FCC RADIO TEST REPORT

FCC ID	:	**QYLAX201NG**
Equipment	:	**WLAN Module**
Brand Name	:	**Getac**
Model Name	:	**AX201NGW**
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 Feb. 10, 2023 and testing was performed from Feb. 17, 2023 to Mar. 06, 2023. 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 variant 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.

Louis Wu

Approved by: Louis Wu

Sporton 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

Report No.	Version	Description	Issue Date
FR111325-04A	01	Initial issue of report	Mar. 29, 2023
FR111325-04A	02	Revise appendix A This report is an updated version, replacing the report issued on Mar. 29, 2023.	Apr. 07, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.247(b)	Power Output Measurement	Pass	-
-	15.247(e)	Power Spectral Density	Not Required	-
-	15.247(d)	Conducted Band Edges	Not Required	-
		Conducted Spurious Emission	Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	-
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.

2. This is a variant report by changing WLAN Main antenna position and adding AC Adapter 3. All the test cases were performed on original report which can be referred to Sporton Report Number FR111325C. Based on the original report, the test cases were verified.

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.
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Cindy Liu

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax and Wi-Fi 5GHz 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
Antenna Type	**WLAN:** <Main> PIFA Antenna <Aux.> PIFA Antenna **Bluetooth:** PIFA Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	Main: 2.86 Aux.: 1.30

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

The product was installed into Tablet (Brand Name: Getac, Model Name: F110, F110G6, F110-Exc, F110-621, F110-601) during test, and the host information was recorded in the following table.

Host Information	
Host 1	Host with SKU A
Host 2	Host with SKU B
Host 3	Host with SKU C

SKU	SKU A	SKU B	SKU C
CPU	i3-1115G7 (Non Vpro)	i5-1135G7 (Non Vpro)	i7-1165G7 (Vpro)
DDR	Kingston DDR4-3200 8GB	Kingston DDR4-3200 16GB	Kingston DDR4-3200 32GB
SSD	256GB	512GB	1TB
PANEL	Full HD AUO	Full HD AUO	Full HD AUO
DIGITIZER	EMRright Digitizer	N/A	EMRright Digitizer
OPTION BAY	Micro SD	2D Barcode Reader	RS232 + LAN
Expansion Bay	N/A	Smart Card	Smart Card
Right side option	Finger Print	NXP RFID(PN7462)	Finger Print
WLAN/BT	Intel AX201	Intel AX201	Intel AX201
WWAN(4G)	NA	EM7511	EM7511
GPS/GNS	GPS/GNSS (MC-1010-G)	EM7511	EM7511
Rear 8M Camera	Support	Support	Support
Webcam FHD	Support	Not Support	Not Support
IR Webcam	Not Support	Support	Support
USB3.2 Gen2 x 1 Type-A	Support	Support	Support
Type-C (thunder bolt)	Support	Support	Support
Audio/MIC	Support	Support	Support

1.1.1 Antenna Directional Gain

<For CDD Mode>

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)ii)

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows:

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

G_{ANT} is set equal to the gain of the antenna having the highest gain.

For PSD measurements, the directional gain calculation.

Array Gain = 10 log(NANT/NSS) dB.

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;
N_{SS} = the number of independent spatial streams of data;
N_{ANT} = the total number of antennas
$g_{j,k} = 10^{G_k / 20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;
G_k is the gain in dBi of the kth antenna.

As minimum N_{SS}=1 is supported by EUT, the formula can be simplified as:

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Where G1, G2….GN denote single antenna gain.

The directional gain “DG” is calculated as following table.

			DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	Ant 1 (dBi)	Ant 2 (dBi)	(dBi)	(dBi)	(dB)	(dB)
2.4GHz	1.30	2.86	2.86	5.13	0.00	0.00

Calculation example:

If a device has two antenna, G_{ANT1}= 1.30dBi; G_{ANT2}= 2.86dBi

Directional gain of power measurement = max(1.30, 2.86) + 0 = 2.86 dBi

Directional gain of PSD derived from formula which is

10 x log { { [10^ (1.30 dBi / 20) + 10^ (2.86 dBi / 20)] ^ 2 } / 2 }

= 5.13 dBi

Power and PSD limit reduction = Composite gain – 6dBi, (min = 0)

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing Location

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, 03CH15-HY

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

FCC designation No.: 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.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- 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

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 only the worst case emissions were reported in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

The final test modes include the worst data rates for each modulation shown in the table below.

Single Antenna

Modulation	Data Rate
802.11ax HE20	MCS0

MIMO Antenna

Modulation	Data Rate
802.11n HT40	MCS0
802.11ax HE20	MCS0

<Ant. 2>

Ch. #	2400-2483.5 MHz
	802.11ax HE20
Low	-
Middle	06
High	-

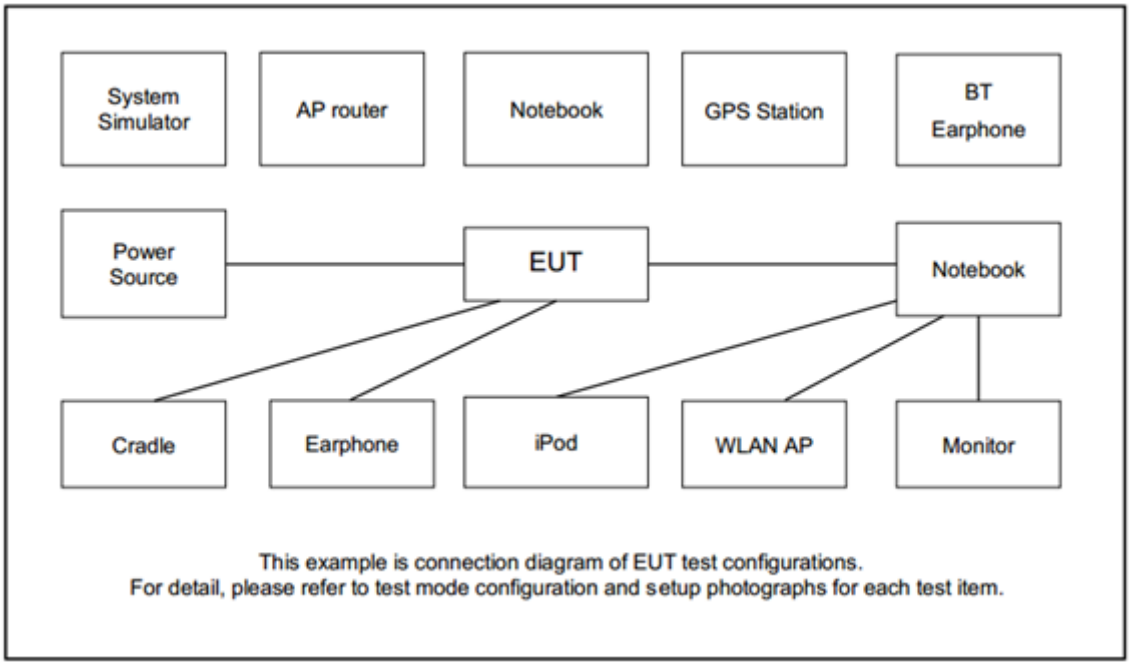
MIMO <Ant. 1+2>

Ch. #	2400-2483.5 MHz
	802.11n HT40
Low	03
Middle	-
High	-

Remark:

1. For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.
2. For Radiated Test Cases, the tests were performed with Adapter 3, Battery 2 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.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “DRTU v.01346.22.140.0” 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 with 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.

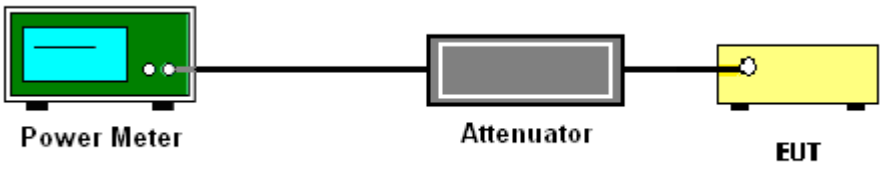
3.1.2 Measuring Instruments

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. 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.
6. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

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

Please refer to Appendix A.

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

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.

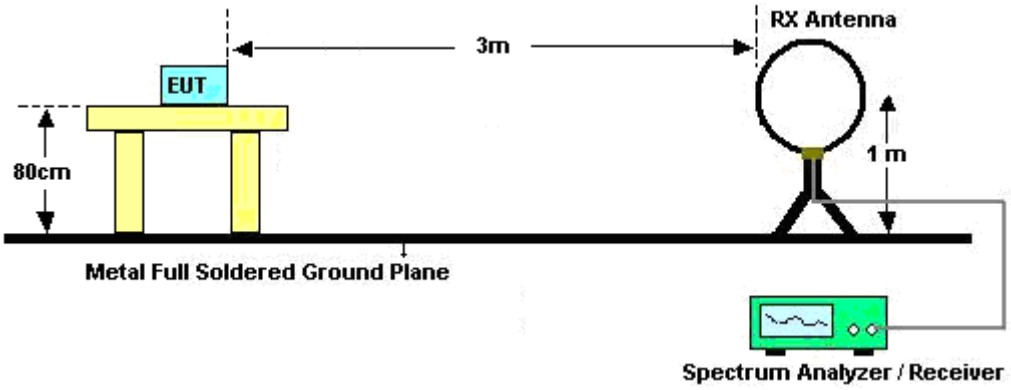
3.2.3 Test Procedures

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 “-“.

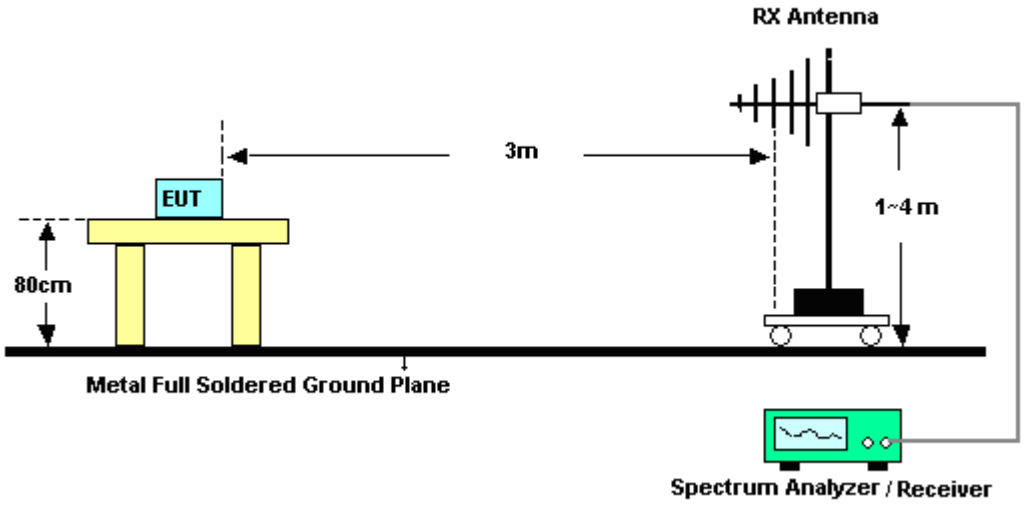
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with 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

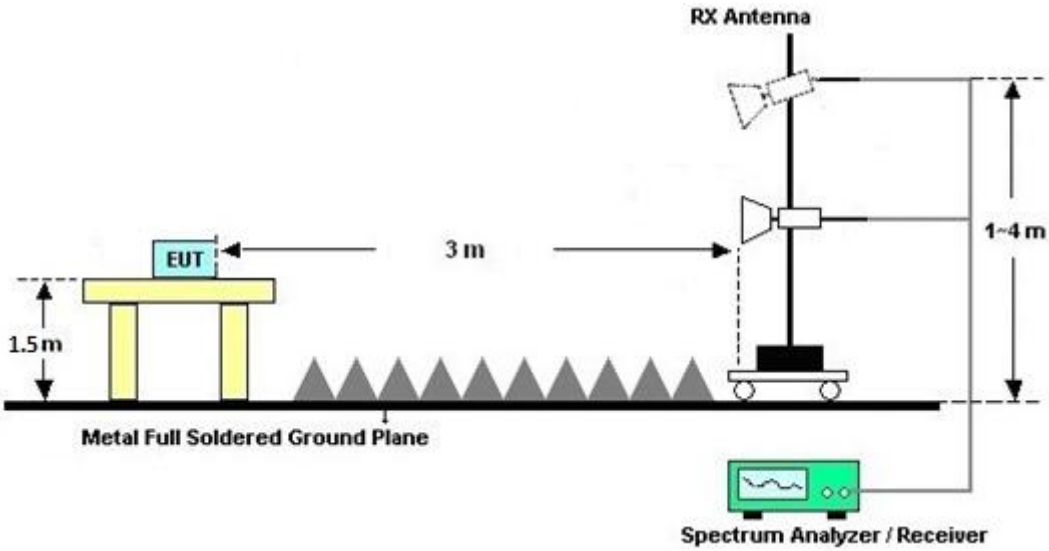
For radiated emissions below 30MHz



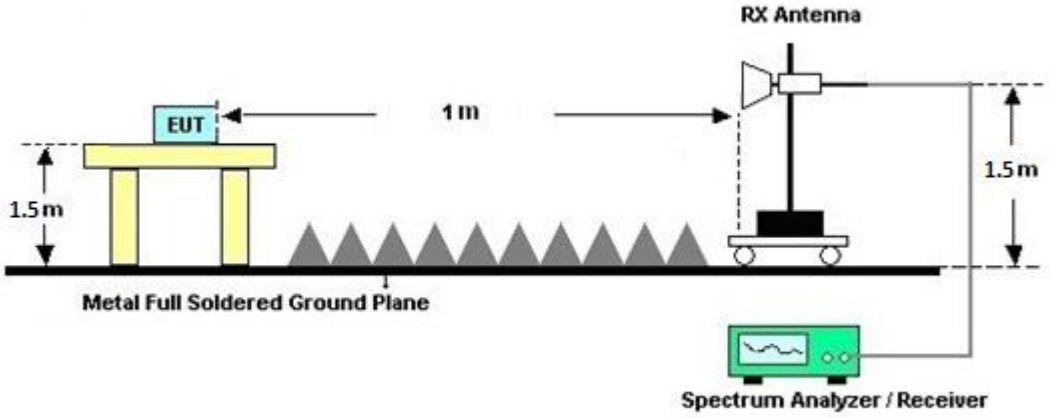
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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 B and C.

3.2.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

3.3 Antenna Requirements

3.3.1 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.

3.3.2 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
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Mar. 18, 2022	Mar. 03, 2023~ Mar. 06, 2023	Mar. 17, 2023	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	0103 & 07	30MHz~1GHz	Apr. 24, 2022	Mar. 03, 2023~ Mar. 06, 2023	Apr. 23, 2023	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 26, 2022	Mar. 03, 2023~ Mar. 06, 2023	Dec. 25, 2023	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02294	1GHz~18GHz	Jun. 23, 2022	Mar. 03, 2023~ Mar. 06, 2023	Jun. 22, 2023	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 14, 2022	Mar. 03, 2023~ Mar. 06, 2023	May 13, 2023	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-303K	171000180005 4002	1GHz~18GHz	Sep. 28, 2022	Mar. 03, 2023~ Mar. 06, 2023	Sep. 27, 2023	Radiation (03CH15-HY)
Preamplifier	EM Electronics	EM01G18G	060802	1GHz-18GHz	Mar. 08, 2022	Mar. 03, 2023~ Mar. 06, 2023	Mar. 07, 2023	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Oct. 18, 2022	Mar. 03, 2023~ Mar. 06, 2023	Oct. 17, 2023	Radiation (03CH15-HY
Spectrum Analyzer	Keysight	N9010	MY54200485	10Hz~44GHz	May 07, 2022	Mar. 03, 2023~ Mar. 06, 2023	May 06, 2023	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Mar. 03, 2023~ Mar. 06, 2023	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Mar. 03, 2023~ Mar. 06, 2023	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24 (k5)	RK-000451	N/A	N/A	Mar. 03, 2023~ Mar. 06, 2023	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY582185/4, MY9838/4PE,5 19228/2	30MHz~18G	Jun. 21, 2022	Mar. 03, 2023~ Mar. 06, 2023	Jun. 20, 2023	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804011/2,8040 12/2	30MHz-40GHz	Jan. 03, 2023	Mar. 03, 2023~ Mar. 06, 2023	Jan. 02, 2024	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 10, 2022	Mar. 03, 2023~ Mar. 06, 2023	Mar. 09, 2023	Radiation (03CH15-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 17. 2022	Feb. 17, 2023	Nov. 16. 2023	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO 12 (NO:113)	10MHz~6GHz	Dec. 13, 2022	Feb. 17, 2023	Dec. 12, 2023	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101905	10Hz - 40GHz(amp)	Aug. 03, 2022	Feb. 17, 2023	Aug. 02, 2023	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.3 dB**

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.4 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Mina Liu	Temperature:	21~25	°C
Test Date:	2023/2/17	Relative Humidity:	51~54	%

TEST RESULTS DATA
Peak Output Power

2.4GHz Band MIMO																
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
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HT40	MCS0	2	3	2422	14.41	14.55	17.49	30.00		2.86		20.35		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HT40	MCS0	2	3	2422	9.32	9.71	12.53	30.00		2.86		15.39		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Output Power

2.4GHz Band Single Antenna																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	1	6	2437	Full	21.75	21.90		30.00	30.00	1.30	2.86	23.05	24.76	36.00	36.00	Pass

2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	13	2472	Full	20.60	20.42	23.52	30.00		2.86		26.38		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band Single Antenna																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power with duty factor (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	1	6	2437	Full	17.11	17.30		30.00	30.00	1.30	2.86	18.41	20.16	36.00	36.00	Pass

2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power with duty factor (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	13	2472	Full	10.45	10.77	13.62	30.00		2.86		16.48		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

Appendix B. Radiated Spurious Emission

Test Engineer :	Eric Shou, Quentin Liu and Bigshow Wang	**Temperature :**	21.5~22.5°C
		Relative Humidity :	50~55%

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE20 Full (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2314	55.32	-18.68	74	42.06	27.77	16.44	30.95	129	28	P	H
		2389.52	44.19	-9.81	54	31.01	27.54	16.56	30.92	129	28	A	H
	*	2437	111.43	-	-	98.19	27.5	16.64	30.9	129	28	P	H
	*	2437	101.61	-	-	88.37	27.5	16.64	30.9	129	28	A	H
802.11ax		2486.14	55.34	-18.66	74	42.08	27.43	16.71	30.88	129	28	P	H
HE20 Full		2483.53	44.25	-9.75	54	30.99	27.43	16.71	30.88	129	28	A	H
CH 06		2338.32	55.4	-18.6	74	42.14	27.72	16.48	30.94	263	251	P	V
2437MHz		2389.36	43.91	-10.09	54	30.73	27.54	16.56	30.92	263	251	A	V
	*	2437	107.84	-	-	94.6	27.5	16.64	30.9	263	251	P	V
	*	2437	97.97	-	-	84.73	27.5	16.64	30.9	263	251	A	V
		2499.1	55.17	-18.83	74	41.91	27.4	16.73	30.87	263	251	P	V
		2483.53	44.05	-9.95	54	30.79	27.43	16.71	30.88	263	251	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11 ax HE20 Full (Harmonic @ 3m)

WIFI Ant. 2	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)
802.11ax HE20 Full CH 06 2437MHz		4874	46.78	-27.22	74	55.15	32.6	9.4	50.37	-	-	P	H
		7311	48.89	-25.11	74	53.62	36.66	10.85	52.24	-	-	P	H
		7311	39.93	-14.07	54	44.66	36.66	10.85	52.24	-	-	A	H
													H
		4874	46.99	-27.01	74	55.36	32.6	9.4	50.37	-	-	P	V
		7311	49.01	-24.99	74	53.74	36.66	10.85	52.24	-	-	P	V
		7311	40.05	-13.95	54	44.78	36.66	10.85	52.24	-	-	A	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.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2386.692	58.13	-15.87	74	51.67	27.29	16.03	36.86	295	39	P	H
		2389.2	46.46	-7.54	54	39.98	27.31	16.03	36.86	295	39	A	H
	*	2422	103.2	-	-	96.45	27.53	16.08	36.86	295	39	P	H
	*	2422	94.31	-	-	87.56	27.53	16.08	36.86	295	39	A	H
802.11n		2495.492	51.48	-22.52	74	44.25	27.88	16.2	36.85	295	39	P	H
HT40		2484.418	40.82	-13.18	54	33.65	27.84	16.18	36.85	295	39	A	H
CH 03		2389.86	56.09	-17.91	74	49.6	27.32	16.03	36.86	193	249	P	V
2422MHz		2389.596	45.59	-8.41	54	39.1	27.32	16.03	36.86	193	249	A	V
	*	2422	101.32	-	-	94.57	27.53	16.08	36.86	193	249	P	V
	*	2422	93.34	-	-	86.59	27.53	16.08	36.86	193	249	A	V
		2494.512	50.94	-23.06	74	43.71	27.88	16.2	36.85	193	249	P	V
		2483.83	40.4	-13.6	54	33.23	27.84	16.18	36.85	193	249	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2	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)
802.11n HT40 CH 03 2422MHz		4844	46.43	-27.57	74	54.84	32.56	9.4	50.37	-	-	P	H
		7266	48.97	-25.03	74	53.64	36.77	10.81	52.25	-	-	P	H
		7266	40.01	-13.99	54	44.68	36.77	10.81	52.25	-	-	A	H
													H
		4844	46.93	-27.07	74	55.34	32.56	9.4	50.37	-	-	P	V
		7266	50.52	-23.48	74	55.19	36.77	10.81	52.25	-	-	P	V
		7266	41.5	-12.5	54	46.17	36.77	10.81	52.25	-	-	A	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 above 18GHz

2.4GHz WIFI 802.11n HT40 (SHF)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		21600	50.83	-23.17	74	69.81	38.96	-3.16	54.78	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
2.4GHz													H
802.11n													H
HT40		18963	50.48	-23.52	74	71.11	38.14	-3.45	55.32	-	-	P	V
SHF		18963	41.13	-32.87	74	61.76	38.14	-3.45	55.32	-	-	A	V
													V
													V
													V
													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 with sufficient margin against limit line or noise floor only.

Emission below 1GHz

2.4GHz WIFI 802.11n HT40 (LF)

WIFI Ant. 1+2	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)
		30	22.08	-17.92	40	29.3	24.53	0.64	32.39	-	-	P	H
		271.53	26.22	-19.78	46	37.51	19.06	2.02	32.37	-	-	P	H
		298.69	27.21	-18.79	46	38.02	19.41	2.1	32.32	-	-	P	H
		480.08	25.24	-20.76	46	31.22	23.8	2.61	32.39	-	-	P	H
		674.08	27.99	-18.01	46	30.82	26.38	3.15	32.36	-	-	P	H
		894.27	37.4	-8.6	46	36.3	28.92	3.68	31.5	-	-	P	H
													H
													H
													H
													H
2.4GHz													H
802.11n													H
HT40		30.97	22.66	-17.34	40	30.14	24.24	0.67	32.39	-	-	P	V
LF		120.21	21.61	-21.89	43.5	35.45	17.31	1.31	32.46	-	-	P	V
		359.8	25.81	-20.19	46	35.03	20.91	2.26	32.39	-	-	P	V
		480.08	26.38	-19.62	46	32.36	23.8	2.61	32.39	-	-	P	V
		746.83	37.06	-8.94	46	38.05	27.93	3.31	32.23	-	-	P	V
		885.54	37.21	-8.79	46	36.23	28.89	3.65	31.56	-	-	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 **Margin** 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:

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		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 C. Radiated Spurious Emission Plots

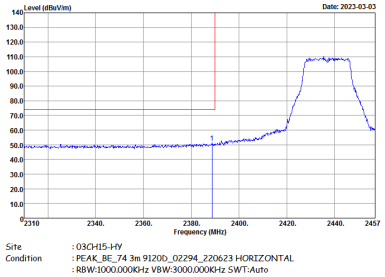
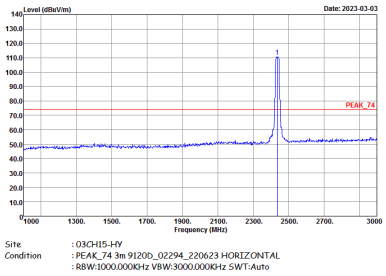
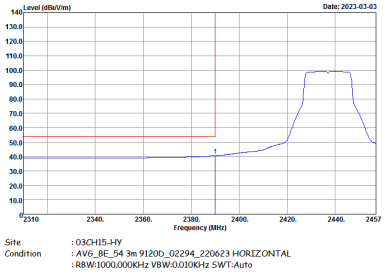
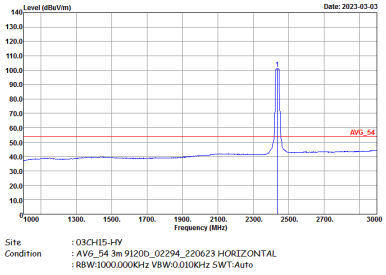
Test Engineer :	Eric Shou, Quentin Liu and Bigshow Wang	**Temperature :**	21.5~22.5°C
		Relative Humidity :	50~55%

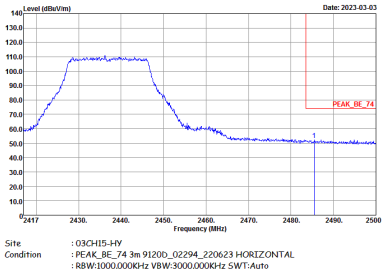
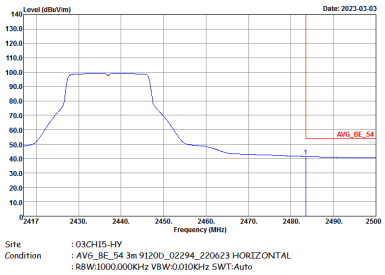
Note symbol

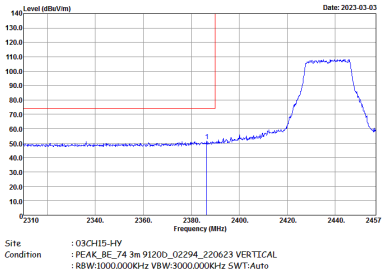
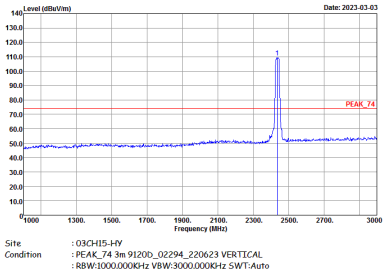
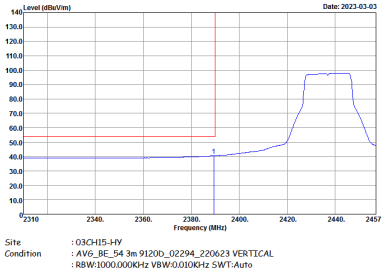
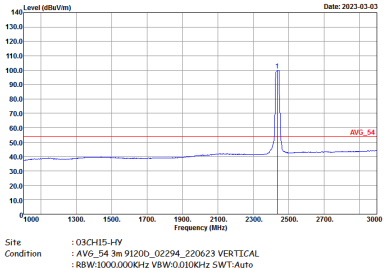
-L	**Low channel location**
-R	**High channel location**

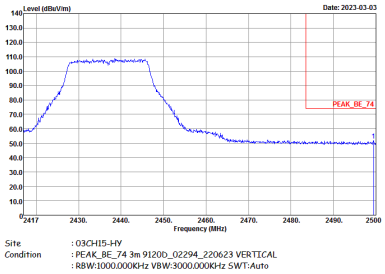
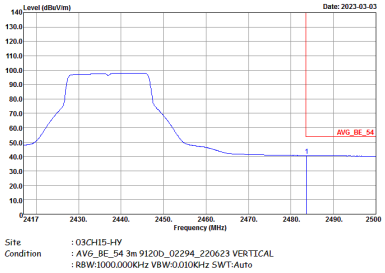
2.4GHz 2400~2483.5MHz

WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - L	
2	Horizontal	Fundamental
Peak		
Avg.		

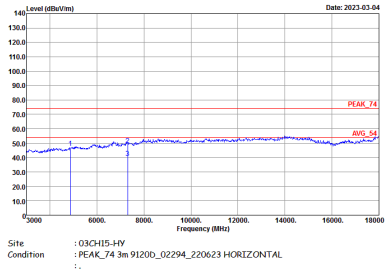
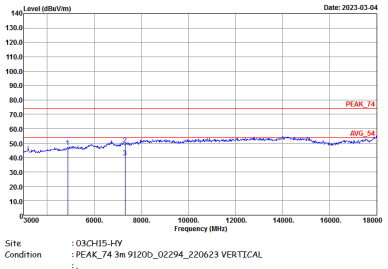
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - R	
2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

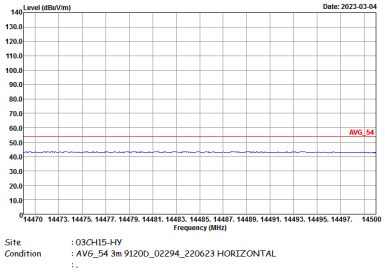
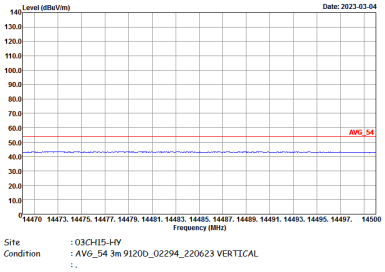
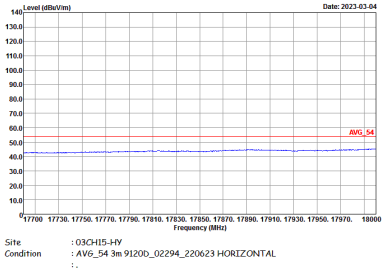
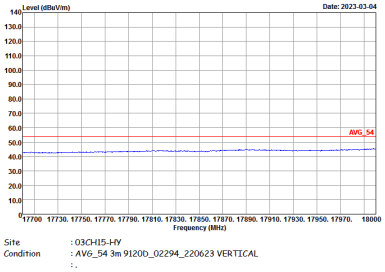
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - L	
2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH06 2437MHz - R	
2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

2.4GHz 2400~2483.5MHz

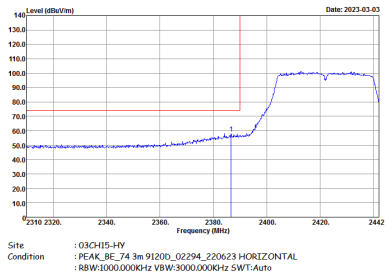
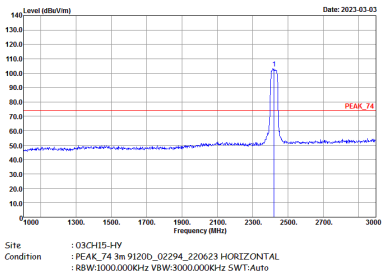
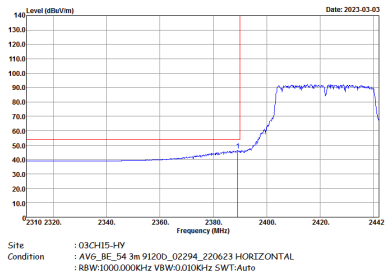
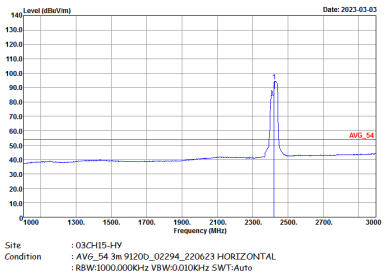
WIFI 802.11 ax HE20 Full (Harmonic @ 3m)

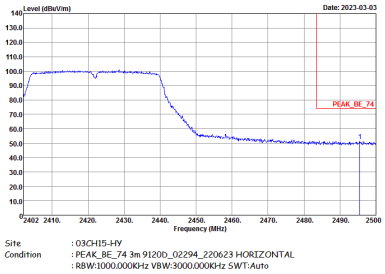
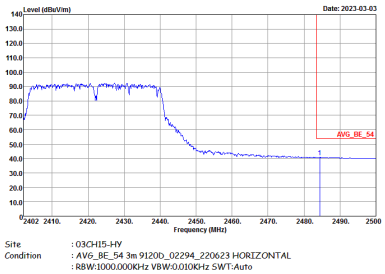
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE20 Full CH06 2437MHz	
2	Horizontal	Vertical
Peak Avg.		

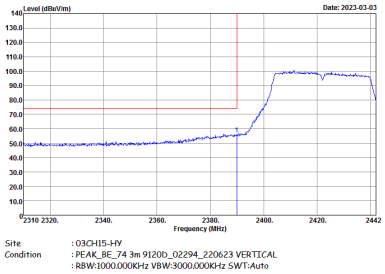
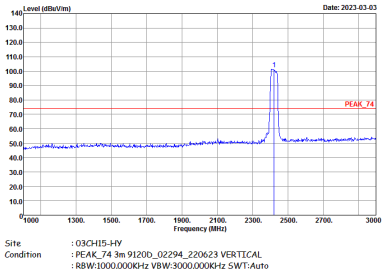
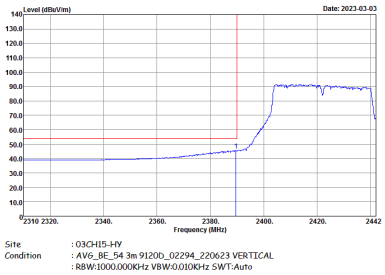
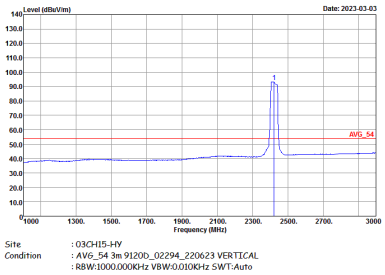
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11 ax HE20 Full CH06 2437MHz	
2	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

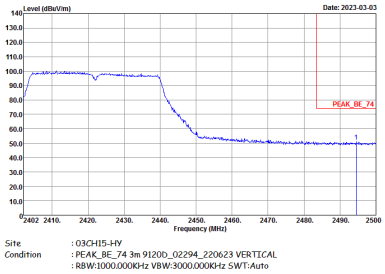
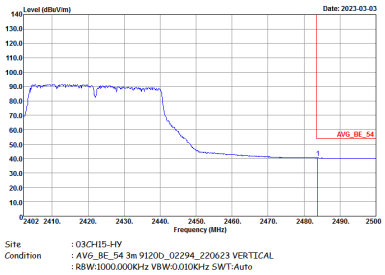
2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

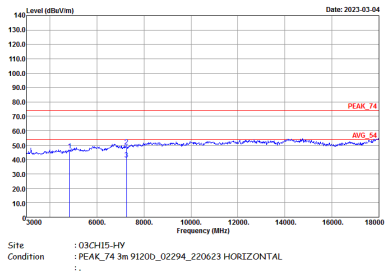
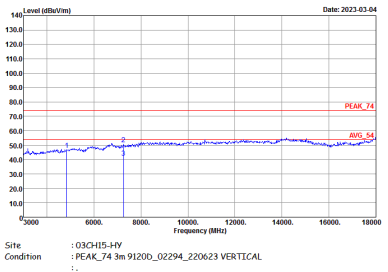
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
1+2	Horizontal	Fundamental
Peak		Left Blank
Avg.		Left Blank

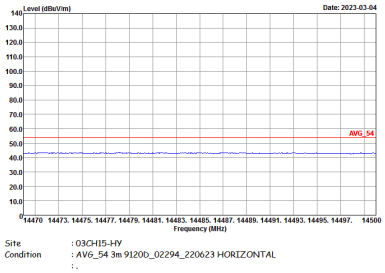
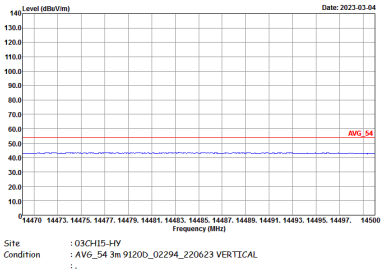
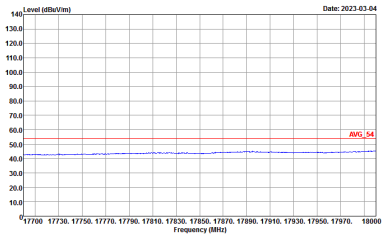
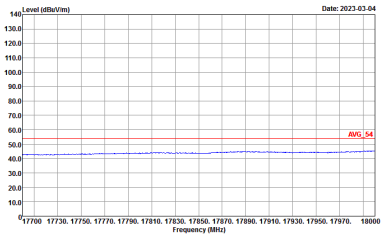
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

2.4GHz 2400~2483.5MHz

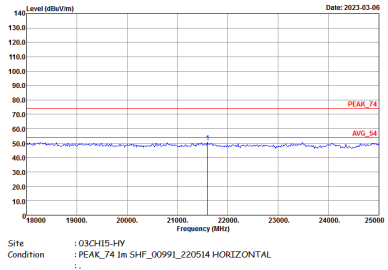
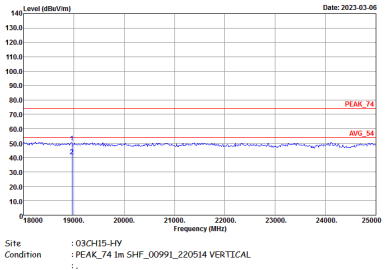
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT40 CH03 2422MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT40 CH03 2422MHz	
1+2	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

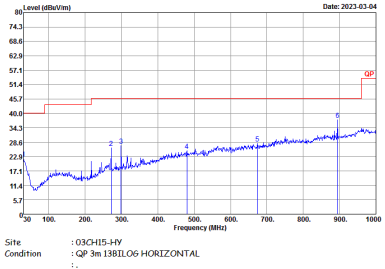
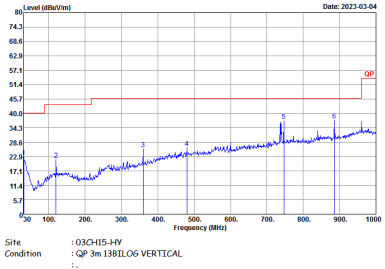
Emission above 18GHz

2.4GHz WIFI 802.11n HT40 (SHF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT40 SHF	
1+2	Horizontal	Vertical
QP / Peak		

Emission below 1GHz

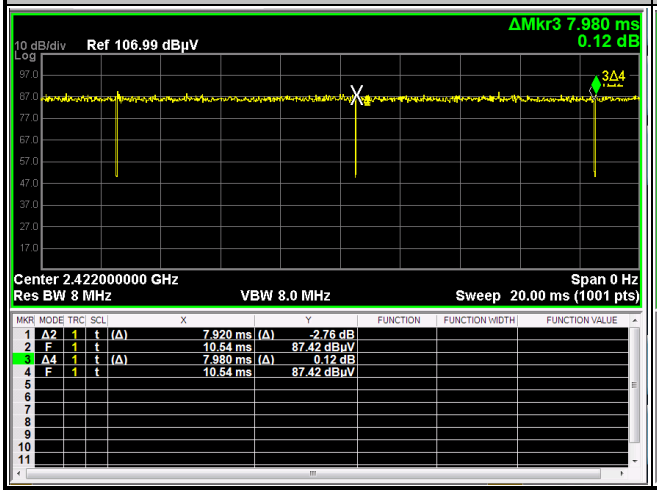
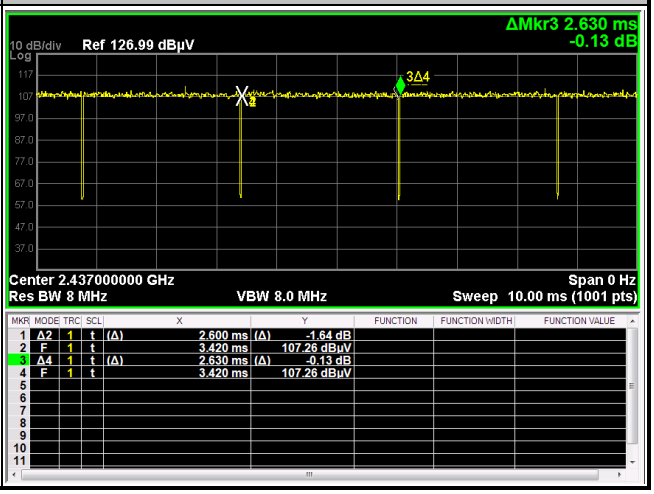
2.4GHz WIFI 802.11n HT40 (LF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT40 LF	
1+2	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1+2	2.4GHz 802.11n HT40	99.25	-	-	10Hz
2	2.4GHz 802.11ax HE20 Full RU	98.86	-	-	10Hz

MIMO <Ant. 1+2> **<Ant. 2>**

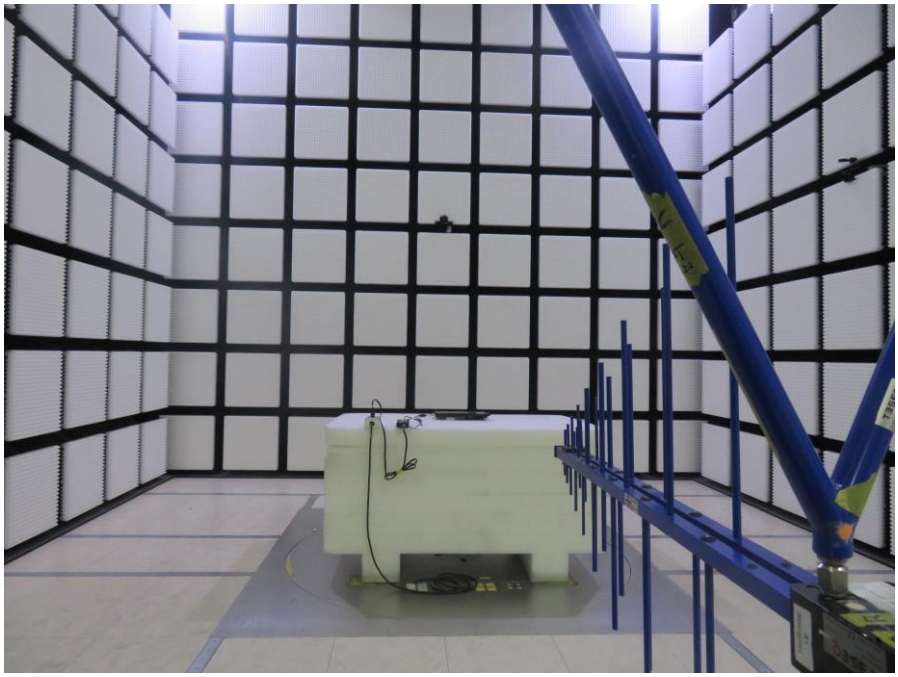
802.11n HT40	802.11ax HE20 Full RU
	

Appendix E. Setup Photographs

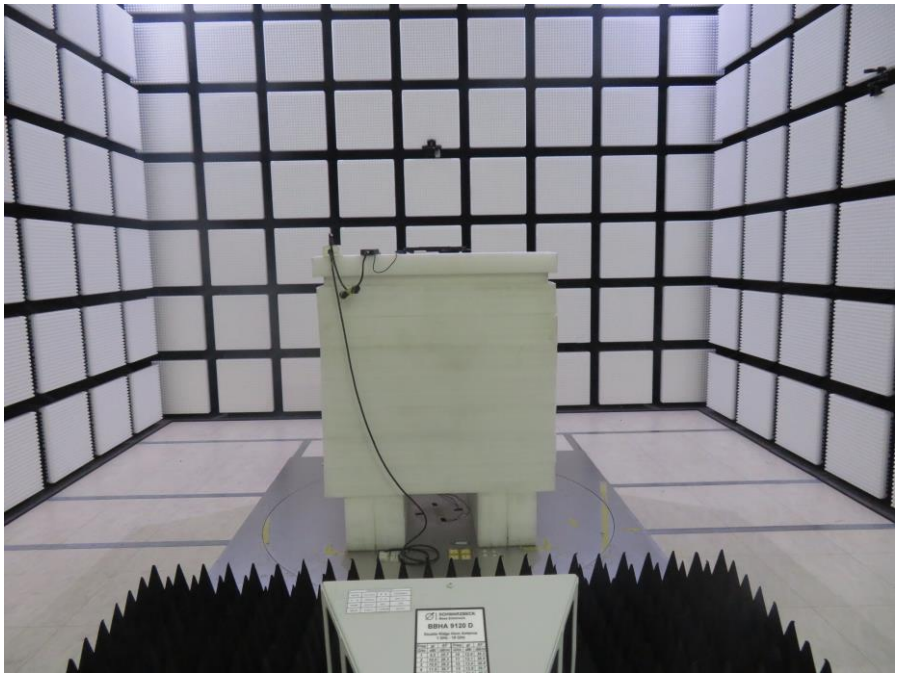
<Radiated Emission>

X Plane

LF



HF



SHF

———THE END———