FCC RADIO TEST REPORT

FCC ID	:	**2ADEFAT-CD1**
Equipment	:	**Airtame Radio Module**
Brand Name	:	**Airtame**
Model Name	:	**AT-CD1**
Applicant	:	**Airtame ApS Danneskiold Samsoes Alle 24, 1sal TV, Copenhagen K 1434, Denmark**
Manufacturer	:	**Airtame ApS Danneskiold Samsoes Alle 24, 1sal TV, Copenhagen K 1434, Denmark**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Apr. 25, 2022 and testing was performed from May 03, 2022 to Jul. 05, 2022. 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.

Neil Kao

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
FR210727003B	01	Initial issue of report	Jun. 20, 2022
FR210727003B	02	1. Add AC Conducted Emission 2. Revise section 3.2.8 3. Revise Appendix C and Appendix D	Jul. 29, 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	6.06 dB under the limit at 329.730 MHz
3.3	15.207	AC Conducted Emission	Pass	1.14 dB under the limit at 12.588 MHz
3.4	15.203 & 15.247(b)	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/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. Please refer to the section " Uncertainty of Evaluation " for measurement uncertainty.

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.

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac.

Product Feature	
Antenna Type	WLAN: <Ant. 1>: PCB Dipole Antenna <Ant. 2>: PCB Dipole Antenna Bluetooth: PCB Dipole Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	3.0

Remark: The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations 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.**
	03CH02-CA, TH01-CA, CO01-CA

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

FCC Designation No.: US1250

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 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

Remark: All the test items were validated and recorded in accordance with the standards without any modification during the testing.

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

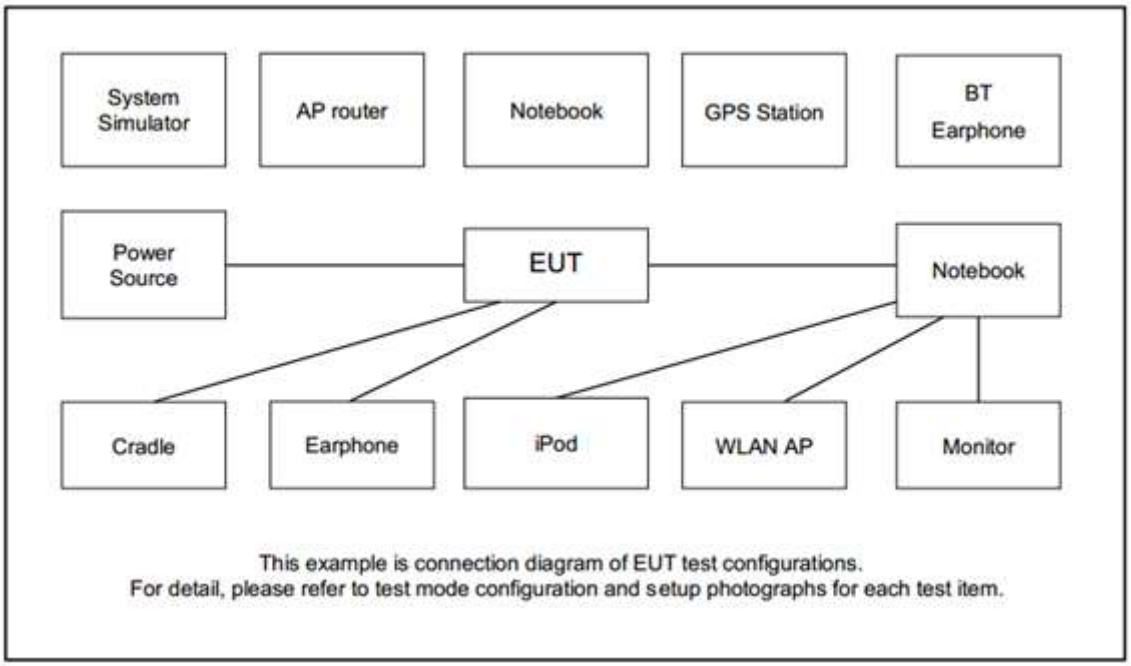
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is 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 find Z plane as worst plane.

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	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
AC Conducted Emission	Mode 1 : WLAN (2.4GHz) Link + Bluetooth Link + RJ45 Link (Charging from Adapter) + Play video with USB-C HDD + HDMI*2 connect to TV (TV Resolution: 1080p) + USB-A 3.0 Link to mouse + USB-A 3.0 connect to keyboard + USB-C 3.0 Link to HDD Mode 2 : WLAN (2.4GHz) Link + Bluetooth Link + RJ45 Link (Charging from PoE Adapter) + Play video with USB-C HDD + HDMI*2 connect to TV (TV Resolution: 4K 30Hz) + USB-A 3.0 Link to mouse + USB-A 3.0 connect to speaker + USB-C 3.0 Link to HDD
Remark: 1. The worst case of Conducted Emission is mode 2; only the test data of it was reported. 2. HDMI Cable means media application transferred between EUT and external display.	

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	NETGEAR	R7800	PY315100319	N/A	Unshielded 1.2m
2.	PoE adapter	TYCON	TP-POE-HP-48G-RC	FCC DoC	N/A	Unshielded, 1m
3.	HDD	WD	WDBYNN0010BBL-0B	FCC DoC	N/A	Shielded, 0.5m
4.	Notebook	Acer	Altos PS548-G1	FCC DoC	N/A	AC I/P: Unshielded, 1.0m DC O/P: Shielded, 1.8m
5.	Monitor	Samsung	U28R552UQR	FCC DoC	Shielded, 1.2 m	Unshielded, 1.8 m
6.	Bluetooth Speaker	JBL	GO2J	CCAH18LP0030E4	N/A	N/A
7.	Keyboard	Lenovo	SK-8827	FCC DoC	N/A	Unshielded 1.0m
8.	Mouse	HP	N910U	FCC DoC	N/A	Unshielded 1.2m
9.	Speaker	Logitech	S150	FCC DoC	N/A	Unshielded 1.0m

2.5 EUT Operation Test Setup

The RF test items, utility “BLE_test_enhanced.sh” 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.

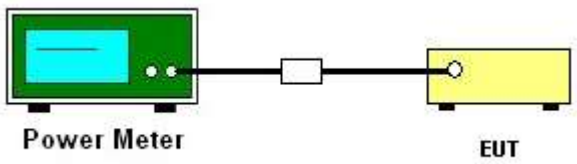
3.1.2 Measuring Instruments

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 11.9.2.3.2 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 (Reporting Only)

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 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

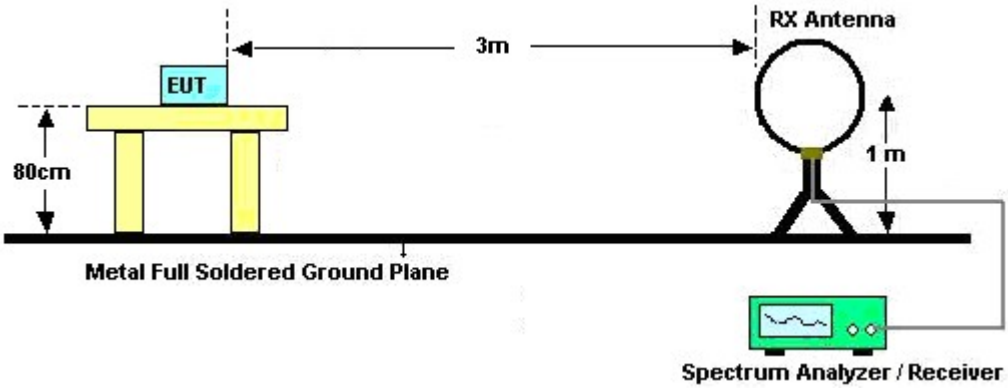
Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

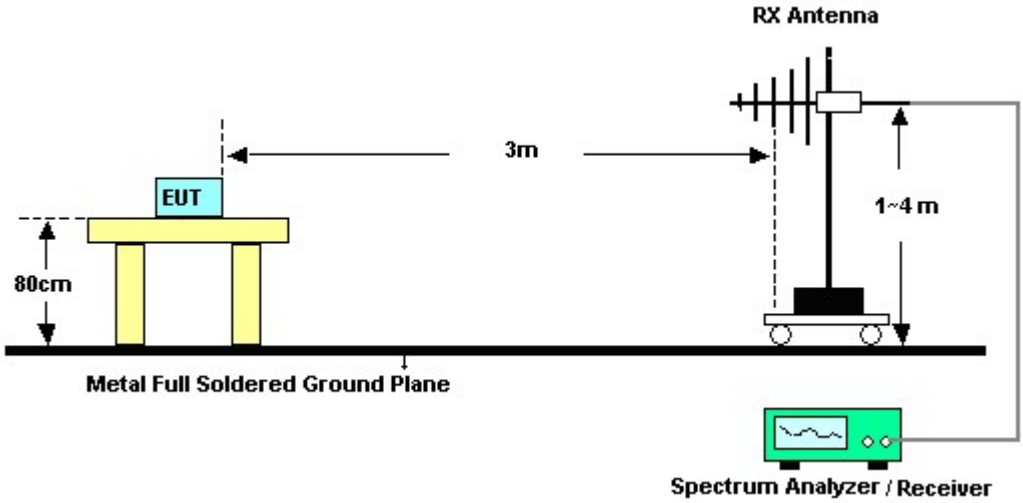
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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

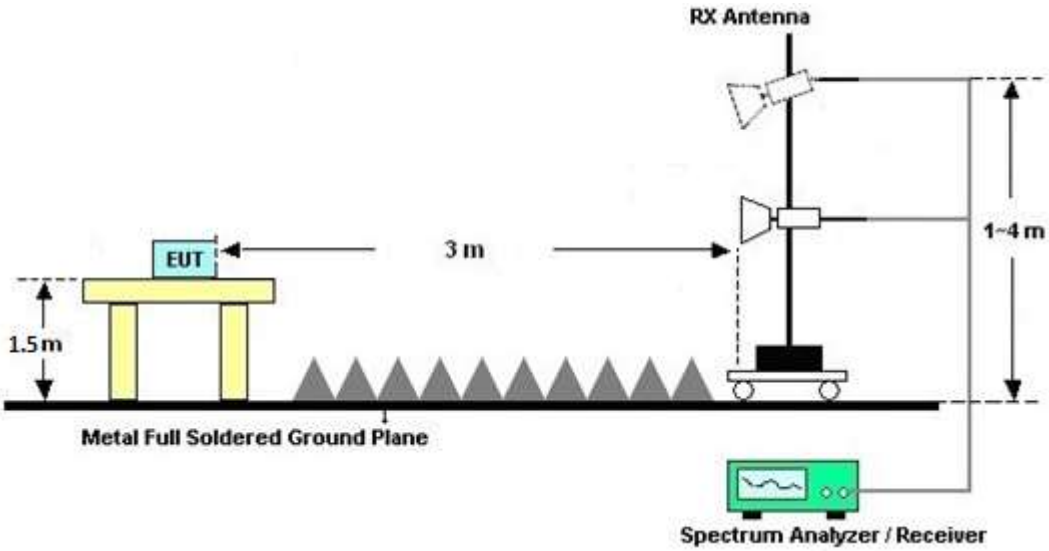
For radiated test below 30MHz



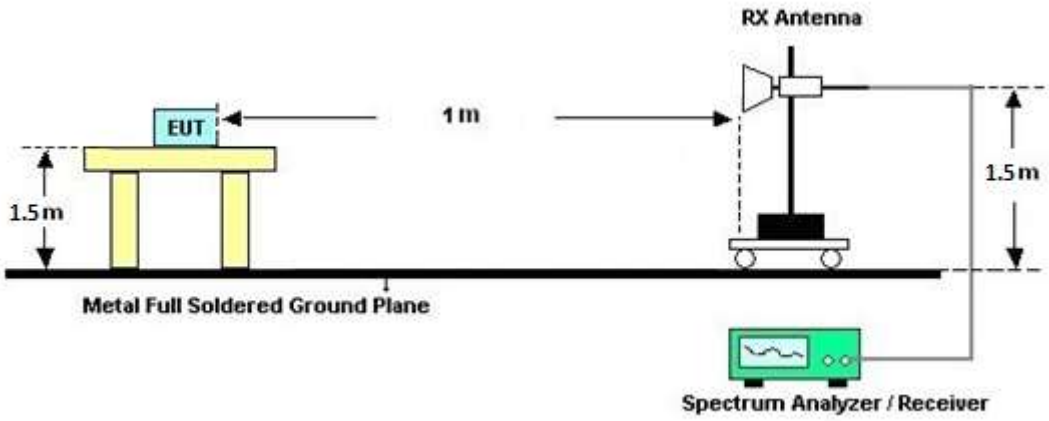
For radiated test from 30MHz to 1GHz



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 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.

Note: When the scan with peak detector exceeds the limit associated with the average detector, additional scan with average detection was performed to show compliance with the average limit. The additional scan plot of the low channel is provided for justification.

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.

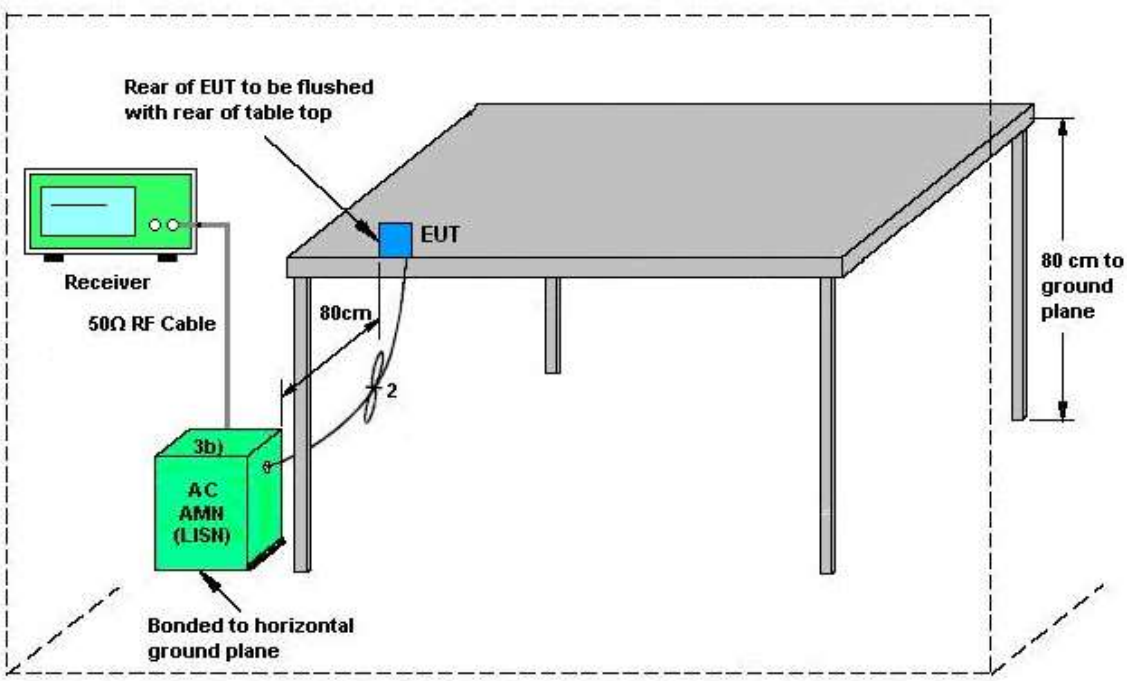
3.3.2 Measuring Instruments

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 B.

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
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 30, 2021	May 03, 2022	Aug. 29, 2022	Conducted (TH01-CA)
Power Sensor	EM Electronics Corporation	RPR3006W	RPR6W-1901 026	10MHz-6GHz	Jul. 26, 2021	May 03, 2022	Jul. 25, 2023	Conducted (TH01-CA)
Switch Box & RF Cable	EM Electronics	EMSW26	1090304	N/A	Mar. 30, 2022	May 03, 2022	Mar. 29, 2023	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	Jun. 02, 2021	May 03, 2022	Jun. 01, 2022	Conducted (TH01-CA)
LISN	TESEQ	NNB51	47415	N/A	May 10, 2022	May 20, 2022~ Jun. 20, 2022	May 09, 2023	Conduction (CO01-CA)
LISN	TESEQ	NNB51	47407	N/A	May 10, 2022	May 20, 2022~ Jun. 20, 2022	May 09, 2023	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	SCHWARZBE CK	VTSD 9561-F N	9561-F-N00412	N/A	Jul. 06, 2021	May 20, 2022~ Jun. 20, 2022	Jul. 05, 2022	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	7GHz	Jun. 02, 2021	May 20, 2022~ May 31, 2022	Jun. 01, 2022	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	7GHz	May 31, 2022	Jun. 01, 2022~ Jun. 20, 2022	May 30, 2023	Conduction (CO01-CA)
Software	R&S	EMC32	N/A	Version 10.30.00	N/A	May 20, 2022~ Jun. 20, 2022	N/A	Conduction (CO01-CA)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9kHz~30MHz	Jan. 07, 2022	May 24, 2022~ Jul. 05, 2022	Jan. 06, 2023	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	54683	30MHz~1GHz	Oct. 15, 2021	May 24, 2022~ Jul. 05, 2022	Oct. 14, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	01895	1GHz~18GHz	Aug. 25, 2021	May 24, 2022~ Jul. 05, 2022	Aug. 24, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBE CK	BBHA 9170D	00842	18GHz~40GHz	Jul. 20, 2021	May 24, 2022~ Jul. 05, 2022	Jul. 19, 2022	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	May 10, 2022	May 24, 2022~ Jul. 05, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 11, 2022	May 24, 2022~ Jul. 05, 2022	May 10, 2023	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	May 10, 2022	May 24, 2022~ Jul. 05, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060725	18GHz-40GHz	May 10, 2022	May 24, 2022~ Jul. 05, 2022	May 09, 2023	Radiation (03CH02-CA)
RF Cable	HUBER+SUH NER	SUCOFLEX 102	8024032/2, 8024062/2, 802856/2	N/A	Jun. 23, 2021	May 24, 2022~ Jun 21, 2022	Jun. 22, 2022	Radiation (03CH02-CA)
RF Cable	HUBER+SUH NER	SUCOFLEX 102	8024032/2, 802406/2, 802875/2	N/A	Jun. 22, 2022	Jun 22, 2022~ Jul 05, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 22, 2021	May 24, 2022~ Jul. 05, 2022	Sep. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3 000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 22, 2021	May 24, 2022~ Jul. 05, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-12 72-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 22, 2021	May 24, 2022~ Jul. 05, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 04, 2021	May 24, 2022~ Jul. 05, 2022	Aug. 03, 2022	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	May 24, 2022~ Jul. 05, 2022	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	May 24, 2022~ Jul. 05, 2022	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	May 24, 2022~ Jul. 05, 2022	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	May 24, 2022~ Jul. 05, 2022	N/A	Radiation (03CH02-CA)

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))	2.0 dB

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.2 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.4 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Liliana Gonzalez	Temperature:	18.3	°C
Test Date:	2022/5/3	Relative Humidity:	39.6	%

TEST RESULTS DATA
Average Power Table
(Reporting Only)

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power-Ant1 (dBm)	Original Report (dBm)
BLE	1Mbps	1	0	2402	6.60	7.25
BLE	1Mbps	1	19	2440	6.58	
BLE	1Mbps	1	39	2480	5.37	
BLE	2Mbps	1	0	2402	2.86	
BLE	2Mbps	1	19	2440	2.77	
BLE	2Mbps	1	39	2480	4.24	

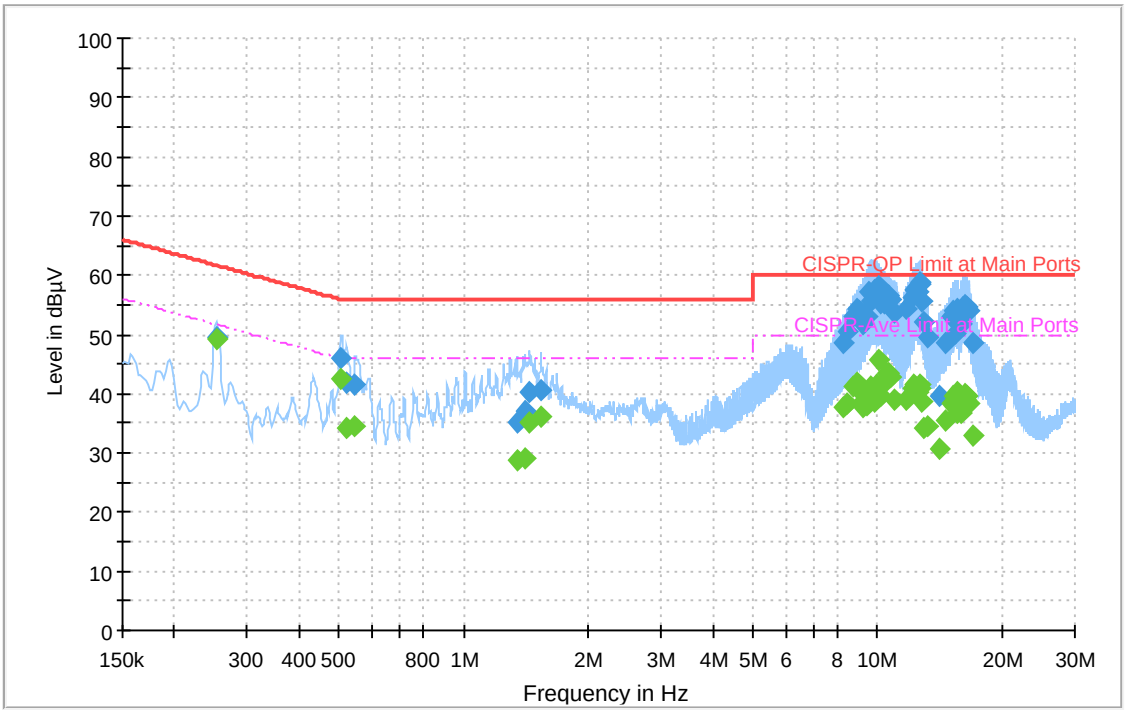
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Yuan Lee	**Temperature :**	19~25℃
		Relative Humidity :	37~44%

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Project	210727003
Mode	2

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.252168	---	49.08	51.69	2.61	L1	OFF	20.3
0.252168	49.60	---	61.69	12.09	L1	OFF	20.3
0.505941	---	42.50	46.00	3.50	L1	OFF	20.3
0.505941	45.87	---	56.00	10.13	L1	OFF	20.3
0.520962	---	34.09	46.00	11.91	L1	OFF	20.3
0.520962	41.88	---	56.00	14.12	L1	OFF	20.3
0.546567	---	34.58	46.00	11.42	L1	OFF	20.3
0.546567	41.68	---	56.00	14.32	L1	OFF	20.3
1.340970	---	28.77	46.00	17.23	L1	OFF	20.3
1.340970	35.14	---	56.00	20.86	L1	OFF	20.3
1.408479	---	29.11	46.00	16.89	L1	OFF	20.3
1.408479	37.18	---	56.00	18.82	L1	OFF	20.3
1.436937	---	35.00	46.00	11.00	L1	OFF	20.3
1.436937	40.12	---	56.00	15.88	L1	OFF	20.3
1.536738	---	36.24	46.00	9.76	L1	OFF	20.3
1.536738	40.63	---	56.00	15.37	L1	OFF	20.3
8.302722	---	37.80	50.00	12.20	L1	OFF	20.4
8.302722	48.71	---	60.00	11.29	L1	OFF	20.4
8.435661	---	38.31	50.00	11.69	L1	OFF	20.4
8.435661	50.42	---	60.00	9.58	L1	OFF	20.4
8.688804	---	41.10	50.00	8.90	L1	OFF	20.4

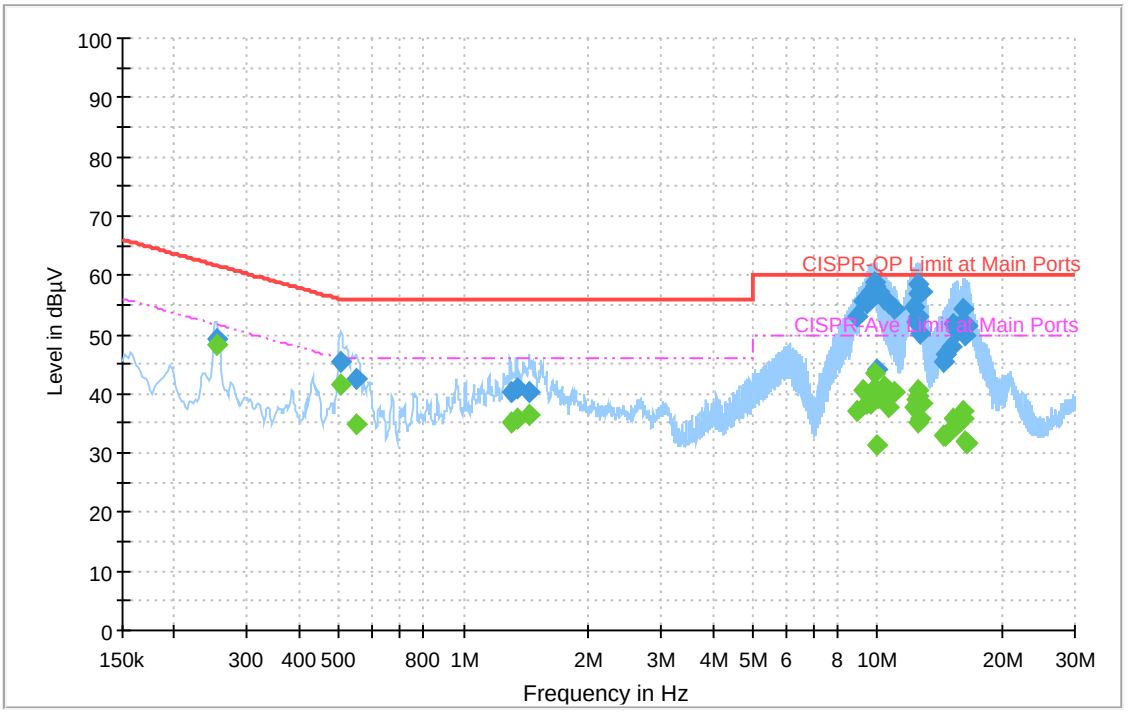
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
8.688804	53.01	---	60.00	6.99	L1	OFF	20.4
8.880558	---	41.98	50.00	8.02	L1	OFF	20.4
8.880558	54.31	---	60.00	5.69	L1	OFF	20.4
9.009186	---	40.59	50.00	9.41	L1	OFF	20.4
9.009186	54.06	---	60.00	5.94	L1	OFF	20.4
9.140487	---	38.49	50.00	11.51	L1	OFF	20.4
9.140487	52.24	---	60.00	7.76	L1	OFF	20.4
9.257460	---	37.61	50.00	12.39	L1	OFF	20.4
9.257460	51.89	---	60.00	8.11	L1	OFF	20.4
9.385233	---	37.91	50.00	12.09	L1	OFF	20.4
9.385233	53.04	---	60.00	6.96	L1	OFF	20.4
9.513258	---	40.49	50.00	9.51	L1	OFF	20.4
9.513258	57.08	---	60.00	2.92	L1	OFF	20.4
9.643326	---	41.12	50.00	8.88	L1	OFF	20.5
9.643326	55.58	---	60.00	4.42	L1	OFF	20.5
9.831966	---	38.55	50.00	11.45	L1	OFF	20.5
9.831966	57.52	---	60.00	2.48	L1	OFF	20.5
9.962088	---	41.54	50.00	8.46	L1	OFF	20.5
9.962088	57.12	---	60.00	2.88	L1	OFF	20.5
10.094388	---	45.64	50.00	4.36	L1	OFF	20.5
10.094388	58.30	---	60.00	1.70	L1	OFF	20.5
10.215996	---	39.70	50.00	10.30	L1	OFF	20.5
10.215996	55.37	---	60.00	4.63	L1	OFF	20.5
10.347189	---	41.74	50.00	8.26	L1	OFF	20.5
10.347189	55.30	---	60.00	4.70	L1	OFF	20.5
10.478742	---	43.37	50.00	6.63	L1	OFF	20.5
10.478742	56.30	---	60.00	3.70	L1	OFF	20.5
10.604544	---	43.55	50.00	6.45	L1	OFF	20.5
10.604544	56.45	---	60.00	3.55	L1	OFF	20.5
10.735215	---	42.81	50.00	7.19	L1	OFF	20.5
10.735215	55.77	---	60.00	4.23	L1	OFF	20.5
10.925457	---	38.94	50.00	11.06	L1	OFF	20.5
10.925457	53.59	---	60.00	6.41	L1	OFF	20.5
11.757327	---	39.08	50.00	10.92	L1	OFF	20.5
11.757327	54.46	---	60.00	5.54	L1	OFF	20.5
12.076512	---	40.76	50.00	9.24	L1	OFF	20.5
12.076512	56.20	---	60.00	3.80	L1	OFF	20.5
12.202467	---	41.42	50.00	8.58	L1	OFF	20.5
12.202467	57.63	---	60.00	2.37	L1	OFF	20.5
12.330249	---	40.33	50.00	9.67	L1	OFF	20.5
12.330249	56.76	---	60.00	3.24	L1	OFF	20.5
12.460146	---	40.19	50.00	9.81	L1	OFF	20.5
12.460146	57.23	---	60.00	2.77	L1	OFF	20.5
12.588018	---	41.57	50.00	8.43	L1	OFF	20.5
12.588018	58.86	---	60.00	1.14	L1	OFF	20.5
12.713964	---	41.05	50.00	8.95	L1	OFF	20.5
12.713964	58.47	---	60.00	1.53	L1	OFF	20.5
12.842673	---	38.53	50.00	11.47	L1	OFF	20.5
12.842673	55.61	---	60.00	4.39	L1	OFF	20.5
12.972660	---	34.11	50.00	15.89	L1	OFF	20.5
12.972660	52.19	---	60.00	7.81	L1	OFF	20.5
13.159545	---	34.62	50.00	15.38	L1	OFF	20.5
13.159545	49.67	---	60.00	10.33	L1	OFF	20.5
14.170533	---	30.52	50.00	19.48	L1	OFF	20.5
14.170533	39.59	---	60.00	20.41	L1	OFF	20.5
14.631153	---	35.54	50.00	14.46	L1	OFF	20.5
14.631153	48.51	---	60.00	11.49	L1	OFF	20.5
15.134748	---	38.48	50.00	11.52	L1	OFF	20.5
15.134748	53.09	---	60.00	6.91	L1	OFF	20.5
15.265356	---	39.65	50.00	10.35	L1	OFF	20.5
15.265356	54.05	---	60.00	5.95	L1	OFF	20.5
15.389745	---	37.70	50.00	12.30	L1	OFF	20.5
15.389745	50.23	---	60.00	9.77	L1	OFF	20.5

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
15.515439	---	36.76	50.00	13.24	L1	OFF	20.5
15.515439	53.49	---	60.00	6.51	L1	OFF	20.5
15.644922	---	40.28	50.00	9.72	L1	OFF	20.5
15.644922	54.33	---	60.00	5.67	L1	OFF	20.5
15.975078	---	36.86	50.00	13.14	L1	OFF	20.5
15.975078	51.62	---	60.00	8.38	L1	OFF	20.5
16.100493	---	39.15	50.00	10.85	L1	OFF	20.5
16.100493	54.58	---	60.00	5.42	L1	OFF	20.5
16.230003	---	39.04	50.00	10.96	L1	OFF	20.5
16.230003	54.66	---	60.00	5.34	L1	OFF	20.5
16.355562	---	39.94	50.00	10.06	L1	OFF	20.5
16.355562	54.95	---	60.00	5.05	L1	OFF	20.5
16.482138	---	39.64	50.00	10.36	L1	OFF	20.5
16.482138	54.61	---	60.00	5.39	L1	OFF	20.5
16.610973	---	38.24	50.00	11.76	L1	OFF	20.5
16.610973	54.10	---	60.00	5.90	L1	OFF	20.5
17.060010	---	32.99	50.00	17.01	L1	OFF	20.5
17.060010	48.59	---	60.00	11.41	L1	OFF	20.5

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Project	210727003
Mode	2

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.253329	---	48.39	51.65	3.26	N	OFF	20.3
0.253329	49.32	---	61.65	12.33	N	OFF	20.3
0.506409	---	41.54	46.00	4.46	N	OFF	20.3
0.506409	45.45	---	56.00	10.55	N	OFF	20.3
0.548565	---	34.86	46.00	11.14	N	OFF	20.3
0.548565	42.54	---	56.00	13.46	N	OFF	20.3
1.298085	---	35.29	46.00	10.71	N	OFF	20.3
1.298085	40.21	---	56.00	15.79	N	OFF	20.3
1.341951	---	35.85	46.00	10.15	N	OFF	20.3
1.341951	40.81	---	56.00	15.19	N	OFF	20.3
1.439997	---	36.44	46.00	9.56	N	OFF	20.3
1.439997	40.36	---	56.00	15.64	N	OFF	20.3
8.944080	---	37.03	50.00	12.97	N	OFF	20.4
8.944080	53.11	---	60.00	6.89	N	OFF	20.4
9.198969	---	40.51	50.00	9.49	N	OFF	20.4
9.198969	55.47	---	60.00	4.53	N	OFF	20.4
9.446181	---	38.47	50.00	11.53	N	OFF	20.4
9.446181	55.17	---	60.00	4.83	N	OFF	20.4
9.635109	---	38.42	50.00	11.58	N	OFF	20.4
9.635109	57.25	---	60.00	2.75	N	OFF	20.4
9.764367	---	39.40	50.00	10.60	N	OFF	20.4

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
9.764367	57.04	---	60.00	2.96	N	OFF	20.4
9.834126	---	43.32	50.00	6.68	N	OFF	20.4
9.834126	58.71	---	60.00	1.29	N	OFF	20.4
9.890898	---	40.93	50.00	9.07	N	OFF	20.4
9.890898	58.28	---	60.00	1.72	N	OFF	20.4
9.952026	---	31.24	50.00	18.76	N	OFF	20.4
9.952026	44.06	---	60.00	15.94	N	OFF	20.4
10.093776	---	39.40	50.00	10.60	N	OFF	20.5
10.093776	57.06	---	60.00	2.94	N	OFF	20.5
10.415238	---	41.36	50.00	8.64	N	OFF	20.5
10.415238	55.97	---	60.00	4.03	N	OFF	20.5
10.671594	---	37.80	50.00	12.20	N	OFF	20.5
10.671594	55.36	---	60.00	4.64	N	OFF	20.5
10.988844	---	40.17	50.00	9.83	N	OFF	20.5
10.988844	54.30	---	60.00	5.70	N	OFF	20.5
12.203457	---	37.68	50.00	12.32	N	OFF	20.5
12.203457	54.63	---	60.00	5.37	N	OFF	20.5
12.391179	---	39.05	50.00	10.95	N	OFF	20.5
12.391179	52.22	---	60.00	7.78	N	OFF	20.5
12.459867	---	35.29	50.00	14.71	N	OFF	20.5
12.459867	52.98	---	60.00	7.02	N	OFF	20.5
12.522813	---	40.57	50.00	9.43	N	OFF	20.5
12.522813	58.31	---	60.00	1.69	N	OFF	20.5
12.584679	---	39.56	50.00	10.44	N	OFF	20.5
12.584679	56.99	---	60.00	3.01	N	OFF	20.5
12.652035	---	35.68	50.00	14.32	N	OFF	20.5
12.652035	50.24	---	60.00	9.76	N	OFF	20.5
12.777594	---	38.49	50.00	11.51	N	OFF	20.5
12.777594	57.27	---	60.00	2.73	N	OFF	20.5
14.424414	---	32.85	50.00	17.15	N	OFF	20.5
14.424414	45.51	---	60.00	14.49	N	OFF	20.5
14.544141	---	32.76	50.00	17.24	N	OFF	20.5
14.544141	46.75	---	60.00	13.25	N	OFF	20.5
15.125820	---	33.78	50.00	16.22	N	OFF	20.5
15.125820	47.86	---	60.00	12.14	N	OFF	20.5
15.254988	---	35.78	50.00	14.22	N	OFF	20.5
15.254988	51.81	---	60.00	8.19	N	OFF	20.5
15.514413	---	34.85	50.00	15.15	N	OFF	20.5
15.514413	50.54	---	60.00	9.46	N	OFF	20.5
16.035909	---	35.74	50.00	14.26	N	OFF	20.5
16.035909	51.96	---	60.00	8.04	N	OFF	20.5
16.164987	---	37.06	50.00	12.94	N	OFF	20.5
16.164987	54.43	---	60.00	5.57	N	OFF	20.5
16.356714	---	32.05	50.00	17.95	N	OFF	20.5
16.356714	49.72	---	60.00	10.28	N	OFF	20.5
16.479564	---	31.70	50.00	18.30	N	OFF	20.5
16.479564	51.31	---	60.00	8.69	N	OFF	20.5

Appendix C. Radiated Spurious Emission

Test Engineer :	Michael Bui	**Temperature :**	20~24°C
		Relative Humidity :	42~48%

<1Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

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)
BLE CH 00 2402MHz		2331.315	55.59	-18.41	74	41.71	27.87	17.32	31.31	119	154	P	H
		2376.045	46.23	-7.77	54	32.4	27.71	17.41	31.29	119	153	A	H
	*	2402	101.89	-	-	88.05	27.66	17.45	31.27	119	153	P	H
	*	2402	101.43	-	-	87.59	27.66	17.45	31.27	119	153	A	H
													H
													H
		2322.705	55.37	-18.63	74	41.46	27.92	17.31	31.32	105	350	P	V
		2375.94	46.18	-7.82	54	32.23	27.83	17.41	31.29	105	350	A	V
	*	2402	100.59	-	-	86.67	27.74	17.45	31.27	105	350	P	V
	*	2402	100.1	-	-	86.18	27.74	17.45	31.27	105	350	A	V
													V
													V
BLE CH 19 2440MHz		2314	56.18	-17.82	74	42.25	27.96	17.29	31.32	100	164	P	H
		2376.08	45.4	-8.6	54	31.57	27.71	17.41	31.29	100	164	A	H
	*	2440	103.07	-	-	89.16	27.66	17.51	31.26	100	164	P	H
	*	2440	102.63	-	-	88.72	27.66	17.51	31.26	100	164	A	H
		2492	55.59	-18.41	74	41.61	27.62	17.59	31.23	100	164	P	H
		2498.8	45.4	-8.6	54	31.42	27.61	17.6	31.23	100	164	A	H
		2366.96	55.33	-18.67	74	41.38	27.86	17.39	31.3	102	341	P	V
		2376.24	45.91	-8.09	54	31.96	27.83	17.41	31.29	102	341	A	V
	*	2440	101.15	-	-	87.31	27.59	17.51	31.26	102	341	P	V
	*	2440	100.66	-	-	86.82	27.59	17.51	31.26	102	341	A	V
		2488.24	55.77	-18.23	74	41.93	27.5	17.58	31.24	102	341	P	V
		2496.4	45.48	-8.52	54	31.63	27.49	17.59	31.23	102	341	A	V

BLE CH 39 2480MHz	*	2480	102.15	-	-	88.19	27.63	17.57	31.24	106	160	P	H
	*	2480	101.72	-	-	87.76	27.63	17.57	31.24	106	160	A	H
		2483.56	55.58	-18.42	74	41.62	27.62	17.58	31.24	106	160	P	H
		2483.52	45.49	-8.51	54	31.53	27.62	17.58	31.24	106	160	A	H
													H
													H
	*	2480	98.21	-	-	84.37	27.51	17.57	31.24	100	331	P	V
	*	2480	97.73	-	-	83.89	27.51	17.57	31.24	100	331	A	V
		2497.52	54.98	-19.02	74	41.12	27.49	17.6	31.23	100	331	P	V
		2489.28	45.34	-8.66	54	31.5	27.5	17.58	31.24	100	331	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.
					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		4804	38.49	-35.51	74	63.67	31.51	11.18	67.88	-	-	P	H
		11910	49.82	-24.18	74	61.2	39.12	17.6	68.1	-	-	P	H
		11910	40.49	-13.51	54	51.87	39.12	17.6	68.1	-	-	A	H
		14490	50.71	-23.29	74	57.15	41.94	19.6	67.98	-	-	P	H
		14490	40.64	-13.36	54	47.08	41.94	19.6	67.98	-	-	A	H
		18000	59.14	-14.86	74	57.6	48.82	22.44	69.72	-	-	P	H
		18000	48.93	-5.07	54	47.39	48.82	22.44	69.72	-	-	A	H
													H
													H
													H
													H
													H
		4804	38.91	-35.09	74	64.06	31.54	11.18	67.88	-	-	P	V
		11370	48.64	-25.36	74	59.79	39.87	17.14	68.16	-	-	P	V
		11370	38.4	-15.6	54	49.55	39.87	17.14	68.16	-	-	A	V
		14490	50.2	-23.8	74	56.64	41.94	19.6	67.98	-	-	P	V
		14490	40.43	-13.57	54	46.87	41.94	19.6	67.98	-	-	A	V
		18000	59.54	-14.46	74	57.78	49.04	22.44	69.72	-	-	P	V
		18000	48.8	-5.2	54	47.04	49.04	22.44	69.72	-	-	A	V
													V
													V
													V
													V
													V

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)
BLE CH 19 2440MHz		4880	39.62	-34.38	74	64.74	31.45	11.35	67.92	-	-	P	H
		7320	43.74	-30.26	74	60.7	36.33	13.78	67.07	-	-	P	H
		11430	48.84	-25.16	74	59.52	40.07	17.2	67.95	-	-	P	H
		11430	38.58	-15.42	54	49.26	40.07	17.2	67.95	-	-	A	H
		14490	50.62	-23.38	74	57.06	41.94	19.6	67.98	-	-	P	H
		14490	41.53	-12.47	54	47.97	41.94	19.6	67.98	-	-	A	H
		17985	59.28	-14.72	74	58.32	48.43	22.43	69.9	-	-	P	H
		17985	49.93	-4.07	54	48.97	48.43	22.43	69.9	-	-	A	H
													H
													H
													H
													H
		4880	38.64	-35.36	74	63.83	31.38	11.35	67.92	-	-	P	V
		7320	43.22	-30.78	74	60.11	36.4	13.78	67.07	-	-	P	V
		11715	48.73	-25.27	74	59.62	39.39	17.43	67.71	-	-	P	V
		11715	38.96	-15.04	54	49.85	39.39	17.43	67.71	-	-	A	V
		14490	50.56	-23.44	74	57	41.94	19.6	67.98	-	-	P	V
		14490	40.38	-13.62	54	46.82	41.94	19.6	67.98	-	-	A	V
		17985	59.79	-14.21	74	58.56	48.7	22.43	69.9	-	-	P	V
		17985	49.83	-4.17	54	48.6	48.7	22.43	69.9	-	-	A	V
													V
													V
													V
													V

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)
BLE CH 39 2480MHz		4960	39.26	-34.74	74	64.3	31.51	11.51	68.06	-	-	P	H
		7440	43.89	-30.11	74	60.72	36.49	13.91	67.23	-	-	P	H
		11490	49.02	-24.98	74	59.35	40.16	17.25	67.74	-	-	P	H
		11490	39.48	-14.52	54	49.81	40.16	17.25	67.74	-	-	A	H
		14490	50.99	-23.01	74	57.43	41.94	19.6	67.98	-	-	P	H
		14490	41.47	-12.53	54	47.91	41.94	19.6	67.98	-	-	A	H
		18000	59.33	-14.67	74	57.79	48.82	22.44	69.72	-	-	P	H
		18000	48.67	-5.33	54	47.13	48.82	22.44	69.72	-	-	A	H
													H
													H
													H
													H
		4960	39.91	-34.09	74	65	31.46	11.51	68.06	-	-	P	V
		7440	43.59	-30.41	74	60.44	36.47	13.91	67.23	-	-	P	V
		11370	49.4	-24.6	74	60.55	39.87	17.14	68.16	-	-	P	V
		11370	39.25	-14.75	54	50.4	39.87	17.14	68.16	-	-	A	V
		14490	51.04	-22.96	74	57.48	41.94	19.6	67.98	-	-	P	V
		14490	41.25	-12.75	54	47.69	41.94	19.6	67.98	-	-	A	V
		18000	59.15	-14.85	74	57.39	49.04	22.44	69.72	-	-	P	V
		18000	49.38	-4.62	54	47.62	49.04	22.44	69.72	-	-	A	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	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)
BLE CH 00 2402MHz		2344.65	55.02	-18.98	74	41.18	27.8	17.35	31.31	302	169	P	H
		2376.15	47.38	-6.62	54	33.55	27.71	17.41	31.29	302	169	A	H
	*	2402	93.92	-	-	80.08	27.66	17.45	31.27	302	169	P	H
	*	2402	92.34	-	-	78.5	27.66	17.45	31.27	302	169	A	H
													H
													H
		2371.215	55.72	-18.28	74	41.77	27.84	17.4	31.29	385	360	P	V
		2376.045	47.11	-6.89	54	33.16	27.83	17.41	31.29	385	360	A	V
	*	2402	90.29	-	-	76.37	27.74	17.45	31.27	385	360	P	V
	*	2402	88.72	-	-	74.8	27.74	17.45	31.27	385	360	A	V
													V
													V
BLE CH 19 2440MHz		2376.4	55.33	-18.67	74	41.5	27.71	17.41	31.29	300	168	P	H
		2376.08	47.63	-6.37	54	33.8	27.71	17.41	31.29	300	168	A	H
	*	2440	92.89	-	-	78.98	27.66	17.51	31.26	300	168	P	H
	*	2440	91.36	-	-	77.45	27.66	17.51	31.26	300	168	A	H
		2491.36	55.85	-18.15	74	41.87	27.62	17.59	31.23	300	168	P	H
		2490.64	45.05	-8.95	54	31.07	27.62	17.59	31.23	300	168	A	H
		2365.2	55.06	-18.94	74	41.11	27.86	17.39	31.3	339	360	P	V
		2376.08	46.45	-7.55	54	32.5	27.83	17.41	31.29	339	360	A	V
	*	2440	90.72	-	-	76.88	27.59	17.51	31.26	339	360	P	V
	*	2440	89.14	-	-	75.3	27.59	17.51	31.26	339	360	A	V
		2493.04	55.6	-18.4	74	41.74	27.5	17.59	31.23	339	360	P	V
		2494.64	44.98	-9.02	54	31.13	27.49	17.59	31.23	339	360	A	V

BLE CH 39 2480MHz	*	2480	102.58	-	-	88.62	27.63	17.57	31.24	109	165	P	H
	*	2480	101.02	-	-	87.06	27.63	17.57	31.24	109	165	A	H
		2484.88	55.28	-18.72	74	41.32	27.62	17.58	31.24	109	165	P	H
		2483.52	45.38	-8.62	54	31.42	27.62	17.58	31.24	109	165	A	H
													H
													H
	*	2480	99.51	-	-	85.67	27.51	17.57	31.24	100	332	P	V
	*	2480	97.88	-	-	84.04	27.51	17.57	31.24	100	332	A	V
		2496.6	55.67	-18.33	74	41.81	27.49	17.6	31.23	100	332	P	V
		2499.6	44.84	-9.16	54	30.98	27.49	17.6	31.23	100	332	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.
					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		4804	39.35	-34.65	74	64.53	31.51	11.19	67.88	-	-	P	H
		11520	48.92	-25.08	74	59.21	40.13	17.27	67.69	-	-	P	H
		11520	38.54	-15.46	54	48.83	40.13	17.27	67.69	-	-	A	H
		14490	51.11	-22.89	74	57.55	41.94	19.6	67.98	-	-	P	H
		14490	40.8	-13.2	54	47.24	41.94	19.6	67.98	-	-	A	H
		18000	59.66	-14.34	74	58.12	48.82	22.44	69.72	-	-	P	H
		18000	49.92	-4.08	54	48.38	48.82	22.44	69.72	-	-	A	H
													H
													H
													H
													H
													H
		4804	39.31	-34.69	74	64.46	31.54	11.19	67.88	-	-	P	V
		11535	48.7	-25.3	74	59.03	40.05	17.29	67.67	-	-	P	V
		11535	38.05	-15.95	54	48.38	40.05	17.29	67.67	-	-	A	V
		14490	50.74	-23.26	74	57.18	41.94	19.6	67.98	-	-	P	V
		14490	40.95	-13.05	54	47.39	41.94	19.6	67.98	-	-	A	V
		17970	59.25	-14.75	74	58.55	48.36	22.41	70.07	-	-	P	V
		17970	49	-5	54	48.3	48.36	22.41	70.07	-	-	A	V
													V
													V
													V
													V
													V

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)
BLE CH 19 2440MHz		4880	38.8	-35.2	74	63.92	31.45	11.35	67.92	-	-	P	H
		7320	43.11	-30.89	74	60.07	36.33	13.78	67.07	-	-	P	H
		11010	49.14	-24.86	74	60.38	40.14	16.84	68.22	-	-	P	H
		11010	38.94	-15.06	54	50.18	40.14	16.84	68.22	-	-	A	H
		14490	50.13	-23.87	74	56.57	41.94	19.6	67.98	-	-	P	H
		14490	39.88	-14.12	54	46.32	41.94	19.6	67.98	-	-	A	H
		18000	59.66	-14.34	74	58.12	48.82	22.44	69.72	-	-	P	H
		18000	49.93	-4.07	54	48.39	48.82	22.44	69.72	-	-	A	H
													H
													H
													H
													H
		4880	38.63	-35.37	74	63.82	31.38	11.35	67.92	-	-	P	V
		7320	43.75	-30.25	74	60.64	36.4	13.78	67.07	-	-	P	V
		11430	48.98	-25.02	74	59.72	40.01	17.2	67.95	-	-	P	V
		11430	39.05	-14.95	54	49.79	40.01	17.2	67.95	-	-	A	V
		14490	51.88	-22.12	74	58.32	41.94	19.6	67.98	-	-	P	V
		14490	42.46	-11.54	54	48.9	41.94	19.6	67.98	-	-	A	V
		17985	59.51	-14.49	74	58.28	48.7	22.43	69.9	-	-	P	V
		17985	49.37	-4.63	54	48.14	48.7	22.43	69.9	-	-	A	V
													V
													V
													V
													V

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)
BLE CH 39 2480MHz		4965	38.93	-35.07	74	63.97	31.52	11.52	68.08	-	-	P	H
		7440	43.9	-30.1	74	60.73	36.49	13.91	67.23	-	-	P	H
		11415	49.19	-24.81	74	59.97	40.04	17.18	68	-	-	P	H
		11415	38.36	-15.64	54	49.14	40.04	17.18	68	-	-	A	H
		14490	51.76	-22.24	74	58.2	41.94	19.6	67.98	-	-	P	H
		14490	42.27	-11.73	54	48.71	41.94	19.6	67.98	-	-	A	H
		18000	60.57	-13.43	74	59.03	48.82	22.44	69.72	-	-	P	H
		18000	50.76	-3.24	54	49.22	48.82	22.44	69.72	-	-	A	H
													H
													H
													H
													H
		4965	38.54	-35.46	74	63.55	31.5	11.52	68.03	-	-	P	V
		7440	43.15	-30.85	74	60.05	36.47	13.91	67.28	-	-	P	V
		11595	49.16	-24.84	74	59.34	39.97	17.34	67.49	-	-	P	V
		11595	39	-15	54	49.18	39.97	17.34	67.49	-	-	A	V
		14490	51.71	-22.29	74	57.91	41.94	19.6	67.74	-	-	P	V
		14490	41.49	-12.51	54	47.69	41.94	19.6	67.74	-	-	A	V
		18000	60.39	-13.61	74	58.33	49.04	22.44	69.42	-	-	P	V
		18000	50.62	-3.38	54	48.56	49.04	22.44	69.42	-	-	A	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)

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)
2.4GHz BLE SHF		24895	39.32	-34.68	74	35.89	39	16.34	51.91	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		24685	38.92	-35.08	74	35.72	38.95	16.13	51.88	-	-	P	V
													V
													V
													V
													V
													V
													V
													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.												

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		34.85	15	-25	40	23.79	22.68	0.97	32.44	100	71	Q	H
		43.58	12.7	-27.3	40	26.5	17.55	1.09	32.44	100	81	Q	H
		143.49	22.74	-20.76	43.5	35.64	17.6	1.9	32.4	-	-	P	H
		329.73	39.94	-6.06	46	49.51	19.99	2.89	32.45	101	65	Q	H
		445.16	35.62	-10.38	46	41.76	23	3.39	32.53	-	-	P	H
		742.95	39.82	-6.18	46	39.78	28.06	4.4	32.42	-	-	P	H
	*												H
													H
													H
													H
													H
													H
		34.85	31.85	-8.15	40	40.64	22.68	0.97	32.44	-	-	P	V
		171.62	20.59	-22.91	43.5	35.19	15.7	2.1	32.4	-	-	P	V
		330.7	36.54	-9.46	46	46.06	20.03	2.9	32.45	-	-	P	V
		437.4	34.58	-11.42	46	40.81	22.95	3.35	32.53	-	-	P	V
		753.62	37.52	-8.48	46	37.32	28.17	4.43	32.4	-	-	P	V
		891.36	38.62	-7.38	46	36.25	29.23	4.83	31.69	-	-	P	V
													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 and emission level has at least 6dB margin against limit or 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	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)
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. Margin(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. Margin(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. Margin(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

Test Engineer :	Michael Bui	**Temperature :**	20~24°C
		Relative Humidity :	42~48%

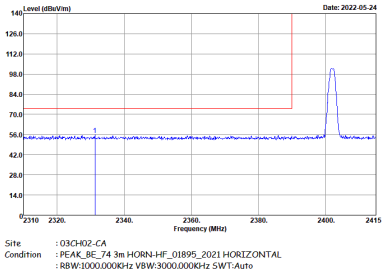
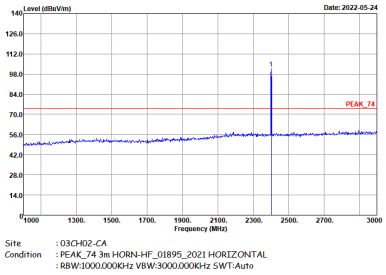
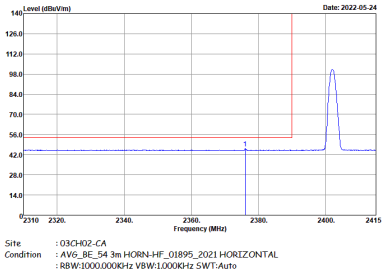
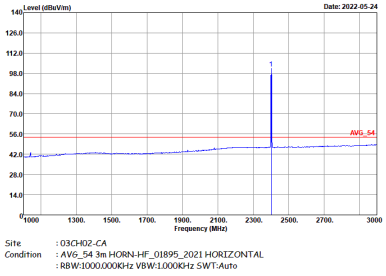
Note symbol

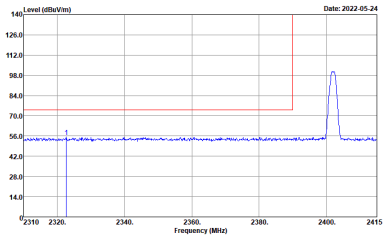
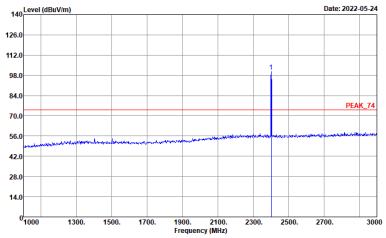
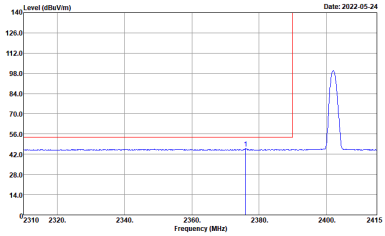
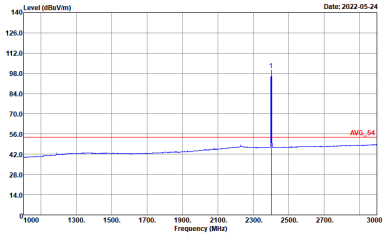
-L	**Low channel location**
-R	**High channel location**

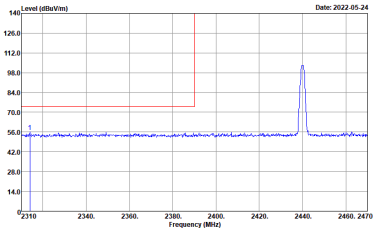
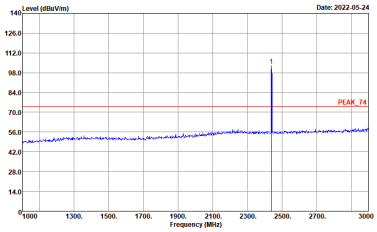
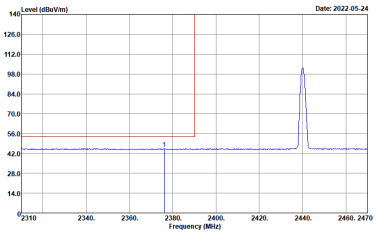
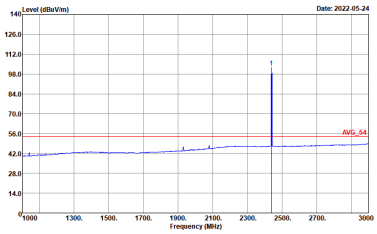
<1Mbps>

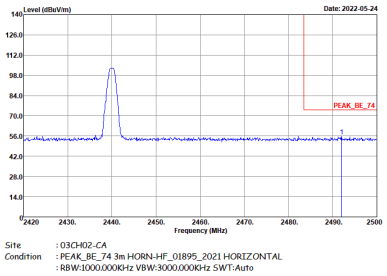
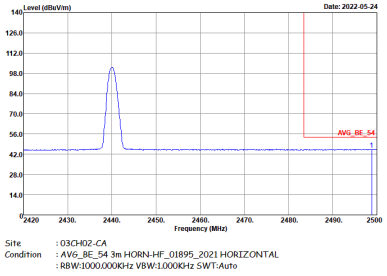
2.4GHz 2400~2483.5MHz

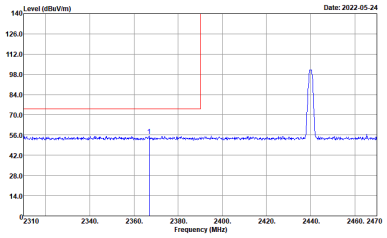
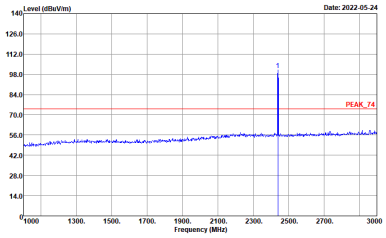
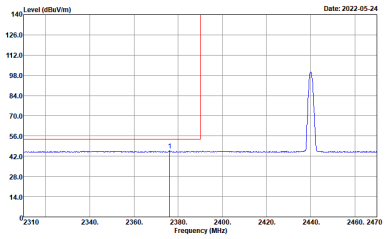
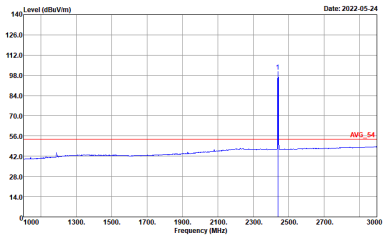
BLE (Band Edge @ 3m)

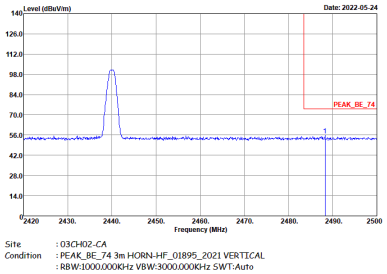
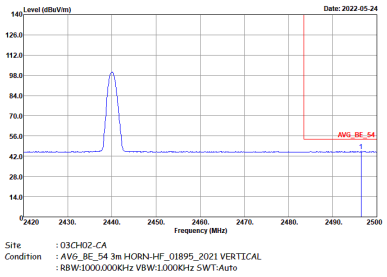
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak		
Avg.		

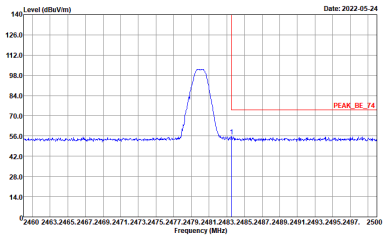
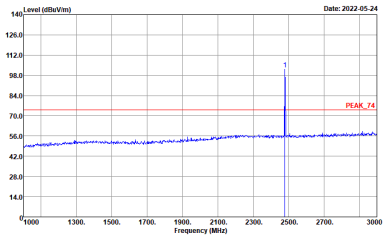
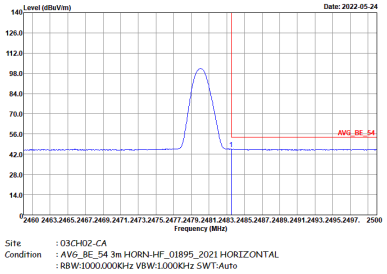
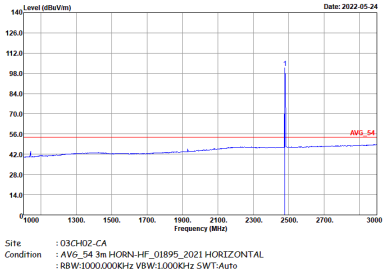
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak		
Avg		

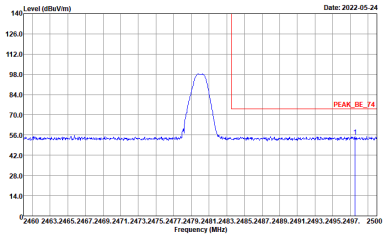
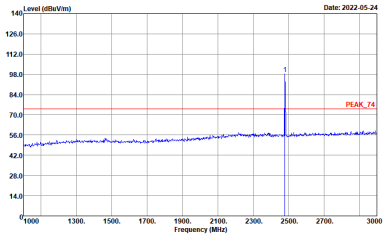
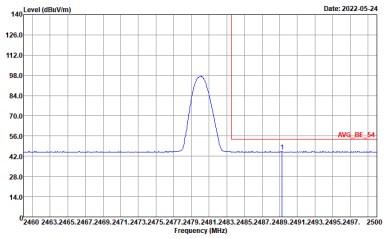
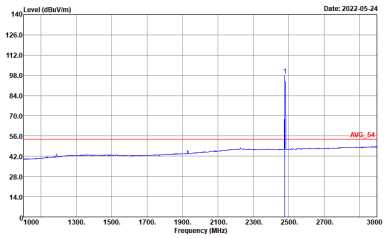
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Vertical	Fundamental
Peak		
Avg.		

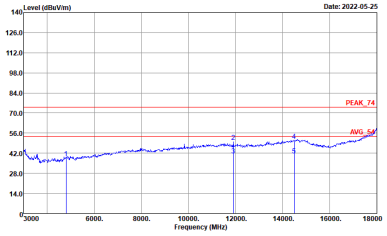
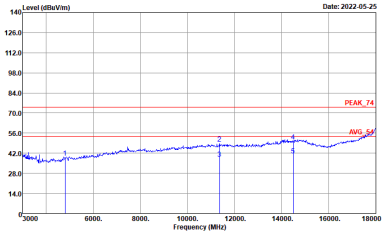
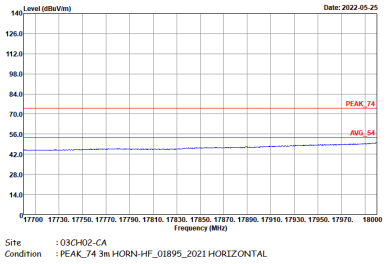
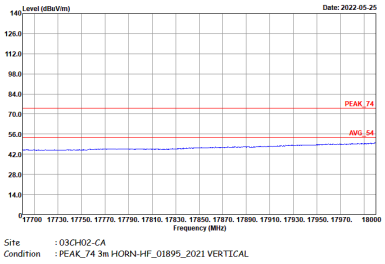
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

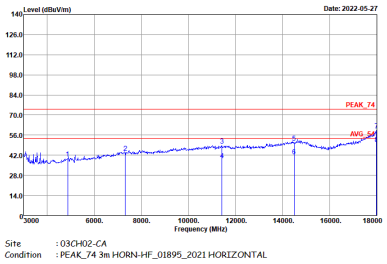
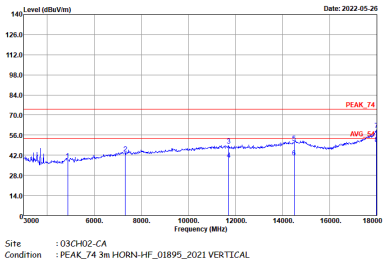
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak		
Avg.		

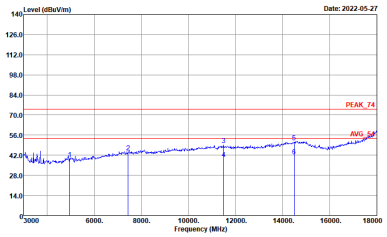
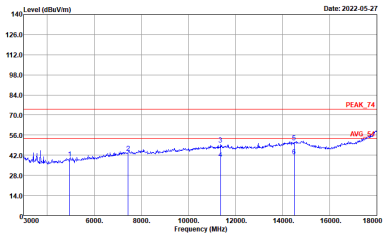
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak		
Avg		

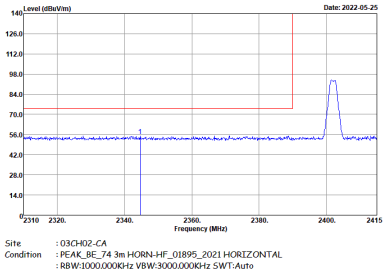
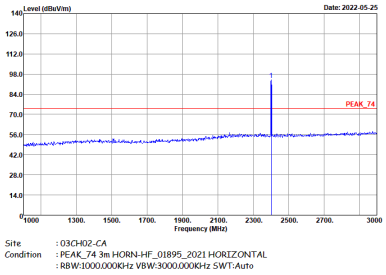
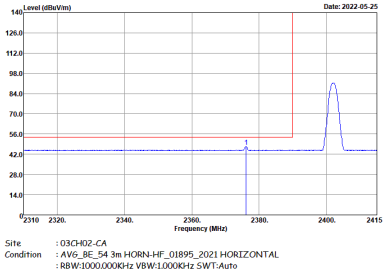
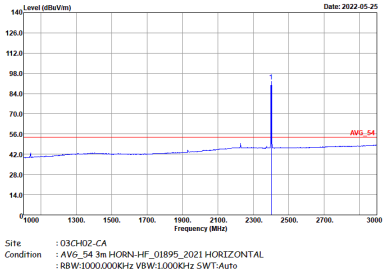
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.		

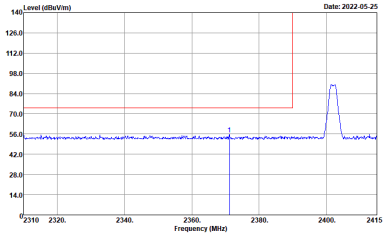
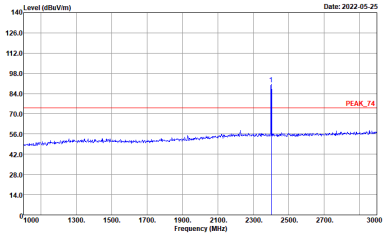
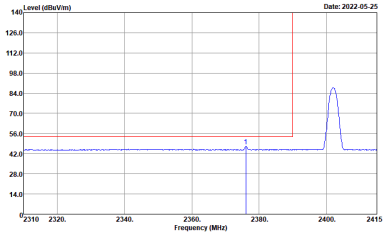
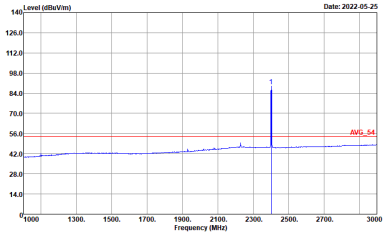
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak		

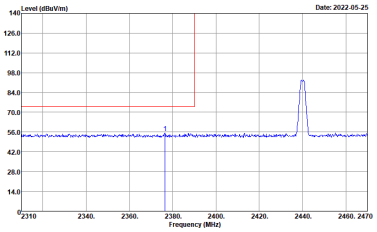
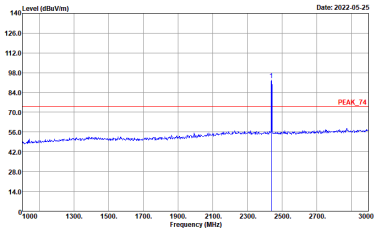
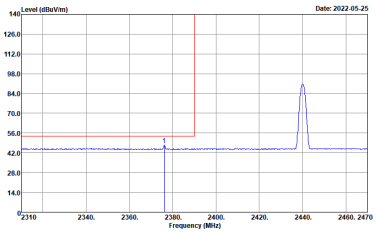
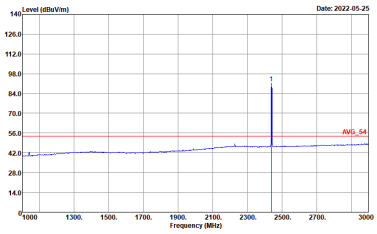
<2Mbps>

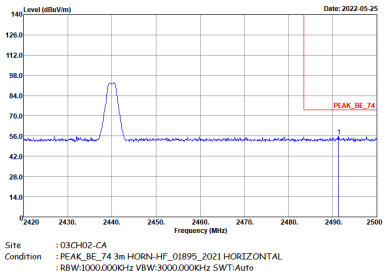
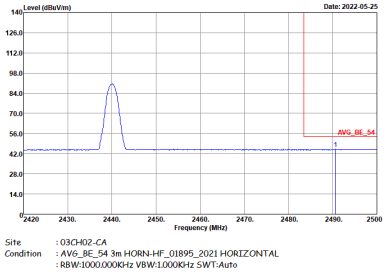
2.4GHz 2400~2483.5MHz

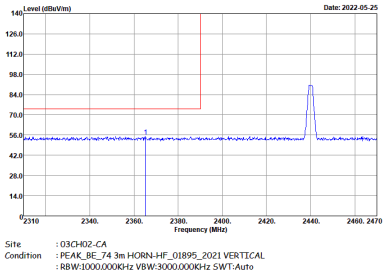
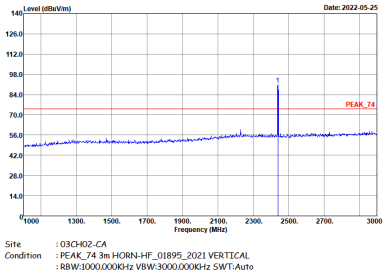
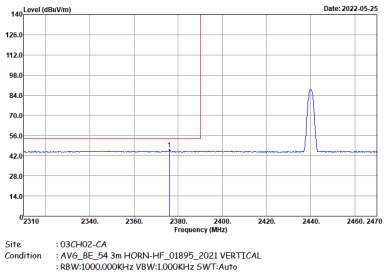
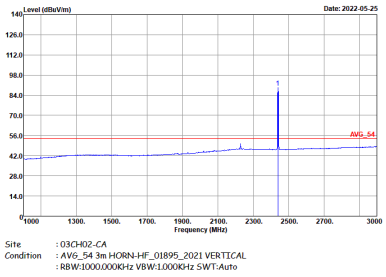
BLE (Band Edge @ 3m)

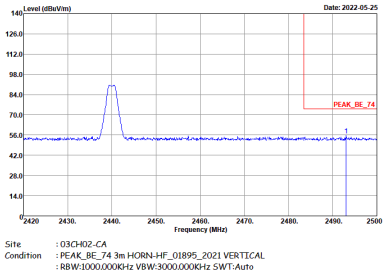
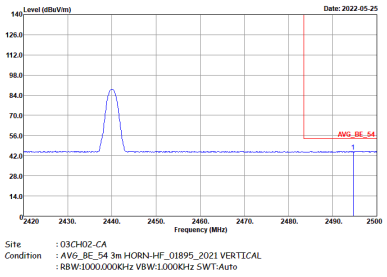
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak		
Avg.		

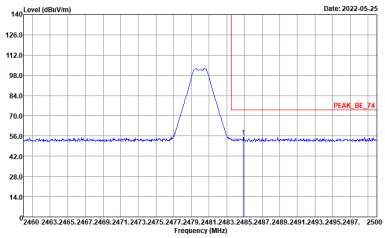
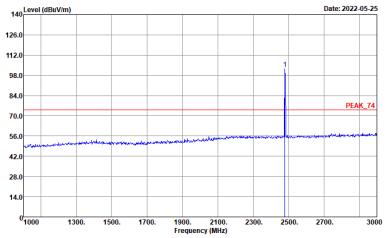
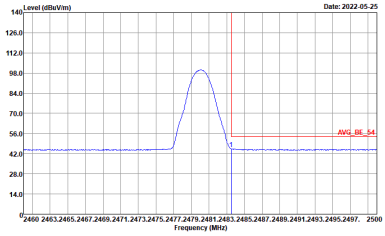
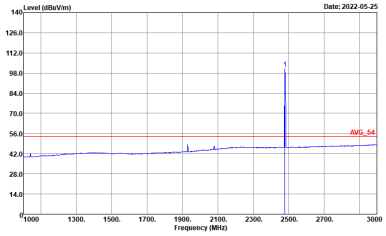
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak		
Avg		

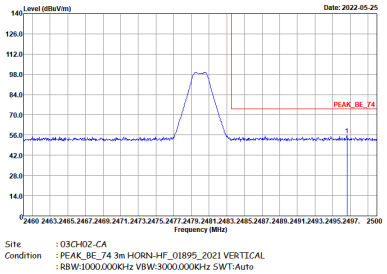
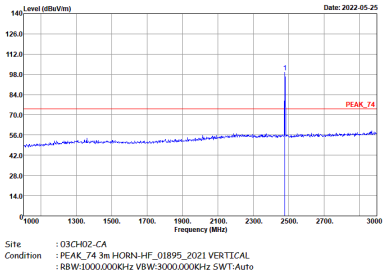
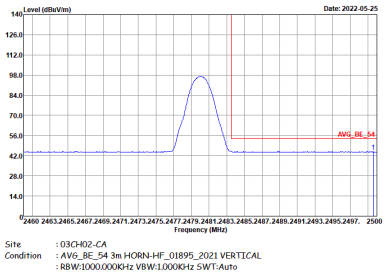
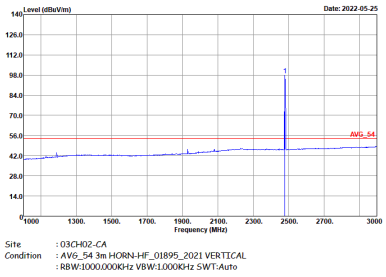
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Vertical	Fundamental
Peak		
Avg.		

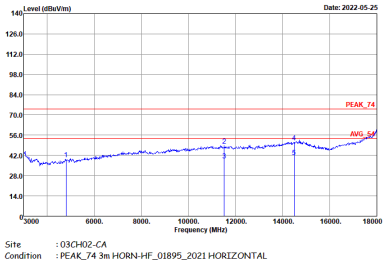
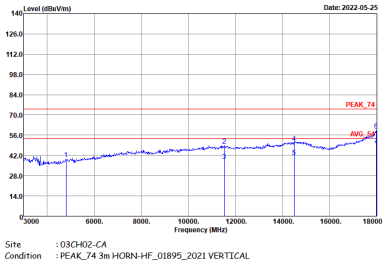
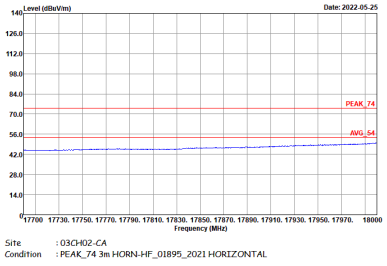
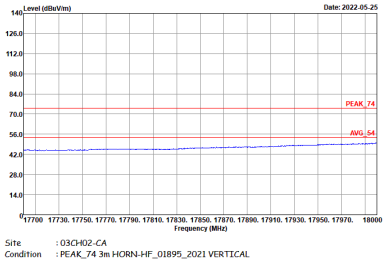
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

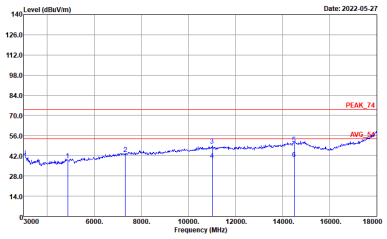
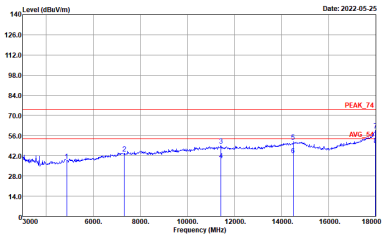
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak		
Avg.		

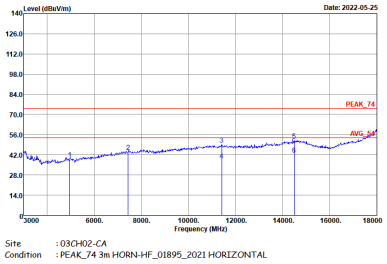
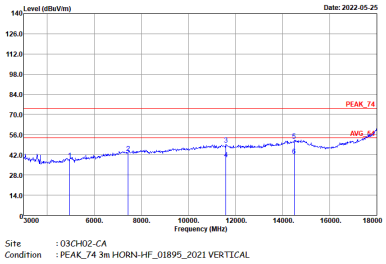
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak		
Avg.		

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

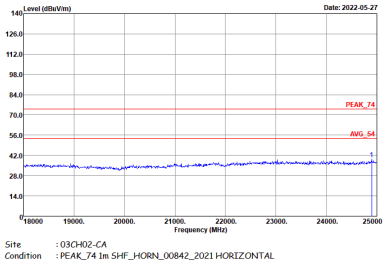
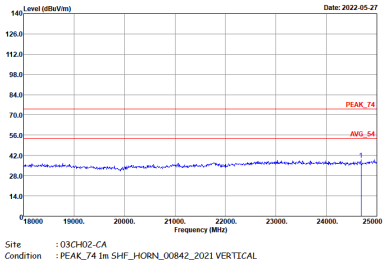
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak		
Avg		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL

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

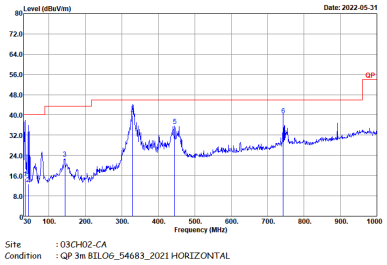
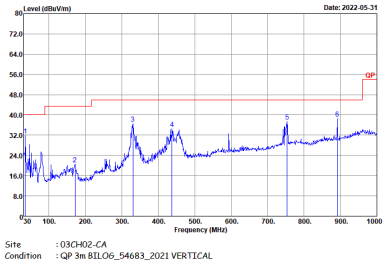
Emission above 18GHz

2.4GHz BLE (SHF @ 1m)

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

Emission below 1GHz

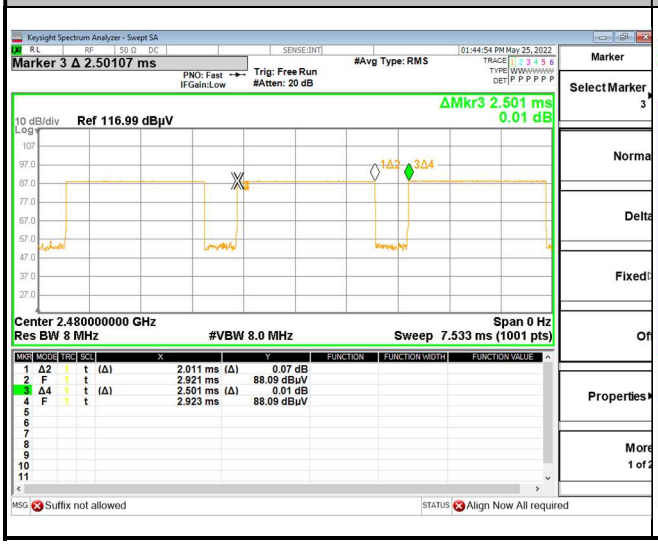
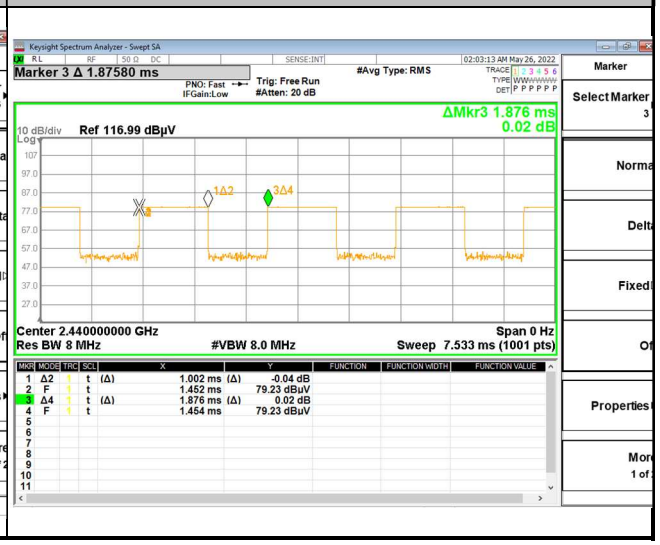
2.4GHz BLE (LF)

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

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth –LE for 1Mbps	80.41	2011	0.50	1kHz
Bluetooth –LE for 2Mbps	53.41	1002	1.00	1kHz

Bluetooth –LE for 1Mbps



Bluetooth –LE for 2Mbps