FCC RADIO TEST REPORT

FCC ID	:	TX2-RTL8822C
Equipment	:	Module
Brand Name	:	Realtek
Model Name	:	RTL8822C
Marketing Name	:	11a/b/g/n/ac RTL8822C Combo module
Applicant	:	Realtek Semiconductor Corp. No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Standard	:	FCC Part 15 Subpart C §15.247

The product was received on Sep. 01, 2022 and testing was performed from Sep. 26, 2022 to Oct. 26, 2022. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issue Date
FR290129B	01	Initial issue of report	Nov. 01, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	-	See Note
-	2.1049	99% Occupied Bandwidth	-	See Note
3.1	15.247(b)(3) 15.247(b)(4)	Output Power	Pass	-
-	15.247(e)	Power Spectral Density	-	See Note
-	15.247(d)	Conducted Band Edges and Spurious Emission	-	See Note
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	8.06 dB under the limit at 819.400 MHz
3.3	15.207	AC Conducted Emission	Pass	10.83 dB under the limit at 0.177 MHz
3.4	15.203	Antenna Requirement	Pass	-

Note: The module (Model: RTL8822C) makes no difference after verifying output power, this report reuses test data from the module report.

Declaration of Conformity:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to report "Uncertainty of Evaluation".
Comments and Explanations:
The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Keven Cheng

Report Producer: Doris Chen

1 General Description

1.1 Product Feature of Equipment Under Test

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

Product Feature	
Installed into the Host	Equipment Name: Steam Deck Brand Name: Valve Model Name: 1010
Sample 1	Host with INPAQ Antenna
Sample 2	Host with AWAN Antenna
Sample 3	Host with HTK Antenna
Antenna Type	WLAN **<Main>:** PIFA Antenna **<Aux.>:** PIFA Antenna Bluetooth: PIFA Antenna

Antenna Information		
INPAQ Antenna	**Antenna Type**	PIFA Antenna
	Part Number	DQ600015300 (WA-P-LE-02-153)
	Peak gain (dBi)	Main Antenna
		Bluetooth:1.38
AWAN Antenna	**Antenna Type**	PIFA Antenna
	Part Number	DQ610001400 (AEP6Y-100014)
	Peak gain (dBi)	Main Antenna
		Bluetooth:1.19
HTK Antenna	**Antenna Type**	PIFA Antenna
	Part Number	DQ60ACQD0E5 (0ACQD022049N)
	Peak gain (dBi)	Main Antenna
		Bluetooth: -0.44

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 Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	CO05-HY, 03CH07-HY

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

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	TH05-HY (TAF Code: 3786)
Remark	The RF Conducted Measurement test item subcontracted to Sporton International Inc. Wensan Laboratory.

FCC designation No.: TW1190 and TW3786

1.4 Applicable Standards

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

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

Remark:

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

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

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

2.2 Test Mode

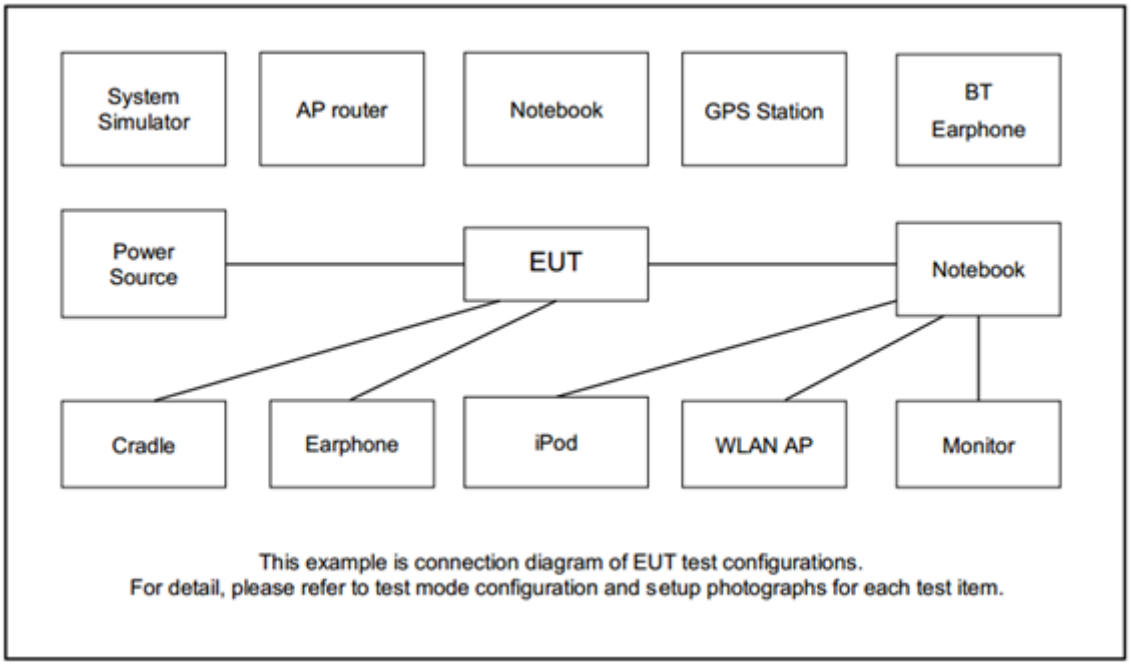
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental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

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

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

Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
Radiated Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: Bluetooth Link + WLAN(2.4GHz) Link + Adapter for Sample 1
Remark: For Radiated Test Cases, the tests were performed with Sample 1.	

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY700A2029	N/A	N/A
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
3.	Notebook	Dell	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “VTE version 0.60.3” was installed in Host which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

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

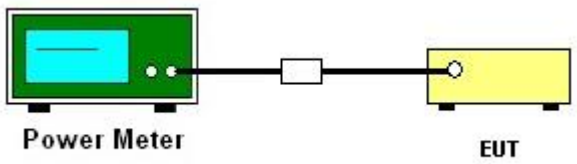
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator.
3. The path loss is compensated to the results for each measurement.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Average Output Power

Please refer to Appendix A.

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the 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

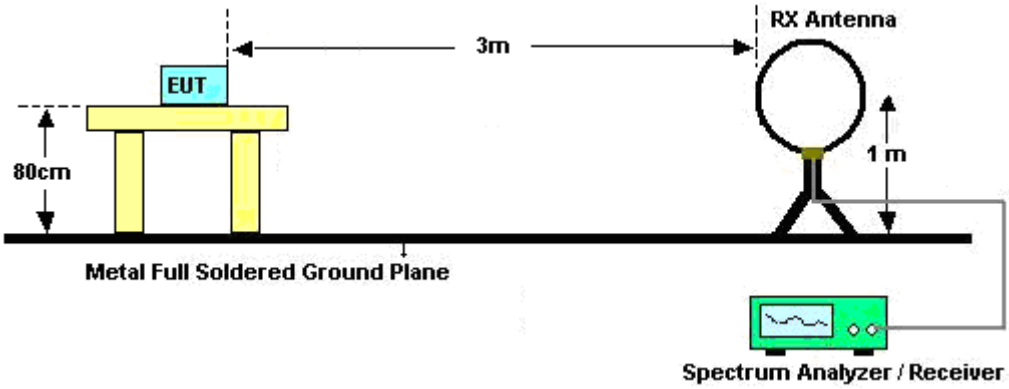
Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

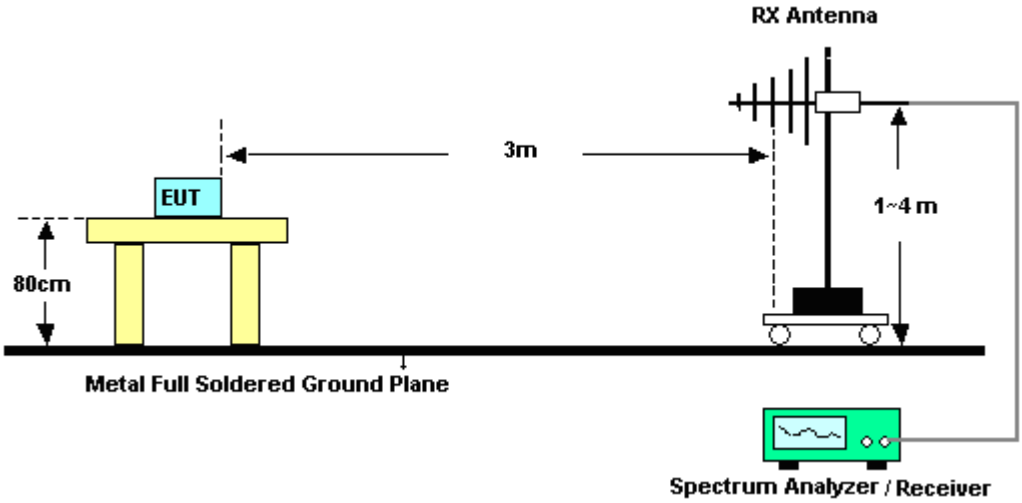
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the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

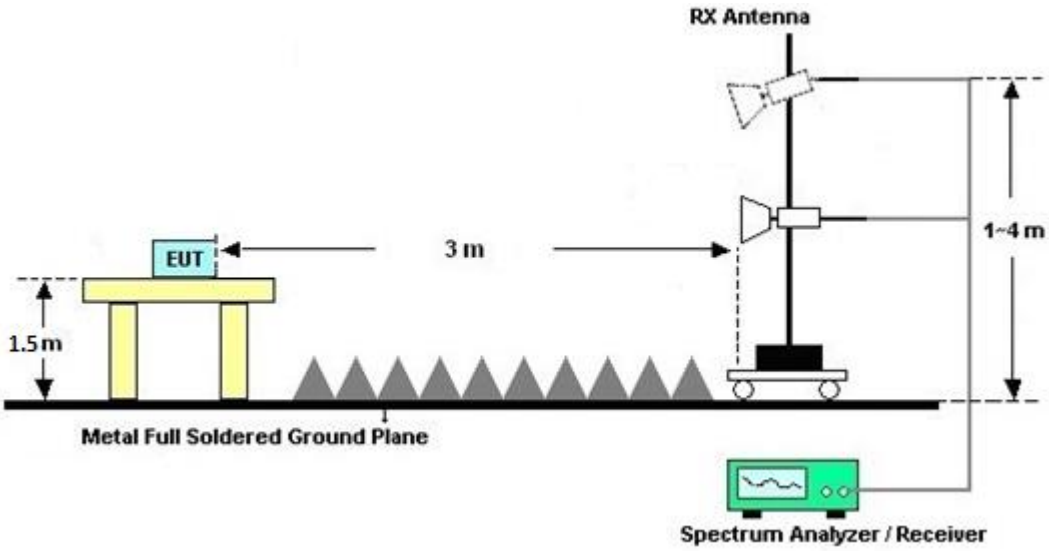
For radiated test below 30MHz



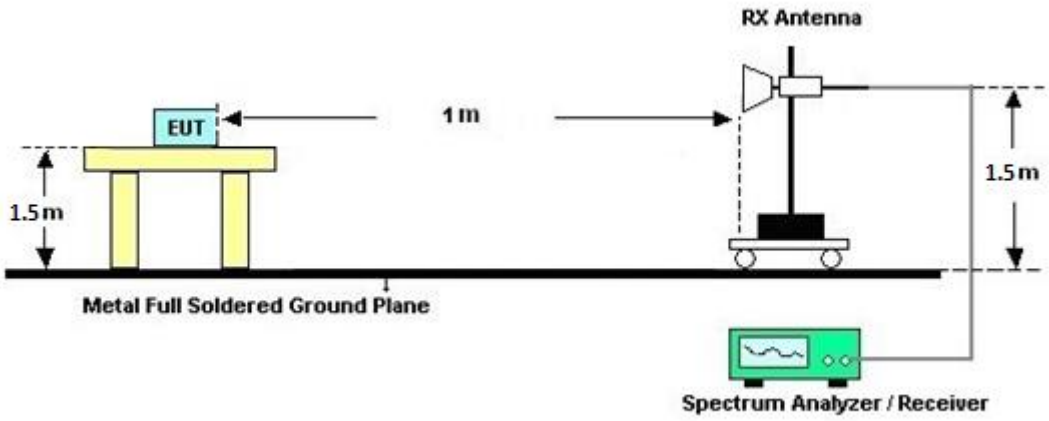
For radiated test from 30MHz to 1GHz



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 (30 MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (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.

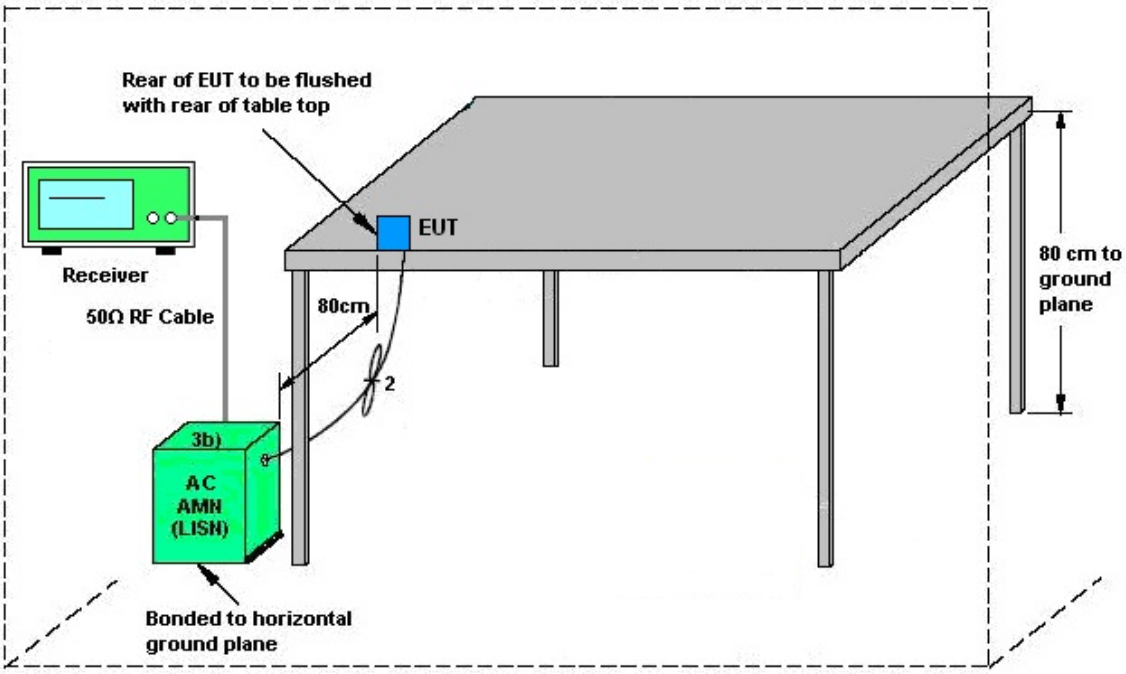
3.3.2 Measuring Instruments

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

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.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	35419 & 03	30MHz~1GHz	Apr. 24, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Apr. 23, 2023	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 03, 2021	Oct. 21, 2022 ~ Oct. 26, 2022	Dec. 02, 2022	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 07, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Jan. 06, 2023	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 21, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Apr. 20, 2023	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 03, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Oct. 02, 2023	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Oct. 03, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Oct. 02, 2023	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 21, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Jul. 20, 2023	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Jul. 22, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Jul. 21, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682/4	30MHz to 18GHz	Feb. 23, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4	9kHz to 18GHz	Feb. 23, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4	9kHz to 18GHz	Feb. 23, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/126E	30MHz~18GHz	Sep. 16, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Sep. 15, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2	18GHz~40GHz	Feb. 23, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Feb. 22, 2023	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Oct. 21, 2022 ~ Oct. 26, 2022	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Oct. 21, 2022 ~ Oct. 26, 2022	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Oct. 21, 2022 ~ Oct. 26, 2022	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Oct. 21, 2022 ~ Oct. 26, 2022	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Oct. 21, 2022 ~ Oct. 26, 2022	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 07, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	Mar. 06, 2023	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY53290053	20Hz~26.5GHz	May 27, 2022	Oct. 21, 2022 ~ Oct. 26, 2022	May 26, 2023	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Nov. 30, 2021	Oct. 21, 2022 ~ Oct. 26, 2022	Nov. 29, 2022	Radiation (03CH07-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Sep. 26, 2022	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2021	Sep. 26, 2022	Nov. 30, 2022	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2021	Sep. 26, 2022	Nov. 16, 2022	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 03, 2021	Sep. 26, 2022	Dec. 02, 2022	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Sep. 26, 2022	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Aug. 01, 2022	Sep. 26, 2022	Jul. 31, 2023	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 30, 2021	Sep. 26, 2022	Dec. 29, 2022	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Sep. 27, 2022~ Oct. 20, 2022	Nov. 15, 2022	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	15I00041SNO 10 (NO:248)	10MHz~6GHz	Dec. 29, 2021	Sep. 27, 2022~ Oct. 20, 2022	Dec. 28, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101905	10Hz - 40GHz	Aug. 03, 2022	Sep. 27, 2022~ Oct. 20, 2022	Aug. 02, 2023	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.1 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.5 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.5 dB

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2 dB

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

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

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Paul Lin	Temperature:	21~25	°C
Test Date:	2022/9/27-2022/10/20	Relative Humidity:	51~54	%

Remark: For Conducted Test Items, Ant. 1 means Chain 1 and Ant. 2 means Chain 0.

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	4.30
BLE	1Mbps	1	19	2440	4.10
BLE	1Mbps	1	39	2480	3.90

TEST RESULTS DATA
Average Power Table

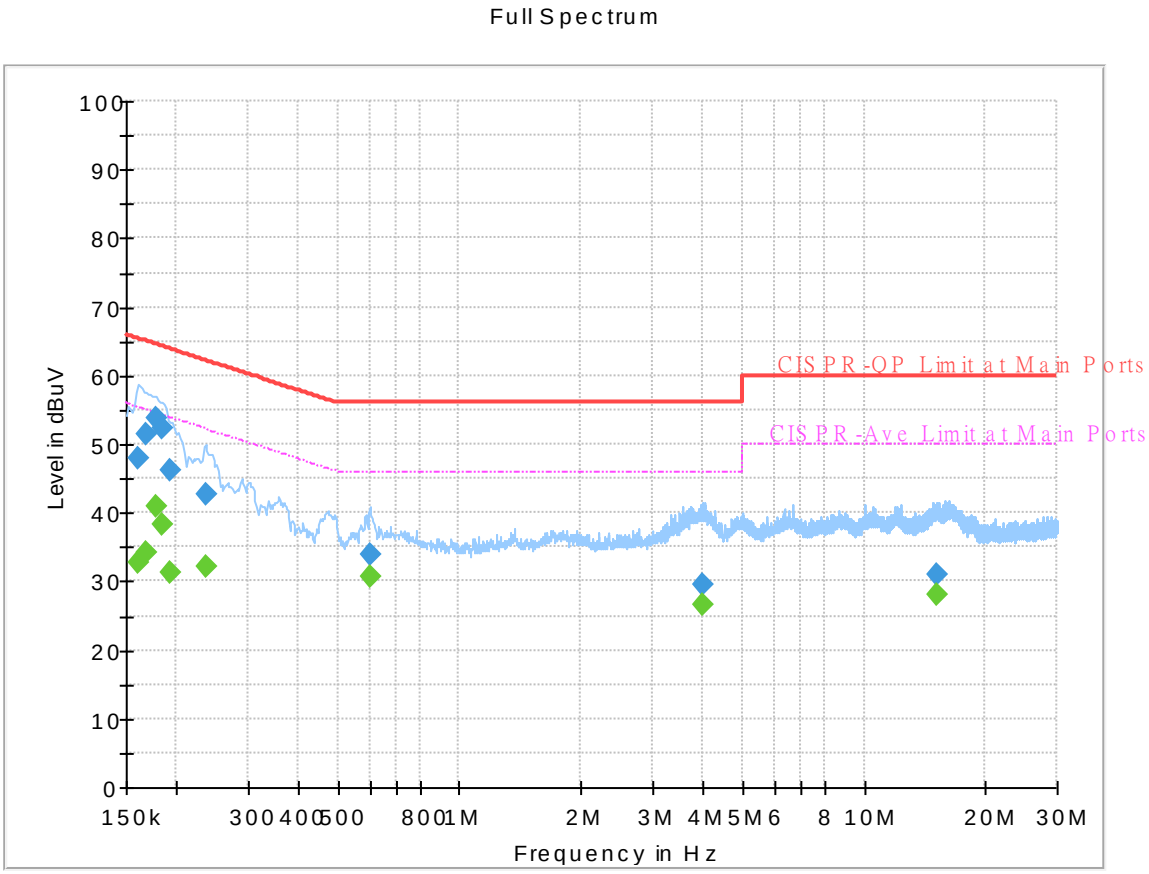
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Average Conducted Power (dBm)
BLE	2Mbps	1	1	2404	4.40
BLE	2Mbps	1	19	2440	4.10
BLE	2Mbps	1	38	2478	4.00

Appendix B. AC Conducted Emission Test Results

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

EUT Information

Report NO :	290129
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

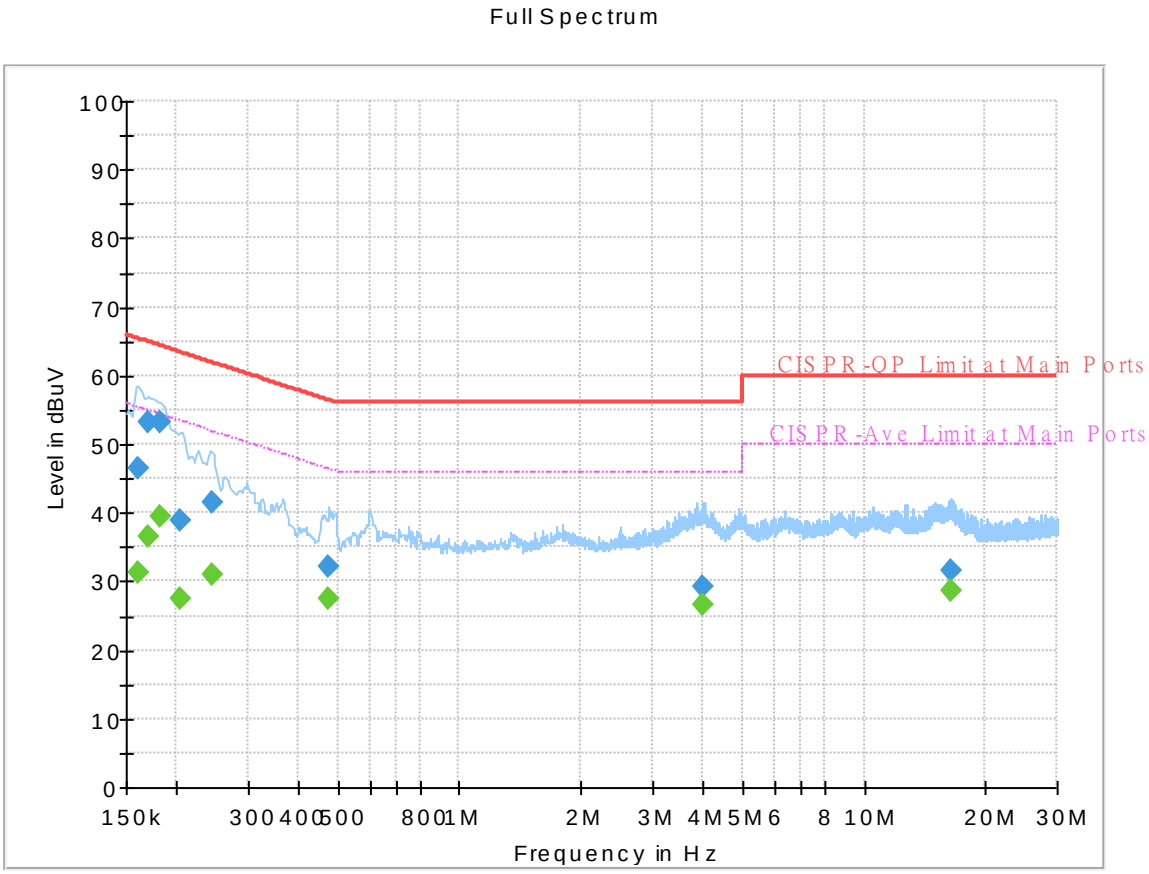


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161250	---	32.64	55.40	22.76	L1	OFF	19.8
0.161250	47.85	---	65.40	17.55	L1	OFF	19.8
0.168000	---	34.08	55.06	20.98	L1	OFF	19.8
0.168000	51.46	---	65.06	13.60	L1	OFF	19.8
0.177000	---	41.00	54.63	13.63	L1	OFF	19.8
0.177000	53.80	---	64.63	10.83	L1	OFF	19.8
0.183750	---	38.27	54.31	16.04	L1	OFF	19.8
0.183750	52.40	---	64.31	11.91	L1	OFF	19.8
0.192750	---	31.18	53.92	22.74	L1	OFF	19.8
0.192750	46.18	---	63.92	17.74	L1	OFF	19.8
0.235500	---	32.23	52.25	20.02	L1	OFF	19.8
0.235500	42.79	---	62.25	19.46	L1	OFF	19.8
0.600000	---	30.57	46.00	15.43	L1	OFF	19.8
0.600000	34.03	---	56.00	21.97	L1	OFF	19.8
4.004250	---	26.62	46.00	19.38	L1	OFF	20.0
4.004250	29.64	---	56.00	26.36	L1	OFF	20.0
15.060750	---	27.94	50.00	22.06	L1	OFF	20.4
15.060750	31.05	---	60.00	28.95	L1	OFF	20.4

EUT Information

Report NO :	290129
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161250	---	31.37	55.40	24.03	N	OFF	19.8
0.161250	46.39	---	65.40	19.01	N	OFF	19.8
0.170250	---	36.46	54.95	18.49	N	OFF	19.8
0.170250	53.15	---	64.95	11.80	N	OFF	19.8
0.181500	---	39.52	54.42	14.90	N	OFF	19.8
0.181500	53.20	---	64.42	11.22	N	OFF	19.8
0.204000	---	27.56	53.45	25.89	N	OFF	19.8
0.204000	38.87	---	63.45	24.58	N	OFF	19.8
0.244500	---	31.11	51.94	20.83	N	OFF	19.8
0.244500	41.50	---	61.94	20.44	N	OFF	19.8
0.476250	---	27.36	46.40	19.04	N	OFF	19.8
0.476250	32.24	---	56.40	24.16	N	OFF	19.8
3.988500	---	26.47	46.00	19.53	N	OFF	20.0
3.988500	29.11	---	56.00	26.89	N	OFF	20.0
16.311750	---	28.59	50.00	21.41	N	OFF	20.5
16.311750	31.70	---	60.00	28.30	N	OFF	20.5

Appendix C. Radiated Spurious Emission

Test Engineer :	Jesse Wang, Stan Hsieh, Ken Wu and Howard Huang	Temperature :	22.6~24.5°C
		Relative Humidity :	58.6~61.3%

Remark: For Radiated Spurious Emission Test Data, Ant. 1 means Chain 1 and Ant. 2 means Chain 0.

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2312.625	53.97	-20.03	74	39.53	31.55	18.21	35.32	118	228	P	H
		2333.73	44.73	-9.27	54	30.3	31.47	18.27	35.31	118	228	A	H
	*	2402	87.24	-	-	72.64	31.42	18.48	35.3	118	228	P	H
	*	2402	86.61	-	-	72.01	31.42	18.48	35.3	118	228	A	H
													H
													H
		2313.99	53.5	-20.5	74	39.06	31.54	18.22	35.32	300	297	P	V
		2324.7	44.72	-9.28	54	30.29	31.5	18.25	35.32	300	297	A	V
	*	2402	87.01	-	-	72.41	31.42	18.48	35.3	300	297	P	V
	*	2402	86.41	-	-	71.81	31.42	18.48	35.3	300	297	A	V
													V
													V

BLE CH 39 2480MHz	*	2480	89.43	-	-	74.19	32.04	18.6	35.4	115	234	P	H
	*	2480	88.91	-	-	73.67	32.04	18.6	35.4	115	234	A	H
		2492.84	54.08	-19.92	74	38.75	32.14	18.61	35.42	115	234	P	H
		2499.52	45.64	-8.36	54	30.24	32.2	18.63	35.43	115	234	A	H
													H
													H
	*	2480	89.38	-	-	74.14	32.04	18.6	35.4	362	296	P	V
	*	2480	88.82	-	-	73.58	32.04	18.6	35.4	362	296	A	V
		2490.68	54.85	-19.15	74	39.53	32.13	18.61	35.42	362	296	P	V
		2499.88	45.53	-8.47	54	30.13	32.2	18.63	35.43	362	296	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	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)
BLE CH 19 2440MHz		4880	40.5	-33.5	74	52.53	34.04	12.79	58.86	-	-	P	H
		7320	41.85	-32.15	74	48.61	35.68	15.06	57.5	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4880	40.94	-33.06	74	52.97	34.04	12.79	58.86	-	-	P	V
		7320	42.19	-31.81	74	48.95	35.68	15.06	57.5	-	-	P	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		34.32	24.16	-15.84	40	30.86	22.34	0.96	30	-	-	P	H
		136.38	29.16	-14.34	43.5	39.72	17.39	2.01	29.96	-	-	P	H
		289.2	32.73	-13.27	46	40.7	19.05	2.92	29.94	-	-	P	H
		331.5	34.13	-11.87	46	41.09	19.75	3.18	29.89	-	-	P	H
		819.4	37.94	-8.06	46	34.72	27.62	5.06	29.46	-	-	P	H
		944	34.72	-11.28	46	28.13	29.9	5.54	28.85	-	-	P	H
													H
													H
													H
													H
													H
													H
		59.16	25.14	-14.86	40	41.98	11.76	1.31	29.91	-	-	P	V
		138.54	26.17	-17.33	43.5	36.82	17.29	2.02	29.96	-	-	P	V
		291.36	28.42	-17.58	46	36.33	19.1	2.93	29.94	-	-	P	V
		532.4	32.9	-13.1	46	35.14	23.77	3.98	29.99	-	-	P	V
		808.9	33.24	-12.76	46	30.08	27.64	5.04	29.52	-	-	P	V
		854.4	34.83	-11.17	46	30.08	28.87	5.15	29.27	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.												

Note symbol

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

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

BLE	Note	Frequency	Level	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 :	Jesse Wang, Stan Hsieh, Ken Wu and Howard Huang	**Temperature :**	22.6~24.5°C
		Relative Humidity :	58.6~61.3%

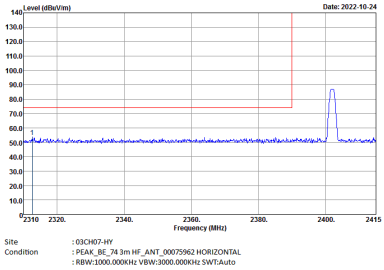
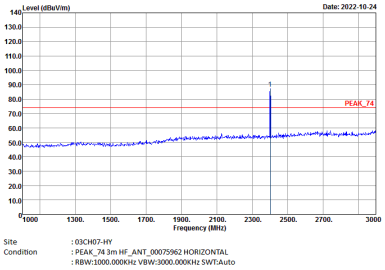
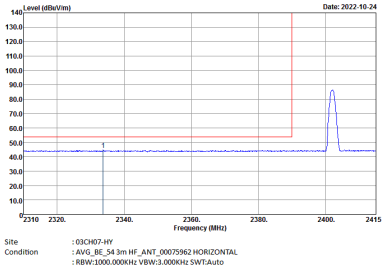
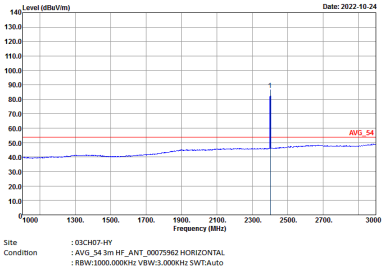
Remark: For Radiated Spurious Emission Test Data, Ant. 1 means Chain 1 and Ant. 2 means Chain 0.

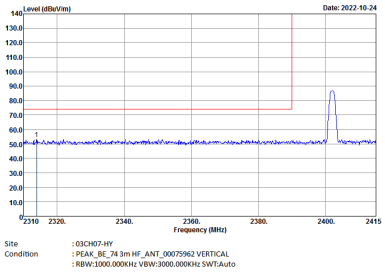
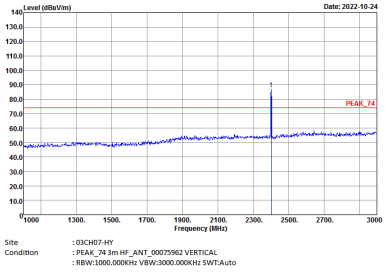
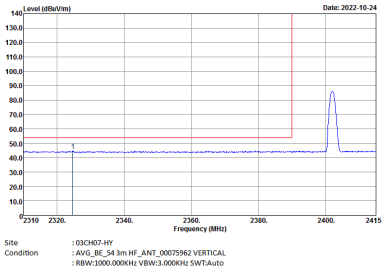
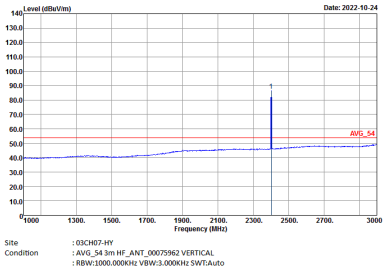
Note symbol

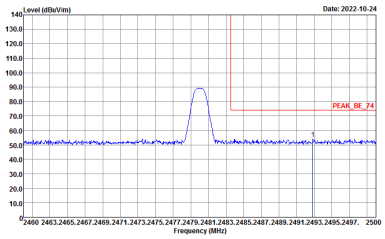
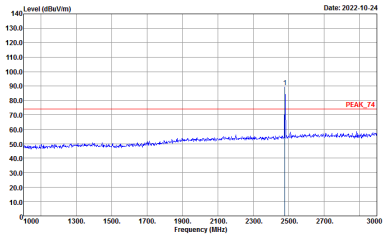
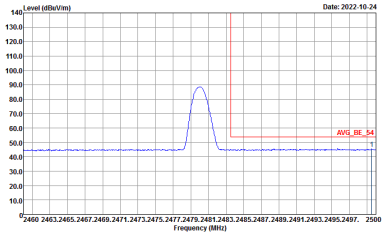
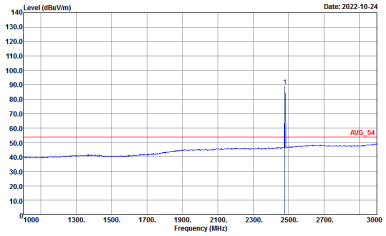
-L	**Low channel location**
-R	**High channel location**

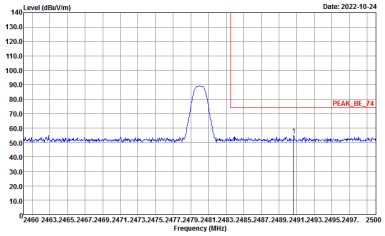
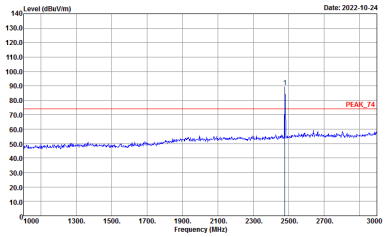
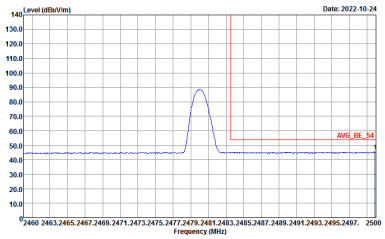
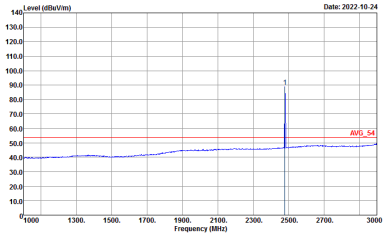
2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

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

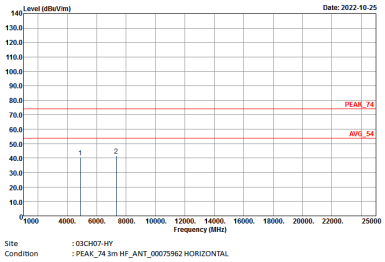
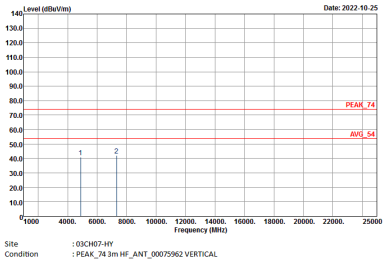
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak		
Avg		

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

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

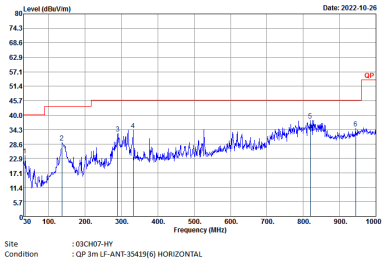
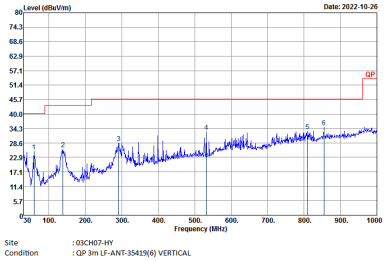
2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

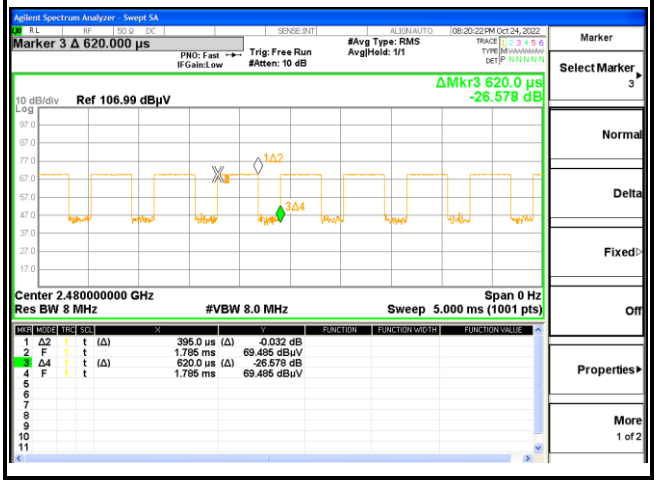
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.		

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	63.71	395	2.53	3kHz

Bluetooth – LE