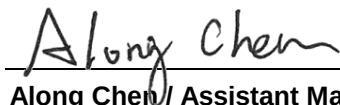


FCC Test Report

FCC ID : Q6G-MS3AE5W
Product Name : Security Network Appliance T35-W
Model No. : MS3AE5W
Brand Name : WatchGuard
Applicant : WatchGuard Technologies, Inc.
Address : 505 5th Ave S. Suite 500, Seattle, WA 98104
USA
Standard : 47 CFR FCC Part 15.407
Received Date : Jul. 07, 2017
Tested Date : Jul. 20 ~ Aug. 03, 2017

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR770701AN	Rev. 01	Initial issue	Aug. 29, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.465MHz 42.82 (Margin -3.79dB) - AV	Pass
15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 5150.00MHz 53.43 (Margin -0.57dB) - AV	Pass
15.407(a)	Emission Bandwidth	Meet the requirement of limit	Pass
15.407(e)	6dB bandwidth	Meet the requirement of limit	Pass
15.407(a)	RF Output Power	Max Power [dBm]: 5150-5250MHz: 25.04 5725-5850MHz: 24.26	Pass
15.407(a)	Peak Power Spectral Density	Meet the requirement of limit	Pass
15.407(g)	Frequency Stability	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
5150-5250	a	5180-5240	36-48 [4]	3	6-54 Mbps
5150-5250	n (HT20)	5180-5240	36-48 [4]	3	MCS 0-23
5150-5250	n (HT40)	5190-5230	38-46 [2]	3	MCS 0-23
5150-5250	ac (VHT20)	5180-5240	36-48 [4]	3	MCS 0-9
5150-5250	ac (VHT40)	5190-5230	38-46 [2]	3	MCS 0-9
5150-5250	ac (VHT80)	5210	42 [1]	3	MCS 0-9

Note 1: RF output power specifies that Maximum Conducted Output Power.
 Note 2: 802.11a/n/ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
5725-5850	a	5745-5825	149-165 [5]	3	6-54 Mbps
5725-5850	n (HT20)	5745-5825	149-165 [5]	3	MCS 0-23
5725-5850	n (HT40)	5755-5795	151-159 [2]	3	MCS 0-23
5725-5850	ac (VHT20)	5745-5825	149-165 [5]	3	MCS 0-9
5725-5850	ac (VHT40)	5755-5795	151-159 [2]	3	MCS 0-9
5725-5850	ac (VHT80)	5775	155 [1]	3	MCS 0-9

Note 1: RF output power specifies that Maximum Conducted Output Power.
 Note 2: 802.11a/n/ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.

1.1.2 Antenna Details

Ant. No.	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)	
				5150~5250	5725~5850
1	ANT 1	dipole	IPEX	4.21	4.21
2	ANT 2	dipole	IPEX	5.96	5.96
3	ANT 3	dipole	IPEX	4.99	4.99

Note: The antennas with highest gain of each type were selected for final testing in this test report.

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	54Vdc from AC adapter
--------------------------	-----------------------

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	AC adapter	Brand: Senao Model: EAA65A-54 Power Rating: I/P: 100-240Vac, 50/60Hz, 1.8A O/P: 54Vdc, 1.2A Power Line: DC 1.5m non-shielded with one core
2	RJ45 cable	1.5m non-shielded without core
3	Power cord	1.85m non-shielded without core

1.1.5 Channel List

For Frequency band 5150-5250 MHz			
802.11 a / HT20 / VHT20		HT40 / VHT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
36	5180	38	5190
40	5200	46	5230
44	5220	VHT80	
48	5240	42	5210

For Frequency band 5725~5850 MHz			
802.11 a / HT20 / VHT20		HT40 / VHT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
149	5745	151	5755
153	5765	159	5795
157	5785	VHT80	
161	5805	155	5775
165	5825	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	QRCT, version: 3.0.187.0		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11a	95.53%	0.20
	VHT20	95.24%	0.21
	VHT40	89.19%	0.50
	VHT80	79.92%	0.97

1.1.7 Power Setting

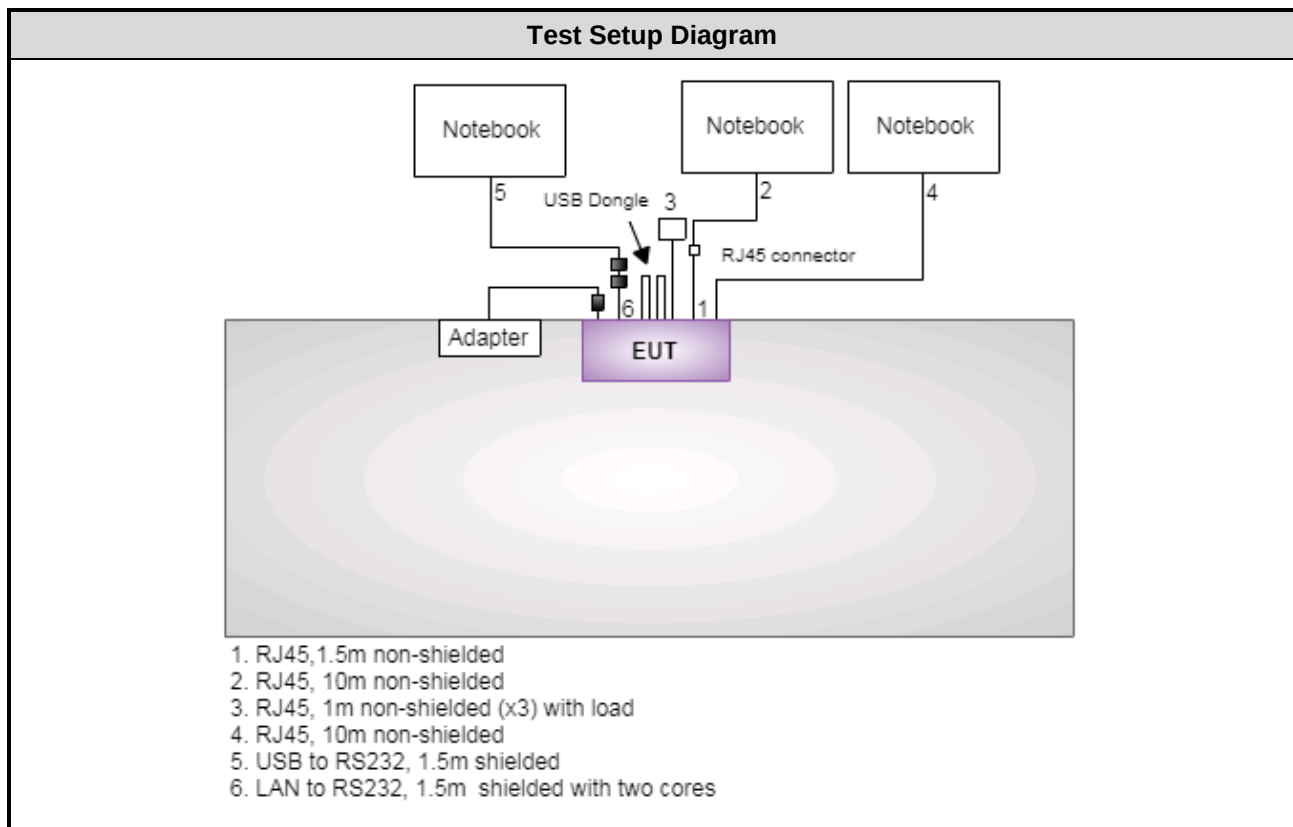
For Frequency band 5150-5250 MHz		
Modulation Mode	Test Frequency (MHz)	Power Set
11a	5180	16.00
11a	5200	19.00
11a	5240	19.00
HT20	5180	16.00
HT20	5200	19.00
HT20	5240	19.00
HT40	5190	11.50
HT40	5230	21.00
VHT20	5180	16.00
VHT20	5200	19.00
VHT20	5240	19.00
VHT40	5190	11.50
VHT40	5230	21.00
VHT80	5210	9.00

For Frequency band 5725~5850 MHz		
Modulation Mode	Test Frequency (MHz)	Power Set
11a	5745	20.00
11a	5785	20.00
11a	5825	20.00
HT20	5745	20.00
HT20	5785	20.00
HT20	5825	20.00
HT40	5755	20.00
HT40	5795	20.00
VHT20	5745	20.00
VHT20	5785	20.00
VHT20	5825	20.00
VHT40	5755	20.00
VHT40	5795	20.00
VHT80	5775	20.00

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	Latitude E6430	DoC	USB to RS232, 1.5m shielded
2	Notebook	DELL	Latitude E5420	DoC	RJ45, 10m non-shielded.
3	Notebook	DELL	Latitude E6430	DoC	RJ45, 10m non-shielded.
4	USB Dongle x2	Gigastone	U211	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Dec. 21, 2016	Dec. 20, 2017
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 08, 2016	Nov. 07, 2017
RF Cable-CON	EMC	EMCCFD300-BM-B M-6000	50821	Dec. 20, 2016	Dec. 19, 2017
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Nov. 25, 2016	Nov. 24, 2017
Receiver	R&S	ESR3	101658	Nov. 24, 2016	Nov. 23, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-524	Oct. 13, 2016	Oct. 12, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 21, 2016	Dec. 20, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 25, 2016	Oct. 24, 2017
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 10, 2016	Nov. 09, 2017
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 09, 2016	Dec. 08, 2017
Preamplifier	EMC	EMC02325	980146	Oct. 08, 2016	Oct. 07, 2017
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2016	Oct. 05, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 09, 2016	Dec. 08, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 09, 2016	Dec. 08, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 09, 2016	Dec. 08, 2017
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16052	Dec. 09, 2016	Dec. 08, 2017
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 09, 2016	Dec. 08, 2017
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 09, 2016	Dec. 08, 2017
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Mar. 15, 2017	Mar. 14, 2018
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 21, 2016	Nov. 20, 2017
Power Meter	Anritsu	ML2495A	1241002	Oct. 06, 2016	Oct. 05, 2017
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 28, 2016	Oct. 27, 2017
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Testing Applied Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.407

ANSI C63.10-2013

FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04

FCC KDB 644545 D03 Guidance for IEEE 802.11ac New Rules v01

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Frequency error	±34.134 Hz
Power density	±0.463 dB
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB
Time	±0.1%
Temperature	±0.6 °C

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	24°C / 57%	Alex Tsai
Radiated Emissions	03CH01-WS	24°C / 62%	Vincent Yeh
RF Conducted	TH01-WS	21°C / 64%	Felix Sung

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

For Frequency band 5150-5250 MHz				
Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	VHT20	5240	MCS 0	---
Radiated Emissions ≤ 1 GHz	VHT20	5240	MCS 0	---
RF Output Power	11a	5180 / 5200 / 5240	6 Mbps	---
	HT20	5180 / 5200 / 5240	MCS 0	
	HT40	5190 / 5230	MCS 0	
	VHT20	5180 / 5200 / 5240	MCS 0	
	VHT40	5190 / 5230	MCS 0	
	VHT80	5210	MCS 0	
Radiated Emissions > 1 GHz Emission Bandwidth Peak Power Spectral Density	11a	5180 / 5200 / 5240	6 Mbps	---
	VHT20	5180 / 5200 / 5240	MCS 0	
	VHT40	5190 / 5230	MCS 0	
	VHT80	5210	MCS 0	
Frequency Stability	Un-modulation	5200	---	---

For Frequency band 5725-5850 MHz				
Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	VHT40	5755	MCS 0	---
Radiated Emissions ≤ 1 GHz	VHT40	5755	MCS 0	---
RF Output Power	11a	5745 / 5785 / 5825	6 Mbps	---
	HT20	5745 / 5785 / 5825	MCS 0	
	HT40	5755 / 5795	MCS 0	
	VHT20	5745 / 5785 / 5825	MCS 0	
	VHT40	5755 / 5795	MCS 0	
	VHT80	5775	MCS 0	
Radiated Emissions > 1 GHz Emission Bandwidth 6dB bandwidth Peak Power Spectral Density	11a	5745 / 5785 / 5825	6 Mbps	---
	VHT20	5745 / 5785 / 5825	MCS 0	
	VHT40	5755 / 5795	MCS 0	
	VHT80	5775	MCS 0	
Frequency Stability	Un-modulation	5785	---	---

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

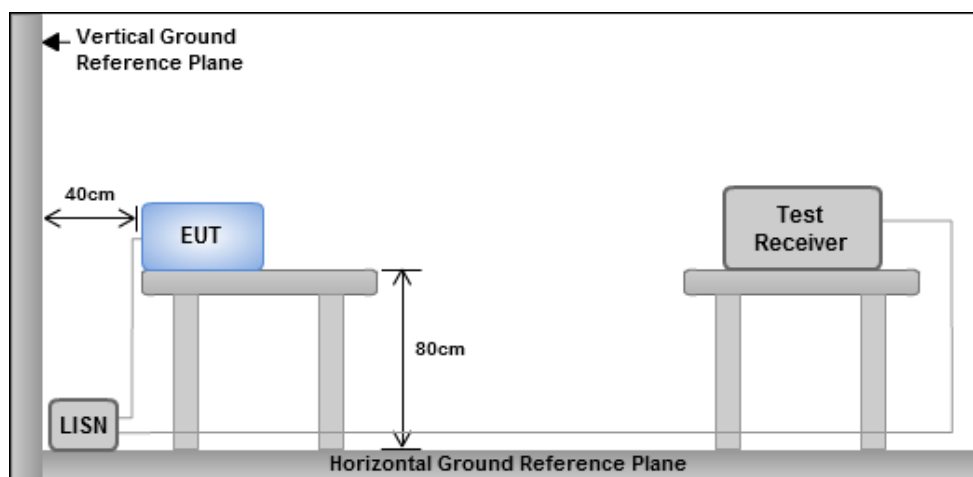
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

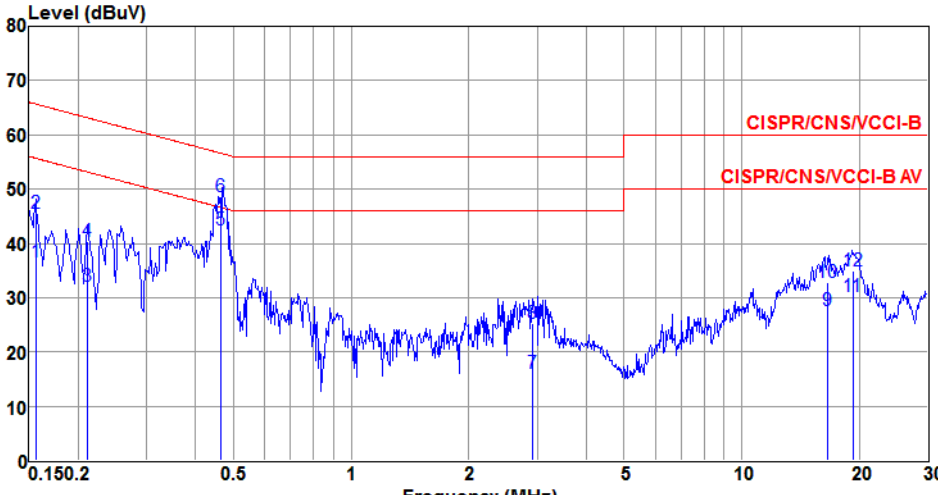
3.1.3 Test Setup



- Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

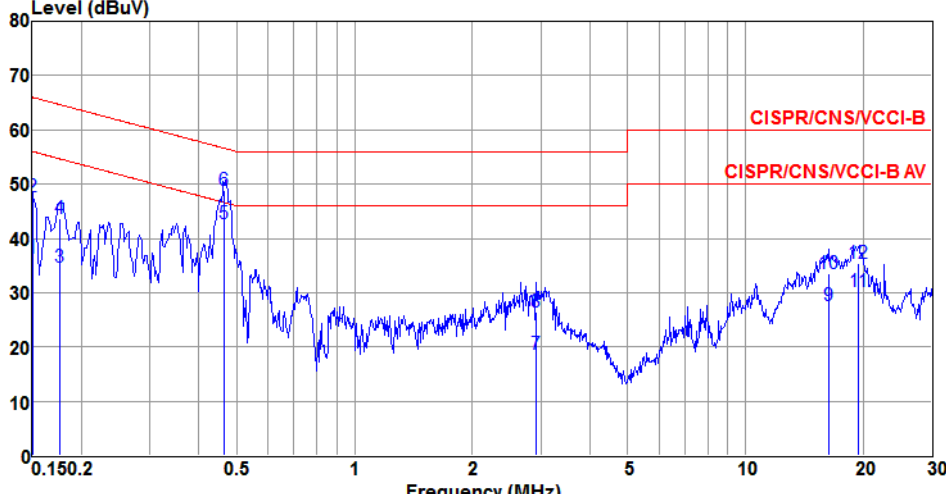
Modulation	VHT20	Test Freq. (MHz)	5240
Power Phase	Line		



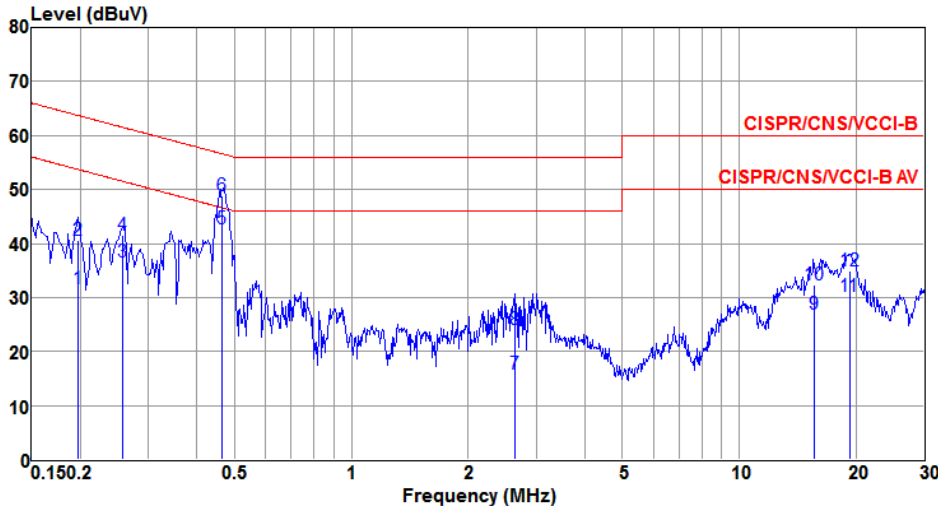
Freq	Level	Limit	Over	Read	LISN	cable		
MHz	dBuV	Line	Limit	Level	factor	loss	Remark	
		dBuV	dB	dBuV	dB	dB		
1	0.156	36.50	55.69	-19.19	36.39	0.07	0.04	Average
2	0.156	45.46	65.69	-20.23	45.35	0.07	0.04	QP
3	0.211	31.99	53.18	-21.19	31.85	0.10	0.04	Average
4	0.211	40.46	63.18	-22.72	40.32	0.10	0.04	QP
5@	0.463	42.38	46.64	-4.26	42.28	0.06	0.04	Average
6	0.463	48.69	56.64	-7.95	48.59	0.06	0.04	QP
7	2.906	16.11	46.00	-29.89	15.86	0.15	0.10	Average
8	2.906	25.21	56.00	-30.79	24.96	0.15	0.10	QP
9	16.627	27.64	50.00	-22.36	27.05	0.35	0.24	Average
10	16.627	32.92	60.00	-27.08	32.33	0.35	0.24	QP
11	19.242	30.18	50.00	-19.82	29.53	0.39	0.26	Average
12	19.242	35.02	60.00	-24.98	34.37	0.39	0.26	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).

2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	VHT20	Test Freq. (MHz)	5240																																																																																																																					
Power Phase	Neutral																																																																																																																							
Level (dBuV)  <table><tr><th></th><th>Freq MHz</th><th>Level dBuV</th><th>Limit Line dBuV</th><th>Over Limit dB</th><th>Read Level dBuV</th><th>LISN factor dB</th><th>cable loss dB</th><th>Remark</th></tr><tr><td>1</td><td>0.150</td><td>36.39</td><td>56.00</td><td>-19.61</td><td>36.25</td><td>0.10</td><td>0.04</td><td>Average</td></tr><tr><td>2</td><td>0.150</td><td>47.59</td><td>66.00</td><td>-18.41</td><td>47.45</td><td>0.10</td><td>0.04</td><td>QP</td></tr><tr><td>3</td><td>0.177</td><td>34.73</td><td>54.64</td><td>-19.91</td><td>34.60</td><td>0.09</td><td>0.04</td><td>Average</td></tr><tr><td>4</td><td>0.177</td><td>43.59</td><td>64.64</td><td>-21.05</td><td>43.46</td><td>0.09</td><td>0.04</td><td>QP</td></tr><tr><td>5</td><td>0.465</td><td>42.82</td><td>46.61</td><td>-3.79</td><td>42.66</td><td>0.12</td><td>0.04</td><td>Average</td></tr><tr><td>6</td><td>0.465</td><td>48.84</td><td>56.61</td><td>-7.77</td><td>48.68</td><td>0.12</td><td>0.04</td><td>QP</td></tr><tr><td>7</td><td>2.910</td><td>18.74</td><td>46.00</td><td>-27.26</td><td>18.49</td><td>0.15</td><td>0.10</td><td>Average</td></tr><tr><td>8</td><td>2.910</td><td>26.48</td><td>56.00</td><td>-29.52</td><td>26.23</td><td>0.15</td><td>0.10</td><td>QP</td></tr><tr><td>9</td><td>16.302</td><td>27.64</td><td>50.00</td><td>-22.36</td><td>27.02</td><td>0.38</td><td>0.24</td><td>Average</td></tr><tr><td>10</td><td>16.302</td><td>33.51</td><td>60.00</td><td>-26.49</td><td>32.89</td><td>0.38</td><td>0.24</td><td>QP</td></tr><tr><td>11</td><td>19.461</td><td>30.15</td><td>50.00</td><td>-19.85</td><td>29.48</td><td>0.41</td><td>0.26</td><td>Average</td></tr><tr><td>12</td><td>19.461</td><td>35.29</td><td>60.00</td><td>-24.71</td><td>34.62</td><td>0.41</td><td>0.26</td><td>QP</td></tr></table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark	1	0.150	36.39	56.00	-19.61	36.25	0.10	0.04	Average	2	0.150	47.59	66.00	-18.41	47.45	0.10	0.04	QP	3	0.177	34.73	54.64	-19.91	34.60	0.09	0.04	Average	4	0.177	43.59	64.64	-21.05	43.46	0.09	0.04	QP	5	0.465	42.82	46.61	-3.79	42.66	0.12	0.04	Average	6	0.465	48.84	56.61	-7.77	48.68	0.12	0.04	QP	7	2.910	18.74	46.00	-27.26	18.49	0.15	0.10	Average	8	2.910	26.48	56.00	-29.52	26.23	0.15	0.10	QP	9	16.302	27.64	50.00	-22.36	27.02	0.38	0.24	Average	10	16.302	33.51	60.00	-26.49	32.89	0.38	0.24	QP	11	19.461	30.15	50.00	-19.85	29.48	0.41	0.26	Average	12	19.461	35.29	60.00	-24.71	34.62	0.41	0.26	QP
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark																																																																																																																
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7	2.910	18.74	46.00	-27.26	18.49	0.15	0.10	Average																																																																																																																
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12	19.461	35.29	60.00	-24.71	34.62	0.41	0.26	QP																																																																																																																
Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).																																																																																																																								

Modulation	VHT40	Test Freq. (MHz)	5755
Power Phase	Line		



The graph displays the measured emission level in dBuV against frequency in MHz. Two red limit lines are shown: CISPR/CNS/VCCI-B (upper) and CISPR/CNS/VCCI-B AV (lower). The blue trace represents the measured signal, with several peaks labeled with numbers 1 through 12. The x-axis ranges from 0.15 to 30 MHz, and the y-axis ranges from 0 to 80 dBuV.

	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.198	31.61	53.71	-22.10	31.47	0.10	0.04	Average
2	0.198	40.69	63.71	-23.02	40.55	0.10	0.04	QP
3	0.258	36.67	51.51	-14.84	36.54	0.09	0.04	Average
4	0.258	41.50	61.51	-20.01	41.37	0.09	0.04	QP
5	0.463	42.79	46.63	-3.84	42.69	0.06	0.04	Average
6	0.463	48.97	56.63	-7.66	48.87	0.06	0.04	QP
7	2.636	15.71	46.00	-30.29	15.47	0.15	0.09	Average
8	2.636	24.00	56.00	-32.00	23.76	0.15	0.09	QP
9	15.610	26.91	50.00	-23.09	26.35	0.33	0.23	Average
10	15.610	32.43	60.00	-27.57	31.87	0.33	0.23	QP
11	19.231	30.19	50.00	-19.81	29.54	0.39	0.26	Average
12	19.231	34.94	60.00	-25.06	34.29	0.39	0.26	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).

Note 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	VHT40	Test Freq. (MHz)	5755																																																																																																																																							
Power Phase	Neutral																																																																																																																																									
Level (dBuV) <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>LISN</th><th>cable</th><th></th></tr><tr><th></th><th>MHz</th><th>dBuV</th><th>Line</th><th>Limit</th><th>Level</th><th>factor</th><th>loss</th><th>Remark</th></tr><tr><th></th><th></th><th></th><th>dBuV</th><th>dB</th><th>dBuV</th><th>dB</th><th>dB</th><th></th></tr></thead><tbody><tr><td>1</td><td>0.201</td><td>31.18</td><td>53.58</td><td>-22.40</td><td>31.05</td><td>0.09</td><td>0.04</td><td>Average</td></tr><tr><td>2</td><td>0.201</td><td>40.69</td><td>63.58</td><td>-22.89</td><td>40.56</td><td>0.09</td><td>0.04</td><td>QP</td></tr><tr><td>3</td><td>0.258</td><td>36.53</td><td>51.51</td><td>-14.98</td><td>36.39</td><td>0.10</td><td>0.04</td><td>Average</td></tr><tr><td>4</td><td>0.258</td><td>41.34</td><td>61.51</td><td>-20.17</td><td>41.20</td><td>0.10</td><td>0.04</td><td>QP</td></tr><tr><td>5</td><td>0.462</td><td>42.63</td><td>46.65</td><td>-4.02</td><td>42.47</td><td>0.12</td><td>0.04</td><td>Average</td></tr><tr><td>6</td><td>0.462</td><td>49.02</td><td>56.65</td><td>-7.63</td><td>48.86</td><td>0.12</td><td>0.04</td><td>QP</td></tr><tr><td>7</td><td>2.560</td><td>19.07</td><td>46.00</td><td>-26.93</td><td>18.84</td><td>0.15</td><td>0.08</td><td>Average</td></tr><tr><td>8</td><td>2.560</td><td>25.88</td><td>56.00</td><td>-30.12</td><td>25.65</td><td>0.15</td><td>0.08</td><td>QP</td></tr><tr><td>9</td><td>16.189</td><td>28.51</td><td>50.00</td><td>-21.49</td><td>27.89</td><td>0.38</td><td>0.24</td><td>Average</td></tr><tr><td>10</td><td>16.189</td><td>33.94</td><td>60.00</td><td>-26.06</td><td>33.32</td><td>0.38</td><td>0.24</td><td>QP</td></tr><tr><td>11</td><td>18.988</td><td>29.87</td><td>50.00</td><td>-20.13</td><td>29.22</td><td>0.40</td><td>0.25</td><td>Average</td></tr><tr><td>12</td><td>18.988</td><td>34.91</td><td>60.00</td><td>-25.09</td><td>34.26</td><td>0.40</td><td>0.25</td><td>QP</td></tr></tbody></table>					Freq	Level	Limit	Over	Read	LISN	cable			MHz	dBuV	Line	Limit	Level	factor	loss	Remark				dBuV	dB	dBuV	dB	dB		1	0.201	31.18	53.58	-22.40	31.05	0.09	0.04	Average	2	0.201	40.69	63.58	-22.89	40.56	0.09	0.04	QP	3	0.258	36.53	51.51	-14.98	36.39	0.10	0.04	Average	4	0.258	41.34	61.51	-20.17	41.20	0.10	0.04	QP	5	0.462	42.63	46.65	-4.02	42.47	0.12	0.04	Average	6	0.462	49.02	56.65	-7.63	48.86	0.12	0.04	QP	7	2.560	19.07	46.00	-26.93	18.84	0.15	0.08	Average	8	2.560	25.88	56.00	-30.12	25.65	0.15	0.08	QP	9	16.189	28.51	50.00	-21.49	27.89	0.38	0.24	Average	10	16.189	33.94	60.00	-26.06	33.32	0.38	0.24	QP	11	18.988	29.87	50.00	-20.13	29.22	0.40	0.25	Average	12	18.988	34.91	60.00	-25.09	34.26	0.40	0.25	QP
	Freq	Level	Limit	Over	Read	LISN	cable																																																																																																																																			
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3.2 Emission Bandwidth

3.2.1 Limit of Emission bandwidth

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

3.2.2 Test Procedures

26dB Bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW, Detector = Peak.
3. Trace mode = max hold.
4. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

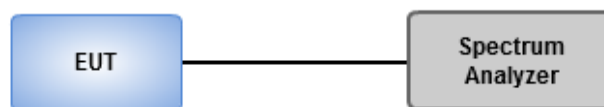
Occupied Bandwidth

1. Set RBW = 1 % to 5 % of the OBW
2. Set VBW $\geq$ 3 RBW
3. Sample detection and single sweep mode shall be used
4. Use the 99 % power bandwidth function of the instrument

6dB Bandwidth

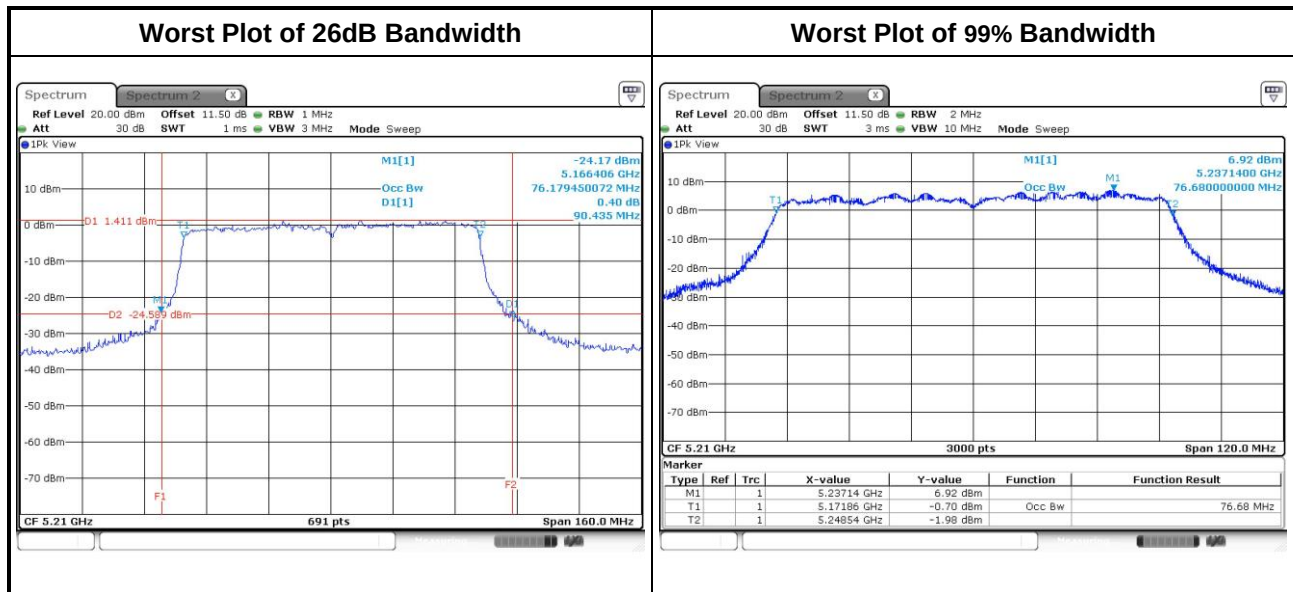
1. Set RBW = 100kHz, VBW = 300kHz
2. Detector = Peak, Trace mode = max hold.
3. Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

3.2.3 Test Setup



3.2.4 Test Result of Emission Bandwidth

For Frequency band 5150-5250 MHz										
Emission Bandwidth										
Mode	N _{TX}	Freq. (MHz)	26dB Bandwidth (MHz)				99% Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3	Chain 0	Chain 1	Chain 2	Chain 3
11a	3	5180	26.61	25.80	25.16	---	16.95	16.85	17.01	---
11a	3	5200	40.87	41.01	37.68	---	18.91	17.66	18.97	---
11a	3	5240	42.97	42.75	39.28	---	19.32	17.94	19.54	---
VHT20	3	5180	35.43	29.86	28.12	---	18.06	17.92	18.13	---
VHT20	3	5200	46.67	44.86	42.17	---	18.99	19.04	19.15	---
VHT20	3	5240	47.68	46.30	46.81	---	19.42	19.23	18.66	---
VHT40	3	5190	47.07	46.03	46.73	---	37.08	36.94	36.96	---
VHT40	3	5230	89.57	86.09	87.54	---	37.96	38.24	38.08	---
VHT80	3	5210	89.04	90.44	87.65	---	76.68	76.36	76.48	---

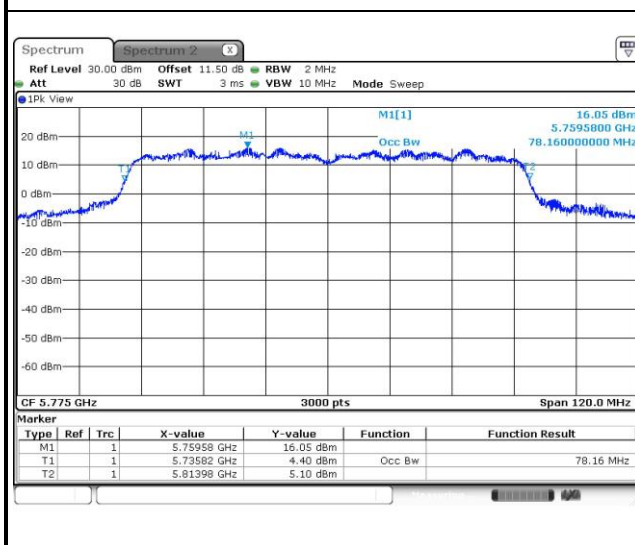


For Frequency band 5725-5850 MHz

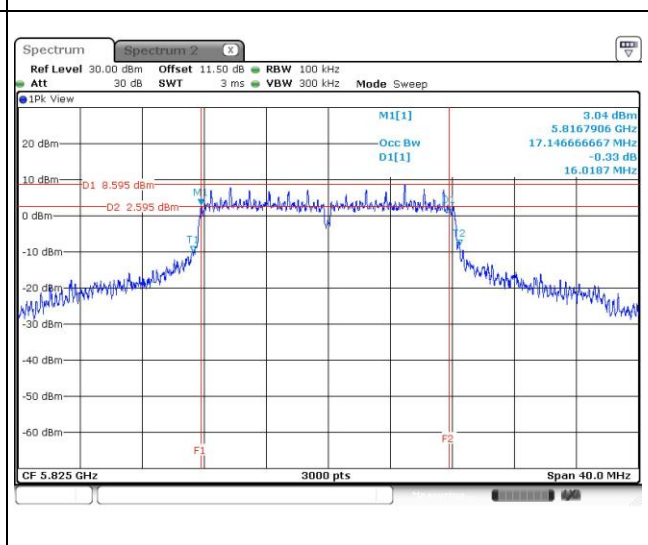
Emission Bandwidth

Mode	N _{TX}	Freq. (MHz)	OBW Bandwidth (MHz)				6dB Bandwidth (MHz)				6dB BW Limit (MHz)
			Chain 0	Chain 1	Chain 2	Chain 3	Chain 0	Chain 1	Chain 2	Chain 3	
11a	3	5745	17.32	17.32	17.70	---	16.29	16.33	16.35	---	0.5
11a	3	5785	17.16	17.19	17.52	---	16.27	16.31	16.05	---	0.5
11a	3	5825	17.03	17.22	17.06	---	16.07	16.30	16.02	---	0.5
VHT20	3	5745	18.24	18.18	18.59	---	16.89	17.27	17.55	---	0.5
VHT20	3	5785	18.16	18.19	18.42	---	17.54	17.18	17.30	---	0.5
VHT20	3	5825	18.05	18.11	18.15	---	17.17	17.51	17.54	---	0.5
VHT40	3	5755	37.38	37.34	38.84	---	36.01	36.28	35.29	---	0.5
VHT40	3	5795	37.20	37.20	37.50	---	35.51	35.32	35.72	---	0.5
VHT80	3	5775	76.72	76.72	78.16	---	75.39	75.28	73.78	---	0.5

Worst Plots of 99% Bandwidth



Worst Plots of 6dB Bandwidth



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Frequency band 5150-5250 MHz		
Operating Mode		Limit
☐	Outdoor access point	Conducted Power: 1 W The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm)
☒	Indoor access point	Conducted Power: 1 W
☐	Fixed point-to-point access points	Conducted Power: 1 W
☐	Client devices	Conducted Power: 250 mW

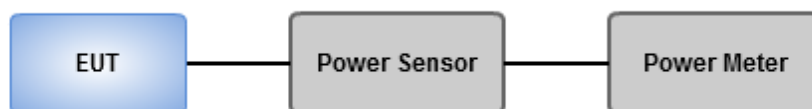
Frequency Band (MHz)	Limit
☐ 5250 ~ 5350	250mW or 11dBm+10 log B
☐ 5470 ~ 5725	250mW or 11dBm+10 log B
☒ 5725 ~ 5850	1 W

Note: "B" is the 26dB emission bandwidth in MHz.

3.3.2 Test Procedures

- ☒ **Method PM-G (Measurement using a gated RF average power meter)**
 - ☒ Measurements may is performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Conducted Output Power

For Frequency band 5150-5250 MHz									
Mode	N _{TX}	Freq. (MHz)	Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11a	3	5180	17.81	17.69	17.52	---	175.637	22.45	30.00
11a	3	5200	19.99	20.21	19.5	---	293.849	24.68	30.00
11a	3	5240	20.18	19.93	20.46	---	313.806	24.97	30.00
HT20	3	5180	17.88	16.05	17.19	---	154.008	21.88	30.00
HT20	3	5200	20.15	19.81	20.28	---	305.893	24.86	30.00
HT20	3	5240	20.25	20.12	20.31	---	316.126	25.00	30.00
HT40	3	5190	12.18	11.62	11.52	---	45.231	16.55	30.00
HT40	3	5230	20.21	19.65	20.28	---	303.871	24.83	30.00
VHT20	3	5180	18.07	17.12	17.17	---	167.763	22.25	30.00
VHT20	3	5200	20.23	19.86	20.35	---	310.659	24.92	30.00
VHT20	3	5240	20.32	20.14	20.34	---	319.066	25.04	30.00
VHT40	3	5190	12.25	11.68	11.58	---	45.899	16.62	30.00
VHT40	3	5230	20.35	19.76	20.41	---	312.917	24.95	30.00
VHT80	3	5210	9.98	9.28	10.75	---	30.311	14.82	30.00

For Frequency band 5725-5850 MHz									
Mode	N _{TX}	Freq. (MHz)	Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11a	3	5745	18.47	18.85	19.04	---	227.211	23.56	30.00
11a	3	5785	18.84	18.36	18.76	---	220.271	23.43	30.00
11a	3	5825	18.21	18.6	18.27	---	205.808	23.13	30.00
HT20	3	5745	18.41	18.61	18.95	---	220.477	23.43	30.00
HT20	3	5785	18.27	18.51	18.91	---	215.904	23.34	30.00
HT20	3	5825	18.39	18.68	18.48	---	213.284	23.29	30.00
HT40	3	5755	19.61	19.41	19.35	---	264.808	24.23	30.00
HT40	3	5795	18.33	18.81	18.25	---	210.944	23.24	30.00
VHT20	3	5745	18.43	18.68	19	---	222.886	23.48	30.00
VHT20	3	5785	18.33	18.55	18.93	---	217.854	23.38	30.00
VHT20	3	5825	18.41	18.73	18.5	---	214.782	23.32	30.00
VHT40	3	5755	19.62	19.44	19.39	---	266.420	24.26	30.00
VHT40	3	5795	18.34	18.85	18.26	---	211.958	23.26	30.00
VHT80	3	5775	18.31	18.86	18.25	---	211.512	23.25	30.00

3.4 Peak Power Spectral Density

3.4.1 Limit of Peak Power Spectral Density

Frequency band 5150-5250 MHz		
Operating Mode		Limit
☐	Outdoor access point	17 dBm / MHz
☒	Indoor access point	17 dBm / MHz
☐	Fixed point-to-point access points	17 dBm / MHz
☐	Client devices	11 dBm / MHz

Frequency Band (MHz)		Limit
☐	5250 ~ 5350	11 dBm / MHz
☐	5470 ~ 5725	11 dBm / MHz
☒	5725 ~ 5850	30 dBm / 500 kHz

3.4.2 Test Procedures

For 5150 ~ 5250 MHz

☐ Method SA-1

1. Set RBW = 1 MHz, VBW = 3 MHz, Sweep time = auto, Detector = RMS.
2. Trace average 100 traces.
3. Use the peak marker function to determine the maximum amplitude level.

☒ Method SA-2 Alternative

1. Set RBW = 1 MHz, VBW = 3 MHz, Detector = RMS.
2. Set sweep time $\geq 10 * (\text{number of points in sweep}) * (\text{total on/off period of the transmitted signal})$.
3. Perform a single sweep.
4. Use the peak marker function to determine the maximum amplitude level.
5. Add $10 \log(1/x)$, where x is the duty cycle.

For 5725 ~ 5850 MHz

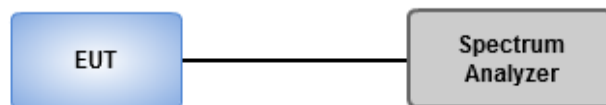
☐ Method SA-1

1. Set RBW = 500 kHz, VBW = 2 MHz, Sweep time = auto, Detector = RMS.
2. Trace average 100 traces.
3. Use the peak marker function to determine the maximum amplitude level.

☒ Method SA-2 Alternative

1. Set RBW = 500 kHz, VBW = 2 MHz, Detector = RMS.
2. Set sweep time $\geq 10 * (\text{number of points in sweep}) * (\text{total on/off period of the transmitted signal})$.
3. Perform a single sweep.
4. Use the peak marker function to determine the maximum amplitude level.
5. Add $10 \log(1/x)$, where x is the duty cycle.

3.4.3 Test Setup

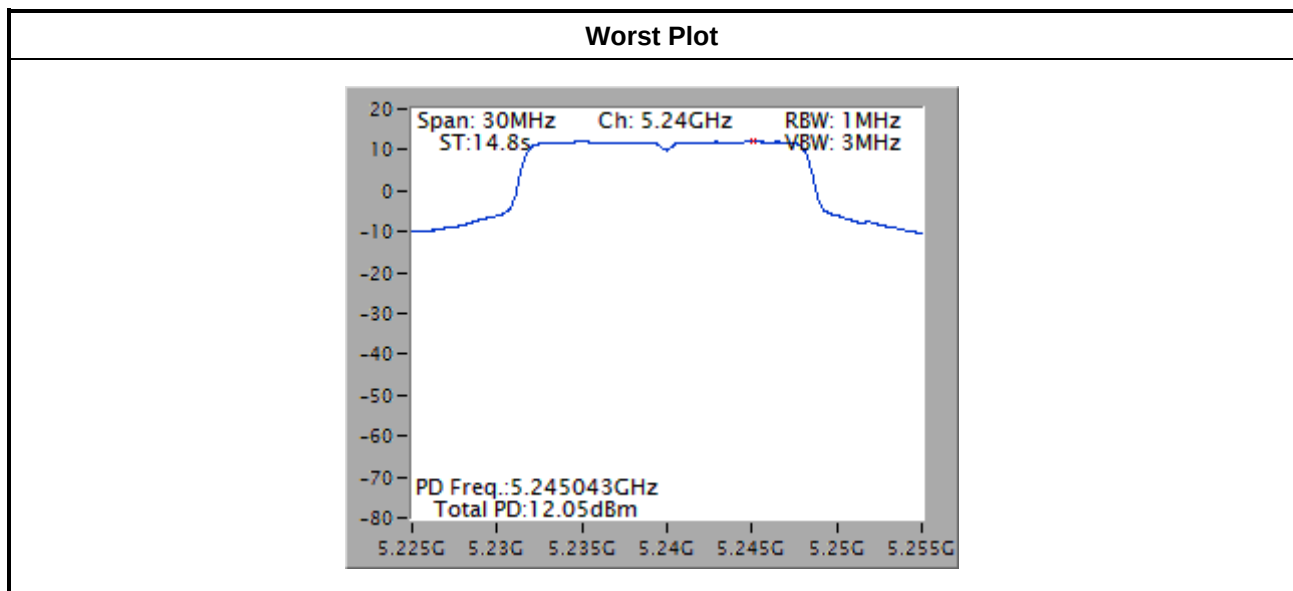


3.4.4 Test Result of Peak Power Spectral Density

For Frequency band 5150-5250 MHz						
Condition			Peak Power Spectral Density (dBm/MHz)			
Modulation Mode	N _{TX}	Freq. (MHz)	PPSD w/o D.F (dBm/MHz)	Duty Factor (dB)	PPSD with D.F (dBm/MHz)	PPSD Limit (dBm/MHz)
11a	3	5180	10.12	0.20	10.32	13.15
11a	3	5200	11.95	0.20	12.15	13.15
11a	3	5240	12.05	0.20	12.25	13.15
VHT20	3	5180	9.69	0.21	9.90	13.15
VHT20	3	5200	11.79	0.21	12.00	13.15
VHT20	3	5240	11.18	0.21	11.39	13.15
VHT40	3	5190	0.94	0.50	1.44	13.15
VHT40	3	5230	8.78	0.50	9.28	13.15
VHT80	3	5210	-4.72	0.97	-3.75	13.15

Note:

1. D.F is duty factor.
2. Test result is bin-by-bin summing measured value of each TX port.
3. Directional gain = $10 * \log((10^{4.21/20} + 10^{5.96/20} + 10^{4.99/20})^3 / 3) = 9.85 \text{ dBi} > 6 \text{ dBi}$
Limit shall be reduced to $17 \text{ dBm} - (9.85 \text{ dBi} - 6 \text{ dBi}) = 13.15 \text{ dBm}$.

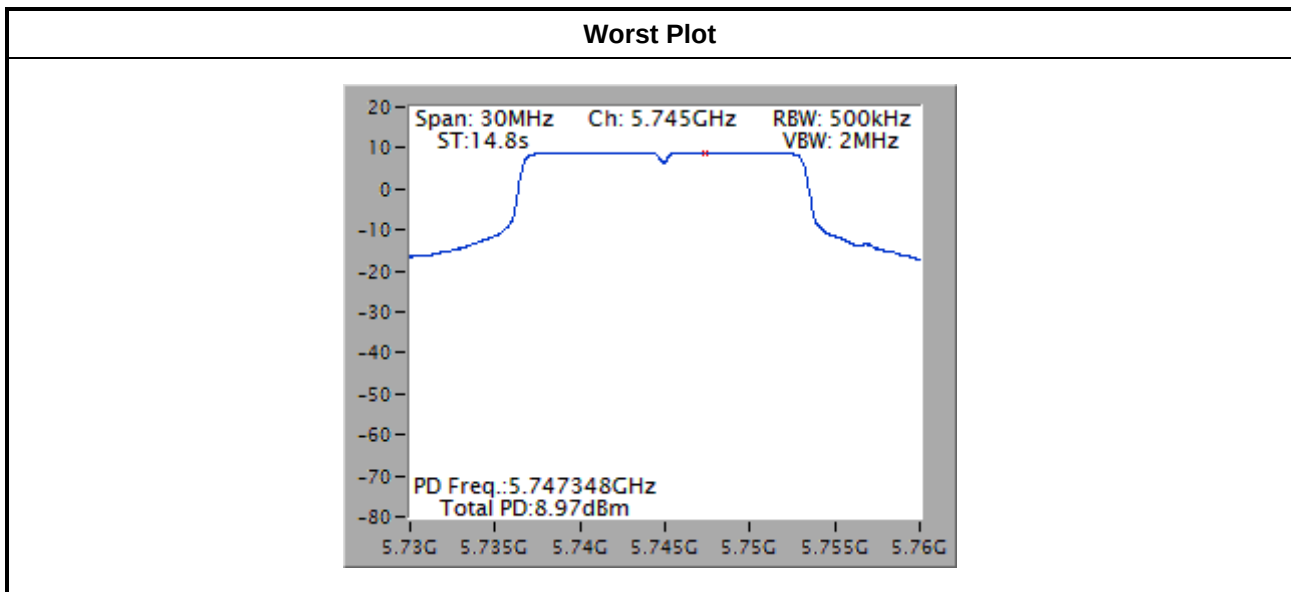


Note: The plot without duty factor.

For Frequency band 5725-5850 MHz						
Condition			Peak Power Spectral Density (dBm/500kHz)			
Modulation Mode	N _{TX}	Freq. (MHz)	PPSD w/o D.F (dBm/500kHz)	Duty Factor (dB)	PPSD with D.F (dBm/500kHz)	PPSD Limit (dBm/500kHz)
11a	3	5745	8.97	0.20	9.17	26.15
11a	3	5785	8.62	0.20	8.82	26.15
11a	3	5825	8.93	0.20	9.13	26.15
VHT20	3	5745	8.70	0.21	8.91	26.15
VHT20	3	5785	8.69	0.21	8.90	26.15
VHT20	3	5825	8.45	0.21	8.66	26.15
VHT40	3	5755	6.12	0.50	6.62	26.15
VHT40	3	5795	5.69	0.50	6.19	26.15
VHT80	3	5775	2.42	0.97	3.39	26.15

Note:

1. D.F is duty factor.
2. Test result is bin-by-bin summing measured value of each TX port.
3. Directional gain = $10 * \log((10^{4.21/20} + 10^{5.96/20} + 10^{4.99/20})^3 / 3) = 9.85 \text{ dBi} > 6 \text{ dBi}$
Limit shall be reduced to $30 \text{ dBm} - (9.85 \text{ dBi} - 6 \text{ dBi}) = 26.15 \text{ dBm}$.



Note: The plot without duty factor.

3.5 Transmitter Radiated and Band Edge Emissions

3.5.1 Limit of Transmitter Radiated and Band Edge Emissions

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

Un-restricted band emissions above 1GHz Limit		
Operating Band	Limit	
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]	
5.725 - 5.850 GHz	☒	15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
	☐	15.407(b)(4)(ii) ,compliance with the emission limits in § 15.247(d) Shall be at least 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power,. Attenuation below the general limits specified in §15.209(a) is not required. In addition,radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see § 15.205(c))

Note 1: Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

3.5.2 Test Procedures

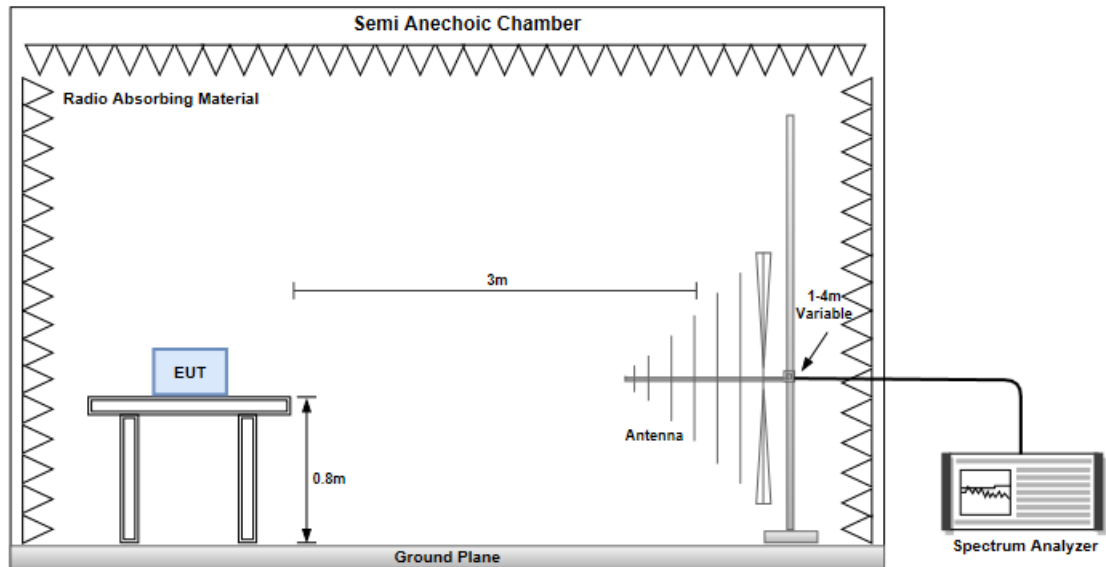
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360° . A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360° , the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

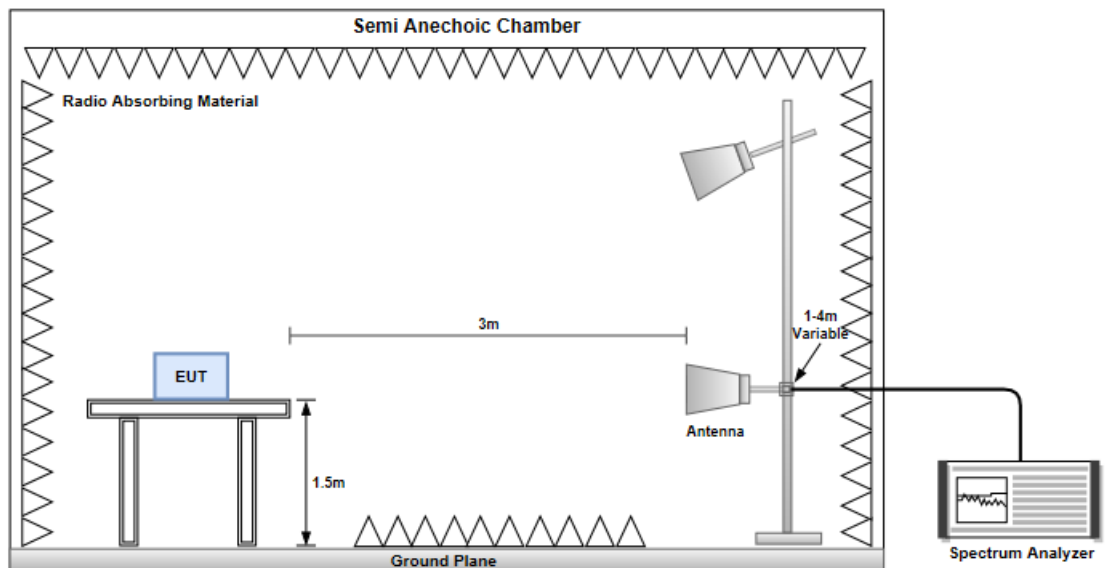
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.5.3 Test Setup

Radiated Emissions below 1 GHz



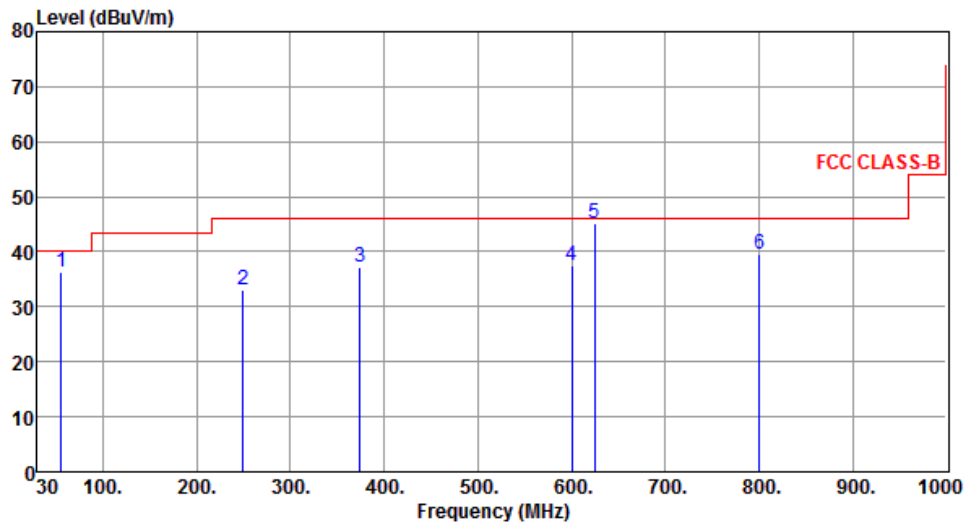
Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	VHT20	Test Freq. (MHz)	5240
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	VHT20	Test Freq. (MHz)	5240
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	55.22	36.17	40.00	-3.83	44.30	-8.13	QP	100	128
2	249.22	33.04	46.00	-12.96	42.42	-9.38	Peak	---	---
3	374.35	37.27	46.00	-8.73	42.97	-5.70	Peak	---	---
4	600.36	37.49	46.00	-8.51	38.21	-0.72	Peak	---	---
5	625.00	45.06	46.00	-0.94	45.50	-0.44	QP	100	62
6	800.18	39.53	46.00	-6.47	37.28	2.25	Peak	---	---

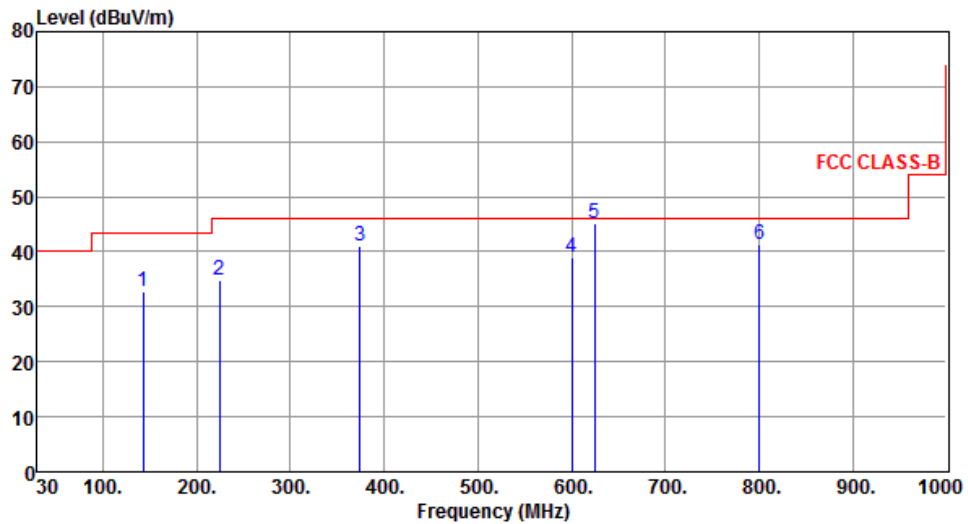
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	VHT40	Test Freq. (MHz)	5755
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	142.52	32.89	43.50	-10.61	41.47	-8.58	Peak	---	---
2	224.00	34.85	46.00	-11.15	45.47	-10.62	Peak	---	---
3	374.35	40.94	46.00	-5.06	46.64	-5.70	Peak	---	---
4	600.36	38.86	46.00	-7.14	39.58	-0.72	Peak	---	---
5	625.00	45.24	46.00	-0.76	45.68	-0.44	QP	128	58
6	800.18	41.36	46.00	-4.64	39.11	2.25	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	VHT40	Test Freq. (MHz)	5755
Polarization	Vertical		
Level (dBuV/m)			

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11a

Modulation	11a	Test Freq. (MHz)	5180
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		
Level (dBuV/m)			

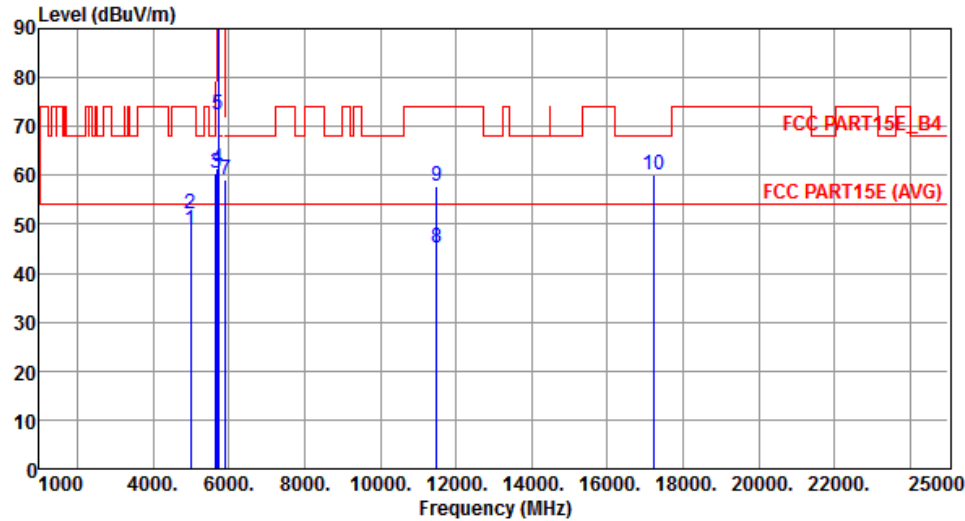
Modulation	11a	Test Freq. (MHz)	5200
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	11a	Test Freq. (MHz)	5200
Polarization	Vertical		
Level (dBuV/m)			

Modulation	11a	Test Freq. (MHz)	5240
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11a	Test Freq. (MHz)	5240
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	11a	Test Freq. (MHz)	5745
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	11a	Test Freq. (MHz)	5745						
Polarization	Vertical								
									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	48.79	54.00	-5.21	44.45	4.34	Average	225	3
2	5000.00	52.20	74.00	-21.80	47.86	4.34	Peak	225	3
3	5650.00	60.52	68.20	-7.68	55.33	5.19	Peak	300	21
4	5700.00	61.55	105.20	-43.65	56.27	5.28	Peak	300	21
5	5720.00	72.56	110.80	-38.24	67.25	5.31	Peak	300	21
6	5725.00	90.44	122.20	-31.76	85.12	5.32	Peak	300	21
7	5925.00	59.19	68.20	-9.01	53.55	5.64	Peak	300	21
8	11490.00	45.33	54.00	-8.67	30.51	14.82	Average	100	22
9	11490.00	57.64	74.00	-16.36	42.82	14.82	Peak	100	22
10	17235.00	60.09	68.20	-8.11	42.38	17.71	Peak	100	75

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11a	Test Freq. (MHz)	5785
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11a	Test Freq. (MHz)	5785
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	11a	Test Freq. (MHz)	5825
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11a	Test Freq. (MHz)	5825
Polarization	Vertical		
Level (dBuV/m)			

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT20

Modulation	VHT20	Test Freq. (MHz)	5180
Polarization	Horizontal		
Level (dBuV/m) <			

Modulation	VHT20	Test Freq. (MHz)	5180
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	VHT20	Test Freq. (MHz)	5200
Polarization	Horizontal		
Level (dBuV/m) <			

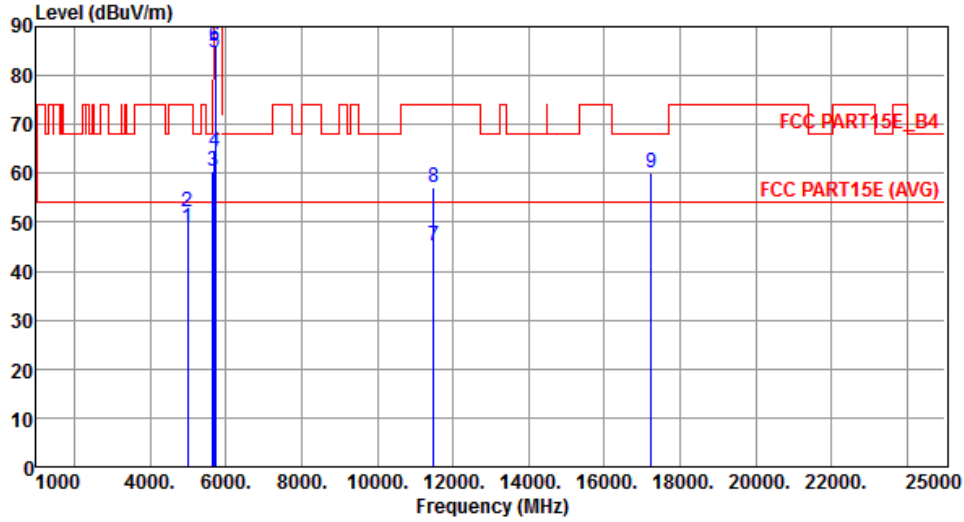
Modulation	VHT20	Test Freq. (MHz)	5200
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	VHT20	Test Freq. (MHz)	5240
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	VHT20	Test Freq. (MHz)	5240
Polarization	Vertical		
Level (dBuV/m) </			

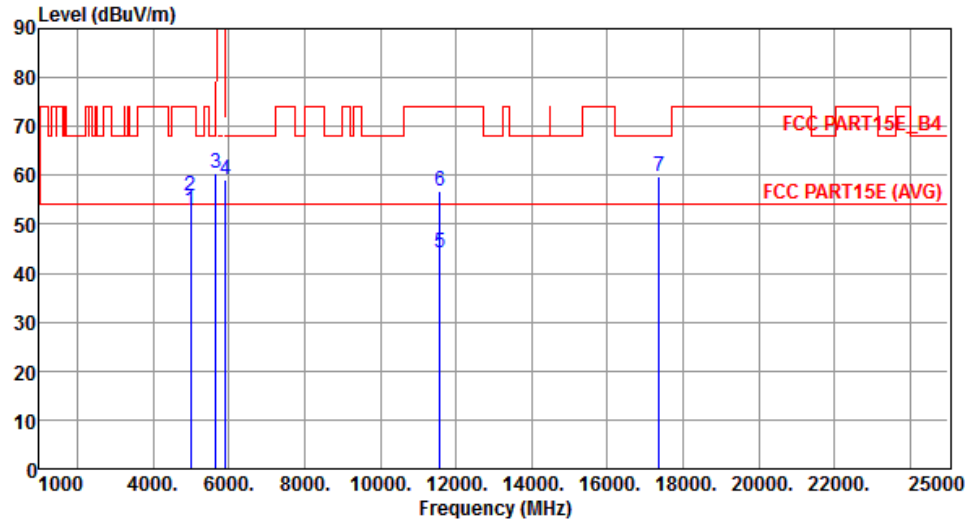
Modulation	VHT20	Test Freq. (MHz)	5745
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	VHT20	Test Freq. (MHz)	5745
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	48.87	54.00	-5.13	44.53	4.34	Average	225	4
2	5000.00	52.20	74.00	-21.80	47.86	4.34	Peak	225	4
3	5650.00	60.32	68.20	-7.88	55.13	5.19	Peak	310	8
4	5700.00	64.59	105.20	-40.61	59.31	5.28	Peak	310	8
5	5720.00	84.55	110.80	-26.25	79.24	5.31	Peak	310	8
6	5725.00	85.95	122.20	-36.25	80.63	5.32	Peak	310	8
7	11490.00	45.06	54.00	-8.94	30.24	14.82	Average	100	12
8	11490.00	56.98	74.00	-17.02	42.16	14.82	Peak	100	12
9	17235.00	60.14	68.20	-8.06	42.43	17.71	Peak	100	91

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

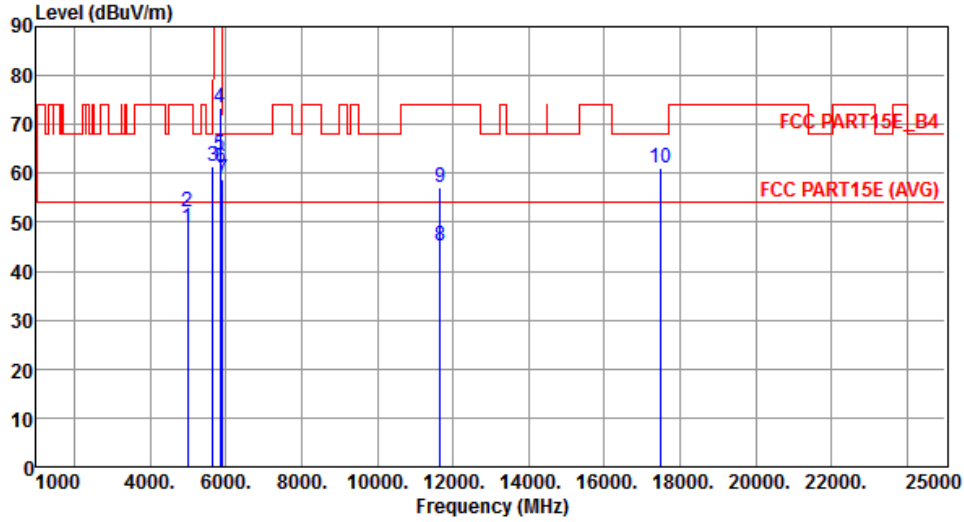
Modulation	VHT20	Test Freq. (MHz)	5785						
Polarization	Horizontal								
									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	52.95	54.00	-1.05	48.61	4.34	Average	297	40
2	5000.00	55.65	74.00	-18.35	51.31	4.34	Peak	297	40
3	5650.00	60.43	68.20	-7.77	55.24	5.19	Peak	100	58
4	5925.00	59.12	68.20	-9.08	53.48	5.64	Peak	100	58
5	11570.00	44.15	54.00	-9.85	29.51	14.64	Average	100	249
6	11570.00	56.85	74.00	-17.15	42.21	14.64	Peak	100	249
7	17355.00	59.68	68.20	-8.52	41.67	18.01	Peak	100	122

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	VHT20	Test Freq. (MHz)	5785
Polarization	Vertical		
Level (dBuV/m)			

Modulation	VHT20	Test Freq. (MHz)	5825
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation	VHT20	Test Freq. (MHz)	5825
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	48.79	54.00	-5.21	44.45	4.34	Average	220	4
2	5000.00	52.20	74.00	-21.80	47.86	4.34	Peak	220	4
3	5650.00	61.54	68.20	-6.66	56.35	5.19	Peak	315	16
4	5850.00	73.37	122.20	-48.83	67.85	5.52	Peak	315	16
5	5855.00	63.88	110.80	-46.92	58.35	5.53	Peak	315	16
6	5875.00	61.04	105.20	-44.16	55.48	5.56	Peak	315	16
7	5925.00	58.89	68.20	-9.31	53.25	5.64	Peak	315	16
8	11650.00	45.07	54.00	-8.93	30.63	14.44	Average	100	10
9	11650.00	57.09	74.00	-16.91	42.65	14.44	Peak	100	10
10	17475.00	61.15	68.20	-7.05	42.86	18.29	Peak	100	116

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT40

Modulation	VHT40	Test Freq. (MHz)	5190
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	VHT40	Test Freq. (MHz)	5190
Polarization	Vertical		
Level (dBuV/m)			

Modulation	VHT40	Test Freq. (MHz)	5230
Polarization	Horizontal		
Level (dBuV/m) </			

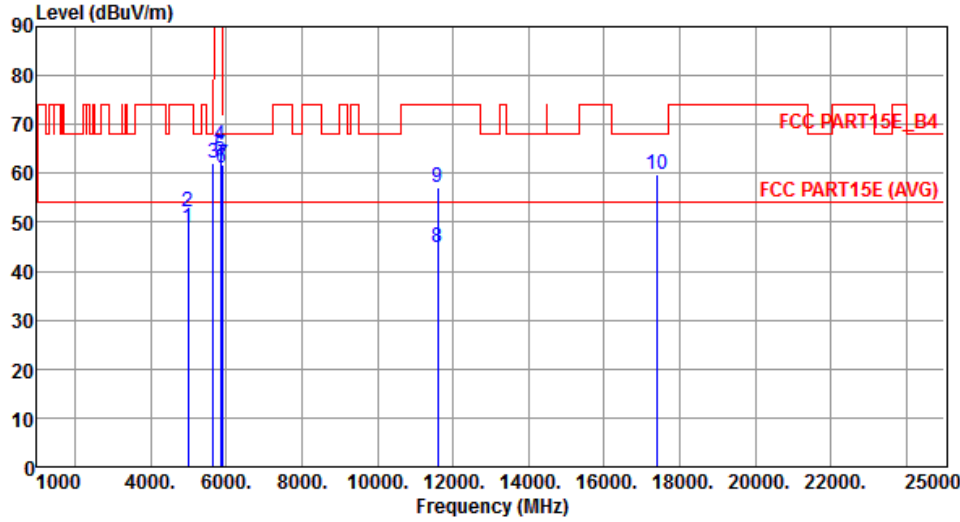
Modulation	VHT40	Test Freq. (MHz)	5230
Polarization	Vertical		
Level (dBuV/m)			

Modulation	VHT40	Test Freq. (MHz)	5755
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	VHT40	Test Freq. (MHz)	5755
Polarization	Vertical		
Level (dBuV/m)			

Modulation	VHT40	Test Freq. (MHz)	5795
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	VHT40	Test Freq. (MHz)	5795
Polarization	Vertical		

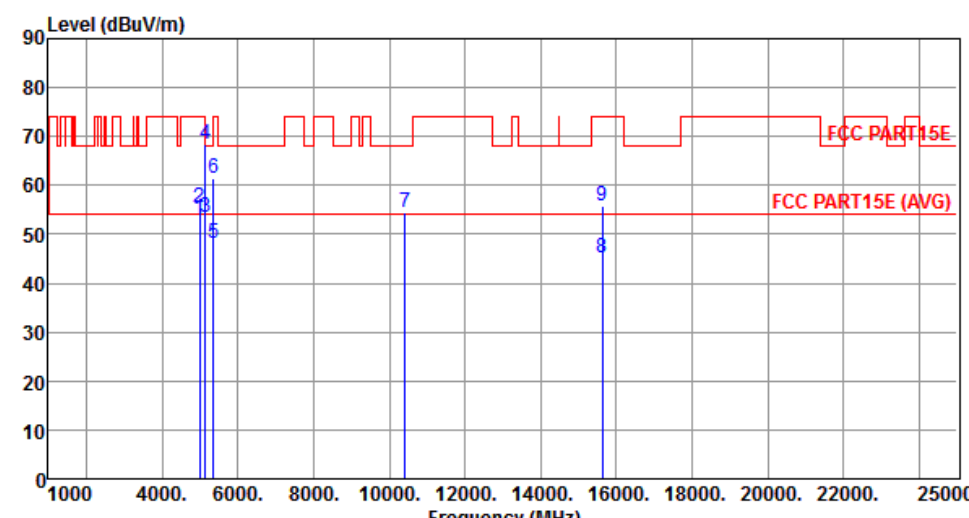


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	48.84	54.00	-5.16	44.50	4.34	Average	222	6
2	5000.00	52.19	74.00	-21.81	47.85	4.34	Peak	222	6
3	5650.00	61.94	68.20	-6.26	56.75	5.19	Peak	322	16
4	5850.00	65.90	122.20	-56.30	60.38	5.52	Peak	322	16
5	5855.00	63.35	110.80	-47.45	57.82	5.53	Peak	322	16
6	5875.00	60.99	105.20	-44.21	55.43	5.56	Peak	322	16
7	5925.00	61.76	68.20	-6.44	56.12	5.64	Peak	322	16
8	11590.00	44.75	54.00	-9.25	30.16	14.59	Average	100	8
9	11590.00	57.05	74.00	-16.95	42.46	14.59	Peak	100	8
10	17385.00	59.71	68.20	-8.49	41.64	18.07	Peak	100	105

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT80

Modulation	VHT80	Test Freq. (MHz)	5210
Polarization	Horizontal		



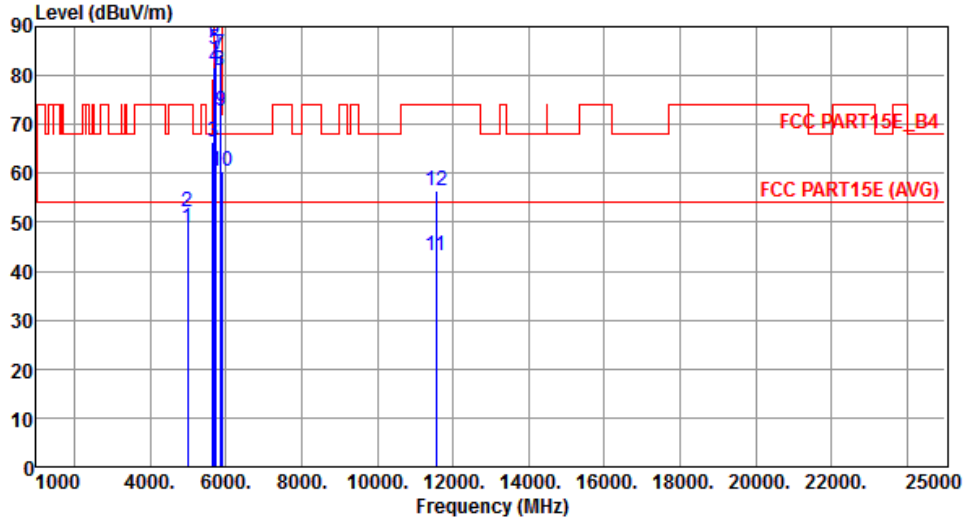
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	52.99	54.00	-1.01	48.65	4.34	Average	294	40
2	5000.00	55.62	74.00	-18.38	51.28	4.34	Peak	294	40
3	5150.00	53.43	54.00	-0.57	48.95	4.48	Average	270	295
4	5150.00	68.43	74.00	-5.57	63.95	4.48	Peak	270	295
5	5350.00	48.05	54.00	-5.95	43.31	4.74	Average	270	295
6	5350.00	61.46	74.00	-12.54	56.72	4.74	Peak	270	295
7	10420.00	54.45	68.20	-13.75	40.58	13.87	Peak	100	241
8	15630.00	45.30	54.00	-8.70	31.05	14.25	Average	100	36
9	15630.00	55.80	74.00	-18.20	41.55	14.25	Peak	100	36

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	VHT80	Test Freq. (MHz)	5210
Polarization	Vertical		
Level (dBuV/m)			

Modulation	VHT80	Test Freq. (MHz)	5775
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation	VHT80	Test Freq. (MHz)	5775
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5000.00	48.86	54.00	-5.14	44.52	4.34	Average	222	4
2	5000.00	52.21	74.00	-21.79	47.87	4.34	Peak	222	4
3	5650.00	66.44	68.20	-1.76	61.25	5.19	Peak	338	10
4	5700.00	81.66	105.20	-23.54	76.38	5.28	Peak	338	10
5	5720.00	85.43	110.80	-25.37	80.12	5.31	Peak	330	10
6	5725.00	87.25	122.20	-34.95	81.93	5.32	Peak	338	10
7	5850.00	84.35	122.20	-37.85	78.83	5.52	Peak	338	10
8	5855.00	81.11	110.80	-29.69	75.58	5.53	Peak	338	10
9	5875.00	72.81	105.20	-32.39	67.25	5.56	Peak	338	10
10	5925.00	60.60	68.20	-7.60	54.96	5.64	Peak	338	10
11	11550.00	43.32	54.00	-10.68	28.63	14.69	Average	100	191
12	11550.00	56.31	74.00	-17.69	41.62	14.69	Peak	100	191

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.6 Frequency Stability

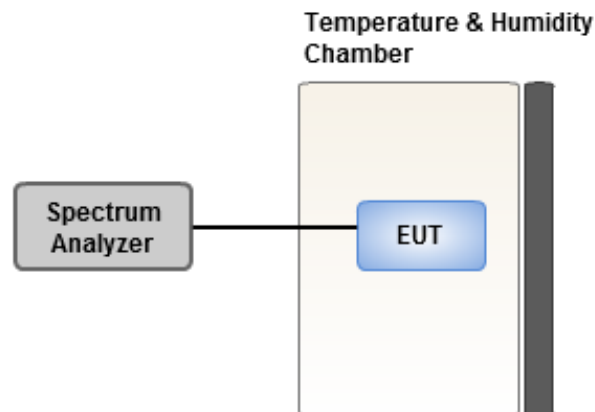
3.6.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

3.6.2 Test Procedures

1. The EUT is installed in an environment test chamber with external power source.
2. Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT.
3. A sufficient stabilization period at each temperature is used prior to each frequency measurement.
4. When temperature is stabled, measure the frequency stability.
5. The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage. Change setting of chamber and external power source to complete all conditions.

3.6.3 Test Setup



3.6.4 Test Result of Frequency Stability

Frequency: 5200 MHz	Frequency Drift (ppm)			
Temperature (°C)	0 minute	2 minutes	5 minutes	10 minutes
T20°C Vmax	5.61	6.21	5.64	5.72
T20°C Vmin	4.54	5.06	4.47	4.49
T50°C Vnom	3.40	3.41	3.81	3.21
T40°C Vnom	3.68	3.37	4.02	3.60
T30°C Vnom	3.13	3.09	3.76	3.59
T20°C Vnom	2.70	3.41	2.47	3.49
T10°C Vnom	2.45	1.97	2.71	2.75
T0°C Vnom	1.72	1.70	2.01	2.62
T-10°C Vnom	1.63	1.65	1.89	2.38
T-20°C Vnom	0.85	0.63	1.47	0.80
T-30°C Vnom	-0.06	-0.11	0.39	-0.30
Vnom [Vac]: 120		Vmax [Vac]: 138		Vmin [Vac]: 102
Tnom [°C]: 20		Tmax [°C]: 50		Tmin [°C]: -30

Frequency: 5785 MHz	Frequency Drift (ppm)			
Temperature (°C)	0 minute	2 minutes	5 minutes	10 minutes
T20°C Vmax	4.66	4.78	5.24	4.95
T20°C Vmin	4.01	4.16	4.33	3.97
T50°C Vnom	3.73	3.70	3.35	4.05
T40°C Vnom	3.08	3.53	3.83	3.11
T30°C Vnom	2.90	2.71	2.91	3.17
T20°C Vnom	2.67	3.15	2.87	2.19
T10°C Vnom	2.39	3.12	2.66	2.39
T0°C Vnom	2.72	2.94	3.01	2.90
T-10°C Vnom	1.46	1.32	1.56	1.79
T-20°C Vnom	1.45	1.41	2.07	1.37
T-30°C Vnom	1.39	1.78	1.81	1.61
Vnom [Vac]: 120		Vmax [Vac]: 138		Vmin [Vac]: 102
Tnom [°C]: 20		Tmax [°C]: 50		Tmin [°C]: -30

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

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