

## Partial FCC Test Report

**Report No.:** RFBEDW-WTW-P20110606-3

**FCC ID:** O57AX200NGW

**Test Model:** AX200NGW

**Received Date:** Nov. 19, 2020

**Test Date:** Dec. 30, 2020 ~ Jan. 05, 2021

**Issued Date:** Jan. 11, 2021

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**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RFBEDW-WTW-P20110606-3	Original Release	Jan. 11, 2021

## 1 Certificate of Conformity

**Product:** WLAN and BT , 2x2 Pcle M.2 2230 adapter card

**Brand:** Intel® Wi-Fi 6 AX200

**Test Model:** AX200NGW

**Sample Status:** Engineering Sample

**Applicant:** Lenovo(Shanghai) Electronics Technology Co., Ltd.

**Test Date:** Dec. 30, 2020 ~ Jan. 05, 2021

**Standards:** 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 :** Shelly Hsueh, **Date:** Jan. 11, 2021  
Shelly Hsueh / Specialist

**Approved by :** Dylan Chiou, **Date:** Jan. 11, 2021  
Dylan Chiou / Senior Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -8.65 dB at 0.15770 MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.5 dB at 30.00 MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	-	Reference only
15.407(a)(1/2/3)	Peak Power Spectral Density	N/A	Refer to Note
15.407(e)	6 dB Bandwidth	N/A	Refer to Note
15.407(g)	Frequency Stability	N/A	Refer to Note
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX not a standard connector.

### Note:

1. This report is a partial report, only test item of Conducted Emission, Radiated Emissions and Maximum Peak Output Power were performed for this report. Other testing data please refer to Intel report no.: 181210-03.TR01, 181210-03.TR02, and 181210-03.TR03 for module (Brand: Intel® Wi-Fi 6 AX200 , Model: AX200NGW).
2. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOB test plots were recorded in Annex A.
3. For U-NII-1, U-NII-2A, U-NII-2C band compliance with rule 15.407(b) of the band-edge items, the test plots were recorded in Annex B. Test Procedures refer to report 4.1.3.
4. 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) ( $\pm$ )
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

## 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	WLAN and BT , 2x2 Pcle M.2 2230 adapter card
<b>Brand</b>	<b>Intel® Wi-Fi 6 AX200</b>
<b>Test Model</b>	AX200NGW
<b>Status of EUT</b>	Engineering Sample
<b>Power Supply Rating</b>	3.3Vdc form host equipment
<b>Modulation Type</b>	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM for OFDMA
<b>Modulation Technology</b>	OFDM, OFDMA
<b>Transfer Rate</b>	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0 Mbps 802.11n: up to 300.0 Mbps 802.11ac: up to 1733.3 Mbps 802.11ax: up to 2402.0 Mbps
<b>Operating Frequency</b>	5180 ~ 5250 MHz, 5250 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz
<b>Number of Channel</b>	5180 ~ 5320 MHz: 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 ~ 5720 MHz: 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)
<b>Output Power</b>	42.858 mW for 5180 ~ 5250 MHz 43.551 mW for 5260 ~ 5320 MHz 43.456 mW for 5500 ~ 5720 MHz 87.203 mW for 5745 ~ 5825 MHz
<b>Antenna Type</b>	Refer to Note as below
<b>Antenna Connector</b>	Refer to Note as below
<b>Accessory Device</b>	N/A
<b>Data Cable Supplied</b>	N/A

**Note:**

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

Modulation Mode	Tx Function
802.11a	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX
802.11ax (HE20)	2TX
802.11ax (HE40)	2TX
802.11ac (VHT80)	2TX
802.11ax (HE80)	2TX
802.11ac (VHT160)	2TX
802.11ax (HE160)	2TX

\* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40 / VHT80 / VHT160 and 802.11ax mode for HE20 / HE40 / HE80 / HE160, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT is authorized for use in specific End-product. Please refer to below table for more details.

Product	Brand	Model
Notebook Computer	Lenovo	IdeaPad 5 Pro 14ACN6*****

Note: \*=0~9,A-Z,a~z,"-" or blank, for marketing use only, with no impact on RF compliance of the product.

3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	Lenovo	ADLX65YLC3D	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 20.0V===3.25A, 65.0W / 15.0V ===3.0A / 9.0V===2.0A / 5.0V ===2.0 A, 10.0W 1.75M / 0core
Adapter 2	Lenovo	ADLX65YDC3D	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 20.0V===3.25A, 65.0W / 15.0V ===3.0A / 9.0V===2.0A / 5.0V ===2.0 A, 10.0W 1.75M / 0core
Adapter 3	Lenovo	ADLX65UDGC2A	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 5.0V===3.0A, 15.0W / 9.0V ===3.0A 15.0V===3.0A / 20.0V ===3.25A, 65.0W 1.75M / 0core
Adapter 4	Lenovo	ADLX65UDGU2A	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 5.0V===3.0A, 15.0W / 9.0V ===3.0A 5.0V===3.0A / 20.0V ===3.25A, 65.0W 1.75M / 0core
Adapter 5	Lenovo	ADLX65UCGU2A	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 5.0V===3.0A, 15.0W / 9.0V ===3.0A 15.0V===3.0A / 20.0V ===3.25A, 65.0W 1.75M / 0core
Battery 1	Lenovo	L20D3PF0	13.2 Vdc, 4775 mAh
Battery 2	Lenovo	L20M3PF1	13.2 Vdc, 4775 mAh
Battery 3	Lenovo	L20C3PF1	13.2 Vdc, 4775 mAh

4. The antenna information is listed as below.

Ant. Type	Brand	Model	Ant.	Antenna Peak Gain (dBi)				
				BT	2400-2500MHz	5150-5350MHz	5470-5725MHz	5725-5850MHz
PIFA	MAGLAYERS	DC33002HW00 / PCA-3010-25GC7-A2	Main	-	1.05	0.25	0.09	0.82
			Aux.	0.32	0.32	1.15	0.59	0.59
	High-Tek Electronics Co., Ltd	DC33002I200 / 0ACCN020007N	Main	-	-2.11	-1.02	1.88	1.88
			Aux.	0.10	0.10	-0.93	-1.70	-3.42

\* The Max antenna gain was chosen for final test.

5. 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.
6. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

#### For 5180 ~ 5320 MHz

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	52	5260
40	5200	56	5280
44	5220	60	5300
48	5240	64	5320

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

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

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	5210	58	5290

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

Channel	Frequency (MHz)
50	5250

**For 5500 ~ 5720 MHz**

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

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

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

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

3 channels are provided for 802.11ac (VHT80):

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

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

Channel	Frequency (MHz)
114	5570

**For 5745 ~ 5825 MHz:**

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

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

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

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

Channel	Frequency (MHz)
155	5775

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE $<$ 1G	PLC	Power	
A	√	√	√	√	EUT with Ant.- MAG. and Adapter 1
B	-	√	√	-	EUT with Ant.- HTK and Adapter 5

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz      **RE $<$ 1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission      **Power**: Maximum Output Power Measurement

**Note:** “-” means no effect.

**Note:** For radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum fundamental emission level channel

#### **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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	5180-5320	802.11n (HT40)	38 to 62	38, 62	OFDM	BPSK	13.5
B	5500-5720	802.11ac (VHT80)	106 to 122	122	OFDM	BPSK	29.3
	5745-5825	802.11ac (VHT80)	155	155	OFDM	BPSK	29.3

#### **Radiated Emission Test (Below 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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	5180-5320	802.11n (HT40)	38 to 62	62	OFDM	BPSK	13.5
B	5745-5825	802.11ac (VHT80)	155	155	OFDM	BPSK	29.3

#### **Power Line Conducted Emission Test:**

- 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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	5180-5320	802.11n (HT40)	38 to 62	62	OFDM	BPSK	13.5
B	5745-5825	802.11ac (VHT80)	155	155	OFDM	BPSK	29.3

**Maximum Output Power Measurement:**

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- 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	Frequency Band (MHz)	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	5180-5320	802.11a	36 to 64	36, 40, 48, 52, 60, 64	OFDM	BPSK	6.0
		802.11n (HT20)	36 to 64	36, 40, 48, 52, 60, 64	OFDM	BPSK	6.5
		802.11n (HT40)	38 to 62	38, 46, 54, 62	OFDM	BPSK	13.5
		802.11ac (VHT20)	36 to 64	36, 40, 48, 52, 60, 64	OFDM	BPSK	7.2
		802.11ac (VHT40)	38 to 62	38, 46, 54, 62	OFDM	BPSK	15.0
		802.11ac (VHT80)	42 to 58	42, 58	OFDM	BPSK	29.3
		802.11ac (HE160)	50	50	OFDM	BPSK	58.5
		802.11ax (HE20)	36 to 64	36, 40, 48, 52, 60, 64	OFDMA	BPSK	MCS0
		802.11ax (HE40)	38 to 62	38, 46, 54, 62	OFDMA	BPSK	MCS0
		802.11ax (HE80)	42 to 58	42, 58	OFDMA	BPSK	MCS0
	802.11ax (HE160)	50	50	OFDMA	BPSK	MCS0	
	5500-5720	802.11a	100 to 144	100, 116, 140, 144	OFDM	BPSK	6.0
		802.11n (HT20)	100 to 144	100, 116, 140, 144	OFDM	BPSK	6.5
		802.11n (HT40)	102 to 142	102, 110, 134, 142	OFDM	BPSK	13.5
		802.11ac (VHT20)	100 to 144	100, 116, 140, 144	OFDM	BPSK	7.2
		802.11ac (VHT40)	102 to 142	102, 110, 134, 142	OFDM	BPSK	15.0
		802.11ac (VHT80)	106 to 138	106, 122, 138	OFDM	BPSK	29.3
		802.11ac (VHT160)	114	114	OFDM	BPSK	58.5
		802.11ax (HE20)	100 to 144	100, 116, 140, 144	OFDMA	BPSK	MCS0
		802.11ax (HE40)	102 to 142	102, 110, 134, 142	OFDMA	BPSK	MCS0
		802.11ax (HE80)	106 to 138	106, 122, 138	OFDMA	BPSK	MCS0
	802.11ax (HE160)	114	114	OFDMA	BPSK	MCS0	
	5745-5825	802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6.0
		802.11n (HT20)	149 to 165	149, 157, 165	OFDM	BPSK	6.5
		802.11n (HT40)	151 to 159	151, 159	OFDM	BPSK	13.5
		802.11ac (VHT20)	149 to 165	149, 157, 165	OFDM	BPSK	7.2
		802.11ac (VHT40)	151 to 159	151, 159	OFDM	BPSK	15.0
		802.11ac (VHT80)	155	155	OFDM	BPSK	29.3
		802.11ax (HE20)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0
		802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	MCS0
802.11ax (HE80)	155	155	OFDMA	BPSK	MCS0		

**Test Condition:**

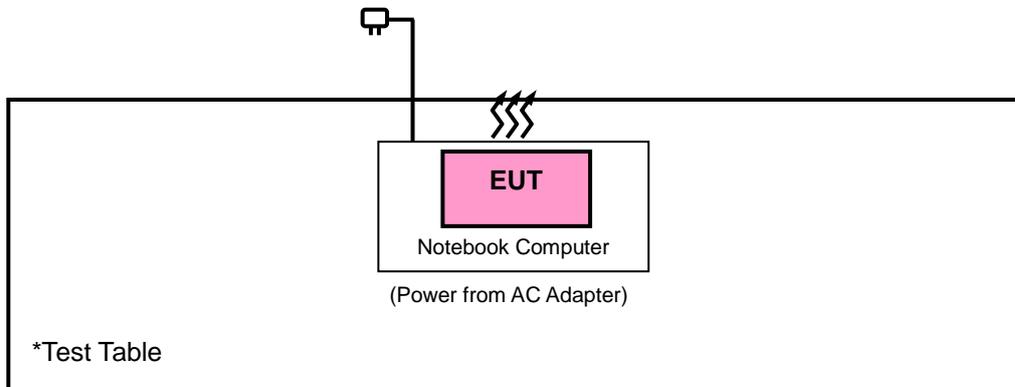
Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Greg Lin
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Greg Lin
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Titan Hsu
Power	25 deg. C, 65 % RH	120 Vac, 60 Hz	Titan Hsu

### 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
1.	Notebook Computer	Lenovo	IdeaPad 5 Pro 14ACN6*****	NA	NA	-
2.	Adapter	Lenovo	ADLX65YLC3D	NA	NA	Mode A
3.	Adapter	Lenovo	ADLX65UCGU2A	NA	NA	Mode B

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards and References

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 E (15.407)

ANSI C63.10-2013

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

#### References Test Guidance:

##### KDB 789033 D02 General UNII Test Procedures New Rules v02r01

##### KDB 662911 D01 Multiple Transmitter Output v02r01

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 1000 MHz, 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 20 dB under any condition of modulation.

## 4.1.2 Limits of Unwanted Emission Out of the Restricted Bands

Applicable To		Limit	
789033 D02 General UNII Test Procedures New Rules v02r01		Field Strength at 3 m	
		PK: 74 (dBµV/m)	AV: 54 (dBµV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
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	<input checked="" type="checkbox"/> 15.407(b)(4)(i)	PK:-27 (dBm/MHz) <sup>*1</sup> PK:10 (dBm/MHz) <sup>*2</sup> PK:15.6 (dBm/MHz) <sup>*3</sup> PK:27 (dBm/MHz) <sup>*4</sup>	PK: 68.2 (dBµV/m) <sup>*1</sup> PK:105.2 (dBµV/m) <sup>*2</sup> PK: 110.8 (dBµV/m) <sup>*3</sup> PK:122.2 (dBµV/m) <sup>*4</sup>
	<input type="checkbox"/> 15.407(b)(4)(ii)	Emission limits in section 15.247(d)	

<sup>\*1</sup> beyond 75 MHz or more above of the band edge.

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

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

<sup>\*4</sup> 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:

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

## 4.1.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna EMCI	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM80 00	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(2507 95/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 04, 2020	Sep. 03, 2021
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55 190004/MY551900 07/MY55210005	Jul. 13, 2020	Jul. 12, 2021

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 9.

#### 4.1.4 Test Procedures

##### **For Radiated Emission below 30 MHz**

- 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 9 kHz at frequency below 30 MHz.

##### **For Radiated Emission above 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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:**

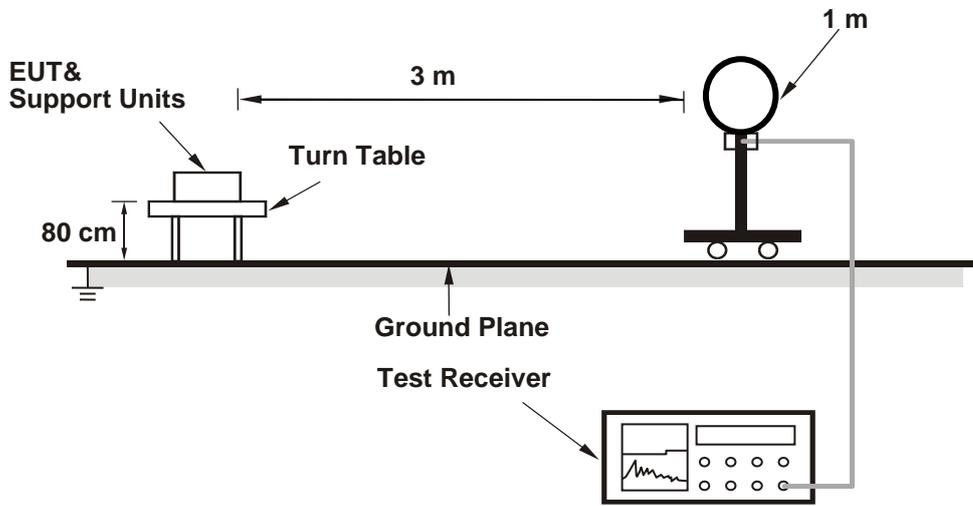
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98 %) or 10 Hz (Duty cycle  $\geq 98$  %) for Average detection (AV) at frequency above 1 GHz.  
(11a: RBW = 1 MHz, VBW = 1 kHz ; 11n (HT20): RBW = 1 MHz, VBW = 1 kHz ;  
11n (HT40): RBW = 1 MHz, VBW = 1 kHz ; 11ac (VHT80): RBW = 1 MHz, VBW = 1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.5 Deviation from Test Standard

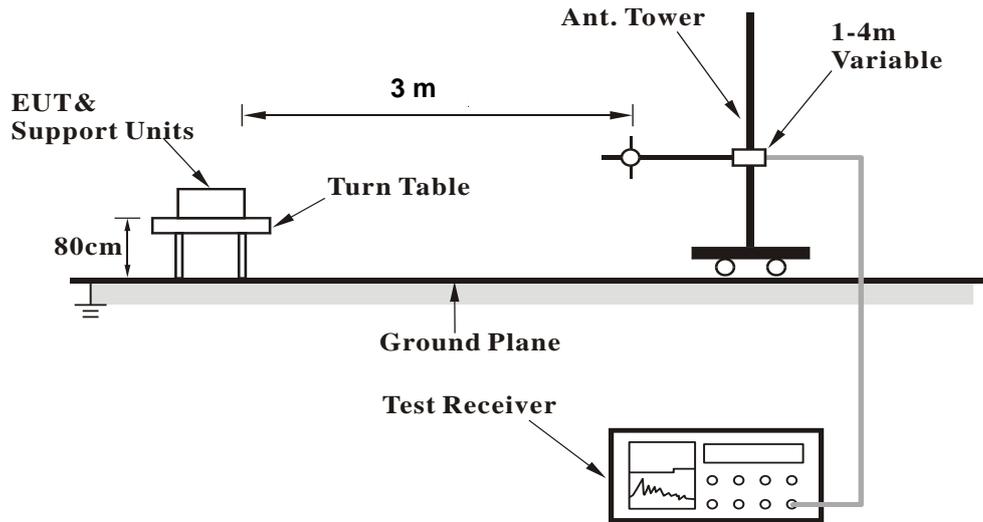
No deviation.

4.1.6 Test Setup

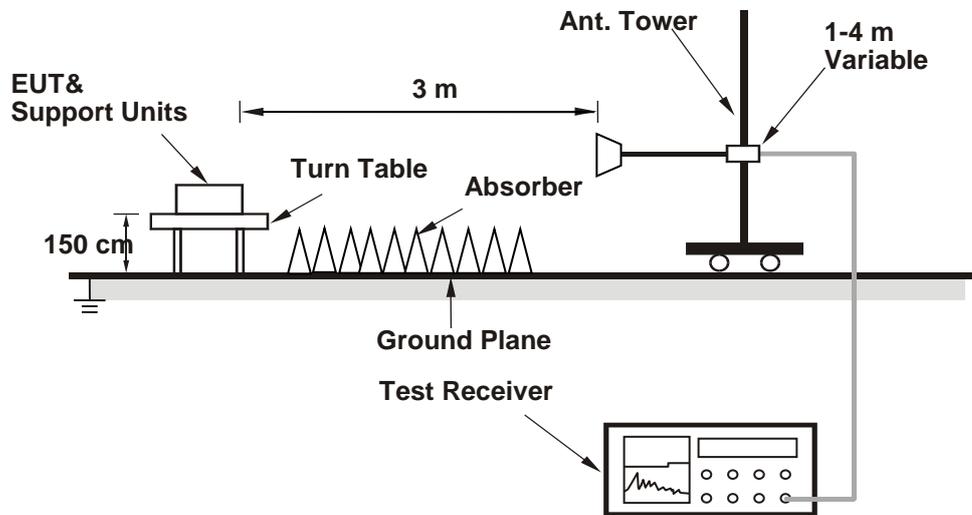
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



**<Radiated Emission above 1 GHz>**



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

**4.1.7 EUT Operating Conditions**

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.8 Test Results

**ABOVE 1GHz DATA**

**Mode A**

<b>RF Mode</b>	TX 802.11n (HT40)	<b>Channel</b>	CH 38 : 5190 MHz
<b>Frequency Range</b>	1GHz ~ 40GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

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	5150.00	56.7 PK	74.0	-17.3	2.23 H	127	54.5	2.2
2	5150.00	43.9 AV	54.0	-10.1	2.23 H	127	41.7	2.2
3	*5190.00	101.3 PK			2.23 H	127	64.9	36.4
4	*5190.00	90.6 AV			2.23 H	127	54.2	36.4
5	#10380.00	55.3 PK	68.2	-12.9	1.83 H	174	40.1	15.2

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	5150.00	63.0 PK	74.0	-11.0	2.64 V	17	60.8	2.2
2	5150.00	49.3 AV	54.0	-4.7	2.64 V	17	47.1	2.2
3	*5190.00	108.7 PK			2.64 V	17	72.3	36.4
4	*5190.00	98.1 AV			2.64 V	17	61.7	36.4
5	#10380.00	55.8 PK	68.2	-12.4	3.57 V	239	40.6	15.2

**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.

<b>RF Mode</b>	TX 802.11n (HT40)	<b>Channel</b>	CH 62 : 5310 MHz
<b>Frequency Range</b>	1GHz ~ 40GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

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	*5310.00	99.6 PK			2.28 H	132	63.5	36.1
2	*5310.00	88.9 AV			2.28 H	132	52.8	36.1
3	5350.00	53.2 PK	74.0	-20.8	2.28 H	132	51.2	2.0
4	5350.00	41.3 AV	54.0	-12.7	2.28 H	132	39.3	2.0
5	10620.00	55.9 PK	74.0	-18.1	1.94 H	171	40.2	15.7
6	10620.00	42.0 AV	54.0	-12.0	1.94 H	171	26.3	15.7

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	*5310.00	106.9 PK			2.83 V	27	70.8	36.1
2	*5310.00	96.2 AV			2.83 V	27	60.1	36.1
3	5350.00	56.4 PK	74.0	-17.6	2.83 V	27	54.4	2.0
4	5350.00	44.2 AV	54.0	-9.8	2.83 V	27	42.2	2.0
5	10620.00	56.4 PK	74.0	-17.6	3.53 V	247	40.7	15.7
6	10620.00	42.5 AV	54.0	-11.5	3.53 V	247	26.8	15.7

**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.
5. " \* ": Fundamental frequency.

### Mode B

<b>RF Mode</b>	TX 802.11ac (VHT80)	<b>Channel</b>	CH 122 : 5610 MHz
<b>Frequency Range</b>	1GHz ~ 40GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

#### 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	5460.00	52.9 PK	74.0	-21.1	3.47 H	301	50.1	2.8
2	5460.00	40.2 AV	54.0	-13.8	3.47 H	301	37.4	2.8
3	#5470.00	54.2 PK	68.2	-14.0	3.47 H	301	51.4	2.8
4	*5610.00	99.6 PK			3.47 H	301	62.6	37.0
5	*5610.00	87.9 AV			3.47 H	301	50.9	37.0
6	#5725.00	54.1 PK	68.2	-14.1	3.47 H	301	51.1	3.0
7	11220.00	56.2 PK	74.0	-17.8	3.16 H	207	40.3	15.9
8	11220.00	41.7 AV	54.0	-12.3	3.16 H	207	25.8	15.9

#### 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	5460.00	53.6 PK	74.0	-20.4	3.98 V	36	50.8	2.8
2	5460.00	41.4 AV	54.0	-12.6	3.98 V	36	38.6	2.8
3	#5470.00	53.8 PK	68.2	-14.4	3.98 V	36	51.0	2.8
4	*5610.00	101.4 PK			3.98 V	36	64.4	37.0
5	*5610.00	89.9 AV			3.98 V	36	52.9	37.0
6	#5725.00	53.8 PK	68.2	-14.4	3.98 V	36	50.8	3.0
7	11220.00	56.5 PK	74.0	-17.5	2.47 V	156	40.6	15.9
8	11220.00	42.2 AV	54.0	-11.8	2.47 V	156	26.3	15.9

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

<b>RF Mode</b>	TX 802.11ac (VHT80)	<b>Channel</b>	CH 155 : 5775 MHz
<b>Frequency Range</b>	1GHz ~ 40GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**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	*5775.00	99.9 PK			3.95 H	292	62.4	37.5
2	*5775.00	88.5 AV			3.95 H	292	51.0	37.5
3	11550.00	56.1 PK	74.0	-17.9	3.08 H	201	40.5	15.6
4	11550.00	41.9 AV	54.0	-12.1	3.08 H	201	26.3	15.6

**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	*5775.00	103.6 PK			3.98 V	37	66.1	37.5
2	*5775.00	92.4 AV			3.98 V	37	54.9	37.5
3	11550.00	56.2 PK	74.0	-17.8	1.42 V	345	40.6	15.6
4	11550.00	43.2 AV	54.0	-10.8	1.42 V	345	27.6	15.6

**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.

**9 kHz ~ 30 MHz Data:**

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**30 MHz ~ 1 GHz Worst-Case Data:**

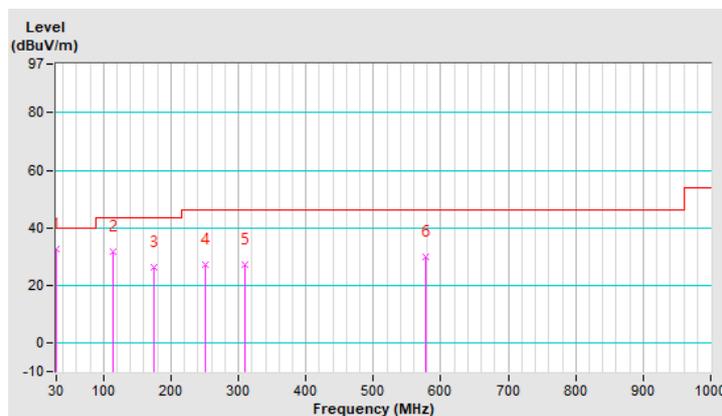
**Mode A**

<b>RF Mode</b>	TX 802.11n (HT40)	<b>Channel</b>	CH 62 : 5310 MHz
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

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	32.8 QP	40.0	-7.2	1.25 H	152	43.1	-10.3
2	113.42	31.6 QP	43.5	-11.9	1.00 H	152	42.9	-11.3
3	175.50	26.3 QP	43.5	-17.2	2.00 H	106	35.5	-9.2
4	251.16	27.1 QP	46.0	-18.9	1.25 H	337	35.8	-8.7
5	309.36	27.4 QP	46.0	-18.6	1.50 H	122	33.9	-6.5
6	577.08	29.7 QP	46.0	-16.3	1.00 H	216	30.8	-1.1

**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.

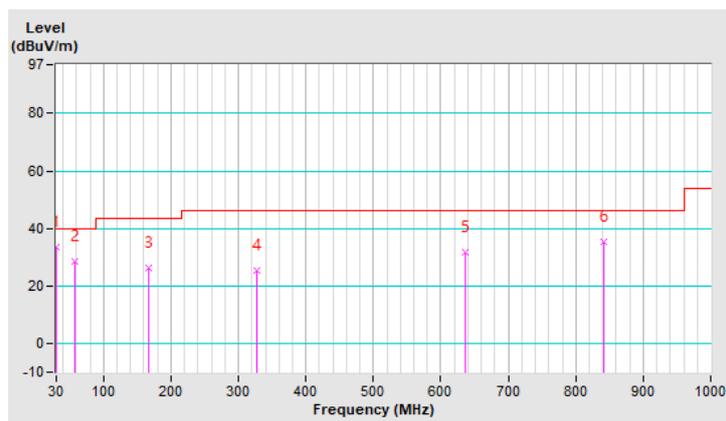


<b>RF Mode</b>	TX 802.11n (HT40)	<b>Channel</b>	CH 62 : 5310 MHz
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

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	30.00	33.3 QP	40.0	-6.7	1.00 V	6	43.6	-10.3
2	57.16	28.4 QP	40.0	-11.6	1.50 V	358	37.7	-9.3
3	167.74	26.4 QP	43.5	-17.1	1.25 V	6	34.9	-8.5
4	326.82	25.4 QP	46.0	-20.6	2.00 V	218	31.5	-6.1
5	635.28	31.6 QP	46.0	-14.4	1.00 V	6	31.4	0.2
6	840.92	35.3 QP	46.0	-10.7	1.50 V	29	31.5	3.8

**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 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.



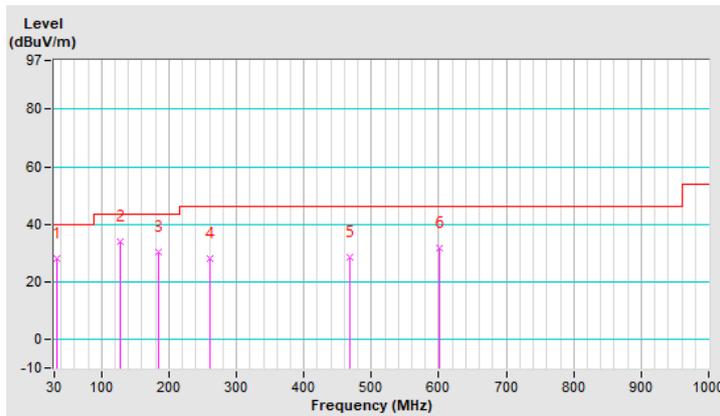
**Mode B**

<b>RF Mode</b>	TX 802.11ac (VHT80)	<b>Channel</b>	CH 155 : 5775 MHz
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

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	27.9 QP	40.0	-12.1	2.00 H	16	38.0	-10.1
2	127.00	34.2 QP	43.5	-9.3	1.00 H	86	44.4	-10.2
3	185.20	30.3 QP	43.5	-13.2	1.25 H	119	40.6	-10.3
4	260.86	28.1 QP	46.0	-17.9	1.50 H	141	36.3	-8.2
5	468.44	28.5 QP	46.0	-17.5	1.25 H	307	31.5	-3.0
6	600.36	31.7 QP	46.0	-14.3	1.00 H	185	32.2	-0.5

**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.

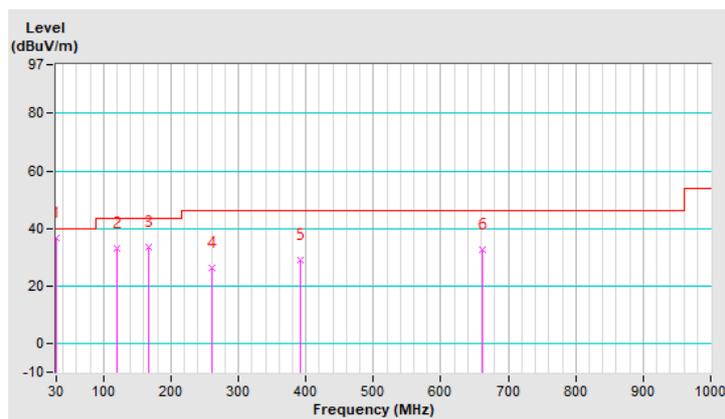


<b>RF Mode</b>	TX 802.11ac (VHT80)	<b>Channel</b>	CH 155 : 5775 MHz
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

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	30.00	36.5 QP	40.0	-3.5	1.50 V	327	46.8	-10.3
2	119.24	32.9 QP	43.5	-10.6	1.00 V	329	43.7	-10.8
3	167.74	33.3 QP	43.5	-10.2	1.25 V	284	41.8	-8.5
4	260.86	26.4 QP	46.0	-19.6	1.50 V	319	34.6	-8.2
5	390.84	29.2 QP	46.0	-16.8	1.00 V	53	34.1	-4.9
6	662.44	32.4 QP	46.0	-13.6	1.25 V	158	31.9	0.5

**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 Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

- Note: 1. The lower limit shall apply at the transition frequencies.  
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 04, 2020	Dec. 03, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 04, 2020	Sep. 03, 2021
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

- 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 Shielded Room 1 (Conduction 1).  
 3. The VCCI Site Registration No. is C-12040.

#### 4.2.3 Test Procedures

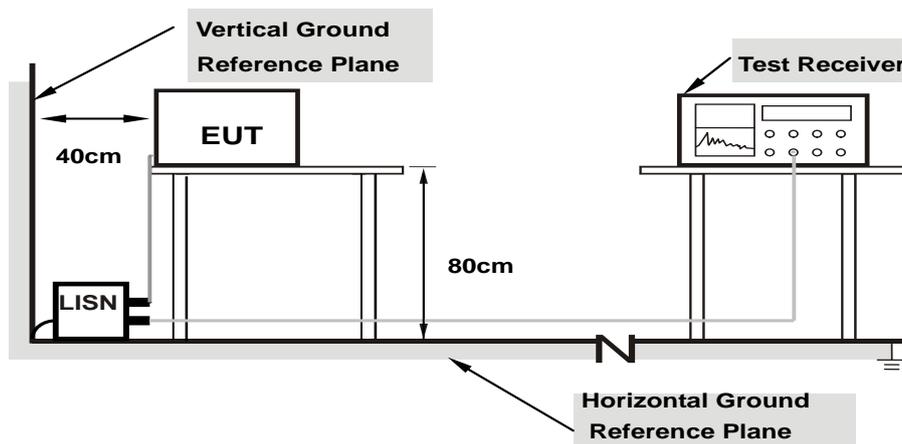
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit -20 dB) was not recorded.

**Note:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



- Note:**
1. Support units were connected to second LISN.
  2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

#### 4.2.6 EUT Operating Conditions

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

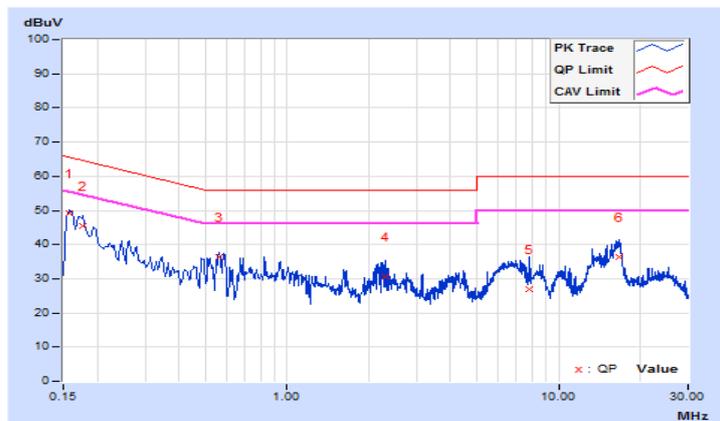
#### 4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 66%RH
Tested by	Titan Hsu	Test Date	2021/1/5
Test Mode	Mode A		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15770	9.65	39.55	26.30	49.20	35.95	65.58	55.58	-16.38	-19.63
2	0.17754	9.66	35.75	22.96	45.41	32.62	64.60	54.60	-19.19	-21.98
3	0.56146	9.66	26.63	21.41	36.29	31.07	56.00	46.00	-19.71	-14.93
4	2.30600	9.71	21.07	8.47	30.78	18.18	56.00	46.00	-25.22	-27.82
5	7.83000	9.77	17.04	11.16	26.81	20.93	60.00	50.00	-33.19	-29.07
6	16.64200	9.85	26.39	18.83	36.24	28.68	60.00	50.00	-23.76	-21.32

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

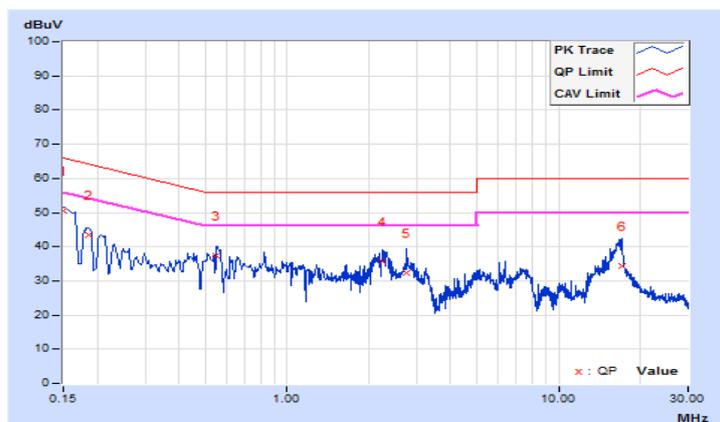


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 66%RH
Tested by	Titan Hsu	Test Date	2021/1/5
Test Mode	Mode A		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.68	40.95	27.44	50.63	37.12	66.00	56.00	-15.37	-18.88
2	0.18600	9.68	33.92	23.23	43.60	32.91	64.21	54.21	-20.61	-21.30
3	0.55000	9.68	27.80	17.26	37.48	26.94	56.00	46.00	-18.52	-19.06
4	2.25400	9.74	25.84	14.05	35.58	23.79	56.00	46.00	-20.42	-22.21
5	2.75000	9.74	22.56	15.29	32.30	25.03	56.00	46.00	-23.70	-20.97
6	17.11800	9.95	24.43	16.97	34.38	26.92	60.00	50.00	-25.62	-23.08

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

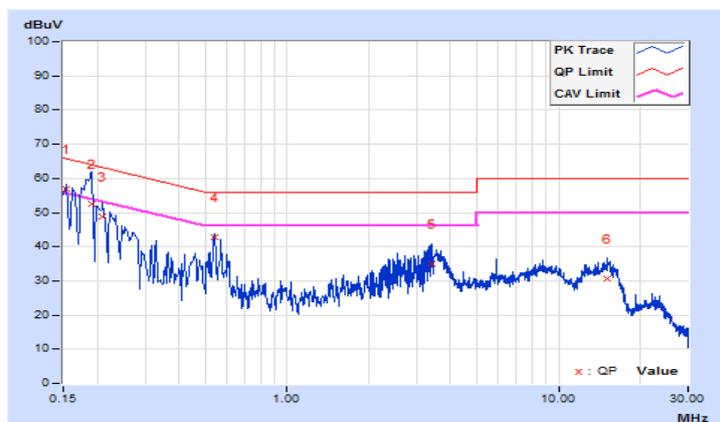


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 66%RH
Tested by	Titan Hsu	Test Date	2021/1/5
Test Mode	Mode B		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	9.82	47.24	33.96	57.06	43.78	65.78	55.78	-8.72	-12.00
2	0.19000	9.84	42.72	28.03	52.56	37.87	64.04	54.04	-11.48	-16.17
3	0.21000	9.85	39.00	24.85	48.85	34.70	63.21	53.21	-14.36	-18.51
4	0.54112	9.88	32.89	25.58	42.77	35.46	56.00	46.00	-13.23	-10.54
5	3.43400	9.98	24.97	13.16	34.95	23.14	56.00	46.00	-21.05	-22.86
6	15.20200	10.15	20.64	15.23	30.79	25.38	60.00	50.00	-29.21	-24.62

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

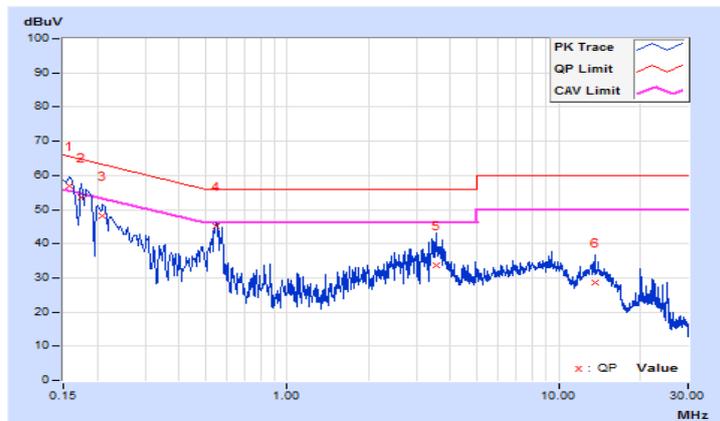


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 66%RH
Tested by	Titan Hsu	Test Date	2021/1/5
Test Mode	Mode B		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15770	9.84	47.09	33.20	56.93	43.04	65.58	55.58	-8.65	-12.54
2	0.17400	9.84	43.69	28.70	53.53	38.54	64.77	54.77	-11.24	-16.23
3	0.20960	9.85	38.25	23.81	48.10	33.66	63.22	53.22	-15.12	-19.56
4	0.54600	9.91	35.24	27.20	45.15	37.11	56.00	46.00	-10.85	-8.89
5	3.53400	10.03	23.78	13.20	33.81	23.23	56.00	46.00	-22.19	-22.77
6	13.59400	10.21	18.32	13.18	28.53	23.39	60.00	50.00	-31.47	-26.61

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



### 4.3 Transmit Power Measurement

#### 4.3.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p $\leq$ 125 mW (21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
	√	Mobile and Portable client device	250 mW (24 dBm)
U-NII-2A		√	250 mW (24 dBm) or 11 dBm + 10 log B*
U-NII-2C		√	250 mW (24 dBm) or 11 dBm + 10 log B*
U-NII-3		√	1 Watt (30 dBm)

\*B is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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

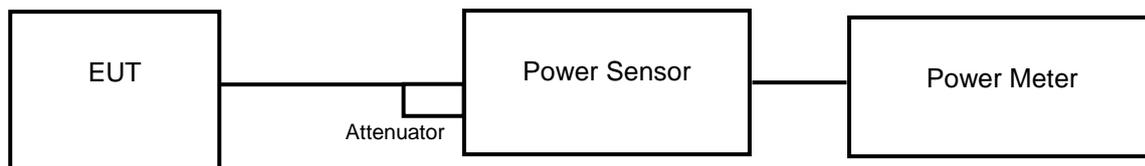
Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  MHz for any  $N_{ANT}$ ;

Array Gain =  $5 \log(N_{ANT}/N_{SS})$  dB or 3 dB, whichever is less for 20 MHz channel widths with  $N_{ANT} \geq 5$ .

For power measurements on all other devices: Array Gain =  $10 \log(N_{ANT}/N_{SS})$  dB.

#### 4.3.2 Test Setup

##### <Power Output Measurement>



#### 4.3.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

#### 4.3.4 Test Procedure

##### **Average Power Measurement**

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

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

#### 4.3.7 Test Results

(SISO)

802.11a

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
36	5180	41.210	40.926	16.15	16.12
40	5200	41.495	40.087	16.18	16.03
48	5240	40.926	39.994	16.12	16.02
52	5260	41.400	40.832	16.17	16.11
60	5300	39.994	40.272	16.02	16.05
64	5320	41.976	40.087	16.23	16.03
100	5500	41.115	40.365	16.14	16.06
116	5580	40.365	39.994	16.06	16.02
140	5700	41.020	39.994	16.13	16.02
144	5720	41.591	40.179	16.19	16.04
149	5745	40.458	40.087	16.07	16.03
157	5785	41.591	40.551	16.19	16.08
165	5825	41.879	41.976	16.22	16.23

802.11n (HT20)

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
36	5180	40.832	42.170	16.11	16.25
40	5200	40.179	40.272	16.04	16.05
48	5240	41.687	40.272	16.2	16.05
52	5260	40.926	40.551	16.12	16.08
60	5300	40.087	41.400	16.03	16.17
64	5320	41.976	39.902	16.23	16.01
100	5500	40.644	40.644	16.09	16.09
116	5580	40.832	41.783	16.11	16.21
140	5700	40.272	41.210	16.05	16.15
144	5720	41.783	40.926	16.21	16.12
149	5745	41.976	40.926	16.23	16.12
157	5785	40.551	39.994	16.08	16.02
165	5825	41.687	41.976	16.2	16.23

**802.11n (HT40)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
38	5190	42.073	41.976	16.24	16.23
46	5230	40.272	40.644	16.05	16.09
54	5270	41.400	40.832	16.17	16.11
62	5310	40.087	39.994	16.03	16.02
102	5510	40.179	41.591	16.04	16.19
110	5550	41.400	39.902	16.17	16.01
134	5670	42.954	41.591	16.33	16.19
142	5710	41.879	40.179	16.22	16.04
151	5755	43.152	40.365	16.35	16.06
159	5795	41.591	39.994	16.19	16.02

**802.11ac (VHT20)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
36	5180	40.926	41.020	16.12	16.13
40	5200	40.458	40.365	16.07	16.06
48	5240	41.591	40.458	16.19	16.07
52	5260	40.832	39.994	16.11	16.02
60	5300	41.976	40.738	16.23	16.1
64	5320	41.687	41.210	16.2	16.15
100	5500	42.170	39.811	16.25	16
116	5580	40.272	40.832	16.05	16.11
140	5700	40.832	40.179	16.11	16.04
144	5720	41.495	40.365	16.18	16.06
149	5745	41.591	40.272	16.19	16.05
157	5785	42.364	40.926	16.27	16.12
165	5825	41.976	41.400	16.23	16.17

**802.11ac (VHT40)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
38	5190	41.400	41.783	16.17	16.21
46	5230	40.551	40.365	16.08	16.06
54	5270	40.365	41.020	16.06	16.13
62	5310	40.179	39.994	16.04	16.02
102	5510	42.658	42.073	16.3	16.24
110	5550	40.832	40.832	16.11	16.11
134	5670	42.855	40.458	16.32	16.07
142	5710	41.591	39.902	16.19	16.01
151	5755	40.551	40.832	16.08	16.11
159	5795	42.073	40.179	16.24	16.04

**802.11ac (VHT80)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
42	5210	42.756	42.658	16.31	16.3
58	5290	42.855	43.551	16.32	16.39
106	5530	43.251	43.152	16.36	16.35
122	5610	42.954	42.954	16.33	16.33
138	5690	43.451	43.351	16.38	16.37
155	5775	43.551	43.652	16.39	16.4

**802.11ac (VHT160)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
50	5250	15.776	15.668	11.98	11.95
114	5570	15.631	15.453	11.94	11.89

**802.11ax (HE20)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
36	5180	25.586	28.314	14.08	14.52
40	5200	26.002	28.576	14.15	14.56
48	5240	25.763	28.840	14.11	14.6
52	5260	26.792	28.314	14.28	14.52
60	5300	26.303	28.973	14.2	14.62
64	5320	26.669	29.444	14.26	14.69
100	5500	26.424	28.973	14.22	14.62
116	5580	26.792	29.376	14.28	14.68
140	5700	26.242	29.107	14.19	14.64
144	5720	25.763	29.040	14.11	14.63
149	5745	19.861	30.269	12.98	14.81
157	5785	19.099	30.409	12.81	14.83
165	5825	19.588	60.256	12.92	17.8

**802.11ax (HE40)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
38	5190	26.485	25.823	14.23	14.12
46	5230	26.424	25.410	14.22	14.05
54	5270	26.977	26.303	14.31	14.2
62	5310	26.424	26.424	14.22	14.22
102	5510	26.182	26.977	14.18	14.31
110	5550	26.669	26.424	14.26	14.22
134	5670	26.607	26.915	14.25	14.3
142	5710	26.303	26.607	14.2	14.25
151	5755	19.907	25.527	12.99	14.07
159	5795	19.634	25.235	12.93	14.02

**802.11ax (HE80)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
42	5210	26.977	26.669	14.31	14.26
58	5290	26.853	26.915	14.29	14.3
106	5530	24.266	25.586	13.85	14.08
122	5610	24.322	25.468	13.86	14.06
138	5690	24.099	26.363	13.82	14.21
155	5775	21.135	26.363	13.25	14.21

**802.11ax (HE160)**

Channel	Frequency (MHz)	Maximum Conducted Power (mW)		Maximum Conducted Power (dBm)	
		Chain 0	Chain 1	Chain 0	Chain 1
50	5250	15.776	15.668	11.98	11.95
114	5570	15.631	15.453	11.94	11.89

**(MIMO)**  
**802.11n (HT20)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
36	5180	13.27	13.24	42.319	16.27
40	5200	13.33	13.24	42.614	16.30
48	5240	13.39	13.13	42.386	16.27
52	5260	13.4	13.22	42.867	16.32
60	5300	13.33	13.27	42.760	16.31
64	5320	12.71	12.8	37.718	15.77
100	5500	13.34	13.28	42.859	16.32
116	5580	13.27	13.11	41.697	16.20
140	5700	12.68	12.77	37.459	15.74
144	5720	13.18	13.09	41.167	16.15
149	5745	16.23	16.12	82.902	19.19
157	5785	16.08	16.02	80.545	19.06
165	5825	16.2	16.23	83.663	19.23

**802.11n (HT40)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
38	5190	13.33	13.29	42.858	16.32
46	5230	13.35	13.22	42.617	16.30
54	5270	13.3	13.37	43.107	16.35
62	5310	11.46	11.25	27.331	14.37
102	5510	13.33	13.27	42.760	16.31
110	5550	13.29	13.27	42.563	16.29
134	5670	13.4	13.31	43.307	16.37
142	5710	13.31	13.24	42.515	16.29
151	5755	16.35	16.06	83.516	19.22
159	5795	16.19	16.02	81.586	19.12

**802.11ac (VHT20)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
36	5180	13.35	13.21	42.568	16.29
40	5200	13.35	13.25	42.762	16.31
48	5240	13.38	13.17	42.526	16.29
52	5260	13.22	13.02	41.034	16.13
60	5300	13.17	13.24	41.835	16.22
64	5320	12.69	12.76	37.458	15.74
100	5500	13.17	13.23	41.787	16.21
116	5580	13.09	13.05	40.554	16.08
140	5700	12.72	12.66	37.157	15.70
144	5720	13.17	13.08	41.073	16.14
149	5745	16.19	16.05	81.863	19.13
157	5785	16.27	16.12	83.290	19.21
165	5825	16.23	16.17	83.376	19.21

**802.11ac (VHT40)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
38	5190	13.31	13.24	42.515	16.29
46	5230	13.35	13.23	42.665	16.30
54	5270	13.3	13.22	42.369	16.27
62	5310	11.41	11.32	27.388	14.38
102	5510	13.36	13.19	42.522	16.29
110	5550	13.47	13.23	43.271	16.36
134	5670	13.35	13.31	43.056	16.34
142	5710	13.33	13.29	42.858	16.32
151	5755	16.08	16.11	81.383	19.11
159	5795	16.24	16.04	82.252	19.15

**802.11ac (VHT80)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
42	5210	13.34	13.22	42.567	16.29
58	5290	12.12	12.09	32.474	15.12
106	5530	12.76	12.87	38.244	15.83
122	5610	13.37	13.31	43.156	16.35
138	5690	13.41	13.33	43.456	16.38
155	5775	16.39	16.4	87.203	19.41

**802.11ac (VHT160)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
50	5250	9.43	9.42	17.520	12.44
114	5570	9.87	9.85	19.366	12.87

**802.11ax (HE20)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
36	5180	13.2	13.08	41.217	16.15
40	5200	13.16	13.07	40.978	16.13
48	5240	13.21	12.95	40.665	16.09
52	5260	13.13	12.89	40.013	16.02
60	5300	13.01	13.01	39.997	16.02
64	5320	12.59	12.56	36.185	15.59
100	5500	12.97	13.03	39.906	16.01
116	5580	13.07	12.95	40.001	16.02
140	5700	12.55	12.69	36.567	15.63
144	5720	13.07	12.98	40.138	16.04
149	5745	12.98	14.81	50.130	17.00
157	5785	12.81	14.83	49.507	16.95
165	5825	12.92	14.8	49.788	16.97

**802.11ax (HE40)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
38	5190	13.2	13.12	41.405	16.17
46	5230	13.11	13.12	40.976	16.13
54	5270	13.19	13.01	40.844	16.11
62	5310	11.33	11.21	26.796	14.28
102	5510	13.19	13.05	41.029	16.13
110	5550	13.3	13.16	42.081	16.24
134	5670	13.19	13.11	41.309	16.16
142	5710	13.23	13.14	41.644	16.20
151	5755	12.99	14.07	45.434	16.57
159	5795	12.93	14.02	44.868	16.52

**802.11ax (HE80)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
42	5210	13.28	13.07	41.558	16.19
58	5290	12.1	12.01	32.104	15.07
106	5530	12.62	12.79	37.292	15.72
122	5610	13.15	13.18	41.451	16.18
138	5690	13.28	13.17	42.031	16.24
155	5775	13.25	14.21	47.498	16.77

**802.11ax (HE160)**

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
50	5250	9.25	9.23	16.789	12.25
114	5570	9.79	9.77	19.0121	12.79

## 5 Pictures of Test Arrangements

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

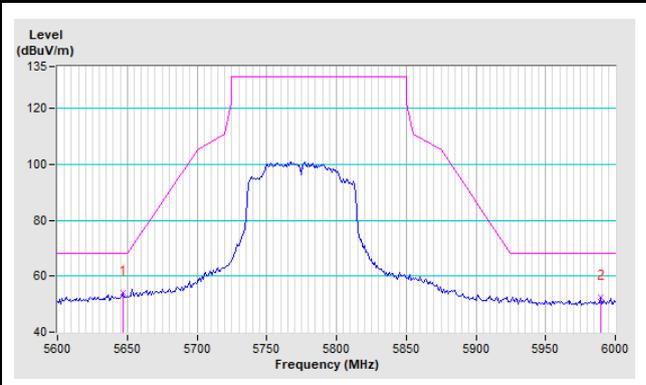
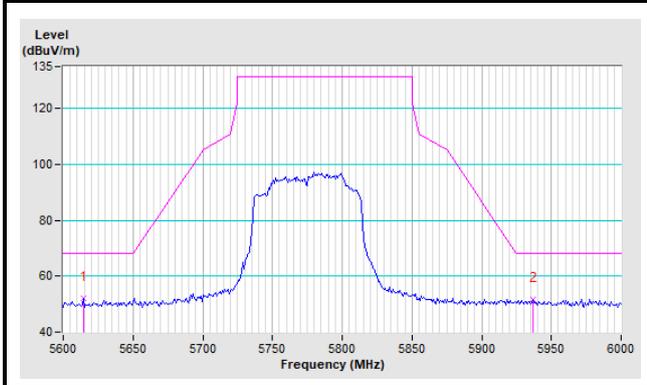
# Annex A- Radiated Out of Band Emission (OOBE) Measurement

## 802.11ac (VHT80)

CH 155 5775 MHz

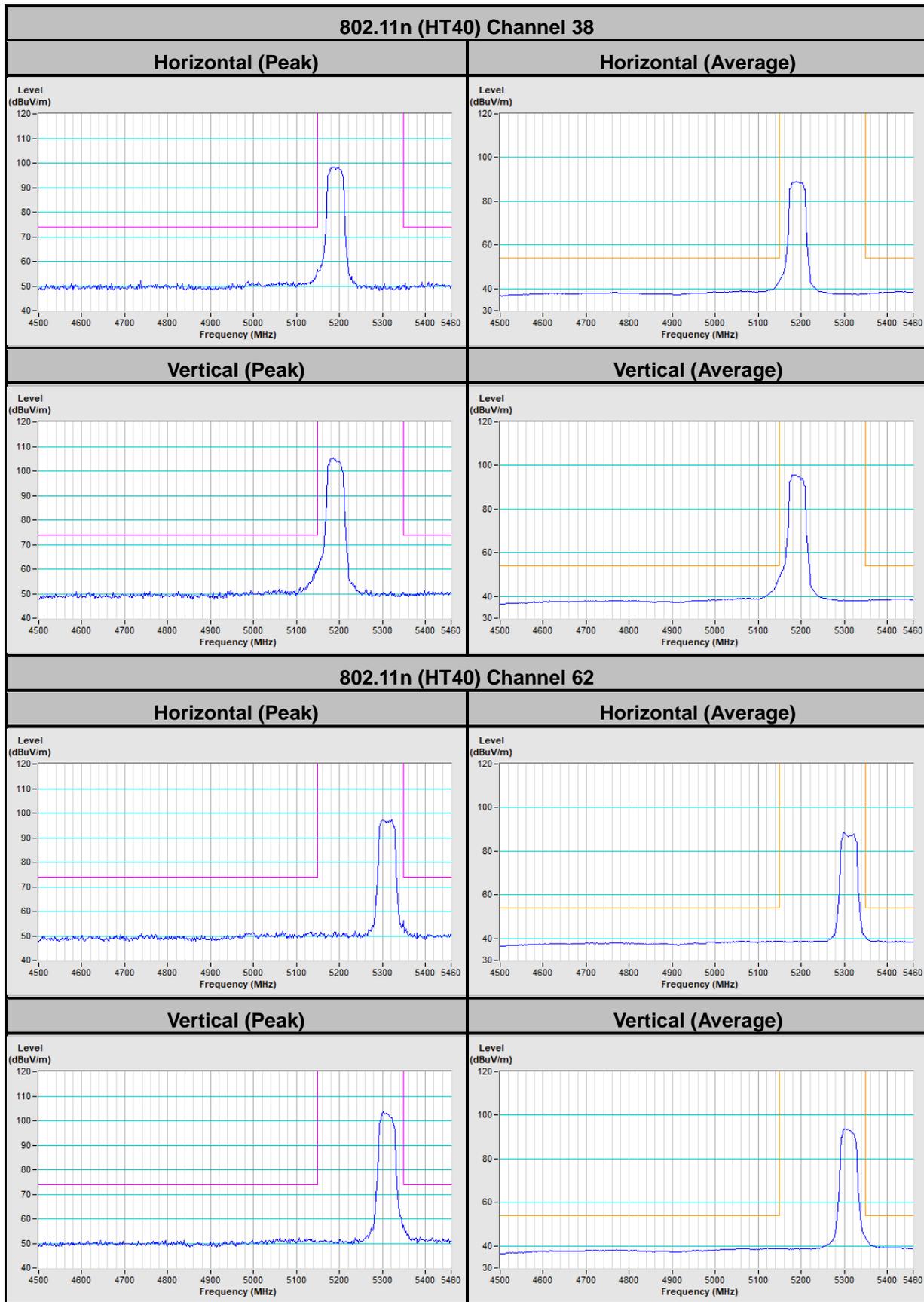
Horizontal

Vertical

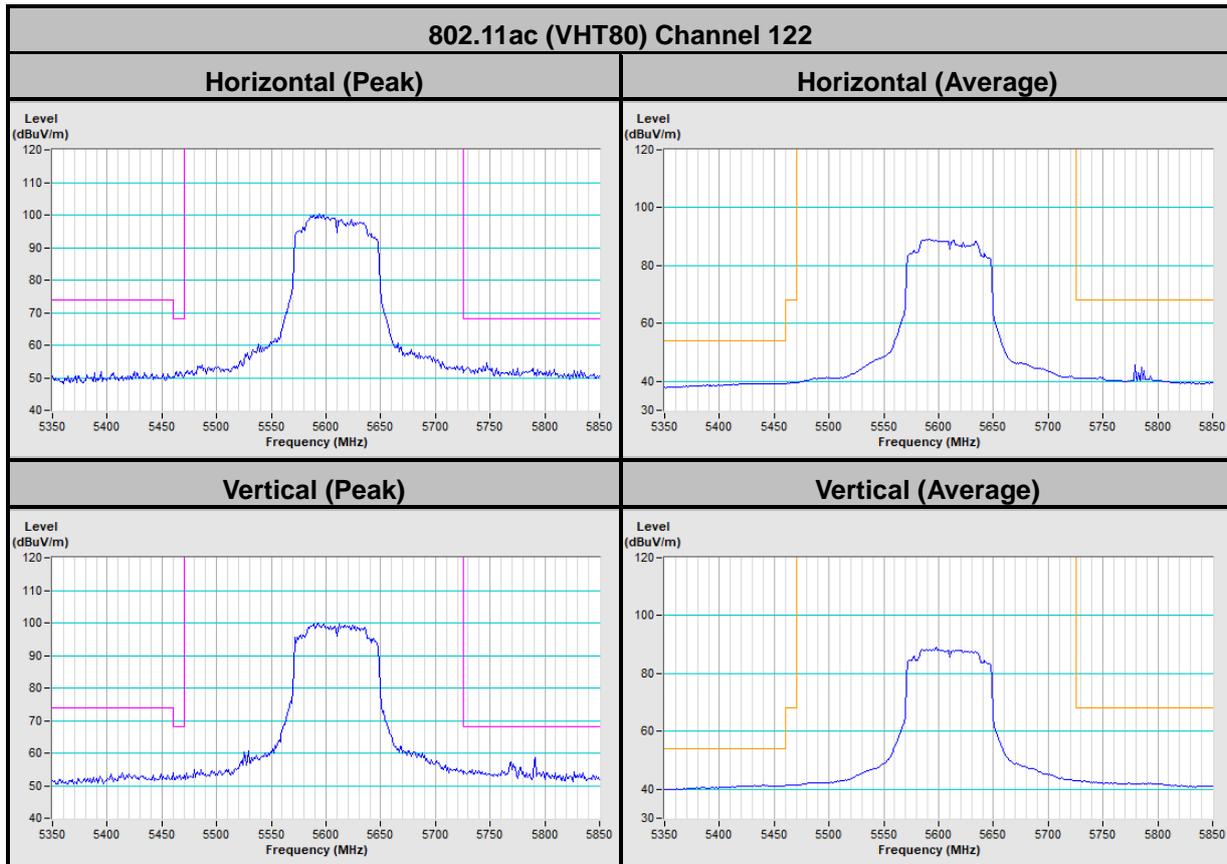


# Annex B- Band-edge measurement

## Mode A



**Mode B**



## 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 according to ISO/IEC 17025.

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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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