



TESTING LABORATORY
CERTIFICATE#4323.01



FCC PART 15.231

TEST REPORT

For

Hexing Electrical Co.,Ltd

1418 moganshan Road, shangcheng Industrial Zone, Hangzhou 310011 China

FCC ID: 2AIUZMJP00

Report Type: Original Report	Product Type: HexNet RF module of smart device
Test Engineer:	Lee Li <i>Lee Li</i>
Report Number:	RSHA200611001-00A
Report Date:	2020-06-24
Reviewed By:	Oscar Ye <i>Oscar Ye</i> RF Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	4
TEST FACILITY	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION	5
EUT EXERCISE SOFTWARE	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	8
TEST EQUIPMENT LIST	9
FCC§15.203 - ANTENNA REQUIREMENT.....	10
APPLICABLE STANDARD	10
ANTENNA CONNECTED CONSTRUCTION	10
FCC §15.207 (A) – AC LINE CONDUCTED EMISSIONS	11
APPLICABLE STANDARD	11
EUT SETUP	11
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE	12
FACTOR & OVER LIMIT CALCULATION.....	12
TEST RESULTS SUMMARY	12
TEST DATA	12
FCC §15.205, §15.209, §15.231 (E) - RADIATED EMISSIONS	15
APPLICABLE STANDARD	15
EUT SETUP	15
EMI TEST RECEIVER SETUP.....	16
TEST PROCEDURE	16
CORRECTED AMPLITUDE & MARGIN CALCULATION	16
TEST RESULTS SUMMARY	17
TEST DATA	17
FCC §15.231(C) - 20DB EMISSION BANDWIDTH TESTING.....	20
APPLICABLE STANDARD	20
TEST PROCEDURE	20
TEST DATA	20
FCC §15.231(E) - DEACTIVATION TESTING	22
APPLICABLE STANDARD	22
EUT SETUP	22
TEST DATA	22

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Hexing Electrical Co.,Ltd
Tested Model	MJP00
Product Type	HexNet RF module of smart device
Power Supply	DC 5 V
RF Function:	SRD
Operating Band/Frequency:	433.36 MHz
Channel Number:	1
Modulation Type:	FSK
Antenna Type:	Rod Antenna
Maximum Antenna Gain:	2.0 dBi

**All measurement and test data in this report was gathered from production sample serial number: 20200611001.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2020-06-11)*

Objective

This test report is prepared on behalf of *Hexing Electrical Co.,Ltd* All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz ~18GHz	5.23dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

Channel List:

Channel	Frequency (MHz)
1	433.36

EUT Exercise Software

RF test software: SecureCRT

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

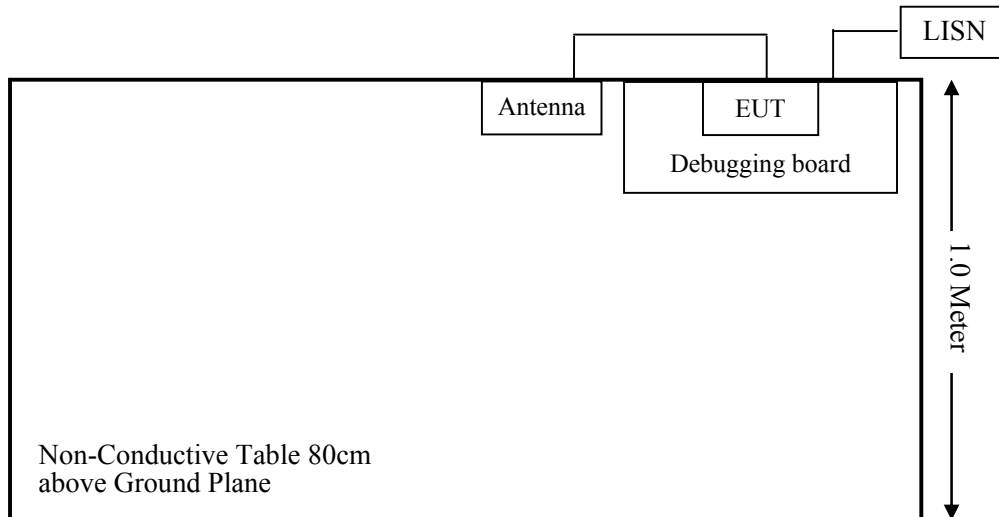
Manufacturer	Description	Model	Serial Number
/	Antenna	/	/

External I/O Cable

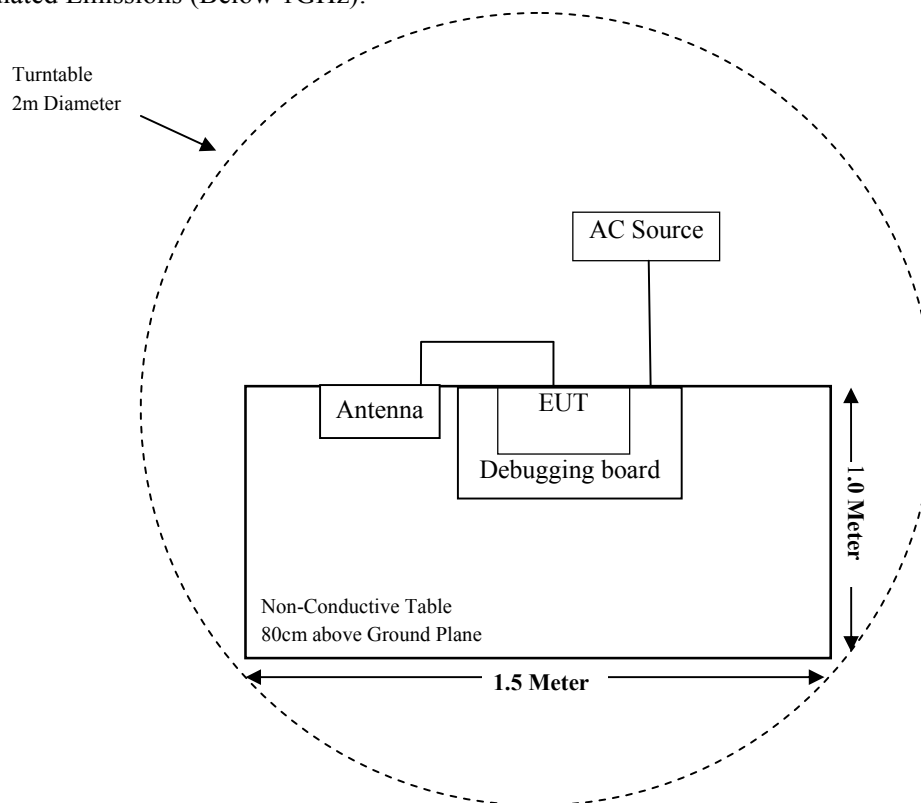
Cable Description	Length (m)	From Port	To
Cable1	1.0	Antenna	EUT
Cable2	1.0	Debugging board	LISN/ AC Source

Block Diagram of Test Setup

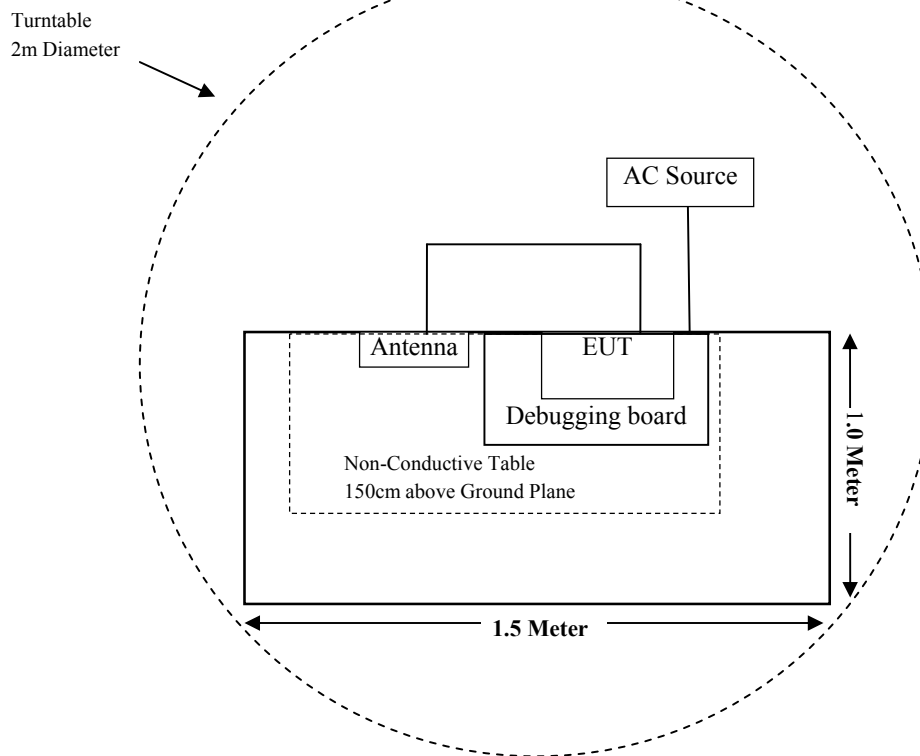
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.231(e)	Radiated Emissions	Compliant
§15.231 (c)	20dB Emission Bandwidth	Compliant
§15.231 (e)	Deactivation	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test(Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-12-14	2020-12-13
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2019-08-05	2020-08-04
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2017-12-26	2020-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Radiated Emission Test(Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2019-11-30	2020-11-29
Rohde & Schwarz	LISN	ENV216	101115	2019-12-14	2020-12-13
Audix	Test Software	e3	V9	/	/
Rohde & Schwarz	Pulse limiter	ESH3-Z2	357.8810.52	2020-01-10	2021-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2019-08-15	2020-08-14

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Antenna Connected Construction

The EUT test with a Rod antenna with an IPEX connector which use a unique type of connector to attach to the EUT and the antenna gain is 2.0 dBi; fulfill the requirement of this section. Please refer to EUT photos.

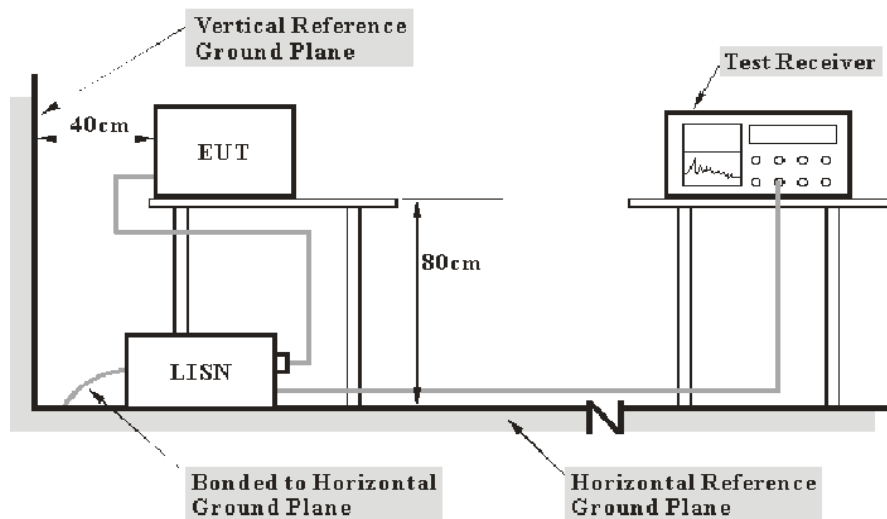
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

ANSI C63.10-2013 clause 6.2

During the conducted emission test, the Debugging board was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over Limit of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)} - \text{Limit (dB}\mu\text{V)}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, FCC Part 15.207.

Test Data

Environmental Conditions

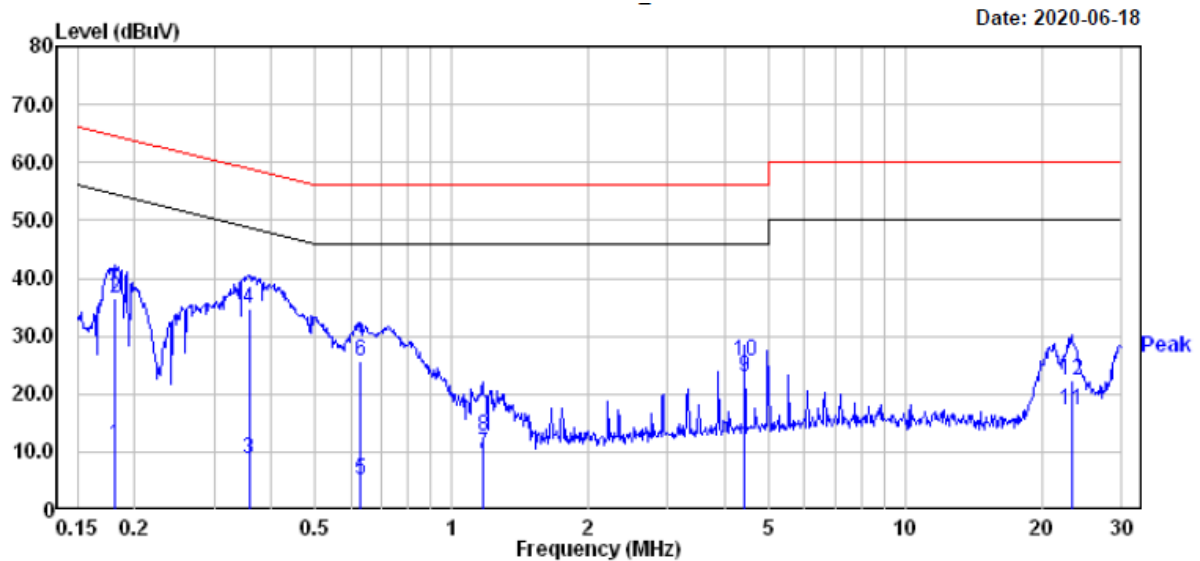
Temperature:	20.2 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Lee Li on 2020-06-18.

Test Result: Compliant.

EUT operation mode: Transmitting

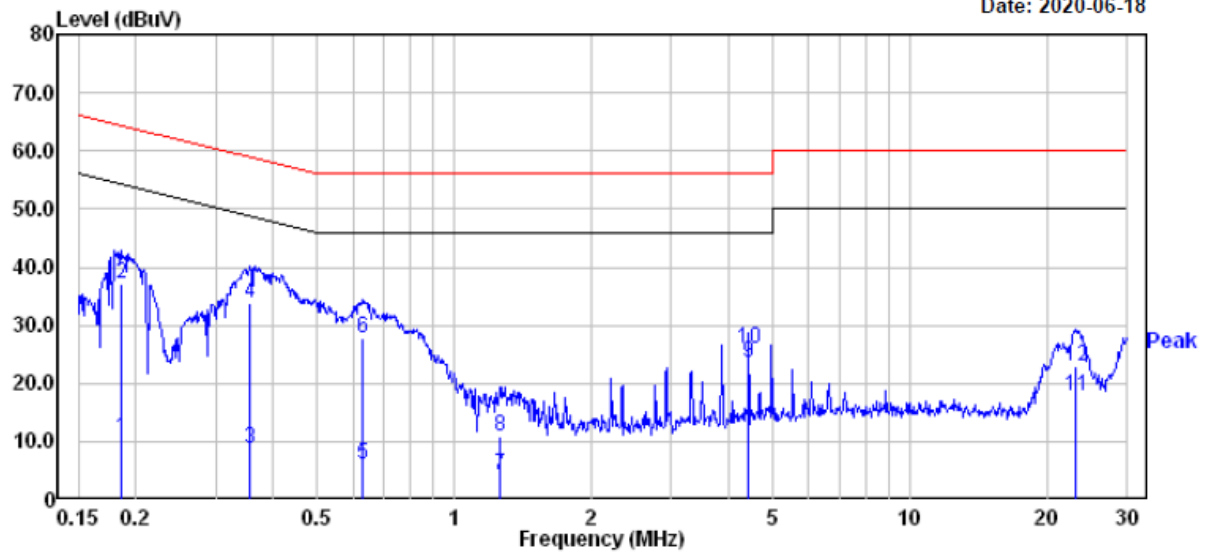
AC 120V/60 Hz, Line



		Read		Limit	Over	
	Freq	Level	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB	dBuV	dBuV	dB
1	0.182	-8.60	19.83	11.23	54.42	-43.19 Average
2	0.182	16.70	19.83	36.53	64.42	-27.89 QP
3	0.358	-10.90	19.80	8.90	48.78	-39.88 Average
4	0.358	14.80	19.80	34.60	58.78	-24.18 QP
5	0.630	-14.60	19.75	5.15	46.00	-40.85 Average
6	0.630	6.00	19.75	25.75	56.00	-30.25 QP
7	1.172	-10.00	19.81	9.81	46.00	-36.19 Average
8	1.172	-7.00	19.81	12.81	56.00	-43.19 QP
9	4.430	3.61	19.47	23.08	46.00	-22.92 Average
10	4.430	6.21	19.47	25.68	56.00	-30.32 QP
11	23.263	-2.70	19.78	17.08	50.00	-32.92 Average
12	23.263	2.60	19.78	22.38	60.00	-37.62 QP

AC 120V/60 Hz, Neutral

Date: 2020-06-18



		Read			Limit	Over	
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.185	-9.19	19.82	10.63	54.24	-43.61	Average
2	0.185	17.21	19.82	37.03	64.24	-27.21	QP
3	0.356	-11.10	19.80	8.70	48.83	-40.13	Average
4	0.356	14.10	19.80	33.90	58.83	-24.93	QP
5	0.627	-13.80	19.75	5.95	46.00	-40.05	Average
6	0.627	8.10	19.75	27.85	56.00	-28.15	QP
7	1.262	-15.50	19.82	4.32	46.00	-41.68	Average
8	1.262	-9.00	19.82	10.82	56.00	-45.18	QP
9	4.430	4.01	19.47	23.48	46.00	-22.52	Average
10	4.430	6.61	19.47	26.08	56.00	-29.92	QP
11	23.140	-2.11	19.79	17.68	50.00	-32.32	Average
12	23.140	3.29	19.79	23.08	60.00	-36.92	QP

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

FCC §15.205, §15.209, §15.231 (e) - RADIATED EMISSIONS**Applicable Standard**

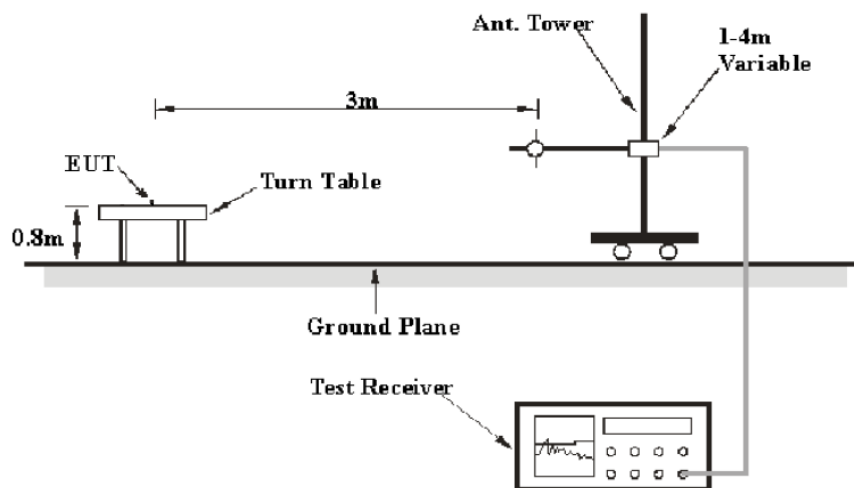
FCC §15.205, §15.209, §15.231 (e)

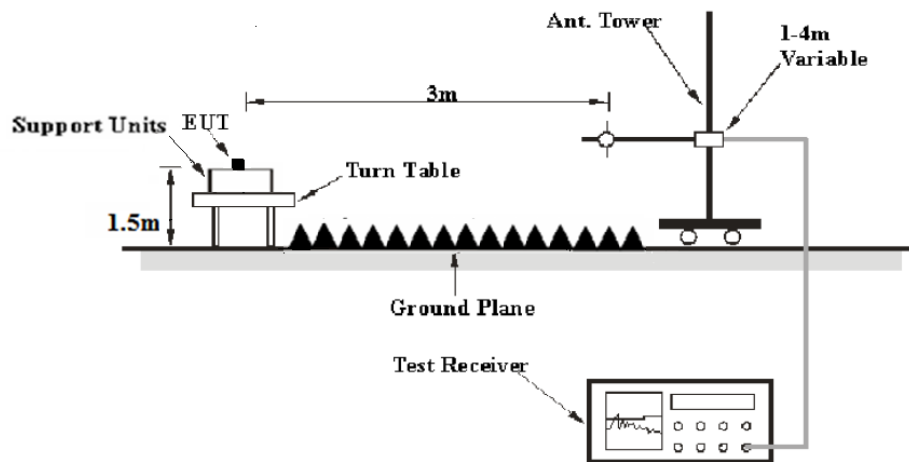
According to §15.231 (e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000 *	150 to 500*
Above 470	5,000	500

*Linear interpolations.

The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

EUT Setup**Below 1GHz:**

Above 1 GHz:

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 4.5 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000MHz	100 kHz	300 kHz	/	QP
1000MHz –4500MHz	1MHz	3MHz	/	PK

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V/m)}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Title 47, FCC §15.205, §15.209, §15.231 (e).

Test Data**Environmental Conditions**

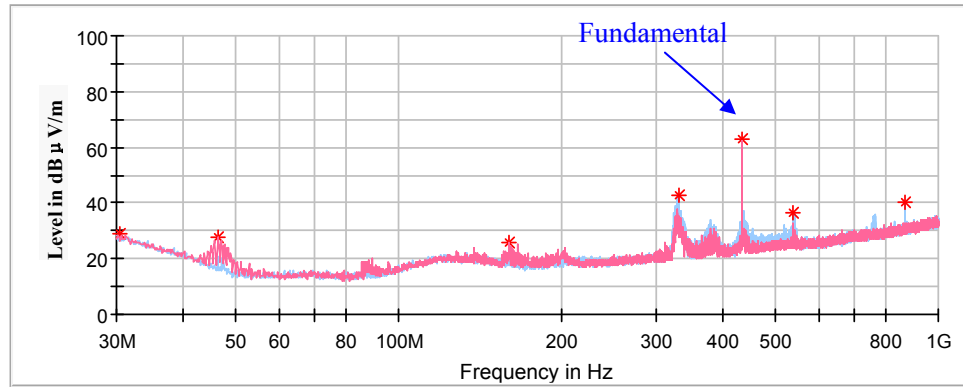
Temperature:	24.5°C
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Lee Li on 2020-06-23.

Test mode: Transmitting

30MHz-1GHz

(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded.)

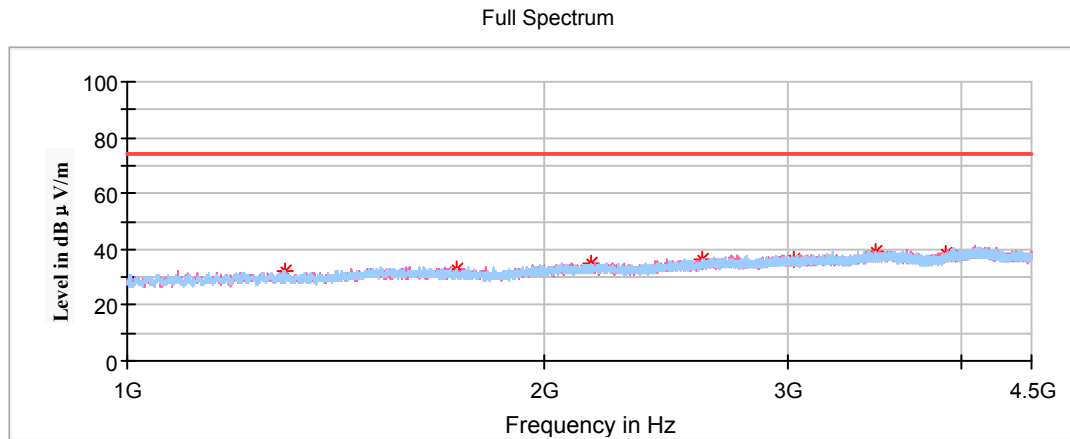


Frequency (MHz)	Corrected Amplitude MaxPeak (dBµV /m)	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polar (H/V)				
30.36	28.70	100	H	151	-4.60	52.85	24.15
46.25	27.71	100	V	29	-15.40	52.85	25.14
159.86	26.06	100	V	294	-13.20	52.85	26.79
329.49	42.87	100	H	28	-10.30	46.00	3.13
433.36	62.81	100	H	299	-7.8	72.85	10.04
539.39	36.20	200	H	169	-5.80	52.85	16.65
866.72	40.46	100	H	299	-0.50	52.85	12.39

Note: If the spurious emissions maximized peak measured value complies with the QP/average limit, it is unnecessary to perform an QP/Average measurement.

1GHz-4.5 GHz

(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)



Frequency (MHz)	Corrected Amplitude MaxPeak (dBμV /m)	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
		Height (cm)	Polar (H/V)				
1300.08	31.88	150	H	153	-17.40	54.00	22.12
1733.44	32.99	150	H	0	-15.50	52.85	19.86
2166.80	35.11	200	H	179	-13.80	52.85	17.74
2600.16	36.30	200	H	100	-12.00	52.85	16.55
3033.52	36.58	200	V	0	-10.00	52.85	16.27
3466.88	38.86	200	H	201	-8.90	52.85	13.99
3900.24	38.74	150	H	352	-7.40	54.00	15.26

If the spurious emissions maximized peak measured value complies with the average limit, it is unnecessary to perform an Average measurement.

Note 1:

Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

FCC §15.231(c) - 20dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data**Environmental Conditions**

Temperature:	24.3 °C
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

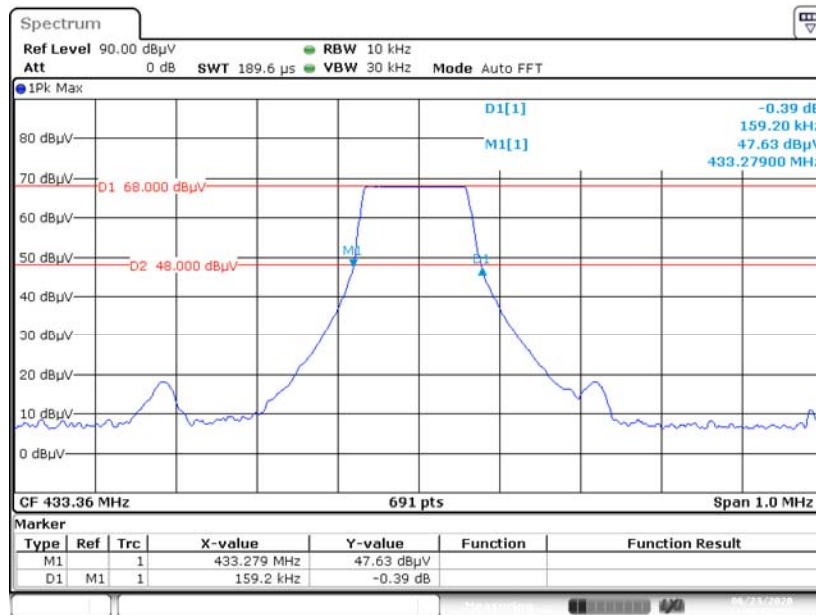
The testing was performed by Lee Li on 2020-06-23.

Test Mode: Transmitting

Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
433.36	159.20	1083.4	Pass

Note: Limit = 0.25% * Center Frequency = 0.25% * 433.36 MHz = 1083.4 kHz

20 dB Emission Bandwidth



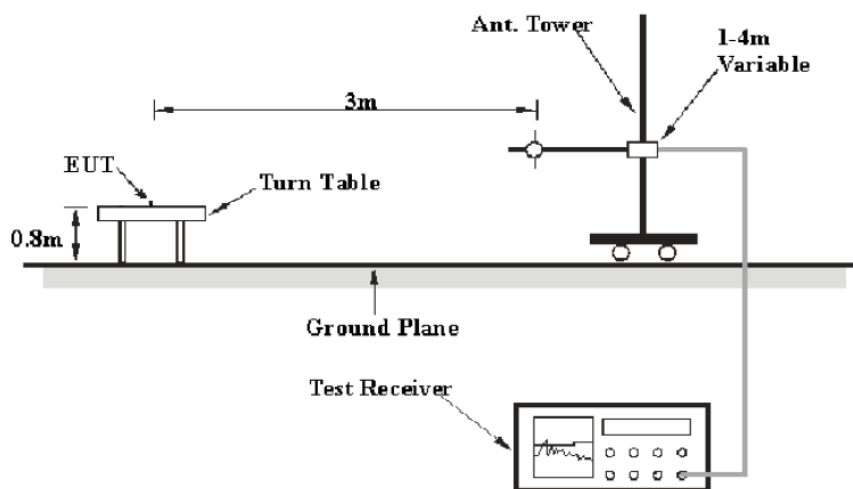
Date: 23 JUN 2020 14:48:56

FCC §15.231(e) - DEACTIVATION TESTING

Applicable Standard

Per 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

EUT Setup



The deactivation test was performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10- 2013. The specification used was the FCC 15.231(e) limits.

Test Data

Environmental Conditions

Temperature:	24.3 °C
Relative Humidity:	49 %
ATM Pressure:	101.2 kPa

The testing was performed by Lee Li on 2020-06-23.

Test mode: Transmitting

Deactivation

Transmission period (ms)	Limit (s)	Result
575.2	< 1	Pass

Silent period

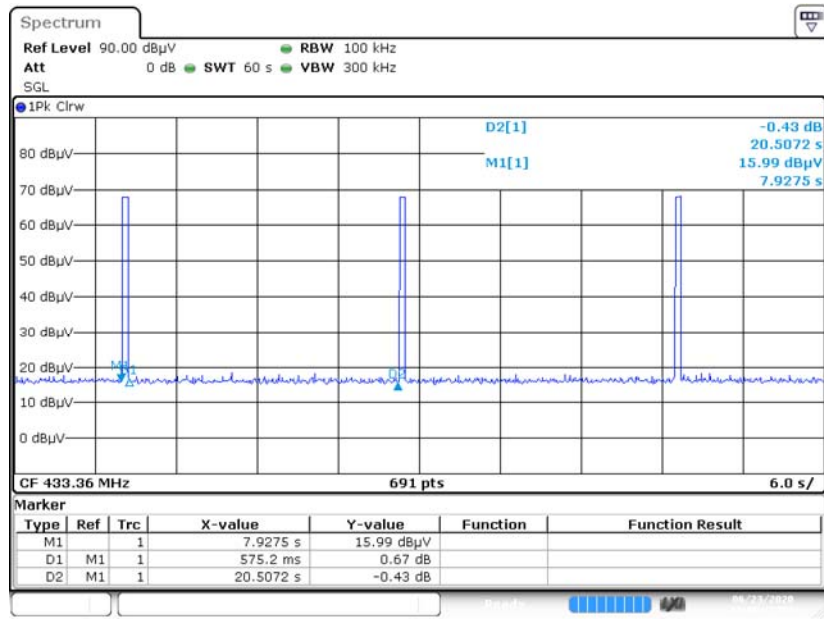
Silent period (s)	Limit (s)	Result
19.932	>17.256	Pass

Note:

The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

The duration time is 0.5752s, $0.5752 \times 30 = 17.256$ s.

Transmission period



Date: 23 JUN 2020 15:10:41

***** END OF REPORT *****