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FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

For

Keezel Router

MODEL No.: 1.00

FCC ID: 2AJFM-0001A

Trade Mark: Keezel

REPORT NO.: ES180713013E2

ISSUE DATE: July 27, 2018

Prepared for

AvocadoNinja B.V.
Valschermkade 16, 1059CD Amsterdam The Netherlands

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant:	AvocadoNinja B.V. Valschermkade 16, 1059CD Amsterdam The Netherlands
Manufacturer:	PRECINTL (HK) LIMITED Fl 2, Galaxy Maker World, Ya Nan Road, Wuhe Blvd South, Bantian,Longgang, Shenzhen, China Zip code: 518129
Product Description:	Keezel Router
Model Number:	1.00
File Number:	ES180713013E2
Date of Test:	July 13, 2018 to July 24, 2018

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 : July 13, 2018 to July 24, 2018

Prepared by : Yaping Shen/Editor

Reviewer : Joe Xia/Supervisor

Approve & Authorized Signer : Lisa Wang/Manager

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2 EUT TECHNICAL DESCRIPTION

Characteristics	Description			
IEEE 802.11 WLAN Mode Supported	☒802.11a(20MHz channel bandwidth) ☒802.11b(20MHz channel bandwidth) ☒802.11g(20MHz channel bandwidth) ☒802.11n(20MHz channel bandwidth) ☒802.11n(40MHz channel bandwidth) ☐802.11ac(20MHz channel bandwidth) ☐802.11ac(40MHz channel bandwidth) ☐802.11ac(80MHz channel bandwidth)			
Data Rate	WIFI: 802.11 b:1,2,5.5,11Mbps; 802.11 g/a:6,9,12,18,24,36,48,54Mbps; 802.11n(HT20)/ac(HT20): MCS0-MCS15; 802.11n(HT40): MCS0-MCS15;			
Modulation	WIFI: OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/g/n; DSSS with DBPSK/DQPSK/CCK for 802.11b;			
Operating Frequency Range	WIFI 5G Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)	5180-5240	4
		802.11n(HT40)	5190-5230	2
	UNII Band III	802.11a/n(HT20)	5745-5825	5
		802.11n(HT40)	5755-5795	2
	2.4G WIFI: 2412-2462MHz for 802.11b/g; 2412-2462MHz for 802.11n(HT20); 2422-2452MHz for 802.11n(HT40);			
Transmit Power Max	16.49 dBm for WIFI 2.4G Band; 17.74 dBm for UNII Band I; 17.03 dBm for UNII Band III			
Antenna Type	Internal Antenna Two antenna for WIFI			
Max Antenna Gain	Antenna 1 : 2.2 dBi for WIFI 2.4 Band Antenna 2 : 3.5 dBi for WIFI 2.4 Band Antenna 1: 1.6 dBi for WIFI 5G Band I Antenna 2: 1.4 dBi for WIFI 5G Band I Antenna 1: 1.6 dBi for WIFI 5G Band III Antenna 2: 1.4 dBi for WIFI 5G Band III			
Directional Gain	5.88 dBi for WIFI 2.4G Band 3.76 dBi for WIFI 5G Band I 3.76 dBi for WIFI 5G Band III			
Power supply	AC 120V 60Hz for Adapter, DC 3.7V from Battery			

Note: *for more details, please refer to the User's manual of the EUT.*

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 D02 General UNII Test Procedures New Rules v02r01, 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: 2AJFM-0001A filing to comply with Section 15.247 of the FCC Part 15, Subpart E Rules.

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 789003 D02 General UNII Test Procedures New Rules v02r01
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
FCC KDB 662911 D02 MIMO With Cross Polarized Antenna V01

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	DUE CAL.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/28/2018	05/27/2019
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	05/28/2018	05/27/2019
50Ω Coaxial Switch	Anritsu	MP59B	M20531	N/A	05/27/2019
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	05/28/2018	05/27/2019
Voltage Probe	Rohde & Schwarz	TK9416	N/A	05/28/2018	05/27/2019
I.S.N	Rohde & Schwarz	ENY22	1109.9508.02	05/28/2018	05/27/2019

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	05/28/2018	05/27/2019
Pre-Amplifier	HP	8447D	2944A07999	05/28/2018	05/27/2019
Bilog Antenna	Schwarzbeck	VULB9163	142	05/28/2018	05/27/2019
Loop Antenna	ARA	PLA-1030/B	1029	05/28/2018	05/27/2019
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/28/2018	05/27/2019
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/28/2018	05/27/2019
Cable	Schwarzbeck	AK9513	ACRX1	05/28/2018	05/27/2019
Cable	Rosenberger	N/A	FP2RX2	05/28/2018	05/27/2019
Cable	Schwarzbeck	AK9513	CRPX1	05/28/2018	05/27/2019
Cable	Schwarzbeck	AK9513	CRRX2	05/28/2018	05/27/2019

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	DUE CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	05/28/2018	05/27/2019
peak power analyzer	Agilent	8990B	4657524	05/28/2018	05/27/2019
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2018	05/27/2019
Spectrum Analyzer	Rohde & Schwarz	FSV40	100967	05/28/2018	05/27/2019

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.

Those data rates (☒802.11a: 6 Mbps; ☒802.11n (HT20): MCS0; ☒802.11n (HT20): MCS15; ☒802.11n (HT40): MCS0; ☒802.11n (HT40): MCS15; ☐802.11ac (HT20): MCS0; ☐802.11ac (HT20): MCS15; ☐802.11ac (HT40): MCS0; ☐802.11ac (HT40): MCS19; ☐802.11ac (HT80): MCS0; ☐802.11ac (HT80): MCS19;) were used for all test.

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)/ac(VHT20):

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

Frequency and Channel list for 802.11n(HT40)/ac(VHT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190				
46	5230				

Frequency and Channel list for 802.11ac(VHT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	5210				

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

Test Frequency and channel for 802.11n(VHT40)

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	N/A	N/A	46	5230

☒ Wifi 5G with UNII Band III

Frequency and Channel list for 802.11a/n(HT20)/ac(VHT20):

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

Frequency and Channel list for 802.11n(HT40)/ac(VHT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755				
159	5795				

Frequency and Channel list for 802.11ac(VHT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
155	5775				

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

Test Frequency and channel for 802.11n(HT40)

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	N/A	N/A	159	5795

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 2015.4 The Laboratory has been assessed according to the requirements ISO/IEC 17025. Accredited by FCC, July 06, 2016 The Certificate Registration Number is 709623. Accredited by FCC, July 06, 2016 The Certificate Registration Number is 406365. Accredited by Industry Canada, November 29, 2012 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:

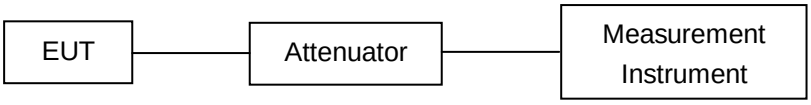
Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test	±2.0dB
Radiated Emission Test	±2.0dB
Power Density	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5℃
Humidity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

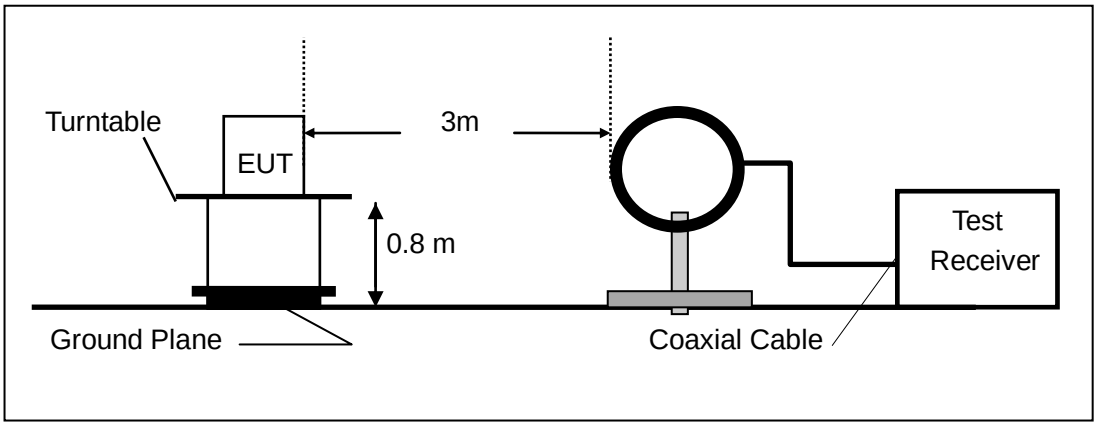
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

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.

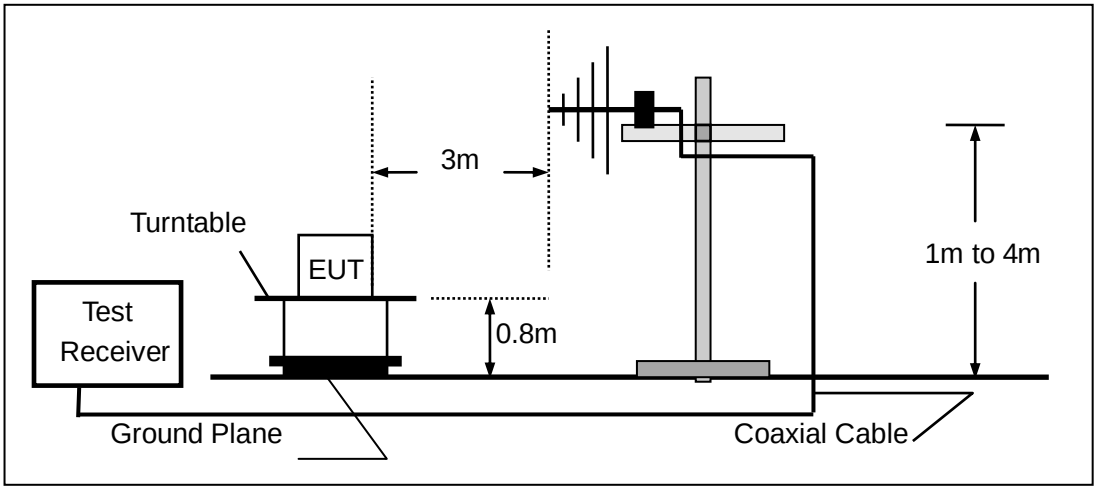
Above 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of 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).

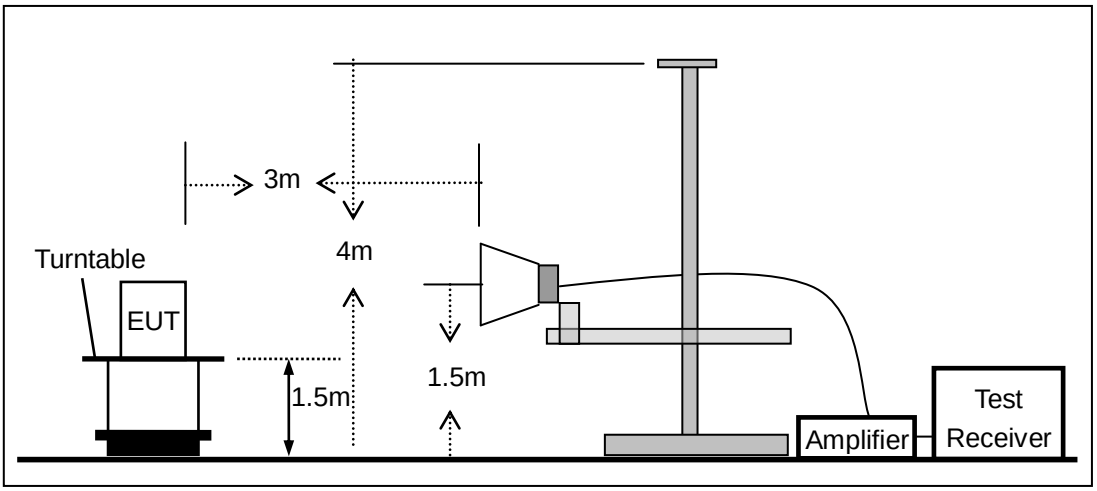
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



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

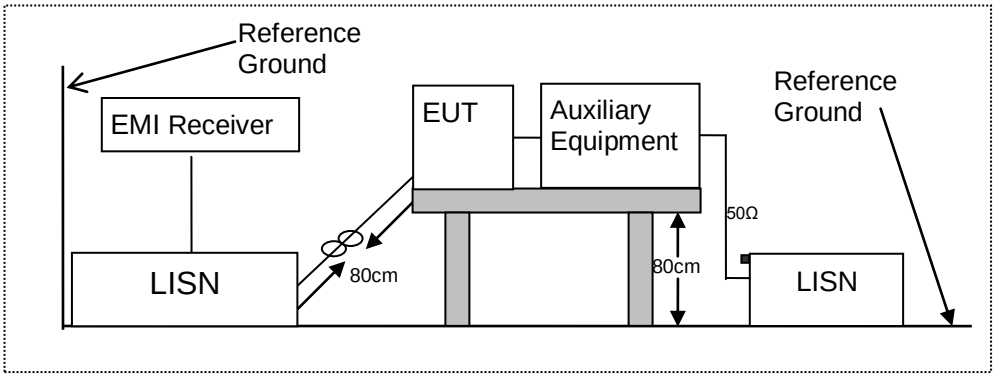


(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

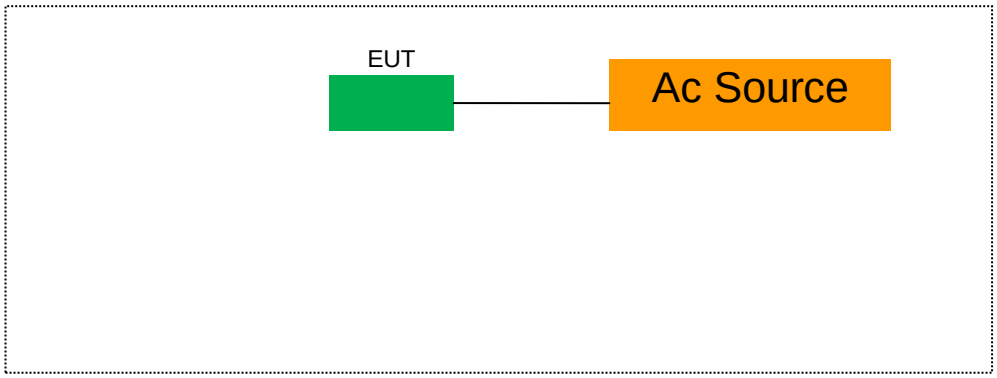


7.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT 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
N/A	N/A	N/A	N/A	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(e) for UNII Band III

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

We tested antenna A and antenna B. The test results are similar, the worst test data for Antenna A:

☒ 802.11a mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	26dB EBW	99% OBW	Limit (MHz)	Verdict
UNII Band I	CH36	5180	25.97	17.02	N/A	N/A
	CH40	5200	25.30	16.90	N/A	N/A
	CH48	5240	24.38	17.14	N/A	N/A
UNII Band III	CH149	5745	24.42	17.02	N/A	N/A
	CH157	5785	25.14	17.30	N/A	N/A
	CH165	5825	22.06	16.86	N/A	N/A
Note: N/A (Not Applicable)						

☒ 802.11n(VHT20) mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	26dB EBW	99% OBW	Limit (MHz)	Verdict
UNII Band I	CH36	5180	23.17	16.97	N/A	N/A
	CH40	5200	23.34	17.90	N/A	N/A
	CH48	5240	24.18	18.02	N/A	N/A
UNII Band III	CH149	5745	26.33	18.06	N/A	N/A
	CH157	5785	24.70	18.06	N/A	N/A
	CH165	5825	23.78	17.98	N/A	N/A
Note: N/A (Not Applicable)						

☒ 802.11n(VHT40) mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	26dB EBW	99% OBW	Limit (MHz)	Verdict
UNII Band I	CH38	5190	40.31	36.11	N/A	N/A
	CH46	5230	45.40	36.52	N/A	N/A
UNII Band III	CH151	5755	40.74	36.08	N/A	N/A
	CH159	5795	41.12	36.21	N/A	N/A
Note: N/A (Not Applicable)						

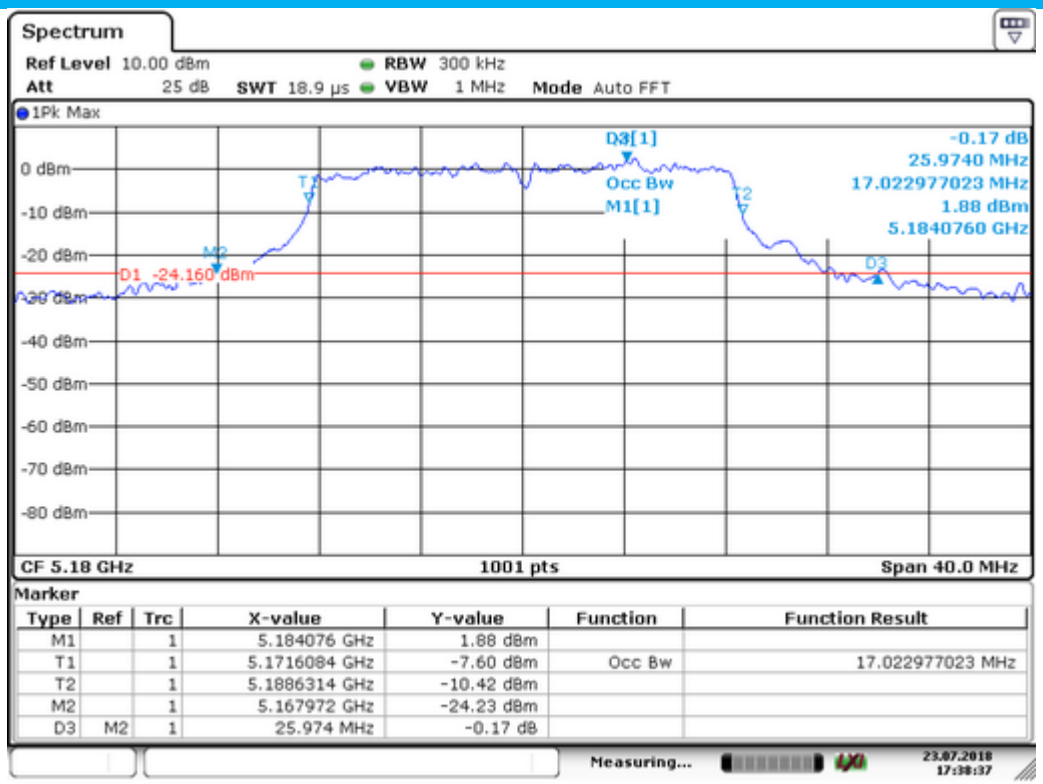
☒ UNII Band I& Band III

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

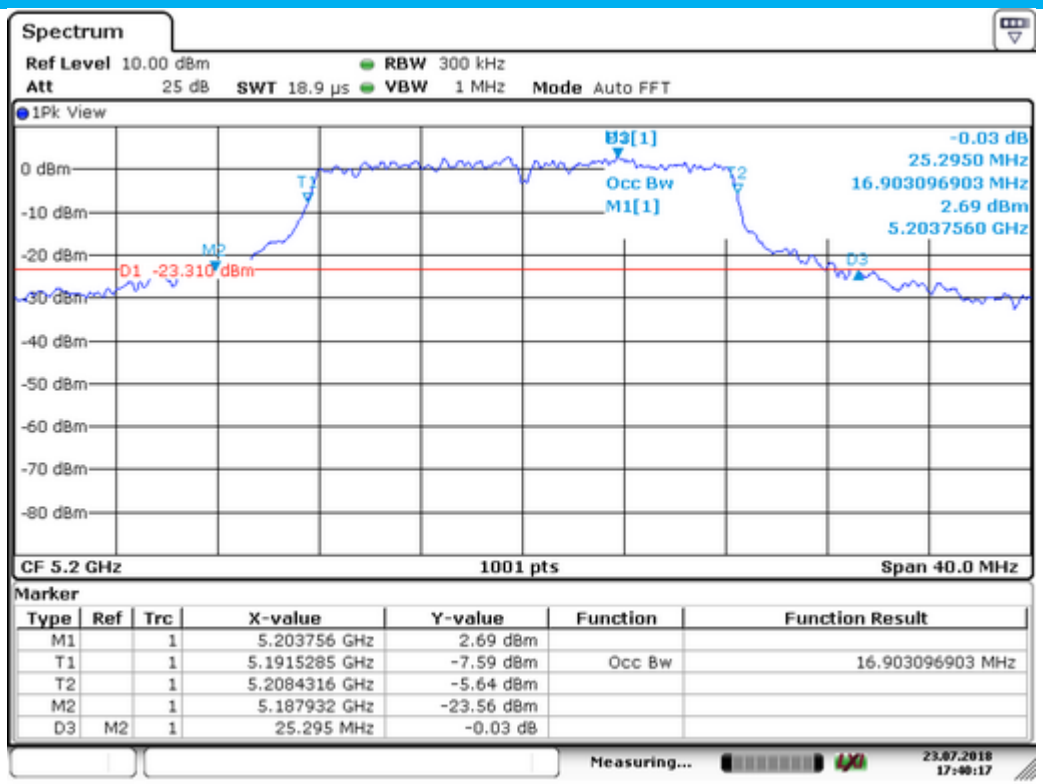
Operation Mode	Channel Number	Channel Freq. (MHz)	6dB EBW	Limit (MHz)	Verdict
802.11a	CH36	5180	16.47	500	PASS
	CH40	5200	16.50	500	PASS
	CH48	5240	16.50	500	PASS
	CH149	5745	16.49	500	PASS
	CH157	5785	16.50	500	PASS
	CH165	5825	16.49	500	PASS
802.11n (VHT20)	CH36	5180	17.79	500	PASS
	CH40	5200	17.70	500	PASS
	CH48	5240	17.77	500	PASS
	CH149	5745	17.78	500	PASS
	CH157	5785	17.80	500	PASS
	CH165	5825	17.74	500	PASS
802.11n (VHT40)	CH38	5190	35.90	500	PASS
	CH46	5230	36.24	500	PASS
	CH151	5755	36.20	500	PASS
	CH159	5795	36.28	500	PASS

Note:
N/A (Not Applicable)

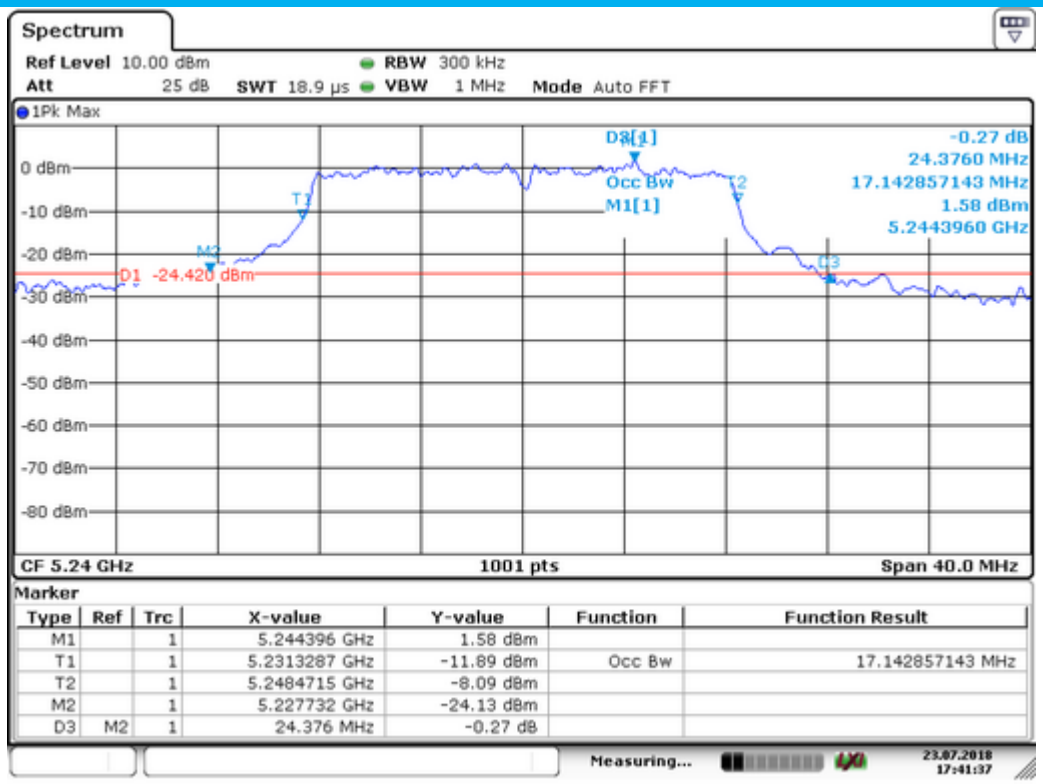
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5180



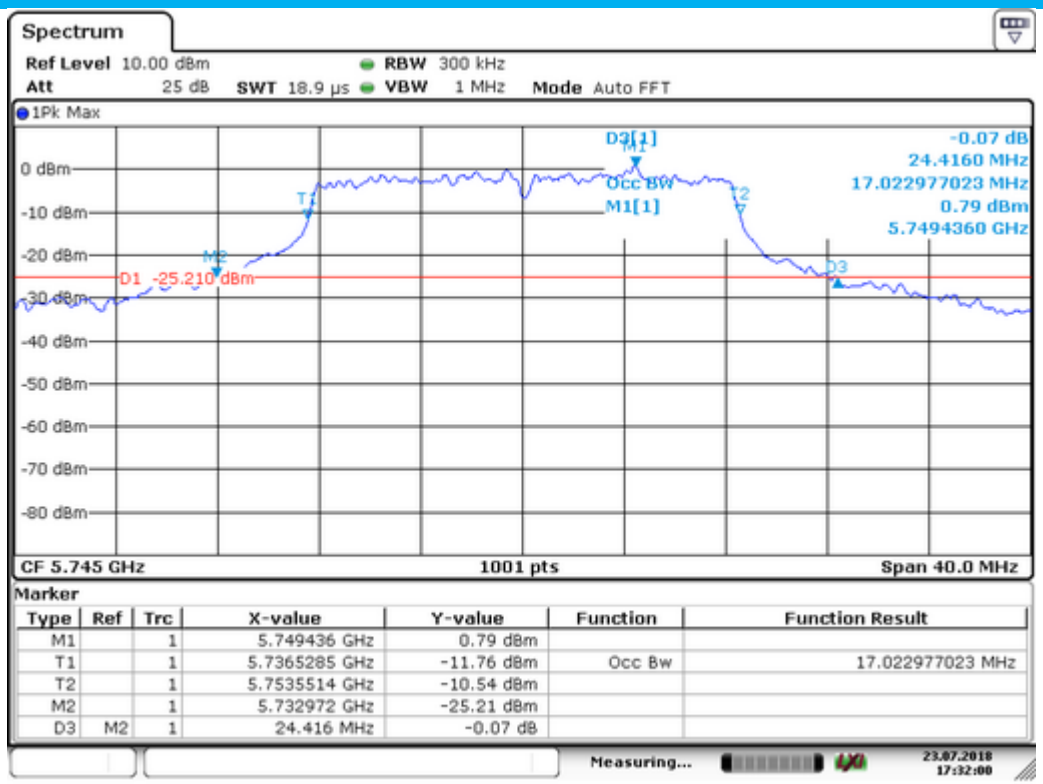
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5200



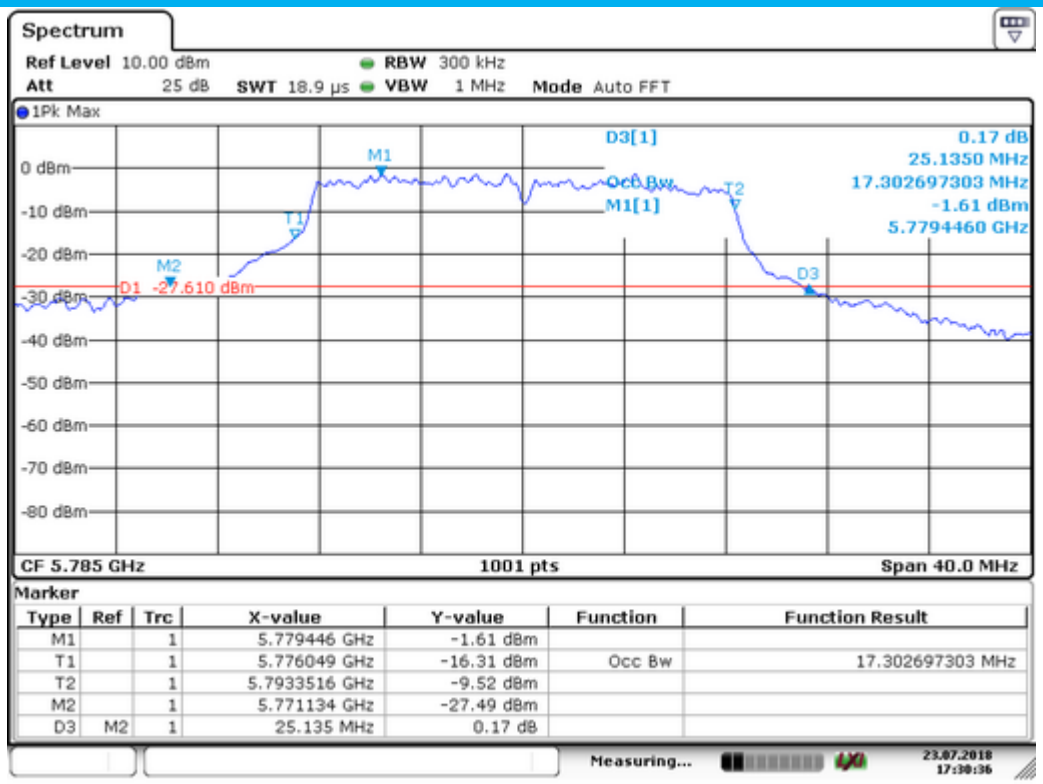
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5240



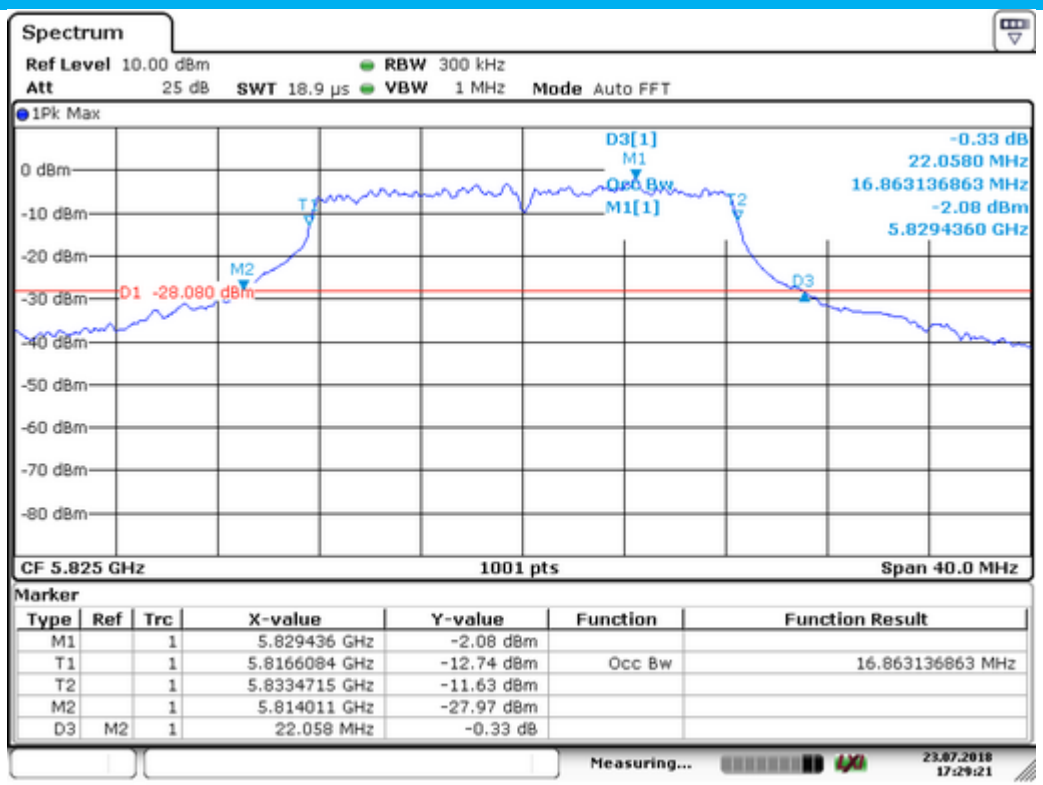
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5745



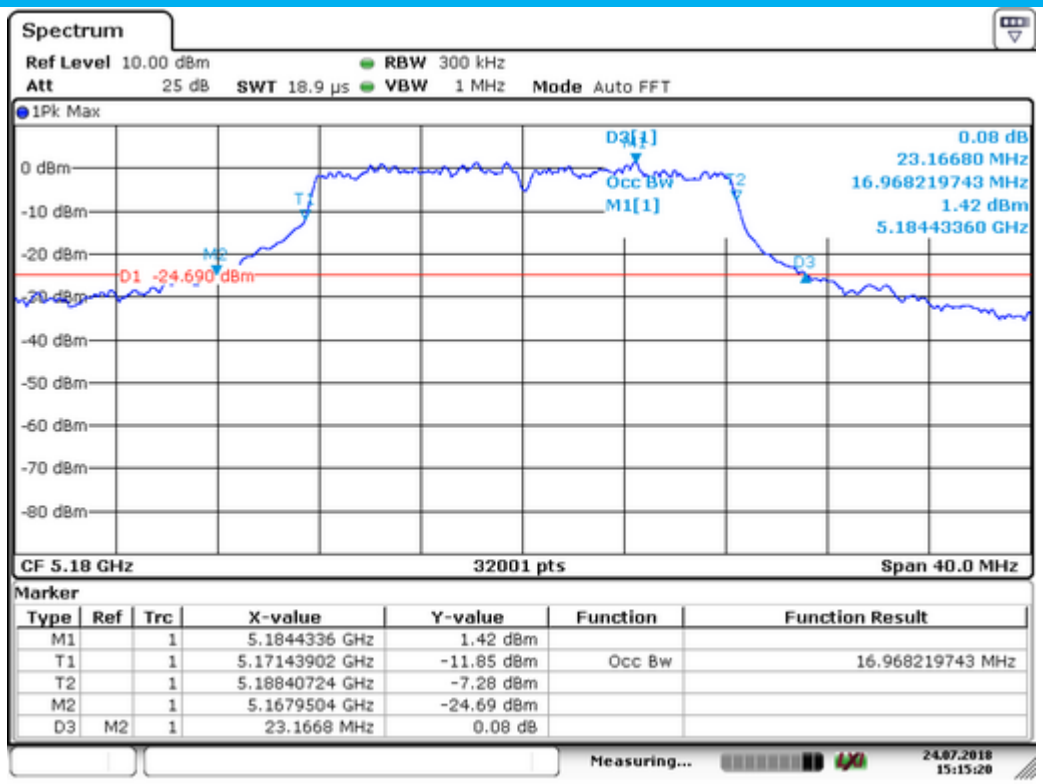
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5785



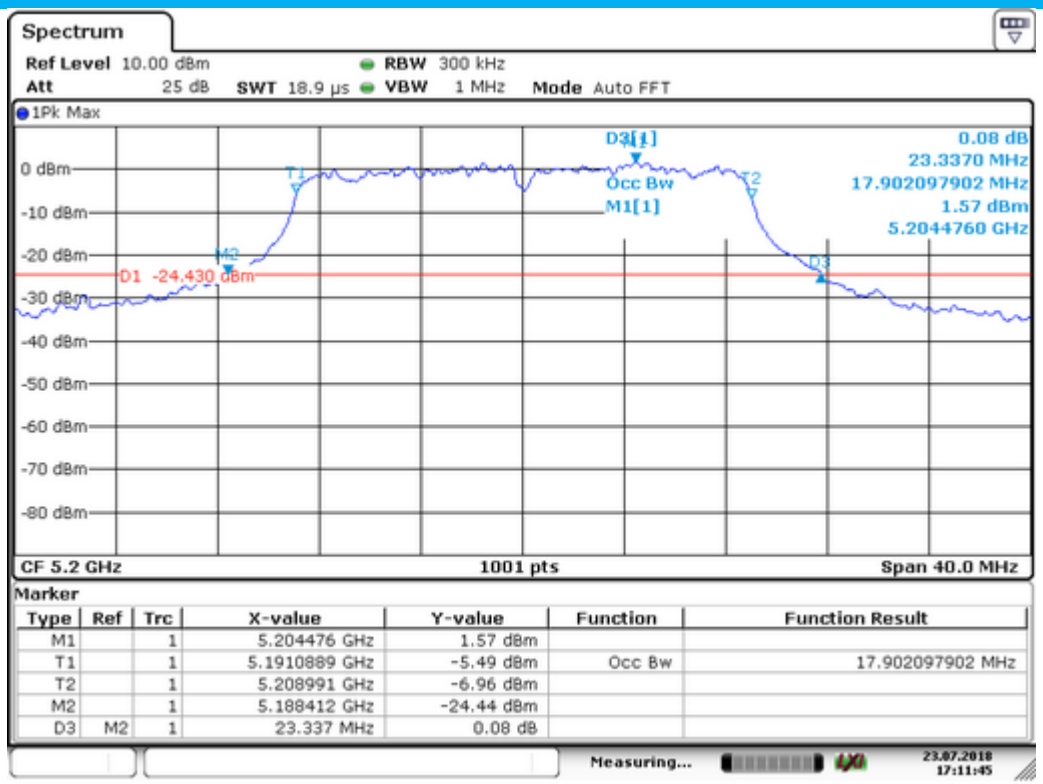
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5825



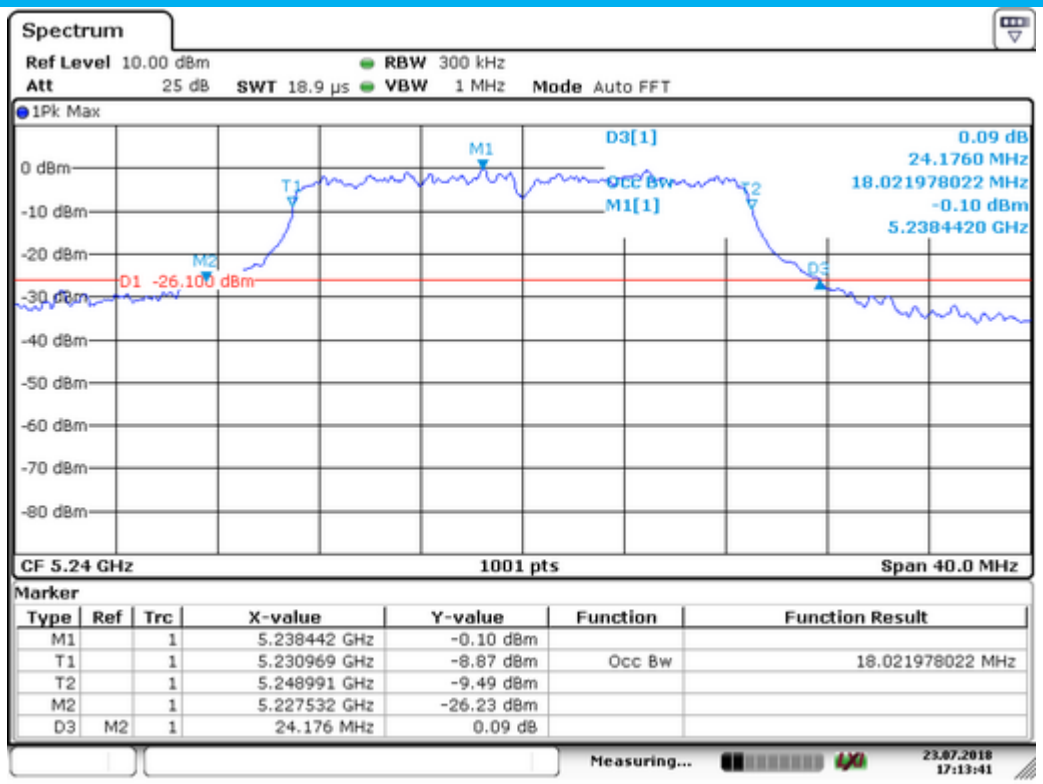
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5180



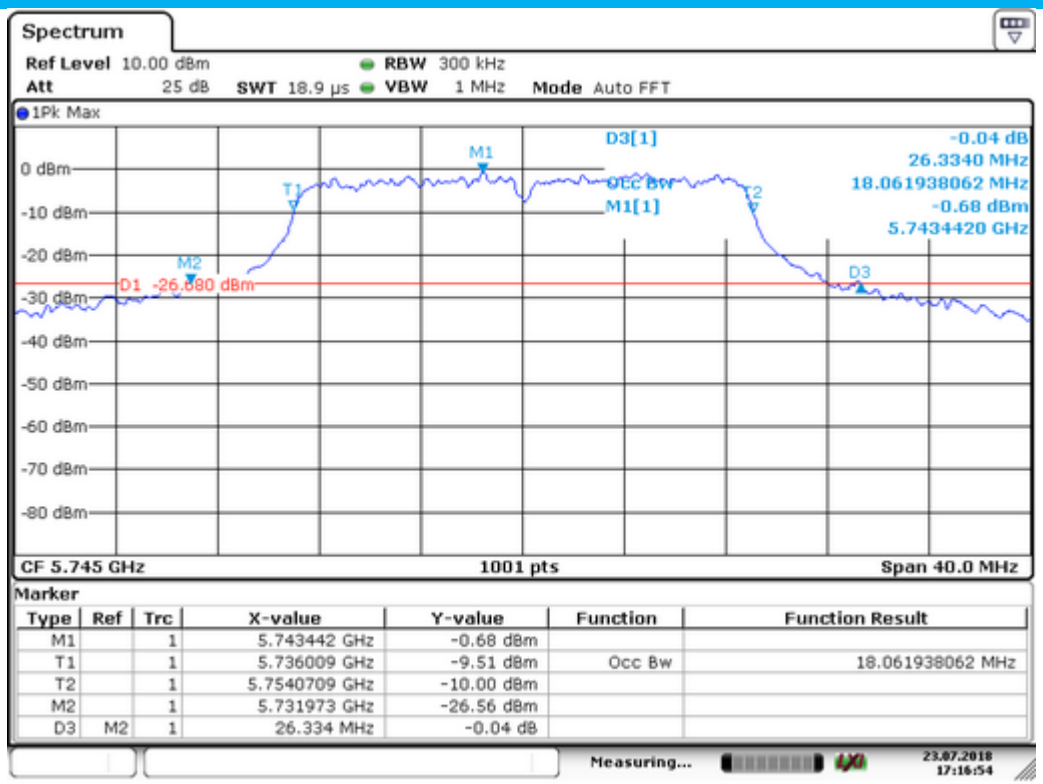
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5200



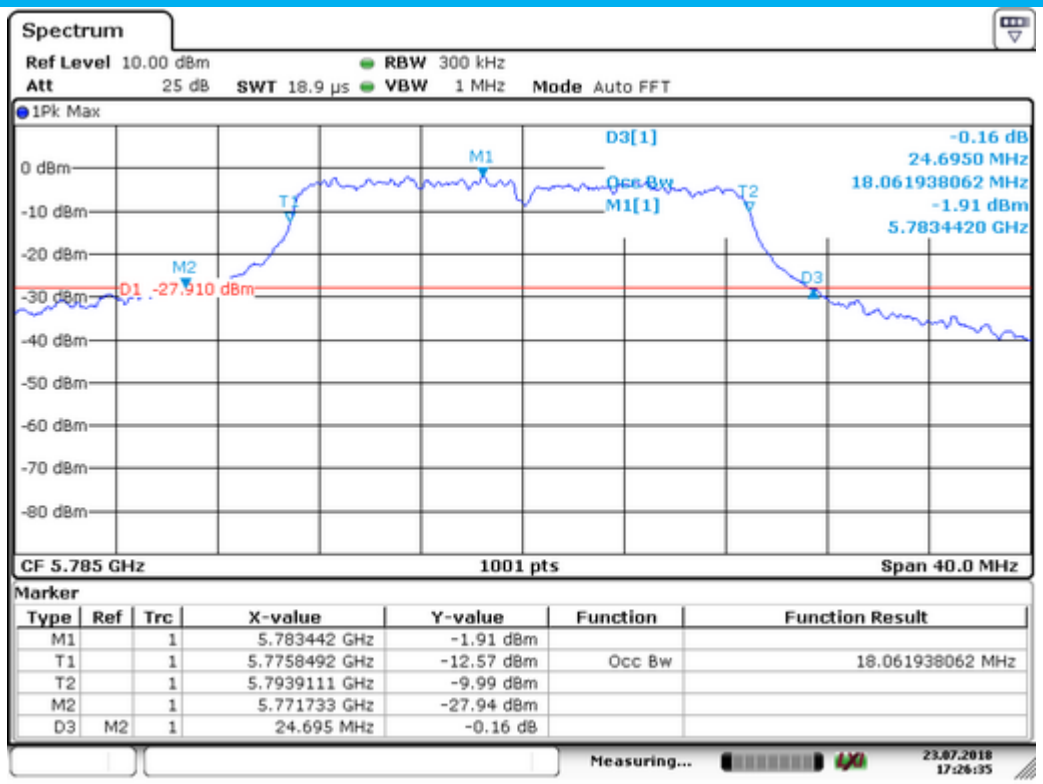
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5240



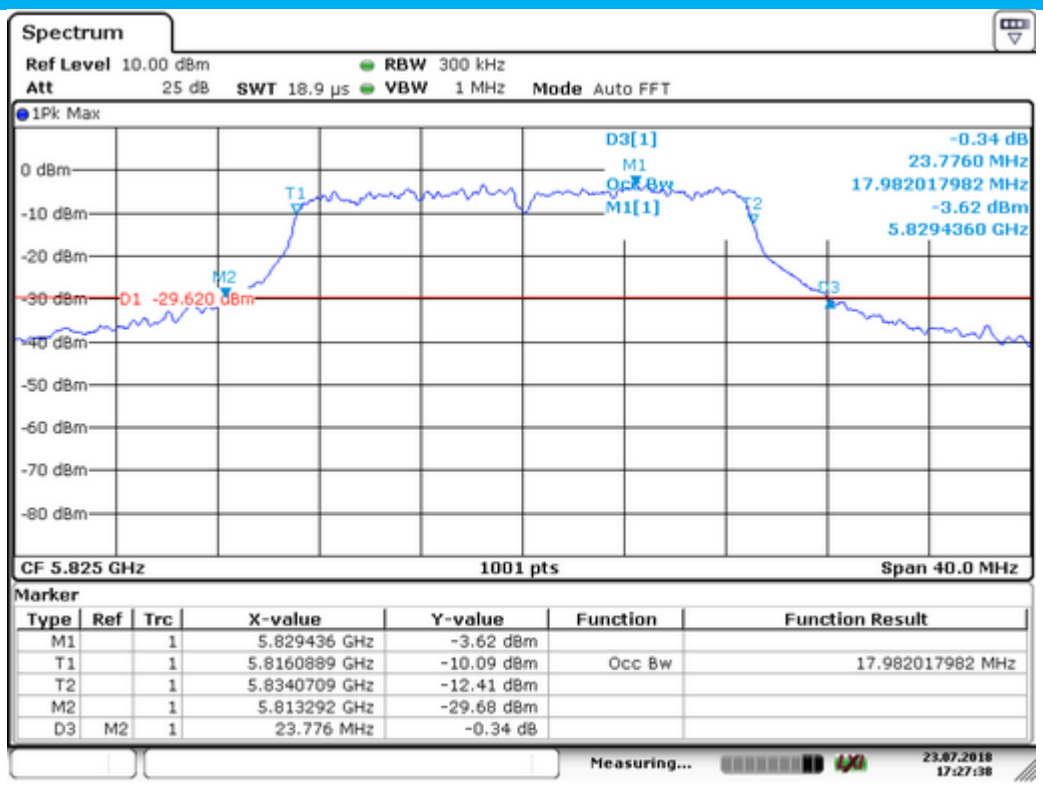
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5745



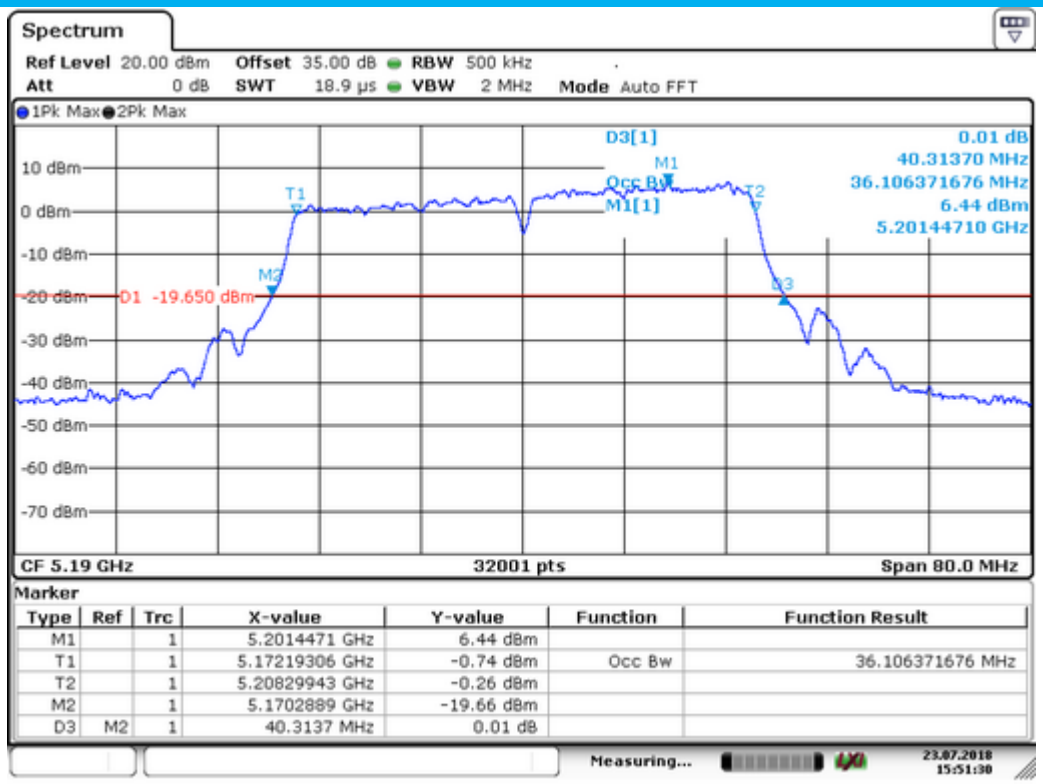
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5785



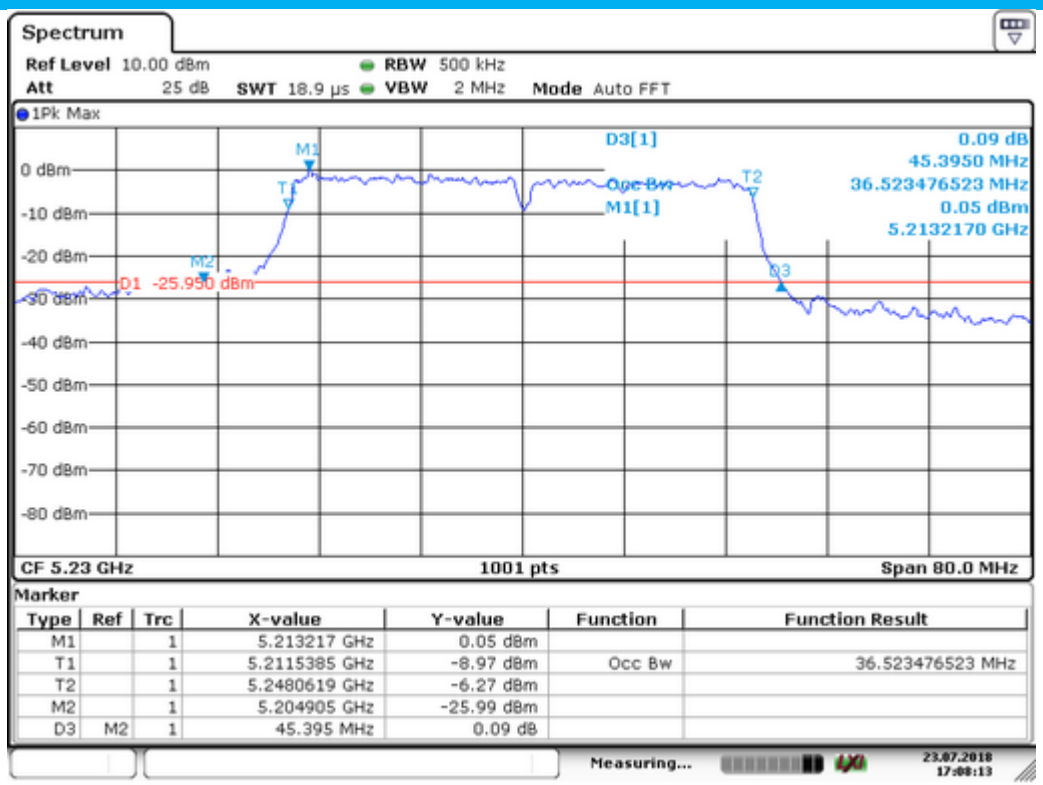
Emission Bandwidth&99% Occupied Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5825



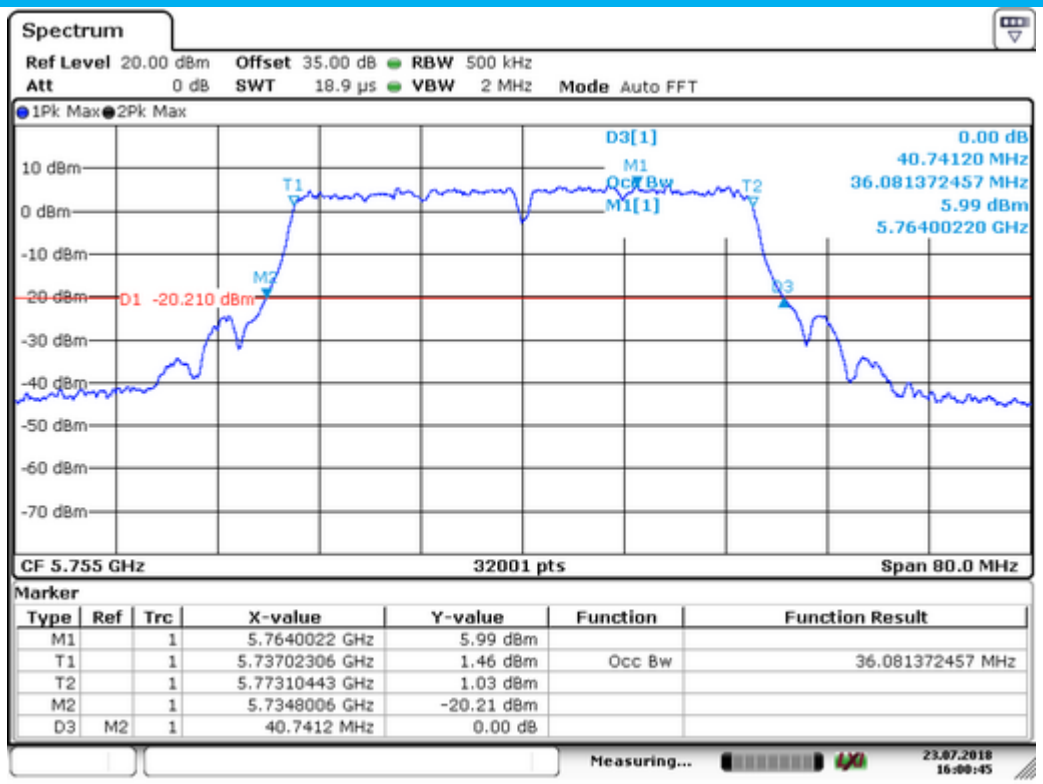
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5190



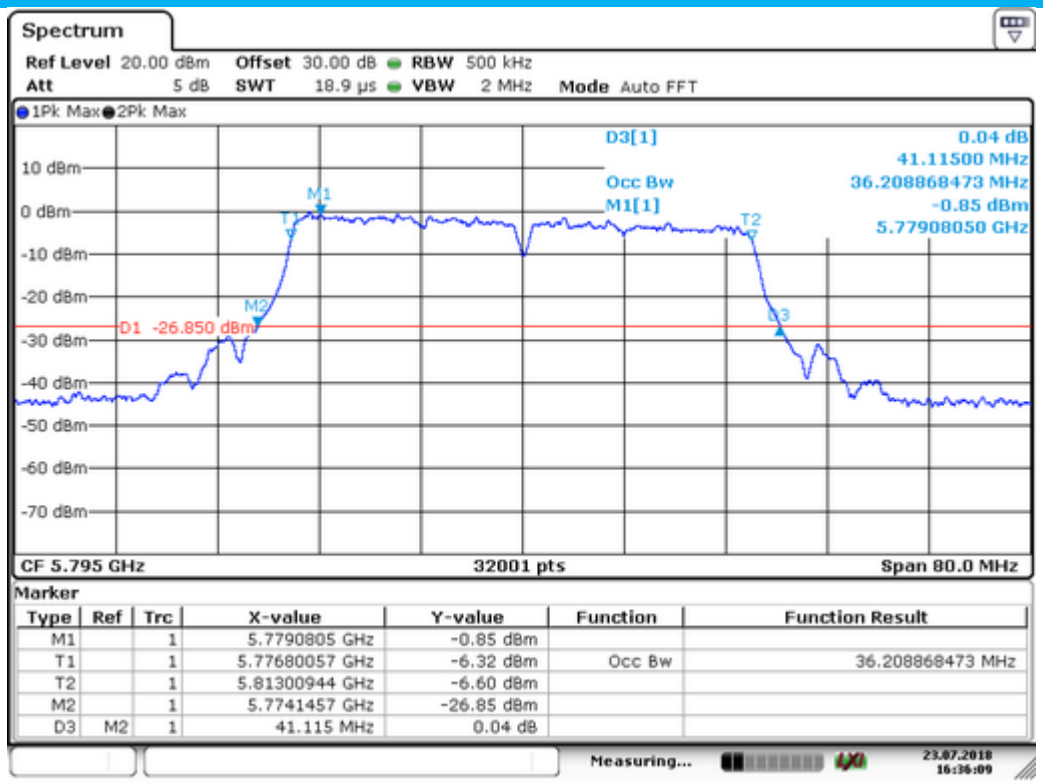
Emission Bandwidth&99% Occupied Bandwidth		UNII Band I	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5230



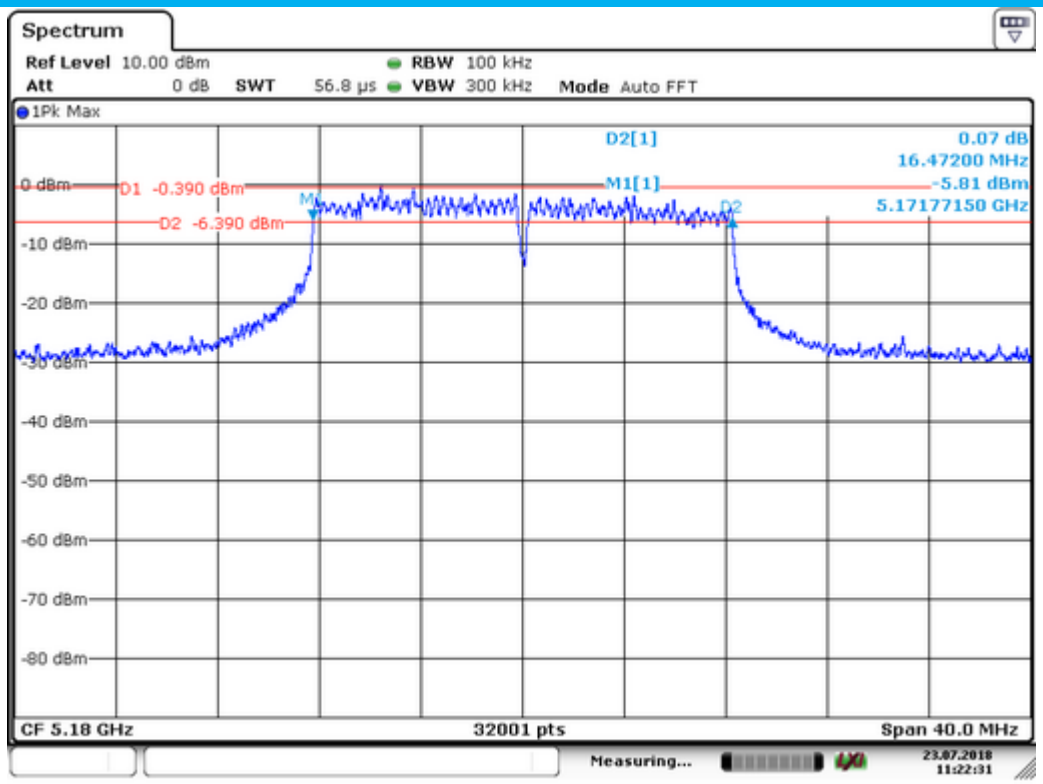
Emission Bandwidth&99% Occupied Bandwidth	UNII Band III		
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5755



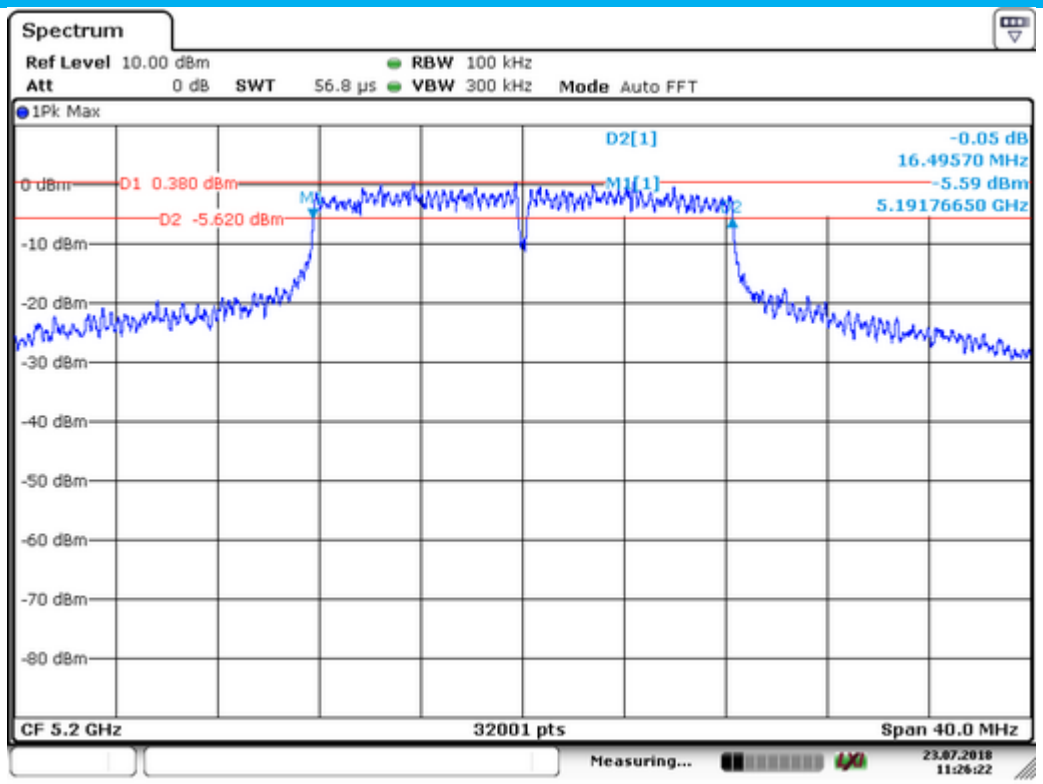
Emission Bandwidth&99% Occupied Bandwidth	UNII Band III		
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5795



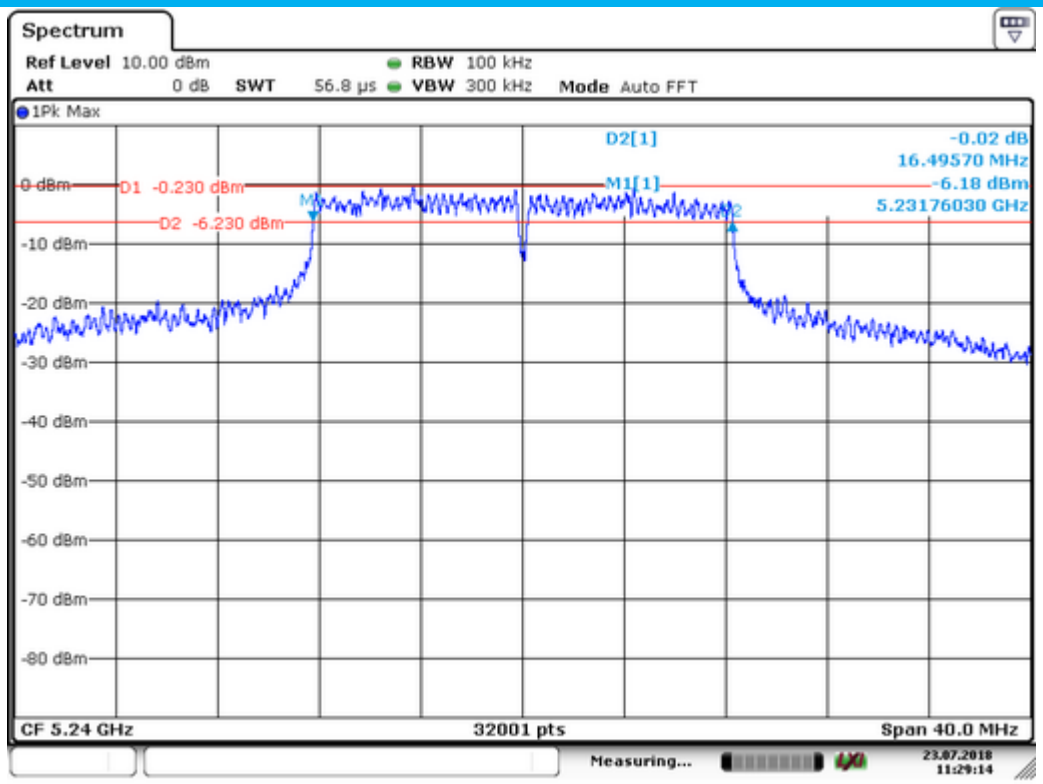
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11a mode	Frequency(MHz)	5180



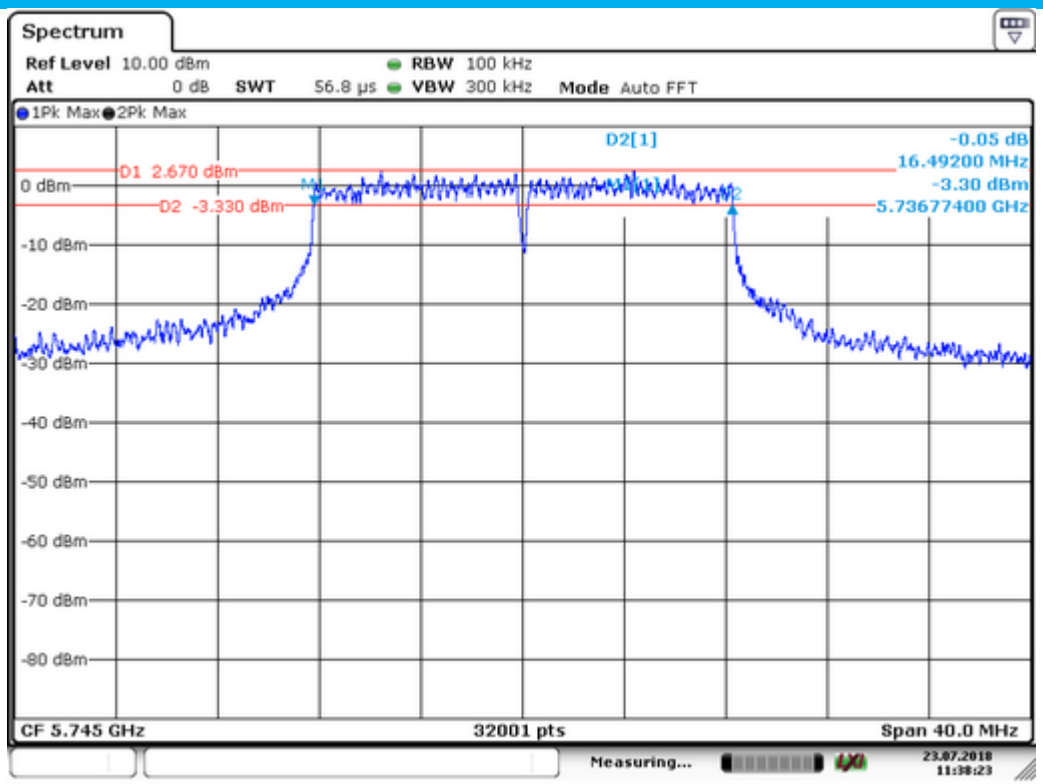
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11a mode	Frequency(MHz)	5200



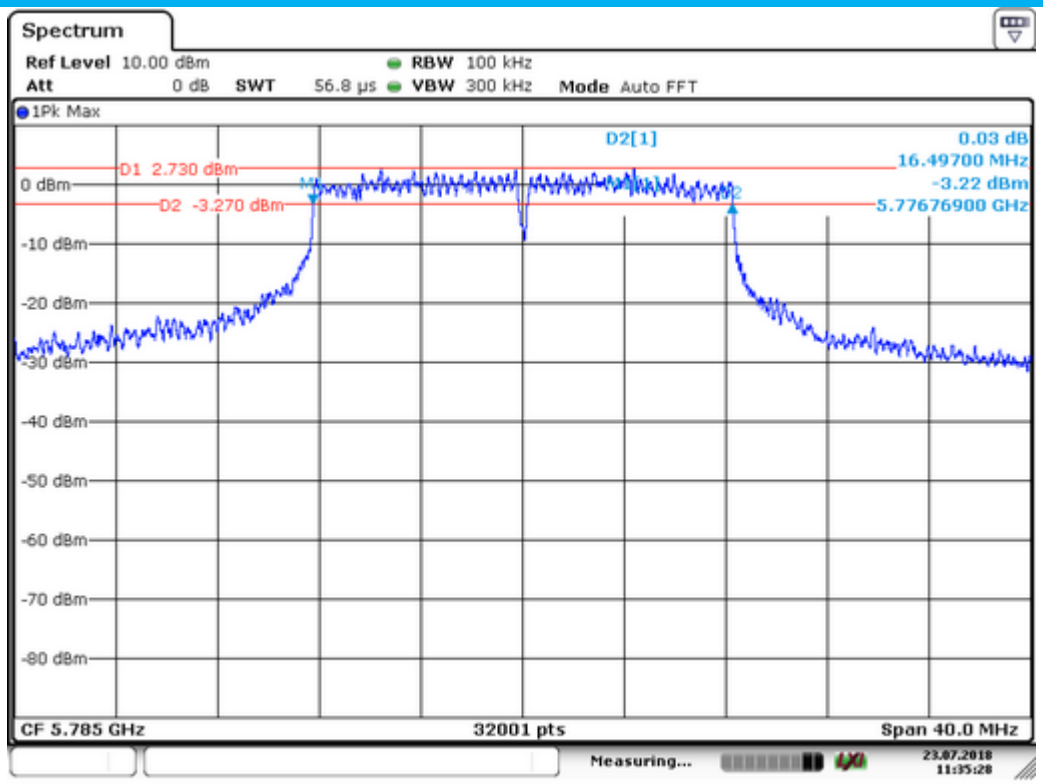
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11a mode	Frequency(MHz)	5240



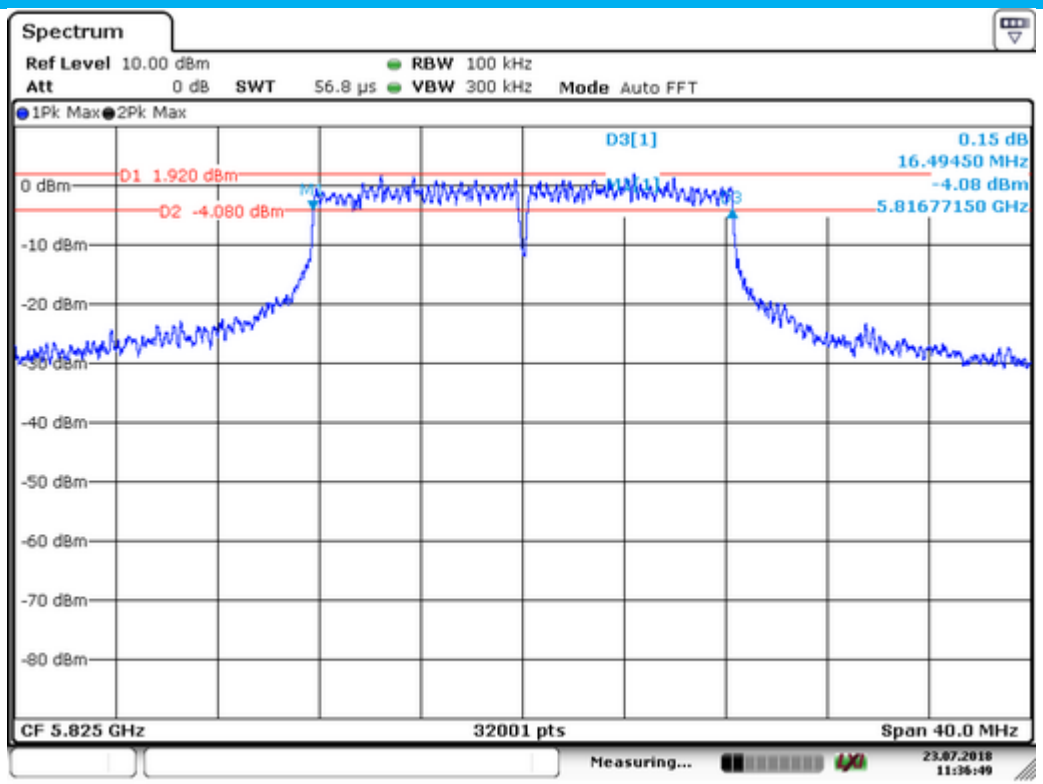
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11a mode	Frequency(MHz)	5745



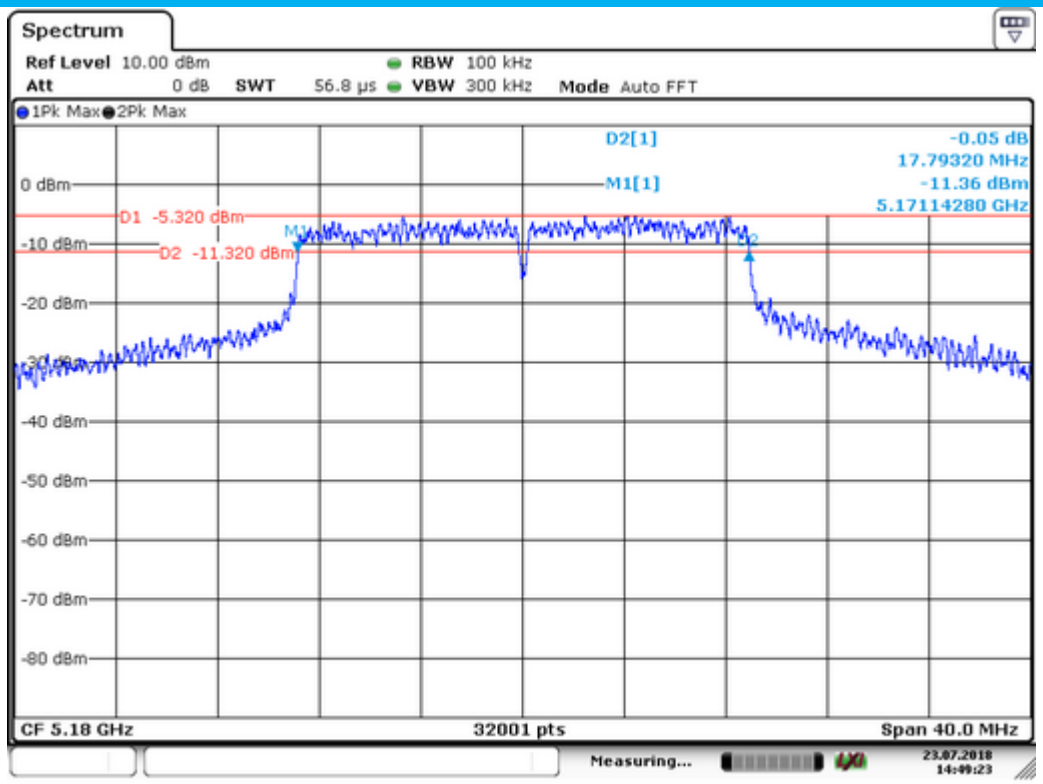
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11a mode	Frequency(MHz)	5785



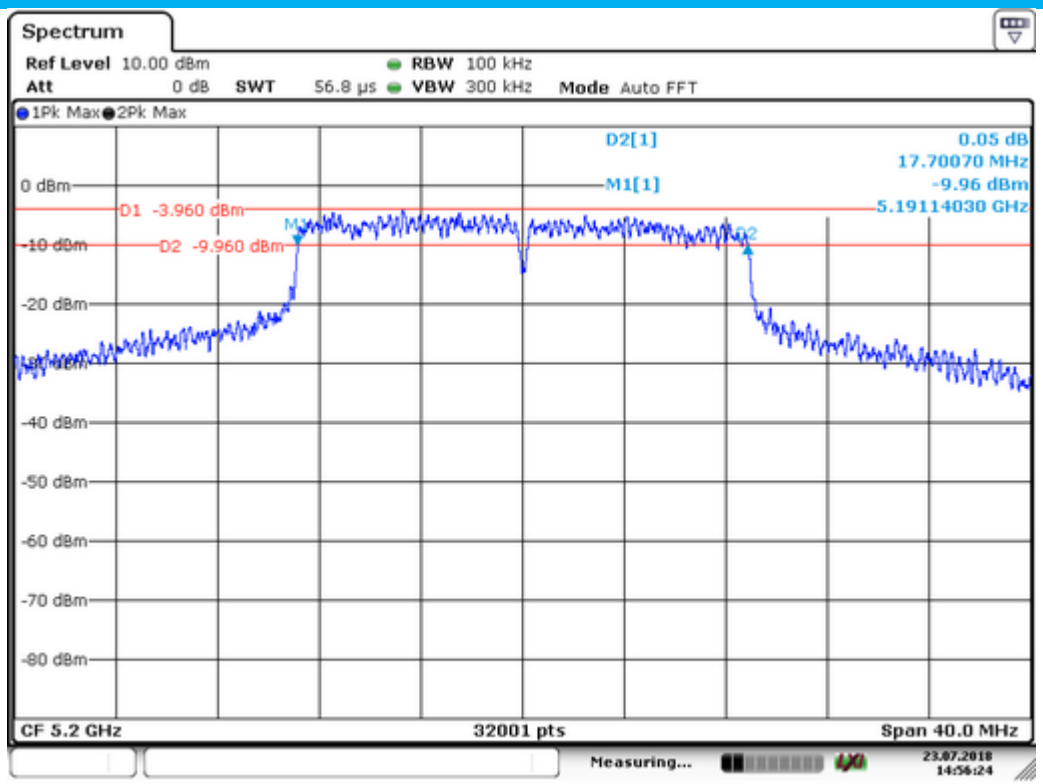
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11a mode	Frequency(MHz)	5825



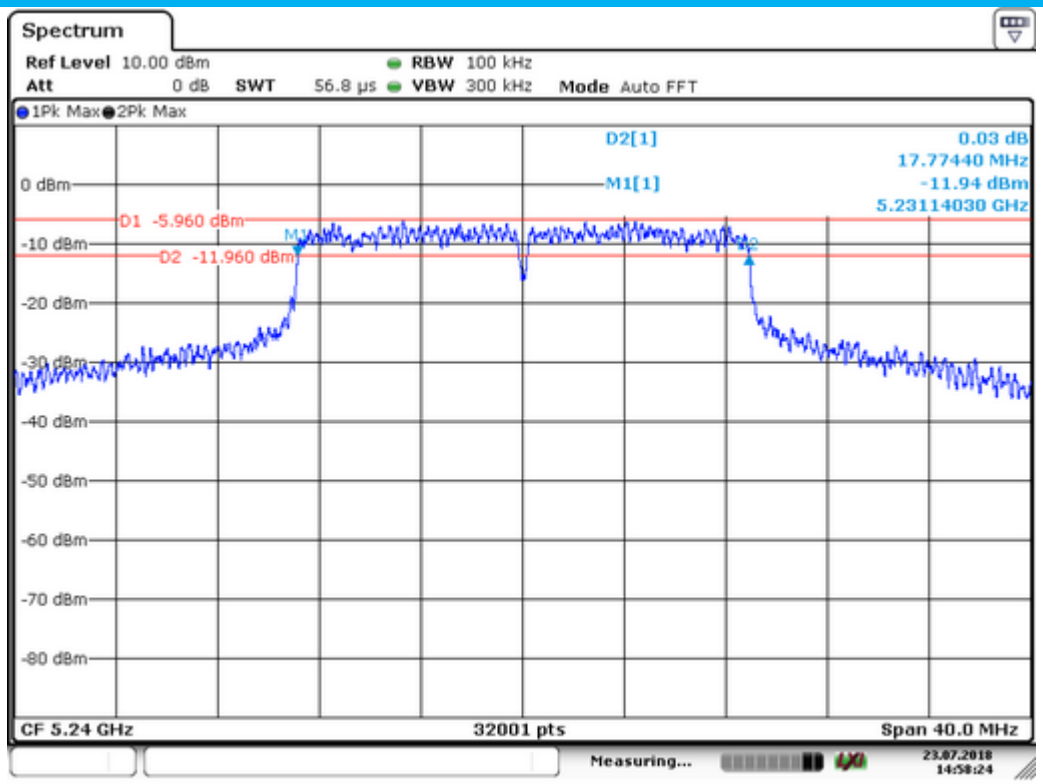
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5180



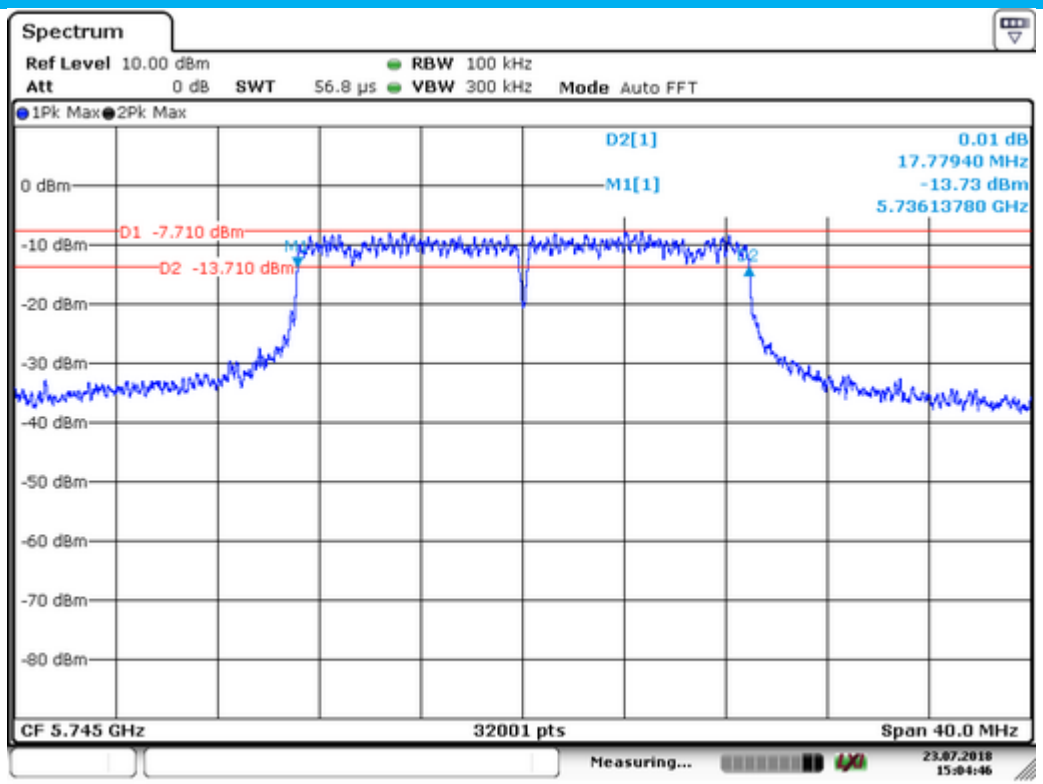
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5200



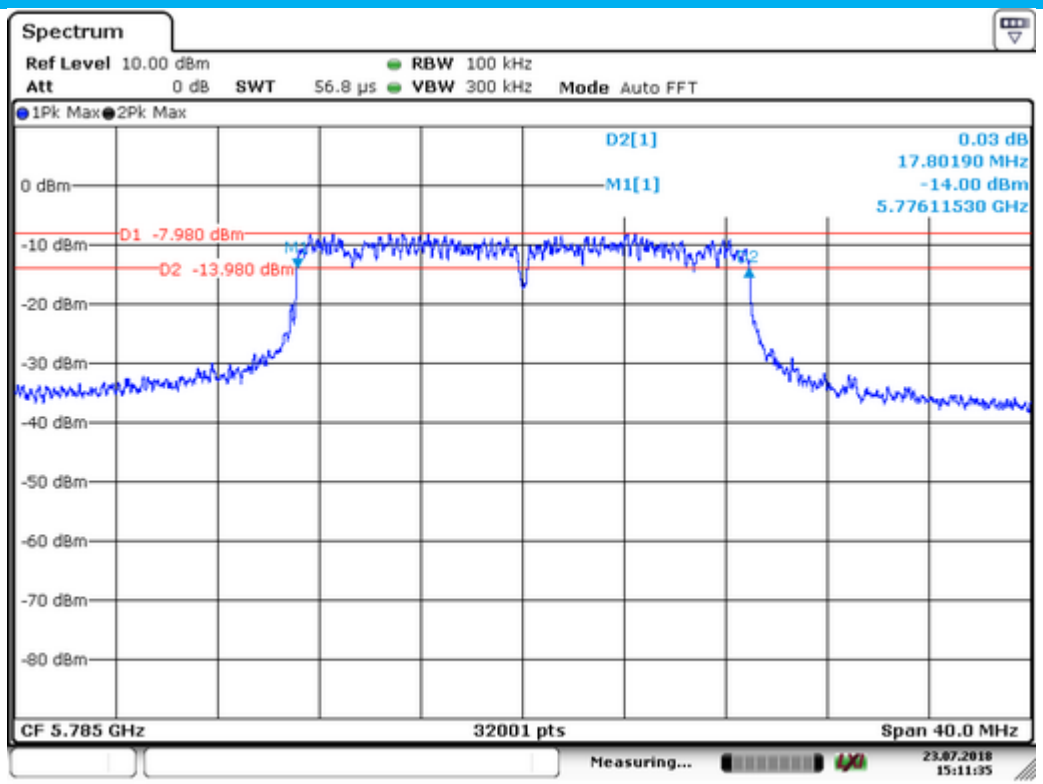
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5240



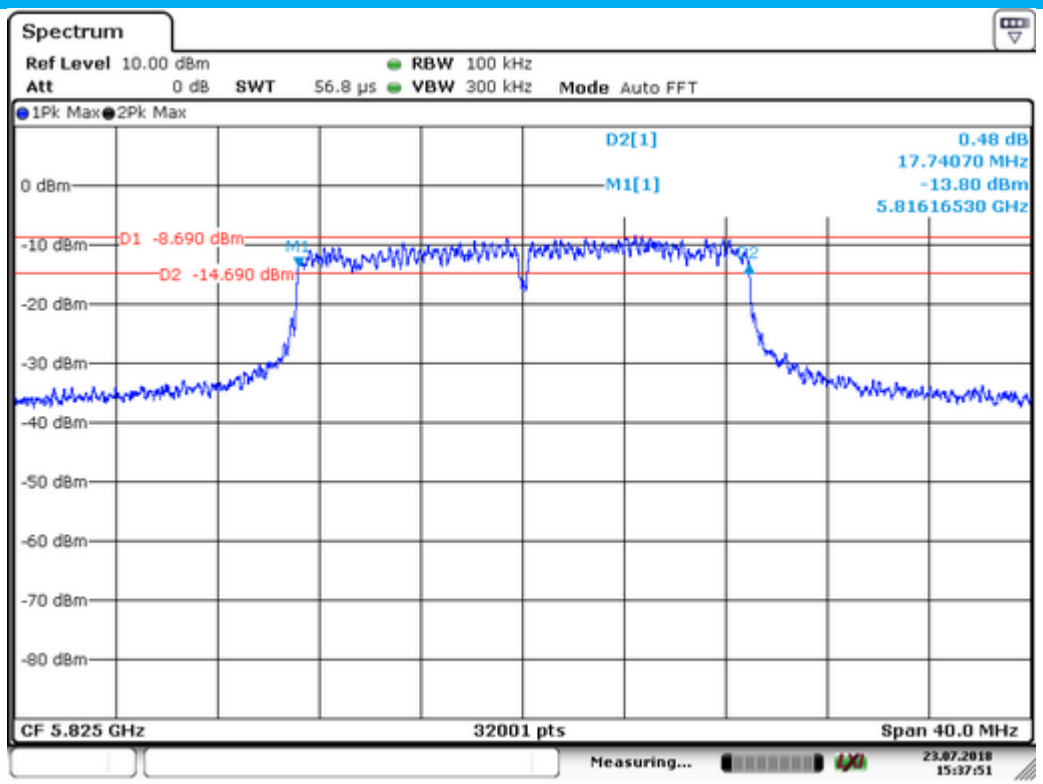
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5745



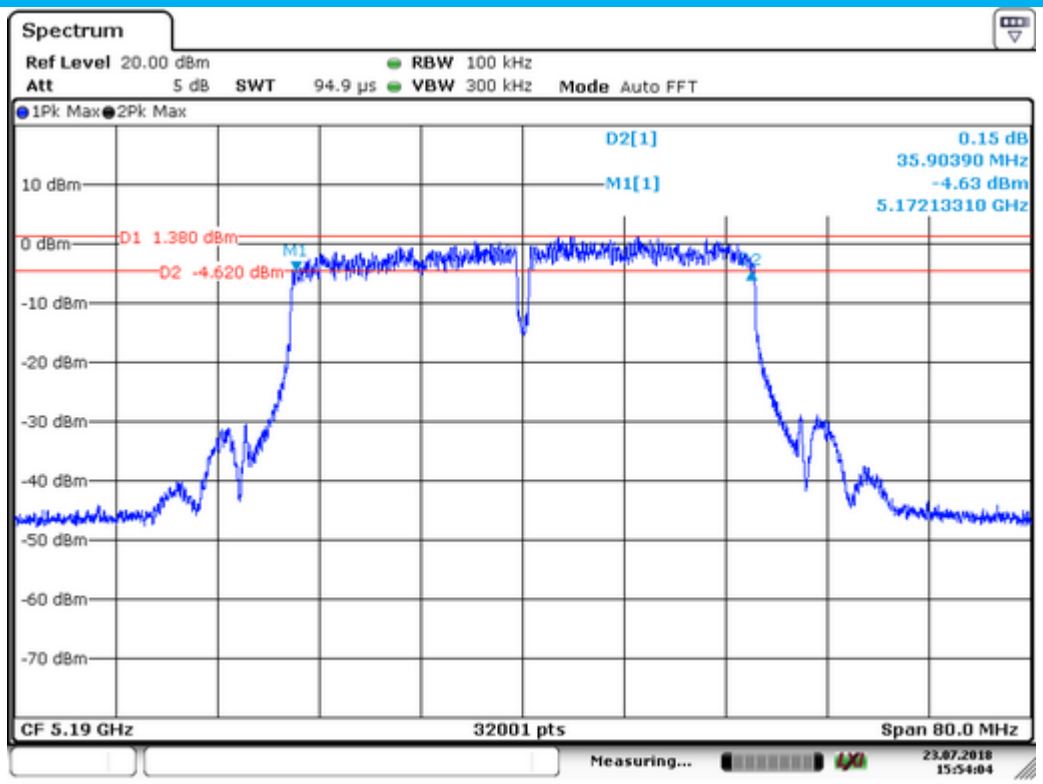
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5785



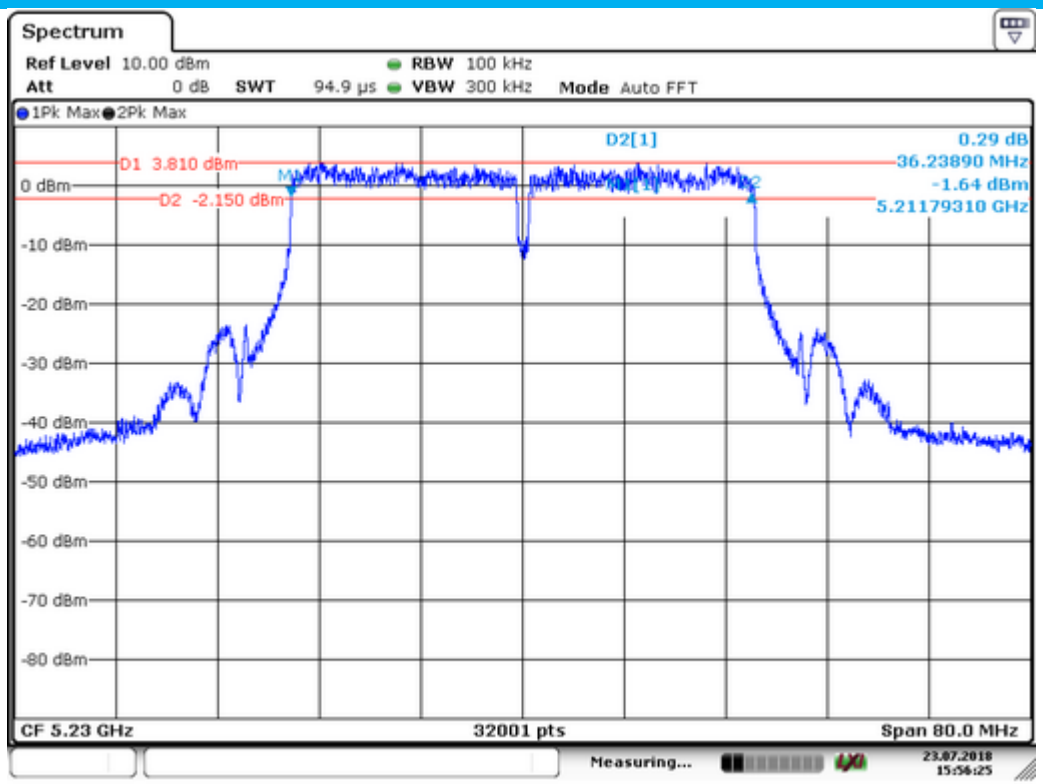
Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5825



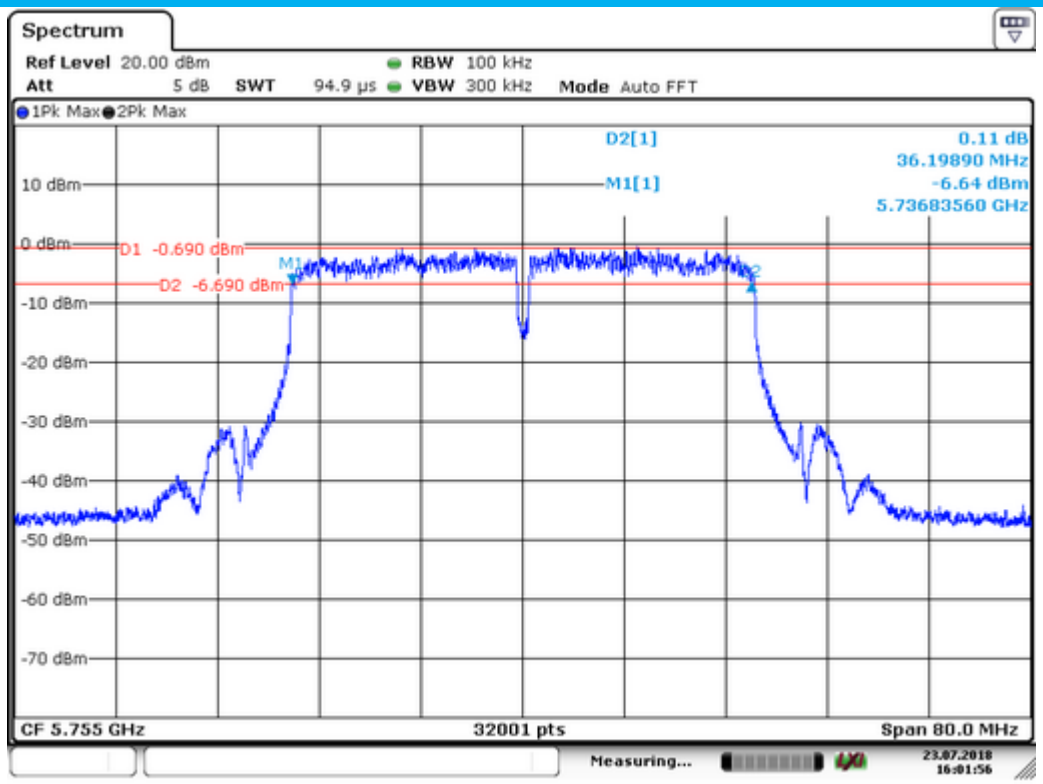
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5190



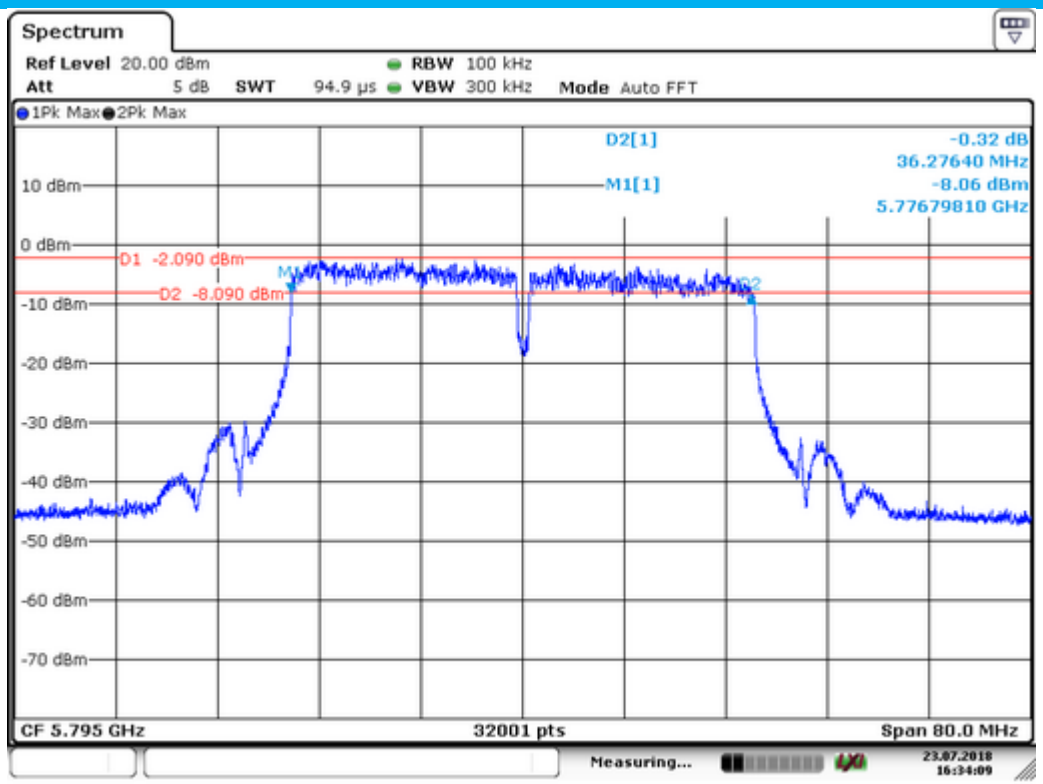
Minimum Emission Bandwidth		UNII Band I	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5230



Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5755



Minimum Emission Bandwidth		UNII Band III	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5795



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 : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)		Limit (dBm)	Verdict
			Ant0	Ant1		
UNII Band I	CH36	5180	17.45	14.15	24	Pass
	CH40	5200	16.38	14.02	24	Pass
	CH48	5240	16.89	13.97	24	Pass
UNII Band III	CH149	5745	14.77	14.44	30	Pass
	CH157	5785	15.02	15.13	30	Pass
	CH165	5825	15.49	15.69	30	Pass

Note:
N/A (Not Applicable)

☒ 802.11n(VHT20) mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)			Limit (dBm)	Verdict
			Ant0	Ant1	Ant0+1		
UNII Band I	CH36	5180	15.95	13.02	17.74	24	Pass
	CH40	5200	16.13	11.17	17.33	24	Pass
	CH48	5240	15.77	12.66	17.50	24	Pass
UNII Band III	CH149	5745	14.60	13.36	17.03	30	Pass
	CH157	5785	13.88	13.55	16.73	30	Pass
	CH165	5825	14.26	12.96	16.67	30	Pass

Note:
N/A (Not Applicable)

☒ 802.11n(VHT40) mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)			Limit (dBm)	Verdict
			Ant0	Ant1	Ant0+1		
UNII Band I	CH38	5190	14.75	12.16	16.66	24	Pass
	CH46	5230	15.12	12.75	17.11	24	Pass
UNII Band III	CH151	5755	12.59	13.66	16.17	30	Pass
	CH159	5795	13.22	13.77	16.51	30	Pass

Note:
N/A (Not Applicable)

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.

8.3.5 Test Results

☒ 802.11a mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	Power Spectral Density		Limit	Verdict
			Ant0	Ant1		
UNII Band I	CH36	5180	-5.47	-2.99	≤11dBm/1MHz	Pass
	CH40	5200	2.36	-3.07	≤11dBm/1MHz	Pass
	CH48	5240	-2.98	-3.00	≤11dBm/1MHz	Pass
UNII Band III	CH149	5745	-0.63	-3.68	≤30dBm/500KHz	Pass
	CH157	5785	-0.28	-7.14	≤30dBm/500KHz	Pass
	CH165	5825	-1.30	-3.82	≤30dBm/500KHz	Pass
Note: N/A (Not Applicable)						

☒ 802.11n(VHT20) mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

Band	Channel Number	Channel Freq. (MHz)	Power Spectral Density			Limit	Verdict
			Ant0	Ant1	Ant0+1		
UNII Band I	CH36	5180	-2.46	-2.46	0.55	≤11dBm/1MHz	Pass
	CH40	5200	-2.68	-2.50	0.42	≤11dBm/1MHz	Pass
	CH48	5240	-2.85	-5.03	-0.79	≤11dBm/1MHz	Pass
UNII Band III	CH149	5745	-0.41	-6.10	0.63	≤30dBm/500KHz	Pass
	CH157	5785	-2.51	-7.86	-1.40	≤30dBm/500KHz	Pass
	CH165	5825	-1.75	-8.63	-0.94	≤30dBm/500KHz	Pass
Note: N/A (Not Applicable)							

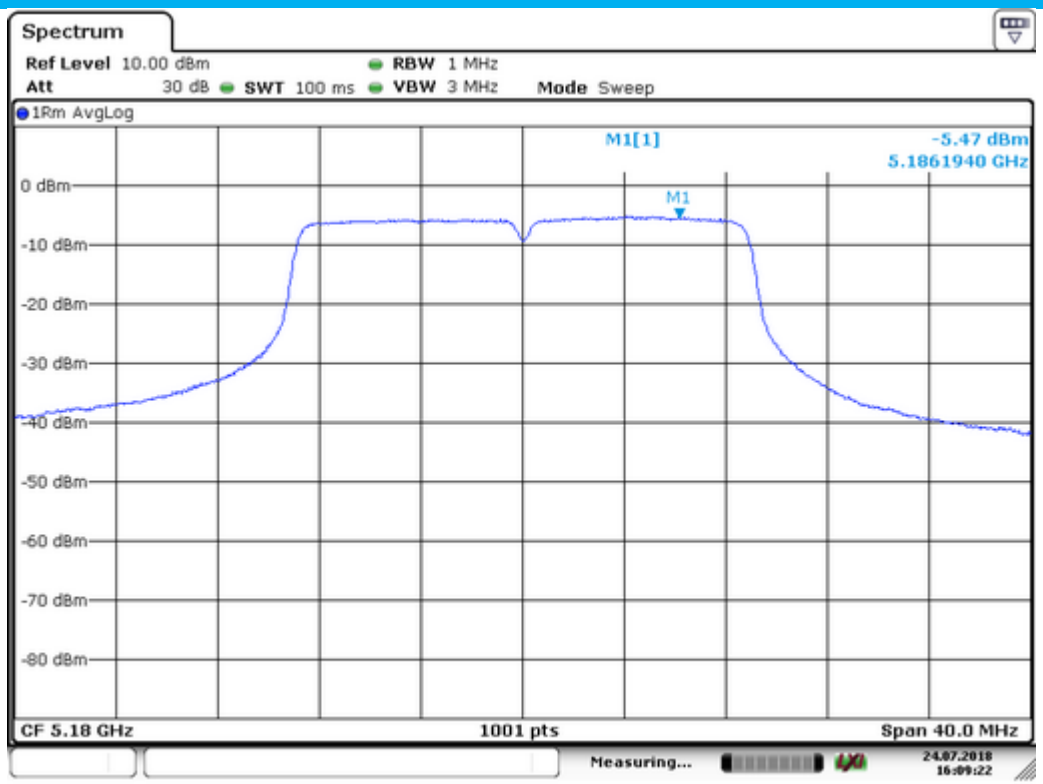
☒ 802.11n(VHT40) mode

Temperature : 28℃ Test Date : July 20,2018
Humidity : 65 % Test By: King Kong

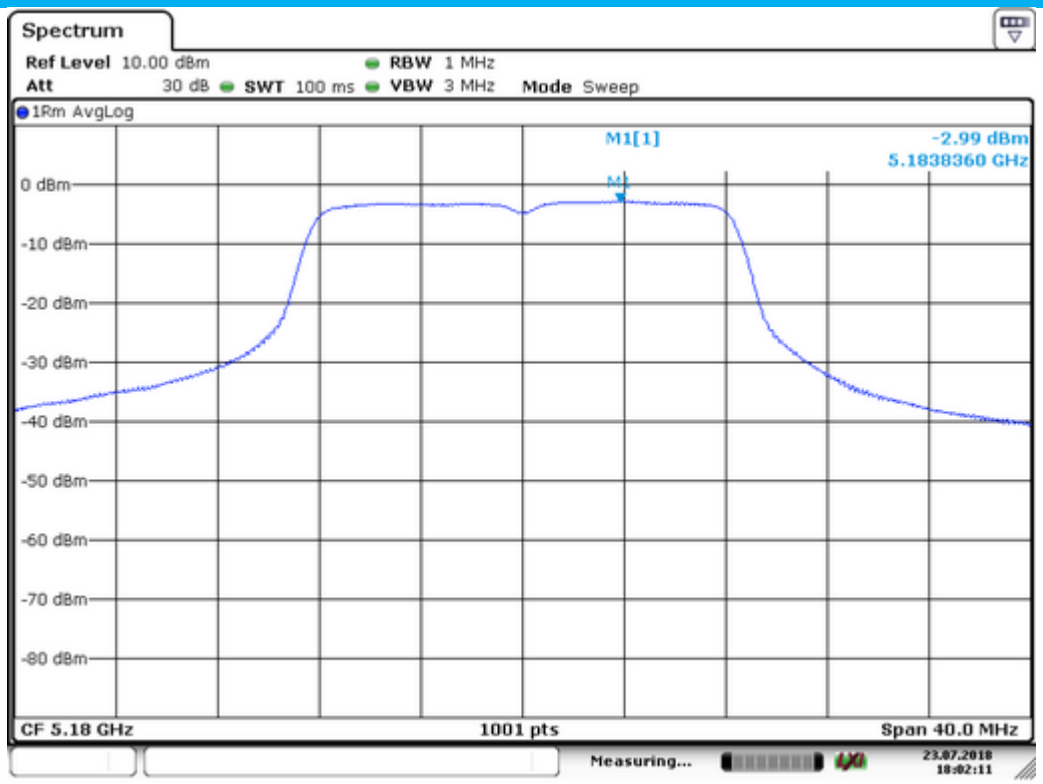
Band	Channel Number	Channel Freq. (MHz)	Power Spectral Density			Limit	Verdict
			Ant0	Ant1	Ant0+1		
UNII Band I	CH38	5190	-7.92	-6.05	-3.87	≤11dBm/1MHz	Pass
	CH46	5230	-2.72	-9.22	-1.84	≤11dBm/1MHz	Pass
UNII Band III	CH151	5755	2.47	-7.11	2.92	≤30dBm/500KHz	Pass
	CH159	5795	-3.79	-8.63	-2.56	≤30dBm/500KHz	Pass
Note: N/A (Not Applicable)							

Power Spectral Density		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5180

Ant0

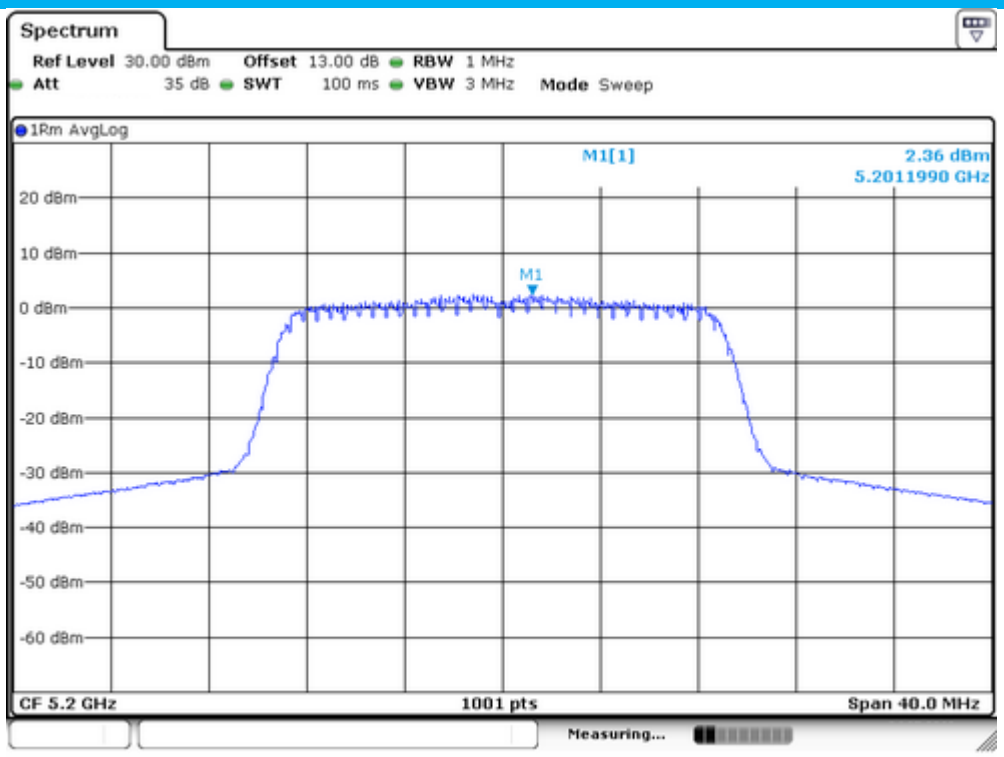


Ant1



Power Spectral Density		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5200

Ant0



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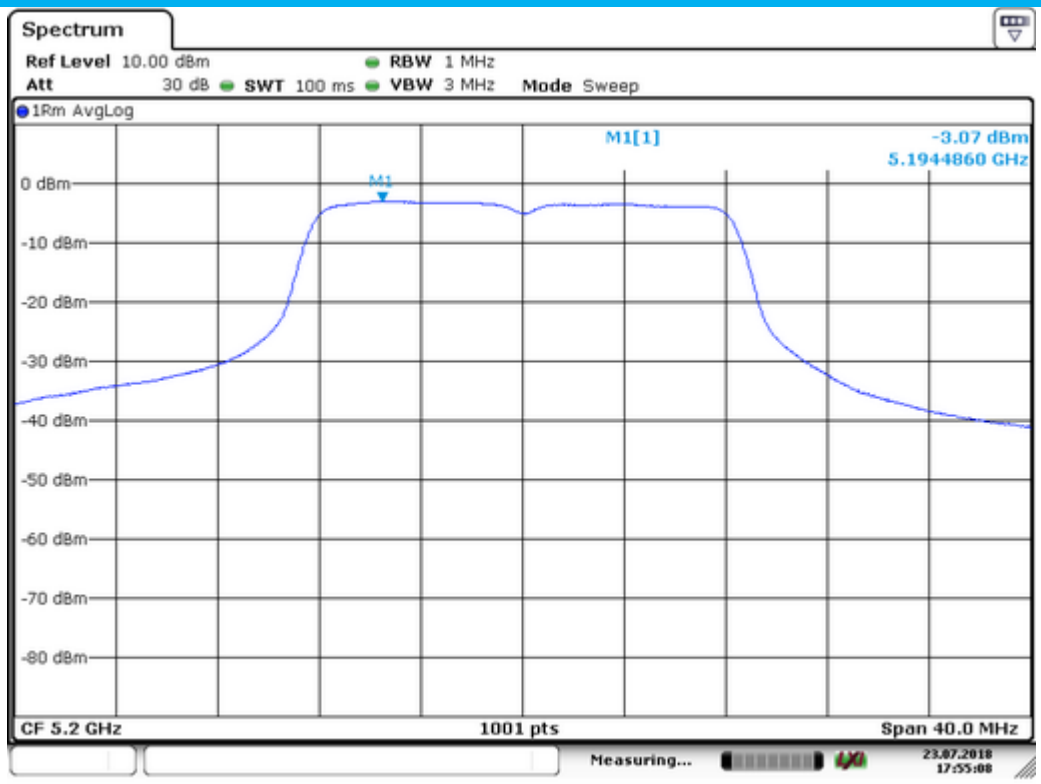
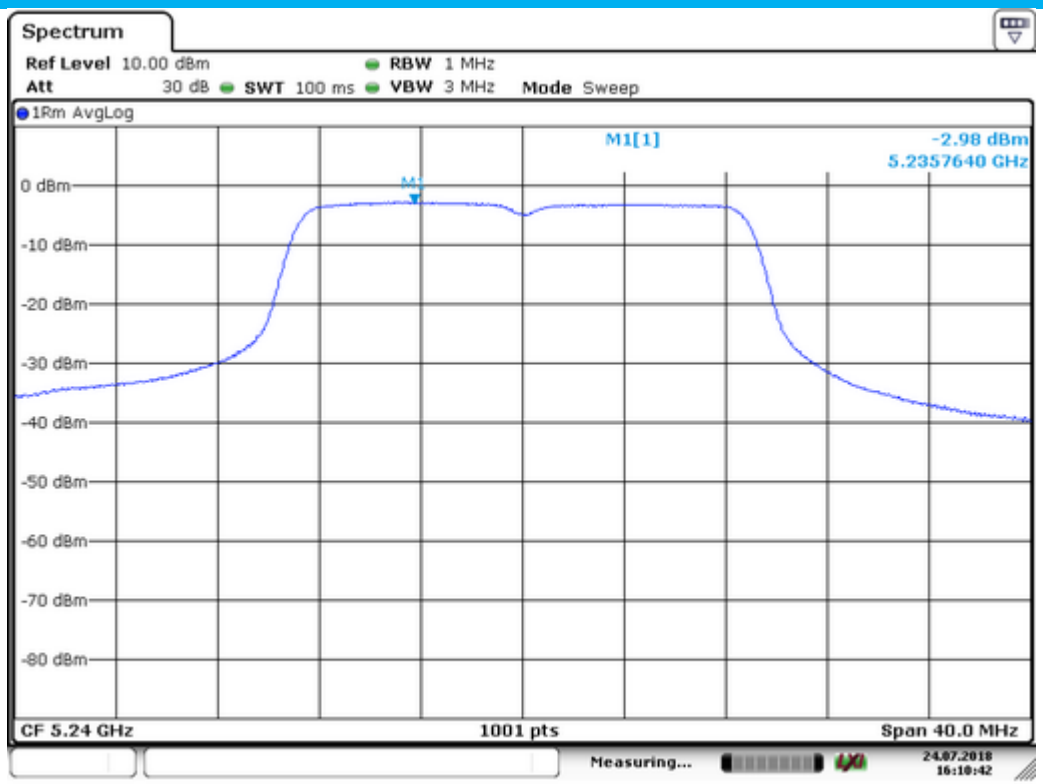
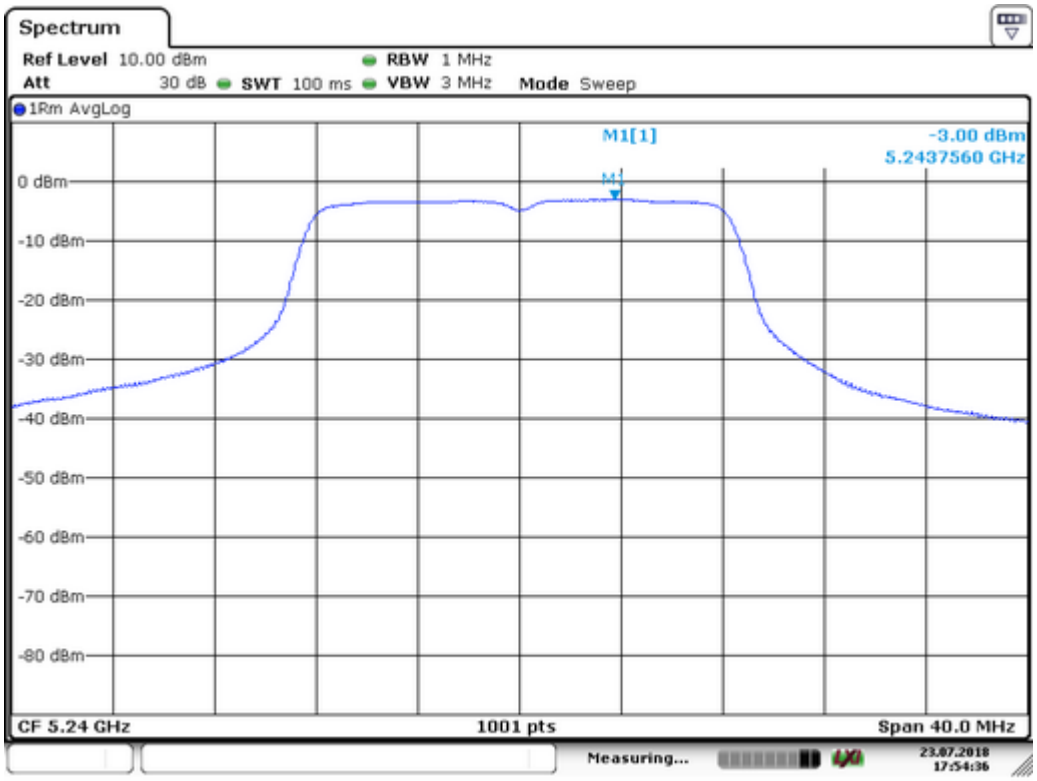


Power Spectral Density		UNII Band I	
Test Model	802.11a	Frequency(MHz)	5240

Ant0

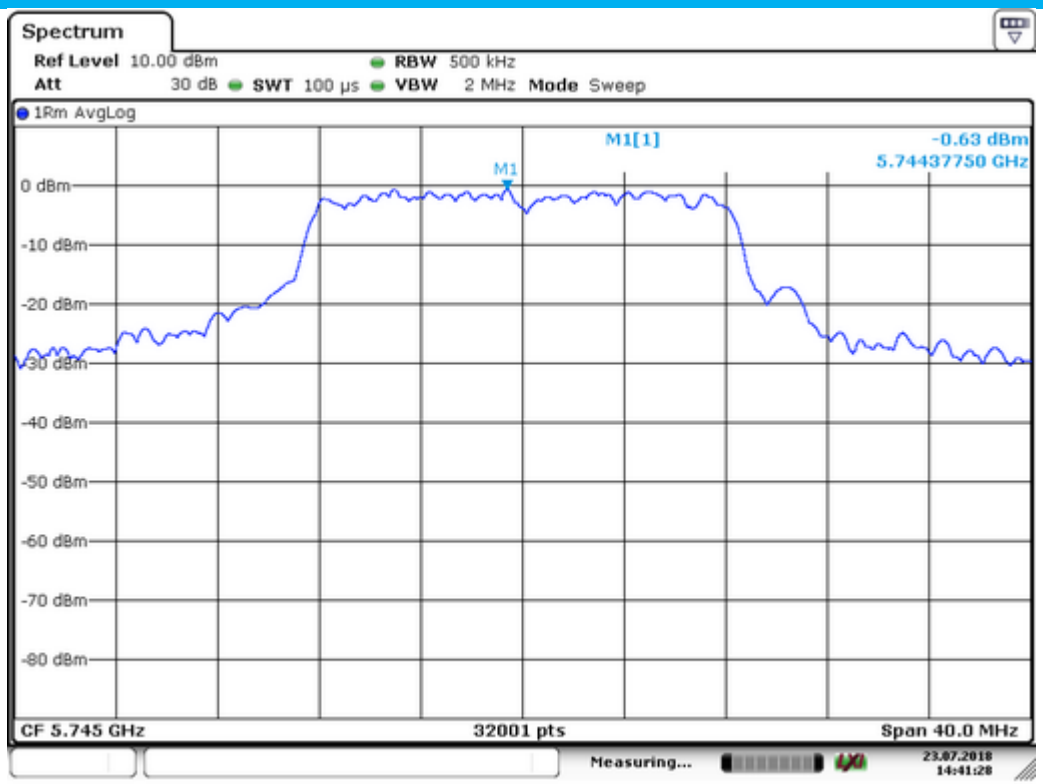


Ant1

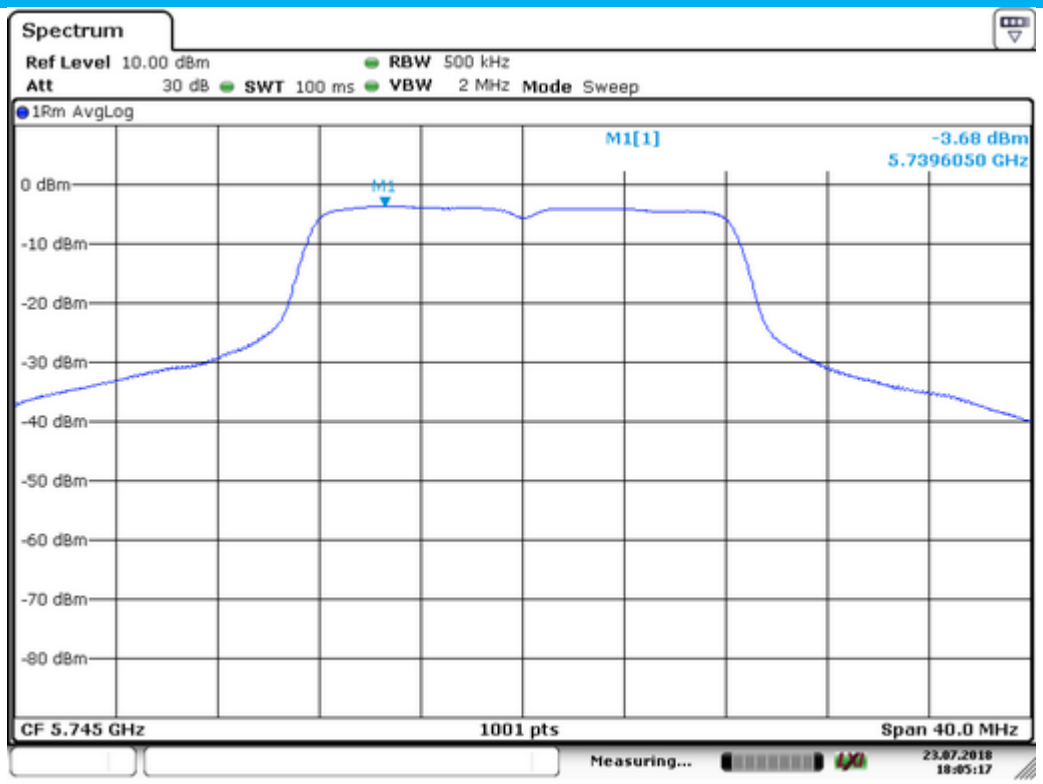


Power Spectral Density		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5745

Ant0

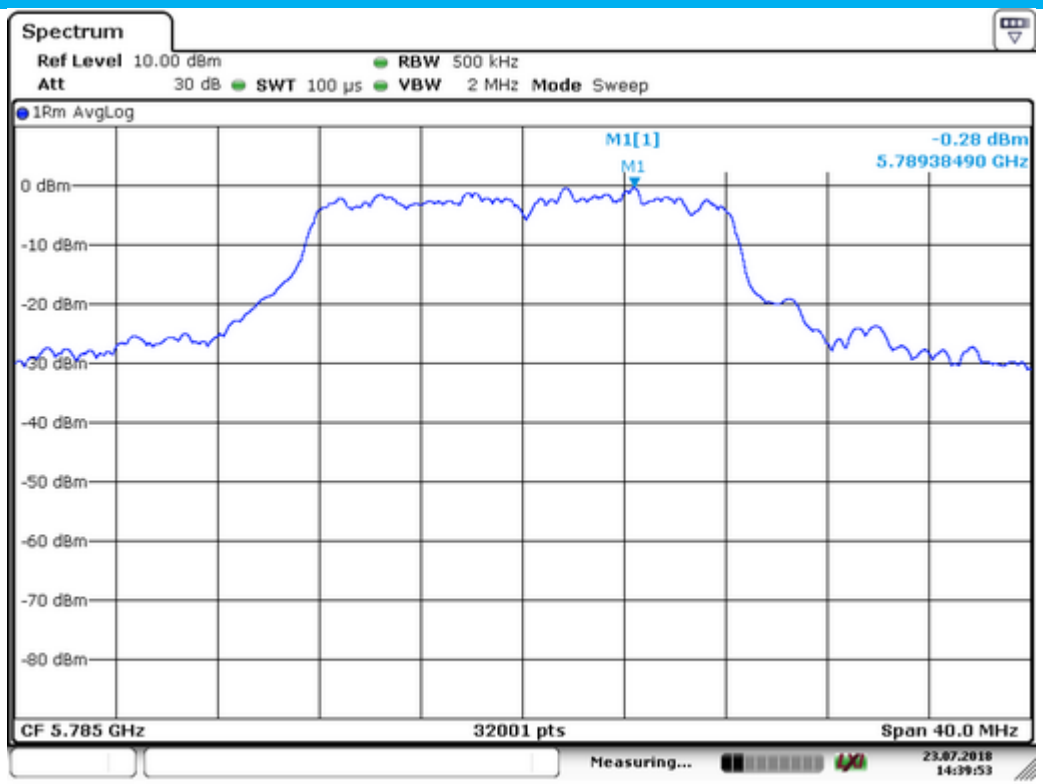


Ant1



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

Ant0



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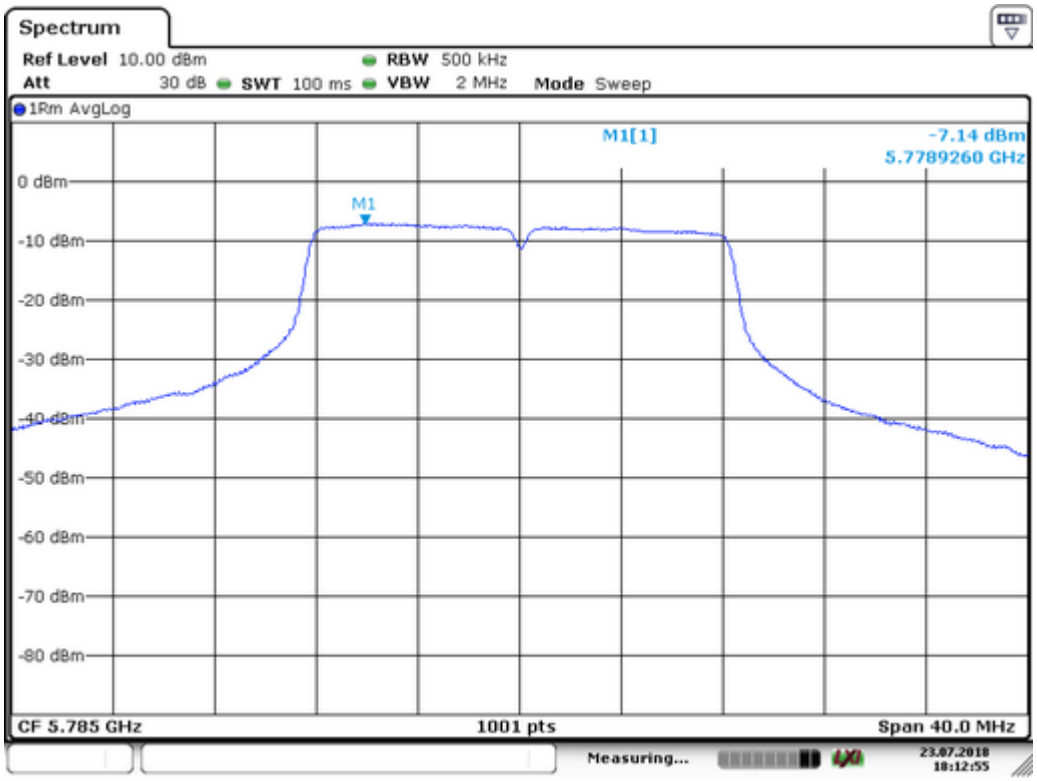
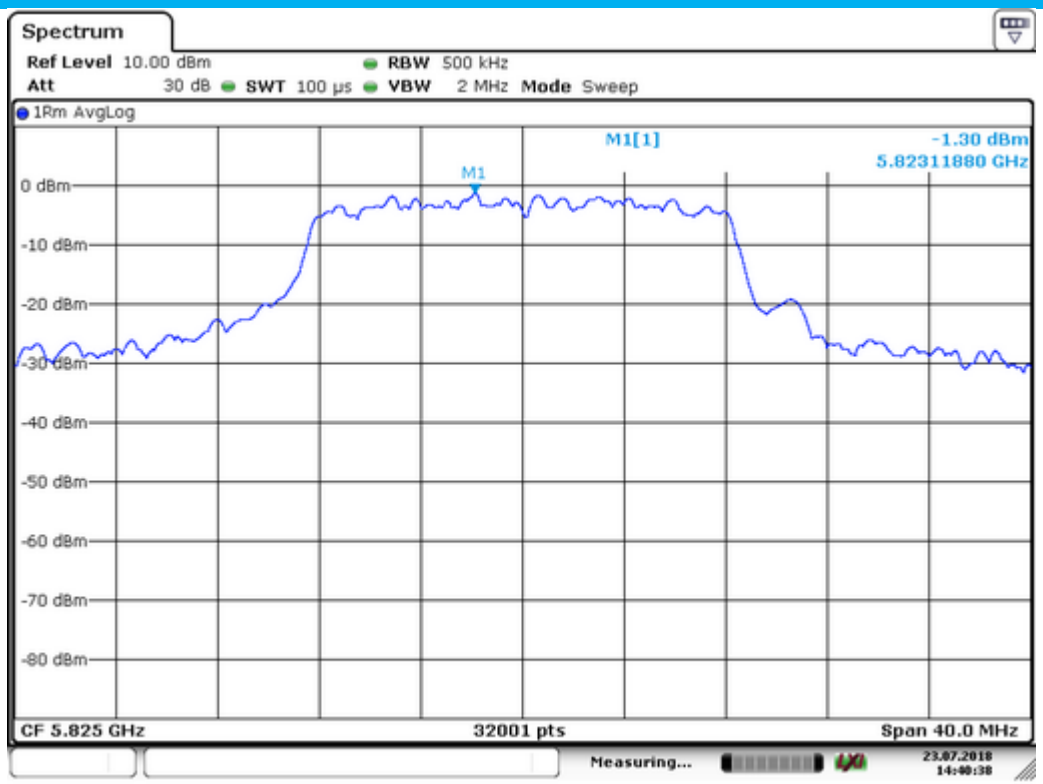
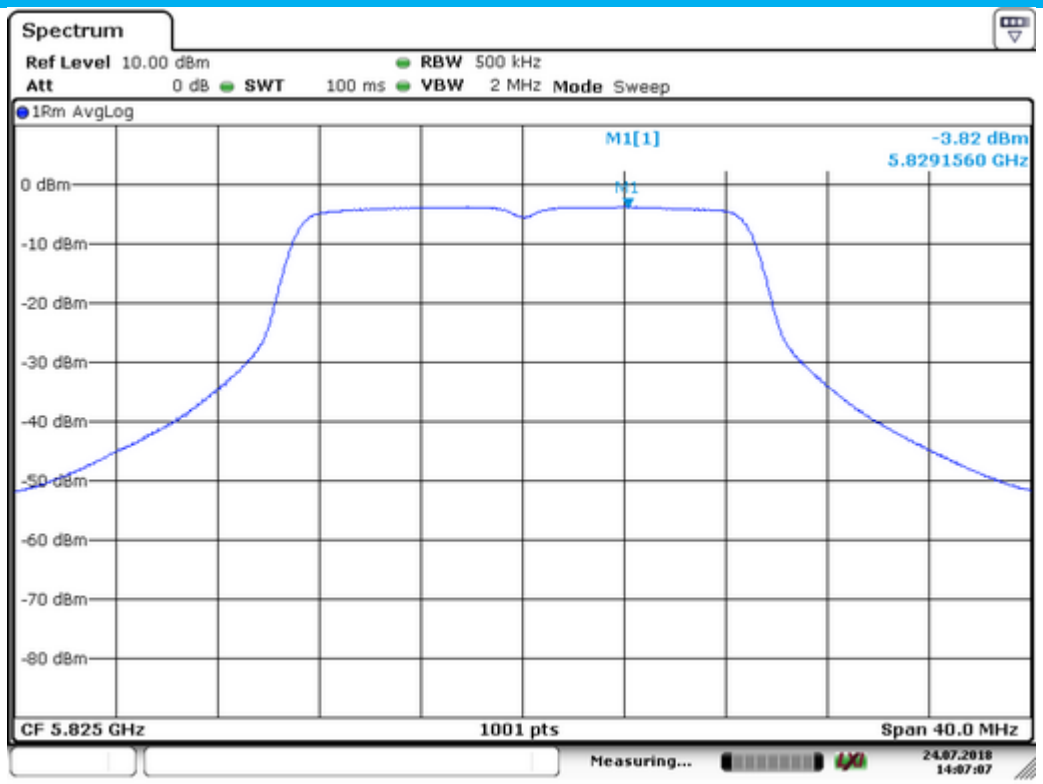


Power Spectral Density		UNII Band III	
Test Model	802.11a	Frequency(MHz)	5825

Ant0

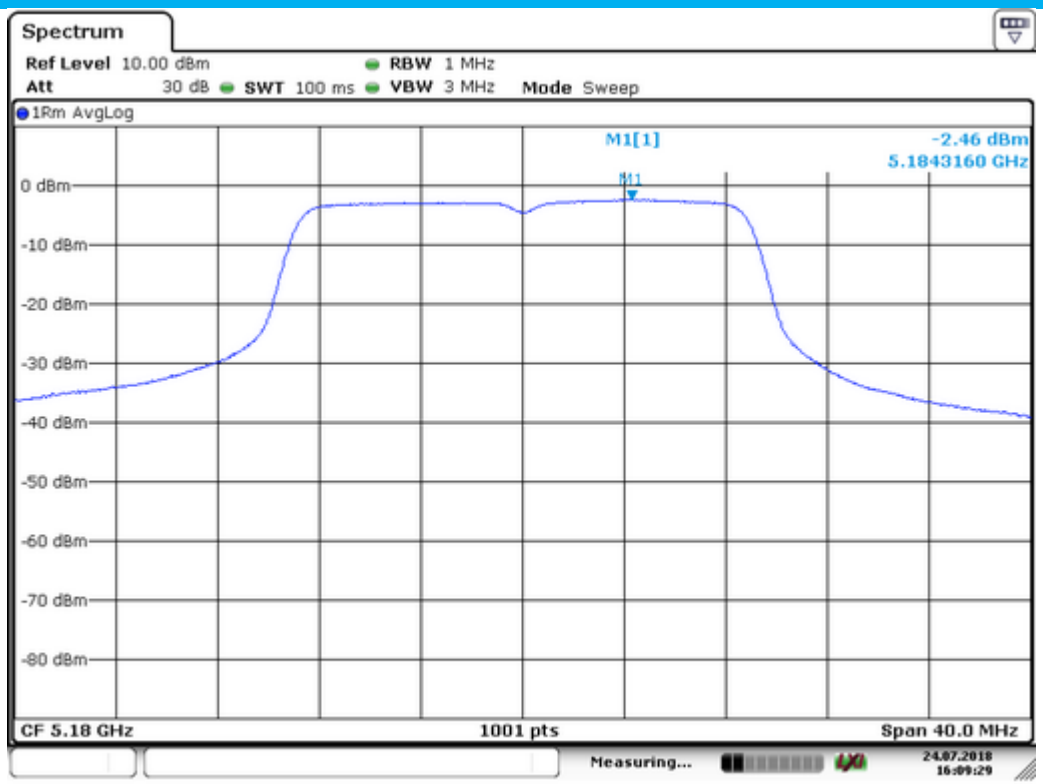


Ant1

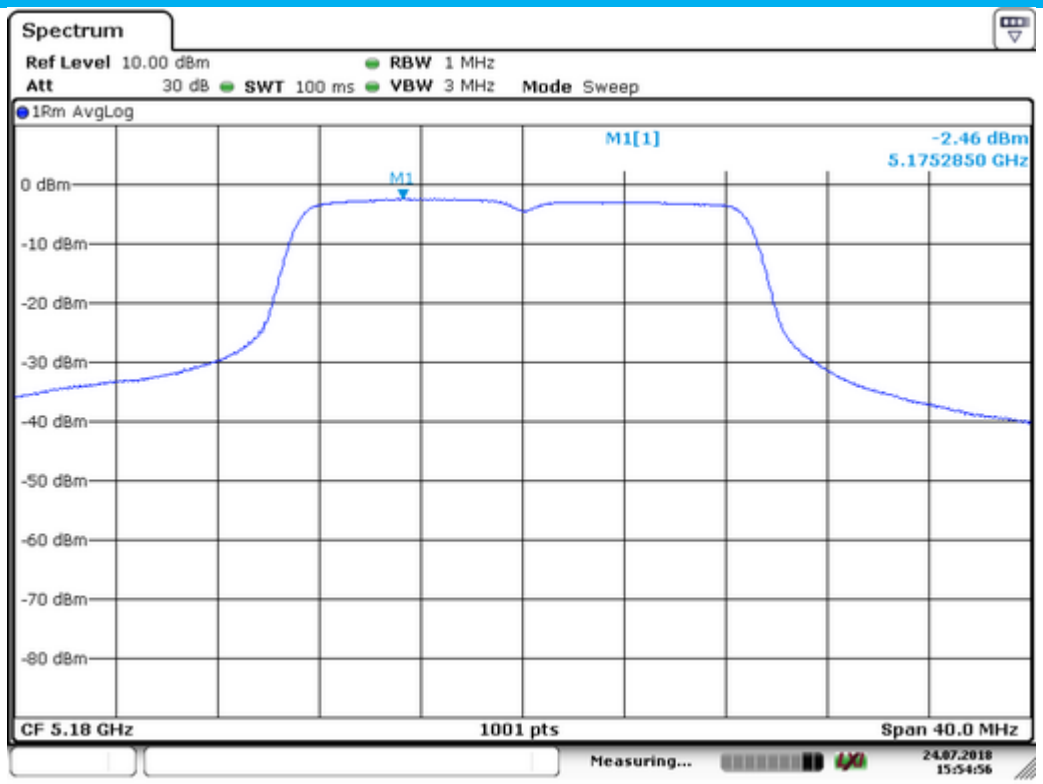


Power Spectral Density		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5180

Ant0

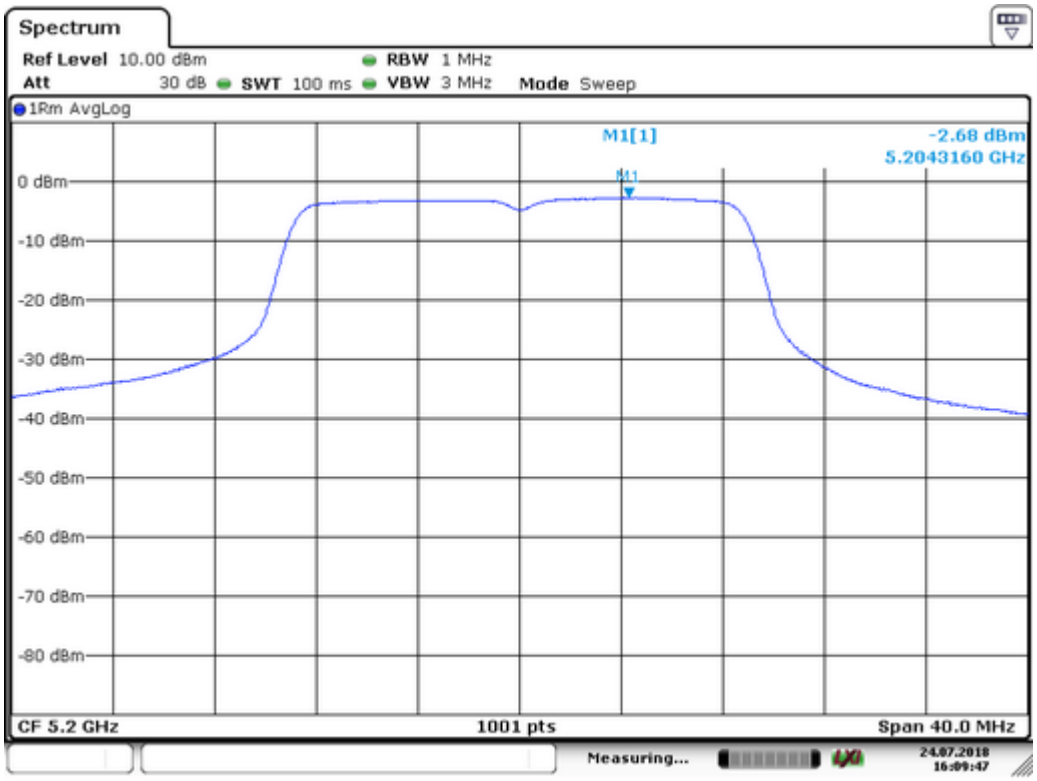


Ant1

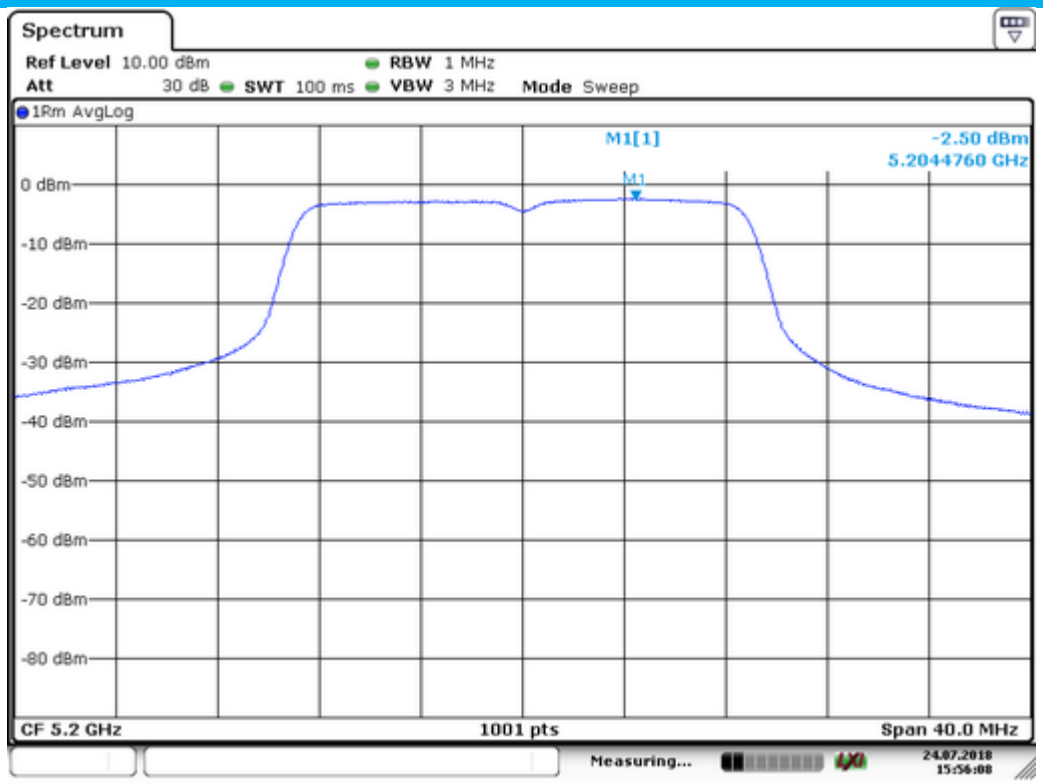


Power Spectral Density		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5200

Ant0

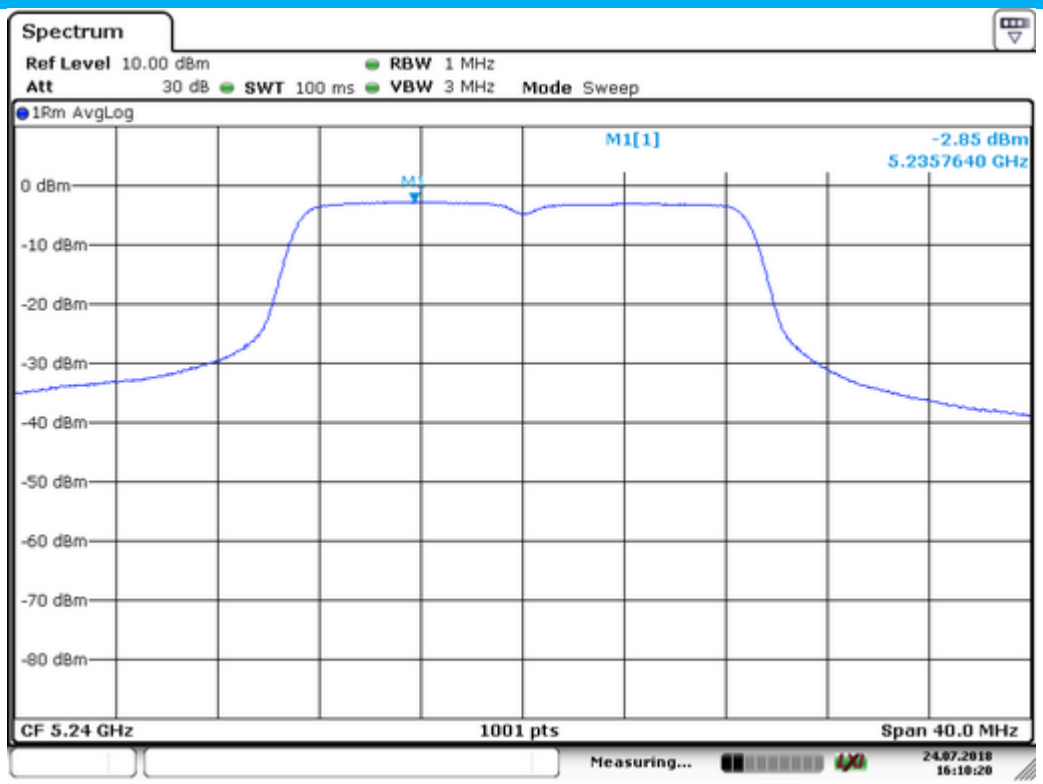


Ant1



Power Spectral Density		UNII Band I	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5240

Ant0



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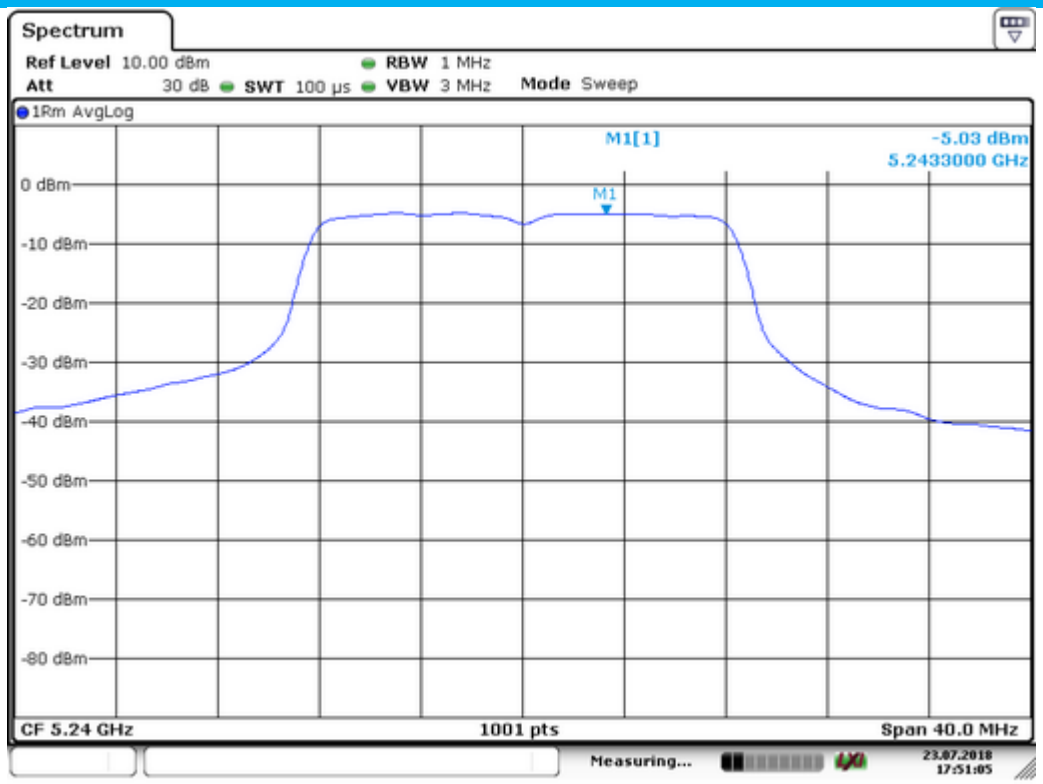
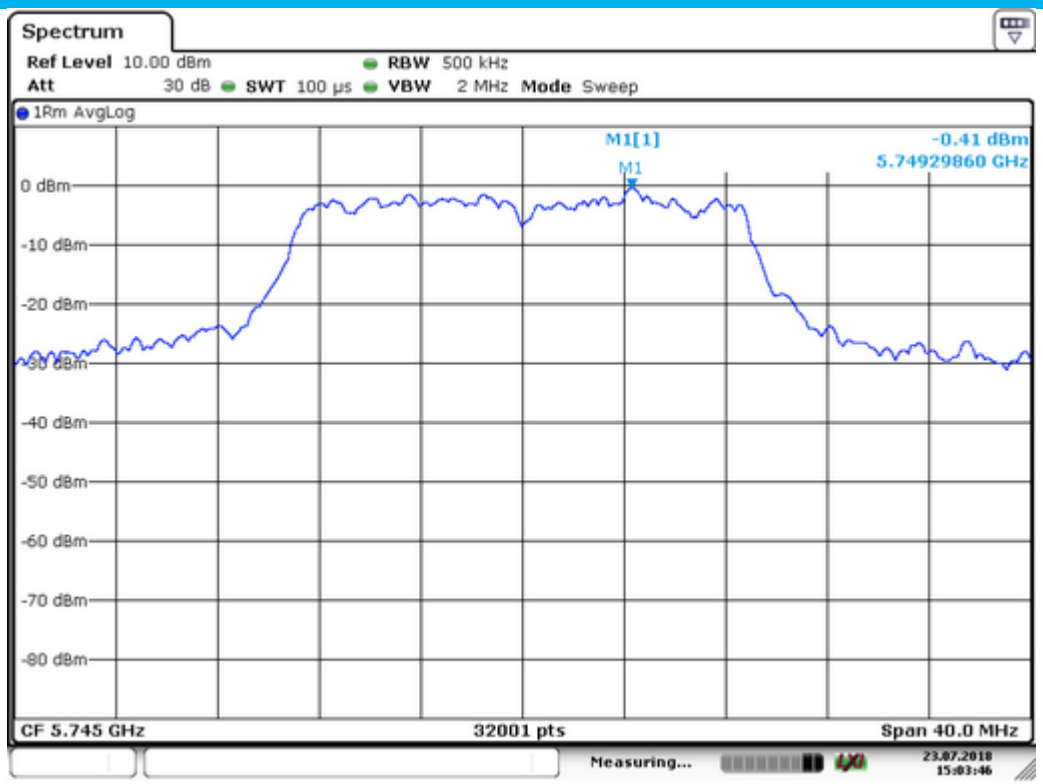


Power Spectral Density		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5745

Ant0



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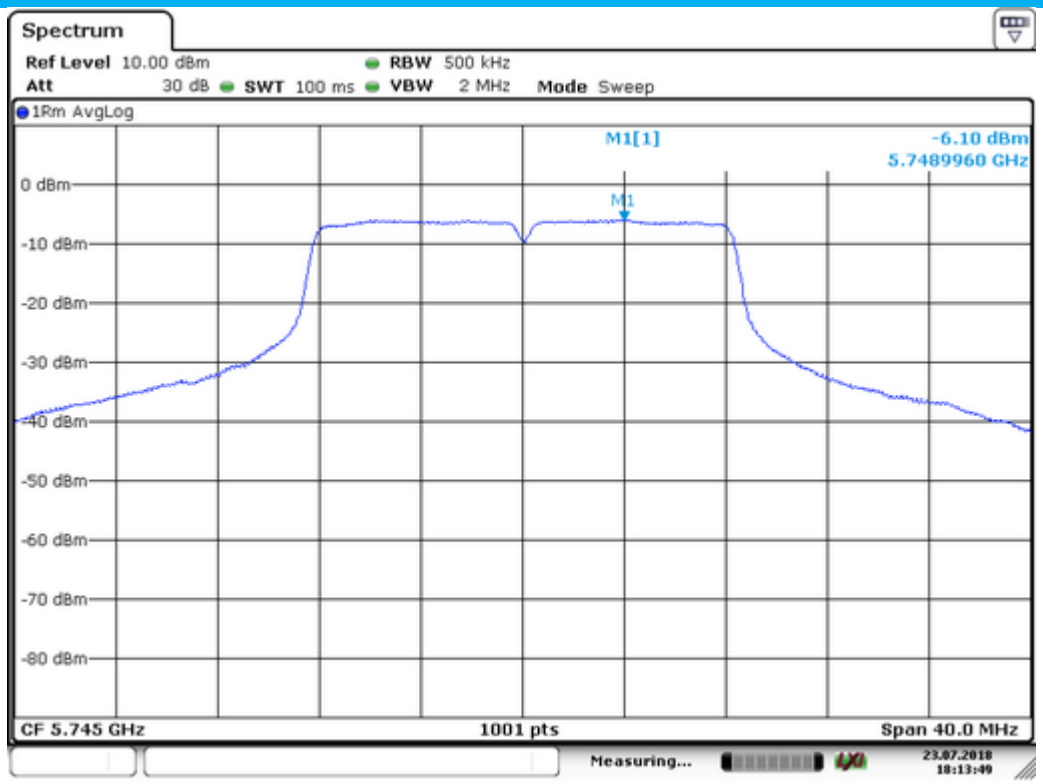
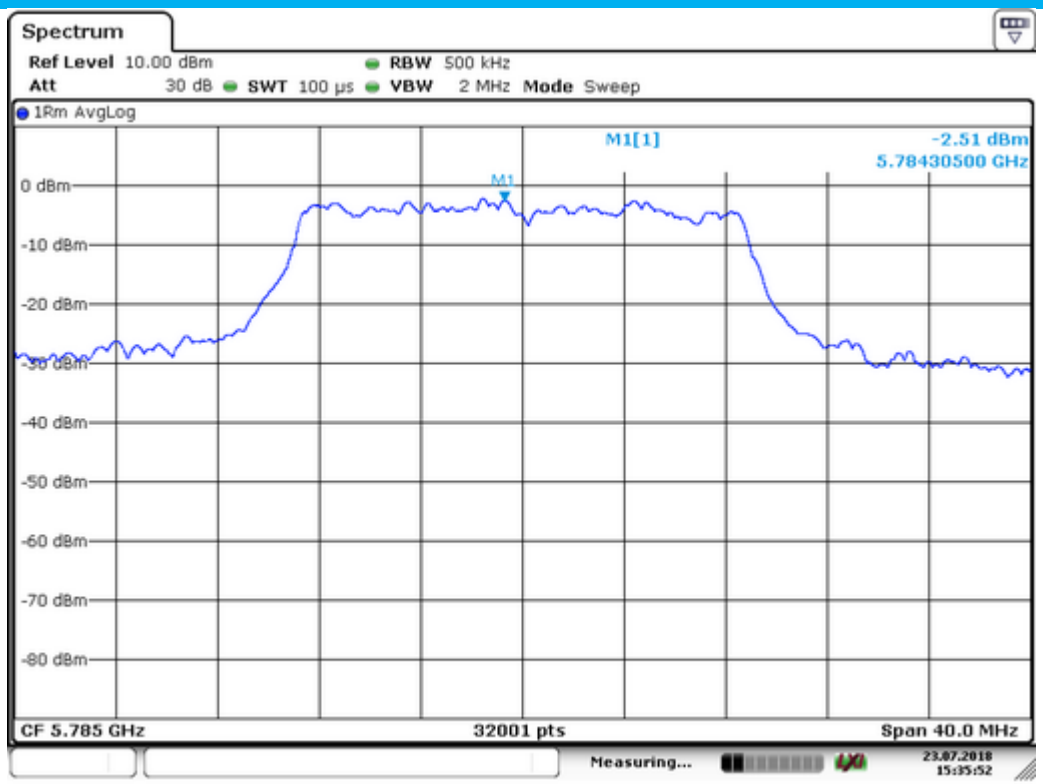


Power Spectral Density		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5785

Ant0



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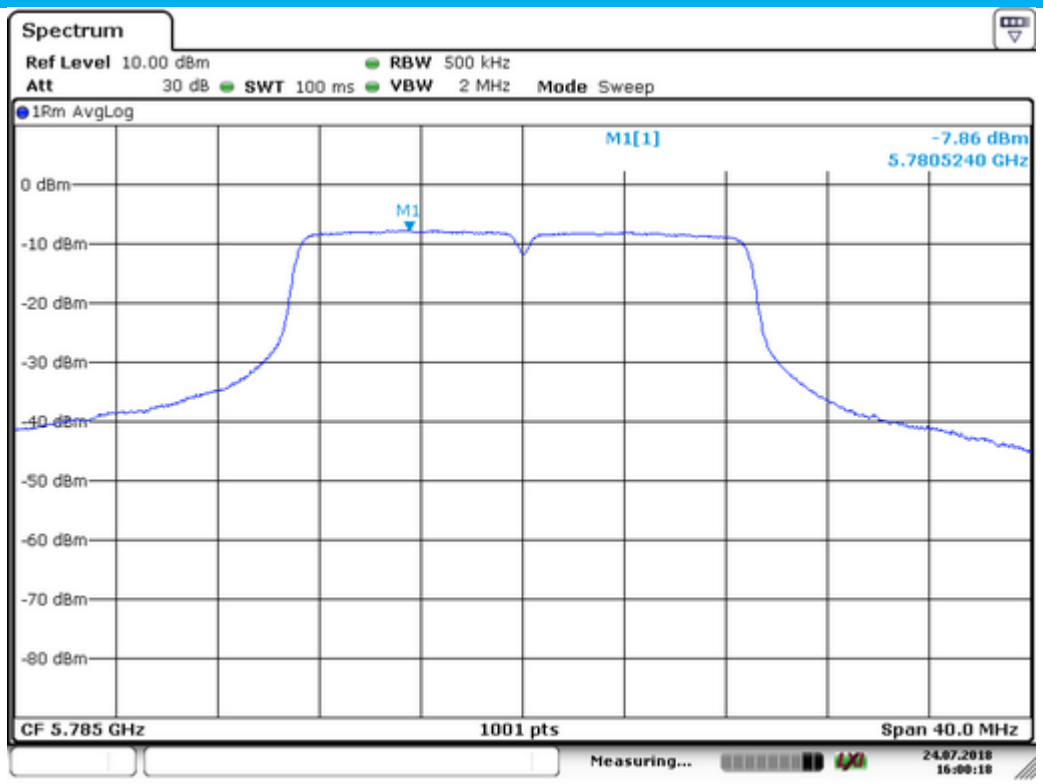
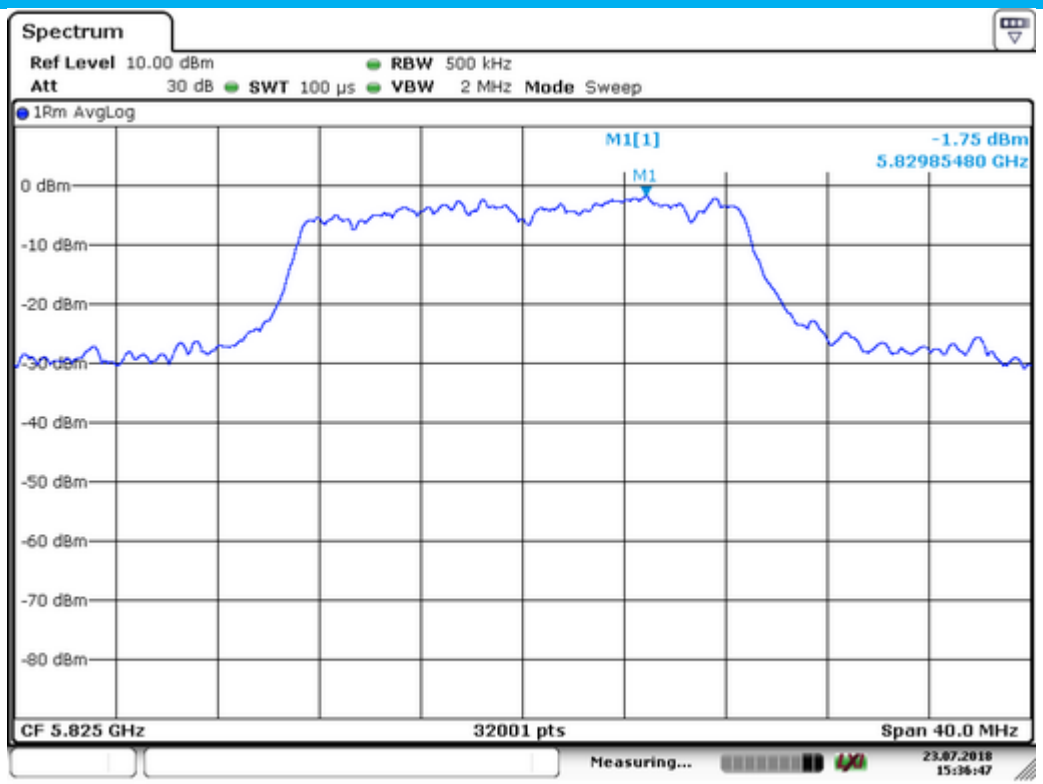
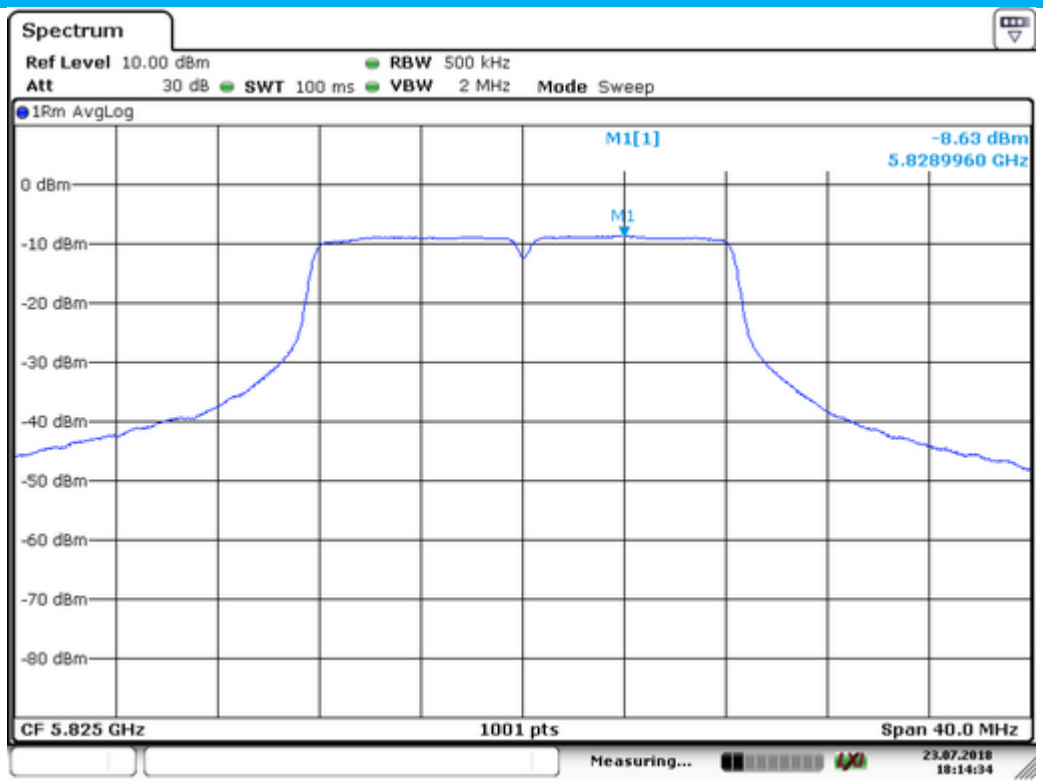


Power Spectral Density		UNII Band III	
Test Model	802.11n(VHT20) mode	Frequency(MHz)	5825

Ant0

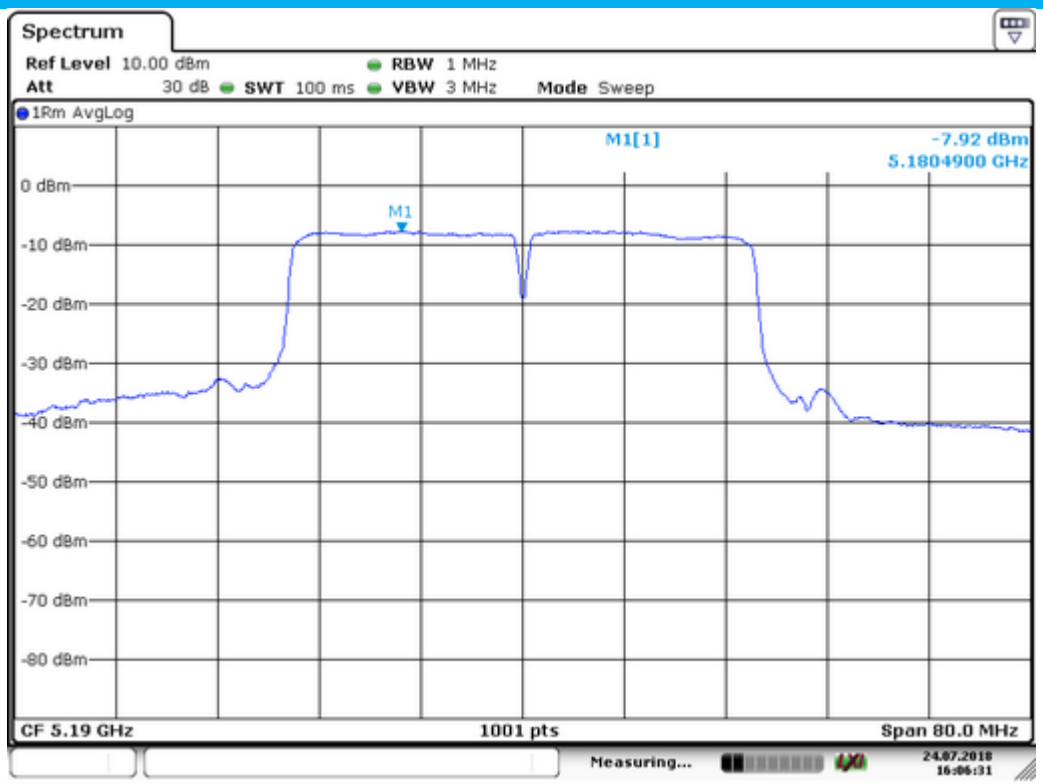


Ant1

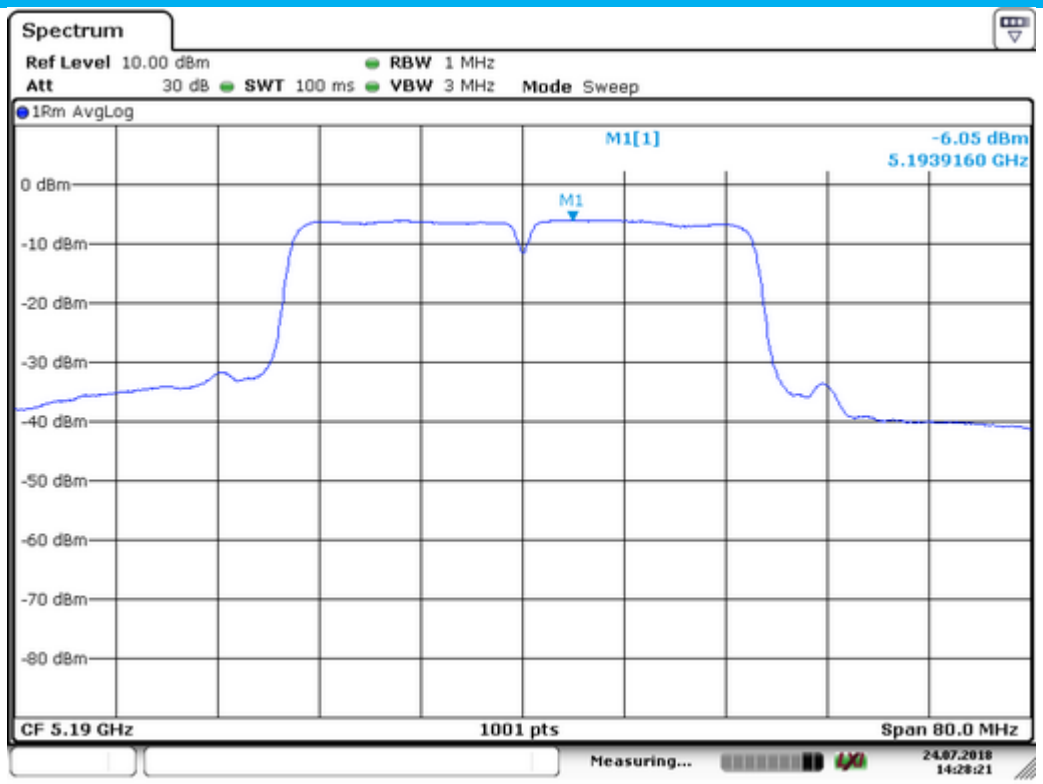


Power Spectral Density		UNII Band I	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5190

Ant0

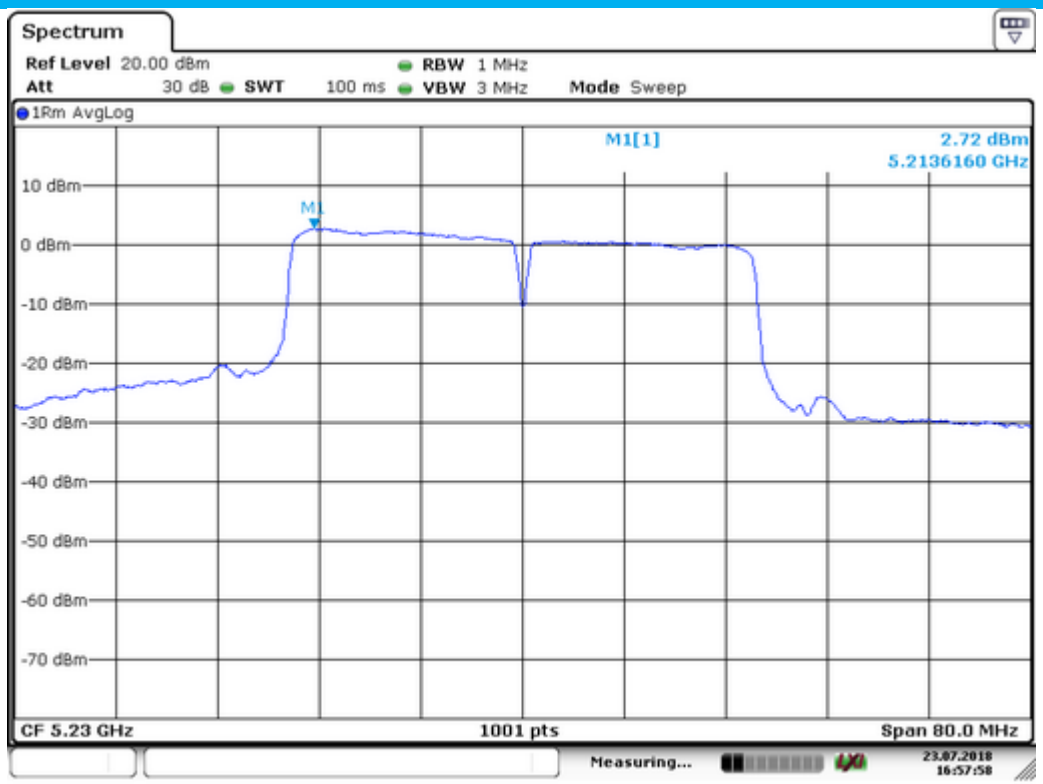


Ant1

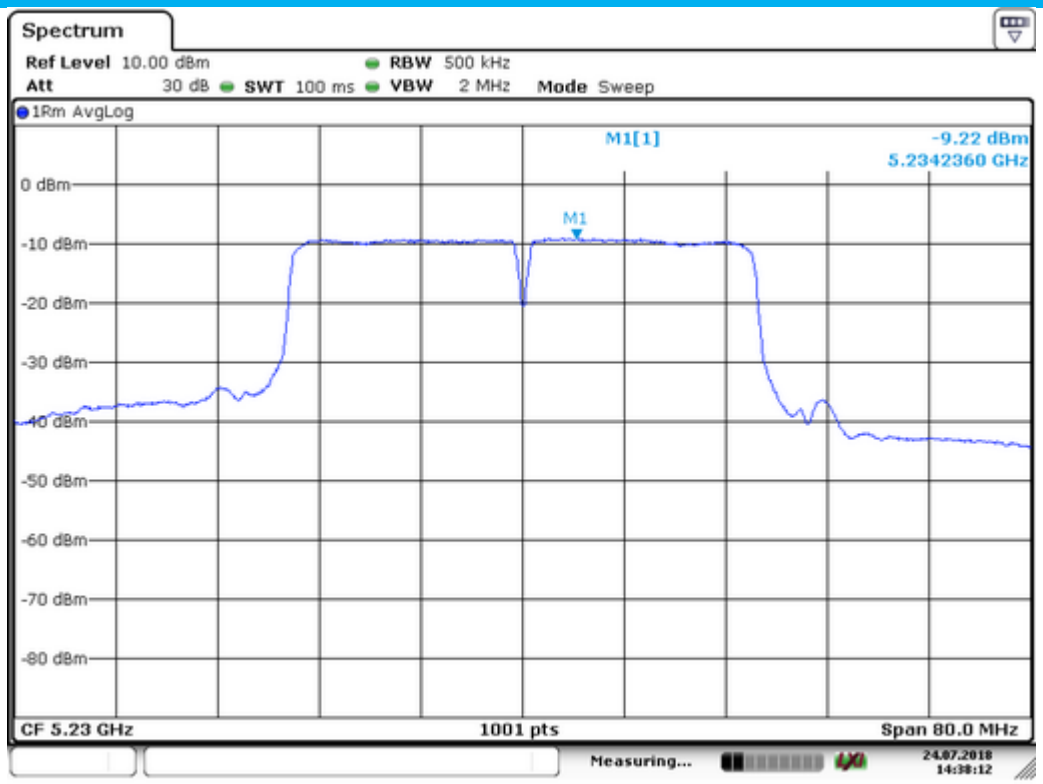


Power Spectral Density		UNII Band I	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5230

Ant0

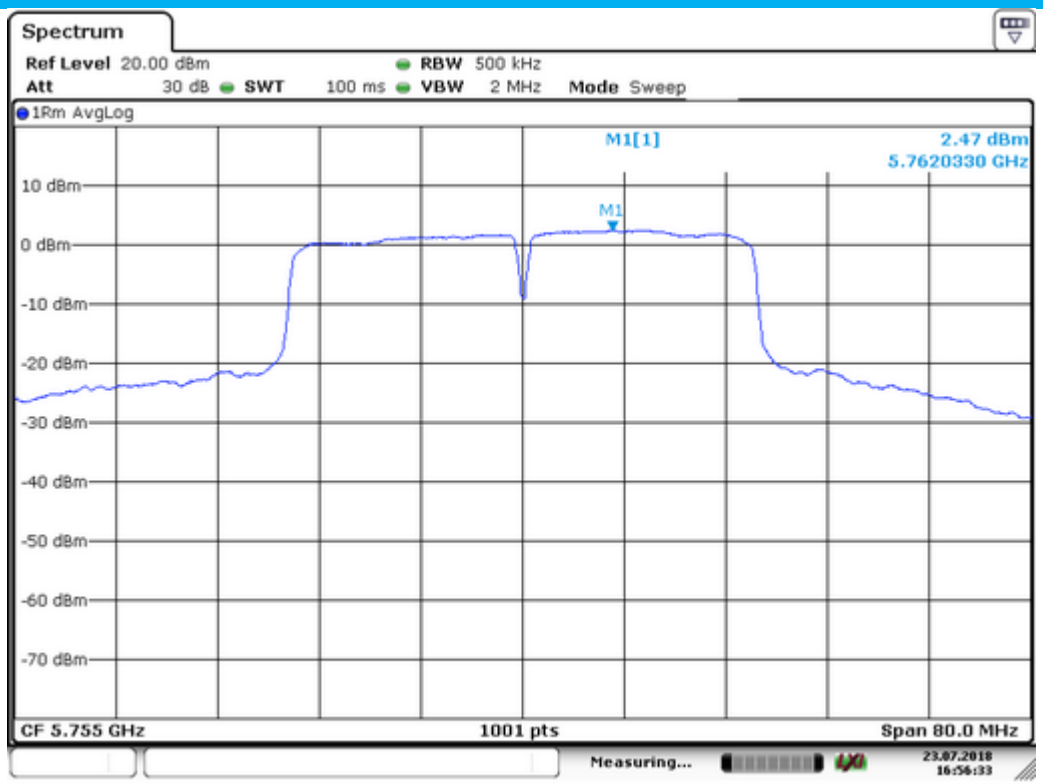


Ant1

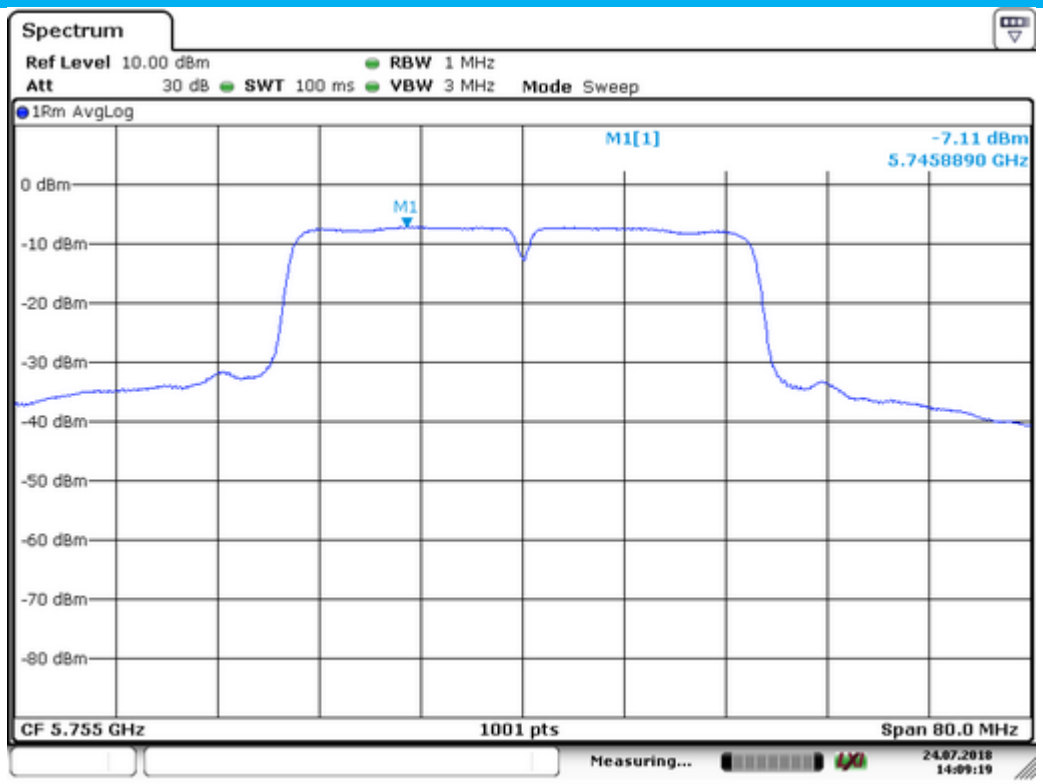


Power Spectral Density		UNII Band III	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5755

Ant0

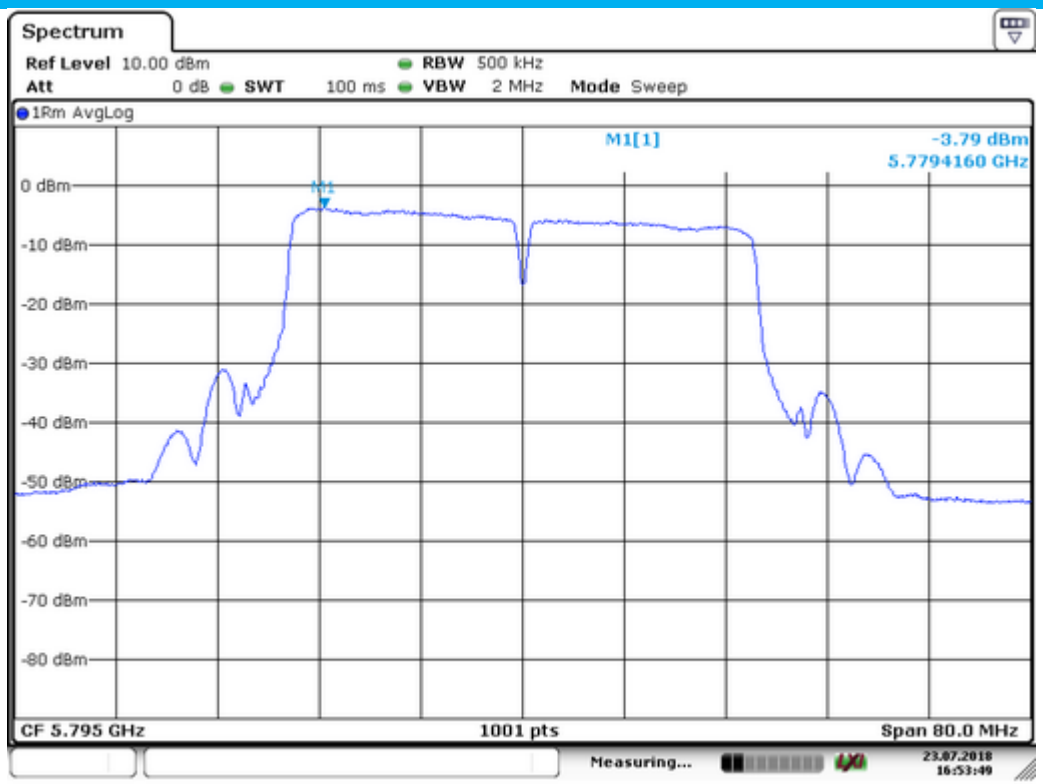


Ant1

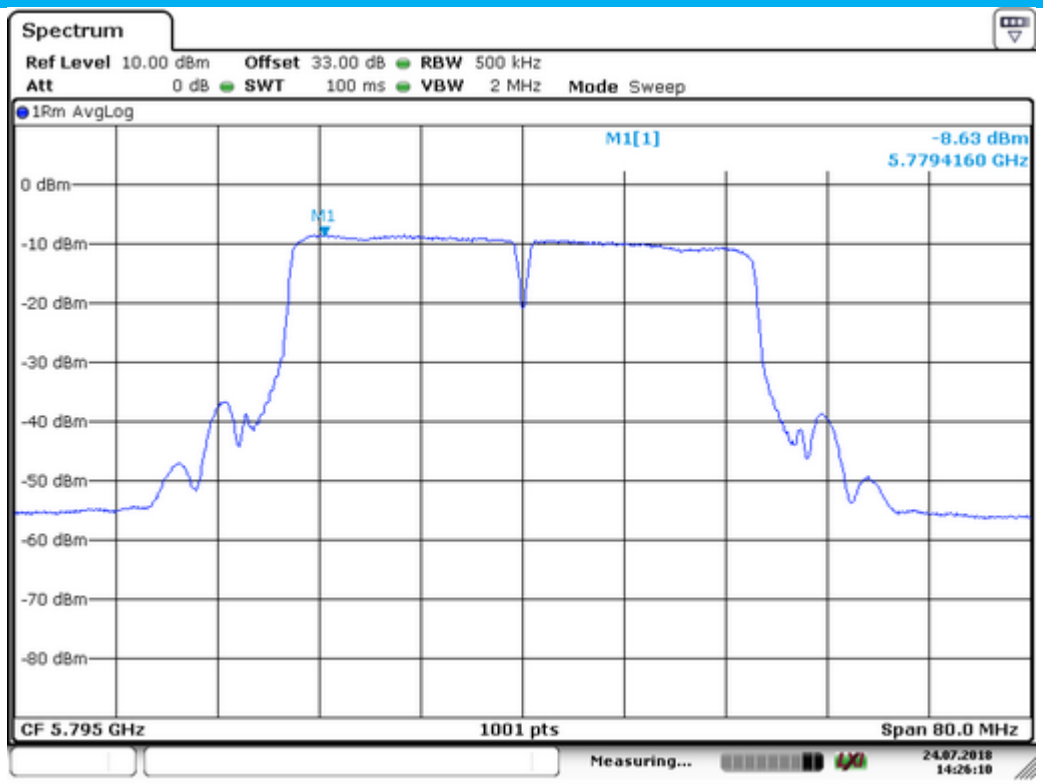


Power Spectral Density		UNII Band III	
Test Model	802.11n(VHT40) mode	Frequency(MHz)	5795

Ant0



Ant1



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

The test data for Antenna A

802.11a mode		5180	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5179.969547	-30.453	Pass
	-10	5179.969235	-30.765	Pass
	0	5179.969451	-30.549	Pass
	10	5179.969258	-30.742	Pass
	20	5179.969369	-30.631	Pass
	30	5179.969741	-30.259	Pass
	40	5179.970452	-29.548	Pass
	50	5179.969426	-30.574	Pass
85% Vnom	20	5179.969361	-30.639	Pass
115% Vnom	20	5179.969584	-30.416	Pass

802.11a mode		5200	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5199.961645	-38.355	Pass
	-10	5199.961362	-38.638	Pass
	0	5199.961214	-38.786	Pass
	10	5199.961558	-38.442	Pass
	20	5200.031442	31.442	Pass
	30	5199.961361	-38.639	Pass
	40	5199.961257	-38.743	Pass
	50	5199.961161	-38.839	Pass
85% Vnom	20	5199.961364	-38.636	Pass
115% Vnom	20	5199.961129	-38.871	Pass

802.11a mode		5240	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5239.977856	-22.144	Pass
	-10	5239.977542	-22.458	Pass
	0	5239.977367	-22.633	Pass
	10	5239.977445	-22.555	Pass
	20	5239.977526	-22.474	Pass
	30	5239.977695	-22.305	Pass
	40	5239.977421	-22.579	Pass
	50	5239.978248	-21.752	Pass
85% Vnom	20	5239.977361	-22.639	Pass
115% Vnom	20	5239.977225	-22.775	Pass

802.11a mode		5745	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5744.986694	-13.306	Pass
	-10	5744.986512	-13.488	Pass
	0	5744.986362	-13.638	Pass
	10	5744.986547	-13.453	Pass
	20	5744.986852	-13.148	Pass
	30	5744.986364	-13.636	Pass
	40	5744.986259	-13.741	Pass
	50	5744.986885	-13.115	Pass
85% Vnom	20	5744.986742	-13.258	Pass
115% Vnom	20	5744.986368	-13.632	Pass

802.11a mode		5785	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5784.991654	-8.346	Pass
	-10	5784.991159	-8.841	Pass
	0	5784.991357	-8.643	Pass
	10	5784.991552	-8.448	Pass
	20	5784.991364	-8.636	Pass
	30	5784.991870	-8.130	Pass
	40	5784.991254	-8.746	Pass
	50	5784.991206	-8.794	Pass
85% Vnom	20	5784.991369	-8.631	Pass
115% Vnom	20	5784.991224	-8.776	Pass

802.11a mode		5825	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5824.982654	-17.346	Pass
	-10	5824.982359	-17.641	Pass
	0	5824.982637	-17.363	Pass
	10	5824.982471	-17.529	Pass
	20	5824.982523	-17.477	Pass
	30	5824.982254	-17.746	Pass
	40	5824.982214	-17.786	Pass
	50	5824.982368	-17.632	Pass
85% Vnom	20	5824.983852	-16.148	Pass
115% Vnom	20	5824.983264	-16.736	Pass

802.11n(VHT20) mode		5180	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5180.001584	1.584	Pass
	-10	5180.001556	1.556	Pass
	0	5180.001224	1.224	Pass
	10	5180.001745	1.745	Pass
	20	5180.001693	1.693	Pass
	30	5180.001580	1.580	Pass
	40	5180.001256	1.256	Pass
	50	5180.001523	1.523	Pass
85% Vnom	20	5180.001506	1.506	Pass
115% Vnom	20	5180.001549	1.549	Pass

802.11n(VHT20) mode		5200	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5199.976694	-23.306	Pass
	-10	5199.975251	-24.749	Pass
	0	5199.975486	-24.514	Pass
	10	5199.975365	-24.635	Pass
	20	5199.975308	-24.692	Pass
	30	5199.975694	-24.306	Pass
	40	5199.975856	-24.144	Pass
	50	5199.975254	-24.746	Pass
85% Vnom	20	5199.975336	-24.664	Pass
115% Vnom	20	5199.976669	-23.331	Pass

802.11n(VHT20) mode		5240	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5239.982694	-17.306	Pass
	-10	5239.981574	-18.426	Pass
	0	5239.981158	-18.842	Pass
	10	5239.981642	-18.358	Pass
	20	5239.981538	-18.462	Pass
	30	5239.981552	-18.448	Pass
	40	5239.981634	-18.366	Pass
	50	5239.981245	-18.755	Pass
85% Vnom	20	5239.981658	-18.342	Pass
115% Vnom	20	5239.981851	-18.149	Pass

802.11n(VHT20) mode		5745	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5744.980963	-19.037	Pass
	-10	5744.980259	-19.741	Pass
	0	5744.980574	-19.426	Pass
	10	5744.980162	-19.838	Pass
	20	5744.980364	-19.636	Pass
	30	5744.980225	-19.775	Pass
	40	5744.980856	-19.144	Pass
	50	5744.980741	-19.259	Pass
85% Vnom	20	5744.980952	-19.048	Pass
115% Vnom	20	5744.980587	-19.413	Pass

802.11n(VHT20) mode		5785	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5784.988694	-11.306	Pass
	-10	5784.988256	-11.744	Pass
	0	5784.988321	-11.679	Pass
	10	5784.988159	-11.841	Pass
	20	5784.988257	-11.743	Pass
	30	5784.988445	-11.555	Pass
	40	5784.988658	-11.342	Pass
	50	5784.988805	-11.195	Pass
85% Vnom	20	5784.988154	-11.846	Pass
115% Vnom	20	5784.988126	-11.874	Pass

802.11n(VHT20) mode		5825	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5824.991582	-8.418	Pass
	-10	5824.991364	-8.636	Pass
	0	5824.991159	-8.841	Pass
	10	5824.991262	-8.738	Pass
	20	5824.991854	-8.146	Pass
	30	5824.991361	-8.639	Pass
	40	5824.991257	-8.743	Pass
	50	5824.991246	-8.754	Pass
85% Vnom	20	5824.991234	-8.766	Pass
115% Vnom	20	5824.991669	-8.331	Pass

802.11n(VHT40) mode		5190		
Temperature :	--	Test Date :	July 20,2018	
Humidity :	65 %	Test By:	King Kong	

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5189.975694	-24.306	Pass
	-10	5189.976582	-23.418	Pass
	0	5189.976381	-23.619	Pass
	10	5189.976664	-23.336	Pass
	20	5189.975259	-24.741	Pass
	30	5189.975648	-24.352	Pass
	40	5189.975552	-24.448	Pass
	50	5189.975261	-24.739	Pass
85% Vnom	20	5189.975369	-24.631	Pass
115% Vnom	20	5189.975668	-24.332	Pass

802.11n(VHT40) mode		5230		
Temperature :	--	Test Date :	July 20,2018	
Humidity :	65 %	Test By:	King Kong	

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5229.972459	-27.541	Pass
	-10	5229.972654	-27.346	Pass
	0	5229.972258	-27.742	Pass
	10	5229.972361	-27.639	Pass
	20	5229.972481	-27.519	Pass
	30	5229.972596	-27.404	Pass
	40	5229.972334	-27.666	Pass
	50	5229.972259	-27.741	Pass
85% Vnom	20	5229.972156	-27.844	Pass
115% Vnom	20	5229.972367	-27.633	Pass

802.11n(VHT40) mode		5755	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5754.994639	-5.361	Pass
	-10	5754.994528	-5.472	Pass
	0	5754.994256	-5.744	Pass
	10	5754.994364	-5.636	Pass
	20	5754.994159	-5.841	Pass
	30	5754.994224	-5.776	Pass
	40	5754.994256	-5.744	Pass
	50	5754.994578	-5.422	Pass
85% Vnom	20	5754.994451	-5.549	Pass
115% Vnom	20	5754.994268	-5.732	Pass

802.11n(VHT40) mode		5795	
Temperature :	--	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5794.985468	-14.532	Pass
	-10	5794.985251	-14.749	Pass
	0	5794.985361	-14.639	Pass
	10	5794.985259	-14.741	Pass
	20	5794.985417	-14.583	Pass
	30	5794.986259	-13.741	Pass
	40	5794.985362	-14.638	Pass
	50	5794.985784	-14.216	Pass
85% Vnom	20	5794.985592	-14.408	Pass
115% Vnom	20	5794.986306	-13.694	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 within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.
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 voltage 120V &240V and the modes 802.11a/n/ac has been tested and the worst result (801.11n(VHT20)) recorded as below:

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

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	801.11n(VHT20)	Frequency(MHz):	5180

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7090.32	V	53.46	-41.77	-27	-14.77
9778.73	V	58.25	-36.98	-27	-9.98
13159.31	V	59.66	-35.57	-27	-8.57
6954.23	H	56.78	-38.45	-27	-11.45
10322.76	H	61.48	-33.75	-27	-6.75
13346.24	H	60.37	-34.86	-27	-7.86

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	801.11n(VHT20)	Frequency(MHz):	5240

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7087.43	V	53.44	-41.79	-27	-14.79
9780.78	V	58.62	-36.61	-27	-9.61
13158.85	V	60.44	-34.79	-27	-7.79
6951.43	H	52.59	-42.64	-27	-15.64
10324.8	H	58.69	-36.54	-27	-9.54
13343.45	H	60.28	-34.95	-27	-7.95

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3)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 :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	801.11n(VHT20)	Frequency(MHz):	5180

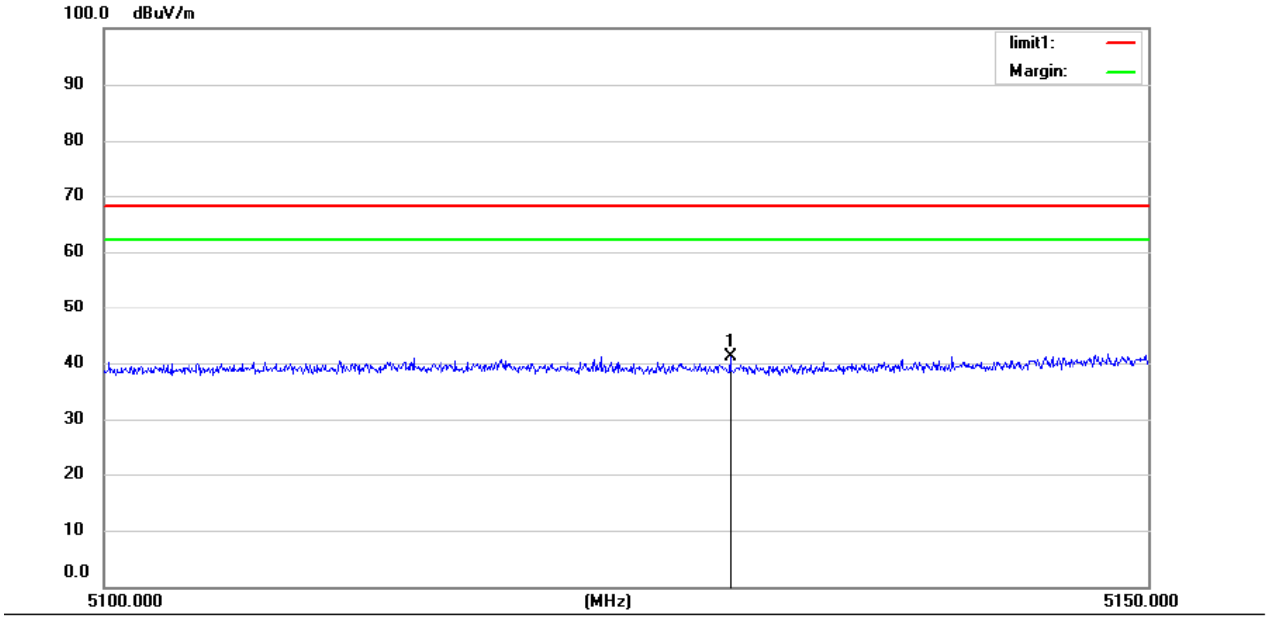
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5149.05	H	69.47	-25.76	-27	Pass
5138.55	V	67.66	-27.57	-27	Pass

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	801.11n(VHT20)	Frequency(MHz):	5240

Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5352.15	V	69.85	-25.38	-27	Pass
5359.05	H	68.35	-26.88	-27	Pass

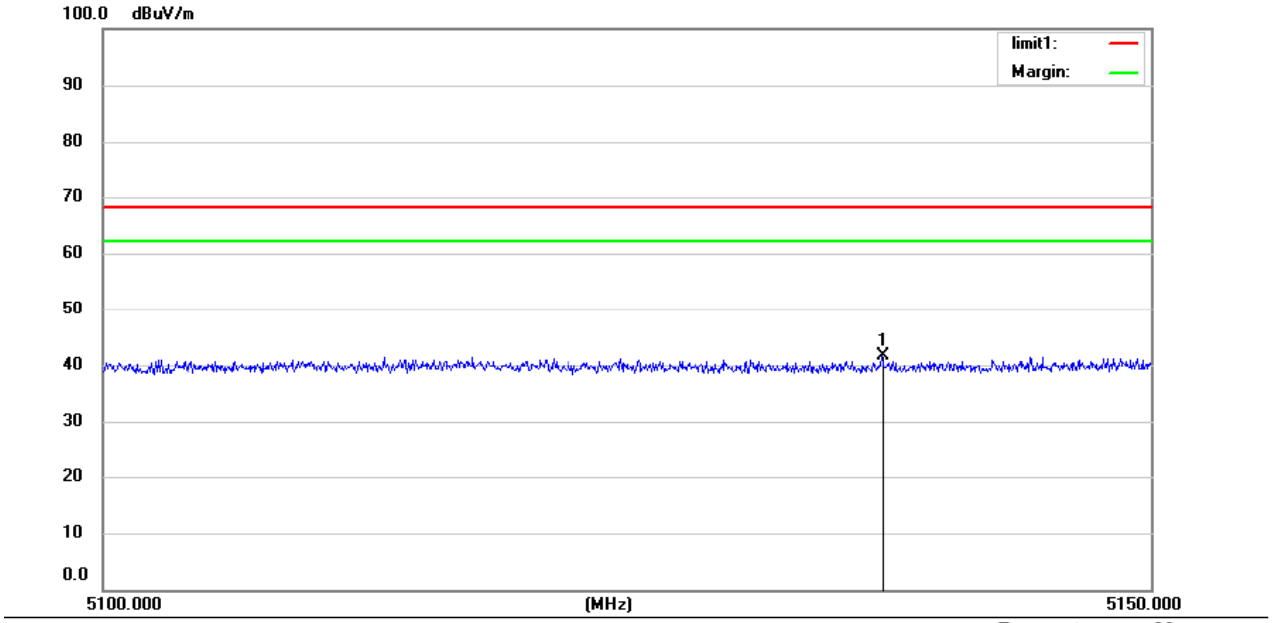
Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3)EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

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



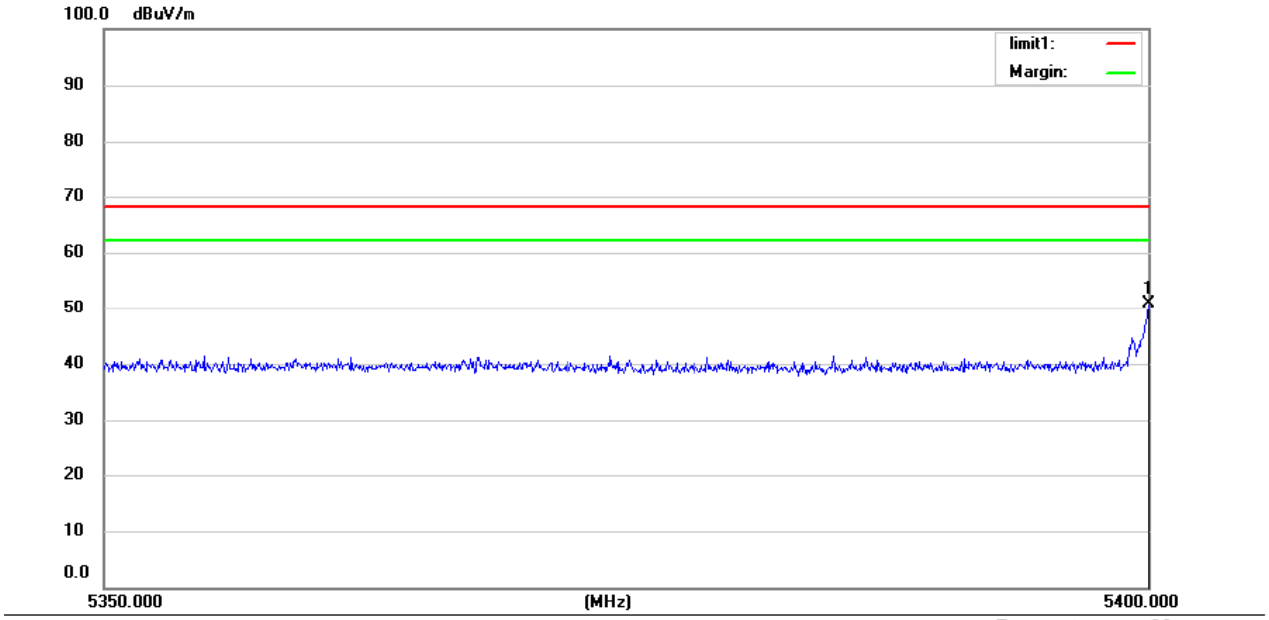
Site Chamber #1 Polarization: ***Horizontal*** Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

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



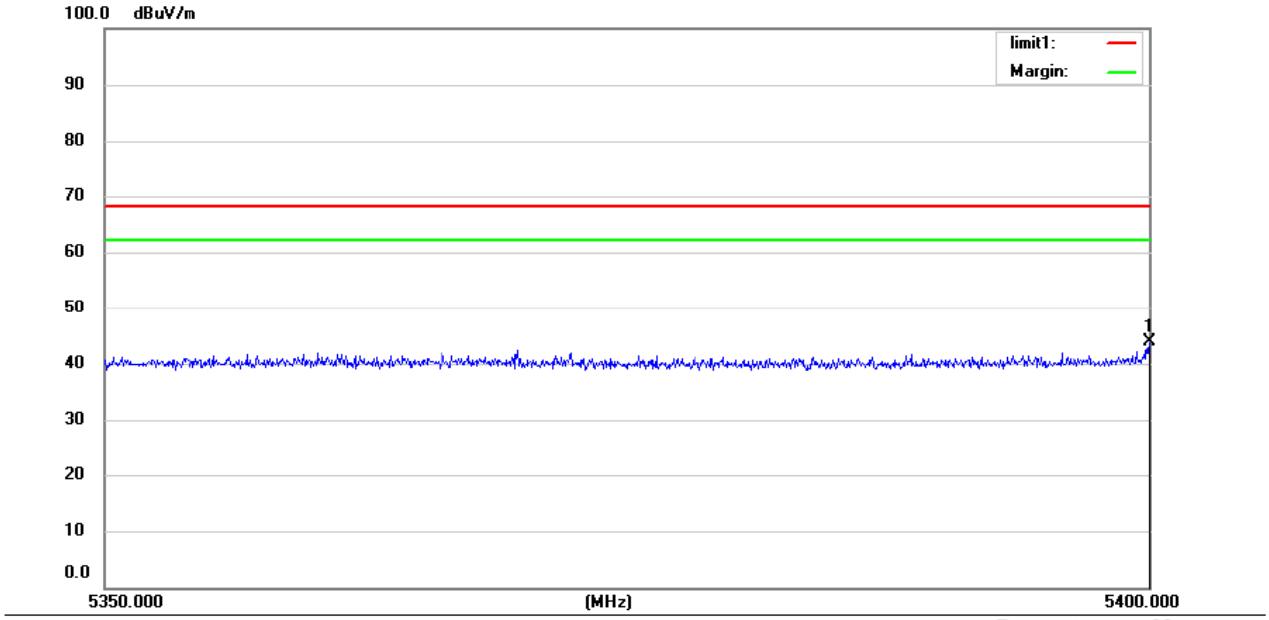
Site Chamber #1 Polarization: ***Vertical*** Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

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



Site Chamber #1 Polarization: ***Horizontal*** Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

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



Site Chamber #1 Polarization: ***Vertical*** Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

■ ☒For Undesirable radiated Spurious Emission in UNII Band III

All the modes 802.11a/n/ac has been tested and the worst result 802.11(HT20) recorded as below:

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

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	802.11(HT20)	Frequency(MHz):	5745

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7142.69	V	50.16	-45.07	-27.00	-18.07
9838.38	V	51.33	-43.9	-27.00	-16.9
13214.11	V	58.56	-26.67	-27.00	-9.67
7004.02	H	54.37	-40.86	-27.00	-13.86
10382.46	H	60.28	-34.95	-27.00	-7.95
13398.47	H	62.76	-32.47	-27.00	-5.47

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	802.11(HT20)	Frequency(MHz):	5785

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7141.34	V	45.18	-50.05	-27.00	-23.05
9837	V	44.42	-50.81	-27.00	-23.81
13215.18	V	60.39	-34.84	-27.00	-7.84
7005.12	H	49.55	-45.68	-27.00	-18.68
10381.03	H	51.85	-43.38	-27.00	-16.38
13399.45	H	54.72	-40.51	-27.00	-13.51

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	802.11(HT20)	Frequency(MHz):	5825

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7142.41	V	46.25	-48.98	-27.00	-21.98
9835.63	V	45.96	-49.27	-27.00	-22.27
13216.22	V	60.46	-34.77	-27.00	-7.77
7006.17	H	48.72	-46.51	-27.00	-19.51
10379.69	H	50.66	-44.57	-27.00	-17.57
13400.51	H	53.54	-41.69	-27.00	-14.69

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3)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 :	July 20,2018
Humidity :	65 %	Test By:	King Kong
Test mode:	802.11a	Frequency:	5745

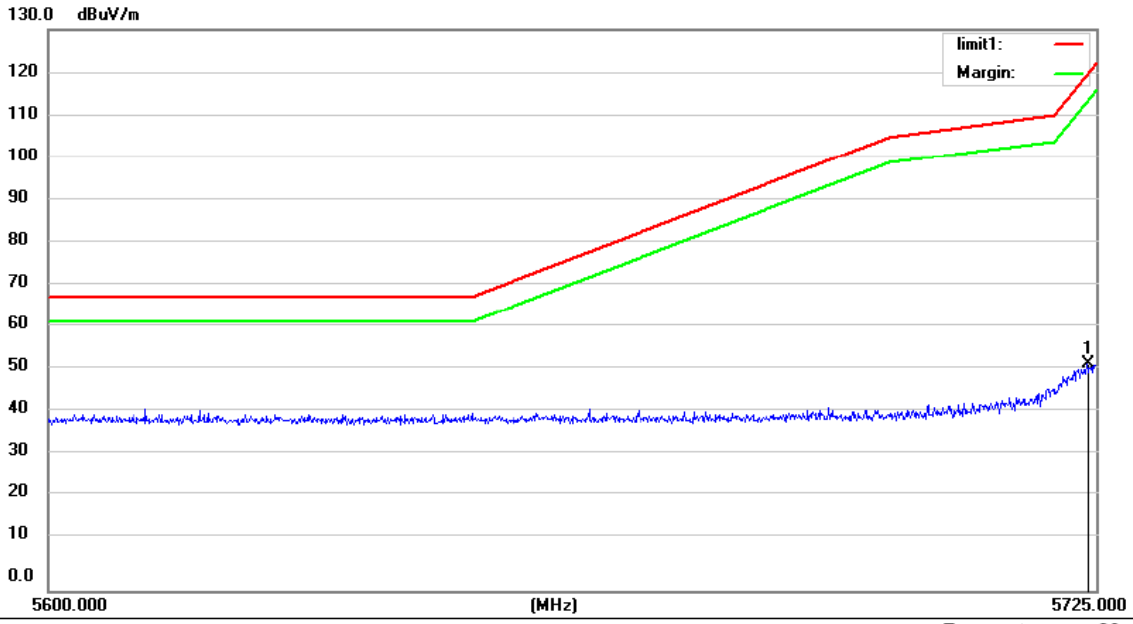
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5725.00	H	51.42	-43.81	-17	PASS
5724.75	V	49.72	-45.51	-17	PASS

Temperature :	28℃	Test Date :	July 20,2018
Humidity :	65 %	Test By:	King Kong
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
5881.75	H	52.03	-43.20	-17	PASS
5874.87	V	50.16	-45.07	-17	PASS

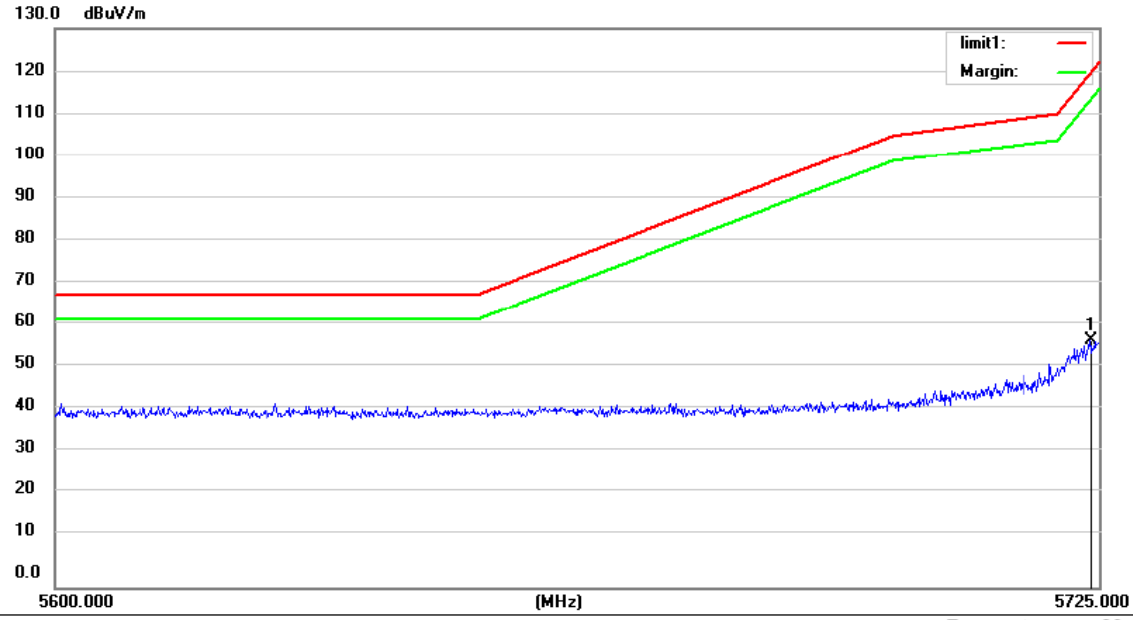
Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3)EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

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



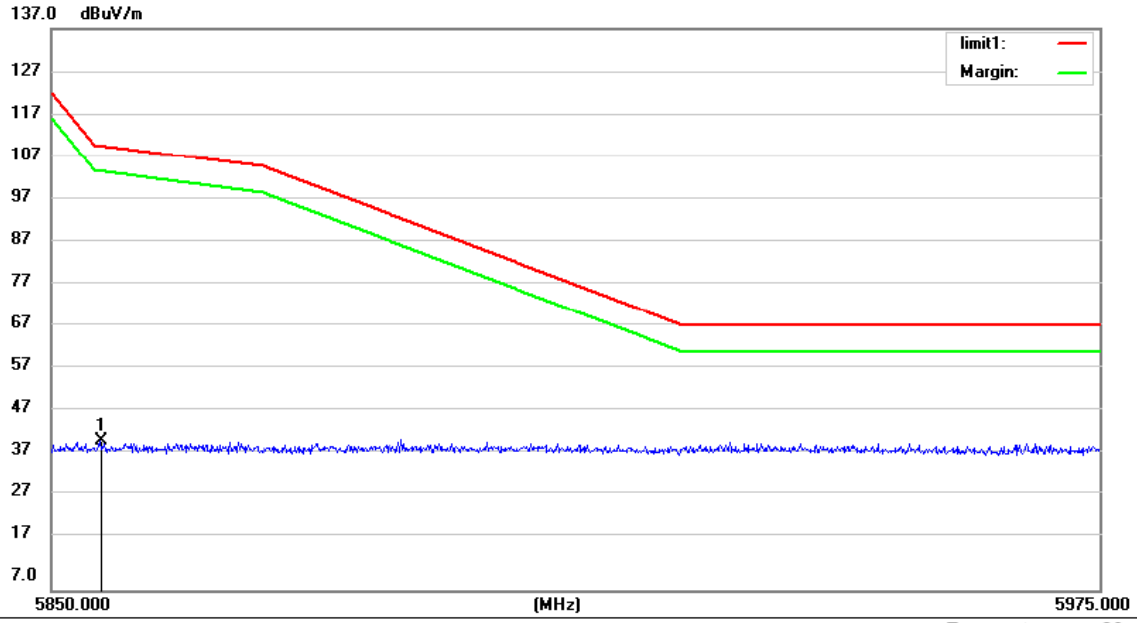
Site Chamber #1	Polarization:	***Horizontal***	Temperature: 26
Limit: (CE)FCC PART 15E	Power:	Battery 3.7V	Humidity: 55 %

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



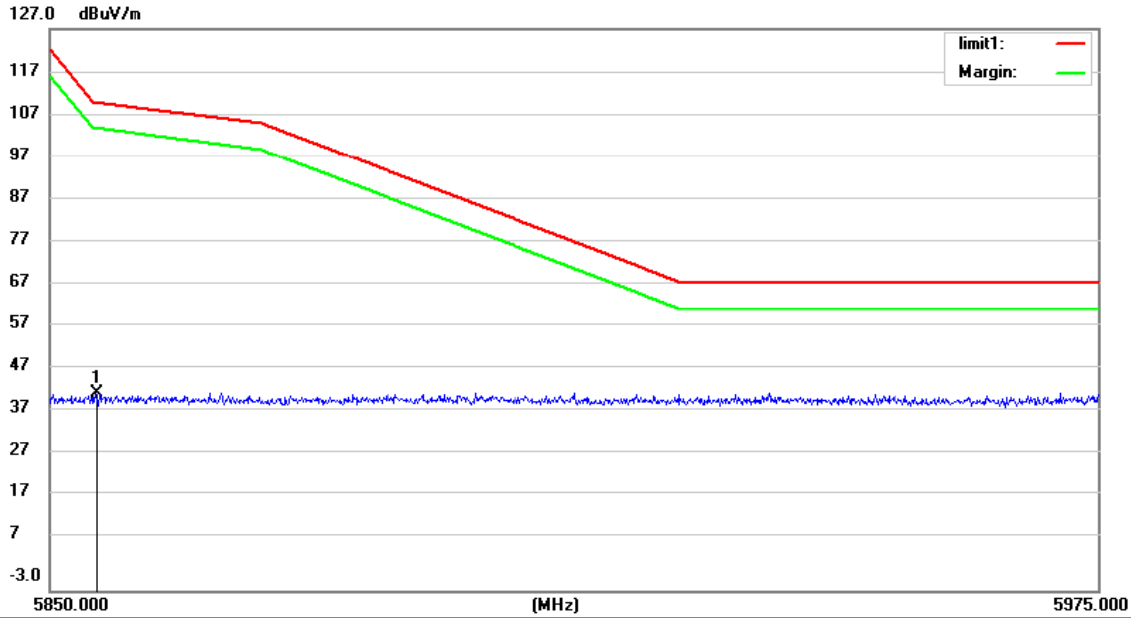
Site Chamber #1	Polarization:	***Vertical***	Temperature: 26
Limit: (CE)FCC PART 15E	Power:	Battery 3.7V	Humidity: 55 %

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



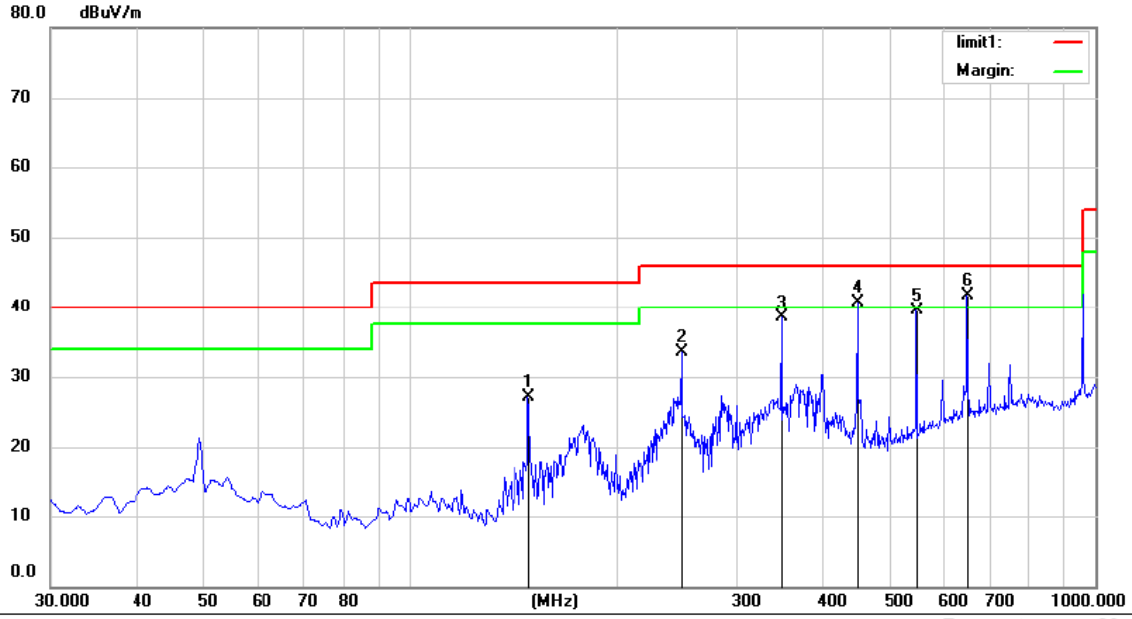
Site Chamber #1 Polarization: *Horizontal* Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

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



Site Chamber #1 Polarization: *Vertical* Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

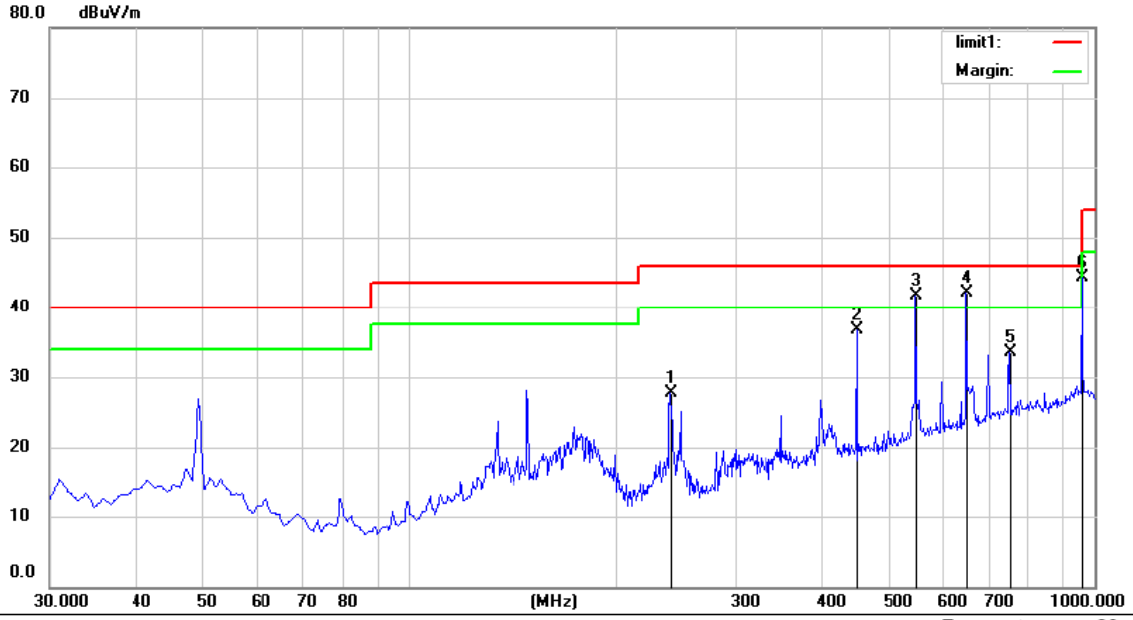
- Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)
- All the modulation modes were tested the data of the worst mode (band I) are recorded in the following pages and the others modulation methods do not exceed the limits.



Site Chamber #1 Polarization: *Horizontal* Temperature: 26
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %
Mode: TX5180
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		149.3100	48.69	-21.56	27.13	43.50	-16.37	QP			
2		250.1900	49.00	-15.54	33.46	46.00	-12.54	QP			
3		350.1000	50.75	-12.22	38.53	46.00	-7.47	QP			
4	I	450.0100	50.66	-9.95	40.71	46.00	-5.29	QP			
5		549.9200	47.18	-7.73	39.45	46.00	-6.55	QP			
6	*	650.8000	46.84	-5.15	41.69	46.00	-4.31	QP			

*:Maximum data x:Over limit I:over margin Operator:



Site Chamber #1 Polarization: *Vertical* Temperature: 26

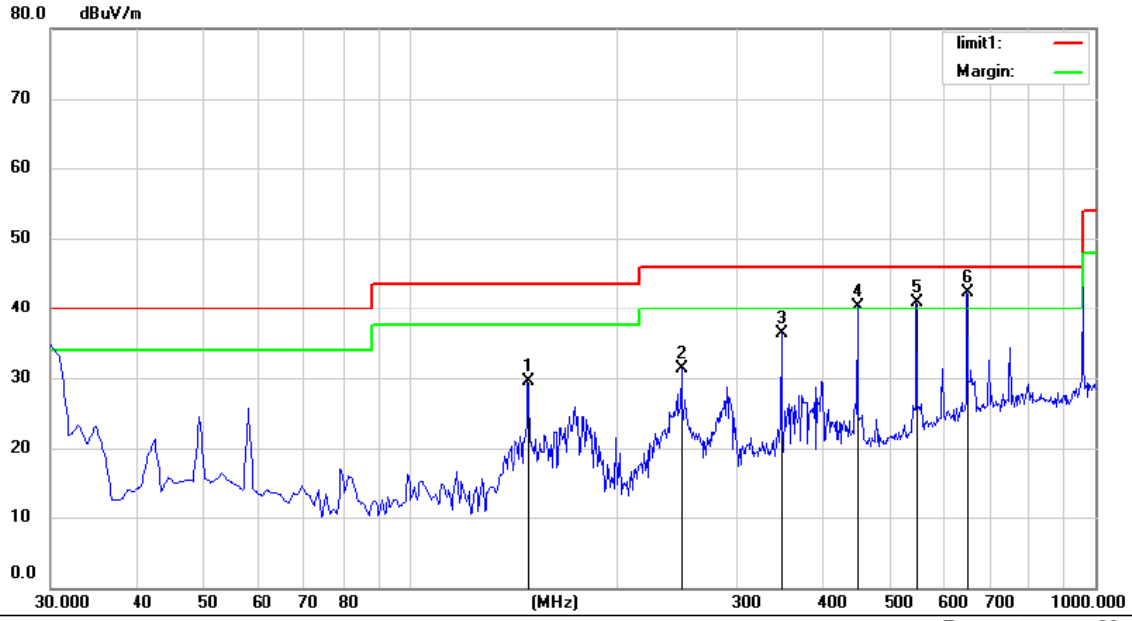
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

Mode: TX5180

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		241.4600	43.71	-15.94	27.77	46.00	-18.23	QP			
2		450.0100	47.47	-10.85	36.62	46.00	-9.38	QP			
3	!	549.9200	49.78	-8.13	41.65	46.00	-4.35	QP			
4	*	650.8000	48.84	-6.65	42.19	46.00	-3.81	QP			
5		750.7100	38.29	-4.75	33.54	46.00	-12.46	QP			
6		960.2300	46.15	-1.94	44.21	54.00	-9.79	QP			

*:Maximum data x:Over limit !:over margin Operator:



Site Chamber #1
Polarization: ***Horizontal***
Temperature: 26

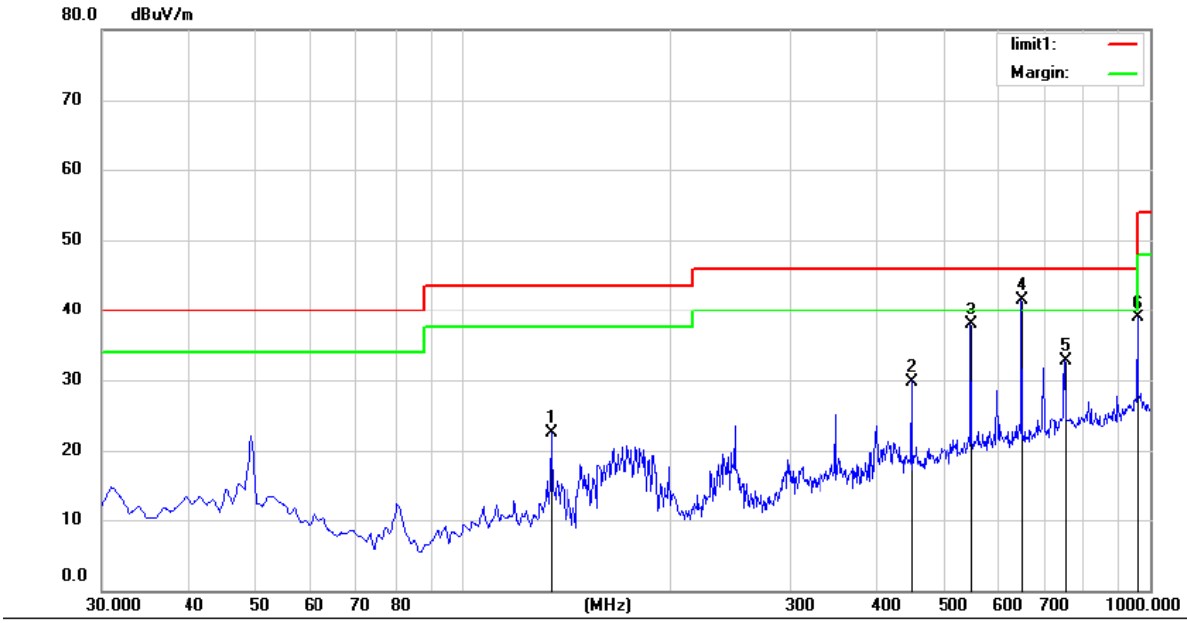
Limit: (CE)FCC PART 15E
Power: Battery 3.7V
Humidity: 55 %

Mode: TX5200

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		149.3100	51.16	-21.56	29.60	43.50	-13.90	QP			
2		250.1900	46.91	-15.54	31.37	46.00	-14.63	QP			
3		350.1000	48.55	-12.22	36.33	46.00	-9.67	QP			
4	!	450.0100	50.23	-9.95	40.28	46.00	-5.72	QP			
5	!	549.9200	48.70	-7.73	40.97	46.00	-5.03	QP			
6	*	650.8000	47.41	-5.15	42.26	46.00	-3.74	QP			

*:Maximum data x:Over limit !:over margin Operator:



Site Chamber #1 Polarization: *Vertical* Temperature: 26

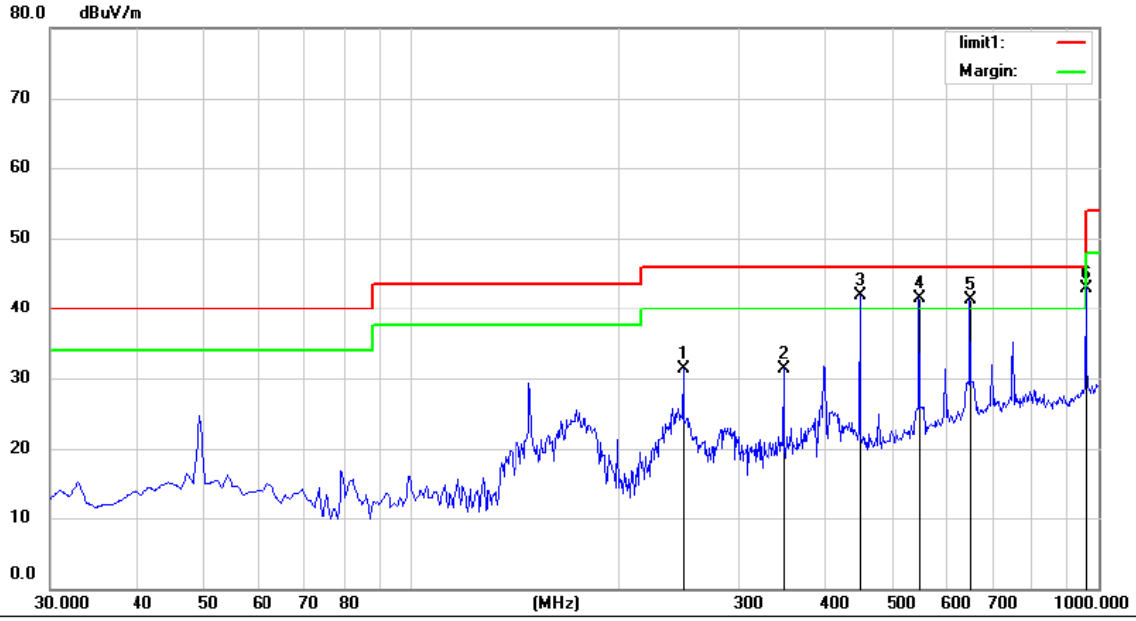
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

Mode: TX5200

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		134.7600	41.23	-18.70	22.53	43.50	-20.97	QP			
2		450.0100	40.65	-10.85	29.80	46.00	-16.20	QP			
3		549.9200	45.98	-8.13	37.85	46.00	-8.15	QP			
4	*	650.8000	48.08	-6.65	41.43	46.00	-4.57	QP			
5		750.7100	37.48	-4.75	32.73	46.00	-13.27	QP			
6		960.2300	40.84	-1.94	38.90	54.00	-15.10	QP			

*:Maximum data x:Over limit !:over margin Operator:



Site Chamber #1 Polarization: ***Horizontal*** Temperature: 26

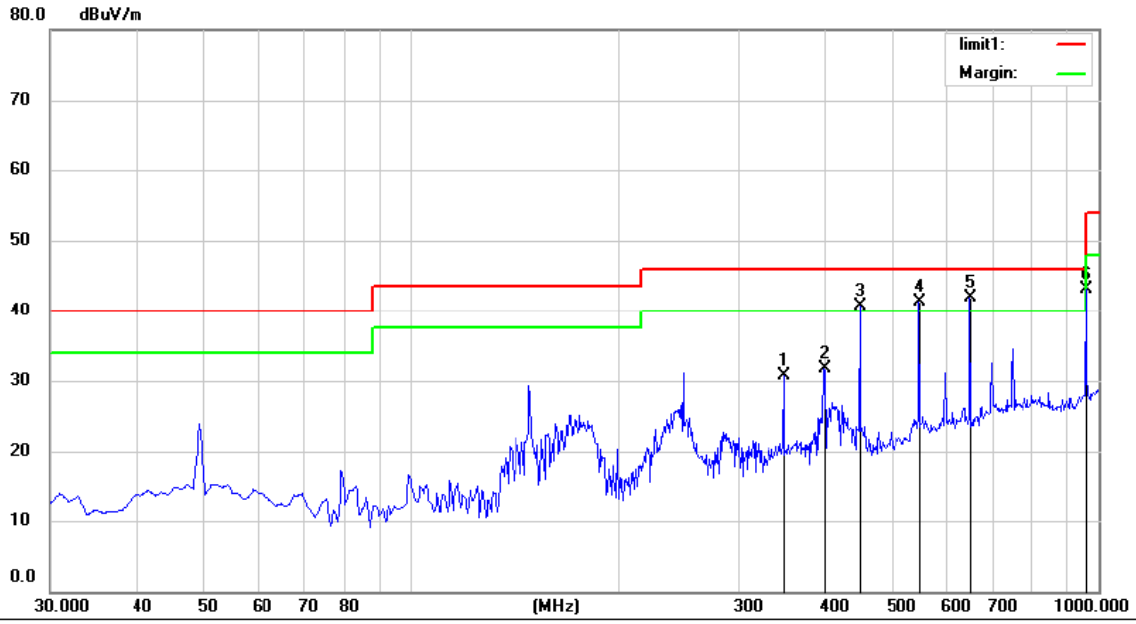
Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

Mode: TX5240

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		250.1900	46.80	-15.54	31.26	46.00	-14.74	QP			
2		350.1000	43.62	-12.22	31.40	46.00	-14.60	QP			
3	*	450.0100	51.91	-9.95	41.96	46.00	-4.04	QP			
4	!	549.9200	49.14	-7.73	41.41	46.00	-4.59	QP			
5	!	650.8000	46.45	-5.15	41.30	46.00	-4.70	QP			
6		960.2300	44.98	-1.98	43.00	54.00	-11.00	QP			

*:Maximum data x:Over limit !:over margin Operator:



Site Chamber #1 Polarization: *Vertical* Temperature: 26

Limit: (CE)FCC PART 15E Power: Battery 3.7V Humidity: 55 %

Mode:TX5240

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		350.1000	43.02	-12.22	30.80	46.00	-15.20	QP			
2		399.5700	42.82	-11.10	31.72	46.00	-14.28	QP			
3	!	450.0100	50.75	-9.95	40.80	46.00	-5.20	QP			
4	!	549.9200	48.95	-7.73	41.22	46.00	-4.78	QP			
5	*	650.8000	46.97	-5.15	41.82	46.00	-4.18	QP			
6		960.2300	45.08	-1.98	43.10	54.00	-10.90	QP			

*:Maximum data x:Over limit !:over margin Operator:

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

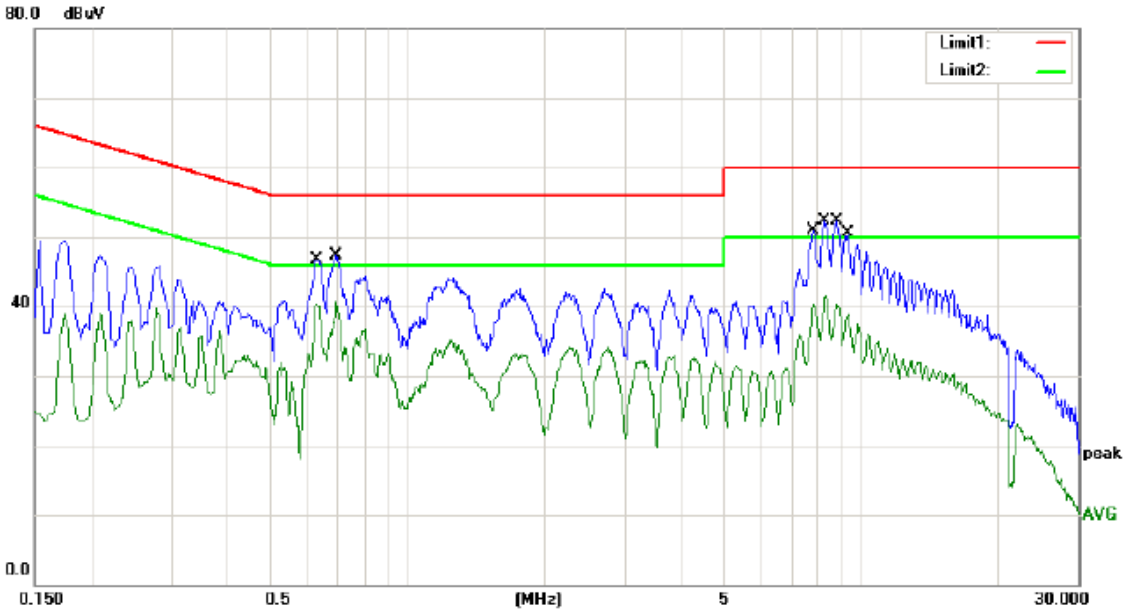
8.6.4 Test Procedure

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

We test the EUT at 120V and 240V, and show the worst result as bellow.



Site site #1 Phase: L1 Temperature: 25

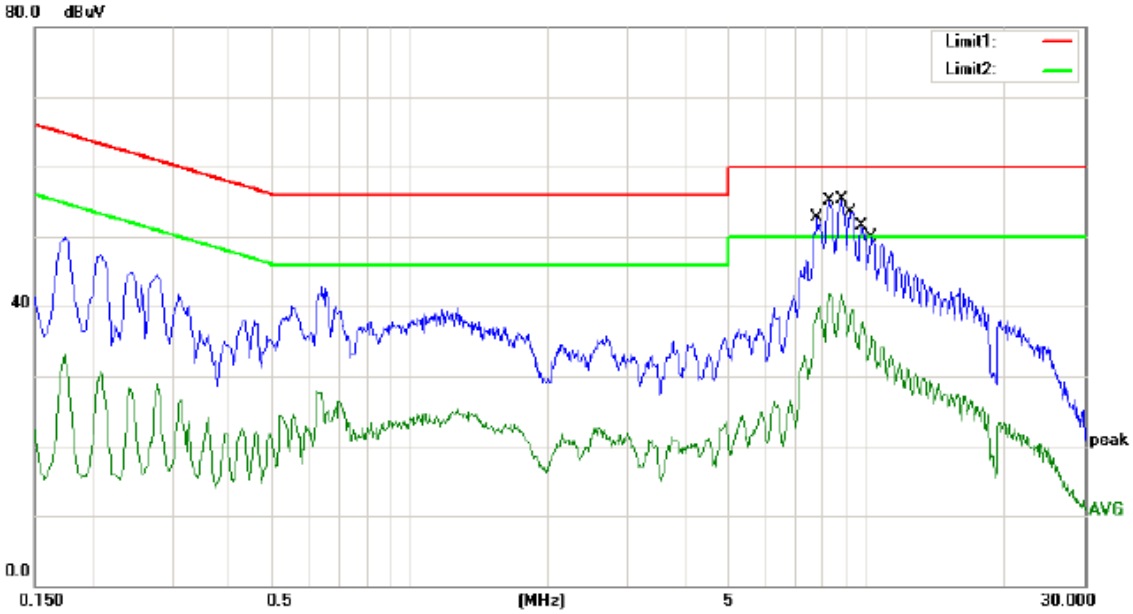
Limit: (CE) FCC PART 15 C_QP Power: AC 230V/50Hz Humidity: 55 %

Mode: TX5180

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.6300	33.51	10.18	43.69	56.00	-12.31	QP	
2		0.6300	30.03	10.18	40.21	46.00	-5.79	AVG	
3		0.6940	34.14	10.18	44.32	56.00	-11.68	QP	
4	*	0.6940	30.58	10.18	40.76	46.00	-5.24	AVG	
5		7.8460	37.79	10.20	47.99	60.00	-12.01	QP	
6		7.8460	30.00	10.20	40.20	50.00	-9.80	AVG	
7		8.3100	39.18	10.20	49.38	60.00	-10.62	QP	
8		8.3100	31.22	10.20	41.42	50.00	-8.58	AVG	
9		8.8260	39.05	10.20	49.25	60.00	-10.75	QP	
10		8.8260	30.06	10.20	40.26	50.00	-9.74	AVG	
11		9.3060	37.20	10.21	47.41	60.00	-12.59	QP	
12		9.3060	28.60	10.21	38.81	50.00	-11.19	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator:



Site site #1 Phase: N Temperature: 25

Limit: (CE) FCC PART 15 C_QP Power: AC 230V/50Hz Humidity: 55 %

Mode: TX5180

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		7.7780	39.50	10.20	49.70	60.00	-10.30	QP	
2		7.7780	29.92	10.20	40.12	50.00	-9.88	AVG	
3		8.2900	42.00	10.20	52.20	60.00	-7.80	QP	
4		8.2900	31.63	10.20	41.83	50.00	-8.17	AVG	
5	*	8.8220	42.12	10.20	52.32	60.00	-7.68	QP	
6		8.8220	31.49	10.20	41.69	50.00	-8.31	AVG	
7		9.2500	40.25	10.21	50.46	60.00	-9.54	QP	
8		9.2500	29.39	10.21	39.60	50.00	-10.40	AVG	
9		9.7540	38.20	10.21	48.41	60.00	-11.59	QP	
10		9.7540	27.44	10.21	37.65	50.00	-12.35	AVG	
11		10.2260	36.67	10.21	46.88	60.00	-13.12	QP	
12		10.2260	25.49	10.21	35.70	50.00	-14.30	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator:

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 two Internal antenna for WIFI 2.4 Band, the max gain Antenna1 is 2.2 dBi, the max gain Antenna2 is 3.5 dBi.
The EUT has two Internal antenna: for WIFI 5G Band, the max gain Antenna1 is 1.6 dBi for WIFI 5G Band I, and the max gain Antenna1 is 1.6dBi for WIFI 5G Band II, the max gain Antenna2 is 1.4 dBi for WIFI 5G Band I, and the max gain Antenna2 is 1.4dBi for WIFI 5G Band II.

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.