

TEST REPORT

Report No.: SHE20060042-02CE

Date: 2021-01-28

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Applicant : Sonim Technologies Inc
Address of Applicant : 6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA

Product Name : Rugged Tablet
Model No. : RS80
Sample No. : E20060042-01#01
FCC ID : WYPRS80
ISED Number : 8090A-RS80
Standards : FCC CFR47 Part 15, Subpart C
RSS-Gen (Issue 5, March 2019)
RSS-210 (Issue 10, December 2019)

Date of Receipt : 2020-9-27
Date of Test : 2020-9-27 ~ 2021-01-28
Date of Issue : 2021-01-28

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 Reviewed by: Oliver Xiang Approved by: Guoyou Chi
(Jennifer Zhou) (jesse huang) (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 Service(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	Sonim Technologies Inc
Address	6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA
Contact Person	Avena.Xu
Telephone	1-650-378-8100
Email	avena.xu@sonimtech.com

1.3 Details of EUT

Product Name	Rugged Tablet
Brand Name	Sonim
Model No.	RS80
FCC ID	WYPRS80
Mode of Operation	NFC
Frequency Range	13.56MHz
Modulation Type	ASK
Hardware version	V1.00
Software version	80.0.0-01-10.0.0-00.35.01
Antenna Type	Internal Antenna
Extreme Temperature Range	-20°C~ +55°C
Test Voltage	High:DC 4.35V Normal:DC 3.8V Low:DC 3.7V

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	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-09
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-09
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-09
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-07-29
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-11-22
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2021-06-09
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2021-06-09
Test Software	BL	BL410_E	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	150kHz-30MHz	± 1.96 dB
Radiated Emission	30 MHz – 1 GHz	± 3.42 dB
	> 1GHz	± 4.20 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	/	/

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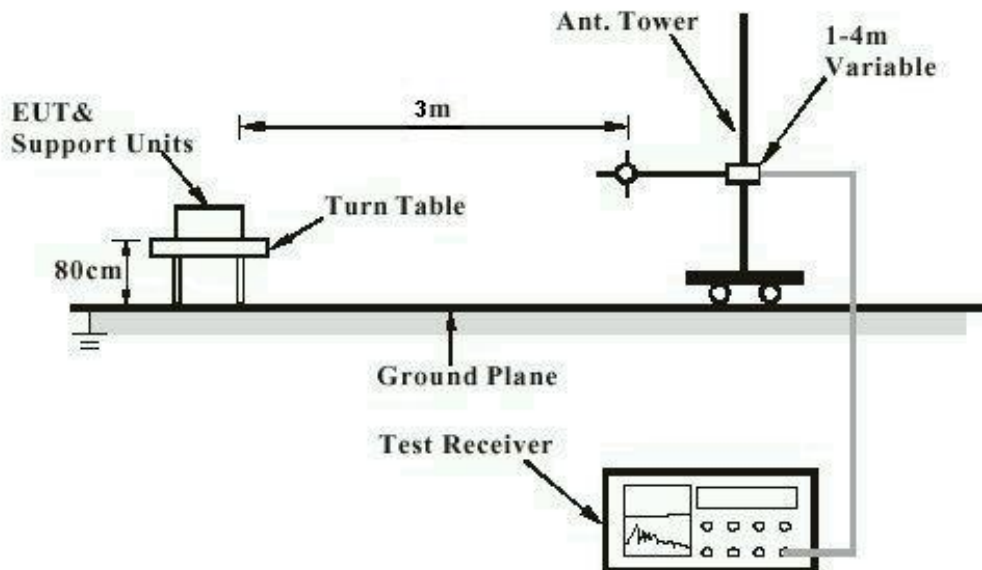
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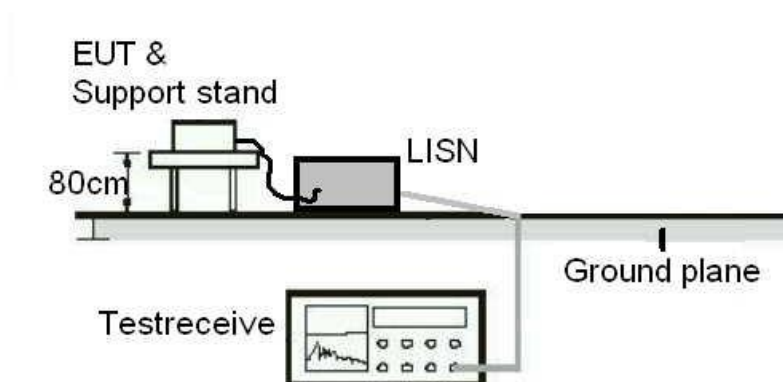
3.4 Test Setup Diagram

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%

Test Procedure

1.The test is performed in a Temperature Chamber.

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

Table 1: Frequency Tolerance

Temperature (°C)	Voltage (VDC)	Measured		Deviation Limit
		Frequency (MHz)	Tolerance (ppm)	
-20	3.8	13.559500	36.8732	±0.01%
-10		13.559750	18.4366	
0		13.559750	18.4366	
+10		13.559750	18.4366	
+20		13.559500	36.8732	
+40		13.559250	55.3097	
+50		13.559250	55.3097	
+20	2.8	13.559625	27.6549	±0.01%
+20	4.35	13.559875	9.21829	

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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%

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 $\geq$ 1% of the 20 dB bandwidth

VBW $\geq$ 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	432.7	515.2

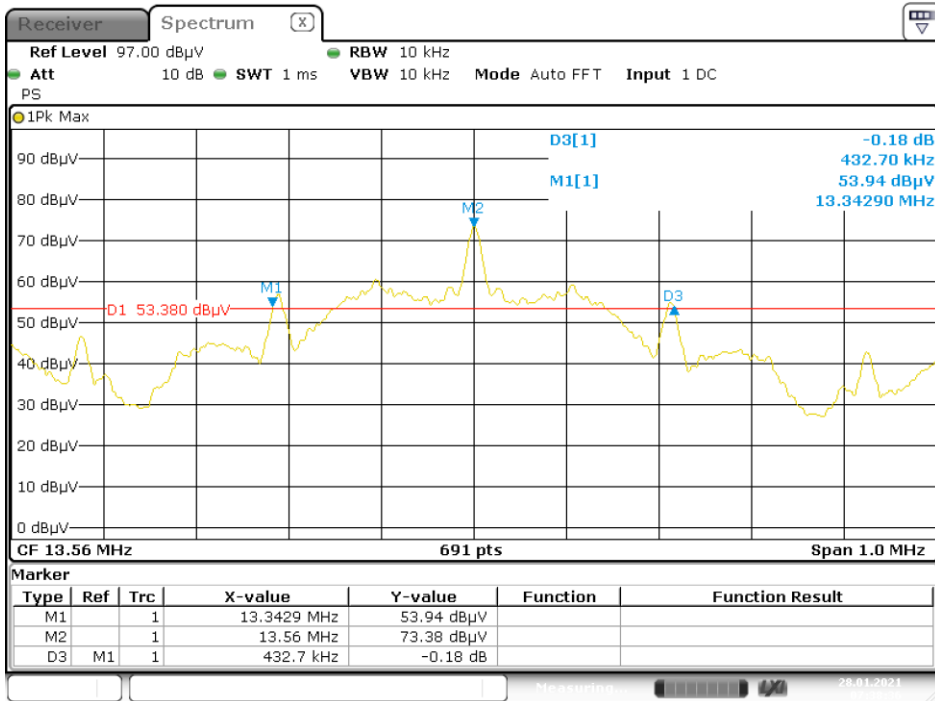
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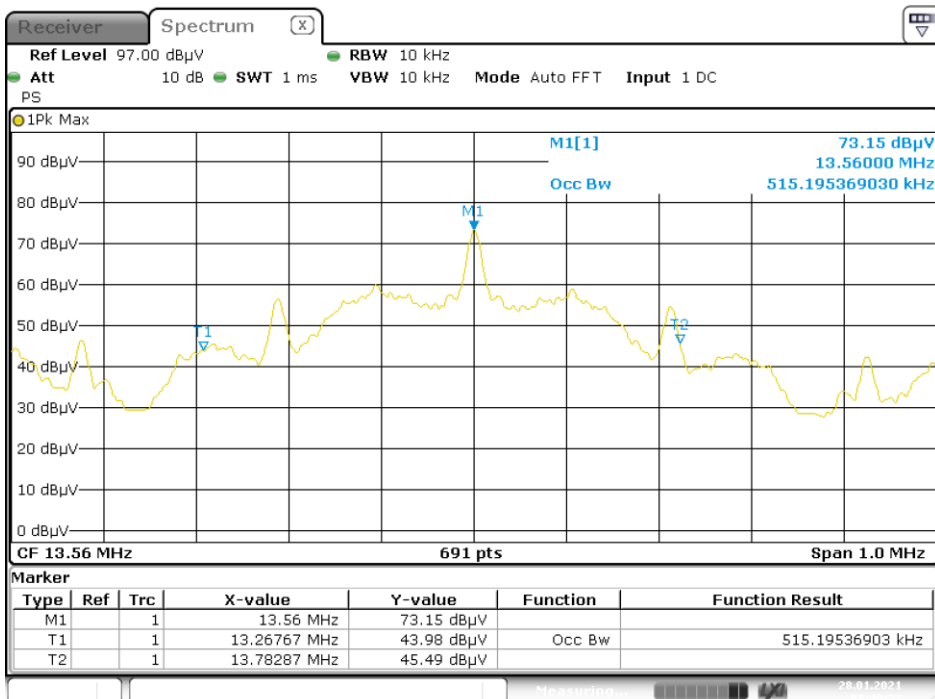
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Figure: 20dB Bandwidth



Date: 28.JAN.2021 07:38:36

Figure: 99% Bandwidth



Date: 28.JAN.2021 07:40:22

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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.

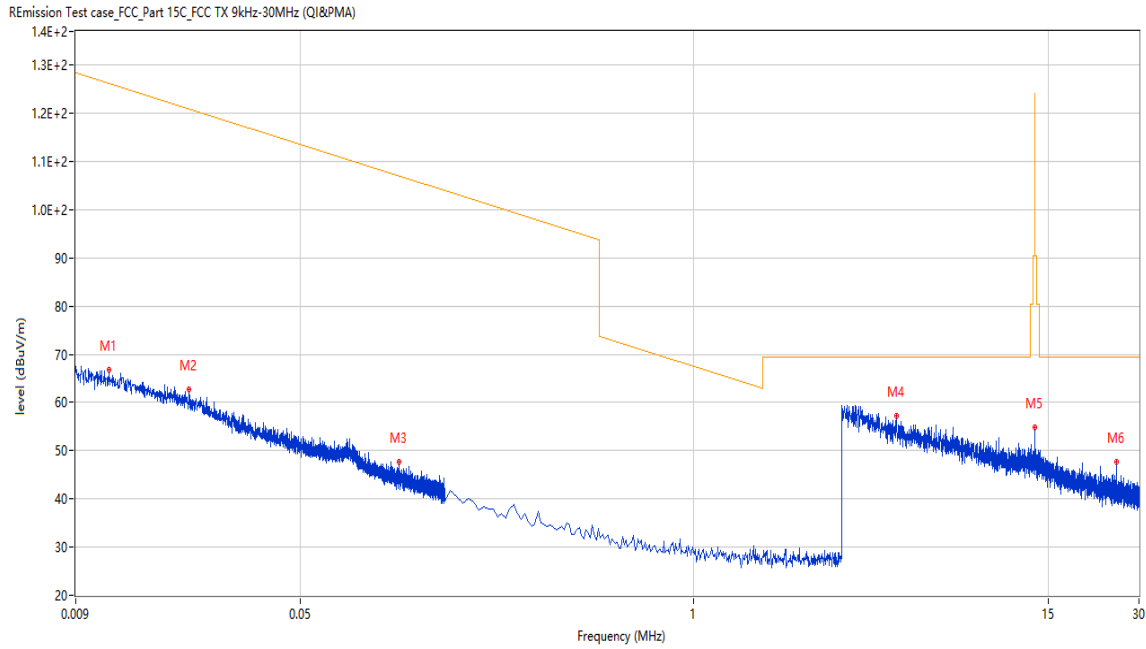
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Test data :



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.012	64.79	19.02	126.3	-61.51	Peak	233.00	100	Horizontal	Pass
2	0.021	60.22	19.79	121.0	-60.78	Peak	158.90	100	Horizontal	Pass
3	0.106	44.22	19.95	107.1	-62.88	Peak	206.30	100	Horizontal	Pass
4	4.708	57.34	19.91	69.5	-12.16	Peak	360.00	100	Horizontal	Pass
5	13.557	47.77	19.88	124.0	-76.23	Peak	360.00	100	Horizontal	Pass
6	25.285	40.59	20.12	69.5	-28.91	Peak	360.00	100	Horizontal	Pass

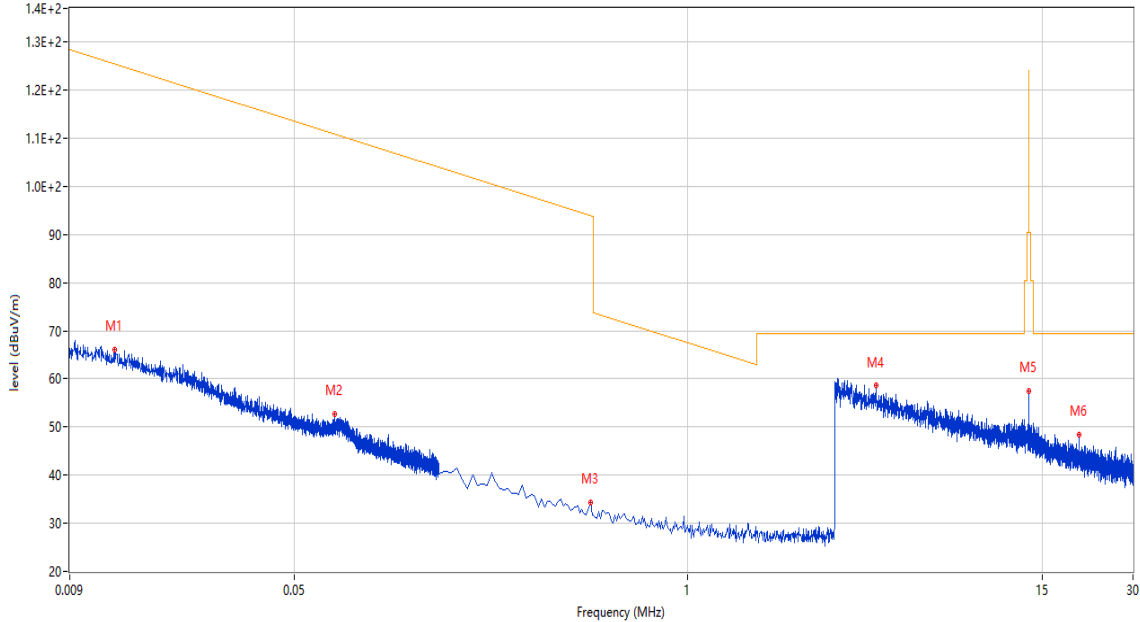
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REmission Test case_FCC_Part 15C_FCC TX 9kHz-30MHz (QI&PMA)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.013	63.52	19.15	125.5	-61.98	Peak	232.50	100	Vertical	Pass
2	0.068	52.68	20.05	110.9	-58.22	Peak	24.40	100	Vertical	Pass
3	0.478	34.39	19.89	93.9	-59.51	Peak	292.00	100	Vertical	Pass
4	4.216	58.77	19.89	69.5	-10.73	Peak	360.00	100	Vertical	Pass
5	13.557	57.49	19.88	124.0	-66.51	Peak	176.80	100	Vertical	Pass
6	19.854	48.30	19.92	69.5	-21.20	Peak	360.00	100	Vertical	Pass

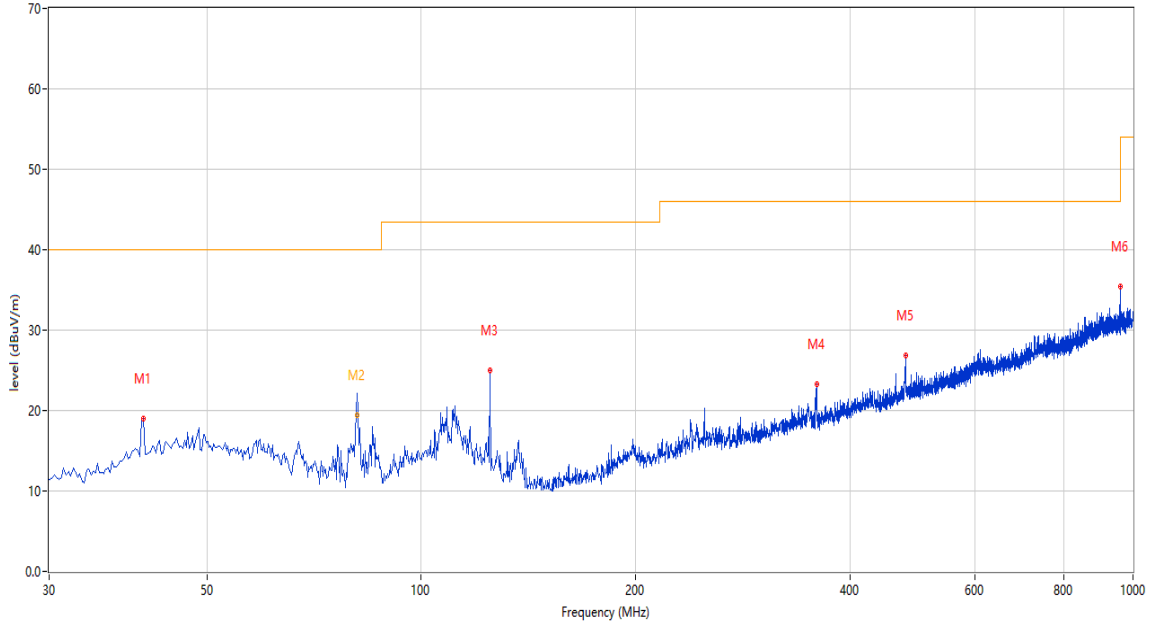
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REmission Test case_FCC_Part 15C_FCC 15.247(2.4G)_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.667	19.02	-20.46	40.0	-20.98	Peak	110.60	200	Horizontal	Pass
2	81.169	23.62	-25.92	40.0	-16.38	Peak	18.90	216	Horizontal	Pass
2*	81.169	19.45	-25.92	40.0	-20.55	QP	18.90	216	Horizontal	Pass
3	124.794	24.96	-23.36	43.5	-18.54	Peak	0.00	200	Horizontal	Pass
4	359.718	23.30	-16.37	46.0	-22.70	Peak	0.00	100	Horizontal	Pass
5	479.725	26.90	-12.95	46.0	-19.10	Peak	9.80	200	Horizontal	Pass
6	959.513	35.38	-3.19	46.0	-10.62	Peak	41.70	200	Horizontal	Pass

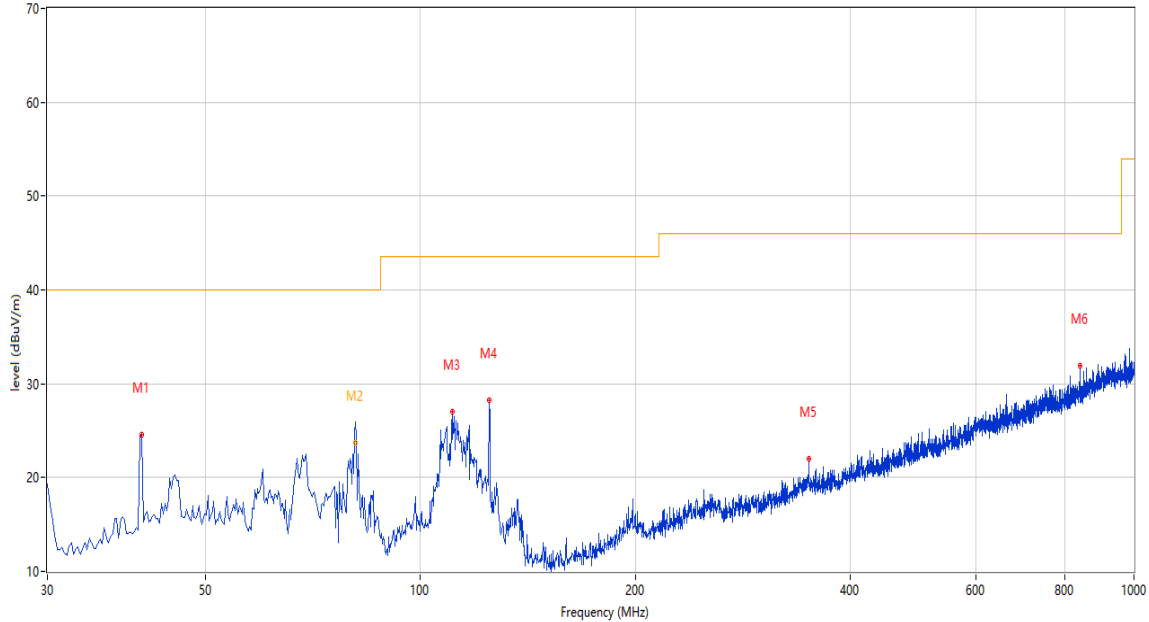
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REmission Test case_FCC_Part 15C_FCC 15.247(2.4G)_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.667	24.57	-20.46	40.0	-15.43	Peak	69.80	100	Vertical	Pass
2	81.169	34.36	-25.92	40.0	-5.64	Peak	197.10	273	Vertical	Pass
2*	81.169	23.73	-25.92	40.0	-16.27	QP	197.10	273	Vertical	Pass
3	110.732	27.01	-21.31	43.5	-16.49	Peak	0.00	200	Vertical	Pass
4	124.794	28.29	-23.36	43.5	-15.21	Peak	0.00	200	Vertical	Pass
5	350.505	22.03	-15.64	46.0	-23.97	Peak	0.00	200	Vertical	Pass
6	840.960	31.87	-5.59	46.0	-14.13	Peak	0.00	200	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.

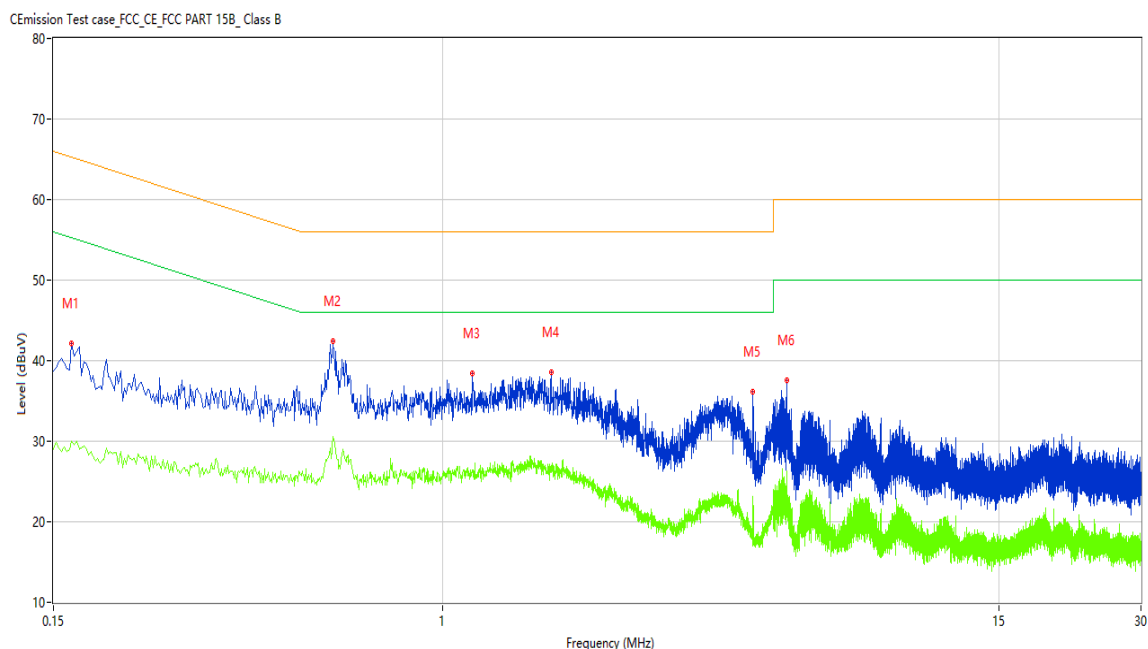
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Figure 1: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBUV)	Factor (dB)	Limit (dBUV)	Over Limit (dB)	Detector	Line	Verdict
1	0.164	40.96	9.67	65.26	-24.30	Peak	L	Pass
1*	0.164	30.84	9.67		-34.42	QP	L	Pass
1**	0.164	29.94	9.67	55.26	-25.32	AV	L	Pass
2	0.586	41.71	9.76	56.00	-14.29	Peak	L	Pass
2*	0.586	37.65	9.76	56.00	-18.35	QP	L	Pass
2**	0.586	30.54	9.76	46.00	-15.46	AV	L	Pass
3	1.156	33.03	9.66	56.00	-22.97	Peak	L	Pass
3*	1.156	26.73	9.66	56.00	-29.27	QP	L	Pass
3**	1.156	26.30	9.66	46.00	-19.70	AV	L	Pass
4	1.698	33.86	9.67	56.00	-22.14	Peak	L	Pass
4*	1.698	27.08	9.67	56.00	-28.92	QP	L	Pass
4**	1.698	26.72	9.67	46.00	-19.28	AV	L	Pass
5	4.532	33.99	9.69	56.00	-22.01	Peak	L	Pass
5*	4.532	22.14	9.69	56.00	-33.86	QP	L	Pass
5**	4.532	23.14	9.69	46.00	-22.86	AV	L	Pass
6	5.346	36.60	9.70	60.00	-23.40	Peak	L	Pass
6*	5.346	28.37	9.70	60.00	-31.63	QP	L	Pass
6**	5.346	24.19	9.70	50.00	-25.81	AV	L	Pass

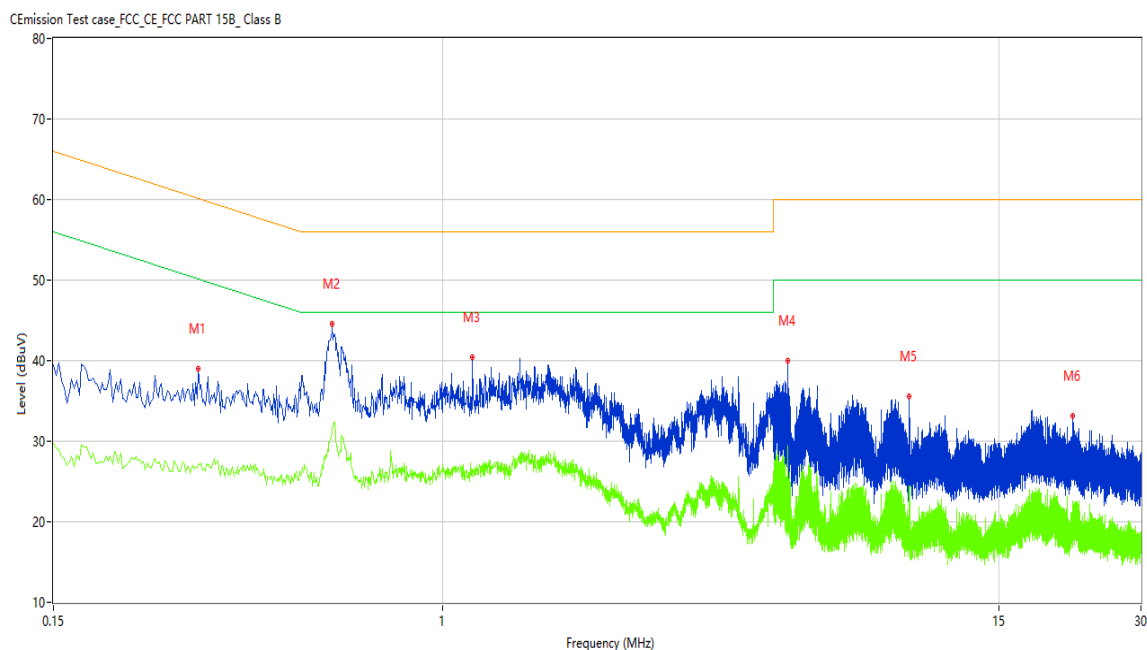
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Figure: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.304	34.25	9.70	60.13	-25.88	Peak	N	Pass
1*	0.304	28.68	9.70	60.13	-31.45	QP	N	Pass
1**	0.304	27.08	9.70	50.13	-23.05	AV	N	Pass
2	0.584	43.89	9.76	56.00	-12.11	Peak	N	Pass
2*	0.584	40.24	9.76	56.00	-15.76	QP	N	Pass
2**	0.584	31.61	9.76	46.00	-14.39	AV	N	Pass
3	1.156	33.79	9.66	56.00	-22.21	Peak	N	Pass
3*	1.156	26.75	9.66	56.00	-29.25	QP	N	Pass
3**	1.156	26.59	9.66	46.00	-19.41	AV	N	Pass
4	5.370	39.89	9.70	60.00	-20.11	Peak	N	Pass
4*	5.370	28.27	9.70	60.00	-31.73	QP	N	Pass
4**	5.370	26.92	9.70	50.00	-23.08	AV	N	Pass
5	9.714	35.53	9.65	60.00	-24.47	Peak	N	Pass
5*	9.714	23.68	9.65	60.00	-36.32	QP	N	Pass
5**	9.714	24.42	9.65	50.00	-25.58	AV	N	Pass
6	21.544	32.28	9.44	60.00	-27.72	Peak	N	Pass
6*	21.544	25.09	9.44	60.00	-34.91	QP	N	Pass
6**	21.544	21.58	9.44	50.00	-28.42	AV	N	Pass

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5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Rear of the sample

TEST REPORT

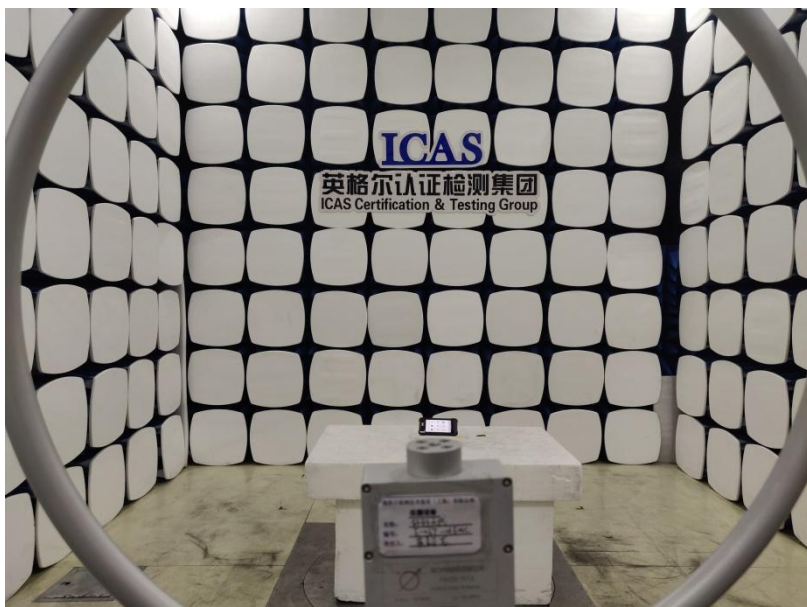
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5.2 Photographs of the Test Set-up

Below 30MHz



Above 30MHz



End of the report