FCC Test Report

Report No.:	RF200717C09-1 R1
FCC ID:	2AKCZ-101
Test Model:	APL57-0F2, APL57-101 (refer to item 3.1 for more details)
Received Date:	Jul. 17, 2020
Test Date:	Aug. 25, 2020 ~ Sep. 28, 2020 (for all tests except beamforming power) Nov. 02, 2021 (for beamforming power)
Issued Date:	Mar. 03, 2022
Applicant:	SonicWall Inc.
Address:	1033 McCarthy Blvd., Milpitas, CA 95035, USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF200717C09-1	Original Release	May 18, 2021
RF200717C09-1 R1	1. Update beamforming power 2. Update 26dB bandwidth and Occupied bandwidth 802.11n (HT20) CH116 test result	Mar. 03, 2022

1 Certificate of Conformity

Product:	Wireless Network Security Appliance
Brand:	SONICWALL
Test Model:	APL57-0F2, APL57-101 (refer to item 3.1 for more details)
Sample Status:	Engineering Sample
Applicant:	SonicWall Inc.
Test Date:	Aug. 25, 2020 ~ Sep. 28, 2020 (for all tests except beamforming power) Nov. 02, 2021 (for beamforming power)
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 : Vera Huang , **Date:** Mar. 03, 2022

Vera Huang / Specialist

Approved by : Jeremy Lin , **Date:** Mar. 03, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(8)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -19.79dB at 20.74600MHz.
15.407(b) (1/2/3/4(i/ii)/8)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.1dB at 5350.00MHz.
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	N/A	Not Applicable
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-2A, U-NII-2C band compliance with rule 15.407(b) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
2. 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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 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	Wireless Network Security Appliance
Brand	SONICWALL
Test Model	APL57-0F2, APL57-101
Model Difference	Refer to note for more details
Sample Status	Engineering Sample
Power Supply Rating	12 Vdc (adapter)
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK
Modulation Technology	OFDM
Transfer Rate	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0 Mbps 802.11n: up to 300Mbps 802.11ac: up to 867Mbps
Operating Frequency	5260 ~ 5320MHz, 5500 ~ 5700MHz
Number of Channel	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
Output Power	CDD Mode: 5260 ~ 5320MHz: 162.941mW 5500 ~ 5700MHz: 130.455mW Beamforming Mode: 5260 ~ 5320MHz: 132.216 mW 5500 ~ 5700MHz: 130.455mW
Antenna Type	Refer to Note as below
Antenna Connector	Refer to Note as below
Accessory Device	Refer to Note as below
Cable Supplied	Refer to Note as below

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report (BV CPS report no.: RF200717C08-1) is adding 5.26GHz to 5.32GHz and 5.50GHz to 5.70GHz by software.
2. The following models are provided to this EUT. The model 'APL57-0F2' was chosen for final tests.
   (a) The EUT using the same PCB Layout.
   (b) Due to series models, the parts are different as below:

Model	APL57-0F2	APL57-101
PSE Out	N/A	N/A
Copper Ports	x8 GbE	x8 GbE
SFP Ports	x2 SFP (Max: 2.5Gbps)	NO
mPCIe WiFi Module	2x2 11ac Wave 2 (Module)	2x2 11ac Wave 2 (Module)
WiFi SPEC	2.4G+5G 11ac+abgn support Beamforming	2.4G+5G 11ac+abgn support Beamforming
ANT for WiFi	x2 ANTs (EXT)	x2 ANTs (EXT)
Console (RJ45)	YES	YES
USB Port	3.0 x2	3.0 x2
FAN(s)	YES	YES
Outer covering	Metal	Metal
CPU	1.4GHz	1.2GHz

3. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	TX Function	Beamforming Mode
802.11a	2TX	Not Support
802.11n (HT20)	2TX	Support
802.11n (HT40)	2TX	Support
802.11ac (VHT20)	2TX	Support
802.11ac (VHT40)	2TX	Support
802.11ac (VHT80)	2TX	Support

   * The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, 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 EUT uses following antennas.

Ant. Type	Dipole					
Ant. Connector	RP-SMA					
Frequency (MHz)	2400	2450	2500	5150	5550	5850
Peak Gain (dBi)	3.19	3.10	3.05	5.85	5.73	5.03

* The max. gain was chosen for final tests.

5. The EUT consumes power from the following adapters.

Product	Brand	Model	Description
Adapter 1	Sunny COMPUTER TECHNOLOGY CO.,LTD.	SYS1546-3612-T3	I/P: 100-240 Vac, 50-60 Hz, 1.5 A O/P: 12 Vdc, 3 A 1.85m power cable with 1 core
Adapter 2 (Support unit only)	BILLION	BA040-120300MAX	I/P: 100-240 Vac, 50/60 Hz, 1 A O/P: 12 Vdc, 3 A 1.46m power cable without core

* After the pretesting, the adapter 1 was chosen for final test.

6. WLAN 2.4GHz & WLAN 5GHz technology cannot transmit at same time.
7. Spurious emission of the simultaneous operation (2.4GHz and 5GHz) has been evaluated and no non-compliance was found.
8. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
9. 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 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	5530 MHz	122	5610 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 & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. "-": Means no effect.
3. Radiated Emission below 1GHz and Power Line Conducted Emission test items chosen the worst maximum power.

Radiated Emission Test (Above 1GHz):

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5260-5320	52 to 64	52, 60, 64	OFDM	6.0
	802.11n (HT20)		52 to 64	52, 60, 64	OFDM	6.5
	802.11n (HT40)		54 to 62	54, 62	OFDM	13.5
	802.11ac (VHT80)		58	58	OFDM	29.3
-	802.11a	5500-5700	100 to 140	100, 116, 140	OFDM	6.0
	802.11n (HT20)		100 to 140	100, 116, 140	OFDM	6.5
	802.11n (HT40)		102 to 134	102, 110, 134	OFDM	13.5
	802.11ac (VHT80)		106 to 122	106, 122	OFDM	29.3

Radiated Emission Test (Below 1GHz):

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

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

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11n (HT40)	5260-5320	52 to 64	54	OFDM	13.5
	802.11n (HT40)	5500-5700	100 to 140		OFDM	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.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11n (HT40)	5260-5320	52 to 64	54	OFDM	13.5
	802.11n (HT40)	5500-5700	100 to 140		OFDM	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.

EUT Configure Mode	Mode	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5260-5320	52 to 64	52, 60, 64	OFDM	6.0
	802.11n (HT20)		52 to 64	52, 60, 64	OFDM	6.5
	802.11n (HT40)		54 to 62	54, 62	OFDM	13.5
	802.11ac (VHT80)		58	58	OFDM	29.3
-	802.11a	5500-5700	100 to 140	100, 116, 140	OFDM	6.0
	802.11n (HT20)		100 to 140	100, 116, 140	OFDM	6.5
	802.11n (HT40)		102 to 134	102, 110, 134	OFDM	13.5
	802.11ac (VHT80)		106 to 122	106, 122	OFDM	29.3

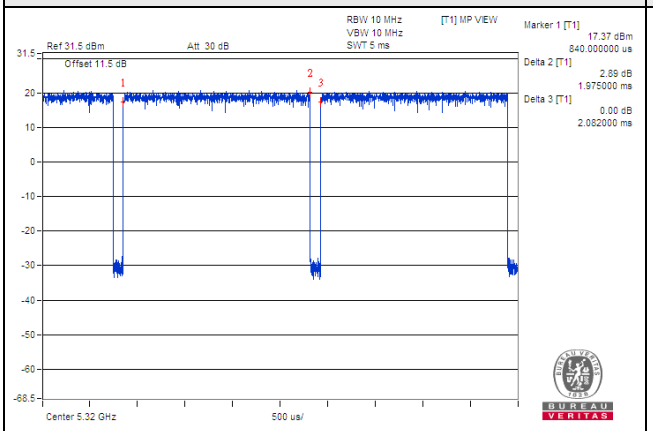
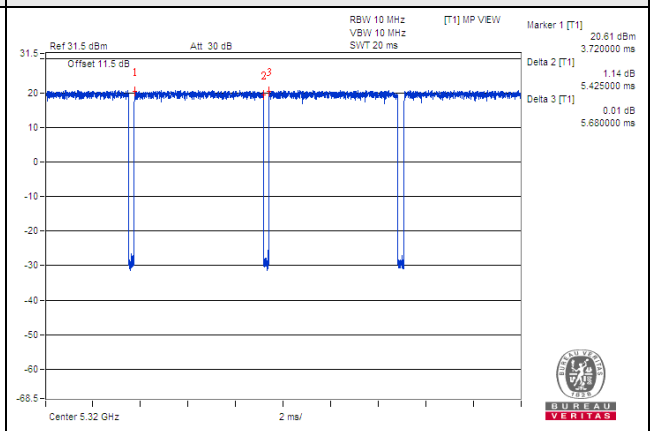
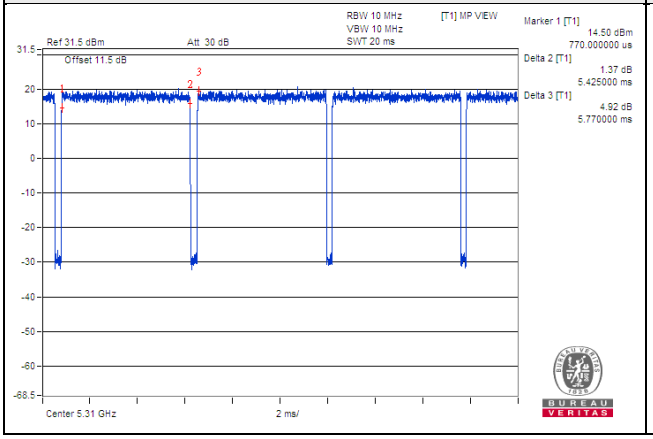
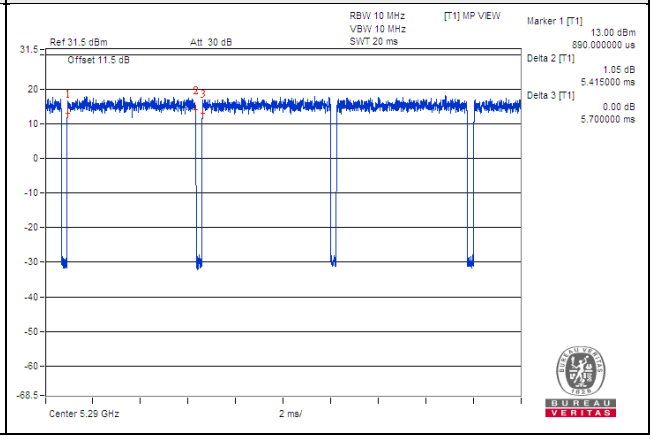
Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	23 deg. C, 66% RH	120Vac, 60Hz	Adair Peng / Titan Hsu
RE<1G	22 deg. C, 68% RH	120Vac, 60Hz	Greg Lin
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Greg Lin
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ivan Tseng

3.3 Duty Cycle of Test Signal

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

802.11a: Duty cycle = 1.975/2.082 = 0.949, Duty factor = 10 * log (1/0.949) = 0.23
802.11n (HT20): Duty cycle = 5.425/5.68 = 0.955, Duty factor = 10 * log (1/0.955) = 0.20
802.11n (HT40): Duty cycle = 5.425/5.77 = 0.94, Duty factor = 10 * log (1/0.94) = 0.27
802.11ac (VHT80): Duty cycle = 5.415/5.7 = 0.95, Duty factor = 10 * log (1/0.95) = 0.22

802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

3.4 Description of Support Units

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

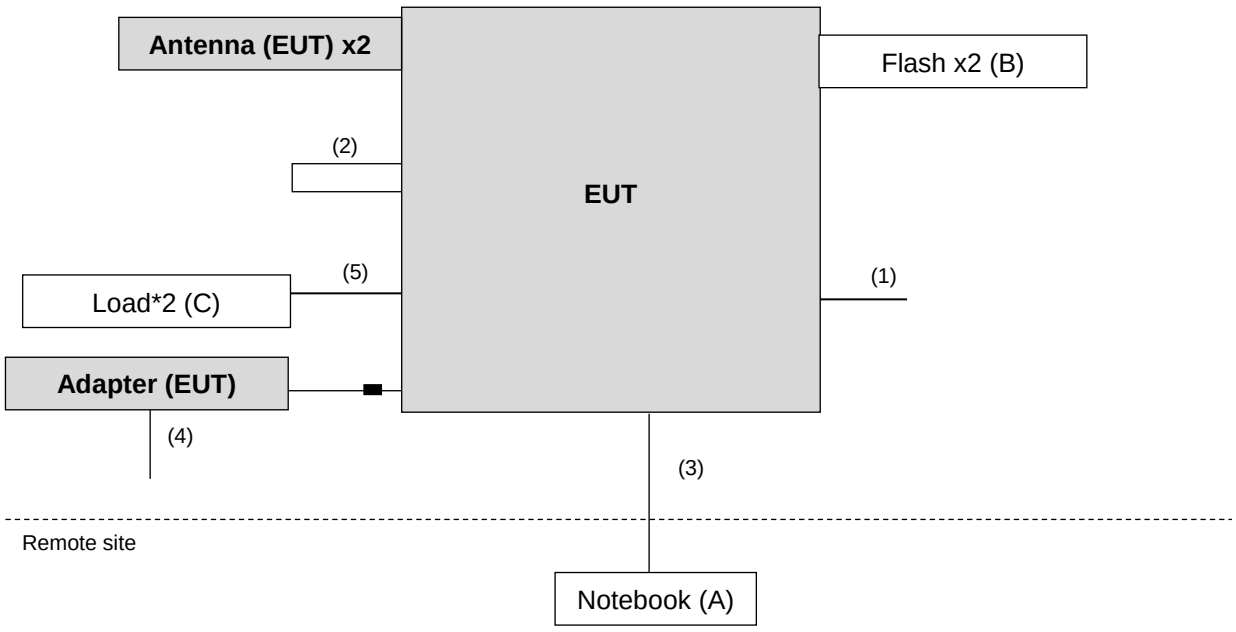
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Flash	HP	v250W	05	NA	-
	Flash	HP	v250W	03	NA	-
C.	Load*2	NA	NA	NA	NA	-

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.	Console cable	1	1.15	N	0	Accessory of EUT
2.	Fiber cable	1	3	N	0	Provided by client
3.	LAN cable	1	6	N	0	RJ45, Cat5e
4.	Power cord	1	0.9	N	0	Accessory of EUT
5.	LAN cable	7	1.5	N	0	RJ45, Cat5e

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards 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

<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

<For all tests except beamforming power>
Test Date: Aug. 25, 2020 ~ Sep. 28, 2020

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102579	Jul. 07, 2020	Jul. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna EMCI	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
			Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 16, 2020	Aug. 15, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 23, 2020	Mar. 22, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 16, 2020	Aug. 15, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 05, 2019	Sep. 04, 2020
			Sep. 04, 2020	Sep. 03, 2021
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519 0004/MY55190007/MY 55210005	Jul. 13, 2020	Jul. 12, 2021

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 3.

<For beamforming power>
Test Date: Nov. 02, 2021

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 07, 2021	Jun. 06, 2022
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 12, 2021	Jul. 11, 2022

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

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.

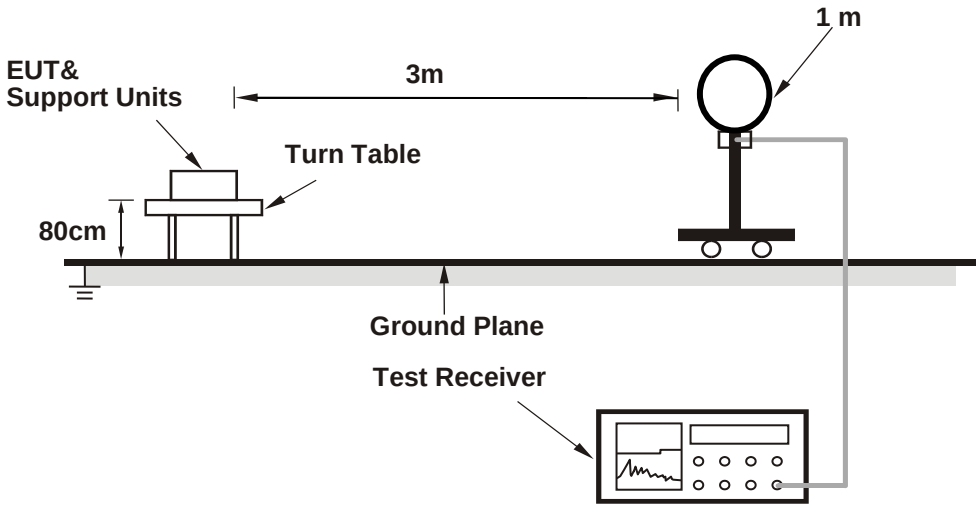
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz. (802.11a: RBW = 1MHz, VBW = 1kHz; 802.11ax (HE20): RBW = 1MHz, VBW = 1kHz; 802.11ax (HE40): RBW = 1MHz, VBW = 1kHz; 802.11ax (HE80): RBW = 1MHz, VBW = 1kHz)
All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

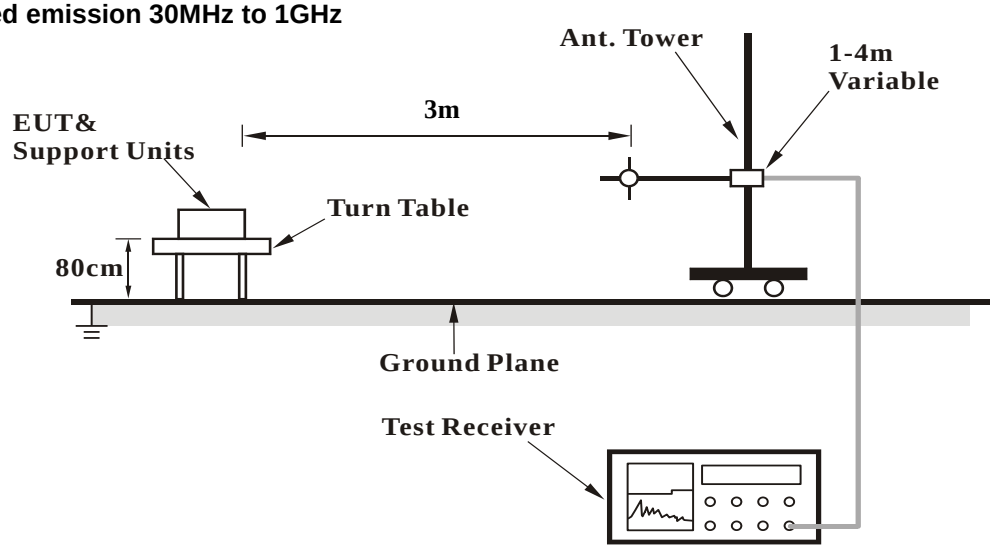
No deviation.

4.1.5 Test Setup

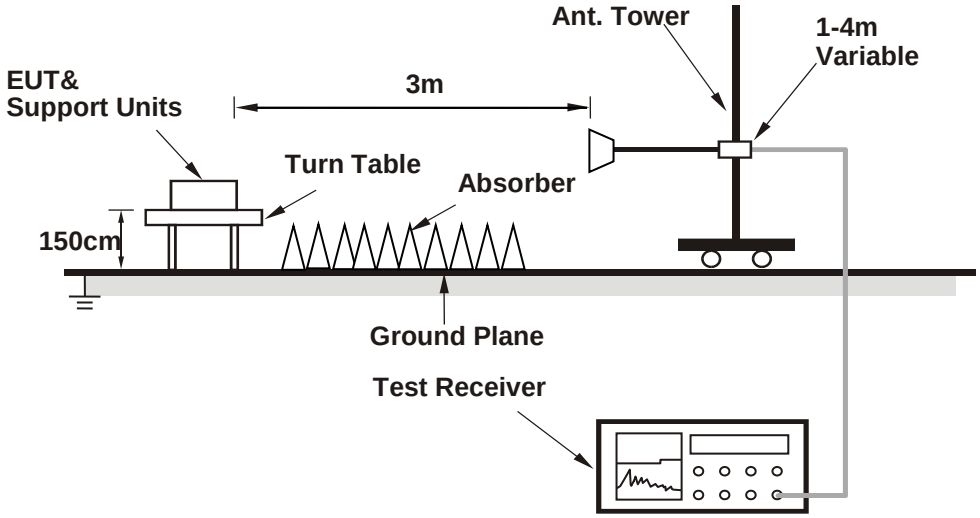
For Radiated emission below 30MHz



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:

RF Mode	TX 802.11a	Channel	CH 52：5260 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	57.8 PK	74.0	-16.2	1.85 H	344	51.3	6.5
2	5150.00	44.3 AV	54.0	-9.7	1.85 H	344	37.8	6.5
3	*5260.00	105.9 PK			1.73 H	334	64.1	41.8
4	*5260.00	95.1 AV			1.73 H	334	53.3	41.8
5	#10520.00	59.4 PK	68.2	-8.8	1.78 H	330	42.0	17.4
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	58.7 PK	74.0	-15.3	1.75 V	120	52.2	6.5
2	5150.00	45.2 AV	54.0	-8.8	1.75 V	120	38.7	6.5
3	*5260.00	123.2 PK			1.68 V	115	81.4	41.8
4	*5260.00	112.2 AV			1.68 V	115	70.4	41.8
5	#10520.00	59.3 PK	68.2	-8.9	1.75 V	22	41.9	17.4

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 60：5300 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	*5300.00	106.2 PK			1.70 H	333	64.3	41.9
2	*5300.00	95.1 AV			1.70 H	333	53.2	41.9
3	10600.00	57.9 PK	74.0	-16.1	1.90 H	344	40.8	17.1
4	10600.00	44.7 AV	54.0	-9.3	1.90 H	344	27.6	17.1
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	*5300.00	123.5 PK			1.65 V	117	81.6	41.9
2	*5300.00	112.2 AV			1.65 V	117	70.3	41.9
3	10600.00	58.5 PK	74.0	-15.5	1.85 V	39	41.4	17.1
4	10600.00	44.8 AV	54.0	-9.2	1.85 V	39	27.7	17.1

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.

RF Mode	TX 802.11a	Channel	CH 64：5320 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	*5320.00	102.2 PK			1.24 H	233	60.3	41.9
2	*5320.00	91.9 AV			1.24 H	233	50.0	41.9
3	5350.00	56.8 PK	74.0	-17.2	1.40 H	239	50.5	6.3
4	5350.00	43.8 AV	54.0	-10.2	1.40 H	239	37.5	6.3
5	10640.00	58.9 PK	74.0	-15.1	1.82 H	315	41.6	17.3
6	10640.00	45.8 AV	54.0	-8.2	1.82 H	315	28.5	17.3
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	*5320.00	118.9 PK			1.47 V	117	77.0	41.9
2	*5320.00	108.6 AV			1.47 V	117	66.7	41.9
3	5350.00	66.3 PK	74.0	-7.7	1.73 V	222	60.0	6.3
4	5350.00	52.3 AV	54.0	-1.7	1.73 V	222	46.0	6.3
5	10640.00	59.4 PK	74.0	-14.6	1.77 V	29	42.1	17.3
6	10640.00	45.4 AV	54.0	-8.6	1.77 V	29	28.1	17.3

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.

RF Mode	TX 802.11a	Channel	CH 100：5500 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	5460.00	57.7 PK	74.0	-16.3	2.80 H	235	51.5	6.2
2	5460.00	45.7 AV	54.0	-8.3	2.80 H	235	39.5	6.2
3	#5470.00	58.0 PK	68.2	-10.2	2.88 H	241	51.8	6.2
4	*5500.00	102.4 PK			2.82 H	238	60.5	41.9
5	*5500.00	92.1 AV			2.82 H	238	50.2	41.9
6	11000.00	60.6 PK	74.0	-13.4	1.82 H	324	42.2	18.4
7	11000.00	47.5 AV	54.0	-6.5	1.82 H	324	29.1	18.4
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	5460.00	60.6 PK	74.0	-13.4	1.63 V	225	54.4	6.2
2	5460.00	46.8 AV	54.0	-7.2	1.63 V	225	40.6	6.2
3	#5470.00	66.5 PK	68.2	-1.7	1.62 V	222	60.3	6.2
4	*5500.00	119.6 PK			1.69 V	223	77.7	41.9
5	*5500.00	109.3 AV			1.69 V	223	67.4	41.9
6	11000.00	60.9 PK	74.0	-13.1	1.52 V	216	42.5	18.4
7	11000.00	47.5 AV	54.0	-6.5	1.52 V	216	29.1	18.4

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 116：5580 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	*5580.00	104.0 PK			2.66 H	202	62.0	42.0
2	*5580.00	93.8 AV			2.66 H	202	51.8	42.0
3	11160.00	60.2 PK	74.0	-13.8	1.88 H	333	42.1	18.1
4	11160.00	47.0 AV	54.0	-7.0	1.88 H	333	28.9	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	*5580.00	121.9 PK			1.64 V	223	79.9	42.0
2	*5580.00	111.3 AV			1.64 V	223	69.3	42.0
3	11160.00	60.4 PK	74.0	-13.6	1.69 V	221	42.3	18.1
4	11160.00	47.2 AV	54.0	-6.8	1.69 V	221	29.1	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.

RF Mode	TX 802.11a	Channel	CH 140：5700 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	*5700.00	101.4 PK			3.11 H	206	59.3	42.1
2	*5700.00	90.7 AV			3.11 H	206	48.6	42.1
3	#5725.00	57.9 PK	68.2	-10.3	3.16 H	210	51.6	6.3
4	11400.00	59.7 PK	74.0	-14.3	3.16 H	212	42.1	17.6
5	11400.00	46.6 AV	54.0	-7.4	3.16 H	212	29.0	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5700.00	116.9 PK			1.73 V	219	74.8	42.1
2	*5700.00	105.8 AV			1.73 V	219	63.7	42.1
3	#5725.00	67.0 PK	68.2	-1.2	1.67 V	218	60.7	6.3
4	11400.00	59.9 PK	74.0	-14.1	1.59 V	223	42.3	17.6
5	11400.00	46.5 AV	54.0	-7.5	1.59 V	223	28.9	17.6

Remarks:

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

RF Mode	TX 802.11n (HT20)	Channel	CH 52：5260 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	57.6 PK	74.0	-16.4	1.85 H	341	51.1	6.5
2	5150.00	44.1 AV	54.0	-9.9	1.85 H	341	37.6	6.5
3	*5260.00	104.6 PK			1.74 H	334	62.8	41.8
4	*5260.00	93.9 AV			1.74 H	334	52.1	41.8
5	#10520.00	59.6 PK	68.2	-8.6	1.85 H	341	42.2	17.4
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	58.1 PK	74.0	-15.9	1.70 V	120	51.6	6.5
2	5150.00	44.8 AV	54.0	-9.2	1.70 V	120	38.3	6.5
3	*5260.00	121.7 PK			1.64 V	117	79.9	41.8
4	*5260.00	111.1 AV			1.64 V	117	69.3	41.8
5	#10520.00	59.4 PK	68.2	-8.8	1.88 V	29	42.0	17.4

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 802.11n (HT20)	Channel	CH 60：5300 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	*5300.00	104.1 PK			1.41 H	332	62.2	41.9
2	*5300.00	93.9 AV			1.41 H	332	52.0	41.9
3	10600.00	58.6 PK	74.0	-15.4	1.85 H	350	41.5	17.1
4	10600.00	44.9 AV	54.0	-9.1	1.85 H	350	27.8	17.1
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	*5300.00	122.1 PK			1.64 V	114	80.2	41.9
2	*5300.00	111.2 AV			1.64 V	114	69.3	41.9
3	10600.00	59.1 PK	74.0	-14.9	1.90 V	44	42.0	17.1
4	10600.00	45.1 AV	54.0	-8.9	1.90 V	44	28.0	17.1

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.

RF Mode	TX 802.11n (HT20)	Channel	CH 64：5320 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	*5320.00	102.7 PK			1.26 H	232	60.8	41.9
2	*5320.00	91.8 AV			1.26 H	232	49.9	41.9
3	5350.00	57.6 PK	74.0	-16.4	1.35 H	227	51.3	6.3
4	5350.00	44.0 AV	54.0	-10.0	1.35 H	227	37.7	6.3
5	10640.00	58.9 PK	74.0	-15.1	1.88 H	320	41.6	17.3
6	10640.00	45.7 AV	54.0	-8.3	1.88 H	320	28.4	17.3
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	*5320.00	118.9 PK			1.51 V	117	77.0	41.9
2	*5320.00	108.0 AV			1.51 V	117	66.1	41.9
3	5350.00	67.9 PK	74.0	-6.1	1.82 V	223	61.6	6.3
4	**5350.00**	**52.9 AV**	**54.0**	**-1.1**	**1.82 V**	**223**	**46.6**	**6.3**
5	10640.00	59.6 PK	74.0	-14.4	1.85 V	35	42.3	17.3
6	10640.00	45.5 AV	54.0	-8.5	1.85 V	35	28.2	17.3

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.

RF Mode	TX 802.11n (HT20)	Channel	CH 100：5500 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	5460.00	57.5 PK	74.0	-16.5	2.10 H	121	51.3	6.2
2	5460.00	45.4 AV	54.0	-8.6	2.10 H	121	39.2	6.2
3	#5470.00	57.8 PK	68.2	-10.4	2.15 H	116	51.6	6.2
4	*5500.00	100.2 PK			2.13 H	119	58.3	41.9
5	*5500.00	90.0 AV			2.13 H	119	48.1	41.9
6	11000.00	60.5 PK	74.0	-13.5	1.89 H	328	42.1	18.4
7	11000.00	47.5 AV	54.0	-6.5	1.89 H	328	29.1	18.4
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	5460.00	59.3 PK	74.0	-14.7	1.70 V	229	53.1	6.2
2	5460.00	46.3 AV	54.0	-7.7	1.70 V	229	40.1	6.2
3	#5470.00	66.8 PK	68.2	-1.4	1.72 V	227	60.6	6.2
4	*5500.00	118.2 PK			1.68 V	225	76.3	41.9
5	*5500.00	107.8 AV			1.68 V	225	65.9	41.9
6	11000.00	60.6 PK	74.0	-13.4	1.55 V	214	42.2	18.4
7	11000.00	47.3 AV	54.0	-6.7	1.55 V	214	28.9	18.4

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 802.11n (HT20)	Channel	CH 116：5580 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	*5580.00	104.3 PK			2.66 H	204	62.3	42.0
2	*5580.00	93.6 AV			2.66 H	204	51.6	42.0
3	11160.00	60.3 PK	74.0	-13.7	1.92 H	336	42.2	18.1
4	11160.00	46.9 AV	54.0	-7.1	1.92 H	336	28.8	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	*5580.00	121.6 PK			1.64 V	219	79.6	42.0
2	*5580.00	110.9 AV			1.64 V	219	68.9	42.0
3	11160.00	60.2 PK	74.0	-13.8	1.63 V	226	42.1	18.1
4	11160.00	47.1 AV	54.0	-6.9	1.63 V	226	29.0	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.

RF Mode	TX 802.11n (HT20)	Channel	CH 140：5700 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	*5700.00	100.8 PK			1.76 H	131	58.7	42.1
2	*5700.00	90.2 AV			1.76 H	131	48.1	42.1
3	#5725.00	57.9 PK	68.2	-10.3	1.78 H	133	51.6	6.3
4	11400.00	59.7 PK	74.0	-14.3	1.82 H	339	42.1	17.6
5	11400.00	46.7 AV	54.0	-7.3	1.82 H	339	29.1	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5700.00	116.3 PK			1.93 V	217	74.2	42.1
2	*5700.00	105.6 AV			1.93 V	217	63.5	42.1
3	#5725.00	66.5 PK	68.2	-1.7	1.73 V	222	60.2	6.3
4	11140.00	60.0 PK	74.0	-14.0	1.63 V	225	42.1	17.9
5	11140.00	46.9 AV	54.0	-7.1	1.63 V	225	29.0	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 802.11n (HT40)	Channel	CH 54：5270 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	*5270.00	100.9 PK			1.49 H	348	59.0	41.9
2	*5270.00	90.4 AV			1.49 H	348	48.5	41.9
3	5350.00	57.4 PK	74.0	-16.6	1.57 H	350	51.1	6.3
4	5350.00	43.9 AV	54.0	-10.1	1.57 H	350	37.6	6.3
5	#10540.00	60.0 PK	68.2	-8.2	1.91 H	344	42.5	17.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5270.00	118.3 PK			1.85 V	115	76.4	41.9
2	*5270.00	107.0 AV			1.85 V	115	65.1	41.9
3	5350.00	66.5 PK	74.0	-7.5	1.91 V	123	60.2	6.3
4	5350.00	52.8 AV	54.0	-1.2	1.91 V	123	46.5	6.3
5	#10540.00	58.9 PK	68.2	-9.3	1.85 V	40	41.4	17.5

Remarks:

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

RF Mode	TX 802.11n (HT40)	Channel	CH 62：5310 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	*5310.00	96.4 PK			2.64 H	106	54.5	41.9
2	*5310.00	86.4 AV			2.64 H	106	44.5	41.9
3	5350.00	57.3 PK	74.0	-16.7	2.55 H	113	51.0	6.3
4	5350.00	43.9 AV	54.0	-10.1	2.55 H	113	37.6	6.3
5	10620.00	58.3 PK	74.0	-15.7	1.87 H	356	41.0	17.3
6	10620.00	45.7 AV	54.0	-8.3	1.87 H	356	28.4	17.3
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	*5310.00	113.9 PK			1.64 V	115	72.0	41.9
2	*5310.00	103.5 AV			1.64 V	115	61.6	41.9
3	5350.00	66.2 PK	74.0	-7.8	1.73 V	108	59.9	6.3
4	5350.00	52.4 AV	54.0	-1.6	1.73 V	108	46.1	6.3
5	10620.00	58.5 PK	74.0	-15.5	1.78 V	45	41.2	17.3
6	10620.00	45.7 AV	54.0	-8.3	1.78 V	45	28.4	17.3

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.

RF Mode	TX 802.11n (HT40)	Channel	CH 102：5510 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	5460.00	57.5 PK	74.0	-16.5	1.49 H	128	51.3	6.2
2	5460.00	45.4 AV	54.0	-8.6	1.49 H	128	39.2	6.2
3	#5470.00	57.8 PK	68.2	-10.4	1.55 H	125	51.6	6.2
4	*5510.00	96.2 PK			1.52 H	121	54.3	41.9
5	*5510.00	85.7 AV			1.52 H	121	43.8	41.9
6	11020.00	60.4 PK	74.0	-13.6	1.86 H	325	42.1	18.3
7	11020.00	47.3 AV	54.0	-6.7	1.86 H	325	29.0	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	5460.00	57.7 PK	74.0	-16.3	1.93 V	251	51.5	6.2
2	5460.00	45.2 AV	54.0	-8.8	1.93 V	251	39.0	6.2
3	#5470.00	66.5 PK	68.2	-1.7	1.99 V	254	60.3	6.2
4	*5510.00	113.1 PK			1.58 V	219	71.2	41.9
5	*5510.00	102.4 AV			1.58 V	219	60.5	41.9
6	11020.00	60.4 PK	74.0	-13.6	1.72 V	231	42.1	18.3
7	11020.00	47.3 AV	54.0	-6.7	1.72 V	231	29.0	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 802.11n (HT40)	Channel	CH 110：5550 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	5460.00	57.5 PK	74.0	-16.5	1.92 H	119	51.3	6.2
2	5460.00	45.7 AV	54.0	-8.3	1.92 H	119	39.5	6.2
3	#5470.00	57.8 PK	68.2	-10.4	1.98 H	125	51.6	6.2
4	*5550.00	99.1 PK			2.00 H	122	57.1	42.0
5	*5550.00	88.9 AV			2.00 H	122	46.9	42.0
6	11100.00	60.0 PK	74.0	-14.0	1.95 H	336	42.1	17.9
7	11100.00	46.9 AV	54.0	-7.1	1.95 H	336	29.0	17.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5460.00	59.0 PK	74.0	-15.0	1.85 V	265	52.8	6.2
2	5460.00	46.2 AV	54.0	-7.8	1.85 V	265	40.0	6.2
3	#5470.00	66.5 PK	68.2	-1.7	1.83 V	269	60.3	6.2
4	*5550.00	116.6 PK			1.88 V	225	74.6	42.0
5	*5550.00	106.3 AV			1.88 V	225	64.3	42.0
6	11100.00	60.1 PK	74.0	-13.9	1.66 V	225	42.2	17.9
7	11100.00	47.0 AV	54.0	-7.0	1.66 V	225	29.1	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.

RF Mode	TX 802.11n (HT40)	Channel	CH 134：5670 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	*5670.00	97.1 PK			1.47 H	132	55.0	42.1
2	*5670.00	87.0 AV			1.47 H	132	44.9	42.1
3	#5725.00	57.8 PK	68.2	-10.4	1.48 H	135	51.5	6.3
4	11340.00	59.9 PK	74.0	-14.1	1.82 H	328	42.1	17.8
5	11340.00	46.8 AV	54.0	-7.2	1.82 H	328	29.0	17.8
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	*5670.00	113.3 PK			1.92 V	220	71.2	42.1
2	*5670.00	103.2 AV			1.92 V	220	61.1	42.1
3	#5725.00	66.5 PK	68.2	-1.7	1.89 V	263	60.2	6.3
4	11340.00	59.9 PK	74.0	-14.1	1.69 V	228	42.1	17.8
5	11340.00	46.8 AV	54.0	-7.2	1.69 V	228	29.0	17.8

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 (VHT80)	Channel	CH 58：5290 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	57.5 PK	74.0	-16.5	2.69 H	102	51.0	6.5
2	5150.00	44.4 AV	54.0	-9.6	2.69 H	102	37.9	6.5
3	*5290.00	94.1 PK			2.64 H	106	52.2	41.9
4	*5290.00	83.8 AV			2.64 H	106	41.9	41.9
5	5350.00	57.0 PK	74.0	-17.0	2.58 H	119	50.7	6.3
6	5350.00	43.9 AV	54.0	-10.1	2.58 H	119	37.6	6.3
7	#10580.00	58.8 PK	68.2	-9.4	1.93 H	337	41.5	17.3
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	5150.00	59.0 PK	74.0	-15.0	1.90 V	116	52.5	6.5
2	5150.00	45.9 AV	54.0	-8.1	1.90 V	116	39.4	6.5
3	*5290.00	108.3 PK			1.73 V	113	66.4	41.9
4	*5290.00	98.7 AV			1.73 V	113	56.8	41.9
5	5350.00	66.8 PK	74.0	-7.2	2.00 V	108	60.5	6.3
6	5350.00	52.3 AV	54.0	-1.7	2.00 V	108	46.0	6.3
7	#10580.00	59.3 PK	68.2	-8.9	1.83 V	52	42.0	17.3

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 106：5530 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	5460.00	57.5 PK	74.0	-16.5	1.49 H	122	51.3	6.2
2	5460.00	45.7 AV	54.0	-8.3	1.49 H	122	39.5	6.2
3	#5470.00	57.7 PK	68.2	-10.5	1.50 H	125	51.5	6.2
4	*5530.00	89.3 PK			1.51 H	121	47.3	42.0
5	*5530.00	79.4 AV			1.51 H	121	37.4	42.0
6	#5725.00	57.8 PK	68.2	-10.4	1.55 H	126	51.5	6.3
7	11060.00	60.2 PK	74.0	-13.8	1.82 H	332	42.1	18.1
8	11060.00	47.1 AV	54.0	-6.9	1.82 H	332	29.0	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	5460.00	65.8 PK	74.0	-8.2	1.66 V	225	59.6	6.2
2	5460.00	46.9 AV	54.0	-7.1	1.66 V	225	40.7	6.2
3	#5470.00	66.5 PK	68.2	-1.7	1.69 V	221	60.3	6.2
4	*5530.00	107.5 PK			1.67 V	222	65.5	42.0
5	*5530.00	97.5 AV			1.67 V	222	55.5	42.0
6	#5725.00	57.8 PK	68.2	-10.4	1.70 V	228	51.5	6.3
7	11060.00	60.2 PK	74.0	-13.8	1.59 V	219	42.1	18.1
8	11060.00	47.0 AV	54.0	-7.0	1.59 V	219	28.9	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.

RF Mode	TX 802.11ac (VHT80)	Channel	CH 122：5610 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	5460.00	57.5 PK	74.0	-16.5	1.44 H	138	51.3	6.2
2	5460.00	45.1 AV	54.0	-8.9	1.44 H	138	38.9	6.2
3	#5470.00	57.5 PK	68.2	-10.7	1.45 H	136	51.3	6.2
4	*5610.00	92.5 PK			1.48 H	132	50.5	42.0
5	*5610.00	82.6 AV			1.48 H	132	40.6	42.0
6	#5725.00	54.5 PK	68.2	-13.7	1.52 H	135	48.2	6.3
7	11220.00	60.4 PK	74.0	-13.6	1.92 H	302	42.3	18.1
8	11220.00	47.1 AV	54.0	-6.9	1.92 H	302	29.0	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	5460.00	57.7 PK	74.0	-16.3	1.73 V	260	51.5	6.2
2	5460.00	46.0 AV	54.0	-8.0	1.73 V	260	39.8	6.2
3	#5470.00	58.7 PK	68.2	-9.5	1.75 V	256	52.5	6.2
4	*5610.00	109.8 PK			1.65 V	222	67.8	42.0
5	*5610.00	99.6 AV			1.65 V	222	57.6	42.0
6	#5725.00	66.6 PK	68.2	-1.6	1.86 V	266	60.3	6.3
7	11220.00	60.2 PK	74.0	-13.8	1.69 V	235	42.1	18.1
8	11220.00	47.2 AV	54.0	-6.8	1.69 V	235	29.1	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.

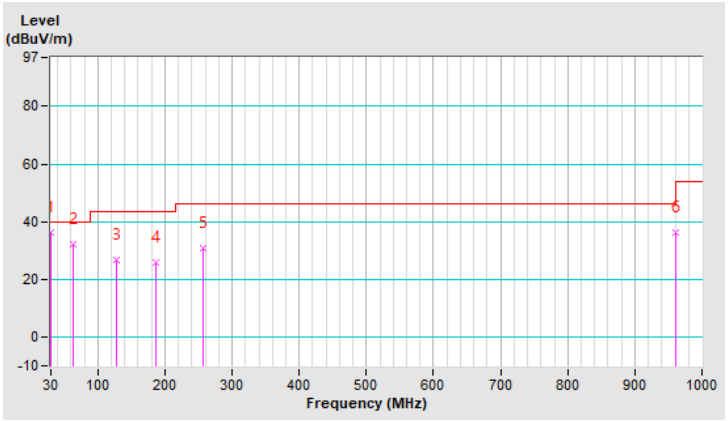
Below 1GHz Worst-Case Data:

RF Mode	TX 802.11n (HT40)	Channel	CH 54：5270 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	30.00	36.3 QP	40.0	-3.7	1.50 H	50	49.4	-13.1
2	63.95	32.1 QP	40.0	-7.9	1.00 H	333	44.7	-12.6
3	127.97	26.5 QP	43.5	-17.0	1.25 H	355	39.9	-13.4
4	187.14	25.8 QP	43.5	-17.7	1.00 H	342	40.1	-14.3
5	256.01	30.8 QP	46.0	-15.2	1.00 H	97	43.4	-12.6
6	960.23	36.3 QP	54.0	-17.7	1.25 H	187	36.8	-0.5

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.

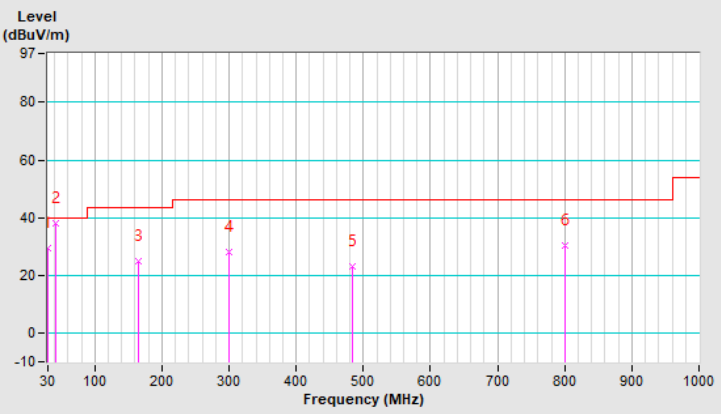


RF Mode	TX 802.11n (HT40)	Channel	CH 54：5270 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	30.00	29.3 QP	40.0	-10.7	1.25 V	212	42.4	-13.1
2	42.61	37.9 QP	40.0	-2.1	1.00 V	159	50.1	-12.2
3	165.80	24.9 QP	43.5	-18.6	1.00 V	6	36.9	-12.0
4	299.66	28.3 QP	46.0	-17.7	1.50 V	150	39.4	-11.1
5	482.99	22.9 QP	46.0	-23.1	1.00 V	160	31.3	-8.4
6	800.18	30.5 QP	46.0	-15.5	1.25 V	198	33.6	-3.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB).
3. 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. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
V-LISN/AMN SCHWARZBECK (Peripheral)	NNBL 8226-2	8226-142	Jul. 31, 2020	Jul. 30, 2021
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 (Conduction 1).
3. The VCCI Site Registration No. is C-12040.
4. Test Date: 2020/08/25

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.

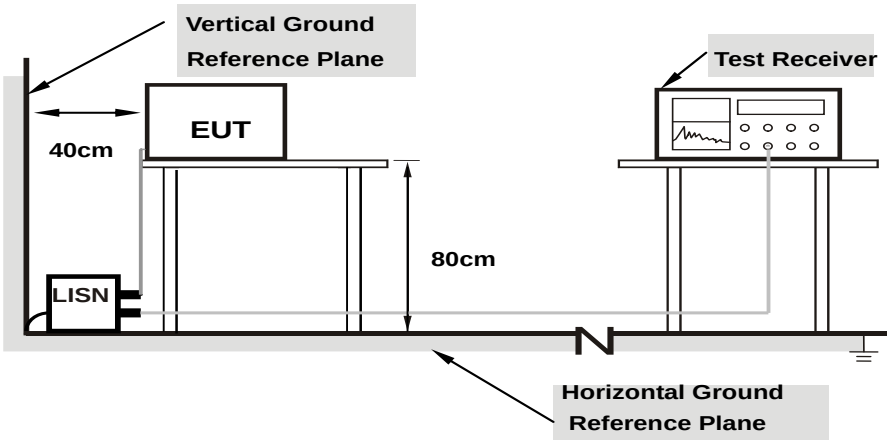
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

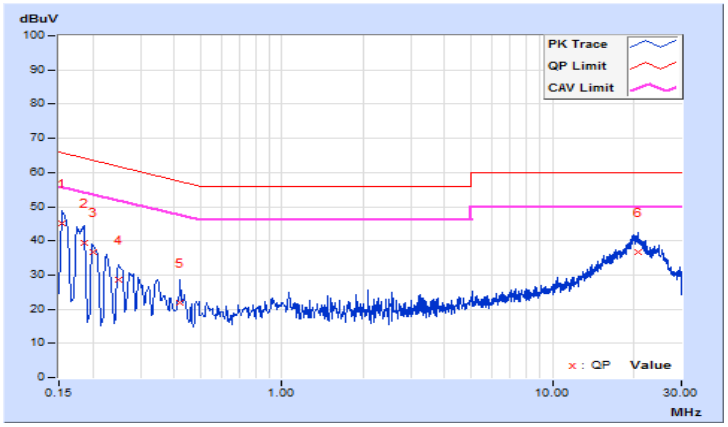
Worst-case data:

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 75%RH
Tested by	Greg Lin	Test Date	2020/8/25

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	0.15400	9.56	35.46	21.75	45.02	31.31	65.78	55.78	-20.76	-24.47
2	0.18568	9.55	29.86	15.55	39.41	25.10	64.23	54.23	-24.82	-29.13
3	0.20200	9.55	27.00	13.38	36.55	22.93	63.53	53.53	-26.98	-30.60
4	0.25000	9.56	19.19	7.85	28.75	17.41	61.76	51.76	-33.01	-34.35
5	0.42200	9.57	12.23	7.06	21.80	16.63	57.41	47.41	-35.61	-30.78
6	**20.74600**	**9.83**	**26.92**	**20.38**	**36.75**	**30.21**	**60.00**	**50.00**	**-23.25**	**-19.79**

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

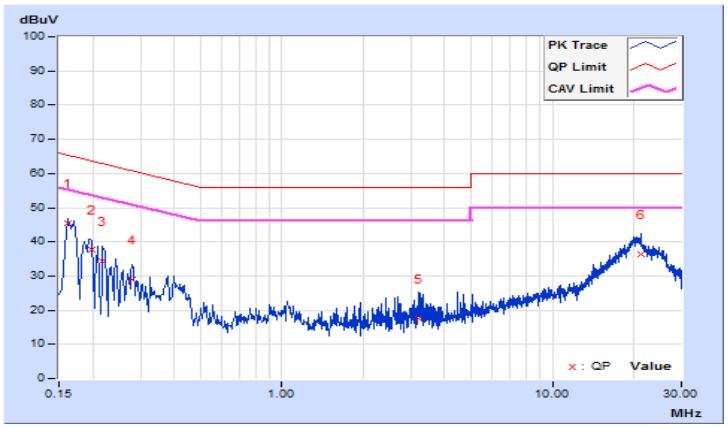


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 75%RH
Tested by	Greg Lin	Test Date	2020/8/25

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	0.16190	9.54	35.96	22.04	45.50	31.58	65.37	55.37	-19.87	-23.79
2	0.19800	9.53	28.32	14.13	37.85	23.66	63.69	53.69	-25.84	-30.03
3	0.21800	9.53	24.82	10.48	34.35	20.01	62.89	52.89	-28.54	-32.88
4	0.27800	9.54	19.42	9.56	28.96	19.10	60.88	50.88	-31.92	-31.78
5	3.18600	9.67	7.82	1.24	17.49	10.91	56.00	46.00	-38.51	-35.09
6	21.24200	9.89	26.31	19.93	36.20	29.82	60.00	50.00	-23.80	-20.18

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

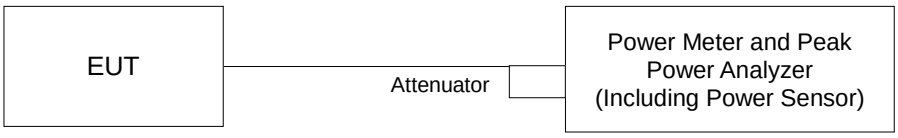
Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

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 $N_{ANT} \geq 5$.

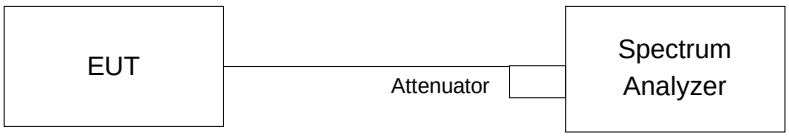
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

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:

CDD Mode

802.11a

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
52	5260	18.19	17.21	118.519	20.74	24.00	Pass
60	5300	17.81	17.10	111.681	20.48	24.00	Pass
64	5320	16.91	16.59	94.694	19.76	23.97	Pass
100	5500	17.78	16.80	107.842	20.33	23.93	Pass
116	5580	18.13	17.15	116.893	20.68	23.92	Pass
140	5700	16.01	14.57	68.544	18.36	23.84	Pass

Note:

Chain 0

1. 11 dBm + 10log (20.85) = 24.19 dBm > 24 dBm.
2. 11 dBm + 10log (20.54) = 24.13 dBm > 24 dBm.
3. 11 dBm + 10log (20.55) = 24.13 dBm > 24 dBm.
4. 11 dBm + 10log (20.06) = 24.02 dBm > 24 dBm.
5. 11 dBm + 10log (21.00) = 24.22 dBm > 24 dBm.
6. 11 dBm + 10log (19.22) = 23.84 dBm < 24 dBm.

Chain 1

1. 11 dBm + 10log (21.26) = 24.28 dBm > 24 dBm.
2. 11 dBm + 10log (20.63) = 24.14 dBm > 24 dBm.
3. 11 dBm + 10log (19.82) = 23.97 dBm < 24 dBm.
4. 11 dBm + 10log (19.62) = 23.93 dBm < 24 dBm.
5. 11 dBm + 10log (19.60) = 23.92 dBm < 24 dBm.
6. 11 dBm + 10log (20.18) = 24.05 dBm > 24 dBm.

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
52	5260	18.04	17.29	117.259	20.69	24	Pass
60	5300	18.13	16.73	112.111	20.50	24	Pass
64	5320	17.32	16.47	98.312	19.93	24	Pass
100	5500	16.70	15.71	84.013	19.24	24	Pass
116	5580	18.62	17.61	130.455	21.15	24	Pass
140	5700	15.49	14.79	65.53	18.16	24	Pass

Note:
Chain 0
1. 11 dBm + 10log (21.76) = 24.38 dBm > 24 dBm.
2. 11 dBm + 10log (21.91) = 24.41 dBm > 24 dBm.
3. 11 dBm + 10log (21.67) = 24.36 dBm > 24 dBm.
4. 11 dBm + 10log (21.44) = 24.31 dBm > 24 dBm.
5. 11 dBm + 10log (22.29) = 24.48 dBm > 24 dBm.
6. 11 dBm + 10log (20.99) = 24.22 dBm > 24 dBm.

Chain 1
1. 11 dBm + 10log (21.25) = 24.27 dBm > 24 dBm.
2. 11 dBm + 10log (21.15) = 24.25 dBm > 24 dBm.
3. 11 dBm + 10log (21.37) = 24.30 dBm > 24 dBm.
4. 11 dBm + 10log (21.11) = 24.24 dBm > 24 dBm.
5. 11 dBm + 10log (21.72) = 24.37 dBm > 24 dBm.
6. 11 dBm + 10log (20.55) = 24.13 dBm > 24 dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
54	5270	19.11	19.11	162.941	22.12	24	Pass
62	5310	14.50	13.92	52.844	17.23	24	Pass
102	5510	15.30	14.05	59.294	17.73	24	Pass
110	5550	18.12	18.12	129.727	21.13	24	Pass
134	5670	15.84	14.59	67.145	18.27	24	Pass

Note:
Chain 0
1. 11 dBm + 10log (71.47) = 29.54 dBm > 24 dBm.
2. 11 dBm + 10log (41.01) = 27.13 dBm > 24 dBm.
3. 11 dBm + 10log (40.91) = 27.12 dBm > 24 dBm.
4. 11 dBm + 10log (57.67) = 28.61 dBm > 24 dBm.
5. 11 dBm + 10log (40.77) = 27.10 dBm > 24 dBm.

Chain 1
1. 11 dBm + 10log (70.10) = 29.46 dBm > 24 dBm.
2. 11 dBm + 10log (41.07) = 27.14 dBm > 24 dBm.
3. 11 dBm + 10log (40.82) = 27.11 dBm > 24 dBm.
4. 11 dBm + 10log (41.19) = 27.15 dBm > 24 dBm.
5. 11 dBm + 10log (41.14) = 27.14 dBm > 24 dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
58	5290	13.39	12.87	41.192	16.15	24	Pass
106	5530	12.45	11.47	31.607	15.00	24	Pass
122	5610	15.14	13.99	57.72	17.61	24	Pass

Note:
Chain 0
1. 11 dBm + 10log (80.84) = 30.08 dBm > 24 dBm.
2. 11 dBm + 10log (80.63) = 30.06 dBm > 24 dBm.
3. 11 dBm + 10log (80.63) = 30.06 dBm > 24 dBm.

Chain 1
1. 11 dBm + 10log (80.99) = 30.08 dBm > 24 dBm.
2. 11 dBm + 10log (80.81) = 30.07 dBm > 24 dBm.
3. 11 dBm + 10log (80.67) = 30.07 dBm > 24 dBm.

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
52	5260	18.04	17.29	117.259	20.69	21.26	Pass
60	5300	18.13	16.73	112.111	20.50	21.26	Pass
64	5320	17.32	16.47	98.312	19.93	21.26	Pass
100	5500	16.70	15.71	84.013	19.24	21.26	Pass
116	5580	18.62	17.61	130.455	21.15	21.26	Pass
140	5700	15.49	14.79	65.53	18.16	21.26	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power limit shall be reduced to 24 - (8.74 - 6) = 21.26dBm.

Chain 0

1. 11 dBm + 10log (21.76) = 24.38 dBm > 24 dBm.
2. 11 dBm + 10log (21.91) = 24.41 dBm > 24 dBm.
3. 11 dBm + 10log (21.67) = 24.36 dBm > 24 dBm.
4. 11 dBm + 10log (21.44) = 24.31 dBm > 24 dBm.
5. 11 dBm + 10log (22.29) = 24.48 dBm > 24 dBm.
6. 11 dBm + 10log (20.99) = 24.22 dBm > 24 dBm.

Chain 1

1. 11 dBm + 10log (21.25) = 24.27 dBm > 24 dBm.
2. 11 dBm + 10log (21.15) = 24.25 dBm > 24 dBm.
3. 11 dBm + 10log (21.37) = 24.30 dBm > 24 dBm.
4. 11 dBm + 10log (21.11) = 24.24 dBm > 24 dBm.
5. 11 dBm + 10log (21.72) = 24.37 dBm > 24 dBm.
6. 11 dBm + 10log (20.55) = 24.13 dBm > 24 dBm.

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
54	5270	18.52	17.86	132.216	21.21	21.26	Pass
62	5310	14.50	13.92	52.844	17.23	21.26	Pass
102	5510	15.30	14.05	59.294	17.73	21.26	Pass
110	5550	18.12	18.12	129.727	21.13	21.26	Pass
134	5670	15.84	14.59	67.145	18.27	21.26	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power limit shall be reduced to 24 - (8.74 - 6) = 21.26dBm.

Chain 0
1. 11 dBm + 10log (71.47) = 29.54 dBm > 24 dBm.
2. 11 dBm + 10log (41.01) = 27.13 dBm > 24 dBm.
3. 11 dBm + 10log (40.91) = 27.12 dBm > 24 dBm.
4. 11 dBm + 10log (57.67) = 28.61 dBm > 24 dBm.
5. 11 dBm + 10log (40.77) = 27.10 dBm > 24 dBm.

Chain 1
1. 11 dBm + 10log (70.10) = 29.46 dBm > 24 dBm.
2. 11 dBm + 10log (41.07) = 27.14 dBm > 24 dBm.
3. 11 dBm + 10log (40.82) = 27.11 dBm > 24 dBm.
4. 11 dBm + 10log (41.19) = 27.15 dBm > 24 dBm.
5. 11 dBm + 10log (41.14) = 27.14 dBm > 24 dBm.

802.11ac (VHT80)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
58	5290	13.39	12.87	41.192	16.15	21.26	Pass
106	5530	12.45	11.47	31.607	15.00	21.26	Pass
122	5610	15.14	13.99	57.72	17.61	21.26	Pass

Note: Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power limit shall be reduced to 24 - (8.74 - 6) = 21.26dBm.

Chain 0
1. 11 dBm + 10log (80.84) = 30.08 dBm > 24 dBm.
2. 11 dBm + 10log (80.63) = 30.06 dBm > 24 dBm.
3. 11 dBm + 10log (80.63) = 30.06 dBm > 24 dBm.

Chain 1
1. 11 dBm + 10log (80.99) = 30.08 dBm > 24 dBm.
2. 11 dBm + 10log (80.81) = 30.07 dBm > 24 dBm.
3. 11 dBm + 10log (80.67) = 30.07 dBm > 24 dBm.

26dB Bandwidth:

802.11a

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
52	5260	20.85	21.26
60	5300	20.54	20.63
64	5320	20.55	19.82
100	5500	20.06	19.62
116	5580	21.00	19.60
140	5700	19.22	20.18

802.11n (HT20)

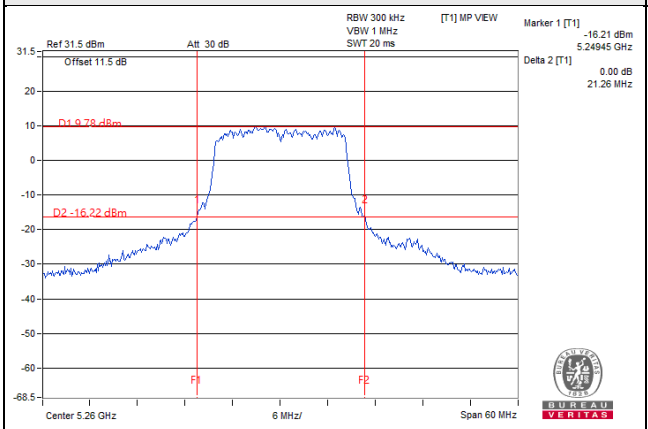
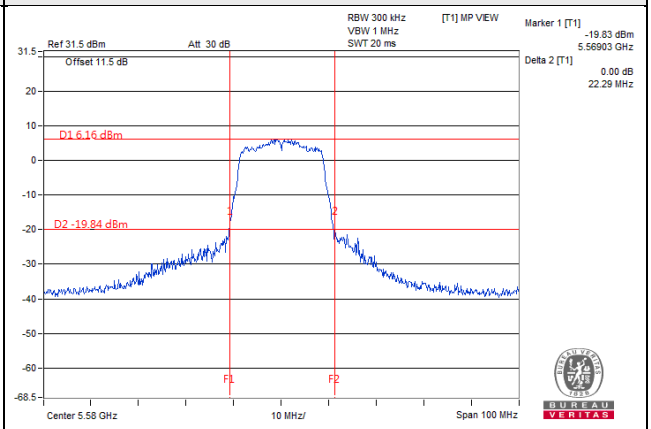
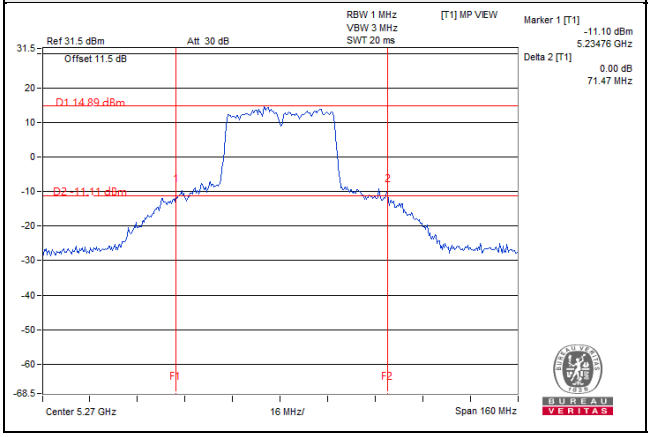
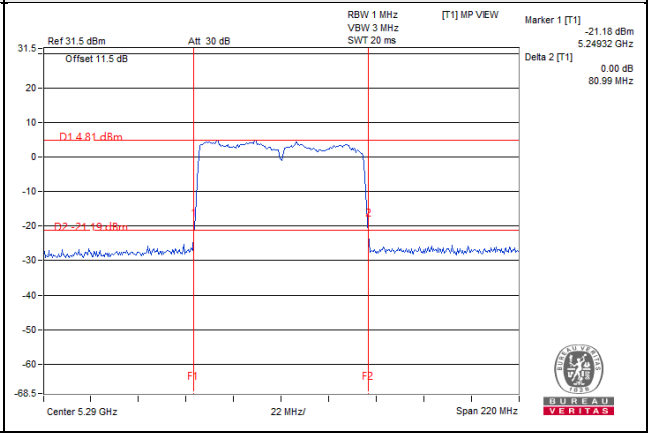
Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
52	5260	21.76	21.25
60	5300	21.91	21.15
64	5320	21.67	21.37
100	5500	21.44	21.11
116	5580	22.29	21.72
140	5700	20.99	20.55

802.11n (HT40)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
54	5270	71.47	70.10
62	5310	41.01	41.07
102	5510	40.91	40.82
110	5550	57.67	41.19
134	5670	40.77	41.14

802.11ac (VHT80)

Chan.	Freq. (MHz)	26dBc Bandwidth (MHz)	
		Chain 0	Chain 1
58	5290	80.84	80.99
106	5530	80.63	80.81
122	5610	80.63	80.67

Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

EUT Average Power

CDD Mode

802.11a

Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	20.74	118.519
5470~5725	20.68	116.893

802.11n (HT20)

Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	20.69	117.259
5470~5725	21.15	130.455

802.11n (HT40)

Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	22.12	162.941
5470~5725	21.13	129.727

802.11ac (VHT80)

Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	16.15	41.192
5470~5725	17.61	57.720

Beamforming Mode

802.11n (HT20)

Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	17.68	58.634
5470~5725	16.23	42.009

802.11n (HT40)

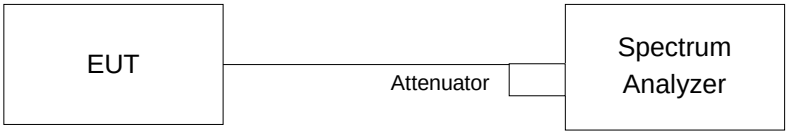
Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	19.11	81.476
5470~5725	18.12	64.868

802.11ac (VHT80)

Frequency Band (MHz)	Max. Power	
	Output Power (dBm)	Output Power (mW)
5250~5350	13.14	20.597
5470~5725	14.60	28.862

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

802.11a

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
52	5260	16.61	16.56
60	5300	16.44	16.56
64	5320	16.56	16.44
100	5500	16.44	16.44
116	5580	16.56	16.44
140	5700	16.32	16.56

802.11n (HT20)

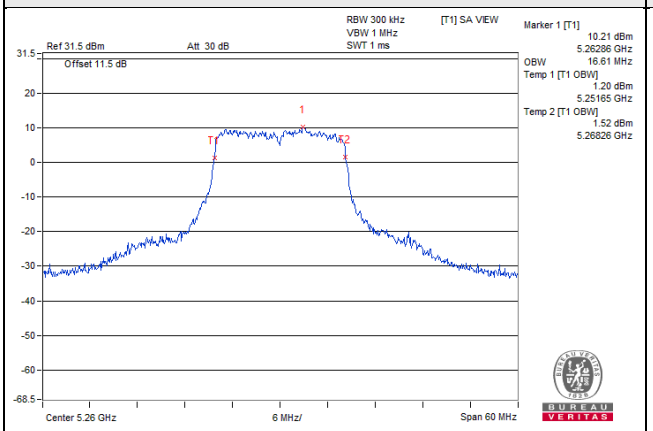
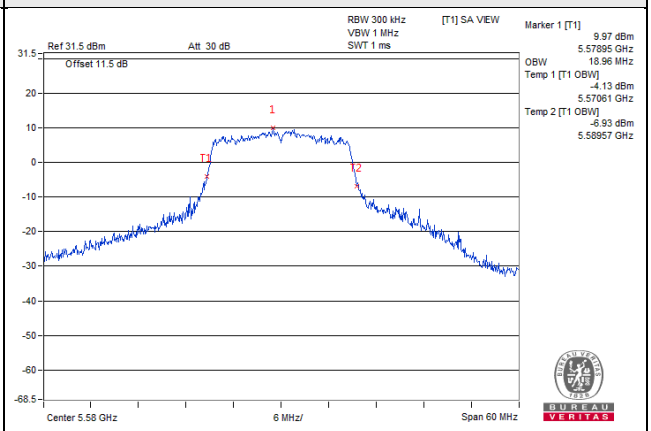
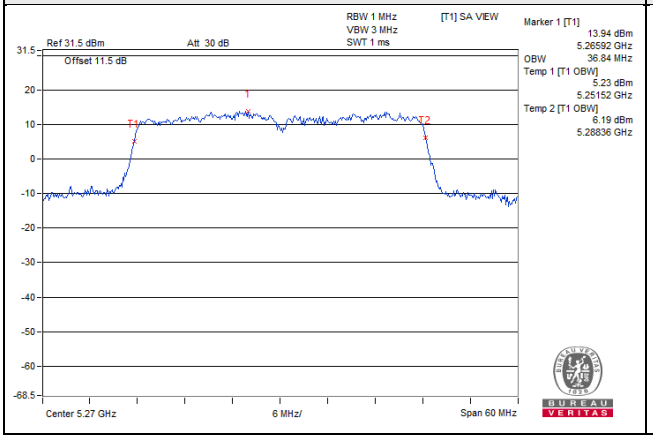
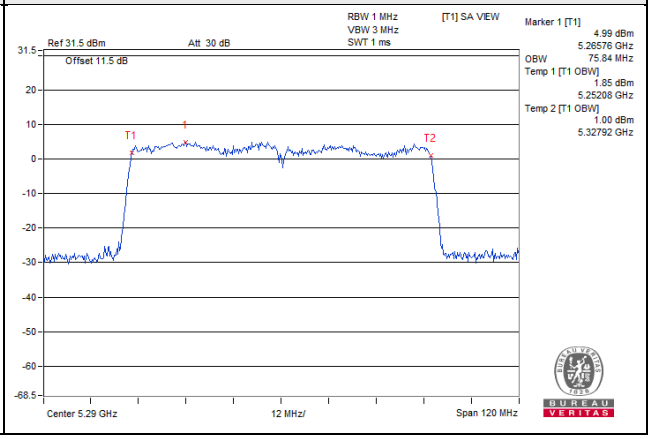
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
52	5260	17.76	17.64
60	5300	17.76	17.76
64	5320	17.76	17.76
100	5500	17.64	17.76
116	5580	18.96	18.96
140	5700	17.76	17.64

802.11n (HT40)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
54	5270	36.84	36.60
62	5310	36.12	36.24
102	5510	36.12	36.00
110	5550	36.48	36.24
134	5670	36.12	36.36

802.11ac (VHT80)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
58	5290	75.84	75.84
106	5530	75.60	75.60
122	5610	75.60	75.60

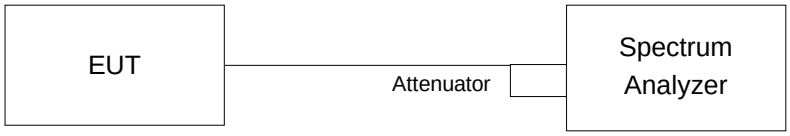
Spectrum Plot of Worst Value	
802.11a	802.11n (HT20)
	
802.11n (HT40)	802.11ac (VHT80)
	

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-2A and U-NII-2C band:

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)

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-2A and U-NII-2C 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				
52	5260	4.26	5.30	0.23	8.05	8.26	Pass
60	5300	4.20	4.90	0.23	7.80	8.26	Pass
64	5320	4.93	2.97	0.23	7.30	8.26	Pass
100	5500	5.67	4.13	0.23	8.21	8.26	Pass
116	5580	5.35	4.58	0.23	8.22	8.26	Pass
140	5700	4.30	1.52	0.23	6.37	8.26	Pass

Note:

1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power density limit shall be reduced to 11 - (8.74 - 6) = 8.26dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

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				
52	5260	4.83	4.19	0.20	7.73	8.26	Pass
60	5300	5.10	3.59	0.20	7.62	8.26	Pass
64	5320	3.83	3.43	0.20	6.84	8.26	Pass
100	5500	3.61	2.63	0.20	6.36	8.26	Pass
116	5580	5.55	4.47	0.20	8.25	8.26	Pass
140	5700	3.00	2.01	0.20	5.74	8.26	Pass

Note:

1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power density limit shall be reduced to 11 - (8.74 - 6) = 8.26dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

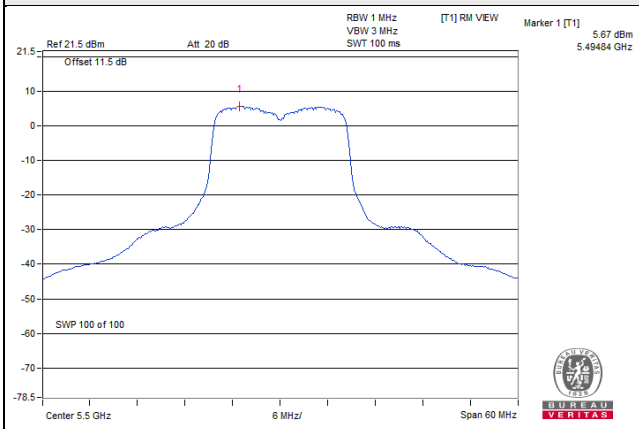
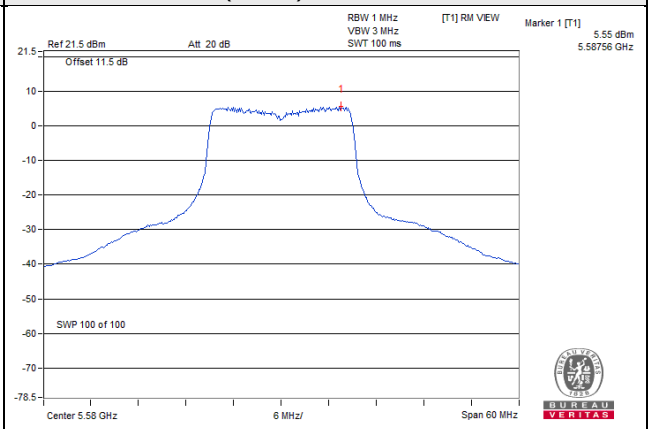
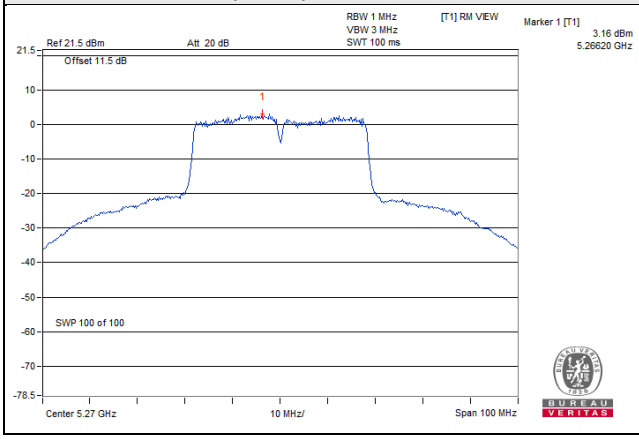
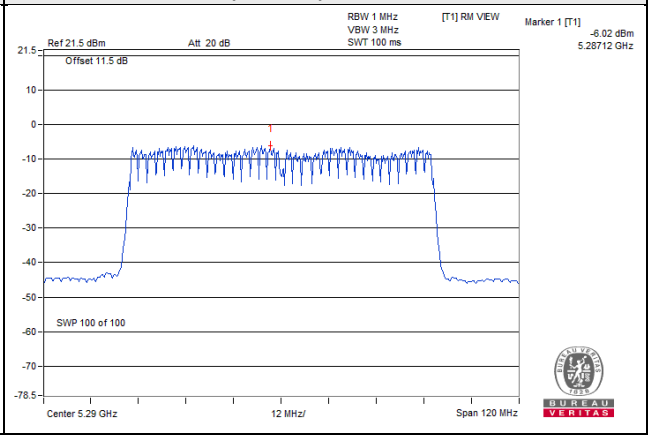
Chan.	Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD with Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
54	5270	3.16	1.40	0.27	5.65	8.26	Pass
62	5310	-0.95	-1.95	0.27	1.86	8.26	Pass
102	5510	-0.59	-1.51	0.27	2.25	8.26	Pass
110	5550	2.58	1.50	0.27	5.35	8.26	Pass
134	5670	-0.15	-1.00	0.27	2.72	8.26	Pass

Note:
1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power density limit shall be reduced to 11 - (8.74 - 6) = 8.26dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (VHT80)

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				
58	5290	-6.48	-6.86	0.22	-3.43	8.26	Pass
106	5530	-8.55	-8.93	0.22	-5.50	8.26	Pass
122	5610	-6.78	-7.00	0.22	-3.66	8.26	Pass

Note:
1. Method E) 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \cdots + 10^{GN/20})^2/2$] = 8.74dBi > 6dBi, so the power density limit shall be reduced to 11 - (8.74 - 6) = 8.26dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

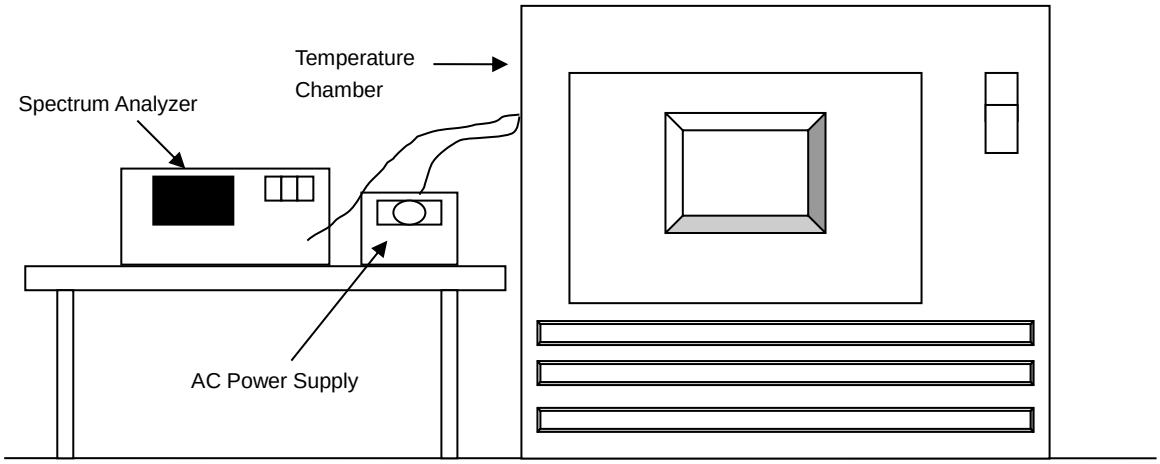
Spectrum Plot of Worst Value	
802.11a / Chain 0 / CH 100	802.11n (HT20) / Chain 0 / CH 116
	
802.11n (HT40) / Chain 0 / CH 54	802.11ac (VHT80) / Chain 0 / CH 58
	

4.6 Frequency Stability

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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
Temperature And Humidity Chamber TERCHY	MHU-225AU	920842	May 27, 2020	May 26, 2021
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021
AC Power Source EEC	6905S	1991553	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. 2020/09/28

4.6.4 Test Procedure

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

b. Turn the EUT on and couple its output to a spectrum analyzer.

c. Turn the EUT off and set the chamber to the highest temperature specified.

d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.

e. Repeat step d with every 10 degrees reduction until the lowest temperature achieved.

f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5260MHz									
Temp. (℃)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
40	120	5259.9748	PASS	5259.9745	PASS	5259.9758	PASS	5259.9773	PASS
30	120	5259.9855	PASS	5259.9867	PASS	5259.9891	PASS	5259.9874	PASS
20	120	5259.9781	PASS	5259.9812	PASS	5259.9812	PASS	5259.9781	PASS
10	120	5259.998	PASS	5260.0014	PASS	5260.0012	PASS	5259.9979	PASS
0	120	5259.9912	PASS	5259.9875	PASS	5259.9921	PASS	5259.9884	PASS

Frequency Stability Versus Voltage									
Operating Frequency: 5260MHz									
Temp. (℃)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result	Measured Frequency (MHz)	Result
20	138	5259.9771	PASS	5259.9805	PASS	5259.9803	PASS	5259.9781	PASS
	120	5259.9781	PASS	5259.9812	PASS	5259.9812	PASS	5259.9781	PASS
	102	5259.9779	PASS	5259.9807	PASS	5259.9804	PASS	5259.9771	PASS

5 Pictures of Test Arrangements

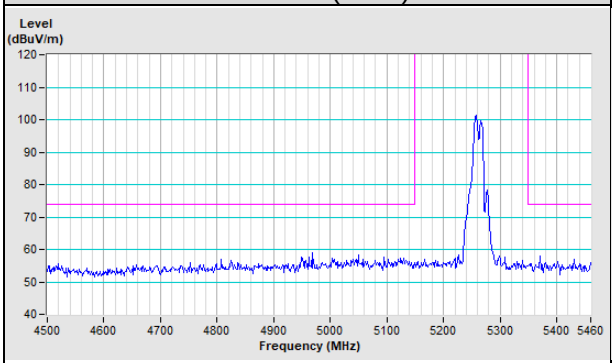
Please refer to the attached file (Test Setup Photo).

Annex A - Band Edge Measurement

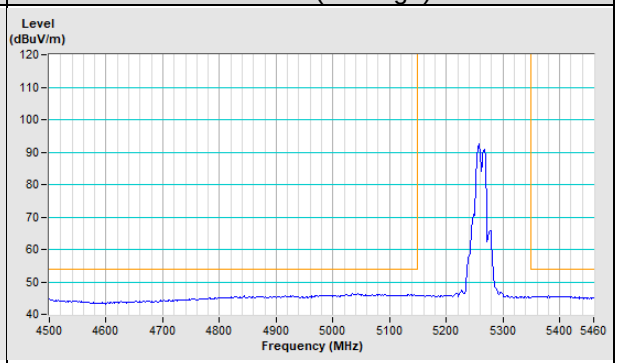
802.11a

Channel 52

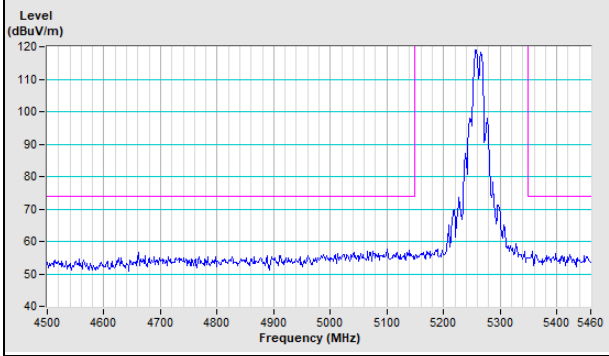
Horizontal (Peak)



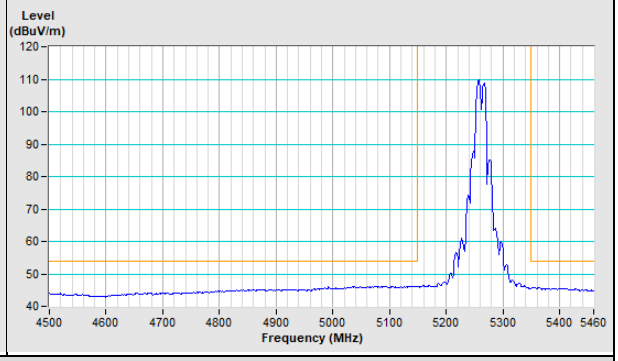
Horizontal (Average)



Vertical (Peak)

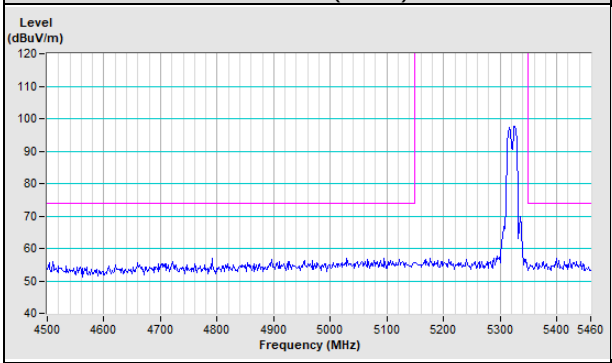


Vertical (Average)

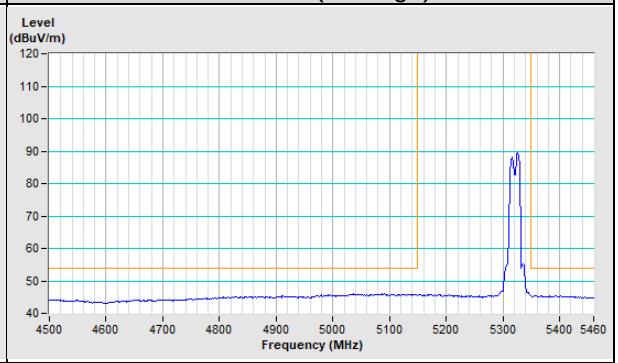


Channel 64

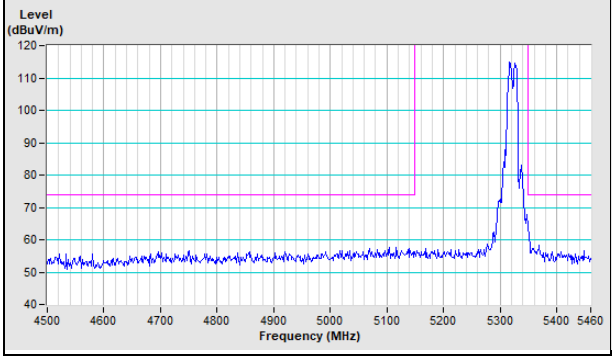
Horizontal (Peak)



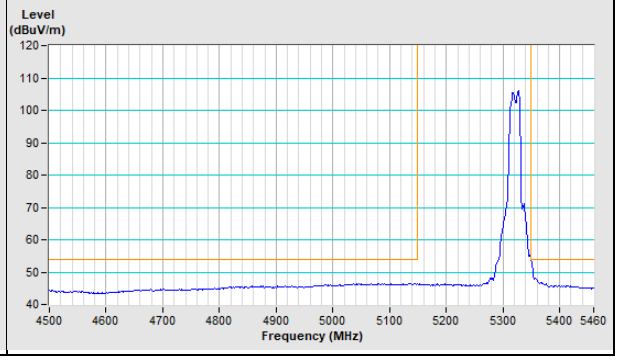
Horizontal (Average)

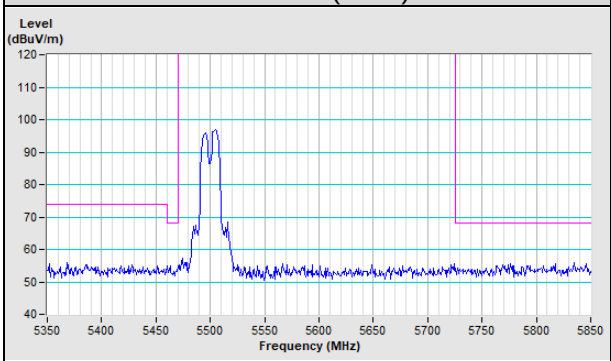
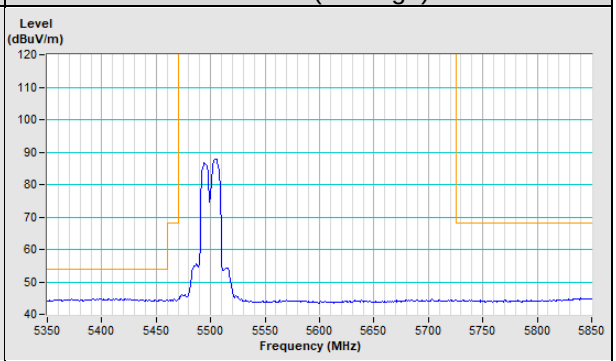
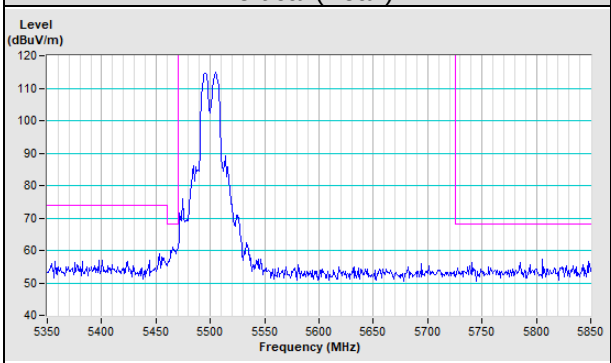
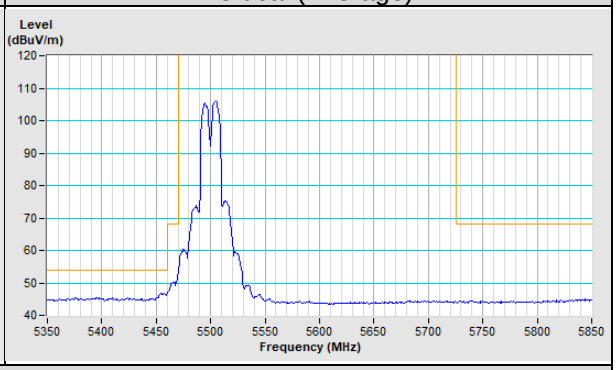
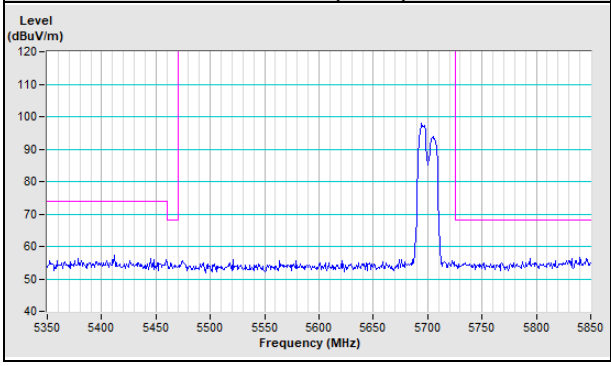
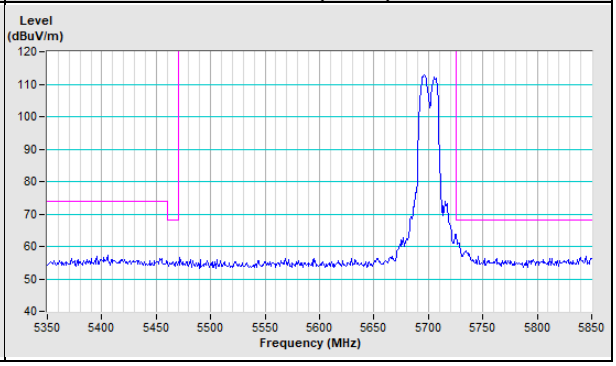


Vertical (Peak)



Vertical (Average)

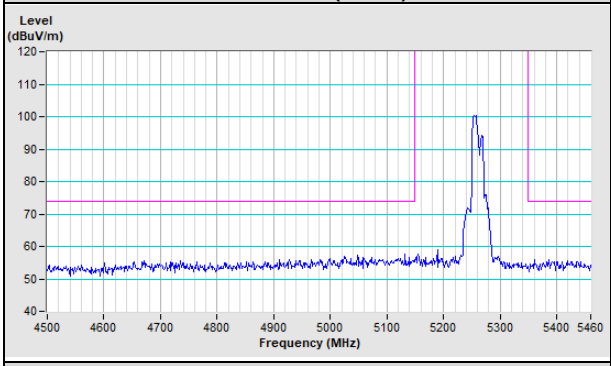


Channel 100	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	
Channel 140	
Horizontal (Peak)	Vertical (Peak)
	

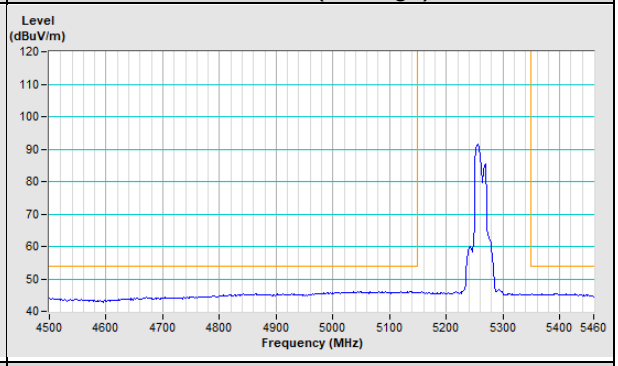
802.11n (HT20)

Channel 52

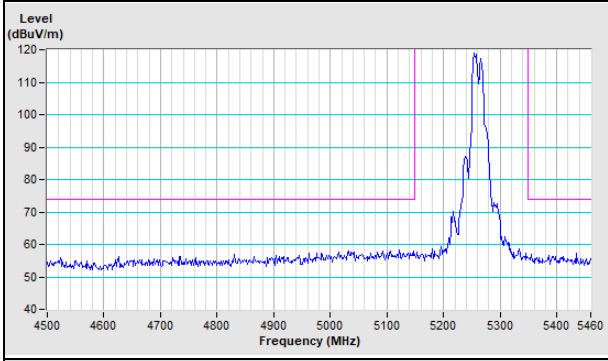
Horizontal (Peak)



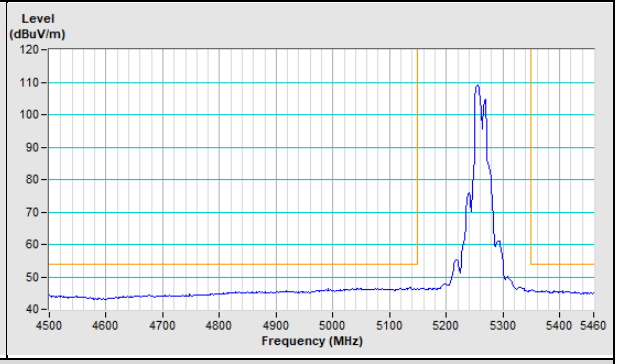
Horizontal (Average)



Vertical (Peak)

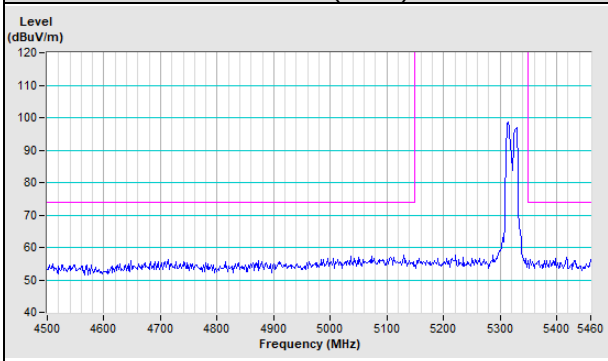


Vertical (Average)

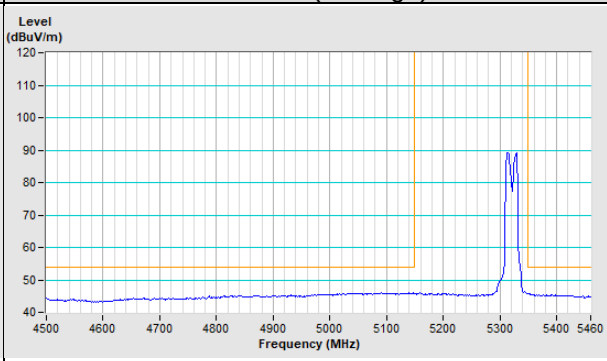


Channel 64

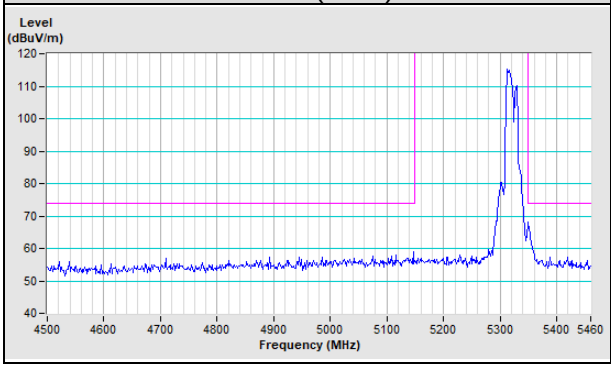
Horizontal (Peak)



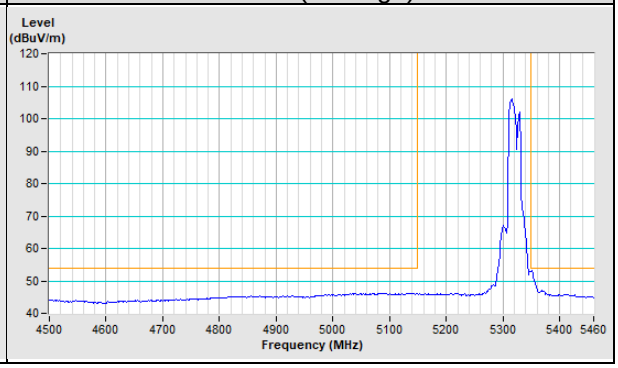
Horizontal (Average)

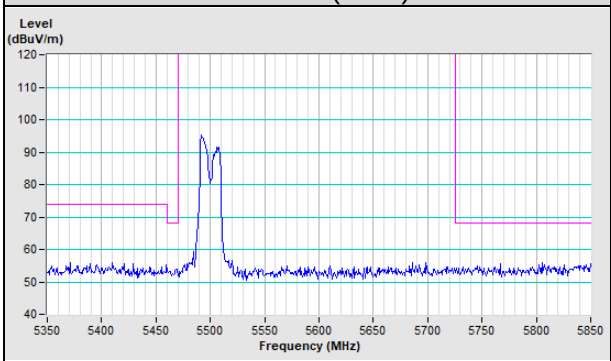
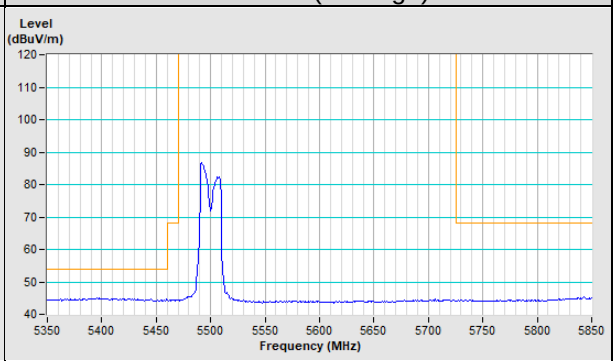
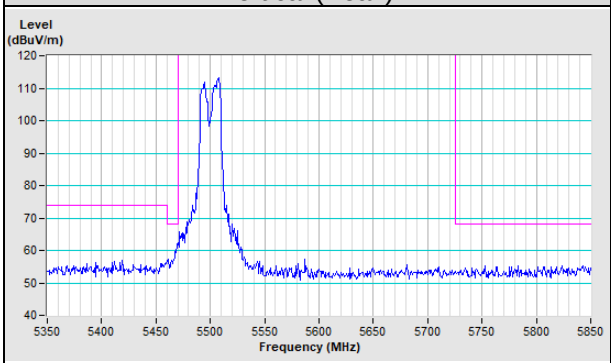
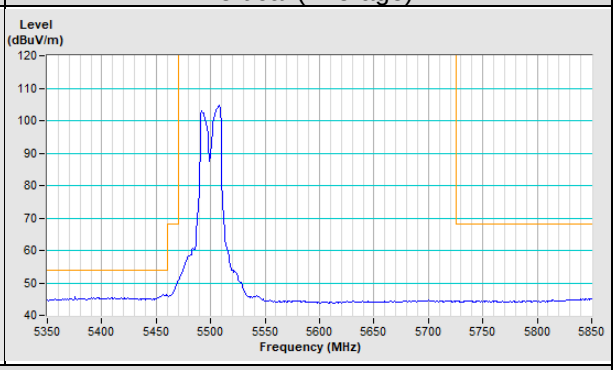
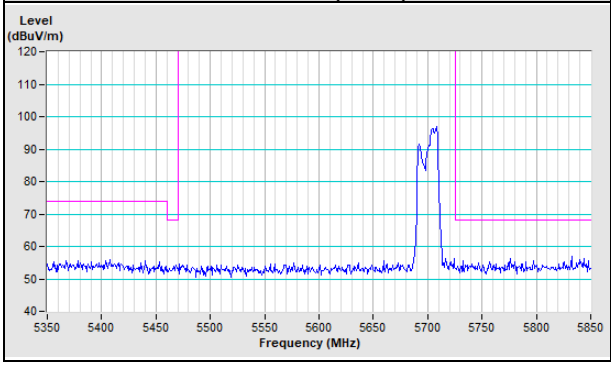
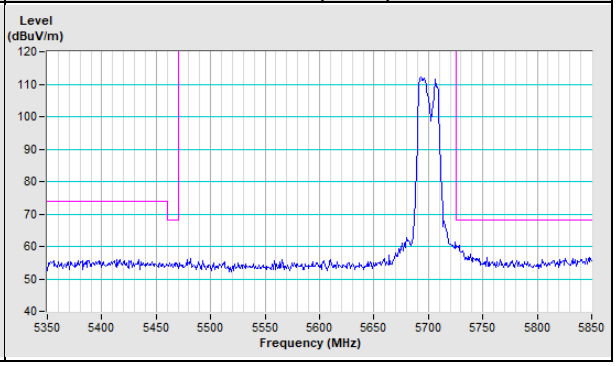


Vertical (Peak)



Vertical (Average)

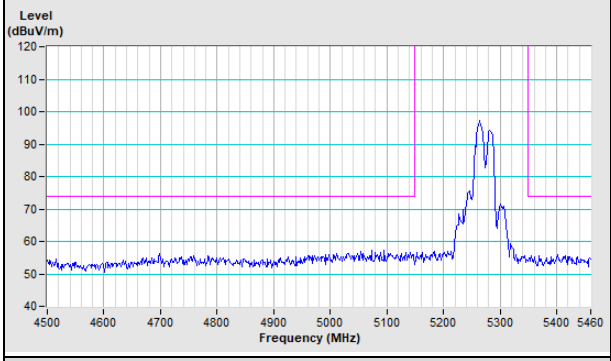


Channel 100	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	
Channel 140	
Horizontal (Peak)	Vertical (Peak)
	

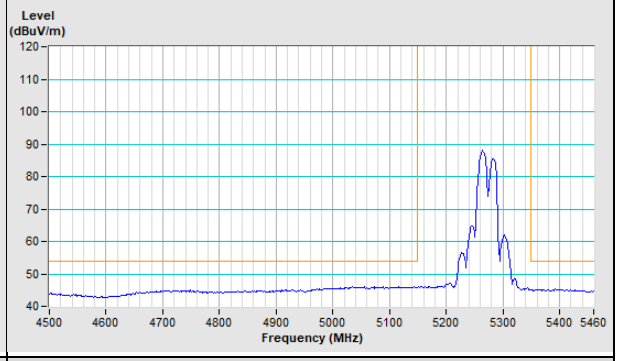
802.11n (HT40)

Channel 54

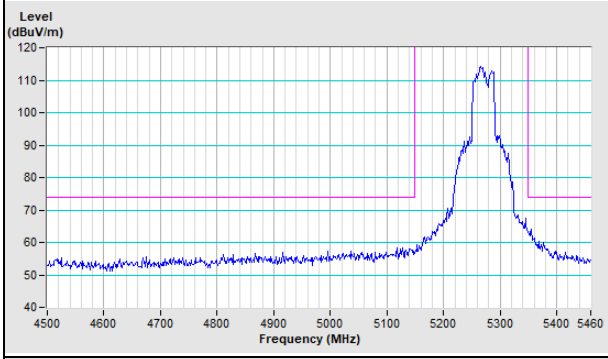
Horizontal (Peak)



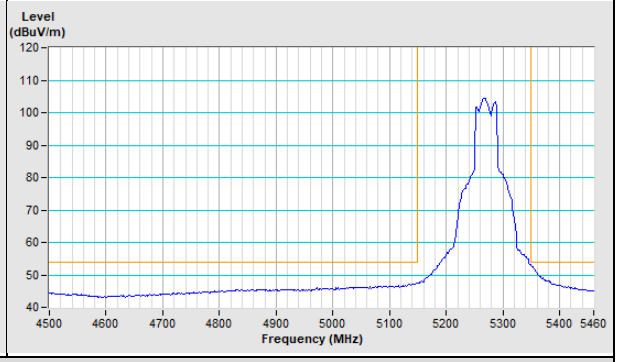
Horizontal (Average)



Vertical (Peak)

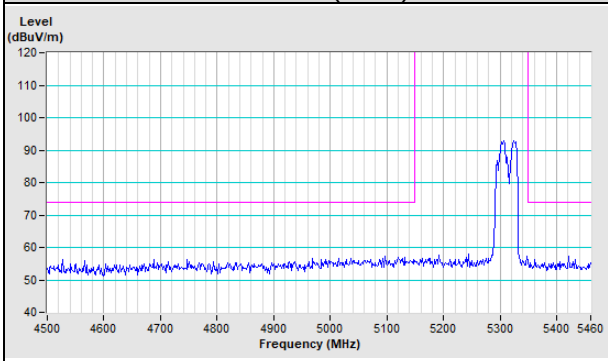


Vertical (Average)

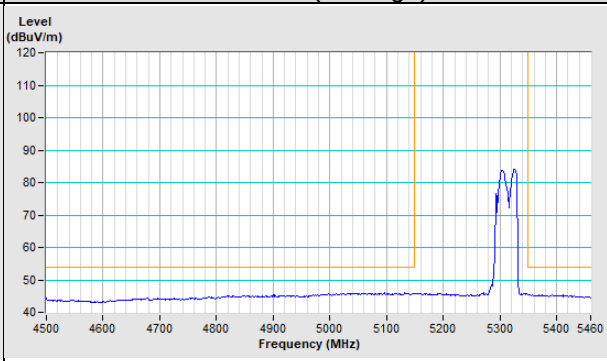


Channel 62

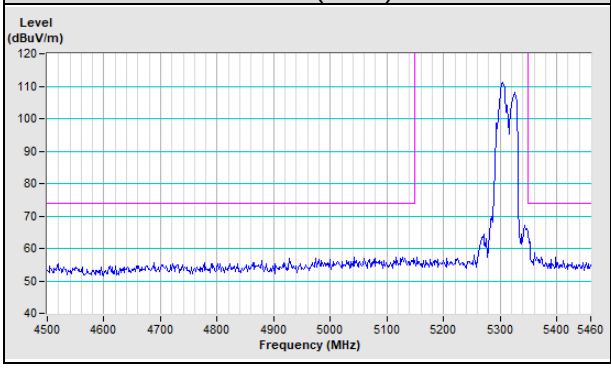
Horizontal (Peak)



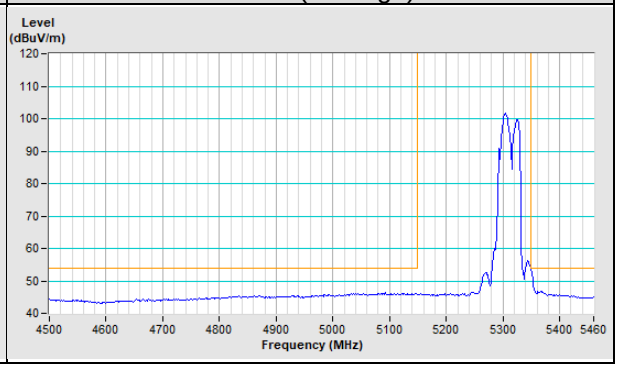
Horizontal (Average)

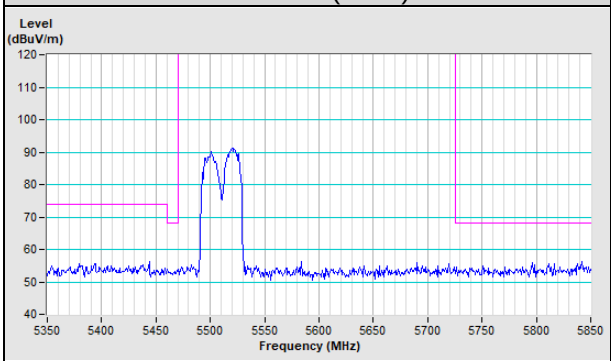
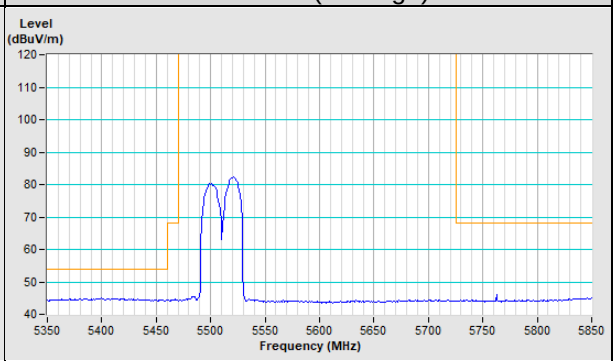
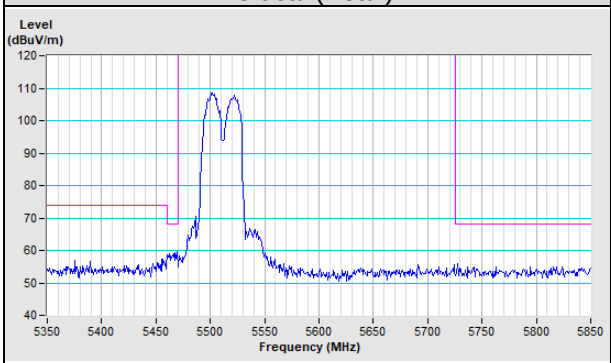
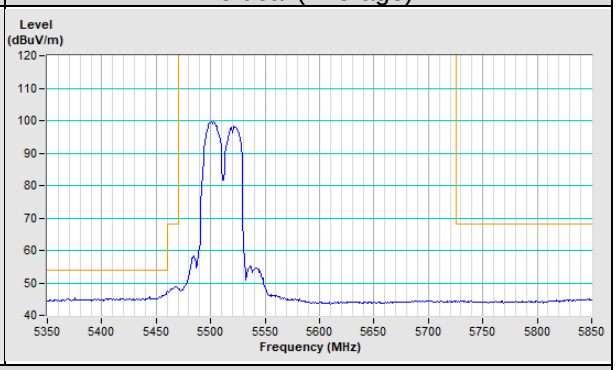
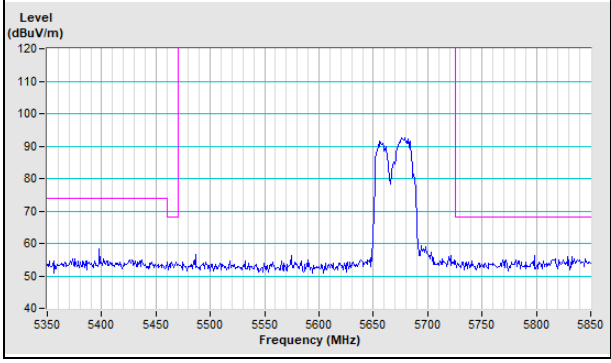
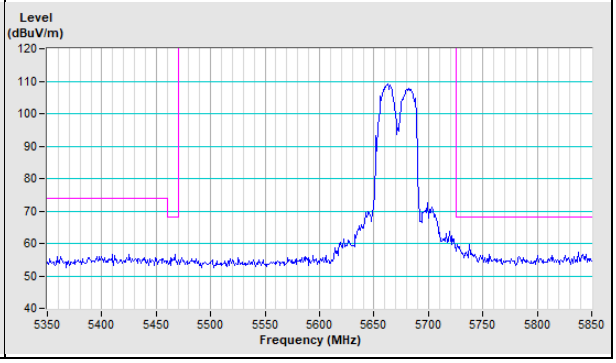


Vertical (Peak)



Vertical (Average)

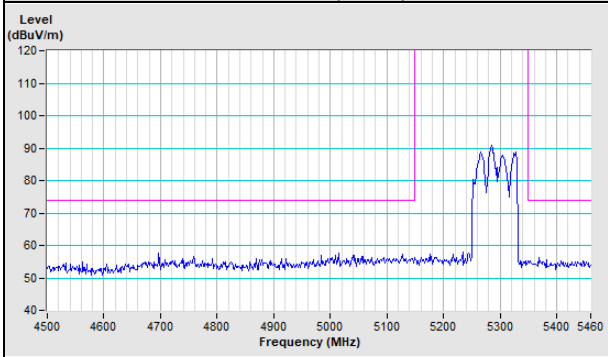


Channel 102	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	
Channel 134	
Horizontal (Peak)	Vertical (Peak)
	

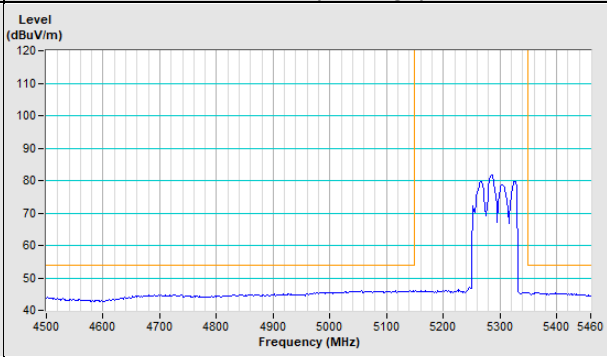
802.11ac (VHT80)

Channel 58

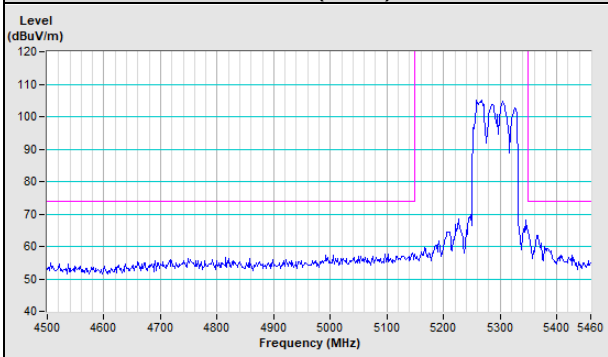
Horizontal (Peak)



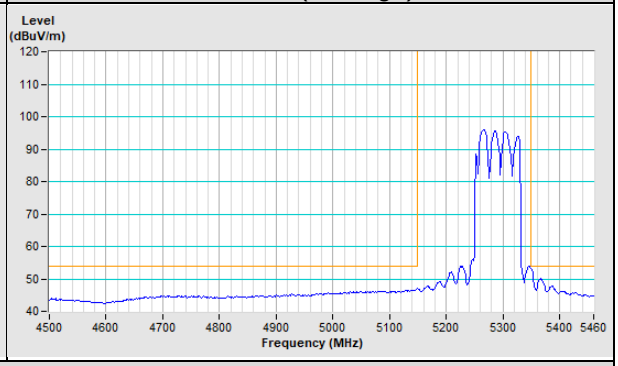
Horizontal (Average)



Vertical (Peak)

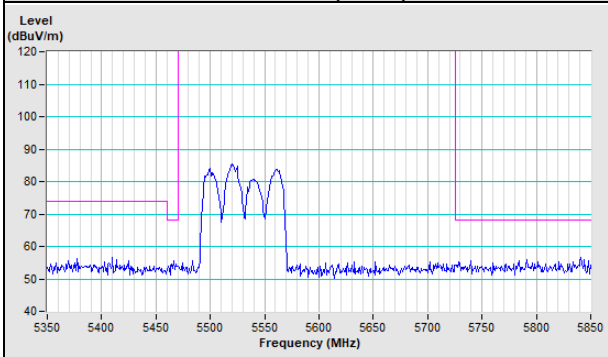


Vertical (Average)

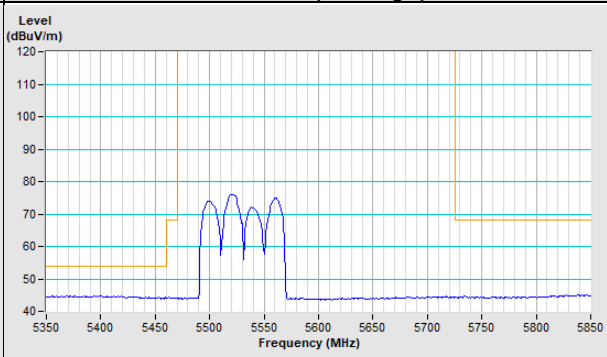


Channel 106

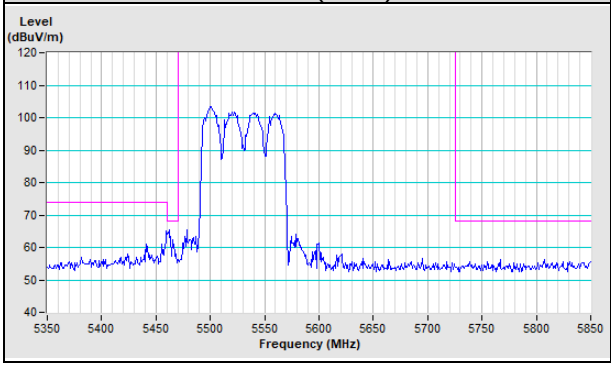
Horizontal (Peak)



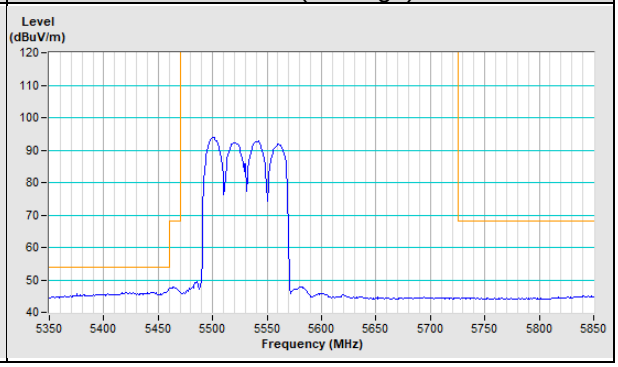
Horizontal (Average)

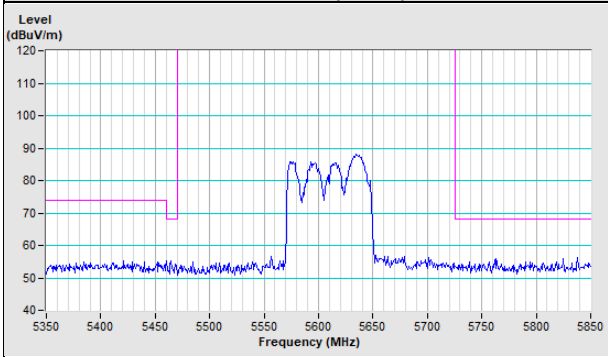
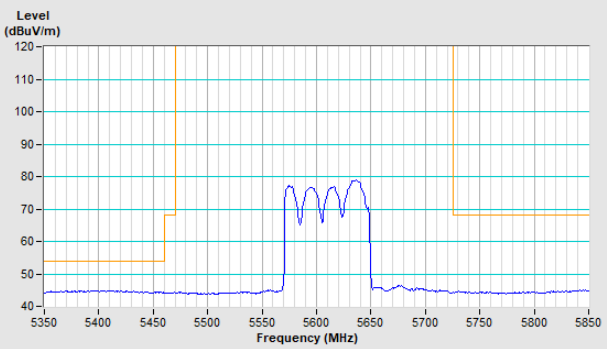
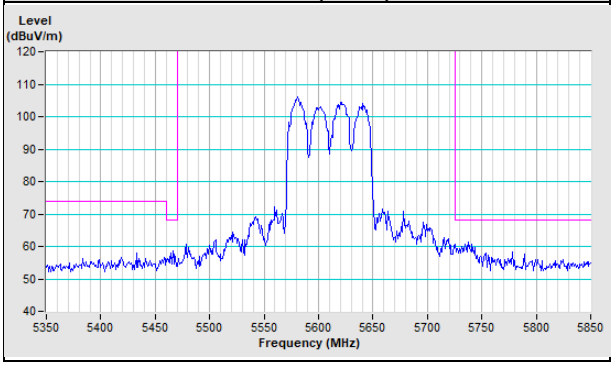
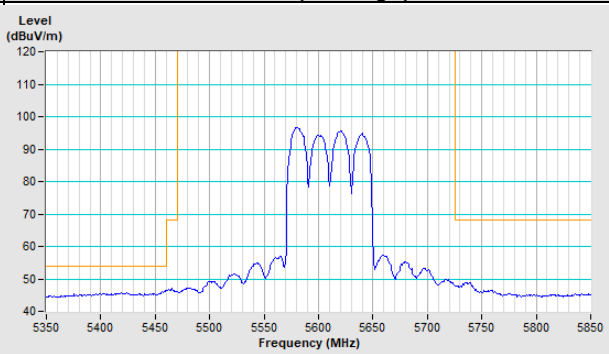


Vertical (Peak)



Vertical (Average)



Channel 122	
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 and approved according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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