



FCC RADIO TEST REPORT

FCC ID : QYLAX210NG
Equipment : WLAN Module
Brand Name : Getac
Model Name : AX210NGW
Applicant : Getac Technology Corporation.
5F., Building A, No. 209, Sec.1, Nangang Rd., Nangang
Dist., Taipei City 11568, Taiwan, R.O.C.
Standard : FCC Part 15 Subpart C §15.247

The product was received on Nov. 15, 2021 and testing was performed from Nov. 27, 2021 to Jan. 11, 2022. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Approved by: Louis Wu

Sportun International Inc. Wensan Laboratory

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



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History of this test report



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)	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	-
3.3	15.207	AC Conducted Emission	Pass	-
3.4	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: The module (Model: AX210NGW) makes no difference after verifying output power, this report reuses test data from the module report.

Declaration of Conformity:

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

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Clio Lo



1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, and Wi-Fi 6GHz 802.11a/n/ac/ax.

Product Feature	
Sample 1	EUT with Host 1
Sample 2	EUT with Host 2
Sample 3	EUT with Host 3
Sample 4	EUT with Host 4
Sample 5	EUT with Host 5
Antenna Type	WLAN: <Main>: PIFA Antenna <Aux.>: PIFA Antenna Bluetooth: PIFA Antenna
Antenna information	
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi) 2.86

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



The product was installed into Notebook (Brand Name: Getac, Model Name: X600, X600 Pro X600Y (Y= 10 characters, Y can be 0-9, a-z, A-Z, “-”, “_” or blank for marketing purpose and no impact safety related critical components and constructions.)) during test, which can be referred the following information:

Host Information	
Host 1	SKU A
Host 2	SKU B
Host 3	SKU C
Host 4	SKU D
Host 5	SKU E

SKU List					
DVT SKUs	SKU A (STD)	SKU B (STD)	SKU C (STD)	SKU D (Pro)	SKU E (Pro)
CPU	I5-11500H	I5-11500H	I5-11500H	I7-11850H	I7-11850H
Display	B156HTN03.8 , AUO	B156HTN03.8 , AUO	B156HTN03.8 , AUO	B156HTN03.8 , AUO	B156HTN03.8 , AUO
Camera	FO20FF-790H , FOXLINK	FO20FF-790H , FOXLINK	FO20FF-790H , FOXLINK	FN20FF-679H, FOXLINK	FN20FF-679H, FOXLINK
MXM	w/o MXM	Nvidia RTX3000	Nvidia GTX1650	Nvidia RTX3000	Nvidia GTX1650
Memory	16GB	16GB	16GB	32GB	32GB
Main storage	512GB	512GB	512GB	1TB	1TB
Second storage	512GB	512GB	512GB	1TB	1TB
Third storage	512GB	512GB	512GB	1TB	1TB
Touch pad	TP-PCT3854	TP-PCT3854	TP-PCT3854	TP-PCT3854	TP-PCT3854
Smart card	Yes	Yes	Yes	Yes	Yes
SD card	No	No	No	Yes	Yes
PCMCIA/EXPRESS card	PCMCIA	PCMCIA	PCMCIA	N/A	N/A
Wifi+BT	AX210NGW	AX210NGW	AX210NGW	AX210NGW	AX210NGW
WWAN	w/o WWAN	EM7511	EM7511	EM7511	EM7511
GPS/GNSS	Mc-1010-V2b	combo with WWAN	combo with WWAN	combo with WWAN	combo with WWAN
AC adapter	FSP150-ABBN3	FSP230-AJAN3	FSP230-AJAN3	FSP230-AJAN3	FSP230-AJAN3
	THP0K15W4A5-1 G	THP0K23W4A5-1 G	THP0K23W4A5-1 G	THP0K23W4A5-1 G	THP0K23W4A5-1 G
FPR	ETU-811JG	ETU-811JG	ETU-811JG	N/A	ETU-811JG
RFID	NA	NA	NA	NA	NA
Main Battery	BP3S2P3450P-0 2	BP3S2P3450P-0 2	BP3S2P3450P-0 2	BP3S2P3450P-0 2	BP3S2P3450P-0 2
Optional IO	RS232	RS232	RS232	VGA	VGA
Pass through	No	No	No	Yes	Yes
Expansion	NA	NA	NA	RS232/RS422 x1	RS232/RS422 x1
				PCMCIA x1 + Express card x1	PCMCIA x1 + Express card x1
ODD	NA	NA	NA	BDR-UD03ASW, PIONEER	BDR-UD03ASW, PIONEER
2nd Battery	NA	NA	NA	BP3S2P2100S-0 3	BP3S2P2100S-0 3
Connectivity module	NA	NA	NA	4 RJ45 module	4 RJ45 module



1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing Location

Test Site	Sportun 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.	Sportun Site No. CO05-HY (TAF Code: 1190)
Remark	The Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory.

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

Test Site	Sportun 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.	Sportun Site No. TH05-HY, 03CH11-HY

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

FCC designation No.: TW1190 and TW3786

1.4 Applicable Standards

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

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

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

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



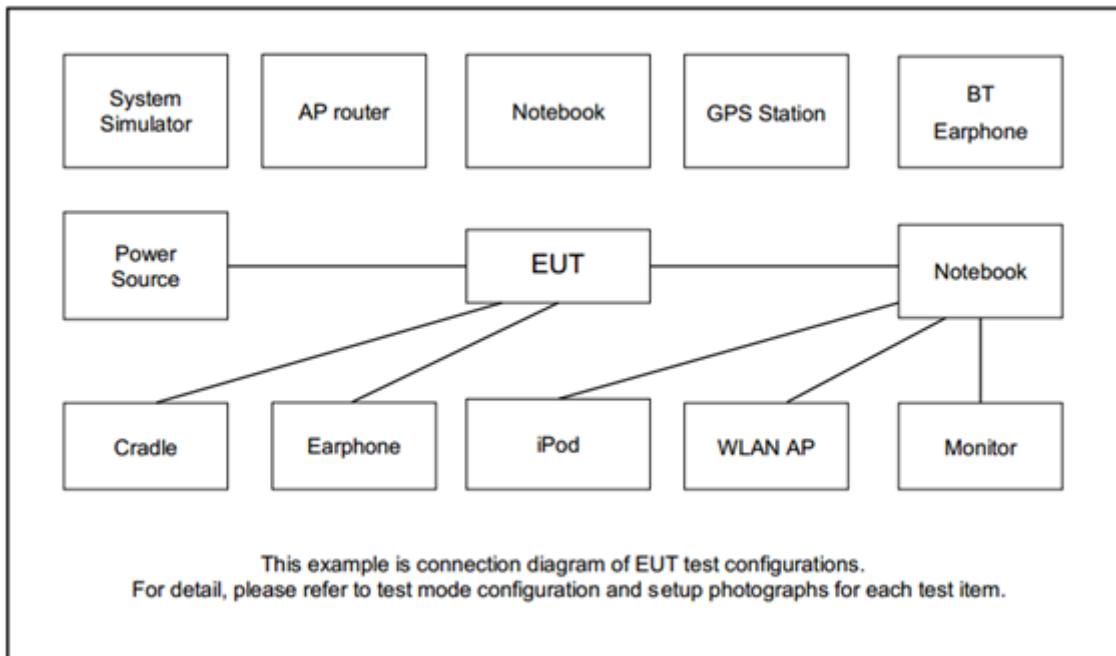
2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).
- b. AC power line Conducted Emission was tested under maximum output power.

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

Summary table of Test Cases	
Test Item	Data Rate / Modulation
Conducted Test Cases	Bluetooth – LE / GFSK
Conducted 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
Radiated Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps
AC Conducted Emission	Mode 1: WLAN (2.4GHz) Link + Bluetooth Link + H-Pattern + Earphone + USB Cable + Adapter 1 + Battery 1 for Sample 1 Mode 2: LTE Band 7 Link + WLAN (2.4GHz) Link + Bluetooth Link + H-Pattern + Earphone + USB Cable + Adapter 2 + Battery 1 for Sample 2 Mode 3: LTE Band 7 Link + WLAN (2.4GHz) Link + Bluetooth Link + H-Pattern + Earphone + USB Cable + Adapter 4 + Battery 1 + Battery 2 for Sample 4 Mode 4: LTE Band 7 Link + WLAN (2.4GHz) Link + Bluetooth Link + H-Pattern + Earphone + USB Cable + Adapter 4 + Battery 1 + Battery 2 for Sample 5
Remark: 1. The worst case of Conducted Emission is mode 2 only the test data of it was reported. 2. For Radiated Test Cases, the tests were performed with Adapter 2, Battery 1 and Sample 2.	

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.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY700A2029	N/A	N/A
3.	WLAN AP	ASUS	GT-AXE11000	MSQ-RTAXJF00	N/A	Unshielded, 1.8m
4.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
5.	Notebook	Dell	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility "DRTU Version 22.21070.0.0-OEM.DRTU12463" 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.

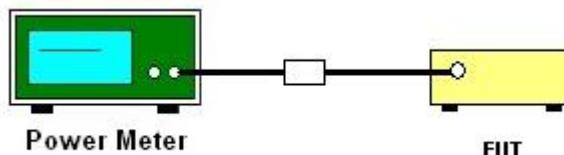
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. For Peak Power, the testing follows ANSI C63.10 Section 11.9.1.3 PKPM1.
2. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
3. The RF output of EUT is connected to the power meter by RF cable and attenuator.
4. The path loss is compensated to the results for each measurement.
5. Set the maximum power setting and enable the EUT to transmit continuously.
6. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.1.6 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

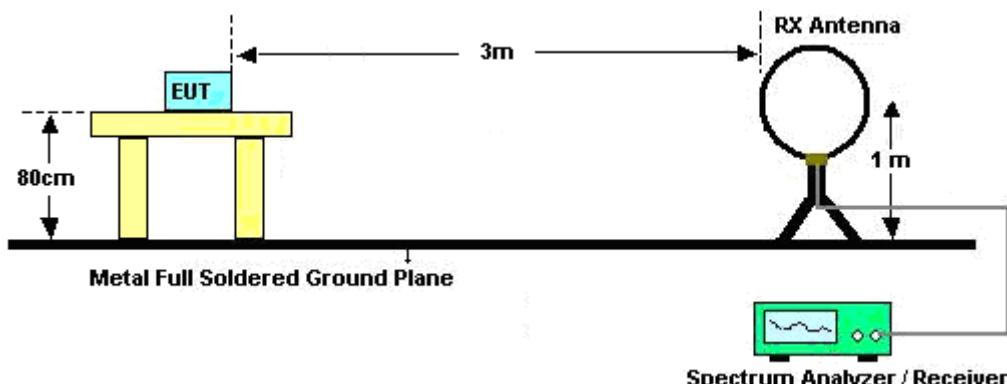
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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 \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW = 3 MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

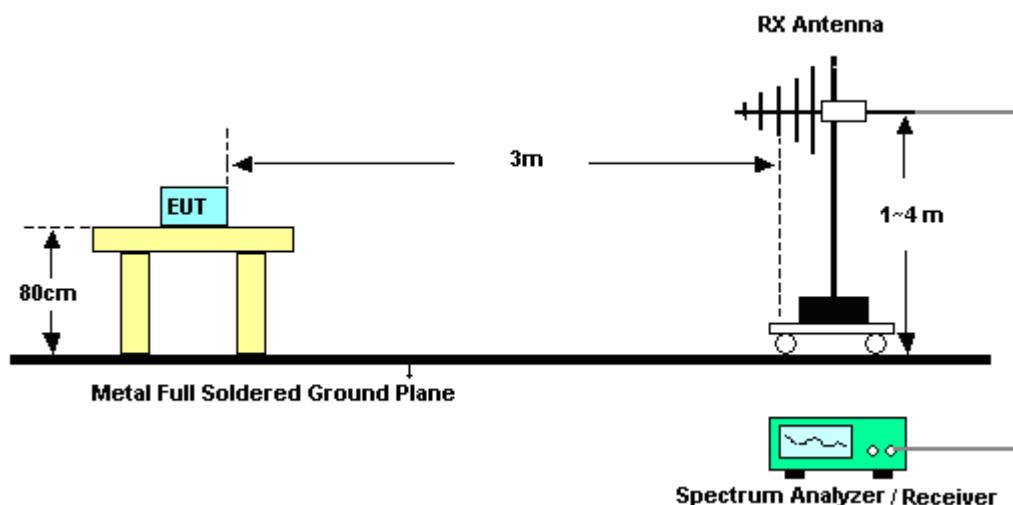
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

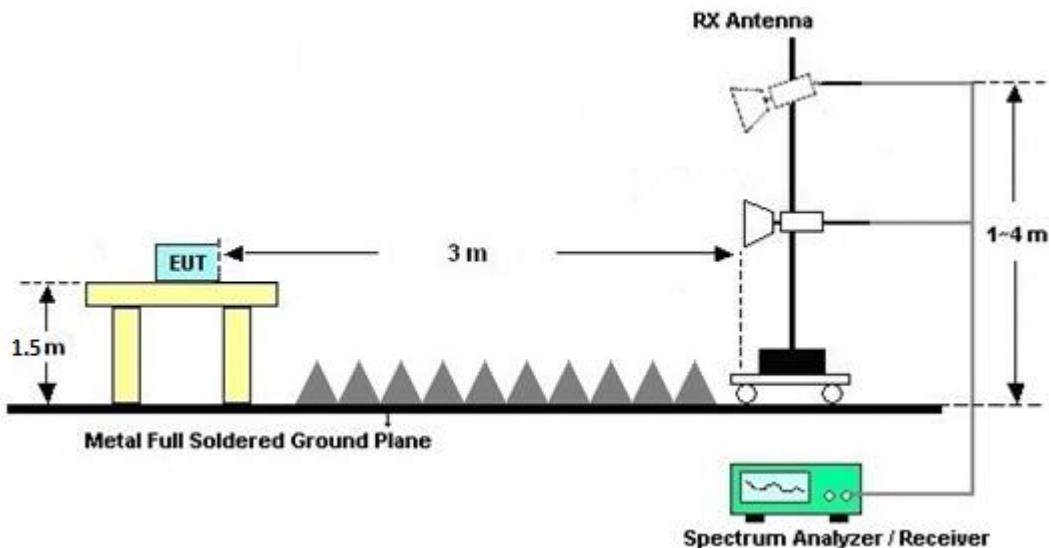
For radiated test below 30MHz



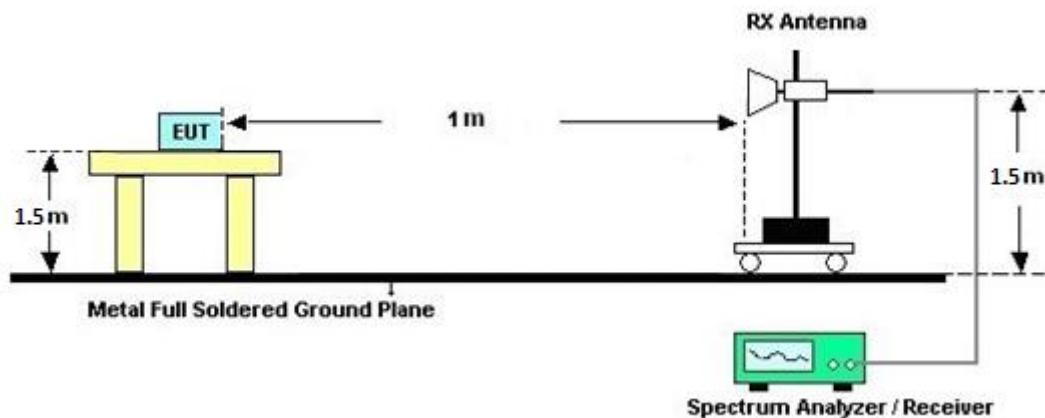
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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

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

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.



3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

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

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

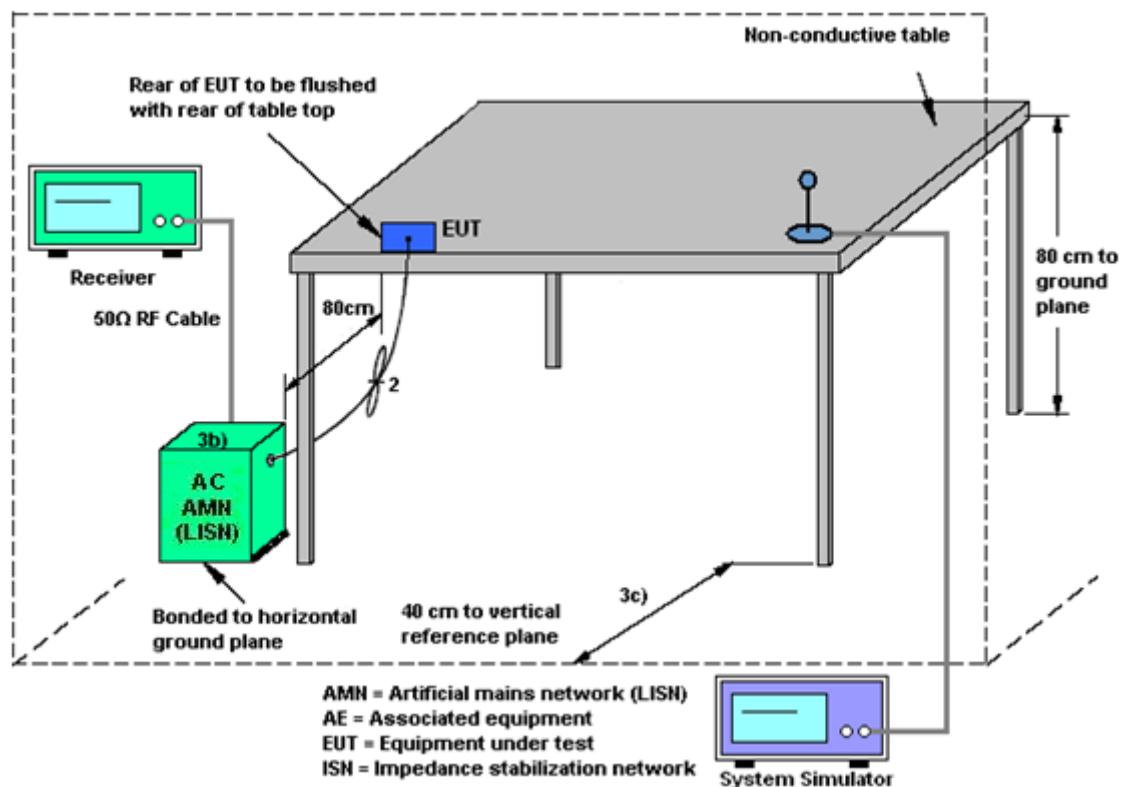
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.3.4 Test Setup



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.4 Antenna Requirements

3.4.1 Standard Applicable

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
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 09, 2021	Dec. 11, 2021~ Dec. 15, 2021	Oct. 08, 2022	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz~18GHz	Oct. 25, 2021	Dec. 11, 2021~ Dec. 15, 2021	Oct. 24, 2022	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTM-303B	TP140325	N/A	Nov. 26, 2021	Dec. 11, 2021~ Dec. 15, 2021	Nov. 25, 2022	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 07, 2021	Dec. 11, 2021~ Dec. 15, 2021	Sep. 06, 2022	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 10, 2021	Dec. 11, 2021~ Dec. 15, 2021	Nov. 09, 2022	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-303	17100018000 55007	1GHz~18GHz	Jun. 16, 2021	Dec. 11, 2021~ Dec. 15, 2021	Jun. 15, 2022	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 15, 2021	Dec. 11, 2021~ Dec. 15, 2021	Oct. 14, 2022	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	3GHz High Pass Filter	Sep. 13, 2021	Dec. 11, 2021~ Dec. 15, 2021	Sep. 12, 2022	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN11	1.53GHz Low Pass Filter	Sep. 13, 2021	Dec. 11, 2021~ Dec. 15, 2021	Sep. 12, 2022	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 11, 2021	Dec. 11, 2021~ Dec. 15, 2021	Mar. 10, 2022	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz~40GHz	Mar. 11, 2021	Dec. 11, 2021~ Dec. 15, 2021	Mar. 10, 2022	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102, SUCOFLEX 104	811852/4, MY2859/2, MY9837/4PE	30MHz~18GHz	Nov. 15, 2021	Dec. 11, 2021~ Dec. 15, 2021	Nov. 14, 2022	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Dec. 11, 2021~ Dec. 15, 2021	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Dec. 11, 2021~ Dec. 15, 2021	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Dec. 11, 2021~ Dec. 15, 2021	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.09824_2019 1225	RK-000992	N/A	N/A	Dec. 11, 2021~ Dec. 15, 2021	N/A	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2020	Dec. 11, 2021~ Dec. 15, 2021	Dec. 27, 2021	Radiation (03CH11-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	Dec. 12, 2021~Jan. 11, 2022	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2021	Dec. 12, 2021~Jan. 11, 2022	Nov. 30, 2022	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2021	Dec. 12, 2021~Jan. 11, 2022	Nov. 16, 2022	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 03, 2021	Dec. 12, 2021~Jan. 11, 2022	Dec. 02, 2022	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Dec. 12, 2021~Jan. 11, 2022	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	00691	N/A	Jul. 28, 2021	Dec. 12, 2021~Jan. 11, 2022	Jul. 27, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Dec. 12, 2021~Dec. 29, 2021	Dec. 30, 2021	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 30, 2021	Dec. 30, 2021~Jan. 11, 2022	Dec. 29, 2022	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Nov. 27, 2021	Nov. 15, 2022	Conducted (TH05-HY)
Power Meter	DARE	RPR3006W	13I00030SNO31(NO:182)	10MHz~6GHz	Dec. 30, 2020	Nov. 27, 2021	Dec. 29, 2021	Conducted (TH05-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Jan. 14, 2021	Nov. 27, 2021	Jan. 13, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Nov. 27, 2021	Aug. 29, 2022	Conducted (TH05-HY)
Switch Box & RF Cable	EM Electronics	EMSW18SE	SW191204(BOX8)	N/A	Jan. 07, 2021	Nov. 27, 2021	Jan. 06, 2022	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% ($U = 2U_{C(y)}$)	3.1 dB
---	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	5.8 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	5.4 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	5.9 dB
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Appendix A. Test Result of Conducted Test Items

Test Engineer:	Junyu Jhou			Temperature:	21.8~24.6			°C
Test Date:	2021/11/27			Relative Humidity:	52.8~63.2			%

<u>TEST RESULTS DATA</u>										
<u>Peak Power Table</u>										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	9.35	30.00	2.86	12.21	36.00	Pass
BLE	1Mbps	1	19	2440	9.43	30.00	2.86	12.29	36.00	Pass
BLE	1Mbps	1	39	2480	9.42	30.00	2.86	12.28	36.00	Pass

<u>TEST RESULTS DATA</u>										
<u>Average Power Table</u>										
<u>(Reporting Only)</u>										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	9.21	30.00	2.86	12.07	36.00	Pass
BLE	1Mbps	1	19	2440	9.27	30.00	2.86	12.13	36.00	Pass
BLE	1Mbps	1	39	2480	9.27	30.00	2.86	12.13	36.00	Pass



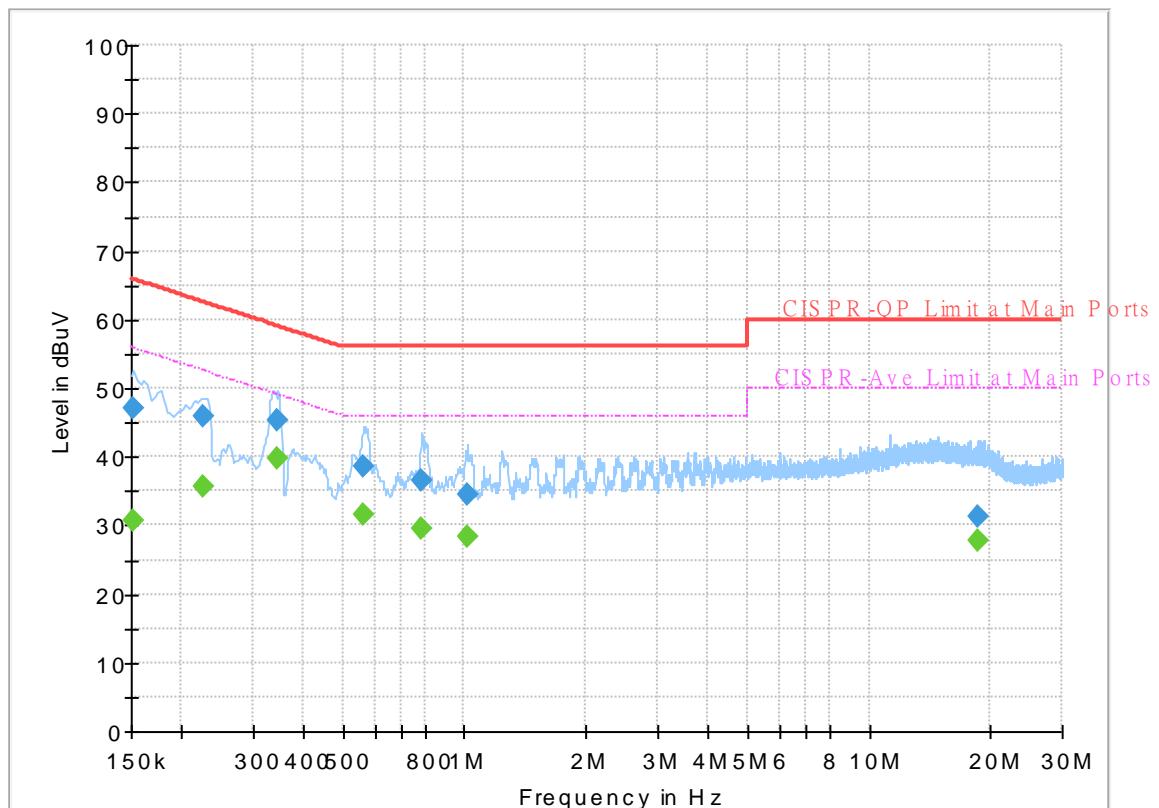
Appendix B. AC Conducted Emission Test Results

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

EUT Information

Report NO : 100537
 Test Mode : Mode 2
 Test Voltage : 120Vac/60Hz
 Phase : Line

Full Spectrum



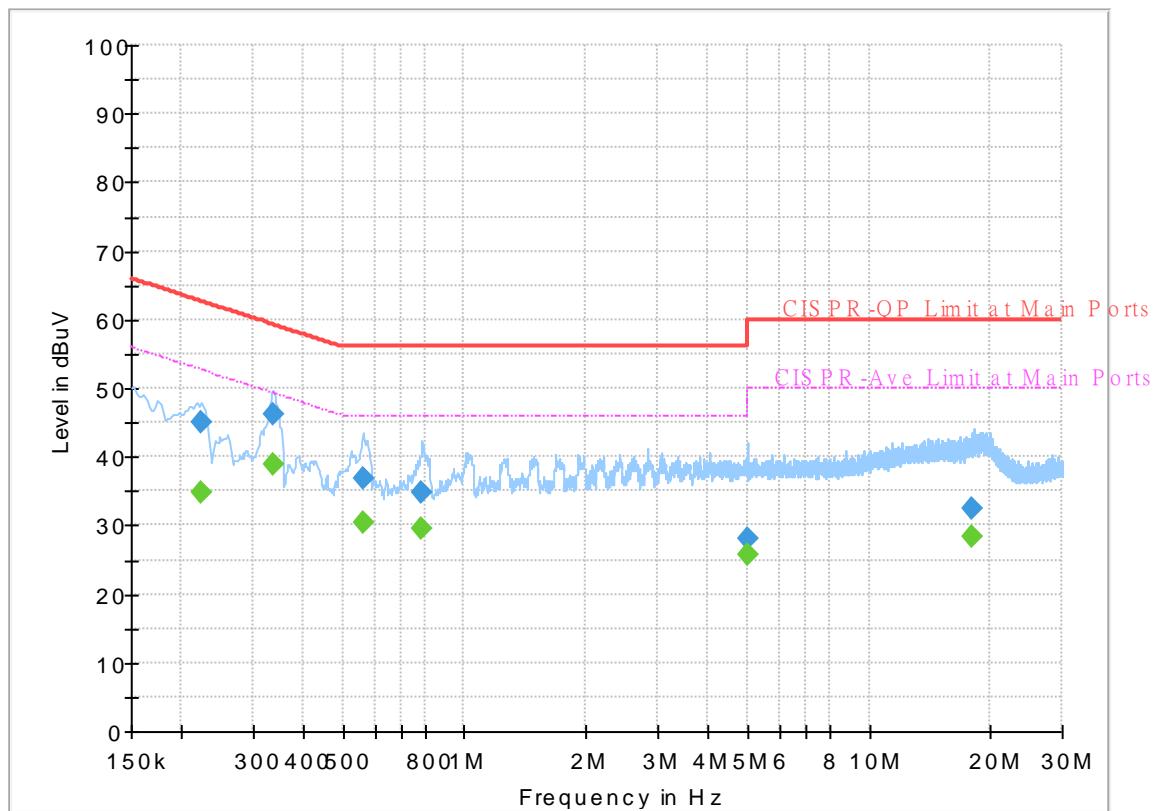
Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	30.71	55.88	25.17	L1	OFF	19.6
0.152250	47.19	---	65.88	18.69	L1	OFF	19.6
0.226500	---	35.55	52.58	17.03	L1	OFF	19.6
0.226500	45.76	---	62.58	16.82	L1	OFF	19.6
0.345750	---	39.71	49.06	9.35	L1	OFF	19.6
0.345750	45.25	---	59.06	13.81	L1	OFF	19.6
0.561750	---	31.57	46.00	14.43	L1	OFF	19.8
0.561750	38.61	---	56.00	17.39	L1	OFF	19.8
0.786750	---	29.52	46.00	16.48	L1	OFF	20.0
0.786750	36.66	---	56.00	19.34	L1	OFF	20.0
1.014000	---	28.31	46.00	17.69	L1	OFF	20.1
1.014000	34.46	---	56.00	21.54	L1	OFF	20.1
18.593250	---	27.70	50.00	22.30	L1	OFF	20.4
18.593250	31.23	---	60.00	28.77	L1	OFF	20.4

EUT Information

Report NO : 100537
 Test Mode : Mode 2
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.224250	---	34.69	52.66	17.97	N	OFF	19.6
0.224250	44.90	---	62.66	17.76	N	OFF	19.6
0.336750	---	38.99	49.28	10.29	N	OFF	19.6
0.336750	46.05	---	59.28	13.23	N	OFF	19.6
0.559500	---	30.36	46.00	15.64	N	OFF	19.8
0.559500	36.74	---	56.00	19.26	N	OFF	19.8
0.786750	---	29.48	46.00	16.52	N	OFF	20.0
0.786750	34.73	---	56.00	21.27	N	OFF	20.0
5.014500	---	25.63	50.00	24.37	N	OFF	20.0
5.014500	27.94	---	60.00	32.06	N	OFF	20.0
17.952000	---	28.33	50.00	21.67	N	OFF	20.5
17.952000	32.50	---	60.00	27.50	N	OFF	20.5



Appendix C. Radiated Spurious Emission

Test Engineer :	Daniel Lee, Hayden Wu, James Chiu and Troye Hsieh	Temperature :	20.1~21.4°C
		Relative Humidity :	55.2~67.3%

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		(MHz)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BLE CH 00 2402MHz		2355.36	52.06	-21.94	74	41.3	27.69	17.03	33.96	250	114	P	H	
		2342.025	43.9	-10.1	54	33.11	27.73	17.02	33.96	250	114	A	H	
	*	2402	101.01	-	-	90.29	27.6	17.07	33.95	250	114	P	H	
	*	2402	100.57	-	-	89.85	27.6	17.07	33.95	250	114	A	H	
													H	
													H	
		2382.24	51.94	-22.06	74	41.2	27.64	17.05	33.95	300	193	P	V	
		2341.71	43.75	-10.25	54	32.96	27.73	17.02	33.96	300	193	A	V	
	*	2402	99.43	-	-	88.71	27.6	17.07	33.95	300	193	P	V	
	*	2402	98.91	-	-	88.19	27.6	17.07	33.95	300	193	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 (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	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 00 2402MHz		4804	42.08	-31.92	74	56.08	32.41	12.05	58.46	-	-	P	H
		11295	44.81	-29.19	74	49.81	39.19	17.66	61.85	-	-	P	H
		14295	47.29	-26.71	74	50.26	40.51	19.81	63.29	-	-	P	H
		17985	49.28	-24.72	74	39.96	42.88	23.08	56.64	-	-	P	H
		17985	39.44	-14.56	54	30.12	42.88	23.08	56.64			A	H
		4804	42.13	-31.87	74	56.13	32.41	12.05	58.46	-	-	P	V
		11295	46.08	-27.92	74	51.08	39.19	17.66	61.85	-	-	P	V
		14295	47.3	-26.7	74	50.27	40.51	19.81	63.29	-	-	P	V
		17985	49.83	-24.17	74	40.51	42.88	23.08	56.64	-	-	P	V
		17985	39.56	-14.44	54	30.24	42.88	23.08	56.64	-	-	A	V
Remark	<ol style="list-style-type: none">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 below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz BLE LF		30	22.02	-17.98	40	29.23	24.27	1.01	32.49	-	-	P	H
		139.61	29.69	-13.81	43.5	43.09	17.22	1.88	32.5	-	-	P	H
		268.62	33.63	-12.37	46	44.44	19.1	2.52	32.43	-	-	P	H
		425.76	33.05	-12.95	46	39.66	22.64	3.16	32.41	-	-	P	H
		507.24	34.82	-11.18	46	40.09	23.86	3.46	32.59	-	-	P	H
		993.21	34.98	-19.02	54	29.28	30.19	6.33	30.82	-	-	P	H
													H
													H
													H
													H
													H
													H
													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	Peak or Average
H/V	Horizontal or Vertical



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

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
			Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
		(MHz)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V)	(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(dB μ V/m) =

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

3. Over Limit(dB) = Level(dB μ V/m) - Limit Line(dB μ V/m)

For Peak Limit @ 2390MHz:

1. Level(dB μ V/m)

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

= 32.22(dB/m) + 4.58(dB) + 54.51(dB μ V) - 35.86 (dB)

= 55.45 (dB μ V/m)

2. Over Limit(dB)

= Level(dB μ V/m) - Limit Line(dB μ V/m)

= 55.45(dB μ V/m) - 74(dB μ V/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dB μ V/m)

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

= 32.22(dB/m) + 4.58(dB) + 42.6(dB μ V) - 35.86 (dB)

= 43.54 (dB μ V/m)

2. Over Limit(dB)

= Level(dB μ V/m) - Limit Line(dB μ V/m)

= 43.54(dB μ V/m) - 54(dB μ V/m)

= -10.46(dB)

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



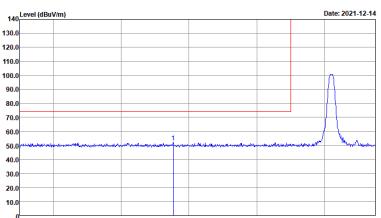
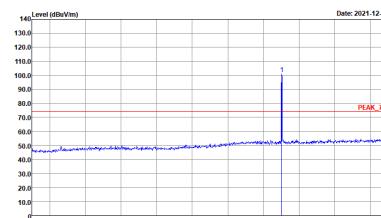
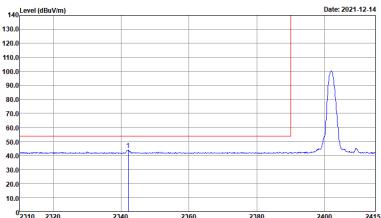
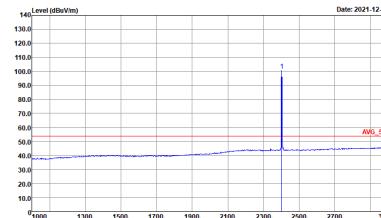
Appendix D. Radiated Spurious Emission Plots

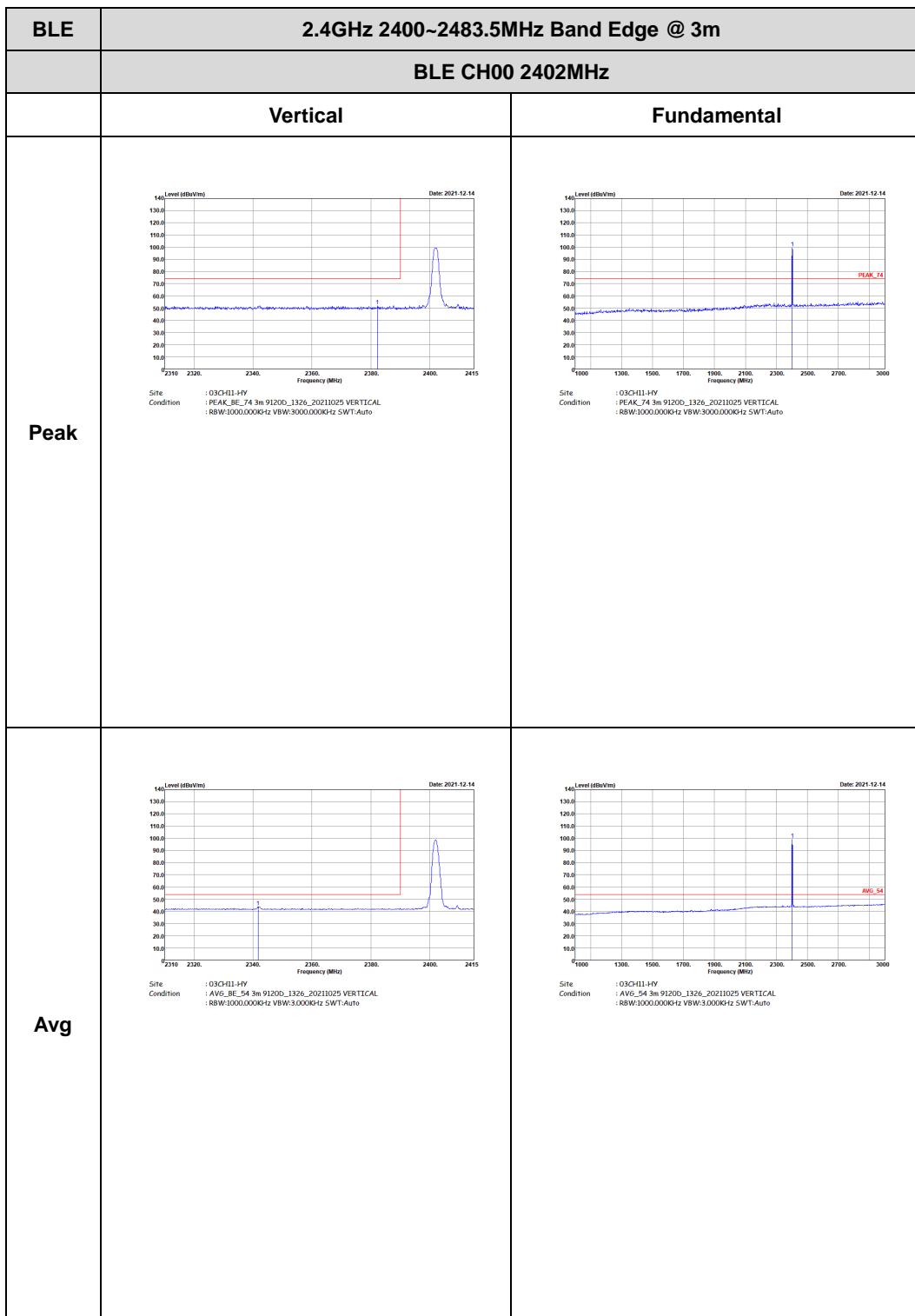
Test Engineer :	Daniel Lee, Hayden Wu, James Chiu and Troye Hsieh	Temperature :	20.1~21.4°C
		Relative Humidity :	55.2~67.3%



2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

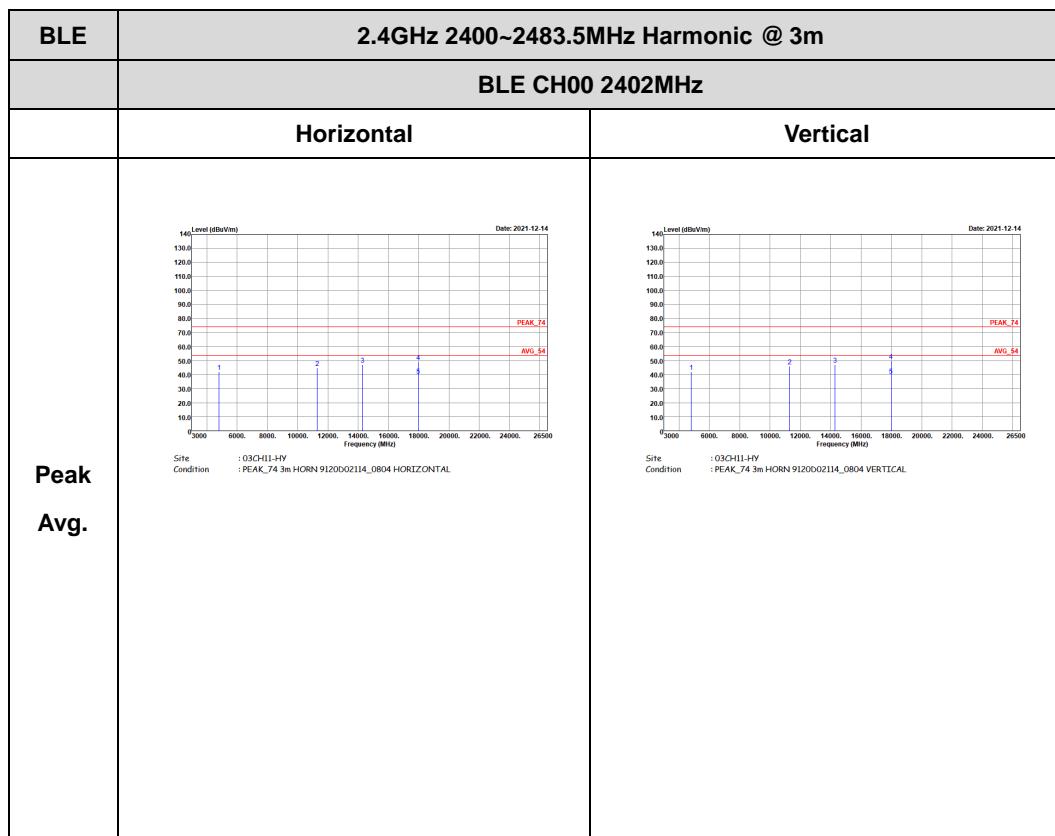
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak	 <p>140 Level (dBuV/m) Date: 2021-12-14 130.0 120.0 110.0 100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0 2310 2320. 2340. 2360. 2380. 2400. 2415 Frequency (MHz)</p> <p>Site : 03CH11-HY Condition : PEAK_BE_74 3m 9120D_1326_20211025 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>140 Level (dBuV/m) Date: 2021-12-14 130.0 120.0 110.0 100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0 1000 1300. 1500. 1700. 1900. 2100. 2300. 2500. 2700. 3000 Frequency (MHz)</p> <p>Site : 03CH11-HY Condition : PEAK_J4 3m 9120D_1326_20211025 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>140 Level (dBuV/m) Date: 2021-12-14 130.0 120.0 110.0 100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0 2310 2320. 2340. 2360. 2380. 2400. 2415 Frequency (MHz)</p> <p>Site : 03CH11-HY Condition : AVG_BE_54 3m 9120D_1326_20211025 HORIZONTAL : RBW:1000.000kHz VBW:3.000kHz SWT:Auto</p>	 <p>140 Level (dBuV/m) Date: 2021-12-14 130.0 120.0 110.0 100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0 1000 1300. 1500. 1700. 1900. 2100. 2300. 2500. 2700. 3000 Frequency (MHz)</p> <p>Site : 03CH11-HY Condition : AVG_J4 3m 9120D_1326_20211025 HORIZONTAL : RBW:1000.000kHz VBW:3.000kHz SWT:Auto</p>





2.4GHz 2400~2483.5MHz

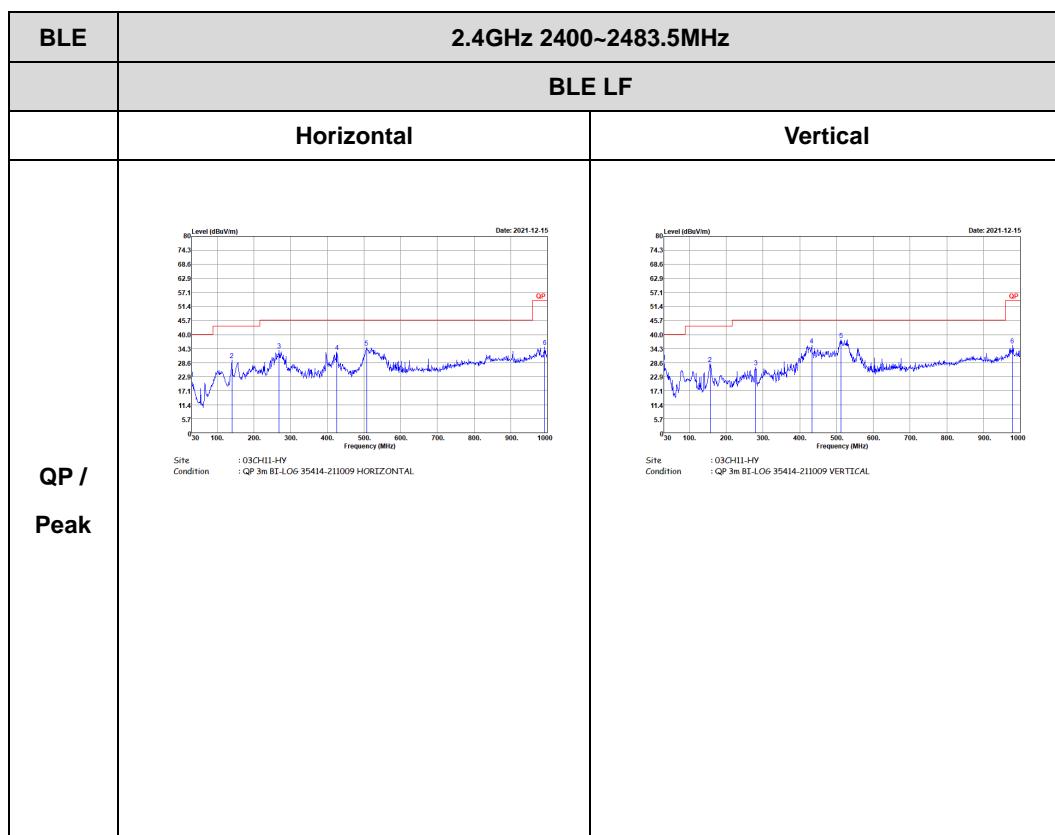
BLE (Harmonic @ 3m)





Emission below 1GHz

2.4GHz BLE (LF)





Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth - LE for 1Mbps	62.18	388	2.58	3kHz

