FCC EMI TEST REPORT

FCC ID	:	**GKRRMMT1**
Equipment	:	**NTN miniPCIE module**
Brand Name	:	**COMPAL**
Model Name	:	**RMM-T1**
Applicant	:	**COMPAL ELECTRONICS, INC. No. 581 & 581-1, Ruiguang Rd., Neihu District Taipei City 11492, Taiwan (R.O.C.)**
Manufacturer	:	**COMPAL (VIETNAM) CO., LTD BA THIEN INDUSTRIAL ZONE, BA HIEN TOWN, BINH XUYEN DISTRICT, VINH PHUC PROVINCE VIETNAM**
Standard	:	**FCC 47 CFR FCC Part 15 Subpart B Class B**

The product was received on Jun. 13, 2024 and testing was performed from Jul. 03, 2024 to Jul. 03, 2024. 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 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.)

Table of Contents

History of this test report

Report No.	Version	Description	Issue Date
FC3D2704	01	Initial issue of report	Aug. 12, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.107	AC Conducted Emission	Pass	20.95 dB under the limit at 0.48 MHz
3.2	15.109	Radiated Emission	Pass	13.67 dB under the limit at 911.80 MHz

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Steve Chen

Report Producer: Michelle Chen

1. General Description

1.1. Product Feature of Equipment Under Test

Product Feature
General Specs NTN and GNSS. **Antenna Type** NTN: Dipole Antenna GPS / Glonass / BDS / Galileo / SBAS: External Antenna

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer 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
- ANSI C63.4a-2017

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

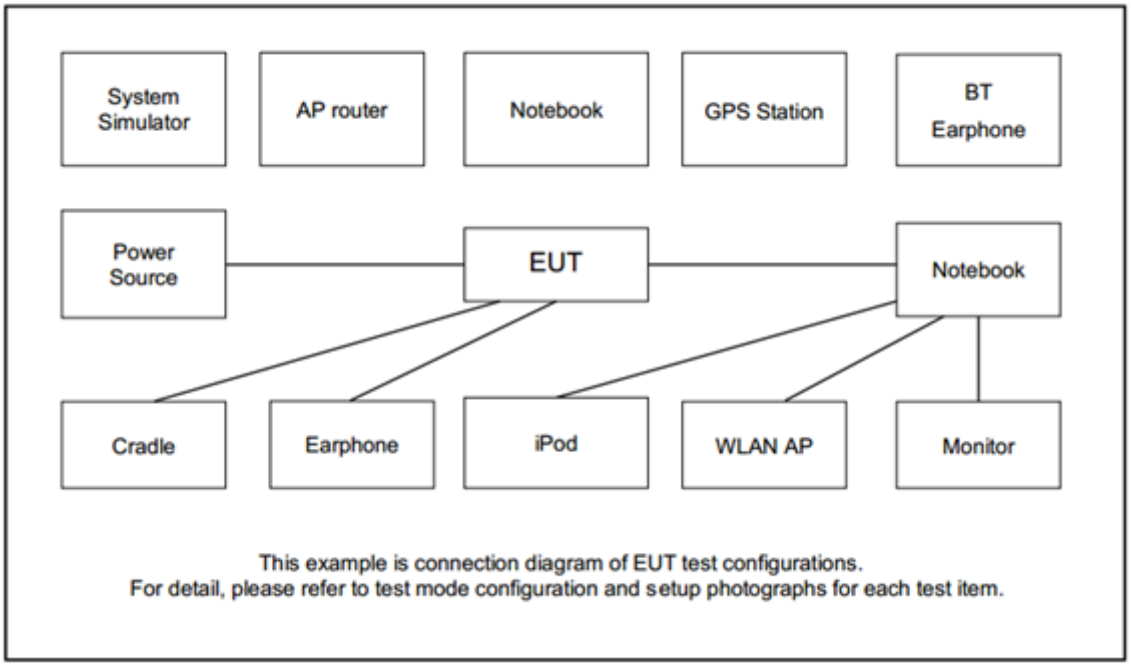
2. Test Configuration of Equipment Under Test

2.1. Test Mode

The EUT 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 : NTN Link + USB Cable (Charging from Adapter)
Radiated Emissions	Mode 1 : NTN Idle + USB Cable (Charging from Adapter)

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	MT8821C	N/A	N/A	Unshielded,1.8m
2.	Notebook	Dell	Latitude 3420	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	USB Cable	Luxshare	Cato V6	N/A	Unshielded,1.5m	N/A
4.	Adapter	SONY	UCH20	N/A	N/A	N/A
5.	Fixture	Compal	RMM-T1 EVB	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The following programs installed in the EUT are programmed during the test:

1. For NTN Link mode, the EUT link to 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.

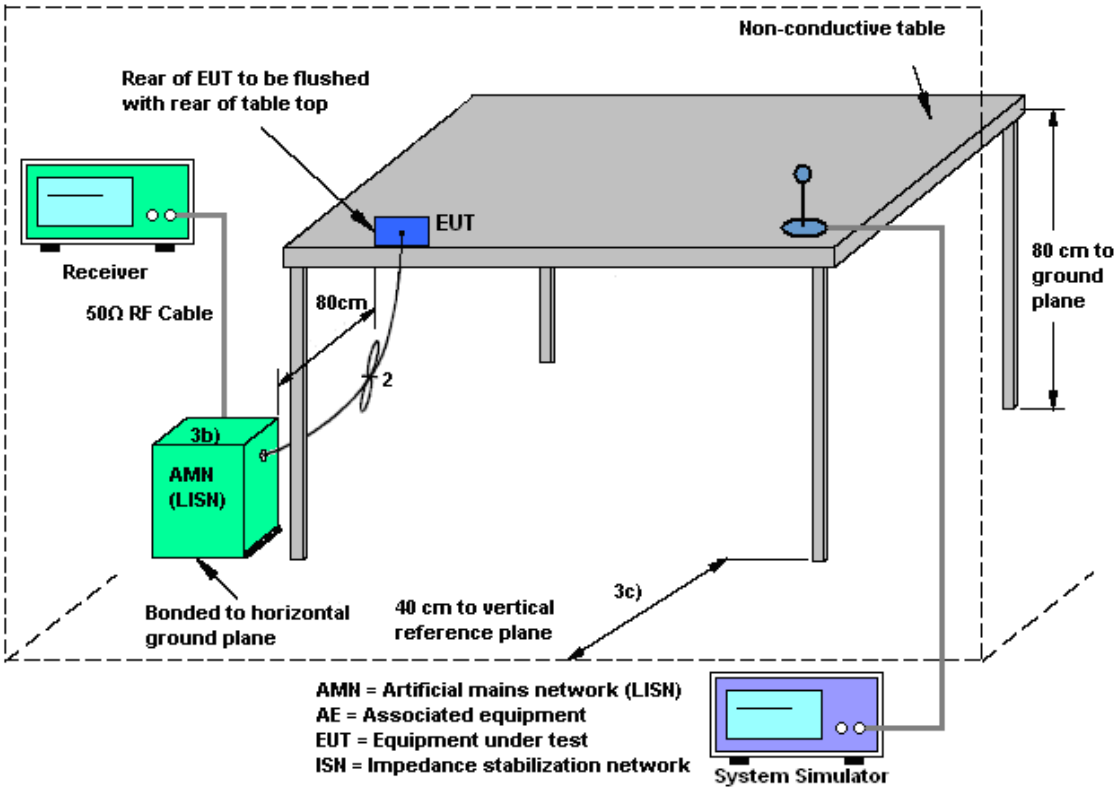
3.1.2. Measuring Instruments

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

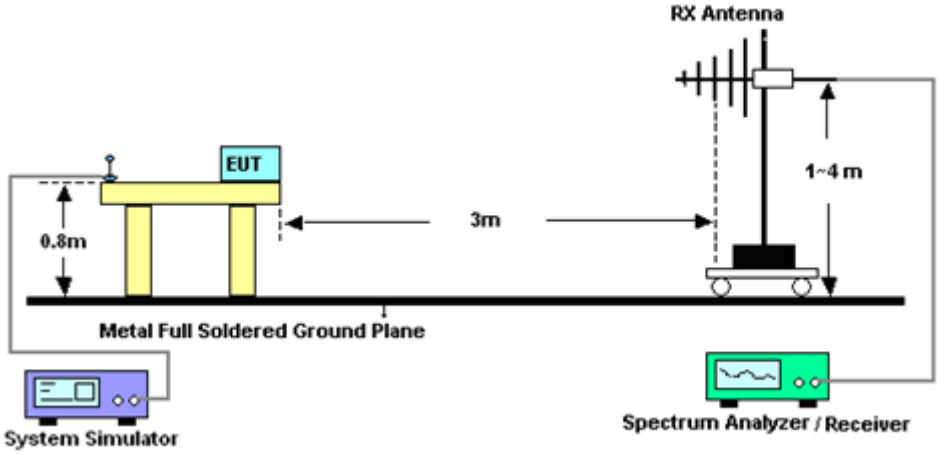
Please refer to the measuring equipment list in this test report.

3.2.3. Test Procedures

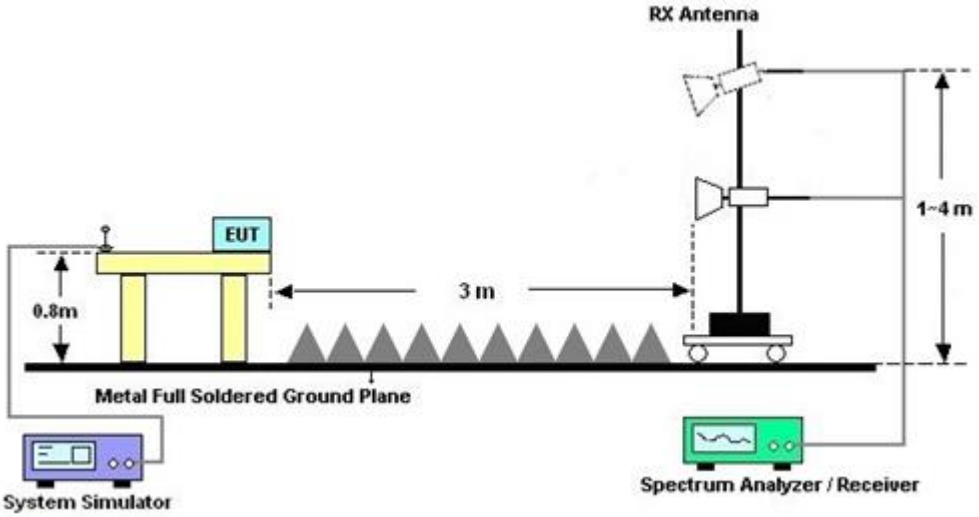
1. The EUT is placed on a turntable with 0.8 meter above ground.
2. The EUT is set 3 meters from the interference receiving antenna, which is mounted on the top of a variable height antenna tower.
3. The table is rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is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

3.2.4. Test Setup of Radiated Emission

For Radiated Emissions from 30 MHz to 1 GHz



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	Jul. 03, 2024	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 06, 2023	Jul. 03, 2024	Dec. 05, 2024	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Oct. 26, 2023	Jul. 03, 2024	Oct. 25, 2024	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 22, 2023	Jul. 03, 2024	Nov. 21, 2024	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Jul. 03, 2024	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Jul. 28, 2023	Jul. 03, 2024	Jul. 27, 2024	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 28, 2023	Jul. 03, 2024	Dec. 27, 2024	Conduction (CO05-HY)
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 16, 2024	Jul. 03, 2024	Apr. 15, 2025	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL 6111C & N-6-06	2725 & AT-N0601	30MHz~1GHz	Nov. 03, 2023	Jul. 03, 2024	Nov. 02, 2024	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 01, 2024	Jul. 03, 2024	Jan. 31, 2025	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02037	1GHz~18GHz	Dec. 28, 2023	Jul. 03, 2024	Dec. 27, 2024	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180001	1GHz~18GHz	Jul. 16, 2023	Jul. 03, 2024	Jul. 15, 2024	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_2000mm SF102_3000mm SF102_7000mm	532421/2 532422/2 532299/2	30MHz to 40GHz	Jul. 02, 2024	Jul. 03, 2024	Jul. 01, 2025	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	104 SF102_2000mm SF102_3000mm SF102_7000mm	802433/4 532421/2 532422/2 532299/2	30Mhz to 18Ghz	Jul. 02, 2024	Jul. 03, 2024	Jul. 01, 2025	Radiation (03CH06-HY)
Hygrometer	TECPEL	DTM-303B	TP210018	N/A	Oct. 24, 2023	Jul. 03, 2024	Oct. 23, 2024	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Jul. 03, 2024	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Jul. 03, 2024	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Jul. 03, 2024	N/A	Radiation (03CH06-HY)
Software	Audix	E3 6.2009-8-24(k5)	N/A	N/A	N/A	Jul. 03, 2024	N/A	Radiation (03CH06-HY)

5. Measurement Uncertainty

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.5 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.3 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.7 dB**

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.6 dB**

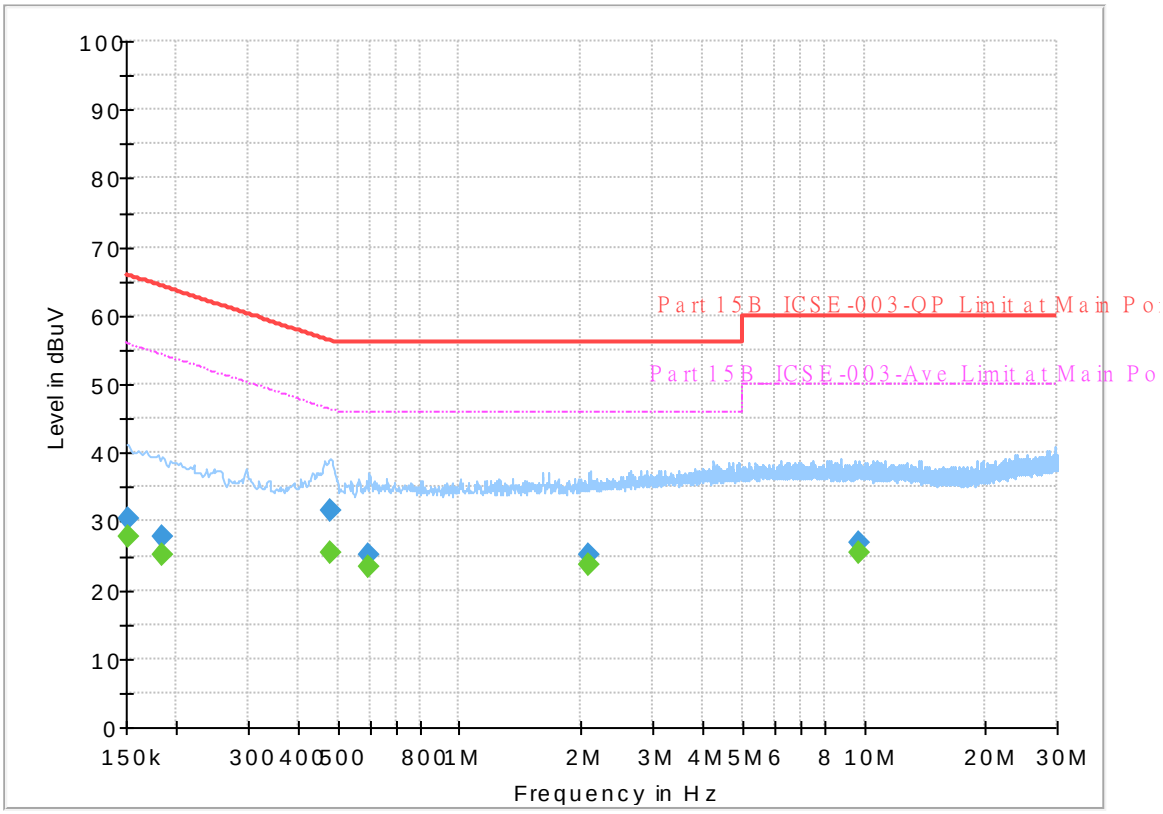
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Calvin Wang	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO :	3D2704
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



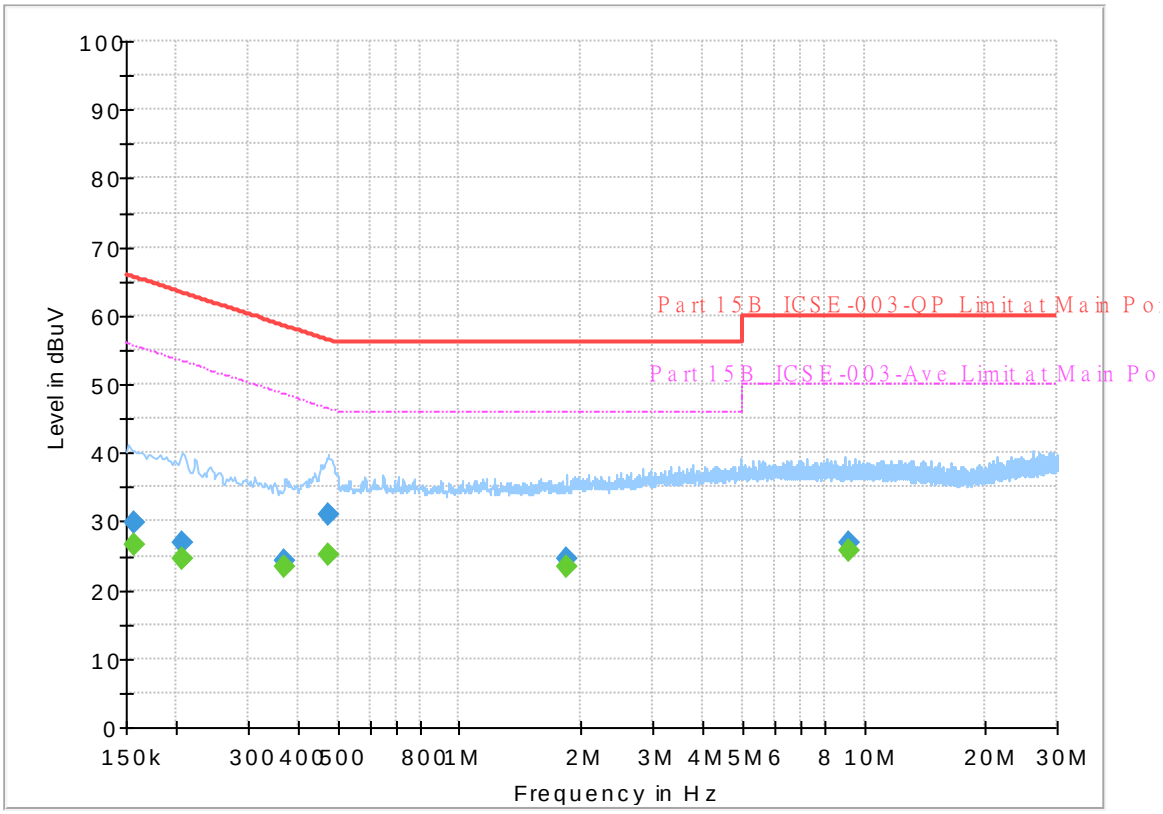
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	27.81	55.88	28.07	L1	OFF	19.8
0.152250	30.47	---	65.88	35.41	L1	OFF	19.8
0.183750	---	25.09	54.31	29.22	L1	OFF	19.8
0.183750	27.72	---	64.31	36.59	L1	OFF	19.8
0.478500	---	25.42	46.37	20.95	L1	OFF	19.8
0.478500	31.46	---	56.37	24.91	L1	OFF	19.8
0.597750	---	23.34	46.00	22.66	L1	OFF	19.8
0.597750	25.08	---	56.00	30.92	L1	OFF	19.8
2.089500	---	23.72	46.00	22.28	L1	OFF	19.9
2.089500	25.08	---	56.00	30.92	L1	OFF	19.9
9.762000	---	25.51	50.00	24.49	L1	OFF	20.3
9.762000	26.78	---	60.00	33.22	L1	OFF	20.3

EUT Information

Report NO :	3D2704
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

Full Spectrum



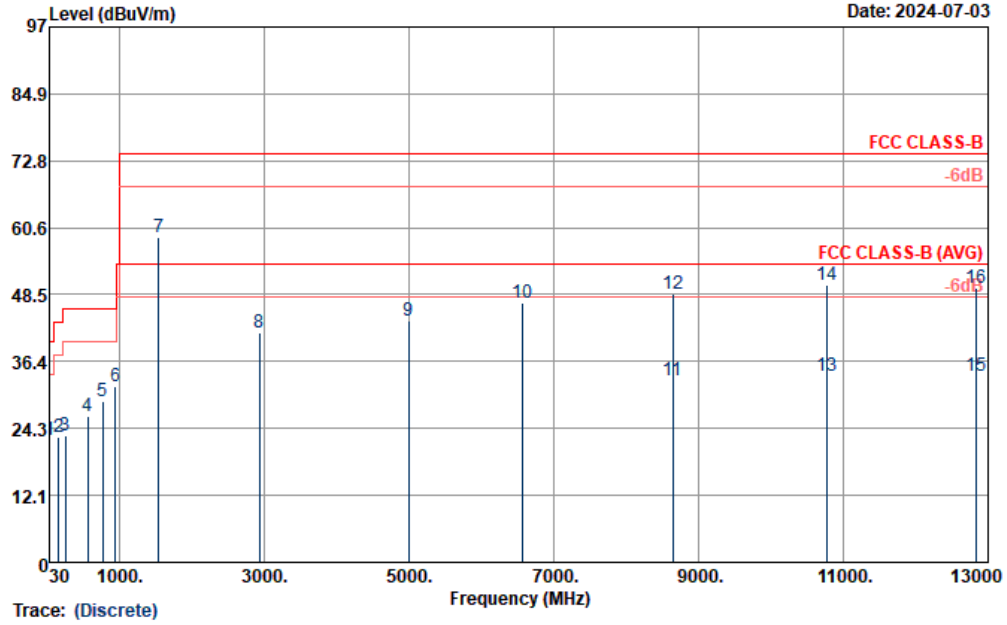
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.156750	---	26.57	55.63	29.06	N	OFF	19.8
0.156750	29.80	---	65.63	35.83	N	OFF	19.8
0.206250	---	24.71	53.36	28.65	N	OFF	19.8
0.206250	26.91	---	63.36	36.45	N	OFF	19.8
0.370500	---	23.45	48.49	25.04	N	OFF	19.8
0.370500	24.30	---	58.49	34.19	N	OFF	19.8
0.474000	---	25.28	46.44	21.16	N	OFF	19.8
0.474000	31.03	---	56.44	25.41	N	OFF	19.8
1.837500	---	23.49	46.00	22.51	N	OFF	19.9
1.837500	24.62	---	56.00	31.38	N	OFF	19.9
9.174750	---	25.59	50.00	24.41	N	OFF	20.3
9.174750	26.82	---	60.00	33.18	N	OFF	20.3

Appendix B. Radiated Emission Test Result

Test Engineer :	YouXian Chen	**Temperature :**	23.7~25.6°C
		Relative Humidity :	46.2~57.8%
Test Distance :	3m	**Polarization :**	Horizontal
Remark :	#7 is system simulator signal which can be ignored.		

■ Emission level (dBμV/m) = 20 log Emission level (μV/m)
■ Factor(dB) = Antenna Factor + Cable Loss + Filter loss – Preamp Factor
■ Corrected Reading: Factor(dB) + Read Level = Level

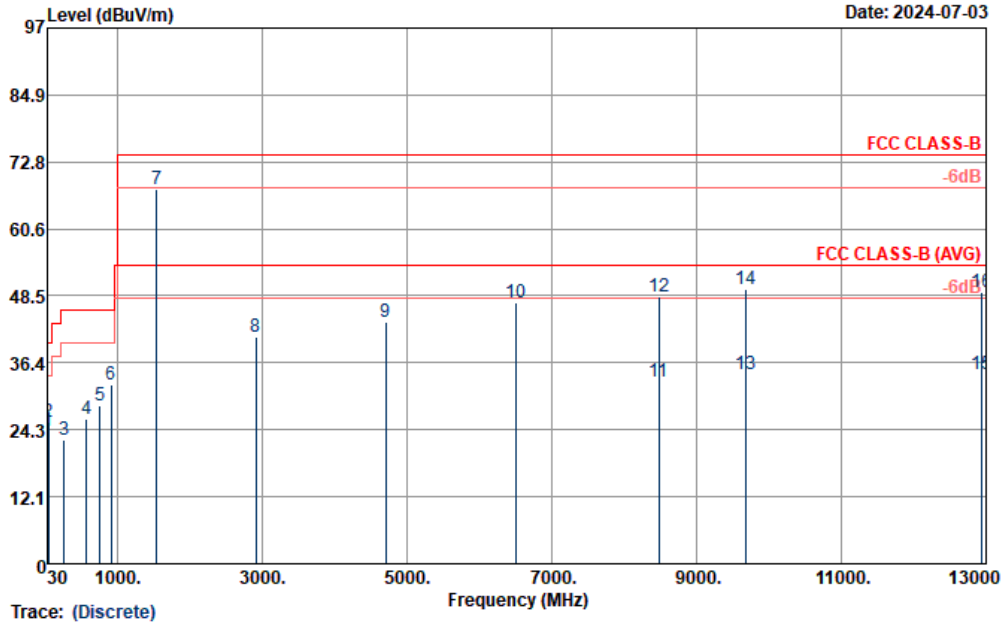


Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120D_02037 HORIZONTAL
Project : 3D2704
Power : 120Vac/60Hz
Memo : Mode 1

	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	30.27	22.04	-17.96	40.00	28.92	-6.88	---	---	Peak
2	159.87	22.64	-20.86	43.50	35.82	-13.18	---	---	Peak
3	253.83	22.95	-23.05	46.00	33.01	-10.06	---	---	Peak
4	560.40	26.38	-19.62	46.00	28.54	-2.16	---	---	Peak
5	767.60	29.23	-16.77	46.00	28.88	0.35	---	---	Peak
6	943.30	31.96	-14.04	46.00	28.06	3.90	---	---	Peak
7	1542.00	58.91			89.00	-30.09	---	---	Peak
8	2936.00	41.69	-32.31	74.00	64.36	-22.67	---	---	Peak
9	4996.00	43.83	-30.17	74.00	61.14	-17.31	---	---	Peak
10	6558.00	46.99	-27.01	74.00	60.33	-13.34	---	---	Peak
11	8648.00	32.95	-21.05	54.00	43.10	-10.15	100	62	Average
12	8648.00	48.65	-25.35	74.00	58.80	-10.15	100	62	Peak
13	10782.00	33.82	-20.18	54.00	40.90	-7.08	100	413	Average
14	10782.00	50.14	-23.86	74.00	57.22	-7.08	100	413	Peak
15	12844.00	33.81	-20.19	54.00	37.69	-3.88	100	44	Average
16	12844.00	49.61	-24.39	74.00	53.49	-3.88	100	44	Peak

Test Engineer :	YouXian Chen	**Temperature :**	23.7~25.6℃
		Relative Humidity :	46.2~57.8%
Test Distance :	3m	**Polarization :**	Vertical
Remark :	#7 is system simulator signal which can be ignored.		

■ Emission level (dBμV/m) = 20 log Emission level (μV/m)
■ Factor(dB) = Antenna Factor + Cable Loss + Filter loss – Preamp Factor
■ Corrected Reading: Factor(dB) + Read Level = Level



Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120D_02037 VERTICAL
Project : 3D2704
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	30.27	24.03	-15.97	40.00	30.91	-6.88	---	---	Peak
2	42.96	25.77	-14.23	40.00	38.50	-12.73	---	---	Peak
3	260.04	22.33	-23.67	46.00	31.36	-9.03	---	---	Peak
4	569.50	26.20	-19.80	46.00	28.61	-2.41	---	---	Peak
5	755.70	28.64	-17.36	46.00	27.99	0.65	---	---	Peak
6	911.80	32.33	-13.67	46.00	29.05	3.28	---	---	Peak
7	1542.00	67.75			97.84	-30.09	---	---	Peak
8	2916.00	41.12	-32.88	74.00	63.82	-22.70	---	---	Peak
9	4708.00	43.73	-30.27	74.00	62.61	-18.88	---	---	Peak
10	6512.00	47.20	-26.80	74.00	60.70	-13.50	---	---	Peak
11	8484.00	33.07	-20.93	54.00	43.30	-10.23	100	208	Average
12	8484.00	48.50	-25.50	74.00	58.73	-10.23	100	208	Peak
13	9676.00	34.32	-19.68	54.00	42.80	-8.48	100	105	Average
14	9676.00	49.64	-24.36	74.00	58.12	-8.48	100	105	Peak
15	12938.00	34.27	-19.73	54.00	37.81	-3.54	100	193	Average
16	12938.00	49.24	-24.76	74.00	52.78	-3.54	100	193	Peak