FCC Test Report

(Co-Located)

Report No.:	RFBEMT-WTW-P21090660-6
FCC ID:	2AYRA-08321
Test Model:	MR2000
Variant Model:	MR20MS, MR20EC, ME20WH (Refer to item 3.1 for more details)
Received Date:	Sep. 30, 2021
Test Date:	Nov. 15 ~ Dec. 17, 2021
Issued Date:	Jan. 18, 2022
Applicant:	Linksys USA, Inc.
Address:	121 Theory, Irvine, CA 92617, USA
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. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan
FCC Registration / Designation Number:	281270 / TW0032

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBEMT-WTW-P21090660-6	Original Release	Jan. 18, 2022

1 Certificate of Conformity

Product:	AX3000 DUAL-BAND WIFI 6 ROUTER
Brand:	LINKSYS
Test Model:	MR2000
Variant Model:	MR20MS, MR20EC, ME20WH (Refer to item 3.1 for more details)
Sample Status:	Engineering Sample
Applicant:	Linksys USA, Inc.
Test Date:	Nov. 15 ~ Dec. 17, 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:** Jan. 18, 2022

Pettie Chen / Senior Specialist

Approved by : Jeremy Lin , **Date:** Jan. 18, 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)/9)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -0.2dB at 2483.50MHz and 4960.00 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	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~1000MHz	2.93 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	AX3000 DUAL-BAND WIFI 6 ROUTER	
Brand	LINKSYS	
Test Model	MR2000	
Variant Model	MR20MS, MR20EC, ME20WH	
Model Difference	for Marketing purpose	
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
	BT EDR	GFSK, π/4-DQPSK, 8DPSK
	BT LE	GFSK
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 573.5Mbps 802.11ax (5GHz Band): up to 2401.9Mbps
	BT EDR	1/2/3Mbps
	BT LE	1/2Mbps
Operating Frequency	WLAN	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5320MHz, 5500 ~ 5700MHz, 5745 ~ 5825MHz, 5845 ~ 5885MHz
	BT EDR	2402 ~ 2480MHz
	BT LE	2402 ~ 2480MHz
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 ~ 5700MHz: 11 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 5 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) 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 ~ 5885MHz: 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)
	BT EDR	79
	BT LE	40

Output Power	WLAN	CDD Mode: 2412 ~ 2462MHz: 216.560mW 5180 ~ 5240MHz: 529.245mW 5260 ~ 5320MHz: 235.644mW 5500 ~ 5700MHz: 232.687mW 5745 ~ 5825MHz: 656.302mW 5845 ~ 5885MHz: 2167.704mW Beamforming Mode: 2412 ~ 2462MHz: 183.461mW 5180 ~ 5240MHz: 501.234mW 5260 ~ 5320MHz: 208.324mW 5500 ~ 5700MHz: 206.296mW 5745 ~ 5825MHz: 656.302mW 5845 ~ 5885MHz: 3917.419 mW
	BT EDR	47.534mW
	BT LE	LE 4.0: 52.000mW LE 5.0: 52.845mW
Antenna Type	Refer to note	
Antenna Connector	Refer to note	
Accessory Device	Adapter	
Cable Supplied	1.0m non-shielded RJ45 Cable	

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)	Support	2TX
802.11n (HT40)	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.

2. The EUT uses following adapters.

Adapter 1	
Brand	Ktec
Model	KSA-18W-120150VU
Input Power	100-240Vac~50/60Hz, 0.5A
Output Power	12Vdc, 1.5A
Power line	1.5m non-shielded cable without core

Adapter 2	
Brand	Moso
Model	MSA-C1500IC12.0-18P-US
Input Power	100-240Vac~50/60Hz, 0.7A max
Output Power	12Vdc, 1.5A
Power line	1.5m non-shielded cable without core

Adapter 3	
Brand	Ktec
Model	KSA-18W-120150D5
Input Power	100-240Vac~50/60Hz, 0.5A
Output Power	12Vdc, 1.5A
Power line	1.5m non-shielded cable without core

Adapter 4	
Brand	Moso
Model	MSA-C1500IC12.0-18P-zz
Input Power	100-240Vac~50/60Hz, 0.7A
Output Power	12Vdc, 1.5A
Power line	1.5m non-shielded cable without core

* Adapter 1 & 3, 2 & 4 are identical to each other, except the plug type for different country, therefore only adapter 1 & 2 were for final test and presented in the test report.

3. The antenna information is listed as below.

WLAN		
Antenna Type	Dipole	
Connector Type	ipex(MHF)	
Frequency	Antenna Gain (dBi)	
	Chain 0	Chain 1
2400~2483.5MHz	3.70	4.09
5150~5250MHz	3.65	3.46
5250~5350MHz	3.57	3.54
5470~5725MHz	3.81	3.75
5725~5850MHz	3.81	3.75
5850~5925MHz	3.71	3.48
Bluetooth		
Antenna Type	Printed antenna with 3.95dBi gain	
Connector Type	NA	

*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.

3.2 Description of Test Modes

For Bluetooth EDR:

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

For Bluetooth LE:

40 channels are provided to this EUT:

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

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 ~ 5700MHz:

11 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		

5 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		

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

Channel	Frequency	Channel	Frequency
106	5530 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 U-NII-4 (5845 ~ 5885MHz)

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

Channel	Frequency	Channel	Frequency	Channel	Frequency
*169	5845 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	OB	
A	√	√	√	Power from adapter 1
B	-	√	-	Power from adapter 2

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

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
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 (HE40) + BLE 2M	2412-2462	1 to 11	6 + 159 + 39	OFDM
		5745-5825	151 to 159		OFDMA
		2402-2480	0 to 39		GFSK
A	802.11g + 802.11ax (HE40) + BLE 2M	2412-2462	1 to 11	6 + 167 + 39	OFDM
		5835-5875	167 to 175		OFDMA
		2402-2480	0 to 39		GFSK

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 (HE40) + BLE 2M	2412-2462	1 to 11	6 + 159 + 39	OFDM
		5745-5825	151 to 159		OFDMA
		2402-2480	0 to 39		GFSK
A, B	802.11g + 802.11ax (HE40) + BLE 2M	2412-2462	1 to 11	6 + 167 + 39	OFDM
		5835-5875	167 to 175		OFDMA
		2402-2480	0 to 39		GFSK

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 (HE40)	2412-2462	1 to 11	6 + 159	OFDM
		5745-5825	151 to 159		OFDMA

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE≥1G	23 deg. C, 65% RH	120 Vac, 60 Hz	Raymond Lee
RE<1G	23 deg. C, 65% RH	120 Vac, 60 Hz	Raymond Lee
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.

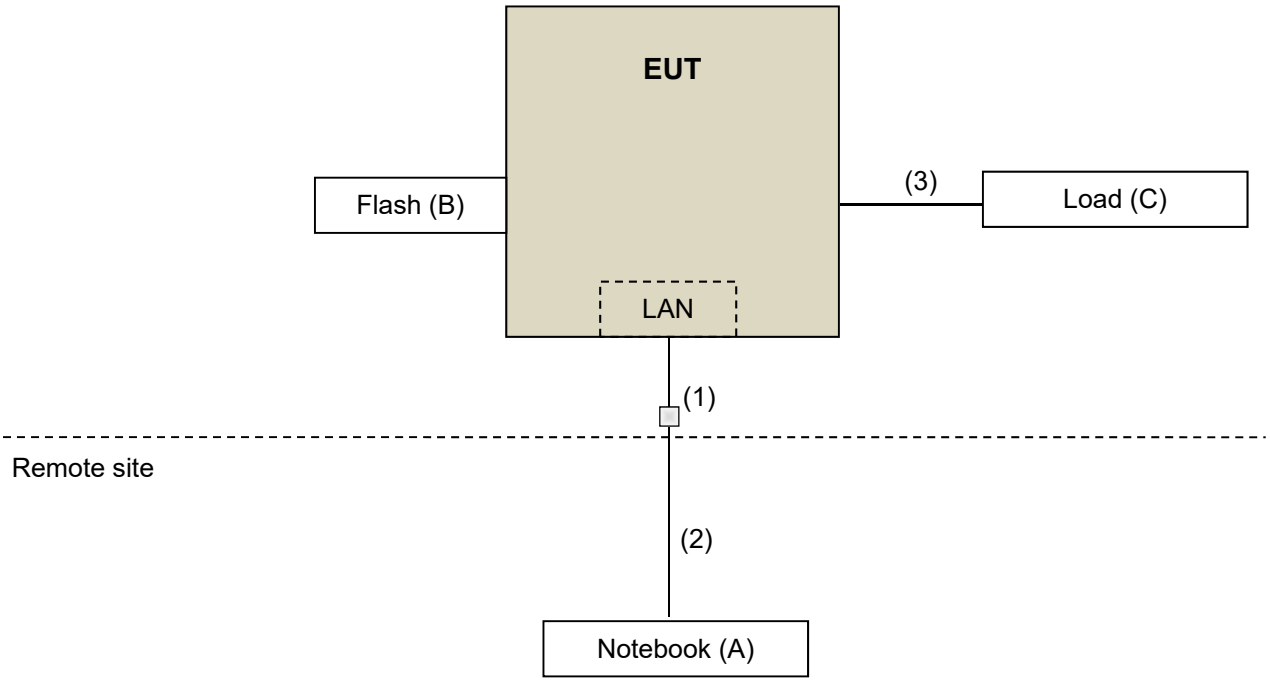
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	Lenovo	20J4 MD A003TW	PF-11H9AK	FCC DoC Approved	-
B.	Flash	Transcend	16GB	NA	NA	-
C.	Load	NA	NA	NA	NA	-

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	1	1	N	0	RJ45, Cat5e, Accessory
2.	LAN cable	1	10	N	0	RJ45, Cat5e
3.	LAN cable	4	1.5	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 EMC Measurement v01r01

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:

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

Limits of unwanted emission out of the restricted bands

(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of −7 dBm/MHz at or above 5.925 GHz.

(ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of −5 dBm/MHz and shall decrease linearly to an e.i.r.p. of −27 dBm/MHz at or above 5.925 GHz.

(iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of −27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

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	ESR3	102783	Dec. 21, 2020	Dec. 20, 2021
Spectrum Analyzer KEYSIGHT	N9020B	MY60110513	Dec. 21, 2020	Dec. 20, 2021
BILOG Antenna SCHWARZBECK	VULB9168	1214	Oct. 28, 2021	Oct. 27, 2022
HORN Antenna RF SPIN	DRH18-E	210104A18E	Jan. 08, 2021	Jan. 07, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	9170-1048	Nov. 14, 2021	Nov. 13, 2022
Preamplifier EMCI	EMC330N	980798	Jan. 12, 2021	Jan. 11, 2022
Preamplifier EMCI	EMC118A45SE	980809	Jan. 12, 2021	Jan. 11, 2022
Preamplifier EMCI	EMC184045SE	980786	Jan. 12, 2021	Jan. 11, 2022
RF signal cable EMCI	EMC104-SM-SM-(9000+2000+1000)	201244+ 201232+ 210103	Jan. 12, 2021	Jan. 11, 2022
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+300+500)	201251+ 201249+ 201248	Jan. 12, 2021	Jan. 11, 2022
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201261+201258+201249	Jan. 12, 2021	Jan. 11, 2022
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-515BSN	NA	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208676	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 19, 2021	Jan. 18, 2022
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 11, 2021	Jan. 10, 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 WM Chamber 9.

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:

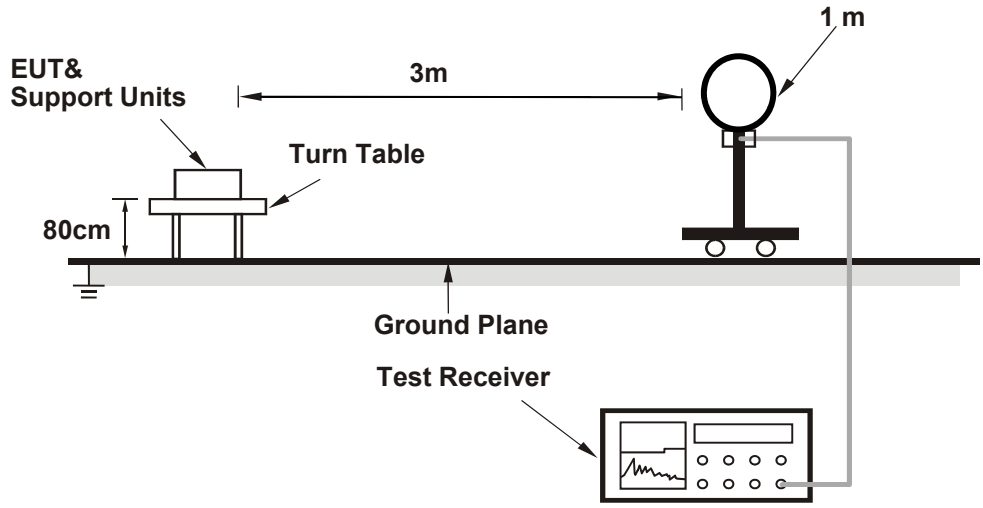
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. For WLAN device measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (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

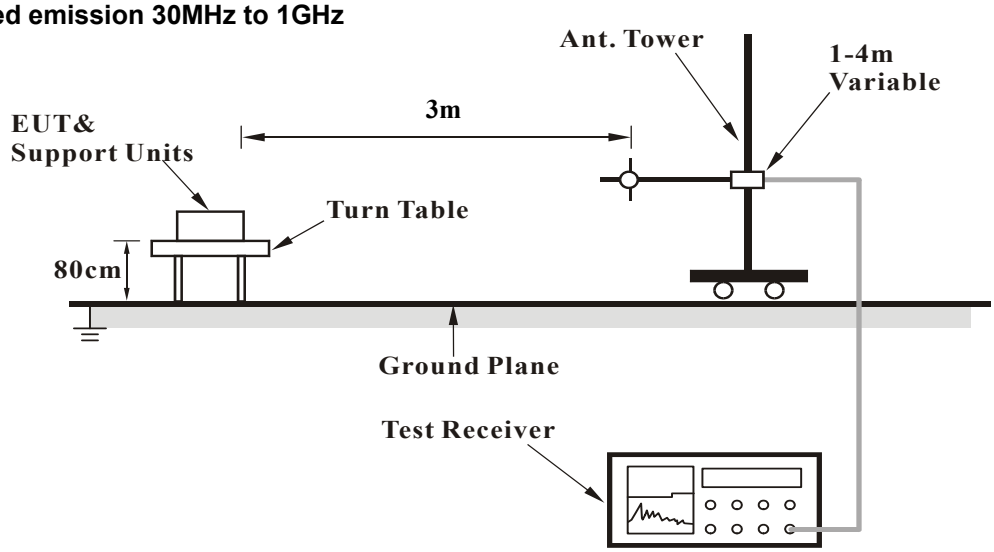
No deviation.

4.1.5 Test Setup

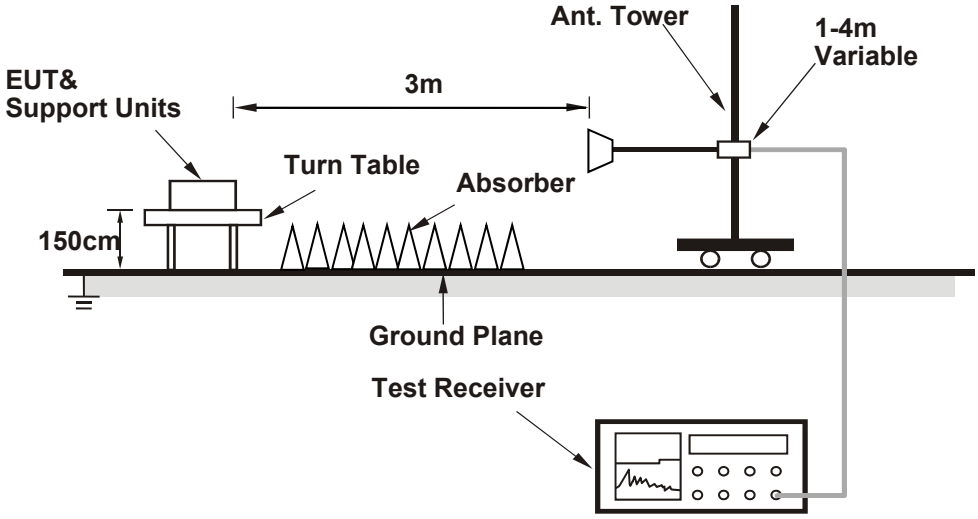
For Radiated emission below 30MHz



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.
d. The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz Data:

802.11g + 802.11ax (HE40) + BT LE 2M

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 159 + Ch 39	**Frequency Range**	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee

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	104.4 PK			1.77 H	240	72.7	31.7
2	*2437.00	95.2 AV			1.77 H	240	63.5	31.7
3	*2480.00	109.4 PK			1.89 H	316	77.7	31.7
4	*2480.00	106.9 AV			1.89 H	316	75.2	31.7
5	2483.50	59.0 PK	74.0	-15.0	1.77 H	240	27.3	31.7
6	2483.50	50.0 AV	54.0	-4.0	1.77 H	240	18.3	31.7
7	4874.00	49.2 PK	74.0	-24.8	1.38 H	129	46.6	2.6
8	4874.00	40.2 AV	54.0	-13.8	1.38 H	129	37.6	2.6
9	4960.00	62.5 PK	74.0	-11.5	1.15 H	80	59.7	2.8
10	4960.00	53.7 AV	54.0	-0.3	1.15 H	80	50.9	2.8
11	#5644.80	56.2 PK	68.2	-12.0	2.41 H	326	53.3	2.9
12	*5795.00	110.6 PK			2.41 H	326	69.0	41.6
13	*5795.00	100.8 AV			2.41 H	326	59.2	41.6
14	#5934.00	57.3 PK	68.2	-10.9	2.41 H	326	53.9	3.4
15	11590.00	56.5 PK	74.0	-17.5	2.77 H	156	47.9	8.6
16	11590.00	46.0 AV	54.0	-8.0	2.77 H	156	37.4	8.6

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

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 159 + Ch 39	**Frequency Range**	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee

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	116.9 PK			1.73 V	176	85.2	31.7
2	*2437.00	108.5 AV			1.73 V	176	76.8	31.7
3	*2480.00	107.4 PK			3.52 V	122	75.7	31.7
4	*2480.00	105.0 AV			3.52 V	122	73.3	31.7
5	2483.50	63.6 PK	74.0	-10.4	1.73 V	176	31.9	31.7
6	**2483.50**	**53.8 AV**	**54.0**	**-0.2**	**1.73 V**	**176**	**22.1**	**31.7**
7	4874.00	52.1 PK	74.0	-21.9	1.48 V	302	49.5	2.6
8	4874.00	42.6 AV	54.0	-11.4	1.48 V	302	40.0	2.6
9	4960.00	54.0 PK	74.0	-20.0	1.06 V	345	51.2	2.8
10	4960.00	44.9 AV	54.0	-9.1	1.06 V	345	42.1	2.8
11	#5611.60	57.8 PK	68.2	-10.4	1.68 V	169	55.2	2.6
12	*5795.00	121.2 PK			1.68 V	169	79.6	41.6
13	*5795.00	111.8 AV			1.68 V	169	70.2	41.6
14	#5973.20	59.1 PK	68.2	-9.1	1.68 V	169	55.6	3.5
15	11590.00	56.7 PK	74.0	-17.3	1.52 V	305	48.1	8.6
16	11590.00	46.0 AV	54.0	-8.0	1.52 V	305	37.4	8.6

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

802.11g + 802.11ax (HE40) + BT LE 2M

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 167 + Ch 39	**Frequency Range**	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee

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	103.2 PK			1.79 H	244	71.5	31.7
2	*2437.00	94.9 AV			1.79 H	244	63.2	31.7
3	*2480.00	109.1 PK			1.91 H	320	77.4	31.7
4	*2480.00	106.7 AV			1.91 H	320	75.0	31.7
5	2483.50	58.7 PK	74.0	-15.3	1.91 H	244	27.0	31.7
6	2483.50	49.7 AV	54.0	-4.3	1.91 H	244	18.0	31.7
7	4874.00	49.1 PK	74.0	-24.9	1.33 H	125	46.5	2.6
8	4874.00	40.1 AV	54.0	-13.9	1.33 H	125	37.5	2.6
9	4960.00	62.6 PK	74.0	-11.4	1.20 H	83	59.8	2.8
10	**4960.00**	**53.8 AV**	**54.0**	**-0.2**	**1.20 H**	**83**	**51.0**	**2.8**
11	#5628.85	57.1 PK	68.2	-11.1	1.94 H	340	54.3	2.8
12	*5835.00	112.2 PK			1.94 H	340	70.6	41.6
13	*5835.00	102.4 AV			1.94 H	340	60.8	41.6
14	#5897.70	62.5 PK	108.2	-45.7	1.94 H	340	59.2	3.3
15	#5928.57	56.6 PK	88.2	-31.6	1.94 H	340	53.2	3.4
16	11670.00	56.0 PK	74.0	-18.0	2.99 H	180	47.4	8.6
17	11670.00	45.9 AV	54.0	-8.1	2.99 H	180	37.3	8.6

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

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 167 + Ch 39	**Frequency Range**	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee

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	116.7 PK			1.75 V	180	85.0	31.7
2	*2437.00	108.4 AV			1.75 V	180	76.7	31.7
3	*2480.00	107.3 PK			3.57 V	123	75.6	31.7
4	*2480.00	104.8 AV			3.57 V	123	73.1	31.7
5	2483.50	63.7 PK	74.0	-10.3	1.75 V	180	32.0	31.7
6	2483.50	53.7 AV	54.0	-0.3	1.75 V	180	22.0	31.7
7	4874.00	51.9 PK	74.0	-22.1	1.50 V	298	49.3	2.6
8	4874.00	42.4 AV	54.0	-11.6	1.50 V	298	39.8	2.6
9	4960.00	53.9 PK	74.0	-20.1	1.09 V	335	51.1	2.8
10	4960.00	44.8 AV	54.0	-9.2	1.09 V	335	42.0	2.8
11	#5632.65	57.9 PK	68.2	-10.3	1.77 V	189	55.0	2.9
12	*5835.00	124.1 PK			1.77 V	189	82.5	41.6
13	*5835.00	113.4 AV			1.77 V	189	71.8	41.6
14	#5901.50	74.1 PK	105.4	-31.3	1.77 V	189	70.8	3.3
15	#5925.73	66.0 PK	88.2	-22.2	1.77 V	189	62.6	3.4
16	11670.00	56.6 PK	74.0	-17.4	1.51 V	305	48.0	8.6
17	11670.00	46.0 AV	54.0	-8.0	1.51 V	305	37.4	8.6

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

Below 1GHz data

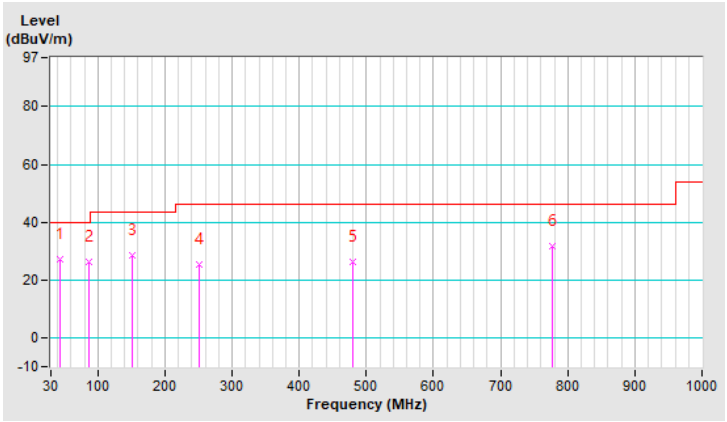
802.11g + 802.11ax (HE40) + BT LE 2M

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 159 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	A		

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	43.58	27.1 QP	40.0	-12.9	1.49 H	18	45.4	-18.3
2	87.23	26.3 QP	40.0	-13.7	1.99 H	201	50.2	-23.9
3	150.28	28.6 QP	43.5	-14.9	1.99 H	260	46.7	-18.1
4	250.19	25.5 QP	46.0	-20.5	1.00 H	100	44.8	-19.3
5	480.08	26.1 QP	46.0	-19.9	1.99 H	26	39.4	-13.3
6	777.87	31.5 QP	46.0	-14.5	1.49 H	212	39.4	-7.9

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.

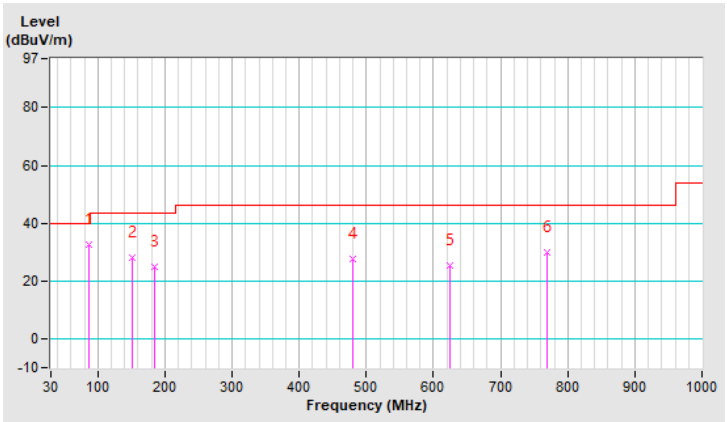


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 159 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	A		

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	86.26	32.6 QP	40.0	-7.4	1.49 V	183	56.5	-23.9
2	151.25	28.2 QP	43.5	-15.3	1.00 V	143	46.4	-18.2
3	184.23	25.1 QP	43.5	-18.4	1.00 V	143	45.3	-20.2
4	480.08	27.6 QP	46.0	-18.4	1.00 V	178	40.9	-13.3
5	624.61	25.3 QP	46.0	-20.7	1.49 V	159	35.5	-10.2
6	770.11	30.0 QP	46.0	-16.0	1.99 V	22	38.1	-8.1

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.

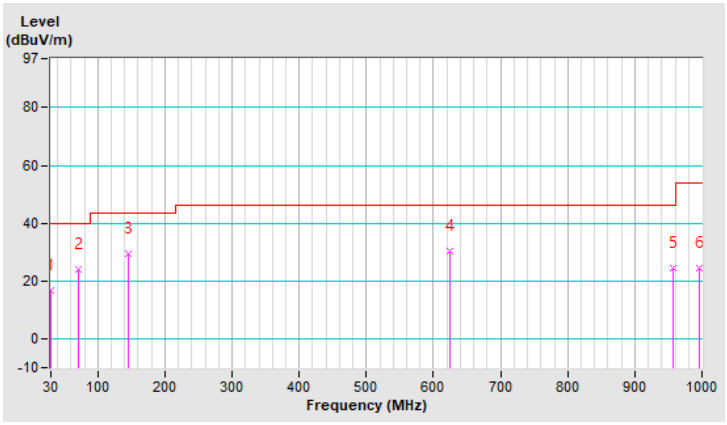


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 159 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	B		

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	30.00	16.8 QP	40.0	-23.2	1.01 H	153	36.3	-19.5
2	70.77	24.2 QP	40.0	-15.8	1.50 H	267	44.8	-20.6
3	145.28	29.6 QP	43.5	-13.9	1.01 H	46	48.1	-18.5
4	624.65	30.5 QP	46.0	-15.5	1.01 H	278	40.8	-10.3
5	957.83	24.6 QP	46.0	-21.4	1.01 H	151	30.4	-5.8
6	995.78	24.5 QP	54.0	-29.5	1.50 H	80	29.6	-5.1

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.

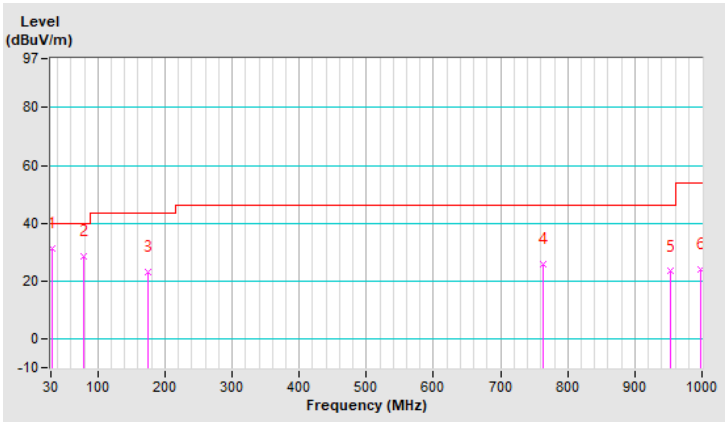


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 159 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	B		

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	31.41	31.1 QP	40.0	-8.9	1.00 V	346	50.8	-19.7
2	79.20	28.7 QP	40.0	-11.3	1.49 V	75	51.6	-22.9
3	174.80	23.2 QP	43.5	-20.3	1.00 V	19	42.4	-19.2
4	762.42	25.7 QP	46.0	-20.3	1.00 V	232	33.9	-8.2
5	953.61	23.3 QP	46.0	-22.7	1.00 V	87	29.2	-5.9
6	998.59	23.9 QP	54.0	-30.1	1.49 V	53	28.9	-5.0

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.



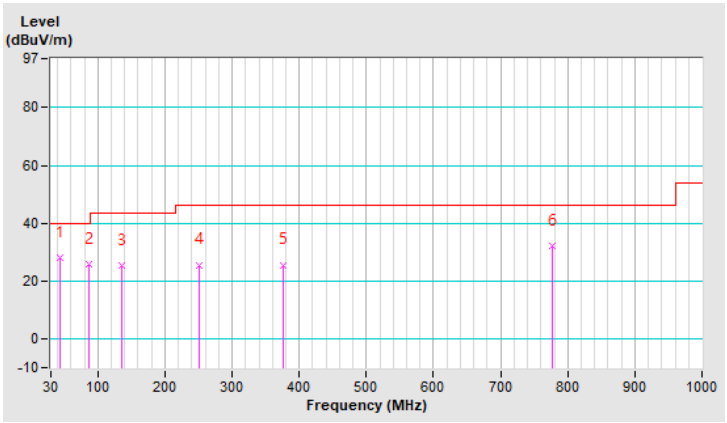
802.11g + 802.11ax (HE40) + BT LE 2M

EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 167 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	A		

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	43.58	27.9 QP	40.0	-12.1	1.01 H	24	46.2	-18.3
2	86.26	25.8 QP	40.0	-14.2	2.00 H	251	49.7	-23.9
3	135.73	25.4 QP	43.5	-18.1	2.00 H	94	44.3	-18.9
4	250.19	25.6 QP	46.0	-20.4	1.01 H	109	44.9	-19.3
5	375.32	25.6 QP	46.0	-20.4	1.01 H	116	41.4	-15.8
6	777.87	32.1 QP	46.0	-13.9	2.00 H	177	40.0	-7.9

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.

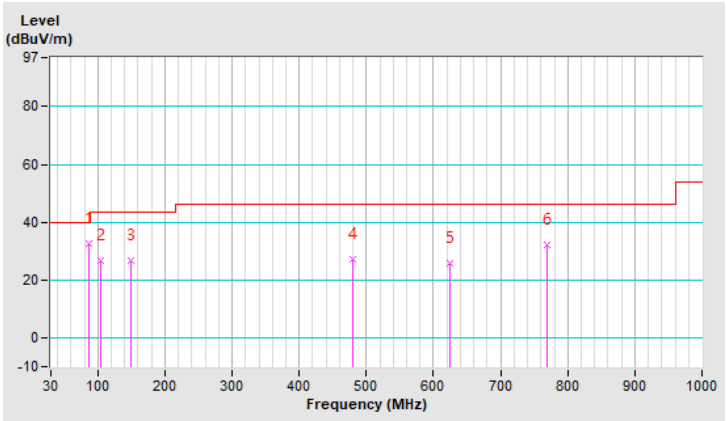


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 167 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	A		

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	87.23	32.7 QP	40.0	-7.3	1.00 V	192	56.6	-23.9
2	103.72	26.8 QP	43.5	-16.7	1.00 V	254	48.9	-22.1
3	149.31	26.8 QP	43.5	-16.7	1.00 V	134	45.0	-18.2
4	480.08	27.1 QP	46.0	-18.9	1.00 V	181	40.4	-13.3
5	624.61	25.9 QP	46.0	-20.1	1.49 V	169	36.1	-10.2
6	770.11	32.3 QP	46.0	-13.7	1.00 V	221	40.4	-8.1

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.

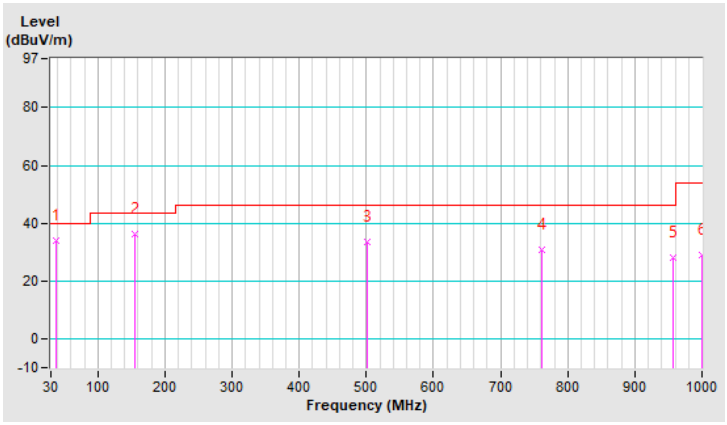


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 167 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	B		

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	37.76	34.1 QP	40.0	-5.9	1.01 H	33	52.8	-18.7
2	155.13	36.2 QP	43.5	-7.3	2.00 H	85	54.3	-18.1
3	500.45	33.6 QP	46.0	-12.4	1.51 H	118	46.7	-13.1
4	762.35	31.0 QP	46.0	-15.0	1.01 H	18	39.1	-8.1
5	956.35	28.0 QP	46.0	-18.0	1.51 H	2	33.7	-5.7
6	1000.00	28.9 QP	54.0	-25.1	1.51 H	80	34.2	-5.3

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.

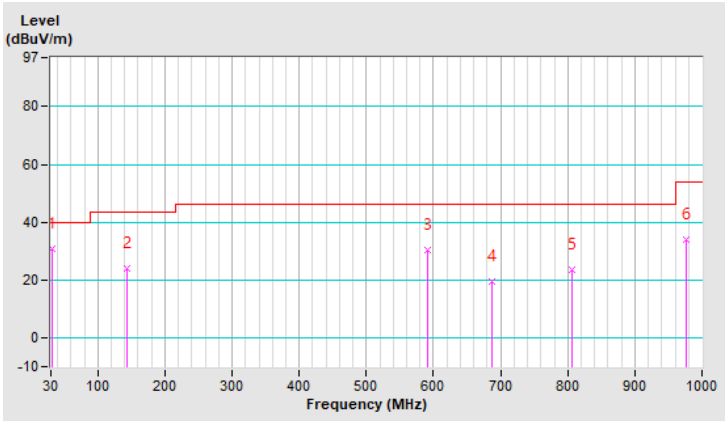


EUT Test Condition		Measurement Detail	
Channel	Ch 6 + Ch 167 + Ch 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Quasi-peak (QP)
Environmental Conditions	23 deg. C, 65 % RH	**Tested By**	Raymond Lee
Test Mode	B		

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	32.81	30.7 QP	40.0	-9.3	1.50 V	217	50.3	-19.6
2	142.46	24.1 QP	43.5	-19.4	1.50 V	224	42.7	-18.6
3	590.91	30.3 QP	46.0	-15.7	1.50 V	124	41.1	-10.8
4	687.91	19.6 QP	46.0	-26.4	1.50 V	297	29.2	-9.6
5	806.00	23.4 QP	46.0	-22.6	1.50 V	18	31.3	-7.9
6	977.51	34.0 QP	54.0	-20.0	1.50 V	235	39.5	-5.5

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.

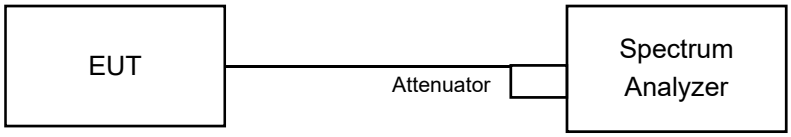


4.2 Conducted Out of Band Emission Measurement

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

a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep time = auto couple.
e. Trace mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

a. Set RBW = 100 kHz.
b. Set VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep = auto couple.
e. Trace Mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum amplitude level.

4.2.5 Deviation from Test Standard

No deviation.

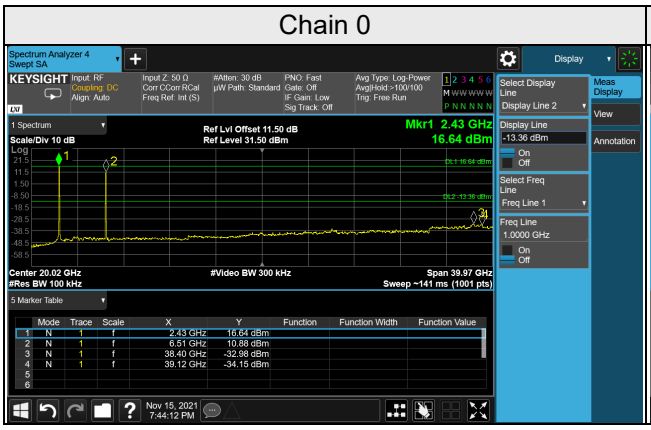
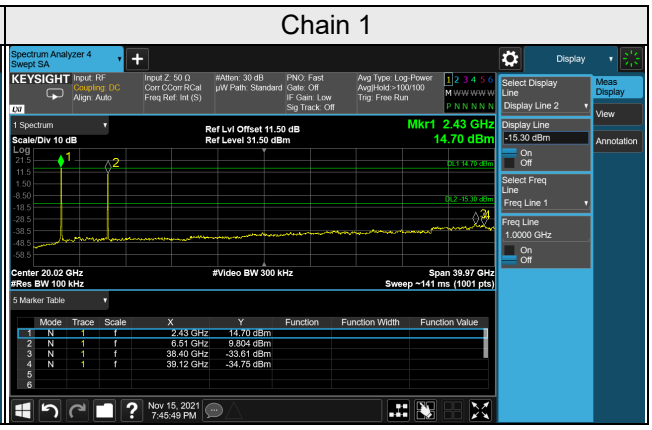
4.2.6 EUT Operating Condition

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 (HE40)

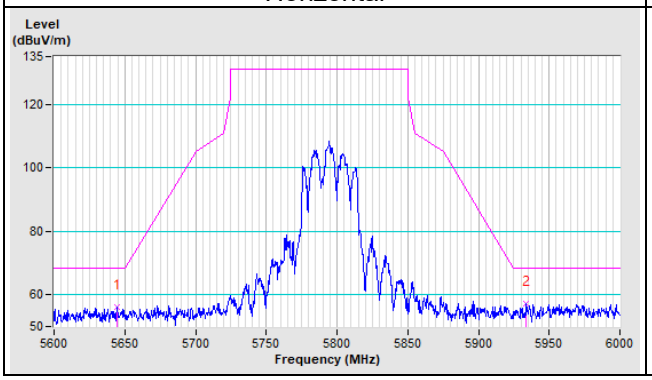
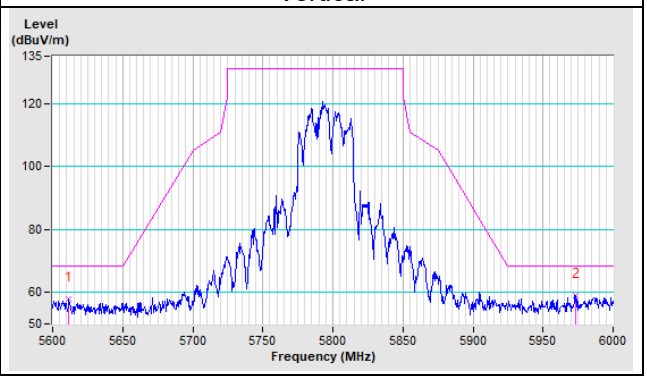
Chain 0	Chain 1
	

5 Pictures of Test Arrangements

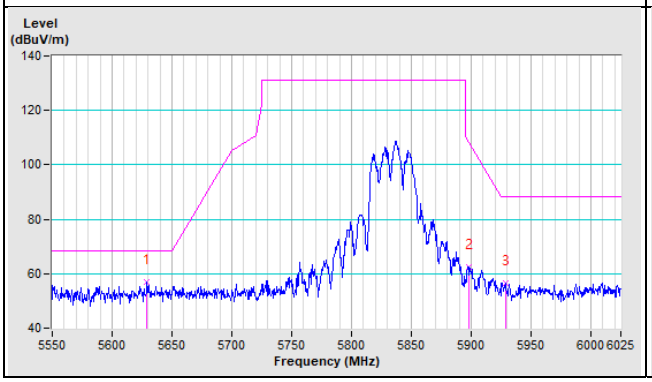
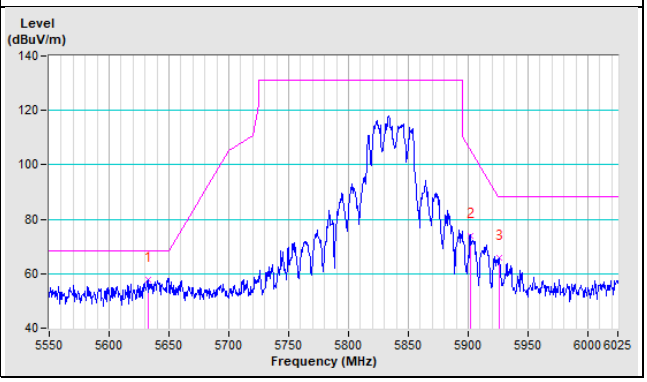
Please refer to the attached file (Test Setup Photo).

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

802.11ax (HE40):

CH159	
Horizontal	Vertical
	

802.11ax (HE40):

CH167	
Horizontal	Vertical
	

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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