FCC Test Report
(5GHz WLAN)

Report No.: RFBEIH-WTW-P21090617-4

FCC ID: 2AK5B-HB2

Test Model: HB2LW1NA1

Received Date: 2021/9/14

Test Date: 2021/9/27 ~ 2021/10/13

Issued Date: 2021/12/14

Applicant: Latch Systems, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories

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FCC Registration / Designation Number: 198487 / TW2021

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Release Control Record

Issue No.	Description	Date Issued
RFBEIH-WTW-P21090617-4	Original release.	2021/12/14

1 Certificate of Conformity

Product: Hub

Brand: LATCH

Test Model: HB2LW1NA1

Sample Status: Engineering sample

Applicant: Latch Systems, Inc.

Test Date: 2021/9/27 ~ 2021/10/13

Standard: 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 : Annie Chang , **Date:** 2021/12/14

Annie Chang / Senior Specialist

Approved by : Jeremy Lin , **Date:** 2021/12/14

Jeremy Lin / 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)(9)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -17.78dB at 0.25938MHz.
15.407(b)(1/2/3/4(i/ii)/9)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.50dB at 5150.00MHz.
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	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX not a standard connector.

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOBE test plots were recorded in Annex A.
3. For U-NII-1 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.

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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.00 dB
Conducted Emissions	9kHz ~ 40GHz	2.63 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1GHz	5.70 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.21 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Hub
Brand	LATCH
Test Model	HB2LW1NA1
Status of EUT	Engineering sample
Power Supply Rating	12Vdc from adapter or 7.5Vdc from battery
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: up to 54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps
Operating Frequency	5180 ~ 5240MHz, 5745 ~ 5825MHz
Number of Channel	**5180 ~ 5240MHz** 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 **5745 ~ 5825MHz** 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	**5180 ~ 5240MHz:** 72.532mW **5745 ~ 5825MHz:** 240.761mW
Antenna Type	**5180 ~ 5240MHz:** Ant. 1: Dipole Antenna with 3.3dBi gain Ant. 2: Dipole Antenna with 3.1dBi gain **5745 ~ 5825MHz:** Ant. 1: Dipole Antenna with 2.5dBi gain Ant. 2: Dipole Antenna with 2.4dBi gain
Antenna Connector	I-PEX
Accessory Device	Adapter
Data Cable Supplied	N/A

Note:

1. 2.4GHz & 5GHz WLAN technologies cannot transmit at same time.
   WCDMA & LTE technologies cannot transmit at same time.
   WLAN, WWAN, Bluetooth & Zigbee technologies can transmit at same time.

2. The EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX FUNCTION
802.11a	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX
802.11ac (VHT80)	2TX

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

3. The EUT was pre-tested with the following modes:
   - ✧ Operating Mode (EUT + Battery)
   - ✧ Operating + Charging Mode (EUT + Adapter)

   The worst emission level was found when the EUT tested under **Operating + Charging Mode (EUT + Adapter)**, therefore, only its test data was recorded in this report.

4. The EUT uses following adapter or battery.

Item	Adapter	Battery
Brand	APD	Simplo
Model	WB-24J12FU	NA50X
AC I/P Rating	100-240V, 50-60Hz, 0.7A	-
DC O/P Rating	12V, 2A	7.5V, 2500mAh, 18Wh
Power cord	AC 2 Pin, Non-shielded DC cable (1.5m)	-

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

5180~5240MHz:

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

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

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

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

5745~5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	Operating + Charging Mode (EUT + Adapter)

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	7.2
	802.11ac (VHT40)		38 to 46	38, 46	OFDM	15.0
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	7.2
	802.11ac (VHT40)		151 to 159	151, 159	OFDM	15.0
	802.11ac (VHT80)		155	155	OFDM	29.3

Radiated Emission Test (Below 1GHz):

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11ac (VHT20)	5180-5240	36 to 48	149	OFDM	7.2
-	802.11ac (VHT20)	5745-5825	149 to 165		OFDM	7.2

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	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11ac (VHT20)	5180-5240	36 to 48	149	OFDM	7.2
-	802.11ac (VHT20)	5745-5825	149 to 165		OFDM	7.2

Antenna Port Conducted 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	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	7.2
	802.11ac (VHT40)		38 to 46	38, 46	OFDM	15.0
	802.11ac (VHT80)		42	42	OFDM	29.3
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	7.2
	802.11ac (VHT40)		151 to 159	151, 159	OFDM	15.0
	802.11ac (VHT80)		155	155	OFDM	29.3

Test Condition:

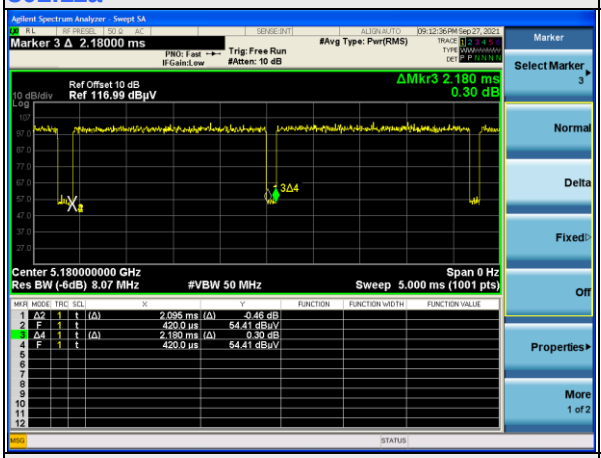
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	23deg. C, 53%RH	120Vac, 60Hz	Jed Wu
RE<1G	23deg. C, 53%RH	120Vac, 60Hz	Jed Wu
PLC	25deg. C, 76%RH	120Vac, 60Hz	Dalen Dai
APCM	25deg. C, 60%RH	120Vac, 60Hz	Dalen Dai

3.3 Duty Cycle of Test Signal

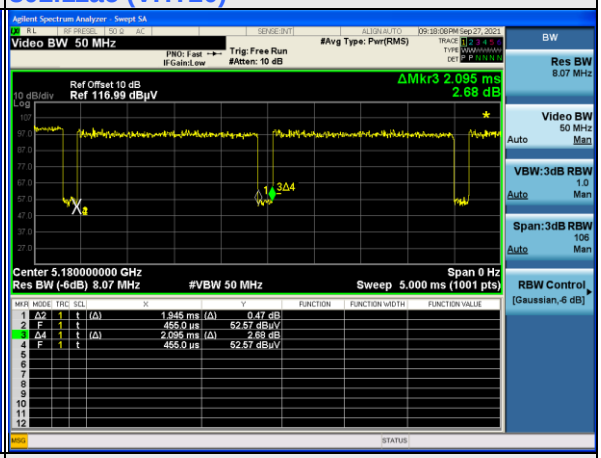
Duty cycle of test signal is < 98%, duty factor shall be considered.

802.11a: Duty cycle = 2.095/2.18 = 0.961, Duty factor = 10 * log(1/0.961) = 0.17
802.11ac (VHT20): Duty cycle = 1.945/2.095 = 0.928, Duty factor = 10 * log(1/0.928) = 0.32
802.11ac (VHT40): Duty cycle = 0.969/1.182 = 0.82, Duty factor = 10 * log(1/0.82) = 0.86
802.11ac (VHT80): Duty cycle = 0.474/0.644 = 0.736, Duty factor = 10 * log(1/0.736) = 1.33

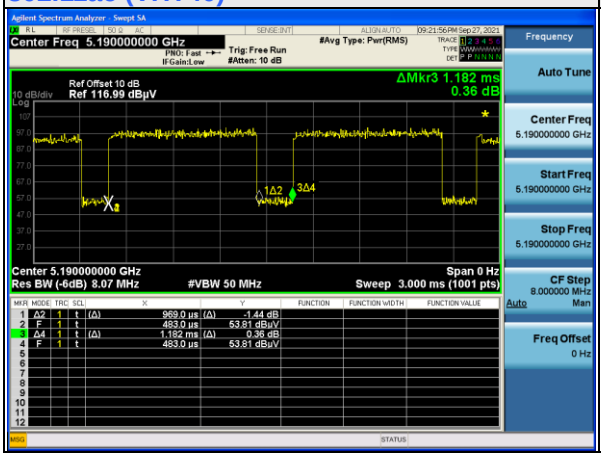
802.11a



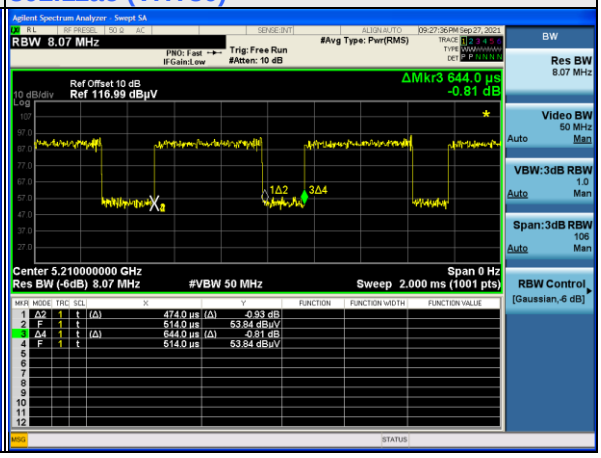
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



3.4 Description of Support Units

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

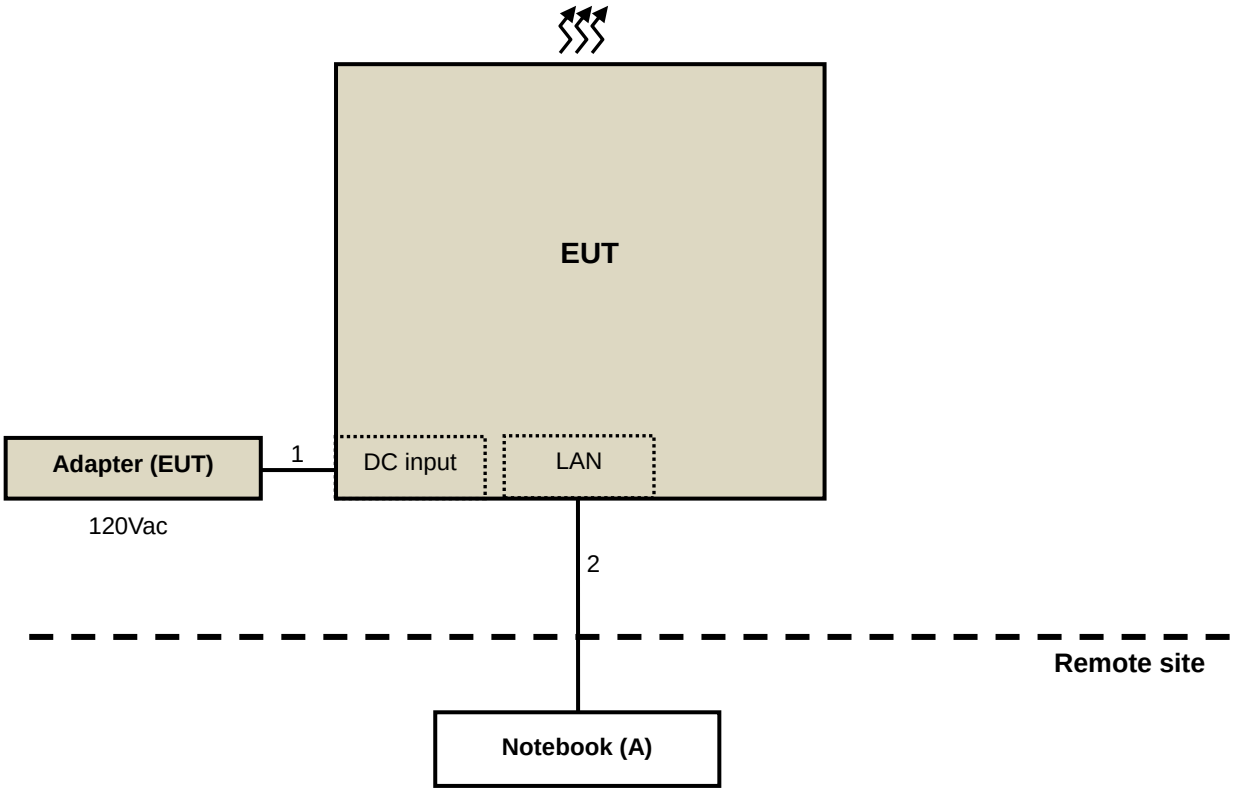
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook PC	Lenovo	81LG	PF1NF9V2	NA	Provided by Lab

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

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/ No)	Cores (Qty.)	Remarks
1.	DC cable	1	1.5	N	0	Supplied by applicant
2.	LAN cable	1	10	N	0	Provided by Lab (RJ45, Cat.5e)

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standard 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 Procedure 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 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK:74 (dBµV/m)	AV:54 (dBµV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK:-27 (dBm/MHz)	PK:68.2(dBµV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	

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

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

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

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

Note:

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver Agilent	N9038A	MY51210129	2021/3/12	2022/3/11
Software BVADT	ADT_Radiated_V8.7.08	NA	NA	NA
Software BVADT	ADT_RF Test Software V6.6.5.4	NA	NA	NA
Auto Control System(Antenna Tower, Table, Controller) ADT	SC100+AT100+TT100	0306	NA	NA
Pre_Amplifier EMCI	EMC001340	980269	2021/6/29	2022/6/28
LOOP ANTENNA EMCI	LPA600	270	2021/9/2	2023/9/1
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2021/7/13	2022/7/12
Pre_Amplifier HP	8447D	2432A03504	2021/2/18	2022/2/17
Bi-log Broadband Antenna Schwarzbeck	VULB9168	139	2020/11/6	2021/11/5
Attenuator Mini-Circuits	UNAT-5+	PAD-CH6-01	2021/7/13	2022/7/12
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2021/7/13	2022/7/12
Antenna(Horn) EMCO	3115	00028257	2020/11/22	2021/11/21
Test Receiver Agilent	N9038A	MY51210129	2021/3/12	2022/3/11
Pre-amplifier HP	8449B	3008A01201	2021/2/19	2022/2/18
RF Coaxial Cable HUBER SUHNER	SF-102	Cable-CH6-01	2021/7/8	2022/7/7
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	2021/5/28	2022/5/27
Fix tool for Boresight	BAF-01	5	NA	NA
Pre_Amplifier MITEQ	AMF-6F-260400-33-8P	892164	2021/2/19	2022/2/18
Antenna(Horn) Schwarzbeck	BBHA-9170	BBHA9170190	2020/11/22	2021/11/21
Spectrum Analyzer R&S	FSV40	101544	2021/5/24	2022/5/23
RF Coaxial Cable WOKEN	WC01	Cable-CH10-03	2021/7/8	2022/7/7
RF Coaxial Cable Rosnol	K1K50-UP0279-K1K50-3000	Cable-CH10(3m)-04	2021/7/8	2022/7/7
Highpass filter SUHNER	11SH10-7000/T18000-O/OP	SN 4	2021/5/28	2022/5/27
Temperature & Humidity Chamber TERCHY	MHU-225AU	920409	2021/7/2	2022/7/1
Spectrum Analyzer R&S	FSV40	101042	2021/9/9	2022/9/8
Digital Multimeter Fluke	87-III	70360742	2021/6/24	2022/6/23
AC Power Source Preen	AFC-500W	F103040004	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 horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in LK - 966 chamber 1.
4. Tested Date: 2021/9/27 ~ 2021/9/29

4.1.3 Test Procedure

For Radiated emission below 30MHz

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

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

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

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

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

NOTE:

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

For Radiated emission above 30MHz

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

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

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

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

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

f. The test-receiver system was set to peak and average 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

2. 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 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz. (802.11a: RBW = 1MHz, VBW = 510Hz; 802.11ac (VHT20): RBW = 1MHz, VBW = 560Hz; 802.11ac (VHT40): RBW = 1MHz, VBW = 1.1kHz; 802.11ac (VHT80): RBW = 1MHz, VBW = 2.2kHz)

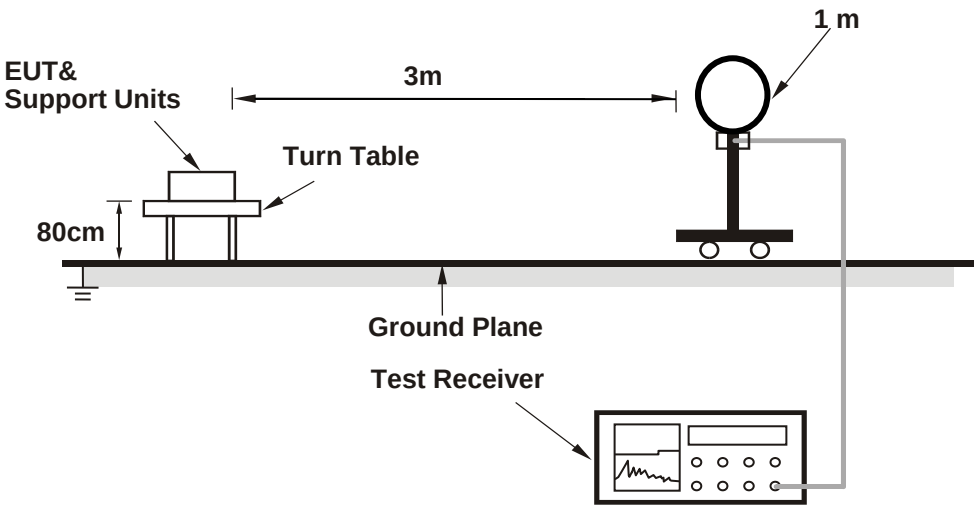
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

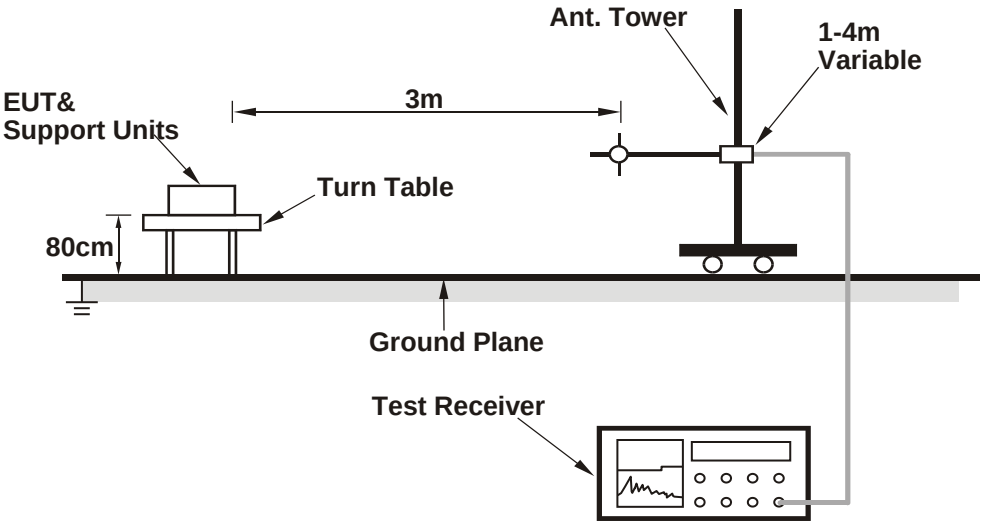
No deviation.

4.1.5 Test Setup

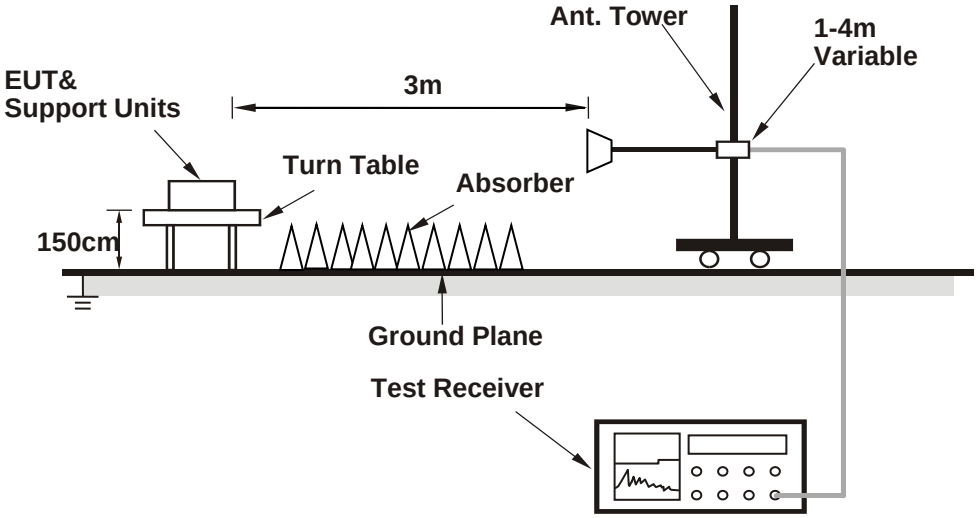
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Condition

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

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	TX 802.11a	**Channel**	CH 36：5180 MHz
Frequency Range	1GHz ~ 40GHz	**Detector Function**	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	62.61 PK	74.00	-11.39	2.79 H	71	55.80	6.81
2	5150.00	48.35 AV	54.00	-5.65	2.79 H	71	41.54	6.81
3	*5180.00	108.51 PK			2.79 H	71	101.48	7.03
4	*5180.00	100.91 AV			2.79 H	71	93.88	7.03
5	#10360.00	55.53 PK	68.20	-12.67	1.89 H	118	40.97	14.56
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	66.14 PK	74.00	-7.86	1.05 V	156	59.33	6.81
2	5150.00	50.03 AV	54.00	-3.97	1.05 V	156	43.22	6.81
3	*5180.00	112.21 PK			1.05 V	156	105.18	7.03
4	*5180.00	104.69 AV			1.05 V	156	97.66	7.03
5	#10360.00	59.62 PK	68.20	-8.58	3.49 V	6	45.06	14.56

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.

RF Mode	TX 802.11a	Channel	CH 40：5200 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	*5200.00	107.69 PK			1.92 H	259	100.52	7.17
2	*5200.00	100.52 AV			1.92 H	259	93.35	7.17
3	#10400.00	56.10 PK	68.20	-12.10	1.82 H	119	41.48	14.62
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	*5200.00	112.11 PK			1.04 V	152	104.94	7.17
2	*5200.00	105.25 AV			1.04 V	152	98.08	7.17
3	#10400.00	59.79 PK	68.20	-8.41	2.61 V	347	45.17	14.62

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.

RF Mode	TX 802.11a	Channel	CH 48：5240 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	*5240.00	106.95 PK			2.64 H	94	99.61	7.34
2	*5240.00	99.35 AV			2.64 H	94	92.01	7.34
3	5350.00	58.77 PK	74.00	-15.23	2.64 H	94	50.93	7.84
4	5350.00	47.74 AV	54.00	-6.26	2.64 H	94	39.90	7.84
5	#10480.00	56.93 PK	68.20	-11.27	1.84 H	123	41.90	15.03
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	*5240.00	111.63 PK			1.04 V	154	104.29	7.34
2	*5240.00	104.48 AV			1.04 V	154	97.14	7.34
3	5350.00	58.76 PK	74.00	-15.24	1.04 V	154	50.92	7.84
4	5350.00	47.96 AV	54.00	-6.04	1.04 V	154	40.12	7.84
5	#10480.00	60.83 PK	68.20	-7.37	2.72 V	0	45.80	15.03

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.

RF Mode	TX 802.11a	Channel	CH 149：5745 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5630.51	58.68 PK	68.20	-9.52	1.39 H	246	51.37	7.31
2	*5745.00	109.34 PK			1.39 H	246	102.13	7.21
3	*5745.00	102.21 AV			1.39 H	246	95.00	7.21
4	#6015.02	60.10 PK	68.20	-8.10	1.39 H	246	52.51	7.59
5	11490.00	55.01 PK	74.00	-18.99	1.09 H	262	38.25	16.76
6	11490.00	44.04 AV	54.00	-9.96	1.09 H	262	27.28	16.76
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	#5633.12	58.48 PK	68.20	-9.72	1.08 V	143	51.18	7.30
2	*5745.00	117.83 PK			1.08 V	143	110.62	7.21
3	*5745.00	110.42 AV			1.08 V	143	103.21	7.21
4	#5986.05	59.39 PK	68.20	-8.81	1.08 V	143	51.85	7.54
5	11490.00	57.21 PK	74.00	-16.79	1.62 V	246	40.45	16.76
6	11490.00	47.18 AV	54.00	-6.82	1.62 V	246	30.42	16.76

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.

RF Mode	TX 802.11a	Channel	CH 157：5785 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5625.05	58.03 PK	68.20	-10.17	3.10 H	213	50.71	7.32
2	*5785.00	110.53 PK			3.10 H	213	103.25	7.28
3	*5785.00	102.78 AV			3.10 H	213	95.50	7.28
4	#5984.15	60.11 PK	68.20	-8.09	3.10 H	213	52.59	7.52
5	11570.00	56.30 PK	74.00	-17.70	1.23 H	249	39.31	16.99
6	11570.00	45.09 AV	54.00	-8.91	1.23 H	249	28.10	16.99
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	#5627.90	58.93 PK	68.20	-9.27	1.58 V	93	51.61	7.32
2	*5785.00	116.56 PK			1.58 V	93	109.28	7.28
3	*5785.00	108.91 AV			1.58 V	93	101.63	7.28
4	#6021.20	60.38 PK	68.20	-7.82	1.58 V	93	52.79	7.59
5	11570.00	57.55 PK	74.00	-16.45	2.23 V	290	40.56	16.99
6	11570.00	46.39 AV	54.00	-7.61	2.23 V	290	29.40	16.99

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.

RF Mode	TX 802.11a	Channel	CH 165：5825 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5645.48	58.53 PK	68.20	-9.67	2.93 H	216	51.28	7.25
2	*5825.00	108.90 PK			2.93 H	216	101.62	7.28
3	*5825.00	102.05 AV			2.93 H	216	94.77	7.28
4	#6003.62	59.72 PK	68.20	-8.48	2.93 H	216	52.14	7.58
5	11650.00	56.60 PK	74.00	-17.40	1.15 H	258	39.36	17.24
6	11650.00	45.44 AV	54.00	-8.56	1.15 H	258	28.20	17.24
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	#5597.98	58.39 PK	68.20	-9.81	2.50 V	324	50.97	7.42
2	*5825.00	117.30 PK			2.50 V	324	110.02	7.28
3	*5825.00	110.35 AV			2.50 V	324	103.07	7.28
4	#5981.77	59.56 PK	68.20	-8.64	2.50 V	324	52.04	7.52
5	11650.00	57.69 PK	74.00	-16.31	1.68 V	243	40.45	17.24
6	11650.00	46.62 AV	54.00	-7.38	1.68 V	243	29.38	17.24

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.

RF Mode	TX 802.11ac (VHT20)	Channel	CH 36：5180 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	62.20 PK	74.00	-11.80	2.22 H	70	55.39	6.81
2	5150.00	48.91 AV	54.00	-5.09	2.22 H	70	42.10	6.81
3	*5180.00	108.44 PK			2.22 H	70	101.41	7.03
4	*5180.00	100.70 AV			2.22 H	70	93.67	7.03
5	#10360.00	55.09 PK	68.20	-13.11	1.93 H	125	40.53	14.56
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	67.68 PK	74.00	-6.32	1.05 V	150	60.87	6.81
2	5150.00	52.49 AV	54.00	-1.51	1.05 V	150	45.68	6.81
3	*5180.00	112.57 PK			1.05 V	150	105.54	7.03
4	*5180.00	104.78 AV			1.05 V	150	97.75	7.03
5	#10360.00	59.03 PK	68.20	-9.17	3.60 V	271	44.47	14.56

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.

RF Mode	TX 802.11ac (VHT20)	Channel	CH 40：5200 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	*5200.00	106.58 PK			1.91 H	261	99.41	7.17
2	*5200.00	98.76 AV			1.91 H	261	91.59	7.17
3	#10400.00	55.70 PK	68.20	-12.50	1.86 H	116	41.08	14.62
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	*5200.00	112.96 PK			1.04 V	151	105.79	7.17
2	*5200.00	105.15 AV			1.04 V	151	97.98	7.17
3	#10400.00	60.05 PK	68.20	-8.15	2.63 V	345	45.43	14.62

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.

RF Mode	TX 802.11ac (VHT20)	Channel	CH 48：5240 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	*5240.00	107.07 PK			2.64 H	94	99.73	7.34
2	*5240.00	99.16 AV			2.64 H	94	91.82	7.34
3	5350.00	58.48 PK	74.00	-15.52	2.64 H	94	50.64	7.84
4	5350.00	47.78 AV	54.00	-6.22	2.64 H	94	39.94	7.84
5	#10480.00	57.64 PK	68.20	-10.56	1.88 H	120	42.61	15.03
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	*5240.00	112.91 PK			1.03 V	152	105.57	7.34
2	*5240.00	104.95 AV			1.03 V	152	97.61	7.34
3	5350.00	59.10 PK	74.00	-14.90	1.03 V	152	51.26	7.84
4	5350.00	48.04 AV	54.00	-5.96	1.03 V	152	40.20	7.84
5	#10480.00	61.09 PK	68.20	-7.11	2.89 V	354	46.06	15.03

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.

RF Mode	TX 802.11ac (VHT20)	Channel	CH 149：5745 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5651.65	57.95 PK	68.20	-10.25	3.61 H	237	50.71	7.24
2	*5745.00	111.21 PK			3.61 H	237	104.00	7.21
3	*5745.00	102.70 AV			3.61 H	237	95.49	7.21
4	#6006.95	59.49 PK	68.20	-8.71	3.61 H	237	51.91	7.58
5	11490.00	56.01 PK	74.00	-17.99	1.26 H	239	39.25	16.76
6	11490.00	44.90 AV	54.00	-9.10	1.26 H	239	28.14	16.76
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	#5638.35	59.21 PK	68.20	-8.99	1.01 V	146	51.93	7.28
2	*5745.00	118.97 PK			1.01 V	146	111.76	7.21
3	*5745.00	110.47 AV			1.01 V	146	103.26	7.21
4	#5991.27	59.85 PK	68.20	-8.35	1.01 V	146	52.30	7.55
5	11490.00	57.11 PK	74.00	-16.89	2.70 V	350	40.35	16.76
6	11490.00	45.74 AV	54.00	-8.26	2.70 V	350	28.98	16.76

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.

RF Mode	TX 802.11ac (VHT20)	Channel	CH 157：5785 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5647.37	58.66 PK	68.20	-9.54	3.10 H	215	51.40	7.26
2	*5785.00	110.06 PK			3.10 H	215	102.78	7.28
3	*5785.00	102.54 AV			3.10 H	215	95.26	7.28
4	#6013.12	59.52 PK	68.20	-8.68	3.10 H	215	51.93	7.59
5	11570.00	55.97 PK	74.00	-18.03	1.24 H	225	38.98	16.99
6	11570.00	44.91 AV	54.00	-9.09	1.24 H	225	27.92	16.99
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	#5614.12	58.94 PK	68.20	-9.26	1.65 V	95	51.57	7.37
2	*5785.00	116.32 PK			1.65 V	95	109.04	7.28
3	*5785.00	108.94 AV			1.65 V	95	101.66	7.28
4	#5981.77	59.99 PK	68.20	-8.21	1.65 V	95	52.47	7.52
5	11570.00	57.39 PK	74.00	-16.61	2.64 V	342	40.40	16.99
6	11570.00	46.26 AV	54.00	-7.74	2.64 V	342	29.27	16.99

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.

RF Mode	TX 802.11ac (VHT20)	Channel	CH 165：5825 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5615.55	57.75 PK	68.20	-10.45	1.51 H	281	50.39	7.36
2	*5825.00	109.74 PK			1.51 H	281	102.46	7.28
3	*5825.00	101.51 AV			1.51 H	281	94.23	7.28
4	#5996.98	59.67 PK	68.20	-8.53	1.51 H	281	52.09	7.58
5	11650.00	56.17 PK	74.00	-17.83	1.28 H	243	38.93	17.24
6	11650.00	44.94 AV	54.00	-9.06	1.28 H	243	27.70	17.24
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	#5616.02	59.22 PK	68.20	-8.98	2.61 V	325	51.86	7.36
2	*5825.00	118.03 PK			2.61 V	325	110.75	7.28
3	*5825.00	109.74 AV			2.61 V	325	102.46	7.28
4	#5981.30	59.88 PK	68.20	-8.32	2.61 V	325	52.36	7.52
5	11650.00	57.32 PK	74.00	-16.68	2.63 V	311	40.08	17.24
6	11650.00	45.98 AV	54.00	-8.02	2.63 V	311	28.74	17.24

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.

RF Mode	TX 802.11ac (VHT40)	Channel	CH 38：5190 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	61.48 PK	74.00	-12.52	1.93 H	259	54.67	6.81
2	5150.00	49.60 AV	54.00	-4.40	1.93 H	259	42.79	6.81
3	*5190.00	101.75 PK			1.93 H	259	94.64	7.11
4	*5190.00	94.63 AV			1.93 H	259	87.52	7.11
5	#10380.00	53.87 PK	68.20	-14.33	1.96 H	127	39.28	14.59
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	65.55 PK	74.00	-8.45	1.12 V	151	58.74	6.81
2	**5150.00**	**53.50 AV**	**54.00**	**-0.50**	**1.12 V**	**151**	**46.69**	**6.81**
3	*5190.00	106.64 PK			1.12 V	151	99.53	7.11
4	*5190.00	99.64 AV			1.12 V	151	92.53	7.11
5	#10380.00	54.79 PK	68.20	-13.41	2.68 V	18	40.20	14.59

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.

RF Mode	TX 802.11ac (VHT40)	Channel	CH 46：5230 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	*5230.00	103.75 PK			2.64 H	94	96.45	7.30
2	*5230.00	96.55 AV			2.64 H	94	89.25	7.30
3	5350.00	58.31 PK	74.00	-15.69	2.64 H	94	50.47	7.84
4	5350.00	47.93 AV	54.00	-6.07	2.64 H	94	40.09	7.84
5	#10460.00	53.98 PK	68.20	-14.22	1.81 H	119	39.05	14.93
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	*5230.00	109.44 PK			1.04 V	149	102.14	7.30
2	*5230.00	102.36 AV			1.04 V	149	95.06	7.30
3	5350.00	58.31 PK	74.00	-15.69	1.04 V	149	50.47	7.84
4	5350.00	48.20 AV	54.00	-5.80	1.04 V	149	40.36	7.84
5	#10460.00	54.74 PK	68.20	-13.46	2.69 V	356	39.81	14.93

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.

RF Mode	TX 802.11ac (VHT40)	Channel	CH 151：5755 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5652.60	58.83 PK	68.20	-9.37	3.40 H	242	51.60	7.23
2	*5755.00	105.64 PK			3.40 H	242	98.42	7.22
3	*5755.00	98.59 AV			3.40 H	242	91.37	7.22
4	#5969.43	60.63 PK	68.20	-7.57	3.40 H	242	53.15	7.48
5	11510.00	55.05 PK	74.00	-18.95	1.36 H	240	38.24	16.81
6	11510.00	44.28 AV	54.00	-9.72	1.36 H	240	27.47	16.81
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	#5649.27	63.57 PK	68.20	-4.63	1.08 V	144	56.32	7.25
2	*5755.00	114.11 PK			1.08 V	144	106.89	7.22
3	*5755.00	107.29 AV			1.08 V	144	100.07	7.22
4	#5990.80	60.56 PK	68.20	-7.64	1.08 V	144	53.01	7.55
5	11510.00	55.87 PK	74.00	-18.13	2.69 V	309	39.06	16.81
6	11510.00	45.08 AV	54.00	-8.92	2.69 V	309	28.27	16.81

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.

RF Mode	TX 802.11ac (VHT40)	Channel	CH 159：5795 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5646.43	58.75 PK	68.20	-9.45	1.52 H	277	51.49	7.26
2	*5795.00	106.02 PK			1.52 H	277	98.72	7.30
3	*5795.00	98.22 AV			1.52 H	277	90.92	7.30
4	#5982.73	60.33 PK	68.20	-7.87	1.52 H	277	52.81	7.52
5	11590.00	56.00 PK	74.00	-18.00	1.26 H	251	38.96	17.04
6	11590.00	45.15 AV	54.00	-8.85	1.26 H	251	28.11	17.04
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	#5574.23	58.82 PK	68.20	-9.38	1.49 V	93	51.25	7.57
2	*5795.00	113.42 PK			1.49 V	93	106.12	7.30
3	*5795.00	105.88 AV			1.49 V	93	98.58	7.30
4	#6014.55	60.89 PK	68.20	-7.31	1.49 V	93	53.30	7.59
5	11590.00	56.21 PK	74.00	-17.79	2.58 V	304	39.17	17.04
6	11590.00	45.34 AV	54.00	-8.66	2.58 V	304	28.30	17.04

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.

RF Mode	TX 802.11ac (VHT80)	Channel	CH 42：5210 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	60.80 PK	74.00	-13.20	1.92 H	92	53.99	6.81
2	5150.00	49.10 AV	54.00	-4.90	1.92 H	92	42.29	6.81
3	*5210.00	97.93 PK			1.92 H	92	90.72	7.21
4	*5210.00	90.03 AV			1.92 H	92	82.82	7.21
5	5350.00	58.84 PK	74.00	-15.16	1.92 H	92	51.00	7.84
6	5350.00	48.38 AV	54.00	-5.62	1.92 H	92	40.54	7.84
7	#10420.00	53.65 PK	68.20	-14.55	1.79 H	130	38.93	14.72
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	65.09 PK	74.00	-8.91	1.04 V	152	58.28	6.81
2	5150.00	53.29 AV	54.00	-0.71	1.04 V	152	46.48	6.81
3	*5210.00	103.91 PK			1.04 V	152	96.70	7.21
4	*5210.00	95.73 AV			1.04 V	152	88.52	7.21
5	5350.00	58.63 PK	74.00	-15.37	1.04 V	152	50.79	7.84
6	5350.00	48.41 AV	54.00	-5.59	1.04 V	152	40.57	7.84
7	#10420.00	54.36 PK	68.20	-13.84	2.74 V	353	39.64	14.72

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.

RF Mode	TX 802.11ac (VHT80)	Channel	CH 155：5775 MHz
Frequency Range	1GHz ~ 40GHz	Detector Function	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	#5647.85	62.09 PK	68.20	-6.11	2.96 H	214	54.83	7.26
2	*5775.00	103.68 PK			2.96 H	214	96.42	7.26
3	*5775.00	96.29 AV			2.96 H	214	89.03	7.26
4	#5926.68	61.61 PK	68.20	-6.59	2.96 H	214	54.31	7.30
5	11550.00	55.54 PK	74.00	-18.46	1.35 H	248	38.62	16.92
6	11550.00	44.13 AV	54.00	-9.87	1.35 H	248	27.21	16.92
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	#5647.37	64.74 PK	68.20	-3.46	1.65 V	94	57.48	7.26
2	*5775.00	109.94 PK			1.65 V	94	102.68	7.26
3	*5775.00	102.75 AV			1.65 V	94	95.49	7.26
4	#5923.82	64.09 PK	68.20	-4.11	1.65 V	94	56.80	7.29
5	11550.00	56.35 PK	74.00	-17.65	2.58 V	300	39.43	16.92
6	11550.00	45.20 AV	54.00	-8.80	2.58 V	300	28.28	16.92

Remarks:

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

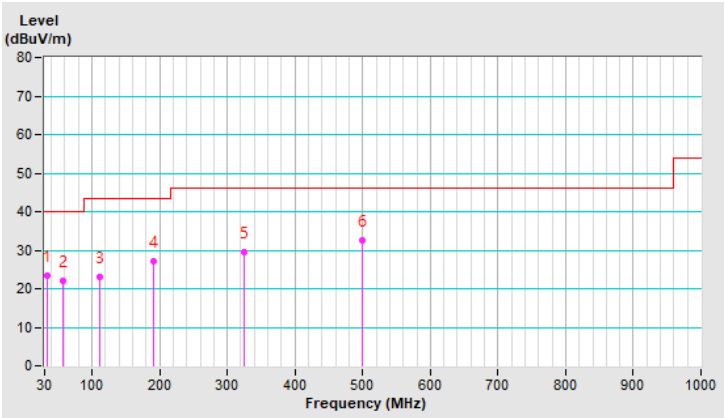
BELOW 1GHz WORST-CASE DATA

RF Mode	TX 802.11ac (VHT20)	Channel	CH 149：5745 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	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	34.12	23.37 QP	40.00	-16.63	1.42 H	97	31.87	-8.50
2	56.24	21.99 QP	40.00	-18.01	1.31 H	99	29.11	-7.12
3	111.29	23.15 QP	43.50	-20.35	1.76 H	260	32.80	-9.65
4	191.84	27.28 QP	43.50	-16.22	2.36 H	250	35.96	-8.68
5	324.06	29.46 QP	46.00	-16.54	1.85 H	109	32.87	-3.41
6	500.01	32.47 QP	46.00	-13.53	2.75 H	245	32.47	0.00

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.

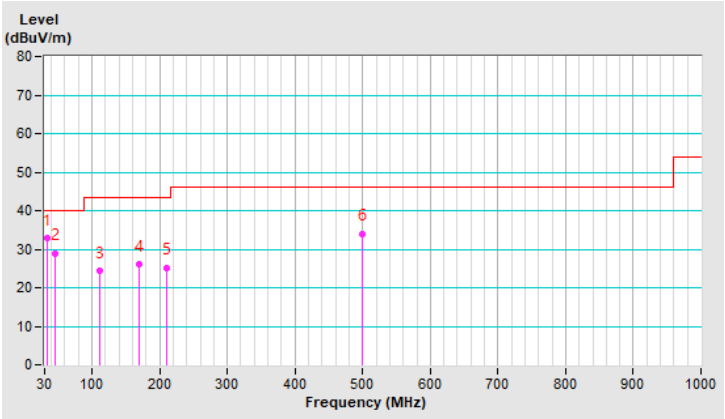


RF Mode	TX 802.11ac (VHT20)	Channel	CH 149：5745 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	34.17	32.74 QP	40.00	-7.26	1.28 V	174	41.24	-8.50
2	44.55	28.88 QP	40.00	-11.12	1.34 V	164	36.01	-7.13
3	111.24	24.30 QP	43.50	-19.20	1.85 V	116	33.95	-9.65
4	169.29	26.00 QP	43.50	-17.50	2.63 V	121	32.36	-6.36
5	211.24	25.01 QP	43.50	-18.49	2.34 V	293	33.43	-8.42
6	499.96	33.94 QP	46.00	-12.06	2.98 V	192	33.94	0.00

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 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver R & S	ESCS 30	838251/021	2020/11/3	2021/11/2
LISN R&S	ENV216	101197	2021/6/23	2022/6/22
LISN R&S	ENV216	101195	2021/5/25	2022/5/24
LISN SCHWARZBECK	NNLK8129	8129229	2021/5/20	2022/5/19
DC LISN SCHWARZBECK	NNLK 8121	8121-808	2021/4/18	2022/4/17
LISN SCHWARZBECK	NNLK 8121	8121-731	2021/4/28	2022/4/27
LISN R&S	ENV216	101196	2021/4/26	2022/4/25
LISN EMCO	3825/2	9504-2359	2021/7/27	2022/7/26
LISN R&S	ESH3-Z6	844950/018	2021/7/25	2022/7/24
LISN EMCO	3825/2	9204-1964	2021/5/19	2022/5/18
DC LISN R&S	ESH3-Z6	100219	2021/7/25	2022/7/24
Coupling/Dcoupling Network SCHWARZBECK	CDNE-M2	00097	2021/5/6	2022/5/5
Coupling/Dcoupling Network SCHWARZBECK	CDNE-M3	00091	2021/5/6	2022/5/5
Coupling/Dcoupling Network TESEQ	CDN A201A	44601	2020/12/27	2021/12/26
RF Coaxial Cable Commate	5D-FB	Cable-CO3-01	2021/9/15	2022/9/14
Attenuator STI	STI02-2200-10	NO.3	2020/10/23	2021/10/22
50 ohms Terminator LYNICS	0900510	E1-01-300	2021/1/27	2022/1/26
50 ohms Terminator LYNICS	0900510	E1-01-301	2021/1/27	2022/1/26
Isolation Transformer Erika Fiedler	D-65396	017	2021/9/9	2022/9/8
Software BVADT	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 Linkou Conduction03
3. The VCCI Site Registration No. C-10274.
4. Tested Date: 2021/10/12

4.2.3 Test Procedure

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.

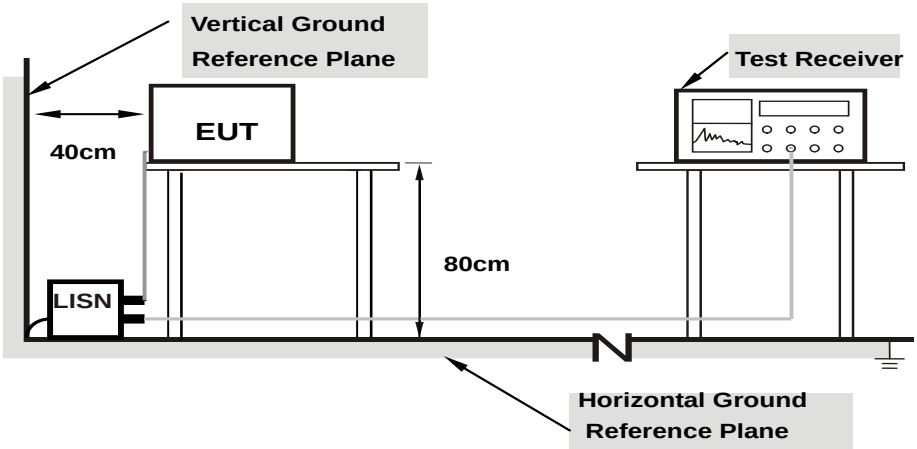
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

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

4.2.6 EUT Operating Condition

Same as Item 4.1.6.

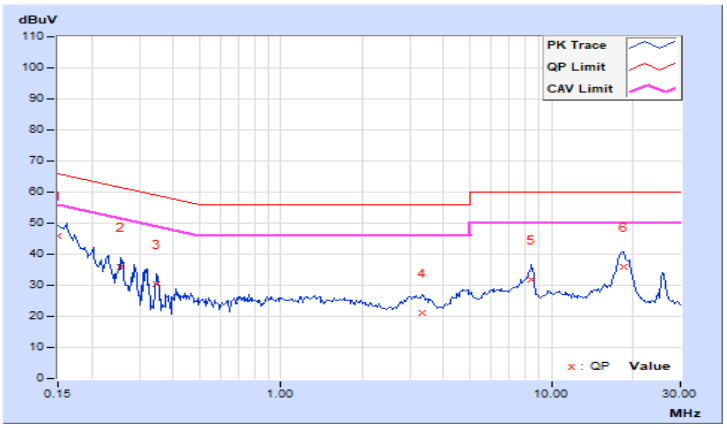
4.2.7 Test Results

RF Mode	TX 802.11ac (VHT20)	Channel	CH 149：5745 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.15000	9.84	36.27	24.89	46.11	34.73	66.00	56.00	-19.89	-21.27
2	0.25547	9.85	26.00	17.31	35.85	27.16	61.58	51.58	-25.73	-24.42
3	0.34531	9.88	20.65	11.01	30.53	20.89	59.07	49.07	-28.54	-28.18
4	3.33203	10.10	11.17	3.37	21.27	13.47	56.00	46.00	-34.73	-32.53
5	8.46484	10.23	21.80	14.68	32.03	24.91	60.00	50.00	-27.97	-25.09
6	18.48047	10.33	25.54	18.79	35.87	29.12	60.00	50.00	-24.13	-20.88

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

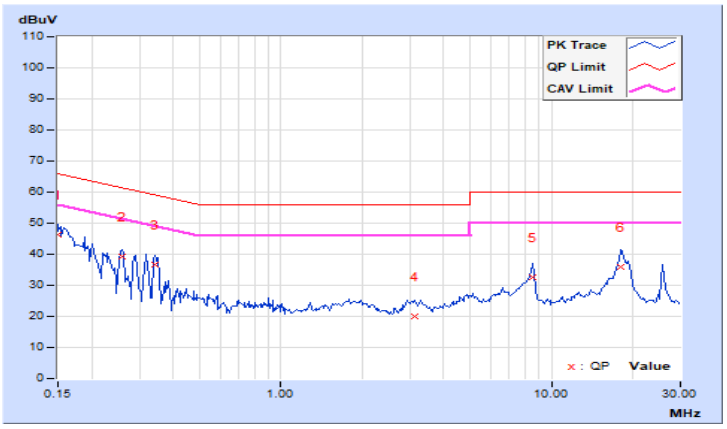


RF Mode	TX 802.11ac (VHT20)	Channel	CH 149：5745 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	9.81	36.55	25.52	46.36	35.33	66.00	56.00	-19.64	-20.67
2	**0.25938**	**9.83**	**29.51**	**23.84**	**39.34**	**33.67**	**61.45**	**51.45**	**-22.11**	**-17.78**
3	0.34141	9.83	26.75	16.94	36.58	26.77	59.17	49.17	-22.59	-22.40
4	3.12891	10.06	9.83	2.77	19.89	12.83	56.00	46.00	-36.11	-33.17
5	8.52734	10.21	22.51	15.27	32.72	25.48	60.00	50.00	-27.28	-24.52
6	18.08203	10.33	25.42	17.03	35.75	27.36	60.00	50.00	-24.25	-22.64

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 ≦ 125mW(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)
	√	Client device	250mW (24 dBm)
U-NII-2A	--		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	--		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

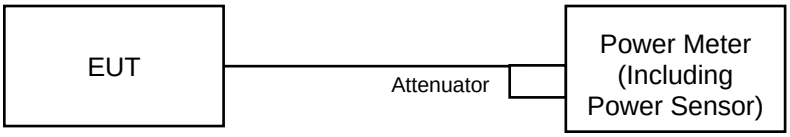
*B is the 26 dB emission bandwidth in megahertz

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 ≥ 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



4.3.3 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Pulse Power Sensor Anritsu	MA2411B	0738404	2021/4/15	2022/4/14
Peak Power meter Anritsu	ML2495A	0842014	2021/4/15	2022/4/14

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 LK - Oven
3. Tested Date: 2021/10/13

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

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

4.3.7 Test Result

802.11a

CHAN.	FREQ. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
36	5180	15.47	15.57	71.295	18.53	23.97	Pass
40	5200	15.56	15.51	71.538	18.55	23.97	Pass
48	5240	15.57	15.58	72.199	18.59	23.97	Pass
149	5745	20.47	20.93	235.309	23.72	30	Pass
157	5785	20.55	20.98	238.815	23.78	30	Pass
165	5825	20.59	20.95	239.003	23.78	30	Pass

802.11ac (VHT20)

CHAN.	FREQ. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
36	5180	15.50	15.55	71.374	18.54	23.97	Pass
40	5200	15.61	15.45	71.467	18.54	23.97	Pass
48	5240	15.58	15.61	**72.532**	18.61	23.97	Pass
149	5745	20.52	20.87	234.900	23.71	30	Pass
157	5785	20.58	21.02	**240.761**	23.82	30	Pass
165	5825	20.55	20.95	237.953	23.76	30	Pass

802.11ac (VHT40)

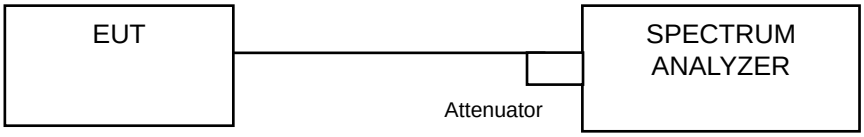
CHAN.	FREQ. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
38	5190	12.16	12.18	32.963	15.18	23.97	Pass
46	5230	15.51	15.59	71.787	18.56	23.97	Pass
151	5755	19.78	19.98	194.601	22.89	30	Pass
159	5795	19.85	20.06	197.996	22.97	30	Pass

802.11ac (VHT80)

CHAN.	FREQ. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
42	5210	10.69	10.73	23.552	13.72	23.97	Pass
155	5775	20.14	20.17	207.268	23.17	30	Pass

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101042	2021/9/9	2022/9/8

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 LK - Oven
3. Tested Date: 2021/10/13

4.4.3 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 SAMPLE. 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.

4.4.4 Test Results

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	16.44	16.44
40	5200	16.44	16.44
48	5240	16.44	16.44
149	5745	25.04	20.43
157	5785	24.96	18.96
165	5825	23.64	18.48

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.52	17.64
40	5200	17.64	17.64
48	5240	17.64	17.64
149	5745	25.44	21.24
157	5785	26.16	21.48
165	5825	25.92	19.32

802.11ac (VHT40)

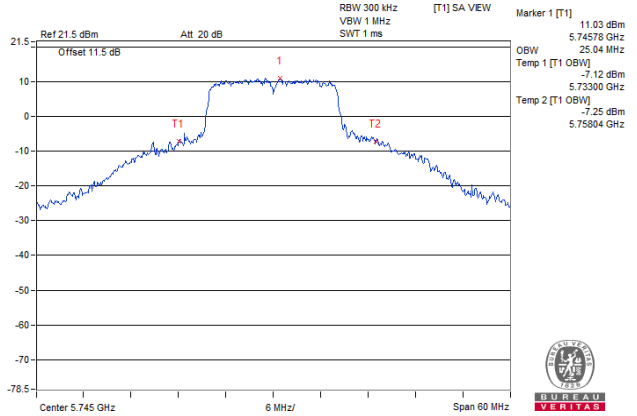
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.48	36.24
46	5230	36.48	36.48
151	5755	42.96	37.92
159	5795	41.76	38.40

802.11ac (VHT80)

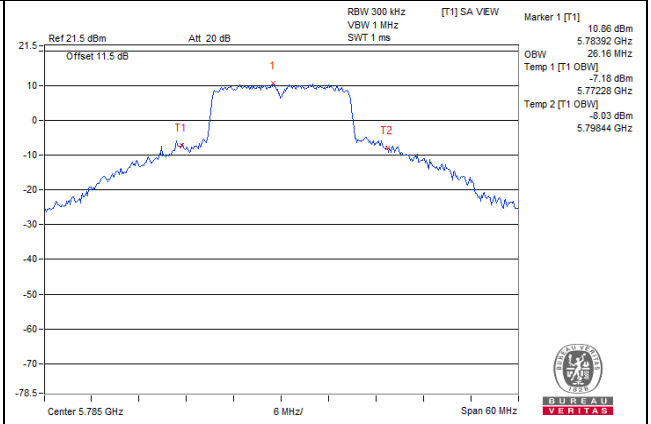
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	74.88	74.88
155	5775	85.92	75.84

Spectrum Plot of Worst Value

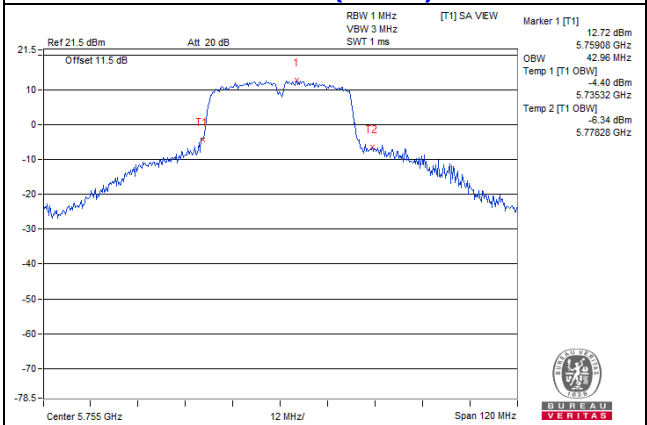
802.11a



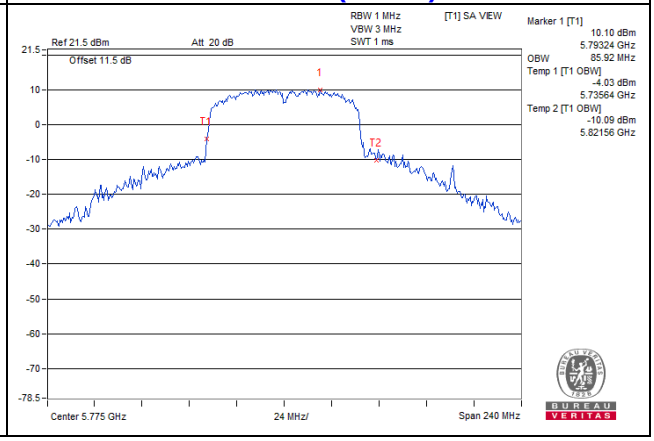
802.11ac (VHT20)



802.11ac (VHT40)

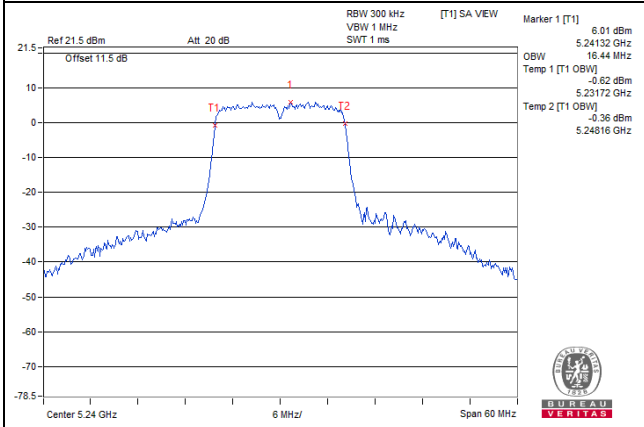


802.11ac (VHT80)

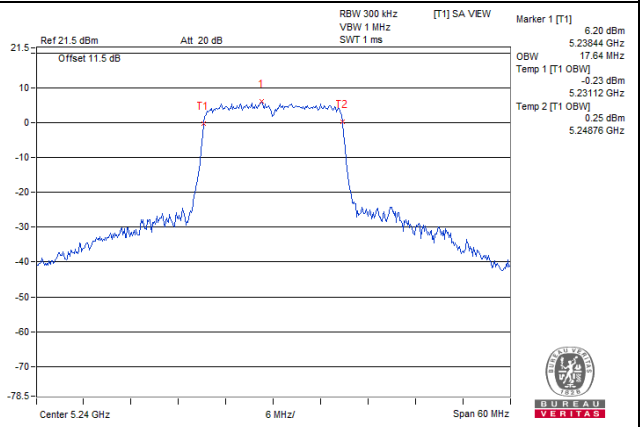


Spectrum Plot for near by DFS band

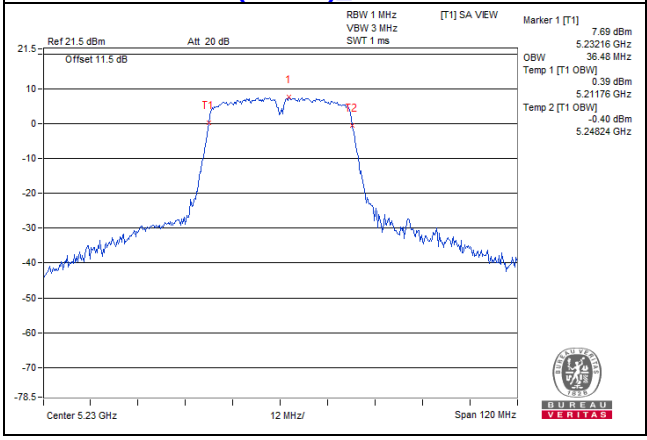
802.11a_Chain0 / CH48



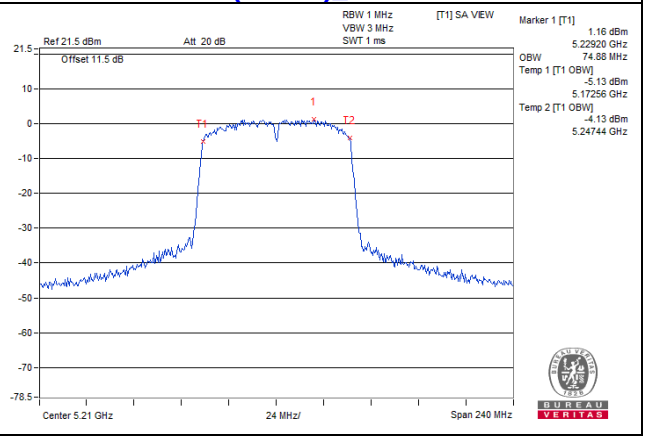
802.11ac (VHT20)_Chain0 / CH48



802.11ac (VHT40)_Chain0 / CH46

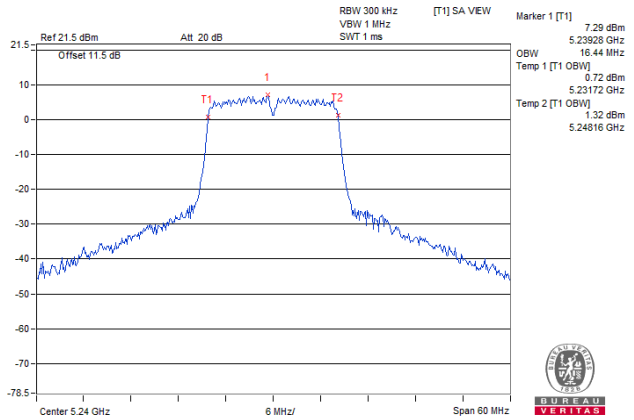


802.11ac (VHT80)_Chain0 / CH42

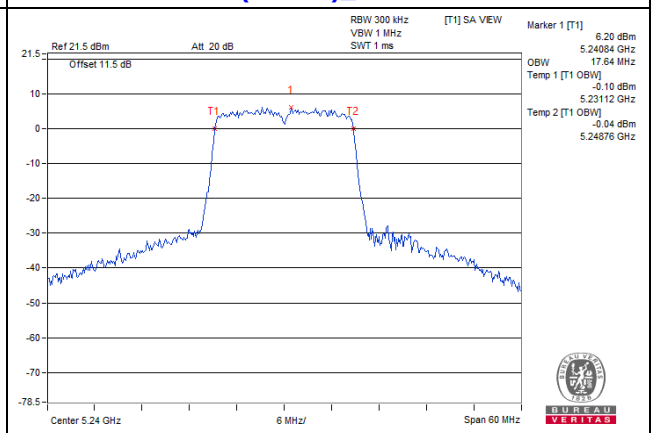


Spectrum Plot for near by DFS band

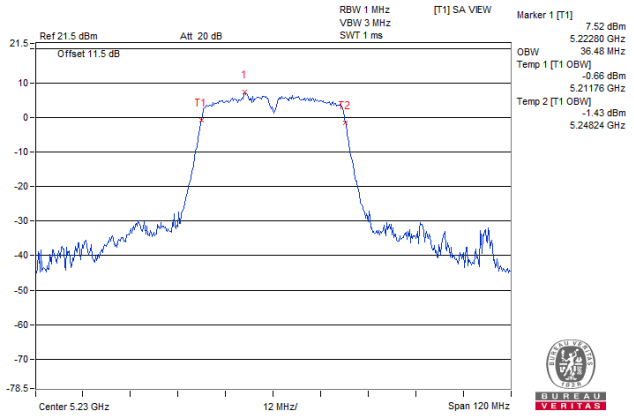
802.11a_Chain1 / CH48



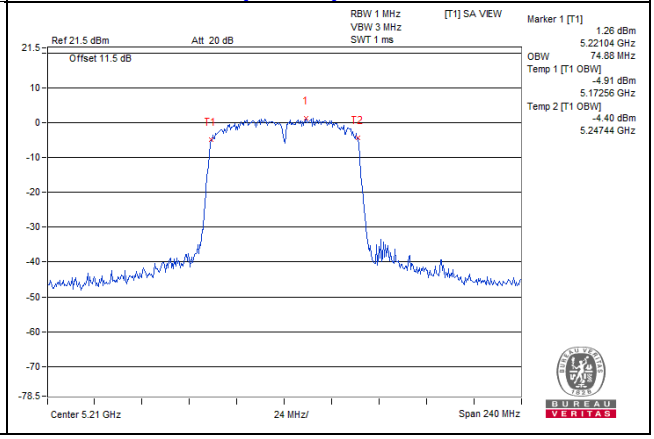
802.11ac (VHT20)_Chain1 / CH48



802.11ac (VHT40)_Chain1 / CH46

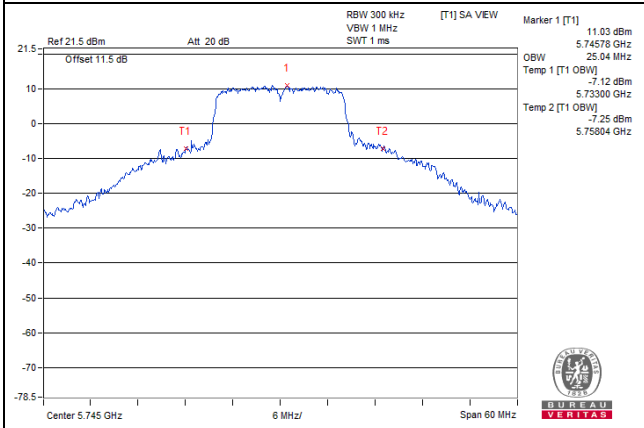


802.11ac (VHT80)_Chain1 / CH42

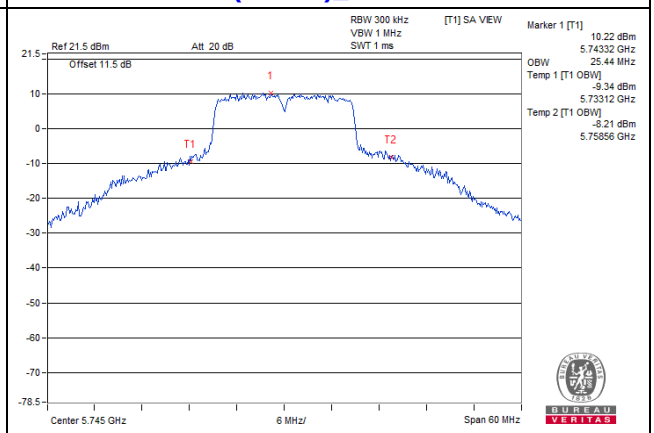


Spectrum Plot for near by DFS band

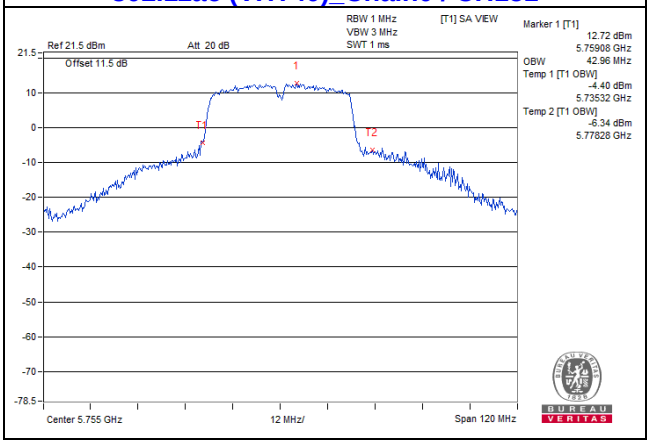
802.11a_Chain0 / CH149



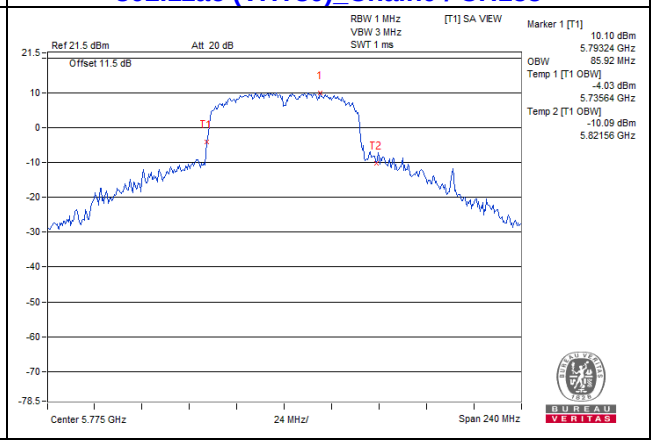
802.11ac (VHT20)_Chain0 / CH149



802.11ac (VHT40)_Chain0 / CH151

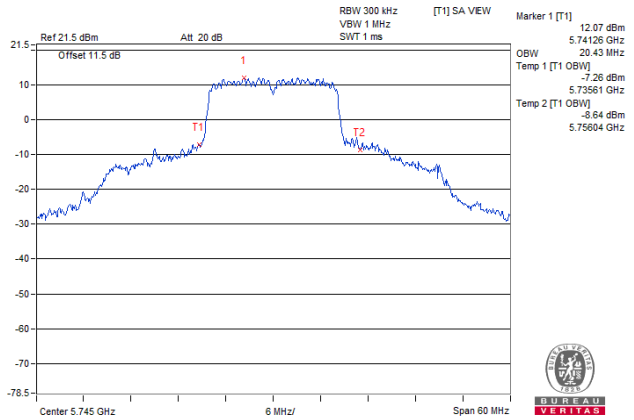


802.11ac (VHT80)_Chain0 / CH155

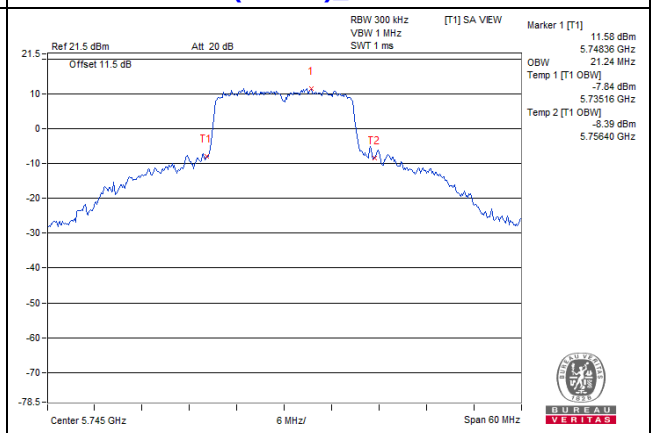


Spectrum Plot for near by DFS band

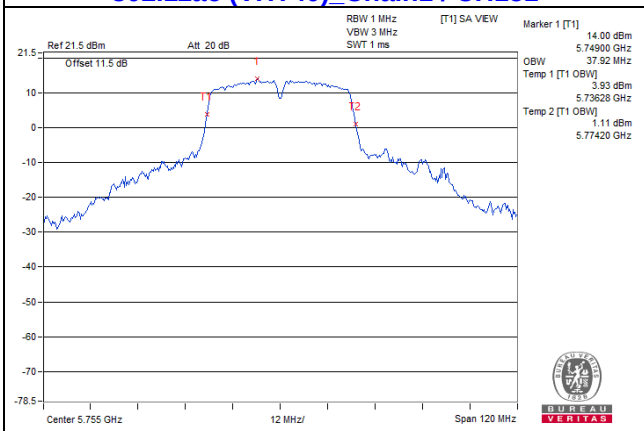
802.11a_Chain1 / CH149



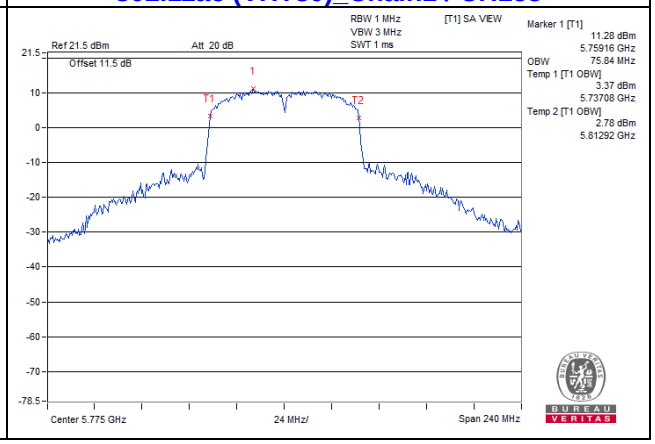
802.11ac (VHT20)_Chain1 / CH149



802.11ac (VHT40)_Chain1 / CH151



802.11ac (VHT80)_Chain1 / CH155

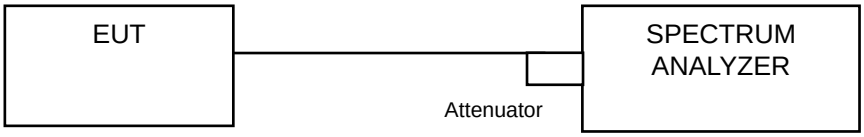


4.5 Peak Power Spectral Density Measurement

4.5.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
	√	Client device	11dBm/ MHz
U-NII-2A	--		11dBm/ MHz
U-NII-2C	--		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.4.2 to get information of above instrument.

4.5.4 Test Procedure

For U-NII-1 band:

Using method SA-2

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 30 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3) Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4) 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 = 10log(500kHz/300kHz)
5) Sweep time = auto, trigger set to “free run”.
6) Trace average at least 100 traces in power averaging mode.
7) Record the max value and add 10 log (1/duty cycle).

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6.

4.5.7 Test Results

For U-NII-1:

802.11a

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm)		Duty Factor (dB)	Total PSD With Duty Factor (dBm)	MAX. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	-0.65	-0.69	0.17	2.51	10.79	Pass
40	5200	0.49	0.63	0.17	3.74	10.79	Pass
48	5240	0.52	0.65	0.17	3.77	10.79	Pass

Note: 1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 6.21dBi > 6dBi , so the power density limit shall be reduced to 11-(6.21-6) = 10.79dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm)		Duty Factor (dB)	Total PSD With Duty Factor (dBm)	MAX. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	-2.21	-0.60	0.32	2.00	10.79	Pass
40	5200	-0.05	-1.20	0.32	2.75	10.79	Pass
48	5240	-0.81	0.06	0.32	2.98	10.79	Pass

Note: 1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 6.21dBi > 6dBi , so the power density limit shall be reduced to 11-(6.21-6) = 10.79dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm)		Duty Factor (dB)	Total PSD With Duty Factor (dBm)	MAX. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	-9.79	-9.52	0.86	-5.78	10.79	Pass
46	5230	-6.77	-5.87	0.86	-2.42	10.79	Pass

Note: 1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 6.21dBi > 6dBi , so the power density limit shall be reduced to 11-(6.21-6) = 10.79dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm)		Duty Factor (dB)	Total PSD With Duty Factor (dBm)	MAX. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	-11.06	-10.99	1.33	-6.68	10.79	Pass

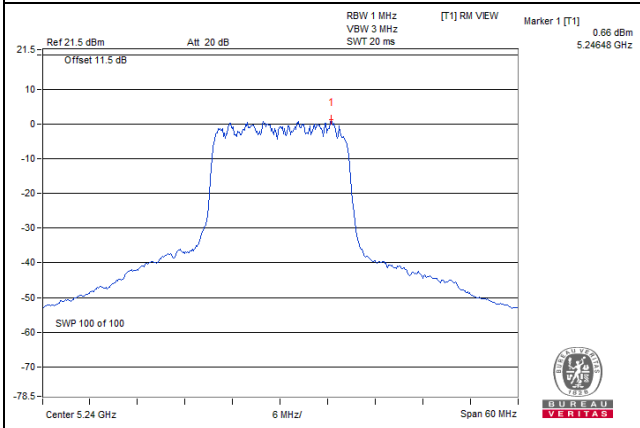
Note: 1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 6.21dBi > 6dBi , so the power density limit shall be reduced to 11-(6.21-6) = 10.79dBm.

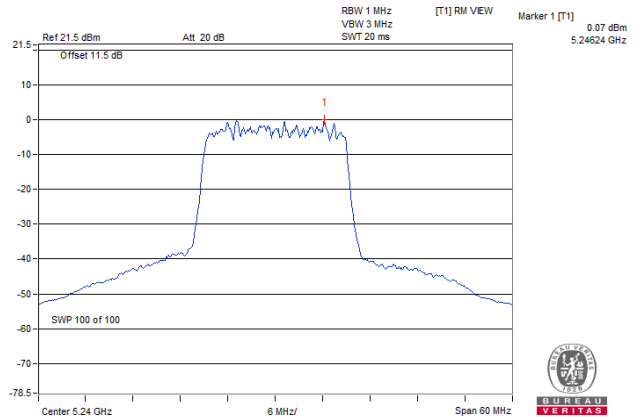
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

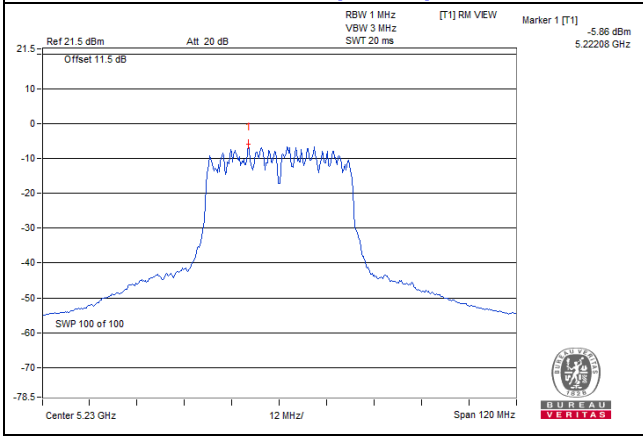
802.11a



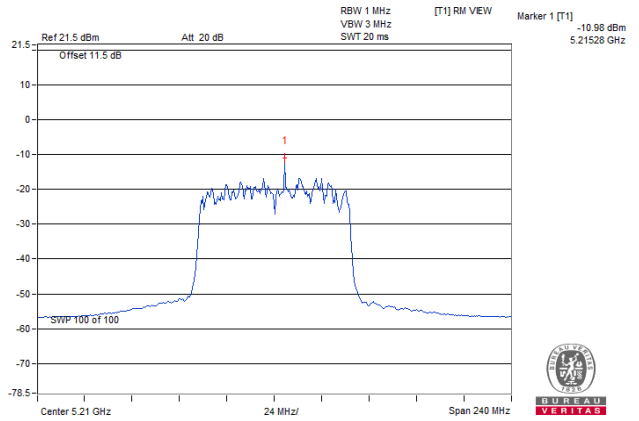
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



For U-NII-3:

802.11a

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)	PSD W/O Duty Factor (dBm/500kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
0	149	5745	-3.30	-1.08	3.01	0.17	2.10	30	Pass
	157	5785	-2.59	-0.37	3.01	0.17	2.81	30	Pass
	165	5825	-2.51	-0.29	3.01	0.17	2.89	30	Pass
1	149	5745	-2.49	-0.27	3.01	0.17	2.91	30	Pass
	157	5785	-2.44	-0.22	3.01	0.17	2.96	30	Pass
	165	5825	-2.01	0.21	3.01	0.17	3.39	30	Pass

Note: 1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is measure value add 10 log (N_{ANT}) dB.

2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 5.46dBi < 6dBi , so the power density limit shall not be reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT20)

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)	PSD W/O Duty Factor (dBm/500kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
0	149	5745	-3.83	-1.61	3.01	0.32	1.72	30	Pass
	157	5785	-4.09	-1.87	3.01	0.32	1.46	30	Pass
	165	5825	-4.11	-1.89	3.01	0.32	1.44	30	Pass
1	149	5745	-2.89	-0.67	3.01	0.32	2.66	30	Pass
	157	5785	-3.53	-1.31	3.01	0.32	2.02	30	Pass
	165	5825	-3.64	-1.42	3.01	0.32	1.91	30	Pass

Note: 1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is measure value add 10 log (N_{ANT}) dB.

2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 5.46dBi < 6dBi , so the power density limit shall not be reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT40)

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)	PSD W/O Duty Factor (dBm/500kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
0	151	5755	-9.83	-7.61	3.01	0.86	-3.74	30	Pass
	159	5795	-9.00	-6.78	3.01	0.86	-2.91	30	Pass
1	151	5755	-9.90	-7.68	3.01	0.86	-3.81	30	Pass
	159	5795	-7.84	-5.62	3.01	0.86	-1.75	30	Pass

Note: 1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is measure value add 10 log (N_{ANT}) dB.

2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 5.46dBi < 6dBi , so the power density limit shall not be reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

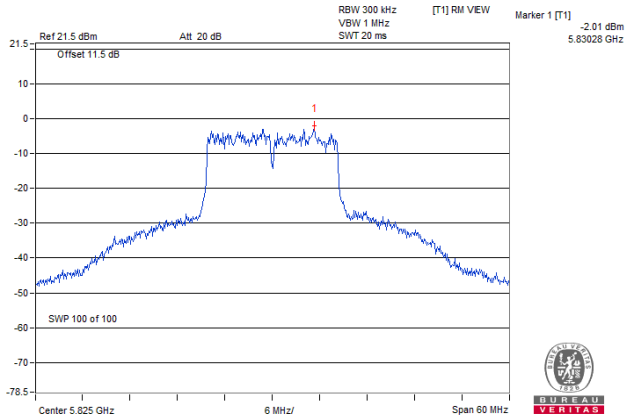
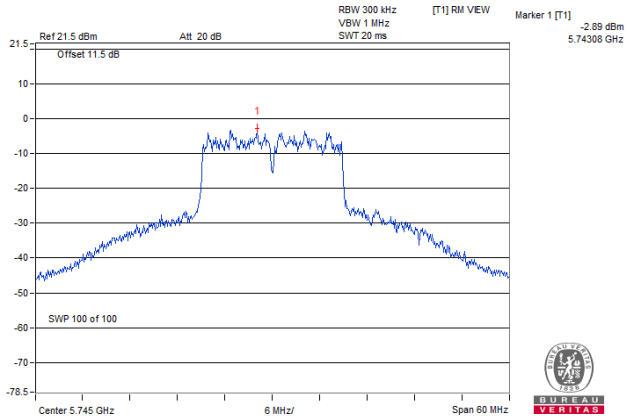
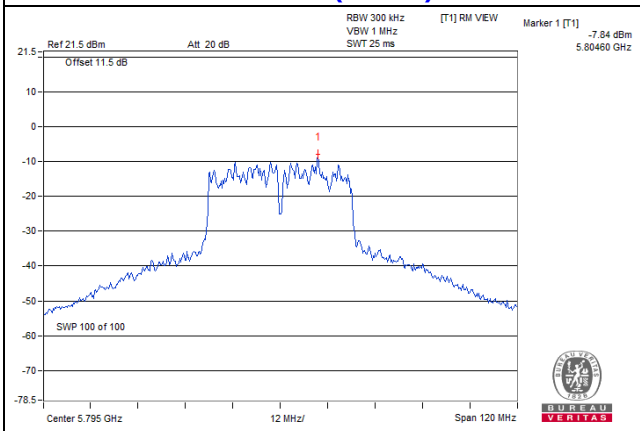
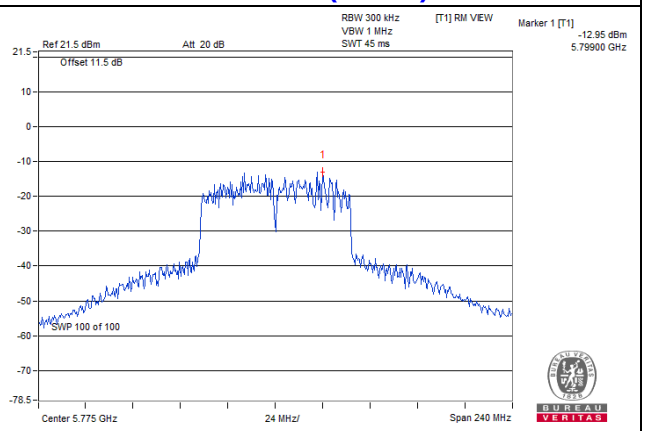
802.11ac (VHT80)

TX chain	Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)	PSD W/O Duty Factor (dBm/500kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
0	155	5775	-13.71	-11.49	3.01	1.33	-7.15	30	Pass
1	155	5775	-12.95	-10.73	3.01	1.33	-6.39	30	Pass

Note: 1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is measure value add 10 log (N_{ANT}) dB.

2. Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 5.46dBi < 6dBi , so the power density limit shall not be reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

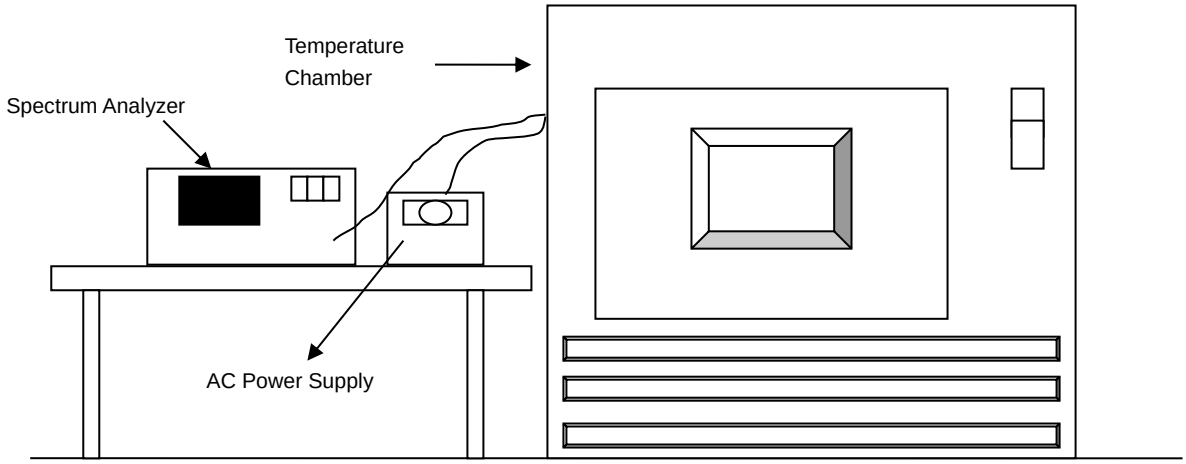
Spectrum Plot of Worst Value	
802.11a	**802.11ac (VHT20)**
	
802.11ac (VHT40)	**802.11ac (VHT80)**
	

4.6 Frequency Stability Measurement

4.6.1 Limits of Frequency Stability Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.4.2 to get information of above instrument.

4.6.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC 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.
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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.6.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
50	120	5180.0205	Pass	5180.0188	Pass	5180.0223	Pass	5180.0198	Pass
40	120	5179.9754	Pass	5179.9739	Pass	5179.9766	Pass	5179.9734	Pass
30	120	5179.9989	Pass	5179.9968	Pass	5179.9987	Pass	5179.9967	Pass
20	120	5180.0189	Pass	5180.0186	Pass	5180.0185	Pass	5180.0185	Pass
10	120	5180.0021	Pass	5180.0017	Pass	5179.9991	Pass	5180.001	Pass
0	120	5180.0091	Pass	5180.0116	Pass	5180.0098	Pass	5180.0086	Pass
-10	120	5180.0111	Pass	5180.0141	Pass	5180.0133	Pass	5180.0132	Pass
-20	120	5180.0078	Pass	5180.0091	Pass	5180.0078	Pass	5180.0065	Pass
-30	120	5180.0127	Pass	5180.0103	Pass	5180.0136	Pass	5180.0136	Pass

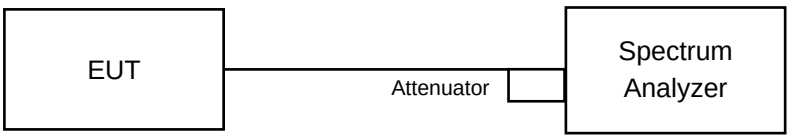
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	138	5180.0237	Pass	5180.0261	Pass	5180.0239	Pass	5180.0259	Pass
	120	5180.0189	Pass	5180.0186	Pass	5180.0185	Pass	5180.0185	Pass
	102	5180.0193	Pass	5180.0212	Pass	5180.022	Pass	5180.0212	Pass

4.7 6dB Bandwidth Measurement

4.7.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.4.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. 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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.36	16.36	0.5	PASS
157	5785	16.39	16.38	0.5	PASS
165	5825	16.38	16.38	0.5	PASS

802.11ac (VHT20)

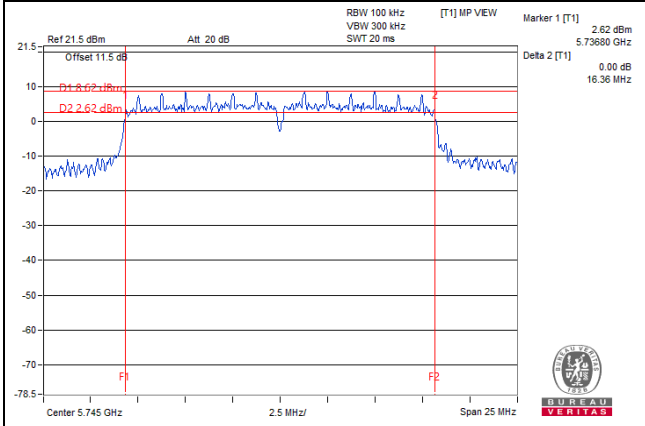
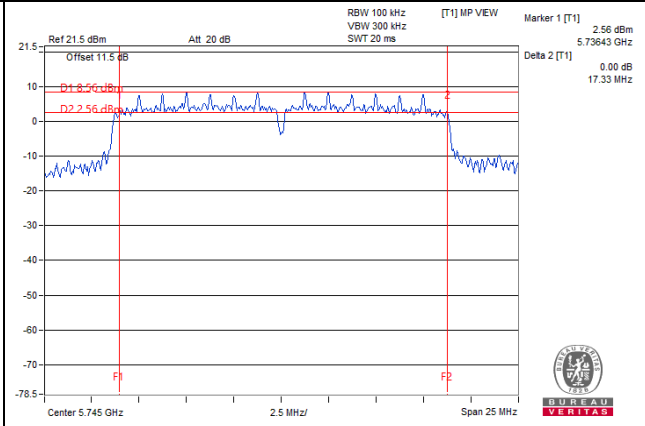
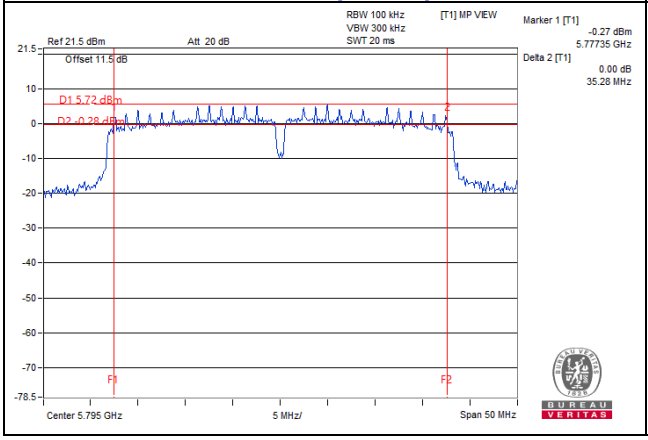
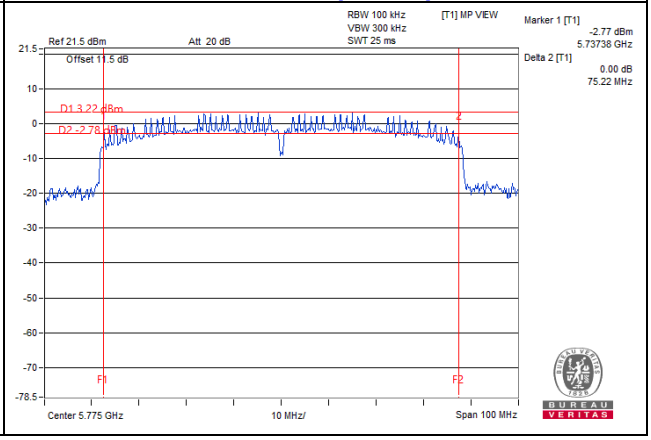
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	17.33	17.59	0.5	PASS
157	5785	17.60	17.57	0.5	PASS
165	5825	17.58	17.36	0.5	PASS

802.11ac (VHT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.29	35.31	0.5	PASS
159	5795	35.28	35.30	0.5	PASS

802.11ac (VHT80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	75.22	75.24	0.5	PASS

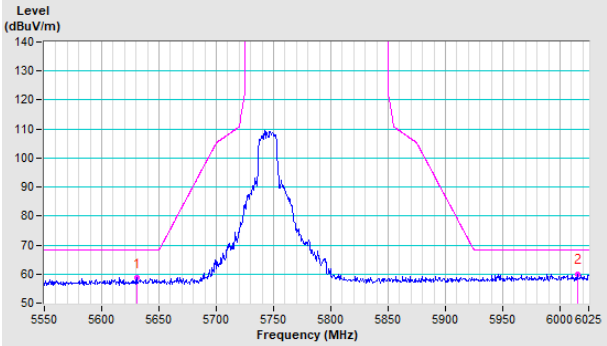
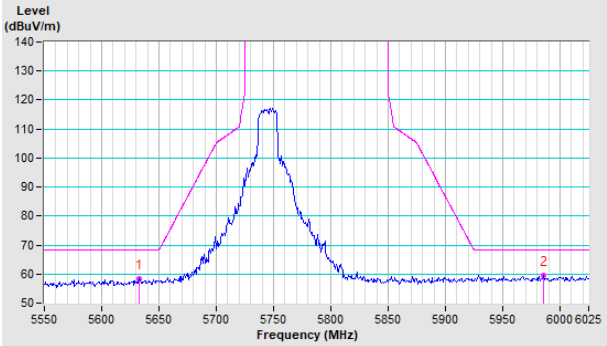
Spectrum Plot of Worst Value	
802.11a	**802.11ac (VHT20)**
	
802.11ac (VHT40)	**802.11ac (VHT80)**
	

5 Pictures of Test Arrangements

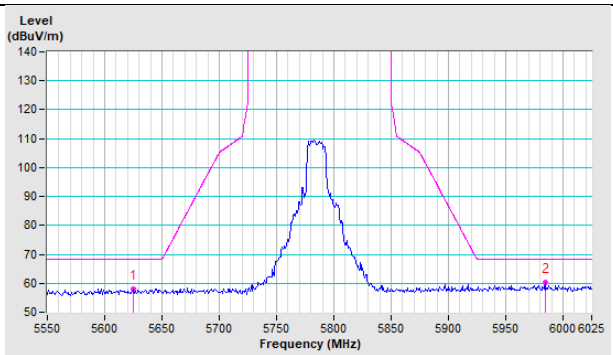
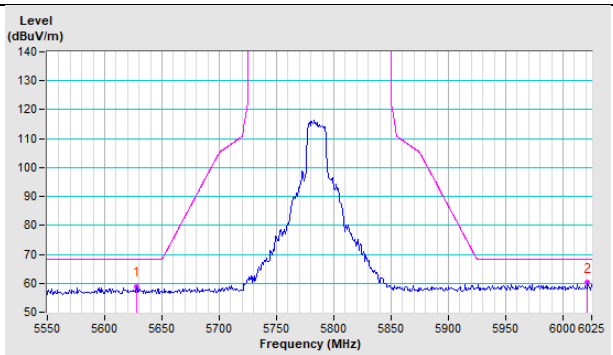
Please refer to the attached file (Test Setup Photo).

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

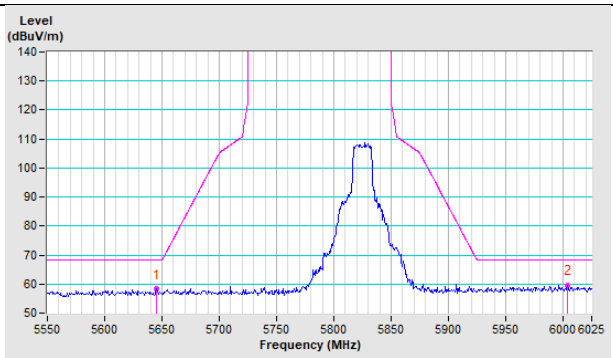
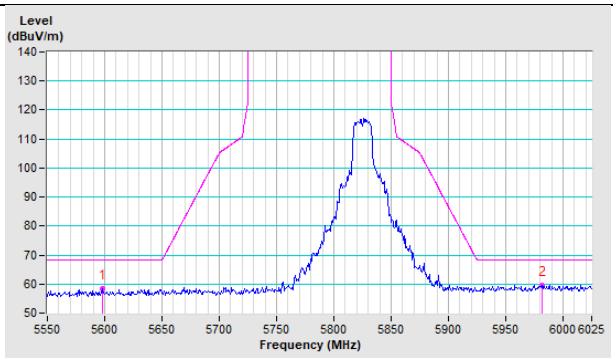
802.11a CH 149：5745 MHz

Horizontal	Vertical
	

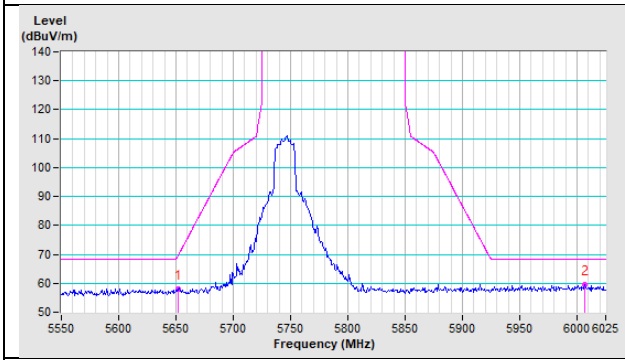
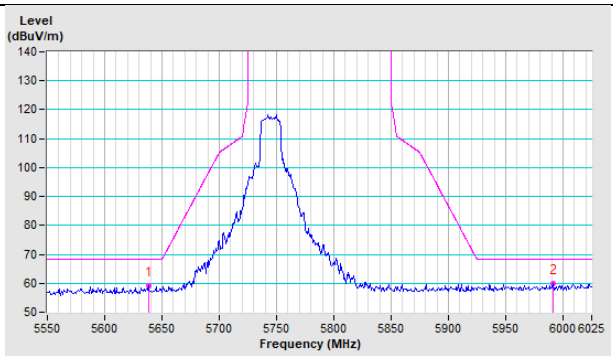
802.11a CH 157：5785 MHz

Horizontal	Vertical
	

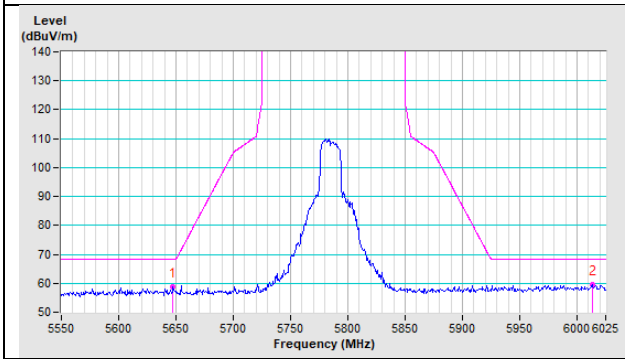
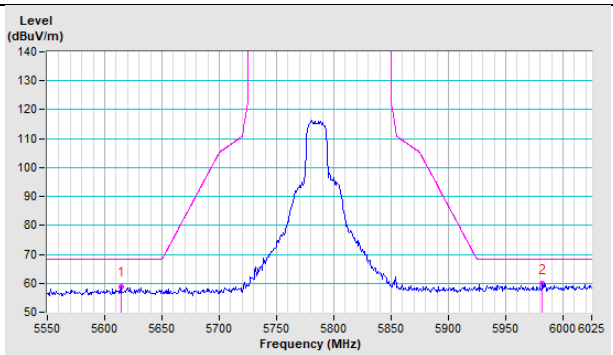
802.11a CH 165：5825 MHz

Horizontal	Vertical
	

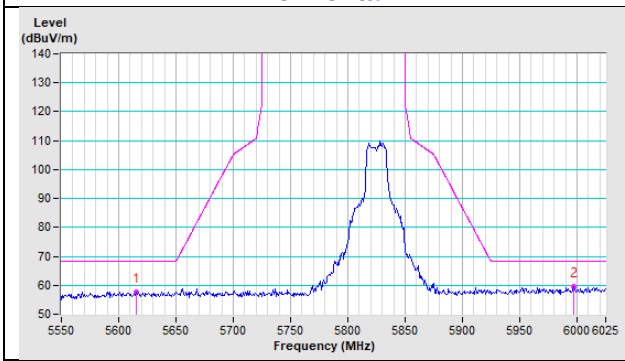
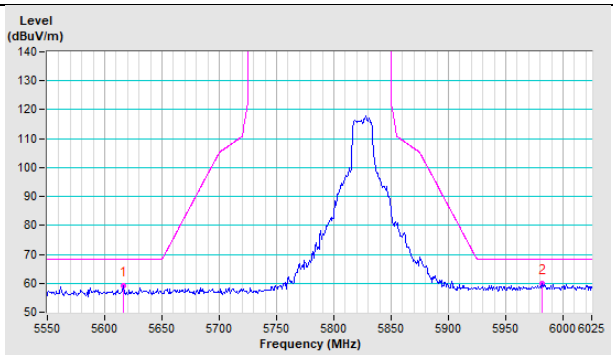
Vertical802.11ac (VHT20) CH 149：5745 MHz

Horizontal	Vertical
	

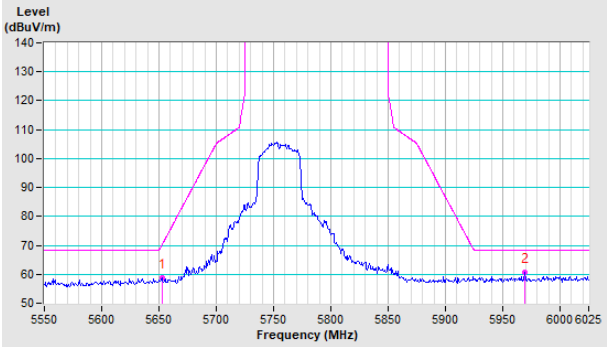
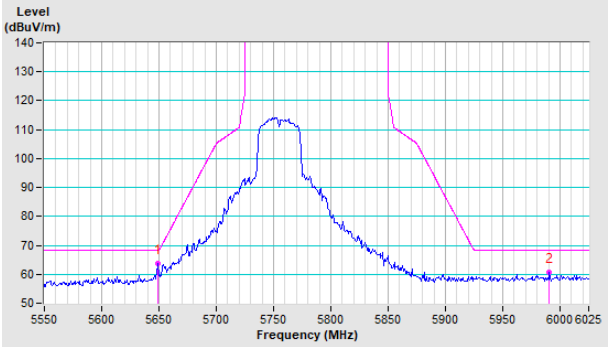
802.11ac (VHT20) CH 157：5785 MHz

Horizontal	Vertical
	

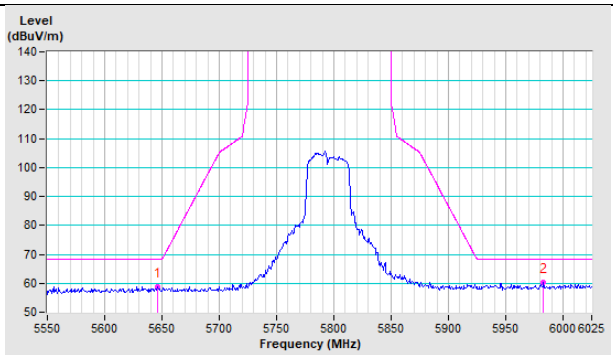
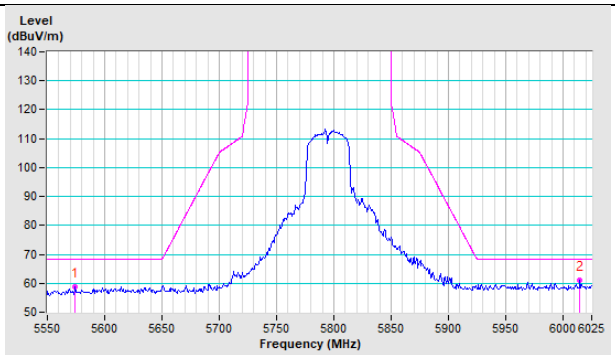
802.11ac (VHT20) CH 165：5825 MHz

Horizontal	Vertical
	

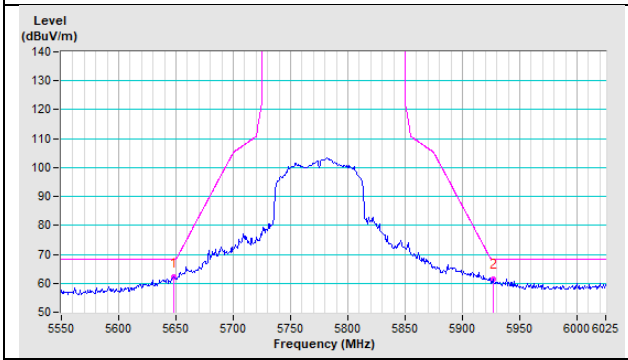
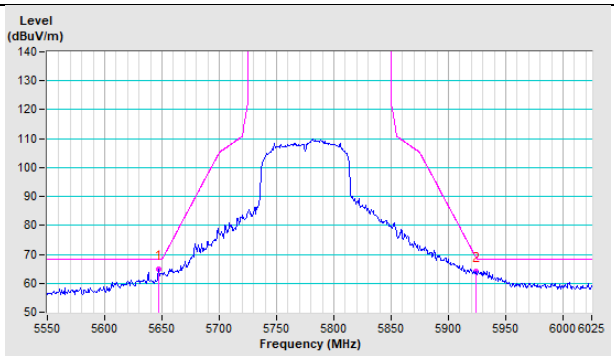
802.11ac (VHT40) CH 151：5755 MHz

Horizontal	Vertical
	

802.11ac (VHT40) CH 159：5795 MHz

Horizontal	Vertical
	

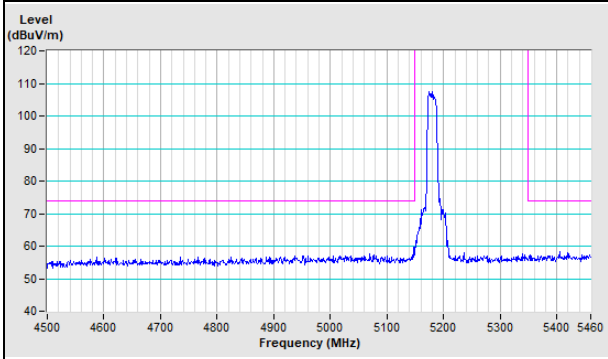
Vertical802.11ac (VHT80) CH 155：5775 MHz

Horizontal	Vertical
	

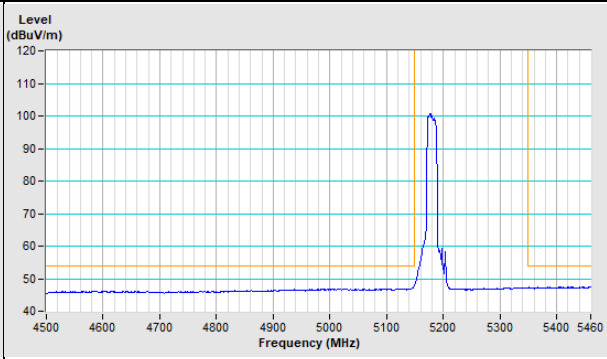
Annex B- Band Edge Measurement

802.11a Channel 36

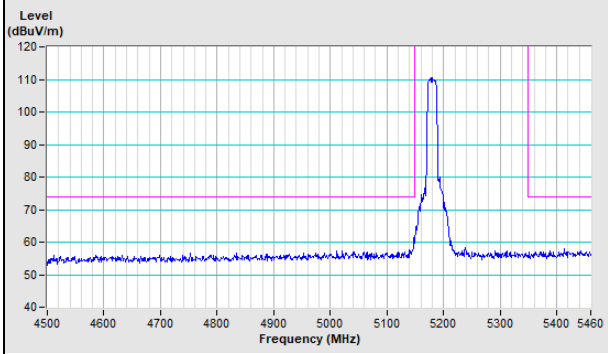
Horizontal (Peak)



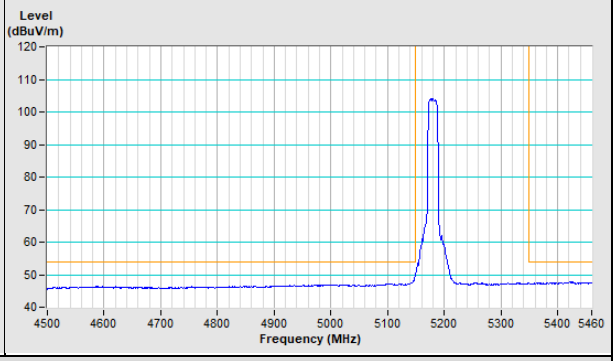
Horizontal (Average)



Vertical (Peak)

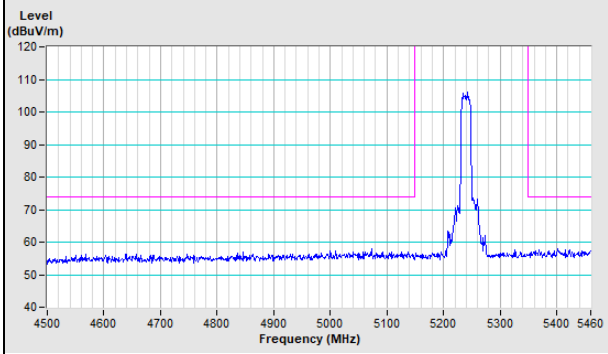


Vertical (Average)

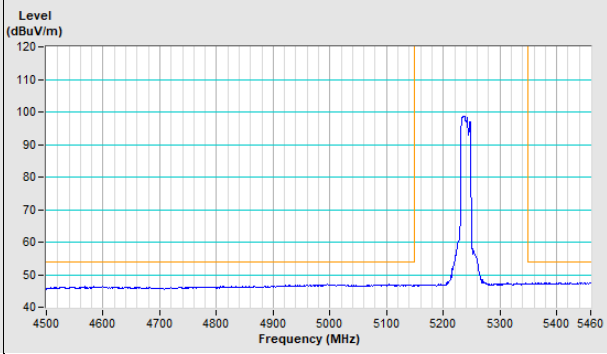


802.11a Channel 48

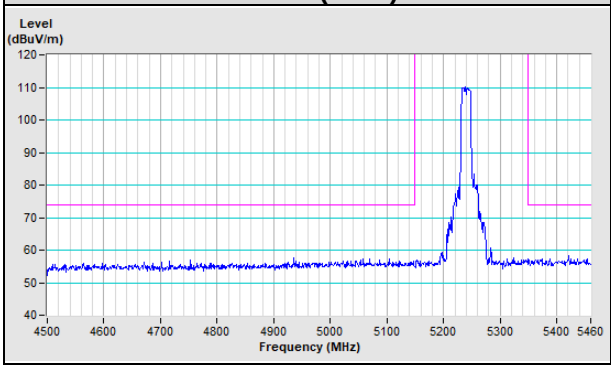
Horizontal (Peak)



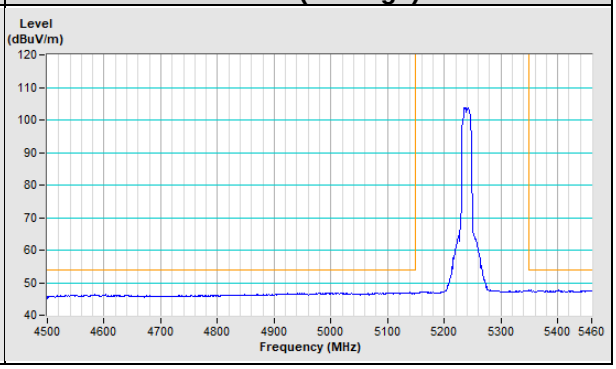
Horizontal (Average)



Vertical (Peak)

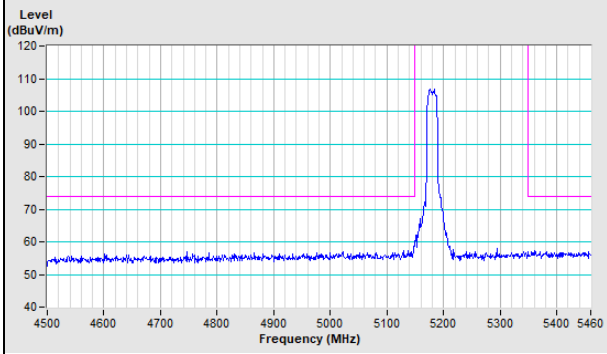


Vertical (Average)

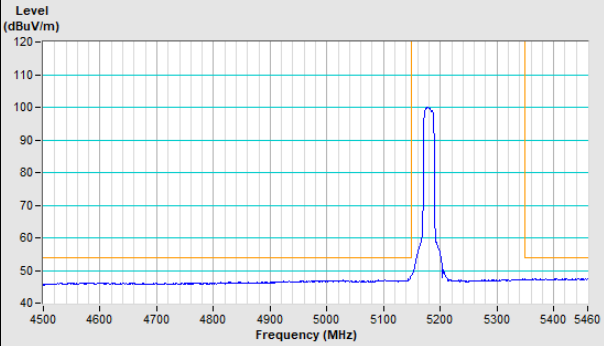


802.11ac (VHT20) Channel 36

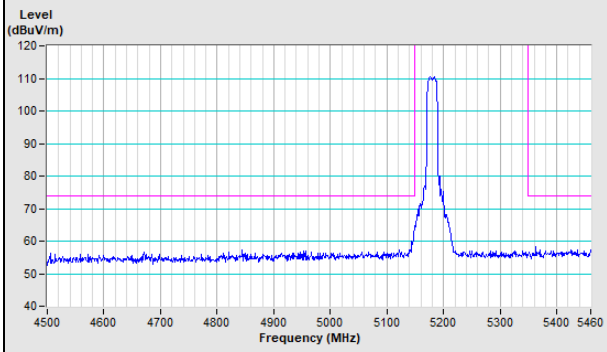
Horizontal (Peak)



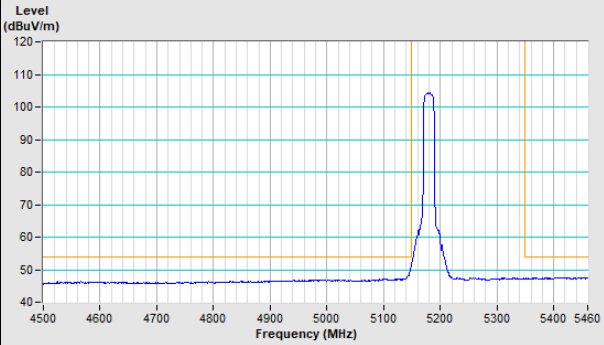
Horizontal (Average)



Vertical (Peak)

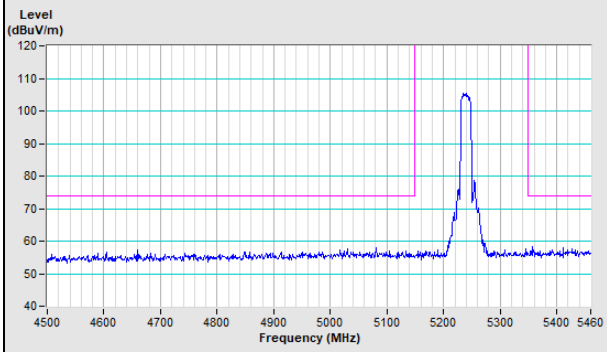


Vertical (Average)

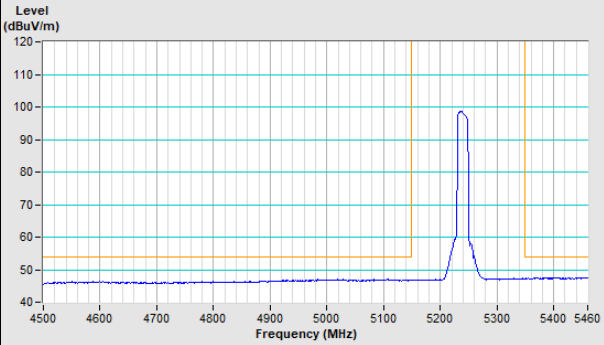


802.11ac (VHT20) Channel 48

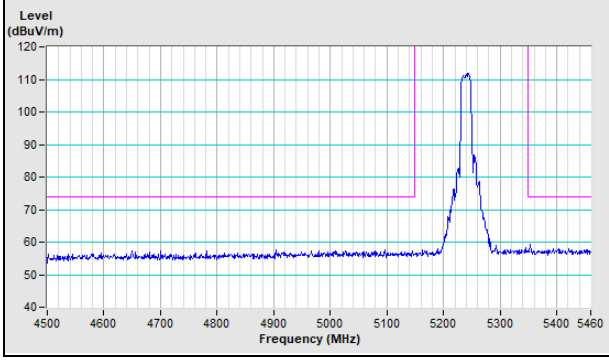
Horizontal (Peak)



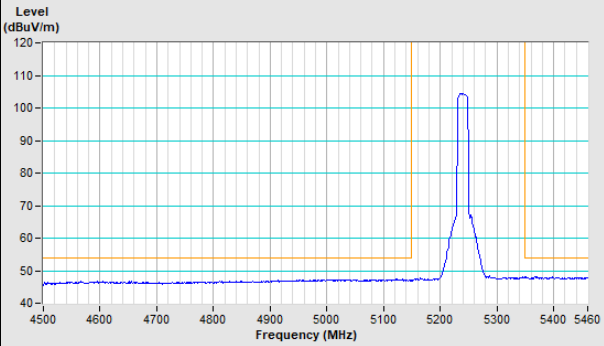
Horizontal (Average)



Vertical (Peak)

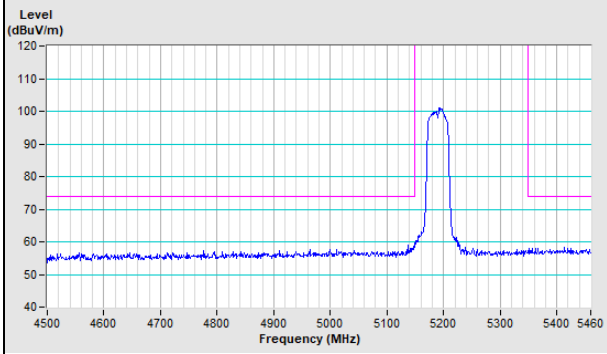


Vertical (Average)

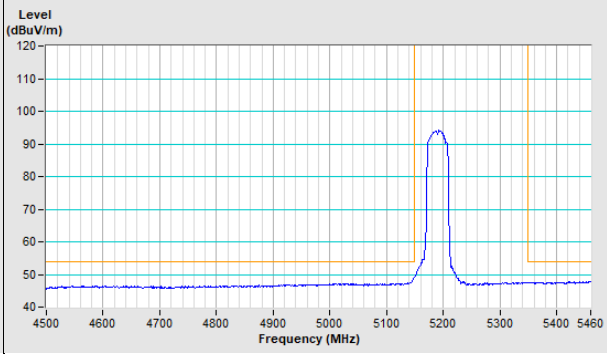


802.11ac (VHT40) Channel 38

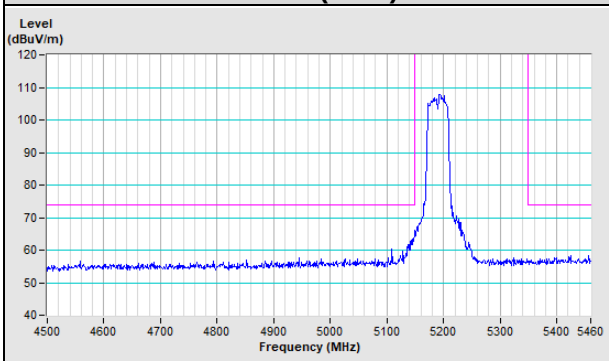
Horizontal (Peak)



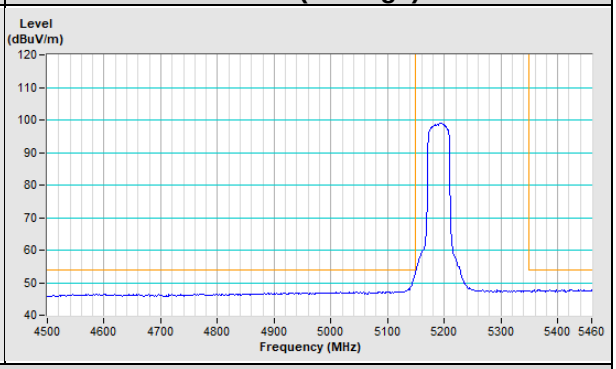
Horizontal (Average)



Vertical (Peak)

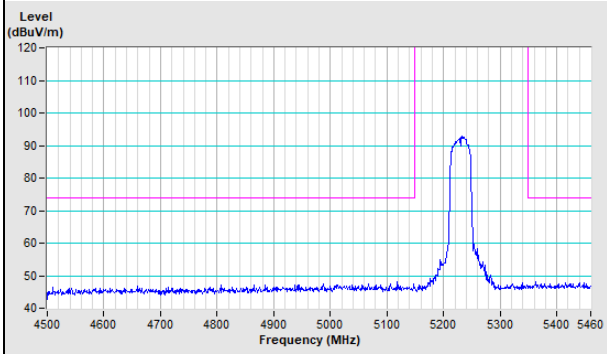


Vertical (Average)

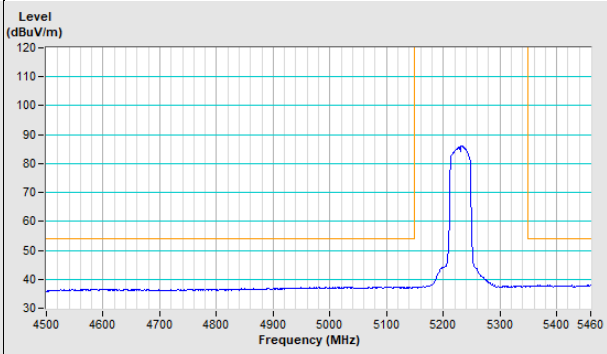


802.11ac (VHT40) Channel 46

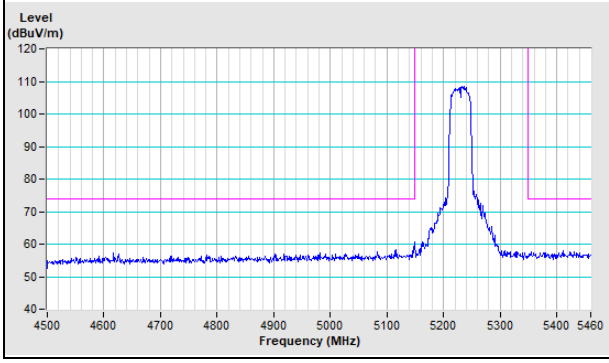
Horizontal (Peak)



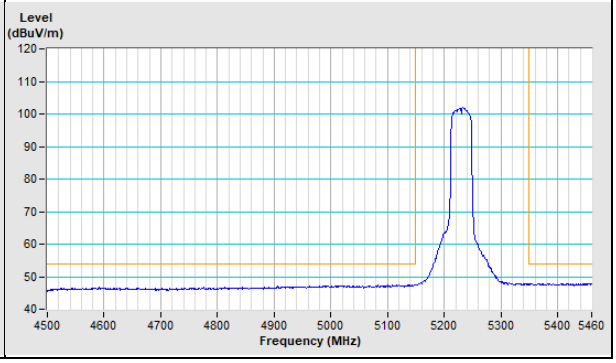
Horizontal (Average)

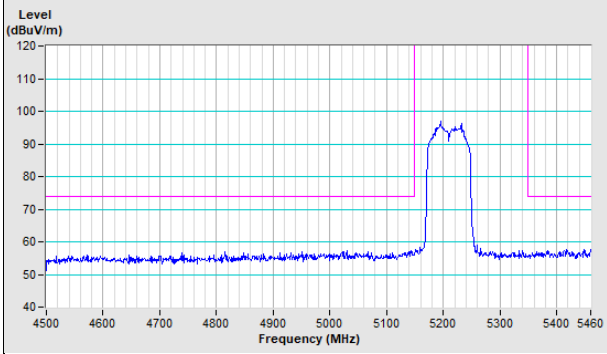
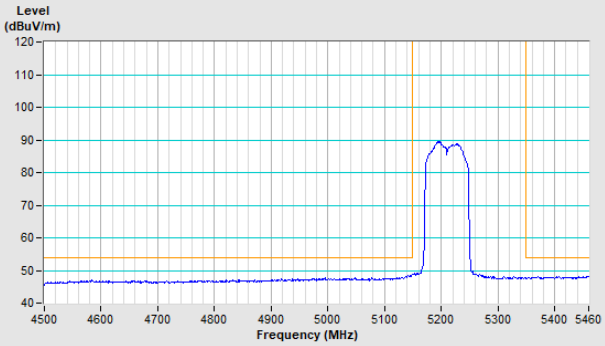
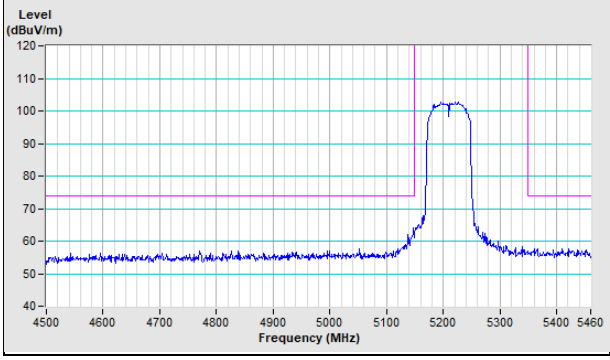
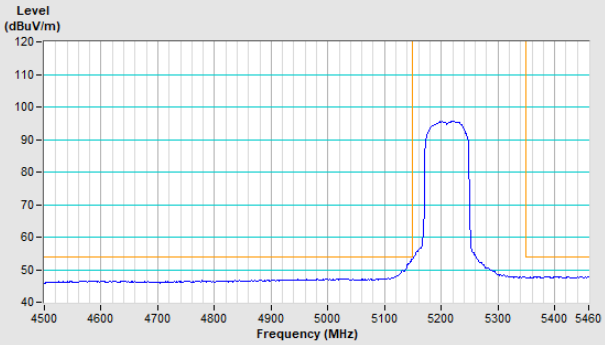


Vertical (Peak)



Vertical (Average)



802.11ac (VHT80) Channel 42	
Horizontal (Peak)	**Horizontal (Average)**
	
Vertical (Peak)	**Vertical (Average)**
	

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.

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

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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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