



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 Nov. 04, 2021 and testing was performed from Nov. 08, 2021 to Nov. 10, 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 variant report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

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	Issue Date
FC133040-04	01	Initial issue of report	Nov. 24, 2021
FC133040-04	02	1. Revise Summary 2. Revise Applicable standards remark 3. Revise Test mode remark	Dec. 07, 2021



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.107	AC Conducted Emission	Pass	14.97 dB under the limit at 0.413 MHz
3.2	15.109	Radiated Emission	Pass	7.54 dB under the limit at 127.200 MHz

Note: This is a variant report by turning on WWAN Band (LTE Band 13, Band 17 / 5G NR n78) via software. All the test cases were performed on original report which can be referred to Sporton Report Number FC133040-02.

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 product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Keven Cheng

Report Producer: Clio Lo



1. General Description

1.1. Product Feature of Equipment Under Test

LTE/5G NR and GNSS.

Product Feature	
Antenna Type	WWAN: Monopole Antenna GPS / Glonass / BDS / Galileo: Monopole Antenna

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

1.2. Modification of EUT

No modifications made to the EUT during the testing.

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 declared by 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

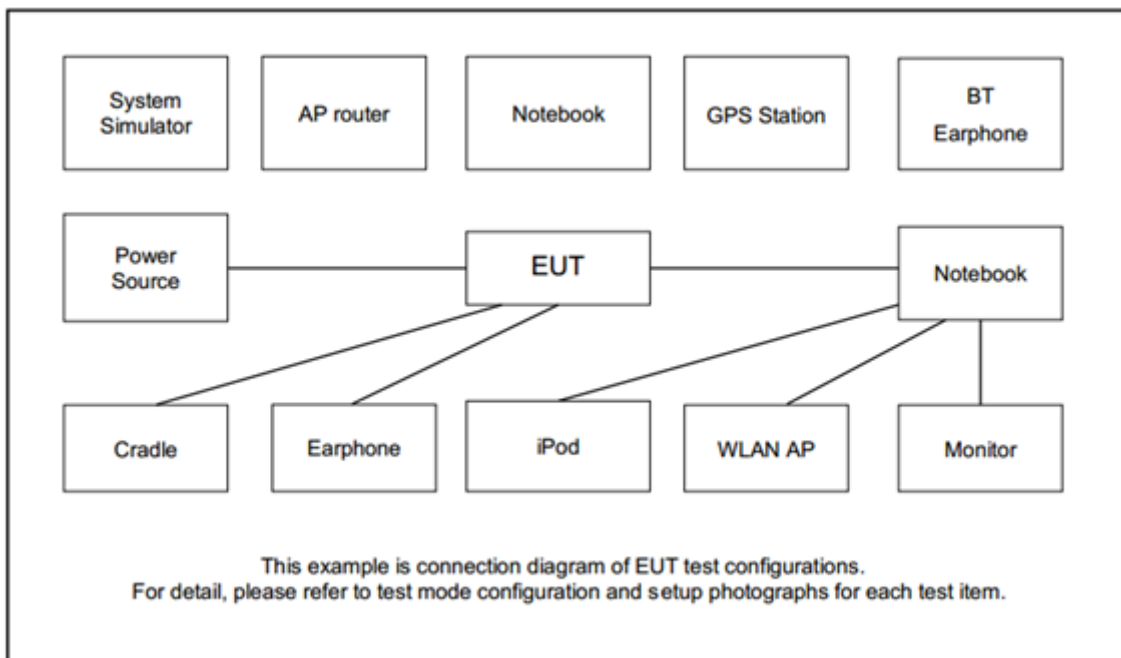
2.1. Test Mode

The EUT is tested along with the peripherals, operating under possible configurations in compliant with normal operation. The maximum emissions can be identified by a pre-scan carried out in different orientations of placement pursuant to ANSI C63.4-2014. Frequency range covered: Conduction Emission (150 kHz to 30 MHz), Radiation Emission (30 MHz to the 5th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Functions Enabled
AC Conducted Emission	Mode 1: LTE Band 13 Link + Adapter
Radiated Emissions	Mode 1: LTE Band 13 Link + Adapter

Remark: For Radiation Emission after pre-scanned the cellular band between 30MHz ~ 960MHz (LTE Band 13); 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, 1.8m
2.	Adapter	Frecom	F24L3-120200SPAU	FCC DoC	N/A	Unshielded, 1.3m
3.	Fixture	COMPAL	ZM52	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT is in LTE idle mode during the test. The EUT is synchronized with the BCCH, and has 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.

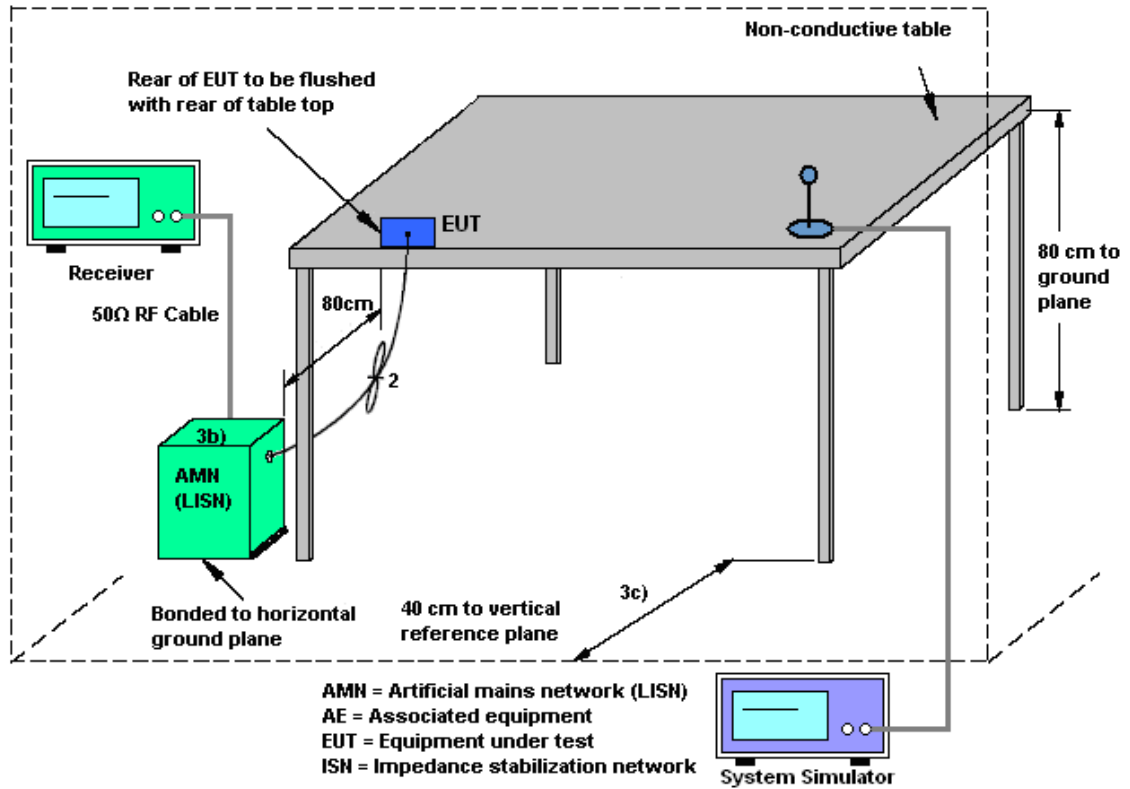
3.1.2. Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.3. Test Procedure

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is 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 Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (If Bandwidth = 9 kHz) 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

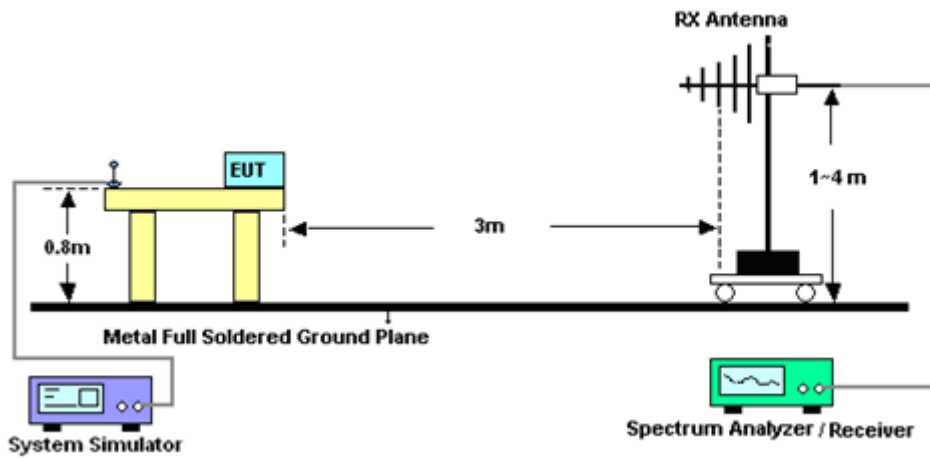
Please refer to the measuring equipment list in this test report.

3.2.3. Test Procedures

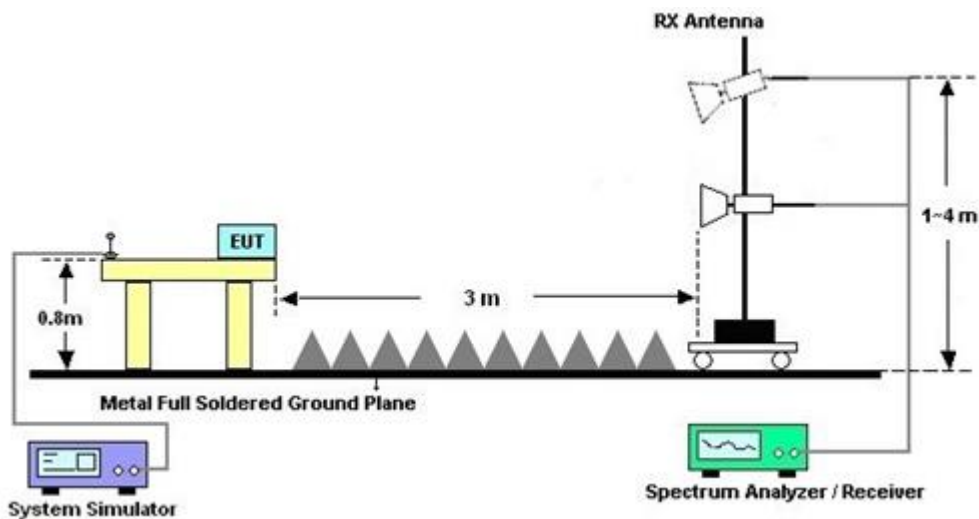
1. The EUT is placed on a turntable with 0.8 meter above ground.
2. The EUT is set 3 meters from the interference receiving antenna, which is mounted on the top of a variable height antenna tower.
3. The table is rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is 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 is 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 is 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 30 MHz to 1 GHz



For Radiated Emissions above 1 GHz



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	Nov. 08, 2021	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	Nov. 08, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 18, 2020	Nov. 08, 2021	Nov. 17, 2021	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 01, 2020	Nov. 08, 2021	Nov. 30, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 08, 2021	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	00691	N/A	Jul. 28, 2021	Nov. 08, 2021	Jul. 27, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Nov. 08, 2021	Dec. 30, 2021	Conduction (CO05-HY)
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 29, 2021	Nov. 10, 2021	Apr. 28, 2022	Radiation (03CH06-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	40103 & 07	30MHz~1GHz	Apr. 28, 2021	Nov. 10, 2021	Apr. 27, 2022	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 03, 2021	Nov. 10, 2021	Feb. 02, 2022	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Sep. 27, 2021	Nov. 10, 2021	Sep. 26, 2022	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180001	1GHz~18GHz	Jul. 19, 2021	Nov. 10, 2021	Jul. 18, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_7000m	532299/2	30MHz to 40GHz	Jul. 05, 2021	Nov. 10, 2021	Jul. 04, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_3000m	532422/2	30MHz to 40GHz	Jul. 05, 2021	Nov. 10, 2021	Jul. 04, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_2000m	532421/2	30MHz to 40GHz	Jul. 05, 2021	Nov. 10, 2021	Jul. 04, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF104	802433/4	30Mhz to 18Ghz	Aug. 19, 2021	Nov. 10, 2021	Aug. 18, 2022	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Nov. 10, 2021	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Nov. 10, 2021	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Nov. 10, 2021	N/A	Radiation (03CH06-HY)
Software	Audix	E3 6.2009-8-24(k5)	N/A	N/A	N/A	Nov. 10, 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% ($U = 2Uc(y)$)	3.1 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.4 dB
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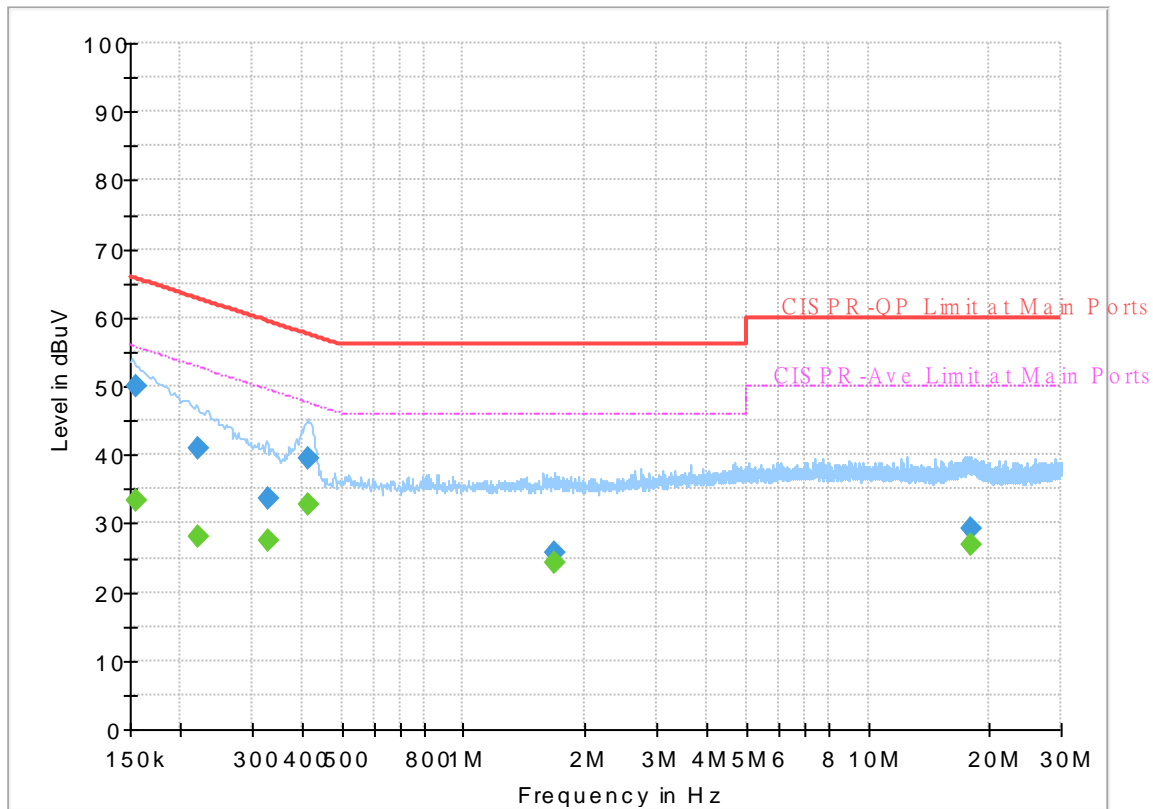
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Calvin Wang	Temperature :	23~26°C
		Relative Humidity :	45~55%

EUT Information

Report NO : 133040-04
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Line

Full Spectrum



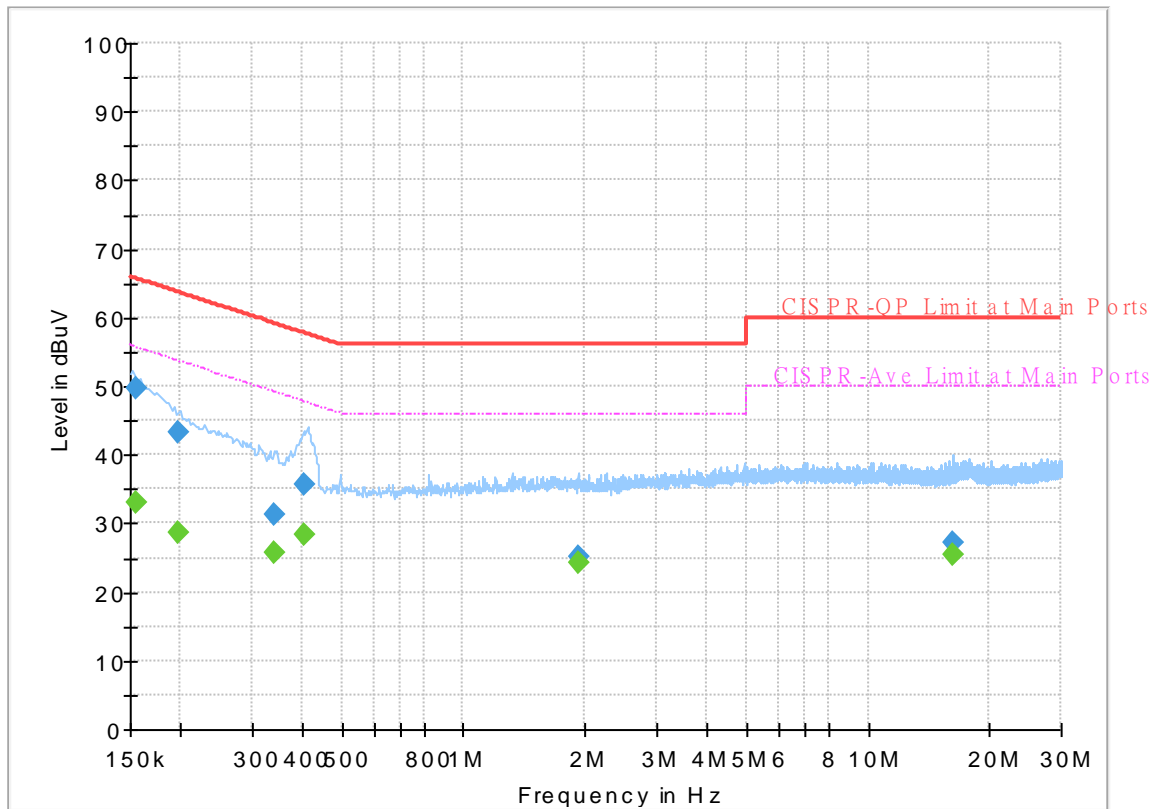
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154500	---	33.36	55.75	22.39	L1	OFF	19.7
0.154500	49.92	---	65.75	15.83	L1	OFF	19.7
0.219750	---	28.01	52.83	24.82	L1	OFF	19.7
0.219750	40.83	---	62.83	22.00	L1	OFF	19.7
0.327750	---	27.34	49.51	22.17	L1	OFF	19.7
0.327750	33.68	---	59.51	25.83	L1	OFF	19.7
0.413250	---	32.61	47.58	14.97	L1	OFF	19.7
0.413250	39.58	---	57.58	18.00	L1	OFF	19.7
1.682250	---	24.31	46.00	21.69	L1	OFF	20.2
1.682250	25.65	---	56.00	30.35	L1	OFF	20.2
17.967750	---	26.81	50.00	23.19	L1	OFF	20.5
17.967750	29.16	---	60.00	30.84	L1	OFF	20.5

EUT Information

Report NO : 133040-04
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum



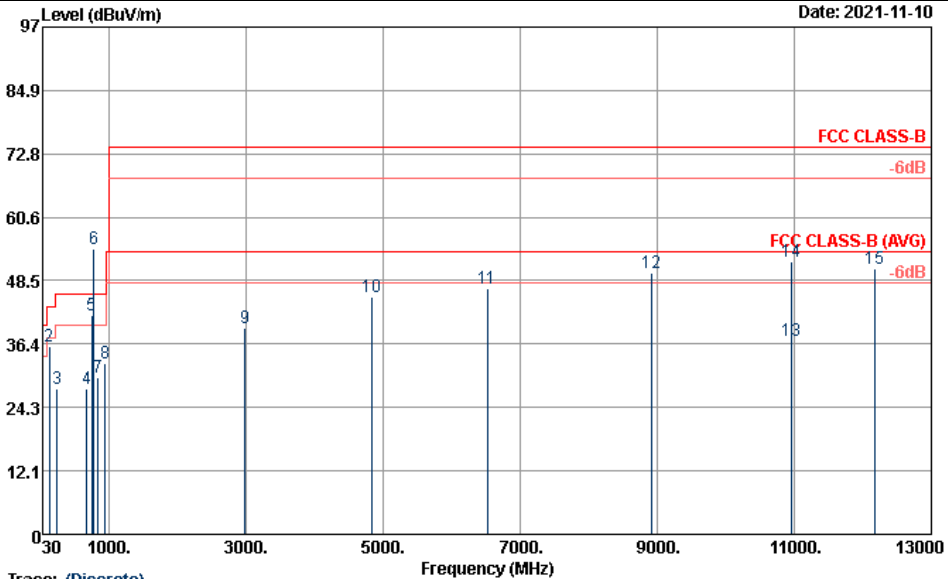
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154500	---	33.01	55.75	22.74	N	OFF	19.7
0.154500	49.70	---	65.75	16.05	N	OFF	19.7
0.197250	---	28.57	53.73	25.16	N	OFF	19.7
0.197250	43.21	---	63.73	20.52	N	OFF	19.7
0.339000	---	25.63	49.23	23.60	N	OFF	19.7
0.339000	31.23	---	59.23	28.00	N	OFF	19.7
0.402000	---	28.43	47.81	19.38	N	OFF	19.7
0.402000	35.69	---	57.81	22.12	N	OFF	19.7
1.916250	---	24.17	46.00	21.83	N	OFF	20.2
1.916250	25.19	---	56.00	30.81	N	OFF	20.2
16.147500	---	25.55	50.00	24.45	N	OFF	20.4
16.147500	27.20	---	60.00	32.80	N	OFF	20.4



Appendix B. Radiated Emission Test Result

Test Engineer :	YouXian Chen	Temperature :	25~28°C
		Relative Humidity :	47~52%
Test Distance :	3m	Polarization :	Horizontal
Remark :	#6 is mobile station signal which can be ignored. #5 is system simulator signal which can be ignored.		



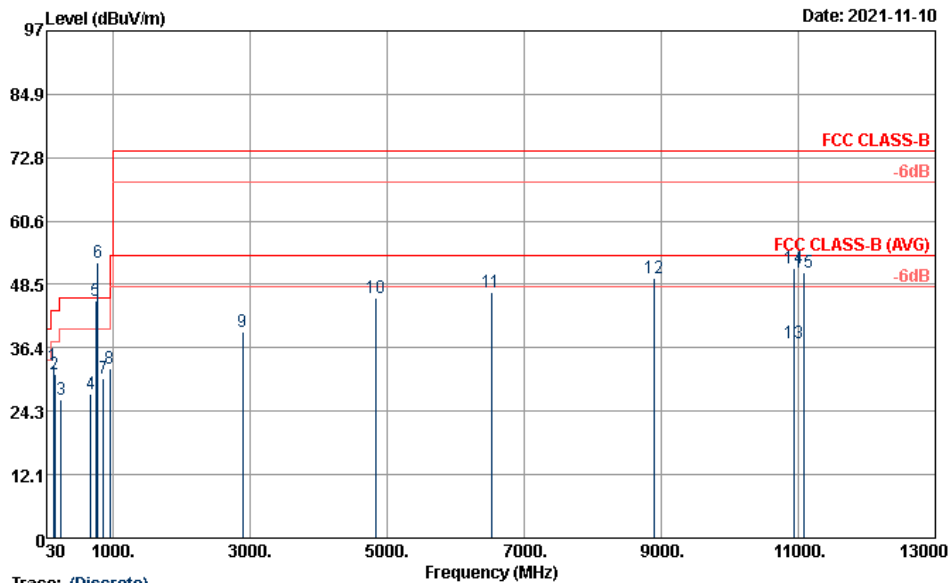
Trace: (Discrete)

Site : 03CH06-HY
 Condition : FCC CLASS-B 3m 9120B_1156 HORIZONTAL
 Project : 133040-04
 Power : 120Vac/60Hz
 Memo : Mode 1

	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	22.55	-17.45	40.00	28.41	-5.86	---	---	Peak
2	127.20	35.96	-7.54	43.50	47.75	-11.79	---	---	Peak
3	243.03	27.79	-18.21	46.00	39.04	-11.25	---	---	Peak
4	678.70	27.93	-18.07	46.00	28.95	-1.02	---	---	Peak
5 !	751.00	41.95			41.16	0.79	---	---	Peak
6 *	782.00	54.58			53.60	0.98	---	---	Peak
7	841.80	30.06	-15.94	46.00	27.99	2.07	---	---	Peak
8	937.70	32.63	-13.37	46.00	28.51	4.12	---	---	Peak
9	2982.00	39.32	-34.68	74.00	64.12	-24.80	---	---	Peak
10	4844.00	45.28	-28.72	74.00	63.37	-18.09	---	---	Peak
11	6516.00	47.09	-26.91	74.00	61.07	-13.98	---	---	Peak
12	8910.00	49.90	-24.10	74.00	59.08	-9.18	---	---	Peak
13	10952.00	37.07	-16.93	54.00	41.80	-4.73	100	103	Average
14	10952.00	52.16	-21.84	74.00	56.89	-4.73	100	103	Peak
15	12170.00	50.68	-23.32	74.00	55.72	-5.04	---	---	Peak



Test Engineer :	YouXian Chen	Temperature :	25~28°C
		Relative Humidity :	47~52%
Test Distance :	3m	Polarization :	Vertical
Remark :	#6 is mobile station signal which can be ignored. #5 is system simulator signal which can be ignored.		



Trace: (Discrete)

Site : 03CH06-HY
 Condition : FCC CLASS-B 3m 9120B_1156 VERTICAL
 Project : 133040-04
 Power : 120Vac/60Hz
 Memo : Mode 1

	Freq	Level	Over	Limit	Read		A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1	130.98	33.02	-10.48	43.50	44.89	-11.87	---	---	Peak
2	150.15	31.42	-12.08	43.50	43.48	-12.06	---	---	Peak
3	239.52	26.35	-19.65	46.00	38.01	-11.66	---	---	Peak
4	675.90	27.62	-18.38	46.00	28.67	-1.05	---	---	Peak
5 !	751.00	45.48			44.69	0.79	---	---	Peak
6 *	782.00	52.56			51.58	0.98	---	---	Peak
7	861.40	30.55	-15.45	46.00	27.94	2.61	---	---	Peak
8	955.20	32.52	-13.48	46.00	27.27	5.25	---	---	Peak
9	2892.00	39.47	-34.53	74.00	64.37	-24.90	---	---	Peak
10	4844.00	45.86	-28.14	74.00	63.95	-18.09	---	---	Peak
11	6522.00	46.92	-27.08	74.00	60.93	-14.01	---	---	Peak
12	8894.00	49.64	-24.36	74.00	58.86	-9.22	---	---	Peak
13	10948.00	37.17	-16.83	54.00	41.91	-4.74	100	303	Average
14	10948.00	51.55	-22.45	74.00	56.29	-4.74	100	303	Peak
15	11080.00	50.92	-23.08	74.00	55.85	-4.93	---	---	Peak