

Test report No:
2530770R.706

FCC TEST REPORT

Product Name	Smart Controller
Trademark	N/A
Model and /or type reference	GS-ONE-TS
FCC ID	2BP4Q-GS-ONE-TS
Applicant's name / address	Aerora North America, Inc. 2570 N. First St, Suite 200 San Jose, CA 95131
Test method requested, standard	FCC CFR Title 47 Part 22 & 24 & 27 ANSI C63.26: 2015 ANSI/TIA-603-E: 2016
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao / Project Manager 
Approved by (name / position & signature)	Frank He / Technical Manager 
Date of issue	2025-09-08
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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Mar. 25, 2025
Date (start test)	Apr. 05, 2025
Date (finish test)	May. 30, 2025

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C - 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2530770R.706	V1.0	Initial issue of report.	2025-09-08

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC Part 22,24,27.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results relate only to the samples tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1 General Information.

USED EQUIPMENT

Conducted Test / TR7

Instrument	Manufacturer	Model No.	Serial No.	Next Cal. Date
Wideband Radio Communication Tester	R&S	CMW 500	170870	2026.05.09
Radio Communication Test Station	Anritsu	MT8000A	6272458317	2025.12.13
Radio Communication Analyzer	Anritsu	MT8821C	6262297906	2025.12.13
Signal analyzer	R&S	FSV30	104212	2025.07.05
ESG Vector Signal Generator	Agilent	E4438C	MY49070163	2025.10.18
Coaxial Cable	N/A	N/A	2188	2026.06.09
RF Control Unit	Tonscend	JS0806-1	168060022	2026.06.09
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2026.05.09
High and low temperature and fast temperature change test box	ASTUOD	ASTD-FBT-225K	N/A	2026.03.15
Filter box	Tonscend	N/A	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	RF06	2025.07.03
Test Software	Tonscend	JS1120	JS1120-8	N/A

Radiated Emission / AC6

Instrument	Manufacturer	Model No.	Serial No.	Next Cal. Date
Anechoic chamber	Quietek	9m*5.5m*5.5m	AC6	2029.06.29
Signal Analyzer	Agilent	N9010A	MY55370495	2025.10.18
Loop Antenna	R&S	HFH2-Z2E	101149	2026.04.15
DRG Horn Antenna	RFSPIN	DRH18-E	CE2C07A18EN	2025.12.06
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9170	750	2025.11.23
Pre-Amplifier	Schwarzbeck	BBV 9721	'00114	2026.05.16
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9168	1231	2026.05.27
Temperature/Humidity Meter	RTS	RTS-8S	RF07	2026.06.16
Temperature/Humidity Meter	RTS	RTS-8S	RF04	2026.06.16
Pre-amplifier	Tonscend	TAP01008028	806JSAP041204251019	2026.05.16
Pre-amplifier	Tonscend	TAP01018048S	806JSAP040204251009	2026.05.16
Wideband Radio Communication Tester	R&S	CMW 500	170870	2026.05.09
Test Software	Tonscend	JS36	JS36-RSE	N/A

Conducted Test / TR7

Instrument	Manufacturer	Model No.	Serial No.	Firmware Version	Software version
Wideband Radio Communication Tester	R&S	CMW 500	170870	X 4.0.62.11	N/A
Radio Communication Analyzer	Anritsu	MT8821C	6262297906	10.10.13.1	N/A
Signal analyzer	R&S	FSV30	104212	3.4	N/A
ESG Vector Signal Generator	Agilent	E4438C	MY49070163	C.05.85	N/A
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	C.06.27	N/A
Test Software	Tonscend	JS1120	JS1120-8	Test Software	V3.1.46

Radiated Emission / AC6

Instrument	Manufacturer	Model No.	Serial No.	Firmware Version	Software version
Signal Analyzer	Agilent	N9010A	MY55370495	A.18.17	N/A
Wideband Radio Communication Tester	R&S	CMW 500	170870	X 4.0.62.11	N/A
Dekra test software	Dekra	N/A	N/A	N/A	5.0.0

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The Uncertainties is comply with standard required as below.

Test item	Uncertainty
RF Output Power	± 1.2 dB
Frequency Stability	± 10 Hz
Occupied Bandwidth	± 10 Hz
Spurious Emissions at antenna terminals	± 1.2 dB
Spurious Emissions at antenna terminals at Block Edges	± 1.2 dB
Radiated Emission(30MHz~1GHz)	Horizontal: 30MHz~200MHz: 4.60 dB 200MHz~1GHz: 4.10 dB Vertical: 30MHz~200MHz: 4.80 dB 200MHz~1GHz: 4.10 dB
Radiated Emission(1GHz~40GHz)	Horizontal: 1GHz~18GHz: 5.00 dB Vertical: 1GHz~18GHz: 4.80 dB Horizontal: 18GHz~40GHz: 4.70 dB Vertical: 18GHz~40GHz: 4.60 dB

1 GENERAL INFORMATION

Product Name	Smart Controller
Trademark	N/A
Model No.	GS-ONE-TS
FCC ID.....	2BP4Q-GS-ONE-TS
Hardware Version.....	V1.3
Software Version	T05
Operating Temperature	-40°C ~ 70°C
Power Supply	DC 7.4 V, 3 A 22.2 W from internal rechargeable battery which can be charged by AC/DC adapter.
Manufacturer	Aerora North America, Inc.
Manufacturer address	2570 N. First St, Suite 200 San Jose, CA 95131
Factory.....	ROTOTEK VIETNAM CO., LTD
Factory address.....	House S4_2nd floor, Hap Linh Industrial Park, Bac Ninh City, Vietnam
Wireless specification	WCDMA
Support Band(s)	Band II / Band IV / Band V
Uplink Frequency	Band II: 1852.4-1907.6 MHz Band IV: 1710-1755 MHz Band V: 826.4-846.6 MHz
Downlink Frequency	Band II: 1932.4-1987.6 MHz Band IV: 2110-2155 MHz Band V: 871.4-891.6 MHz
Type of Modulation	QPSK
Antenna Type	FPC
Antenna Gain	689MHz ~ 4.0GHz: 2 dBi

Remark:

As above information is provided and confirmed by the applicant. DEKRA is not liable to the accuracy, suitability, reliability or/and integrity of the information.

2 DESCRIPTION OF TEST SETUP

Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Wideband Radio Communication Tester	CMW 500	R&S	230Vac
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
software	Type / Version	Manufacturer	Supplied by
CMW 500	N/A	N/A	N/A

Accessories Information	Cable		
	Length used during test [m]	Attached during test	Shielded
N/A	1	☒	☐
N/A	8	☒	☐

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 2	2024	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
FCC CFR Title 47 Part 22	2024	Public Mobile Services
FCC CFR Title 47 Part 24	2024	Personal Communications Services
FCC CFR Title 47 Part 27	2024	Miscellaneous Wireless Communications Services
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
KDB971168 D01 v03r01	2018	Measurement Guidance for Certification of Licensed Digital Transmitters
KDB971168 D02 v02r01	2023	Miscellaneous and Basic Review and Approval Items for Transmitting Equipment Used in Licensed Radio Services

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

(Please define the deviations from the standard(s) if applicable)

3.3 Overview of results

WCDMA V

Test Item	FCC Rule No.	Requirements	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	ERP ≤ 7 W	PASS
Peak-Average Ratio	§22.913(d)	Limit ≤ 13 dB	See Remark
Modulation Characteristics	§2.1047	Digital modulation	See Remark
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	See Remark
Band Edges Compliance	§2.1051, §22.917(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	See Remark
Spurious Emission at Antenna Terminals	§2.1051, §22.917(a)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	See Remark
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	PASS
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §22.355	$\leq \pm 2.5$ ppm.	See Remark

Remark:

Only the Effective (Isotropic) Radiated Power Output Data and Radiated Spurious Emission were fully tested.

These items please refer to the LTE Module 2061278R-E3042110011.

The FCC ID is N7ENM74B has been certified, and the test report issued by DEKRA Testing and Certification Co., Ltd. on 11/19/2020.

WCDMA II:

Test Item	FCC Rule No.	Requirements	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232(c)	$EIRP \leq 2\text{ W}$	PASS
Peak-Average Ratio	§24.232(d)	Limit $\leq 13\text{ dB}$	See Remark
Modulation Characteristics	§2.1047	Digital modulation	See Remark
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	See Remark
Band Edges Compliance	§2.1051, §24.238(a)	$\leq -13\text{ dBm}/1\% \cdot \text{EBW}$, in 1 MHz bands immediately outside and adjacent to the frequency block.	See Remark
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	$\leq -13\text{ dBm}/1\text{ MHz}$, from 9 kHz to 10^{th} harmonics but outside authorized operating frequency ranges.	See Remark
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	$\leq -13\text{ dBm}/1\text{ MHz}$.	PASS
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §24.235	Within authorized bands of operation/frequency block.	See Remark

Remark:

Only the Effective (Isotropic) Radiated Power Output Data and Radiated Spurious Emission were fully tested. These items please refer to the LTE Module 2061278R-E3042110011.

The FCC ID is N7ENM74B has been certified, and the test report issued by DEKRA Testing and Certification Co., Ltd. on 11/19/2020.

LTE band IV:

Test Item	FCC Rule No.	Requirements	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	$EIRP \leq 1\text{ W}$	PASS
Peak-Average Ratio	§27.50(d)(5)	Limit $\leq 13\text{ dB}$	See Remark
Modulation Characteristics	§2.1047	Digital modulation	See Remark
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	See Remark
Band Edges Compliance	§2.1051, §27.53(h)	$\leq -13\text{ dBm}/1\% \cdot \text{EBW}$, in 1 MHz bands immediately outside and adjacent to the frequency block.	See Remark
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	$\leq -13\text{ dBm}/1\text{ MHz}$, from 9 kHz to 10^{th} harmonics but outside authorized operating frequency ranges.	See Remark
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	$\leq -13\text{ dBm}/1\text{ MHz}$.	PASS
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(1) §27.54	Within authorized bands of operation/frequency block.	See Remark

Remark:

Only the Effective (Isotropic) Radiated Power Output Data and Radiated Spurious Emission were fully tested. These items please refer to the LTE Module 2061278R-E3042110011.

The FCC ID is N7ENM74B has been certified, and the test report issued by DEKRA Testing and Certification Co., Ltd. on 11/19/2020.

3.4 Worst-case configuration and mode

The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case scenario from all possible combinations among available modulations, data rates and antenna ports, the worst case configurations listed below for the final test.
3. The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.
4. Regards to the frequency band operation: the lowest, middle and highest frequency channel were selected to perform the test, then shown on this report.
5. For portable device, radiated tests was verified over X, Y, Z axis, and shown the worst case on this report.

3.5 Test Facility

USA : FCC Designation Number: CN1199

4 TEST RESULTS

4.1 Effective (Isotropic) Radiated Power Output

VERDICT: PASS

4.1.1 Limit

Standard: 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)

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.

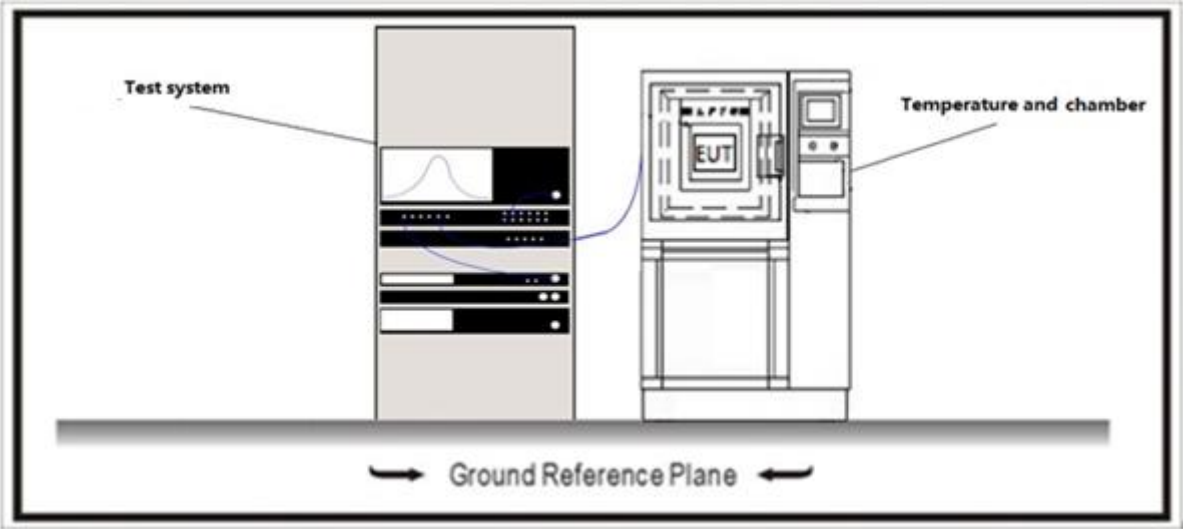
FCC section 27.50(d) (4), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum 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 90.542(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.

4.1.2 Test Setup



4.1.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.26-2015	5.2	RF output power measurement procedures
The conducted RF Output Power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester R&S CMW500, selecting maximum transmission power of the EUT and different modes of modulation. Peak to average ratio(PAPR) is used equation $PAPR(dB)=PPK(dBm)-PAVG(dBm)$, where PPK is measured peak power, and PAVG is measured average power. The maximum equivalent isotropically radiated power(e.i.r.p.) is calculated by adding the declared maximum antenna gain(dBi). The maximum effective radiated power e.r.p. is calculated form the maximum equivalent isotropically radiated power(e.i.r.p.) by subtracting 2.15 dB: $E.R.P = E.I.R.P. - 2.15\text{ dB}$			

4.2 Peak-to-Average Ratio(CCDF)

VERDICT: PASS

4.2.1 Limit

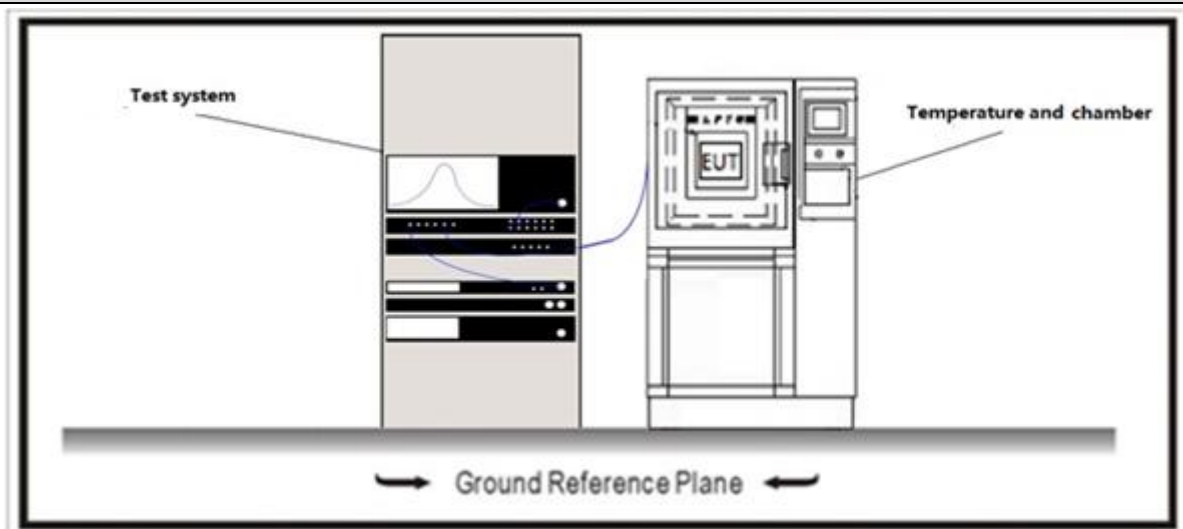
Standard: FCC § 2.1046 & 24.232(d) & 27.50(d)

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

According to FCC section 24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with 24.232 (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of § 24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

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

4.2.2 Test Setup



4.2.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.26-2015	5.2	RF output power measurement procedures

The conducted RF Output Power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester R&S CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

Peak to average ratio(PAPR) is used equation $PAPR(dB) = PPK(dBm) - PAVG(dBm)$, where PPK is measured peak power, and PAVG is measured average power.

The maximum equivalent isotropically radiated power(e.i.r.p.) is calculated by adding the declared maximum antenna gain(dBi).

The maximum effective radiated power e.r.p. is calculated form the maximum equivalent isotropically radiated power(e.i.r.p.) by subtracting 2.15 dB: $E.R.P = E.I.R.P. - 2.15 \text{ dB}$

4.3 Frequency Stability**VERDICT: PASS****4.3.1 Limit****Standard:** FCC § 2.1055 & 22.355 & 24.235 & 27.54 & 90.213

FCC § 2.1055

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

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

(2) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10°C through the range.

The frequency stability shall be measured with variation of primary supply voltage as follows:

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

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

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

FCC § 22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

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

Frequency range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC § 24.235

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

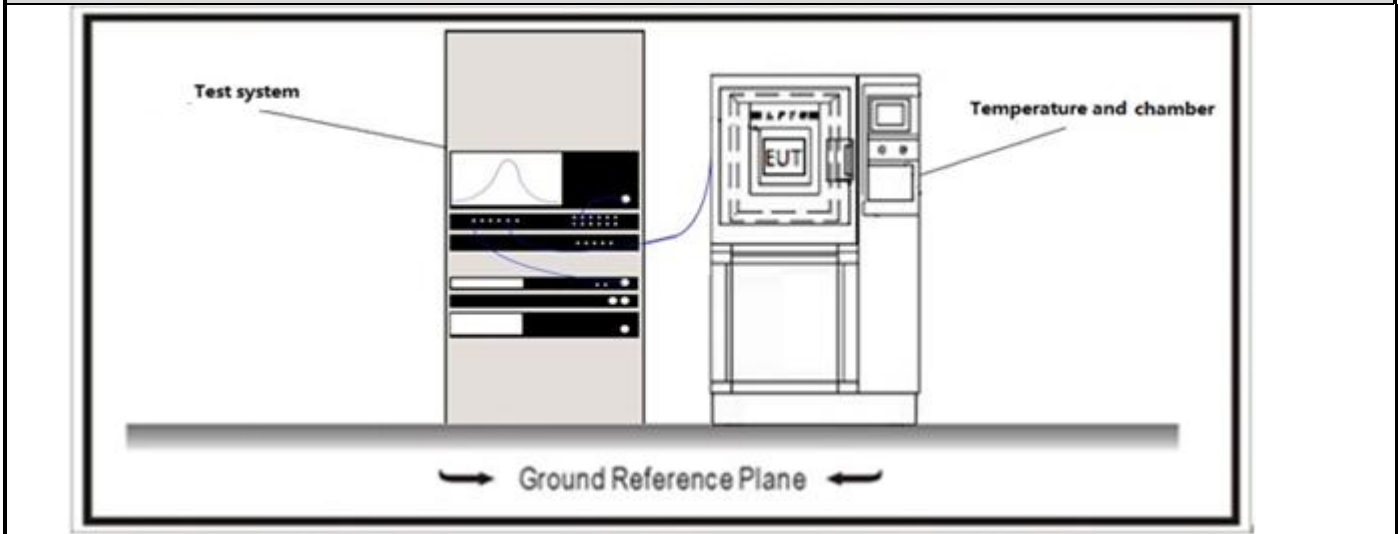
FCC §27.54

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

FCC § 90.213

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

4.3.2 Test Setup



4.3.3 Test Procedure

	References Rule	Chapter	Description
☒	ANSI C63.26	5.6	Frequency stability testing

The frequency tolerance measurements over temperature variations were made over temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a environmental temperature chamber and the temperature was lowered hourly in 10°C steps from $+50^{\circ}\text{C}$ to -30°C .

The supply voltage was varied between 85% and 115% of nominal voltage.

The EUT was set in "Radio Resource Control (RRC) mode" in the middle channel using the Universal Radio Communication tester CMW 500 / Anritsu MT8000 / Anritsu MT8821 and the maximum frequency error was measured using the built-in calibrated frequency meter. The worst case NB-IoT mode for conducted power was used for the test.

In order to check that the frequency stability is sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point is established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation are identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods is added or subtracted from the values of f_L and f_H to check that the resulting frequencies remain within the band.

The reference point measurements were made at the RF output terminals of the EUT using directional coupler and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester CMW 500 / Anritsu MT8000 / Anritsu MT8821 selecting maximum transmission power of the EUT and different modes of modulation.

4.4 Occupied Bandwidth

VERDICT: PASS

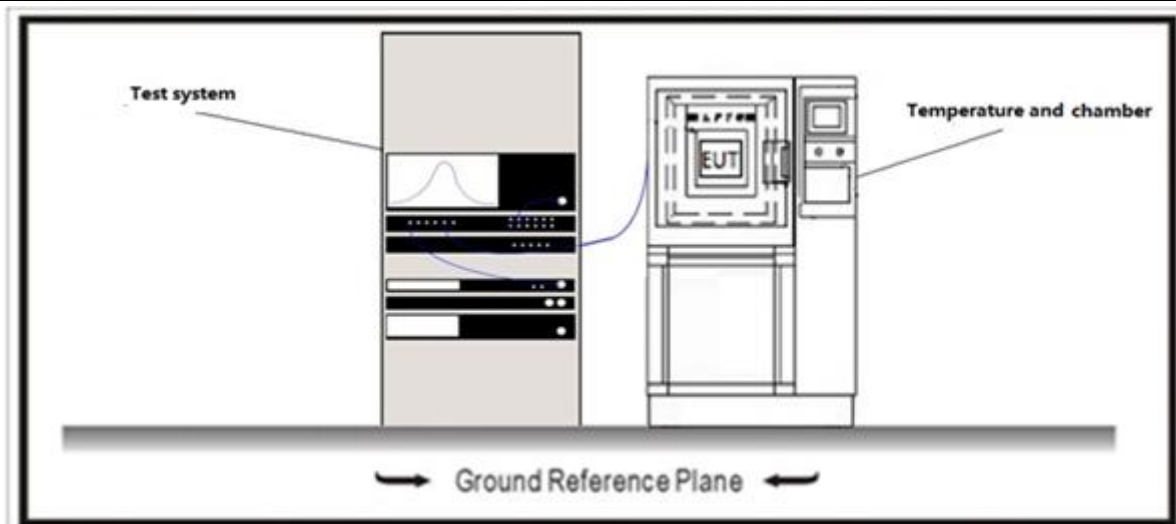
4.4.1 Limit

Standard: FCC § 2.1049

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Many of the individual rule parts specify a relative OBW in lieu of the 99% OBW. In such cases, the OBW is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

4.4.2 Test Setup



4.4.3 Test Procedure

References Rule		Chapter	Description
☒	ANSI C63.26	5.4	Occupied bandwidth

The occupied bandwidth measurement was performed at the output terminals of the EUT using directional coupler and spectrum analyser. The EUT was controller via the Universal Radio Communication tester CMW 500 / Anritsu MT8000 / Anritsu MT8821 selecting maximum transmission power of the EUT and different modes of modulation. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyser.

4.5 Spurious Emissions at antenna terminals**VERDICT: PASS****4.5.1 Limit**

Standard: FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n) & 90.691 & 90.543 & 96.41(e)

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)

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

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

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

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

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

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

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(f)

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

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of

operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1) & 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(l) (2)

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

FCC §27.53(m) (4) & RSS-199 §4.5

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

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

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

FCC §27.53(n) (2)

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

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 $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ 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 $43 + 10 \log_{10}(P)$ 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.

(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

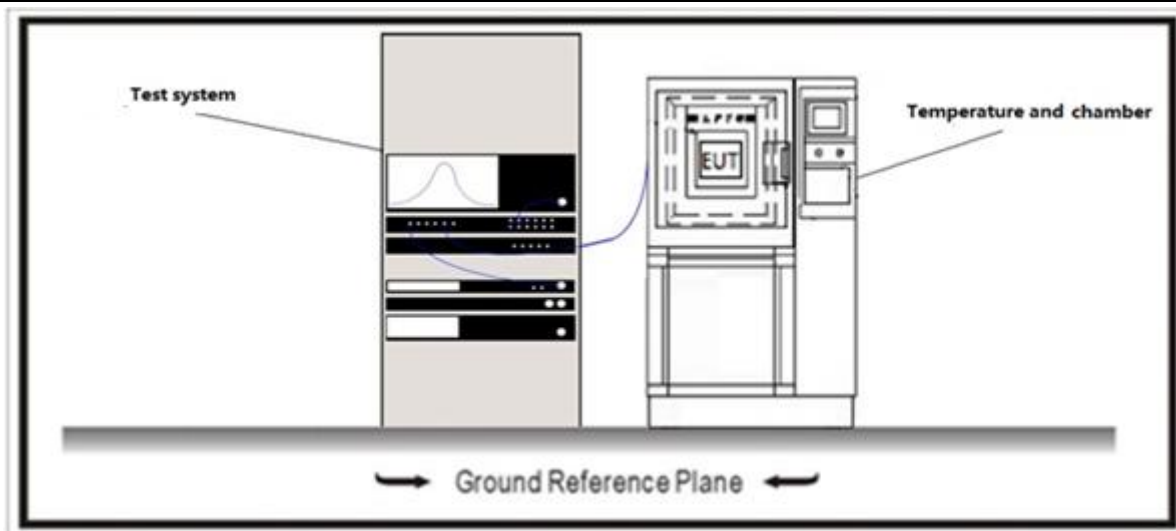
authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC §96.41(e)

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz. The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, 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 emission are attenuated at least 26 dB below the transmitter power.

4.5.2 Test Setup



4.5.3 Test Procedure

References Rule	Chapter	Description
☒ ANSI C63.26	5.7	Unwanted (out-of-band and spurious) conducted emissions measurement procedures (conducted test at antenna port)

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester CMW 500 / Anritsu MT8000 / Anritsu MT8821 (selecting maximum transmission power of the EUT and different modes of modulation) using directional coupler.

The spectrum was investigated from 9 kHz to the 10th harmonic of the highest frequency generated within the equipment.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $X + 10 \log (P)$ dB. P in watts. The specification can be interpreted as an absolute limit when the specified

attenuation is actually subtracted from the maximum permissible transmitter power [i.e., $10 \log P - \{X + 10 \log P\}$], resulting in an absolute level of -X dBW [or $(-X + 30)$ dBm].

The configuration of tones and modulation which is the worst case for conducted power was used.

4.6 Spurious Emissions at antenna terminals at Block Edges**VERDICT: PASS****4.6.1 Limit**

Standard: FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n) & 90.691 & 90.543 & 96.41(e)

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

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC § 22.917(a) & 24.238(a)

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

FCC § 27.53(a) (4)

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

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

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

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

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

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

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180- 2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.

FCC §27.53(l) (2)

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

FCC §27.53(m) (4)

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

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

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

FCC §27.53(n) (2)

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

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 $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ 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 $43 + 10 \log_{10}(P)$ 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.

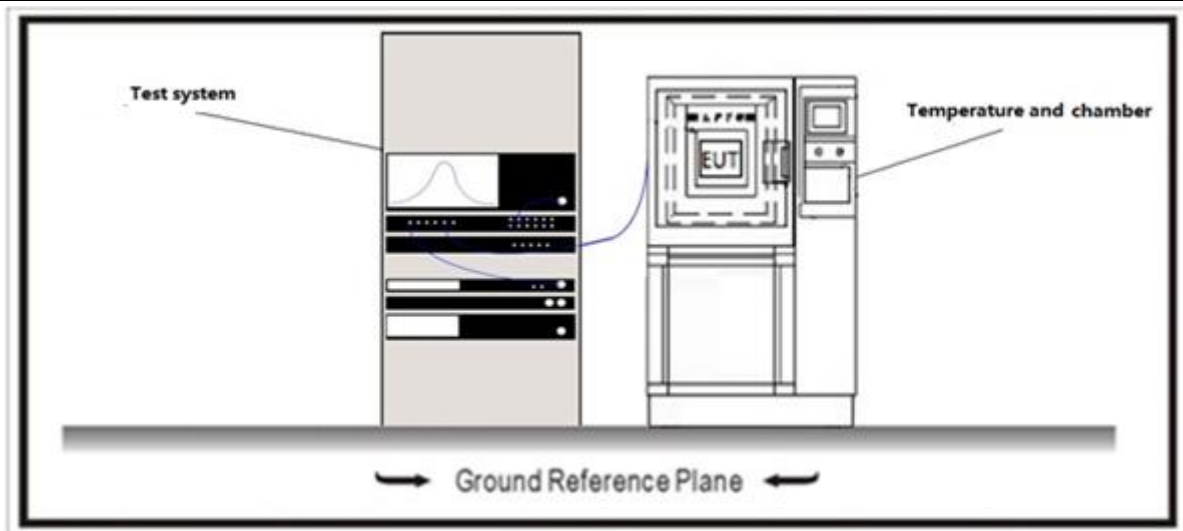
FCC §96.41(e)

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz. The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, 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 emission are attenuated at least 26 dB below the transmitter power.

4.6.2 Test Setup



4.6.3 Test Procedure

	References Rule	Chapter	Description
☒	ANSI C63.26	5.7	Unwanted (out-of-band and spurious) conducted emissions measurement procedures (conducted test at antenna port)

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester CMW 500 / Anritsu MT8000 / Anritsu MT8821 (selecting maximum transmission power of the EUT and different modes of modulation) using directional coupler.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For NB IoT Band 5/26: For §22, in the 1 MHz bands immediately outside and adjacent to the frequency block or band, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. For §90, use RBW = 300 Hz for offsets less than 37.5 kHz from a channel edge; RBW = 100 kHz for offsets greater than 37.5 kHz is allowed.

For NB IoT Band 2/25: 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.

For NB IoT Band 12/17/71/85: 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.

For NB IoT Band 13: On any frequency outside the 746-758 MHz band and 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed; on all frequencies between 763-775 MHz and 793-805 MHz, any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

For NB-IoT Band 4/66: In the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $X + 10 \log (P)$ dB. P in watts. The specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., $10 \log P - \{X + 10 \log P\}$], resulting in an absolute level of -X dBW [or $(-X + 30)$ dBm].

4.7 Radiated Emissions**VERDICT: PASS****4.7.1 Limit**

Standard: FCC § 2.1053 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n) & 90.691 & 90.543 & 96.41(e)

FCC § 22.917(a) & 24.238(a)

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

FCC § 27.53(a) (4)

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

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

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

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

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

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

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment. FCC § 27.53(f)

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

FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

FCC § 27.53(l) (2)

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

FCC §27.53(m) (4)

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

- 40+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 than 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

FCC §27.53(n) (2)

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

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.

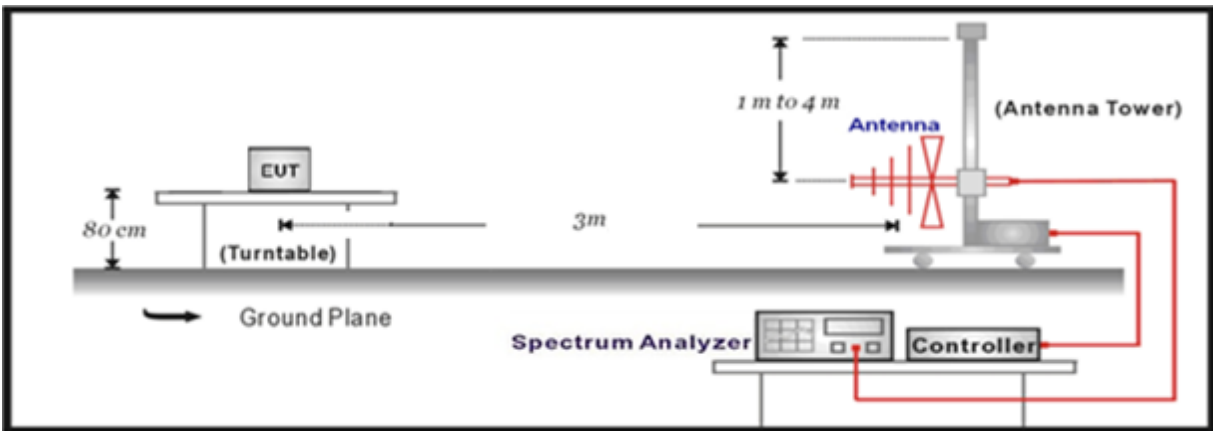
FCC §96.41(e)

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz. The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed - 40 dBm/MHz.

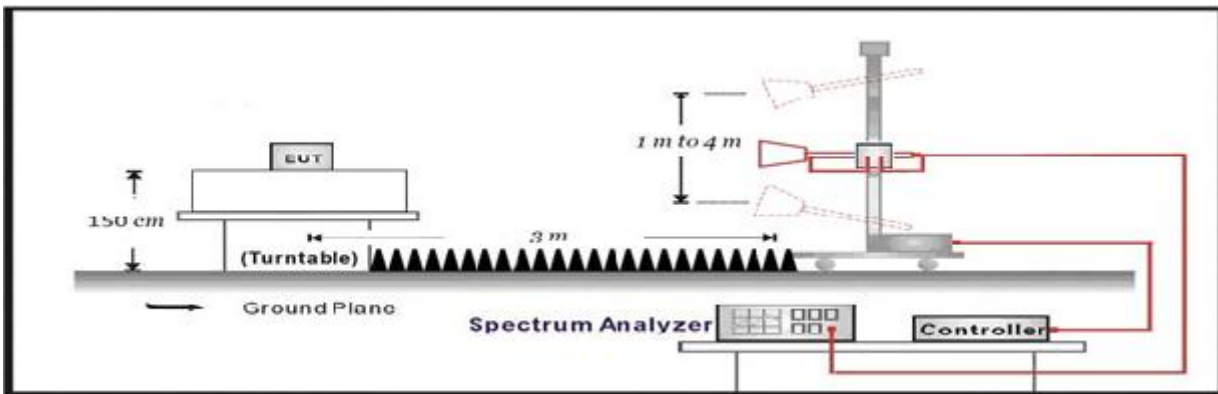
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency 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 emission are attenuated at least 26 dB below the transmitter power.

4.7.2 Test Setup

30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



4.7.3 Test Procedure

	Reference Rule	Chapter	Description
☒	ANSI C63.26	5.5	Radiated emissions testing

The spectrum was scanned from 9 kHz to the 10th harmonic of the highest frequency generated within the equipment.

Emissions below 18 GHz were measured at a 3 meter test distance.

The EUT was tested in three orthogonal axes and in all possible test configurations and poisoning when measurement antenna is oriented in both horizontal and vertical polarization, the worst case emissions was showed in the report.

Radiated emissions were used the substitution method described in ANSI/TIA-603-E-2016.

Radiated emissions were measured with 100kHz RBW below 1GHz and 1MHz RBW above 1GHz.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $X + 10 \log (P)$ dB. P in watts. The specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., $10 \log P - \{X + 10 \log P\}$], resulting in an absolute level of -X dBW [or $(-X + 30)$ dBm].

4.8 Test setup photo and EUT Photo	VERDICT: PASS
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Remark: The test setup photo and EUT Photo please see appendix.

5 TEST RESULT

Appendix A: Effective (Isotropic) Radiated Power Output

Band WCDMA II		Power (dBm)			EIRP (dBm)			EIRP (W)			Antenna Gain	Limit	Verdict
TX Channel		9262	9400	9538	9262	9400	9538	9262	9400	9538			
Frequency (MHz)		1852.4	1880	1907.6	1852.4	1880	1907.6	1852.4	1880	1907.6			
3GPP Rel 99	RMC 12.2Kbps	22.77	22.96	22.75	24.77	24.96	24.75	0.30	0.31	0.30	2.00	2 W	PASS
3GPP Rel 6	HSDPA Subtest-1	21.88	22.01	22.14	23.88	24.01	24.14	0.24	0.25	0.26	2.00		
3GPP Rel 6	HSDPA Subtest-2	21.80	22.14	21.72	23.80	24.14	23.72	0.24	0.26	0.24	2.00		
3GPP Rel 6	HSDPA Subtest-3	21.43	21.44	21.27	23.43	23.44	23.27	0.22	0.22	0.21	2.00		
3GPP Rel 6	HSDPA Subtest-4	21.29	21.71	21.49	23.29	23.71	23.49	0.21	0.23	0.22	2.00		
3GPP Rel 6	HSUPA Subtest-1	21.56	21.61	21.63	23.56	23.61	23.63	0.23	0.23	0.23	2.00		
3GPP Rel 6	HSUPA Subtest-2	20.30	20.57	20.33	22.30	22.57	22.33	0.17	0.18	0.17	2.00		
3GPP Rel 6	HSUPA Subtest-3	20.93	21.07	20.98	22.93	23.07	22.98	0.20	0.20	0.20	2.00		
3GPP Rel 6	HSUPA Subtest-4	20.35	20.79	20.62	22.35	22.79	22.62	0.17	0.19	0.18	2.00		
3GPP Rel 6	HSUPA Subtest-5	20.88	20.93	21.12	22.88	22.93	23.12	0.19	0.20	0.21	2.00		

Band WCDMA IV		Power (dBm)			EIRP (dBm)			EIRP (W)			Antenna Gain	Limit	Verdict
TX Channel		1312	1413	1513	1312	1413	1513	1312	1413	1513			
Frequency (MHz)		1712.4	1732.6	1752.6	1712.4	1732.6	1752.6	1712.4	1732.6	1752.6			
3GPP Rel 99	RMC 12.2Kbps	22.74	22.99	22.60	24.74	24.99	24.60	0.30	0.32	0.29	2.00	2 W	PASS
3GPP Rel 6	HSDPA Subtest-1	21.79	21.93	22.11	23.79	23.93	24.11	0.24	0.25	0.26	2.00		
3GPP Rel 6	HSDPA Subtest-2	21.77	22.05	21.58	23.77	24.05	23.58	0.24	0.25	0.23	2.00		
3GPP Rel 6	HSDPA Subtest-3	21.33	21.37	21.08	23.33	23.37	23.08	0.22	0.22	0.20	2.00		
3GPP Rel 6	HSDPA Subtest-4	21.10	21.86	21.45	23.10	23.86	23.45	0.20	0.24	0.22	2.00		
3GPP Rel 6	HSUPA Subtest-1	21.75	21.41	21.55	23.75	23.41	23.55	0.24	0.22	0.23	2.00		
3GPP Rel 6	HSUPA Subtest-2	20.37	20.48	20.45	22.37	22.48	22.45	0.17	0.18	0.18	2.00		
3GPP Rel 6	HSUPA Subtest-3	20.75	20.97	20.87	22.75	22.97	22.87	0.19	0.20	0.19	2.00		
3GPP Rel 6	HSUPA Subtest-4	20.34	21.01	20.57	22.34	23.01	22.57	0.17	0.20	0.18	2.00		
3GPP Rel 6	HSUPA Subtest-5	20.83	20.98	21.07	22.83	22.98	23.07	0.19	0.20	0.20	2.00		

Band WCDMA V		Power (dBm)			ERP (dBm)			ERP (W)			Antenna Gain	Limit	Verdict
TX Channel		4132	4182	4233	4132	4182	4233	4132	4182	4233			
Frequency (MHz)		826.4	836.4	846.6	826.4	836.4	846.6	826.4	836.4	846.6			
3GPP Rel 99	RMC 12.2Kbps	23.02	23.17	22.89	22.87	23.02	22.74	0.19	0.20	0.19	2.00	7 W	PASS
3GPP Rel 6	HSDPA Subtest-1	22.30	22.19	22.16	22.15	22.04	22.01	0.16	0.16	0.16	2.00		
3GPP Rel 6	HSDPA Subtest-2	22.11	22.27	22.14	21.96	22.12	21.99	0.16	0.16	0.16	2.00		
3GPP Rel 6	HSDPA Subtest-3	21.47	21.85	21.36	21.32	21.70	21.21	0.14	0.15	0.13	2.00		
3GPP Rel 6	HSDPA Subtest-4	21.68	22.14	21.71	21.53	21.99	21.56	0.14	0.16	0.14	2.00		
3GPP Rel 6	HSUPA Subtest-1	21.81	21.97	21.83	21.66	21.82	21.68	0.15	0.15	0.15	2.00		
3GPP Rel 6	HSUPA Subtest-2	20.53	20.96	20.51	20.38	20.81	20.36	0.11	0.12	0.11	2.00		
3GPP Rel 6	HSUPA Subtest-3	21.27	21.48	21.28	21.12	21.33	21.13	0.13	0.14	0.13	2.00		
3GPP Rel 6	HSUPA Subtest-4	20.71	21.21	20.62	20.56	21.06	20.47	0.11	0.13	0.11	2.00		
3GPP Rel 6	HSUPA Subtest-5	21.12	21.00	21.31	20.97	20.85	21.16	0.13	0.12	0.13	2.00		

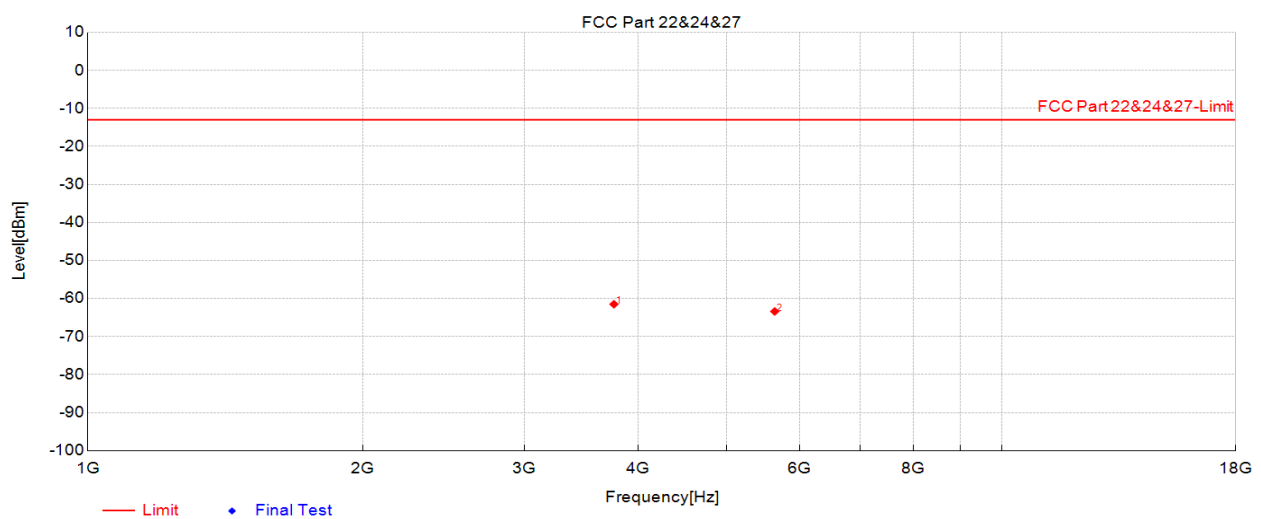
Appendix B: Radiated Emissions

Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band2 Traffic 1880MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	3762	-60.80	-61.51	-0.7	-13.0	48.5	Horizon	RMS	PASS
2	5640.0000	-69.43	-63.40	6.0	-13.0	50.4	Horizon	RMS	PASS

Note:(1)Level=Reading+Factor

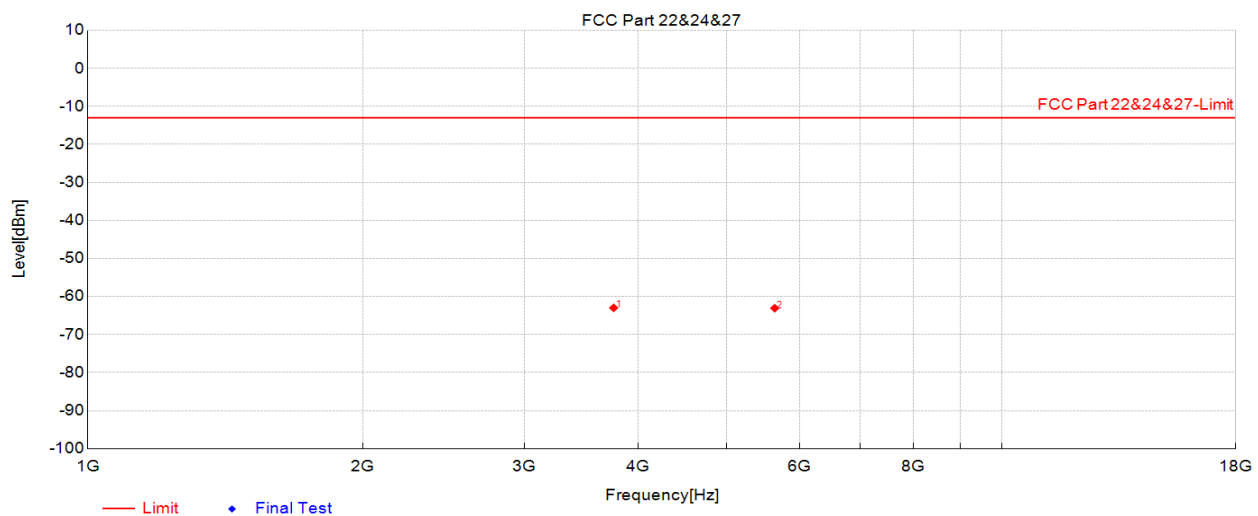
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Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band2 Traffic 1880MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	3759	-62.19	-62.98	-0.8	-13.0	50.0	Vertical	RMS	PASS
2	5640.0000	-68.91	-63.08	5.8	-13.0	50.1	Vertical	RMS	PASS

Note:(1)Level=Reading+Factor

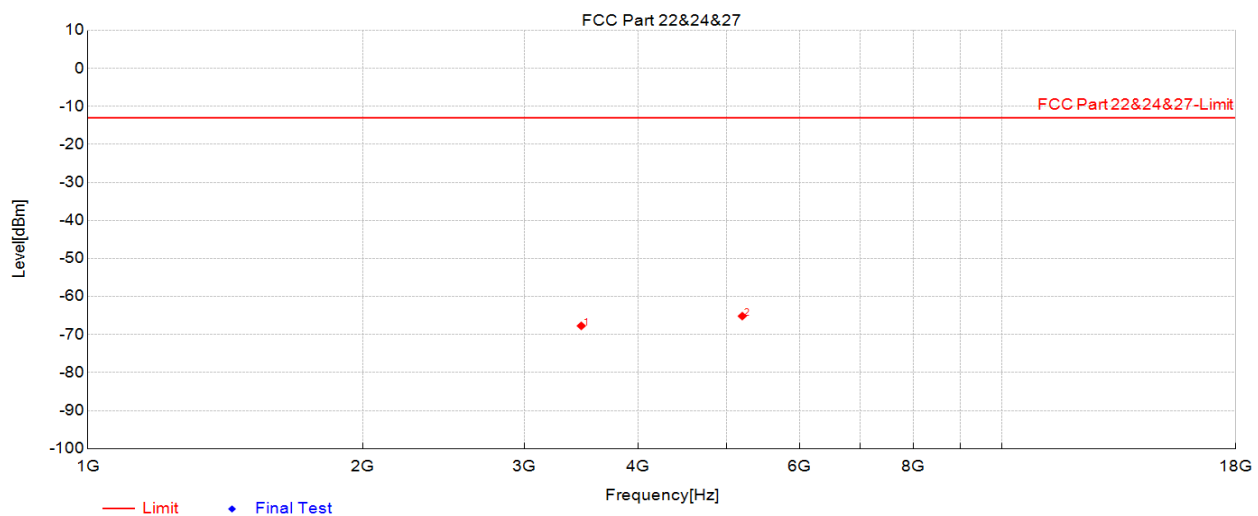
(2)Margin=Limit-Level

Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band4 Traffic 1732.6MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	3465.2000	-64.95	-67.72	-2.8	-13.0	54.7	Horizon	RMS	PASS
2	5197.8000	-68.88	-65.15	3.7	-13.0	52.2	Horizon	RMS	PASS

Note:(1)Level=Reading+Factor

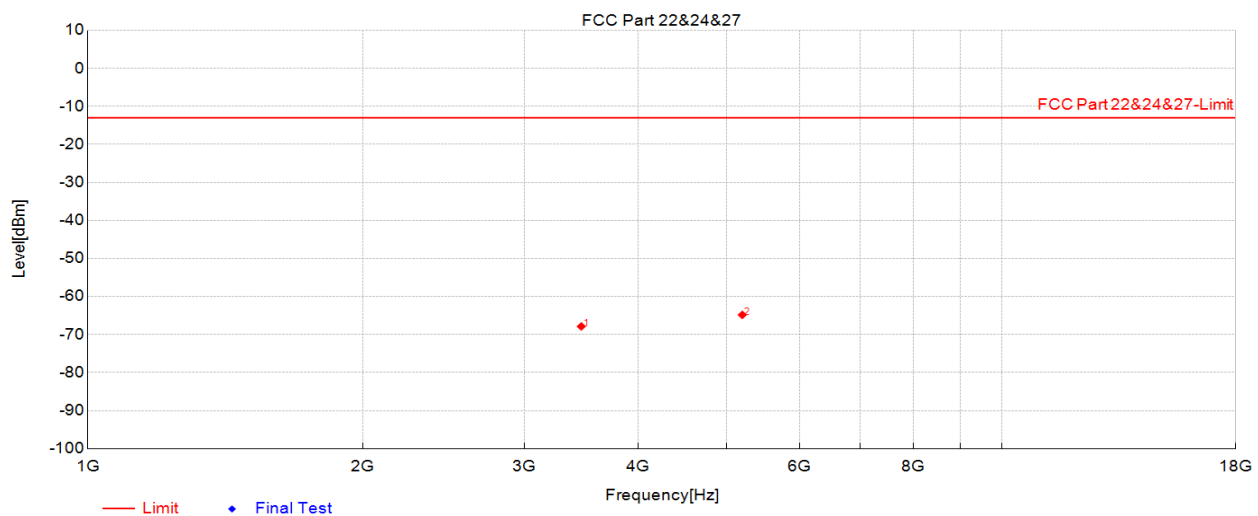
(2)Margin=Limit-Level

Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band4 Traffic 1732.6MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	3465.2000	-64.79	-67.86	-3.1	-13.0	54.9	Vertical	RMS	PASS
2	5197.8000	-69.00	-64.83	4.2	-13.0	51.8	Vertical	RMS	PASS

Note:(1)Level=Reading+Factor

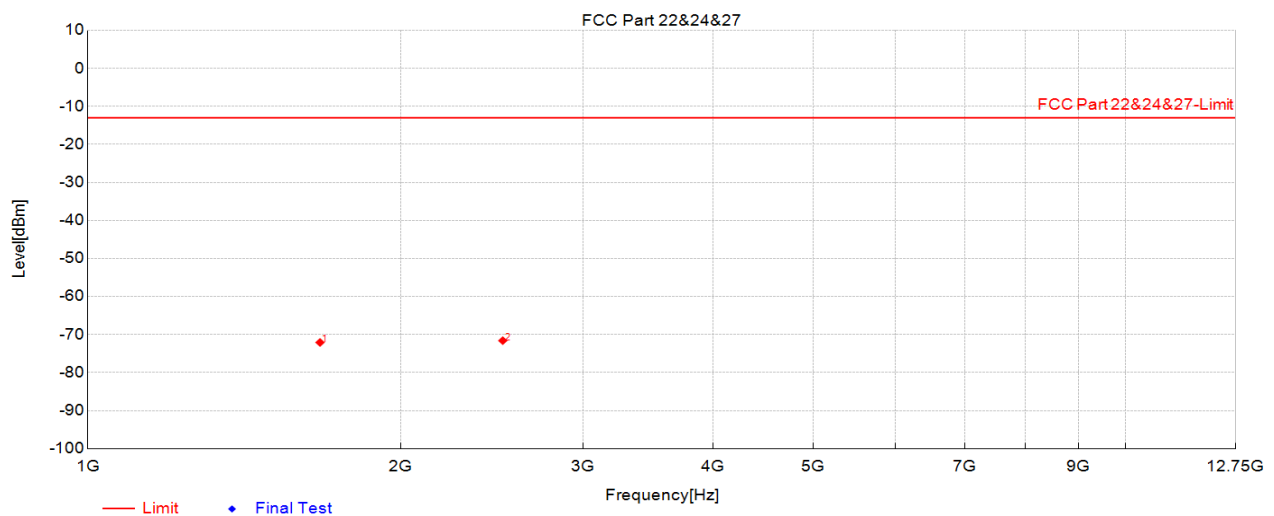
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Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band5 Traffic 836.6MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	1673.2000	-62.28	-72.08	-9.8	-13.0	59.1	Horizon	RMS	PASS
2	2509.8000	-64.60	-71.60	-7.0	-13.0	58.6	Horizon	RMS	PASS

Note:(1)Level=Reading+Factor

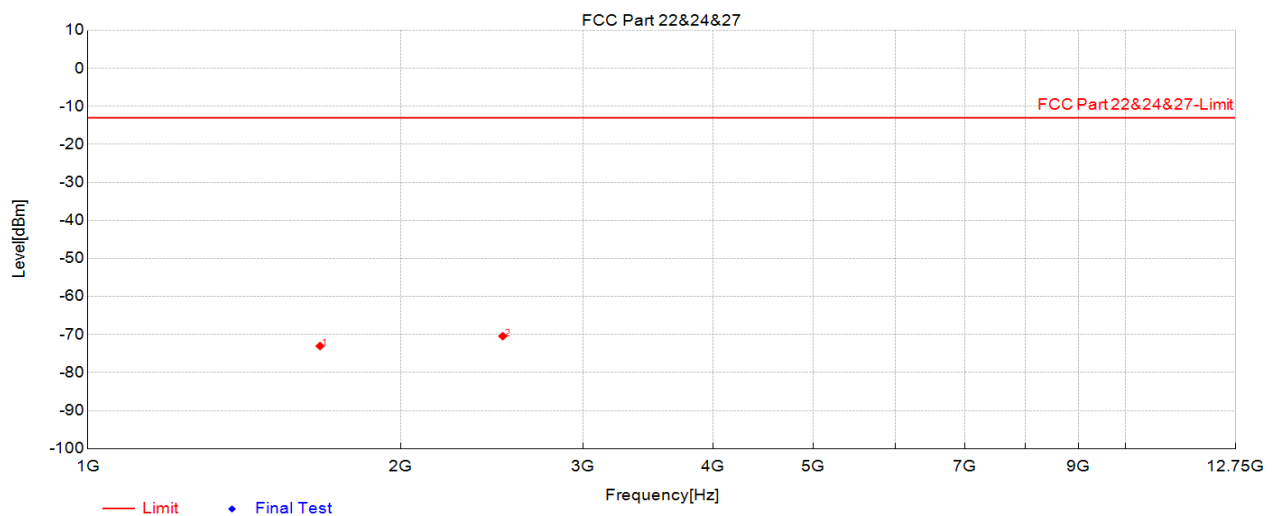
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Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band5 Traffic 836.6MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	1673.2000	-63.04	-73.02	-10.0	-13.0	60.0	Vertical	RMS	PASS
2	2509.8000	-63.98	-70.43	-6.5	-13.0	57.4	Vertical	RMS	PASS

Note:(1)Level=Reading+Factor

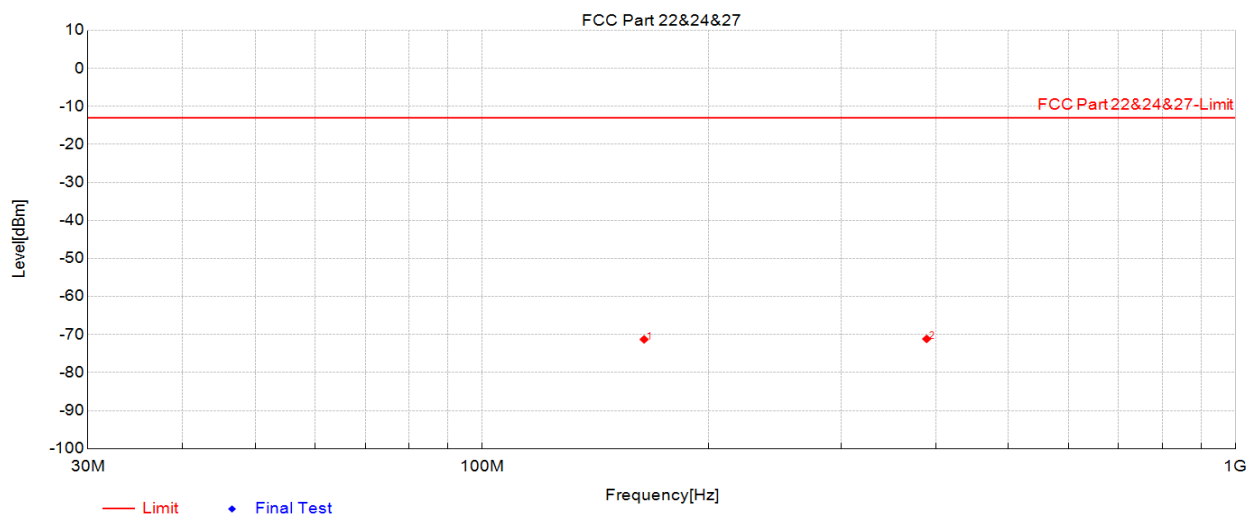
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Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band2 Traffic 1880MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	164.151	-99.01	-71.28	27.7	-13.0	58.3	Horizon	RMS	PASS
2	389.288	-98.38	-71.15	27.2	-13.0	58.2	Horizon	RMS	PASS

Note:(1)Level=Reading+Factor

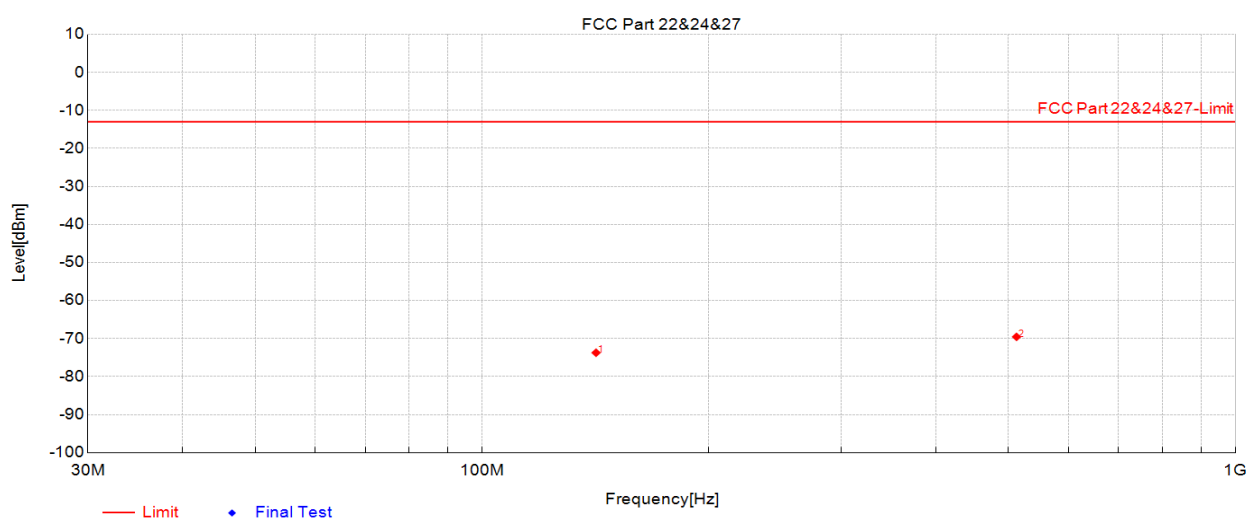
(2)Margin=Limit-Level

Test Report

Project Information

Profile:	2530770R	Site:	AC6
EUT:	Smart Controller	Engineer:	Yu Liu
Voltage:	230 Vac / 50 Hz		
Test Standard:	FCC Part 22&24&27		
Note:	WCDMA band2 Traffic 1880MHz		

Test Graph



Data List

NO.	Frequency [MHz]	Reading [dBm]	Level [dBm]	Factor [dB]	Limit [dBm]	Margin [dB]	Polarity	Detector	Verdict
1	141.744	-99.43	-73.73	25.7	-13.0	60.7	Vertical	RMS	PASS
2	512.284	-98.98	-69.55	29.4	-13.0	56.6	Vertical	RMS	PASS

Note:(1)Level=Reading+Factor

(2)Margin=Limit-Level

Note 1: Spurious emissions level = Signal Generator Reading(dBm) - Cable loss(dB) + substitute antenna gain(dBi).

Note 2: For each band, we tested all configurations and only the worst mode is shown in the report.

The End