TEST REPORT

Applicant	:	Home Tech Innovation, Inc
Address of Applicant	:	1035 Cambridge St, Suite 11A, Cambridge, MA 02141
Product Name	:	Suvie Kitchen Robot
Model No.	:	S020M
Sample No.	:	E21040017-01#01
FCC ID	:	2AT2K-S020M
	:	
Standards	:	FCC CFR47 Part 15, Subpart C
Date of Receipt	:	2021-04-26
Date of Test	:	2021-04-26 ~ 2021-05-17
Date of Issue	:	2021-05-17

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by: Jennifer Zhou (Jennifer Zhou) Reviewed by: Oliver Xiang (Oliver Xiang) Approved by: Guoyou Chi (Authorized signatory: Guoyou Chi)

Contents

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	Home Tech Innovation, Inc
Address	1035 Cambridge St, Suite 11A, Cambridge, MA 02141
Contact Person	Kevin Incorvia
Telephone	+1 617 800 5336
Email	kincorvia@suvie.com
Manufacturer Company Name	Home Tech Innovation, Inc
Address	1035 Cambridge St, Suite 11A, Cambridge, MA 02141

1.3 Details of EUT

Product Name	Suvie Kitchen Robot
Brand Name	Suvie
Model Name Under Test	S020M
FCC ID	2AT2K-S020M
Mode of Operation	NFC
Frequency Range	13.56MHz
Modulation Type	ASK
Hardware version	S020M1.0.1
Software version	fw
Antenna Type	Internal Antenna
Test Temperature	25℃
Test Voltage	AC 120V 60Hz

1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

1.5 Test Verdict

No.	FCC Part No.	Description	Test Result	Verdict
1	15.203	Antenna Requirement	Clause 4.1.1	PASS
2	15.225(e)	Frequency Tolerance	Clause 4.1.2	PASS
3	15.215(c)	20dB Bandwidth	Clause 4.1.3	PASS
4	ANSI 63.10 Section 6.9	99% Bandwidth	Clause 4.1.3	PASS
5	15.225	Radiated Emission	Clause 4.1.4	PASS
6	15.207	Conducted Emission	Clause 4.1.5	PASS

2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2020-08-19	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2020-06-09	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2020-06-09	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-09	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2020-07-29	2021-07-28
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2020-06-08	2021-06-07
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-22	2021-11-21
EMC chamber 9*6*6（L*W*H)	CHANGNING	966	N/A	2020-06-09	2021-06-08
Shielded Enclosure 8*5*4（L*W*H)	CHANGNING	854	N/A	2020-06-09	2021-06-08
Test Software	BL	BL410_E	N/A	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3.42 dB
	> 1GHz	± 4.20 dB
Conducted Emission on AC Mains	9 kHz to 30 MHz	± 1.96 dB

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
Test channel	13.56MHz

The basic operation modes are:

A. On
   1. test mode
      a. Transmitting
         i. Test Channel
B. Standby
C. Off

3.2 Special Accessories and Auxiliary Equipment

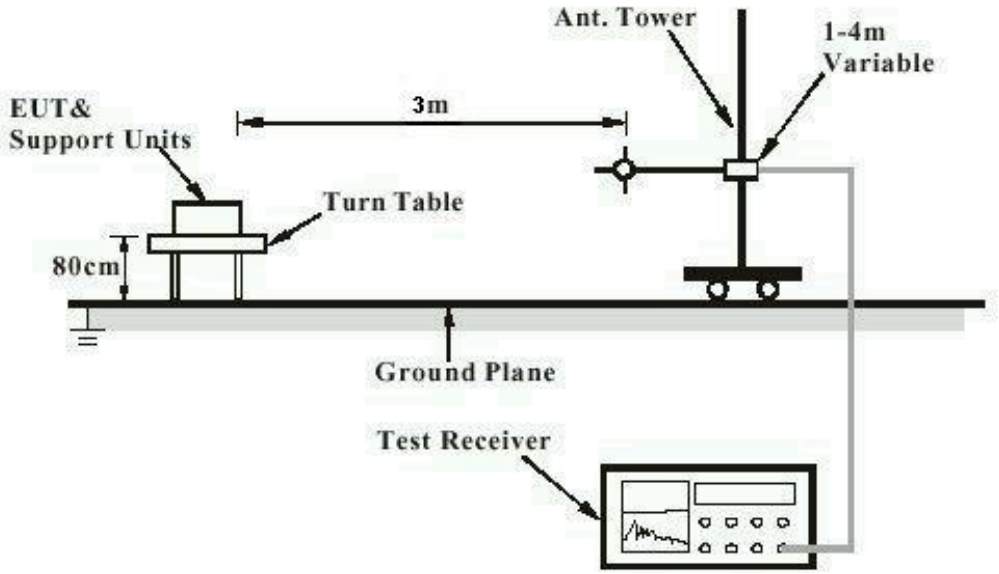
Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	/	/

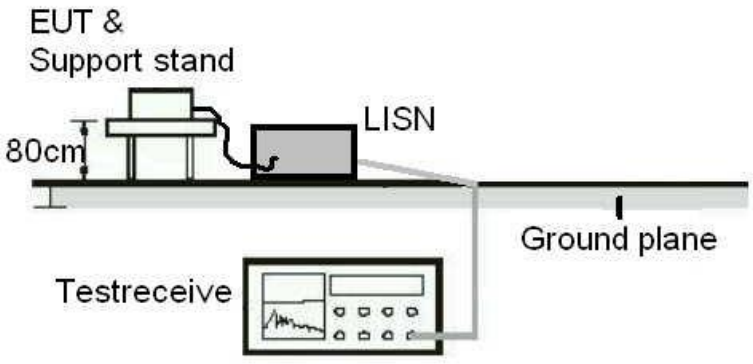
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 30MHz are done with a table height of 0.8m.

Diagram of Measurement Equipment Configuration for Conduction Measurement



4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT: **PASS**

Test standard	:	Part 15.203
Requirement	:	The use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a gain of 0 dBi. The antenna is an internal antenna with no possibility of replacement with a non-approvrd antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

4.1.2 Frequency Tolerance

RESULT: **PASS**

Test standard : FCC Part 15.225(e)

Requirement : ANSI C63.10-2013

Kind of test site : Shielded room

Test setup

Test Channel : Test channel

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 50%

Test Procedure

1.The test is performed in a Temperature Chamber.

2.The EUT is configured as MS + AC Power Supply.

Table 1: Frequency Tolerance

Test Conditions		Measured		Deviation Limit
		Frequency (MHz)	Tolerance (ppm)	
NT	NV	13.559000	-73.746313	±0.01%
LT	LV	13.560250	18.436578	
LT	HV	13.560870	64.159292	
HT	HV	13.559500	-36.873156	
HT	LV	13.560620	45.722714	

Note: NT=25℃ NV=AC120V LT=-20℃ LV=AC102V HT=50℃ HV=AC138V

4.1.3 20dB Bandwidth and 99% Bandwidth

RESULT: **PASS**

Test standard	:	FCC Part 15.215(c) ANSI 63.10 Section 6.9
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Chamber

Test setup

Test Channel	:	Test channel
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	50%

Test procedure

The 20dB bandwidth is measured with a spectrum analyzer connected via a receiver antenna placed near the EUT while the EUT is operating in transmission mode.

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak Trace = max hold.

Table 2: 20dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
ASK	13.56	354.60	486.25

Figure: 20dB Bandwidth

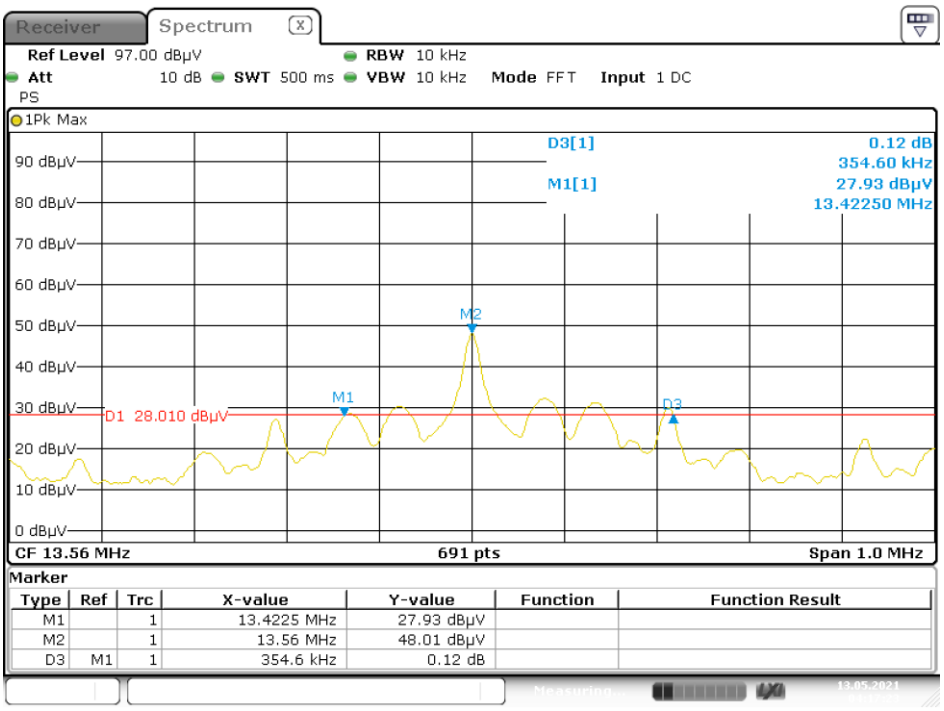


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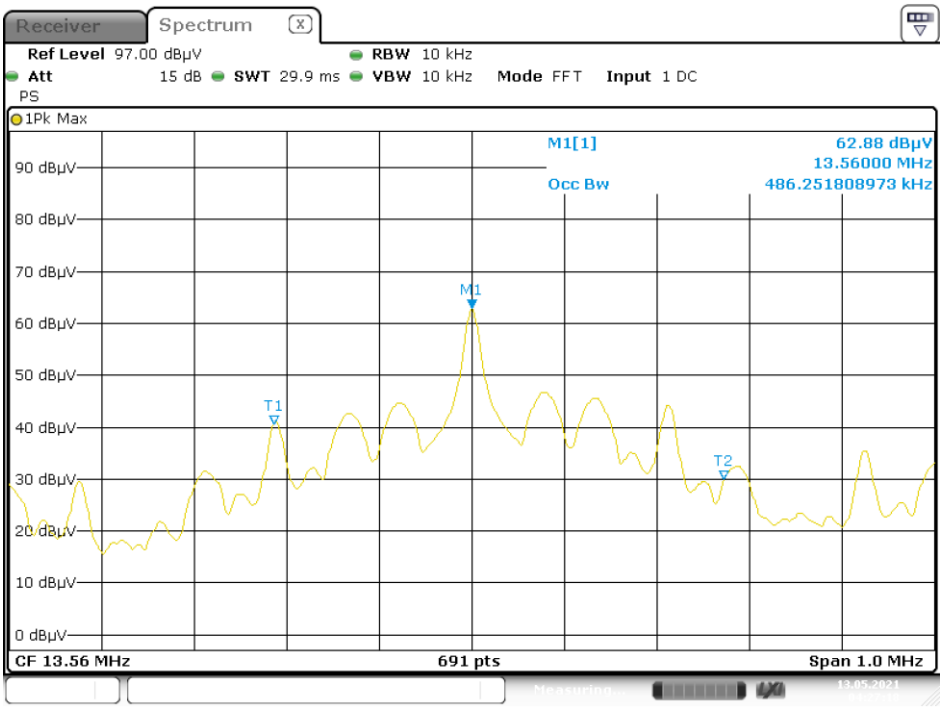
Figure: 99% Bandwidth



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4.1.4 Radiated Emission

RESULT: **PASS**

Test standard	:	FCC Part 15.225
Requirement	:	ANSI C63.10-2013
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Test channel
Operation Mode	:	A
Ambient temperature	:	25°C
Relative humidity	:	50%

Notes:

Operation within the band 13.110-14.010 MHz as contained in §15.225:

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

(f) The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The Z-plane results were found as the worst case and were shown in this report.

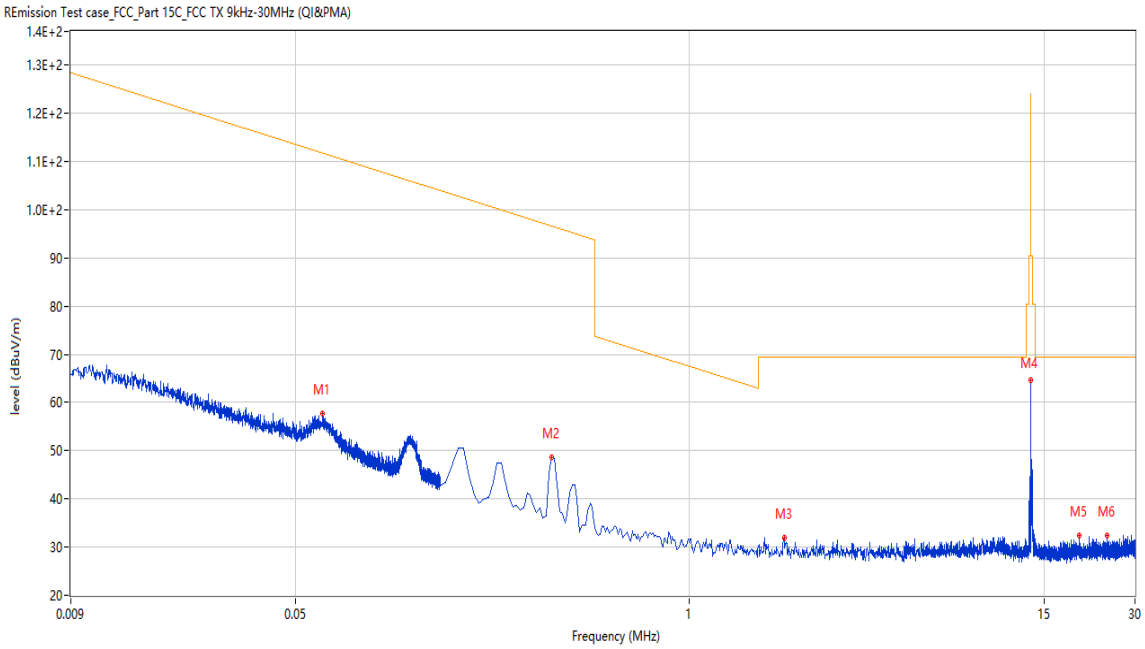
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(KHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(KHz)	87.6-20log(F)
1.705 ~ 13.110	30	30	29.54
13.110 ~ 13.410	30	106	40.51
13.410~ 13.553	30	334	50.47
13.553~13.567	30	15848	84.00
13.567~13.710	30	334	50.47
13.710~14.010	30	106	40.51
14.010~30	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0

(1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz.Radiated emissions limits in these three bands are based on measurements employing an average detector.
(2) At frequencies below 30MHz, measurement may be performed at a distance closer then that specified, and the limit at closer measurement distance can be extrapolated by below formula:
$Limit_{3m}(dBuV/m) = Limit_{300m}(dBuV/m) + 40Log(300m/3m) = Limit_{300m}(dBuV/m) + 80$
$Limit_{3m}(dBuV/m) = Limit_{30m}(dBuV/m) + 40Log(30m/3m) = Limit_{30m}(dBuV/m) + 40$

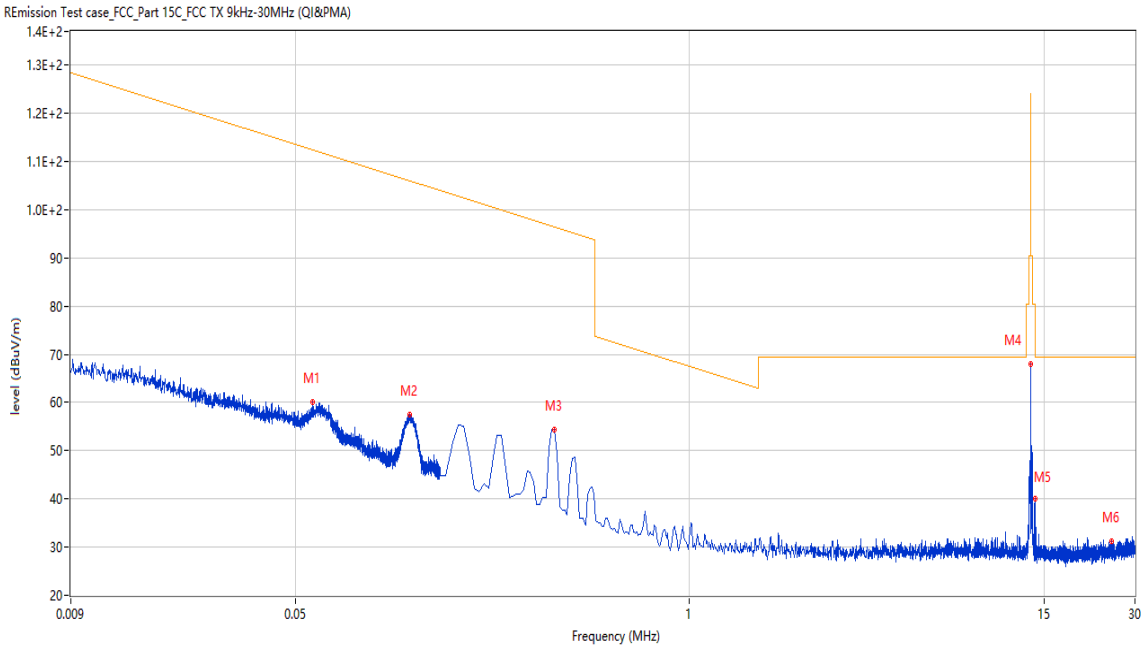
(3) EUT was placed on a non-metallic table, 100 cm above the ground plane inside a semi-anechoic chamber.
(4) Test antenna was located 3m from the EUT on an adjustable mast

According ANSI C63.10:2013 clause 6.4.4.2 and 6,5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

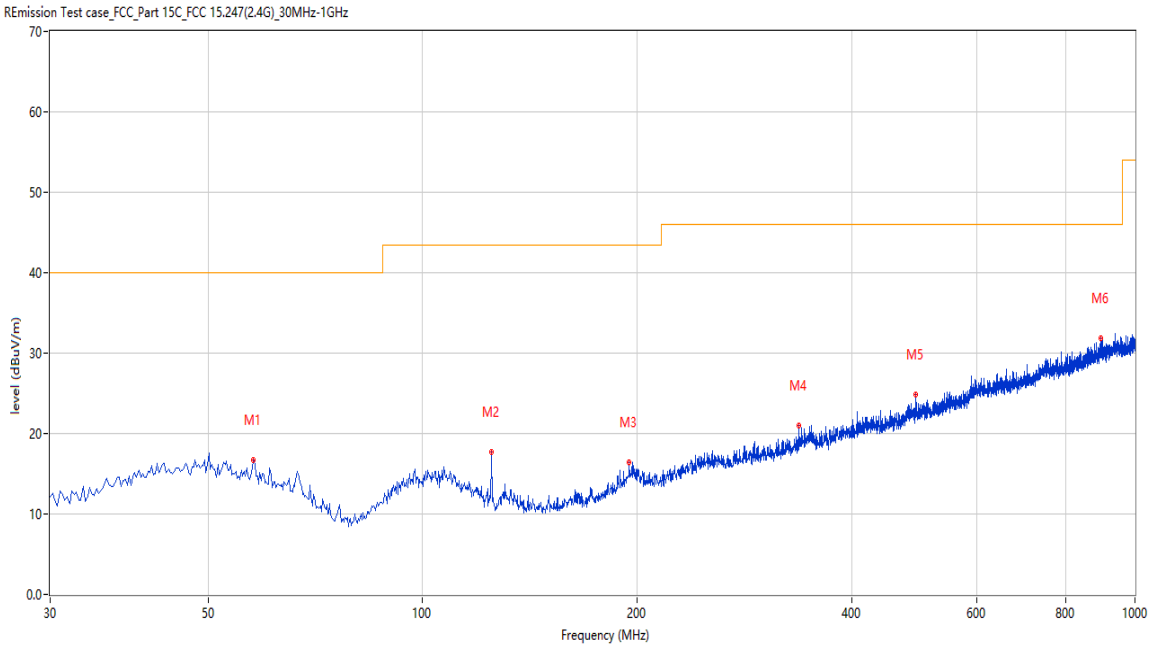
Test data :



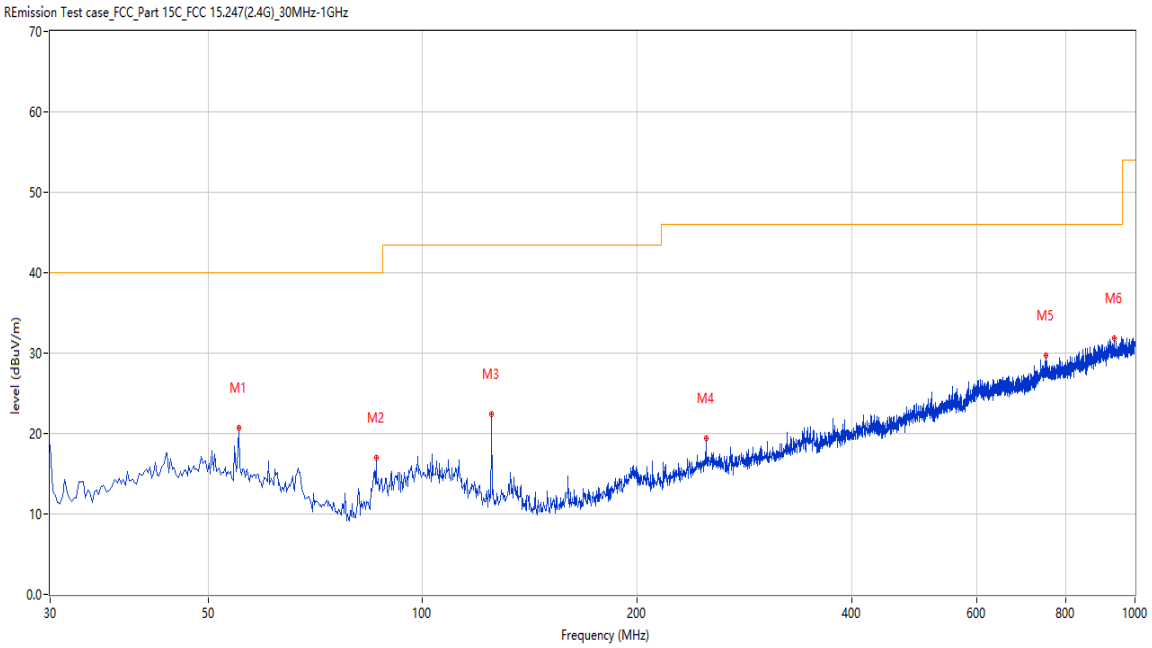
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.061	56.17	20.50	111.8	-55.63	Peak	65.40	100	Horizontal	Pass
2	0.351	48.71	20.35	96.6	-47.89	Peak	54.60	100	Horizontal	Pass
3	2.067	31.91	21.03	69.5	-37.59	Peak	88.90	100	Horizontal	Pass
4	13.557	64.75	20.86	124.0	-59.25	Peak	289.00	100	Horizontal	Pass
5	19.585	32.31	21.00	69.5	-37.19	Peak	258.50	100	Horizontal	Pass
6	24.300	32.37	21.34	69.5	-37.13	Peak	2.40	100	Horizontal	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.057	58.07	20.49	112.4	-54.33	Peak	62.60	100	Vertical	Pass
2	0.119	57.08	20.44	106.0	-48.92	Peak	102.00	100	Vertical	Pass
3	0.359	54.31	20.35	96.4	-42.09	Peak	104.50	100	Vertical	Pass
4	13.557	67.96	20.86	124.0	-56.04	Peak	0.00	100	Vertical	Pass
5	13.982	40.12	20.90	80.5	-40.38	Peak	1.20	100	Vertical	Pass
6	25.106	31.31	21.38	69.5	-38.19	Peak	117.90	100	Vertical	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	57.881	16.65	-20.30	40.0	-23.35	Peak	359.60	100	Horizontal	Pass
2	125.036	17.75	-23.27	43.5	-25.75	Peak	0.00	200	Horizontal	Pass
3	195.101	16.50	-20.04	43.5	-27.00	Peak	214.30	100	Horizontal	Pass
4	337.171	21.03	-16.33	46.0	-24.97	Peak	106.00	100	Horizontal	Pass
5	491.847	24.92	-12.68	46.0	-21.08	Peak	0.00	200	Horizontal	Pass
6	894.296	31.83	-4.11	46.0	-14.17	Peak	0.00	200	Horizontal	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	55.214	20.76	-19.87	40.0	-19.24	Peak	0.00	200	Vertical	Pass
2	86.003	16.93	-24.22	40.0	-23.07	Peak	172.00	100	Vertical	Pass
3	125.036	22.37	-23.27	43.5	-21.13	Peak	45.10	100	Vertical	Pass
4	249.893	19.46	-18.65	46.0	-26.54	Peak	0.00	200	Vertical	Pass
5	750.287	29.65	-6.70	46.0	-16.35	Peak	45.10	100	Vertical	Pass
6	935.996	31.83	-3.21	46.0	-14.17	Peak	249.00	100	Vertical	Pass

Note ： margin（Over Limit）>10dB,so do not need to test by QP Detector

4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT: **PASS**

Test standard	:	FCC Part 15.207(a)
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

Test setup

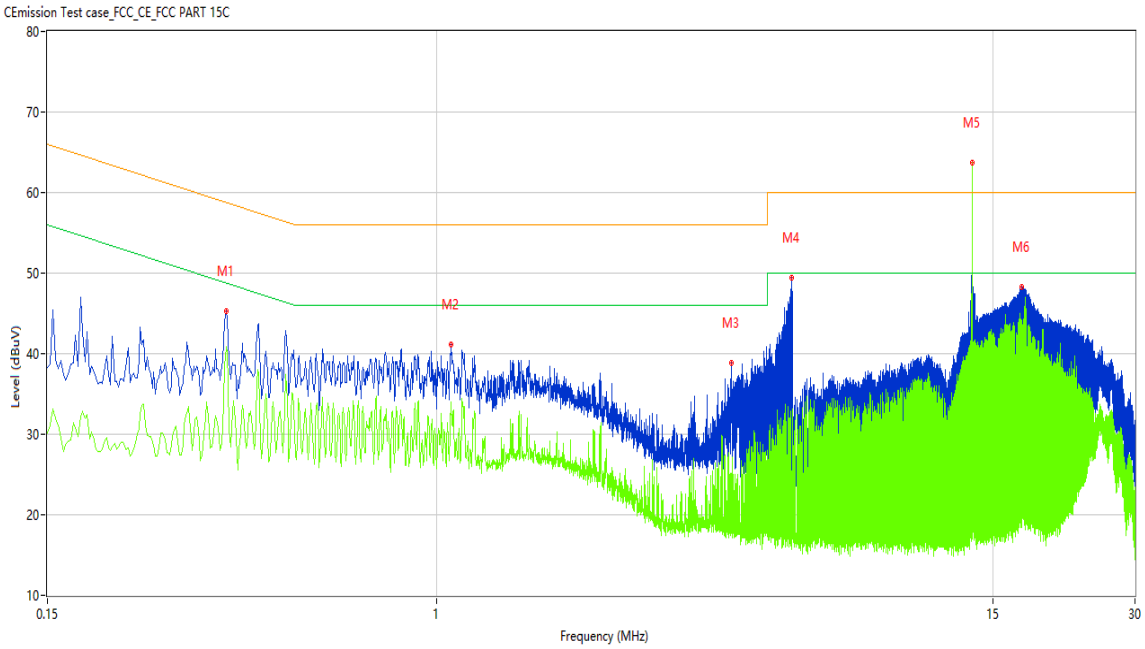
Input Voltage	:	AC 120V, 60Hz; AC 240V, 50Hz
Operation Mode	:	A.1.a
Earthing	:	Not Connected
Ambient temperature	:	25°C
Relative humidity	:	50%

For details refer to following test plot.

Note:

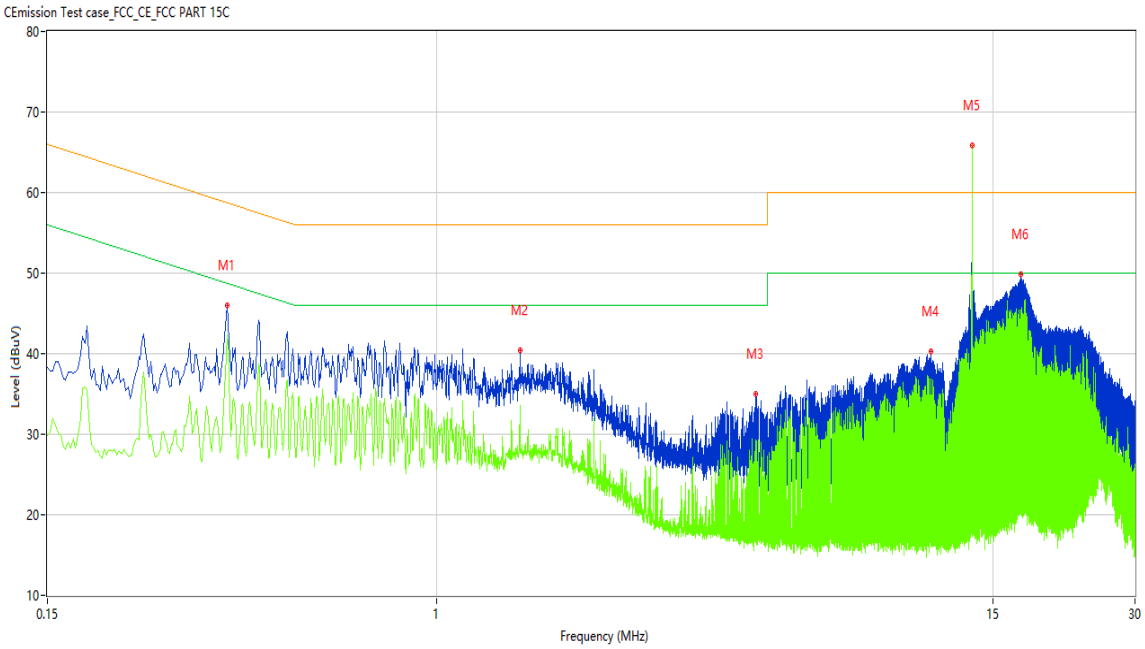
The all configurations were tested respectively, but only the worst configuration shown here.

Figure 1: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.358	48.02	9.72	58.77	-10.75	Peak	L	Pass
1*	0.358	42.55	9.72	58.77	-16.22	QP	L	Pass
1**	0.358	40.83	9.72	48.77	-7.94	AV	L	Pass
2	1.070	51.80	9.66	56.00	-4.20	Peak	L	Pass
2*	1.070	34.97	9.66	56.00	-21.03	QP	L	Pass
2**	1.070	34.05	9.66	46.00	-11.95	AV	L	Pass
3	4.204	39.16	9.69	56.00	-16.84	Peak	L	Pass
3*	4.204	29.51	9.69	56.00	-26.49	QP	L	Pass
3**	4.204	25.09	9.69	46.00	-20.91	AV	L	Pass
4	5.636	47.74	9.70	60.00	-12.26	Peak	L	Pass
4*	5.636	38.76	9.70	60.00	-21.24	QP	L	Pass
4**	5.636	25.44	9.70	50.00	-24.56	AV	L	Pass
5	13.558	63.38	9.59	60.00	3.38	Peak	L	N/A
5*	13.558	62.32	9.59	60.00	2.32	QP	L	N/A
5**	13.558	63.66	9.59	50.00	13.66	AV	L	N/A
6	17.274	48.45	9.49	60.00	-11.55	Peak	L	Pass
6*	17.274	45.62	9.49	60.00	-14.38	QP	L	Pass
6**	17.274	42.20	9.49	50.00	-7.80	AV	L	Pass

Figure: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.360	45.29	9.72	58.73	-13.44	Peak	N	Pass
1*	0.360	42.94	9.72	58.73	-15.79	QP	N	Pass
1**	0.360	42.41	9.72	48.73	-6.32	AV	N	Pass
2	1.498	36.63	9.67	56.00	-19.37	Peak	N	Pass
2*	1.498	32.03	9.67	56.00	-23.97	QP	N	Pass
2**	1.498	33.64	9.67	46.00	-12.36	AV	N	Pass
3	4.734	34.72	9.70	56.00	-21.28	Peak	N	Pass
3*	4.734	28.99	9.70	56.00	-27.01	QP	N	Pass
3**	4.734	29.30	9.70	46.00	-16.70	AV	N	Pass
4	11.120	39.42	9.65	60.00	-20.58	Peak	N	Pass
4*	11.120	36.26	9.65	60.00	-23.74	QP	N	Pass
4**	11.120	36.84	9.65	50.00	-13.16	AV	N	Pass
5	13.558	65.37	9.59	60.00	5.37	Peak	N	N/A
5*	13.558	64.45	9.59	60.00	4.45	QP	N	N/A
5**	13.558	65.80	9.59	50.00	15.80	AV	N	N/A
6	17.210	49.45	9.49	60.00	-10.55	Peak	N	Pass
6*	17.210	46.65	9.49	60.00	-13.35	QP	N	Pass
6**	17.210	45.07	9.49	50.00	-4.93	AV	N	Pass

5 Appendixes

5.1 Photographs of the Sample

Front of the sample

Rear of the sample

5.2 Photographs of the Test Set-up

Below 30MHz

Above 30MHz

End of the report