TEST REPORT

Applicant	:	Sonim Technologies Inc
Address of Applicant	:	6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA
Product Name	:	Rugged Tablet
Model No.	:	RS80
Sample No.	:	E21040014-01#01 E21040014-01#04
FCC ID	:	WYPRS80
ISED Number	:	8090A-RS80
Standards	:	FCC CFR47 Part 2 RSS-Gen (Others refer to chapter 1.4)
Date of Receipt	:	2021-04-19
Date of Test	:	2021-04-19 ~ 2021-05-21
Date of Issue	:	2021-05-21

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by: Jennifer Zhou (Jennifer Zhou) Reviewed by: Oliver Xiang (Oliver Xiang) Approved by: Guoyou Chi (Authorized signatory: Guoyou Chi)

Contents

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	Sonim Technologies Inc
Address	6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA
Contact Person	Avena.Xu
Telephone	1-650-378-8100
Email	avena.xu@sonimtech.com

1.3 Details of EUT

Product Name	Rugged Tablet
Brand Name	Sonim
Model No.	RS80
FCC ID	WYPRS80
Mode of Operation	GPRS/EDGE 850/1900; WCDMA/HSDPA/HSUPA Band II/IV/V;LTE FDD Band 2/4/5/7/12/13/14/25/26/66; LTE TDD Band 38/41;
Modulation Type	QPSK for WCDMA; QPSK/16QAM for HSDPA/HSUPA/LTE;
Power Class	GSM/GPRS 850: 4 GSM/GPRS 1900: 1 EDGE 850/1900: E2 WCDMA/HSDPA/HSUPA Band II: 3 WCDMA/HSDPA/HSUPA Band IV: 3 WCDMA/HSDPA/HSUPA Band V: 3 LTE FDD Band 2: 3 LTE FDD Band 4: 3 LTE FDD Band 5: 3 LTE FDD Band 7: 3 LTE TDD Band 38: 3 LTE TDD Band 41: 3 LTE FDD Band 66: 3 LTE band 12/13/25: 1

Multislot Class	GPRS/EDGE: 12
Antenna Type	Internal Antenna
Antenna Gain	Peak gain1.05dBi
Extreme Temperature Range	-20℃~ +55℃
Hardware version	V1.00
Software version	80.0.0-01-10.0.0-00.35.01
Test SW Version	BL410_R;BL410_E

1.4 Test Methodology

47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
47 CFR Part 27	Miscellaneous Wireless Communications Services
RSS-Gen	General Requirements and Information for the Certification of Radio Apparatus
RSS-199	Broadband Radio Service (BRS) Equipment Operating in the Band 2500–2690 MHz
ANSI/TIA-603-E March 2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI C63.26:2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
KDB 971168 D01 v03r01	Measurement Guidance for Certification of Licensed Digital Transmitters

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

1.5 Test Verdict

No.	FCC Part No.	ISED Part No.	Description	Test Result	Verdict
1	2.1046	RSS-199 4.4	Conducted RF Output Power	Reporting Only Clause 5.1.1	PASS
2	2.1046 27.50	RSS-199 4.4	Effective (Isotropic) Radiated Power	Clause 5.1.1	PASS
3	2.1046 27.50(d)	RSS-199 4.4	Peak to Average Radio	Clause 5.1.2	PASS
4	2.1049 27.53	RSS-Gen 6.6	Occupied Bandwidth	Clause 5.1.3	PASS
5	2.1055 27.54	RSS-Gen 6.11 RSS-199 4.3	Frequency Stability	Clause 5.1.4	PASS
6	2.1051 27.53	RSS-Gen 6.13 RSS-199 4.5	Spurious Emission at Antenna Terminals	Clause 5.1.5	PASS
7	2.1051 27.53	RSS-199 4.5	Band Edge	Clause 5.1.6	PASS
8	2.1051 27.53	RSS-Gen 6.13 RSS-199 4.5	Field Strength of Spurious Radiation	Clause 5.1.7	PASS
9	N/A	RSS-Gen 8.8	AC Power-Line Conducted Emissions	Clause 5.1.8	PASS
10	N/A	RSS-Gen 7	Receiver Spurious Emissions	Clause 5.1.9	PASS

Note(s):
Since add LTE Band38 with no changes in products. Therefore, only the LTE Band38 test items were necessary. Other bands in the Field Strength of Spurious Radiation only show the worst case in this report except LTE Band38.

2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Test Environments

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

Test Voltage	NV (Normal Voltage)	3.80 V
	LV (Low Voltage)	3.70 V

	HV (High Voltage)	4.35 V
Test Temperature	NT (Normal Temperature)	+25 °C
	LT (Low Temperature)	-20 °C
	HT (High Temperature)	+55 °C

2.3 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020A	MY59260184	2021-08-23
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-07-28
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-18
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	150835	2021-08-18
DC Power Supply	ACPOWER	ADC-0800025-15	D215010003	2022-03-19
Temperature Chamber	SHKTEST	SHK-B101	20190819001	2021-12-22
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-07-28
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-07-26
EMC chamber 9*6*6（L*W*H)	CHANGNING	966	N/A	2023-06-08
Shielded Enclosure 8*5*4（L*W*H)	CHANGNING	854	N/A	2021-06-08
Test Software	BL	BL410_E	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A

2.4 Measurement Uncertainty

FCC Part Section	Test Description	Uncertainty
2.1046	Conducted RF Output Power	±0.68dB
2.1046 24.232(d) 27.50(d)	Peak to Average Radio	±0.015%
2.1049 22.917 24.238 27.53	Occupied Bandwidth	±30kHz
2.1055	Frequency Stability	±12Hz

22.355 24.235 27.54 90.213		
2.1051 22.917 24.238 27.53 90.691	Spurious Emission at Antenna Terminals	±2.56dB
2.1051 22.917 24.238 27.53 90.691	Band Edge	±2.56dB

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Test Item	LTE Band	Bandwidth (MHz)						Modulation Type		RB#			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	LCH	MCH	HCH
Effective (Isotropic) Radiated Power	38	n	n	v	v	v	v	v	v	v	v	v	v	v	v
Peak to Average Radio	38	n	n	--	--	--	v	v	v	v	--	v	v	v	v
Occupied Bandwidth	38	n	n	v	v	v	v	v	v	--	--	v	v	v	v
Frequency Stability	38	n	n	--	v	--	--	v	v	--	--	v	--	v	--
Spurious Emission at Antenna Terminals	38	n	n	v	v	v	v	v	v	v	--	--	v	v	v
Band Edge	38	n	n	v	v	v	v	v	v	v	--	v	v	--	v
Field Strength of Spurious Radiation	38	n	n	v	v	v	v	v	--	v	--	--	--	v	--

Note(s):

1. The mark ‘v’ means that this configuration is chosen for testing.
2. The mark ‘n’ means that this bandwidth is not supported.

3.2 Test Setup Diagram

Diagram of Measurement Equipment Configuration for Antenna Port Test

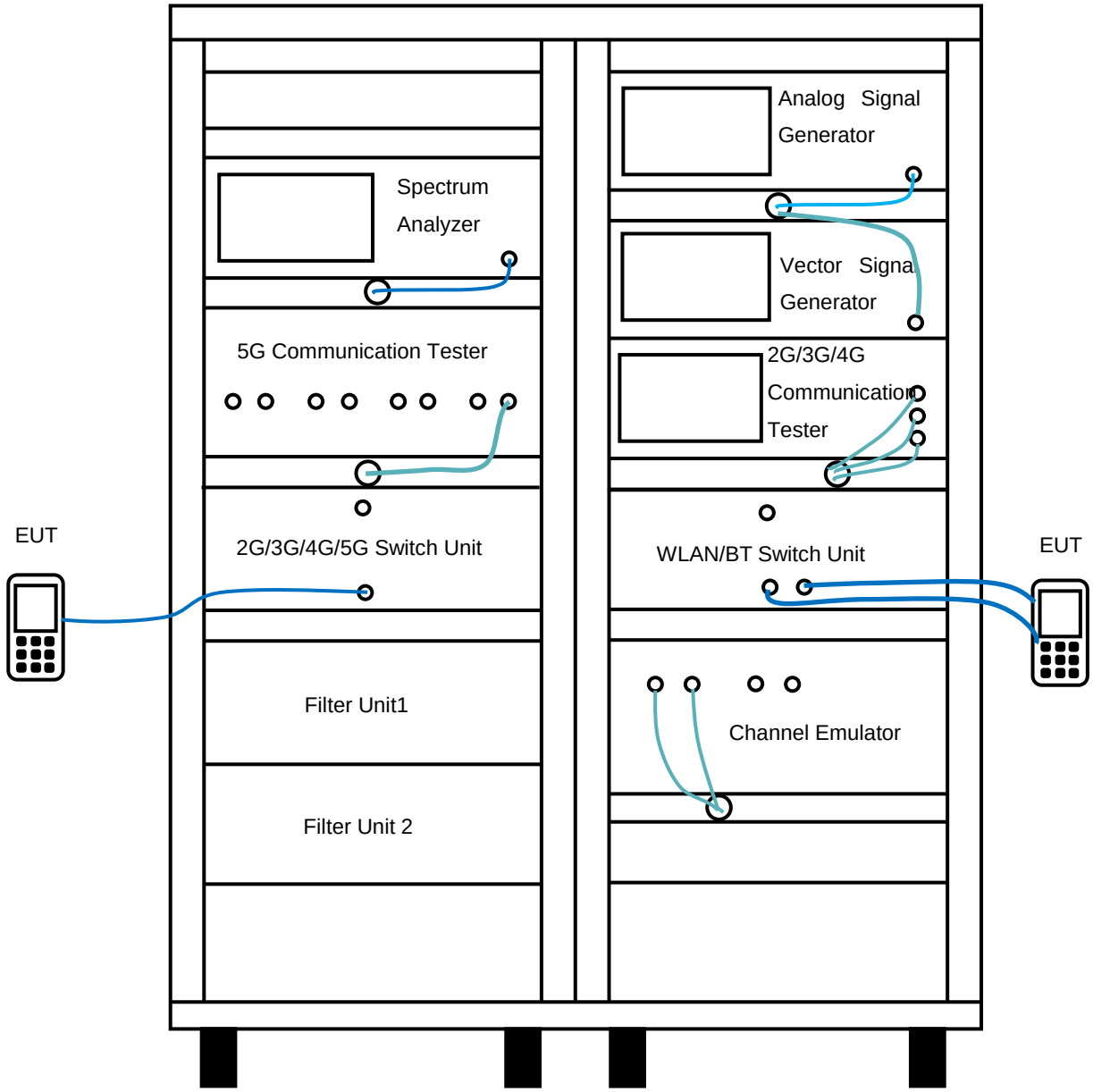
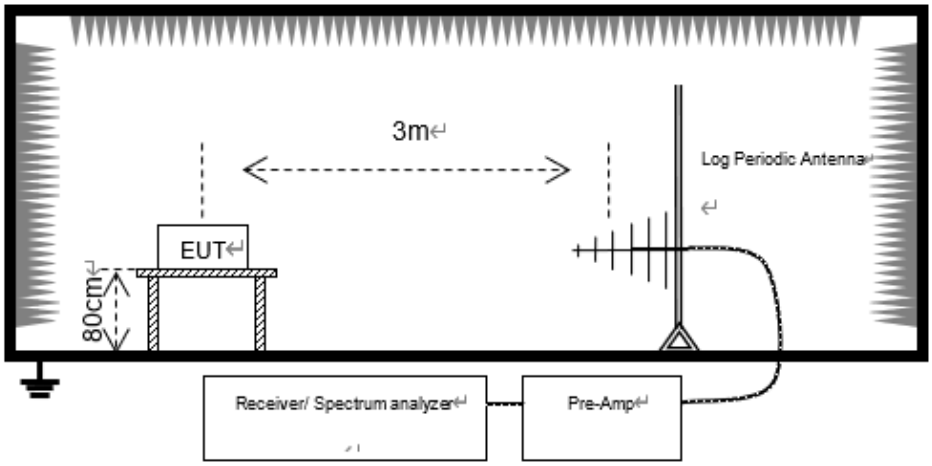
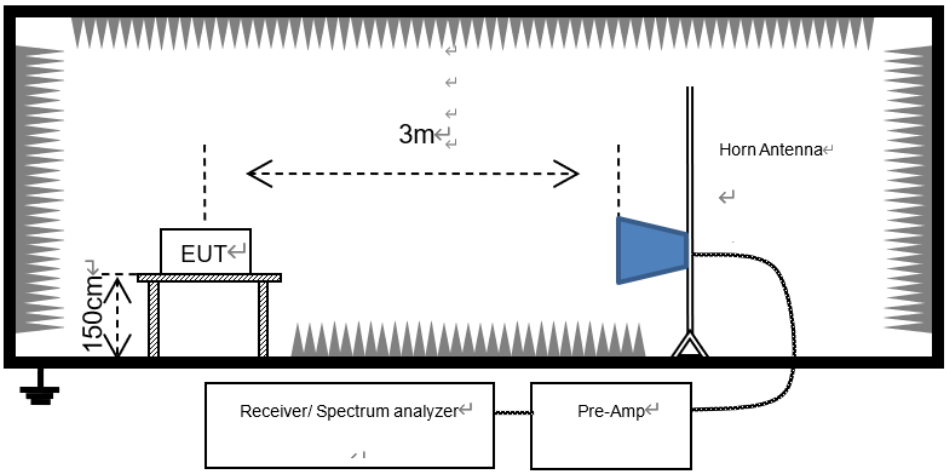


Diagram of Measurement Configuration for Radiation Test





Note: Measurements below 1GHz are done with a table height of 0.8m and above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Configuration for Frequency Stability

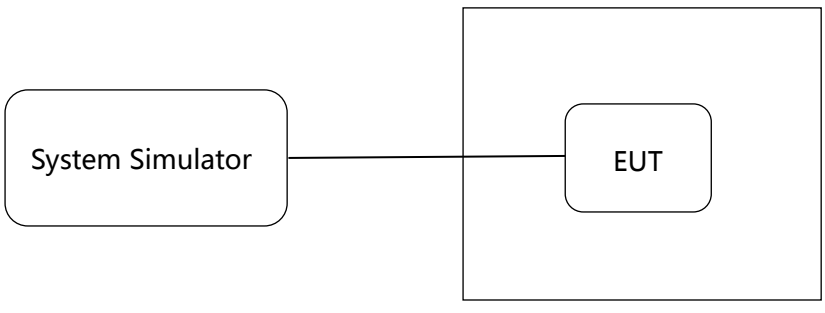
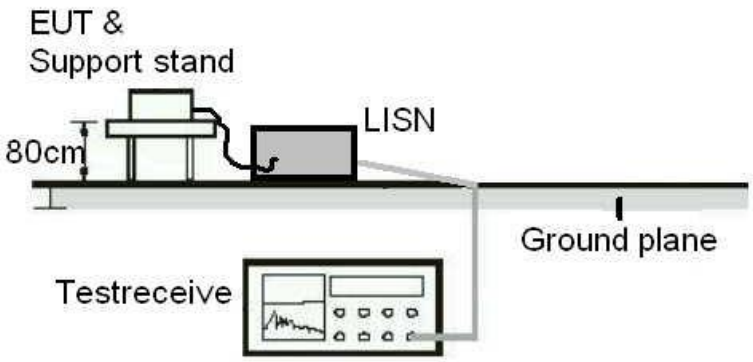


Diagram of Measurement Equipment Configuration for Conduction Measurement



4 Test Items

4.1 Transmitter Radiated Power (EIRP/ERP)

4.1.1 Limit

FCC § 2.1046(a) & 22.913(a) & 24.232(c) & 27.50(b) & 27.50(c) & 27.50(d) & 27.50(h)

According to FCC section 22.913(a) (2), the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC section 24.232(c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to FCC section 27.50(b) (10), portable stations (hand-held devices) transmitting in the 746-757MHz, 776-788MHz, and 805-806MHz bands are limited to 3 watts ERP.

FCC section 27.50(c) (10), portable stations (hand-held devices) in the 698-746MHz band are limited to 3 watts ERP.

FCC section 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. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

Fixed, mobile, and portable (hand-held) stations operating in the 2000-2020 MHz band are limited to 2 watts EIRP.

And FCC section 27.50(h) (2), for mobile and other user stations, mobile stations are limited to 2 watts EIRP. All user stations are limited to 2 watts transmitter output power.

RSS-132 § 5.4 & RSS-133 § 6.4 & RSS-139 § 6.5 & RSS-199 § 4.4

According to RSS-132 § 5.4, the Effective Radiated Power (ERP) for mobile equipment shall not exceed 11.5 watts.

According to RSS-133 § 6.4 (SRSP 510), mobile stations and hand-held portables are limited to 2 watts maximum EIRP.

According to RSS-139 § 6.5, the EIRP for mobile and portable transmitters shall not exceed 1 watt.

According to RSS-199 § 4.4, for mobile subscriber equipment, the EIRP shall not exceed 2 watts.

4.1.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$EIRP = P_T + G_T - L_C$

ERP = EIRP -2.15

Where:

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

The relevant equation for determining the ERP/EIRP from the radiated RF output power is:

ERP/EIRP = SA Read Value + Correction Factor

where:

ERP/EIRP = effective or equivalent radiated power in dBm

SA Read Value = measured transmitter power received by EMI receiver or spectrum analyzer in dBm

Correction Factor = total correction factor including cable loss in dB

During the test, the data of Correction Factor (dB) is added in the EMI receiver or spectrum analyzer, so SA Read Value (dBm) is the final values which contains the data of Correction Factor (dB).

4.1.3 Test Result

Please refer to 5.1.1.

4.2 Peak-to-Average Ratio

4.2.1 Limit

FCC § 2.1046 & 24.232(d) & 27.50(d)

RSS-132 § 5.4 & RSS-133 § 6.4 & RSS-139 § 6.5 & RSS-199 § 4.4

In addition, when the transmitter power is measured in terms of average value, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

According to FCC section 24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with 24.232 (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of § 24.51. 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.

For FCC section 24.232(e), peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

According to FCC section 27.50(d), in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

4.2.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

4.2.3 Test Result

Please refer to 5.1.2.

4.3 Occupied Bandwidth

4.3.1 Limit

FCC § 2.1049

RSS-Gen § 6.6

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.
Many of the individual rule parts specify a relative OBW in lieu of the 99% OBW. In such cases, the OBW is defined as the width of the signal between two points, one below the carrier center frequency and on above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

4.3.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.4
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

4.3.3 Test Result

Please refer to 5.1.3.

4.4 Frequency Stability

4.4.1 Limit

FCC § 2.1055 & 22.355 & 24.235 &27.54

RSS-Gen § 6.11 & RSS-132 § 5.3 & RSS-133 § 6.3 & RSS-139 § 6.4 & RSS-199 § 4.3

FCC § 2.1055

The frequency stability shall be measured with variation of ambient temperature as follows:

(1) The temperature is varied from -30°C to +50°C.

(2) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10°C through the range. The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating and point which shall be specified by the manufacture.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

FCC § 22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in table as below.

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

FCC § 24.235

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

FCC § 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.4.2 Test Procedures

For Temperature Variation

1. The testing follows ANSI C63.26 section 5.6.4
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

For Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at 20±5°C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

4.4.3 Test Result

Please refer to 5.1.4.

4.5 Spurious Emission at Antenna Terminals

4.5.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(c) & 27.53(g) & 27.53(h) & 27.53(m)
RSS-Gen § 6.13 & RSS-132 § 5.5 & RSS-133 § 6.5 & RSS-139 § 6.6

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

FCC § 22.917(a) & 24.238(a)
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43+10*log(P) dB. This is calculated to be -13 dBm.

FCC § 27.53(c)
For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the 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, in accordance with the following:
(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.
However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;
(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(g)
For operations in the 600MHz band and the 698-746MHz band, 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) dB.

FCC § 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.

FCC § 27.53(m) (4)
For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

RSS-199 § 4.5
For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:
40+10logP dB (−10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
43+10logP dB (−13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
55+10logP dB (−25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

4.5.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. CMW500 is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
= -13dBm.

11. For Band 7/41

The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

= P(W)- [55+ 10log(P)] (dB)

= [30+ 10log(P)] (dBm) - [55+ 10log(P)] (dB)

= -25dBm.

4.5.3 Test Result

Please refer to 5.1.5.

4.6 Band Edge

4.6.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(c) & 27.53(g) & 27.53(h) & 27.53(m)
RSS-132 § 5.5 & RSS-133 § 6.5 & RSS-139 § 6.6

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

FCC § 22.917(a) & 24.238(a)
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43+10*log(P) dB. This is calculated to be -13 dBm.

FCC § 27.53(c)
For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the 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, in accordance with the following:
(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.
However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;
(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(g)
For operations in the 600MHz band and the 698-746MHz band, 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) dB.

FCC § 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.

FCC § 27.53(m) (4)
For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

RSS-199 § 4.5
For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:
40+10logP dB (−10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
43+10logP dB (−13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
55+10logP dB (−25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

4.6.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.
Example:
The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.
9. For LTE Band 7/41, the other 40 dB, and 55 dB have additionally applied same calculation
above.

4.6.3 Test Result

Please refer to 5.1.6.

4.7 Field Strength of Spurious Radiation

4.7.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(c) & 27.53(g) & 27.53(h) & 27.53(m)
RSS-Gen § 6.13 & RSS-132 § 5.5 & RSS-133 § 6.5 & RSS-139 § 6.6

FCC § 22.917(a) & 24.238(a)
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43+10*log(P) dB. This is calculated to be -13 dBm.

FCC § 27.53(c)
For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the 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, in accordance with the following:
(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.
However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;
(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(g)
For operations in the 600MHz band and the 698-746MHz band, 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) dB.

FCC § 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.

FCC § 27.53(m) (4)
For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz

and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

RSS-199 § 4.5
For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:
40+10logP dB (−10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
43+10logP dB (−13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
55+10logP dB (−25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).
In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

4.7.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
= -13dBm.
13. For Band 7/41: The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [55+ 10log(P)] (dB)

= [30+ 10log(P)] (dBm) - [55+ 10log(P)] (dB)
= -25dBm.

4.7.3 Test Result

Please refer to 5.1.7.

4.8 AC Power-line Conducted Emissions

4.8.1 Limit

Limit

RSS-Gen § 8.8

For AC power-line conducted emissions, both quasi-peak and average detectors having the characteristics specified in CAN/CSA-CISPR 16-1-1:15 for the 150 kHz to 30 MHz frequency range shall be employed.
Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 3, as measured using a 50 μH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.
For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 3 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

4.8.2 Test Procedures

1. The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4).
2. The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument.
3. The test frequency range is from 150 kHz to 30 MHz.
4. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors.
5. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.
6. Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation.
7. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

4.8.3 Test Result

Please refer to 5.1.8

4.9 Receiver Spurious Emissions

4.9.1 Limit

Limit

RSS-Gen § 7.3/4 & RSS-132 § 5.6 & RSS-133 § 6.6

For emissions at frequencies below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. At frequencies above 1 GHz, measurements shall be performed using a linear average detector with a minimum resolution bandwidth of 1 MHz.

As an alternative to CISPR quasi-peak or average measurements, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization, as required, with a measurement bandwidth equal to, or greater than, the applicable CISPR quasi-peak bandwidth or 1 MHz bandwidth, respectively.

Receiver Radiated Limits

Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna ports. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least five times the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.

Spurious emissions from receivers shall not exceed the radiated emissions limits shown in Table 2 below.

Table 2 –Receiver radiated emissions limits

Frequency (MHz)	Field Strength (μV/m at 3 metres)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Receiver Conducted Limits

If the receiver has a detachable antenna of known impedance, an antenna-conducted spurious emissions measurement is permitted as an alternative to radiated measurement. However, the radiated method is preferred.

The antenna-conducted test shall be performed with the antenna disconnected and with the receiver antenna port connected to a measuring instrument having equal input impedance to that specified for the antenna. The RF cable connecting the receiver under test to the measuring instrument shall also have the same impedance

to that specified for the receiver's antenna.

The spurious emissions from the receiver at any discrete frequency, measured at the antenna port by the antenna-conducted method, shall not exceed 2 nW in the frequency range 30-1000 MHz and 5 nW above 1 GHz.

4.9.2 Test Procedures

1. The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4).
2. All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.
3. An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph.
4. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

4.9.3 Test Result

Please refer to 5.1.9

5 Test Results

5.1.1 Transmitter Radiated Power (EIRP/ERP)

Conducted power measurement results for LTE

FDD LTE Band 38							
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	37850	38000	38150	37850	38000	38150
20MHz	1 (RB_Pos:0)	22.81	23.01	23.20	22.15	22.24	22.47
	1 (RB_Pos:49)	22.93	23.09	23.27	22.15	22.12	22.45
	1 (RB_Pos:99)	23.15	23.31	**23.51**	22.40	22.56	22.79
	50 (RB_Pos:0)	21.79	21.89	22.03	20.79	20.97	21.05
	50 (RB_Pos:24)	21.88	22.09	22.08	20.84	21.09	21.11
	50 (RB_Pos:49)	21.93	22.12	**22.15**	20.98	21.15	21.19
	100 (RB_Pos:0)	21.89	22.06	22.11	20.89	21.07	21.12
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	37825	38000	38175	37825	38000	38175
15MHz	1 (RB_Pos:0)	22.80	23.01	23.12	22.05	22.49	22.49
	1 (RB_Pos:37)	22.94	23.18	23.21	22.14	22.61	22.59
	1 (RB_Pos:74)	23.04	23.29	23.32	22.29	22.77	22.72
	36 (RB_Pos:0)	21.77	21.94	22.02	20.80	20.96	21.05
	36 (RB_Pos:18)	21.84	22.08	22.17	20.92	21.09	21.22
	36 (RB_Pos:37)	21.95	22.09	22.20	20.95	21.10	21.22
	75 (RB_Pos:0)	21.86	22.04	22.11	20.92	21.04	21.14
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	37800	38000	38200	37800	38000	38200
10MHz	1 (RB_Pos:0)	23.08	23.27	23.32	22.41	22.72	22.75
	1 (RB_Pos:24)	22.91	23.17	23.14	22.27	22.67	22.49
	1 (RB_Pos:49)	23.25	23.46	23.48	22.66	22.95	22.90
	25 (RB_Pos:0)	21.92	22.08	22.16	20.89	21.08	21.20
	25 (RB_Pos:12)	21.93	22.08	22.05	20.90	21.16	21.17
	25 (RB_Pos:24)	22.07	22.15	22.20	20.99	21.17	21.29
	50 (RB_Pos:0)	21.98	22.22	22.14	21.00	21.19	21.15
Bandwidth (MHz)	**RB Set**	**Power (dBm)**					
		QPSK			**16QAM**		
	Channel	37775	38000	38225	37775	38000	38225
5MHz	1 (RB_Pos:0)	23.10	23.20	23.25	22.36	22.61	22.44

	1 (RB_Pos:12)	23.04	23.20	23.20	22.31	22.62	22.40
	1 (RB_Pos:24)	23.07	23.13	23.20	22.26	22.61	22.43
	12 (RB_Pos:0)	21.98	22.21	22.10	20.98	21.33	21.23
	12 (RB_Pos:6)	21.98	22.17	22.10	20.98	21.28	21.20
	12 (RB_Pos:11)	21.93	22.04	22.14	20.98	21.15	21.15
	25 (RB_Pos:0)	21.98	22.13	22.14	21.03	21.18	21.18

Effective (Isotropic) Radiated Power Measurement Results for LTE

FDD LTE Band 38									
Test BW	**CH**	**Modul.**	**RB Set (Size#Offset)**	**Measured EIRP**				**Limit (W)**	**Verdict**
				SA Read Value (dBm)	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (W)**		
5 MHz	**Low**	**QPSK**	RB1#0	-1.8	19.5	17.70	0.06	2	PASS
			RB25#0	-2.78	19.5	16.72	0.05	2	PASS
		16QAM	RB1#0	-2.15	19.5	17.35	0.05	2	PASS
			RB25#0	-3.58	19.5	15.92	0.04	2	PASS
	Middle	**QPSK**	RB1#0	-1.39	19.5	18.11	0.06	2	PASS
			RB25#0	-2.33	19.5	17.17	0.05	2	PASS
		16QAM	RB1#0	-1.85	19.5	17.65	0.06	2	PASS
			RB25#0	-3.5	19.5	16.00	0.04	2	PASS
	High	**QPSK**	RB1#0	-1.33	19.5	18.17	0.07	2	PASS
			RB25#0	-2.5	19.5	17.00	0.05	2	PASS
		16QAM	RB1#0	-2.06	19.5	17.44	0.06	2	PASS
			RB25#0	-3.46	19.5	16.04	0.04	2	PASS
10 MHz	**Low**	**QPSK**	RB1#0	-1.67	19.5	17.83	0.06	2	PASS
			RB50#0	-2.49	19.5	17.01	0.05	2	PASS
		16QAM	RB1#0	-2.12	19.5	17.38	0.05	2	PASS
			RB50#0	-3.64	19.5	15.86	0.04	2	PASS
	Middle	**QPSK**	RB1#0	-1.24	19.5	18.26	0.07	2	PASS
			RB50#0	-2.71	19.5	16.79	0.05	2	PASS
		16QAM	RB1#0	-1.93	19.5	17.57	0.06	2	PASS
			RB50#0	-3.64	19.5	15.86	0.04	2	PASS
	High	**QPSK**	RB1#0	-1.56	19.5	17.94	0.06	2	PASS
			RB50#0	-2.32	19.5	17.18	0.05	2	PASS
		16QAM	RB1#0	-1.76	19.5	17.74	0.06	2	PASS
			RB50#0	-3.36	19.5	16.14	0.04	2	PASS
15 MHz	**Low**	**QPSK**	RB1#0	-1.84	19.5	17.66	0.06	2	PASS
			RB75#0	-2.94	19.5	16.56	0.05	2	PASS

		16QAM	RB1#0	-2.63	19.5	16.87	0.05	2	PASS
			RB75#0	-3.96	19.5	15.54	0.04	2	PASS
	Middle	**QPSK**	RB1#0	-1.81	19.5	17.69	0.06	2	PASS
			RB75#0	-2.84	19.5	16.66	0.05	2	PASS
		16QAM	RB1#0	-2.07	19.5	17.43	0.06	2	PASS
			RB75#0	-3.77	19.5	15.73	0.04	2	PASS
	High	**QPSK**	RB1#0	-1.67	19.5	17.83	0.06	2	PASS
			RB75#0	-2.53	19.5	16.97	0.05	2	PASS
		16QAM	RB1#0	-2.24	19.5	17.26	0.05	2	PASS
			RB75#0	-3.63	19.5	15.87	0.04	2	PASS
20MHz	**Low**	**QPSK**	RB1#0	-1.71	19.5	17.79	0.06	2	PASS
			RB100#0	-2.9	19.5	16.60	0.05	2	PASS
		16QAM	RB1#0	-2.64	19.5	16.86	0.05	2	PASS
			RB100#0	-3.85	19.5	15.65	0.04	2	PASS
	Middle	**QPSK**	RB1#0	-1.52	19.5	17.98	0.06	2	PASS
			RB100#0	-2.85	19.5	16.65	0.05	2	PASS
		16QAM	RB1#0	-2.35	19.5	17.15	0.05	2	PASS
			RB100#0	-3.55	19.5	15.95	0.04	2	PASS
	High	**QPSK**	RB1#0	-1.74	19.5	17.76	0.06	2	PASS
			RB100#0	-2.73	19.5	16.77	0.05	2	PASS
		16QAM	RB1#0	-2.48	19.5	17.02	0.05	2	PASS
			RB100#0	-3.58	19.5	15.92	0.04	2	PASS

5.1.2 Peak to Average Ratio

Note(s):

1. For GSM, GPRS and EGPRS, there are peak power to demonstrate compliance, PAR measurements are not required.
2. Test plots please refer to the document “SHE21040014-02YE Data EXHIBIT A”.

Peak to Average Ratio Measurement Results for LTE

TDD LTE Band 38							
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Peak to Average Ratio (dB)**	**Limit (dB)**	**Refer to Plot[Note 2]**	**Verdict**
20 MHz	**Low**	**QPSK**	RB1#0	8.44	13	1.1	PASS
			RB100#0	9.07	13	1.2	PASS
		16QAM	RB1#0	9.10	13	1.3	PASS
			RB100#0	10.91	13	1.4	PASS
	Middle	**QPSK**	RB1#0	8.29	13	1.5	PASS

			RB100#0	9.18	13	1.6	PASS
		16QAM	RB1#0	10.06	13	1.7	PASS
			RB100#0	10.71	13	1.8	PASS
	High	**QPSK**	RB1#0	8.67	13	1.9	PASS
			RB100#0	10.22	13	1.10	PASS
		16QAM	RB1#0	8.98	13	1.11	PASS
			RB100#0	10.90	13	1.12	PASS

5.1.3 Occupied Bandwidth

Note(s):

1. All modes were tested, but only the typical data were reported in this report.
2. Test plots please refer to the document “SHE21040014-02YE Data EXHIBIT B”.

Occupied Bandwidth Measurement Results for LTE

TDD LTE Band 38						
Test BW	**CH**	**Modul.**	**RB Set (Size#Offset)**	**99% Occupied Bandwidth (MHz)**	**-26 dB Bandwidth (MHz)**	**Refer to Plot[Note 2]**
5 MHz	**Low**	**QPSK**	RB25#0	4.508	5.168	1.1
		16QAM	RB25#0	4.498	5.000	1.2
	Middle	**QPSK**	RB25#0	4.496	4.995	1.3
		16QAM	RB25#0	4.507	5.017	1.4
	High	**QPSK**	RB25#0	4.503	5.035	1.5
		16QAM	RB25#0	4.503	4.995	1.6
10 MHz	**Low**	**QPSK**	RB50#0	9.001	9.930	1.7
		16QAM	RB50#0	8.977	9.903	1.8
	Middle	**QPSK**	RB50#0	8.988	9.966	1.9
		16QAM	RB50#0	8.986	9.843	1.10
	High	**QPSK**	RB50#0	8.976	10.165	1.11
		16QAM	RB50#0	8.945	9.811	1.12
15 MHz	**Low**	**QPSK**	RB75#0	13.485	16.611	1.13
		16QAM	RB75#0	13.515	15.151	1.14
	Middle	**QPSK**	RB75#0	13.515	16.098	1.15
		16QAM	RB75#0	13.500	15.797	1.16
	High	**QPSK**	RB75#0	13.447	14.949	1.17
		16QAM	RB75#0	13.524	15.535	1.18
20 MHz	**Low**	**QPSK**	RB100#0	17.984	19.512	1.19
		16QAM	RB100#0	17.969	20.025	1.20
	Middle	**QPSK**	RB100#0	17.972	20.956	1.21
		16QAM	RB100#0	18.011	21.937	1.22

	High	**QPSK**	RB100#0	17.972	20.198	1.23
		16QAM	RB100#0	17.950	20.350	1.24

5.1.4 Frequency Stability

Frequency Stability Measurement Results for LTE

TDD LTE Band 38						
Test Conditions		**Frequency Deviation**				**Verdict**
Power (V)	**Temperature (℃)**	**QPSK 10MHz**		**16QAM 10MHz**		
		Middle channel 2605 MHz		**Middle channel 2605 MHz**		
		Value (Hz)	**Limits (Hz)**	**Value (Hz)**	**Limits (Hz)**	
3.8 V	-30	--	±6512.5	--	±6512.5	PASS
	-20	-0.73		-0.44		
	-10	-1.37		-0.50		
	0	-0.26		3.17		
	10	1.79		-2.17		
	20	-2.06		-0.19		
	25	-3.52		-0.11		
	30	-0.79		0.87		
	40	-1.50		-2.72		
	50	1.77		-1.36		
3.7 V	25	2.71		1.57		
4.35V	25	-0.53		4.45		

5.1.5 Spurious Emission at Antenna Terminals

Note(s):

1. GSM and EGPRS modes have been verified, and only the worst data with different bandwidth for LTE are shown here.
2. The frequencies of verdict which are marked by "N/A" should be ignored because they are MS carrier frequency.
3. Test plots please refer to the document “SHE21040014-02YE Data EXHIBIT C”.

Spurious Emission Measurement Results for LTE

TDD LTE Band 38					
Test BW	**CH**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 3]**	**Verdict**
5 MHz	**Low**	**QPSK**	RB1#0	1.1	PASS
		16QAM	RB1#0	1.2	PASS
	Middle	**QPSK**	RB1#0	1.3	PASS
		16QAM	RB1#0	1.4	PASS
	High	**QPSK**	RB1#0	1.5	PASS
		16QAM	RB1#0	1.6	PASS
10 MHz	**Low**	**QPSK**	RB1#0	1.7	PASS
		16QAM	RB1#0	1.8	PASS
	Middle	**QPSK**	RB1#0	1.9	PASS
		16QAM	RB1#0	1.10	PASS
	High	**QPSK**	RB1#0	1.11	PASS
		16QAM	RB1#0	1.12	PASS
15 MHz	**Low**	**QPSK**	RB1#0	1.13	PASS
		16QAM	RB1#0	1.14	PASS
	Middle	**QPSK**	RB1#0	1.15	PASS
		16QAM	RB1#0	1.16	PASS
	High	**QPSK**	RB1#0	1.17	PASS
		16QAM	RB1#0	1.18	PASS
20 MHz	**Low**	**QPSK**	RB1#0	1.19	PASS
		16QAM	RB1#0	1.20	PASS
	Middle	**QPSK**	RB1#0	1.21	PASS
		16QAM	RB1#0	1.22	PASS
	High	**QPSK**	RB1#0	1.23	PASS
		16QAM	RB1#0	1.24	PASS

5.1.6 Band Edge

Note(s):

1. Test plots please refer to the document “SHE21040014-02YE Data EXHIBIT D”.

Band Edge Measurement Results for LTE

TDD LTE Band 38					
Test BW	**CH**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 1]**	**Verdict**
5 MHz	**Low**	**QPSK**	RB1#0	1.1	PASS
			RB25#0	1.2	PASS
		16QAM	RB1#0	1.3	PASS
			RB25#0	1.4	PASS
	High	**QPSK**	RB1#0	1.5	PASS
			RB25#0	1.6	PASS
		16QAM	RB1#0	1.7	PASS
			RB25#0	1.8	PASS
10 MHz	**Low**	**QPSK**	RB1#0	1.9	PASS
			RB50#0	1.10	PASS
		16QAM	RB1#0	1.11	PASS
			RB50#0	1.12	PASS
	High	**QPSK**	RB1#0	1.13	PASS
			RB50#0	1.14	PASS
		16QAM	RB1#0	1.15	PASS
			RB50#0	1.16	PASS
15 MHz	**Low**	**QPSK**	RB1#0	1.17	PASS
			RB75#0	1.18	PASS
		16QAM	RB1#0	1.19	PASS
			RB75#0	1.20	PASS
	High	**QPSK**	RB1#0	1.21	PASS
			RB75#0	1.22	PASS
		16QAM	RB1#0	1.23	PASS
			RB75#0	1.24	PASS
20 MHz	**Low**	**QPSK**	RB1#0	1.25	PASS
			RB100#0	1.26	PASS
		16QAM	RB1#0	1.27	PASS
			RB100#0	1.28	PASS
	High	**QPSK**	RB1#0	1.29	PASS
			RB100#0	1.30	PASS
		16QAM	RB1#0	1.31	PASS
			RB100#0	1.32	PASS

5.1.7 Field Strength of Spurious Radiation

Note(s):

1. GSM and EGPRS modes have been verified, only the worst data with different transmit bandwidth for LTE are shown here.
2. The frequencies of verdict which are marked by "N/A" should be ignored because they are MS carrier frequency.
3. When measurement frequency is above 18GHz, there is only noise floor of test system existing. So that there is no test data above 18GHz in the report.
4. Test plots please refer to the document “SHE21040014-02YE Data FCC PCE GSM TX EXHIBIT E” and “SHE21040014-02YE Data FCC PCE WCDMA TX EXHIBIT E” and “SHE21040014-02YE Data FCC PCE LTE-TX EXHIBIT E”

Field Strength of Spurious Radiation Measurement Results for GSM/WCDMA

Test Band	Channel	Refer to Plot[Note 4]	Verdict
GPRS 850	**Middle**	--	PASS
GPRS 1900	**Middle**	--	PASS
EDGE 850	**Middle**	--	PASS
EDGE 1900	**Middle**	--	PASS
WCDMA Band II	**Middle**	--	PASS
WCDMA Band IV	**Middle**	--	PASS
WCDMA Band V	**Middle**	--	PASS

Band Edge Measurement Results for LTE

FDD LTE Band 2					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

FDD LTE Band 4					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

FDD LTE Band 5					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
10 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

FDD LTE Band 7					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass
FDD LTE Band 12					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
10 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

FDD LTE Band 13					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
10 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

FDD LTE Band 25					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

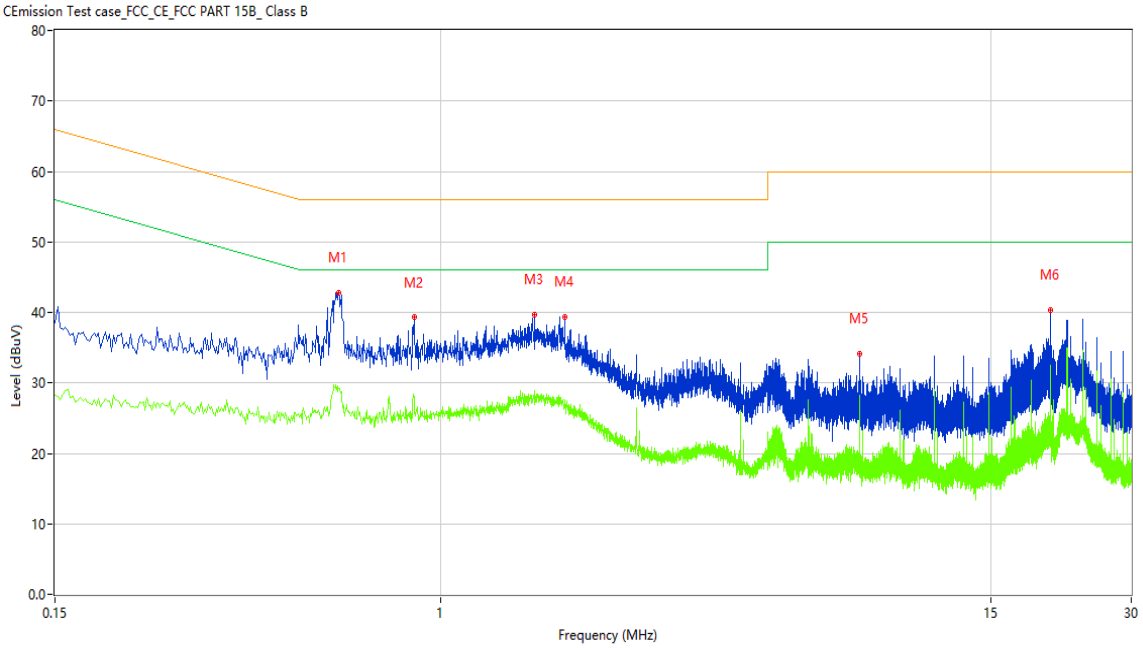
FDD LTE Band 38					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

FDD LTE Band 41					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

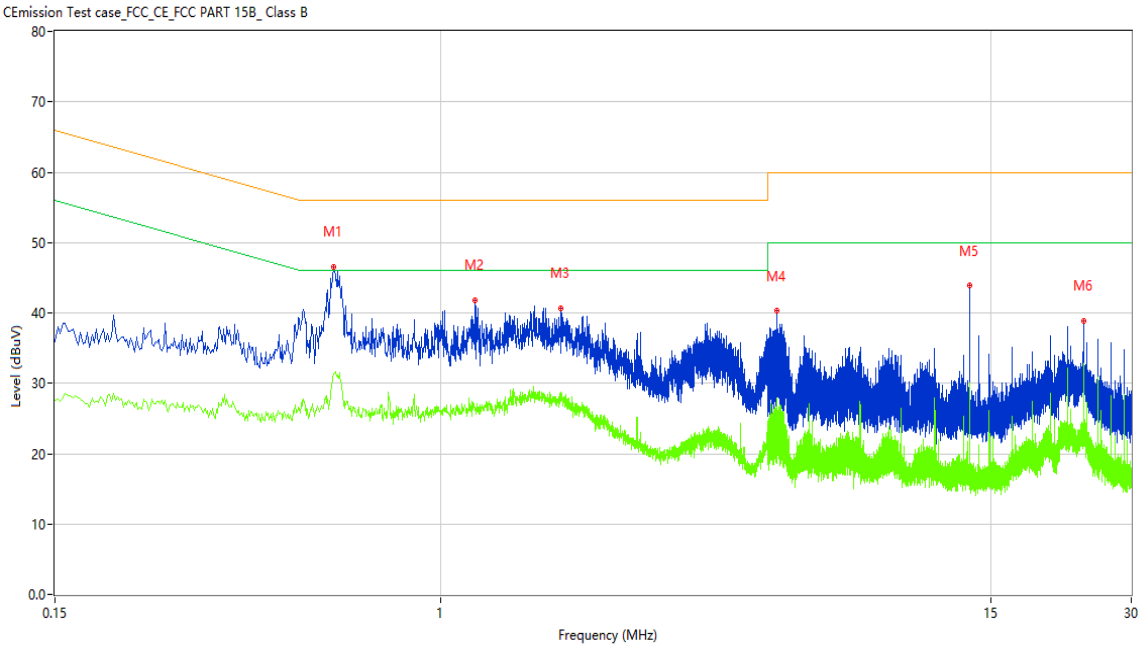
FDD LTE Band 66					
Test BW	**Channel**	**Modul.**	**RB Set (Size#Offset)**	**Refer to Plot[Note 4]**	**Verdict**
20 MHz	**Middle**	**QPSK**	RB1#0	--	Pass

5.1.8 AC Power-line Conducted Emissions

Note: Only the worst test results were recorded in this report.



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.606	43.52	9.74	56.00	-12.48	Peak	L	Pass
1*	0.606	39.08	9.74	56.00	-16.92	QP	L	Pass
1**	0.606	29.16	9.74	46.00	-16.84	AV	L	Pass
2	0.878	37.37	9.76	56.00	-18.63	Peak	L	Pass
2*	0.878	31.32	9.76	56.00	-24.68	QP	L	Pass
2**	0.878	28.04	9.76	46.00	-17.96	AV	L	Pass
3	1.592	35.77	9.67	56.00	-20.23	Peak	L	Pass
3*	1.592	28.33	9.67	56.00	-27.67	QP	L	Pass
3**	1.592	28.97	9.67	46.00	-17.03	AV	L	Pass
4	1.846	35.01	9.67	56.00	-20.99	Peak	L	Pass
4*	1.846	28.29	9.67	56.00	-27.71	QP	L	Pass
4**	1.846	27.54	9.67	46.00	-18.46	AV	L	Pass
5	7.876	32.04	9.67	60.00	-27.96	Peak	L	Pass
5*	7.876	25.49	9.67	60.00	-34.51	QP	L	Pass
5**	7.876	28.29	9.67	50.00	-21.71	AV	L	Pass
6	20.134	37.16	9.41	60.00	-22.84	Peak	L	Pass
6*	20.134	29.33	9.41	60.00	-30.67	QP	L	Pass
6**	20.134	32.44	9.41	50.00	-17.56	AV	L	Pass



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.590	46.34	9.76	56.00	-9.66	Peak	N	Pass
1*	0.590	42.78	9.76	56.00	-13.22	QP	N	Pass
1**	0.590	31.17	9.76	46.00	-14.83	AV	N	Pass
2	1.188	40.36	9.66	56.00	-15.64	Peak	N	Pass
2*	1.188	34.16	9.66	56.00	-21.84	QP	N	Pass
2**	1.188	26.43	9.66	46.00	-19.57	AV	N	Pass
3	1.810	38.57	9.68	56.00	-17.43	Peak	N	Pass
3*	1.810	32.10	9.68	56.00	-23.90	QP	N	Pass
3**	1.810	28.68	9.68	46.00	-17.32	AV	N	Pass
4	5.230	40.35	9.70	60.00	-19.65	Peak	N	Pass
4*	5.230	33.48	9.70	60.00	-26.52	QP	N	Pass
4**	5.230	26.89	9.70	50.00	-23.11	AV	N	Pass
5	13.538	44.53	9.59	60.00	-15.47	Peak	N	Pass
5*	13.538	27.78	9.59	60.00	-32.22	QP	N	Pass
5**	13.538	29.96	9.59	50.00	-20.04	AV	N	Pass
6	23.700	40.03	9.44	60.00	-19.97	Peak	N	Pass
6*	23.700	36.23	9.44	60.00	-23.77	QP	N	Pass
6**	23.700	31.52	9.44	50.00	-18.48	AV	N	Pass

5.1.9 Receiver Spurious Emissions

Note: Only the worst test results were recorded in this report.

Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
79.215	-71.25	-18.95	-13.0	-58.25	204.40	Horizontal	Vertical	Pass
106.611	-69.74	-11.52	-13.0	-56.74	335.40	Horizontal	Vertical	Pass
236.558	-75.02	-3.62	-13.0	-62.02	43.20	Horizontal	Vertical	Pass
850.415	-64.06	9.77	-13.0	-51.06	173.10	Horizontal	Vertical	Pass
1200.950	-52.44	2.29	-13.0	-39.44	197.80	Horizontal	Vertical	Pass
5587.603	-41.82	11.39	-13.0	-28.82	248.50	Horizontal	Vertical	Pass

Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
32.182	-76.63	-12.62	-13.0	-63.63	7.00	Vertical	Vertical	Pass
98.368	-72.82	-11.49	-13.0	-59.82	4.00	Vertical	Vertical	Pass
449.420	-74.57	-1.94	-13.0	-61.57	8.00	Vertical	Vertical	Pass
831.262	-64.21	6.25	-13.0	-51.21	2.00	Vertical	Vertical	Pass
1200.950	-52.88	2.29	-13.0	-39.88	2.00	Vertical	Vertical	Pass
5512.372	-42.22	11.93	-13.0	-29.22	3.00	Vertical	Vertical	Pass

6 Photos

6.1 Photographs of the Sample

Front of the sample

Rear of the sampl

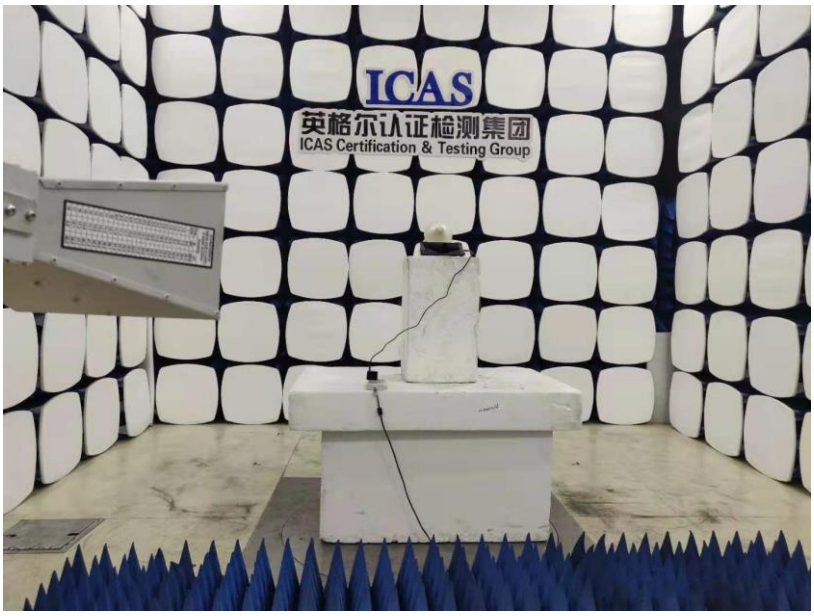
6.2 Set-up for Conducted Emissions

6.3 Set-up for Conducted RF test at Antenna Port

6.4 Set-up for Spurious Emissions below 1GHz

Below 1 GHz

6.5 Set-up for Spurious Emissions above 1GHz



Above 1GHz

End of the report