FCC Test Report
(Spot Check)

Report No.:	RF170905C13F-1
FCC ID:	PY318400432
Original FCC ID:	PY317200377
Test Model:	RBS50Y
Received Date:	Nov. 26, 2018
Test Date:	Dec. 20 ~ Dec. 26, 2018
Issued Date:	Jan. 03, 2019
Applicant:	NETGEAR, INC.
Address:	350 East Plumeria Drive San Jose, CA 95134
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF170905C13F-1	Original release	Jan. 03, 2019

1 Certificate of Conformity

Product:	Orbi Router, Orbi Satellite, Orbi AC3000 Tri-band WiFi System
Brand:	NETGEAR
Test Model:	RBS50Y
Sample Status:	Engineering sample
Applicant:	NETGEAR, INC.
Test Date:	Dec. 20 ~ Dec. 26, 2018
Standards:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Jan. 03, 2019

Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Jan. 03, 2019

Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -16.72dB at 0.16953MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.4dB at 11100.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	-	Reference only.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex (MHF) not a standard connector.

*For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOBE test plots were recorded in Annex A.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Orbi Router, Orbi Satellite, Orbi AC3000 Tri-band WiFi System
Brand	NETGEAR
Test Model	RBS50Y
Sample Status	Engineering sample
Power Supply Rating	12Vdc from adapter
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 600Mbps 802.11ac: up to 1734Mbps
Operating Frequency	5180 ~ 5240MHz, 5260 ~ 5320MHz, 5500 ~ 5700MHz, 5745 ~ 5825MHz
Number of Channel	5180 ~ 5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5260 ~ 5320MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5500 ~ 5700MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 11 802.11n (HT40), 802.11ac (VHT40): 5 802.11ac (VHT80): 2 5745 ~ 5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	CDD Mode: 5180 ~ 5240MHz 1TX: 51.286mW 5180 ~ 5240MHz 2TX: 51.168mW 5260 ~ 5320MHz: 231.739mW 5500 ~ 5700MHz: 224.905mW 5745 ~ 5825MHz: 909.913mW Beamforming Mode: 5180 ~ 5240MHz: 25.882mW 5260 ~ 5320MHz: 225.944mW 5500 ~ 5700MHz: 129.420mW 5745 ~ 5825MHz: 647.143mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Cable Supplied	N/A

Note:

1. Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot–check test data are decided by applicant's engineering judgment, for more details pleae refer to declaration letter exhibit.
2. The differences compared with the original report (BV ADT report no.: RF170905C13-1 and RF170905C13A-1) is removing BT LE function to apply a new FCC ID: PY318400432. Therefore, test item for conducted power had been re-tested, the other test items only for worst channels for each band has been re-tested. Refer to original report for the other test data.
3. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitters and 4 receivers.

Band	Modulation Mode	Beamforming Mode	TX Function
5GHz Band 1	802.11a	Not Support	1TX / 2TX
	802.11n (HT20)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11n (HT40)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11ac (VHT20)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11ac (VHT40)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11ac (VHT80)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
5GHz Band 2	802.11a	Not Support	2TX
	802.11n (HT20)	Support (CDD / NSS=1)	2TX
	802.11n (HT40)	Support (CDD / NSS=1)	2TX
	802.11ac (VHT20)	Support (CDD / NSS=1)	2TX
	802.11ac (VHT40)	Support (CDD / NSS=1)	2TX
	802.11ac (VHT80)	Support (CDD / NSS=1)	2TX
5GHz Band 3 and 4	802.11a	Not Support	4TX
	802.11n (HT20)	Support (CDD / NSS=1)	4TX
	802.11n (HT40)	Support (CDD / NSS=1)	4TX
	802.11ac (VHT20)	Support (CDD / NSS=1)	4TX
	802.11ac (VHT40)	Support (CDD / NSS=1)	4TX
	802.11ac (VHT80)	Support (CDD / NSS=1)	4TX

* The modulation and bandwidth are similar for 802.11n mode for 20MHz/40MHz and 802.11ac mode for 20MHz/40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)
* For 802.11n and 802.11ac, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

4. The following RF Modules are for the EUT.

Brand	Model	RF Module	Band
NETGEAR	RBS50Y	Module 1	2.4G
			UNII-1
			UNII-2A
		Module 2	UNII-2C
			UNII-3

RF Module	Filter	Position	Remark
Module 1	1st	TFL1,TFL2	pin to pin & Same design
	2nd	TFL1,TFL2	pin to pin & Same design
Module 2	1st	BHPF1,BHPF2,BHPF3,BHPF4	pin to pin & Same design
	2nd	BHPF1,BHPF2,BHPF3,BHPF4	pin to pin & Same design

RF Module	RF Switch	Position	Remark
Module 1	1st	AS1,AS2,TS1,TS2	pin to pin & Same design
	2nd	AS1,AS2,TS1,TS2	pin to pin & Same design

5. The EUT uses following antennas.

Ant. Type	Dipole				
Connecter Type	i-pex(MHF)				
Directional Antenna Gain (dBi)					
Item	2.4G	UNII-1	UNII-2A	UNII-2C	UNII-3
-	5.31	5.97	5.41	8.74	7.57

6. The EUT consumes power from the following adapters.

Adapter 1 (US)	
Brand	NETGEAR
Model	AD2110F10
P/N	332-10999-01
Input Power	100-120Vac, 50/60Hz, 1.0A
Output Power	12Vdc, 2.5A
Power Line	3m power cable without core attached on adapter

Adapter 2 (US)	
Brand	NETGEAR
Model	2ADF030F1 NA
P/N	332-11000-01
Input Power	100-120Vac, 50/60Hz, 1.0A
Output Power	12Vdc, 2.5A
Power Line	3m power cable without core attached on adapter

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	5210MHz

For 5260 ~ 5320MHz:

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

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

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

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
58	5290MHz

For 5500 ~ 5700MHz

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

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

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

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz		

2 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
106	5530MHz	122	5610 MHz

For 5745 ~ 5825MHz:

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

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

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

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Powered by adapter 1
B	-	√	√	-	Powered by adapter 2

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission 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.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A	802.11ac (VHT20)	5180-5240	36 to 48	36, 48	OFDM	6.0
A	802.11a	5260-5320	52 to 64	60	OFDM	6.0
A	802.11ac (VHT40)	5500-5700	100 to 140	110	OFDM	6.0
A	802.11a	5745-5825	149 to 165	165	OFDM	6.0

Radiated Emission Test (Below 1GHz):

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A, B	802.11a	5745-5825	149 to 165	165	OFDM	6.0

Power Line Conducted Emission Test:

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A, B	802.11a	5745-5825	149 to 165	165	OFDM	6.0

Peak Power Spectral Density, Bandwidth and Frequency Stability Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A	802.11ac (VHT20)	5180-5240	36 to 48	36, 48	OFDM	6.0
A	802.11a	5260-5320	52 to 64	60	OFDM	6.0
A	802.11ac (VHT40)	5500-5700	100 to 140	110	OFDM	6.0
A	802.11a	5745-5825	149 to 165	165	OFDM	6.0

Transmit Power Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
	802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	6.5
	802.11ac (VHT40)		38 to 46	38, 46	OFDM	13.5
	802.11ac (VHT80)		42	42	OFDM	29.3
A	802.11a	5260-5320	52 to 64	52, 60, 64	OFDM	6.0
	802.11ac (VHT20)		52 to 64	52, 60, 64	OFDM	6.5
	802.11ac (VHT40)		54 to 62	54, 62	OFDM	13.5
	802.11ac (VHT80)		58	58	OFDM	29.3
A	802.11a	5500-5700	100 to 140	100, 116, 140	OFDM	6.0
	802.11ac (VHT20)		100 to 140	100, 116, 140	OFDM	6.5
	802.11ac (VHT40)		102 to 134	102, 110, 134	OFDM	13.5
	802.11ac (VHT80)		106 to 122	106, 122	OFDM	29.3
A	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
	802.11ac (VHT20)		149 to 165	149, 157, 165	OFDM	6.5
	802.11ac (VHT40)		151 to 159	151, 159	OFDM	13.5
	802.11ac (VHT80)		155	155	OFDM	29.3

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 70% RH	120Vac, 60Hz	Noah Chang
RE<1G	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee
PLC	22 deg. C, 66% RH	120Vac, 60Hz	Adair Peng
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ted Chang

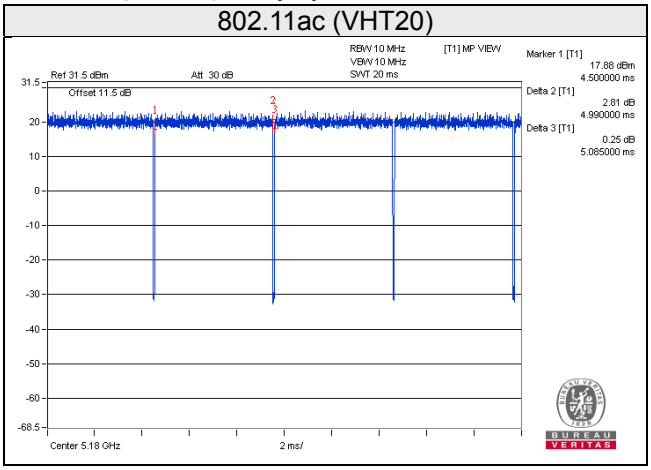
3.3 Duty Cycle of Test Signal

For U-NII-1 Band 1TX

Duty cycle of test signal is > 98%, duty factor is not required.

802.11ac (VHT20): Duty cycle = 4.990/5.085 = 0.981

802.11ac (VHT20)

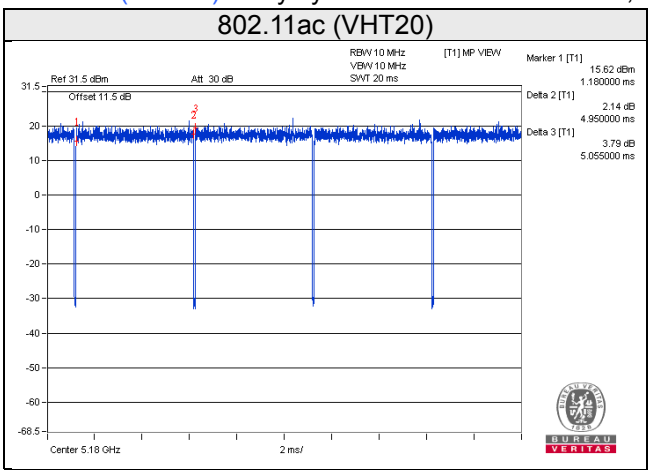


For U-NII-1 Band 2TX

Duty cycle of test signal is < 98%, duty factor is required.

802.11ac (VHT20): Duty cycle = 4.950/5.055 = 0.979, Duty factor = 10 * log(1/0.979) = 0.09

802.11ac (VHT20)

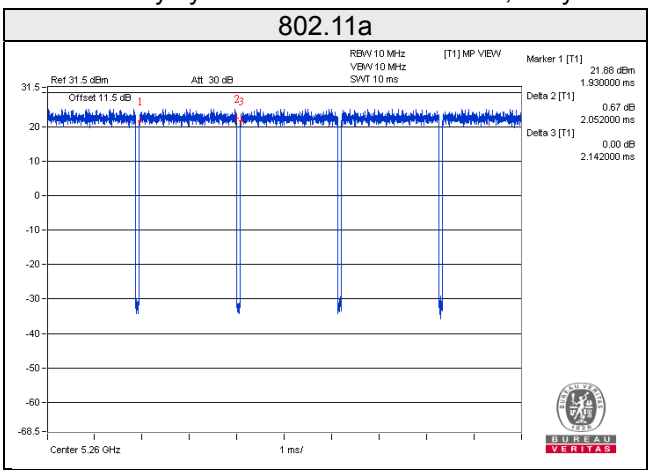


For U-NII-2A Band

Duty cycle of test signal is < 98%, duty factor is required.

802.11a: Duty cycle = 2.052/2.142 = 0.958, Duty factor = 10 * log(1/0.958) = 0.19

802.11a

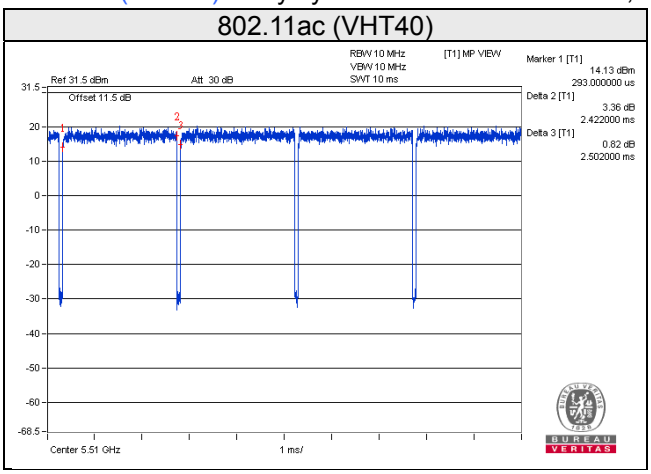


For U-NII-2C Band

Duty cycle of test signal is < 98%, duty factor is required.

802.11ac (VHT40): Duty cycle = 2.422/2.502 = 0.968, Duty factor = 10 * log(1/0.968) = 0.14

802.11ac (VHT40)

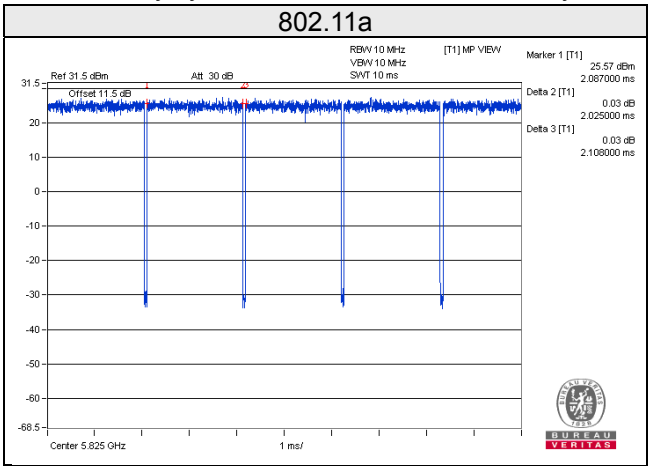


For U-NII-3 Band

Duty cycle of test signal is < 98%, duty factor is required.

802.11a: Duty cycle = 2.025/2.108 = 0.961, Duty factor = 10 * log(1/0.961) = 0.17

802.11a



3.4 Description of Support Units

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

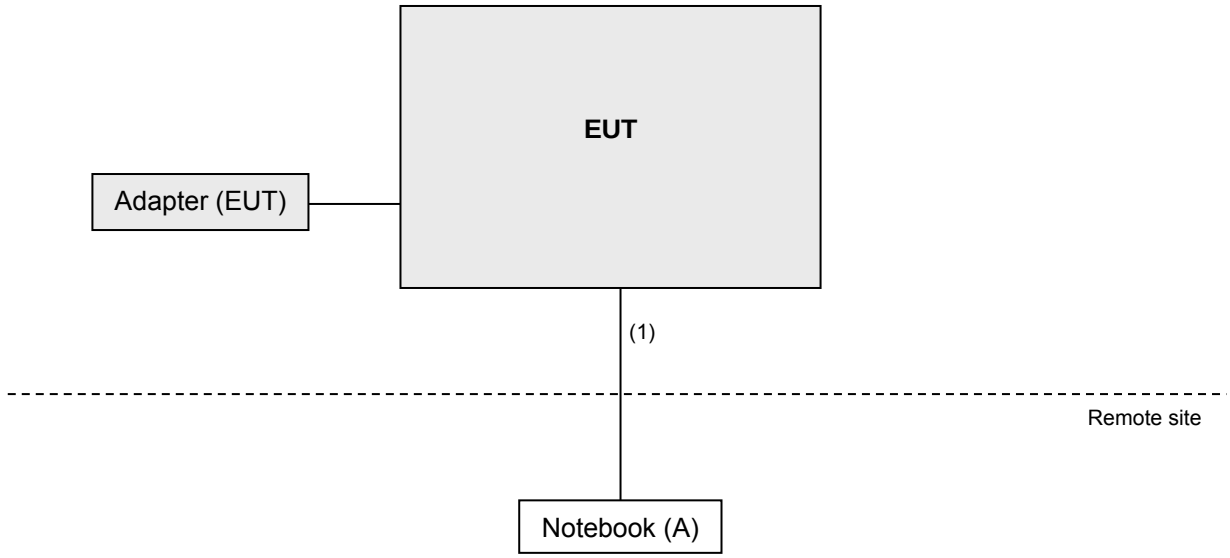
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	3	N	0	-

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart E (15.407)
KDB 789033 D02 General UNII Test Procedure New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10:2013

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

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

<table>
<tr><td colspan="3">Applicable To</td><td colspan="2">Limit</td></tr>
<tr><td colspan="3" rowspan="2">789033 D02 General UNII Test Procedure New Rules v02r01</td><td colspan="2">Field Strength at 3m</td></tr>
<tr><td>PK: 74 (dBμV/m)</td><td>AV: 54 (dBμV/m)</td></tr>
<tr><td>Frequency Band</td><td colspan="2">Applicable To</td><td>EIRP Limit</td><td>Equivalent Field Strength at 3m</td></tr>
<tr><td>5150~5250 MHz</td><td colspan="2">15.407(b)(1)</td><td rowspan="3">PK: -27 (dBm/MHz)</td><td rowspan="3">PK: 68.2(dBμV/m)</td></tr>
<tr><td>5250~5350 MHz</td><td colspan="2">15.407(b)(2)</td></tr>
<tr><td>5470~5725 MHz</td><td colspan="2">15.407(b)(3)</td></tr>
<tr><td rowspan="2">5725~5850 MHz</td><td>☒</td><td>15.407(b)(4)(i)</td><td>PK: -27 (dBm/MHz) *1
PK: 10 (dBm/MHz) *2
PK: 15.6 (dBm/MHz) *3
PK: 27 (dBm/MHz) *4</td><td>PK: 68.2(dBμV/m) *1
PK: 105.2 (dBμV/m) *2
PK: 110.8(dBμV/m) *3
PK: 122.2 (dBμV/m) *4</td></tr>
<tr><td>☐</td><td>15.407(b)(4)(ii)</td><td colspan="2">Emission limits in section 15.247(d)</td></tr>
<tr><td colspan="5">*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.</td></tr>
</table>

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 25, 2018	Sep. 24, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 21, 2018	Nov. 20, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Aug. 08, 2018	Aug. 07, 2019
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jul. 02, 2018	Jul. 01, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2018	Aug. 07, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2018	Aug. 07, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Nov. 14, 2018	Nov. 13, 2019
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 17, 2018	Jul. 16, 2019

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.
3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is 7450F-4.

4.1.3 Test Procedures

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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

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

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

3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.

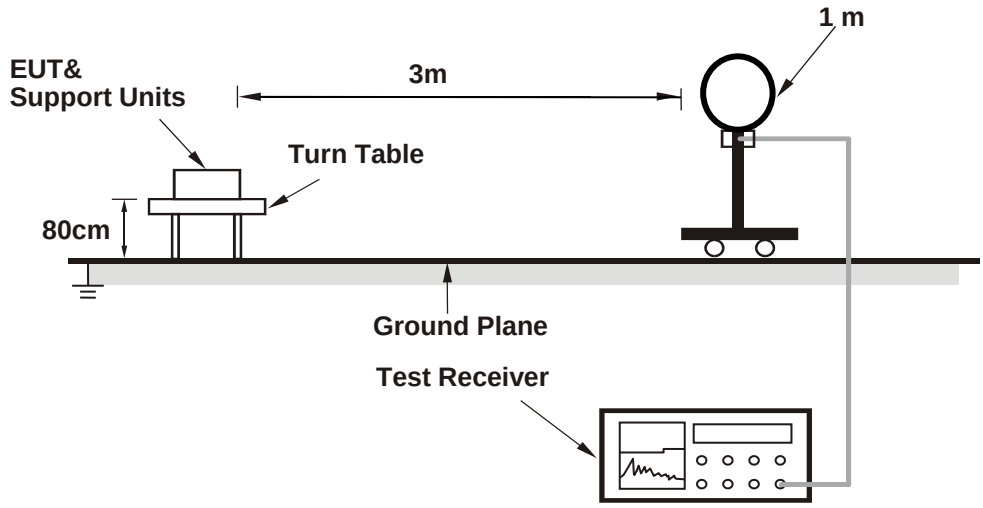
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

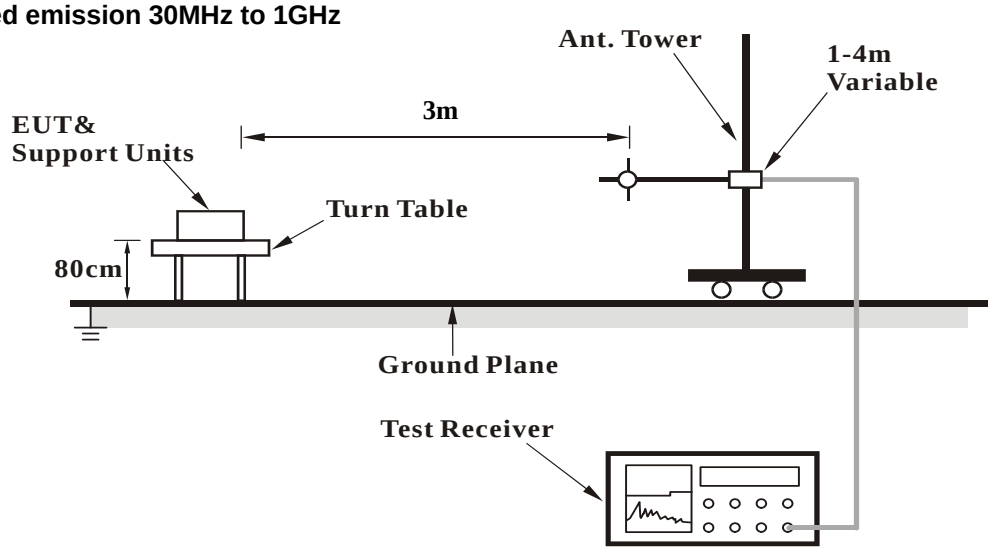
No deviation.

4.1.5 Test Setup

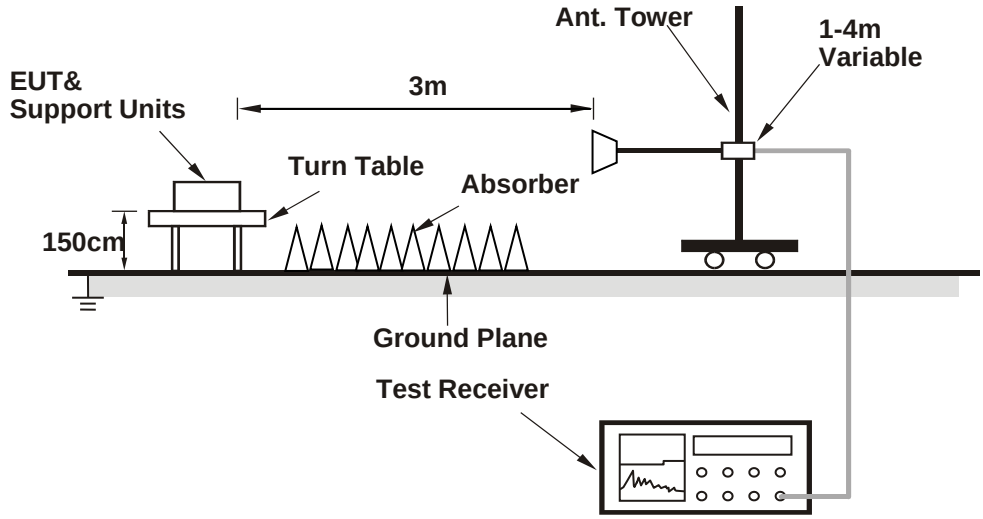
For Radiated emission below 30MHz



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 Conditions

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

4.1.7 Test Results

Above 1GHz data:

802.11a

CHANNEL	TX Channel 60	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5300.00	108.1 PK			1.37 H	26	67.0	41.1
2	*5300.00	97.8 AV			1.37 H	26	56.7	41.1
3	10600.00	62.4 PK	74.0	-11.6	1.69 H	251	39.2	23.2
4	10600.00	48.9 AV	54.0	-5.1	1.69 H	251	25.7	23.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5300.00	115.0 PK			1.19 V	335	73.9	41.1
2	*5300.00	104.6 AV			1.19 V	335	63.5	41.1
3	10600.00	63.1 PK	74.0	-10.9	2.11 V	290	39.9	23.2
4	10600.00	50.1 AV	54.0	-3.9	2.11 V	290	26.9	23.2

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency
6. " # ": The radiated frequency is out of the restricted band

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5640.80	60.2 PK	68.2	-8.0	1.52 H	63	47.5	12.7
2	*5825.00	118.1 PK			1.52 H	63	75.5	42.6
3	*5825.00	108.0 AV			1.52 H	63	65.4	42.6
4	#5959.20	61.1 PK	68.2	-7.1	1.52 H	63	47.5	13.6
5	11650.00	62.8 PK	74.0	-11.2	1.98 H	335	39.2	23.6
6	11650.00	49.9 AV	54.0	-4.1	1.98 H	335	26.3	23.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5624.80	63.0 PK	68.2	-5.2	1.48 V	340	50.3	12.7
2	*5825.00	128.1 PK			1.48 V	340	85.5	42.6
3	*5825.00	116.8 AV			1.48 V	340	74.2	42.6
4	#5964.80	63.4 PK	68.2	-4.8	1.48 V	340	49.7	13.7
5	11650.00	62.6 PK	74.0	-11.4	2.52 V	214	39.0	23.6
6	11650.00	50.0 AV	54.0	-4.0	2.52 V	214	26.4	23.6

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency
6. " # ": The radiated frequency is out of the restricted band

802.11ac (VHT20)

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.2 PK	74.0	-15.8	2.18 H	325	45.6	12.6
2	5150.00	44.5 AV	54.0	-9.5	2.18 H	325	31.9	12.6
3	*5180.00	82.0 PK			2.18 H	325	40.5	41.5
4	*5180.00	71.8 AV			2.18 H	325	30.3	41.5
5	#10360.00	61.5 PK	68.2	-6.7	2.63 H	114	39.0	22.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	63.1 PK	74.0	-10.9	1.40 V	316	50.5	12.6
2	5150.00	48.9 AV	54.0	-5.1	1.40 V	316	36.3	12.6
3	*5180.00	112.5 PK			1.40 V	316	71.0	41.5
4	*5180.00	101.4 AV			1.40 V	316	59.9	41.5
5	#10360.00	62.6 PK	68.2	-5.6	2.52 V	211	40.1	22.5

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency
6. " # ": The radiated frequency is out of the restricted band

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	104.2 PK			1.58 H	42	63.0	41.2
2	*5240.00	93.3 AV			1.58 H	42	52.1	41.2
3	5350.00	58.3 PK	74.0	-15.7	1.58 H	42	45.9	12.4
4	5350.00	45.2 AV	54.0	-8.8	1.58 H	42	32.8	12.4
5	#10480.00	61.4 PK	68.2	-6.8	2.95 H	172	38.6	22.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	111.4 PK			1.30 V	308	70.2	41.2
2	*5240.00	100.0 AV			1.30 V	308	58.8	41.2
3	5350.00	59.4 PK	74.0	-14.6	1.30 V	308	47.0	12.4
4	5350.00	46.5 AV	54.0	-7.5	1.30 V	308	34.1	12.4
5	#10480.00	61.8 PK	68.2	-6.4	2.52 V	154	39.0	22.8

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency
6. " # ": The radiated frequency is out of the restricted band

802.11ac (VHT40)

CHANNEL	TX Channel 110	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5550.00	110.5 PK			1.92 H	68	68.7	41.8
2	*5550.00	100.3 AV			1.92 H	68	58.5	41.8
3	11100.00	62.5 PK	74.0	-11.5	3.01 H	152	39.1	23.4
4	11100.00	49.8 AV	54.0	-4.2	3.01 H	152	26.4	23.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5550.00	117.2 PK			1.58 V	18	75.4	41.8
2	*5550.00	107.1 AV			1.58 V	18	65.3	41.8
3	11100.00	63.6 PK	74.0	-10.4	2.11 V	263	40.2	23.4
4	**11100.00**	**50.6 AV**	**54.0**	**-3.4**	**2.11 V**	**263**	**27.2**	**23.4**

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. The other emission levels were very low against the limit
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency
6. " # ": The radiated frequency is out of the restricted band

Below 1GHz Worst-Case Data:

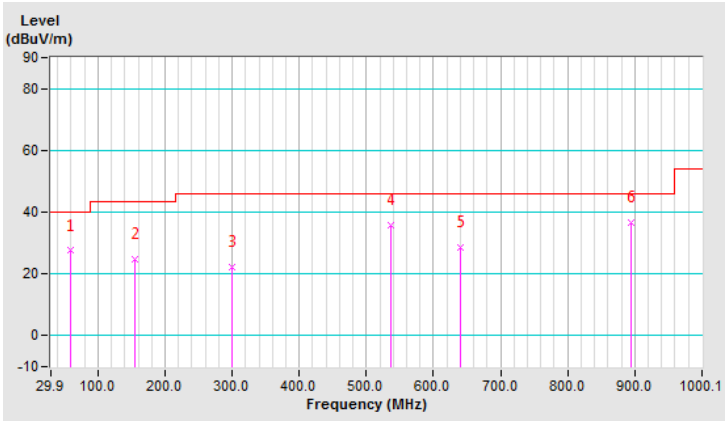
802.11a

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	59.01	27.5 QP	40.0	-12.5	1.49 H	58	37.2	-9.7
2	156.03	24.8 QP	43.5	-18.7	1.49 H	12	33.5	-8.7
3	299.62	22.2 QP	46.0	-23.8	1.00 H	106	30.2	-8.0
4	536.34	35.6 QP	46.0	-10.4	1.49 H	117	40.0	-4.4
5	641.13	28.5 QP	46.0	-17.5	1.00 H	150	30.1	-1.6
6	895.32	36.8 QP	46.0	-9.2	1.49 H	152	33.5	3.3

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

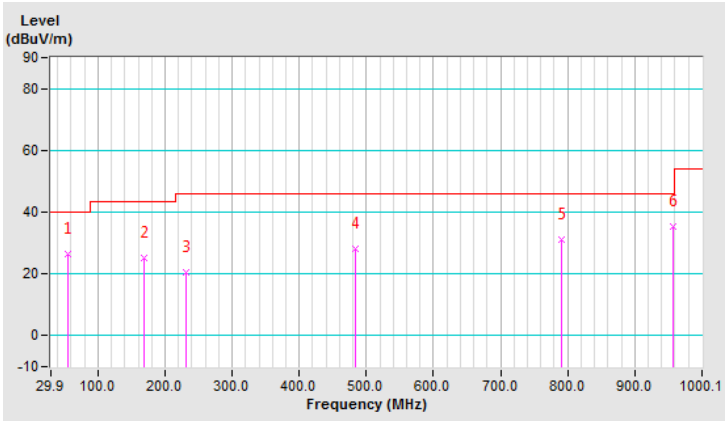


CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	55.13	26.6 QP	40.0	-13.4	1.49 V	48	35.8	-9.2
2	169.61	25.1 QP	43.5	-18.4	1.49 V	244	34.3	-9.2
3	231.70	20.5 QP	46.0	-25.5	1.00 V	148	31.1	-10.6
4	483.95	28.2 QP	46.0	-17.8	1.49 V	215	33.5	-5.3
5	790.54	31.1 QP	46.0	-14.9	1.00 V	192	29.5	1.6
6	957.41	35.4 QP	46.0	-10.6	1.49 V	191	31.1	4.3

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

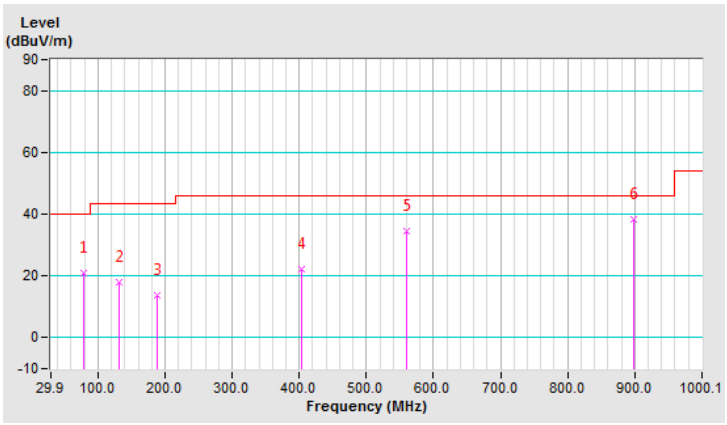


CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	78.41	20.9 QP	40.0	-19.1	1.00 H	173	33.9	-13.0
2	130.80	17.9 QP	43.5	-25.6	2.00 H	6	28.0	-10.1
3	189.01	13.9 QP	43.5	-29.6	1.00 H	318	25.0	-11.1
4	404.40	22.2 QP	46.0	-23.8	2.00 H	171	28.7	-6.5
5	559.63	34.5 QP	46.0	-11.5	1.49 H	105	38.6	-4.1
6	899.20	38.4 QP	46.0	-7.6	1.49 H	292	35.0	3.4

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report

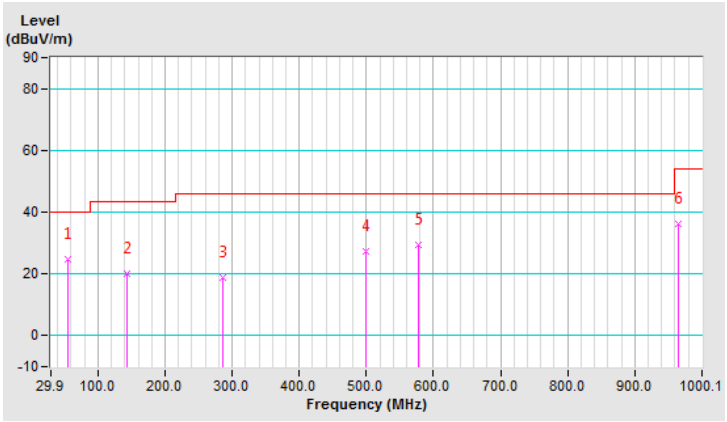


CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	55.13	24.9 QP	40.0	-15.1	2.00 V	280	34.1	-9.2
2	142.44	20.1 QP	43.5	-23.4	2.00 V	240	29.2	-9.1
3	286.03	19.0 QP	46.0	-27.0	1.00 V	91	27.3	-8.3
4	499.48	27.5 QP	46.0	-18.5	1.49 V	142	32.5	-5.0
5	577.09	29.5 QP	46.0	-16.5	1.49 V	118	32.9	-3.4
6	965.17	36.1 QP	54.0	-17.9	1.49 V	283	31.6	4.5

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz
4. Margin value = Emission Level – Limit value
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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 10, 2018	Dec. 09, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

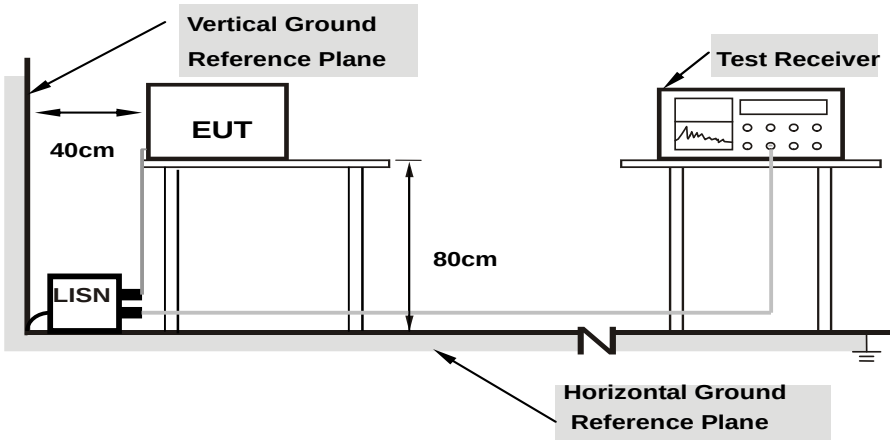
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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 Conditions

Same as 4.1.6.

4.2.7 Test Results

Worst-case data:

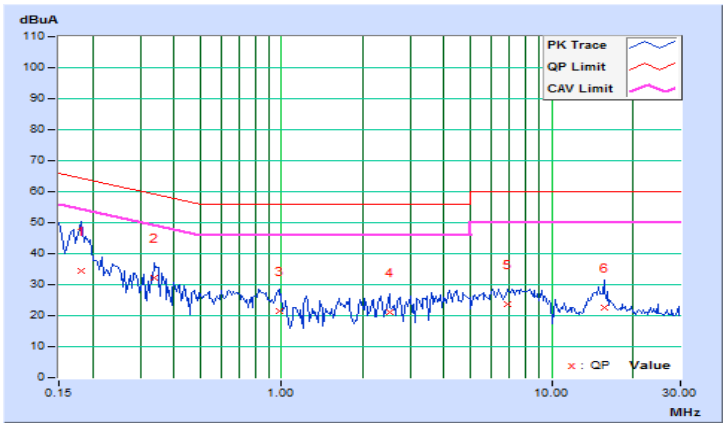
802.11a

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18125	9.72	24.84	6.78	34.56	16.50	64.43	54.43	-29.87	-37.93
2	0.33750	9.74	22.61	14.37	32.35	24.11	59.26	49.26	-26.91	-25.15
3	0.97813	9.68	11.90	5.38	21.58	15.06	56.00	46.00	-34.42	-30.94
4	2.51172	9.75	11.47	5.21	21.22	14.96	56.00	46.00	-34.78	-31.04
5	6.87891	9.83	14.02	7.93	23.85	17.76	60.00	50.00	-36.15	-32.24
6	15.66016	9.92	12.83	8.64	22.75	18.56	60.00	50.00	-37.25	-31.44

Remarks:

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

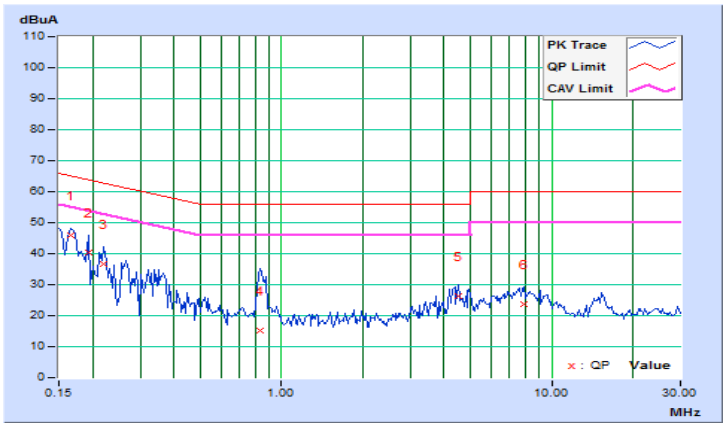


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.72	36.28	22.73	46.00	32.45	65.18	55.18	-19.18	-22.73
2	0.19297	9.73	30.81	17.76	40.54	27.49	63.91	53.91	-23.37	-26.42
3	0.22031	9.73	26.90	12.64	36.63	22.37	62.81	52.81	-26.18	-30.44
4	0.82969	9.73	5.54	2.13	15.27	11.86	56.00	46.00	-40.73	-34.14
5	4.50781	9.82	16.65	5.19	26.47	15.01	56.00	46.00	-29.53	-30.99
6	7.90625	9.88	13.64	8.81	23.52	18.69	60.00	50.00	-36.48	-31.31

Remarks:

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

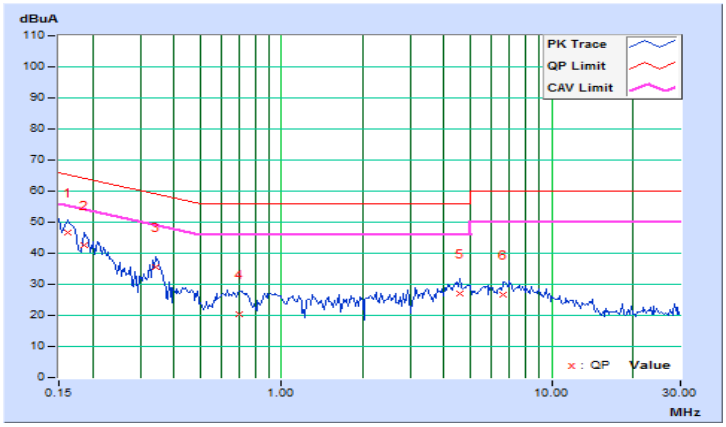


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.73	36.87	20.93	46.60	30.66	65.38	55.38	-18.78	-24.72
2	0.18516	9.72	32.90	17.72	42.62	27.44	64.25	54.25	-21.63	-26.81
3	0.34141	9.74	25.77	20.10	35.51	29.84	59.17	49.17	-23.66	-19.33
4	0.70078	9.71	10.58	10.05	20.29	19.76	56.00	46.00	-35.71	-26.24
5	4.59375	9.80	17.38	10.41	27.18	20.21	56.00	46.00	-28.82	-25.79
6	6.64063	9.83	16.75	10.64	26.58	20.47	60.00	50.00	-33.42	-29.53

Remarks:

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

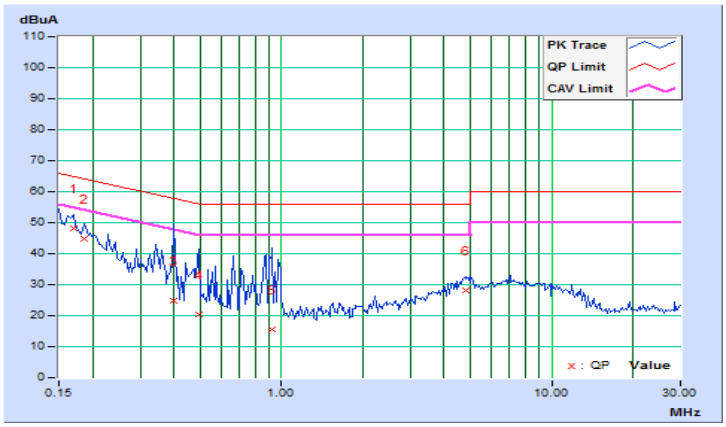


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.16953**	**9.72**	**38.54**	**23.93**	**48.26**	**33.65**	**64.98**	**54.98**	**-16.72**	**-21.33**
2	0.18516	9.73	35.02	19.26	44.75	28.99	64.25	54.25	-19.50	-25.26
3	0.40000	9.75	15.13	5.57	24.88	15.32	57.85	47.85	-32.97	-32.53
4	0.49766	9.75	10.67	2.54	20.42	12.29	56.04	46.04	-35.62	-33.75
5	0.92734	9.72	5.87	1.33	15.59	11.05	56.00	46.00	-40.41	-34.95
6	4.81641	9.82	18.21	8.84	28.03	18.66	56.00	46.00	-27.97	-27.34

Remarks:

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



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1	√	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
		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

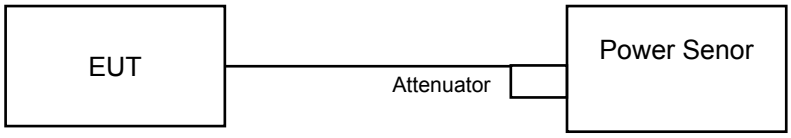
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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 $N_{ANT} \geq 5$.

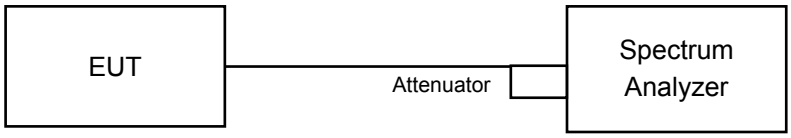
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup

For Power Output



For 26dB Bandwidth



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

For Average Power Measurement

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

For 26dB Bandwidth

a. Set RBW = approximately 1% of the emission bandwidth.

b. Set the VBW > RBW.

c. Detector = Peak.

d. Trace mode = max hold.

e. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

Power Output:

For U-NII-1 Band 1TX

802.11a

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
36	5180	51.168	17.09	30.00	3.71	20.80	21.00	Pass
40	5200	50.699	17.05	30.00	3.71	20.76	21.00	Pass
48	5240	50.699	17.05	30.00	3.71	20.76	21.00	Pass

802.11ac (VHT20)

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
36	5180	**51.286**	17.10	30.00	3.71	20.81	21.00	Pass
40	5200	50.350	17.02	30.00	3.71	20.73	21.00	Pass
48	5240	51.168	17.09	30.00	3.71	20.80	21.00	Pass

802.11ac (VHT40)

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
38	5190	50.582	17.04	30.00	3.71	20.75	21.00	Pass
46	5230	50.234	17.01	30.00	3.71	20.72	21.00	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Conducted Power (mW)	Conducted Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
42	5210	51.050	17.08	30.00	3.71	20.79	21.00	Pass

For U-NII-1 Band 2TX

CDD Mode

802.11a

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
36	5180	14.08	14.00	50.699	17.05	30.00	3.71	20.76	21.00	Pass
40	5200	14.00	14.09	50.816	17.06	30.00	3.71	20.77	21.00	Pass
48	5240	14.05	14.00	50.582	17.04	30.00	3.71	20.75	21.00	Pass

802.11ac (VHT20)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
36	5180	14.05	14.03	50.699	17.05	30.00	3.71	20.76	21.00	Pass
40	5200	13.99	14.02	50.350	17.02	30.00	3.71	20.73	21.00	Pass
48	5240	14.10	14.05	**51.168**	17.09	30.00	3.71	20.80	21.00	Pass

802.11ac (VHT40)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
38	5190	14.02	14.00	50.350	17.02	30.00	3.71	20.73	21.00	Pass
46	5230	14.01	14.05	50.582	17.04	30.00	3.71	20.75	21.00	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
42	5210	14.03	14.05	50.699	17.05	30.00	3.71	20.76	21.00	Pass

Beamforming Mode

802.11ac (VHT20)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
36	5180	11.08	11.09	25.704	14.10	30.00	5.97	20.07	21.00	Pass
40	5200	11.10	11.13	**25.882**	14.13	30.00	5.97	20.10	21.00	Pass
48	5240	11.10	11.09	25.763	14.11	30.00	5.97	20.08	21.00	Pass

Note: Directional gain = 5.97dBi < 6dBi, so the limit no need to be reduced.

802.11ac (VHT40)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
38	5190	11.10	11.08	25.704	14.10	30.00	5.97	20.07	21.00	Pass
46	5230	11.13	11.02	25.645	14.09	30.00	5.97	20.06	21.00	Pass

Note: Directional gain = 5.97dBi < 6dBi, so the limit no need to be reduced.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP limit (dBm)	Pass / Fail
		Chain 0	Chain 1							
42	5210	11.02	11.07	25.468	14.06	30.00	5.97	20.03	21.00	Pass

Note: Directional gain = 5.97dBi < 6dBi, so the limit no need to be reduced.

For U-NII-2A Band

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
52	5260	20.59	20.43	224.905	23.52	24.00	Pass
60	5300	20.42	20.69	227.510	23.57	24.00	Pass
64	5320	20.59	20.68	**231.739**	23.65	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (32.20) = 26.08 > 24dBm
2. 11dBm + 10log (25.13) = 25.00 > 24dBm
3. 11dBm + 10log (31.13) = 25.93 > 24dBm

Chain 1
1. 11dBm + 10log (38.13) = 26.81 > 24dBm
2. 11dBm + 10log (27.54) = 25.39 > 24dBm
3. 11dBm + 10log (33.42) = 26.24 > 24dBm

802.11ac (VHT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
52	5260	20.45	20.57	224.905	23.52	24.00	Pass
60	5300	20.57	20.49	225.944	23.54	24.00	Pass
64	5320	20.60	20.38	223.872	23.50	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (28.14) = 25.49 > 24dBm
2. 11dBm + 10log (29.90) = 25.76 > 24dBm
3. 11dBm + 10log (32.07) = 26.06 > 24dBm

Chain 1
1. 11dBm + 10log (40.72) = 27.10 > 24dBm
2. 11dBm + 10log (38.97) = 26.91 > 24dBm
3. 11dBm + 10log (32.88) = 26.17 > 24dBm

802.11ac (VHT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
54	5270	20.42	20.53	223.357	23.49	24.00	Pass
62	5310	18.52	19.48	159.956	22.04	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (74.77) = 29.74 > 24dBm
2. 11dBm + 10log (40.98) = 27.13 > 24dBm
Chain 1
1. 11dBm + 10log (87.56) = 30.42 > 24dBm
2. 11dBm + 10log (41.09) = 27.14 > 24dBm

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
58	5290	18.60	19.25	156.675	21.95	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (83.86) = 30.24 > 24dBm
Chain 1
1. 11dBm + 10log (83.05) = 30.19 > 24dBm

Beamforming Mode

802.11ac (VHT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
52	5260	20.45	20.57	224.905	23.52	24.00	Pass
60	5300	20.57	20.49	**225.944**	23.54	24.00	Pass
64	5320	20.60	20.38	223.872	23.50	24.00	Pass

Note: Directional gain = 5.41dBi < 6dBi, so the limit no need to be reduced.

Chain 0

1. 11dBm + 10log (28.14) = 25.49 > 24dBm
2. 11dBm + 10log (29.90) = 25.76 > 24dBm
3. 11dBm + 10log (32.07) = 26.06 > 24dBm

Chain 1

1. 11dBm + 10log (40.72) = 27.10 > 24dBm
2. 11dBm + 10log (38.97) = 26.91 > 24dBm
3. 11dBm + 10log (32.88) = 26.17 > 24dBm

802.11ac (VHT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
54	5270	20.42	20.53	223.357	23.49	24.00	Pass
62	5310	18.52	19.48	159.956	22.04	24.00	Pass

Note: Directional gain = 5.41dBi < 6dBi, so the limit no need to be reduced.

Chain 0

1. 11dBm + 10log (74.77) = 29.74 > 24dBm
2. 11dBm + 10log (40.98) = 27.13 > 24dBm

Chain 1

1. 11dBm + 10log (87.56) = 30.42 > 24dBm
2. 11dBm + 10log (41.09) = 27.14 > 24dBm

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
58	5290	18.60	19.25	156.675	21.95	24.00	Pass

Note: Directional gain = 5.41dBi < 6dBi, so the limit no need to be reduced.

Chain 0

1. 11dBm + 10log (83.86) = 30.24 > 24dBm

Chain 1

1. 11dBm + 10log (83.05) = 30.19 > 24dBm

For U-NII-2C Band

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
100	5500	16.08	16.09	16.00	16.08	161.436	22.08	23.97	Pass
116	5580	16.27	16.14	16.00	16.00	162.930	22.12	23.89	Pass
140	5700	16.49	16.45	16.32	16.17	172.982	22.38	23.92	Pass

Note:
Chain 0
1. 11dBm + 10log (19.90) = 23.99 < 24dBm
2. 11dBm + 10log (19.95) = 24.00 = 24dBm
3. 11dBm + 10log (20.09) = 24.03 > 24dBm

Chain 1
1. 11dBm + 10log (19.99) = 24.01 > 24dBm
2. 11dBm + 10log (20.34) = 24.08 > 24dBm
3. 11dBm + 10log (19.75) = 23.96 < 24dBm

Chain 2
1. 11dBm + 10log (19.83) = 23.97 < 24dBm
2. 11dBm + 10log (19.48) = 23.89 < 24dBm
3. 11dBm + 10log (19.63) = 23.92 < 24dBm

Chain 3
1. 11dBm + 10log (19.93) = 24.00 = 24dBm
2. 11dBm + 10log (19.93) = 24.00 = 24dBm
3. 11dBm + 10log (20.15) = 24.04 > 24dBm

802.11ac (VHT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
100	5500	16.29	16.07	16.04	16.14	164.437	22.16	24.00	Pass
116	5580	16.02	16.08	16.12	16.09	162.181	22.10	24.00	Pass
140	5700	16.16	16.17	16.20	16.08	164.816	22.17	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (20.64) = 24.15 > 24dBm
2. 11dBm + 10log (20.60) = 24.14 > 24dBm
3. 11dBm + 10log (20.79) = 24.18 > 24dBm

Chain 1
1. 11dBm + 10log (20.78) = 24.18 > 24dBm
2. 11dBm + 10log (20.71) = 24.16 > 24dBm
3. 11dBm + 10log (20.68) = 24.16 > 24dBm

Chain 2
1. 11dBm + 10log (20.74) = 24.17 > 24dBm
2. 11dBm + 10log (20.71) = 24.16 > 24dBm
3. 11dBm + 10log (20.66) = 24.15 > 24dBm

Chain 3
1. 11dBm + 10log (20.56) = 24.13 > 24dBm
2. 11dBm + 10log (20.62) = 24.14 > 24dBm
3. 11dBm + 10log (20.63) = 24.14 > 24dBm

802.11ac (VHT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
102	5510	17.38	17.42	17.55	17.43	222.331	23.47	24.00	Pass
110	5550	17.50	17.43	17.52	17.54	**224.905**	23.52	24.00	Pass
134	5670	17.58	17.42	17.38	17.38	221.820	23.46	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (41.12) = 27.14 > 24dBm
2. 11dBm + 10log (41.03) = 27.13 > 24dBm
3. 11dBm + 10log (41.05) = 27.13 > 24dBm

Chain 1
1. 11dBm + 10log (40.90) = 27.11 > 24dBm
2. 11dBm + 10log (40.84) = 27.11 > 24dBm
3. 11dBm + 10log (40.93) = 27.12 > 24dBm

Chain 2
1. 11dBm + 10log (40.77) = 27.10 > 24dBm
2. 11dBm + 10log (40.75) = 27.10 > 24dBm
3. 11dBm + 10log (40.82) = 27.10 > 24dBm

Chain 3
1. 11dBm + 10log (40.73) = 27.09 > 24dBm
2. 11dBm + 10log (40.99) = 27.12 > 24dBm
3. 11dBm + 10log (40.77) = 27.10 > 24dBm

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
106	5530	17.49	17.45	17.47	17.42	222.844	23.48	24.00	Pass
122	5610	17.50	17.49	17.41	17.45	222.844	23.48	24.00	Pass

Note:
Chain 0
1. 11dBm + 10log (83.61) = 30.22 > 24dBm
2. 11dBm + 10log (84.05) = 30.25 > 24dBm

Chain 1
1. 11dBm + 10log (83.53) = 30.22 > 24dBm
2. 11dBm + 10log (83.98) = 30.24 > 24dBm

Chain 2
1. 11dBm + 10log (83.73) = 30.23 > 24dBm
2. 11dBm + 10log (83.95) = 30.24 > 24dBm

Chain 3
1. 11dBm + 10log (82.84) = 30.18 > 24dBm
2. 11dBm + 10log (83.18) = 30.20 > 24dBm

Beamforming Mode

802.11ac (VHT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
100	5500	15.12	15.08	15.11	15.10	**129.420**	21.12	21.26	Pass
116	5580	15.02	15.10	15.16	15.09	129.122	21.11	21.26	Pass
140	5700	15.16	15.03	15.00	14.93	127.350	21.05	21.26	Pass

Note: Directional gain = 8.74dBi > 6dBi, so the power limit shall be reduced to 24-(8.74-6) = 21.26dBm.

Chain 0
1. 11dBm + 10log (20.64) = 24.15 > 24dBm
2. 11dBm + 10log (20.60) = 24.14 > 24dBm
3. 11dBm + 10log (20.79) = 24.18 > 24dBm

Chain 1
1. 11dBm + 10log (20.78) = 24.18 > 24dBm
2. 11dBm + 10log (20.71) = 24.16 > 24dBm
3. 11dBm + 10log (20.68) = 24.16 > 24dBm

Chain 2
1. 11dBm + 10log (20.74) = 24.17 > 24dBm
2. 11dBm + 10log (20.71) = 24.16 > 24dBm
3. 11dBm + 10log (20.66) = 24.15 > 24dBm

Chain 3
1. 11dBm + 10log (20.56) = 24.13 > 24dBm
2. 11dBm + 10log (20.62) = 24.14 > 24dBm
3. 11dBm + 10log (20.63) = 24.14 > 24dBm

802.11ac (VHT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
102	5510	14.89	15.00	15.10	15.04	126.765	21.03	21.26	Pass
110	5550	15.02	14.92	15.10	15.06	127.350	21.05	21.26	Pass
134	5670	15.09	15.07	15.01	15.00	127.644	21.06	21.26	Pass

Note: Directional gain = 8.74dBi > 6dBi, so the power limit shall be reduced to 24-(8.74-6) = 21.26dBm.

Chain 0
1. 11dBm + 10log (41.12) = 27.14 > 24dBm
2. 11dBm + 10log (41.03) = 27.13 > 24dBm
3. 11dBm + 10log (41.05) = 27.13 > 24dBm

Chain 1
1. 11dBm + 10log (40.90) = 27.11 > 24dBm
2. 11dBm + 10log (40.84) = 27.11 > 24dBm
3. 11dBm + 10log (40.93) = 27.12 > 24dBm

Chain 2
1. 11dBm + 10log (40.77) = 27.10 > 24dBm
2. 11dBm + 10log (40.75) = 27.10 > 24dBm
3. 11dBm + 10log (40.82) = 27.10 > 24dBm

Chain 3
1. 11dBm + 10log (40.73) = 27.09 > 24dBm
2. 11dBm + 10log (40.99) = 27.12 > 24dBm
3. 11dBm + 10log (40.77) = 27.10 > 24dBm

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
106	5530	14.89	15.02	15.06	15.07	126.765	21.03	21.26	Pass
122	5610	15.13	14.99	15.12	14.96	127.938	21.07	21.26	Pass

Note: Directional gain = 8.74dBi > 6dBi, so the power limit shall be reduced to 24-(8.74-6) = 21.26dBm.

Chain 0

1. 11dBm + 10log (83.61) = 30.22 > 24dBm
2. 11dBm + 10log (84.05) = 30.25 > 24dBm

Chain 1

1. 11dBm + 10log (83.53) = 30.22 > 24dBm
2. 11dBm + 10log (83.98) = 30.24 > 24dBm

Chain 2

1. 11dBm + 10log (83.73) = 30.23 > 24dBm
2. 11dBm + 10log (83.95) = 30.24 > 24dBm

Chain 3

1. 11dBm + 10log (82.84) = 30.18 > 24dBm
2. 11dBm + 10log (83.18) = 30.20 > 24dBm

For U-NII-3 Band

CDD Mode

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
149	5745	23.47	23.58	23.59	23.55	905.733	29.57	30.00	Pass
157	5785	23.52	23.60	23.58	23.59	**909.913**	29.59	30.00	Pass
165	5825	23.64	23.58	23.58	23.49	**909.913**	29.59	30.00	Pass

802.11ac (VHT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
149	5745	23.48	23.45	23.49	23.48	891.251	29.50	30.00	Pass
157	5785	23.58	23.55	23.60	23.55	**909.913**	29.59	30.00	Pass
165	5825	23.40	23.44	23.58	23.62	897.429	29.53	30.00	Pass

802.11ac (VHT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
151	5755	22.49	22.68	22.55	22.40	716.143	28.55	30.00	Pass
159	5795	23.58	23.60	23.49	23.41	899.498	29.54	30.00	Pass

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
155	5775	19.05	19.03	18.87	18.90	314.775	24.98	30.00	Pass

Beamforming Mode

802.11ac (VHT20)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
149	5745	22.08	22.03	22.07	21.99	639.735	28.06	28.43	Pass
157	5785	22.16	22.03	22.05	21.96	641.210	28.07	28.43	Pass
165	5825	22.01	21.99	22.07	22.06	638.263	28.05	28.43	Pass

Note: Directional gain = 7.57dBi > 6dBi, so the power limit shall be reduced to 30-(7.57-6) = 28.43dBm.

802.11ac (VHT40)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
151	5755	22.07	22.16	22.18	21.96	**647.143**	28.11	28.43	Pass
159	5795	22.05	22.14	22.06	22.00	642.688	28.08	28.43	Pass

Note: Directional gain = 7.57dBi > 6dBi, so the power limit shall be reduced to 30-(7.57-6) = 28.43dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
155	5775	19.06	19.08	18.79	18.95	315.500	24.99	28.43	Pass

Note: Directional gain = 7.57dBi > 6dBi, so the power limit shall be reduced to 30-(7.57-6) = 28.43dBm.

26dB Bandwidth:

For U-NII-2A Band

802.11a

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
52	5260	32.20	38.13
60	5300	25.13	27.54
64	5320	31.13	33.42

802.11ac (VHT20)

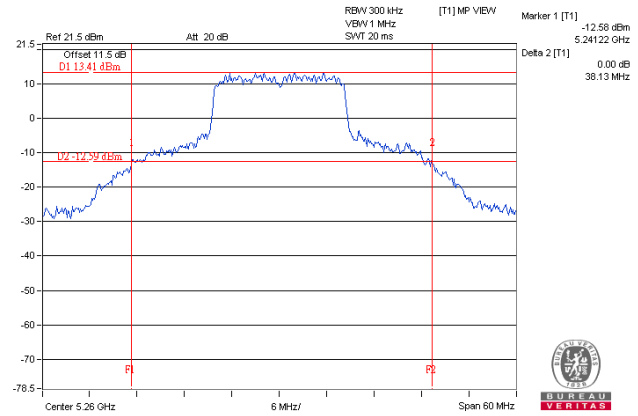
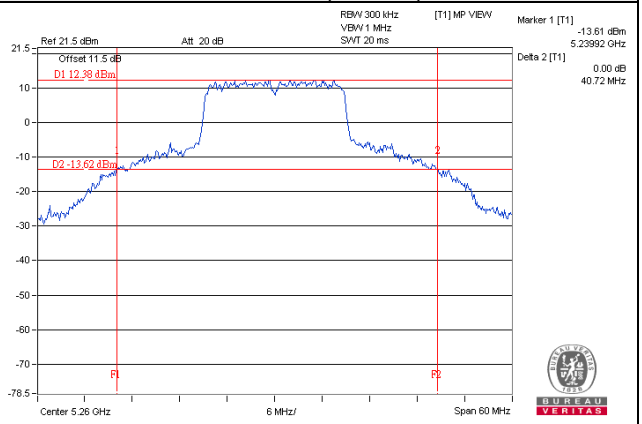
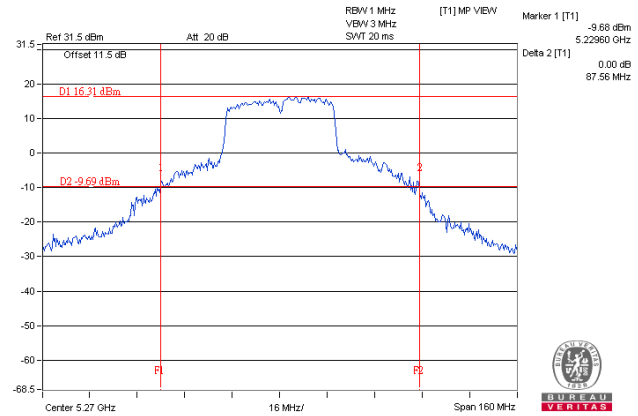
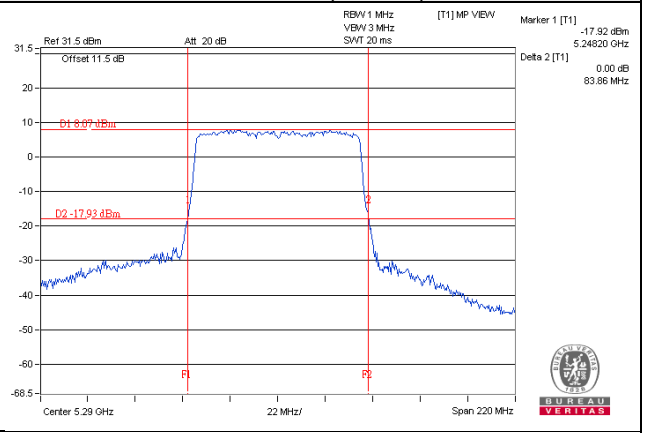
Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
52	5260	28.14	40.72
60	5300	29.90	38.97
64	5320	32.07	32.88

802.11ac (VHT40)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
54	5270	74.77	87.56
62	5310	40.98	41.09

802.11ac (VHT80)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
58	5290	83.86	83.05

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

For U-NII-2C Band

802.11a

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
100	5500	19.90	19.99	19.83	19.93
116	5580	19.95	20.34	19.48	19.93
140	5700	20.09	19.75	19.63	20.15

802.11ac (VHT20)

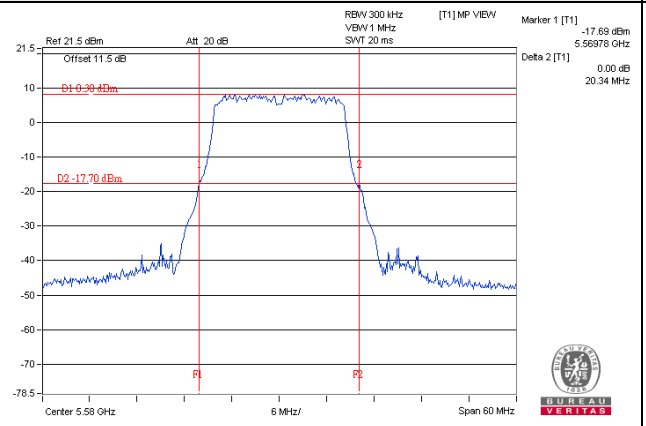
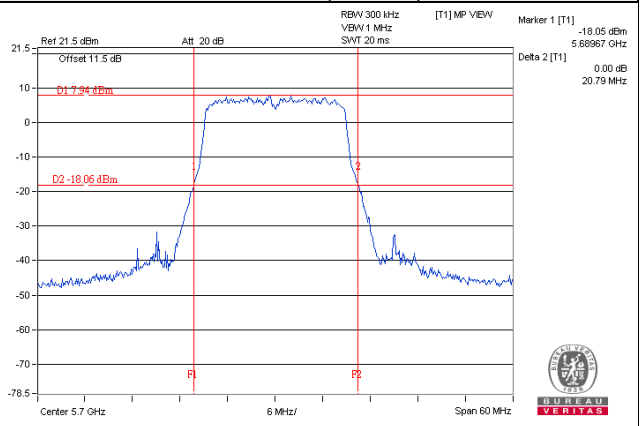
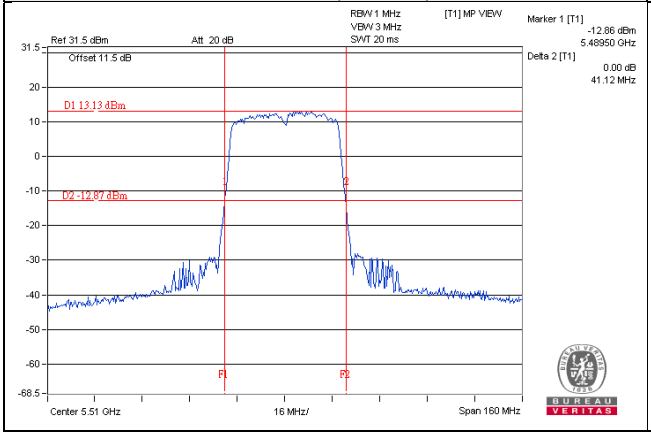
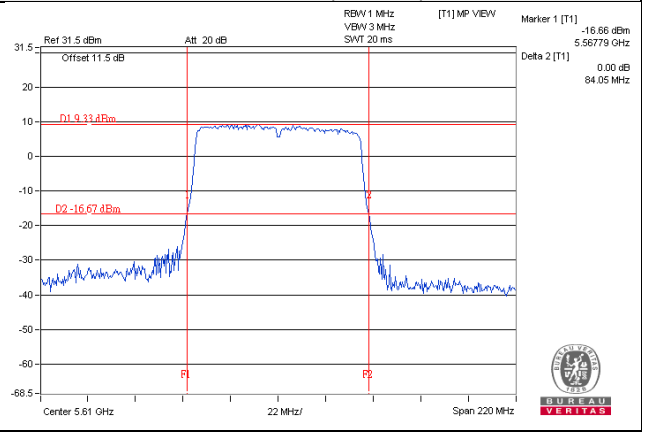
Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
100	5500	20.64	20.78	20.74	20.56
116	5580	20.60	20.71	20.71	20.62
140	5700	20.79	20.68	20.66	20.63

802.11ac (VHT40)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
102	5510	41.12	40.90	40.77	40.73
110	5550	41.03	40.84	40.75	40.99
134	5670	41.05	40.93	40.82	40.77

802.11ac (VHT80)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
106	5530	83.61	83.53	83.73	82.84
122	5610	84.05	83.98	83.95	83.18

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

EUT Maximum Conducted Power

CDD Mode

802.11a

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	231.739	23.65
5470~5725	172.982	22.38

802.11ac (VHT20)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	225.944	23.54
5470~5725	164.816	22.17

802.11ac (VHT40)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	223.357	23.49
5470~5725	224.905	23.52

802.11ac (VHT80)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	156.675	21.95
5470~5725	222.844	23.48

Beamforming Mode

802.11ac (VHT20)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	225.944	23.54
5470~5725	129.420	21.12

802.11ac (VHT40)

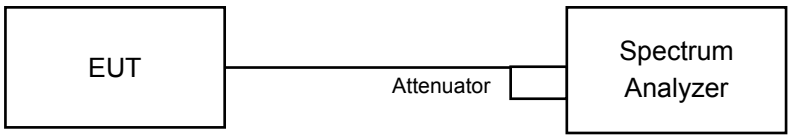
Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	223.357	23.49
5470~5725	127.644	21.06

802.11ac (VHT80)

Frequency Band (MHz)	Max. Power	
	Output Power (mW)	Output Power (dBm)
5250~5350	156.675	21.95
5470~5725	127.938	21.07

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

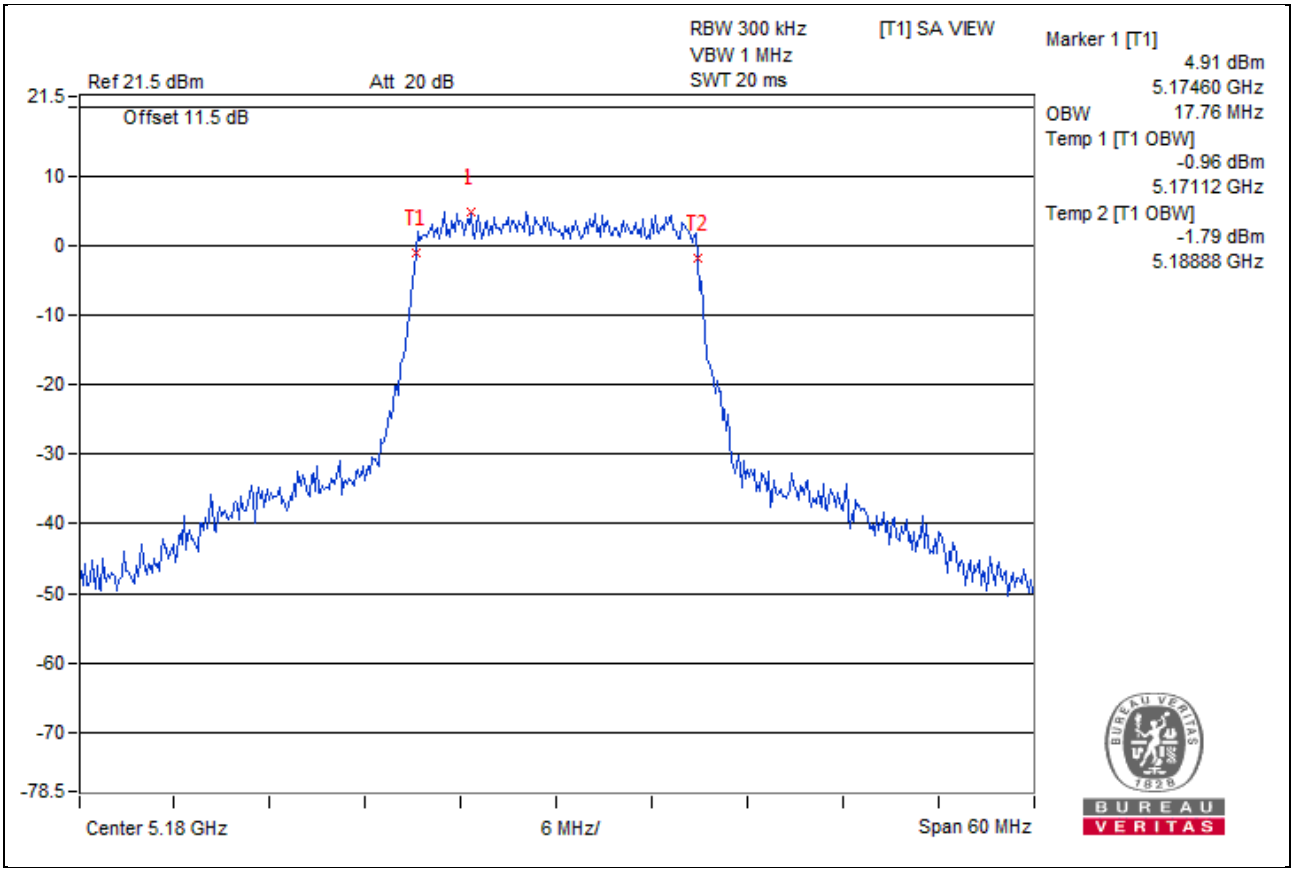
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution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

4.4.4 Test Result

For U-NII-1 Band 1TX

802.11ac (VHT20)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)
36	5180	17.76

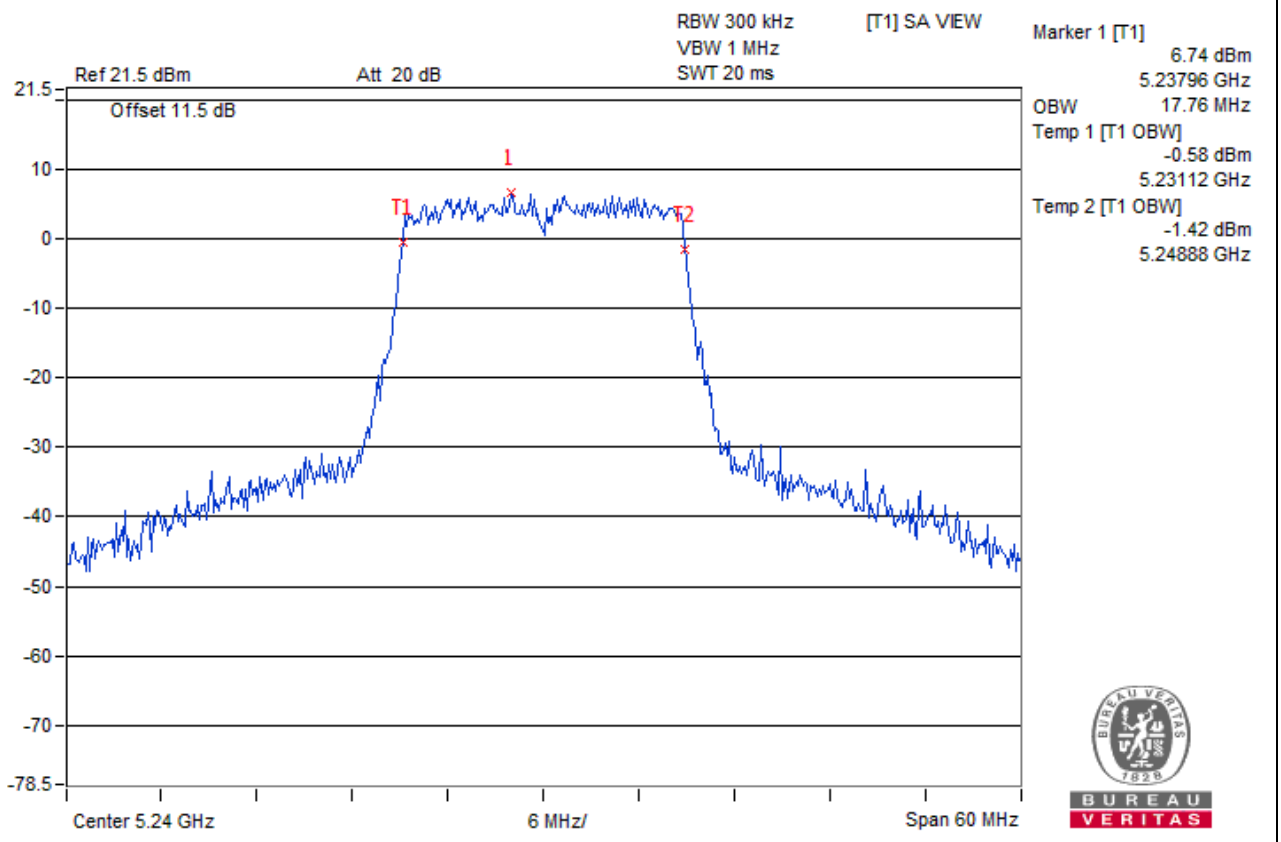


For U-NII-1 Band 2TX

802.11ac (VHT20)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
48	5240	17.64	17.76

Spectrum Plot of Worst Value

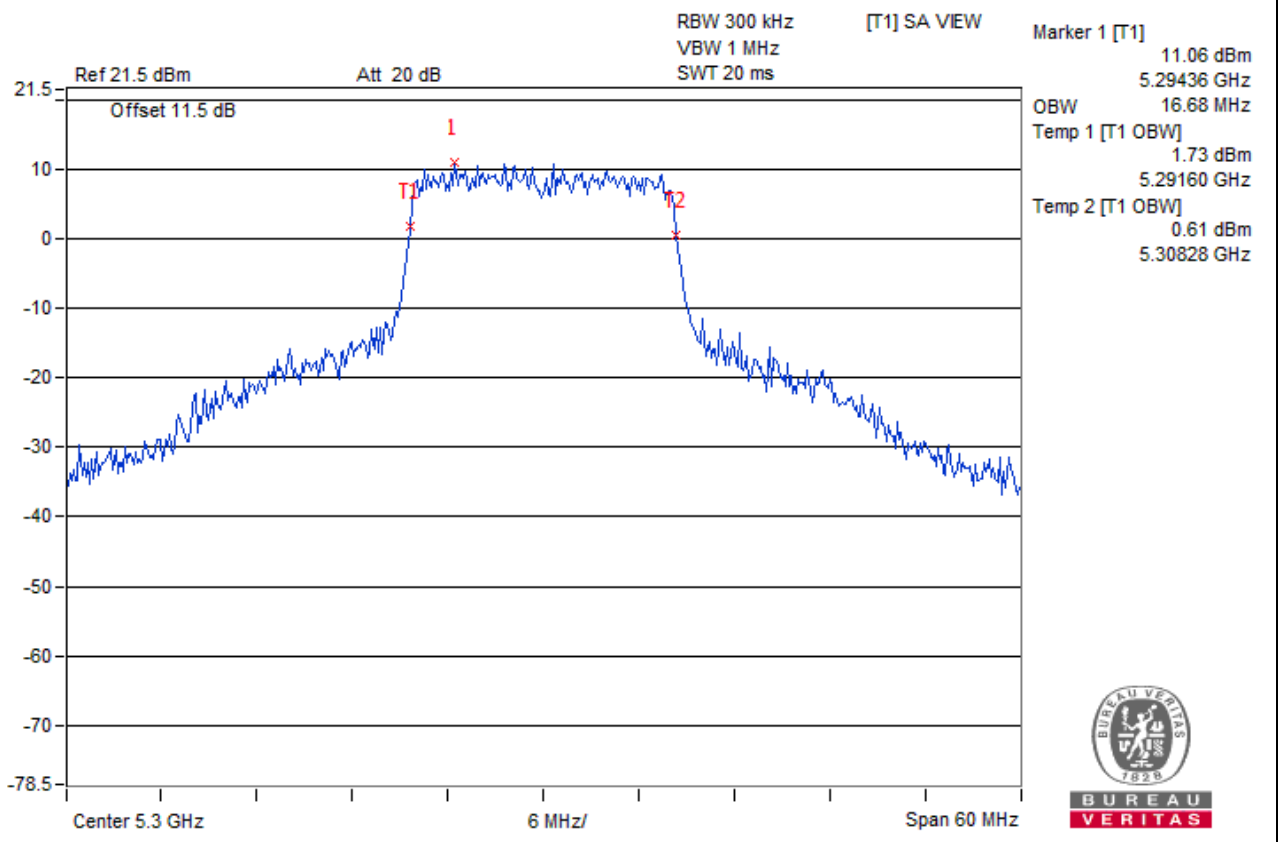


For U-NII-2A Band

802.11a

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
60	5300	16.56	16.68

Spectrum Plot of Worst Value

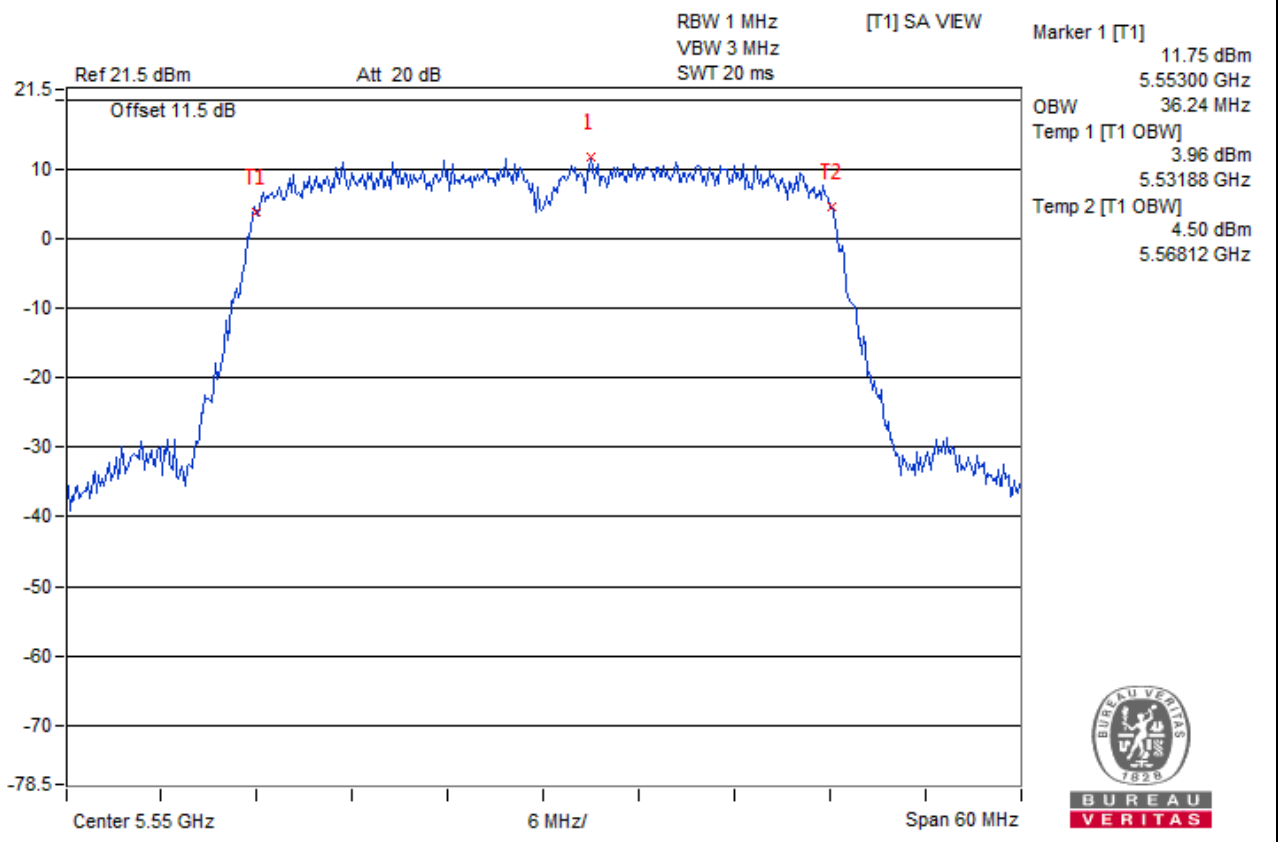


For U-NII-2C Band

802.11ac (VHT40)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
110	5550	36.24	36.24	36.24	36.12

Spectrum Plot of Worst Value

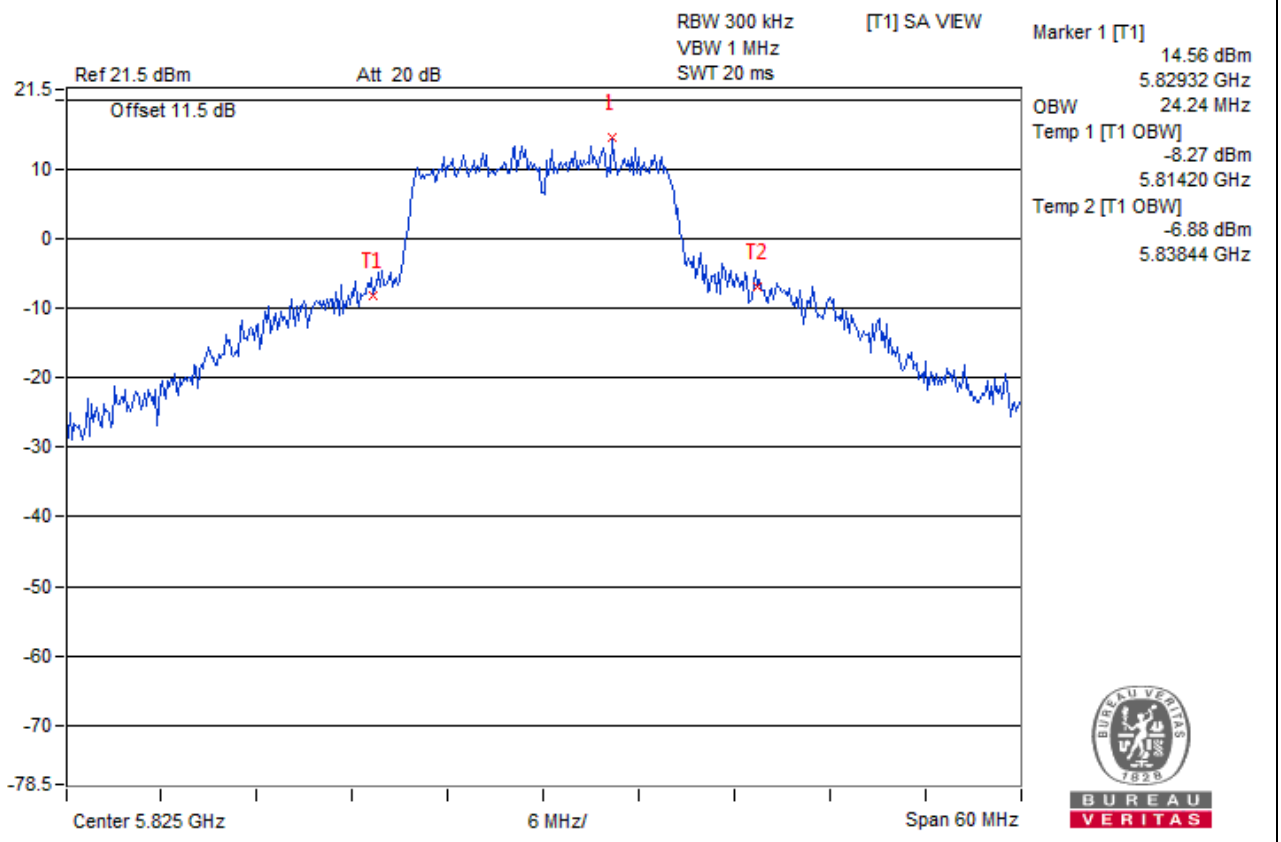


For U-NII-3 Band

802.11a

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
165	5825	17.52	17.76	24.24	21.24

Spectrum Plot of Worst Value

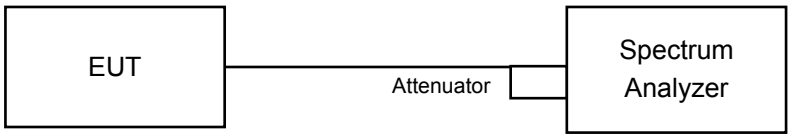


4.5 Peak Power Spectral Density Measurement

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	
		Mobile and Portable 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 Procedures

For U-NII-1, U-NII-2A and U-NII-2C band:

Duty cycle of test signal is > 98%

Using method SA-1

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS

c. Sweep time = auto, trigger set to “free run”.

d. Trace average at least 100 traces in power averaging mode.

e. Record the max value

Duty cycle of test signal is < 98%

Using method SA-2

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 1MHz, Set VBW ≥ 3 MHz, Detector = RMS

c. Set Channel power measure = 1MHz

d. Sweep time = auto, trigger set to “free run”.

e. Trace average at least 100 traces in power averaging mode.

f. Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

Duty cycle of test signal is > 98%

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS

c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.

d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz/300kHz)

e. Sweep time = auto, trigger set to “free run”.

f. Trace average at least 100 traces in power averaging mode.

g. Record the max value

Duty cycle of test signal is < 98%

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS

c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.

d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz / 300 kHz)

e. Sweep time = auto, trigger set to “free run”.

f. Trace average at least 100 traces in power averaging mode.

g. Record the max value and add 10 log (1/duty cycle)

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

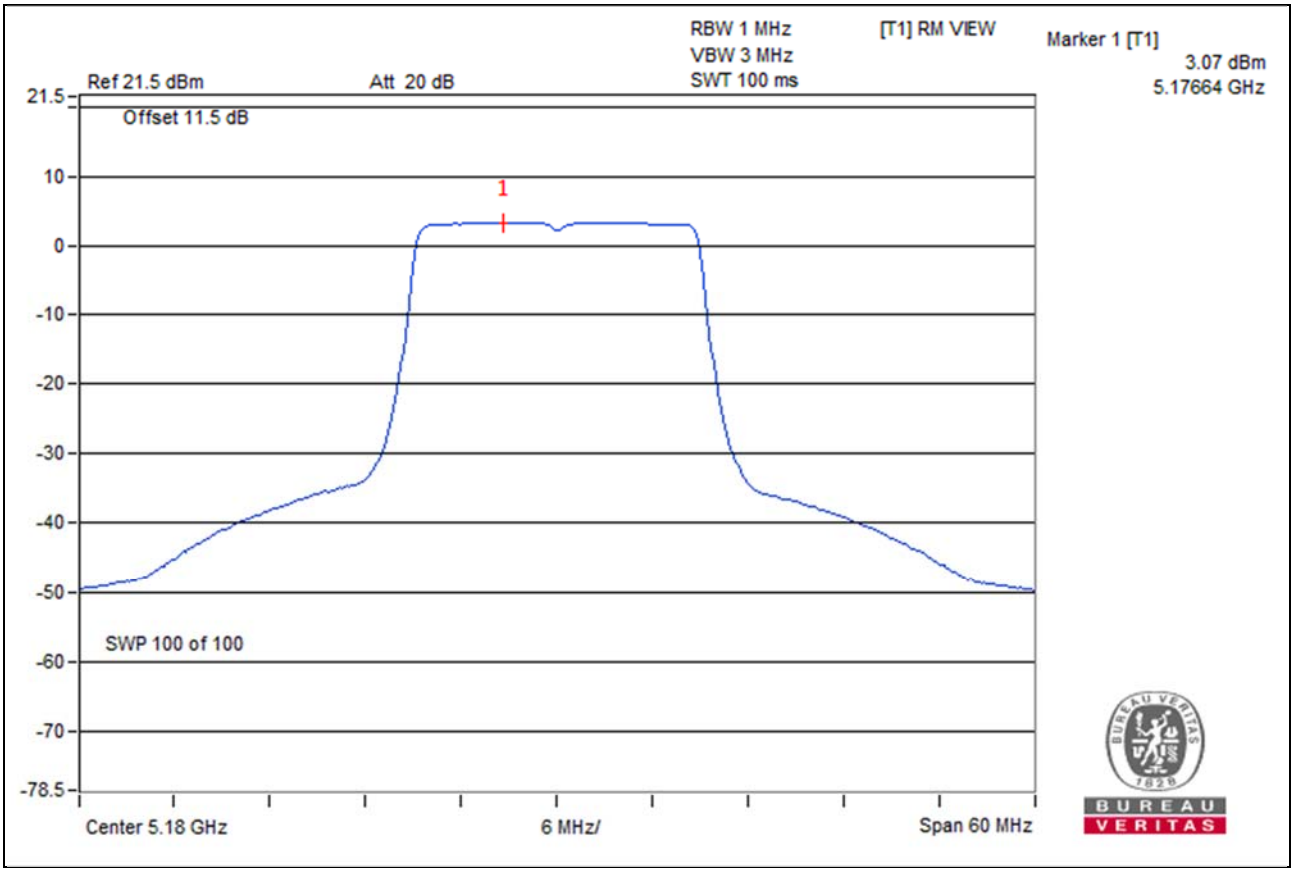
Same as 4.3.6.

4.5.7 Test Results

For U-NII-1 Band 1TX

802.11ac (VHT20)

Chan.	Freq. (MHz)	PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
36	5180	3.07	17.00	Pass



For U-NII-1 Band 2TX

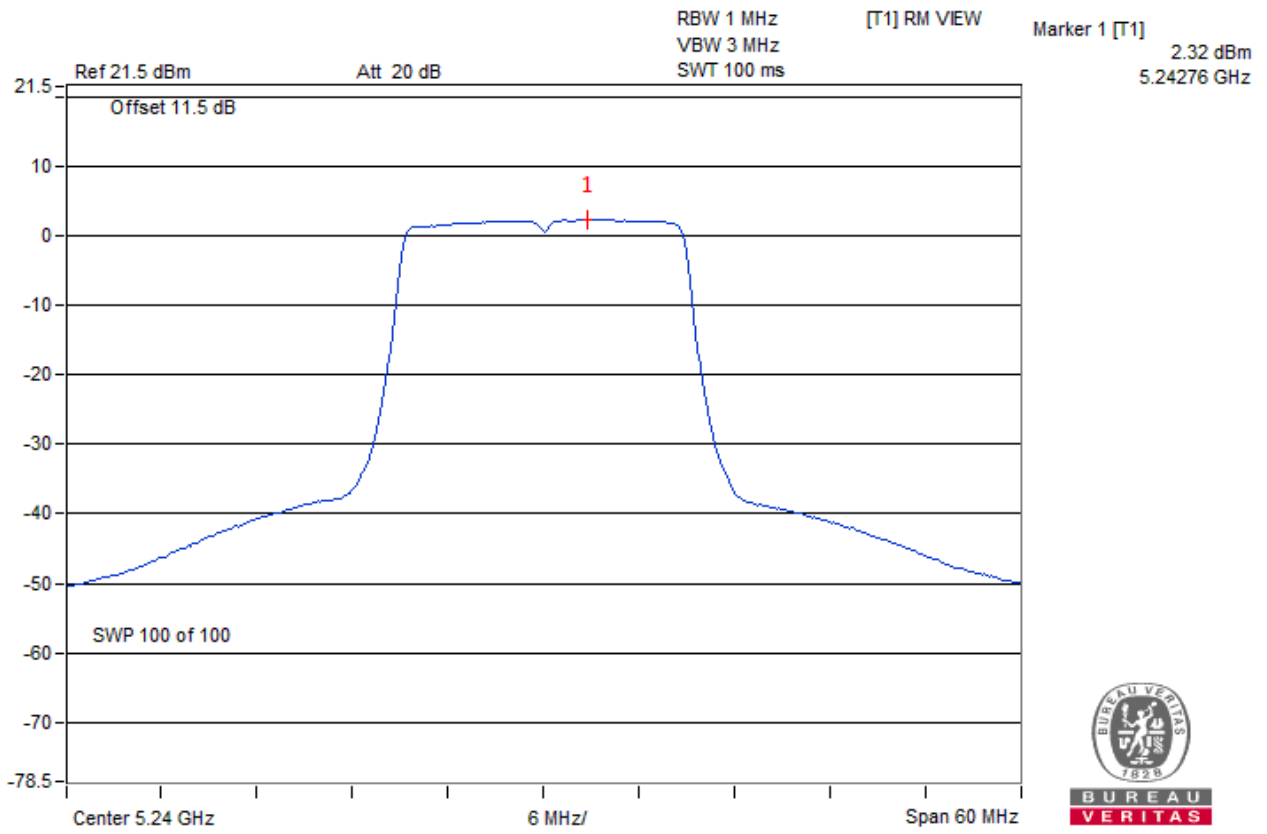
802.11ac (VHT20)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
48	5240	1.07	2.32	0.09	4.84	17.00	Pass

Note:

1. Method 1 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 = 5.97dBi < 6dBi, so the limit no need to be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value



For U-NII-2A Band

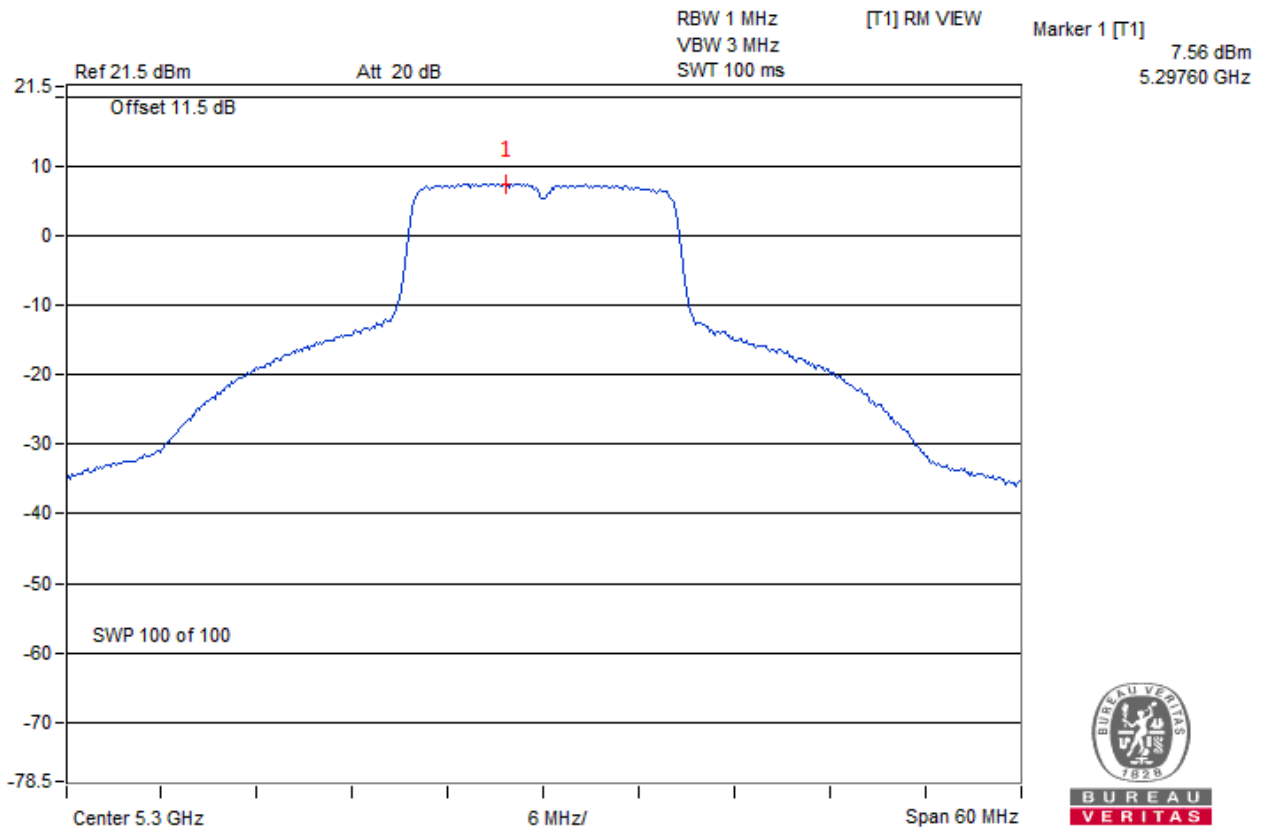
802.11a

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
60	5300	6.22	7.55	0.19	10.14	11.00	Pass

Note:

1. Method 1 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 = 5.41dBi < 6dBi, so the limit no need to be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value



For U-NII-2C Band

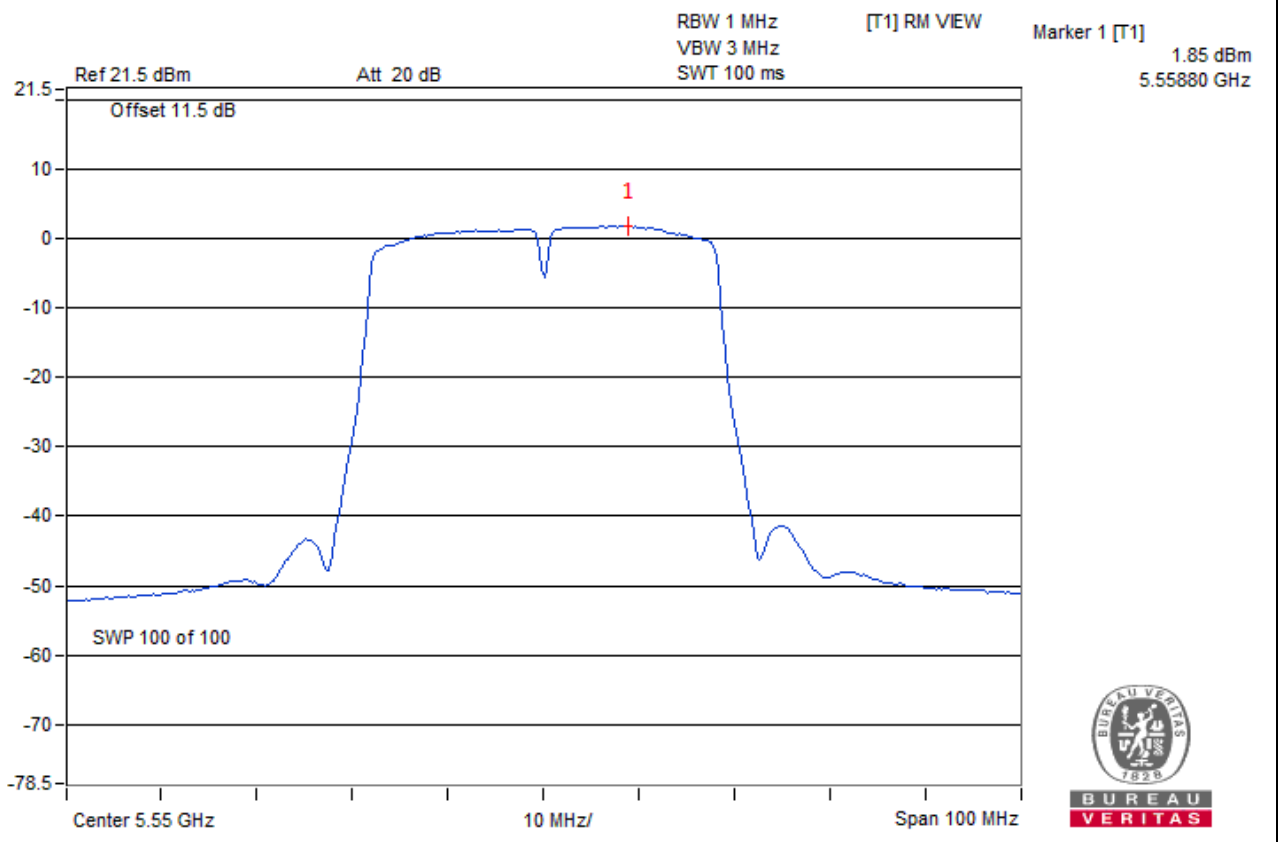
802.11ac (VHT40)

Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
110	5550	1.19	1.85	1.55	1.46	0.14	7.68	8.26	Pass

Note:

1. Method 1 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 = 8.74dBi > 6dBi, so the power limit shall be reduced to 11-(8.74-6) = 8.26dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value



For U-NII-3 Band

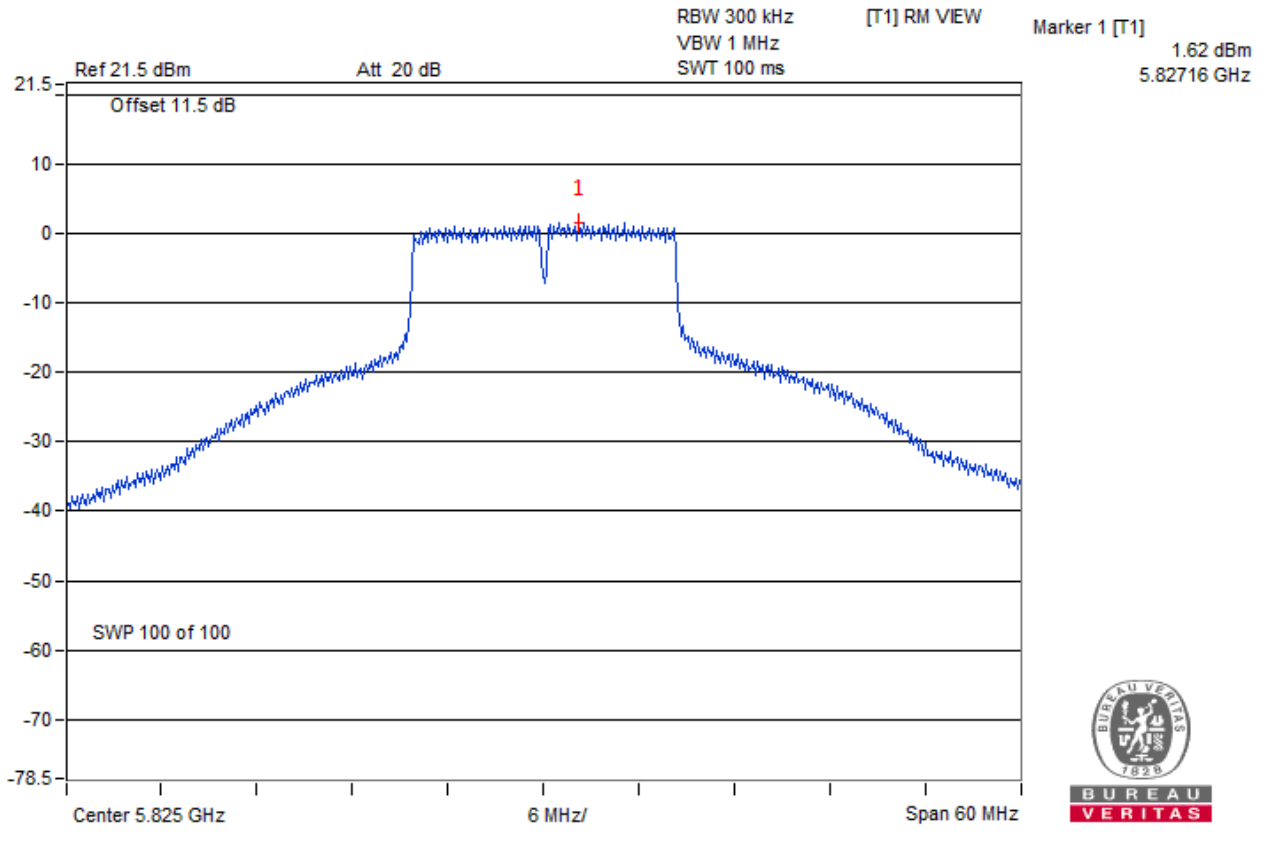
802.11a

TX chain	Chan.	Freq. (MHz)	PSD W/O Duty Factor		10 log (N=4) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/ 500kHz)	Pass / Fail
			(dBm/300kHz)	(dBm/500kHz)					
0	165	5825	1.20	3.42	6.02	0.17	9.61	28.43	Pass
1	165	5825	0.97	3.19	6.02	0.17	9.38	28.43	Pass
2	165	5825	1.62	3.84	6.02	0.17	10.03	28.43	Pass
3	165	5825	1.58	3.80	6.02	0.17	9.99	28.43	Pass

Note:

1. Method 1 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 = 7.57dBi > 6dBi, so the power density limit shall be reduced to 30-(7.57-6) = 28.43dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

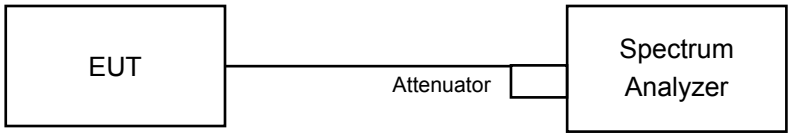


4.6 6dB Bandwidth Measurement

4.6.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

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

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

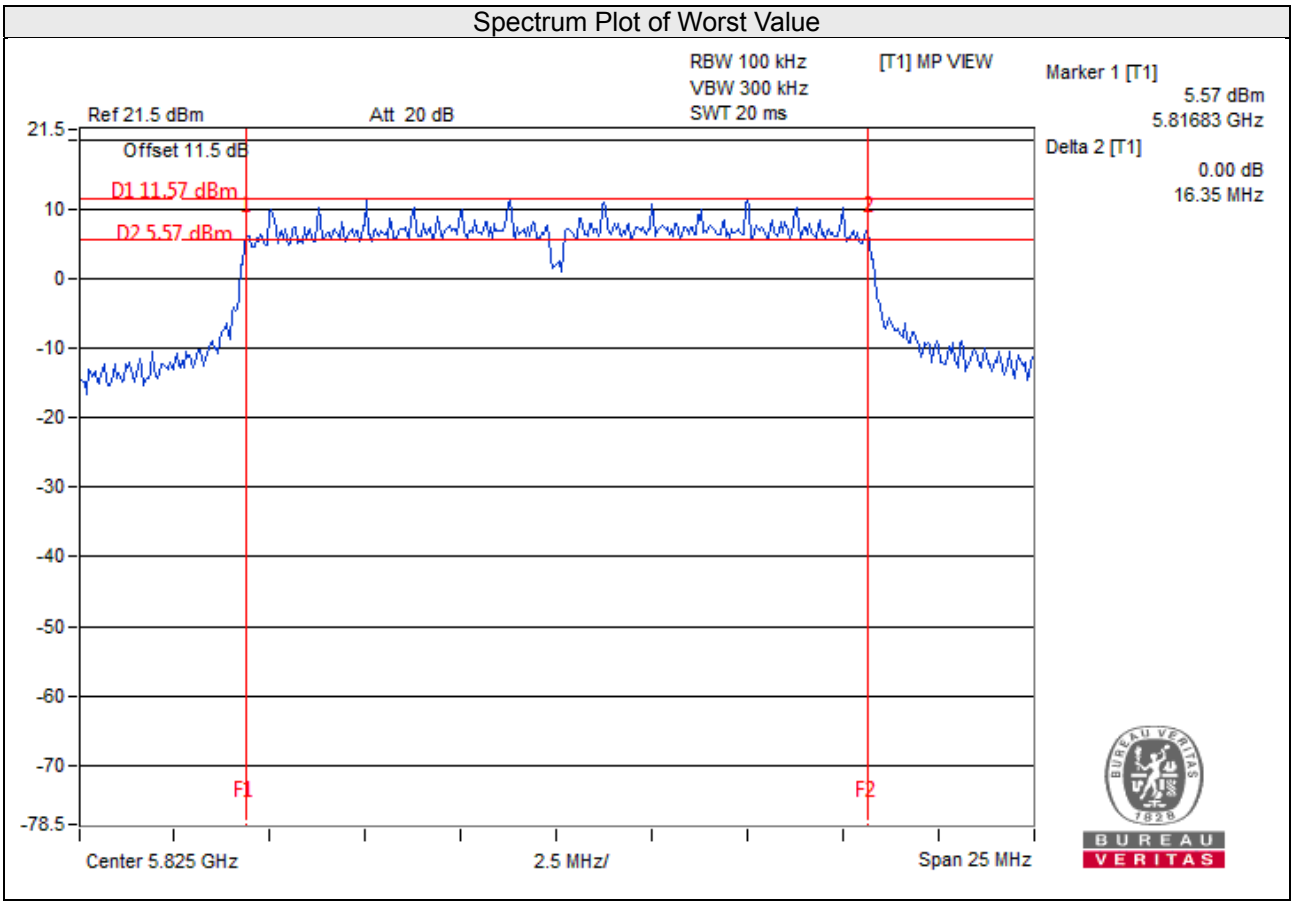
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
165	5825	16.37	16.35	16.37	16.36	0.5	Pass

Spectrum Plot of Worst Value

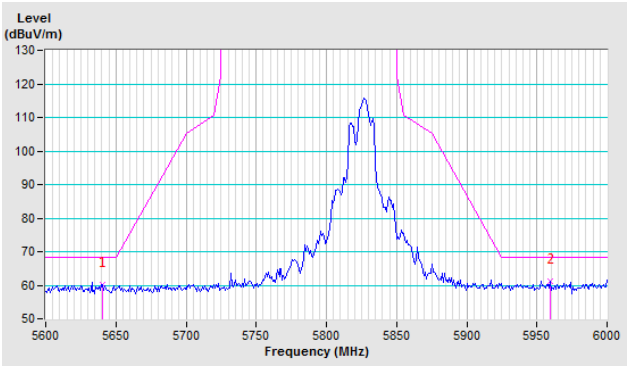
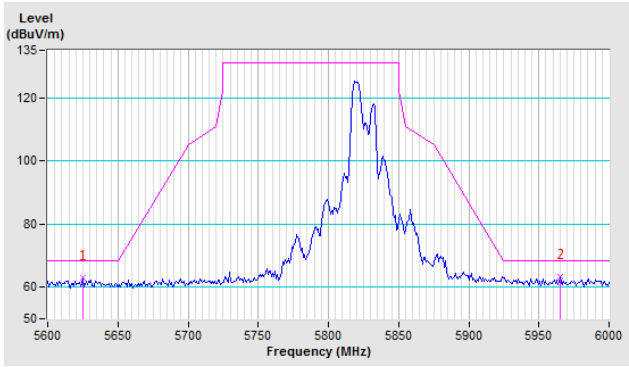


5 Pictures of Test Arrangements

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

CH165	
Horizontal	Vertical
	

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 and approved according to ISO/IEC 17025.

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

Linko 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
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 ---