

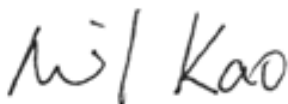


FCC RADIO TEST REPORT

FCC ID : 2AVDZCM27
Equipment : IEEE 802.11 2X2 MIMO a/b/g/n/ac Wireless
LAN + Bluetooth + NFC NGFF Module
Brand Name : LiveU, Inc.
Model Name : AW-CM276NF
Applicant : LiveU, Inc
2 University Plaza Drive Suite 505,
Hackensack, New Jersey
Manufacturer : LiveU Ltd.
5 Hagavish St, Kfar Saba 4442211, Israel
Standard : FCC Part 15 Subpart C §15.247

The product was received on Jul. 01, 2022 and testing was performed from Jul. 07, 2022 to Jul. 23, 2025. We, Sporton International (USA) Inc., 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 (USA) Inc., the test report shall not be reproduced except in full.



Approved by: Neil Kao

Sporton International (USA) Inc.
1175 Montague Expressway, Milpitas, CA 95035



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description.....	5
1.1 Product Feature of Equipment Under Test.....	5
1.2 Modification of EUT	5
1.3 Testing Location	5
1.4 Applicable Standards.....	5
2 Test Configuration of Equipment Under Test.....	6
2.1 Carrier Frequency Channel	6
2.2 Test Mode.....	7
2.3 Connection Diagram of Test System.....	8
2.4 Support Unit used in test configuration and system	8
2.5 EUT Operation Test Setup	8
3 Test Result.....	9
3.1 Output Power Measurement.....	9
3.2 Radiated Band Edges and Spurious Emission Measurement	10
3.3 AC Conducted Emission Measurement.....	13
3.4 Antenna Requirements.....	15
4 List of Measuring Equipment	16
5 Measurement Uncertainty	18
Appendix A. Conducted Test Results	
Appendix B. AC Conducted Emission Test Result	
Appendix C. Radiated Spurious Emission Test Result	
Appendix D. Radiated Spurious Emission Plots	
Appendix E. Duty Cycle Plots	
Appendix F. Setup Photographs	



History of this test report

Report No.	Version	Description	Issue Date
FR220617002B	01	Initial issue of report	Sep. 30, 2025
FR220617002B	02	Revised Appendix C This report is an updated version, replacing the report issued on Sep. 30, 2025	Oct. 09, 2025

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(b)(3) 15.247(b)(4)	Output Power	Pass	-
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	-
3.3	15.207	AC Conducted Emission	Pass	-
3.4	15.203	Antenna Requirement	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/manufacture 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: Leon Huang

Report Producer: Shiori Chen



1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature		
General Specs Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, and Wi-Fi 5GHz 802.11a/ac.		
Antenna Type Bluetooth:PCB printed antenna inverted F		
Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	-1.04

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 Testing Location

Test Site	Sporton International (USA) Inc.
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300
Test Site No.	Sporton Site No.
	TH01-CA, CO01-CA, 03CH02-CA

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

FCC Designation No.: US 1250

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.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



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	-	-

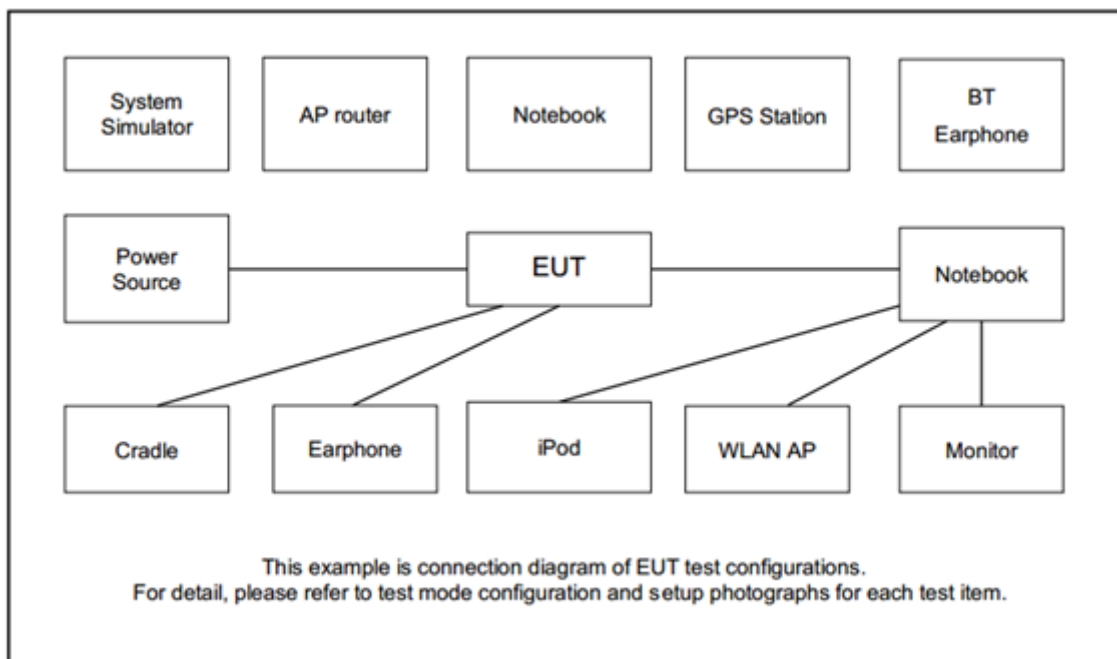
2.2 Test Mode

- 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
Conducted Test Cases	Bluetooth – LE / GFSK
	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps
	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: WLAN 2.4G TX
Remark:	
1. For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.	
2. The detailed Radiated test modes are shown in Appendix C.	

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.	Laptop	Acer	Altos PS548-G1	DOC	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “PuTTY Release 0.62 & Labtool” was installed in Laptop 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.

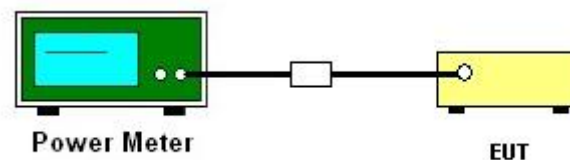
3.1.2 Measuring Instruments

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 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator.
3. The path loss is compensated to the results for each measurement.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Average Output Power

Please refer to Appendix 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 transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required 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.

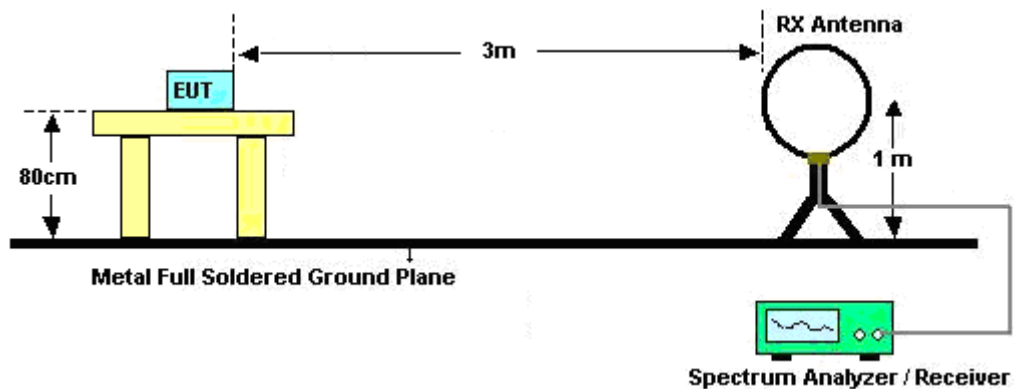
3.2.3 Test Procedures

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 “-”.

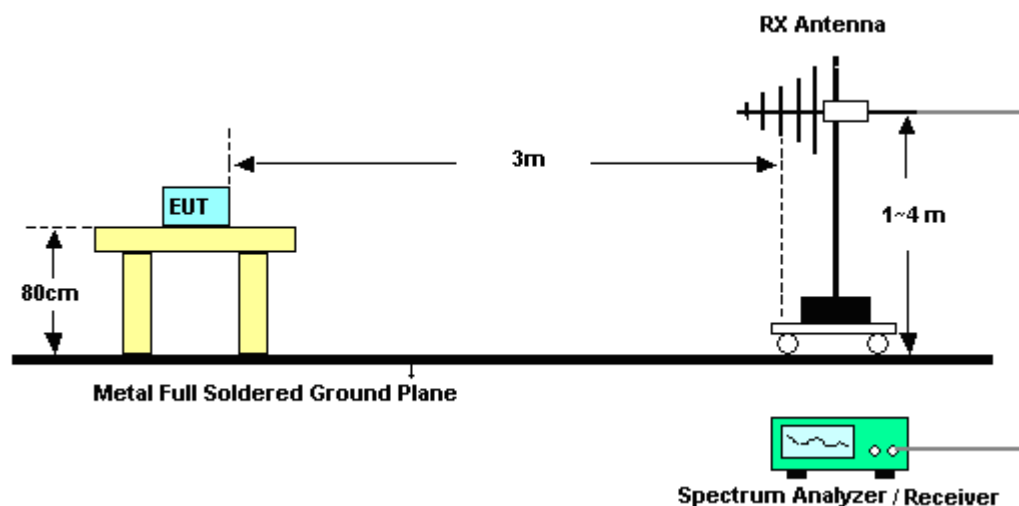
8. Use the following spectrum analyzer settings:
- (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW = 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW = 3 MHz for $f \geq 1$ GHz for peak measurement.
- For average measurement:
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, 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

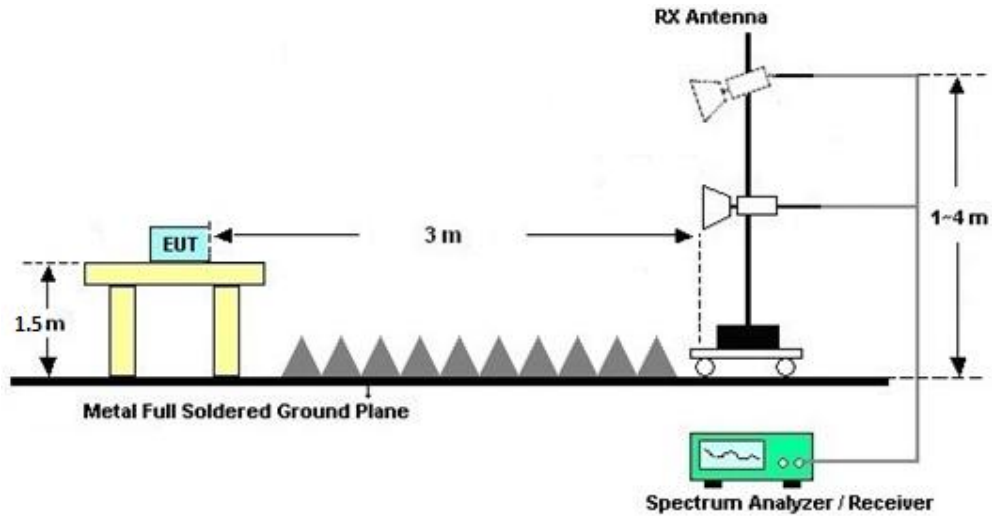
For radiated test below 30MHz



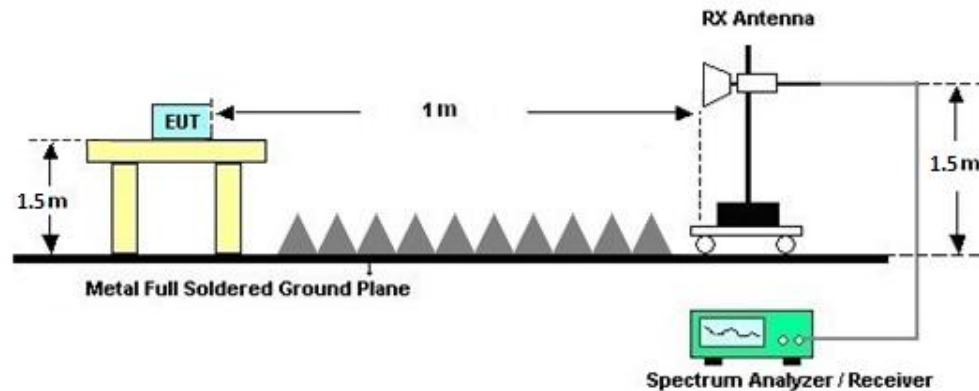
For radiated test from 30MHz to 1GHz



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 C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

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 (dB μ V)	
	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.

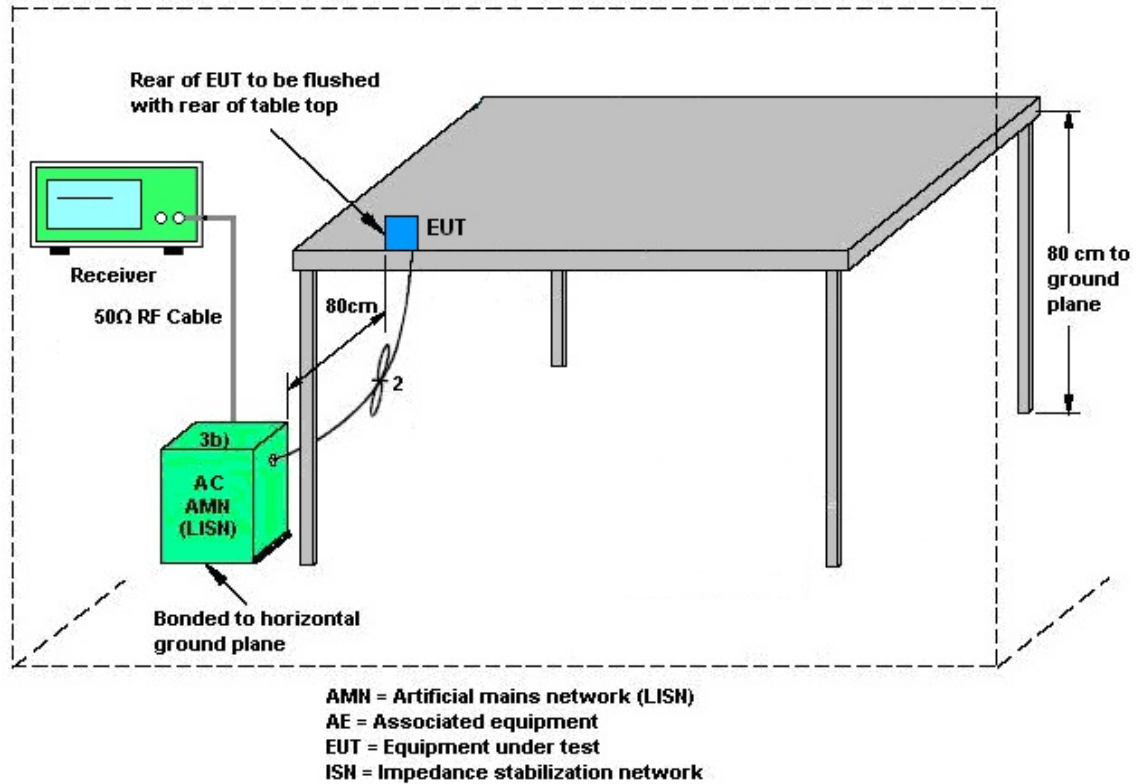
3.3.2 Measuring Instruments

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



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.4 Antenna Requirements

3.4.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

3.4.2 Antenna Anti-Replacement Construction

Antenna permanently attached.



4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Aug.13, 2024	Jul. 16, 2025	Aug. 12, 2025	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Sep.05, 2023	Jun. 25, 2024~ Sep. 03, 2024	Sep. 04, 2024	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Aug.13, 2024	Sep. 04, 2024~ Oct. 02, 2024	Aug. 12, 2025	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00842	18GHz~40GHz	Aug. 19,2024	Jul. 14, 2025~ Jul. 16, 2025	Aug. 18, 2025	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02140	1GHz~18GHz	Jan. 29, 2024	Jun. 25, 2024~ Oct. 02, 2024	Jan. 28, 2025	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	Apr.14, 2025	Jul. 16, 2025	Apr. 13, 2026	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060726	18GHz-40GHz	Apr. 15, 2025	Jun. 14, 2025~ Jun. 16, 2025	Apr. 14, 2026	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	Apr. 24, 2024	Jun. 25, 2024~ Oct. 02, 2024	Apr. 23, 2025	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18 G-56-01-A70	EC1900251	1GHz~18GHz	Apr. 24, 2024	Jun. 25, 2024~ Oct. 02, 2024	Apr. 23, 2025	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	804209/2, 802406/2, 802875/2, 802952/2	N/A	Oct. 10, 2024	Oct. 11, 2024~ Jul. 16, 2025	Oct. 09, 2025	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	804209/2, 802406/2, 802875/2, 802952/2	N/A	Oct. 13, 2023	Jun. 25, 2024~ Oct. 11, 2024	Oct. 12, 2024	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Aug. 14, 2024	Jun. 14, 2025~ Jun. 16, 2025	Aug. 13, 2025	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Aug. 30, 2023	Jun. 25, 2024~ Aug. 13, 2024	Aug. 29, 2024	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Aug. 14, 2024	Aug. 14, 2024~ Oct. 02, 2024	Aug. 13, 2025	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1 272-11000-40 SS	SN2	1.2GHz Low Pass Filter	Jun. 03, 2025	Jul. 16, 2025	Jun. 02, 2026	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700 -3000-18000-6 OST	SN10	3GHz High Pass Filter	Jun. 04, 2024	Jun. 25, 2024~ Oct. 02, 2024	Jun. 03, 2025	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 14, 2024	Jul. 14, 2025~ Jul. 16, 2025	Aug. 13, 2025	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 30, 2023	Jun. 25, 2024~ Aug. 13, 2024	Aug. 29, 2024	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 14, 2024	Aug. 14, 2024~ Oct. 02, 2024	Aug. 13, 2025	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Jun. 25, 2024~ Jul. 16, 2025	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jun. 25, 2024~ Jul. 16, 2025	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jun. 25, 2024~ Jul. 16, 2025	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Jun. 25, 2024~ Jul. 16, 2025	N/A	Radiation (03CH02-CA)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LISN	TESEQ	NNB51	47415	N/A	Aug. 14,2024	Jul. 23, 2025	Aug. 13,2025	Conduction (CO01-CA)
LISN	TESEQ	NNB51	47407	N/A	Apr 15, 2025	Jul. 23, 2025	Apr. 14, 2026	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9kHz~7GHz	Apr. 15, 2025	Jul. 23, 2025	Apr. 14, 2026	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jun. 03, 2025	Jul. 23, 2025	Jun. 02, 2026	Conduction (CO01-CA)
LISN Cable	HUBER+SUHNER	RG-214/U	LISN cable -01	N/A	Jun. 03, 2025	Jul. 23, 2025	Jun. 02, 2026	Conduction (CO01-CA)
Test Software	R&S	EMC32 V10.30.0	N/A	N/A	N/A	Jul. 23, 2025	N/A	Conduction (CO01-CA)
Hygrometer	Testo	608-H1	45141354	N/A	Jul. 30, 2021	Jul .07. 2022-Jul.08. 2022	Jul. 29, 2022	Conducted (TH01-CA)
Power Sensor	DARE!!	RPR3006W	RPR6W-1901024	10MHz-8GHz	May 10, 2022	Jul. 07. 2022-Jul. 08. 2022	May 09, 2023	Conducted (TH01-CA)
Switch Box	EM Electronics	EMSW26	1090304	N/A	Mar. 30, 2022	Jul. 07. 2022-Jul. 08. 2022	Mar. 29, 2023	Conducted (TH01-CA)
Power meter	Anritsu	ML2495A	1804004	N/A	May 10, 2022	Jul. 07. 2022-Jul. 08. 2022	May 09, 2023	Conducted (TH01-CA)

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	3.9 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.1 dB
--	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.3 dB
--	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.6 dB
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Appendix B. AC Conducted Emission Test Results

Test Engineer :	Jin Peng	Temperature :	21.2~23.1°C
		Relative Humidity :	42.1~43.9%

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Liliana Gonzalez	Temperature:	22.1~24.7	°C
Test Date:	2022/7/8	Relative Humidity:	48.7~50.8	%

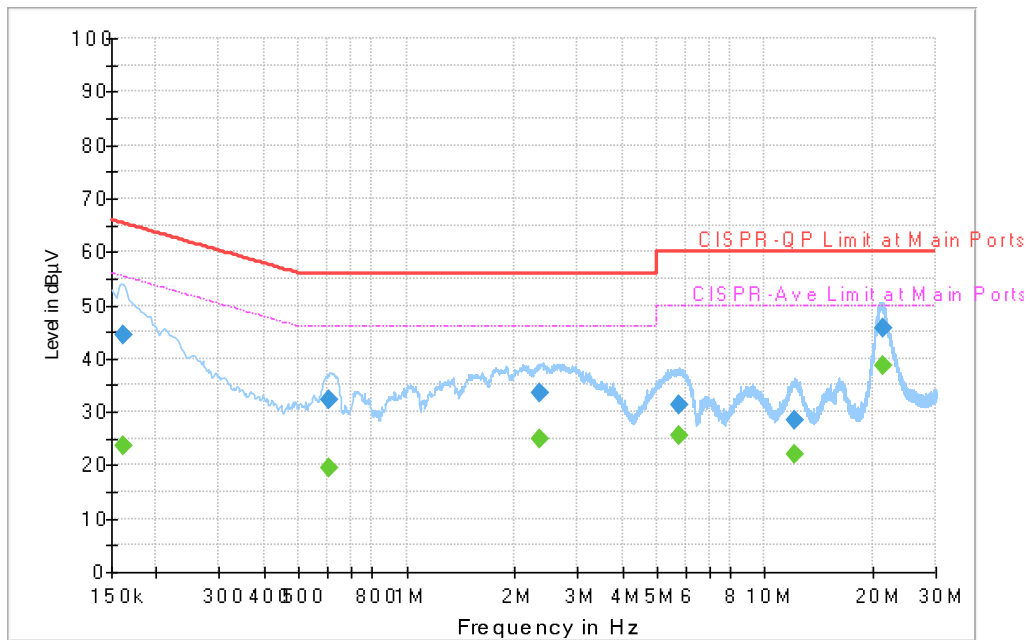
TEST RESULTS DATA**Average Power Table**

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	4.27	30.00	-1.04	3.23	36.00	Pass
BLE	1Mbps	1	19	2440	4.05	30.00	-1.04	3.01	36.00	Pass
BLE	1Mbps	1	39	2480	3.87	30.00	-1.04	2.83	36.00	Pass

EUT Information

Test Site Location : CO01-CA
 Project 220617002
 Power: 120Vac/60Hz
 Mode 1
 Line

Full Spectrum



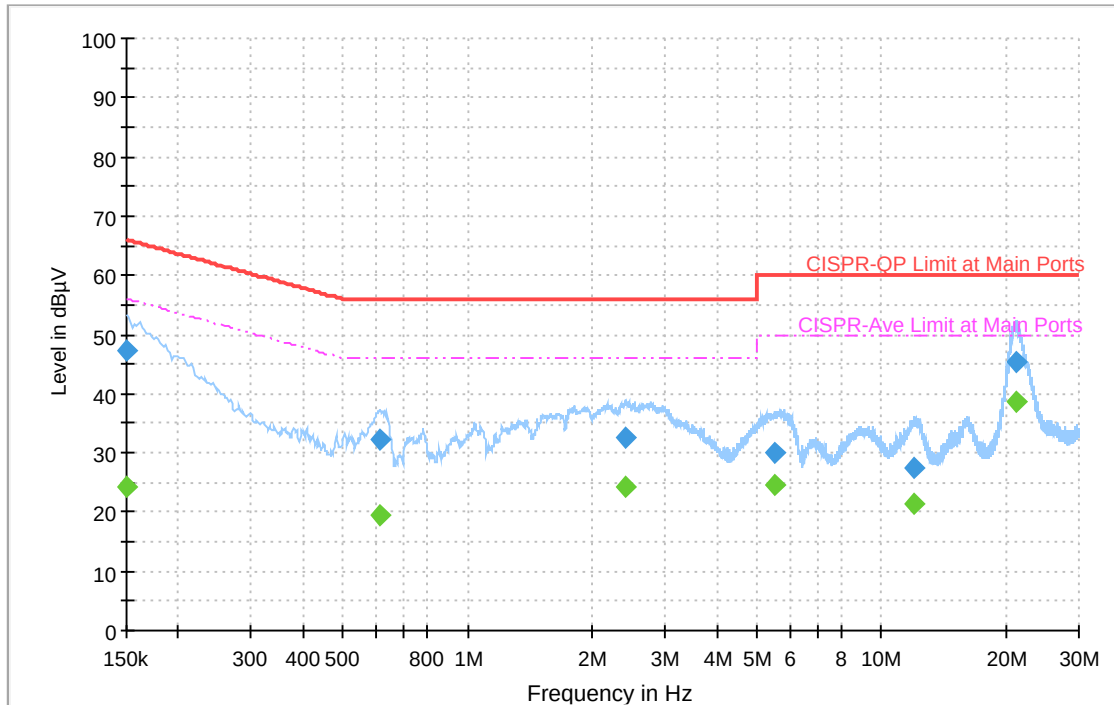
Final_Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161745	---	23.65	55.37	31.72	L1	OFF	20.5
0.161745	44.46	---	65.37	20.91	L1	OFF	20.5
0.609450	---	19.59	46.00	26.41	L1	OFF	20.1
0.609450	32.33	---	56.00	23.67	L1	OFF	20.1
2.354937	---	24.98	46.00	21.02	L1	OFF	20.1
2.354937	33.47	---	56.00	22.53	L1	OFF	20.1
5.791119	---	25.66	50.00	24.34	L1	OFF	20.5
5.791119	31.42	---	60.00	28.58	L1	OFF	20.5
12.079914	---	22.11	50.00	27.89	L1	OFF	21.2
12.079914	28.43	---	60.00	31.57	L1	OFF	21.2
21.332436	---	38.53	50.00	11.47	L1	OFF	22.1
21.332436	45.54	---	60.00	14.46	L1	OFF	22.1

EUT Information

Test Site Location : CO01-CA
 Project 220617002
 Power: 120Vac/60Hz
 Mode 1
 Neutral

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150050	---	24.15	56.00	31.85	N	OFF	20.5
0.150050	47.29	---	66.00	18.71	N	OFF	20.5
0.617136	---	19.54	46.00	26.46	N	OFF	20.1
0.617136	32.31	---	56.00	23.69	N	OFF	20.1
2.401179	---	24.28	46.00	21.72	N	OFF	20.1
2.401179	32.52	---	56.00	23.48	N	OFF	20.1
5.498421	---	24.48	50.00	25.52	N	OFF	20.5
5.498421	30.12	---	60.00	29.88	N	OFF	20.5
11.971446	---	21.30	50.00	28.70	N	OFF	21.2
11.971446	27.61	---	60.00	32.39	N	OFF	21.2
21.096060	---	38.78	50.00	11.22	N	OFF	22.1
21.096060	45.44	---	60.00	14.56	N	OFF	22.1



Appendix C. Radiated Spurious Emission

Test Engineer:	Renz Roxas, Minh Nguyen, Jesse Fan, and Kevin Hsu	Temperature:	15.2~25.4°C
		Relative Humidity:	35.7~50.3%



2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2383.71	56.58	-17.42	74	41.89	27.39	18.39	31.09	300	67	P	H
		2380.77	46.64	-7.36	54	31.96	27.39	18.39	31.1	300	67	A	H
	*	2402	98.51	-	-	83.77	27.38	18.44	31.08	300	67	P	H
	*	2402	98.2	-	-	83.46	27.38	18.44	31.08	300	67	A	H
													H
													H
		2354.94	56.12	-17.88	74	41.66	27.26	18.32	31.12	400	133	P	V
		2386.65	46.7	-7.3	54	32	27.39	18.4	31.09	400	133	A	V
	*	2402	97.33	-	-	82.59	27.38	18.44	31.08	400	133	P	V
	*	2402	97.1	-	-	82.36	27.38	18.44	31.08	400	133	A	V
													V
													V
BLE CH 39 2480MHz	*	2480	101.32	-	-	86.04	27.69	18.65	31.06	391	48	P	H
	*	2480	101.07	-	-	85.79	27.69	18.65	31.06	391	48	A	H
		2499.8	56.64	-17.36	74	41.26	27.73	18.7	31.05	391	48	P	H
		2487.4	47.74	-6.26	54	32.42	27.71	18.67	31.06	391	48	A	H
													H
													H
	*	2480	96.9	-	-	81.62	27.69	18.65	31.06	400	133	P	V
	*	2480	96.64	-	-	81.36	27.69	18.65	31.06	400	133	A	V
		2489.6	57.35	-16.65	74	42.02	27.71	18.68	31.06	400	133	P	V
		2487.64	47.47	-6.53	54	32.15	27.71	18.67	31.06	400	133	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	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	Line (dBμV/m)	Level (dBμV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	Avg. (P/A)	(H/V)
BLE CH 00 2402MHz		4804	42.53	-31.47	74	64.78	32.56	12.54	67.35			P	H
		7206	44.33	-29.67	74	58.61	36.85	14.85	65.98			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	45.77	-28.23	74	68.02	32.56	12.54	67.35			P	V
		7206	44.82	-29.18	74	59.1	36.85	14.85	65.98			P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	Line (dBμV/m)	Level (dBμV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	Avg. (P/A)	(H/V)
BLE CH 19 2440MHz		4880	40.95	-33.05	74	63.1	32.72	12.6	67.47			P	H
		7320	45.11	-28.89	74	60.22	36.8	14.99	66.9			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4880	43.28	-30.72	74	65.43	32.72	12.6	67.47			P	V
		7320	44.03	-29.97	74	59.14	36.8	14.99	66.9			P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	Line (dBμV/m)	Level (dBμV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	Avg. (P/A)	(H/V)
BLE CH 39 2480MHz		4960	40.92	-33.08	74	62.8	33	12.66	67.54			P	H
		7440	44.6	-29.4	74	59.97	36.41	15.15	66.93			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4960	44.02	-29.98	74	65.9	33	12.66	67.54			P	V
		7440	43.46	-30.54	74	58.83	36.41	15.15	66.93			P	V
													V
													V
													V
													V
													V
													V
													V
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													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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		325.16	34.65	-11.35	46	44.44	19.58	2.99	32.53			P	H
		374.98	37.59	-8.41	46	45.76	20.93	3.23	32.56			P	H
		399.89	36.33	-9.67	46	43.59	21.71	3.33	32.6			P	H
		424.8	35.19	-10.81	46	41.09	23	3.43	32.61			P	H
		890.719	36.08	-9.92	46	33.7	28.87	4.92	31.79			P	H
		945.11	37.25	-8.75	46	32.75	30.38	5.11	31.42			P	H
													H
													H
													H
													H
													H
													H
		117.89	31	-12.5	43.5	44.12	17.41	1.8	32.45			P	V
		374.98	36.55	-9.45	46	44.72	20.93	3.23	32.56			P	V
		399.89	36.28	-9.72	46	43.54	21.71	3.33	32.6			P	V
		424.8	36.12	-9.88	46	42.02	23	3.43	32.61			P	V
		675.151	32.98	-13.02	46	34.44	26.56	4.31	32.62			P	V
		945.11	38.44	-7.56	46	33.94	30.38	5.11	31.42			P	V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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		24916	41.47	-32.53	74	36.03	39.1	28.49	52.61			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		23495	41.82	-32.18	74	37.21	39.2	27.23	52.28			P	V
													V
													V
													V
													V
													V
													V
												V	
												V	
Remark	3. No other spurious found. 4. All results are PASS against limit line.												



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 D. Radiated Spurious Emission Plots

Note symbol

-L	Low channel location
-R	High channel location

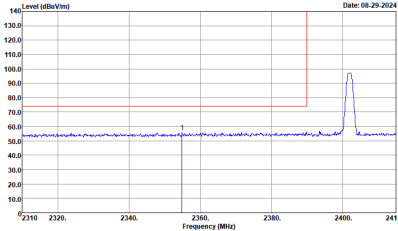
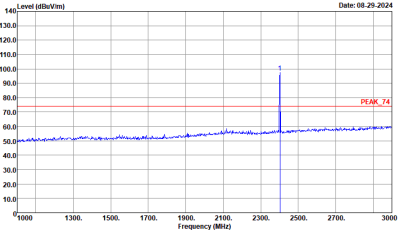
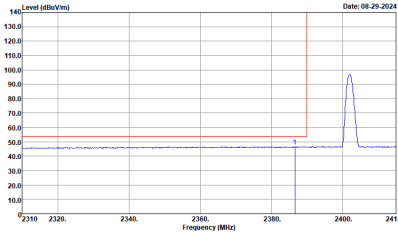
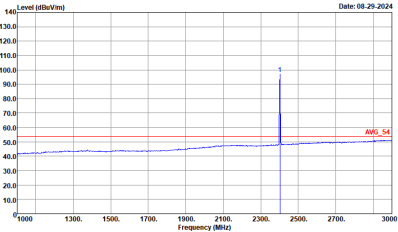


2.4GHz 2400~2483.5MHz

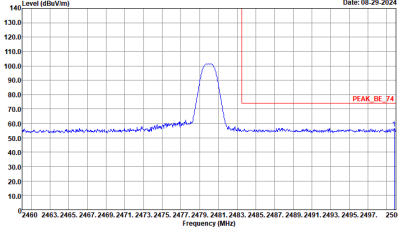
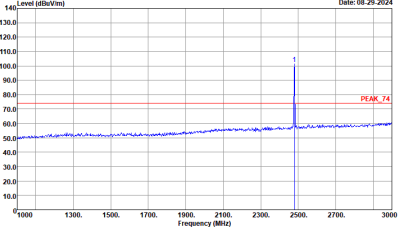
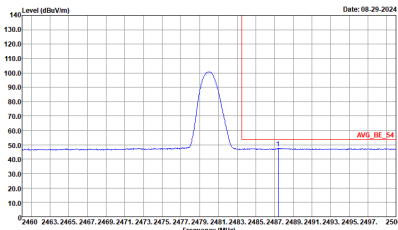
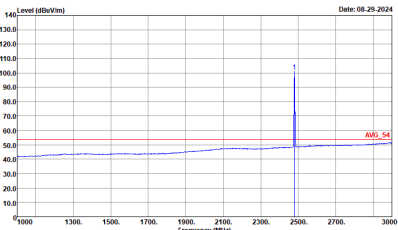
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Fundamental
Peak	Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4	Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4
Avg.	Site : 03CH02-CA Condition : AVG_BE_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4	Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4

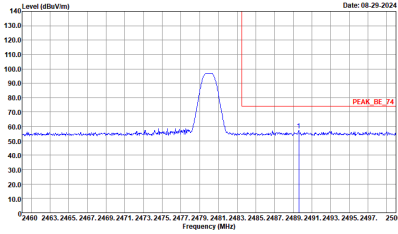
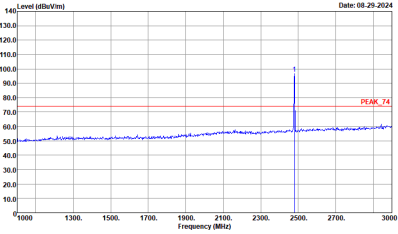
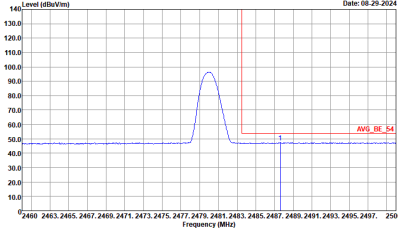
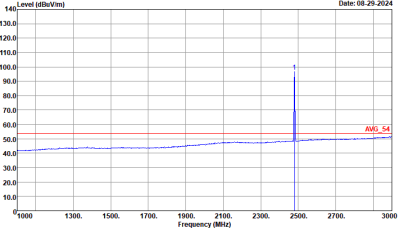


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74_3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4	 Site : 03CH02-CA Condition : PEAK_74_3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4
	 Site : 03CH02-CA Condition : AVG_BE_54_3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4	 Site : 03CH02-CA Condition : AVG_54_3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4
	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4	 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : X Setting : 4

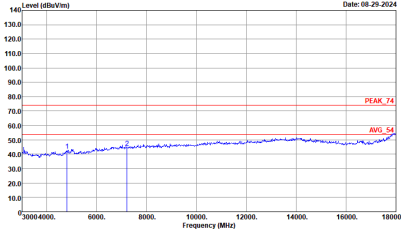
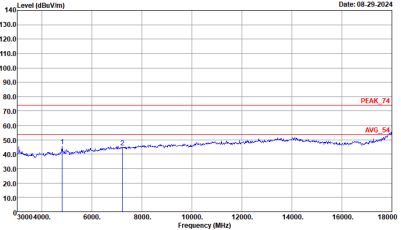


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4	 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : X Setting : 4



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
Avg.	Level (dBV/m) Date: 08-29-2024 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	Level (dBV/m) Date: 08-29-2024 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4

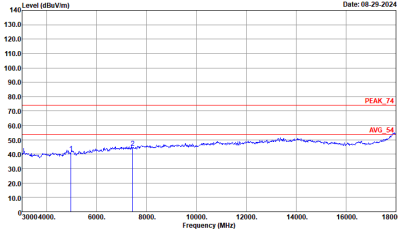
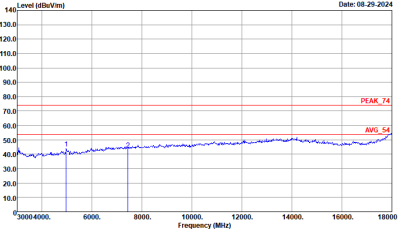


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
Peak Avg.	Level (dBm/Vm) Date: 08-29-2024 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	Level (dBm/Vm) Date: 08-29-2024 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
Avg.	Level (dBV/m) Date: 08-29-2024 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	Level (dBV/m) Date: 08-29-2024 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



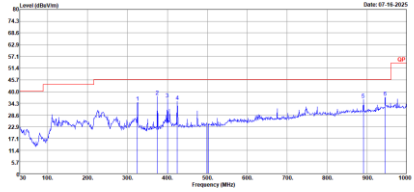
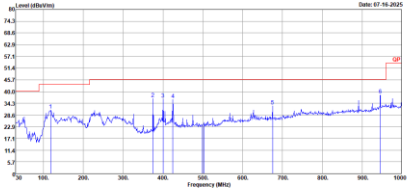
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Peak	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_248129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02140_248129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Avg.	Level (dBV/m) Date: 08-29-2024 Site : 03CH02-CA Condition : AVG_54_3m_HORN_02140_248129_HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	Level (dBV/m) Date: 08-29-2024 Site : 03CH02-CA Condition : AVG_54_3m_HORN_02140_248129_VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



Emission below 1GHz
2.4GHz BLE (LF @ 3m)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
1	Horizontal	Vertical
Peak Avg.	 Site : 05CH02-CA Condition : QP 3m 81LOG_58392_240813_H HORIZONTAL Detector : Peak Power : 120V Power 120Vvac/60Hz Plane : X Setting : 4	 Site : 05CH02-CA Condition : QP 3m 81LOG_58392_240813_H VERTICAL Detector : Peak Power : 120V Power 120Vvac/60Hz Plane : X Setting : 4



Emission after 18GHz
2.4GHz BLE (SHF @ 1m)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE SHF	
1	Horizontal	Vertical
Peak Avg.	Site : 05CH02-CA Condition : PEAK_74 5m SHF_HORI_B41_2400007 HORIZONTAL FREQ: 10000.000000Hz VSW: 3000.000000Hz SW: Auto Detector : Peak Power : 120Vsw/60Hz Plane : X Setting : 4	Site : 05CH02-CA Condition : PEAK_74 5m SHF_VORI_B41_2400007 VERTICAL FREQ: 10000.000000Hz VSW: 3000.000000Hz SW: Auto Detector : Peak Power : 120Vsw/60Hz Plane : X Setting : 4



Appendix E. Duty Cycle Plots

Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth - LE for 1Mbps	61.92	386	2.59	3kHz

