



FCC EMI TEST REPORT

The product was received on May 24, 2018 and testing was started from Jun. 08, 2018 and completed on Jun. 18, 2018. We, SPORTON INTERNATIONAL INC., 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant 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.

Jones, T. -

Approved by: Jones Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1. General Description	5
1.1. Product Feature of Equipment Under Test	5
1.2. Modification of EUT	5
1.3. Test Location.....	5
1.4. Applicable Standards	5
2. Test Configuration of Equipment Under Test	6
2.1. Test Mode	6
2.2. Connection Diagram of Test System	7
2.3. Support Unit used in test configuration and system.....	7
2.4. EUT Operation Test Setup	8
3. Test Result	9
3.1. Test of AC Conducted Emission Measurement	9
3.2. Test of Radiated Emission Measurement	11
4. List of Measuring Equipment.....	14
5. Uncertainty of Evaluation.....	15

Appendix A. AC Conducted Emission Test Result**Appendix B. Radiated Emission Test Result****Appendix C. Setup Photographs**



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 12.58 dB at 0.188 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 3.07 dB at 38.910 MHz for Quasi-Peak

Remark: This is a variant report which can be referred Product Equality Declaration. Since the test result is not affected by the changes, the FC852420-01 test report reuses test data from the FC852420 test report.

Reviewed by: Louis Wu

Report Producer: Polly Tsai



1. General Description

1.1. Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, FM Receiver, and GNSS.

Product Specification subjective to this standard	
Antenna Type	WWAN: Monopole Antenna WLAN: Monopole Antenna Bluetooth: Monopole Antenna GPS/Glonass/BDS/Galileo: PIFA Antenna FM: using earphone as antenna

1.2. Modification of EUT

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

1.3. Test Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1093 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
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

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
- 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.

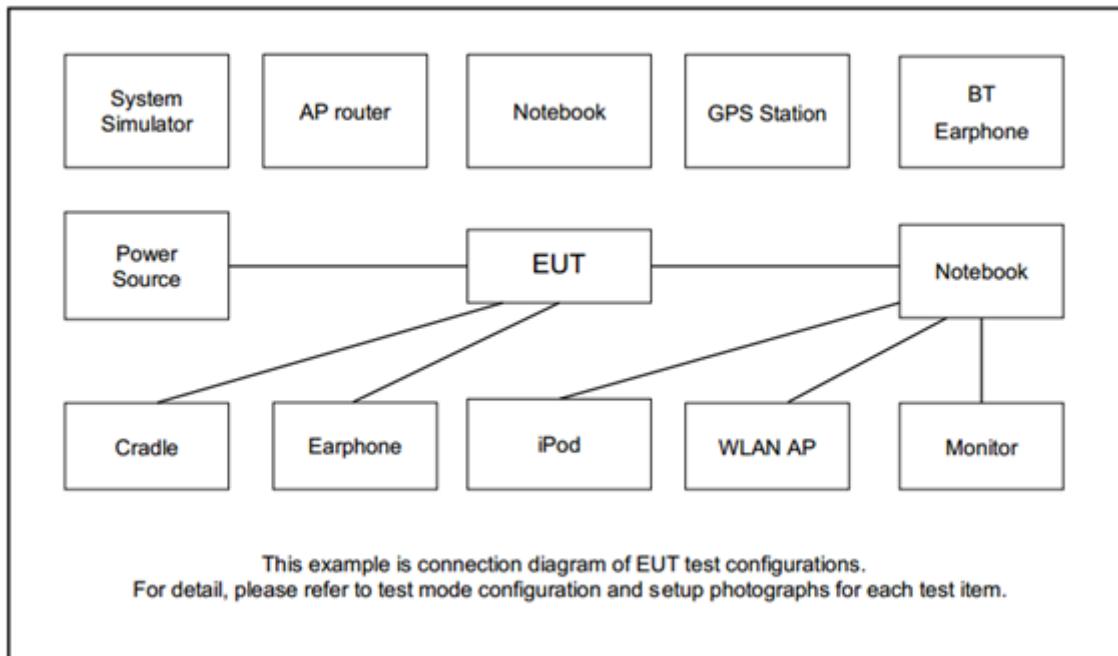
Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1: GSM850 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Camera (Front) + Earphone + USB Cable (Charging from Adapter 1) Mode 2: GSM1900 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Camera (Rear) + Earphone + USB Cable (Charging from Adapter 2) Mode 3: WCDMA Band II Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + MPEG4 + Earphone + USB Cable (Charging from Adapter 1) Mode 4: WCDMA Band V Idle + Bluetooth Idle + WLAN (5GHz) Idle + GPS Rx + Earphone + USB Cable (Charging from Adapter 2) Mode 5: LTE Band 17 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + FM Rx + Earphone + USB Cable (Data Link with Notebook)
Radiated Emissions	Mode 1: GSM850 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Camera (Front) + Earphone + USB Cable (Charging from Adapter 1) Mode 2: GSM1900 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Camera (Rear) + Earphone + USB Cable (Charging from Adapter 2) Mode 3: WCDMA Band II Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + MPEG4 + Earphone + USB Cable (Charging from Adapter 1) Mode 4: WCDMA Band V Idle + Bluetooth Idle + WLAN (5GHz) Idle + GPS Rx + Earphone + USB Cable (Charging from Adapter 2) Mode 5: LTE Band 17 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + FM Rx + Earphone + USB Cable (Data Link with Notebook)

Remark:

1. The worst case of AC is mode 5; only the test data of this mode was reported.
2. The worst case of RE is mode 3; only the test data of this mode was reported.
3. Data Linking with Notebook means data application transferred mode between EUT and Notebook.

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.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
3.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
4.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
5.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
6.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
7.	Notebook	DELL	Latitude E3340	FCC DoC/ Contains FCC ID: PD97260NGU	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
8.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
9.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A



2.4. EUT Operation Test Setup

The EUT was in GSM or WCDMA 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.

At the same time, the EUT was attached to the Bluetooth earphone or WLAN AP, and the following programs installed in the EUT were programmed during the test:

1. Data application is transferred between Laptop and EUT via USB cable.
2. Execute “VisualGPSCe” to make the EUT receive continuous signals from GPS station.
3. Execute “Video Player” to play MPEG4 files.
4. Turn on camera to capture images.
5. Execute “FM Function” to receive FM signal.



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.

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.

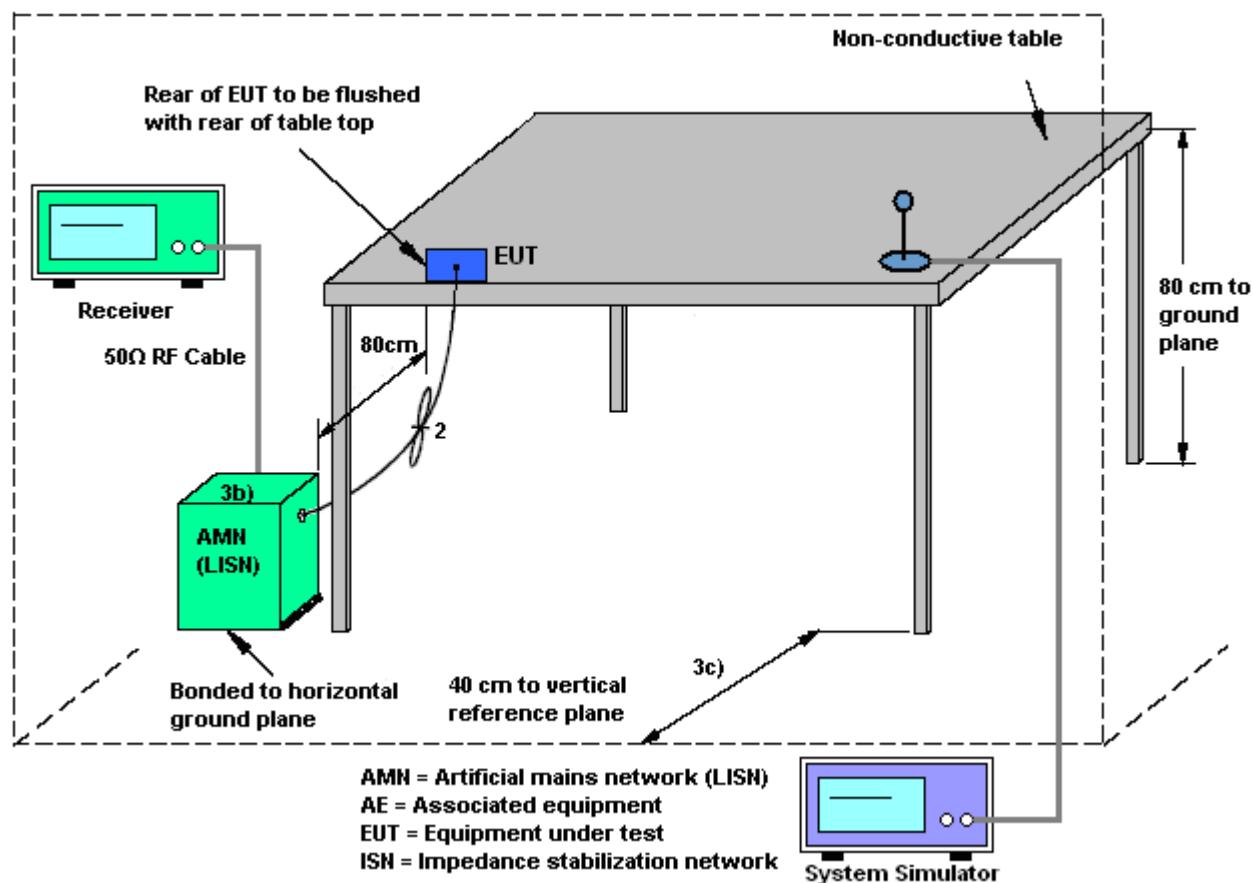
3.1.2 Measuring Instruments

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:

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.

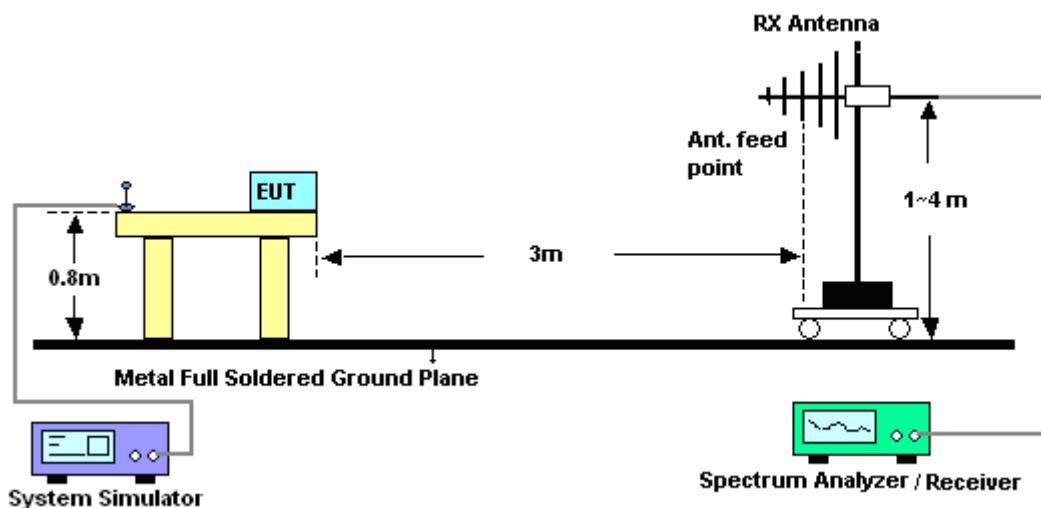


3.2.3. Test Procedures

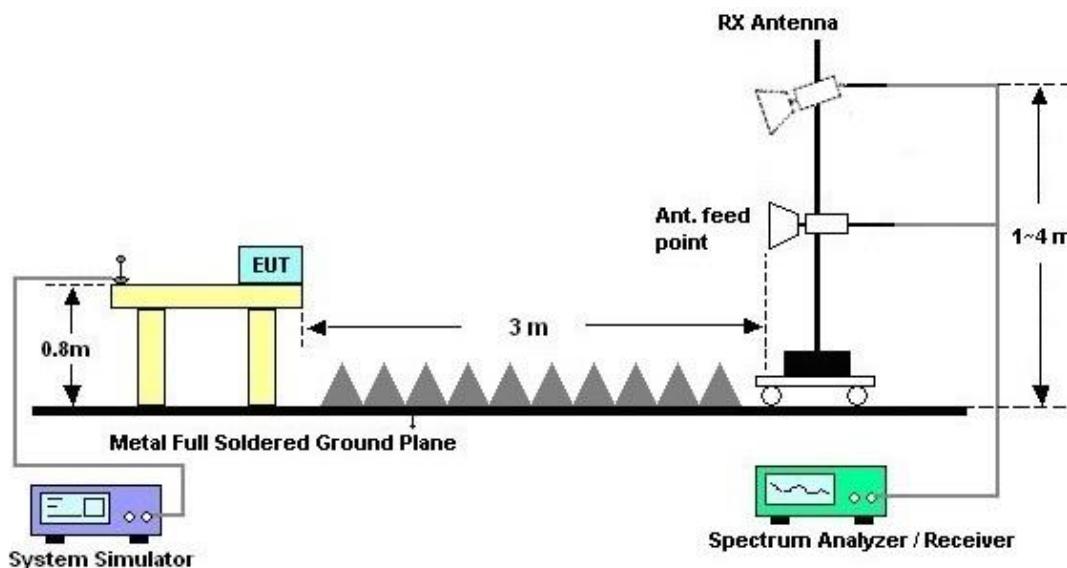
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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	Jun. 18, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	Jun. 18, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Jun. 18, 2018	Nov. 29, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 08, 2017	Jun. 18, 2018	Dec. 07, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jun. 18, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Jun. 18, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Jun. 18, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL6111C&N-6-06	2725&AT-N0601	30MHz~1GHz	Oct. 14, 2017	Jun. 08, 2018	Oct. 13, 2018	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 04, 2018	Jun. 08, 2018	Jan. 03, 2019	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Aug. 08, 2017	Jun. 08, 2018	Aug. 07, 2018	Radiation (03CH06-HY)
Preamplifier	SONOMA	310N	186713	9kHz~1GHz	May 02, 2018	Jun. 08, 2018	May 01, 2019	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1850117	1GHz ~ 18GHz	May 24, 2018	Jun. 08, 2018	May 23, 2019	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Jun. 08, 2018	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Jun. 08, 2018	N/A	Radiation (03CH06-HY)
Test Software	AUDIX	e3	6.2009-8-2 4(k5)	N/A	N/A	Jun. 08, 2018	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% ($U = 2U_{C(y)}$)	2.7
-------------------------------------------------------------------------------	-----

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	3.9
-------------------------------------------------------------------------------	-----

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	4.7
-------------------------------------------------------------------------------	-----

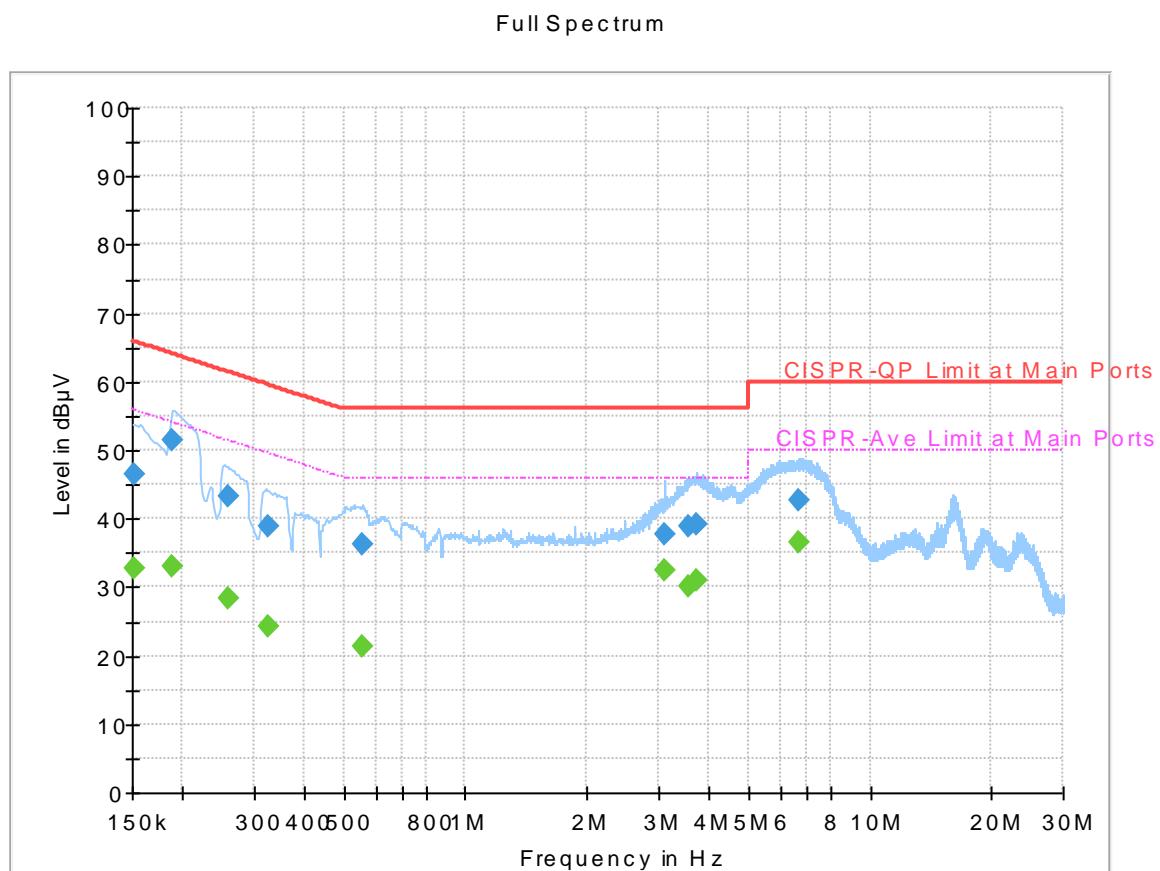


Appendix A. AC Conducted Emission Test Results

Test Engineer :	Arthur Hsieh	Temperature :	21~25°C
		Relative Humidity :	51~55%

EUT Information

Test Mode : Mode 5
 Test Voltage : Power From System
 Phase : Line



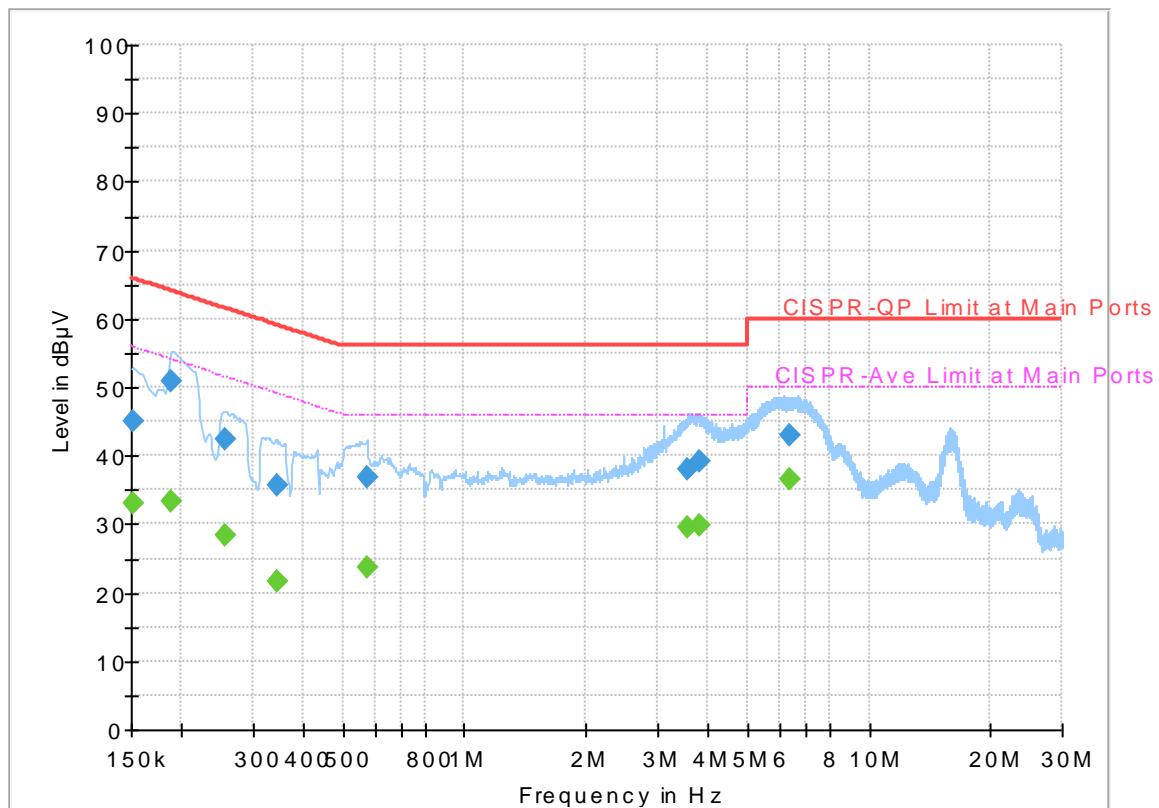
Final Result

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	32.82	55.88	23.06	L1	OFF	19.5
0.152250	46.46	---	65.88	19.42	L1	OFF	19.5
0.188250	---	33.16	54.11	20.95	L1	OFF	19.5
0.188250	51.53	---	64.11	12.58	L1	OFF	19.5
0.258000	---	28.34	51.50	23.16	L1	OFF	19.5
0.258000	43.14	---	61.50	18.36	L1	OFF	19.5
0.325500	---	24.15	49.57	25.42	L1	OFF	19.5
0.325500	38.88	---	59.57	20.69	L1	OFF	19.5
0.557250	---	21.22	46.00	24.78	L1	OFF	19.5
0.557250	36.36	---	56.00	19.64	L1	OFF	19.5
3.097500	---	32.56	46.00	13.44	L1	OFF	19.6
3.097500	37.60	---	56.00	18.40	L1	OFF	19.6
3.558750	---	30.07	46.00	15.93	L1	OFF	19.6
3.558750	38.88	---	56.00	17.12	L1	OFF	19.6
3.720750	---	30.88	46.00	15.12	L1	OFF	19.6
3.720750	39.22	---	56.00	16.78	L1	OFF	19.6
6.641250	---	36.67	50.00	13.33	L1	OFF	19.6
6.641250	42.67	---	60.00	17.33	L1	OFF	19.6

EUT Information

Test Mode : Mode 5
 Test Voltage : Power From System
 Phase : Neutral

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	33.10	55.88	22.78	N	OFF	19.5
0.152250	44.95	---	65.88	20.93	N	OFF	19.5
0.188250	---	33.38	54.11	20.73	N	OFF	19.5
0.188250	50.97	---	64.11	13.14	N	OFF	19.5
0.255750	---	28.27	51.57	23.30	N	OFF	19.5
0.255750	42.39	---	61.57	19.18	N	OFF	19.5
0.343500	---	21.76	49.12	27.36	N	OFF	19.5
0.343500	35.65	---	59.12	23.47	N	OFF	19.5
0.573000	---	23.69	46.00	22.31	N	OFF	19.5
0.573000	36.90	---	56.00	19.10	N	OFF	19.5
3.556500	---	29.42	46.00	16.58	N	OFF	19.6
3.556500	37.91	---	56.00	18.09	N	OFF	19.6
3.822000	---	29.76	46.00	16.24	N	OFF	19.6
3.822000	39.04	---	56.00	16.96	N	OFF	19.6
6.369000	---	36.53	50.00	13.47	N	OFF	19.6
6.369000	43.06	---	60.00	16.94	N	OFF	19.6



Appendix B. Radiated Emission Test Result

Test Engineer :	Donny Tang	Temperature :		21~24°C																																		
		Relative Humidity :		52~55%																																		
Test Distance :	3m	Polarization :		Horizontal																																		
Remark :	#7 is system simulator signal which can be ignored.																																					
<p>Site : 03CH06-HY Condition : FCC CLASS-B 3m 9120D_1156_170915 HORIZONTAL Power : 120Vac/60Hz Memo : Mode 3</p>																																						
<table border="1"> <thead> <tr> <th rowspan="2">Freq</th> <th rowspan="2">Level</th> <th>Over</th> <th>Limit</th> <th>Read</th> <th>Antenna</th> <th>Cable</th> <th>Preamp</th> <th>A/Pos</th> <th>T/Pos</th> <th rowspan="2">Remark</th> </tr> <tr> <th>Line</th> <th>Limit</th> <th>Level</th> <th>Factor</th> <th>Loss</th> <th>Factor</th> </tr> </thead> <tbody> <tr> <td>MHz</td> <td>dBuV/m</td> <td>dB</td> <td>dBuV/m</td> <td>dBuV</td> <td>dB/m</td> <td>dB</td> <td>dB</td> <td>cm</td> <td>deg</td> <td></td> </tr> </tbody> </table>											Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	A/Pos	T/Pos	Remark	Line	Limit	Level	Factor	Loss	Factor	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	A/Pos	T/Pos	Remark																												
		Line	Limit	Level	Factor	Loss	Factor																															
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg																													
1	64.83	25.28	-14.72	40.00	44.16	11.79	1.08	31.75	---	--- Peak																												
2	87.78	30.28	-9.72	40.00	46.47	14.30	1.25	31.74	100	172 Peak																												
3	172.56	31.61	-11.89	43.50	46.47	15.15	1.71	31.72	---	--- Peak																												
4	338.50	30.51	-15.49	46.00	39.84	19.87	2.51	31.71	---	--- Peak																												
5	450.50	31.44	-14.56	46.00	37.30	22.99	2.92	31.77	---	--- Peak																												
6	958.00	32.85	-13.15	46.00	28.60	31.02	4.16	30.93	---	--- Peak																												
7	1960.00	57.03			86.10	25.71	6.32	61.10	---	--- Peak																												
8	2964.00	36.89	-37.11	74.00	61.56	28.64	8.07	61.38	---	--- Peak																												
9	4920.00	41.14	-32.86	74.00	57.78	31.33	10.70	58.67	---	--- Peak																												
10	6726.00	44.48	-29.52	74.00	55.64	34.77	12.73	58.66	---	--- Peak																												
11	8730.00	46.32	-27.68	74.00	52.33	36.75	14.81	57.57	---	--- Peak																												
12	10828.00	49.28	-24.72	74.00	49.67	39.92	16.57	56.88	---	--- Peak																												
13	11150.00	49.67	-24.33	74.00	49.10	39.89	17.06	56.38	100	133 Peak																												

 | | | | | | | | | |

TEL : 886-3-327-3456	Page Number	: B1 of B2
FAX : 886-3-328-4978		



Test Engineer :	Donny Tang	Temperature :		21~24°C										
		Relative Humidity :		52~55%										
Test Distance :	3m	Polarization :		Vertical										
Remark :	#7 is system simulator signal which can be ignored.													
<p>Site : 03CH06-HY Condition : FCC CLASS-B 3m 9120D_1156_170915 VERTICAL Power : 120Vac/60Hz Memo : Mode 3</p>														
	Freq	Over Limit	Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark					
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm deg					
1	38.91	36.93	-3.07	40.00	48.18	19.74	0.78	31.77	100 Peak					
2	51.87	32.38	-7.62	40.00	49.72	13.34	1.08	31.76	--- Peak					
3	170.94	35.76	-7.74	43.50	50.48	15.30	1.70	31.72	--- Peak					
4	450.50	37.07	-8.93	46.00	42.93	22.99	2.92	31.77	--- Peak					
5	929.30	31.93	-14.07	46.00	29.30	29.66	4.15	31.18	--- Peak					
6	959.40	32.56	-13.44	46.00	28.24	31.07	4.17	30.92	--- Peak					
7	1960.00	54.66		83.73	25.71	6.32	61.10	---	--- Peak					
8	2436.00	37.47	-36.53	74.00	64.43	27.07	7.07	61.10	--- Peak					
9	4918.00	40.88	-33.12	74.00	57.56	31.29	10.70	58.67	--- Peak					
10	6976.00	43.58	-30.42	74.00	53.86	35.45	12.88	58.61	--- Peak					
11	8750.00	45.40	-28.60	74.00	51.43	36.76	14.82	57.61	--- Peak					
12	10876.00	48.38	-25.62	74.00	48.54	39.98	16.64	56.78	--- Peak					
13	11008.00	49.45	-24.55	74.00	49.01	40.10	16.83	56.49	100 155 Peak					