



FCC EMI TEST REPORT

FCC ID : LHJ-FE4NA0210
Equipment : FE4NA0210
Brand Name : Continental
Model Name : FE4NA0210
Applicant : Continental Automotive Systems, Inc.
21440 W Lake Cook Rd.
Manufacturer : Continental Automotive Systems, Inc.
21440 W Lake Cook Rd.
Standard : FCC 47 CFR FCC Part 15 Subpart B Class B

The product was received on Oct. 30, 2019 and testing was started from Oct. 30, 2019 and completed on Nov. 04, 2019. 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.

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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History of this test report



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 13.35 dB at 0.627 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 13.13 dB at 948.590 MHz

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: Amy Chen



1. General Description

1.1. Product Feature of Equipment Under Test

Product Feature	
Equipment	FE4NA0210
Brand Name	Continental
Model Name	FE4NA0210
FCC ID	LHJ-FE4NA0210
EUT supports Radios application	WCDMA/HSPA/LTE/GNSS
HW Version	FE4NA0210
EUT Stage	Identical Prototype

1.2. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV : 1712.4 MHz ~ 1752.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 12 : 699.7 MHz ~ 715.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 14 : 790.5 MHz ~ 795.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz
Rx Frequency	WCDMA Band V: 871.4 MHz ~ 891.6 MHz WCDMA Band IV: 2112.4 MHz ~ 2152.6 MHz WCDMA Band II: 1932.4 MHz ~ 1987.6 MHz LTE Band 2 : 1930.7 MHz ~ 1989.3 MHz LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz LTE Band 5 : 869.7 MHz ~ 893.3 MHz LTE Band 12 : 729.7 MHz ~ 745.3 MHz LTE Band 13 : 748.5 MHz ~ 753.5 MHz LTE Band 14 : 760.5 MHz ~ 765.5 MHz LTE Band 29 : 718.5 MHz ~ 726.5 MHz LTE Band 30 : 2352.5 MHz ~ 2357.5 MHz LTE Band 66: 2110.7 MHz ~ 2199.3 MHz GNSS : 1.57542 GHz; 1176.45 MHz (GPS / Glonass / BDS / Galileo / SBAS)



Standards-related Product Specification	
Antenna Type	Fixed External Antenna Antenna Model name: SPDA24700/2700 Antenna Manufactory: Pulse electronics
Antenna Gain	698-960 MHz : 2dBi 1710-2170 MHz : 2dBi 2500-2700MHz : 2dBi
Type of Modulation	WCDMA: QPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA : QPSK (Uplink) LTE: QPSK / 16QAM / 64QAM GNSS: BPSK

1.3. Modification of EUT

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

1.4. 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
Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. 03CH10-HY

FCC designation No.: TW1093 and TW1098

1.5. 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.

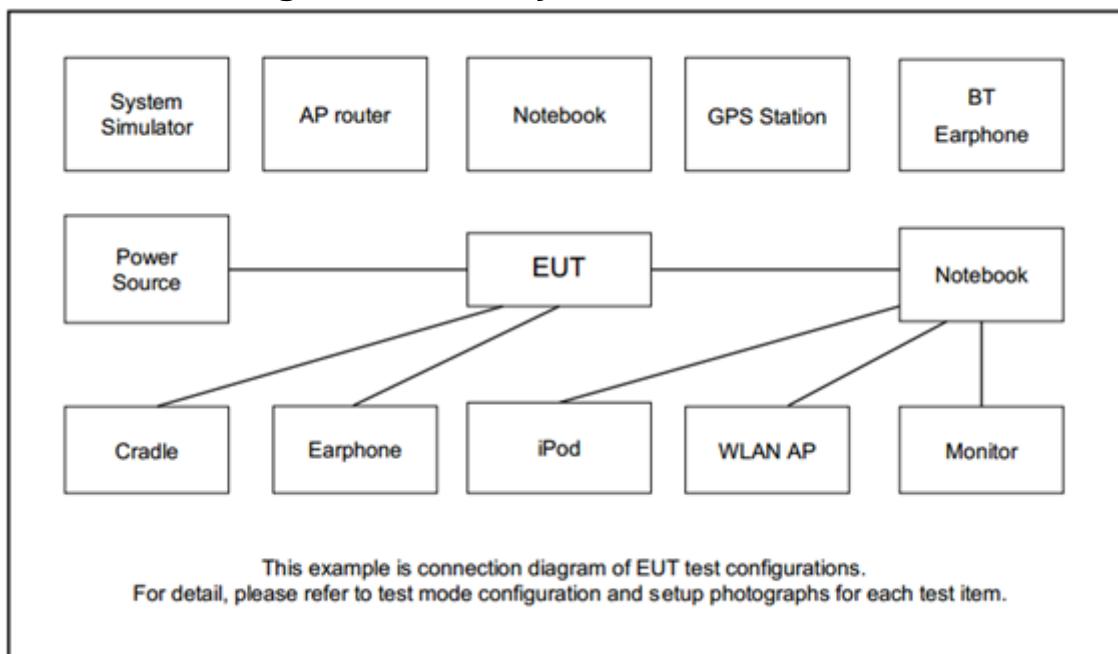
Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1: WCDMA Band II Idle + AC Adapter (AC to DC) Mode 2: LTE Band 5 Idle + AC Adapter (AC to DC)
Radiated Emissions	Mode 1: WCDMA Band II Idle + AC Adapter (AC to DC) Mode 2: LTE Band 5 Idle + AC Adapter (AC to DC)

Remark:

1. The worst case of AC is mode 1; only the test data of this mode was reported.
2. The worst case of RE is mode 2; only the test data of this mode was reported.
3. For radiation emission after pre-scanned the cellular band between 30MHz ~ 960MHz (LTE Band 5); only the worst case for cellular band 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	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	LTE Dipole	Continental	ATS018T-W120U	QAWA-18-12-US01	N/A	N/A
3.	Adapter	Continental	SPDA24700/2700	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was in WCDMA or LTE idle mode during the testing. The EUT was synchronized with the BCCH, and had been continuous receiving mode by setting paging reorganization of the system simulator.



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.

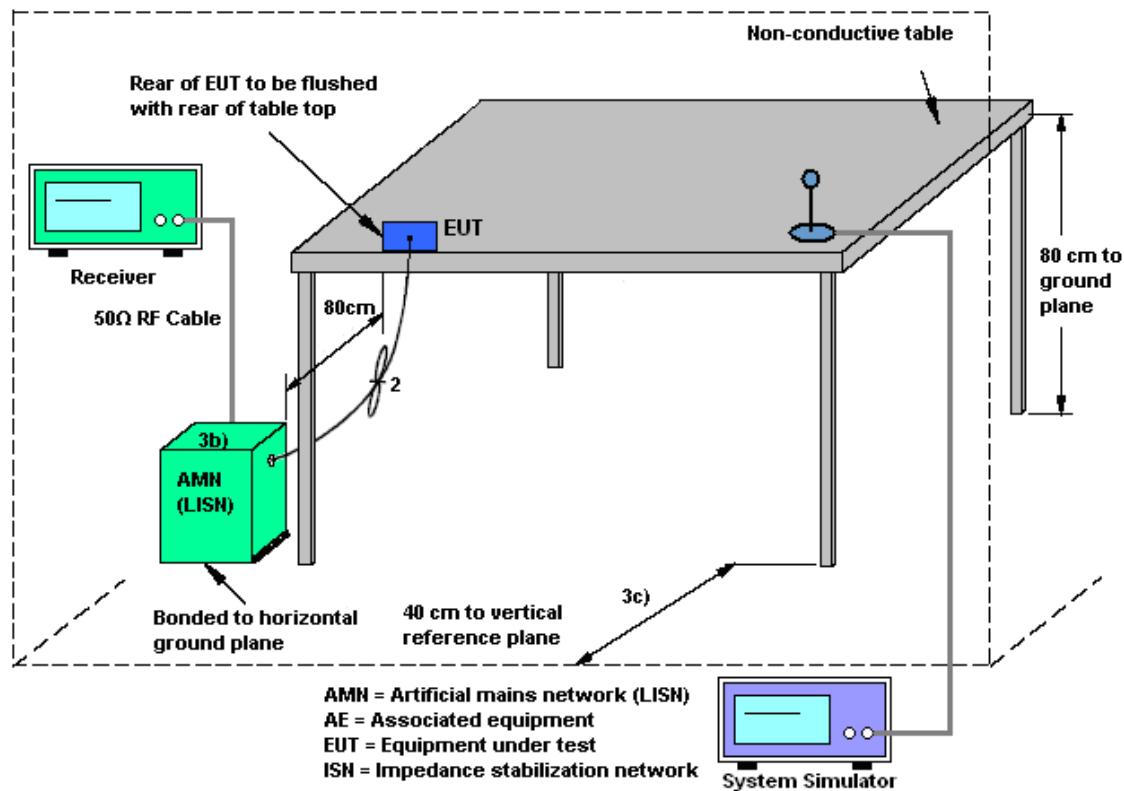
3.1.2. Measuring Instruments

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

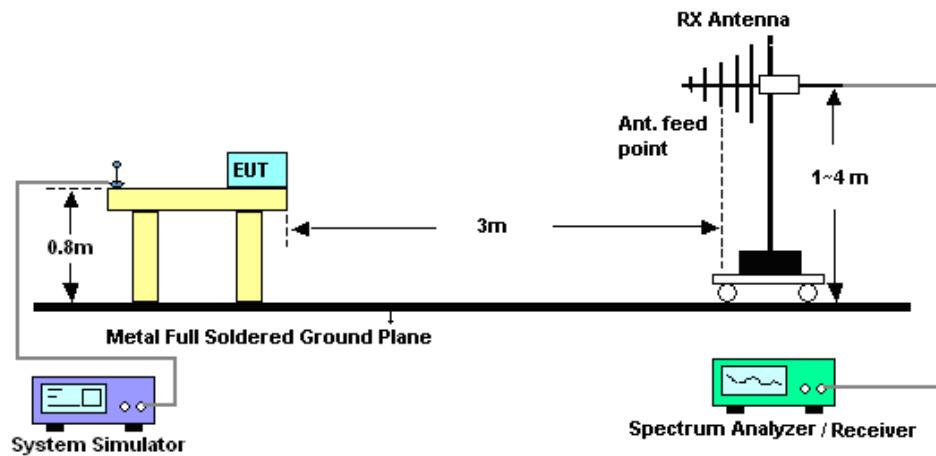
Refer a test equipment and calibration data table in this test report.

3.2.3. Test Procedures

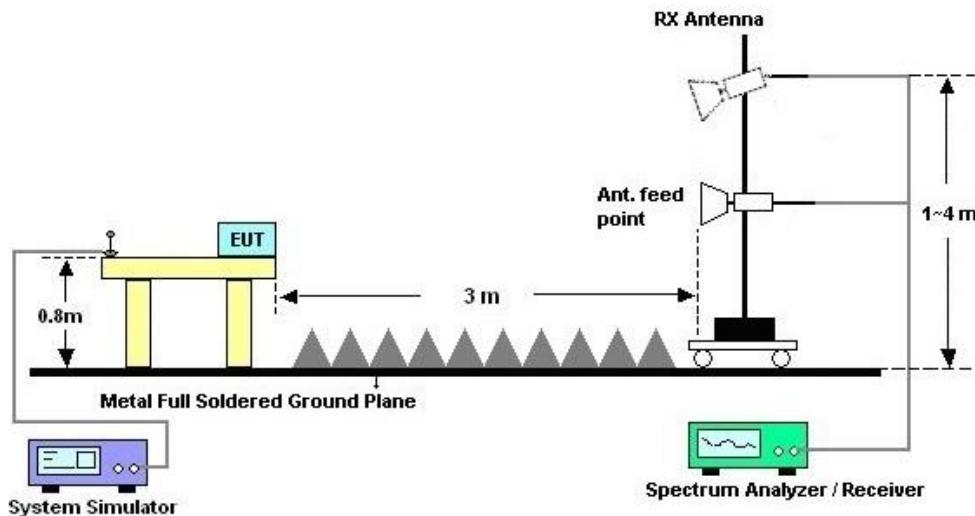
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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 (dB μ V/m) = 20 log Emission level (μ V/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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 04, 2019	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 12, 2018	Nov. 04, 2019	Nov. 11, 2019	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 19, 2019	Nov. 04, 2019	Mar. 18, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 14, 2018	Nov. 04, 2019	Nov. 13, 2019	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 04, 2019	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Dec. 31, 2018	Nov. 04, 2019	Dec. 30, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Dec. 31, 2018	Nov. 04, 2019	Dec. 30, 2019	Conduction (CO05-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 22, 2019	Oct. 30, 2019	Oct. 21, 2020	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35413 & 02	30MHz~1GHz	Feb. 12, 2019	Oct. 30, 2019	Feb. 11, 2020	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz~18GHz	Oct. 09, 2019	Oct. 30, 2019	Oct. 08, 2020	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JAP00101800-30-10P	160118550004	1GHz~18GHz	Sep. 27, 2019	Oct. 30, 2019	Sep. 26, 2020	Radiation (03CH10-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Oct. 30, 2019	N/A	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Oct. 30, 2019	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Oct. 30, 2019	N/A	Radiation (03CH10-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Oct. 30, 2019	N/A	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Nov. 29, 2018	Oct. 30, 2019	Nov. 28, 2019	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / 102	MY11692/4PE, MY11693/4PE, MY2855/2	30MHz~1GHz	Nov. 08, 2018	Oct. 30, 2019	Nov. 07, 2019	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / 102	MY11692/4PE, MY11693/4PE, MY2855/2	1GHz~18GHz	Nov. 08, 2018	Oct. 30, 2019	Nov. 07, 2019	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 13, 2019	Oct. 30, 2019	Mar. 12, 2020	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 13, 2019	Oct. 30, 2019	Mar. 12, 2020	Radiation (03CH10-HY)



5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	2.2
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	4.8
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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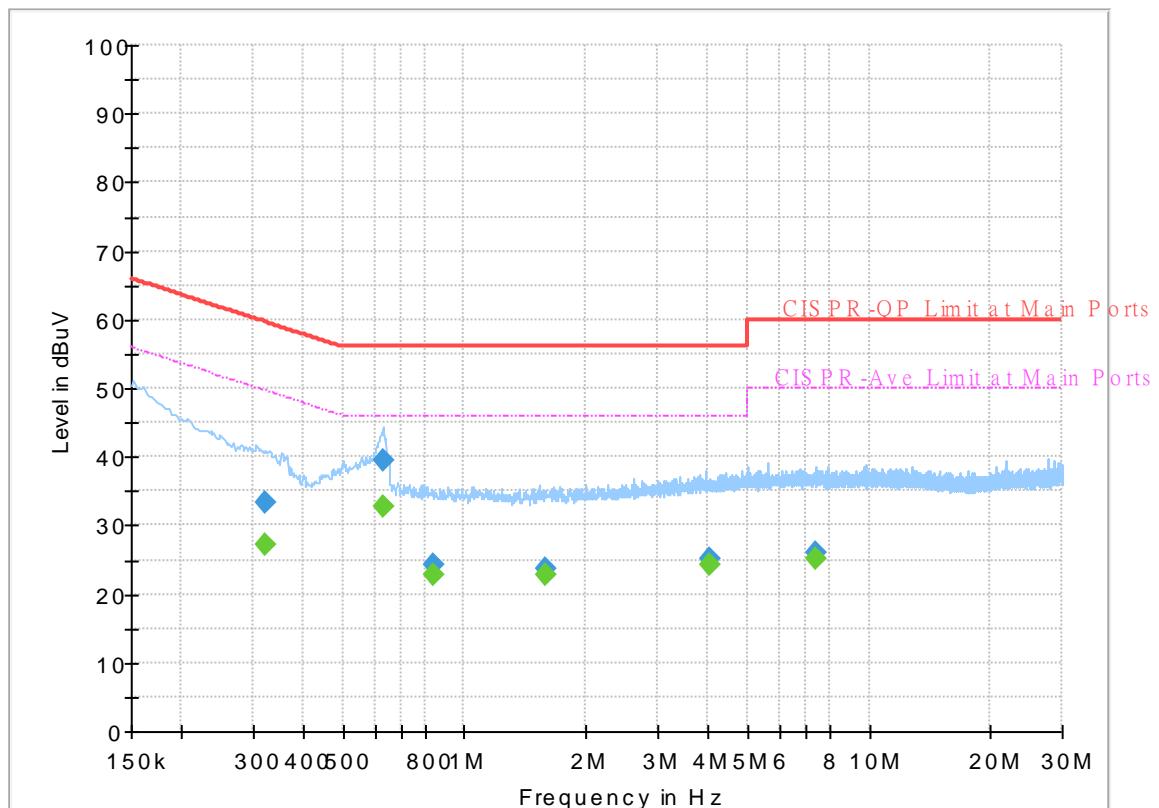
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Howard Huang	Temperature :	25~26°C
		Relative Humidity :	40~42%

EUT Information

Report NO : 031205
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Line

Full Spectrum



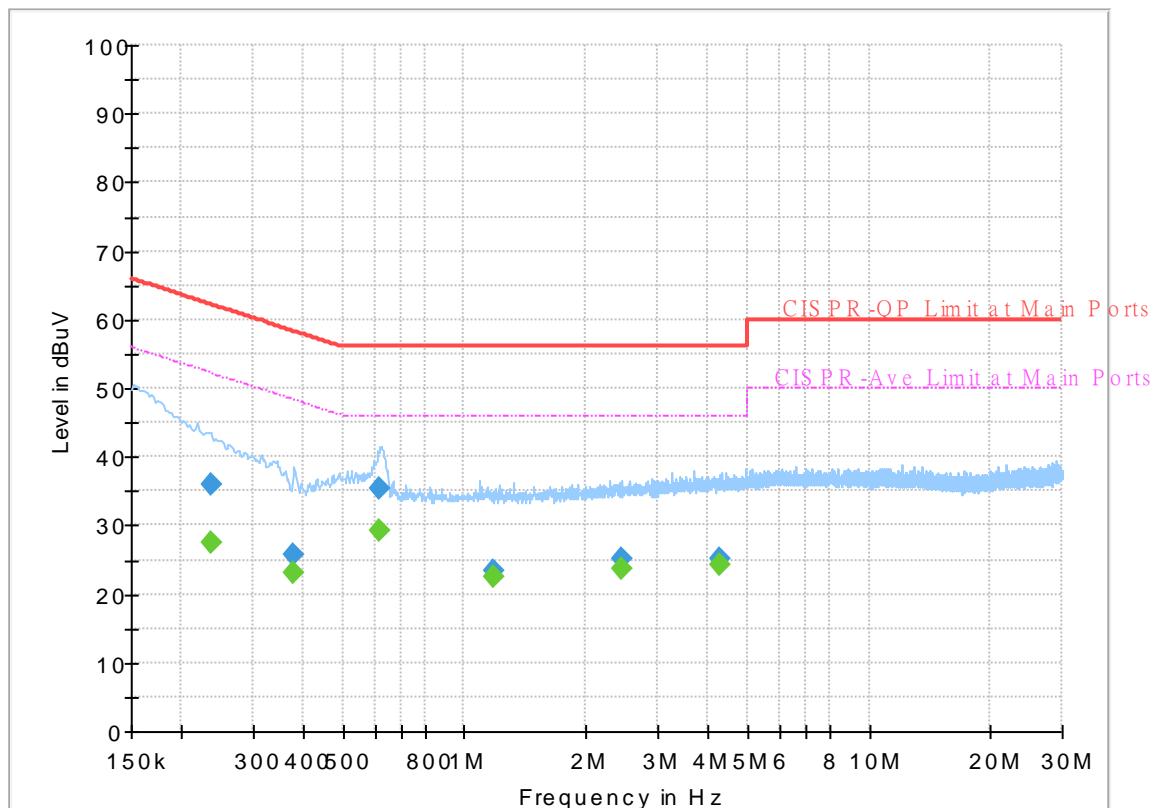
Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.323250	---	27.17	49.62	22.45	L1	OFF	19.4
0.323250	33.36	---	59.62	26.26	L1	OFF	19.4
0.627000	---	32.65	46.00	13.35	L1	OFF	19.4
0.627000	39.48	---	56.00	16.52	L1	OFF	19.4
0.840750	---	22.73	46.00	23.27	L1	OFF	19.5
0.840750	24.20	---	56.00	31.80	L1	OFF	19.5
1.578750	---	22.70	46.00	23.30	L1	OFF	19.5
1.578750	23.61	---	56.00	32.39	L1	OFF	19.5
4.029000	---	24.34	46.00	21.66	L1	OFF	19.6
4.029000	25.19	---	56.00	30.81	L1	OFF	19.6
7.359000	---	25.01	50.00	24.99	L1	OFF	19.7
7.359000	26.07	---	60.00	33.93	L1	OFF	19.7

EUT Information

Report NO : 031205
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum



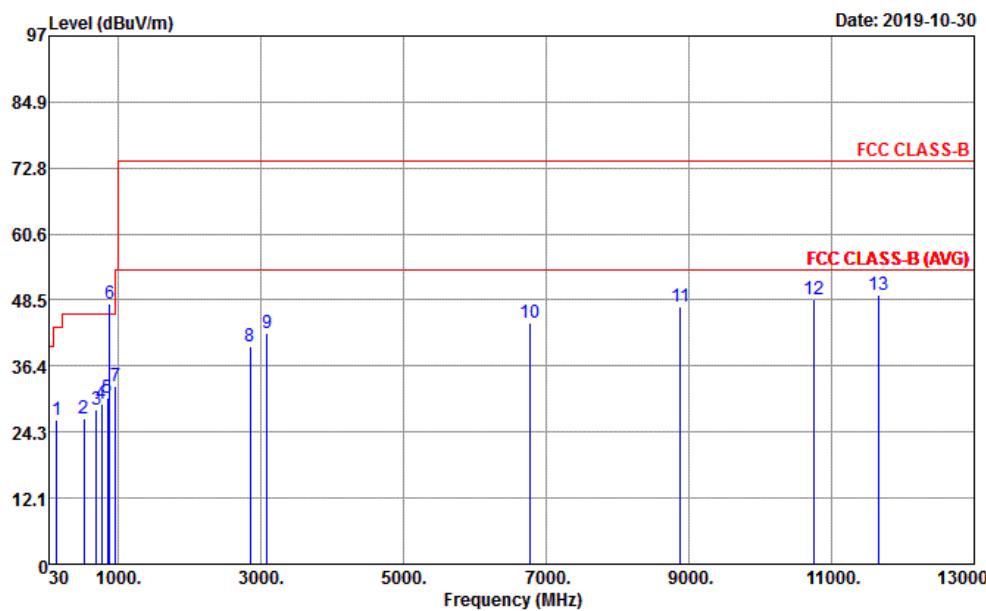
Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.235500	---	27.56	52.25	24.69	N	OFF	19.5
0.235500	35.83	---	62.25	26.42	N	OFF	19.5
0.379500	---	23.23	48.29	25.06	N	OFF	19.5
0.379500	25.75	---	58.29	32.54	N	OFF	19.5
0.618000	---	29.26	46.00	16.74	N	OFF	19.5
0.618000	35.43	---	56.00	20.57	N	OFF	19.5
1.173750	---	22.45	46.00	23.55	N	OFF	19.5
1.173750	23.46	---	56.00	32.54	N	OFF	19.5
2.449500	---	23.55	46.00	22.45	N	OFF	19.6
2.449500	25.15	---	56.00	30.85	N	OFF	19.6
4.260750	---	24.36	46.00	21.64	N	OFF	19.6
4.260750	25.24	---	56.00	30.76	N	OFF	19.6



Appendix B. Radiated Emission Test Result

Test Engineer :	Yu Wang	Temperature :	20~22°C
		Relative Humidity :	63~68%
Test Distance :	3m	Polarization :	Horizontal
Remark :	#6 is system simulator signal which can be ignored.		

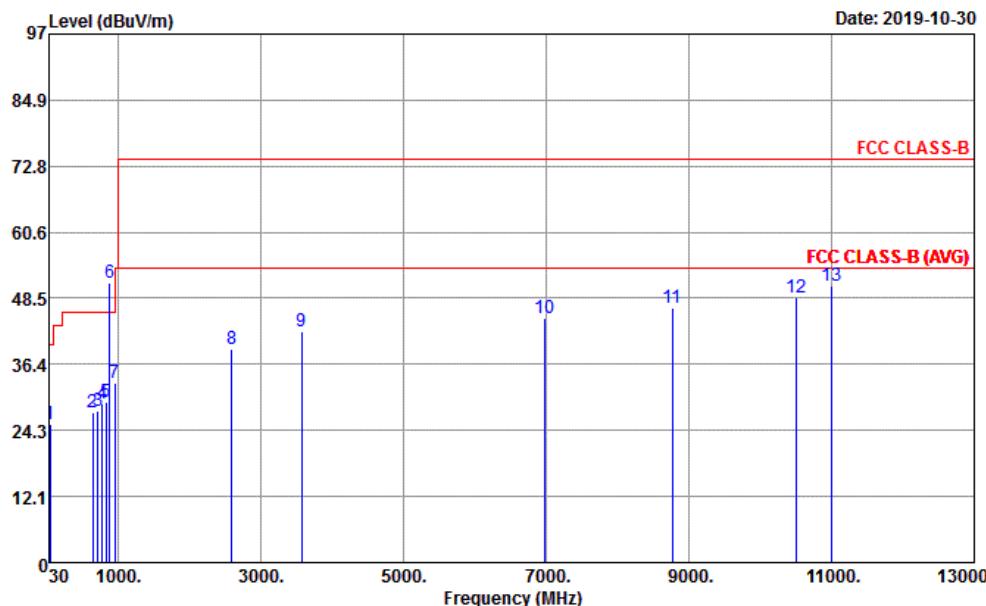


Site : 03CH10-HY
 Condition : FCC CLASS-B 3m HORN 9120D-HF HORIZONTAL
 Project : 031205
 Power : 120Vac/60Hz
 Mode : 2

Freq	Level	Over Limit	Limit	Antenna Line Factor	Read Level	Cable Preamp Loss	A/Pos	T/Pos	Remark	
									MHz	dBuV/m
1	134.76	26.61	-16.89	43.50	17.50	40.18	1.26	32.33	---	---
2	522.76	26.67	-19.33	46.00	24.04	32.49	2.58	32.44	---	---
3	691.54	28.36	-17.64	46.00	26.60	31.14	3.02	32.40	---	---
4	765.26	29.47	-16.53	46.00	28.30	30.25	3.19	32.27	---	---
5	853.53	30.59	-15.41	46.00	29.30	29.77	3.37	31.85	---	---
6 *	881.60	47.94		29.16	47.08	3.40	31.70		---	Peak
7	959.26	32.64	-13.36	46.00	31.29	28.71	3.53	30.89	100	0 Peak
8	2846.00	39.92	-34.08	74.00	28.28	66.25	7.43	62.04	---	---
9	3092.00	42.35	-31.65	74.00	28.67	67.97	7.83	62.12	---	---
10	6780.00	44.42	-29.58	74.00	34.46	62.86	10.47	63.37	---	---
11	8882.00	47.38	-26.62	74.00	37.94	62.04	11.81	64.41	---	---
12	10746.00	48.58	-25.42	74.00	39.93	59.17	13.03	63.55	---	---
13	11666.00	49.47	-24.53	74.00	39.27	59.97	13.73	63.50	100	0 Peak



Test Engineer :	Yu Wang	Temperature :	20~22°C
		Relative Humidity :	63~68%
Test Distance :	3m	Polarization :	Vertical
Remark :	#6 is system simulator signal which can be ignored.		



Site : 03CH10-HY

Condition : FCC CLASS-B 3m HORN 9120D-HF VERTICAL

Project : 031205

Power : 120Vac/60Hz

Mode : 2

Freq	Level	Over Limit	Antenna Line Factor	Read Level	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	
									MHz	dBuV/m
1	40.67	25.37	-14.63	40.00	19.13	38.14	0.58	32.48	---	---
2	643.04	27.56	-18.44	46.00	26.60	30.49	2.95	32.48	---	---
3	710.94	27.72	-18.28	46.00	26.74	30.29	3.06	32.37	---	---
4	776.90	29.15	-16.85	46.00	28.40	29.79	3.21	32.25	---	---
5	829.28	29.55	-16.45	46.00	28.46	29.78	3.32	32.01	---	---
6 *	881.60	51.37		29.16	50.51	3.40	31.70		---	Peak
7	948.59	32.87	-13.13	46.00	30.89	29.48	3.51	31.01	100	0 Peak
8	2588.00	39.25	-34.75	74.00	27.50	66.53	7.16	61.94	---	Peak
9	3574.00	42.44	-31.56	74.00	28.95	67.59	8.11	62.21	---	Peak
10	6972.00	44.83	-29.17	74.00	35.29	62.62	10.40	63.48	---	Peak
11	8768.00	46.88	-27.12	74.00	37.81	61.64	11.74	64.31	---	Peak
12	10514.00	48.71	-25.29	74.00	39.87	59.68	12.85	63.69	---	Peak
13	11010.00	50.77	-23.23	74.00	40.16	60.78	13.23	63.40	100	0 Peak