

TEST REPORT

Report No.: SHE20040045-02CE

Date: 2020-7-22

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Applicant : Shenzhen UniStrong Science & Technology Co., Ltd.
Address of Applicant : B,4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China

Product Name : Rugged android tablet
Model No. : UT56
Sample No. : E20040045-01#05
FCC ID : 2AOPD-UT56
ISED Number : 11546A-UT56
Standards : FCC CFR47 Part 15, Subpart C
RSS-Gen (Issue 5, March 2019)
RSS-210 (Issue 10, December 2019)

Date of Receipt : 2020-4-23
Date of Test : 2020-4-23 ~ 2020-7-14
Date of Issue : 2020-7-21

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: jesse (jesse huang) Approved by: Guoyou Chi (Authorized signatory: 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	Shenzhen UniStrong Science & Technology Co.,Ltd.
Address	B,4-4Factory, Zhengcheng Road, Fuyong Baoan District, Shenzhen, China
Contact Person	Lili Zheng
Telephone	+86-21-54467182
Email	ll.zheng@unistrong.com

1.3 Details of EUT

Product Name	Rugged android tablet
Brand Name	Unistrong
Model No.	UT56
FCC ID	2AOPD-UT56
Mode of Operation	NFC
Frequency Range	13.56MHz
Modulation Type	ASK
Antenna Type	Internal Antenna
Antenna Gain	0 dBi
Extreme Temperature Range	-10°C ~ +55°C
Test Voltage	DC 3.8V

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.

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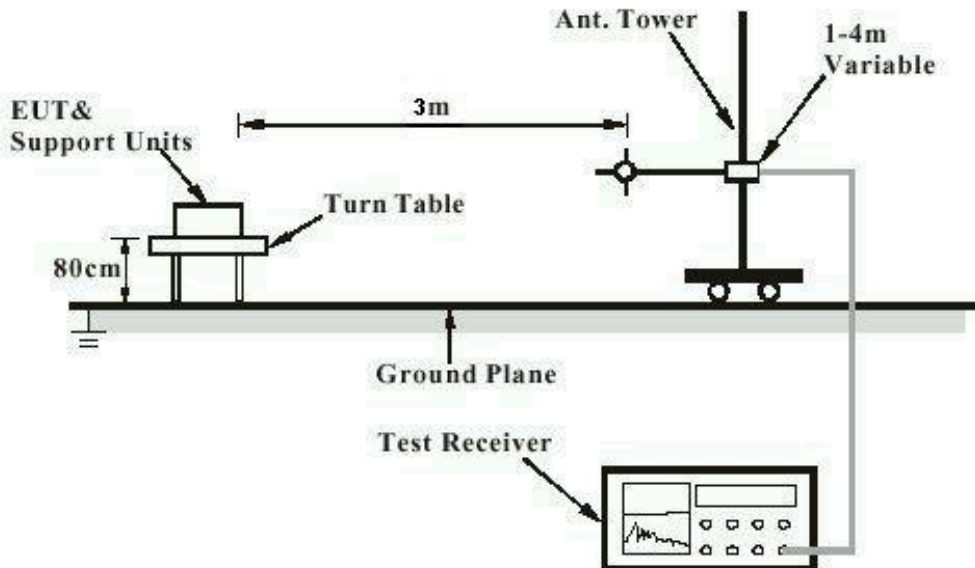
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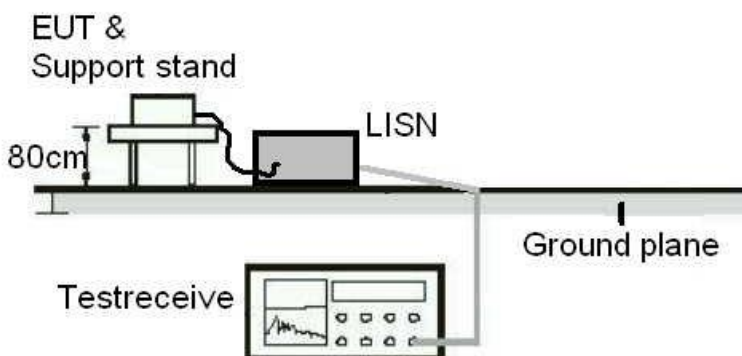
3.4 Test Setup Diagram

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 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	3.8	13.560000	0	< 100
-10		13.560000	0	
0		13.560000	0	
+10		13.560000	0	
+20		13.560000	0	
+40		13.560000	0	
+50		13.560000	0	
+20	2.8	13.559950	4	
+20	4.35	13.560000	0	

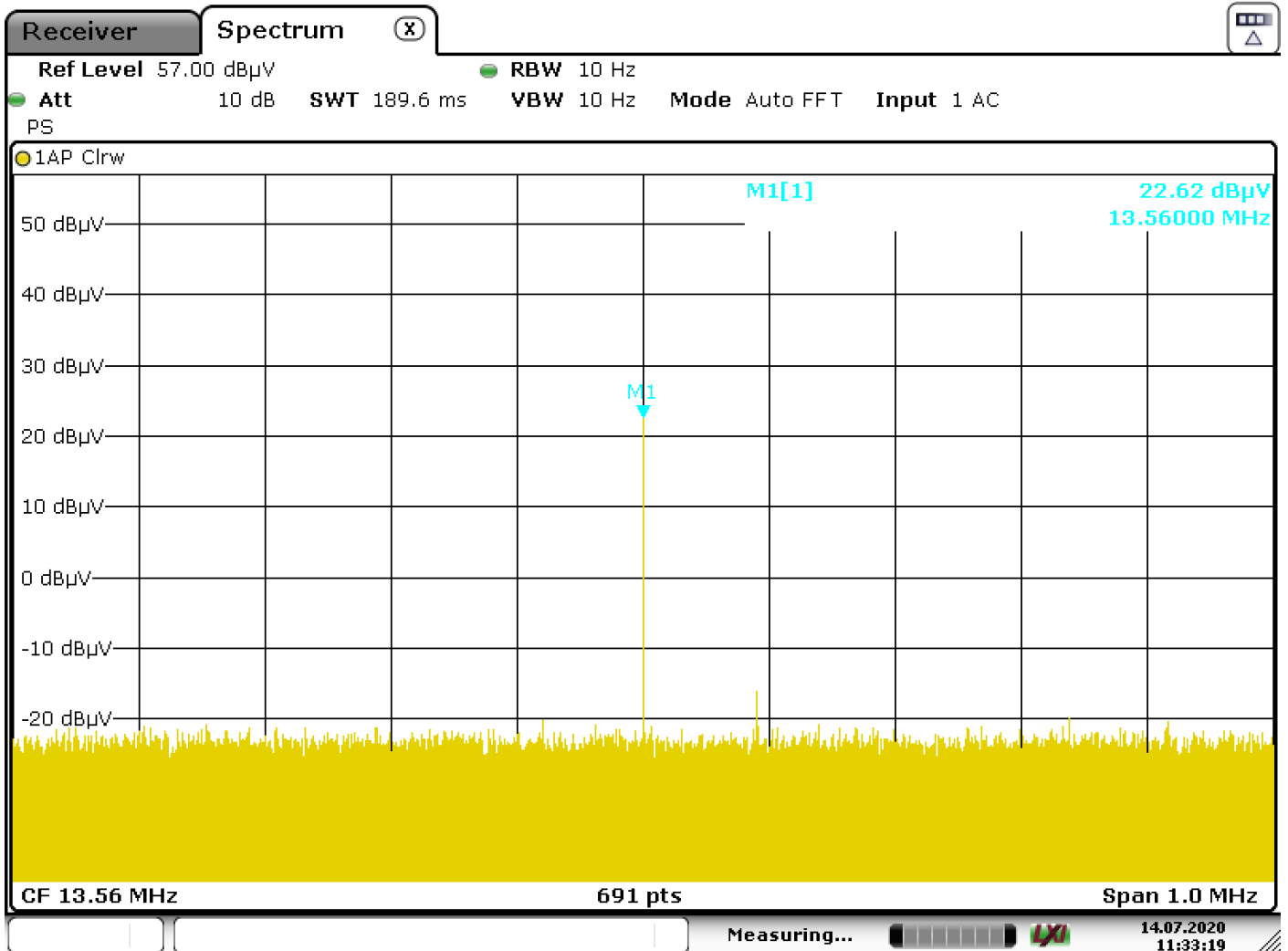
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Figure: Normal Condition



Date: 14.JUL.2020 11:33:19

14.07.2020
11:33:19

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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	24.75	21.129

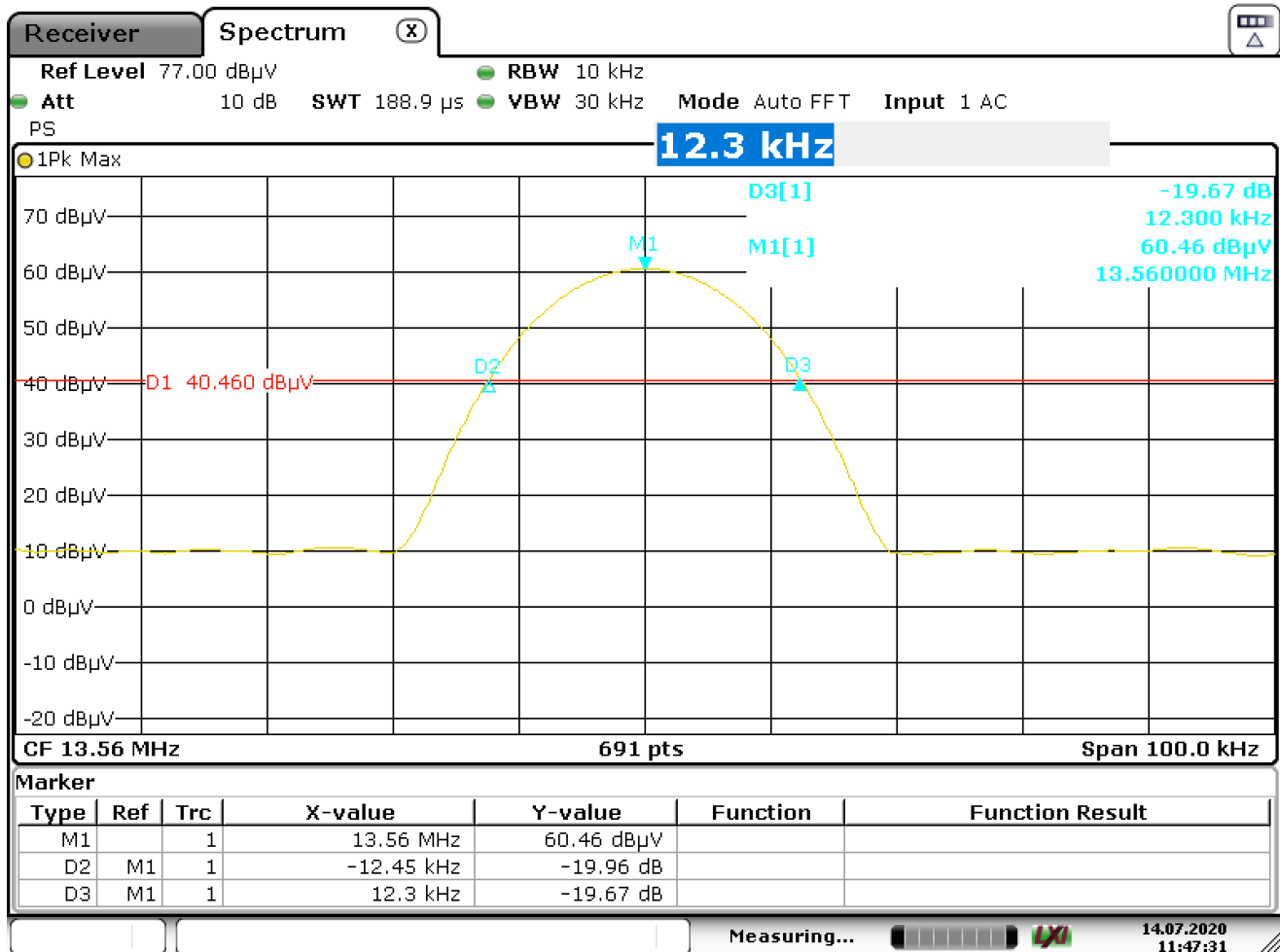
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Figure: 20dB Bandwidth



Date: 14.JUL.2020 11:47:31

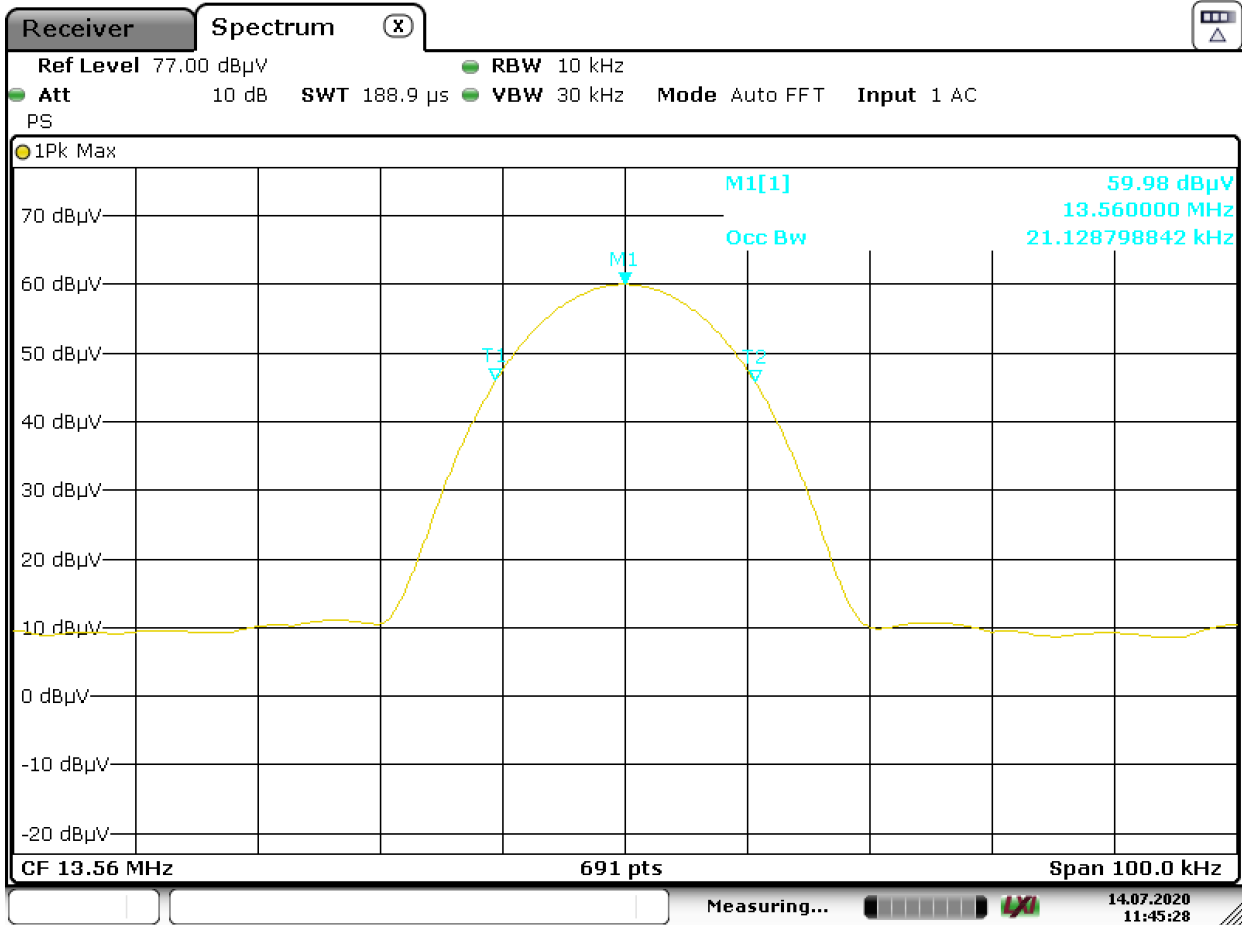
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Figure: 99% Bandwidth



Date: 14.JUL.2020 11:45:28

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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	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
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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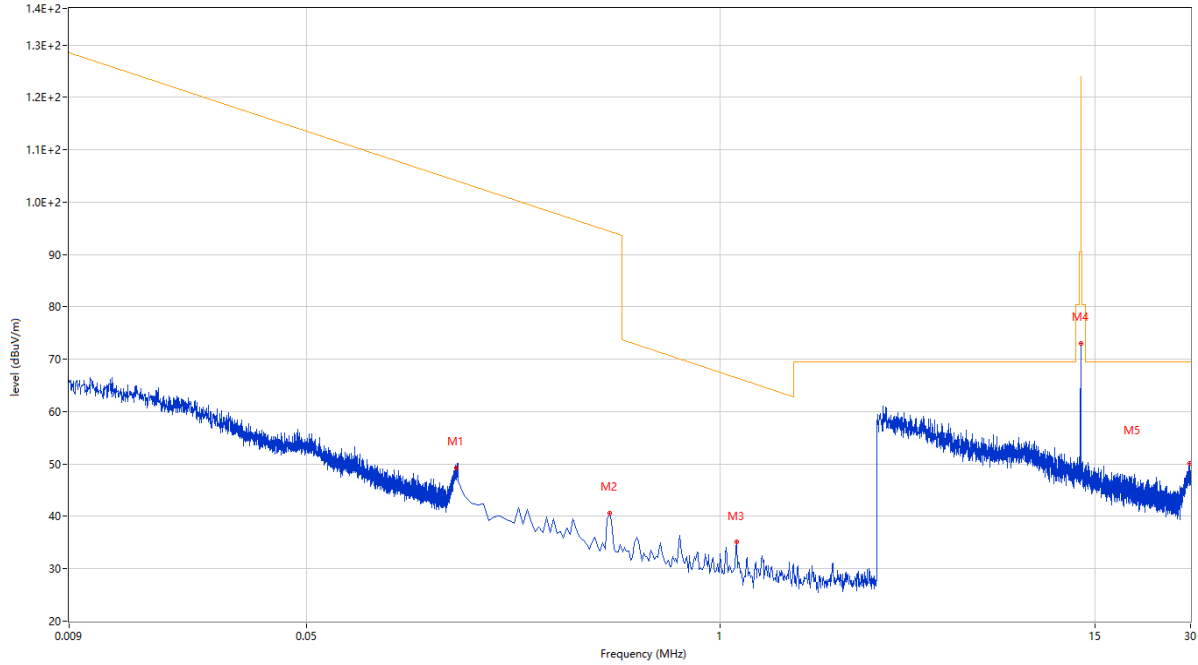
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Test data :

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	0.148	48.33	21.04	104.1	-55.77	Peak	97.60	100	Horizontal	Pass
2	0.448	40.70	21.07	94.5	-53.80	Peak	360.00	100	Horizontal	Pass
3	1.127	35.10	21.07	66.5	-31.40	Peak	145.70	100	Horizontal	Pass
4	13.557	73.09	20.94	124.0	-50.91	Peak	92.50	100	Horizontal	Pass
5	29.873	50.08	21.57	69.5	-19.42	Peak	360.00	100	Horizontal	Pass

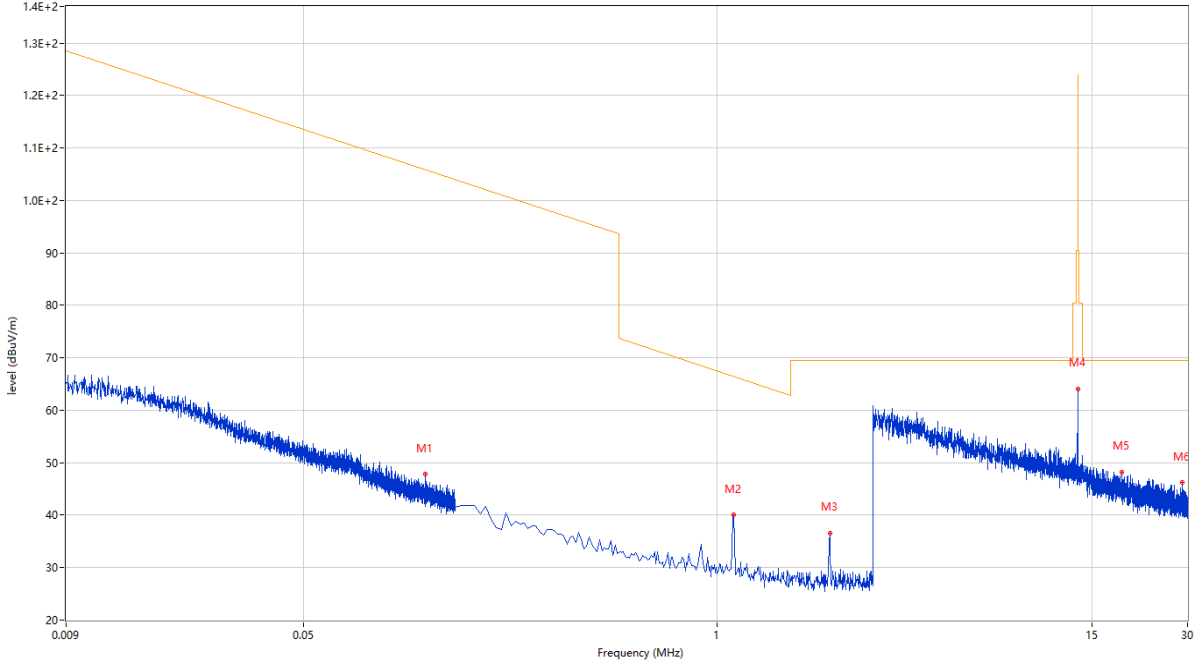
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R Emission Test case_FCC_Part 15C_FCC TX 9kHz-30MHz (QI&PMA)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.121	44.54	21.07	105.9	-61.36	Peak	194.00	100	Vertical	Pass
2	1.127	40.05	21.07	66.5	-26.45	Peak	360.00	100	Vertical	Pass
3	2.254	36.44	20.50	69.5	-33.06	Peak	359.60	100	Vertical	Pass
4	13.557	64.01	20.94	124.0	-59.99	Peak	329.50	100	Vertical	Pass
5	18.623	48.11	21.00	69.5	-21.39	Peak	360.00	100	Vertical	Pass
6	28.963	46.18	21.53	69.5	-23.32	Peak	360.00	100	Vertical	Pass

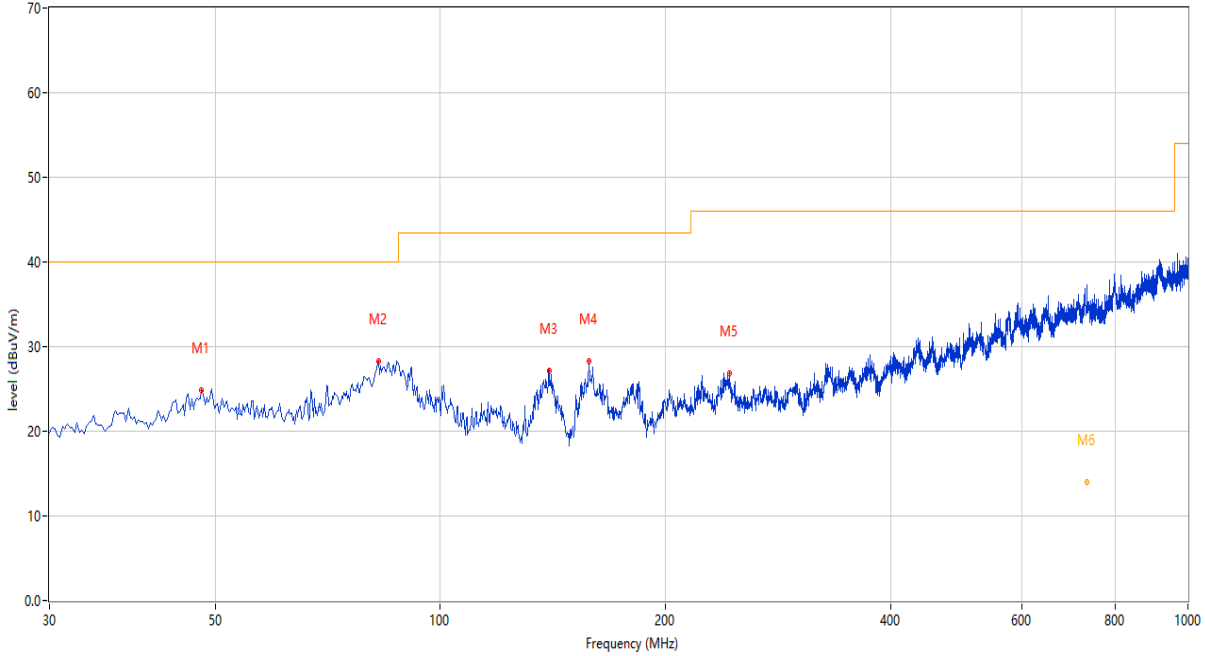
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REmission Test case_FCC_Part 15B_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.941	24.93	-23.67	40.0	-15.07	Peak	0.00	200	Horizontal	Pass
2	82.609	28.26	-28.74	40.0	-11.74	Peak	246.00	200	Horizontal	Pass
3	139.825	27.14	-29.06	43.5	-16.36	Peak	259.40	200	Horizontal	Pass
4	158.250	28.36	-27.89	43.5	-15.14	Peak	272.80	200	Horizontal	Pass
5	243.347	26.86	-25.28	46.0	-19.14	Peak	348.10	100	Horizontal	Pass
6	732.809	20.20	-14.02	46.0	-25.80	Peak	83.20	194	Horizontal	Pass
6*	732.809	13.97	-14.02	46.0	-32.03	QP	83.20	194	Horizontal	Pass

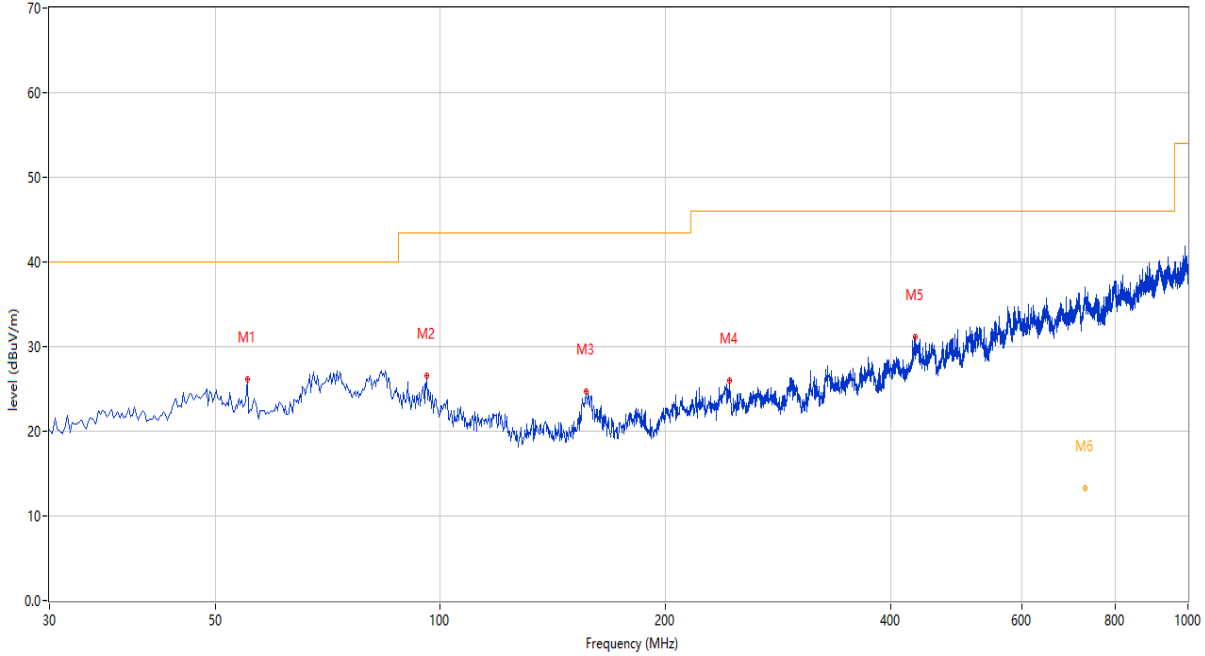
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REmission Test case_FCC_Part 15B_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	55.214	26.09	-25.46	40.0	-13.91	Peak	0.00	200	Vertical	Pass
2	95.944	26.61	-26.85	43.5	-16.89	Peak	0.00	200	Vertical	Pass
3	156.553	24.77	-27.53	43.5	-18.73	Peak	164.20	100	Vertical	Pass
4	243.347	25.93	-25.28	46.0	-20.07	Peak	0.00	200	Vertical	Pass
5	431.480	31.08	-19.37	46.0	-14.92	Peak	151.20	100	Vertical	Pass
6	728.708	20.05	-14.39	46.0	-25.95	Peak	239.40	386	Vertical	Pass
6*	728.708	13.29	-14.39	46.0	-32.71	QP	239.40	386	Vertical	Pass

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

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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.

Note:

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

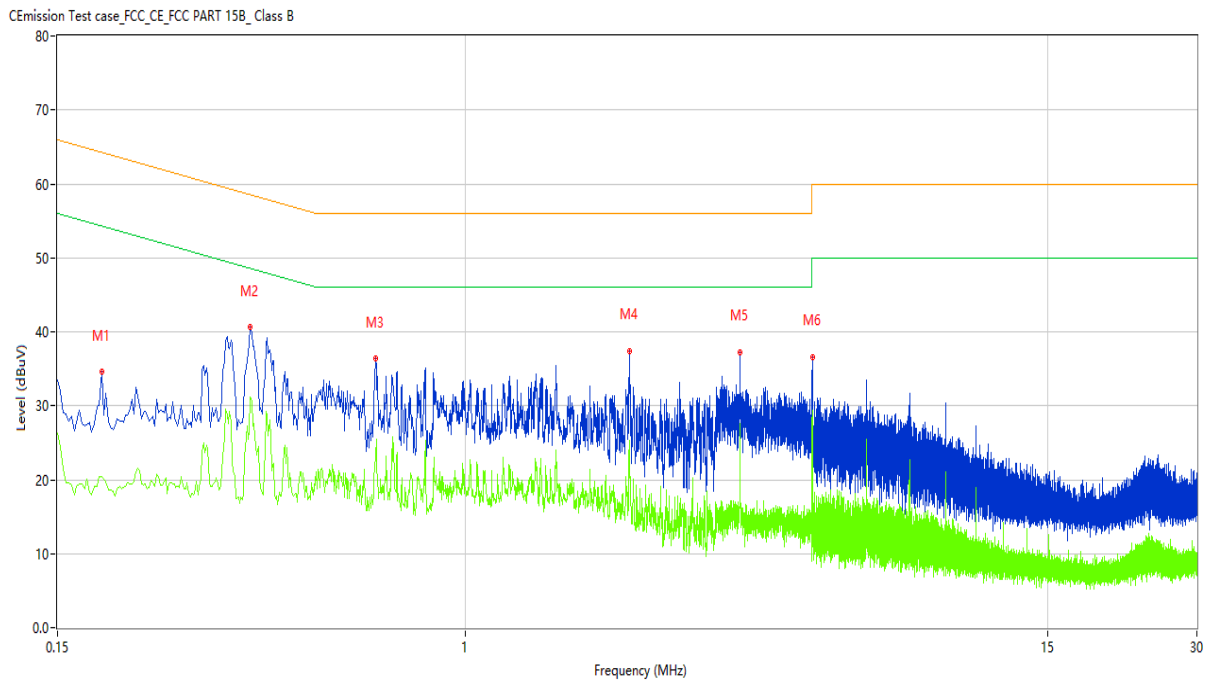
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Figure 1: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.184	40.40	10.15	64.30	-23.90	Peak	L	Pass
1*	0.184	30.71	10.15	64.30	-33.59	QP	L	Pass
1**	0.184	20.49	10.15	54.30	-33.81	AV	L	Pass
2	0.368	43.05	10.14	58.55	-15.50	Peak	L	Pass
2*	0.368	39.25	10.14	58.55	-19.30	QP	L	Pass
2**	0.368	31.25	10.14	48.55	-17.30	AV	L	Pass
3	0.658	37.26	10.15	56.00	-18.74	Peak	L	Pass
3*	0.658	31.14	10.15	56.00	-24.86	QP	L	Pass
3**	0.658	23.25	10.15	46.00	-22.75	AV	L	Pass
4	2.144	32.96	10.18	56.00	-23.04	Peak	L	Pass
4*	2.144	25.53	10.18	56.00	-30.47	QP	L	Pass
4**	2.144	25.17	10.18	46.00	-20.83	AV	L	Pass
5	3.584	38.69	10.23	56.00	-17.31	Peak	L	Pass
5*	3.584	33.43	10.23	56.00	-22.57	QP	L	Pass
5**	3.584	27.54	10.23	46.00	-18.46	AV	L	Pass
6	5.016	37.63	10.25	60.00	-22.37	Peak	L	Pass
6*	5.016	30.25	10.25	60.00	-29.75	QP	L	Pass
6**	5.016	29.37	10.25	50.00	-20.63	AV	L	Pass

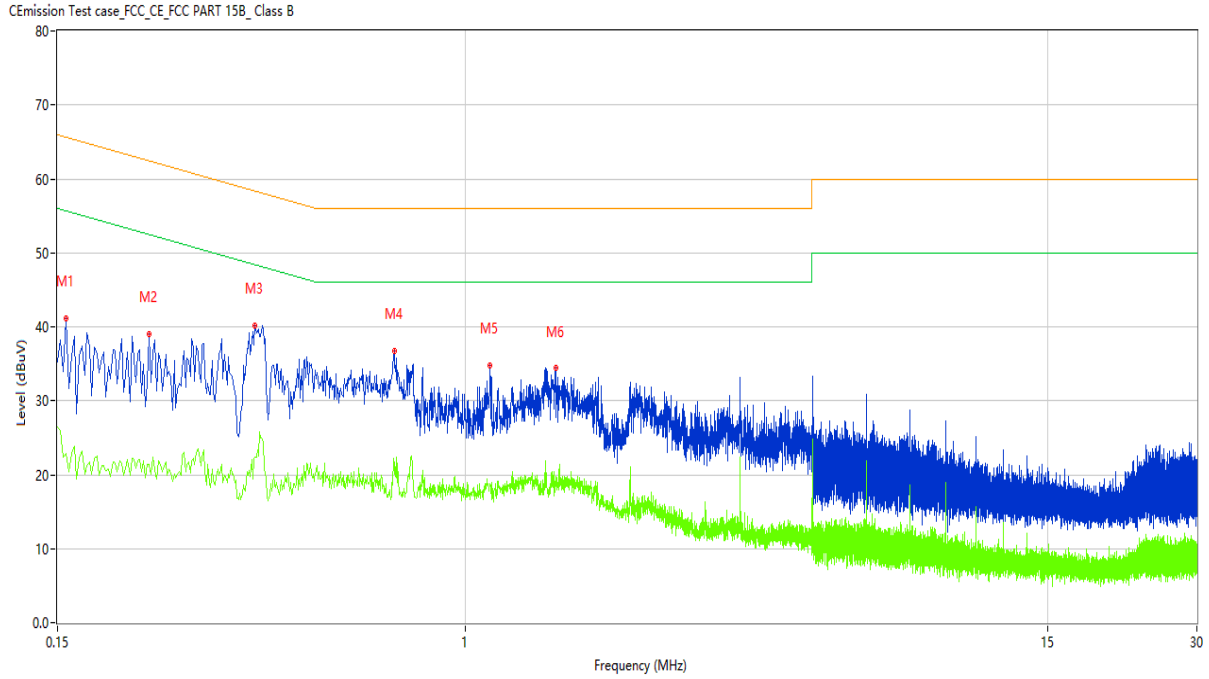
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Figure: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.150	42.94	10.15	66.00	-23.06	Peak	N	Pass
1*	0.150	34.34	10.15	66.00	-31.66	QP	N	Pass
1**	0.150	26.44	10.15	56.00	-29.56	AV	N	Pass
2	0.230	41.03	10.14	62.45	-21.42	Peak	N	Pass
2*	0.230	31.89	10.14	62.45	-30.56	QP	N	Pass
2**	0.230	21.46	10.14	52.45	-30.99	AV	N	Pass
3	0.376	40.74	10.14	58.37	-17.63	Peak	N	Pass
3*	0.376	35.78	10.14	58.37	-22.59	QP	N	Pass
3**	0.376	22.38	10.14	48.37	-25.99	AV	N	Pass
4	0.718	37.63	10.15	56.00	-18.37	Peak	N	Pass
4*	0.718	32.18	10.15	56.00	-23.82	QP	N	Pass
4**	0.718	21.45	10.15	46.00	-24.55	AV	N	Pass
5	1.120	35.57	10.16	56.00	-20.43	Peak	N	Pass
5*	1.120	27.20	10.16	56.00	-28.80	QP	N	Pass
5**	1.120	18.81	10.16	46.00	-27.19	AV	N	Pass
6	1.522	35.87	10.16	56.00	-20.13	Peak	N	Pass
6*	1.522	27.89	10.16	56.00	-28.11	QP	N	Pass
6**	1.522	19.68	10.16	46.00	-26.32	AV	N	Pass

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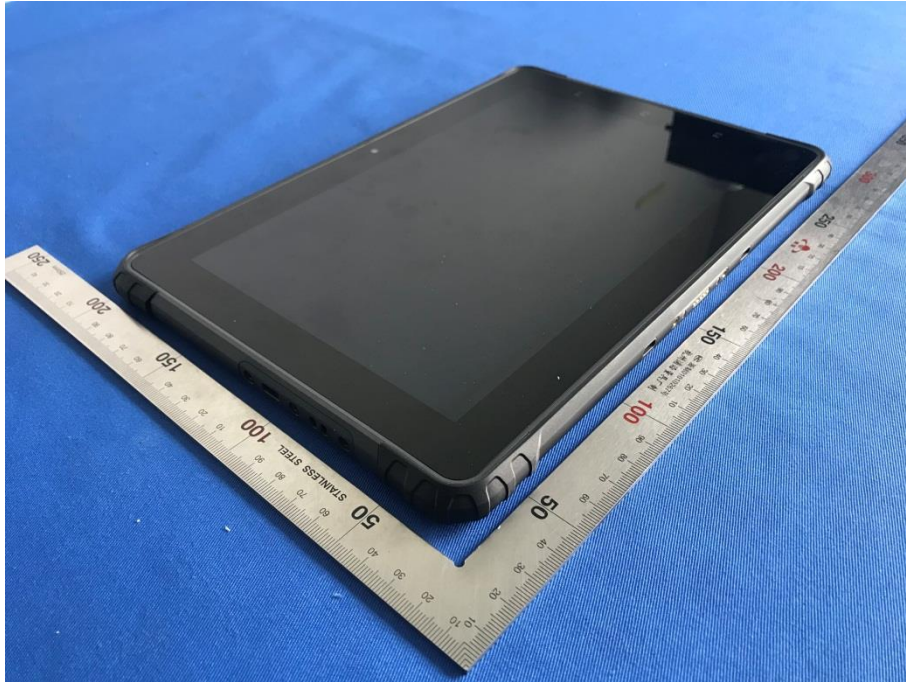
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5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Rear of the sample

TEST REPORT

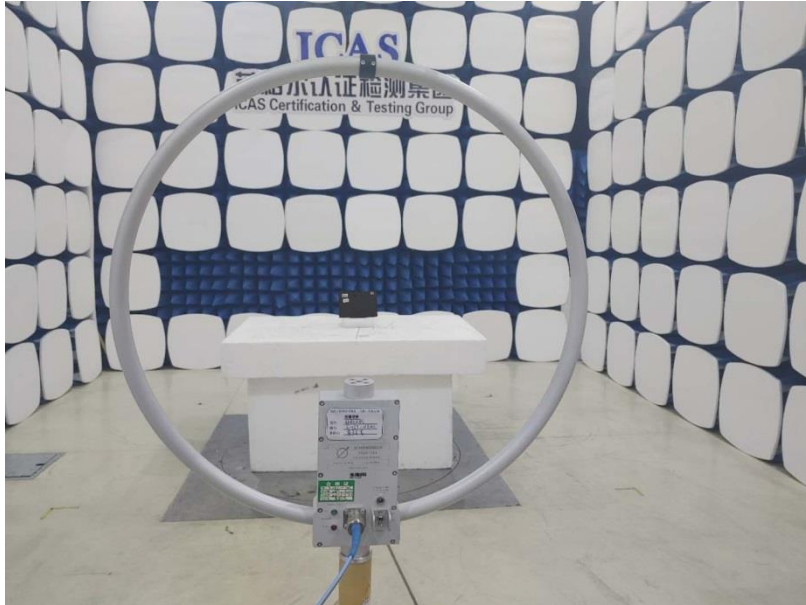
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5.2 Photographs of the Test Set-up

Below 30MHz



Above 30MHz



End of the report