

FCC Test Report (Co-Located)

Report No.: RFBBQZ-WTW-P21091048-3

FCC ID: PY321300545

Test Model: RAXE300

Received Date: Aug. 13, 2021

Test Date: Nov. 12, 2021

Issued Date: Dec. 24, 2021

Applicant and Manufacturer: NETGEAR, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBBQZ-WTW-P21091048-3	Original Release	Dec. 24, 2021

1 Certificate of Conformity

Product: NIGHTHAWK AXE7800 Tri-Band WiFi 6E Router

Brand: NETGEAR

Test Model: RAXE300

Sample Status: Engineering Sample

Applicant and Manufacturer: NETGEAR, Inc.

Test Date: Nov. 12, 2021

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 : Pettie Chen, **Date:** Dec. 24, 2021
Pettie Chen / Senior Specialist

Approved by : Jeremy Lin, **Date:** Dec. 24, 2021
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)/9)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -0.5dB at 2390.00 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) ($\pm$)
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	NIGHTHAWK AXE7800 Tri-Band WiFi 6E Router	
Brand	NETGEAR	
Test Model	RAXE300	
Sample Status	Engineering sample	
Power Supply rating	12Vdc (adapter)	
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 600Mbps 802.11ac (5GHz Band): up to 3466.8Mbps 802.11ax (2.4GHz Band): up to 574Mbps 802.11ax (5GHz Band): up to 4803.9Mbps
Operating Frequency	WLAN	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5320MHz, 5500 ~ 5720MHz, 5745 ~ 5825MHz, 5955 ~ 6415MHz, 6435 ~ 6525MHz, 6525 ~ 6875MHz, 6875 ~ 7115MHz
Number of Channel	WLAN	2412 ~ 2462MHz: 11 for 802.11b, 802.11g, 802.11n (HT20), 802.11n (VHT20), 802.11ax (HE20) 7 for 802.11n (HT40), 802.11n (VHT40), 802.11ax (HE40) 5180 ~ 5320MHz: 8 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 4 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40) 2 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) 5955 ~ 7115MHz: 59 for 802.11ax (HE20) 29 for 802.11ax (HE40) 14 for 802.11ax (HE80) 7 for 802.11ax (HE160)

Output Power	WLAN	CDD Mode: 2412 ~ 2462MHz: 854.266mW 5180 ~ 5240MHz: 847.100mW 5260 ~ 5320MHz: 216.912mW 5500 ~ 5720MHz: 213.383mW 5745 ~ 5825MHz: 852.899mW Beamforming Mode: 2412 ~ 2462MHz: 826.722mW 5180 ~ 5240MHz: 847.100mW 5260 ~ 5320MHz: 216.912mW 5500 ~ 5720MHz: 213.383mW 5745 ~ 5825MHz: 852.899mW
		Nss 1 5955 ~ 6415MHz: 27.94dBm / 622.300mW 6435 ~ 6525MHz: 28.54dBm / 714.496mW 6525 ~ 6875MHz: 26.89dBm / 488.652mW 6875 ~ 7115MHz: 26.31dBm / 427.563mW Nss 2 5955 ~ 6415MHz: 27.98dBm / 628.058mW 6435 ~ 6525MHz: 28.57dBm / 719.449mW 6525 ~ 6875MHz: 26.97dBm / 497.737mW 6875 ~ 7115MHz: 26.71dBm / 468.813mW
Antenna Type	Refer to note	
Antenna Connector	Refer to note	
Accessory Device	Adapter	
Cable Supplied	1.95m non-shielded RJ45 cable without core	

Note:

1. The EUT has three different sources, after pretest the main source was the worst case for final test.

Option	Source	difference
Option A	Main	USB IC and USB layout
Option B	2nd	
Option C	3rd	

2. 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/VHT80/VHT160 on 802.11ac mode and HE20/HE40/HE80/HE160 on 802.11ax mode. Therefore the investigated worst case is the representative mode in test report. (Final test mode refer section 3.2.1)

** 802.11n and 802.11ac/ax, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

3. The EUT uses following adapters.

Adapter 1	
Brand	Netgear
Model	AD2150F10
P/N	332-11494-02
Input Power	100-120Vac ~50/60Hz; 1A
Output Power	12Vdc, 35A
Power line	1.78m cable without core

Adapter 2	
Brand	Netgear
Model	ADS-45FI-12 12042EPCU-L
P/N	332-11526-02
Input Power	100~120 Vac; ~60 Hz; 1.5 A
Output Power	12Vdc, 3.5A
Power line	1.84m cable without core

4. The EUT uses following antennas.

Antenna Type	Dipole				
Antenna Connector	i-pex				
Antenna Gain	Chain0	Chain1	Chain2	Chain3	Directional Gain (dBi)
2400~2483.5MHz	1.50	1.50	-	-	4.11
5150~5250MHz	2.00	1.90	2.10	2.10	6.26
5250~5350MHz	2.40	2.50	2.20	2.20	6.20
5470~5725MHz	2.30	2.70	2.60	2.60	6.23
5725~5850MHz	3.00	2.90	2.80	2.80	6.27
5920~6425MHz	2.9	2.7	-	-	-
6425~6525MHz	1.9	1.7	-	-	-
6525~6875MHz	2.1	2.0	-	-	-
6875~7125MHz	2.1	2.2	-	-	-

* The detailed antenna information, please refer to the Operational Description-Antenna Specification report.

3.2 Description of Test Modes

For WLAN 2.4G:

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), 802.11n (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), 802.11n (VHT40), 802.11ax (HE40):

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

For 5180 ~ 5320MHz:

8 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
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz
54	5270 MHz	62	5310 MHz

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

Channel	Frequency	Channel	Frequency
42	5210MHz	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	122	5610 MHz
138	5690 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 5925 ~ 6425MHz (U-NII-5 band)

24 channels are provided for 802.11a, 802.11ax (HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	5955 MHz	5	5975 MHz	9	5995 MHz	13	6015 MHz
17	6035 MHz	21	6055 MHz	25	6075 MHz	29	6095 MHz
33	6115 MHz	37	6135 MHz	41	6155 MHz	45	6175 MHz
49	6195 MHz	53	6215 MHz	57	6235 MHz	61	6255 MHz
65	6275 MHz	69	6295 MHz	73	6315 MHz	77	6335 MHz
81	6355 MHz	85	6375 MHz	89	6395 MHz	93	6415 MHz

12 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
3	5965 MHz	11	6005 MHz	19	6045 MHz	27	6085 MHz
35	6125 MHz	43	6165 MHz	51	6205 MHz	59	6245 MHz
67	6285 MHz	75	6325 MHz	83	6365 MHz	91	6405 MHz

6 channel is provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
7	5985 MHz	23	6065 MHz	39	6145 MHz	55	6225 MHz
71	6305 MHz	87	6385 MHz				

3 channel is provided for 802.11ax (HE160):

Channel	Frequency	Channel	Frequency	Channel	Frequency
15	6025 MHz	47	6185 MHz	79	6345 MHz

For 6425 ~ 6525MHz (U-NII-6 band)

5 channels are provided for 802.11a, 802.11ax (HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
97	6435 MHz	101	6455 MHz	105	6475 MHz	109	6495 MHz
113	6515 MHz						

3 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency	Channel	Frequency
99	6445 MHz	107	6485 MHz	*115	6525 MHz

2 channel is provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
103	6465 MHz	*119	6545 MHz

1 channel is provided for 802.11ax (HE160):

Channel	Frequency
*111	6505 MHz

For 6525 ~ 6875MHz (U-NII-7 band)

18 channels are provided for 802.11a, 802.11ax (HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
117	6535 MHz	121	6555 MHz	125	6575 MHz	129	6595 MHz
133	6615 MHz	137	6635 MHz	141	6655 MHz	145	6675 MHz
149	6695 MHz	153	6715 MHz	157	6735 MHz	161	6755 MHz
165	6775 MHz	169	6795 MHz	173	6815 MHz	177	6835 MHz
181	6855 MHz	*185	6875 MHz				

9 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
123	6565 MHz	131	6605 MHz	139	6645 MHz	147	6685 MHz
155	6725 MHz	163	6765 MHz	171	6805 MHz	179	6845 MHz
*187	6885 MHz						

4 channels are provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
135	6625 MHz	151	6705 MHz	167	6785 MHz	*183	6865 MHz

2 channels are provided for 802.11ax (HE160):

Channel	Frequency	Channel	Frequency
143	6665 MHz	175	*6825 MHz

For 6875 ~ 7125MHz (U-NII-8 band):

12 channels are provided for 802.11a, 802.11ax (HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
189	6895 MHz	193	6915 MHz	197	6935 MHz	201	6955 MHz
205	6975 MHz	209	6995 MHz	213	7015 MHz	217	7035 MHz
221	7055 MHz	225	7075 MHz	229	7095 MHz	233	7115 MHz

5 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency	Channel	Frequency
195	6925 MHz	203	6965 MHz	211	7005 MHz
219	7045 MHz	227	7085 MHz		

2 channel is provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
199	6945 MHz	215	7025 MHz

1 channel is provided for 802.11ax (HE160):

Channel	Frequency
207	6985 MHz

Note: * mean this's straddle channel.

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to			Description
	RE $\geq$ 1G	RE<1G	OB	
A	√	√	√	Power from adapter 1
B	-	√	-	Power from adapter 2

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz
OB: Conducted Out-Band Emission Measurement

Note:

- The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
- "-": 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) + 802.11ax (HE160)	2412-2462	1 to 11	6 + 165 + 111	DSSS
		5745-5825	149 to 165		OFDMA
		6505	111		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) + 802.11ax (HE160)	2412-2462	1 to 11	6 + 165 + 111	DSSS
		5745-5825	149 to 165		OFDMA
		6505	111		OFDMA

Conducted Out-Band Emission Measurement:

- ☒ 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 (HE160)	2412-2462	1 to 11	6 + 111	DSSS
		6505	111		OFDMA

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE $\geq$ 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
OB	25 deg. C, 70% RH	120 Vac, 60 Hz	Luis Lee

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.

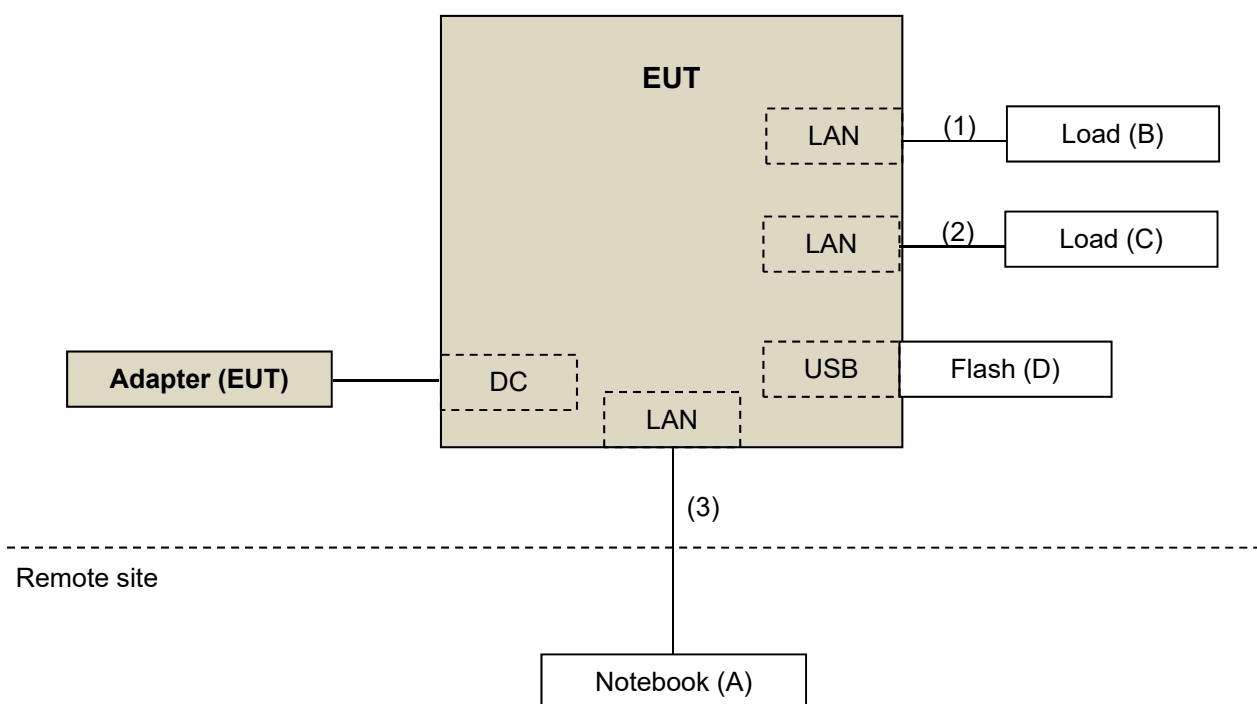
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-
C.	Load	NA	NA	NA	NA	-
D.	Flash	SanDisk	SDDDC3-032G	NA	NA	-

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	4	1.5	N	0	RJ45, Cat5e
2.	LAN cable	1	1.5	N	0	RJ45, Cat5e
3.	LAN cable	1	6	N	0	RJ45, Cat5e

3.3.1 Configuration of System under Test



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 558074 D01 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

KDB 987594 D02 U-NII 6 GHz EMC Measurement v01v01

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}
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
^{*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:

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

Limits of unwanted emission out of the restricted bands

Frequencies (MHz)	EIRP Limit	Equivalent Field Strength at 3m
5925MHz > F > 7125MHz	Peak:-7 (dBm/MHz)	88.2(dBμV/m)
	Average: -27 (dBm/MHz)	68.2(dBμV/m)

Note:

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2020	Dec. 30, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 15, 2021	Sep. 14, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 03, 2020 Nov. 01, 2021	Nov. 02, 2021 Oct. 31, 2022
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Jun. 05, 2021	Jun. 04, 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

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:

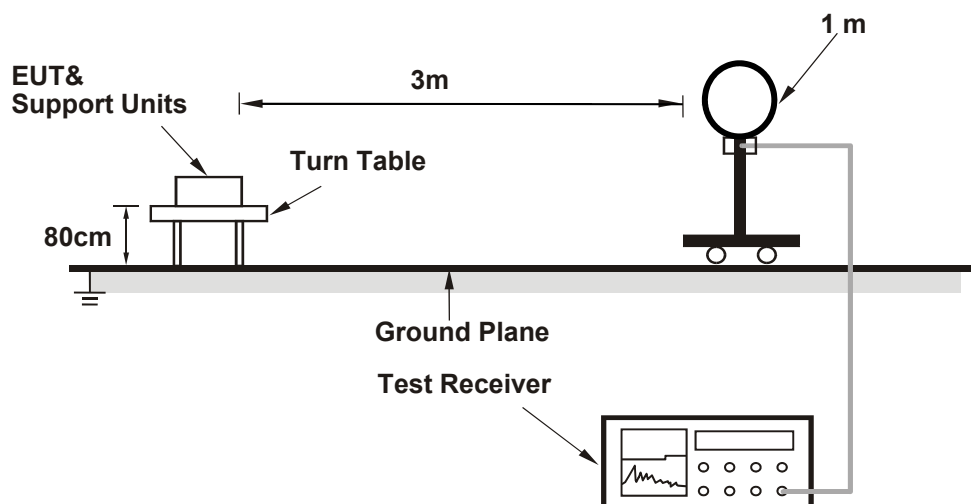
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. For WLAN device measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) 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

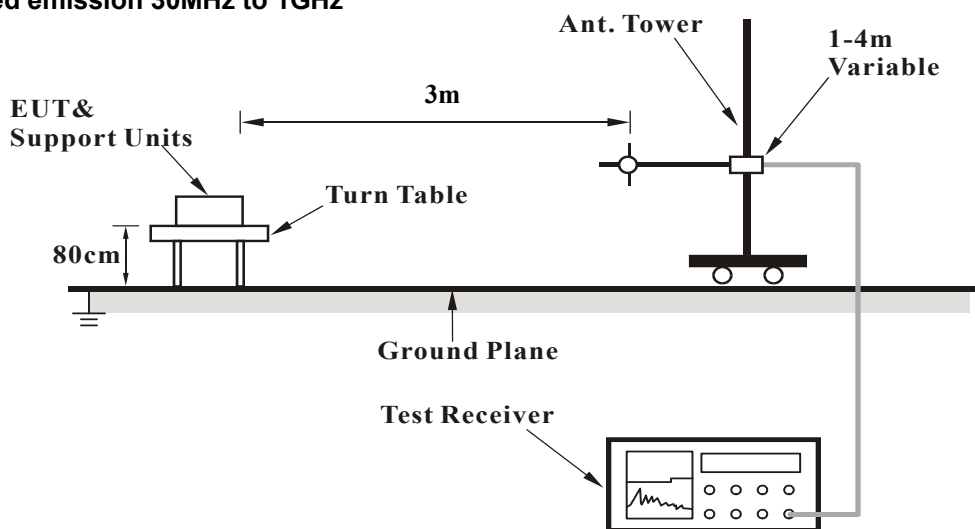
No deviation.

4.1.5 Test Setup

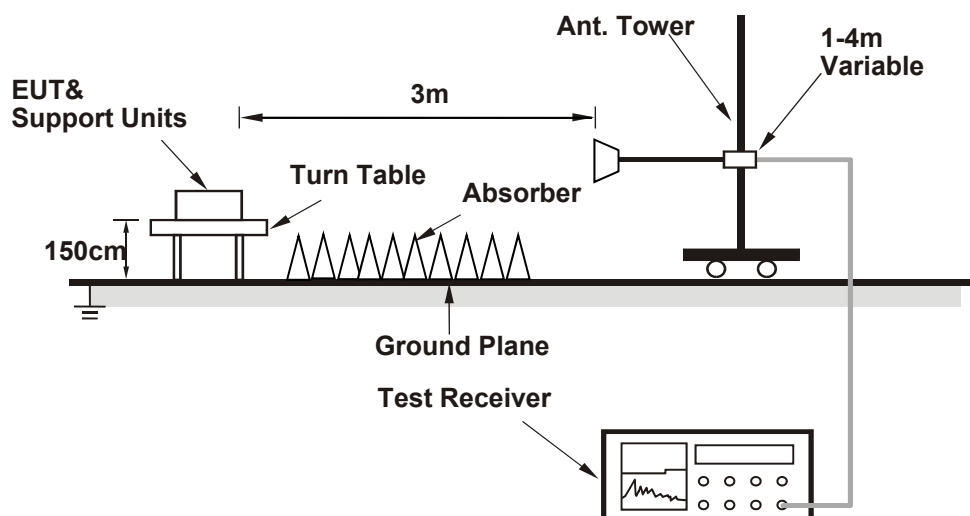
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- 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.
- The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz Data:

802.11g + 802.11ax (HE20) + 802.11ax (HE160)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 165 + Ch 111	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	2390.00	61.2 PK	74.0	-12.8	1.90 H	153	27.1	34.1
2	2390.00	46.9 AV	54.0	-7.1	1.90 H	153	12.8	34.1
3	*2437.00	110.6 PK			1.92 H	153	76.5	34.1
4	*2437.00	100.5 AV			1.92 H	153	66.4	34.1
5	2483.50	60.1 PK	74.0	-13.9	1.90 H	153	26.0	34.1
6	2483.50	47.3 AV	54.0	-6.7	1.90 H	153	13.2	34.1
7	4874.00	52.9 PK	74.0	-21.1	2.43 H	259	39.2	13.7
8	4874.00	40.0 AV	54.0	-14.0	2.43 H	259	26.3	13.7
9	#5631.60	62.20 PK	68.20	-6.00	1.77 H	235	48.50	13.70
10	*5825.00	122.0 PK			1.77 H	235	78.0	44.0
11	*5825.00	109.7 AV			1.77 H	235	65.7	44.0
12	#5971.20	62.30 PK	68.20	-5.90	1.77 H	235	47.80	14.50
13	*6505.00	105.4 PK			2.59 H	210	59.1	46.3
14	*6505.00	92.1 AV			2.59 H	210	45.8	46.3
15	11650.00	64.7 PK	74.0	-9.3	2.82 H	173	40.0	24.7
16	11650.00	52.2 AV	54.0	-1.8	2.82 H	173	27.5	24.7
17	#13010.00	62.7 PK	88.2	-25.5	2.73 H	163	39.5	23.2
18	#13010.00	49.3 AV	68.2	-18.9	2.73 H	163	26.1	23.2

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.
5. " * " : Fundamental frequency.
6. " # " : The radiated frequency is out of the restricted band.

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 165 + Ch 111	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 : 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	2390.00	71.9 PK	74.0	-2.1	1.55 V	355	37.8	34.1
2	2390.00	53.5 AV	54.0	-0.5	1.55 V	355	19.4	34.1
3	*2437.00	122.8 PK			1.55 V	355	88.7	34.1
4	*2437.00	113.8 AV			1.55 V	355	79.7	34.1
5	2483.50	70.8 PK	74.0	-3.2	1.55 V	355	36.7	34.1
6	2483.50	53.3 AV	54.0	-0.7	1.55 V	355	19.2	34.1
7	4874.00	50.8 PK	74.0	-23.2	2.42 V	164	37.1	13.7
8	4874.00	40.0 AV	54.0	-14.0	2.42 V	164	26.3	13.7
9	#5624.40	67.10 PK	68.20	-1.10	1.59 V	5	53.40	13.70
10	*5825.00	124.1 PK			1.59 V	5	80.1	44.0
11	*5825.00	115.3 AV			1.59 V	5	71.3	44.0
12	#5952.80	63.70 PK	68.20	-4.50	1.59 V	5	49.20	14.50
13	*6505.00	110.5 PK			2.63 V	12	64.2	46.3
14	*6505.00	98.1 AV			2.63 V	12	51.8	46.3
15	11650.00	63.9 PK	74.0	-10.1	2.71 V	175	39.2	24.7
16	11650.00	51.2 AV	54.0	-2.8	2.71 V	175	26.5	24.7
17	#13010.00	64.2 PK	88.2	-24.0	2.95 V	266	41.0	23.2
18	#13010.00	51.5 AV	68.2	-16.7	2.95 V	266	28.3	23.2

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.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz data

Mode A

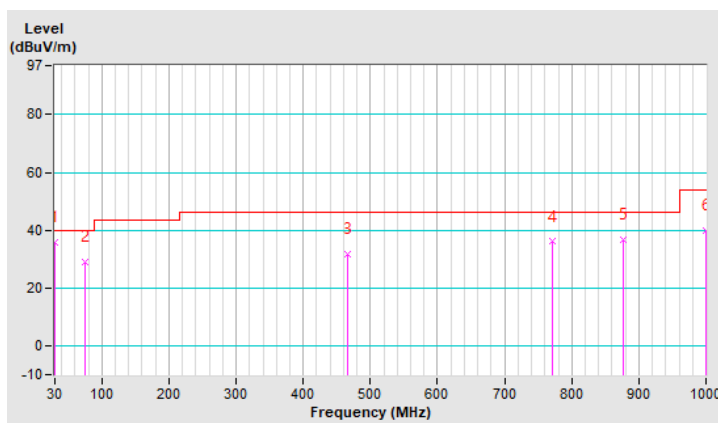
802.11g + 802.11ax (HE20) + 802.11ax (HE160)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 165 + Ch 111	Frequency Range	30 MHz ~ 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	30.91	35.80 QP	40.00	-4.20	1.00 H	165	46.40	-10.60
2	75.59	28.90 QP	40.00	-11.10	2.00 H	10	41.00	-12.10
3	466.50	31.80 QP	46.00	-14.20	1.51 H	128	36.60	-4.80
4	771.08	36.00 QP	46.00	-10.00	1.51 H	242	34.00	2.00
5	875.84	36.90 QP	46.00	-9.10	1.00 H	118	33.00	3.90
6	1000.00	39.80 QP	54.00	-14.20	1.51 H	236	33.60	6.20

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.

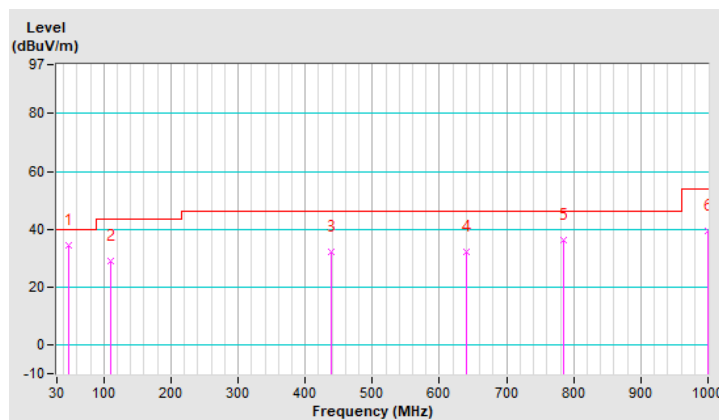


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 165 + Ch 111	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	Tested By	Titan Hsu

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	47.46	34.30 QP	40.00	-5.70	1.00 V	210	43.20	-8.90
2	109.54	28.80 QP	43.50	-14.70	1.99 V	142	41.10	-12.30
3	438.37	32.00 QP	46.00	-14.00	1.00 V	141	37.20	-5.20
4	641.10	32.00 QP	46.00	-14.00	1.00 V	280	33.20	-1.20
5	784.66	36.40 QP	46.00	-9.60	1.00 V	6	34.20	2.20
6	1000.00	39.30 QP	54.00	-14.70	1.50 V	330	33.10	6.20

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

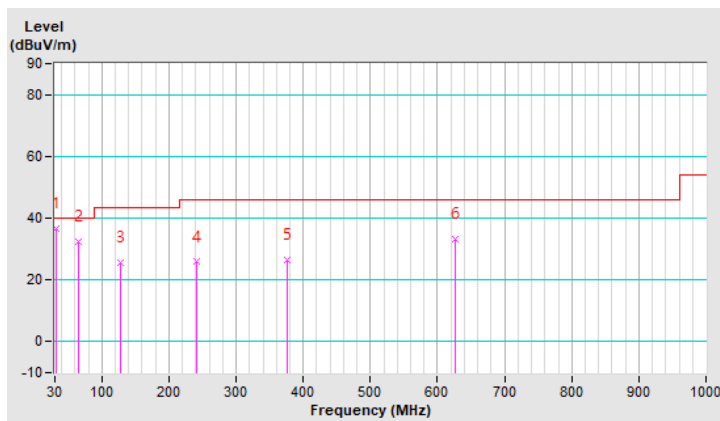
802.11g + 802.11ax (HE20) + 802.11ax (HE160)

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 165 + Ch 111	Frequency Range	30 MHz ~ 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	32.91	36.8 QP	40.0	-3.2	1.00 H	166	47.3	-10.5
2	65.89	32.4 QP	40.0	-7.6	1.00 H	32	42.7	-10.3
3	127.97	25.4 QP	43.5	-18.1	1.51 H	140	36.0	-10.6
4	240.49	25.8 QP	46.0	-20.2	1.00 H	345	35.9	-10.1
5	375.32	26.3 QP	46.0	-19.7	1.51 H	112	32.7	-6.4
6	625.58	33.3 QP	46.0	-12.7	1.00 H	60	34.7	-1.4

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.

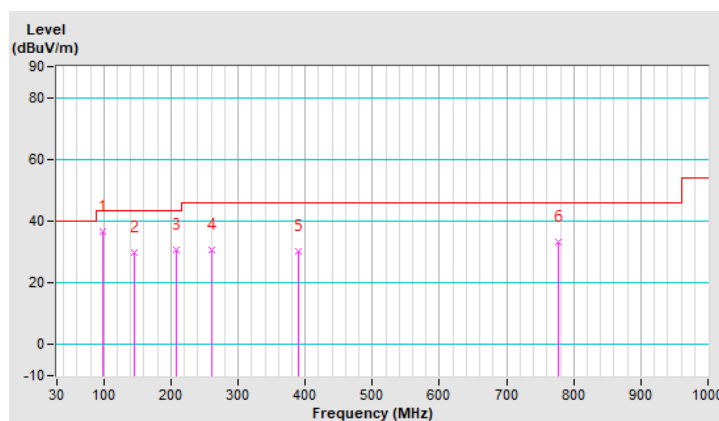


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 165 + Ch 111	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 66 % RH	Tested By	Titan Hsu

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	97.90	36.6 QP	43.5	-6.9	1.00 V	315	50.2	-13.6
2	144.46	30.0 QP	43.5	-13.5	1.00 V	315	39.0	-9.0
3	208.48	30.6 QP	43.5	-12.9	1.00 V	247	42.2	-11.6
4	260.86	30.5 QP	46.0	-15.5	1.00 V	225	39.4	-8.9
5	388.90	30.2 QP	46.0	-15.8	1.00 V	270	36.2	-6.0
6	776.90	33.4 QP	46.0	-12.6	1.50 V	255	31.1	2.3

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 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.



4.2 Conducted Out of Band Emission Measurement

4.2.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.2.5 Deviation from Test Standard

No deviation.

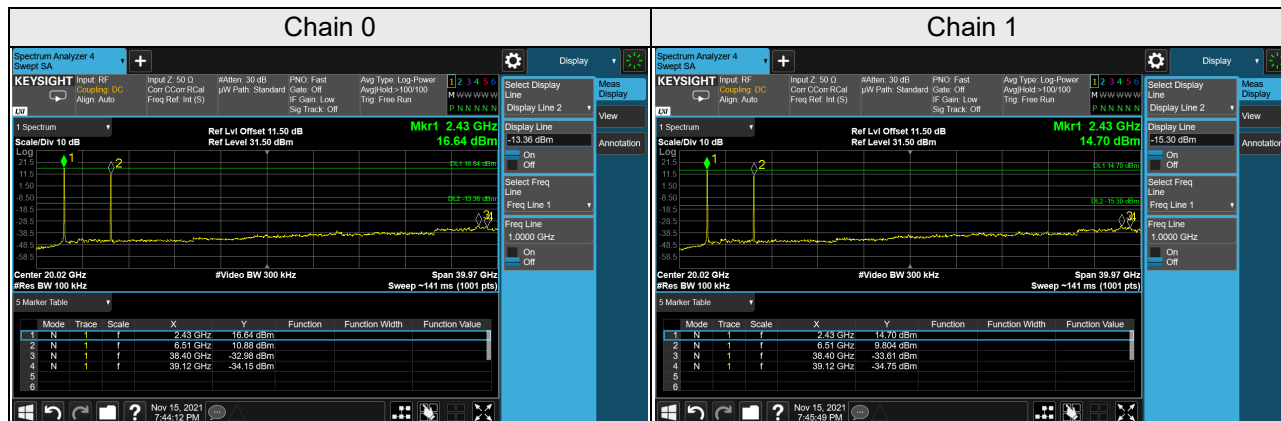
4.2.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11g + 802.11ax (HE160)

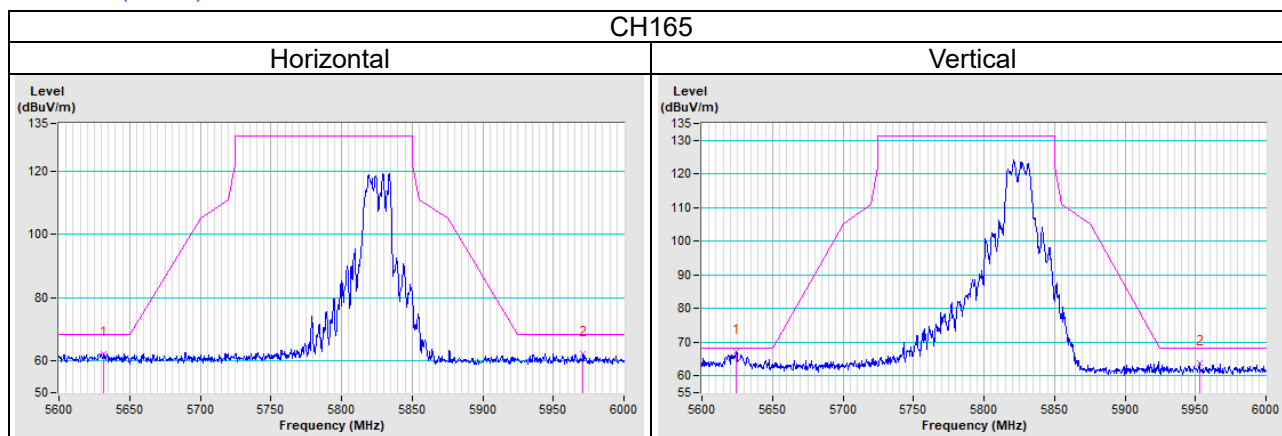


5 Pictures of Test Arrangements

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

Annex A- Radiated out of Band Emission (OOBE) Measurement (For U-NII-3 band)

802.11ax (HE20)



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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