

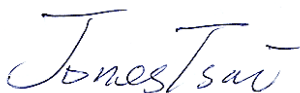
FCC EMI TEST REPORT

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 Apr. 29, 2019 and testing was started from May 03, 2019 and completed on May 09, 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 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 partial 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
FC890514-05A	01	Initial issue of report	Jun. 17, 2019



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 14.87 dB at 0.193 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 4.35 dB at 240.060 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: Louis Wu

Report Producer: Jessie Ho

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	355567090025452
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	Brand Name : Motorola
	Model Name : SC18C46623

Supported Unit Used in Test Configuration and System	
AC Adapter 1	Brand Name : Motorola
	Model Name : SC-51
	Manufacturer : Salom
AC Adapter 2	Brand Name : Motorola
	Model Name : SC-51
	Manufacturer : Chenyang
Mobile Phone	Brand Name : Motorola
	FCC ID : IHDT56WB1

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

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

FCC Designation No. TW1093

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.

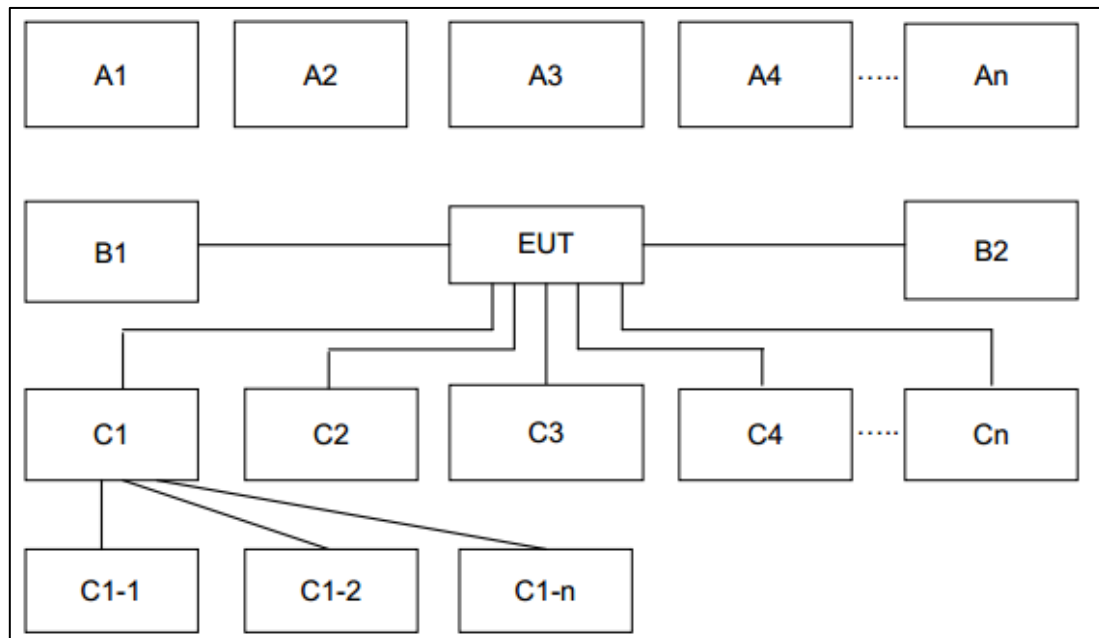
2. Test Configuration of Equipment Under Test

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 (Data Link with Notebook) + Mobile Phone
	Mode 2: LTE Band 13 Idle (EUT) + USB Cable (Charging from AC Adapter 1) + Mobile Phone
Radiated Emissions	Mode 1: LTE Band 5 Idle (EUT) + USB Cable (Data Link with Notebook) + Mobile Phone
	Mode 2: LTE Band 13 Idle (EUT) + USB Cable (Charging from AC Adapter 1) + Mobile Phone
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. 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	-	-	-	-	-
A1	System Simulator	GSM/UMTS/CDMA/ WCDMA/LTE	X	X					
No.	Power Source	Connection Type	1	2	-	-	-	-	-
B1	AC : 120V/60Hz	AC Power Cable		X					
No.	Setup Peripherals	Connection Type	1	2	-	-	-	-	-
C1	Notebook	USB Cable	X						
C1-1	iPod	USB Cable to C1	X						
C1-2	AP router	RJ-45 Cable to C1	X						
C2	Phone	Cover	X	X					

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.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8m
3.	Notebook	ASUS	P2430U	FCC DoC	N/A	AC I/P : Unshielded, 1.2m DC O/P : Shielded, 1.8m
4.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2.4. EUT Operation Test Setup

The EUT was in 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.

At the same time, the data application is transferred between Laptop and Phone via USB cable.

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.

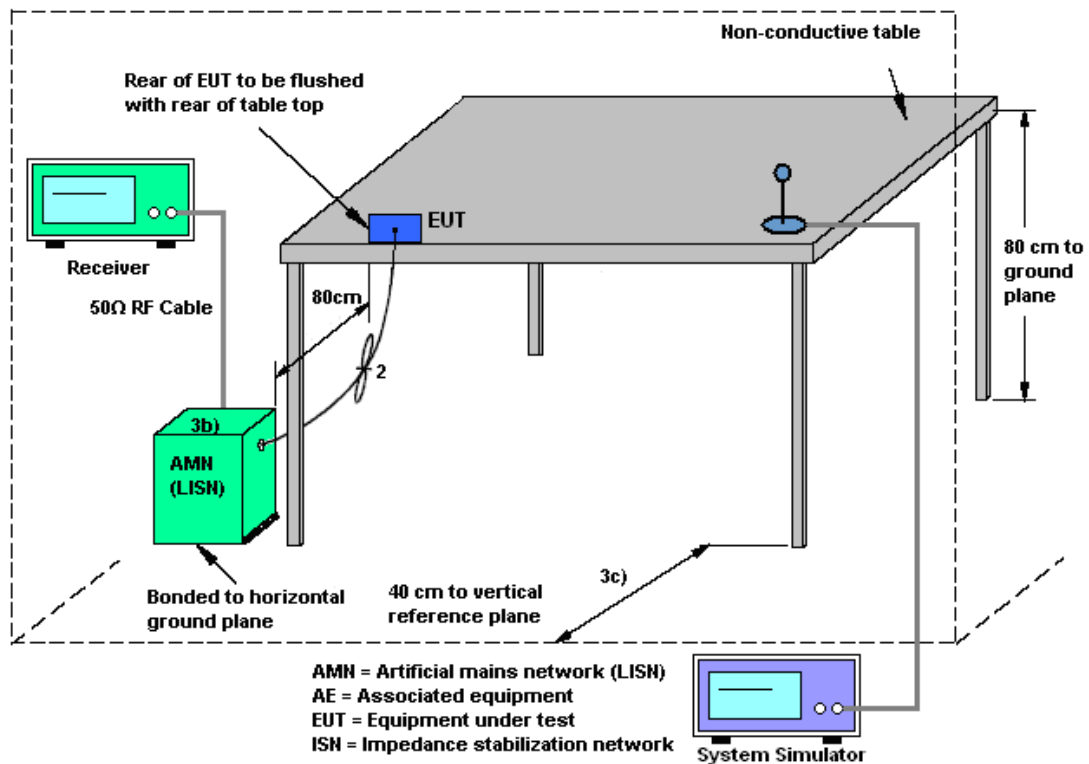
3.1.2 Measuring Instruments

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

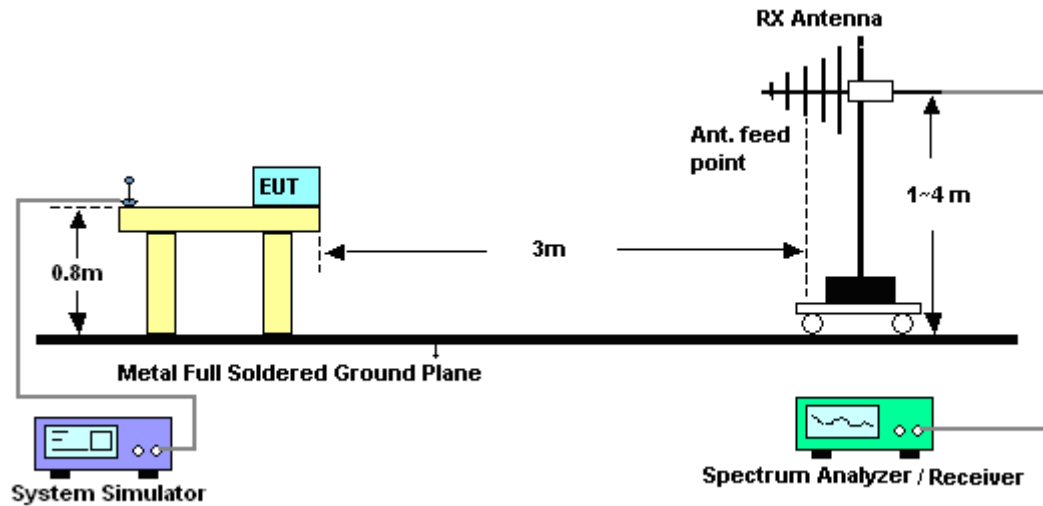
Refer a test equipment and calibration data table in this test report.

3.2.3. Test Procedures

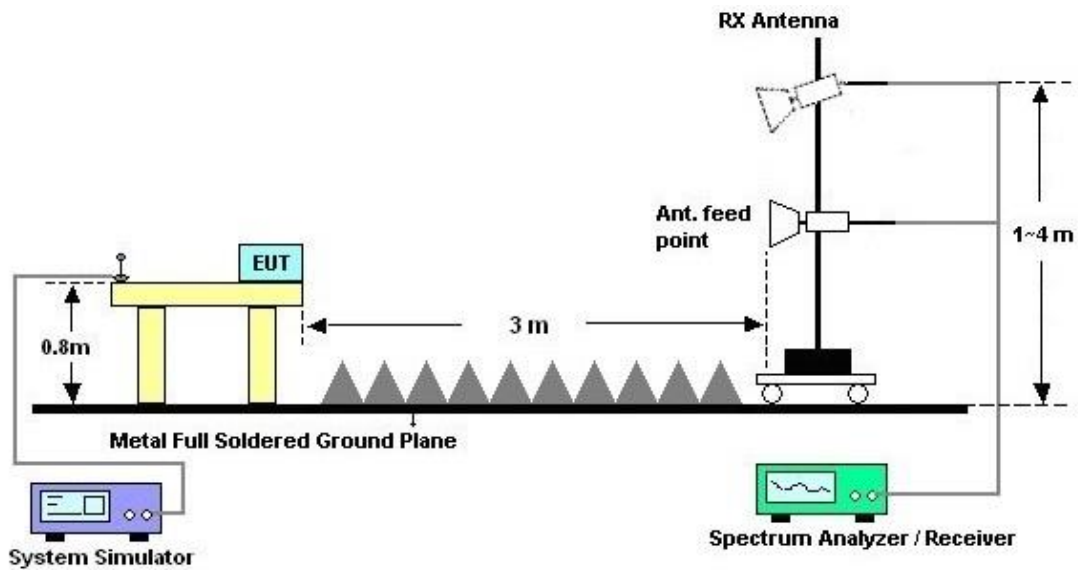
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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-1000W	N/A	N/A	N/A	May 03, 2019	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9KHz~3.6GHz	Nov. 12, 2018	May 03, 2019	Nov. 11, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 14, 2018	May 03, 2019	Nov. 13, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 09, 2018	May 03, 2019	Nov. 08, 2019	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	May 03, 2019	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Dec. 31, 2018	May 03, 2019	Dec. 30, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Dec. 31, 2018	May 03, 2019	Dec. 30, 2019	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL6111C&N-6-06	2725&AT-N0601	30MHz~1GHz	Oct. 13, 2018	May 08, 2019 ~ May 09, 2019	Oct. 12, 2019	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 08, 2019	May 08, 2019 ~ May 09, 2019	Jan. 07, 2020	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Aug. 24, 2018	May 08, 2019 ~ May 09, 2019	Aug. 23, 2019	Radiation (03CH06-HY)
Preamplifier	SONOMA	310N	186713	9kHz~1GHz	May 01, 2019	May 08, 2019 ~ May 09, 2019	Apr. 30, 2020	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1850117	1GHz ~ 18GHz	May 24, 2018	May 08, 2019 ~ May 09, 2019	May 23, 2019	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	May 08, 2019 ~ May 09, 2019	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	May 08, 2019 ~ May 09, 2019	N/A	Radiation (03CH06-HY)
Test Software	AUDIX	e3	6.2009-8-24(k5)	N/A	N/A	May 08, 2019 ~ May 09, 2019	N/A	Radiation (03CH06-HY)
RF Cable	HUBER+SUHNER/WOKEN/HARBOUR INDUSTRIES	SUCOFLEX 104 /STORM/LL142	MY24966/4/00100A1O2A 178T/CA3601-3601-1000	30MHz-26GHz	Nov. 22, 2018	May 08, 2019 ~ May 09, 2019	Nov. 21, 2019	Radiation (03CH06-HY)
Filter	Microwave	H1G013G1	SN477215	1.0G High Pass	Nov. 02, 2018	May 08, 2019 ~ May 09, 2019	Nov. 01, 2019	Radiation (03CH06-HY)
Filter	Wainwright	WLKS1200-8S	SN3	1.2G Low Pass	Nov. 02, 2018	May 08, 2019 ~ May 09, 2019	Nov. 01, 2019	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% ($U = 2Uc(y)$)	2.2
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

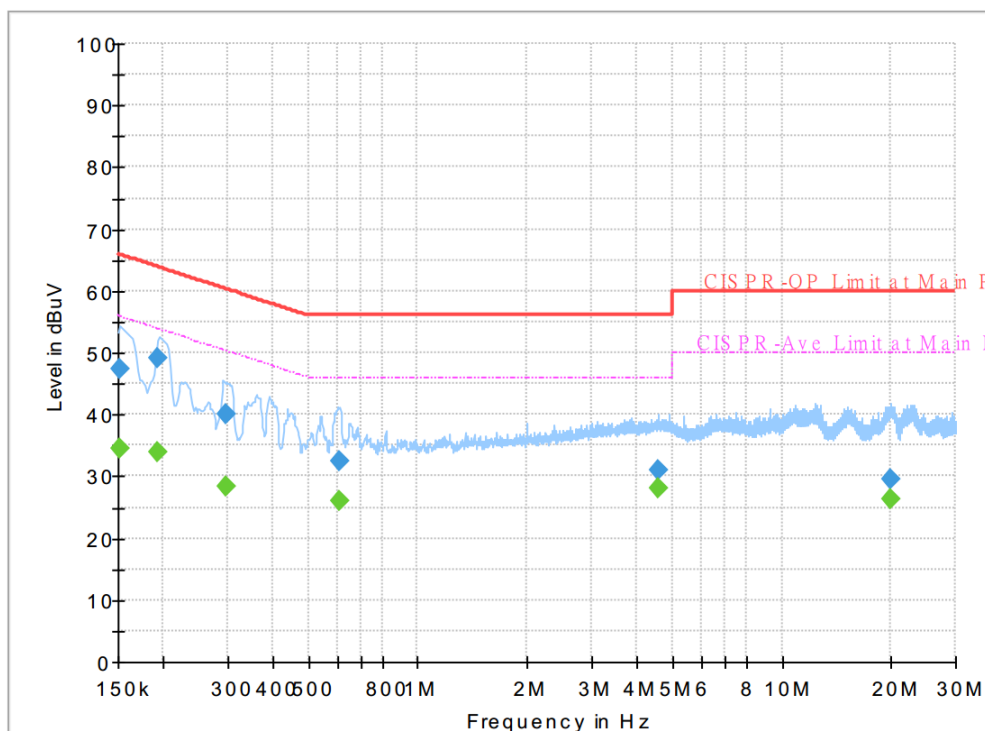
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.9
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.7
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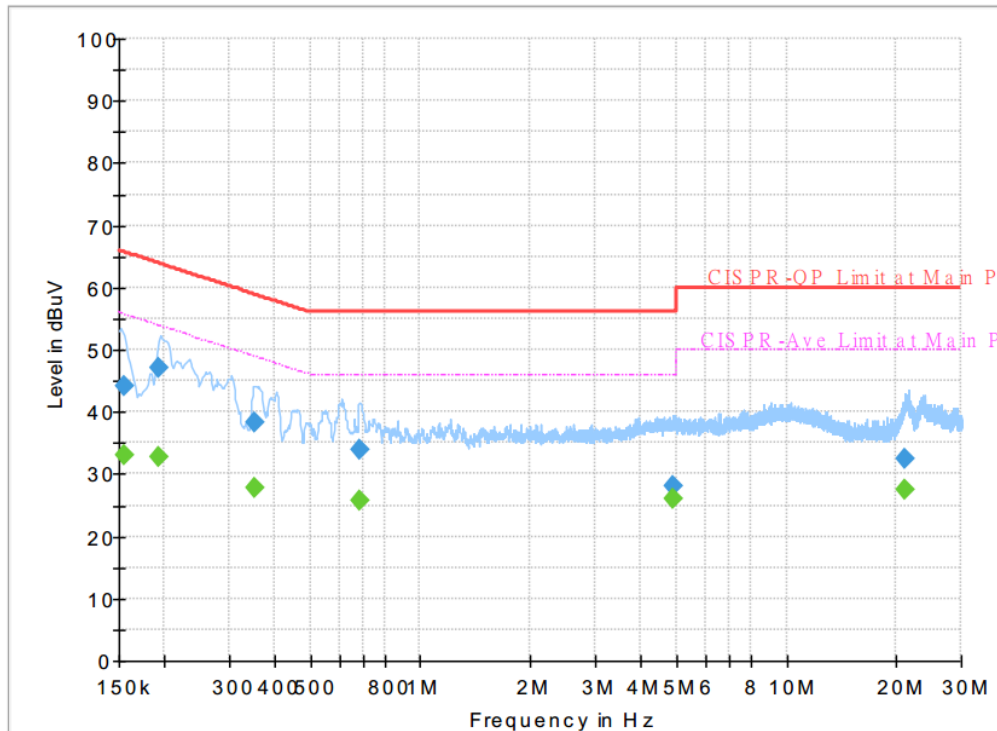
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Jimmy Chang	Temperature :	24~26°C
		Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line



Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	34.39	55.88	21.49	L1	OFF	19.5
0.152250	47.51	---	65.88	18.37	L1	OFF	19.5
0.192750	---	34.05	53.92	19.87	L1	OFF	19.5
0.192750	49.05	---	63.92	14.87	L1	OFF	19.5
0.298500	---	28.25	50.28	22.03	L1	OFF	19.5
0.298500	39.96	---	60.28	20.32	L1	OFF	19.5
0.609000	---	25.90	46.00	20.10	L1	OFF	19.6
0.609000	32.48	---	56.00	23.52	L1	OFF	19.6
4.591500	---	28.06	46.00	17.94	L1	OFF	19.7
4.591500	30.90	---	56.00	25.10	L1	OFF	19.7
19.851000	---	26.44	50.00	23.56	L1	OFF	20.3
19.851000	29.42	---	60.00	30.58	L1	OFF	20.3

Test Engineer :	Jimmy Chang	Temperature :	24~26°C
		Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral

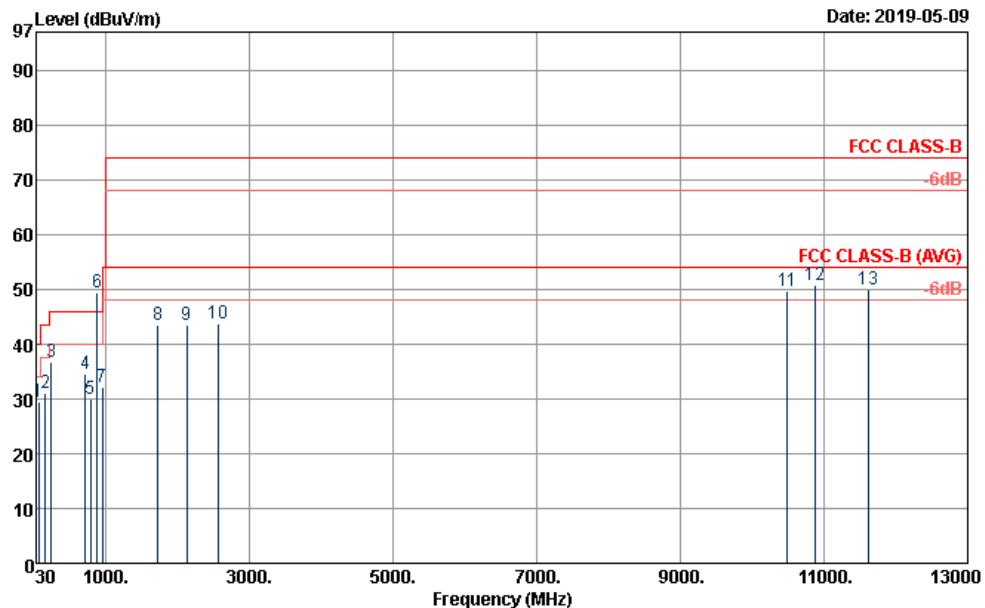


Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154500	---	32.96	55.75	22.79	N	OFF	19.5
0.154500	44.14	---	65.75	21.61	N	OFF	19.5
0.192750	---	32.79	53.92	21.13	N	OFF	19.5
0.192750	47.19	---	63.92	16.73	N	OFF	19.5
0.352500	---	27.77	48.90	21.13	N	OFF	19.5
0.352500	38.36	---	58.90	20.54	N	OFF	19.5
0.681000	---	25.76	46.00	20.24	N	OFF	19.6
0.681000	33.92	---	56.00	22.08	N	OFF	19.6
4.908750	---	26.02	46.00	19.98	N	OFF	19.7
4.908750	27.98	---	56.00	28.02	N	OFF	19.7
21.079500	---	27.40	50.00	22.60	N	OFF	20.4
21.079500	32.59	---	60.00	27.41	N	OFF	20.4



Appendix B. Radiated Emission Test Result

Test Engineer :	Brad Liu and Yuan Lee	Temperature :	23~25°C
		Relative Humidity :	54~57%
Test Distance :	3m	Polarization :	Horizontal
Remark :	#6 is system simulator signal which can be ignored.		

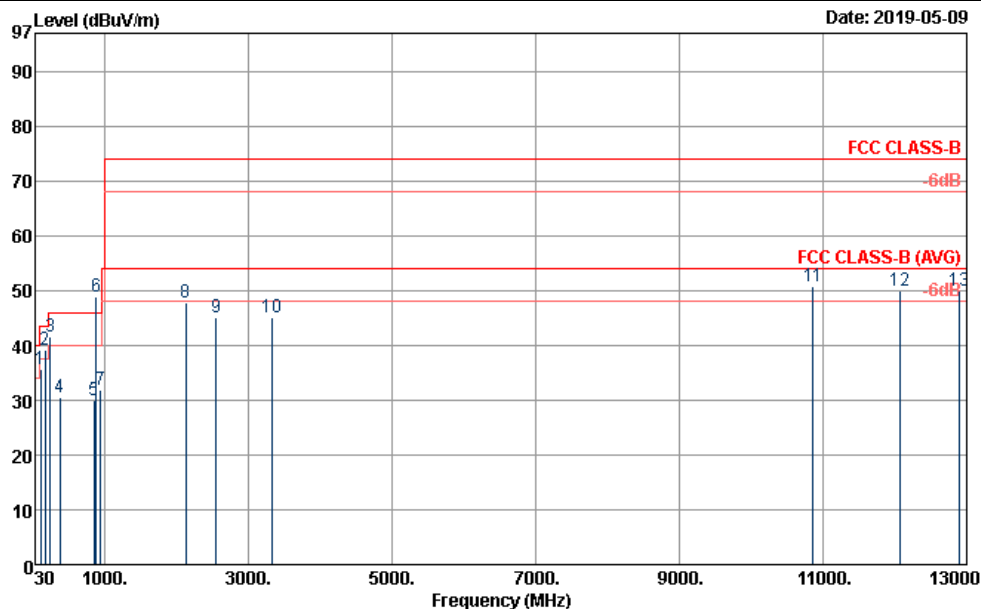


Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120B_1156_180824 HORIZONTAL
Project : 890514-05
Power : From System
Memo : Mode 1
: NB to EUT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamplifier Loss	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	63.75	29.36	-10.64	40.00	48.43	11.84	0.84	31.75	---	---	Peak
2	158.25	31.14	-12.36	43.50	44.76	16.67	1.43	31.72	---	---	Peak
3	240.06	36.70	-9.30	46.00	49.33	17.22	1.85	31.70	100	108	Peak
4	720.00	34.71	-11.29	46.00	36.63	26.74	3.32	31.98	---	---	Peak
5	792.10	30.04	-15.96	46.00	30.53	27.97	3.43	31.89	---	---	Peak
6 *	881.70	49.37			48.34	28.88	3.67	31.52	---	---	Peak
7	953.10	32.14	-13.86	46.00	28.59	30.54	3.98	30.97	---	---	Peak
8	1725.00	43.45	-30.55	74.00	73.41	25.30	5.49	61.10	---	---	Peak
9	2125.00	43.50	-30.50	74.00	70.67	27.40	6.11	61.10	---	---	Peak
10	2565.00	43.88	-30.12	74.00	70.46	27.47	6.68	61.14	---	---	Peak
11	10494.00	49.81	-24.19	74.00	51.38	40.00	14.84	57.62	---	---	Peak
12	10872.00	50.67	-23.33	74.00	50.80	40.38	15.07	56.78	100	75	Peak
13	11628.00	50.07	-23.93	74.00	50.04	39.60	15.58	56.32	---	---	Peak



Test Engineer :	Brad Liu and Yuan Lee	Temperature :	23~25°C
		Relative Humidity :	54~57%
Test Distance :	3m	Polarization :	Vertical
Remark :	#6 is system simulator signal which can be ignored.		



Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120B_1156_180824 VERTICAL
Project : 890514-05
Power : From System
Memo : Mode 1
: NB to EUT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	A/Pos	T/Pos		
	MHz	dBuV/m	dB	dBuV/m	dBuV	Loss Factor	cm	deg	Remark	
1	107.76	35.72	-7.78	43.50	49.50	16.72	1.23	31.73	---	Peak
2	164.73	39.09	-4.41	43.50	53.33	16.05	1.43	31.72	---	Peak
3	240.06	41.65	-4.35	46.00	54.28	17.22	1.85	31.70	100	117 Peak
4	370.70	30.54	-15.46	46.00	39.16	20.80	2.30	31.72	---	Peak
5	850.20	29.92	-16.08	46.00	29.19	28.78	3.61	31.66	---	Peak
6 *	881.70	48.91	2.91	46.00	47.88	28.88	3.67	31.52	---	Peak
7	944.70	32.01			29.18	30.08	3.79	31.04	---	Peak
8	2125.00	47.91	-26.09	74.00	75.08	27.40	6.11	61.10	---	Peak
9	2550.00	45.24	-28.76	74.00	71.91	27.40	6.65	61.13	---	Peak
10	3320.00	45.12	-28.88	74.00	70.27	28.13	7.75	61.53	---	Peak
11	10865.00	50.89	-23.11	74.00	51.03	40.37	15.07	56.78	100	169 Peak
12	12062.00	50.09	-23.91	74.00	51.25	38.97	15.87	57.16	---	Peak
13	12902.00	49.91	-24.09	74.00	51.49	39.20	16.87	58.80	---	Peak

—THE END—