

FCC TEST REPORT
For
Shandong USR IOT Technology Limited

Serial to GPRS Module
Model No.: USR-GM3, USR-GM3s, USR-GPRS232-7S3, USR-GPRS232-730,
USR-GPRS232-702, USR-GPRS232-703, USR-GPRS232-704,
USR-GPRS232-705, USR-GPRS232-732, USR-GPRS232-734

Prepared for : Shandong USR IOT Technology Limited
Address : Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu,
250101, Jinan, Shandong, China

Prepared By : Shenzhen Anbotech Compliance Laboratory Limited
Address : 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road,
Nanshan District, Shenzhen, Guangdong, China
Tel: (86) 755-26066544
Fax: (86) 755-26014772

Report Number : R0116051023I
Date of Test : Jun. 02~ Sept. 27, 2016
Date of Report : Sept. 29, 2016

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TEST REPORT

Applicant : Shandong USR IOT Technology Limited
Manufacturer : Shandong USR IOT Technology Limited
EUT : Serial to GPRS Module
Model No. : USR-GM3, USR-GM3s, USR-GPRS232-7S3, USR-GPRS232-730,
USR-GPRS232-702, USR-GPRS232-703, USR-GPRS232-704,
USR-GPRS232-705, USR-GPRS232-732, USR-GPRS232-734
Serial No. : N.A.
Trade Mark : 
Rating : DC 3.8V, 750mA

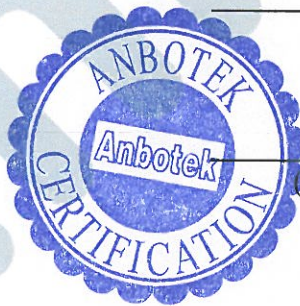
Measurement Procedure Used:**FCC Part 2, FCC Part 22 Subpart H, FCC Part 24 Subpart E, ANSI/TIA 603-D (2010)**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 22(H):2015; FCC Part 24(E):2015 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Jun. 02~ Sept. 27, 2016

Prepared by :



(Tested Engineer / Baron Wen)

Reviewer :

(Project Manager / Amy Ding)

Approved & Authorized Signer :

(Manager/Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

| | |
|-------------------------|--|
| EUT | : Serial to GPRS Module |
| Model Number | : USR-GM3, USR-GM3s, USR-GPRS232-7S3, USR-GPRS232-730, USR-GPRS232-702, USR-GPRS232-703, USR-GPRS232-704, USR-GPRS232-705, USR-GPRS232-732, USR-GPRS232-734 (Note: All samples are the same except the model number and colour, so we prepare “USR-GM3” for test only.) |
| Test Voltage | : AC 120V, 60Hz for adapter/ AC 240V, 60Hz for adapter |
| Adapter | : Model No.: DQS151-120100-VC Input: AC 100-240V, 50/60Hz, 0.4A Max Output: DC 12.0V, 1.0A |
| Frequency | : GSM850 TX: 824.2~848.8MHz; RX: 869.2~893.8MHz PCS1900 TX: 1850.2~1909.8MHz; RX: 1930.2~1989.8MHz |
| Number of Channels: | : GSM 850: 124CH PCS1900: 299CH |
| Modulation Type | : GSM/GPRS:GFSK |
| Antenna Gain | : GSM: GSM 850: 2.5dBi PCS 1900: 2.5dBi |
| Applicant Address | : Shandong USR IOT Technology Limited Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu, 250101, Jinan, Shandong, China |
| Manufacturer Address | : Shandong USR IOT Technology Limited Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu, 250101, Jinan, Shandong, China |
| Factory Address | : Shandong USR IOT Technology Limited Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu, 250101, Jinan, Shandong, China |
| Date of receipt | : Jun. 02, 2016 |
| Date of Test | : Jun. 02~ Sept. 27, 2016 |

1.2. Auxiliary Equipment Used during Test

N/A

1.3. Description of Test Facility

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

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, Jun. 13, 2016.

Test Location

All Emissions tests were performed at
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC
Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong,
China

1.4. Measurement Uncertainty

Radiation Uncertainty : Ur = 4.1 dB (Horizontal)
Ur = 4.3 dB (Vertical)

Conduction Uncertainty : Uc = 3.4dB

2. Technical test

2.1. Summary of Test Results

| | |
|---|------|
| No Deviations from the technical specification(s) were ascertained in the course of the tests Performed | |
| Final Verdict: (only "Pass" if all single measurements are "Pass") | Pass |

2.2. Test Report

The EUT has been tested according to the following specifications:
The radiated emission testing was performed according to the procedures of ANSI/TIA-603-D:2010,KDB 971168 D01 v02r02 and KDB 648474 D03 v01r04

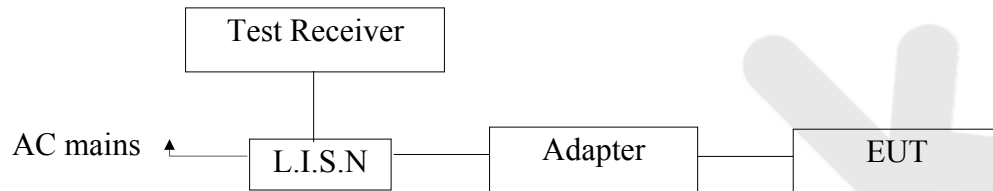
| Standard | Test Type | Result | Notes |
|---|--|--------|----------|
| 2.1046 | Conducted emission | Pass | |
| 1.1307 2.1093 | RF Exposure (SAR) | Pass | Note 1 |
| 2.1046 22.913(a) 24.232(c) 27.50(c.10) | RF Output Power | Pass | Complies |
| 24.232 (d) | Peak-Average Ratio | Pass | Complies |
| 2.1049 22.905 22.917 24.238 | 99% & -26 dB Occupied Bandwidth | Pass | Complies |
| 2.1051 22.917(a) 24.238(a) | Spurious Emissions at Antenna Terminal | Pass | Complies |
| 22.917(a) 24.238(a) | Out of band emission, Band Edge | Pass | Complies |
| 2.1053 22.917(a) 24.238(a) | Band edge test | Pass | Complies |
| 2.1055 22.355 24.235 | Frequency stability vs. temperature Frequency stability vs. voltage | Pass | Complies |

Note1: Please refer to RF SAR Report.

3. Conducted Emission

3.1 Block Diagram of Test Setup

3.1.1. Block diagram of connection between the EUT and simulators



3.2 Power Line Conducted Emission Measurement Limits (15.207)

| Frequency MHz | Limits dB(μV) | |
|------------------|------------------|---------------|
| | Quasi-peak Level | Average Level |
| 0.15 ~ 0.50 | 66 ~ 56* | 56 ~ 46* |
| 0.50 ~ 5.00 | 56 | 46 |
| 5.00 ~ 30.00 | 60 | 50 |

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.3 Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4 Operating Condition of EUT

- 3.4.1. Setup the EUT and simulator as shown as Section 3.1.
- 3.4.2. Turn on the power of all equipment.
- 3.4.3. Let the EUT work in test mode (On) and measure it.

3.5 Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI/TIA-603-D:2010 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test results are reported on Section 3.6.

Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|--------------------|----------------------|-----------|------------|---------------|---------------|
| 1. | Two-Line V-network | Rohde & Schwarz | ENV216 | 100055 | Apr. 16, 2016 | 1 Year |
| 2. | EMI Test Receiver | Rohde & Schwarz | ESCI | 100627 | Apr. 16, 2016 | 1 Year |
| 3. | RF Switching Unit | Compliance Direction | RSU-M2 | 38303 | Apr. 16, 2016 | 1 Year |

3.6 Power Line Conducted Emission Measurement Results

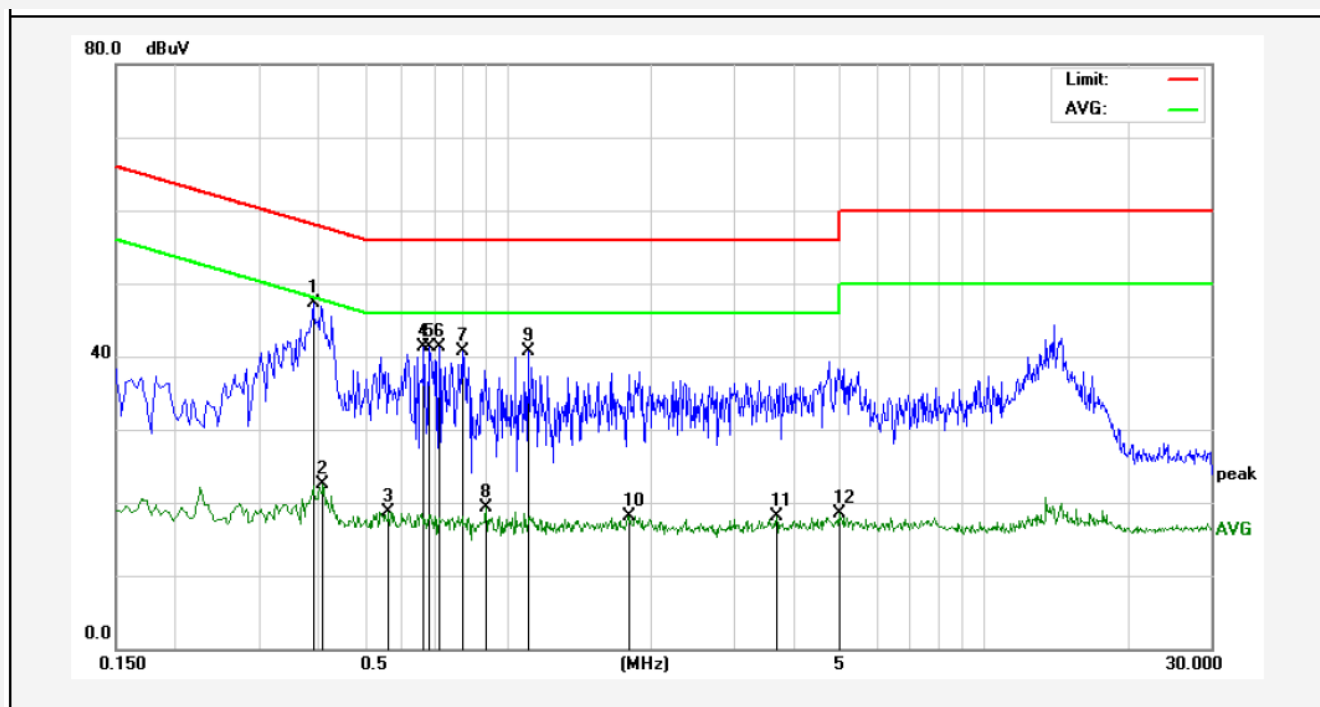
PASS.

The frequency range from 150KHz to 30 MHz is investigated.

Please refer the following pages.

CONDUCTED EMISSION TEST DATA

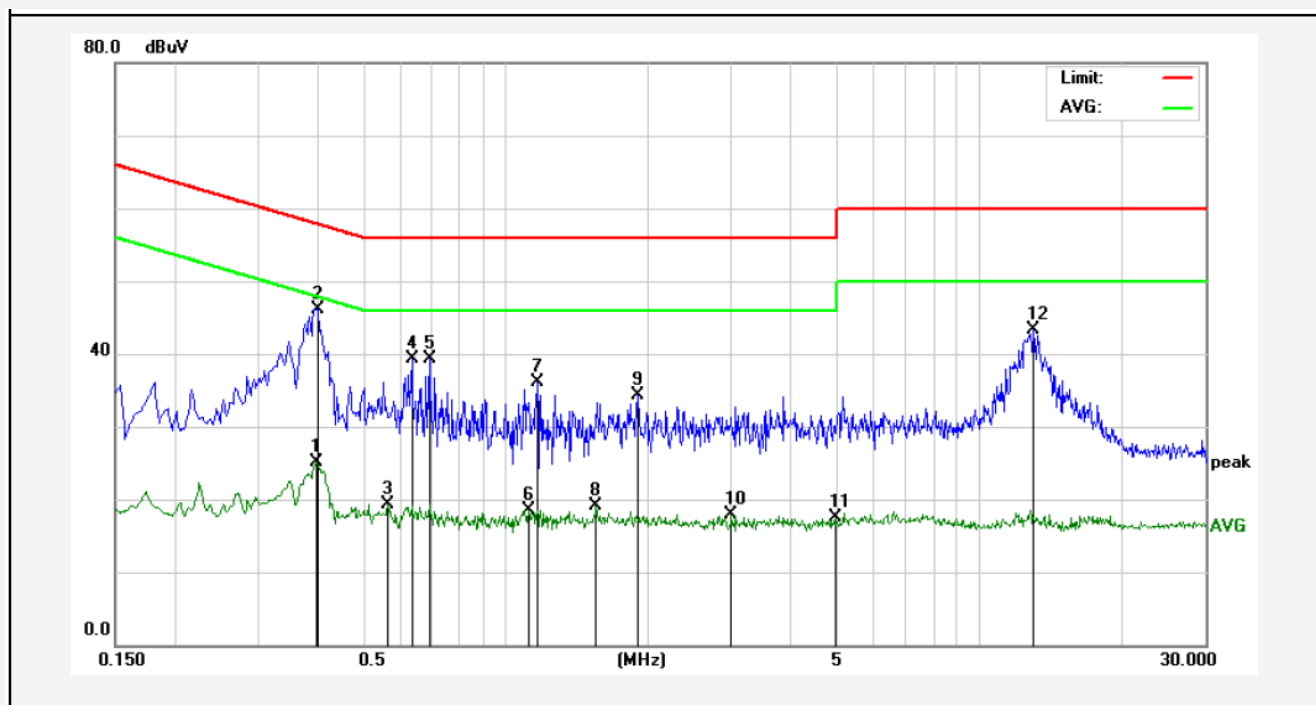
Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Tem.:25°C Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1 | 0.3899 | 27.26 | 19.92 | 47.18 | 58.06 | -10.88 | QP | |
| 2 | 0.4100 | 2.41 | 19.94 | 22.35 | 47.65 | -25.30 | AVG | |
| 3 | 0.5620 | -1.31 | 19.99 | 18.68 | 46.00 | -27.32 | AVG | |
| 4 | 0.6660 | 21.24 | 20.02 | 41.26 | 56.00 | -14.74 | QP | |
| 5 | 0.6860 | 21.22 | 20.03 | 41.25 | 56.00 | -14.75 | QP | |
| 6 | 0.7180 | 21.30 | 20.04 | 41.34 | 56.00 | -14.66 | QP | |
| 7 | 0.8020 | 20.63 | 20.05 | 40.68 | 56.00 | -15.32 | QP | |
| 8 | 0.9020 | -0.67 | 20.06 | 19.39 | 46.00 | -26.61 | AVG | |
| 9 | 1.1019 | 20.72 | 20.12 | 40.84 | 56.00 | -15.16 | QP | |
| 10 | 1.8020 | -1.85 | 20.14 | 18.29 | 46.00 | -27.71 | AVG | |
| 11 | 3.6740 | -1.96 | 20.16 | 18.20 | 46.00 | -27.80 | AVG | |
| 12 | 4.9660 | -1.52 | 20.21 | 18.69 | 46.00 | -27.31 | AVG | |

CONDUCTED EMISSION TEST DATA

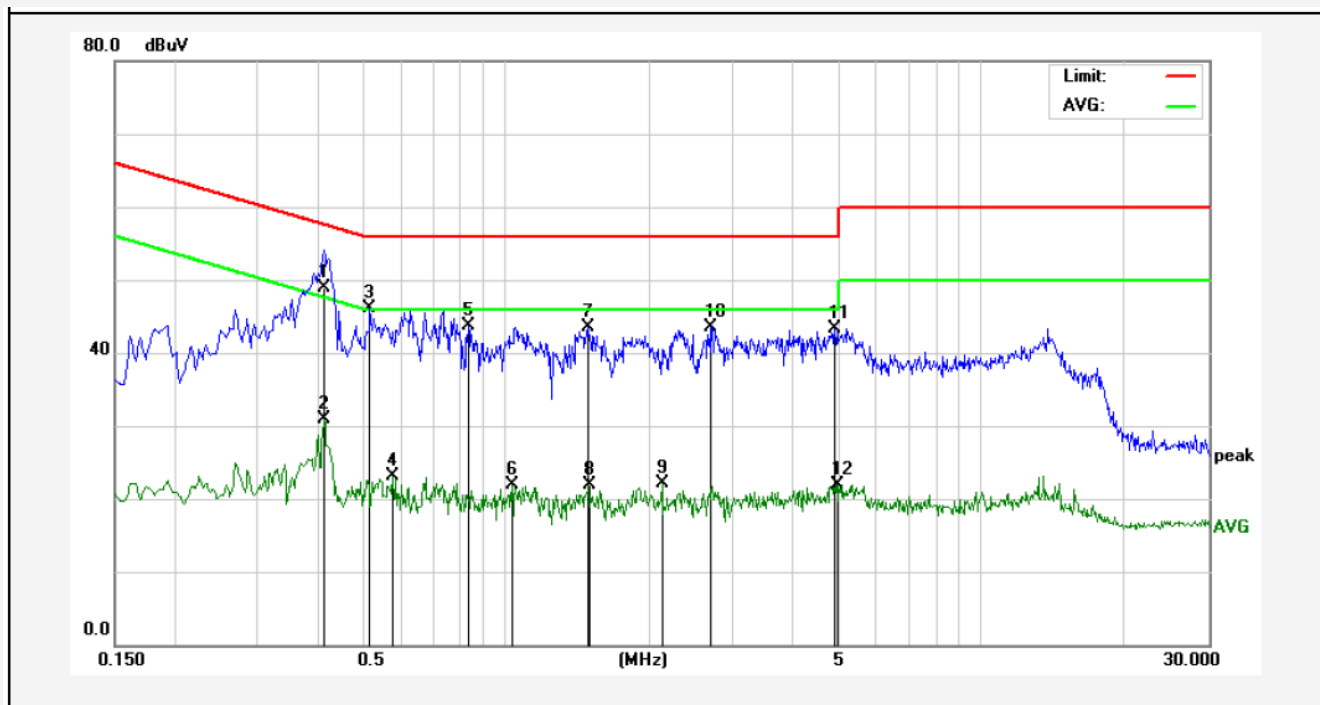
Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: AC 120V, 60Hz for adapter
Comment: Neutral Line
Tem.:25℃ Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1 | 0.3980 | 5.18 | 19.93 | 25.11 | 47.89 | -22.78 | AVG | |
| 2 | 0.4020 | 26.17 | 19.94 | 46.11 | 57.81 | -11.70 | QP | |
| 3 | 0.5660 | -0.66 | 19.99 | 19.33 | 46.00 | -26.67 | AVG | |
| 4 | 0.6340 | 19.36 | 20.02 | 39.38 | 56.00 | -16.62 | QP | |
| 5 | 0.6900 | 19.35 | 20.03 | 39.38 | 56.00 | -16.62 | QP | |
| 6 | 1.1180 | -1.44 | 20.12 | 18.68 | 46.00 | -27.32 | AVG | |
| 7 | 1.1660 | 16.02 | 20.12 | 36.14 | 56.00 | -19.86 | QP | |
| 8 | 1.5540 | -0.90 | 20.13 | 19.23 | 46.00 | -26.77 | AVG | |
| 9 | 1.9060 | 14.29 | 20.14 | 34.43 | 56.00 | -21.57 | QP | |
| 10 | 3.0020 | -2.05 | 20.16 | 18.11 | 46.00 | -27.89 | AVG | |
| 11 | 4.9540 | -2.57 | 20.19 | 17.62 | 46.00 | -28.38 | AVG | |
| 12 | 12.9980 | 23.33 | 20.32 | 43.65 | 60.00 | -16.35 | QP | |

CONDUCTED EMISSION TEST DATA

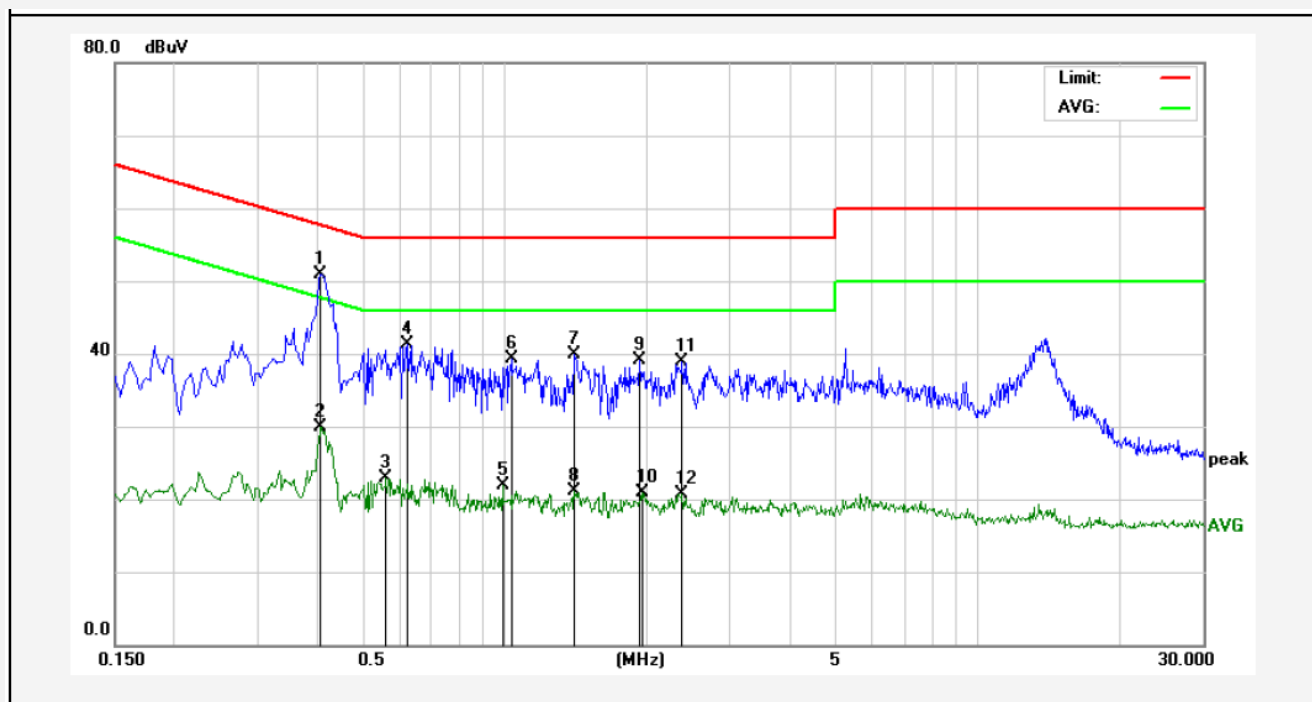
Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: AC 240V, 60Hz for adapter
Comment: Live Line
Tem.:25°C Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1 | 0.4140 | 28.94 | 19.94 | 48.88 | 57.57 | -8.69 | QP | |
| 2 | 0.4140 | 10.94 | 19.94 | 30.88 | 47.57 | -16.69 | AVG | |
| 3 | 0.5180 | 26.07 | 19.98 | 46.05 | 56.00 | -9.95 | QP | |
| 4 | 0.5780 | 3.01 | 19.99 | 23.00 | 46.00 | -23.00 | AVG | |
| 5 | 0.8340 | 23.67 | 20.06 | 43.73 | 56.00 | -12.27 | QP | |
| 6 | 1.0300 | 1.87 | 20.12 | 21.99 | 46.00 | -24.01 | AVG | |
| 7 | 1.4819 | 23.42 | 20.13 | 43.55 | 56.00 | -12.45 | QP | |
| 8 | 1.4900 | 1.96 | 20.13 | 22.09 | 46.00 | -23.91 | AVG | |
| 9 | 2.1220 | 2.11 | 20.14 | 22.25 | 46.00 | -23.75 | AVG | |
| 10 | 2.7020 | 23.60 | 20.15 | 43.75 | 56.00 | -12.25 | QP | |
| 11 | 4.9100 | 23.32 | 20.19 | 43.51 | 56.00 | -12.49 | QP | |
| 12 | 4.9380 | 1.88 | 20.19 | 22.07 | 46.00 | -23.93 | AVG | |

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: AC 240V, 60Hz for adapter
Comment: Neutral Line
Tem.:25℃ Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1 | 0.4100 | 30.81 | 19.94 | 50.75 | 57.65 | -6.90 | QP | |
| 2 | 0.4100 | 9.93 | 19.94 | 29.87 | 47.65 | -17.78 | AVG | |
| 3 | 0.5620 | 2.83 | 19.99 | 22.82 | 46.00 | -23.18 | AVG | |
| 4 | 0.6260 | 21.36 | 20.02 | 41.38 | 56.00 | -14.62 | QP | |
| 5 | 0.9900 | 1.93 | 20.07 | 22.00 | 46.00 | -24.00 | AVG | |
| 6 | 1.0339 | 19.23 | 20.12 | 39.35 | 56.00 | -16.65 | QP | |
| 7 | 1.4060 | 19.81 | 20.13 | 39.94 | 56.00 | -16.06 | QP | |
| 8 | 1.4060 | 1.10 | 20.13 | 21.23 | 46.00 | -24.77 | AVG | |
| 9 | 1.9340 | 19.14 | 20.05 | 39.19 | 56.00 | -16.81 | QP | |
| 10 | 1.9500 | 0.89 | 20.12 | 21.01 | 46.00 | -24.99 | AVG | |
| 11 | 2.3780 | 18.93 | 20.13 | 39.06 | 56.00 | -16.94 | QP | |
| 12 | 2.3780 | 0.71 | 20.13 | 20.84 | 46.00 | -25.16 | AVG | |

4. RF Output Power

4.1 Applicable Standard

According to FCC PART 22.913 (a), Max EIRP: 38.45dBm; FCC PART 24.232 (c), Max EIRP: 33.00dBm

4.2 Test Procedure

For Conducted Power:

The transmitter output port was connected to base station.

Set EUT at maximum power through base station.

Select lowest, middle, and highest channels for each band and different test mode.

For ERP/EIRP:

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

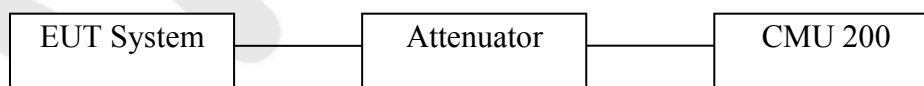
The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = $10 \log (\text{TX power in Watts}/0.001)$ – the absolute level

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

4.3 Test Setup



4.4 Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|--------------------------------------|-------------------------|---------------------------|---------------|---------------|---------------|
| 1. | Spectrum Analysis | Agilent | E4407B | US39390582 | Apr. 16, 2016 | 1 Year |
| 2. | Preamplifier | Instruments corporation | EMC011830 | 980100 | Apr. 16, 2016 | 1 Year |
| 3. | EMI Test Receiver | Rohde & Schwarz | ESPI | 101604 | Apr. 16, 2016 | 1 Year |
| 4. | Double Ridged Horn Antenna | Instruments corporation | GTH-0118 | 351600 | Apr. 19, 2016 | 1 Year |
| 5. | Double Ridged Horn Antenna | Instruments corporation | GTH-0118 | 351600 | Apr. 19, 2016 | 1 Year |
| 6. | Bilog Broadband Antenna | Schwarzbeck | VULB9163 | VULB 9163-289 | Apr. 19, 2016 | 1 Year |
| 7. | Bilog Broadband Antenna | Schwarzbeck | VULB9163 | VULB 9163-289 | Apr. 19, 2016 | 1 Year |
| 8. | Pre-amplifier | SONOMA | 310N | 186860 | Apr. 16, 2016 | 1 Year |
| 9. | MXA Spectrum Analysis | Agilent | N9020A | MY51170037 | Jun 30, 2016 | 1 Year |
| 10. | MXG RF Vector Signal Generator | Agilent | N5182A | MY48180656 | Jun. 30, 2016 | 1 Year |
| 11. | DC Power supply | IV | IV-8080 | YQSB0096 | Jun. 30, 2016 | 1 Year |
| 12. | Temp & Humidity programmable Chamber | Longan | LA-H005F | L0407008 | Dec. 20, 2015 | 1 Year |
| 13. | Universal Radio Communication Tester | Rohde & Schwarz | CMU 200 | 114196 | Jun. 30, 2016 | 1 Year |
| 14. | Universal Radio Communication Tester | Rohde & Schwarz | CMU 500 | 114196 | Jun. 30, 2016 | 1 Year |
| 15. | Filter | COM-MW | ZHPF-BM1100-6000-0730 | 1307006523 | Jun. 25, 2016 | 1 Year |
| 16. | Filter | COM-MW | COM-MW/ZHPF-M3.5-18G-3834 | B2015094550 | Jun. 25, 2016 | 1 Year |

3.5 Test Results

Pass

Test Data as following:

Conducted Power

| Burst Average Power (dBm) | | | | | | | | |
|--|--------|--------------|-------|------------------------|---------|--------------|--------|------------------------|
| Band | GSM850 | | | | PCS1900 | | | |
| Channel | 128 | 190 | 251 | Tune up Power tolerant | 512 | 661 | 810 | Tune up Power tolerant |
| Frequency (MHz) | 824.2 | 836.6 | 848.8 | / | 1850.2 | 1880 | 1909.8 | / |
| GSM Voice (1 uplink),GMSK | 31.56 | 31.67 | 31.52 | 30.7±1 | 28.75 | 28.84 | 28.29 | 29±1 |
| GPRS Multi-Slot Class 8 (1 uplink),GMSK | 31.25 | 31.31 | 31.14 | 30.5±1 | 28.29 | 28.30 | 28.11 | 28±1 |
| GPRS Multi-Slot Class 10 (2 uplink) GMSK | 29.67 | 29.81 | 29.72 | 30±1 | 26.37 | 26.53 | 26.28 | 27±1 |
| GPRS Multi-Slot Class 12 (4 uplink) GMSK (4 uplink),GMSK | 27.58 | 27.73 | 27.19 | 27±1 | 24.75 | 24.89 | 24.86 | 24±1 |
| Remark : GPRS, CS1 coding scheme. Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link | | | | | | | | |

Note: Since GSM mode has higher power, so the test items below were not performed to GPRS and EGPRS mode.

| ERP & EIRPERP for Cellular Band (Part 22H) | | | | | | |
|--|------------------------|----------------------|------------------------------|----------------|---------------------|------------|
| GSM | | | | | | |
| Frequency(MHz) | Substituted level(dBm) | Antenna Polarization | Antenna Gain correction(dBi) | Cable Loss(dB) | Absolute Level(dBm) | Limit(dBm) |
| 824.2 | 20.13 | V | 7.1 | 0.55 | 26.68 | 38.45 |
| 824.2 | 19.42 | H | 7.1 | 0.55 | 25.97 | 38.45 |
| 836.6 | 19.92 | V | 7.1 | 0.57 | 26.45 | 38.45 |
| 836.6 | 18.58 | H | 7.1 | 0.57 | 25.11 | 38.45 |
| 848.8 | 20.24 | V | 7.2 | 0.57 | 26.87 | 38.45 |
| 848.8 | 19.71 | H | 7.2 | 0.57 | 26.34 | 38.45 |
| GPRS | | | | | | |
| 824.2 | 20.21 | V | 7.1 | 0.55 | 26.76 | 33 |
| 824.2 | 19.32 | H | 7.1 | 0.55 | 25.87 | 33 |
| 836.6 | 20.20 | V | 7.1 | 0.57 | 26.73 | 33 |
| 836.6 | 19.09 | H | 7.1 | 0.57 | 25.62 | 33 |
| 848.8 | 19.87 | V | 7.2 | 0.57 | 26.50 | 33 |
| 848.8 | 18.94 | H | 7.2 | 0.57 | 25.57 | 33 |

| ERP & EIRPERP for Cellular Band (Part 24H)GSM | | | | | | |
|---|------------------------|----------------------|------------------------------|----------------|---------------------|------------|
| Frequency(MHz) | Substituted level(dBm) | Antenna Polarization | Antenna Gain correction(dBi) | Cable Loss(dB) | Absolute Level(dBm) | Limit(dBm) |
| 1850.2 | 16.95 | V | 10.3 | 1.02 | 26.23 | 33 |
| 1850.2 | 14.84 | H | 10.3 | 1.02 | 24.12 | 33 |
| 1880 | 16.78 | V | 10.3 | 1.10 | 25.98 | 33 |
| 1880 | 14.96 | H | 10.3 | 1.10 | 24.16 | 33 |
| 1909.8 | 16.91 | V | 10.3 | 1.15 | 26.06 | 33 |
| 1909.8 | 14.82 | H | 10.3 | 1.15 | 23.97 | 33 |
| GPRS | | | | | | |
| 1850.2 | 16.42 | V | 10.3 | 1.02 | 25.70 | 33 |
| 1850.2 | 14.37 | H | 10.3 | 1.02 | 23.65 | 33 |
| 1880 | 16.57 | V | 10.3 | 1.10 | 25.77 | 33 |
| 1880 | 14.62 | H | 10.3 | 1.10 | 23.82 | 33 |
| 1909.8 | 16.39 | V | 10.3 | 1.15 | 25.54 | 33 |
| 1909.8 | 14.22 | H | 10.3 | 1.15 | 23.37 | 33 |

5. Peak-Average Ratio

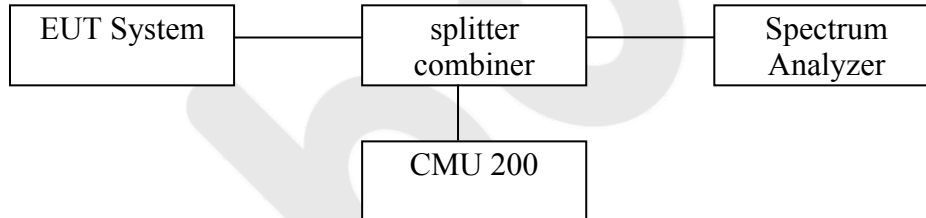
5.1 Applicable Standard

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

5.2 Test Procedure

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

5.3 Test Setup



5.4 Test Equipment

Same as the equipment listed in section 4.4

5.5 Test Results

Pass

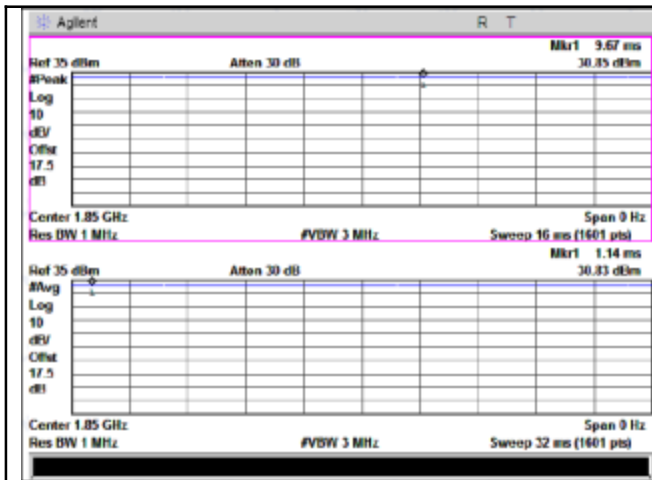
Test Data as following:

**PCS1900
GSM**

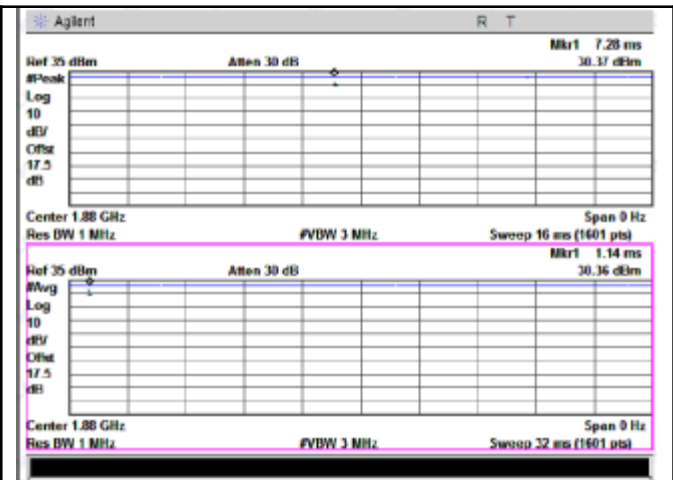
| Frequency (MHz) | Conducted power (dBm) | | Peak-Average Ratio (PAR) |
|--------------------|-----------------------|---------|--------------------------|
| | Peak | Average | |
| 1850.2 | 28.63 | 27.18 | 0.02 |
| 1880 | 28.75 | 27.25 | 0.01 |
| 1909.8 | 28.34 | 27.16 | 0.40 |

GPRS

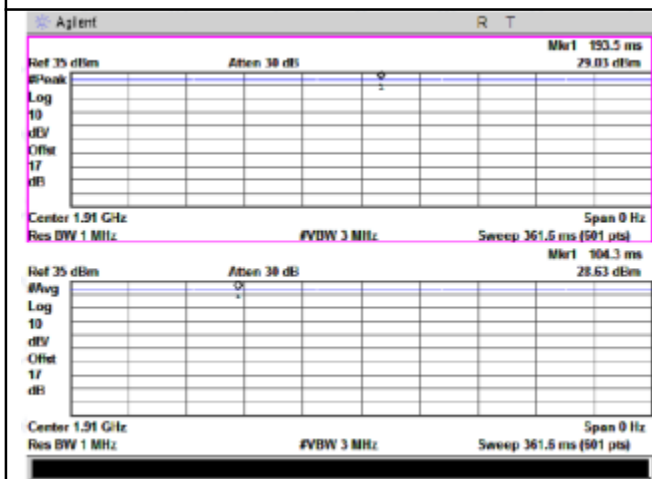
| Frequency (MHz) | Conducted power (dBm) | | Peak-Average Ratio (PAR) |
|--------------------|-----------------------|---------|--------------------------|
| | Peak | Average | |
| 1850.2 | 28.22 | 27.17 | 0.07 |
| 1880 | 28.34 | 27.34 | 0.01 |
| 1909.8 | 28.15 | 27.16 | 0.01 |



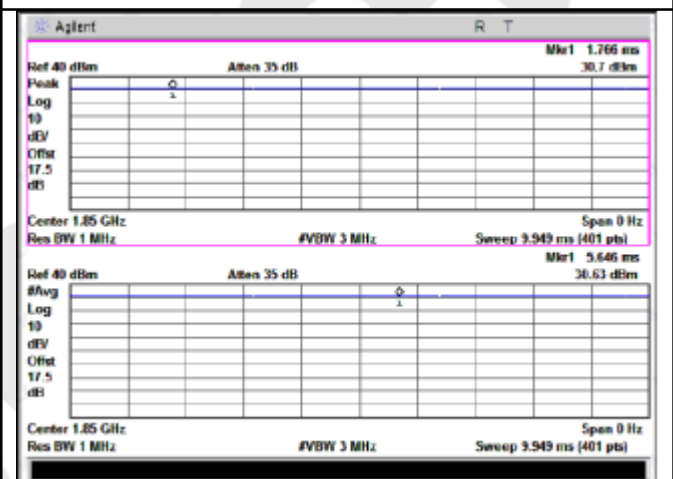
PCS 1900 BW - Low CH 1850.2MHz



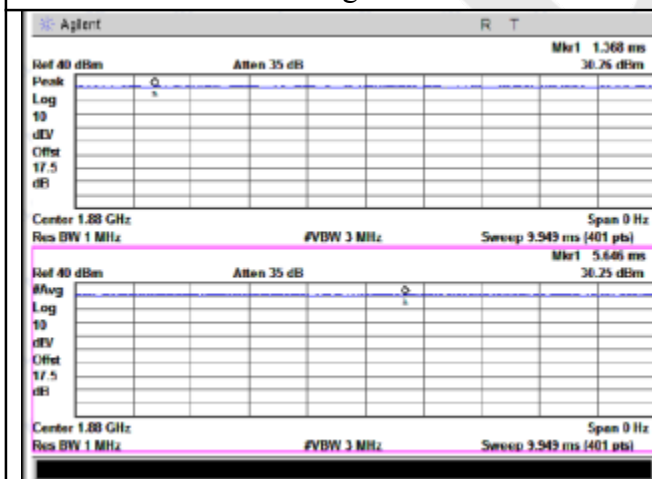
PCS 1900 BW - Mid CH 1880MHz



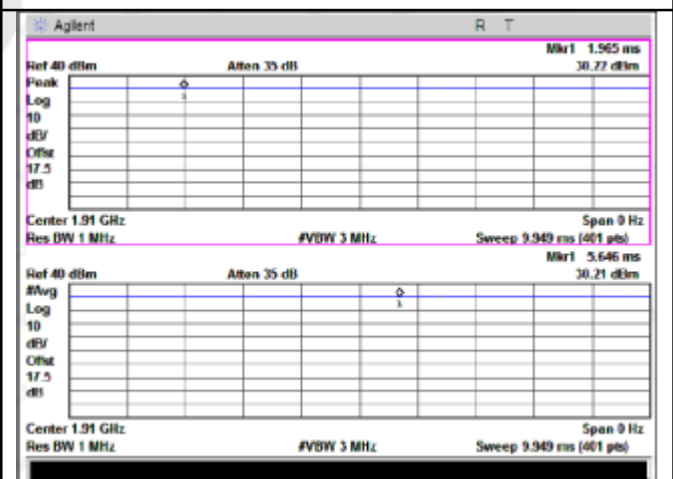
PCS 1900 BW - High CH 1909.8MHz



PCS 1900 BW - Low CH 1850.2MHz



PCS 1900 BW - Mid CH 1880MHz



PCS 1900 BW - High CH 1909.8MHz

6. Occupied Bandwidth

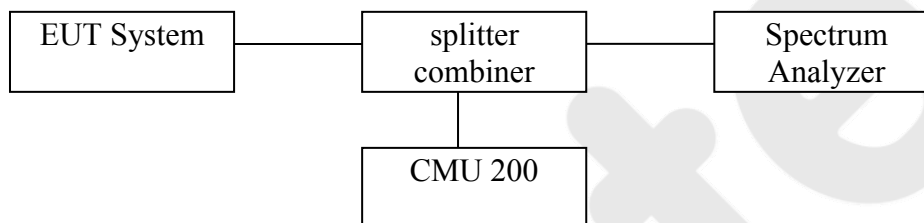
6.1 Applicable Standard

According to FCC PART 2.1049, PART 22.917, PART 22.905, PART 24.238; 99% Occupied Bandwidth (kHz)

6.2 Test Procedure

The EUT was connected to Spectrum Analyzer and Base Station via power divider.
The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.

6.3 Test Setup



6.4 Test Equipment

Same as the equipment listed in section 4.4.

6.5 Test Results

Pass

Test Data as following

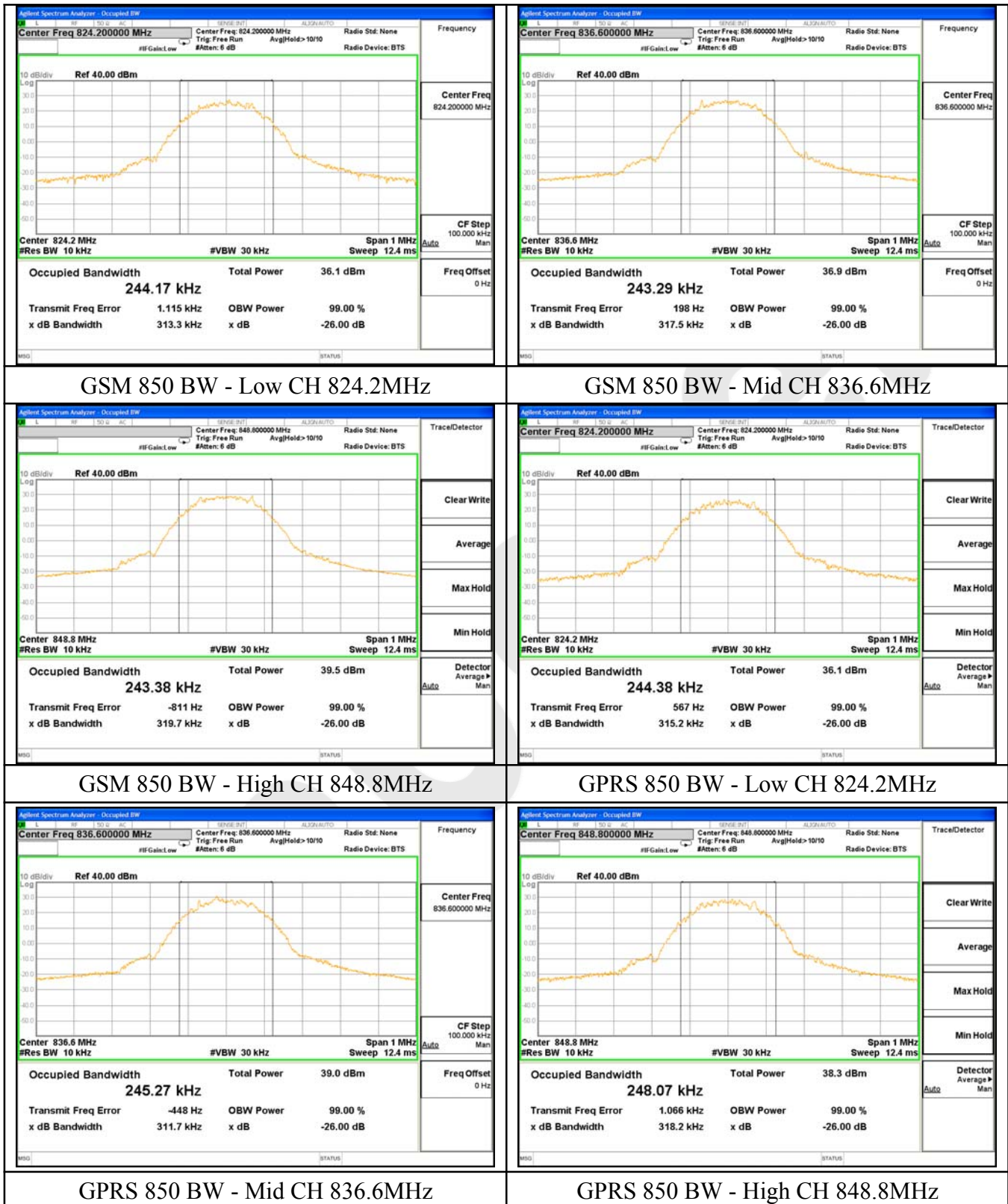
Cellular Band (Part 22H) Result

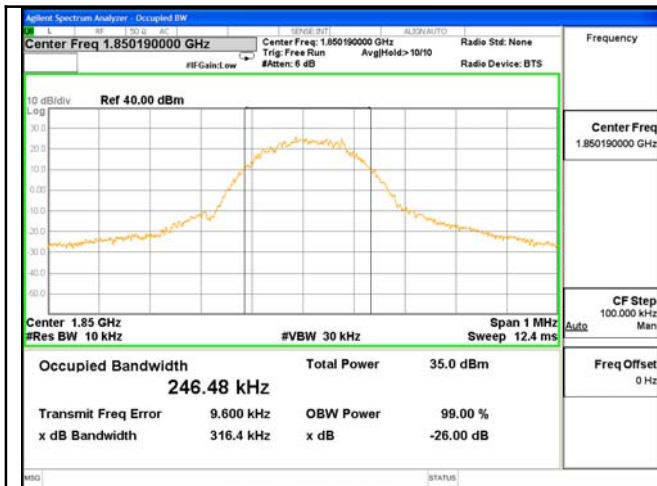
| GSM | | | |
|---------|-----------------|------------------------------|-----------------------|
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Bandwidth (kHz) |
| 128 | 824.2 | 244.17 | 313.3 |
| 190 | 836.6 | 243.29 | 317.5 |
| 251 | 848.8 | 243.38 | 319.7 |
| GPRS | | | |
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Bandwidth (kHz) |
| 128 | 824.2 | 244.38 | 315.2 |
| 190 | 836.6 | 245.27 | 317.7 |
| 251 | 848.8 | 248.07 | 318.2 |

PCS Band (Part 24E) Result

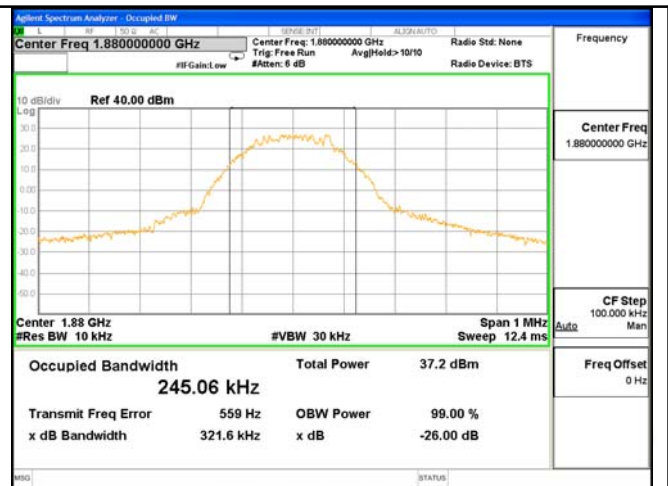
| GSM | | | |
|-------------|-----------------|------------------------------|-----------------------|
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Bandwidth (kHz) |
| 512 | 1850.2 | 246.48 | 316.4 |
| 661 | 1880.0 | 245.06 | 321.6 |
| 810 | 1909.8 | 248.85 | 319.3 |
| GPRS | | | |
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Bandwidth (kHz) |
| 512 | 1850.2 | 247.11 | 314.0 |
| 661 | 1880.0 | 246.89 | 317.4 |
| 810 | 1909.8 | 243.50 | 315.2 |

Test Plots

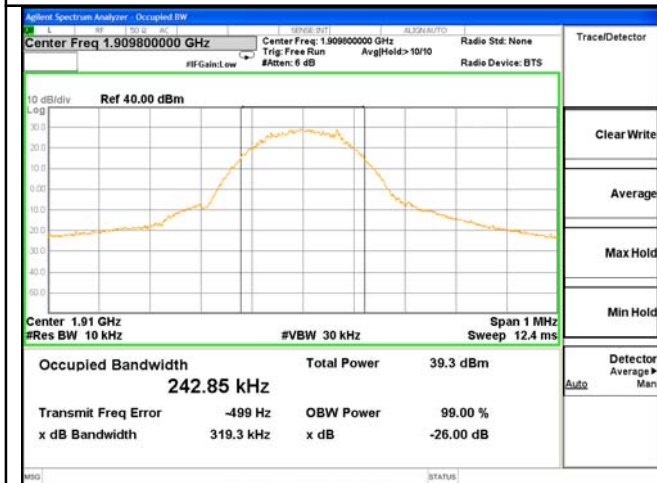




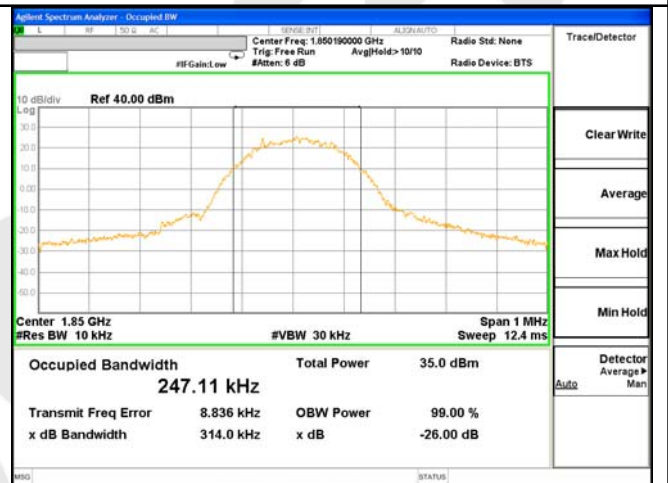
PCS 1900 BW - Low CH 1850.2MHz



PCS 1900 BW - Mid CH 1880MHz



PCS 1900 BW - High CH 1909.8MHz



GPRS 1900 BW - Low CH 1850.2MHz



GPRS 1900 BW - Mid CH 1880MHz



GPRS 1900 BW - High CH 1909.8MHz

7. Spurious Emissions at Antenna Terminals

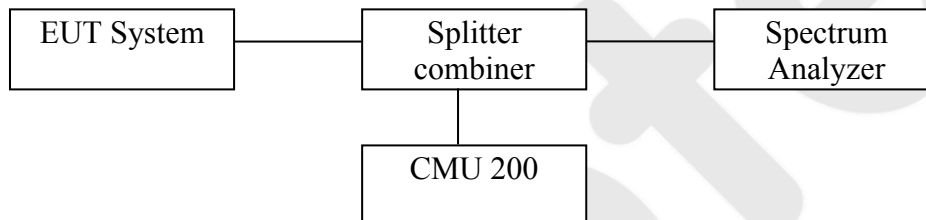
7.1 Applicable Standard

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

7.2 Test Procedure

The EUT was connected to Spectrum Analyzer and Base Station via power divider.
The Band Edges of low and high channels for the highest RF powers were measured.
Setting RBW as roughly BW/100.

7.3 Test Setup



7.4 Test Equipment

Same as the equipment listed in section 4.4.

7.5 Test Results

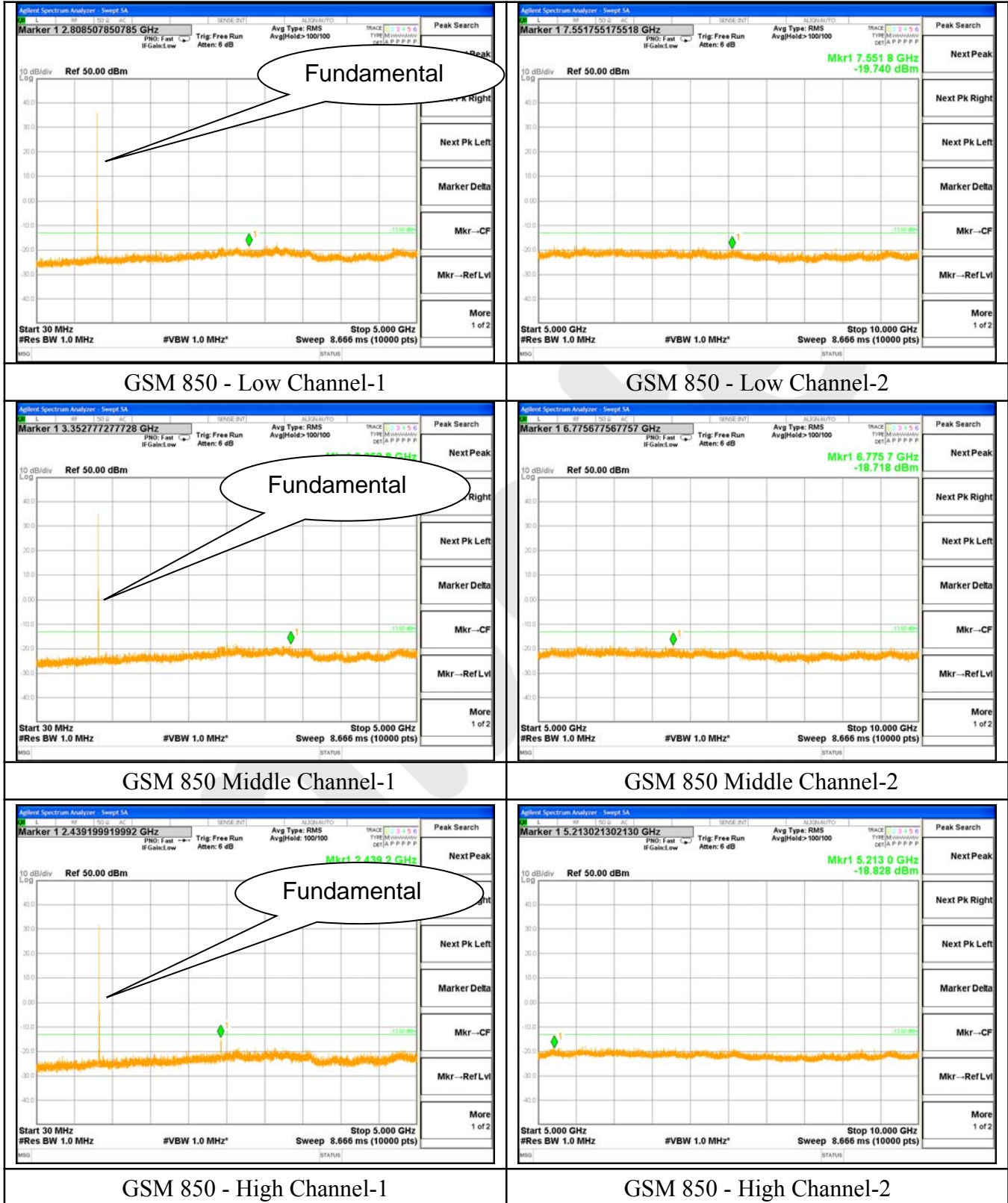
Pass

Test Data as following:

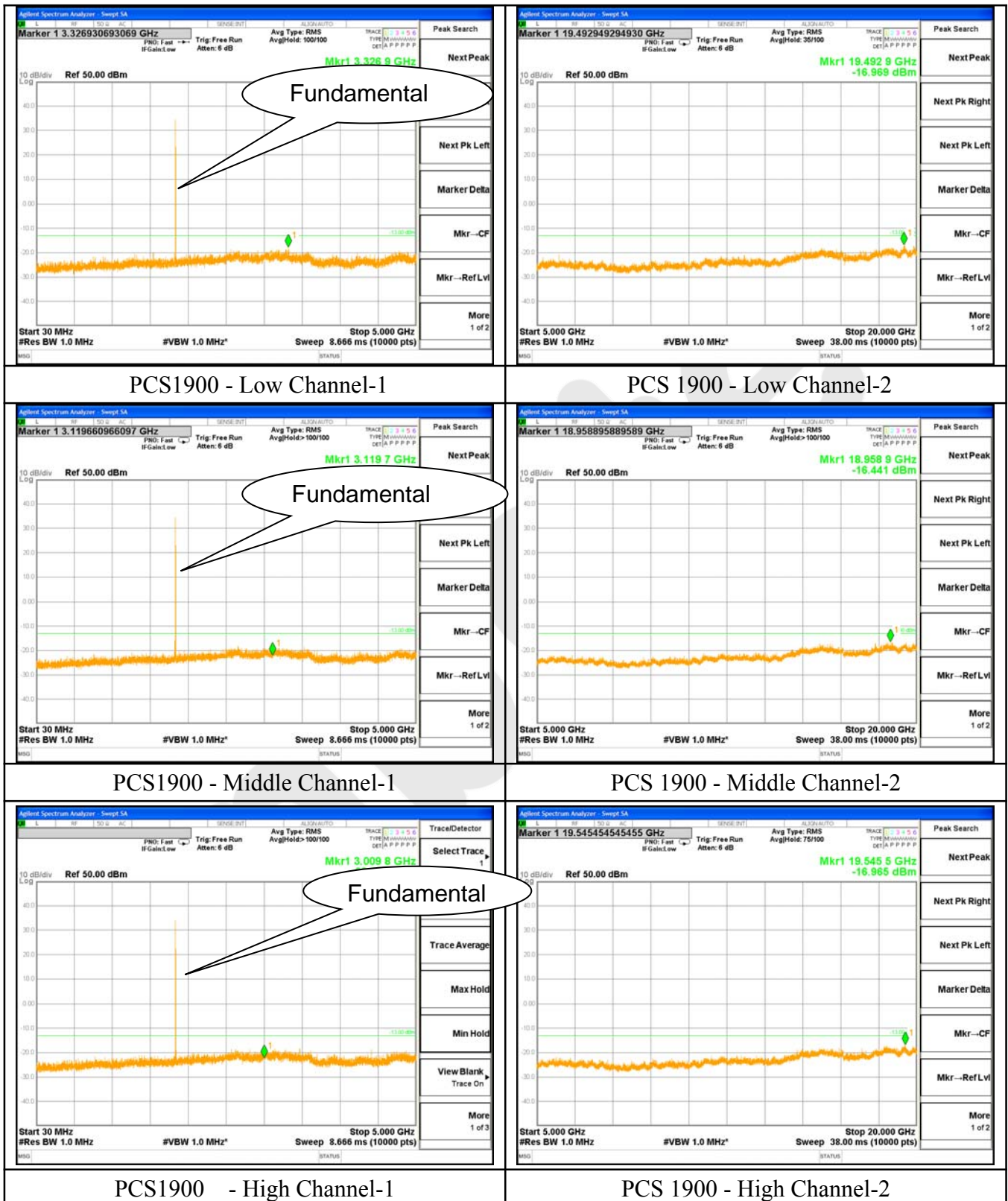
The EUT was tested on (GSM Mode, GPRS Mode) modes, only the worst data of (GSM Mode) is attached in the following pages.

Test Plots

Cellular Band (Part 22H) Result



PCS Band (Part24E) Result



8. Spurious Radiated Emissions

8.1 Definition and Requirement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

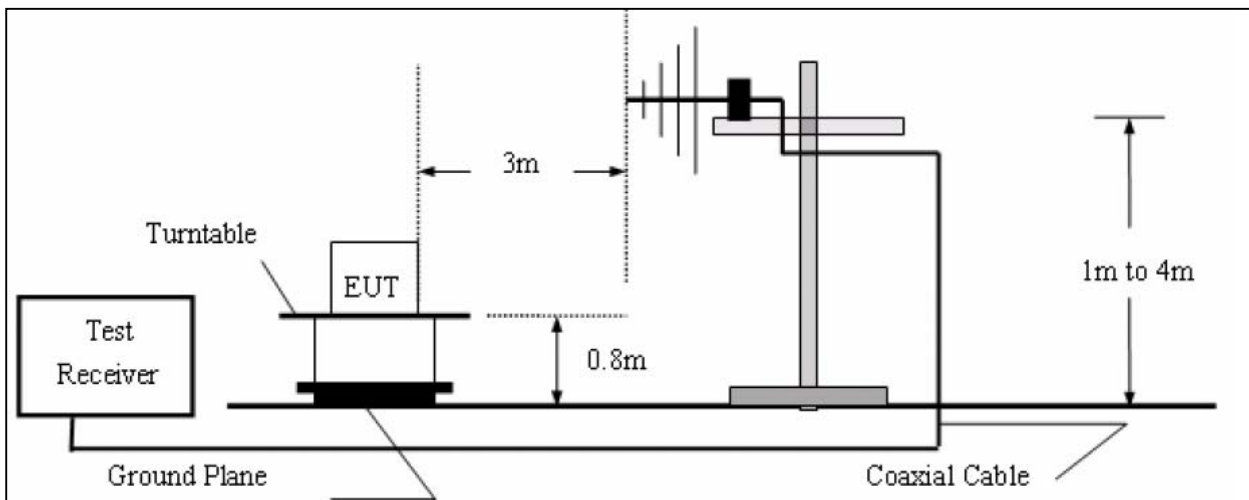
8.2 Test setup

1. The transmitter was placed on a wooden turntable, and it was transmitting into a nonradiating load which was also placed on the turntable.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

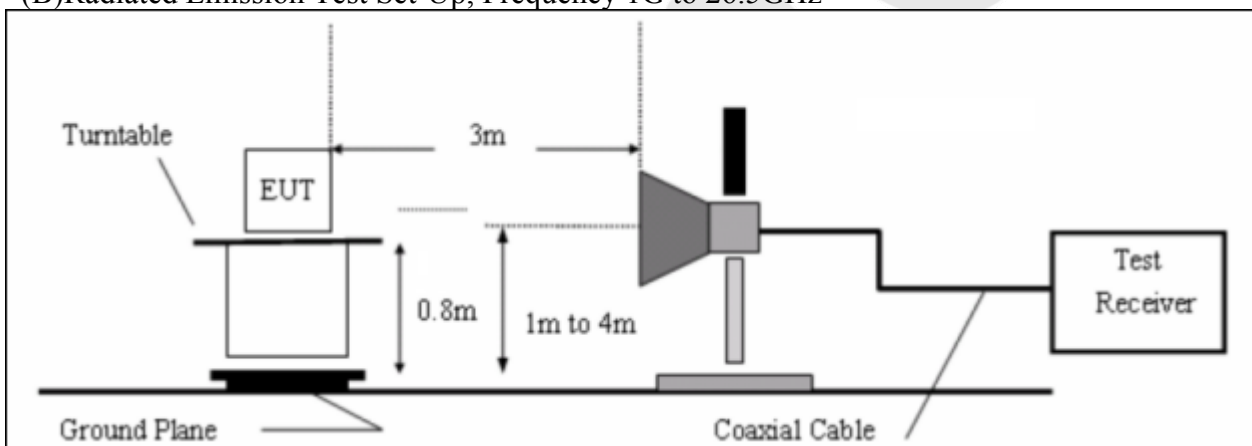
Sample Calculation:

EUT Field Strength = Raw Amplitude (dB μ V/m) - Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)

(A) Radiated Emission Test Set-Up, Frequency 30-1000MHz



(B) Radiated Emission Test Set-Up, Frequency 1G to 26.5GHz



8.3 Test Equipment

Same as the equipment listed in section 4.4.

8.4 Test Results

Pass.

Test Data as following:

The EUT was tested on (GSM Mode, GPRS Mode) modes, only the worst data of (GSM Mode) is attached in the following pages.

Cellular Band (Part 22H) Result

Low channel

| Frequency (MHz) | Substituted level(dBm) | Polarity (H/V) | AntennaGain Correction (dB) | Cable Loss(dB) | Corrected Reading (dBm) | Limit(dBm) | Margin (dB) |
|-----------------|------------------------|----------------|-----------------------------|----------------|-------------------------|------------|-------------|
| 1648.4 | -41.39 | V | 7.95 | 0.78 | -34.22 | -13 | -21.22 |
| 1648.4 | -36.08 | H | 7.95 | 0.78 | -28.91 | -13 | -15.91 |
| 318.843 | -46.34 | V | 6.5 | 0.3 | -40.14 | -13 | -27.14 |
| 755.929 | -48.25 | H | 6.8 | 0.41 | -41.86 | -13 | -28.86 |

Middle channel

| Frequency (MHz) | Substituted level(dBm) | Polarity (H/V) | AntennaGain Correction (dB) | Cable Loss (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|------------------------|----------------|-----------------------------|-----------------|-------------------------|-------------|-------------|
| 1673.2 | -46.95 | V | 7.95 | 0.78 | -39.78 | -13 | -26.78 |
| 1673.2 | -37.26 | H | 7.95 | 0.78 | -30.09 | -13 | -17.09 |
| 317.288 | -54.63 | V | 6.5 | 0.3 | -48.43 | -13 | -35.43 |
| 706.168 | -46.57 | H | 6.8 | 0.41 | -40.18 | -13 | -27.18 |

High channel

| Frequency (MHz) | Substituted level(dBm) | Polarity (H/V) | AntennaGain Correction (dB) | Cable Loss (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|------------------------|----------------|-----------------------------|-----------------|-------------------------|-------------|-------------|
| 1697.6 | -45.56 | V | 7.95 | 0.78 | -38.39 | -13 | -25.39 |
| 1697.6 | -37.82 | H | 7.95 | 0.78 | -30.65 | -13 | -17.65 |
| 376.856 | -46.92 | V | 6.5 | 0.3 | -40.72 | -13 | -27.72 |
| 752.281 | -51.94 | H | 6.8 | 0.41 | -45.55 | -13 | -32.55 |

Cellular Band (Part 24E)

Low channel

| Frequency (MHz) | Substituted level(dBm) | Polarity(H/V) | AntennaGain Correction (dB) | Cable Loss (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|------------------------|---------------|-----------------------------|-----------------|-------------------------|-------------|-------------|
| 3704.8 | -49.87 | V | 7.95 | 0.78 | -42.70 | -13 | -29.70 |
| 3704.8 | -39.54 | H | 7.95 | 0.78 | -32.37 | -13 | -19.37 |
| 343.621 | -51.97 | V | 6.5 | 0.3 | -45.77 | -13 | -32.77 |
| 725.852 | -46.49 | H | 6.8 | 0.41 | -40.10 | -13 | -27.10 |

Middle channel

| Frequency (MHz) | Substituted level(dBm) | Polarity(H/V) | AntennaGain Correction (dB) | Cable Loss (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|------------------------|---------------|-----------------------------|-----------------|-------------------------|-------------|-------------|
| 3760 | -39.37 | V | 7.95 | 0.78 | -32.20 | -13 | -19.20 |
| 3760 | -40.51 | H | 7.95 | 0.78 | -33.34 | -13 | -20.34 |
| 285.488 | -52.90 | V | 6.5 | 0.3 | -46.70 | -13 | -33.70 |
| 652.351 | -52.31 | H | 6.8 | 0.41 | -45.92 | -13 | -32.92 |

High channel

| Frequency (MHz) | Substituted level(dBm) | Polarity (H/V) | AntennaGain Correction (dB) | Cable Loss (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|------------------------|----------------|-----------------------------|-----------------|-------------------------|-------------|-------------|
| 3815.2 | -42.29 | V | 7.95 | 0.78 | -35.12 | -13 | -22.12 |
| 3815.2 | -35.24 | H | 7.95 | 0.78 | -28.07 | -13 | -15.07 |
| 422.015 | -50.67 | V | 6.5 | 0.3 | -44.47 | -13 | -31.47 |
| 613.827 | -45.26 | H | 6.8 | 0.41 | -38.87 | -13 | -25.87 |

9. Band Edge

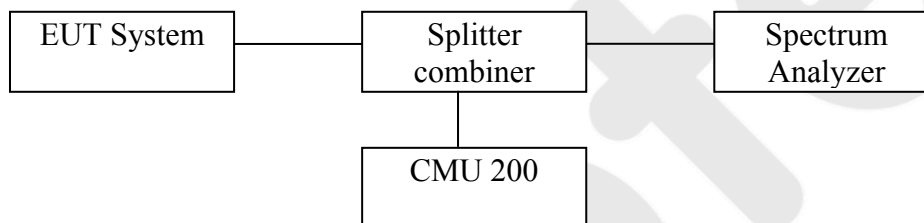
9.1 Standard Application

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

9.2 Test Procedure

The EUT was connected to Spectrum Analyzer and Base Station via power divider.
The Band Edges of low and high channels for the highest RF powers were measured.
Setting RBW as roughly BW/100.

9.3 Test Setup



9.4 Test Equipment

Same as the equipment listed in section 4.4.

9.5 Test Results

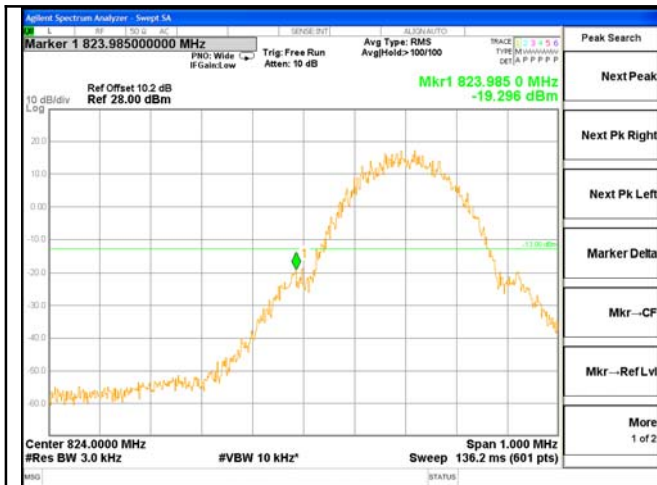
Pass

Test Data as following:

Cellular Band (Part 22H) Result

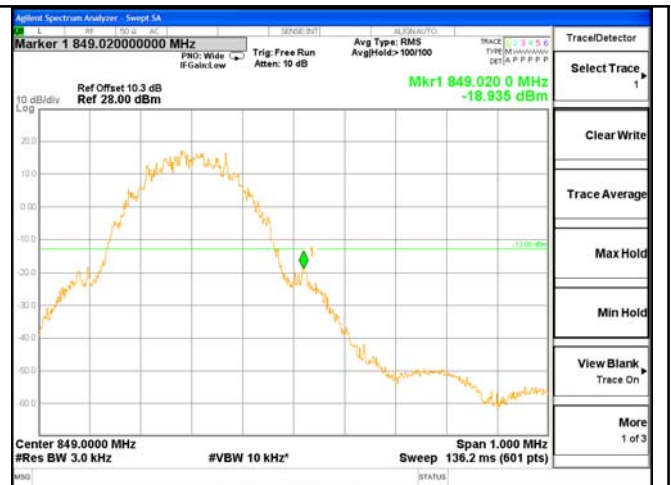
| GSM 850 | | |
|-----------------|----------------|-------------|
| Frequency (MHz) | Emission (dBm) | Limit (dBm) |
| 823.9850 | -19.296 | -13 |
| 849.0200 | -18.935 | -13 |
| GPRS 850 | | |
| Frequency (MHz) | Emission (dBm) | Limit (dBm) |
| 823.9767 | -18.866 | -13 |
| 849.0167 | -19.716 | -13 |

Test Plots



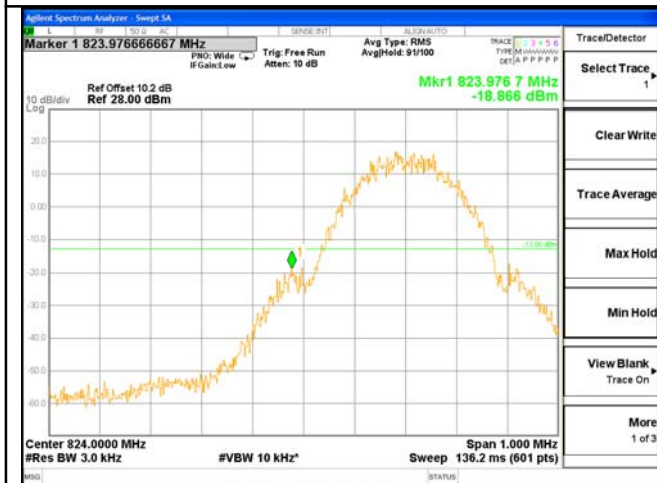
GSM 850 - Low Channel

Note: Offset=Cable loss (10.0) + 10log
(3.18/3)=10.0+0.3=10.3 dB



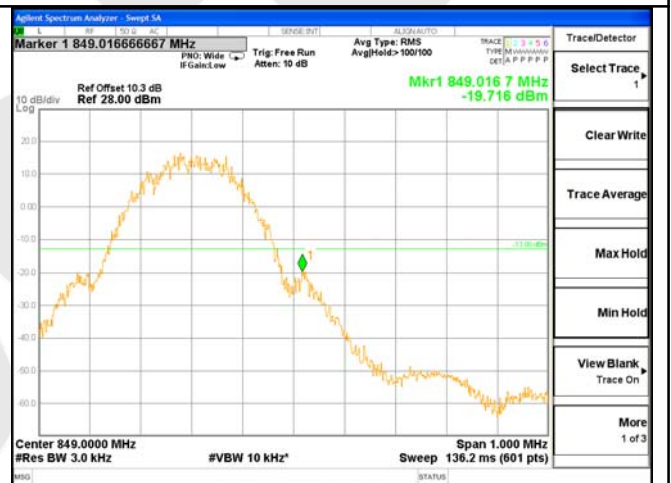
GSM 850 - High Channel

Note: Offset=Cable loss (10.0) + 10log
(3.18/3)=10.0+0.3=10.3 dB



GPRS 850 - Low Channel

Note: Offset=Cable loss (10.0) + 10log
(3.18/3)=10.0+0.3=10.3 dB



GPRS 850 - High Channel

Note: Offset=Cable loss (10.0) + 10log
(3.13/3)=10.0+0.2=10.2 dB

PCS Band (Part24E) Result

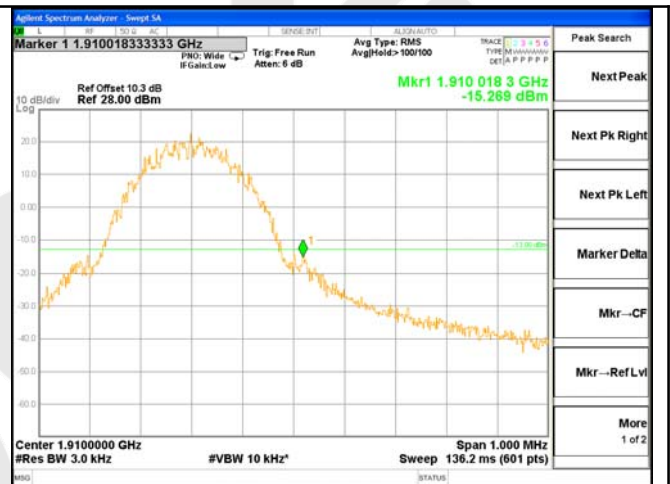
| PCS 1900 | | |
|-----------------|----------------|-------------|
| Frequency (MHz) | Emission (dBm) | Limit (dBm) |
| 1849.9800 | -16.909 | -13 |
| 1910.1830 | -15.269 | -13 |
| GPRS 1900 | | |
| Frequency (MHz) | Emission (dBm) | Limit (dBm) |
| 1849.9983 | -15.579 | -13 |
| 1910.0217 | -15.856 | -13 |

Test Plots



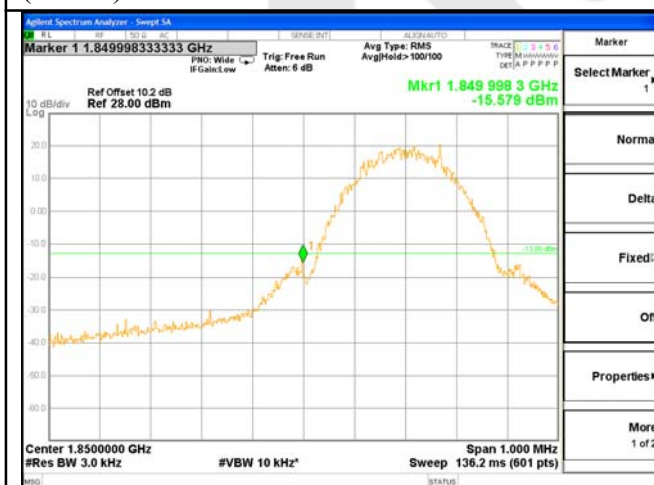
PCS 1900 - Low Channel

Note: Offset=Cable loss (10.0) + 10log
(3.16/3)=10.0+0.2=10.2 dB



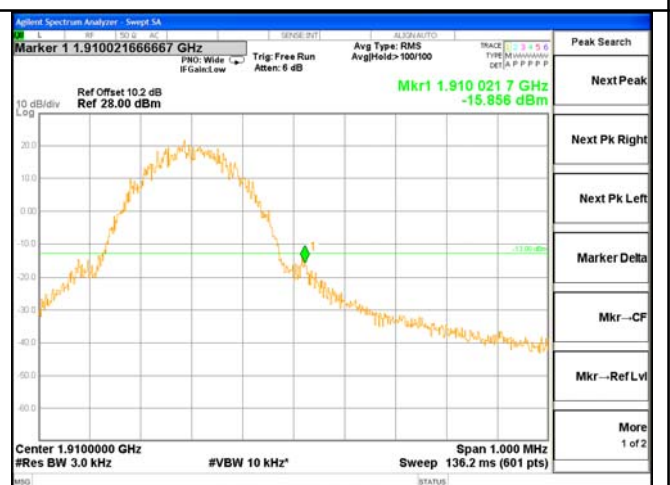
PCS 1900 - High Channel

Note: Offset=Cable loss (10.0) + 10log
(3.19/3)=10.0+0.3=10.3 dB



GPRS 1900 - Low Channel

Note: Offset=Cable loss (10.0) + 10log
(3.14/3)=10.0+0.2=10.2 dB



GPRS 1900 - High Channel

Note: Offset=Cable loss (10.0) + 10log
(3.15/3)=10.0+0.2=10.2 dB

10. Frequency Stability

10.1 Standard Application

According to FCC PART 22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

According to FCC PART 24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.

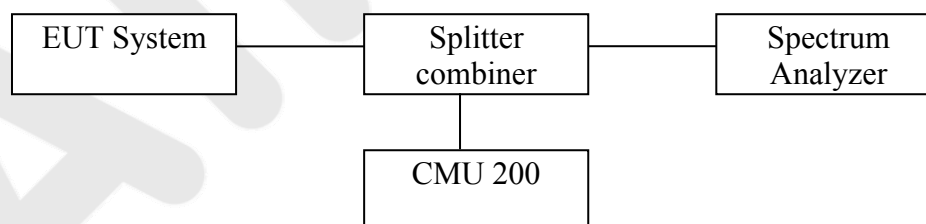
| Frequency Range (MHz) | Base, fixed (ppm) | Mobile ≤ 3 watts (ppm) | Mobile ≤ 3 watts (ppm) |
|-----------------------|-------------------|------------------------|------------------------|
| 25 to 50 | 20.0 | 20.0 | 50.0 |
| 50 to 450 | 5.0 | 5.0 | 50.0 |
| 450 to 512 | 2.5 | 5.0 | 5.0 |
| 821 to 896 | 1.5 | 2.5 | 2.5 |
| 928 to 929 | 5.0 | N/A | N/A |
| 929 to 960 | 1.5 | N/A | N/A |
| 2110 to 2220 | 10.0 | N/A | N/A |

10.2 Test Procedure

A communication link was established between EUT and base station. The frequency error was monitored and measured by base station under variation of ambient temperature and variation of primary supply voltage.

Limit: The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

10.3 Test Setup



10.4 Test Equipment

Same as the equipment listed in section 4.4

10.5 Test Results

Pass. Test Data as following:

Cellular Band (Part 22H) Result

| GSM 850 | | | | |
|--------------------------------|----------------------|----------------------|-----------------------|-------------|
| Middle Channel, fo = 836.6 MHz | | | | |
| Temperature(°C) | Power Supplied (Vdc) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -10 | 3.7 | 16 | 0.019 | 2.5 |
| 0 | | 25 | 0.030 | 2.5 |
| 10 | | 14 | 0.017 | 2.5 |
| 20 | | 12 | 0.014 | 2.5 |
| 30 | | 11 | 0.013 | 2.5 |
| 40 | | 25 | 0.030 | 2.5 |
| 50 | | 23 | 0.027 | 2.5 |
| 55 | | 14 | 0.017 | 2.5 |
| 25 | 4.2 | 19 | 0.023 | 2.5 |
| | 3.5 | 13 | 0.016 | 2.5 |

| GPRS 850 | | | | |
|--------------------------------|----------------------|----------------------|-----------------------|-------------|
| Middle Channel, fo = 836.6 MHz | | | | |
| Temperature(°C) | Power Supplied (Vdc) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -10 | 3.7 | 24 | 0.029 | 2.5 |
| 0 | | 21 | 0.025 | 2.5 |
| 10 | | 15 | 0.018 | 2.5 |
| 20 | | 8 | 0.010 | 2.5 |
| 30 | | 14 | 0.017 | 2.5 |
| 40 | | 13 | 0.016 | 2.5 |
| 50 | | 17 | 0.020 | 2.5 |
| 55 | | 16 | 0.019 | 2.5 |
| 25 | 4.2 | 22 | 0.026 | 2.5 |
| | 3.5 | 27 | 0.032 | 2.5 |

PCS Band (Part 24E) Result

| PCS 1900 | | | | |
|------------------------------|----------------------|----------------------|-----------------------|-------------|
| Middle Channel, fo =1880 MHz | | | | |
| Temperature(°C) | Power Supplied (Vdc) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -10 | 3.7 | 32 | 0.017 | 2.5 |
| 0 | | 24 | 0.013 | 2.5 |
| 10 | | 33 | 0.018 | 2.5 |
| 20 | | 25 | 0.013 | 2.5 |
| 30 | | 16 | 0.009 | 2.5 |
| 40 | | 35 | 0.019 | 2.5 |
| 50 | | 19 | 0.010 | 2.5 |
| 55 | | 24 | 0.013 | 2.5 |
| 25 | 4.2 | 27 | 0.014 | 2.5 |
| | 3.5 | 36 | 0.019 | 2.5 |

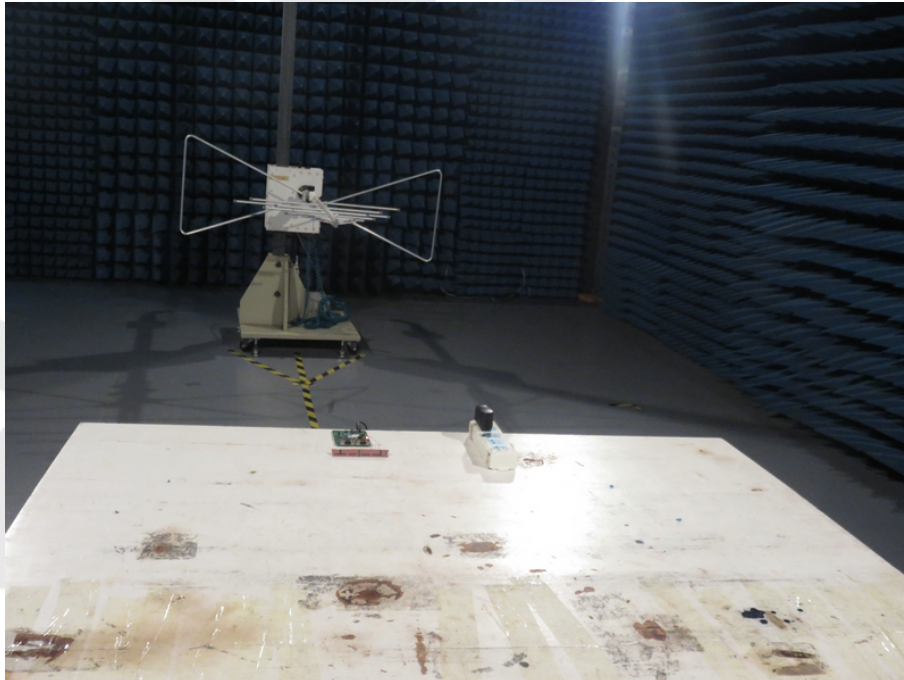
| GPRS 1900 | | | | |
|------------------------------|----------------------|----------------------|-----------------------|-------------|
| Middle Channel, fo =1880 MHz | | | | |
| Temperature(°C) | Power Supplied (Vdc) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| -10 | 3.7 | 35 | 0.019 | 2.5 |
| 0 | | 33 | 0.018 | 2.5 |
| 10 | | 39 | 0.021 | 2.5 |
| 20 | | 12 | 0.006 | 2.5 |
| 30 | | 17 | 0.009 | 2.5 |
| 40 | | 26 | 0.014 | 2.5 |
| 50 | | 34 | 0.018 | 2.5 |
| 55 | | 23 | 0.012 | 2.5 |
| 25 | 4.2 | 27 | 0.014 | 2.5 |
| | 3.5 | 29 | 0.015 | 2.5 |

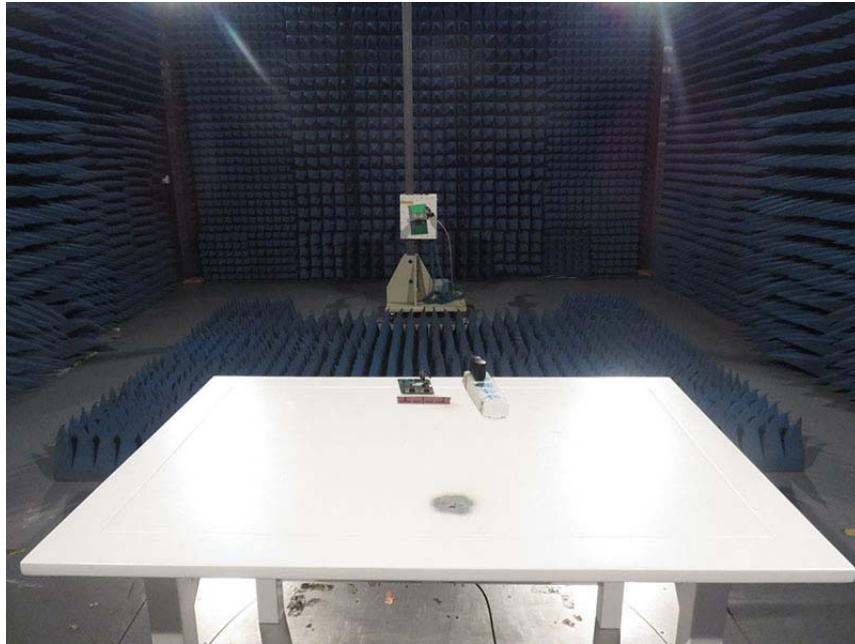
APPENDIX I (TEST PHOTOGRAPHS)

Photo of Conducted Emission Test



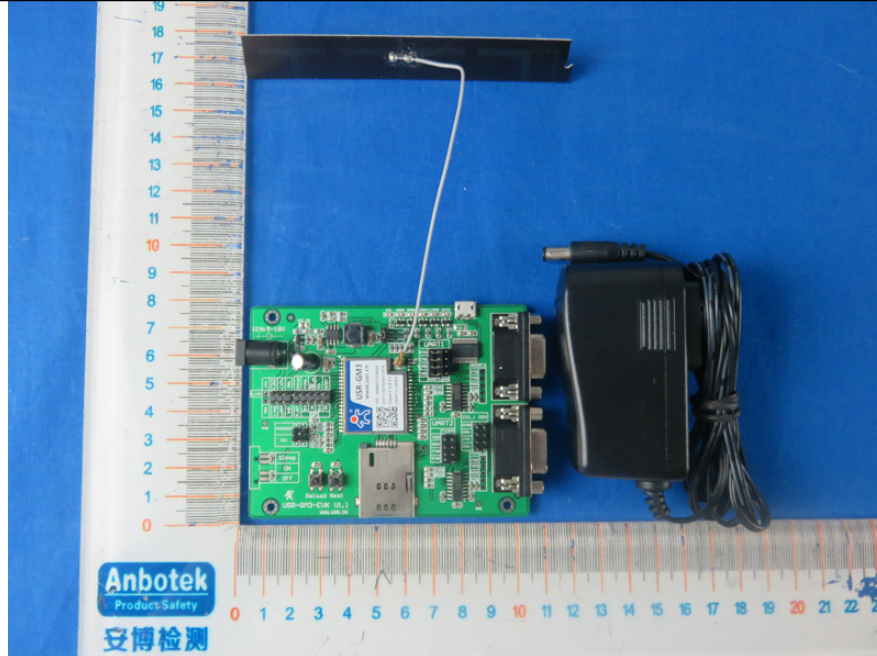
Photo of Radiated Emission Test



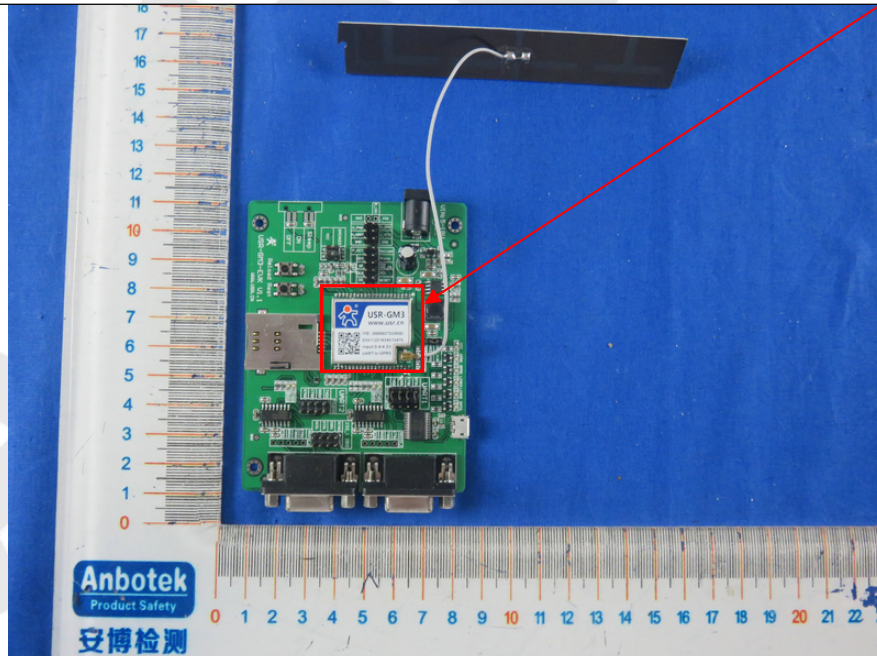


APPENDIX II (EXTERNAL PHOTOS)

1. Figure
The EUT-Overall View

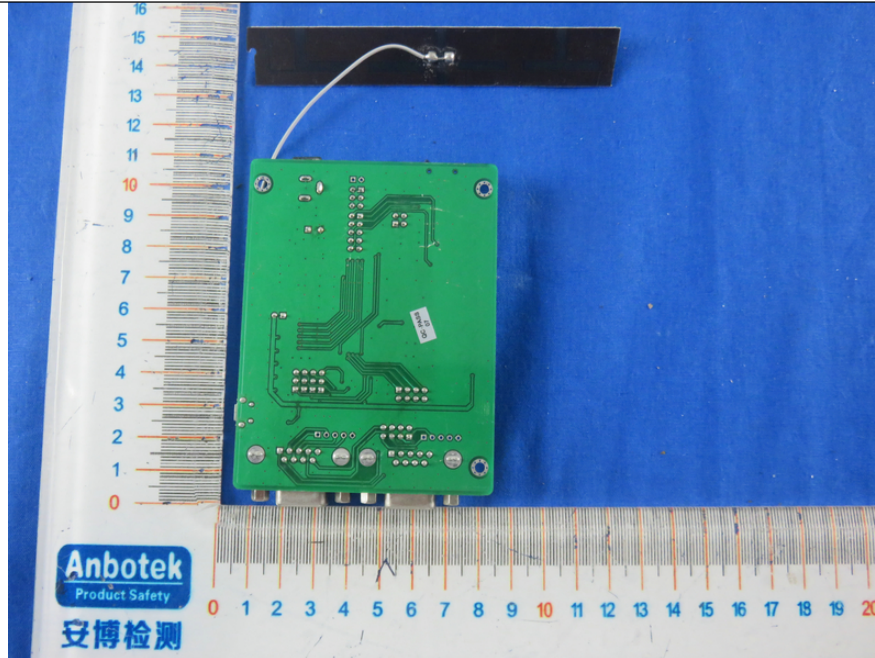


2. Figure
The EUT-Front View

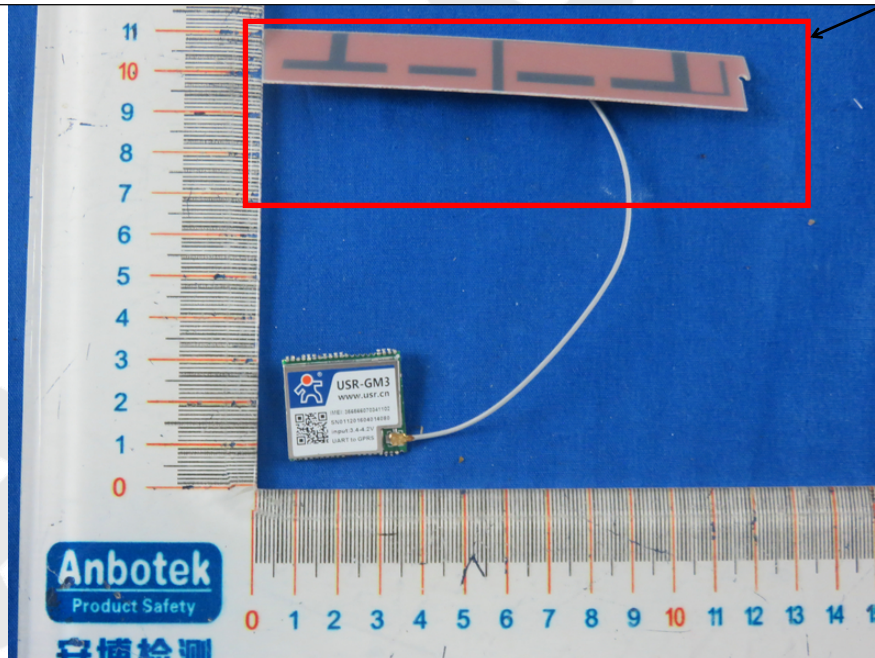


EUT is placed
on the host

3. Figure
The EUT-Back View



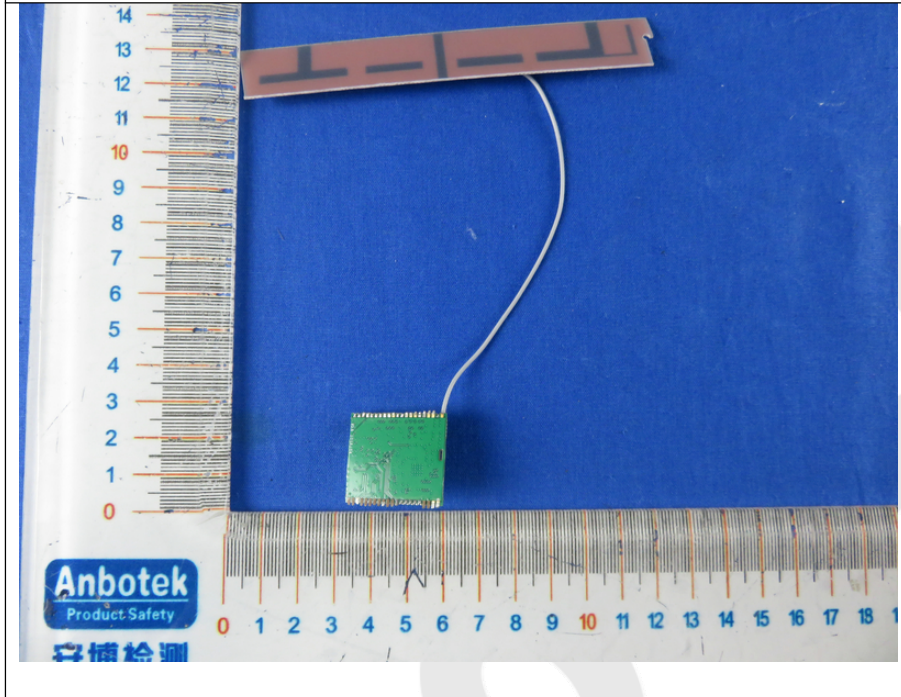
4. Figure
The EUT-Front View



Antenna

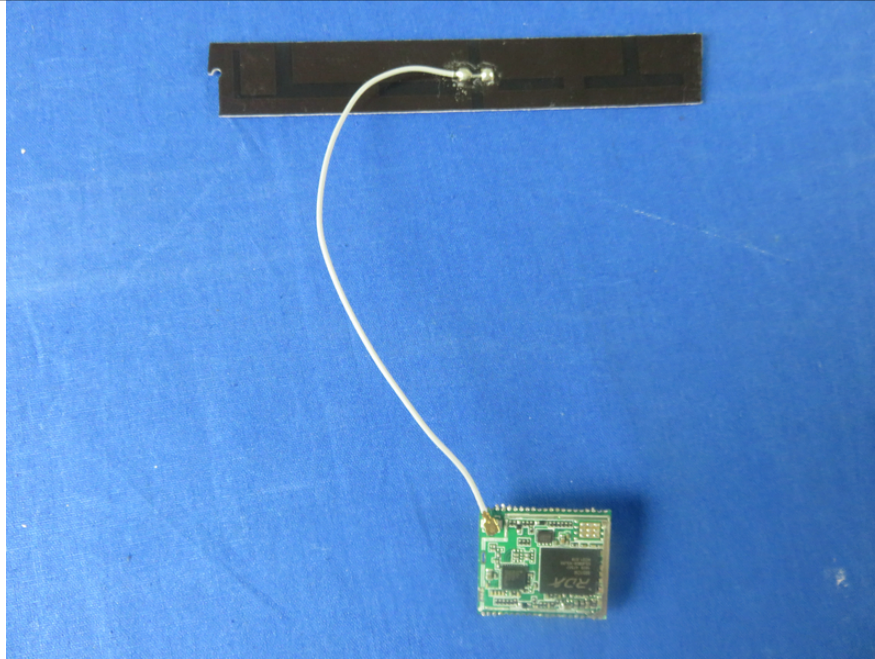
5. Figure

The EUT-Back View



APPENDIX III (INTERNAL PHOTOS)

1. Figure
The EUT-Inside View



2. Figure
The EUT-Inside View

