

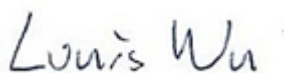


FCC EMI TEST REPORT

FCC ID : GKRRMLN1
Equipment : 5G LGA Module
Brand Name : COMPAL
Model Name : RML-N1
Marketing Name : 5G LGA Module
Applicant : Compal Electronics, Inc.
No.581 & 581-1, Ruiguang Rd., Neihu District,
Taipei, (114) Taiwan
Manufacturer : Compal Electronics, Inc.
No.581 & 581-1, Ruiguang Rd., Neihu District,
Taipei, (114) Taiwan
Standard : FCC 47 CFR FCC Part 15 Subpart B Class B

The product was received on Mar. 31, 2021 and testing was started from Apr. 08, 2021 and completed on Apr. 13, 2021. 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 333, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FC133040-02	01	Initial issue of report	Jun. 30, 2021
FC133040-02	02	Revise Product Feature of Equipment Under Test, Applicable Standards, Support Unit used in test configuration and system, Test Mode and Radiated Emission Test Result	Jul. 09, 2021

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 12.95 dB at 0.152 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 11.53 dB at 123.150 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: Vivian Hsu

1. General Description

1.1. Product Feature of Equipment Under Test

LTE/5G NR and GNSS

Product Specification subjective to this standard	
Test Antenna Type	WWAN: Monopole Antenna GPS/BDS/Galileo/GLONASS: Monopole Antenna

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

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 333, 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:

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

2. 47 CFR Ch. I (10–1–18 Edition) Part 15,101 (b)

Only those receivers that operate (tune) within the frequency range of 30–960 MHz, CB receivers and radar detectors are subject to the authorizations shown in paragraph (a) of this section. Receivers operating above 960MHz or below 30 MHz, except for radar detectors and CB receivers, are exempt from complying with the technical provisions of this part but are subject to § 15.5.

2. Test Configuration of Equipment Under Test

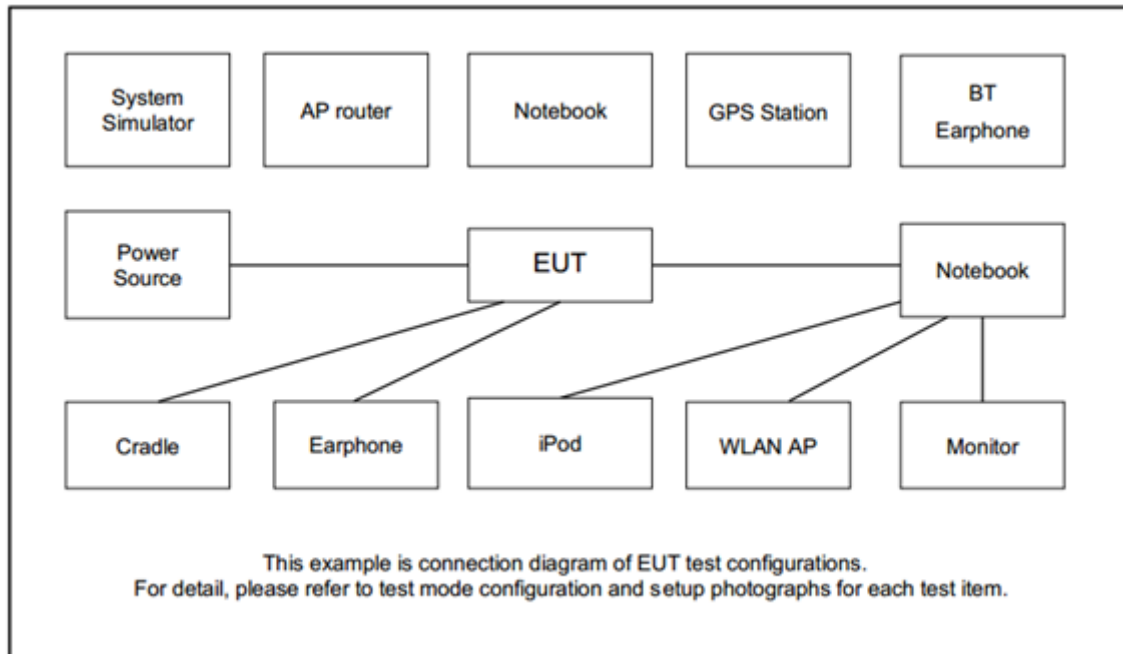
2.1. Test Mode

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 12 Link + Adapter
	Mode 2: LTE Band 26 Link + Adapter
	Mode 3: LTE Band 71 Link + Adapter
Radiated Emissions	Mode 1: LTE Band 12 Link + Adapter
	Mode 2: LTE Band 26 Link + Adapter
	Mode 3: LTE Band 71 Link + Adapter
Remark: <ol style="list-style-type: none">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. For radiation emission after pre-scanned the cellular band between 30MHz ~ 960MHz (LTE Band 5/12/71/26; 5G NR n5/ n12/ n71); 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	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Adapter	Frecom	F24L3-120200SPAU	N/A	N/A	Unshielded, 1.8 m
3.	fixture	Compal	ZM52	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was in LTE link mode during the test. The EUT was synchronized with the BCCH, and had been continuous transmitting 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.

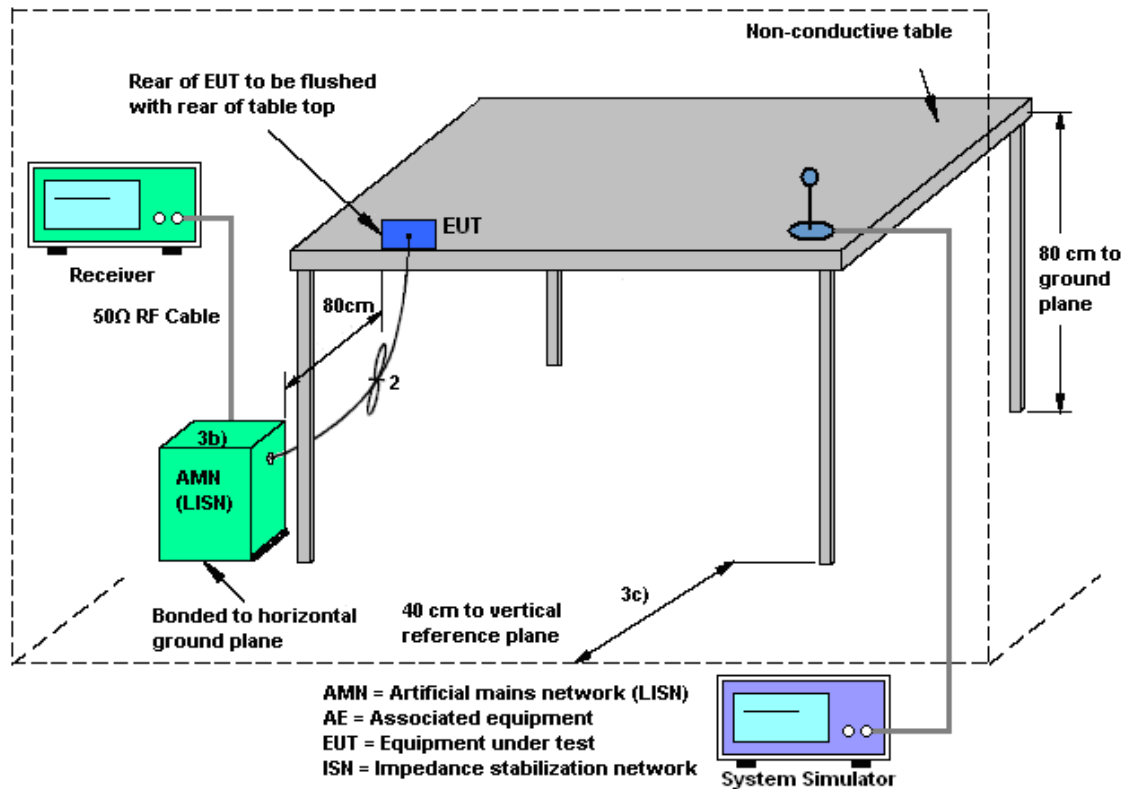
3.1.2. Measuring Instruments

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 shall 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

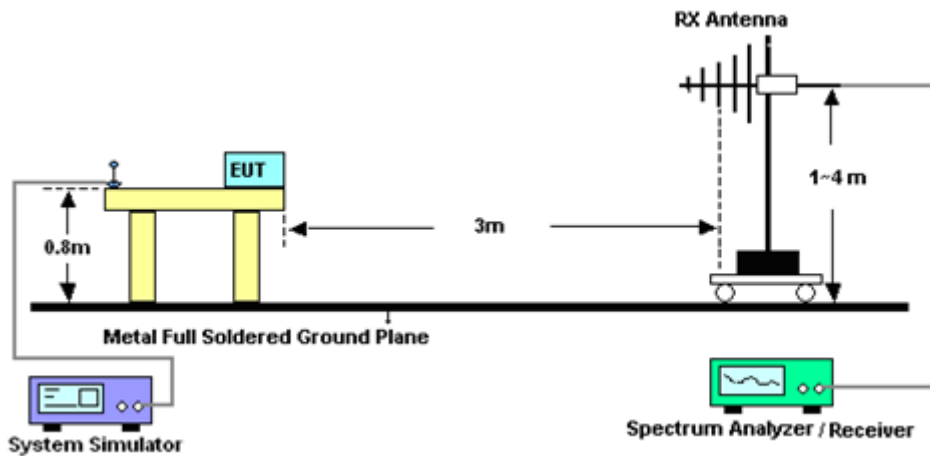
Refer a test equipment and calibration data table in this test report.

3.2.3. Test Procedures

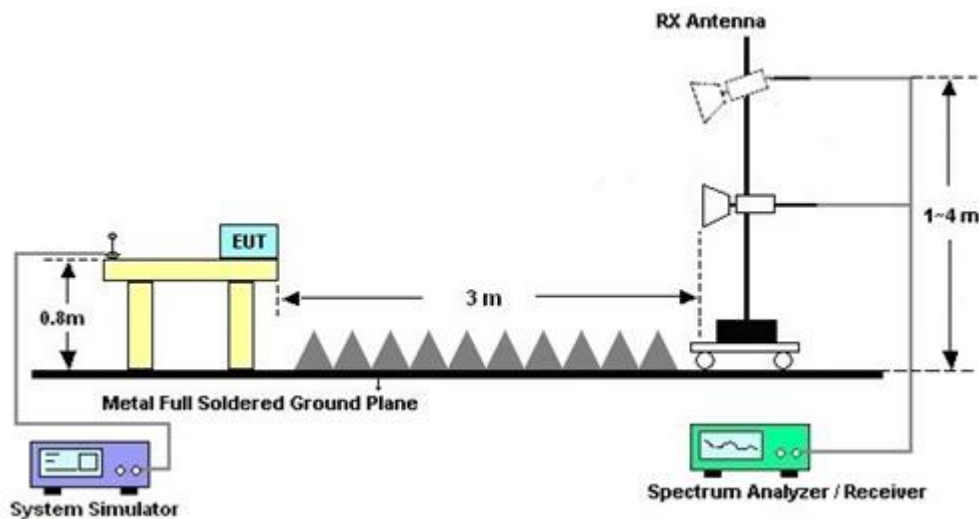
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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=120 kHz/VBW=300 kHz for frequency below 1 GHz; RBW=1 MHz VBW=3 MHz (Peak), RBW=1 MHz/VBW=10 Hz (Average) for frequency above 1 GHz).
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	Apr. 08, 2021	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	Apr. 08, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 18, 2020	Apr. 08, 2021	Nov. 17, 2021	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 16, 2020	Apr. 08, 2021	Nov. 15, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Apr. 08, 2021	N/A	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Feb. 25, 2021	Apr. 08, 2021	Feb. 24, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Apr. 08, 2021	Dec. 30, 2021	Conduction (CO05-HY)
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 30, 2020	Apr. 13, 2021	Apr. 29, 2021	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL 6111C & N-6-06	2725 & AT-N0601	30MHz~1GHz	Jan. 08, 2021	Apr. 13, 2021	Jan. 07, 2022	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 03, 2021	Apr. 13, 2021	Feb. 02, 2022	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Sep. 15, 2020	Apr. 13, 2021	Sep. 14, 2021	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180001	1GHz~18GHz	Jul. 21, 2020	Apr. 13, 2021	Jul. 20, 2021	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / STORM/LL142	MY24966/4 / 00100A1O2A178T	30MHz~18GHz	Nov. 20, 2020	Apr. 13, 2021	Nov. 19, 2021	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF104	802433/4	30Mhz to 18Ghz	Aug. 20, 2020	Apr. 13, 2021	Aug. 19, 2021	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Apr. 13, 2021	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Apr. 13, 2021	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Apr. 13, 2021	N/A	Radiation (03CH06-HY)
Software	Audix	E3 6.2009-8-24 (k5)	N/A	N/A	N/A	Apr. 13, 2021	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% ($U = 2U_c(y)$)	2.3
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.9
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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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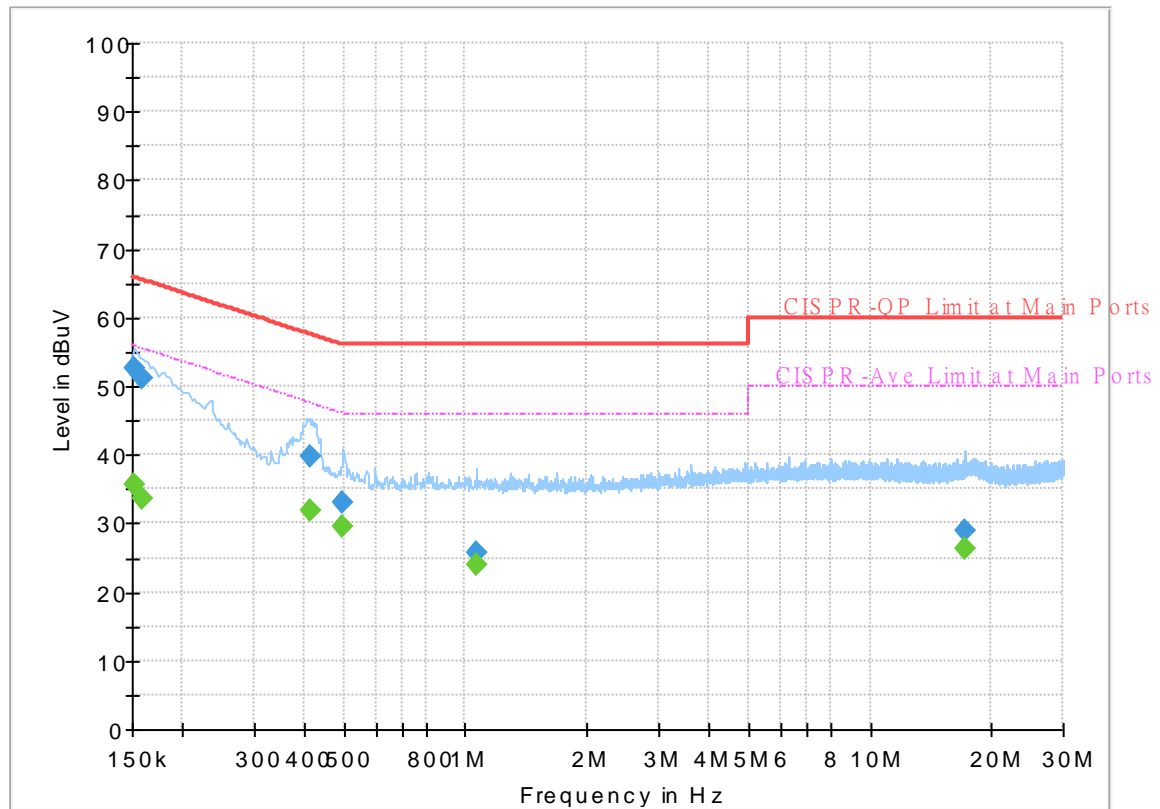
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Tom Lee	Temperature :	23~26℃
		Relative Humidity :	40~50%

EUT Information

Report NO : 133040-02
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

Full Spectrum



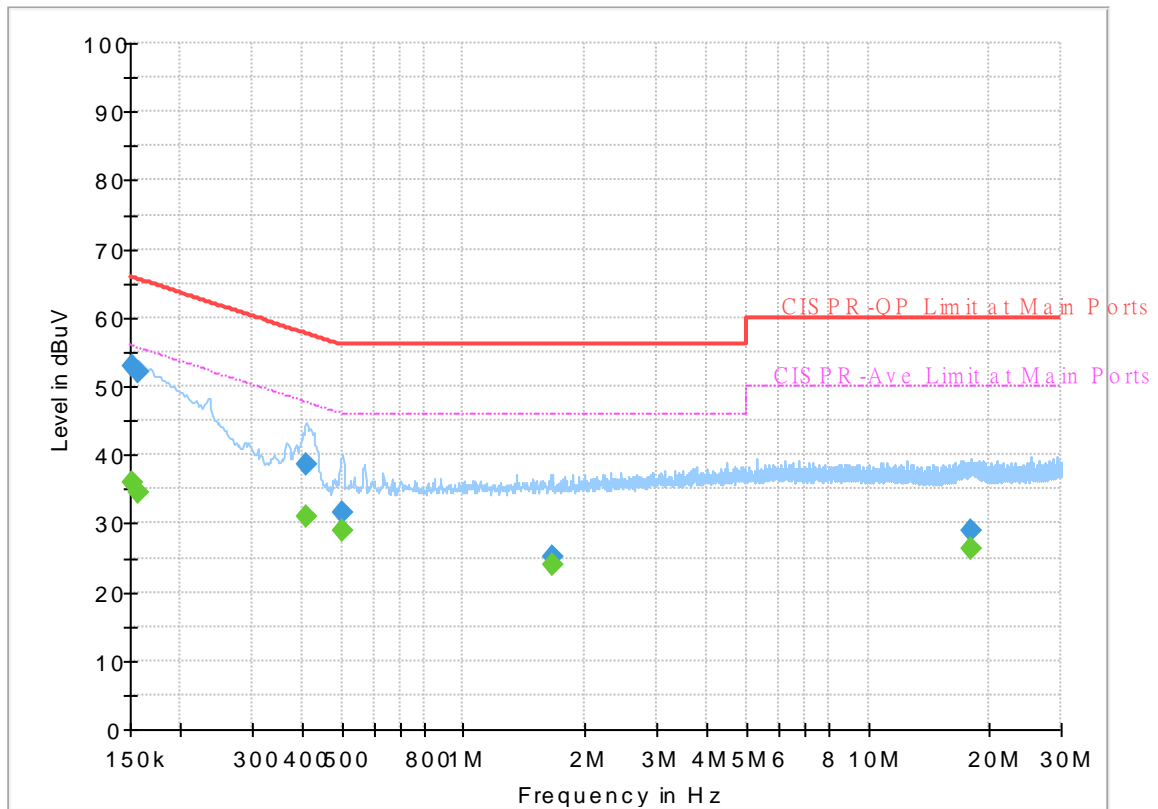
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	35.81	55.88	20.07	L1	OFF	19.7
0.152250	52.54	---	65.88	13.34	L1	OFF	19.7
0.159000	---	33.73	55.52	21.79	L1	OFF	19.7
0.159000	51.25	---	65.52	14.27	L1	OFF	19.7
0.413250	---	31.90	47.58	15.68	L1	OFF	19.8
0.413250	39.71	---	57.58	17.87	L1	OFF	19.8
0.498750	---	29.45	46.02	16.57	L1	OFF	19.9
0.498750	33.06	---	56.02	22.96	L1	OFF	19.9
1.061250	---	24.12	46.00	21.88	L1	OFF	20.3
1.061250	25.88	---	56.00	30.12	L1	OFF	20.3
17.092500	---	26.31	50.00	23.69	L1	OFF	20.4
17.092500	28.85	---	60.00	31.15	L1	OFF	20.4

EUT Information

Report NO : 133040-02
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

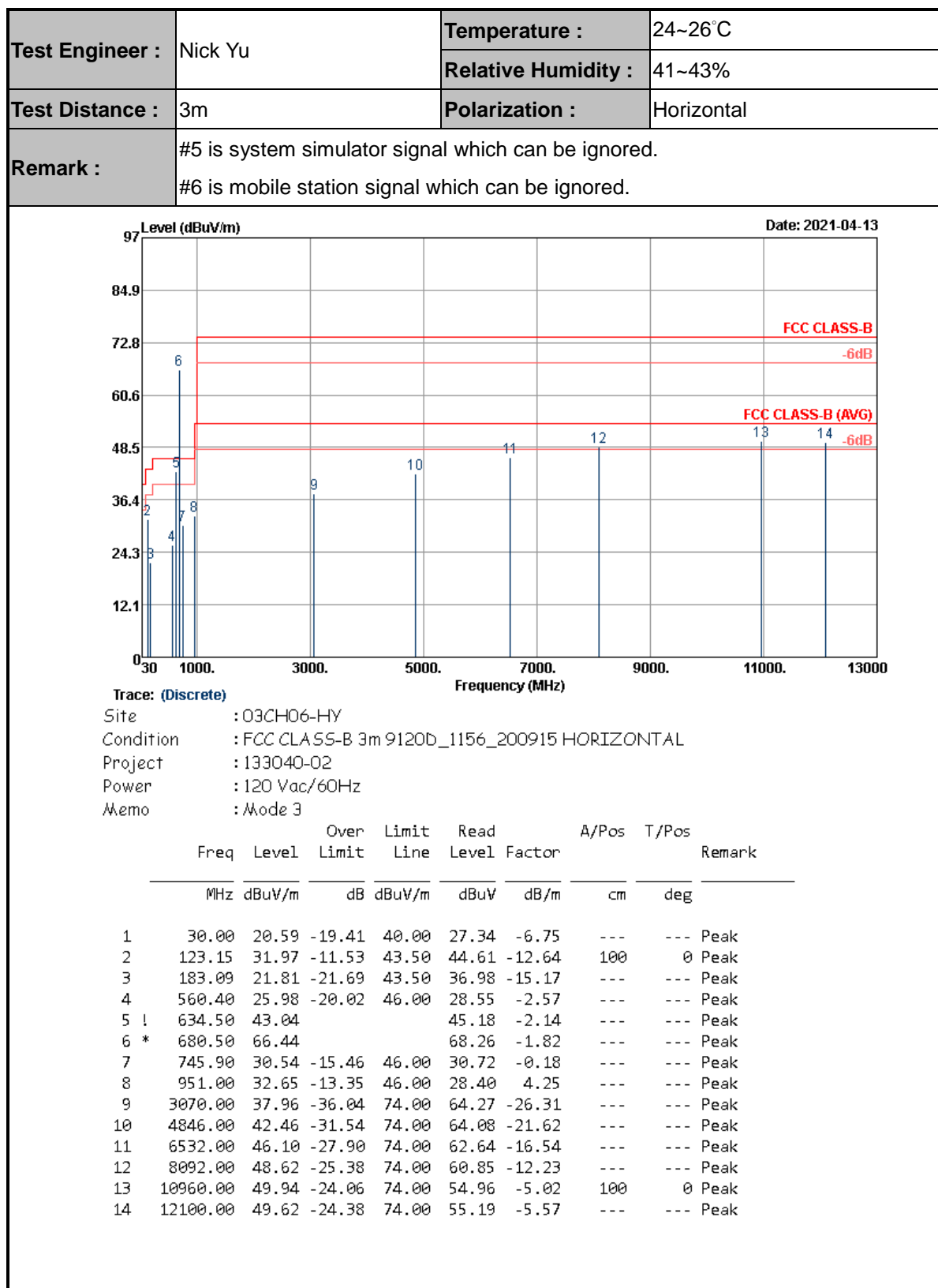
Full Spectrum



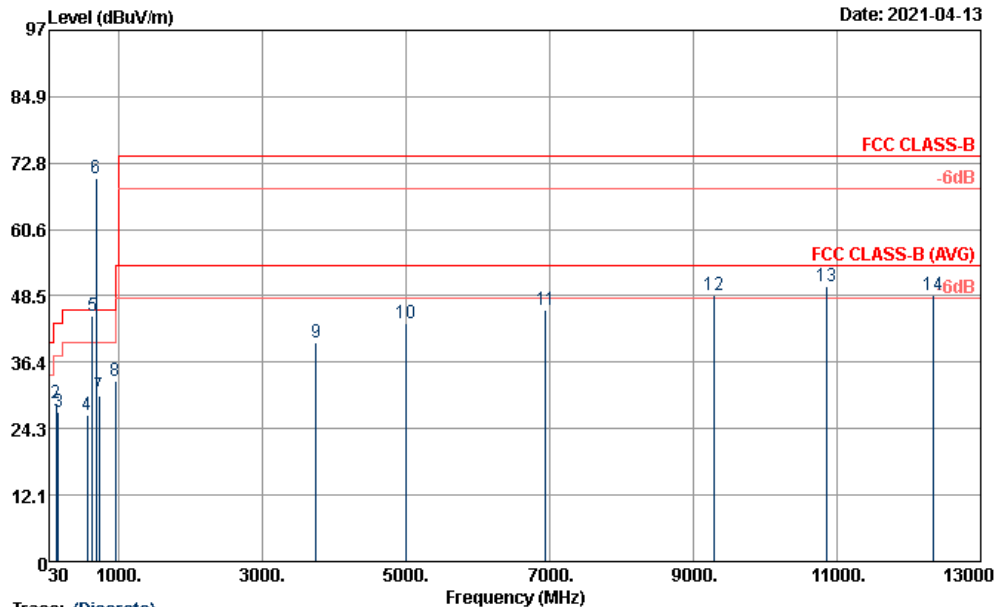
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	35.99	55.88	19.89	N	OFF	19.7
0.152250	52.93	---	65.88	12.95	N	OFF	19.7
0.156750	---	34.48	55.63	21.15	N	OFF	19.7
0.156750	52.04	---	65.63	13.59	N	OFF	19.7
0.411000	---	30.91	47.63	16.72	N	OFF	19.8
0.411000	38.56	---	57.63	19.07	N	OFF	19.8
0.503250	---	28.96	46.00	17.04	N	OFF	19.9
0.503250	31.61	---	56.00	24.39	N	OFF	19.9
1.659750	---	23.88	46.00	22.12	N	OFF	20.3
1.659750	25.24	---	56.00	30.76	N	OFF	20.3
17.913750	---	26.45	50.00	23.55	N	OFF	20.6
17.913750	28.92	---	60.00	31.08	N	OFF	20.6

Appendix B. Radiated Emission Test Result



Test Engineer :	Nick Yu	Temperature :	24~26°C
		Relative Humidity :	41~43%
Test Distance :	3m	Polarization :	Vertical
Remark :	#5 is system simulator signal which can be ignored. #6 is mobile station signal which can be ignored.		



Trace: (Discrete)

Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120B_1156_200915 VERTICAL
Project : 133040-02
Power : 120 Vac/60Hz
Memo : Mode 3

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1	30.00	23.72	-16.28	40.00	30.47	-6.75	---	---	Peak
2	125.04	28.87	-14.63	43.50	41.53	-12.66	---	---	Peak
3	159.06	27.36	-16.14	43.50	40.99	-13.63	---	---	Peak
4	561.10	26.86	-19.14	46.00	29.47	-2.61	---	---	Peak
5 !	634.50	44.92			47.06	-2.14	---	---	Peak
6 *	680.50	69.94			71.76	-1.82	---	---	Peak
7	730.50	30.19	-15.81	46.00	30.54	-0.35	---	---	Peak
8	957.30	32.96	-13.04	46.00	28.43	4.53	100	0	Peak
9	3748.00	40.01	-33.99	74.00	64.60	-24.59	---	---	Peak
10	5002.00	43.46	-30.54	74.00	64.38	-20.92	---	---	Peak
11	6940.00	45.86	-28.14	74.00	61.05	-15.19	---	---	Peak
12	9280.00	48.69	-25.31	74.00	57.81	-9.12	---	---	Peak
13	10858.00	50.29	-23.71	74.00	55.63	-5.34	100	0	Peak
14	12346.00	48.66	-25.34	74.00	54.55	-5.89	---	---	Peak