RF Test Report

For

Applicant name:	**Shanghai AllyNav Technology Co.,Ltd.**
Address:	Room 201, Buliding 1,No 215, Gaoguang RD, Qingpu District,Shanghai, China
EUT name:	GNSS Receiver
Brand name:	N/A
Model number:	R26pro
Series model number:	N/A
FCC ID:	2AT4HR26PRO

Issued By

Company name:	**BTF Testing Lab (Shenzhen) Co., Ltd.**
Address:	101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Report number:	BTF250620R00104
Test standards:	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part22 FCC CFR Title 47 Part24 FCC CFR Title 47 Part27
Test conclusion:	Pass
Date of sample receipt:	2025-01-21
Test date:	2025-01-21 to 2025-06-19
Date of issue:	2025-06-19

Test by: Sean He

Sean He / Tester

Prepared by: Chris Liu

Chris Liu/ Project engineer

Approved by

Ryan.CJ /EMC manager

Note: All the test results in this report only related to the testing samples. Which can be duplicated completely for the legal use with approval of applicant; it shall not be reproduced except in full without the written approval of BTF Testing Lab (Shenzhen) Co., Ltd., All the objections should be raised within thirty days from the date of issue. To validate the report, you can contact us.

Revision History		
Version	Issue date	Revisions content
R_V0	2025-06-19	Original
Note: *Once the revision has been made, then previous versions reports are invalid.*		

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

Table of Contents

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

1 Introduction

1.1 Laboratory Location

Test location:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Phone number:	+86-0755-23146130
Fax number:	+86-0755-23146130

1.2 Laboratory Facility

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

- **FCC - Designation No.: CN1409**
  BTF Testing Lab (Shenzhen) Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The test firm Registration No. is 695374.
- **CNAS - Registration No.: CNAS L17568**
  BTF Testing Lab (Shenzhen) Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L17568.
- **A2LA - Registration No.: 6660.01**
  BTF Testing Lab (Shenzhen) Co., Ltd. is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.

1.3 Announcement

(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 Product Information

2.1 Application Information

Company name:	Shanghai AllyNav Technology Co.,Ltd.
Address:	Room 201, Buliding 1,No 215, Gaoguang RD, Qingpu District,Shanghai, China

2.2 Manufacturer Information

Company name:	Shanghai AllyNav Technology Co.,Ltd.
Address:	Room 201, Buliding 1,No 215, Gaoguang RD, Qingpu District,Shanghai, China

2.3 Factory Information

Company name:	Shanghai AllyNav Technology Co.,Ltd.
Address:	Room 201, Buliding 1,No 215, Gaoguang RD, Qingpu District,Shanghai, China

2.4 General Description of Equipment under Test (EUT)

EUT name	GNSS Receiver
Under test model name	R26pro
Series model name	N/A
Description of model name differentiation	N/A
Hardware Version	V2.010
Software Version	V200.2.10
Rating:	Input Voltage 12VDC 2A

2.5 Technical Information

Operation frequency:	FDD LTE Band 2: 1850 MHz ~ 1910 MHz FDD LTE Band 4: 1710 MHz ~ 1755 MHz FDD LTE Band 5: 824 MHz ~ 849 MHz FDD LTE Band 7:2500 MHz ~ 2570 MHz TDD LTE Band 38:2570 MHz ~2620 MHz TDD LTE Band 41:2496 MHz ~2690 MHz	
Modulation Type:	LTE	QPSK
		16QAM
Antenna type:	External Antenna	

<table>
<tr><td>Antenna gain:</td><td colspan="3">FDD LTE Band 2: 2.52 dBi
FDD LTE Band 4: 2.52 dBi
FDD LTE Band 5: 3.27 dBi
FDD LTE Band 7: 1.12 dBi
TDD LTE Band 38: 1.12 dBi
TDD LTE Band 41: 1.12 dBi
(declare by Applicant)</td></tr>
<tr><td>Power Class</td><td colspan="3">3</td></tr>
<tr><td>Maximum conducted power</td><td colspan="2">LTE Band 2:22.05dBm
LTE Band 4:22.26 dBm
LTE Band 5:23.44 dBm</td><td>LTE Band 7:22.83dBm
LTE Band 38:22.33dBm
LTE Band 41:22.56dBm</td></tr>
<tr><td rowspan="8">Designation of Emissions(Remark: the necessarybandwidth of which is theworst value from themeasured occupiedbandwidths for each type ofchannel bandwidthconfguration.)</td><td>E-UTRA</td><td>QPSK</td><td>16QAM</td></tr>
<tr><td>LTE Band 2</td><td>17M9G7D
13M5G7D</td><td>17M9W7D</td></tr>
<tr><td>LTE Band 4</td><td>18M0G7D
13M5G7D</td><td>18M0W7D</td></tr>
<tr><td>LTE Band 5</td><td>8M97G7D</td><td>8M97W7D</td></tr>
<tr><td>LTE Band 7</td><td>18M0G7D</td><td>18M0W7D</td></tr>
<tr><td>LTE Band 38</td><td>17M9G7D
13M5G7D</td><td>18M0W7D</td></tr>
<tr><td>LTE Band 41</td><td>18M0G7D
4M50G7D</td><td>18M0W7D</td></tr>
</table>

3 Test Information

3.1 Test Standards

Identity	Document Title
FCC CFR Title 47 Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
FCC CFR Title 47 Part 22 Subpart H	Cellular Radiotelephone Service
FCC CFR Title 47 Part 24 Subpart E	Broadband PCS
FCC CFR Title 47 Part 27 Subpart H	Competitive Bidding Procedures for the 698-746 MHz Band
FCC CFR Title 47 Part 27 Subpart L	1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 2110-2155MHz, 2155-2180 MHz, 2180-2200 MHz Bands
FCC CFR Title 47 Part 27 Subpart M	Broadband Radio Service and Educational Broadband Service
ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

3.2 Summary of Test

Clauses	Test Items	Result
§ 2.1046 § 22.913(a)(5) – LTE B5 § 24.232(c) – LTE B2 § 27.50(d)(4) – LTE B4 § 27.50(h)(2) –LTE B7/B38/B41	RF Output Power	Pass
§ 24.232(d) –LTE B2 § 27.50(d)(5) – LTE B4	Peak-to-Average Power Ratio	Pass
§ 2.1047	Modulation Characteristics	Pass
§ 2.1049	26dB Emission Bandwidth 99% Occupied Bandwidth	Pass
§ 2.1051 § 22.917(a) – LTE B5 § 24.238(a) –LTE B2 § 27.53(h) –LTE B4 § 27.53(m)(4) –LTE B7/B38/B41	Out of Band Emission at Antenna Terminals	Pass
§ 2.1053 § 22.917(a) – LTE B5 § 24.238(a) – LTE B2 § 27.53(h) –LTE B4 § 27.53(m)(4) –LTE B7/B38/B41	Field Strength of Spurious Radiation	Pass
§ 2.1055 § 22.355 – LTE B5 § 24.235 – LTE B2	Frequency Stability	Pass

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
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§ 27.54 –LTE B4/B7/B38/B41		

Remark:

1. Pass: met the requirements.

2. N/A: not applicable.

3.3 Uncertainty of Test

Measurement	Value
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3.0 dB
Unwanted Emissions, conducted	±3.0 dB
Supply voltages	±3 %
Time	±5 %
Conducted Emission for LISN (9kHz ~ 150kHz)	±2.97 dB
Conducted Emission for LISN (150kHz ~ 30MHz)	±2.45 dB
Radiated Emission (30MHz ~ 1000MHz)	±4.80 dB
Radiated Emission (1GHz ~ 18GHz)	±4.82 dB
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3.4 Additions to, deviations, or exclusions from the method

None

3.5 Test Auxiliary Equipment

Description	Manufacturer	Model	Serial No.	Length	Description
/	/	/	/	/	/

3.6 Test Equipment List

Radiated test method					
Test Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
EMI Receiver	Rohde &Schwarz	ESCI7	101032	2024/10/25	2025/10/24
Signal Analyzer	Rohde & Schwarz	FSQ40	100010	2024/10/25	2025/10/24
Log periodic antenna	Schwarzbeck	VULB 9168	01328	2024/10/28	2025/10/27
Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	61997	2024/10/25	2025/10/24
Preamplifier (30MHz ~ 1GHz)	Schwarzbeck	BBV9744	00246	2024/09/24	2025/09/23
Horn Antenna (1GHz ~18GHz)	Schwarzbeck	BBHA9120D	2597	2024/10/30	2025/10/29
Horn Antenna (15GHz ~ 40GHz)	SCHWARZBECK	BBHA9170	1157	2024/10/24	2025/10/23
Preamplifier (1GHz ~ 40GHz)	TST Pass	LNA10180G45	246	2024/09/24	2025/09/23
Test Software	Frad	EZ_EMC	Version: FA-03A2 RE+		

Conducted test method					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Keysight	N9020A	MY50410020	2024/10/25	2025/10/24
ESG Vector Signal Generator	Agilent	E4438C	MY45094854	2024/10/25	2025/10/24
MXG Vector Signal Generator	Agilent	N5182A	MY46240163	2024/10/25	2025/10/24
Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	61997	2024/10/25	2025/10/24
Temperature Humidity Chamber	ZZCKONG	ZZ-K02A	20210928007	2024/10/25	2025/10/24
DC Power Supply	Tongmen	etm-6050c	20211026123	2024/10/25	2025/10/24
RF Control Unit	Techy	TR1029-1	/	2024/10/25	2025/10/24
RF Sensor Unit	Techy	TR1029-2	/	2024/10/25	2025/10/24
Test Software	TST Pass	/	Version: 2.0		

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4 Test Configuration

4.1 Environment Condition

Selected Values During Tests		
Temperature	Relative Humidity	Ambient Pressure
Normal: +15°C to +35°C Extreme: -30°C to +50°C	20% to 75%	86 kPa to 106 kPa

4.2 Test mode

QPSK mode:	Keep the EUT communication with simulated station in QPSK mode
16QAM mode:	Keep the EUT communication with simulated station in 16QAM mode
Remark: Per-scan all kind of data rate, and report only reflects the test data of worst data rate mode.	

4.3 Test Channel of EUT

Regards to the operating frequency range over 10 MHz, the lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

LTE Band 2					
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**3 MHz**		
Lowest	18607	1850.7	Lowest	18915	1851.5
Middle	18900	1880.0	Middle	18900	1880.0
Highest	19193	1909.3	Highest	19185	1908.5
5 MHz			**10 MHz**		
Lowest	18625	1852.5	Lowest	18650	1855.0
Middle	18900	1880.0	Middle	18900	1880.0
Highest	19175	1907.5	Highest	19150	1905.0
15 MHz			**20 MHz**		
Lowest	18675	1857.5	Lowest	18700	1860.0
Middle	18900	1880.0	Middle	18900	1880.0
Highest	19125	1902.5	Highest	19100	1900.0
LTE Band 4					
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**3 MHz**		
Lowest	19957	1710.7	Lowest	19965	1711.5
Middle	20175	1732.5	Middle	20175	1732.5
Highest	20393	1754.3	Highest	20385	1753.5
5 MHz			**10 MHz**		
Lowest	19975	1712.5	Lowest	20000	1715.0
Middle	20175	1732.5	Middle	20175	1732.5
Highest	20375	1752.5	Highest	20350	1750.0
15 MHz			**20 MHz**		
Lowest	20025	1717.5	Lowest	20050	1720.0
Middle	20175	1732.5	Middle	20175	1732.5
Highest	20325	1747.5	Highest	20300	1745.0

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LTE Band 5					
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**3 MHz**		
Lowest	20407	824.7	Lowest	20415	825.5
Middle	20525	836.5	Middle	20525	836.5
Highest	20643	848.3	Highest	20635	847.5
5 MHz			**10 MHz**		
Lowest	20425	826.5	Lowest	20450	829.0
Middle	20525	836.5	Middle	20525	836.5
Highest	20625	846.5	Highest	20600	844.0

LTE Band 7					
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
5 MHz			**10 MHz**		
Lowest	20775	2502.5	Lowest	20800	2505.0
Middle	21100	2535.0	Middle	21100	2535.0
Highest	21425	2567.5	Highest	21400	2565.0
15 MHz			**20 MHz**		
Lowest	20825	2507.5	Lowest	20850	2510.0
Middle	21100	2535.0	Middle	21100	2535.0
Highest	21375	2562.5	Highest	21350	2560.0

LTE Band 38					
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
5 MHz			**10 MHz**		
Lowest	37775	2572.5	Lowest	37800	2575.0
Middle	38000	2595.0	Middle	38000	2595.0
Highest	38225	2617.5	Highest	38200	3515.0
15 MHz			**20 MHz**		
Lowest	37825	2577.5	Lowest	37850	2580.0
Middle	38000	2595.0	Middle	38000	3895.0
Highest	38175	2612.5	Highest	38150	2610.0

LTE Band 41					
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
5 MHz			**10 MHz**		
Lowest	39675	2498.5	Lowest	39700	2501.0
Middle	40620	2593.0	Middle	40620	2593.0
Highest	41565	2687.5	Highest	41540	2685.0
15 MHz			**20 MHz**		
Lowest	39725	2503.5	Lowest	39750	2506.0
Middle	40620	2593.0	Middle	40620	2593.0
Highest	41515	2682.5	Highest	41490	2680.0

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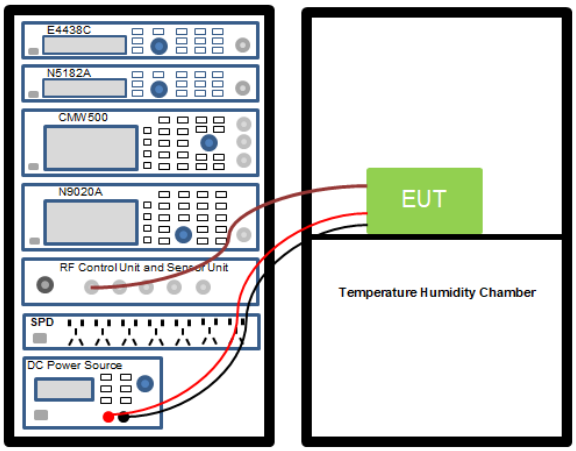
4.4 Test procedure

Radiated test method
For below 1GHz: 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data. **For above 1GHz:** 1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
Conducted test method
1. The GSM/WCDMA/LTE antenna port of EUT was connected to the test port of the test system through an RF cable. 2. The EUT is keeping in continuous transmission mode and tested in all modulation modes. 3. Open the test software, prepare a test plan, and control the system through the software. After the test is completed, the test report is exported through the test software.

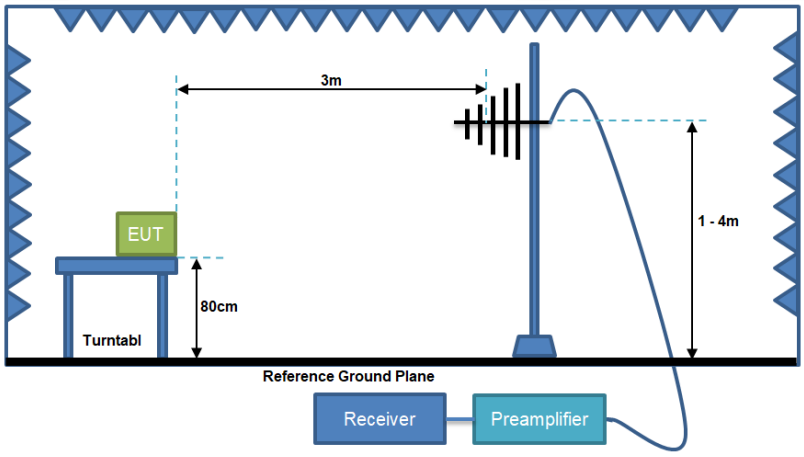
4.5 Test Setup Block

1) Conducted test method:

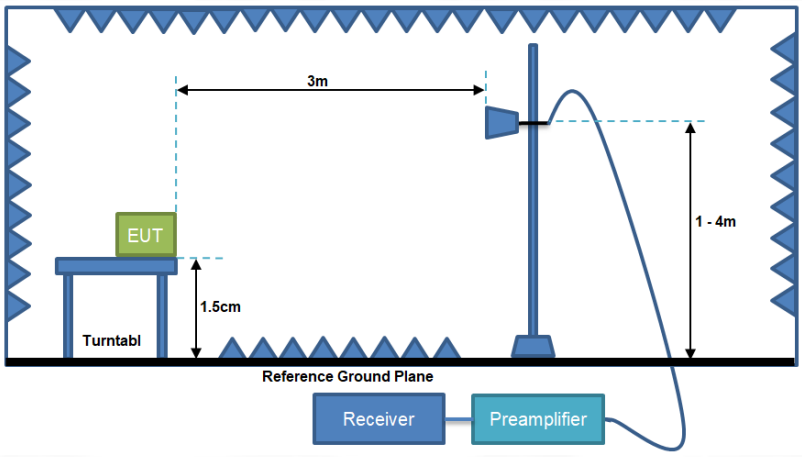


2) Radiated test method:

Below 1GHz



Above 1GHz



5 Technical requirements specification

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); RSS-103 4.6; RSS-132 5.4, RSS-133 6.4, RSS-139 6.5

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.

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.

5.1.2 Test Setup

The section 4.4 test setup 4 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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:

Conducted Output Power Value (dBm) = Measured Value (dBm) + 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:
Conducted Output Power Value (dBm) = 24.7 dBm + 8.5 dB = 33.2 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:
ERP/EIRP = PMeas + GT − LC

where:
ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);

PMeas = 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.

5.1.4 Test Result

Please refer to the appendix report

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

5.2 Peak to Average Ratio

5.2.1 Limit

FCC § 2.1046 & 24.232(d) & 27.50(d); RSS-130 4.6.1, RSS-133 6.4, RSS-139 6.5, RSS199 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); RSS-133 6.4, 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)); RSS-133 6.4,, 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); RSS-139 6.5, in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

According to RSS-19 4.4, In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of
continuous transmission.

5.2.2 Test Setup

The section 4.5 test setup 5 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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

PAPR (dB) = PPk (dBm) - PAvg (dBm).

5.2.4 Test Result

Please refer to the appendix report

5.3 Occupied Bandwidth

5.3.1 Limit

FCC § 2.1049, RSS-Gen 6.7
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 4.5 test setup 5 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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 10log (OBW / 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 the appendix report

5.4 Frequency Stability

5.4.1 Limit

FCC § 2.1055 & 22.355 & 24.235 & 27.54 ; RSS-130 4.5, RSS-132 5.3, RSS-133 6.3, RSS-139 6.4

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, RSS-132 5.3

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, RSS-133 6.3

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

FCC § 27.54, RSS-139 6.4

5.4.2 Test Setup

The section 4.5 test setup 6 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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 the appendix report

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(m); RSS-130 4.7, 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), RSS-132 5.5, RSS-133 6.5

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), RSS-139 6.6

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), RSS-139 6.6

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) , RSS-139 6.6

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) , RSS-139 6.6

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) , RSS-139 6.6

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) , RSS-139 6.6
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.

5.5.2 Test Setup

The section 4.5 test setup 5 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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.
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.

CMW500 is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.

The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.

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

Record the frequencies and levels of spurious emissions.

5.5.4 Test Result

Please refer to the appendix report

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

5.6 Band Edge Emission

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(m); RSS-130 4.7, 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), RSS-132 5.5, RSS-133 6.5

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), RSS-139 6.6

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), RSS-139 6.6

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
6.25Hz 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 6.25kHz 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), RSS-139 6.6

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), RSS-139 6.6

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), RSS-139 6.6

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.

5.6.2 Test Setup

The section 4.5 test setup 5 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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 50Ohm; the path loss as the factor is calibrated to correct the reading.

2. CMW500 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%*cBW (RBW), and sweep point number referred to following formula. Sweep point number = 2*Span/RBW VBW=3RBW
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*log(10 kHz / 6.25 kHz) = 2.04 dB
Limit Line = -35 dBm + 2.04 dB = -32.96dBm

5.6.4 Test Result

Please refer to the appendix report

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(m) ; RSS-130 4.7, 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(a) (4), RSS-139 6.6

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), RSS-139 6.6

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), RSS-139 6.6
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), RSS-139 6.6
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), RSS-139 6.6
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 (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.

5.7.2 Test Setup

The section 4.5 test setup 4 description is used for conducted test, and the test setup description is used for radiated test. The photo of test setup please refer to Appendix I Test Setup Photos

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 received, 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: ERP/EIRP (dBm) = SA Read Value (dBm) + 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).

5.7.4 Test Result

Note1: It was found that the emission value below 1GHz and above 18GHz was below the limit of 20dB, so it was recorded in the report.

Note2: For all bandwidths of LTE frequency band, modulation types and RB configurations were pretested, and it was found that minimum bandwidths, QPSK modulation and 1RB0 were the worst modes, and only the worst modes were reflected in the report.

Temperature	23℃	Humidity	52%
Test voltage	12V	Test Engineer	Sean He

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

LTE Band 2, 15MHz Bandwidth 30MHz -1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
34.760	-88.9	-13.0	75.9	18.7	31.8	Horizontal
79.382	-80.0	-13.0	67.0	14.9	32.2	Horizontal
123.916	-73.4	-13.0	60.4	16.9	31.0	Horizontal
162.326	-66.1	-13.0	53.1	18.3	31.4	Horizontal
210.786	-76.1	-13.0	63.1	16.1	31.9	Horizontal
347.418	-79.2	-13.0	66.2	20.1	32.7	Horizontal
33.328	-80.8	-13.0	67.8	18.6	31.8	Vertical
52.760	-78.8	-13.0	65.8	19.1	31.0	Vertical
123.482	-70.5	-13.0	57.5	16.9	31.0	Vertical
160.909	-68.4	-13.0	55.4	18.5	31.4	Vertical
191.745	-74.4	-13.0	61.4	16.3	31.7	Vertical
425.028	-84.0	-13.0	71.0	22.2	32.8	Vertical

LTE Band 2, 15MHz Bandwidth Above 1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
1160.504	-71.3	-13.0	58.3	25.5	53.6	Horizontal
1959.588	-50.0	-13.0	37.0	26.2	53.9	Horizontal
3305.070	-64.2	-13.0	51.2	29.5	53.9	Horizontal
5065.058	-58.2	-13.0	45.2	33.1	52.4	Horizontal
7867.291	-55.3	-13.0	42.3	36.7	52.0	Horizontal
11219.479	-55.0	-13.0	42.0	38.7	51.7	Horizontal
1287.206	-70.6	-13.0	57.6	25.6	53.5	Vertical
1959.871	-49.3	-13.0	36.3	26.2	53.9	Vertical
3044.165	-65.0	-13.0	52.0	29.4	54.1	Vertical
3747.875	-63.7	-13.0	50.7	30.2	53.5	Vertical
5167.835	-58.0	-13.0	45.0	33.0	52.4	Vertical
8867.343	-54.3	-13.0	41.3	37.8	52.4	Vertical

Remark:

1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

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101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

LTE Band 4, 15MHz Bandwidth 30MHz -1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
35.812	-89.7	-13.0	76.7	18.7	31.8	Horizontal
80.786	-81.3	-13.0	68.3	14.8	32.0	Horizontal
121.976	-71.4	-13.0	58.4	16.7	31.0	Horizontal
158.946	-66.3	-13.0	53.3	18.6	31.4	Horizontal
199.986	-72.5	-13.0	59.5	15.7	31.8	Horizontal
581.722	-80.8	-13.0	67.8	25.5	31.7	Horizontal
34.276	-78.9	-13.0	65.9	18.7	31.8	Vertical
50.144	-76.4	-13.0	63.4	19.5	30.9	Vertical
121.549	-69.1	-13.0	56.1	16.7	31.0	Vertical
154.008	-69.4	-13.0	56.4	19.0	31.3	Vertical
653.086	-80.5	-13.0	67.5	26.4	31.8	Vertical
906.482	-77.1	-13.0	64.1	29.0	32.3	Vertical

LTE Band 4, 15MHz Bandwidth Above 1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
1363.612	-70.3	-13.0	57.3	25.5	53.5	Horizontal
2132.154	-54.1	-13.0	41.1	26.8	54.0	Horizontal
2339.445	-67.8	-13.0	54.8	27.2	54.0	Horizontal
4744.771	-60.1	-13.0	47.1	32.3	52.7	Horizontal
6309.358	-56.1	-13.0	43.1	34.8	51.6	Horizontal
8498.475	-54.6	-13.0	41.6	37.4	52.2	Horizontal
1263.431	-71.3	-13.0	58.3	25.6	53.5	Vertical
1894.975	-69.8	-13.0	56.8	25.8	53.8	Vertical
2132.154	-45.8	-13.0	32.8	26.8	54.0	Vertical
3211.373	-63.9	-13.0	50.9	29.4	54.0	Vertical
4980.135	-58.0	-13.0	45.0	33.0	52.4	Vertical
6571.803	-55.4	-13.0	42.4	35.4	51.6	Vertical

Remark:

1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain

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101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
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LTE Band 5, 10MHz Bandwidth 30MHz -1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
34.096	-93.8	-13.0	80.8	18.6	31.8	Horizontal
76.781	-88.9	-13.0	75.9	15.3	32.4	Horizontal
128.789	-82.3	-13.0	69.3	17.3	31.1	Horizontal
160.909	-75.4	-13.0	62.4	18.4	31.4	Horizontal
295.147	-89.5	-13.0	76.5	19.0	32.3	Horizontal
489.027	-85.9	-13.0	72.9	23.3	31.7	Horizontal
42.600	-81.1	-13.0	68.1	19.2	31.6	Vertical
94.926	-75.1	-13.0	62.1	14.8	31.1	Vertical
126.329	-65.2	-13.0	52.2	17.1	31.1	Vertical
194.113	-78.1	-13.0	65.1	16.1	31.7	Vertical
388.673	-77.0	-13.0	64.0	21.1	33.1	Vertical
876.783	-50.1	-13.0	37.1	28.9	32.2	Vertical

LTE Band 5, 10MHz Bandwidth Above 1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
1159.665	-72.0	-13.0	59.0	25.5	53.6	Horizontal
2047.895	-69.3	-13.0	56.3	26.6	53.9	Horizontal
3510.879	-64.6	-13.0	51.6	29.5	53.8	Horizontal
5238.517	-58.2	-13.0	45.2	33.0	52.4	Horizontal
10104.895	-54.9	-13.0	41.9	38.4	51.9	Horizontal
13427.275	-56.0	-13.0	43.0	39.7	51.9	Horizontal
1357.713	-71.2	-13.0	58.2	25.5	53.5	Vertical
2057.982	-68.8	-13.0	55.8	26.6	53.9	Vertical
2369.045	-67.7	-13.0	54.7	27.3	54.0	Vertical
3336.263	-62.8	-13.0	49.8	29.5	53.9	Vertical
4565.175	-60.4	-13.0	47.4	31.8	52.9	Vertical
5869.530	-57.1	-13.0	44.1	33.8	51.7	Vertical

Remark:

1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

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101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

LTE Band 7, 20MHz Bandwidth 30MHz -1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
36.702	-90.1	-25.0	65.1	18.8	31.8	Horizontal
123.916	-60.6	-25.0	35.6	16.9	31.0	Horizontal
165.197	-77.2	-25.0	52.2	18.1	31.5	Horizontal
230.502	-77.6	-25.0	52.6	16.9	32.0	Horizontal
387.312	-83.0	-25.0	58.0	21.1	33.1	Horizontal
808.846	-77.5	-25.0	52.5	28.5	32.0	Horizontal
58.101	-77.0	-25.0	52.0	18.3	31.1	Vertical
92.950	-73.5	-25.0	48.5	14.8	31.3	Vertical
126.995	-66.1	-25.0	41.1	17.2	31.1	Vertical
204.955	-82.6	-25.0	57.6	15.9	31.8	Vertical
390.723	-79.3	-25.0	54.3	21.2	33.1	Vertical
756.713	-78.1	-25.0	53.1	27.7	32.0	Vertical

LTE Band 7, 20MHz Bandwidth Above 1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
1204.765	-71.4	-25.0	46.4	25.7	53.6	Horizontal
2654.795	-42.5	-25.0	17.5	28.2	54.1	Horizontal
3554.787	-64.3	-25.0	39.3	29.7	53.7	Horizontal
5361.834	-58.6	-25.0	33.6	33.0	52.3	Horizontal
8383.806	-54.1	-25.0	29.1	37.3	52.2	Horizontal
12545.529	-56.2	-25.0	31.2	39.4	51.7	Horizontal
1311.049	-71.6	-25.0	46.6	25.6	53.5	Vertical
2050.560	-68.1	-25.0	43.1	26.6	53.9	Vertical
2654.028	-43.2	-25.0	18.2	28.2	54.1	Vertical
3953.735	-60.8	-25.0	35.8	30.8	53.3	Vertical
8828.981	-54.5	-25.0	29.5	37.7	52.4	Vertical
11409.149	-55.7	-25.0	30.7	38.8	51.7	Vertical

Remark:

1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

BTF Testing Lab (Shenzhen) Co., Ltd.
101/201/301, Building 1, Block 2, Tantou Industrial Park,Tantou Community, Songgang Subdistrict, Bao'an District, Shenzhen, China
Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

LTE Band 38, 15MHz Bandwidth 30MHz -1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
33.858	-88.6	-25.0	63.6	18.6	31.8	Horizontal
123.050	-59.9	-25.0	34.9	16.8	31.0	Horizontal
213.763	-75.1	-25.0	50.1	16.2	31.9	Horizontal
354.183	-80.8	-25.0	55.8	20.3	32.8	Horizontal
446.414	-84.3	-25.0	59.3	22.8	32.4	Horizontal
779.607	-78.2	-25.0	53.2	28.1	32.0	Horizontal
39.162	-82.7	-25.0	57.7	18.9	31.8	Vertical
91.495	-77.9	-25.0	52.9	14.8	31.4	Vertical
123.482	-65.6	-25.0	40.6	16.9	31.0	Vertical
194.113	-77.6	-25.0	52.6	16.1	31.7	Vertical
387.312	-78.9	-25.0	53.9	21.1	33.1	Vertical
933.908	-76.5	-25.0	51.5	29.3	32.4	Vertical
LTE Band 38, 15MHz Bandwidth Above 1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
1188.681	-70.5	-25.0	45.5	25.7	53.6	Horizontal
2055.604	-69.1	-25.0	44.1	26.6	53.9	Horizontal
2595.238	-63.5	-25.0	38.5	27.9	54.1	Horizontal
5166.341	-58.6	-25.0	33.6	33.0	52.4	Horizontal
8927.778	-50.0	-25.0	25.0	37.8	52.5	Horizontal
9968.551	-47.8	-25.0	22.8	38.4	51.9	Horizontal
1295.792	-70.3	-25.0	45.3	25.6	53.5	Vertical
1792.937	-69.8	-25.0	44.8	25.1	53.7	Vertical
2594.488	-41.8	-25.0	16.8	27.9	54.1	Vertical
3552.219	-63.9	-25.0	38.9	29.6	53.7	Vertical
5018.427	-58.2	-25.0	33.2	33.1	52.4	Vertical
6570.853	-54.4	-25.0	29.4	35.4	51.6	Vertical

Remark:

1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain

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Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

LTE Band 41, 5MHz Bandwidth 30MHz -1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
36.766	-89.4	-25.0	64.4	18.8	31.8	Horizontal
123.916	-60.4	-25.0	35.4	16.9	31.0	Horizontal
189.739	-80.7	-25.0	55.7	16.4	31.7	Horizontal
302.481	-84.4	-25.0	59.4	19.2	32.3	Horizontal
523.635	-82.8	-25.0	57.8	24.0	31.5	Horizontal
774.158	-78.4	-25.0	53.4	28.0	32.0	Horizontal
33.562	-89.7	-25.0	64.7	18.6	31.8	Vertical
60.069	-84.6	-25.0	59.6	18.0	31.2	Vertical
121.123	-61.6	-25.0	36.6	16.7	31.0	Vertical
202.810	-76.6	-25.0	51.6	15.8	31.8	Vertical
277.580	-81.6	-25.0	56.6	18.5	32.2	Vertical
485.609	-83.9	-25.0	58.9	23.3	31.7	Vertical

LTE Band 41, 5MHz Bandwidth Above 1GHz Middle channel						
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Polarization
1212.450	-70.4	-25.0	45.4	25.7	53.6	Horizontal
1849.788	-69.1	-25.0	44.1	25.4	53.7	Horizontal
2592.614	-61.7	-25.0	36.7	27.9	54.1	Horizontal
3809.032	-61.7	-25.0	36.7	30.4	53.4	Horizontal
6526.372	-54.5	-25.0	29.5	35.3	51.6	Horizontal
8684.714	-49.6	-25.0	24.6	37.6	52.3	Horizontal
1289.813	-70.3	-25.0	45.3	25.6	53.5	Vertical
1916.180	-70.0	-25.0	45.0	25.9	53.8	Vertical
2593.738	-46.3	-25.0	21.3	27.9	54.1	Vertical
3048.127	-64.3	-25.0	39.3	29.4	54.1	Vertical
6016.389	-55.0	-25.0	30.0	34.1	51.5	Vertical
8478.847	-50.7	-25.0	25.7	37.4	52.2	Vertical

Remark:

1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain

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Email: info@btf-lab.com Tel: +86-755-23146130 http://www.btf-lab.com

6 Test Setup Photos

Please refer to the Appendix I Test Setup Photos

7 EUT Constructional Details (EUT Photos)

Please refer to the Appendix II External Photos &Appendix III External Photos

BTF Testing Lab (Shenzhen) Co., Ltd.

F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

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--END OF REPORT--