FCC RADIO TEST REPORT

FCC ID	:	**2AW3A-1NAC21ACUCM**
Equipment	:	**EV Charger**
Brand Name	:	**RIVIAN**
Model Name	:	**PT00057322** **PT00261633** **PT00401761** **PT00340197**
Marketing Name	:	**RIVIAN WAYPOINTS CHARGER** **RIVIAN FLEET AC DISPENSER**
Applicant	:	**Rivian Automotive LLC.** **607 Hansen Way, Palo Alto, CA 94304**
Manufacturer	:	**Lite-On Technology Corporation** **15F , No.555, Siyuan Rd., Xinzhuang Dist., New Taipei City, Taiwan (R.O.C.)**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Mar. 17, 2022 and testing was performed from Apr. 09, 2022 to May 17, 2022. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issue Date
FR230116A	01	Initial issue of report	Sep. 14, 2022
FR230116A	02	Revise the section 2.2 and section 3.1.5	Sep. 27, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(b)(3)	Output Power	Pass	-
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	10.19 dB under the limit at 2498.400 MHz
3.3	15.207	AC Conducted Emission	Pass	1.39 dB under the limit at 0.279 MHz
3.4	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: The module (Model:ANNA-B112) makes no difference after verifying output power, this report reuses test data from the module report.

Declaration of Conformity:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".
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: Yun Huang

Report Producer: Kaye Yang

1 General Description

1.1 Product Feature of Equipment Under Test

GSM/LTE, Bluetooth - LE, Wi-Fi 2.4GHz 802.11b/g/n and NFC.

Product Feature	
Sample 1	SKU 1
Sample 2	SKU 2
Sample 3	SKU 3
Sample 4	SKU 4
Antenna Type	WWAN: Fixed External Antenna WLAN: FPC Antenna Bluetooth - LE: Internal Antenna NFC: PCB Loop Antenna

Antenna information		
2402 MHz ~ 2480 MHz	Peak Gain (dBi)	0.5

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

	SKU 1	SKU 2	SKU 3	SKU 4
	Public	**Fleet**	**Fleet**	**Fleet**
	LITEON: W1-UC166-0TH1ER	**LITEON: W1-UC16A-00H1ER**	**LITEON: W1-UC168-00H1ER**	**LITEON: W1-UC166-00H1ER**
	RIVIAN: PT00057322	**RIVIAN:PT00261633**	**RIVIAN: PT00340197**	**RIVIAN:PT00401761**
LCD Panel	Yes	NO	NO	NO
Charge Plug	25ft	32ft	25ft	18ft
LTE module	YES	YES	YES	YES
BLE module	YES	YES	YES	YES
Wi-Fi module	YES	YES	YES	YES
RFID module	YES	YES	YES	YES
Holster	YES	NO	NO	NO
Holster cover	YES	YES	YES	YES

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing 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 (TAF Code: 1190)
Remark	The AC Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory.

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW3786

1.4 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

2.2 Test Mode

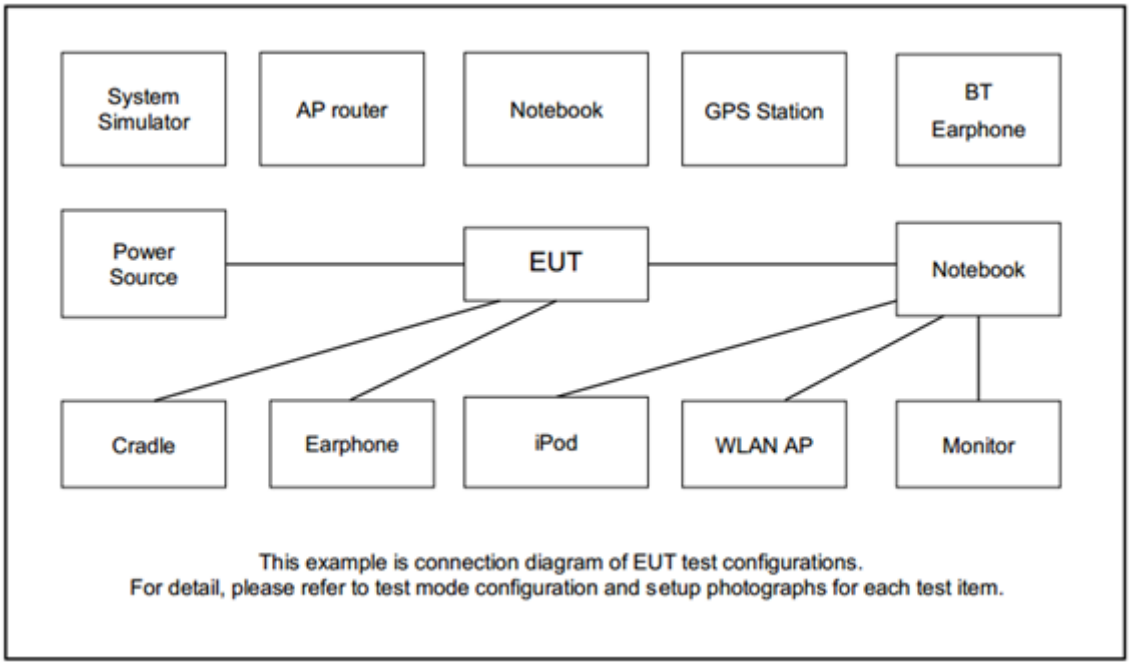
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
Radiated Test Cases	**Bluetooth – LE / GFSK**
	Mode 1: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_2Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_2Mbps
AC Conducted Emission	Mode 1 :WLAN (2.4GHz) Link + Bluetooth Link + Power Cable (240 Vac) for Sample 1 Mode 2 :WLAN (2.4GHz) Link + Bluetooth Link + Power Cable (240 Vac) for Sample 2
Remark: 1. The worst case of Conducted Emission is mode 2; only the test data of it was reported. 2. For Radiated Test Cases, the tests were performed with Sample 1.	

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Mobile Phone	SAMSUNG	SM-A730F/DS	A3LSMA730F	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “Dut Wlan BT Labtool” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

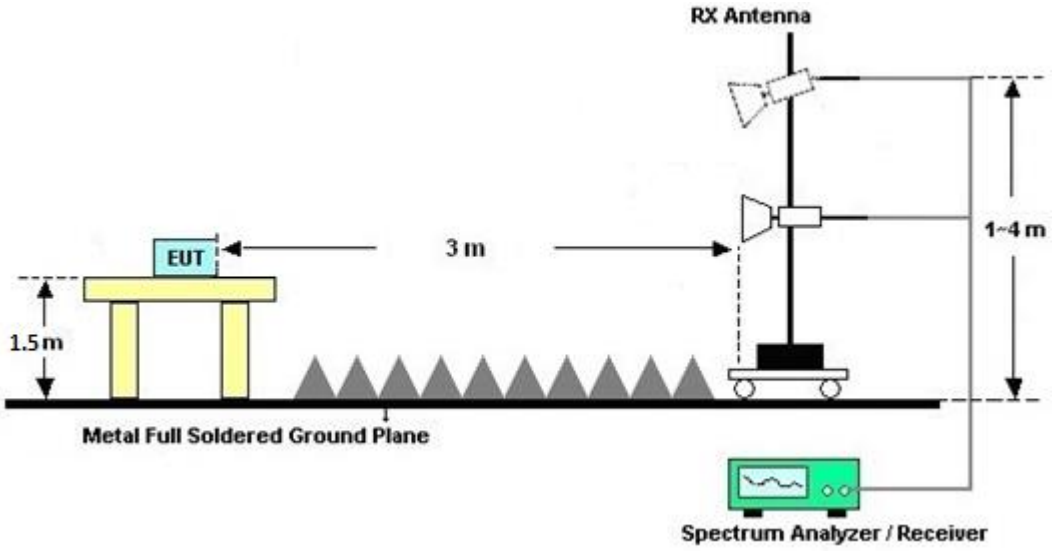
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.2.4 Method AVSGA-2.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
4. Set VBW ≥ [3 × RBW].
5. Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)
6. Sweep time = auto.
7. Detector = RMS (i.e., power averaging), if available. Otherwise, use the sample detector mode.
8. The sweep to “free run.”
9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.
10. Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
11. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is 25%.

3.1.4 Test Setup



3.1.5 Test Result of Average Output Power

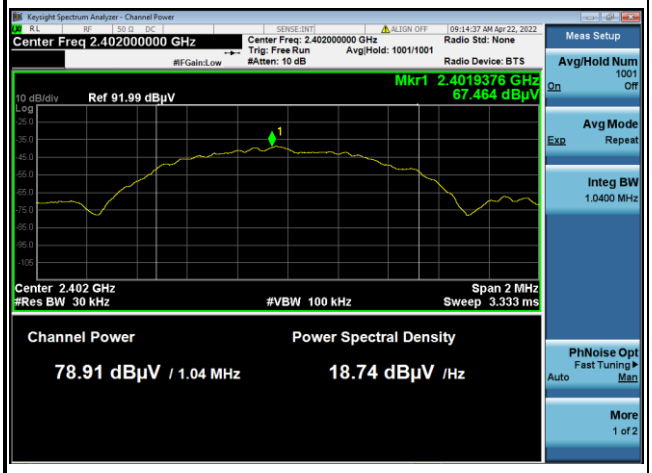
<1Mbps>

Setting	Frequency	Field Strengh@3m						Output Power			
		Level	Read Level	Antenna Factor	Path Loss	Preamp Factor	Duty Factor	EIRP	Gain	Conducted Power	Limit
	(MHz)	(dBuV/m)	(dBuV)	(dB/m)	(dB)	(dB)	(dB)	(dBm)	(dBi)	(dBm)	(dBm)
0	2402	91.80	78.91	27.51	17.30	33.95	2.03	-3.40	0.5	-3.90	30.00
	2440	91.24	78.13	27.66	17.36	33.94	2.03	-3.96	0.5	-4.46	30.00
	2480	90.01	76.73	27.76	17.42	33.93	2.03	-5.19	0.5	-5.69	30.00

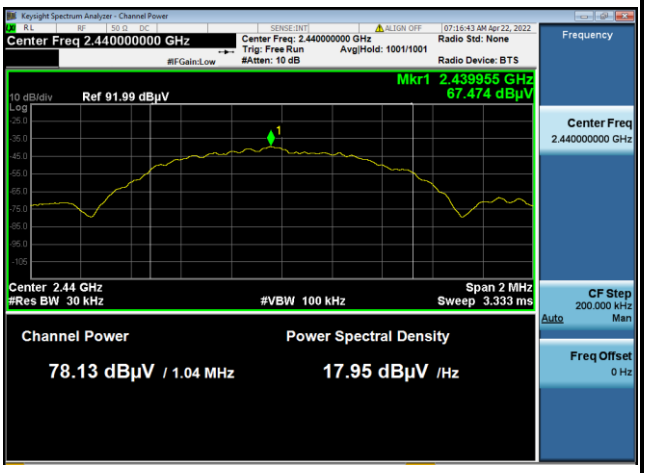
Note:

3. Field Strengh (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Path Loss (dB) - Preamp Factor (dB) + Duty Factor (dB)
4. EIRP (dBm) = Field Strengh (dBuV/m)@3m - 95.2
5. Conducted Power (dBm) = EIRP (dBm) - Gain (dBi)

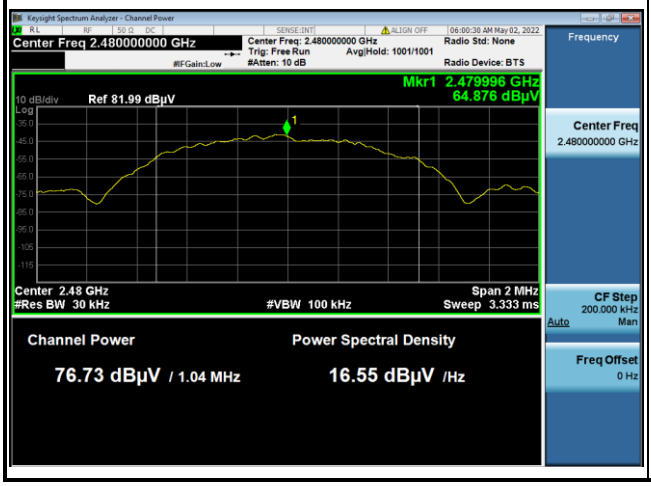
Read Level Channel 00



Read Level Channel 19



Read Level Channel 39



N/A

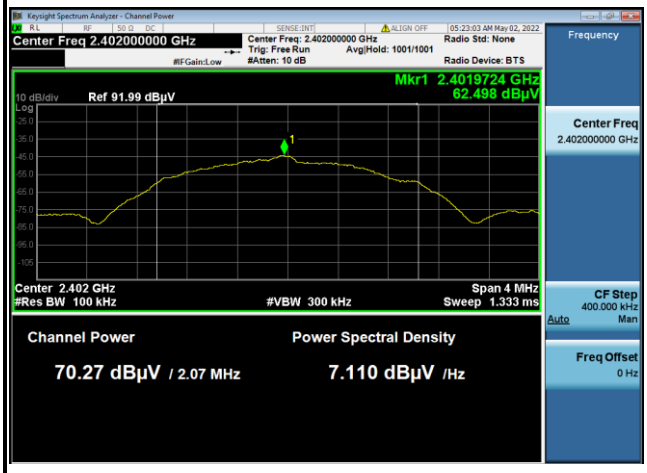
<2Mbps>

Setting	Frequency	Field Strengh@3m						Output Power			
		Level	Read Level	Antenna Factor	Path Loss	Preamp Factor	Duty Factor	EIRP	Gain	Conducted Power	Limit
	(MHz)	(dBuV/m)	(dBuV)	(dB/m)	(dB)	(dB)	(dB)	(dBm)	(dBi)	(dBm)	(dBm)
-4	2402	85.94	70.27	27.51	17.30	33.95	4.81	-9.26	0.5	-9.76	30.00
	2440	86.79	70.90	27.66	17.36	33.94	4.81	-8.41	0.5	-8.91	30.00
	2480	86.71	70.65	27.76	17.42	33.93	4.81	-8.49	0.5	-8.99	30.00

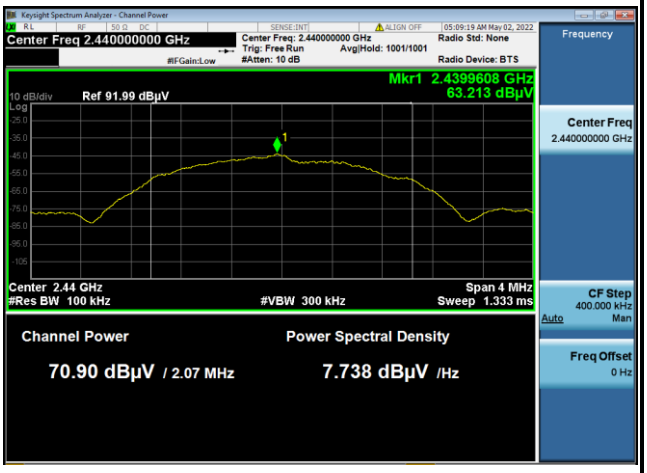
Note:

1. Field Strengh (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Path Loss (dB) - Preamp Factor (dB) + Duty Factor (dB)
2. EIRP (dBm) = Field Strengh (dBuV/m)@3m - 95.2
3. Conducted Power (dBm) = EIRP (dBm) - Gain (dBi)

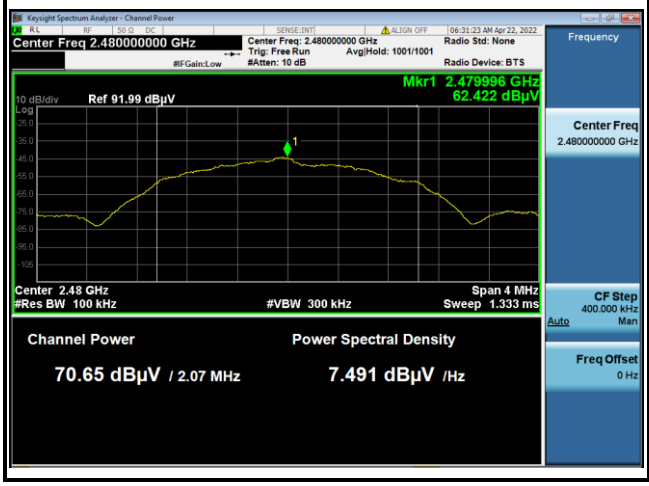
Read Level Channel 00



Read Level Channel 19



Read Level Channel 39



N/A

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device is measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

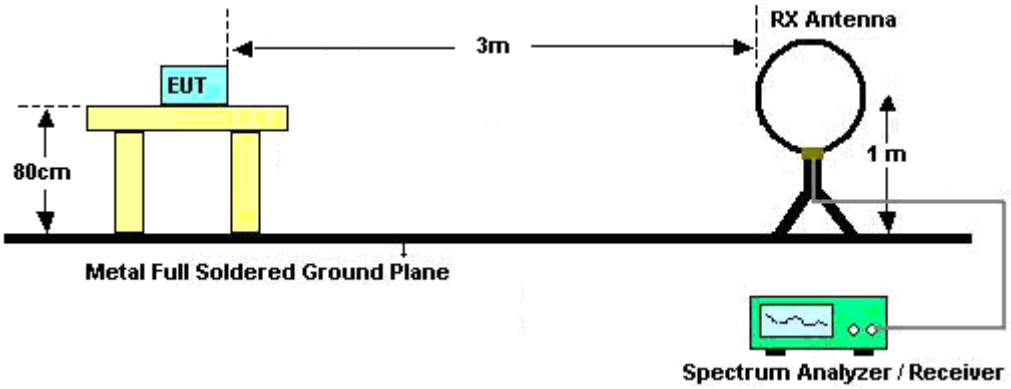
Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

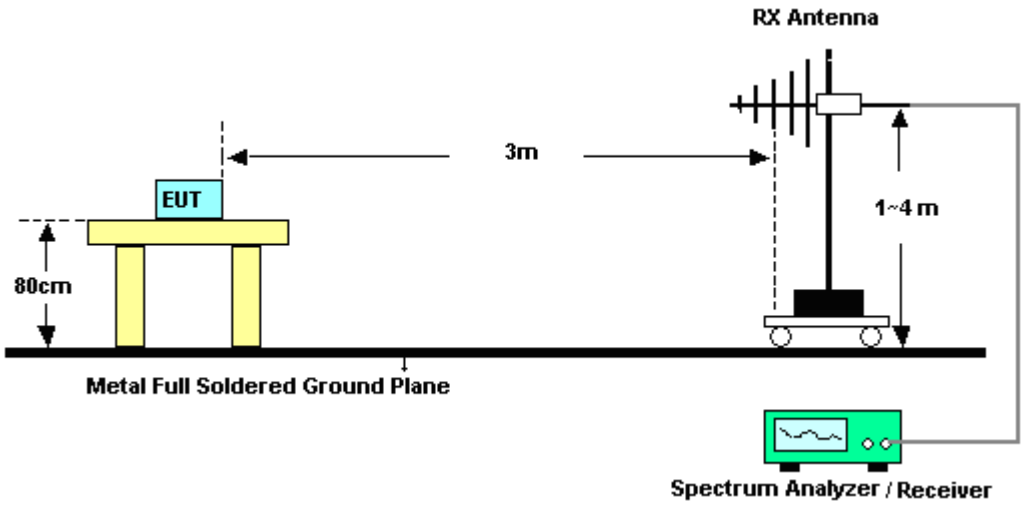
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW = 3 MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

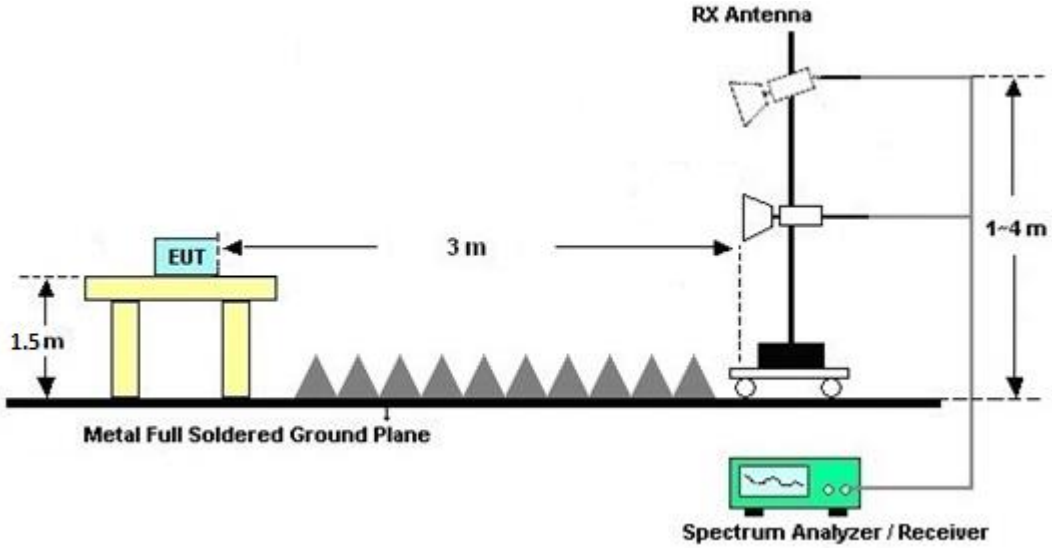
For radiated test below 30MHz



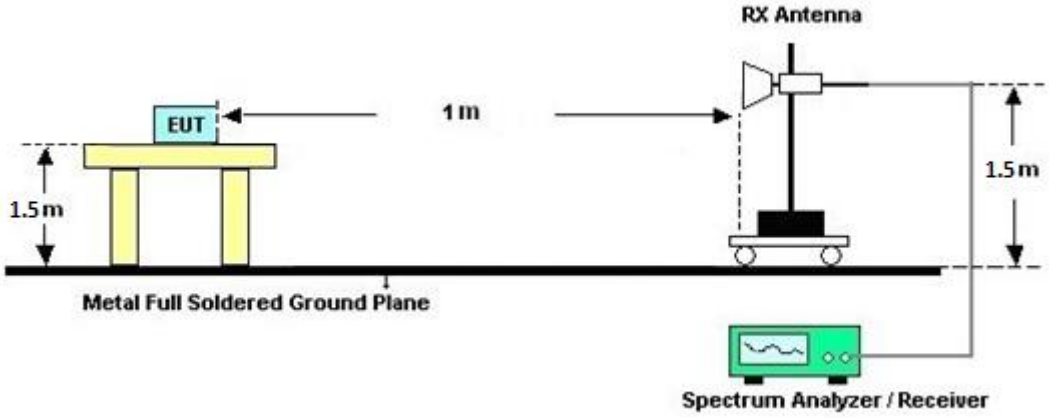
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.2.7 Duty Cycle

Please refer to Appendix D.

3.2.8 Test Result of Radiated Spurious Emission (30 MHz ~ 10th Harmonic)

Please refer to Appendix B and C.

3.3 AC Conducted Emission Measurement

3.3.1 Limit 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 (dBμV)	
	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.

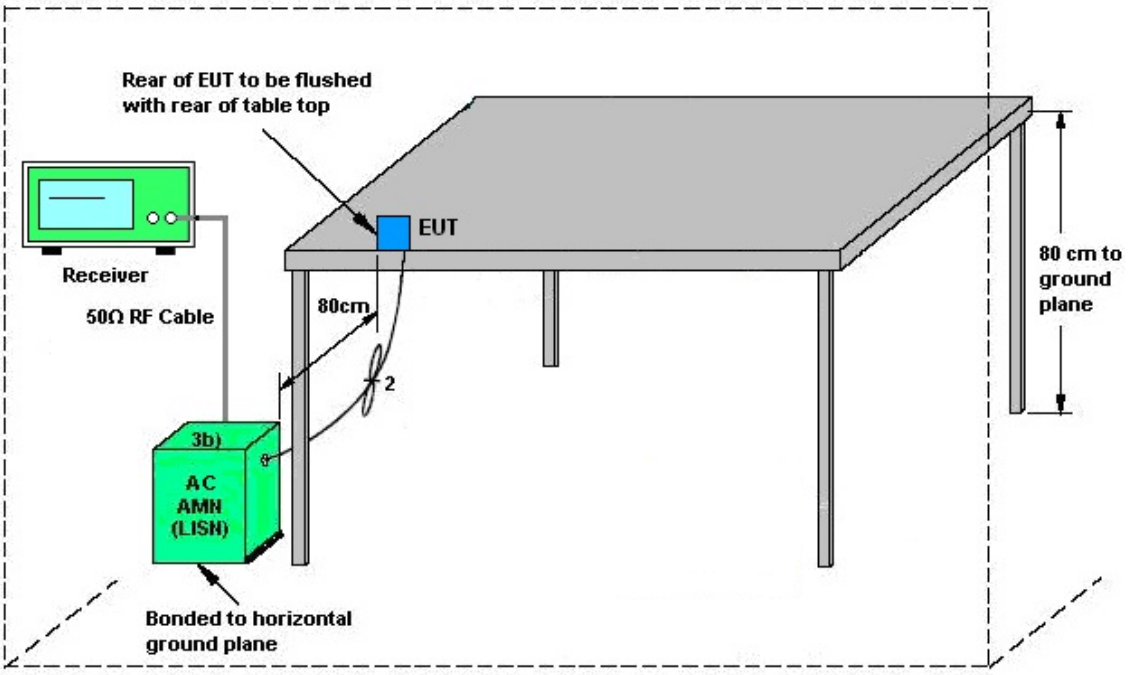
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

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.

3.3.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

3.4 Antenna Requirements

3.4.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

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. 11, 2022	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2021	Apr. 11, 2022	Nov. 30, 2022	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2021	Apr. 11, 2022	Nov. 16, 2022	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 03, 2021	Apr. 11, 2022	Dec. 02, 2022	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Apr. 11, 2022	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Jul. 28, 2021	Apr. 11, 2022	Jul. 27, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 30, 2021	Apr. 11, 2022	Dec. 29, 2022	Conduction (CO05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 07, 2022	Apr. 22, 2022~ May 17, 2022	Jan. 06, 2023	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 09, 2021	Apr. 22, 2022~ May 17, 2022	Oct. 08, 2022	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1212	1GHz ~ 18GHz	Mar. 10, 2022	Apr. 22, 2022~ May 17, 2022	Mar. 09, 2023	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00993	18GHz~40GHz	Nov. 30, 2021	Apr. 22, 2022~ May 17, 2022	Nov. 29, 2022	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 10, 2021	Apr. 22, 2022~ May 17, 2022	Dec. 09, 2022	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 10, 2021	Apr. 22, 2022~ May 17, 2022	Nov. 09, 2022	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055007	1GHz~18GHz	Jun. 16, 2021	Apr. 22, 2022~ May 17, 2022	Jun. 15, 2022	Radiation (03CH11-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 22, 2021	Apr. 22, 2022~ May 17, 2022	Jun. 21, 2022	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 15, 2021	Apr. 22, 2022~ May 17, 2022	Oct. 14, 2022	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	20MHz~8.4GHz	Jul. 15, 2021	Apr. 22, 2022~ May 17, 2022	Jul. 14, 2022	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Apr. 22, 2022~ May 17, 2022	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Apr. 22, 2022~ May 17, 2022	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Apr. 22, 2022~ May 17, 2022	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Apr. 22, 2022~ May 17, 2022	N/A	Radiation (03CH11-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 10, 2022	Apr. 22, 2022~ May 17, 2022	Mar. 09, 2023	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz-30MHz	Mar. 10, 2022	Apr. 22, 2022~ May 17, 2022	Mar. 09, 2023	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30MHz-18GHz	Mar. 10, 2022	Apr. 22, 2022~ May 17, 2022	Mar. 09, 2023	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	811852/4	30MHz-18GHz	Mar. 10, 2022	Apr. 22, 2022~ May 17, 2022	Mar. 09, 2023	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN11	1.53G Low Pass	Sep. 13, 2021	Apr. 22, 2022~ May 17, 2022	Sep. 12, 2022	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	3GHz High Pass Filter	Sep. 13, 2021	Apr. 22, 2022~ May 17, 2022	Sep. 12, 2022	Radiation (03CH11-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40SS	SN3	6.75GHz High Pass Filter	Sep. 13, 2021	Apr. 22, 2022~ May 17, 2022	Sep. 12, 2022	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-900-1000-15000-60SS	SN12	1GHz High Pass Filter	Nov. 04, 2021	Apr. 22, 2022~ May 17, 2022	Nov. 03, 2022	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTM-303B	TP140325	N/A	Nov. 26, 2021	Apr. 22, 2022~ May 17, 2022	Nov. 25, 2022	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTM-303B	TP200880	N/A	Sep. 30, 2021	Apr. 22, 2022~ May 17, 2022	Sep. 29, 2022	Radiation (03CH11-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Apr. 09, 2022	Aug. 29, 2022	Radiation (03CH11-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))	**2.7 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.8 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.4 dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.9 dB**

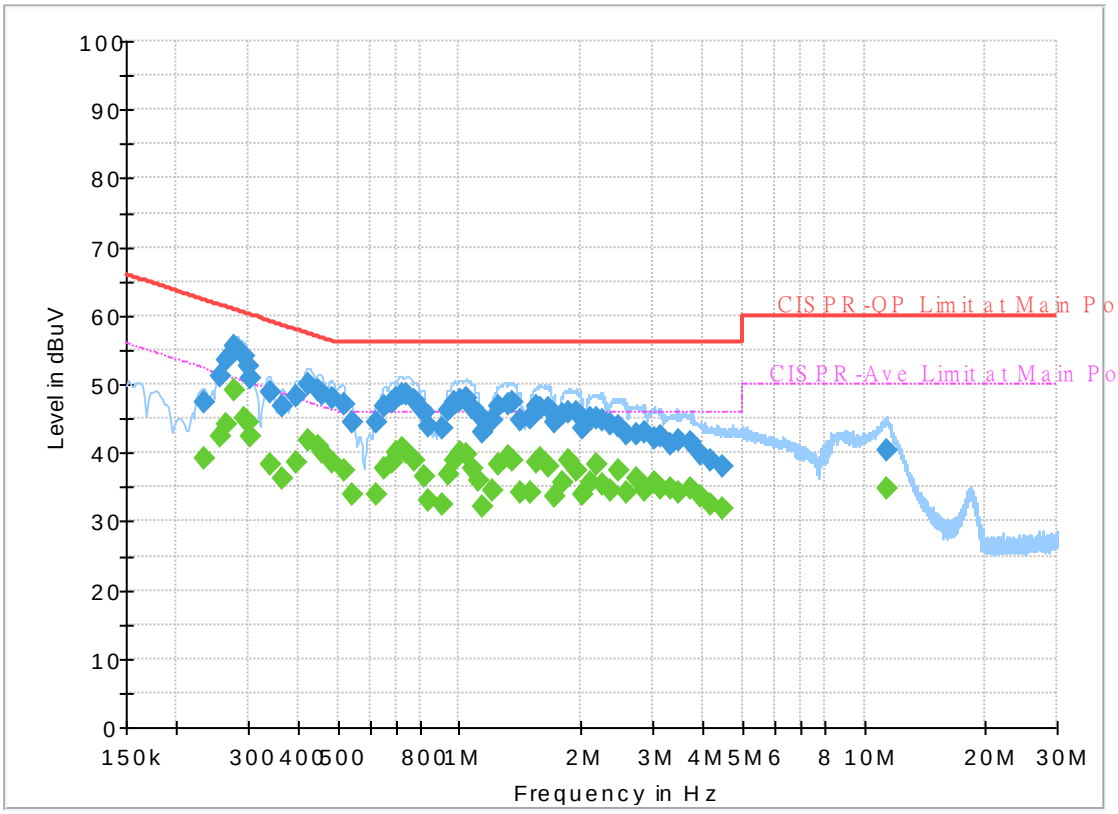
Appendix A. AC Conducted Emission Test Results

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

EUT Information

Report NO :	230116
Test Mode :	Mode 2
Test Voltage :	240V/60Hz
Phase :	Line

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.233250	---	39.24	52.33	13.09	L1	OFF	19.6
0.233250	47.30	---	62.33	15.03	L1	OFF	19.6
0.255840	---	42.54	51.57	9.03	L1	OFF	19.6
0.255840	51.20	---	61.57	10.37	L1	OFF	19.6
0.264750	---	44.23	51.28	7.05	L1	OFF	19.6
0.264750	53.61	---	61.28	7.67	L1	OFF	19.6
0.278250	---	49.12	50.87	1.75	L1	OFF	19.6
0.278250	55.43	---	60.87	5.44	L1	OFF	19.6
0.292740	---	45.11	50.45	5.34	L1	OFF	19.6
0.292740	54.06	---	60.45	6.39	L1	OFF	19.6
0.299670	---	44.45	50.25	5.80	L1	OFF	19.6
0.299670	52.60	---	60.25	7.65	L1	OFF	19.6
0.303000	---	42.49	50.16	7.67	L1	OFF	19.6
0.303000	50.83	---	60.16	9.33	L1	OFF	19.6
0.339000	---	38.36	49.23	10.87	L1	OFF	19.6
0.339000	48.92	---	59.23	10.31	L1	OFF	19.6
0.363750	---	36.32	48.64	12.32	L1	OFF	19.6
0.363750	46.85	---	58.64	11.79	L1	OFF	19.6
0.393000	---	38.71	48.00	9.29	L1	OFF	19.6
0.393000	48.23	---	58.00	9.77	L1	OFF	19.6
0.424500	---	41.96	47.36	5.40	L1	OFF	19.6

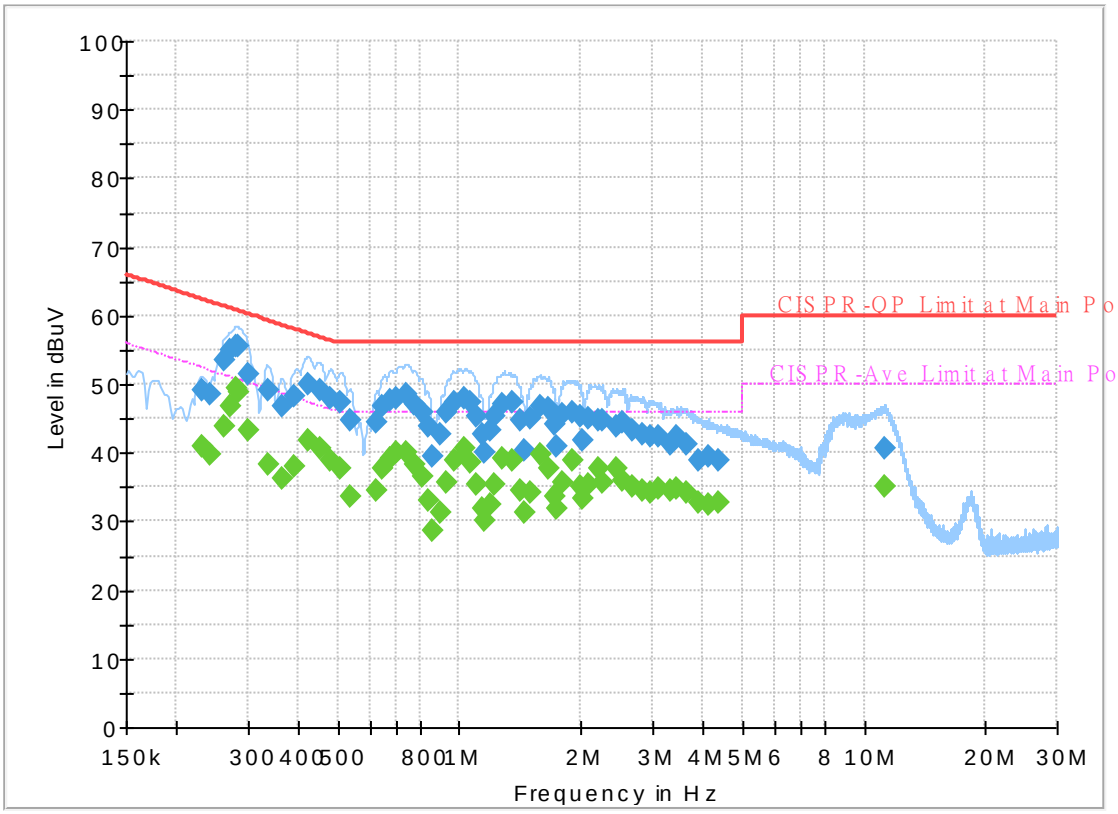
0.424500	50.01	---	57.36	7.35	L1	OFF	19.6
0.447000	---	40.82	46.93	6.11	L1	OFF	19.6
0.447000	49.19	---	56.93	7.74	L1	OFF	19.6
0.456000	---	39.92	46.77	6.85	L1	OFF	19.6
0.456000	48.61	---	56.77	8.16	L1	OFF	19.6
0.483000	---	38.69	46.29	7.60	L1	OFF	19.6
0.483000	47.86	---	56.29	8.43	L1	OFF	19.6
0.516750	---	37.31	46.00	8.69	L1	OFF	19.6
0.516750	46.93	---	56.00	9.07	L1	OFF	19.6
0.541500	---	33.98	46.00	12.02	L1	OFF	19.6
0.541500	44.57	---	56.00	11.43	L1	OFF	19.6
0.622500	---	34.06	46.00	11.94	L1	OFF	19.6
0.622500	44.32	---	56.00	11.68	L1	OFF	19.6
0.649500	---	37.76	46.00	8.24	L1	OFF	19.6
0.649500	46.81	---	56.00	9.19	L1	OFF	19.6
0.681000	---	38.47	46.00	7.53	L1	OFF	19.6
0.681000	47.49	---	56.00	8.51	L1	OFF	19.6
0.699000	---	40.01	46.00	5.99	L1	OFF	19.6
0.699000	48.04	---	56.00	7.96	L1	OFF	19.6
0.721500	---	40.54	46.00	5.46	L1	OFF	19.6
0.721500	48.47	---	56.00	7.53	L1	OFF	19.6
0.737250	---	40.05	46.00	5.95	L1	OFF	19.6
0.737250	48.51	---	56.00	7.49	L1	OFF	19.6
0.771000	---	38.89	46.00	7.11	L1	OFF	19.6
0.771000	47.60	---	56.00	8.40	L1	OFF	19.6
0.816000	---	36.46	46.00	9.54	L1	OFF	19.6
0.816000	45.77	---	56.00	10.23	L1	OFF	19.6
0.840750	---	33.16	46.00	12.84	L1	OFF	19.6
0.840750	43.84	---	56.00	12.16	L1	OFF	19.6
0.908250	---	32.47	46.00	13.53	L1	OFF	19.6
0.908250	43.46	---	56.00	12.54	L1	OFF	19.6
0.939750	---	36.70	46.00	9.30	L1	OFF	19.6
0.939750	46.05	---	56.00	9.95	L1	OFF	19.6
0.966750	---	38.98	46.00	7.02	L1	OFF	19.6
0.966750	47.31	---	56.00	8.69	L1	OFF	19.6
1.005000	---	39.94	46.00	6.06	L1	OFF	19.6
1.005000	47.78	---	56.00	8.22	L1	OFF	19.6
1.041000	---	39.81	46.00	6.19	L1	OFF	19.6
1.041000	47.81	---	56.00	8.19	L1	OFF	19.6
1.077000	---	37.60	46.00	8.40	L1	OFF	19.6
1.077000	46.60	---	56.00	9.40	L1	OFF	19.6
1.110750	---	35.86	46.00	10.14	L1	OFF	19.6
1.110750	45.55	---	56.00	10.45	L1	OFF	19.6
1.140000	---	32.22	46.00	13.78	L1	OFF	19.6
1.140000	43.07	---	56.00	12.93	L1	OFF	19.6
1.209750	---	34.46	46.00	11.54	L1	OFF	19.6
1.209750	44.77	---	56.00	11.23	L1	OFF	19.6
1.252500	---	38.18	46.00	7.82	L1	OFF	19.6
1.252500	46.72	---	56.00	9.28	L1	OFF	19.6
1.320000	---	39.57	46.00	6.43	L1	OFF	19.6
1.320000	47.01	---	56.00	8.99	L1	OFF	19.6
1.358250	---	38.90	46.00	7.10	L1	OFF	19.6
1.358250	47.23	---	56.00	8.77	L1	OFF	19.6
1.412250	---	34.09	46.00	11.91	L1	OFF	19.6
1.412250	44.85	---	56.00	11.15	L1	OFF	19.6
1.497750	---	34.26	46.00	11.74	L1	OFF	19.6
1.497750	45.07	---	56.00	10.93	L1	OFF	19.6
1.549500	---	38.61	46.00	7.39	L1	OFF	19.6
1.549500	46.80	---	56.00	9.20	L1	OFF	19.6
1.587750	---	39.13	46.00	6.87	L1	OFF	19.6
1.587750	46.55	---	56.00	9.45	L1	OFF	19.6
1.657500	---	38.04	46.00	7.96	L1	OFF	19.6
1.657500	46.59	---	56.00	9.41	L1	OFF	19.6
1.711500	---	33.76	46.00	12.24	L1	OFF	19.6
1.711500	44.34	---	56.00	11.66	L1	OFF	19.6
1.806000	---	35.76	46.00	10.24	L1	OFF	19.6
1.806000	45.69	---	56.00	10.31	L1	OFF	19.6
1.869000	---	38.85	46.00	7.15	L1	OFF	19.6
1.869000	45.83	---	56.00	10.17	L1	OFF	19.6
1.947750	---	37.44	46.00	8.56	L1	OFF	19.6
1.947750	46.03	---	56.00	9.97	L1	OFF	19.6

2.008500	---	33.98	46.00	12.02	L1	OFF	19.6
2.008500	43.60	---	56.00	12.40	L1	OFF	19.6
2.103000	---	35.79	46.00	10.21	L1	OFF	19.6
2.103000	44.94	---	56.00	11.06	L1	OFF	19.6
2.188500	---	38.40	46.00	7.60	L1	OFF	19.6
2.188500	44.94	---	56.00	11.06	L1	OFF	19.6
2.256000	---	35.47	46.00	10.53	L1	OFF	19.6
2.256000	44.83	---	56.00	11.17	L1	OFF	19.6
2.375250	---	34.61	46.00	11.39	L1	OFF	19.6
2.375250	44.27	---	56.00	11.73	L1	OFF	19.6
2.472000	---	37.47	46.00	8.53	L1	OFF	19.6
2.472000	43.93	---	56.00	12.07	L1	OFF	19.6
2.582250	---	34.17	46.00	11.83	L1	OFF	19.6
2.582250	42.62	---	56.00	13.38	L1	OFF	19.6
2.748750	---	36.29	46.00	9.71	L1	OFF	19.6
2.748750	42.71	---	56.00	13.29	L1	OFF	19.6
2.854500	---	34.63	46.00	11.37	L1	OFF	19.6
2.854500	42.93	---	56.00	13.07	L1	OFF	19.6
3.030000	---	35.59	46.00	10.41	L1	OFF	19.6
3.030000	42.05	---	56.00	13.95	L1	OFF	19.6
3.153750	---	34.82	46.00	11.18	L1	OFF	19.6
3.153750	42.48	---	56.00	13.52	L1	OFF	19.6
3.327000	---	34.81	46.00	11.19	L1	OFF	19.6
3.327000	41.18	---	56.00	14.82	L1	OFF	19.6
3.477750	---	34.34	46.00	11.66	L1	OFF	19.6
3.477750	41.77	---	56.00	14.23	L1	OFF	19.6
3.723000	---	34.90	46.00	11.10	L1	OFF	19.6
3.723000	41.48	---	56.00	14.52	L1	OFF	19.6
3.934500	---	33.55	46.00	12.45	L1	OFF	19.6
3.934500	39.81	---	56.00	16.19	L1	OFF	19.6
4.161750	---	32.57	46.00	13.43	L1	OFF	19.6
4.161750	38.76	---	56.00	17.24	L1	OFF	19.6
4.452000	---	31.87	46.00	14.13	L1	OFF	19.7
4.452000	38.14	---	56.00	17.86	L1	OFF	19.7
11.415750	---	34.78	50.00	15.22	L1	OFF	19.8
11.415750	40.49	---	60.00	19.51	L1	OFF	19.8

EUT Information

Report NO :	230116
Test Mode :	Mode 2
Test Voltage :	240V/60Hz
Phase :	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.231000	---	40.83	52.41	11.58	N	OFF	19.6
0.231000	49.17	---	62.41	13.24	N	OFF	19.6
0.242250	---	39.72	52.02	12.30	N	OFF	19.6
0.242250	48.57	---	62.02	13.45	N	OFF	19.6
0.262680	---	43.94	51.35	7.41	N	OFF	19.6
0.262680	53.42	---	61.35	7.93	N	OFF	19.6
0.271500	---	46.80	51.07	4.27	N	OFF	19.6
0.271500	54.83	---	61.07	6.24	N	OFF	19.6
0.279420	---	49.44	50.83	1.39	N	OFF	19.6
0.279420	55.54	---	60.83	5.29	N	OFF	19.6
0.282750	---	48.76	50.74	1.98	N	OFF	19.6
0.282750	55.41	---	60.74	5.33	N	OFF	19.6
0.300930	---	43.19	50.22	7.03	N	OFF	19.6
0.300930	51.47	---	60.22	8.75	N	OFF	19.6
0.336750	---	38.37	49.28	10.91	N	OFF	19.6
0.336750	49.09	---	59.28	10.19	N	OFF	19.6
0.363750	---	36.22	48.64	12.42	N	OFF	19.6
0.363750	46.79	---	58.64	11.85	N	OFF	19.6
0.390750	---	38.04	48.05	10.01	N	OFF	19.6
0.390750	48.22	---	58.05	9.83	N	OFF	19.6
0.422250	---	41.78	47.40	5.62	N	OFF	19.6

0.422250	50.10	---	57.40	7.30	N	OFF	19.6
0.451500	---	40.70	46.85	6.15	N	OFF	19.6
0.451500	49.10	---	56.85	7.75	N	OFF	19.6
0.480750	---	38.76	46.33	7.57	N	OFF	19.6
0.480750	47.93	---	56.33	8.40	N	OFF	19.6
0.507750	---	37.79	46.00	8.21	N	OFF	19.6
0.507750	47.51	---	56.00	8.49	N	OFF	19.6
0.537000	---	33.68	46.00	12.32	N	OFF	19.6
0.537000	44.63	---	56.00	11.37	N	OFF	19.6
0.622500	---	34.40	46.00	11.60	N	OFF	19.6
0.622500	44.31	---	56.00	11.69	N	OFF	19.6
0.647250	---	37.60	46.00	8.40	N	OFF	19.6
0.647250	46.80	---	56.00	9.20	N	OFF	19.6
0.672000	---	39.23	46.00	6.77	N	OFF	19.6
0.672000	47.63	---	56.00	8.37	N	OFF	19.6
0.696750	---	39.99	46.00	6.01	N	OFF	19.6
0.696750	47.99	---	56.00	8.01	N	OFF	19.6
0.737250	---	40.09	46.00	5.91	N	OFF	19.6
0.737250	48.50	---	56.00	7.50	N	OFF	19.6
0.777750	---	38.31	46.00	7.69	N	OFF	19.6
0.777750	47.11	---	56.00	8.89	N	OFF	19.6
0.809250	---	36.49	46.00	9.51	N	OFF	19.6
0.809250	45.85	---	56.00	10.15	N	OFF	19.6
0.836250	---	33.17	46.00	12.83	N	OFF	19.6
0.836250	43.97	---	56.00	12.03	N	OFF	19.6
0.856500	---	28.79	46.00	17.21	N	OFF	19.6
0.856500	39.59	---	56.00	16.41	N	OFF	19.6
0.899250	---	31.16	46.00	14.84	N	OFF	19.6
0.899250	42.79	---	56.00	13.21	N	OFF	19.6
0.928500	---	35.56	46.00	10.44	N	OFF	19.6
0.928500	45.88	---	56.00	10.12	N	OFF	19.6
0.971250	---	39.03	46.00	6.97	N	OFF	19.6
0.971250	47.44	---	56.00	8.56	N	OFF	19.6
1.029750	---	40.61	46.00	5.39	N	OFF	19.6
1.029750	48.00	---	56.00	8.00	N	OFF	19.6
1.068000	---	38.70	46.00	7.30	N	OFF	19.6
1.068000	47.23	---	56.00	8.77	N	OFF	19.6
1.101750	---	35.24	46.00	10.76	N	OFF	19.6
1.101750	45.19	---	56.00	10.81	N	OFF	19.6
1.140000	---	31.99	46.00	14.01	N	OFF	19.6
1.140000	42.78	---	56.00	13.22	N	OFF	19.6
1.155750	---	30.09	46.00	15.91	N	OFF	19.6
1.155750	40.05	---	56.00	15.95	N	OFF	19.6
1.194000	---	32.40	46.00	13.60	N	OFF	19.6
1.194000	43.35	---	56.00	12.65	N	OFF	19.6
1.216500	---	35.52	46.00	10.48	N	OFF	19.6
1.216500	45.43	---	56.00	10.57	N	OFF	19.6
1.272750	---	39.09	46.00	6.91	N	OFF	19.6
1.272750	47.05	---	56.00	8.95	N	OFF	19.6
1.358250	---	38.96	46.00	7.04	N	OFF	19.6
1.358250	47.28	---	56.00	8.72	N	OFF	19.6
1.410000	---	34.49	46.00	11.51	N	OFF	19.6
1.410000	44.76	---	56.00	11.24	N	OFF	19.6
1.450500	---	31.25	46.00	14.75	N	OFF	19.6
1.450500	40.33	---	56.00	15.67	N	OFF	19.6
1.497750	---	34.28	46.00	11.72	N	OFF	19.6
1.497750	45.17	---	56.00	10.83	N	OFF	19.6
1.578750	---	39.80	46.00	6.20	N	OFF	19.6
1.578750	46.74	---	56.00	9.26	N	OFF	19.6
1.657500	---	37.78	46.00	8.22	N	OFF	19.6
1.657500	46.57	---	56.00	9.43	N	OFF	19.6
1.711500	---	33.57	46.00	12.43	N	OFF	19.6
1.711500	44.14	---	56.00	11.86	N	OFF	19.6
1.743000	---	31.90	46.00	14.10	N	OFF	19.6
1.743000	41.07	---	56.00	14.93	N	OFF	19.6
1.806000	---	35.72	46.00	10.28	N	OFF	19.6
1.806000	45.66	---	56.00	10.34	N	OFF	19.6
1.893750	---	39.03	46.00	6.97	N	OFF	19.6
1.893750	45.82	---	56.00	10.18	N	OFF	19.6
1.981500	---	35.09	46.00	10.91	N	OFF	19.6
1.981500	45.18	---	56.00	10.82	N	OFF	19.6

2.024250	---	33.34	46.00	12.66	N	OFF	19.6
2.024250	41.84	---	56.00	14.16	N	OFF	19.6
2.091750	---	35.33	46.00	10.67	N	OFF	19.6
2.091750	45.17	---	56.00	10.83	N	OFF	19.6
2.206500	---	37.68	46.00	8.32	N	OFF	19.6
2.206500	44.87	---	56.00	11.13	N	OFF	19.6
2.251500	---	35.57	46.00	10.43	N	OFF	19.6
2.251500	44.68	---	56.00	11.32	N	OFF	19.6
2.442750	---	37.61	46.00	8.39	N	OFF	19.6
2.442750	43.97	---	56.00	12.03	N	OFF	19.6
2.526000	---	35.83	46.00	10.17	N	OFF	19.6
2.526000	44.45	---	56.00	11.55	N	OFF	19.6
2.688000	---	35.02	46.00	10.98	N	OFF	19.6
2.688000	43.26	---	56.00	12.74	N	OFF	19.6
2.852250	---	34.41	46.00	11.59	N	OFF	19.6
2.852250	42.81	---	56.00	13.19	N	OFF	19.6
2.964750	---	34.29	46.00	11.71	N	OFF	19.6
2.964750	42.36	---	56.00	13.64	N	OFF	19.6
3.124500	---	34.83	46.00	11.17	N	OFF	19.6
3.124500	42.35	---	56.00	13.65	N	OFF	19.6
3.318000	---	34.39	46.00	11.61	N	OFF	19.6
3.318000	41.24	---	56.00	14.76	N	OFF	19.6
3.450750	---	34.81	46.00	11.19	N	OFF	19.6
3.450750	42.29	---	56.00	13.71	N	OFF	19.6
3.644250	---	34.15	46.00	11.85	N	OFF	19.6
3.644250	41.13	---	56.00	14.87	N	OFF	19.6
3.887250	---	32.62	46.00	13.38	N	OFF	19.6
3.887250	39.02	---	56.00	16.98	N	OFF	19.6
4.143750	---	32.57	46.00	13.43	N	OFF	19.6
4.143750	39.35	---	56.00	16.65	N	OFF	19.6
4.393500	---	32.76	46.00	13.24	N	OFF	19.7
4.393500	38.80	---	56.00	17.20	N	OFF	19.7
11.267250	---	35.10	50.00	14.90	N	OFF	19.8
11.267250	40.51	---	60.00	19.49	N	OFF	19.8

Appendix B. Radiated Spurious Emission

Test Engineer :	Theodore, Fu Chen, Troye Hsieh	**Temperature :**	20.1~21.7°C
		Relative Humidity :	56.1~67.5%

<1Mbps>

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 19 2440MHz		4880	45.94	-28.06	74	60.15	32.62	11.65	58.48	100	100	P	H
		4880	42.45	-11.55	54	56.66	32.62	11.65	58.48	100	100	A	H
		7320	42.88	-31.12	74	51.59	37.02	13.44	59.17	-	-	P	H
		11025	46.88	-27.12	74	52.09	38.9	17.42	61.53	-	-	P	H
		14475	46.81	-27.19	74	48.46	40.57	20.81	63.03	-	-	P	H
		17985	48.73	-25.27	74	39.85	42.49	23.03	56.64	-	-	P	H
		17985	39.41	-14.59	54	30.53	42.49	23.03	56.64	-	-	A	H
													H
													H
													H
													H
													H
		4880	45.1	-28.9	74	59.31	32.62	11.65	58.48	400	244	P	V
		4880	39.67	-14.33	54	53.88	32.62	11.65	58.48	400	244	A	V
		7320	41.82	-32.18	74	50.53	37.02	13.44	59.17	-	-	P	V
		11130	47.02	-26.98	74	52.26	38.96	17.46	61.66	-	-	P	V
		14505	47.12	-26.88	74	48.68	40.59	20.85	63	-	-	P	V
		17985	49.34	-24.66	74	40.46	42.49	23.03	56.64	-	-	P	V
		17985	39.89	-14.11	54	31.01	42.49	23.03	56.64	-	-	A	V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz	*	2480	88.81	-	-	77.56	27.76	17.42	33.93	200	179	P	H
	*	2480	86.8	-	-	75.55	27.76	17.42	33.93	200	179	A	H
		2490.72	53.21	-20.79	74	41.91	27.78	17.44	33.92	200	179	P	H
		2492.32	43.67	-10.33	54	32.37	27.78	17.44	33.92	200	179	A	H
													H
													H
	*	2480	89.43	-	-	78.18	27.76	17.42	33.93	300	171	P	V
	*	2480	87.89	-	-	76.64	27.76	17.42	33.93	300	171	A	V
		2487.76	53.42	-20.58	74	42.13	27.78	17.43	33.92	300	171	P	V
		2498.4	43.81	-10.19	54	32.48	27.8	17.45	33.92	300	171	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz
BLE (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 19 2440MHz		4880	46.73	-27.27	74	60.94	32.62	11.65	58.48	100	93	P	H
		4880	41.77	-12.23	54	55.98	32.62	11.65	58.48	100	93	A	H
		7320	41.88	-32.12	74	50.59	37.02	13.44	59.17	-	-	P	H
		10935	47.64	-26.36	74	52.83	38.9	17.33	61.42	-	-	P	H
		14475	47.22	-26.78	74	48.87	40.57	20.81	63.03	-	-	P	H
		17985	48.83	-25.17	74	39.95	42.49	23.03	56.64	-	-	P	H
		17985	39.14	-14.86	54	30.26	42.49	23.03	56.64	-	-	A	H
													H
													H
													H
													H
													H
		4880	43.74	-30.26	74	57.95	32.62	11.65	58.48	400	243	P	V
		4880	40.67	-13.33	54	54.88	32.62	11.65	58.48	400	243	A	V
		7320	41.56	-32.44	74	50.27	37.02	13.44	59.17	-	-	P	V
		11325	46.89	-27.11	74	52.07	39.17	17.54	61.89	-	-	P	V
		14475	47.94	-26.06	74	49.59	40.57	20.81	63.03	-	-	P	V
		17970	48.54	-25.46	74	39.81	42.39	23.01	56.67	-	-	P	V
		17970	39.75	-14.25	54	31.02	42.39	23.01	56.67	-	-	A	V
													V
													V
													V
													V
													V

BLE	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 39 2480MHz		4960	47.28	-26.72	74	60.86	33.02	11.89	58.49	300	277	P	H
		4960	42.46	-11.54	54	56.04	33.02	11.89	58.49	300	277	A	H
		7440	41.01	-32.99	74	49.94	36.44	13.75	59.12	-	-	P	H
		11430	47.27	-26.73	74	52.61	39.1	17.58	62.02	-	-	P	H
		14475	46.85	-27.15	74	48.5	40.57	20.81	63.03	-	-	P	H
		17895	49.04	-24.96	74	41.12	41.83	22.94	56.85	-	-	P	H
		17895	38.77	-15.23	54	30.85	41.83	22.94	56.85	-	-	A	H
													H
													H
													H
													H
													H
		4960	43.21	-30.79	74	56.79	33.02	11.89	58.49	400	106	P	V
		4960	41.38	-12.62	54	54.96	33.02	11.89	58.49	400	106	A	V
		7440	41.61	-32.39	74	50.54	36.44	13.75	59.12	-	-	P	V
		11475	46.98	-27.02	74	52.35	39.1	17.6	62.07	-	-	P	V
		14490	46.41	-27.59	74	48	40.59	20.83	63.01	-	-	P	V
		17985	49.75	-24.25	74	40.87	42.49	23.03	56.64	-	-	P	V
		17985	39.95	-14.05	54	31.07	42.49	23.03	56.64	-	-	A	V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission above 18GHz

2.4GHz BLE (SHF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE SHF		21647	38.27	-35.73	74	57.72	38.1	-2.85	54.7	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		23222	39.42	-34.58	74	57.26	38.9	-2.68	54.06	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		52.31	31	-9	40	49.35	13.04	1.09	32.48	-	-	P	H
		206.54	34.05	-9.45	43.5	49.39	14.94	2.22	32.5	-	-	P	H
		258.92	35.99	-10.01	46	46.34	19.41	2.5	32.26	-	-	P	H
		479.11	37.62	-8.38	46	42.83	23.5	3.34	32.05	-	-	P	H
		848.68	30.27	-15.73	46	28.27	29.01	4.49	31.5	-	-	P	H
		949.56	31.49	-14.51	46	27.23	30.38	4.78	30.9	-	-	P	H
													H
													H
													H
													H
													H
													H
		52.31	29.39	-10.61	40	47.74	13.04	1.09	32.48	100	76	Q	V
		143.49	34.56	-8.94	43.5	48.01	17.13	1.87	32.45	-	-	P	V
		239.52	35	-11	46	48.07	16.88	2.4	32.35	-	-	P	V
		479.11	36.28	-9.72	46	41.49	23.5	3.34	32.05	-	-	P	V
		891.36	30.3	-15.7	46	28.09	28.85	4.63	31.27	-	-	P	V
		947.62	30.4	-15.6	46	26.26	30.28	4.77	30.91	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

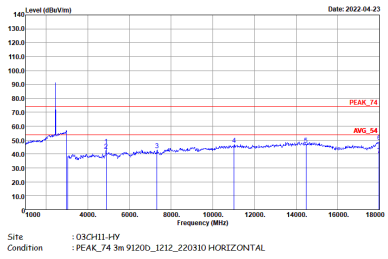
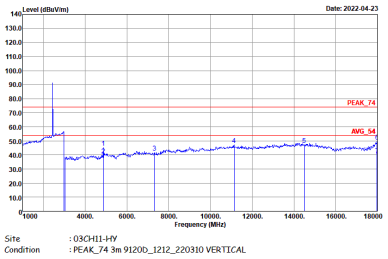
Appendix C. Radiated Spurious Emission Plots

Test Engineer :	Theodore, Fu Chen, Troye Hsieh	**Temperature :**	20.1~21.7°C
		Relative Humidity :	56.1~67.5%

<1Mbps>

2.4GHz 2400~2483.5MHz

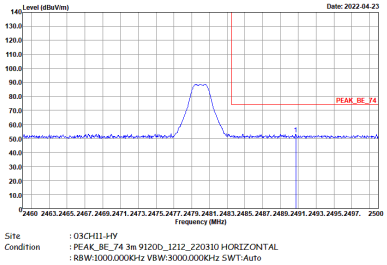
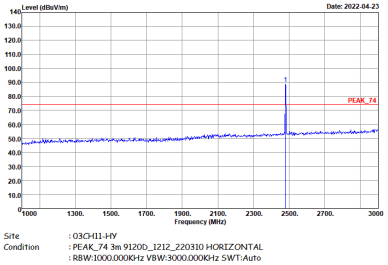
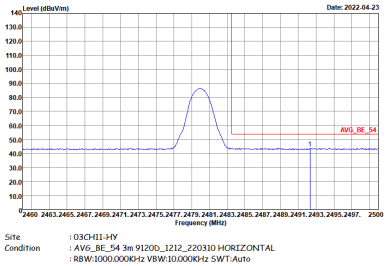
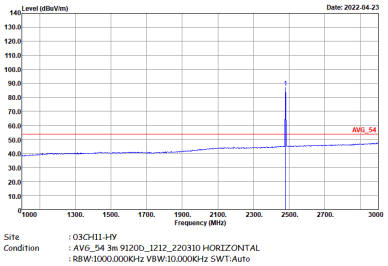
BLE (Harmonic @ 3m)

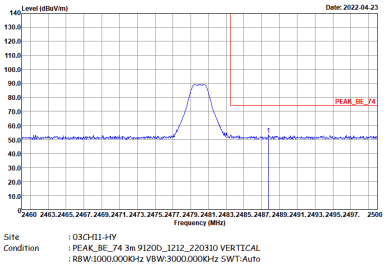
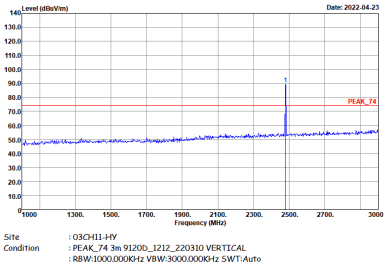
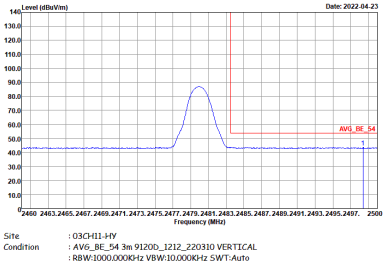
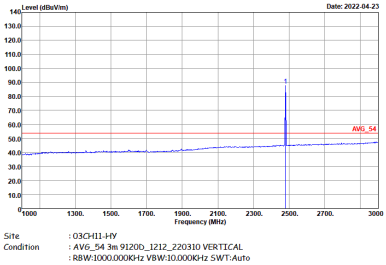
BLE	**2.4GHz 2400~2483.5MHz Harmonic @ 3m**	
	BLE CH19 2440MHz	
	Horizontal	**Vertical**
Peak **Avg.**		

<2Mbps>

2.4GHz 2400~2483.5MHz

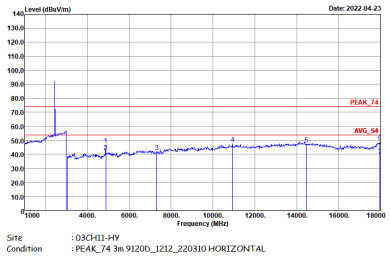
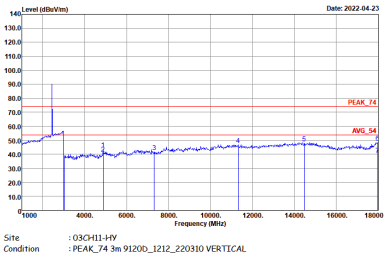
BLE (Band Edge @ 3m)

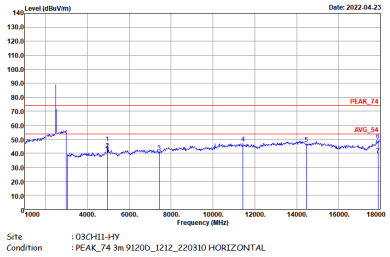
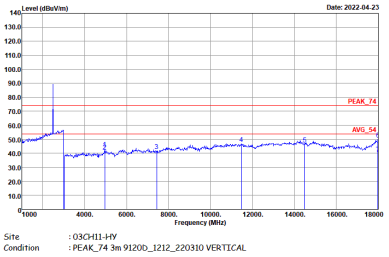
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m 9120D_1212_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH11-HY Condition : PEAK_74 3m 9120D_1212_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH11-HY Condition : AV6_BE_54 3m 9120D_1212_220310 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto	 Site : 03CH11-HY Condition : AV6_54 3m 9120D_1212_220310 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto

2.4GHz 2400~2483.5MHz

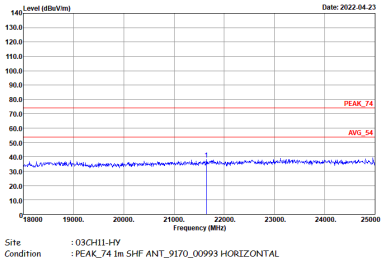
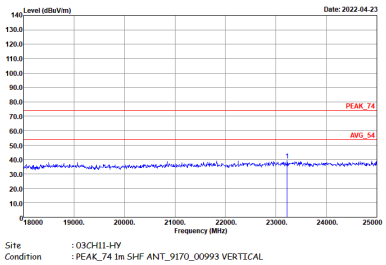
BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak Avg.		

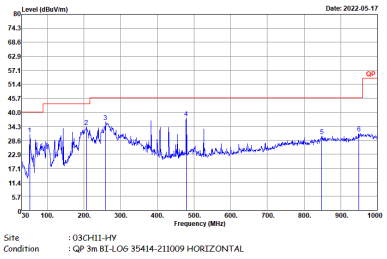
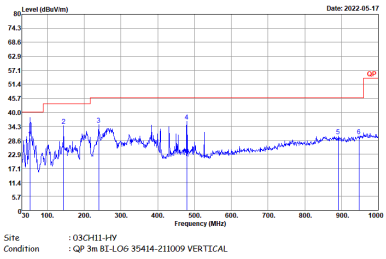
Emission above 18GHz

2.4GHz BLE (SHF @ 1m)

BLE	2.4GHz 2400~2483.5MHz	
	BLE SHF	
	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
	BLE LF	
	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth – LE for 1Mbps	62.62	392	2.55	3kHz
Bluetooth – LE for 2Mbps	33.01	206	4.85	10kHz

Bluetooth – LE for 1Mbps	Bluetooth – LE for 2Mbps