



RF Test Report



For

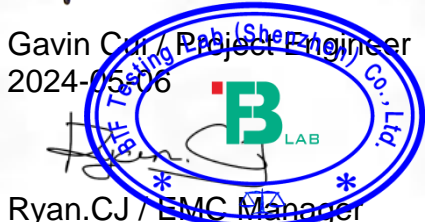
Applicant Name: Shenzhen Eview GPS Technology
Address: Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District Shenzhen China
EUT Name: Personal Mobile Alarm System
Brand Name: N/A
Model Number: EC-04-ATT
Series Model Number: EC-04

Issued By

Company Name: BTF Testing Lab (Shenzhen) Co., Ltd.
Address: F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

Report Number: BTF240407R00103
Test Standards: FCC CFR Title 47 Part 2
FCC CFR Title 47 Part24
FCC CFR Title 47 Part27
FCC ID: 2AUMJEC-04-ATT
Test Conclusion: Pass
Test Date: 2024-04-07 to 2024-04-17
Date of Issue: 2024-05-06

Prepared By: 
Date: 2024-05-06
Approved By: 
Date: 2024-05-06



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	2024-04-17	Original
<i>Note: Once the revision has been made, then previous versions reports are invalid.</i>		

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1. Introduction

1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

1.2 Identification of the Responsible Testing Location

Test Location:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Description:	All measurement facilities used to collect the measurement data are located at F101,201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
FCC Registration Number:	518915
Designation Number:	CN1330

1.3 Laboratory Condition

Ambient Temperature:	20°C to 35°C
Ambient Relative Humidity:	45% to 55%
Ambient Pressure:	100 kPa to 102 kPa

1.4 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:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District Shenzhen China

2.2 Manufacturer Information

Company Name:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District Shenzhen China

2.3 Factory Information

Company Name:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District Shenzhen China

2.4 General Description of Equipment under Test (EUT)

EUT Name:	Personal Mobile Alarm System
Test Model Number:	EC-04-ATT
Series Model Number:	EC-04
Description of Model name differentiation:	All the models are identical to each other except for model name.
Hardware Version:	EC-04_V1.2
Software Version:	EC04_0110_V1.0.43.8

2.5 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Power Supply	DC 3.85V Battery Powered			
Ratings	Input: 5V \Rightarrow 1000mA Battery: 3.85V 720mAh 2.772Wh			
Operating Bands	LTE Band 2/4/12			
	LTE	QPSK		
		16QAM		
TX Frequency Range	FDD LTE Band 2: 1850.7 MHz ~ 1909.3 MHz FDD LTE Band 4: 1710.7 MHz ~ 1754.3 MHz FDD LTE Band 12: 699.7 MHz ~ 715.3 MHz			
Rx Frequency Range	FDD LTE Band 2: 1930.7 MHz ~ 1989.3 MHz FDD LTE Band 4: 2110.7 MHz ~ 2154.3 MHz FDD LTE Band 12: 729.7 MHz ~ 745.3 MHz			
Power Class	FDD LTE Band 2: 3 FDD LTE Band 4: 3 FDD LTE Band 12: 3			
Antenna Type	LDS Antenna			
Antenna Gain	LTE B2 -3.4dBi	LTE B4 -4.0dBi	LTE B12 -6.4dBi	/
The Max RF Output Power (EIRP/ERP)	LTE Band 2: 18.79dBm LTE Band 4: 18.80dBm FDD LTE Band 12: 14.79dBm			

Note: The EUT information are declared by manufacturer. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

3. Summary of Test Results

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 Subpart H	Cellular Radiotelephone Service
3	47 CFR Part 24 Subpart E	Broadband PCS
4	47 CFR Part 27	Miscellaneous Wireless Communications Services
5	ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
6	KDB 971168 D01 v03r01	Measurement Guidance for Certification of Licensed Digital Transmitters
7	ANSI C63.26:2015	IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

3.2 Summary of Test Result

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

3.3 Uncertainty of Test

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2 and TR100 028-1/-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
RF output power, conducted	0.63 dB
Conducted spurious emissions	0.94 dB
Radiated emissions (<1 GHz)	4.12 dB
Radiated emissions (>1 GHz)	4.16 dB
Occupied Channel Bandwidth	69 KHz
Frequency Stability	0.4 KHz
Temperature	0.82 °C
Humidity	4.1 %

4. Test Configuration

4.1 Environment Condition

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

Test Voltage of the EUT	NV (Normal Voltage)	3.85 V
	LV (Low Voltage)	3.465 V
	HV (High Voltage)	4.235 V
Test Temperature of the EUT	NT (Normal Temperature)	+25 °C
	LT (Low Temperature)	-30 °C
	HT (High Temperature)	+50 °C

4.2 Test Equipment List

Conducted Method Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2023.11.16	2024.11.15	☑
WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2023.11.16	2024.11.15	☑
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2023.11.16	2024.11.15	☑
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2023.11.16	2024.11.15	☑
RF Sensor Unit	Techy	TR1029-2	/	2023.11.16	2024.11.15	☑
RF Control Unit	Techy	TR1029-1	/	2023.11.16	2024.11.15	☑
RFTest software	/	V1.00	/	/	/	☑

Radiated Method Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2023.11.16	2024.11.15	☑
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2023.11.16	2024.11.15	☑
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2023.11.16	2024.11.15	☑
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2023.11.16	2024.11.15	☑
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/	☑
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2023.11.16	2024.11.15	☑

RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
Preamplifier	SCHWARZBECK	BBV9744	00246	2023.11.16	2024.11.15	<input checked="" type="checkbox"/>
Horn Antenna	Schwarzbeck	BBHA9120D	2597	2023.11.13	2024.11.12	<input checked="" type="checkbox"/>
Low Noise Pre-amplifier	Sket	LNPA_1840G-50	SK2022032902	/	/	<input checked="" type="checkbox"/>
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	/	/	<input checked="" type="checkbox"/>
Broadband Preamplifier	Schwarzbeck	BBV9718D	00008	/	/	<input checked="" type="checkbox"/>

4.3 Test Auxiliary Equipment

Description	Manufacturer	Model	Serial No.	Length	Description	Use
/	/	/	/	/	/	<input checked="" type="checkbox"/>

4.4 Test Configurations

LTE Band	Bandwidth (MHz)						Modulation Type		RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	1	Half	Full	LCH	MCH	HCH
Effective (Isotropic) Radiated Power														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
Peak to Average Ratio														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
Occupied Bandwidth														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
Frequency Stability														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
Spurious Emission at Antenna Terminals														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
Band Edge														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
Field Strength of Spurious Radiation														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
<p>Note 1: The mark “v” means that this configuration is chosen for testing.</p> <p>Note 2: The mark “n” means that this bandwidth is not supported.</p>														

Band 2

Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
Low Range	1.4	18607	1850.7	607	1930.7
	3	18615	1851.5	615	1931.5
	5	18625	1852.5	625	1932.5
	10	18650	1855	650	1935
	15 ^[1]	18675	1857.5	675	1937.5
	20 ^[1]	18700	1860	700	1940
Mid Range	1.4/3/5/10/15 ^[1] /20 ^[1]	18900	1880	900	1960
High Range	1.4	19193	1909.3	1193	1989.3
	3	19185	1908.5	1185	1988.5
	5	19175	1907.5	1175	1987.5
	10	19150	1905	1150	1985
	15 ^[1]	19125	1902.5	1125	1982.5
	20 ^[1]	19100	1900	1100	1980

NOTE 1: Bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (TS 36.101 [27] Clause 7.3) is allowed.

Band 4

Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
Low Range	1.4	19957	1710.7	1957	2110.7
	3	19965	1711.5	1965	2111.5
	5	19975	1712.5	1975	2112.5
	10	20000	1715	2000	2115
	15	20025	1717.5	2025	2117.5
	20	20050	1720	2050	2120
Mid Range	1.4/3/5/10/15/20	20175	1732.5	2175	2132.5
High Range	1.4	20393	1754.3	2393	2154.3
	3	20385	1753.5	2385	2153.5
	5	20375	1752.5	2375	2152.5
	10	20350	1750	2350	2150
	15	20325	1747.5	2325	2147.5
	20	20300	1745	2300	2145

Band 12

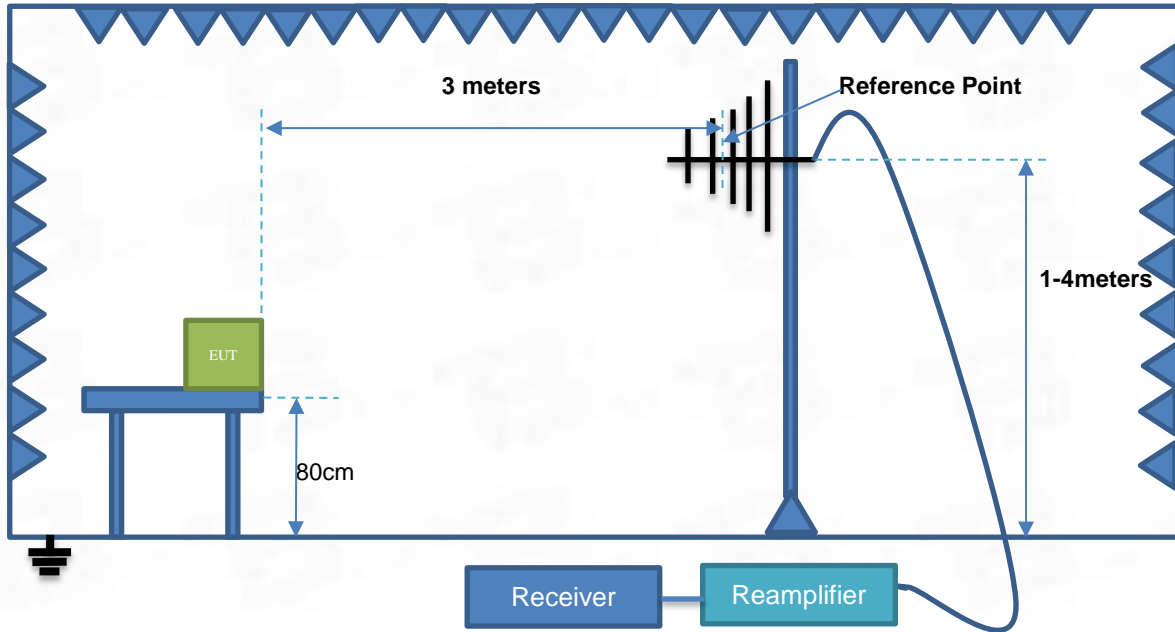
Table 4.3.1.12-1: Test frequencies for E-UTRA channel bandwidth for operating band 12

Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
Low Range	1.4	23017	699.7	5017	729.7
	3	23025	700.5	5025	730.5
	5 ^[1]	23035	701.5	5035	731.5
	10 ^[1]	23060	704	5060	734
Mid Range	1.4/3/5 ^[1] /10 ^[1]	23095	707.5	5095	737.5
High Range	1.4	23173	715.3	5173	745.3
	3	23165	714.5	5165	744.5
	5 ^[1]	23155	713.5	5155	743.5
	10 ^[1]	23130	711	5130	741

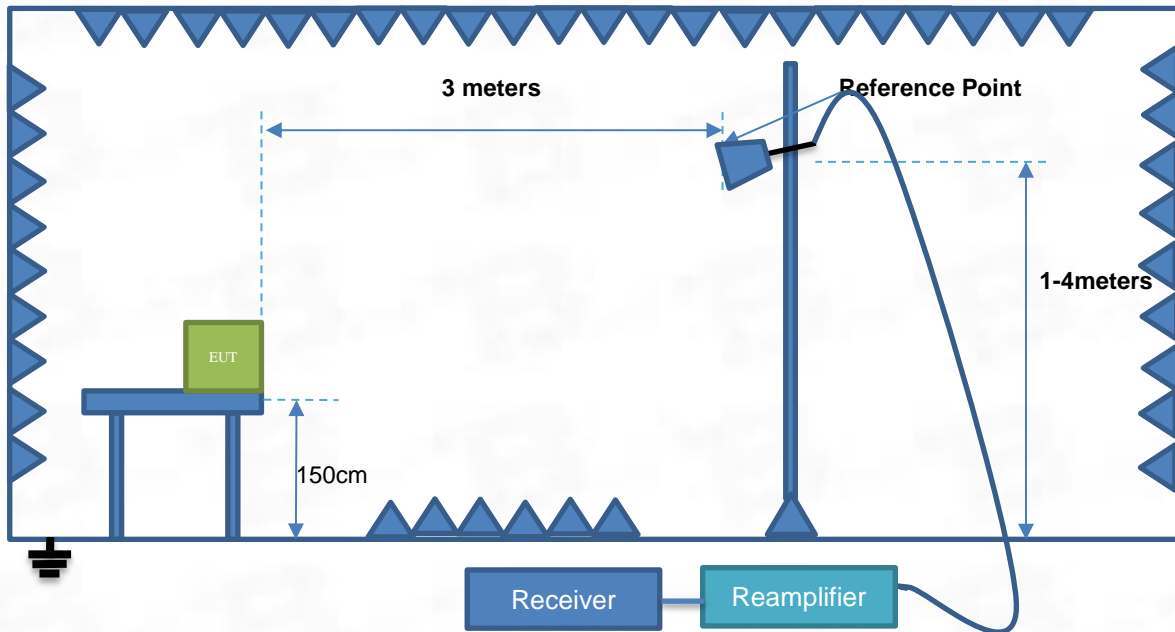
NOTE 1: Bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (TS 36.101 [27] Clause 7.3) is allowed.

4.5 Test Setup

Test Setup 1

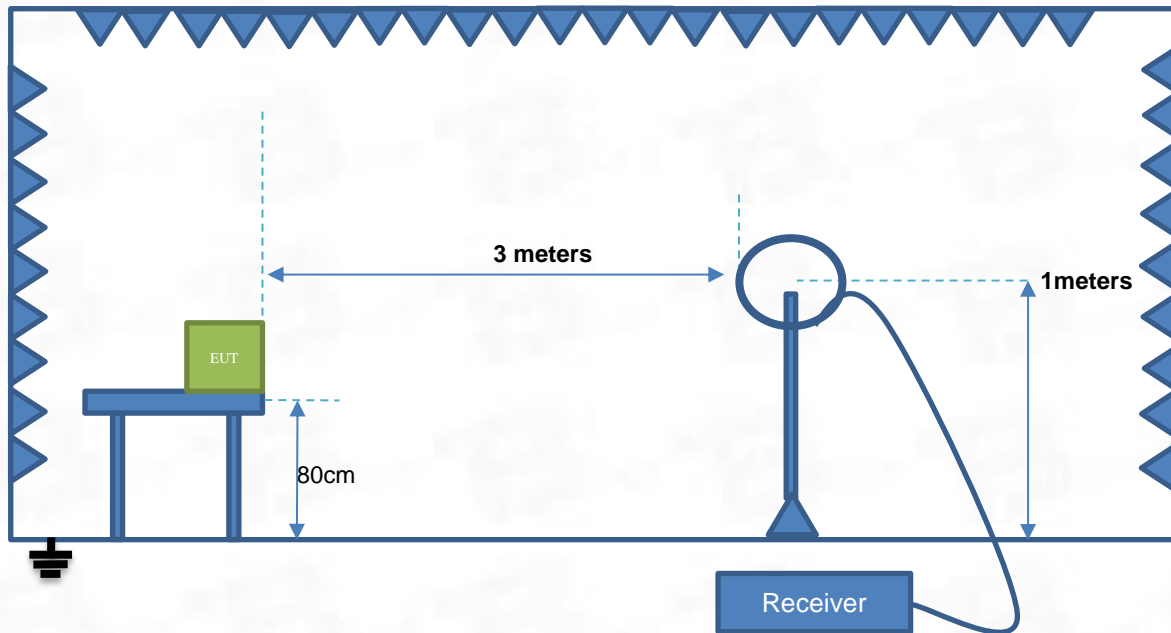


Radiation Test (30MHz – 1GHz)



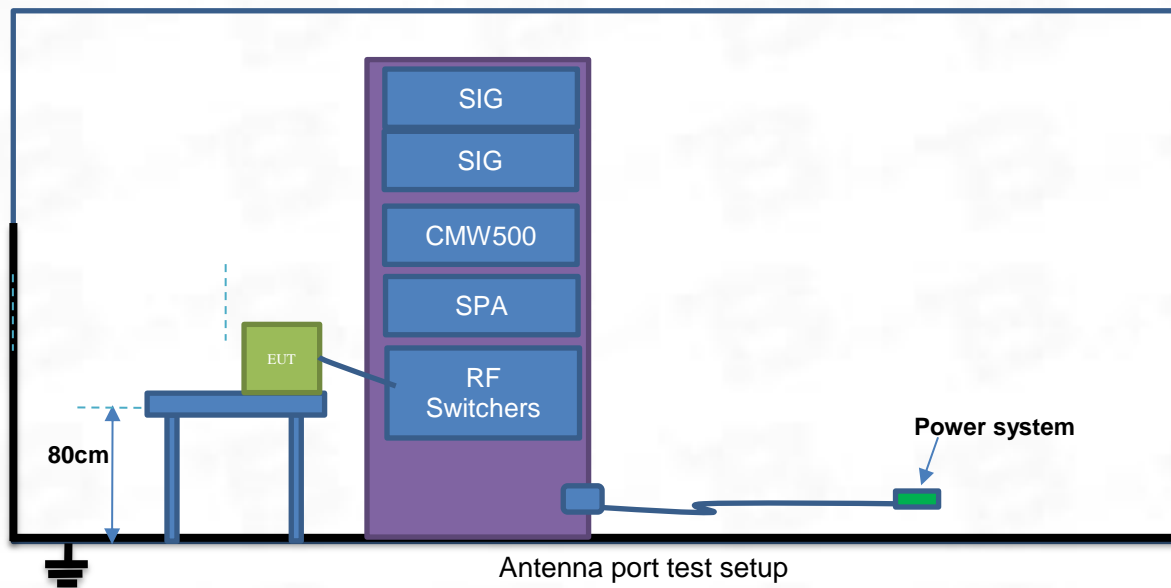
Radiation Test (Above 1GHz)

Test Setup 2



Radiation Test (9k - 30MHz)

Test Setup 3



Antenna port test setup

5. Test Items

5.1 Transmitter Radiated Power (EIRP/ERP)

5.1.1 Limit

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

5.1.3 Test Procedure

Description of the Conducted Output Power Measurement

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

The relevant equation for determining the conducted measured value is:

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

where:

Conducted Output Power Value = final conducted measured value in the conducted power test, in dBm; Measured Value = measured conducted power received by spectrum analyzer or power meter, in dBm;

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

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

For example:

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

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

Description of the Transmitter Radiated Power Measurement

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

Final measurement calculation as below:

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

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

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:

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

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

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

where:

ERP/EIRP = effective or equivalent radiated power, in dBm;

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

Factor = total correction factor including cable loss, in dB;

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

For example:

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

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

5.1.4 Test Result

Refer to appendix report.

5.2 Field Strength of Spurious Radiation

5.2.1 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 $43 + 10 \log_{10}(P)$ dB. FCC § 27.53(m) (4)

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

- $40+10\log P$ dB (-10 dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.
- $43+10\log P$ dB (-13 dBm, 50 nW) on all frequencies between 5 MHz and X MHz from the channel edge,
- $55+10\log P$ dB (-25 dBm, 3 nW) on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth (26 dB).

In addition, the attenuation factor shall not be less 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 $116 \text{Log}_{10}(f/6.1)$ decibels or $50 + 10 \text{Log}_{10}(P)$ 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 $43 + 10\text{Log}_{10}(P)$ 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 $43 + 10 \log_{10} p$.
- (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) $40 + 10 \log_{10} p$ from the channel edges to 5 MHz away
 - (ii) $43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and
 - (iii) $55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than $43 + 10 \log_{10} p$ on all frequencies between 2490.5 MHz and 2496 MHz, and $55 + 10 \log_{10} p$ 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.

5.2.2 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 ANNEX B.

5.2.3 Test Procedure

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.

4. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the average bandwidth was set to 1 MHz.
5. The transmitter shall be switched on; the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole (824 ~ 849 MHz) or horn antenna (1 850 ~ 1 910 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
14. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Final measurement calculation as below:

The relevant equation for determining the ERP/EIRP from the radiated RF output power is: $ERP/EIRP \text{ (dBm)} = SA \text{ Read Value (dBm)} + \text{Correction Factor (dB)}$

where:

ERP/EIRP = effective or equivalent radiated power, in dBm;

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

Factor = total correction factor including cable loss, in dB;

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

For example:

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

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

5.2.4 Test Result

Please refer to ANNEX A.7

4G Part

Note: 1.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.

2.All mode are tested, and the report only shows the worst mode.of GFSK & maximum bandwidth

Band:	2	Test channel:	Lowest	Test mode:	20M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3701.400	-33.95	-16.76	-50.71	-13.00	-37.71	peak	P
2 *	5552.100	-31.78	-11.79	-43.57	-13.00	-30.57	peak	P
3	7402.800	-30.33	-14.20	-44.53	-13.00	-31.53	peak	P

Band:	2	Test channel:	Lowest	Test mode:	20M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3701.400	-34.36	-16.76	-51.12	-13.00	-38.12	peak	P
2 *	5552.100	-32.52	-11.79	-44.31	-13.00	-31.31	peak	P
3	7402.800	-30.68	-14.20	-44.88	-13.00	-31.88	peak	P

Band:	2	Test channel:	Middle	Test mode:	20M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3760.000	-32.98	-16.69	-49.67	-13.00	-36.67	peak	P
2 *	5640.000	-31.86	-12.09	-43.95	-13.00	-30.95	peak	P
3	7520.000	-29.75	-14.30	-44.05	-13.00	-31.05	peak	P

Band:	2	Test channel:	Middle	Test mode:	20M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3760.000	-34.37	-16.69	-51.06	-13.00	-38.06	peak	P
2	5640.000	-33.48	-12.09	-45.57	-13.00	-32.57	peak	P
3 *	7520.000	-30.40	-14.30	-44.70	-13.00	-31.70	peak	P

Band:	2	Test channel:	Highest	Test mode:	20M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3818.600	-34.38	-16.61	-50.99	-13.00	-37.99	peak	P
2	5727.900	-31.28	-12.38	-43.66	-13.00	-30.66	peak	P
3 *	7637.200	-27.80	-14.34	-42.14	-13.00	-29.14	peak	P

Band:	2	Test channel:	Highest	Test mode:	20M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3818.600	-33.83	-16.61	-50.44	-13.00	-37.44	peak	P
2 *	5727.900	-30.28	-12.38	-42.66	-13.00	-29.66	peak	P
3	7637.200	-28.68	-14.34	-43.02	-13.00	-30.02	peak	P

Band:	4	Test channel:	Lowest	Test mode:	20M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3435.000	-34.30	-16.95	-51.25	-13.00	-38.25	peak	P
2	5152.500	-32.48	-13.70	-46.18	-13.00	-33.18	peak	P
3 *	6870.000	-31.41	-13.52	-44.93	-13.00	-31.93	peak	P

Band:	4	Test channel:	Lowest	Test mode:	20M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3435.000	-32.38	-16.95	-49.33	-13.00	-36.33	peak	P
2	5152.500	-32.64	-13.70	-46.34	-13.00	-33.34	peak	P
3 *	6870.000	-30.94	-13.52	-44.46	-13.00	-31.46	peak	P

Band:	4	Test channel:	Middle	Test mode:	20M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3465.000	-33.22	-16.99	-50.21	-13.00	-37.21	peak	P
2	5197.500	-31.99	-13.42	-45.41	-13.00	-32.41	peak	P
3 *	6930.000	-30.69	-13.66	-44.35	-13.00	-31.35	peak	P

Band:	4	Test channel:	Middle	Test mode:	20M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3465.000	-33.11	-16.99	-50.10	-13.00	-37.10	peak	P
2	5197.500	-32.19	-13.42	-45.61	-13.00	-32.61	peak	P
3 *	6930.000	-30.56	-13.66	-44.22	-13.00	-31.22	peak	P

Band:	4	Test channel:	Highest	Test mode:	20M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3495.000	-33.85	-17.02	-50.87	-13.00	-37.87	peak	P
2	5242.500	-31.37	-13.15	-44.52	-13.00	-31.52	peak	P
3 *	6990.000	-30.04	-13.81	-43.85	-13.00	-30.85	peak	P

Band:	4	Test channel:	Highest	Test mode:	20M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	3495.000	-32.74	-17.02	-49.76	-13.00	-36.76	peak	P
2	5242.500	-30.92	-13.15	-44.07	-13.00	-31.07	peak	P
3 *	6990.000	-28.83	-13.81	-42.64	-13.00	-29.64	peak	P

Band:	12	Test channel:	Lowest	Test mode:	10M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	1399.400	-40.34	-19.38	-59.72	-13.00	-46.72	peak	P
2	2099.100	-38.04	-18.09	-56.13	-13.00	-43.13	peak	P
3 *	2798.800	-36.13	-17.06	-53.19	-13.00	-40.19	peak	P

Band:	12	Test channel:	Lowest	Test mode:	10M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	1399.400	-40.05	-19.38	-59.43	-13.00	-46.43	peak	P
2	2099.100	-38.30	-18.09	-56.39	-13.00	-43.39	peak	P
3 *	2798.800	-35.92	-17.06	-52.98	-13.00	-39.98	peak	P

Band:	12	Test channel:	Middle	Test mode:	10M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	1415.000	-39.89	-19.43	-59.32	-13.00	-46.32	peak	P
2	2122.500	-37.68	-18.08	-55.76	-13.00	-42.76	peak	P
3 *	2830.000	-35.50	-16.97	-52.47	-13.00	-39.47	peak	P

Band:	12	Test channel:	Middle	Test mode:	10M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	1415.000	-40.17	-19.43	-59.60	-13.00	-46.60	peak	P
2	2122.500	-38.93	-18.08	-57.01	-13.00	-44.01	peak	P
3 *	2830.000	-35.98	-16.97	-52.95	-13.00	-39.95	peak	P

Band:	12	Test channel:	Highest	Test mode:	10M	Polarization:	H	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	1430.600	-39.29	-19.48	-58.77	-13.00	-45.77	peak	P
2	2145.900	-38.71	-18.08	-56.79	-13.00	-43.79	peak	P
3 *	2861.200	-35.98	-16.88	-52.86	-13.00	-39.86	peak	P

Band:	12	Test channel:	Highest	Test mode:	10M	Polarization:	V	
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	P/F
1	1430.600	-39.94	-19.48	-59.42	-13.00	-46.42	peak	P
2	2145.900	-38.30	-18.08	-56.38	-13.00	-43.38	peak	P
3 *	2861.200	-35.43	-16.88	-52.31	-13.00	-39.31	peak	P

Note: Reading=Receiver reading
 Factor=Antenna factor+Cable loss
 Level=Reading+Factor
 Limit=Limit stated in standard
 Margin=Measurement-Limits



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