9 | 3.00 | 8.58 | -39.16 | -13.00 | -26.16 | H |
| 2509.80 | -48.63 | 4.32 | 3.00 | 6.8 | -46.15 | -13.00 | -33.15 | H |
| 1673.20 | -39.20 | 3.9 | 3.00 | 8.58 | -34.52 | -13.00 | -21.52 | V |
| 2509.80 | -44.93 | 4.32 | 3.00 | 6.8 | -42.45 | -13.00 | -29.45 | V |

*GSM/TM3/GSM850_ High Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1697.60 | -48.71 | 3.91 | 3.00 | 9.06 | -43.56 | -13.00 | -30.56 | H |
| 2546.40 | -51.61 | 4.32 | 3.00 | 6.65 | -49.28 | -13.00 | -36.28 | H |
| 1697.60 | -45.32 | 3.91 | 3.00 | 9.06 | -40.17 | -13.00 | -27.17 | V |
| 2546.40 | -47.24 | 4.32 | 3.00 | 6.65 | -44.91 | -13.00 | -31.91 | V |

*GSM/TM1/GSM1900_ Low Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 3700.40 | -44.92 | 5.26 | 3.00 | 9.88 | -40.30 | -13.00 | -27.30 | H |
| 5550.60 | -46.47 | 6.11 | 3.00 | 11.36 | -41.22 | -13.00 | -28.22 | H |
| 3700.40 | -41.51 | 5.26 | 3.00 | 9.88 | -36.89 | -13.00 | -23.89 | V |
| 5550.60 | -44.15 | 6.11 | 3.00 | 11.36 | -38.90 | -13.00 | -25.90 | V |

*GSM/TM1/GSM1900_ Middle Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 3760.00 | -43.89 | 5.32 | 3.00 | 10.03 | -39.18 | -13.00 | -26.18 | H |
| 5640.00 | -48.36 | 6.19 | 3.00 | 11.41 | -43.14 | -13.00 | -30.14 | H |
| 3760.00 | -39.52 | 5.32 | 3.00 | 10.03 | -34.81 | -13.00 | -21.81 | V |
| 5640.00 | -44.88 | 6.19 | 3.00 | 11.41 | -39.66 | -13.00 | -26.66 | V |

*GSM/TM1/GSM1900_ High Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 3819.60 | -48.91 | 5.36 | 3.00 | 9.62 | -44.65 | -13.00 | -31.65 | H |
| 5729.40 | -51.71 | 6.24 | 3.00 | 11.46 | -46.49 | -13.00 | -33.49 | H |
| 3819.60 | -45.19 | 5.36 | 3.00 | 9.62 | -40.93 | -13.00 | -27.93 | V |
| 5729.40 | -47.24 | 6.24 | 3.00 | 11.46 | -42.02 | -13.00 | -29.02 | V |

*GSM/TM3/GSM1900_ Low Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 3700.40 | -47.13 | 5.26 | 3.00 | 9.88 | -42.51 | -13.00 | -29.51 | H |
| 5550.60 | -48.14 | 6.11 | 3.00 | 11.36 | -42.89 | -13.00 | -29.89 | H |
| 3700.40 | -43.34 | 5.26 | 3.00 | 9.88 | -38.72 | -13.00 | -25.72 | V |
| 5550.60 | -45.61 | 6.11 | 3.00 | 11.36 | -40.36 | -13.00 | -27.36 | V |

*GSM/TM3/GSM1900_ Middle Channel*

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 3760.00 | -45.99 | 5.32 | 3.00 | 10.03 | -41.28 | -13.00 | -28.28 | H |
| 5640.00 | -50.20 | 6.19 | 3.00 | 11.41 | -44.98 | -13.00 | -31.98 | H |
| 3760.00 | -41.16 | 5.32 | 3.00 | 10.03 | -36.45 | -13.00 | -23.45 | V |
| 5640.00 | -47.00 | 6.19 | 3.00 | 11.41 | -41.78 | -13.00 | -28.78 | V |

*GSM/TM3/GSM1900_ High Channel*

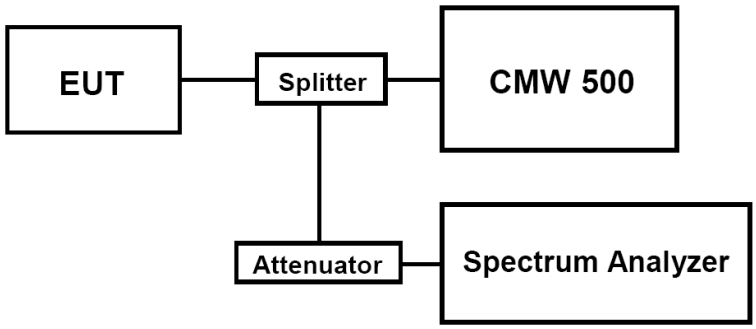
| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | Diatance | $G_a$ Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 3819.60 | -50.92 | 5.36 | 3.00 | 9.62 | -46.66 | -13.00 | -33.66 | H |
| 5729.40 | -53.78 | 6.24 | 3.00 | 11.46 | -48.56 | -13.00 | -35.56 | H |
| 3819.60 | -47.50 | 5.36 | 3.00 | 9.62 | -43.24 | -13.00 | -30.24 | V |
| 5729.40 | -48.81 | 6.24 | 3.00 | 11.46 | -43.59 | -13.00 | -30.59 | V |

## 4.3 Occupied Bandwidth and Emission Bandwidth

**TEST APPLICABLE**

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of PCS1900 band and GSM850 band. The table below lists the measured 99% Bandwidth
and -26dBc Bandwidth.

**TEST CONFIGURATION**




**TEST PROCEDURE**

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The Occupied bandwidth and Emission Bandwidth were measured with Spectrum AnalyzerN9020A;
3. Set RBW=5.1KHz,VBW=51KHz,Span=1MHz,SWT=Auto;
4. Set SPA Max hold and View, Set 99% Occupied Bandwidth/ Set -26dBc Occupied Bandwidth
5. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (Low, middle and high of operational frequency range).

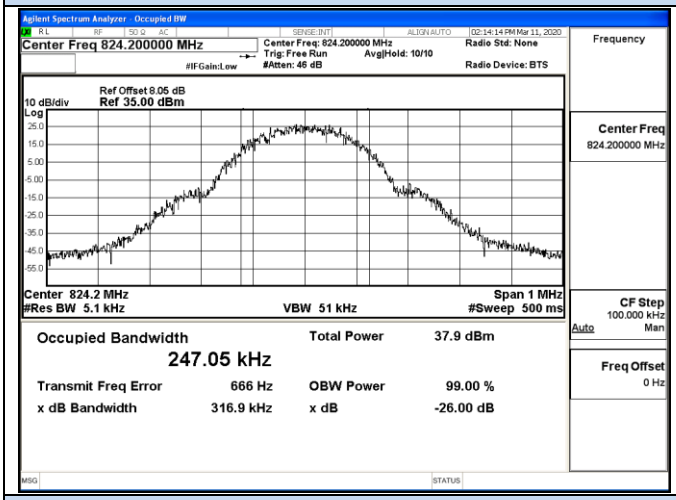
**TEST RESULTS**

| Test Mode | Channel | Frequency (MHz) | Occupied Bandwidth (99% BW) (KHz) | Emission Bandwidth (-26 dBc BW) (KHz) | Verdict |
|---|---|---|---|---|---|
| GSM/TM1 /GSM850 | 128 | 824.2 | 247.05 | 316.9 | PASS |
| | 190 | 836.6 | 243.93 | 309.6 | PASS |
| | 251 | 848.8 | 243.77 | 307.4 | PASS |
| GSM/TM3 /EDGE850 | 128 | 824.2 | 252.03 | 316.4 | PASS |
| | 190 | 836.6 | 250.25 | 315.5 | PASS |
| | 251 | 848.8 | 250.93 | 319.0 | PASS |
| GSM/TM1 /GSM1900 | 512 | 1850.2 | 245.03 | 313.4 | PASS |
| | 661 | 1880.0 | 243.68 | 315.0 | PASS |
| | 810 | 1909.8 | 244.62 | 310.2 | PASS |
| GSM/TM3 /EDGE1900 | 512 | 1850.2 | 251.14 | 315.4 | PASS |
| | 661 | 1880.0 | 248.64 | 316.6 | PASS |
| | 810 | 1909.8 | 253.40 | 328.3 | PASS |

*Remark:*
1. *Test results including cable loss;*
2. *Please refer to following plots;*

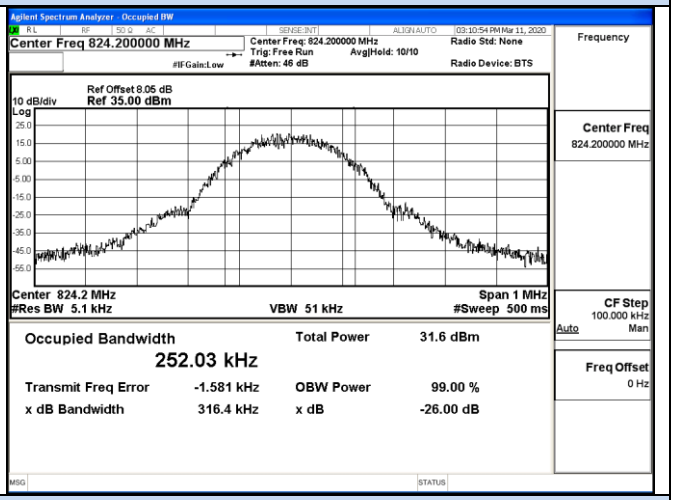
## Occupied Bandwidth and Emission Bandwidth

### GSM/TM1/GSM850

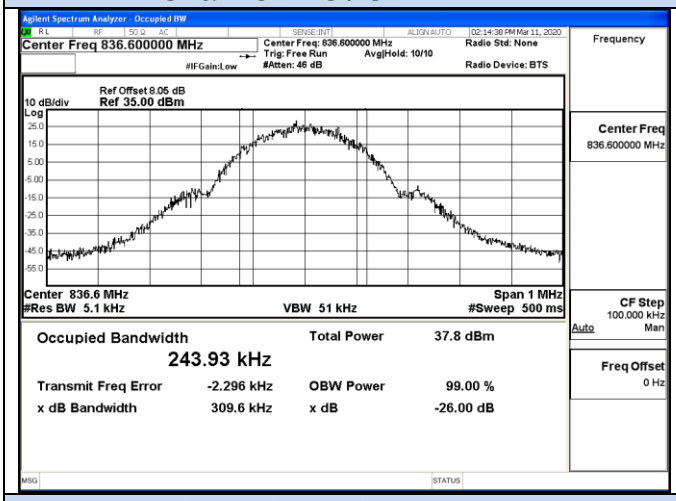



Channel 128 / 824.2 MHz

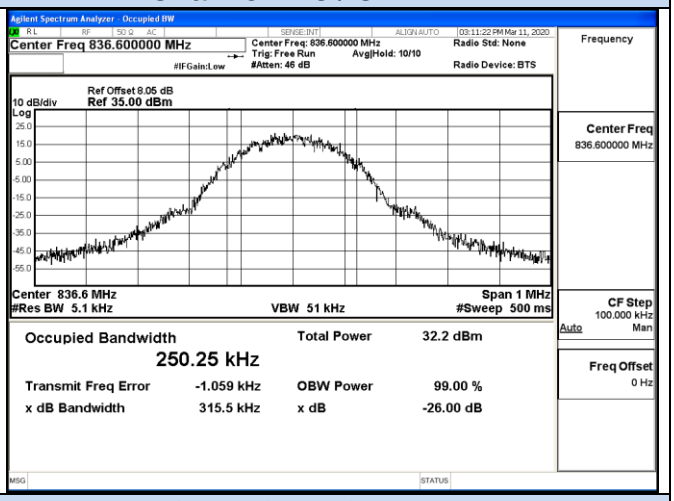
### GSM/TM3/EDGE850



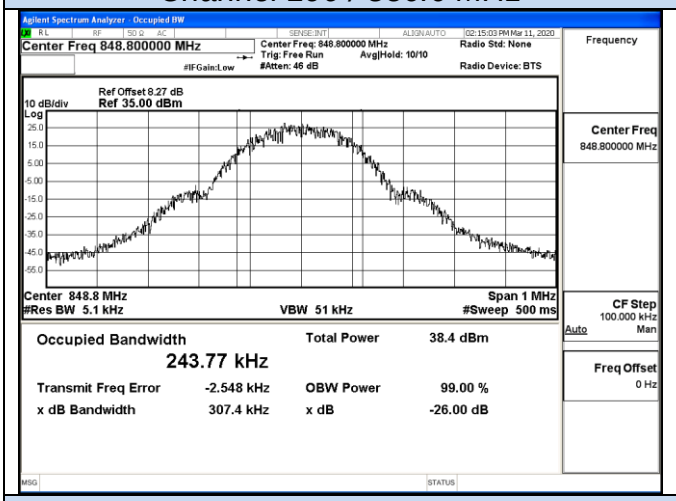

Channel 128 / 824.2 MHz



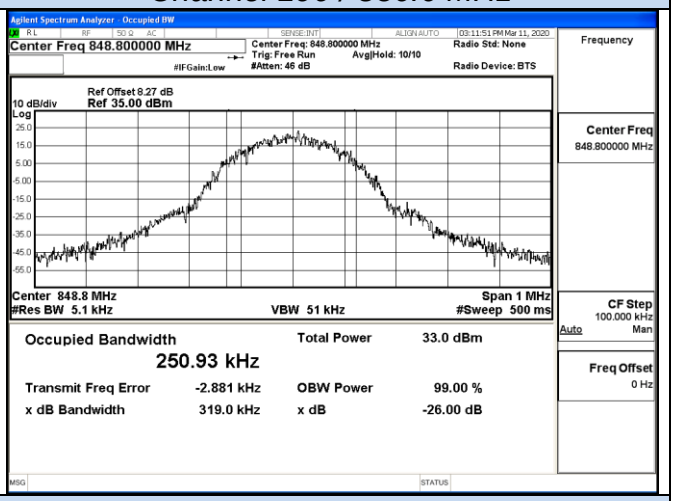

Channel 190 / 836.6 MHz




Channel 190 / 836.6 MHz



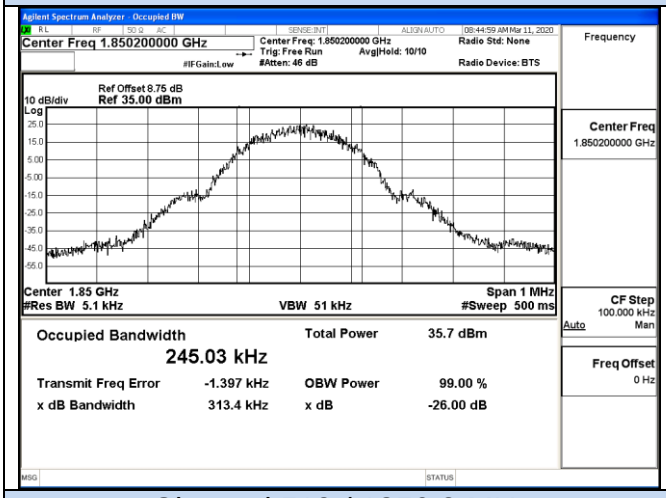

Channel 251 / 848.8 MHz



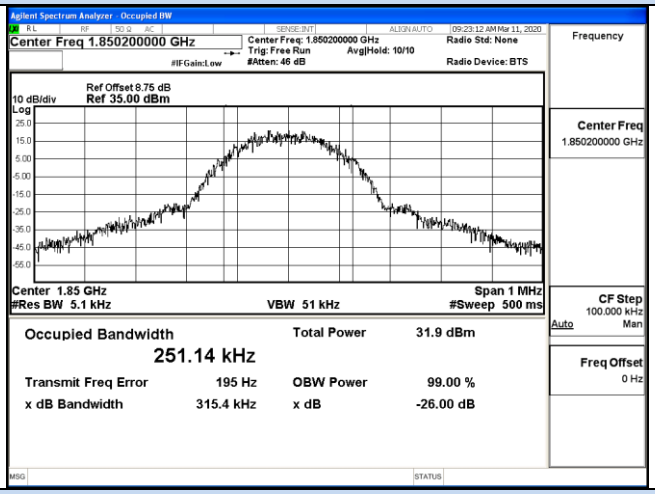

Channel 251 / 848.8 MHz

## Occupied Bandwidth and Emission Bandwidth

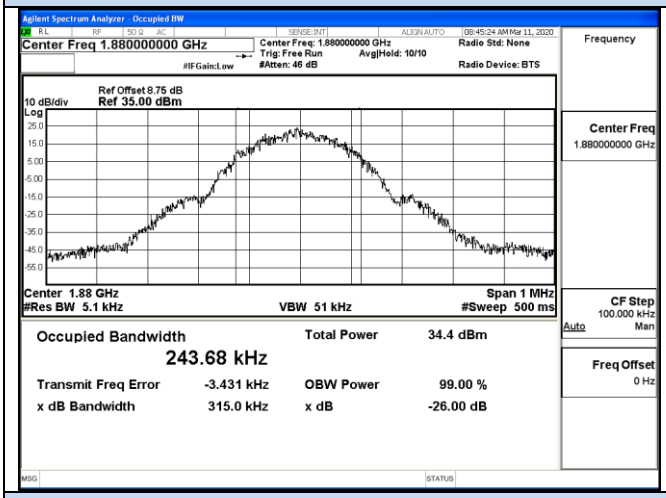
### GSM/TM1/GSM1900



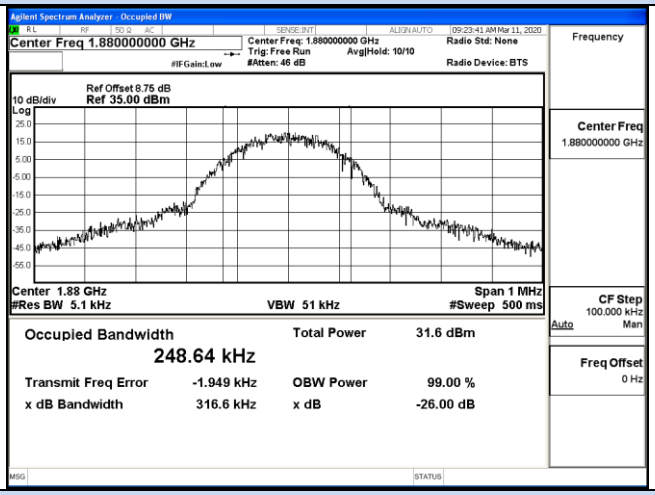

### GSM/TM3/ EDGE1900



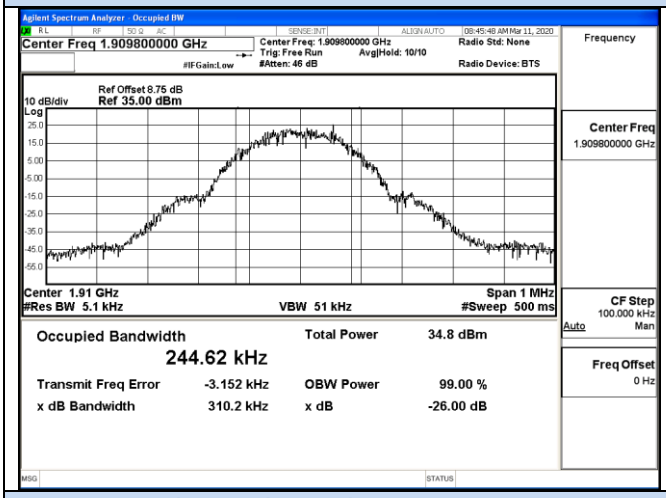

### Channel 512 / 1850.2 MHz



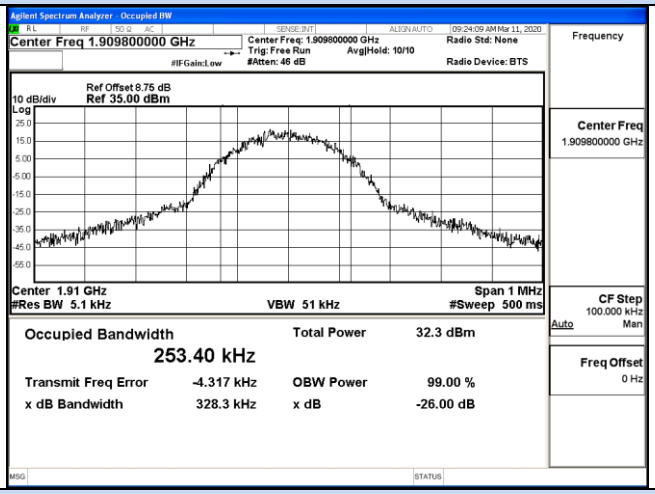

### Channel 512 / 1850.2 MHz




### Channel 661 / 1880.0MHz




### Channel 661 / 1880.0MHz




### Channel 810 / 1909.8 MHz

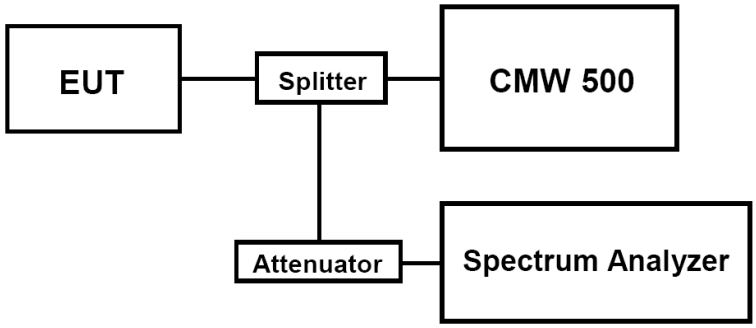
### Channel 810 / 1909.8 MHz

## 4.4 Band Edge Complicance

**TEST APPLICABLE**

During the process of testing, the EUT was controlled via R&S WIDEBAND RADIO COMMUNICATION TESTER (CMW 500) to ensure max power transmission and proper modulation.

**TEST CONFIGURATION**



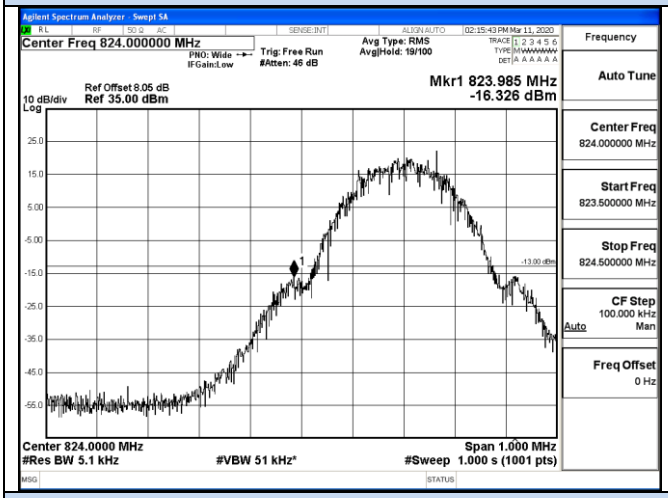
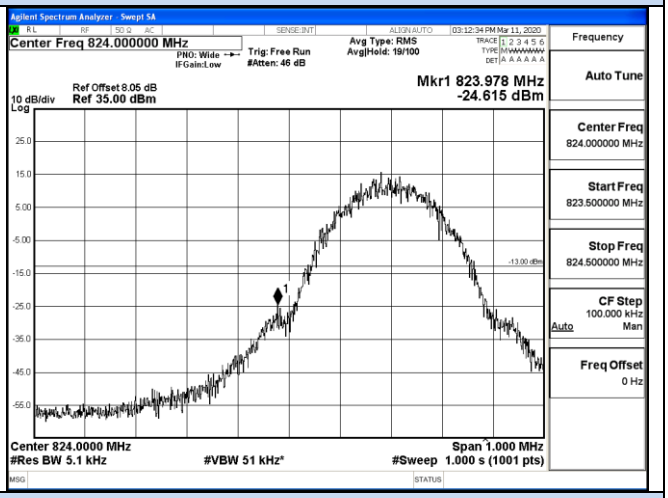
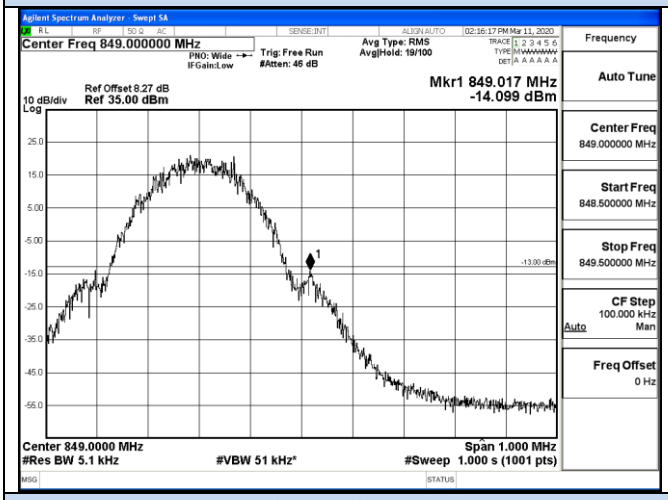
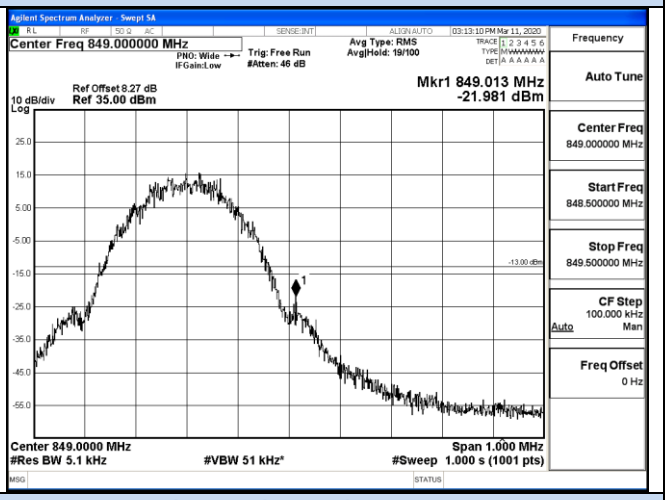

**TEST PROCEDURE**

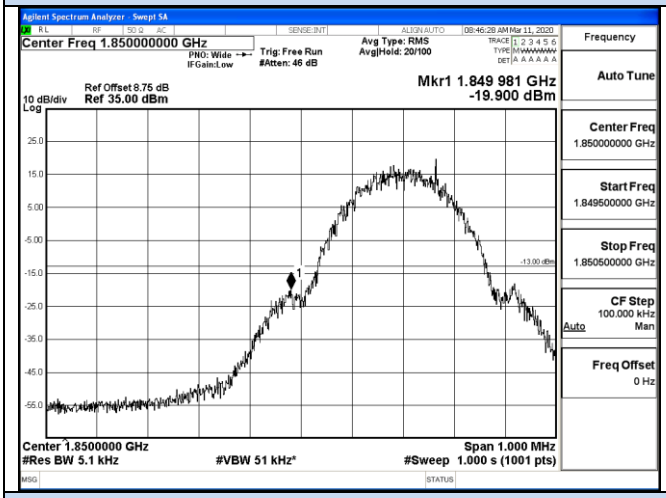
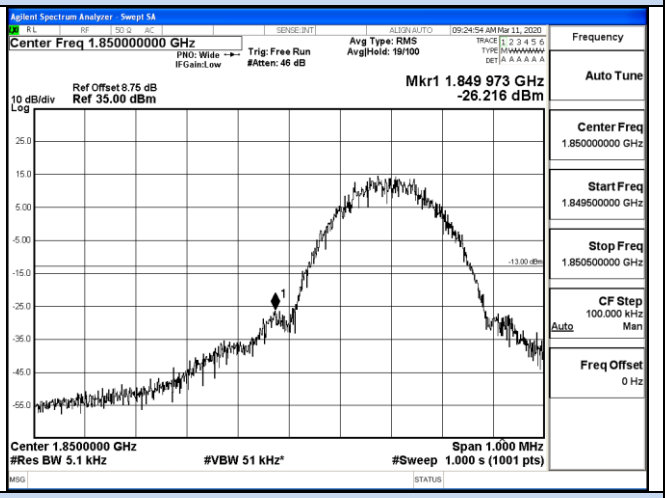
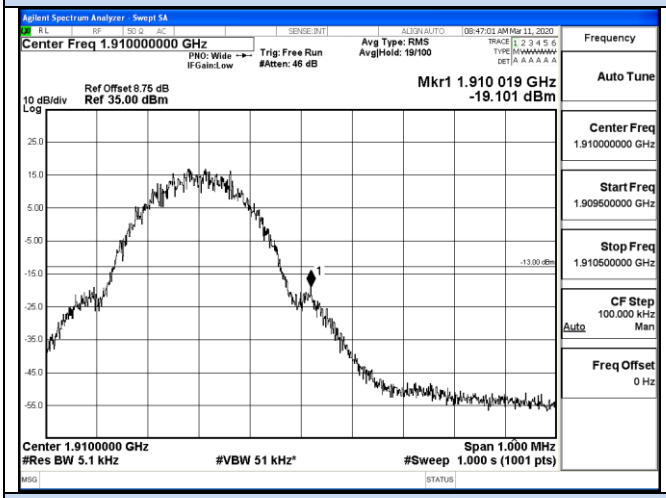
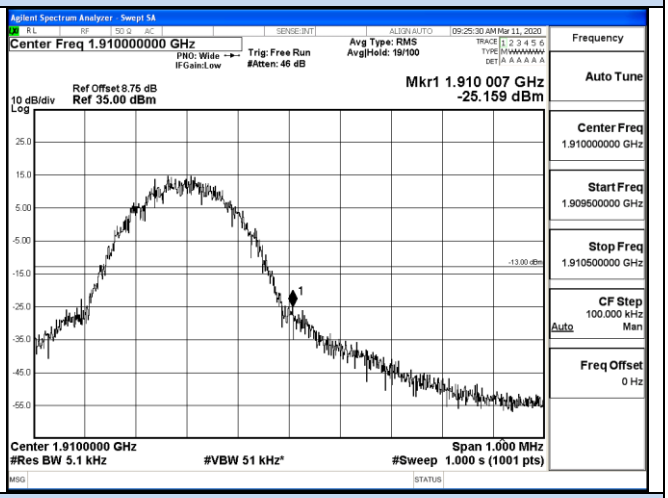
1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Spectrum Analyzer N9020A;
3. Set RBW=5.1KHz,VBW=51KHz,Span=1MHz,SWT=Auto, Dector: RMS;
1. These measurements were done at 2 frequencies, 1850.20 MHz and 1909.80 MHz for PCS1900 band; 824.20 MHz and 848.80 MHz for GSM850 band. (bottom and top of operational frequency range).

**TEST RESULTS**

| Test Mode | Channel | Frequency (MHz) | Band Edg Compliance (dBm) | Limits (dBm) | Verdict |
|---|---|---|---|---|---|
| GSM/TM1/GSM850 | 128 | 824.2 | <-13dBm | -13dBm | PASS |
| | 251 | 848.8 | <-13dBm | -13dBm | |
| GSM/TM3/EDGE850 | 128 | 824.2 | <-13dBm | -13dBm | PASS |
| | 251 | 848.8 | <-13dBm | -13dBm | |
| GSM/TM1/GSM1900 | 512 | 1850.2 | <-13dBm | -13dBm | PASS |
| | 810 | 1909.8 | <-13dBm | -13dBm | |
| GSM/TM3/EDGE1900 | 512 | 1850.2 | <-13dBm | -13dBm | PASS |
| | 810 | 1909.8 | <-13dBm | -13dBm | |

*Remark:*
1. *Test results including cable loss;*
2. *Please refer to following plots;*

| Band-edge Compliance | |
|---|---|
| GSM/TM1/GSM850 | GSM/TM3/EDGE850 |
|  |  |
| Channel 128 / 824.2 MHz | Channel 128 / 824.2 MHz |
|  |  |
| Channel 251 / 848.8 MHz | Channel 251 / 848.8 MHz |

| Band-edge Compliance | |
|---|---|
| GSM/TM1/GSM1900 | GSM/TM3/EDGE1900 |
|  |  |
| Channel 512 / 1850.2 MHz | Channel 512 / 1850.2 MHz |
|  |  |
| Channel 810 / 1909.8 MHz | Channel 810 / 1909.8 MHz |

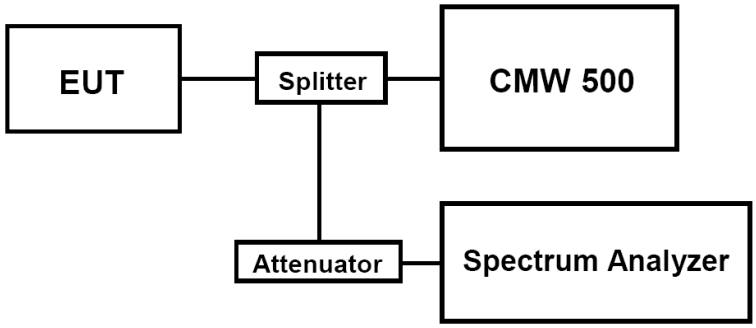
## 4.5 Spurious Emssion on Antenna Port

**TEST APPLICABLE**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 and RSS-GEN the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the $10^{th}$ harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 9 KHz to 20 GHz, data taken from 30 MHz to 20 GHz. For GSM850, this equates to a frequency range of 9 KHz to 9 GHz,data taken from 30 MHz to 9 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; if the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give an optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
   The trace mode is set to MaxHold to get the highest signal at each frequency;
   Wait 25 seconds;
   Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**TEST CONFIGURATION**




**TEST PROCEDURE**

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Spectrum Analyzer N9020A;
3. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20 MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (Low, middle and high of operational frequency range).

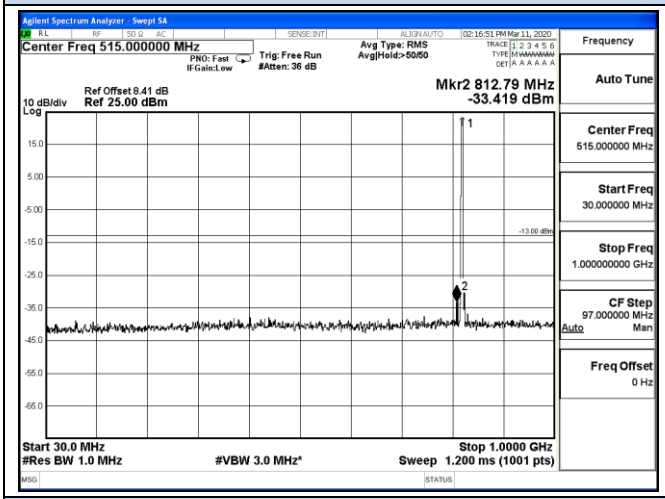
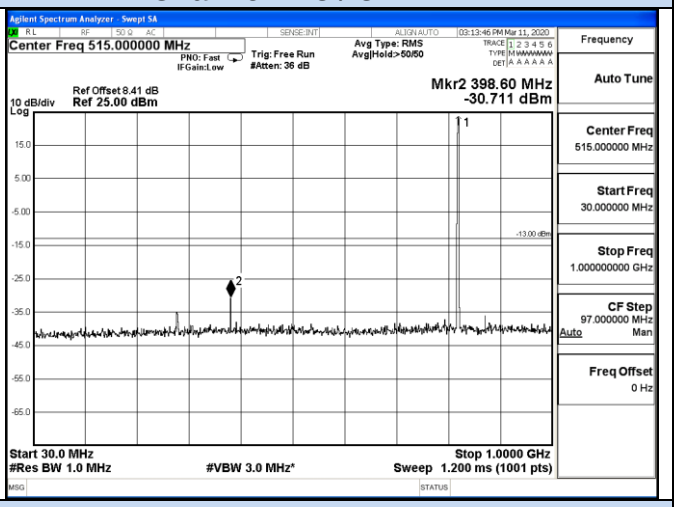
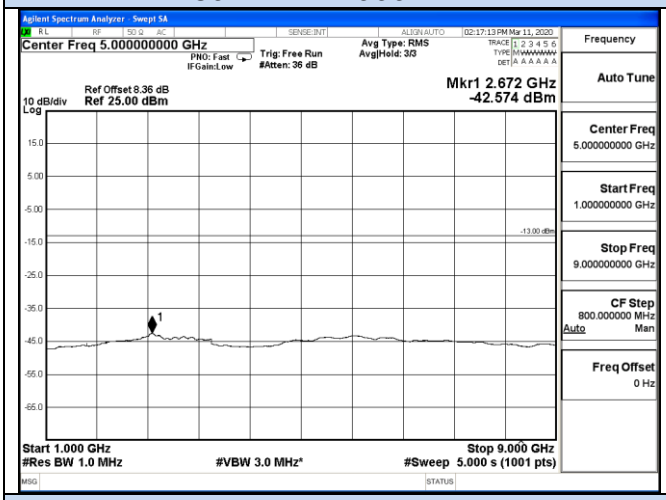
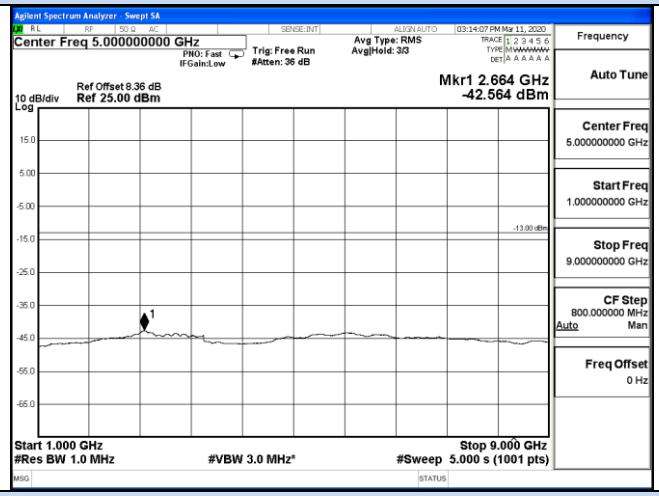
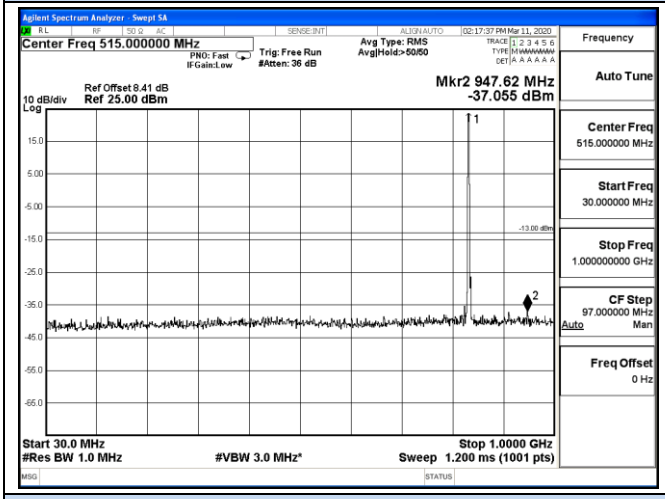
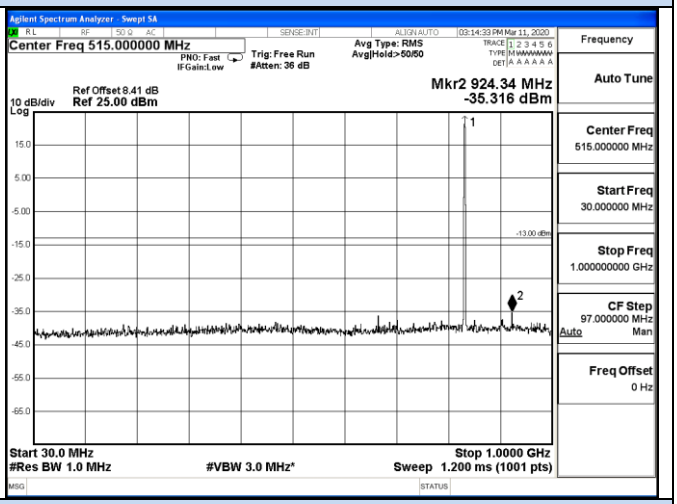
**TEST LIMIT**

Part 24.238, Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**TEST RESULTS**

| Test Mode | Channel | Frequency (MHz) | Spurious RF Conducted Emission (dBm) | Limits (dBm) | Verdict |
|---|---|---|---|---|---|
| GSM/TM1/GSM850 | 128 | 824.2 | <-13dBm | -13dBm | PASS |
| | 190 | 836.6 | <-13dBm | -13dBm | |
| | 251 | 848.8 | <-13dBm | -13dBm | |
| GSM/TM3/EDGE850 | 128 | 824.2 | <-13dBm | -13dBm | PASS |
| | 190 | 836.6 | <-13dBm | -13dBm | |
| | 251 | 848.8 | <-13dBm | -13dBm | |
| GSM/TM1/GSM1900 | 512 | 1850.2 | <-13dBm | -13dBm | PASS |
| | 661 | 1880.0 | <-13dBm | -13dBm | |
| | 810 | 1909.8 | <-13dBm | -13dBm | |
| GSM/TM3/EDGE1900 | 512 | 1850.2 | <-13dBm | -13dBm | PASS |
| | 661 | 1880.0 | <-13dBm | -13dBm | |
| | 810 | 1909.8 | <-13dBm | -13dBm | |

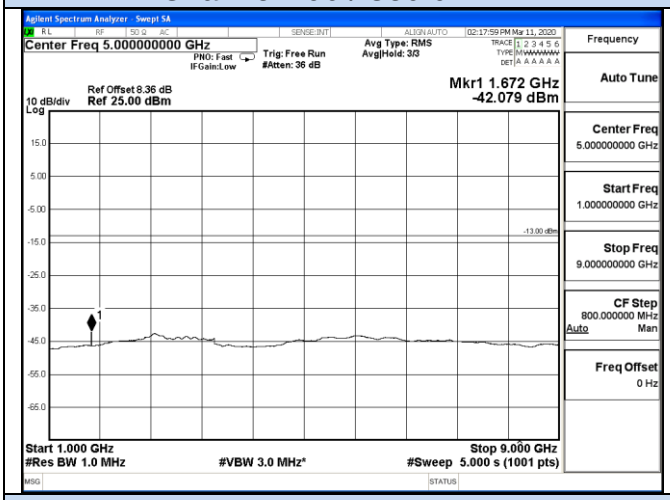
*Remark:*
1. *Test results including cable loss;*
2. *Please refer to following plots;*
3. *Not reorded test plots from 9 KHz to 30 MHz as emission levels 20dB lower than emission limit;*

| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM1/GSM850 | GSM/TM3/EDGE850 |
| Channel 128 / 824.2 MHz | Channel 128 / 824.2 MHz |
|  |  |
| 30 MHz – 1000 MHz | 30 MHz – 1000 MHz |
|  |  |
| 1 GHz – 9 GHz | 1 GHz – 9 GHz |
| Channel 190 / 836.6 MHz | Channel 190 / 836.6 MHz |
|  |  |
| 30 MHz – 1000 MHz | 30 MHz – 1000 MHz |

## Spurious Emission on Antenna Port

### GSM/TM1/GSM850

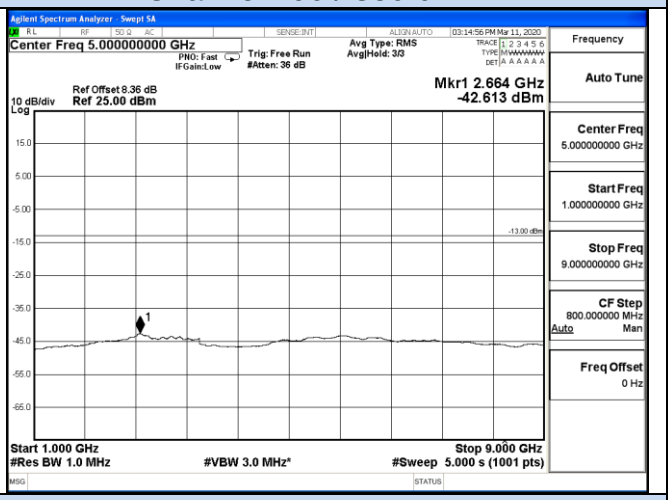
Channel 190 / 836.6 MHz




1 GHz – 9 GHz

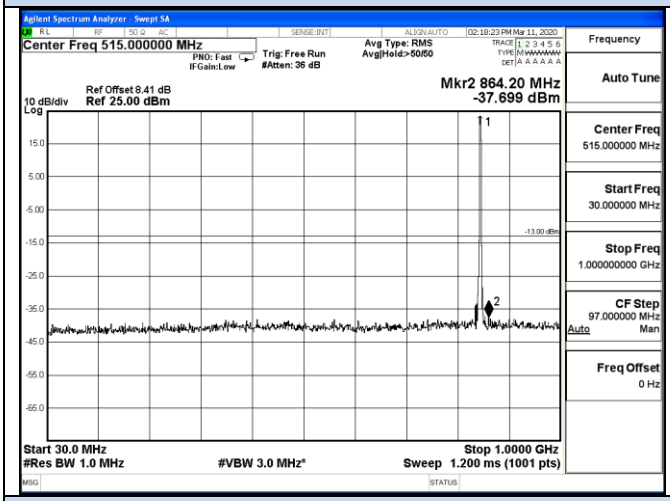
### GSM/TM3/EDGE850

Channel 190 / 836.6 MHz



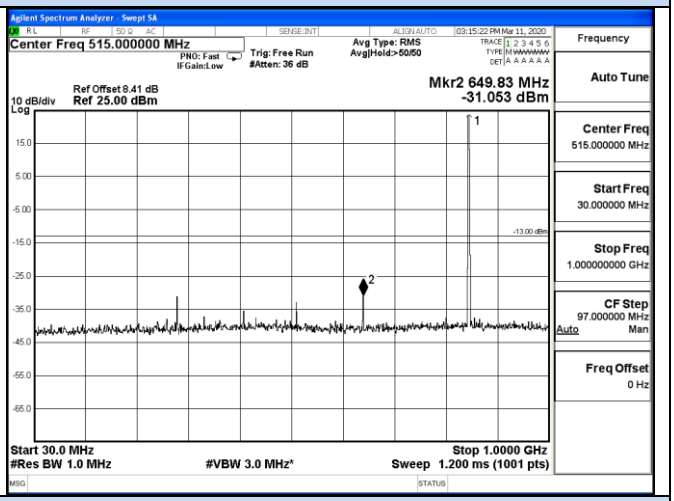

1 GHz – 9 GHz

Channel 251 / 848.8 MHz

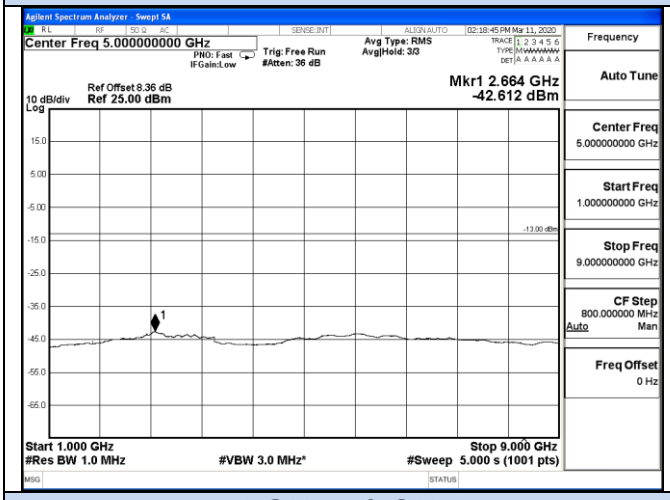



30 MHz – 1000 MHz

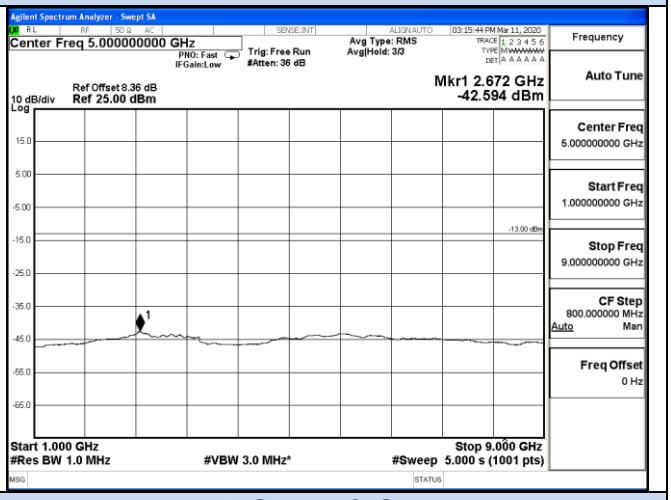
Channel 251 / 848.8 MHz



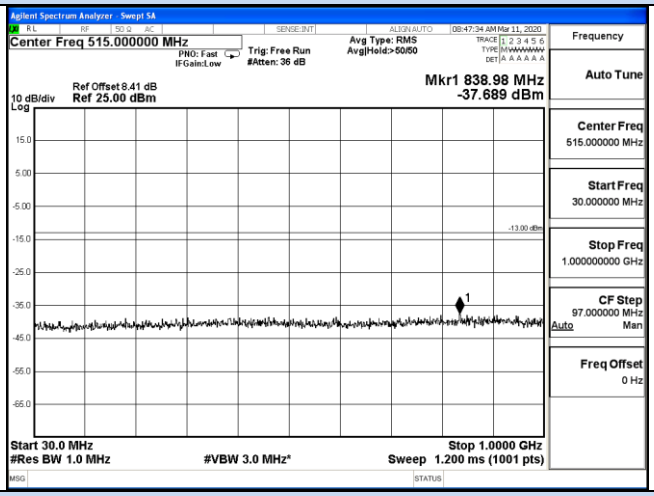
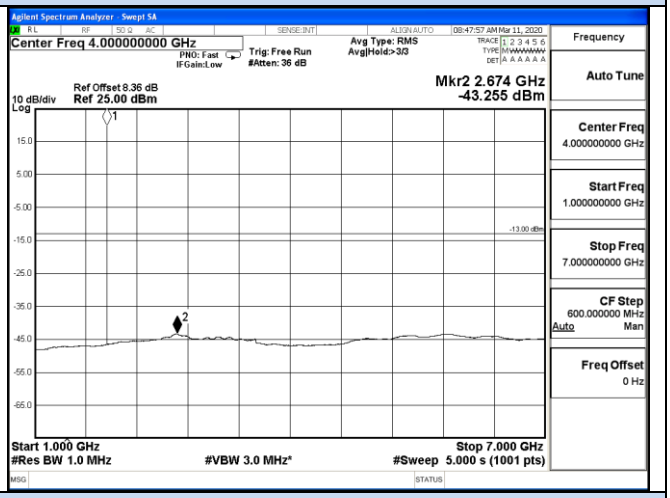
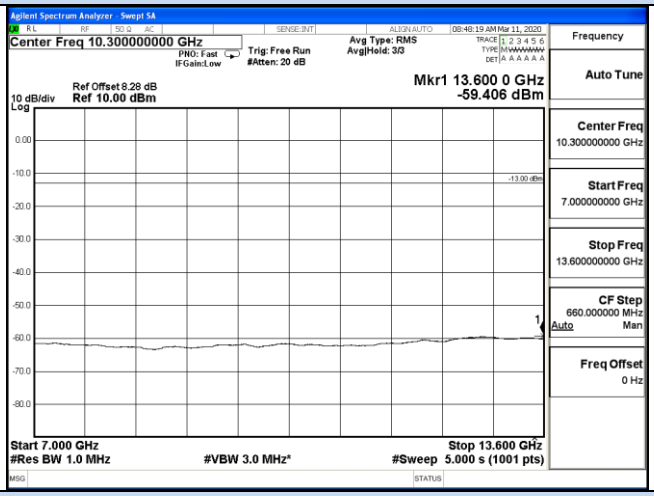
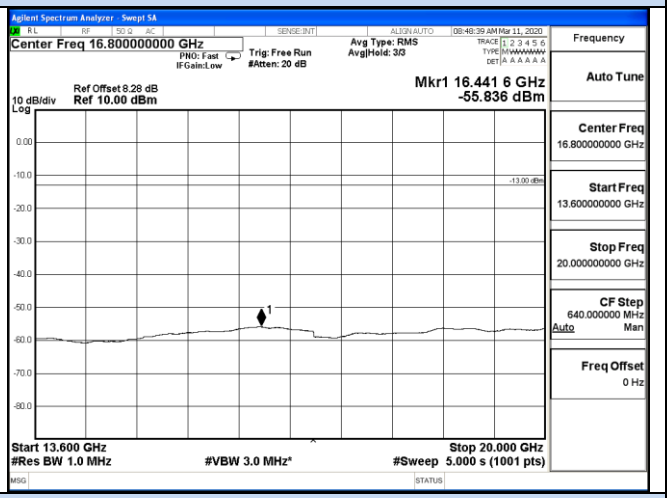

30 MHz – 1000 MHz

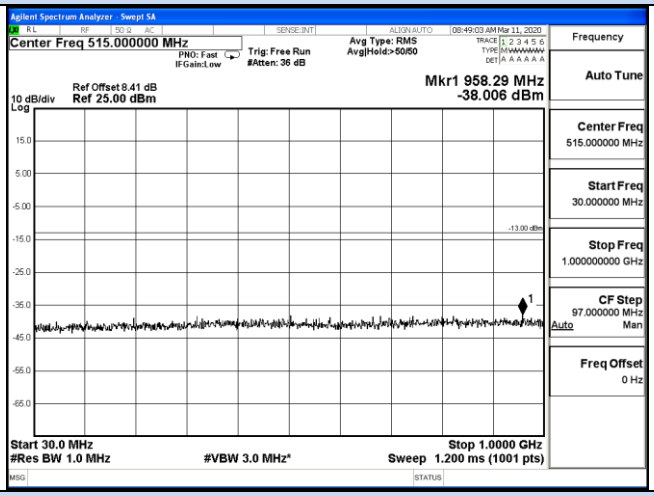
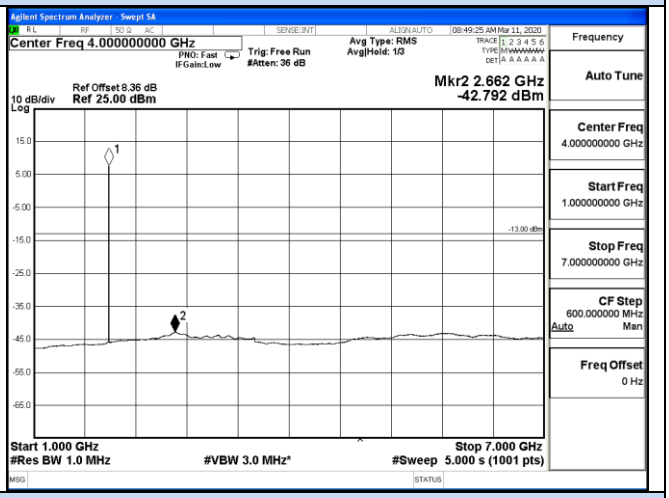
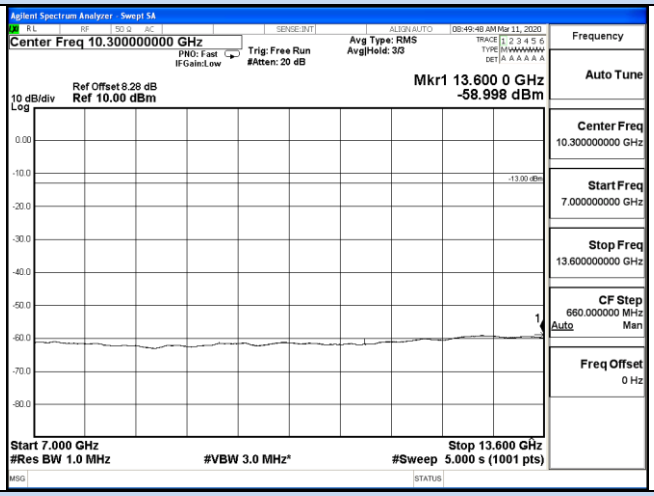
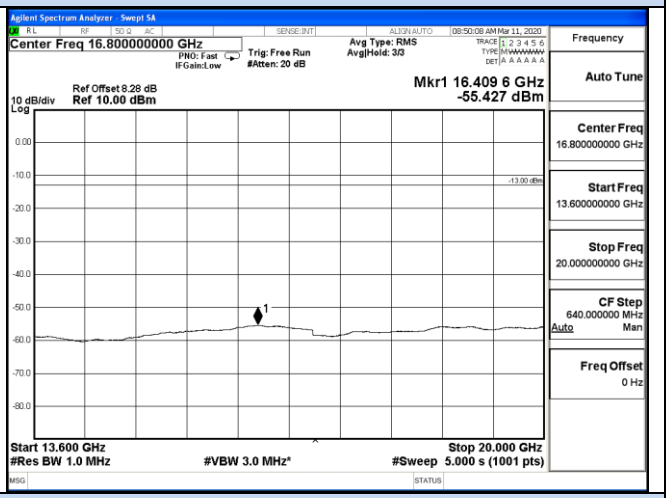


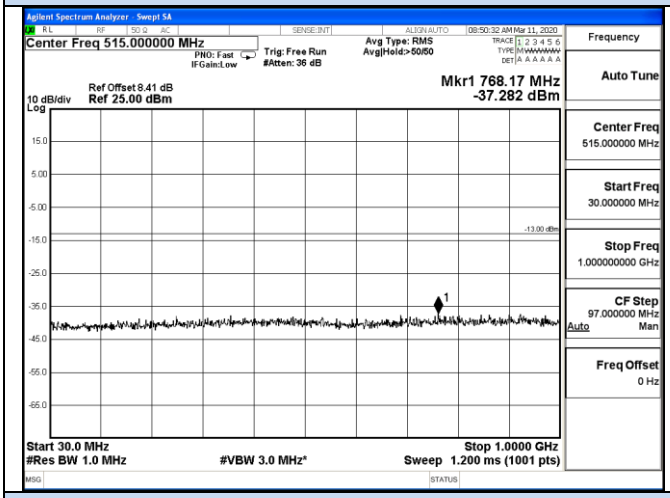
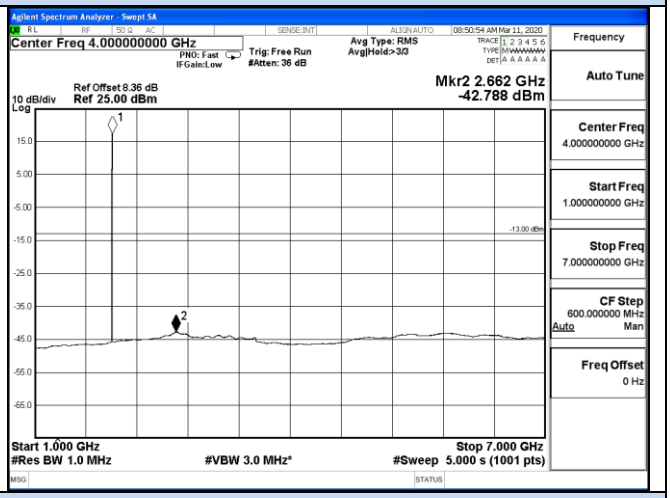
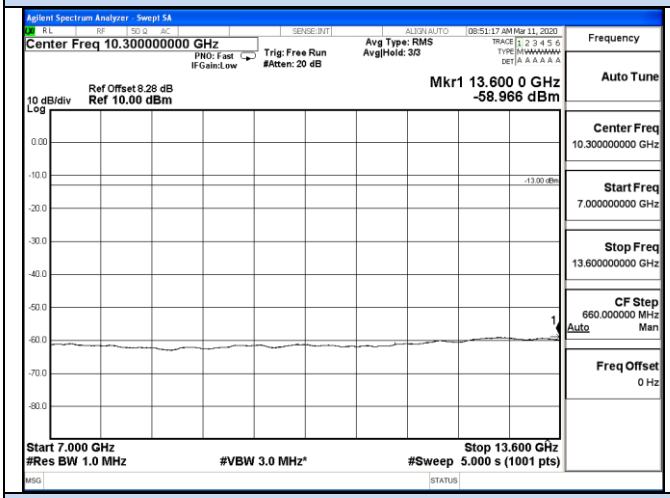
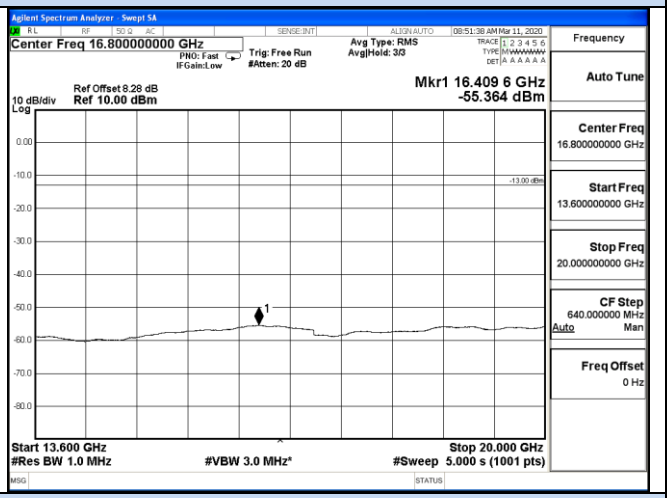

1 GHz – 9 GHz

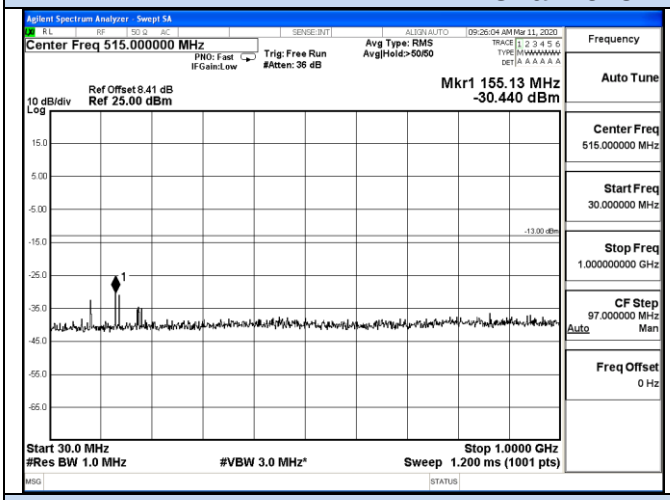
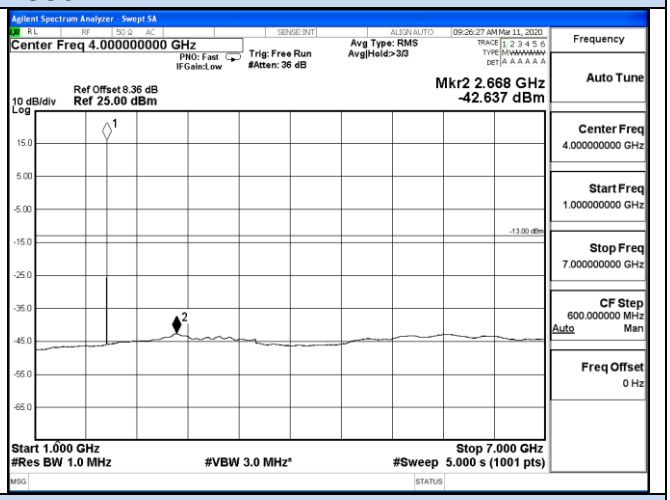
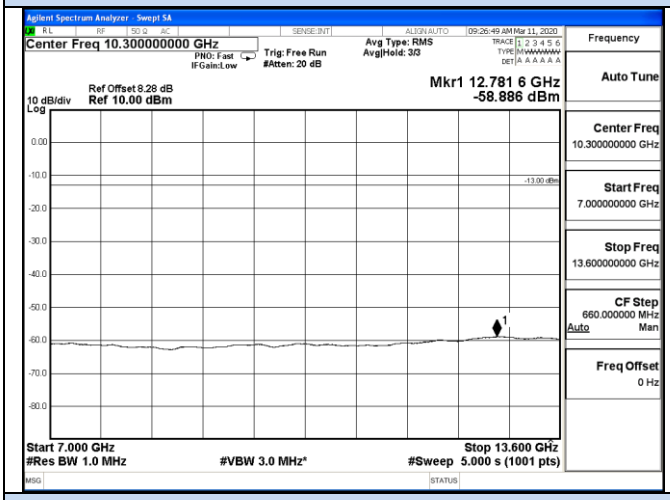
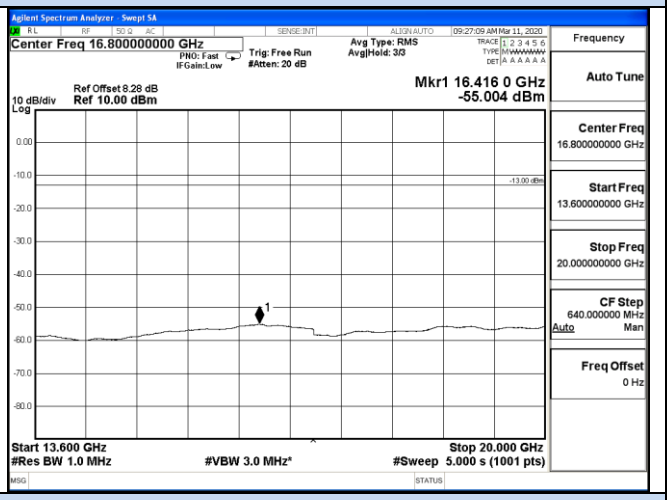


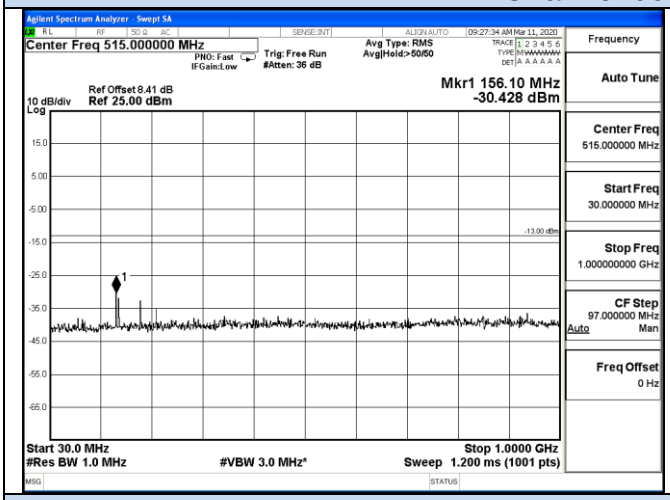
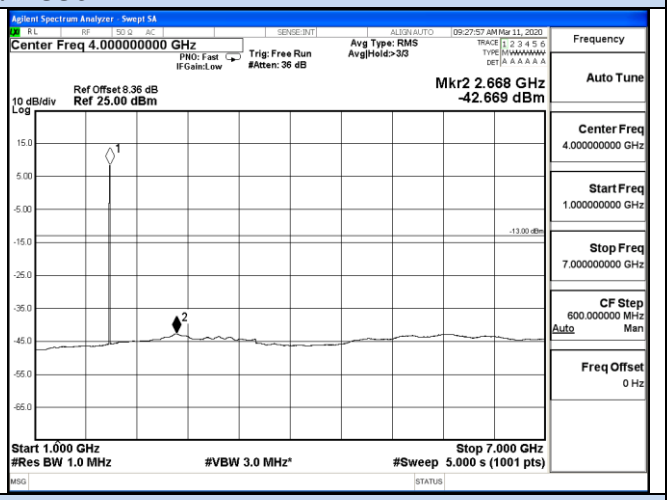
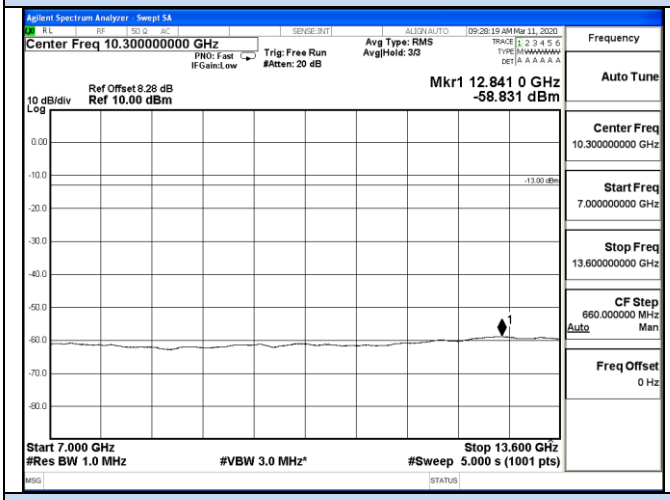
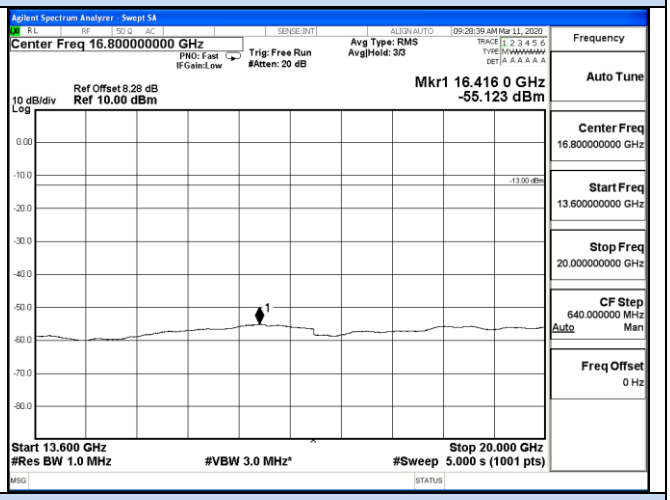

1 GHz – 9 GHz

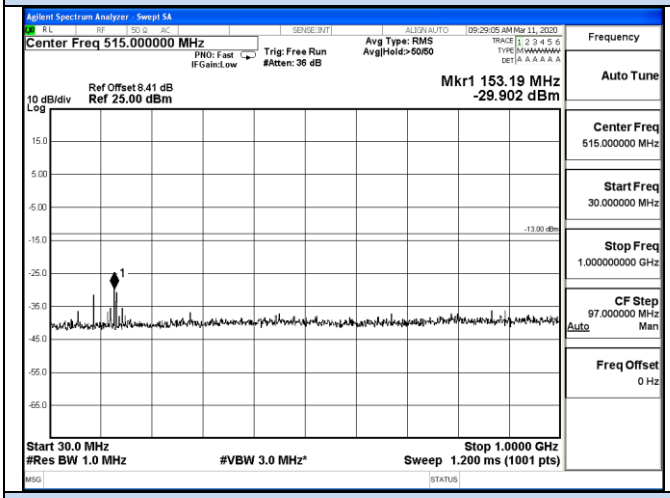
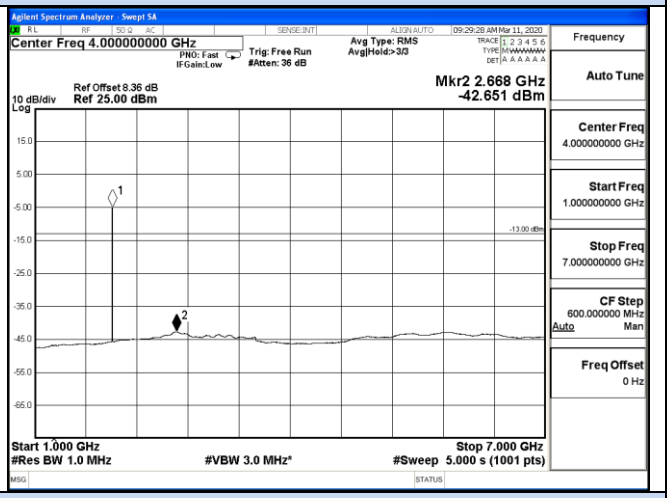
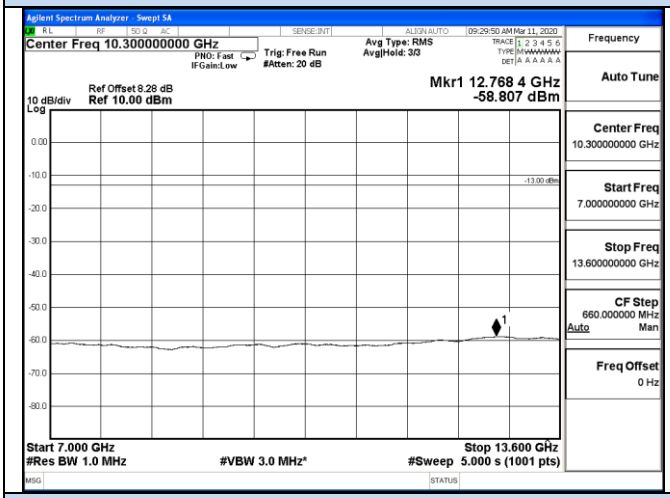
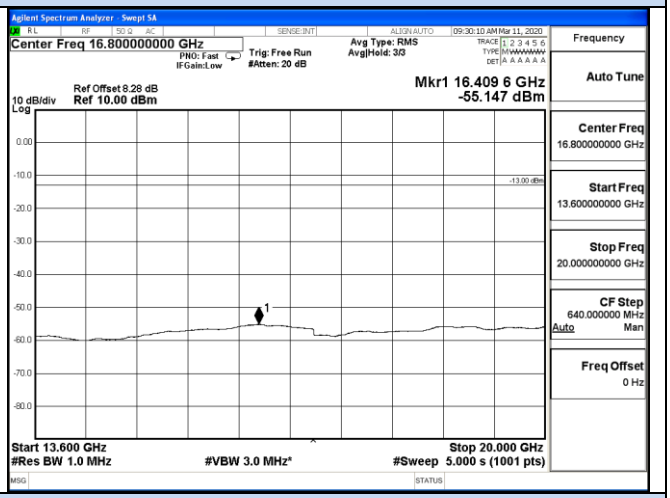
| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM1/GSM1900 | |
| Channel 512 / 1850.2 MHz | |
|  |  |
| 30 MHz – 1000 MHz | 1 GHz – 7 GHz |
|  |  |
| 7 GHz – 13.6 GHz | 13.6 GHz – 20 GHz |

| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM1/GSM1900 | |
| Channel 661 / 1880 MHz | |
|  |  |
| 30 MHz – 1000 MHz | 1 GHz – 7 GHz |
|  |  |
| 7 GHz – 13.6 GHz | 13.6 GHz – 20 GHz |

| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM1/GSM1900 | |
| Channel 810 / 1909.8 MHz | |
|  |  |
| 30 MHz – 1000 MHz | 1 GHz – 7 GHz |
|  |  |
| 7 GHz – 13.6 GHz | 13.6 GHz – 20 GHz |

| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM3/EDGE1900 | |
| Channel 512 / 1850.2 MHz | |
|  |  |
| 30 MHz – 1000 MHz | 1 GHz – 7 GHz |
|  |  |
| 7 GHz – 13.6 GHz | 13.6 GHz – 20 GHz |

| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM3/EDGE1900 | |
| Channel 661 / 1880 MHz | |
|  |  |
| 30 MHz – 1000 MHz | 1 GHz – 7 GHz |
|  |  |
| 7 GHz – 13.6 GHz | 13.6 GHz – 20 GHz |

| Spurious Emission on Antenna Port | |
|---|---|
| GSM/TM3/EDGE1900 | |
| Channel 810 / 1909.8 MHz | |
|  |  |
| 30 MHz – 1000 MHz | 1 GHz – 7 GHz |
|  |  |
| 7 GHz – 13.6 GHz | 13.6 GHz – 20 GHz |

## 4.6 Frequency Stability Test

**TEST APPLICABLE**

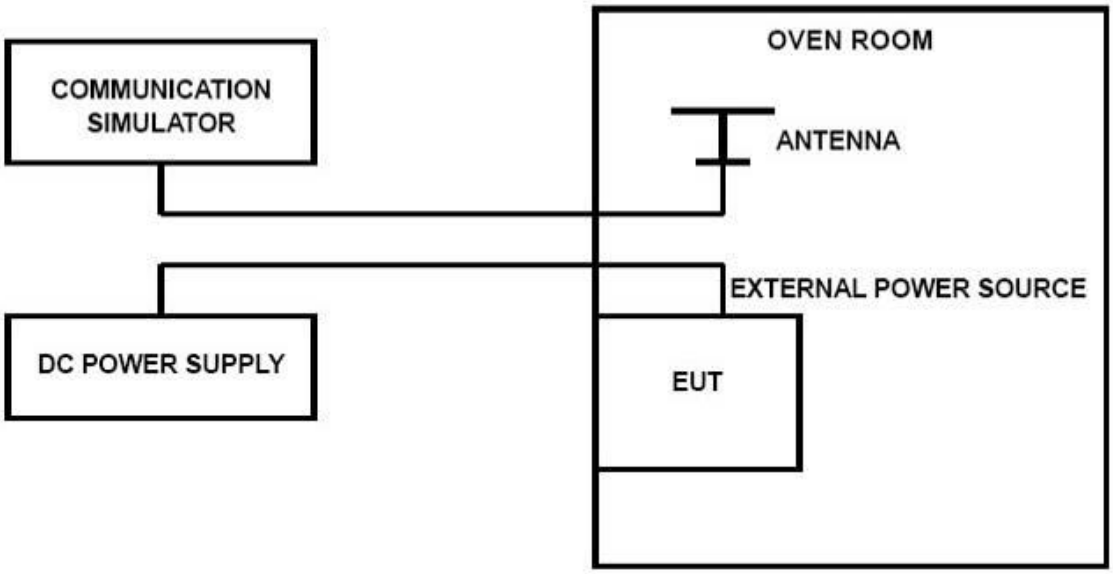
1. According to FCC Part 2 Section 2.1055 (a)(1) and RSS-GEN, the frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃ centigrade.
2. According to FCC Part 2 Section 2.1055 (E) (2) and RSS-GEN, for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried voltage equipment and the end voltage point was 3.23V.

**TEST PROCEDURE**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S WIDEBAND RADIO COMMUNICATION TESTER (CMW 500).

1. Measure the carrier frequency at room temperature;
2. Subject the EUT to overnight soak at -30℃;
3. With the EUT, powered via nominal voltage, connected to the CMW 500 and in a simulated call on middle channel of PCS 1900 and GSM850, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 0.5 hours unpowered, to allow any self-heating to stabilize, before continuing;
6. Subject the EUT to overnight soak at +50℃;
7. With the EUT, powered via nominal voltage, connected to the CMW 500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
8. Repeat the above measurements at 10℃ increments from +50℃ to -30℃. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure;

**TEST CONFIGURATION**



## TEST LIMITS

***For Hand carried battery powered equipment***

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.23VDC and 4.37VDC, with a nominal voltage of 3.80DC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

***For equipment powered by primary supply voltage***

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

## TEST RESULTS

| GSM/TM1/GSM850 | | | | | |
|---|---|---|---|---|---|
| DC Power | Temperature (℃) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.23 | 25 | 5 | 0.006 | ±2.50 | PASS |
| 3.80 | 25 | 14 | 0.017 | ±2.50 | PASS |
| 4.37 | 25 | -4 | -0.005 | ±2.50 | PASS |
| 3.80 | -30 | 6 | 0.007 | ±2.50 | PASS |
| 3.80 | -20 | -8 | -0.010 | ±2.50 | PASS |
| 3.80 | -10 | -15 | -0.017 | ±2.50 | PASS |
| 3.80 | 0 | -7 | -0.009 | ±2.50 | PASS |
| 3.80 | 10 | -4 | -0.005 | ±2.50 | PASS |
| 3.80 | 20 | 14 | 0.017 | ±2.50 | PASS |
| 3.80 | 30 | 2 | 0.003 | ±2.50 | PASS |
| 3.80 | 40 | 0 | 0.000 | ±2.50 | PASS |
| 3.80 | 50 | 11 | 0.013 | ±2.50 | PASS |

| GSM/TM3/EDGE850 | | | | | |
|---|---|---|---|---|---|
| DC Power | Temperature (℃) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.23 | 25 | -2 | -0.003 | ±2.50 | PASS |
| 3.80 | 25 | 0 | 0.000 | ±2.50 | PASS |
| 4.37 | 25 | 6 | 0.007 | ±2.50 | PASS |
| 3.80 | -30 | -6 | -0.007 | ±2.50 | PASS |
| 3.80 | -20 | 0 | 0.000 | ±2.50 | PASS |
| 3.80 | -10 | 10 | 0.012 | ±2.50 | PASS |
| 3.80 | 0 | -14 | -0.016 | ±2.50 | PASS |
| 3.80 | 10 | -9 | -0.010 | ±2.50 | PASS |
| 3.80 | 20 | -7 | -0.008 | ±2.50 | PASS |
| 3.80 | 30 | 15 | 0.018 | ±2.50 | PASS |
| 3.80 | 40 | -8 | -0.010 | ±2.50 | PASS |
| 3.80 | 50 | -8 | -0.010 | ±2.50 | PASS |

| GSM/TM1/GSM1900 | | | | | |
|---|---|---|---|---|---|
| DC Power | Temperature (℃) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.23 | 25 | -10 | -0.005 | ±2.50 | PASS |
| 3.80 | 25 | -15 | -0.008 | ±2.50 | PASS |
| 4.37 | 25 | 6 | 0.003 | ±2.50 | PASS |
| 3.80 | -30 | 0 | 0.000 | ±2.50 | PASS |
| 3.80 | -20 | 15 | 0.008 | ±2.50 | PASS |
| 3.80 | -10 | -6 | -0.003 | ±2.50 | PASS |
| 3.80 | 0 | 7 | 0.004 | ±2.50 | PASS |
| 3.80 | 10 | -1 | -0.001 | ±2.50 | PASS |
| 3.80 | 20 | -9 | -0.005 | ±2.50 | PASS |
| 3.80 | 30 | 5 | 0.003 | ±2.50 | PASS |
| 3.80 | 40 | 14 | 0.007 | ±2.50 | PASS |
| 3.80 | 50 | 11 | 0.006 | ±2.50 | PASS |

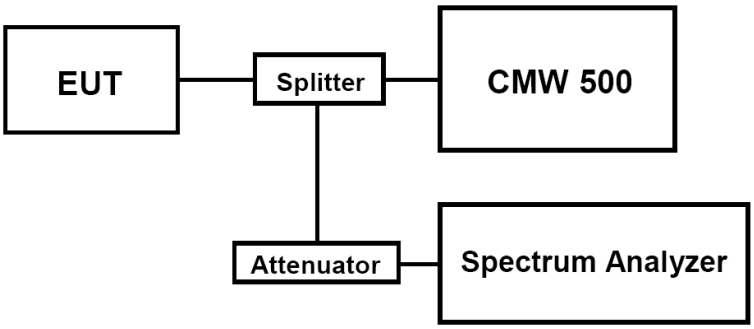
| GSM/TM3/EDGE1900 | | | | | |
|---|---|---|---|---|---|
| DC Power | Temperature (℃) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.23 | 25 | -6 | -0.003 | ±2.50 | PASS |
| 3.80 | 25 | -2 | -0.001 | ±2.50 | PASS |
| 4.37 | 25 | 14 | 0.007 | ±2.50 | PASS |
| 3.80 | -30 | 2 | 0.001 | ±2.50 | PASS |
| 3.80 | -20 | -6 | -0.003 | ±2.50 | PASS |
| 3.80 | -10 | -10 | -0.005 | ±2.50 | PASS |
| 3.80 | 0 | -7 | -0.004 | ±2.50 | PASS |
| 3.80 | 10 | 3 | 0.002 | ±2.50 | PASS |
| 3.80 | 20 | 7 | 0.004 | ±2.50 | PASS |
| 3.80 | 30 | 13 | 0.007 | ±2.50 | PASS |
| 3.80 | 40 | -11 | -0.006 | ±2.50 | PASS |
| 3.80 | 50 | -12 | -0.007 | ±2.50 | PASS |

## 4.7 Peak-to-Average Ratio (PAR)

**LIMIT**

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

**TEST CONFIGURATION**




**TEST PROCEDURE**

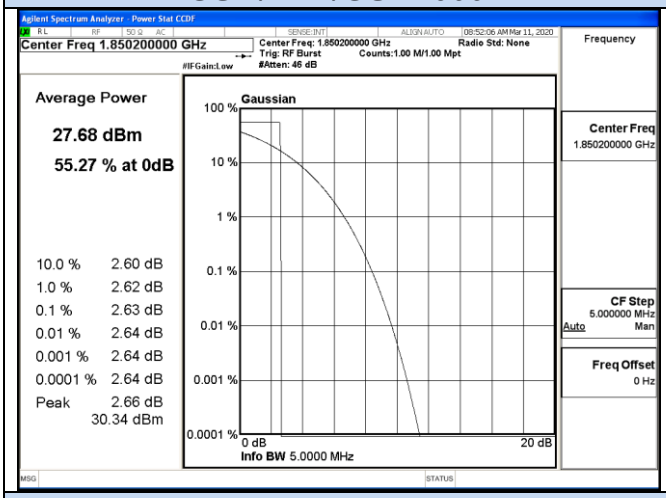
Use spectrum to measure the total peak power and record as $P_{Pk}$. Use spectrum to measure the total average power and record as $P_{Avg}$. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm).
Determine the PAPR from:
PAPR (dB) = $P_{Pk}$ (dBm) - $P_{Avg}$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

**TEST RESULTS**

| Test Mode | Channel | Frequency (MHz) | PAPR Value (dB) | Limits (dB) | Verdict |
|---|---|---|---|---|---|
| GSM/TM1/GSM1900 | 512 | 1850.20 | 2.63 | 13.0 | PASS |
| | 661 | 1880.00 | 2.63 | 13.0 | |
| | 810 | 1909.80 | 2.62 | 13.0 | |
| GSM/TM3/EDGE1900 | 512 | 1850.20 | 5.24 | 13.0 | PASS |
| | 661 | 1880.00 | 5.17 | 13.0 | |
| | 810 | 1909.80 | 5.10 | 13.0 | |
| GSM/TM1/GSM850 | 128 | 824.2 | 2.65 | 13.0 | PASS |
| | 190 | 836.6 | 2.63 | 13.0 | |
| | 251 | 848.8 | 2.62 | 13.0 | |
| GSM/TM3/EDGE850 | 128 | 824.2 | 5.29 | 13.0 | PASS |
| | 190 | 836.6 | 5.31 | 13.0 | |
| | 251 | 848.8 | 5.35 | 13.0 | |

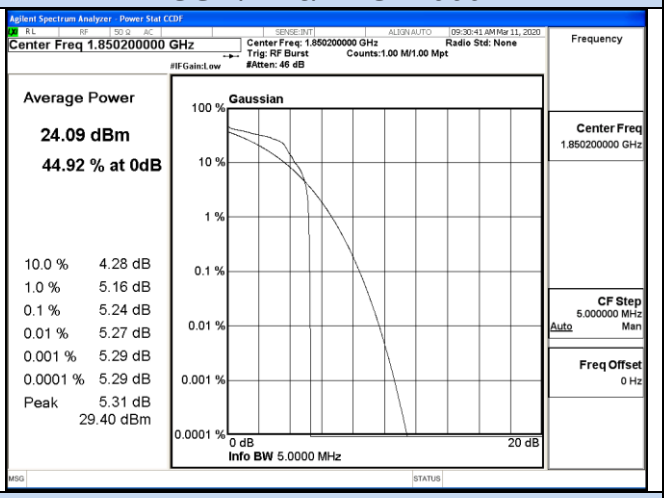
## Peak-to-Average Ratio (PAR)

### GSM/TM1/GSM1900

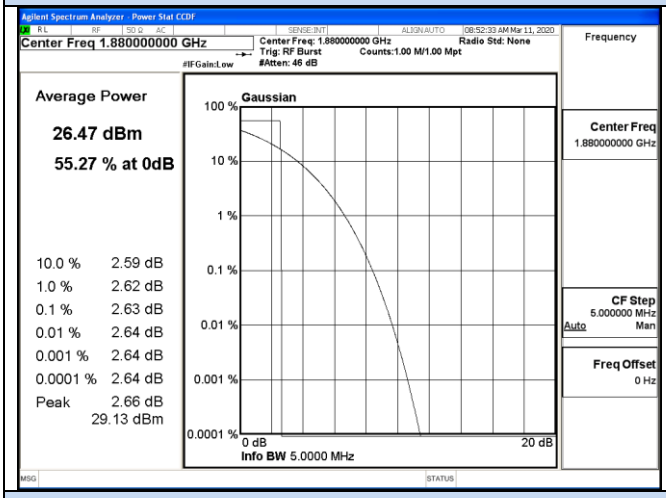



Channel 512 / 1850.2 MHz

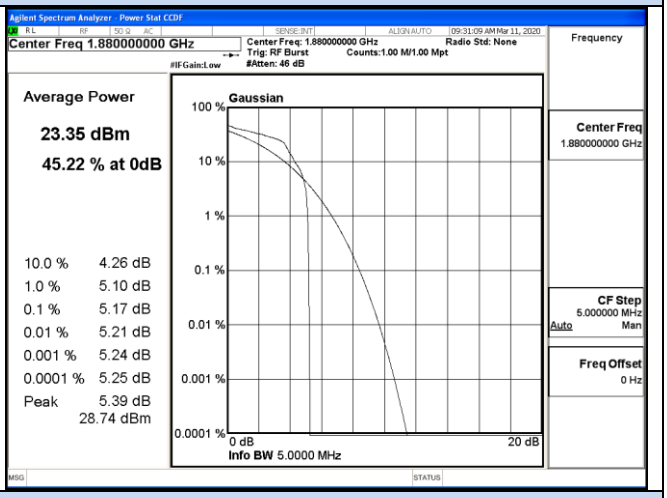
### GSM/TM3/EDGE1900



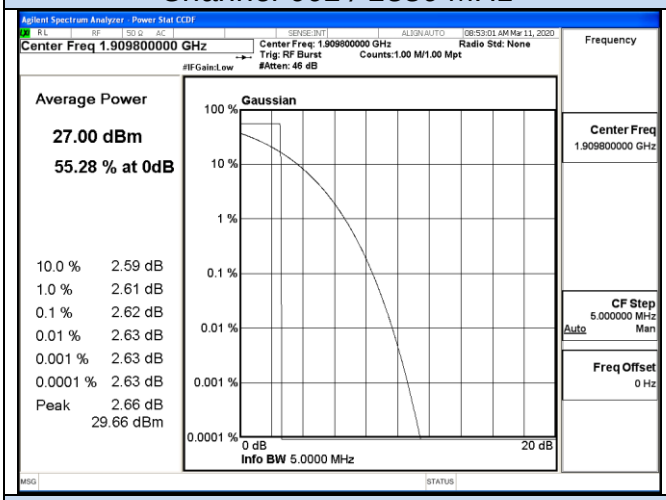

Channel 512 / 1850.2 MHz



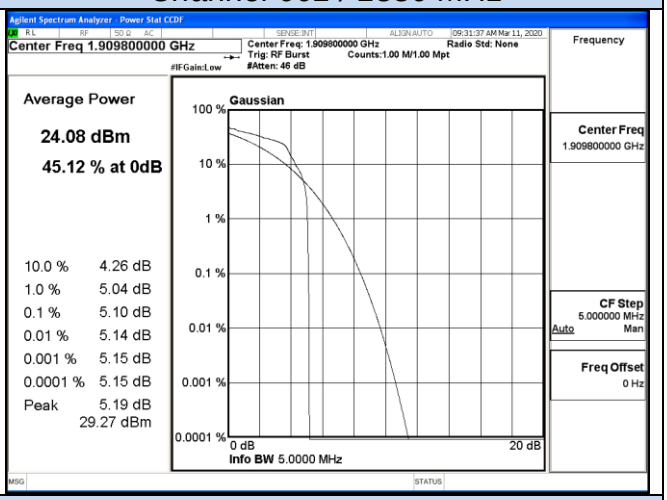

Channel 661 / 1880 MHz




Channel 661 / 1880 MHz



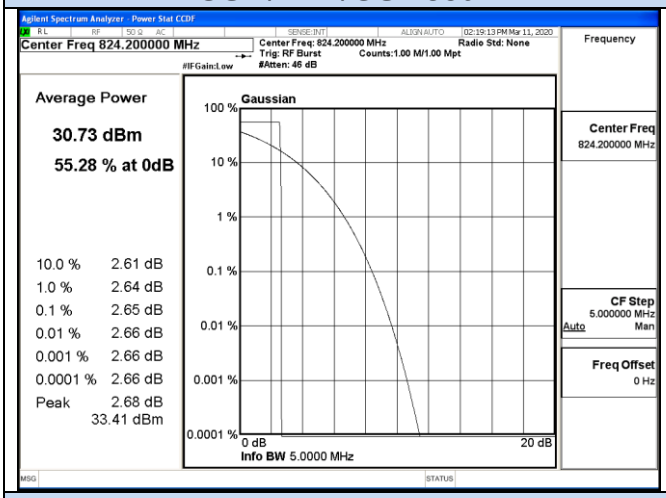

Channel 810 / 1909.8 MHz




Channel 810 / 1909.8 MHz

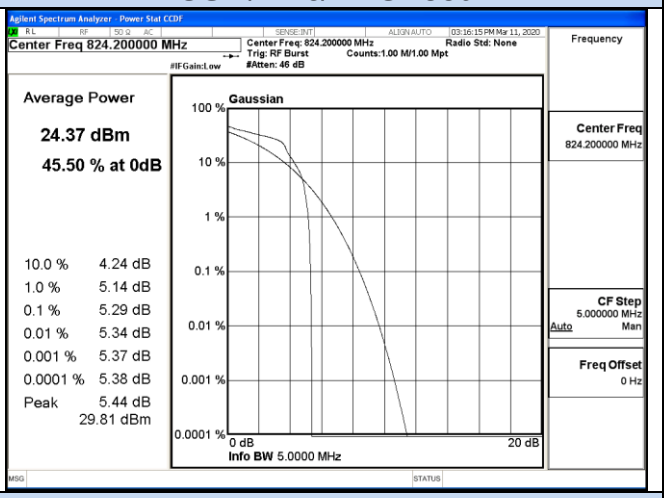
## Peak-to-Average Ratio (PAR)

### GSM/TM1/GSM850

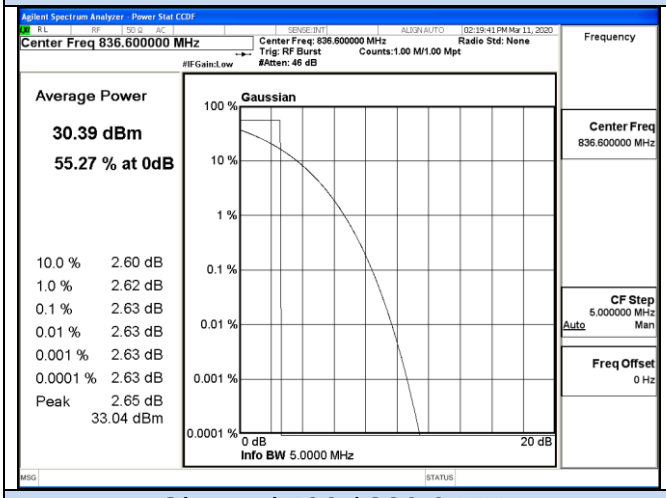



Channel 128 / 824.2 MHz

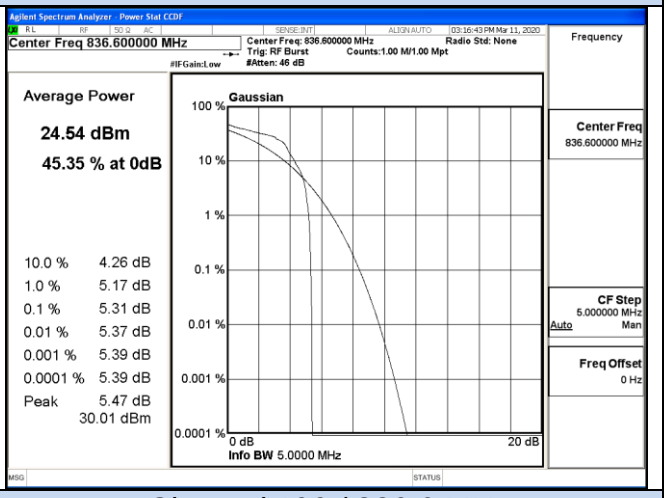
### GSM/TM3/EDGE850



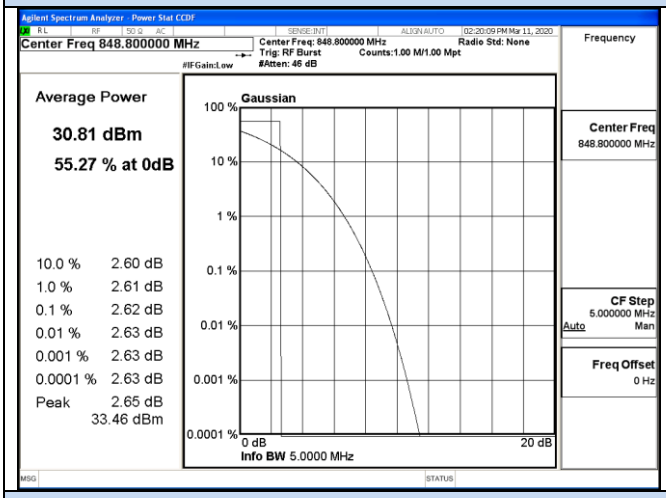

Channel 128 / 824.2 MHz



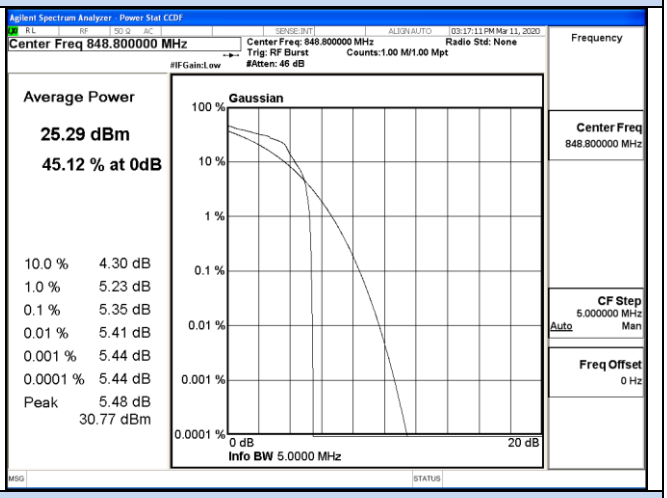

Channel 190 / 836.6 MHz




Channel 190 / 836.6 MHz




Channel 251 / 848.8 MHz




Channel 251 / 848.8 MHz

# 5 TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

# 6 EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

# 7 INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

**.....End of Report.....**