FCC Test Report

(Co-Located)

Report No.:	RFBBQZ-WTW-P21123590-4
FCC ID:	PY321300543
Test Model:	WAX615
Received Date:	Nov. 11, 2021
Test Date:	Jan. 14~ Jan. 19, 2022
Issued Date:	Jan. 20, 2022
Applicant and Manufacturer:	NETGEAR, Inc.
Address:	350 East Plumeria Drive San Jose, CA 95134
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RFBBQZ-WTW-P21123590-4	Original Release	Jan. 20, 2022

1 Certificate of Conformity

Product:	Insight Managed AX3000 WiFi 6 Access Point
Brand:	NETGEAR
Test Model:	WAX615
Sample Status:	Engineering Sample
Applicant:	NETGEAR, Inc.
Test Date:	Jan. 14~ Jan. 19, 2022
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jan. 20, 2022

Polly Chien / Specialist

Approved by : _____ , **Date:** Jan. 20, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)		
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -2.5dB at 11730.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Insight Managed AX3000 WiFi 6 Access Point	
Brand	NETGEAR	
Test Model	WAX615	
Sample Status	Engineering sample	
Power Supply rating	12Vdc from adapter 54Vdc from PoE	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA
Transfer Rate	WLAN	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11b:11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n (2.4GHz Band): up to 400Mbps 802.11n (5GHz Band): up to 300Mbps 802.11ac (5GHz Band): up to 1733.3Mbps 802.11ax (2.4GHz Band): up to 574Mbps 802.11ax (5GHz Band): up to 2401.9Mbps
Operating Frequency	WLAN	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5240MHz, 5250 ~ 5320MHz, 5500 ~ 5720MHz, 5745 ~ 5825MHz, 5845 ~ 5885MHz
Number of Channel	WLAN	2412 ~ 2462MHz: 11 for 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20) 7 for 802.11n (HT40), VHT40, 802.11ax (HE40) 5180 ~ 5240 MHz: 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40) 1 for 802.11ac (VHT80), 802.11ax (HE80) 5250 ~ 5320MHz: 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40) 1 for 802.11ac (VHT80), 802.11ax (HE80) 1 for 802.11ac (VHT160), 802.11ax (HE160) 5500 ~ 5720MHz: 12 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 6 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40) 3 for 802.11ac (VHT80), 802.11ax (HE80) 1 for 802.11ac (VHT160), 802.11ax (HE160) 5745 ~ 5825 MHz: 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40) 1 for 802.11ac (VHT80), 802.11ax (HE80) 5845 ~ 5885 MHz: 3 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40) 1 for 802.11ac (VHT80), 802.11ax (HE80) 1 for 802.11ac (VHT160), 802.11ax (HE160)

Output Power	WLAN	CDD Mode: 2412 ~ 2462MHz: 835.045mW (Conducted Power) 5180 ~ 5250MHz: 816.219mW (Conducted Power) 5250 ~ 5320MHz: 211.364mW (Conducted Power) 5500 ~ 5720MHz: 212.829mW (Conducted Power) 5745 ~ 5825MHz: 800.816mW (Conducted Power) 5845 ~ 5885MHz: 1309.182 mW (EIRP) Beamforming Mode: 2412 ~ 2462MHz: 798.995mW (Conducted Power) 5180 ~ 5250MHz: 816.219mW (Conducted Power) 5250 ~ 5320MHz: 211.364mW (Conducted Power) 5500 ~ 5720MHz: 212.829mW (Conducted Power) 5745 ~ 5825MHz: 800.816mW (Conducted Power) 5845 ~ 5885MHz: 1849.269 mW (EIRP)
Antenna Type	Refer to note	
Antenna Connector	Refer to note	
Accessory Device	Refer to note	
Cable Supplied	NA	

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	Beamforming Mode	TX Function
802.11b	Not Support	2TX
802.11g	Not Support	2TX
802.11a	Not Support	2TX
802.11n (HT20)	Not Support	2TX
802.11n (HT40)	Not Support	2TX
802.11ac (VHT20)	Support	2TX
802.11ac (VHT40)	Support	2TX
802.11ac (VHT80)	Support	2TX
802.11ac (VHT160)	Support	2TX
802.11ax (HE20)	Support	2TX
802.11ax (HE40)	Support	2TX
802.11ax (HE80)	Support	2TX
802.11ax (HE160)	Support	2TX

* The bandwidth and modulation are similar for HT20/HT40 on 802.11n mode and VHT20/VHT40 on 802.11ac mode and HE20/HE40/HE80 on 802.11ax mode. Therefore the investigated worst case is the representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT consumes power from the following adapters and POE.

Adapter 1	
Brand	Netgear
Model	ADS-40FPA-12 12030EPCU-L ADS-40FPA-12 12030EPC-L
P/N	332-11584-02
Input Power	100-120Vac ~60Hz Max. 1A
Output Power	12Vdc, 2.5A
Power line	1.8m cable without core

Adapter 2	
Brand	Netgear
Model	AD2067F10
P/N	332-10944-02
Input Power	100-120Vac ~50/60Hz Max. 1A
Output Power	12Vdc, 2.5A
Power line	1.8m cable without core

* Adapter 1 was chosen for final test and presented in the test report.

POE (for support unit only)	
Brand	Netgear
Model	GS524UP
Input Power	100–240Vac, 50–60Hz, 8–4A
Output Power	480W

3. The Antenna information is listed as below.

ANT. No.	Type	Connector	Frequency Range	Gain (dBi)
2.4G_0	Dipole	IPEX	2400~2483.5MHz	2.66
2.4G_1	Dipole	IPEX	2400~2483.5MHz	2.49
5G_0	Dipole	IPEX	5150~5250MHz	2.93
			5250~5350MHz	2.93
			5470~5725MHz	2.91
			5725~5850MHz	2.89
			5850~5895MHz	2.89
5G_1	Dipole	IPEX	5150~5250MHz	2.85
			5250~5350MHz	2.85
			5470~5725MHz	2.92
			5725~5850MHz	2.83
			5850~5895MHz	2.83

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

4. WLAN 2.4GHz & WLAN 5GHz technology can transmit at same time.

3.2 Description of Test Modes

For WLAN 2.4G:

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40), VHT40, 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

For 5180 ~ 5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
42	5210MHz

For 5250 ~ 5320MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
58	5290MHz

1 channel is provided for 802.11ac (VHT160), 802.11ax (HE160):

Channel	Frequency
50	5250MHz

For 5500 ~ 5720MHz:

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

6 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
106	5530 MHz	138	5690 MHz
122	5610 MHz		

1 channel is provided for 802.11ac (VHT160), 802.11ax (HE160):

Channel	Frequency
114	5570MHz

For 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
155	5775MHz

For 5850 ~ 5895MHz:

3 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency
*169	5845.5 MHz	173	5865 MHz	177	5885 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
*167	5835 MHz	175	5875 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
*171	5855 MHz

1 channel is provided for 802.11ac (VHT160), 802.11ax (HE160):

Channel	Frequency
*163	5815 MHz

Note: * Straddle channels.

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to		Description
	RE≥1G	RE<1G	
A	√	√	Powered by adpater
B	-	√	Powered by POE

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

NOTE:
1. For radiated emission (below 1GHz) and power line conducted emission test items, the worst radiated emission mode was selected.
2. "-": means no effect.

Radiated Emission Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
A	802.11g + 802.11ax (HE20)	2412-2462	1 to 11	6 + 40	OFDM
		5180-5240	36 to 48		OFDMA
A	802.11g + 802.11ax (HE20)	2412-2462	1 to 11	6 + 173	OFDM
		5845-5885	169 to 177		OFDMA

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
A, B	802.11g + 802.11ax (HE20)	2412-2462	1 to 11	6 + 40	OFDM
		5180-5240	36 to 48		OFDMA
A, B	802.11g + 802.11ax (HE20)	2412-2462	1 to 11	6 + 173	OFDM
		5845-5885	169 to 177		OFDMA

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	23 deg. C, 66% RH	120 Vac, 60 Hz	Titan Hsu
RE<1G	23 deg. C, 66% RH	120 Vac, 60 Hz	Titan Hsu

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5430	2RL3YW1	FCC DoC Approved	-
B.	PoE	Netgear	GS524UP	NA	NA	Provided by client

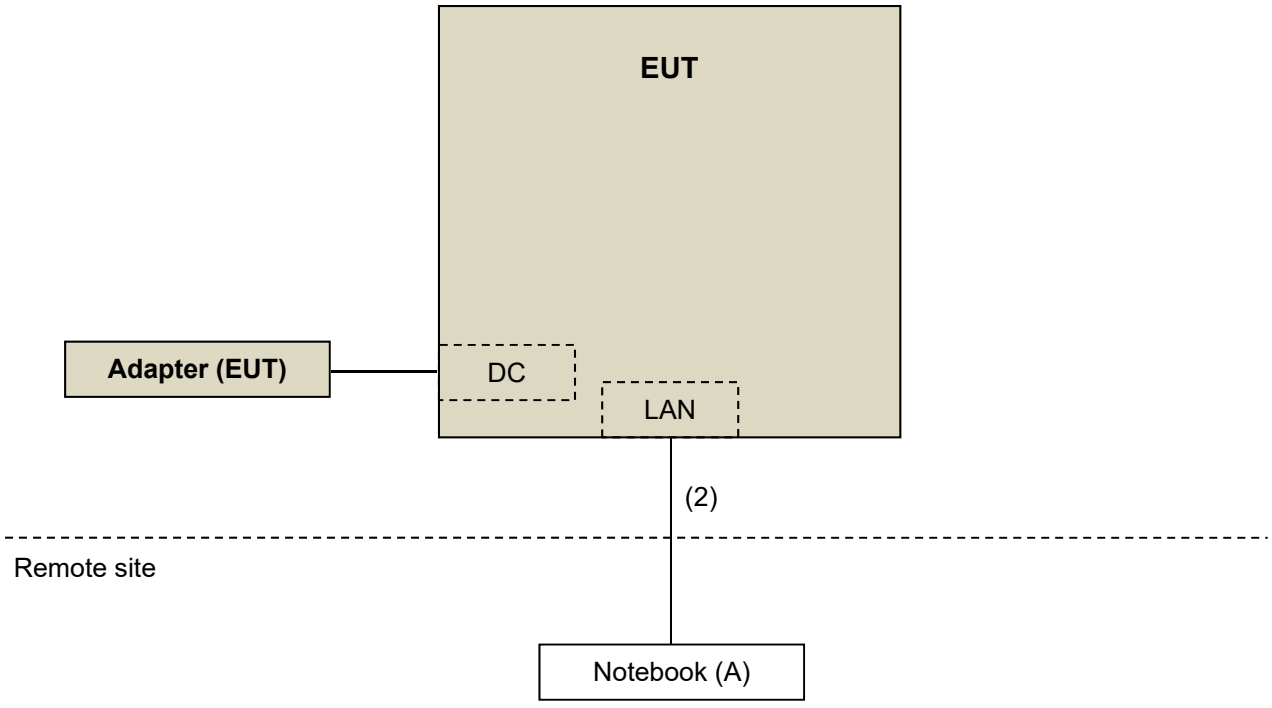
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

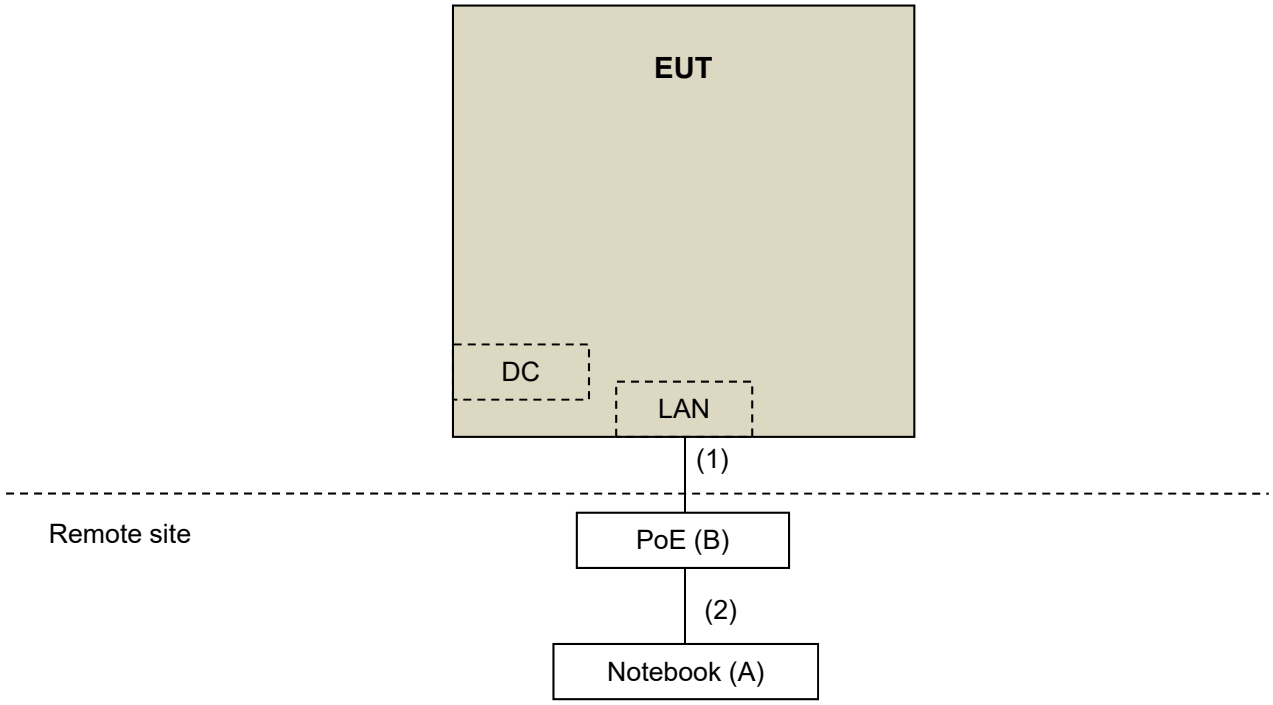
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	1	1.5	N	0	RJ45, Cat5e
2.	LAN cable	1	7	N	0	RJ45, Cat5e

3.3.1 Configuration of System under Test

Mode A



Mode B



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)

FCC Part 15, Subpart E (15.407)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:
KDB 987594 D02 EMC Measurement v01r01
KDB 789033 D02 General UNII Test Procedure New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01
KDB 291074 D02 EMC Measurement v01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK: 74 (dBμV/m)	AV: 54 (dBμV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK: -27 (dBm/MHz)	PK: 68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK: -27 (dBm/MHz) *1 PK: 10 (dBm/MHz) *2 PK: 15.6 (dBm/MHz) *3 PK: 27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK: 105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK: 122.2 (dBμV/m) *4

*1 beyond 75 MHz or more above of the band edge.

*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.

*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.

*4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts).

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 30, 2021	Dec. 29, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 15, 2021	Sep. 14, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 01, 2021	Oct. 30, 2022
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Oct. 26, 2021	Oct. 25, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jun. 05, 2021	Jun. 04, 2022
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH4-01	Jul. 24, 2021	Jul. 23, 2022
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Jul. 24, 2021	Jul. 23, 2022
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Jul. 24, 2021	Jul. 23, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jun. 05, 2021	Jun. 04, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jun. 05, 2021	Jun. 04, 2022
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 04, 2021	Sep. 03, 2022
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 12, 2021	Jul. 11, 2022

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

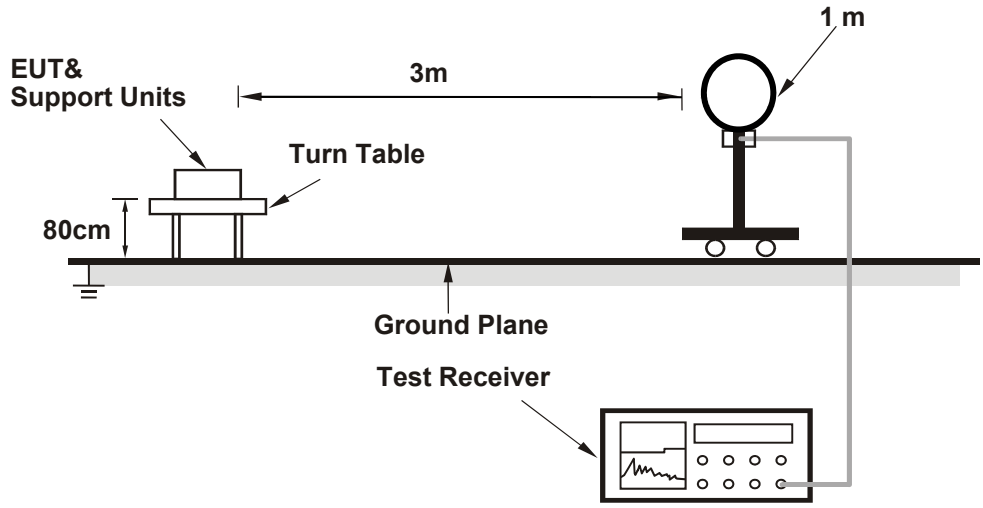
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. For WLAN device measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

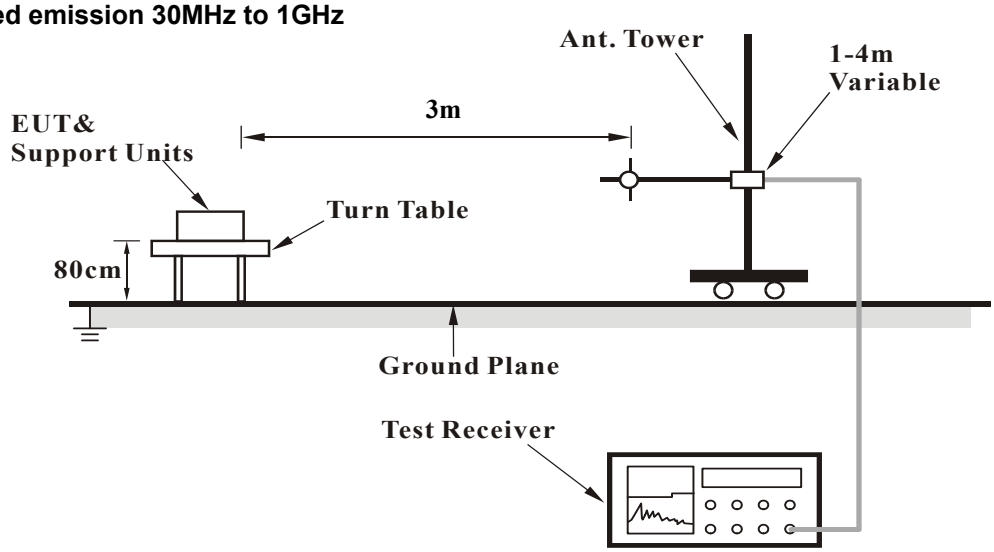
No deviation.

4.1.5 Test Setup

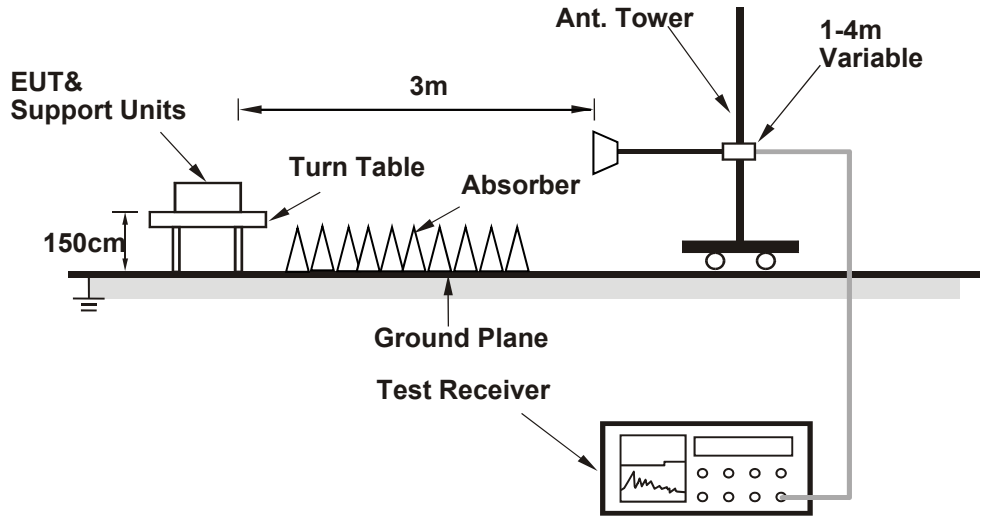
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

802.11g + 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 40	Frequency Range	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	23 deg. C, 66 % RH	Tested By	Titan Hsu

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	123.8 PK			1.85 H	65	89.5	34.3
2	*2437.00	114.5 AV			1.85 H	65	80.2	34.3
3	4874.00	51.1 PK	74.0	-22.9	2.02 H	158	37.5	13.6
4	4874.00	40.6 AV	54.0	-13.4	2.02 H	158	27.0	13.6
5	*5200.00	122.6 PK			1.08 H	305	80.4	42.2
6	*5200.00	111.2 AV			1.08 H	305	69.0	42.2
7	#10400.00	62.0 PK	68.2	-6.2	1.95 H	233	39.2	22.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	117.8 PK			3.35 V	52	83.5	34.3
2	*2437.00	107.8 AV			3.35 V	52	73.5	34.3
3	4874.00	50.8 PK	74.0	-23.2	1.61 V	232	37.2	13.6
4	4874.00	39.7 AV	54.0	-14.3	1.61 V	232	26.1	13.6
5	*5200.00	116.7 PK			3.75 V	35	74.5	42.2
6	*5200.00	106.7 AV			3.75 V	35	64.5	42.2
7	#10400.00	61.9 PK	68.2	-6.3	2.05 V	335	39.1	22.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11g + 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 173	**Frequency Range**	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*2437.00	123.5 PK			1.85 H	65	89.2	34.3
2	*2437.00	114.4 AV			1.85 H	65	80.1	34.3
3	4874.00	51.1 PK	74.0	-22.9	2.05 H	158	37.5	13.6
4	4874.00	40.8 AV	54.0	-13.2	2.05 H	158	27.2	13.6
5	#5641.20	60.8 PK	68.2	-7.4	1.32 H	315	47.4	13.4
6	*5865.00	123.2 PK			1.32 H	315	79.4	43.8
7	*5865.00	112.3 AV			1.32 H	315	68.5	43.8
8	#5916.70	63.5 PK	94.3	-30.8	1.32 H	315	49.5	14.0
9	#5961.82	62.5 PK	88.2	-25.7	1.32 H	315	48.3	14.2
10	11730.00	63.3 PK	74.0	-10.7	2.35 H	247	39.0	24.3
11	**11730.00**	**51.5 AV**	**54.0**	**-2.5**	**2.35 H**	**247**	**27.2**	**24.3**
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*2437.00	117.8 PK			3.45 V	58	83.5	34.3
2	*2437.00	107.7 AV			3.45 V	58	73.4	34.3
3	4874.00	50.8 PK	74.0	-23.2	1.61 V	235	37.2	13.6
4	4874.00	39.7 AV	54.0	-14.3	1.61 V	235	26.1	13.6
5	#5560.93	60.2 PK	68.2	-8.0	3.65 V	255	46.8	13.4
6	*5865.00	116.3 PK			3.65 V	255	72.5	43.8
7	*5865.00	105.8 AV			3.65 V	255	62.0	43.8
8	#5920.50	61.5 PK	91.5	-30.0	3.65 V	255	47.4	14.1
9	#5997.93	60.0 PK	88.2	-28.2	3.65 V	255	45.8	14.2
10	11730.00	62.8 PK	74.0	-11.2	2.21 V	315	38.5	24.3
11	11730.00	50.8 AV	54.0	-3.2	2.21 V	315	26.5	24.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz data

Mode A

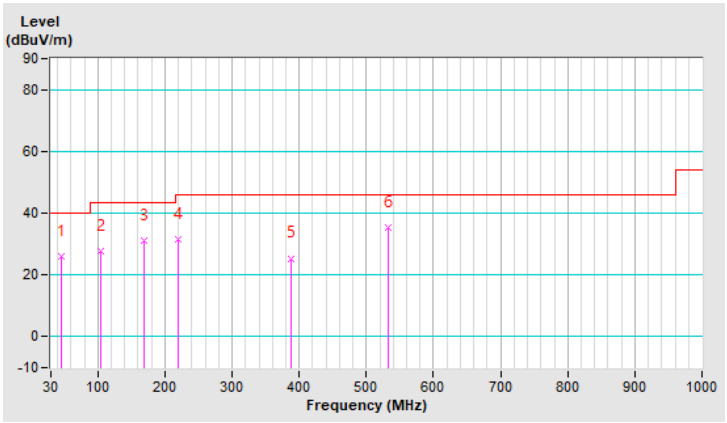
802.11g + 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 40	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	45.52	26.2 QP	40.0	-13.8	1.00 H	135	34.9	-8.7
2	103.72	27.7 QP	43.5	-15.8	1.49 H	96	40.5	-12.8
3	169.68	31.1 QP	43.5	-12.4	1.49 H	117	40.3	-9.2
4	220.12	31.5 QP	46.0	-14.5	1.49 H	72	43.0	-11.5
5	386.96	25.4 QP	46.0	-20.6	1.00 H	48	31.5	-6.1
6	532.46	35.5 QP	46.0	-10.5	1.49 H	186	39.1	-3.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

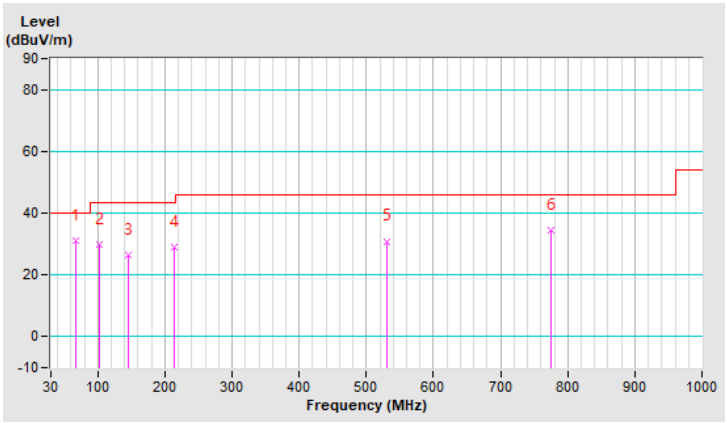


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 40	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	66.86	31.2 QP	40.0	-8.8	1.00 V	107	41.2	-10.0
2	101.78	29.7 QP	43.5	-13.8	1.50 V	290	42.8	-13.1
3	144.46	26.3 QP	43.5	-17.2	1.50 V	55	35.3	-9.0
4	214.30	29.1 QP	43.5	-14.4	1.00 V	170	40.6	-11.5
5	530.52	30.9 QP	46.0	-15.1	1.50 V	59	34.5	-3.6
6	774.96	34.7 QP	46.0	-11.3	1.50 V	130	32.5	2.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



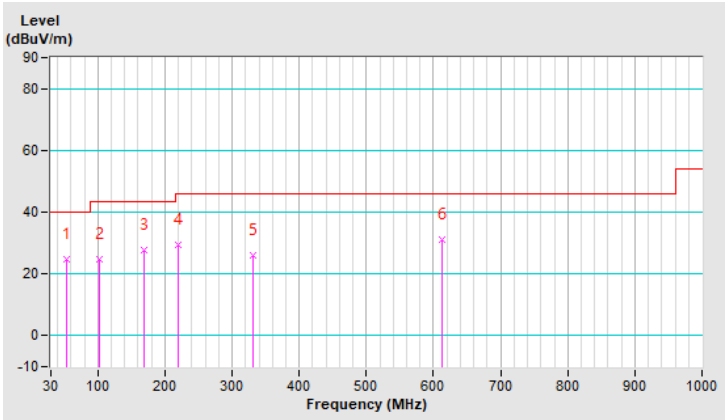
802.11g + 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 173	Frequency Range	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	Tested By	Titan Hsu

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	53.28	24.9 QP	40.0	-15.1	1.50 H	125	33.6	-8.7
2	101.78	24.8 QP	43.5	-18.7	1.00 H	260	37.9	-13.1
3	169.68	27.8 QP	43.5	-15.7	1.00 H	101	37.0	-9.2
4	220.12	29.4 QP	46.0	-16.6	1.50 H	231	40.9	-11.5
5	330.70	25.9 QP	46.0	-20.1	1.00 H	308	32.7	-6.8
6	612.00	31.3 QP	46.0	-14.7	1.00 H	203	32.8	-1.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

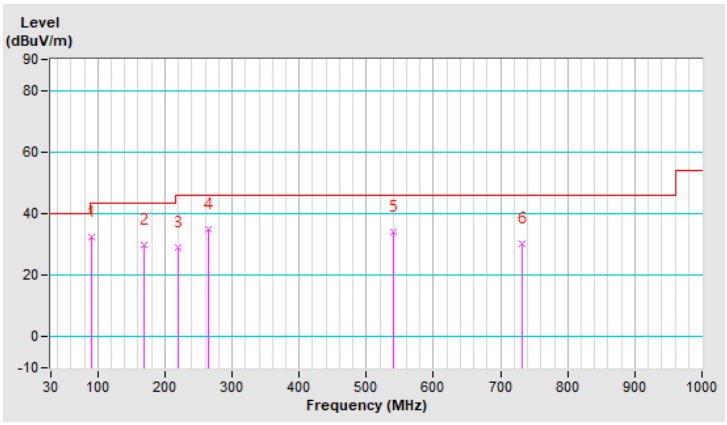


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 173	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	90.14	32.2 QP	43.5	-11.3	1.50 V	183	46.5	-14.3
2	169.68	29.7 QP	43.5	-13.8	1.00 V	104	38.9	-9.2
3	220.12	29.1 QP	46.0	-16.9	1.00 V	166	40.6	-11.5
4	264.74	34.9 QP	46.0	-11.1	1.00 V	43	43.6	-8.7
5	540.22	34.0 QP	46.0	-12.0	1.00 V	197	37.4	-3.4
6	732.28	30.4 QP	46.0	-15.6	1.50 V	154	29.7	0.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



Mode B

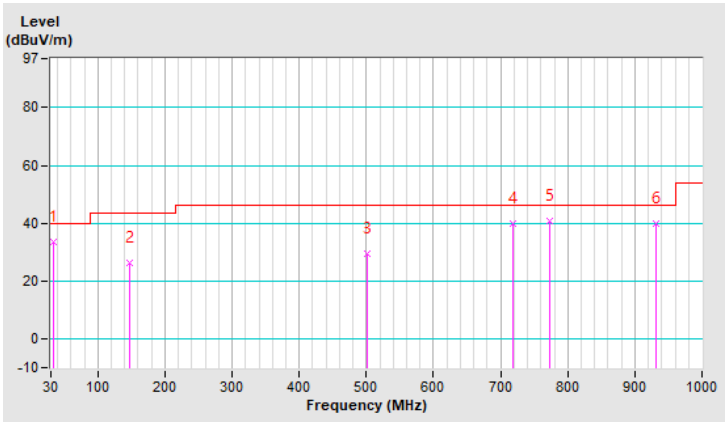
802.11g + 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 40	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	33.88	33.4 QP	40.0	-6.6	1.00 H	78	43.5	-10.1
2	146.40	26.1 QP	43.5	-17.4	1.49 H	272	34.9	-8.8
3	501.42	29.5 QP	46.0	-16.5	1.49 H	174	33.4	-3.9
4	718.70	39.8 QP	46.0	-6.2	1.49 H	295	39.5	0.3
5	773.02	40.6 QP	46.0	-5.4	1.00 H	277	38.5	2.1
6	932.10	39.9 QP	46.0	-6.1	1.49 H	4	34.7	5.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

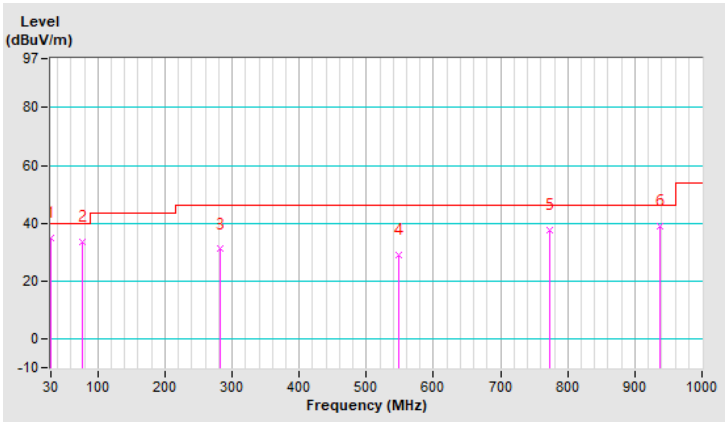


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 40	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	30.88	35.0 QP	40.0	-5.0	1.00 V	10	45.5	-10.5
2	76.56	33.5 QP	40.0	-6.5	1.00 V	169	45.6	-12.1
3	282.20	31.0 QP	46.0	-15.0	1.00 V	242	39.0	-8.0
4	547.98	28.8 QP	46.0	-17.2	1.50 V	291	32.3	-3.5
5	773.02	37.7 QP	46.0	-8.3	1.00 V	6	35.6	2.1
6	937.92	39.1 QP	46.0	-6.9	2.00 V	189	33.7	5.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



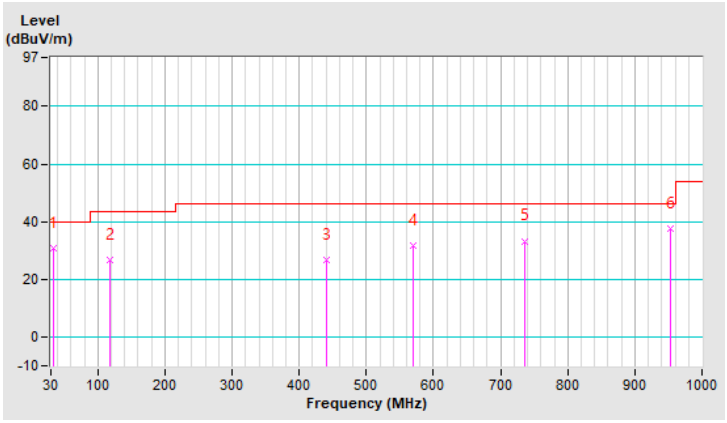
802.11g + 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 173	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	34.62	30.6 QP	40.0	-9.4	1.50 H	233	40.6	-10.0
2	117.30	26.9 QP	43.5	-16.6	1.51 H	286	38.3	-11.4
3	441.28	26.7 QP	46.0	-19.3	1.51 H	313	31.7	-5.0
4	569.32	31.5 QP	46.0	-14.5	1.51 H	180	34.5	-3.0
5	736.16	33.3 QP	46.0	-12.7	1.51 H	96	32.4	0.9
6	953.44	37.7 QP	46.0	-8.3	1.51 H	223	32.0	5.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

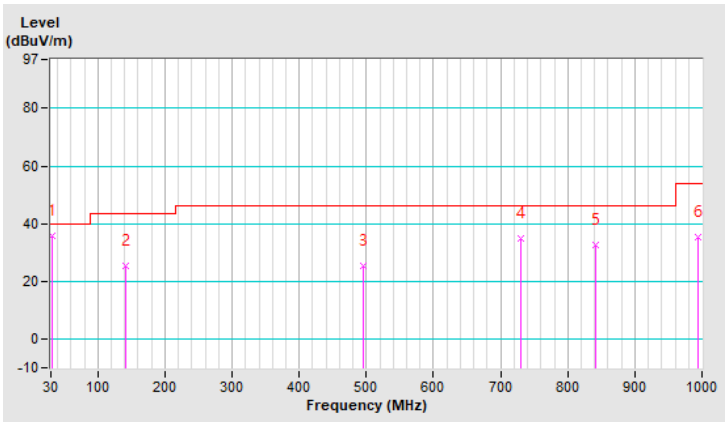


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 173	**Frequency Range**	9kHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	**Tested By**	Titan Hsu

Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	31.88	36.0 QP	40.0	-4.0	1.00 V	333	46.3	-10.3
2	140.58	25.2 QP	43.5	-18.3	1.49 V	284	34.4	-9.2
3	495.60	25.5 QP	46.0	-20.5	1.49 V	218	29.6	-4.1
4	730.34	34.9 QP	46.0	-11.1	1.49 V	337	34.2	0.7
5	840.92	32.6 QP	46.0	-13.4	1.49 V	319	29.2	3.4
6	994.18	35.4 QP	54.0	-18.6	1.00 V	0	28.9	6.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

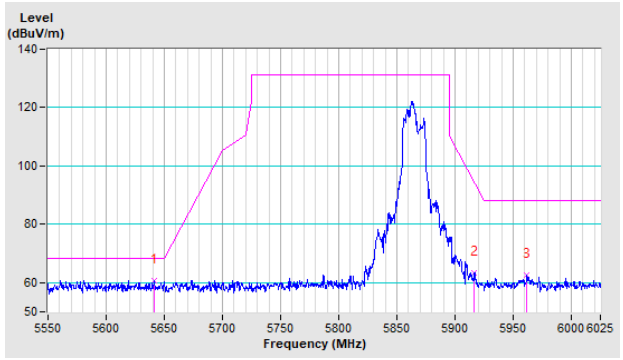
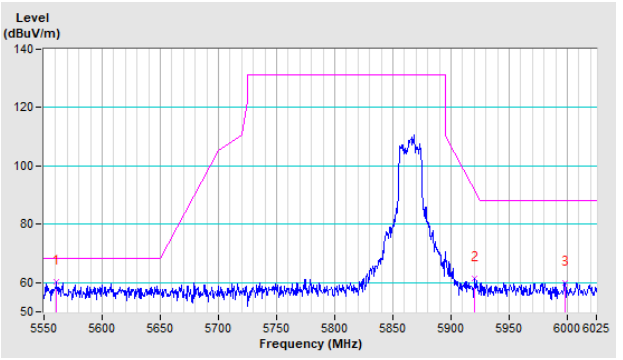


5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Annex A – Band Edge Measurement

802.11ax (HE20)

Channel 173	
Horizontal (Peak)	Vertical (Peak)
	

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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