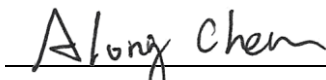


FCC C2PC Test Report

FCC ID : SWX-UAPACPRO
Equipment : UniFi® AC Access Point
Model No. : UAP-AC-PRO
Brand Name : UBIQUITI
Applicant : Ubiquiti Networks, Inc.
Address : 2580 Orchard Parkway, San Jose, California,
United States 95131
Standard : 47 CFR FCC Part 15.407
Received Date : Feb. 09, 2017
Tested Date : Feb. 10 ~ Feb. 13, 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



Testing Laboratory
2732

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Release Record

Report No.	Version	Description	Issued Date
FR720901	Rev. 01	Initial issue	Feb. 16, 2017
FR720901	Rev. 02	Modified EIRP table	Feb. 20, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.532MHz 42.50 (Margin -3.50dB) - AV	Pass
15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 5150.00MHz 52.99 (Margin -1.01dB) - AV	Pass
15.407(a)	Emission Bandwidth	Meet the requirement of limit	Pass
15.407(a)	RF Output Power	Max Power [dBm]: 17.78	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

This report is issued as a FCC Class II Permissive Change .The modifications are concerned with following:

✧ Application for outdoor used

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.

1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	Dual-Band Antennas	3.00	N/A	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	48Vdc from POE
-------------------	----------------

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	POE	Brand Name: UBIQUITI Model Name: GP-H480-050G Power Rating: I/P: 100-120Vac, 50/60Hz, 0.75A O/P: 48Vdc, 0.5A Power Line: 0.68m 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

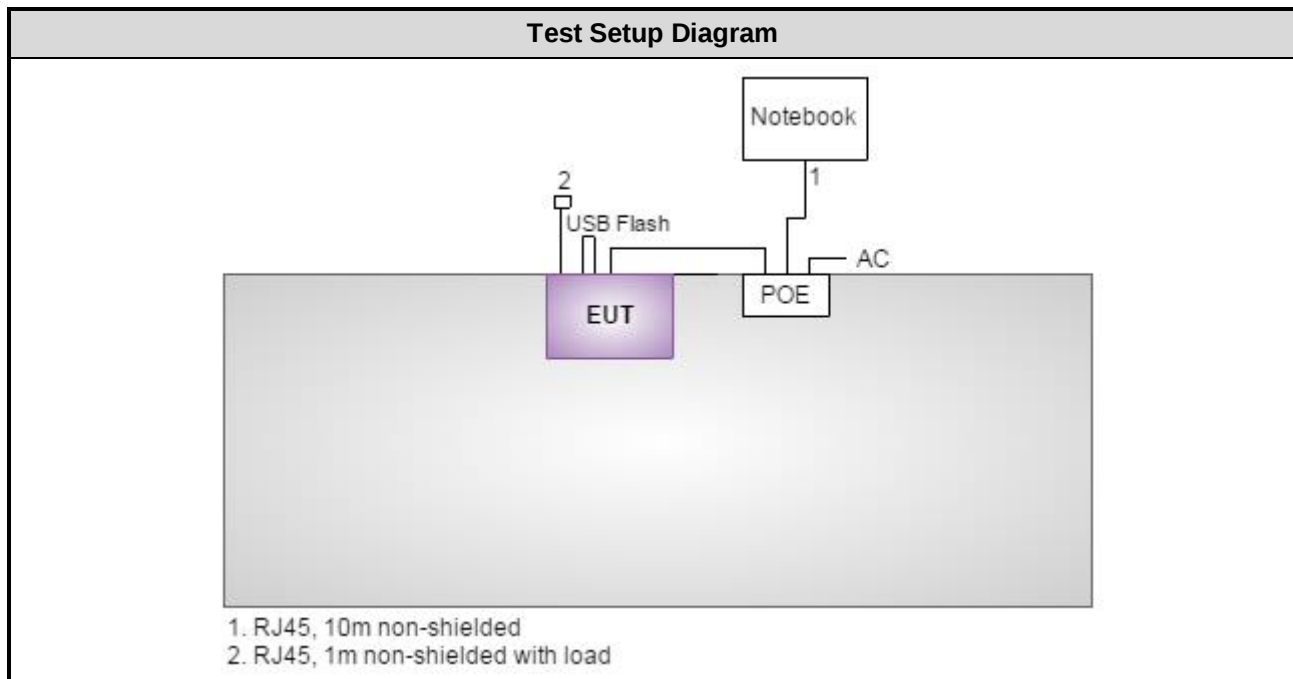
1.1.6 Test Tool and Duty Cycle

Test Tool	Telnet		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11a	96.80	0.14
	VHT20	96.98	0.13
	VHT40	91.53	0.38
	VHT80	86.56	0.63

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	RJ45, 10m non-shielded.
2	Flash	Kingston	DTSE9	---	---

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-BM-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 chamber3 / (03CH03-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 09, 2016	Sep. 08, 2017
Receiver	Agilent	N9038A	MY53290044	Oct. 06, 2016	Oct. 05, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 26, 2016	Apr. 25, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 09, 2017	Feb. 08, 2018
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	980187	Sep. 08, 2016	Sep. 07, 2017
Preamplifier	Agilent	83017A	MY53270014	Aug. 22, 2016	Aug. 21, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 04, 2017	Feb. 03, 2018
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 04, 2017	Feb. 03, 2018
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 04, 2017	Feb. 03, 2018
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 04, 2017	Feb. 03, 2018
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 04, 2017	Feb. 03, 2018
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 04, 2017	Feb. 03, 2018
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	Feb. 17, 2016	Feb. 16, 2017
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 v01r03

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

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

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 ≤ 1 GHz	± 3.66 dB
Radiated emission > 1 GHz	± 5.37 dB
Time	$\pm 0.1\%$
Temperature	± 0.6 °C

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	16°C / 61%	Howard Huang
Radiated Emissions	03CH01-WS	20°C / 64%	Aska Huang
RF Conducted	TH01-WS	22°C / 64%	Brad Wu

- FCC Designation.: TW0009
- FCC site registration No.: 207696
- IC site registration No.: 10807C-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	11a	5240	6 Mbps	---
Radiated Emissions ≤1GHz	11a	5240	6 Mbps	---
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 >1GHz 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	---	---
Note: The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.				

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

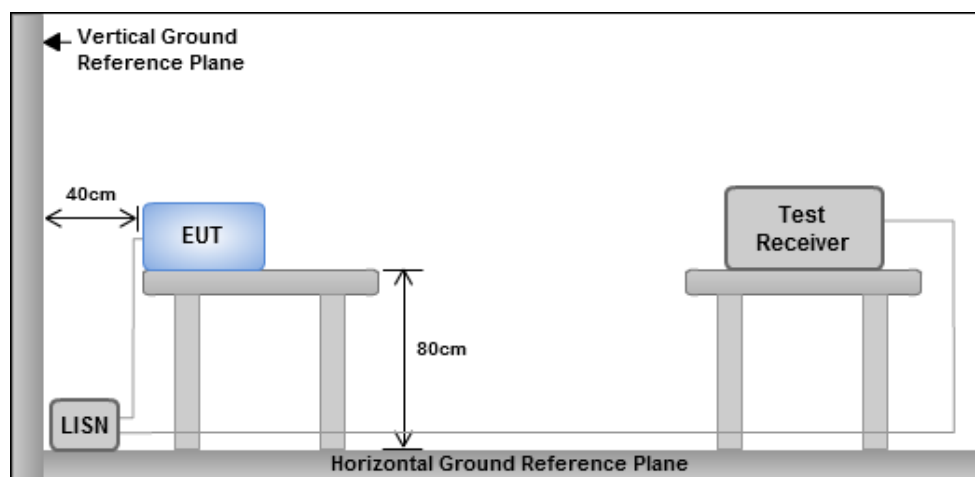
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

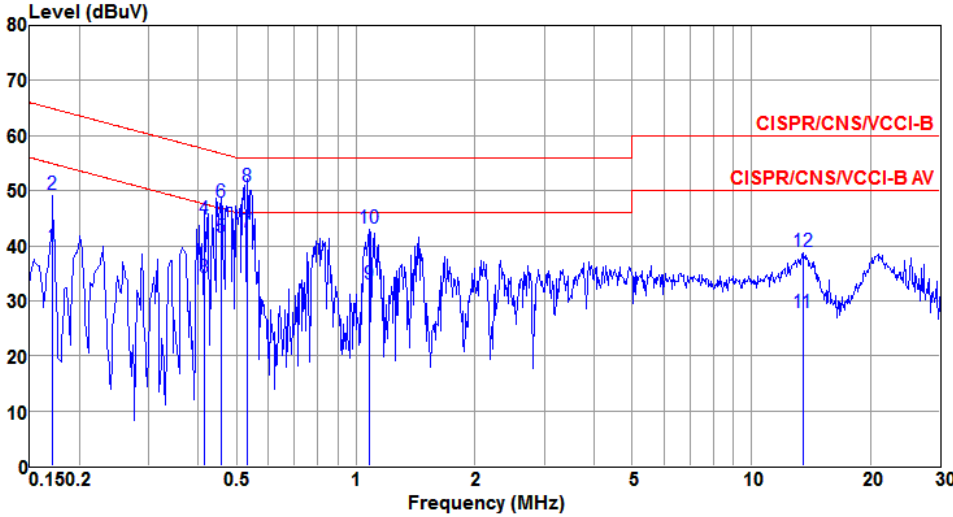
3.1.3 Test Setup



- 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	11a	Test Freq. (MHz)	5240
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.171	39.98	54.90	-14.92	39.88	0.08	0.02	Average
2	0.171	49.23	64.90	-15.67	49.13	0.08	0.02	QP
3	0.415	34.27	47.55	-13.28	34.18	0.06	0.03	Average
4	0.415	44.92	57.55	-12.63	44.83	0.06	0.03	QP
5	0.456	41.53	46.76	-5.23	41.44	0.06	0.03	Average
6	0.456	47.91	56.76	-8.85	47.82	0.06	0.03	QP
7	0.532	42.50	46.00	-3.50	42.40	0.06	0.04	Average
8	0.532	50.79	56.00	-5.21	50.69	0.06	0.04	QP
9	1.082	33.10	46.00	-12.90	32.96	0.08	0.06	Average
10	1.082	43.08	56.00	-12.92	42.94	0.08	0.06	QP
11	13.479	27.77	50.00	-22.23	27.29	0.28	0.20	Average
12	13.479	38.90	60.00	-21.10	38.42	0.28	0.20	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	11a	Test Freq. (MHz)	5240
Power Phase	Neutral		
Level (dBuV) <			

3.2 Emission Bandwidth

3.2.1 Test Procedures

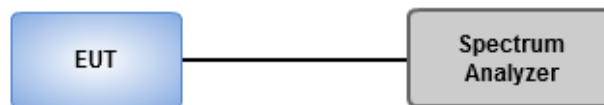
26dB Bandwidth

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

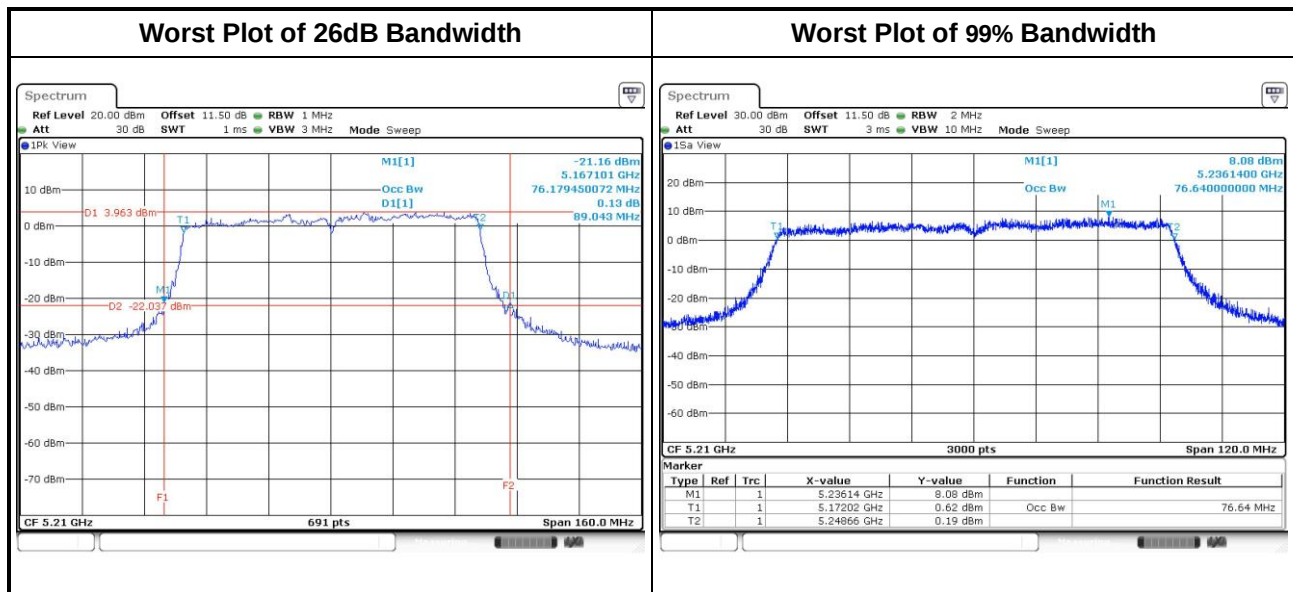
1. Set RBW = 1 % to 5 % of the OBW
2. Set VBW $\geq$ 3 RBW
3. Sample detection and single sweep mode shall be used
4. Use the 99 % power bandwidth function of the instrument

3.2.2 Test Setup



3.2.3 Test Result of Emission Bandwidth

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	22.49	22.38	22.32	---	16.82	16.69	16.69	---
11a	3	5200	22.67	22.67	21.45	---	16.81	16.70	16.68	---
11a	3	5240	22.20	22.32	22.38	---	16.71	16.69	16.64	---
VHT20	3	5180	22.67	22.84	23.07	---	17.66	17.80	17.90	---
VHT20	3	5200	22.03	22.96	23.48	---	18.06	17.92	17.85	---
VHT20	3	5240	21.80	23.25	22.90	---	17.72	17.88	17.79	---
VHT40	3	5190	45.45	46.03	44.87	---	36.42	36.80	36.82	---
VHT40	3	5230	44.75	45.45	46.73	---	36.48	36.72	36.88	---
VHT80	3	5210	88.81	87.19	89.04	---	76.60	76.40	76.64	---



3.3 RF Output Power

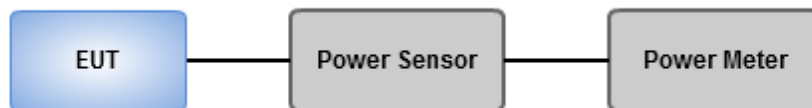
3.3.1 Limit of RF Output Power

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
☐	Mobile and portable client devices	Conducted Power: 250 mW

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			
11a	3	5180	13.35	12.43	13.08	59.449	17.74	30
11a	3	5200	13.41	12.58	12.92	59.630	17.75	30
11a	3	5240	13.11	13.16	12.76	60.046	17.78	30
HT20	3	5180	13.02	12.31	12.92	56.655	17.53	30
HT20	3	5200	13.04	12.43	13.04	57.773	17.62	30
HT20	3	5240	13.01	12.96	12.72	58.475	17.67	30
HT40	3	5190	12.91	12.16	12.78	54.954	17.40	30
HT40	3	5230	13.21	12.42	12.51	56.223	17.50	30
VHT20	3	5180	13.13	12.43	13.00	58.010	17.64	30
VHT20	3	5200	13.16	12.55	13.10	59.108	17.72	30
VHT20	3	5240	13.12	13.04	12.81	59.747	17.76	30
VHT40	3	5190	13.00	12.25	12.92	56.329	17.51	30
VHT40	3	5230	13.33	12.51	12.62	57.633	17.61	30
VHT80	3	5210	11.05	10.65	10.68	36.045	15.57	30

3.3.5 Test Result of maximum E.I.R.P at any elevation angle above 30 degrees

Mode	N _{TX}	Freq. (MHz)	Conducted Power of each antenna port (dBm)		Maximum Gain above 30° (dBi)	E.I.R.P Power above 30° (dBm)	Total E.I.R.P above 30° (dBm)	E.I.R.P Limit (dBm)
11a	3	5180	Chain 0	13.35	3	16.35	20.74	21
			Chain 1	12.43	3	15.43		
			Chain 2	13.08	3	16.08		
	3	5200	Chain 0	13.41	3	16.41	20.75	21
			Chain 1	12.58	3	15.58		
			Chain 2	12.92	3	15.92		
	3	5240	Chain 0	13.11	3	13.11	20.78	21
			Chain 1	13.16	3	13.16		
			Chain 2	12.76	3	12.76		
HT20	3	5180	Chain 0	13.02	3	16.02	20.53	21
			Chain 1	12.31	3	15.31		
			Chain 2	12.92	3	15.92		
	3	5200	Chain 0	13.04	3	16.04	20.62	21
			Chain 1	12.43	3	15.43		
			Chain 2	13.04	3	16.04		
	3	5240	Chain 0	13.01	3	16.01	20.67	21
			Chain 1	12.96	3	15.96		
			Chain 2	12.72	3	15.72		
HT40	3	5190	Chain 0	12.91	3	15.91	20.40	21
			Chain 1	12.16	3	15.16		
			Chain 2	12.78	3	15.78		
	3	5230	Chain 0	13.21	3	16.21	20.50	21
			Chain 1	12.42	3	15.42		
			Chain 2	12.51	3	15.51		
VHT20	3	5180	Chain 0	13.13	3	16.13	20.64	21
			Chain 1	12.43	3	15.43		
			Chain 2	13.00	3	16.00		
	3	5200	Chain 0	13.16	3	16.16	20.72	21
			Chain 1	12.55	3	15.55		
			Chain 2	13.10	3	16.10		
	3	5240	Chain 0	13.12	3	16.12	20.76	21
			Chain 1	13.04	3	16.04		
			Chain 2	12.81	3	15.81		

Mode	N _{TX}	Freq. (MHz)	Measured value of each antenna port (dBm)		Gain above 30° (dB)	E.I.R.P Power above 30° (dBm)	Total E.I.R.P above 30° (dBm)	E.I.R.P Limit (dBm)
VHT40	3	5190	Chain 0	13.00	3	16.00	20.51	21
			Chain 1	12.25	3	15.25		
			Chain 2	12.92	3	15.92		
	3	5230	Chain 0	13.33	3	16.33	20.61	21
			Chain 1	12.51	3	15.51		
			Chain 2	12.62	3	15.62		
VHT80	3	5210	Chain 0	11.05	3	14.05	18.57	21
			Chain 1	10.65	3	13.65		
			Chain 2	10.68	3	13.68		

3.4 Peak Power Spectral Density

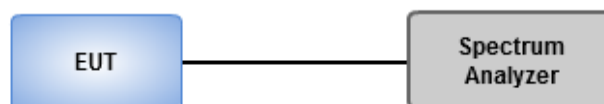
3.4.1 Limit of Peak Power Spectral Density

Operating Mode		Limit
☒	Outdoor access point	17 dBm / MHz
☐	Indoor access point	17 dBm / MHz
☐	Fixed point-to-point access points	17 dBm / MHz
☐	Mobile and portable client devices	11 dBm / MHz

3.4.2 Test Procedures

- ☐ 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 $\geq 10 \times (\text{number of points in sweep}) \times (\text{total on/off period of the transmitted signal})$.
 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

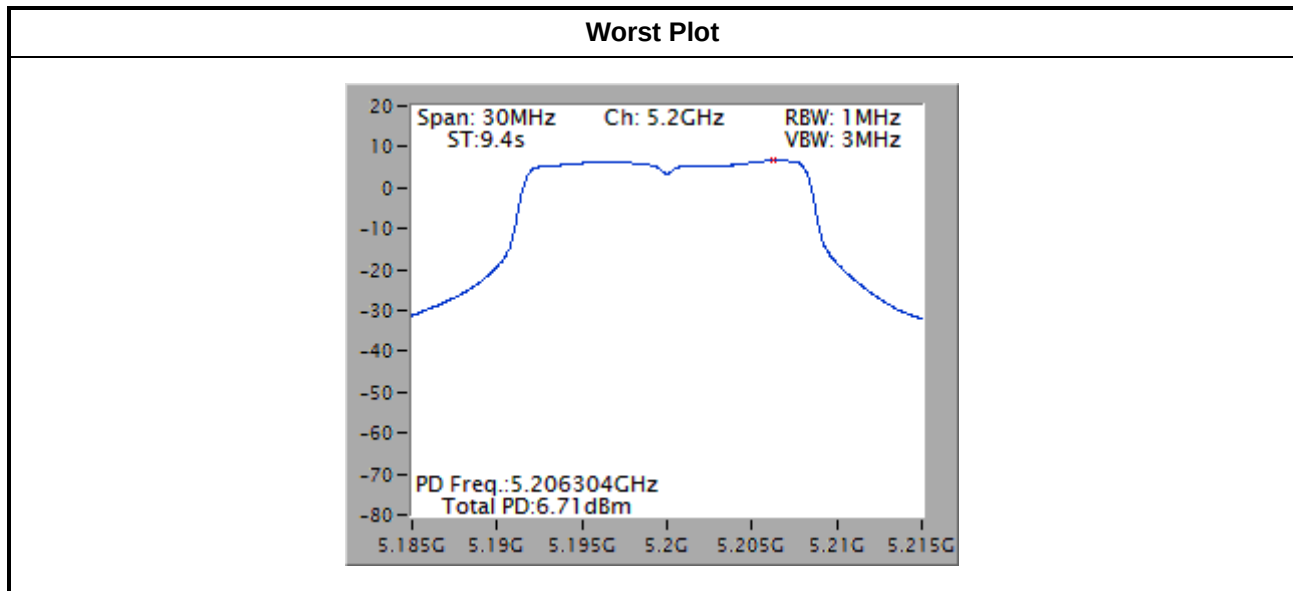


3.4.4 Test Result of Peak Power Spectral Density

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	6.24	0.14	6.38	15.23
11a	3	5200	6.71	0.14	6.85	15.23
11a	3	5240	6.70	0.14	6.84	15.23
VHT20	3	5180	5.85	0.13	5.98	15.23
VHT20	3	5200	6.23	0.13	6.36	15.23
VHT20	3	5240	6.32	0.13	6.45	15.23
VHT40	3	5190	2.25	0.38	2.63	15.23
VHT40	3	5230	2.65	0.38	3.03	15.23
VHT80	3	5210	-2.58	0.63	-1.95	15.23

Note:

1. D.F is duty factor.
2. Test result is bin-by-bin summing measured value of each TX port.
3. Directional gain = $3 + 10 \cdot \log(3/1) = 7.77 \text{ dBi} > 6 \text{ dBi}$.
Limit shall be reduced to $17 \text{ dBm} - (7.77 \text{ dBi} - 6 \text{ dBi}) = 15.23 \text{ dBm}$.



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]

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

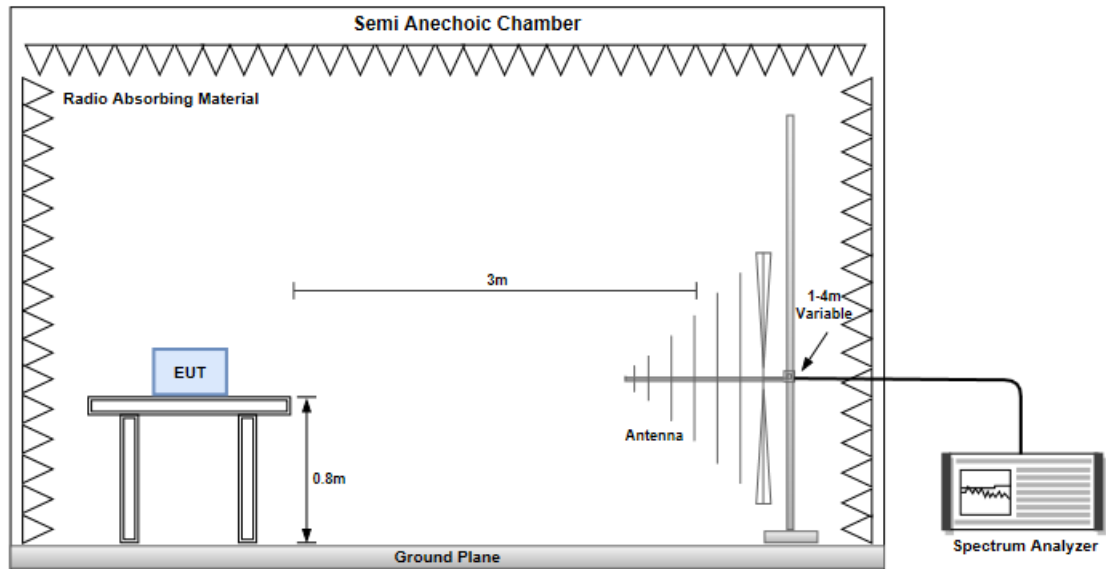
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

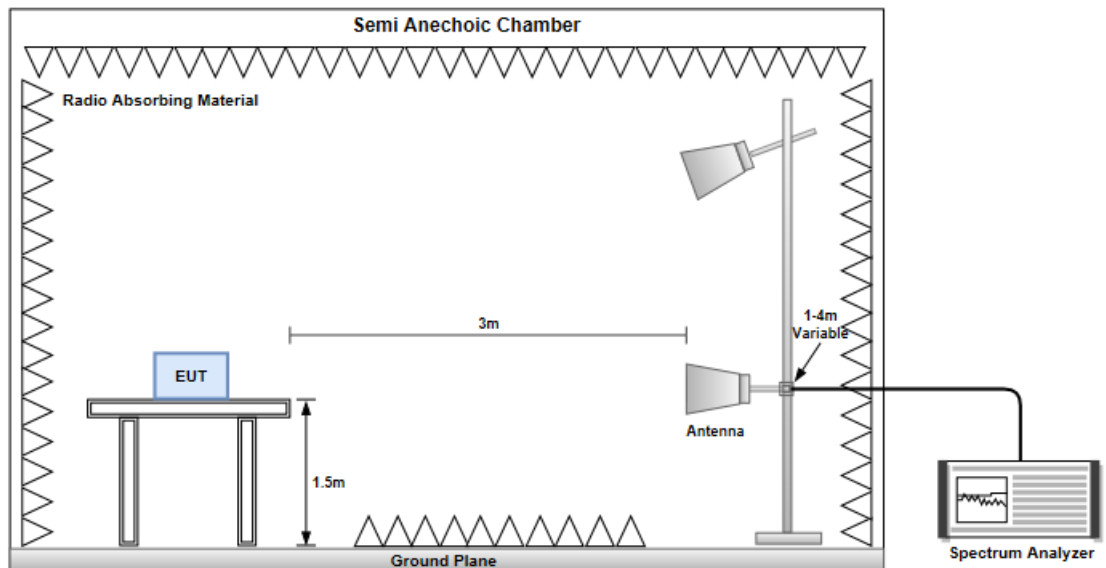
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 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	11a	Test Freq. (MHz)	5240
Polarization	Horizontal		
Level (dBuV/m)			

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

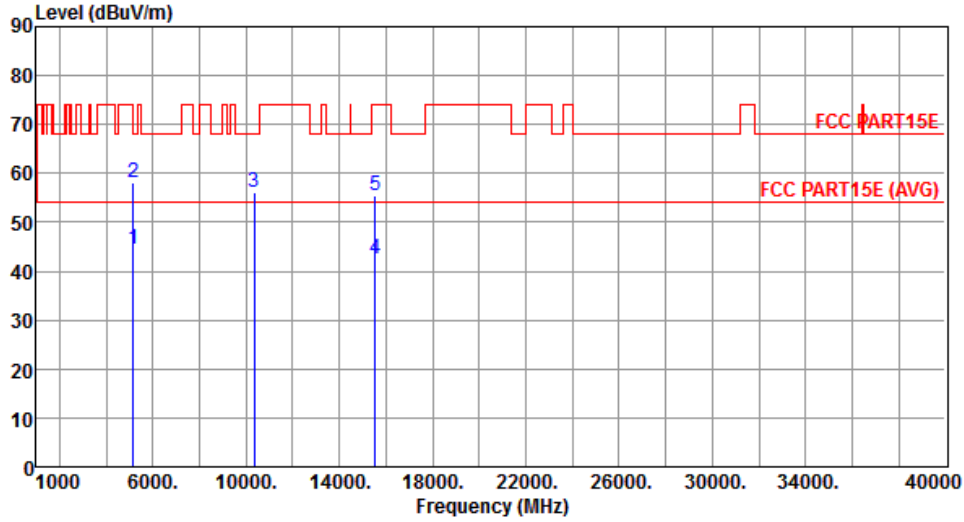
3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11a

Modulation	11a	Test Freq. (MHz)	5180
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	5150.00	44.70	54.00	-9.30	39.68	5.02	Average	100	320
2	5150.00	58.12	74.00	-15.88	53.10	5.02	Peak	100	320
3	10360.00	54.23	68.20	-13.97	40.49	13.74	Peak	100	149
4	15540.00	42.65	54.00	-11.35	27.68	14.97	Average	100	153
5	15540.00	55.50	74.00	-18.50	40.53	14.97	Peak	100	153

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).

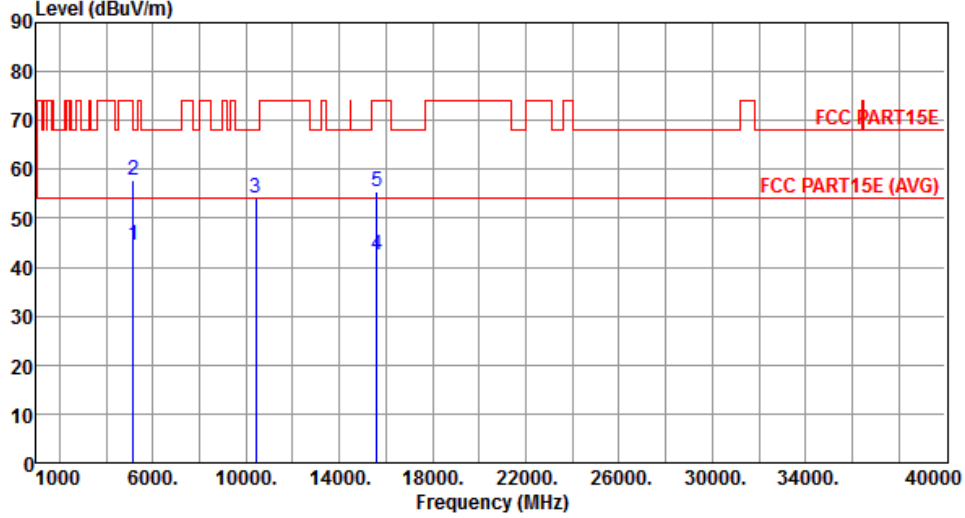
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	44.40	54.00	-9.60	39.38	5.02	Average	256	45
2	5150.00	58.26	74.00	-15.74	53.24	5.02	Peak	256	45
3	10360.00	56.03	68.20	-12.17	42.29	13.74	Peak	248	321
4	15540.00	42.37	54.00	-11.63	27.40	14.97	Average	222	142
5	15540.00	55.35	74.00	-18.65	40.38	14.97	Peak	222	142

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).

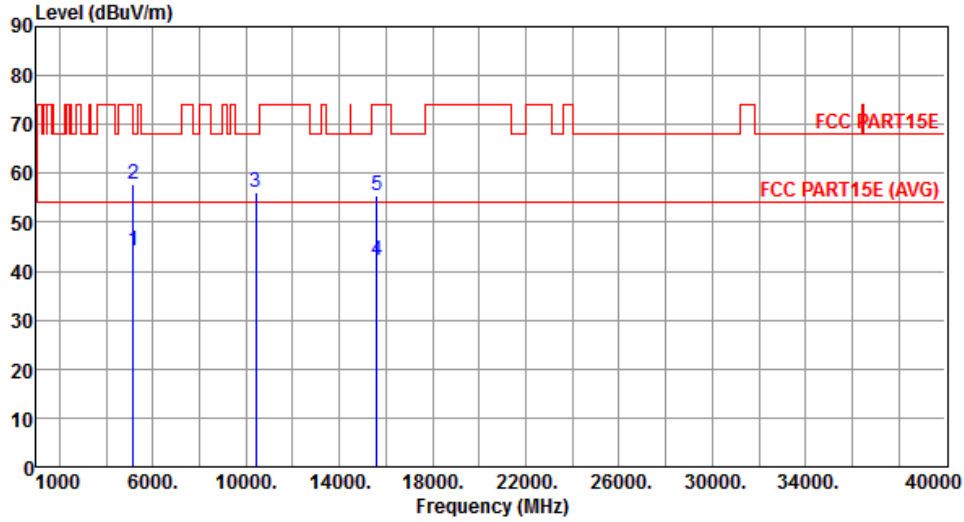
Modulation	11a	Test Freq. (MHz)	5200
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	44.57	54.00	-9.43	39.55	5.02	Average	100	318
2	5150.00	57.88	74.00	-16.12	52.86	5.02	Peak	100	318
3	10400.00	54.01	68.20	-14.19	40.24	13.77	Peak	100	171
4	15600.00	42.58	54.00	-11.42	27.64	14.94	Average	100	155
5	15600.00	55.31	74.00	-18.69	40.37	14.94	Peak	100	155

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).

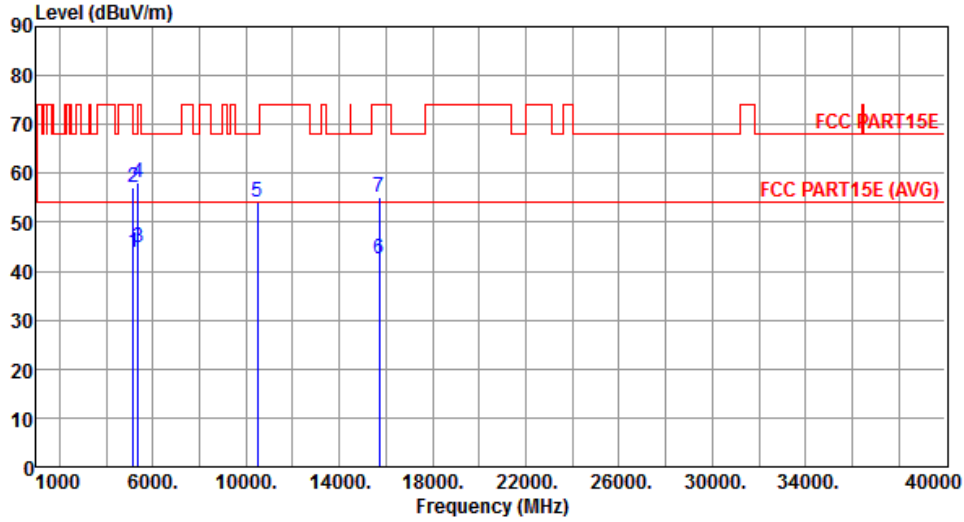
Modulation	11a	Test Freq. (MHz)	5200
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	44.26	54.00	-9.74	39.24	5.02	Average	252	44
2	5150.00	57.88	74.00	-16.12	52.86	5.02	Peak	252	44
3	10400.00	56.08	68.20	-12.12	42.31	13.77	Peak	245	320
4	15600.00	42.18	54.00	-11.82	27.24	14.94	Average	220	140
5	15600.00	55.42	74.00	-18.58	40.48	14.94	Peak	220	140

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)	5240
Polarization	Horizontal		



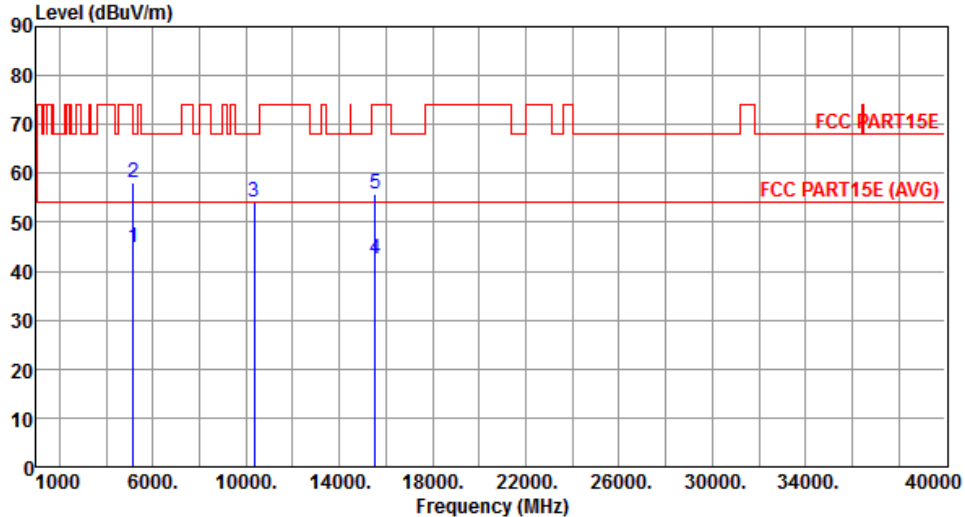
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.79	54.00	-10.21	38.77	5.02	Average	100	315
2	5150.00	57.13	74.00	-16.87	52.11	5.02	Peak	100	315
3	5350.00	44.79	54.00	-9.21	39.48	5.31	Average	100	315
4	5350.00	58.08	74.00	-15.92	52.77	5.31	Peak	100	315
5	10480.00	54.09	68.20	-14.11	40.28	13.81	Peak	100	153
6	15720.00	42.58	54.00	-11.42	27.67	14.91	Average	100	162
7	15720.00	55.18	74.00	-18.82	40.27	14.91	Peak	100	162

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)	5240
Polarization	Vertical		
Level (dBuV/m) <			

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

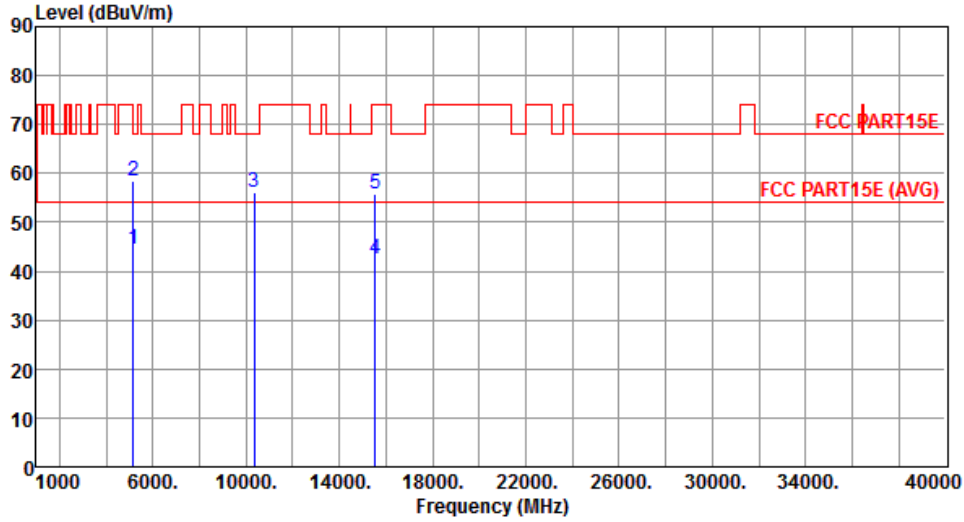
Modulation	VHT20	Test Freq. (MHz)	5180
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	44.85	54.00	-9.15	39.83	5.02	Average	100	318
2	5150.00	58.26	74.00	-15.74	53.24	5.02	Peak	100	318
3	10360.00	54.19	68.20	-14.01	40.45	13.74	Peak	100	142
4	15540.00	42.50	54.00	-11.50	27.53	14.97	Average	100	165
5	15540.00	55.69	74.00	-18.31	40.72	14.97	Peak	100	165

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).

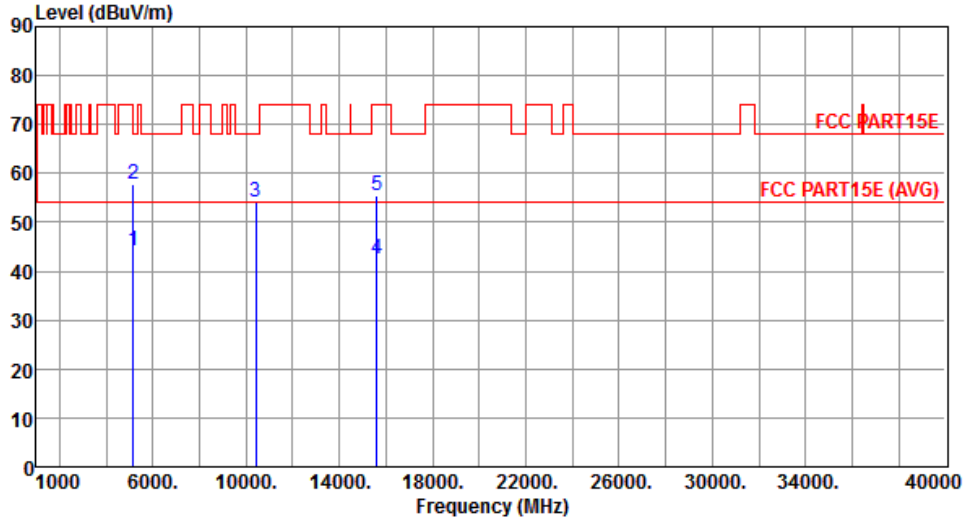
Modulation	VHT20	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	44.46	54.00	-9.54	39.44	5.02	Average	255	44
2	5150.00	58.54	74.00	-15.46	53.52	5.02	Peak	255	44
3	10360.00	56.23	68.20	-11.97	42.49	13.74	Peak	245	320
4	15540.00	42.52	54.00	-11.48	27.55	14.97	Average	221	136
5	15540.00	55.68	74.00	-18.32	40.71	14.97	Peak	221	136

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).

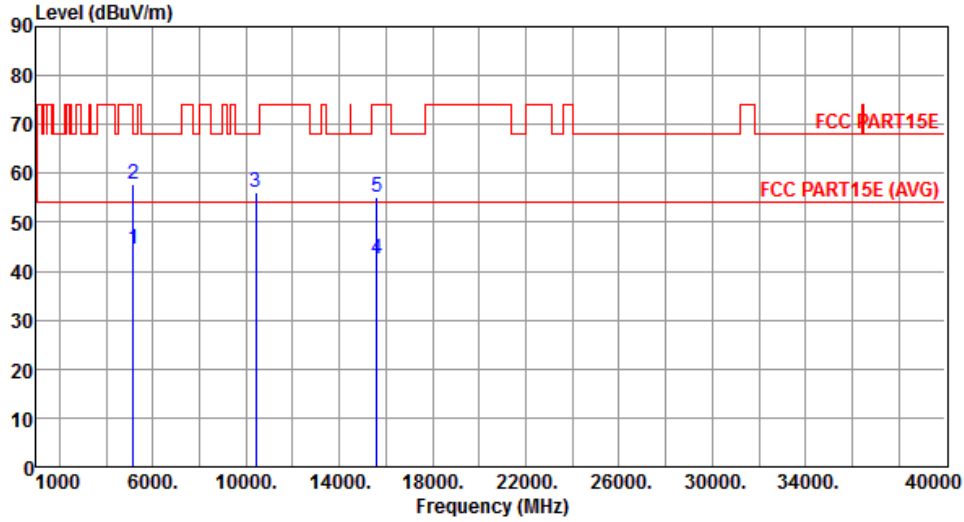
Modulation	VHT20	Test Freq. (MHz)	5200
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	44.29	54.00	-9.71	39.27	5.02	Average	100	315
2	5150.00	57.75	74.00	-16.25	52.73	5.02	Peak	100	315
3	10400.00	54.14	68.20	-14.06	40.37	13.77	Peak	100	170
4	15600.00	42.42	54.00	-11.58	27.48	14.94	Average	100	152
5	15600.00	55.47	74.00	-18.53	40.53	14.94	Peak	100	152

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)	5200
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	5150.00	44.63	54.00	-9.37	39.61	5.02	Average	248	53
2	5150.00	57.75	74.00	-16.25	52.73	5.02	Peak	248	53
3	10400.00	56.25	68.20	-11.95	42.48	13.77	Peak	244	318
4	15600.00	42.62	54.00	-11.38	27.68	14.94	Average	215	138
5	15600.00	55.21	74.00	-18.79	40.27	14.94	Peak	215	138

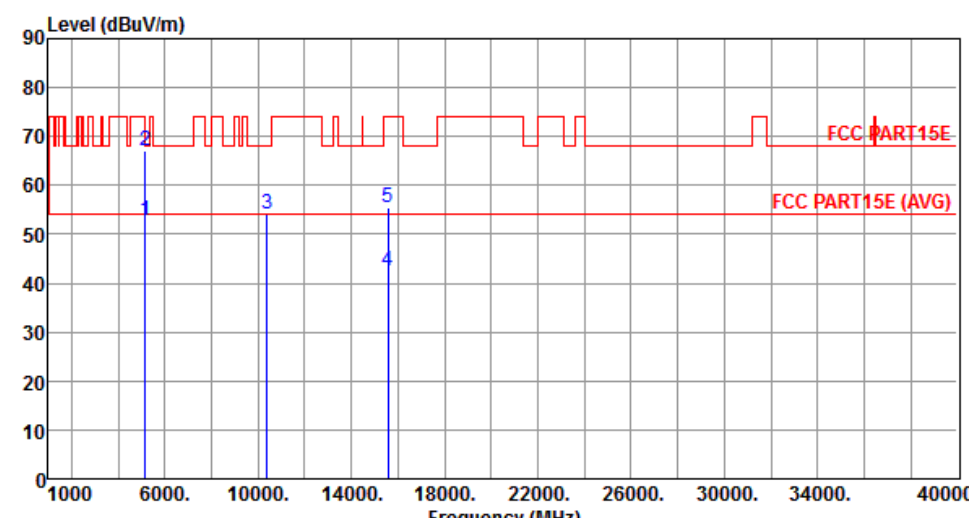
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

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

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

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

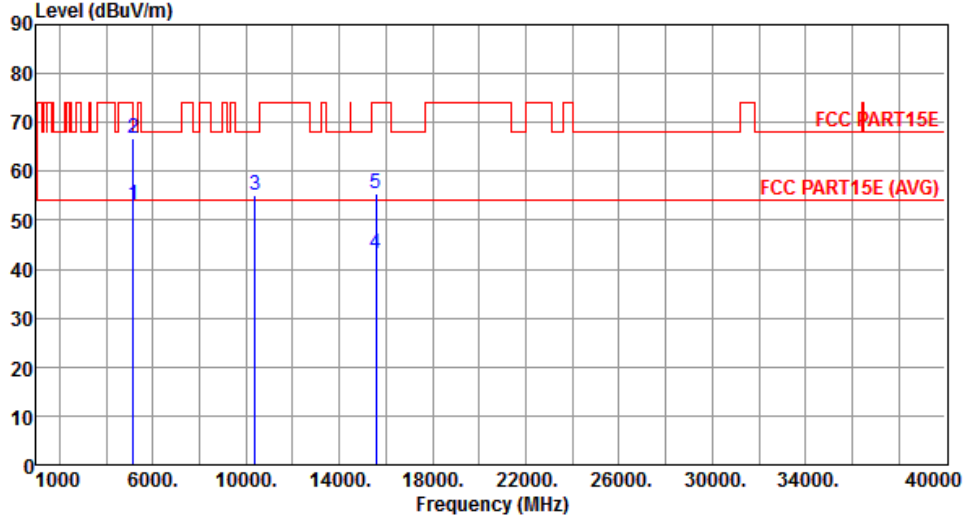
Modulation	VHT40	Test Freq. (MHz)	5190
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	52.67	54.00	-1.33	47.65	5.02	Average	100	311
2	5150.00	66.98	74.00	-7.02	61.96	5.02	Peak	100	311
3	10380.00	54.07	68.20	-14.13	40.32	13.75	Peak	100	156
4	15570.00	42.48	54.00	-11.52	27.52	14.96	Average	100	163
5	15570.00	55.33	74.00	-18.67	40.37	14.96	Peak	100	163

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).

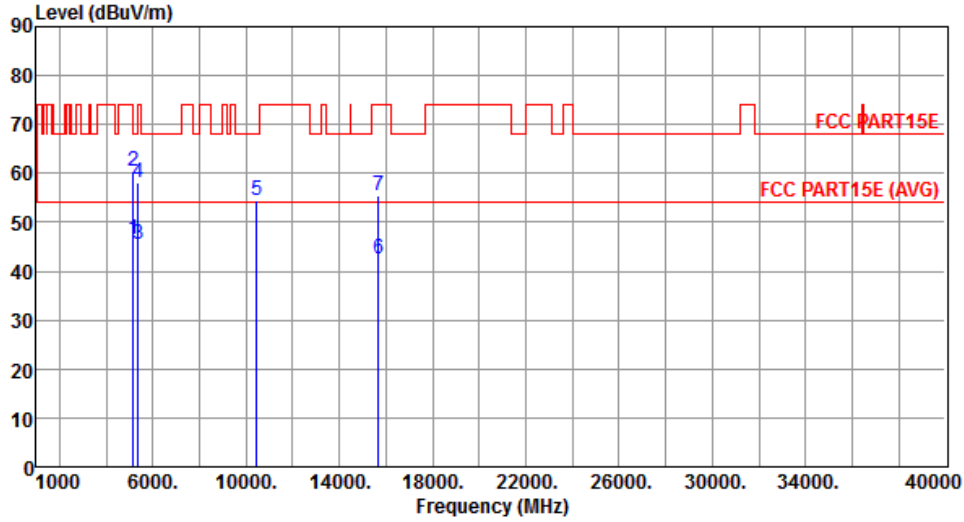
Modulation	VHT40	Test Freq. (MHz)	5190
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	52.99	54.00	-1.01	47.97	5.02	Average	266	330
2	5150.00	66.75	74.00	-7.25	61.73	5.02	Peak	266	330
3	10380.00	55.29	68.20	-12.91	41.54	13.75	Peak	225	318
4	15570.00	43.10	54.00	-10.90	28.14	14.96	Average	220	246
5	15570.00	55.61	74.00	-18.39	40.65	14.96	Peak	220	246

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).

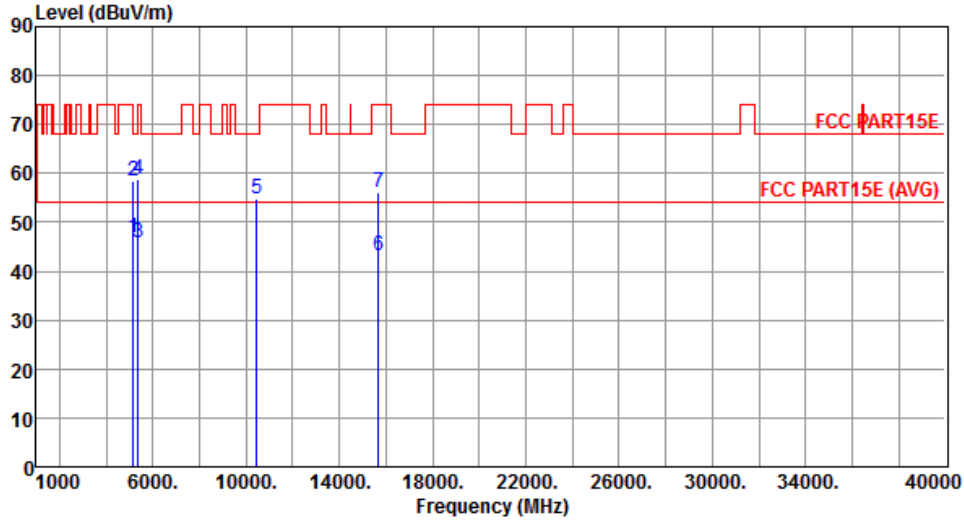
Modulation	VHT40	Test Freq. (MHz)	5230
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	46.64	54.00	-7.36	41.62	5.02	Average	100	310
2	5150.00	60.45	74.00	-13.55	55.43	5.02	Peak	100	310
3	5350.00	45.42	54.00	-8.58	40.11	5.31	Average	100	310
4	5350.00	58.07	74.00	-15.93	52.76	5.31	Peak	100	310
5	10460.00	54.40	68.20	-13.80	40.61	13.79	Peak	100	155
6	15690.00	42.43	54.00	-11.57	27.51	14.92	Average	100	160
7	15690.00	55.38	74.00	-18.62	40.46	14.92	Peak	100	160

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	VHT40	Test Freq. (MHz)	5230
Polarization	Vertical		

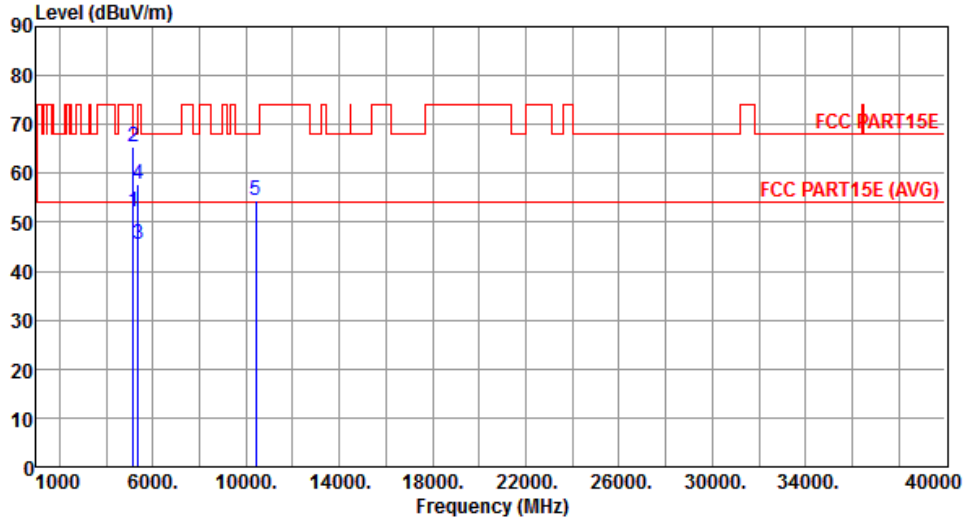


	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	46.70	54.00	-7.30	41.68	5.02	Average	252	318
2	5150.00	58.56	74.00	-15.44	53.54	5.02	Peak	252	318
3	5350.00	45.81	54.00	-8.19	40.50	5.31	Average	252	318
4	5350.00	58.75	74.00	-15.25	53.44	5.31	Peak	252	318
5	10460.00	54.82	68.20	-13.38	41.03	13.79	Peak	222	316
6	15690.00	43.20	54.00	-10.80	28.28	14.92	Average	218	245
7	15690.00	56.02	74.00	-17.98	41.10	14.92	Peak	218	245

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

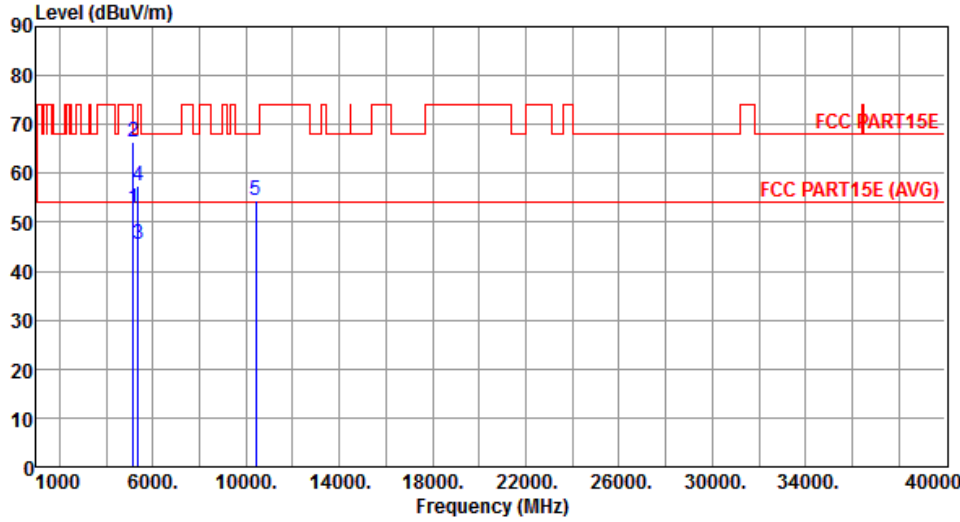
Modulation	VHT80	Test Freq. (MHz)	5210
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	52.24	54.00	-1.76	47.22	5.02	Average	100	321
2	5150.00	65.47	74.00	-8.53	60.45	5.02	Peak	100	321
3	5350.00	45.42	54.00	-8.58	40.11	5.31	Average	100	321
4	5350.00	57.79	74.00	-16.21	52.48	5.31	Peak	100	321
5	10420.00	54.39	68.20	-13.81	40.61	13.78	Peak	100	321

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		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	52.77	54.00	-1.23	47.75	5.02	Average	265	323
2	5150.00	66.28	74.00	-7.72	61.26	5.02	Peak	265	323
3	5350.00	45.54	54.00	-8.46	40.23	5.31	Average	265	323
4	5350.00	57.37	74.00	-16.63	52.06	5.31	Peak	265	323
5	10420.00	54.46	68.20	-13.74	40.68	13.78	Peak	155	320

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

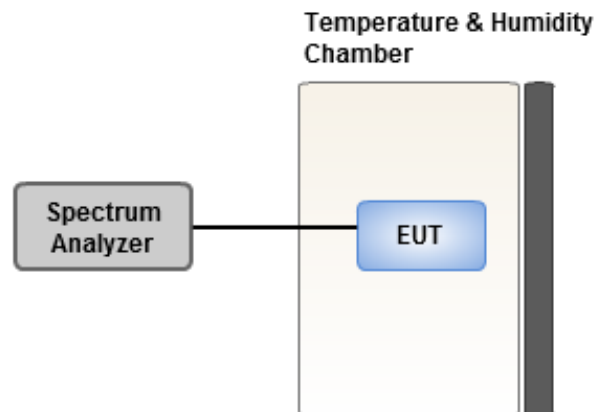
3.6.1 Limit of Frequency Stability

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 70 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	6.72	6.15	7.04	7.06
T20°C Vmin	4.36	4.42	4.99	4.36
T70°C Vnom	4.97	4.98	4.92	5.81
T60°C Vnom	3.20	3.33	3.13	4.02
T50°C Vnom	3.02	2.70	3.28	3.06
T40°C Vnom	2.18	2.06	2.27	2.04
T30°C Vnom	2.76	2.52	2.96	2.21
T20°C Vnom	3.76	4.26	3.67	3.62
T10°C Vnom	1.82	2.27	2.06	2.30
T0°C Vnom	1.69	2.32	2.27	2.04
T-10°C Vnom	0.61	0.56	0.44	0.91
T-20°C Vnom	0.42	3.38	3.45	3.50
T-30°C Vnom	2.02	0.34	2.75	2.43
Vnom [Vac]: 120	Vmax [Vac]: 138		Vmin [Vac]: 102	
Tnom [°C]: 20	Tmax [°C]: 70		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>.

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