

TEST REPORT

Applicant: Waveinnova Inc
Address: 319 Thompson Ave, Mountain View, CA 94043,USA
Equipment Type: WaveTrac X1
Model Name: 0124-010
Brand Name: WaveTrac
FCC ID: 2BFGFWTX1
Test Standard: 47 CFR Part 2
(Others refer to chapter 3.1)
Sample Arrival Date: Apr. 05, 2024
Test Date: Apr. 15, 2024 - Apr. 30, 2024
Date of Issue: May 07, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.



Tested by: Liu Juren

Checked by: Wu Huihui

Approved by: Tolan Tu
(Testing Director)

Liu Juren

Wu Huihui

Tolan Tu

Revision History		
Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>May 07, 2024</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1 GENERAL INFORMATION	4
1.1 Test Laboratory	4
1.2 Test Location	4
2 PRODUCT INFORMATION	5
2.1 Applicant Information	5
2.2 Manufacturer Information	5
2.3 General Description for Equipment under Test (EUT)	5
2.4 Technical Information	6
3 SUMMARY OF TEST RESULTS	8
3.1 Test Standards	8
3.2 Test Verdict	9
4 GENERAL TEST CONFIGURATIONS	10
4.1 Test Environments	10
4.2 Test Equipment List	10
4.3 Test Configurations	12
4.4 Test Setup	13
5 TEST ITEMS	15
5.1 Transmitter Radiated Power (EIRP/ERP)	15
5.2 Peak to Average Ratio	19
5.3 Occupied Bandwidth	21
5.4 Frequency Stability	23
5.5 Spurious Emission at Antenna Terminals	25
5.6 Band Edge	29
5.7 Field Strength of Spurious Radiation	33
ANNEX A TEST RESULTS	37

A.1 Transmitter Radiated Power (EIRP/ERP)	37
A.2 Peak to Average Ratio	46
A.3 Occupied Bandwidth	46
A.4 Frequency Stability	46
A.5 Spurious Emission at Antenna Terminals	46
A.6 Band Edge	46
A.1 Field Strength of Spurious Radiation	47
ANNEX B TEST SETUP PHOTOS	48
ANNEX C EUT EXTERNAL PHOTOS	48
ANNEX D EUT INTERNAL PHOTOS	48

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	<input checked="" type="checkbox"/> Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	<input type="checkbox"/> 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Waveinnova Inc
Address	319 Thompson Ave, Mountain View, CA 94043,USA

2.2 Manufacturer Information

Manufacturer	Waveinnova Inc
Address	319 Thompson Ave, Mountain View, CA 94043,USA

2.3 General Description for Equipment under Test (EUT)

EUT Name	WaveTrac X1
Model Name Under Test	0124-010
Hardware Version	WAVETRAC_X1
Software Version	BC660KGLAAR01A05
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

All Network and Wireless connectivity for EUT	4G Network FDD NB-IoT Band 2,4,5,12,13,17,25,66,85 GPS, GLONASS, Beidou, Galileo BLE,WIFI(Only Receiver)
About the Product	The equipment is WaveTrac X1, intended for used with information technology equipment.

The following is the technical information of the EUT tested frequency bands in this report.

Operating Bands	FDD NB-IoT Band 2,4,5,12,13,17,25,66,85			
	LTE	BPSK		
		QPSK		
Antenna Type	SMD Antenna			
Antenna Gain	FDD LTE Band 2: 2.7dBi FDD LTE Band 4: 2.7 dBi FDD LTE Band 5: 0 dBi FDD LTE Band 12: -0.2 dBi FDD LTE Band 13: -0.2 dBi FDD LTE Band 17: -0.2 dBi FDD LTE Band 25: 2.7 dBi FDD LTE Band 66: 2.7 dBi FDD LTE Band 85: -0.2 dBi			
The Max RF Output Power (EIRP/ERP)	FDD LTE Band 2: 25.13dBm FDD LTE Band 4: 25.37dBm FDD LTE Band 5: 20.30 dBm FDD LTE Band 12: 20.36 dBm FDD LTE Band 13: 20.20 dBm FDD LTE Band 17: 20.46 dBm FDD LTE Band 25: 24.95 dBm FDD LTE Band 66: 25.16 dBm FDD LTE Band 85: 20.44 dBm			
Band	Power Class		Tx Frequency Range	Rx Frequency Range
	BPSK	QPSK		
LTE B2	3		1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
LTE B4	3		1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz
LTE B5	3		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
LTE B12	3		699 ~ 716 MHz	729 ~ 746 MHz
LTE B13	3		777 ~ 787 MHz	746 ~ 756 MHz
LTE B17	3		704 ~ 716 MHz	734 ~ 746 MHz
LTE B25	3		1850 ~ 1915 MHz;	1930 ~ 1995 MHz
LTE B66	3		1710 ~ 1780 MHz	2110 ~ 2180 MHz

LTE B85	3	698 ~ 716 MHz	728 ~ 746 MHz
---------	---	---------------	---------------

Note1: The EUT information provided by the applicant, except for The Max RF Conducted Power. For more detailed band specifications and features description, please refer to the manufacturer's specifications or user's manual.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 Subpart H	Cellular Radiotelephone Service
3	47 CFR Part 24 Subpart E	Broadband PCS
4	47 CFR Part 27	Miscellaneous Wireless Communications Services
5	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
6	KDB 971168 D01 v03	Measurement Guidance for Certification of Licensed Digital Transmitters

3.2 Test Verdict

No.	Test Description	FCC Part No.	Test Result	Test Verdict
1	Conducted RF Output Power	2.1046	Reporting only (ANNEX A.1)	Pass
2	Effective (Isotropic) Radiated Power	2.1046 22.913 24.232 27.50	ANNEX A.1	Pass
3	Peak to Average Ratio	2.1046 24.232(d) 27.50(d)	ANNEX A.2	Pass
4	Occupied Bandwidth	2.1049 22.917 24.238 27.53	ANNEX A.3	Pass
5	Frequency Stability	2.1055 22.355 24.235 27.54	ANNEX A.4	Pass
6	Spurious Emission at Antenna Terminals	2.1051 22.917 24.238 27.53	ANNEX A.5	Pass
7	Band Edge	2.1051 22.917 24.238 27.53	ANNEX A.6	Pass
8	Field Strength of Spurious Radiation	2.1053 22.917 24.238 27.53	ANNEX A.7	Pass

Note: The RF module installed in the EUT is electronically and mechanically identical to the original certified module in the test report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021, just Effective (Isotropic) Radiated Power and Field Strength of Spurious Radiation were retested in this report. Other test items please refer to the report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity		20% to 75%
Atmospheric Pressure		98 kPa to 102 kPa
Test Voltage of the EUT	NV (Normal Voltage)	3.6V
	LV (Low Voltage)	3V
	HV (High Voltage)	3.65V
Test Temperature of the EUT	NT (Normal Temperature)	15 °C to 35 °C
	LT (Low Temperature)	-35 °C
	HT (High Temperature)	+75 °C

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Version	Cal. Date	Cal. Due
2/3/4/5G RF Test System						
BL410 Test Software	BALUN	BL410R	N/A	3.0.536	N/A	N/A
UCTS Test Software	Anritsu	UCTS	N/A	V 6.21.1105.0	N/A	N/A
Temperature Chamber	AHK	SP20	1412	N/A	2023.09.11	2024.09.10
Universal Radio Communication Tester	R&S	CMU 200	121487	V5.21	2023.12.05	2024.12.04
Wideband Radio Communication Tester	R&S	CMW 500	167190	V4.0.60	2023.05.11	2024.05.10
Wideband Radio Communication Tester	R&S	CMW 500	102318	V3.2.71	2023.05.16	2024.05.15
Spectrum Analyzer	keysight	N9020A	MY50531628	A.16.09	2023.05.12	2024.05.11
Spectrum Analyzer	R&S	FSV40	101544	2.30.SP4	2023.12.27	2024.12.26
DC Power Supply	ITECH	IT6863A	800014020757810006	N/A	2023.08.16	2024.08.15
Radiated Test System						
Radiated Test System Test Software	BALUN	BL410-E	N/A	V22.930	N/A	N/A
Wideband Radio	R&S	CMW 500	167190	V4.0.60	2023.05.11	2024.05.10

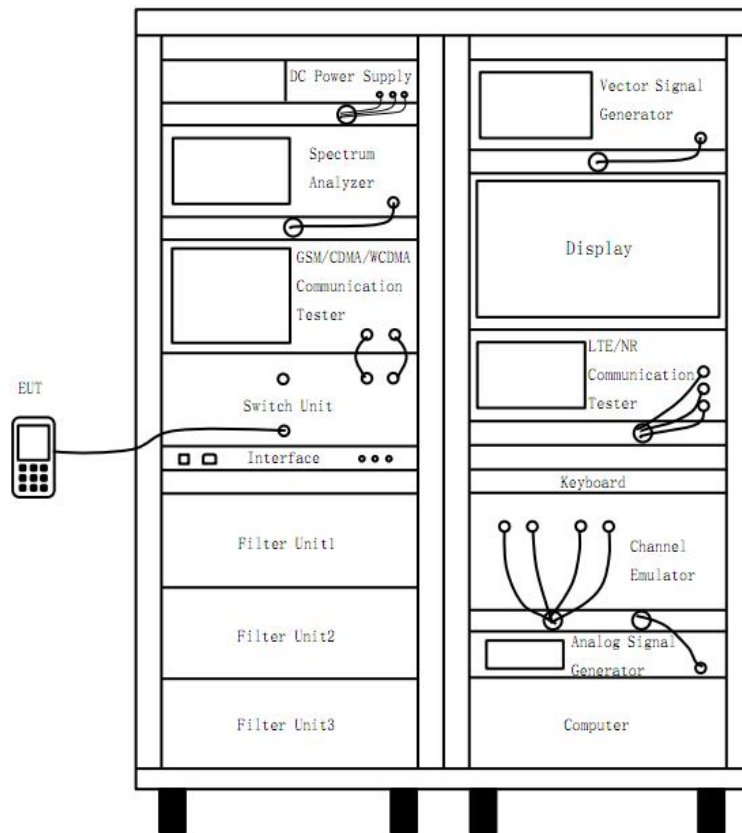
Communication Tester						
Wideband Radio Communication Tester	R&S	CMW 500	102318	V3.2.71	2023.05.16	2024.05.15
Spectrum Analyzer	R&S	FSV40	101544	2.30.SP4	2023.12.27	2024.12.26
Test Antenna-Bi-Log(30 MHz-3 GHz)	Schwarzbeck	VULB 9163	9163-624	N/A	2021.08.20	2024.08.19
Test Antenna-Horn(1-18 GHz)	Schwarzbeck	BBHA 9120D	01917	N/A	2022.06.09	2025.06.08
Test Antenna-Horn(18-40 GHz)	A-INFO	LB-180400KF	J211060273	N/A	2021.07.02	2024.07.01
Anechoic Chamber	YIHENG	9m*6m*6m	144	N/A	2022.02.09	2024.09.03
EMI Receiver	Keysight	N9038A	MY53220118	A.14.16	2023.09.05	2024.09.04

4.3 Test Configurations

NB-IoT Band	Sub-carrier spacing (kHz)		Modulation Type		Test Channel		
	3.75	15	BPSK	QPSK	LCH	MCH	HCH
Effective (Isotropic) Radiated Power							
2	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v
5	v	v	v	v	v	v	v
12	v	v	v	v	v	v	v
13	v	v	v	v	v	v	v
17	v	v	v	v	v	v	v
25	v	v	v	v	v	v	v
66	v	v	v	v	v	v	v
85	v	v	v	v	v	v	v
Field Strength of Spurious Radiation							
2	Worst case						
4	Worst case						
5	Worst case						
12	Worst case						
13	Worst case						
17	Worst case						
25	Worst case						
66	Worst case						
85	Worst case						
<p>Note 1: The mark “v” means that this configuration is chosen for testing.</p> <p>Note 2: The mark “n” means that this bandwidth is not supported.</p>							

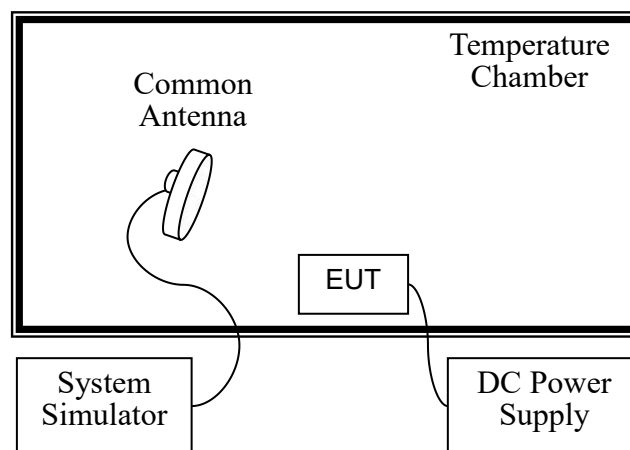
4.4 Test Setup

4.4.1 For Antenna Port Test



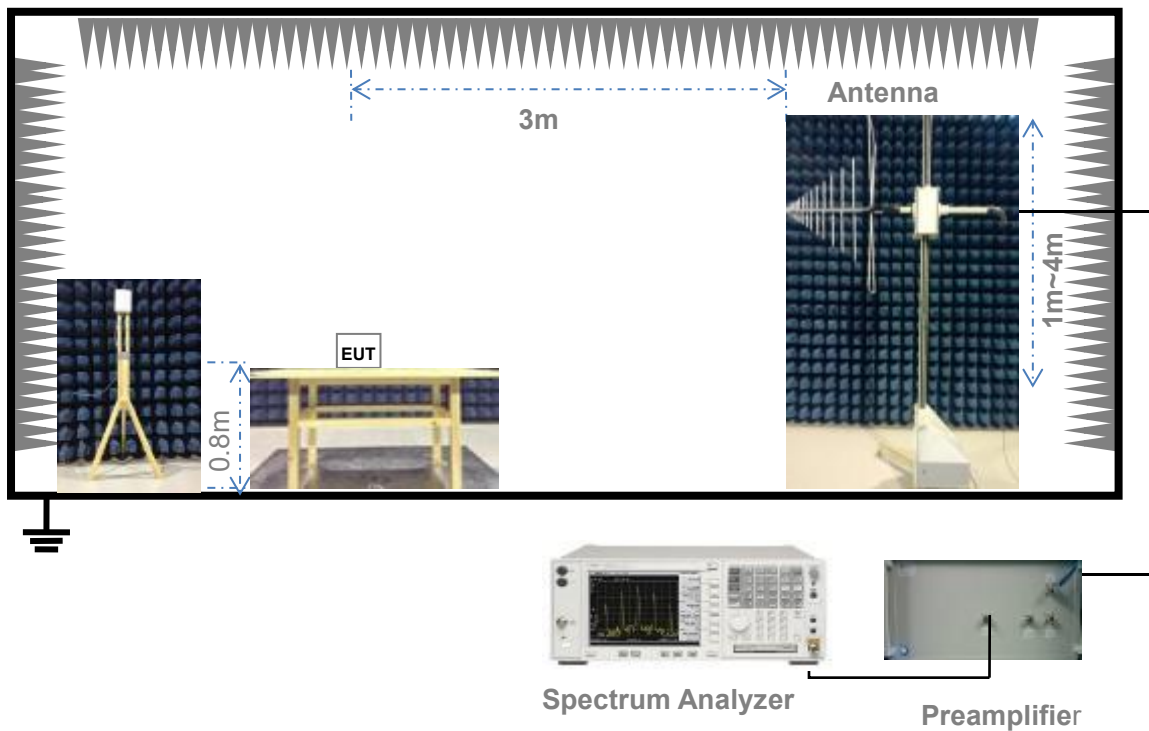
(Diagram 1)

4.4.2 For Frequency Stability Test



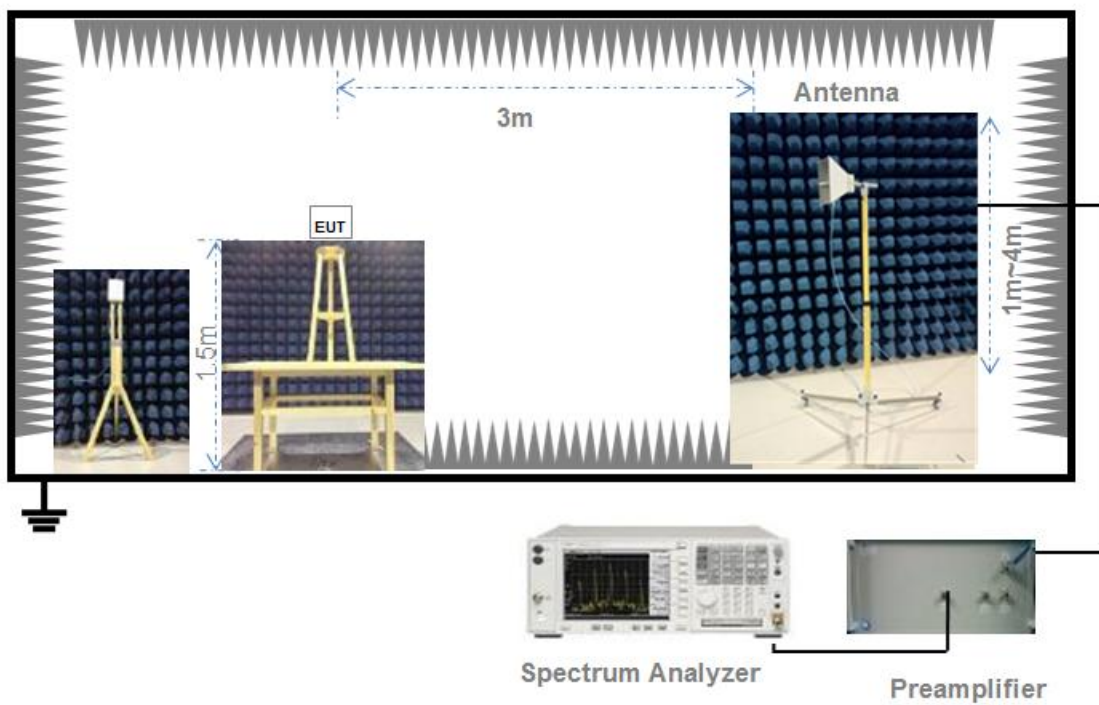
(Diagram 2)

4.4.3 For Radiated Test (30 MHz ~ 1 GHz)



(Diagram 3)

4.4.4 For Radiated Test (Above 1 GHz)



(Diagram 4)

5 TEST ITEMS

5.1 Transmitter Radiated Power (EIRP/ERP)

5.1.1 Limit

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

According to FCC section 22.913(a) (5), 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(a) (3), for mobile and portable stations transmitting in the 2305-2315MHz band or the 2350-2360MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands.

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 600MHz uplink band and the 698-746MHz band, and fixed and mobile stations in the 600MHz uplink 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.

(7) 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 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

FCC section 27.50(j) (3), for mobile, and portable (hand-held) stations operating in the 3700-3980 MHz band are limited to 1 watt EIRP.

FCC section 27.50(k) (3), Mobile devices are limited to 1Watt (30 dBm) EIRP in the 3450-3550 MHz band.

5.1.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for conducted test, and the section 4.4.3 and

4.4.4 (Diagram 3, 4) test setup description is used for radiated test. The photo of test setup please refer to ANNEX B.

5.1.3 Test Procedure

Description of the Conducted Output Power Measurement

The EUT is coupled to the SS with attenuator through power splitter; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. A system simulator is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The relevant equation for determining the conducted measured value is:

$$\text{Conducted Output Power Value (dBm)} = \text{Measured Value (dBm)} + \text{Path Loss (dB)}$$

where:

Conducted Output Power Value = final conducted measured value in the conducted power test, in dBm;

Measured Value = measured conducted power received by spectrum analyzer or power meter, in dBm;

Path Loss = signal attenuation in the connecting cable between the transmitter and spectrum analyzer or power meter, including external cable loss, in dB;

During the test, the data of Path Loss (dB) is added in the spectrum analyzer or power meter, so Measured Value (dBm) is the final values which contains the data of Path Loss (dB).

For example:

In the conducted output power test, when measured value for GSM850 is 24.7 dBm, and path loss is 8.5 dB, then final conducted output power value is:

$$\text{Conducted Output Power Value (dBm)} = 24.7 \text{ dBm} + 8.5 \text{ dB} = 33.2 \text{ dBm}$$

Description of the Transmitter Radiated Power Measurement

In many cases, the RF output power limits for licensed digital transmission devices is specified in terms of effective radiated power (ERP) or equivalent isotropic radiated power (EIRP). Typically, ERP is specified when the operating frequency is less than or equal to 1 GHz and EIRP is specified when the operating frequency is greater than 1 GHz. Both are determined by adding the transmit antenna gain to the conducted RF output power with the primary difference between the two being that when determining the ERP, the transmit antenna gain is referenced to a dipole antenna (i.e., dBd) whereas when determining the EIRP, the transmit antenna gain is referenced to an isotropic antenna (dBi).

Final measurement calculation as below:

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

$$\text{ERP/EIRP} = P_{\text{Meas}} + \text{GT} - \text{LC}$$

where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

dBd (ERP)=dBi (EIRP) -2.15 dB

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

For example:

In the EIRP test, when P_{Meas} value for GSM1900 is 30.2 dBm, LC is 0.6 dB, and GT is -3.4 dB, then final EIRP value is:

$$\text{EIRP for GSM1900} = 30.2 \text{ dBm} - 3.4 \text{ dBi} - 0.6 \text{ dB} = 26.2 \text{ dBm}$$

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

$$\text{ERP/EIRP (dBm)} = \text{SA Read Value (dBm)} + \text{Correction Factor (dB)}$$

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).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value for GSM850 is:

$$\text{ERP (dBm)} = 21\text{dBm} + 8\text{dB} = 29\text{dBm}$$

5.1.4 Test Result

Please refer to ANNEX A.1.

5.2 Peak to Average Ratio

5.2.1 Limit

FCC § 2.1046 & 24.232(d) & 27.50(d) & 27.50(j) & 27.50(k)

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.

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) (5) & 27.50(j) & 27.50(k), in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

5.2.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

Here the lowest, middle and highest channels are selected to perform testing to verify the peak-to-average ratio.

According to KDB 971168 D01, there is CCDF procedure for PAPR:

- a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- b) Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Set the measurement interval as follows:
 - 1) for continuous transmissions, set to 1 ms,
 - 2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing

sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.

e) Record the maximum PAPR level associated with a probability of 0.1%.

Alternate procedure for PAPR:

Use one of the procedures presented in 4.1 to measure the total peak power and record as P_{PK} . Use one of the applicable procedures presented 4.2 to measure the total average power and record as P_{Avg} . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = P_{PK} (dBm) - P_{Avg} (dBm).$$

5.2.4 Test Result

Please refer to ANNEX A.2.

5.3 Occupied Bandwidth

5.3.1 Limit

FCC § 2.1049

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.

5.3.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The following procedure shall be used for measuring power bandwidth.

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the anticipated OBW).
- b) The nominal IF filter bandwidth (3 dB 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.
- c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least $10\log(\text{OBW} / \text{RBW})$ below the reference level.
- d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.
- e) For -26 dB OBW, the dynamic range of the spectrum analyzer at the selected RBW shall be at least 10dB below the target “-X dB down” requirement, e.g. -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be 36dB below the reference value.
- f) Set the detection mode to peak, and the trace mode to max hold.
- g) For 99% OBW, use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

If the instrument does not have a 99 % power bandwidth function, the trace data points are to be recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is

recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % power bandwidth is the difference between these two frequencies.

h) For -26 dB OBW, 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).

Determine the “-X dB down amplitude” as equal to (reference value -X). Alternatively, this calculation can be performed by the analyzer by using the marker-delta function.

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 “-X dB down amplitude” determined in step g). 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.

i) The OBW shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

j) Change variable modulations, coding, or channel bandwidth settings, then repeat above test procedures.

5.3.4 Test Result

Please refer to ANNEX A.3.

5.4 Frequency Stability

5.4.1 Limit

FCC § 2.1055 & 22.355 & 24.235 & 27.54

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 C-1 of this section.

Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services

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.

5.4.2 Test Setup

The section 4.4.2 (Diagram 2) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

1. The EUT is placed in a temperature chamber.
2. The temperature is set to 25°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured.
3. The temperature is increased by not more than 10 degrees, allowed to stabilize and soak, and then repeat the frequency error measurement.
4. Repeat procedure 3 until +50°C and -30°C is reached.
5. Change supply voltage, and repeat measurement until extreme voltage is reached.

5.4.4 Test Result

Please refer to ANNEX A.4.

5.5 Spurious Emission at Antenna Terminals

5.5.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n)

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(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1) By a factor of not less than: $43 + 10 \log(P)$ dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log(P)$ dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than $61 + 10 \log(P)$ dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than $67 + 10 \log(P)$ dB on all frequencies between 2328 and 2337MHz.

(2) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2300 and 2305MHz, $55 + 10 \log(P)$ dB on all frequencies between 2296 and 2300MHz, $61 + 10 \log(P)$ dB on all frequencies between 2292 and 2296MHz, $67 + 10 \log(P)$ dB on all frequencies between 2288 and 2292MHz, and $70 + 10 \log(P)$ dB below 2288MHz.

(3) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2360 and 2365MHz, and not less than $70 + 10 \log(P)$ dB above 2365MHz.

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;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations;

(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(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

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. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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 $43 + 10 \log_{10} (P)$ dB.

FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40+10\log P$ dB (-10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
- $43+10\log P$ dB (-13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
- $55+10\log P$ 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 than $43 + 10 \log (P)$ 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.

FCC § 27.53(n) (2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

5.5.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency blocks 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.

1. The EUT is coupled to the system simulator and spectrum analyzer; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.
2. Base Station is used to establish communication with the EUT, and its parameters are set to force the

EUT transmitting at maximum output power.

3. The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.
4. Spurious emissions are tested with 0.001MHz RBW for frequency less than 150kHz, 0.01MHz RBW for frequency less than 30MHz, 0.1MHz RBW for frequency less than 1GHz, and 1MHz RBW for frequency above 1GHz. And sweep point number are at least 401, referring to following formula.

Sweep point number = Span/RBW

VBW=3*RBW

Detector Mode=mean or average power

5. Record the frequencies and levels of spurious emissions.

5.5.4 Test Result

Please refer to ANNEX A.5.

5.6 Band Edge

5.6.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n)

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(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1) By a factor of not less than: $43 + 10 \log(P)$ dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log(P)$ dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than $61 + 10 \log(P)$ dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than $67 + 10 \log(P)$ dB on all frequencies between 2328 and 2337MHz.

(2) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2300 and 2305MHz, $55 + 10 \log(P)$ dB on all frequencies between 2296 and 2300MHz, $61 + 10 \log(P)$ dB on all frequencies between 2292 and 2296MHz, $67 + 10 \log(P)$ dB on all frequencies between 2288 and 2292MHz, and $70 + 10 \log(P)$ dB below 2288MHz.

(3) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2360 and 2365MHz, and not less than $70 + 10 \log(P)$ dB above 2365MHz.

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;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations;

(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. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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 $43 + 10 \log_{10} (P)$ dB.

FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40+10\log P$ dB (-10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
- $43+10\log P$ dB (-13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,

- $55+10\log P$ 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 than $43 + 10 \log (P)$ 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.

FCC § 27.53(n) (2)

For mobile operations in the $3450-3550$ MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

5.6.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading.

1. The EUT is coupled to the system simulator and spectrum analyzer; the RF load attached to EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading.
2. Base Station is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.
3. The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.
4. The center of the spectrum analyzer was set to block edge frequency.
5. Band edge are tested with $1\% \cdot cBW$ (RBW), and sweep point number referred to following formula.

$$\text{Sweep point number} = 2 \cdot \text{Span} / \text{RBW}$$

$$\text{VBW} = 3 \cdot \text{RBW}$$

6. Record the frequencies and levels of spurious emissions.

For mobile and portable stations, 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. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

$10 \cdot \log(10 \text{ kHz} / 6.25 \text{ kHz}) = 2.04 \text{ dB}$
Limit Line = $-35 \text{ dBm} + 2.04 \text{ dB} = -32.96 \text{ dBm}$

5.6.4 Test Result

Please refer to ANNEX A.6.

5.7 Field Strength of Spurious Radiation

5.7.1 Limit

FCC § 2.1053 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n)

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(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1) By a factor of not less than: $43 + 10 \log(P)$ dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log(P)$ dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than $61 + 10 \log(P)$ dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than $67 + 10 \log(P)$ dB on all frequencies between 2328 and 2337MHz.

(2) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2300 and 2305MHz, $55 + 10 \log(P)$ dB on all frequencies between 2296 and 2300MHz, $61 + 10 \log(P)$ dB on all frequencies between 2292 and 2296MHz, $67 + 10 \log(P)$ dB on all frequencies between 2288 and 2292MHz, and $70 + 10 \log(P)$ dB below 2288MHz.

(3) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2360 and 2365MHz, and not less than $70 + 10 \log(P)$ dB above 2365MHz.

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;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations;

(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(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to - 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

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. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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 $43 + 10 \log_{10}(P)$ dB.

FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40+10\log P$ dB (-10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
- $43+10\log P$ dB (-13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
- $55+10\log P$ 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 than $43 + 10 \log (P)$ 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.

FCC § 27.53(n) (2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

5.7.2 Test Setup

The section 4.4.3 and 4.4.4 (Diagram 3, 4) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the average bandwidth was set to 1 MHz.
5. The transmitter shall be switched on; the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole (824 ~ 849 MHz) or horn antenna (1 850 ~ 1 910 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the

maximum signal is received.

13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.

14. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Final measurement calculation as below:

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

$$\text{ERP/EIRP (dBm)} = \text{SA Read Value (dBm)} + \text{Correction Factor (dB)}$$

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).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value for GSM850 is:

$$\text{ERP (dBm)} = 21\text{dBm} + 8\text{dB} = 29\text{dBm}$$

5.7.4 Test Result

Please refer to ANNEX A.7.

ANNEX A TEST RESULTS

A.1 Transmitter Radiated Power (EIRP/ERP)

NB-IOT Mode Test Data

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
NB-IoT BAND2									
3.75kHz	LCH	QPSK	RB1#0	22.12	2.7	24.82	0.303	2.00	Pass
			RB1#47	22.2	2.7	24.90	0.309	2.00	Pass
		BPSK	RB1#0	22.22	2.7	24.92	0.310	2.00	Pass
			RB1#47	22.13	2.7	24.83	0.304	2.00	Pass
	MCH	QPSK	RB1#0	22.43	2.7	25.13	0.326	2.00	Pass
			RB1#47	22.16	2.7	24.86	0.306	2.00	Pass
		BPSK	RB1#0	22.17	2.7	24.87	0.307	2.00	Pass
			RB1#47	22.18	2.7	24.88	0.308	2.00	Pass
	HCH	QPSK	RB1#0	22.22	2.7	24.92	0.310	2.00	Pass
			RB1#47	22.16	2.7	24.86	0.306	2.00	Pass
		BPSK	RB1#0	22.18	2.7	24.88	0.308	2.00	Pass
			RB1#47	22.09	2.7	24.79	0.301	2.00	Pass
15kHz	LCH	QPSK	RB1#0	22.22	2.7	24.92	0.310	2.00	Pass
			RB1#11	22.24	2.7	24.94	0.312	2.00	Pass
			RB12#0	21.27	2.7	23.97	0.249	2.00	Pass
		BPSK	RB1#0	22.11	2.7	24.81	0.303	2.00	Pass
	RB1#11		22.14	2.7	24.84	0.305	2.00	Pass	
	MCH	QPSK	RB1#0	22.37	2.7	25.07	0.321	2.00	Pass
			RB1#11	22.10	2.7	24.80	0.302	2.00	Pass
			RB12#0	20.12	2.7	22.82	0.191	2.00	Pass
		BPSK	RB1#0	22.04	2.7	24.74	0.298	2.00	Pass
	RB1#11		22.01	2.7	24.71	0.296	2.00	Pass	
	HCH	QPSK	RB1#0	22.05	2.7	24.75	0.299	2.00	Pass
			RB1#11	22.03	2.7	24.73	0.297	2.00	Pass
RB12#0			20.90	2.7	23.60	0.229	2.00	Pass	
BPSK		RB1#0	22.04	2.7	24.74	0.298	2.00	Pass	
	RB1#11	22.02	2.7	24.72	0.296	2.00	Pass		

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
NB-IoT BAND4									
3.75kHz	LCH	QPSK	RB1#0	22.29	2.7	24.99	0.316	1.000	Pass
			RB1#47	22.19	2.7	24.89	0.308	1.000	Pass
		BPSK	RB1#0	22.26	2.7	24.96	0.313	1.000	Pass
			RB1#47	22.15	2.7	24.85	0.305	1.000	Pass
	MCH	QPSK	RB1#0	22.67	2.7	25.37	0.344	1.000	Pass
			RB1#47	22.18	2.7	24.88	0.308	1.000	Pass
		BPSK	RB1#0	22.19	2.7	24.89	0.308	1.000	Pass
			RB1#47	22.20	2.7	24.90	0.309	1.000	Pass
	HCH	QPSK	RB1#0	22.23	2.7	24.93	0.311	1.000	Pass
			RB1#47	22.17	2.7	24.87	0.307	1.000	Pass
		BPSK	RB1#0	22.19	2.7	24.89	0.308	1.000	Pass
			RB1#47	22.10	2.7	24.80	0.302	1.000	Pass
15kHz	LCH	QPSK	RB1#0	22.23	2.7	24.93	0.311	1.000	Pass
			RB1#11	22.21	2.7	24.91	0.310	1.000	Pass
			RB12#0	21.37	2.7	24.07	0.255	1.000	Pass
		BPSK	RB1#0	22.14	2.7	24.84	0.305	1.000	Pass
	RB1#11		22.17	2.7	24.87	0.307	1.000	Pass	
	MCH	QPSK	RB1#0	22.38	2.7	25.08	0.322	1.000	Pass
			RB1#11	22.12	2.7	24.82	0.303	1.000	Pass
			RB12#0	20.18	2.7	22.88	0.194	1.000	Pass
		BPSK	RB1#0	22.11	2.7	24.81	0.303	1.000	Pass
	RB1#11		22.03	2.7	24.73	0.297	1.000	Pass	
	HCH	QPSK	RB1#0	22.08	2.7	24.78	0.301	1.000	Pass
			RB1#11	22.08	2.7	24.78	0.301	1.000	Pass
RB12#0			20.92	2.7	23.62	0.230	1.000	Pass	
BPSK		RB1#0	22.17	2.7	24.87	0.307	1.000	Pass	
	RB1#11	22.13	2.7	24.83	0.304	1.000	Pass		

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
NB-IoT BAND5										
3.75kHz	LCH	QPSK	RB1#0	22.16	0	-2.15	20.01	0.100	7.000	Pass
			RB1#47	22.28	0	-2.15	20.13	0.103	7.000	Pass
		BPSK	RB1#0	22.21	0	-2.15	20.06	0.101	7.000	Pass
			RB1#47	22.18	0	-2.15	20.03	0.101	7.000	Pass
	MCH	QPSK	RB1#0	22.45	0	-2.15	20.30	0.107	7.000	Pass
			RB1#47	22.19	0	-2.15	20.04	0.101	7.000	Pass
		BPSK	RB1#0	22.32	0	-2.15	20.17	0.104	7.000	Pass
			RB1#47	22.26	0	-2.15	20.11	0.103	7.000	Pass
	HCH	QPSK	RB1#0	22.25	0	-2.15	20.10	0.102	7.000	Pass
			RB1#47	22.19	0	-2.15	20.04	0.101	7.000	Pass
		BPSK	RB1#0	22.20	0	-2.15	20.05	0.101	7.000	Pass
			RB1#47	22.17	0	-2.15	20.02	0.100	7.000	Pass
15kHz	LCH	QPSK	RB1#0	22.27	0	-2.15	20.12	0.103	7.000	Pass
			RB1#11	22.25	0	-2.15	20.10	0.102	7.000	Pass
			RB12#0	21.39	0	-2.15	19.24	0.084	7.000	Pass
		BPSK	RB1#0	22.18	0	-2.15	20.03	0.101	7.000	Pass
			RB1#11	22.19	0	-2.15	20.04	0.101	7.000	Pass
	MCH	QPSK	RB1#0	22.43	0	-2.15	20.28	0.107	7.000	Pass
			RB1#11	22.16	0	-2.15	20.01	0.100	7.000	Pass
			RB12#0	20.24	0	-2.15	18.09	0.064	7.000	Pass
		BPSK	RB1#0	22.13	0	-2.15	19.98	0.100	7.000	Pass
			RB1#11	22.14	0	-2.15	19.99	0.100	7.000	Pass
	HCH	QPSK	RB1#0	22.08	0	-2.15	19.93	0.098	7.000	Pass
			RB1#11	22.16	0	-2.15	20.01	0.100	7.000	Pass
			RB12#0	20.93	0	-2.15	18.78	0.076	7.000	Pass
		BPSK	RB1#0	22.16	0	-2.15	20.01	0.100	7.000	Pass
			RB1#11	22.11	0	-2.15	19.96	0.099	7.000	Pass

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
NB-IoT BAND12										
3.75kHz	LCH	QPSK	RB1#0	22.41	-0.2	-2.35	20.06	0.101	3.000	Pass
			RB1#47	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
		BPSK	RB1#0	22.28	-0.2	-2.35	19.93	0.098	3.000	Pass
			RB1#47	22.28	-0.2	-2.35	19.93	0.098	3.000	Pass
	MCH	QPSK	RB1#0	22.71	-0.2	-2.35	20.36	0.109	3.000	Pass
			RB1#47	22.23	-0.2	-2.35	19.88	0.097	3.000	Pass
		BPSK	RB1#0	22.36	-0.2	-2.35	20.01	0.100	3.000	Pass
			RB1#47	22.43	-0.2	-2.35	20.08	0.102	3.000	Pass
	HCH	QPSK	RB1#0	22.47	-0.2	-2.35	20.12	0.103	3.000	Pass
			RB1#47	22.34	-0.2	-2.35	19.99	0.100	3.000	Pass
		BPSK	RB1#0	22.26	-0.2	-2.35	19.91	0.098	3.000	Pass
			RB1#47	22.42	-0.2	-2.35	20.07	0.102	3.000	Pass
15kHz	LCH	QPSK	RB1#0	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
			RB1#11	22.48	-0.2	-2.35	20.13	0.103	3.000	Pass
			RB12#0	21.78	-0.2	-2.35	19.43	0.088	3.000	Pass
		BPSK	RB1#0	22.25	-0.2	-2.35	19.90	0.098	3.000	Pass
	RB1#11		22.25	-0.2	-2.35	19.90	0.098	3.000	Pass	
	MCH	QPSK	RB1#0	22.38	-0.2	-2.35	20.03	0.101	3.000	Pass
			RB1#11	22.28	-0.2	-2.35	19.93	0.098	3.000	Pass
			RB12#0	20.29	-0.2	-2.35	17.94	0.062	3.000	Pass
		BPSK	RB1#0	22.18	-0.2	-2.35	19.83	0.096	3.000	Pass
	RB1#11		22.19	-0.2	-2.35	19.84	0.096	3.000	Pass	
	HCH	QPSK	RB1#0	22.19	-0.2	-2.35	19.84	0.096	3.000	Pass
			RB1#11	22.18	-0.2	-2.35	19.83	0.096	3.000	Pass
RB12#0			20.66	-0.2	-2.35	18.31	0.068	3.000	Pass	
BPSK		RB1#0	22.19	-0.2	-2.35	19.84	0.096	3.000	Pass	
	RB1#11	22.43	-0.2	-2.35	20.08	0.102	3.000	Pass		

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
NB-IoT BAND13										
3.75kHz	LCH	QPSK	RB1#0	22.61	-0.2	-2.35	20.26	0.106	3.000	Pass
			RB1#47	22.37	-0.2	-2.35	20.02	0.100	3.000	Pass
		BPSK	RB1#0	22.43	-0.2	-2.35	20.08	0.102	3.000	Pass
			RB1#47	22.11	-0.2	-2.35	19.76	0.095	3.000	Pass
	MCH	QPSK	RB1#0	22.55	-0.2	-2.35	20.20	0.105	3.000	Pass
			RB1#47	22.26	-0.2	-2.35	19.91	0.098	3.000	Pass
		BPSK	RB1#0	22.38	-0.2	-2.35	20.03	0.101	3.000	Pass
			RB1#47	22.47	-0.2	-2.35	20.12	0.103	3.000	Pass
	HCH	QPSK	RB1#0	22.49	-0.2	-2.35	20.14	0.103	3.000	Pass
			RB1#47	22.35	-0.2	-2.35	20.00	0.100	3.000	Pass
		BPSK	RB1#0	22.36	-0.2	-2.35	20.01	0.100	3.000	Pass
			RB1#47	22.48	-0.2	-2.35	20.13	0.103	3.000	Pass
15kHz	LCH	QPSK	RB1#0	22.37	-0.2	-2.35	20.02	0.100	3.000	Pass
			RB1#11	22.49	-0.2	-2.35	20.14	0.103	3.000	Pass
			RB12#0	21.79	-0.2	-2.35	19.44	0.088	3.000	Pass
		BPSK	RB1#0	22.28	-0.2	-2.35	19.93	0.098	3.000	Pass
			RB1#11	22.31	-0.2	-2.35	19.96	0.099	3.000	Pass
	MCH	QPSK	RB1#0	22.30	-0.2	-2.35	19.95	0.099	3.000	Pass
			RB1#11	22.21	-0.2	-2.35	19.86	0.097	3.000	Pass
			RB12#0	20.11	-0.2	-2.35	17.76	0.060	3.000	Pass
		BPSK	RB1#0	22.19	-0.2	-2.35	19.84	0.096	3.000	Pass
			RB1#11	22.21	-0.2	-2.35	19.86	0.097	3.000	Pass
	HCH	QPSK	RB1#0	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
			RB1#11	22.27	-0.2	-2.35	19.92	0.098	3.000	Pass
			RB12#0	20.68	-0.2	-2.35	18.33	0.068	3.000	Pass
		BPSK	RB1#0	22.23	-0.2	-2.35	19.88	0.097	3.000	Pass
			RB1#11	22.13	-0.2	-2.35	19.78	0.095	3.000	Pass

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
NB-IoT BAND17										
3.75kHz	LCH	QPSK	RB1#0	22.56	-0.2	-2.35	20.21	0.105	3.000	Pass
			RB1#47	22.21	-0.2	-2.35	19.86	0.097	3.000	Pass
		BPSK	RB1#0	22.66	-0.2	-2.35	20.31	0.107	3.000	Pass
			RB1#47	22.56	-0.2	-2.35	20.21	0.105	3.000	Pass
	MCH	QPSK	RB1#0	22.81	-0.2	-2.35	20.46	0.111	3.000	Pass
			RB1#47	22.23	-0.2	-2.35	19.88	0.097	3.000	Pass
		BPSK	RB1#0	22.38	-0.2	-2.35	20.03	0.101	3.000	Pass
			RB1#47	22.39	-0.2	-2.35	20.04	0.101	3.000	Pass
	HCH	QPSK	RB1#0	22.38	-0.2	-2.35	20.03	0.101	3.000	Pass
			RB1#47	22.23	-0.2	-2.35	19.88	0.097	3.000	Pass
		BPSK	RB1#0	22.36	-0.2	-2.35	20.01	0.100	3.000	Pass
			RB1#47	22.16	-0.2	-2.35	19.81	0.096	3.000	Pass
15kHz	LCH	QPSK	RB1#0	22.38	-0.2	-2.35	20.03	0.101	3.000	Pass
			RB1#11	22.33	-0.2	-2.35	19.98	0.100	3.000	Pass
			RB12#0	21.78	-0.2	-2.35	19.43	0.088	3.000	Pass
		BPSK	RB1#0	22.39	-0.2	-2.35	20.04	0.101	3.000	Pass
			RB1#11	22.46	-0.2	-2.35	20.11	0.103	3.000	Pass
	MCH	QPSK	RB1#0	22.75	-0.2	-2.35	20.40	0.110	3.000	Pass
			RB1#11	22.22	-0.2	-2.35	19.87	0.097	3.000	Pass
			RB12#0	20.28	-0.2	-2.35	17.93	0.062	3.000	Pass
		BPSK	RB1#0	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
	RB1#11		22.20	-0.2	-2.35	19.85	0.097	3.000	Pass	
	HCH	QPSK	RB1#0	22.29	-0.2	-2.35	19.94	0.099	3.000	Pass
			RB1#11	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
RB12#0			20.87	-0.2	-2.35	18.52	0.071	3.000	Pass	
BPSK		RB1#0	22.21	-0.2	-2.35	19.86	0.097	3.000	Pass	
		RB1#11	22.07	-0.2	-2.35	19.72	0.094	3.000	Pass	

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
NB-IoT BAND25									
3.75kHz	LCH	QPSK	RB1#0	22.14	2.7	24.84	0.305	2.000	Pass
			RB1#47	22.21	2.7	24.91	0.310	2.000	Pass
		BPSK	RB1#0	22.23	2.7	24.93	0.311	2.000	Pass
			RB1#47	22.16	2.7	24.86	0.306	2.000	Pass
	MCH	QPSK	RB1#0	22.32	2.7	25.02	0.318	2.000	Pass
			RB1#47	22.17	2.7	24.87	0.307	2.000	Pass
		BPSK	RB1#0	22.19	2.7	24.89	0.308	2.000	Pass
			RB1#47	22.15	2.7	24.85	0.305	2.000	Pass
	HCH	QPSK	RB1#0	22.23	2.7	24.93	0.311	2.000	Pass
			RB1#47	22.17	2.7	24.87	0.307	2.000	Pass
		BPSK	RB1#0	22.19	2.7	24.89	0.308	2.000	Pass
			RB1#47	22.10	2.7	24.80	0.302	2.000	Pass
15kHz	LCH	QPSK	RB1#0	22.23	2.7	24.93	0.311	2.000	Pass
			RB1#11	22.25	2.7	24.95	0.313	2.000	Pass
			RB12#0	21.28	2.7	23.98	0.250	2.000	Pass
		BPSK	RB1#0	22.10	2.7	24.80	0.302	2.000	Pass
	RB1#11		22.15	2.7	24.85	0.305	2.000	Pass	
	MCH	QPSK	RB1#0	22.38	2.7	25.08	0.322	2.000	Pass
			RB1#11	22.11	2.7	24.81	0.303	2.000	Pass
			RB12#0	20.13	2.7	22.83	0.192	2.000	Pass
		BPSK	RB1#0	22.05	2.7	24.75	0.299	2.000	Pass
	RB1#11		22.02	2.7	24.72	0.296	2.000	Pass	
	HCH	QPSK	RB1#0	22.06	2.7	24.76	0.299	2.000	Pass
			RB1#11	22.04	2.7	24.74	0.298	2.000	Pass
RB12#0			20.91	2.7	23.61	0.230	2.000	Pass	
BPSK		RB1#0	22.06	2.7	24.76	0.299	2.000	Pass	
	RB1#11	22.03	2.7	24.73	0.297	2.000	Pass		

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Limit (W)	Verdict
NB-IoT BAND66									
3.75kHz	LCH	QPSK	RB1#0	22.31	2.7	25.01	0.317	1.000	Pass
			RB1#47	22.26	2.7	24.96	0.313	1.000	Pass
		BPSK	RB1#0	22.27	2.7	24.97	0.314	1.000	Pass
			RB1#47	22.18	2.7	24.88	0.308	1.000	Pass
	MCH	QPSK	RB1#0	22.46	2.7	25.16	0.328	1.000	Pass
			RB1#47	22.19	2.7	24.89	0.308	1.000	Pass
		BPSK	RB1#0	22.27	2.7	24.97	0.314	1.000	Pass
			RB1#47	22.21	2.7	24.91	0.310	1.000	Pass
	HCH	QPSK	RB1#0	22.24	2.7	24.94	0.312	1.000	Pass
			RB1#47	22.19	2.7	24.89	0.308	1.000	Pass
		BPSK	RB1#0	22.25	2.7	24.95	0.313	1.000	Pass
			RB1#47	22.18	2.7	24.88	0.308	1.000	Pass
15kHz	LCH	QPSK	RB1#0	22.25	2.7	24.95	0.313	1.000	Pass
			RB1#11	22.26	2.7	24.96	0.313	1.000	Pass
			RB12#0	21.39	2.7	24.09	0.256	1.000	Pass
		BPSK	RB1#0	22.17	2.7	24.87	0.307	1.000	Pass
	RB1#11		22.18	2.7	24.88	0.308	1.000	Pass	
	MCH	QPSK	RB1#0	22.41	2.7	25.11	0.324	1.000	Pass
			RB1#11	22.14	2.7	24.84	0.305	1.000	Pass
			RB12#0	20.19	2.7	22.89	0.195	1.000	Pass
		BPSK	RB1#0	22.16	2.7	24.86	0.306	1.000	Pass
	RB1#11		22.04	2.7	24.74	0.298	1.000	Pass	
	HCH	QPSK	RB1#0	22.05	2.7	24.75	0.299	1.000	Pass
			RB1#11	22.09	2.7	24.79	0.301	1.000	Pass
RB12#0			20.93	2.7	23.63	0.231	1.000	Pass	
BPSK		RB1#0	22.18	2.7	24.88	0.308	1.000	Pass	
	RB1#11	22.16	2.7	24.86	0.306	1.000	Pass		

Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Conducted Output AV Power (dBm)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Limit (W)	Verdict
NB-IoT BAND85										
3.75kHz	LCH	QPSK	RB1#0	22.12	-0.2	-2.35	19.77	0.095	3.000	Pass
			RB1#47	22.39	-0.2	-2.35	20.04	0.101	3.000	Pass
		BPSK	RB1#0	22.47	-0.2	-2.35	20.12	0.103	3.000	Pass
			RB1#47	22.16	-0.2	-2.35	19.81	0.096	3.000	Pass
	MCH	QPSK	RB1#0	22.79	-0.2	-2.35	20.44	0.111	3.000	Pass
			RB1#47	22.29	-0.2	-2.35	19.94	0.099	3.000	Pass
		BPSK	RB1#0	22.31	-0.2	-2.35	19.96	0.099	3.000	Pass
			RB1#47	22.49	-0.2	-2.35	20.14	0.103	3.000	Pass
	HCH	QPSK	RB1#0	22.33	-0.2	-2.35	19.98	0.100	3.000	Pass
			RB1#47	22.38	-0.2	-2.35	20.03	0.101	3.000	Pass
		BPSK	RB1#0	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
			RB1#47	22.18	-0.2	-2.35	19.83	0.096	3.000	Pass
15kHz	LCH	QPSK	RB1#0	22.31	-0.2	-2.35	19.96	0.099	3.000	Pass
			RB1#11	22.28	-0.2	-2.35	19.93	0.098	3.000	Pass
			RB12#0	21.81	-0.2	-2.35	19.46	0.088	3.000	Pass
		BPSK	RB1#0	22.32	-0.2	-2.35	19.97	0.099	3.000	Pass
			RB1#11	22.42	-0.2	-2.35	20.07	0.102	3.000	Pass
	MCH	QPSK	RB1#0	22.78	-0.2	-2.35	20.43	0.110	3.000	Pass
			RB1#11	22.27	-0.2	-2.35	19.92	0.098	3.000	Pass
			RB12#0	20.25	-0.2	-2.35	17.90	0.062	3.000	Pass
		BPSK	RB1#0	22.28	-0.2	-2.35	19.93	0.098	3.000	Pass
	RB1#11		22.29	-0.2	-2.35	19.94	0.099	3.000	Pass	
	HCH	QPSK	RB1#0	22.27	-0.2	-2.35	19.92	0.098	3.000	Pass
			RB1#11	22.29	-0.2	-2.35	19.94	0.099	3.000	Pass
RB12#0			20.88	-0.2	-2.35	18.53	0.071	3.000	Pass	
BPSK		RB1#0	22.31	-0.2	-2.35	19.96	0.099	3.000	Pass	
		RB1#11	22.03	-0.2	-2.35	19.68	0.093	3.000	Pass	

A.2 Peak to Average Ratio

Note: The Peak to Average Ratio please refer to the FCC test report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021. Section **5.6 Peak to Average Ratio**.

A.3 Occupied Bandwidth

Note: The Occupied Bandwidth please refer to the FCC test report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021. Section **5.2 Occupied Bandwidth**.

A.4 Frequency Stability

Note: The Frequency Stability please refer to the the FCC test report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021. Section **5.3 Frequency Stability**.

A.5 Spurious Emission at Antenna Terminals

Note: The Spurious Emission at Antenna Terminals please refer to the FCC test report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021. Section **5.7 Spurious Emission at Antenna Terminals**.

A.6 Band Edge

Note: The Band Edge please refer to the FCCtest report 2012RSU022-U1, which issued by MRT Technology (Suzhou) Co., Ltd. on Jan. 26, 2021. Section **5.5 Band Edge**.

A.1 Field Strength of Spurious Radiation

Note 1: All modes have been tested, and only the worst case data are shown here.

Note 2: The frequencies of verdict which are marked by "N/A" should be ignored because they are UE carrier frequency.

Note 3: Test plots please refer to the document "Annex No.:BL-SH2440049-501 Data Part 1.pdf".

Note 4: The disturbance above 26.5GHz was very low, and the above harmonics were the highest point could be found when testing, so only the worst case data displayed in this report.

NB-IoT Mode Test Verdict

Test Band	Test Sub-carrier spacing	Test Channel	Test Mode	Test RB (Size#Offset)	Refer to Plot ^{Note3}	Verdict
NB-IoT Band 2	3.75kHz	MCH	QPSK	RB1#0	1.1	Pass
NB-IoT Band 4	3.75kHz	MCH	QPSK	RB1#0	1.2	Pass
NB-IoT Band 5	3.75kHz	MCH	QPSK	RB1#0	1.3	Pass
NB-IoT Band 12	3.75kHz	MCH	QPSK	RB1#0	1.4	Pass
NB-IoT Band 13	3.75kHz	MCH	QPSK	RB1#0	1.5	Pass
NB-IoT Band 17	3.75kHz	MCH	QPSK	RB1#0	1.6	Pass
NB-IoT Band 25	3.75kHz	MCH	QPSK	RB1#0	1.7	Pass
NB-IoT Band 66	3.75kHz	MCH	QPSK	RB1#0	1.8	Pass
NB-IoT Band 85	3.75kHz	MCH	QPSK	RB1#0	1.9	Pass

ANNEX B TEST SETUP PHOTOS

Please refer to the document “BL-SH2440049-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer to the document “BL-SH2440049-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer to the document “BL-SH2440049-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--