



FCC EMI TEST REPORT

FCC ID : 2APLE18300406
Equipment : Essential Indoor Camera
Brand Name : Arlo
Model Name : VMC2040
Applicant : Arlo Technologies Inc
2200 Faraday Avenue, Suite 150, Carlsbad,
CA 92008, USA
Manufacturer : Arlo Technologies Inc
2200 Faraday Avenue, Suite 150, Carlsbad,
CA 92008, USA
Standard : FCC 47 CFR FCC Part 15 Subpart B Class B

The product was received on May 11, 2020 and testing was started from Sep. 01, 2020 and completed on Oct. 14, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.107	AC Conducted Emission	Pass	Under limit 16.99 dB at 0.153 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 5.23 dB at 52.950 MHz for Quasi-Peak

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Dara Chiu

Report Producer: Lucy Wu



1. General Description

1.1. Product Feature of Equipment Under Test

Wi-Fi 2.4GHz 802.11b/g/n

Product Specification subjective to this standard	
Antenna Type	PIFA Antenna

1.2. Modification of EUT

No modifications are made to the EUT during all test items.

1.3. Test Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	CO05-HY	03CH06-HY

FCC designation No.: TW1093

1.4. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC 47 CFR FCC Part 15 Subpart B Class B
- ♦ ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.



2. Test Configuration of Equipment Under Test

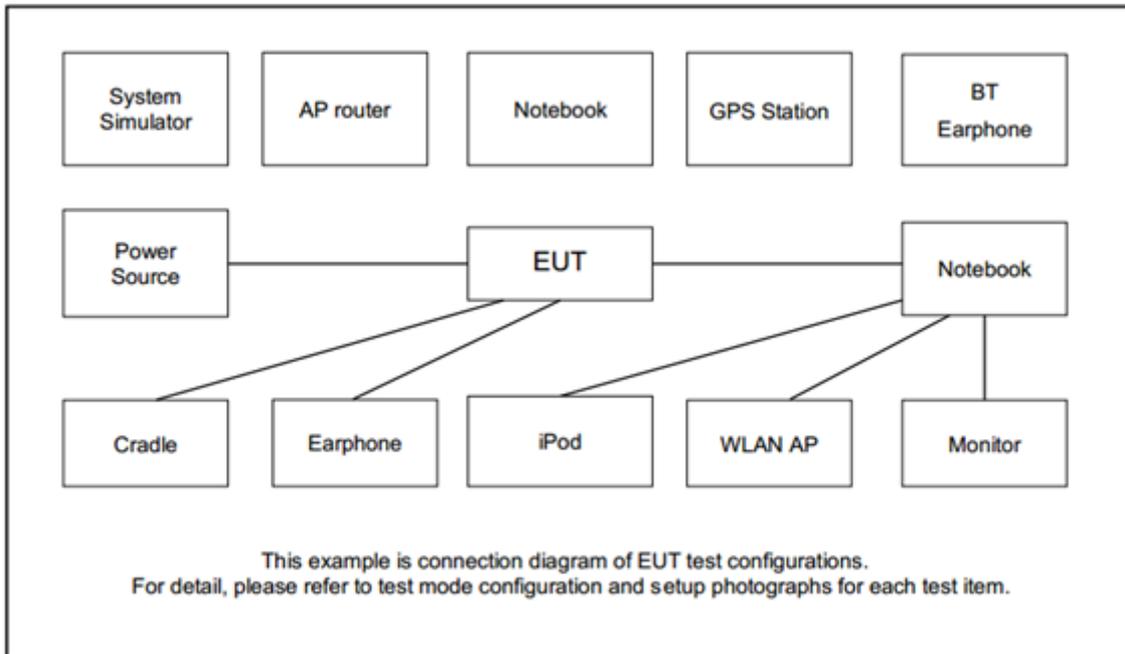
2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1: Camera with Phone + WLAN (2.4GHz) Link + USB Cable (Charging from AC Adapter 1) + IR On + Speaker On + Mic On
	Mode 2: Camera with Phone + WLAN (2.4GHz) Link + USB Cable (Charging from AC Adapter 2) + IR On + Speaker On + Mic On
	Mode 3: Camera + WLAN (2.4GHz) Idle + USB Cable (Charging from AC Adapter 2) + IR On + Speaker On + Mic On
Radiated Emissions	Mode 1: Camera with Phone + WLAN (2.4GHz) Link + USB Cable (Charging from AC Adapter 1) + IR On + Speaker On + Mic On
	Mode 2: Camera with Phone + WLAN (2.4GHz) Link + USB Cable (Charging from AC Adapter 2) + IR On + Speaker On + Mic On
	Mode 3: Camera + WLAN (2.4GHz) Idle + USB Cable (Charging from AC Adapter 1) + IR On + Speaker On + Mic On
Remark:	
1. The worst case of AC is mode 2; only the test data of this mode was reported.	
2. The worst case of RE is mode 1; only the test data of this mode was reported.	

2.2. Connection Diagram of Test System



2.3. Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	Zyxel	EMG3425-Q10A	I88EMG3425Q10A	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Mobile Phone	SAMSUNG	SM-A730F/DS	A3LSMA730F	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was attached to the WLAN AP, and the following programs installed in the EUT were programmed during the test:

1. Turn on camera to capture images.
2. Turn on IR LED function.
3. Turn on Mic function.
4. Turn on Speaker function.
5. EUT links with Notebook and executes ping via WLAN AP.



3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1. Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

<Class B>

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

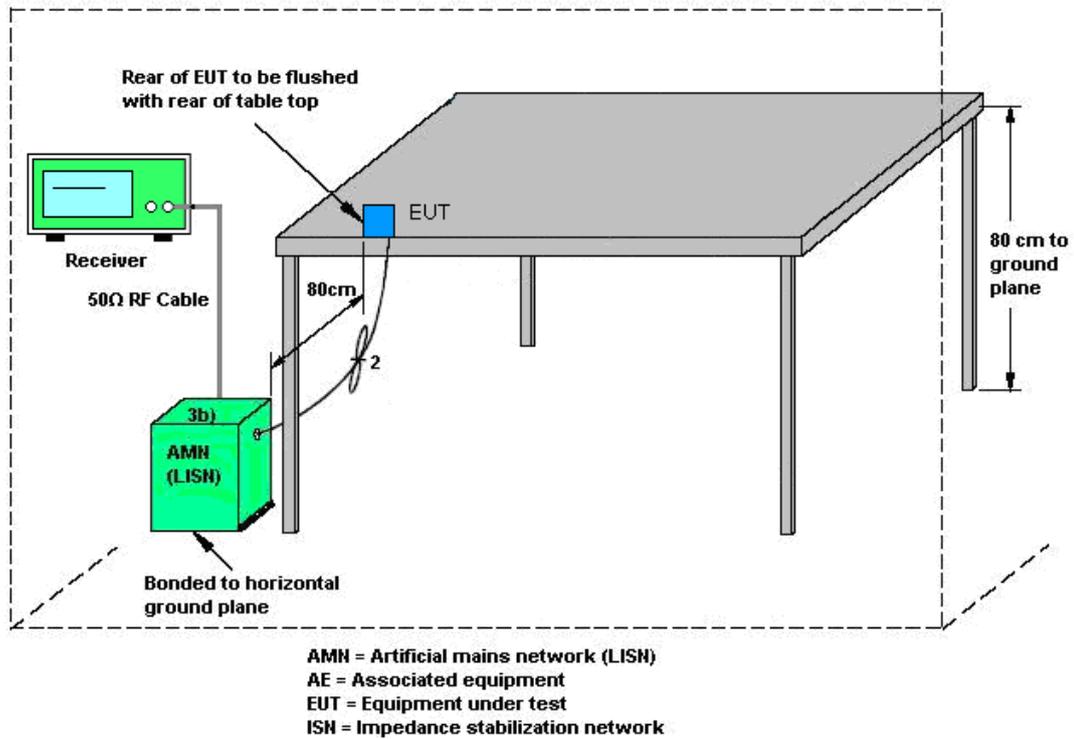
3.1.2. Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3. Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.1.4. Test Setup



3.1.5. Test Result of AC Conducted Emission

Please refer to Appendix A.



3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

<Class B>

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

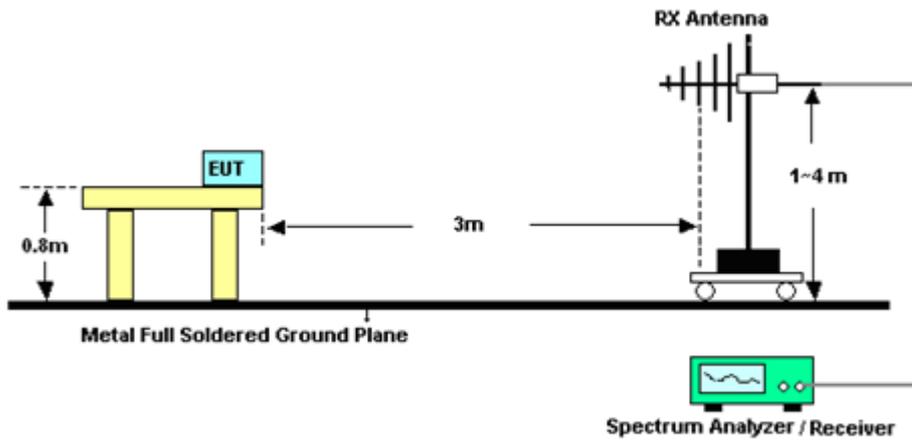
Refer a test equipment and calibration data table in this test report.

3.2.3. Test Procedures

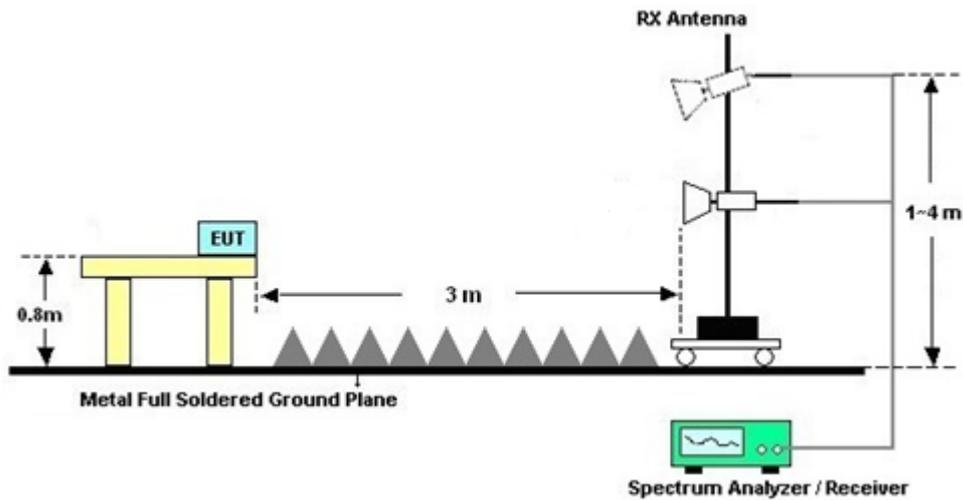
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBµV/m) = 20 log Emission level (µV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

Please refer to Appendix B.



4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Sep. 01, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Sep. 01, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 07, 2019	Sep. 01, 2020	Nov. 06, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Sep. 01, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Sep. 01, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Sep. 01, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Sep. 01, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 30, 2020	Oct. 13, 2020~ Oct. 14, 2020	Apr. 29, 2021	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL 6111C & N-6-06	2725 & AT-N0601	30MHz~1GHz	Jan. 09, 2020	Oct. 13, 2020~ Oct. 14, 2020	Jan. 08, 2021	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 10, 2020	Oct. 13, 2020~ Oct. 14, 2020	Jan. 09, 2021	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Sep. 15, 2020	Oct. 13, 2020~ Oct. 14, 2020	Sep. 14, 2021	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180001	1GHz~18GHz	Jul. 21, 2020	Oct. 13, 2020~ Oct. 14, 2020	Jul. 20, 2021	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / STORM/LL142	MY24966/4 / 00100A1O2A178T	30MHz~26GHz	Nov. 21, 2019	Oct. 13, 2020~ Oct. 14, 2020	Nov. 20, 2020	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF104	802433/4	30MHz~18GHz	Aug. 20, 2020	Oct. 13, 2020~ Oct. 14, 2020	Aug. 19, 2021	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Oct. 13, 2020~ Oct. 14, 2020	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Oct. 13, 2020~ Oct. 14, 2020	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Oct. 13, 2020~ Oct. 14, 2020	N/A	Radiation (03CH06-HY)
Software	Audix	E3 6.2009-8-24(k5)	N/A	N/A	N/A	Oct. 13, 2020~ Oct. 14, 2020	N/A	Radiation (03CH06-HY)



5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.3
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.9
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3
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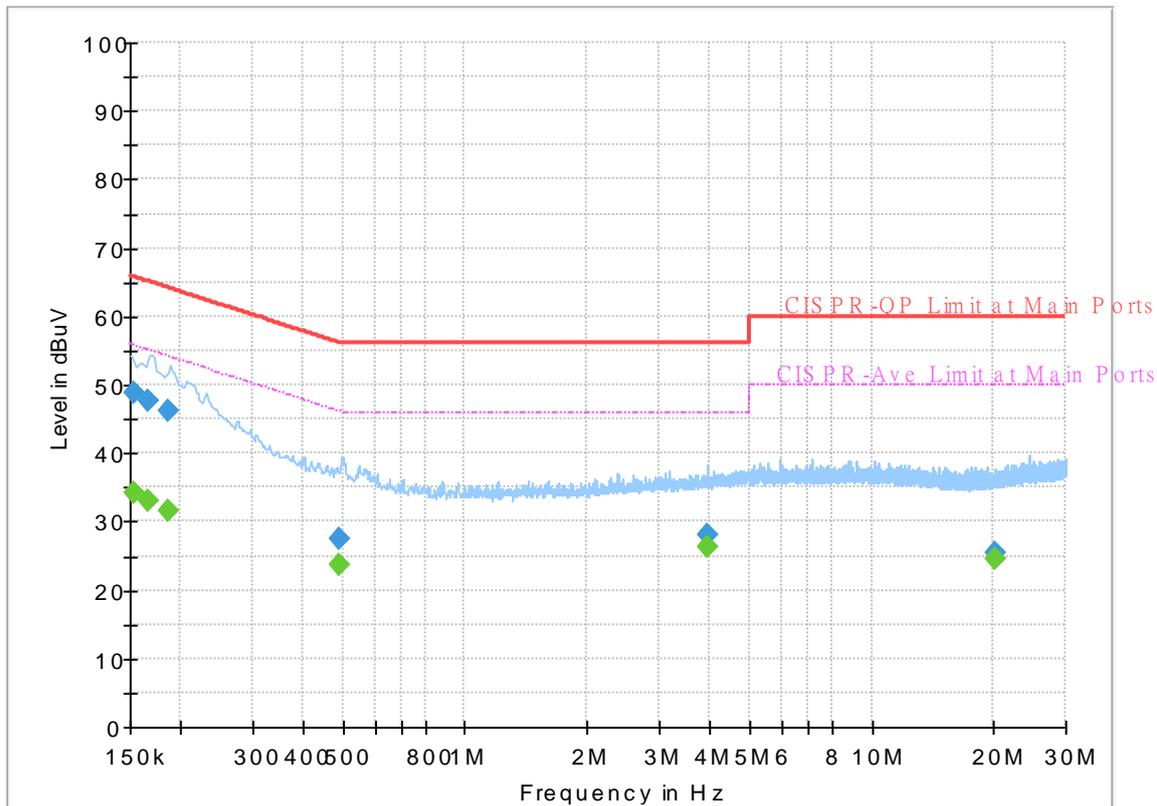
Appendix A. AC Conducted Emission Test Results

Test Engineer : Howard Huang	Temperature : 24~26°C
	Relative Humidity : 35~38%

EUT Information

Report NO : 042248
 Test Mode : Mode 2
 Test Voltage : 120Vac/60Hz
 Phase : Line

Full Spectrum



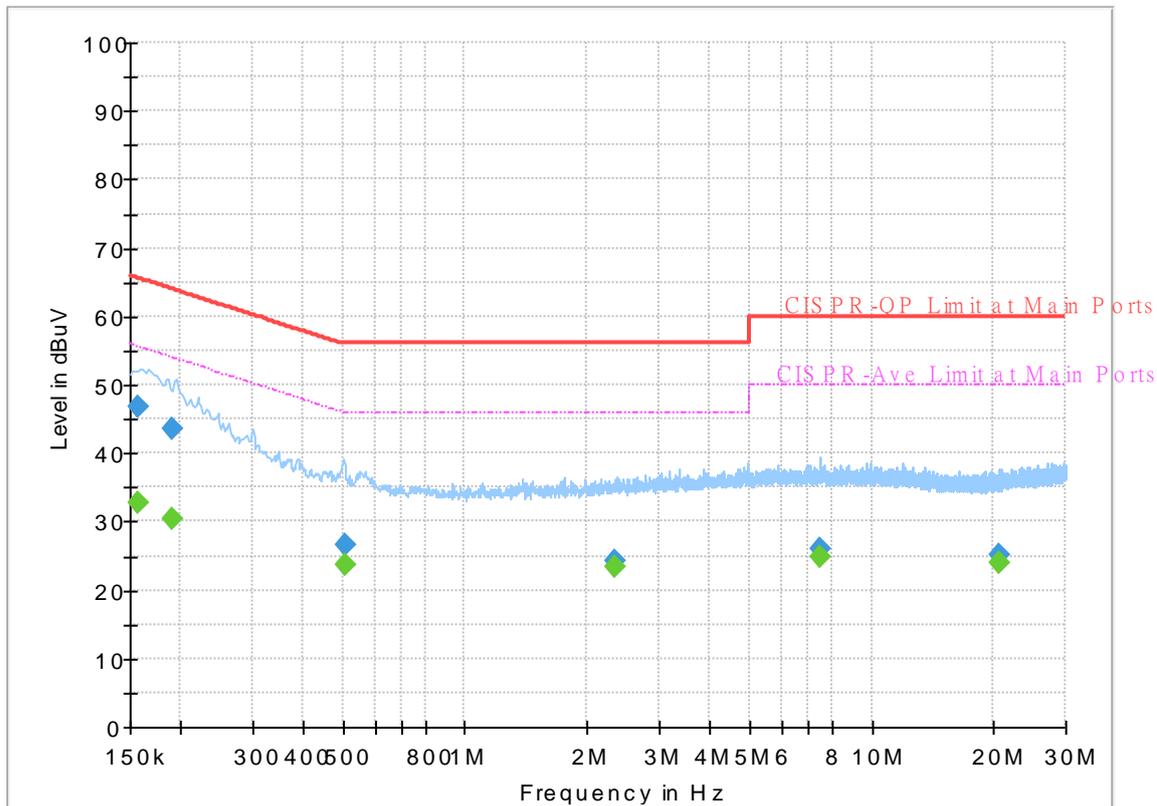
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152700	---	34.23	55.85	21.62	L1	OFF	19.6
0.152700	48.86	---	65.85	16.99	L1	OFF	19.6
0.166830	---	33.09	55.12	22.03	L1	OFF	19.6
0.166830	47.64	---	65.12	17.48	L1	OFF	19.6
0.186990	---	31.55	54.17	22.62	L1	OFF	19.6
0.186990	46.13	---	64.17	18.04	L1	OFF	19.6
0.492000	---	23.72	46.13	22.41	L1	OFF	19.6
0.492000	27.59	---	56.13	28.54	L1	OFF	19.6
3.959070	---	26.30	46.00	19.70	L1	OFF	19.7
3.959070	28.03	---	56.00	27.97	L1	OFF	19.7
20.205150	---	24.46	50.00	25.54	L1	OFF	20.4
20.205150	25.51	---	60.00	34.49	L1	OFF	20.4

EUT Information

Report NO : 042248
 Test Mode : Mode 2
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum

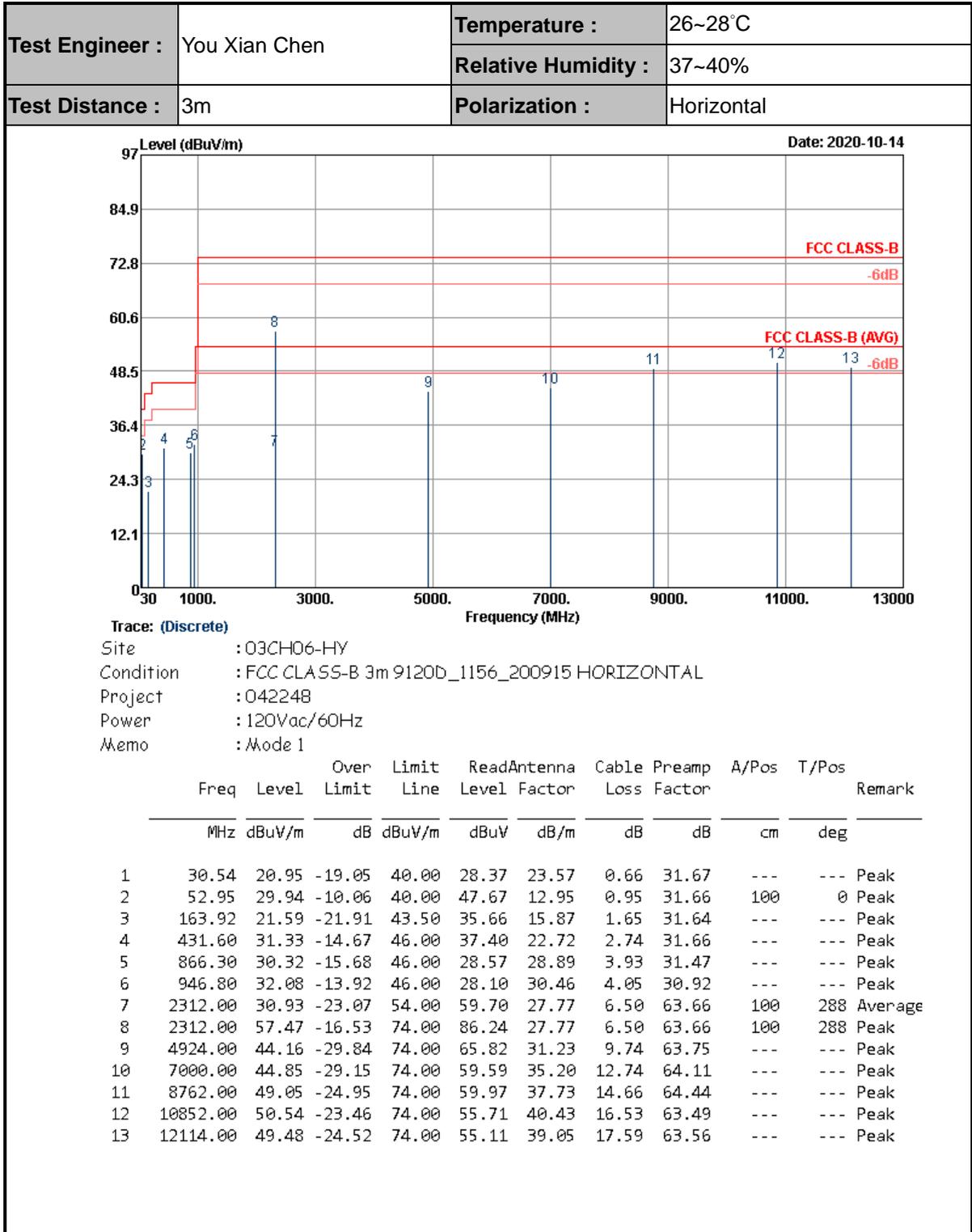


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.156750	---	32.71	55.63	22.92	N	OFF	19.5
0.156750	46.81	---	65.63	18.82	N	OFF	19.5
0.190500	---	30.47	54.02	23.55	N	OFF	19.5
0.190500	43.54	---	64.02	20.48	N	OFF	19.5
0.507660	---	23.71	46.00	22.29	N	OFF	19.5
0.507660	26.62	---	56.00	29.38	N	OFF	19.5
2.344740	---	23.38	46.00	22.62	N	OFF	19.6
2.344740	24.34	---	56.00	31.66	N	OFF	19.6
7.507590	---	24.93	50.00	25.07	N	OFF	19.8
7.507590	25.91	---	60.00	34.09	N	OFF	19.8
20.496750	---	24.05	50.00	25.95	N	OFF	19.9
20.496750	25.07	---	60.00	34.93	N	OFF	19.9

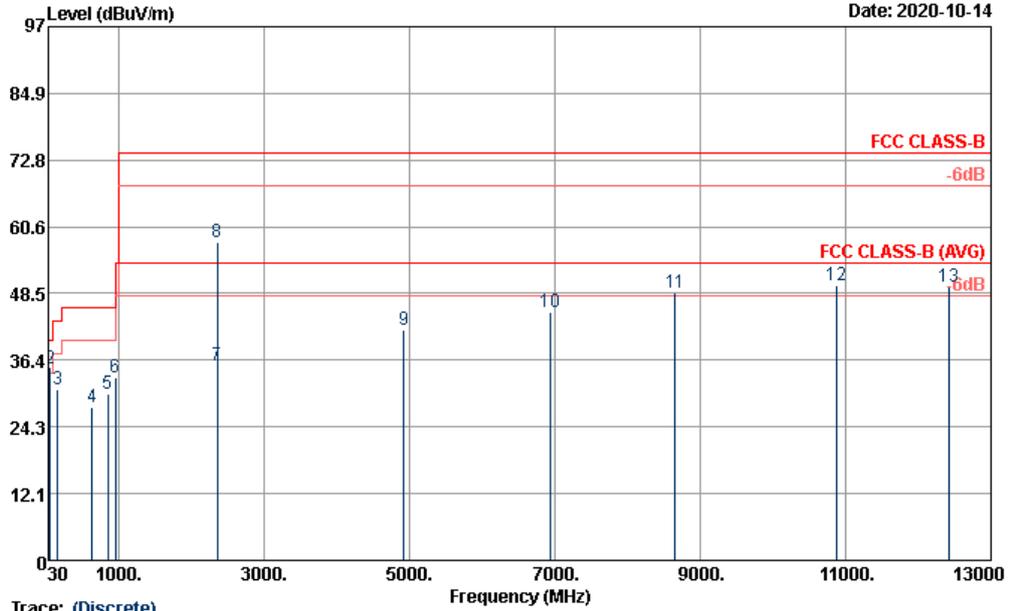


Appendix B. Radiated Emission Test Result





Test Engineer :	You Xian Chen	Temperature :	26~28°C
		Relative Humidity :	37~40%
Test Distance :	3m	Polarization :	Vertical



Site : 03CH06-HY
 Condition : FCC CLASS-B 3m 9120D_1156_200915 VERTICAL
 Project : 042248
 Power : 120Vac/60Hz
 Memo : Mode 1

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 !	48.63	35.17	-4.83	40.00	50.94	14.97	0.89	31.66	---	---	Peak
2 !	52.95	34.77	-5.23	40.00	52.50	12.95	0.95	31.66	100	287	QP
3	163.92	31.09	-12.41	43.50	45.16	15.87	1.65	31.64	---	---	Peak
4	636.00	27.74	-18.26	46.00	29.73	26.23	3.38	31.83	---	---	Peak
5	846.70	30.29	-15.71	46.00	28.53	28.99	3.91	31.57	---	---	Peak
6	951.00	33.29	-12.71	46.00	29.30	30.42	4.06	30.89	---	---	Peak
7	2352.00	35.31	-18.69	54.00	64.10	27.70	6.51	63.64	100	109	Average
8	2352.00	57.84	-16.16	74.00	86.63	27.70	6.51	63.64	100	109	Peak
9	4924.00	42.01	-31.99	74.00	63.67	31.23	9.74	63.75	---	---	Peak
10	6934.00	45.10	-28.90	74.00	60.44	35.07	12.43	64.09	---	---	Peak
11	8652.00	48.71	-25.29	74.00	60.01	37.40	14.61	64.45	---	---	Peak
12	10868.00	50.05	-23.95	74.00	55.20	40.43	16.55	63.49	---	---	Peak
13	12420.00	49.81	-24.19	74.00	55.78	38.46	17.89	63.62	---	---	Peak