FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

For

WIFI Module

MODEL No.: AP6330

FCC ID: 2ARRD-AP6330

Trade Mark: AMPAK

REPORT NO.: ES180831014W02

ISSUE DATE: June 05, 2018

Prepared for

Lighthouse Technologies Limited
FLAT/RM 608 6/F PHOTONICS CTR 2 SCIENCE PARK EAST AVENUE
HONG KONG SCIENCE PART SHATIN NT

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant:	Lighthouse Technologies Limited FLAT/RM 608 6/F PHOTONICS CTR 2 SCIENCE PARK EAST AVENUE HONG KONG SCIENCE PART SHATIN NT
Manufacturer:	Lighthouse Technologies(HuiZhou) Limited Building A-3, No. 9 Yuanhui Road,Chenjiang, Zhongkai Hi-tech Industrial Development Zone, Huizhou
Product Description:	WIFI Module
Model Number:	AP6330
Trade Mark:	AMPAK
File Number:	ES180831014W02

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart E	PASS

The above equipment was tested by EMTEK(SHENZHEN) CO., LTD.. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15.407

The test results of this report relate only to the tested sample identified in this report.

Date of Test : October 11, 2018 to November 06, 2018

Prepared by: Yaping Shen/Editor

Reviewer: Sevin Li /Supervisor

Approve & Authorized Signer : Lisa Wang/Manager

TABLE OF CONTENTS

1 TEST RESULT CERTIFICATION 2

2 EUT TECHNICAL DESCRIPTION 4

3 SUMMARY OF TEST RESULT 5

4 TEST METHODOLOGY 6

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS 6
4.2 MEASUREMENT EQUIPMENT USED 6
4.3 DESCRIPTION OF TEST MODES 7

5 FACILITIES AND ACCREDITATIONS 8

5.1 FACILITIES 8
5.2 LABORATORY ACCREDITATIONS AND LISTINGS 8

6 TEST SYSTEM UNCERTAINTY 9

7 SETUP OF EQUIPMENT UNDER TEST 10

7.1 RADIO FREQUENCY TEST SETUP 10
7.2 RADIO FREQUENCY TEST SETUP 10
7.3 CONDUCTED EMISSION TEST SETUP 12
7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM 13
7.5 SUPPORT EQUIPMENT 13

8 TEST REQUIREMENTS 14

8.1 BANDWIDTH MEASUREMENT 14
8.2 MAXIMUM CONDUCTED OUTPUT POWER 34
8.3 MAXIMUM PEAK POWER DENSITY 37
8.4 FREQUENCY STABILITY 46
8.5 UNDESIRABLE RADIATED SPURIOUS EMISSION 49
8.6 POWER LINE CONDUCTED EMISSIONS 67
8.7 ANTENNA APPLICATION 70

2 EUT TECHNICAL DESCRIPTION

Characteristics	Description			
IEEE 802.11 WLAN Mode Supported	☒802.11a(20MHz channel bandwidth) ☒802.11n(20MHz channel bandwidth)			
Data Rate	802.11a:54/48/36/24/18/12/9/6 Mbps 802.11n:up to 72.2 Mbps			
Modulation	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n;			
Operating Frequency Range	WIFI 5G Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)	5180-5240	4
	UNII Band III	802.11a/n(HT20)	5745-5825	5
Transmit Power Max	13.86 dBm for UNII Band I 16.27dBm for UNII Band III			
Antenna Type	Integral antenna via a SMA connector			
Antenna Gain	0 dBi			
Power supply:	DC 2.9V from external power			

3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
15.407 (a) 15.407 (e)	99% , 6dB and 26dB Bandwidth	PASS	
15.407 (a)	Maximum Conducted Output Power	PASS	
15.407 (a)	Peak Power Spectral Density	PASS	
15.407 (b)	Radiated Spurious Emission	PASS	
15.407(g)	Frequency Stability	PASS	
15.407 (b)(6) 15.207	Power Line Conducted Emission	PASS	
15.407(a) 15.203	Antenna Application	PASS	
NOTE1: N/A (Not Applicable) NOTE2: According to FCC OET KDB 789033 D2 General UNII Test Procedures New Rules v01r02, In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.			

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2ARRD-AP6330 filing to comply with Section 15.247 of the FCC Part 15, Subpart E Rules.

FCC part15.407 (c) :
The Device will automatically discontinue transmission in case of either absence of information to transmit or operational failure. When the EUT is absence of information to transmit or operational failure, the power supply of WIFI transmitter module will shut off, so that the EUT can’t enter the work state, so as to stop transmitting the information.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:
FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart E
FCC KDB 789033 D2 General UNII Test Procedures New Rules v01r04

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	May 20, 2018	May 19, 2019
L.I.S.N.	Rohde & Schwarz	ENV216	101161	May 20, 2018	May 19, 2019
50Ω Coaxial Switch	Anritsu	MP59B	6100175589	May 20, 2018	May 19, 2019
Voltage Probe	Rohde & Schwarz	ESH2-Z3	100122	May 20, 2018	May 19, 2019
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	May 20, 2018	May 19, 2019
I.S.N	Teseq GmbH	ISN T800	30327	May 20, 2018	May 19, 2019

4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	DUE CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 20, 2018	May 19, 2019
Pre-Amplifier	HP	8447F	2944A07999	May 20, 2018	May 19, 2019
Bilog Antenna	Schwarzbeck	VULB9163	142	May 20, 2018	May 19, 2019
Loop Antenna	ARA	PLA-1030/B	1029	May 20, 2018	May 19, 2019
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 20, 2018	May 19, 2019
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 20, 2018	May 19, 2019
Cable	Schwarzbeck	AK9513	ACRX1	May 20, 2018	May 19, 2019
Cable	Rosenberger	N/A	FP2RX2	May 20, 2018	May 19, 2019
Cable	Schwarzbeck	AK9513	CRPX1	May 20, 2018	May 19, 2019
Cable	Schwarzbeck	AK9513	CRRX2	May 20, 2018	May 19, 2019

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	May 20, 2018	May 19, 2019
Signal Analyzer	Agilent	N9010A	My53470879	May 20, 2018	May 19, 2019
Power meter	Anritsu	ML2495A	0824006	May 20, 2018	May 19, 2019
Power sensor	Anritsu	MA2411B	0738172	May 20, 2018	May 19, 2019

Remark: *Each piece of equipment is scheduled for calibration once a year.*

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.
The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

☒Wifi 5G with UNII Band I
Frequency and Channel list for 802.11a/n(HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220		
40	5200	48	5240		

Test Frequency and Channel for 802.11a/n(HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	40	5200	48	5240

☒ Wifi 5G with UNII Band III
Frequency and Channel list for 802.11a/n(HT20):

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

Test Frequency and Channel for 802.11a/n(HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785	165	5825

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.	:	Accredited by CNAS,2016.10.24 The certificate is valid until 2022.10.28 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005) The Certificate Registration Number is L2291. Accredited by TUV Rheinland Shenzhen 2016.5.19 The Laboratory has been assessed according to the requirements ISO/IEC 17025. Accredited by FCC, August 06, 2018 Designation Number: CN1204 Test Firm Registration Number: 882943 Accredited by A2LA, August 31, 2020 The Certificate Registration Number is 4321.01. Accredited by Industry Canada, November 24, 2015 The Certificate Registration Number is 4480A
Name of Firm	:	EMTEK(SHENZHEN) CO., LTD.
Site Location	:	Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

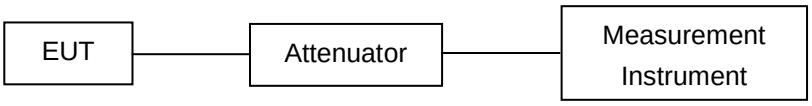
Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test	±2.0dB
Radiated Emission Test	±2.0dB
Power Density	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5℃
Humidity	±3%

Measurement Uncertainty for a level of Confidence of 95%

7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP

The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP

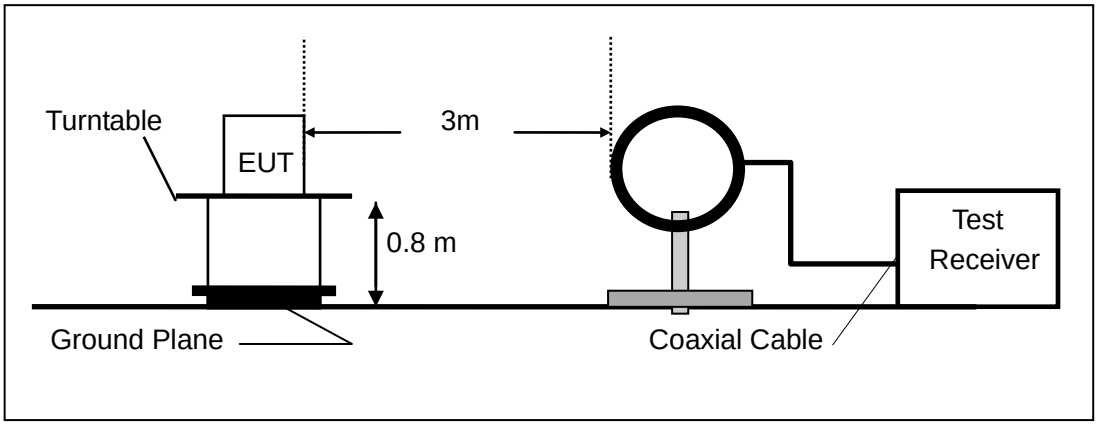
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

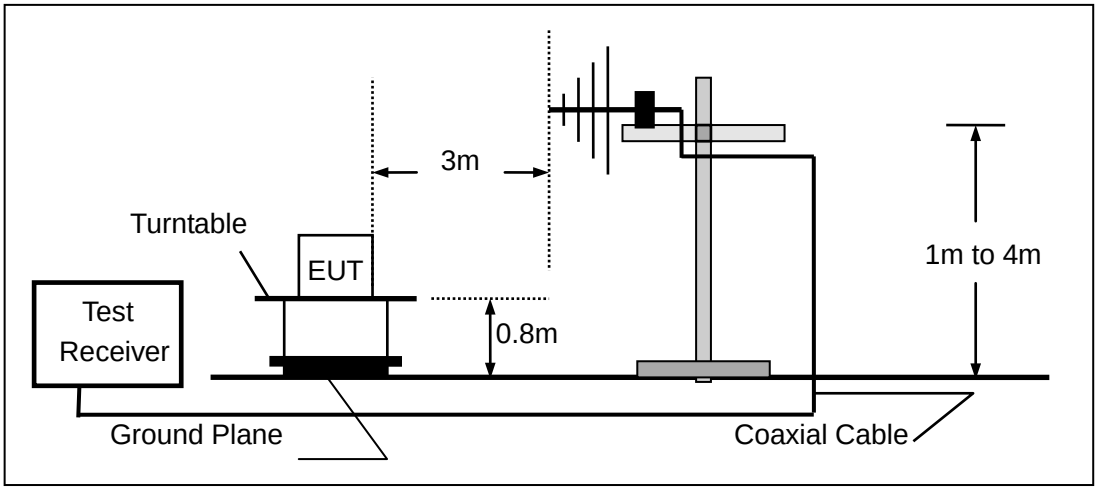
Above 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz：
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)
The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

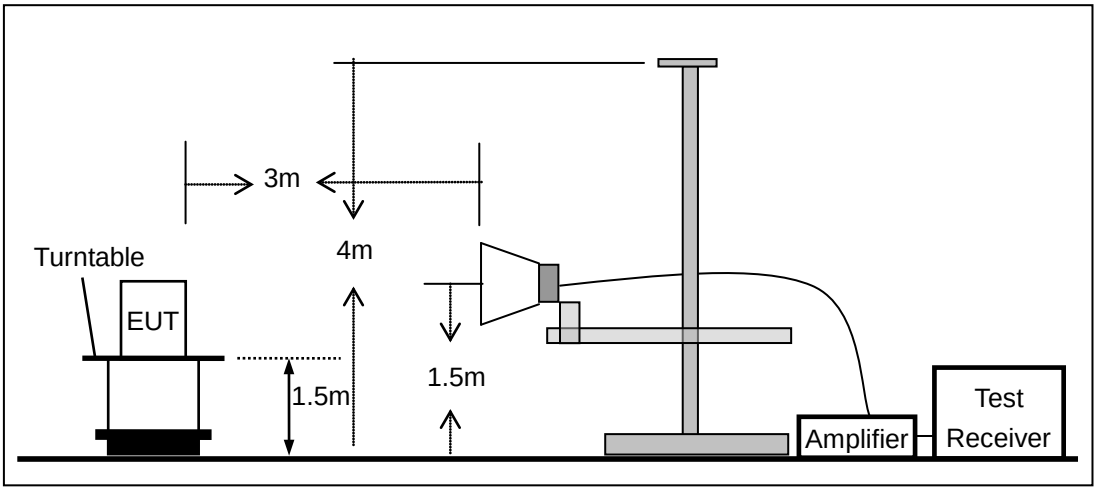
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

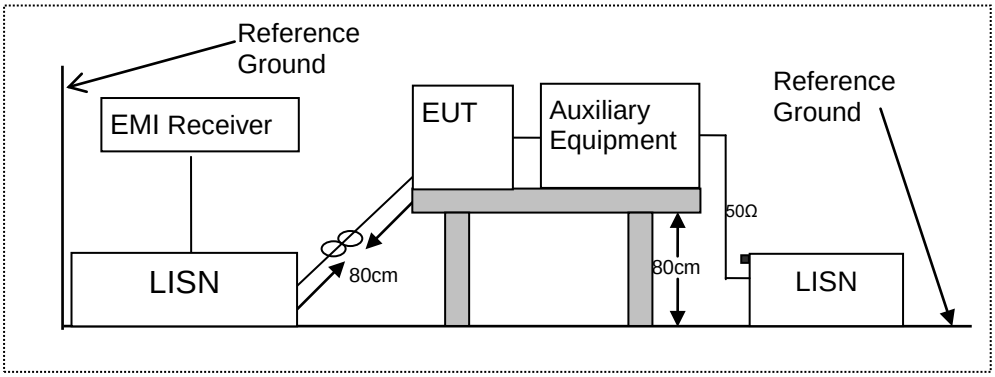


7.3 CONDUCTED EMISSION TEST SETUP

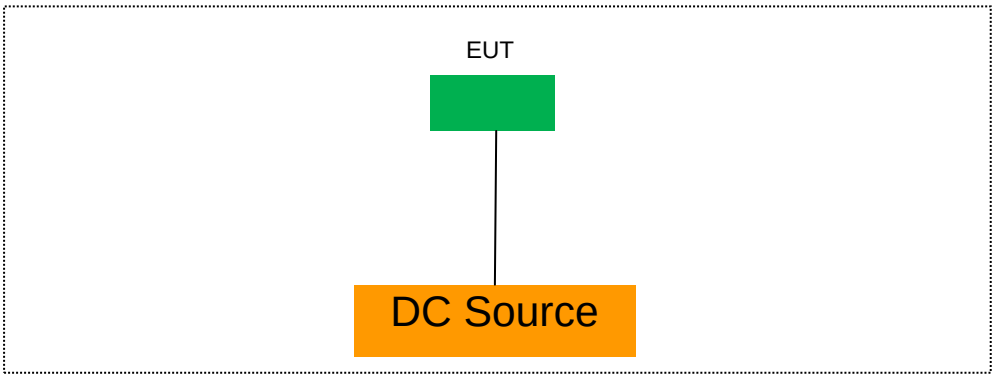
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



7.5 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1	Adapter	XINGHEYUAN	XHY050200UECH	N/A	N/A	N/A

Notes:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

8 TEST REQUIREMENTS

8.1 BANDWIDTH MEASUREMENT

8.1.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to FCC Part 15.407(e) for UNII Band III
According to 789033 D02 Section II(C)
According to 789033 D02 Section II(D)

8.1.2 Conformance Limit

No limit requirement.
The minimum 6 dB emission bandwidth of at least 500 KHz for the UNII Band III.

8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.1.4 Test Procedure

Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below

- The following procedure shall be used for measuring (26 dB) power bandwidth:

Center Frequency: test Frequency
Set RBW = approximately 1% of the emission bandwidth.
Set the VBW > RBW.
Detector = Peak.
Trace mode = max hold.
X dB Bandwidth: 26 dB
Measure the maximum width of the emission that is 26 dB down from the maximum 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%.

- Minimum Emission Bandwidth for the UNII Band III

Center Frequency: test Frequency
Set RBW = 100 kHz
Set VBW ≥ 3 · RBW
Detector = Peak
Trace mode = max hold
Sweep = auto couple
X dB Bandwidth: 6 dB
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

- The following procedure shall be used for measuring (99 %) power bandwidth:

Set center frequency to the nominal EUT channel center frequency.
Set span = 1.5 times to 5.0 times the OBW.
Set RBW = 1 % to 5 % of the OBW
Set VBW ≥ 3 · RBW
Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
Use the 99 % power bandwidth function of the instrument (if available).
If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

8.1.5 Test Results

☒ 802.11a mode

Temperature : 28℃ Test Date : October 26, 2018
Humidity : 65 % Test By: XW

Band	Channel Number	Channel Freq. (MHz)	26dB EBW		99% OBW		Limit (MHz)	Verdict
			Ant0	Ant1	Ant0	Ant1		
UNII Band I	CH36	5180	19.26	--	16.62	--	N/A	N/A
	CH40	5200	19.06	--	16.62	--	N/A	N/A
	CH48	5240	18.94	--	16.58	--	N/A	N/A
UNII Band III	CH149	5745	24.30	--	16.70	--	N/A	N/A
	CH157	5785	24.58	--	16.74	--	N/A	N/A
	CH165	5825	25.26	--	16.78	--	N/A	N/A

Note:
N/A (Not Applicable)

☒ 802.11n(VHT20) mode

Temperature : 28℃ Test Date : October 26, 2018
Humidity : 65 % Test By: XW

Band	Channel Number	Channel Freq. (MHz)	26dB EBW		99% OBW		Limit (MHz)	Verdict
			Ant0	Ant1	Ant0	Ant1		
UNII Band I	CH36	5180	19.42	--	17.50	--	N/A	N/A
	CH40	5200	19.34	--	17.50	--	N/A	N/A
	CH48	5240	19.38	--	17.50	--	N/A	N/A
UNII Band III	CH149	5745	21.38	--	17.66	--	N/A	N/A
	CH157	5785	23.74	--	17.70	--	N/A	N/A
	CH165	5825	23.30	--	17.70	--	N/A	N/A

Note:
N/A (Not Applicable)

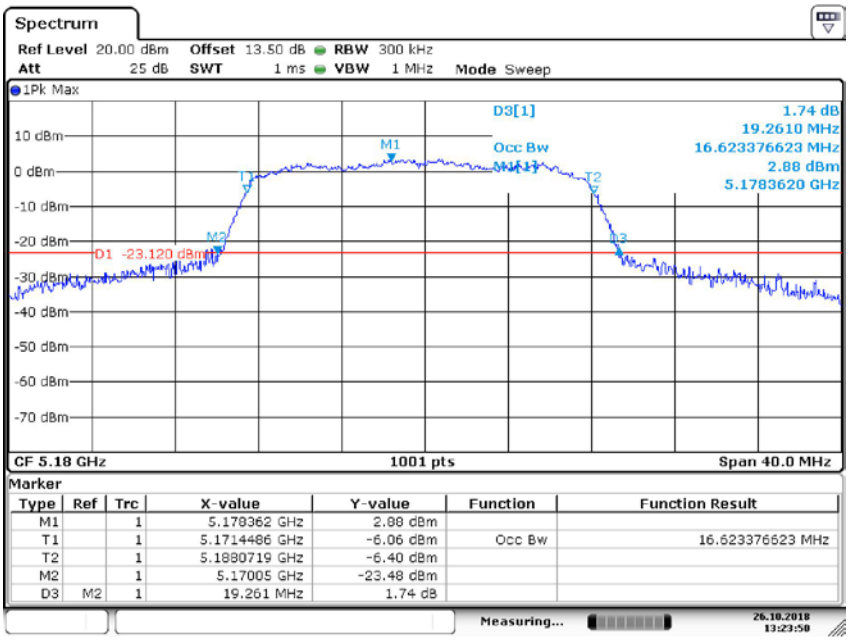
☒ UNII Band III

Temperature : 28℃ Test Date : October 26, 2018
Humidity : 65 % Test By: XW

Operation Mode	Channel Number	Channel Freq. (MHz)	6dB EBW		Limit (kHz)	Verdict
			Ant0	Ant1		
802.11a	CH149	5745	15.43	--	500	PASS
	CH157	5785	15.10	--	500	PASS
	CH165	5825	15.10	--	500	PASS
802.11n (VHT20)	CH149	5745	16.06	--	500	PASS
	CH157	5785	16.90	--	500	PASS
	CH165	5825	15.94	--	500	PASS

Note:
N/A (Not Applicable)

Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5180
Ant0			



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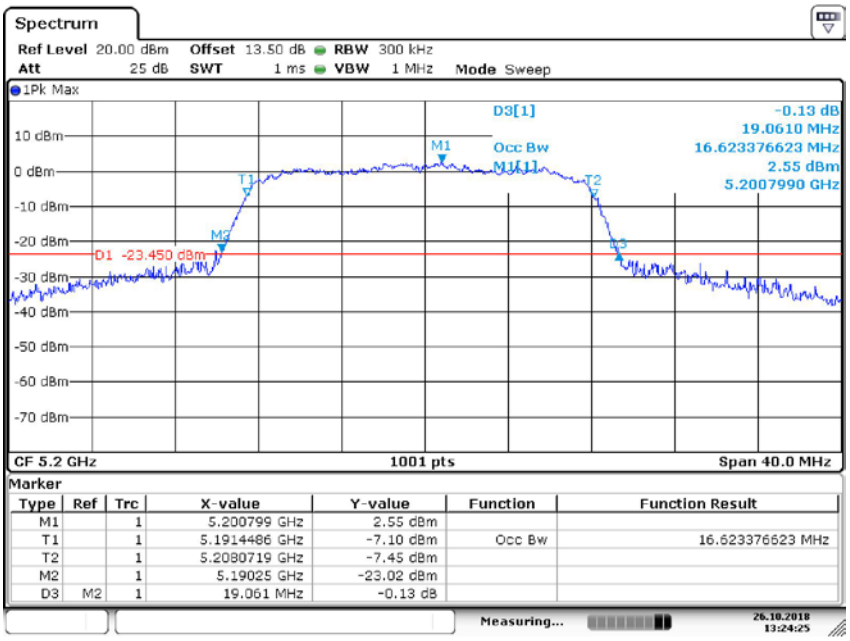
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5200
Ant0			



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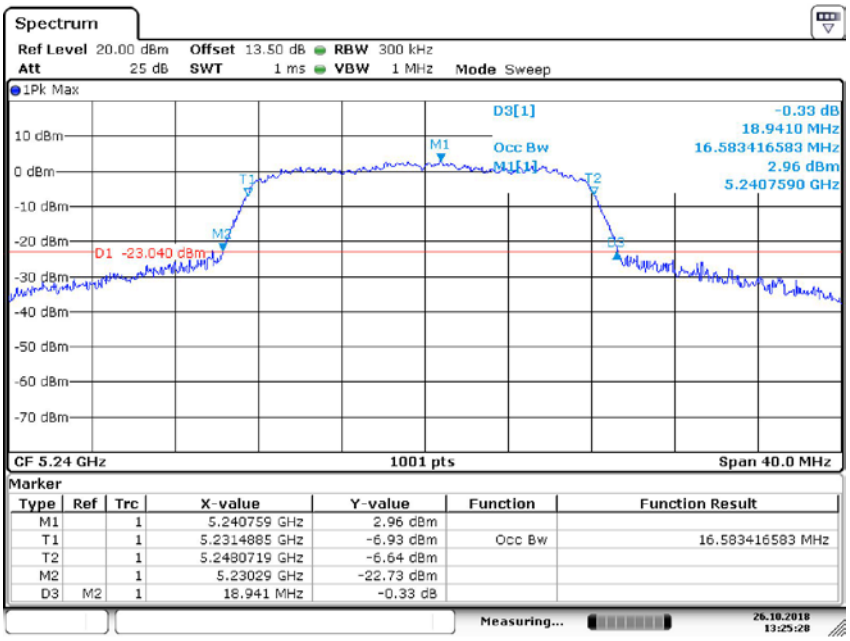
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5240
Ant0			



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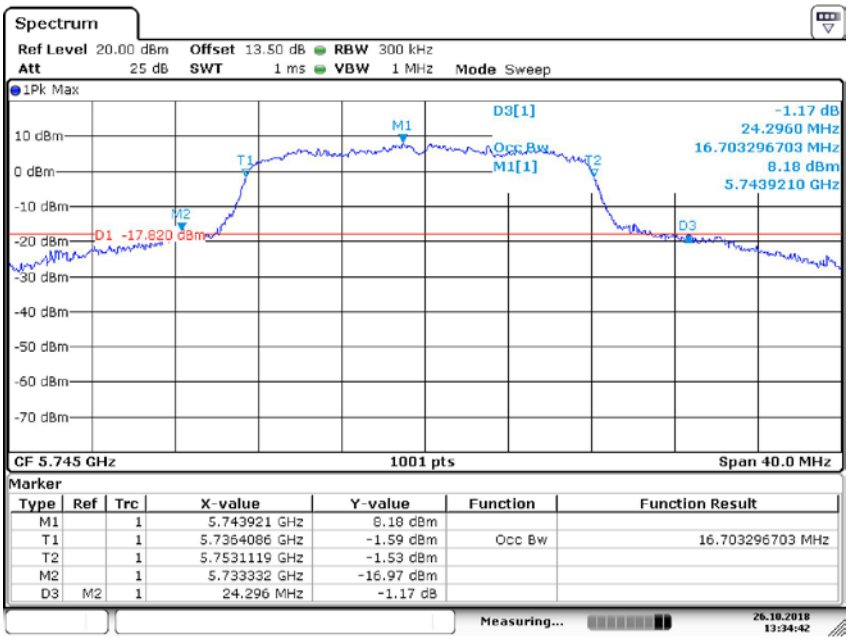
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5745
Ant0			



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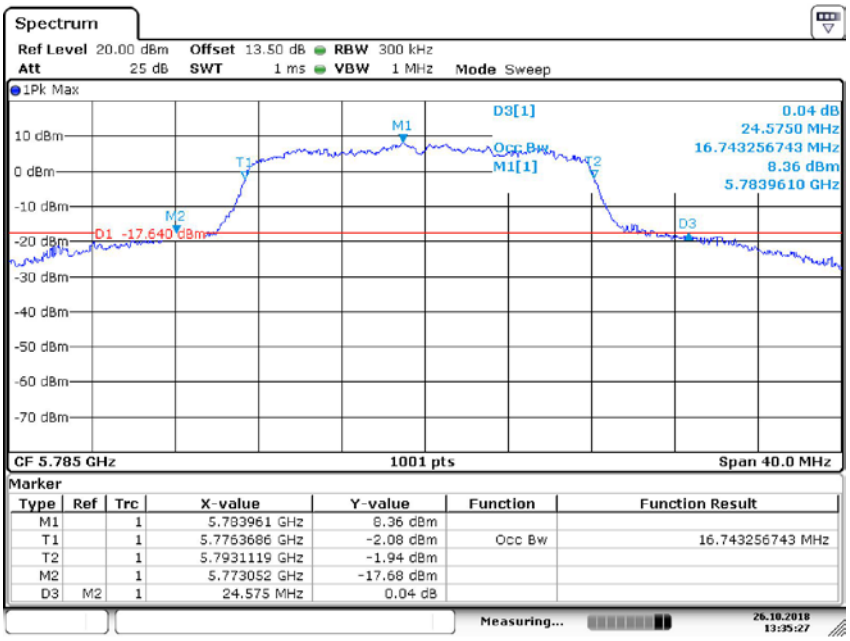
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5785
Ant0			



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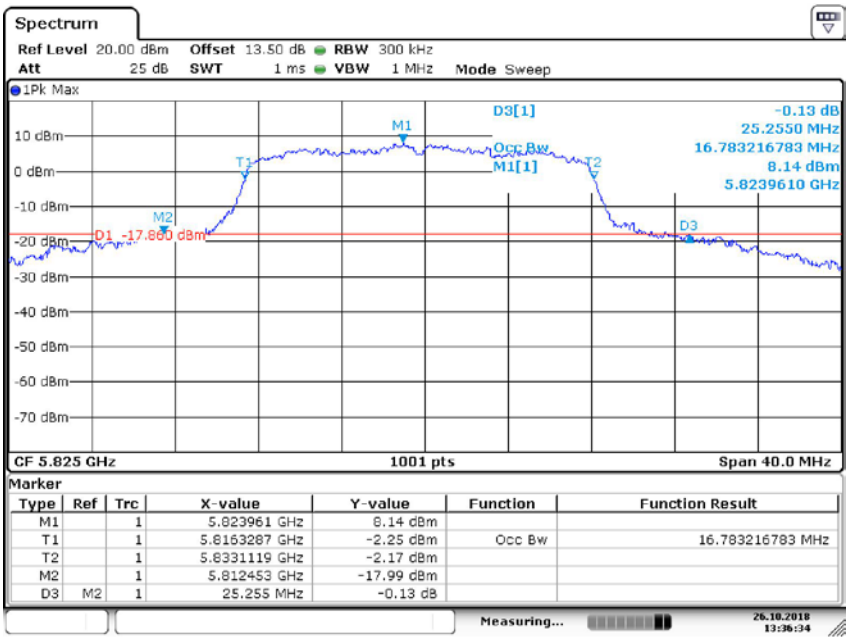
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5825
Ant0			



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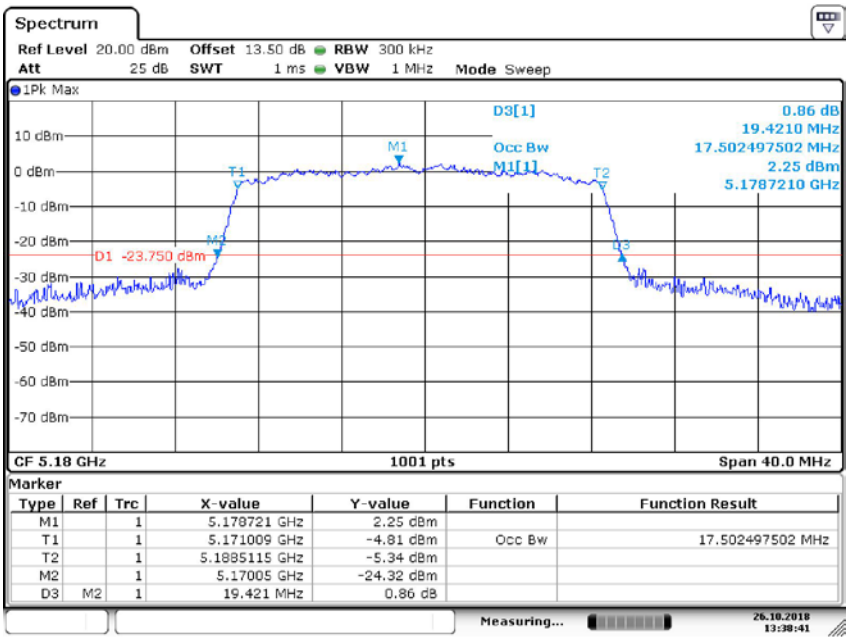
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5180
Ant0			



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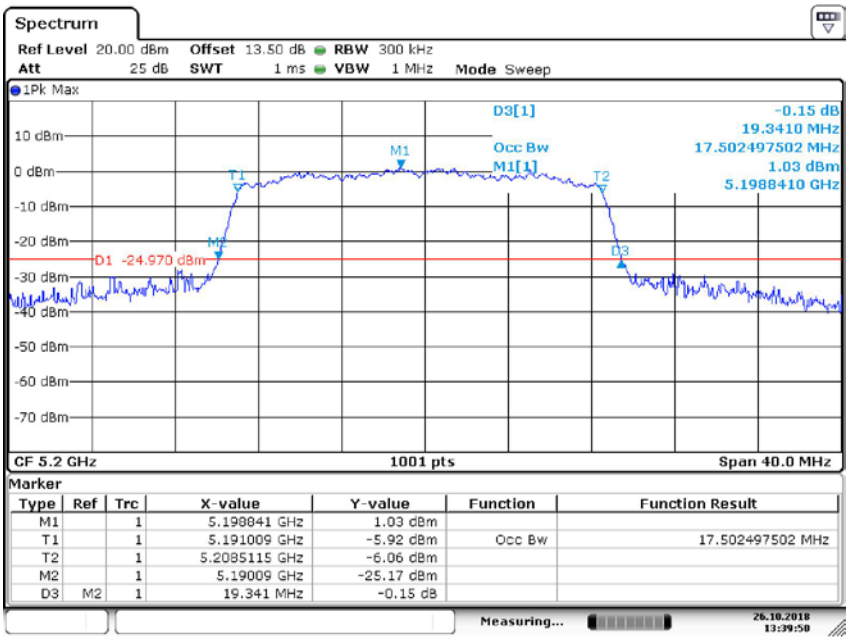
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5200

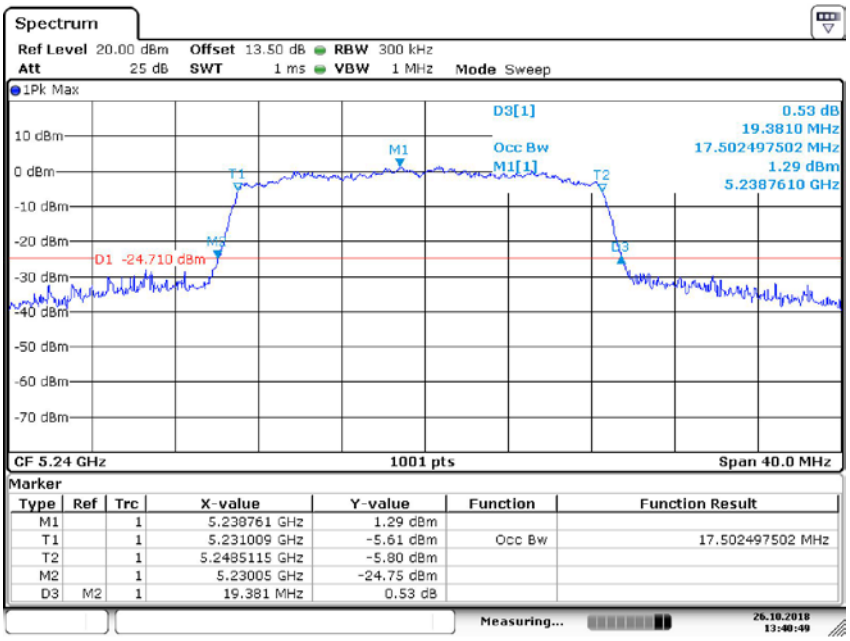
Ant0



Date: 26.OCT.2018 13:39:50

Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5240

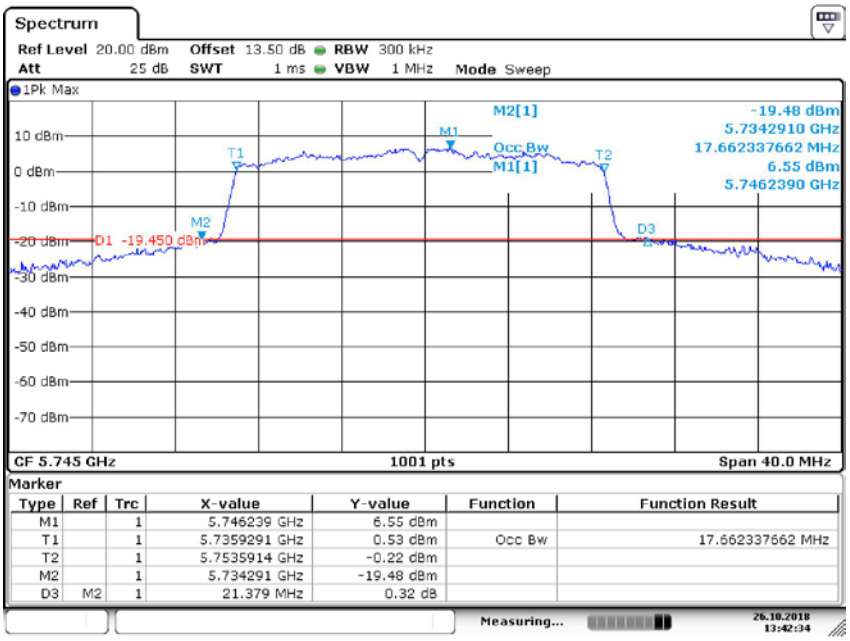
Ant0



Date: 26.OCT.2018 13:40:48

Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5745

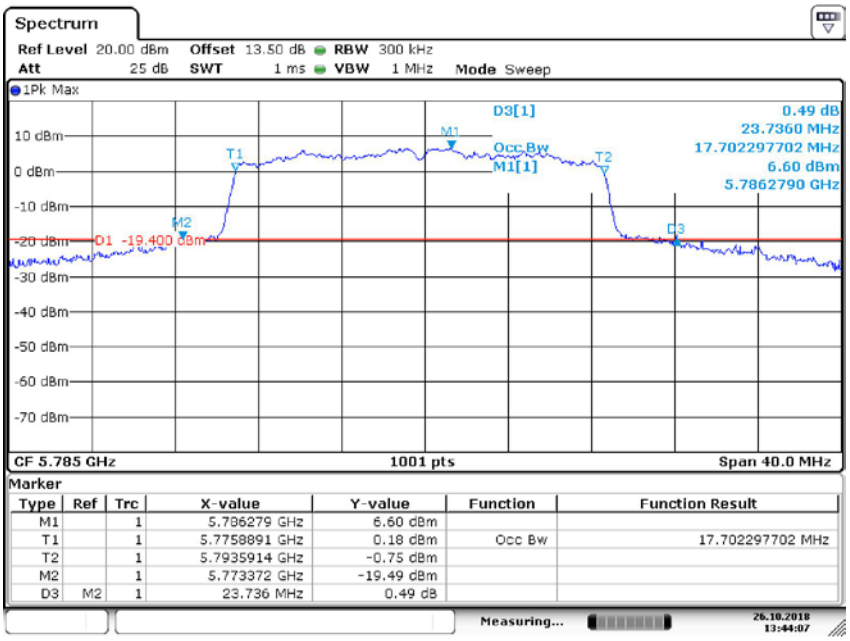
Ant0



Date: 26.OCT.2018 13:42:34

Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5785

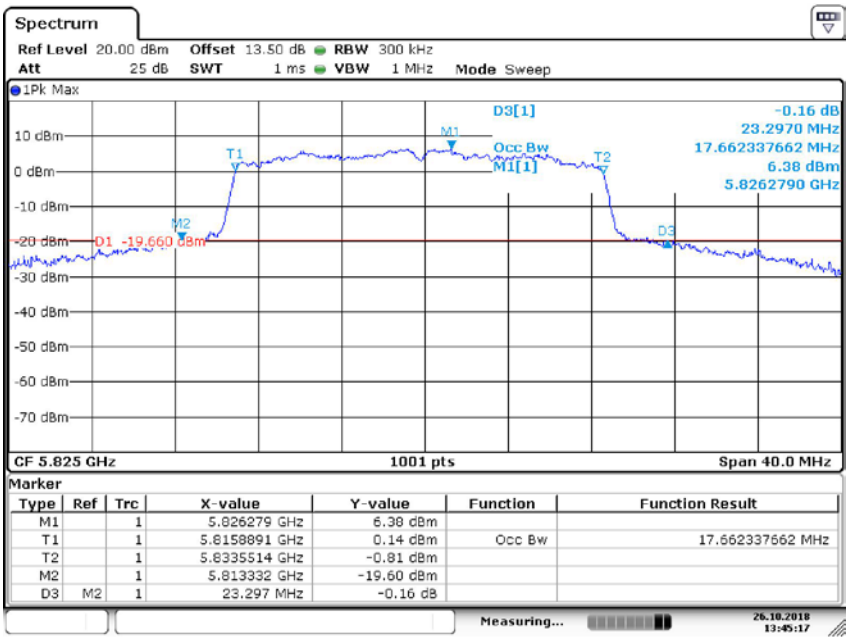
Ant0



Date: 26.OCT.2018 13:44:08

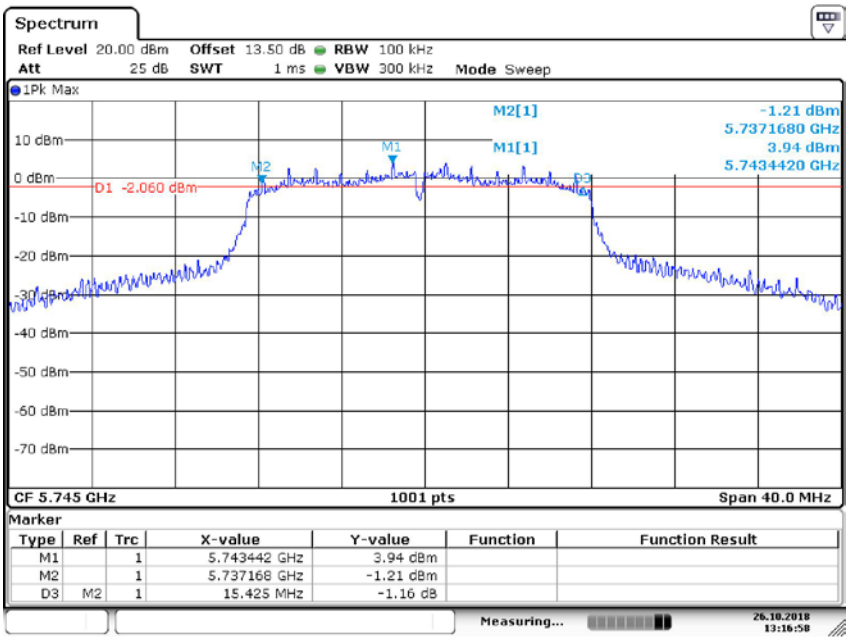
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5825

Ant0



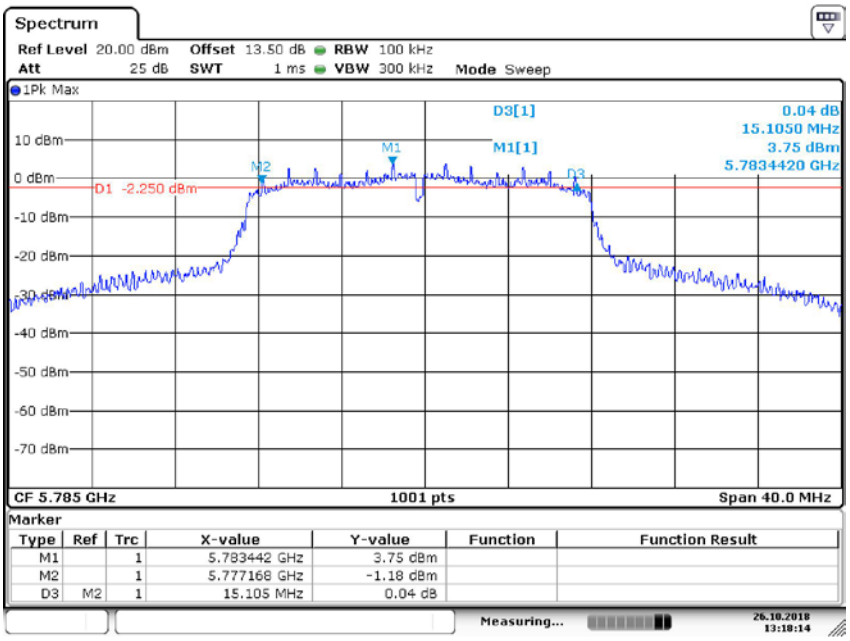
Date: 26.OCT.2018 13:45:17

Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11a mode	Frequency(MHz)	5745
Ant0			



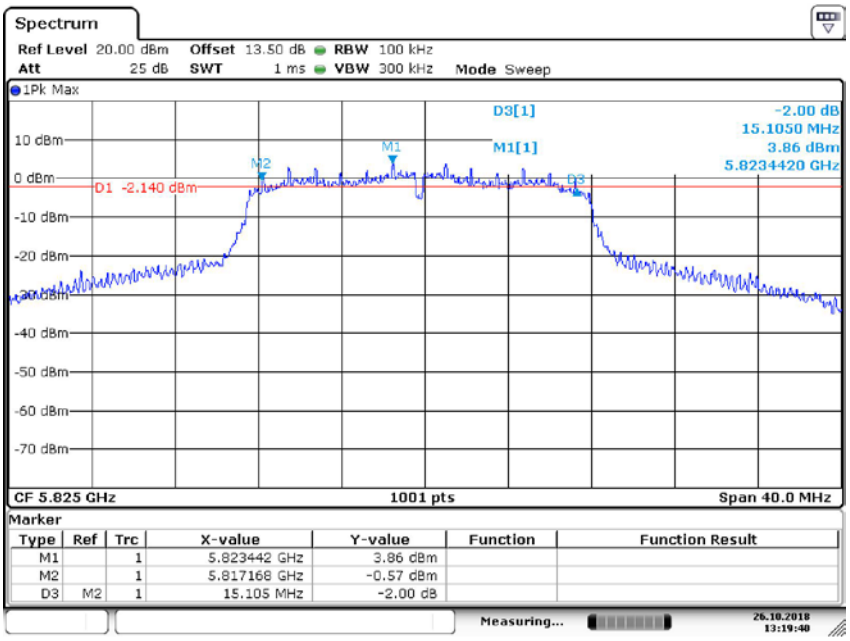
Date: 26.OCT.2018 13:16:58

Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11a mode	Frequency(MHz)	5785
Ant0			



Date: 26.OCT.2018 13:18:14

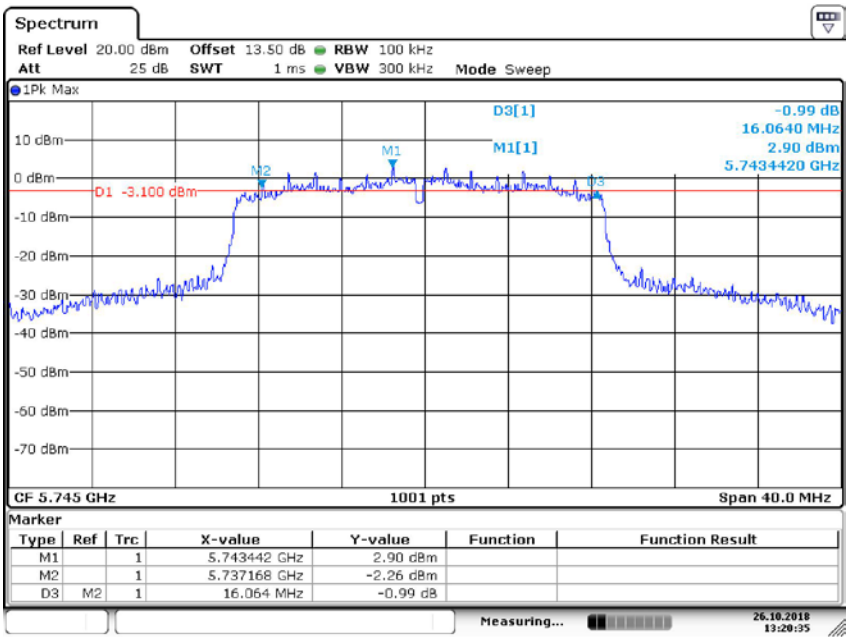
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11a mode	Frequency(MHz)	5825
Ant0			



Date: 26.OCT.2018 13:19:40

Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5745

Ant0



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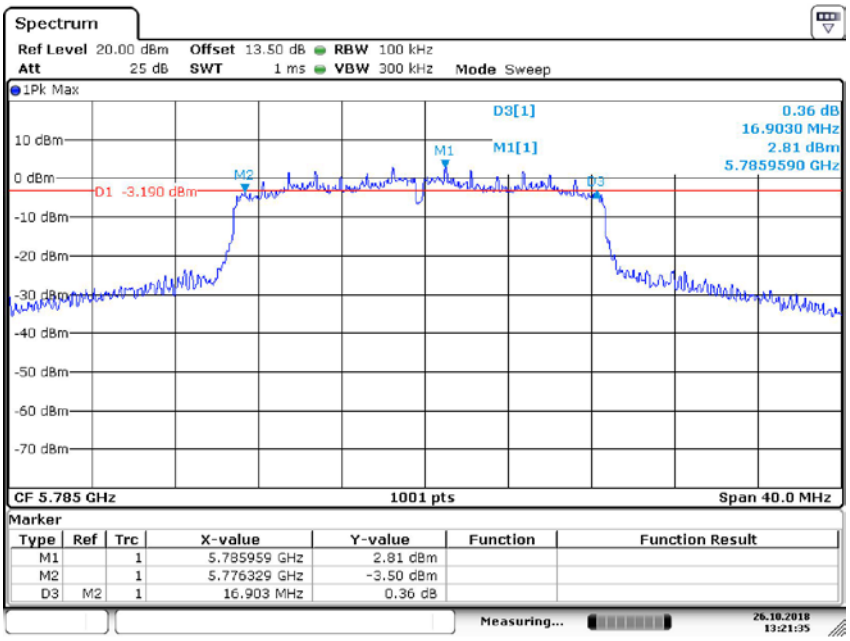
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5785

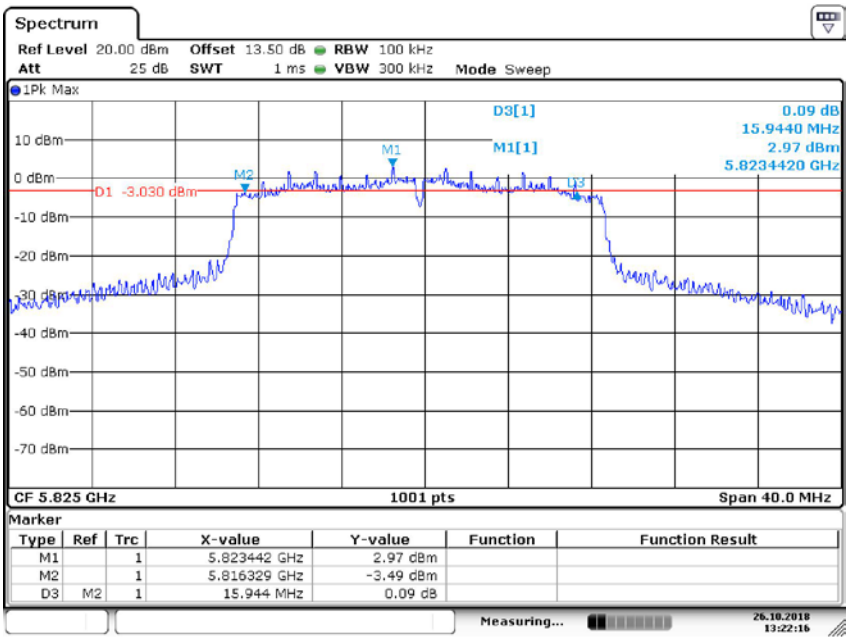
Ant0



Date: 26.OCT.2018 13:21:35

Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5825

Ant0



Date: 26.OCT.2018 13:22:17

8.2 MAXIMUM CONDUCTED OUTPUT POWER

8.2.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to 789033 D02 Section II(E)

8.2.2 Conformance Limit

- For the band 5.15-5.25 GHz,

(a) (1) (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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).
(a) (1) (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(a) (1) (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(a) (1) (iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

- For the 5.25-5.35 GHz and 5.47-5.725 GHz bands

(a) (2) the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

- For the band 5.725-5.85 GHz

(a) (3)For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.2.4 Test Procedure

The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):
Measurements may be 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.

a. The Transmitter output (antenna port) was connected to the power meter.
b. Turn on the EUT and power meter and then record the power value.
c. Repeat above procedures on all channels needed to be tested.

8.2.5 Test Results

☒ 802.11a mode

Temperature :	28℃	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

Band	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
UNII Band I	CH36	5180	13.49	24	Pass
	CH40	5200	13.86	24	Pass
	CH48	5240	13.15	24	Pass
UNII Band III	CH149	5745	16.27	30	Pass
	CH157	5785	16.07	30	Pass
	CH165	5825	15.34	30	Pass

☒ 802.11n(HT20) mode

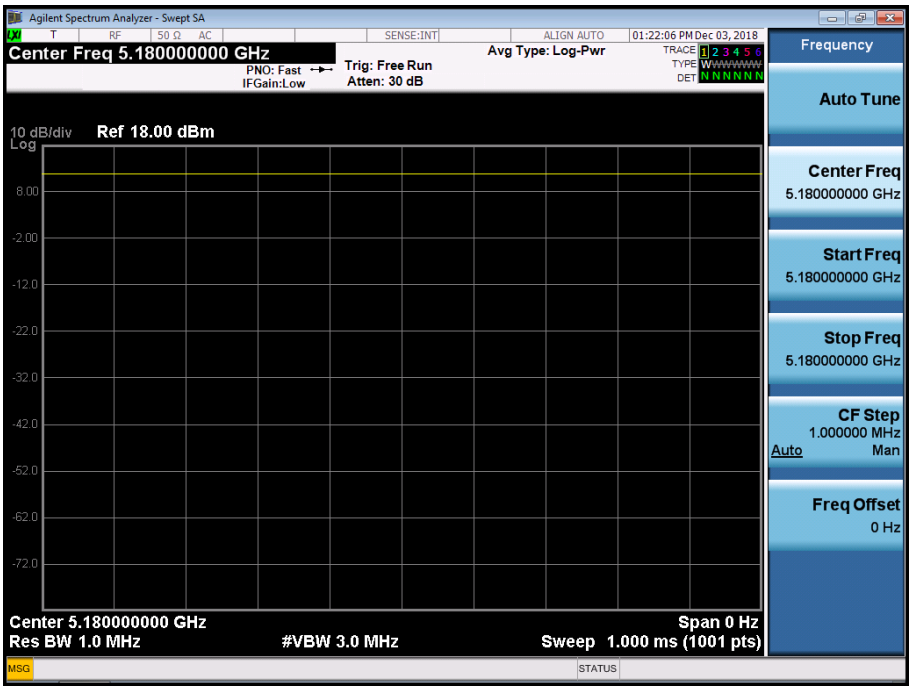
Temperature :	28℃	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

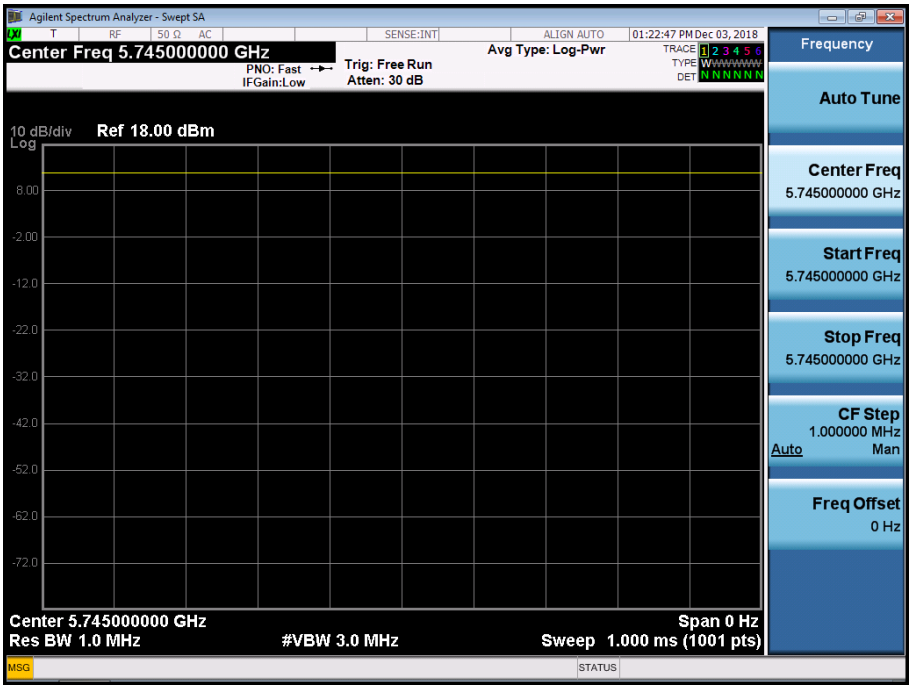
Band	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
UNII Band I	CH36	5180	12.11	24	Pass
	CH40	5200	12.48	24	Pass
	CH48	5240	11.88	24	Pass
UNII Band III	CH149	5745	15.34	30	Pass
	CH157	5785	15.12	30	Pass
	CH165	5825	14.42	30	Pass

All modes 802.11a/n have been tested, and the worst result with recorded was report as below:

Duty cycle=100%

802.11a mode





8.3 MAXIMUM PEAK POWER DENSITY

8.3.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to 789033 D02 Section II(F)

8.3.2 Conformance Limit

- For the band 5.15-5.25 GHz,

(a) (1) (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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).
(a) (1) (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(a) (1) (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(a) (1) (iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

- For the 5.25-5.35 GHz and 5.47-5.725 GHz bands

(b) (2) the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

- For the band 5.725-5.85 GHz

(a) (3)For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.3.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.3.4 Test Procedure

Methods refer to FCC KDB 789033

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”.

2) Use the peak search function on the instrument to find the peak of the spectrum.

3) The result is the PPSD.
4) The above procedures make use of 500kHz resolution bandwidth to satisfy the 500kHz measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz “provided that the measured power is integrated to show the total power over the measurement bandwidth” (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 500kHz bandwidth
Note: As a practical matter, it is recommended to use reduced RBW of 500 kHz for the sections 5.c) and 5.d) above, since RBW=500 kHz is available on nearly all spectrum analyzers.

8.3.5 Test Results

☒ 802.11a mode

Temperature : 28℃ Test By: XW
Humidity : 65 %

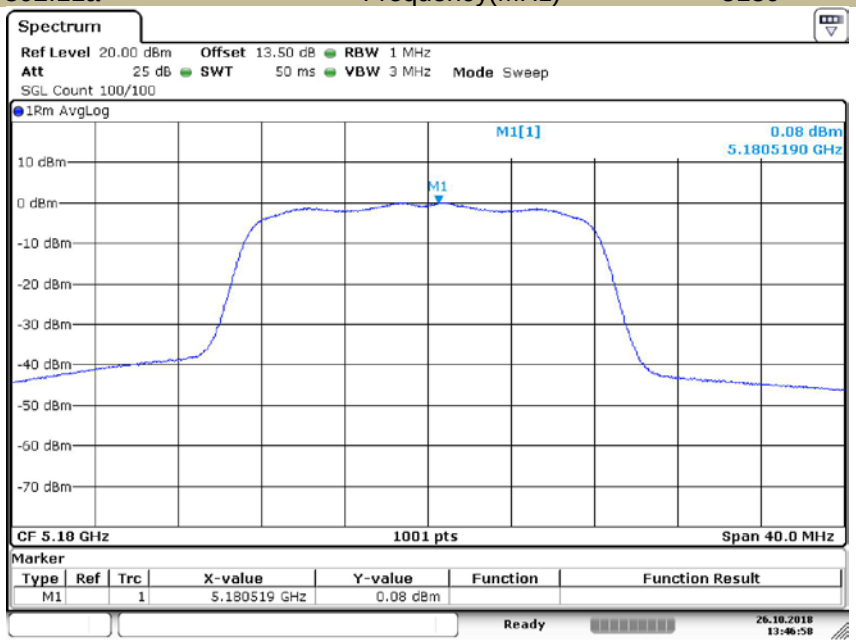
Band	Channel Number	Channel Freq. (MHz)	Power Spectral Density	Limit	Verdict
UNII Band I	CH36	5180	0.08	≤11dBm/1MHz	Pass
	CH40	5200	-1.03	≤11dBm/1MHz	Pass
	CH48	5240	-0.76	≤11dBm/1MHz	Pass
UNII Band III	CH149	5745	0.80	≤30dBm/500KHz	Pass
	CH157	5785	0.81	≤30dBm/500KHz	Pass
	CH165	5825	0.68	≤30dBm/500KHz	Pass
Note: N/A (Not Applicable)					

☒ 802.11n(HT20) mode

Temperature : 28℃ Test By: XW
Humidity : 65 %

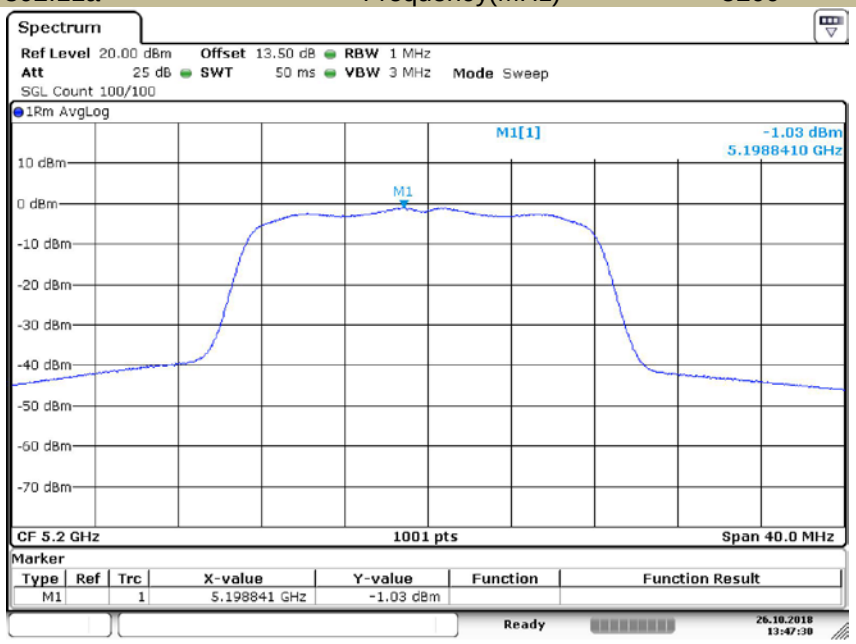
Band	Channel Number	Channel Freq. (MHz)	Power Spectral Density	Limit	Verdict
UNII Band I	CH36	5180	-1.42	≤11dBm/1MHz	Pass
	CH40	5200	-2.44	≤11dBm/1MHz	Pass
	CH48	5240	-2.39	≤11dBm/1MHz	Pass
UNII Band III	CH149	5745	-0.29	≤30dBm/500KHz	Pass
	CH157	5785	-0.28	≤30dBm/500KHz	Pass
	CH165	5825	-0.55	≤30dBm/500KHz	Pass
Note: N/A (Not Applicable)					

Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5180



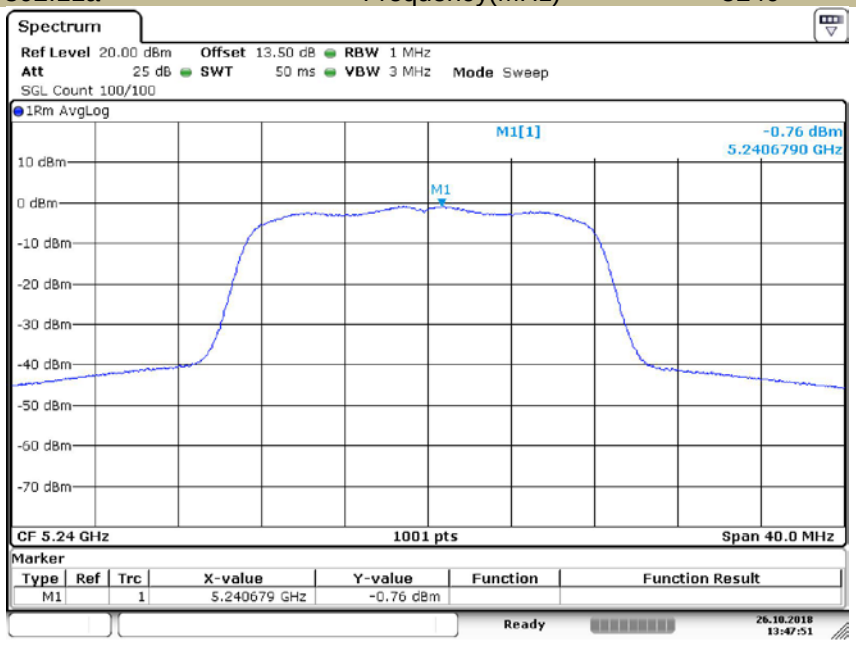
Date: 26.OCT.2018 13:46:58

Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5200



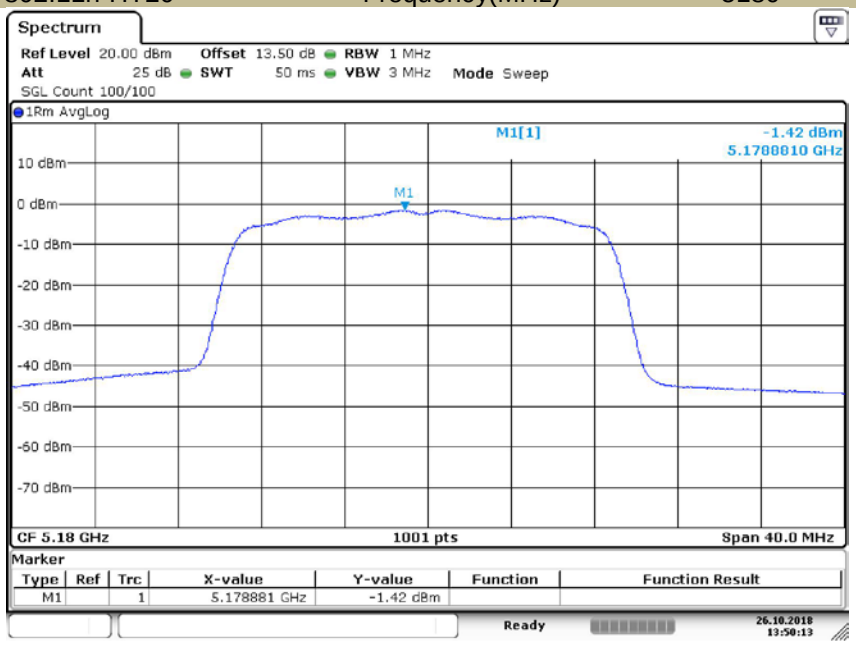
Date: 26.OCT.2018 13:47:30

Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5240



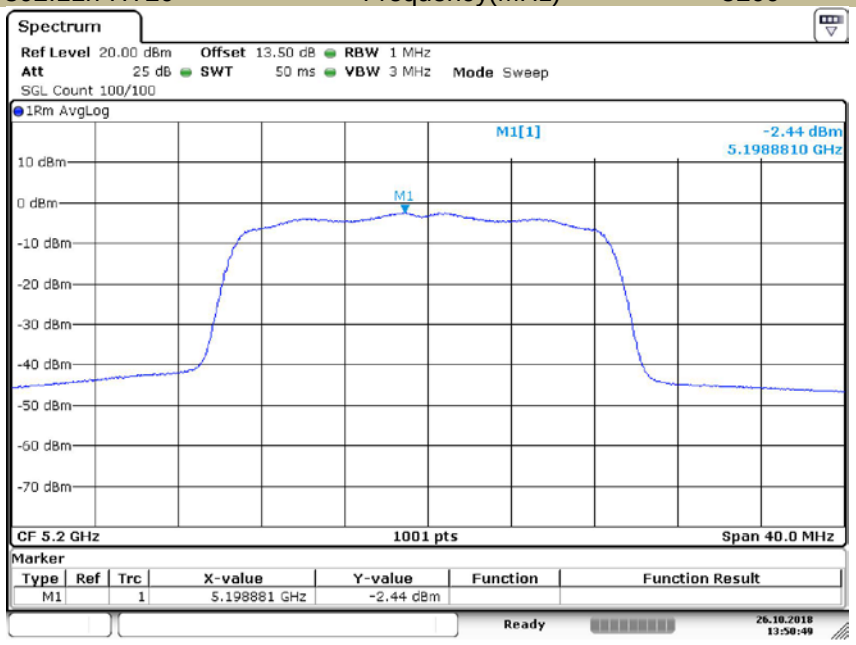
Date: 26.OCT.2018 13:47:51

Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5180



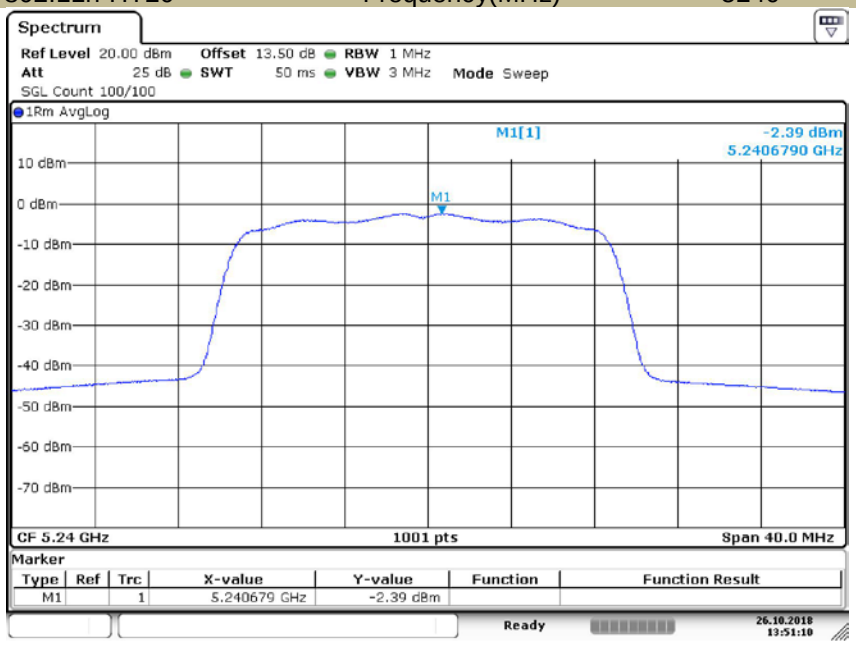
Date: 26.OCT.2018 13:50:13

Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5200



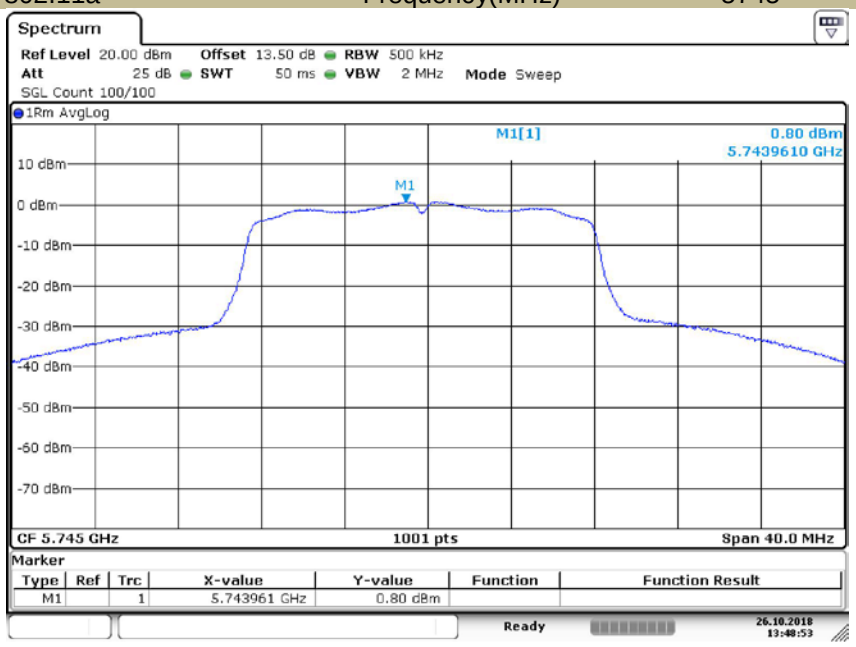
Date: 26.OCT.2018 13:50:49

Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5240



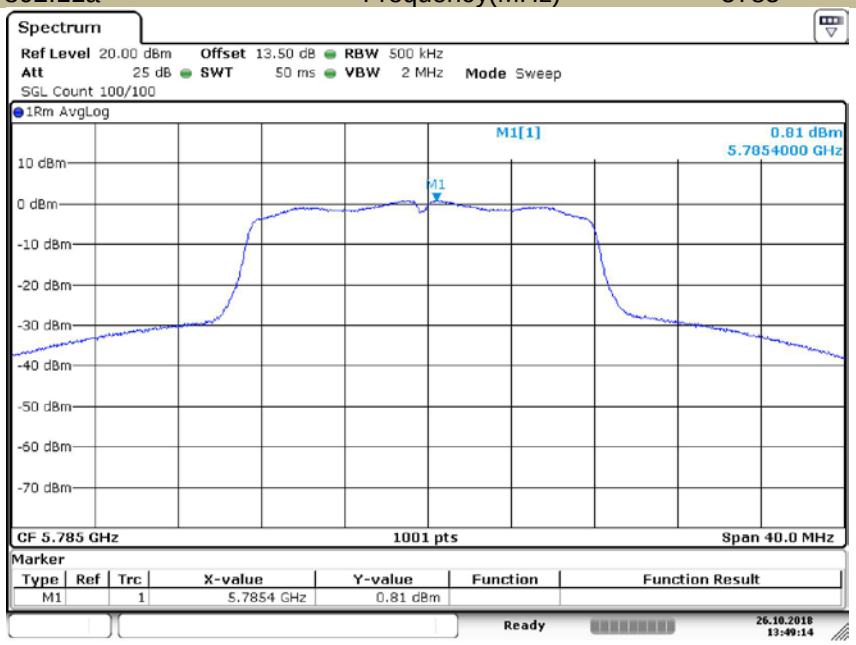
Date: 26.OCT.2018 13:51:10

Power Spectral Density		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5745



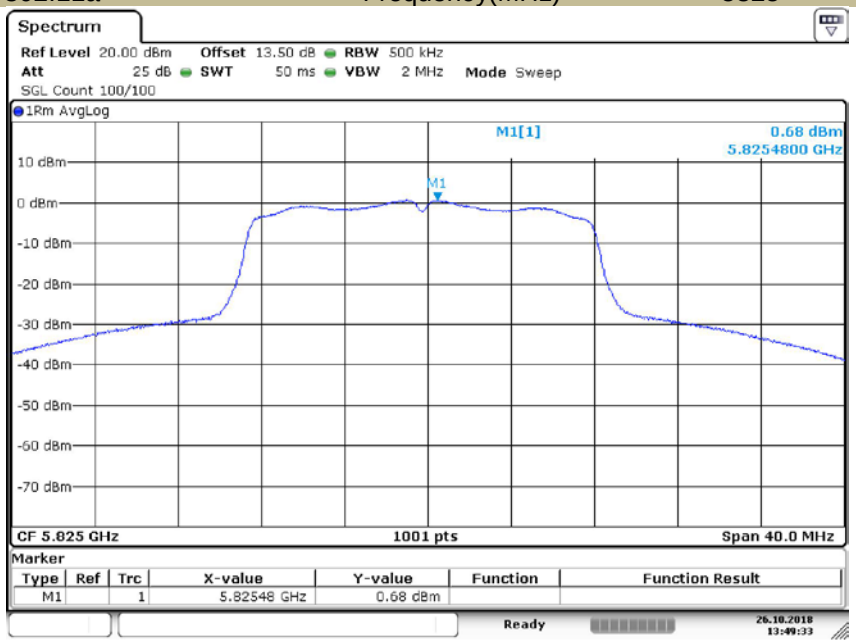
Date: 26.OCT.2018 13:48:53

Power Spectral Density		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5785



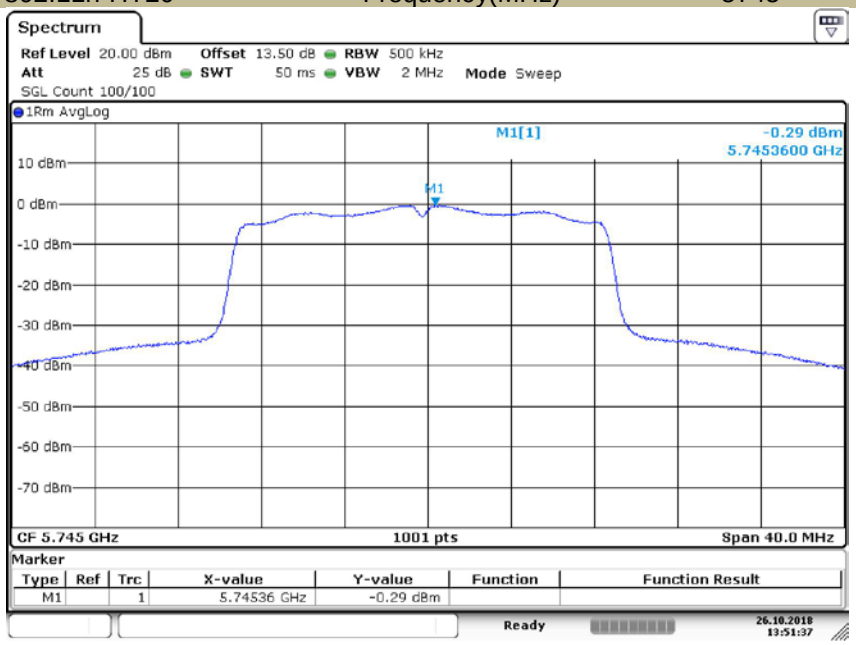
Date: 26.OCT.2018 13:49:13

Power Spectral Density		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5825



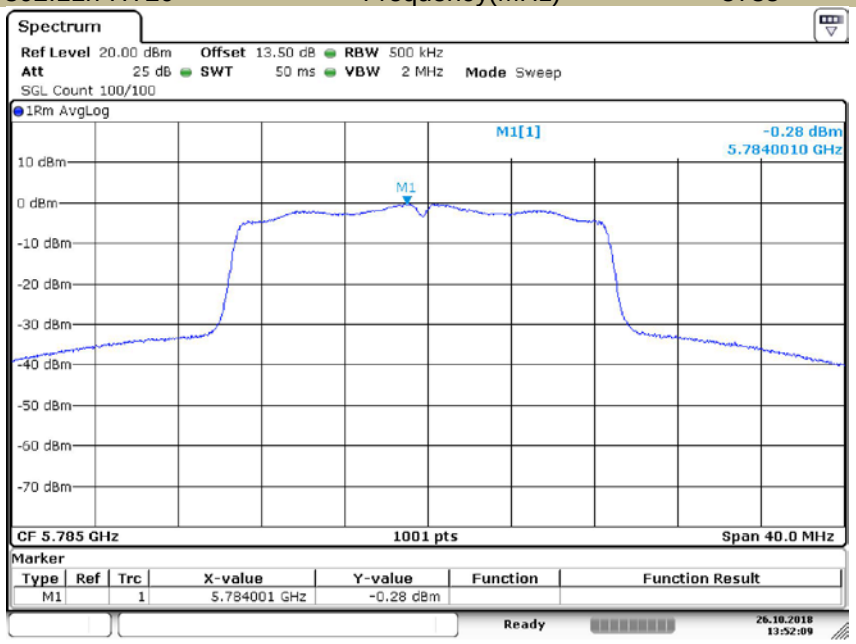
Date: 26.OCT.2018 13:49:33

Power Spectral Density		UNII Band III	
Test Model	802.11n-HT20	Frequency(MHz)	5745



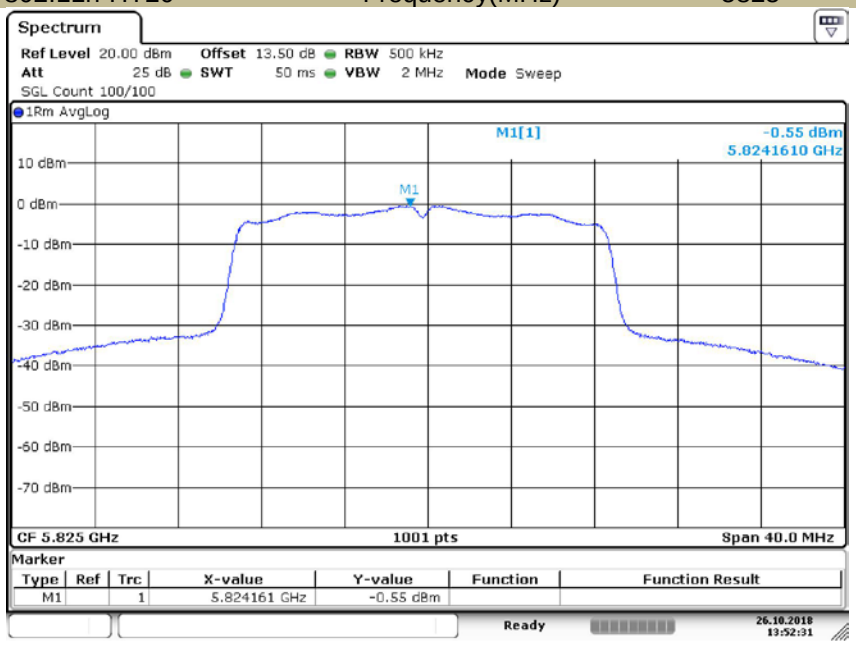
Date: 26.OCT.2018 13:51:37

Power Spectral Density		UNII Band III	
Test Model	802.11n-HT20	Frequency(MHz)	5785



Date: 26.OCT.2018 13:52:09

Power Spectral Density		UNII Band III	
Test Model	802.11n-HT20	Frequency(MHz)	5825



Date: 26.OCT.2018 13:52:32

8.4 FREQUENCY STABILITY

8.4.1 Applicable Standard

According to FCC Part 15.407(g)
ANSI C63.10 Section 6.8

8.4.2 Conformance Limit

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 users manual.

8.4.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.4.4 Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously
Set RBW = 10 kHz.
Set the video bandwidth (VBW) =30 kHz.
Set Span= Entire absence of modulation emissions bandwidth
Set Detector = Peak.
Set Trace mode = max hold.
Set Sweep = auto couple.
Allow the trace to stabilize.
The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
Beginning at each temperature level specified in user manual, the frequency shall be measured within one minute after application of primary power to the transmitter and at intervals of no more than one minute thereafter until ten minutes have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance, whichever time period is greater. During each test, the ambient temperature shall not be allowed to rise more than 10° centigrade above the respective beginning ambient temperature level
Measure and record the results in the test report.

8.4.5 Test Results

All modulation have been tested, and the worst results have been recorded in the report.

Antenna 0		5180	
Temperature :	--	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5179.998	-2	Pass
	-10	5179.998	-2	Pass
	0	5179.998	-2	Pass
	10	5179.996	-4	Pass
	20	5179.997	-3	Pass
	30	5179.996	-4	Pass
	40	5179.995	-5	Pass
	50	5179.995	-5	Pass
85% Vnom	20	5179.998	-2	Pass
115% Vnom	20	5179.997	-3	Pass

Antenna 0		5200	
Temperature :	--	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5199.989	-11	Pass
	-10	5199.989	-11	Pass
	0	5199.990	-10	Pass
	10	5199.990	-10	Pass
	20	5200.003	3	Pass
	30	5199.988	-12	Pass
	40	5199.989	-11	Pass
	50	5199.986	-14	Pass
85% Vnom	20	5199.990	-10	Pass
115% Vnom	20	5199.990	-10	Pass

Antenna 0		5240	
Temperature :	--	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5239.997	-3	Pass
	-10	5239.996	-4	Pass
	0	5239.997	-3	Pass
	10	5239.996	-4	Pass
	20	5239.994	-6	Pass
	30	5239.996	-4	Pass
	40	5239.992	-8	Pass
	50	5239.994	-6	Pass
85% Vnom	20	5239.997	-3	Pass
115% Vnom	20	5239.996	-4	Pass

Antenna 0		5745	
Temperature :	--	Test Date :	May04, 2017
Humidity :	65 %	Test By:	XW

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5745.000	0	Pass
	-10	5744.999	-1	Pass
	0	5745.002	2	Pass
	10	5745.003	3	Pass
	20	5745.004	4	Pass
	30	5745.001	1	Pass
	40	5745.000	0	Pass
	50	5745.002	2	Pass
85% Vnom	20	5745.002	2	Pass
115% Vnom	20	5745.002	2	Pass

Antenna 0		5785	
Temperature :	--	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5784.999	-1	Pass
	-10	5785.001	1	Pass
	0	5785.003	3	Pass
	10	5785.002	2	Pass
	20	5785.002	2	Pass
	30	5785.004	4	Pass
	40	5785.002	2	Pass
	50	5785.005	5	Pass
85% Vnom	20	5785.005	5	Pass
115% Vnom	20	5785.005	5	Pass

Antenna 0		5825	
Temperature :	--	Test Date :	October 26, 2018
Humidity :	65 %	Test By:	XW

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5824.997	-3	Pass
	-10	5824.995	-5	Pass
	0	5824.996	-4	Pass
	10	5824.993	-7	Pass
	20	5824.992	-8	Pass
	30	5824.994	-6	Pass
	40	5824.997	-3	Pass
	50	5824.994	-6	Pass
85% Vnom	20	5824.993	-7	Pass
115% Vnom	20	5824.998	-2	Pass

8.5 UNDESIRABLE RADIATED SPURIOUS EMISSION

8.5.1 Applicable Standard

According to FCC Part 15.407 (b)
According to 789033 D02 Section II(G)

8.5.2 Conformance Limit

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
For transmitters operating in the 5.725-5.85 GHz band: 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.
The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209
The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	2400/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The provisions of §15.205 apply to intentional radiators operating under this section,15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

8.5.3 Test Configuration

Test according to clause 6.2 radio frequency test setup

8.5.4 Test Procedure

■ Unwanted Emissions Measurements below 1000 MHz

Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.
The EUT was placed on a turn table which is 0.8m above ground plane.
And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
Repeat above procedures until all frequency measured was complete.
We use software control the EUT, Let EUT hopping on and transmit with highest power, All the modes have been tested and the worst result was reported.
Use the following spectrum analyzer settings:
Set RBW=120kHz for f < 1 GHz(30MHz to 1GHz), 200Hz for f<150KHz(9KHz to 150KHz), 9KHz for <30MHz (150KHz to 30KHz).
Set the VBW > RBW.
Detector = Peak.
Trace mode = max hold.
Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.
Repeat above procedures until all frequency measured was complete.

■ Unwanted Maximum peak Emissions Measurements above 1000 MHz

Maximum emission levels are measured by setting the analyzer as follows:
RBW = 1 MHz.
VBW ≥ 3 MHz.
Detector = Peak.
Sweep time = auto.
Trace mode = max hold.
Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

■ Unwanted Average Emissions Measurements above 1000 MHz

Method VB (Averaging using reduced video bandwidth): Alternative method.
RBW = 1 MHz.
Video bandwidth. • If the EUT is configured to transmit with duty cycle ≥ 98 percent, set VBW ≤ RBW/100 (i.e., 10 kHz) but not less than 10 Hz.
• If the EUT duty cycle is < 98 percent, set VBW ≥ 1/T, where T is defined in section II.B.1.a).
Video bandwidth mode or display mode • The instrument shall be set to ensure that video filtering is applied in the power domain. Typically, this requires setting the detector mode to RMS and setting the Average-VBW Type to Power (RMS).
• As an alternative, the analyzer may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some analyzers require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode.
Detector = Peak.
Sweep time = auto.
Trace mode = max hold.
Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of 1/x, where x is the duty cycle. For example, use at least 200 traces if the duty cycle is 25 percent. (If a specific emission is demonstrated to be continuous—i.e., 100 percent duty cycle—rather than turning on and off with the transmit cycle, at least 50 traces shall be averaged.)

■ Band edge measurements.

Unwanted band-edge emissions may be measured using either of the special band-edge measurement techniques (the marker-delta or integration methods) described below. Note that the marker-delta method is primarily a radiated measurement technique that requires the 99% occupied bandwidth edge to be within 2 MHz of the authorized band edge, whereas the integration method can be used in either a radiated or conducted measurement without any special requirement with regards to the displacement of the unwanted emission(s) relative to the authorized bandwidth.

Marker-Delta Method.

The marker-delta method, as described in ANSI C63.10, can be used to perform measurements of the radiated unwanted emissions level of emissions provided that the 99% occupied bandwidth of the fundamental is within 2 MHz of the authorized band-edge.

8.5.5 Test Results

■ ☒For Undesirable radiated Spurious Emission in UNII Band I

The modes 802.11a/n has been tested and the worst result recorded as below:

● ☒Undesirable radiated Spurious Emission Above 1GHz (1GHz to 40GHz)

Test mode: 802.11a Frequency: 5180

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
7430.36	V	56.73	45.7	74	54	-17.27	-8.30
15551.60	V	50.75	35.29	74	54	-23.25	-18.71
7430.36	H	58.85	43.23	74	54	-15.15	-10.77
15551.60	H	50.00	39.15	74	54	-24.00	-14.85

Test mode: 802.11a Frequency: 5200

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
7518.25	V	55.36	45.29	74	54	-18.64	-8.71
15446.98	V	49.07	37.08	74	54	-24.93	-16.92
7518.25	H	56.78	43.68	74	54	-17.22	-10.32
15446.98	H	50.11	38.09	74	54	-23.89	-15.91

Test mode: 802.11a Frequency: 5240

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
7625.81	V	56.8	44.94	74	54	-17.20	-9.06
15665.19	V	50.91	36.93	74	54	-23.09	-17.07
7625.81	H	58.81	42.81	74	54	-15.19	-11.19
15665.19	H	50.67	38.91	74	54	-23.33	-15.09

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp

(4)Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5180

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
5992.03	V	42.83	-52.40	-27	-25.40
9784.39	V	42.75	-52.48	-27	-25.48
5992.03	H	42.1	-53.13	-27	-26.13
9784.39	H	40.65	-54.58	-27	-27.58

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5220

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
6019.63	V	40.14	-55.09	-27	-28.09
9619.06	V	40.88	-54.35	-27	-27.35
6019.63	H	40.89	-54.34	-27	-27.34
9619.06	H	41.76	-53.47	-27	-26.47

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5240

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
5706.03	V	43.52	-51.71	-27	-24.71
9897.04	V	40.56	-54.67	-27	-27.67
5706.03	H	40.68	-54.55	-27	-27.55
9897.04	H	41.82	-53.41	-27	-26.41

Note: (1) Emission Level= Reading Level+Probe Factor +Cable Loss.
(2) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

- ☒Undesirable radiated Undesirable radiated Spurious Emission in Band Edge

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5180

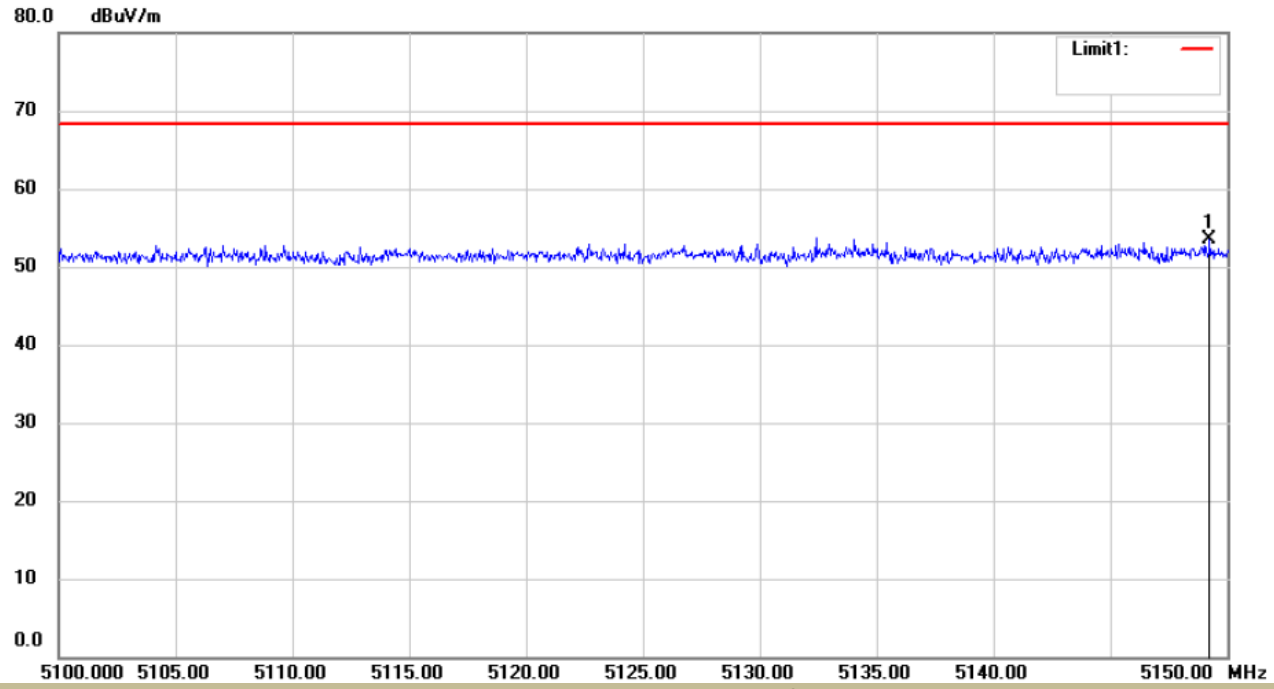
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5149.25	V	53.47	-41.76	-27.00	Pass
5142.20	H	53.09	-42.14	-27.00	Pass

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5240

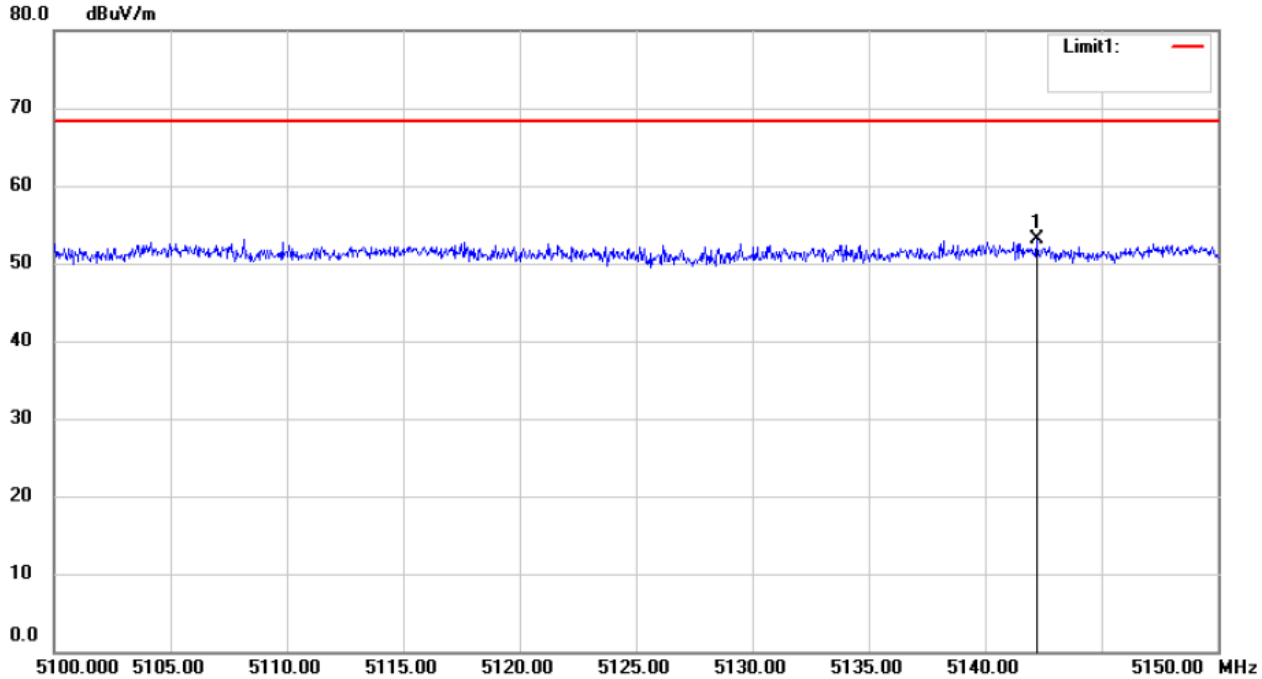
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5354.05	V	52.56	-42.67	-27.00	Pass
5352.50	H	53.73	-41.50	-27.00	Pass

Note: (1) Emission Level= Reading Level+Probe Factor +Cable Loss.
(2) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

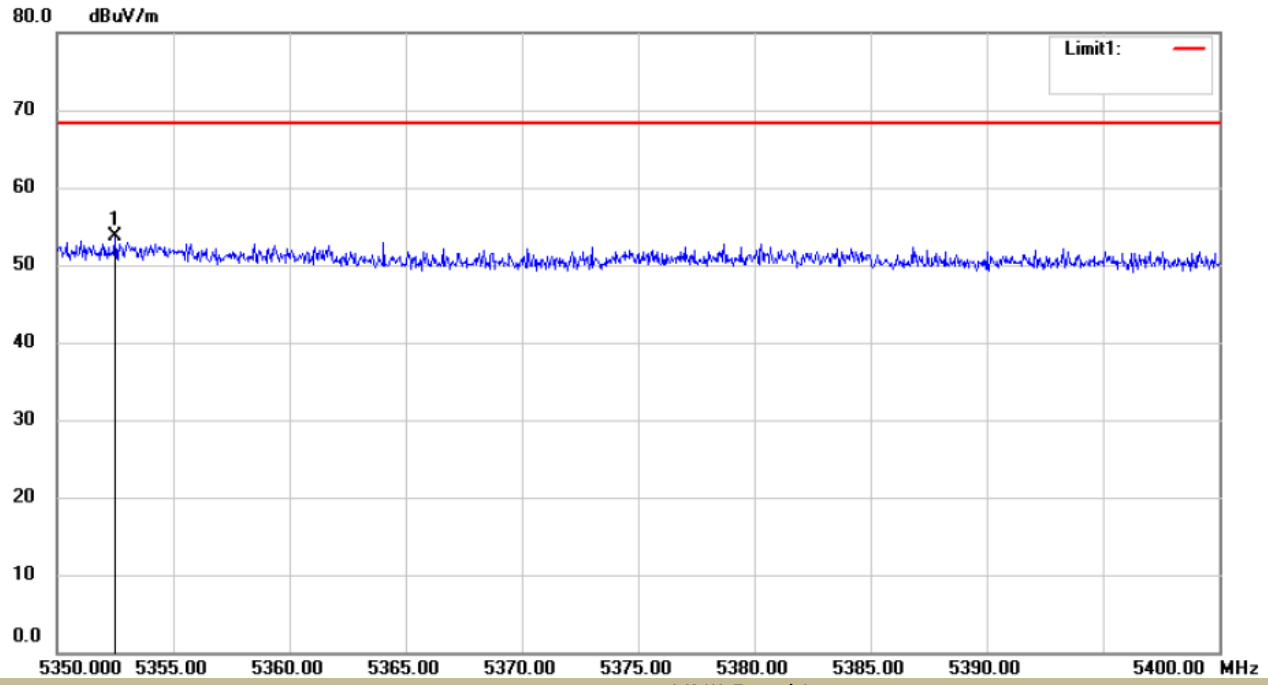
Test Model	UNII Band I Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5180 ☐5200 ☐5240 Ant.Pol H



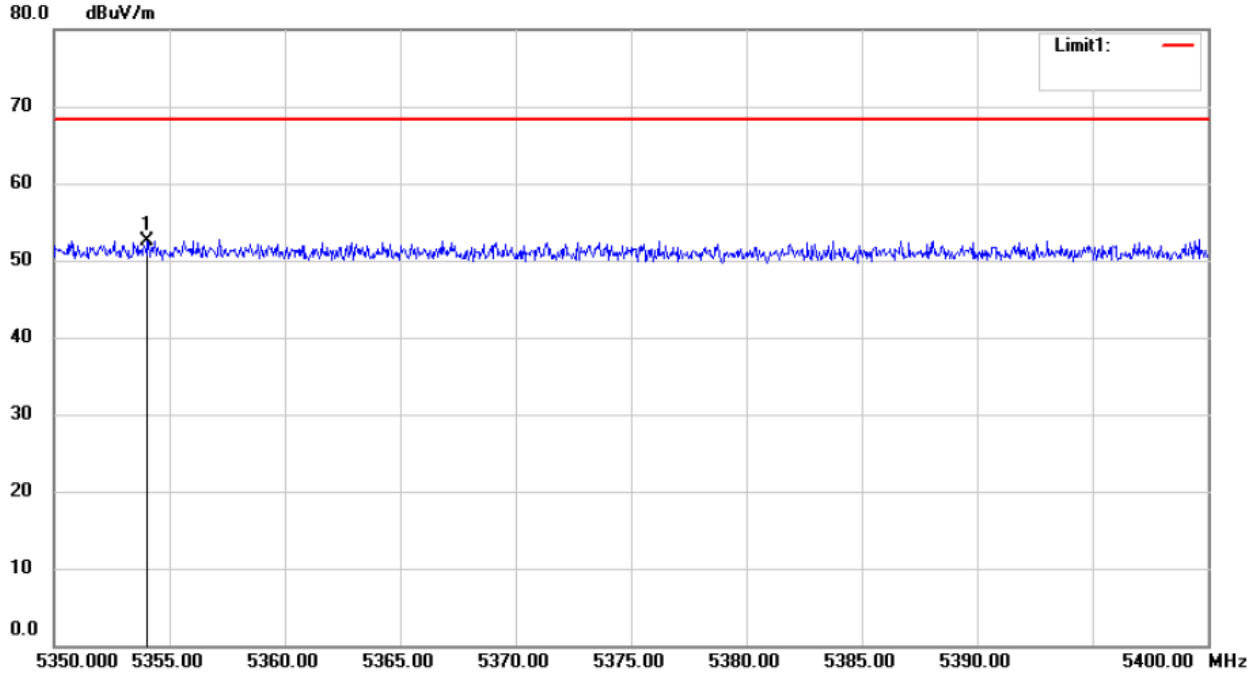
Test Model	UNII Band I Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5180 ☐5200 ☐5240 Ant.Pol V



Test Model	UNII Band I Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☐5180 ☐5200 ☒5240 Ant.Pol H



Test Model	UNII Band I Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☐5180 ☐5200 ☒5240 Ant.Pol V



■ ☒For Undesirable radiated Spurious Emission in UNII Band III

All the modes 802.11a/n has been tested and the worst result 802.11a recorded as below:

● ☒Undesirable radiated Spurious Emission Above 1GHz (1GHz to 40GHz)

Test mode: 802.11a Frequency: 5745

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
7736.49	V	54.51	44.36	74	54	-19.49	-9.64
15567.08	V	49.35	36.29	74	54	-24.65	-17.71
7736.49	H	56.66	41.2	74	54	-17.34	-12.80
15567.08	H	53.45	39.85	74	54	-20.55	-14.15

Test mode: 802.11a Frequency: 5785

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
7569.64	V	55.2	44.32	74	54	-18.80	-9.68
16091.8	V	48.33	36.23	74	54	-25.67	-17.77
7569.64	H	57.94	42.49	74	54	-16.06	-11.51
16091.80	H	53.05	39.16	74	54	-20.95	-14.84

Test mode: 802.11a Frequency: 5825

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
7671.56	V	55.99	43.44	74	54	-18.01	-10.56
16027.75	V	50.58	37.07	74	54	-23.42	-16.93
7671.56	H	55.49	43.12	74	54	-18.51	-10.88
16027.75	H	52.18	40.67	74	54	-21.82	-13.33

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4)Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5745

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7015.89	V	42.41	-52.82	-27	-25.82
10041.55	V	42.34	-52.89	-27	-25.89
7015.89	H	41.3	-53.93	-27	-26.93
10041.55	H	43.57	-51.66	-27	-24.66

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5785

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7030.49	V	40.27	-54.96	-27	-27.96
9962.71	V	41.48	-53.75	-27	-26.75
7030.49	H	41.92	-53.31	-27	-26.31
9962.71	H	41.83	-53.40	-27	-26.40

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency(MHz):	5825

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7009.66	V	40.86	-54.37	-27	-27.37
10031.82	V	41.53	-53.70	-27	-26.70
7009.66	H	43.49	-51.74	-27	-24.74
10031.82	H	42.01	-53.22	-27	-26.22

Note: (1) Emission Level= Reading Level+Probe Factor +Cable Loss.
(2) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

- ☒Undesirable radiated Spurious Emission in band edge

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency:	5745

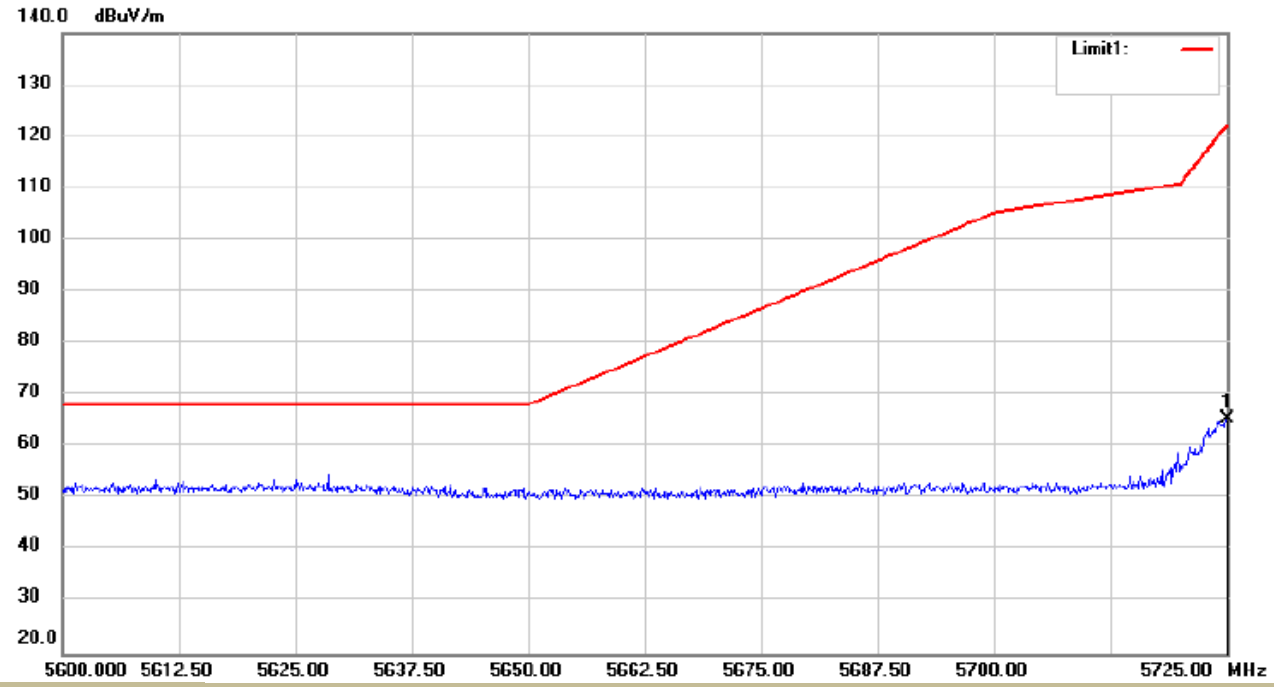
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5723.75	V	65.60	-29.63	24.15	PASS
5725.00	H	65.53	-29.70	27.00	PASS

Temperature :	28℃	Test Date :	November 05, 2018
Humidity :	65 %	Test By:	XW
Test mode:	802.11a	Frequency:	5825

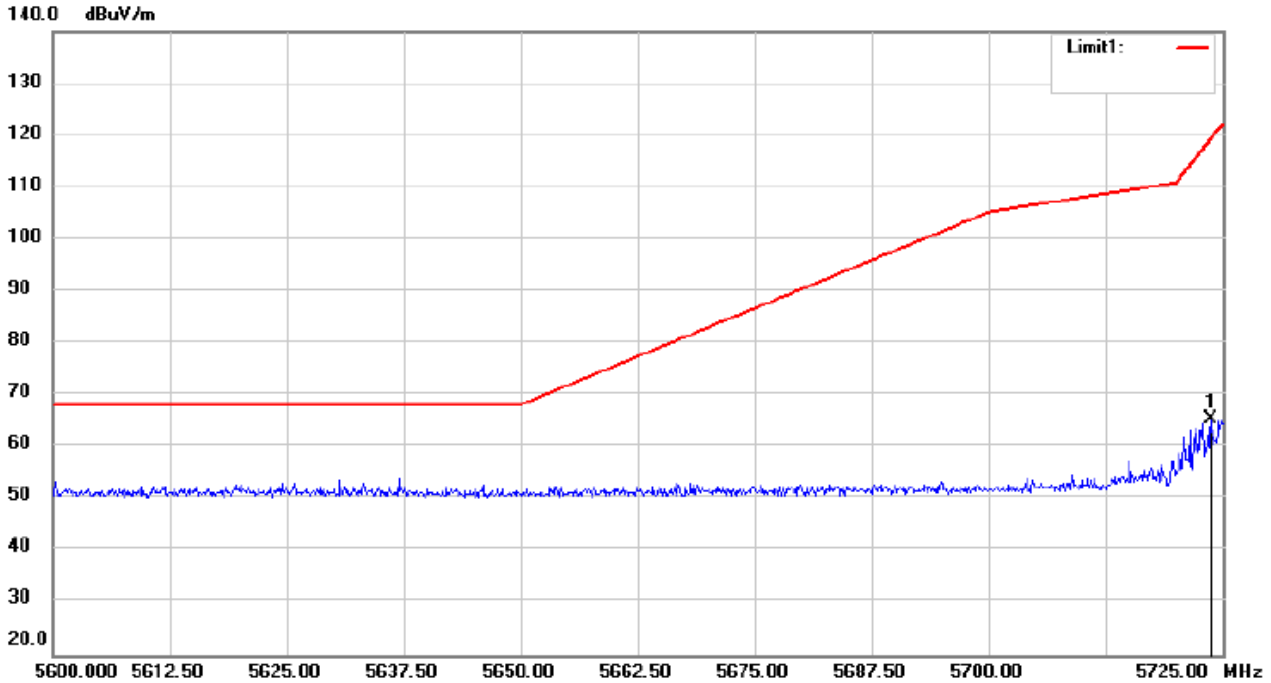
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5850.50	V	59.00	-36.23	25.86	PASS
5850.13	H	61.14	-34.09	26.71	PASS

Note: (1) Emission Level= Reading Level+Probe Factor +Cable Loss.
(2) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

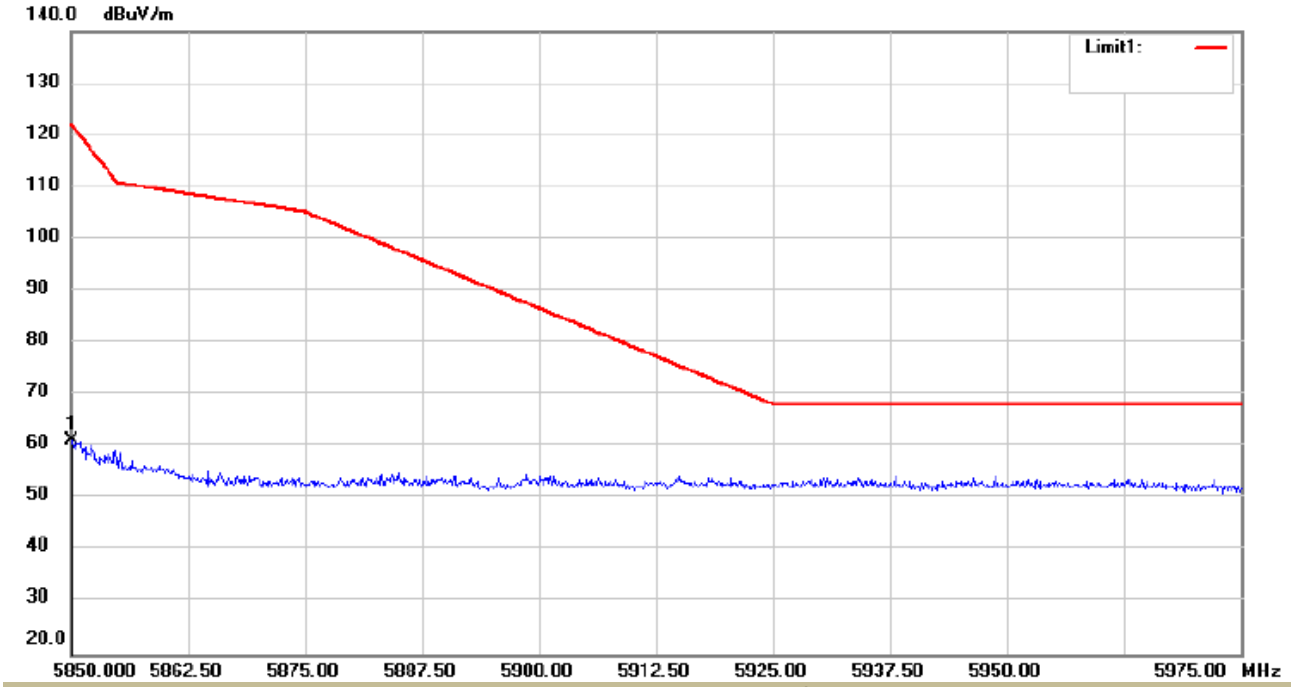
Test Model	UNII Band III Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5745 Ant.Pol H



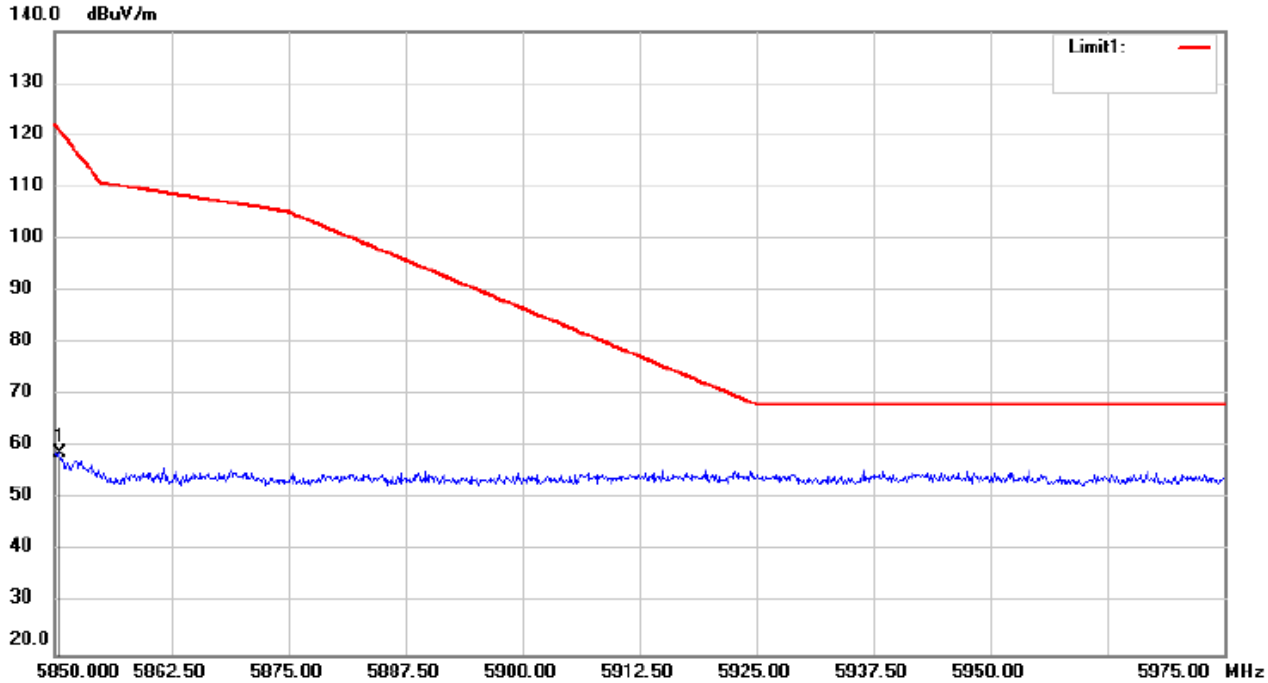
Test Model	UNII Band III Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5745 Ant.Pol V



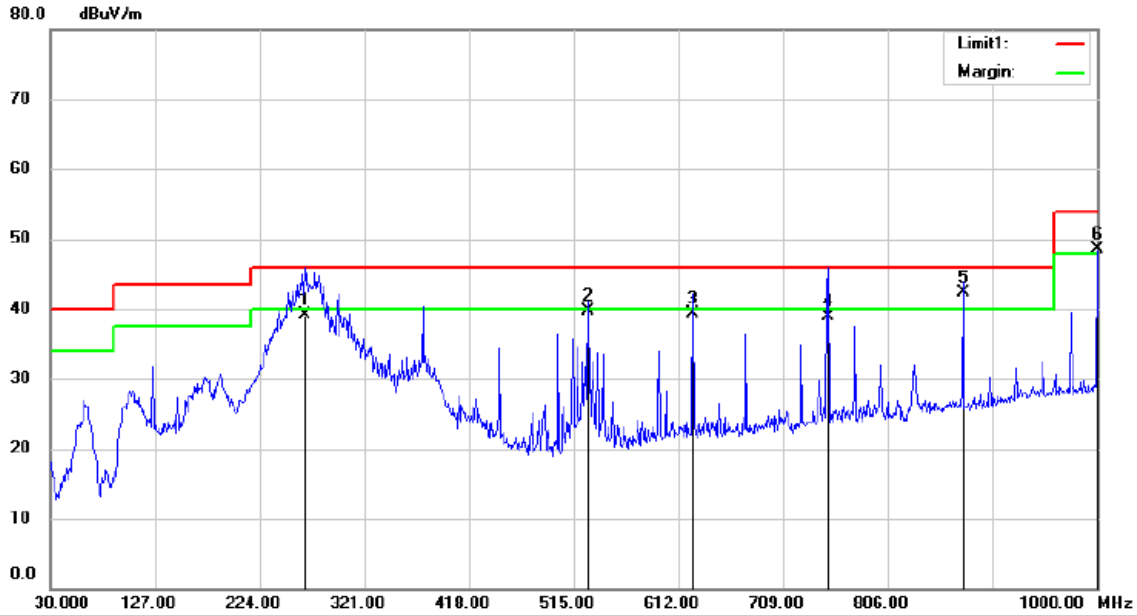
Test Model	UNII Band III Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5825 Ant.Pol H



Test Model	UNII Band III Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5825 Ant.Pol V



- Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)
  All mode have been tested, and the worst results have been recorded in the report.



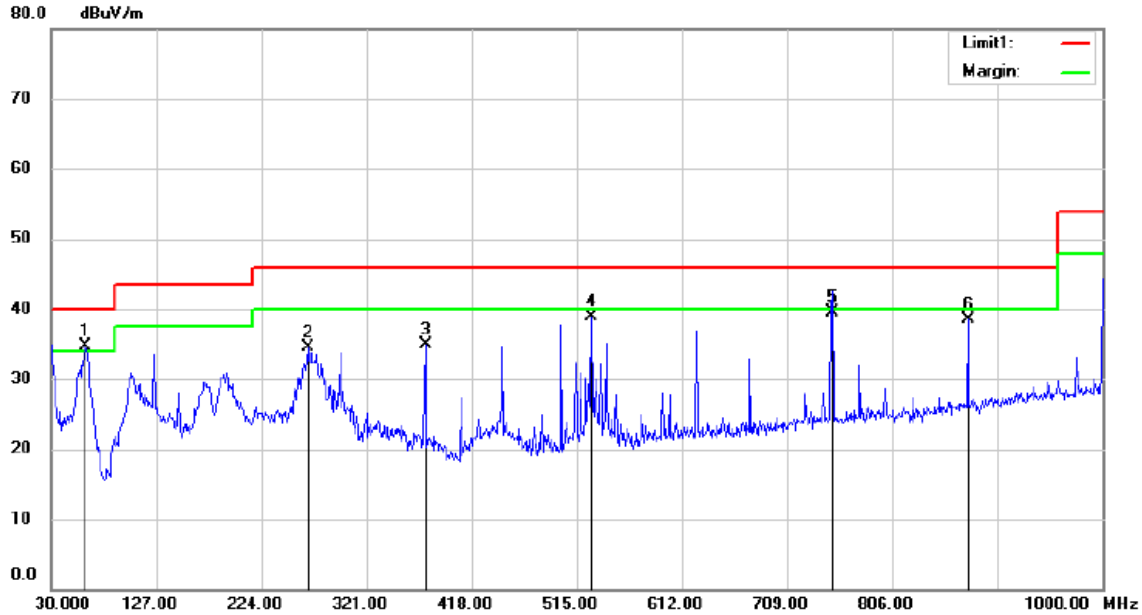
Site 3m Chamber #3 Polarization: ***Horizontal*** Temperature: 27 C

Limit: (RE)FCC PART 15C Power: Humidity: 49 %

Mode:TX(11a 5180)

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		265.7100	52.66	-13.46	39.20	46.00	-6.80	QP			
2		528.5800	46.99	-7.29	39.70	46.00	-6.30	QP			
3		625.5800	44.72	-5.32	39.40	46.00	-6.60	QP			
4		750.7100	42.28	-3.38	38.90	46.00	-7.10	QP			
5	*	875.8400	43.81	-1.41	42.40	46.00	-3.60	QP			
6	!	1000.000	47.81	0.72	48.53	54.00	-5.47	QP			



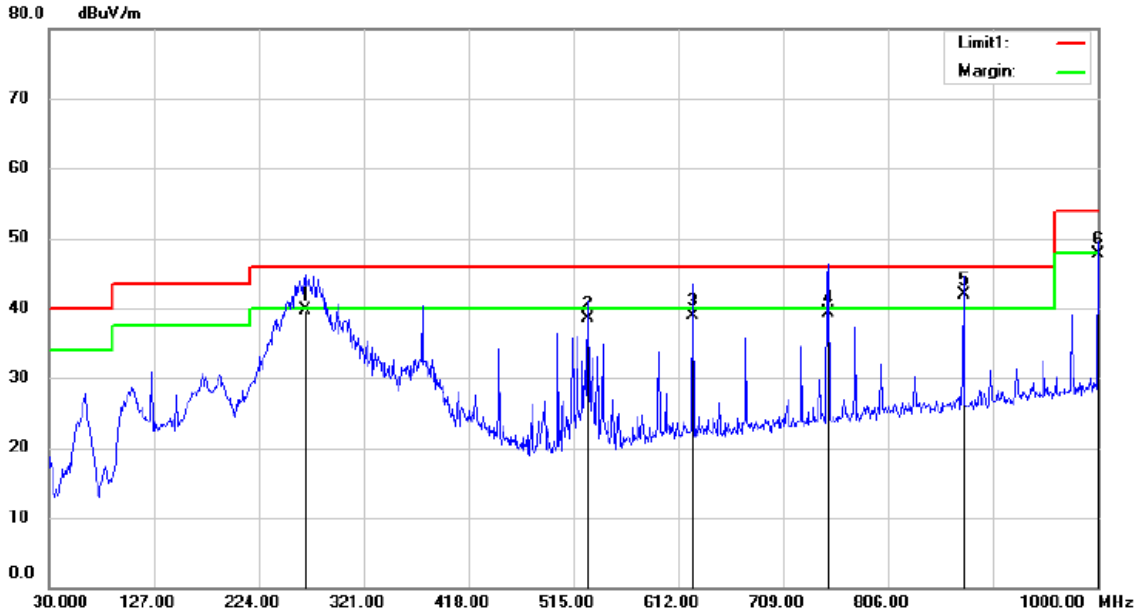
Site 3m Chamber #3 Polarization: *Vertical* Temperature: 27 C

Limit: (RE)FCC PART 15C Power: Humidity: 49 %

Mode:TX(11a 5180)

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	61.0400	50.22	-15.58	34.64	40.00	-5.36	QP			
2		266.6800	48.02	-13.48	34.54	46.00	-11.46	QP			
3		375.3200	45.74	-10.76	34.98	46.00	-11.02	QP			
4		528.5800	46.17	-7.29	38.88	46.00	-7.12	QP			
5		750.7100	42.88	-3.38	39.50	46.00	-6.50	QP			
6		875.8400	40.00	-1.41	38.59	46.00	-7.41	QP			



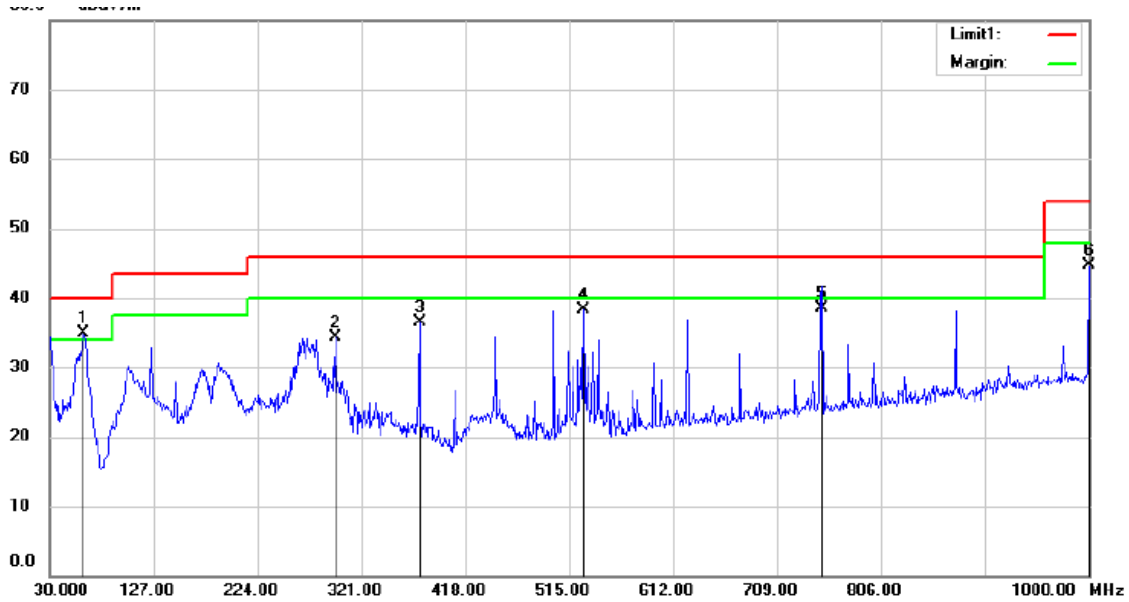
Site 3m Chamber #3 Polarization: ***Horizontal*** Temperature: 27 C

Limit: (RE)FCC PART 15C Power: Humidity: 49 %

Mode:TX(11a 5200)

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		266.6800	53.18	-13.48	39.70	46.00	-6.30	QP			
2		528.5800	45.89	-7.29	38.60	46.00	-7.40	QP			
3		625.5800	44.32	-5.32	39.00	46.00	-7.00	QP			
4		750.7100	42.68	-3.38	39.30	46.00	-6.70	QP			
5	*	875.8400	43.31	-1.41	41.90	46.00	-4.10	QP			
6		1000.000	47.08	0.72	47.80	54.00	-6.20	QP			



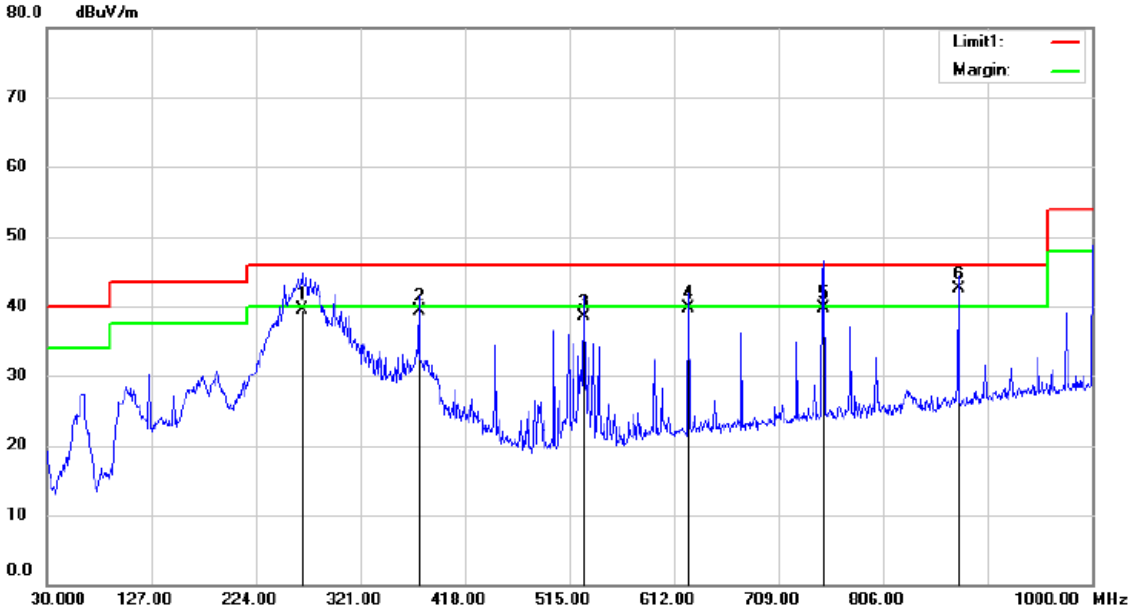
Site 3m Chamber #3 Polarization: *Vertical* Temperature: 27 C

Limit: (RE)FCC PART 15C Power: Humidity: 49 %

Mode: TX(11a 5200)

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	61.0400	50.49	-15.58	34.91	40.00	-5.09	QP			
2		296.7500	46.92	-12.54	34.38	46.00	-11.62	QP			
3		375.3200	47.24	-10.76	36.48	46.00	-9.52	QP			
4		528.5800	45.54	-7.29	38.25	46.00	-7.75	QP			
5		750.7100	41.98	-3.38	38.60	46.00	-7.40	QP			
6		1000.000	43.94	0.72	44.66	54.00	-9.34	QP			



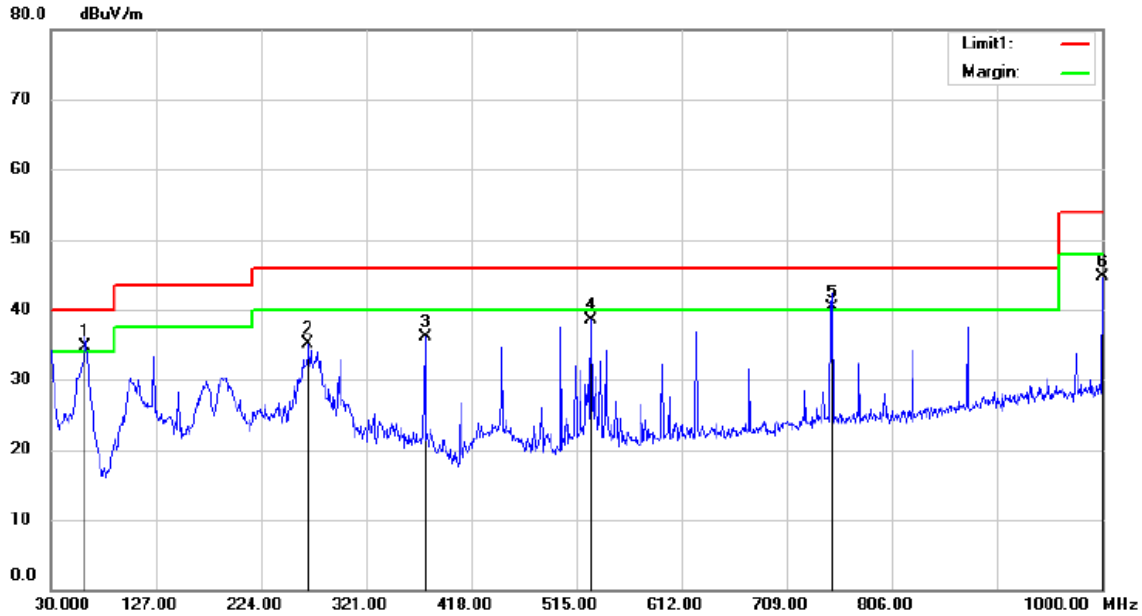
Site 3m Chamber #3 Polarization: ***Horizontal*** Temperature: 27 C

Limit: (RE)FCC PART 15C Power: Humidity: 49 %

Mode:TX(11a 5240)

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		266.6800	52.98	-13.48	39.50	46.00	-6.50	QP			
2		375.3200	50.16	-10.76	39.40	46.00	-6.60	QP			
3		528.5800	45.79	-7.29	38.50	46.00	-7.50	QP			
4		625.5800	45.02	-5.32	39.70	46.00	-6.30	QP			
5		750.7100	43.18	-3.38	39.80	46.00	-6.20	QP			
6	*	875.8400	44.01	-1.41	42.60	46.00	-3.40	QP			



Site 3m Chamber #3 Polarization: *Vertical* Temperature: 27 C

Limit: (RE)FCC PART 15C Power: Humidity: 49 %

Mode:TX(11a 5240)

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	62.0100	50.48	-15.68	34.80	40.00	-5.20	QP			
2		267.6500	48.64	-13.49	35.15	46.00	-10.85	QP			
3		375.3200	46.87	-10.76	36.11	46.00	-9.89	QP			
4		528.5800	45.84	-7.29	38.55	46.00	-7.45	QP			
5	!	750.7100	43.68	-3.38	40.30	46.00	-5.70	QP			
6		1000.000	43.98	0.72	44.70	54.00	-9.30	QP			

8.6 POWER LINE CONDUCTED EMISSIONS

8.6.1 Applicable Standard

According to FCC Part 15.207(a)

8.6.2 Conformance Limit

Conducted Emission Limit		
Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	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.

8.6.3 Test Configuration

Test according to clause 6.3 conducted emission test setup

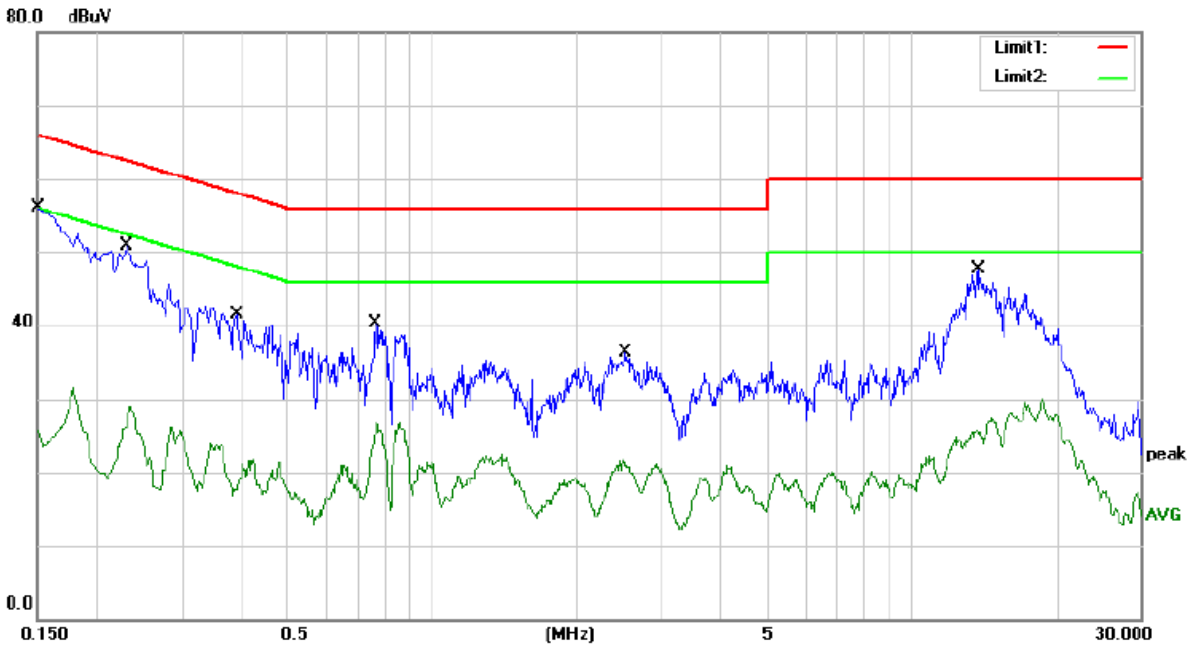
8.6.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.
Maximum procedure was performed on the highest emissions to ensure EUT compliance.
Repeat above procedures until all frequency measured were complete.

8.6.5 Test Results

Pass

The 120V &240V voltagehave been tested, and the worst result recorded was report as below:



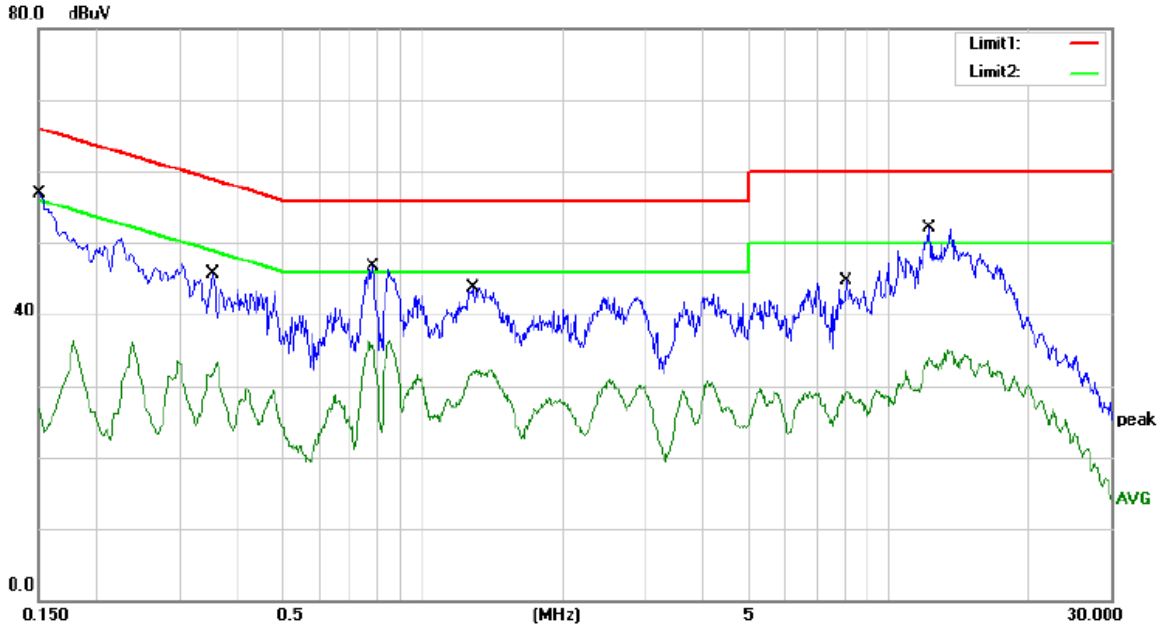
Site Conduction #2 Phase: L1 Temperature: 24.9

Limit: (CE)FCC PART 15 class B QP Power: AC 120V/60Hz Humidity: 54 %

Mode: TX

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	46.19	9.89	56.08	66.00	-9.92	QP	
2		0.1500	21.61	9.89	31.50	56.00	-24.50	AVG	
3		0.2300	40.93	9.90	50.83	62.45	-11.62	QP	
4		0.2300	19.02	9.90	28.92	52.45	-23.53	AVG	
5		0.3900	31.50	9.91	41.41	58.06	-16.65	QP	
6		0.3900	13.97	9.91	23.88	48.06	-24.18	AVG	
7		0.7620	30.39	9.92	40.31	56.00	-15.69	QP	
8		0.7620	16.83	9.92	26.75	46.00	-19.25	AVG	
9		2.5380	26.42	9.94	36.36	56.00	-19.64	QP	
10		2.5380	11.74	9.94	21.68	46.00	-24.32	AVG	
11		13.7260	37.76	10.04	47.80	60.00	-12.20	QP	
12		13.7260	17.45	10.04	27.49	50.00	-22.51	AVG	



Site Conduction #2 Phase: N Temperature: 24.9
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 54 %

Mode: TX
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	47.04	9.89	56.93	66.00	-9.07	QP	
2		0.1500	19.49	9.89	29.38	56.00	-26.62	AVG	
3		0.3540	35.78	9.91	45.69	58.87	-13.18	QP	
4		0.3540	23.43	9.91	33.34	48.87	-15.53	AVG	
5		0.7820	36.81	9.92	46.73	56.00	-9.27	QP	
6		0.7820	26.34	9.92	36.26	46.00	-9.74	AVG	
7		1.2860	33.79	9.93	43.72	56.00	-12.28	QP	
8		1.2860	22.41	9.93	32.34	46.00	-13.66	AVG	
9		8.0900	34.71	10.00	44.71	60.00	-15.29	QP	
10		8.0900	19.15	10.00	29.15	50.00	-20.85	AVG	
11	*	12.1980	42.14	10.03	52.17	60.00	-7.83	QP	
12		12.1980	25.01	10.03	35.04	50.00	-14.96	AVG	

8.7 ANTENNA APPLICATION

8.7.1 Antenna Requirement

Standard	Requirement
FCC CRF Part 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.407 (a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

8.7.2 Result

PASS.

The EUT has a integral antennas for WIFI, the antenna max gain is 0 dBi,

Note:

- ☒ Antenna use a permanently attached antenna which is not replaceable.
- ☐ Not using a standard antenna jack or electrical connector for antenna replacement
- ☐ The antenna has to be professionally installed (please provide method of installation)

Which in accordance to section 15.203, please refer to the internal photos.