

FCC PART 15B, CLASS B TEST REPORT

For

IMachine (Xiamen) Intelligent Devices Co.,Ltd.

Unit 1502-2, No.3 Jinzhong Road, Huli District, Xiamen, China

FCC ID: 2AUA5-IMACHINE-A1

Report Type: Original Report	Product Type: ALL IN ONE
Report Number: RXM190916056-00A	
Report Date: 2020-03-19	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	ALL IN ONE
Tested Model	A1
Multiple Model	B1, C1, D1, E1, F1, G1, H1, I1, J1
Voltage Range	DC 24V from adapter
Highest operating frequency	2480 MHz
Date of Test	2019-10-15 to 2020-03-19
Sample serial number	RXM190926050-RF-S1(Assigned by BACL, Shenzhen)
Received date	2019-09-16
Sample/EUT Status	Good condition
Adapter information	Model: DJ-240250-SA Input: AC 100-240V, 50/60Hz, 0.15A Output: DC 24V, 2.5A

Notes: This series products model: B1, C1, D1, E1, F1, G1, H1, I1, J1 and A1 are electrically identical. Model A1 was selected for fully testing, the detailed information can be referred to the product similarity declaration letter.

Objective

This test report is prepared on behalf of *IMachine (Xiamen) Intelligent Devices Co.,Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A, B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of the EUT with FCC Part 15 B.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS&DTS submissions with FCC ID: 2AUA5-IMACHINE-A1.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will be taken into consideration for the test data recorded in the report

Parameter		uncertainty
Conducted Emissions		$\pm 1.95\text{dB}$
Emissions, radiated	Below 1GHz	$\pm 4.75\text{dB}$
	Above 1GHz	$\pm 4.88\text{dB}$

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a manufacturer testing fashion.

Test mode: operating (during test,the EUT screen was playing video, ping data with router from LAN port, read and write data from U-disk, and the printer was printing)

EUT Exercise Software

N/A

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

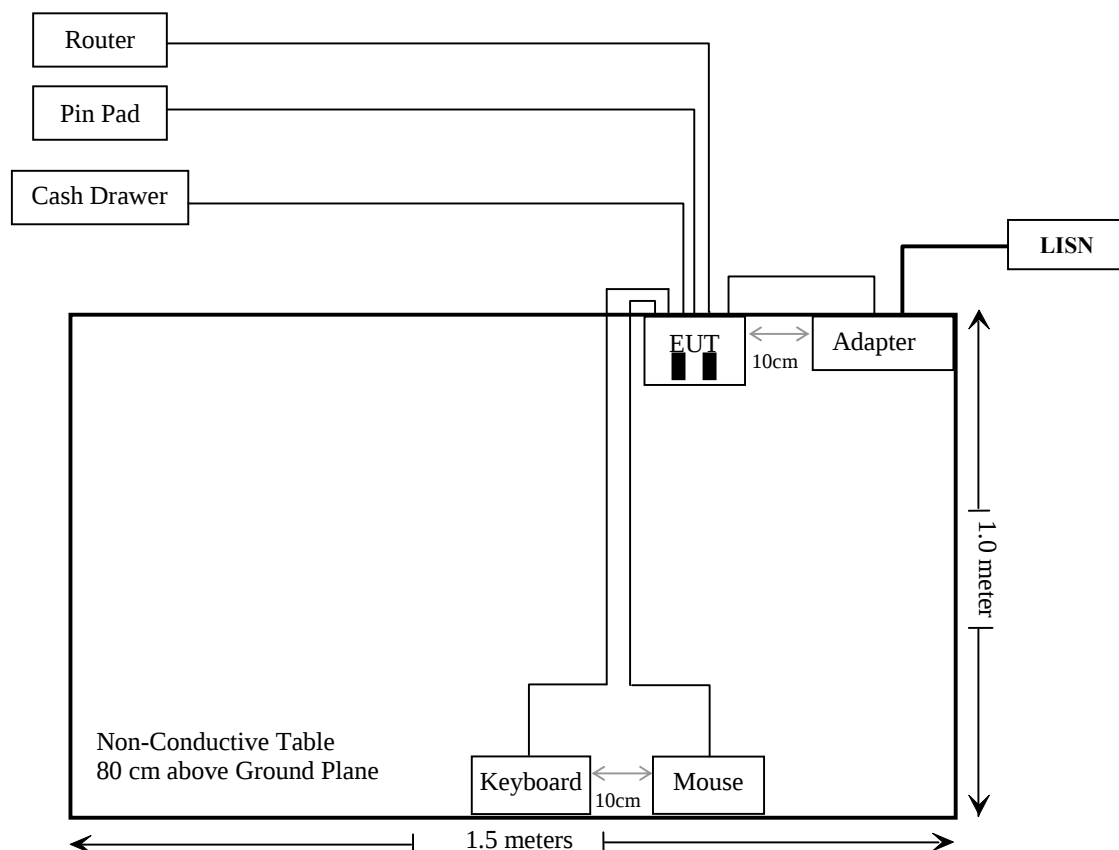
Manufacturer	Description	Model	Serial Number
Microsoft	Keyboard	1406	0200706128743
DELL	Mouse	MOC5UO	G1900NKD
TECLAST	U-disk	Un-known	Un-known
ADATA	U-disk	Un-known	Un-known
TECLAST	U-disk	Un-known	Un-known
SAGEM	Router	SAGEM F@ST TM 2604 White	Un-known
MAKEN	Cash Drawer	MT-350T	Un-known
YD	PIN Pad	YD511DA-RJ	Un-known

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shielding Detachable USB Cable	1.5	EUT	Mouse
Shielding Detachable K/B Cable With Magnet Ring	1.5	EUT	Keyboard
Un-Shielding Detachable AC Cable	1.2	LISN	Adapter
Un-Shielding Detachable DC Cable	1.2	EUT	Adapter
Un-Shielding Detachable RJ45 Cable	10	EUT	Router
Un-Shielding Detachable RJ11 Cable	10	EUT	Cash Drawer
Un-Shielding Detachable RJ9 to RS232 Cable	10	EUT	PIN Pad

Block Diagram of Test Setup

For conducted emission:



Note: ■ mark U-disk

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Spurious Emissions	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019/7/9	2020/7/8
Rohde & Schwarz	LISN	ENV216	101613	2019/1/25	2020/1/24
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2018/11/29	2019/11/29
/	CE Cable	CE Cable	UF A210B-1-0720-504504	2018/11/29	2019/11/29
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
/	Cable 2	RF Cable 2	/	2019/11/29	2020/11/28
/	Cable	Chamber Cable 1	/	2019/11/29	2020/11/28
/	Cable	Chamber Cable 4	EC-007	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2018/11/29	2019/11/29
COM-POWER	Amplifier	QLW-18405536-J0	15964001002	2018/11/29	2019/11/29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
the electro-Mechanics Co	Horn Antenna	3116	9510-2270	2019/10/13	2022/10/12
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2018/11/29	2019/11/29
/	RF Cable	W1101-EQ1 OUT	/	2018/11/29	2019/11/29
/	Signal Cable	RG-214	2	2018/11/29	2019/11/29
SNSD	Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2019/4/20	2020/4/20

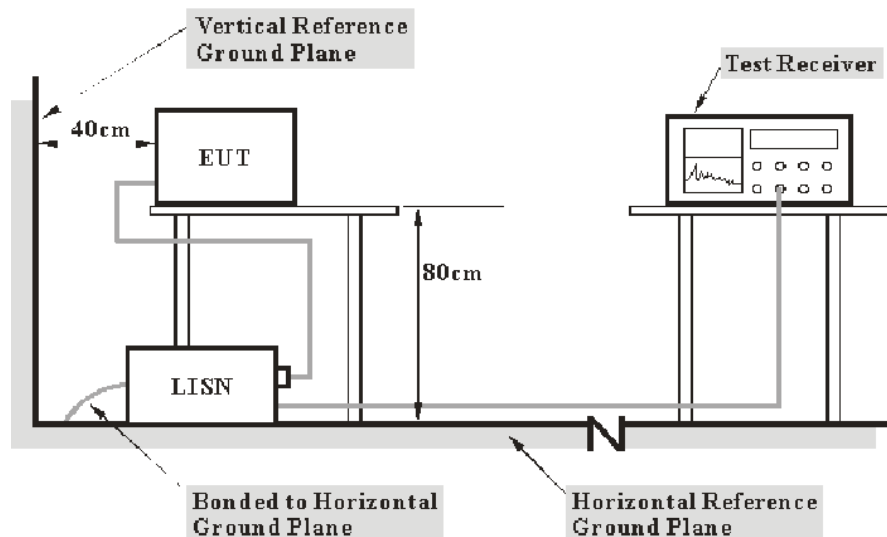
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.107 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

According to FCC §15.107

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with per ANSI C63.4-2014. The related limit was specified in FCC Part 15.107 CLASS B.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the host PC was connected to the first LISN and the other relevant equipments were connected to the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the EUT complied with the FCC Part 15.107,

Test Data

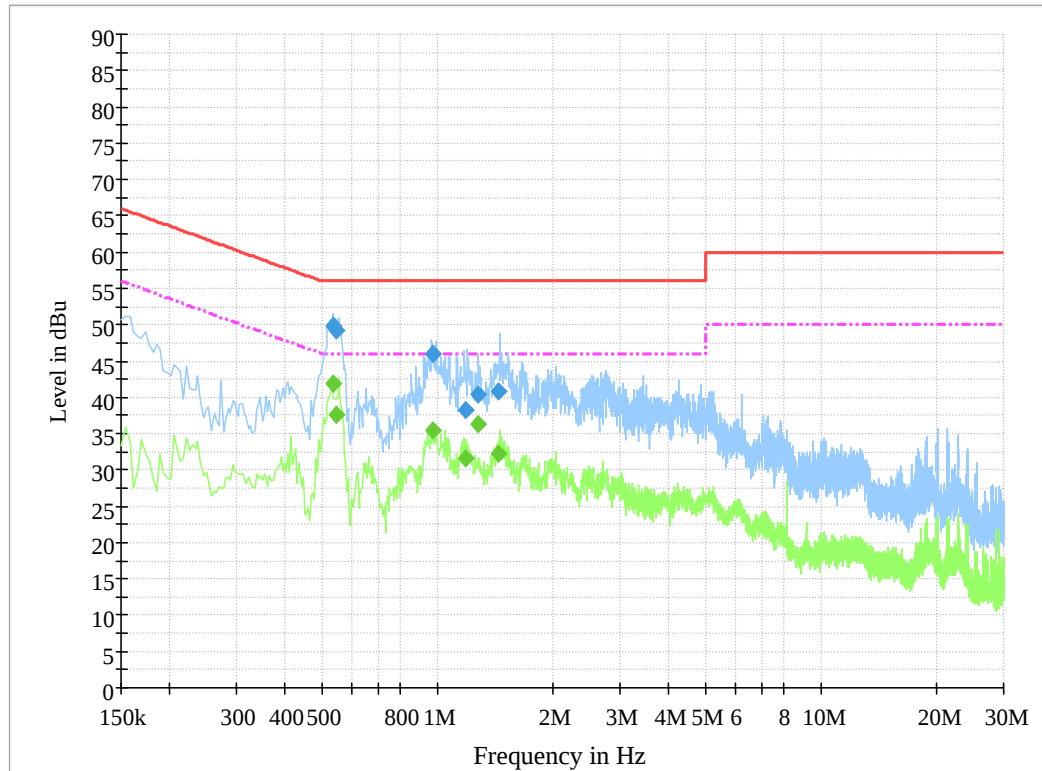
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

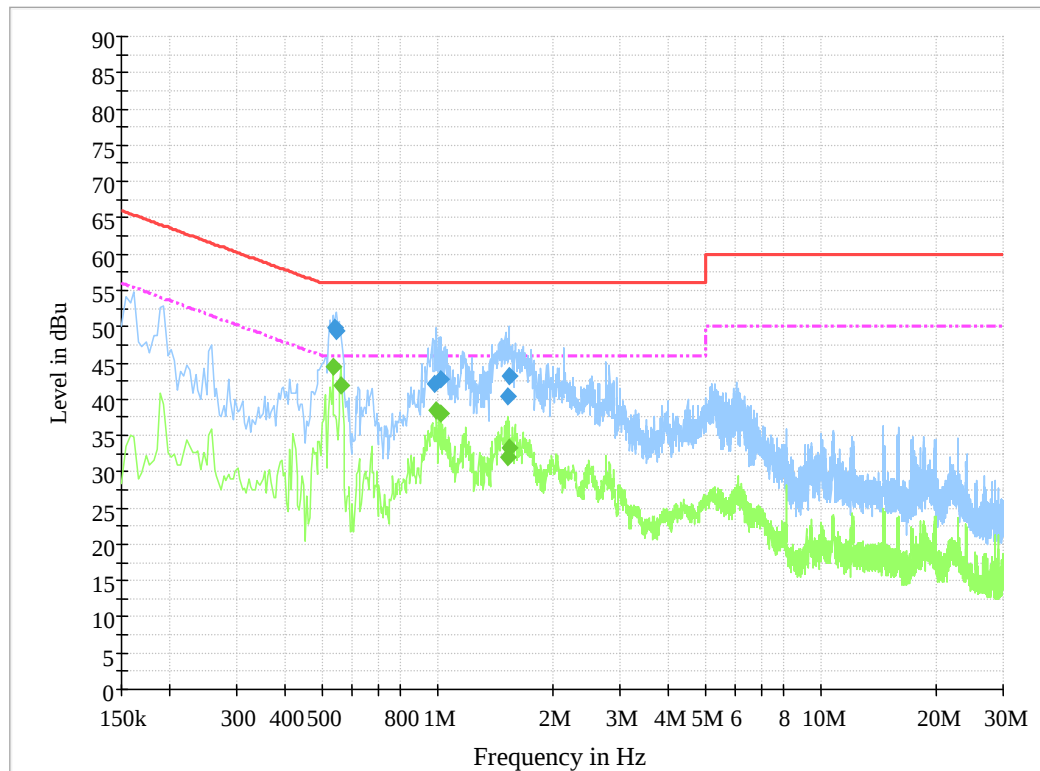
The testing was performed by Kiki Geng on 2019-10-15.

EUT Operation Mode: Operating

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.533990	49.9	19.8	56.0	6.1	QP
0.545930	49.2	19.8	56.0	6.8	QP
0.971450	45.9	19.9	56.0	10.1	QP
1.183970	38.2	19.8	56.0	17.8	QP
1.282830	40.3	19.8	56.0	15.7	QP
1.440130	40.7	19.8	56.0	15.3	QP
0.533990	41.8	19.8	46.0	4.2	Ave.
0.545930	37.6	19.8	46.0	8.4	Ave.
0.971450	35.4	19.9	46.0	10.6	Ave.
1.183970	31.7	19.8	46.0	14.3	Ave.
1.282830	36.3	19.8	46.0	9.7	Ave.
1.440130	32.3	19.8	46.0	13.7	Ave.

AC 120V/60 Hz, Neutral

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.541990	49.8	19.8	56.0	6.2	QP
0.545810	49.5	19.8	56.0	6.5	QP
0.987030	42.0	19.8	56.0	14	QP
1.018670	42.8	19.8	56.0	13.2	QP
1.534930	40.4	19.8	56.0	15.6	QP
1.538810	43.3	19.8	56.0	12.7	QP
0.534000	44.5	19.8	46.0	1.5	Ave.
0.562000	41.9	19.8	46.0	4.1	Ave.
0.998000	38.5	19.8	46.0	7.5	Ave.
1.022000	37.9	19.8	46.0	8.1	Ave.
1.522000	32.1	19.8	46.0	13.9	Ave.
1.546000	33.3	19.8	46.0	12.7	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

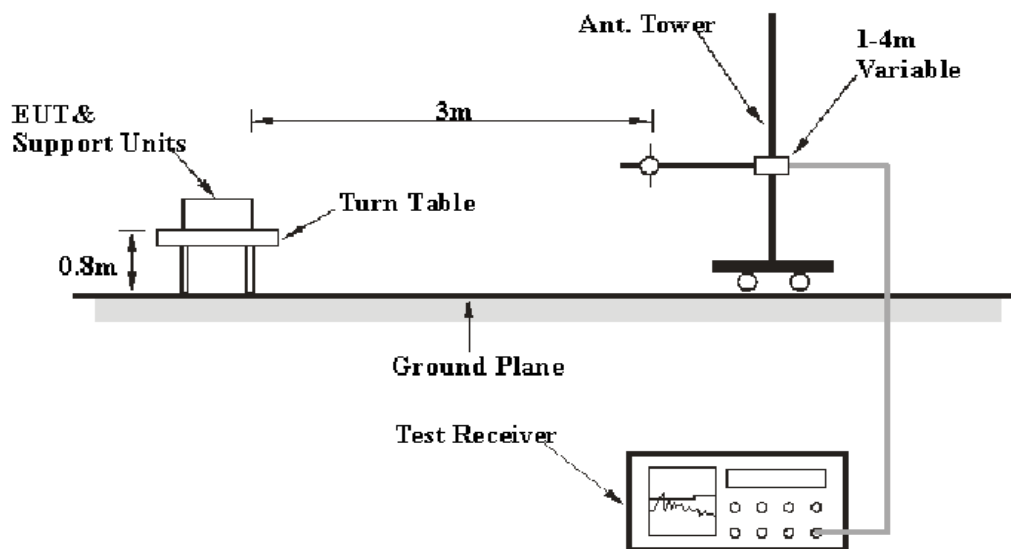
FCC §15.109 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

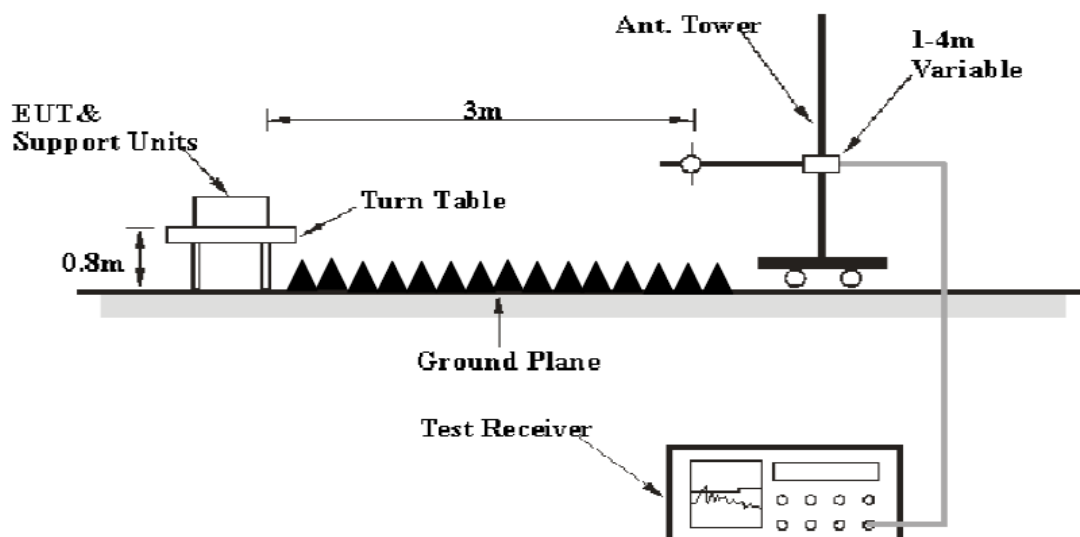
FCC §15.109

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 CLASS B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 12.5 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	PK

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the EUT complied with the FCC §15.109 CLASS B.

Test Data

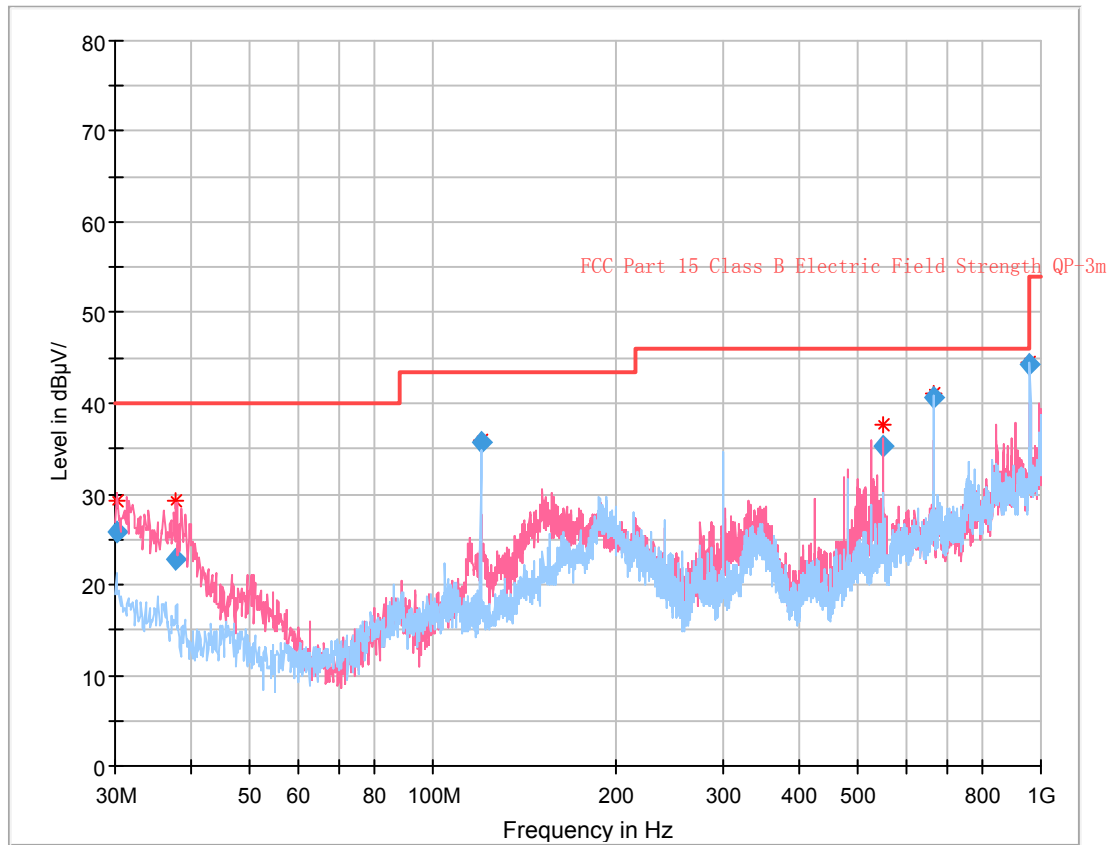
Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Zero Yan on 2020-03-19 for below 1G and Curry Xiang on 2019-11-05 for above 1G.

EUT Operation Mode: Operating

30 MHz~1 GHz:



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
30.114623	25.89	109.0	V	324.0	-7.7	40.00	14.11
37.754125	22.78	109.0	V	0.0	-12.3	40.00	17.22
120.001125	35.75	273.0	H	171.0	-14.3	43.50	7.75
550.030875	35.18	109.0	V	0.0	-4.1	46.00	10.82
666.721625	40.57	204.0	H	322.0	-1.5	46.00	5.43
960.029375	44.30	188.0	H	312.0	5.3	53.90	9.60

Above 1 GHz:

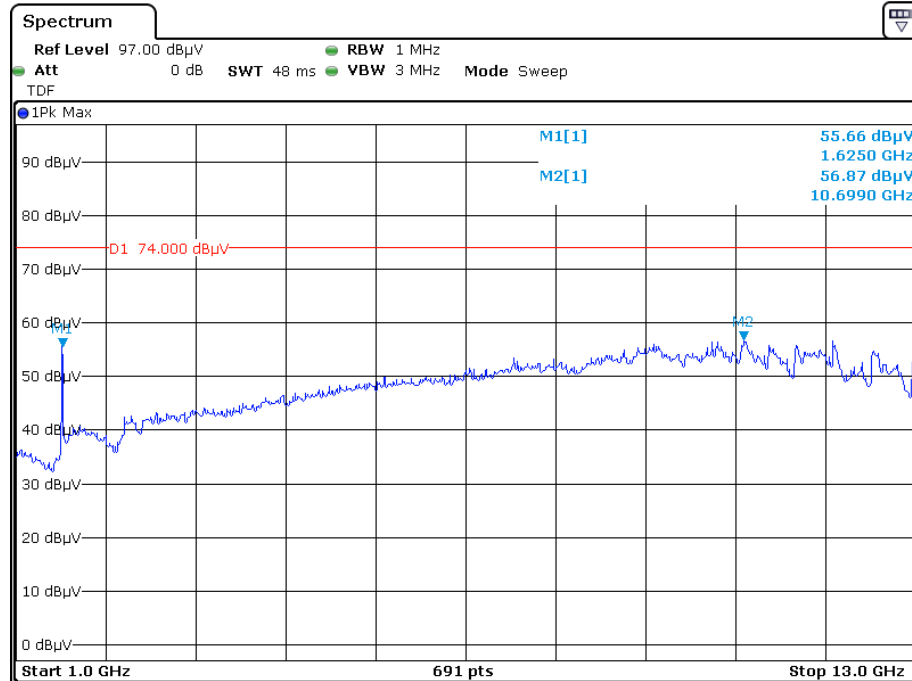
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBuV/m)	FCC Part 15B	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBuV/m)	Margin (dB)
1625.03	60.58	PK	341	1.4	H	-2.61	57.97	74	16.03
1625.03	39.03	Ave.	341	1.4	H	-2.61	36.42	54	17.58
1625.03	60.21	PK	176	1.3	V	-2.61	57.60	74	16.40
1625.03	38.84	Ave.	176	1.3	V	-2.61	36.23	54	17.77
2633.41	43.76	PK	253	1.7	H	0.14	43.90	74	30.10
2633.41	28.57	Ave.	253	1.7	H	0.14	28.71	54	25.29
2633.41	44.02	PK	88	2.0	V	0.14	44.16	74	29.84
2633.41	29.11	Ave.	88	2.0	V	0.14	29.25	54	24.75

Note:

- 1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
- 2) Corrected Amplitude = Correction Factor + Reading
- 3) Margin = Limit - Corrected Amplitude

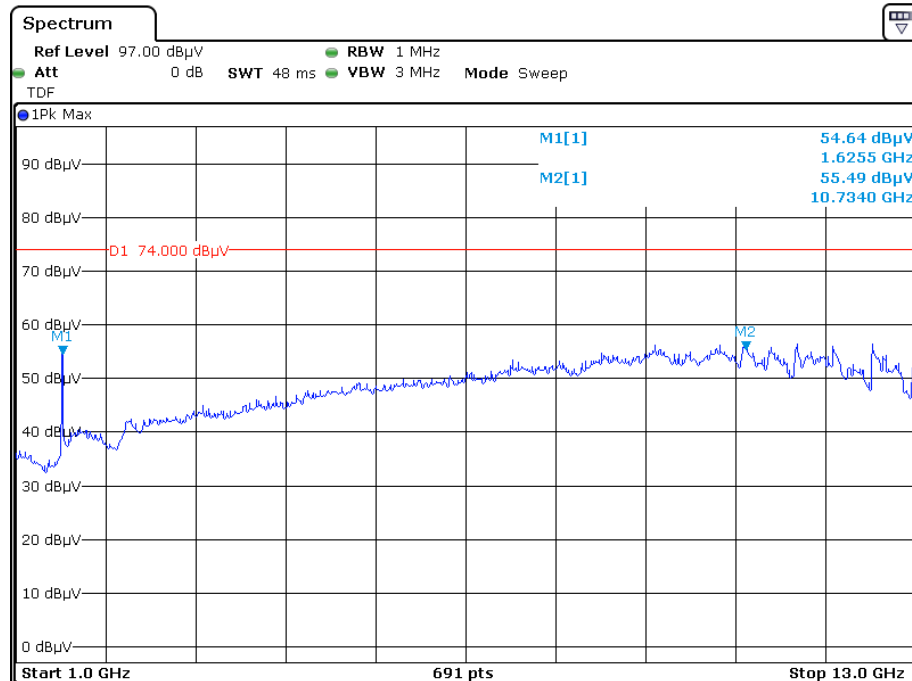
Pre-scan for peak

Horizontal – Peak



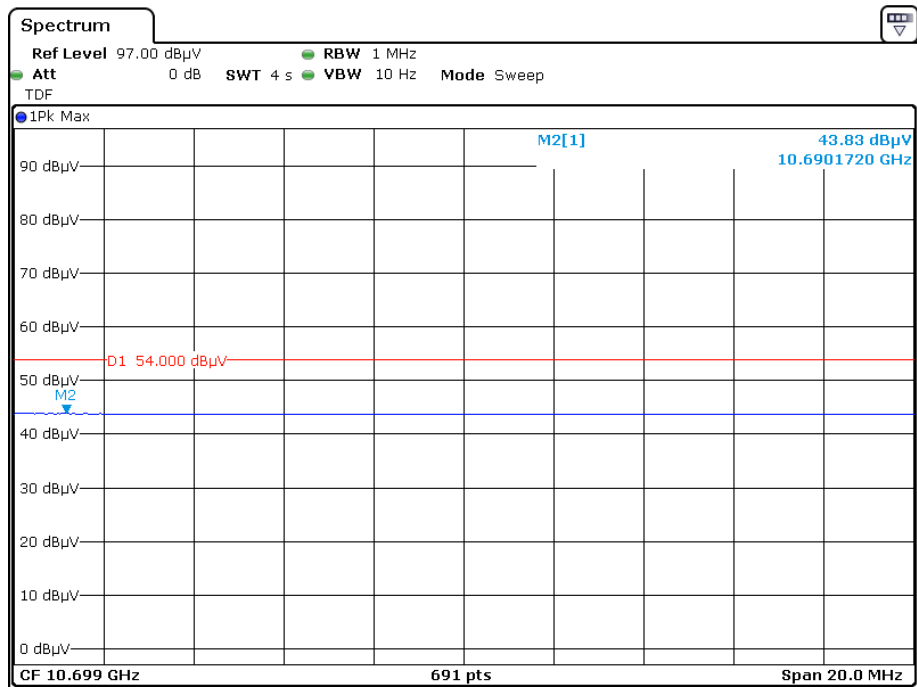
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Vertical - Peak



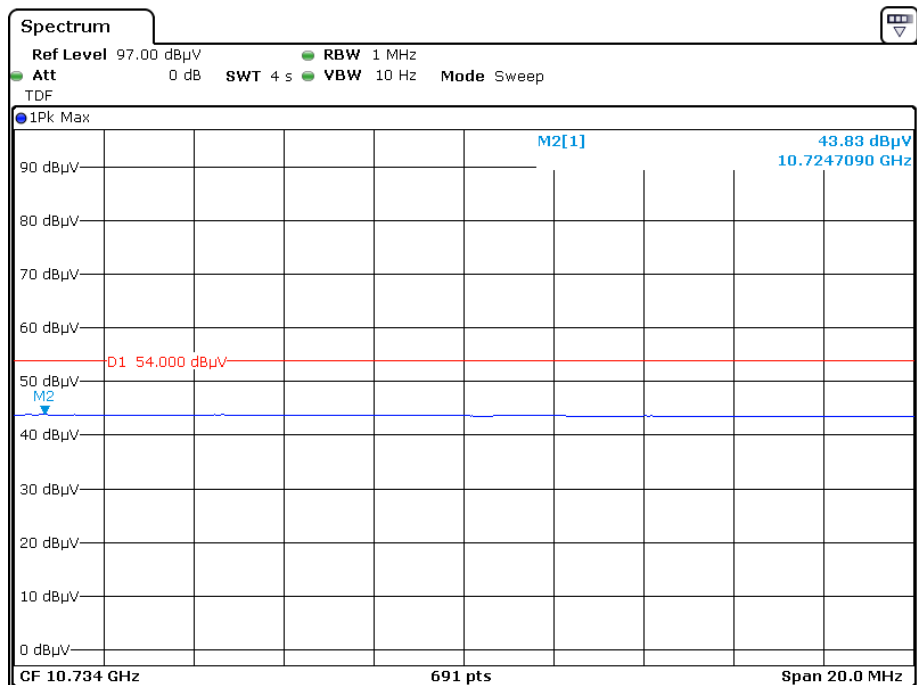
Date: 5.NOV.2019 22:48:39

Horizontal – Average



Date: 5.NOV.2019 22:45:51

Vertical - Average



Date: 5.NOV.2019 22:52:18

***** END OF REPORT *****