

TEST REPORT

Report No.: SHE19090021-01AE

Date: 2019-12-10

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Applicant : Shanghai ZoomSmart Technology Co.,Ltd.
Address of Applicant : Room 802 Hengxi Road No.809 Pujiang Town Minhang district, Shanghai, China

Product Name : Rugged Phone
Model No. : LT600
Sample No. : E19090021-01#05
FCC ID : 2AUFL-LT600

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2019-09-16
Date of Test : 2019-09-23 ~ 2019-12-12
Date of Issue : 2019-12-12

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.

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Guoyou Chi
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Revision Record			
Version	Date	Revisions	Revised By
1.0	2019-12-12	Original	--

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1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Services (Shanghai) Co., Ltd.
Address	155 Pingbei Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	Shanghai ZoomSmart Technology Co.,Ltd.
Address	Room 802 Hengxi Road No.809 Pujiang Town Minhang district, Shanghai, China
Contact Person	yc.qiao
Telephone	15800844215
Email	yc.qiao@zoomsmart.com.cn

1.3 Details of EUT

Product Name	Rugged Phone
Brand Name	ZOOMSMART
Model No.	LT600
FCC ID	2AUFL-LT600
Mode of Operation	NFC
Frequency Range	13.56MHz
Modulation Type	ASK
Antenna Type	Internal Antenna
Antenna Gain	0 dBi
Extreme Temperature Range	0℃~ +40℃
Test Voltage	DC 3.85V

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

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the test.

1.5 Test Verdict

No.	FCC Part No.	ISED Part No.	Description	Test Result	Verdict
1	15.203	RSS-Gen7.1.4	Antenna Requirement	Clause 4.1.1	PASS
2	15.225(e)	RSS-210 B.6	Frequency Tolerance	Clause 4.1.2	PASS
3	2.1049	RSS-Gen	20dB Bandwidth and 99% Bandwidth	Clause 4.1.3	PASS
4	15.225	RSS-210 B.6	Radiated Emission	Clause 4.1.4	PASS
5	15.207	RSS-Gen	Conducted Emission	Clause 4.1.5	PASS

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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. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2020-07-28
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2020-06-24
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2020-06-19
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-19
V-network	SCHWARZBECK	NSLK 8127	8127-902	2020-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2020-08-22
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2020-06-06
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2020-06-06
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2020-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-26
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-08-28
Test Software	BL	BL410_E	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 dB
	> 1GHz	± 3 dB

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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	NXP	PNX

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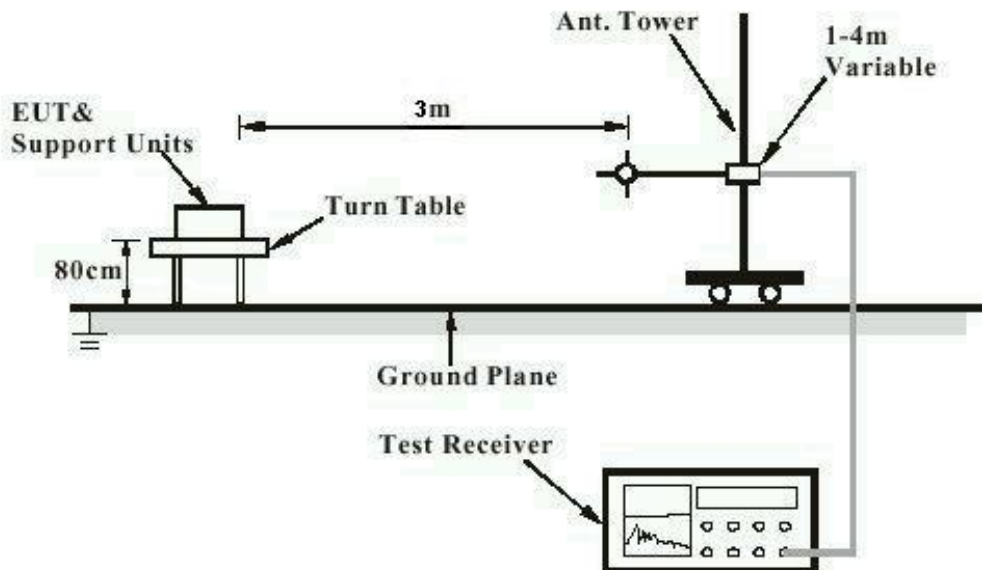
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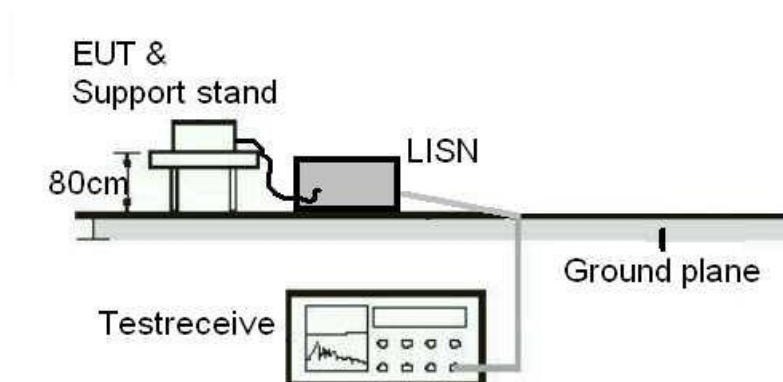
3.4 Test Setup Diagram

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



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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 directional gain of 0 dBi. The antenna is an internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

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

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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 : 52%

Table 1: Frequency Tolerance

Temperature (°C)	Voltage (VDC)	Measured		Limit (ppm)
		Frequency (MHz)	Tolerance (ppm)	
-20	3.85	13.559734223	20	< 100
-10		13.559745323	19	
0		13.559732145	20	
+10		13.559743233	19	
+20		13.559737160	19	
+40		13.559654434	25	
+50		13.559743425	19	
+20	3.6	13.559147453	63	
+20	4.4	13.559737160	19	

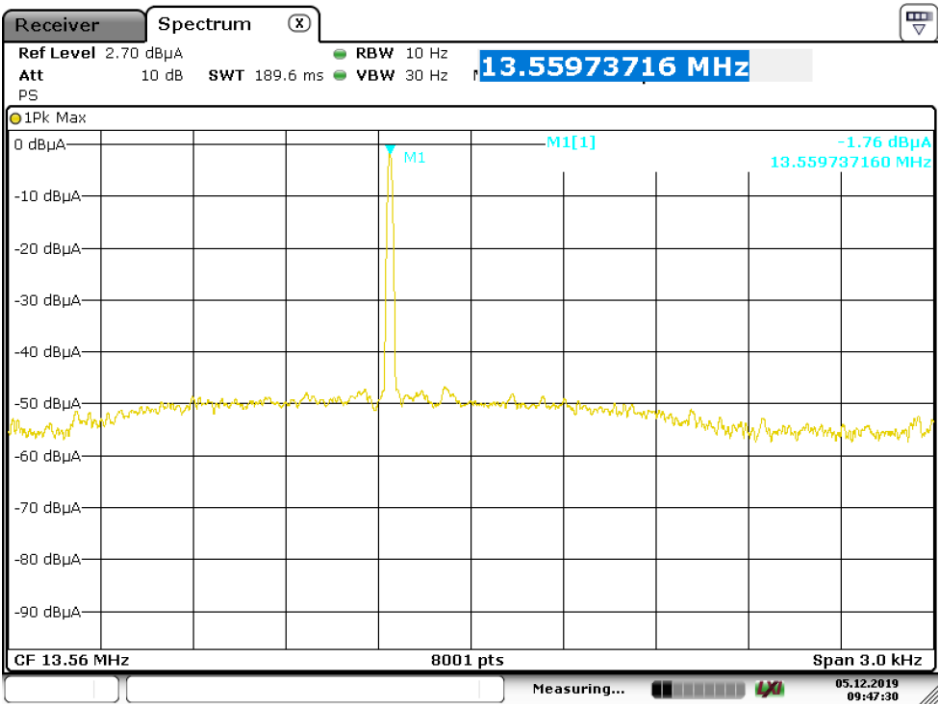
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Figure: +20(°C)/3.85VDC



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4.1.3 20dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 2.1049

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 : 52%

Table 2: 20dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
ASK	13.56	26.51	27.84

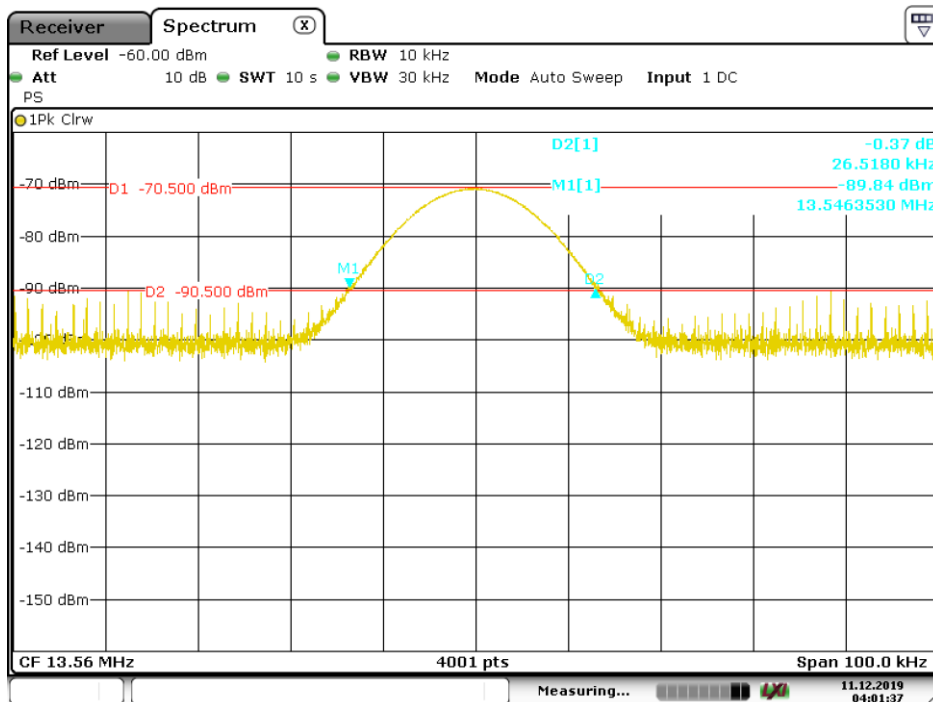
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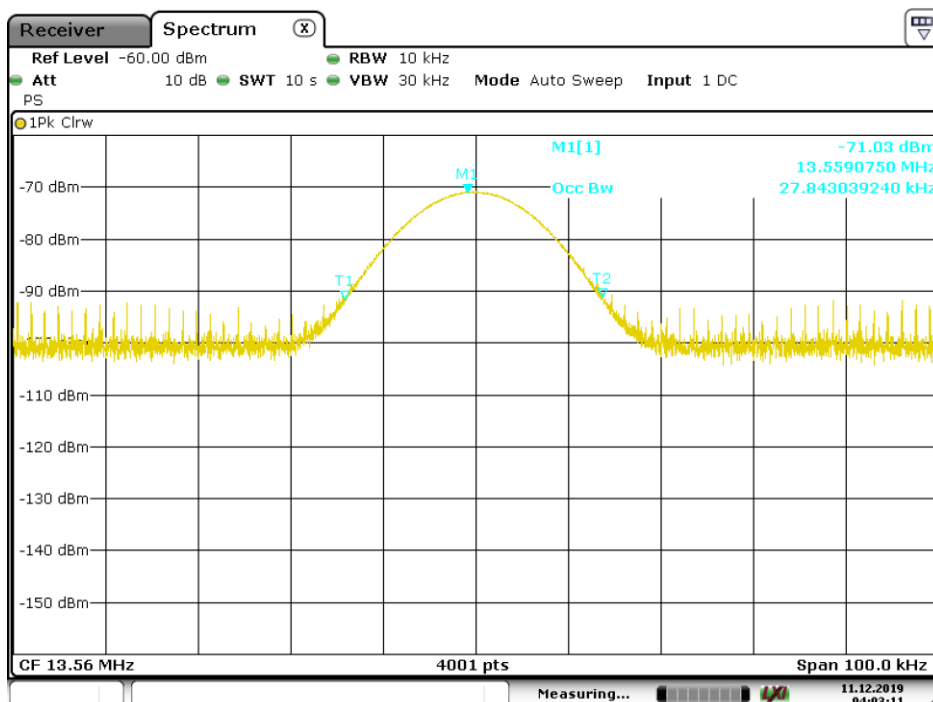
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Figure: 20dB Bandwidth



Date: 11.DEC.2019 04:01:37

Figure: 99% Bandwidth



Date: 11.DEC.2019 04:03:11

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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 : 52%

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.

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

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(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 than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dBuV/m}) = \text{Limit}_{300\text{m}}(\text{dBuV/m}) + 40\text{Log}(300\text{m}/3\text{m}) = \text{Limit}_{300\text{m}}(\text{dBuV/m}) + 80$$

$$\text{Limit}_{3\text{m}}(\text{dBuV/m}) = \text{Limit}_{30\text{m}}(\text{dBuV/m}) + 40\text{Log}(30\text{m}/3\text{m}) = \text{Limit}_{30\text{m}}(\text{dBuV/m}) + 40$$

(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.

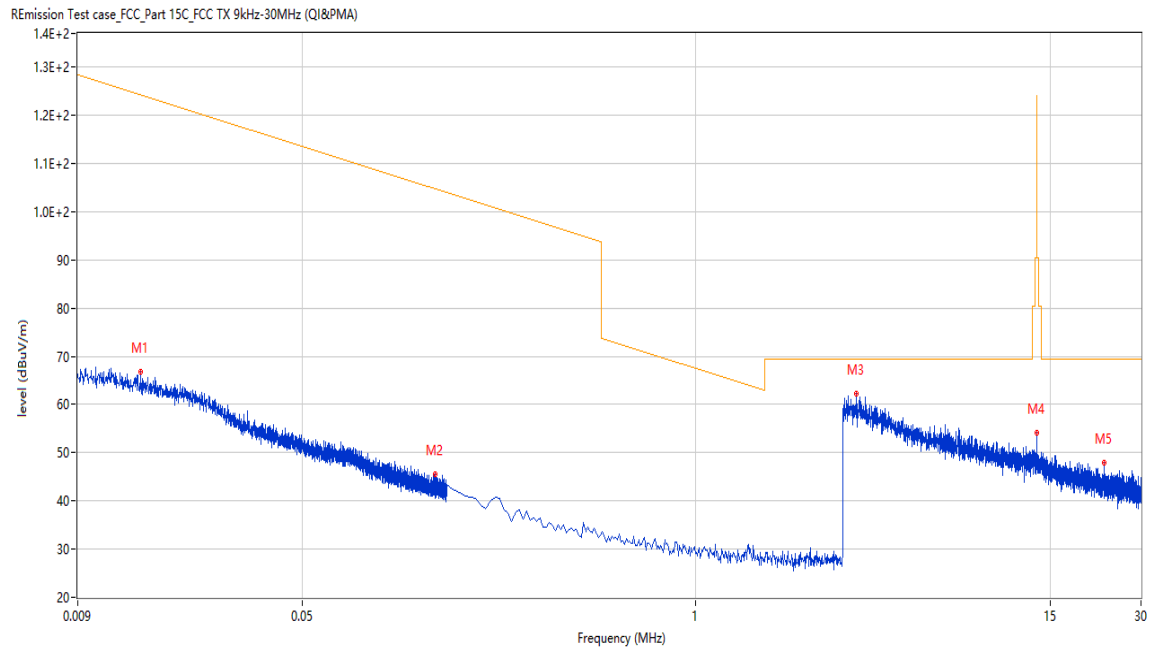
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Test data :



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.015	63.21	20.43	124.3	-61.09	Peak	107.60	100	Horizontal	Pass
2	0.137	45.49	21.05	104.8	-59.31	Peak	335.30	100	Horizontal	Pass
3	3.425	62.18	20.96	69.5	-7.32	Peak	360.00	100	Horizontal	Pass
4	13.557	54.16	20.94	124.0	-69.84	Peak	85.10	100	Horizontal	Pass
5	22.711	48.05	21.23	69.5	-21.45	Peak	360.00	100	Horizontal	Pass

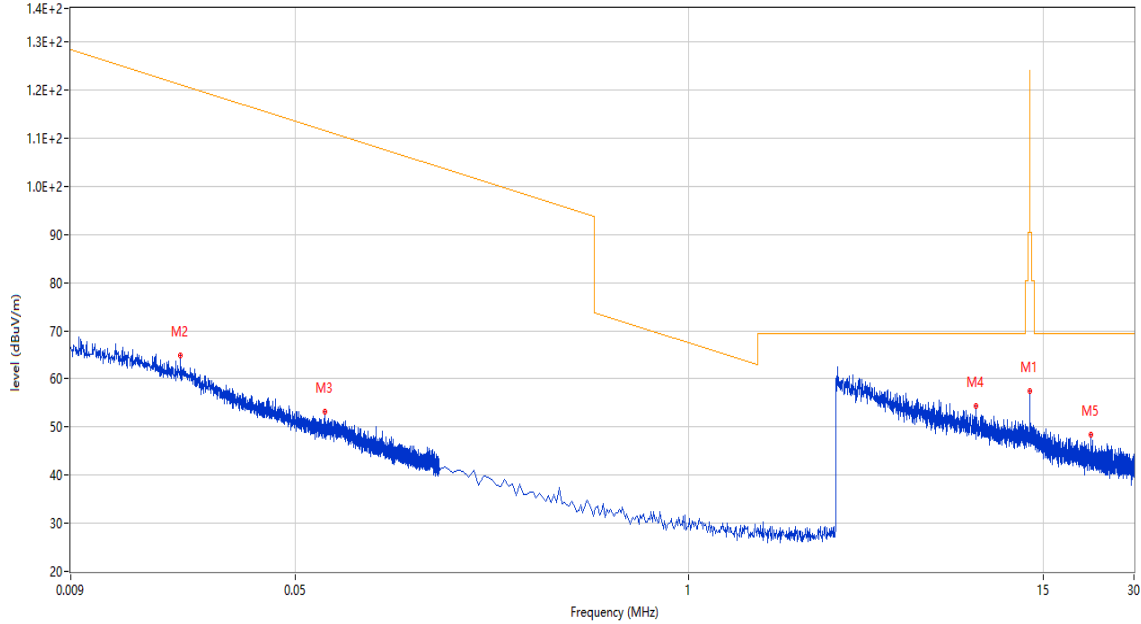
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REmission Test case_FCC_Part 15C_FCC TX 9kHz-30MHz (QI&PMA)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	13.557	57.41	20.94	124.0	-66.59	Peak	206.00	100	Vertical	Pass
2	0.021	61.98	20.73	121.2	-59.22	Peak	0.00	100	Vertical	Pass
3	0.062	53.23	21.07	111.6	-58.37	Peak	150.70	100	Vertical	Pass
4	8.991	54.43	21.07	69.5	-15.07	Peak	360.00	100	Vertical	Pass
5	21.569	48.34	21.19	69.5	-21.16	Peak	360.00	100	Vertical	Pass

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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 : 52%

For details refer to following test plot.

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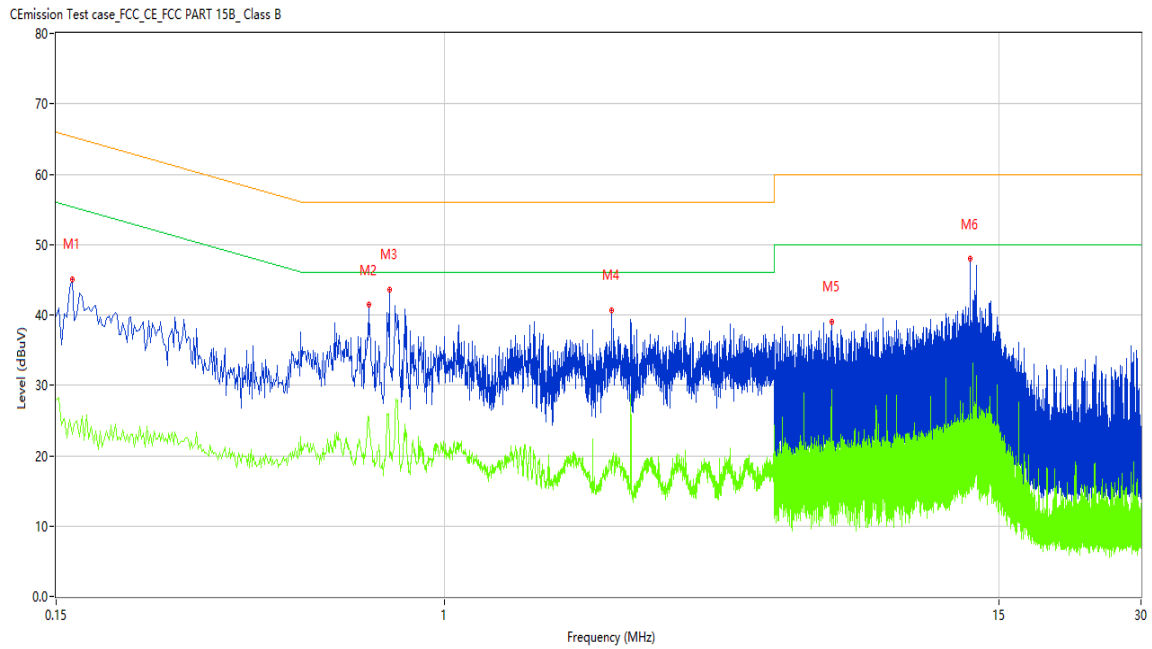
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Note:

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	0.154	43.20	10.15	65.78	-22.58	Peak	L	Pass
1*	0.154	34.22	10.15	65.78	-31.56	QP	L	Pass
1**	0.154	24.40	10.15	55.78	-31.38	AV	L	Pass
2	0.690	43.04	10.15	56.00	-12.96	Peak	L	Pass
2*	0.690	34.68	10.15	56.00	-21.32	QP	L	Pass
2**	0.690	25.50	10.15	46.00	-20.50	AV	L	Pass
3	0.764	43.01	10.15	56.00	-12.99	Peak	L	Pass
3*	0.764	30.48	10.15	56.00	-25.52	QP	L	Pass
3**	0.764	23.20	10.15	46.00	-22.80	AV	L	Pass
4	2.258	38.91	10.19	56.00	-17.09	Peak	L	Pass
4*	2.258	31.42	10.19	56.00	-24.58	QP	L	Pass
4**	2.258	18.69	10.19	46.00	-27.31	AV	L	Pass
5	6.616	38.00	10.30	60.00	-22.00	Peak	L	Pass
5*	6.616	29.39	10.30	60.00	-30.61	QP	L	Pass
5**	6.616	29.40	10.30	50.00	-20.60	AV	L	Pass
6	13.026	40.74	10.47	60.00	-19.26	Peak	L	Pass
6*	13.026	32.07	10.47	60.00	-27.93	QP	L	Pass
6**	13.026	29.14	10.47	50.00	-20.86	AV	L	Pass

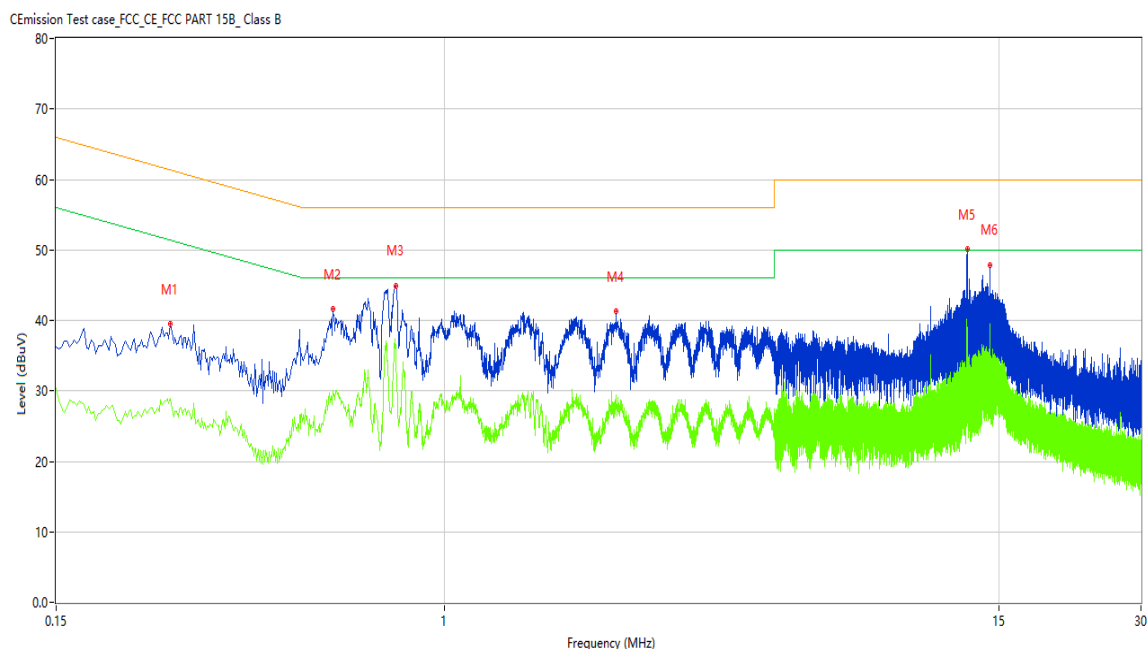
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Figure: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.262	40.58	10.14	61.37	-20.79	Peak	N	Pass
1*	0.262	35.30	10.14	61.37	-26.07	QP	N	Pass
1**	0.262	28.97	10.14	51.37	-22.40	AV	N	Pass
2	0.580	41.97	10.15	56.00	-14.03	Peak	N	Pass
2*	0.580	37.83	10.15	56.00	-18.17	QP	N	Pass
2**	0.580	30.06	10.15	46.00	-15.94	AV	N	Pass
3	0.788	46.10	10.15	56.00	-9.90	Peak	N	Pass
3*	0.788	44.65	10.15	56.00	-11.35	QP	N	Pass
3**	0.788	36.56	10.15	46.00	-9.44	AV	N	Pass
4	2.310	41.28	10.19	56.00	-14.72	Peak	N	Pass
4*	2.310	37.18	10.19	56.00	-18.82	QP	N	Pass
4**	2.310	29.10	10.19	46.00	-16.90	AV	N	Pass
5	12.872	43.78	10.46	60.00	-16.22	Peak	N	Pass
5*	12.872	36.55	10.46	60.00	-23.45	QP	N	Pass
5**	12.872	38.50	10.46	50.00	-11.50	AV	N	Pass
6	14.344	43.96	10.45	60.00	-16.04	Peak	N	Pass
6*	14.344	38.05	10.45	60.00	-21.95	QP	N	Pass
6**	14.344	39.56	10.45	50.00	-10.44	AV	N	Pass

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5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Rear of the sample

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5.2 Set-up for Conducted Emissions



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5.3 Set-up for Spurious Emissions below 30MHz



5.4 Set-up for Spurious Emissions above 30MHz



End of the report