



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



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History of this test report

Report No.	Version	Description	Issue Date
FR220617002A	01	Initial issue of report	Sep. 30, 2025

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(b)(1) 15.247(b)(4)	Peak Output Power	Pass	-
3.2	15.247(d)	Radiated Band Edges and Radiated 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/manufacturee 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.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	27	2429	54	2456
	1	2403	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	39	2441	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	78	2480
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-

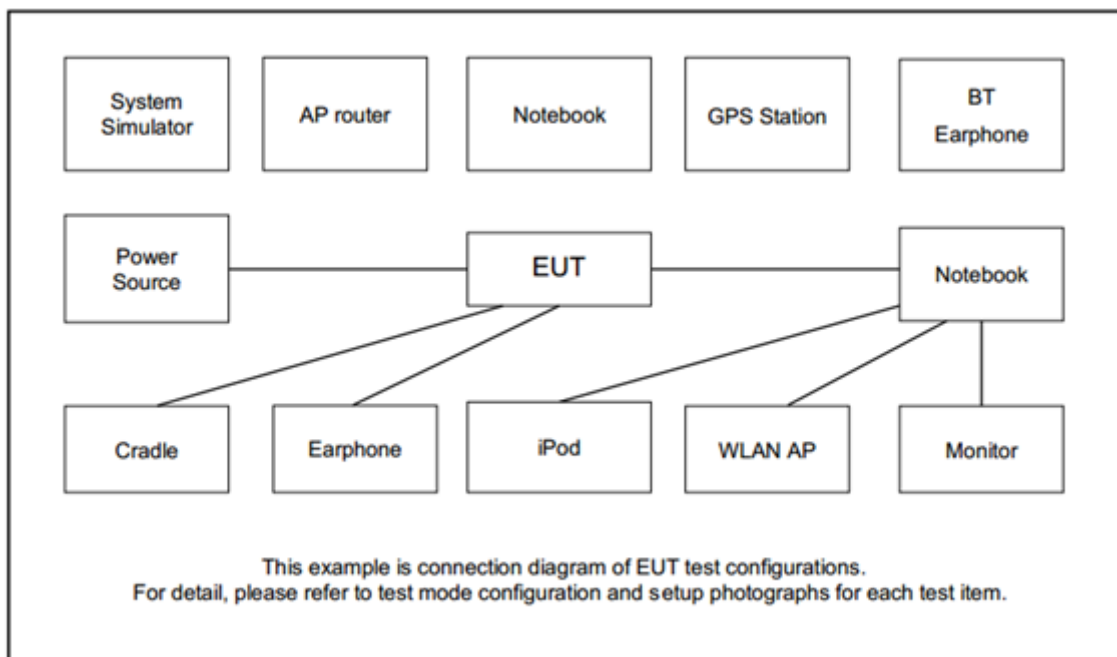
2.2 Test Mode

- 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 plane, and the worst mode of radiated spurious emissions is Bluetooth 3Mbps mode, and recorded 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 BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz
	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz
	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz
AC Conducted Emission	Mode 1 :WLAN 2.4G TX		
Remark: 1. For Radiated Test Cases, the worst mode data rate 3Mbps was reported only since the highest RF output power in the preliminary tests. The conducted spurious emissions and conducted band edge measurement for other data rates were not worse than 3Mbps, and no other significantly frequencies found in conducted spurious emission. 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

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

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.

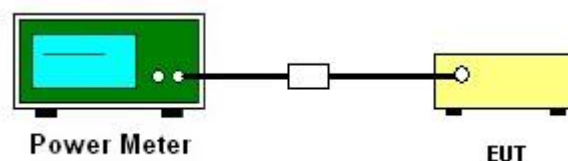
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
1. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Measure the conducted output power with cable loss and record the results in the test report.
4. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Peak 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. 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

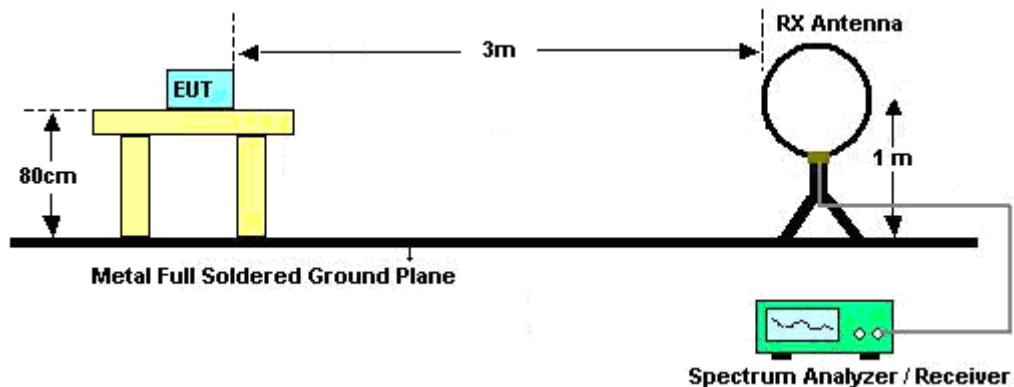
- The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
- The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
- For each suspected emission, the EUT is arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- Set the maximum power setting and enable the EUT to transmit continuously.
- Use the following spectrum analyzer settings:
 - Span shall wide enough to fully capture the emission being measured;
 - Set RBW = 100 kHz for $f < 1$ GHz, RBW = 1 MHz for $f > 1$ GHz ; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - For average measurement: use duty cycle correction factor method per 15.35(c).
 Duty cycle = On time/100 milliseconds
 On time = $N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n$
 Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
 Average Emission Level = Peak Emission Level + $20 \cdot \log$ (Duty cycle)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

7. 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 “-”.
8. 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 “-”.

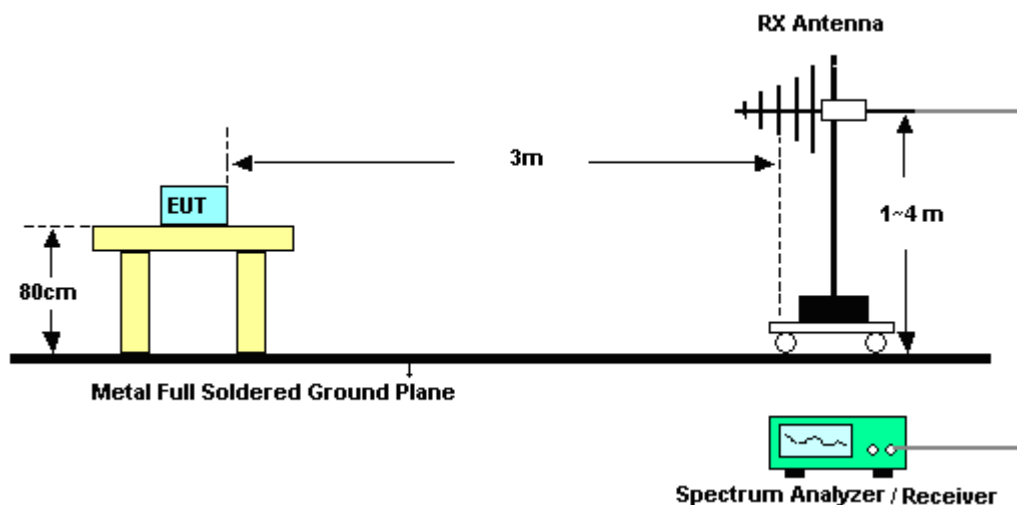
Note: The average levels are calculated from the peak level corrected with duty cycle correction factor (-34.42dB) derived from $20\log(\text{dwell time}/100\text{ms})$. This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.2.4 Test Setup

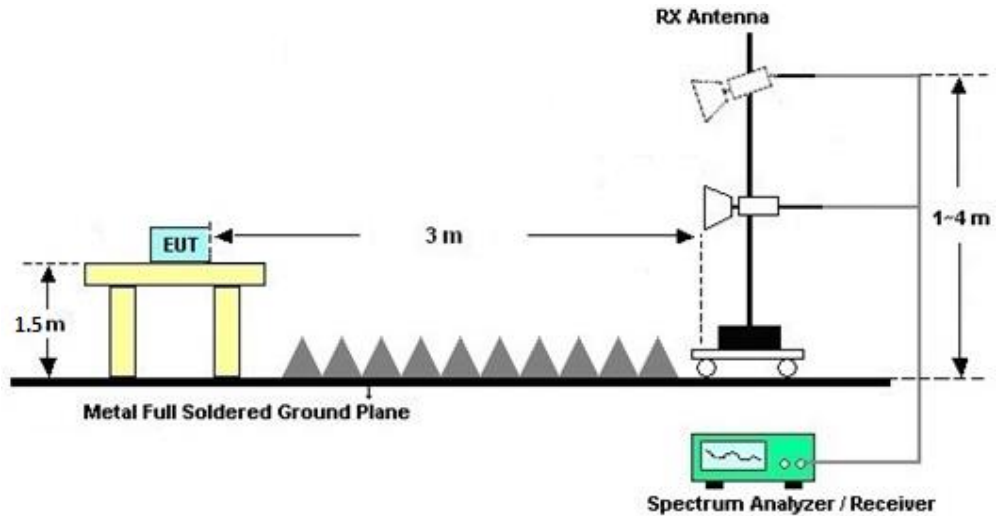
For radiated test below 30MHz



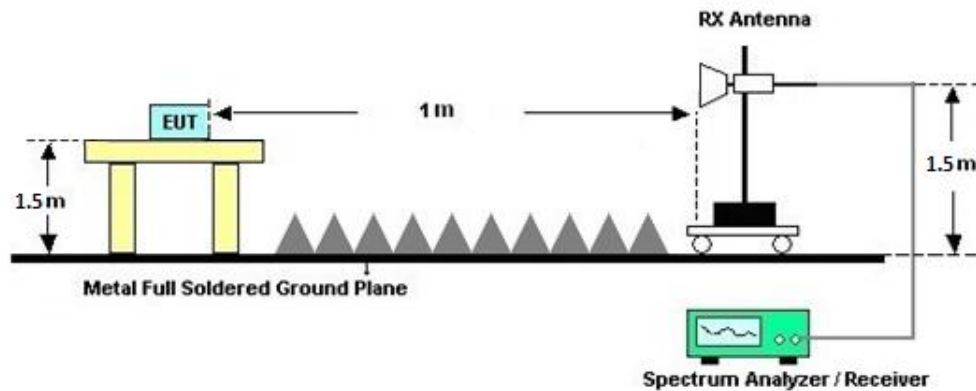
For radiated test from 30MHz to 1GHz



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 (30MHz ~ 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 (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.

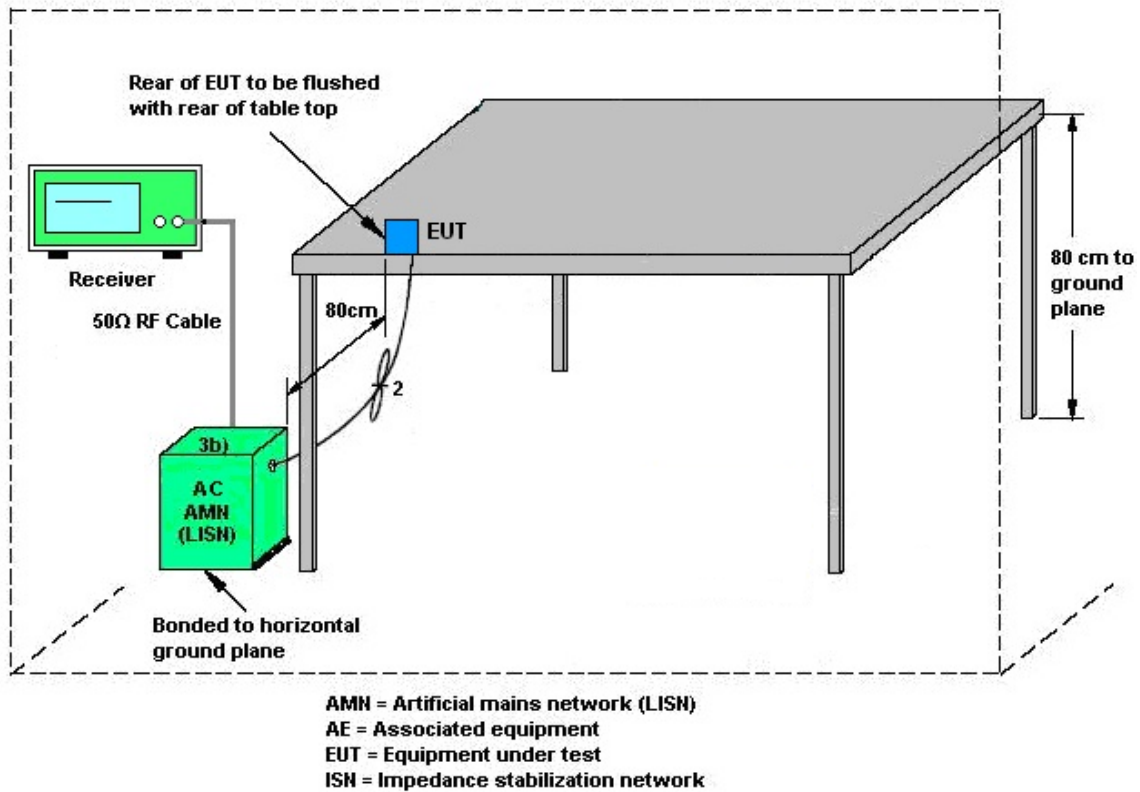
3.3.2 Measuring Instruments

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



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% ($U = 2Uc(y)$)	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% ($U = 2Uc(y)$)	5.1 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

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

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	5.81	30.00	Pass
	39	1	5.72	30.00	Pass
	78	1	5.43	30.00	Pass
2DH1	0	1	6.42	20.97	Pass
	39	1	6.21	20.97	Pass
	78	1	6.07	20.97	Pass
3DH1	0	1	6.60	20.97	Pass
	39	1	6.35	20.97	Pass
	78	1	6.23	20.97	Pass



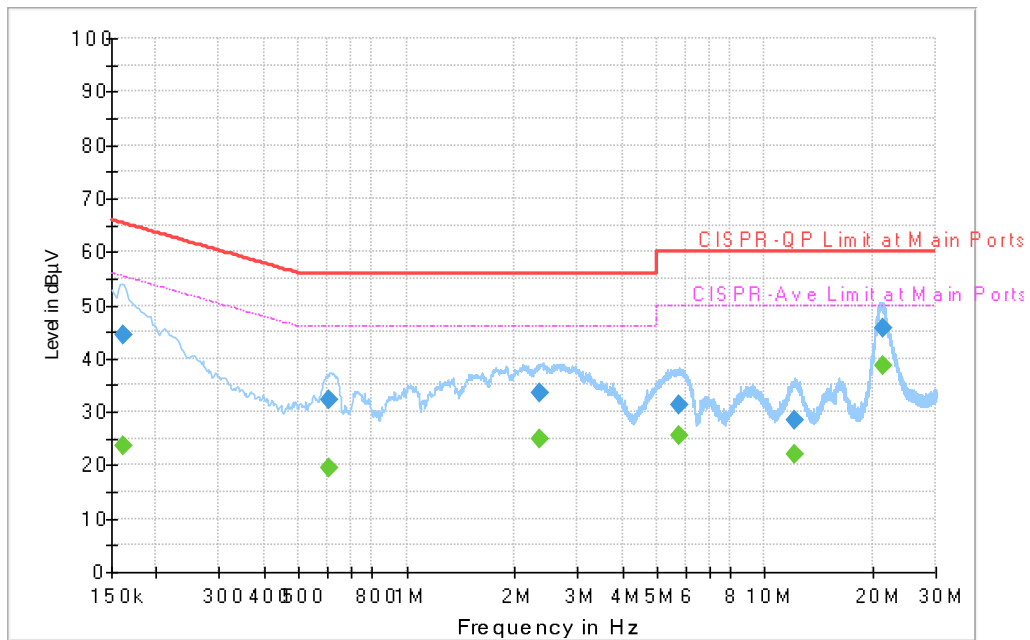
Appendix B. AC Conducted Emission Test Results

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

EUT Information

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

Full Spectrum



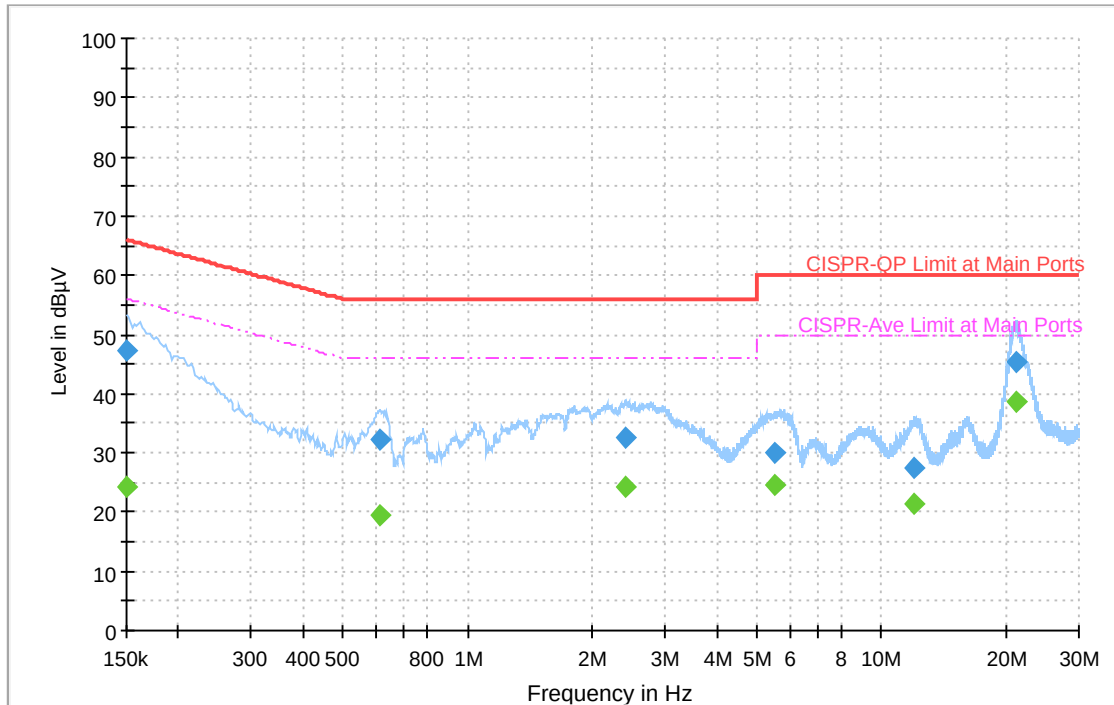
Final_Result

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

BT (Band Edge @ 3m)

BT	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)
BT CH 00 2402MHz		2368.065	46.98	-27.02	74	42.4	27.31	8.38	31.11	300	62	P	H
		2368.065	12.56	-61.44	54	-	-	-	-	-	-	A	H
	*	2402	97.92	-	-	93.16	27.38	8.46	31.08	300	62	P	H
	*	2402	63.5	-	-	-	-	-	-	-	-	A	H
													H
													H
		2357.775	46.04	-27.96	74	41.52	27.27	8.36	31.11	400	143	P	V
		2357.775	11.62	-62.38	54	-	-	-	-	-	-	A	V
	*	2402	97.02	-	-	92.26	27.38	8.46	31.08	400	143	P	V
	*	2402	62.6	-	-	-	-	-	-	-	-	A	V
													V
													V
BT CH 78 2480MHz	*	2480	99.5	-	-	94.21	27.69	8.66	31.06	400	47	P	H
	*	2480	65.08	-	-	-	-	-	-	-	-	A	H
		2483.56	54.17	-19.83	74	48.86	27.7	8.67	31.06	400	47	P	H
		2483.56	19.75	-54.25	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	98.2	-	-	92.91	27.69	8.66	31.06	400	154	P	V
	*	2480	63.78	-	-	-	-	-	-	-	-	A	V
		2483.56	53.62	-20.38	74	48.31	27.7	8.67	31.06	400	154	P	V
		2483.56	19.2	-54.8	54	-	-	-	-	-	-	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****BT (Harmonic @ 3m)**

BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (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)
BT CH 00 2402MHz		4804	41.64	-32.36	74	63.89	32.56	11.91	67.35			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	43.93	-30.07	74	66.18	32.56	11.91	67.35			P	V
													V
													V
													V
													V
													V
													V
													V
													V



BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (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)
BT CH 39 2441MHz		4882	41.32	-32.68	74	63.49	32.72	12.01	67.48			P	H
		7323	44.29	-29.71	74	59.44	36.78	14.62	66.93			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4882	41.07	-32.93	74	63.24	32.72	12.01	67.48			P	V
		7323	44.86	-29.14	74	60.01	36.78	14.62	66.93			P	V
													V
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BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (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)
BT CH 78 2480MHz		4960	41.13	-32.87	74	63.01	33	12.12	67.54			P	H
		7440	44.17	-29.83	74	59.54	36.41	14.75	66.93			P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4960	42.38	-31.62	74	64.26	33	12.12	67.54			P	V
		7440	44.62	-29.38	74	59.99	36.41	14.75	66.93			P	V
													V
													V
													V
													V
													V
													V
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													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 BT (LF)

[illegible]



Emission after 18GHz

2.4GHz BT (SHF)

[illegible]



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:

BT	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)
BT 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

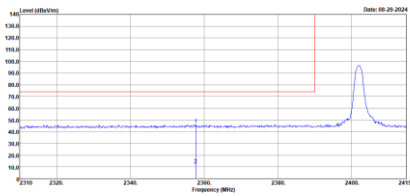
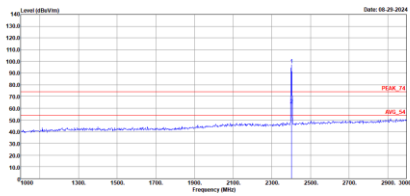


2.4GHz 2400~2483.5MHz

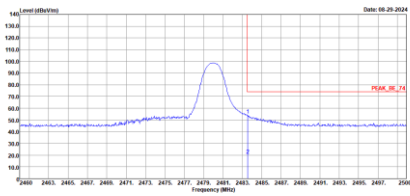
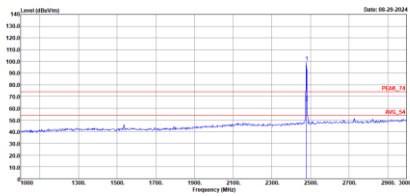
BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
1	Horizontal	Fundamental
Peak	Site : 05CH02-CA Condition : PEAK_BE_74 3m HORN_02148_240120 HORIZONTAL Detector : Peak Plane : AUT Power 120Vac/60Hz Setting : 4	Site : 05CH02-CA Condition : PEAK_74 3m HORN_02148_240120 HORIZONTAL Detector : Peak Plane : AUT Power 120Vac/60Hz Setting : 4

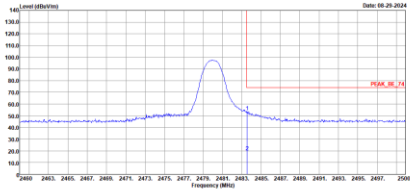
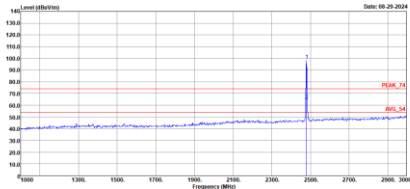


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
1	Vertical	Fundamental
Peak	 Site : 010M02-CA Condition : PEAK_02_74 3m HORN_02140_2402120 VERTICAL Detector : Peak Plane : AVX Power 120Vac/60Hz Setting : 4	 Site : 010M02-CA Condition : PEAK_02_74 3m HORN_02140_2402120 VERTICAL Detector : Peak Plane : AVX Power 120Vac/60Hz Setting : 4



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
1	Horizontal	Fundamental
Peak	 Site : 05CMB2-CA Condition : PEAK_78_74 3m HORN_02140_2480120 HORIZONTAL Detector : Peak Plane : X Setting : 4	 Site : 05CMB2-CA Condition : PEAK_74 3m HORN_02140_2480120 HORIZONTAL Detector : Peak Plane : X Setting : 4

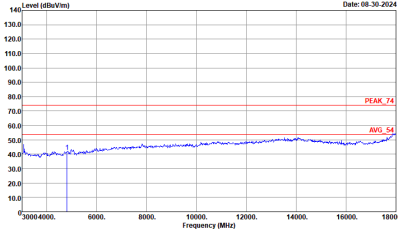
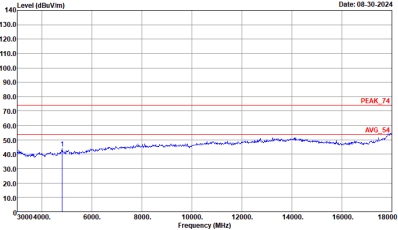


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
1	Vertical	Fundamental
Peak	 Site : 05CH02-CA Condition : PEAK_BE_74 3m HORN_02140_240120 VERTICAL FREQ: 2400.000000Hz VSW: 3000.000000Hz SWT: Auto Detector : Peak Aver Power: 120Vac/60Hz Plane : X Setting : 4	 Site : 05CH02-CA Condition : PEAK_74 3m HORN_02140_240120 VERTICAL FREQ: 2400.000000Hz VSW: 3000.000000Hz SWT: Auto Detector : Peak Aver Power: 120Vac/60Hz Plane : X Setting : 4



2.4GHz 2400~2483.5MHz

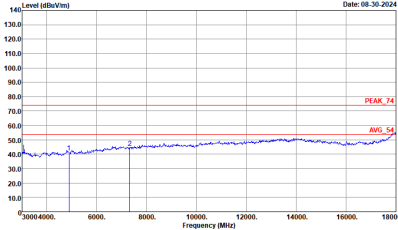
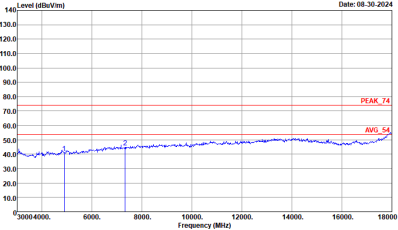
BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT 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

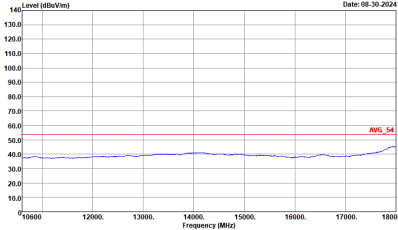
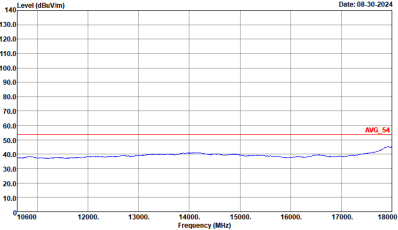


BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH00 2402MHz	
1	Horizontal	Vertical
Avg.	Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 VERTICAL Detector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

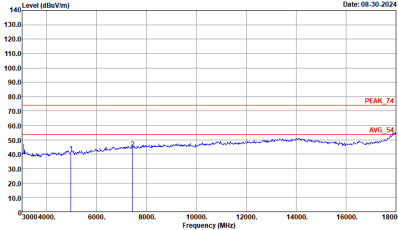
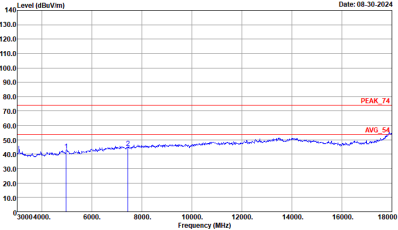


BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH39 2440MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK 74 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	 Site : 03CH02-CA Condition : PEAK 74 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH39 2440MHz	
1	Horizontal	Vertical
Avg.	 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz	
1	Horizontal	Vertical
Peak	 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

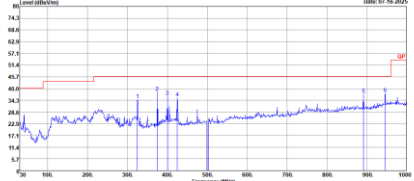
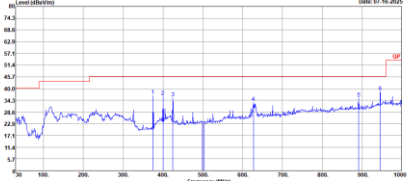


BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz	
1	Horizontal	Vertical
Avg.	Level (dBV/m) Date: 08-30-2024 AVG_54 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 HORIZONTAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4	Level (dBV/m) Date: 08-30-2024 AVG_54 Site : 03CH02-CA Condition : AVG_54 3m HORN_02140_240129 VERTICAL Detector : Peak Plane : AVR Power 120Vac/60Hz Setting : X Setting : 4



Emission below 1GHz

2.4GHz BT (LF @ 3m)

BT	2.4GHz 2400~2483.5MHz	
ANT	BT LF	
1	Horizontal	Vertical
Peak Avg.	 Site : 810802-CA Condition : QP 3m 810802_58392_240813_H HORIZONTAL Detector : Peak Power : 120V Power 120Vvac/60Hz Plane : X Setting : 4	 Site : 810802-CA Condition : QP 3m 810802_58392_240813_H VERTICAL Detector : Peak Power : 120V Power 120Vvac/60Hz Plane : X Setting : 4



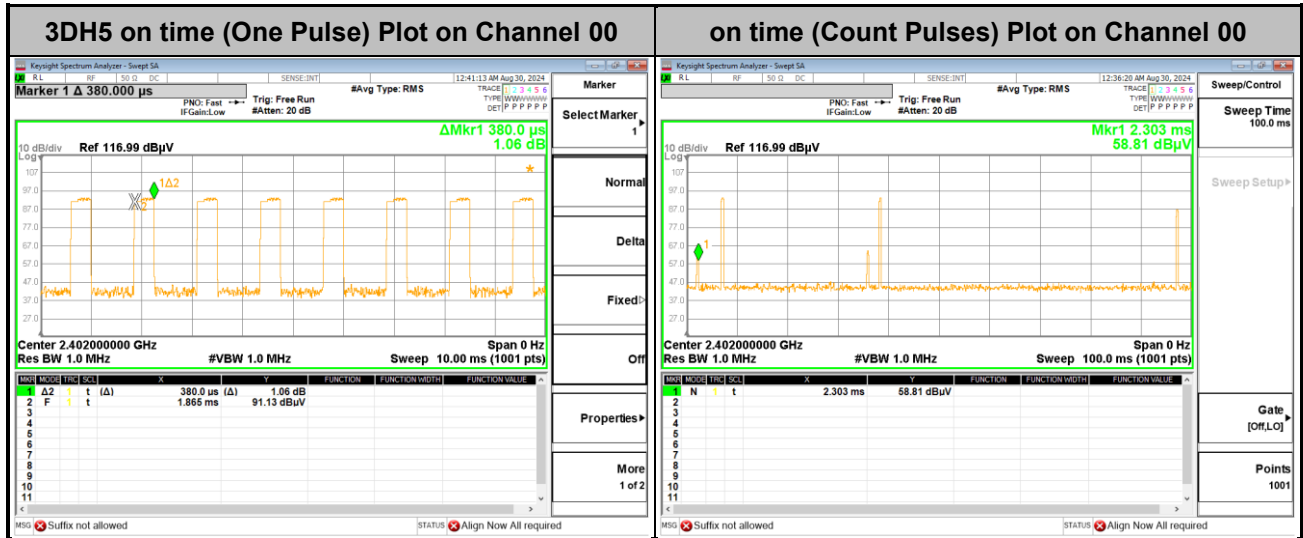
Emission after 18GHz

2.4GHz BT (SHF @ 1m)

BT	2.4GHz 2400~2483.5MHz	
ANT	BT SHF	
1	Horizontal	Vertical
Peak Avg.	Site : BSCM02-CA Condition : PEAK_74 1m SHF_HORR_B41_2400007 HORIZONTAL Detector : Peak Power : 120V Power 120Vvac/60Hz Plane : X Setting : 4	Site : BSCM02-CA Condition : PEAK_74 1m SHF_HORR_B41_2400007 VERTICAL Detector : Peak Power : 120V Power 120Vvac/60Hz Plane : X Setting : 4



Appendix E. Duty Cycle Plots



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $5 * 0.38 / 100 = 1.9 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -34.42 \text{ dB}$
3. 3DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

$$0.38 \text{ ms} \times 20 \text{ channels} = 38 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 38 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$0.38 \text{ ms} \times 2 = 3.8 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(3.8 \text{ ms}/100 \text{ ms}) = -34.42 \text{ dB}$$