RF TEST REPORT

Applicant	Shanghai Smawave Technology Co. ,Ltd
FCC ID	2AU8HSC421
Product	Cat12 Indoor CPE
Brand	Smawave
Model	SC421
Report No.	R2404A0415-R5
Issue Date	May 23, 2024

Eurofins TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15E (2023)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Prepared by: Zhu Chentao *Approved by: Xu Kai*

Eurofins TA Technology (Shanghai) Co., Ltd.

Building 3, No.145, Jintang Rd, Pudong Shanghai, P.R.China
TEL: +86-021-50791141/2/3
FAX: +86-021-50791141/2/3-8000

TABLE OF CONTENT

Summary of measurement results

Number	Test Case	Clause in FCC rules	Verdict
1	Average output power	15.407(a)	PASS
2	Occupied bandwidth	15.407(e)	PASS
3	Frequency stability	15.407(g)	PASS
4	Power spectral density	15.407(a)	PASS
5	Unwanted Emissions	15.407(b)	PASS
6	Conducted Emissions	15.207	PASS
Date of Testing: April 25, 2024 ~ May 10, 2024 Date of Sample Received: April 15, 2024			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard. All indications of Pass/Fail in this report are opinions expressed by Eurofins TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **Eurofins TA Technology (Shanghai) Co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

Eurofins TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA (Certificate Number: 3857.01)

Eurofins TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3. Testing Location

Company:	Eurofins TA Technology (Shanghai) Co., Ltd.
Address:	Building 3, No.145, Jintang Rd, Pudong Shanghai, P.R.China
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	https://www.eurofins.com/electrical-and-electronics
E-mail:	Kain.Xu@cpt.eurofinscn.com

2. General Description of Equipment under Test

2.1. Applicant and Manufacturer Information

Applicant	Shanghai Smawave Technology Co. ,Ltd
Applicant address	3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China
Manufacturer	Shanghai Smawave Technology Co. ,Ltd
Manufacturer address	3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China

2.2. General information

EUT Description			
Model	SC421		
SN	Conducted: FG1JQE0001 Radiated: SC421X00241500011		
Hardware Version	/		
Software Version	/		
Power Supply	AC adapter		
Antenna Type	PCB Antenna		
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)		
Antenna Gain	Band	Antenna 1 (dBi)	Antenna 2 (dBi)
	U-NII-1	1.75	1.83
	U-NII-3	2.55	2.14
MIMO Directional Gain	Band	Power (dBi)	PSD (dBi)
	U-NII-1	1.83	4.84
	U-NII-3	2.55	5.56
Beamforming Directional Gain	Band	Power (dBi)	PSD (dBi)
	U-NII-1	2.80	2.80
	U-NII-3	2.80	2.80
Operating Frequency Range(s)	U-NII-1: 5150MHz-5250MHz U-NII-3: 5725MHz -5850MHz		
Modulation Type	802.11a: OFDM 802.11n (HT20/HT40): OFDM 802.11ac (VHT20/VHT40/VHT80): OFDM		
Max. Output Power	20.18 dBm		
Testing temperature range	-30 ° C to 50° C		
Operating temperature range	-10 ° C to 45 ° C		

Operating voltage range	9.6 V to 14.4V
Testing voltage range	Extreme Low 9.6 V; Normal 12 V; Extreme High 14.4 V
State DC voltage	12 V
EUT Accessory	
Adapter	Manufacturer: SHENZHEN TOPOW Model: TPA259-18120-US
Auxiliary test equipment	
PC	Manufacturer: DELL Model: Latitude 3301 (SN: DR6DJW2)

Note:
1. The EUT is sent from the applicant to Eurofins TA and the information of the EUT is declared by the applicant.
2. This device support automatically discontinue transmission, while the device is not transmitting any information, the device can automatically discontinue transmission and become standby mode for power saving. The device can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.
3. (a) Manufacturers implements security features in any digitally modulated devices capable of operating in any of the U-NII bands, so that third parties are not able to reprogram the device to operate outside the parameters for which the device was certified. The software prevents the user from operating the transmitter with operating frequencies, output power, modulation types or other radio frequency parameters outside those that were approved for the device. Manufacturers uses means including, but not limited to the use of a private network that allows only authenticated users to download software, electronic signatures in software or coding in hardware that is decoded by software to verify that new software can be legally loaded into a device to meet these requirements and must describe the methods in their application for equipment authorization.
(b) Manufacturers take steps to ensure that DFS functionality cannot be disabled by the operator of the U-NII device.
4. The manufacturer declared the Beamforming gain is 2.80dBi, data sharing between Beamforming and MIMO.

3. Applied Standards

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

Test standards:

FCC CFR47 Part 15E (2023) Unlicensed National Information Infrastructure Devices

ANSI C63.10-2013

Reference standard:

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

KDB 662911 D01 Multiple Transmitter Output v02r01

4. Test Configuration

Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (y axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Mode	Data Rate		
	Antenna 1	Antenna 2	MIMO/Beamforming
802.11a	6 Mbps	6 Mbps	6 Mbps
802.11n HT20	MCS0	MCS0	MCS8
802.11n HT40	MCS0	MCS0	MCS8
802.11ac VHT20	MCS0	MCS0	MCS0
802.11ac VHT40	MCS0	MCS0	MCS0
802.11ac VHT80	MCS0	MCS0	MCS0

The worst case Antenna mode for each of the following tests for Wi-Fi:

Test Cases	Antenna 1	Antenna 2	MIMO/Beamforming
Average conducted output power	O	O	O
Occupied bandwidth	--	--	O
Frequency stability	--	--	802.11a
Power Spectral Density	O	O	O
Unwanted Emissions	--	--	802.11a 802.11n HT20/40 802.11ac VHT80
Conducted Emissions	--	--	802.11ac VHT80
Note：“O”: test all bands			

Wireless Technology and Frequency Range

Wireless Technology		Bandwidth	Channel	Frequency
Wi-Fi	U-NII-1	20 MHz	36	5180MHz
			40	5200MHz
			44	5220MHz
			48	5240MHz
		40 MHz	38	5190MHz
			46	5230MHz
		80 MHz	42	5210MHz
	U-NII-3	20 MHz	149	5745MHz
			153	5765MHz
			157	5785MHz
			161	5805MHz
			165	5825MHz
		40 MHz	151	5755MHz
			159	5795MHz
		80 MHz	155	5775MHz
Does this device support TPC Function? ☐Yes ☒No				

5. Test Case Results

5.1. Occupied Bandwidth

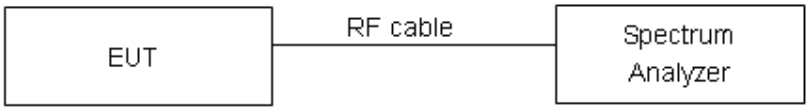
Ambient condition

Temperature	Relative humidity	Pressure
15°C ~ 35°C	20% ~ 80%	86 kPa ~ 106 kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.
For U-NII-1, set RBW ≈1% OCB kHz, VBW ≥ 3 × RBW, 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.
For U-NII-3, Set RBW = 100 kHz, VBW ≥ 3 × RBW, 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.
Use the 99 % power bandwidth function of the instrument

Test Setup



Limits

For U-NII-1
No specific occupied bandwidth requirements in Part 15.407.
For U-NII-3
Rule FCC Part §15.407(e)
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

U-NII-1

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5180	16.539	19.900	PASS
	5200	16.566	20.093	PASS
	5240	16.793	22.343	PASS
802.11n HT20	5180	17.604	20.255	PASS
	5200	17.605	20.224	PASS
	5240	17.746	21.039	PASS
802.11n HT40	5190	36.065	40.477	PASS
	5230	36.099	46.464	PASS
802.11ac VHT20	5180	17.610	20.090	PASS
	5200	17.630	20.540	PASS
	5240	17.727	23.910	PASS
802.11ac VHT40	5190	35.996	40.452	PASS
	5230	36.055	47.058	PASS
802.11ac VHT80	5210	75.455	80.233	PASS

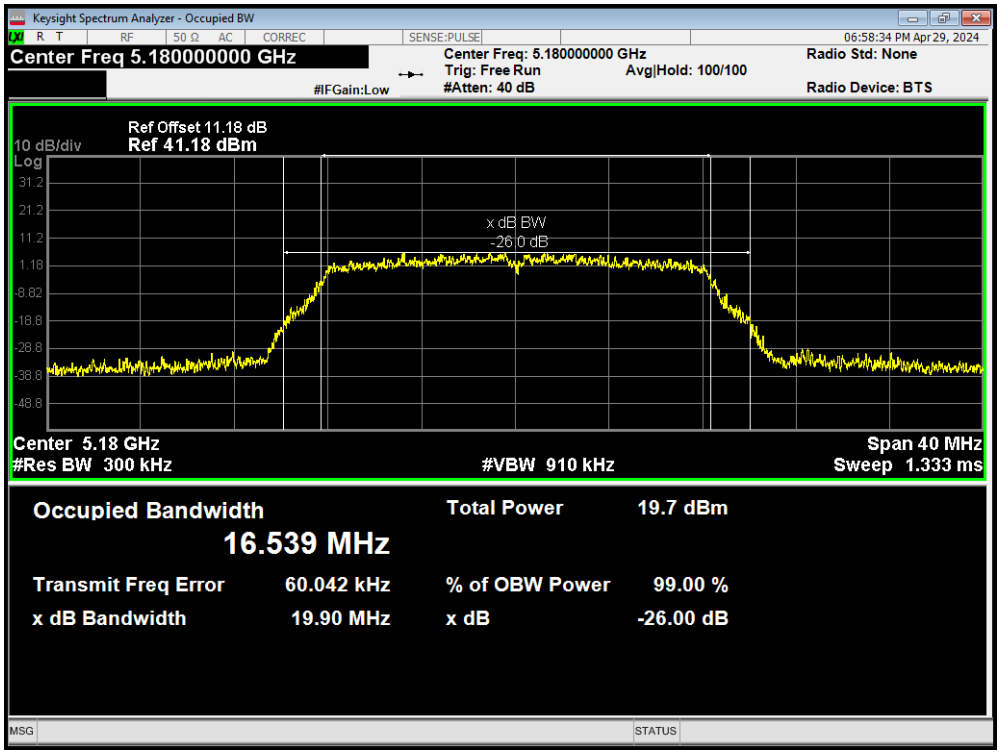
U-NII-3

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11a	5745	16.676	14.309	500	PASS
	5785	16.684	15.271	500	PASS
	5825	16.517	15.479	500	PASS
802.11n HT20	5745	17.739	15.034	500	PASS
	5785	17.683	13.461	500	PASS
	5825	17.595	15.660	500	PASS
802.11n HT40	5755	36.117	33.839	500	PASS
	5795	36.114	34.997	500	PASS
802.11ac VHT20	5745	17.705	14.559	500	PASS
	5785	17.683	13.879	500	PASS
	5825	17.661	13.848	500	PASS
802.11ac VHT40	5755	36.233	33.801	500	PASS
	5795	36.154	33.757	500	PASS
802.11ac VHT80	5775	75.558	75.070	500	PASS

99% bandwidth

U-NII-1

OBW 802.11a 5180MHz



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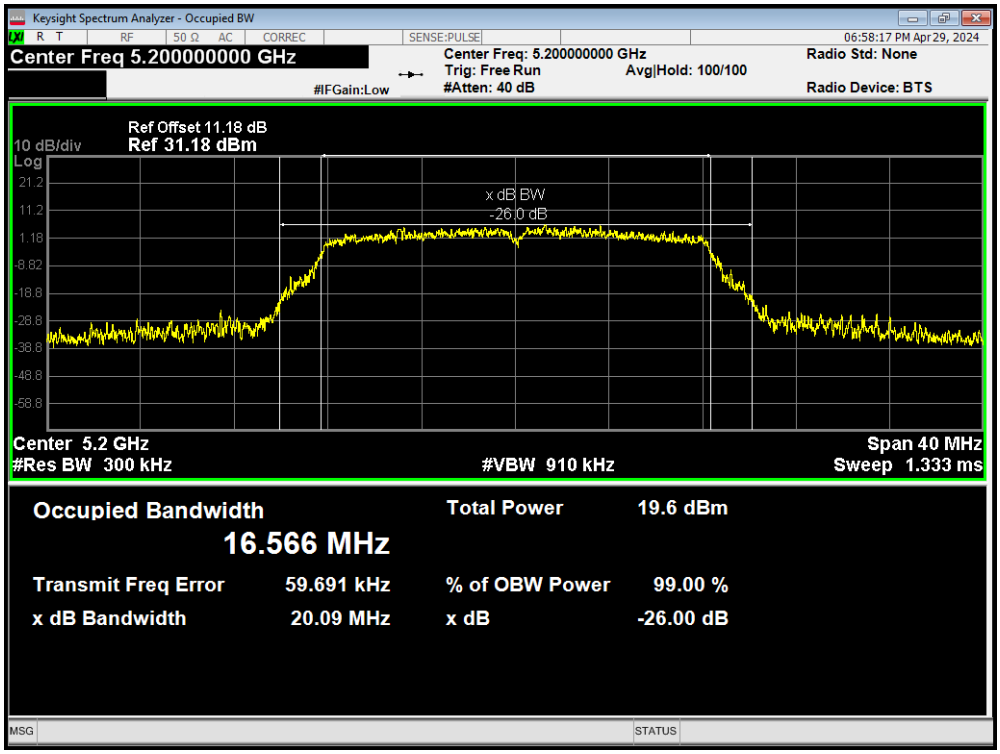

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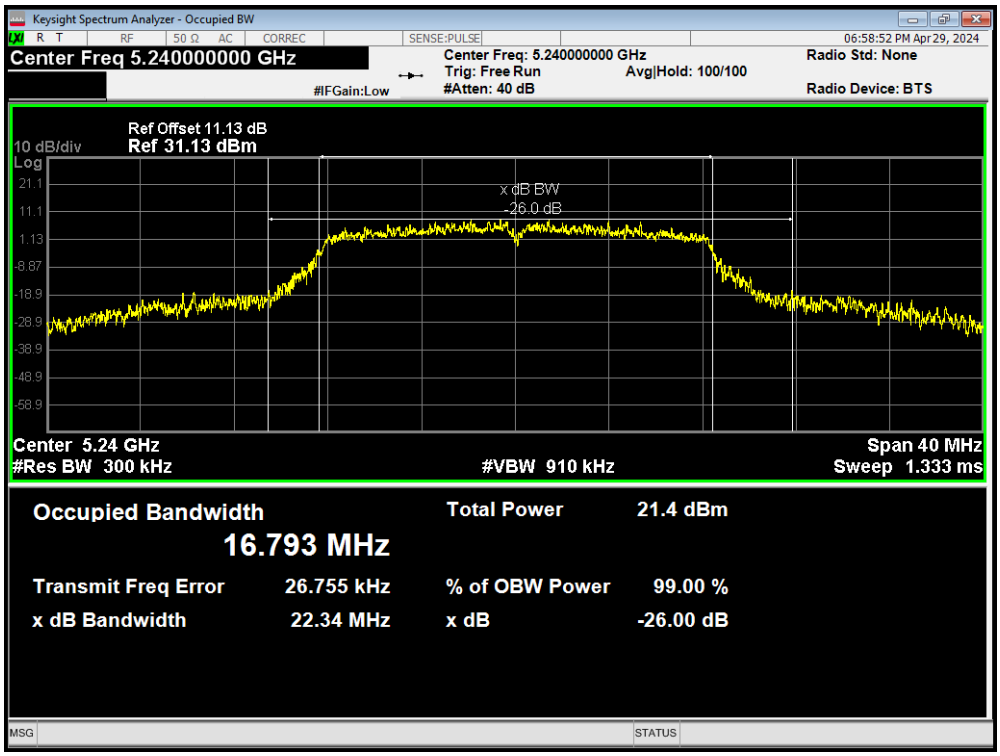
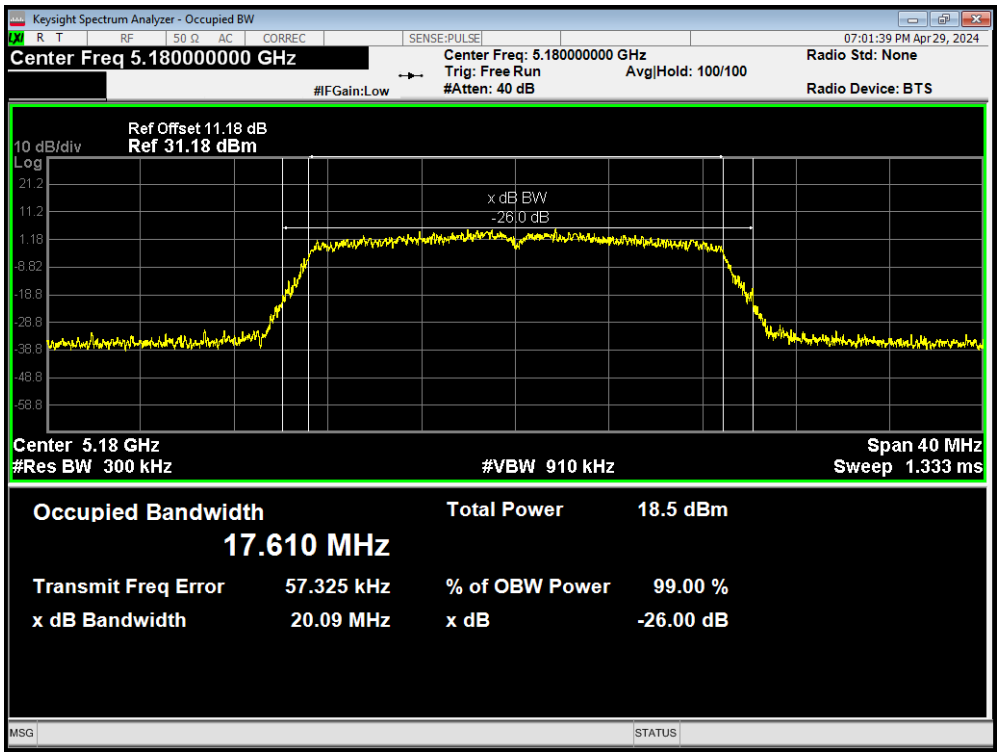


OBW 802.11ac(VHT20) 5180MHz



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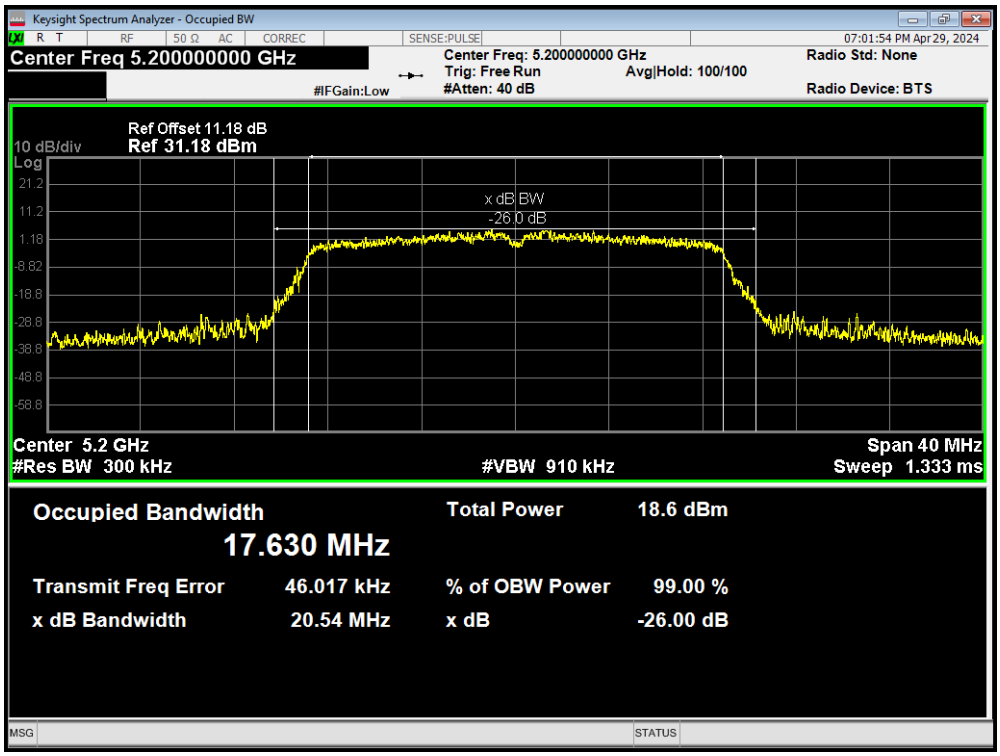

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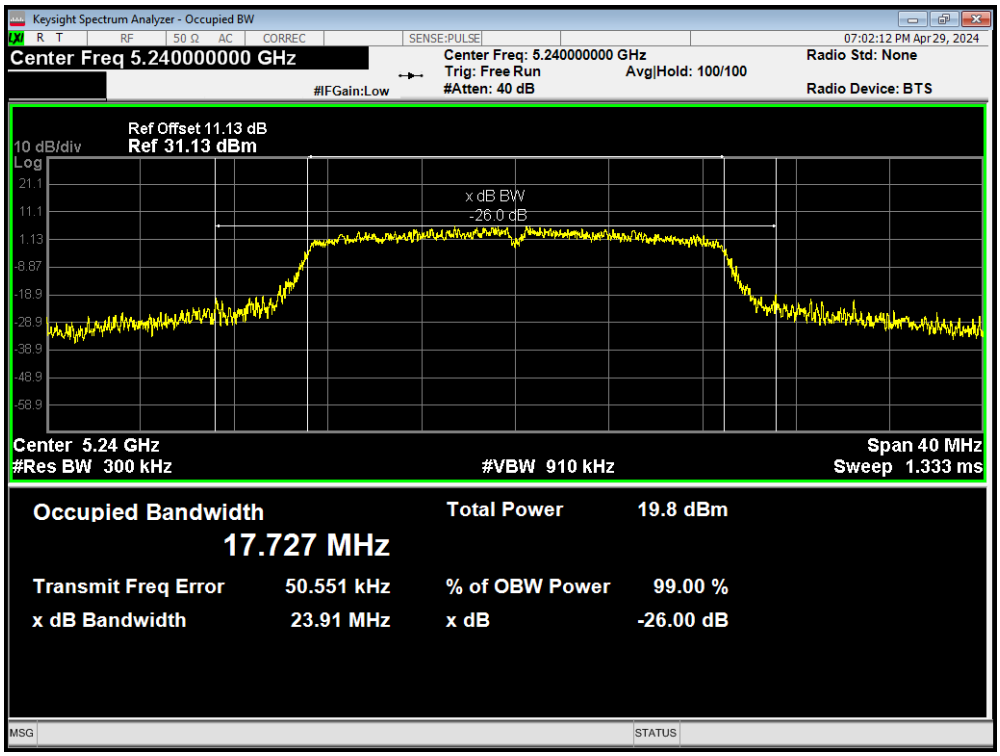

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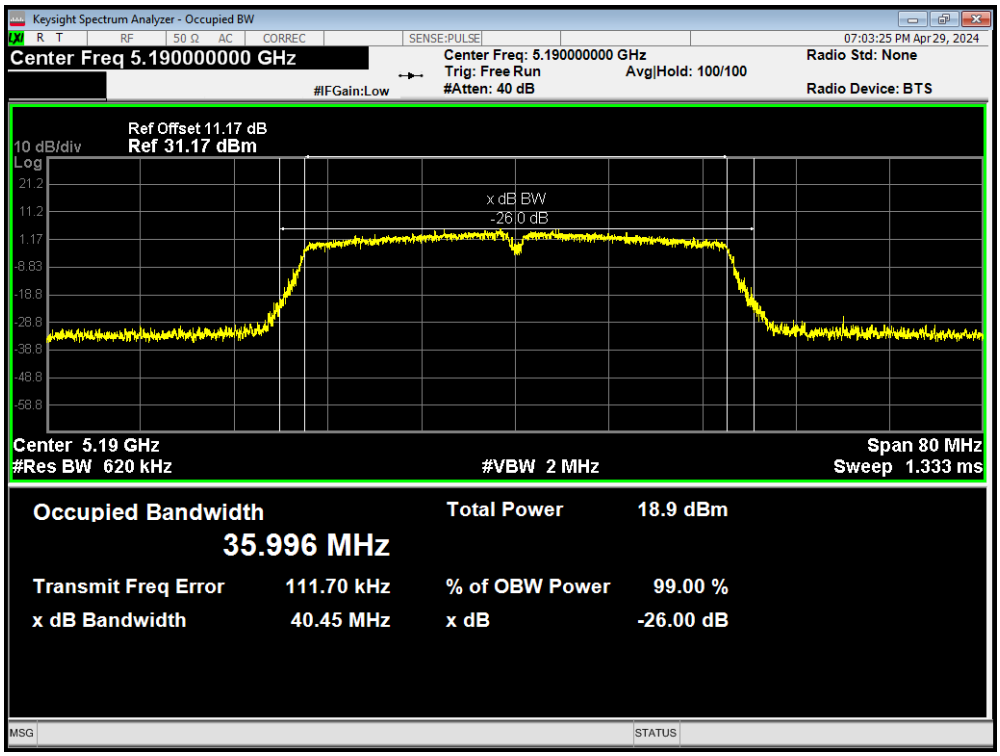

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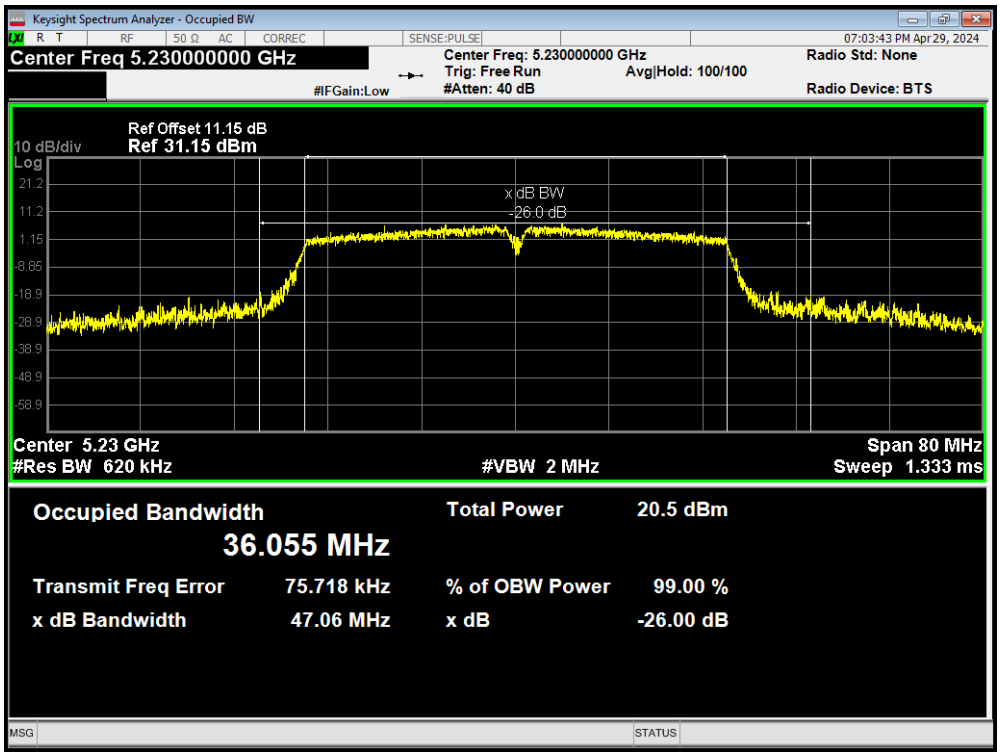
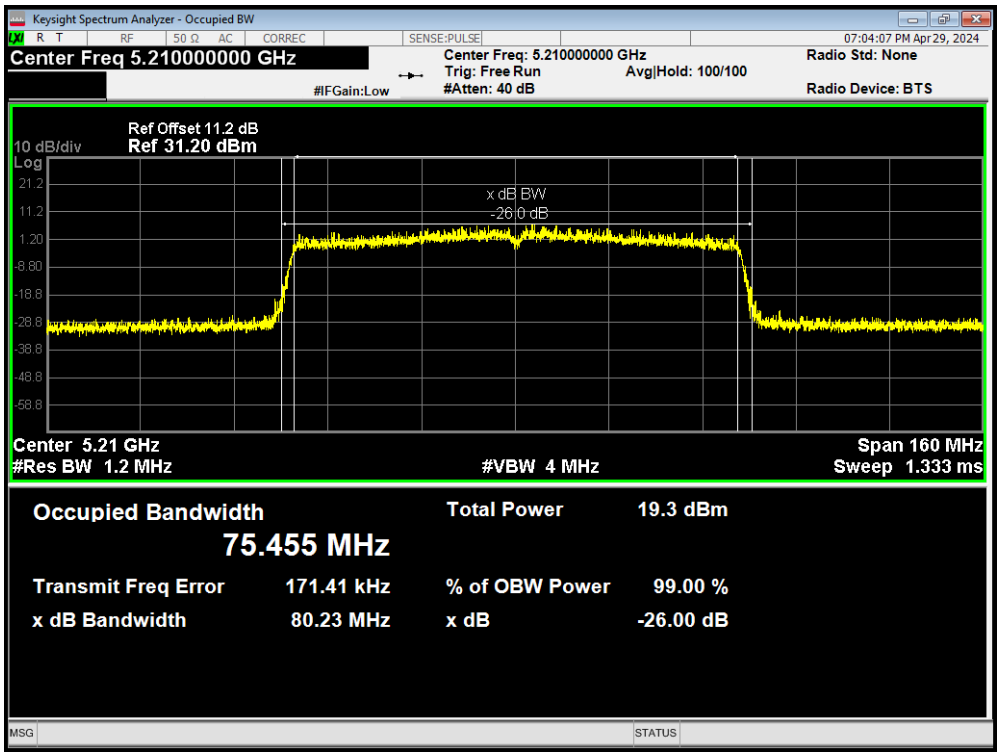


OBW 802.11ac(VHT80) 5210MHz



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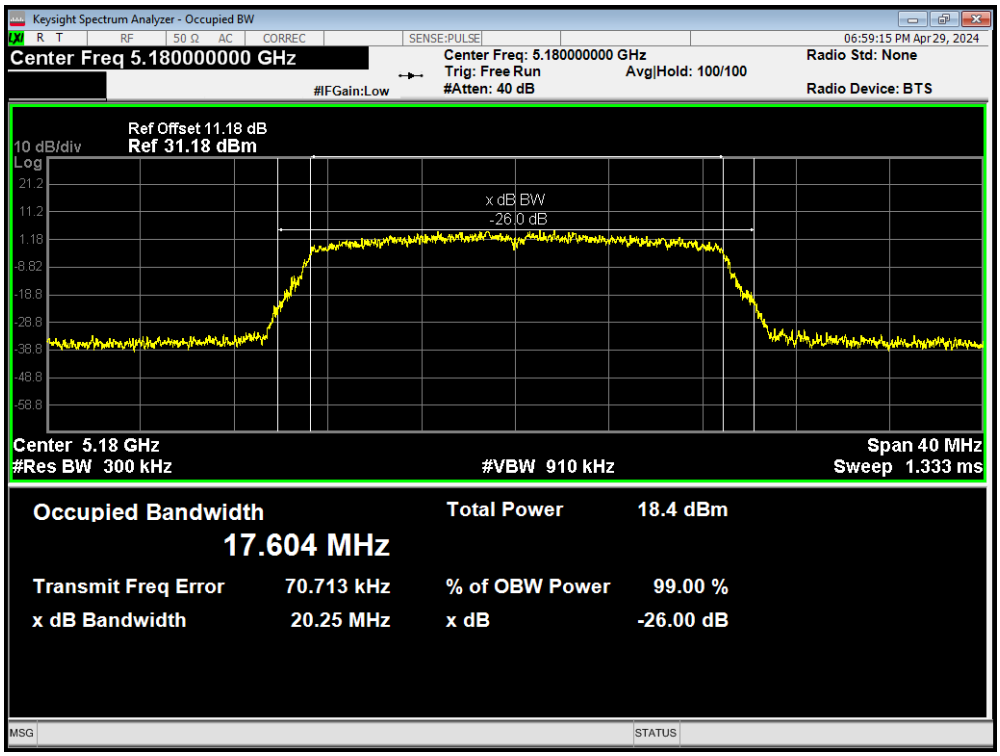

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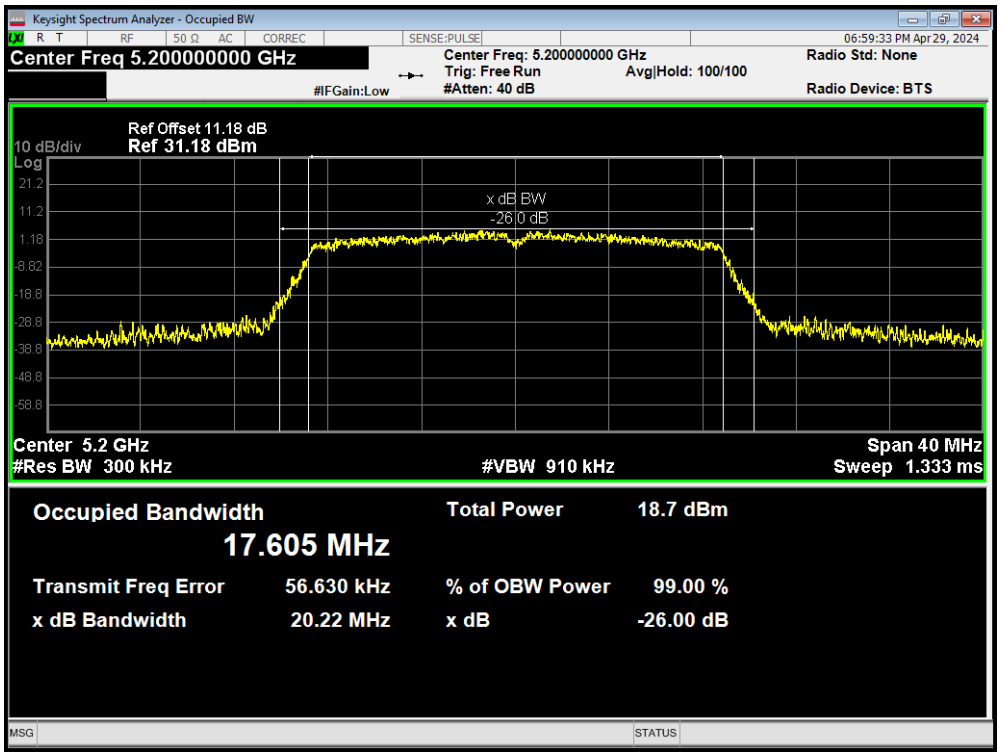

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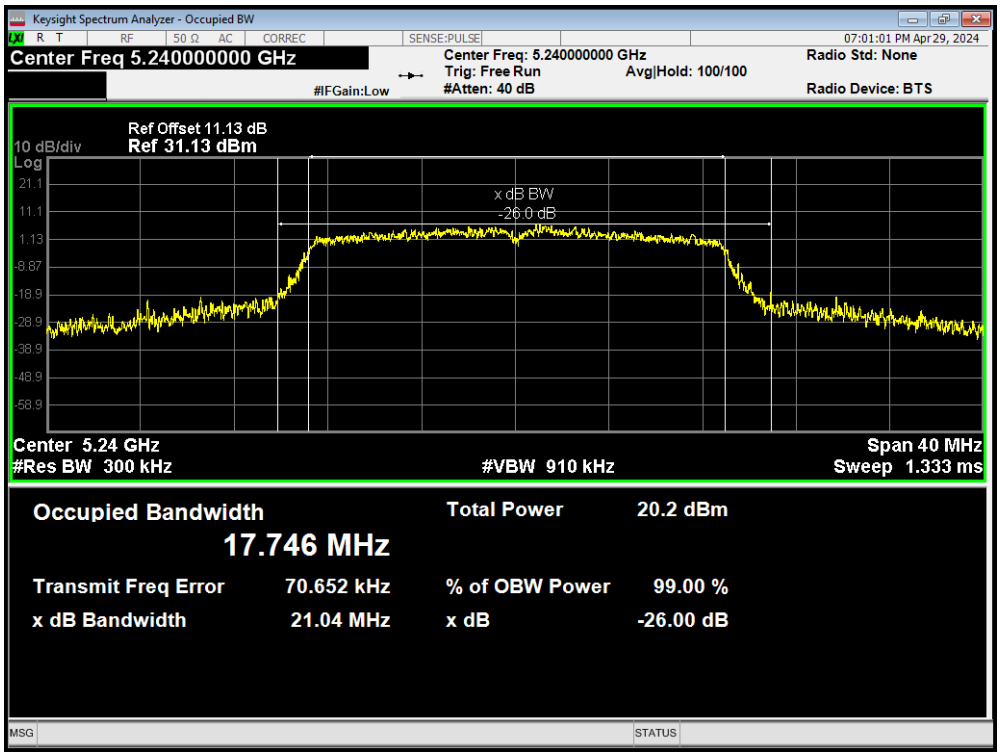
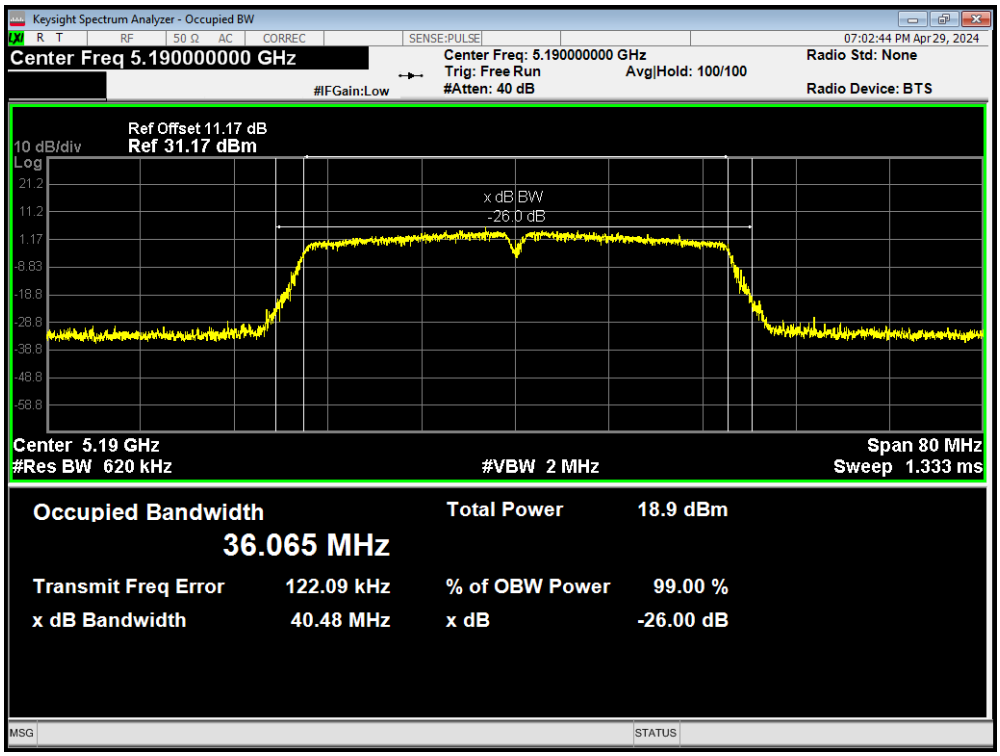
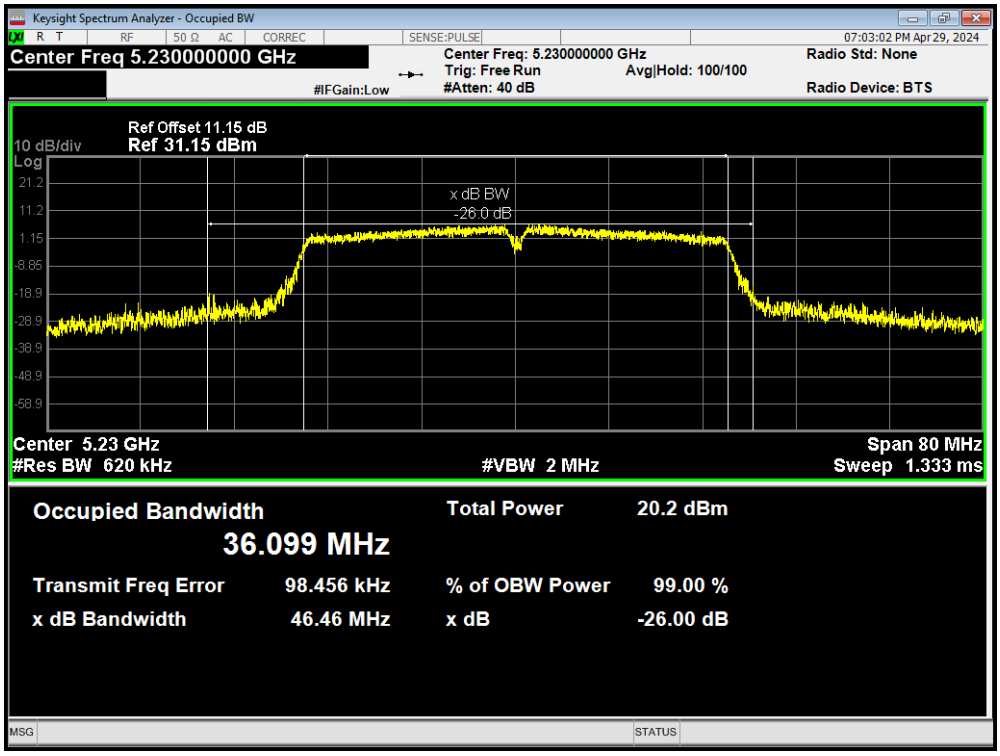


OBW 802.11n(HT40) 5190MHz

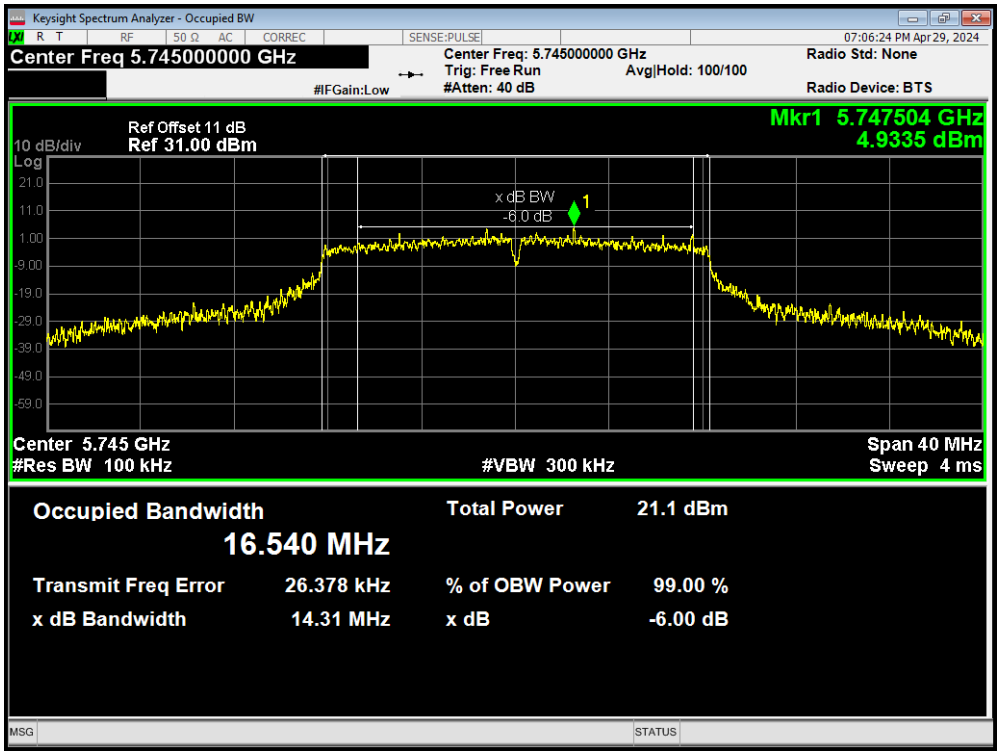


OBW 802.11n(HT40) 5230MHz

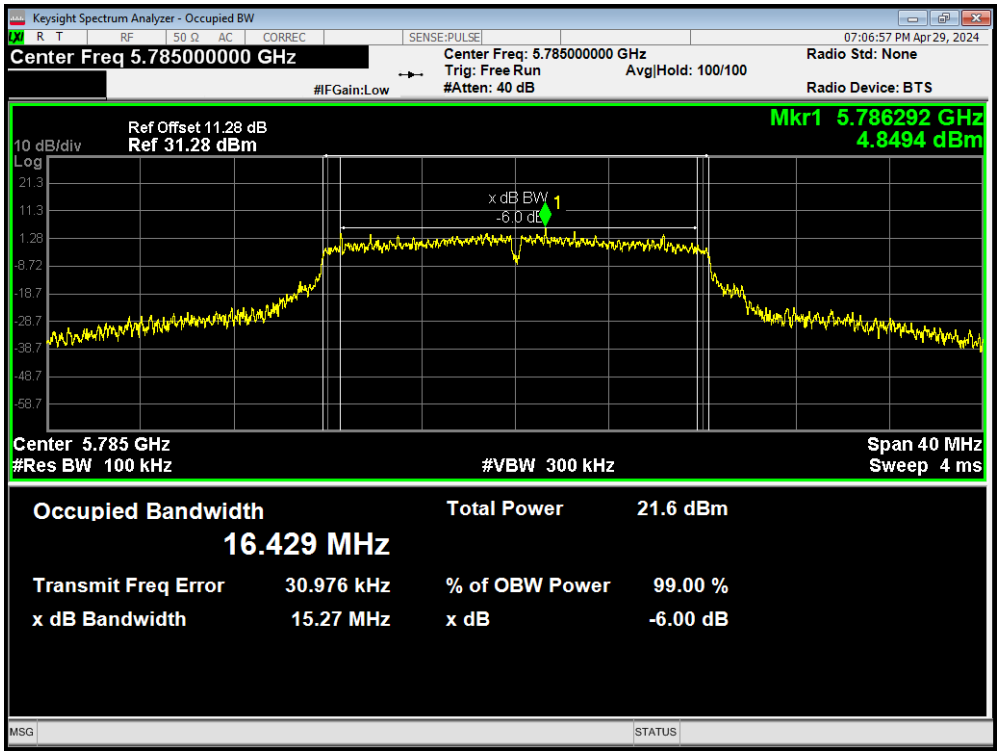


U-NII-3

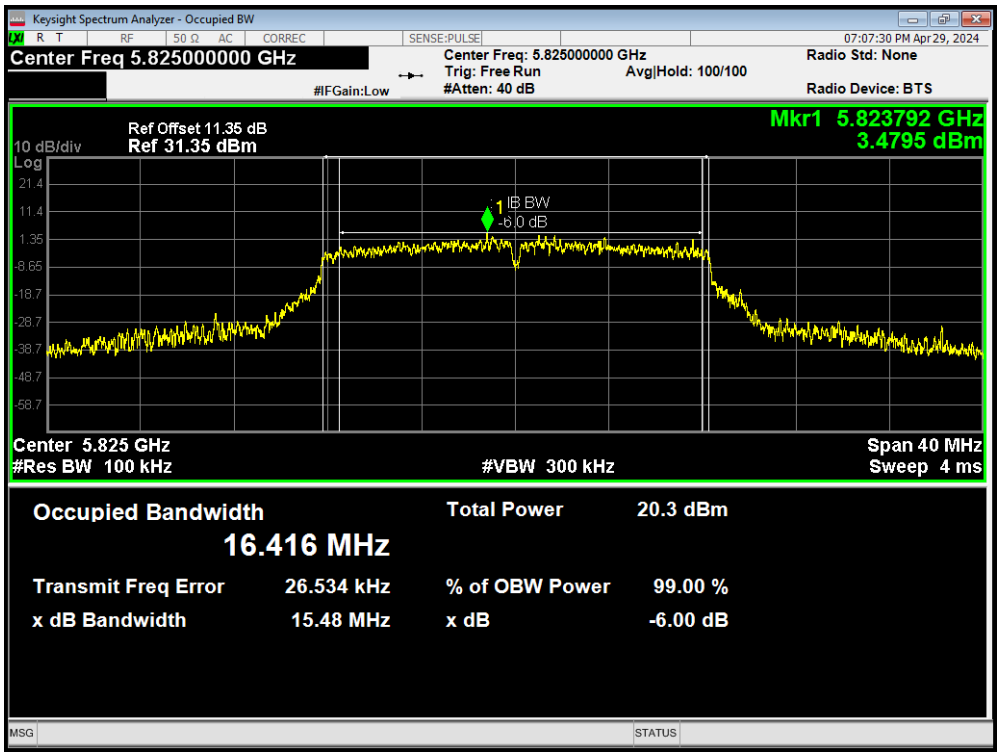
-6dB Bandwidth 802.11a 5745MHz



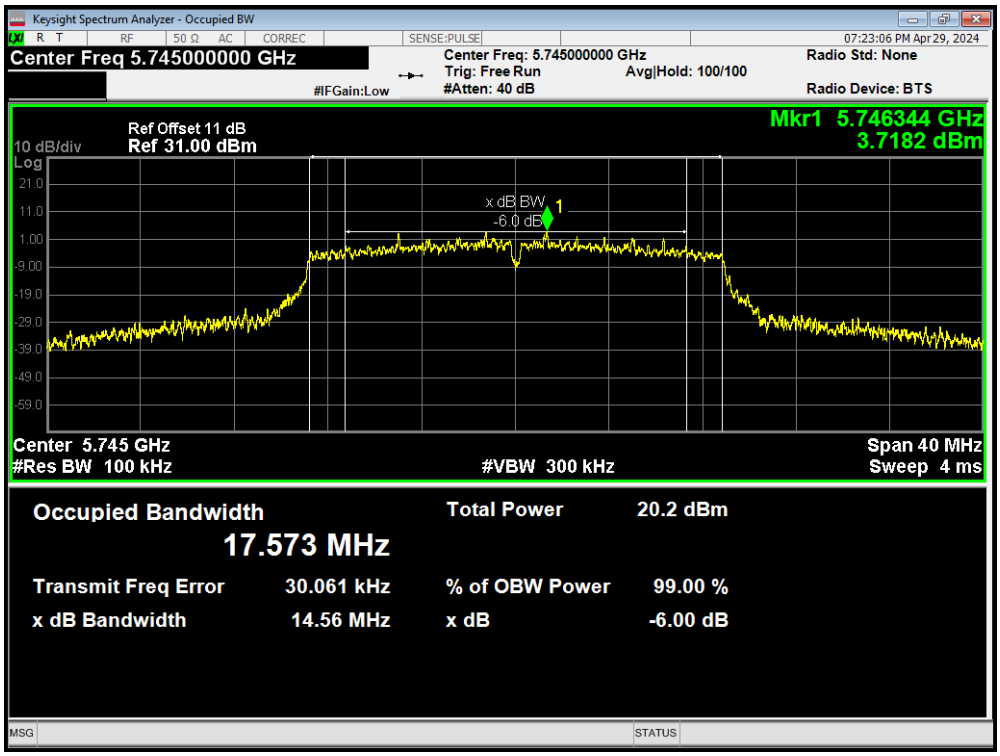
-6dB Bandwidth 802.11a 5785MHz



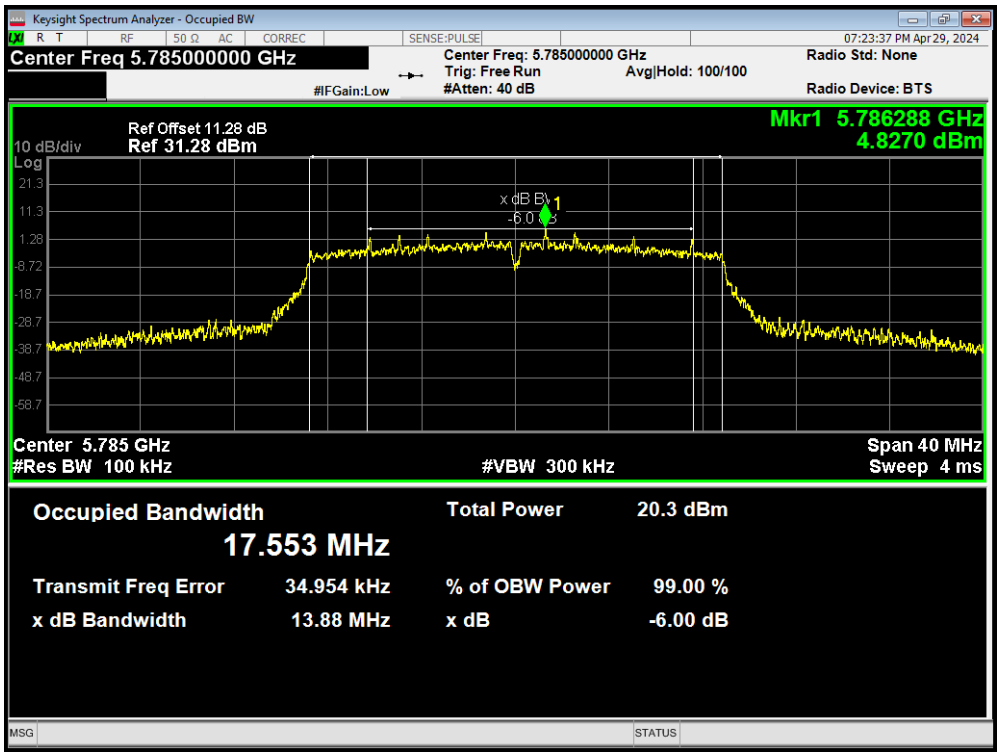
-6dB Bandwidth 802.11a 5825MHz



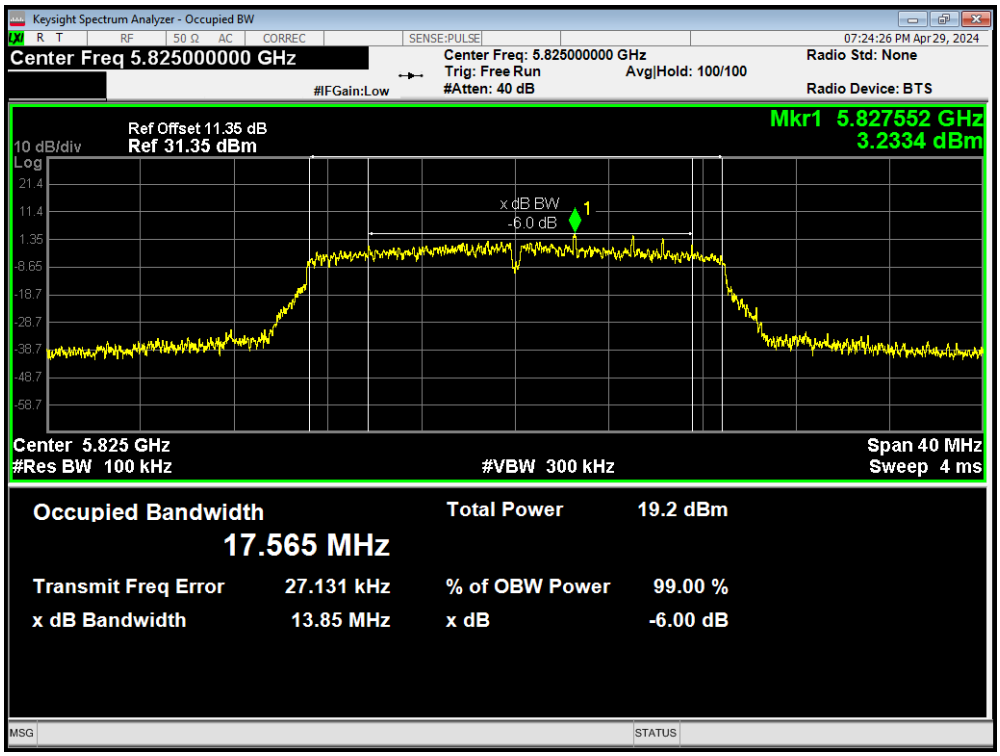
-6dB Bandwidth 802.11ac(VHT20) 5745MHz



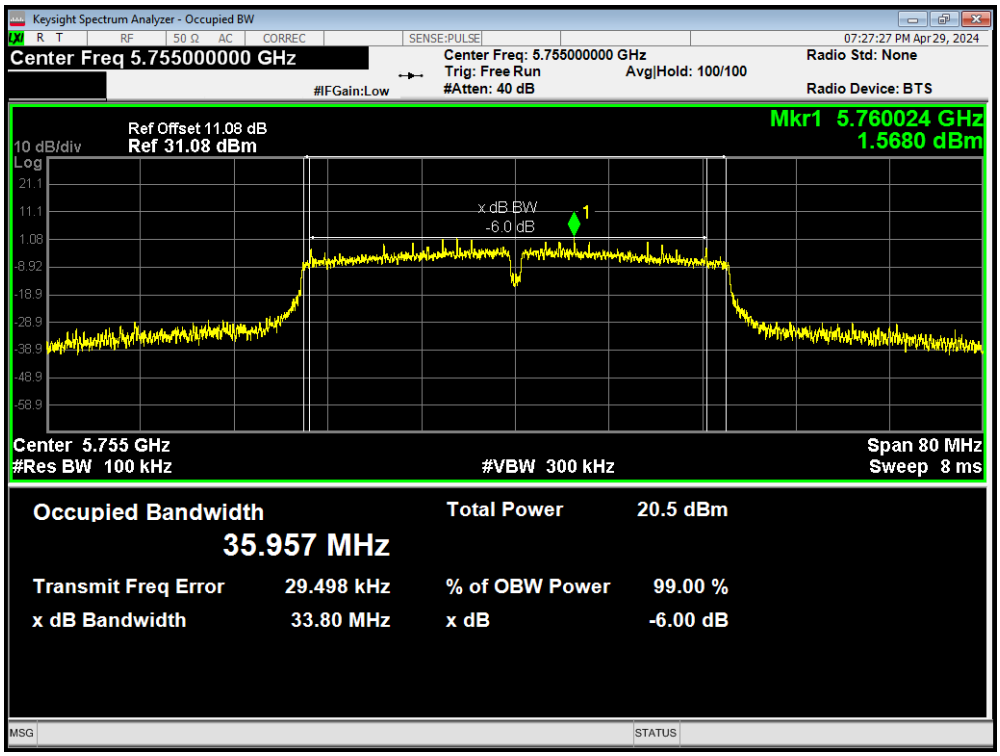
-6dB Bandwidth 802.11ac(VHT20) 5785MHz



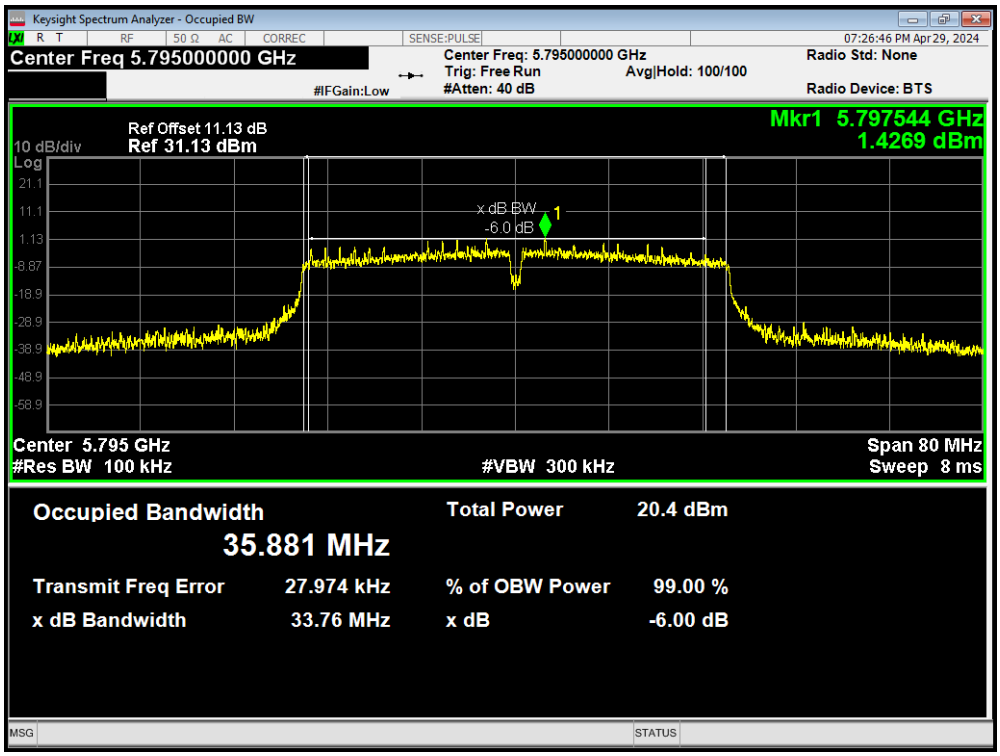
-6dB Bandwidth 802.11ac(VHT20) 5825MHz



-6dB Bandwidth 802.11ac(VHT40) 5755MHz



-6dB Bandwidth 802.11ac(VHT40) 5795MHz



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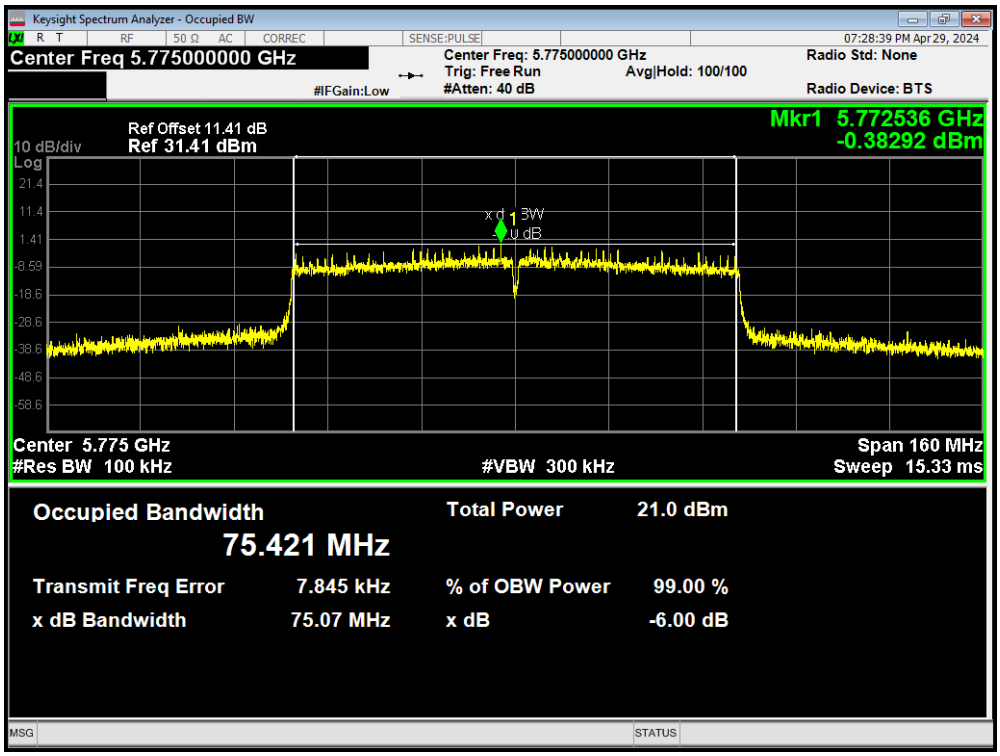
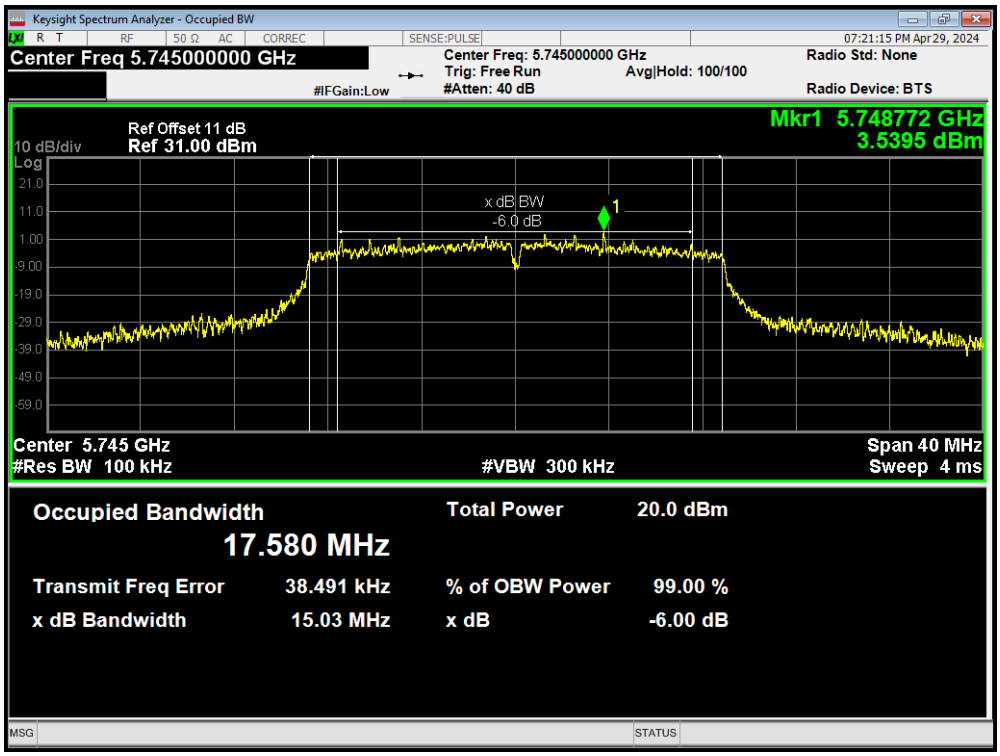
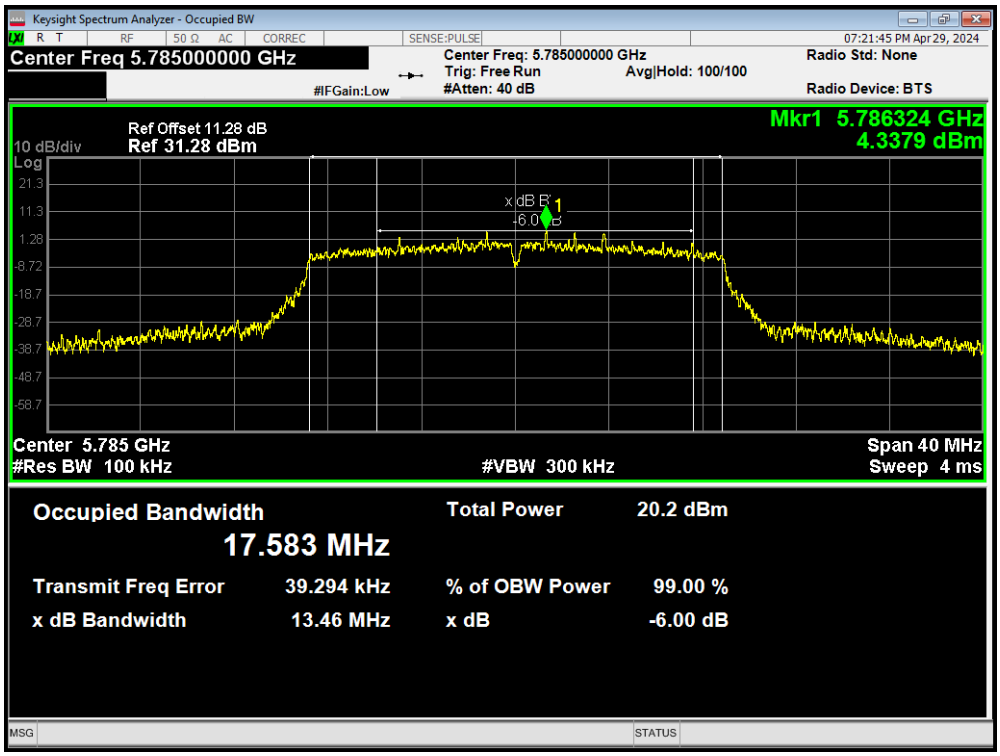


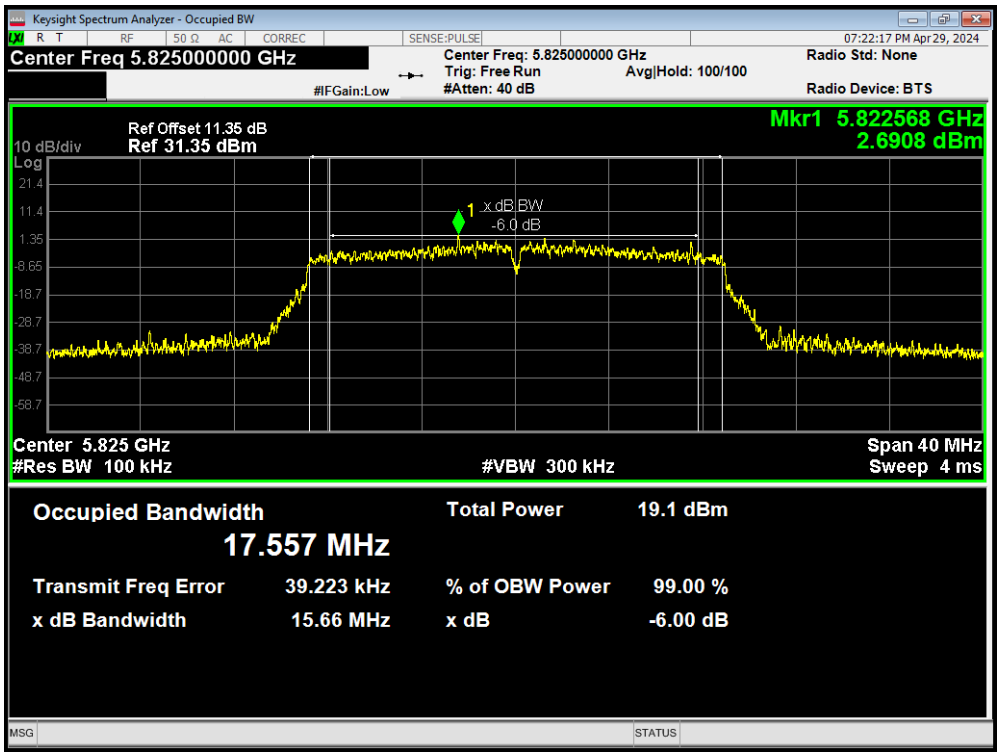
-6dB Bandwidth 802.11n(HT20) 5745MHz



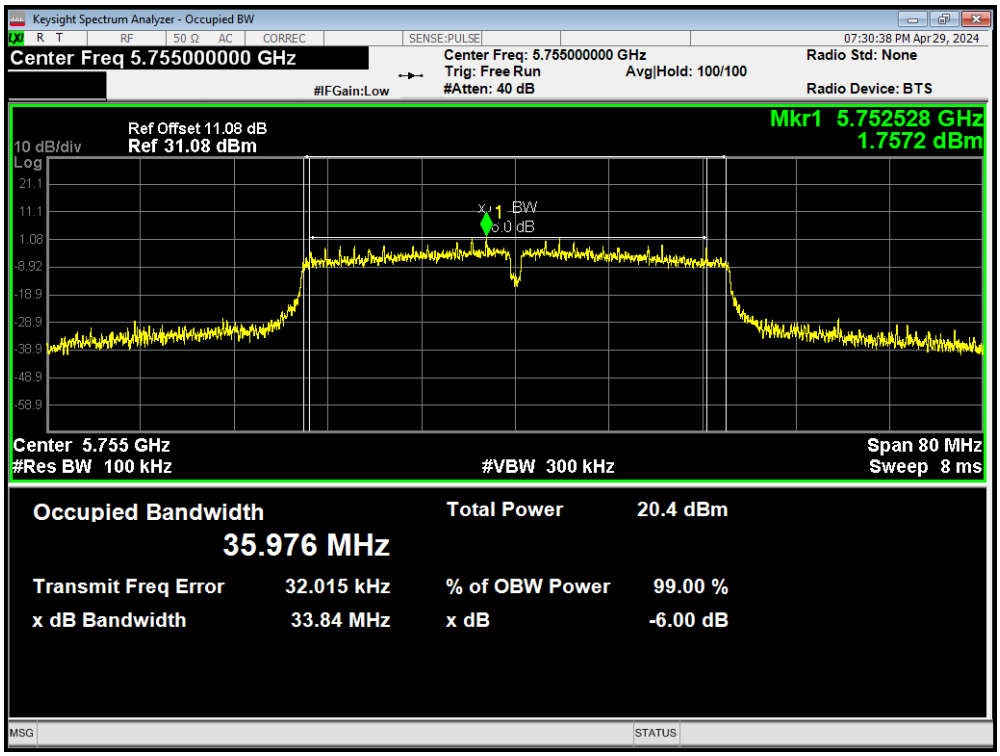
-6dB Bandwidth 802.11n(HT20) 5785MHz



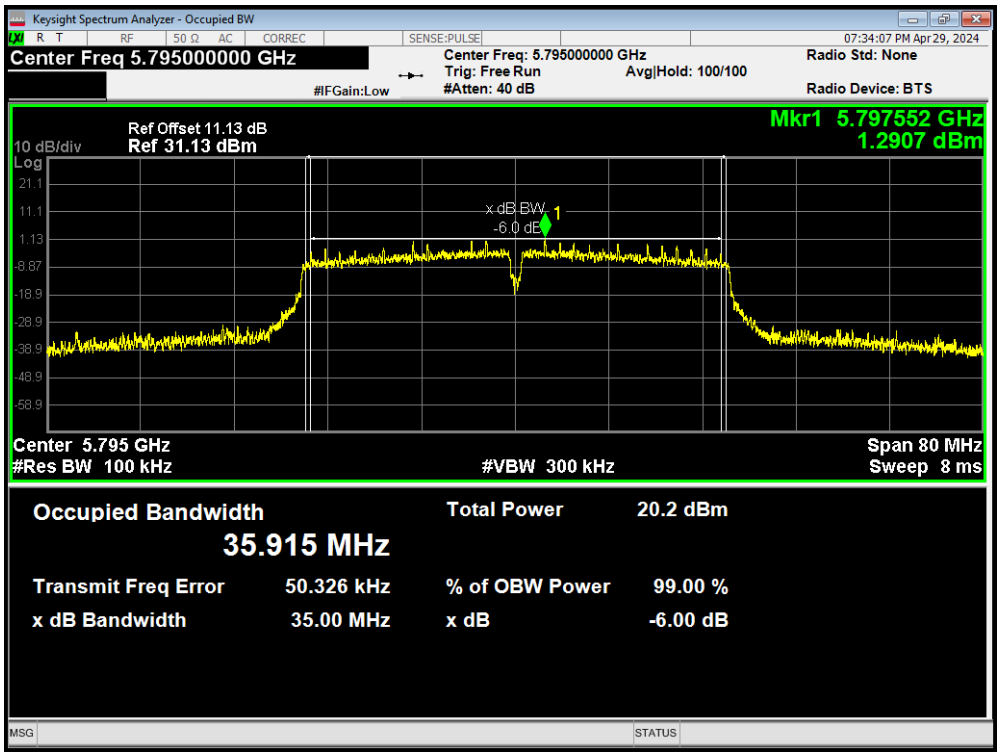
-6dB Bandwidth 802.11n(HT20) 5825MHz



-6dB Bandwidth 802.11n(HT40) 5755MHz



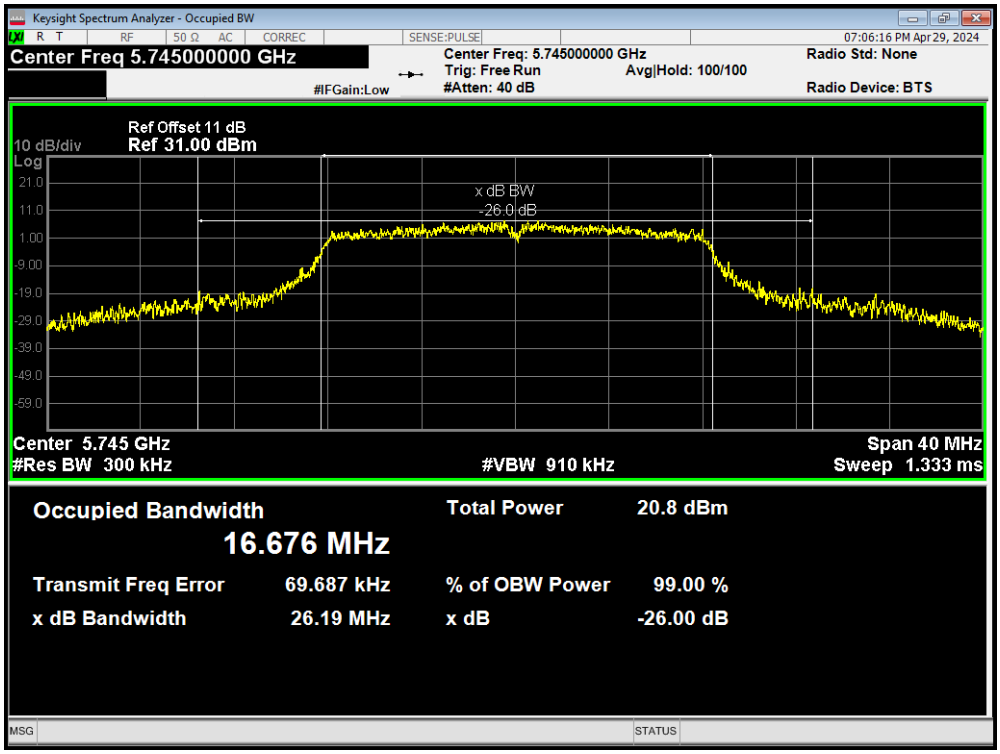
-6dB Bandwidth 802.11n(HT40) 5795MHz



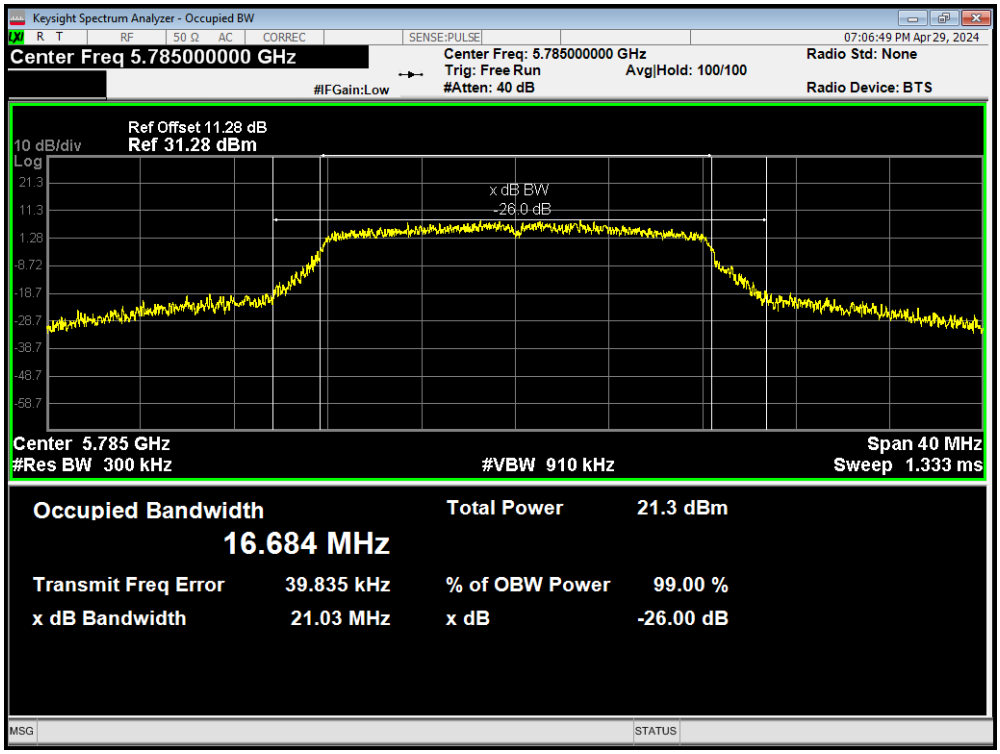
Minimum 6 dB bandwidth

U-NII-3

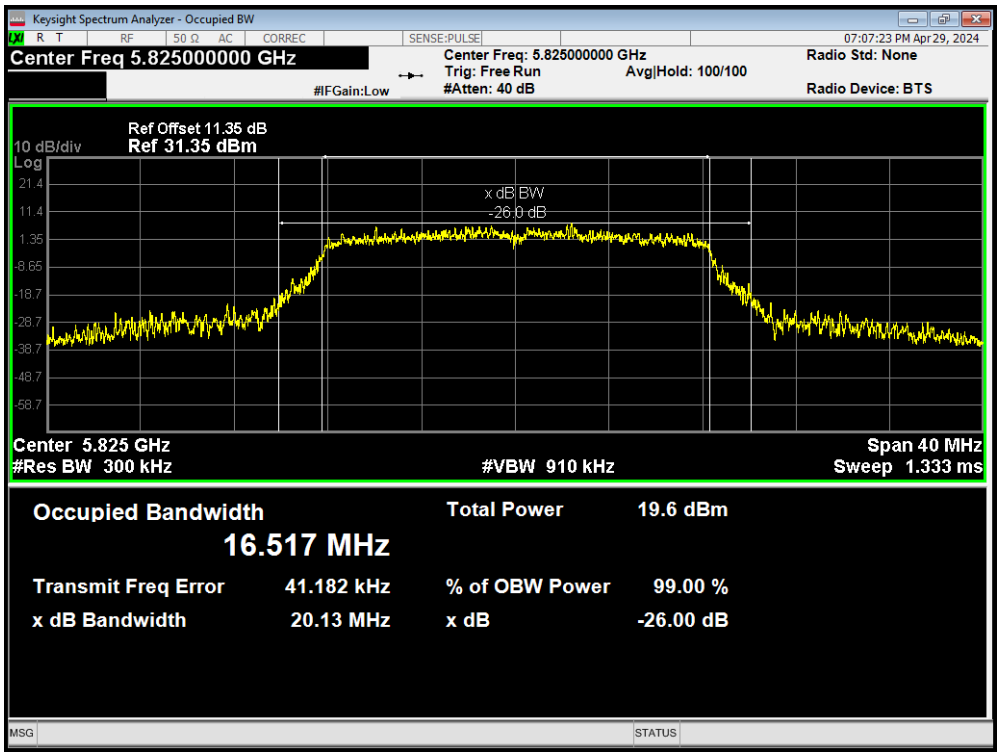
OBW 802.11a 5745MHz



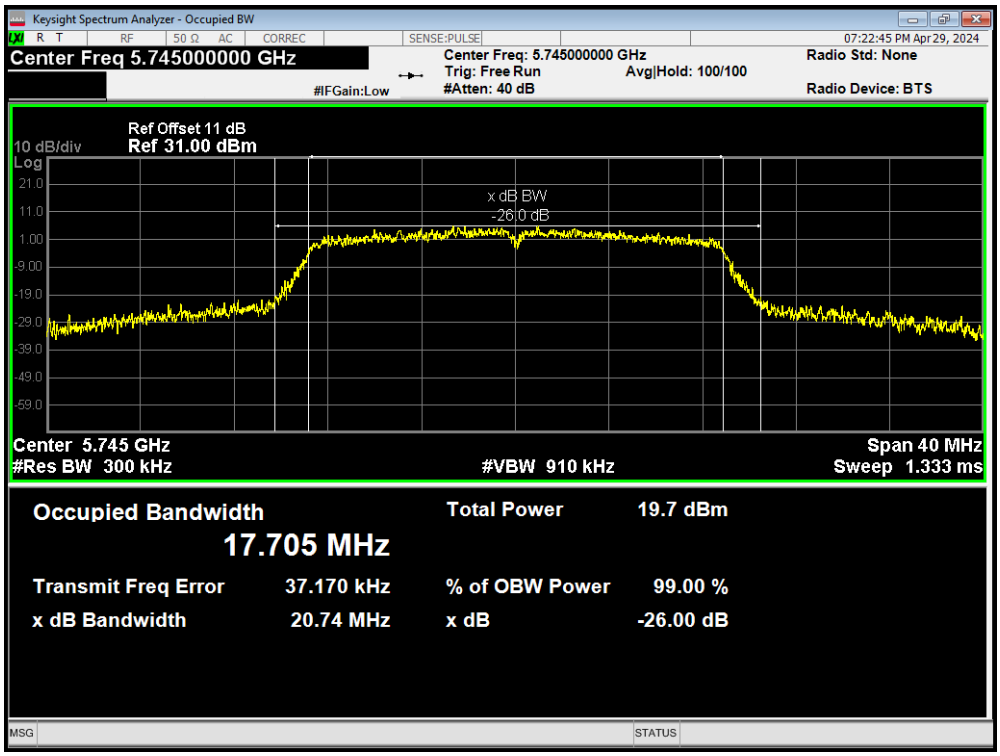
OBW 802.11a 5785MHz



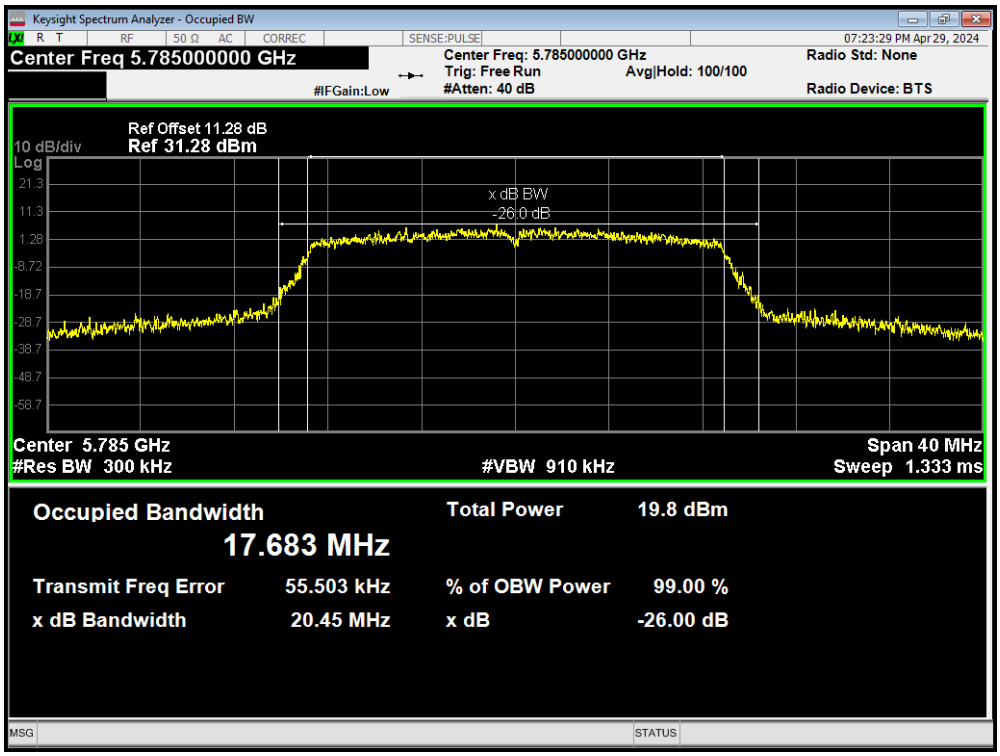
OBW 802.11a 5825MHz



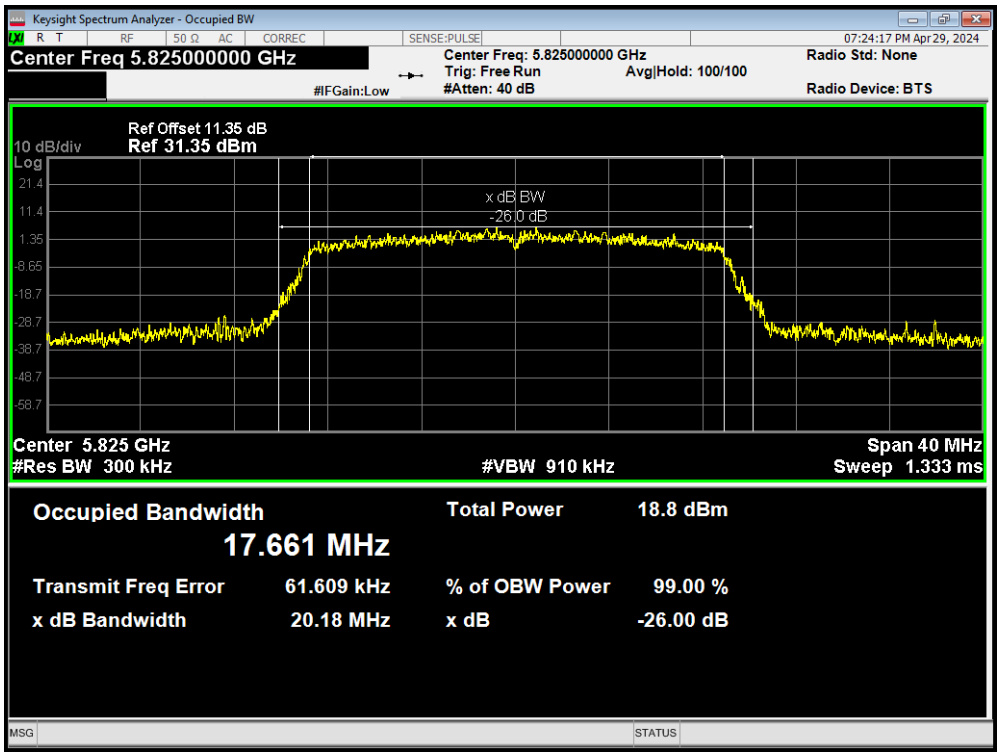
OBW 802.11ac(VHT20) 5745MHz



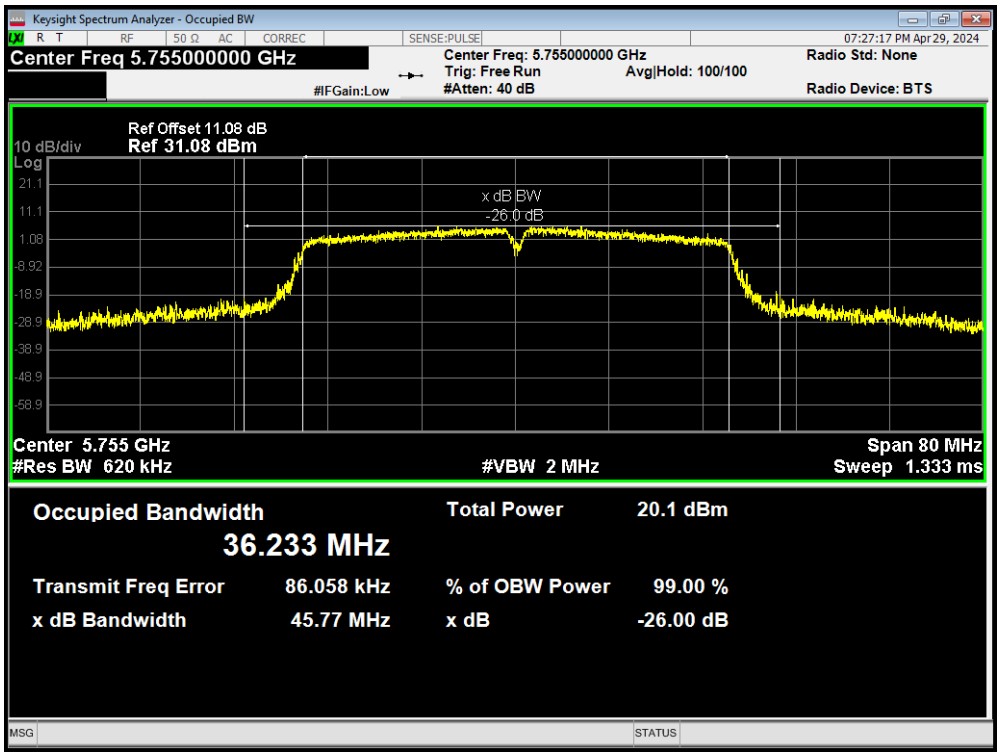
OBW 802.11ac(VHT20) 5785MHz



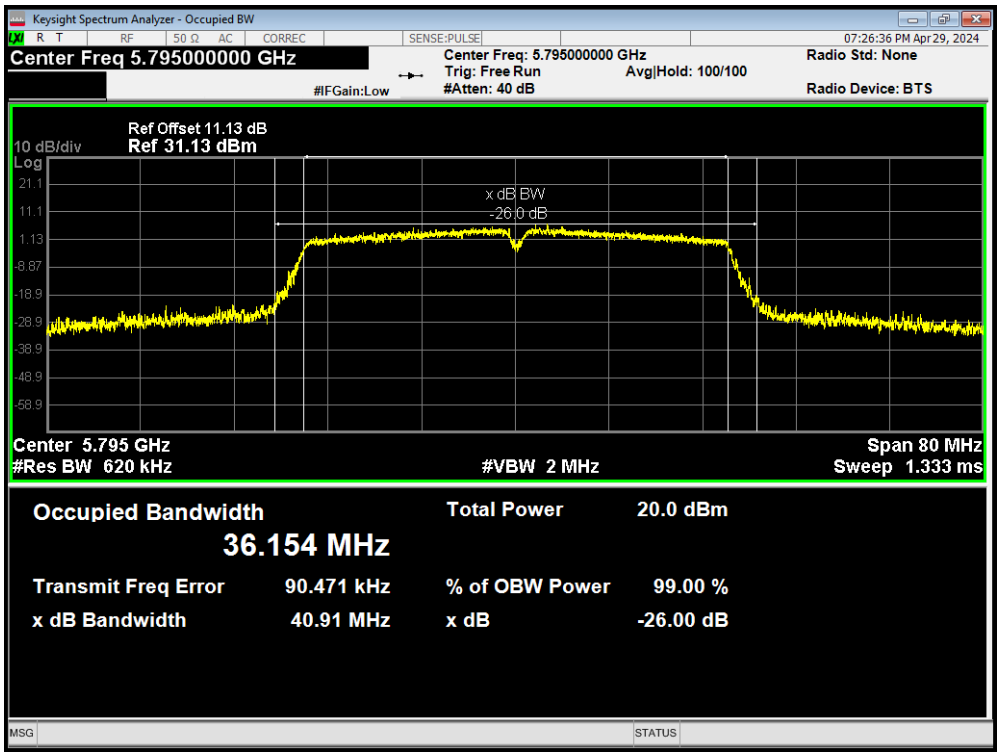
OBW 802.11ac(VHT20) 5825MHz



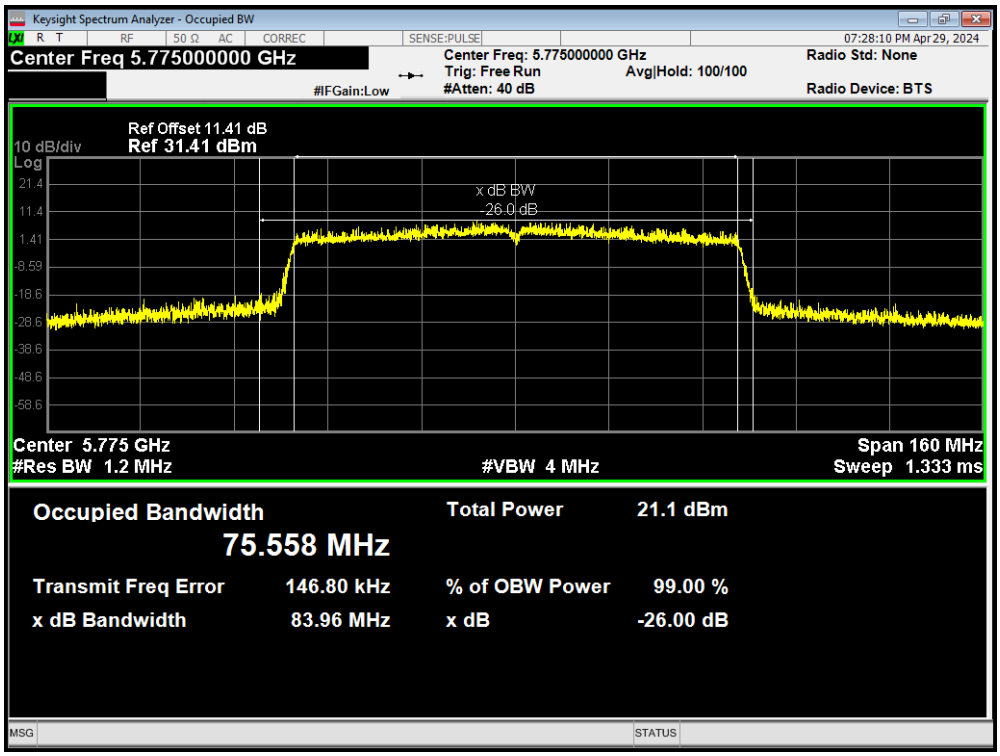
OBW 802.11ac(VHT40) 5755MHz



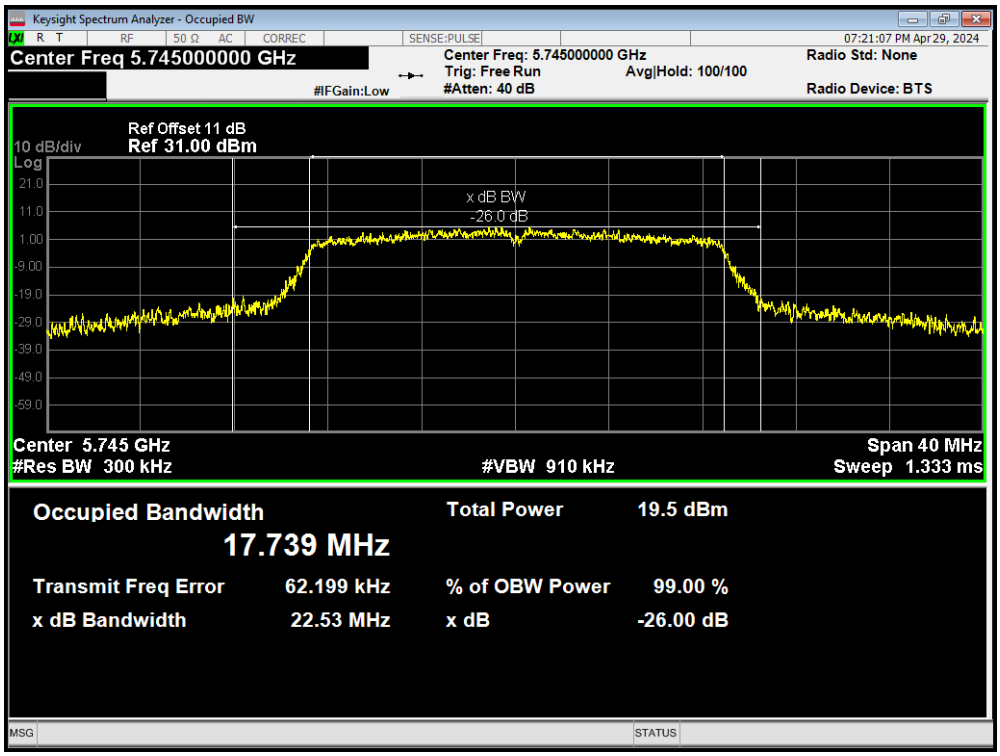
OBW 802.11ac(VHT40) 5795MHz



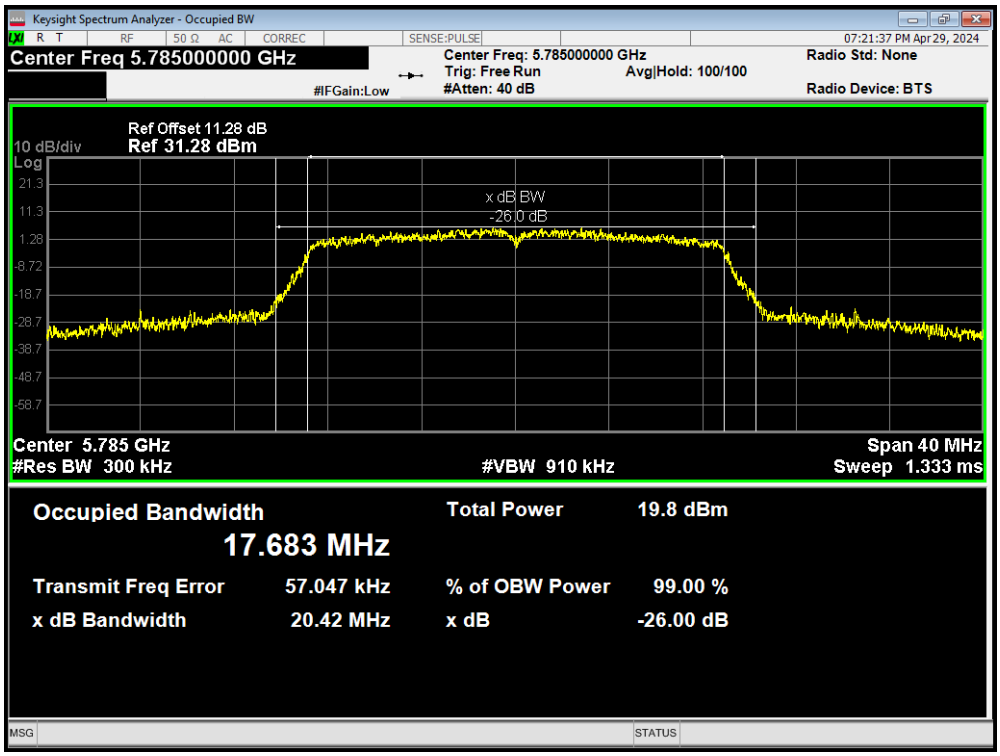
OBW 802.11ac(VHT80) 5775MHz



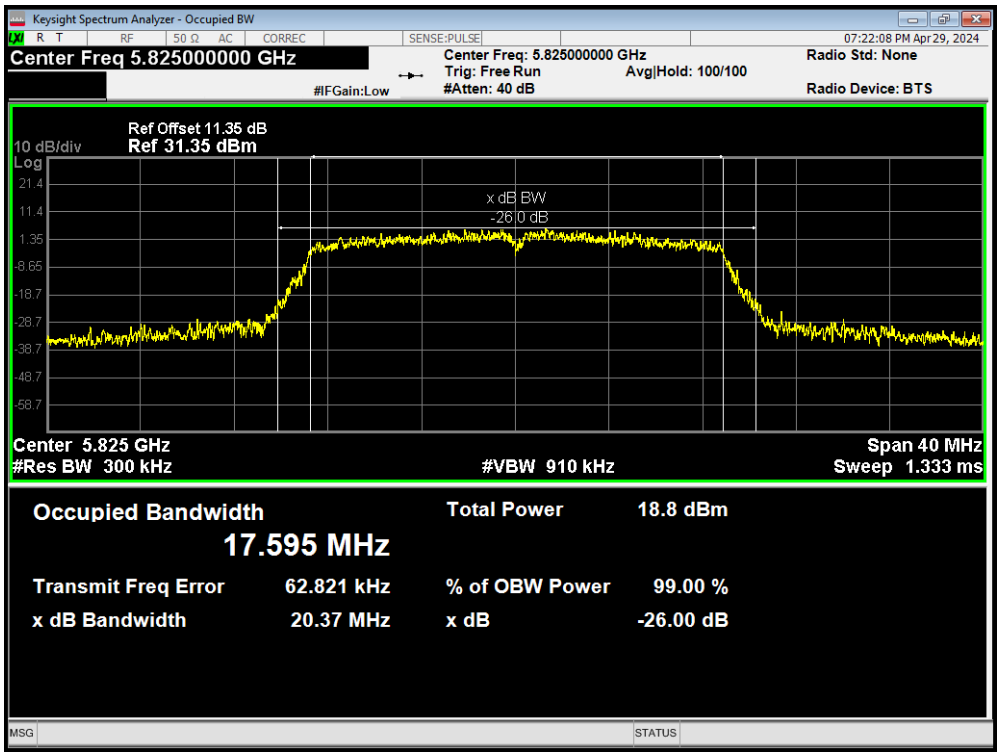
OBW 802.11n(HT20) 5745MHz



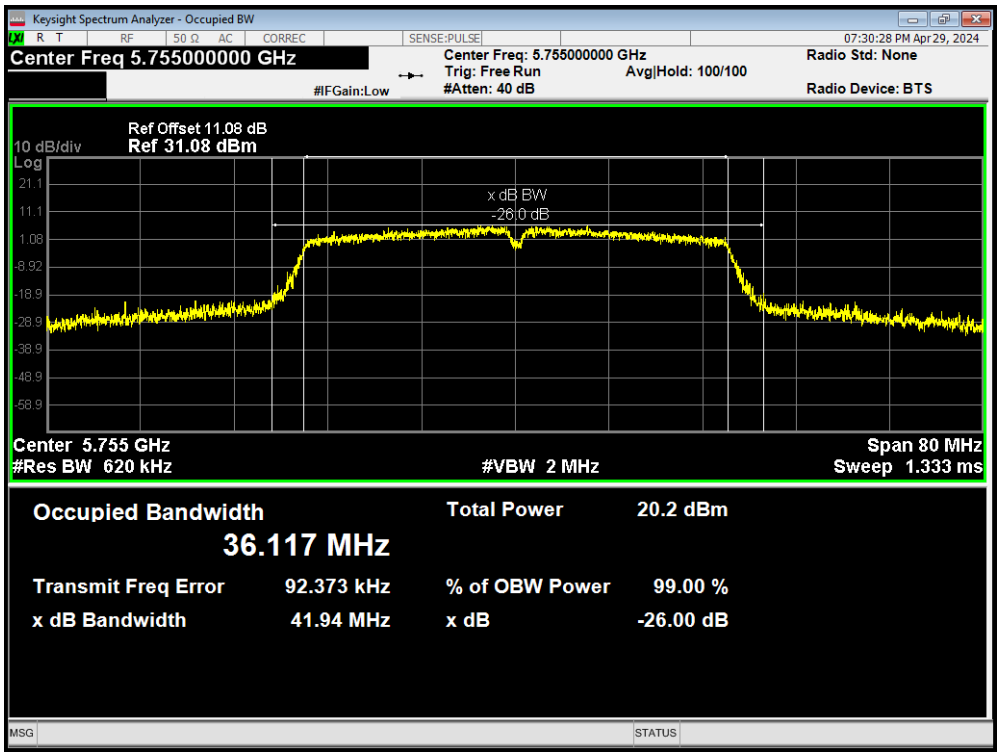
OBW 802.11n(HT20) 5785MHz



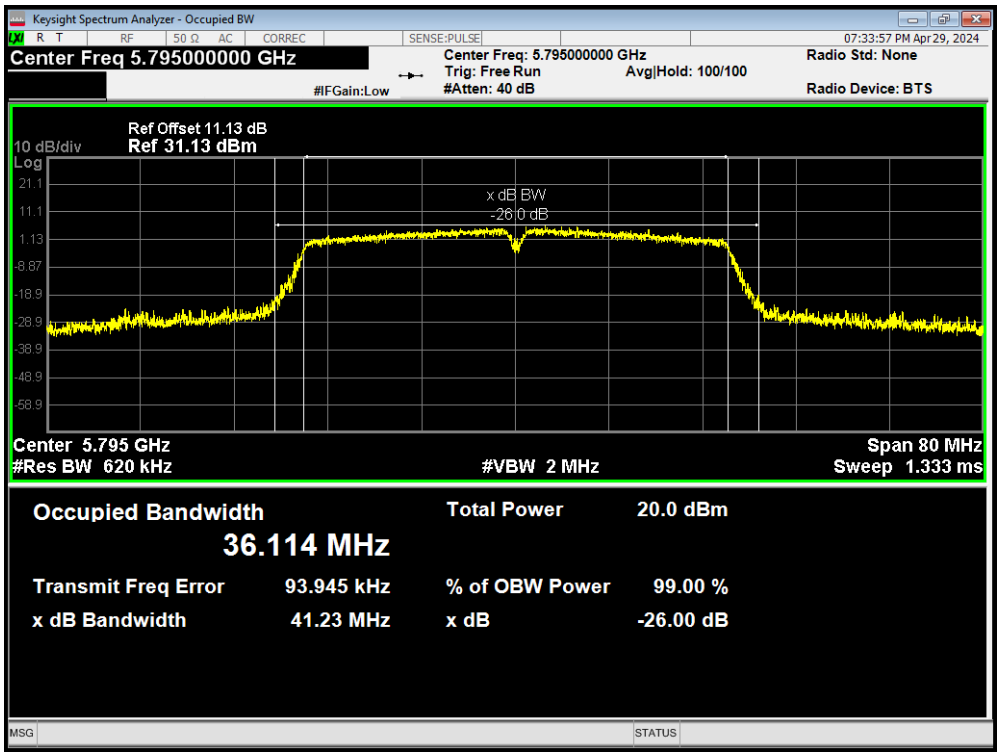
OBW 802.11n(HT20) 5825MHz



OBW 802.11n(HT40) 5755MHz



OBW 802.11n(HT40) 5795MHz



5.2. Average Power Output

Ambient condition

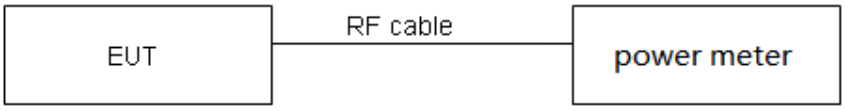
Temperature	Relative humidity	Pressure
15°C ~ 35°C	20% ~ 80%	86 kPa ~ 106 kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the average power meter through an external attenuator and a known loss cable. The EUT is max power transmission with proper modulation. We use Maximum average Conducted Output Power Level Method in KDB789033 for this test

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test Setup



Limits

Rule FCC Part 15.407(a)(1) / FCC Part 15.407(a) (3)
(1) For the band 5.15-5.25 GHz.
(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).
(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.
(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.
(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.
(2)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.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

Test Results

Mode	Duty cycle	Duty cycle correction Factor (dB)
802.11a	0.959	0.18
802.11n HT20	0.956	0.19
802.11n HT40	0.916	0.38
802.11ac VHT20	0.956	0.19
802.11ac VHT40	0.916	0.38
802.11ac VHT80	0.846	0.73
Note: when Duty cycle≥0.98, Duty cycle correction Factor not required.		

SISO Antenna1 Power Index								
Channel	802.11a	802.11n HT20	802.11ac VHT20	Channel	802.11n HT40	802.11ac VHT40	Channel	802.11ac VHT80
CH36	16	16	16	CH38	16	16	CH42	16
CH40	16	15	15	CH46	15	15	/	/
CH48	16	15	15	/	/	/	/	/
CH149	15	15	15	CH151	15	15	CH155	15
CH157	15	15	15	CH159	15	15	/	/
CH165	15	15	15	/	/	/	/	/

SISO Antenna2 Power Index								
Channel	802.11a	802.11n HT20	802.11ac VHT20	Channel	802.11n HT40	802.11ac VHT40	Channel	802.11ac VHT80
CH36	19.5	20.5	20.5	CH38	19.5	19.5	CH42	21.5
CH40	19.5	20.5	20.5	CH46	19	19	/	/
CH48	19.5	20	20	/	/	/	/	/
CH149	17	19	19	CH151	18.5	18.5	CH155	19
CH157	17	18.5	18.5	CH159	18.5	18.5	/	/
CH165	17	18.5	18.5	/	/	/	/	/

MIMO/Beamforming Power Index								
Channel	802.11a	802.11n HT20	802.11ac VHT20	Channel	802.11n HT40	802.11ac VHT40	Channel	802.11ac VHT80
CH36	11.5	12.5	12.5	CH38	11	11	CH42	10.5
CH40	16	16	16	CH46	12	12	/	/
CH48	12	13	13	/	/	/	/	/
CH149	16	16	16	CH151	15	15	CH155	13
CH157	16	16	16	CH159	15	15	/	/
CH165	16	16	16	/	/	/	/	/

SISO Antenna1

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Test Mode	Channel/ Frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	36/5180	17.88	18.06	24.00	PASS
	40/5200	15.60	15.78	24.00	PASS
	48/5240	15.63	15.81	24.00	PASS
802.11n HT20	36/5180	17.84	18.03	24.00	PASS
	40/5200	15.72	15.91	24.00	PASS
	48/5240	15.49	15.68	24.00	PASS
802.11n HT40	38/5190	17.30	17.68	24.00	PASS
	46/5230	14.93	15.31	24.00	PASS
802.11ac VHT20	36/5180	17.93	18.12	24.00	PASS
	40/5200	15.96	16.15	24.00	PASS
	48/5240	15.67	15.86	24.00	PASS
802.11ac VHT40	38/5190	17.45	17.83	24.00	PASS
	46/5230	14.98	15.36	24.00	PASS
802.11ac VHT80	42/5210	16.44	17.17	24.00	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

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Test Mode	Channel/ Frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	149/5745	17.45	17.63	30.00	PASS
	157/5785	17.48	17.66	30.00	PASS
	165/5825	17.38	17.56	30.00	PASS
802.11n HT20	149/5745	17.14	17.33	30.00	PASS
	157/5785	17.32	17.51	30.00	PASS
	165/5825	17.24	17.43	30.00	PASS
802.11n HT40	151/5755	16.84	17.22	30.00	PASS
	159/5795	16.77	17.15	30.00	PASS
802.11ac VHT20	149/5745	17.15	17.34	30.00	PASS
	157/5785	17.24	17.43	30.00	PASS
	165/5825	17.26	17.45	30.00	PASS
802.11ac VHT40	151/5755	16.85	17.23	30.00	PASS
	159/5795	16.76	17.14	30.00	PASS
802.11ac VHT80	155/5775	16.58	17.31	30.00	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

SISO Antenna2

U-NII-1

Test Mode	Channel/ Frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	36/5180	18.66	18.84	24.00	PASS
	40/5200	18.71	18.89	24.00	PASS
	48/5240	18.73	18.91	24.00	PASS
802.11n HT20	36/5180	18.55	18.74	24.00	PASS
	40/5200	18.60	18.79	24.00	PASS
	48/5240	18.73	18.92	24.00	PASS
802.11n HT40	38/5190	18.58	18.96	24.00	PASS
	46/5230	18.28	18.66	24.00	PASS
802.11ac VHT20	36/5180	18.53	18.72	24.00	PASS
	40/5200	18.62	18.81	24.00	PASS
	48/5240	18.66	18.85	24.00	PASS
802.11ac VHT40	38/5190	18.22	18.60	24.00	PASS
	46/5230	18.27	18.65	24.00	PASS
802.11ac VHT80	42/5210	18.08	18.81	24.00	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

U-NII-3

Test Mode	Channel/ Frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	149/5745	18.53	18.71	30.00	PASS
	157/5785	18.70	18.88	30.00	PASS
	165/5825	18.51	18.69	30.00	PASS
802.11n HT20	149/5745	18.77	18.96	30.00	PASS
	157/5785	18.64	18.83	30.00	PASS
	165/5825	18.78	18.97	30.00	PASS
802.11n HT40	151/5755	18.51	18.89	30.00	PASS
	159/5795	18.17	18.55	30.00	PASS
802.11ac VHT20	149/5745	18.64	18.83	30.00	PASS
	157/5785	18.62	18.81	30.00	PASS
	165/5825	18.77	18.96	30.00	PASS
802.11ac VHT40	151/5755	18.52	18.90	30.00	PASS
	159/5795	18.51	18.89	30.00	PASS
802.11ac VHT80	155/5775	18.12	18.85	30.00	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

MIMO

U-NII-1

Test Mode	Channel/ Frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11a	36/5180	16.37	16.55	12.02	12.20	17.91	24.00	PASS
	44/5220	15.19	15.37	16.01	16.19	18.81	24.00	PASS
	48/5240	15.61	15.79	13.81	13.99	17.99	24.00	PASS
802.11n HT20	36/5180	16.12	16.31	11.77	11.96	17.67	24.00	PASS
	44/5220	15.10	15.29	15.86	16.05	18.70	24.00	PASS
	48/5240	15.39	15.58	13.43	13.62	17.72	24.00	PASS
802.11n HT40	38/5190	13.65	14.03	9.42	9.80	15.42	24.00	PASS
	46/5230	14.40	14.78	11.80	12.18	16.68	24.00	PASS
802.11ac VHT20	36/5180	15.57	15.76	11.31	11.50	17.14	24.00	PASS
	44/5220	14.64	14.83	15.52	15.71	18.30	24.00	PASS
	48/5240	15.07	15.26	13.30	13.49	17.48	24.00	PASS
802.11ac VHT40	38/5190	13.68	14.06	9.42	9.80	15.44	24.00	PASS
	46/5230	13.74	14.12	11.00	11.38	15.97	24.00	PASS
802.11ac VHT80	42/5210	12.80	13.53	8.55	9.28	14.91	24.00	PASS

Note: 1. Average Power with duty factor = Average Power Measured +Duty cycle correction factor

2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$.

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)(ii): If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Directional gain = $G_{ANT\ MAX}$ + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = $G_{ANT\ MAX}$ + Array Gain =1.83+0=1.83 dBi<6dBi. So the power limit is 24dBm.

U-NII-3

Test Mode	Channel/ Frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11a	149/5745	16.08	16.26	17.46	17.64	20.02	30.00	PASS
	157/5785	16.22	16.40	17.64	17.82	20.18	30.00	PASS
	165/5825	16.11	16.29	17.44	17.62	20.02	30.00	PASS
802.11n HT20	149/5745	16.03	16.22	16.87	17.06	19.67	30.00	PASS
	157/5785	15.97	16.16	17.69	17.88	20.12	30.00	PASS
	165/5825	16.17	16.36	16.97	17.16	19.79	30.00	PASS
802.11n HT40	151/5755	15.57	15.95	15.34	15.72	18.85	30.00	PASS
	159/5795	15.69	16.07	15.47	15.85	18.97	30.00	PASS
802.11ac VHT20	149/5745	16.01	16.20	16.96	17.15	19.71	30.00	PASS
	157/5785	15.88	16.07	17.37	17.56	19.89	30.00	PASS
	165/5825	16.02	16.21	17.30	17.49	19.91	30.00	PASS
802.11ac VHT40	151/5755	15.55	15.93	15.37	15.75	18.85	30.00	PASS
	159/5795	15.57	15.95	15.43	15.81	18.89	30.00	PASS
802.11ac VHT80	155/5775	15.34	16.07	14.57	15.30	18.71	30.00	PASS

Note: 1. Average Power with duty factor = Average Power Measured +Duty cycle correction factor

2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power =$10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$.

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)(ii): If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Directional gain = $G_{ANT\ MAX}$ + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = $G_{ANT\ MAX}$ + Array Gain =2.55+0=2.55 dBi<6dBi. So the power limit is 30dBm.

Beamforming

U-NII-1

Test Mode	Channel/ Frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11a	36/5180	16.37	16.55	12.02	12.20	17.91	24.00	PASS
	44/5220	15.19	15.37	16.01	16.19	18.81	24.00	PASS
	48/5240	15.61	15.79	13.81	13.99	17.99	24.00	PASS
802.11n HT20	36/5180	16.12	16.31	11.77	11.96	17.67	24.00	PASS
	44/5220	15.10	15.29	15.86	16.05	18.70	24.00	PASS
	48/5240	15.39	15.58	13.43	13.62	17.72	24.00	PASS
802.11n HT40	38/5190	13.65	14.03	9.42	9.80	15.42	24.00	PASS
	46/5230	14.40	14.78	11.80	12.18	16.68	24.00	PASS
802.11ac VHT20	36/5180	15.57	15.76	11.31	11.50	17.14	24.00	PASS
	44/5220	14.64	14.83	15.52	15.71	18.30	24.00	PASS
	48/5240	15.07	15.26	13.30	13.49	17.48	24.00	PASS
802.11ac VHT40	38/5190	13.68	14.06	9.42	9.80	15.44	24.00	PASS
	46/5230	13.74	14.12	11.00	11.38	15.97	24.00	PASS
802.11ac VHT80	42/5210	12.80	13.53	8.55	9.28	14.91	24.00	PASS

Note: 1. Average Power with duty factor = Average Power Measured +Duty cycle correction factor
2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),
The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$.
3. The manufacturer declared the directional gain is 2.80dBi. And directional gain = 2.80dBi <6dBi. So the limit is 24 dBm. Data sharing between Beamforming and MIMO.

U-NII-3

Test Mode	Channel/ Frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11a	149/5745	16.08	16.26	17.46	17.64	20.02	30.00	PASS
	157/5785	16.22	16.40	17.64	17.82	20.18	30.00	PASS
	165/5825	16.11	16.29	17.44	17.62	20.02	30.00	PASS
802.11n HT20	149/5745	16.03	16.22	16.87	17.06	19.67	30.00	PASS
	157/5785	15.97	16.16	17.69	17.88	20.12	30.00	PASS
	165/5825	16.17	16.36	16.97	17.16	19.79	30.00	PASS
802.11n HT40	151/5755	15.57	15.95	15.34	15.72	18.85	30.00	PASS
	159/5795	15.69	16.07	15.47	15.85	18.97	30.00	PASS
802.11ac VHT20	149/5745	16.01	16.20	16.96	17.15	19.71	30.00	PASS
	157/5785	15.88	16.07	17.37	17.56	19.89	30.00	PASS
	165/5825	16.02	16.21	17.30	17.49	19.91	30.00	PASS
802.11ac VHT40	151/5755	15.55	15.93	15.37	15.75	18.85	30.00	PASS
	159/5795	15.57	15.95	15.43	15.81	18.89	30.00	PASS
802.11ac VHT80	155/5775	15.34	16.07	14.57	15.30	18.71	30.00	PASS

Note: 1. Average Power with duty factor = Average Power Measured +Duty cycle correction factor
2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),
The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$.
3. The manufacturer declared the directional gain is 2.80dBi. And directional gain = 2.80dBi <6dBi. So the limit is 30 dBm. Data sharing between Beamforming and MIMO.

5.3. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
15°C ~ 35°C	20% ~ 80%	86 kPa ~ 106 kPa

Method of Measurement

1. Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.

b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.

c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

g) Measure the frequency at each of frequencies specified in 5.6.

h) Switch OFF the EUT but do not switch OFF the oscillator heater.

i) Lower the chamber temperature by not more that 10°C, and allow the temperature inside the chamber to stabilize.

j) Repeat step f) through step i) down to the lowest specified temperature.

2. Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature (+15°C to +25 °C). An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency-measuring instrument.

b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
c) Measure the frequency at each of the frequencies specified in 5.6.
d) Repeat the above procedure at 85% and 115% of the nominal supply voltage.

Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936Hz

Test Results

Voltage (V)	Temperature (°C)	U-NII-1 Test Results			
		5200MHz			
		1min	2min	5min	10min
12	-30	5200.009096	5200.007845	5199.998437	5199.994233
12	-20	5200.005754	5200.007212	5199.997631	5199.986202
12	-10	5200.003438	5200.004019	5199.996522	5199.978380
12	0	5199.996529	5200.000470	5199.991624	5199.978861
12	10	5199.991305	5199.998197	5199.985917	5199.978165
12	20	5199.981942	5199.995495	5199.978307	5199.968202
12	30	5199.973767	5199.992477	5199.971022	5199.966567
12	40	5199.969979	5199.987948	5199.968810	5199.964872
12	50	5199.967849	5199.985373	5199.960790	5199.959872
9.6	20	5199.961525	5199.982446	5199.953345	5199.956647
14.4	20	5199.958768	5199.979569	5199.951002	5199.948009
Max. ΔMHz		-0.041232	-0.020431	-0.048998	-0.051991
PPM		-7.929231	-3.929038	-9.422692	-9.998269

Voltage (V)	Temperature (°C)	U-NII-3 Test Results			
		5785MHz			
		1min	2min	5min	10min
12	-30	5784.994269	5784.992389	5784.985317	5784.985252
12	-20	5784.986416	5784.988975	5784.981356	5784.984974
12	-10	5784.976615	5784.983524	5784.971526	5784.975663
12	0	5784.983273	5784.982928	5784.976127	5784.981478
12	10	5784.973490	5784.979682	5784.968266	5784.971488
12	20	5784.972489	5784.976827	5784.961677	5784.962265
12	30	5784.969267	5784.972662	5784.956670	5784.954995
12	40	5784.965927	5784.966334	5784.956319	5784.950187
12	50	5784.964672	5784.965126	5784.947067	5784.949462
9.6	20	5784.958988	5784.961268	5784.944800	5784.947598
14.4	20	5784.958813	5784.959603	5784.942037	5784.939916
Max. ΔMHz		-0.041187	-0.040397	-0.057963	-0.060084
PPM		-7.119620	-6.983060	-10.019533	-10.386171

5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
15°C ~ 35°C	20% ~ 80%	86 kPa ~ 106 kPa

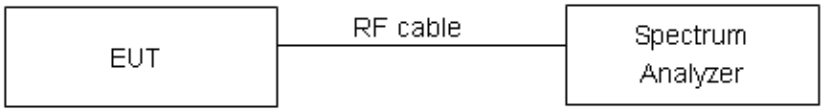
Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

Set RBW = 1MHz, VBW =3MHz for the band 5.150-5.250GHz.
Set RBW = 470kHz, VBW =1.5MHz for the band 5.725-5.850GHz

The conducted PSD is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule FCC Part 15.407(a)(1)/ FCC Part 15.407(a)(3)
For an indoor access point operating in the band 5.15-5.25 GHz, 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.
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 band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500kHz band. If transmittingantennas 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.

Frequency Bands/GHz	Limits
5.15-5.25	11dBm/MHz
5.725-5.85	30dBm/500kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

SISO Antenna1

U-NII-1

Mode	Channel/ Frequency (MHz)	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	36/5180	8.33	8.51	11.00	PASS
	40/5200	6.12	6.30	11.00	PASS
	48/5240	5.50	5.68	11.00	PASS
802.11n HT20	36/5180	8.25	8.44	11.00	PASS
	40/5200	6.10	6.29	11.00	PASS
	48/5240	5.86	6.05	11.00	PASS
802.11n HT40	38/5190	4.85	5.23	11.00	PASS
	46/5230	2.21	2.59	11.00	PASS
802.11ac VHT20	36/5180	8.53	8.72	11.00	PASS
	40/5200	6.16	6.35	11.00	PASS
	48/5240	5.92	6.11	11.00	PASS
802.11ac VHT40	38/5190	5.07	5.45	11.00	PASS
	46/5230	2.69	3.07	11.00	PASS
802.11ac VHT80	42/5210	1.39	2.12	11.00	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

U-NII-3

Mode	Channel /Frequency (MHz)	Read Value (dBm/470kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Conclusion
802.11a	149/5745	4.65	5.10	30.00	PASS
	157/5785	4.53	4.98	30.00	PASS
	165/5825	4.59	5.04	30.00	PASS
802.11n HT20	149/5745	4.36	4.82	30.00	PASS
	157/5785	4.02	4.48	30.00	PASS
	165/5825	4.38	4.84	30.00	PASS
802.11n HT40	151/5755	0.87	1.52	30.00	PASS
	159/5795	1.38	2.03	30.00	PASS
802.11ac VHT20	149/5745	4.70	5.16	30.00	PASS
	157/5785	4.43	4.89	30.00	PASS
	165/5825	4.74	5.20	30.00	PASS
802.11ac VHT40	151/5755	0.80	1.45	30.00	PASS
	159/5795	0.85	1.50	30.00	PASS
802.11ac VHT80	155/5775	-1.98	-0.98	30.00	PASS
Note: PSD=Read Value+Duty cycle correction factor +10*log(500/470)					

SISO Antenna2

U-NII-1

Mode	Channel/ Frequency (MHz)	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	36/5180	8.94	9.12	11.00	PASS
	40/5200	8.86	9.04	11.00	PASS
	48/5240	9.45	9.63	11.00	PASS
802.11n HT20	36/5180	9.13	9.32	11.00	PASS
	40/5200	9.12	9.31	11.00	PASS
	48/5240	8.75	8.94	11.00	PASS
802.11n HT40	38/5190	5.82	6.20	11.00	PASS
	46/5230	5.62	6.00	11.00	PASS
802.11ac VHT20	36/5180	8.93	9.12	11.00	PASS
	40/5200	8.95	9.14	11.00	PASS
	48/5240	8.79	8.98	11.00	PASS
802.11ac VHT40	38/5190	5.44	5.82	11.00	PASS
	46/5230	5.59	5.97	11.00	PASS
802.11ac VHT80	42/5210	2.30	3.03	11.00	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

U-NII-3

Mode	Channel /Frequency (MHz)	Read Value (dBm/470kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Conclusion
802.11a	149/5745	5.69	6.14	30.00	PASS
	157/5785	5.84	6.29	30.00	PASS
	165/5825	5.60	6.05	30.00	PASS
802.11n HT20	149/5745	6.02	6.48	30.00	PASS
	157/5785	5.70	6.16	30.00	PASS
	165/5825	1.83	2.29	30.00	PASS
802.11n HT40	151/5755	2.55	3.20	30.00	PASS
	159/5795	2.13	2.78	30.00	PASS
802.11ac VHT20	149/5745	5.77	6.23	30.00	PASS
	157/5785	5.72	6.18	30.00	PASS
	165/5825	5.76	6.22	30.00	PASS
802.11ac VHT40	151/5755	2.33	2.98	30.00	PASS
	159/5795	2.55	3.20	30.00	PASS
802.11ac VHT80	155/5775	-0.85	0.15	30.00	PASS
Note: PSD=Read Value+Duty cycle correction factor +10*log(500/470)					

MIMO

U-NII-1

Mode	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total PSD (dBm/MHz)		
		Read Value (dBm/MHz)	PSD (dBm/MHz)	Read Value (dBm/MHz)	PSD (dBm/MHz)			
802.11a	36/5180	7.08	7.26	2.80	2.98	8.64	11.00	PASS
	40/5200	6.00	6.18	6.87	7.05	9.65	11.00	PASS
	48/5240	5.78	5.96	4.27	4.45	8.28	11.00	PASS
802.11n HT20	36/5180	6.73	6.92	2.17	2.36	8.22	11.00	PASS
	40/5200	5.16	5.35	7.73	7.92	9.83	11.00	PASS
	48/5240	5.76	5.95	4.35	4.54	8.31	11.00	PASS
802.11n HT40	38/5190	1.06	1.44	-3.36	-2.98	2.78	11.00	PASS
	46/5230	1.60	1.98	-0.72	-0.34	3.98	11.00	PASS
802.11ac VHT20	36/5180	5.78	5.97	1.86	2.05	7.45	11.00	PASS
	40/5200	5.05	5.24	6.85	7.04	9.24	11.00	PASS
	48/5240	5.04	5.23	3.16	3.35	7.40	11.00	PASS
802.11ac VHT40	38/5190	0.86	1.24	-3.19	-2.81	2.68	11.00	PASS
	46/5230	1.47	1.85	-1.31	-0.93	3.69	11.00	PASS
802.11ac VHT80	42/5210	-2.48	-1.75	-7.15	-6.42	-0.48	11.00	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),

the power spectral density=$10\log(10^{(\text{PSD antenna 1 in dBm/10})}+10^{(\text{PSD antenna 2 in dBm/10})})$

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)(ii): If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Directional gain = $G_{ANT\ MAX}$ + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB,

so directional gain=$G_{ANT\ MAX}$ + Array Gain=1.83+10log(2/1)=4.84<6 dBi.

So the PSD limit is 11 dBm.

U-NII-3

Mode	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm/ 500kHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm/ 500kHz)		
		Read Value (dBm/ 470kHz)	PSD (dBm/ 500kHz)	Read Value (dBm/ 470kHz)	PSD (dBm/ 500kHz)			
802.11a	149/5745	3.19	3.64	4.49	4.94	7.35	30.00	PASS
	157/5785	3.83	4.28	4.62	5.07	7.70	30.00	PASS
	165/5825	3.34	3.79	4.55	5.00	7.45	30.00	PASS
802.11n HT20	149/5745	3.19	3.64	4.49	4.94	7.35	30.00	PASS
	157/5785	3.83	4.28	4.62	5.07	7.70	30.00	PASS
	165/5825	3.34	3.79	4.55	5.00	7.45	30.00	PASS
802.11n HT40	151/5755	3.26	3.72	3.62	4.08	6.91	30.00	PASS
	159/5795	3.05	3.51	4.53	4.99	7.32	30.00	PASS
802.11ac VHT20	149/5745	3.19	3.65	4.09	4.55	7.13	30.00	PASS
	157/5785	-0.13	0.52	-0.36	0.29	3.42	30.00	PASS
	165/5825	-0.12	0.53	-1.04	-0.39	3.10	30.00	PASS
802.11ac VHT40	151/5755	2.61	3.07	3.89	4.35	6.77	30.00	PASS
	159/5795	2.89	3.35	4.34	4.80	7.15	30.00	PASS
802.11ac VHT80	155/5775	3.08	3.54	3.65	4.11	6.84	30.00	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor +10*log(500/470).

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),

the power spectral density=$10\log(10^{(\text{PSD antenna 1 in dBm/10})}+10^{(\text{PSD antenna 2 in dBm/10})})$

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)(ii): If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Directional gain = $G_{ANT\ MAX}$ + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB,

so directional gain=$G_{ANT\ MAX}$ +Array Gain=2.55+10log(2/1)=5.56<6 dBi.

So the PSD limit is 30dBm.

Beamforming

U-NII-1

Mode	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total PSD (dBm/MHz)		
		Read Value (dBm/MHz)	PSD (dBm/MHz)	Read Value (dBm/MHz)	PSD (dBm/MHz)			
802.11a	36/5180	7.08	7.26	2.80	2.98	8.64	11.00	PASS
	40/5200	6.00	6.18	6.87	7.05	9.65	11.00	PASS
	48/5240	5.78	5.96	4.27	4.45	8.28	11.00	PASS
802.11n HT20	36/5180	6.73	6.92	2.17	2.36	8.22	11.00	PASS
	40/5200	5.16	5.35	7.73	7.92	9.83	11.00	PASS
	48/5240	5.76	5.95	4.35	4.54	8.31	11.00	PASS
802.11n HT40	38/5190	1.06	1.44	-3.36	-2.98	2.78	11.00	PASS
	46/5230	1.60	1.98	-0.72	-0.34	3.98	11.00	PASS
802.11ac VHT20	36/5180	5.78	5.97	1.86	2.05	7.45	11.00	PASS
	40/5200	5.05	5.24	6.85	7.04	9.24	11.00	PASS
	48/5240	5.04	5.23	3.16	3.35	7.40	11.00	PASS
802.11ac VHT40	38/5190	0.86	1.24	-3.19	-2.81	2.68	11.00	PASS
	46/5230	1.47	1.85	-1.31	-0.93	3.69	11.00	PASS
802.11ac VHT80	42/5210	-2.48	-1.75	-7.15	-6.42	-0.48	11.00	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),

the power spectral density=$10\log(10^{(\text{PSD antenna 1 in dBm/10})}+10^{(\text{PSD antenna 2 in dBm/10})})$

3. The manufacturer declared the directional gain is 2.80dBi. And directional gain = 2.80dBi <6dBi. So the limit is 11 dBm. Data sharing between Beamforming and MIMO.

U-NII-3

Mode	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm/ 500kHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm/ 500kHz)		
		Read Value (dBm/ 470kHz)	PSD (dBm/ 500kHz)	Read Value (dBm/ 470kHz)	PSD (dBm/ 500kHz)			
802.11a	149/5745	3.19	3.64	4.49	4.94	7.35	30.00	PASS
	157/5785	3.83	4.28	4.62	5.07	7.70	30.00	PASS
	165/5825	3.34	3.79	4.55	5.00	7.45	30.00	PASS
802.11n HT20	149/5745	3.19	3.64	4.49	4.94	7.35	30.00	PASS
	157/5785	3.83	4.28	4.62	5.07	7.70	30.00	PASS
	165/5825	3.34	3.79	4.55	5.00	7.45	30.00	PASS
802.11n HT40	151/5755	3.26	3.72	3.62	4.08	6.91	30.00	PASS
	159/5795	3.05	3.51	4.53	4.99	7.32	30.00	PASS
802.11ac VHT20	149/5745	3.19	3.65	4.09	4.55	7.13	30.00	PASS
	157/5785	-0.13	0.52	-0.36	0.29	3.42	30.00	PASS
	165/5825	-0.12	0.53	-1.04	-0.39	3.10	30.00	PASS
802.11ac VHT40	151/5755	2.61	3.07	3.89	4.35	6.77	30.00	PASS
	159/5795	2.89	3.35	4.34	4.80	7.15	30.00	PASS
802.11ac VHT80	155/5775	3.08	3.54	3.65	4.11	6.84	30.00	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor +10*log(500/470).

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),

the power spectral density=$10\log(10^{(\text{PSD antenna 1 in dBm/10})}+10^{(\text{PSD antenna 2 in dBm/10})})$

3. The manufacturer declared the directional gain is 2.80dBi. And directional gain = 2.80dBi <6dBi. So the limit is 30 dBm. Data sharing between Beamforming and MIMO.