FCC RADIO TEST REPORT

Applicant……	:	Fender Musical Instruments
Address……...	:	17600 N. Perimeter Drive, Suite 100, Scottsdale, Arizona, 85255 United States
Manufacturer……..	:	Fender Musical Instruments
Address……...	:	17600 N. Perimeter Drive, Suite 100, Scottsdale, Arizona, 85255 United States
Factory……...	:	FN-LINK TECHNOLOGY LIMITED
Address……..	:	No.8, Litong Road, Liuyang Economic & Technical Development Zone, Changsha, Hunan China
Product Name…….	:	WIFI+BT Module
Brand Name……...	:	Fender
Model No. ……..	:	7727252000
FCC ID……....	:	XQW-TMPPR5642
Measurement Standard….	:	47 CFR FCC PART 15 Subpart E (section 407)
Receipt Date of Samples….	:	September 17, 2022
Date of Tested……	:	September 18, 2022 to December 09, 2022
Date of Report……	:	March 06, 2023

This report shows that above equipment is technically compliant with the requirements of the standards above. All test results in this report apply only to the tested sample(s). Without prior written approval of Dongguan Nore Testing Center Co., Ltd, this report shall not be reproduced except in full.

Prepared by

Jenny Liu / Project Engineer

Approved by

Iori Fan / Authorized Signatory

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Revision History

Report Number	Description	Issued Date
NTC2210095FV00	Initial Issue	2023-03-06

1. Summary of Test Result

FCC Rules	Description of Test	Result	Remarks
§15.207 (a)	AC Power Conducted Emission	PASS	---
§15.407(a)	Max. Conducted Output Power	PASS	---
§15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	PASS	---
§15.407(e)	6dB Bandwidth	PASS	---
§15.407(a)	Power Spectral Density	PASS	---
§15.407(b) §15.205	Radiated Emissions	PASS	---
§15.407(b)	Band Edge Emissions	PASS	---
§15.407(g)	Frequency Stability	PASS	---
§15.203	Antenna Requirement	PASS	---
§15.407(h)	Dynamic Frequency Selection	PASS	---

2. General Description of EUT

Product Information	
Product name:	WIFI+BT Module
Main Model Name:	7727252000
Additional Model Name:	N/A
Model Difference:	N/A
S/N:	2204-1408
Brand Name	Fender
Hardware version:	revision C
Software version:	rtl88x2CU_WiFi_linux_v5.14.0.3-2-gba458274c.20220418_COEX20211210-2727.tar.gz 20220818_LINUX_BT_DRIVER.tgz
Rating:	DC 3.3V / 510mA
Classification:	Class B
Typical arrangement:	Tabletop / Built-in
I/O Port:	Refer to the user's manual
Accessories Information	
Adapter:	N/A
Cable:	N/A
Other:	N/A
Additional Information	
Note:	N/A
Remark:	All the information above are provided by the manufacturer. More detailed feature of the EUT please refers to the user manual.

Technical Specification	
Frequency Range:	5180-5240MHz 5260-5320MHz, 5500-5700MHz 5745-5825MHz
Modulation Technology:	OFDM
Modulation Type:	BPSK, QPSK for 802.11a 256QAM, 64QAM, 16QAM, QPSK, BPSK for 802.11n/ac
Number of Channel:	U-NII-1, U-NII-2A: 4 Channel for 802.11a/n(HT20)/ac(VHT20) 2 Channel for 802.11n(HT40)/ac(VHT40) 1 Channel for 802.11ac(VHT80) U-NII-2C: 11 Channel for 802.11a/n(HT20)/ac(VHT20) 5 Channel for 802.11n(HT40)/ac(VHT40) 2 Channel for 802.11ac(VHT80) U-NII-3: 5 Channel for 802.11a/n(HT20)/ac(VHT20) 2 Channel for 802.11n(HT40)/ac(VHT40) 1 Channel for 802.11ac(VHT80)
Antenna Type:	Integrated
Number of Antenna	3 (WLAN x 2, BT x 1)
Antenna Gain:	2.12 dBi maximum (Declared by the manufacturer)
Beamforming Gain:	Not support
Type:	Client without Radar detection.

Antenna Information

Ant. (Chain)	Brand	Model name	Antenna Type	Connector	Gain (dBi)	Application range
1 (WLAN)	Linx	ANT-DB-nSP250	Integrated	U.FL	1.47	2.4 to 2.5 GHz
					2.12	5.150 to 5.850 GHz
2 (WLAN)	Linx	ANT-DB-nSP250	Integrated	U.FL	-3.43	2.4 to 2.5 GHz
					0.19	5.150 to 5.850 GHz
3 (BT)	Linx	ANT-DB-nSP250	Integrated	U.FL	2.11	2.4 to 2.5 GHz

Note: Antenna Directional gain = 10 log $[(10^{2.12/20} + 10^{0.19/20})^2 / 2]$= 4.22dBi

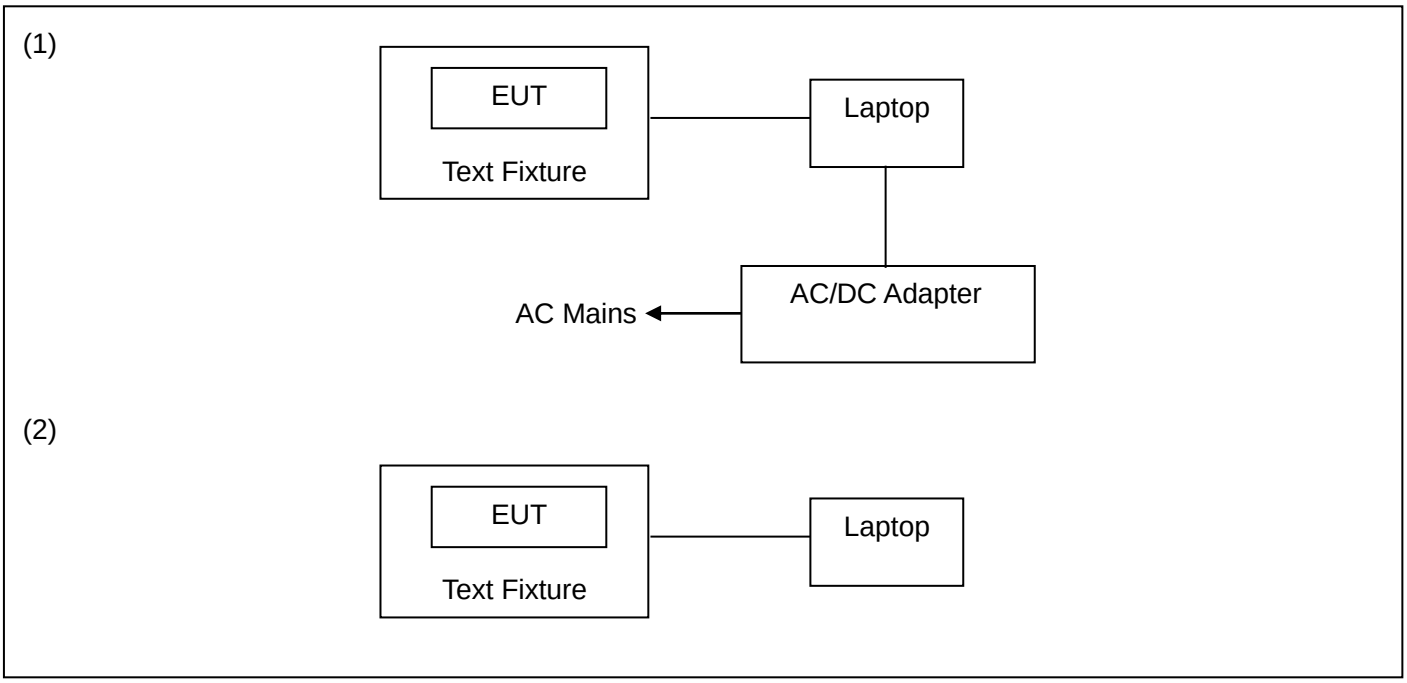
Channel List					
U-NII-1 Band 5180-5240MHz					
IEEE 802.11a/n(HT20)/ac(VHT20)/		IEEE 802.11n(HT40)/ac(VHT40)		IEEE 802.11 ac (VHT80))	
Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz
36	5180	38	5190	42	5210
40	5200	46	5230	-	-
44	5220	-	-	-	-
48	5240	-	-	-	-
U-NII-2A Band 5260-5320MHz					
52	5260	54	5270	58	5290
56	5280	62	5310	-	-
60	5300	-	-	-	-
64	5320	-	-	-	-
U-NII-2C Band 5500-5700MHz					
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	-	-
112	5560	126	5630	-	-
116	5580	134	5670	-	-
132	5660	-	-	-	-
136	5680	-	-	-	-
140	5700	-	-	-	-

U-NII-3 Band 5745~5825MHz					
IEEE 802.11a/n(HT20)/ac(VHT20)		IEEE 802.11n(HT40)/ac(VHT40)		IEEE 802.11 ac (VHT80)	
Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz
149	5745	151	5755	155	5775
153	5765	159	5795	-	-
157	5785	-	-		
161	5805	-	-		
165	5825	-	-		

3. Test Channels and Modes Detail

No.	Mode	Channel	Frequency (MHz)	Remark
1	TX	36	5180	IEEE 802.11a/n(HT20)/ac(HT20)
		40	5200	IEEE 802.11a/n(HT20)/ac(HT20)
		48	5240	IEEE 802.11a/n(HT20) /ac(HT20)
		52	5260	IEEE 802.11a/n(HT20) /ac(HT20)
		60	5300	IEEE 802.11a/n(HT20) /ac(HT20)
		64	5320	IEEE 802.11a/n(HT20) /ac(HT20)
		100	5500	IEEE 802.11a/n(HT20) /ac(HT20)
		116	5580	IEEE 802.11a/n(HT20) /ac(HT20)
		140	5700	IEEE 802.11a/n(HT20) /ac(HT20)
		149	5745	IEEE 802.11a/n(HT20) /ac(HT20)
		157	5785	IEEE 802.11a/n(HT20) /ac(HT20)
		165	5825	IEEE 802.11a/n(HT20) /ac(HT20)
		38	5190	IEEE 802.11n(HT40) /ac(VHT40)
		46	5230	IEEE 802.11n(HT40) /ac(VHT40)
		54	5270	IEEE 802.11n(HT40) /ac(VHT40)
		62	5310	IEEE 802.11n(HT40) /ac(VHT40)
		102	5510	IEEE 802.11n(HT40) /ac(VHT40)
		134	5670	IEEE 802.11n(HT40) /ac(VHT40)
		151	5755	IEEE 802.11n(HT40) /ac(VHT40)
		159	5795	IEEE 802.11n(HT40) /ac(VHT40)
		42	5210	IEEE 802.11ac(VHT80)
		58	5290	IEEE 802.11ac(VHT80)
		122	5610	IEEE 802.11ac(VHT80)
		155	5775	IEEE 802.11ac(VHT80)
2.	Normal Mode	---	---	---
Note: TX mode means that the EUT was programmed to be in continuously transmitting mode.				

4. Configuration of EUT



5. Modification of EUT

No modifications are made to the EUT during all test items.

6. Description of Support Device

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Brand	M/N	S/N	Cable Specification	Remarks
1.	PC	---	---	---	---	Provided by lab
2.	PC	HONOR	HBL-W19	M3VPM19C05000965	---	Provide by the Lab
3.	Adapter	HUAWEI	HW-200325 CP0	C973Y1KC403277	---	Provide by the Lab
4.	Test fixture	---	---	---	---	Provided by manufacturer
5.	Adapter	QUNZHI	PT-067	---	---	Provided by lab

Software	Power Setting								
Linux (Terminal)	Mode	Ant_1				Ant_2			
		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a	Default				Default			
	IEEE 802.11n(HT20)								
	IEEE 802.11ac(VHT20)								
	IEEE 802.11n(HT40)								
	IEEE 802.11ac(VHT40)								
	IEEE 802.11ac(VHT80)								

7. Test Facility and Location

Test Site	:	Dongguan Nore Testing Center Co., Ltd. (Dongguan NTC Co., Ltd.)
Accreditations and Authorizations	:	The Laboratory has been assessed and proved to be in compliance with CNAS/CL01 Listed by CNAS, August 13, 2018 The Certificate Registration Number is L5795. The Certificate is valid until August 13, 2024 The Laboratory has been assessed and proved to be in compliance with ISO17025 Listed by A2LA, November 01, 2017 The Certificate Registration Number is 4429.01 The Certificate is valid until December 31, 2023 Listed by FCC, November 06, 2017 Test Firm Registration Number is 907417 Listed by Industry Canada, June 08, 2017 The Certificate Registration Number is 46405-9743A
Test Site Location	:	Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

8. Applicable Standards and References

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

Test Standards:

47 CFR Part 15, Subpart E, 15.407

ANSI C63.10-2013

References Test Guidance:

KDB 789033 D02 v02r01

KDB 905462 D03 v01r02

9. Deviations and Abnormalities from Standard Conditions

No additions, deviations and exclusions from the standard.

10. Test Conditions

No.	Test Item	Test Mode	Test Voltage	Tested by	Remarks
1.	AC Power Conducted Emission	1	AC 120V/60Hz	Sean	See note 1
2.	Max. Conducted Output Power	1	AC 120V/60Hz	Sean	See note 1
3.	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	1	AC 120V/60Hz	Sean	See note 1
4.	6dB Bandwidth	1	AC 120V/60Hz	Sean	See note 1
5.	Power Spectral Density	1	AC 120V/60Hz	Sean	See note 1
6.	Radiated Emissions	1	AC 120V/60Hz DC 5V	Sean	See note 1,3
7.	Band Edge Emissions	1	AC 120V/60Hz	Sean	See note 1
8.	Frequency Stability	1	DC 3.3V	Sean	See note 1
9.	Antenna Requirement	---	---	---	See note 1
10.	Dynamic Frequency Selection	2	AC 120V/60Hz	Sean	See note 1

Note:

1. The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35℃, 30~70%, 86~106kPa
2. AC 120V/60Hz is the input voltage of the adapter; DC 3,3V come from DC source.
3. DC 5V come from the PC.
4. As the EUT can be operated multiple positions, all X,Y,Z axis were considered during the test and only the worst case X was recorded.

11. Measurement Uncertainty

No.	Test Item	Frequency	Uncertainty	Remarks
1.	Conducted Emission	150KHz ~ 30MHz	±3.04 dB	---
2.	Radiated Emission	9kHz ~ 30MHz	±5.04 dB	
		30MHz ~ 1GHz	±5.04 dB	---
		1GHz ~ 18GHz	±5.23 dB	---
		18GHz ~ 40GHz	±5.23 dB	
3.	RF Conducted	10Hz ~ 40GHz	±0.78 dB	---
4.	Occupied Channel Bandwidth	---	±1.42 x10^{-7}	---

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The measurement uncertainly levels above are estimated and calculated according to CISPR 16-4-2.
3. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

12. Sample Calculations

Conducted Emission						
Freq. (MHz)	**Reading Level (dBuV)**	**Correct Factor (dB)**	**Measurement (dBuV)**	**Limit (dBuV)**	**Over (dB)**	**Detector**
0.1900	30.10	10.60	40.70	79.00	-38.30	QP

Where,

Freq.	= Emission frequency in MHz
Reading Level	= Spectrum Analyzer/Receiver Reading
Corrector Factor	= Insertion loss of LISN + Cable Loss + RF Switching Unit attenuation
Measurement	= Reading + Corrector Factor
Limit	= Limit stated in standard
Margin	= Measurement - Limit
Detector	= Reading for Quasi-Peak / Average / Peak

Radiated Spurious Emissions and Restricted Bands						
Freq. (MHz)	**Reading Level (dBuV)**	**Correct Factor (dB/m)**	**Measurement (dBuV/m)**	**Limit (dBuV/m)**	**Over (dB)**	**Detector**
60.0700	45.88	-18.38	27.50	49.00	-21.50	QP

Where,

Freq.	= Emission frequency in MHz
Reading Level	= Spectrum Analyzer/Receiver Reading
Corrector Factor	= Antenna Factor + Cable Loss - Pre-amplifier
Measurement	= Reading + Corrector Factor
Limit	= Limit stated in standard
Over	= Margin, which calculated by Measurement - Limit
Detector	= Reading for Quasi-Peak / Average / Peak

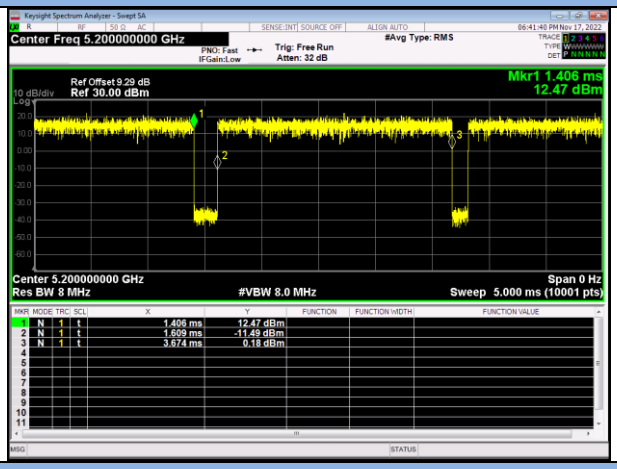
Note: For all conducted test items, the spectrum analyzer offset or transducer is derived from RF cable loss and attenuator factor. The offset or transducer is equal to the RF cable loss plus attenuator factor.

13. Duty cycle

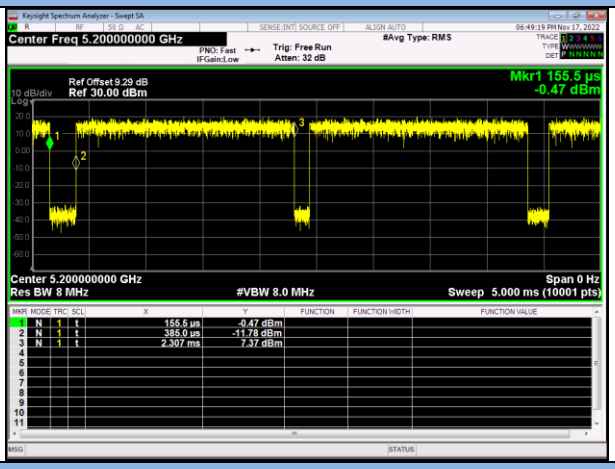
Operation Band (MHz)	Mode	Ton (ms)	Ton+off (ms)	Duty Cycle (%)	1/T minimum VBW (kHz)	Duty Cycle Factor (dB)
U-NII-1	802.11a	2.065	2.268	91.05%	0.48	0.41
	802.11n(HT20)	1.922	2.1515	89.33%	0.52	0.49
	802.11n(HT40)	0.946	1.1215	84.35%	1.06	0.74
	802.11ac(VHT20)	1.934	2.097	92.23%	0.52	0.35
	802.11ac(VHT40)	0.9535	1.0725	88.90%	1.05	0.51
	802.11ac(VHT80)	0.4615	0.6255	73.78%	2.17	1.32
U-NII-2A	802.11a	2.065	2.259	91.41%	0.48	0.39
	802.11n(HT20)	1.6659	2.070	80.48%	0.60	0.94
	802.11n(HT40)	0.9455	1.067	88.61%	1.06	0.53
	802.11ac(VHT20)	1.934	2.098	92.18%	0.52	0.35
	802.11ac(VHT40)	0.953	1.189	80.15%	1.05	0.96
	802.11ac(VHT80)	0.4615	0.6165	74.86%	2.17	1.26
U-NII-2C	802.11a	2.065	2.178	94.81%	0.48	0.23
	802.11n(HT20)	1.922	2.152	89.31%	0.52	0.49
	802.11n(HT40)	0.946	1.068	88.58%	1.06	0.53
	802.11ac(VHT20)	1.933	2.097	92.18%	0.52	0.35
	802.11ac(VHT40)	0.9535	1.0815	88.16%	1.05	0.55
	802.11ac(VHT80)	0.461	0.607	75.95%	2.17	1.19
U-NII-3	802.11a	2.066	2.197	94.04%	0.48	0.27
	802.11n(HT20)	1.922	2.1155	90.85%	0.52	0.42
	802.11n(HT40)	0.945	1.058	89.32%	1.06	0.49
	802.11ac(VHT20)	2.066	2.197	94.04%	0.48	0.27
	802.11ac(VHT40)	0.954	1.2075	79.01%	1.05	1.02
	802.11ac(VHT80)	0.4615	0.6255	73.78%	2.17	1.32
Remark: Duty Cycle= (Ton/ Ton+off)*100% Duty Cycle factor=10*log(1/ Duty cycle)						

U-NII-1 Band

IEEE 802.11a



IEEE 802.11n(HT20)



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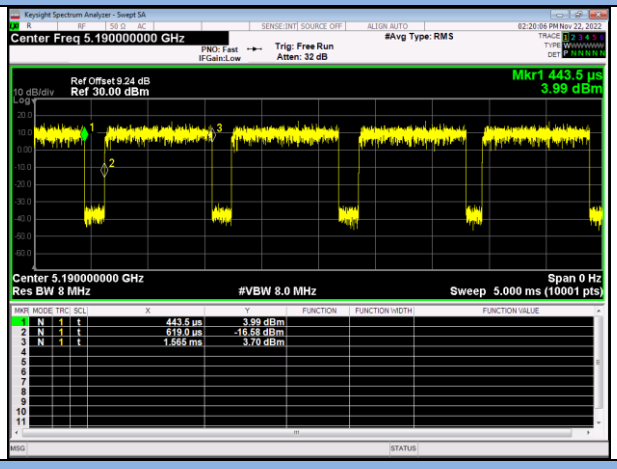

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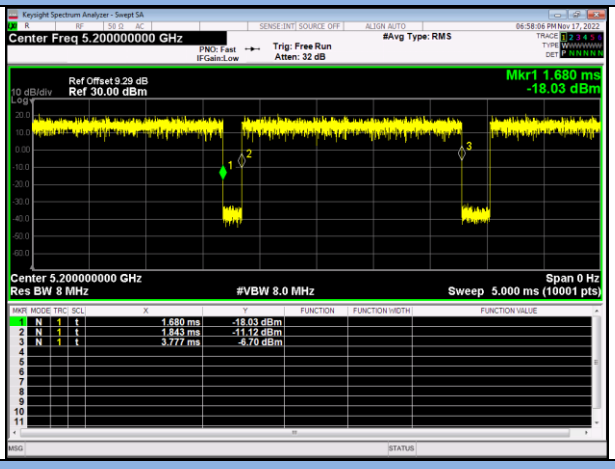

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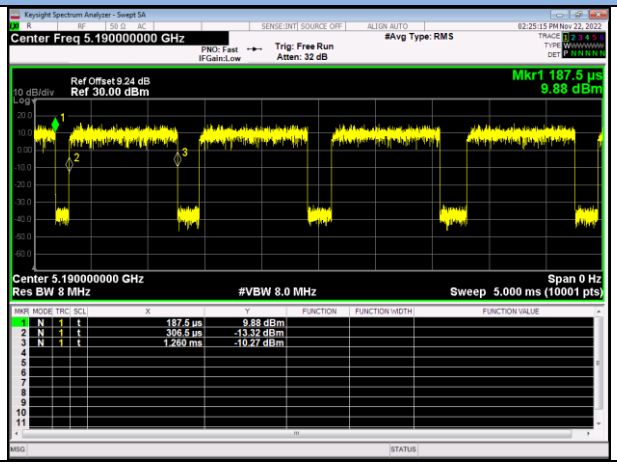

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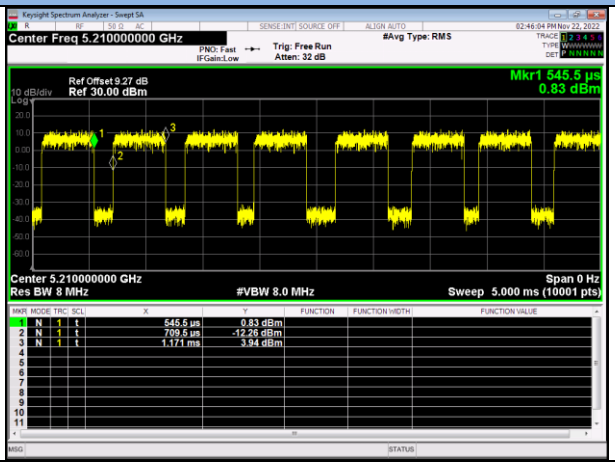
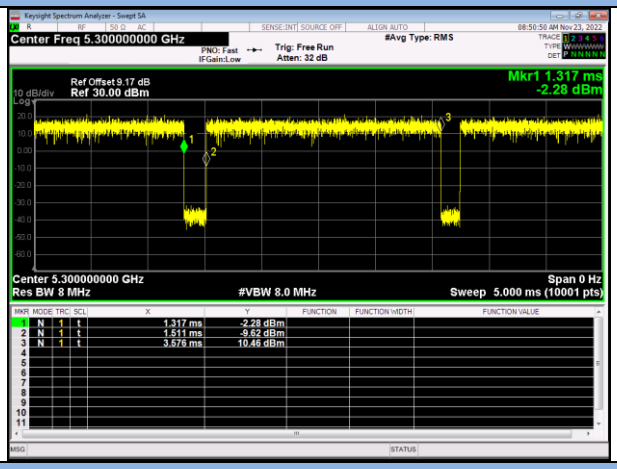


U-NII-2A Band

IEEE 802.11a



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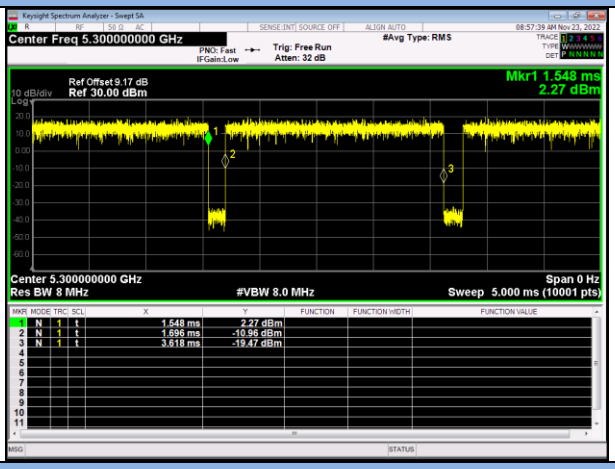

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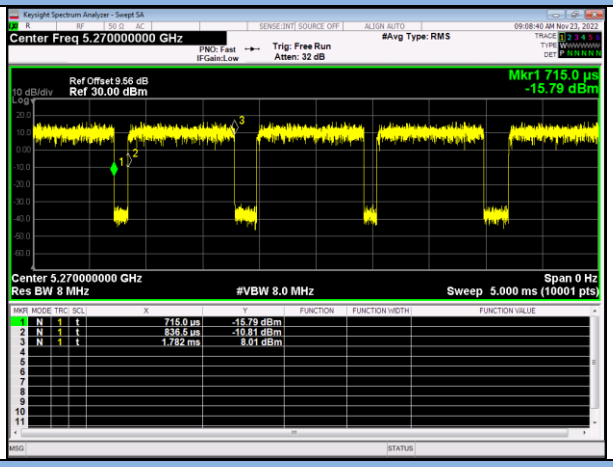

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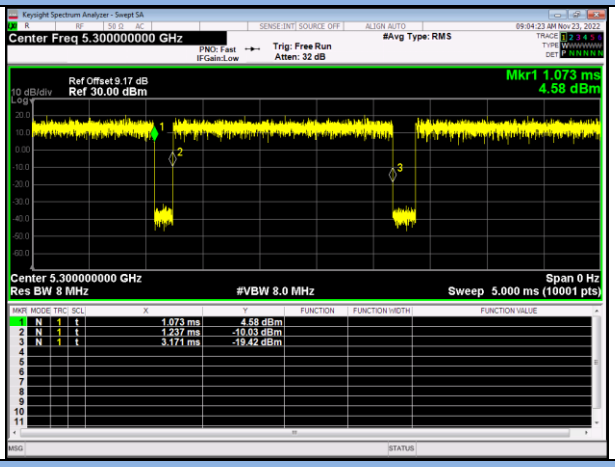

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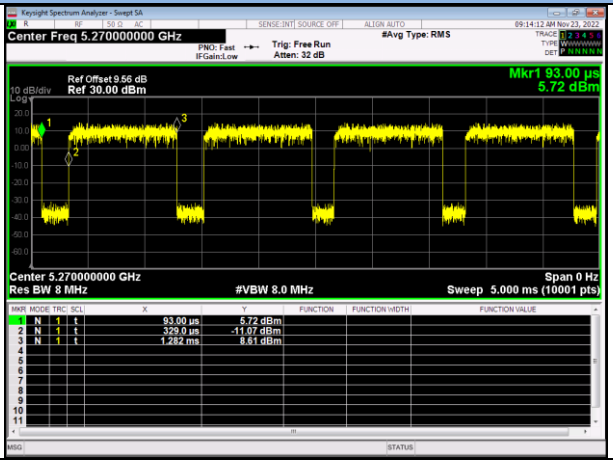
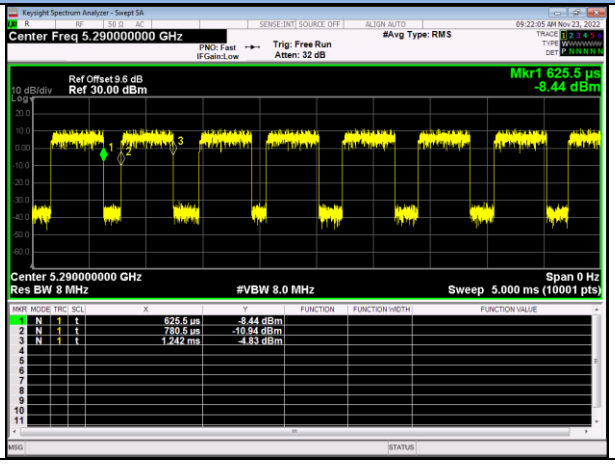
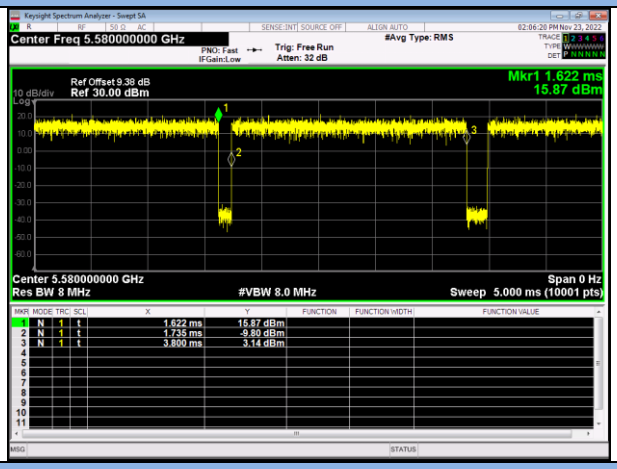


IEEE 802.11ac(VHT80)



U-NII-2C Band

IEEE 802.11a



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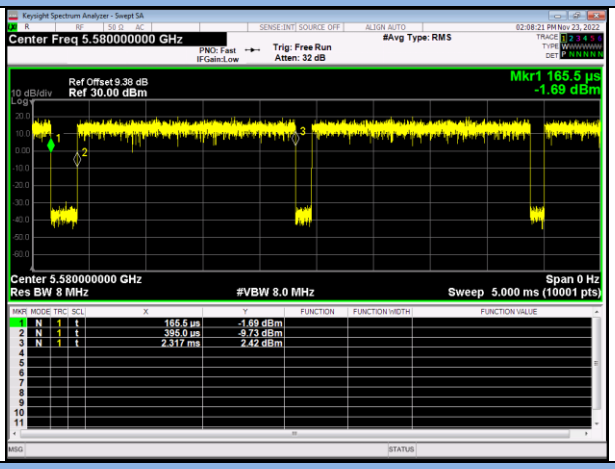

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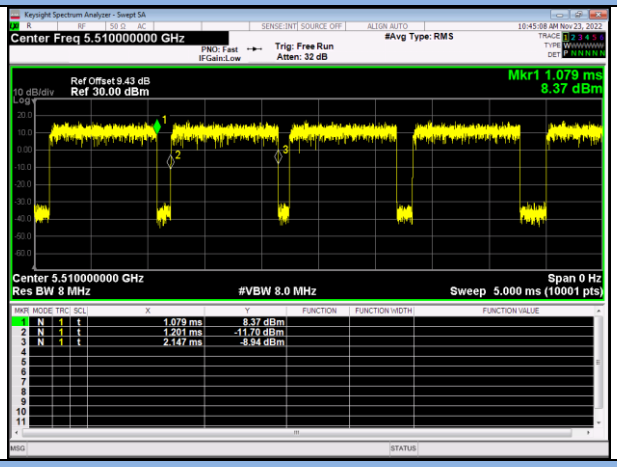

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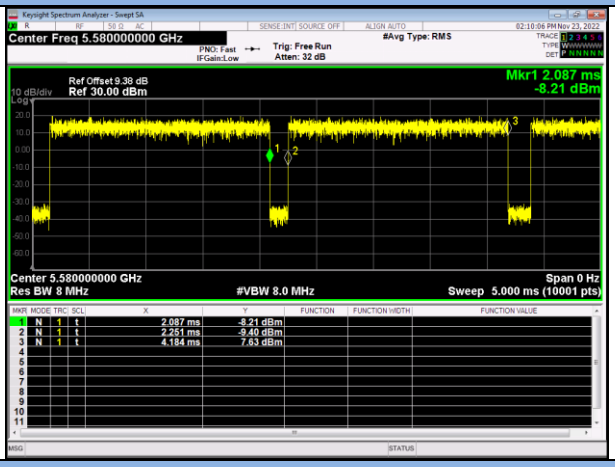

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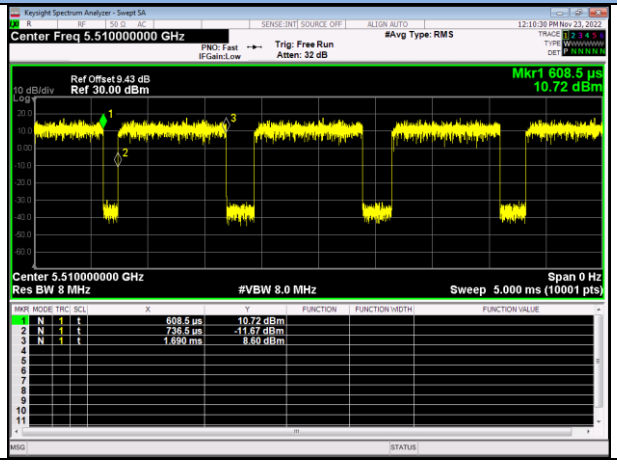
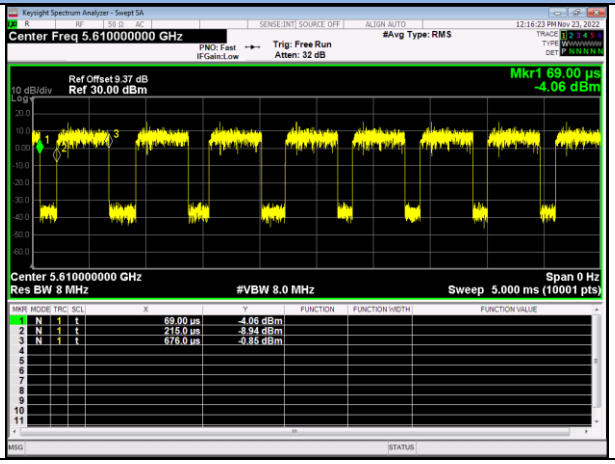
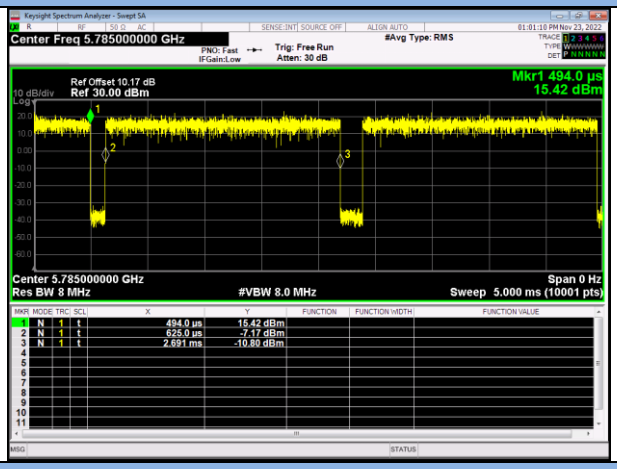


IEEE 802.11ac(VHT80)

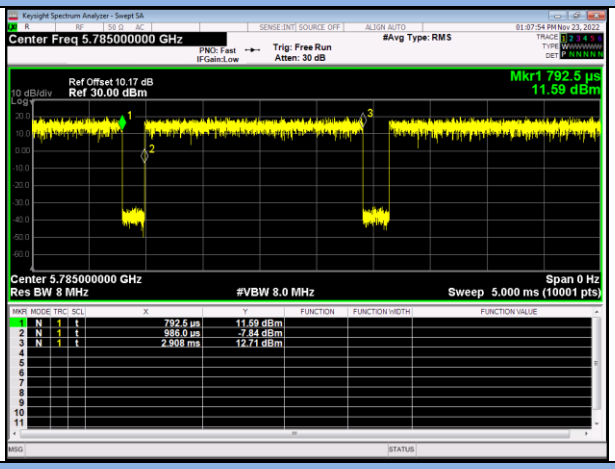


U-NII-3 Band

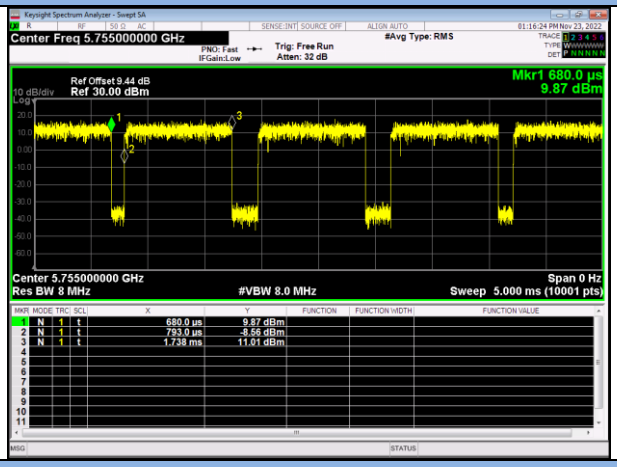
IEEE 802.11a



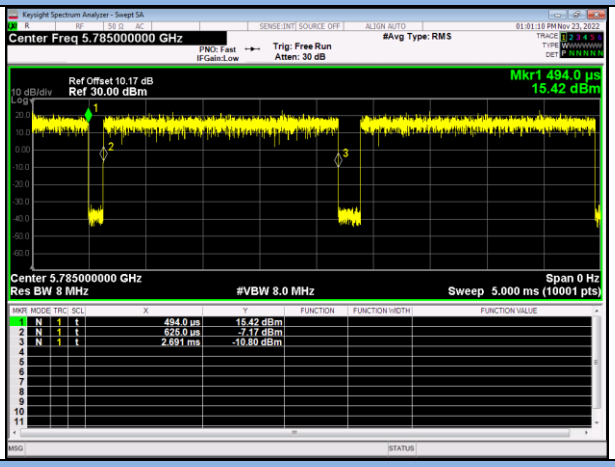
IEEE 802.11n(HT20)



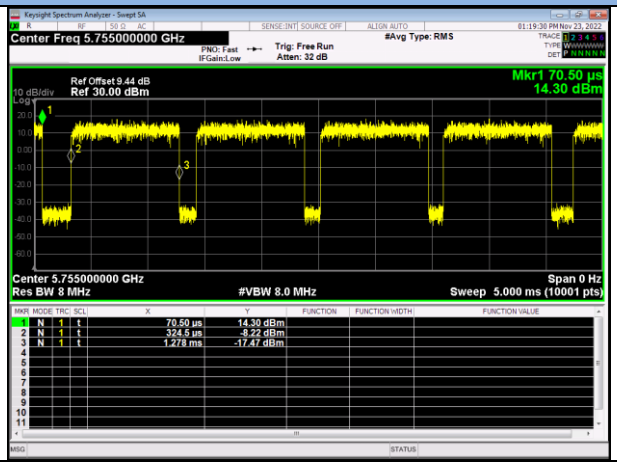
IEEE 802.11n(HT40)



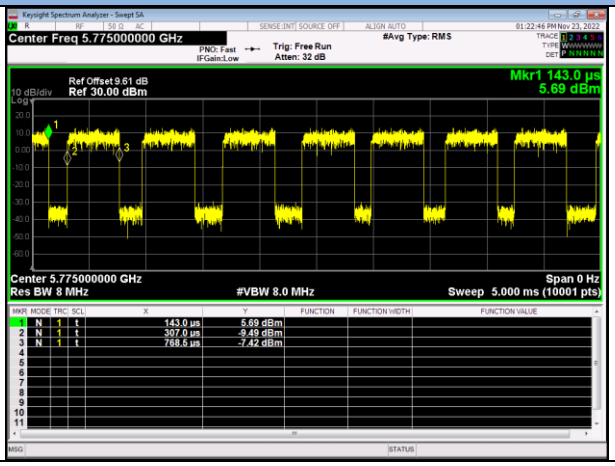
IEEE 802.11ac(VHT20)



IEEE 802.11ac(VHT40)



IEEE 802.11ac(VHT80)



14. Test Items and Results

14.1 Conducted Emissions Measurement

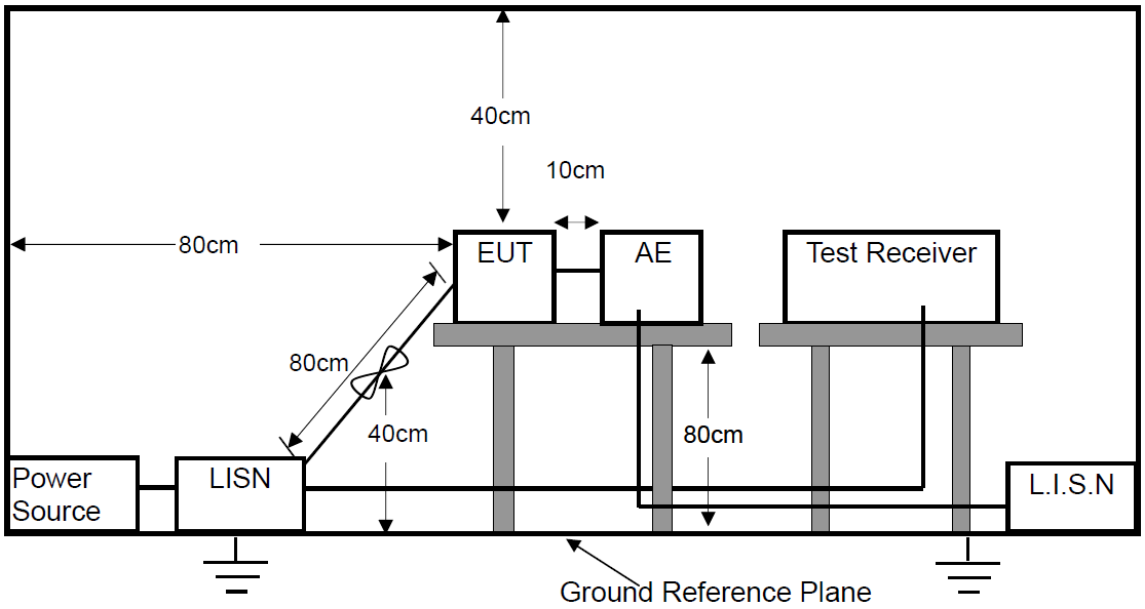
LIMITS

According to the requirements of FCC PART 15.207, the limits are as follows:

Frequency (MHz)	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

Note: 1. If the limits for the average detector are met when using the quasi-peak detector, then the limits for the measurements with the average detector are considered to be met.
2. The lower limit shall apply at the transition frequencies.
3. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5MHz.

BLOCK DIAGRAM OF TEST SETUP



TEST PROCEDURES

a. The EUT was placed on a wooden table 0.8m height from the metal ground plan and 0.4m from the conducting wall of the shielding room and it was kept at 0.8m from any other grounded conducting surface.

b. All I/O cables and support devices were positioned as per ANSI C63.10.

c. Connect mains power port of the EUT to a line impedance stabilization network (LISN).

d. Connect all support devices to the other LISN and AAN, if needed.

e. Scan the frequency range from 150KHz to 30MHz at both sides of AC line for maximum conducted interference checking and record the test data.

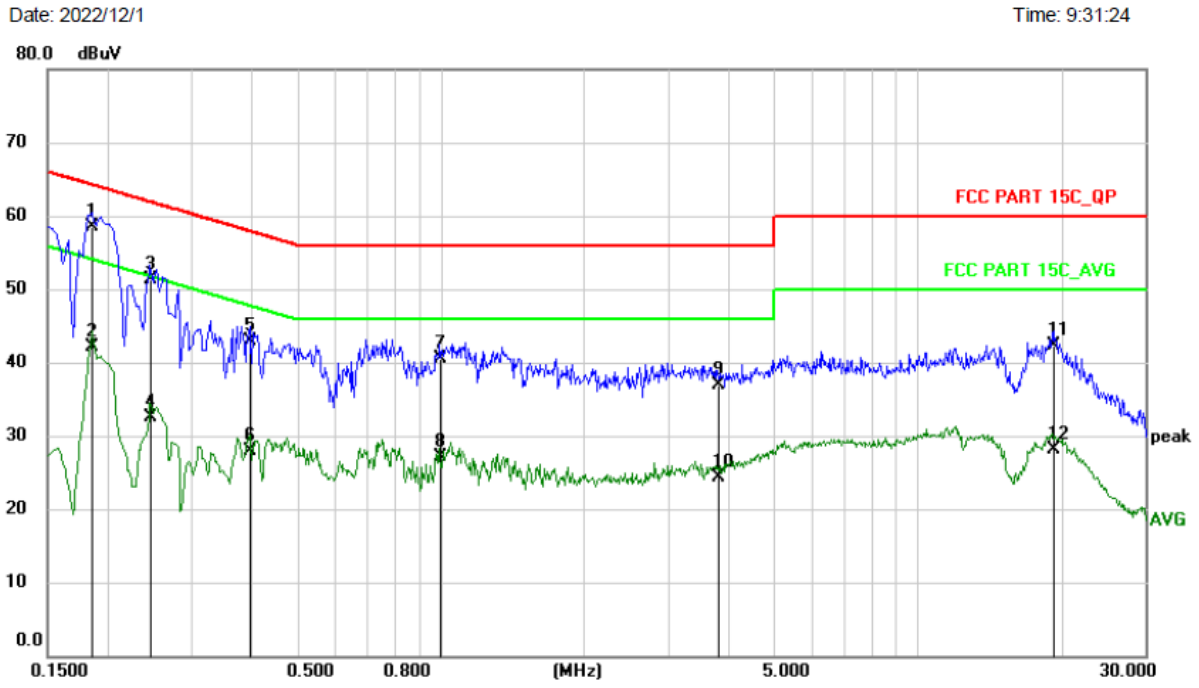
TEST RESULTS

PASS

Please refer to the following pages.

M/N: 7727252000	Testing Voltage: AC 120V/60Hz
Phase: L1	Detector: QP & AVG
Test Mode: 2	

Conducted Emission Measurement



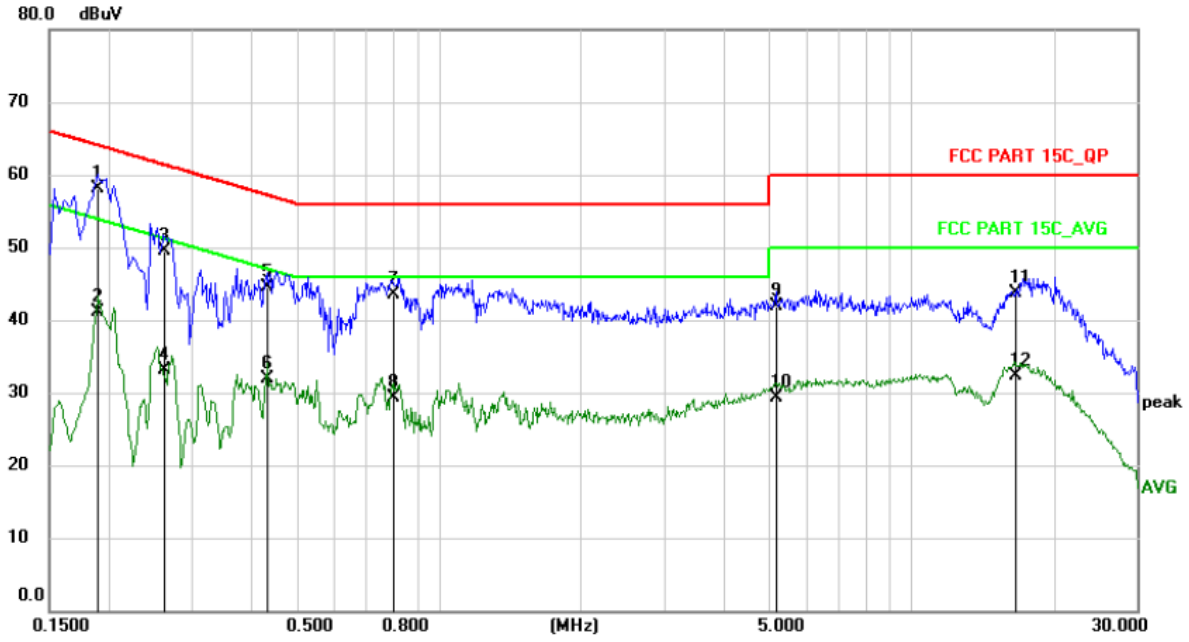
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1859	37.90	20.60	58.50	64.22	-5.72	QP	
2		0.1859	21.60	20.60	42.20	54.22	-12.02	AVG	
3		0.2459	30.69	20.61	51.30	61.89	-10.59	QP	
4		0.2459	11.89	20.61	32.50	51.89	-19.39	AVG	
5		0.3980	22.29	20.61	42.90	57.90	-15.00	QP	
6		0.3980	7.39	20.61	28.00	47.90	-19.90	AVG	
7		0.9979	19.89	20.61	40.50	56.00	-15.50	QP	
8		0.9979	6.49	20.61	27.10	46.00	-18.90	AVG	
9		3.8060	16.26	20.64	36.90	56.00	-19.10	QP	
10		3.8060	3.76	20.64	24.40	46.00	-21.60	AVG	
11		19.1700	21.47	20.83	42.30	60.00	-17.70	QP	
12		19.1700	7.37	20.83	28.20	50.00	-21.80	AVG	

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

M/N: 7727252000	Testing Voltage: AC 120V/60Hz
Phase: N	Detector: QP & AVG
Test Mode: 2	

Conducted Emission Measurement

Date: 2022/12/1 Time: 9:36:45



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1900	37.54	20.56	58.10	64.04	-5.94	QP	
2		0.1900	20.64	20.56	41.20	54.04	-12.84	AVG	
3		0.2620	29.03	20.57	49.60	61.37	-11.77	QP	
4		0.2620	12.53	20.57	33.10	51.37	-18.27	AVG	
5		0.4339	24.03	20.57	44.60	57.18	-12.58	QP	
6		0.4339	11.43	20.57	32.00	47.18	-15.18	AVG	
7		0.8020	23.03	20.57	43.60	56.00	-12.40	QP	
8		0.8020	8.73	20.57	29.30	46.00	-16.70	AVG	
9		5.1817	21.29	20.61	41.90	60.00	-18.10	QP	
10		5.1817	8.69	20.61	29.30	50.00	-20.70	AVG	
11		16.5100	23.03	20.67	43.70	60.00	-16.30	QP	
12		16.5100	11.63	20.67	32.30	50.00	-17.70	AVG	

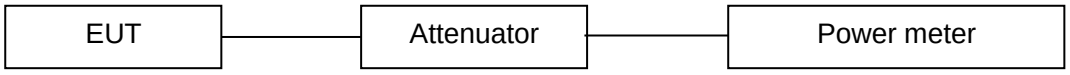
Note: *:Maximum data x:Over limit !:over margin

14.2 Maximum Conducted Output Power Measurement

LIMITS

Operation Band	EUT category	Limit
☒5180~5240MHz	☐Outdoor Access Point	1 Watt (30dBm) (Max. e.i.r.p ≤ 125mW(21dBm) at any elevation angle above 30 degrees as measured from the horizon)
	☐Fixed point-to-point Access Point	1 Watt (30dBm)
	☐Indoor Access Point	1 Watt (30dBm)
	☒Mobile and Portable client device	250mW (24dBm)
☒5260~5320MHz	-	250mW (24dBm)
☒5500~5700MHz	-	250mW (24dBm)
☒5745~5825MHz	-	1 Watt (30dBm)

BLOCK DIAGRAM OF TEST SETUP



TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 v02r01 for compliance testing of Unlicensed National Information Infrastructure (U-NII) Device -section (E) Maximum conducted output power.
3. Measurement using a power meter (PM) =b Method PM-G (Measurement using a gated RF average power meter).

TEST RESULTS

PASS

Please refer to the following table.

U-NII-1					
Frequency MHz	Data Rate Mbps	Average Output Power dBm			Limit dBm
IEEE 802.11a Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5180	6	14.961			24.00
Channel: 5200	6	14.946			24.00
Channel: 5240	6	14.933			24.00
IEEE 802.11n(HT20)Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5180	MCS 8	ANT_1	ANT_2	Total	24.00
		13.654	12.847	16.28	
Channel: 5200	MCS 8	13.652	13.323	16.50	24.00
Channel: 5240	MCS 8	13.431	12.992	16.23	24.00
IEEE 802.11n(HT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5190	MCS 8	12.844	11.359	15.17	24.00
Channel: 5230	MCS 8	12.528	11.926	15.25	24.00
IEEE 802.11ac (VHT20) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5180	MCS 8	13.518	12.769	16.17	24.00
Channel: 5200	MCS 8	13.445	13.461	16.46	24.00
Channel: 5240	MCS 8	13.409	12.572	16.02	24.00
IEEE 802.11ac (VHT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5190	MCS 8	12.973	11.277	15.22	24.00
Channel: 5230	MCS 8	12.561	11.688	15.16	24.00
IEEE 802.11ac (VHT80) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5210	MCS 8	12.122	11.129	14.66	24.00

Note: 1. As for IEEE 802.11a mode, both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.

2. As for IEEE 802.11n/ac mode, EUT working in MIMO mode. Directional Gain for MIMO.

3. Directional gain = 10 log $[(10^{2.12/20} + 10^{0.19/20})^2 / 2]$= 4.22dBi < 6 dBi

4. Duty Cycle Factor was considered during the test.

U-NII-2A					
Frequency MHz	Data Rate Mbps	Average Output Power dBm			Limit dBm
IEEE 802.11a Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5260	6	14.698			24
Channel: 5300	6	14.954			24
Channel: 5320	6	15.436			24
IEEE 802.11n(HT20)Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5260	MIMO	ANT_1	ANT_2	Total	24.00
	MCS 8	13.309	12.867	16.10	
Channel: 5300	MCS 8	13.242	12.527	15.91	24.00
Channel: 5320	MCS 8	13.586	12.464	16.07	24.00
IEEE 802.11n(HT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5270	MCS 8	12.683	12.141	15.43	24.00
Channel: 5310	MCS 8	12.931	11.670	15.36	24.00
IEEE 802.11ac (VHT20) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5260	MCS 8	13.026	12.838	15.94	24.00
Channel: 5300	MCS 8	13.194	12.417	15.83	24.00
Channel: 5320	MCS 8	13.529	12.294	15.97	24.00
IEEE 802.11ac (VHT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5270	MCS 8	12.814	12.050	15.46	24.00
Channel: 5310	MCS 8	12.816	11.094	15.05	24.00
IEEE 802.11ac (VHT80) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5290	MCS 8	12.118	11.007	14.61	24.00

Note: 1. As for IEEE 802.11a mode, both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.

2. As for IEEE 802.11n/ac mode, EUT working in MIMO mode. Directional Gain for MIMO.

3. Directional gain = 10 log $[(10^{2.12/20} + 10^{0.19/20})^2 / 2]$= 4.22dBi < 6 dBi

4. Duty Cycle Factor was considered during the test.

U-NII-2C					
Frequency MHz	Data Rate Mbps	Average Output Power dBm			Limit dBm
IEEE 802.11a Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5500	6	15.339			24.00
Channel: 5580	6	12.661			24.00
Channel: 5700	6	16.431			24.00
IEEE 802.11n(HT20)Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5500	MIMO	ANT_1	ANT_2	Total	24.00
	MCS 8	14.102	12.671	16.46	
Channel: 5580	MCS 8	11.109	12.405	14.82	24.00
Channel: 5700	MCS 8	14.872	13.527	17.26	24.00
IEEE 802.11n(HT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5510	MCS 8	13.589	12.767	16.21	24.00
Channel: 5670	MCS 8	13.056	12.327	15.72	24.00
IEEE 802.11ac (VHT20) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5500	MCS 8	13.917	12.705	16.36	24.00
Channel: 5580	MCS 8	11.755	12.318	15.06	24.00
Channel: 5700	MCS 8	14.640	13.535	17.13	24.00
IEEE 802.11ac (VHT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5510	MCS 8	13.645	12.844	16.27	24.00
Channel: 5670	MCS 8	12.956	12.330	15.66	24.00
IEEE 802.11ac (VHT80) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5610	MCS 8	10.538	11.290	13.94	24.00

Note: 1. As for IEEE 802.11a mode, both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.

2. As for IEEE 802.11n/ac mode, EUT working in MIMO mode. Directional Gain for MIMO.

3. Directional gain = 10 log $[(10^{2.12/20} + 10^{0.19/20})^2 / 2]$= 4.22dBi < 6 dBi

4. Duty Cycle Factor was considered during the test.

U-NII-3					
Frequency MHz	Data Rate Mbps	Average Output Power dBm			Limit dBm
IEEE 802.11a Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5745	6	16.108			30.00
Channel: 5785	6	14.807			30.00
Channel: 5825	6	15.233			30.00
IEEE 802.11n(HT20)Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5745	MIMO	ANT_1	ANT_2	Total	30.00
	MCS 8	14.593	13.814	17.23	
Channel: 5785	MCS 8	12.900	13.721	16.34	30.00
Channel: 5825	MCS 8	13.273	14.075	16.70	30.00
IEEE 802.11n(HT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5755	MCS 8	13.972	13.680	16.84	30.00
Channel: 5795	MCS 8	12.000	13.469	15.81	30.00
IEEE 802.11ac (VHT20) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5745	MCS 8	14.464	13.977	17.24	30.00
Channel: 5785	MCS 8	12.944	13.722	16.36	30.00
Channel: 5825	MCS 8	13.283	13.668	16.49	30.00
IEEE 802.11ac (VHT40) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5755	MCS 8	14.167	13.735	16.97	30.00
Channel: 5795	MCS 8	12.177	13.404	15.84	30.00
IEEE 802.11ac (VHT80) Mode (OFDM, Antenna Gain=2.12dBi)					
Channel: 5775	MCS 8	12.935	12.864	15.91	30.00

Note: 1. As for IEEE 802.11a mode, both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.

2. As for IEEE 802.11n/ac mode, EUT working in MIMO mode. Directional Gain for MIMO.

3. Directional gain = 10 log $[(10^{2.12/20} + 10^{0.19/20})^2 / 2]$= 4.22dBi < 6 dBi

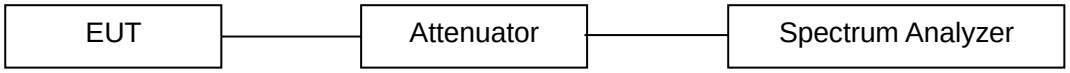
4. Duty Cycle Factor was considered during the test.

14.3 6dB Bandwidth Measurement

LIMITS

The minimum 6dB bandwidth shall be at least 500 kHz

BLOCK DIAGRAM OF TEST SETUP



TEST PROCEDURES

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to ANSI C63.10 clause 11.8.1:

a. Set the RBW = 100KHz.

b. Set the VBW ≥ 3 x RBW

c. Set the Detector = peak.

d. Set the Sweep time = auto couple.

e. Set the Trace mode = max hold.

f. Allow trace to fully 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.

TEST RESULTS

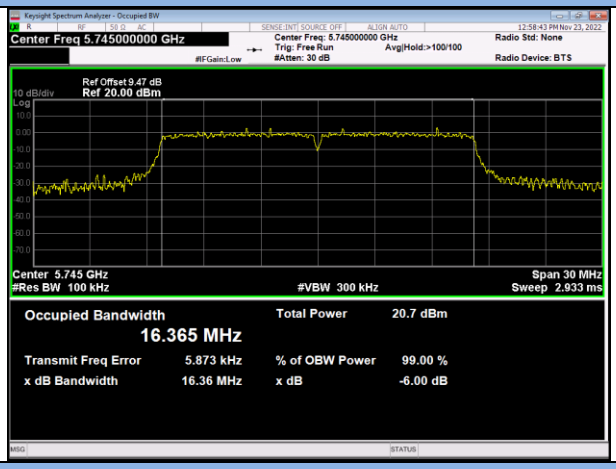
PASS

Please refer to the following tables.

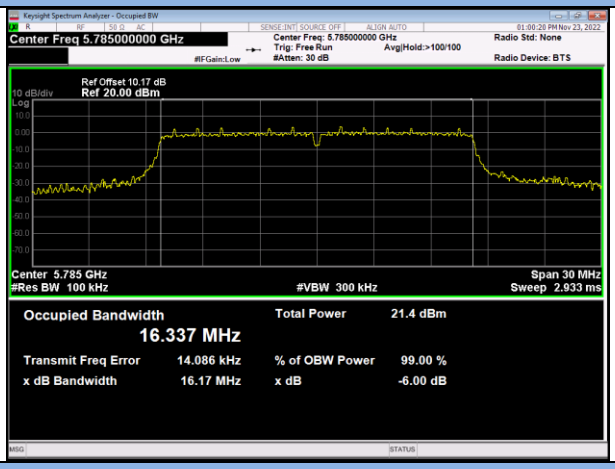
U-NII-3			
Frequency MHz	Data Rate Mbps	6dB Bandwidth MHz	Limit
IEEE 802.11a Mode (OFDM)			
Channel: 5745	6	16.36	>500KHz
Channel: 5785	6	16.17	>500KHz
Channel: 5825	6	16.34	>500KHz
IEEE 802.11n(HT20) Mode (OFDM)			
Channel: 5745	MCS0	17.18	>500KHz
Channel: 5785	MCS0	17.21	>500KHz
Channel: 5825	MCS0	17.56	>500KHz
IEEE 802.11n(HT40) Mode (OFDM)			
Channel: 5755	MCS0	35.21	>500KHz
Channel: 5795	MCS0	35.18	>500KHz
IEEE 802.11ac (VHT20) Mode (OFDM)			
Channel: 5745	MCS0	17.56	>500KHz
Channel: 5785	MCS0	17.18	>500KHz
Channel: 5825	MCS0	17.30	>500KHz
IEEE 802.11ac (VHT40) Mode (OFDM)			
Channel: 5755	MCS0	35.14	>500KHz
Channel: 5795	MCS0	35.18	>500KHz
IEEE 802.11ac (VHT80) Mode (OFDM)			
Channel: 5775	MCS0	72.68	>500KHz
Note: Both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.			

U-NII-3

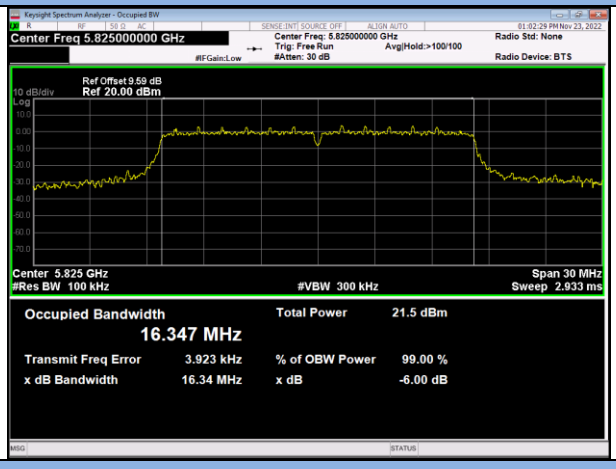
IEEE 802.11a Low Channel



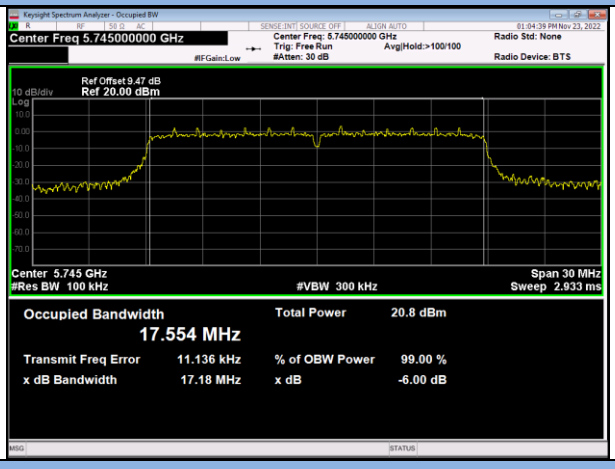
IEEE 802.11a Middle Channel



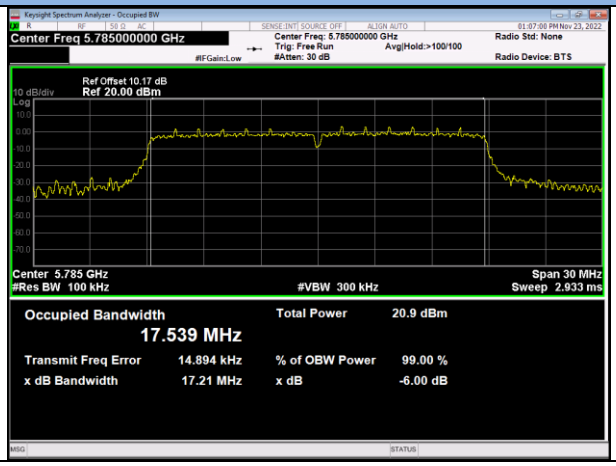
IEEE 802.11a High Channel



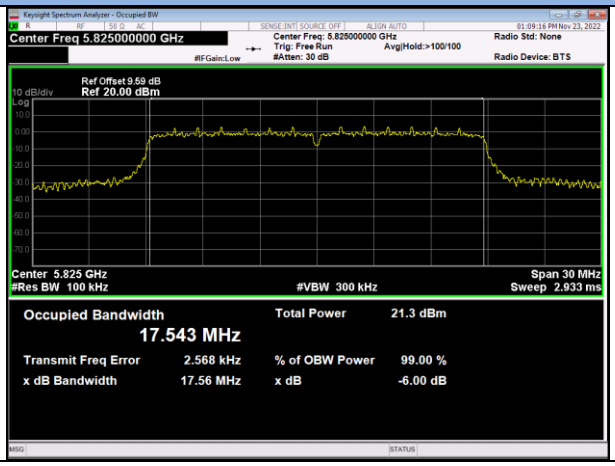
IEEE 802.11n(HT20) Low Channel



IEEE 802.11n(HT20) Middle Channel

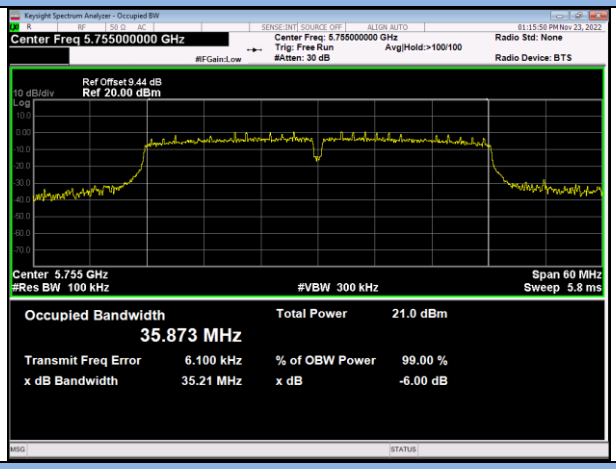


IEEE 802.11n(HT20) High Channel

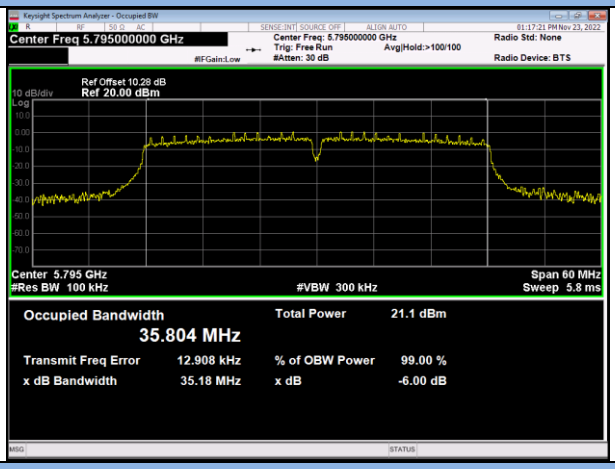


U-NII-3

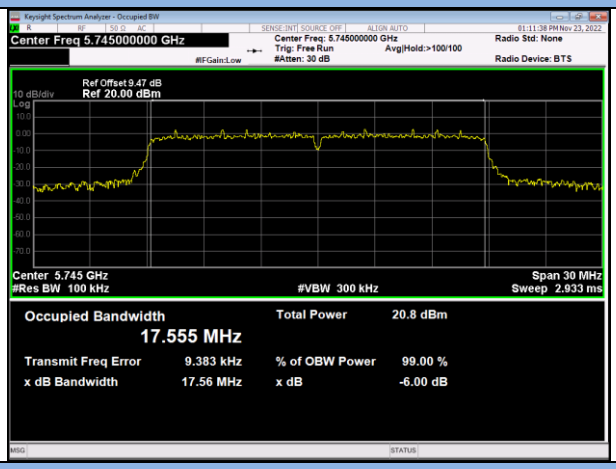
IEEE 802.11n(HT40) Low Channel



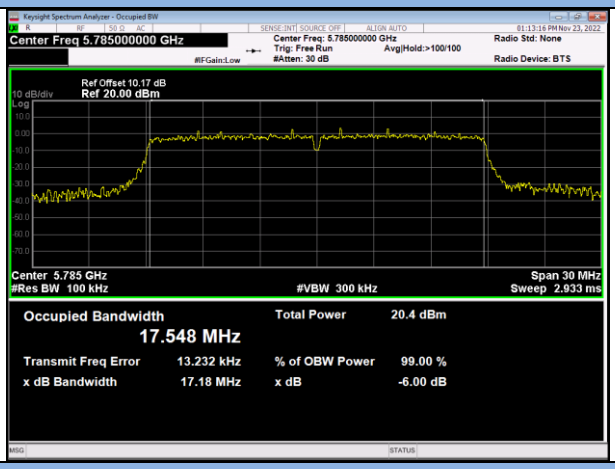
IEEE 802.11n(HT40) High Channel



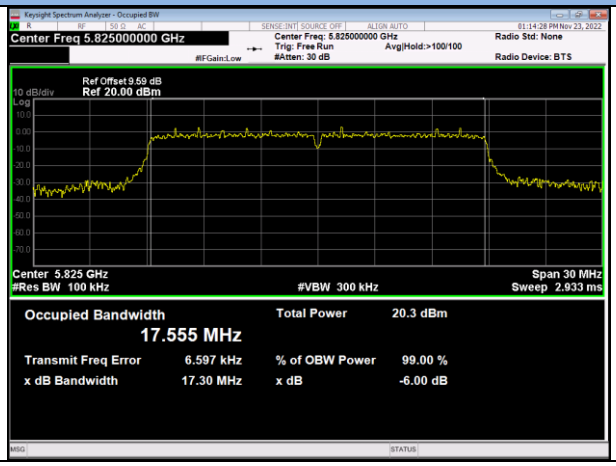
IEEE 802.11ac(VHT20) Low Channel



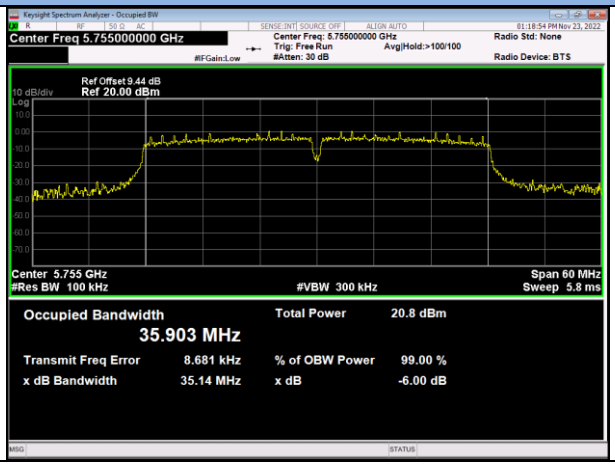
IEEE 802.11ac(VHT20) Middle Channel

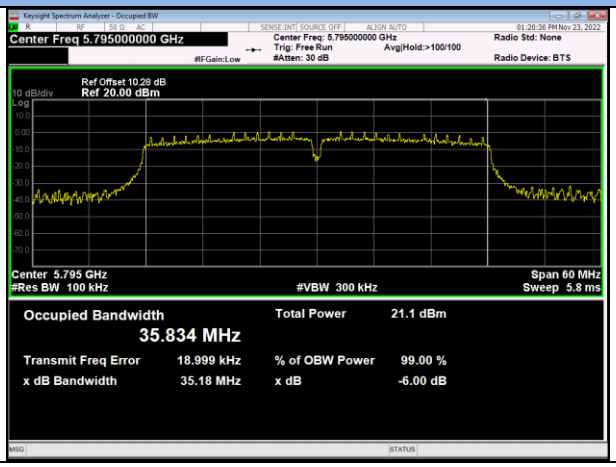
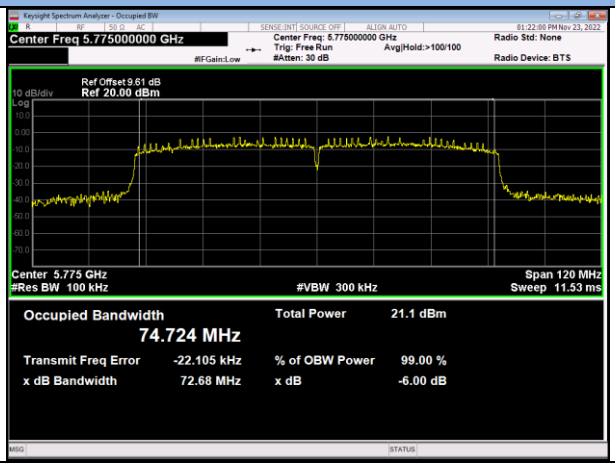


IEEE 802.11ac(VHT20) High Channel



IEEE 802.11ac(VHT40) Low Channel



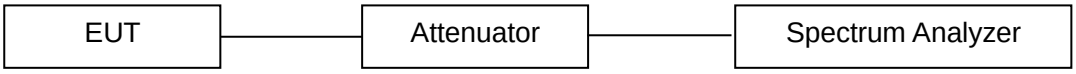
U-NII-3	
IEEE 802.11ac(VHT40) High Channel	IEEE 802.11ac(VHT80)
	

14.4 26dB Bandwidth & 99% Occupied Bandwidth

LIMITS

No restriction limits.

BLOCK DIAGRAM OF TEST SETUP



TEST PROCEDURES

The antenna port of the EUT was connected to the input of a spectrum analyzer.

Analyzer was set as below according to FCC KDB789033(v02r01):

a. For 26dB bandwidth, Set the RBW = Approximately 1% of the emission bandwidth

b. Set the VBW > RBW

c. Detector = peak.

d. Sweep time = auto couple.

e. Trace mode = max hold.

f. Allow trace to fully 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 26 dB relative to the maximum level measured in the fundamental emission.

1. For 99% occupied bandwidth, Set the RBW = 1% to 5% of the OBW
2. Set the VBW ≥ 3 x RBW
3. Detector = peak.
4. Span = 1.5 times to 5.0 times the OBW
5. Sweep time = auto couple.
6. Trace mode = max hold. Allow trace to fully stabilize.
7. Use the 99% power bandwidth function of the spectrum analyzer measure the occupied bandwidth.

TEST RESULTS

PASS

Please refer to the following table.

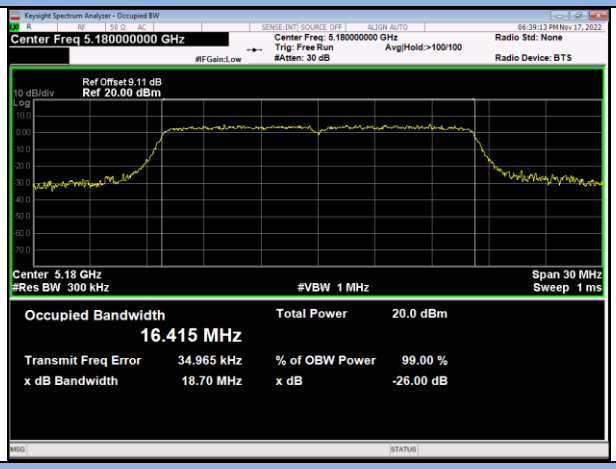
U-NII-1			
Frequency MHz	Data Rate Mbps	26dB Bandwidth MHz	99% Occupied Bandwidth MHz
IEEE 802.11a Mode (OFDM)			
Channel: 5180	6	18.70	---
Channel: 5200	6	19.44	---
Channel: 5240	6	18.94	---
IEEE 802.11n(HT20) Mode (OFDM)			
Channel: 5180	MCS0	19.73	---
Channel: 5200	MCS0	19.74	---
Channel: 5240	MCS0	19.78	---
IEEE 802.11n(HT40) Mode (OFDM)			
Channel: 5190	MCS0	41.10	---
Channel: 5230	MCS0	41.20	---
IEEE 802.11ac (VHT20) Mode (OFDM)			
Channel: 5180	MCS0	19.72	---
Channel: 5200	MCS0	19.74	---
Channel: 5240	MCS0	19.71	---
IEEE 802.11ac (VHT40) Mode (OFDM)			
Channel: 5190	MCS0	41.64	---
Channel: 5230	MCS0	41.09	---
IEEE 802.11ac (VHT80) Mode (OFDM)			
Channel: 5210	MCS0	81.39	---
Note: Both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.			

U-NII-2A			
Frequency MHz	Data Rate Mbps	26dB Bandwidth MHz	99% Occupied Bandwidth MHz
IEEE 802.11a Mode (OFDM)			
Channel: 5260	6	18.68	---
Channel: 5300	6	18.76	---
Channel: 5320	6	18.71	---
IEEE 802.11n(HT20) Mode (OFDM)			
Channel: 5260	MCS0	19.61	---
Channel: 5300	MCS0	19.56	---
Channel: 5320	MCS0	19.67	---
IEEE 802.11n(HT40) Mode (OFDM)			
Channel: 5270	MCS0	41.90	---
Channel: 5310	MCS0	41.52	---
IEEE 802.11ac (VHT20) Mode (OFDM)			
Channel: 5260	MCS0	21.51	---
Channel: 5300	MCS0	19.62	---
Channel: 5320	MCS0	19.67	---
IEEE 802.11ac (VHT40) Mode (OFDM)			
Channel: 5270	MCS0	40.97	---
Channel: 5310	MCS0	41.01	---
IEEE 802.11ac (VHT80) Mode (OFDM)			
Channel:5290	MCS0	81.28	---
Note: Both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.			

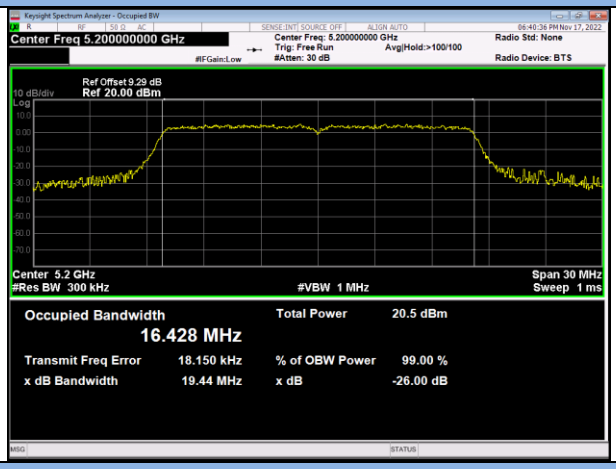
U-NII-2C			
Frequency MHz	Data Rate Mbps	26dB Bandwidth MHz	99% Occupied Bandwidth MHz
IEEE 802.11a Mode (OFDM)			
Channel: 5500	6	18.77	---
Channel: 5580	6	18.54	---
Channel: 5700	6	19.15	---
IEEE 802.11n(HT20) Mode (OFDM)			
Channel: 5500	MCS0	20.43	---
Channel: 5580	MCS0	19.63	---
Channel: 5700	MCS0	19.70	---
IEEE 802.11n(HT40) Mode (OFDM)			
Channel: 5510	MCS0	41.11	---
Channel: 5670	MCS0	40.97	---
IEEE 802.11ac (VHT20) Mode (OFDM)			
Channel: 5500	MCS0	19.81	---
Channel: 5580	MCS0	19.60	---
Channel: 5700	MCS0	19.70	---
IEEE 802.11ac (VHT40) Mode (OFDM)			
Channel: 5510	MCS0	41.70	---
Channel: 5670	MCS0	41.44	---
IEEE 802.11ac (VHT80) Mode (OFDM)			
Channel: 5610	MCS0	81.37	---
Note: Both of antennas have considered during pre-test, but only the worst case (ANT_1) was recorded.			

U-NII-1 / 26dB Bandwidth

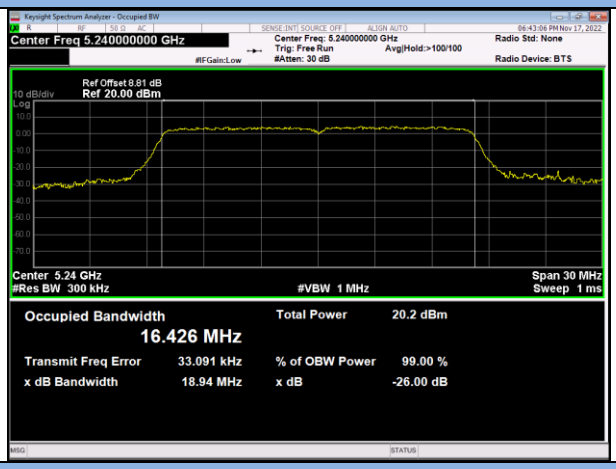
IEEE 802.11a Low Channel



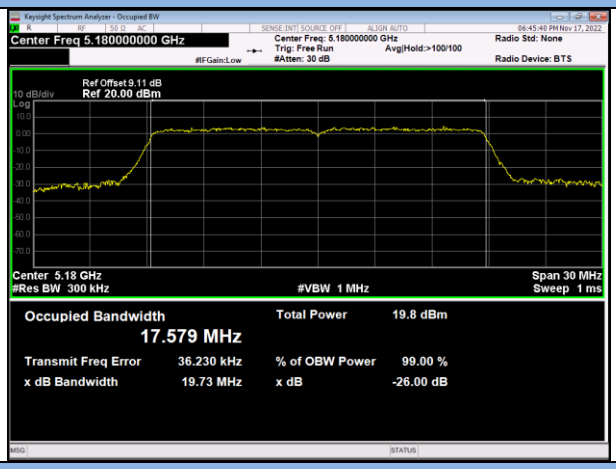
IEEE 802.11a Middle Channel



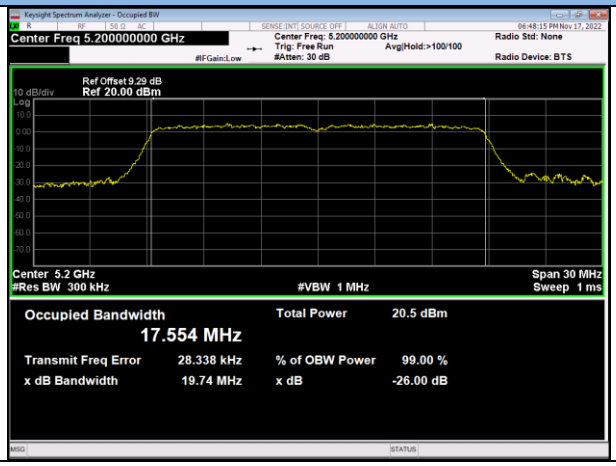
IEEE 802.11a High Channel



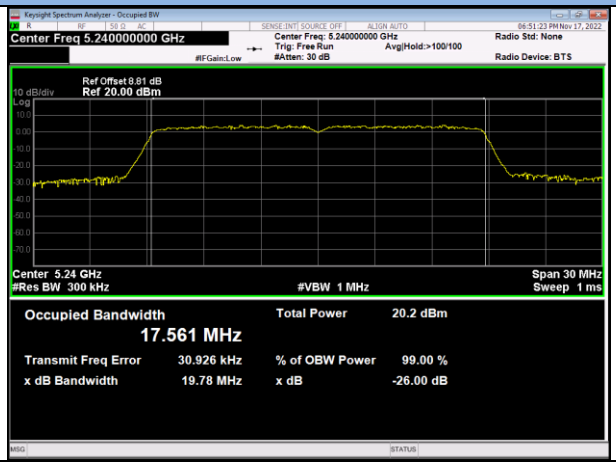
IEEE 802.11n(HT20) Low Channel



IEEE 802.11n(HT20) Middle Channel

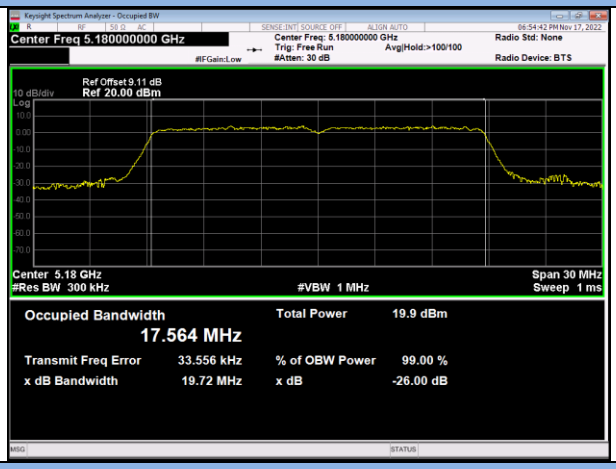


IEEE 802.11n(HT20) High Channel

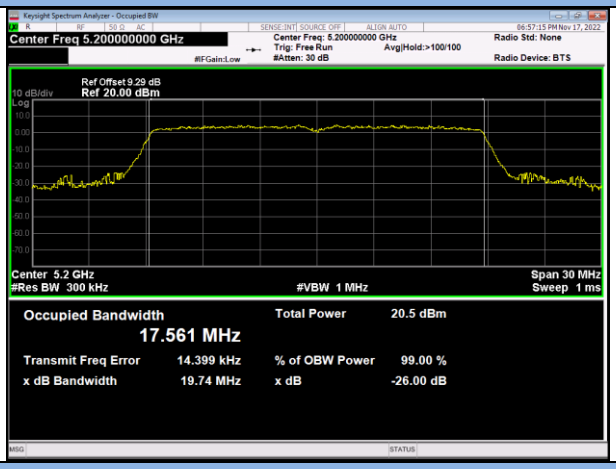


U-NII-1 / 26dB Bandwidth

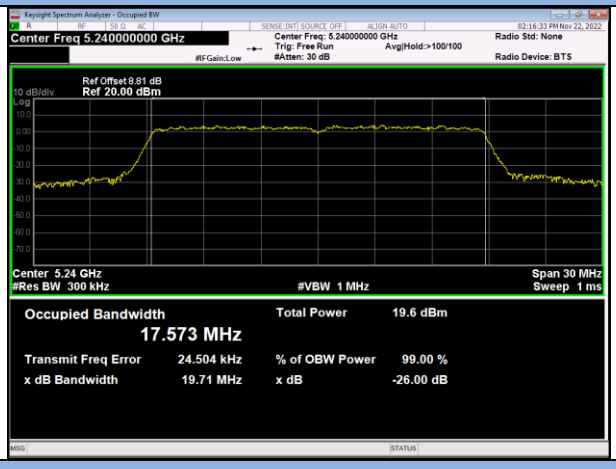
IEEE 802.11ac(VHT20) Low Channel



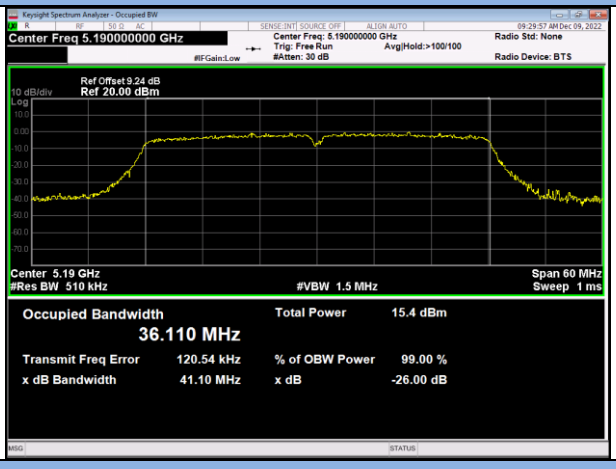
IEEE 802.11ac(VHT20) Middle Channel



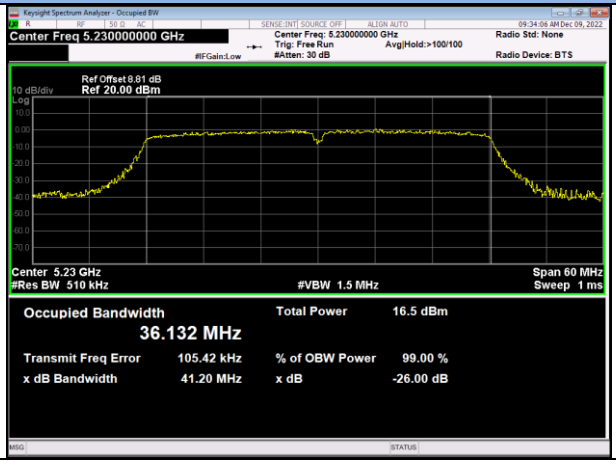
IEEE 802.11ac(VHT20) High Channel



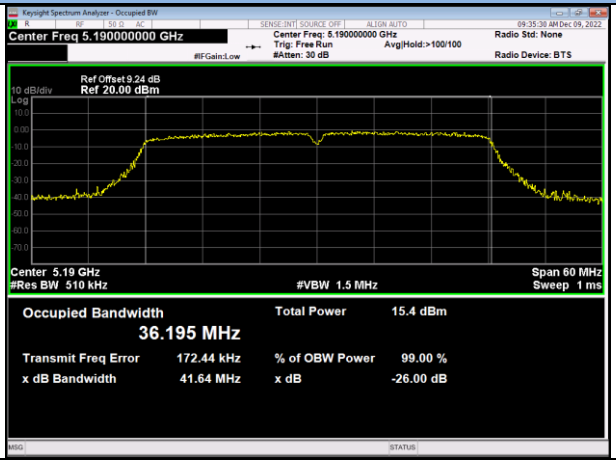
IEEE 802.11n(HT40) Low Channel

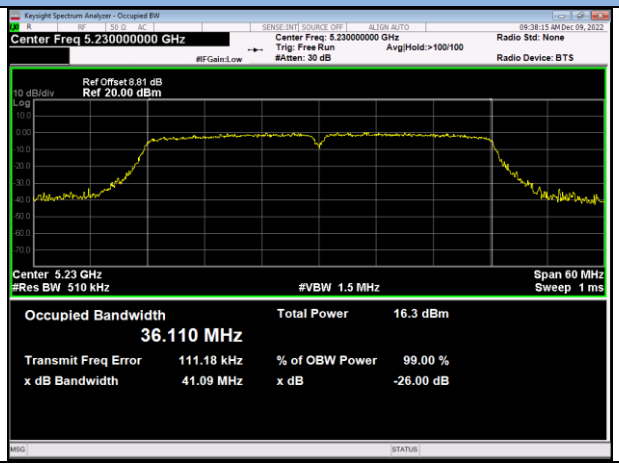
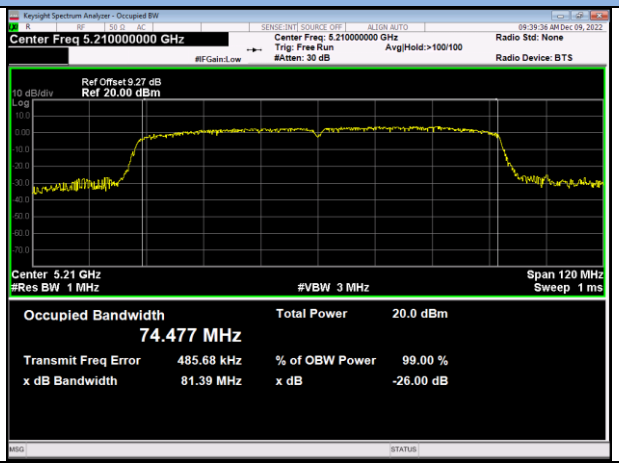


IEEE 802.11n(HT40) High Channel



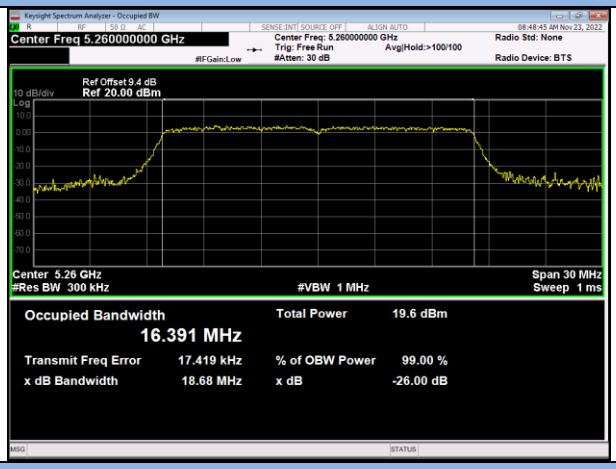
IEEE 802.11ac(VHT40) Low Channel



U-NII-1 / 26dB Bandwidth	
IEEE 802.11ac(VHT40) High Channel	IEEE 802.11ac(VHT80)
	

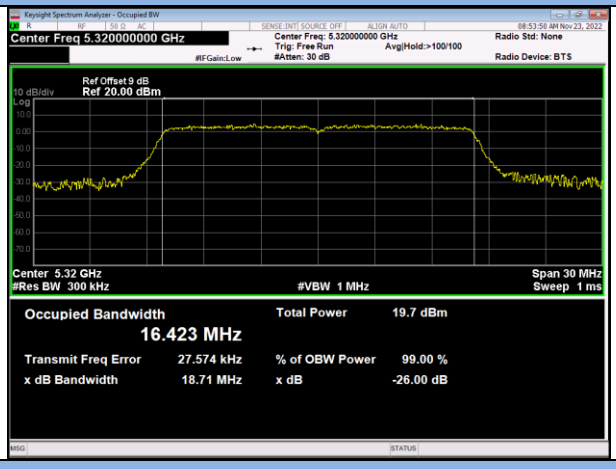
U-NII-2A / 26dB Bandwidth

IEEE 802.11a Low Channel

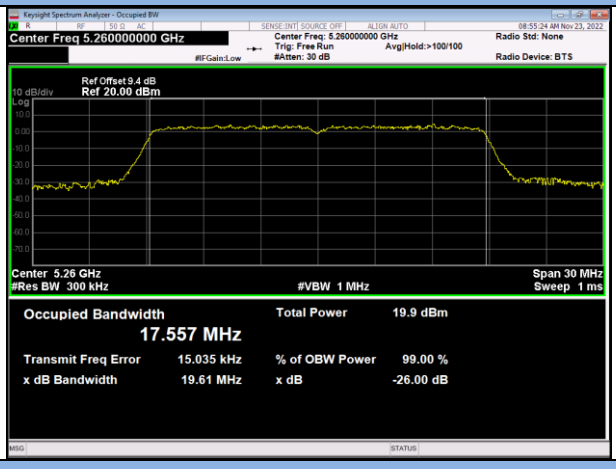


IEEE 802.11a Middle Channel

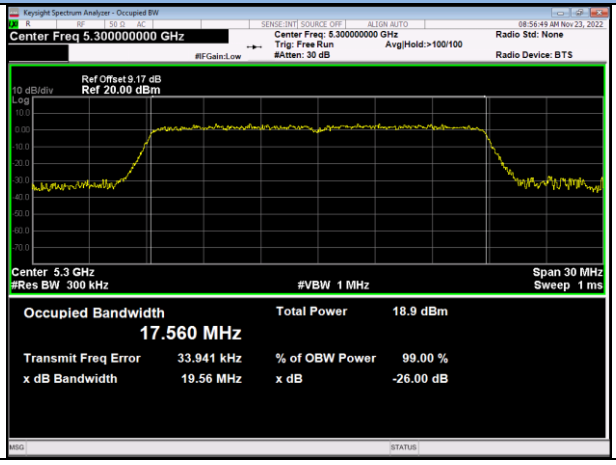
IEEE 802.11a High Channel



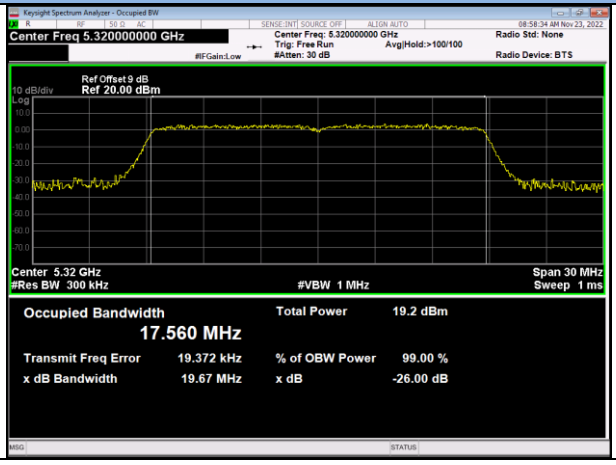
IEEE 802.11n(HT20) Low Channel



IEEE 802.11n(HT20) Middle Channel

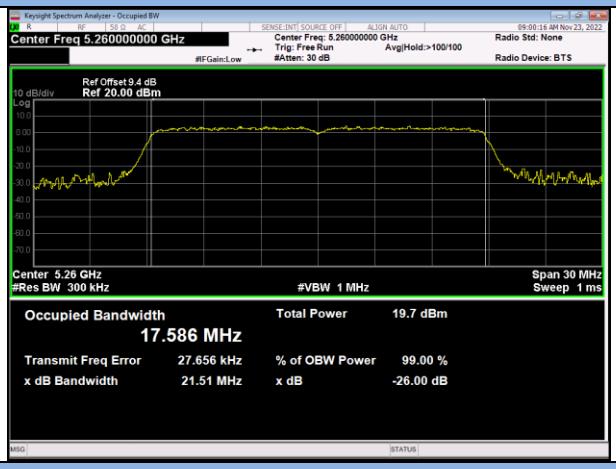


IEEE 802.11n(HT20) High Channel

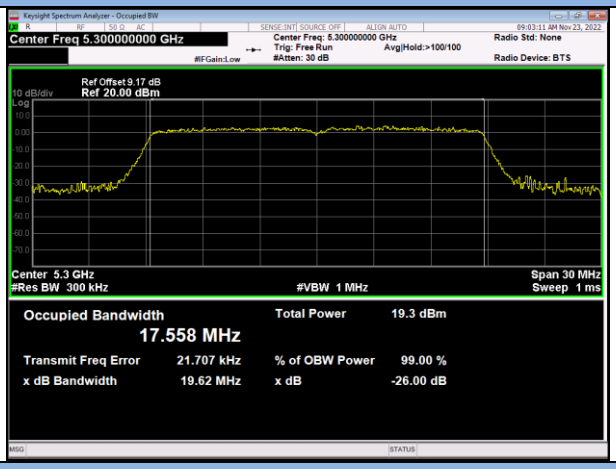


U-NII-2A / 26dB Bandwidth

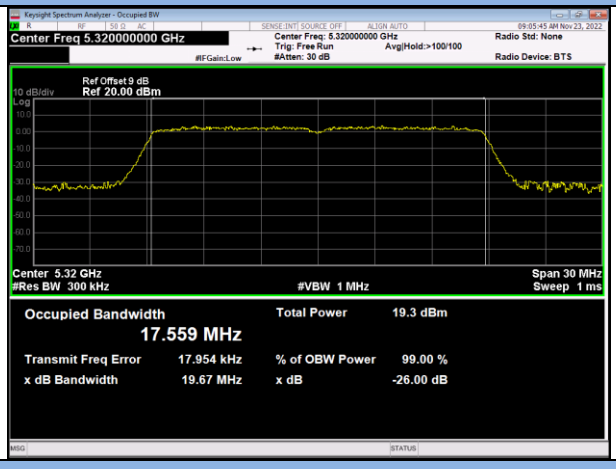
IEEE 802.11ac(VHT20) Low Channel



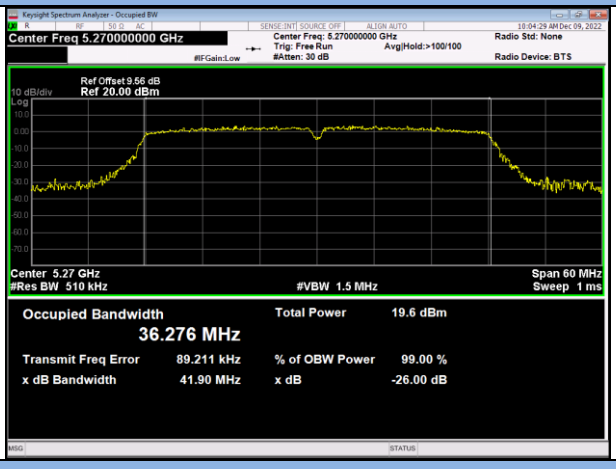
IEEE 802.11ac(VHT20) Middle Channel



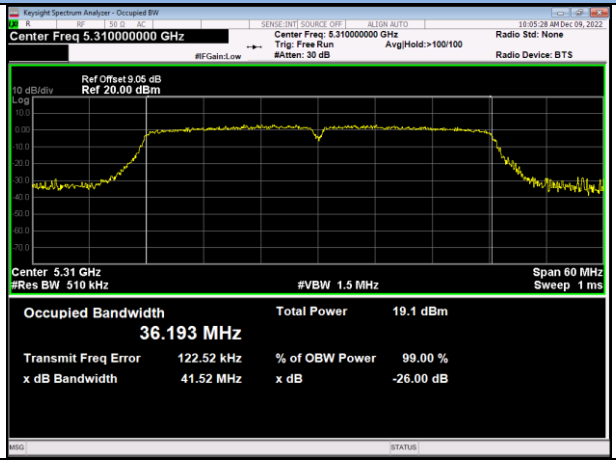
IEEE 802.11ac(VHT20) High Channel



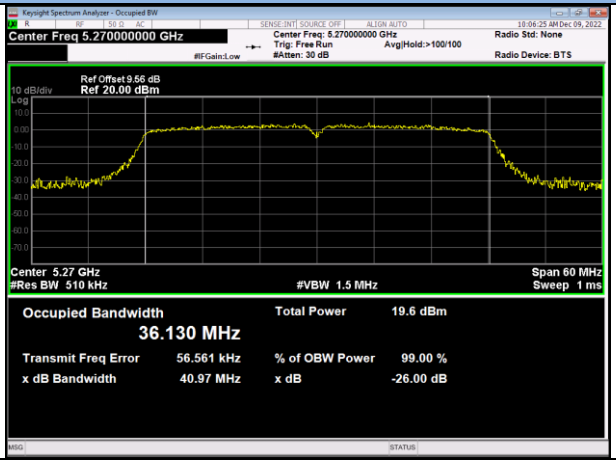
IEEE 802.11n(HT40) Low Channel

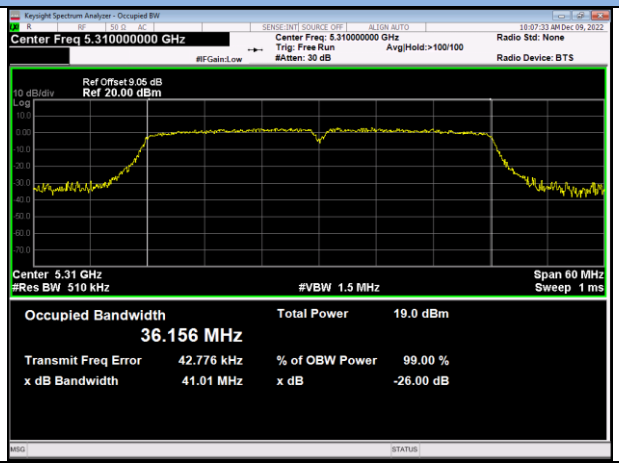
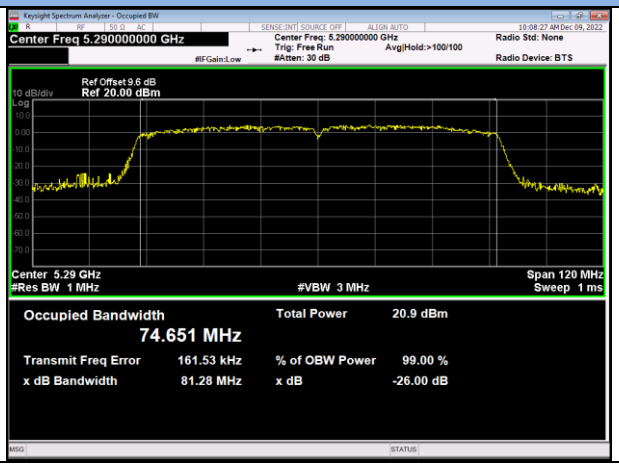


IEEE 802.11n(HT40) High Channel



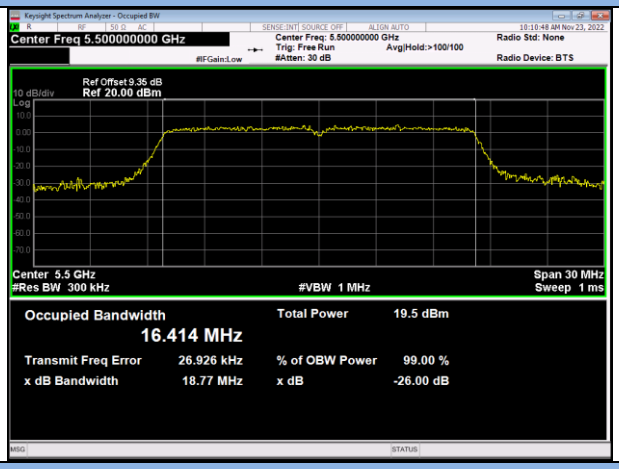
IEEE 802.11ac(VHT40) Low Channel



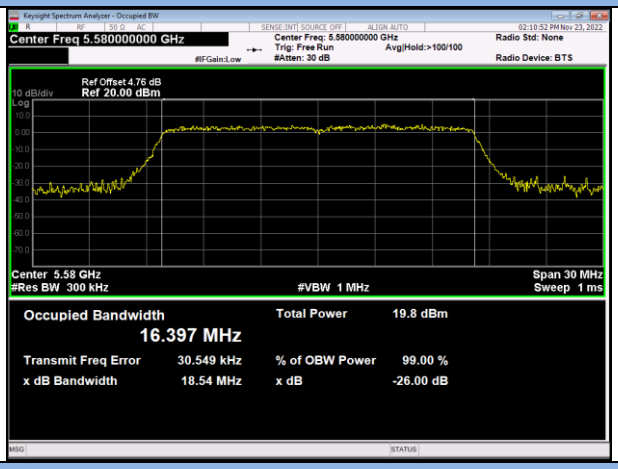
U-NII-2A / 26dB Bandwidth	
IEEE 802.11ac(VHT40) High Channel	IEEE 802.11ac(VHT80)
	

U-NII-2C / 26dB Bandwidth

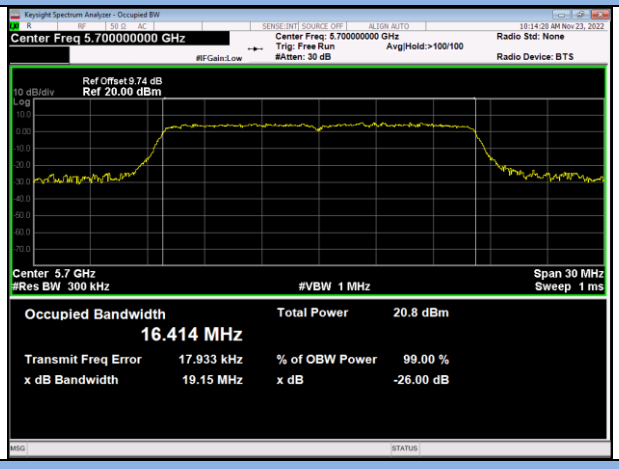
IEEE 802.11a Low Channel



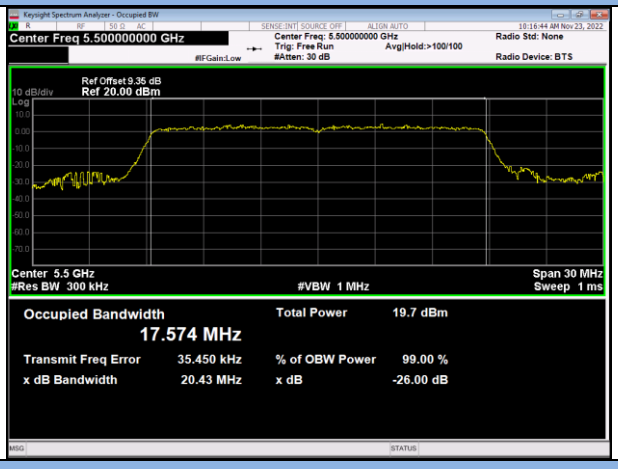
IEEE 802.11a Middle Channel



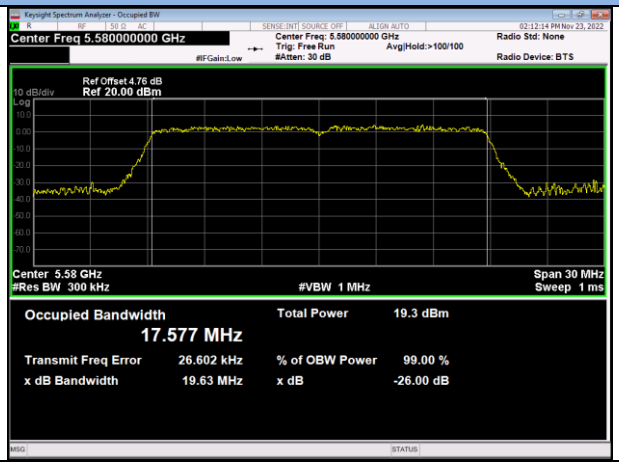
IEEE 802.11a High Channel



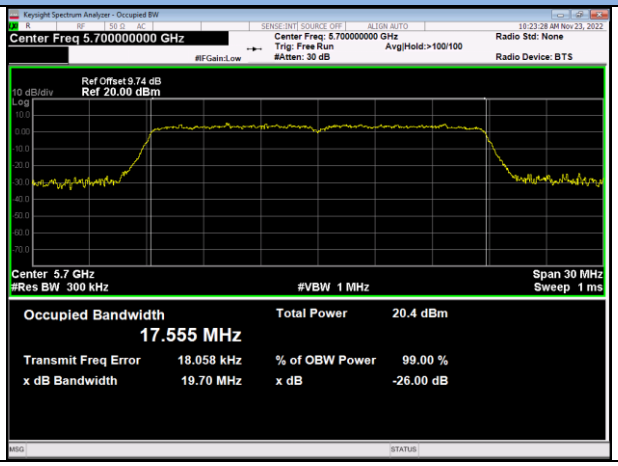
IEEE 802.11n(HT20) Low Channel



IEEE 802.11n(HT20) Middle Channel

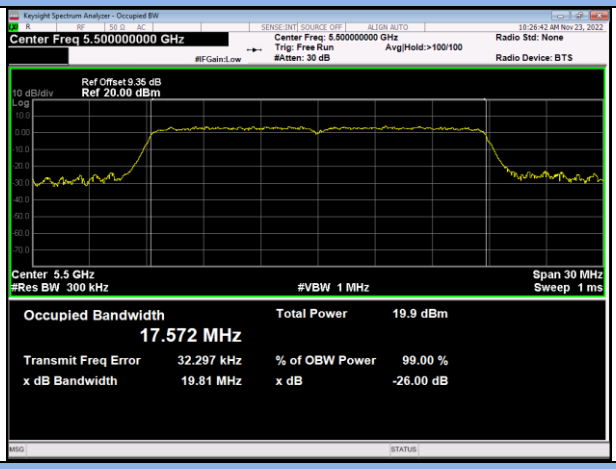


IEEE 802.11n(HT20) High Channel

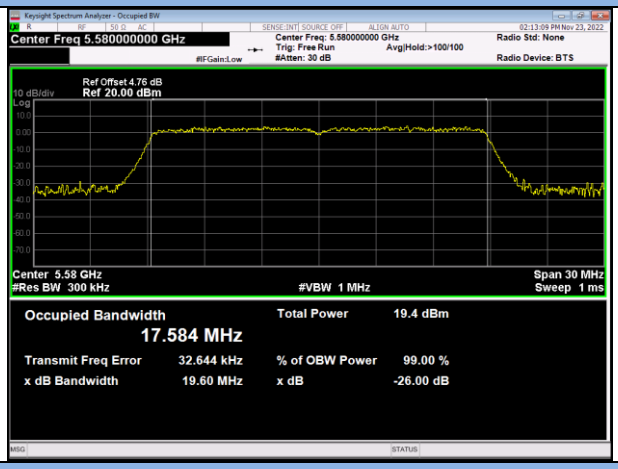


U-NII-2C / 26dB Bandwidth

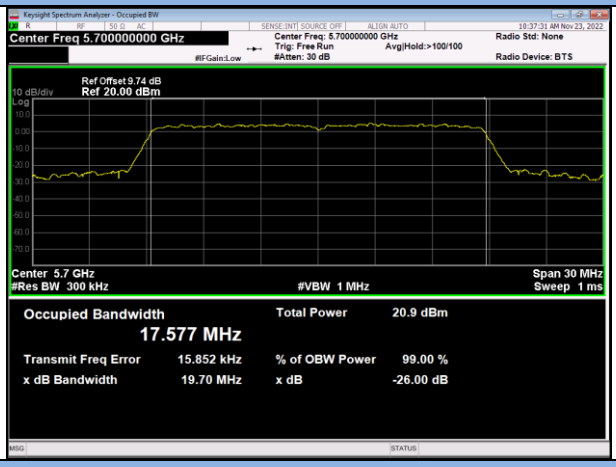
IEEE 802.11ac(VHT20) Low Channel



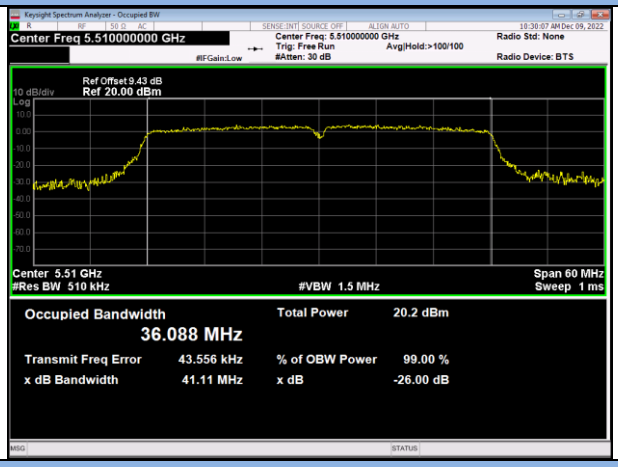
IEEE 802.11ac(VHT20) Middle Channel



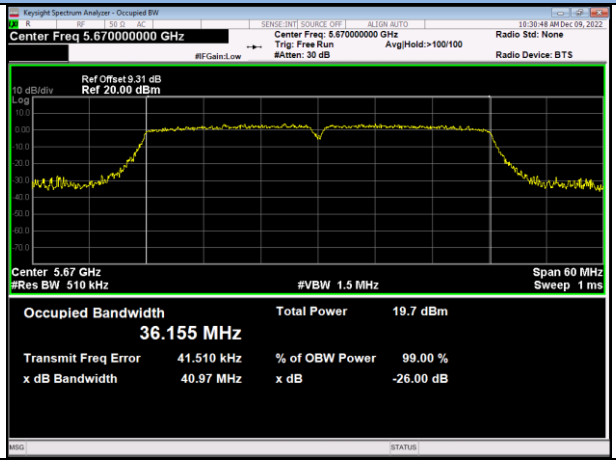
IEEE 802.11ac(VHT20) High Channel



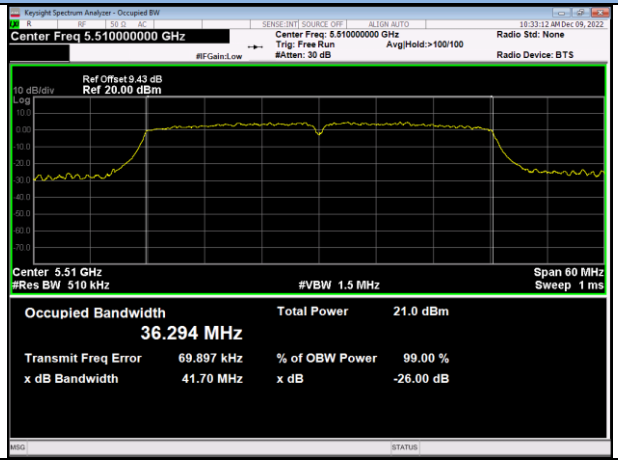
IEEE 802.11n(HT40) Low Channel



IEEE 802.11n(HT40) High Channel



IEEE 802.11ac(VHT40) Low Channel



U-NII-2C / 26dB Bandwidth	
IEEE 802.11ac(VHT40) High Channel	IEEE 802.11ac(VHT80)