RF Test Report

For

Applicant name: **Shanghai Mini Deer Robot Co., LTD.**

Address: Room 505, Building No.1,Lane 215,Gaoguang Road, Qingpu District,Shanghai, China

EUT name: Rugged high-precision vehicle-mounted tablet

Brand name: N/A

Model number: DT101

Series model number: N/A

FCC ID: 2BKEC-DT101

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: BTF250701R00206

Test standards:
FCC CFR Title 47 Part 2
FCC CFR Title 47 Part22
FCC CFR Title 47 Part24
FCC CFR Title 47 Part27
FCC CFR Title 47 Part90

Test conclusion: Pass

Date of sample receipt: 2025-02-02

Test date: 2025.02.08-2025.06.06

Date of issue: 2025-07-21

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	2025-07-21	Original

Note:
Once the revision has been made, then previous versions reports are invalid.

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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 518915.
- **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 Mini Deer Robot Co., LTD.
Address:	Room 505, Building No.1,Lane 215,Gaoguang Road, Qingpu District,Shanghai, China

2.2 Manufacturer Information

Company name:	Shanghai AllyNav Technology Co.,Ltd.
Address:	Room 201, Building 1, No. 99, Lane 215, Gaoguang Road, Qingpu District Shanghai, China

2.3 Factory Information

Company name:	Shanghai AllyNav Technology Co.,Ltd.
Address:	Room 201, Building 1, No. 99, Lane 215, Gaoguang Road, Qingpu District Shanghai, China

2.4 General Description of Equipment under Test (EUT)

EUT name	Rugged high-precision vehicle-mounted tablet
Under test model name	DT101
Series model name	N/A
Description of model name differentiation	N/A
Hardware Version	D516 A1C4/A2C4(0)
Software Version	D516_Q_V022En20250114
Rating:	DC 36V

2.5 Technical Information

Operation frequency:	WCDMA/HSDPA/HSUPA Band 2:1850MHz ~ 1910 MHz WCDMA/HSDPA/HSUPA Band 4: 1710MHz ~ 1755 MHz WCDMA/HSDPA/HSUPA Band 5: 824MHz ~ 849 MHz FDD LTE Band 2: 1850MHz ~ 1910 MHz FDD LTE Band 4: 1710MHz ~ 1755 MHz FDD LTE Band 5: 824MHz ~ 849 MHz FDD LTE Band 7:2500MHz ~ 2570 MHz FDD LTE Band 12: 699MHz ~ 716 MHz FDD LTE Band 17:704MHz ~ 716 MHz FDD LTE Band 25: 1850MHz~ 1915 MHz FDD LTE Band 26: 814MHz ~ 849 MHz FDD LTE Band 38: 2570MHz ~ 2620 MHz TDD LTE Band 41:2555MHz ~ 2655MHz	
Modulation Type:	GSM/GPRS	GMSK
	EGPRS	8PSK

	WCDMA	QPSK
	HSDPA/HSUPA	QPSK
		16QAM
	LTE	QPSK
		16QAM
Antenna type:	Internal Antenna	
Antenna gain:	WCDMABand 2: 2.93 dBi WCDMA Band 4: -1.66 dBi WCDMA Band 5: 1.99 dBi FDD LTE Band 2: 2.93 dBi FDD LTE Band 4: -1.66 dBi FDD LTE Band 5: 1.99 dBi (declare by Applicant)	FDD LTE Band 7: 5.43 dBi FDD LTE Band 12: -4.94 dBi FDD LTE Band 17: -4.94 dBi FDD LTE Band 25: 2.93 dBi FDD LTE Band 26: 1.99 dBi FDD LTE Band 38: 4.94dBi TDD LTE Band 41: 5.43 dBi (declare by Applicant)
Power Class	WCDMA/HSDPA/HSUPA Band 2: 3 WCDMA/HSDPA/HSUPA Band 4: 3 WCDMA/HSDPA/HSUPA Band 5: 3 FDD LTE Band 2: 3 FDD LTE Band 4: 3 FDD LTE Band 5: 3	FDD LTE Band 7: 3 FDD LTE Band 12: 3 FDD LTE Band 17: 3 FDD LTE Band 25: 3 FDD LTE Band 26: 3 FDD LTE Band 38: 3 TDD LTE Band 41: 3
Maximum conducted power	WCDMA Band II:22.50dBm WCDMA Band IV: 21.98dBm WCDMA Band V: 22.20dBm LTE Band 2: 22.92dBm LTE Band 4: 22.56dBm LTE Band 5: 22.54dBm	LTE Band 7: 20.46dBm FDD LTE Band 12:23.23dBm FDD LTE Band 17: 23.26dBm FDD LTE Band 25: 22.56dBm FDD LTE Band26: 22.21dBm FDD LTE Band38:20.68dBm TDD LTE Band 41:20.60dBm

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
FCC CFR Title 47 Part 90 Subpart S	Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands
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) –WCDMA850 & LTE B5/B26 § 24.232(c) –PCS/WCDMA1900 & LTE B2/B25 § 27.50(c)(10) –LTE B12/B17 § 27.50(d)(4) –WCDMA1700 & LTE B4 § 27.50(h)(2) –LTE B7/B38/B41 § 90.635(b) –LTE B26	RF Output Power	Pass
§ 24.232(d) –PCS/WCDMA1900 & LTE B2/B25 § 27.50(d)(5) –WCDMA1700 & 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) –WCDMA850 & LTE B5/B26 § 24.238(a) –PCS/WCDMA1900 & LTE B2/B25 § 27.53(g) –LTE B12/B17 § 27.53(h) –LTE B4 § 27.53(m)(4) –LTE B7/B38/B41	Out of Band Emission at Antenna Terminals	Pass

§ 90.691(a) –LTE B26		
§ 2.1053 § 22.917(a) –WCDMA850 & LTE B5/B26 § 24.238(a) –PCS/WCDMA1900 & LTE B2/B25 § 27.53(g) –LTE B12/B17 § 27.53(h) –LTE B4 § 27.53(m)(4) –LTE B7/B38/B41 § 90.691(a) –LTE B26	Field Strength of Spurious Radiation	Pass
§ 2.1055 § 22.355 –WCDMA850 & LTE B5/B26 § 24.235 –PCS/WCDMA1900 & LTE B2/B25 § 27.54 –LTE B4/B7/B12/B17/B38/B41 § 90.213 –LTE B26	Frequency Stability	Pass
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		

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

GSM mode:	Keep the EUT communication with simulated station in GSM mode
GPRS mode:	Keep the EUT communication with simulated station in GPRS mode
EGPRS mode:	Keep the EUT communication with simulated station in EGPRS mode
RMC mode:	Keep the EUT communication with simulated station in RMC mode
HSDPA mode:	Keep the EUT communication with simulated station in HSDPA mode
HSUPA mode:	Keep the EUT communication with simulated station in HSUPA 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
64QAM mode:	Keep the EUT communication with simulated station in 64QAM 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:

WCDMA 850			**WCDMA 1900**		
Lowest	4132	826.4	Lowest	9262	1852.4
Middle	4183	836.6	Middle	9400	1880.0
Highest	4233	846.6	Highest	9538	1907.6
WCDMA 1700					
Lowest	1312	1712.4			
Middle	1413	1732.6			
Highest	1513	1752.6			

LTE Band 2

Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**3 MHz**		
Lowest	18607	1850.7	Lowest	18615	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

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 12

Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**3 MHz**		
Lowest	23017	699.70	Lowest	23025	700.50
Middle	23095	707.50	Middle	23095	707.50
Highest	23173	715.30	Highest	23165	714.50
5 MHz			**10 MHz**		
Lowest	23035	701.50	Lowest	23060	704.00
Middle	23095	707.50	Middle	23095	707.50
Highest	23155	713.50	Highest	23130	711.00

LTE Band 17

Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
5 MHz			**10 MHz**		
Lowest	23755	706.50	Lowest	23780	704.00
Middle	23790	710.00	Middle	23790	710.00
Highest	23825	713.50	Highest	23800	711.00

LTE Band 25

Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**3 MHz**		
Lowest	26047	1850.70	Lowest	26055	1851.50
Middle	26340	1880.00	Middle	26340	1880.00
Highest	26683	1914.30	Highest	26675	1913.50
5 MHz			**10 MHz**		
Lowest	26065	1852.50	Lowest	26090	1855.00
Middle	26340	1880.00	Middle	26340	1880.00
Highest	26665	1912.50	Highest	26640	1910.00
15 MHz			**20 MHz**		
Lowest	26115	1857.50	Lowest	26140	1860.00
Middle	26340	1880.00	Middle	26365	1880.00
Highest	26615	1907.50	Highest	26590	1905.00

LTE Band 26(814MHz ~ 849MHz)

Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
1.4 MHz			**5 MHz**		
Lowest	26697	836.8	Lowest	26705	832.0
Middle	26865	838.0	Middle	26865	837.5
Highest	27033	839.2	Highest	27025	839.0
10 MHz			**15 MHz**		
Lowest	26715	827.0	Lowest	26740	819.0
Middle	26865	838.0	Middle	26865	834.0
Highest	27015	849.0	Highest	26990	849.0
20 MHz					
Lowest	26765	814.0			
Middle	26865	831.5			
Highest	26965	849.0			

LTE Band 38

Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
5 MHz			**10 MHz**		
Lowest	38925	2592.5	Lowest	38900	2590.0
Middle	38950	2595.0	Middle	38950	2595.0
Highest	38975	2597.5	Highest	39000	2600.0
15 MHz			**20 MHz**		
Lowest	38875	2587.5	Lowest	38850	2585.0
Middle	38950	2595.0	Middle	38950	2595.0
Highest	39025	2602.5	Highest	39050	2605.0

LTE Band 41(2555MHz ~ 2655MHz)

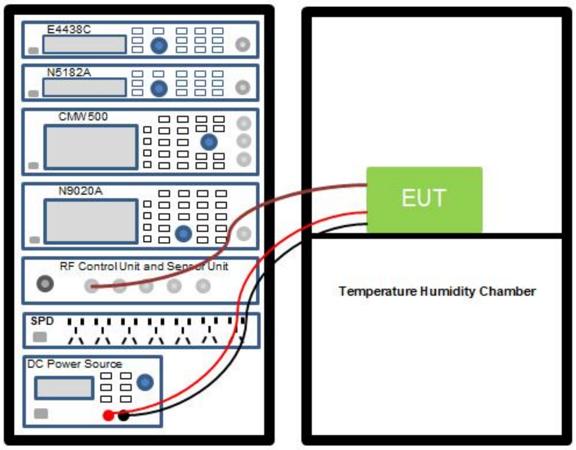
Channels	Channel No.	Frequency (MHz)	Channels	Channel No.	Frequency (MHz)
5 MHz			**10 MHz**		
Lowest	40265	2557.5	Lowest	40290	2560.0
Middle	40640	2595.0	Middle	40640	2595.0
Highest	41215	2652.5	Highest	41190	2650.0
15 MHz			**20 MHz**		
Lowest	40315	2562.5	Lowest	40340	2565.0
Middle	40640	2595.0	Middle	40640	2595.0
Highest	41165	2647.5	Highest	41140	2645.0

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.

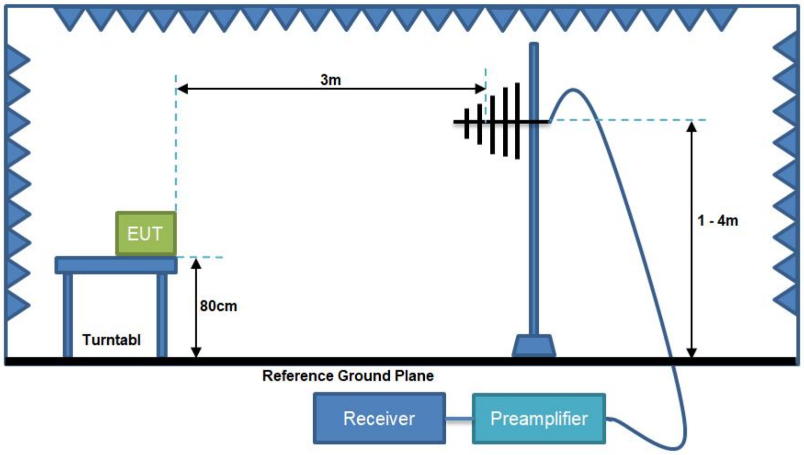
4.5 Test Setup Block

1) Conducted test method:

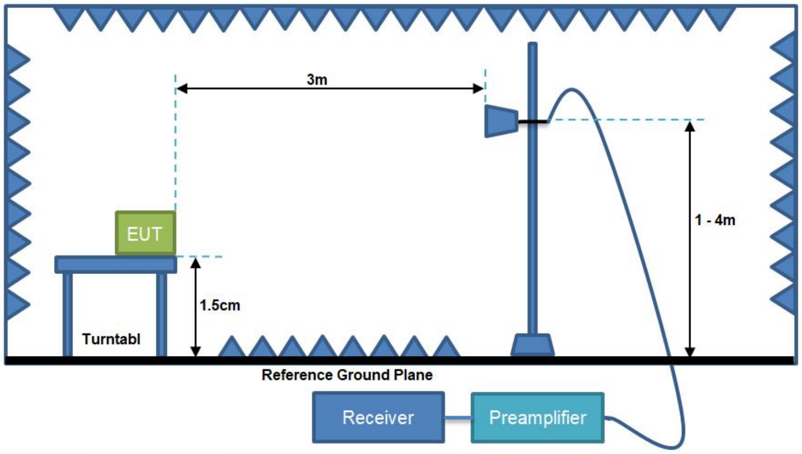

E4438C
N5182A
CMW500
N9020A
RF Control Unit and Sensor Unit
SPD
DC Power Source
EUT
Temperature Humidity Chamber

2) Radiated test method:

Below 1GHz


3m
EUT
1 - 4m
80cm
Turntabl
Reference Ground Plane
Receiver
Preamplifier

Above 1GHz


3m
EUT
1 - 4m
1.5cm
Turntabl
Reference Ground Plane
Receiver
Preamplifier

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) & 90.635(b) & 90.542(a); RSS-103 4.6; RSS-132 5.4, RSS-133 6.4, RSS-139 6.5, RSS199 4.4

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.

According to FCC section 90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts (20dBW).

According to FCC section 90.542(a) (7), portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

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.

For example:
In the EIRP test, when PMeas value for GSM1900 is 30.2 dBm, LC is 0.6 dB, and GT is -3.4 dB, then final EIRP value is:
EIRP for GSM1900 = 30.2 dBm - 3.4 dBi - 0.6 dB = 26.2 dBm

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).

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:
ERP (dBm) = 21dBm + 8dB = 29dBm

5.1.4 Test Result

Please refer to the appendix report

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 & 90.213; RSS-130 4.5, RSS-132 5.3, RSS-133 6.3, RSS-139 6.4, RSS199 4.3

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

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.
FCC § 90.213, RSS199 4.3

The frequency stability shall not depart from the reference frequency in excess of ±2.5ppm for mobile stations.

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) & 90.691 & 90.543; RSS-130 4.7, RSS-132 5.5, RSS-133 6.5, RSS-139 6.6, RSS199 4.5

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.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, 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 all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) 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.

(f) For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics 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.

RSS199 4.5

(a) for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least 43 + 10 log10 p.

(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

(i) 40 + 10 log10 p from the channel edges to 5 MHz away

(ii) 43 + 10 log10 p between 5 MHz and X MHz from the channel edges, and

(iii) 55 + 10 log10 p at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than 43 + 10 log10 p on all frequencies between 2490.5 MHz and 2496 MHz, and 55 + 10 log10 p at or below 2490.5 MHz.

In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

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

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) & 90.691& 90.543; RSS-130 4.7, RSS-132 5.5, RSS-133 6.5, RSS-139 6.6, RSS199 4.5

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.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116

Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, 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 all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) 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.

RSS199 4.5

(a) for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least 43 + 10 log10 p.

(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

(i) 40 + 10 log10 p from the channel edges to 5 MHz away
(ii) 43 + 10 log10 p between 5 MHz and X MHz from the channel edges, and
(iii) 55 + 10 log10 p at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than 43 + 10 log10 p on all frequencies between 2490.5 MHz and 2496 MHz, and 55 + 10 log10 p at or below 2490.5 MHz.

In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

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) & 90.691& 90.543 ; RSS-130 4.7, RSS-132 5.5, RSS-133 6.5, RSS-139 6.6, RSS199 4.5

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.

FCC § 90.691

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation,

where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

FCC § 90.543

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, 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 all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.
(2) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.
(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.
(4) Compliance with the provisions of paragraphs (e)(1) and (2) 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.

RSS199 4.5

(a) for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least 43 + 10 log10 p.
(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:
  (i) 40 + 10 log10 p from the channel edges to 5 MHz away
  (ii) 43 + 10 log10 p between 5 MHz and X MHz from the channel edges, and
  (iii) 55 + 10 log10 p at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than 43 + 10 log10 p on all frequencies between 2490.5 MHz and 2496 MHz, and 55 + 10 log10 p at or below 2490.5 MHz.

In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

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).

The RF fundamental frequency should be excluded against the limit line in the operating frequency band.In the 50Ω test system at a distance of 3 meters, the compensation coefficient for free space path loss is approximately 95.2 dB, so the limit is:
The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
= -13dBm+ 95.2= 82.2 dBμV/m.
The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [55+ 10log(P)] (dB)
= [30+ 10log(P)] (dBm) - [55+ 10log(P)] (dB)
= -25dBm + 95.2= 70.2 dBμV/m.

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	21.5℃	Humidity	52%
Test voltage	DC 36V	Test Engineer	Sean He

WCDMA 850
Middle channel

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2753.159	34.7	82.2	47.5	28.5	42.5	Horizontal	Pass
6143.162	40.8	82.2	41.4	34.5	41.0	Horizontal	Pass
9464.720	47.7	82.2	34.5	38.1	40.3	Horizontal	Pass
2704.362	30.6	82.2	51.6	28.3	42.7	Vertical	Pass
4160.068	33.2	82.2	49.0	31.1	42.6	Vertical	Pass
5756.126	35.8	82.2	46.4	33.5	40.9	Vertical	Pass

Note:1.Margin = Result (Result =Reading + Factor)–Limit
2.Factor= Cable Loss +Antenna Factor-Amplifier Gain

WCDMA 1700
Middle channel

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
1741.605	62.7	82.2	19.5	25.1	43.9	Horizontal	Pass
3564.046	40.1	82.2	42.1	29.7	42.3	Horizontal	Pass
6729.908	47.1	82.2	35.1	35.6	40.3	Horizontal	Pass
2113.404	54.2	82.2	28.0	26.7	43.7	Vertical	Pass
2927.766	36.0	82.2	46.2	29.1	41.8	Vertical	Pass
4614.903	37.9	82.2	44.3	31.9	42.2	Vertical	Pass

Note:1.Margin = Result (Result =Reading + Factor)–Limit
2.Factor= Cable Loss +Antenna Factor-Amplifier Gain

WCDMA 1900 Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2537.344	33.1	82.2	49.1	27.8	43.4	Horizontal	Pass
4463.434	37.9	82.2	44.3	31.6	42.4	Horizontal	Pass
6914.036	43.8	82.2	38.4	35.9	40.1	Horizontal	Pass
2201.126	32.2	82.2	50.0	26.9	43.7	Vertical	Pass
4035.853	37.0	82.2	45.2	30.9	42.7	Vertical	Pass
6803.264	42.2	82.2	40.0	35.7	40.2	Vertical	Pass
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 2, 5MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
1871.752	39.5	82.2	42.7	25.6	43.9	Horizontal	Pass
3021.530	37.6	82.2	44.6	29.4	41.5	Horizontal	Pass
5008.886	39.6	82.2	42.6	33.1	41.6	Horizontal	Pass
1871.388	45.7	82.2	36.5	25.6	43.9	Vertical	Pass
2992.566	36.4	82.2	45.8	29.3	41.5	Vertical	Pass
5773.984	39.7	82.2	42.5	33.6	40.9	Vertical	Pass
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 4, 5MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
1738.847	38.2	82.2	44.0	25.2	43.9	Horizontal	43.9
2139.680	58.2	82.2	24.0	26.8	43.7	Horizontal	43.7
3674.886	35.3	82.2	46.9	30.0	42.4	Horizontal	42.4
1824.038	33.0	82.2	49.2	25.2	43.9	Vertical	43.9
2249.268	43.6	82.2	38.6	27.1	43.7	Vertical	43.7
3091.604	52.1	82.2	30.1	29.4	41.6	Vertical	41.6
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 5, 3MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2207.883	35.3	82.2	46.9	27.0	43.7	Horizontal	43.7
4265.079	42.7	82.2	39.5	31.3	42.5	Horizontal	42.5
6675.180	46.6	82.2	35.6	35.5	40.4	Horizontal	40.4
2390.669	32.2	82.2	50.0	27.4	43.6	Vertical	43.6
4056.323	36.7	82.2	45.5	31.0	42.7	Vertical	42.7
6827.800	41.5	82.2	40.7	35.8	40.2	Vertical	40.2
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 7, 20MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
1812.786	30.7	70.2	39.5	25.2	43.9	Horizontal	43.9
2952.367	35.7	70.2	34.5	29.2	41.7	Horizontal	41.7
4701.008	37.5	70.2	32.7	32.2	42.1	Horizontal	42.1
1779.257	32.1	70.2	38.1	25.1	43.9	Vertical	43.9
3196.556	32.5	70.2	37.7	29.4	41.8	Vertical	41.8
5970.483	35.3	70.2	34.9	34.1	41.2	Vertical	41.2
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 12, 1.4MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2362.890	30.1	82.2	52.1	27.3	43.6	Horizontal	43.6
4329.355	34.7	82.2	47.5	31.4	42.5	Horizontal	42.5
8238.475	36.4	82.2	45.8	37.2	40.0	Horizontal	40.0
2814.368	35.7	82.2	46.5	28.7	42.2	Vertical	42.2
3205.040	37.5	82.2	44.7	29.4	41.8	Vertical	41.8
5354.612	40.6	82.2	41.6	33.0	40.9	Vertical	40.9
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 17, 5MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2594.113	30.3	82.2	51.9	28.0	43.1	Horizontal	43.1
4187.815	32.8	82.2	49.4	31.2	42.6	Horizontal	42.6
6390.110	36.7	82.2	45.5	35.0	40.7	Horizontal	40.7
2338.220	32.8	82.2	49.4	27.3	43.6	Vertical	43.6
3849.082	35.2	82.2	47.0	30.5	42.5	Vertical	42.5
6333.120	37.9	82.2	44.3	34.9	40.8	Vertical	40.8
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 25, 3MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
1666.140	30.5	82.2	51.7	25.2	43.9	Horizontal	43.9
2696.690	33.7	82.2	48.5	28.3	42.7	Horizontal	42.7
4297.241	36.5	82.2	45.7	31.3	42.5	Horizontal	42.5
1896.869	28.9	82.2	53.3	25.8	43.8	Vertical	43.8
3557.037	35.3	82.2	46.9	29.7	42.3	Vertical	42.3
6011.310	39.6	82.2	42.6	34.2	41.2	Vertical	41.2
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 26, 3MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2139.872	29.9	82.2	52.3	26.8	43.7	Horizontal	43.7
3422.705	32.3	82.2	49.9	29.5	42.1	Horizontal	42.1
6746.950	35.1	82.2	47.1	35.6	40.3	Horizontal	40.3
2400.925	32.9	82.2	49.3	27.4	43.6	Vertical	43.6
3901.491	37.0	82.2	45.2	30.6	42.6	Vertical	42.6
6223.778	39.4	82.2	42.8	34.6	40.9	Vertical	40.9
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 38, 20MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2079.342	31.7	70.2	38.5	26.7	43.8	Horizontal	43.8
2586.196	52.6	70.2	17.6	27.9	43.2	Horizontal	43.2
4531.256	37.9	70.2	32.3	31.7	42.3	Horizontal	42.3
2071.110	31.5	70.2	38.7	26.6	43.8	Vertical	43.8
4121.768	47.0	70.2	23.2	31.1	42.6	Vertical	42.6
6264.837	35.7	70.2	34.5	34.7	40.9	Vertical	40.9
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

LTE Band 41, 15MHz Bandwidth Middle channel							
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Marging (dB)	Ant.F/G. (dB)	Amp.G. (dB)	Pol.	Result
2123.917	32.5	70.2	37.7	26.8	43.7	Horizontal	43.7
2679.689	52.0	70.2	18.2	28.2	42.8	Horizontal	42.8
4348.553	37.2	70.2	33.0	31.4	42.5	Horizontal	42.5
1480.231	33.1	70.2	37.1	25.4	44.0	Vertical	44.0
2679.950	45.7	70.2	24.5	28.3	42.8	Vertical	42.8
4597.872	38.3	70.2	31.9	31.9	42.2	Vertical	42.2
Note:1.Margin = Result (Result =Reading + Factor)–Limit 2.Factor= Cable Loss +Antenna Factor-Amplifier Gain							

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

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