

FCC Test Report

Report No.: RF200703E03-1

FCC ID: UXX-S5A036A

Test Model: S5A037A

Series Model: S5A036A

Received Date: July 03, 2020

Test Date: July 08 to 27, 2020

Issued Date: Aug. 11, 2020

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**FCC Registration /
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Release Control Record

Issue No.	Description	Date Issued
RF200703E03-1	Original release.	Aug. 11, 2020

1 Certificate of Conformity

Product: Enterprise Branch Router

Brand: cradlepoint

Test Model: S5A037A

Series Model: S5A036A

Sample Status: ENGINEERING SAMPLE

Applicant: Cradlepoint, Inc

Test Date: July 08 to 27, 2020

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 EMC characteristics under the conditions specified in this report.

Prepared by : Vivian Huang , **Date:** Aug. 11, 2020
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** Aug. 11, 2020
Clark Lin / Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -5.17dB at 0.36094MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement*	Pass	Meet the requirement of limit. Minimum passing margin is -0.4dB at 11650.00MHz.
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(MHF) not a standard connector.

Note:

1. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OBE test plots were recorded in Annex A.
2. For U-NII-1, U-NII-2A, U-NII-2C band compliance with rule 15.407(b) of the band-edge items, the test plots were recorded in Annex B. Test Procedures refer to report 4.1.3.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	30MHz ~ 1GHz	5.1 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Enterprise Branch Router
Brand	cradlepoint
Test Model	S5A037A
Series Model	S5A036A
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter or 7.26Vdc from battery
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 in 2.4GHz
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 866.7 Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20), VHT20: 11 802.11n (HT40), VHT40: 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	CDD Mode: 2.412 ~ 2.462 GHz: 678.631 mW 5.18 ~ 5.24GHz: 245.002mW 5.745 ~ 5.825GHz: 248.321mW Beamforming Mode: 2.412 ~ 2.462 GHz: 678.631 mW 5.18 ~ 5.24GHz: 245.002mW 5.745 ~ 5.825GHz: 248.321mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter × 1, Battery x1
Cable Supplied	NA

Note:

1. There are WLAN and LTE technology used for the EUT.
2. The EUT has below model names, which are identical to each other in all aspects except for the following table:

Brand	Product Marketing Name (PMN)	Model	Wi-Fi Function	Embedded Radio (WWAN Module)	Description
cradlepoint	E110-C4D	S5A036A	Yes	Brand: Quectel Model: EC-25AF	1. Different location of LED.
	E100-C4D	S5A037A	Yes	Contains FCC ID: XMR201808EC25AF Contains IC: 10224A-2018EC25AF	2. GPS antenna: Built in: S5A036A, External: S5A037A 3. Different housing.

Note: The EUT was pre-tested with above models, the worst case was found in S5A037A. Therefore only the test data of the model was recorded in this report.

3. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3
WLAN (2.4GHz)	WLAN (5GHz)	WWAN

4. Simultaneously transmission condition.

Condition	Technology
1	WWAN + WLAN (2.4GHz)
2	WWAN + WLAN (5GHz)
3	WLAN (2.4GHz) + WLAN (5GHz)
4	WWAN + WLAN (2.4GHz) + WLAN (5GHz)

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

5. The EUT must be supplied with a power and the following different models could be chosen:

Adapter			
No	Brand	Model No.	Spec.
1	KUANTECH	KSA-36W-120300D5	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
2	Asian Power Devices	WA-36A12R	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
3	Asian Power Devices	WA-36N12R	Input: 100-240V, 1A, 50-60Hz Output: 12V, 3A DC output cable (Unshielded, 1.5 m)
Battery			
No	Brand	Model No.	Spec.
1	Getac	170848-000	7.26V 7800Ah 56.62Wh

Note:

- From the above adapters, the AC Power Conducted Emissions test worst case was found in **Adapter No.: 3**. Therefore only the test data of the mode was recorded in this report.
- From the above adapters and battery, the Radiated Emissions test worst case was found in **Adapter No.: 1**. Therefore only the test data of the mode was recorded in this report.

6. The antennas provided to the EUT, please refer to the following table:

WLAN Antenna								
Ant. No.	RF Chain No.	Brand	Ant. Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)	Cable Loss (dB)
1	WiFi Chain0	cradlepoint	2.9	2.4~2.4835	PCB	i-pex(MHF)	130	Including
			2.8	5.15~5.25				
			3.1	5.725~5.85				
2	WiFi Chain1	cradlepoint	2.9	2.4~2.4835	PCB	i-pex(MHF)	230	Including
			2.8	5.15~5.25				
			3.1	5.725~5.85				
WWAN Antenna								
Antenna No.		Band		Freq. Range (MHz)		Gain (dBi)		Antenna Type
1		WCDMA Band 2		1850~1910		1.4		Dipole
		WCDMA Band 4		1710~1755		1.4		
		WCDMA Band 5		824~849		0.72		
		LTE Band 2		1850~1910		1.54		
		LTE Band 4		1710~1755		1.54		
		LTE Band 5		824~849		0.7		
		LTE Band 12		688~716		0.7		
		LTE Band 13		777~787		0.7		
		LTE Band 14		788~798		0.7		
		LTE Band 66		1710~1780		1.54		
		LTE Band 71		663~698		0.7		
2		WCDMA Band 2		1850~1910		1.26		Dipole
		WCDMA Band 4		1710~1755		1.26		
		WCDMA Band 5		824~849		0.65		
		LTE Band 2		1850~1910		1.53		
		LTE Band 4		1710~1755		1.53		
		LTE Band 5		824~849		0.7		
		LTE Band 12		688~716		0.7		
		LTE Band 13		777~787		0.7		
		LTE Band 14		788~798		0.7		
		LTE Band 66		1710~1780		1.53		
		LTE Band 71		663~698		0.7		

7. The EUT incorporates a MIMO function.

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
802.11ac (VHT20)	2TX	2RX
802.11ac (VHT40)	2TX	2RX
802.11ac (VHT80)	2TX	2RX

Note:

1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and non-beamforming mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), the manufacturer will control the power for 802.11n mode is the same as the 802.11ac or more lower than it and investigated worst case to representative mode in test report. (Final test mode refer to section 3.2.1)
8. 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.
9. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

FOR 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	5210 MHz

FOR 5745 ~ 5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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.

CDD Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
802.11ac (VHT80)		155	155	OFDM	BPSK	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.

CDD Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5180-5240 5745-5825	38 to 46 151 to 159	159	OFDM	BPSK	13.5

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.

CDD Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT40)	5180-5240 5745-5825	38 to 46 151 to 159	159	OFDM	BPSK	13.5

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.

CDD Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6
802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	BPSK	6.5
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
802.11ac (VHT80)		155	155	OFDM	BPSK	29.3
Beamforming Mode (output power only)						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11ac (VHT20)	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3
802.11ac (VHT20)	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.5
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	13.5
802.11ac (VHT80)		155	155	OFDM	BPSK	29.3

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE _≥ 1G	23deg. C, 67%RH	120Vac, 60Hz	Ryan Du
RE _{<} 1G	23deg. C, 63%RH	120Vac, 60Hz	Kevin Ko
PLC	25deg. C, 75%RH	120Vac, 60Hz	Kevin Ko
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

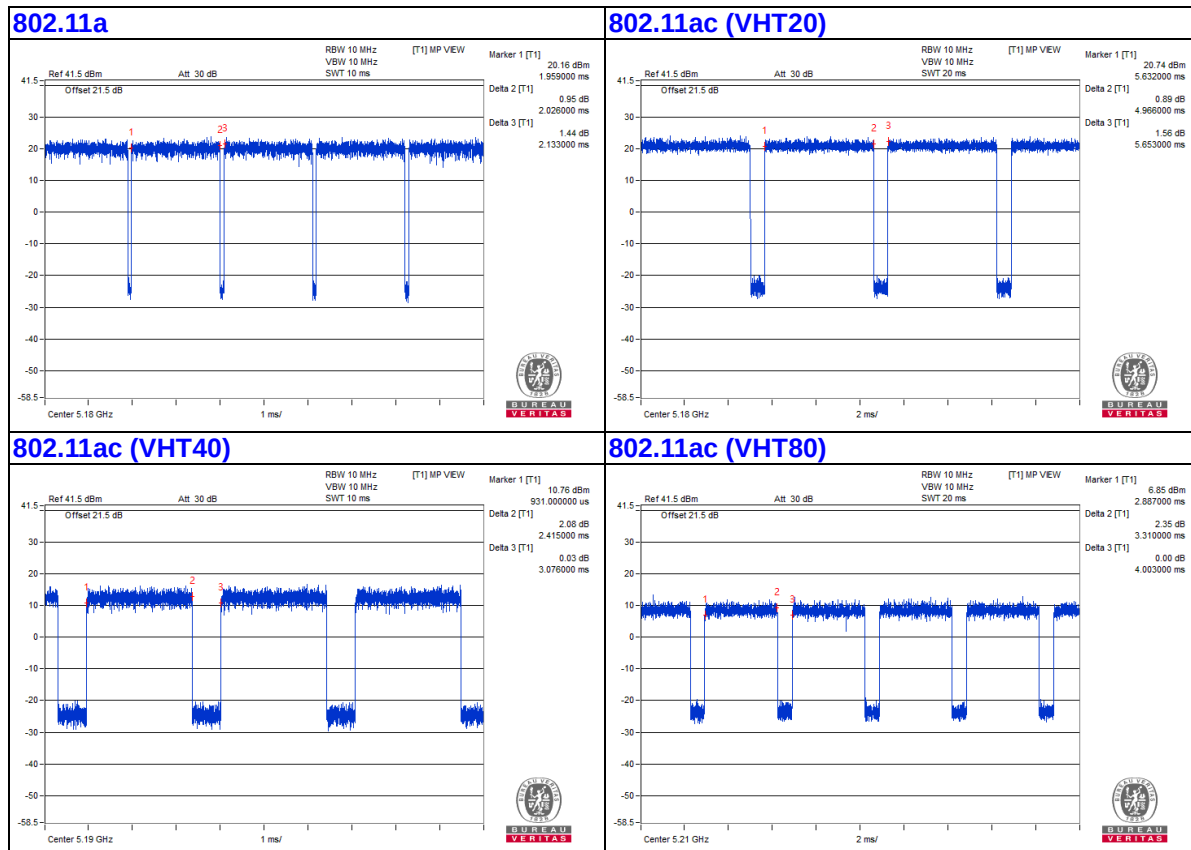
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11a: Duty cycle = 2.026 ms/2.133 ms = 0.95, Duty factor = $10 * \log (1/\text{Duty cycle}) = 0.22$

802.11ac (VHT20): Duty cycle = 4.966 ms/5.653 ms = 0.878, Duty factor = $10 * \log (1/\text{Duty cycle}) = 0.56$ dB

802.11ac (VHT40): Duty cycle = 2.415 ms/3.076 ms = 0.785, Duty factor = $10 * \log (1/\text{Duty cycle}) = 1.05$ dB

802.11ac (VHT80): Duty cycle = 3.31 ms/4.003 ms = 0.827, Duty factor = $10 * \log (1/\text{Duty cycle}) = 0.83$ dB



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.

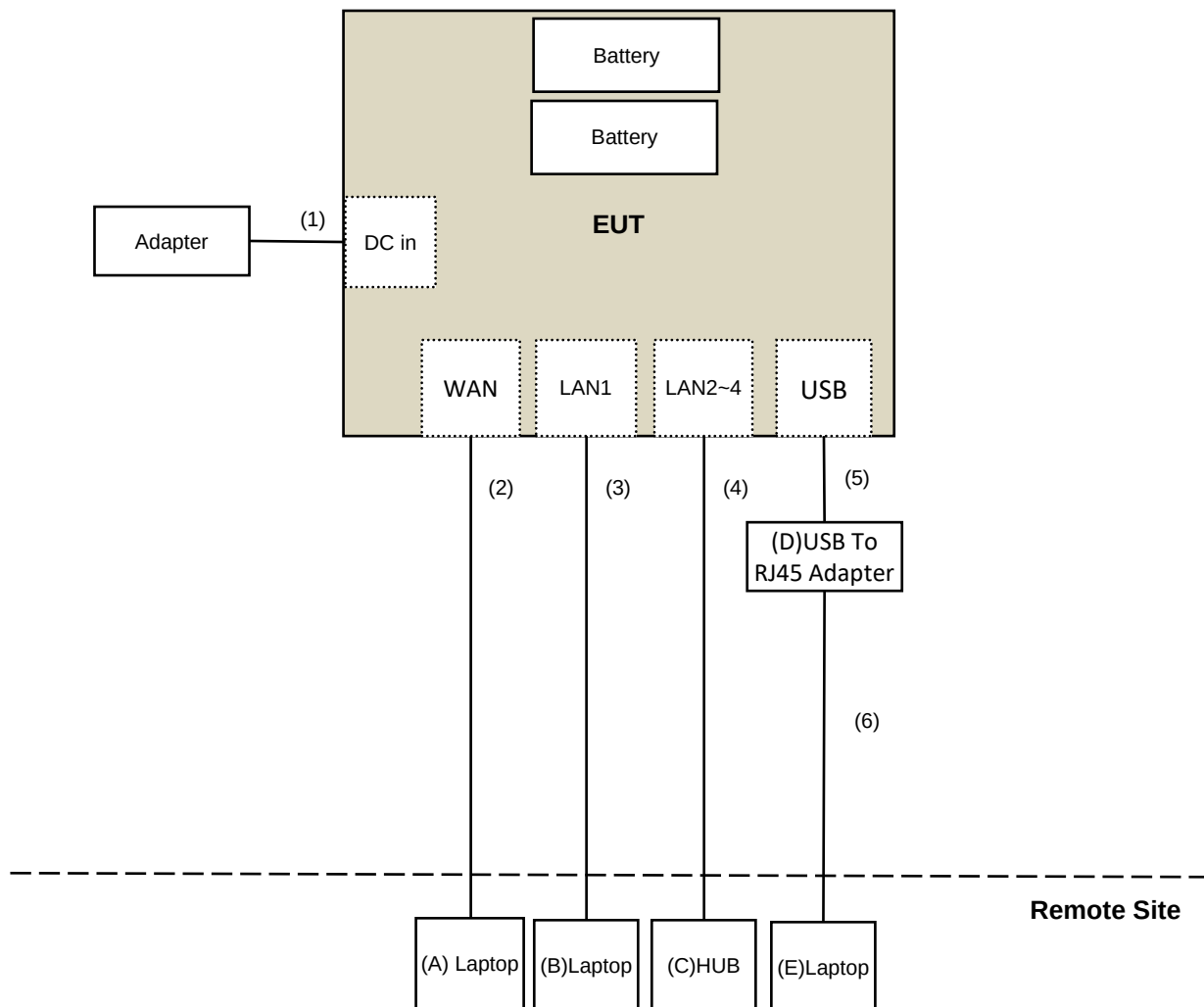
ID	Product	Brand	Model No.	Serial No	FCC ID	Remarks
A.	Laptop	DELL	Latitude E5440	519OP32	FCC DoC	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	HUB	ZyXEL	GS1100-16	S150H44000046	FCC DoC	Provided by Lab
D.	USB To RJ45 Adapter	Uptech	NET130	NA	NA	Supplied by client
E.	Laptop	DELL	E5430	GM1SKV1	FCC DoC	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.5m).

ID	Descriptions (Cables)	Qty	Length (m)	Shielding (Yes/No)	Cores (Number)	Remarks
1	DC Cable	1	1.5	No	0	Supplied by client
2	RJ-45 Cable	1	10	No	0	Provided by Lab
3	RJ-45 Cable	1	10	No	0	Provided by Lab
4	RJ-45 Cable	3	10	No	0	Provided by Lab
5	USB Cable	1	0.1	Yes	0	Supplied by client
6	RJ-45 Cable	1	10	No	0	Provided by Lab

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 (dBuV/m)	AV:54 (dBuV/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(dBuV/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(dBuV/m) ^{*1} PK:105.2 (dBuV/m) ^{*2} PK: 110.8(dBuV/m) ^{*3} PK:122.2 (dBuV/m) ^{*4}
^{*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:

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

4.1.2 Test Instruments

For radiated emission test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 06, 2020	July 05, 2021
Pre-Amplifier EMCi	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	Apr. 28, 2020	Apr. 27, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-3-1	Mar. 17, 2020	Mar. 16, 2021
RF Cable	8D	966-3-2	Mar. 17, 2020	Mar. 16, 2021
RF Cable	8D	966-3-3	Mar. 17, 2020	Mar. 16, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCi	EMC12630SE	980384	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-1200	160922	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180601	June 09, 2020	June 08, 2021
RF Cable	EMC104-SM-SM-6000	180602	June 09, 2020	June 08, 2021
Spectrum Analyzer Keysight	N9030A	MY54490679	July 13, 2020	July 12, 2021
Pre-Amplifier EMCi	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 966 Chamber No. 3.
3. Tested Date: July 22, 2020

For bandedge & OOB test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 06, 2020	July 05, 2021
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-1200	160922	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180601	June 09, 2020	June 08, 2021
RF Cable	EMC104-SM-SM-6000	180602	June 09, 2020	June 08, 2021
Spectrum Analyzer Keysight	N9030A	MY54490679	July 17, 2019	July 16, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 966 Chamber No. 3.
3. Tested Date: July 08 to 10, 2020

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
AC Power Source Extech Electronics	6205	1440452	NA	NA
DC Power Supply Topward	6603D	795558	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 16, 2020	Jan. 15, 2021
True RMS Clamp Meter FLUKE	325	31130711WS	June 06, 2020	June 05, 2021
Voltage Meter FLUKE	179	89610322	Sep. 25, 2019	Sep. 24, 2020
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

- NOTE:**
1. The test was performed in Oven room 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: July 27, 2020

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:

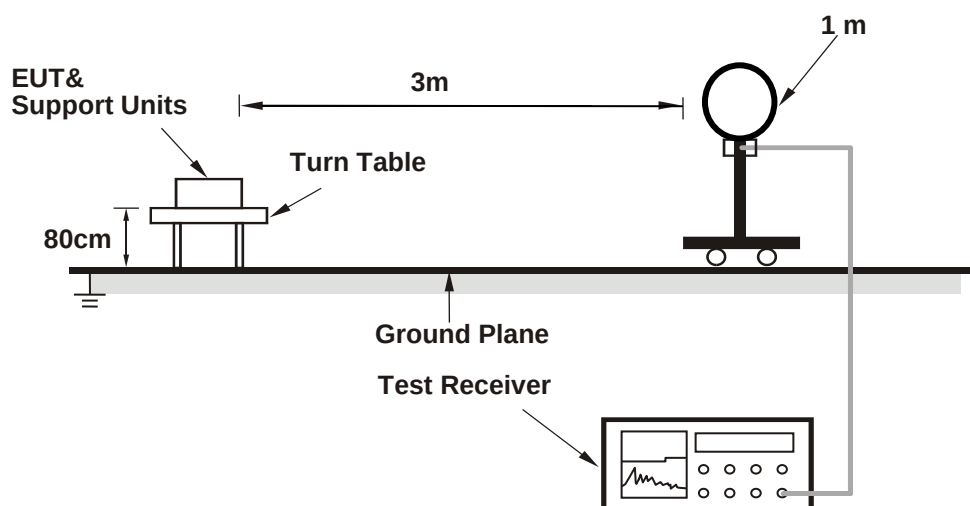
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

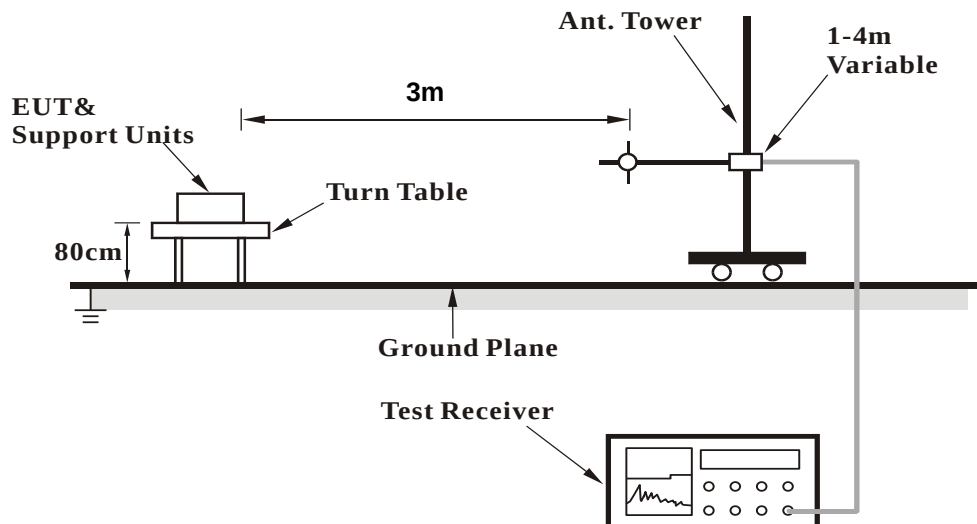
No deviation.

4.1.5 Test Setup

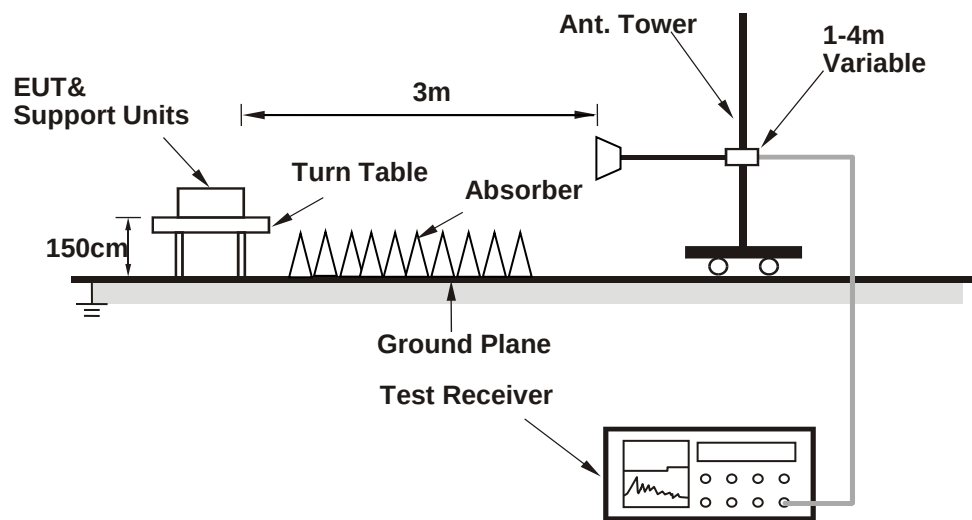
For Radiated emission below 30MHz



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

- Connected the EUT with the Laptop Computer which is placed on remote site.
- Controlling software (QDART_1.0.44) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

802.11a

Channel	TX Channel 36	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	66.2 PK	74.0	-7.8	1.03 H	13	62.5	3.7
2	5150.00	51.1 AV	54.0	-2.9	1.03 H	13	47.4	3.7
3	*5180.00	112.7 PK			1.03 H	13	109.1	3.6
4	*5180.00	103.5 AV			1.03 H	13	99.9	3.6
5	#10360.00	60.2 PK	68.2	-8.0	1.92 H	53	47.5	12.7
6	15540.00	53.8 PK	74.0	-20.2	1.74 H	68	40.6	13.2
7	15540.00	41.9 AV	54.0	-12.1	1.74 H	68	28.7	13.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	67.8 PK	74.0	-6.2	1.09 V	264	64.1	3.7
2	5150.00	53.0 AV	54.0	-1.0	1.09 V	264	49.3	3.7
3	*5180.00	115.8 PK			1.09 V	264	112.2	3.6
4	*5180.00	106.0 AV			1.09 V	264	102.4	3.6
5	#10360.00	66.4 PK	68.2	-1.8	3.71 V	352	53.7	12.7
6	15540.00	59.8 PK	74.0	-14.2	2.69 V	360	46.6	13.2
7	15540.00	47.6 AV	54.0	-6.4	2.69 V	360	34.4	13.2

Remarks:

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

Channel	TX Channel 40	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	64.7 PK	74.0	-9.3	1.00 H	11	61.0	3.7
2	5150.00	49.7 AV	54.0	-4.3	1.00 H	11	46.0	3.7
3	*5200.00	116.5 PK			1.00 H	11	113.0	3.5
4	*5200.00	106.9 AV			1.00 H	11	103.4	3.5
5	#6420.00	43.9 PK	68.2	-24.3	2.65 H	38	37.9	6.0
6	#10400.00	60.3 PK	68.2	-7.9	1.96 H	66	47.5	12.8
7	15600.00	53.6 PK	74.0	-20.4	1.80 H	60	40.1	13.5
8	15600.00	41.7 AV	54.0	-12.3	1.80 H	60	28.2	13.5
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	65.5 PK	74.0	-8.5	1.12 V	269	61.8	3.7
2	5150.00	50.6 AV	54.0	-3.4	1.12 V	269	46.9	3.7
3	*5200.00	119.2 PK			1.12 V	269	115.7	3.5
4	*5200.00	109.7 AV			1.12 V	269	106.2	3.5
5	#6420.00	48.5 PK	68.2	-19.7	2.58 V	360	42.5	6.0
6	#10400.00	66.7 PK	68.2	-1.5	3.73 V	348	53.9	12.8
7	15600.00	59.2 PK	74.0	-14.8	2.64 V	360	45.7	13.5
8	15600.00	47.2 AV	54.0	-6.8	2.64 V	360	33.7	13.5

Remarks:

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

Channel	TX Channel 48	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	51.4 PK	74.0	-22.6	1.02 H	13	47.7	3.7
2	5150.00	39.0 AV	54.0	-15.0	1.02 H	13	35.3	3.7
3	*5240.00	115.4 PK			1.02 H	13	111.9	3.5
4	*5240.00	105.8 AV			1.02 H	13	102.3	3.5
5	5350.00	52.6 PK	74.0	-21.4	1.02 H	13	49.2	3.4
6	5350.00	39.9 AV	54.0	-14.1	1.02 H	13	36.5	3.4
7	#10480.00	59.8 PK	68.2	-8.4	1.90 H	51	46.7	13.1
8	15720.00	53.6 PK	74.0	-20.4	1.79 H	67	39.8	13.8
9	15720.00	41.9 AV	54.0	-12.1	1.79 H	67	28.1	13.8
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	51.9 PK	74.0	-22.1	1.13 V	259	48.2	3.7
2	5150.00	41.0 AV	54.0	-13.0	1.13 V	259	37.3	3.7
3	*5240.00	118.0 PK			1.13 V	259	114.5	3.5
4	*5240.00	108.3 AV			1.13 V	259	104.8	3.5
5	5350.00	51.0 PK	74.0	-23.0	1.13 V	259	47.6	3.4
6	5350.00	39.9 AV	54.0	-14.1	1.13 V	259	36.5	3.4
7	#10480.00	66.4 PK	68.2	-1.8	3.70 V	359	53.3	13.1
8	15720.00	59.5 PK	74.0	-14.5	2.63 V	360	45.7	13.8
9	15720.00	47.5 AV	54.0	-6.5	2.63 V	360	33.7	13.8

Remarks:

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

Channel	TX Channel 149	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5745.00	112.6 PK			1.06 H	6	108.6	4.0
2	*5745.00	103.3 AV			1.06 H	6	99.3	4.0
3	11490.00	55.9 PK	74.0	-18.1	1.45 H	261	42.6	13.3
4	11490.00	45.7 AV	54.0	-8.3	1.45 H	261	32.4	13.3
5	#17235.00	53.3 PK	68.2	-14.9	1.83 H	82	35.7	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5745.00	117.3 PK			1.14 V	266	113.3	4.0
2	*5745.00	107.9 AV			1.14 V	266	103.9	4.0
3	11490.00	64.1 PK	74.0	-9.9	2.58 V	359	50.8	13.3
4	11490.00	53.5 AV	54.0	-0.5	2.58 V	359	40.2	13.3
5	#17235.00	56.6 PK	68.2	-11.6	2.37 V	360	39.0	17.6

Remarks:

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

Channel	TX Channel 157	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5785.00	113.1 PK			1.06 H	6	109.0	4.1
2	*5785.00	103.8 AV			1.06 H	6	99.7	4.1
3	11570.00	56.0 PK	74.0	-18.0	1.49 H	259	42.8	13.2
4	11570.00	45.8 AV	54.0	-8.2	1.49 H	259	32.6	13.2
5	#17355.00	52.9 PK	68.2	-15.3	1.80 H	93	35.3	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5785.00	118.0 PK			1.13 V	266	113.9	4.1
2	*5785.00	108.4 AV			1.13 V	266	104.3	4.1
3	11570.00	64.2 PK	74.0	-9.8	3.53 V	359	51.0	13.2
4	11570.00	53.4 AV	54.0	-0.6	3.53 V	359	40.2	13.2
5	#17355.00	56.9 PK	68.2	-11.3	2.32 V	360	39.3	17.6

Remarks:

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

Channel	TX Channel 165	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5825.00	113.1 PK			1.03 H	9	108.8	4.3
2	*5825.00	103.8 AV			1.03 H	9	99.5	4.3
3	11650.00	56.2 PK	74.0	-17.8	1.53 H	259	42.9	13.3
4	11650.00	46.2 AV	54.0	-7.8	1.53 H	259	32.9	13.3
5	#17475.00	53.3 PK	68.2	-14.9	1.85 H	98	35.4	17.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5825.00	118.1 PK			1.16 V	267	113.8	4.3
2	*5825.00	108.8 AV			1.16 V	267	104.5	4.3
3	11650.00	64.4 PK	74.0	-9.6	3.48 V	355	51.1	13.3
4	11650.00	53.6 AV	54.0	-0.4	3.48 V	355	40.3	13.3
5	#17475.00	56.8 PK	68.2	-11.4	2.30 V	360	38.9	17.9

Remarks:

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

802.11ac (VHT20)

Channel	TX Channel 36	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	69.3 PK	74.0	-4.7	1.21 H	13	65.6	3.7
2	5150.00	52.8 AV	54.0	-1.2	1.21 H	13	49.1	3.7
3	*5180.00	112.7 PK			1.21 H	13	109.1	3.6
4	*5180.00	102.5 AV			1.21 H	13	98.9	3.6
5	#10360.00	60.4 PK	68.2	-7.8	1.88 H	28	47.7	12.7
6	15540.00	53.7 PK	74.0	-20.3	1.75 H	54	40.5	13.2
7	15540.00	42.1 AV	54.0	-11.9	1.75 H	54	28.9	13.2

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	67.2 PK	74.0	-6.8	1.12 V	254	63.5	3.7
2	5150.00	52.7 AV	54.0	-1.3	1.12 V	254	49.0	3.7
3	*5180.00	116.7 PK			1.12 V	254	113.1	3.6
4	*5180.00	106.6 AV			1.12 V	254	103.0	3.6
5	#10360.00	66.2 PK	68.2	-2.0	3.70 V	360	53.5	12.7
6	15540.00	59.6 PK	74.0	-14.4	2.58 V	360	46.4	13.2
7	15540.00	47.4 AV	54.0	-6.6	2.58 V	360	34.2	13.2

Remarks:

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

Channel	TX Channel 40	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	113.5 PK			1.06 H	10	110.0	3.5
2	*5200.00	104.1 AV			1.06 H	10	100.6	3.5
3	#10400.00	60.2 PK	68.2	-8.0	1.88 H	41	47.4	12.8
4	15600.00	54.1 PK	74.0	-19.9	1.81 H	65	40.6	13.5
5	15600.00	42.1 AV	54.0	-11.9	1.81 H	65	28.6	13.5
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	118.0 PK			1.23 V	267	114.5	3.5
2	*5200.00	107.5 AV			1.23 V	267	104.0	3.5
3	#10400.00	66.8 PK	68.2	-1.4	3.65 V	351	54.0	12.8
4	15600.00	59.1 PK	74.0	-14.9	2.63 V	360	45.6	13.5
5	15600.00	47.2 AV	54.0	-6.8	2.63 V	360	33.7	13.5

Remarks:

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

Channel	TX Channel 48	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	51.9 PK	74.0	-22.1	1.11 H	8	48.2	3.7
2	5150.00	40.1 AV	54.0	-13.9	1.11 H	8	36.4	3.7
3	*5240.00	113.9 PK			1.11 H	8	110.4	3.5
4	*5240.00	104.7 AV			1.11 H	8	101.2	3.5
5	5350.00	51.0 PK	74.0	-23.0	1.11 H	8	47.6	3.4
6	5350.00	40.0 AV	54.0	-14.0	1.11 H	8	36.6	3.4
7	#10480.00	60.5 PK	68.2	-7.7	1.91 H	57	47.4	13.1
8	15720.00	54.5 PK	74.0	-19.5	1.84 H	71	40.7	13.8
9	15720.00	42.3 AV	54.0	-11.7	1.84 H	71	28.5	13.8
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	51.4 PK	74.0	-22.6	1.13 V	272	47.7	3.7
2	5150.00	41.8 AV	54.0	-12.2	1.13 V	272	38.1	3.7
3	*5240.00	117.7 PK			1.13 V	272	114.2	3.5
4	*5240.00	107.5 AV			1.13 V	272	104.0	3.5
5	5350.00	50.7 PK	74.0	-23.3	1.13 V	272	47.3	3.4
6	5350.00	39.8 AV	54.0	-14.2	1.13 V	272	36.4	3.4
7	#10480.00	66.9 PK	68.2	-1.3	3.64 V	350	53.8	13.1
8	15720.00	59.6 PK	74.0	-14.4	2.62 V	360	45.8	13.8
9	15720.00	47.4 AV	54.0	-6.6	2.62 V	360	33.6	13.8

Remarks:

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

Channel	TX Channel 149	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5745.00	114.1 PK			1.06 H	6	110.1	4.0
2	*5745.00	103.8 AV			1.06 H	6	99.8	4.0
3	11490.00	55.8 PK	74.0	-18.2	1.41 H	262	42.5	13.3
4	11490.00	45.4 AV	54.0	-8.6	1.41 H	262	32.1	13.3
5	#17235.00	52.8 PK	68.2	-15.4	1.45 H	259	35.2	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5745.00	117.0 PK			1.15 V	265	113.0	4.0
2	*5745.00	107.6 AV			1.15 V	265	103.6	4.0
3	11490.00	67.1 PK	74.0	-6.9	3.58 V	358	53.8	13.3
4	11490.00	53.3 AV	54.0	-0.7	3.58 V	358	40.0	13.3
5	#17235.00	56.9 PK	68.2	-11.3	2.29 V	354	39.3	17.6

Remarks:

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

Channel	TX Channel 157	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5785.00	114.8 PK			1.04 H	5	110.7	4.1
2	*5785.00	104.0 AV			1.04 H	5	99.9	4.1
3	11570.00	55.3 PK	74.0	-18.7	1.35 H	271	42.1	13.2
4	11570.00	45.0 AV	54.0	-9.0	1.35 H	271	31.8	13.2
5	#17355.00	52.8 PK	68.2	-15.4	1.48 H	269	35.2	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5785.00	118.0 PK			1.14 V	267	113.9	4.1
2	*5785.00	108.2 AV			1.14 V	267	104.1	4.1
3	11570.00	66.9 PK	74.0	-7.1	4.00 V	355	53.7	13.2
4	11570.00	53.4 AV	54.0	-0.6	4.00 V	355	40.2	13.2
5	#17355.00	57.5 PK	68.2	-10.7	2.30 V	347	39.9	17.6

Remarks:

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

Channel	TX Channel 165	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5825.00	114.4 PK			1.08 H	6	110.1	4.3
2	*5825.00	104.1 AV			1.08 H	6	99.8	4.3
3	11650.00	55.4 PK	74.0	-18.6	1.41 H	249	42.1	13.3
4	11650.00	45.3 AV	54.0	-8.7	1.41 H	249	32.0	13.3
5	#17475.00	52.9 PK	68.2	-15.3	1.43 H	281	35.0	17.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5825.00	117.5 PK			1.13 V	266	113.2	4.3
2	*5825.00	108.4 AV			1.13 V	266	104.1	4.3
3	11650.00	66.4 PK	74.0	-7.6	3.58 V	354	53.1	13.3
4	11650.00	53.1 AV	54.0	-0.9	3.58 V	354	39.8	13.3
5	#17475.00	57.7 PK	68.2	-10.5	2.33 V	345	39.8	17.9

Remarks:

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

802.11ac (VHT40)

Channel	TX Channel 38	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	62.1 PK	74.0	-11.9	1.00 H	14	58.4	3.7
2	5150.00	50.7 AV	54.0	-3.3	1.00 H	14	47.0	3.7
3	*5190.00	104.1 PK			1.00 H	14	100.5	3.6
4	*5190.00	95.4 AV			1.00 H	14	91.8	3.6
5	#10380.00	59.7 PK	68.2	-8.5	1.94 H	52	47.0	12.7
6	15570.00	55.1 PK	74.0	-18.9	1.84 H	85	41.7	13.4
7	15570.00	41.4 AV	54.0	-12.6	1.84 H	85	28.0	13.4

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	66.3 PK	74.0	-7.7	1.02 V	263	62.6	3.7
2	5150.00	53.5 AV	54.0	-0.5	1.02 V	263	49.8	3.7
3	*5190.00	106.5 PK			1.02 V	263	102.9	3.6
4	*5190.00	97.5 AV			1.02 V	263	93.9	3.6
5	#10380.00	65.4 PK	68.2	-2.8	3.68 V	343	52.7	12.7
6	15570.00	58.3 PK	74.0	-15.7	2.57 V	360	44.9	13.4
7	15570.00	46.4 AV	54.0	-7.6	2.57 V	360	33.0	13.4

Remarks:

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

Channel	TX Channel 46	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	59.6 PK	74.0	-14.4	1.06 H	12	55.9	3.7
2	5150.00	45.7 AV	54.0	-8.3	1.06 H	12	42.0	3.7
3	*5230.00	110.0 PK			1.06 H	12	106.5	3.5
4	*5230.00	100.9 AV			1.06 H	12	97.4	3.5
5	5350.00	51.8 PK	74.0	-22.2	1.06 H	12	48.4	3.4
6	5350.00	40.4 AV	54.0	-13.6	1.06 H	12	37.0	3.4
7	#10460.00	59.9 PK	68.2	-8.3	1.97 H	38	46.9	13.0
8	15690.00	55.1 PK	74.0	-18.9	1.79 H	94	41.2	13.9
9	15690.00	42.7 AV	54.0	-11.3	1.79 H	94	28.8	13.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	61.0 PK	74.0	-13.0	1.02 V	263	57.3	3.7
2	5150.00	47.0 AV	54.0	-7.0	1.02 V	263	43.3	3.7
3	*5230.00	112.3 PK			1.02 V	263	108.8	3.5
4	*5230.00	102.9 AV			1.02 V	263	99.4	3.5
5	5350.00	51.6 PK	74.0	-22.4	1.02 V	263	48.2	3.4
6	5350.00	40.3 AV	54.0	-13.7	1.02 V	263	36.9	3.4
7	#10460.00	66.2 PK	68.2	-2.0	3.66 V	335	53.2	13.0
8	15690.00	59.8 PK	74.0	-14.2	2.55 V	360	45.9	13.9
9	15690.00	47.8 AV	54.0	-6.2	2.55 V	360	33.9	13.9

Remarks:

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

Channel	TX Channel 151	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5755.00	110.8 PK			1.10 H	7	106.8	4.0
2	*5755.00	101.4 AV			1.10 H	7	97.4	4.0
3	11510.00	58.4 PK	74.0	-15.6	1.63 H	266	45.1	13.3
4	11510.00	47.1 AV	54.0	-6.9	1.63 H	266	33.8	13.3
5	#17265.00	53.2 PK	68.2	-15.0	1.44 H	282	35.7	17.5
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	*5755.00	115.5 PK			1.14 V	265	111.5	4.0
2	*5755.00	106.3 AV			1.14 V	265	102.3	4.0
3	11510.00	64.5 PK	74.0	-9.5	3.76 V	360	51.2	13.3
4	11510.00	53.2 AV	54.0	-0.8	3.76 V	360	39.9	13.3
5	#17265.00	57.4 PK	68.2	-10.8	2.36 V	331	39.9	17.5

Remarks:

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

Channel	TX Channel 159	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	*5795.00	110.4 PK			1.06 H	7	106.2	4.2
2	*5795.00	101.0 AV			1.06 H	7	96.8	4.2
3	11590.00	58.6 PK	74.0	-15.4	1.64 H	261	45.3	13.3
4	11590.00	47.5 AV	54.0	-6.5	1.64 H	261	34.2	13.3
5	#17385.00	53.8 PK	68.2	-14.4	1.43 H	271	36.1	17.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5795.00	115.6 PK			1.11 V	267	111.4	4.2
2	*5795.00	106.2 AV			1.11 V	267	102.0	4.2
3	11590.00	63.8 PK	74.0	-10.2	3.52 V	355	50.5	13.3
4	11590.00	53.4 AV	54.0	-0.6	3.52 V	355	40.1	13.3
5	#17385.00	57.1 PK	68.2	-11.1	2.39 V	322	39.4	17.7

Remarks:

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

802.11ac (VHT80)

Channel	TX Channel 42	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		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	64.9 PK	74.0	-9.1	1.00 H	11	61.2	3.7
2	5150.00	53.4 AV	54.0	-0.6	1.00 H	11	49.7	3.7
3	*5210.00	99.8 PK			1.00 H	11	96.2	3.6
4	*5210.00	90.9 AV			1.00 H	11	87.3	3.6
5	5350.00	51.8 PK	74.0	-22.2	1.00 H	11	48.4	3.4
6	5350.00	40.6 AV	54.0	-13.4	1.00 H	11	37.2	3.4
7	#10420.00	59.7 PK	68.2	-8.5	1.96 H	43	46.9	12.8
8	15630.00	53.2 PK	74.0	-20.8	1.81 H	98	39.5	13.7
9	15630.00	38.5 AV	54.0	-15.5	1.81 H	98	24.8	13.7

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	65.0 PK	74.0	-9.0	1.09 V	264	61.3	3.7
2	5150.00	53.5 AV	54.0	-0.5	1.09 V	264	49.8	3.7
3	*5210.00	102.4 PK			1.09 V	264	98.8	3.6
4	*5210.00	92.7 AV			1.09 V	264	89.1	3.6
5	5350.00	52.7 PK	74.0	-21.3	1.09 V	264	49.3	3.4
6	5350.00	41.1 AV	54.0	-12.9	1.09 V	264	37.7	3.4
7	#10420.00	60.2 PK	68.2	-8.0	3.65 V	345	47.4	12.8
8	15630.00	54.4 PK	74.0	-19.6	2.54 V	360	40.7	13.7
9	15630.00	42.0 AV	54.0	-12.0	2.54 V	360	28.3	13.7

Remarks:

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

Channel	TX Channel 155	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 40GHz		Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5775.00	107.6 PK			1.05 H	5	103.5	4.1
2	*5775.00	97.7 AV			1.05 H	5	93.6	4.1
3	11550.00	58.3 PK	74.0	-15.7	1.62 H	258	45.1	13.2
4	11550.00	47.1 AV	54.0	-6.9	1.62 H	258	33.9	13.2
5	#17325.00	53.8 PK	68.2	-14.4	1.76 H	77	36.2	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5775.00	110.2 PK			1.33 V	257	106.1	4.1
2	*5775.00	101.0 AV			1.33 V	257	96.9	4.1
3	11550.00	63.0 PK	74.0	-11.0	3.33 V	358	49.8	13.2
4	11550.00	51.9 AV	54.0	-2.1	3.33 V	358	38.7	13.2
5	#17325.00	55.3 PK	68.2	-12.9	2.71 V	360	37.7	17.6

Remarks:

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

Below 1GHz Data:

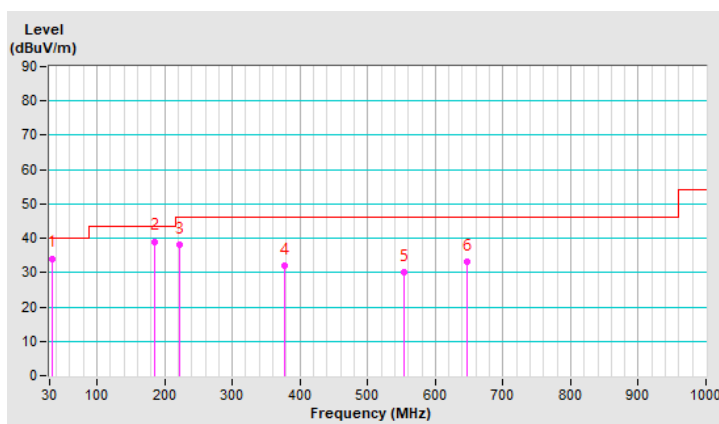
802.11ac (VHT40)

CHANNEL	TX Channel 159	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	34.46	34.1 QP	40.0	-5.9	2.00 H	262	42.7	-8.6
2	185.76	39.1 QP	43.5	-4.4	1.50 H	80	48.1	-9.0
3	221.33	38.1 QP	46.0	-7.9	1.00 H	89	47.8	-9.7
4	377.31	32.0 QP	46.0	-14.0	1.00 H	304	35.6	-3.6
5	554.65	30.1 QP	46.0	-15.9	2.00 H	360	29.4	0.7
6	647.07	33.3 QP	46.0	-12.7	1.50 H	360	30.2	3.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

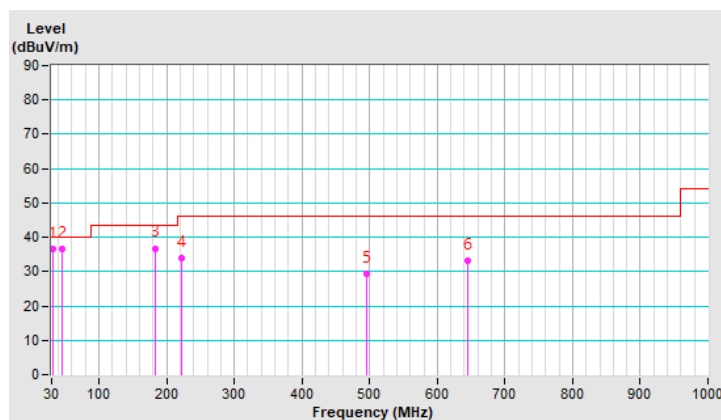


CHANNEL	TX Channel 159	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	32.57	36.6 QP	40.0	-3.4	1.00 V	329	45.4	-8.8
2	46.30	36.4 QP	40.0	-3.6	1.00 V	76	44.1	-7.7
3	182.56	36.8 QP	43.5	-6.7	1.00 V	311	45.5	-8.7
4	221.38	33.8 QP	46.0	-12.2	1.00 V	272	43.5	-9.7
5	495.21	29.3 QP	46.0	-16.7	2.00 V	158	29.8	-0.5
6	644.37	33.3 QP	46.0	-12.7	1.00 V	258	30.2	3.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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	847124/029	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
Fixed attenuator EMCI	STI02-2200-10	003	Aug. 30, 2019	Aug. 29, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
- 3 Tested Date: July 23, 2020

4.2.3 Test Procedure

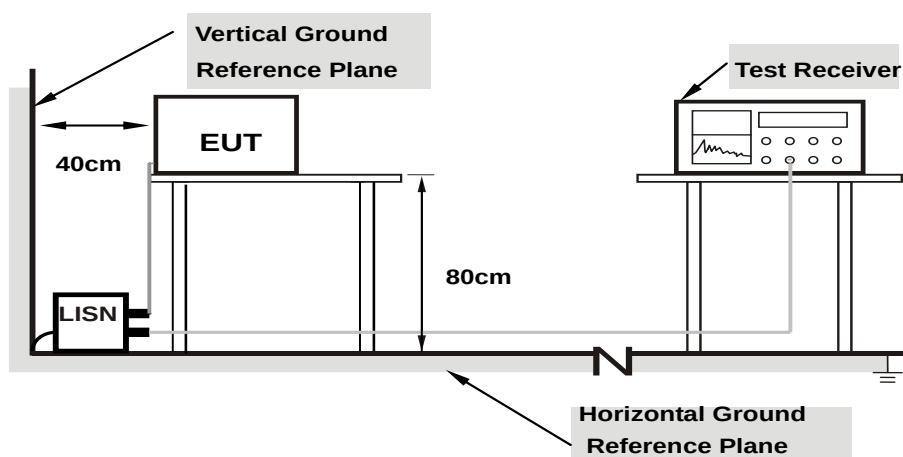
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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 4.1.6.

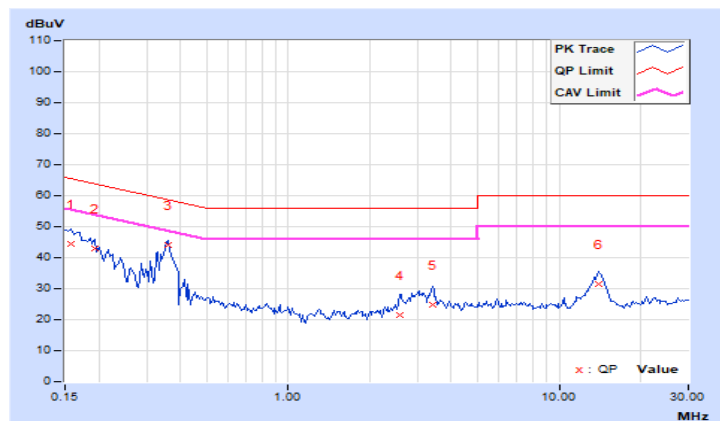
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.98	34.53	16.36	44.51	26.34	65.58	55.58	-21.07	-29.24
2	0.19297	9.99	33.15	25.09	43.14	35.08	63.91	53.91	-20.77	-18.83
3	0.36094	10.01	34.21	33.53	44.22	43.54	58.71	48.71	-14.49	-5.17
4	2.58203	10.18	11.22	-3.12	21.40	7.06	56.00	46.00	-34.60	-38.94
5	3.39844	10.23	14.74	3.16	24.97	13.39	56.00	46.00	-31.03	-32.61
6	14.03516	10.96	20.57	13.68	31.53	24.64	60.00	50.00	-28.47	-25.36

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

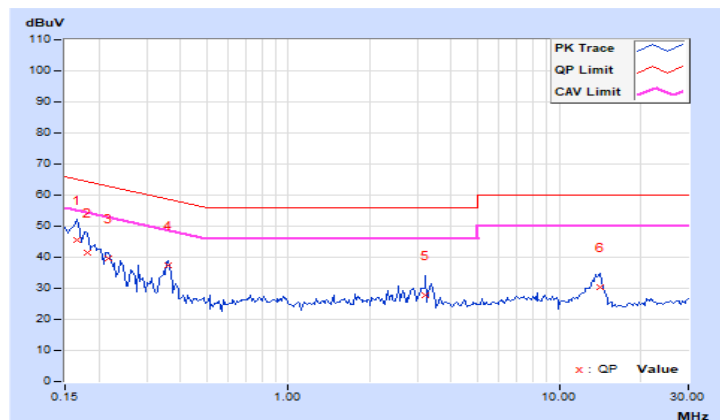


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.99	35.50	25.95	45.49	35.94	65.18	55.18	-19.69	-19.24
2	0.18125	10.00	31.46	13.15	41.46	23.15	64.43	54.43	-22.97	-31.28
3	0.21641	10.00	29.62	21.50	39.62	31.50	62.96	52.96	-23.34	-21.46
4	0.36094	10.02	27.23	26.32	37.25	36.34	58.71	48.71	-21.46	-12.37
5	3.19922	10.23	17.56	5.90	27.79	16.13	56.00	46.00	-28.21	-29.87
6	14.12109	10.82	19.55	13.55	30.37	24.37	60.00	50.00	-29.63	-25.63

Remarks:

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



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p $\leq$ 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)
	√	Mobile and Portable 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 $N_{ANT} \leq 4$;

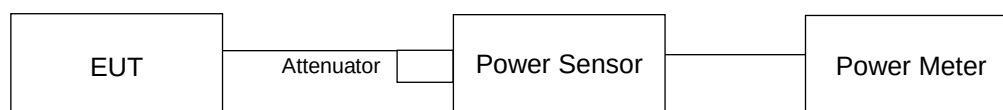
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

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.

Note: This device can support different category application which switched by access point mode and client mode by software.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. 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 Results

CDD Mode

802.11a

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	18.41	18.44	139.166	21.44	30.00	Pass
40	5200	20.59	20.88	237.013	23.75	30.00	Pass
48	5240	19.93	19.63	190.234	22.79	30.00	Pass
149	5745	18.49	19.13	152.478	21.83	30.00	Pass
157	5785	19.47	19.16	170.925	22.33	30.00	Pass
165	5825	19.33	19.39	172.6	22.37	30.00	Pass

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	18.50	18.36	139.343	21.44	30.00	Pass
40	5200	20.77	20.99	245.002	23.89	30.00	Pass
48	5240	20.43	20.36	219.05	23.41	30.00	Pass
149	5745	18.98	19.44	166.97	22.23	30.00	Pass
157	5785	19.27	19.66	176.998	22.48	30.00	Pass
165	5825	19.49	19.33	174.624	22.42	30.00	Pass

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	12.98	12.76	38.741	15.88	30.00	Pass
46	5230	18.49	18.44	140.455	21.48	30.00	Pass
151	5755	20.32	21.19	239.169	23.79	30.00	Pass
159	5795	20.73	21.14	248.321	23.95	30.00	Pass

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	11.52	11.36	27.868	14.45	30.00	Pass
155	5775	19.11	18.93	159.633	22.03	30.00	Pass

Beamforming Mode

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
36	5180	18.50	18.36	139.343	21.44	30.00	Pass
40	5200	20.77	20.99	245.002	23.89	30.00	Pass
48	5240	20.43	20.36	219.05	23.41	30.00	Pass
149	5745	18.98	19.44	166.97	22.23	29.89	Pass
157	5785	19.27	19.66	176.998	22.48	29.89	Pass
165	5825	19.49	19.33	174.624	22.42	29.89	Pass

Note: 1. For U-NII-1: Directional gain = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, so the power limit shall not be reduced.

2. For U-NII-3: Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.11 - 6) = 29.89\text{dBm}$.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
38	5190	12.98	12.76	38.741	15.88	30.00	Pass
46	5230	18.49	18.44	140.455	21.48	30.00	Pass
151	5755	20.32	21.19	239.169	23.79	29.89	Pass
159	5795	20.73	21.14	248.321	23.95	29.89	Pass

Note: 1. For U-NII-1: Directional gain = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, so the power limit shall not be reduced.

2. For U-NII-3: Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.11 - 6) = 29.89\text{dBm}$.

802.11ac (VHT80)

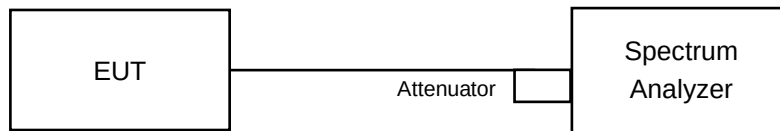
Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	11.52	11.36	27.868	14.45	30.00	Pass
155	5775	19.11	18.93	159.633	22.03	29.89	Pass

Note: 1. For U-NII-1: Directional gain = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, so the power limit shall not be reduced.

2. For U-NII-3: Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.11 - 6) = 29.89\text{dBm}$.

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

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	16.8	16.92
40	5200	19.08	22.68
48	5240	17.04	19.56
149	5745	16.8	20.88
157	5785	17.04	20.52
165	5825	17.04	20.4

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	18.12	18.12
40	5200	21	23.52
48	5240	19.32	18.36
149	5745	18.12	23.28
157	5785	18.24	23.76
165	5825	18.12	23.64

802.11ac (VHT40)

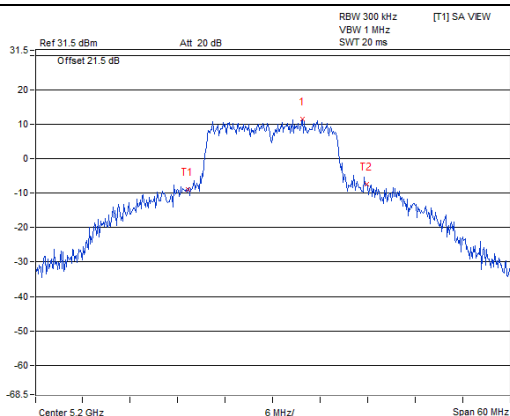
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	36.24	36.24
46	5230	36.72	37.2
151	5755	48	49.2
159	5795	39.36	46.8

802.11ac (VHT80)

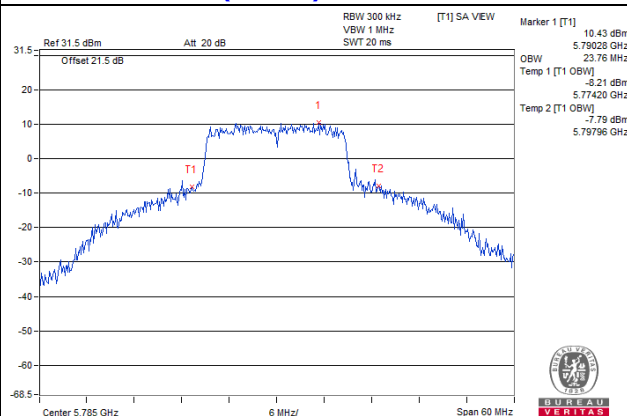
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	75.84	76.32
155	5775	76.8	83.04

Spectrum Plot of Max. Value

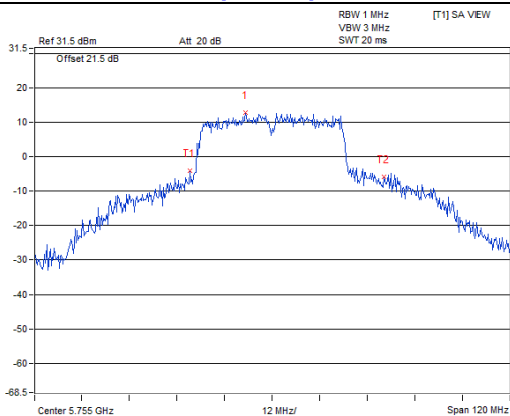
802.11a_Chain 1 / CH40



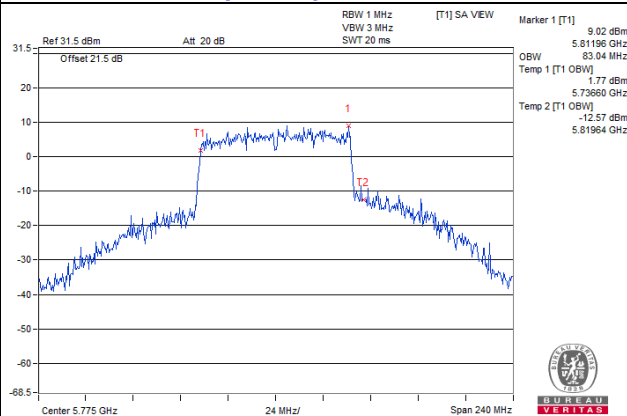
802.11ac (VHT20)_Chain 1 / CH157



802.11ac (VHT40)_Chain 1 / CH151

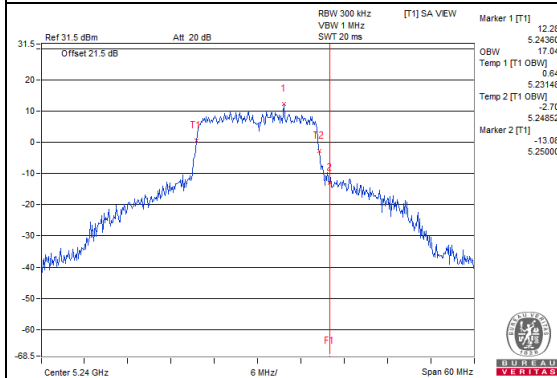


802.11ac (VHT80)_Chain 1 / CH155

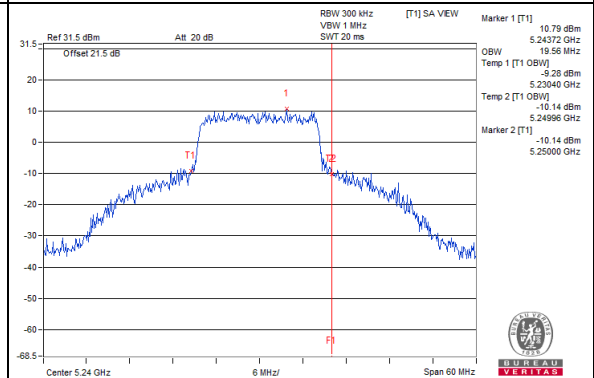


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

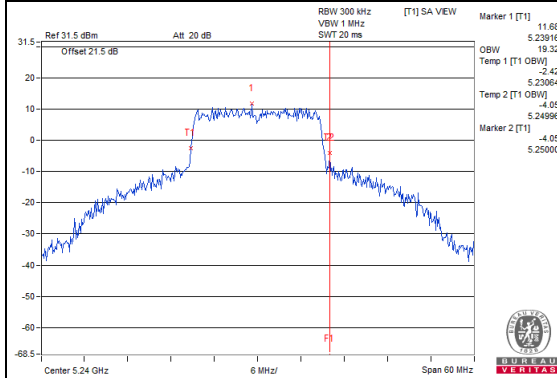
802.11a_Chain 0 / CH48



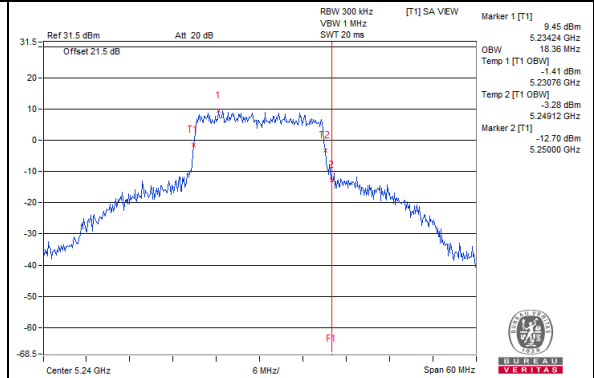
802.11a_Chain 1 / CH48



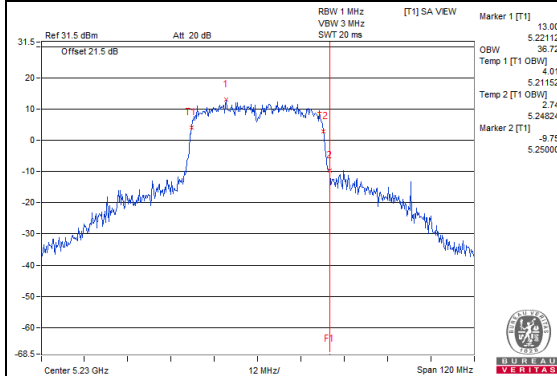
802.11ac (VHT20)_Chain 0 / CH48



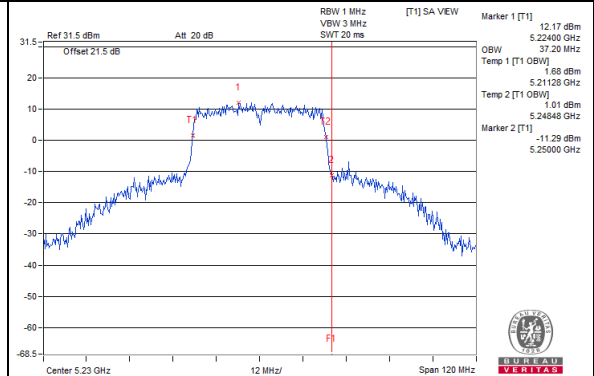
802.11ac (VHT20)_Chain 1 / CH48



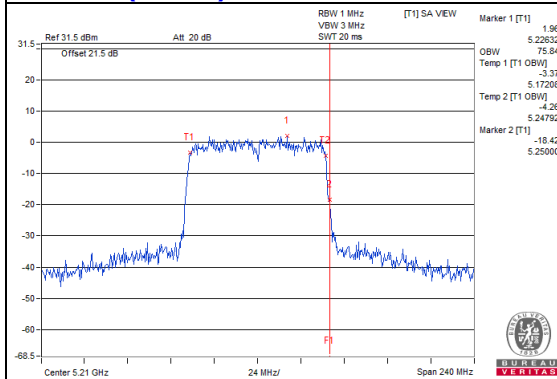
802.11ac (VHT40)_Chain 0 / CH46



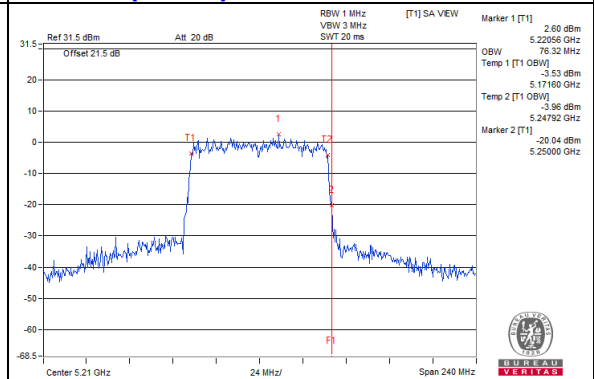
802.11ac (VHT40)_Chain 1 / CH46



802.11ac (VHT80)_Chain 0 / CH42

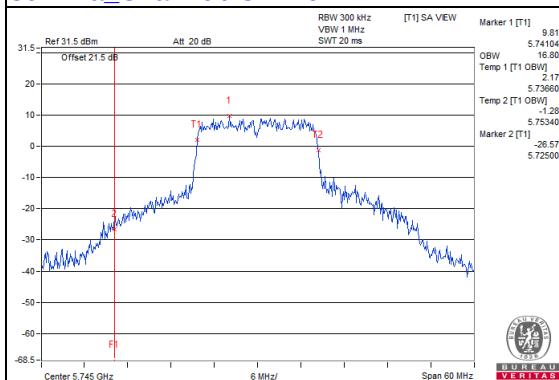


802.11ac (VHT80)_Chain 1 / CH42

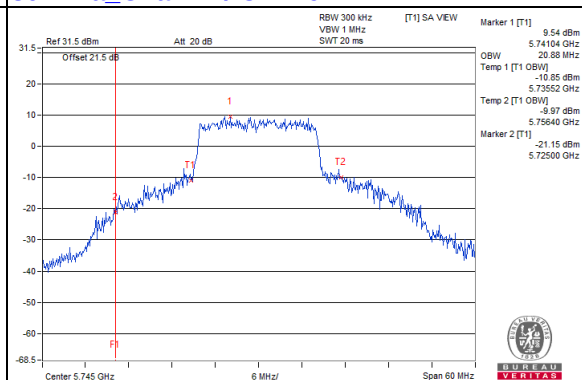


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

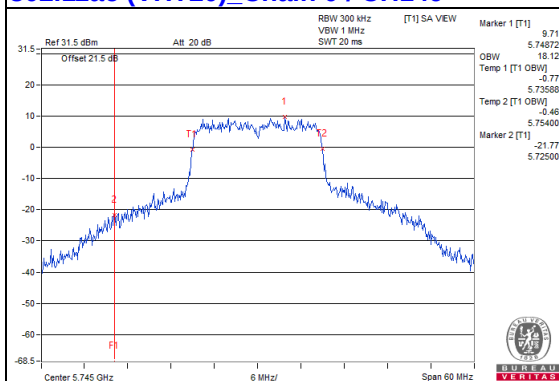
802.11a_Chain 0 / CH149



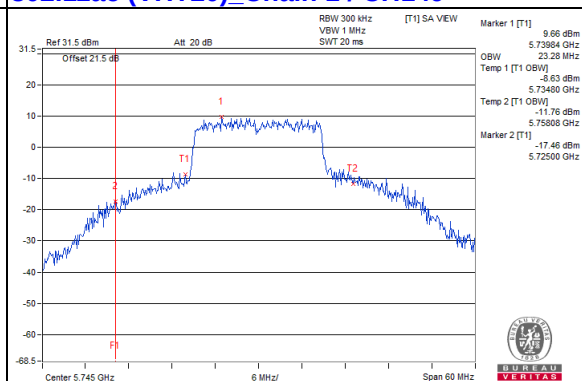
802.11a_Chain 1 / CH149



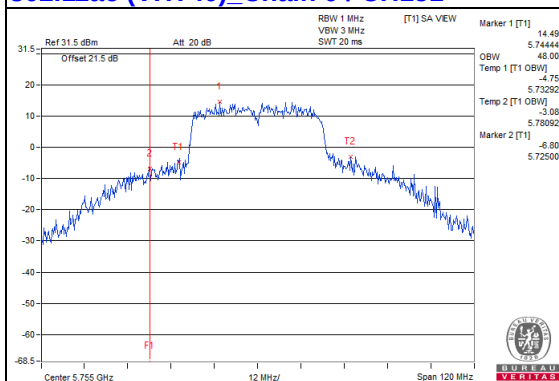
802.11ac (VHT20)_Chain 0 / CH149



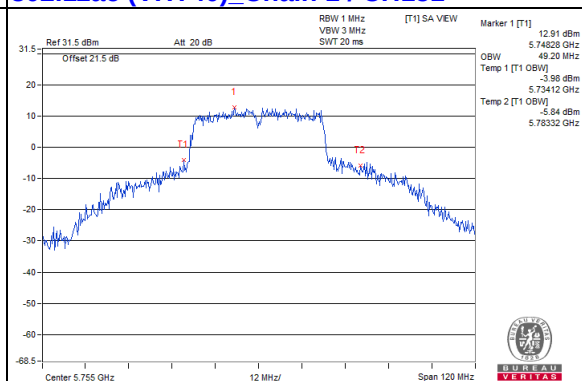
802.11ac (VHT20)_Chain 1 / CH149



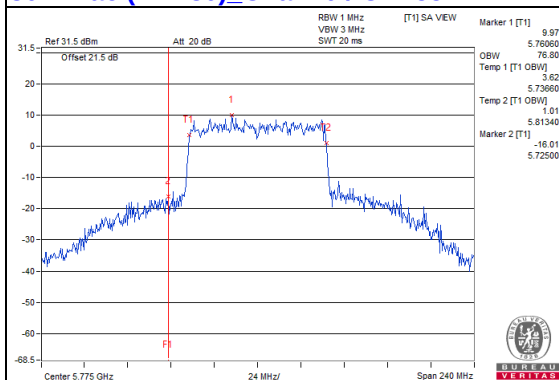
802.11ac (VHT40)_Chain 0 / CH151



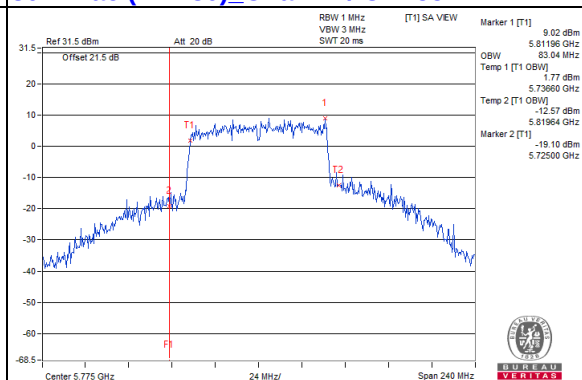
802.11ac (VHT40)_Chain 1 / CH151



802.11ac (VHT80)_Chain 0 / CH155



802.11ac (VHT80)_Chain 1 / CH155

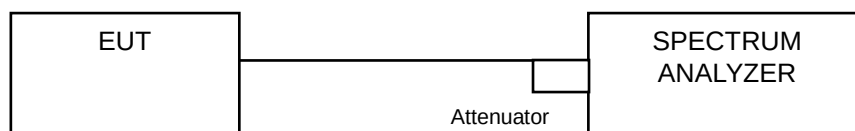


4.5 Peak Power Spectral Density Measurement

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 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For U-NII-1:

Using method SA-2

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

For U-NII-3:

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 (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(500 \text{ kHz}/300\text{kHz})$
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/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1				
36	5180	4.69	3.99	0.22	7.58	17.00	PASS
40	5200	6.43	6.88	0.22	9.89	17.00	PASS
48	5240	6.11	5.91	0.22	9.24	17.00	PASS

- Note: 1. Method 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 = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1				
36	5180	4.27	4.29	0.56	7.85	17.00	PASS
40	5200	5.53	4.06	0.56	8.43	17.00	PASS
48	5240	5.27	4.62	0.56	8.53	17.00	PASS

- Note: 1. Method 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 = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1				
38	5190	-5.81	-5.98	1.05	-1.83	17.00	PASS
46	5230	0.76	0.44	1.05	4.66	17.00	PASS

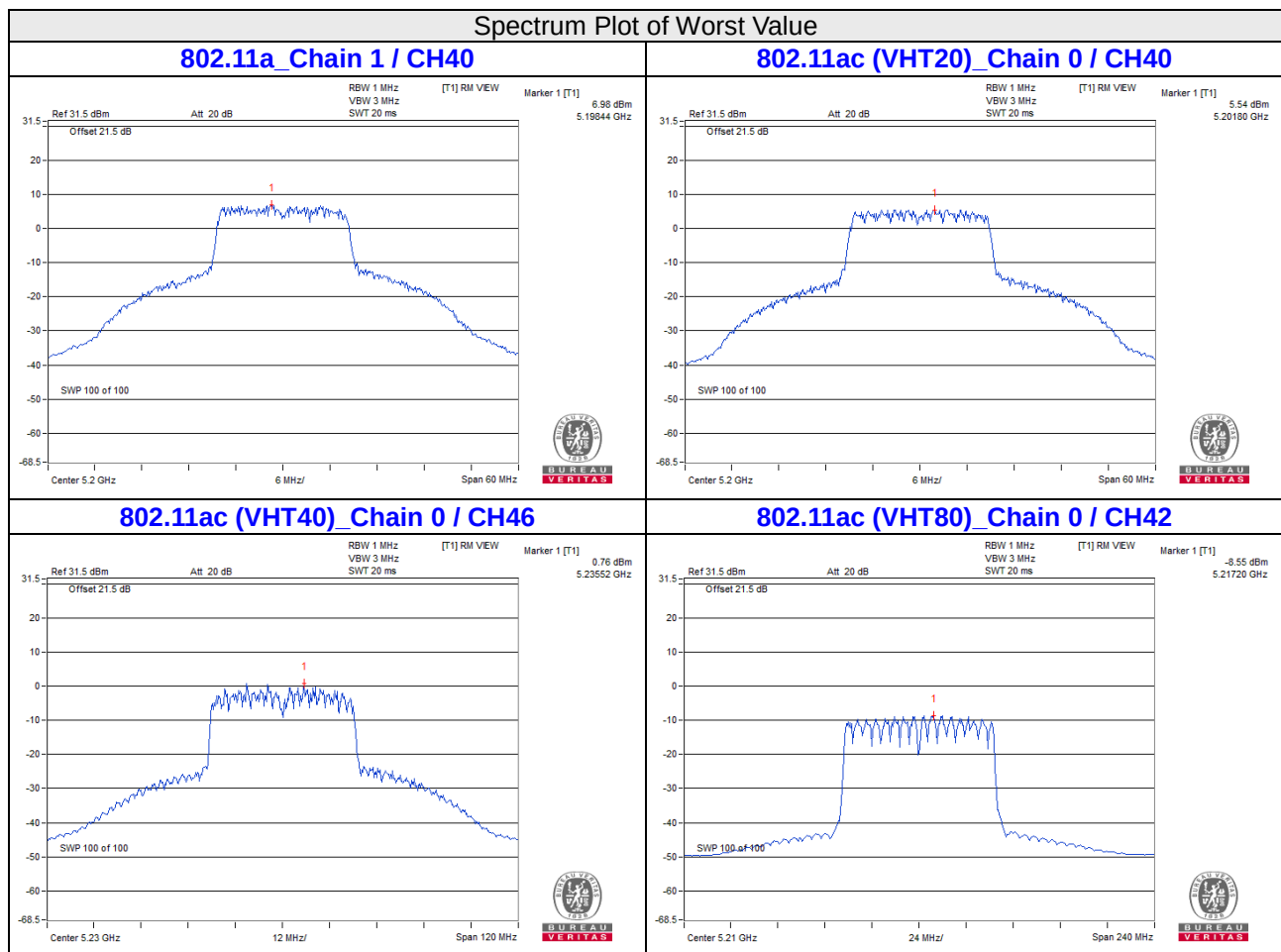
- Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1				
42	5210	-8.91	-11.25	0.83	-6.08	17.00	PASS

- Note: 1. Method 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 = $2.8\text{dBi} + 10\log(2) = 5.81\text{dBi} < 6\text{dBi}$, 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



For U-NII-3:

802.11a

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)		Duty Factor (dB)	Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1						
149	5745	-3.22	-2.89	0.22	1.0423	0.18	2.40	29.89	PASS
157	5785	-1.98	-2.54	0.22	1.2531	0.98	3.20	29.89	PASS
165	5825	-2.84	-2.42	0.22	1.1508	0.61	2.83	29.89	PASS

- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30 - (6.11 - 6) = 29.89\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)		Duty Factor (dB)	Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1						
149	5745	-2.97	-2.88	0.56	1.1614	0.65	2.87	29.89	PASS
157	5785	-2.64	-2.98	0.56	1.1912	0.76	2.98	29.89	PASS
165	5825	-2.74	-2.45	0.56	1.2531	0.98	3.20	29.89	PASS

- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30 - (6.11 - 6) = 29.89\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)		Duty Factor (dB)	Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1						
151	5755	-6.00	-6.64	1.05	0.5957	-2.25	-0.03	29.89	PASS
159	5795	-5.82	-6.26	1.05	0.6353	-1.97	0.25	29.89	PASS

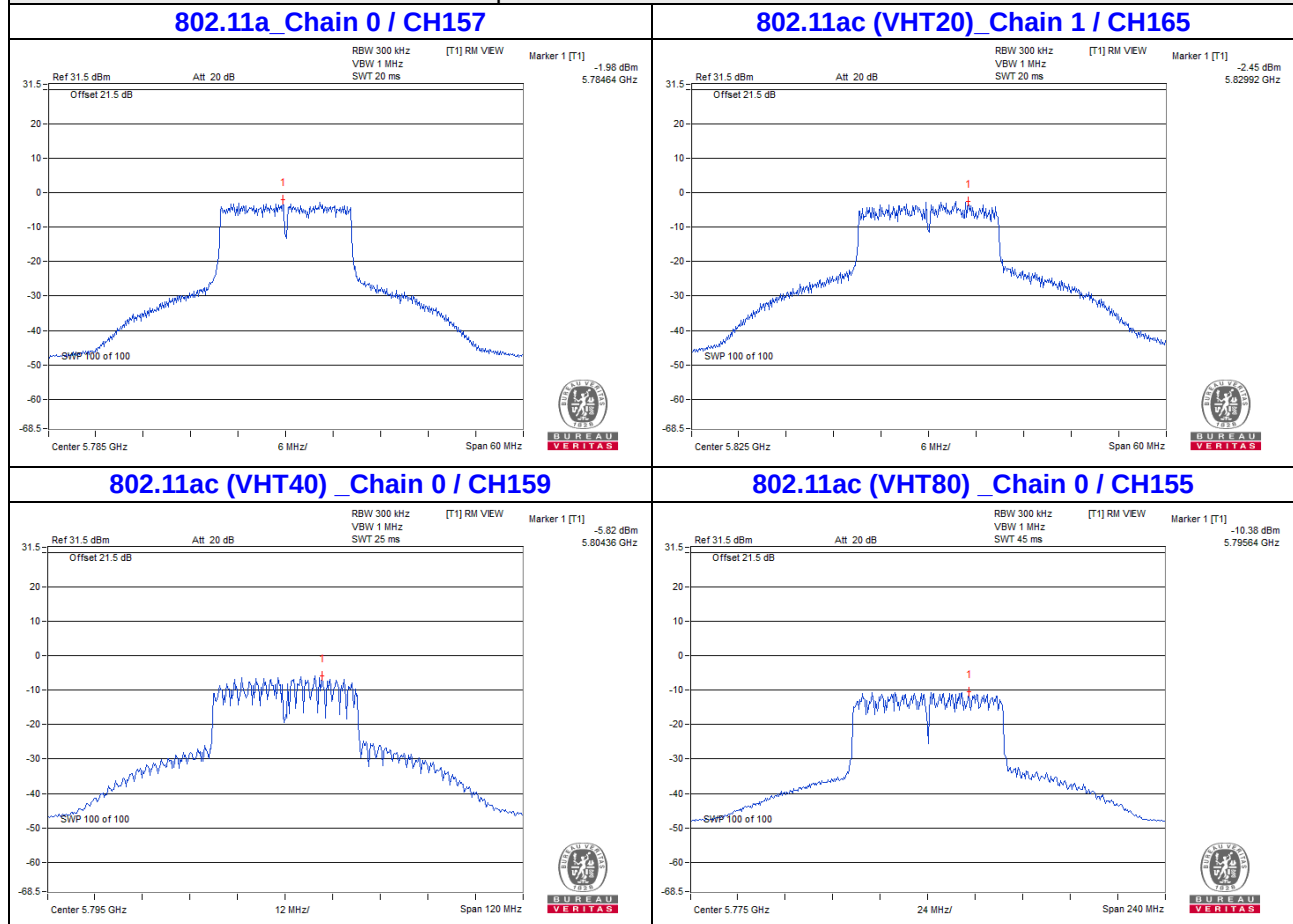
- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30 - (6.11 - 6) = 29.89\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/300kHz)		Duty Factor (dB)	Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1						
155	5775	-10.38	-11.09	0.83	0.20512	-6.88	-4.66	29.89	PASS

- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = $3.1\text{dBi} + 10\log(2) = 6.11\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $30-(6.11-6) = 29.89\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

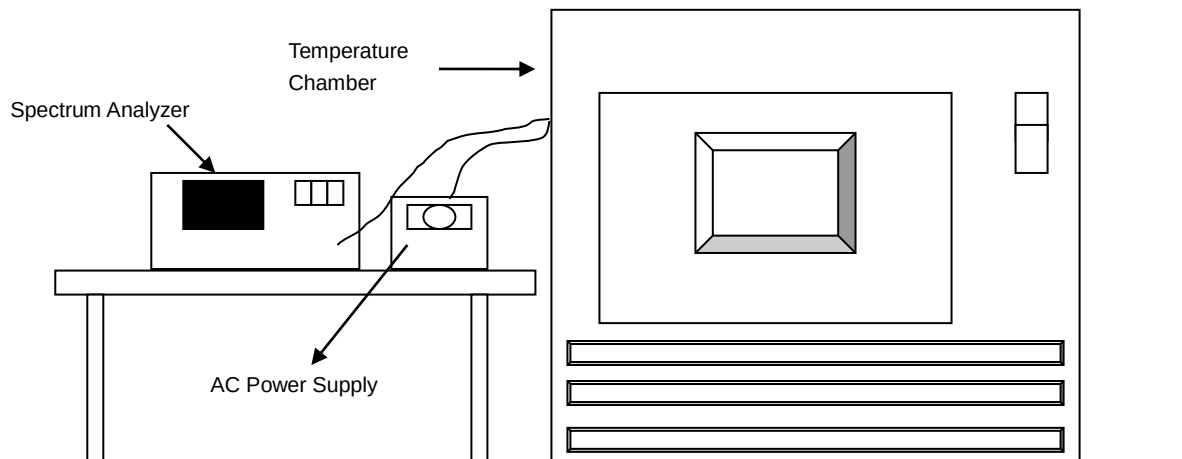


4.6 Frequency Stability Measurement

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 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeat step (d) with the temperature chamber set to the next desired temperature until measurements down to the lowest specified temperature have been completed.
- 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. (°C)	Power Supply (Vac)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
40	120	5180.0137	PASS	5180.0116	PASS	5180.0122	PASS	5180.0165	PASS
30	120	5179.9782	PASS	5179.9789	PASS	5179.9774	PASS	5179.9812	PASS
20	120	5180.0056	PASS	5180.0067	PASS	5180.0037	PASS	5180.0034	PASS
10	120	5180.0042	PASS	5180.005	PASS	5180.0045	PASS	5180.0043	PASS
0	120	5180	PASS	5180.0022	PASS	5180.004	PASS	5180.0039	PASS

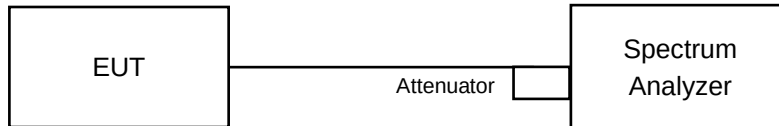
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	138	5180.0047	PASS	5180.0059	PASS	5180.0047	PASS	5180.0041	PASS
	120	5180.0056	PASS	5180.0067	PASS	5180.0037	PASS	5180.0034	PASS
	102	5180.0053	PASS	5180.0069	PASS	5180.0045	PASS	5180.0043	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 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

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	16.4	16.35	0.5	Pass
157	5785	16.39	16.4	0.5	Pass
165	5825	16.35	16.11	0.5	Pass

802.11ac (VHT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	17.61	17.66	0.5	Pass
157	5785	17.62	16.99	0.5	Pass
165	5825	17.58	17.63	0.5	Pass

802.11ac (VHT40)

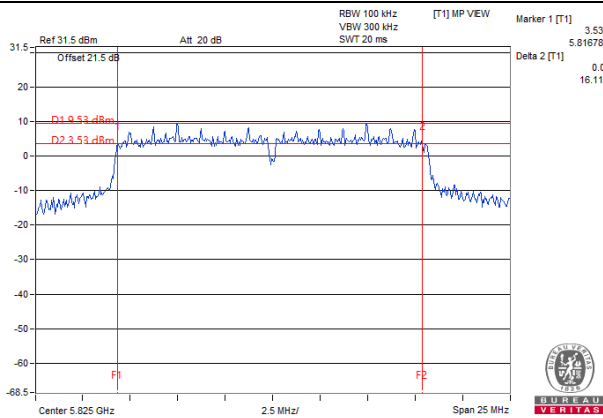
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
151	5755	35.17	35.87	0.5	Pass
159	5795	35.16	34.14	0.5	Pass

802.11ac (VHT80)

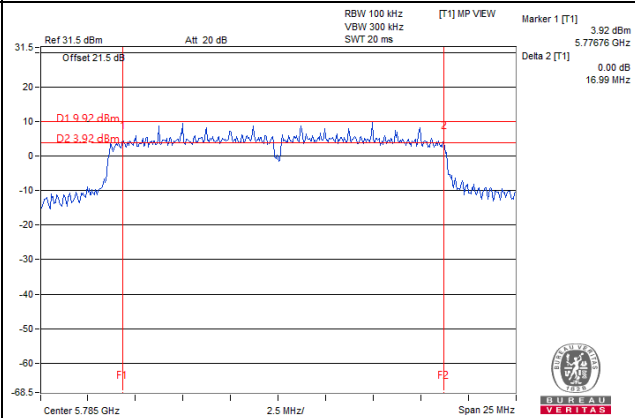
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
155	5775	76	75.88	0.5	Pass

Spectrum Plot of Worst Value

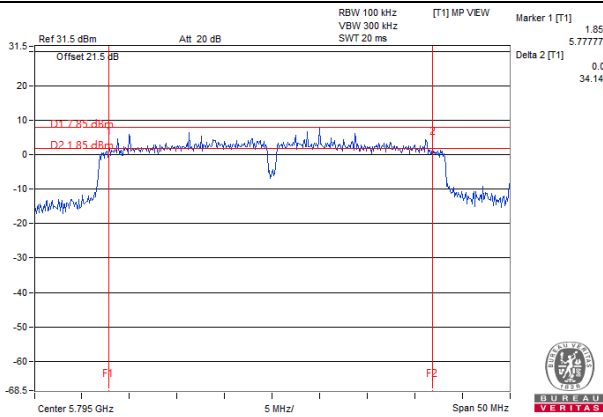
802.11a_Chain 1 / CH165



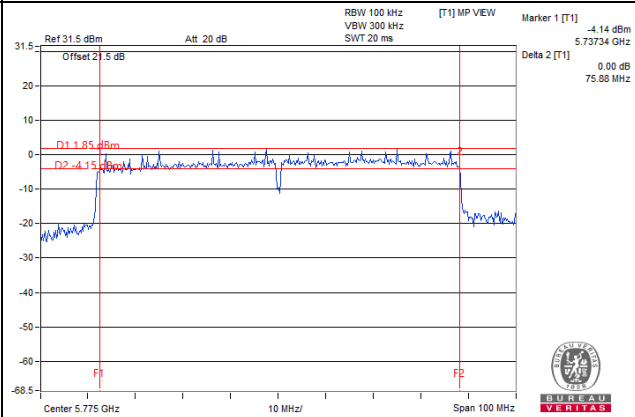
802.11ac (VHT20)_Chain 1 / CH157



802.11ac (VHT40)_Chain 1 / CH159



802.11ac (VHT80)_Chain 1 / CH155



5 Pictures of Test Arrangements

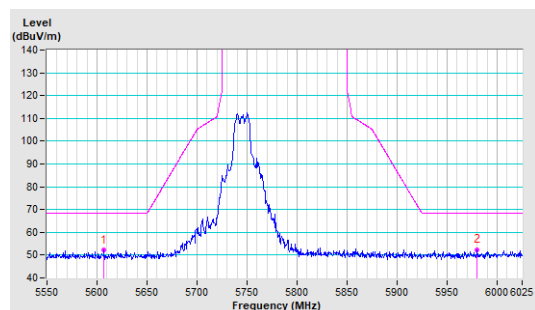
Please refer to the attached file (Test Setup Photo).

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

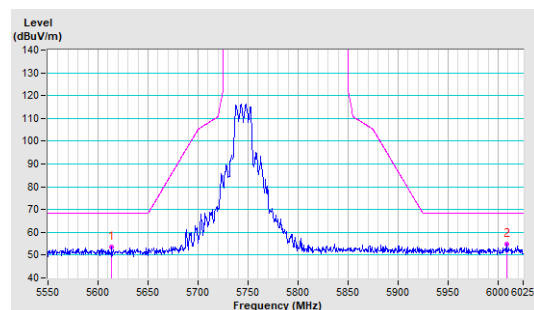
802.11a

CH 149 5745 MHz

Horizontal

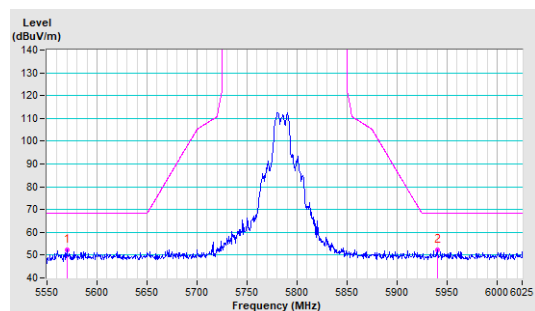


Vertical

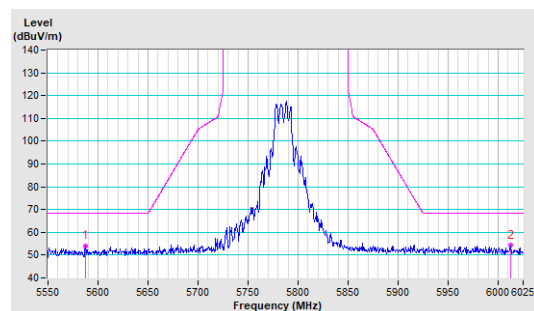


CH 157 5785 MHz

Horizontal

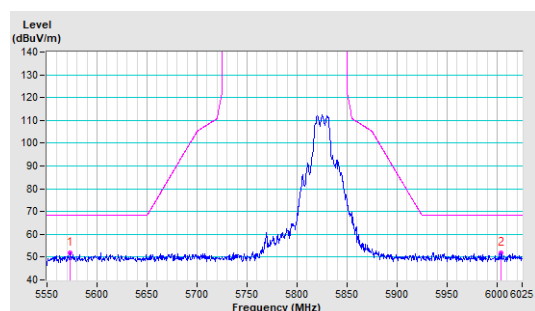


Vertical

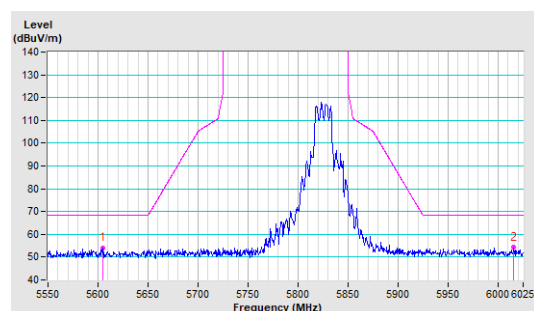


CH 165 5825 MHz

Horizontal



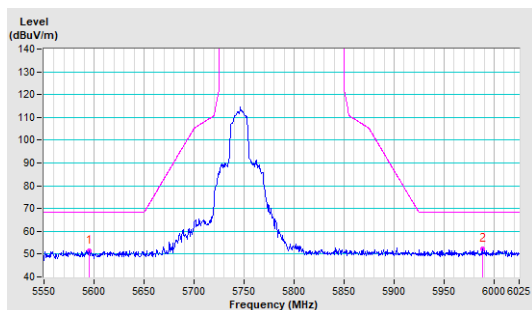
Vertical



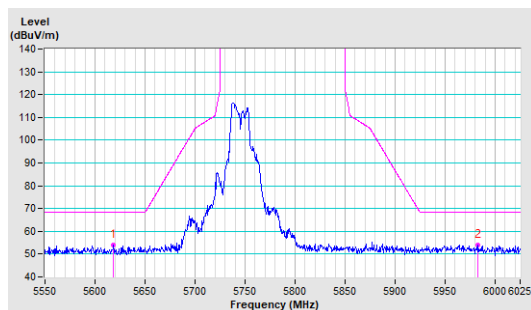
802.11ac (VHT20)

CH 149 5745 MHz

Horizontal

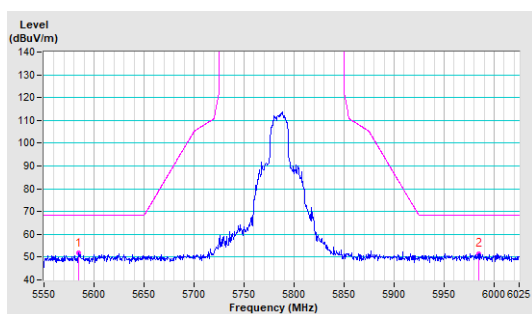


Vertical

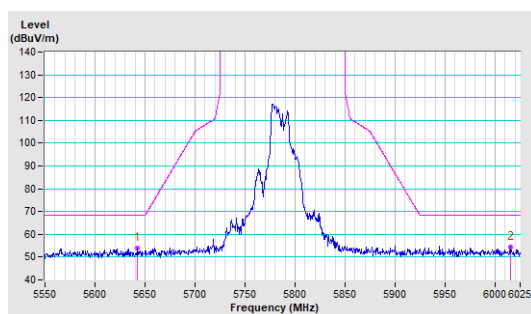


CH 157 5785 MHz

Horizontal

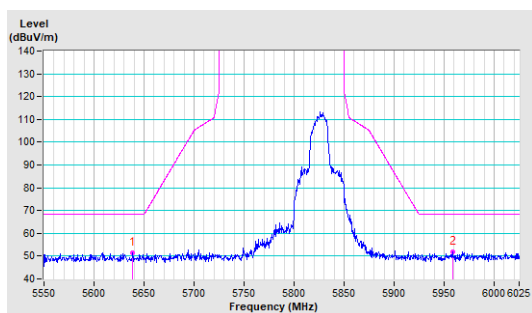


Vertical

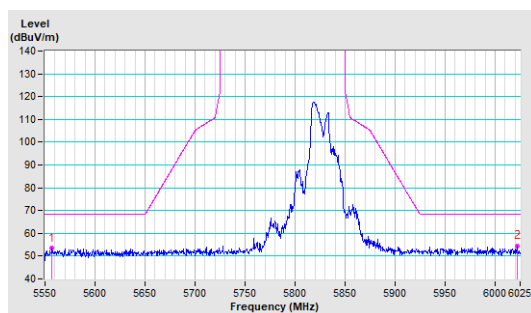


CH 165 5825 MHz

Horizontal



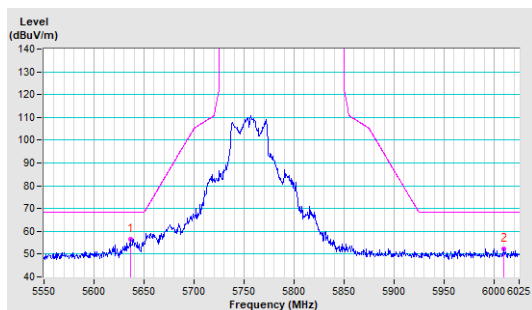
Vertical



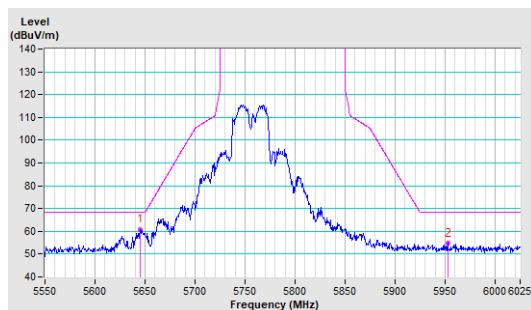
802.11ac (VHT40)

CH 151 5755 MHz

Horizontal

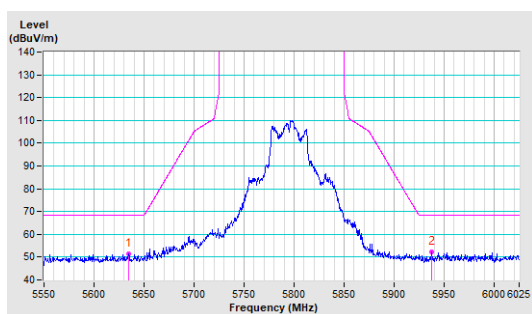


Vertical

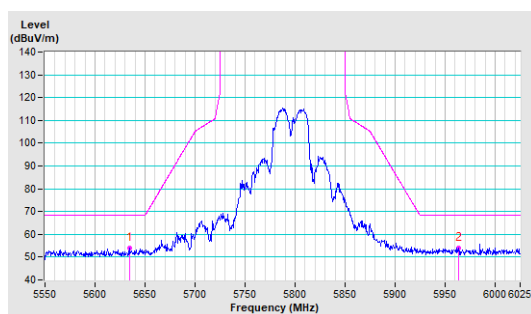


CH 159 5795 MHz

Horizontal



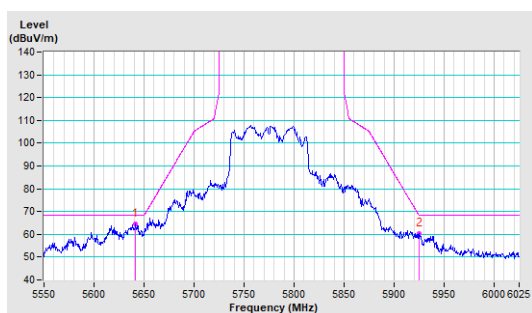
Vertical



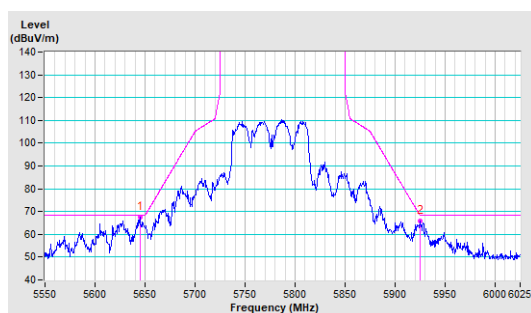
802.11ac (VHT80)

CH 155 5775 MHz

Horizontal

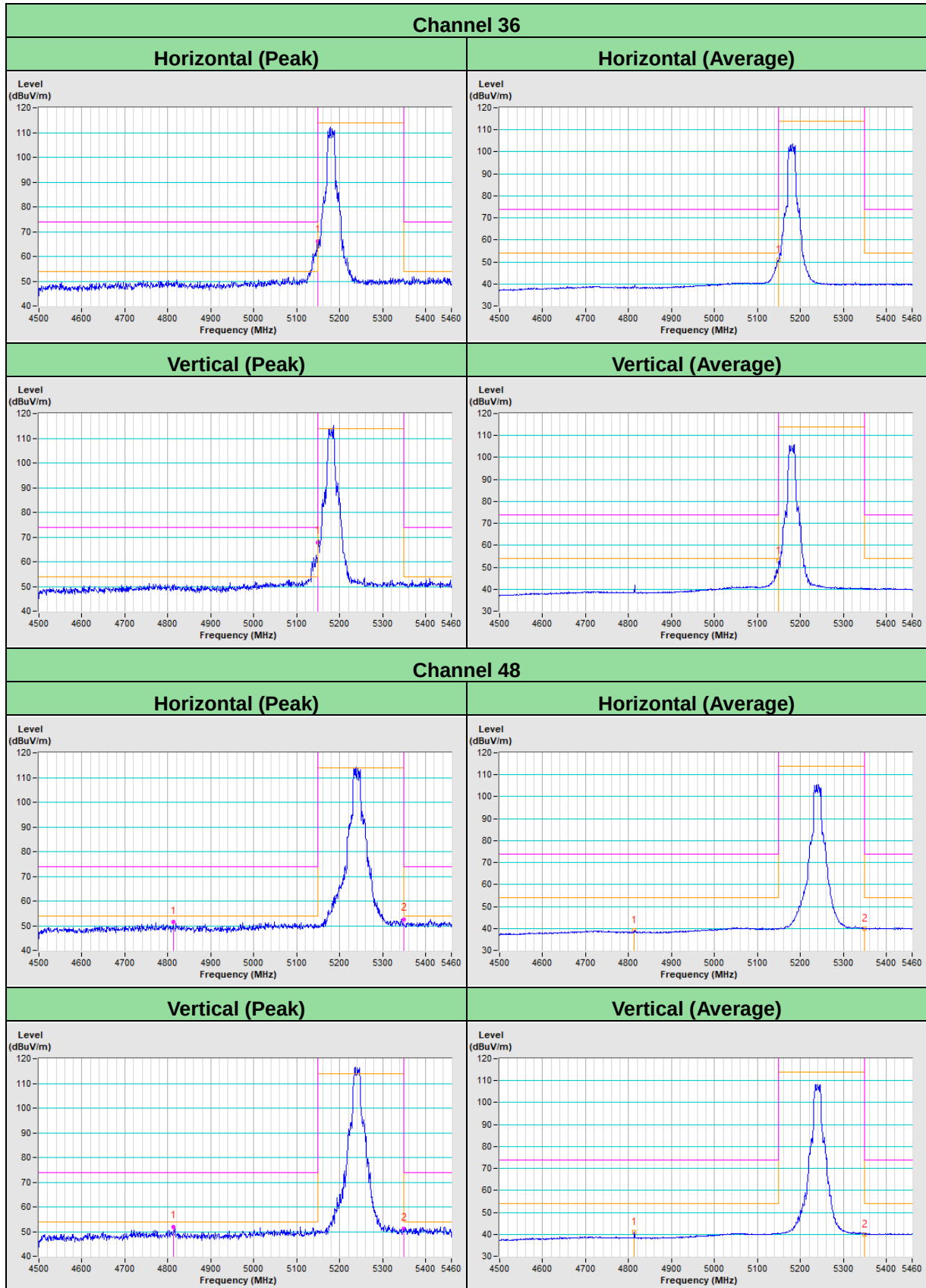


Vertical

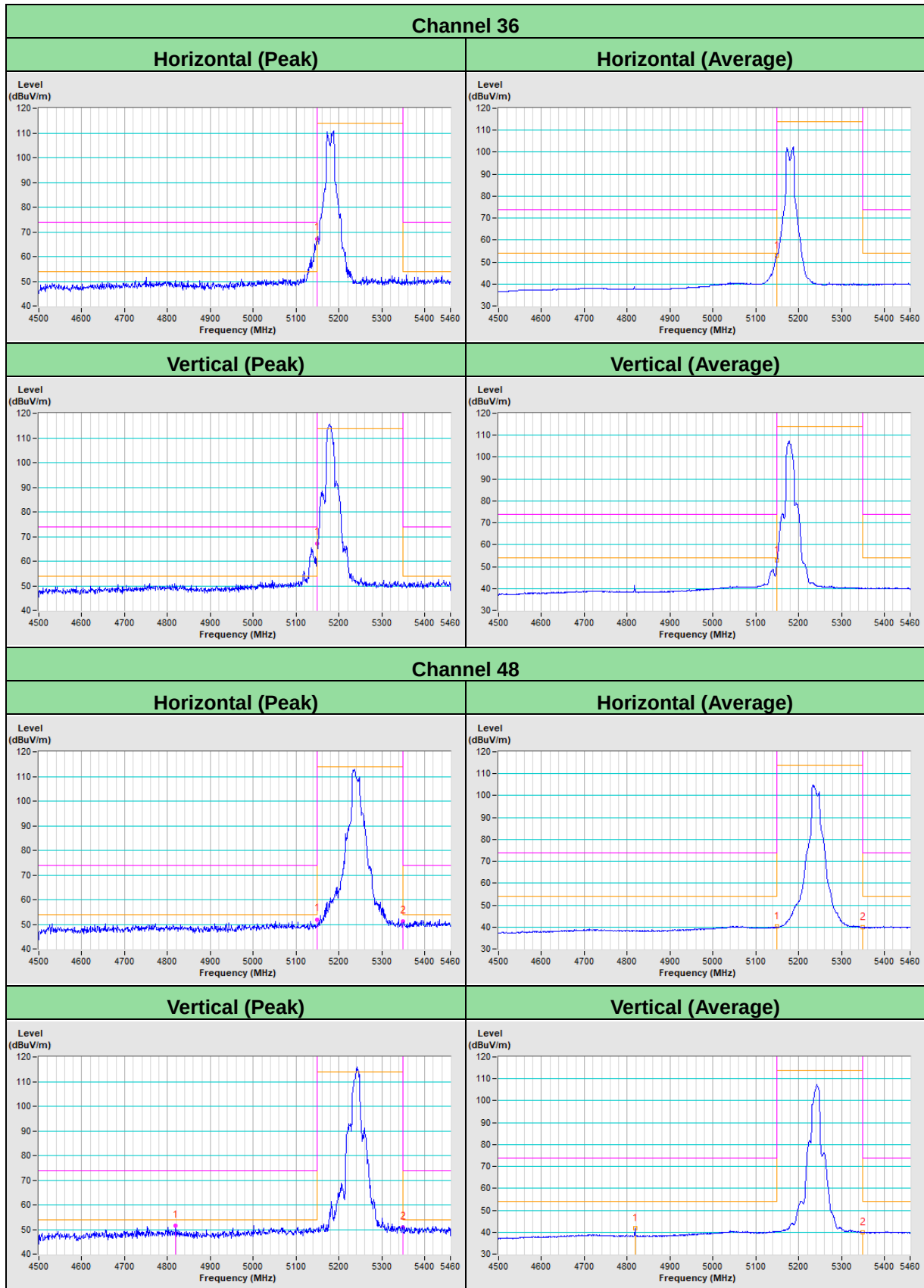


Annex B- Band-edge measurement (For U-NII-1 band)

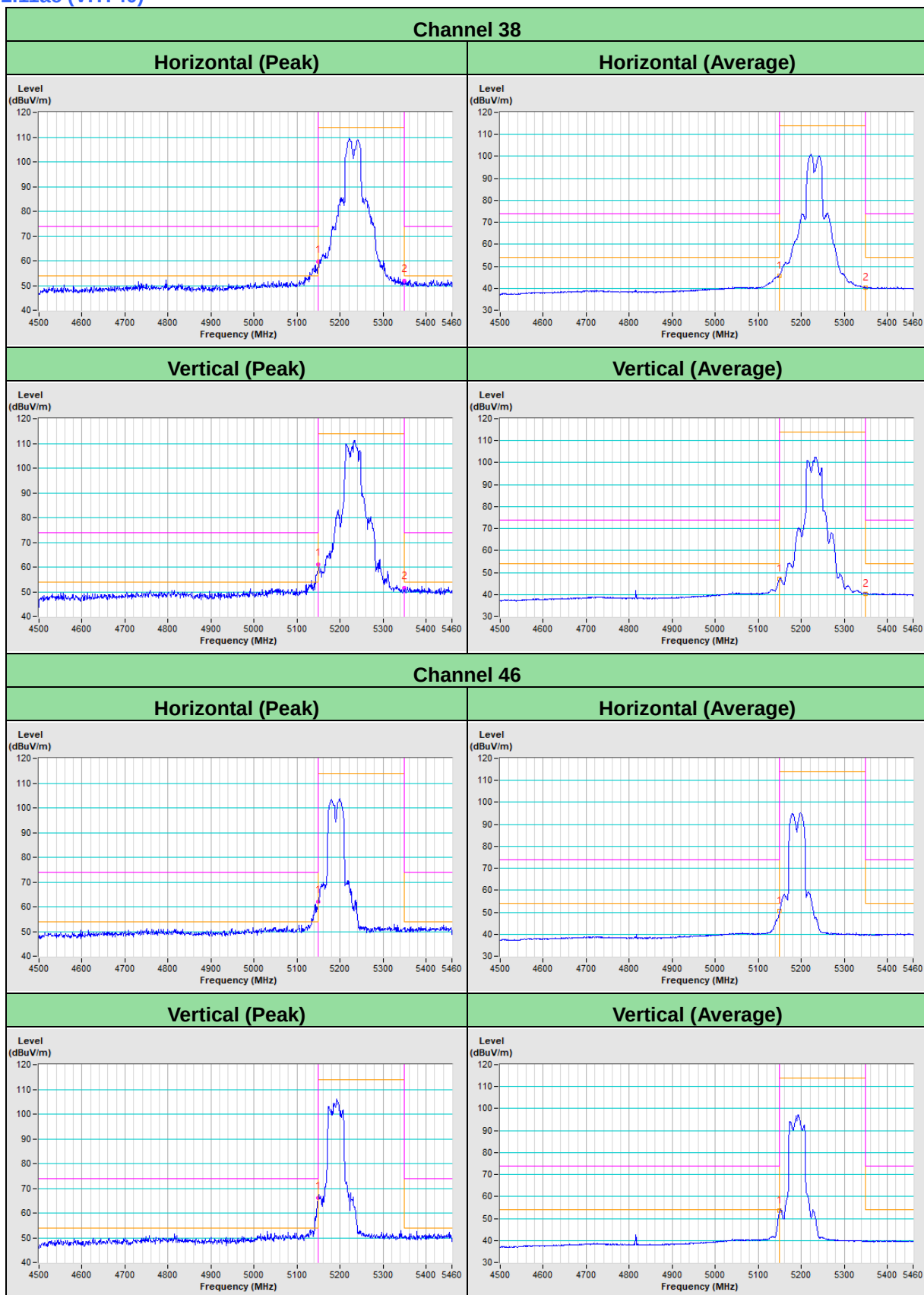
802.11a



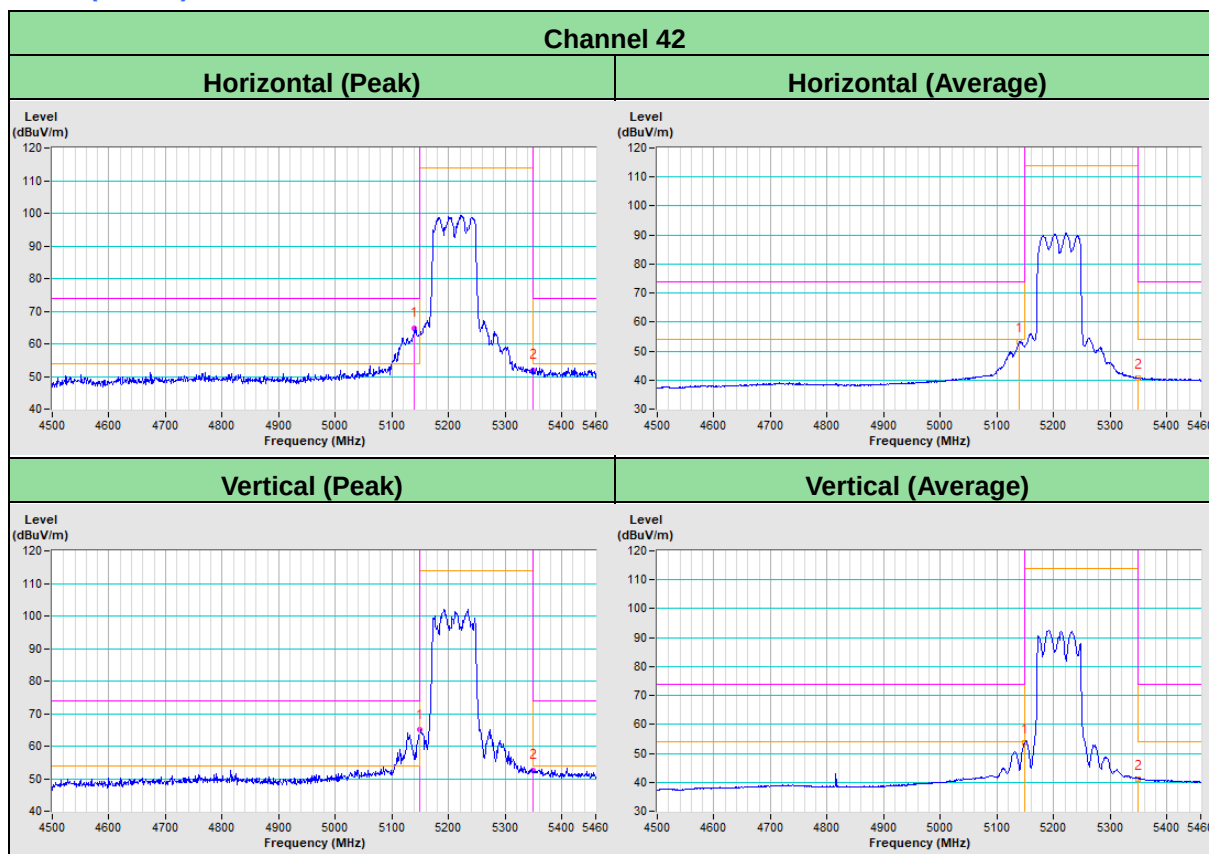
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



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

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