

FCC Test Report

Report No.: RFBCKS-WTW-P21070524-1

FCC ID: 2AWHPR211

Test Model: UTR-211

Received Date: 2021/7/15

Test Date: 2021/7/27 ~ 2021/9/23

Issued Date: 2021/10/6

Applicant: Space Exploration Technologies Corp. (SPACEX)

Address: 1 Rocket Rd., Hawthorne, CA 90250 USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwa.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan.

**FCC Registration /
Designation Number:** 723255 / TW2022



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

Table of Contents

Release Control Record	4
1 Certificate of Conformity.....	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information.....	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	9
3.2.1 Test Mode Applicability and Tested Channel Detail	10
3.3 Duty Cycle of Test Signal	12
3.4 Description of Support Units	13
3.4.1 Configuration of System under Test	14
3.5 General Description of Applied Standard and references.....	16
4 Test Types and Results	17
4.1 Radiated Emission and Bandedge Measurement.....	17
4.1.1 Limits of Radiated Emission and Bandedge Measurement	17
4.1.2 Test Instruments	18
4.1.3 Test Procedure	20
4.1.4 Deviation from Test Standard	21
4.1.5 Test Setup.....	21
4.1.6 EUT Operating Condition	22
4.1.7 Test Results	23
4.2 Conducted Emission Measurement	43
4.2.1 Limits of Conducted Emission Measurement	43
4.2.2 Test Instruments	43
4.2.3 Test Procedure	44
4.2.4 Deviation from Test Standard	44
4.2.5 Test Setup.....	44
4.2.6 EUT Operating Condition	44
4.2.7 Test Results	45
4.3 Transmit Power Measurement	47
4.3.1 Limits of Transmit Power Measurement	47
4.3.2 Test Setup.....	47
4.3.3 Test Instruments	47
4.3.4 Test Procedure	47
4.3.5 Deviation from Test Standard	47
4.3.6 EUT Operating Condition	47
4.3.7 Test Results	48
4.4 Occupied Bandwidth Measurement	52
4.4.1 Test Setup.....	52
4.4.2 Test Instruments	52
4.4.3 Test Procedure	52
4.4.4 Test Results	53
4.5 Peak Power Spectral Density Measurement	61
4.5.1 Limits of Peak Power Spectral Density Measurement	61
4.5.2 Test Setup.....	61
4.5.3 Test Instruments	61
4.5.4 Test Procedure	61
4.5.5 Deviation from Test Standard	62
4.5.6 EUT Operating Condition	62
4.5.7 Test Results	63
4.6 Frequency Stability Measurement.....	67
4.6.1 Limits of Frequency Stability Measurement	67

4.6.2	Test Setup.....	67
4.6.3	Test Instruments	67
4.6.4	Test Procedure	67
4.6.5	Deviation from Test Standard	67
4.6.6	EUT Operating Condition	67
4.6.7	Test Results	68
4.7	6dB Bandwidth Measurement	69
4.7.1	Limits of 6dB Bandwidth Measurement	69
4.7.2	Test Setup.....	69
4.7.3	Test Instruments	69
4.7.4	Test Procedure	69
4.7.5	Deviation from Test Standard	69
4.7.6	EUT Operating Condition	69
4.7.7	Test Results	70
5	Pictures of Test Arrangements.....	72
	Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)	73
	Annex B- Band-edge measurement (For U-NII-1 band)	76
	Appendix – Information of the Testing Laboratories	80

Release Control Record

Issue No.	Description	Date Issued
RFBCKS-WTW-P21070524-1	Original release.	2021/10/6

1 Certificate of Conformity

Product: Starlink Router

Brand:

SPACEX



Test Model: UTR-211

Sample Status: Engineering sample

Applicant: Space Exploration Technologies Corp. (SPACEX)

Test Date: 2021/7/27 ~ 2021/9/23

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:** 2021/10/6
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** 2021/10/6
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 -8.14dB at 0.15391MHz.
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 -0.2dB 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	No antenna connector is used.

Note:

1. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOB test plots were recorded in Annex A.
2. 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.
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	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Starlink Router
Brand	 SPACEX
Test Model	UTR-211
Status of EUT	Engineering sample
Power Supply Rating	100Vac ~240Vac
Modulation Type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode
Modulation Technology	OFDM
Transfer Rate	802.11a: up to 54 Mbps 802.11n: up to 450 Mbps 802.11ac: up to 1300 Mbps
Operating Frequency	5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	CDD Mode: 5.18 ~ 5.24 GHz: 336.763 mW 5.745 ~ 5.825 GHz: 439.396 mW Beamforming Mode: 5.18 ~ 5.24 GHz: 272.08 mW 5.745 ~ 5.825 GHz: 439.396 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. The EUT has below radios as following table:

Radio 1	Radio 2
WLAN 2.4GHz	WLAN 5GHz

2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN 2.4GHz	WLAN 5GHz

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

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

Antenna No.	RF Chain No.	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
1	0	4.2	2.4~2.4835 GHz	PCB	none (like solder)
		7.8	5.15~5.85 GHz		
2	1	3.4	2.4~2.4835 GHz	PCB	none (like solder)
		7.3	5.15~5.85 GHz		
3	2	3.9	2.4~2.4835 GHz	PCB	none (like solder)
		8.4	5.15~5.85 GHz		

Note: Max. gain was selected for the final test.

4. The directional antenna gain, please refer to the following table:

Frequency Range (GHz)	Directional Antenna Gain (dBi)
2.4~2.4835	7.53
5.15~5.25	9.27
5.725~5.85	9.06

5. The EUT incorporates a MIMO function.

5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	3TX	3RX
802.11n (HT20)	3TX	3RX
802.11n (HT40)	3TX	3RX
802.11ac (VHT20)	3TX	3RX
802.11ac (VHT40)	3TX	3RX
802.11ac (VHT80)	3TX	3RX

Note:

1. All of modulation mode support beamforming function except 802.11a 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), therefore 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)

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

3.2 Description of Test Modes

FOR 5180 ~ 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
PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz
APCM: Antenna Port Conducted Measurement

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, 44, 48	OFDM	BPSK	6
802.11ac (VHT20)		36 to 48	36, 44, 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	151	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	151	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, 44, 48	OFDM	BPSK	6
802.11ac (VHT20)		36 to 48	36, 44, 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, 44, 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	25deg. C, 66%RH	120Vac, 60Hz	Tom Yang
RE _{<} 1G	25deg. C, 66%RH	120Vac, 60Hz	Tom Yang
PLC	25deg. C, 66%RH	120Vac, 60Hz	Tom Yang
APCM	25deg. C, 66%RH	120Vac, 60Hz	Leon Dai

3.3 Duty Cycle of Test Signal

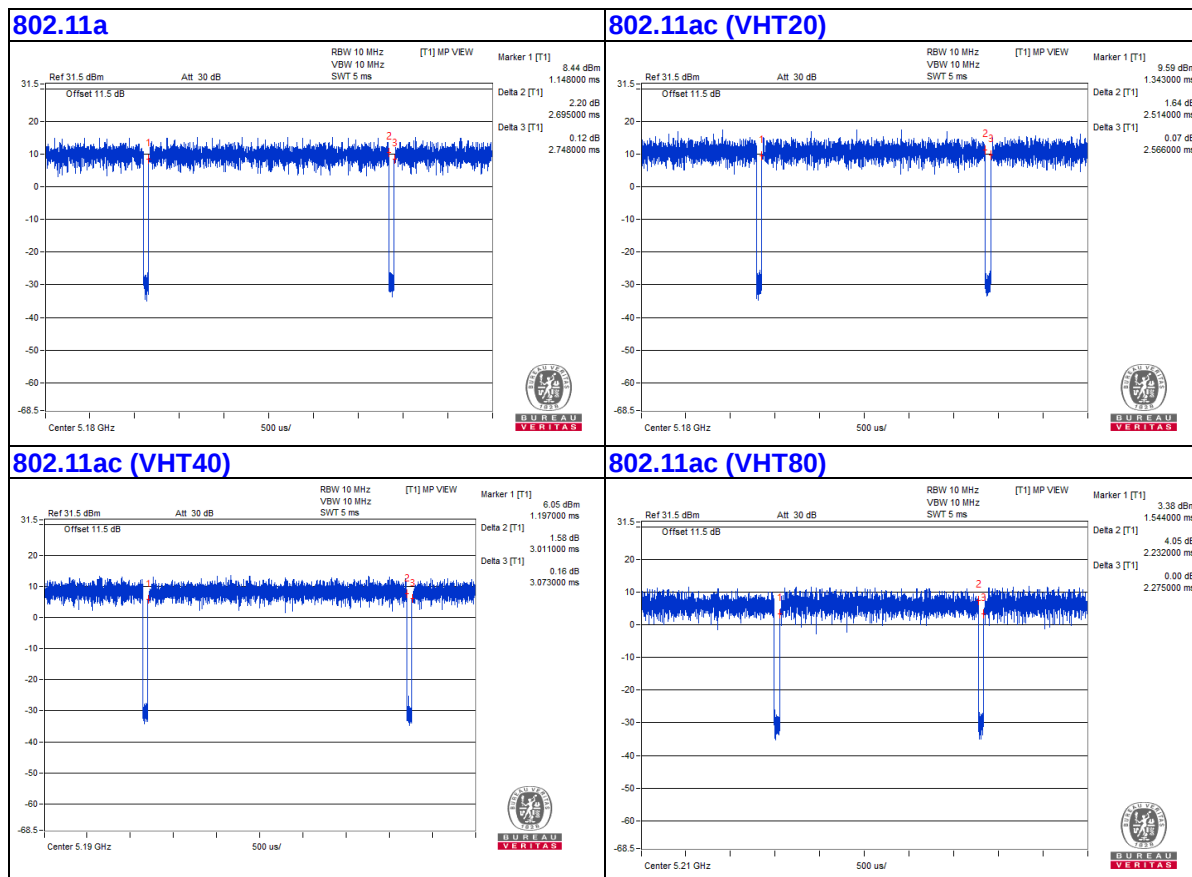
Duty cycle of test signal is $\geq 98\%$, duty factor is not required.

802.11a: Duty cycle = $2.695 \text{ ms} / 2.748 \text{ ms} = 0.981$

802.11ac (VHT20): Duty cycle = $2.514 \text{ ms} / 2.566 \text{ ms} = 0.98$

802.11ac (VHT40): Duty cycle = $3.011 \text{ ms} / 3.073 \text{ ms} = 0.98$

802.11ac (VHT80): Duty cycle = $2.232 \text{ ms} / 2.275 \text{ ms} = 0.981$



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	E5430	HYV4VY1	NA	Provided by Lab
B.	Test Tool	Starlink	NA	NA	NA	Supplied by client
C.	PoE Load	Starlink	NA	NA	NA	Supplied by client
D.	Laptop	DELL	E5430	4YV4VY1	NA	Provided by Lab

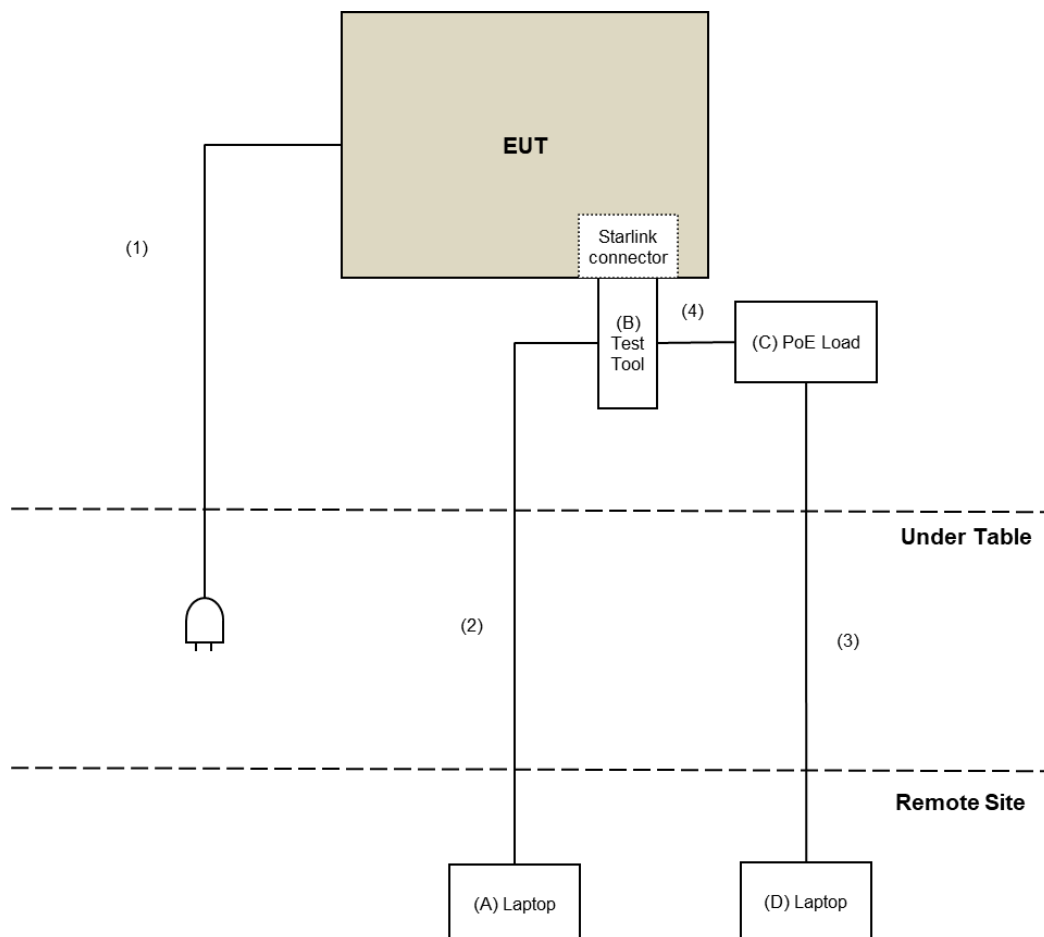
Note:

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

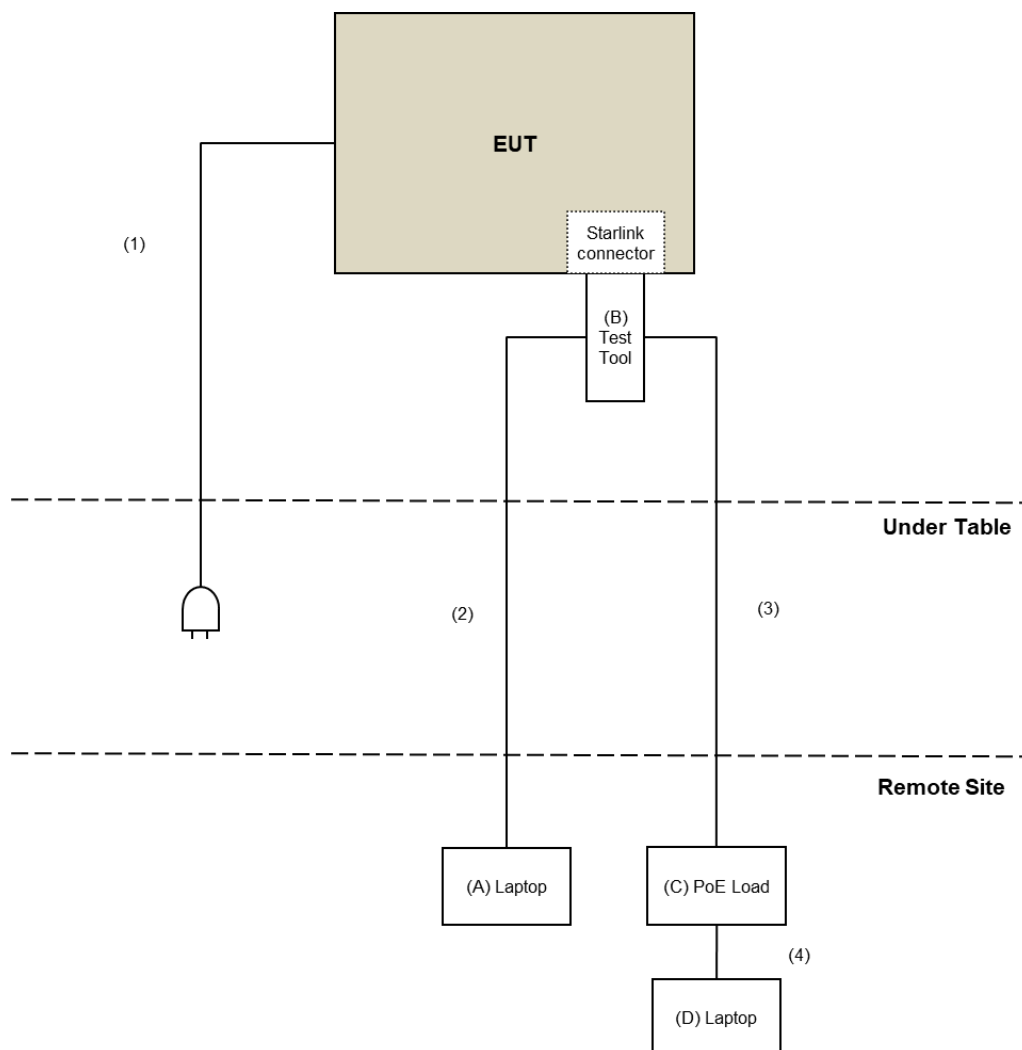
ID	Descriptions (Cables)	Qty	Length (m)	Shielding (Yes/No)	Cores (Number)	Remarks
1	AC Cable	1	2	No	0	Supplied by client
2	RJ-45 Cable	1	10	No	0	Provided by Lab
3	RJ-45 Cable	1	10	No	0	Provided by Lab
4	RJ-45 Cable	1	3	No	0	Provided by Lab

3.4.1 Configuration of System under Test

For AC Power Conducted Emissions test:



For Radiated Emission 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 & Bandedge & OBE test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver Agilent	N9038A	MY50010156	2021/7/22	2022/7/21
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2021/5/24	2022/5/23
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2021/1/7	2022/1/6
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2021/1/7	2022/1/6
Pre_Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	2020/10/20	2021/10/19
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	2020/11/5	2021/11/4
RF Coaxial Cable COMMATE/PEWC	8D	966-3-1	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-2	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-3	2021/3/16	2022/3/15
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	2020/9/24	2021/9/23
Horn Antenna Schwarzbeck	BBHA9120-D	9120D-406	2020/11/22	2021/11/21
Pre_Amplifier EMCI	EMC12630SE	980384	2021/1/11	2022/1/10
RF Coaxial Cable EMCI	EMC104-SM-SM-1500	180504	2021/4/26	2022/4/25
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180601	2021/6/8	2022/6/7
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	210201	2021/5/13	2022/5/12
Fix tool for Boresight antenna tower LIOW GUU	FBA-01	FBA_SIP01	NA	NA
Spectrum Analyzer Keysight	N9030A	MY54490679	2021/7/9	2022/7/8
Pre_Amplifier EMCI	EMC184045SE	980387	2021/1/11	2022/1/10
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170519	2020/11/22	2021/11/21
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2021/1/11	2022/1/10
RF cable (40GHz) EMCI	EMC-KM-KM-4000	200214	2021/3/10	2022/3/9

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: 2021/7/27 ~ 2021/8/27

For other test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
Power Meter Anritsu	ML2495A	1529002	2021/6/21	2022/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2021/5/31	2022/5/30
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA
AC Power Source GOOD WILL	6905S	1991551	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	2021/1/14	2022/1/13
True RMS Clamp Meter Fluke	325	31130711WS	2021/6/2	2022/6/1

- 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: 2021/9/23

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:

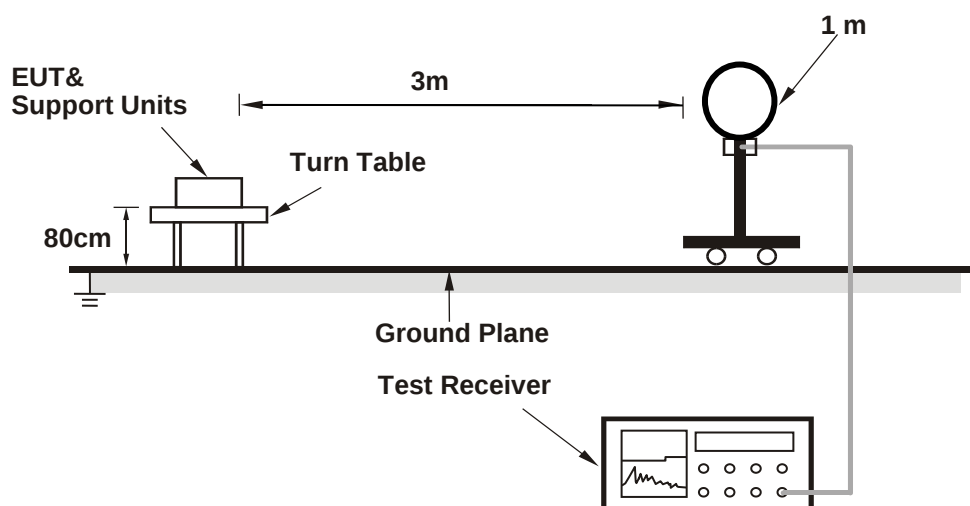
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

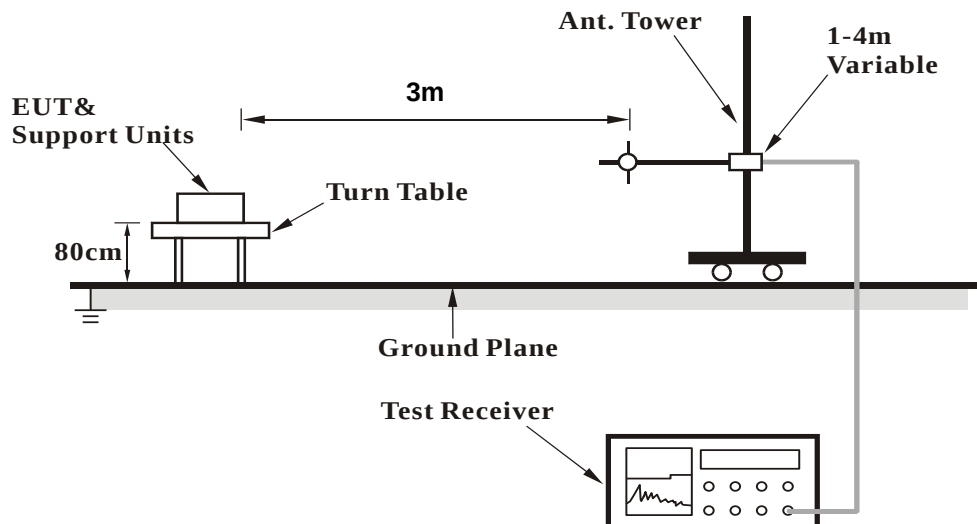
No deviation.

4.1.5 Test Setup

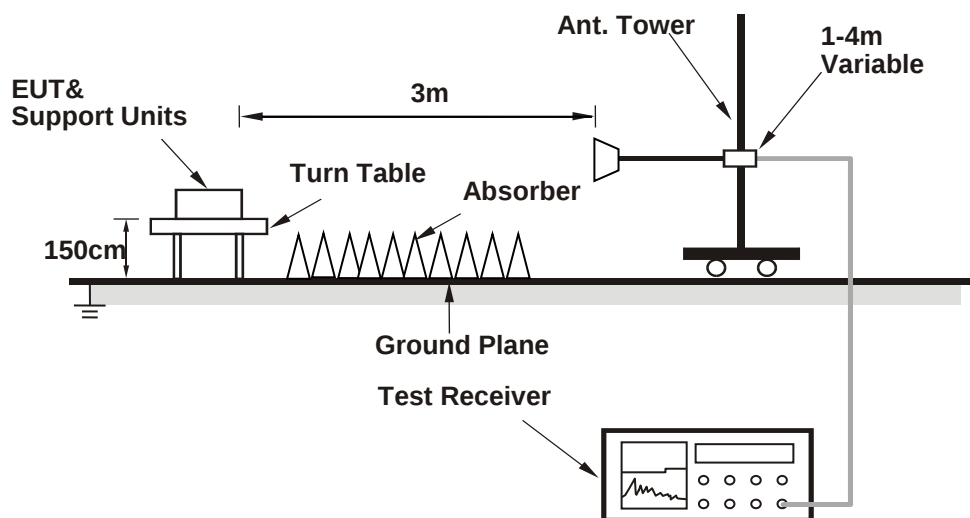
For Radiated emission below 30MHz



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 (MT7629 QA 0.0.2.5) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

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	68.5 PK	74.0	-5.5	3.79 H	180	63.8	4.7
2	5150.00	53.7 AV	54.0	-0.3	3.79 H	180	49.0	4.7
3	*5180.00	115.1 PK			3.79 H	180	110.5	4.6
4	*5180.00	106.9 AV			3.79 H	180	102.3	4.6
5	#10360.00	50.8 PK	68.2	-17.4	1.50 H	151	37.4	13.4
6	15540.00	49.5 PK	74.0	-24.5	1.40 H	241	35.0	14.5
7	15540.00	38.1 AV	54.0	-15.9	1.40 H	241	23.6	14.5
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	67.9 PK	74.0	-6.1	2.74 V	182	63.2	4.7
2	5150.00	49.5 AV	54.0	-4.5	2.74 V	182	44.8	4.7
3	*5180.00	114.3 PK			2.74 V	182	109.7	4.6
4	*5180.00	104.7 AV			2.74 V	182	100.1	4.6
5	#10360.00	51.4 PK	68.2	-16.8	1.45 V	21	38.0	13.4
6	15540.00	50.2 PK	74.0	-23.8	1.70 V	30	35.7	14.5
7	15540.00	38.9 AV	54.0	-15.1	1.70 V	30	24.4	14.5

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.

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	5150.00	67.1 PK	74.0	-6.9	3.83 H	174	62.4	4.7
2	5150.00	53.5 AV	54.0	-0.5	3.83 H	174	48.8	4.7
3	*5200.00	119.3 PK			3.83 H	174	114.9	4.4
4	*5200.00	111.2 AV			3.83 H	174	106.8	4.4
5	#10400.00	51.1 PK	68.2	-17.1	1.47 H	141	37.5	13.6
6	15600.00	49.5 PK	74.0	-24.5	1.34 H	256	35.0	14.5
7	15600.00	38.2 AV	54.0	-15.8	1.34 H	256	23.7	14.5
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	67.5 PK	74.0	-6.5	2.87 V	129	62.8	4.7
2	5150.00	49.2 AV	54.0	-4.8	2.87 V	129	44.5	4.7
3	*5200.00	116.5 PK			2.87 V	129	112.1	4.4
4	*5200.00	107.3 AV			2.87 V	129	102.9	4.4
5	#10400.00	51.1 PK	68.2	-17.1	1.46 V	34	37.5	13.6
6	15600.00	50.4 PK	74.0	-23.6	1.74 V	32	35.9	14.5
7	15600.00	39.1 AV	54.0	-14.9	1.74 V	32	24.6	14.5

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.

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	120.4 PK			3.71 H	199	116.0	4.4
2	*5240.00	110.8 AV			3.71 H	199	106.4	4.4
3	5441.10	52.9 PK	74.0	-21.1	3.71 H	199	48.5	4.4
4	5441.10	42.1 AV	54.0	-11.9	3.71 H	199	37.7	4.4
5	5446.32	52.6 PK	74.0	-21.4	3.71 H	199	48.2	4.4
6	5446.32	40.6 AV	54.0	-13.4	3.71 H	199	36.2	4.4
7	#10480.00	50.4 PK	68.2	-17.8	1.49 H	162	36.7	13.7
8	15720.00	50.0 PK	74.0	-24.0	1.40 H	225	35.6	14.4
9	15720.00	38.5 AV	54.0	-15.5	1.40 H	225	24.1	14.4
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	*5240.00	116.9 PK			2.86 V	134	112.5	4.4
2	*5240.00	107.8 AV			2.86 V	134	103.4	4.4
3	5442.50	53.9 PK	74.0	-20.1	2.86 V	134	49.5	4.4
4	5442.50	43.4 AV	54.0	-10.6	2.86 V	134	39.0	4.4
5	#10480.00	51.1 PK	68.2	-17.1	1.41 V	25	37.4	13.7
6	15720.00	50.3 PK	74.0	-23.7	1.76 V	17	35.9	14.4
7	15720.00	38.9 AV	54.0	-15.1	1.76 V	17	24.5	14.4

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.

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	#5639.10	57.2 PK	68.2	-11.0	3.85 H	184	52.7	4.5
2	*5745.00	118.7 PK			3.85 H	184	113.7	5.0
3	*5745.00	108.5 AV			3.85 H	184	103.5	5.0
4	#6024.20	53.4 PK	68.2	-14.8	3.85 H	184	48.2	5.2
5	11490.00	50.7 PK	74.0	-23.3	1.53 H	136	36.1	14.6
6	11490.00	39.9 AV	54.0	-14.1	1.53 H	136	25.3	14.6
7	#17235.00	49.5 PK	68.2	-18.7	1.36 H	251	31.5	18.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5552.26	53.8 PK	68.2	-14.4	2.54 V	128	49.3	4.5
2	*5745.00	119.2 PK			2.54 V	128	114.2	5.0
3	*5745.00	109.3 AV			2.54 V	128	104.3	5.0
4	#5988.78	52.9 PK	68.2	-15.3	2.54 V	128	47.7	5.2
5	11490.00	51.2 PK	74.0	-22.8	1.48 V	25	36.6	14.6
6	11490.00	39.7 AV	54.0	-14.3	1.48 V	25	25.1	14.6
7	#17235.00	50.3 PK	68.2	-17.9	1.70 V	40	32.3	18.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
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	#5586.27	55.9 PK	68.2	-12.3	3.79 H	188	51.4	4.5
2	*5785.00	117.7 PK			3.79 H	188	112.6	5.1
3	*5785.00	108.0 AV			3.79 H	188	102.9	5.1
4	#5986.36	52.8 PK	68.2	-15.4	3.79 H	188	47.6	5.2
5	11570.00	50.4 PK	74.0	-23.6	1.42 H	130	35.8	14.6
6	11570.00	39.6 AV	54.0	-14.4	1.42 H	130	25.0	14.6
7	#17355.00	50.0 PK	68.2	-18.2	1.37 H	218	31.8	18.2
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	#5581.17	55.2 PK	68.2	-13.0	2.60 V	126	50.7	4.5
2	*5785.00	118.3 PK			2.60 V	126	113.2	5.1
3	*5785.00	109.1 AV			2.60 V	126	104.0	5.1
4	#5985.33	53.4 PK	68.2	-14.8	2.60 V	126	48.2	5.2
5	11570.00	52.1 PK	74.0	-21.9	1.40 V	26	37.5	14.6
6	11570.00	40.4 AV	54.0	-13.6	1.40 V	26	25.8	14.6
7	#17355.00	50.8 PK	68.2	-17.4	1.75 V	28	32.6	18.2

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.

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	#5583.94	56.3 PK	68.2	-11.9	3.91 H	184	51.8	4.5
2	*5825.00	118.3 PK			3.91 H	184	113.3	5.0
3	*5825.00	108.6 AV			3.91 H	184	103.6	5.0
4	#5944.83	52.8 PK	68.2	-15.4	3.91 H	184	47.7	5.1
5	11650.00	49.9 PK	74.0	-24.1	1.49 H	146	35.5	14.4
6	11650.00	39.2 AV	54.0	-14.8	1.49 H	146	24.8	14.4
7	#17475.00	50.5 PK	68.2	-17.7	1.46 H	217	31.7	18.8
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	#5588.34	57.6 PK	68.2	-10.6	2.68 V	126	53.1	4.5
2	*5825.00	117.5 PK			2.68 V	126	112.5	5.0
3	*5825.00	108.7 AV			2.68 V	126	103.7	5.0
4	#5975.81	52.5 PK	68.2	-15.7	2.68 V	126	47.3	5.2
5	11650.00	51.8 PK	74.0	-22.2	1.39 V	40	37.4	14.4
6	11650.00	40.3 AV	54.0	-13.7	1.39 V	40	25.9	14.4
7	#17475.00	50.9 PK	68.2	-17.3	1.71 V	33	32.1	18.8

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.

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	69.5 PK	74.0	-4.5	3.68 H	178	64.8	4.7
2	5150.00	53.5 AV	54.0	-0.5	3.68 H	178	48.8	4.7
3	*5180.00	117.0 PK			3.68 H	178	112.4	4.6
4	*5180.00	108.2 AV			3.68 H	178	103.6	4.6
5	#10360.00	50.5 PK	68.2	-17.7	1.49 H	143	37.1	13.4
6	15540.00	49.4 PK	74.0	-24.6	1.39 H	239	34.9	14.5
7	15540.00	37.8 AV	54.0	-16.2	1.39 H	239	23.3	14.5
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	66.9 PK	74.0	-7.1	2.68 V	126	62.2	4.7
2	5150.00	49.5 AV	54.0	-4.5	2.68 V	126	44.8	4.7
3	*5180.00	115.3 PK			2.68 V	126	110.7	4.6
4	*5180.00	105.5 AV			2.68 V	126	100.9	4.6
5	#10360.00	51.8 PK	68.2	-16.4	1.42 V	35	38.4	13.4
6	15540.00	51.1 PK	74.0	-22.9	1.80 V	32	36.6	14.5
7	15540.00	39.6 AV	54.0	-14.4	1.80 V	32	25.1	14.5

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.

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	5150.00	67.2 PK	74.0	-6.8	3.62 H	178	62.5	4.7
2	5150.00	53.5 AV	54.0	-0.5	3.62 H	178	48.8	4.7
3	*5200.00	117.2 PK			3.62 H	178	112.8	4.4
4	*5200.00	110.4 AV			3.62 H	178	106.0	4.4
5	#10400.00	50.0 PK	68.2	-18.2	1.50 H	153	36.4	13.6
6	15600.00	50.2 PK	74.0	-23.8	1.44 H	241	35.7	14.5
7	15600.00	38.5 AV	54.0	-15.5	1.44 H	241	24.0	14.5
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	66.7 PK	74.0	-7.3	2.74 V	131	62.0	4.7
2	5150.00	49.1 AV	54.0	-4.9	2.74 V	131	44.4	4.7
3	*5200.00	115.3 PK			2.74 V	131	110.9	4.4
4	*5200.00	105.6 AV			2.74 V	131	101.2	4.4
5	#10400.00	51.7 PK	68.2	-16.5	1.36 V	16	38.1	13.6
6	15600.00	50.6 PK	74.0	-23.4	1.75 V	17	36.1	14.5
7	15600.00	39.2 AV	54.0	-14.8	1.75 V	17	24.7	14.5

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.

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	118.3 PK			3.65 H	184	113.9	4.4
2	*5240.00	109.4 AV			3.65 H	184	105.0	4.4
3	5357.50	49.8 PK	74.0	-24.2	3.65 H	184	45.4	4.4
4	5357.50	42.7 AV	54.0	-11.3	3.65 H	184	38.3	4.4
5	5391.30	53.1 PK	74.0	-20.9	3.65 H	184	48.8	4.3
6	5391.30	41.5 AV	54.0	-12.5	3.65 H	184	37.2	4.3
7	#10480.00	50.5 PK	68.2	-17.7	1.50 H	140	36.8	13.7
8	15720.00	49.5 PK	74.0	-24.5	1.40 H	237	35.1	14.4
9	15720.00	38.0 AV	54.0	-16.0	1.40 H	237	23.6	14.4
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	*5240.00	116.9 PK			2.61 V	124	112.5	4.4
2	*5240.00	107.3 AV			2.61 V	124	102.9	4.4
3	5440.90	53.8 PK	74.0	-20.2	2.61 V	124	49.4	4.4
4	5440.90	43.0 AV	54.0	-11.0	2.61 V	124	38.6	4.4
5	#10480.00	52.0 PK	68.2	-16.2	1.38 V	40	38.3	13.7
6	15720.00	51.1 PK	74.0	-22.9	1.79 V	17	36.7	14.4
7	15720.00	39.5 AV	54.0	-14.5	1.79 V	17	25.1	14.4

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.

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	#5645.04	54.1 PK	68.2	-14.1	3.74 H	187	49.6	4.5
2	*5745.00	116.7 PK			3.74 H	187	111.7	5.0
3	*5745.00	107.6 AV			3.74 H	187	102.6	5.0
4	#5984.55	52.9 PK	68.2	-15.3	3.74 H	187	47.7	5.2
5	11490.00	50.2 PK	74.0	-23.8	1.48 H	125	35.6	14.6
6	11490.00	39.4 AV	54.0	-14.6	1.48 H	125	24.8	14.6
7	#17235.00	50.0 PK	68.2	-18.2	1.41 H	238	32.0	18.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5618.66	54.0 PK	68.2	-14.2	2.53 V	128	49.5	4.5
2	*5745.00	117.4 PK			2.53 V	128	112.4	5.0
3	*5745.00	107.3 AV			2.53 V	128	102.3	5.0
4	#6019.86	52.9 PK	68.2	-15.3	2.53 V	128	47.7	5.2
5	11490.00	52.3 PK	74.0	-21.7	1.40 V	17	37.7	14.6
6	11490.00	40.8 AV	54.0	-13.2	1.40 V	17	26.2	14.6
7	#17235.00	50.8 PK	68.2	-17.4	1.74 V	38	32.8	18.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
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	#5581.35	54.5 PK	68.2	-13.7	3.54 H	180	50.0	4.5
2	*5785.00	115.3 PK			3.54 H	180	110.2	5.1
3	*5785.00	108.0 AV			3.54 H	180	102.9	5.1
4	#6022.71	52.7 PK	68.2	-15.5	3.54 H	180	47.5	5.2
5	11570.00	50.2 PK	74.0	-23.8	1.41 H	144	35.6	14.6
6	11570.00	39.7 AV	54.0	-14.3	1.41 H	144	25.1	14.6
7	#17355.00	49.4 PK	68.2	-18.8	1.41 H	235	31.2	18.2
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	#5578.65	56.2 PK	68.2	-12.0	2.77 V	130	51.7	4.5
2	*5785.00	117.6 PK			2.77 V	130	112.5	5.1
3	*5785.00	107.8 AV			2.77 V	130	102.7	5.1
4	#5985.10	53.3 PK	68.2	-14.9	2.77 V	130	48.1	5.2
5	11570.00	51.9 PK	74.0	-22.1	1.36 V	32	37.3	14.6
6	11570.00	40.4 AV	54.0	-13.6	1.36 V	32	25.8	14.6
7	#17355.00	50.9 PK	68.2	-17.3	1.81 V	37	32.7	18.2

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.

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	#5622.56	54.7 PK	68.2	-13.5	3.89 H	192	50.2	4.5
2	*5825.00	116.5 PK			3.89 H	192	111.5	5.0
3	*5825.00	107.3 AV			3.89 H	192	102.3	5.0
4	#6018.39	52.4 PK	68.2	-15.8	3.89 H	192	47.2	5.2
5	11650.00	49.6 PK	74.0	-24.4	1.53 H	149	35.2	14.4
6	11650.00	39.0 AV	54.0	-15.0	1.53 H	149	24.6	14.4
7	#17475.00	49.5 PK	68.2	-18.7	1.37 H	217	30.7	18.8
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	#5578.82	56.1 PK	68.2	-12.1	2.58 V	186	51.6	4.5
2	*5825.00	116.8 PK			2.58 V	186	111.8	5.0
3	*5825.00	107.1 AV			2.58 V	186	102.1	5.0
4	#6020.25	52.4 PK	68.2	-15.8	2.58 V	186	47.2	5.2
5	11650.00	51.8 PK	74.0	-22.2	1.37 V	16	37.4	14.4
6	11650.00	40.0 AV	54.0	-14.0	1.37 V	16	25.6	14.4
7	#17475.00	50.6 PK	68.2	-17.6	1.70 V	15	31.8	18.8

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.

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	62.6 PK	74.0	-11.4	3.73 H	176	57.9	4.7
2	5150.00	53.7 AV	54.0	-0.3	3.73 H	176	49.0	4.7
3	*5190.00	109.6 PK			3.73 H	176	105.1	4.5
4	*5190.00	100.7 AV			3.73 H	176	96.2	4.5
5	#10380.00	50.4 PK	68.2	-17.8	1.43 H	127	37.0	13.4
6	15570.00	50.0 PK	74.0	-24.0	1.39 H	221	35.4	14.6
7	15570.00	38.5 AV	54.0	-15.5	1.39 H	221	23.9	14.6
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	5150.00	59.8 PK	74.0	-14.2	2.64 V	124	55.1	4.7
2	5150.00	50.3 AV	54.0	-3.7	2.64 V	124	45.6	4.7
3	*5190.00	108.9 PK			2.64 V	124	104.4	4.5
4	*5190.00	98.4 AV			2.64 V	124	93.9	4.5
5	#10380.00	51.3 PK	68.2	-16.9	1.40 V	17	37.9	13.4
6	15570.00	51.3 PK	74.0	-22.7	1.78 V	40	36.7	14.6
7	15570.00	39.7 AV	54.0	-14.3	1.78 V	40	25.1	14.6

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.

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	5147.60	63.0 PK	74.0	-11.0	3.69 H	166	58.2	4.8
2	5147.60	52.2 AV	54.0	-1.8	3.69 H	166	47.4	4.8
3	5150.00	61.5 PK	74.0	-12.5	3.69 H	166	56.8	4.7
4	5150.00	53.6 AV	54.0	-0.4	3.69 H	166	48.9	4.7
5	*5230.00	115.9 PK			3.69 H	166	111.5	4.4
6	*5230.00	106.7 AV			3.69 H	166	102.3	4.4
7	5350.00	55.0 PK	74.0	-19.0	3.69 H	166	50.7	4.3
8	5350.00	44.0 AV	54.0	-10.0	3.69 H	166	39.7	4.3
9	#10460.00	50.2 PK	68.2	-18.0	1.50 H	149	36.6	13.6
10	15690.00	49.6 PK	74.0	-24.4	1.47 H	233	35.1	14.5
11	15690.00	38.2 AV	54.0	-15.8	1.47 H	233	23.7	14.5
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	59.3 PK	74.0	-14.7	2.62 V	180	54.6	4.7
2	5150.00	49.6 AV	54.0	-4.4	2.62 V	180	44.9	4.7
3	*5230.00	113.6 PK			2.62 V	180	109.2	4.4
4	*5230.00	103.7 AV			2.62 V	180	99.3	4.4
5	5350.00	55.7 PK	74.0	-18.3	2.62 V	180	51.4	4.3
6	5350.00	43.3 AV	54.0	-10.7	2.62 V	180	39.0	4.3
7	#10460.00	51.5 PK	68.2	-16.7	1.39 V	14	37.9	13.6
8	15690.00	50.5 PK	74.0	-23.5	1.78 V	18	36.0	14.5
9	15690.00	39.0 AV	54.0	-15.0	1.78 V	18	24.5	14.5

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.

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	#5636.28	62.3 PK	68.2	-5.9	3.85 H	186	57.8	4.5
2	*5755.00	115.6 PK			3.85 H	186	110.6	5.0
3	*5755.00	104.7 AV			3.85 H	186	99.7	5.0
4	#5952.79	52.3 PK	68.2	-15.9	3.85 H	186	47.1	5.2
5	11510.00	49.7 PK	74.0	-24.3	1.50 H	155	35.1	14.6
6	11510.00	39.2 AV	54.0	-14.8	1.50 H	155	24.6	14.6
7	#17265.00	49.7 PK	68.2	-18.5	1.45 H	234	31.8	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	#5637.39	60.4 PK	68.2	-7.8	2.54 V	132	55.9	4.5
2	*5755.00	114.8 PK			2.54 V	132	109.8	5.0
3	*5755.00	105.0 AV			2.54 V	132	100.0	5.0
4	#6022.83	52.4 PK	68.2	-15.8	2.54 V	132	47.2	5.2
5	11510.00	52.6 PK	74.0	-21.4	1.45 V	23	38.0	14.6
6	11510.00	40.9 AV	54.0	-13.1	1.45 V	23	26.3	14.6
7	#17265.00	51.1 PK	68.2	-17.1	1.70 V	16	33.2	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.

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	#5649.18	58.9 PK	68.2	-9.3	3.81 H	192	54.4	4.5
2	*5795.00	115.1 PK			3.81 H	192	110.0	5.1
3	*5795.00	105.5 AV			3.81 H	192	100.4	5.1
4	#5926.72	58.7 PK	68.2	-9.5	3.81 H	192	53.6	5.1
5	11590.00	50.8 PK	74.0	-23.2	1.44 H	154	36.2	14.6
6	11590.00	39.8 AV	54.0	-14.2	1.44 H	154	25.2	14.6
7	#17385.00	50.3 PK	68.2	-17.9	1.43 H	225	32.0	18.3
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	#5638.68	55.2 PK	68.2	-13.0	2.59 V	131	50.7	4.5
2	*5795.00	114.3 PK			2.59 V	131	109.2	5.1
3	*5795.00	104.9 AV			2.59 V	131	99.8	5.1
4	#5937.31	55.0 PK	68.2	-13.2	2.59 V	131	49.9	5.1
5	11590.00	51.6 PK	74.0	-22.4	1.35 V	11	37.0	14.6
6	11590.00	40.0 AV	54.0	-14.0	1.35 V	11	25.4	14.6
7	#17385.00	50.7 PK	68.2	-17.5	1.71 V	12	32.4	18.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
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	63.1 PK	74.0	-10.9	3.81 H	177	58.4	4.7
2	5150.00	53.8 AV	54.0	-0.2	3.81 H	177	49.1	4.7
3	*5210.00	106.1 PK			3.81 H	177	101.7	4.4
4	*5210.00	98.0 AV			3.81 H	177	93.6	4.4
5	5350.00	51.4 PK	74.0	-22.6	3.81 H	177	47.1	4.3
6	5350.00	40.1 AV	54.0	-13.9	3.81 H	177	35.8	4.3
7	#10420.00	50.2 PK	68.2	-18.0	1.52 H	147	36.7	13.5
8	15630.00	49.3 PK	74.0	-24.7	1.47 H	216	34.7	14.6
9	15630.00	37.7 AV	54.0	-16.3	1.47 H	216	23.1	14.6

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	5150.00	61.5 PK	74.0	-12.5	2.72 V	126	56.8	4.7
2	5150.00	51.5 AV	54.0	-2.5	2.72 V	126	46.8	4.7
3	*5210.00	103.6 PK			2.72 V	126	99.2	4.4
4	*5210.00	94.2 AV			2.72 V	126	89.8	4.4
5	5350.00	50.3 PK	74.0	-23.7	2.72 V	126	46.0	4.3
6	5350.00	40.1 AV	54.0	-13.9	2.72 V	126	35.8	4.3
7	5389.90	51.5 PK	74.0	-22.5	2.72 V	126	47.2	4.3
8	5389.90	39.6 AV	54.0	-14.4	2.72 V	126	35.3	4.3
9	#10420.00	52.4 PK	68.2	-15.8	1.45 V	35	38.9	13.5
10	15630.00	50.5 PK	74.0	-23.5	1.81 V	23	35.9	14.6
11	15630.00	39.1 AV	54.0	-14.9	1.81 V	23	24.5	14.6

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.

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	#5649.37	67.7 PK	68.2	-0.5	3.83 H	189	63.2	4.5
2	*5775.00	109.9 PK			3.83 H	189	104.8	5.1
3	*5775.00	100.1 AV			3.83 H	189	95.0	5.1
4	#5924.31	59.4 PK	68.7	-9.3	3.83 H	189	54.3	5.1
5	11550.00	50.5 PK	74.0	-23.5	1.43 H	145	35.9	14.6
6	11550.00	39.5 AV	54.0	-14.5	1.43 H	145	24.9	14.6
7	#17325.00	49.8 PK	68.2	-18.4	1.36 H	232	31.7	18.1
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	#5638.72	65.9 PK	68.2	-2.3	2.70 V	125	61.4	4.5
2	*5775.00	110.5 PK			2.70 V	125	105.4	5.1
3	*5775.00	100.2 AV			2.70 V	125	95.1	5.1
4	#5928.43	59.4 PK	68.2	-8.8	2.70 V	125	54.3	5.1
5	11550.00	51.6 PK	74.0	-22.4	1.37 V	33	37.0	14.6
6	11550.00	40.2 AV	54.0	-13.8	1.37 V	33	25.6	14.6
7	#17325.00	50.8 PK	68.2	-17.4	1.78 V	14	32.7	18.1

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

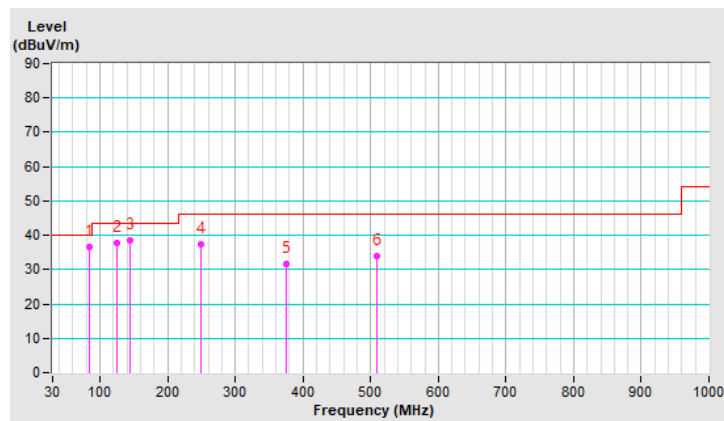
Below 1GHz Data:

RF Mode	TX 802.11ac (VHT40)	Channel	CH 151 : 5755 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	85.00	36.6 QP	40.0	-3.4	2.00 H	226	50.3	-13.7
2	125.01	37.7 QP	43.5	-5.8	1.50 H	81	47.0	-9.3
3	144.02	38.3 QP	43.5	-5.2	2.00 H	72	46.1	-7.8
4	250.02	37.3 QP	46.0	-8.7	1.00 H	294	45.9	-8.6
5	375.00	31.7 QP	46.0	-14.3	1.00 H	0	36.1	-4.4
6	510.00	33.8 QP	46.0	-12.2	1.50 H	206	34.5	-0.7

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 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.

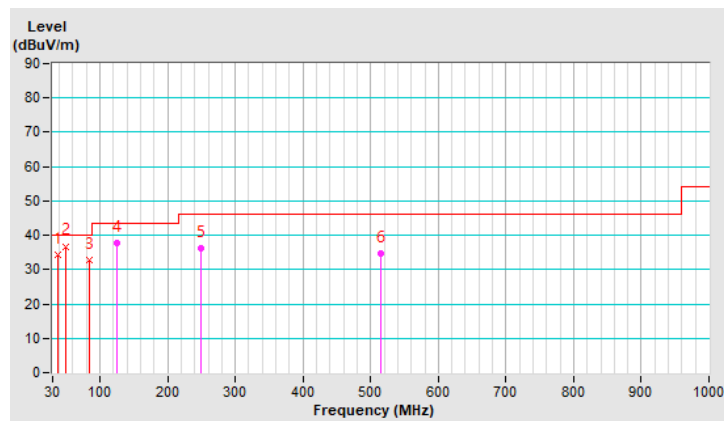


RF Mode	TX 802.11ac (VHT40)	Channel	CH 151 : 5755 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	37.95	34.3 QP	40.0	-5.7	1.00 V	38	43.2	-8.9
2	48.43	36.8 QP	40.0	-3.2	1.50 V	247	44.9	-8.1
3	84.25	32.7 QP	40.0	-7.3	1.00 V	6	46.3	-13.6
4	125.01	37.7 QP	43.5	-5.8	1.00 V	228	47.0	-9.3
5	250.04	36.2 QP	46.0	-9.8	1.00 V	296	44.8	-8.6
6	514.32	34.7 QP	46.0	-11.3	1.00 V	125	35.4	-0.7

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 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	2020/10/20	2021/10/19
LISN R&S	ESH3-Z5	848773/004	2020/10/27	2021/10/26
LISN R & S	ESH3-Z5	835239/001	2021/3/26	2022/3/25
50 ohms Terminator	50	3	2020/10/26	2021/10/25
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2020/9/26	2021/9/25
Fixed attenuator STI	STI02-2200-10	005	2021/8/27	2022/8/26
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: 2021/8/27

4.2.3 Test Procedure

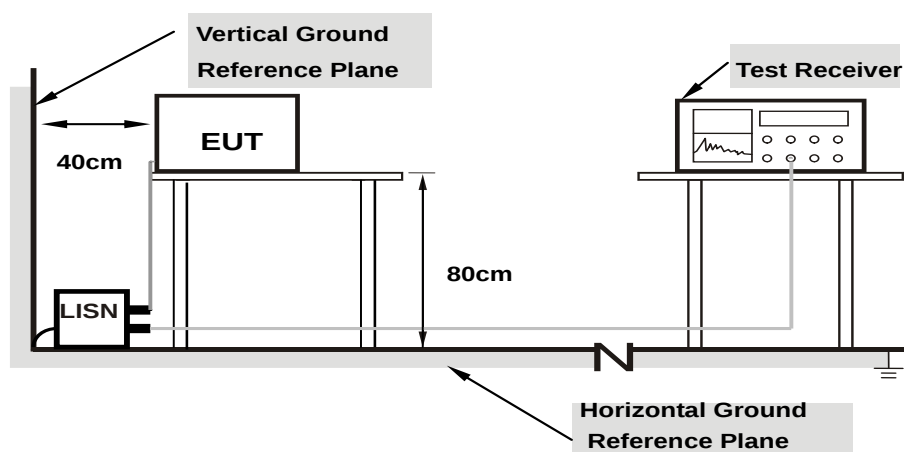
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

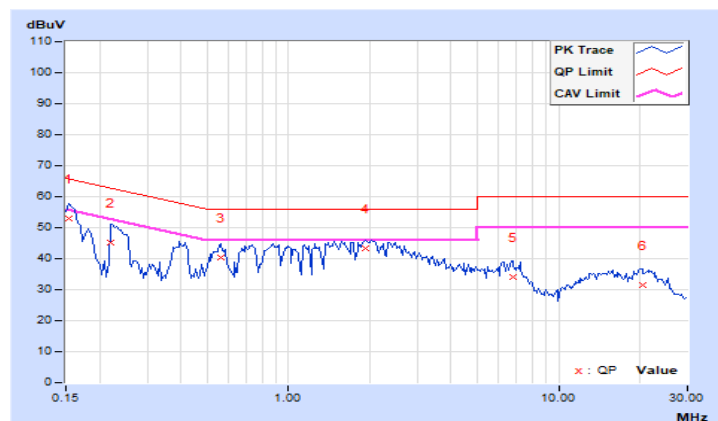
4.2.7 Test Results

RF Mode	TX 802.11ac (VHT40)	Channel	CH 151 : 5755 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	0.15391	9.95	43.06	37.70	53.01	47.65	65.79	55.79	-12.78	-8.14
2	0.22031	9.97	35.13	22.26	45.10	32.23	62.81	52.81	-17.71	-20.58
3	0.56016	10.00	30.54	17.09	40.54	27.09	56.00	46.00	-15.46	-18.91
4	1.93359	10.07	33.12	20.35	43.19	30.42	56.00	46.00	-12.81	-15.58
5	6.78516	10.34	23.82	15.57	34.16	25.91	60.00	50.00	-25.84	-24.09
6	20.38672	11.13	20.49	14.14	31.62	25.27	60.00	50.00	-28.38	-24.73

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

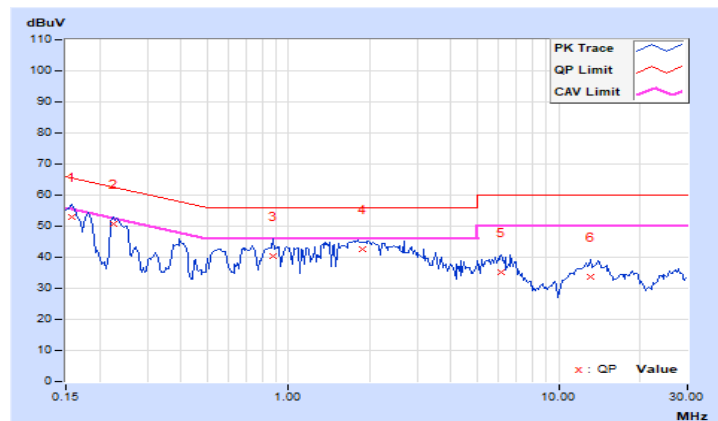


RF Mode	TX 802.11ac (VHT40)	Channel	CH 151 : 5755 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.15781	9.92	43.06	36.03	52.98	45.95	65.58	55.58	-12.60	-9.63
2	0.22422	9.95	40.77	31.43	50.72	41.38	62.66	52.66	-11.94	-11.28
3	0.87266	9.99	30.55	18.99	40.54	28.98	56.00	46.00	-15.46	-17.02
4	1.87109	10.03	32.50	20.67	42.53	30.70	56.00	46.00	-13.47	-15.30
5	6.16016	10.22	24.79	16.14	35.01	26.36	60.00	50.00	-24.99	-23.64
6	13.09375	10.55	23.01	17.10	33.56	27.65	60.00	50.00	-26.44	-22.35

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 $N_{ANT} \leq 4$;

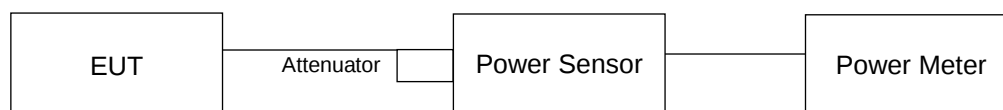
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

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

**For UNII-1
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	Chain 2				
36	5180	16.75	17.60	16.68	151.418	21.80	27.6	Pass
40	5200	20.22	21.09	20.13	336.763	25.27	27.6	Pass
48	5240	20.01	21.04	20.23	332.727	25.22	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to $30-(8.4-6) = 27.6$ dBm.

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	Chain 2				
36	5180	15.85	16.69	15.78	122.969	20.90	27.6	Pass
40	5200	19.27	20.17	19.22	272.08	24.35	27.6	Pass
48	5240	19.11	20.14	19.31	270.057	24.31	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to $30-(8.4-6) = 27.6$ 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	Chain 2				
38	5190	14.37	15.22	14.30	87.534	19.42	27.6	Pass
46	5230	19.18	20.09	19.37	271.385	24.34	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to $30-(8.4-6) = 27.6$ 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	Chain 2				
42	5210	12.45	13.31	12.37	56.267	17.50	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to $30-(8.4-6) = 27.6$ dBm.

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	Chain 2				
36	5180	15.85	16.69	15.78	122.969	20.90	26.73	Pass
44	5220	19.27	20.17	19.22	272.08	24.35	26.73	Pass
48	5240	19.11	20.14	19.31	270.057	24.31	26.73	Pass

Note: 1. Directional gain = 9.27dBi > 6dBi , so the power limit shall be reduced to $30-(9.27-6) = 26.73\text{dBm}$.

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	Chain 2				
38	5190	14.37	15.22	14.30	87.534	19.42	26.73	Pass
46	5230	19.18	20.09	19.37	271.385	24.34	26.73	Pass

Note: 1. Directional gain = 9.27dBi > 6dBi , so the power limit shall be reduced to $30-(9.27-6) = 26.73\text{dBm}$.

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	Chain 2				
42	5210	12.45	13.31	12.37	56.267	17.50	26.73	Pass

Note: 1. Directional gain = 9.27dBi > 6dBi , so the power limit shall be reduced to $30-(9.27-6) = 26.73\text{dBm}$.

**For UNII-3
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	Chain 2				
149	5745	21.19	22.05	21.10	420.672	26.24	27.6	Pass
157	5785	21.01	22.00	21.22	417.106	26.20	27.6	Pass
165	5825	21.17	21.98	21.15	418.996	26.22	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to 30-(8.4-6) = 27.6dBm.

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	Chain 2				
149	5745	21.68	21.58	20.68	408.061	26.11	27.6	Pass
157	5785	21.62	21.36	20.66	398.397	26.00	27.6	Pass
165	5825	21.60	21.41	20.43	393.308	25.95	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to 30-(8.4-6) = 27.6dBm.

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	Chain 2				
151	5755	22.22	21.57	21.11	439.396	26.43	27.6	Pass
159	5795	22.04	21.66	21.05	433.861	26.37	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to 30-(8.4-6) = 27.6dBm.

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	Chain 2				
155	5775	20.26	19.83	19.01	281.947	24.50	27.6	Pass

Note: 1. Maximum gain = 8.4dBi > 6dBi, so the power limit shall be reduced to 30-(8.4-6) = 27.6dBm.

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	Chain 2				
149	5745	21.68	21.58	20.68	408.061	26.11	26.94	Pass
157	5785	21.62	21.36	20.66	398.397	26.00	26.94	Pass
165	5825	21.60	21.41	20.43	393.308	25.95	26.94	Pass

Note: 1. For U-NII-3: Directional gain = 9.06dBi > 6dBi , so the power limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

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	Chain 2				
151	5755	22.22	21.57	21.11	439.396	26.43	26.94	Pass
159	5795	22.04	21.66	21.05	433.861	26.37	26.94	Pass

Note: 1. For U-NII-3: Directional gain = 9.06dBi > 6dBi , so the power limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

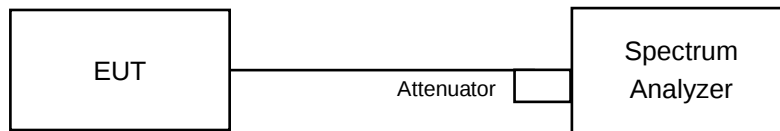
802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
155	5775	20.26	19.83	19.01	281.947	24.50	26.94	Pass

Note: 1. For U-NII-3: Directional gain = 9.06dBi > 6dBi , so the power limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

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

For UNII-1

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
36	5180	16.68	16.56	16.44
40	5200	16.8	16.8	16.68
48	5240	16.8	16.8	16.8

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
36	5180	17.76	17.52	17.64
44	5220	17.76	17.52	17.64
48	5240	17.76	17.64	17.76

802.11ac (VHT40)

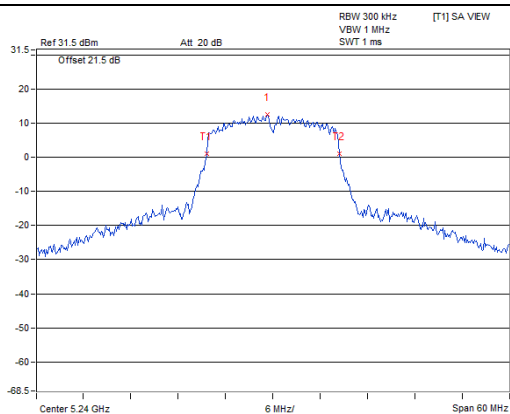
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
38	5190	36.48	36.48	36.24
46	5230	36.48	36.48	36.48

802.11ac (VHT80)

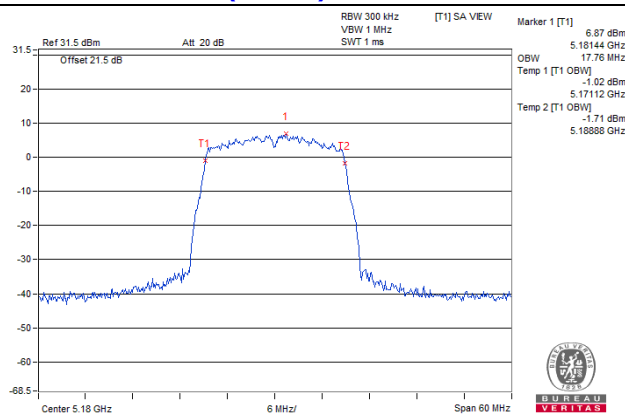
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
42	5210	76.32	74.88	74.88

Spectrum Plot of Max. Value

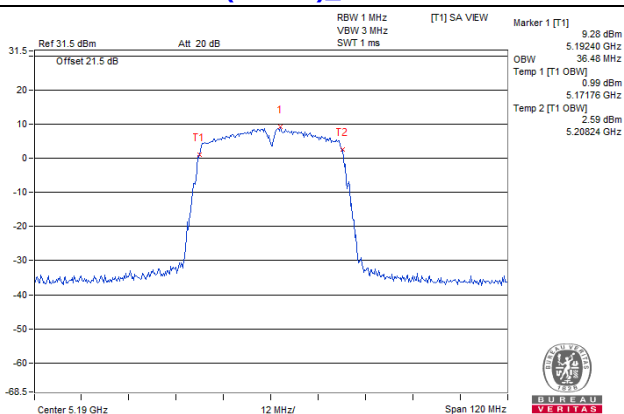
802.11a_Chain 2 / CH48



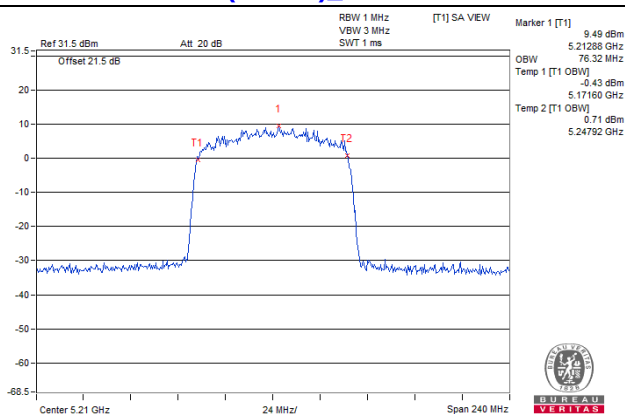
802.11ac (VHT20)_Chain 0 / CH36



802.11ac (VHT40)_Chain 0 / CH38



802.11ac (VHT80)_Chain 0 / CH42



For UNII-3

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
149	5745	17.88	18.12	20.28
157	5785	18.36	19.2	23.04
165	5825	17.76	19.8	22.44

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
149	5745	19.08	18.48	20.16
157	5785	19.8	19.2	23.04
165	5825	19.08	19.92	21.12

802.11ac (VHT40)

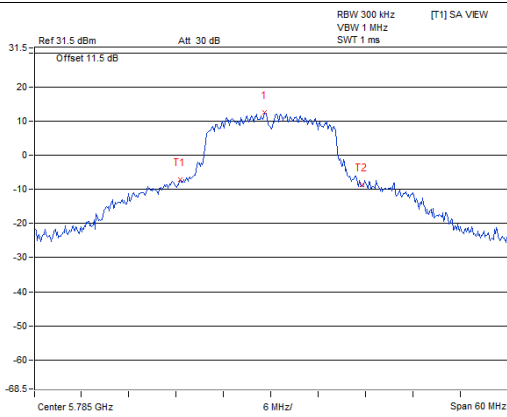
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
151	5755	39.12	44.4	48
159	5795	39.6	48	53.76

802.11ac (VHT80)

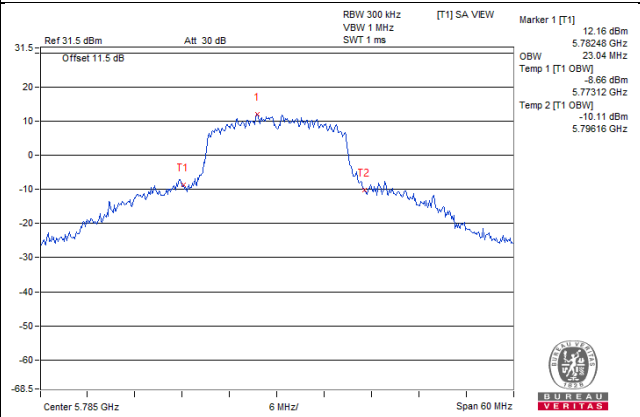
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
155	5775	75.84	75.36	86.88

Spectrum Plot of Max. Value

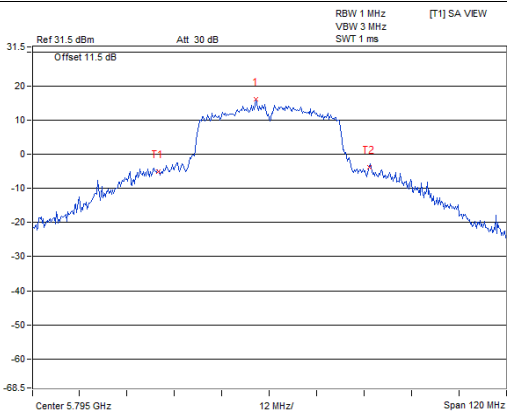
802.11a_Chain 2 / CH157



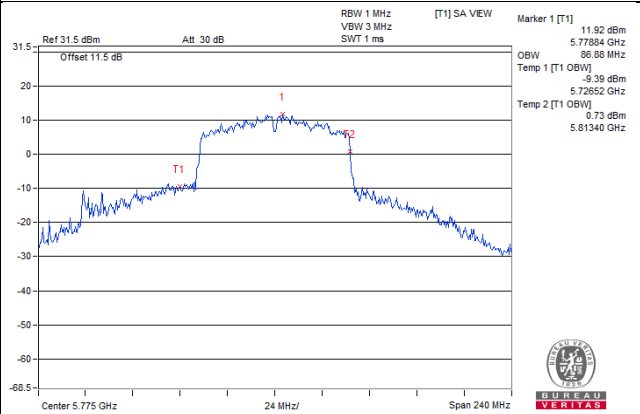
802.11ac (VHT20)_Chain 2 / CH157



802.11ac (VHT40)_Chain 2 / CH159

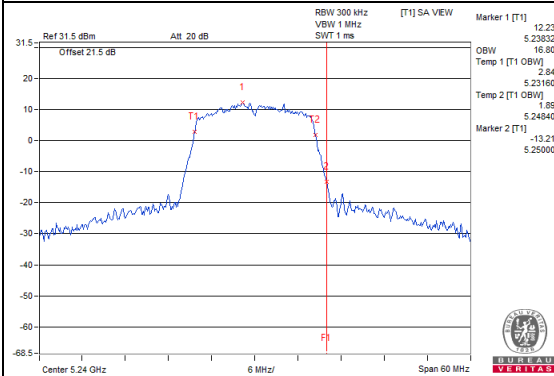


802.11ac (VHT80)_Chain 2 / CH155

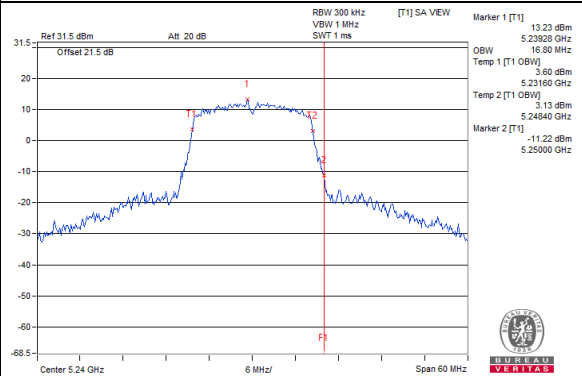


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

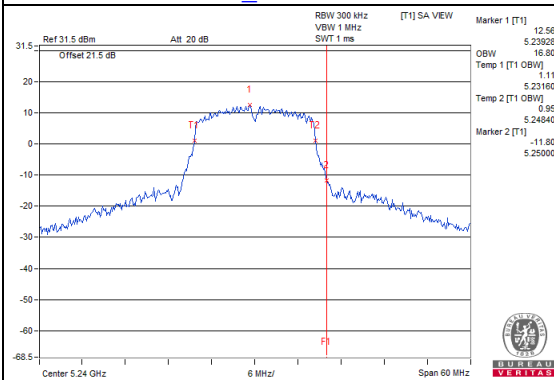
802.11a_Chain 0 / CH48



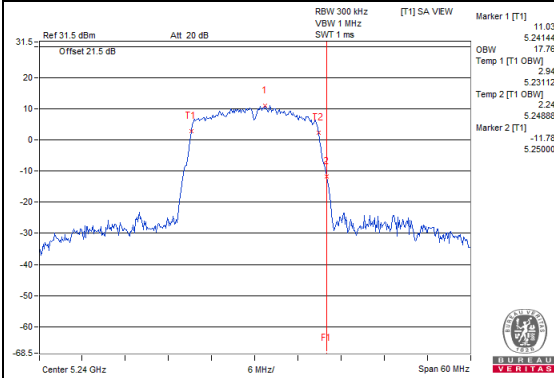
802.11a_Chain 1 / CH48



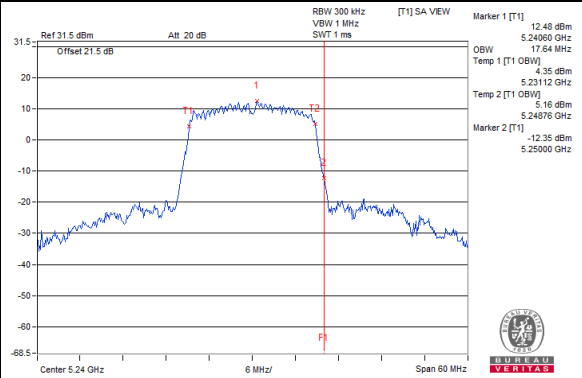
802.11a_Chain 2 / CH48



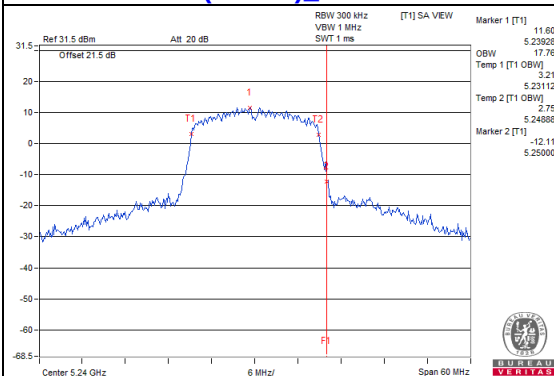
802.11ac (VHT20)_Chain 0 / CH48



802.11ac (VHT20)_Chain 1 / CH48

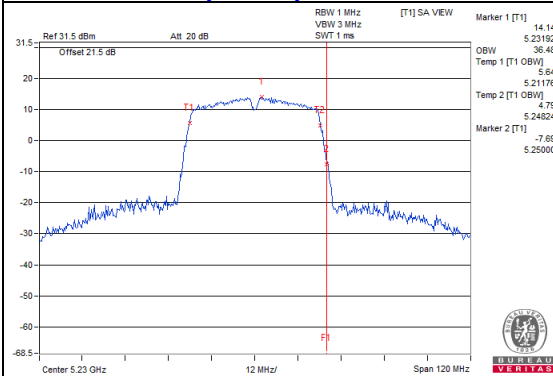


802.11ac (VHT20)_Chain 2 / CH48

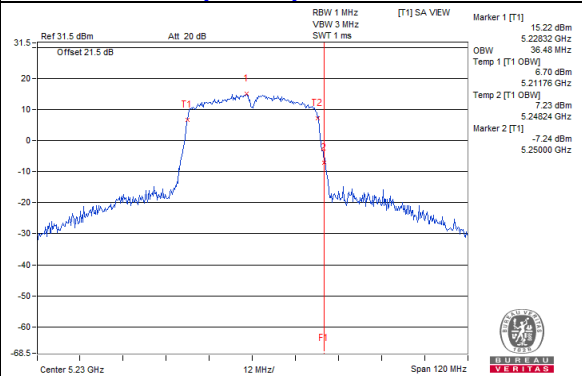


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

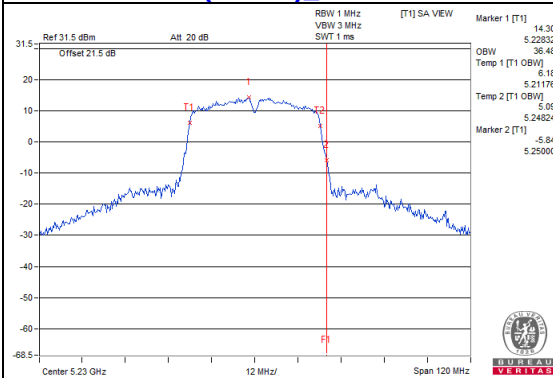
802.11ac (VHT40)_Chain 0 / CH46



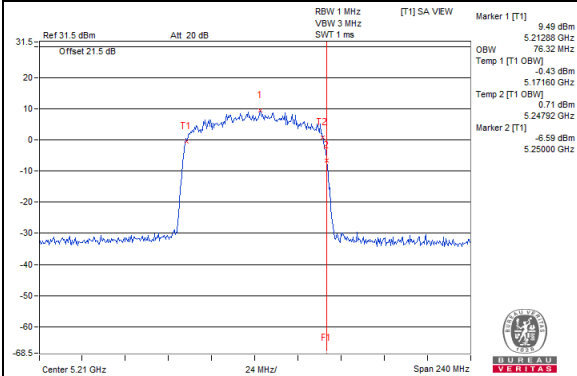
802.11ac (VHT40)_Chain 1 / CH46



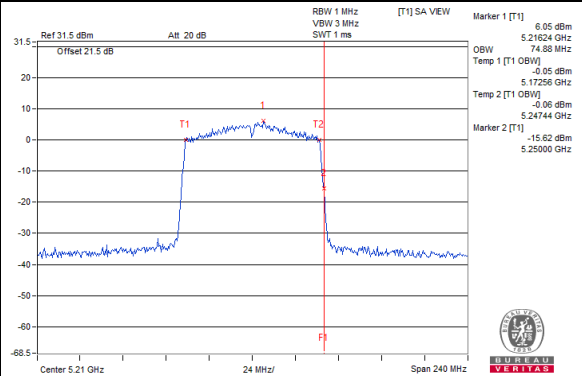
802.11ac (VHT40)_Chain 2 / CH46



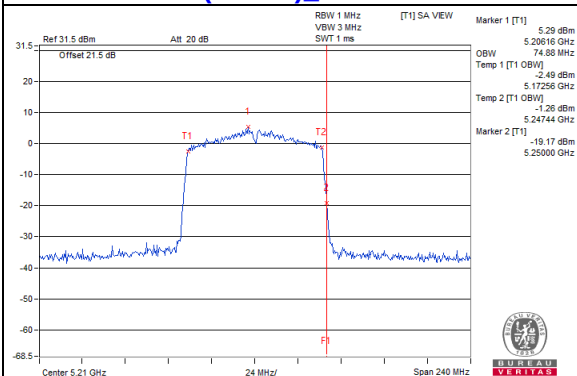
802.11ac (VHT80)_Chain 0 / CH42



802.11ac (VHT80)_Chain 1 / CH42

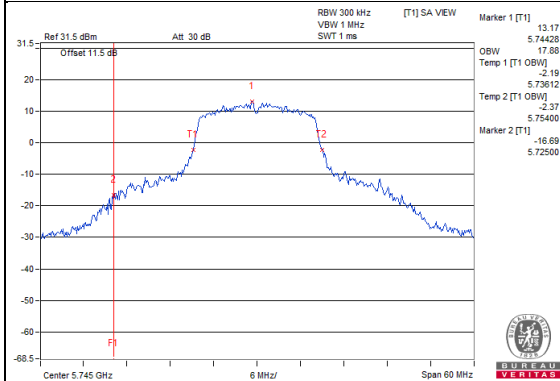


802.11ac (VHT80)_Chain 2 / CH42

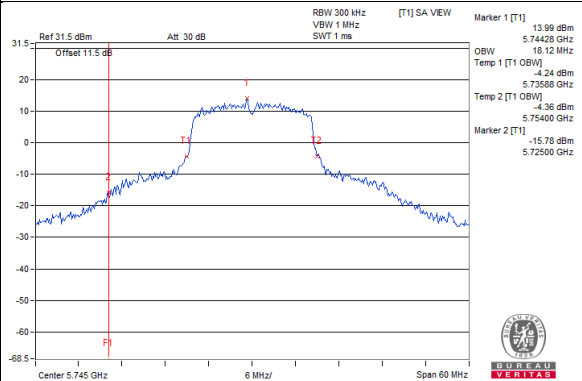


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

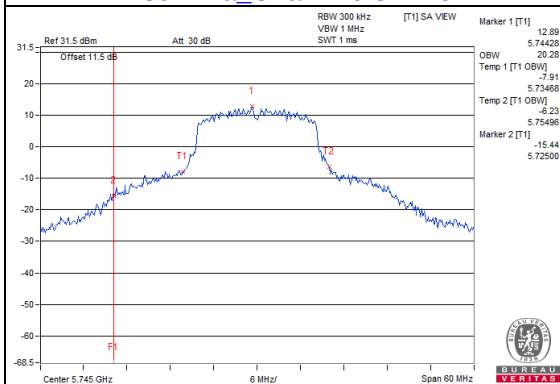
802.11a_Chain 0 / CH149



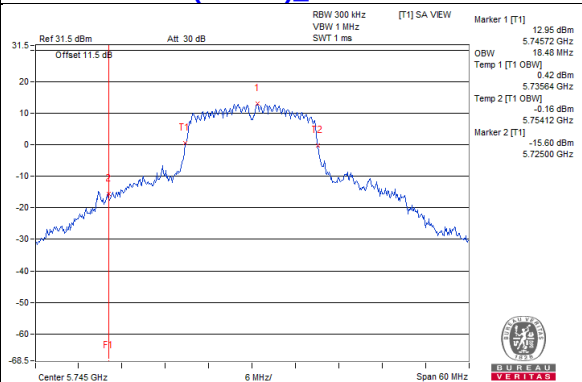
802.11a_Chain 1 / CH149



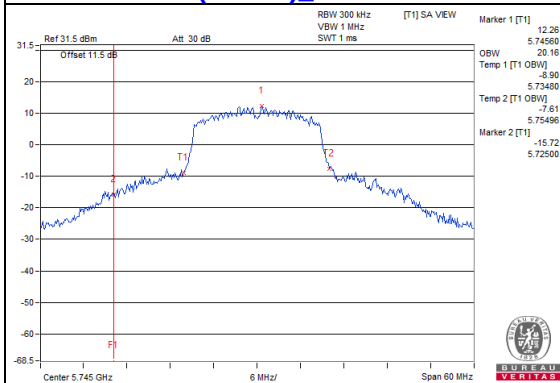
802.11a_Chain 2 / CH149



802.11ac (VHT20)_Chain 1 / CH149

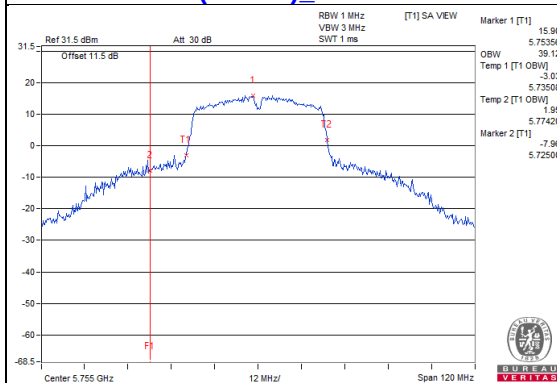


802.11ac (VHT20)_Chain 2 / CH149

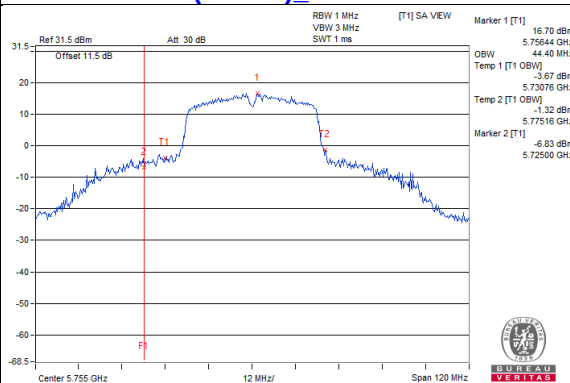


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

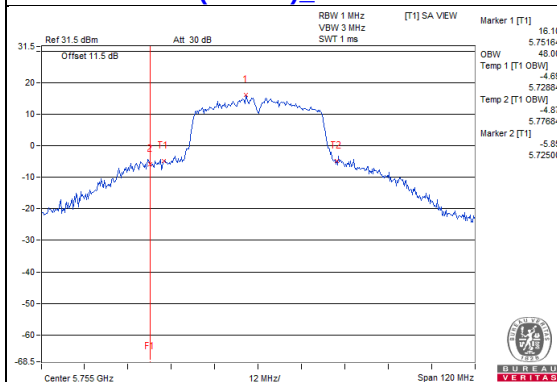
802.11ac (VHT40) Chain 0 / CH151



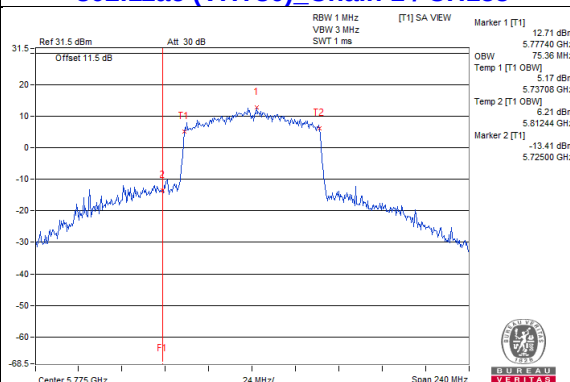
802.11ac (VHT40) Chain 1 / CH151



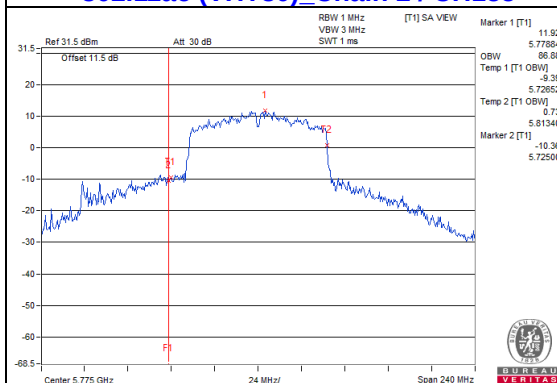
802.11ac (VHT40) Chain 2 / CH151



802.11ac (VHT80) Chain 1 / CH155



802.11ac (VHT80) Chain 2 / CH155

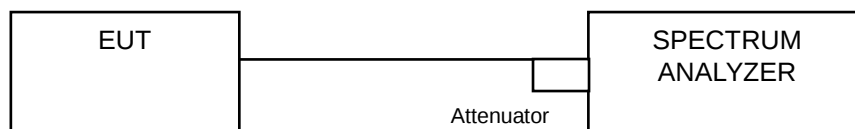


4.5 Peak Power Spectral Density Measurement

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-1

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

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 (increasing) 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

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 UNII-1

802.11a

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)			Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1	Chain2			
36	5180	3.35	5.98	4.55	9.53	13.73	PASS
40	5200	8.48	9.05	7.99	13.30	13.73	PASS
48	5240	8.14	8.72	8.16	13.12	13.73	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 = 9.27 dBi > 6dBi , so the power density limit shall be reduced to $17-(9.27-6) = 13.73\text{dBm}$.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)			Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1	Chain2			
36	5180	2.93	4.27	3.98	8.54	13.73	PASS
40	5200	7.41	7.64	7.09	12.16	13.73	PASS
48	5240	6.48	7.71	7.39	12.00	13.73	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 = 9.27 dBi > 6dBi , so the power density limit shall be reduced to $17-(9.27-6) = 13.73\text{dBm}$.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)			Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1	Chain2			
38	5190	-0.95	0.36	-0.97	4.30	13.73	PASS
46	5230	4.01	5.03	4.04	9.16	13.73	PASS

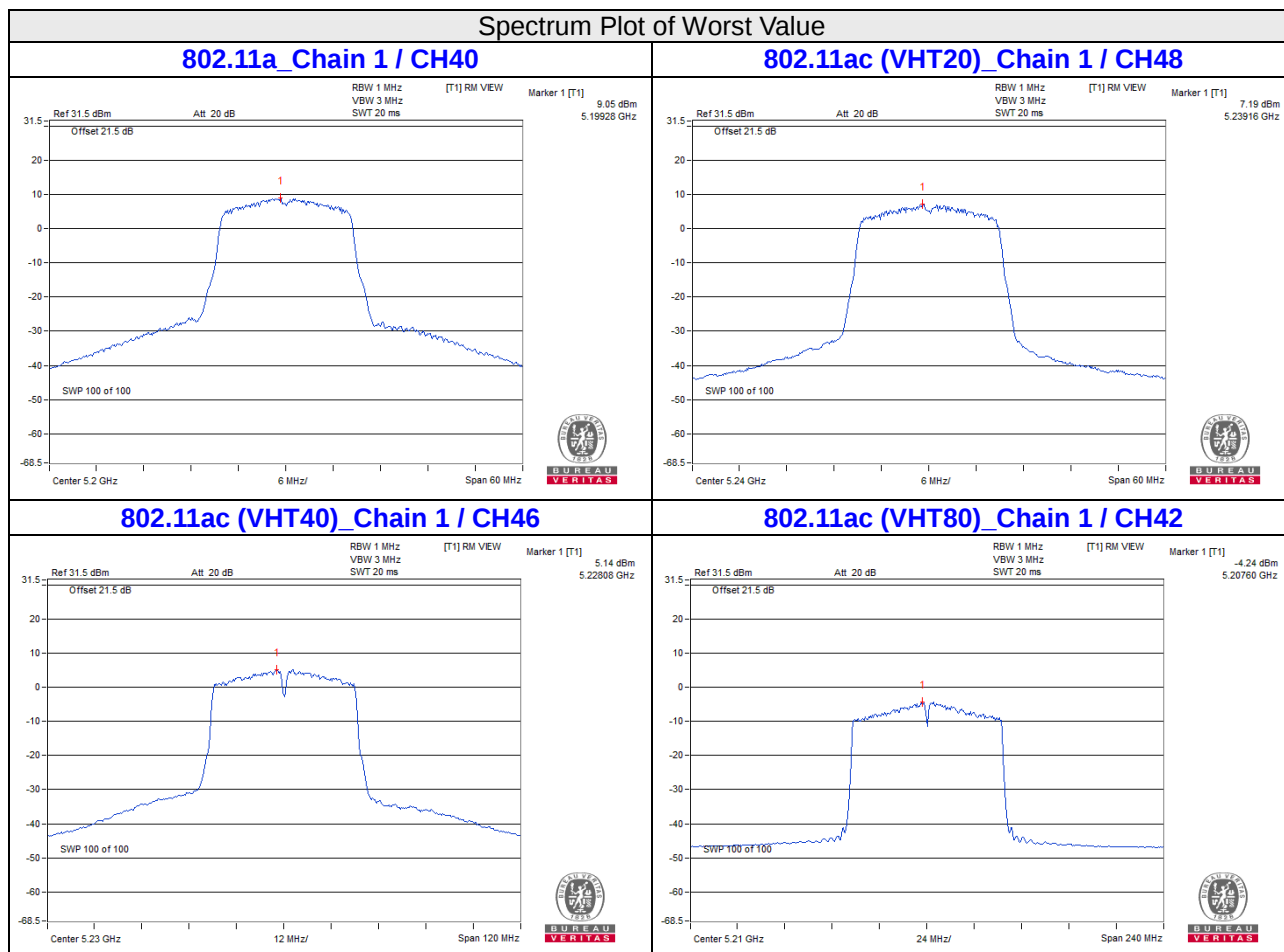
Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
 2. Directional gain = 9.27 dBi > 6dBi , so the power density limit shall be reduced to $17-(9.27-6) = 13.73\text{dBm}$.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)			Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain0	Chain1	Chain2			
42	5210	-4.82	-4.24	-5.21	0.03	13.73	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 = 9.27 dBi > 6dBi , so the power density limit shall be reduced to $17-(9.27-6) = 13.73\text{dBm}$.

Spectrum Plot of Worst Value



For UNII-3

802.11a

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)			Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
149	5745	5.29	5.52	4.53	9.783	9.90	12.12	26.94	PASS
157	5785	4.78	5.42	4.35	9.212	9.64	11.86	26.94	PASS
165	5825	4.72	5.14	3.91	8.691	9.39	11.61	26.94	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 = 9.06dBi > 6dBi , so the power density limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)			Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
149	5745	3.90	4.84	4.18	8.121	9.10	11.32	26.94	PASS
157	5785	5.16	4.92	3.96	8.874	9.48	11.70	26.94	PASS
165	5825	5.16	4.77	3.38	8.458	9.27	11.49	26.94	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 = 9.06dBi > 6dBi , so the power density limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)			Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
151	5755	2.49	2.45	1.63	4.988	6.98	9.20	26.94	PASS
159	5795	2.46	2.45	1.01	4.782	6.80	9.02	26.94	PASS

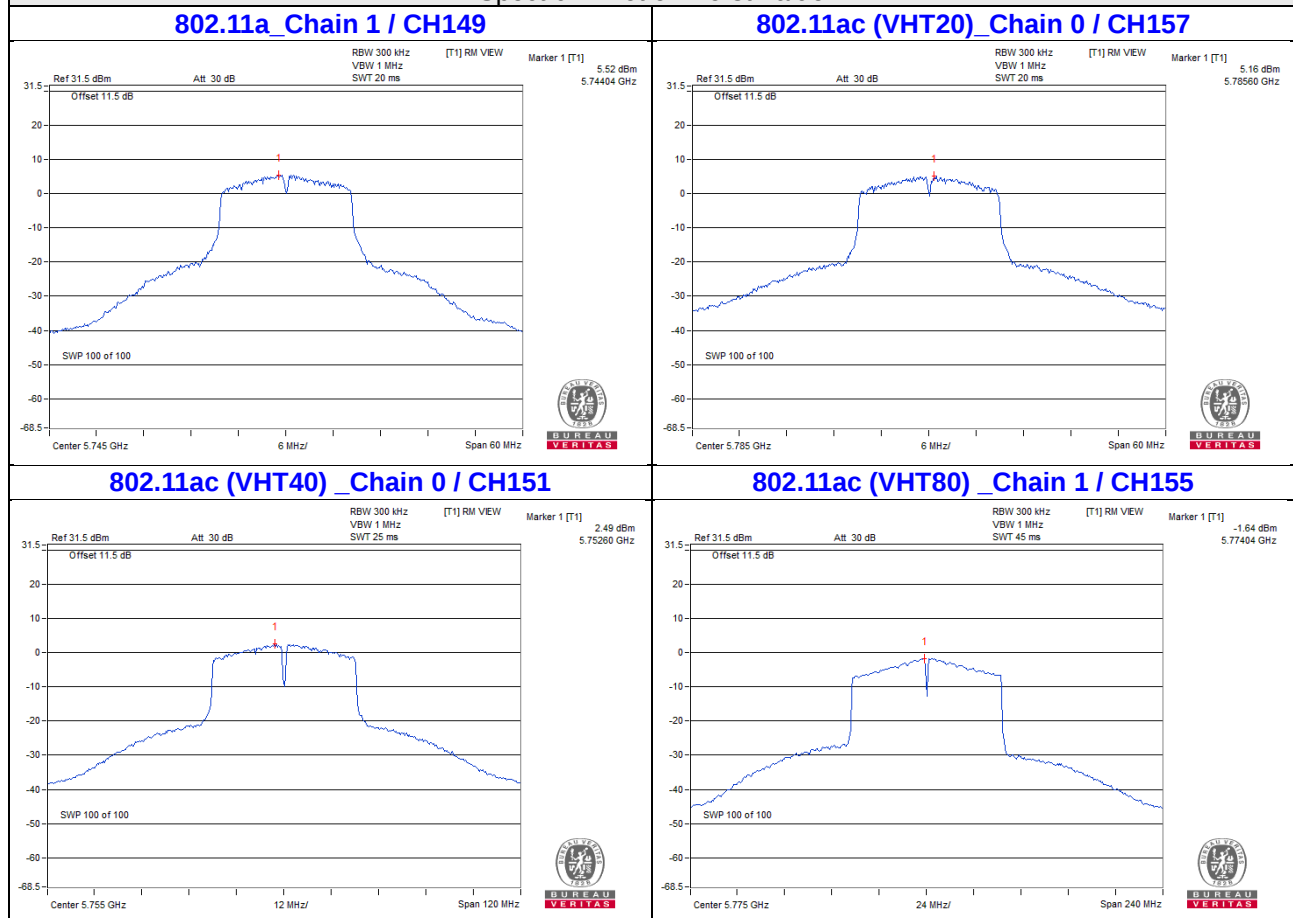
Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 9.06dBi > 6dBi , so the power density limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	PSD (dBm/300kHz)			Total PSD (mW/300kHz)	Total PSD (dBm/300kHz)	Total PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Pass / Fail
		Chain0	Chain1	Chain2					
155	5775	-1.67	-1.64	-2.35	1.9484	2.90	5.12	26.94	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 = 9.06dBi > 6dBi , so the power density limit shall be reduced to $30-(9.06-6) = 26.94\text{dBm}$.

Spectrum Plot of Worst Value

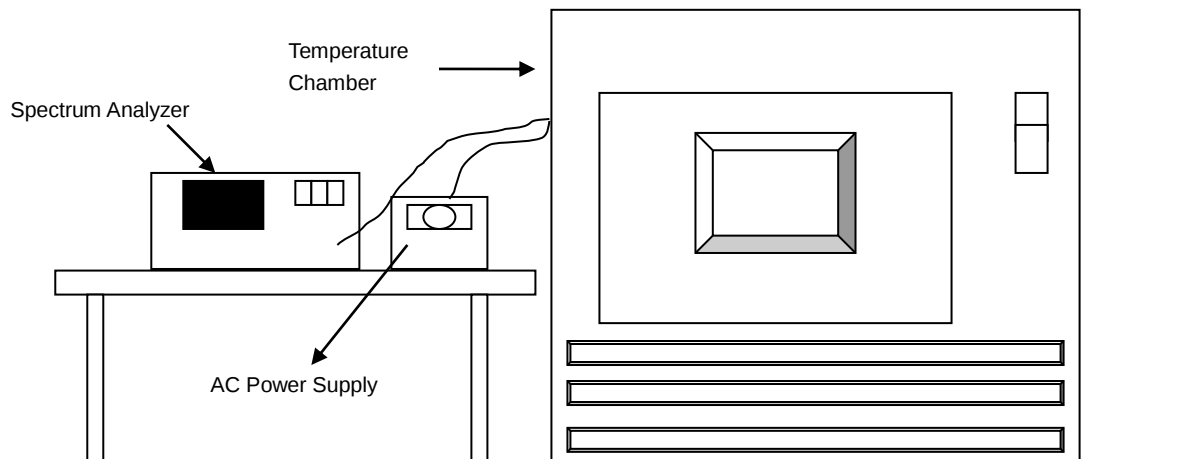


4.6 Frequency Stability Measurement

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
50	120	5180.0167	Pass	5180.015	Pass	5180.0158	Pass	5180.0144	Pass
40	120	5180.0039	Pass	5180.003	Pass	5180.0022	Pass	5180.0039	Pass
30	120	5179.9867	Pass	5179.9835	Pass	5179.9831	Pass	5179.984	Pass
20	120	5180.005	Pass	5180.0038	Pass	5180.0022	Pass	5180.0037	Pass
10	120	5179.9896	Pass	5179.9871	Pass	5179.9877	Pass	5179.9888	Pass
0	120	5179.9986	Pass	5179.9983	Pass	5179.9979	Pass	5179.9977	Pass
-10	120	5180.0226	Pass	5180.0243	Pass	5180.0269	Pass	5180.0227	Pass
-20	120	5179.9765	Pass	5179.9755	Pass	5179.9769	Pass	5179.9748	Pass
-30	120	5179.9887	Pass	5179.9881	Pass	5179.9884	Pass	5179.9855	Pass

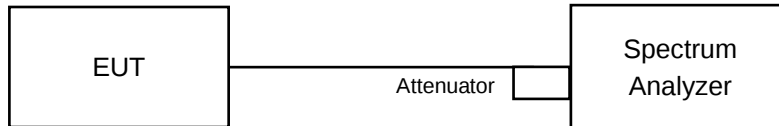
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	138	5180.0054	Pass	5180.0038	Pass	5180.0024	Pass	5180.0034	Pass
	120	5180.005	Pass	5180.0038	Pass	5180.0022	Pass	5180.0037	Pass
	102	5180.0056	Pass	5180.0048	Pass	5180.0028	Pass	5180.0046	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	Chain 2		
149	5745	15.19	15.19	15.18	0.5	Pass
157	5785	15.17	15.18	15.74	0.5	Pass
165	5825	15.18	15.18	15.75	0.5	Pass

802.11ac (VHT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
149	5745	15.16	15.76	15.18	0.5	Pass
157	5785	15.16	15.18	15.15	0.5	Pass
165	5825	15.19	15.75	15.18	0.5	Pass

802.11ac (VHT40)

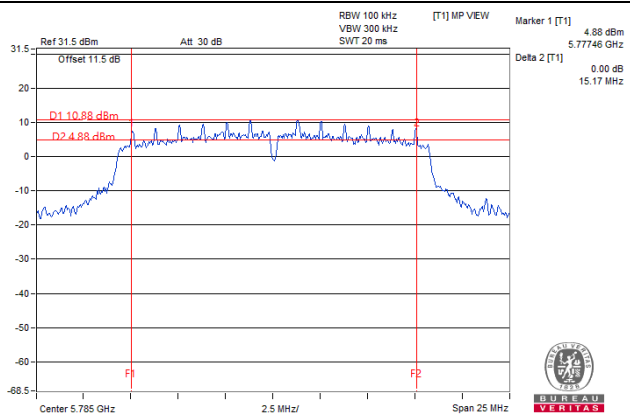
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
151	5755	35.21	35.24	33.94	0.5	Pass
159	5795	35.26	33.97	33.94	0.5	Pass

802.11ac (VHT80)

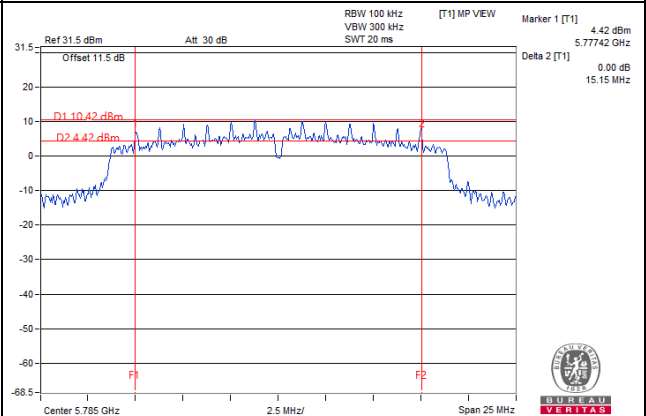
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
155	5775	74.11	74.11	75.23	0.5	Pass

Spectrum Plot of Worst Value

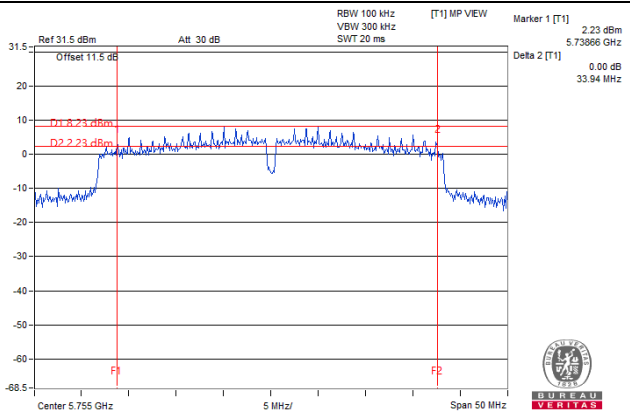
802.11a_Chain 0 / CH157



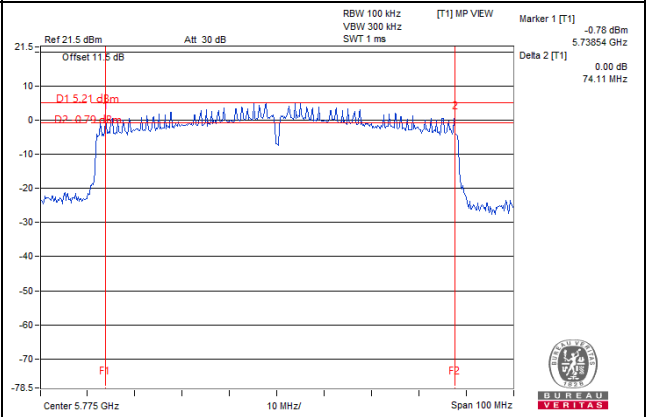
802.11ac (VHT20)_Chain 2 / CH157



802.11ac (VHT40)_Chain 2 / CH151



802.11ac (VHT80)_Chain 0 / CH155



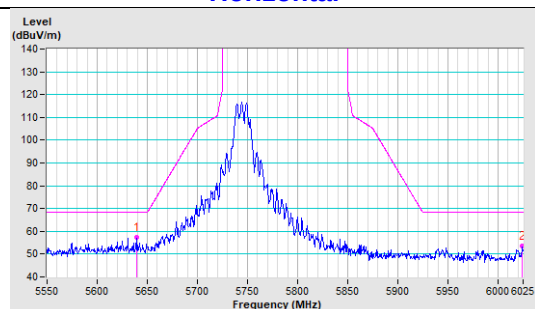
5 Pictures of Test Arrangements

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

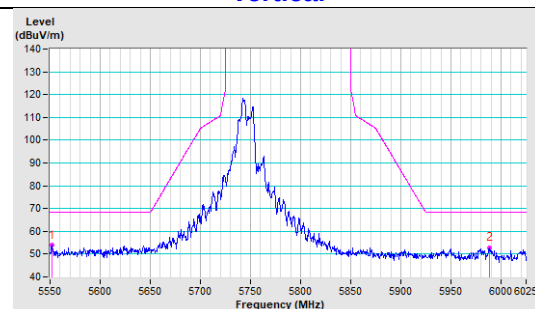
Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

802.11a CH 149 : 5745 MHz

Horizontal

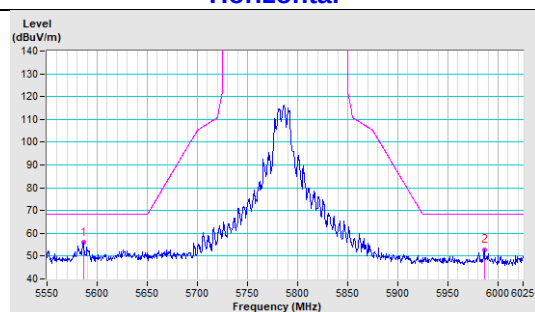


Vertical

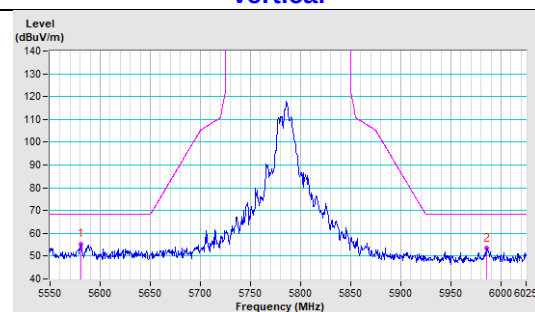


802.11a CH 157 : 5785 MHz

Horizontal

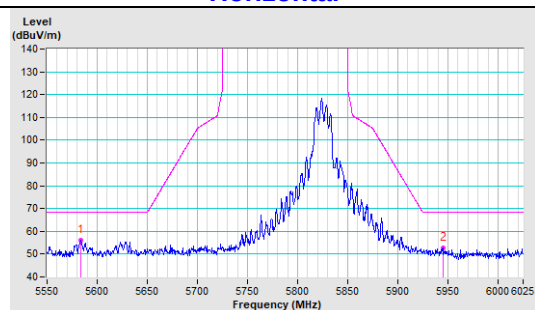


Vertical

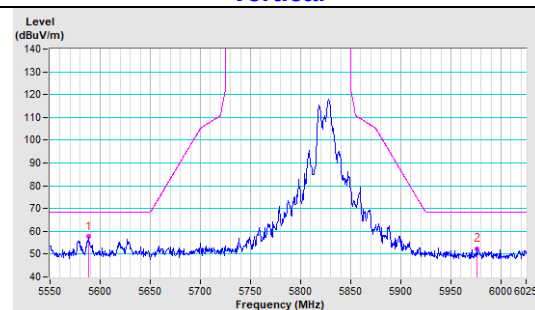


802.11a CH 165 : 5825 MHz

Horizontal

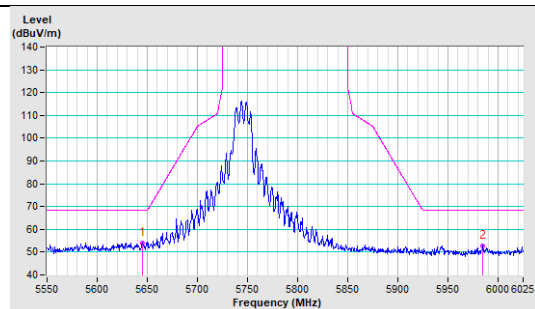


Vertical

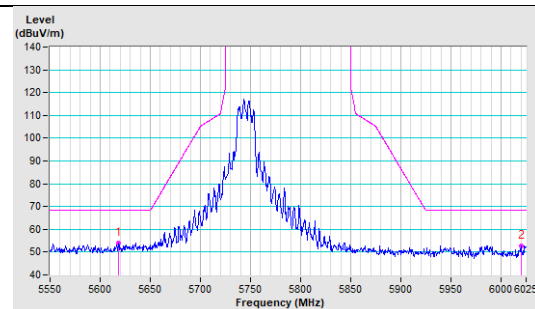


802.11ac (VHT20) CH 149 : 5745 MHz

Horizontal

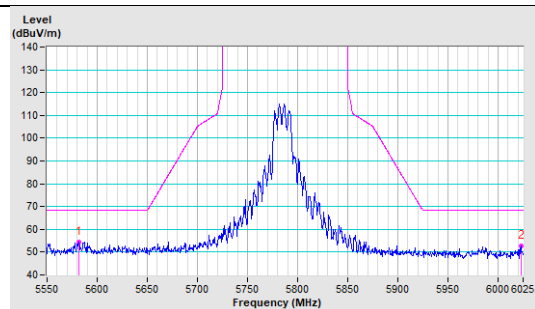


Vertical

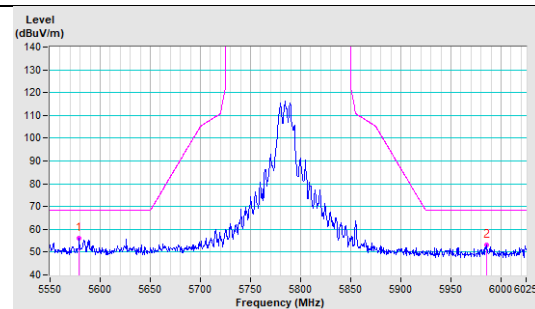


802.11ac (VHT20) CH 157 : 5785 MHz

Horizontal

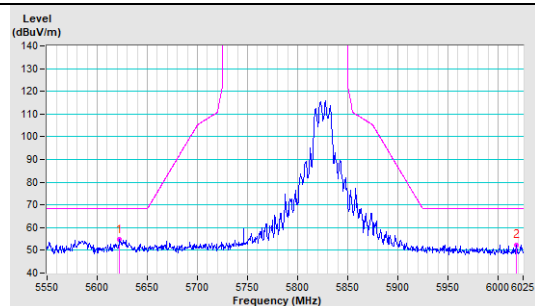


Vertical

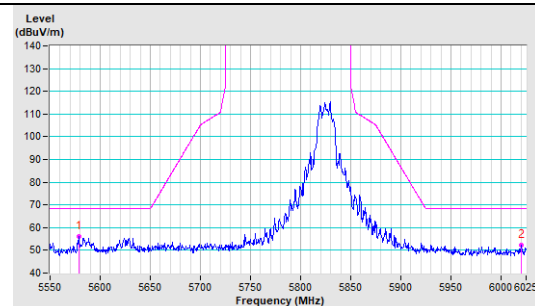


802.11ac (VHT20) CH 165 : 5825 MHz

Horizontal

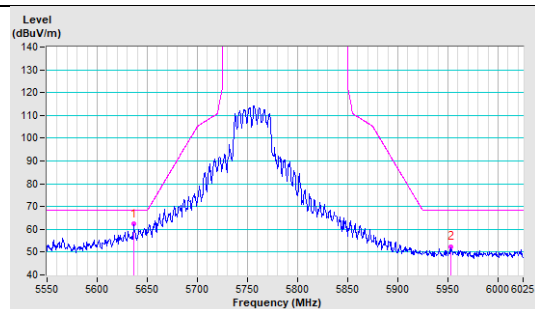


Vertical

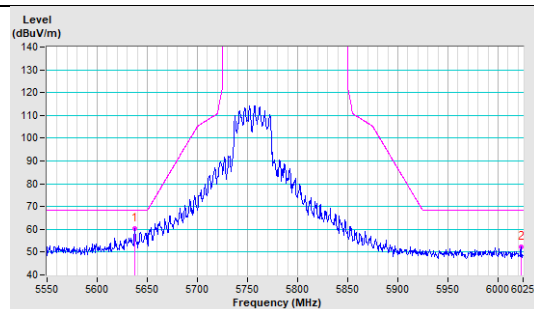


802.11ac (VHT40) CH 151 : 5755 MHz

Horizontal

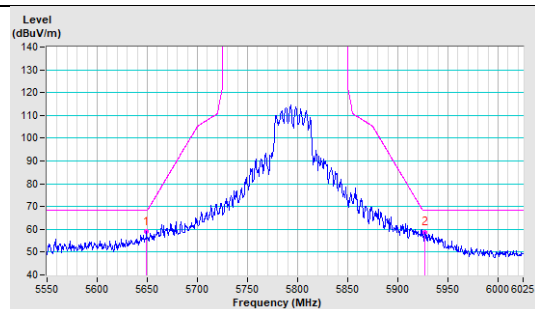


Vertical

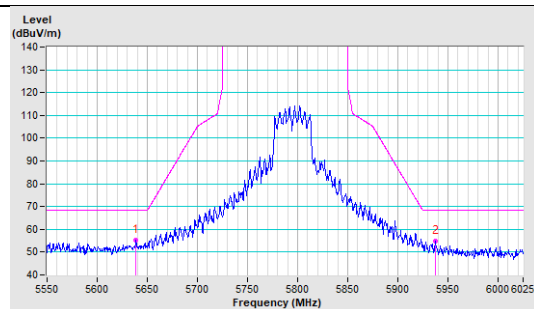


802.11ac (VHT40) CH 159 : 5795 MHz

Horizontal

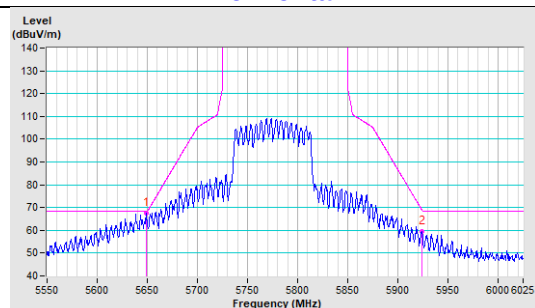


Vertical

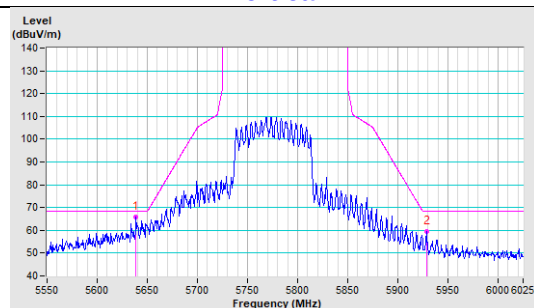


802.11ac (VHT80) CH 155 : 5775 MHz

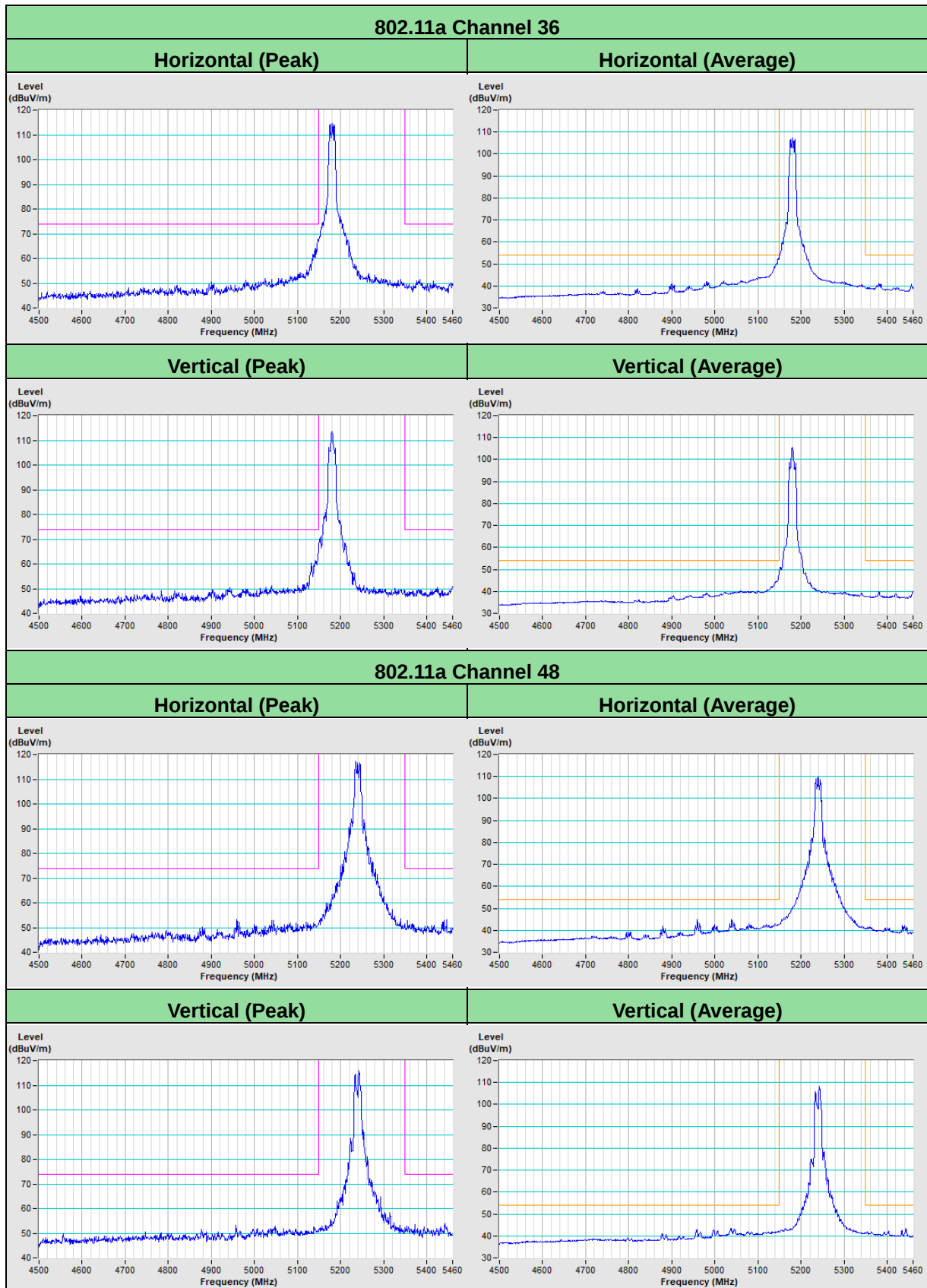
Horizontal



Vertical

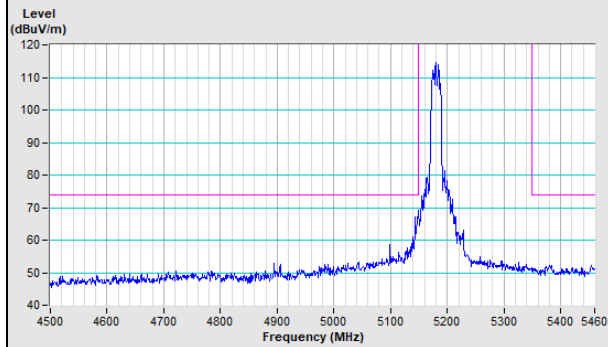


Annex B- Band-edge measurement (For U-NII-1 band)

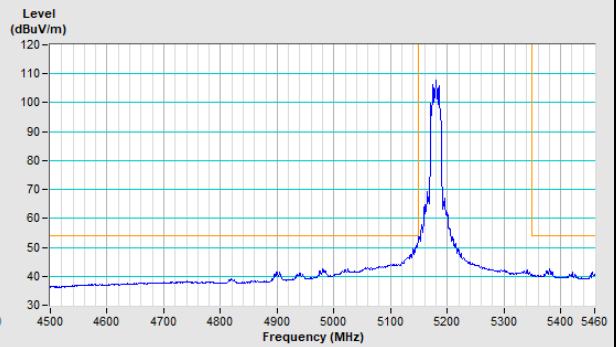


802.11ac (VHT20) Channel 36

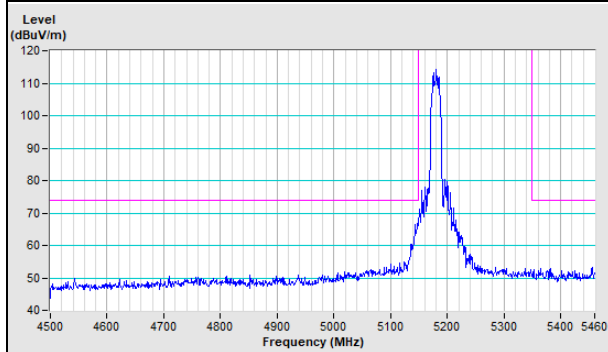
Horizontal (Peak)



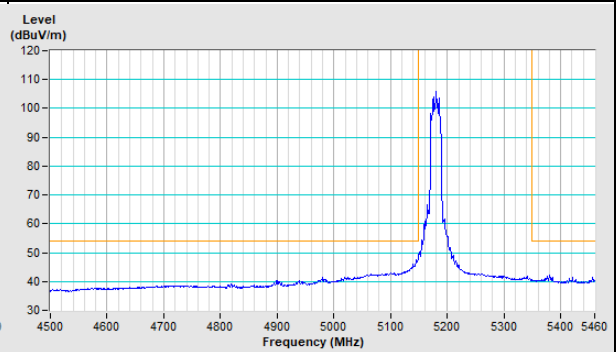
Horizontal (Average)



Vertical (Peak)

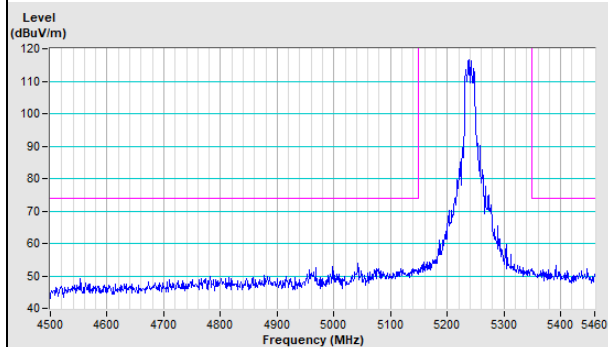


Vertical (Average)

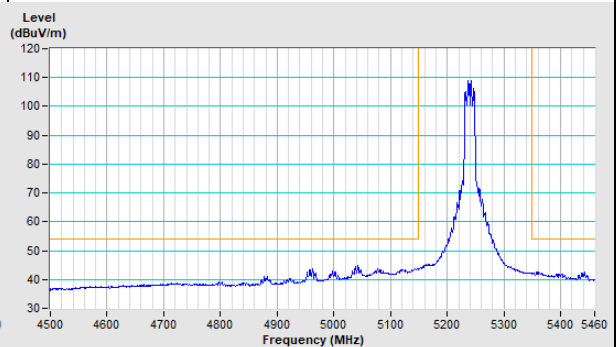


802.11ac (VHT20) Channel 48

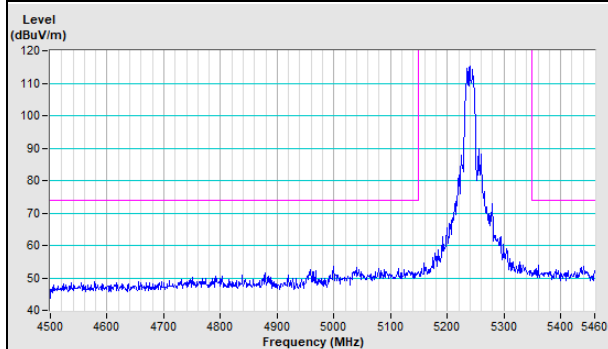
Horizontal (Peak)



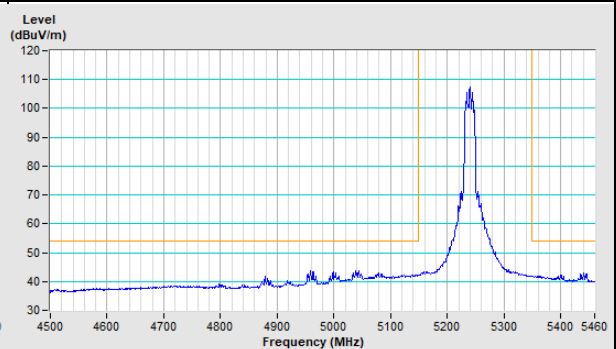
Horizontal (Average)

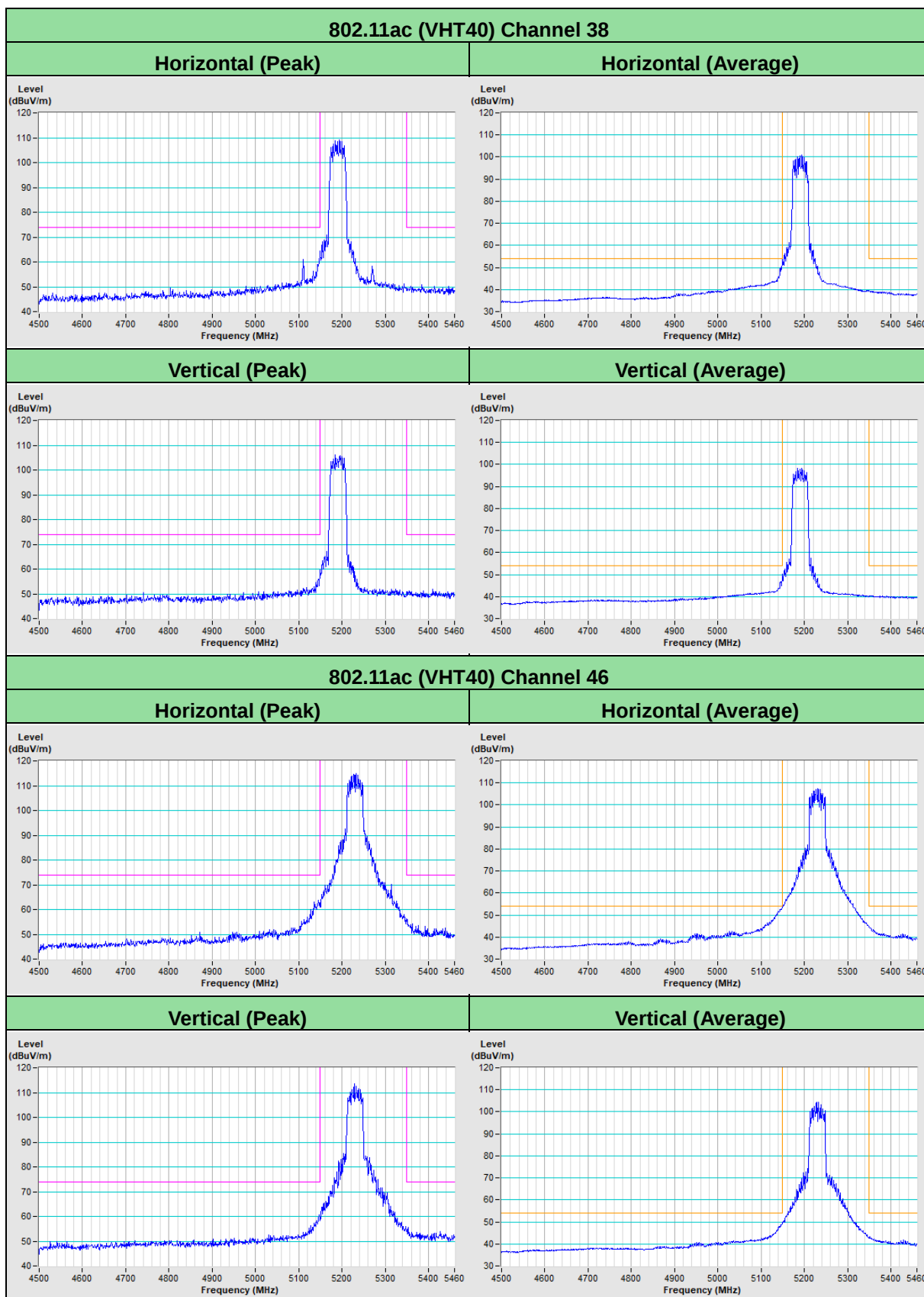


Vertical (Peak)



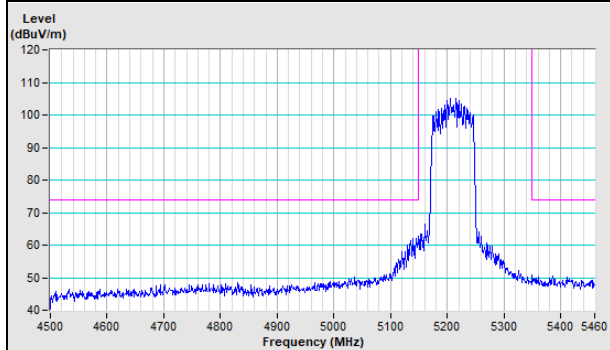
Vertical (Average)



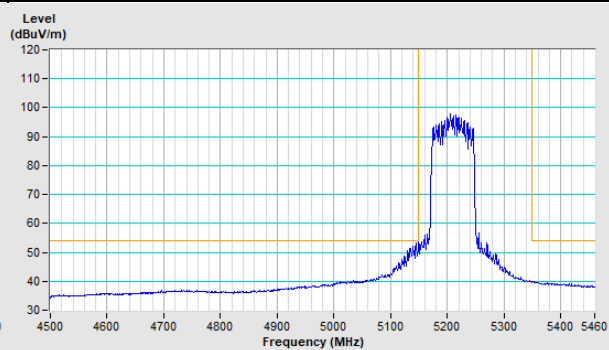


802.11ac (VHT80) Channel 42

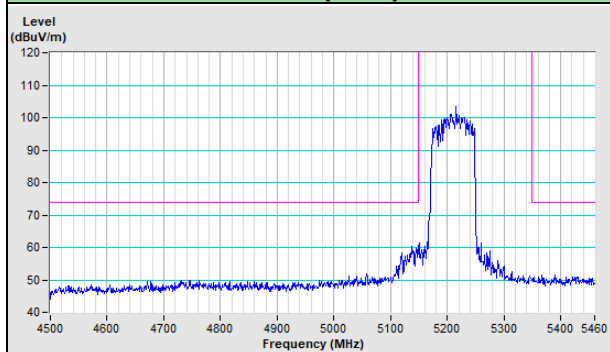
Horizontal (Peak)



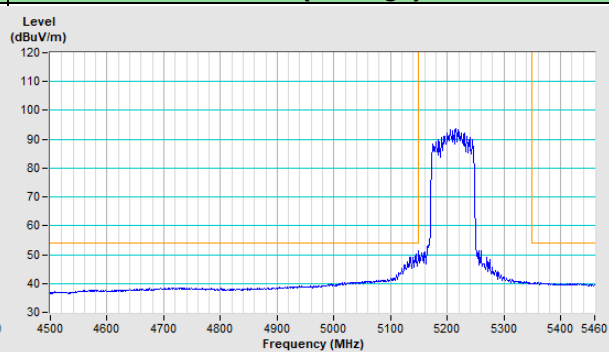
Horizontal (Average)



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---