# FCC TEST REPORT

| | |
|---|---|
| **Product Name:** | Mobile Phone |
| **Trade Mark:** | N/A |
| **Model No.:** | CRUSH X565 |
| **Report Number:** | 180709006RFM-3 |
| **Test Standards:** | FCC 47 CFR Part 27<br>FCC 47 CFR Part 2 |
| **FCC ID:** | 2AIMEX565 |
| **Test Result:** | PASS |
| **Date of Issue:** | July 26, 2018 |

Prepared for:

**SMT TELECOMM HK LIMITED**
**Unit C 8/F CHARMHILL CTR 50 HILLWOOD RD TST KL, Kowloon, Hong Kong**

Prepared by:

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Tested by: Henry Lu, Project Engineer

Reviewed by: Kevin Liang, Assistant Manager

Approved by: Billy Li, Technical Director

Date: July 26, 2018

UnionTrust Laboratories * Certified *

# Version

| Version No. | Date | Description |
|---|---|---|
| V1.0 | July 26, 2018 | Original |

# CONTENTS

# 1. GENERAL INFORMATION

## 1.1 CLIENT INFORMATION

| | |
|---|---|
| **Applicant:** | SMT TELECOMM HK LIMITED |
| **Address of Applicant:** | Unit C 8/F CHARMHILL CTR 50 HILLWOOD RD TST KL, Kowloon, Hong Kong |
| **Manufacturer:** | SMT TELECOMM HK LIMITED |
| **Address of Manufacturer:** | Unit C 8/F CHARMHILL CTR 50 HILLWOOD RD TST KL, Kowloon, Hong Kong |

## 1.2 EUT INFORMATION

### 1.2.1 General Description of EUT

| | | |
|---|---|---|
| **Product Name:** | Mobile Phone | |
| **Model No.:** | CRUSH X565 | |
| **Add. Model No.:** | N/A | |
| **Trade Mark:** | N/A | |
| **DUT Stage:** | Identical Prototype | |
| **EUT Supports Function:** | GSM Bands: | GSM850/1900 |
| | UTRA Bands: | Band II/ Band IV/ Band V |
| | 2.4 GHz ISM Band: | IEEE 802.11b/g/n |
| | | Bluetooth V4.0 |
| **Software Version:** | SMT_SN_X565_V2984_FINAL | |
| **Hardware Version:** | W56A_V3 | |
| **IMEI Code:** | 387192451020364, 219254078364031; 321447530691208, 320359601481274 | |
| **Sample Received Date:** | July 10, 2018 | |
| **Sample Tested Date:** | July 10, 2018 to July 19, 2018 | |

### 1.2.2 Description of Accessories

| **Adapter** | |
|---|---|
| **Model No.:** | PCX565 |
| **Input:** | 100-240 V~50/60 Hz 0.15 A |
| **Output:** | 5.0 V ⎓ 1000 mA |
| **AC Cable:** | N/A |
| **DC Cable:** | N/A |

| **Battery** | |
|---|---|
| **Model No.:** | BPX565 |
| **Battery Type:** | Lithium-ion Rechargeable Battery |
| **Rated Voltage:** | 3.8 Vdc |
| **Rated Capacity:** | 2000 mAh |

| **Cable** | |
|---|---|
| **Description:** | USB Micro-B Plug Cable |
| **Cable Type:** | Shielded without ferrite |
| **Length:** | 1.1 Meter |

## 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

| | | |
|---|---|---|
| **Support Networks:** | WCDMA, HSDPA, HSUPA | |
| **Type of Modulation:** | WCDMA Band IV | BPSK |
| | HSDPA Band IV: | QPSK |
| | HSUPA Band IV: | QPSK |
| **Frequency Range:** | WCDMA Band IV: | 1712.4-1752.6 MHz |
| **Max RF Output Power:** | WCDMA Band IV: | 23.88dBm |
| **Max EIRP:** | WCDMA Band IV: | 19.60dBm |
| **Type of Emission:** | WCDMA Band IV: | 4M26F9W |
| **Antenna Type:** | PIFA Antenna | |
| **Antenna Gain:** | WCDMA Band IV: | 3.27 dBi |
| **Normal Test Voltage:** | 3.8 Vdc | |
| **Extreme Test Voltage:** | 3.5 to 4.3Vdc | |
| **Extreme Test Temperature:** | -30 °C to +50 °C | |

## 1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

| Description | Manufacturer | Model No. | Serial Number | Supplied by |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |

2) Support Cable

| Cable No. | Description | Connector | Length | Supplied by |
|---|---|---|---|---|
| 1 | Antenna Cable | SMA | 0.30 Meter | UnionTrust |

## 1.5 TEST LOCATION

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

## 1.6 TEST FACILITY

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

**CNAS-Lab Code: L9069**
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

**IC-Registration No.: 21600-1**
The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.:

21600-1.

**A2LA-Lab Certificate No.: 4312.01**
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**FCC Accredited Lab.**
Designation Number: CN1194
Test Firm Registration Number: 259480

## 1.7 DEVIATION FROM STANDARDS

None.

## 1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

## 1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

## 1.10 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Conducted emission 9KHz-150KHz | ±3.8 dB |
| 2 | Conducted emission 150KHz-30MHz | ±3.4 dB |
| 3 | Radiated emission 9KHz-30MHz | ±4.9 dB |
| 4 | Radiated emission 30MHz-1GHz | ±4.7 dB |
| 5 | Radiated emission 1GHz-18GHz | ±5.1 dB |
| 6 | Radiated emission 18GHz-26GHz | ±5.2 dB |
| 7 | Radiated emission 26GHz-40GHz | ±5.2 dB |

## 2. TEST SUMMARY

| FCC 47 CFR Part 27 Test Cases (WCDMA Band IV) | | | |
|---|---|---|---|
| **Test Item** | **Test Requirement** | **Test Method** | **Result** |
| **Equivalent Isotropic Radiated Power (EIRP)** | FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |
| **Conducted Output Power** | FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |
| **Peak-to-average ratio** | FCC 47 CFR Part 27.50(d)(5) | KDB 971168 D01v03 | PASS |
| **99%&26dB Bandwidth** | FCC 47 CFR Part 2.1049(h) FCC 47 CFR Part 27.53(h) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |
| **Band Edge at antenna terminals** | FCC 47 CFR Part 27.53(h)(1) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |
| **Spurious emissions at antenna terminals** | FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(h) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |
| **Field strength of spurious radiation** | FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(h) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |
| **Frequency stability** | FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54 | ANSI/TIA-603-E-2016 & KDB 971168 D01v03 | PASS |

# 3. EQUIPMENT LIST

| Radiated Emission Test Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Used** | **Equipment** | **Manufacturer** | **Model No.** | **Serial Number** | **Cal. date (mm dd, yyyy)** | **Cal. Due date (mm dd, yyyy)** |
| ☑ | 3M Chamber & Accessory Equipment | ETS-LINDGREN | 3M | N/A | Dec. 20, 2015 | Dec. 19, 2018 |
| ☑ | Receiver | R&S | ESIB26 | 100114 | Dec. 10, 2017 | Dec. 10, 2018 |
| ☑ | Broadband Antenna | ETS-LINDGREN | 3142E | 00201566 | Dec. 17, 2017 | Dec. 17, 2018 |
| ☑ | Preamplifier | HP | 8447F | 2805A02960 | Dec. 10, 2017 | Dec. 10, 2018 |
| ☑ | Broadband Antenna (Pre-amplifier) | ETS-LINDGREN | 3142E-PA | 00201891 | May 19, 2018 | May 19, 2019 |
| ☑ | Horn Antenna | ETS-LINDGREN | 3117 | 00164202 | Dec. 17, 2017 | Dec. 17, 2018 |
| ☑ | Horn Antenna (Pre-amplifier) | ETS-LINDGREN | 3117-PA | 00201874 | May 22, 2018 | May 22, 2019 |
| ☑ | Multi device Controller | ETS-LINDGREN | 7006-001 | 00160105 | N/A | N/A |
| ☑ | Wideband Radio Communication Tester | R&S | CMW500 | 116254 | June 07, 2018 | June 07, 2019 |
| ☑ | Test Software | Audix | e3 | Software Version: 9.160323 | | |

| 2/3/4G RF Test System Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Used** | **Equipment** | **Manufacturer** | **Model No.** | **Serial Number** | **Cal. date (mm dd, yyyy)** | **Cal. Due date (mm dd, yyyy)** |
| ☑ | Receiver | R&S | ESR7 | 1316.3003K07 -101181-K3 | Dec. 10, 2017 | Dec. 10, 2018 |
| ☑ | EXA Spectrum Analyzer | KEYSIGHT | N9010A | MY51440197 | Dec.10, 2017 | Dec. 10, 2018 |
| ☑ | Wideband Radio Communication Tester | R&S | CMW500 | 116254 | June 07, 2018 | June 07, 2019 |
| ☑ | Universal Radio Communication Tester | R&S | CMU200 | 114713 | Dec. 10, 2017 | Dec. 10, 2018 |
| ☑ | DC Source | KIKUSUI | PWR400L | LK003024 | Sep. 14, 2017 | Sep. 13, 2018 |
| ☑ | Temp & Humidity chamber | Votisch | VT4002 | 58566133290 020 | June 05, 2018 | June 05, 2019 |
| ☑ | Test Software | ECIT | AutomationTestSystem | | Software Version: 2.170530 | |

# 4. TEST CONFIGURATION

## 4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

### 4.1.1 Normal or Extreme Test Conditions

| Test Environment | Selected Values During Tests | | |
|---|---|---|---|
| Test Condition | Ambient | | |
| | Temperature (°C) | Voltage (V) | Relative Humidity (%) |
| TN/VN | +15 to +35 | 3.8 | 20 to 75 |
| TL/VL | -30 | 3.5 | 20 to 75 |
| TH/VL | +50 | 3.5 | 20 to 75 |
| TL/VH | -30 | 4.3 | 20 to 75 |
| TH/VH | +50 | 4.3 | 20 to 75 |

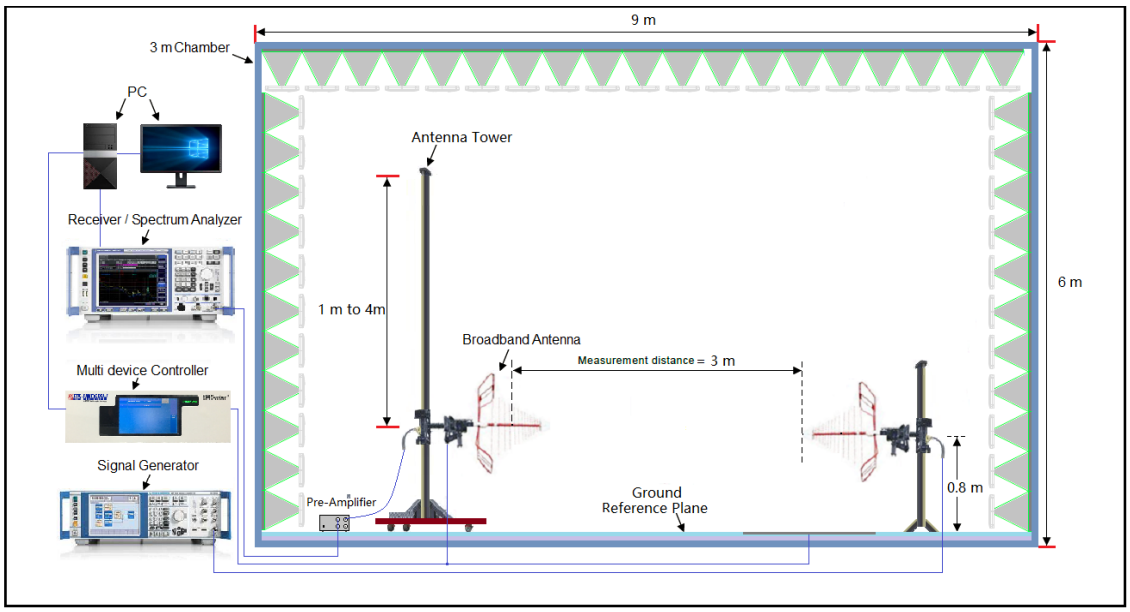
**Remark:**

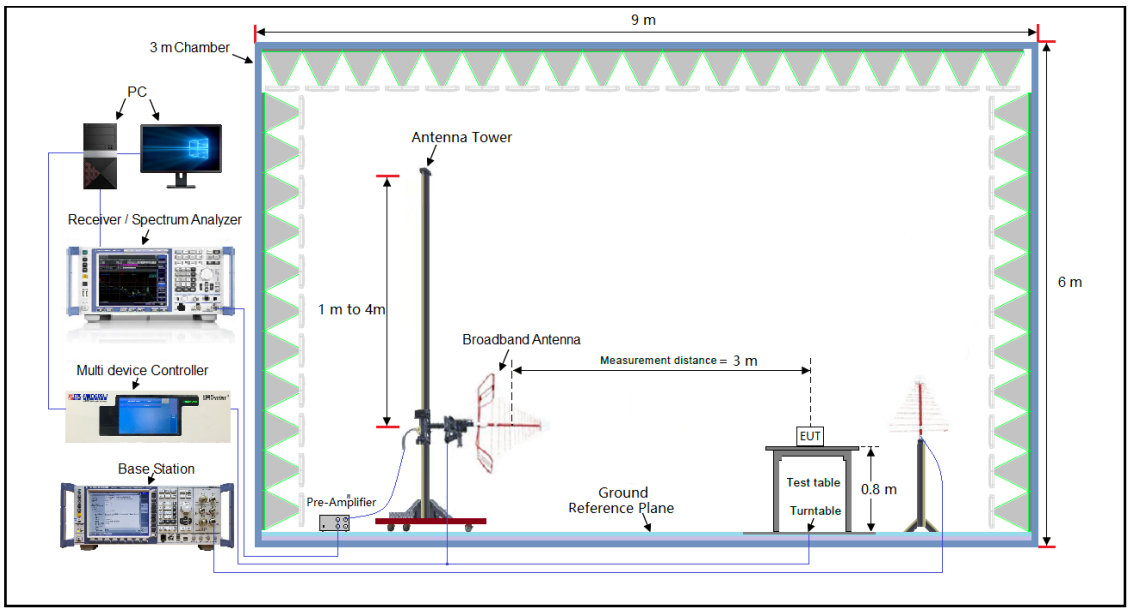
1) The EUT just work in such extreme temperature of -30 °C to +50 °C and the extreme voltage of 3.5 V to 4.3 V, so here the EUT is tested in the temperature of -30 °C to +50 °C and the voltage of 3.5 V to 4.3 V.
2) VN: Normal Voltage; TN: Normal Temperature;
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

## 4.2 TEST SETUP

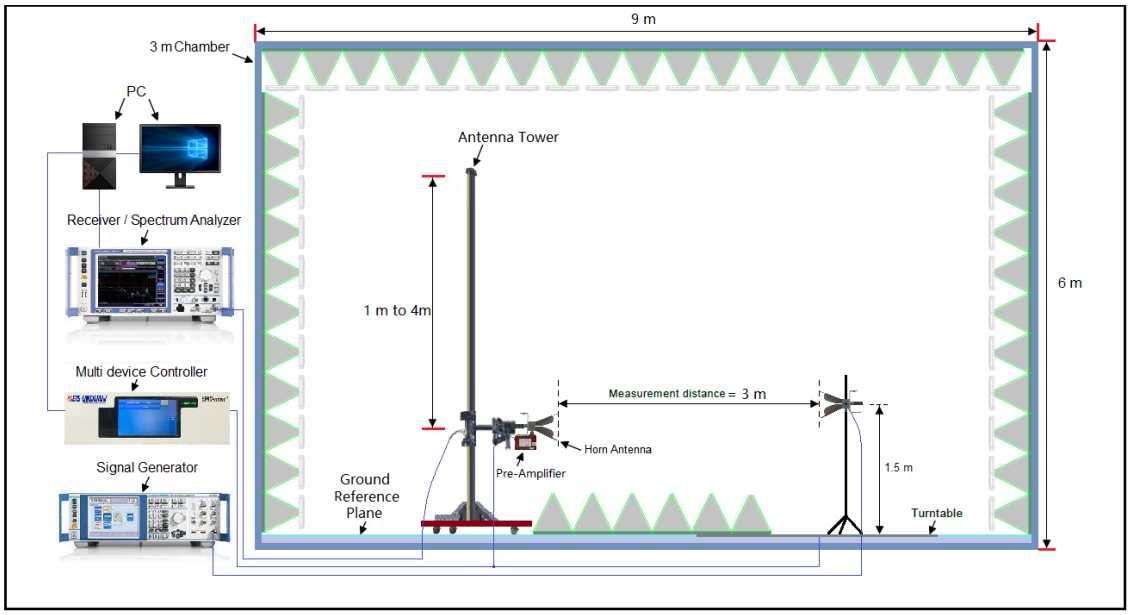
### 4.2.1 For Radiated Emissions test setup

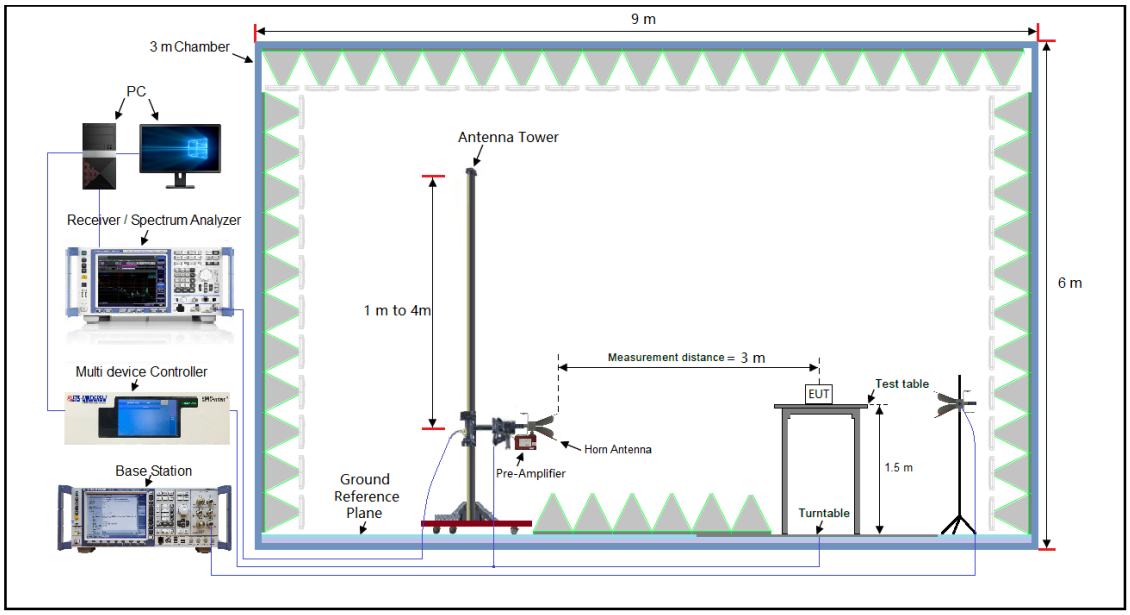
**Setup - 1_ERP Test setup**



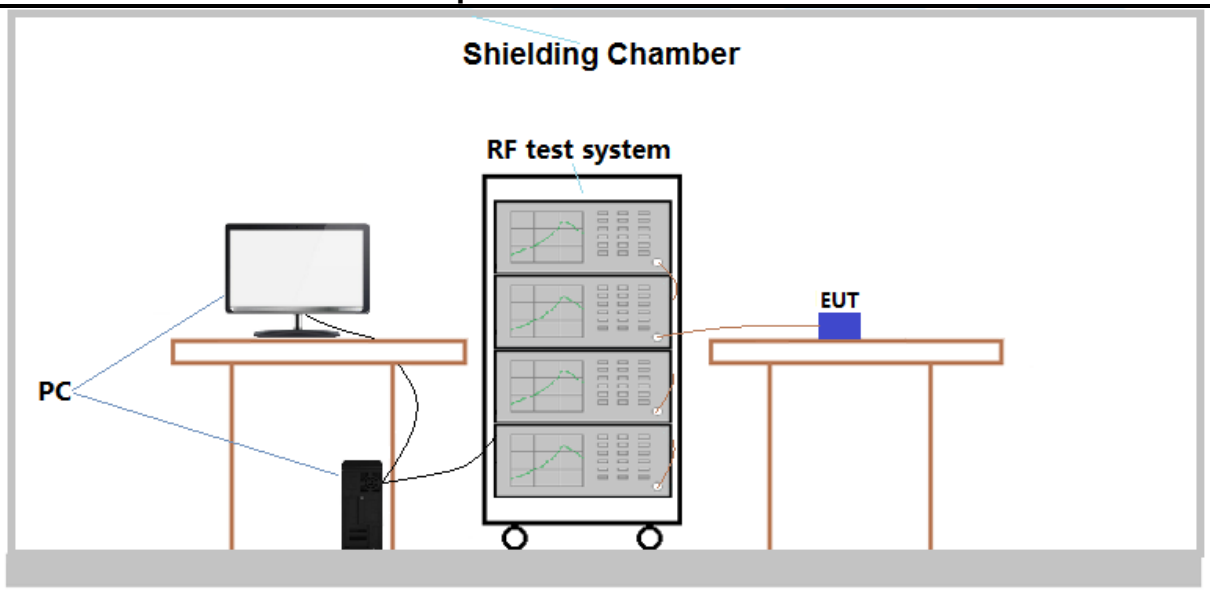



**Setup - 2_EIRP Test setup**

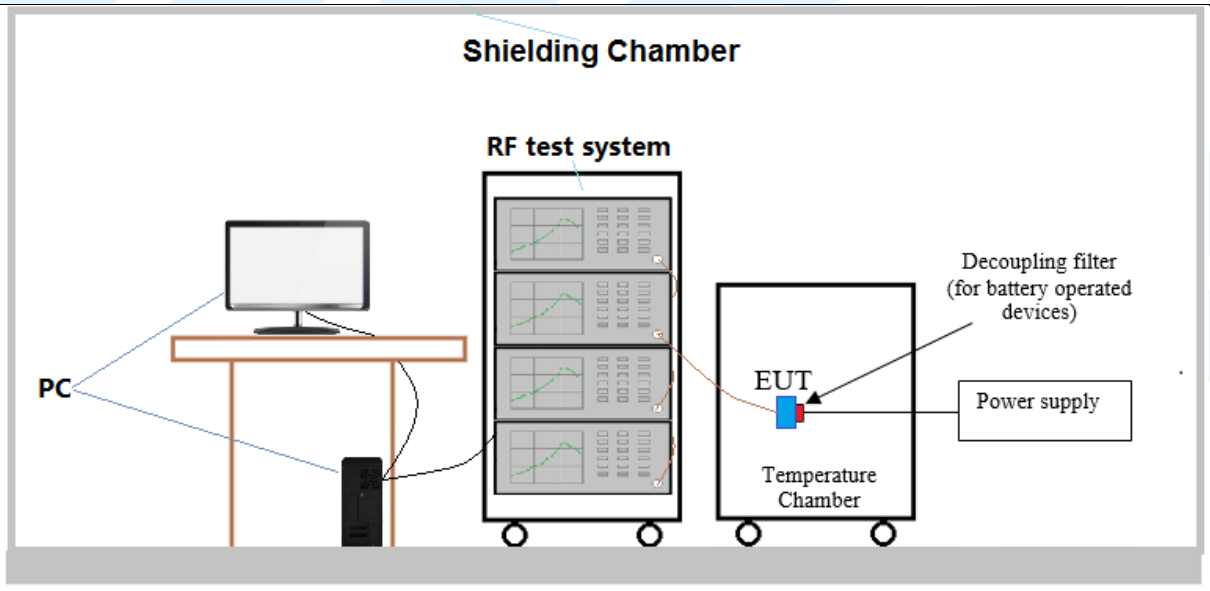


### 4.2.2 For Conducted RF test setup




Normal Environment




Extreme Environment

## 4.3 TEST CHANNELS

| Band | Tx/Rx Frequency | RF Channel | | |
|---|---|---|---|---|
| | | Low(L) | Middle(M) | High(H) |
| WCDMA Band IV | Tx (1710 MHz-1755 MHz) | Channel 1312 | Channel 1412 | Channel 1513 |
| | | 1712.4 MHz | 1732.4 MHz | 1752.6 MHz |

## 4.4 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.8Vdc rechargeable Li-on battery. Only the worst case data were recorded in this test report.

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

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

## 4.5 PRE-SCAN

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below.

| WCDMA Band IV Maximum Average Power (dBm) | | | |
|---|---|---|---|
| **Channel** | **1312** | **1412** | **1513** |
| **Frequency(MHz)** | **1712.4 MHz** | **1732.4 MHz** | **1752.6 MHz** |
| RMC 12.2K | 23.87 | **23.88** | 23.84 |
| HSDPA Subtest-1 | 22.67 | 22.68 | 22.69 |
| HSDPA Subtest-2 | 22.70 | 22.69 | 22.64 |
| HSDPA Subtest-3 | 22.25 | 22.18 | 22.12 |
| HSDPA Subtest-4 | 22.20 | 22.16 | 22.10 |
| HSUPA Subtest-1 | 22.79 | 22.54 | 22.61 |
| HSUPA Subtest-2 | 20.74 | 20.58 | 20.59 |
| HSUPA Subtest-3 | 21.77 | 21.56 | 21.54 |
| HSUPA Subtest-4 | 20.25 | 20.24 | 20.21 |
| HSUPA Subtest-5 | 22.24 | 22.19 | 22.60 |

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the worse mode applicability and tested channel detail as below:

| Band | Radiated | Conducted |
|---|---|---|
| WCDMA Band IV | RMC 12.2Kbps Link | RMC 12.2Kbps Link |

# 5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

## 5.1 REFERENCE DOCUMENTS FOR TESTING

| No. | Identity | Document Title |
|---|---|---|
| 1 | FCC 47 CFR Part 2 Subpart J | Frequency allocations and radio treaty matters; general rules and regulations |
| 2 | FCC 47 CFR Part 27 | Miscellaneous Wireless Communications Services |
| 3 | ANSI/TIA-603-E-2016 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 4 | KDB 971168 D01 | KDB 971168 D01 Power Meas License Digital Systems v03 |

## 5.2 ERP OR EIRP

**Test Requirement:** FCC 47 CFR Part 2.1046(a)
**WCDMA Band IV & LTE Band 4:** FCC 47 CFR Part 27.50(d)(4)

**Test Method:** KDB 971168 D01v03 & ANSI/TIA-603-E-2016

**Limit:**

**FCC 47 CFR Part 27.50(d)(4):** Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

**Test Procedure:**

Test procedure as below:

1) The EUT was powered ON and placed on a 0.8/1.5m high table at a 3 meter semi/fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7) were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)
EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)
EIRP=ERP+2.15dB

where:
Pg is the generator output power into the substitution antenna.

10) Test the EUT in the lowest channel, the middle channel the Highest channel
11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the Y axis positioning which it is worse case.
12) Repeat above procedures until all frequencies measured was complete.

**Receiver Setup:**

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 30MHz-1GHz | Peak | 100kHz | 300kHz | Peak |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak |

**Test Setup:** Refer to section 4.2.1 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** See table below

| Channel | WCDMA RMC 12.2Kbps Maximum EIRP (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| Lowest | 19.26 | 30.00 | Pass |
| Middle | 19.60 | 30.00 | Pass |
| Highest | 18.89 | 30.00 | Pass |

## 5.3 CONDUCTED OUTPUT POWER

**Test Requirement:** FCC 47 CFR Part 2.1046(a)
**WCDMA Band IV & LTE Band 4:** FCC 47 CFR Part 27.50(d)(4)

**Test Method:** KDB 971168 D01v03 & ANSI/TIA-603-E-2016

**Limit:**

**FCC 47 CFR Part 27.50(d)(4):** Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

**Test Procedure:**

The EUT was set up for the maximum power with WCDMA and LTE 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.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** The full result refer to section 4.5 for details.

## 5.4 PEAK-TO-AVERAGE RATIO

**Test Requirement:** FCC 47 CFR Part 24.232(d)

**Test Method:** KDB 971168 D01v03

**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

**Test Procedure:**

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth
b) Set the number of counts to a value that stabilizes the measured CCDF curve
c) Record the maximum PAPR level associated with a probability of 0.1 %

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** See table below

| Channel | WCDMA RMC 12.2Kbps | HSDPA | HSUPA | Limit (dBm) | Result |
|---|---|---|---|---|---|
| Lowest | 1.25 | 2.17 | 2.26 | 13 | Pass |
| Middle | 1.48 | 3.28 | 2.81 | 13 | Pass |
| Highest | 1.80 | 2.84 | 2.78 | 13 | Pass |

**The test plot as follows:**

| WCDMA RMC 12.2Kbps | HSDPA |
|---|---|
| **Lowest Channel** | |
|  |  |
| **Middle Channel** | |
|  |  |
| **Highest Channel** | |
|  |  |

| HSUPA | |
|---|---|
| **Lowest Channel** | **Middle Channel** |
|  |  |
| **Highest Channel** | |
|  | N/A |

## 5.5 99%&26DB BANDWIDTH

**Test Requirement:** FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 24.238(b)

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03

**Limit:** No Limit

**Test Procedure:**

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

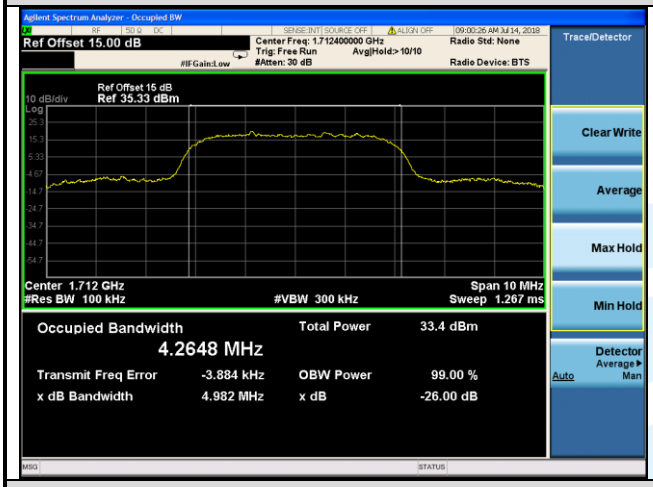
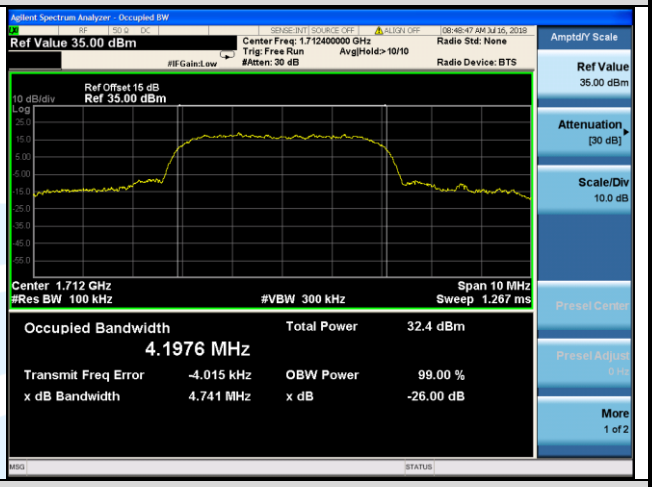
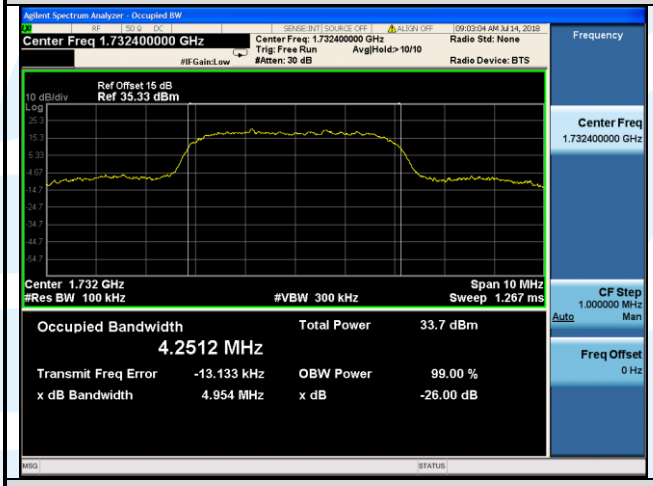
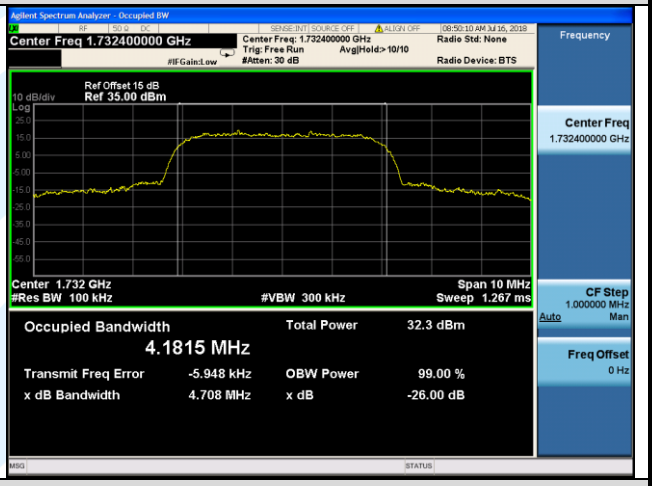
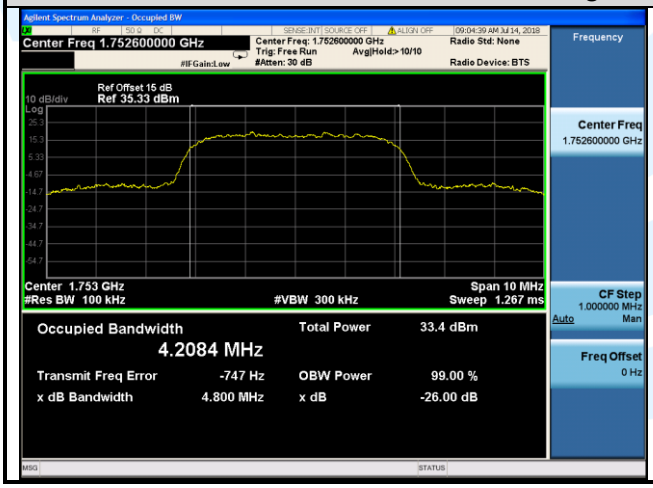
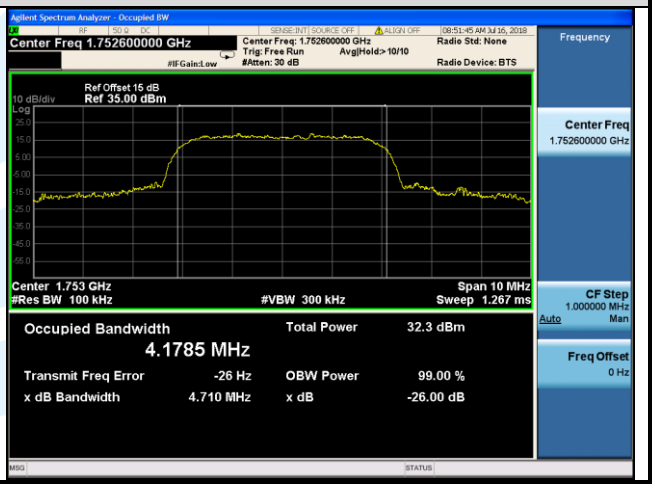
**Test Mode:** Link mode

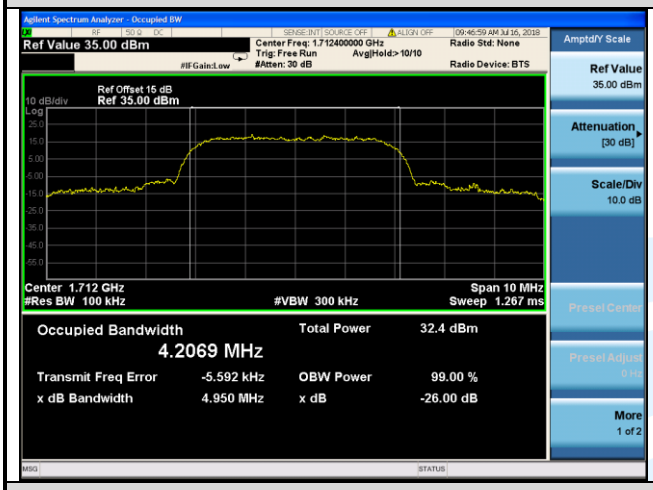
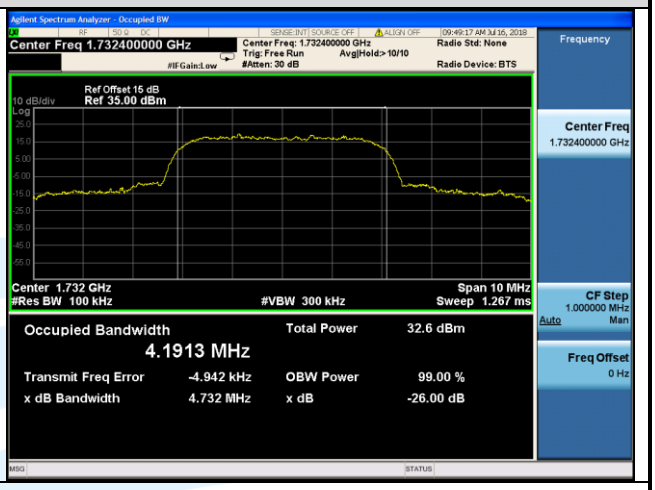
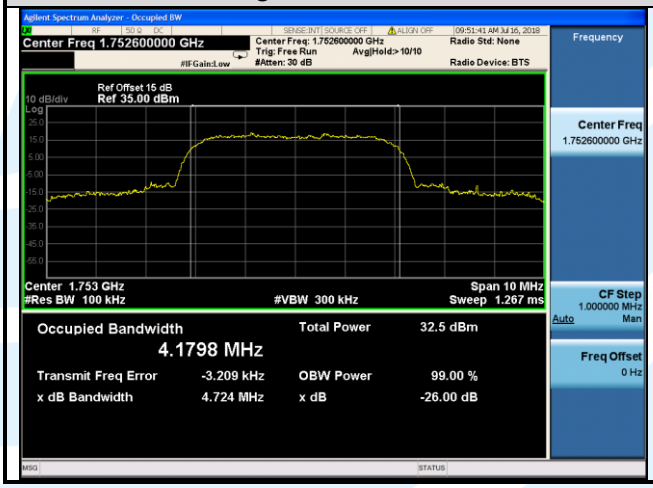
**Test Results:** Pass

**Test Data:** See table below

| 99% & 26 dB Bandwidth | | | | |
|---|---|---|---|---|
| **Test Mode** | **Channel** | **Frequency (MHz)** | **26 dB BW (MHz)** | **99% BW (MHz)** |
| WCDMA RMC 12.2Kbps | 1312 | 1712.4 | 4.982 | 4.2648 |
| | 1412 | 1732.4 | 4.954 | 4.2512 |
| | 1513 | 1752.6 | 4.800 | 4.2084 |
| HSDPA | 1312 | 1712.4 | 4.741 | 4.1976 |
| | 1412 | 1732.4 | 4.708 | 4.1815 |
| | 1513 | 1752.6 | 4.710 | 4.1785 |
| HSUPA | 1312 | 1712.4 | 4.950 | 4.2069 |
| | 1412 | 1732.4 | 4.732 | 4.1913 |
| | 1513 | 1752.6 | 4.724 | 4.1798 |

**The test plot as follows:**

| WCDMA | HSDPA |
|---|---|
| **Lowest Channel** | |
|  |  |
| **Middle Channel** | |
|  |  |
| **Highest Channel** | |
|  |  |

| HSUPA | |
|---|---|
| **Lowest Channel** | **Middle Channel** |
|  |  |
| **Highest Channel** | |
|  | N/A |

## 5.6 BAND EDGE AT ANTENNA TERMINALS

**Test Requirement:** **WCDMA Band IV & LTE Band 4:** FCC 47 CFR Part 27.53(h)(1)

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03

**Limit:**

**FCC 47 CFR Part 27.53(h)(1)**: Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. The emission limit equal to –13 dBm.

FCC 47 CFR Part 27.53(h)(3): Measurement procedure. (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

**Test Procedure:**

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.
For each band edge measurement:

1) Set the spectrum analyzer span to include the block edge frequency.
2) Set a marker to point the corresponding band edge frequency in each test case.
3) Set display line at -13 dBm
4) Set resolution bandwidth to at least 1% of emission bandwidth.
5) Set spectrum analyzer with RMS detector.
6) Record the max trace plot into the test report

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

## WCDMA RMC 12.2Kbps

### Lowest Channel


### Highest Channel


## HSDPA

### Lowest Channel


### Highest Channel


## HSUPA

### Lowest Channel


### Highest Channel

## 5.7 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**Test Requirement:** **WCDMA Band IV & LTE Band 4:** FCC 47 CFR Part 27.53(h)(1)

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03

**Limit:**

**FCC 47 CFR Part 27.53(h)(1)**: Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. The emission limit equal to –13 dBm.

FCC 47 CFR Part 27.53(h)(3): Measurement procedure. (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

**Test Procedure:**

The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range. b. Measuring frequency range is from 30 MHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

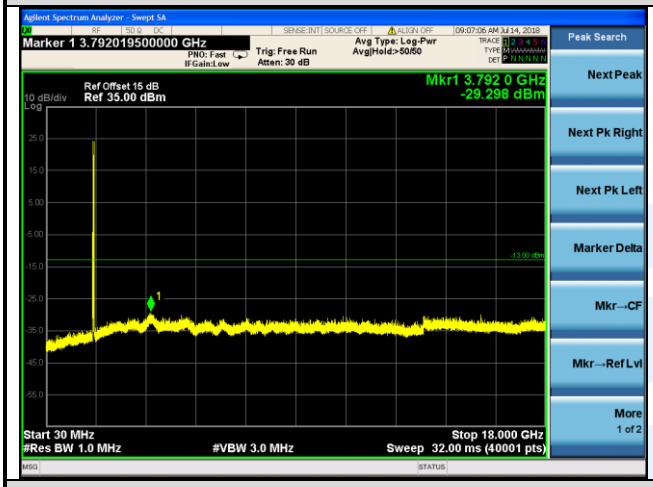
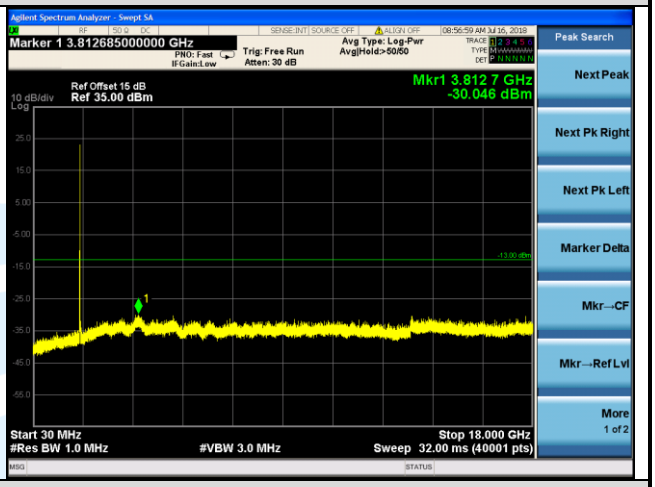
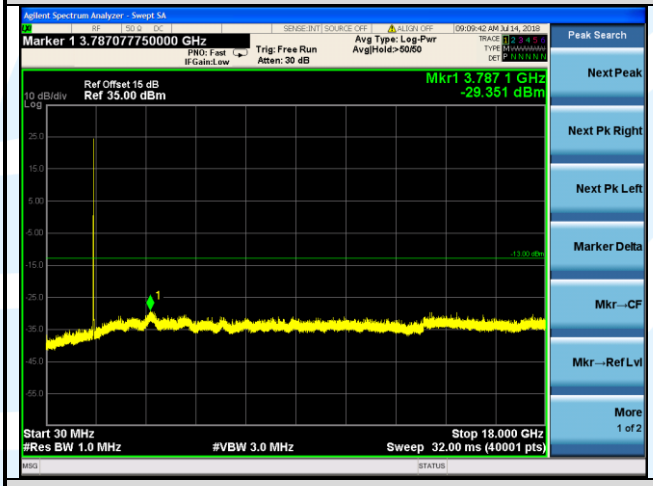
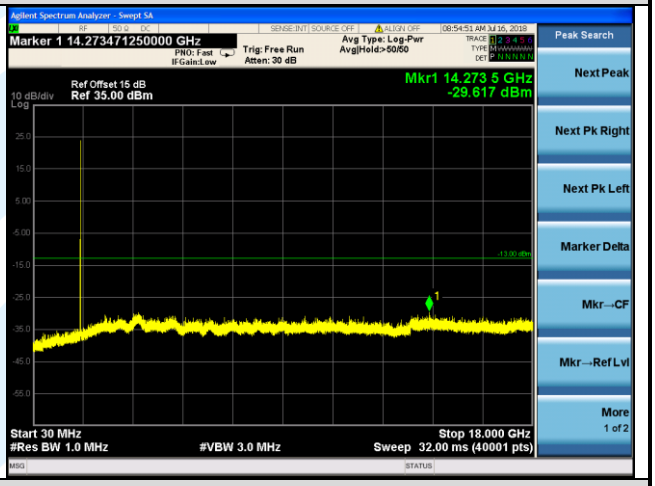
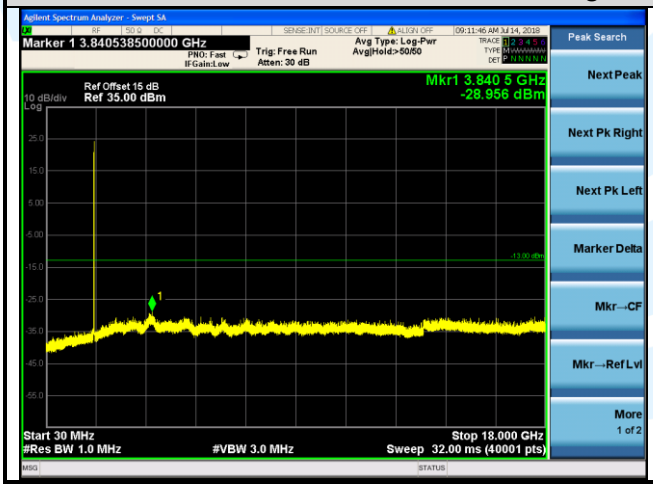
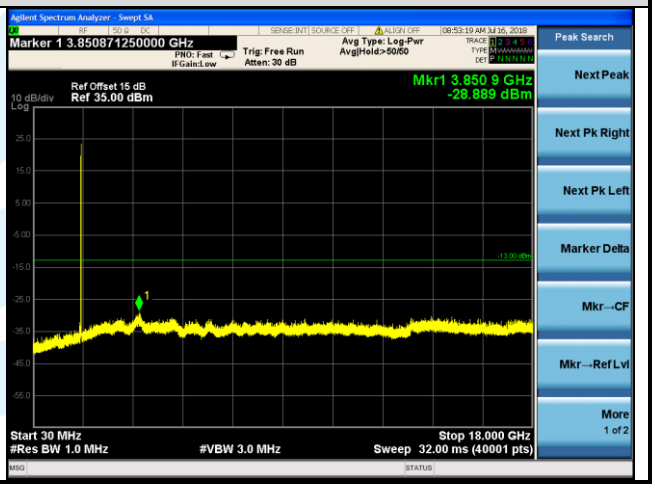
**Test Setup:** Refer to section 4.2.2 for details.

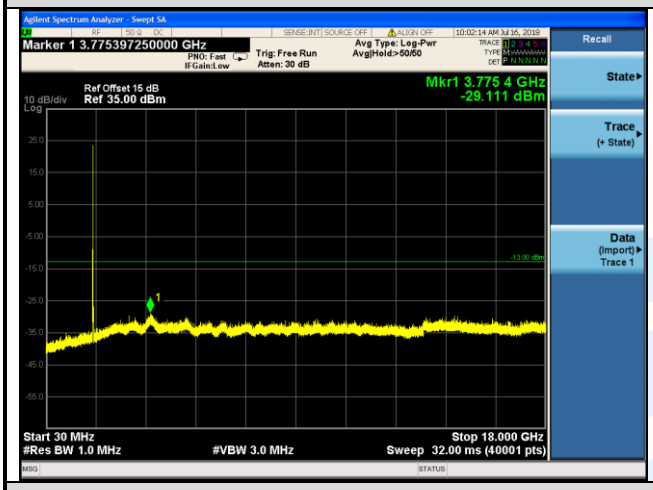
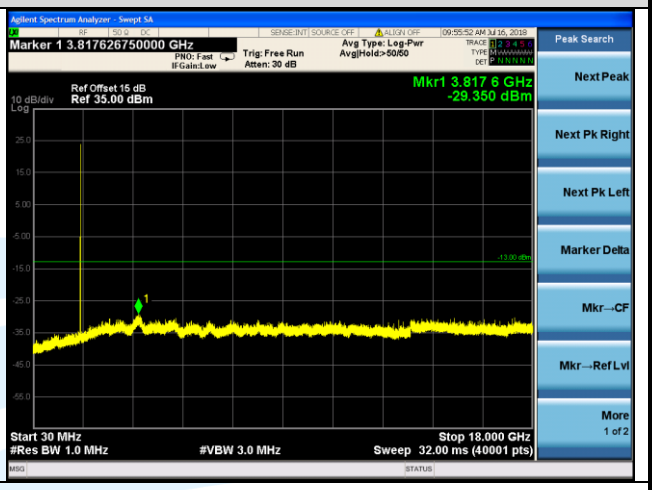
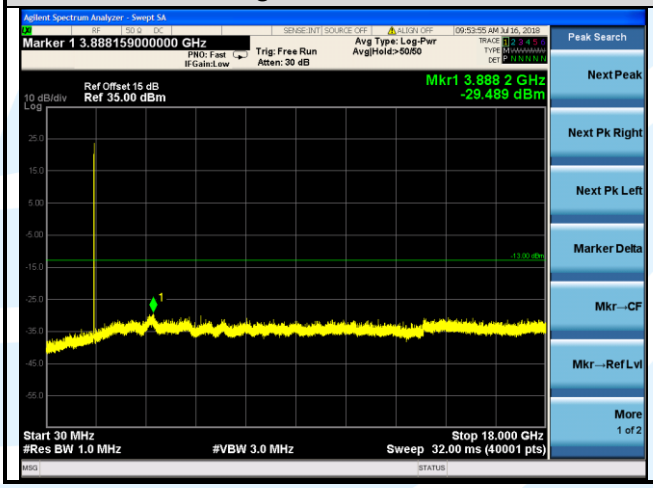
**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**The test plot as follows:**

| WCDMA RMC 12.2Kbps | HSDPA |
|---|---|
| **Lowest Channel** | |
|  |  |
| **Middle Channel** | |
|  |  |
| **Highest Channel** | |
|  |  |

| HSUPA | |
|---|---|
| **Lowest Channel** | **Middle Channel** |
|  |  |
| **Highest Channel** | |
|  | N/A |

## 5.8 FIELD STRENGTH OF SPURIOUS RADIATION

**Test Requirement:** **WCDMA Band IV & LTE Band 4:** FCC 47 CFR Part 27.53(h)(1)

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03

**Receiver Setup:**

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 0.009 MHz-30 MHz | Peak | 10 kHz | 30 KHz | Peak |
| 30 MHz-1 GHz | Quasi-peak | 100 kHz | 300 KHz | Peak |
| Above 1 GHz | Peak | 1 MHz | 3 MHz | Peak |

**Limits:**

**FCC 47 CFR Part 27.53(h)(1)**: Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. The emission limit equal to –13 dBm.

FCC 47 CFR Part 27.53(h)(3): Measurement procedure. (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

**Test Setup:** Refer to section 4.2.1 for details.

**Test Procedures:**

1. Scan up to 10th harmonic, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Test procedure as below:

1) The EUT was powered ON and placed on a 0.8/1.5m high table at a 3 meter semi/fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7) were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)
EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)
EIRP=ERP+2.15dB

where:
Pg is the generator output power into the substitution antenna.

10) Test the EUT in the lowest channel, the middle channel the Highest channel
11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the Y axis positioning which it is worse case.
12) Repeat above procedures until all frequencies measured was complete.

**Equipment Used:** Refer to section 3 for details.

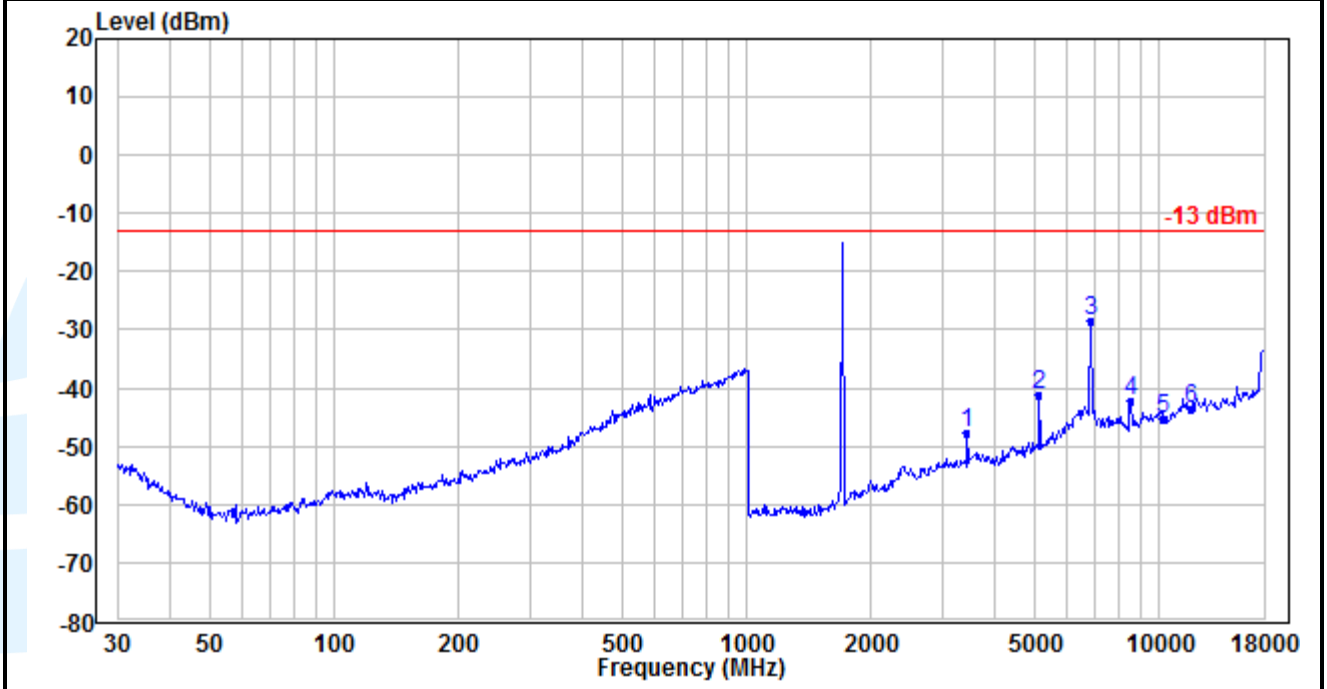
**Test Result:** Pass

**The measurement data as follows:**

**Radiated Emission Test Data**

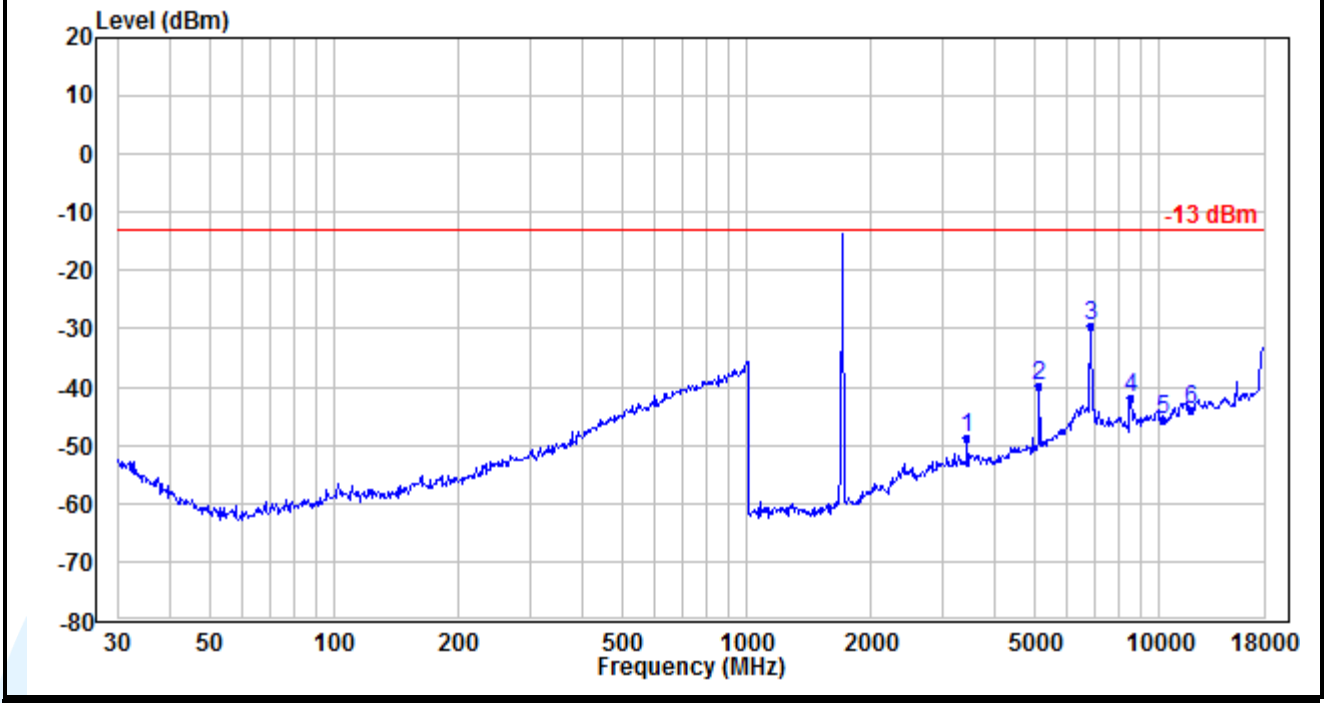
**WCDMA RMC 12.2Kbps_Lowest Channel**

**Horizontal**




| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 3424.800 | -102.09 | 54.37 | -47.72 | -13.00 | -34.72 | Peak |
| 2 | 5137.200 | -102.52 | 61.41 | -41.11 | -13.00 | -28.11 | Peak |
| 3 | 6849.800 | 471.42 | -500.00 | -28.58 | -13.00 | -15.58 | Peak |
| 4 | 8562.000 | 457.88 | -500.00 | -42.12 | -13.00 | -29.12 | Peak |
| 5 | 10274.400 | 454.57 | -500.00 | -45.43 | -13.00 | -32.43 | Peak |
| 6 | 11986.800 | 456.31 | -500.00 | -43.69 | -13.00 | -30.69 | Peak |

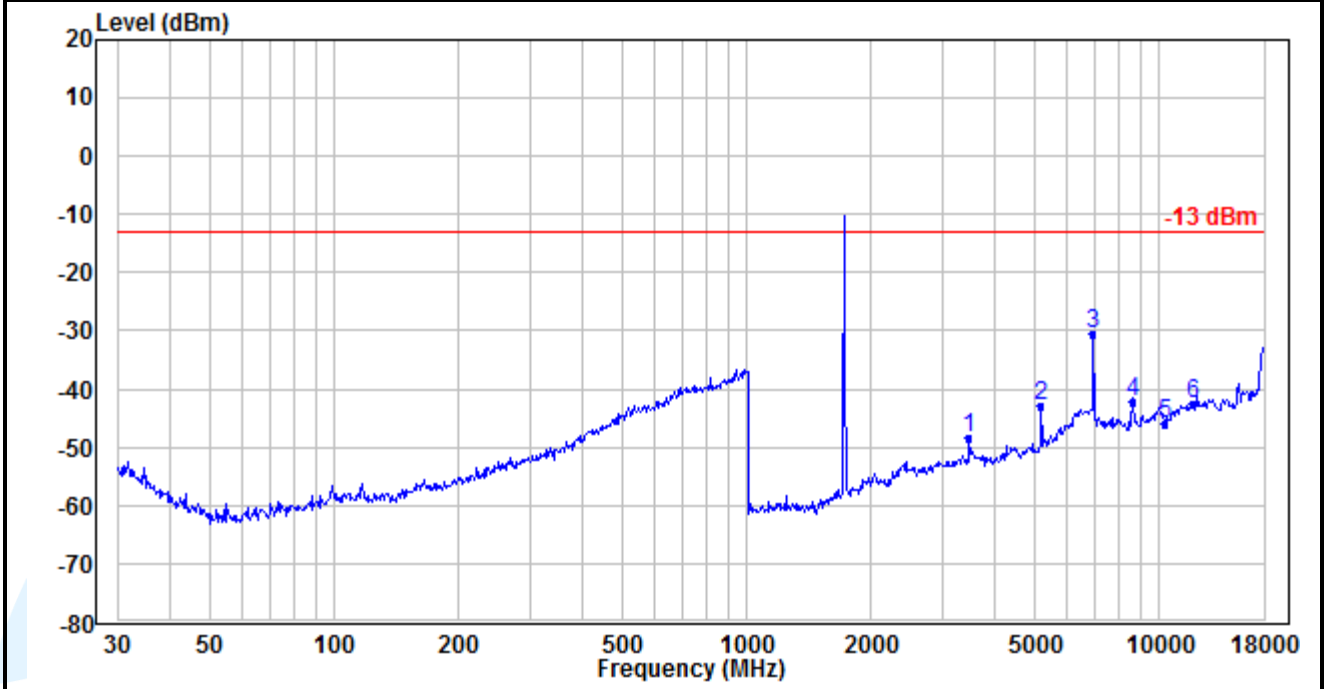
**Vertical**




| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 3424.800 | -102.98 | 54.37 | -48.61 | -13.00 | -35.61 | Peak |
| 2 | 5137.200 | -101.20 | 61.41 | -39.79 | -13.00 | -26.79 | Peak |
| 3 | 6849.600 | 470.37 | -500.00 | -29.63 | -13.00 | -16.63 | Peak |
| 4 | 8562.000 | 458.02 | -500.00 | -41.98 | -13.00 | -28.98 | Peak |
| 5 | 10274.400 | 454.43 | -500.00 | -45.57 | -13.00 | -32.57 | Peak |
| 6 | 11986.800 | 456.13 | -500.00 | -43.87 | -13.00 | -30.87 | Peak |

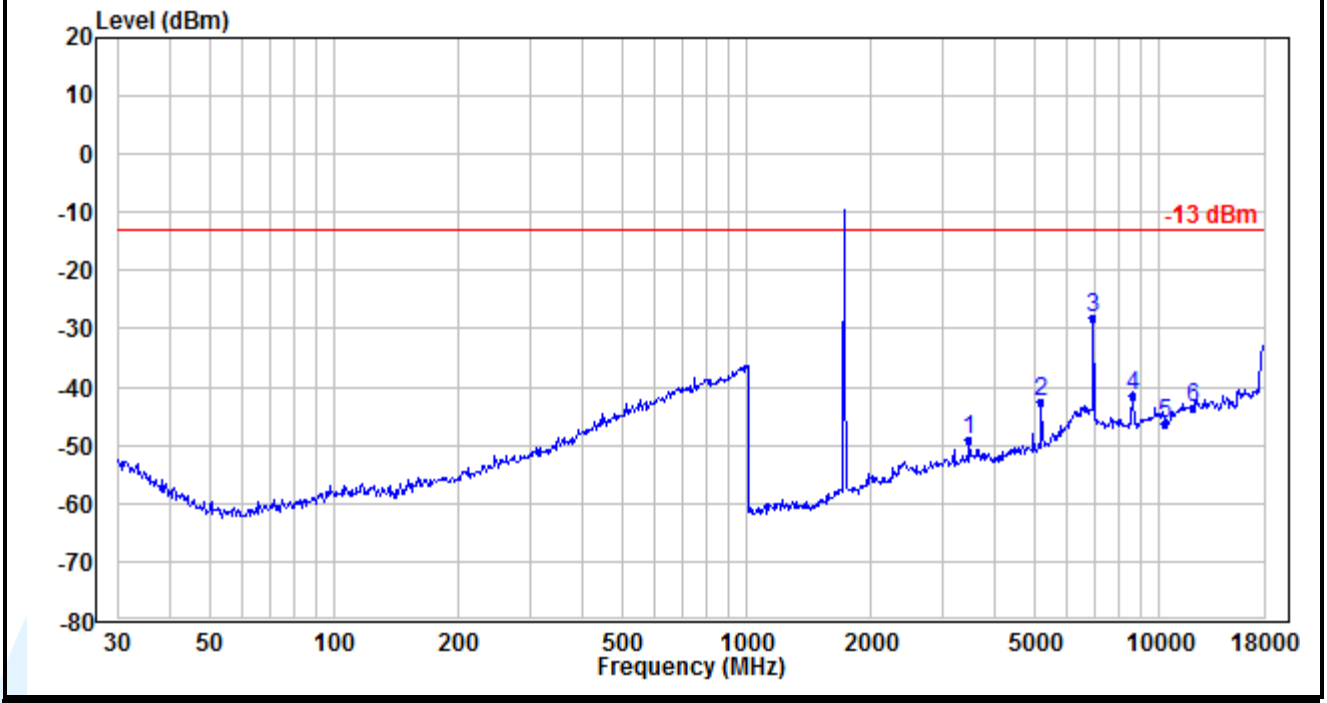
**WCDMA RMC 12.2Kbps_Middle Channel**

**Horizontal**




| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 3464.800 | -102.97 | 54.60 | -48.37 | -13.00 | -35.37 | Peak |
| 2 | 5197.200 | -104.64 | 61.77 | -42.87 | -13.00 | -29.87 | Peak |
| 3 | 6929.600 | 469.65 | -500.00 | -30.35 | -13.00 | -17.35 | Peak |
| 4 | 8662.000 | 457.73 | -500.00 | -42.27 | -13.00 | -29.27 | Peak |
| 5 | 10394.400 | 453.88 | -500.00 | -46.12 | -13.00 | -33.12 | Peak |
| 6 | 12126.800 | 457.38 | -500.00 | -42.62 | -13.00 | -29.62 | Peak |

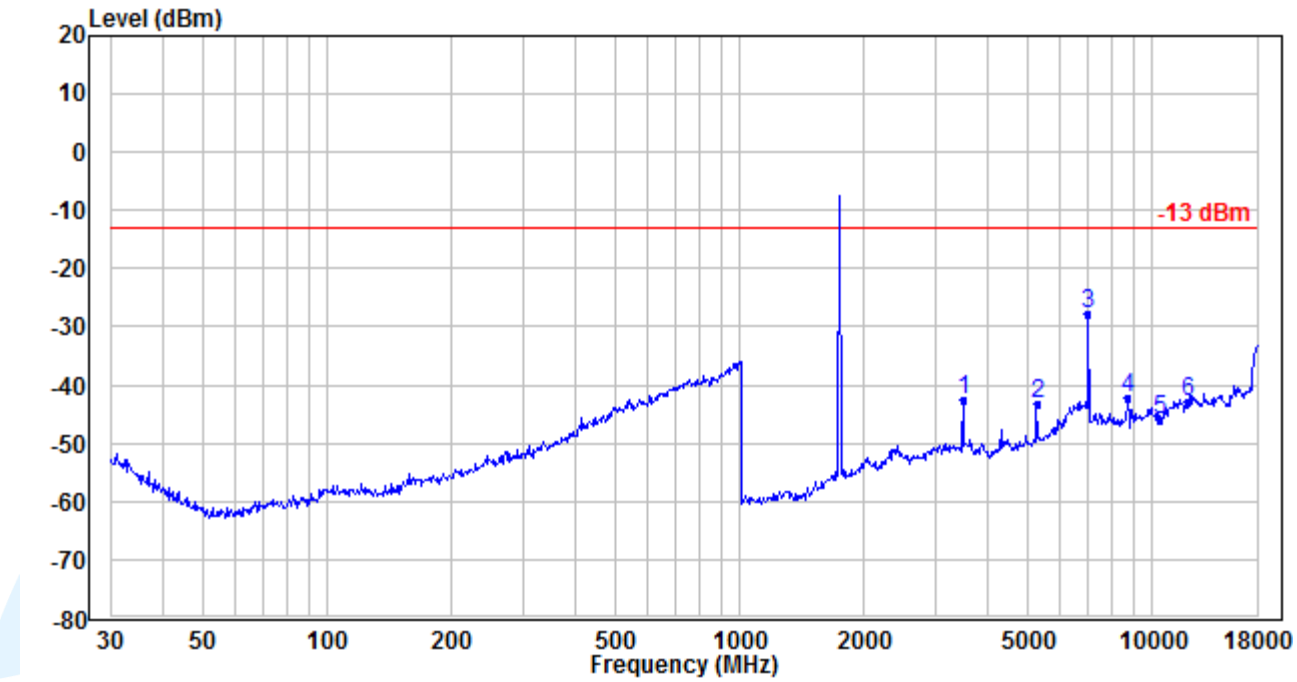
**Vertical**




| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 3464.800 | -103.80 | 54.60 | -49.20 | -13.00 | -36.20 | Peak |
| 2 | 5197.200 | -104.34 | 61.77 | -42.57 | -13.00 | -29.57 | Peak |
| 3 | 6929.600 | 471.82 | -500.00 | -28.18 | -13.00 | -15.18 | Peak |
| 4 | 8662.000 | 458.49 | -500.00 | -41.51 | -13.00 | -28.51 | Peak |
| 5 | 10394.400 | 453.64 | -500.00 | -46.36 | -13.00 | -33.36 | Peak |
| 6 | 12126.800 | 456.42 | -500.00 | -43.58 | -13.00 | -30.58 | Peak |

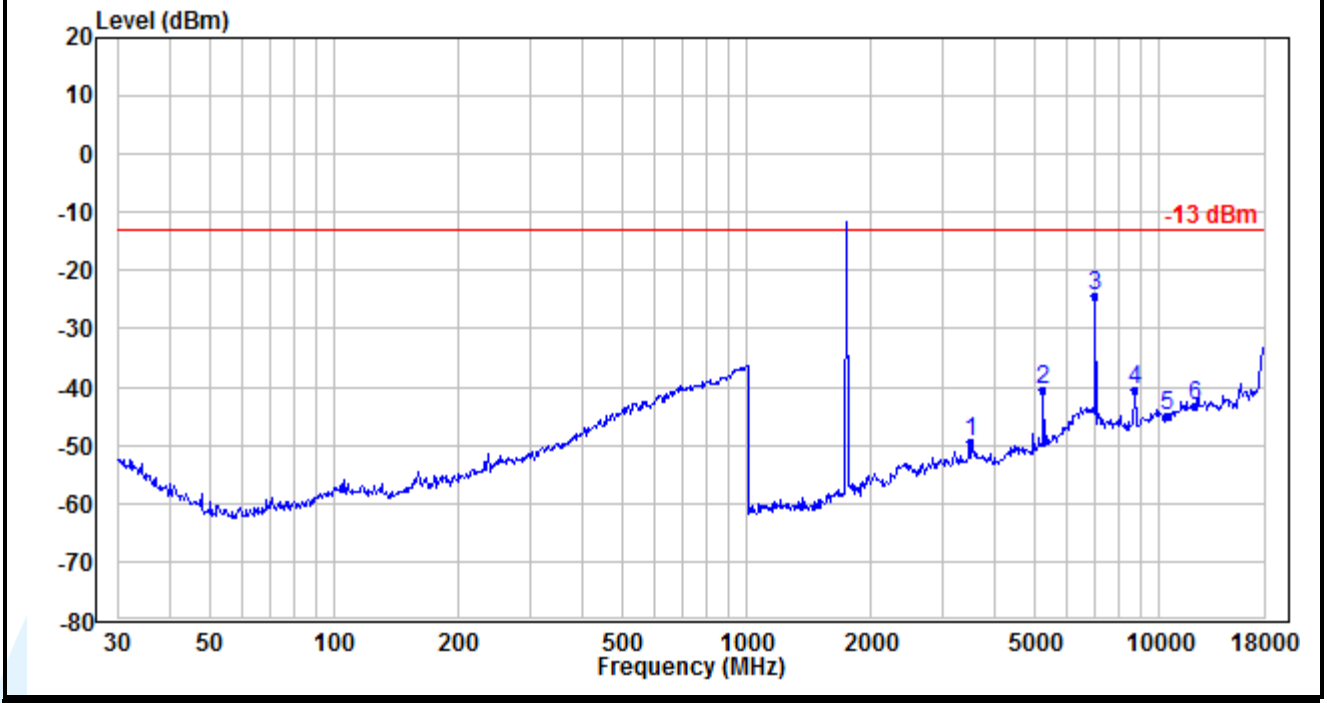
**WCDMA RMC 12.2Kbps_Highest Channel**

**Horizontal**




| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 3505.200 | -97.37 | 54.82 | -42.55 | -13.00 | -29.55 | Peak |
| 2 | 5297.800 | -105.62 | 62.38 | -43.24 | -13.00 | -30.24 | Peak |
| 3 | 7010.400 | 472.26 | -500.00 | -27.74 | -13.00 | -14.74 | Peak |
| 4 | 8763.000 | 457.72 | -500.00 | -42.28 | -13.00 | -29.28 | Peak |
| 5 | 10515.600 | 454.19 | -500.00 | -45.81 | -13.00 | -32.81 | Peak |
| 6 | 12268.200 | 457.00 | -500.00 | -43.00 | -13.00 | -30.00 | Peak |

**Vertical**




| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 3505.200 | -104.16 | 54.82 | -49.34 | -13.00 | -36.34 | Peak |
| 2 | 5257.800 | -102.64 | 62.15 | -40.49 | -13.00 | -27.49 | Peak |
| 3 | 7010.400 | 475.54 | -500.00 | -24.46 | -13.00 | -11.46 | Peak |
| 4 | 8763.000 | 459.65 | -500.00 | -40.35 | -13.00 | -27.35 | Peak |
| 5 | 10515.600 | 454.89 | -500.00 | -45.11 | -13.00 | -32.11 | Peak |
| 6 | 12268.200 | 456.91 | -500.00 | -43.09 | -13.00 | -30.09 | Peak |

**Remark:**

1) All tested is under the condition of the main wave is filtered out.

2) All the above radiation data, the fundamental frequency is not marked, it may exceed the limit, please ignore it.

## 5.9 FREQUENCY STABILITY

**Test Requirement:** FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 24.235

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03

**Limits:** The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

**Test Setup:** Refer to section 4.2.2 for details.

**Test Procedures:**

1) Use CMW 500 or CMU 200 with Frequency Error measurement capability.
   a) Temp. = −30° to + 50°C
   b) Voltage =low voltage, 3.5 Vdc, Normal, 3.8 Vdc and High voltage, 4.3 Vdc.
2) Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

3) Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

**Equipment Used:** Refer to section 3 for details.

**Test Result:** Pass

| Modulation | Channel/ Frequency (MHz) | Voltage (Vdc) | Temperature (℃) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Pass/ Fail |
|---|---|---|---|---|---|---|---|
| WCDMA RMC 12.2Kbps | | | | | | | |
| BPSK | 1412 / 1732.4 | VL | TN | -27 | -0.0156 | Note 1 | Pass |
| | | VN | | -29 | -0.0167 | | Pass |
| | | VH | | -28 | -0.0162 | | Pass |
| | | VN | 50 | -26 | -0.0150 | | Pass |
| | | | 40 | -31 | -0.0179 | | Pass |
| | | | 30 | -31 | -0.0179 | | Pass |
| | | | 20 | -29 | -0.0167 | | Pass |
| | | | 10 | -26 | -0.0150 | | Pass |
| | | | 0 | -27 | -0.0156 | | Pass |
| | | | -10 | -28 | -0.0162 | | Pass |
| | | | -20 | -29 | -0.0167 | | Pass |
| | | | -30 | -34 | -0.0196 | | Pass |

**Note1:** The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

## APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

## APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***