

Radio Test Report

Equipment : Rugged Tablet Computer
Brand Name : AAEON
Model No. : xRTC-700Bx (x - Where x may be any combination of alphanumeric characters or "-" or blank.)
FCC ID : OHBRTC700BWBGH
Standard : 47 CFR FCC Part 22(H), 24(E)
WCDMA Band : II, V
FCC Classification : PCB
Applicant / Manufacturer : AAEON Technology Inc.
5F, No. 135, Lane 235, Pao Chiao Rd., Taipei, Taiwan

The product sample received on Jul. 29, 2016 and completely tested on Aug. 30, 2016. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI/TIA-603-D-2010, ANSI C63.4 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Kevin Liang / Assistant Manager



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Summary of Test Result

| Test Specifications | | | | | |
|---------------------|--|---|--|---|----------|
| Report Clause | FCC Std. Clause | Description | Measured | Limit | Result |
| 3.1 | 2.1049 22.917(a) 24.238(a) 27.53(h) | Emission Bandwidth | Bandwidth F9W=4.2065MHz | Information for Emission Designator | Complied |
| 3.1.6 | 2.1047 | Emission Designator | F9W | Information only | Complied |
| 3.2 | 2.1046 | Transmitter Conducted Output Power | Conducted Power [dBm] Cellular: 22.84 PCS: 23.44 | Information for RF exposure | Complied |
| 3.2.7 | 24.232(d) 27.50(d) | Peak to Average Ratio | 3.48dB | ≤13dB | Complied |
| 3.3 | 22.913(a) | Effective Radiated Power (ERP) | ERP [dBm] Cellular:14.48 | ≤7W[38.45dBm] | Complied |
| 3.4 | 24.232(c) 27.50(d) | Effective Isotropic Radiated Power (EIRP) | EIRP [dBm] PCS: 23.63 | PCS: ≤2W[33.01dBm] AWS: ≤1W[30.00dBm] | Complied |
| 3.5 | 2.1051 22.917(a) 24.238(a) 27.53(h) | Transmitter Conducted Unwanted Emissions | refer to test data | ≤43+10log(P) [-13dBm] P=TX Power in Watts | Complied |
| 3.6 | 2.1051 22.917(a) 24.238(a) 27.53(h) | Transmitter Conducted Bandedge Emissions | refer to test data | ≤43+10log(P) [-13dBm] P=TX Power in Watts | Complied |
| 3.7 | 2.1053 22.917(a) 24.238(a) 27.53(h) | Transmitter Radiated Unwanted Emissions | [dBm]: 800.180MHz 42.72 (Margin 3.28dB) | ≤43+10log(P) [-13dBm] P=TX Power in Watts | Complied |
| 3.8 | 2.1055 22.355 24.353 27.54 | Frequency Stability | Cellular: 0.0209ppm PCS: 0.0172ppm | ≤ ± 2.5ppm within band | Complied |

Revision History

[illegible]

1 General Description

1.1.1 RF General Information

| Function | Class/Category | |
|---|----------------|----|
| <input checked="" type="checkbox"/> HSDPA | Category | 10 |
| <input checked="" type="checkbox"/> HSUPA | Category | 6 |

| RF General Information | | | | | | | |
|--|-----------|--------------------|----------------|----------|---------------------|---------------|--------|
| Freq. Band | Mode | TX Ch. Freq. (MHz) | Channel Number | BW (MHz) | Emission Designator | Max. ERP/EIRP | |
| | | | | | | (dBm) | (W) |
| Cellular | WCDMA850 | 826.4-846.6 | 4132-4233 | 5 | 4M17F9W | 14.48 | 0.0281 |
| PCS | WCDMA1900 | 1852.4-1907.6 | 9262-9538 | 5 | 4M21F9W | 23.63 | 0.2307 |
| Note 1: WCDMA Rel.99 mode consists of QPSK modulation and HSDPA Rel. 5 mode consists of QPSK and 16QAM modulation. | | | | | | | |
| Note 2: WCDMA850 (WCDMA Band V), WCDMA1900 (WCDMA Band II) | | | | | | | |

1.1.2 Antenna Information

| Antenna Category | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Integral antenna (antenna permanently attached) |
| <input checked="" type="checkbox"/> | Temporary RF connector provided |
| <input type="checkbox"/> | No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path. |

| Antenna General Information | | | | |
|-----------------------------|-----------|-----------|-----------|------------|
| Operating Band | Ant. Cat. | Ant. Type | Connector | Gain (dBi) |
| Band V | Integral | PIFA | I-pex | -6.21 |
| Band II | Integral | PIFA | I-pex | 0.19 |

1.1.3 Type of EUT

| Identify EUT | |
|-------------------------------------|---|
| Presentation of Equipment | <input checked="" type="checkbox"/> Production ; <input type="checkbox"/> Pre-Production ; <input type="checkbox"/> Prototype |
| Type of EUT | |
| <input checked="" type="checkbox"/> | Stand-alone |
| <input type="checkbox"/> | Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: ... |
| <input type="checkbox"/> | Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: ... |
| <input type="checkbox"/> | Other: |

1.1.4 EUT Operational Condition

| | | | |
|--------------------------|--|---|--|
| Supply Voltage | <input checked="" type="checkbox"/> AC mains | <input checked="" type="checkbox"/> DC | |
| Type of DC Source | <input type="checkbox"/> Internal DC supply | <input checked="" type="checkbox"/> External AC adapter | <input checked="" type="checkbox"/> Li-ion Battery |
| Test Voltage | <input checked="" type="checkbox"/> Vnom (7.4 V) | <input checked="" type="checkbox"/> Vmax (8.4 V) | <input checked="" type="checkbox"/> Vmin (6.0 V) |
| Test Climatic | <input checked="" type="checkbox"/> Tnom (20°C) | <input checked="" type="checkbox"/> Tmax (50°C) | <input checked="" type="checkbox"/> Tmin (-20°C) |

1.2 Accessories and Support Equipment

| Accessories | | | | |
|--------------|--------------|--|--------------|--------------|
| AC Adapter 1 | Brand Name | FSP | Model Name | FSP036-RBBN2 |
| | Power Rating | I/P:100-240Vac, 1.2A, O/P: 12Vdc, 3A | | |
| | Power Cord | 1.2 meter, non-shielded cable, with one ferrite core | | |
| Battery 1 | Brand Name | Getac | Model Name | RTC600S |
| | Vendor | 7.4 Vdc, 1530 mAh | Power Rating | Li-ion, 2S1P |
| Battery 2 | Brand Name | Getac | Model Name | RTC600H |
| | Vendor | 7.4 Vdc, 1530 mAh | Power Rating | Li-ion, 2S1P |
| LCD Panel | Brand Name | INNOLUX | Model Name | N070ICG-LD1 |

Reminder: Regarding to more detail and other information, please refer to user manual.

| Support Equipment | | | |
|-------------------|-----------|------------|------------|
| No. | Equipment | Brand Name | Model Name |
| 1 | SIM Card | Anritsu | - |

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ Part 22(H), 24(E)
- ♦ ANSI/TIA-603-D-2010
- ♦ KDB 971168 D01 v02r02
- ♦ KDB 412172 D01 v01r01

1.4 Testing Location Information

| Testing Location | | | | | | | | | |
|---|--------|---------------|---|---|-----|------------------|----------------|------------|--|
| <input checked="" type="checkbox"/> | HWA YA | ADD | : | No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. | | | | | |
| | | TEL | : | 886-3-327-3456 | FAX | : | 886-3-327-0973 | | |
| Test Site Registration Number: FCC 553509 | | | | | | | | | |
| Test Condition | | Test Site No. | | Test Engineer | | Test Environment | | Test Date | |
| RF Conducted | | TH01-HY | | Howard | | 25°C / 65% | | 30/08/2016 | |
| Radiated Emission | | 03CH03-HY | | Jeff | | 21.5°C / 58% | | 18/08/2016 | |

1.5 Measurement Uncertainty




ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

| Measurement Uncertainty | | |
|-------------------------------|---------------|-------------|
| Test Item | | Uncertainty |
| Emission bandwidth | | ±1.4 % |
| RF output power, conducted | | ±0.6 dB |
| Unwanted emissions, conducted | 30 – 1000 MHz | ±0.5 dB |
| | 1 – 18 GHz | ±0.6 dB |
| | 18 – 40 GHz | ±0.8 dB |
| | 40 – 200 GHz | N/A |
| All emissions, radiated | 30 – 1000 MHz | ±2.5 dB |
| | 1 – 18 GHz | ±3.5 dB |
| | 18 – 40 GHz | ±3.8 dB |
| | 40 – 200 GHz | N/A |
| Temperature | | ±0.8 °C |
| Humidity | | ±3 % |
| DC and low frequency voltages | | ±3 % |
| Time | | ±1.4 % |
| Duty Cycle | | ±1.4 % |

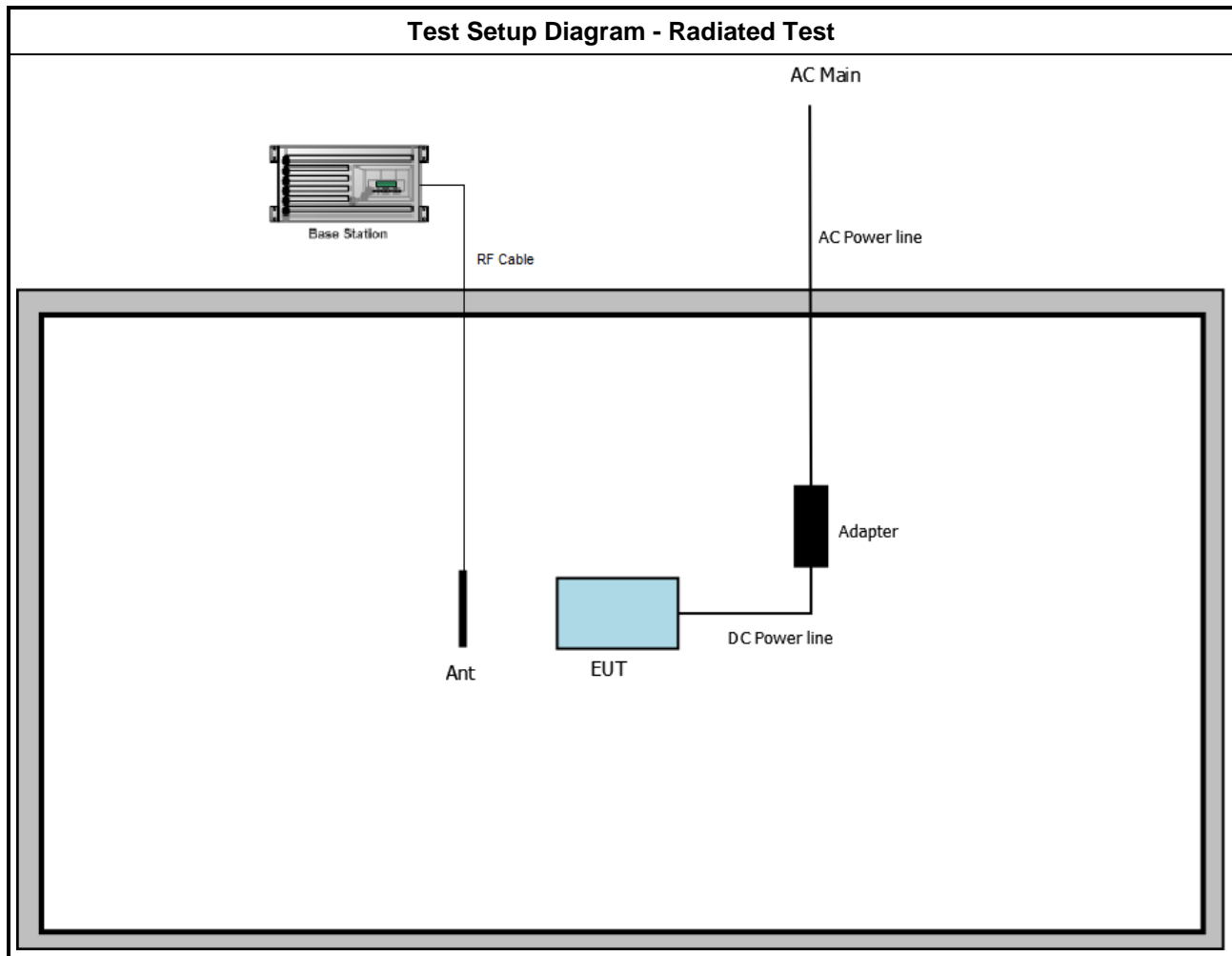
2 Test Configuration of EUT

2.1 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| Tests Item | Emission Bandwidth, Transmitter Conducted Output Power, Peak-Average Ratio, Transmitter Conducted Bandedge Emissions Transmitter Conducted Unwanted Emissions, Frequency Stability |
| Test Condition | Conducted measurement at transmit chains |
| Modulation Mode | WCDMA |

| The Worst Case Mode for Following Conformance Tests | | | |
|---|---|--|---|
| Tests Item | Effective Radiated Power (ERP) Effective Isotropic Radiated Power (EIRP) Transmitter Radiated Unwanted Emissions | | |
| Test Condition | Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. | | |
| Modulation Mode | WCDMA | | |
| User Position | <input type="checkbox"/> EUT will be placed in fixed position. | | |
| | <input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. | | |
| | <input checked="" type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. | | |
| Orthogonal Planes of EUT | X Plane | Y Plane | Z Plane |
| |  |  |  |
| Worst Planes of EUT | V | | |

2.2 Test Setup Diagram



3 Transmitter Test Result

3.1 Emission Bandwidth

3.1.1 Emission Bandwidth Limit

| Emission Bandwidth Limit |
|--|
| Information for Emission Designator. |
| Note 1: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the span. These measurements shall also be performed at normal test conditions. |

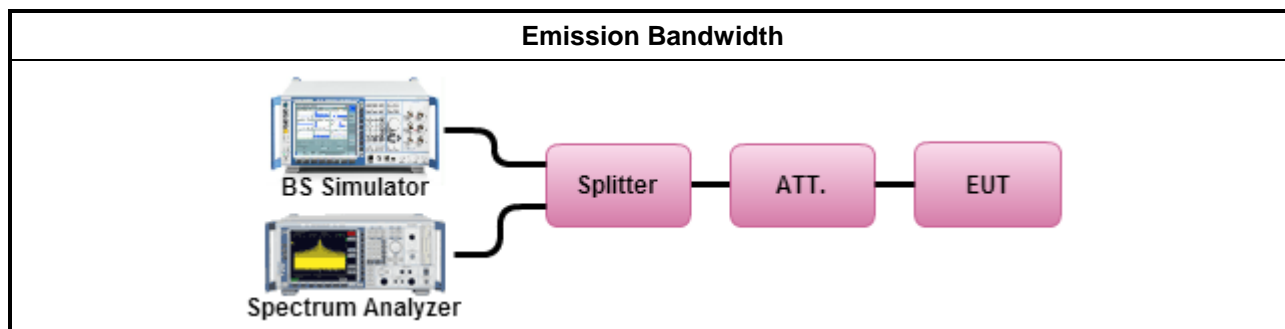
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

| Test Method |
|--|
| <input checked="" type="checkbox"/> For the emission bandwidth shall be measured using one of the options below: |
| <input checked="" type="checkbox"/> Refer as ANSI/TIA-603-D, clause 1.3.4.4 for test bandwidth. |
| <input checked="" type="checkbox"/> Refer as KDB 971168, clause 4 for signal bandwidth. |
| <input type="checkbox"/> Refer as IC RSS-Gen, clause 6.6 for emission bandwidth. |
| <input checked="" type="checkbox"/> For conducted measurement. |
| <input checked="" type="checkbox"/> If EUT supports single transmit chain and measurements performed on this transmit chain. |
| <input type="checkbox"/> If EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case. |
| <input type="checkbox"/> If EUT supports multiple transmit chains using options given below: |
| <input type="checkbox"/> Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1. |
| <input type="checkbox"/> Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains. |
| <input type="checkbox"/> For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level. |

3.1.4 Test Setup



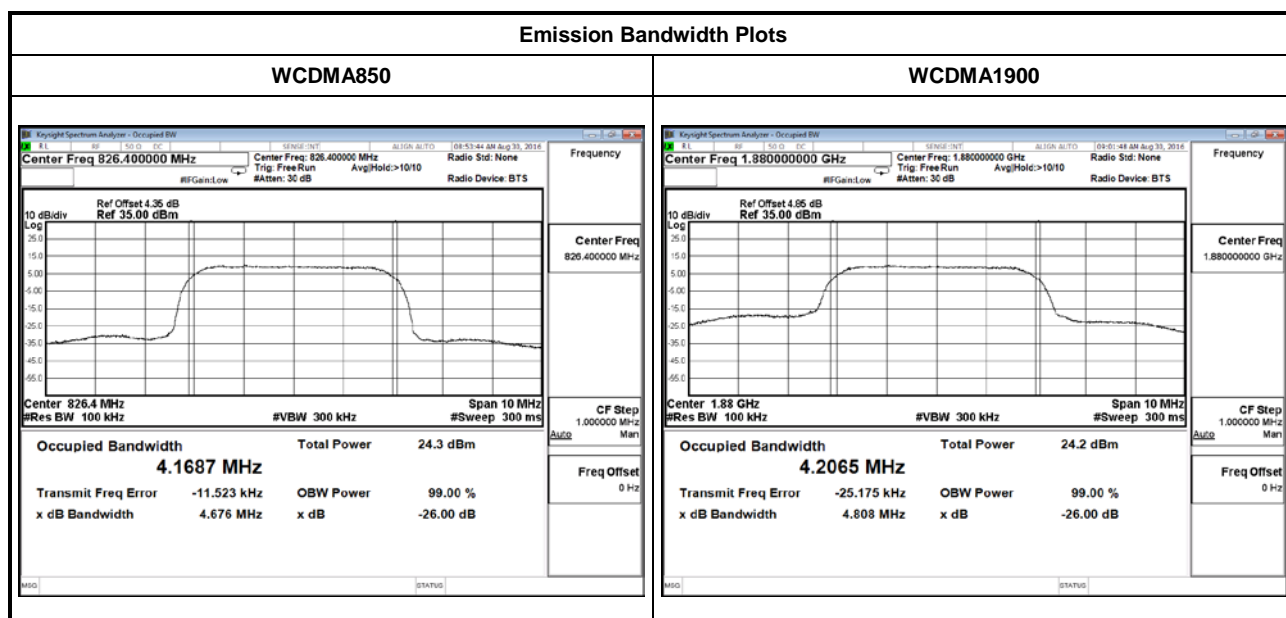
3.1.5 Test Result of Emission Bandwidth

| Emission Bandwidth Result | | | | |
|---------------------------|------|-------------|----------------------|---------------------|
| Mode | Ch. | Freq. (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
| WCDMA850 | 4132 | 826.4 | 4.676 | 4.1687 |
| | 4182 | 836.4 | 4.689 | 4.1475 |
| | 4233 | 846.6 | 4.682 | 4.1653 |
| WCDMA1900 | 9262 | 1852.4 | 4.727 | 4.1834 |
| | 9400 | 1880.0 | 4.808 | 4.2065 |
| | 9538 | 1907.6 | 4.740 | 4.1894 |
| Limit | | | N/A | |
| Result | | | Complied | |

3.1.6 Emission Designator

| Emission Designator | |
|---------------------|---------------------|
| Mode | Emission Designator |
| WCDMA850 | 4M17F9W |
| WCDMA1900 | 4M21F9W |

Note 1: WCDMA 99% BW, F = Frequency Modulation, 9 = Composite Digital Info, W = Combination (Audio/Data)



3.2 Transmitter Conducted Output Power

3.2.1 Transmitter Conducted Output Power Limit

| Transmitter Conducted Output Power Limit |
|--|
| Information for RF exposure |

3.2.2 Transmitter Peak to Average Ratio Limit

| Transmitter Peak to Average Ratio Limit |
|---|
| PAR ≤ 13dB |

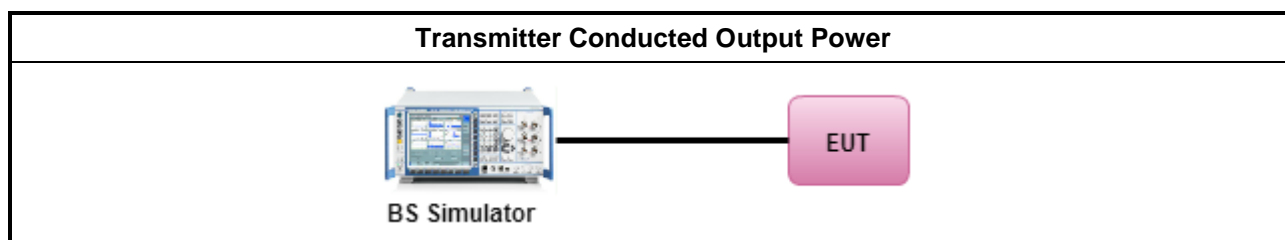
3.2.3 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.4 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Transmitter Conducted Output Power |
| <input type="checkbox"/> | Refer as KDB 941225 D01 clause 5 for GSM GPRS EDGE modes. |
| <input type="checkbox"/> | Refer as KDB 941225 D01 clause 5 for GSM/(E)GPRS Dual Transfer Mode. |
| <input checked="" type="checkbox"/> | Refer as KDB 941225 D01 clause 4 for 3G device modes. |
| <input checked="" type="checkbox"/> | Refer as KDB 941225 D01 clause 4 for 3GPP R6, R7 and R8 additional information. |
| <input type="checkbox"/> | Refer as KDB 941225 D05 for LTE modes. |
| <input type="checkbox"/> | Refer as RSS-Gen, clause 6.12 for power measurement. |
| <input checked="" type="checkbox"/> | Transmitter Peak-Average Ratio |
| <input checked="" type="checkbox"/> | For WCDMA signals refer as KDB 971168, clause 5.7 for CCDF function. |
| <input type="checkbox"/> | For GSM signals refer average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power. |
| <input checked="" type="checkbox"/> | For conducted measurement. |
| <input checked="" type="checkbox"/> | If EUT supports single transmit chain and measurements performed on this transmit chain. |
| <input type="checkbox"/> | If EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case. |
| <input type="checkbox"/> | If EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them. |

3.2.5 Test Setup



3.2.6 Test Result of Transmitter Conducted Output Power

| WCDMA Worst Modulation for Output Power | | |
|---|-------|-----------------------|
| 3GPP Release Ver. | Mode | Configuration |
| 99 | WCDMA | 12.2kbps RMC |
| 5 | HSDPA | Subtest 1 ~ Subtest 4 |
| 6 | HSUPA | Subtest 1 ~ Subtest 5 |

| Mode | Subtest | RF Output Power [dBm] | | | | | | |
|-------|---------------|-----------------------|-------|-------|---------------|-------|-------|----------|
| | | Band V (Cellular) | | | Band II (PCS) | | | MPR [dB] |
| | | 4132 | 4182 | 4233 | 9262 | 9400 | 9538 | |
| WCDMA | 12.2 kbps RMC | 22.77 | 22.76 | 22.84 | 23.44 | 22.22 | 22.39 | - |
| HSDPA | Subtest 1 | 21.65 | 22.81 | 22.80 | 22.06 | 21.14 | 21.00 | 0 |
| | Subtest 2 | 21.72 | 22.84 | 22.83 | 22.15 | 21.13 | 21.03 | 0 |
| | Subtest 3 | 21.20 | 22.36 | 22.41 | 21.58 | 20.45 | 20.62 | 0.5 |
| | Subtest 4 | 21.25 | 22.38 | 22.35 | 21.58 | 20.55 | 20.55 | 0.5 |
| HSUPA | Subtest 1 | 22.08 | 21.89 | 21.82 | 20.54 | 20.30 | 20.56 | 0 |
| | Subtest 2 | 21.29 | 21.02 | 21.21 | 20.89 | 19.81 | 19.84 | 2 |
| | Subtest 3 | 21.33 | 21.27 | 21.09 | 20.65 | 19.33 | 19.58 | 1 |
| | Subtest 4 | 21.81 | 21.56 | 21.65 | 21.38 | 20.53 | 20.30 | 2 |
| | Subtest 5 | 21.11 | 20.97 | 20.90 | 20.54 | 20.24 | 20.24 | 0 |

3.2.7 Test Result of Transmitter Peak to Average Ratio

| Transmitter Peak to Average Ratio Result | | | |
|--|------|-------------|----------------------------|
| Mode | Ch. | Freq. (MHz) | Peak to Average Ratio (dB) |
| WCDMA850 | 4132 | 826.4 | 3.39 |
| | 4182 | 836.4 | 2.84 |
| | 4233 | 846.6 | 3.48 |
| WCDMA1900 | 9262 | 1852.4 | 2.5 |
| | 9400 | 1880 | 2.14 |
| | 9538 | 1907.6 | 2.27 |
| Limit | | | 13 |
| Result | | | Complied |

3.3 Effective Radiated Power

3.3.1 Effective Radiated Power Limit

| Cellular Band Effective Radiated Power (ERP) Limit |
|---|
| ERP \leq 7W [38.45dBm] (EIRP 40.6dBm [135.8 dBuV/m at 3m]). |

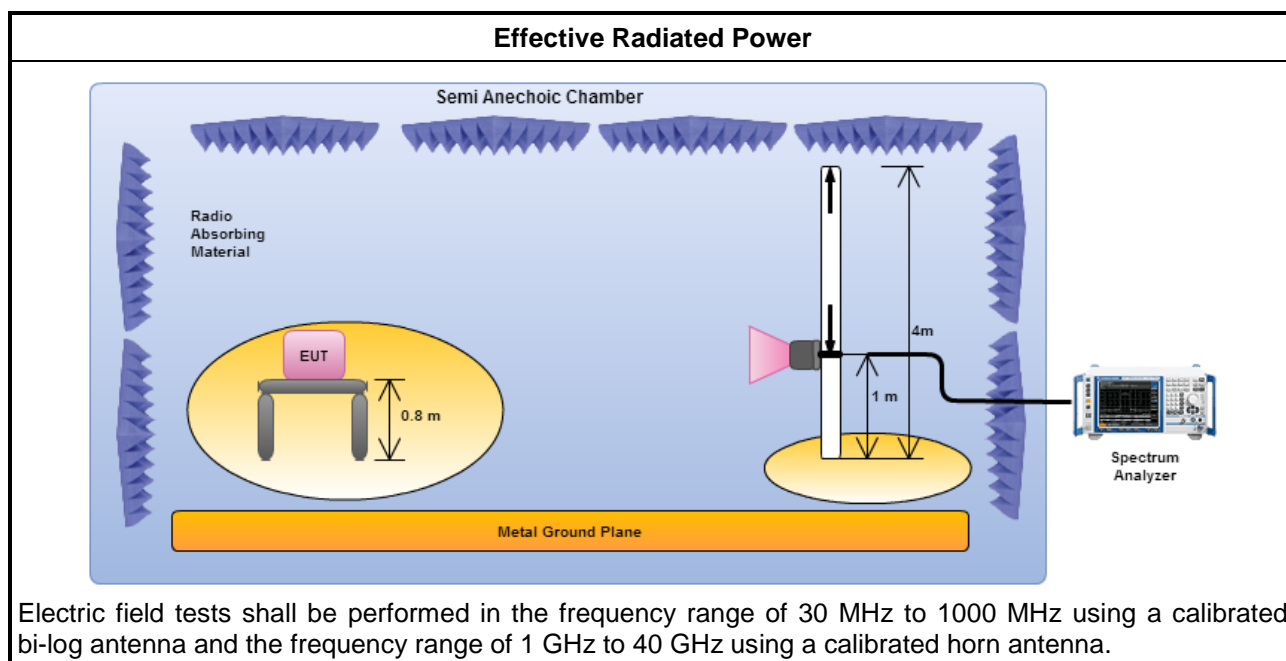
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | For wideband (> 1 MHz) digital transmission systems power measure following as KDB 971168. |
| <input checked="" type="checkbox"/> | Effective Radiated Power (ERP) |
| <input checked="" type="checkbox"/> | Refer as KDB 412172, clause 1.2 following as power approach. e.i.r.p.= $P_T + G_T + L_C$. |
| <input type="checkbox"/> | Refer as KDB 412172, clause 1.1 following as field strength approach. e.i.r.p.= $(E \times d)^2 / 30$. |
| <input checked="" type="checkbox"/> | Refer as KDB 412172, clause 1.3 ERP = EIRP - 2.15 dB. |
| <input checked="" type="checkbox"/> | For radiated measurement. |
| <input type="checkbox"/> | Refer as KDB 412172, clause 2.2 following eirp can be used radiated test configuration. |
| <input checked="" type="checkbox"/> | Refer as KDB 412172, clause 2.3 following eirp can be used signal/antenna substitution techniques. |
| <input type="checkbox"/> | Refer as ANSI/TIA-603-D-2010, clause 2.2.17 for radiated measurement. |
| <input type="checkbox"/> | Refer as RSS-Gen, clause 6.12 for power measurement. |

3.3.4 Test Setup



3.3.5 Test Result of Effective Radiated Power

| Mode | Channel | Frequency (MHz) | ERP(dBm) | SPA. Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) |
|---|---------|-----------------|----------|--------------------|------------------|--------------------|-----------------------|--------------------|
| WCDMA850 | 4132 | 826.4 | 14.44 | -22.80 | 8.94 | 0.25 | 7.9 | H |
| | 4182 | 836.4 | 14.48 | -23.12 | 8.79 | 0.25 | 8.09 | H |
| | 4233 | 846.6 | 13.43 | -24.26 | 7.54 | 0.25 | 8.29 | H |
| <p>Note 1: EUT was tested in all WCDMA/HSDPA configurations and the highest power is reported in 12.2 kbps RMC and TPC bits all set "1".</p> <p>Note 2: EUT was tested with its standard battery.</p> <p>Note 3: Measurement worst emissions of receive antenna polarization.</p> | | | | | | | | |

3.4 Effective Isotropic Radiated Power

3.4.1 Effective Isotropic Radiated Power Limit

| PCS Band and AWS Band Effective Isotropic Radiated Power (EIRP) Limit |
|--|
| PCS Band: EIRP \leq 2W [33.01dBm] (128.2 dBuV/m at 3m) AWS Band: EIRP \leq 1W [30.00dBm] (125.2 dBuV/m at 3m) |

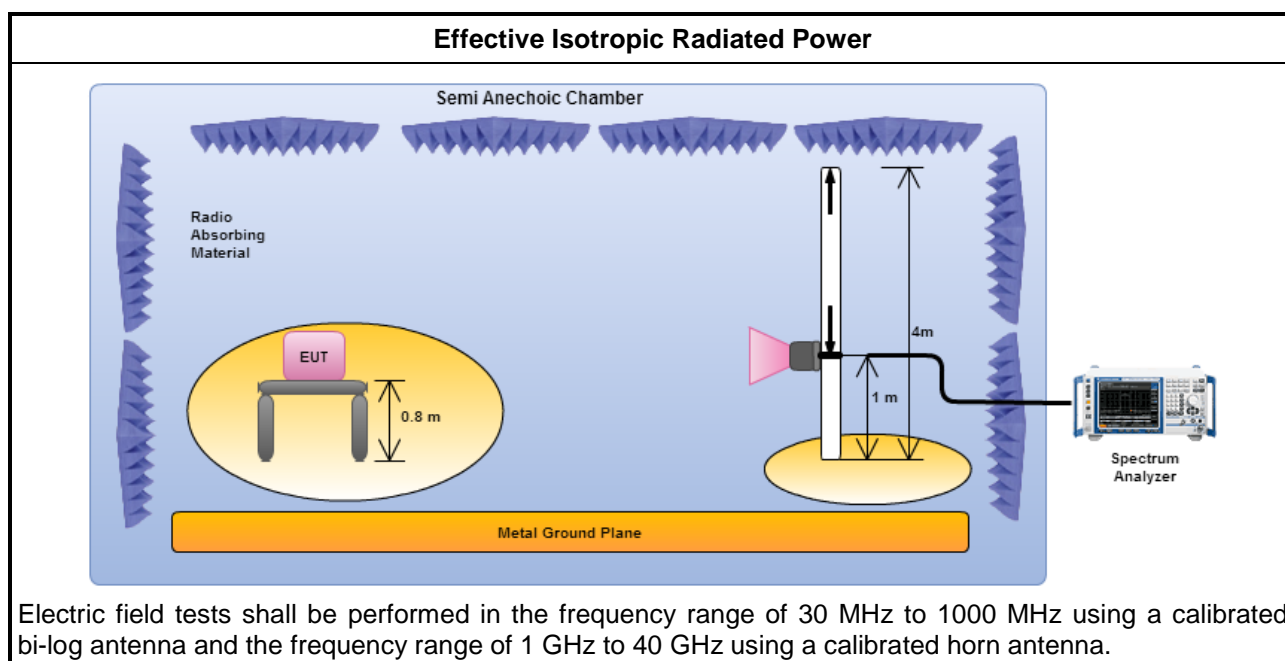
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

| Test Method | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | For wideband (> 1 MHz) digital transmission systems power measure following as KDB 971168. |
| <input checked="" type="checkbox"/> | Effective Isotropic Radiated Power (EIRP) |
| <input checked="" type="checkbox"/> | Refer as KDB 412172, clause 1.2 following as power approach. $e.i.r.p. = P_T + G_T + L_c$. |
| <input type="checkbox"/> | Refer as KDB 412172, clause 1.1 following as field strength approach. $e.i.r.p. = (E \times d)^2 / 30$. |
| <input checked="" type="checkbox"/> | For radiated measurement. |
| <input type="checkbox"/> | Refer as KDB 412172, clause 2.2 following eirp can be used radiated test configuration. |
| <input checked="" type="checkbox"/> | Refer as KDB 412172, clause 2.3 following eirp can be used signal/antenna substitution techniques. |
| <input type="checkbox"/> | Refer as ANSI/TIA-603-D-2010, clause 2.2.17 for radiated measurement. |
| <input type="checkbox"/> | Refer as RSS-Gen, clause 6.12 for power measurement. |

3.4.4 Test Setup



3.4.5 Test Result of Effective Isotropic Radiated Power

| Mode | Channel | Frequency (MHz) | ERP(dBm) | SPA Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) |
|--|---------|-----------------|----------|-------------------|------------------|--------------------|-----------------------|--------------------|
| WCDMA1900 | 9262 | 1852.4 | 21.95 | -18.39 | 20.02 | 2.57 | 4.50 | V |
| | 9400 | 1880.0 | 19.62 | -19.11 | 17.81 | 2.60 | 4.41 | V |
| | 9538 | 1907.6 | 23.63 | -16.39 | 21.92 | 2.60 | 4.31 | V |
| Note 1: EUT was tested in all WCDMA/HSDPA configurations and the highest power is reported in 12.2 kbps RMC and TPC bits all set "1". Note 2: EUT was tested with its standard battery. Note 3: Measurement worst emissions of receive antenna polarization. | | | | | | | | |

3.5 Transmitter Conducted Unwanted Emissions

3.5.1 Transmitter Conducted Unwanted Emissions Limit

Transmitter Conducted Unwanted Emissions Limit

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $[43 + 10 \log (P)]$ (-13dBm).

3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

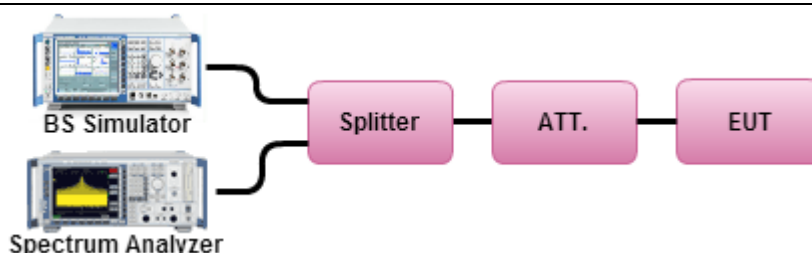
3.5.3 Test Procedures

Test Method

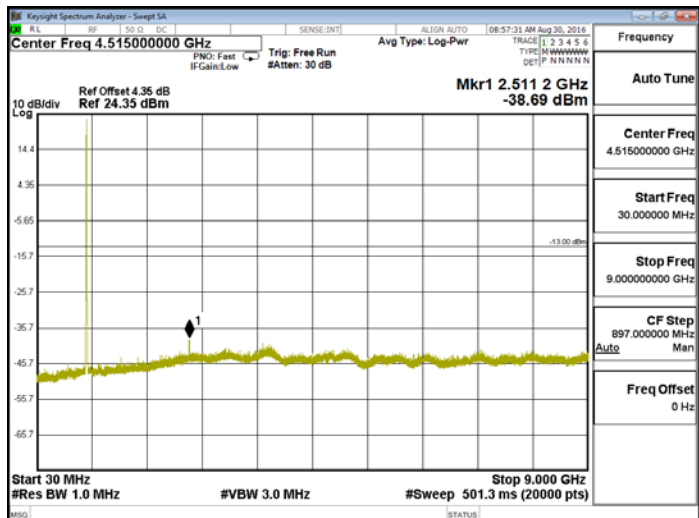
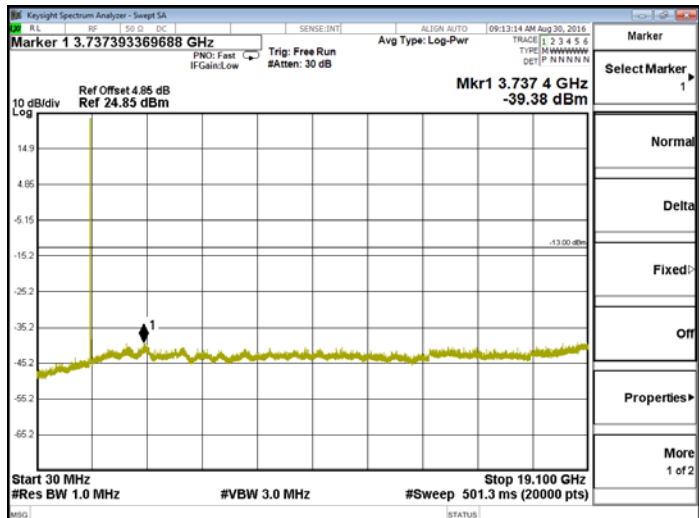
- ☒ Refer as ANSI/TIA-603-D-2010, clause 3.2.13 for conducted measurement.
- ☐ Refer as RSS-Gen, clause 6.13 for transmitter unwanted emissions measurement.
- ☐ In case a narrower measurement bandwidth was used, the following conversion formula has to be applied: (e.g. if reference bandwidth 1 MHz and measurement bandwidth 100 kHz, then measurement bandwidth conversion factor is 10 dB); $B = A + 10 \log (BW_{ref} / BW_{measured})$
- A is the value at the narrower measurement bandwidth;
 - B is the value referred to the reference bandwidth;
 - Correction Factor(dB)= $10 \log (1\% \text{ Emission BW/RBW})$;
- ☒ For conducted measurement.
- ☒ For conducted measurements on devices with single transmit chain.
- ☐ For conducted measurements on devices with multiple transmit chains using options given below:
- ☐ Option 1: measure and sum the spectra across the transmitter outputs.
- ☐ Option 2: N transmitter outputs, then spurious emissions limits on each individual output. Measure and add $10 \log (N)$ dB.

3.5.4 Test Setup

Transmitter Conducted Unwanted Emissions



3.5.5 Test Result of Transmitter Conducted Unwanted Emissions

| | | | |
|--|------|------------|----------------------|
| Transmitter Conducted Unwanted Emissions | | Mode | WCDMA850 |
| Channel | 4182 | Test Range | 30 MHz - 10 harmonic |
|  | | | |
| Transmitter Conducted Unwanted Emissions | | Mode | WCDMA1900 |
| Channel | 9400 | Test Range | 30 MHz - 10 harmonic |
|  | | | |

Note: "ALIGN OFF" means that we turn off the auto align. We align the spectrum at each time before test.

3.6 Transmitter Conducted Bandedge Emissions

3.6.1 Transmitter Conducted Bandedge Emissions Limit

| Transmitter Conducted Bandedge Emissions Limit |
|---|
| <p>Cellular Band:</p> <p>(i) In the first 1.0 MHz band immediately outside frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log(P)$ (watts) (-13dBm).</p> <p>(ii) After the first 1.0 MHz immediately outside frequency block, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log(P)$ (watts) (-13dBm). If the measurement is performed using 1% of the emission bandwidth, power integration over 100 kHz is required.</p> <p>PCS/AWS Band:</p> <p>(i) In the 1.0 MHz bands immediately outside frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log(P)$ (watts) (-13dBm).</p> <p>(ii) After the first 1.0 MHz immediately outside frequency block, the power of emissions in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log(P)$ (watts) (-13dBm). If the measurement is performed using 1% of the occupied bandwidth, power integration over 1 MHz is required.</p> |

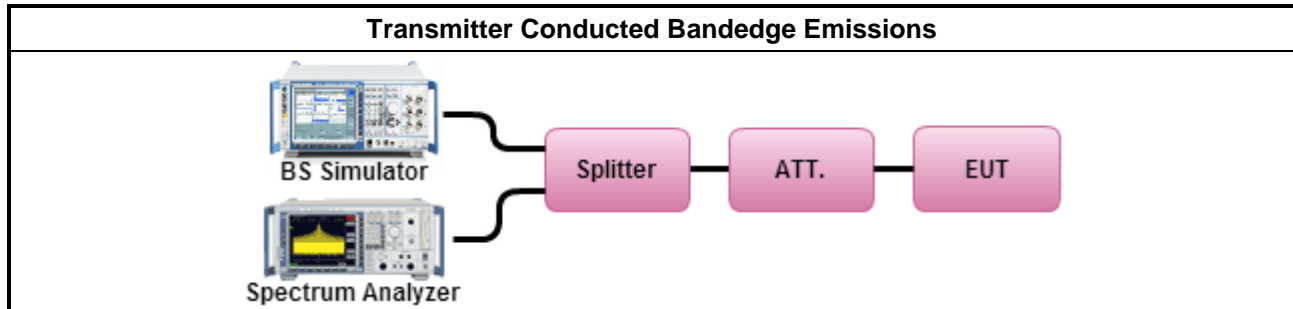
3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

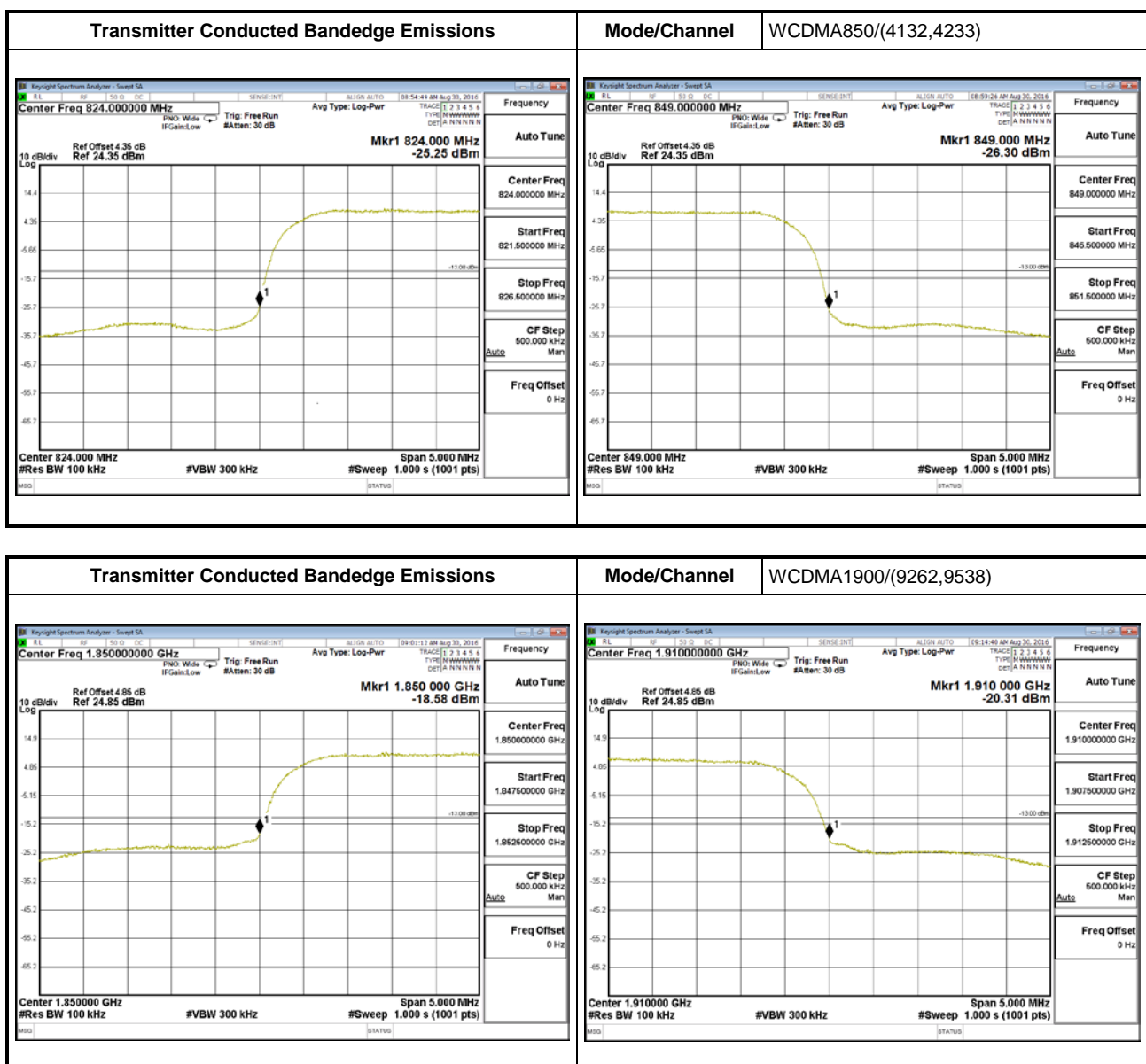
3.6.3 Test Procedures

| Test Method | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Refer as ANSI/TIA-603-D-2010, clause 3.2.13 for conducted measurement. |
| <input type="checkbox"/> | Refer as RSS-Gen, clause 6.13 for transmitter unwanted emissions measurement. |
| <input type="checkbox"/> | <p>In case a narrower measurement bandwidth was used, the following conversion formula has to be applied: (e.g. if reference bandwidth 1 MHz and measurement bandwidth 100 kHz, then measurement bandwidth conversion factor is 10 dB); $B = A + 10 \log (BW_{ref} / BW_{measured})$</p> <ul style="list-style-type: none"> • A is the value at the narrower measurement bandwidth; • B is the value referred to the reference bandwidth; • Correction Factor(dB)= $10\log(1\% \text{ Emission BW/RBW})$; |
| <input checked="" type="checkbox"/> | For conducted measurement. |
| <input checked="" type="checkbox"/> | For conducted measurements on devices with single transmit chain. |
| <input type="checkbox"/> | For conducted measurements on devices with multiple transmit chains using options given below: |
| <input type="checkbox"/> | Option 1: measure and sum the spectra across the transmitter outputs. |
| <input type="checkbox"/> | Option 2: N transmitter outputs, then spurious emissions limits on each individual output. Measure and add $10 \log (N)$ dB. |

3.6.4 Test Setup



3.6.5 Test Result of Transmitter Conducted Bandedge Emissions



Note: "ALIGN OFF" means that we turn off the auto align. We align the spectrum at each time before test.

3.7 Transmitter Radiated Unwanted Emissions

3.7.1 Transmitter Radiated Unwanted Emissions Limit

| Transmitter Radiated Unwanted Emissions Limit |
|--|
| The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $[43 + 10 \log (P)]$ (EIRP -13dBm). |

3.7.2 Measuring Instruments

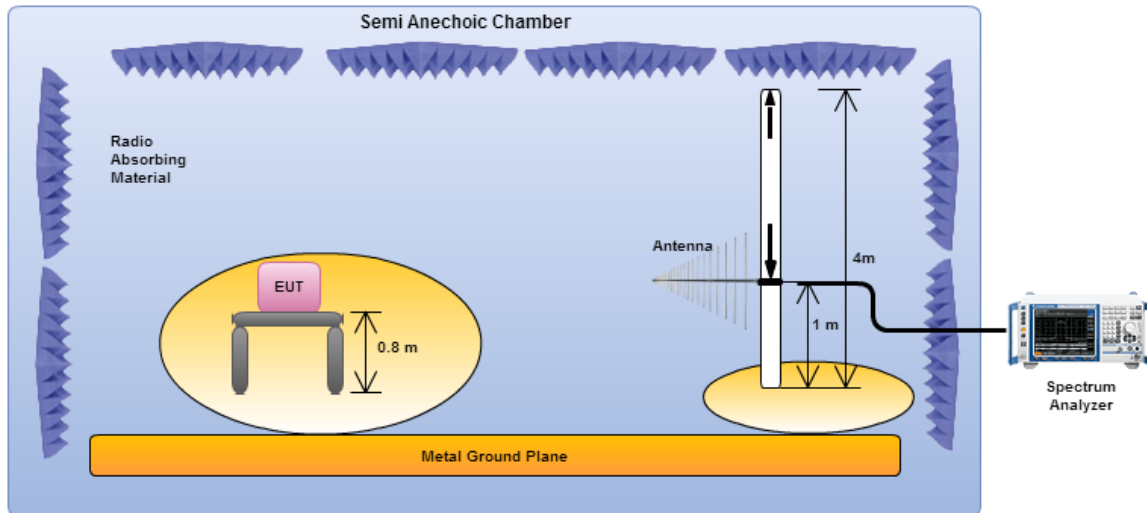
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

| Test Method |
|--|
| <input checked="" type="checkbox"/> Refer as ANSI/TIA-603-D-2010, clause 3.2.12 for radiated measurement. |
| <input type="checkbox"/> Refer as RSS-Gen, clause 4.9 for transmitter unwanted emissions measurement. |
| <input type="checkbox"/> In case a narrower measurement bandwidth was used, the following conversion formula has to be applied: (e.g. if reference bandwidth 1 MHz and measurement bandwidth 100 kHz, then measurement bandwidth conversion factor is 10 dB) $B = A + 10 \log (BW_{ref} / BW_{measured})$ <ul style="list-style-type: none"> • A is the value at the narrower measurement bandwidth; • B is the value referred to the reference bandwidth; • Correction Factor(dB)= $10 \log(1\% \text{ Emission BW/RBW})$; |
| <input checked="" type="checkbox"/> Effective Isotropic Radiated Power (EIRP) |
| <input checked="" type="checkbox"/> Refer as KDB 412172, clause 1.2 following as power approach. $e.i.r.p. = P_T + G_T + L_C$. <input type="checkbox"/> Refer as KDB 412172, clause 1.1 following as field strength approach. $e.i.r.p. = (E \times d)^2 / 30$. |
| <input checked="" type="checkbox"/> For radiated measurement. |
| <input type="checkbox"/> Refer as KDB 412172, clause 2.2 following eirp can be used radiated test configuration. <input checked="" type="checkbox"/> Refer as KDB 412172, clause 2.3 following eirp can be used signal/antenna substitution techniques. <input type="checkbox"/> Refer as ANSI/TIA-603-D-2010, clause 2.2.17 for radiated measurement. <input type="checkbox"/> Refer as RSS-Gen, clause 6.12 for power measurement. |

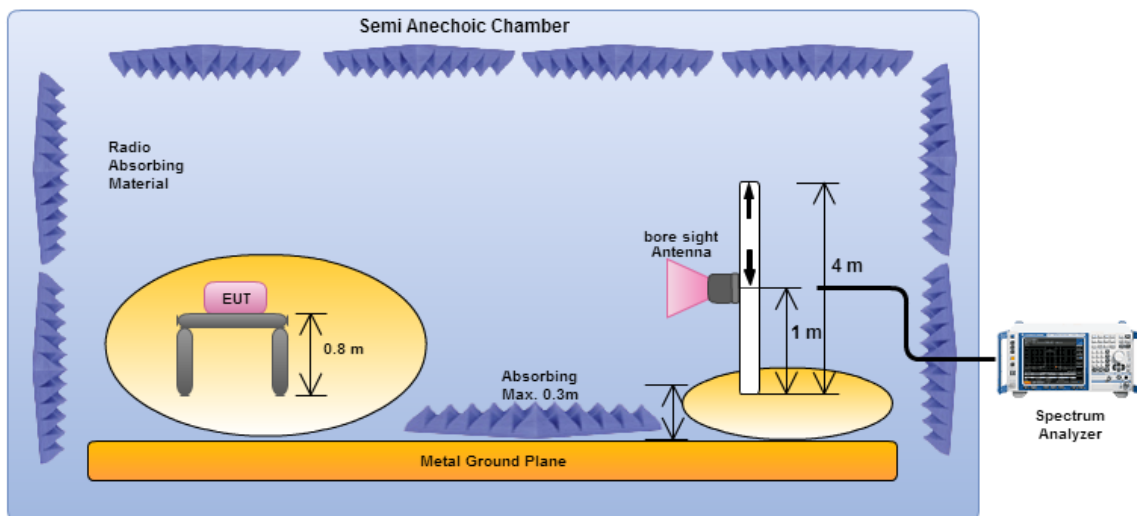
3.7.4 Test Setup

Transmitter Radiated Unwanted Emissions (below 1GHz)



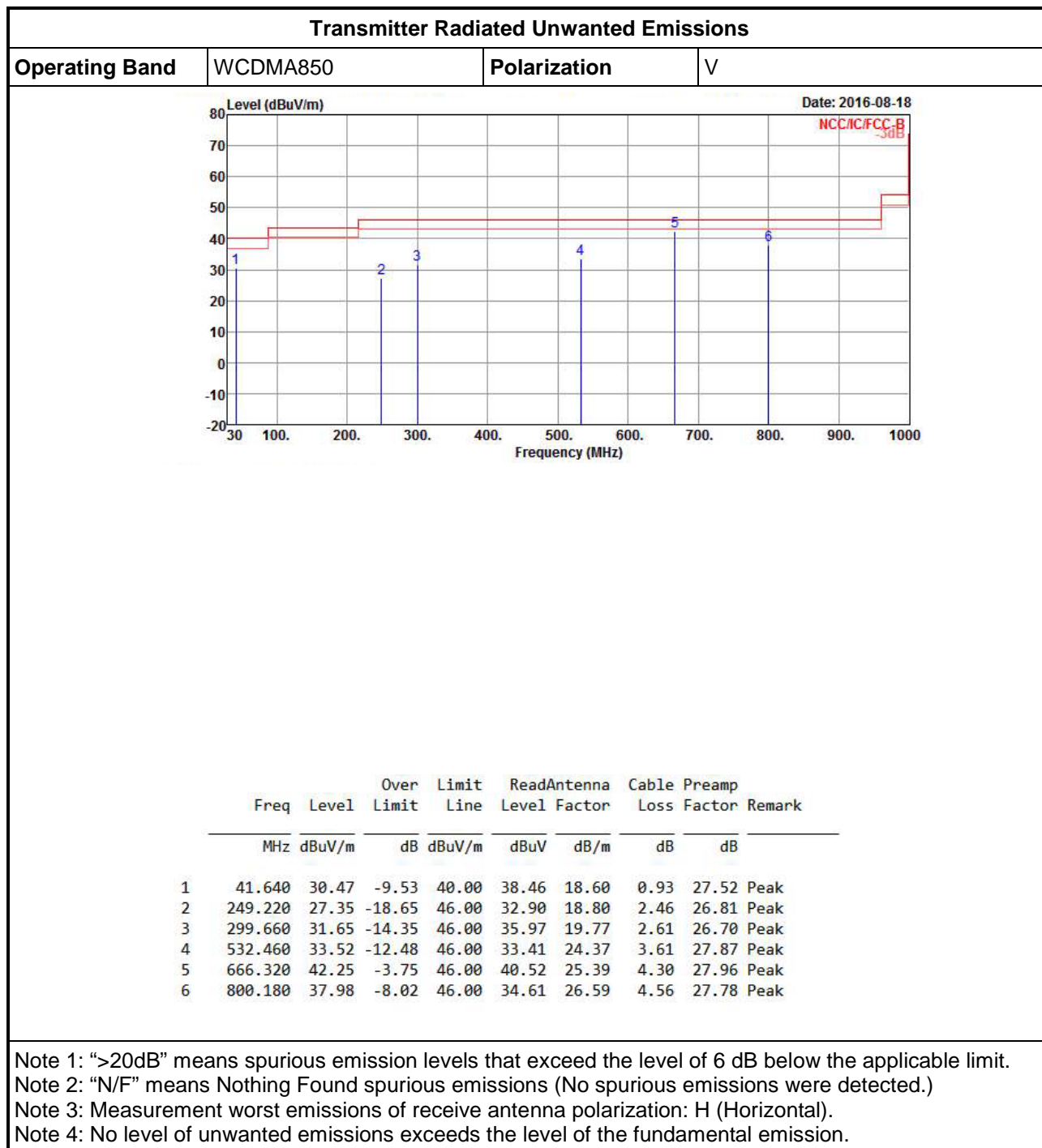
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna.

Transmitter Radiated Unwanted Emissions (Above 1GHz)



Electric field tests shall be performed in the frequency range of 1 GHz to 10th harmonic of highest fundamental frequency or 40 GHz using a calibrated horn antenna.

3.7.5 Test Result of Transmitter Radiated Unwanted Emissions(Below 1GHz)

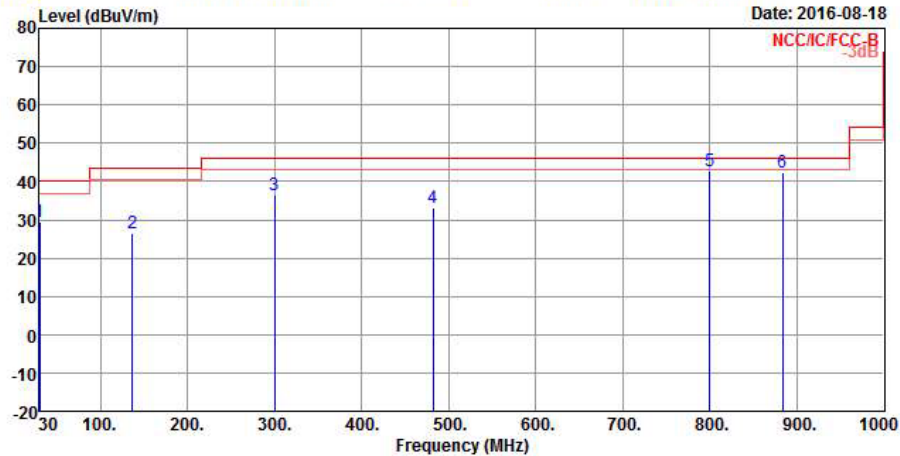


Transmitter Radiated Unwanted Emissions

Operating Band WCDMA850

Polarization H

H



| | Freq | Level | Over | Limit | ReadAntenna | Cable | Preamp | |
|---|---------|--------|--------|--------|-------------|-------|--------|------------|
| | MHz | dBuV/m | Limit | Line | Level | Loss | Factor | Remark |
| | | | dB | dBuV/m | dBuV | dB/m | dB | dB |
| 1 | 30.000 | 29.31 | -10.69 | 40.00 | 30.46 | 25.62 | 0.78 | 27.55 Peak |
| 2 | 136.700 | 26.67 | -16.83 | 43.50 | 33.99 | 18.09 | 1.81 | 27.22 Peak |
| 3 | 299.660 | 36.48 | -9.52 | 46.00 | 40.80 | 19.77 | 2.61 | 26.70 Peak |
| 4 | 482.020 | 33.13 | -12.87 | 46.00 | 33.74 | 23.49 | 3.50 | 27.60 Peak |
| 5 | 800.180 | 42.72 | -3.28 | 46.00 | 39.35 | 26.59 | 4.56 | 27.78 QP |
| 6 | 883.600 | 42.45 | -3.55 | 46.00 | 37.74 | 27.41 | 4.86 | 27.56 Peak |

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).

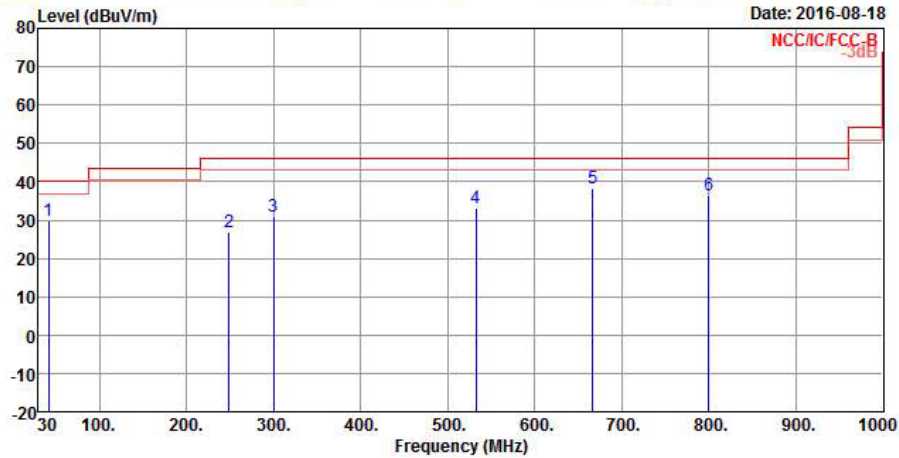
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions
Operating Band

WCDMA1900

Polarization

V



| | Freq | Level | Over Limit | Limit Line | ReadAntenna Level | Cable Factor | Preamp Loss | Remark |
|---|---------|--------|------------|------------|-------------------|--------------|-------------|------------|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB |
| 1 | 41.640 | 29.94 | -10.06 | 40.00 | 37.93 | 18.60 | 0.93 | 27.52 Peak |
| 2 | 249.220 | 26.99 | -19.01 | 46.00 | 32.54 | 18.80 | 2.46 | 26.81 Peak |
| 3 | 299.660 | 31.09 | -14.91 | 46.00 | 35.41 | 19.77 | 2.61 | 26.70 Peak |
| 4 | 532.460 | 33.22 | -12.78 | 46.00 | 33.11 | 24.37 | 3.61 | 27.87 Peak |
| 5 | 666.320 | 38.26 | -7.74 | 46.00 | 36.53 | 25.39 | 4.30 | 27.96 Peak |
| 6 | 800.180 | 36.36 | -9.64 | 46.00 | 32.99 | 26.59 | 4.56 | 27.78 Peak |

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).

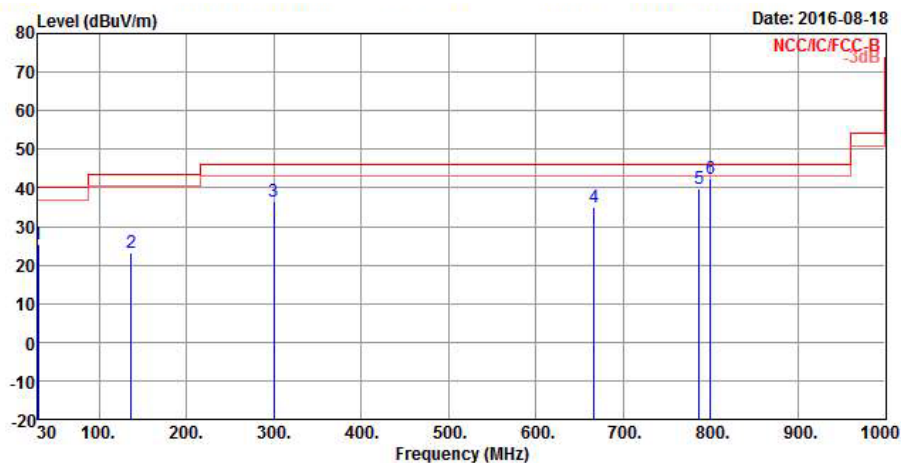
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions

Operating Band WCDMA1900

Polarization H

H



| | Freq | Level | Over Limit | Limit Line | ReadAntenna Level | Cable Loss | Preampl Factor | Remark |
|---|---------|--------|------------|------------|-------------------|------------|----------------|------------|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB |
| 1 | 30.000 | 25.44 | -14.56 | 40.00 | 26.59 | 25.62 | 0.78 | 27.55 Peak |
| 2 | 136.700 | 23.29 | -20.21 | 43.50 | 30.61 | 18.09 | 1.81 | 27.22 Peak |
| 3 | 299.660 | 36.52 | -9.48 | 46.00 | 40.84 | 19.77 | 2.61 | 26.70 Peak |
| 4 | 666.320 | 34.89 | -11.11 | 46.00 | 33.16 | 25.39 | 4.30 | 27.96 Peak |
| 5 | 786.600 | 39.92 | -6.08 | 46.00 | 36.66 | 26.51 | 4.55 | 27.80 Peak |
| 6 | 800.180 | 42.43 | -3.57 | 46.00 | 39.06 | 26.59 | 4.56 | 27.78 Peak |

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).
 Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

3.7.6 Test Result of Transmitter Radiated Unwanted Emissions(Above 1GHz)

| Mode | WCDMA850(BAND5) | | | | | | | | |
|-----------------|-----------------|------------|-----------------|--------------------|------------------|--------------------|-----------------------|--------------------|--------|
| Frequency (MHz) | ERP(dBm) | Limit(dBm) | Over Limit (dB) | SPA. Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) | Result |
| 1672.80 | -64.58 | -13 | -51.58 | -46.21 | -65.12 | 2.42 | 5.11 | V | PASS |
| 2509.20 | -61.00 | -13 | -48.00 | -59.10 | -61.3 | 3.07 | 5.52 | V | PASS |
| 3345.60 | -65.43 | -13 | -52.43 | -64.88 | -67.5 | 3.48 | 7.70 | H | PASS |

| Mode | WCDMA1900(BAND2) | | | | | | | | |
|-----------------|------------------|------------|-----------------|--------------------|------------------|--------------------|-----------------------|--------------------|--------|
| Frequency (MHz) | EIRP(dBm) | Limit(dBm) | Over Limit (dB) | SPA. Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) | Result |
| 3760 | -43.77 | -13 | -30.77 | -56.14 | -48.41 | 3.77 | 8.41 | H | PASS |
| 5640 | -54.14 | -13 | -41.14 | -56.65 | -59.39 | 5.01 | 10.26 | H | PASS |
| 7520 | -49.64 | -13 | -36.64 | -60.33 | -55.76 | 5.7 | 11.82 | H | PASS |

3.8 Frequency Stability

3.8.1 Frequency Stability Limit

| Frequency Stability Limit | |
|---|--|
| <input checked="" type="checkbox"/> | The transmitter center frequency stability shall be ± 2.5 ppm maximum. The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation. |
| <input checked="" type="checkbox"/> | Temperature: |
| <input checked="" type="checkbox"/> | -30°C to +50°C in 10°C step. |
| <input checked="" type="checkbox"/> | If the EUT cannot be turned on at -30°C, the testing lowest temperature will be raised in 10°C step until the EUT can be turned on. |
| <input checked="" type="checkbox"/> | Voltage: |
| <input checked="" type="checkbox"/> | For non hand-carried battery and AC powered equipment: 85% to 115% of the nominal value |
| <input checked="" type="checkbox"/> | For hand-carried, battery-powered equipment: Voltage is reduced to the battery operating end point which shall be specified by the manufacturer. |
| Note 1: These measurements shall also be performed at normal and extreme test conditions. | |

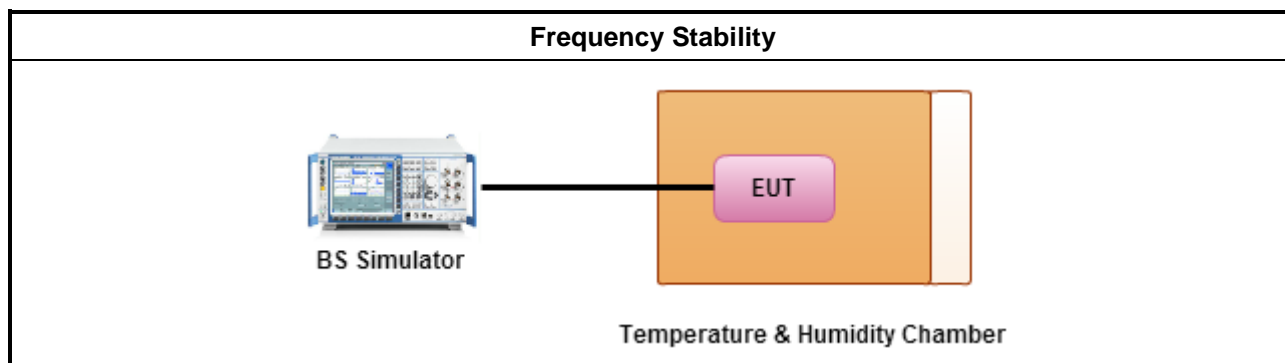
3.8.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.8.3 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Refer as ANSI/TIA-603-D-2010, clause 3.2.2 for frequency stability tests |
| <input type="checkbox"/> | Refer as RSS-Gen, clause 6.11 for transmitter frequency stability measurement. |
| <input checked="" type="checkbox"/> | Frequency stability with respect to ambient temperature |
| <input checked="" type="checkbox"/> | Frequency stability when varying supply voltage |
| <input checked="" type="checkbox"/> | For conducted measurement. |
| <input checked="" type="checkbox"/> | For conducted measurements on devices with multiple transmit chains: Measurements need only to be performed on one of the active transmit chains (antenna outputs) |
| <input type="checkbox"/> | For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level. |

3.8.4 Test Setup



3.8.5 Test Result of Frequency Stability

| Mode | | WCDMA850 | | WCDMA1900 | |
|-----------------|-------------|----------------------|-----------------------|----------------------|-----------------------|
| Channel | | 4182 | | 9400 | |
| Frequency (MHz) | | 836.4 | | 1880.0 | |
| Temp. (°C) | Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (Hz) | Frequency Error (ppm) |
| 50 | 7.4 | 17.45 | 0.0209 | 32.33 | 0.0172 |
| 40 | 7.4 | 15.86 | 0.0190 | 30.12 | 0.0160 |
| 30 | 7.4 | 15.23 | 0.0182 | 30.39 | 0.0162 |
| 20 | 7.4 | 13.67 | 0.0163 | 30.12 | 0.0160 |
| 10 | 7.4 | 17 | 0.0203 | 31.24 | 0.0166 |
| 0 | 7.4 | 9.72 | 0.0116 | 15.14 | 0.0081 |
| -10 | 7.4 | 8.67 | 0.0104 | 16.07 | 0.0085 |
| -20 | 7.4 | 9.05 | 0.0108 | 17.35 | 0.0092 |
| -30 | 7.4 | - | - | - | - |
| 20 | 8.4 | 14.32 | 0.0171 | 30.48 | 0.0162 |
| 20 | 7.4 | 13.67 | 0.0163 | 30.12 | 0.0160 |
| 20 | 6 | 10.94 | 0.0131 | 30.08 | 0.0160 |
| Limit [ppm] | | ± 2.5 | | | |

4 Test Equipment and Calibration Data

RF Conducted

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date |
|---------------------------------|--------------|-----------|------------|-----------------------------|------------------|----------------------|
| Wireless communication test Set | Agilent | 8960 | 108087 | Wireless communication test | 03/05/2016 | 02/05/2017 |
| Spectrum | KEYSIGHT | N9010A | MY54200885 | 10Hz ~ 44GHz | 04/07/2016 | 03/07/2017 |

Radiated Emissions

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date |
|---------------------------------|----------------|-----------|------------|--------------------|------------------|----------------------|
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 30MHz ~ 1GHz 3m | 28/11/2015 | 27/11/2016 |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 1GHz ~ 18GHz 3m | 16/12/2015 | 15/12/ 2016 |
| Amplifier | HP | 8447D | 2944A08033 | 10kHz ~ 1.3GHz | 10/05//2016 | 09/05/2017 |
| Amplifier | Agilent | 8449B | 3008A02120 | 1GHz ~ 26.5GHz | 02/09/2015 | 01/09/ 2016 |
| Spectrum | R&S | FSV40 | 101513 | 9kHz ~ 40GHz | 16/02/ 2016 | 15/02/ 2017 |
| Bilog Antenna | SCHAFFNER | CBL 6112D | 22237 | 30MHz ~ 1GHz | 18/09/ 2015 | 17/09/2016 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 1531 | 1GHz ~ 18GHz | 22/04/ 2016 | 21/04/ 2017 |
| Wireless communication test Set | Agilent | 8960 | MY53202219 | 2G/3G Base Station | 03/05/2016 | 02/05/2017 |