FCC TEST REPORT

FCC: 2BGVD-HANDLELOCK

Product	:	**Smart lock**
Model Name	:	**Handle lock, deadlock**
Brand	:	MINGJIA®
Report No.	:	**NCT24021475E1-2**

Prepared for

Yongjia MINGJIA Hardware Co.,Ltd

Binjiang Industry Area Dongcheng Street Yongjia County Wenzhou City Zhejiang Province, China

Prepared by

Shenzhen NCT Testing Technology Co., Ltd.

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1 TEST RESULT CERTIFICATION

Applicant's name	:	Yongjia MINGJIA Hardware Co.,Ltd
Address	:	Binjiang Industry Area Dongcheng Street Yongjia County Wenzhou City Zhejiang Province, China
Manufacture's name	:	Yongjia MINGJIA Hardware Co.,Ltd
Address	:	Binjiang Industry Area Dongcheng Street Yongjia County Wenzhou City Zhejiang Province, China
Product name	:	Smart lock
Model number	:	Handle lock, deadlock
Standards	:	FCC CFR47 Part 15 Section 15.225
Test procedure	:	ANSI C63.10:2013
Date of test	:	May 24, 2024-Jun. 19, 2024
Date of Issue	:	Jun. 19, 2024

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

Keven Wu / Engineer

Technical Manager:

Henry Wang / Manager

Contents

2 Test Summary

FCC CFR47 Part 15 Section 15.225			
Standard Section	Test Item	Result	Remark
15.203	Antenna requirement	PASS	
15.207	Conducted Emission	N/A	
15.225(d) 15.209	Radiated Spurious Emission	PASS	
15.215	Bandwidth	PASS	
15.225(d) 15.209	Restricted Spurious Emission	PASS	
15.225(e)	Frequency Stability Tolerance	PASS	

Remark:

1. “N/A” denotes test is not applicable in this Test Report.

3 General Information

3.1 General Description of E.U.T.

Product Name	:	Smart lock
Model Name	:	Handle lock
Sample ID	:	24021475-001#
Sample(s) Status:	:	Engineer sample
Series Model	:	deadlock
Model Different.:	:	All the same except the model number
Operation Frequency	:	13.56 MHz
Number of Channel	:	1
Type of Modulation	:	ASK
Antenna installation	:	PCB Antenna
Antenna Gain	:	0 dBi
Power supply	:	DC 5V from Type-C Port or 1.5V by battery*4
Hardware Version	:	N/A
Software Version	:	N/A
Remark: the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.		

3.2 Test Setup Configuration

Radiated Emission

EUT

Conducted Spurious

EUT

3.3 Test Mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

3.4 Test Site

Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Company Number: 30806

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

4 Equipment During Test

4.1 Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	944 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESPI	101604	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	ENV 216	102796	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	VN1-13S	004023	CRANAGE	2023/6/21	2024/6/20
Cable	RG223-1500MM	NA	RG	2023/6/21	2024/6/20

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESCI	101178	Rohde & Schwarz	2023/6/21	2024/6/20
Spectrum Analyze（10Hz-26.5GHz）	N9020A	MY50510202	Agilent	2023/6/21	2024/6/20
Amplifi（30MHz-1GHz）	BBV 9743 B	00374	SCHNARZBECK	2023/6/21	2024/6/20
Bilog Antenna（30MHz-1GHz）	VULB9162	00473	SCHNARZBECK	2023/3/19	2025/3/18
Horn antenna（1GHz-18GHz）	BBHA 9120 D	02622	SCHNARZBECK	2023/3/19	2025/3/18
Pream plifier（1GHz-18GHz）	BBV 9718D	0024	SCHNARZBECK	2023/6/21	2024/6/20
Spectrum Analyze（1GHz-40GHz）	FSV 40	100952	Rohde & Schwarz	2023/6/21	2024/6/20
Pream plifier（15GHz-40GHz）	BBV 9718D	0024	SCHNARZBECK	2023/6/21	2024/6/20
Broadband Antenna（15GHz-40GHz）	SAS-574	588	A.H.System	2023/3/19	2025/3/18
Loop Antenna (9KHz-30MHz)	FMZB1519B	014	SCHNARZBECK	2023/6/21	2024/6/20

Amplifier (9KHz-30MHz)	CVP 9222 C	00109	SCHNARZBECK	2023/6/21	2024/6/20
MXG Signal Analyzer	N9020A	101178	RS	2023/6/21	2024/6/20
MXG Vector Signal Generator	N5182A	MY50510202	Agilent	2023/6/21	2024/6/20
MXG Analog Signal Generator	N5181A	00374	SCHWARZBECK	2023/6/21	2024/6/20
Power Sensor	TR1029-2	00473	SCHNARZBECK	2023/6/21	2024/6/20
RF Swith	TR1029-1	02622	SCHNARZBECK	2023/6/21	2024/6/20
Cable	DA800-4000MM	NA	DA	2023/6/21	2024/6/20
Cable	DA800-11000MM	NA	DA	2023/6/21	2024/6/20

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	AUDIX	e3	6.120718
2	EMC radiation test system	AUDIX	e3	6.120718
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9KHZ~30MHz)	±3.82dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

4.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Smart lock	MINGJIA®	Handle lock	N/A	EUT
E-2	Adapter	N/A	X2903	N/A	Auxiliary

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

5 Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method	:	ANSI C63.10: 2013
Test Result	:	PASS
Frequency Range	:	150kHz to 30MHz
Class/Severity	:	Class B

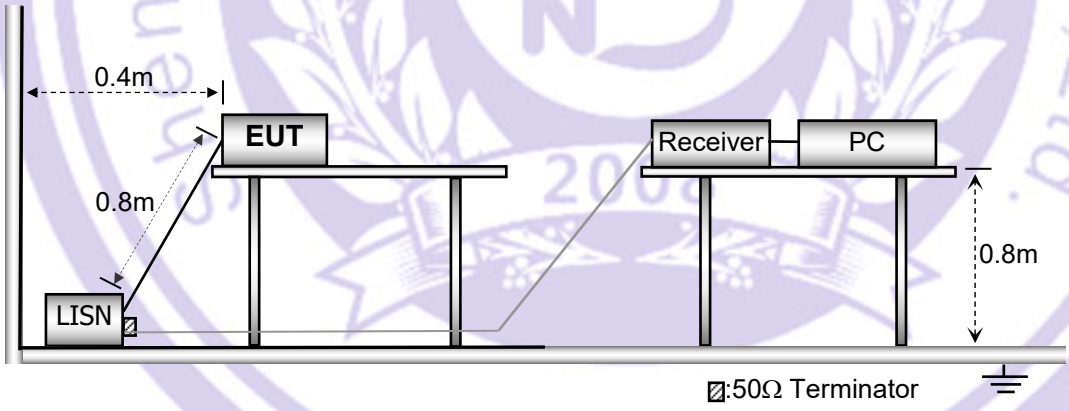
5.1 E.U.T. Operation

Operating Environment :

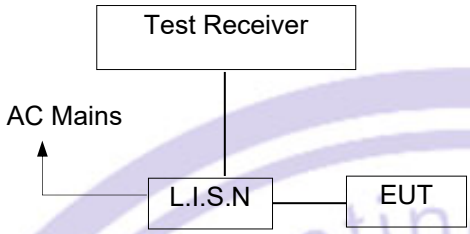
Temperature	:	24.5 °C
Humidity	:	51.3 % RH
Atmospheric Pressure	:	101.11kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:
1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.6 Measurement Description

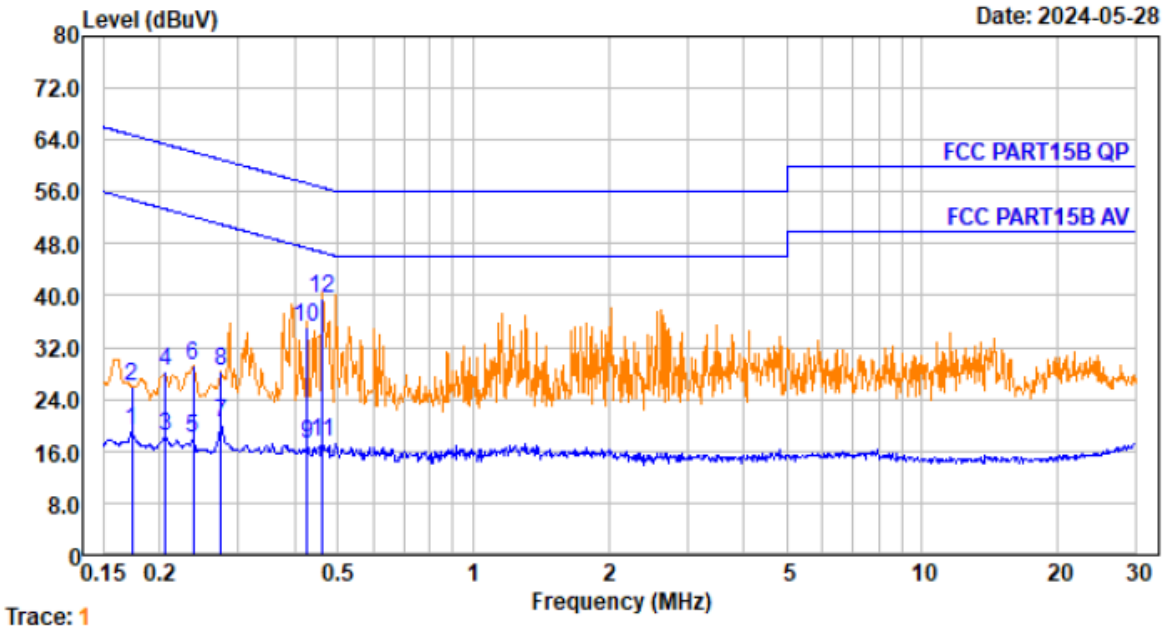
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

Pass

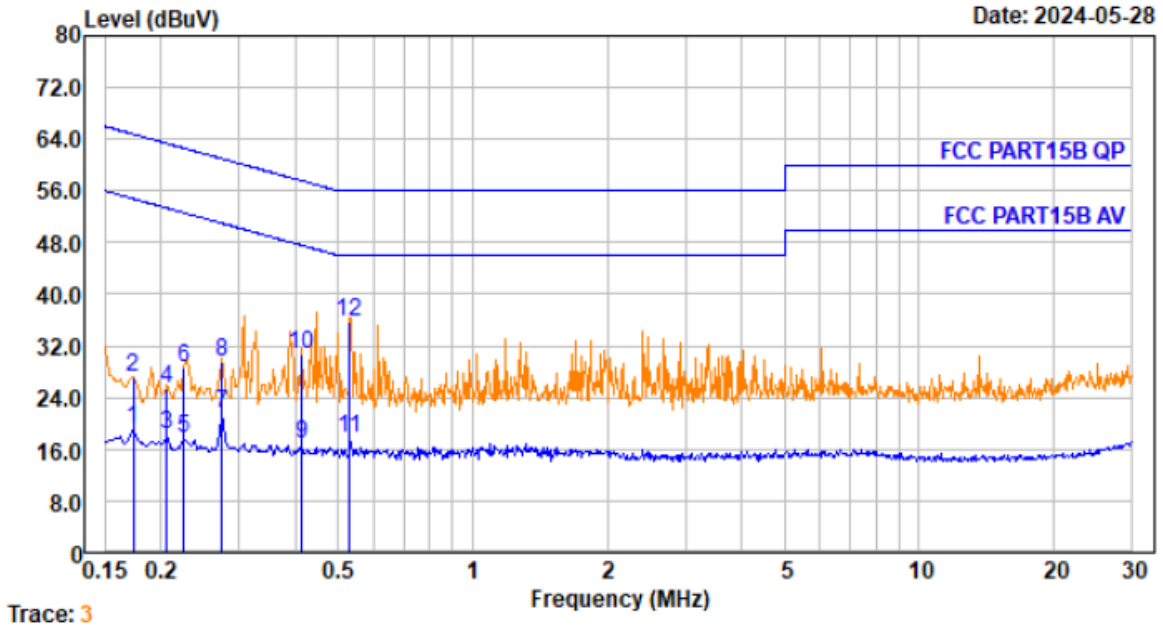
Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (GFSK) are recorded in the following pages and the others modulation methods do not exceed the limits.

Channel:	Middle	Phase :	L



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Aux Factor dB	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.174	0.09	9.55	10.15	-0.74	19.05	54.77	-35.72	Average
2.	0.174	0.09	9.55	10.15	6.29	26.08	64.77	-38.69	QP
3.	0.206	0.09	9.55	10.15	-1.50	18.29	53.36	-35.07	Average
4.	0.206	0.09	9.55	10.15	8.60	28.39	63.36	-34.97	QP
5.	0.238	0.10	9.55	10.14	-1.67	18.12	52.17	-34.05	Average
6.	0.238	0.10	9.55	10.14	9.41	29.20	62.17	-32.97	QP
7.	0.274	0.11	9.56	10.14	0.61	20.42	50.98	-30.56	Average
8.	0.274	0.11	9.56	10.14	8.59	28.40	60.98	-32.58	QP
9.	0.426	0.08	9.57	10.12	-2.63	17.14	47.33	-30.19	Average
10.	0.426	0.08	9.57	10.12	15.39	35.16	57.33	-22.17	QP
11.	0.461	0.07	9.57	10.12	-2.35	17.41	46.67	-29.26	Average
12.	0.461	0.07	9.57	10.12	19.69	39.45	56.67	-17.22	QP

Channel:	Middle	Phase :	N



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Aux Factor dB	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.174	0.09	9.54	10.15	-0.56	19.22	54.77	-35.55	Average
2.	0.174	0.09	9.54	10.15	7.50	27.28	64.77	-37.49	QP
3.	0.206	0.09	9.55	10.15	-1.57	18.22	53.36	-35.14	Average
4.	0.206	0.09	9.55	10.15	5.50	25.29	63.36	-38.07	QP
5.	0.226	0.10	9.55	10.14	-2.15	17.64	52.61	-34.97	Average
6.	0.226	0.10	9.55	10.14	8.90	28.69	62.61	-33.92	QP
7.	0.274	0.11	9.56	10.14	1.80	21.61	50.98	-29.37	Average
8.	0.274	0.11	9.56	10.14	9.79	29.60	60.98	-31.38	QP
9.	0.415	0.08	9.57	10.12	-3.01	16.76	47.55	-30.79	Average
10.	0.415	0.08	9.57	10.12	11.00	30.77	57.55	-26.78	QP
11.	0.529	0.06	9.58	10.11	-1.93	17.82	46.00	-28.18	Average
12.	0.529	0.06	9.58	10.11	16.11	35.86	56.00	-20.14	QP

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor

6 Radiated Spurious Emissions & Restricted Spurious Emission

Test Requirement : FCC CFR 47 Part 15 Section 15.225(d)&15.209

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

According to RSS-210 Annex B.6

Devices shall comply with the following requirements:

the field strength of any emission shall not exceed the following limits:

15.848 mV/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz

334 µV/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz

106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz

RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz

6.1 EUT Operation

Operating Environment :

Temperature: : 24.5°C

Humidity: : 52 % RH

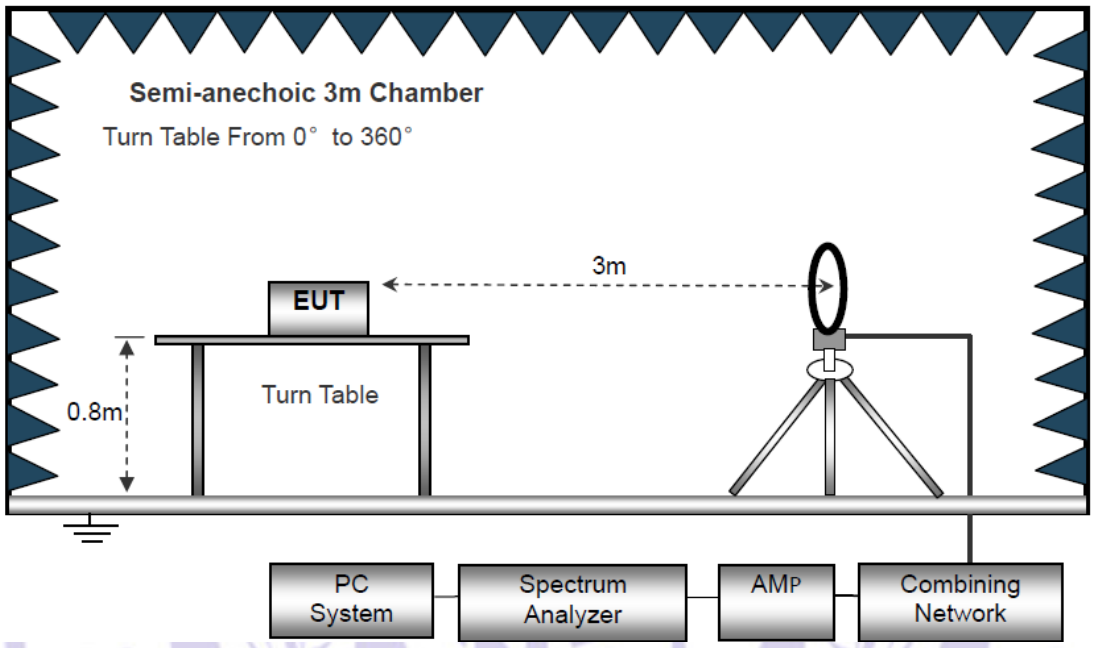
Atmospheric Pressure: : 101.11kPa

Test Voltage : DC 1.5V by battery*4（DC 6V）

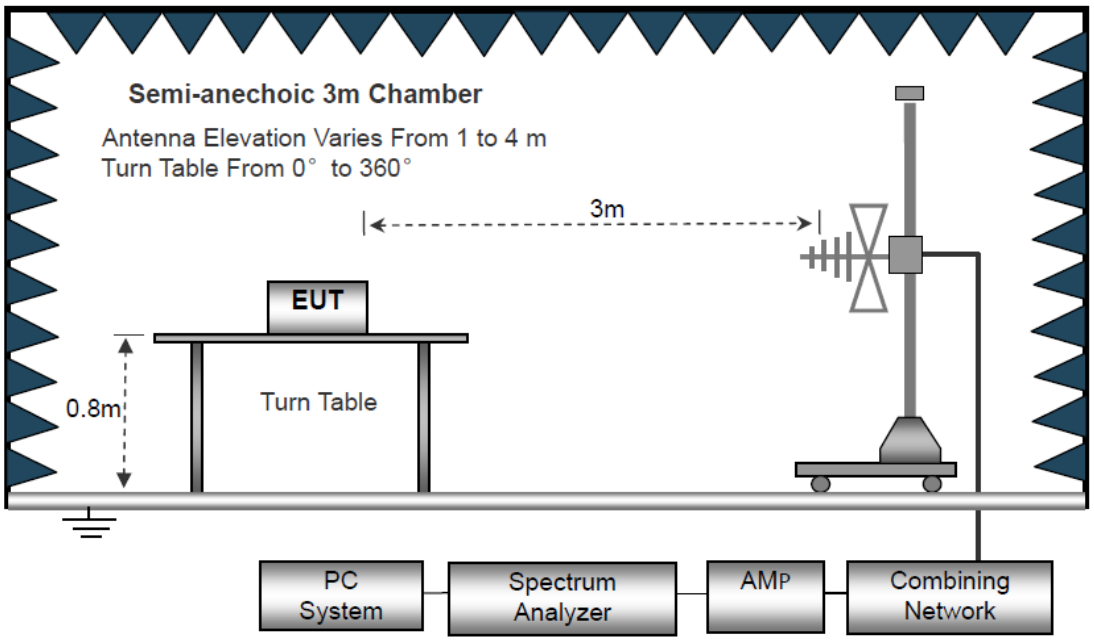
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

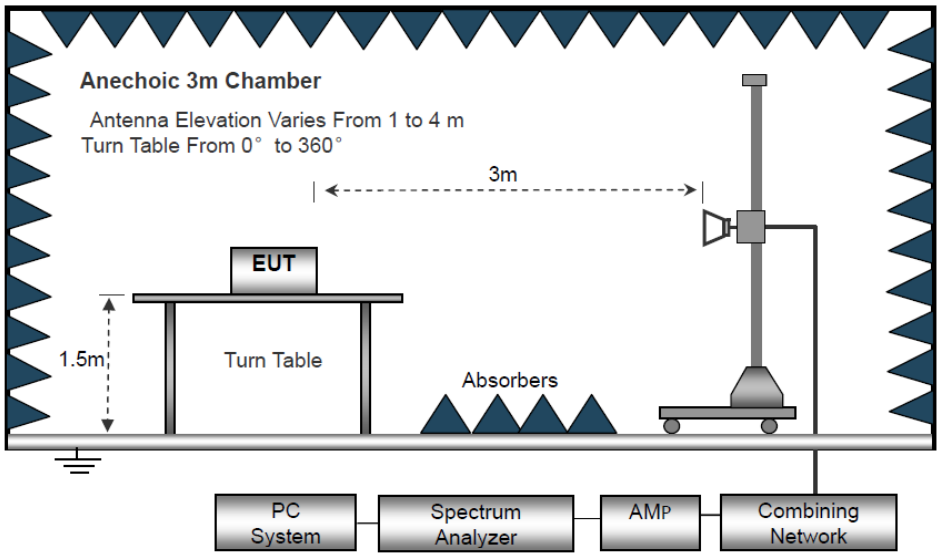
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

Below 30MHz			
IF Bandwidth	:	10kHz	
Resolution Bandwidth	:	10kHz	
Video Bandwidth	:	10kHz	
30MHz ~ 1GHz			
Detector	:	PK	QP
Resolution Bandwidth	:	100kHz	120kHz
Video Bandwidth	:	300kHz	300kHz
Above 1GHz			
Detector	:	PK	AV
Resolution Bandwidth	:	1MHz	1MHz
Video Bandwidth	:	3MHz	10Hz

6.4 Test Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room

6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

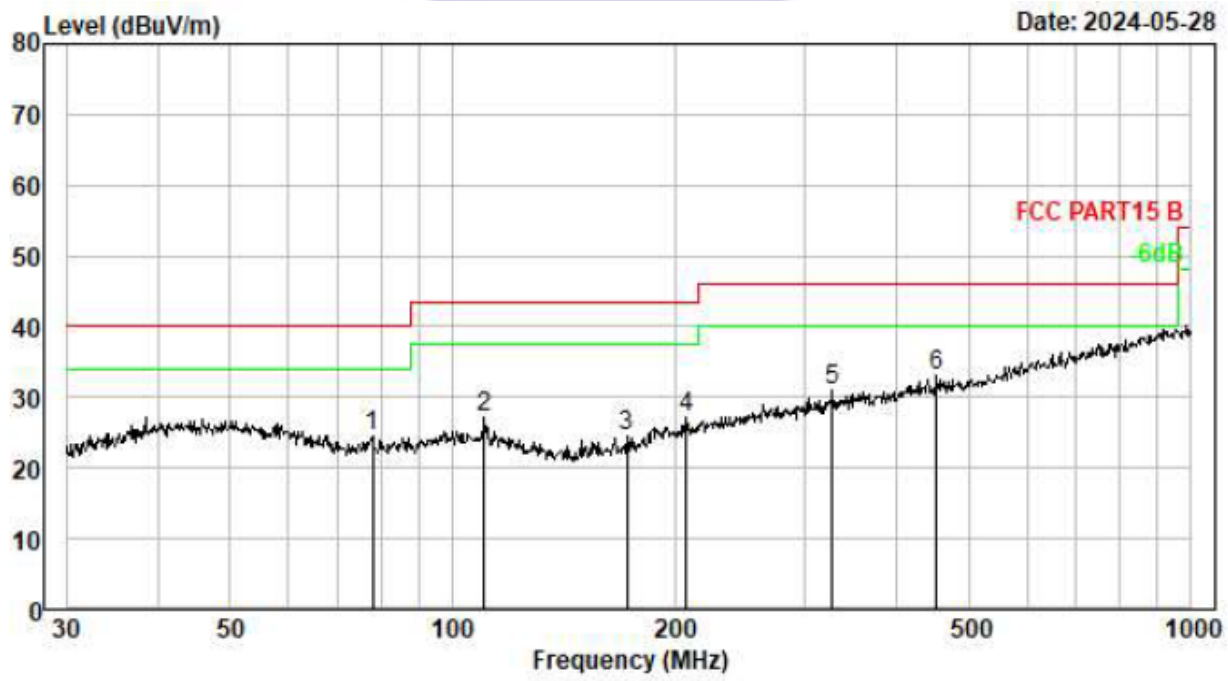
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
0.635	21.56	20.94	42.5	71.55	-29.05	QP
1.438	15.86	20.86	36.72	64.33	-27.61	QP
1.618	16.96	20.73	37.69	63.42	-25.73	QP
3.235	16.03	20.58	36.61	69.54	-32.93	QP
6.637	17.96	20.07	38.03	69.54	-31.51	QP
19.143	18.69	19.11	37.8	69.54	-31.74	QP
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Note:

Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

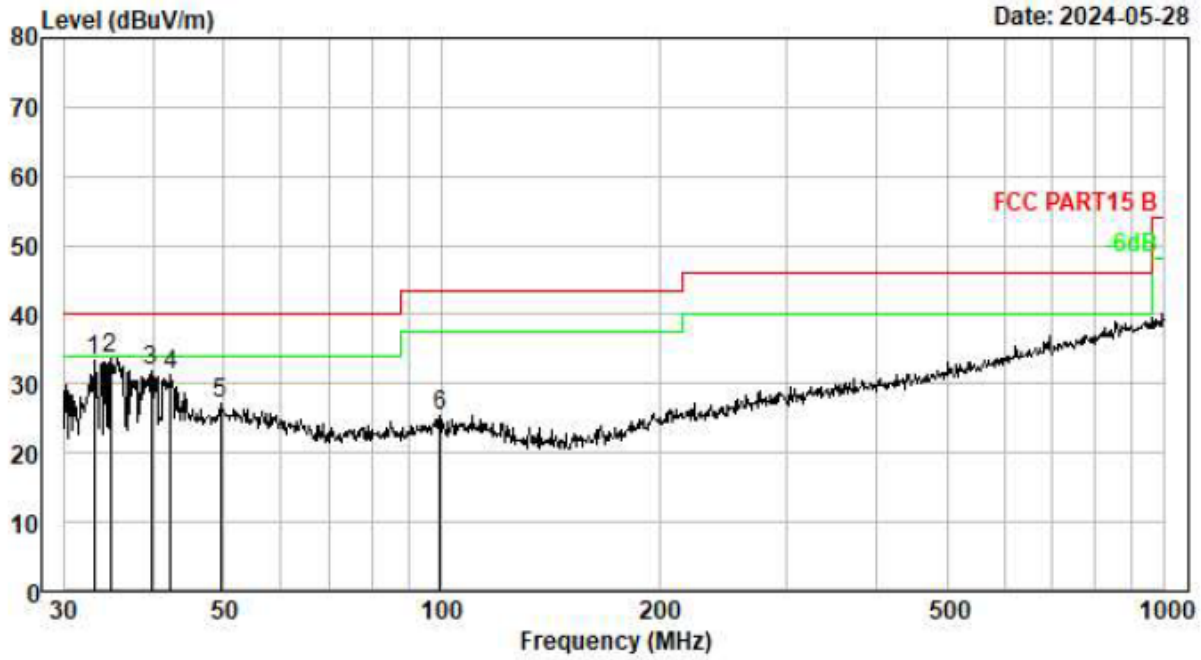
Test plot for Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Preamp Gain dB	Receiver Reading dBµV	Emission Level dBµV/m	Limit dBµV/m	Over Limit dB	Remark
1	77.865	0.60	9.64	0.00	14.33	24.57	40.00	-15.43	QP
2	110.569	0.74	11.15	0.00	15.38	27.27	43.50	-16.23	QP
3	172.599	0.98	9.43	0.00	14.12	24.53	43.50	-18.97	QP
4	207.123	1.08	11.65	0.00	14.41	27.14	43.50	-16.36	QP
5	326.740	1.32	14.75	0.00	15.03	31.10	46.00	-14.90	QP
6	452.720	1.50	16.58	0.00	14.87	32.95	46.00	-13.05	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor

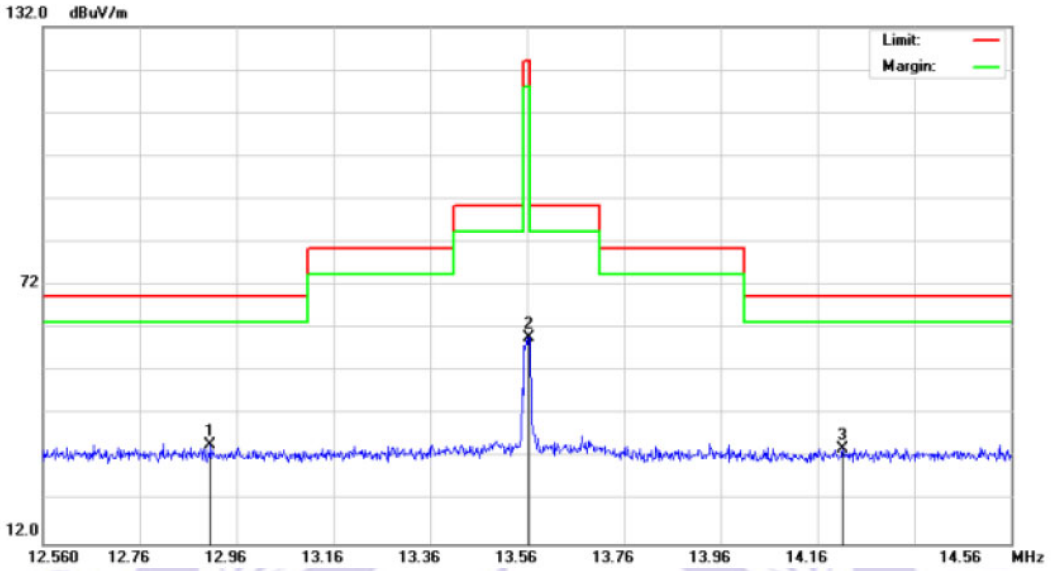
Test plot for Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Preamp Gain dB	Receiver Reading dBµV	Emission Level dBµV/m	Limit dBµV/m	Over Limit dB	Remark
1	33.095	0.28	10.59	0.00	22.51	33.38	40.00	-6.62	QP
2	34.882	0.30	11.12	0.00	22.27	33.69	40.00	-6.31	QP
3	39.715	0.34	12.43	0.00	19.05	31.82	40.00	-8.18	QP
4	42.154	0.37	12.55	0.00	18.32	31.24	40.00	-8.76	QP
5	49.533	0.43	12.69	0.00	14.03	27.15	40.00	-12.85	QP
6	99.528	0.69	11.05	0.00	13.62	25.36	43.50	-18.14	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor

Restricted Spurious Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	12.9060	10.31	24.59	34.90	69.50	-34.60	peak
2		13.5640	35.30	24.64	59.94	124.0	-64.06	peak
3		14.2118	9.43	24.69	34.12	69.50	-35.38	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Margin = Measurement Level – Limit

7 6dB&99% Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.215

Test Method : ANSI C63.10:2013

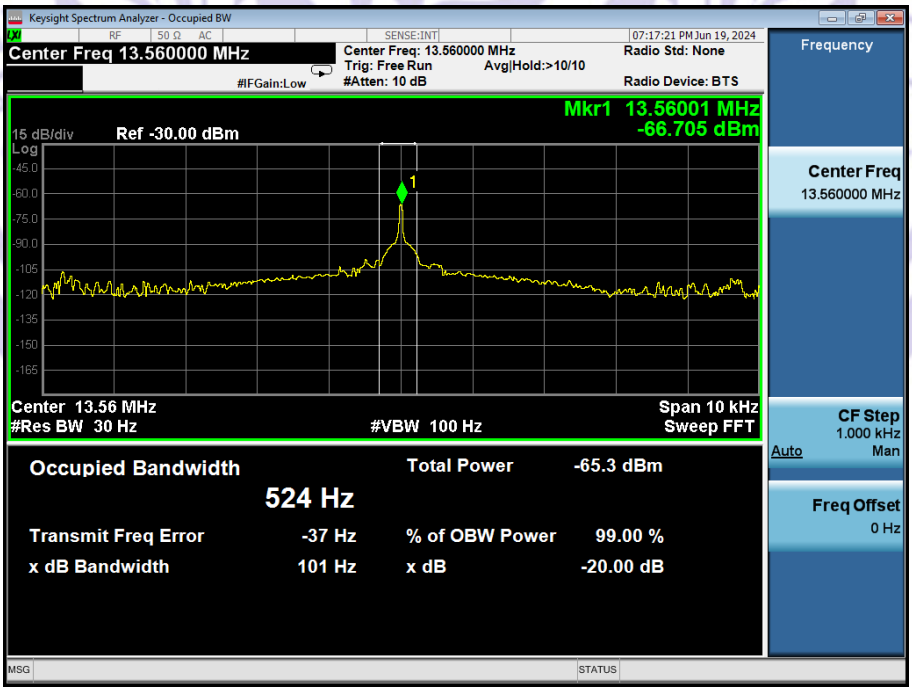
Test Limit /

7.1 Test Procedure

1. Set RBW = 1% to 5% of the OBW
2. Set the video bandwidth (VBW) ZRBW.
3. Detector = Peak.
4. Trace mode = max hold
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associatedwith the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.

7.2 Test Result

Modulation	Frequency (MHz)	20dB bandwidth (Hz)	99%dB bandwidth (Hz)	Result
ASK	13.56	101	524	Pass



8 FREQUENCY STABILITY

Test Requirement : FCC CFR47 Part 15 Section 15.225(e)

Test Method : ANSI C63.10:2013

Test Limit : the carrier frequency stability shall not exceed ±100 ppm

8.1 Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.

2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.

3. The EUT was placed inside the temperature chamber.

4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency.

Turn EUT off and set the chamber temperature to －20℃. After the temperature stabilized for approximately 30 minutes recorded the frequency.

Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

Reduce the input voltage to specified extreme voltage variation (+/- 15%) or endpoint, record the maximum frequency change.

8.2 Test Result

Reference Frequency: 13.56MHz					
Voltage (V)	Temperature (℃)	Frequency (KHz)	Frequency Deviation (Hz)	Deviation (ppm)	Limit (ppm)
6	+20(Ref)	13.560103	0.000103	7.60	±100
	-20	13.560063	0.000063	4.65	±100
	-10	13.560187	0.000187	13.79	±100
	0	13.560130	0.00013	9.59	±100
	+10	13.560108	0.000108	7.96	±100
	+20	13.560090	0.00009	6.64	±100
	+25	13.560140	0.00014	10.32	±100
	+30	13.560151	0.000151	11.14	±100
	+40	13.560177	0.000177	13.05	±100
	+50	13.560062	0.000062	4.57	±100
6.6	+20	13.560030	0.000030	2.21	±100
5.4	+20	13.560101	0.000101	7.45	±100

9 Antenna Application

9.1 Antenna Requirement

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

9.2 Result

The antenna is PCB Antenna which permanently attached, and the best case gain of the antenna is 0 dBi. It complies with the standard requirement.

10 Test Setup &EUT Photos

Reference to the attachment for details.

******THE END REPORT******