TEST REPORT

Product Name : Embedded Wi-Fi/BT Module
Model Number : EMC3380-S,EMC3380-D
FCC ID : P53-EMC3380

Prepared for	:	Shanghai MXCHIP Information Technology Co., Ltd.
Address	:	9th Floor,No.5,Lane2145 JinshaJiang Road,Putuo District,ShangHai,China (200333)
Prepared by	:	EMTEK (SHENZHEN) CO., LTD.
Address	:	Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China Tel: (0755) 26954280 Fax: (0755) 26954282
Report Number	:	ES210118058W03
Date(s) of Tests	:	January 20, 2021 to March 12, 2021
Date of issue	:	March 15, 2021

1 TEST RESULT CERTIFICATION

Applicant	:	Shanghai MXCHIP Information Technology Co., Ltd.
Address	:	9th Floor,No.5,Lane2145 JinshaJiang Road,Putuo District,ShangHai,China (200333)
Manufacturer	:	Shanghai MXCHIP Information Technology Co., Ltd.
Address	:	9F, Building B, Lane 2145, Jinshajiang Road, Putuo District, Shanghai, China
Trade Mark	:	MXCHIP®
EUT	:	Embedded Wi-Fi/BT Module
Model Number	:	EMC3380-S,EMC3380-D

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 : January 20, 2021 to March 12, 2021

Prepared by : Sewen Guo /Editor

Reviewer : Sevin Li /Supervisor

Approve & Authorized Signer : Lisa Wang/Manager

EMTEK (SHENZHEN) CO., LTD. TESTING

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2 EUT TECHNICAL DESCRIPTION

Characteristics	Description	
Product:	Embedded Wi-Fi/BT Module	
Model Number:	EMC3380-S,EMC3380-D (Two models are identical in circuitry and electrical, mechanical and physical construction; the only difference is EMC3380-D model with PCB antenna; EMC3380-S model with IPEX antenna connector)	
Sample Number:	2#	
Wifi Type:	☒Wifi 5G with 5150MHz-5250MHz Band ☒Wifi 5G with 5250MHz-5350MHz Band ☒Wifi 5G with 5725MHz-5850MHz Band	
WLAN Supported:	☒802.11a ☒802.11n(20MHz channel bandwidth) ☒802.11n(40MHz channel bandwidth)	
Data Rate :	802.11a:54/48/36/24/18/12/9/6Mbps 802.11n:up to 300 Mbps	
Modulation:	☒OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n;	
Frequency Range:	☒UNII-1: 5150MHz-5250MHz Band	
	☒5180-5240MHz for 802.11a; ☒5180-5240MHz for 802.11n(HT20);	☒5190-5230MHz for 802.11n(HT40);
	☒UNII-2A: 5250MHz-5350MHz Band	
	☒5260-5320MHz for 802.11a; ☒5260-5320MHz for 802.11n(HT20);	☒5270-5310MHz for 802.11n(HT40);
	☒UNII-3 with 5725MHz-5850MHz Band	
	☒5745-5825MHz for 802.11a; ☒5745-5825MHz for 802.11n(HT20);	☒5755-5795MHz for 802.11n(HT40);
TPC Function:	☐ Applicable	☒Not Applicable
Antenna Gain:	EMC3380-D (Antenna 1): PCB Antenna; Max Antenna Gain 2dBi EMC3380-S (Antenna 2): IPEX connector; Max Support Antenna Gian 2dBi	
Transmit Power:	Output Power (Max.) for 5150MHz-5250MHz	12.21 dBm
	Output Power (Max.) for 5250MHz-5350MHz	12.50 dBm

	Output Power (Max.) for 5725MHz-5875MHz	11.05 dBm
Power Supply:	DC 2.7V to 3.3V	
Test Power:	DC 3.3V via R&D board (R&D board power supply via USB Port 5V)	
Date of Received:	January 20, 2021	
Temperature Range:	-20°C ~ 85°C	

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 D2 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: P53-EMC3380 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 789033 D2 General UNII Test Procedures New Rules v02r01

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	101384	2020/5/16	2021/5/15
L.I.S.N.	Rohde & Schwarz	ENV216	5	2020/5/16	2021/5/15
L.I.S.N.	Kyoritsu	KNW-407	8-1492-9	2020/5/16	2021/5/15
Absorbing Clamp	Rohde & Schwarz	MDS-21	833711/025	2020/7/4	2021/7/3
Loop antenna	Laplace	RF300	8006	2020/6/30	2021/6/29
Van der Hoofden test-head	Schwarzbeck	VDHH 9502	9502-054	2020/5/16	2021/5/15
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100107	2020/5/17	2021/5/16

4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	DUE CAL.
Pre-Amplifier	HP	8447F	2944A07999	2020/5/16	2021/5/15
EMI Test Receiver	Rohde & Schwarz	ESCI	101414	2020/5/16	2021/5/15
Bilog Antenna	Schwarzbeck	VULB9163	712	2019/9/22	2021/9/21
Horn antenna	Schwarzbeck	BBHA9120D	9120D-1178	2020/7/4	2021/7/3
Pre-Amplifie	Lunar EM	LNA1G18-48	J1011131010001	2020/5/16	2021/5/15
Spectrum Analyzer	Rohde & Schwarz	FSV40	100967	2020/5/16	2021/5/15
Horn antenna	Schwarzbeck	BBHA9170	9170-399	2019/6/16	2021/6/15
Loop Antenna	Schwarzbeck	FMZB1519	1519-012	2019/7/14	2021/7/13
Cable	Schwarzbeck	AK9513	ACRX1	2020/5/16	2021/5/15
Cable	Rosenberger	N/A	FP2RX2	2020/5/16	2021/5/15
Cable	Schwarzbeck	AK9513	CRPX1	2020/5/16	2021/5/15
Cable	Schwarzbeck	AK9513	CRRX2	2020/5/16	2021/5/15

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Signal Analyzer	Agilent	N9010A	MY53470879	2020/5/16	2021/5/15
Spectrum Analyzer	Rohde & Schwarz	FSV40	100967	2020/5/16	2021/5/15
Spectrum Analyzer	Rohde & Schwarz	FSV30	103039	2020/5/16	2021/5/15
DC Power	Manson	HCS-3202	G431609656	2020/8/29	2021/8/28
Power Meter	\	PS-X10-100	\	2020/5/16	2021/5/15
Power Splitter	MiNi-circuits	ZAPD-30-S+	\	2020/5/17	2021/5/16
Thermometer	Hegao	HTC-1	\	2020/7/8	2021/7/7
Temp. / Humidity Chamber	ESPEC	EL-02KA	12107166	2020/6/30	2021/6/29

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 U-NII - 1
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		

Frequency and Channel list for 802.11n (HT40):

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

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 (HT40):

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 U-NII -2A

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300		
56	5280	64	5320		

Frequency and Channel list for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270				
62	5310				

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

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	56	5280	64	5320

Test Frequency and channel for 802.11n (HT40):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270	N/A	N/A	62	5310

☒ Wifi 5G with U-NII -3

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		

Frequency and Channel list for 802.11n (HT40):

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

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

4.4 TEST SOFTWARE

Item	Software
RF conducted:	ETSI Certification of Regulations Test Solution(V1.04.01)
Radiated Emission:	EMTEK(Ver.RA-03A1)-Shenzhen

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

Building 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** The Certificate Registration Number is L2291. The Laboratory has been assessed and proved to be in compliance with CNAS-CL01 (identical to ISO/IEC 17025:2017) **Accredited by FCC** Designation Number: CN1204 Test Firm Registration Number: 882943 **Accredited by A2LA** The Certificate Number is 4321.01. **Accredited by Industry Canada** The Conformity Assessment Body Identifier is CN0008
Name of Firm	:	EMTEK (SHENZHEN) CO., LTD.
Site Location	:	Building 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:

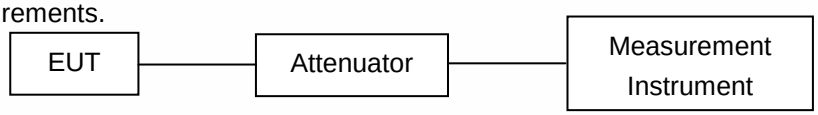
Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test	±2.0dB
Radiated Emission Test	±2.0dB
Power Density	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5℃
Humidity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

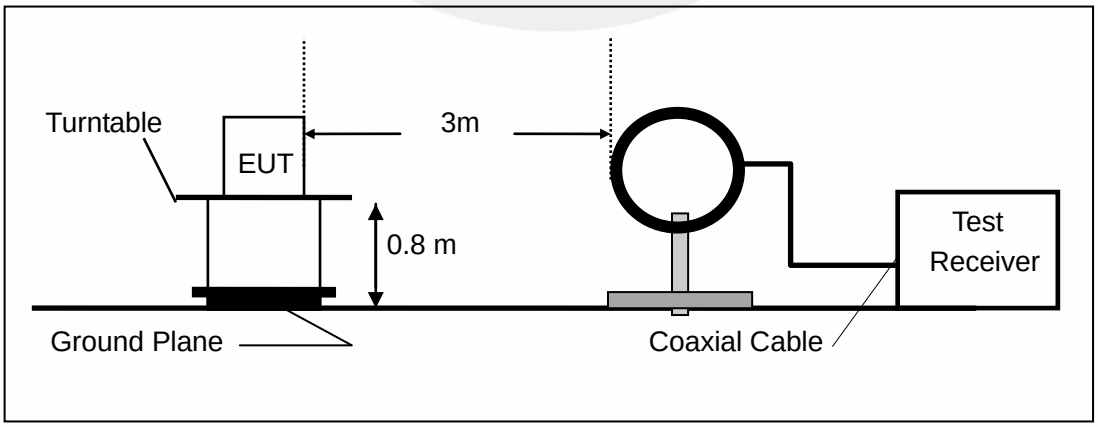
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

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.

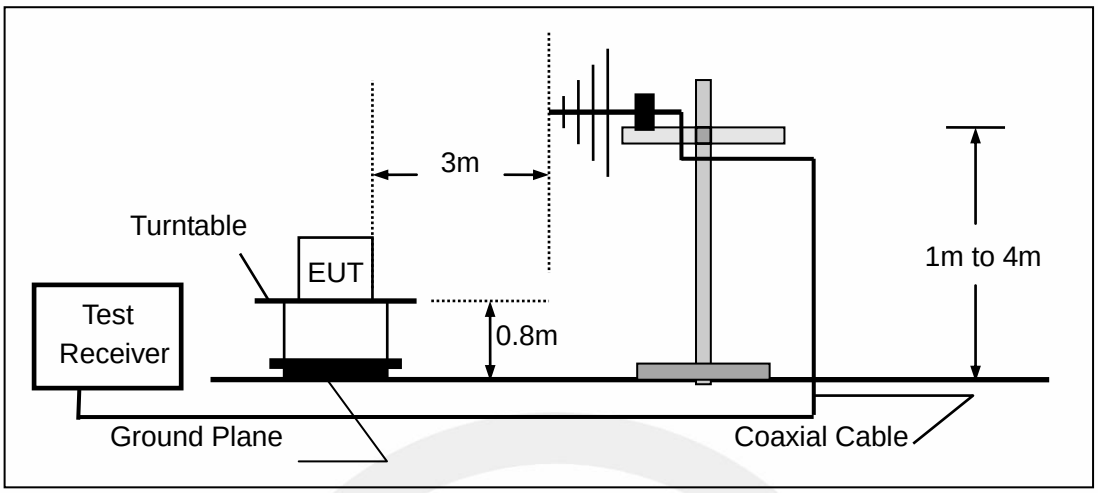
Above 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of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

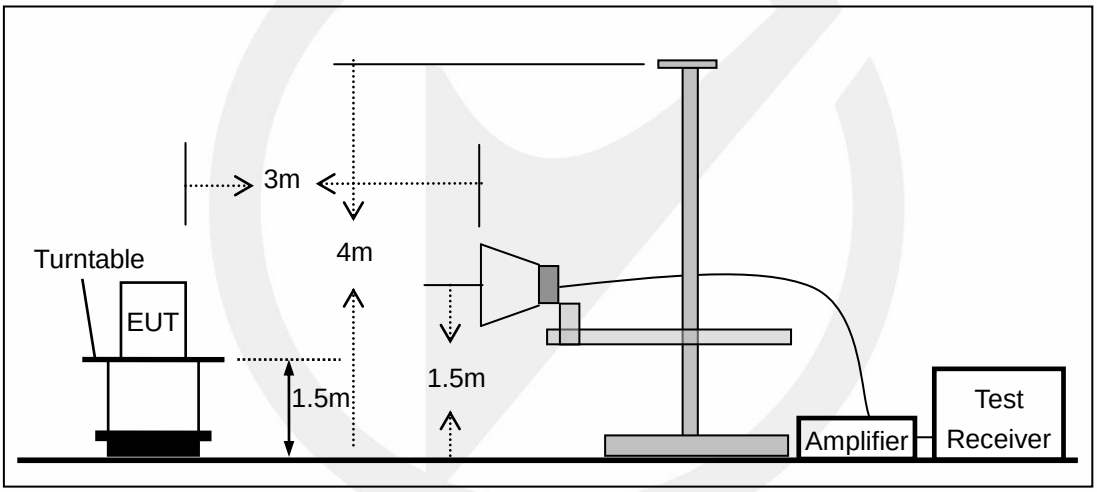
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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

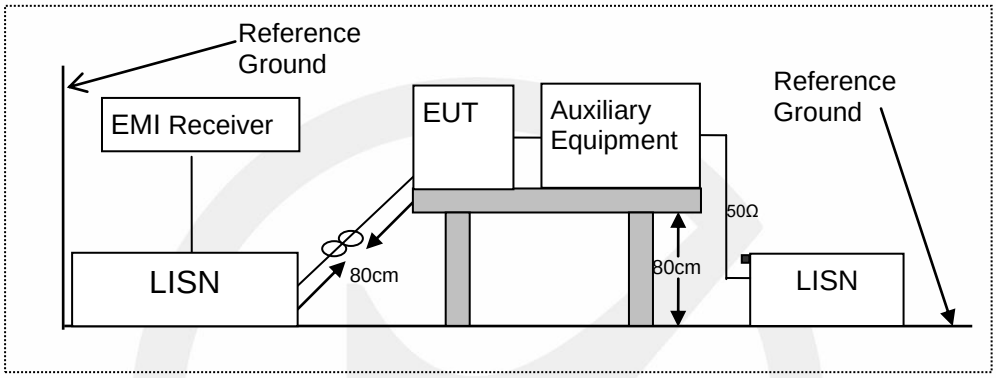


7.3 CONDUCTED EMISSION TEST SETUP

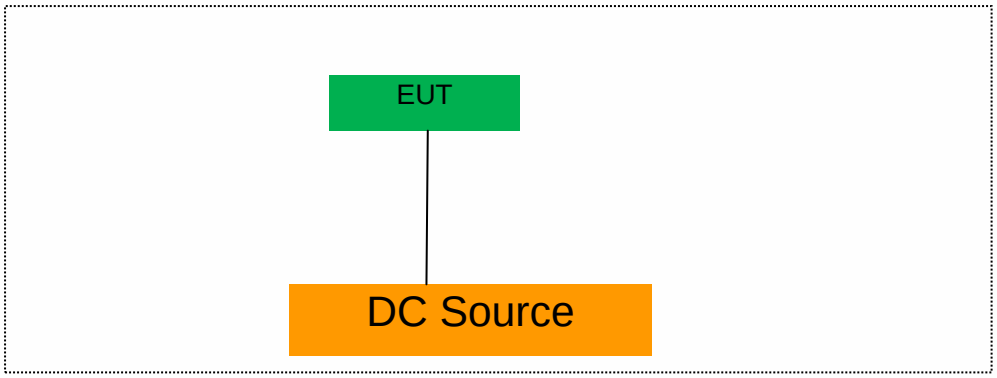
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All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

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	acer	ZR1	LXTECOCO76643158372500

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

(1) For the band 5.15-5.25 GHz.
(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. 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, 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.

(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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. 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.

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

8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.1.4 Test Procedure

According to 789033 D02 v02r01 section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the 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%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth
The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v01r02 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

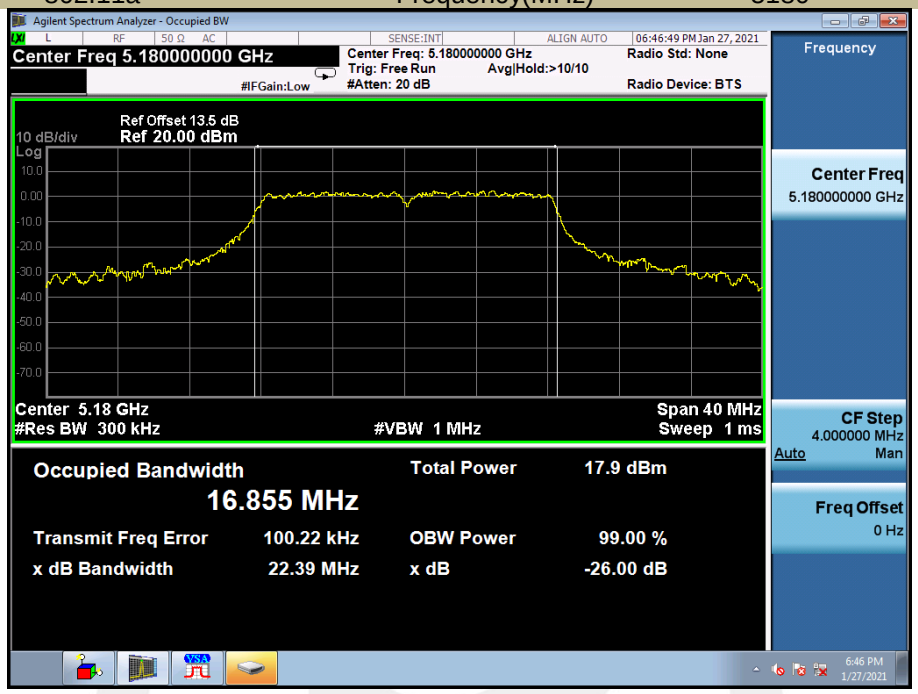
The following procedure shall be used for measuring (99 %) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 • RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. 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

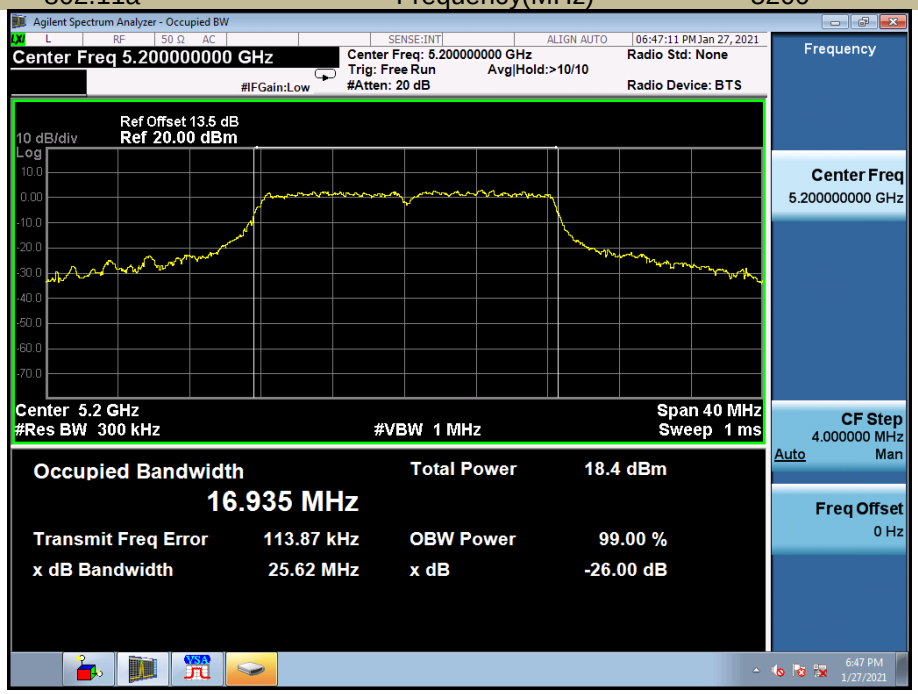
5150-5250MHz

Test Mode	Test Channel MHz		26 dB Bandwidth MHz	99% Bandwidth MHz	Verdict
802.11a	CH36	5180	22.39	16.855	Pass
	CH40	5200	25.62	16.935	Pass
	CH48	5240	33.20	17.408	Pass
802.11n-HT20	CH36	5180	23.48	17.964	Pass
	CH40	5200	24.95	18.052	Pass
	CH48	5240	35.41	18.579	Pass
802.11n-HT40	CH38	5190	41.86	35.976	Pass
	CH46	5230	66.36	36.289	Pass

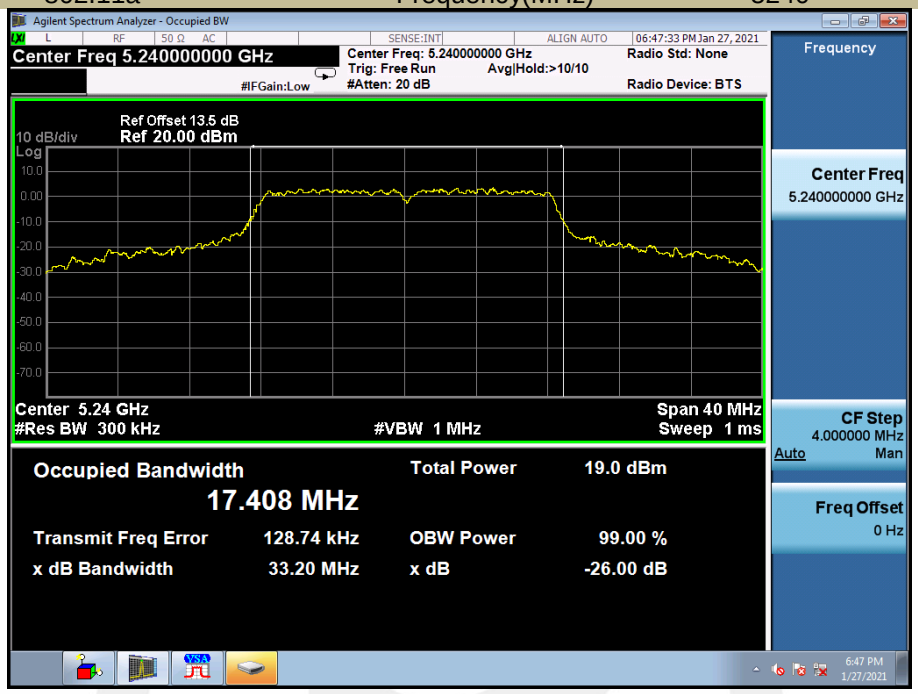
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5180



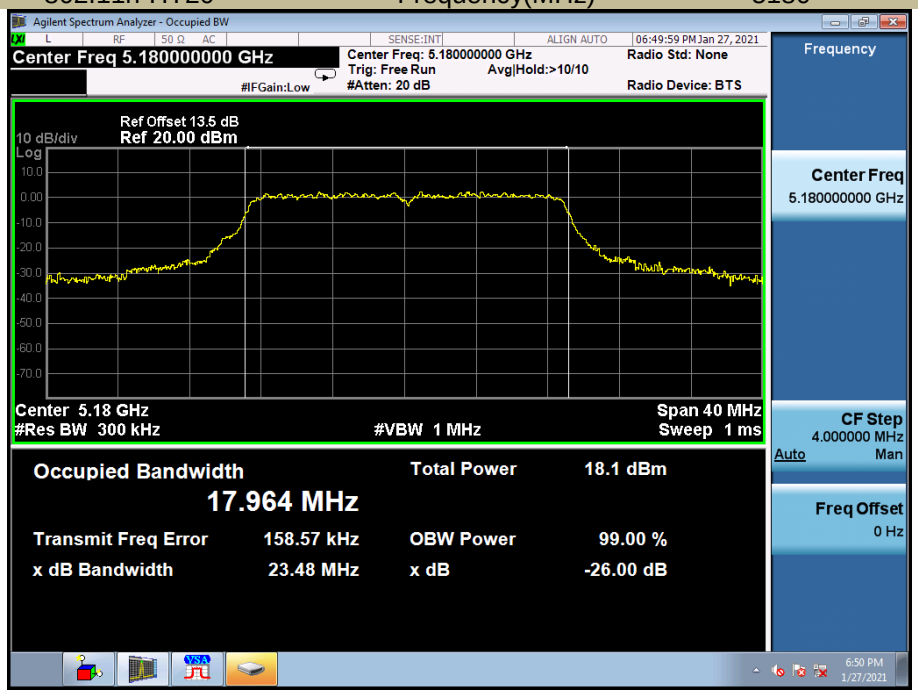
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5200



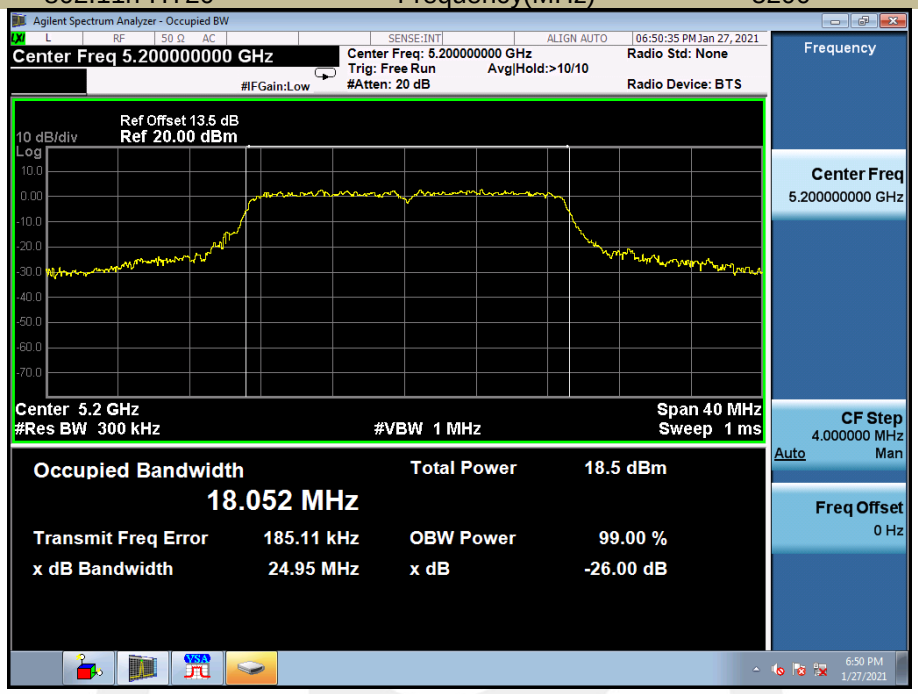
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5240



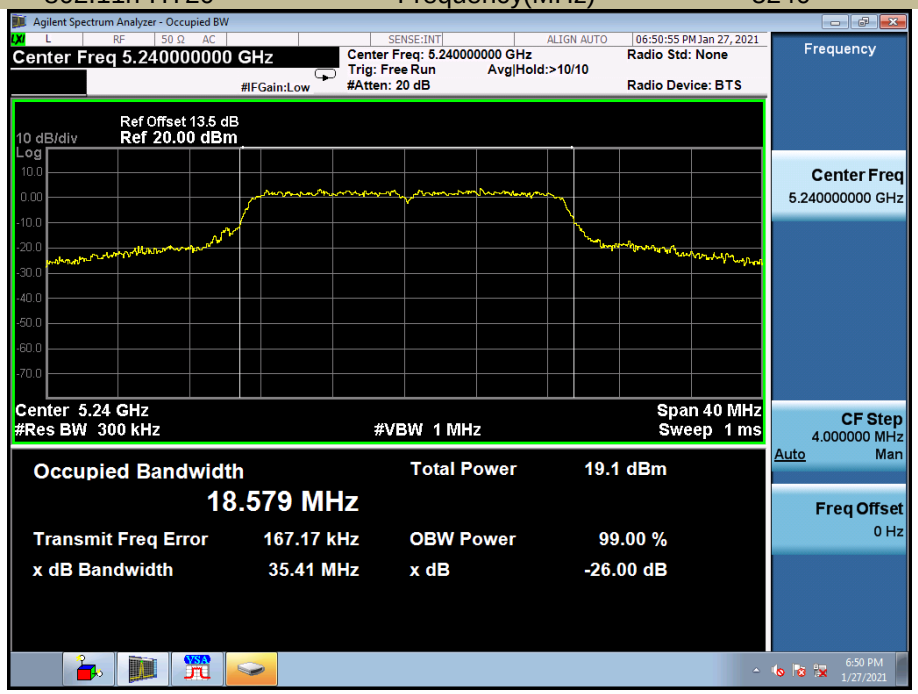
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5180



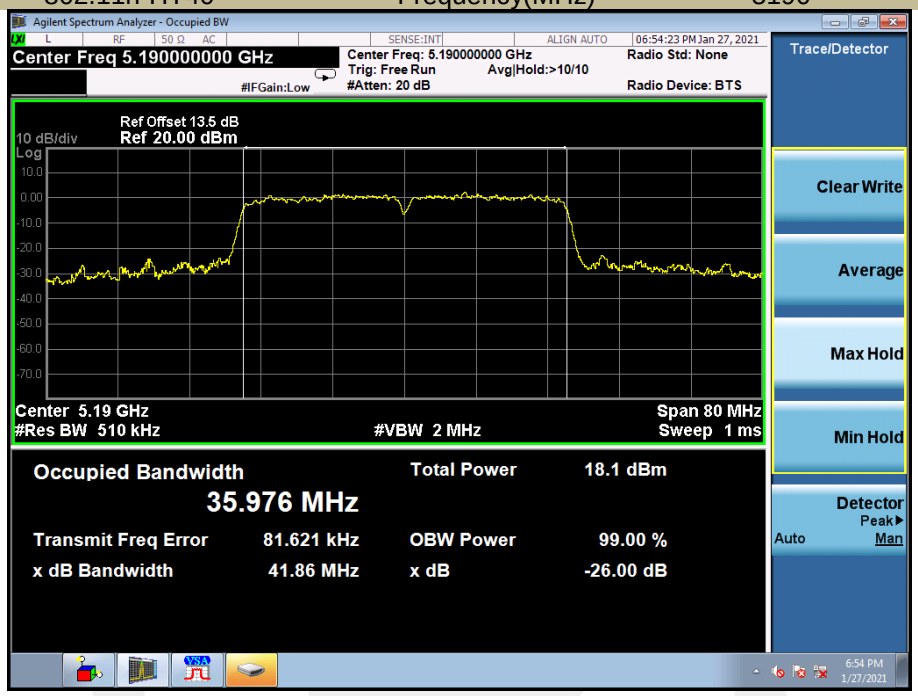
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5200



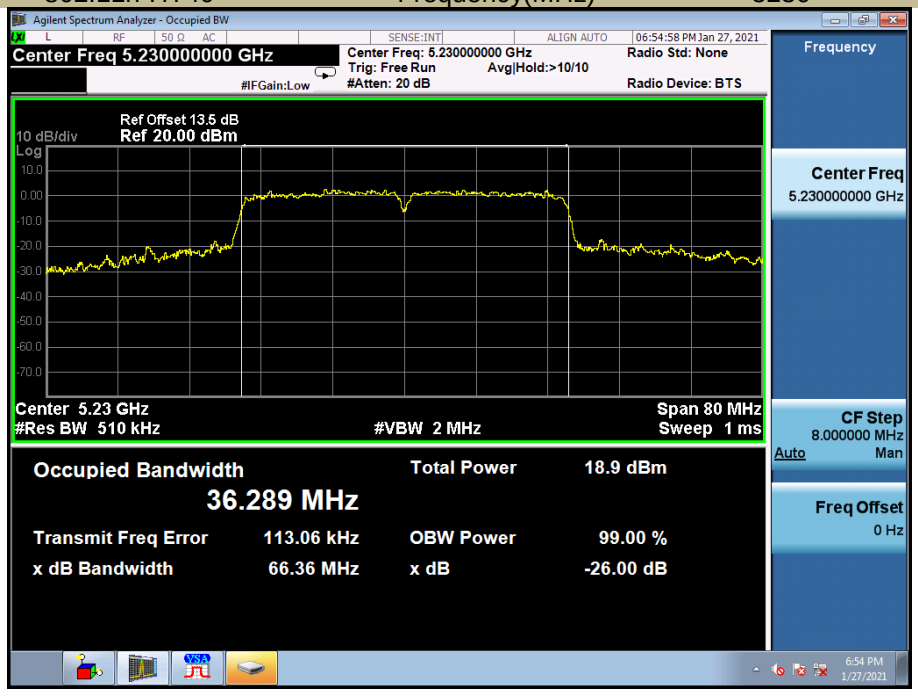
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5240



-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11n-HT40	Frequency(MHz)	5190



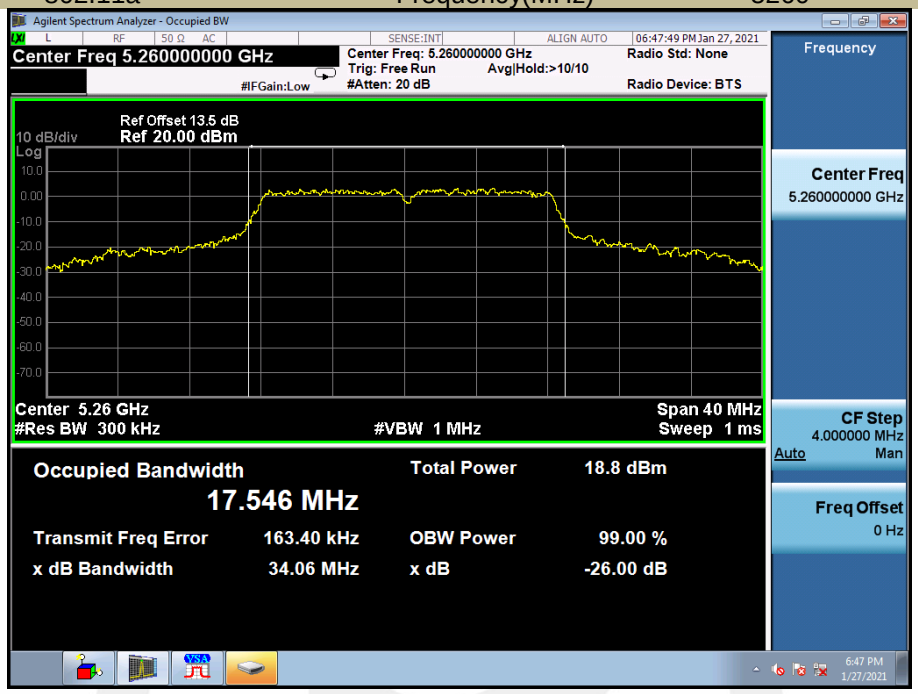
-26 dB & 99% Occupied Bandwidth		U-NII - 1	
Test Model	802.11n-HT40	Frequency(MHz)	5230



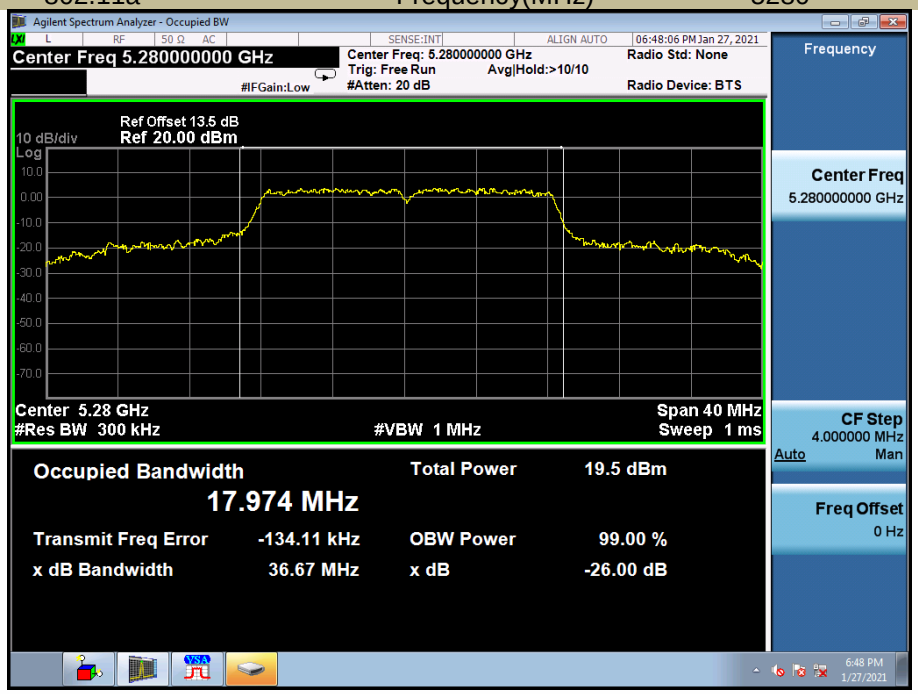
5250-5350MHz

Test Mode	Test Channel MHz		26 dB Bandwidth MHz	99% Bandwidth MHz	Verdict
802.11a	CH52	5260	34.06	17.546	Pass
	CH56	5280	36.67	17.974	Pass
	CH64	5320	36.33	17.594	Pass
802.11n-HT20	CH52	5260	35.81	18.752	Pass
	CH56	5280	38.24	19.027	Pass
	CH64	5320	37.72	18.814	Pass
802.11n-HT40	CH54	5270	79.39	36.773	Pass
	CH62	5310	76.42	37.735	Pass

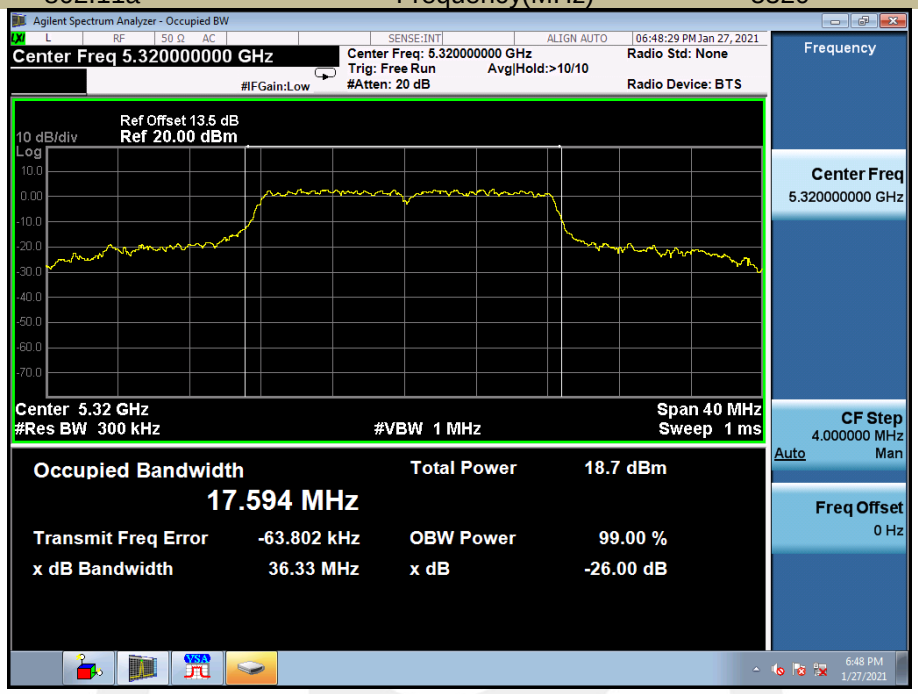
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11a	Frequency(MHz)	5260



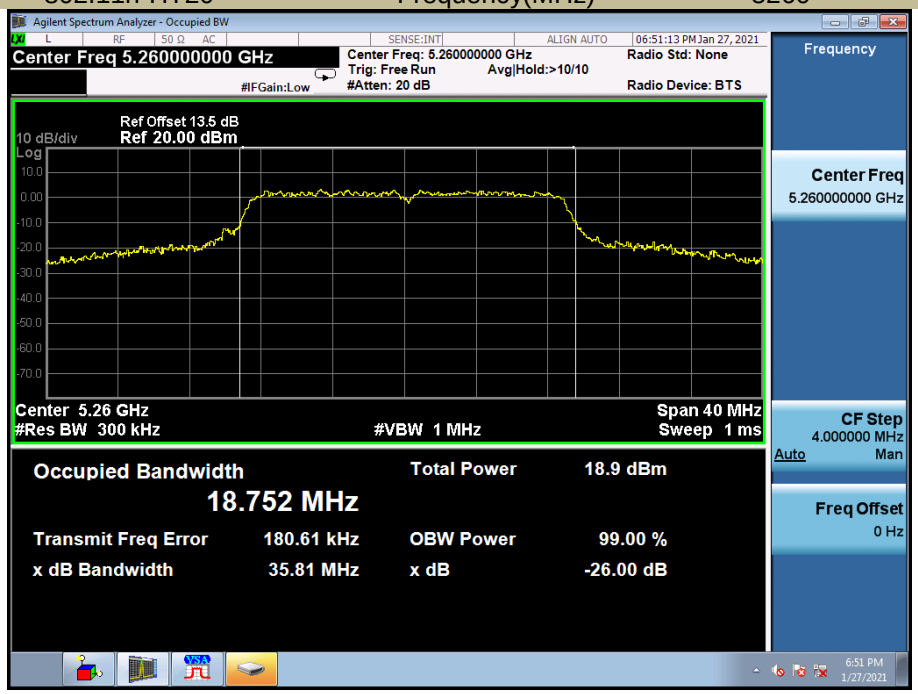
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11a	Frequency(MHz)	5280



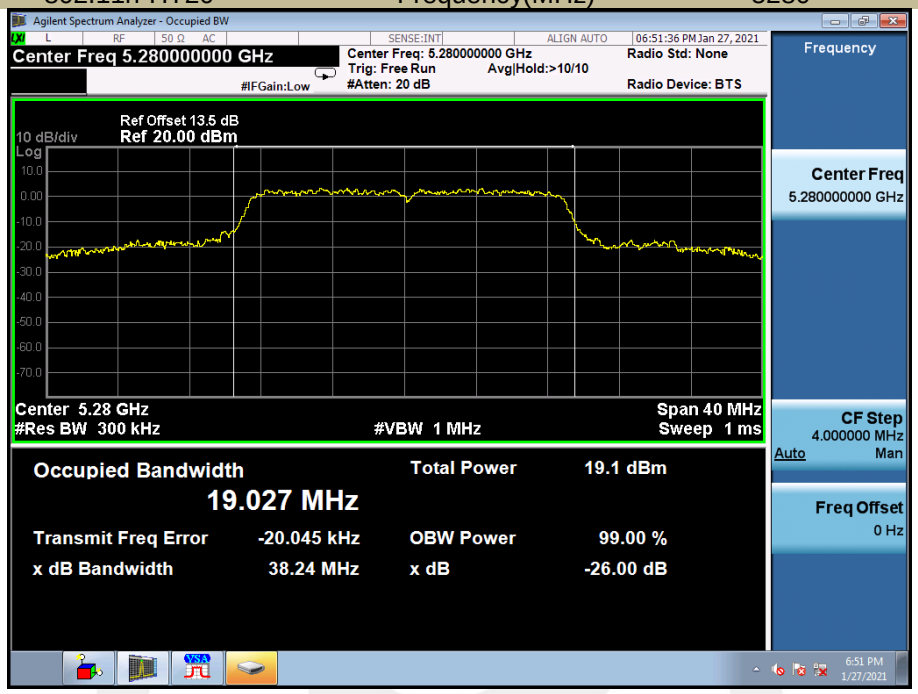
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11a	Frequency(MHz)	5320



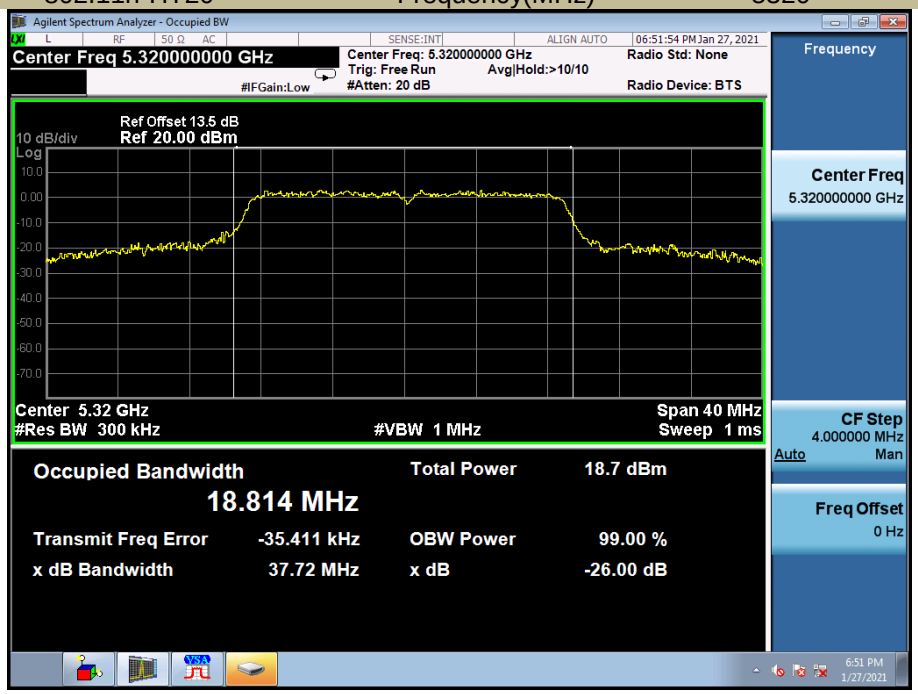
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11n-HT20	Frequency(MHz)	5260



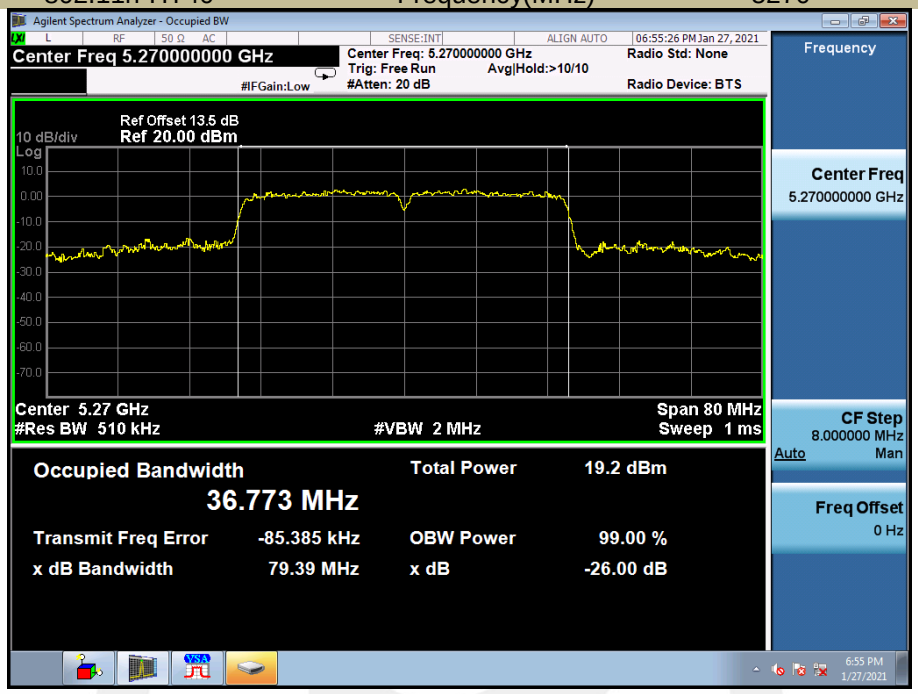
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11n-HT20	Frequency(MHz)	5280



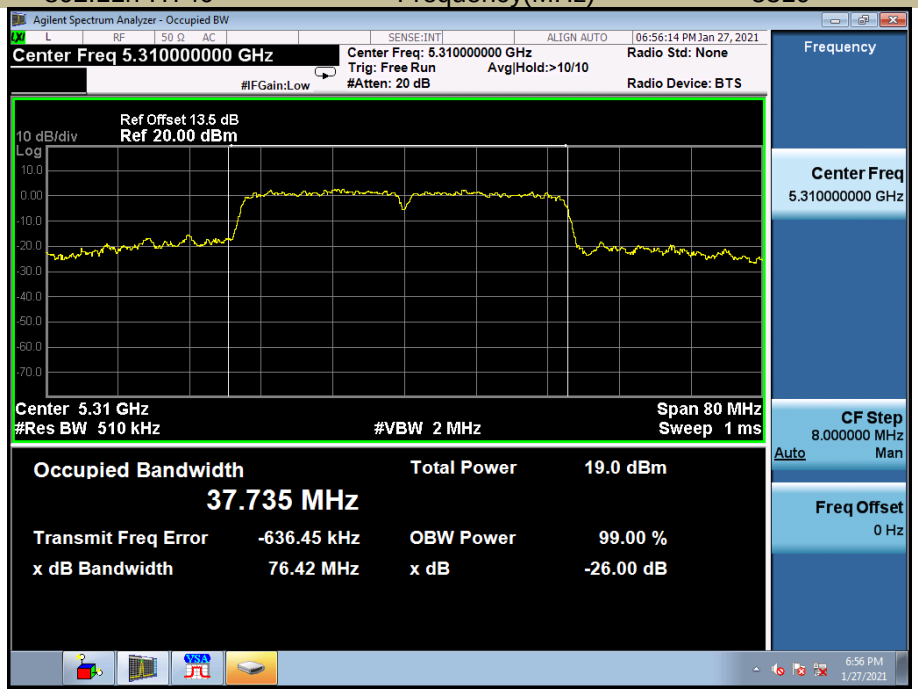
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11n-HT20	Frequency(MHz)	5320



-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11n-HT40	Frequency(MHz)	5270



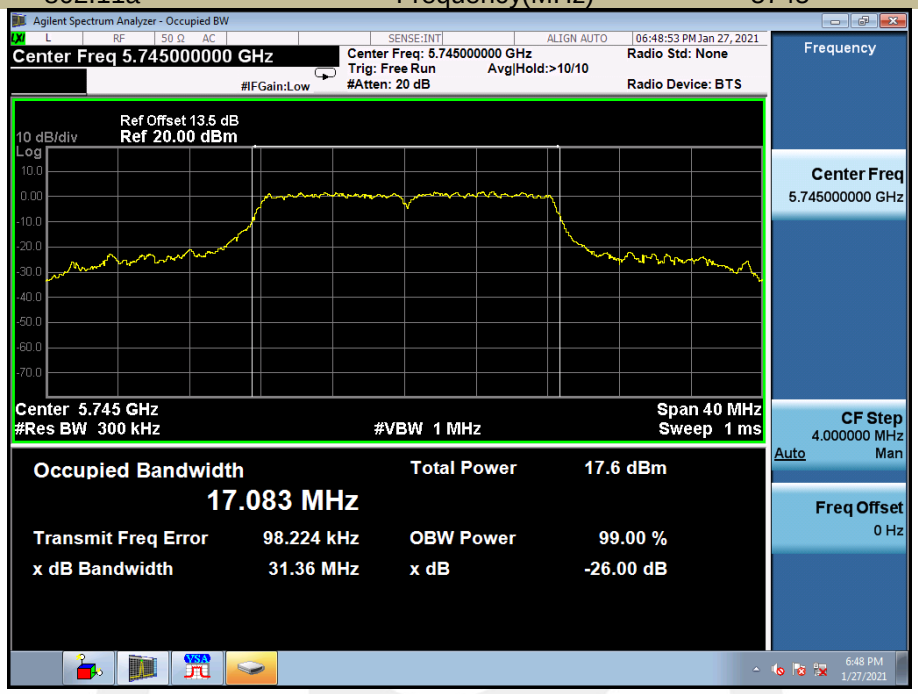
-26 dB & 99% Occupied Bandwidth		U-NII – 2A	
Test Model	802.11n-HT40	Frequency(MHz)	5310



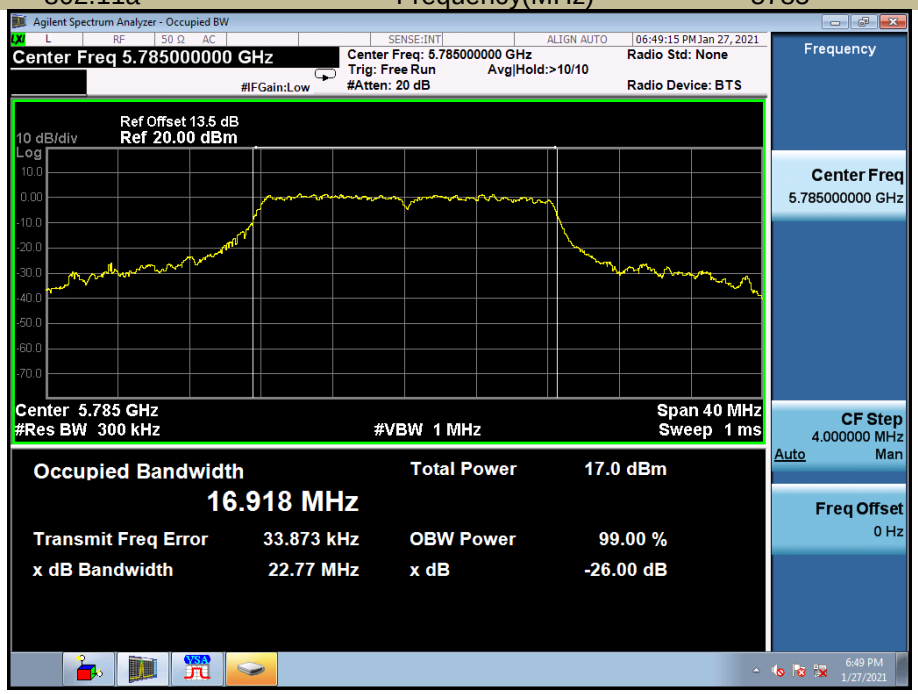
5725-5850MHz

Test Mode	Test Channel MHz		6 dB Bandwidth MHz	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11a	CH149	5745	16.590	31.36	17.083	≥500
	CH157	5785	16.570	22.77	16.918	≥500
	CH165	5825	16.560	21.60	16.842	≥500
802.11n-HT20	CH149	5745	17.760	34.38	18.133	≥500
	CH157	5785	17.700	23.01	17.940	≥500
	CH165	5825	17.740	22.99	17.956	≥500
802.11n-HT40	CH151	5755	36.440	59.86	36.056	≥500
	CH159	5795	36.440	48.32	36.059	≥500

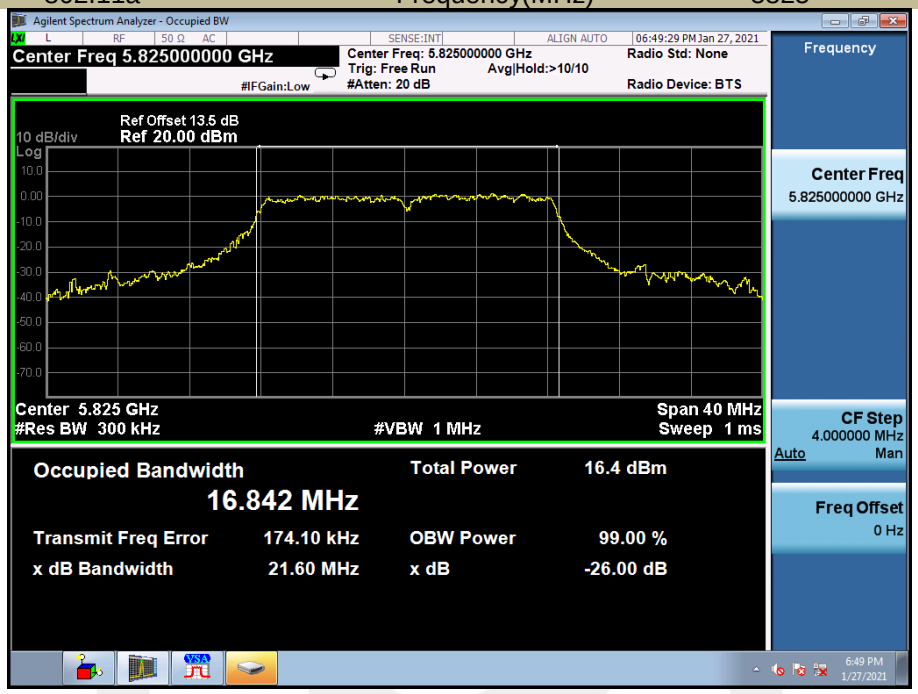
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5745



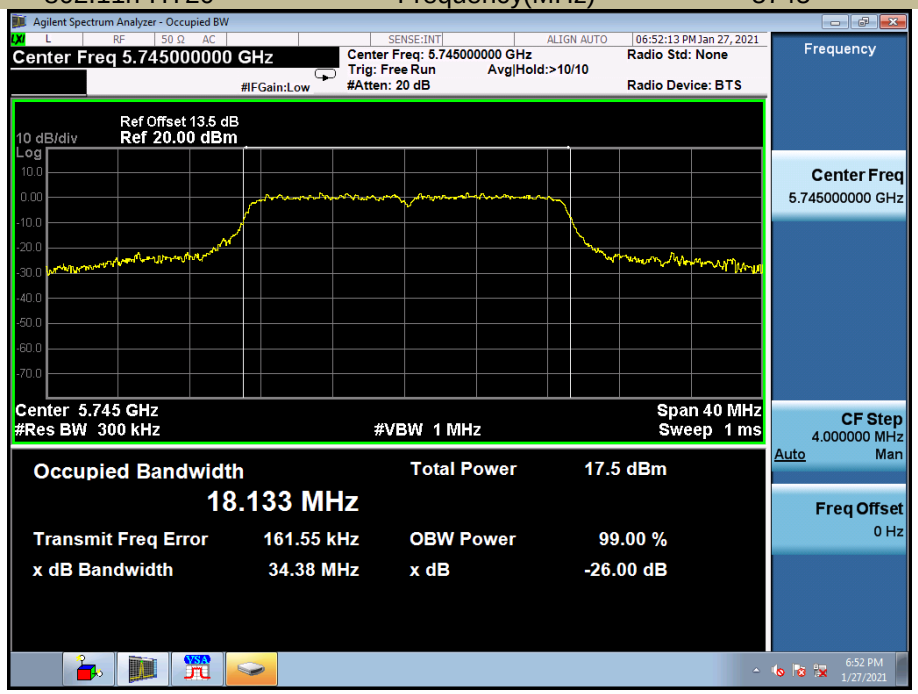
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5785



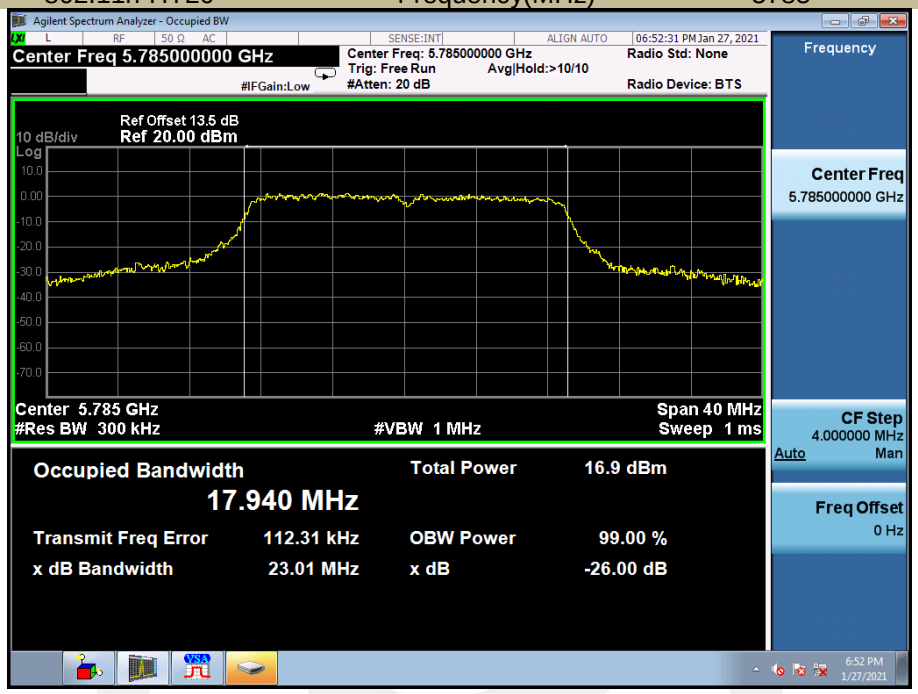
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5825



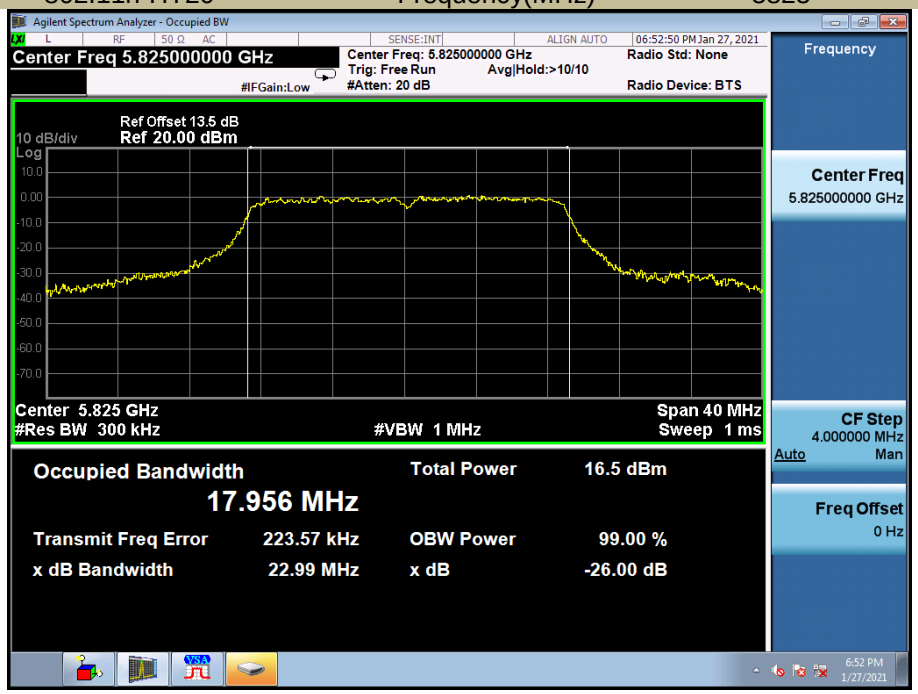
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5745



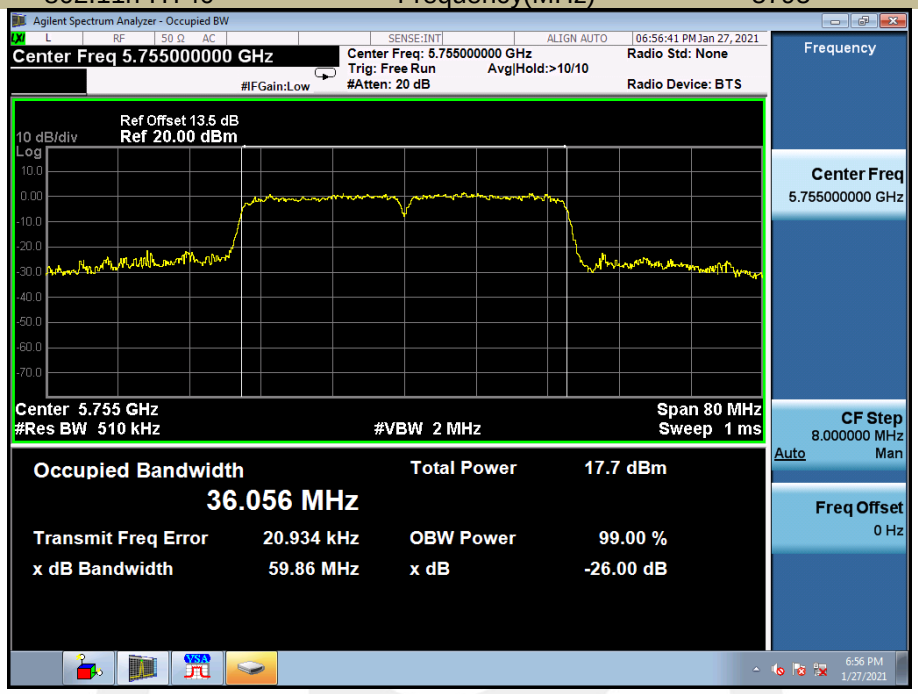
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5785



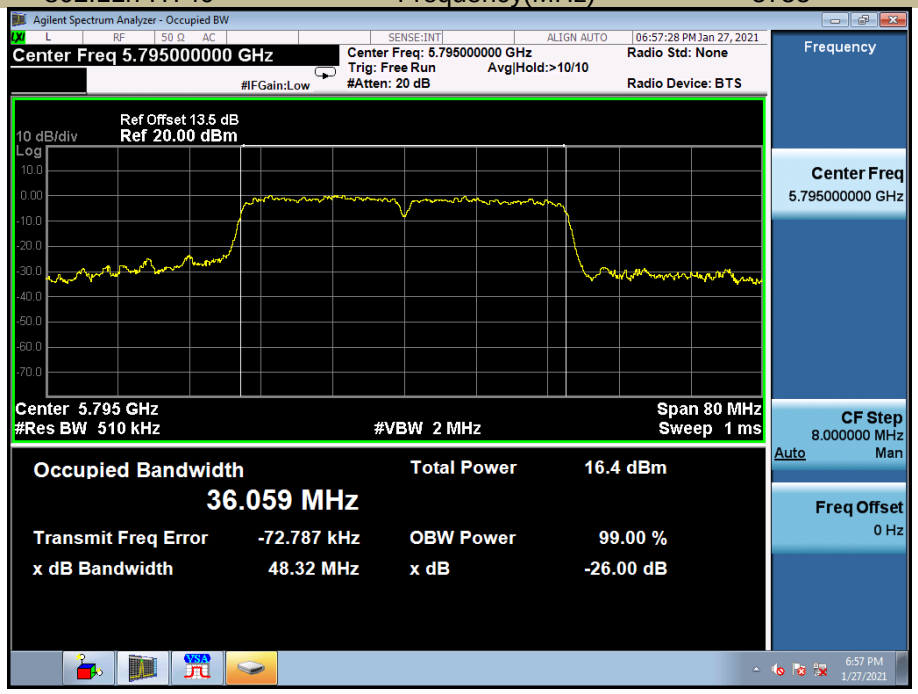
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5825



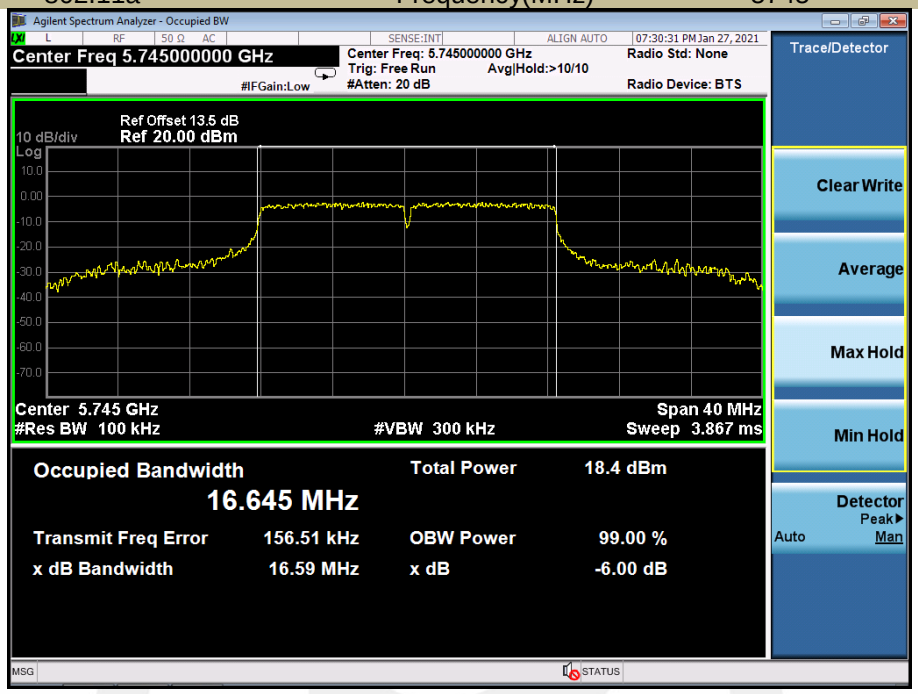
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5795



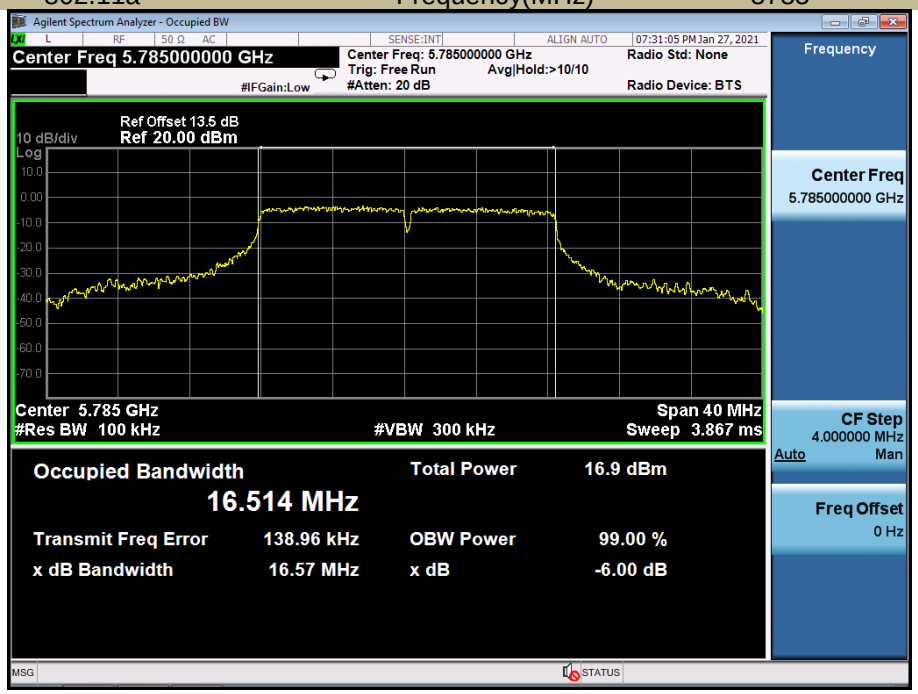
-26 dB & 99% Occupied Bandwidth		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5755



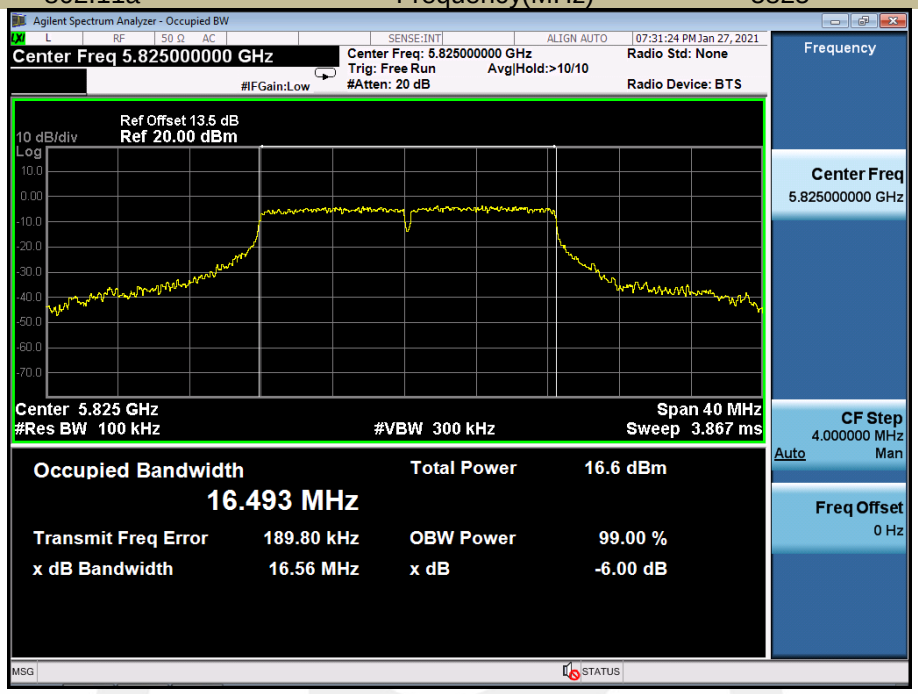
-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5745



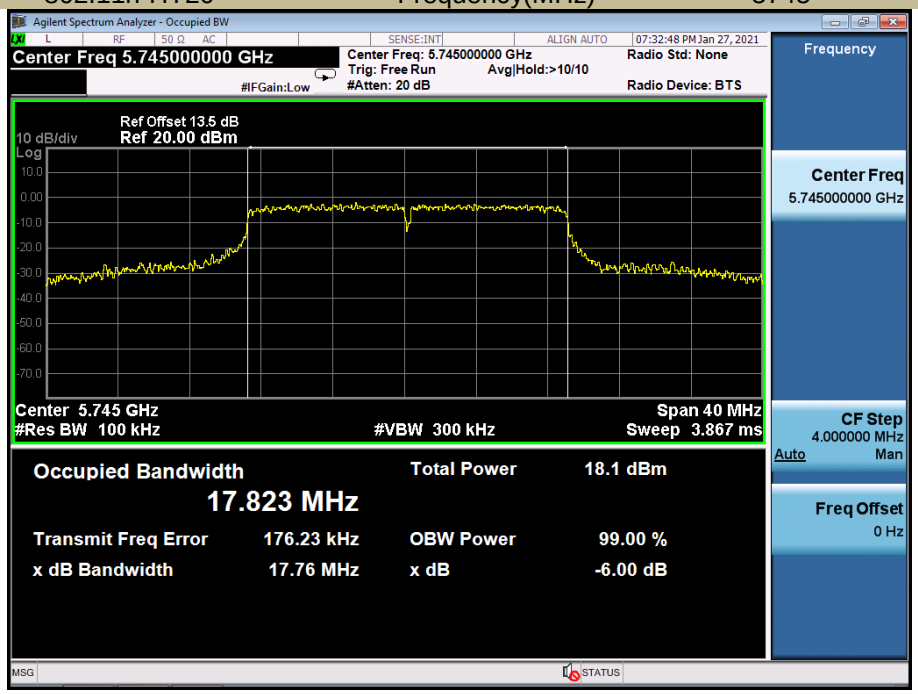
-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5785



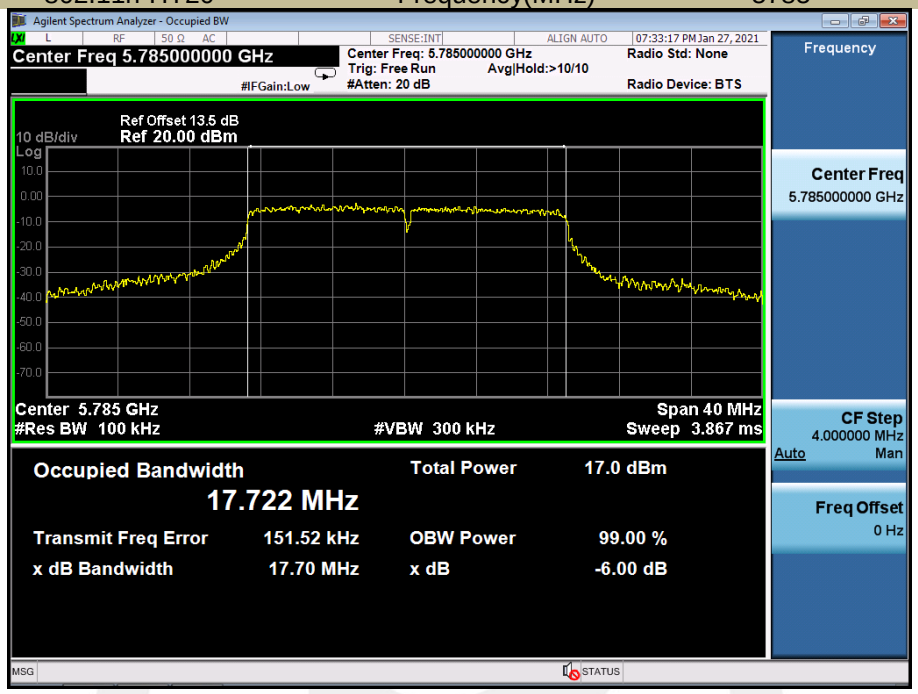
-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5825



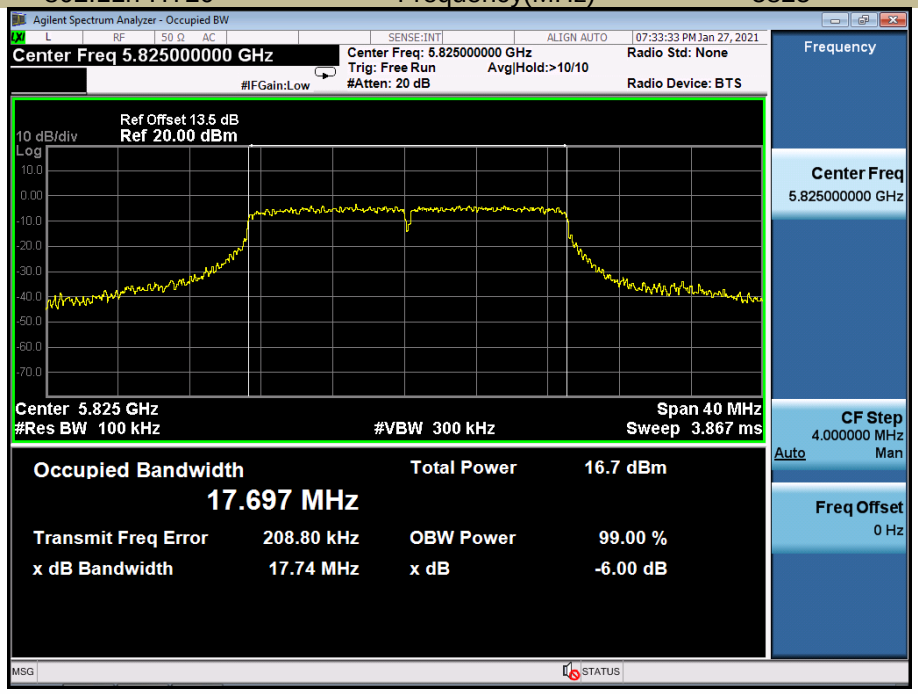
-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5745



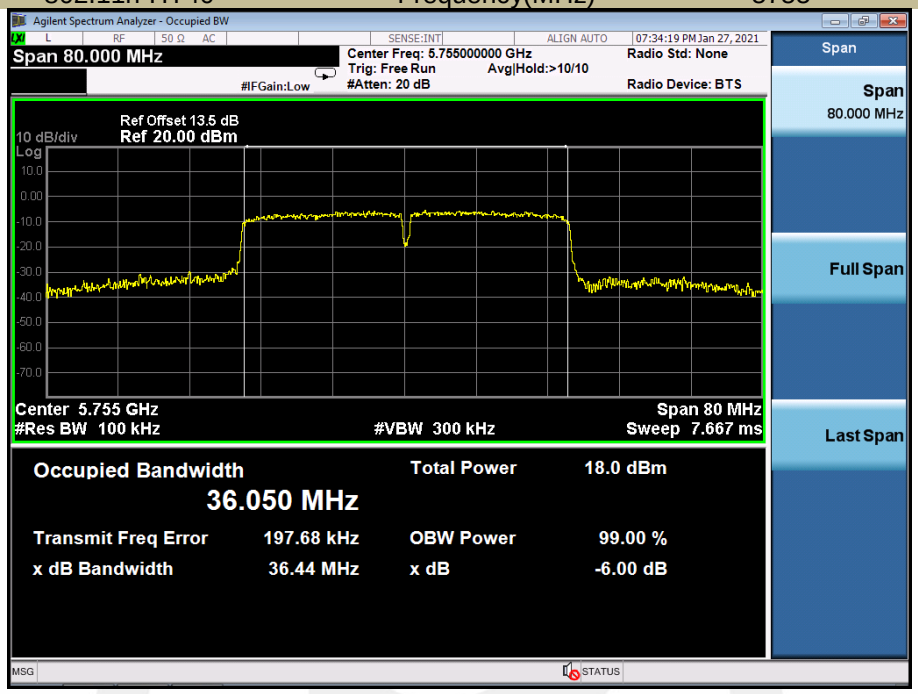
-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5785



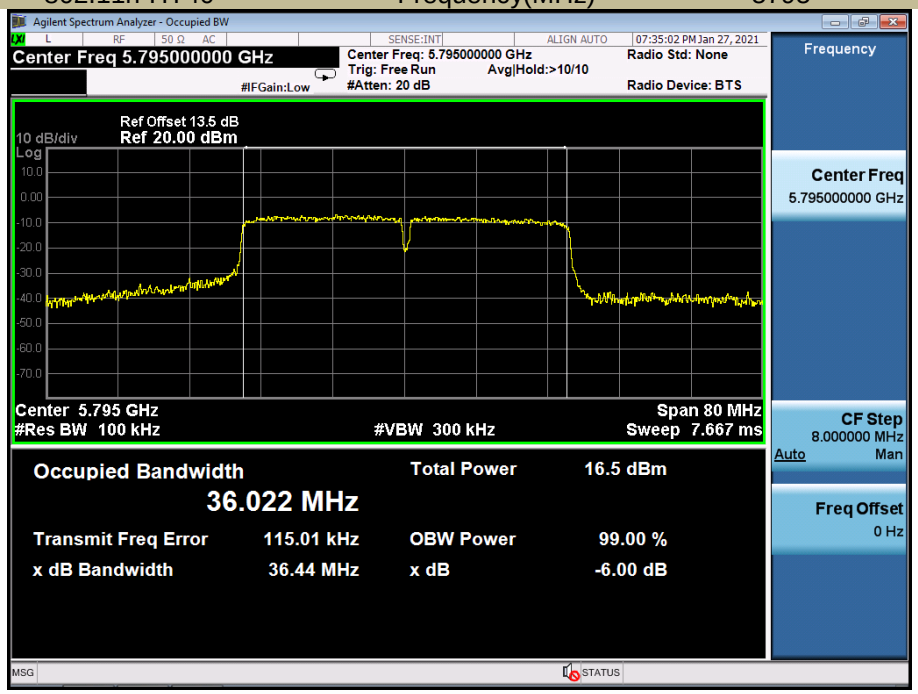
-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5825



-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5755



-6 dB Emission Bandwidth		U-NII - 3	
Test Model	802.11n-HT40	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. In addition, the maximum power spectral density shall not exceed 17 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. 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. In addition, the maximum power spectral density shall not exceed 17 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.

(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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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 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. 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 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. 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

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

Band	Operating mode	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
U-NII – 1	802.11a	CH36	5180	11.08	24	Pass
		CH40	5200	11.62	24	Pass
		CH48	5240	12.21	24	Pass
	802.11n-HT20	CH36	5180	11.24	24	Pass
		CH40	5200	11.59	24	Pass
		CH48	5240	12.16	24	Pass
	802.11n-HT40	CH38	5190	10.86	24	Pass
		CH46	5230	11.87	24	Pass

Band	Operating mode	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
U-NII – 2A	802.11a	CH52	5260	12.22	24	Pass
		CH56	5280	12.47	24	Pass
		CH64	5320	12.09	24	Pass
	802.11n-HT20	CH52	5260	12.11	24	Pass
		CH56	5280	12.50	24	Pass
		CH64	5320	12.06	24	Pass
	802.11n-HT40	CH54	5270	12.40	24	Pass
		CH62	5310	12.15	24	Pass

Band	Operating mode	Channel Number	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
U-NII – 3	802.11a	CH149	5745	10.98	30	Pass
		CH157	5785	10.33	30	Pass
		CH165	5825	10.04	30	Pass
	802.11n-HT20	CH149	5745	11.00	30	Pass
		CH157	5785	10.34	30	Pass
		CH165	5825	10.08	30	Pass
	802.11n-HT40	CH151	5755	11.05	30	Pass
		CH159	5795	9.71	30	Pass

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. In addition, the maximum power spectral density shall not exceed 17 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. 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. In addition, the maximum power spectral density shall not exceed 17 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.

(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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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 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. 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 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. 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

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

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.l.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections

5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

8.3.5 Test Results

5150-5250MHz

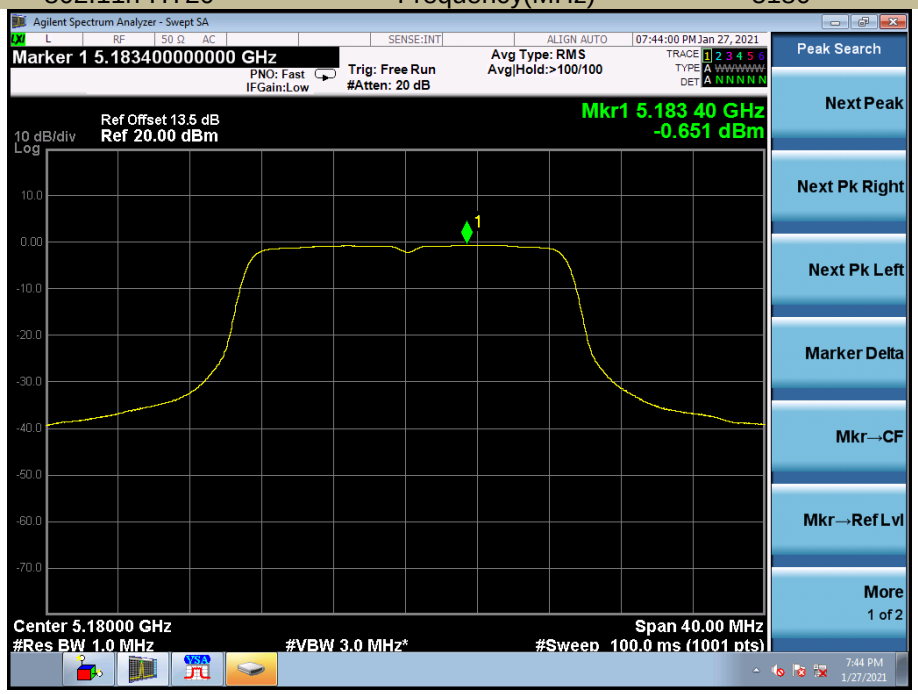
Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	0.204	11
	5200	0.413	11
	5240	0.671	11
802.11n-HT20	5180	-0.651	11
	5200	-0.234	11
	5240	-0.307	11
802.11n-HT40	5190	-3.455	11
	5230	-2.706	11

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

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

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

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



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

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