

FCC Radio Test Report

FCC ID: XMR202112UC200AGL

This report concerns: Original Grant

Project No. : 2110H019
Equipment : UMTS/HSPA+ Module
Brand Name : Quectel
Test Model : UC200A-GL
Series Model : N/A
Applicant : Quectel Wireless Solutions Co., Ltd
Address : Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233.
Manufacturer : Quectel Wireless Solutions Co., Ltd
Address : Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233.
Date of Receipt : Nov. 15, 2021
Date of Test : Nov. 15, 2021 ~ Nov. 22, 2021
Issued Date : Nov. 25, 2021
Report Version : R00
Test Sample : Engineering Sample No.: SH20211115157 for EUT, SH20211115156-3 for adapter.
Standard(s) : 47 CFR FCC Part 22 Subpart H
ANSI/TIA/EIA-603-E-2016
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Maker Qi

Prepared by : Maker Qi

Ryan Wang

Approved by : Ryan Wang



TESTING CERT #5123.03

Add: No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China

TEL: +86-021-61765666

Web: www.newbtl.com

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NIST, A2LA, or any agency of the U.S. Government.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and is not use in determining the Pass/Fail results.

| Table of Contents | Page |
|--|-------------|
| REPORT ISSUED HISTORY | 5 |
| 1 . SUMMARY OF TEST RESULTS | 6 |
| 1.1 TEST FACILITY | 7 |
| 1.2 MEASUREMENT UNCERTAINTY | 7 |
| 1.3 TEST ENVIRONMENT CONDITIONS | 7 |
| 2 . GENERAL INFORMATION | 8 |
| 2.1 GENERAL DESCRIPTION OF EUT | 8 |
| 2.2 DESCRIPTION OF TEST MODES AND TEST CONDITION | 9 |
| 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATIONOFSYSTEMTESTED | 10 |
| 3.4 DESCRIPTION OF SUPPORT UNITS | 10 |
| 3 . TEST RESULT | 11 |
| 3.1 OUTPUT POWER MEASUREMENT | 11 |
| 3.1.1 LIMIT | 11 |
| 3.1.2 TEST PROCEDURE | 11 |
| 3.1.3 TEST SETUP LAYOUT | 11 |
| 3.1.4 TEST DEVIATION | 11 |
| 3.1.5 TEST RESULTS | 11 |
| 3.2 OCCUPIED BANDWIDTH MEASUREMENT | 12 |
| 3.2.1 TEST PROCEDURE | 12 |
| 3.2.2 TEST SETUP LAYOUT | 12 |
| 3.2.3 TEST DEVIATION | 12 |
| 3.2.4 TEST RESULTS | 12 |
| 3.3 CONDUCTED EMISSIONS MEASUREMENT | 13 |
| 3.3.1 LIMIT | 13 |
| 3.3.2 TEST PROCEDURES | 13 |
| 3.3.3 TEST SETUP LAYOUT | 13 |
| 3.3.4 TEST DEVIATION | 13 |
| 3.3.5 TEST RESULTS | 13 |
| 3.4 RADIATED EMISSIONS MEASUREMENT | 14 |
| 3.4.1 LIMIT | 14 |
| 3.4.2 TEST PROCEDURES | 14 |
| 3.4.3 TEST SETUP LAYOUT | 15 |
| 3.4.4 TEST DEVIATION | 16 |
| 3.4.5 TEST RESULTS (9KHZ TO 30MHZ) | 16 |
| 3.4.6 TEST RESULTS (30MHZ TO 1000MHZ) | 16 |
| 3.4.7 TEST RESULTS (ABOVE 1000MHZ) | 16 |
| 3.5 BAND EDGE MEASUREMENT | 17 |
| 3.5.1 LIMIT | 17 |

| Table of Contents | Page |
|--|-------------|
| 3.5.2 TEST PROCEDURES | 17 |
| 3.5.3 TEST SETUP LAYOUT | 17 |
| 3.5.4 TEST DEVIATION | 17 |
| 3.5.5 TEST RESULTS | 17 |
| 3.6 PEAK TO AVERAGE RATIO MEASUREMENT | 18 |
| 3.6.1 LIMIT | 18 |
| 3.6.2 TEST PROCEDURES | 18 |
| 3.6.3 TEST SETUP LAYOUT | 18 |
| 3.6.4 TEST DEVIATION | 18 |
| 3.6.5 TEST RESULTS | 18 |
| 3.7 FREQUENCY STABILITY MEASUREMENT | 19 |
| 3.7.1 LIMIT | 19 |
| 3.7.2 TEST PROCEDURES | 19 |
| 3.7.3 TEST SETUP LAYOUT | 19 |
| 3.7.4 TEST DEVIATION | 19 |
| 3.7.5 TEST RESULTS | 19 |
| 4. LIST OF MEASUREMENT EQUIPMENTS | 20 |
| 5. EUT TEST PHOTO | 22 |
| APPENDIX A - OUTPUT POWER | 24 |
| APPENDIX B - OCCUPIED BANDWIDTH | 27 |
| APPENDIX C - CONDUCTED EMISSIONS | 31 |
| APPENDIX D - RADIATED EMISSION (9KHZ TO 30MHZ) | 34 |
| APPENDIX E - RADIATED EMISSION (30MHZ TO 1GHZ) | 35 |
| APPENDIX F - RADIATED EMISSION (ABOVE 1GHZ) | 40 |
| APPENDIX G - BAND EDGE | 45 |
| APPENDIX H - PEAK TO AVERAGE RATIO | 48 |
| APPENDIX I - FREQUENCY STABILITY | 51 |

REPORT ISSUED HISTORY

| Report Version | Description | Issued Date |
|----------------|-----------------|---------------|
| R00 | Original Issue. | Nov. 25, 2021 |

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

| FCC Part 22 Subpart H & Part 2 | | | |
|--------------------------------|------------------------------|----------|--------|
| Standard(s) Section | Test Item | Judgment | Remark |
| 2.1046 22.913(a) | Effective Radiated Power | PASS | ----- |
| 2.1049 | Occupied Bandwidth | PASS | ----- |
| 2.1051 22.917(a) | Conducted Spurious Emissions | PASS | ----- |
| 2.1053 22.917(a) | Radiated Spurious Emissions | PASS | ----- |
| 22.917(a) | Band Edge Measurements | PASS | ----- |
| - | Peak To Average Ratio | PASS | ----- |
| 2.1055 22.355 | Frequency Stability | PASS | ----- |

Note:

For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China.

BTL's Test Firm Registration Number for FCC: 476765

BTL's Designation Number for FCC: CN1241

1.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor) $k=1.96$ or $k=2$ (which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Measurement Uncertainty for a Level of Confidence of 95 %, $U=2 \times U_c(y)$.

The BTL measurement uncertainty as below table:

A. Radiated Measurement :

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U,(dB) |
|-----------|--------|-----------------------------|------------|--------|
| SH-CB02 | CISPR | 9 KHz~30 MHz | - | 2.16 |
| | | 30MHz ~ 200MHz | V | 4.04 |
| | | 30MHz ~ 200MHz | H | 2.90 |
| | | 200MHz ~ 1,000MHz | V | 3.76 |
| | | 200MHz ~ 1,000MHz | H | 3.82 |

| Test Site | Method | Measurement Frequency Range | U,(dB) |
|-----------------|--------|-----------------------------|--------|
| SH-CB02 (3m) | CISPR | 1GHz ~ 6GHz | 4.40 |
| | | 6GHz ~ 18GHz | 4.86 |

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

| Test Item | Temperature | Humidity | Test Voltage | Tested By |
|------------------------------|--------------------|----------|--------------|------------|
| Output Power & ERP | 22°C | 51% | DC 3.8V | Danny Dang |
| Occupied Bandwidth | 22°C | 51% | DC 3.8V | Danny Dang |
| Conducted Spurious Emissions | 22°C | 51% | DC 3.8V | Danny Dang |
| Radiated Spurious Emissions | 26°C | 61% | DC 3.8V | Danny Dang |
| Band Edge | 22°C | 51% | DC 3.8V | Danny Dang |
| Peak to Average Ratio | 22°C | 51% | DC 3.8V | Danny Dang |
| Frequency Stability | Normal and Extreme | | | Danny Dang |

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| | | | | |
|---------------------|--|-----------------------------|-------|-----|
| Equipment | UMTS/HSPA+ Module | | | |
| Brand Name | Quectel | | | |
| Test Model | UC200A-GL | | | |
| Series Model | N/A | | | |
| Model Difference(s) | N/A | | | |
| Software Version | UC200AGLAAR01A02M16_PAX | | | |
| Hardware Version | R1.0 | | | |
| Power Source | DC Voltage supplied from AC/DC adapter(support unit) | | | |
| Power Rating | Supply voltage:3.4-4.5V, Typical supply voltage:3.8V | | | |
| Antenna Type | Dipole | | | |
| Antenna Gain | GSM850 | 2.53 dBi | | |
| | WCDMA V | | | |
| Modulation Type | GSM | GMSK | | |
| | GPRS | GMSK | | |
| | EDGE | GMSK, 8PSK | | |
| | WCDMA | UL: QPSK DL: QPSK, 16QAM | | |
| Operation Frequency | EDGE/GSM/GPRS | 824.2MHz ~ 848.8MHz | | |
| | WCDMA Band V | 826.4MHz ~ 846.6MHz | | |
| Max. ERP Power | GSM | GMSK | 32.76 | dBm |
| | GPRS | GMSK | 32.78 | dBm |
| | EDGE | 8PSK | 27.99 | dBm |
| | WCDMA | QPSK | 23.81 | dBm |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. WCDMA (UL: QPSK; DL: QPSK) mode was found to be the worst case and recorded.

2.2 DESCRIPTION OF TEST MODES AND TEST CONDITION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

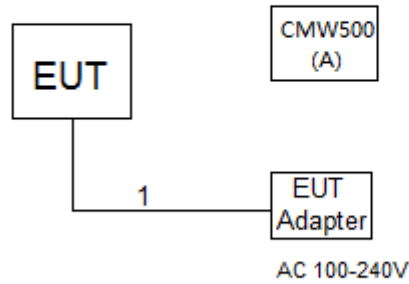
The worst case was found when positioned on X-plane for EIRP and X-axis for radiated emission.

Following channel(s) was (were) selected for the final test as listed below:

| GSM MODE | | | |
|-----------------------|-------------------|----------------|-----------------|
| Test Item | Available Channel | Tested Channel | Mode |
| ERP | 128 to 251 | 128, 190, 251 | GSM, GPRS, EDGE |
| Output Power | 128 to 251 | 128, 190, 251 | GSM, GPRS, EDGE |
| Occupied Bandwidth | 128 to 251 | 128, 190, 251 | GSM, EDGE |
| Conducuted Emission | 128 to 251 | 190 | GSM, EDGE |
| Radiated Emission | 128 to 251 | 190 | EDGE |
| Band Edge | 128 to 251 | 128, 251 | GSM, EDGE |
| Peak to Average Ratio | 128 to 251 | 128, 190, 251 | GSM, EDGE |
| Frequency Stability | 128 to 251 | 190 | GSM |

| WCDMA MODE | | | |
|-----------------------|-------------------|------------------|---------------------|
| Test Item | Available Channel | Tested Channel | Mode |
| ERP | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| Output Power | 4132 to 4233 | 4132, 4182, 4233 | WCDMA, HSDPA, HSUPA |
| Conducted Emission | 4132 to 4233 | 4182 | WCDMA |
| Radiated Emission | 4132 to 4233 | 4182 | WCDMA |
| Band Edge | 4132 to 4233 | 4132, 4233 | WCDMA |
| Peak to Average Ratio | 4132 to 4233 | 4132, 4182, 4233 | WCDMA |
| Frequency Stability | 4132 to 4233 | 4182 | WCDMA |

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATIONOFSYSTEMTESTED



3.4 DESCRIPTION OF SUPPORT UNITS

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

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. |
|------|-----------|-----------|----------------|------------|
| A | CMW500 | R&S | N/A | 129246 |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|------|------------|---------------|--------------|--------|
| 1 | DC | NO | NO | 1m |

3. TEST RESULT

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMIT

Mobile / Portable station are limited to 7 watts e.r.p.

3.1.2 TEST PROCEDURE

EIRP/ ERP:

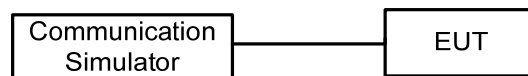
1. EIRP= Output Power +Antenan gain
ERP power= EIPR power-2.15dBi.

Output Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE and WCDMA link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

3.1.3 TEST SETUP LAYOUT

Output Power Measurement



3.1.4 TEST DEVIATION

No deviation

3.1.5 TEST RESULTS

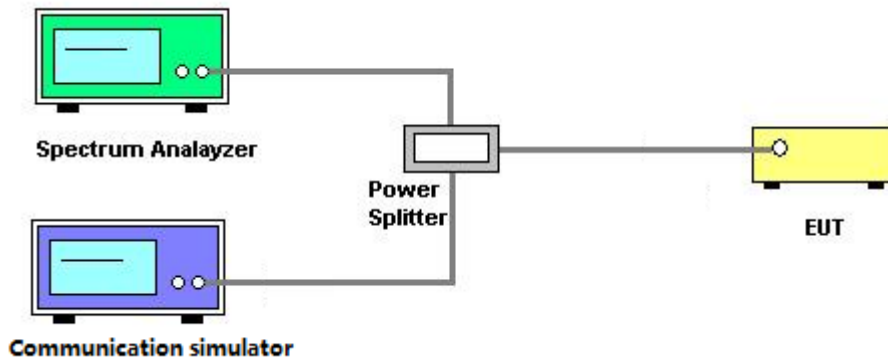
Please refer to the Appendix A.

3.2 OCCUPIED BANDWIDTH MEASUREMENT

3.2.1 TEST PROCEDURE

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth and 26dB bandwidth.

3.2.2 TEST SETUP LAYOUT



3.2.3 TEST DEVIATION

No deviation

3.2.4 TEST RESULTS

Please refer to the Appendix B.

3.3 CONDUCTED EMISSIONS MEASUREMENT

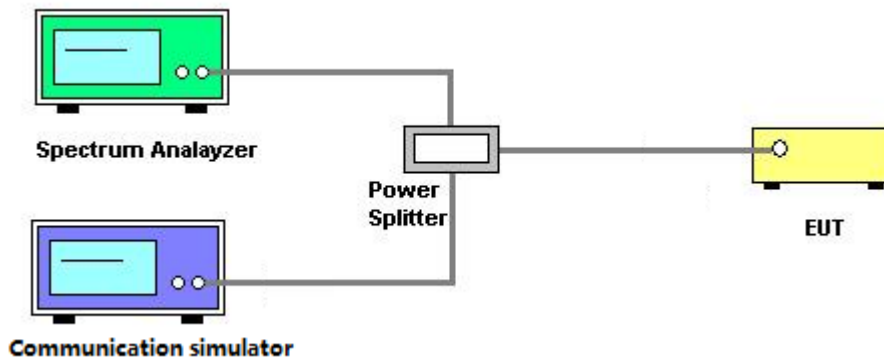
3.3.1 LIMIT

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 emission limit equal to -13dBm.

3.3.2 TEST PROCEDURES

1. The testing follows FCC KDB 971168 v03r01 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured. Set RBW \geq 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.3.3 TEST SETUP LAYOUT



3.3.4 TEST DEVIATION

No deviation

3.3.5 TEST RESULTS

Please refer to the Appendix C.

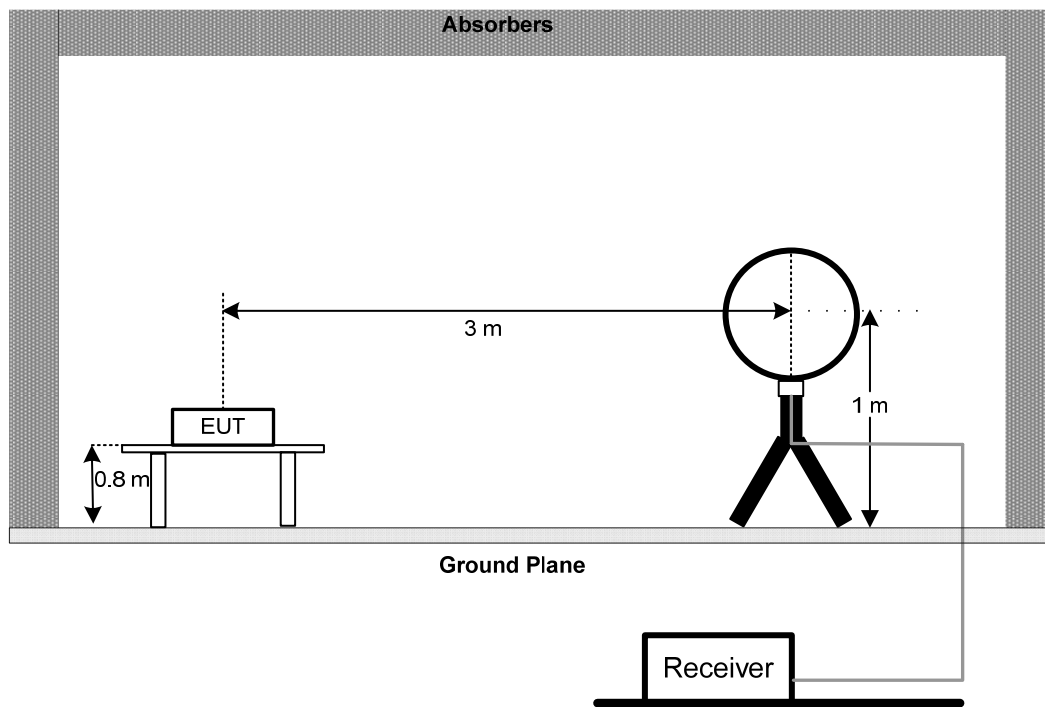
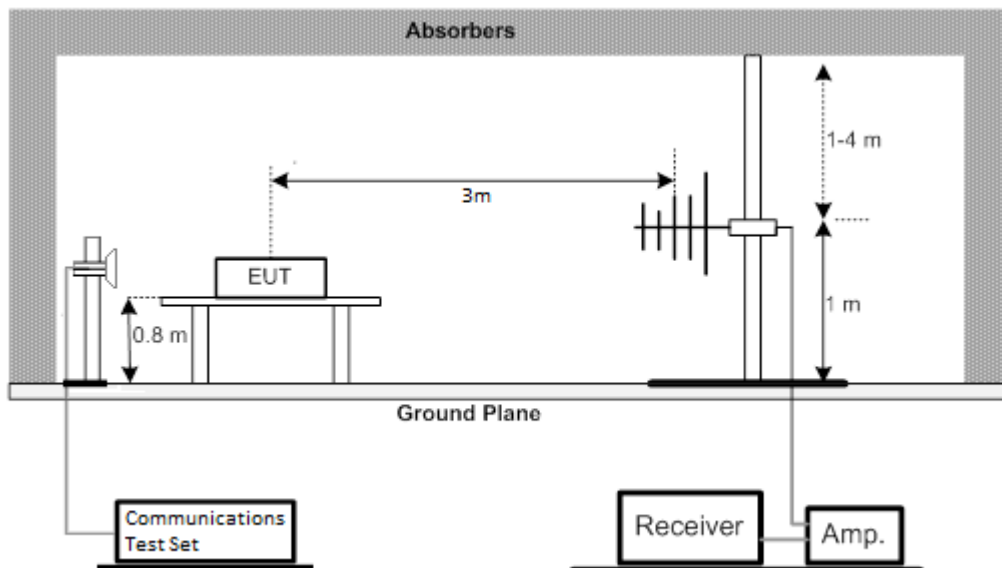
3.4 RADIATED EMISSIONS MEASUREMENT

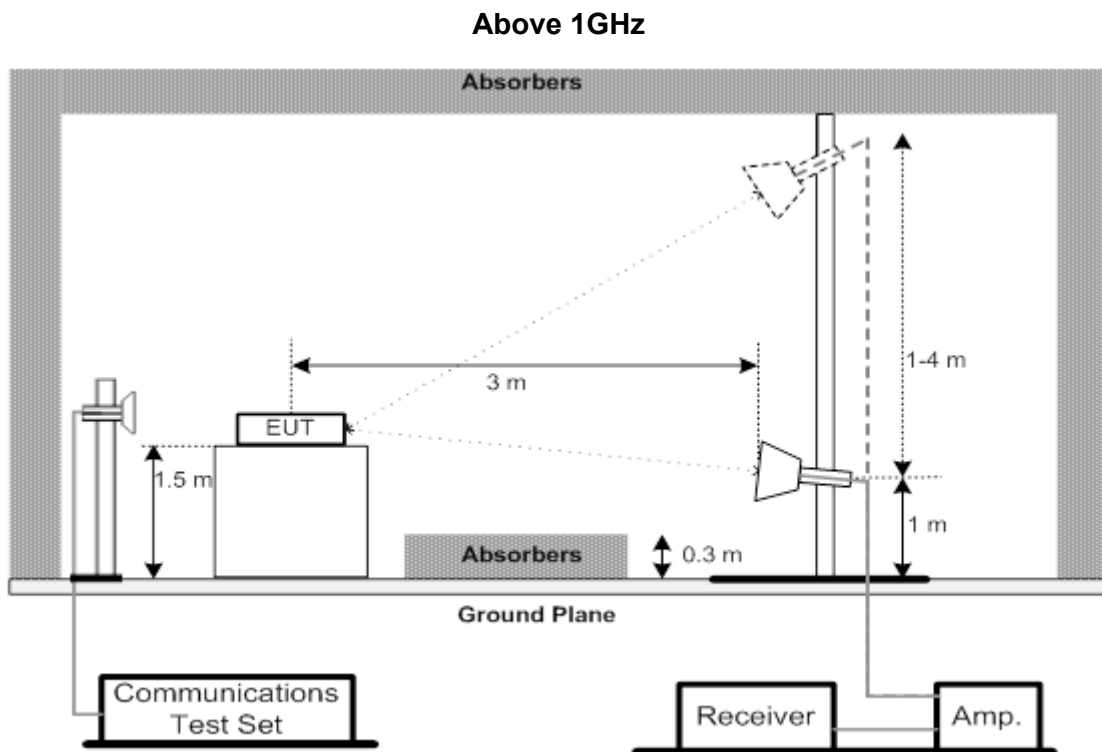
3.4.1 LIMIT

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 emission limit equal to -13dBm.

3.4.2 TEST PROCEDURES

1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G
3. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15\text{dBi.}$
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

3.4.3 TEST SETUP LAYOUT**Below 30MHz****30MHz to 1GHz**



3.4.4 TEST DEVIATION

No deviation

3.4.5 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Appendix D.

3.4.6 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the Appendix E.

3.4.7 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the Appendix F.

3.5 BAND EDGE MEASUREMENT

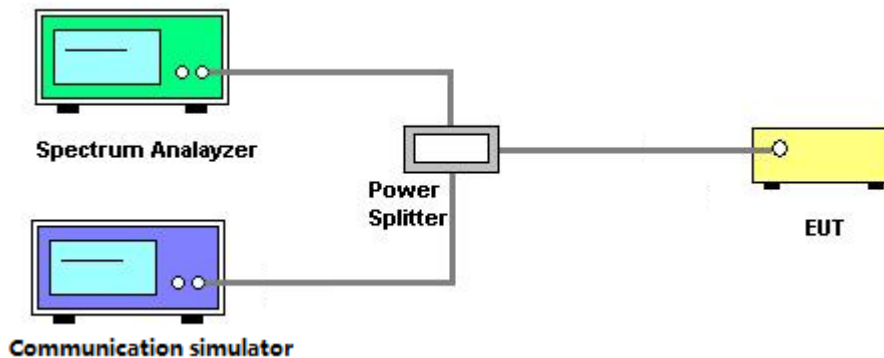
3.5.1 LIMIT

A 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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.5.2 TEST PROCEDURES

1. All measurements were done at low and high operational frequency range.
2. The center frequency of spectrum is the band edge frequency and span is 1.5MHz. RB of the spectrum is 3kHz and VB of the spectrum is 10kHz (GSM/EDGE).
3. The center frequency of spectrum is the band edge frequency and span is 10MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA).
4. Record the max trace plot into the test report.

3.5.3 TEST SETUP LAYOUT



3.5.4 TEST DEVIATION

No deviation

3.5.5 TEST RESULTS

Please refer to the Appendix G.

3.6 PEAK TO AVERAGE RATIO MEASUREMENT

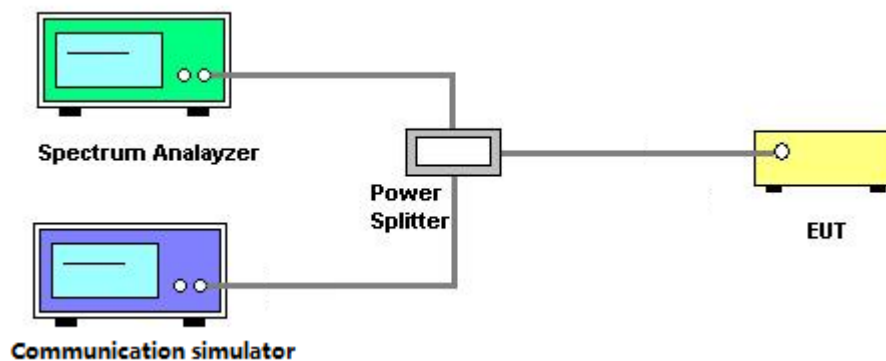
3.6.1 LIMIT

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

3.6.2 TEST PROCEDURES

1. Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

3.6.3 TEST SETUP LAYOUT



3.6.4 TEST DEVIATION

No deviation

3.6.5 TEST RESULTS

Please refer to the Appendix H.

3.7 FREQUENCY STABILITY MEASUREMENT

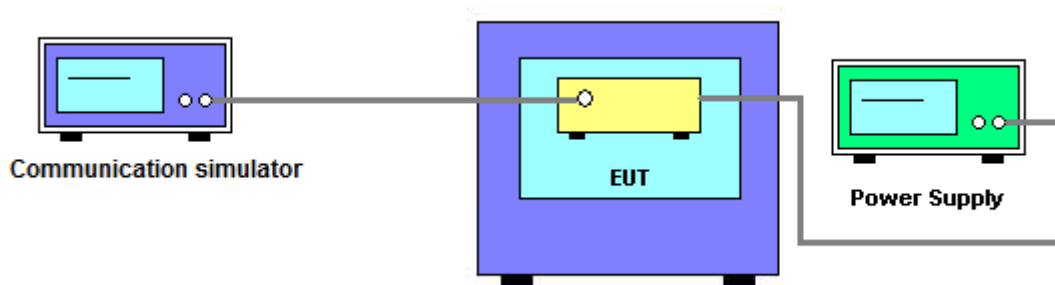
3.7.1 LIMIT

± 1.5 ppm is for base and fixed station. ± 2.5 ppm is for mobile station.

3.7.2 TEST PROCEDURES

1. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
2. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.
4. The frequency error was recorded frequency error from the communication simulator.

3.7.3 TEST SETUP LAYOUT



3.7.4 TEST DEVIATION

No deviation

3.7.5 TEST RESULTS

Please refer to the Appendix I.

4. LIST OF MEASUREMENT EQUIPMENTS

| Radiated Emission Measurement(9K-30M) | | | | | |
|---------------------------------------|-----------------------------------|--------------|--------------------------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Loop Antenna | EMCI | EMCI LPA600 | 275 | May. 20, 2022 |
| 2 | MXE EMI Receiver | Keysight | N9038A | MY56400088 | Mar. 21, 2022 |
| 3 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 4 | Wideband Radio Communication Test | R&S | CMW500 | 129246 | Aug. 23, 2022 |

| Radiated Emission Measurement(30M-1G) | | | | | |
|---------------------------------------|-----------------------------------|--------------|--------------------------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9160 | 9160-3233 | Mar. 26, 2022 |
| 2 | Pre-Amplifier | emci | EMC9135 | 980401 | Mar. 20, 2022 |
| 3 | MXE EMI Receiver | Keysight | N9038A | MY56400088 | Mar. 21, 2022 |
| 4 | Test Cable | emci | EMC104-SM-SM-7000 | 181020 | Apr. 11, 2022 |
| 5 | Test Cable | emci | EMC104-SM-SM-2500 | 170618 | Apr. 11, 2022 |
| 6 | Test Cable | emci | EMC104-SM-SM-800 | 170647 | Apr. 11, 2022 |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 8 | Wideband Radio Communication Test | R&S | CMW500 | 129246 | Aug. 23, 2022 |

| Radiated Emission Measurement(1G-18G) | | | | | |
|---------------------------------------|--------------------------------------|--------------|--------------------------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Double Ridged Broadband Horn Antenna | Schwarzbeck | BBHA 9120D | 9120D-1817 | Mar. 26, 2022 |
| 2 | Pre-Amplifier | emci | EMC051845SE | 980725 | Aug. 23, 2022 |
| 3 | EXA Spectrum Analyzer | Keysight | N9010A | MY56480579 | Mar. 21, 2022 |
| 4 | Test Cable | emci | EMC104-SM-SM-7000 | 181020 | Apr. 11, 2022 |
| 5 | Test Cable | emci | EMC104-SM-SM-2500 | 170618 | Apr. 11, 2022 |
| 6 | Test Cable | emci | EMC104-SM-SM-800 | 170647 | Apr. 11, 2022 |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 8 | Wideband Radio Communication Test | R&S | CMW500 | 129246 | Aug. 23, 2022 |

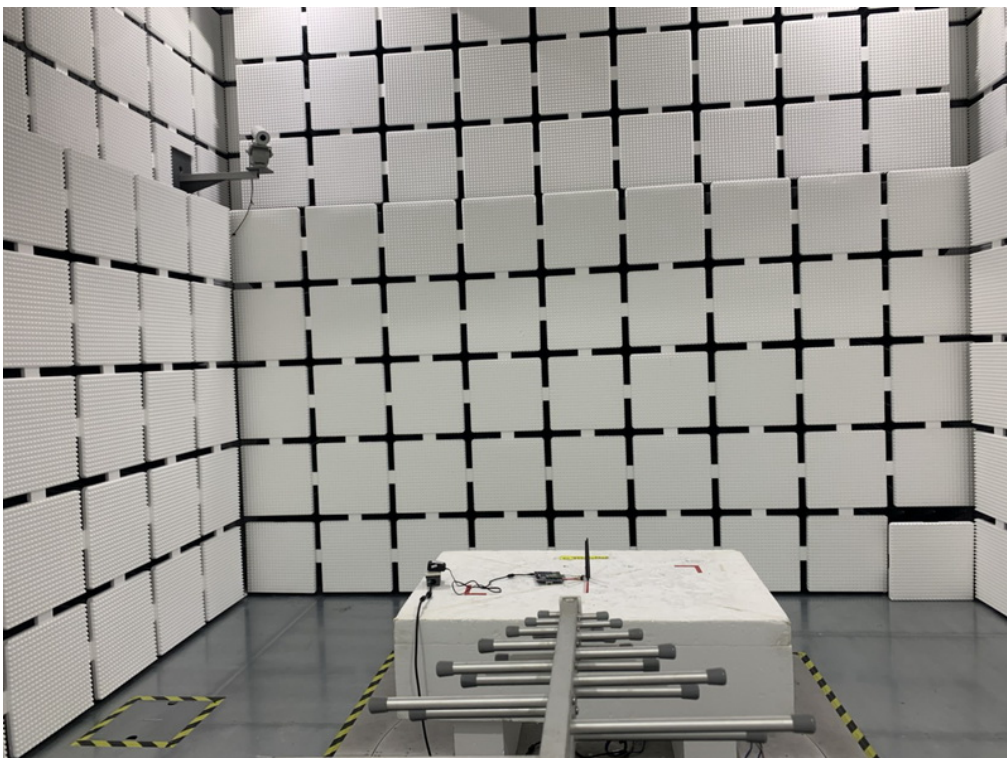
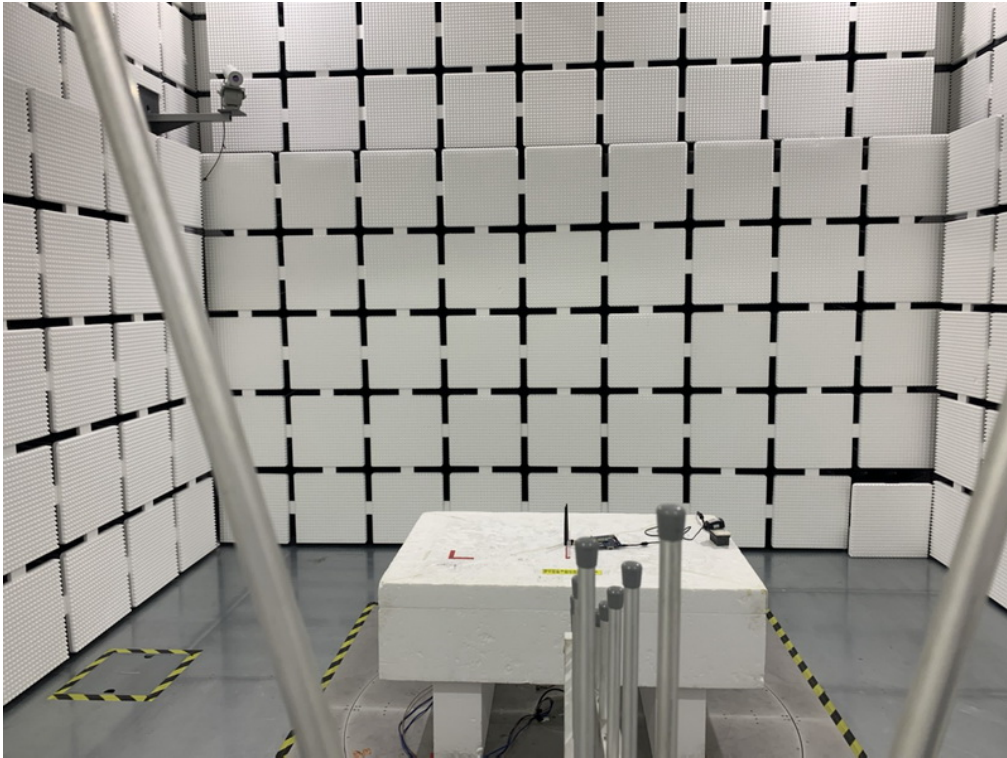
For WCDMA

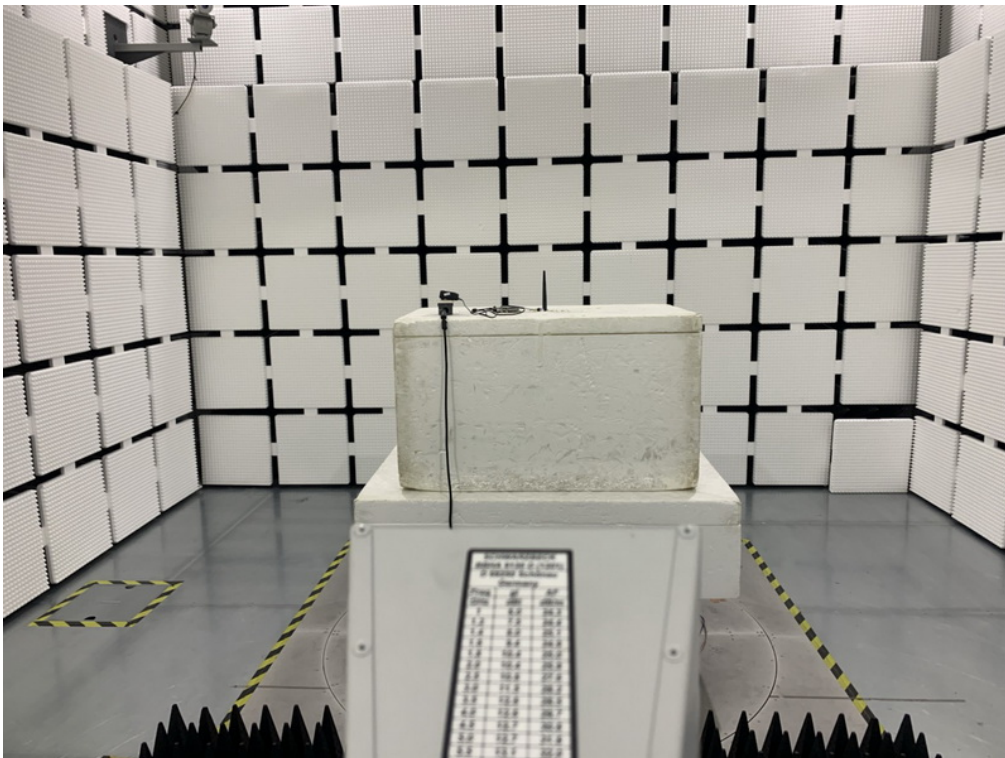
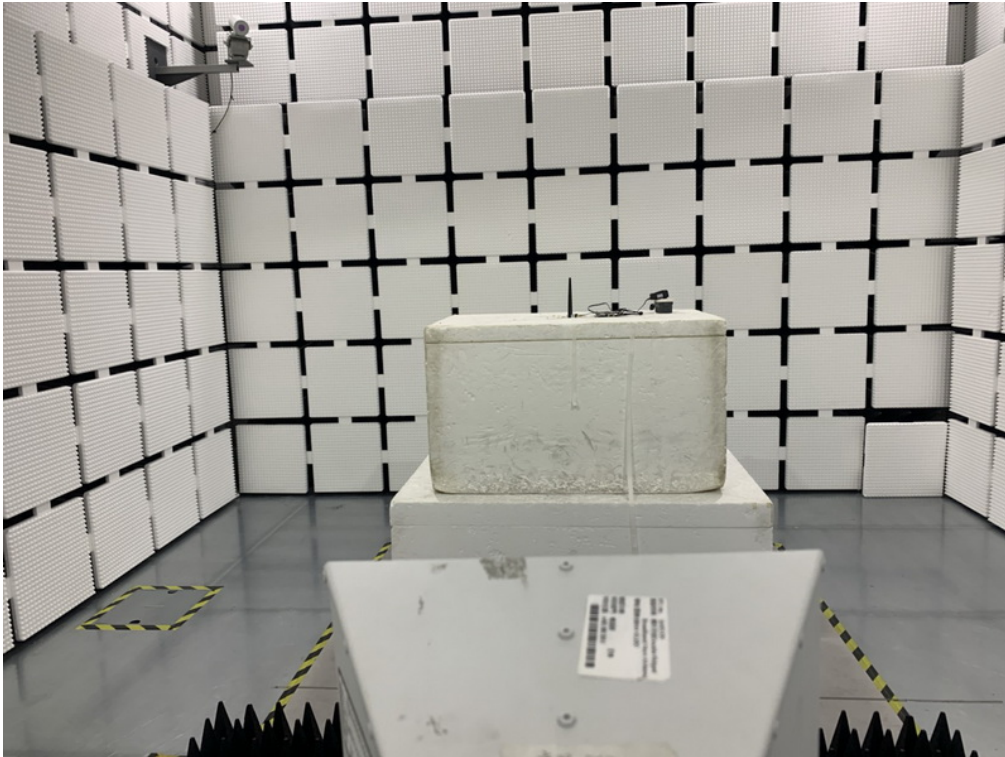
| Conducted Emission & Band Edge & Occupied Bandwidth Measurement | | | | | |
|--|-----------------------------------|--------------|-------------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Wideband Radio Communication Test | R&S | CMW500 | 129246 | Aug. 23, 2022 |
| 2 | EXA Spectrum Analyzer | Keysight | N9010A | MY56480579 | Mar. 21, 2022 |
| 3 | Power Divider | JUK | PD-2SF-2060 | N/A | N/A |

| Frequency Stability Measurement | | | | | |
|--|-----------------------------------|--------------|-------------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Wideband Radio Communication Test | R&S | CMW500 | 129246 | Aug. 23, 2022 |
| 2 | EXA Spectrum Analyzer | Keysight | N9010A | MY56480579 | Mar. 21, 2022 |
| 3 | Power Divider | JUK | PD-2SF-2060 | N/A | N/A |
| 4 | Temperature And Humidity Box | Blue pand | BPHS-120B | 170616454 | Aug. 23, 2022 |

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

5. EUT TEST PHOTO**Radiated Emissions Test Photos****30 MHz to 1000 MHz**

Radiated Emissions Test Photos**Above 1 GHz**

APPENDIX A - OUTPUT POWER

Output Power (dBm):

| GSM850 | | Burst Output Power | | |
|---------------------|-----------|--------------------|----------|----------|
| | | 128CH | 190CH | 251CH |
| | | 824.2MHz | 836.6MHz | 848.8MHz |
| GSM(GMSK) | | 32.38 | 32.32 | 32.34 |
| GPRS/EDGE (GMSK) | 1 Tx Slot | 32.40 | 32.34 | 32.37 |
| | 2 Tx Slot | 32.38 | 32.33 | 32.36 |
| | 3 Tx Slot | 31.21 | 31.16 | 31.22 |
| | 4 Tx Slot | 29.47 | 29.41 | 29.49 |
| EDGE (8PSK) | 1 Tx Slot | 27.51 | 27.61 | 27.54 |
| | 2 Tx Slot | 27.20 | 27.57 | 27.36 |
| | 3 Tx Slot | 25.33 | 25.84 | 25.76 |
| | 4 Tx Slot | 23.47 | 23.74 | 23.55 |

| Modulation | Band | WCDMA V | | |
|------------|-----------------|----------|----------|----------|
| | Tx Channel | 4132CH | 4182CH | 4233CH |
| | Frequency | 826.4MHz | 836.4MHz | 846.6MHz |
| QPSK | RMC 12.2K | 23.27 | 23.39 | 23.40 |
| | RMC 64K | 23.22 | 23.40 | 23.41 |
| | RMC 144K | 23.19 | 23.37 | 23.33 |
| | RMC 384K | 23.19 | 23.43 | 23.19 |
| | HSDPA Subtest-1 | 23.11 | 22.94 | 23.19 |
| | HSDPA Subtest-2 | 22.88 | 22.73 | 23.11 |
| | HSDPA Subtest-3 | 22.59 | 22.59 | 23.09 |
| | HSDPA Subtest-4 | 22.32 | 22.47 | 22.89 |
| | HSUPA Subtest-1 | 22.59 | 22.39 | 22.80 |
| | HSUPA Subtest-2 | 22.37 | 22.17 | 22.40 |
| | HSUPA Subtest-3 | 22.39 | 22.11 | 22.45 |
| | HSUPA Subtest-4 | 22.36 | 21.85 | 22.33 |
| | HSUPA Subtest-5 | 22.10 | 21.70 | 22.35 |

ERP Power (dBm):

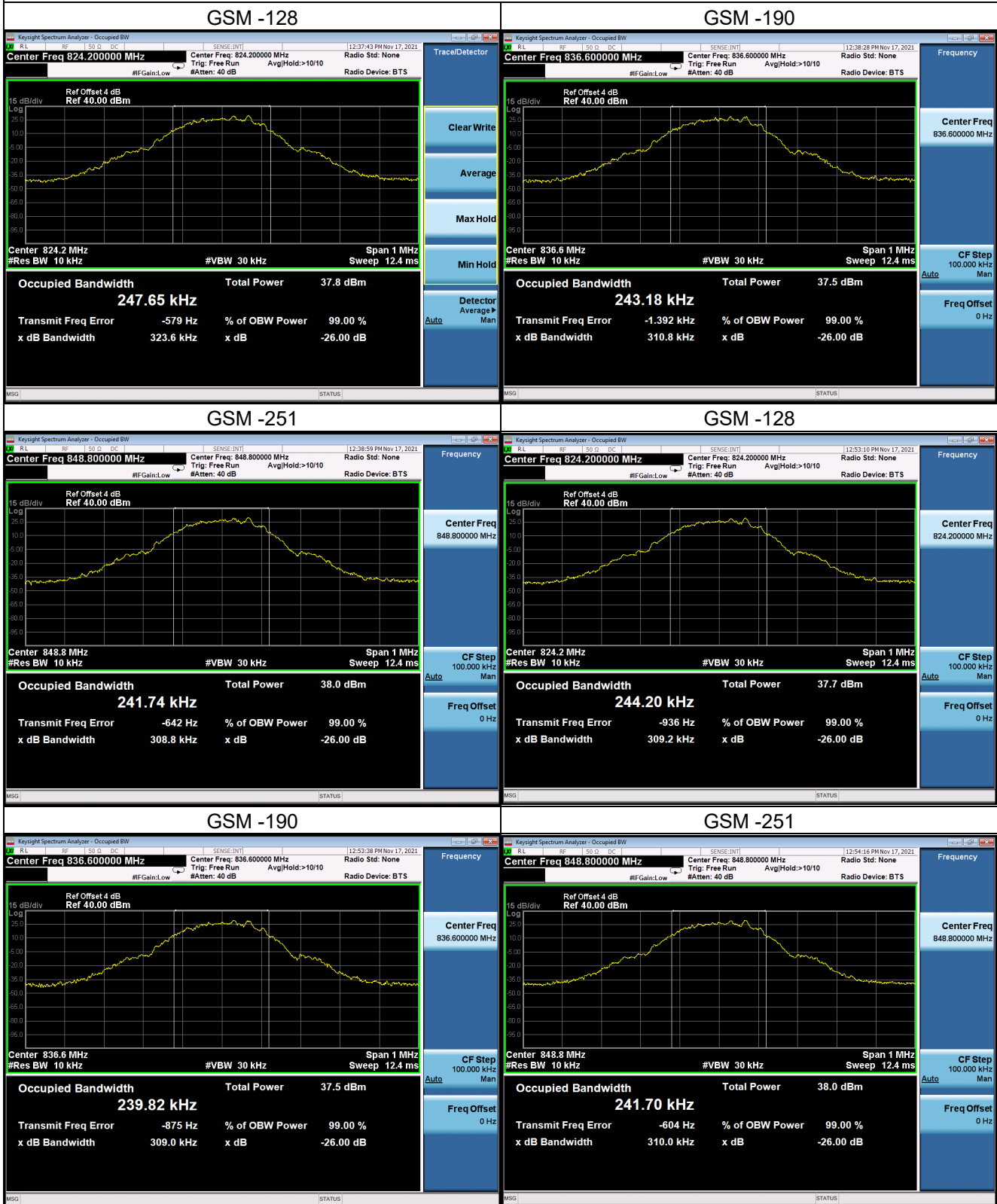
| GSM850 | | ERP Power | | |
|---------------------|-----------|-----------|----------|----------|
| | | 128CH | 190CH | 251CH |
| | | 824.2MHz | 836.6MHz | 848.8MHz |
| GSM(GMSK) | | 32.76 | 32.70 | 32.72 |
| GPRS/EDGE (GMSK) | 1 Tx Slot | 32.78 | 32.72 | 32.75 |
| | 2 Tx Slot | 32.76 | 32.71 | 32.74 |
| | 3 Tx Slot | 31.59 | 31.54 | 31.60 |
| | 4 Tx Slot | 29.85 | 29.79 | 29.87 |
| EDGE (8PSK) | 1 Tx Slot | 27.89 | 27.99 | 27.92 |
| | 2 Tx Slot | 27.58 | 27.95 | 27.74 |
| | 3 Tx Slot | 25.71 | 26.22 | 26.14 |
| | 4 Tx Slot | 23.85 | 24.12 | 23.93 |

| Modulation | Band | WCDMA V | | |
|------------|-----------------|----------|----------|----------|
| | Tx Channel | 4132CH | 4182CH | 4233CH |
| | Frequency | 826.4MHz | 836.4MHz | 846.6MHz |
| QPSK | RMC 12.2K | 23.65 | 23.77 | 23.78 |
| | RMC 64K | 23.60 | 23.78 | 23.79 |
| | RMC 144K | 23.57 | 23.75 | 23.71 |
| | RMC 384K | 23.57 | 23.81 | 23.57 |
| | HSDPA Subtest-1 | 23.49 | 23.32 | 23.57 |
| | HSDPA Subtest-2 | 23.26 | 23.11 | 23.49 |
| | HSDPA Subtest-3 | 22.97 | 22.97 | 23.47 |
| | HSDPA Subtest-4 | 22.70 | 22.85 | 23.27 |
| | HSUPA Subtest-1 | 22.97 | 22.77 | 23.18 |
| | HSUPA Subtest-2 | 22.75 | 22.55 | 22.78 |
| | HSUPA Subtest-3 | 22.77 | 22.49 | 22.83 |
| | HSUPA Subtest-4 | 22.74 | 22.23 | 22.71 |
| | HSUPA Subtest-5 | 22.48 | 22.08 | 22.73 |

APPENDIX B - OCCUPIED BANDWIDTH

| GSM850 | | | | | |
|---------|-----------------|------------------------------|---------|-----------------|------------------------------|
| GSM | | | EDGE | | |
| GMSK | | | 8PSK | | |
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) | Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |
| 128 | 824.2 | 0.2477 | 128 | 824.2 | 0.2442 |
| 190 | 836.6 | 0.2432 | 190 | 836.6 | 0.2398 |
| 251 | 848.8 | 0.2417 | 251 | 848.8 | 0.2417 |
| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) | Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
| 128 | 824.2 | 0.3236 | 128 | 824.2 | 0.3092 |
| 190 | 836.6 | 0.3108 | 190 | 836.6 | 0.3090 |
| 251 | 848.8 | 0.3088 | 251 | 848.8 | 0.3100 |

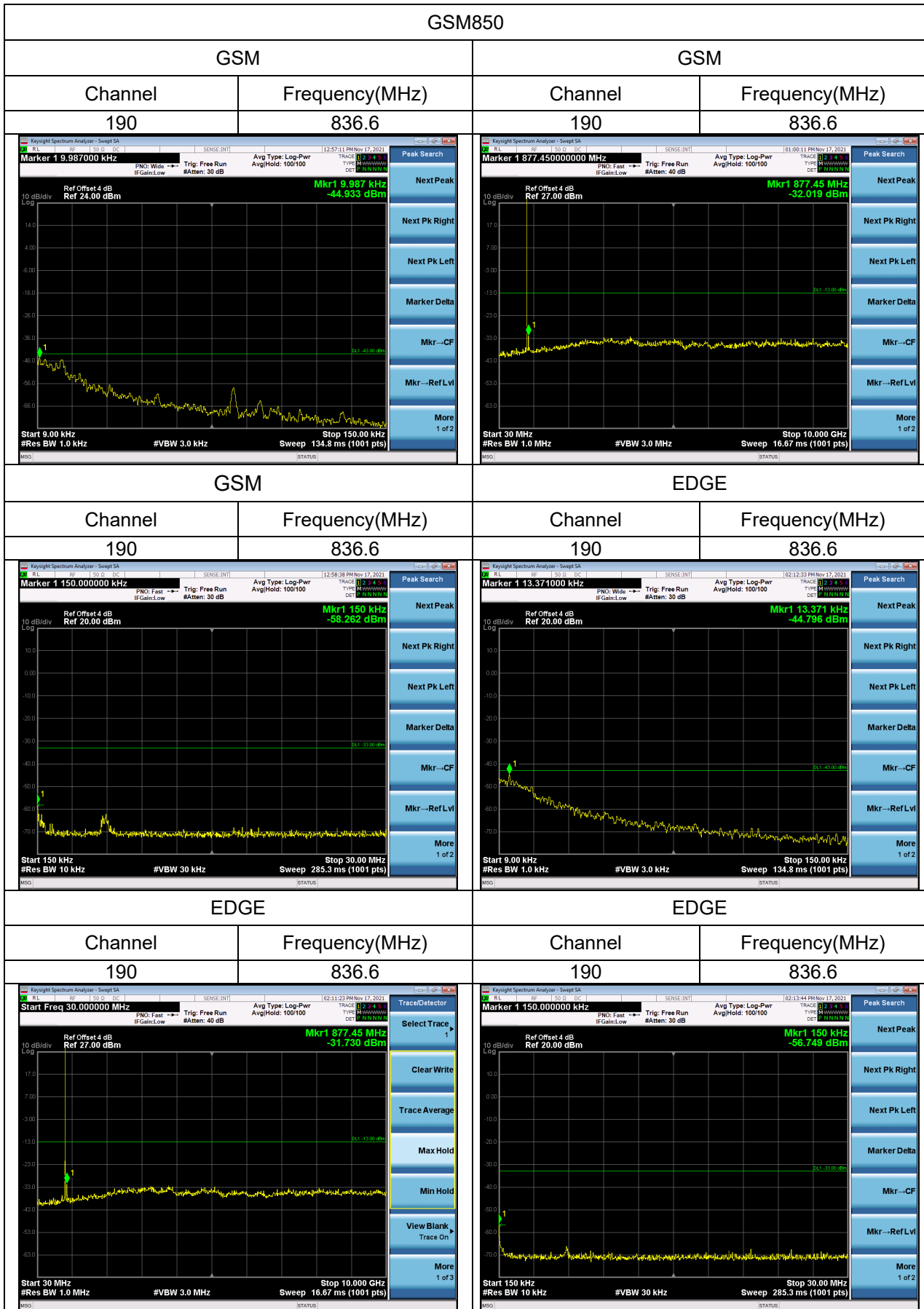
Spectrum Plot



| WCDMA Band V | | | | | |
|--------------|-----------------|------------------------------|---------|-----------------|----------------------|
| QPSK | | | | | |
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) | Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
| 4132 | 826.4 | 4.1706 | 4132 | 826.4 | 4.721 |
| 4182 | 836.4 | 4.1540 | 4182 | 836.4 | 4.712 |
| 4233 | 846.6 | 4.1614 | 4233 | 846.6 | 4.717 |



APPENDIX C - CONDUCTED EMISSIONS



| WCDMA Band V | | | |
|--------------|----------------|---------|----------------|
| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
| 4182 | 836.4 | 4182 | 836.4 |
| | | | |
| Channel | Frequency(MHz) | - | - |
| 4182 | 836.4 | - | - |
| | | - | |

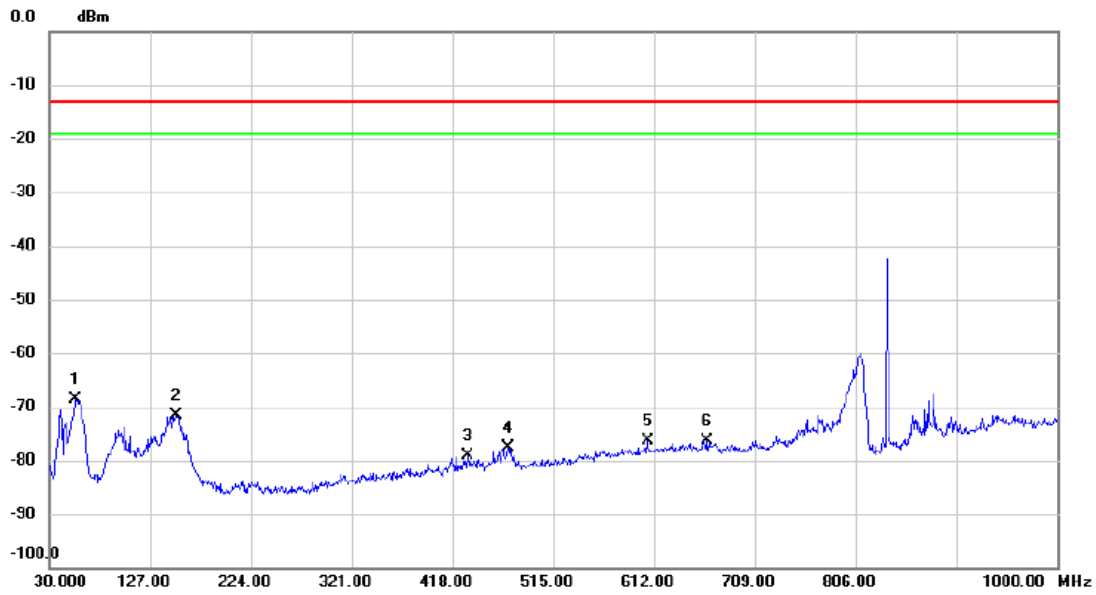
APPENDIX D - RADIATED EMISSION (9KHZ TO 30MHZ)

Note: Below 30MHz, The measured value have enough margin over 20dB than the limit, therefore they are not reported.

APPENDIX E - RADIATED EMISSION (30MHZ TO 1GHZ)

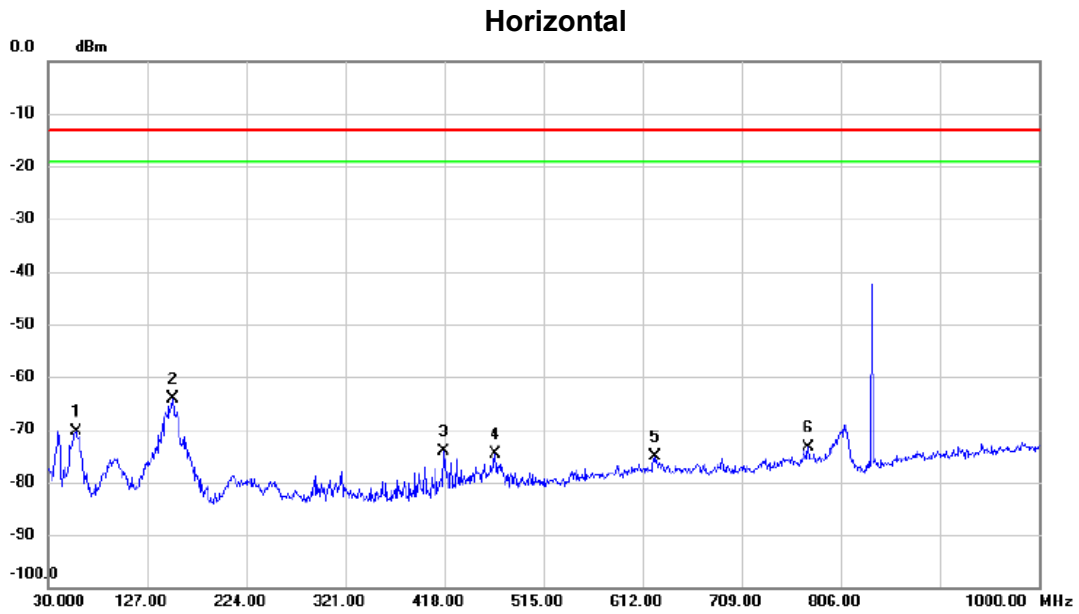
Test Mode: GSM850_TX Mode

Vertical



| No. | Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measure- ment dBm | Limit dBm | Margin dB | Detector | Comment |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|--------------|--------------|----------|---------|
| 1 | * | 55.2200 | -58.71 | -9.87 | -68.58 | -13.00 | -55.58 | RMS | |
| 2 | | 151.7350 | -72.06 | 0.36 | -71.70 | -13.00 | -58.70 | RMS | |
| 3 | | 432.5500 | -80.04 | 0.82 | -79.22 | -13.00 | -66.22 | RMS | |
| 4 | | 471.3500 | -78.64 | 1.11 | -77.53 | -13.00 | -64.53 | RMS | |
| 5 | | 605.6950 | -80.63 | 4.15 | -76.48 | -13.00 | -63.48 | RMS | |
| 6 | | 663.4100 | -80.47 | 4.09 | -76.38 | -13.00 | -63.38 | RMS | |

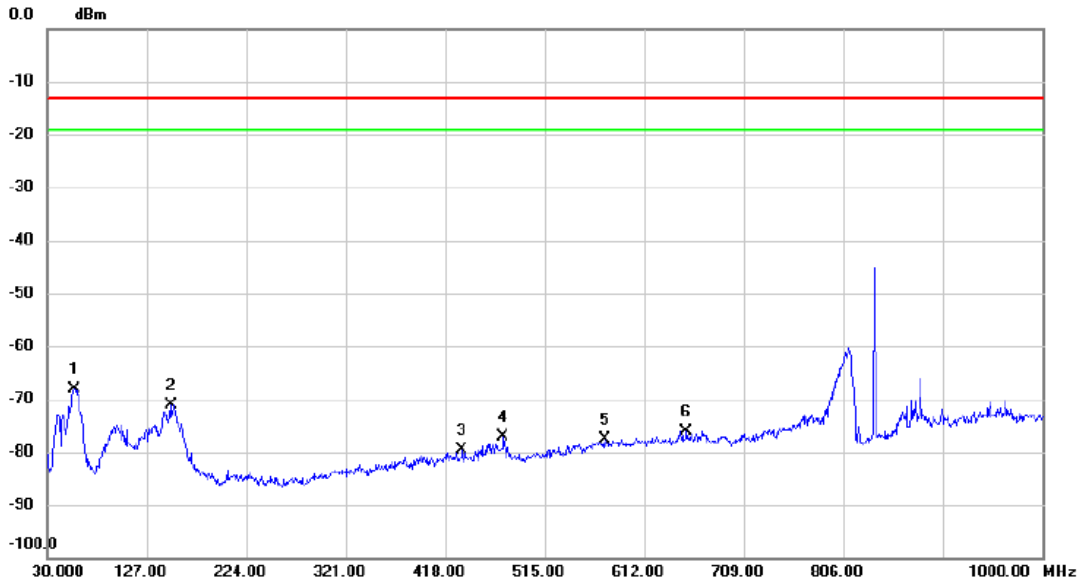
Test Mode: GSM850_TX Mode



| No. | Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measure- ment dBm | Limit dBm | Margin dB | Detector | Comment |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|--------------|--------------|----------|---------|
| 1 | | 57.1600 | -63.58 | -6.72 | -70.30 | -13.00 | -57.30 | RMS | |
| 2 | * | 152.2200 | -61.23 | -2.87 | -64.10 | -13.00 | -51.10 | RMS | |
| 3 | | 417.5150 | -74.60 | 0.56 | -74.04 | -13.00 | -61.04 | RMS | |
| 4 | | 467.9550 | -75.82 | 1.14 | -74.68 | -13.00 | -61.68 | RMS | |
| 5 | | 623.6400 | -79.20 | 4.10 | -75.10 | -13.00 | -62.10 | RMS | |
| 6 | | 773.9900 | -79.31 | 5.96 | -73.35 | -13.00 | -60.35 | RMS | |

Test Mode: WCDMA Band V_TX Mode

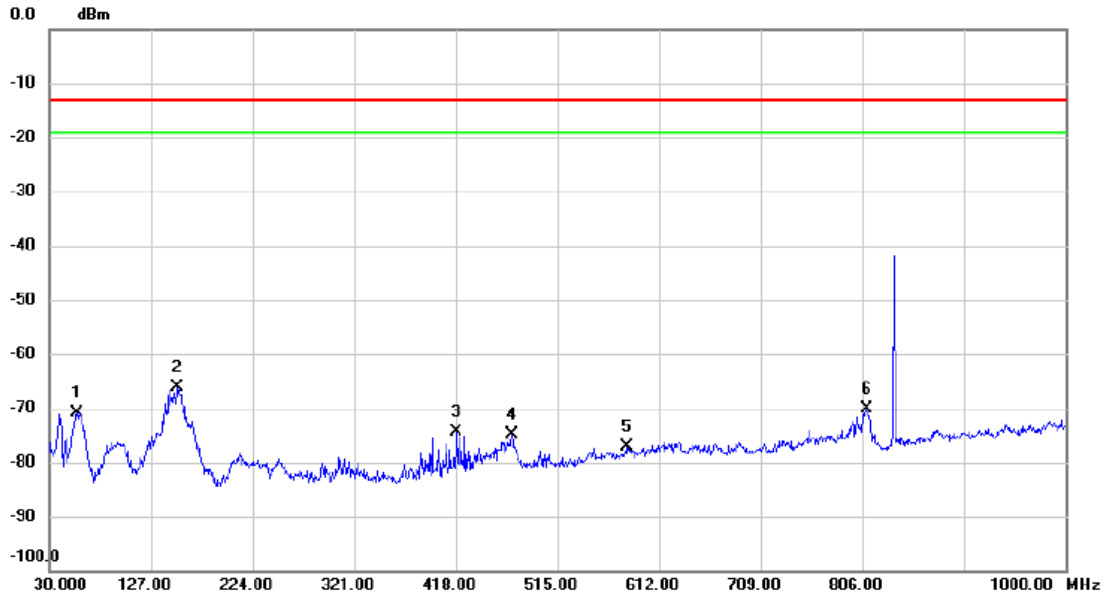
Vertical



| No. | Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measure- ment dBm | Limit dBm | Margin dB | Detector | Comment |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|--------------|--------------|----------|---------|
| 1 | * | 56.6750 | -58.08 | -9.95 | -68.03 | -13.00 | -55.03 | RMS | |
| 2 | | 150.2800 | -71.67 | 0.48 | -71.19 | -13.00 | -58.19 | RMS | |
| 3 | | 434.4900 | -80.41 | 0.84 | -79.57 | -13.00 | -66.57 | RMS | |
| 4 | | 474.2600 | -78.23 | 1.13 | -77.10 | -13.00 | -64.10 | RMS | |
| 5 | | 573.2000 | -81.19 | 3.53 | -77.66 | -13.00 | -64.66 | RMS | |
| 6 | | 652.7400 | -80.18 | 4.08 | -76.10 | -13.00 | -63.10 | RMS | |

Test Mode: WCDMA Band V_TX Mode

Horizontal

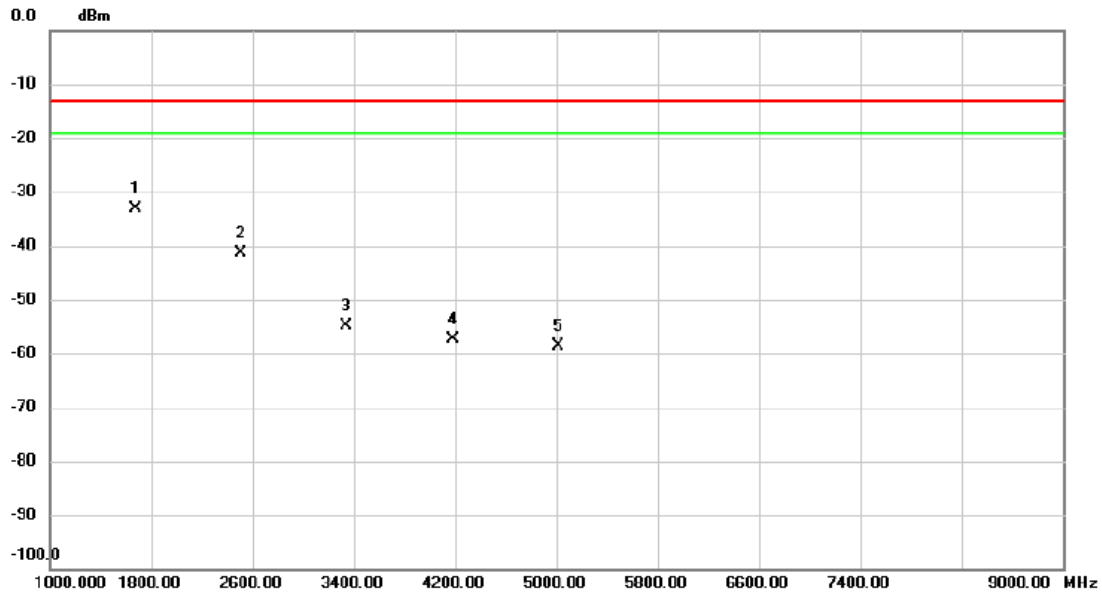


| No. | Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measure- ment dBm | Limit dBm | Margin dB | Detector | Comment |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|--------------|--------------|----------|---------|
| 1 | | 56.6750 | -64.26 | -6.63 | -70.89 | -13.00 | -57.89 | RMS | |
| 2 | * | 152.2200 | -63.15 | -2.87 | -66.02 | -13.00 | -53.02 | RMS | |
| 3 | | 418.9700 | -74.91 | 0.58 | -74.33 | -13.00 | -61.33 | RMS | |
| 4 | | 471.8350 | -75.97 | 1.19 | -74.78 | -13.00 | -61.78 | RMS | |
| 5 | | 581.4450 | -80.95 | 3.72 | -77.23 | -13.00 | -64.23 | RMS | |
| 6 | | 810.8500 | -76.42 | 6.41 | -70.01 | -13.00 | -57.01 | RMS | |

APPENDIX F - RADIATED EMISSION (ABOVE 1GHZ)

Test Mode: GSM850_TX Mode

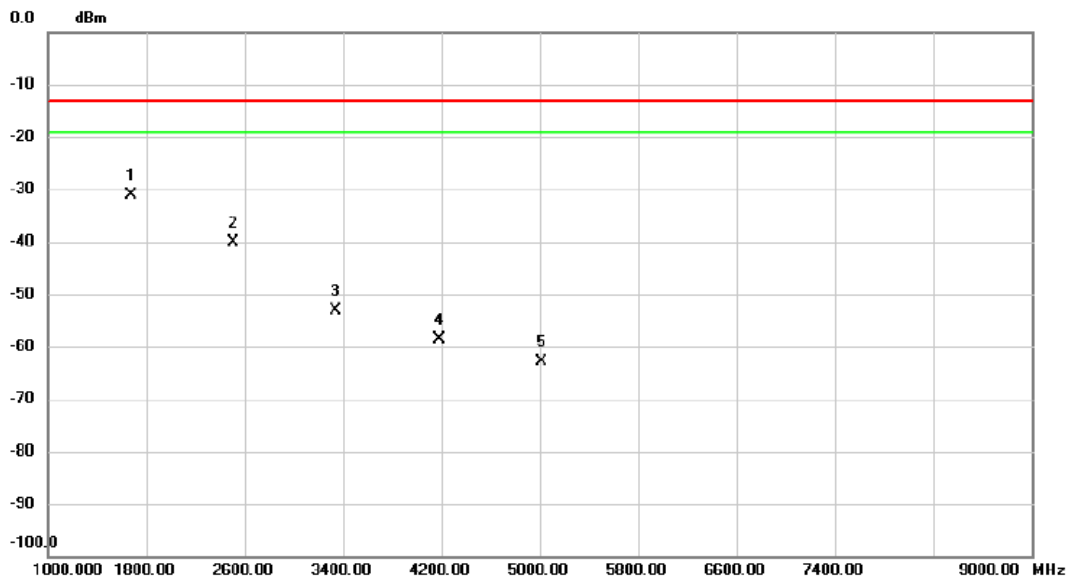
Vertical



| No. Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measurement dBm | Limit dBm | Margin dB | Detector | Comment |
|---------|-----------|-------------------|-------------------|-----------------|-----------|-----------|----------|---------|
| 1 * | 1672.800 | -22.03 | -11.19 | -33.22 | -13.00 | -20.22 | RMS | |
| 2 | 2509.200 | -33.81 | -7.53 | -41.34 | -13.00 | -28.34 | RMS | |
| 3 | 3345.600 | -48.51 | -6.24 | -54.75 | -13.00 | -41.75 | RMS | |
| 4 | 4182.000 | -53.37 | -4.09 | -57.46 | -13.00 | -44.46 | RMS | |
| 5 | 5018.400 | -56.20 | -2.42 | -58.62 | -13.00 | -45.62 | RMS | |

| | |
|------------|----------------|
| Test Mode: | GSM850_TX Mode |
|------------|----------------|

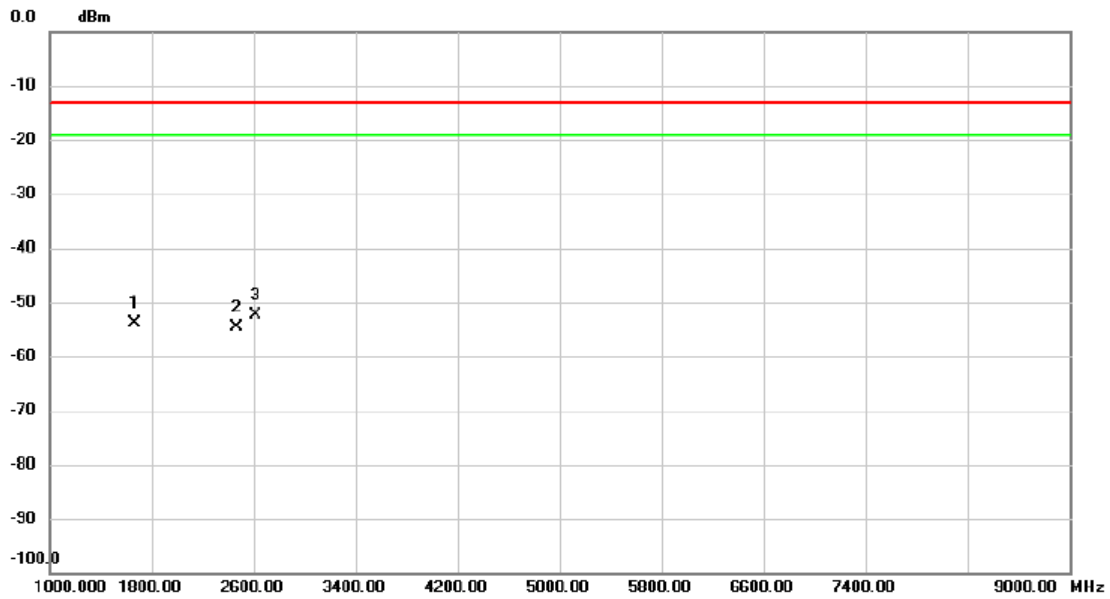
Horizontal



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Detector | Comment |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBm | dB | dBm | dBm | dB | | |
| 1 | * | 1672.800 | -20.02 | -11.01 | -31.03 | -13.00 | -18.03 | RMS | |
| 2 | | 2509.200 | -32.26 | -7.92 | -40.18 | -13.00 | -27.18 | RMS | |
| 3 | | 3345.600 | -46.84 | -6.21 | -53.05 | -13.00 | -40.05 | RMS | |
| 4 | | 4182.000 | -54.30 | -4.20 | -58.50 | -13.00 | -45.50 | RMS | |
| 5 | | 5018.800 | -60.22 | -2.60 | -62.82 | -13.00 | -49.82 | RMS | |

Test Mode: WCDMA Band V_ TX Mode

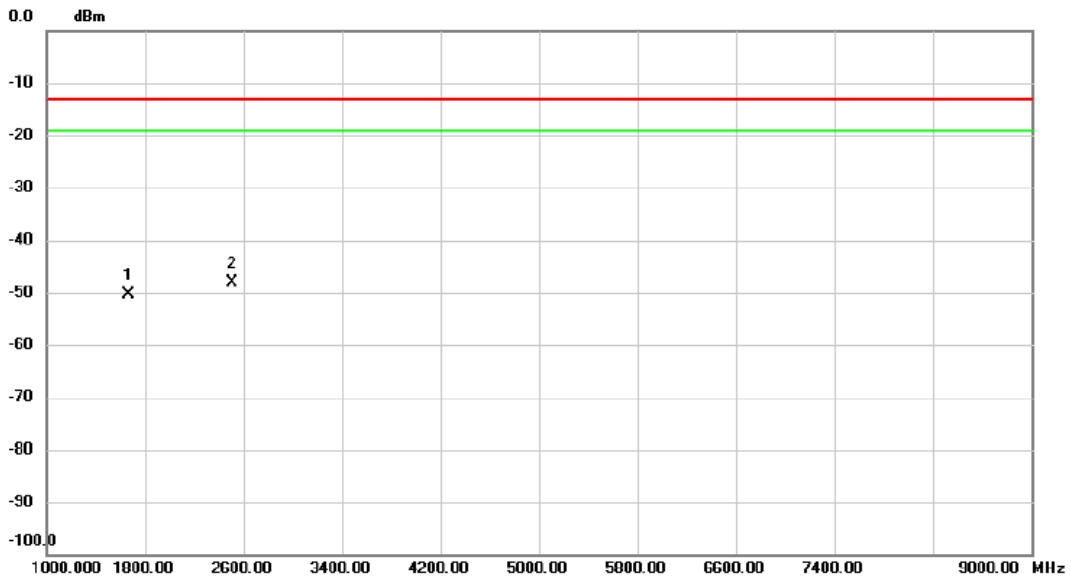
Vertical



| No. Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measure- ment dBm | Limit dBm | Margin dB | Detector | Comment |
|---------|--------------|-------------------------|-------------------------|-------------------------|--------------|--------------|----------|---------|
| 1 | 1671.200 | -42.58 | -11.18 | -53.76 | -13.00 | -40.76 | RMS | |
| 2 | 2463.600 | -46.87 | -7.69 | -54.56 | -13.00 | -41.56 | RMS | |
| 3 * | 2616.400 | -45.13 | -7.18 | -52.31 | -13.00 | -39.31 | RMS | |

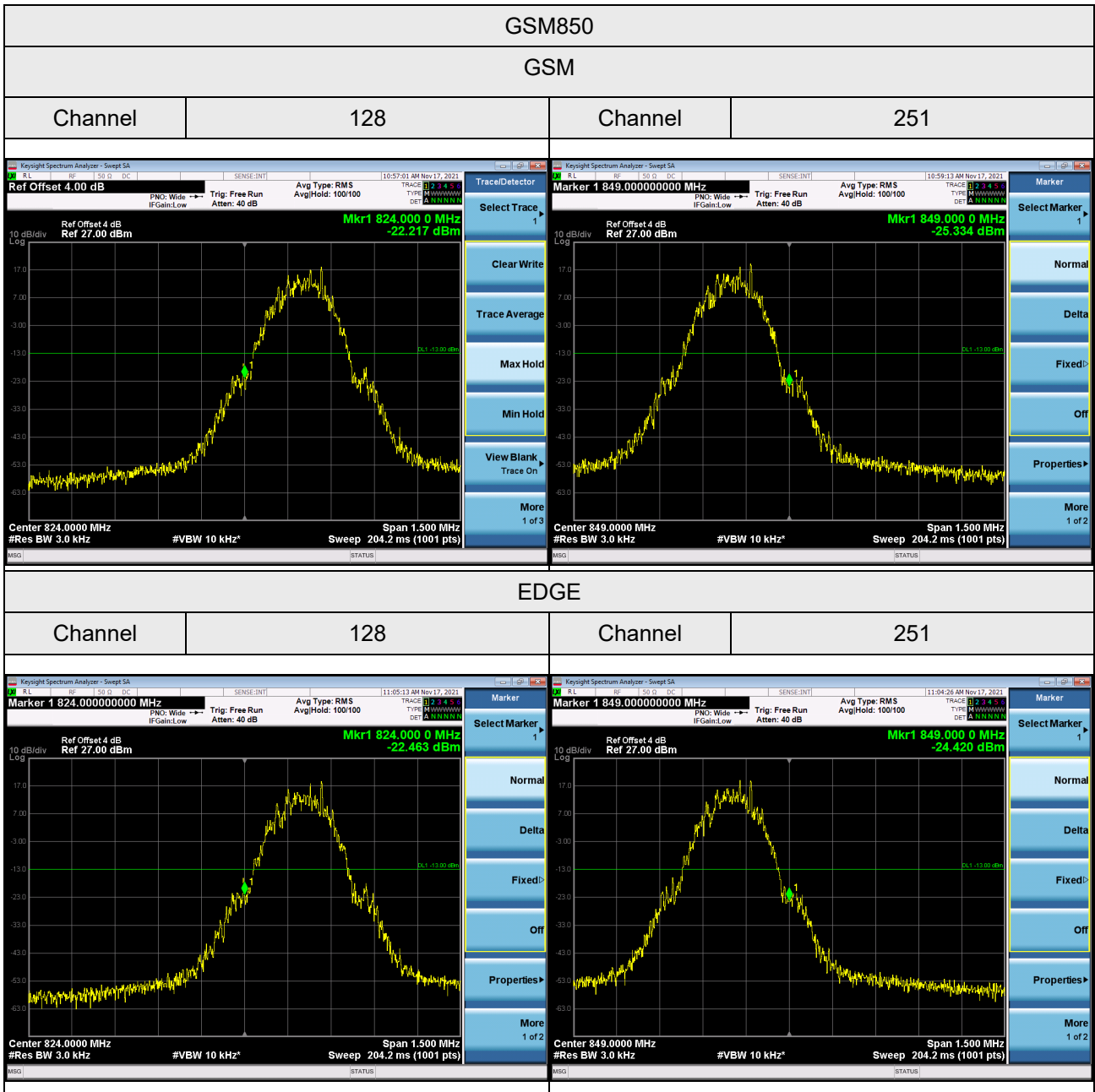
Test Mode: WCDMA Band V_ TX Mode

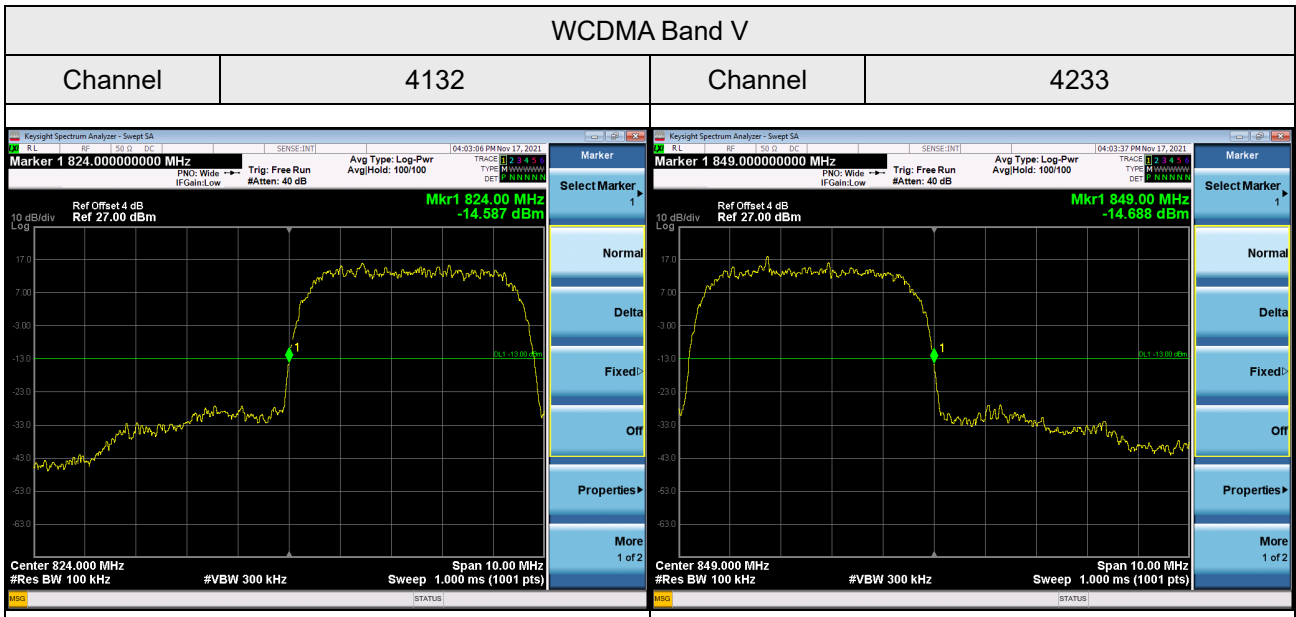
Horizontal



| No. | Mk. | Freq. MHz | Reading Level dBm | Correct Factor dB | Measure- ment dBm | Limit dBm | Margin dB | Detector | Comment |
|-----|-----|--------------|-------------------------|-------------------------|-------------------------|--------------|--------------|----------|---------|
| 1 | | 1671.200 | -39.26 | -11.01 | -50.27 | -13.00 | -37.27 | RMS | |
| 2 | * | 2512.400 | -40.29 | -7.92 | -48.21 | -13.00 | -35.21 | RMS | |

APPENDIX G - BAND EDGE





APPENDIX H - PEAK TO AVERAGE RATIO

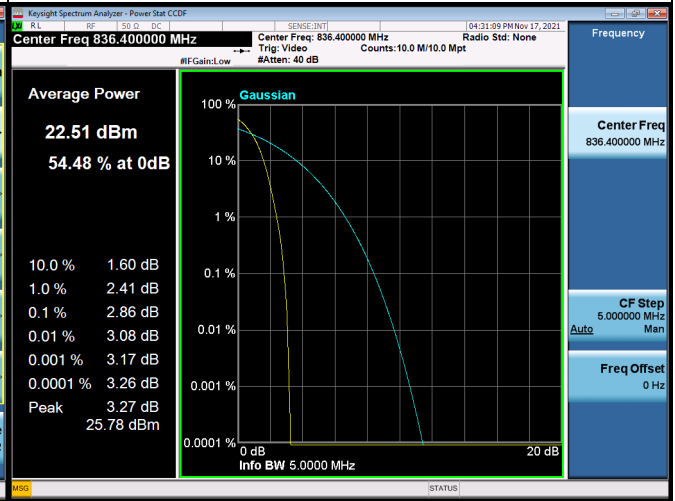
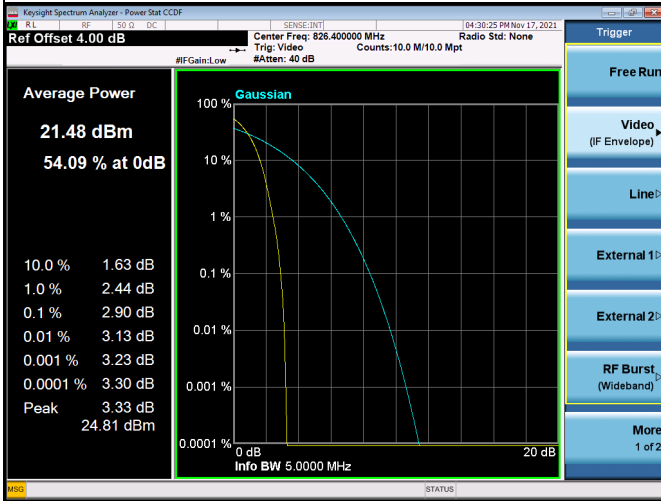
GSM 850 Spectrum Plot



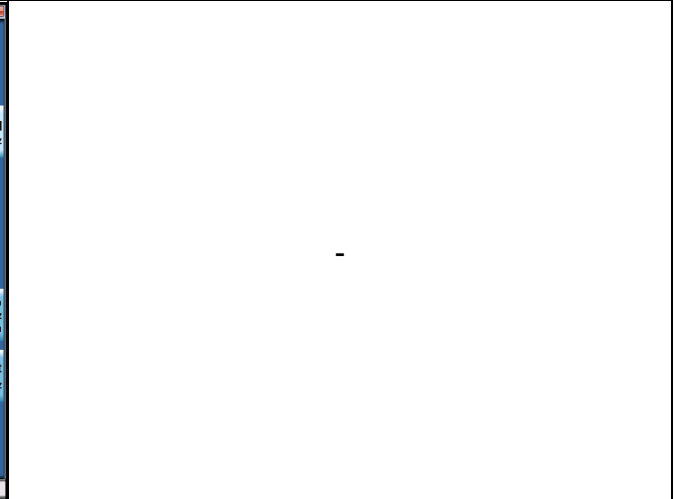
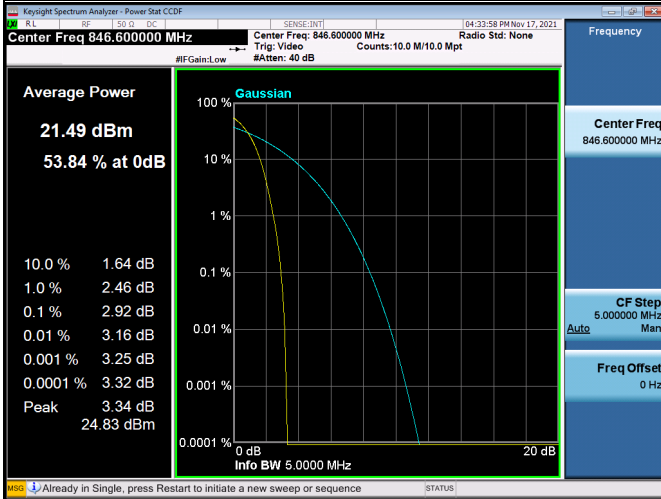
WCDMA Band V Spectrum Plot

4132

4182



4233



APPENDIX I - FREQUENCY STABILITY

| | |
|------------|--------------|
| Test Mode: | GSM850_CH190 |
|------------|--------------|

Temperature vs. Frequency Stability

| Temperature(°C) | Frequency Error (Hz) | Frequency Error (ppm) | Limit(ppm) |
|----------------------|----------------------|-----------------------|------------|
| -20 | -6.48 | -0.007745637 | ±2.5 |
| -10 | 3.79 | 0.004530241 | |
| 0 | 4.21 | 0.005032273 | |
| 10 | 6.29 | 0.007518527 | |
| 20 | 3.74 | 0.004470476 | |
| 30 | 6.76 | 0.008080325 | |
| 40 | 5.94 | 0.007100167 | |
| 50 | 3.72 | 0.004446569 | |
| Max. Deviation (ppm) | 6.76 | 0.008080325 | |

Voltage vs. Frequency Stability

| Voltage(Volts) | Frequency Error (Hz) | Frequency Error (ppm) | Limit(ppm) |
|----------------------|----------------------|-----------------------|------------|
| 4.5 | -5.60 | -0.006693760 | ±2.5 |
| 3.8 | -6.75 | -0.008068372 | |
| 3.4 | -5.04 | -0.006024384 | |
| Max. Deviation (ppm) | 6.75 | -0.006024384 | |

| | |
|------------|---------------------|
| Test Mode: | WCDMA Band V_CH4407 |
|------------|---------------------|

Temperature vs. Frequency Stability

| Temperature(°C) | Frequency Error (Hz) | Frequency Error (ppm) | Limit(ppm) |
|----------------------|----------------------|-----------------------|------------|
| -20 | -4.31 | 0.005153037 | ± 2.5 |
| -10 | 2.76 | 0.003299857 | |
| 0 | -1.59 | 0.001901004 | |
| 10 | 2.45 | 0.002929220 | |
| 20 | 4.36 | 0.005212817 | |
| 30 | -3.23 | 0.003861789 | |
| 40 | -4.05 | 0.004842181 | |
| 50 | 4.96 | 0.005930177 | |
| Max. Deviation (ppm) | 4.96 | 0.005930177 | |

Voltage vs. Frequency Stability

| Voltage(Volts) | Frequency Error (Hz) | Frequency Error (ppm) | Limit(ppm) |
|----------------------|----------------------|-----------------------|------------|
| 4.5 | -5.12 | 0.006121473 | ± 2.5 |
| 3.8 | -2.47 | 0.002953132 | |
| 3.4 | 3.56 | 0.004256337 | |
| Max. Deviation (ppm) | 5.12 | 0.006121473 | |

End of Test Report