

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart E (Section 15.407)  
**Report No.:** RFBZCH-WTW-P23100496  
**FCC ID:** ACJ932AH2301  
**Product:** Display Audio  
**Brand:** Panasonic  
**Model No.:** AH2301  
**Received Date:** 2023/10/20  
**Test Date:** 2023/11/16 ~ 2023/12/15  
**Issued Date:** 2024/1/24

**Applicant:** Panasonic Corporation of North America

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

**Designation Number:** 427177 / TW0011

**Approved by:** Jeremy Lin , **Date:** 2024/1/24  
Jeremy Lin / Project Engineer

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Prepared by : Polly Chien / Specialist

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## Release Control Record

Issue No.	Description	Date Issued
RFBZCH-WTW-P23100496	Original release.	2024/1/24

## 1 Certificate

**Product:** Display Audio

**Brand:** Panasonic

**Test Model:** AH2301

**Sample Status:** Engineering sample

**Applicant:** Panasonic Corporation of North America

**Test Date:** 2023/11/16 ~ 2023/12/15

**Standard:** 47 CFR FCC Part 15, Subpart E (Section 15.407)

**Measurement** ANSI C63.10-2013

**procedure:** KDB 789033 D02 General UNII Test Procedure New Rules v02r01

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.

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
Clause	Test Item	Result	Remark
15.407(a)(3)	RF Output Power	Pass	Meet the requirement of limit.
15.407(a)(3)	Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6 dB Bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
---	Occupied Bandwidth	-	Reference only.
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.407(b)(9)	AC Power Conducted Emissions	N/A	Power supply from DC power source.
15.407(b)(9)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -6.4 dB at 290.00 MHz
15.407(b) (4(i)/10)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -6.1 dB at 5645.65 MHz
15.203	Antenna Requirement	Pass	No antenna connector is used.

Notes: 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	Specification	Expanded Uncertainty (k=2) (±)
RF Output Power	-	1.371 dB
Power Spectral Density	-	1.017 dB
6 dB Bandwidth	-	206.5 Hz
Occupied Bandwidth	-	72 Hz
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.44 dB
	30 MHz ~ 1 GHz	2.02 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	1.01 dB
	18 GHz ~ 40 GHz	1.15 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Display Audio
Brand	Panasonic
Test Model	AH2301
Status of EUT	Engineering sample
Power Supply Rating	12 Vdc (10Vdc ~ 16Vdc)
Modulation Type	BPSK, QPSK, 16QAM, 64QAM, 256QAM
Modulation Technology	OFDM
Transfer Rate	Up to 433.3 Mbps
Operating Frequency	5.745 GHz ~ 5.825 GHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	27.797 mW (14.44 dBm)

Note:

1. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (5 GHz)	Bluetooth

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Gain (dBi)	Antenna Type	Connector Type
WLAN 5G		
1.82	PCB	NA

\* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2. The EUT provides 1 completed transmitter and 1 receiver:

5 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11a	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
802.11ac (VHT20)	1TX	1RX
802.11ac (VHT40)	1TX	1RX
802.11ac (VHT80)	1TX	1RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20 MHz (40 MHz), 802.11ac mode for 20 MHz (40 MHz, 80 MHz), therefore the manufacturer will control the power for 802.11n/ac mode investigated worst case to representative mode in test report.



### 3.3 Channel List

#### FOR 5745 ~ 5825 MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775 MHz

### 3.4 Test Mode Applicability and Tested Channel Detail

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

Test Item	Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power	802.11a	149, 157, 165	BPSK	6Mb/s
	802.11n (HT20)	149, 157, 165	BPSK	MCS0
	802.11n (HT40)	151, 159	BPSK	MCS0
	802.11ac (VHT20)	149, 157, 165	BPSK	MCS0
	802.11ac (VHT40)	151, 159	BPSK	MCS0
	802.11ac (VHT80)	155	BPSK	MCS0
6 dB Bandwidth / Power Spectral Density	802.11a	149, 157, 165	BPSK	6Mb/s
	802.11ac (VHT20)	149, 157, 165	BPSK	MCS0
	802.11ac (VHT40)	151, 159	BPSK	MCS0
	802.11ac (VHT80)	155	BPSK	MCS0
Occupied Bandwidth	802.11a	149, 157, 165	BPSK	6Mb/s
	802.11ac (VHT20)	149, 157, 165	BPSK	MCS0
	802.11ac (VHT40)	151, 159	BPSK	MCS0
	802.11ac (VHT80)	155	BPSK	MCS0
Frequency Stability	802.11a	149	un-modulation	-
Unwanted Emissions below 1 GHz	802.11a	149	BPSK	6Mb/s
Unwanted Emissions above 1 GHz	802.11a	149, 157, 165	BPSK	6Mb/s
	802.11ac (VHT20)	149, 157, 165	BPSK	MCS0
	802.11ac (VHT40)	151, 159	BPSK	MCS0
	802.11ac (VHT80)	155	BPSK	MCS0

Note: The EUT was positioned on the X-plane during testing.

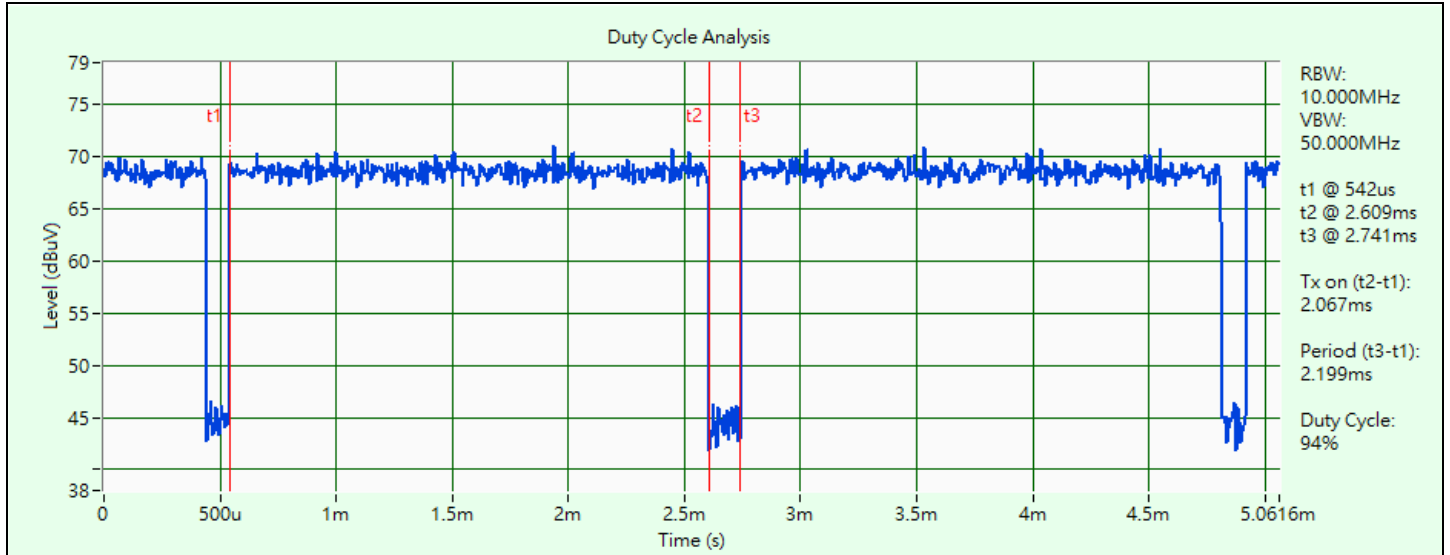
### 3.5 Duty Cycle of Test Signal

**802.11a:** Duty cycle = 2.067 ms / 2.199 ms x 100% = 94.0%, duty factor = 10 \* log (1/Duty cycle) = 0.27 dB

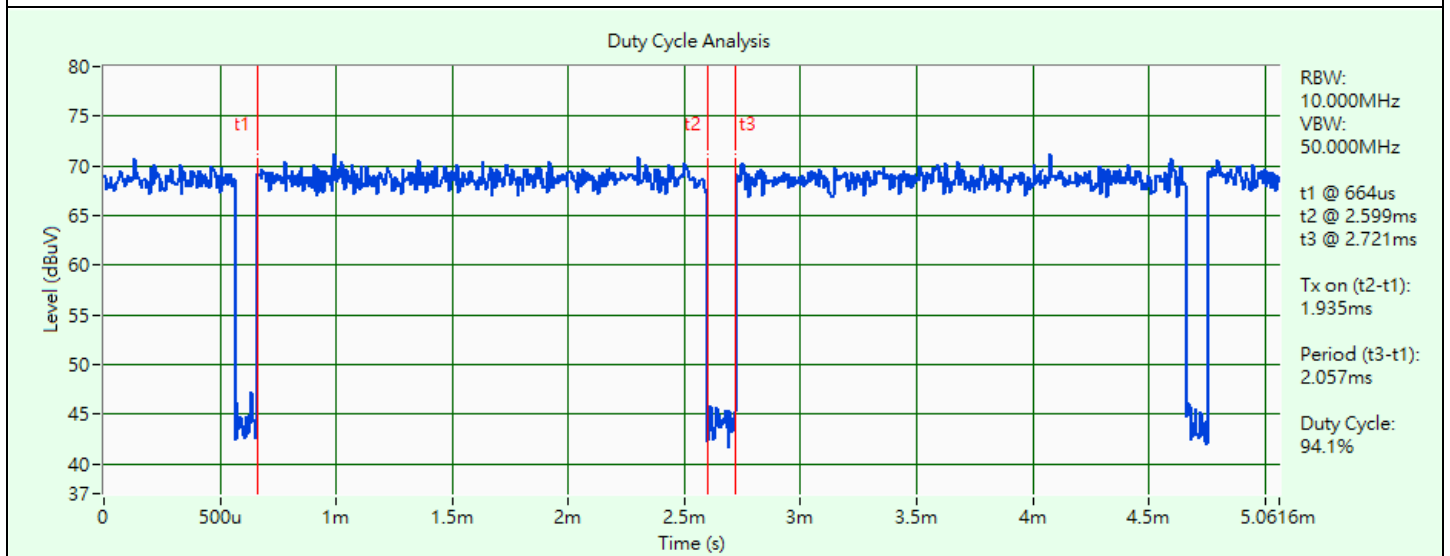
**802.11ac (VHT20):** Duty cycle = 1.935 ms / 2.057 ms x 100% = 94.1%, duty factor = 10 \* log (1/Duty cycle) = 0.27 dB

**802.11ac (VHT40):** Duty cycle = 0.958 ms / 1.125 ms x 100% = 85.2%, duty factor = 10 \* log (1/Duty cycle) = 0.70 dB

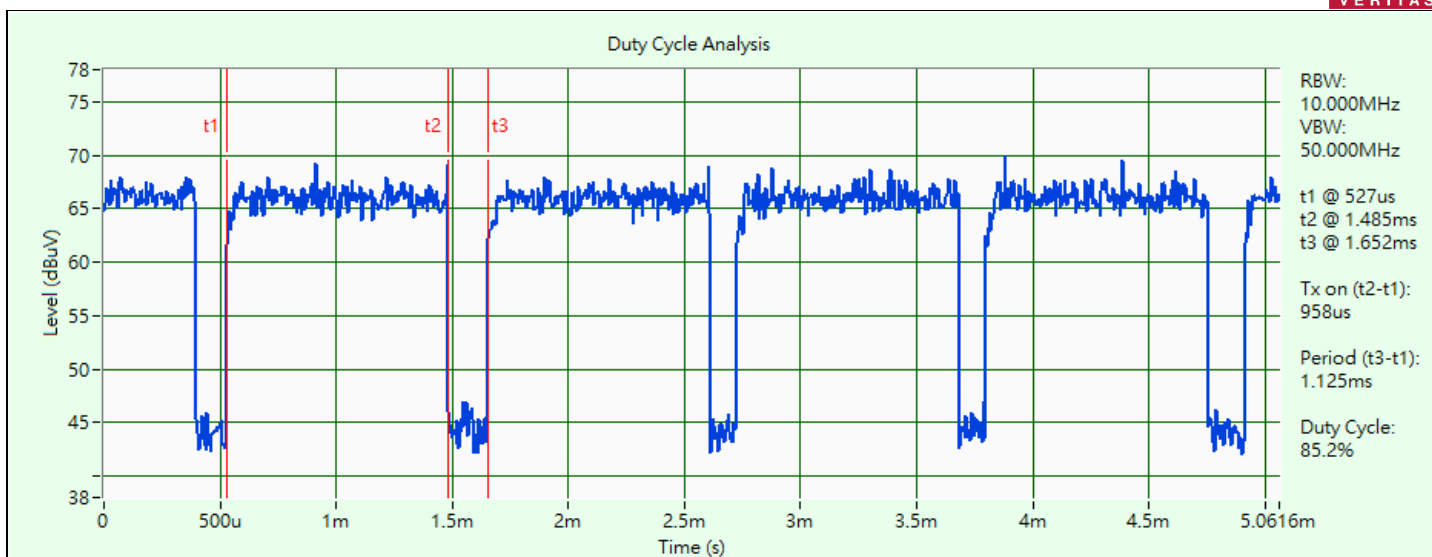
**802.11ac (VHT80):** Duty cycle = 0.466 ms / 0.558 ms x 100% = 83.5%, duty factor = 10 \* log (1/Duty cycle) = 0.78 dB



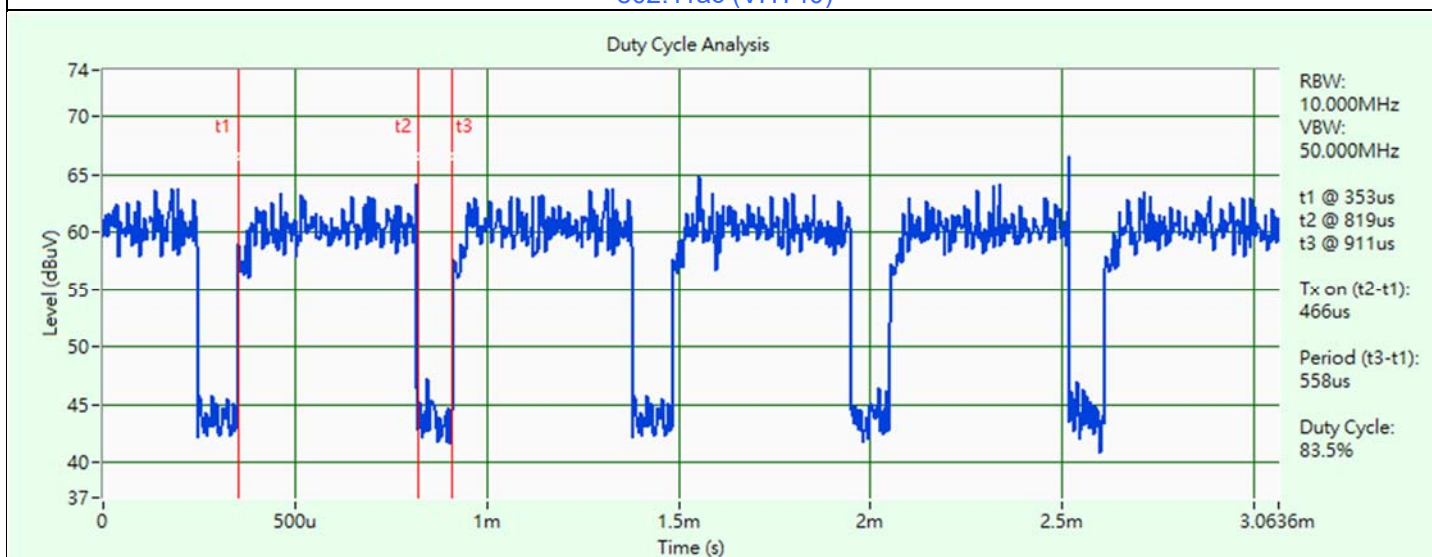
802.11a



802.11ac (VHT20)



802.11ac (VHT40)

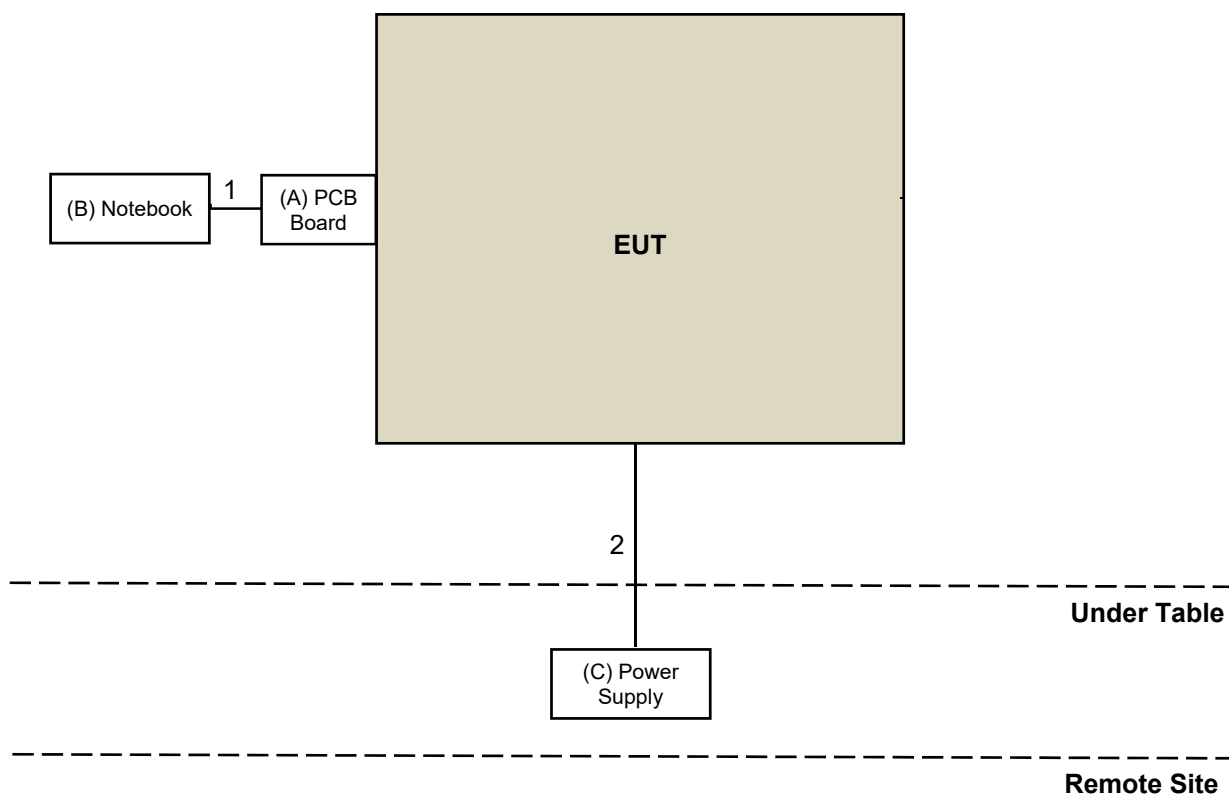


802.11ac (VHT80)

### 3.6 Test Program Used and Operation Descriptions

Controlling software PuTTY\_0.62 has been activated to set the EUT under transmission condition continuously at specific channel frequency.

### 3.7 Connection Diagram of EUT and Peripheral Devices



### 3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	PCB Board	NA	NA	NA	NA	Supplied by applicant
B	Notebook	Lenovo	TP00048A	NA	NA	Provided by Lab
C	Power Supply	GWINSTEK	GPS-3030DD	NA	NA	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	1	Y	0	Provided by Lab
2	I/O Cable	1	1	N	0	Supplied by applicant

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Peak Power Analyzer Keysight	8990B	MY51000485	2023/1/19	2024/1/18
Wideband Power Sensor Keysight	N1923A	MY58020002	2023/1/18	2024/1/17
		MY58140009	2023/1/18	2024/1/17
Fixed Attenuator Woken	MDCS18N-10	MDCS18N-10-01	2023/03/27	2024/03/26

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/12/15

### 4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSV3044	101504	2023/6/5	2024/6/4
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A
Fixed Attenuator Woken	MDCS18N-10	MDCS18N-10-01	2023/03/27	2024/03/26

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/12/15

### 4.3 6 dB Bandwidth

Refer to section 4.2 to get information of the instruments.

### 4.4 Occupied Bandwidth

Refer to section 4.2 to get information of the instruments.

#### 4.5 Frequency Stability

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
3-channel DC power supply JIN YIH Technology	ODP3033	ODP30332128138	N/A	N/A
Digital Multimeter Fluke	87-III	70360742	2023/7/6	2024/7/5
Signal & Spectrum Analyzer R&S	FSV3044	101504	2023/6/5	2024/6/4
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A
Temperature & Humidity Chamber Terchy	HRM-120RF	931022	2022/12/27	2023/12/26

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/12/15

#### 4.6 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	UNAT_5+	PAD-CH6-01	N/A	N/A
Antenna Tower Controller Max-Full	MF-7802	N/A	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-616	2023/10/18	2024/10/17
Loop Antenna Electro-Metrics	EM-6879	269	2023/9/23	2024/9/22
Loop Antenna TESEQ	HLA 6121	45745	2023/8/8	2024/8/7
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
Preamplifier Agilent	310N	187226	2023/6/13	2024/6/12
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/1/7	2024/1/6
RF Coaxial Cable ETS-Lindgren	EMC104-SM-SM-10000	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4)	2023/6/13	2024/6/12
	RFC-SMS-100-SMS-24-IN	Cable-CH1-02(RFC-SMS-100-SMS-24)	2023/6/13	2024/6/12
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	TT-1510	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802	N/A	N/A	N/A

Notes:

1. The test was performed in XD - 966 chamber 6.
2. Tested Date: 2023/11/17



#### 4.7 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	UNAT_5+	PAD-CH6-01	N/A	N/A
Antenna Tower Controller Max-Full	MF-7802	N/A	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	8	N/A	N/A
Horn Antenna ETS-Lindgren	3117	00143293	2023/11/12	2024/11/11
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170241	2023/10/16	2024/10/15
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
Preamplifier Agilent	83017A	MY39501373	2023/6/13	2024/6/12
Preamplifier EMCI	EMC 184045	980116	2023/9/27	2024/9/26
RF Coaxial Cable ETS-Lindgren	EMC104-SM-SM-10000	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4)	2023/6/13	2024/6/12
	RFC-SMS-100-SMS-24-IN	Cable-CH1-02(RFC-SMS-100-SMS-24)	2023/6/13	2024/6/12
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	2023/1/7	2024/1/6
RF Coaxial Cable HUBER+SUHNER&EMCI	SUCOFLEX 104& EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	2023/1/7	2024/1/6
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	TT-1510	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802	N/A	N/A	N/A

Notes:

1. The test was performed in XD - 966 chamber 6.
2. Tested Date: 2023/11/16 ~ 2023/11/17

## 5 Limits of Test Items

### 5.1 RF Output Power

Operation Band	Limit
U-NII-3	1 Watt (30 dBm)

### 5.2 Power Spectral Density

Operation Band	Limit
U-NII-3	30 dBm/500 kHz

### 5.3 6 dB Bandwidth

Within the 5.725-5.850 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 5.4 Occupied Bandwidth

The results are for reference only.

### 5.5 Frequency Stability

The frequency of the carrier signal shall be maintained within band of operation.

### 5.6 Unwanted Emissions below 1 GHz

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

#### Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

## 5.7 Unwanted Emissions above 1 GHz

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)
Above 960	500	3

### Notes:

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.

### Limits of unwanted emission out of the restricted bands

Applicable To	Limit	
789033 D02 General UNII Test Procedure New Rules v02r01	Field Strength at 3 m	
	PK: 74 (dBμV/m)	AV: 54 (dBμV/m)

### For transmitters operating in the 5.725-5.850 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
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>

<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.

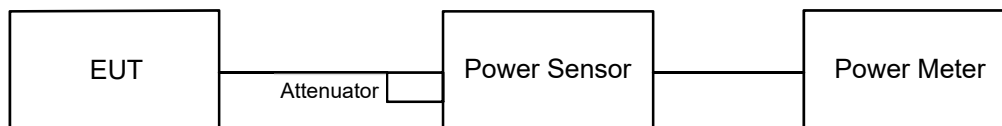
Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

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

## 6 Test Arrangements

### 6.1 RF Output Power

#### 6.1.1 Test Setup

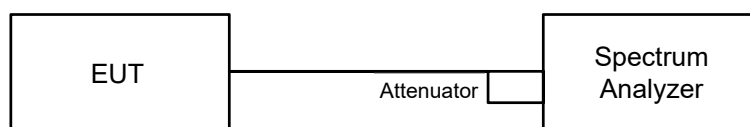


#### 6.1.2 Test Procedure

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 and set the detector to average. Duty factor is not added to measured value.

### 6.2 Power Spectral Density

#### 6.2.1 Test Setup



#### 6.2.2 Test Procedure

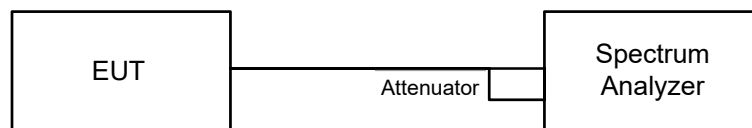
##### For specified measurement bandwidth 500 kHz:

Method SA-2

- a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
- b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
- c. Scale the observed power level to an equivalent value in 500 kHz by adjusting (increasing) the measured power by a bandwidth correction factor (BWCF) where  $BWCF = 10\log(500 \text{ kHz}/300 \text{ kHz})$
- d. Sweep points ≥  $[2 \times \text{span} / \text{RBW}]$ . (This gives bin-to-bin spacing ≤  $\text{RBW} / 2$ , so that narrowband signals are not lost between frequency bins.)
- e. Sweep time = auto, trigger set to “free run”.
- f. Trace average at least 100 traces in power averaging mode.
- g. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
- h. Record the max value and add  $10 \log (1/\text{duty cycle})$ .

### 6.3 6 dB Bandwidth

#### 6.3.1 Test Setup

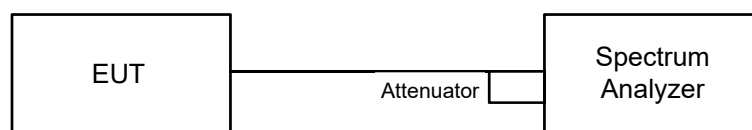


#### 6.3.2 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 6.4 Occupied Bandwidth

#### 6.4.1 Test Setup

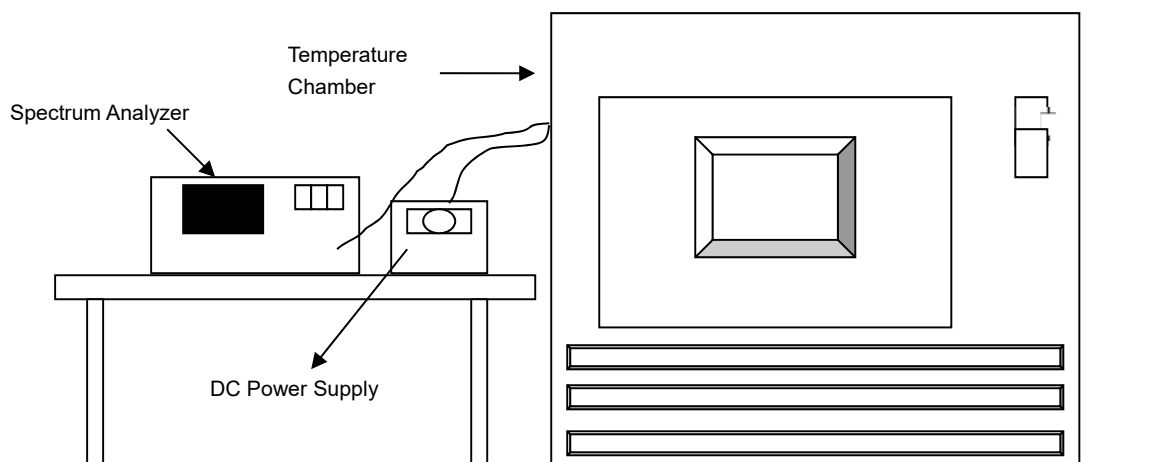


#### 6.4.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to Sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

## 6.5 Frequency Stability

### 6.5.1 Test Setup



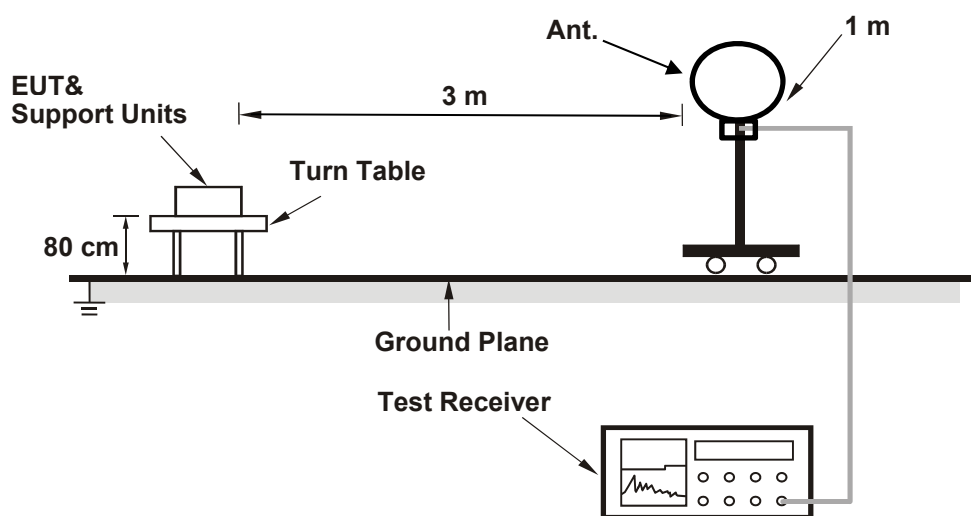
### 6.5.2 Test Procedure

- a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- b. Turn the EUT on and couple its output to a spectrum analyzer.
- c. Turn the EUT off and set the chamber to the highest temperature specified.
- d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.
- e. Repeat step (d) with the temperature chamber set to the next desired temperature until measurements down to the lowest specified temperature have been completed.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

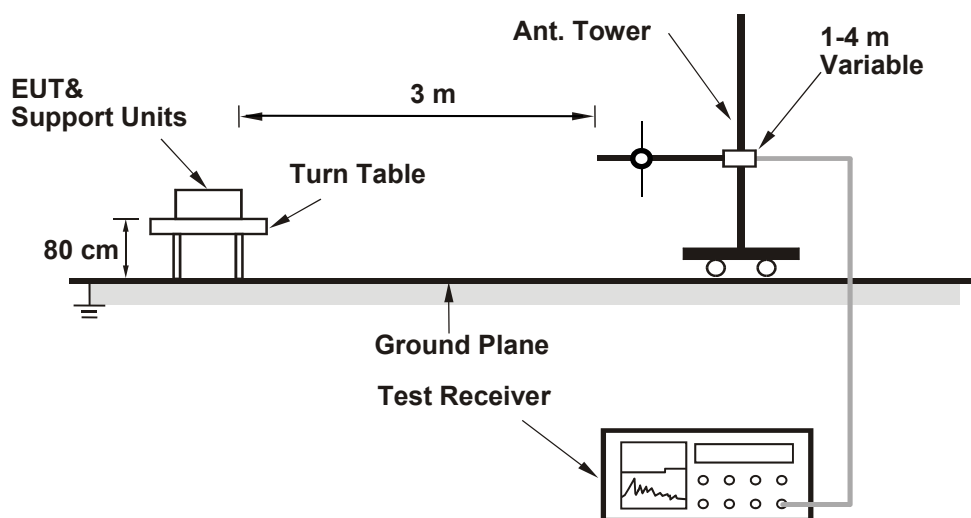
## 6.6 Unwanted Emissions below 1 GHz

### 6.6.1 Test Setup

#### For Radiated emission below 30 MHz



#### For Radiated emission above 30 MHz



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

## 6.6.2 Test Procedure

### 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 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

#### Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

### For Radiated emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters 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.

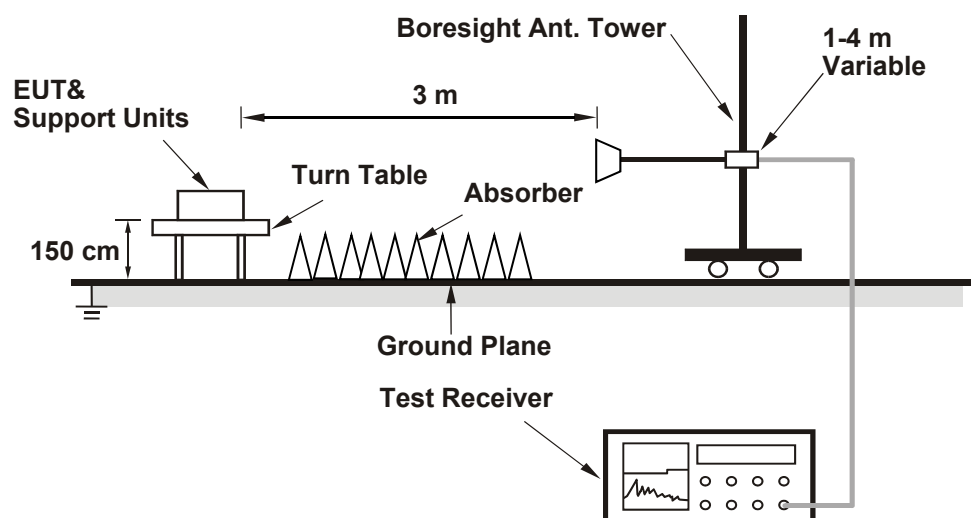
#### Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.



## 6.7 Unwanted Emissions above 1 GHz

### 6.7.1 Test Setup



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

### 6.7.2 Test Procedure

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to peak and average detects 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.

#### Notes:

- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
- For fundamental and harmonic signal measurement, 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.
- All modes of operation were investigated and the worst-case emissions are reported.

## 7 Test Results of Test Item

### 7.1 RF Output Power

Input Power:	12 Vdc	Environmental Conditions:	22°C, 64% RH	Tested By:	Tim Chen
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#### 802.11a

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
149	5745	27.797	14.44	30	Pass
157	5785	26.485	14.23	30	Pass
165	5825	23.55	13.72	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the output power limit shall not be reduced.

#### 802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
149	5745	26.363	14.21	30	Pass
157	5785	25.942	14.14	30	Pass
165	5825	22.646	13.55	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the output power limit shall not be reduced.

#### 802.11n (HT40)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
151	5755	26.792	14.28	30	Pass
159	5795	24.946	13.97	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the output power limit shall not be reduced.

#### 802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
149	5745	26.546	14.24	30	Pass
157	5785	27.227	14.35	30	Pass
165	5825	23.174	13.65	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the output power limit shall not be reduced.

### 802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
151	5755	26.977	14.31	30	Pass
159	5795	25.119	14.00	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the output power limit shall not be reduced.

### 802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Power Limit (dBm)	Test Result
155	5775	27.542	14.40	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the output power limit shall not be reduced.

## 7.2 Power Spectral Density

Input Power:	12 Vdc	Environmental Conditions:	22°C, 64% RH	Tested By:	Tim Chen
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### 802.11a

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)	Duty Factor (dB)	PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Test Result
149	5745	-7.14	0.27	-4.65	30	Pass
157	5785	-7.65	0.27	-5.16	30	Pass
165	5825	-8.18	0.27	-5.69	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the power density limit shall not be reduced.

### 802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)	Duty Factor (dB)	PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Test Result
149	5745	-7.67	0.27	-5.18	30	Pass
157	5785	-8.5	0.27	-6.01	30	Pass
165	5825	-8.15	0.27	-5.66	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the power density limit shall not be reduced.

### 802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)	Duty Factor (dB)	PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Test Result
151	5755	-11.87	0.7	-8.95	30	Pass
159	5795	-12.05	0.7	-9.13	30	Pass

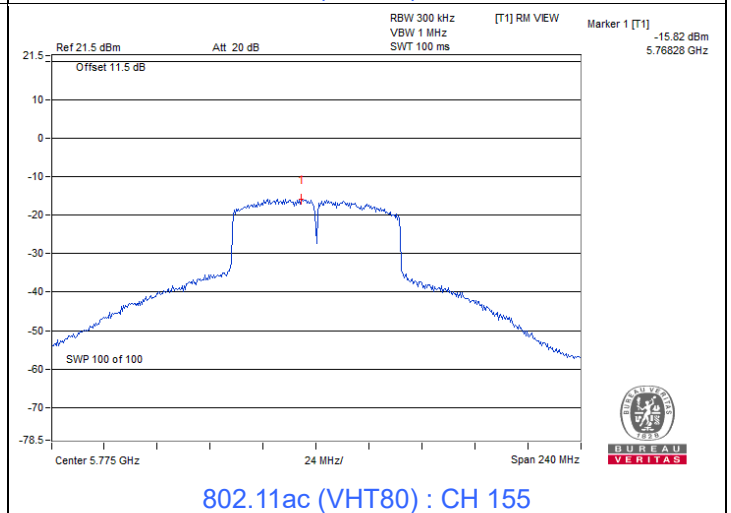
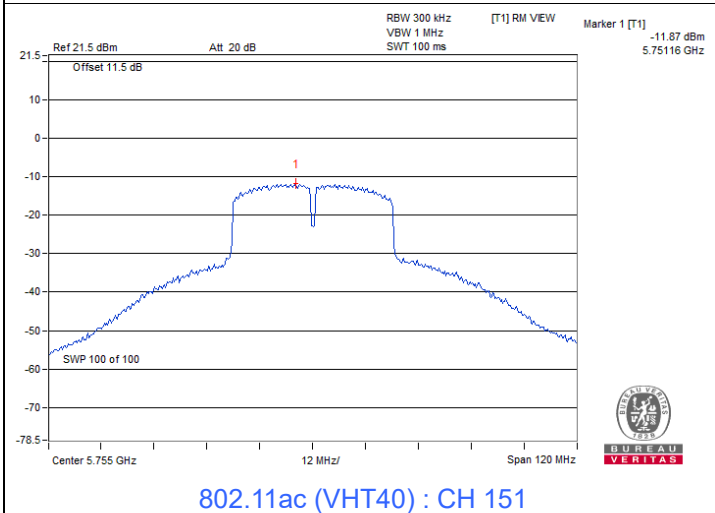
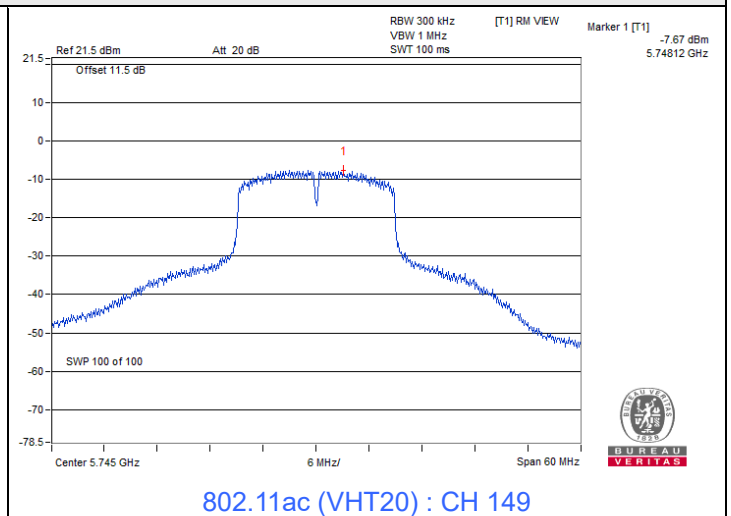
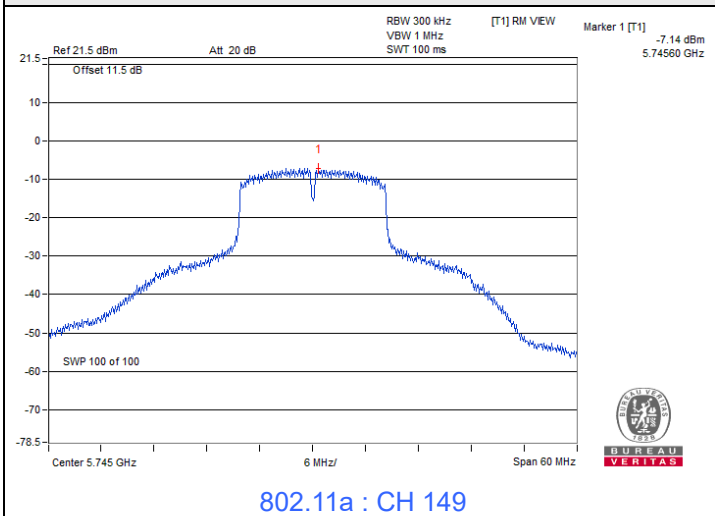
Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the power density limit shall not be reduced.

### 802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)	Duty Factor (dB)	PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Test Result
155	5775	-15.82	0.78	-12.82	30	Pass

Note: For U-NII-3, the antenna gain is 1.82 dBi < 6 dBi, so the power density limit shall not be reduced.

### Spectrum Plot of Maximum Value



### 7.3 6 dB Bandwidth

Input Power:	12 Vdc	Environmental Conditions:	22°C, 64% RH	Tested By:	Tim Chen
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#### 802.11a

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
149	5745	15.17	0.5	Pass
157	5785	15.35	0.5	Pass
165	5825	15.36	0.5	Pass

#### 802.11ac (VHT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
149	5745	15.21	0.5	Pass
157	5785	15.99	0.5	Pass
165	5825	15.21	0.5	Pass

#### 802.11ac (VHT40)

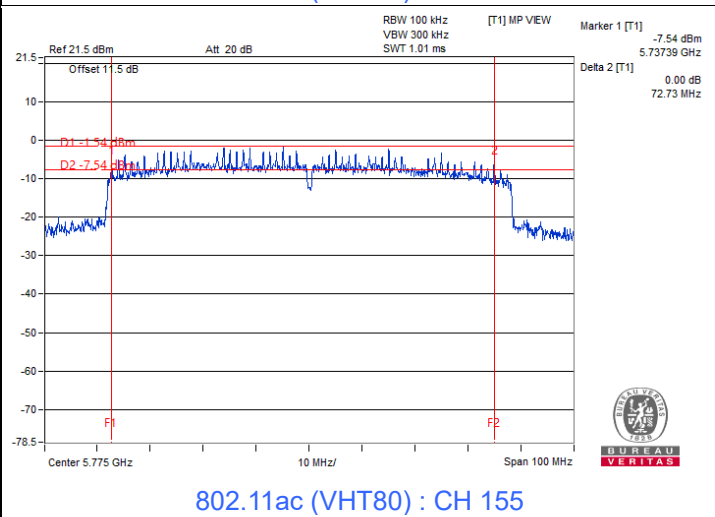
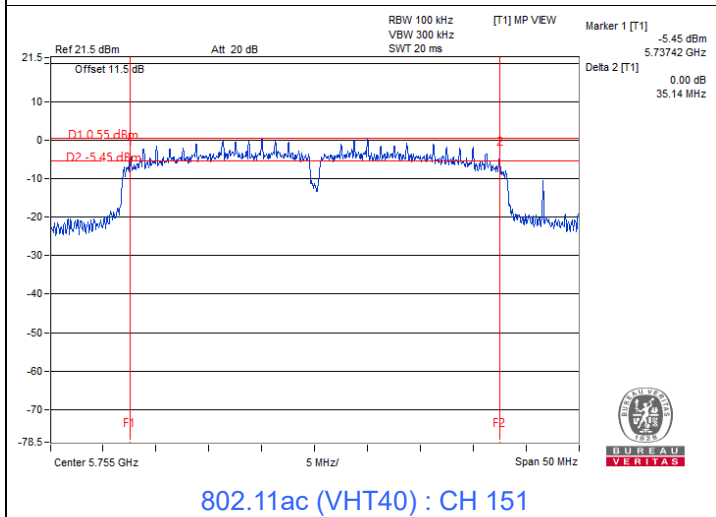
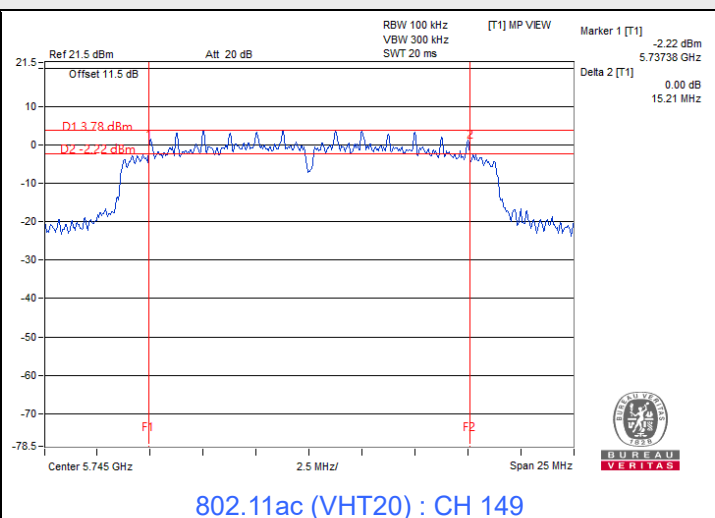
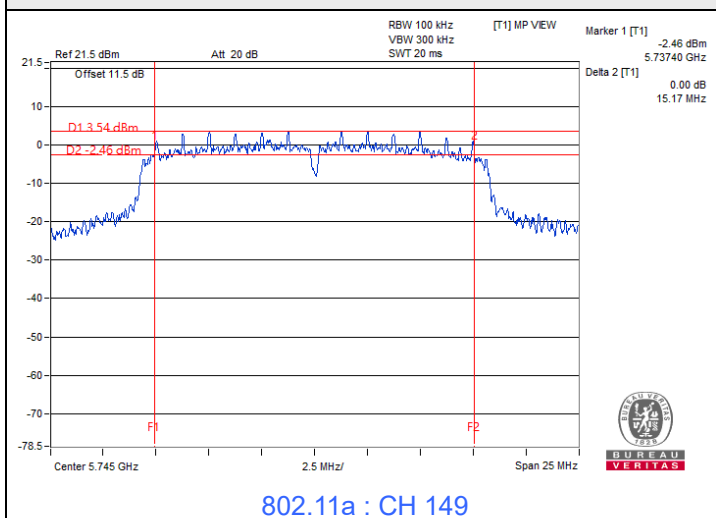
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
151	5755	35.14	0.5	Pass
159	5795	35.2	0.5	Pass

#### 802.11ac (VHT80)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
155	5775	72.73	0.5	Pass



### Spectrum Plot of Minimum Value



#### 7.4 Occupied Bandwidth

Input Power:	12 Vdc	Environmental Conditions:	22°C, 64% RH	Tested By:	Tim Chen
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##### 802.11a

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
149	5745	19.32
157	5785	21.12
165	5825	20.28

##### 802.11ac (VHT20)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
149	5745	18.36
157	5785	23.52
165	5825	18.36

##### 802.11ac (VHT40)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
151	5755	41.4
159	5795	39.12

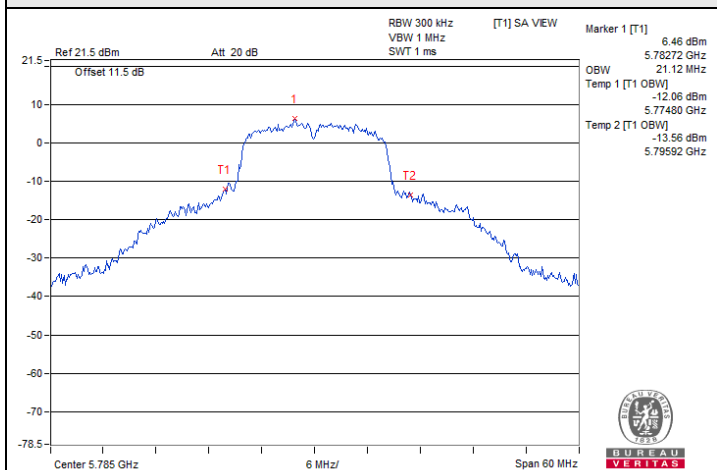
##### 802.11ac (VHT80)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
155	5775	89.76

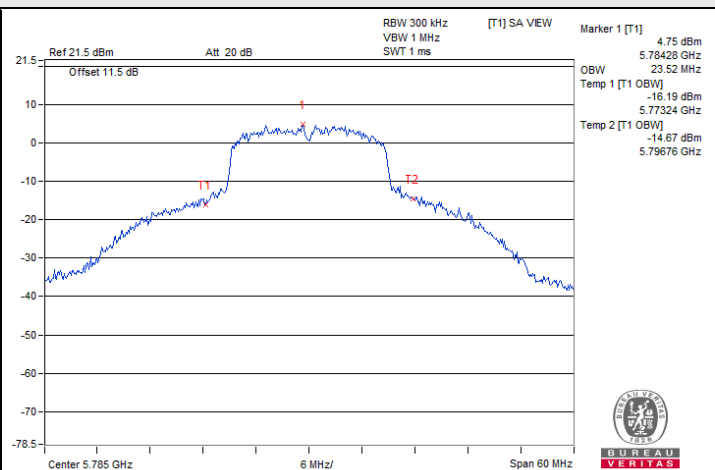




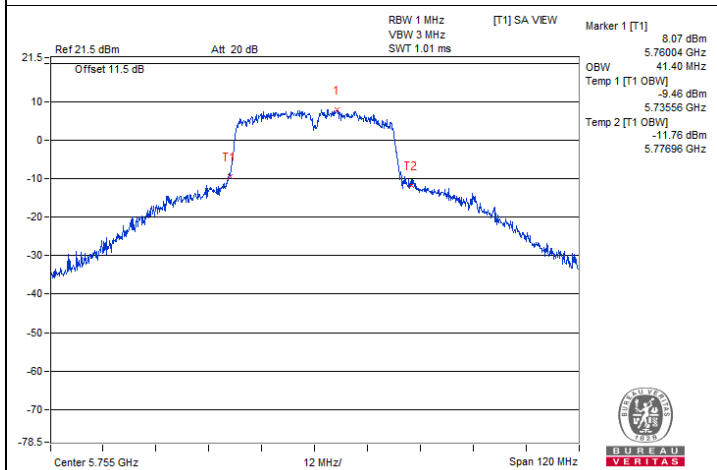
### Spectrum Plot of Maximum Value



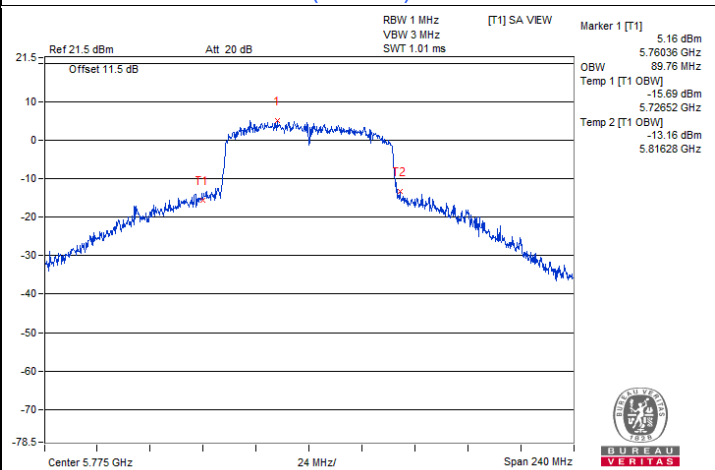
802.11a : CH 157



802.11ac (VHT20) : CH 157



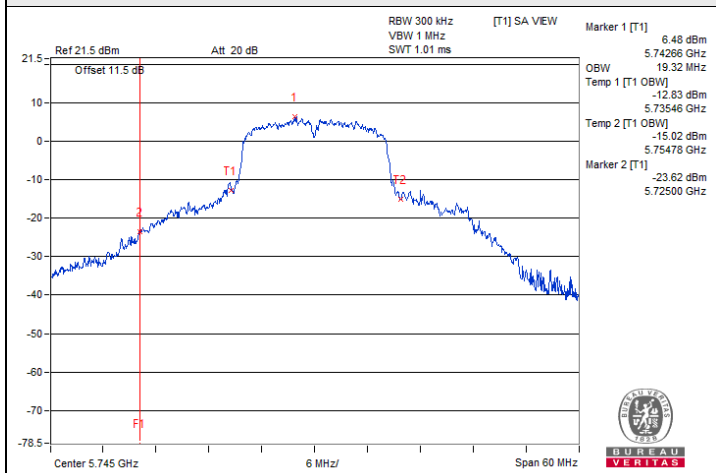
802.11ac (VHT40) : CH 151



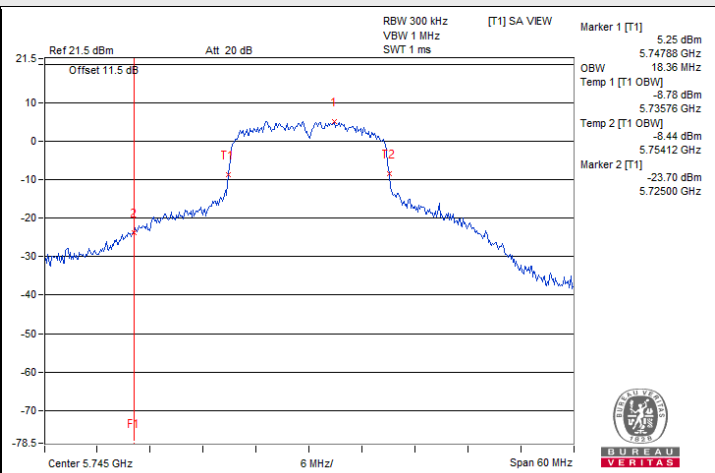
802.11ac (VHT80) : CH 155



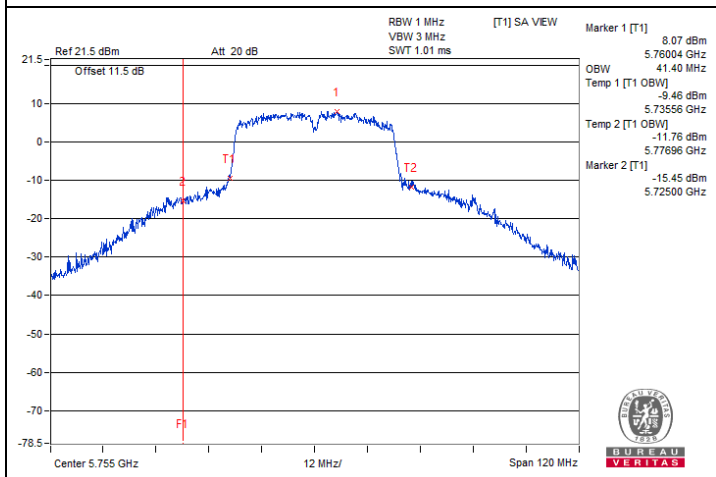
### Spectrum Plot for nearby DFS band (DFS is required, if 99% OCP straddle into U-NII-2C)



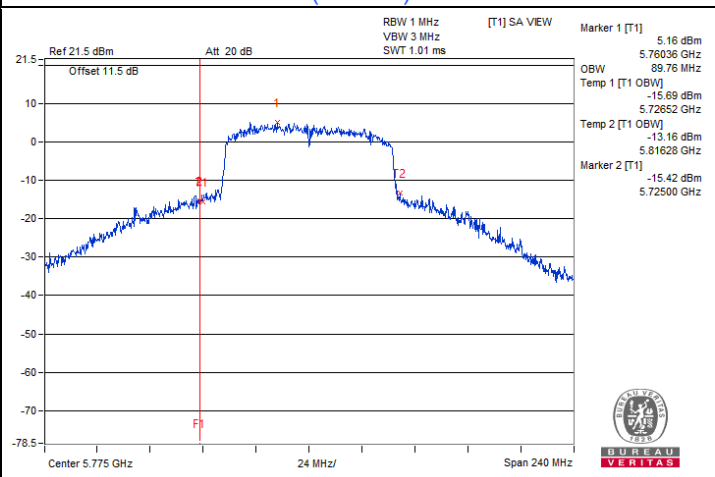
802.11a : CH 149



802.11ac (VHT20) : CH 149



802.11ac (VHT40) : CH 151



802.11ac (VHT80) : CH 155

## 7.5 Frequency Stability

Input Power:	12 Vdc	Environmental Conditions:	22°C, 64% RH	Tested By:	Tim Chen
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Frequency Stability Versus Temperature									
Operating Frequency: 5745 MHz									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Test Result	Measured Frequency (MHz)	Test Result	Measured Frequency (MHz)	Test Result	Measured Frequency (MHz)	Test Result
70	12	5744.9892	Pass	5744.9879	Pass	5744.9902	Pass	5744.9891	Pass
60	12	5744.974	Pass	5744.9752	Pass	5744.9733	Pass	5744.9732	Pass
50	12	5745.0061	Pass	5745.0091	Pass	5745.0058	Pass	5745.0072	Pass
40	12	5745.0186	Pass	5745.0206	Pass	5745.019	Pass	5745.0195	Pass
30	12	5744.9799	Pass	5744.9796	Pass	5744.9789	Pass	5744.9752	Pass
20	12	5744.9716	Pass	5744.974	Pass	5744.971	Pass	5744.9716	Pass
10	12	5744.9938	Pass	5744.9942	Pass	5744.9958	Pass	5744.9924	Pass
0	12	5744.9942	Pass	5744.9953	Pass	5744.9947	Pass	5744.9922	Pass
-10	12	5745.004	Pass	5745.0005	Pass	5745.0027	Pass	5745.002	Pass
-20	12	5744.9932	Pass	5744.9884	Pass	5744.9927	Pass	5744.9925	Pass
-30	12	5745.0253	Pass	5745.0245	Pass	5745.0253	Pass	5745.0229	Pass

Frequency Stability Versus Voltage									
Operating Frequency: 5745 MHz									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Test Result	Measured Frequency (MHz)	Test Result	Measured Frequency (MHz)	Test Result	Measured Frequency (MHz)	Test Result
20	16	5744.9708	Pass	5744.9726	Pass	5744.973	Pass	5744.9733	Pass
	12	5744.9716	Pass	5744.974	Pass	5744.971	Pass	5744.9716	Pass
	10	5744.9754	Pass	5744.977	Pass	5744.9762	Pass	5744.9745	Pass

## 7.6 Unwanted Emissions below 1 GHz

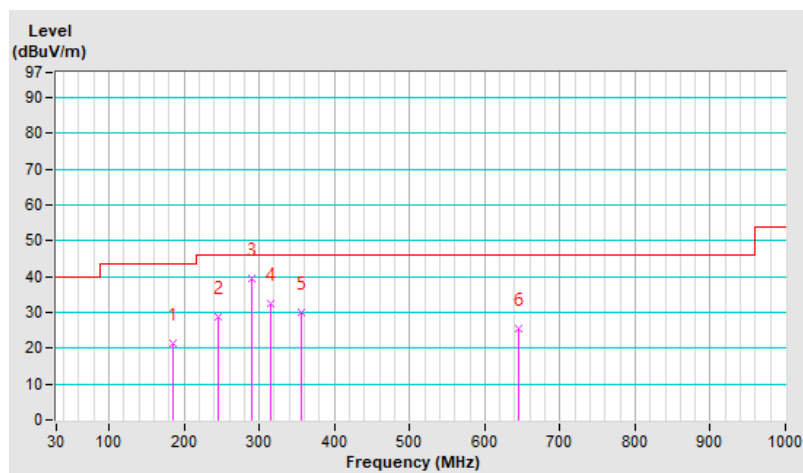
RF Mode	802.11a	Channel	CH 149 : 5745 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 61% RH
Tested By	Charles Hsiao		

### 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	184.41	21.3 QP	43.5	-22.2	1.52 H	284	41.1	-19.8
2	245.51	28.8 QP	46.0	-17.2	1.42 H	229	47.8	-19.0
<b>3</b>	<b>290.00</b>	<b>39.6 QP</b>	<b>46.0</b>	<b>-6.4</b>	<b>1.56 H</b>	<b>344</b>	<b>57.0</b>	<b>-17.4</b>
4	315.54	32.3 QP	46.0	-13.7	1.05 H	211	48.9	-16.6
5	355.56	30.0 QP	46.0	-16.0	1.20 H	25	45.8	-15.8
6	644.48	25.5 QP	46.0	-20.5	1.47 H	77	35.0	-9.5

#### 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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

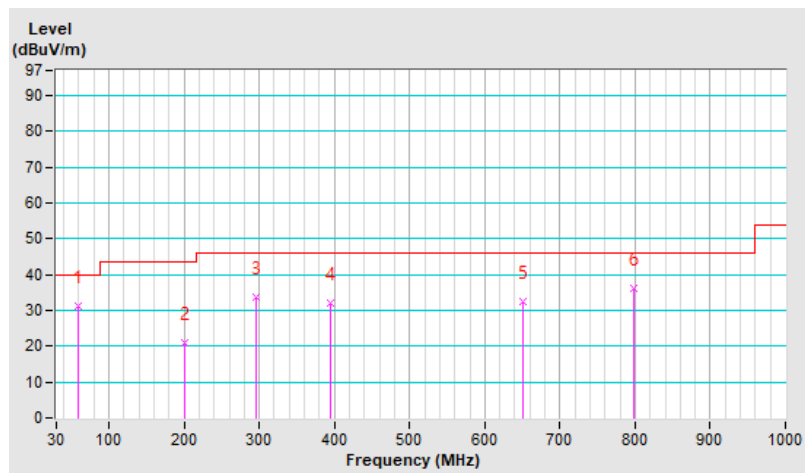


<b>RF Mode</b>	802.11a	<b>Channel</b>	CH 149 : 5745 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Charles Hsiao		

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	60.00	31.3 QP	40.0	-8.7	1.54 V	177	49.7	-18.4
2	200.10	21.1 QP	43.5	-22.4	1.14 V	107	41.9	-20.8
3	295.56	33.8 QP	46.0	-12.2	1.67 V	180	51.1	-17.3
4	395.54	32.1 QP	46.0	-13.9	1.45 V	177	46.8	-14.7
5	650.50	32.3 QP	46.0	-13.7	1.53 V	229	41.8	-9.5
6	798.00	36.0 QP	46.0	-10.0	1.54 V	201	43.1	-7.1

**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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



### 7.7 Unwanted Emissions above 1 GHz

<b>RF Mode</b>	802.11a	<b>Channel</b>	CH 149 : 5745 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

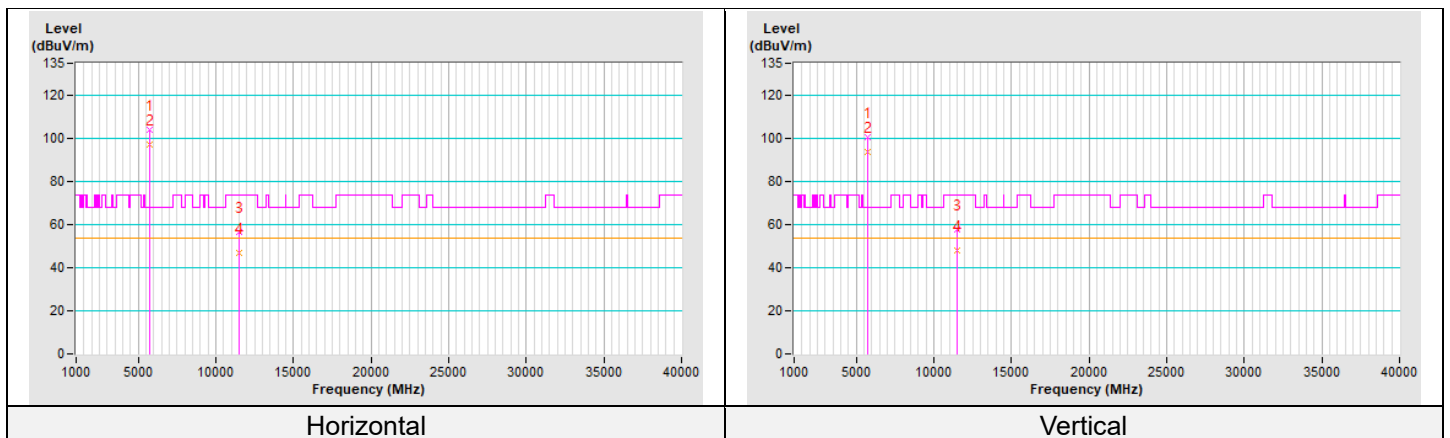
Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5635.64	56.2 PK	68.2	-12.0	1.59 H	6	43.3	12.9
2	*5745.00	104.0 PK			1.59 H	63	60.6	43.4
3	*5745.00	97.3 AV			1.59 H	63	53.9	43.4
4	#5993.19	56.6 PK	68.2	-11.6	1.59 H	6	42.6	14.0
5	11490.00	56.6 PK	74.0	-17.4	1.52 H	204	36.7	19.9
6	11490.00	47.0 AV	54.0	-7.0	1.52 H	204	27.1	19.9

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	#5626.43	57.2 PK	68.2	-11.0	2.62 V	0	44.3	12.9
2	*5745.00	100.4 PK			2.62 V	0	57.0	43.4
3	*5745.00	93.9 AV			2.62 V	0	50.5	43.4
4	#5951.55	58.5 PK	68.2	-9.7	2.62 V	0	44.6	13.9
5	11490.00	57.5 PK	74.0	-16.5	2.26 V	142	37.6	19.9
6	11490.00	47.8 AV	54.0	-6.2	2.26 V	142	27.9	19.9

**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, the limit was restricted at the RF Output Power.



<b>RF Mode</b>	802.11a	<b>Channel</b>	CH 157 : 5785 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

**Antenna Polarity & Test Distance : Horizontal at 3 m**

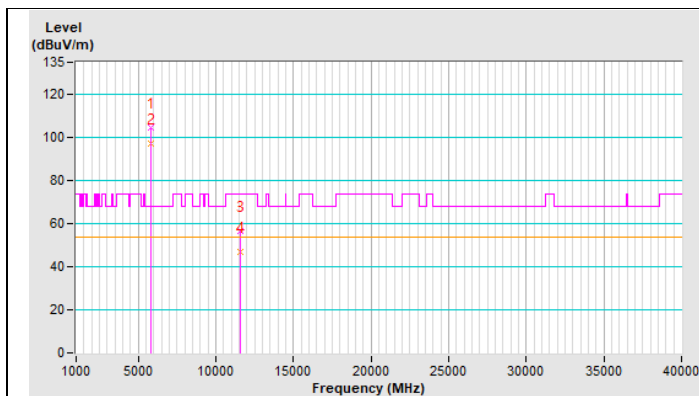
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5620.82	56.8 PK	68.2	-11.4	1.59 H	20	43.8	13.0
2	*5785.00	104.5 PK			1.59 H	20	61.1	43.4
3	*5785.00	97.3 AV			1.59 H	20	53.9	43.4
4	#5976.78	57.7 PK	68.2	-10.5	1.59 H	20	43.7	14.0
5	11570.00	56.8 PK	74.0	-17.2	1.14 H	162	36.9	19.9
6	11570.00	47.1 AV	54.0	-6.9	1.14 H	162	27.2	19.9

**Antenna Polarity & Test Distance : Vertical at 3 m**

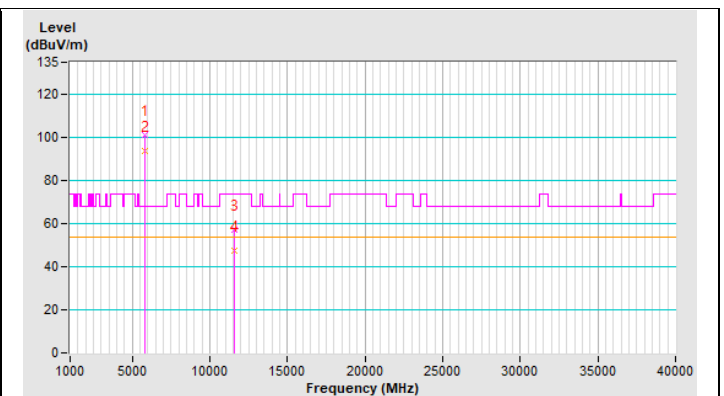
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5635.64	57.2 PK	68.2	-11.0	2.57 V	0	44.3	12.9
2	*5785.00	101.1 PK			2.57 V	0	57.7	43.4
3	*5785.00	93.6 AV			2.57 V	0	50.2	43.4
4	#5993.99	57.8 PK	68.2	-10.4	2.57 V	0	43.8	14.0
5	11570.00	57.0 PK	74.0	-17.0	2.61 V	148	37.1	19.9
6	11570.00	47.5 AV	54.0	-6.5	2.61 V	148	27.6	19.9

**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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



Horizontal



Vertical

<b>RF Mode</b>	802.11a	<b>Channel</b>	CH 165 : 5825 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

**Antenna Polarity & Test Distance : Horizontal at 3 m**

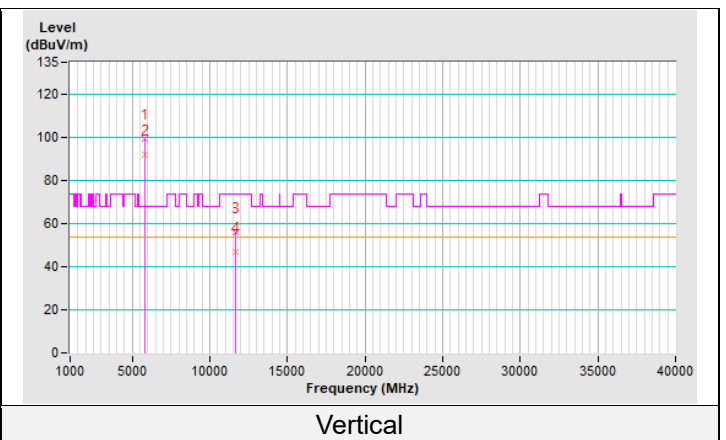
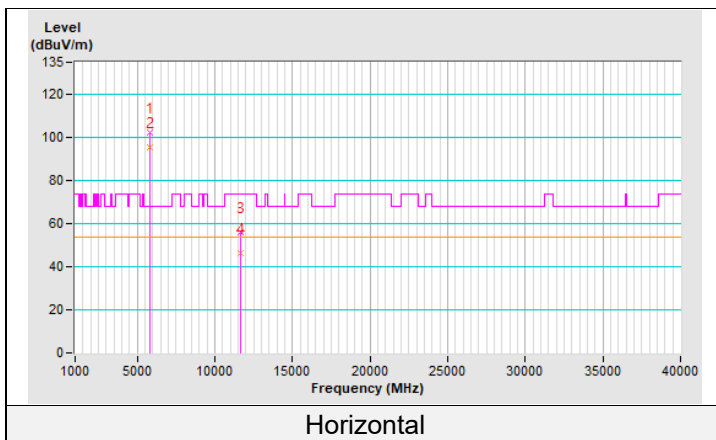
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5601.60	56.9 PK	68.2	-11.3	1.57 H	20	43.9	13.0
2	*5825.00	102.2 PK			1.57 H	20	58.7	43.5
3	*5825.00	95.7 AV			1.57 H	20	52.2	43.5
4	#5968.77	57.2 PK	68.2	-11.0	1.57 H	20	43.2	14.0
5	11650.00	56.2 PK	74.0	-17.8	1.72 H	64	36.3	19.9
6	11650.00	46.6 AV	54.0	-7.4	1.72 H	64	26.7	19.9

**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	#5641.64	57.3 PK	68.2	-10.9	2.59 V	2	44.4	12.9
2	*5825.00	99.7 PK			1.57 V	15	56.2	43.5
3	*5825.00	92.2 AV			1.57 V	15	48.7	43.5
4	#5998.00	58.5 PK	68.2	-9.7	2.59 V	2	44.5	14.0
5	11650.00	56.3 PK	74.0	-17.7	2.11 V	145	36.4	19.9
6	11650.00	46.7 AV	54.0	-7.3	2.11 V	145	26.8	19.9

**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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.





<b>RF Mode</b>	802.11ac (VHT20)	<b>Channel</b>	CH 149 : 5745 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

**Antenna Polarity & Test Distance : Horizontal at 3 m**

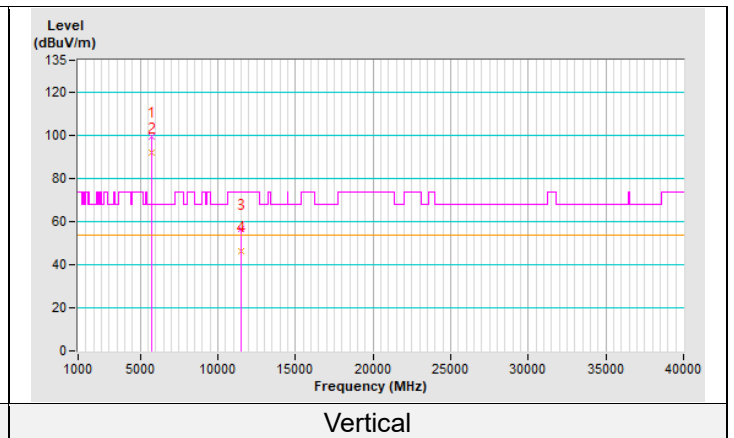
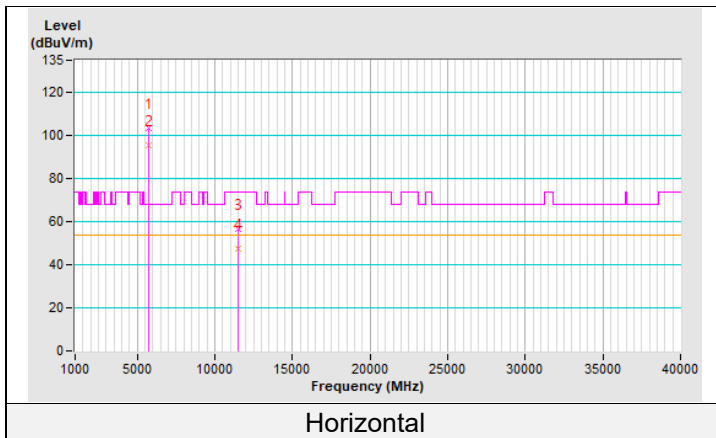
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5605.61	56.7 PK	68.2	-11.5	1.59 H	6	43.7	13.0
2	*5745.00	103.7 PK			1.59 H	6	60.3	43.4
3	*5745.00	95.7 AV			1.59 H	6	52.3	43.4
4	#5989.99	57.2 PK	68.2	-11.0	1.59 H	6	43.2	14.0
5	11490.00	56.7 PK	74.0	-17.3	1.76 H	58	36.8	19.9
6	11490.00	47.2 AV	54.0	-6.8	1.76 H	58	27.3	19.9

**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	#5619.62	55.8 PK	68.2	-12.4	2.62 V	0	42.8	13.0
2	*5745.00	99.8 PK			2.62 V	0	56.4	43.4
3	*5745.00	91.9 AV			2.62 V	0	48.5	43.4
4	#5973.97	57.6 PK	68.2	-10.6	2.62 V	0	43.6	14.0
5	11490.00	56.4 PK	74.0	-17.6	2.56 V	192	36.5	19.9
6	11490.00	46.6 AV	54.0	-7.4	2.56 V	192	26.7	19.9

**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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



<b>RF Mode</b>	802.11ac (VHT20)	<b>Channel</b>	CH 157 : 5785 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

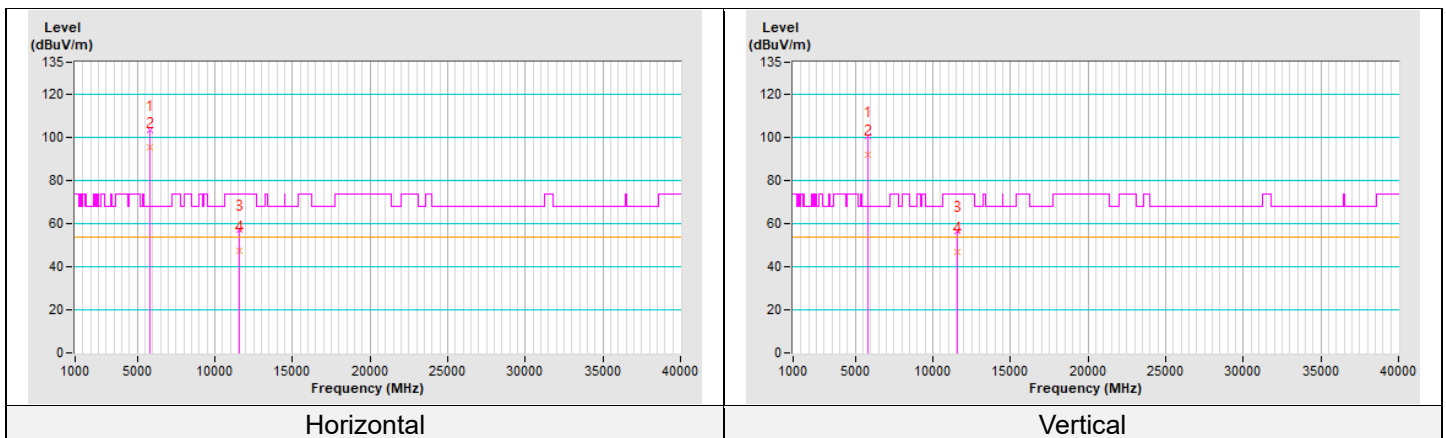
Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5634.03	56.1 PK	68.2	-12.1	1.59 H	20	43.2	12.9
2	*5785.00	103.5 PK			1.59 H	20	60.1	43.4
3	*5785.00	95.7 AV			1.59 H	20	52.3	43.4
4	#5984.78	57.1 PK	68.2	-11.1	1.59 H	20	43.1	14.0
5	11570.00	57.1 PK	74.0	-16.9	1.52 H	58	37.2	19.9
6	11570.00	47.4 AV	54.0	-6.6	1.52 H	58	27.5	19.9

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	#5622.42	57.0 PK	68.2	-11.2	2.57 V	0	44.1	12.9
2	*5785.00	100.4 PK			2.57 V	0	57.0	43.4
3	*5785.00	92.3 AV			2.57 V	0	48.9	43.4
4	#5994.39	57.7 PK	68.2	-10.5	2.57 V	0	43.7	14.0
5	11570.00	56.7 PK	74.0	-17.3	2.50 V	143	36.8	19.9
6	11570.00	47.0 AV	54.0	-7.0	2.50 V	143	27.1	19.9

**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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



<b>RF Mode</b>	802.11ac (VHT20)	<b>Channel</b>	CH 165 : 5825 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

**Antenna Polarity & Test Distance : Horizontal at 3 m**

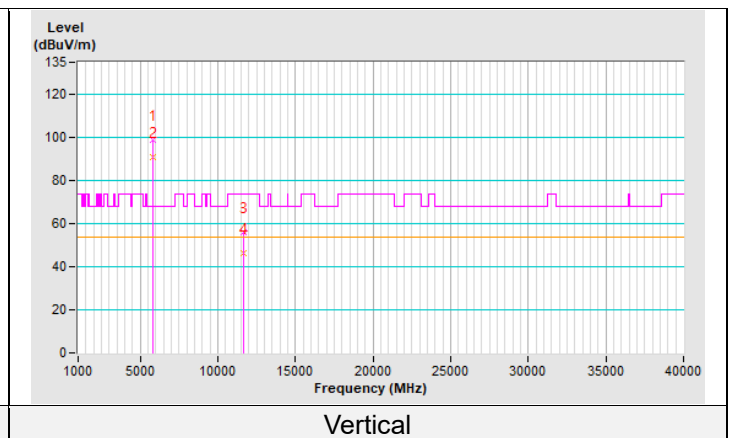
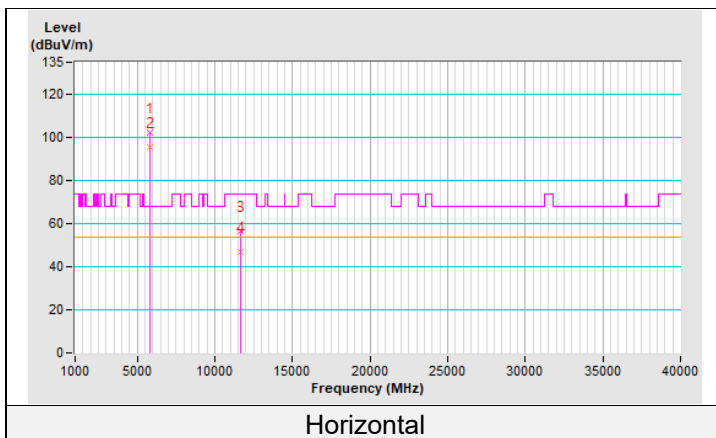
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5601.60	56.9 PK	68.2	-11.3	1.57 H	20	43.9	13.0
2	*5825.00	102.6 PK			1.57 H	20	59.1	43.5
3	*5825.00	95.5 AV			1.57 H	20	52.0	43.5
4	#5952.75	57.7 PK	68.2	-10.5	1.57 H	20	43.8	13.9
5	11650.00	56.6 PK	74.0	-17.4	2.50 H	112	36.7	19.9
6	11650.00	46.9 AV	54.0	-7.1	2.50 H	112	27.0	19.9

**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	#5639.64	56.8 PK	68.2	-11.4	2.59 V	2	43.9	12.9
2	*5825.00	99.0 PK			2.59 V	2	55.5	43.5
3	*5825.00	91.0 AV			2.59 V	2	47.5	43.5
4	#5984.78	58.1 PK	68.2	-10.1	2.59 V	2	44.1	14.0
5	11650.00	56.2 PK	74.0	-17.8	1.05 V	27	36.3	19.9
6	11650.00	46.6 AV	54.0	-7.4	1.05 V	27	26.7	19.9

**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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



<b>RF Mode</b>	802.11ac (VHT40)	<b>Channel</b>	CH 151 : 5755 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=2 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

**Antenna Polarity & Test Distance : Horizontal at 3 m**

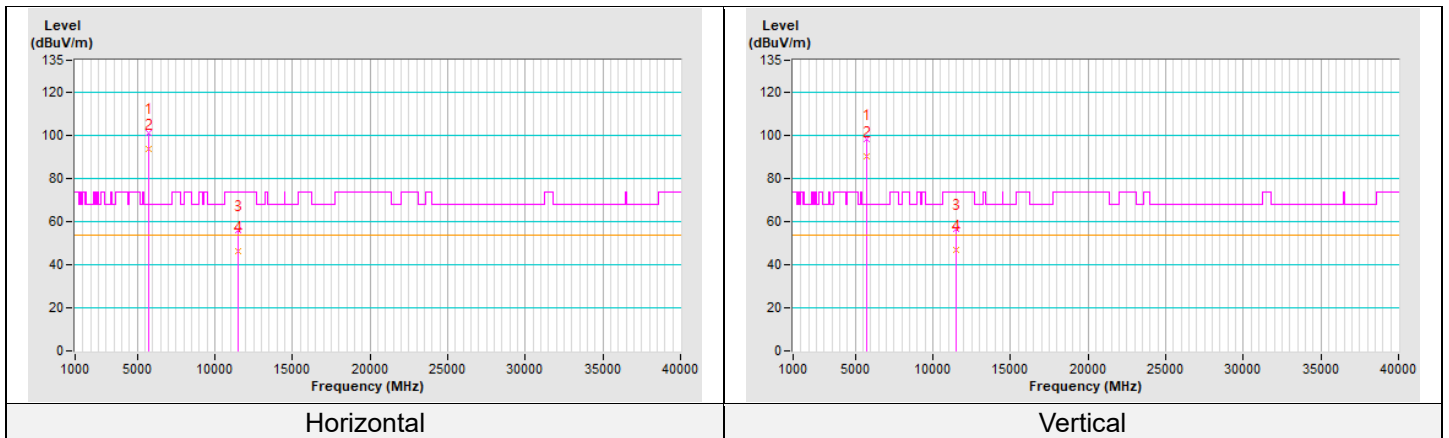
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5600.80	58.1 PK	68.2	-10.1	1.67 H	20	45.1	13.0
2	*5755.00	101.0 PK			1.67 H	20	57.6	43.4
3	*5755.00	93.7 AV			1.67 H	20	50.3	43.4
4	#5993.19	57.3 PK	68.2	-10.9	1.67 H	20	43.3	14.0
5	11510.00	56.3 PK	74.0	-17.7	1.17 H	304	36.4	19.9
6	11510.00	46.5 AV	54.0	-7.5	1.17 H	304	26.6	19.9

**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	#5629.23	56.2 PK	68.2	-12.0	2.62 V	0	43.3	12.9
2	*5755.00	98.4 PK			2.62 V	0	55.0	43.4
3	*5755.00	90.3 AV			2.62 V	0	46.9	43.4
4	#5998.80	57.6 PK	68.2	-10.6	2.62 V	0	43.6	14.0
5	11510.00	56.6 PK	74.0	-17.4	2.10 V	62	36.7	19.9
6	11510.00	47.0 AV	54.0	-7.0	2.10 V	62	27.1	19.9

**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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



<b>RF Mode</b>	802.11ac (VHT40)	<b>Channel</b>	CH 159 : 5795 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=2 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

**Antenna Polarity & Test Distance : Horizontal at 3 m**

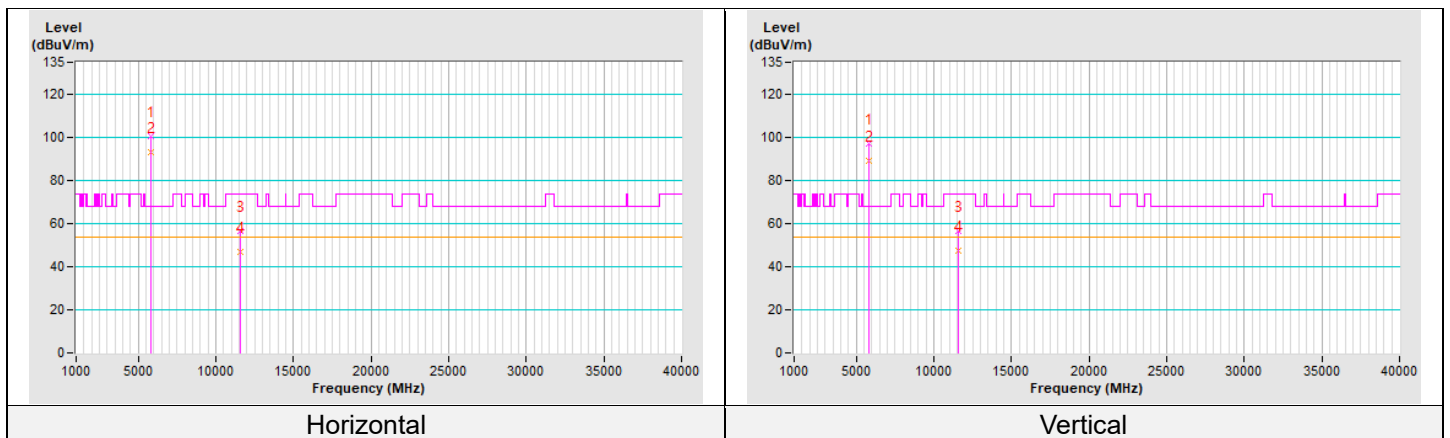
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5644.84	56.5 PK	68.2	-11.7	1.60 H	20	43.4	13.1
2	*5795.00	100.5 PK			1.60 H	20	57.1	43.4
3	*5795.00	93.0 AV			1.60 H	20	49.6	43.4
4	#5947.95	56.8 PK	68.2	-11.4	1.60 H	20	42.9	13.9
5	11590.00	56.6 PK	74.0	-17.4	1.25 H	284	36.6	20.0
6	11590.00	46.8 AV	54.0	-7.2	1.25 H	284	26.8	20.0

**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	#5650.05	56.6 PK	68.2	-11.6	2.57 V	6	43.5	13.1
2	*5795.00	97.1 PK			2.57 V	6	53.7	43.4
3	*5795.00	89.5 AV			2.57 V	6	46.1	43.4
4	#5991.99	57.1 PK	68.2	-11.1	2.57 V	6	43.1	14.0
5	11590.00	56.9 PK	74.0	-17.1	2.41 V	102	36.9	20.0
6	11590.00	47.2 AV	54.0	-6.8	2.41 V	102	27.2	20.0

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



<b>RF Mode</b>	802.11ac (VHT80)	<b>Channel</b>	CH 155 : 5775 MHz
<b>Frequency Range</b>	1 GHz ~ 40 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 kHz, DET=Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25°C, 61% RH
<b>Tested By</b>	Karl Lee		

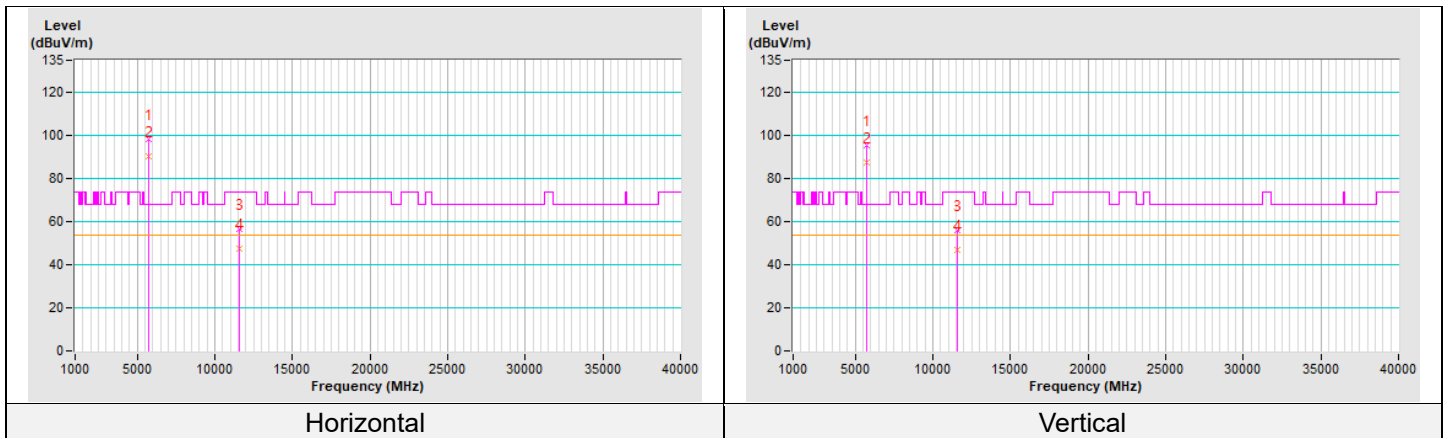
Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5645.65	62.1 PK	68.2	-6.1	1.67 H	20	49.0	13.1
2	*5775.00	98.6 PK			1.67 H	20	55.2	43.4
3	*5775.00	90.6 AV			1.67 H	20	47.2	43.4
4	#5924.32	58.1 PK	68.7	-10.6	1.67 H	20	44.3	13.8
5	11550.00	56.8 PK	74.0	-17.2	2.55 H	136	36.9	19.9
6	11550.00	47.2 AV	54.0	-6.8	2.55 H	136	27.3	19.9

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	#5646.85	60.8 PK	68.2	-7.4	2.61 V	14	47.7	13.1
2	*5775.00	95.6 PK			2.61 V	14	52.2	43.4
3	*5775.00	87.3 AV			2.61 V	14	43.9	43.4
4	#5993.99	57.6 PK	68.2	-10.6	2.61 V	14	43.6	14.0
5	11550.00	56.3 PK	74.0	-17.7	1.72 V	304	36.4	19.9
6	11550.00	46.7 AV	54.0	-7.3	1.72 V	304	26.8	19.9

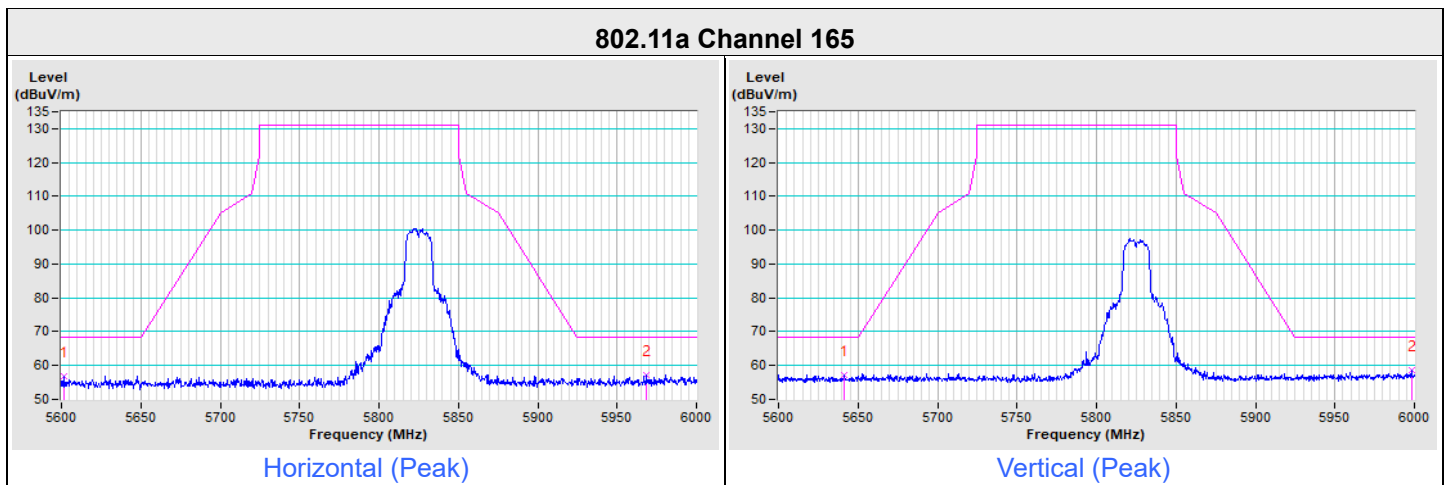
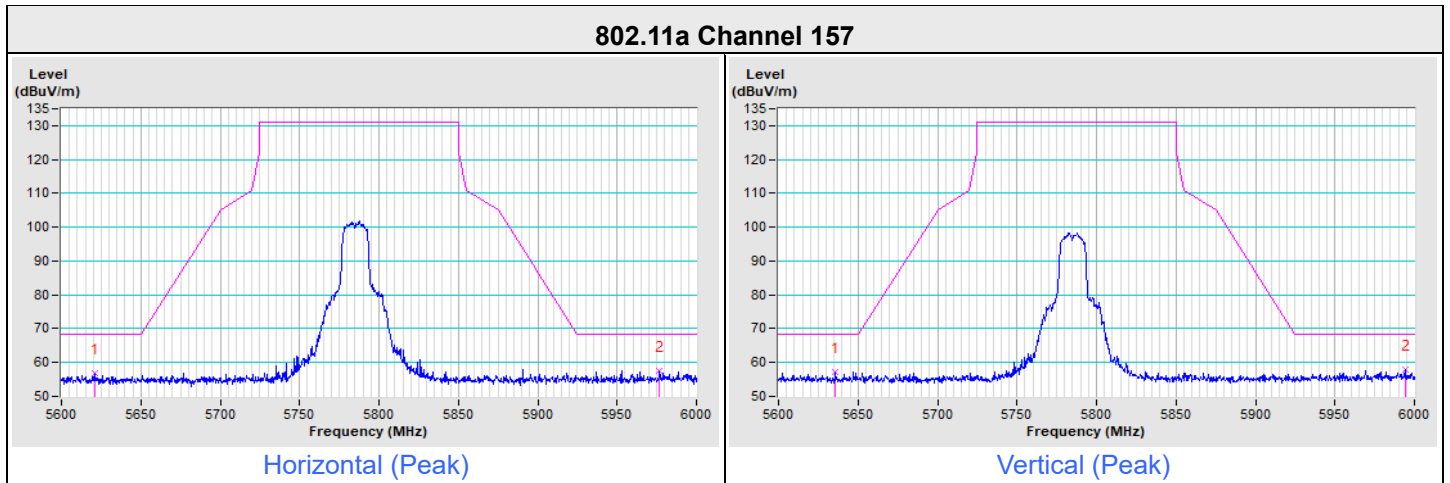
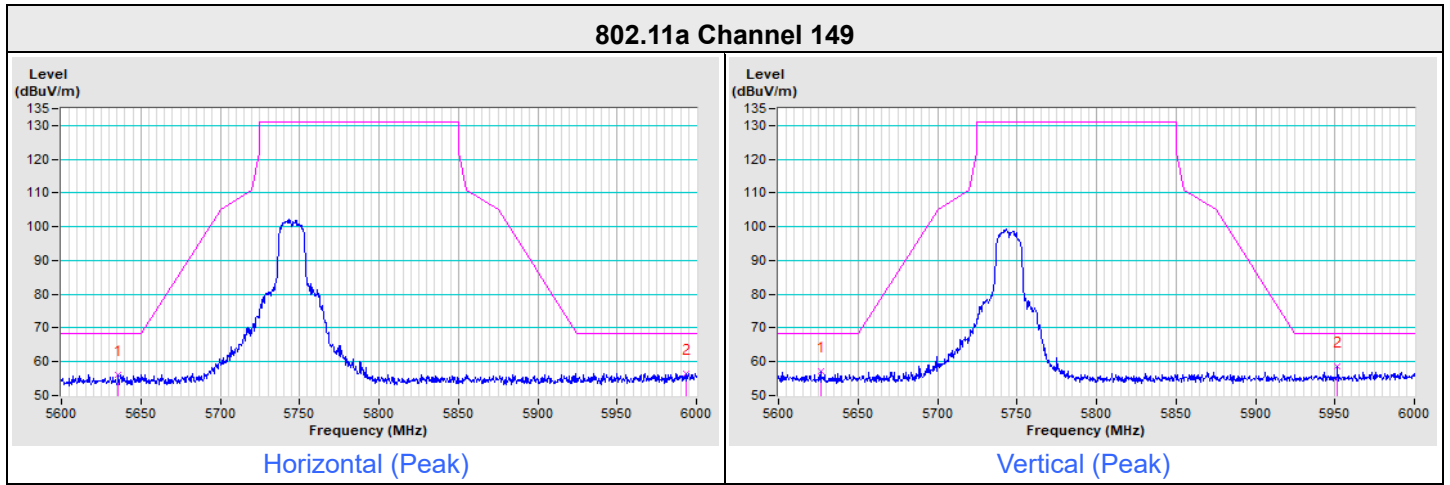
**Remarks:**

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, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.



### Plot of Band Edge

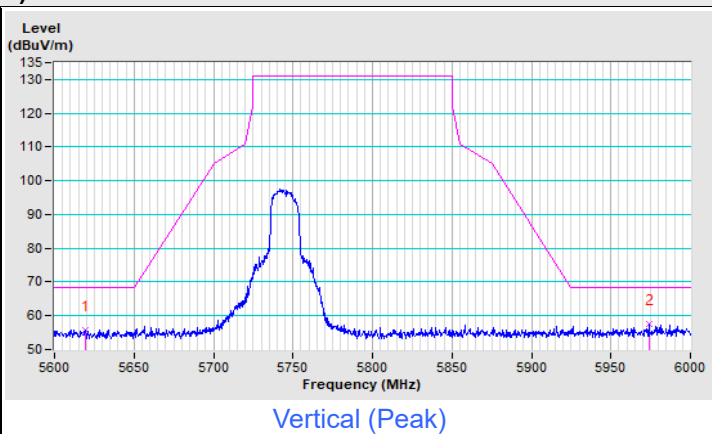
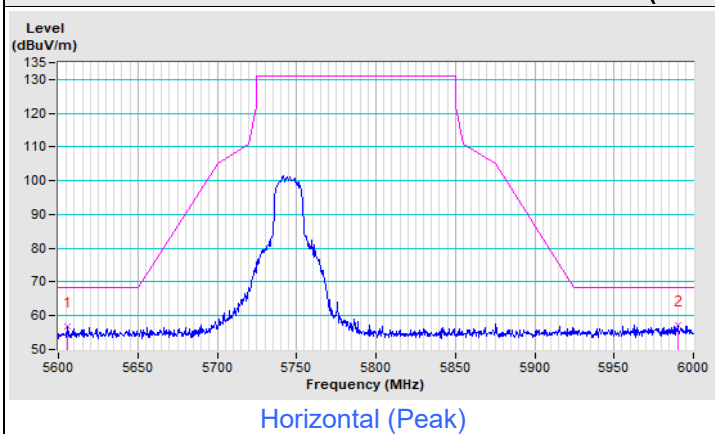
Frequency Range	5.6 GHz ~ 6 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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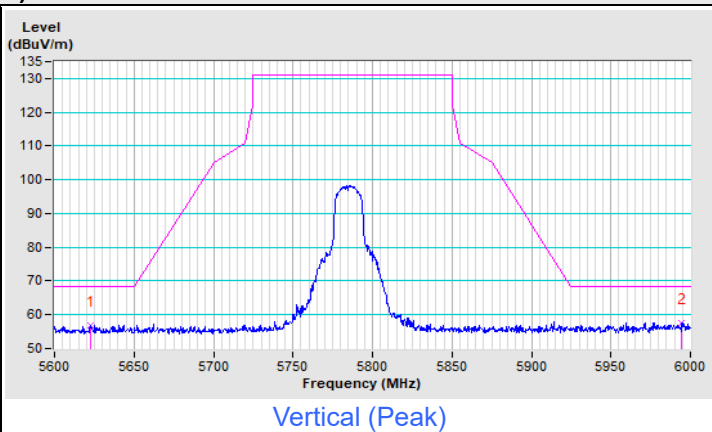
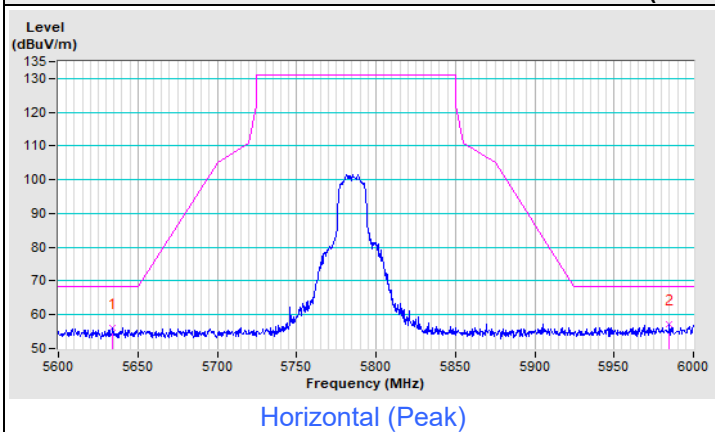


Frequency Range	5.6 GHz ~ 6 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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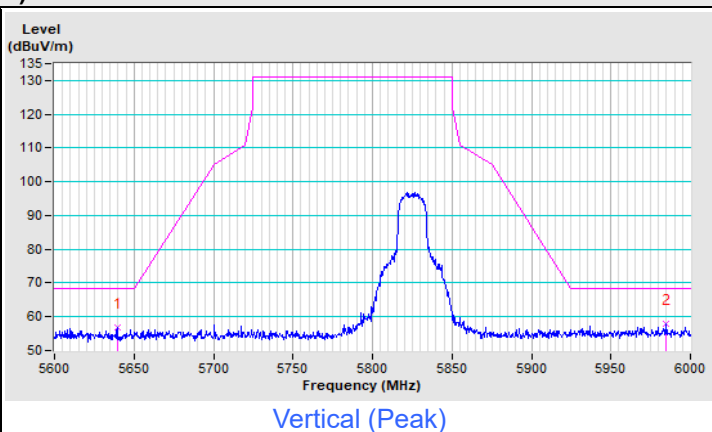
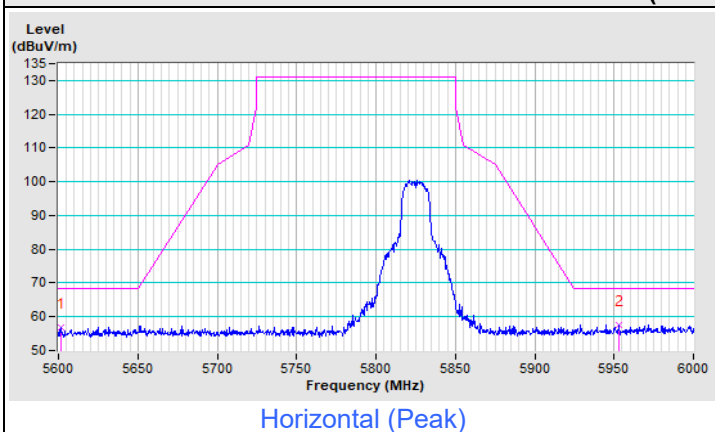
### 802.11ac (VHT20) Channel 149



### 802.11ac (VHT20) Channel 157



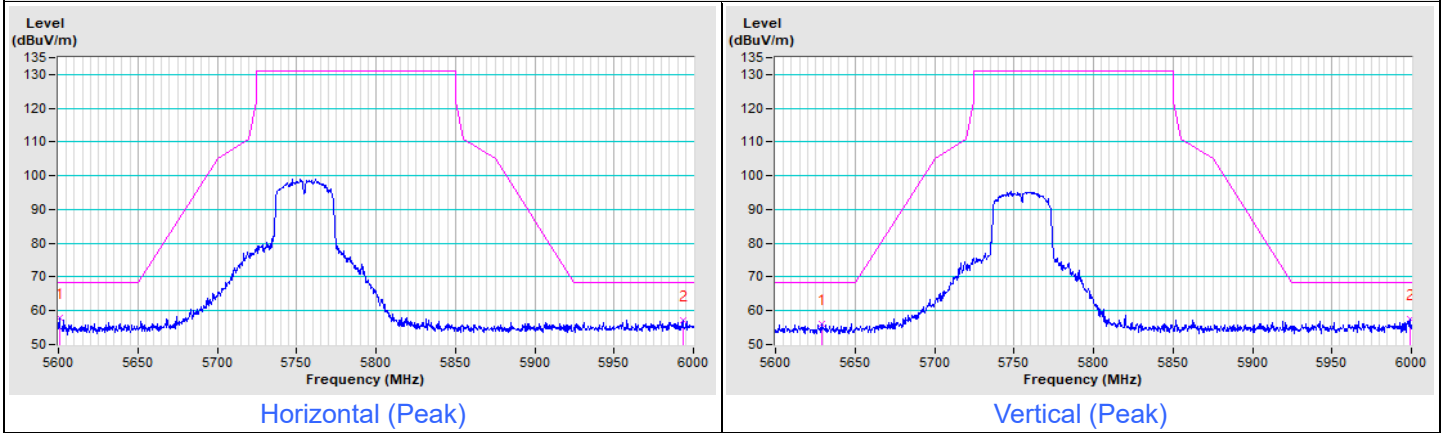
### 802.11ac (VHT20) Channel 165



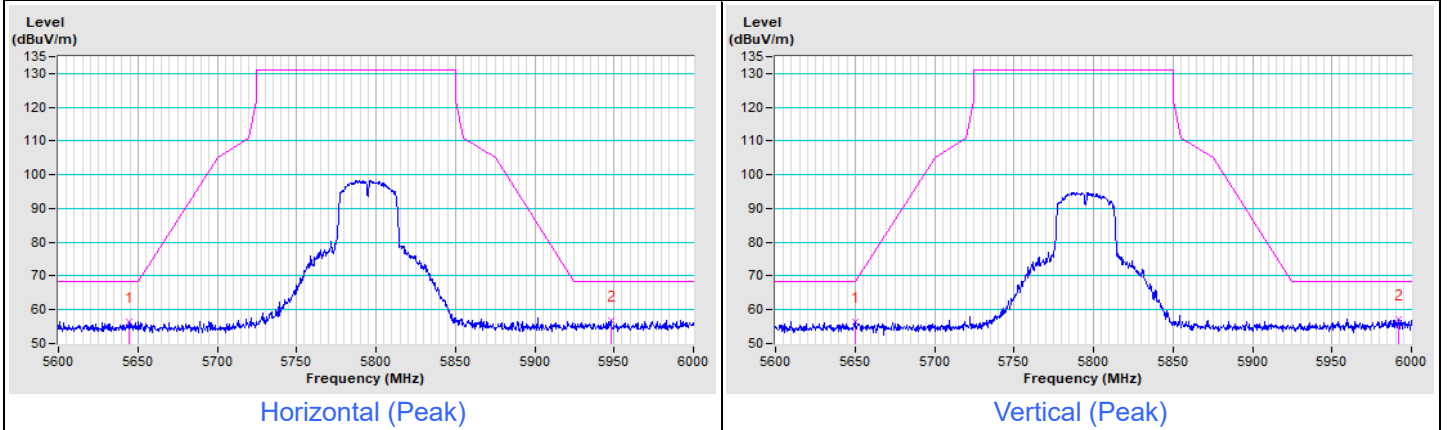


Frequency Range	5.6 GHz ~ 6 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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### 802.11ac (VHT40) Channel 151

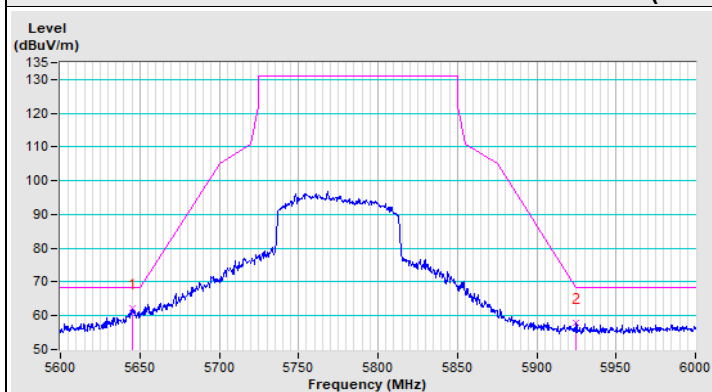


### 802.11ac (VHT40) Channel 159

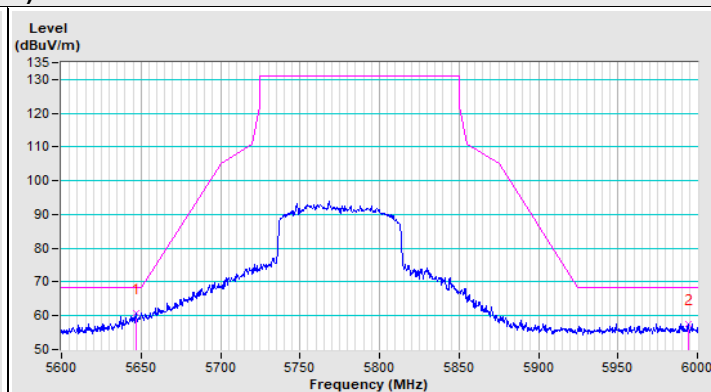


Frequency Range	5.6 GHz ~ 6 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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### 802.11ac (VHT80) Channel 155



Horizontal (Peak)



Vertical (Peak)

## 8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)



## 9 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.

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

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**Web Site:** <http://ee.bureauveritas.com.tw>

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

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