



FCC EMI TEST REPORT

FCC ID : 2BHFNHESTIAA2
Equipment : NTN-LoRaWAN Dongle
Brand Name : APAL
Model Name : Hestia A2
Applicant : Creative5 Inc.
7F, No. 300, Sec. 1, Neihu Rd., Neihu Dist.
Taipei City, 11493, Taiwan
Manufacturer : Creative5 Inc.
7F, No. 300, Sec. 1, Neihu Rd., Neihu Dist.
Taipei City, 11493, Taiwan
Standard : FCC 47 CFR FCC Part 15 Subpart B Class B

The product was received on Jan. 09, 2025 and testing was performed from Mar. 24, 2025 to Mar. 26, 2025. 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.

Approved by: Louis Wu

Sportun 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



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.107	AC Conducted Emission	Pass	-
3.2	15.109	Radiated Emission	Pass	-

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: Keven Cheng

Report Producer: Michelle Chen



1. General Description

1.1. Product Feature of Equipment Under Test

Product Feature
General Specs NTN, LoRa, and GNSS.

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

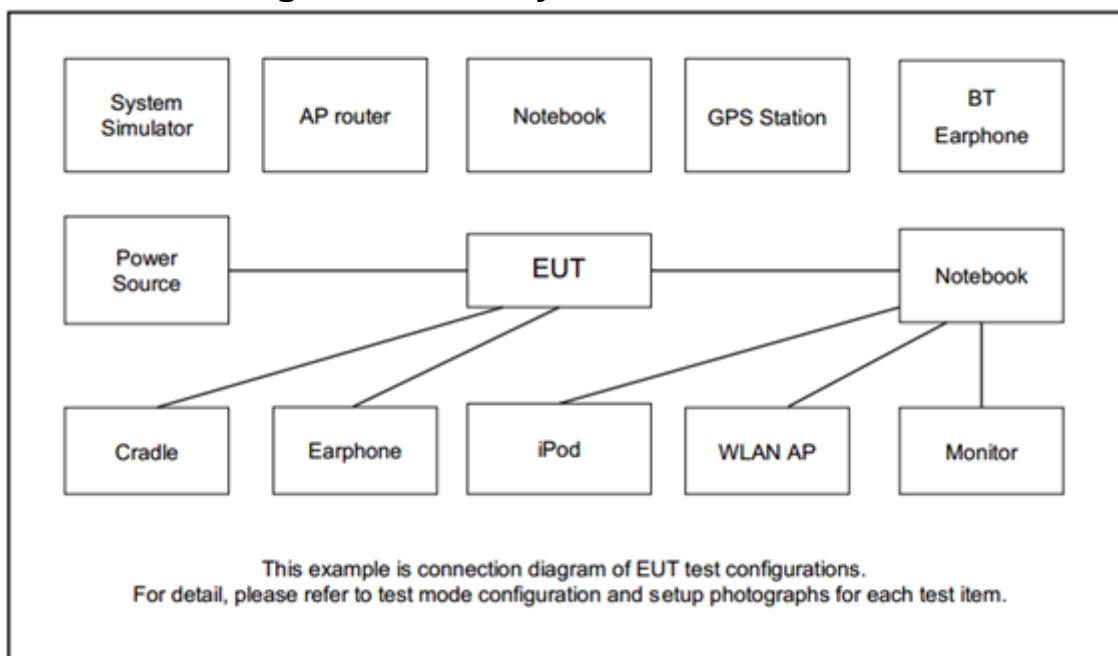
2. Test Configuration of Equipment Under Test

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: Band 255 idle + LoRa on + GPS Rx + Cable (Charging with Notebook)
Radiated Emissions	Mode 1: Band 255 idle + LoRa on + GPS Rx + Cable (Charging with Notebook)

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	Lenovo	TP00116A	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Rounter	N/A	N/A	N/A	N/A	N/A
5.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8m
6.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
7.	iPod	Apple	A1285	DoC	Shielded, 1.0m	N/A

2.4. EUT Operation Test Setup

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

1. For NTN Band 255, the EUT was attached to the System Simulator.
2. Turn on LoRa function.
3. Execute "GPS Test" to make the EUT receive continuous signals from GPS station.



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.

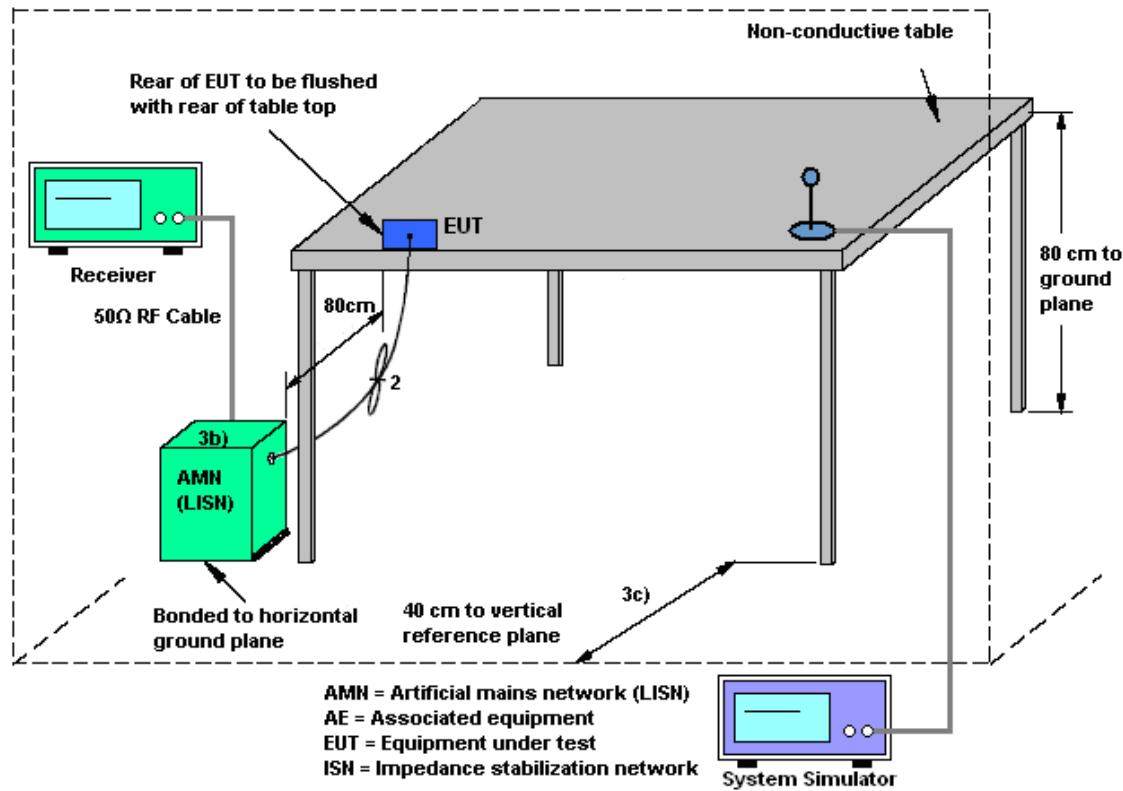
3.1.2. Measuring Instruments

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

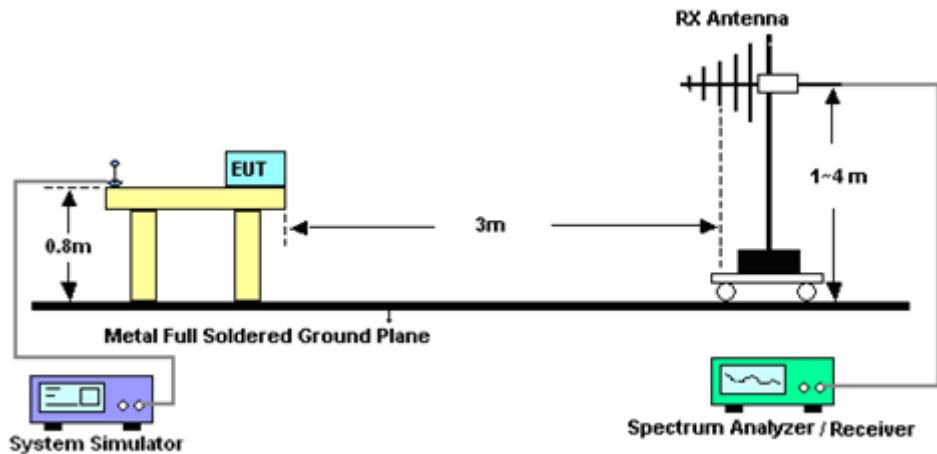
Please refer to the measuring equipment list in this test report.

3.2.3. Test Procedures

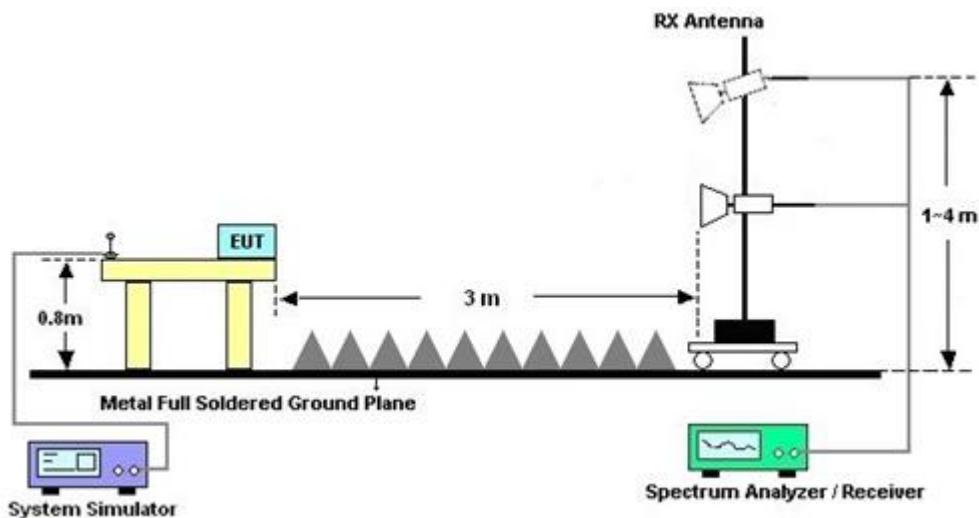
1. The EUT is placed on a turntable with 0.8 meter above ground.
2. The EUT is set 3 meters from the interference receiving antenna for measured frequency 30MHz~18GHz, which is mounted on the top of a variable height antenna tower.
3. The table is rotated 360 degrees to determine the position of the 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.

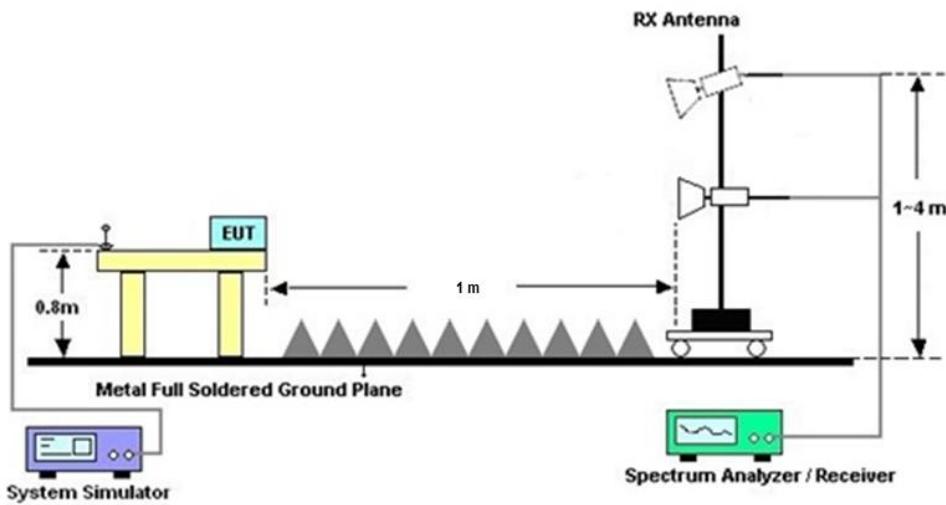
3.2.4. Test Setup of Radiated Emission

For Radiated Emissions from 30 MHz to 1 GHz



For Radiated Emissions from 1GHz to 18GHz



For Radiated Emissions above 18GHz**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
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 16, 2024	Mar. 24, 2025	Apr. 15, 2025	Radiation (03CH06-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 05, 2024	Mar. 24, 2025	Oct. 04, 2025	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 23, 2025	Mar. 24, 2025	Jan. 22, 2026	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02037	1GHz~18GHz	Dec. 20, 2024	Mar. 24, 2025	Dec. 19, 2025	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180001	1GHz~18GHz	Jul. 15, 2024	Mar. 24, 2025	Jul. 14, 2025	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF104 SF102_2000mm SF102_3000mm SF102_7000mm	802433/4 532421/2 532422/2 532299/2	30MHz to 18GHz	Jul. 02, 2024	Mar. 24, 2025	Jul. 01, 2025	Radiation (03CH06-HY)
Hygrometer	TECPEL	DTM-303B	TP210018	N/A	Oct. 14, 2024	Mar. 24, 2025	Oct. 13, 2025	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Mar. 24, 2025	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Mar. 24, 2025	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Mar. 24, 2025	N/A	Radiation (03CH06-HY)
Software	Audix	E3	N/A	N/A	N/A	Mar. 24, 2025	N/A	Radiation (03CH06-HY)
Signal Analyzer	R&S	FSV3044	101103	N/A	Jan. 22, 2025	Mar. 24, 2025	Jan. 21, 2026	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18~40GHz	Nov. 28, 2024	Mar. 24, 2025	Nov. 27, 2025	Radiation (03CH06-HY)
Preamplifier	EMEC	EM18G40G	0600789	18~40GHz	Aug. 05, 2024	Mar. 24, 2025	Aug. 04, 2025	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801606/2	9KHz ~ 40GHz	Apr. 22, 2024	Mar. 24, 2025	Apr. 21, 2025	Radiation (03CH06-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 26, 2025	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 10, 2024	Mar. 26, 2025	Dec. 09, 2025	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Oct. 14, 2024	Mar. 26, 2025	Oct. 13, 2025	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 12, 2024	Mar. 26, 2025	Dec. 11, 2025	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 14, 2024	Mar. 26, 2025	Nov. 13, 2025	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Mar. 26, 2025	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	00691	N/A	Jul. 30, 2024	Mar. 26, 2025	Jul. 29, 2025	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	MQT24082501	N/A	Oct. 15, 2024	Mar. 26, 2025	Oct. 14, 2025	Conduction (CO05-HY)



5. Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2U _c (y))	3.7 dB
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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))	5.8 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2U _c (y))	4.8 dB
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Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2U _c (y))	5.4 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2U _c (y))	5.0 dB
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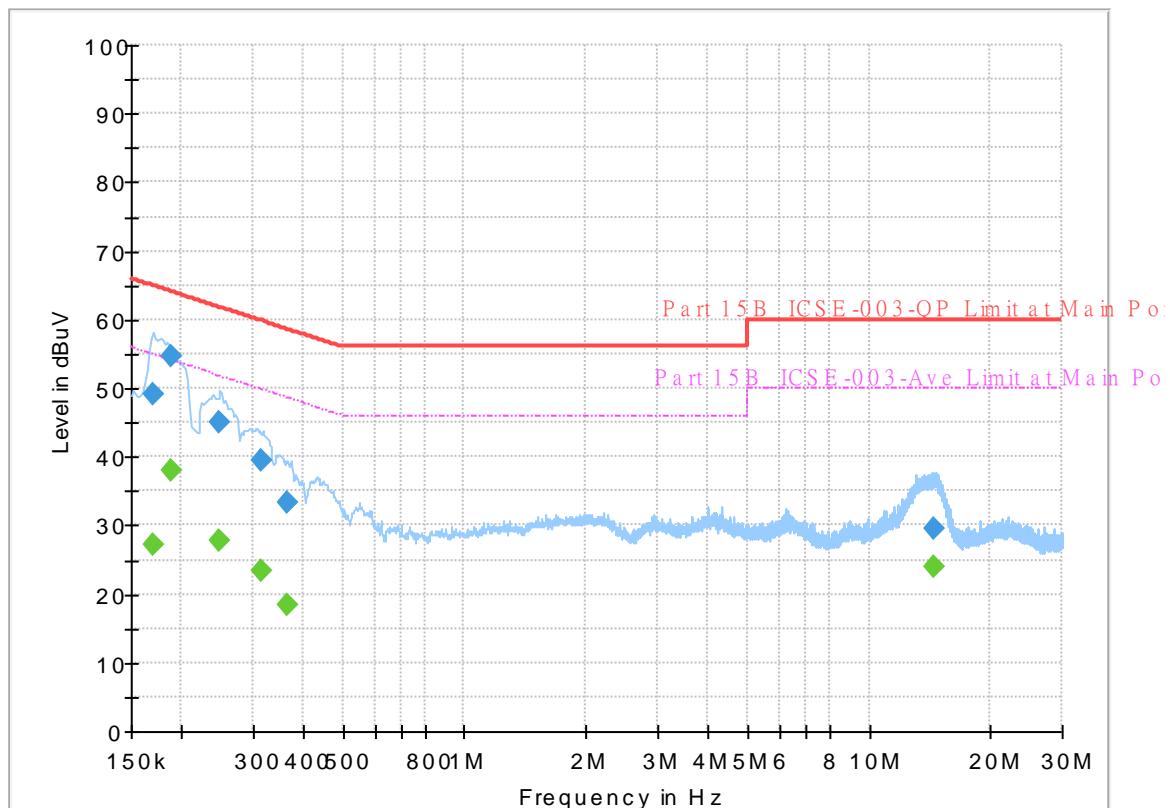


Appendix A. AC Conducted Emission Test Results

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

EUT Information

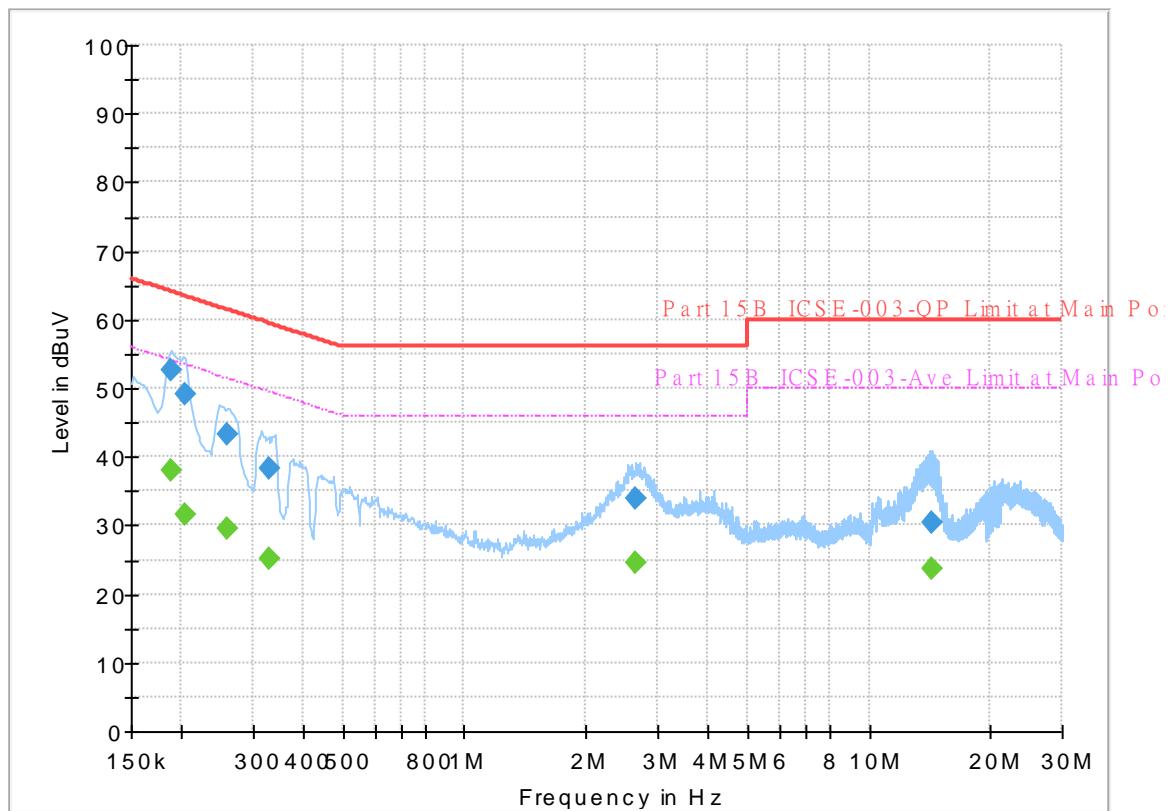
Report NO : 480227-01
 Test Mode : Mode 1
 Test Voltage : Power From System
 Phase : Line

Full Spectrum**Final Result**

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.170250	---	27.27	54.95	27.68	L1	OFF	19.8
0.170250	49.16	---	64.95	15.79	L1	OFF	19.8
0.188250	---	38.10	54.11	16.01	L1	OFF	19.8
0.188250	54.80	---	64.11	9.31	L1	OFF	19.8
0.249000	---	27.92	51.79	23.87	L1	OFF	19.8
0.249000	45.07	---	61.79	16.72	L1	OFF	19.8
0.314250	---	23.41	49.86	26.45	L1	OFF	19.8
0.314250	39.39	---	59.86	20.47	L1	OFF	19.8
0.363750	---	18.34	48.64	30.30	L1	OFF	19.8
0.363750	33.38	---	58.64	25.26	L1	OFF	19.8
14.451000	---	24.02	50.00	25.98	L1	OFF	19.9
14.451000	29.53	---	60.00	30.47	L1	OFF	19.9

EUT Information

Report NO : 480227-01
 Test Mode : Mode 1
 Test Voltage : Power From System
 Phase : Neutral

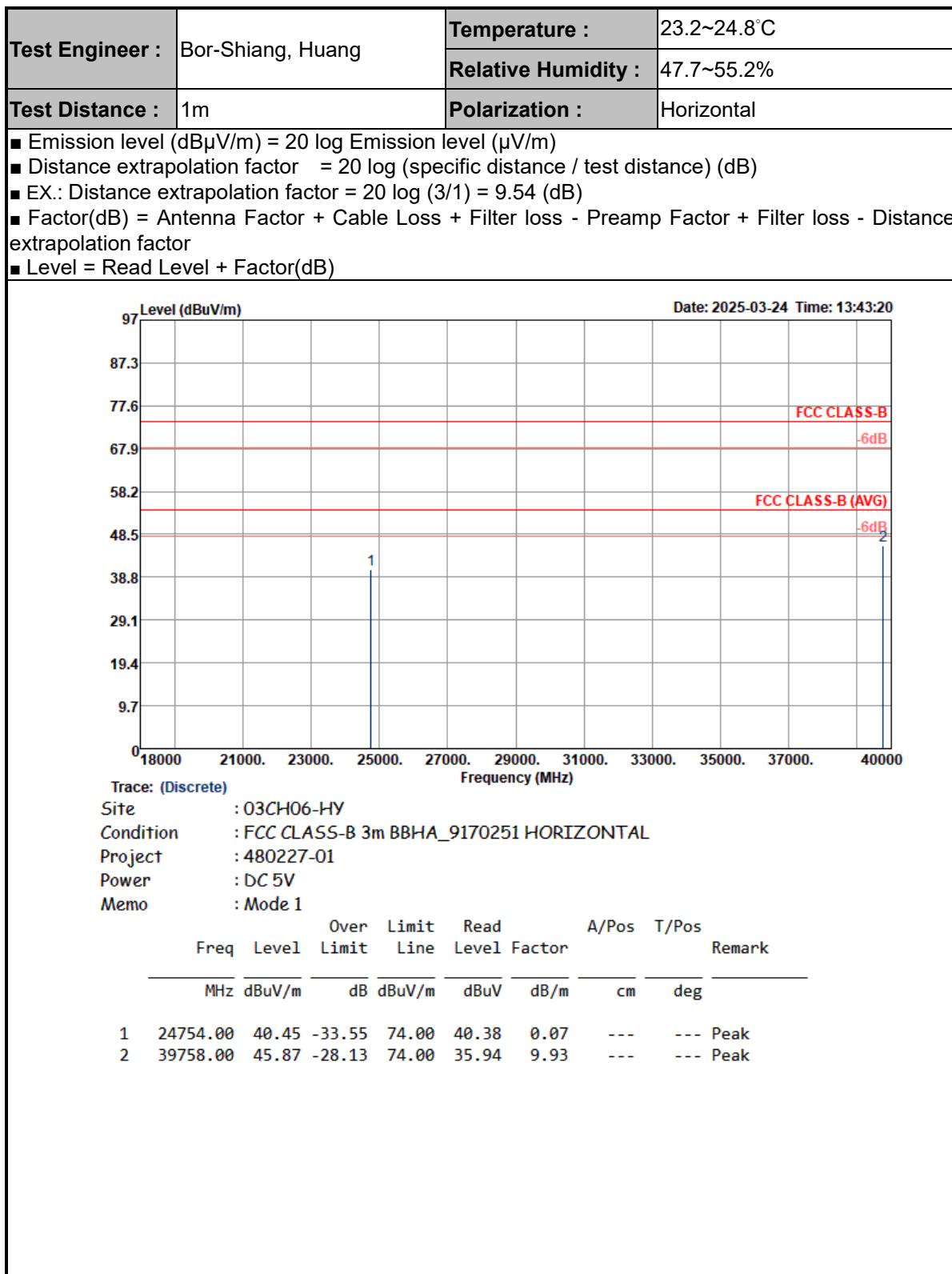
Full Spectrum**Final Result**

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.188250	---	37.87	54.11	16.24	N	OFF	19.8
0.188250	52.61	---	64.11	11.50	N	OFF	19.8
0.204000	---	31.51	53.45	21.94	N	OFF	19.8
0.204000	49.25	---	63.45	14.20	N	OFF	19.8
0.260250	---	29.42	51.42	22.00	N	OFF	19.8
0.260250	43.14	---	61.42	18.28	N	OFF	19.8
0.327750	---	25.24	49.51	24.27	N	OFF	19.8
0.327750	38.35	---	59.51	21.16	N	OFF	19.8
2.652000	---	24.70	46.00	21.30	N	OFF	19.8
2.652000	33.89	---	56.00	22.11	N	OFF	19.8
14.347500	---	23.62	50.00	26.38	N	OFF	20.0
14.347500	30.38	---	60.00	29.62	N	OFF	20.0



Appendix B. Radiated Emission Test Result

Test Engineer :	Bor-Shiang, Huang	Temperature :	23.2~24.8°C																																																																																																																																																																																																													
		Relative Humidity :	47.7~55.2%																																																																																																																																																																																																													
Test Distance :	3m	Polarization :	Horizontal																																																																																																																																																																																																													
<ul style="list-style-type: none"> ■ 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 																																																																																																																																																																																																																
<p>Level (dBuV/m)</p> <p>Date: 2025-03-24 Time: 13:33:54</p> <p>Frequency (MHz)</p> <p>Trace: (Discrete)</p> <p>Site : 03CH06-HY</p> <p>Condition : FCC CLASS-B 3m 9120D_02037 HORIZONTAL</p> <p>Project : 480227-01</p> <p>Power : DC 5V</p> <p>Memo : Mode 1</p> <table border="1"> <thead> <tr> <th>Freq</th> <th>Over Limit</th> <th>Limit</th> <th>Read Line</th> <th>A/Pos Factor</th> <th>T/Pos</th> <th>Remark</th> </tr> <tr> <th>MHz</th> <th>dBuV/m</th> <th>dB</th> <th>dBuV/m</th> <th>dBuV</th> <th>dB/m</th> <th>cm</th> <th>deg</th> </tr> </thead> <tbody> <tr><td>1</td><td>30.27</td><td>22.18</td><td>-17.82</td><td>40.00</td><td>28.63</td><td>-6.45</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>2</td><td>125.04</td><td>16.47</td><td>-27.03</td><td>43.50</td><td>28.54</td><td>-12.07</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>3</td><td>250.05</td><td>22.41</td><td>-23.59</td><td>46.00</td><td>32.95</td><td>-10.54</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>4</td><td>750.10</td><td>32.88</td><td>-13.12</td><td>46.00</td><td>31.48</td><td>1.40</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>5</td><td>874.70</td><td>34.43</td><td>-11.57</td><td>46.00</td><td>31.23</td><td>3.20</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>6</td><td>1000.00</td><td>41.45</td><td>-12.55</td><td>54.00</td><td>35.48</td><td>5.97</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>7</td><td>1542.00</td><td>59.03</td><td>-14.97</td><td>74.00</td><td>89.17</td><td>-30.14</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>8</td><td>2830.00</td><td>41.35</td><td>-32.65</td><td>74.00</td><td>64.26</td><td>-22.91</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>9</td><td>4962.00</td><td>44.08</td><td>-29.92</td><td>74.00</td><td>61.54</td><td>-17.46</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>10</td><td>6546.00</td><td>46.46</td><td>-27.54</td><td>74.00</td><td>59.94</td><td>-13.48</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>11</td><td>7880.00</td><td>47.30</td><td>-26.70</td><td>74.00</td><td>59.00</td><td>-11.70</td><td>---</td><td>---</td><td>Peak</td></tr> <tr><td>12</td><td>9516.00</td><td>34.89</td><td>-19.11</td><td>54.00</td><td>42.80</td><td>-7.91</td><td>100</td><td>69</td><td>Average</td></tr> <tr><td>13</td><td>9516.00</td><td>49.44</td><td>-24.56</td><td>74.00</td><td>57.35</td><td>-7.91</td><td>100</td><td>69</td><td>Peak</td></tr> <tr><td>14</td><td>11860.00</td><td>33.77</td><td>-20.23</td><td>54.00</td><td>40.31</td><td>-6.54</td><td>100</td><td>28</td><td>Average</td></tr> <tr><td>15</td><td>11860.00</td><td>49.10</td><td>-24.90</td><td>74.00</td><td>55.64</td><td>-6.54</td><td>100</td><td>28</td><td>Peak</td></tr> <tr><td>16</td><td>14090.00</td><td>35.86</td><td>-18.14</td><td>54.00</td><td>37.09</td><td>-1.23</td><td>100</td><td>285</td><td>Average</td></tr> <tr><td>17</td><td>14090.00</td><td>52.17</td><td>-21.83</td><td>74.00</td><td>53.40</td><td>-1.23</td><td>100</td><td>285</td><td>Peak</td></tr> <tr><td>18</td><td>17980.00</td><td>37.70</td><td>-16.30</td><td>54.00</td><td>30.29</td><td>7.41</td><td>100</td><td>28</td><td>Average</td></tr> <tr><td>19</td><td>17980.00</td><td>52.65</td><td>-21.35</td><td>74.00</td><td>45.24</td><td>7.41</td><td>100</td><td>28</td><td>Peak</td></tr> </tbody> </table>				Freq	Over Limit	Limit	Read Line	A/Pos Factor	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	1	30.27	22.18	-17.82	40.00	28.63	-6.45	---	---	Peak	2	125.04	16.47	-27.03	43.50	28.54	-12.07	---	---	Peak	3	250.05	22.41	-23.59	46.00	32.95	-10.54	---	---	Peak	4	750.10	32.88	-13.12	46.00	31.48	1.40	---	---	Peak	5	874.70	34.43	-11.57	46.00	31.23	3.20	---	---	Peak	6	1000.00	41.45	-12.55	54.00	35.48	5.97	---	---	Peak	7	1542.00	59.03	-14.97	74.00	89.17	-30.14	---	---	Peak	8	2830.00	41.35	-32.65	74.00	64.26	-22.91	---	---	Peak	9	4962.00	44.08	-29.92	74.00	61.54	-17.46	---	---	Peak	10	6546.00	46.46	-27.54	74.00	59.94	-13.48	---	---	Peak	11	7880.00	47.30	-26.70	74.00	59.00	-11.70	---	---	Peak	12	9516.00	34.89	-19.11	54.00	42.80	-7.91	100	69	Average	13	9516.00	49.44	-24.56	74.00	57.35	-7.91	100	69	Peak	14	11860.00	33.77	-20.23	54.00	40.31	-6.54	100	28	Average	15	11860.00	49.10	-24.90	74.00	55.64	-6.54	100	28	Peak	16	14090.00	35.86	-18.14	54.00	37.09	-1.23	100	285	Average	17	14090.00	52.17	-21.83	74.00	53.40	-1.23	100	285	Peak	18	17980.00	37.70	-16.30	54.00	30.29	7.41	100	28	Average	19	17980.00	52.65	-21.35	74.00	45.24	7.41	100	28	Peak
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Test Engineer :	Bor-Shiang, Huang	Temperature :	23.2~24.8°C																																																																																																																																																																																																																		
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15	11742.00	49.08	-24.92	74.00	55.68	-6.60	100	180	Peak																																																																																																																																																																																																												
16	14855.00	36.08	-17.92	54.00	36.99	-0.91	100	77	Average																																																																																																																																																																																																												
17	14855.00	52.26	-21.74	74.00	53.17	-0.91	100	77	Peak																																																																																																																																																																																																												
18	17965.00	37.43	-16.57	54.00	30.20	7.23	100	29	Average																																																																																																																																																																																																												
19	17965.00	53.14	-20.86	74.00	45.91	7.23	100	29	Peak																																																																																																																																																																																																												

