



FCC EMI TEST REPORT

FCC ID : IHDT56XL1
Equipment : Mobile 5G MOD
Brand Name : Motorola
Model Name : MD1005G
Applicant : Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL
60654 USA
Manufacturer : Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL
60654 USA
Standard : FCC 47 CFR FCC Part 15 Subpart B

The product was received on Sep. 05, 2018 and testing was started from Oct. 25, 2018 and completed on Nov. 13, 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 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: Jones Tsai

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

Report No.	Version	Description	Issued Date
FC890514	01	Initial issue of report	Dec. 21, 2018



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 13.03 dB at 0.152 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 7.47 dB at 934.200 MHz

Reviewed by: Louis Wu

Report Producer: Natasha Hsieh



1. General Description

1.1. Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile 5G MOD
Brand Name	Motorola
Model Name	MD1005G
FCC ID	IHDT56XL1
IMEI Code	Conduction : 355567090010496 Radiation : 355567090011767
EUT supports Radios application	LTE/5G NR
HW Version	DVT2
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Specification of Accessories	
USB Cable 1	Brand Name : Motorola
	Model Name : SC18C46623

Supported Unit Used in Test Configuration and System	
AC Adapter 1	Brand Name : Motorola
	Model Name : SC-22
	Manufacturer : Chenyang
AC Adapter 2	Brand Name : Motorola
	Model Name : SC-51
	Manufacturer : Salom
Mobile Phone	Brand Name : Motorola
	FCC ID : IHDT56XJ1

1.2. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	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 13: 779.5 MHz ~ 784.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz LTE Band 48: 3552.5 MHz ~ 3697.5 MHz 5G NR n260: 37000 MHz ~ 40000 MHz 5G NR n261: 27500 MHz ~ 28350 MHz
Rx Frequency	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 13: 748.5 MHz ~ 753.5 MHz LTE Band 66: 2110.7 MHz ~ 2199.3 MHz 5G NR n260: 37000 MHz ~ 40000 MHz 5G NR n261: 27500 MHz ~ 28350 MHz
Antenna Type	Fixed Internal Antenna
Type of Modulation	LTE: QPSK / 16QAM / 64QAM 5G NR: QPSK / 16QAM / 64QAM

1.3. Modification of EUT

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

1.4. 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

1.5. 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
- ANSI C63.4-2014

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

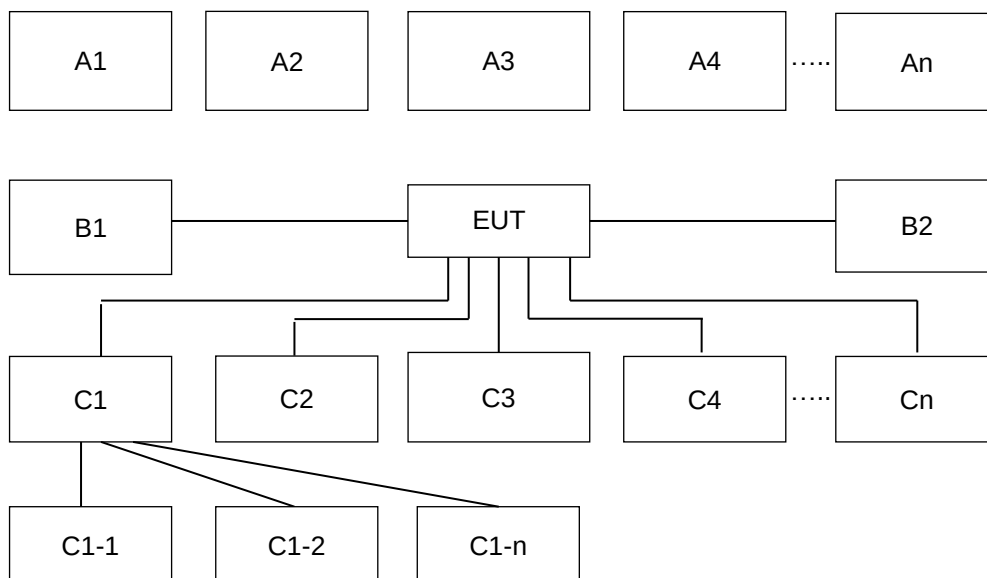
2. Test Configuration of Equipment Under Test

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: LTE Band 5 Idle (EUT) + USB Cable + Adapter 1
	Mode 2: EUT with Mobile Phone + LTE Band 5 Idle (EUT) + LTE Band 5 Idle (Mobile Phone) + Bluetooth Idle + WLAN (2.4GHz) Idle + USB Cable + Adapter 1 + MPEG4
	Mode 3: LTE Band 5 Idle (EUT) + USB Tethering (Data Link with Notebook)
Radiated Emissions	Mode 1: LTE Band 5 Idle (EUT) + USB Cable + Adapter 2
	Mode 2: EUT with Mobile Phone + LTE Band 5 Idle (EUT) + LTE Band 5 Idle (Mobile Phone) + Bluetooth Idle + WLAN (2.4GHz) Idle + USB Cable + Adapter 2 + MPEG4
	Mode 3: LTE Band 5 Idle (EUT) + USB Tethering (Data Link with Notebook)
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 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



Test Setup								
No.	Wireless Station	Connection Type	Test Mode					
			1	2	3			
A1	System Simulator	GSM/UMTS/CDMA/WCDMA/LTE	X	X	X			
A2	Bluetooth Earphone	Bluetooth		X				
A3	AP router	WiFi		X				
No.	Power Source	Connection Type	1	2	3			
B1	AC : 120V/60Hz	AC Power Cable	X	X				
No.	Setup Peripherals	Connection Type	1	2	3			
C1	Smart Phone	Pogo Ping I/O interface without Cable		X				
C1-1	SD card	SD I/O interface without Cable to C1		X				
C2	Notebook	USB Cable			X			
C2-1	HDD	USB Cable to C2			X			
C2-2	AP router	RJ-45 Cable to C2			X			

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	lenovo	LBH 301	FCC DoC	N/A	N/A
3.	Notebook	Asus	P2430U	FCC DoC	N/A	AC I/P : Unshielded, 1.2 m DC O/P : Shielded, 1.8 m
4.	USB3.0 HD	lenovo	F310S	FCC DoC	Shielded, 0.5 m	N/A
5.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.4. EUT Operation Test Setup

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

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

1. Mobile Phone links with Notebook and executes ping and iperf to transfer files.
2. Execute "Video player" to play MPEG4 files.

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.

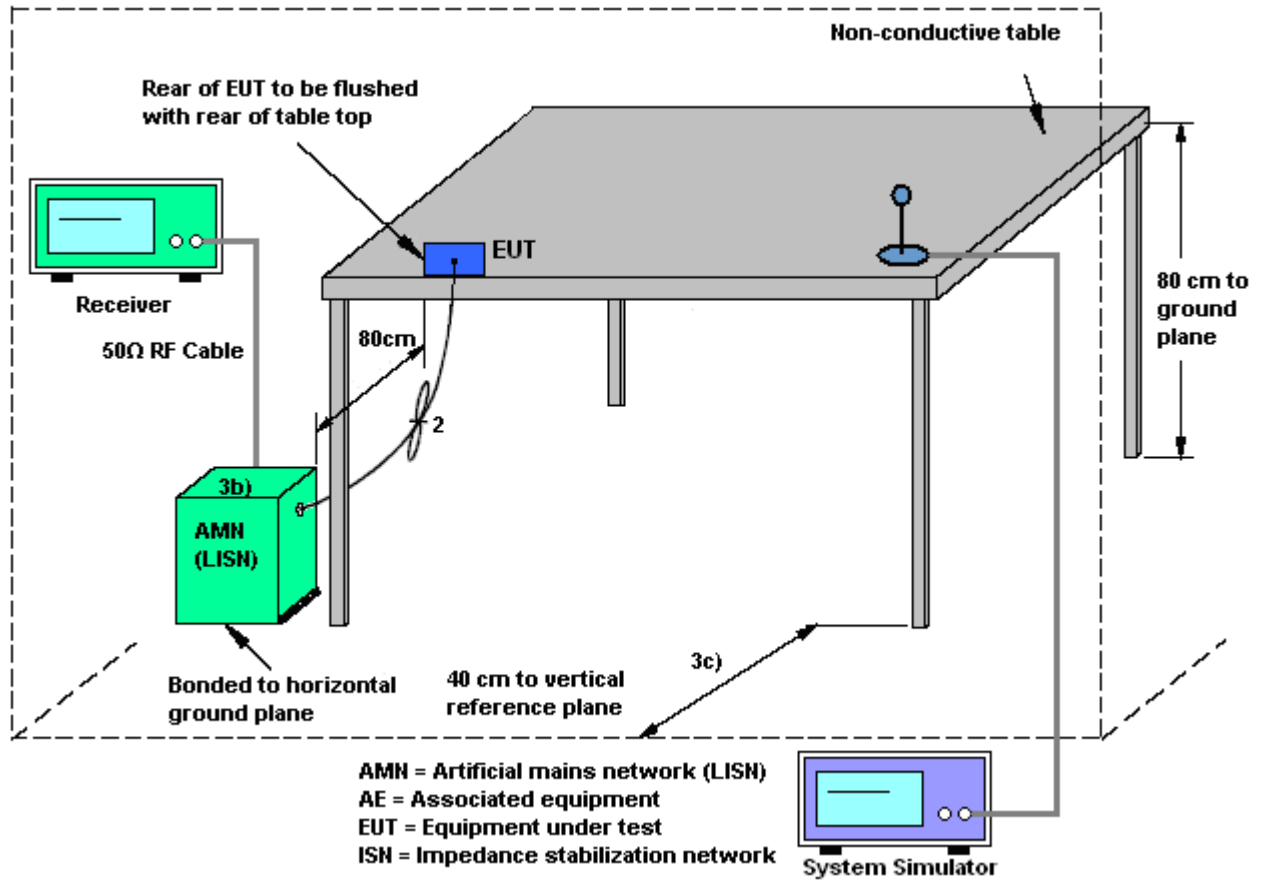
3.1.2 Measuring Instruments

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

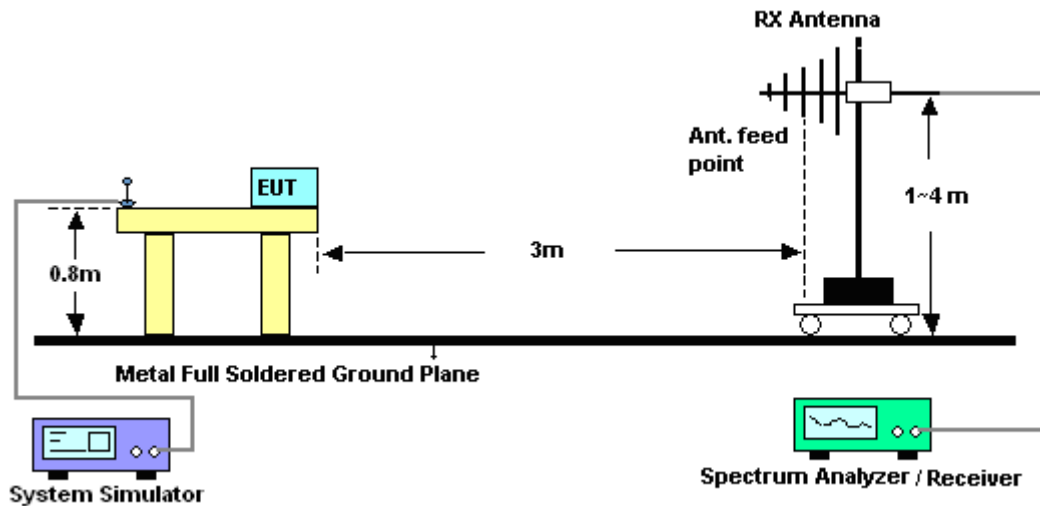
Refer a test equipment and calibration data table in this test report.

3.2.3. Test Procedures

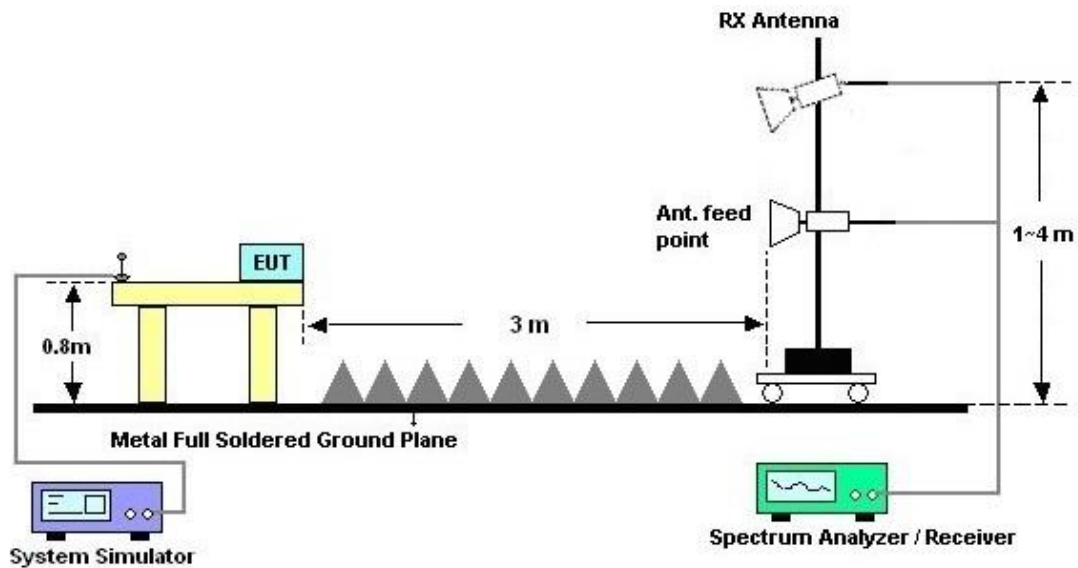
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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 (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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000 W	N/A	N/A	N/A	Oct. 27, 2018~ Nov. 13, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9KHz~3.6GHz	Dec. 08, 2017	Oct. 27, 2018~ Nov. 13, 2018	Dec. 07, 2018	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 06, 2018	Oct. 27, 2018~ Nov. 13, 2018	Mar. 05, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Oct. 27, 2018~ Nov. 13, 2018	Nov. 29, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Oct. 27, 2018~ Nov. 13, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Oct. 27, 2018~ Nov. 13, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Oct. 27, 2018~ Nov. 13, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL6111C &N-6-06	2725&AT-N0 601	30MHz~1GHz	Oct. 13, 2018	Oct. 25, 2018~ Nov. 13, 2018	Oct. 12, 2019	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 04, 2018	Oct. 25, 2018~ Nov. 13, 2018	Jan. 03, 2019	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Aug. 24, 2018	Oct. 25, 2018~ Nov. 13, 2018	Aug. 23, 2019	Radiation (03CH06-HY)
Preamplifier	SONOMA	310N	186713	9kHz~1GHz	May 02, 2018	Oct. 25, 2018~ Nov. 13, 2018	May 01, 2019	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-00 101800-30-10P	1850117	1GHz ~ 18GHz	May 24, 2018	Oct. 25, 2018~ Nov. 13, 2018	May 23, 2019	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Oct. 25, 2018~ Nov. 13, 2018	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF78020821 2	1m~4m	N/A	Oct. 25, 2018~ Nov. 13, 2018	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Oct. 25, 2018~ Nov. 13, 2018	N/A	Radiation (03CH06-HY)
Test Software	AUDIX	e3	6.2009-8-24 (k5)	N/A	N/A	Oct. 25, 2018~ Nov. 13, 2018	N/A	Radiation (03CH06-HY)
RF Cable	HUBER+SUHNER/UTIFLEX	SUCOFLEX 104 / UFA210A	MY24966/4 / LF-01	30MHz-1GHz	Nov. 24, 2017	Oct. 25, 2018~ Nov. 13, 2018	Nov. 23, 2018	Radiation (03CH06-HY)
RF Cable	Infinet/Sunhner	LL142/SF104	CA3601-360 1-HLL	1GHz-26GHz	Nov. 24, 2017	Oct. 25, 2018~ Nov. 13, 2018	Nov. 23, 2018	Radiation (03CH06-HY)
Filter	Microwave	H1G013G1	SN477215	1.0G High Pass	Dec. 07, 2017	Oct. 25, 2018~ Nov. 13, 2018	Dec. 06, 2018	Radiation (03CH06-HY)
Filter	Wainwright	WLKS1200 -8SS	SN3	1.2G Low Pass	Nov. 21, 2017	Oct. 25, 2018~ Nov. 13, 2018	Nov. 20, 2018	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% ($U = 2Uc(y)$)	2.20
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

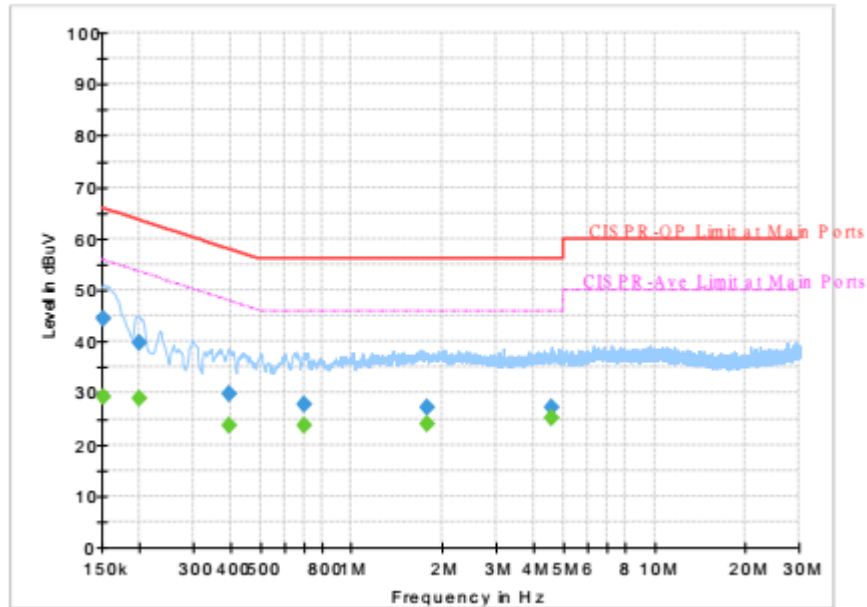
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.90
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.70
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Appendix A. AC Conducted Emission Test Results

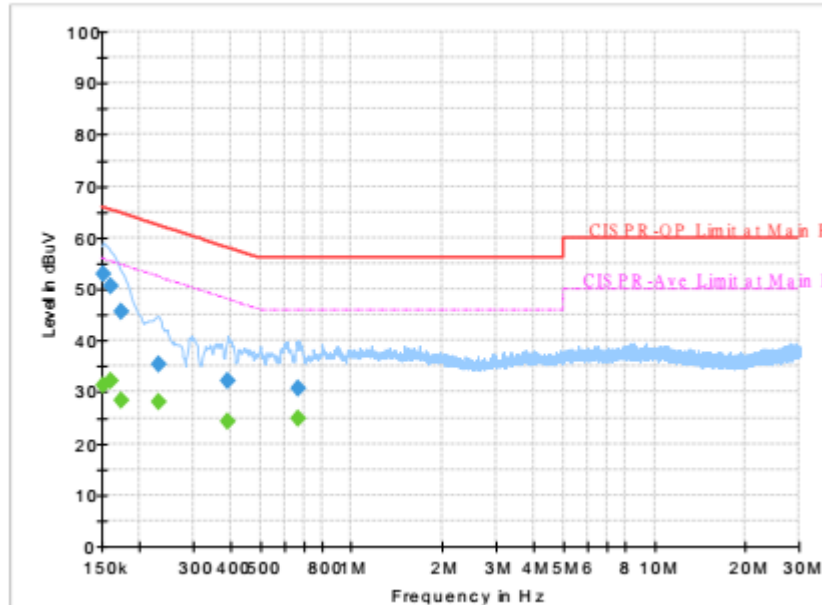
Test Engineer :	Eric Jeng	Temperature :	25~27°C
		Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Line



Final Result :

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	29.34	55.88	26.54	L1	OFF	19.5
0.152250	44.31	---	65.88	21.57	L1	OFF	19.5
0.199500	---	29.09	53.63	24.54	L1	OFF	19.5
0.199500	39.72	---	63.63	23.91	L1	OFF	19.5
0.393000	---	23.64	48.00	24.36	L1	OFF	19.5
0.393000	29.68	---	58.00	28.32	L1	OFF	19.5
0.699000	---	23.69	46.00	22.31	L1	OFF	19.6
0.699000	27.78	---	56.00	28.22	L1	OFF	19.6
1.783500	---	24.10	46.00	21.90	L1	OFF	19.6
1.783500	27.24	---	56.00	28.76	L1	OFF	19.6
4.584750	---	25.27	46.00	20.73	L1	OFF	19.7
4.584750	27.33	---	56.00	28.67	L1	OFF	19.7

Test Engineer :	Eric Jeng	Temperature :	25~27°C
		Relative Humidity :	50~52%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

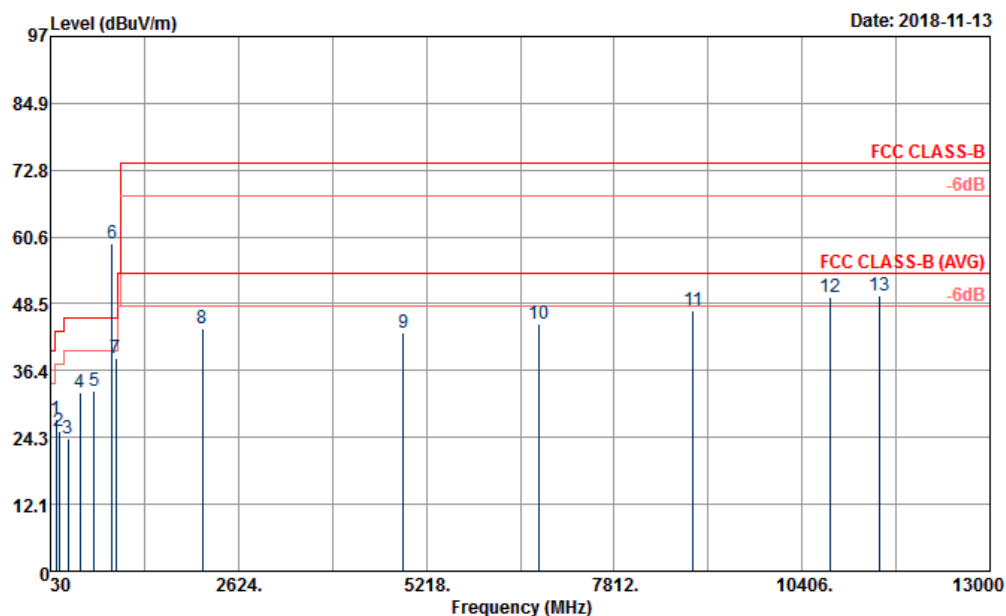

Final Result :

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	31.31	55.88	24.57	N	OFF	19.5
0.152250	52.85	---	65.88	13.03	N	OFF	19.5
0.161250	---	32.29	55.40	23.11	N	OFF	19.5
0.161250	50.53	---	65.40	14.87	N	OFF	19.5
0.174750	---	28.36	54.73	26.37	N	OFF	19.5
0.174750	45.65	---	64.73	19.08	N	OFF	19.5
0.231000	---	28.13	52.41	24.28	N	OFF	19.5
0.231000	35.35	---	62.41	27.06	N	OFF	19.5
0.390750	---	24.25	48.05	23.80	N	OFF	19.5
0.390750	32.09	---	58.05	25.96	N	OFF	19.5
0.669750	---	24.89	46.00	21.11	N	OFF	19.6
0.669750	30.60	---	56.00	25.40	N	OFF	19.6



Appendix B. Radiated Emission Test Result

Test Engineer :	Eric Jeng and Donny Tang	Temperature :	23~25°C
		Relative Humidity :	50~51%
Test Distance :	3m	Polarization :	Horizontal
Remark :	#6 is system simulator signal which can be ignored.		

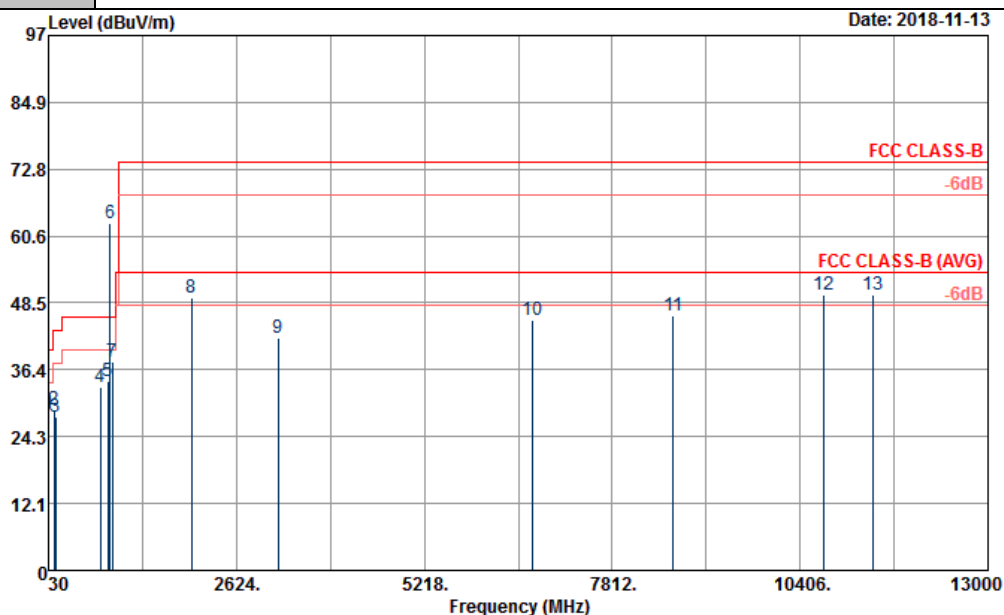


Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120D_1156_180824 HORIZONTAL
Project : 890514
Power : From System
Memo : Mode 3

	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	109.92	27.62	-15.88	43.50	41.07	16.88	1.40	31.73	---	---
2	151.50	25.39	-18.11	43.50	38.66	16.83	1.62	31.72	---	---
3	268.95	24.18	-21.82	46.00	34.89	18.76	2.23	31.70	---	---
4	437.20	32.41	-13.59	46.00	38.54	22.75	2.88	31.76	---	---
5	637.40	32.58	-13.42	46.00	35.06	26.05	3.43	31.96	---	---
6 *	881.70	59.35			57.80	28.95	4.12	31.52	---	---
7	934.20	38.53	-7.47	46.00	35.38	30.15	4.14	31.14	100	23
8	2128.00	44.12	-29.88	74.00	71.16	27.40	6.66	61.10	---	---
9	4900.00	43.29	-30.71	74.00	60.13	31.20	10.69	58.73	---	---
10	6770.00	44.73	-29.27	74.00	56.13	34.40	12.85	58.65	---	---
11	8900.00	47.25	-26.75	74.00	52.46	37.70	14.87	57.78	---	---
12	10792.00	49.79	-24.21	74.00	49.93	40.30	16.53	56.97	---	---
13	11477.00	50.00	-24.00	74.00	48.71	39.87	17.54	56.12	100	226



Test Engineer :	Eric Jeng and Donny Tang	Temperature :	23~25°C
		Relative Humidity :	50~51%
Test Distance :	3m	Polarization :	Vertical
Remark :	#6 is system simulator signal which can be ignored.		



Site : 03CH06-HY
 Condition : FCC CLASS-B 3m 9120D_1156_180824 VERTICAL
 Project : 890514
 Power : From System
 Memo : Mode 3

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	32.97	28.42	-11.58	40.00	36.74	22.71	0.74	31.77	---	---	Peak
2	112.35	29.19	-14.31	43.50	42.57	16.93	1.42	31.73	---	---	Peak
3	129.63	27.87	-15.63	43.50	40.68	17.39	1.52	31.72	---	---	Peak
4	741.70	33.33	-12.67	46.00	33.80	27.80	3.68	31.95	---	---	Peak
5	850.20	34.39	-11.61	46.00	32.77	29.28	4.00	31.66	---	---	Peak
6 *	881.70	62.84			61.29	28.95	4.12	31.52	---	---	Peak
7	910.40	37.75	-8.25	46.00	35.53	29.40	4.17	31.35	100	77	Peak
8	2000.00	49.32	-24.68	74.00	77.61	26.40	6.41	61.10	---	---	Peak
9	3200.00	42.10	-31.90	74.00	66.23	28.80	8.55	61.48	---	---	Peak
10	6702.00	45.41	-28.59	74.00	57.10	34.30	12.67	58.66	---	---	Peak
11	8654.00	46.16	-27.84	74.00	51.46	37.40	14.79	57.49	---	---	Peak
12	10742.00	49.90	-24.10	74.00	50.46	40.06	16.45	57.07	---	---	Peak
13	11416.00	49.94	-24.06	74.00	48.82	39.82	17.47	56.17	100	221	Peak