RF TEST REPORT

Applicant	Quectel Wireless Solutions Company Limited
FCC ID	XMR2023FCU760KN
Product	Wi-Fi & Bluetooth Module
Brand	Quectel
Model	FCU760K-N
Report No.	R2308A0881-R3
Issue Date	May 28, 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.

Zhu Chentao

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Approved by: Xu Kai

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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: August 30, 2023 ~ May 17, 2024 Date of Sample Received: August 28, 2023			
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
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Contact:	Xu Kai
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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	Quectel Wireless Solutions Company Limited
Applicant address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233
Manufacturer	Quectel Wireless Solutions Company Limited
Manufacturer address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233

2.2. General information

EUT Description		
Model	FCU760K-N	
SN	Conducted	E1M23G807000071
	Radiated	E1M23G807000068
Hardware Version	R1.0	
Software Version	NA	
Power Supply	External power supply	
Antenna Type	Dipole Antenna	
Antenna Connector	RP SMA Male (meet with the standard FCC Part 15.203 requirement)	
Antenna Gain	U-NII-1: -0.9 dBi U-NII-2A: -1.4 dBi U-NII-2C: -0.3 dBi U-NII-3: 0.4 dBi	
Operating Frequency Range(s)	U-NII-1: 5150MHz-5250MHz U-NII-2A: 5250MHz -5350MHz U-NII-2C: 5470MHz-5725MHz U-NII-3: 5725MHz -5850MHz	
Modulation Type	802.11a: OFDM 802.11n (HT20/HT40): OFDM 802.11ac (VHT20/VHT40): OFDM 802.11ax (HE20/HE40): OFDM (Only Support Full Ru)	
Max. Output Power	18.27 dBm	
Operating temperature range	-20 ° C to 80° C	
Operating voltage range	3.0 V to 3.6 V	
Testing temperature range	-30 ° C to 50° C	
State voltage	3.3V	

Auxiliary test equipment	
Adapter	Manufacturer: HUAWEI Model: HW-050450C01
PC	Manufacturer: DELL Model: INSPIRON 5493(12206714403)
Mother board	Manufacturer: Quectel Wireless Solutions Company Limited Model: /

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.

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 (vertical), lie-down position (horizontal). The worst emission was found in stand-up position (horizontal) 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
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0

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
	U-NII-2A	20 MHz	52	5260MHz
			56	5280MHz
			60	5300MHz
			64	5320MHz
		40 MHz	54	5270MHz
			62	5310MHz
	U-NII-2C	20 MHz	100	5500MHz
			104	5520MHz
			108	5540MHz
			112	5560MHz
			116	5580MHz
			120	5600MHz
			124	5620MHz
			128	5640MHz
			132	5660MHz
			136	5680MHz
			140	5700MHz
			144	5720MHz
		40 MHz	102	5510MHz
			110	5550MHz
			118	5590MHz
			126	5630MHz
			134	5670MHz
			142	5710MHz
	U-NII-3	20 MHz	149	5745MHz
			153	5765MHz
			157	5785MHz
			161	5805MHz
			165	5825MHz
		40 MHz	151	5755MHz
			159	5795MHz
Does this device support TPC Function? ☐Yes ☒No				
Does this device support TDWR Band? ☒Yes ☐No				

5. Test Case Results

5.1. Occupied Bandwidth

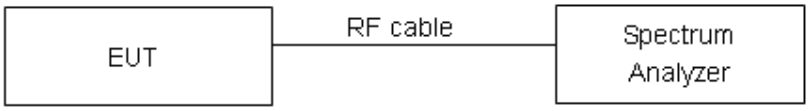
Ambient condition

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/U-NII-2A/U-NII-2C, 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/U-NII-2A/U-NII-2C
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	16.909	23.933	PASS
	5200	16.884	25.751	PASS
	5240	16.890	25.060	PASS
802.11n HT20	5180	18.089	26.327	PASS
	5200	18.102	25.928	PASS
	5240	18.078	27.835	PASS
802.11n HT40	5190	36.552	47.075	PASS
	5230	36.640	50.873	PASS
802.11ac VHT20	5180	18.044	25.381	PASS
	5200	18.125	25.424	PASS
	5240	18.056	26.628	PASS
802.11ac VHT40	5190	36.566	45.534	PASS
	5230	36.572	46.825	PASS
802.11ax HE20	5180	19.116	24.945	PASS
	5200	19.173	26.004	PASS
	5240	19.104	25.051	PASS
802.11ax HE40	5190	37.898	44.945	PASS
	5230	38.001	45.348	PASS

U-NII-2A

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5260	16.923	29.066	PASS
	5300	16.859	25.349	PASS
	5320	16.924	25.079	PASS
802.11n HT20	5260	18.126	27.716	PASS
	5300	18.110	25.096	PASS
	5320	18.133	29.350	PASS
802.11n HT40	5270	36.535	51.586	PASS
	5310	36.544	50.426	PASS
802.11ac VHT20	5260	18.136	25.904	PASS
	5300	18.123	25.615	PASS
	5320	18.083	25.457	PASS
802.11ac VHT40	5270	36.606	47.874	PASS
	5310	36.548	49.221	PASS
802.11ax HE20	5260	19.138	24.697	PASS
	5300	19.125	25.106	PASS
	5320	19.121	25.113	PASS
802.11ax HE40	5270	38.001	43.273	PASS
	5310	37.949	44.694	PASS

U-NII-2C

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5500	16.991	25.810	PASS
	5600	17.062	24.989	PASS
	5700	17.084	25.396	PASS
	5720	17.019	24.731	PASS
802.11n HT20	5500	18.263	27.138	PASS
	5600	18.219	27.770	PASS
	5700	18.233	27.051	PASS
	5720	18.243	26.995	PASS
802.11n HT40	5510	36.804	47.986	PASS
	5590	36.810	47.584	PASS
	5670	36.790	48.573	PASS
	5710	36.888	47.184	PASS
802.11ac VHT20	5500	18.196	26.064	PASS
	5600	18.250	26.940	PASS
	5700	18.232	26.505	PASS
	5720	18.253	25.530	PASS
802.11ac VHT40	5510	36.769	47.698	PASS
	5590	36.809	48.707	PASS
	5670	36.790	47.411	PASS
	5710	36.789	48.370	PASS
802.11ax HE20	5500	19.230	25.038	PASS
	5600	19.173	27.571	PASS
	5700	19.177	25.924	PASS
	5720	19.259	24.217	PASS
802.11ax HE40	5510	38.093	45.065	PASS
	5590	38.120	46.658	PASS
	5670	38.111	45.550	PASS
	5710	38.092	45.872	PASS

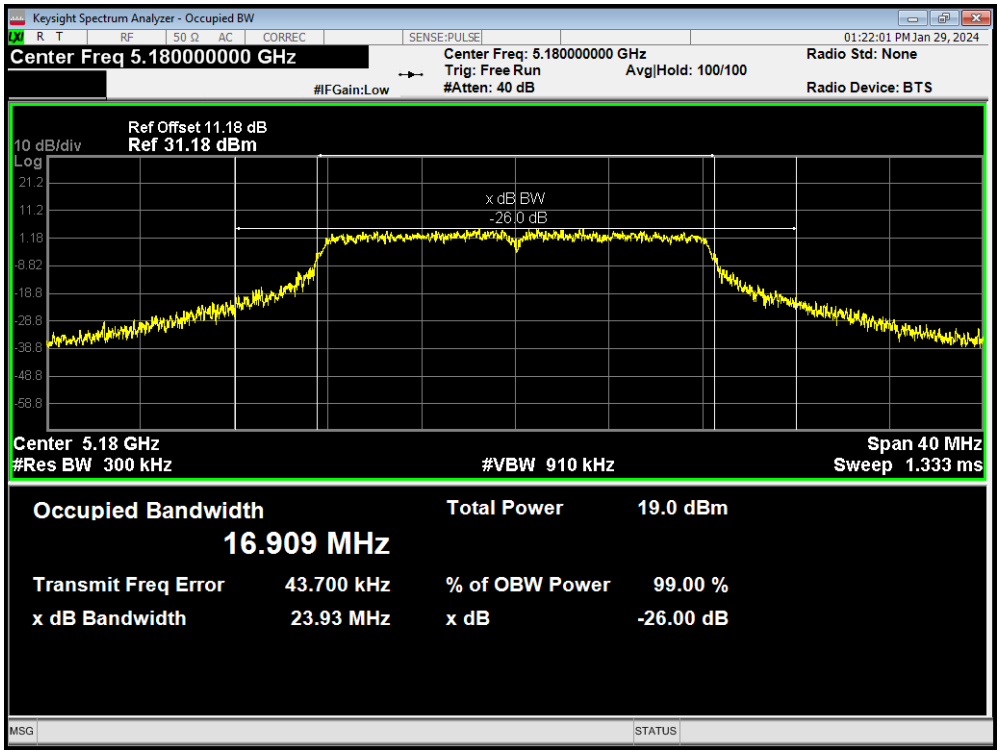
U-NII-3

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11a	5720	17.003	16.370	500	PASS
	5745	17.057	16.356	500	PASS
	5785	17.018	16.361	500	PASS
	5825	17.024	16.366	500	PASS
802.11n HT20	5720	18.291	17.609	500	PASS
	5745	18.236	17.619	500	PASS
	5785	18.230	17.615	500	PASS
	5825	18.281	17.606	500	PASS
802.11n HT40	5710	36.847	36.379	500	PASS
	5755	36.787	36.391	500	PASS
	5795	36.882	36.343	500	PASS
802.11ac VHT20	5720	18.186	17.669	500	PASS
	5745	18.212	17.790	500	PASS
	5785	18.221	17.616	500	PASS
	5825	18.193	17.704	500	PASS
802.11ac VHT40	5710	36.885	36.355	500	PASS
	5755	36.739	36.368	500	PASS
	5795	36.754	36.413	500	PASS
802.11ax HE20	5720	19.289	19.008	500	PASS
	5745	19.277	19.008	500	PASS
	5785	19.275	18.892	500	PASS
	5825	19.220	18.955	500	PASS
802.11ax HE40	5710	38.093	38.154	500	PASS
	5755	38.169	38.113	500	PASS
	5795	38.104	37.974	500	PASS

99% bandwidth

U-NII-1

OBW 802.11a 5180MHz



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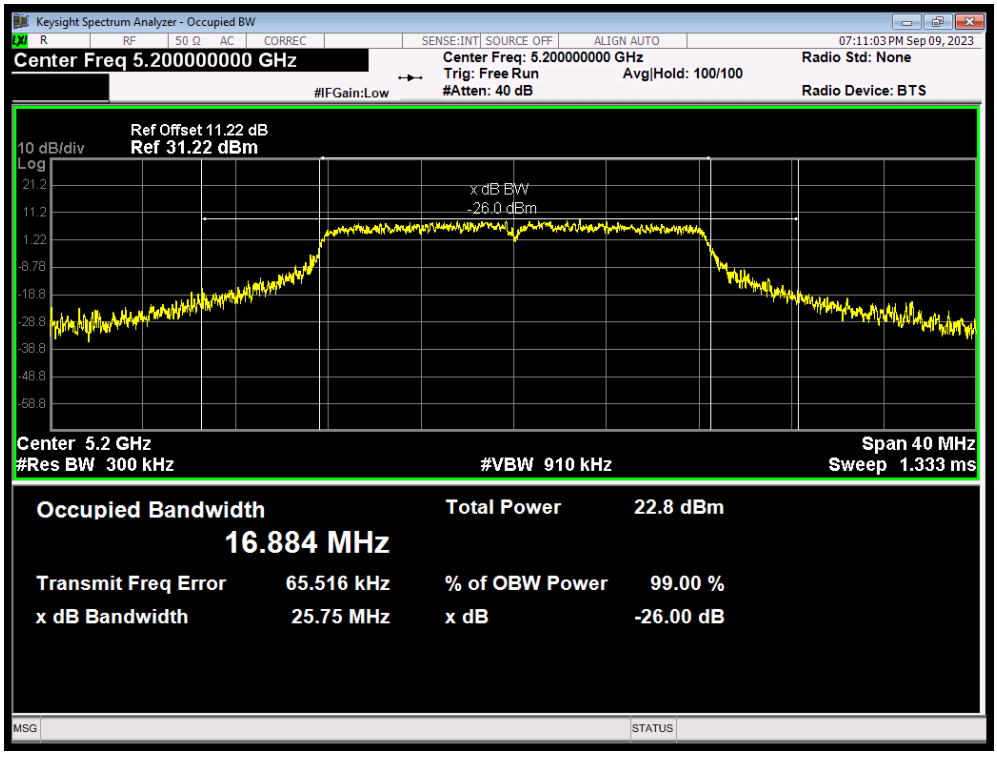

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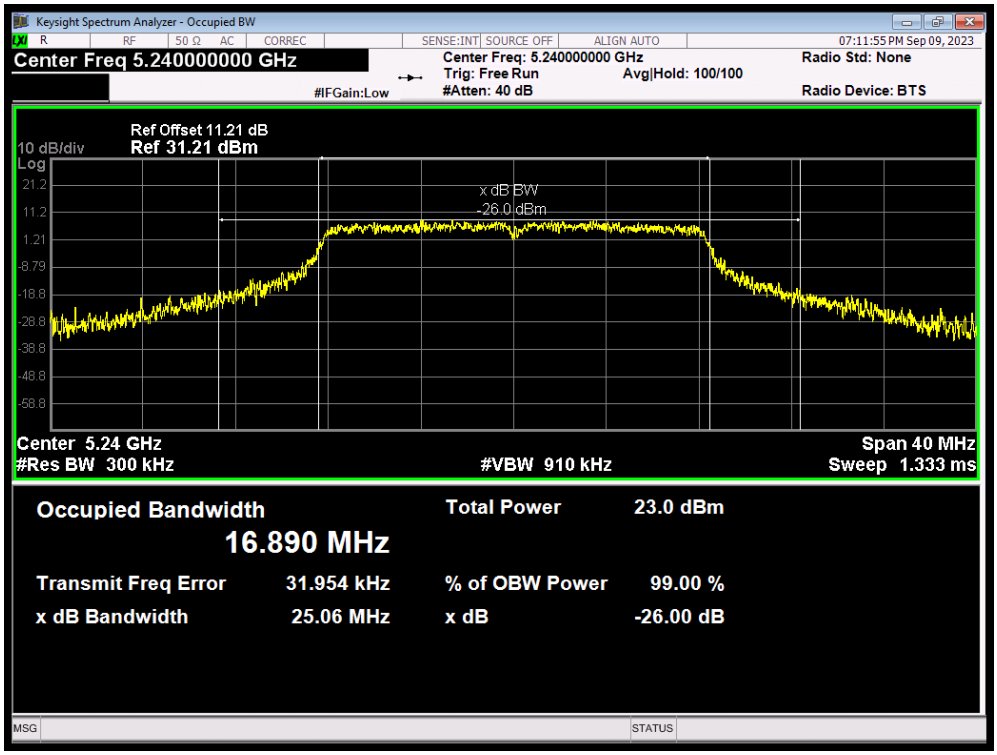

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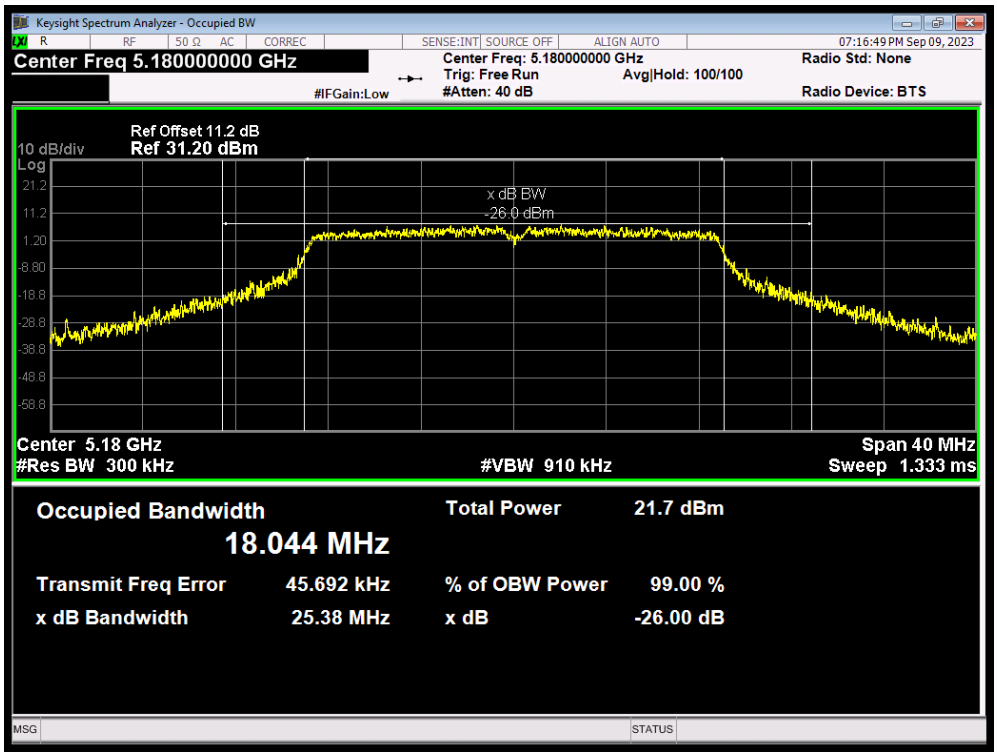

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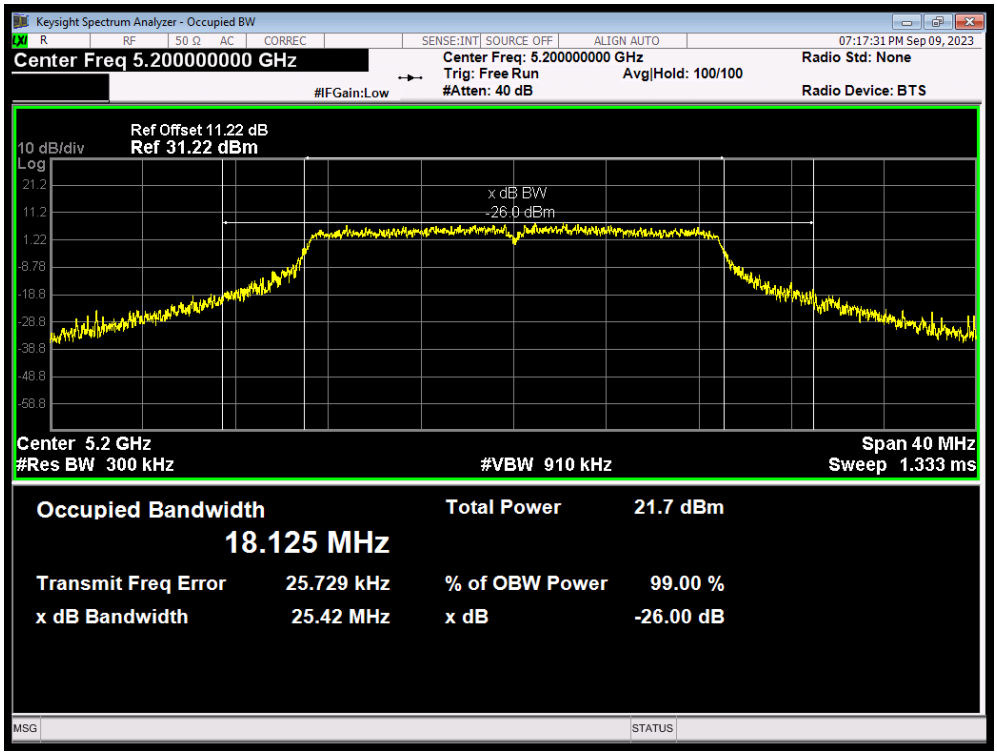

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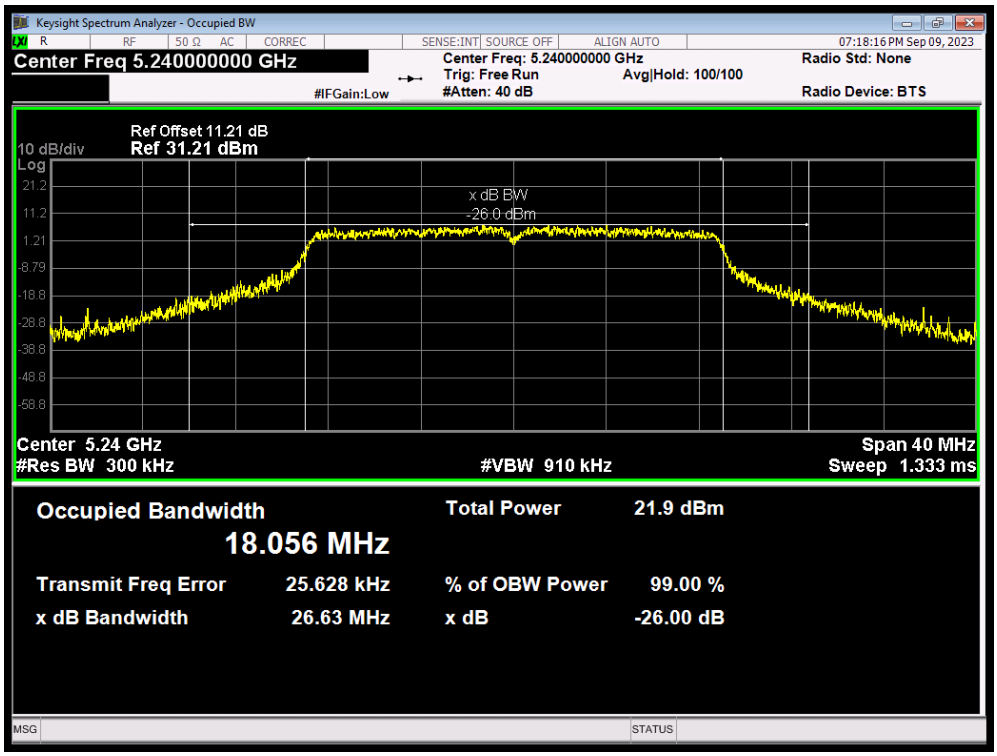
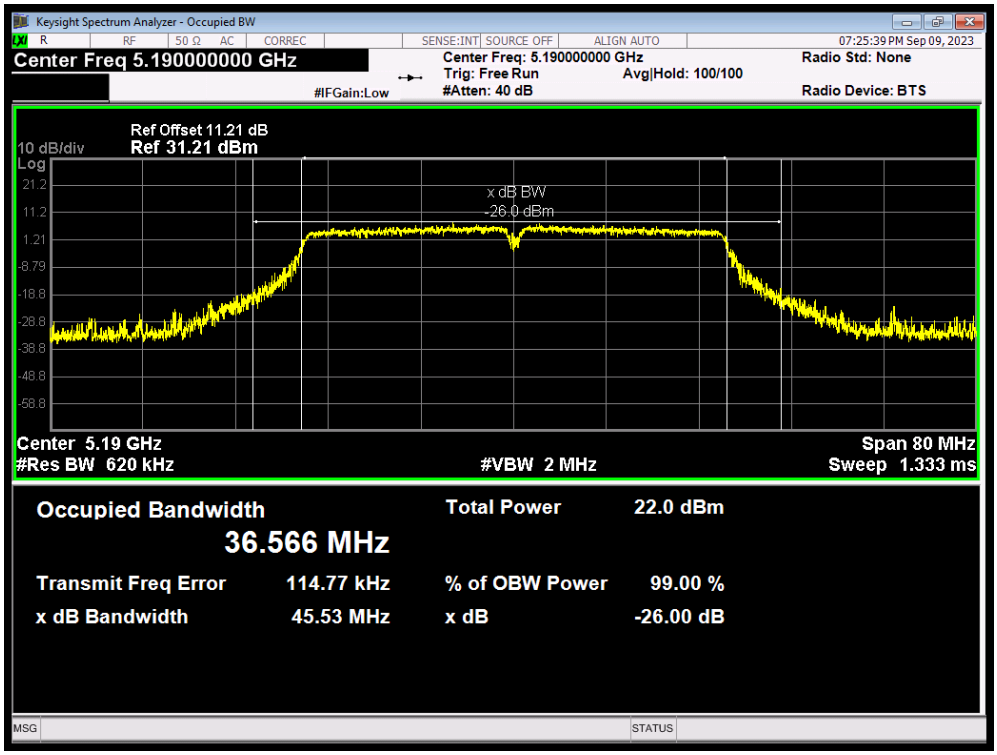


OBW 802.11ac(VHT40) 5190MHz



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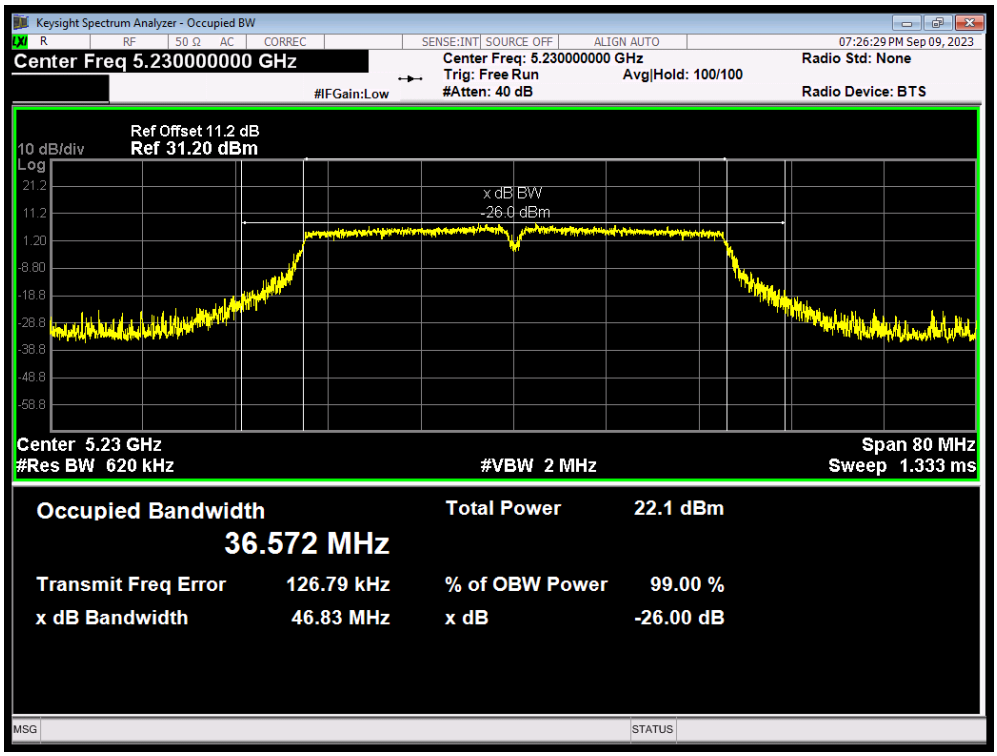

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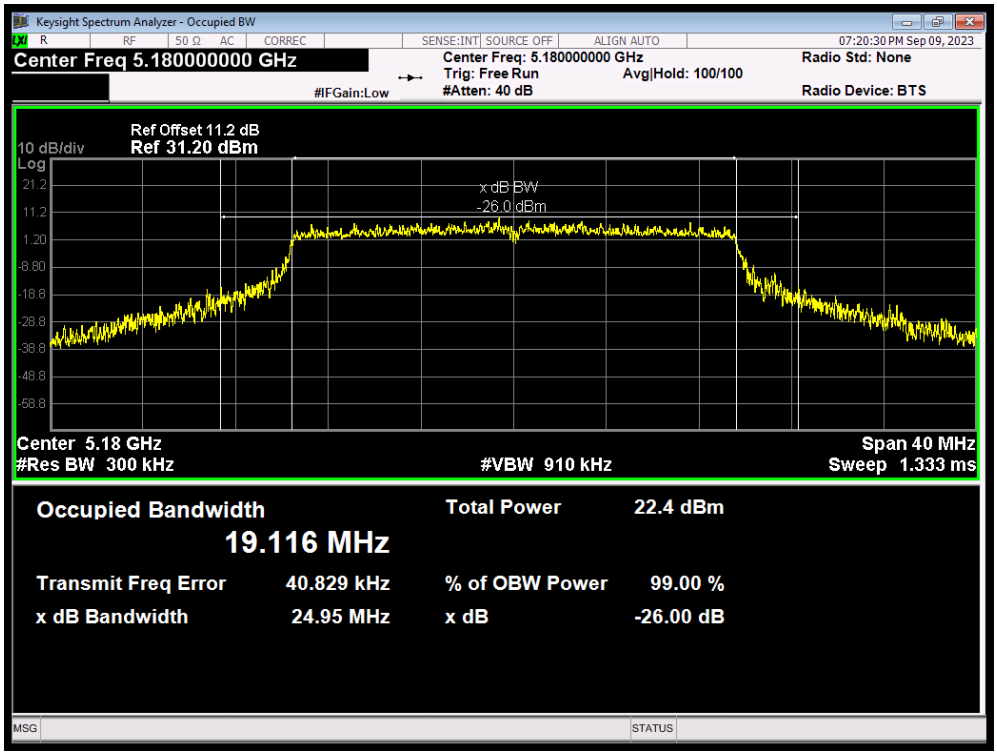

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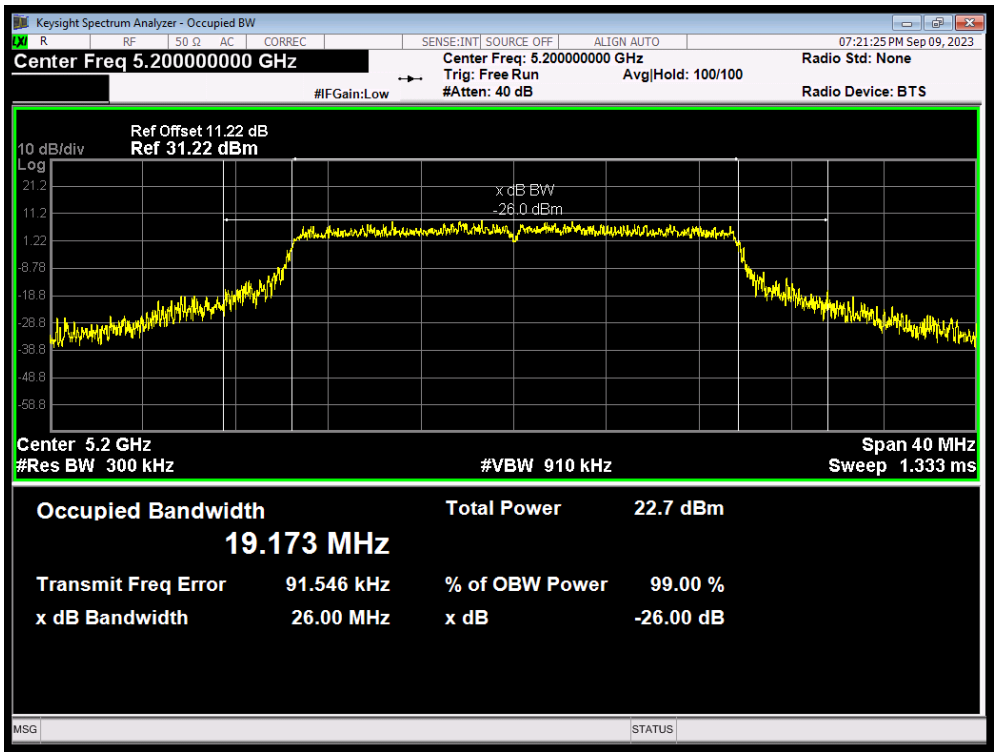

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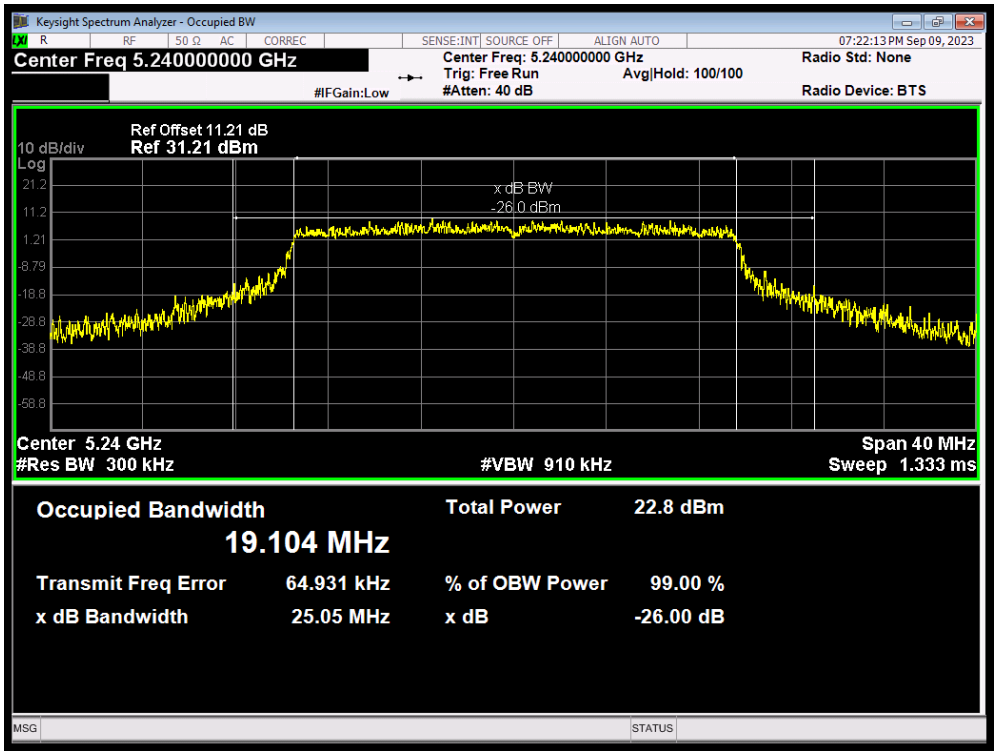

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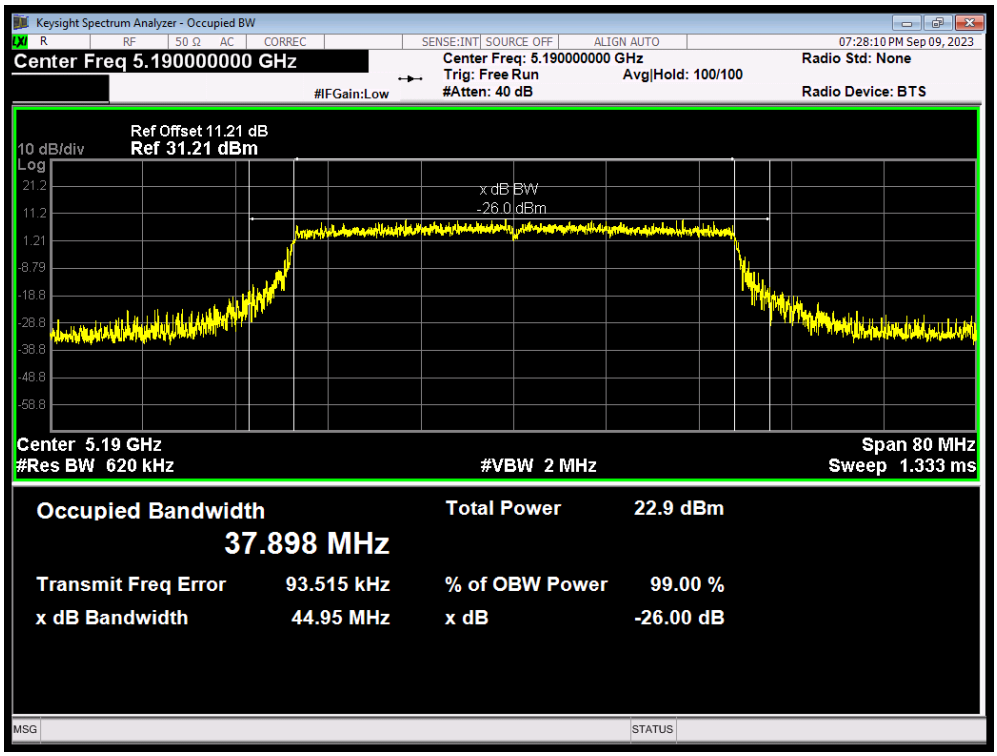

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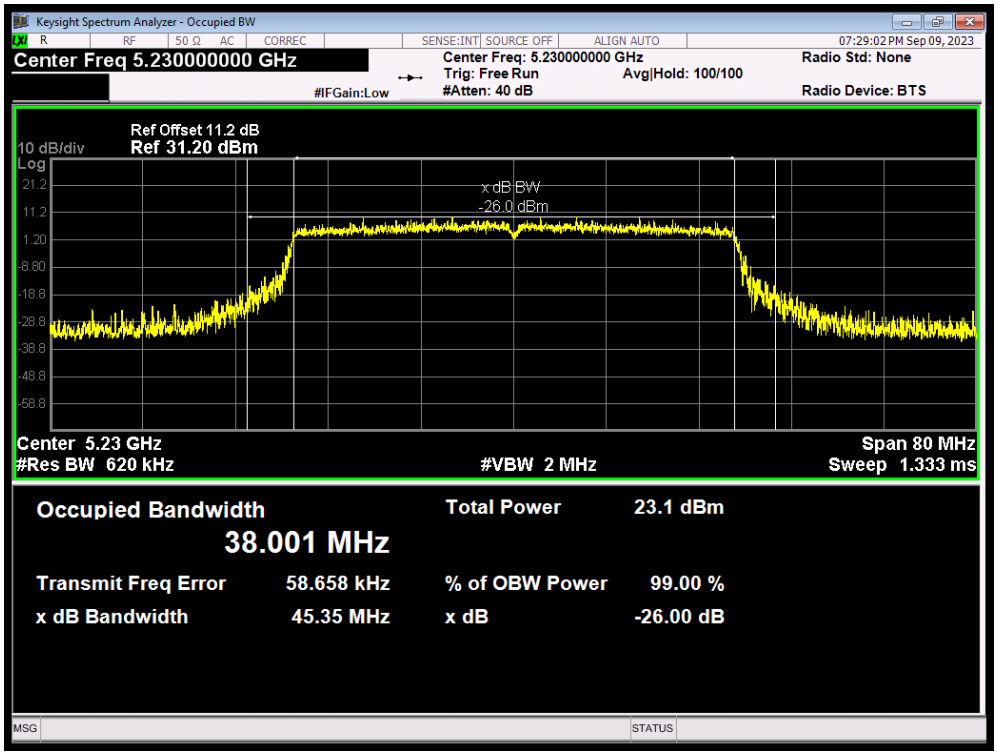
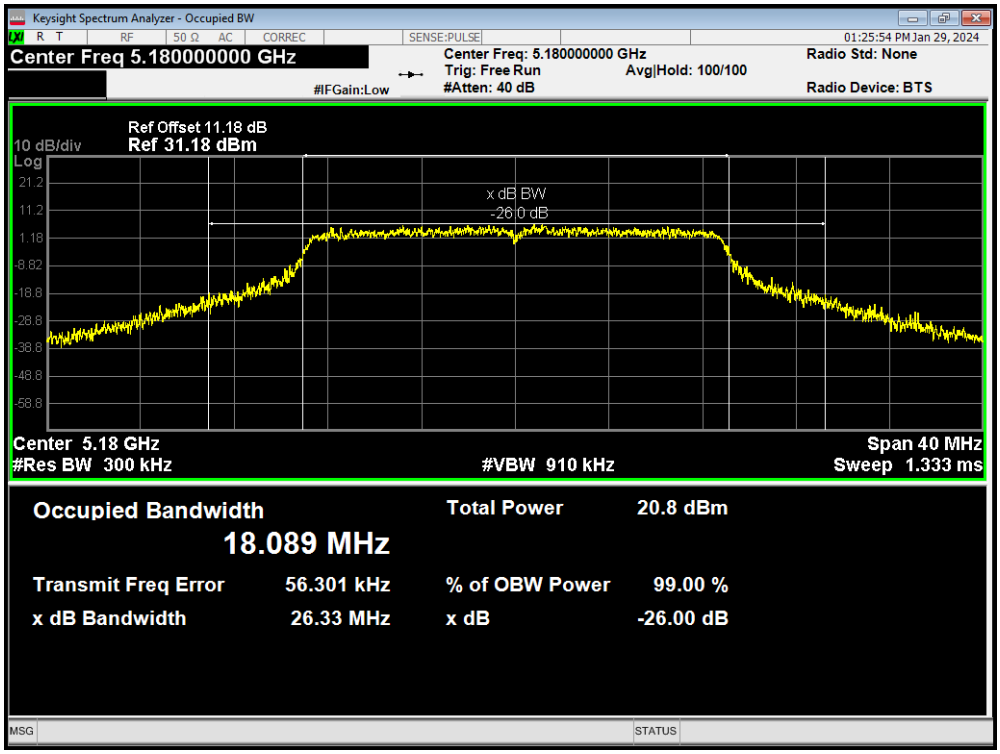
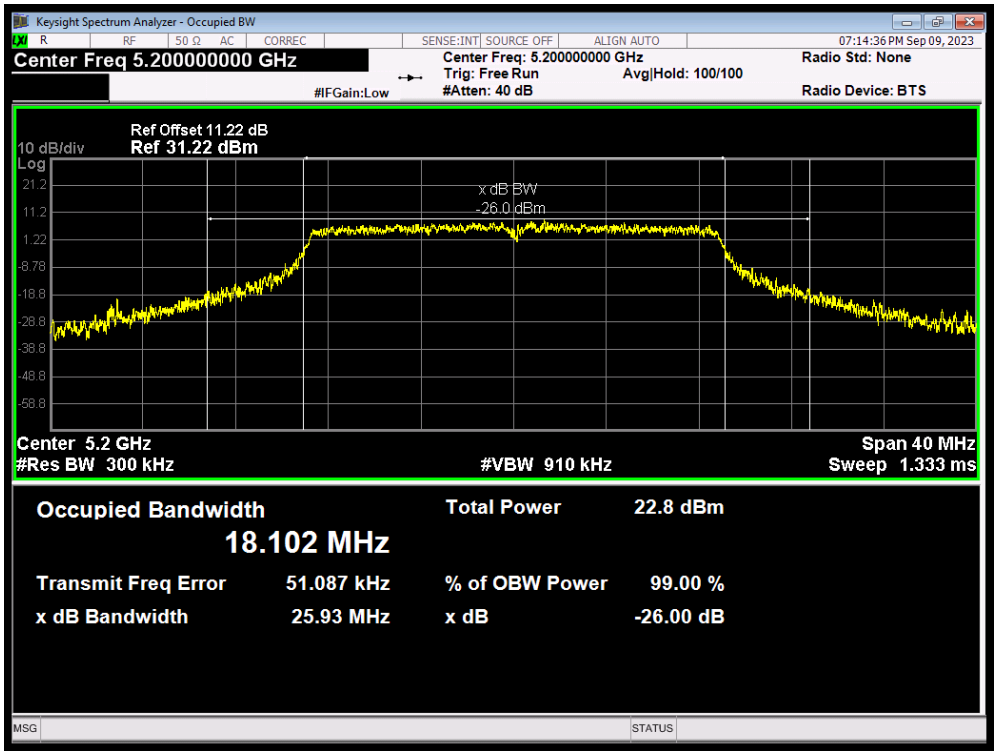


OBW 802.11n(HT20) 5180MHz



OBW 802.11n(HT20) 5200MHz



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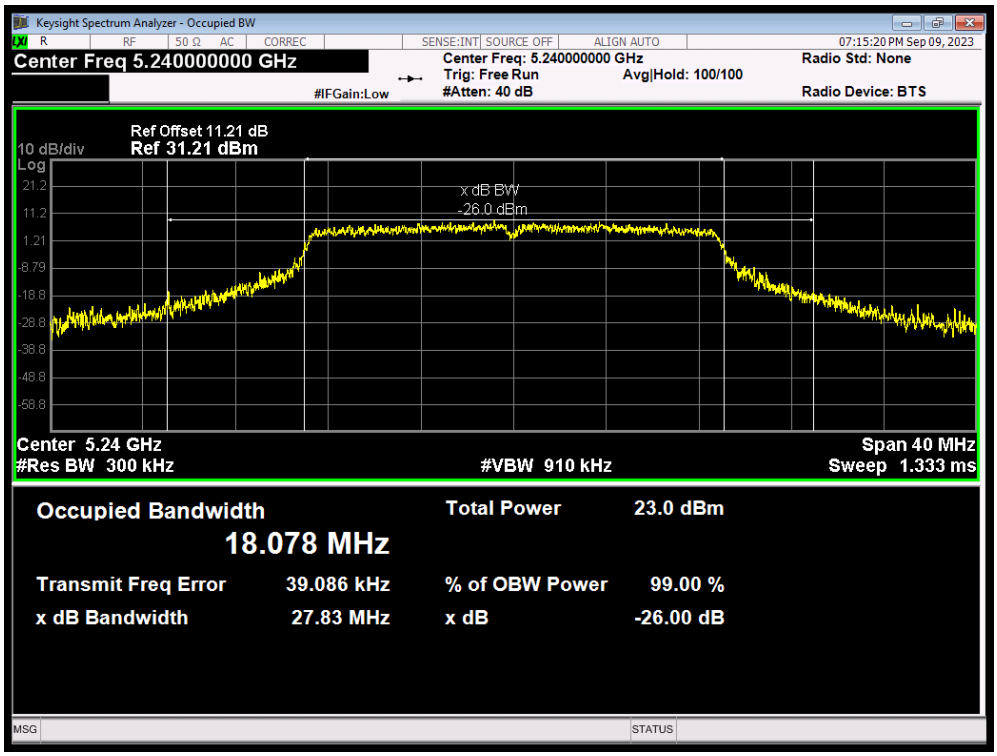

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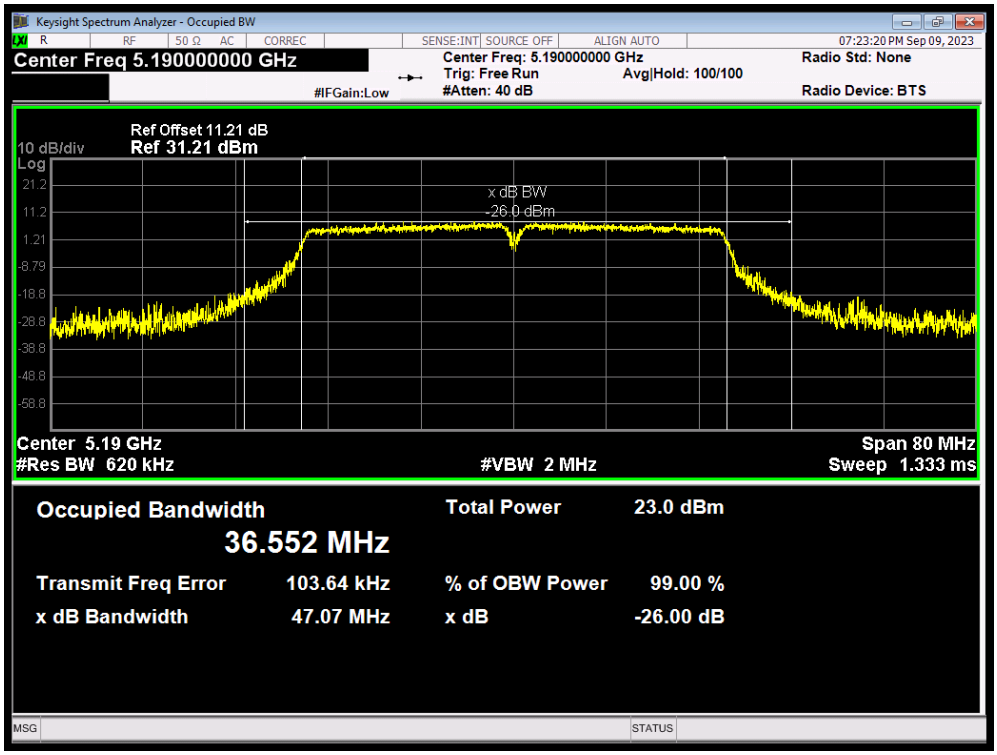

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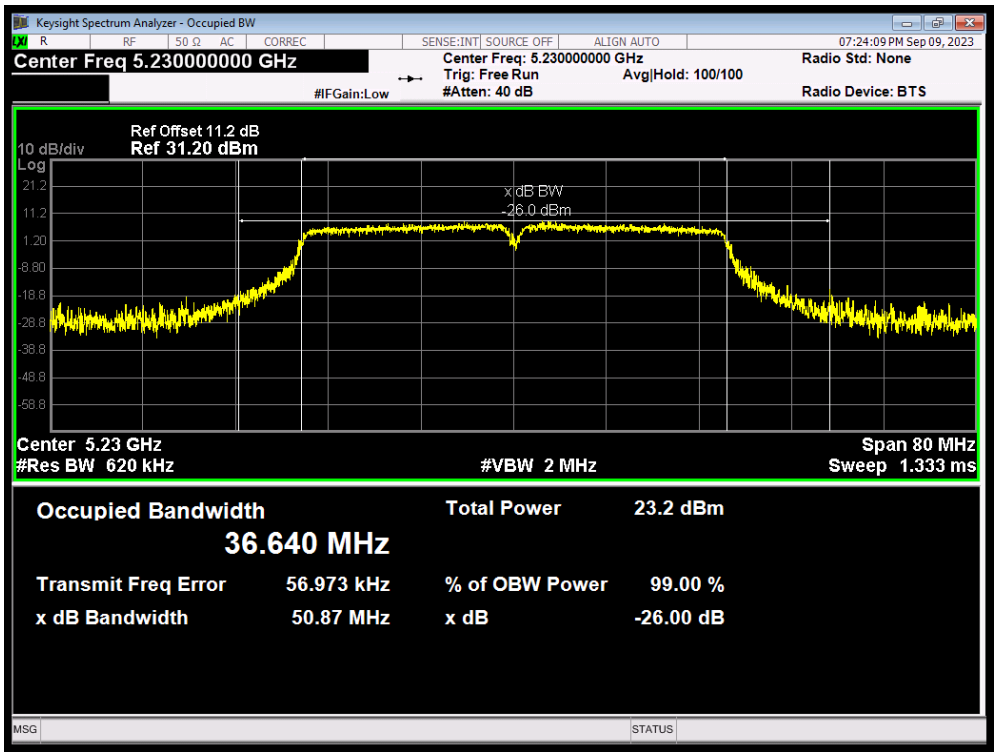
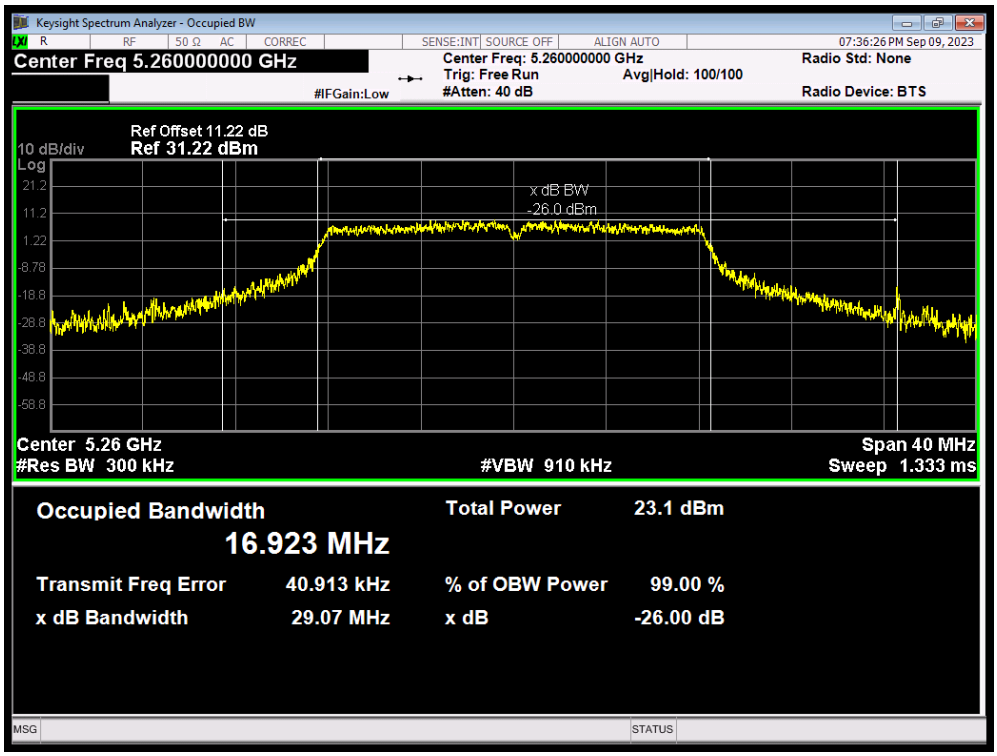


U-NII-2A

OBW 802.11a 5260MHz



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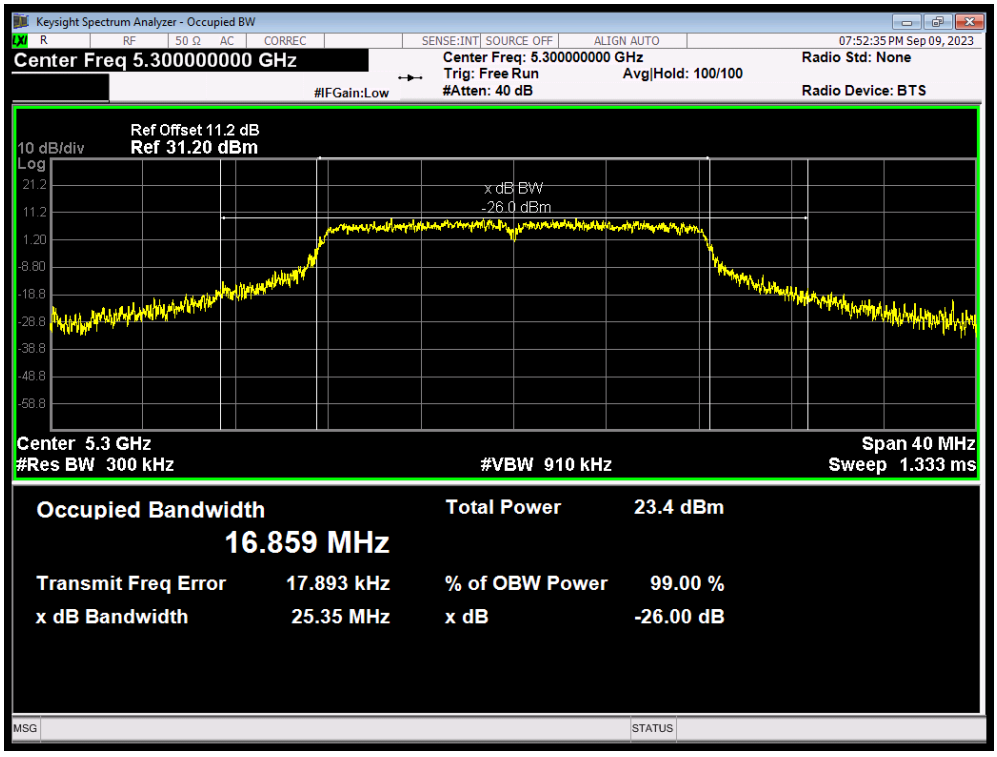

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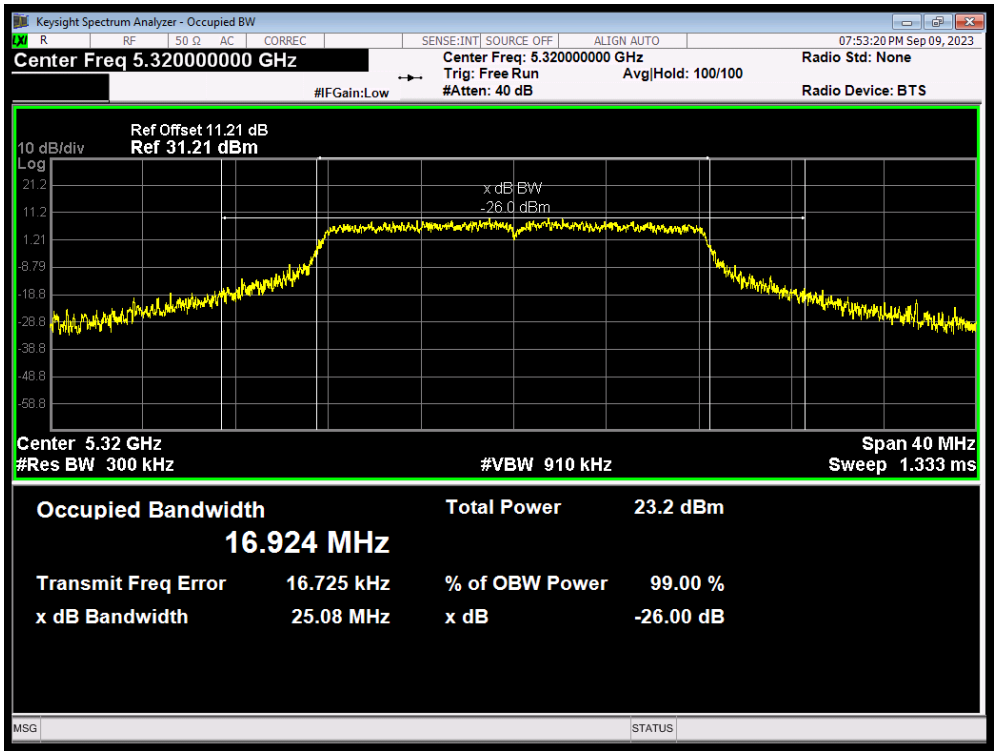
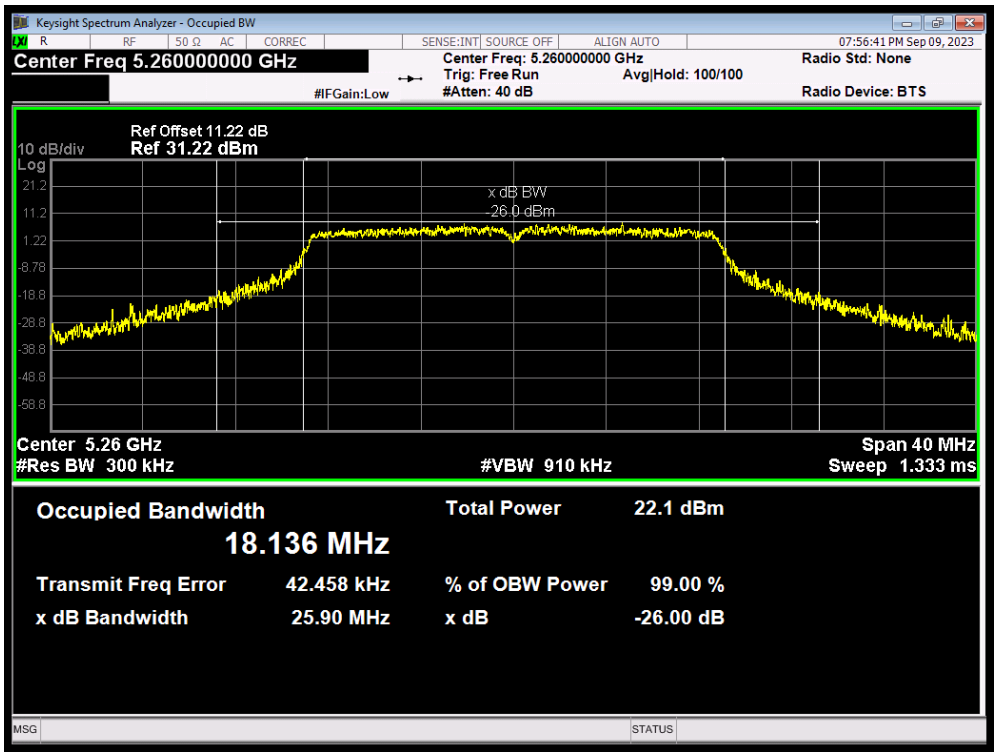


OBW 802.11ac(VHT20) 5260MHz



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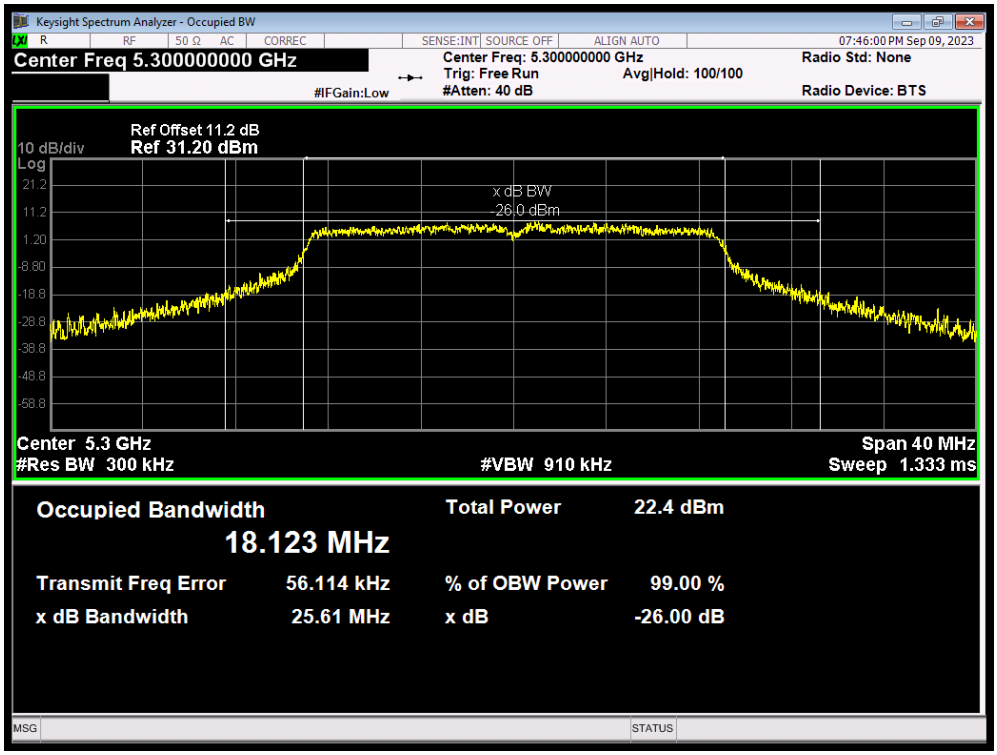
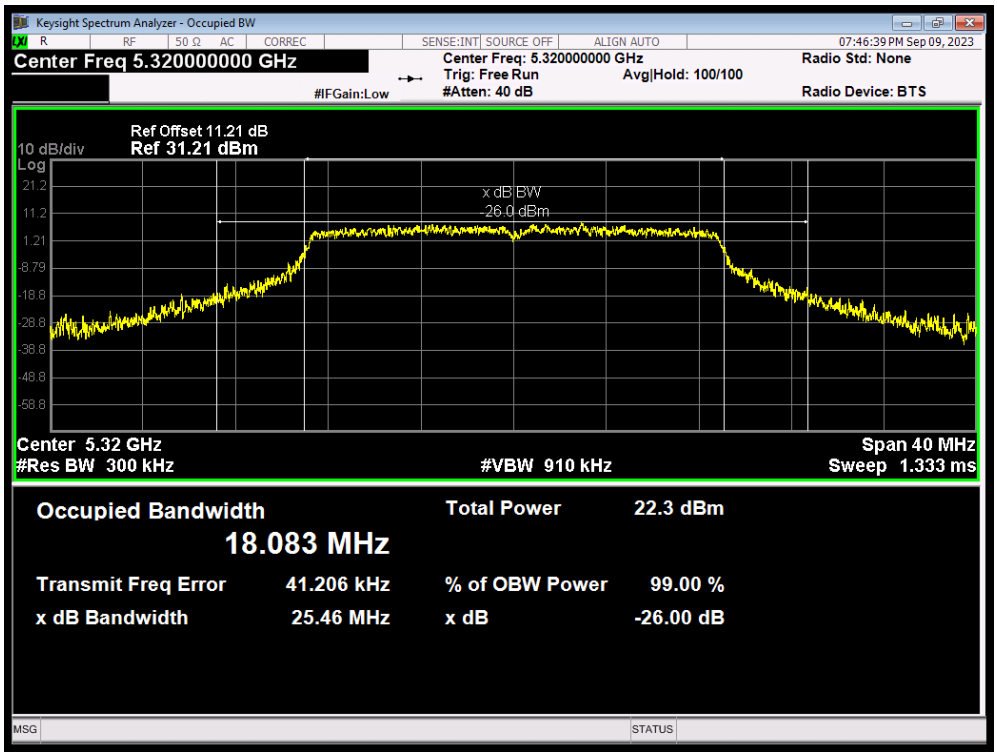
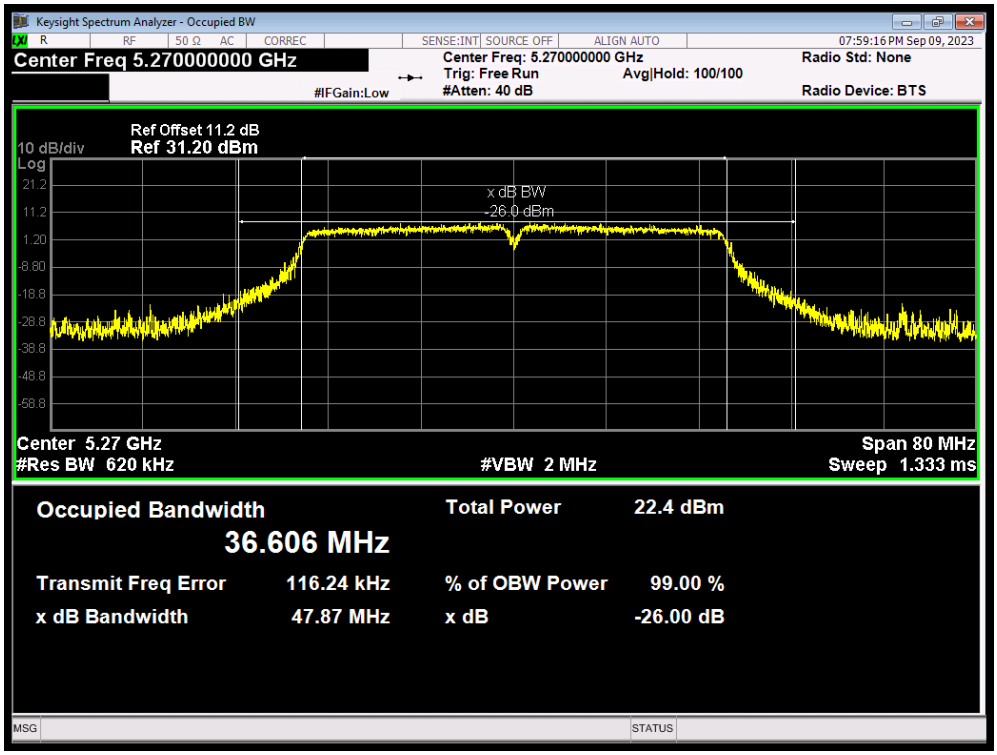


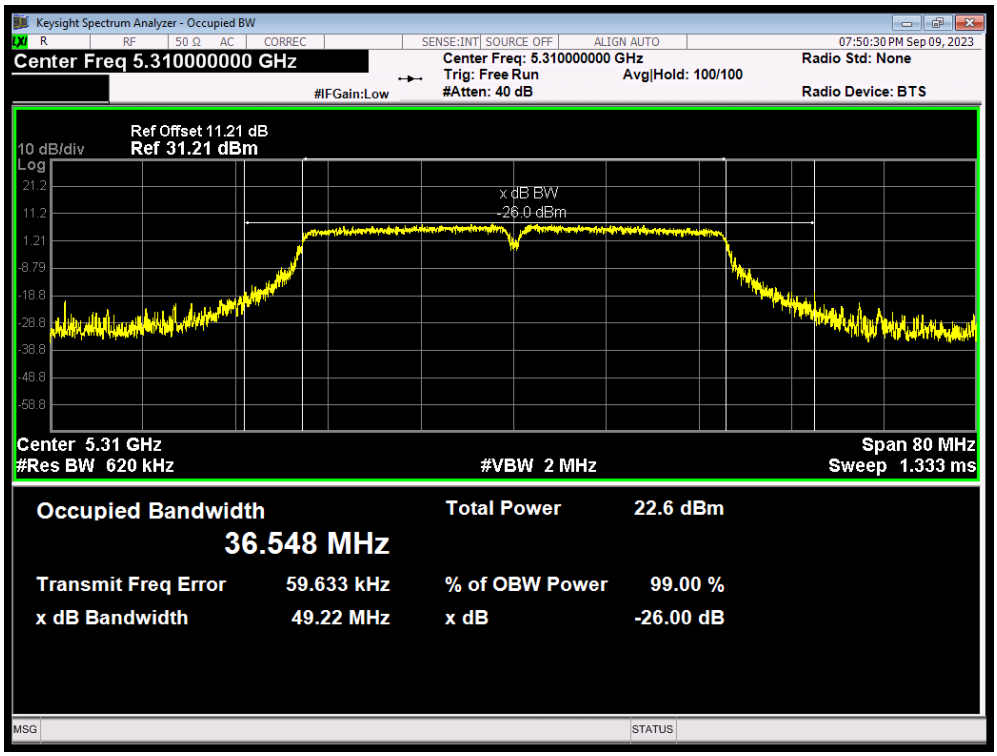
OBW 802.11ac(VHT20) 5320MHz



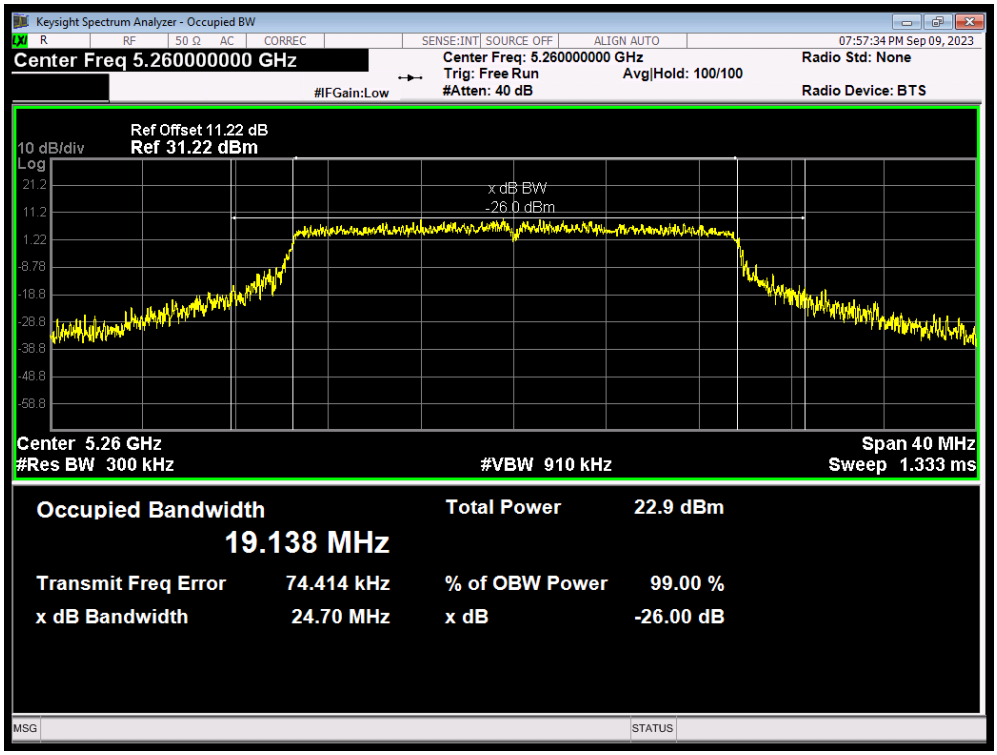
OBW 802.11ac(VHT40) 5270MHz



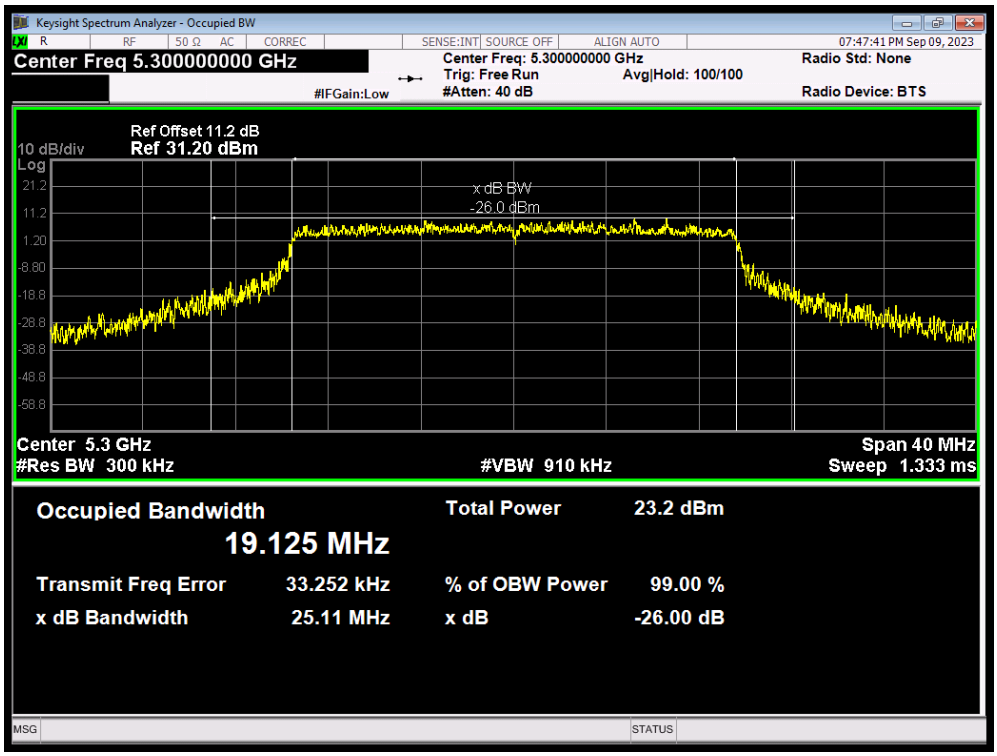
OBW 802.11ac(VHT40) 5310MHz



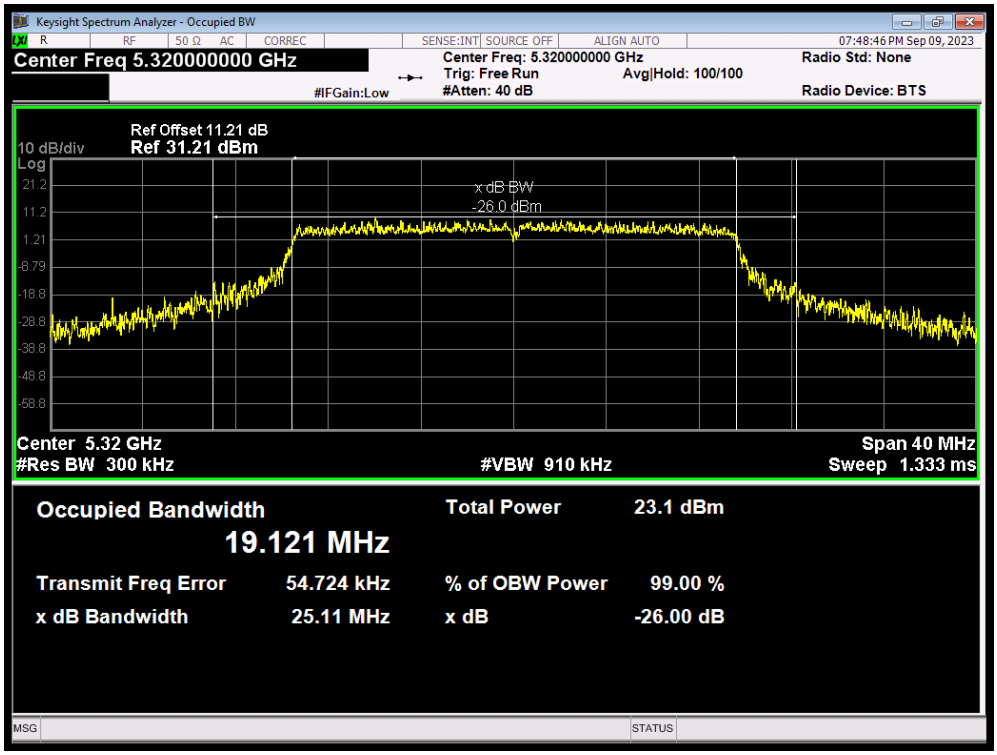
OBW 802.11ax(HE20) 5260MHz



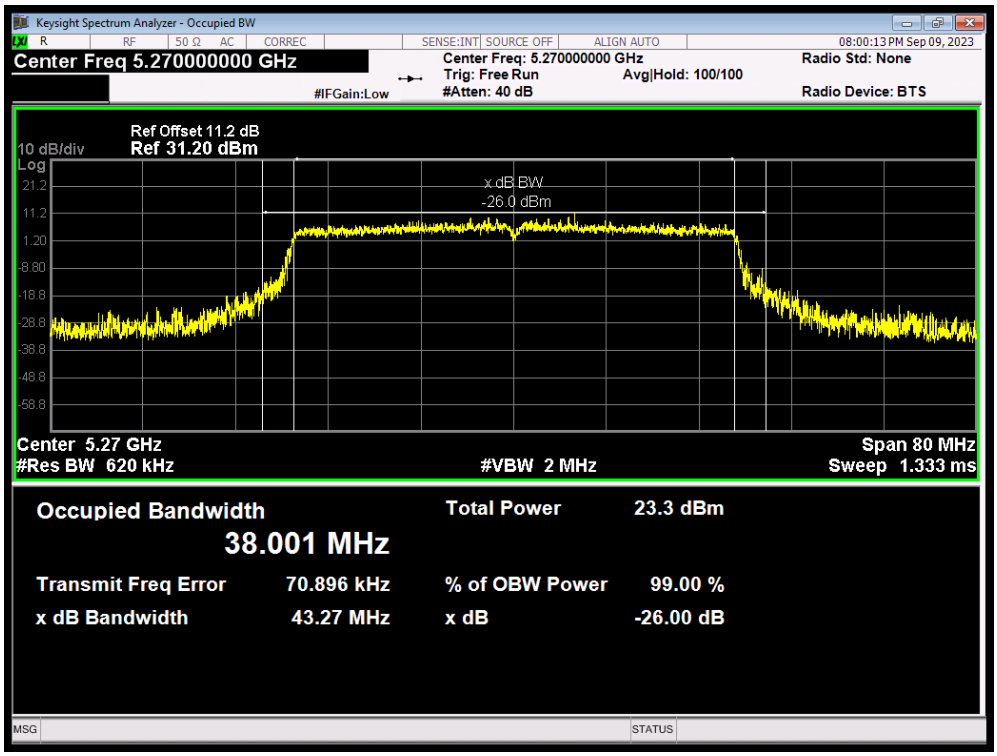
OBW 802.11ax(HE20) 5300MHz



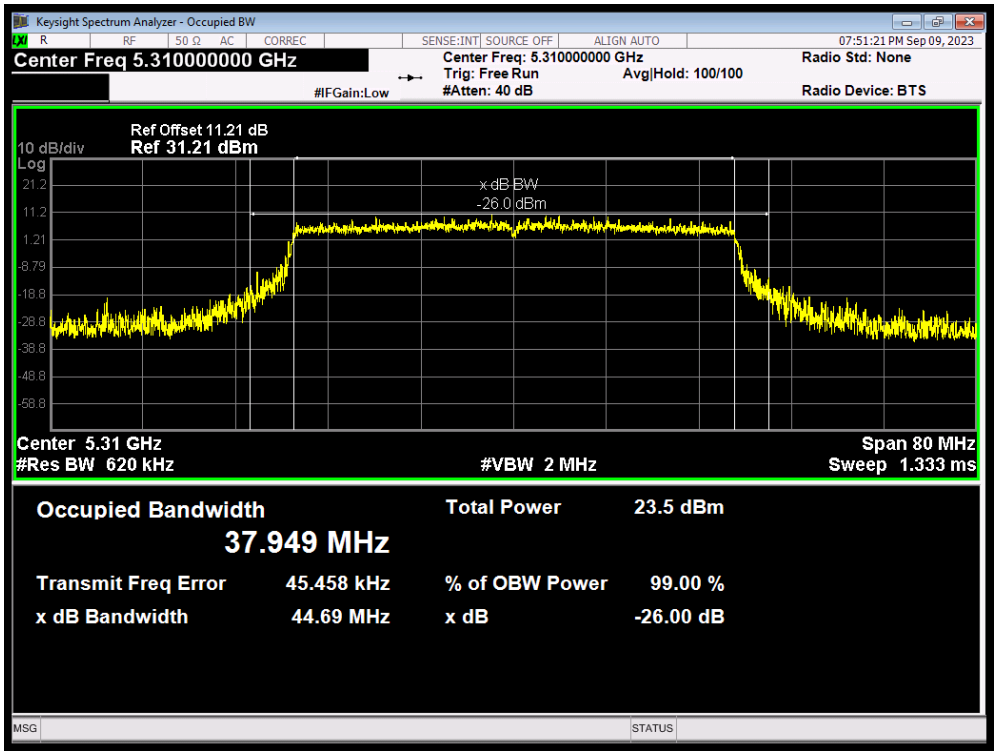
OBW 802.11ax(HE20) 5320MHz



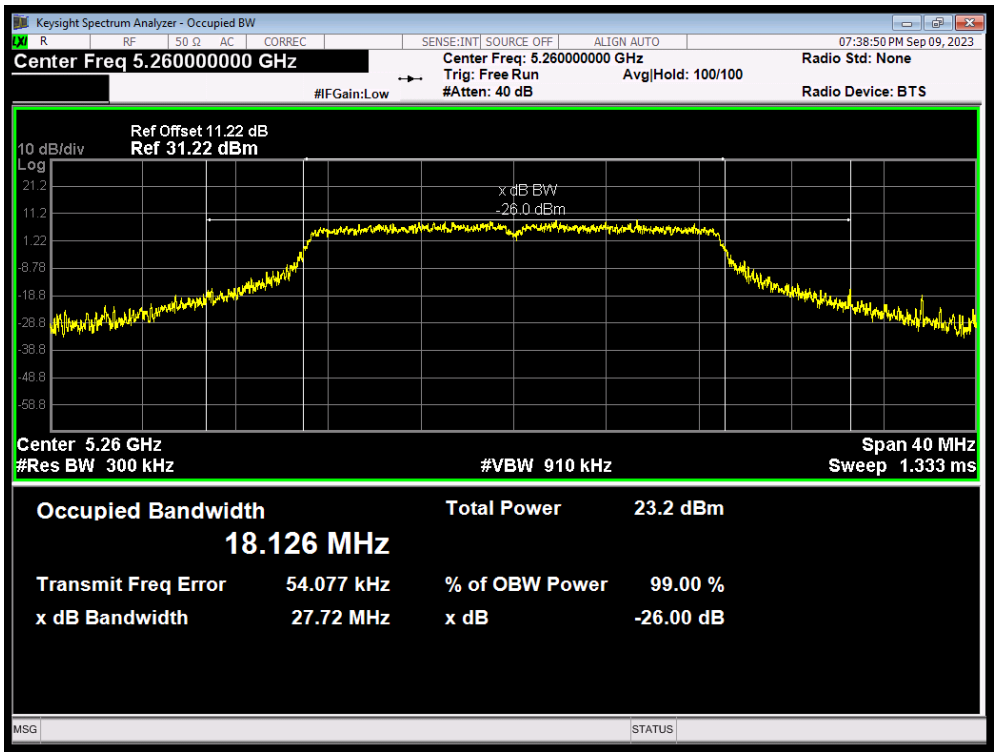
OBW 802.11ax(HE40) 5270MHz



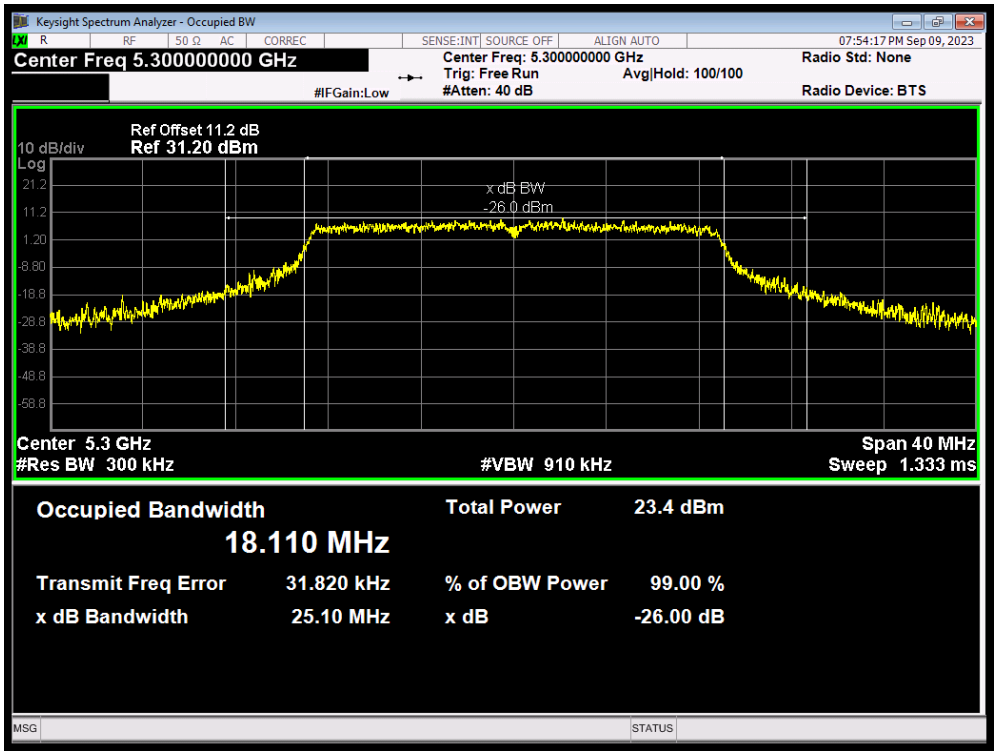
OBW 802.11ax(HE40) 5310MHz



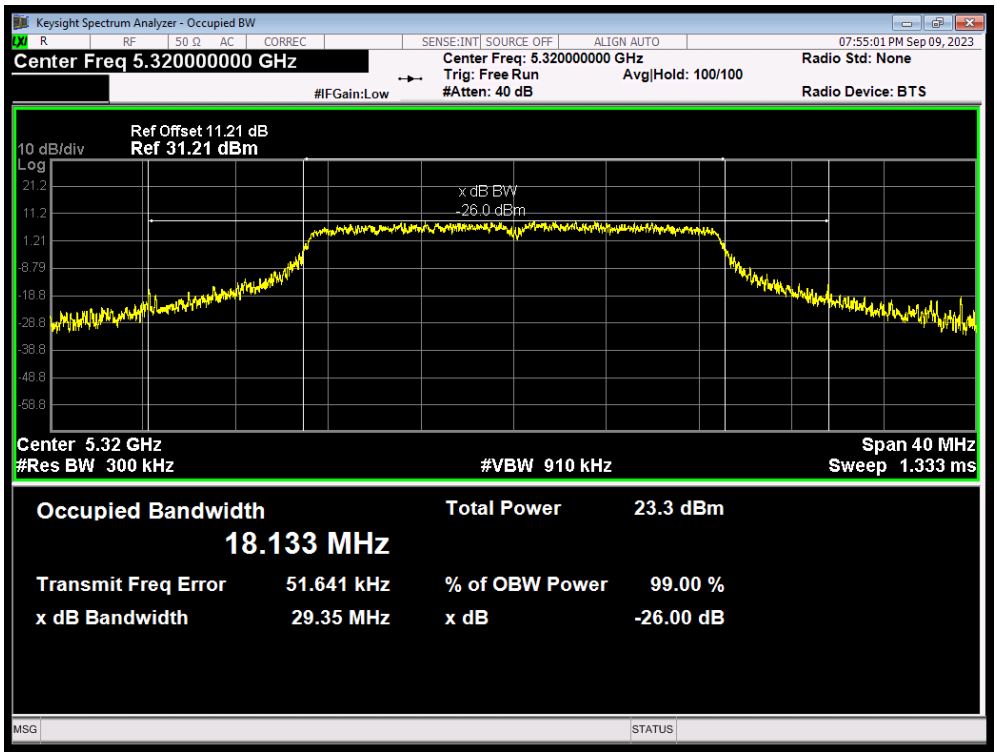
OBW 802.11n(HT20) 5260MHz



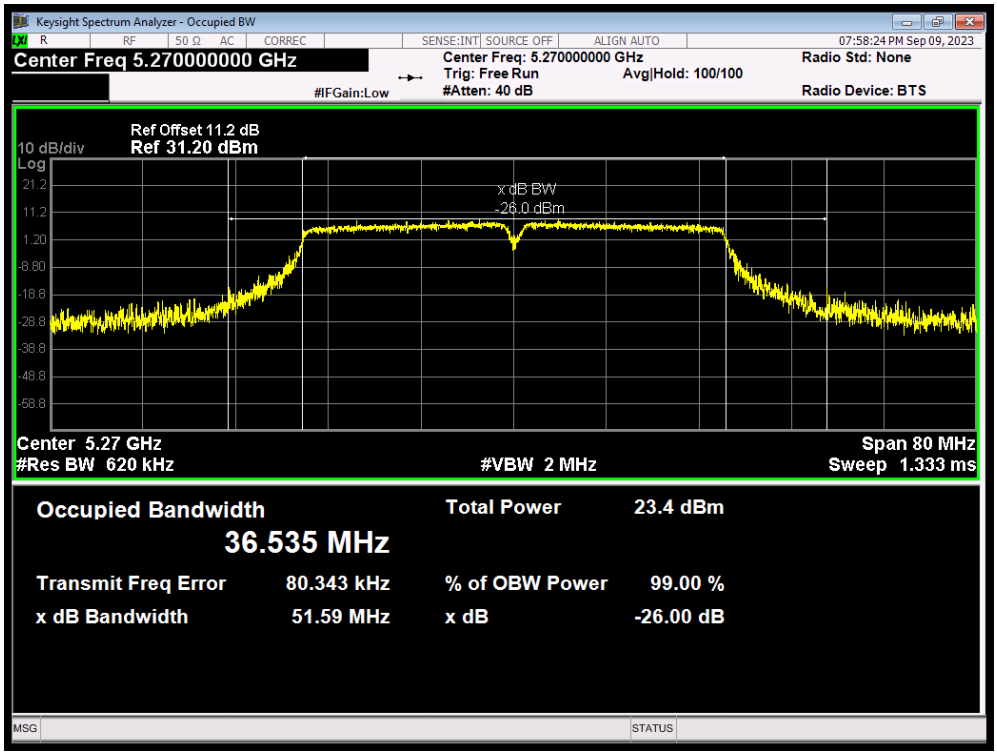
OBW 802.11n(HT20) 5300MHz



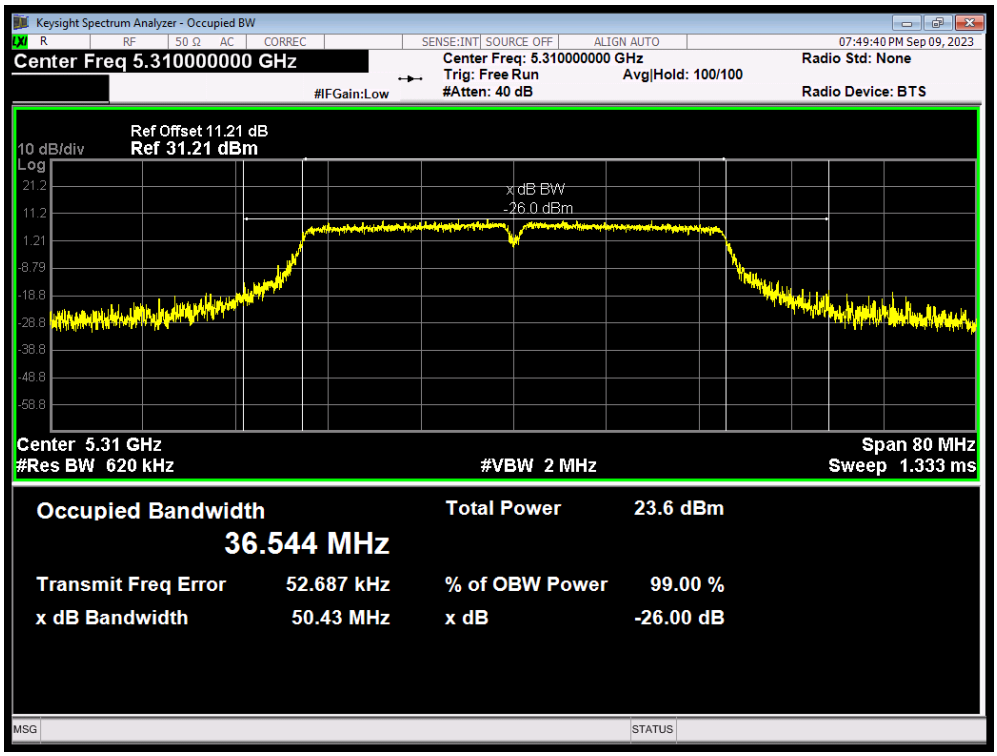
OBW 802.11n(HT20) 5320MHz



OBW 802.11n(HT40) 5270MHz

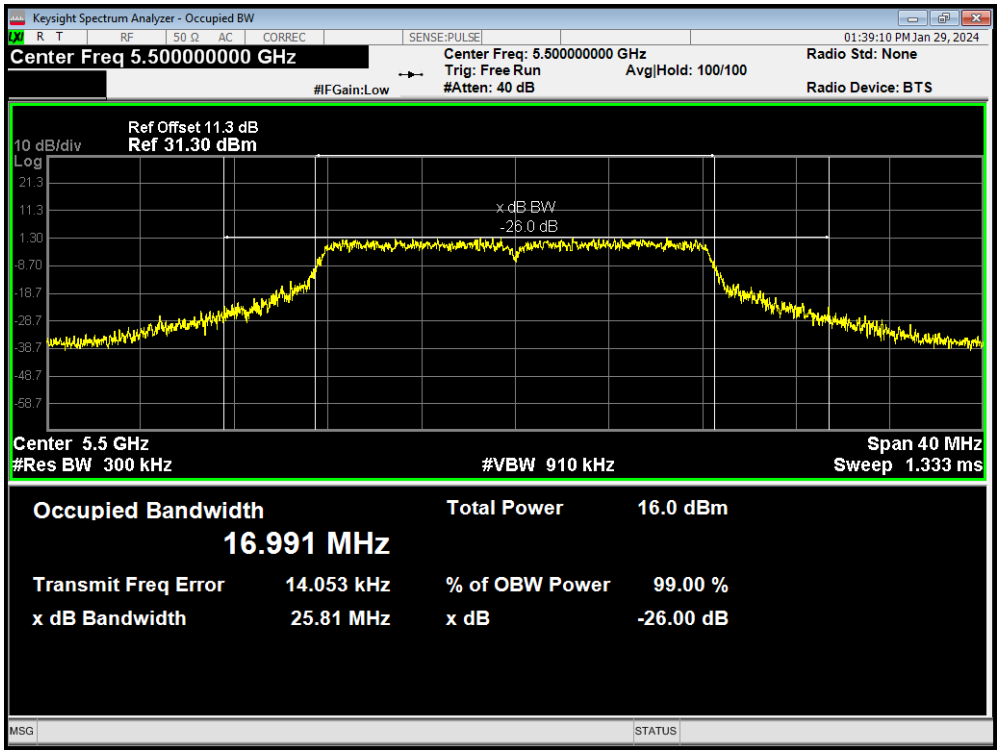


OBW 802.11n(HT40) 5310MHz

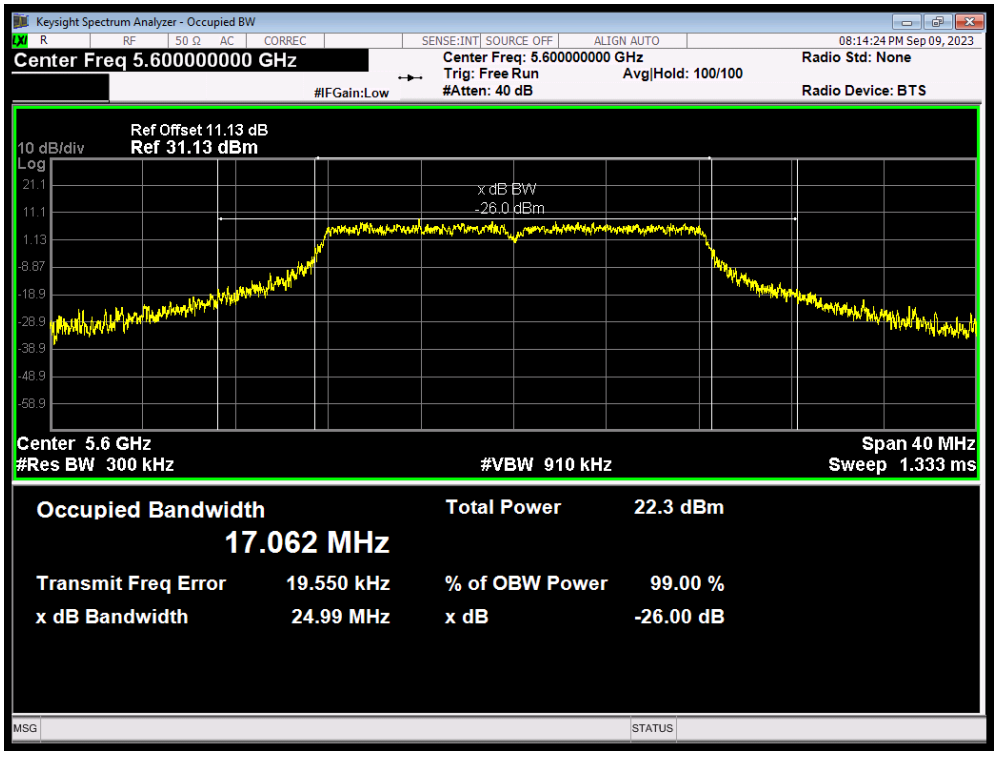


U-NII-2C

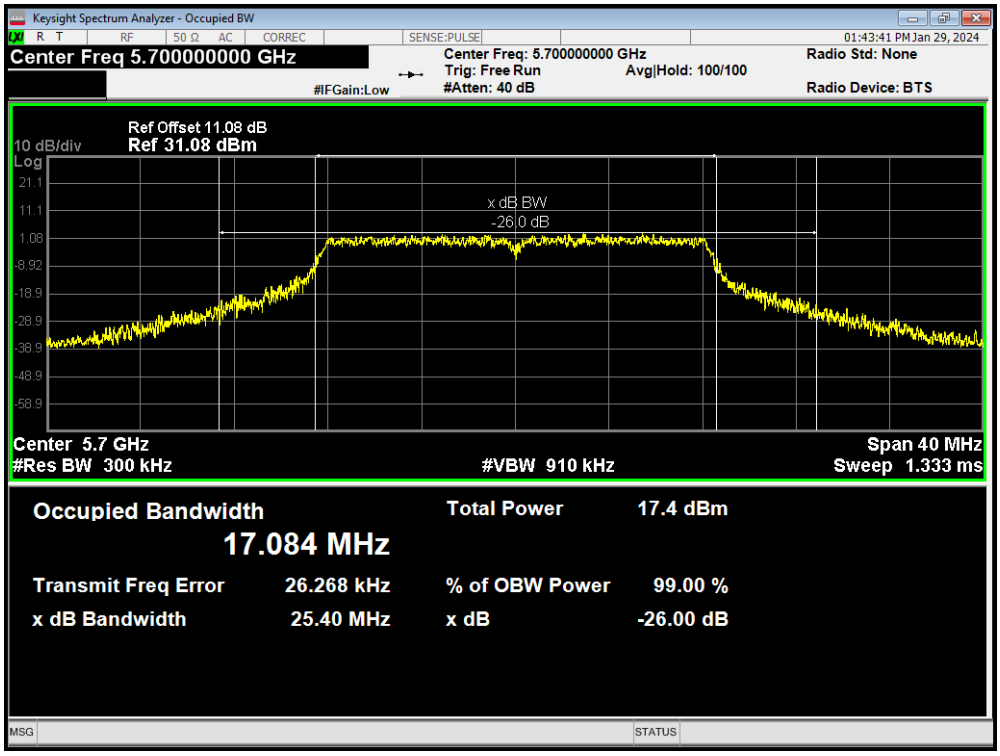
OBW 802.11a 5500MHz



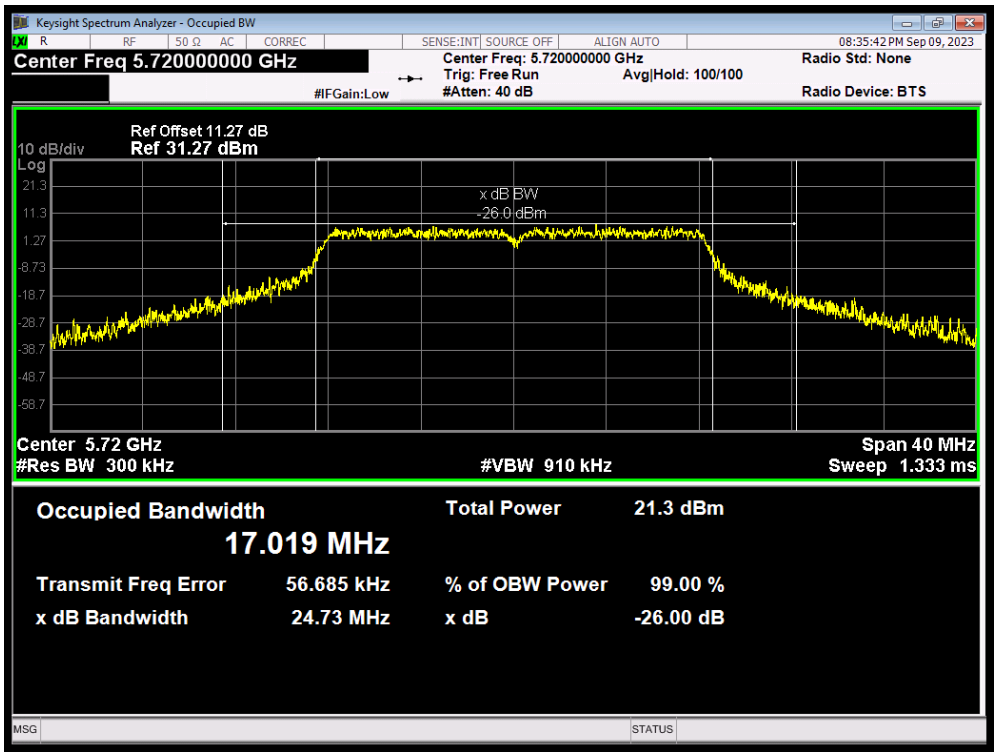
OBW 802.11a 5600MHz



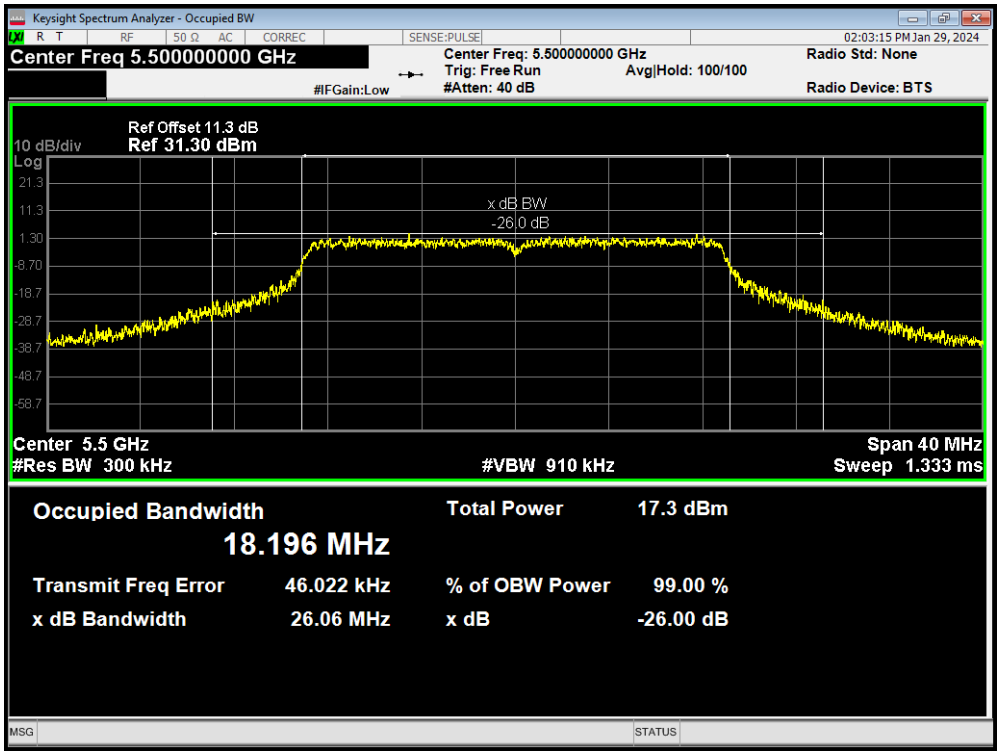
OBW 802.11a 5700MHz



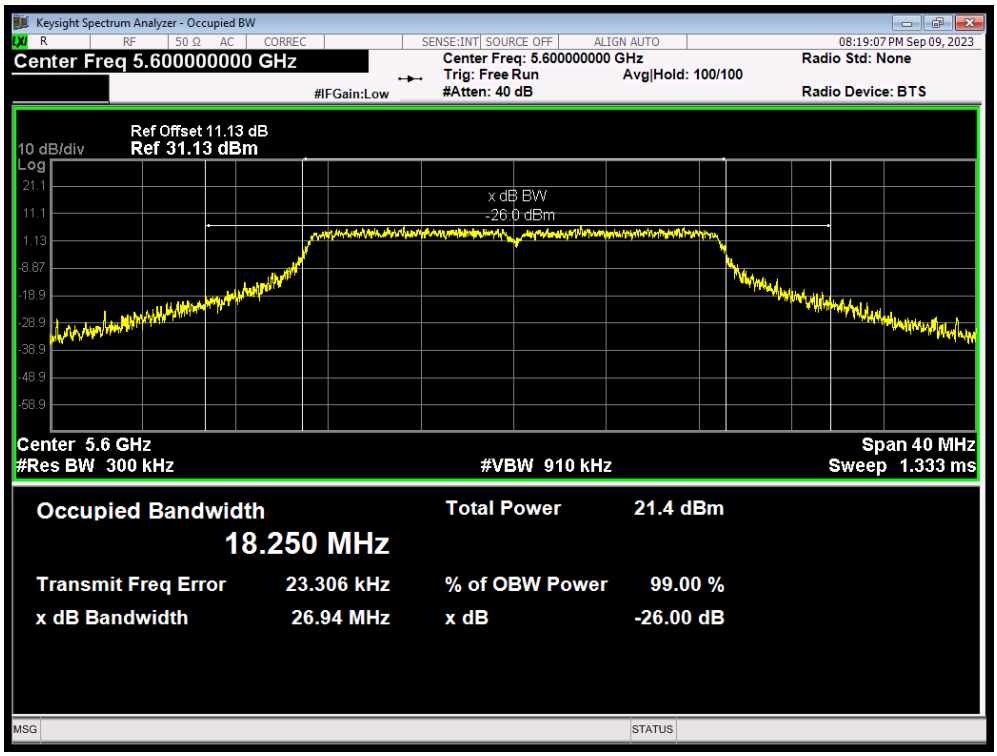
OBW 802.11a 5720MHz



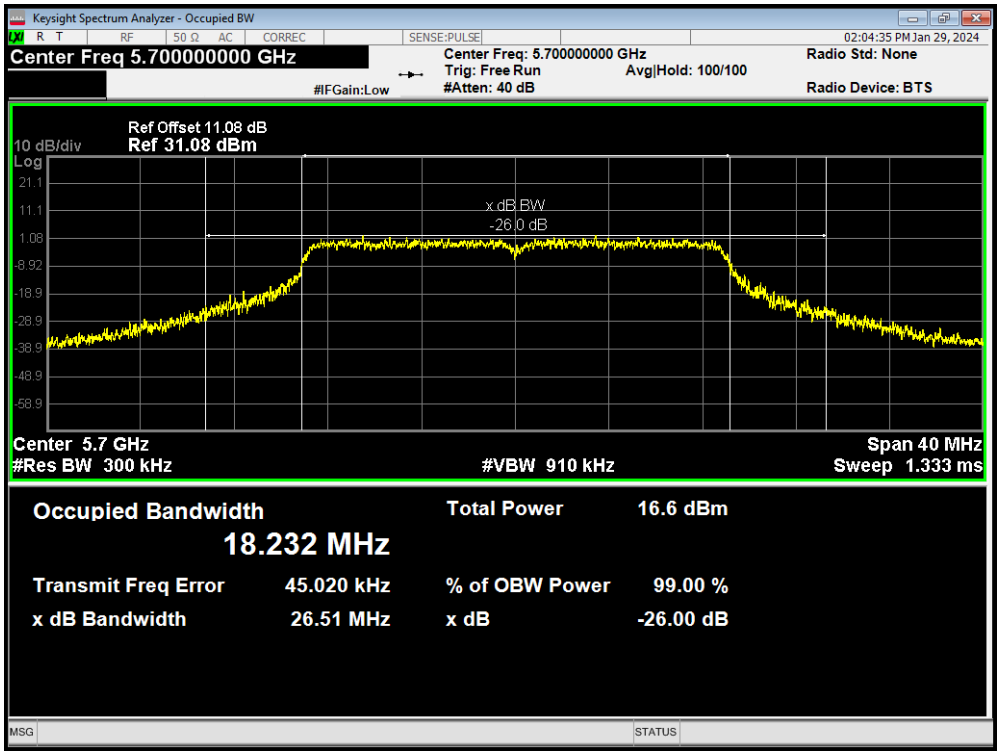
OBW 802.11ac(VHT20) 5500MHz



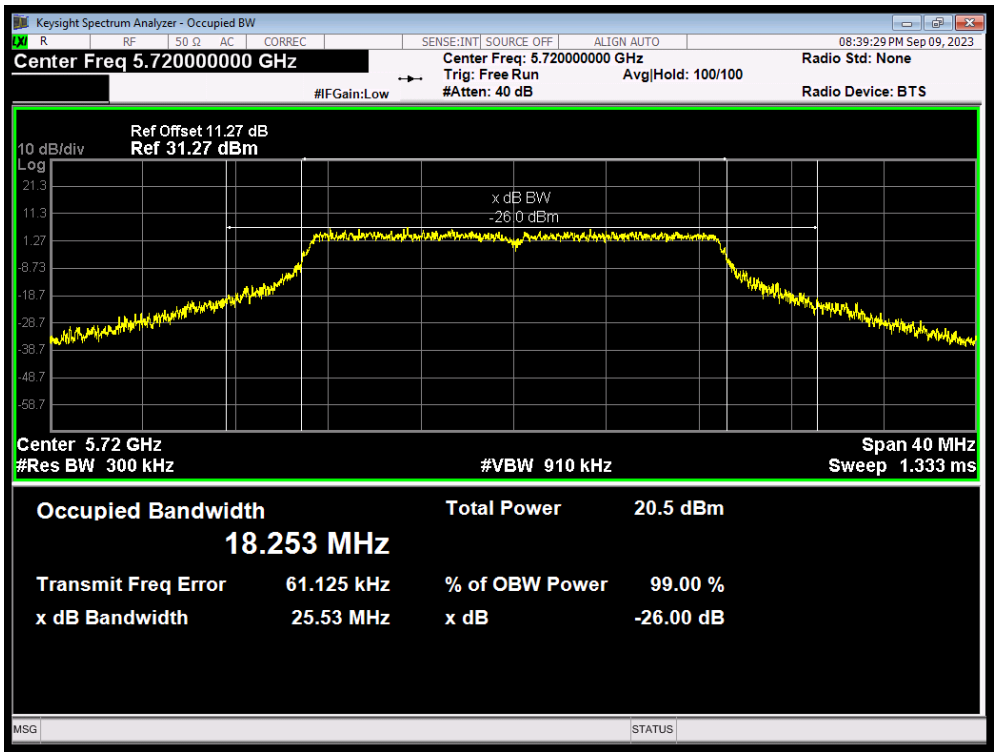
OBW 802.11ac(VHT20) 5600MHz



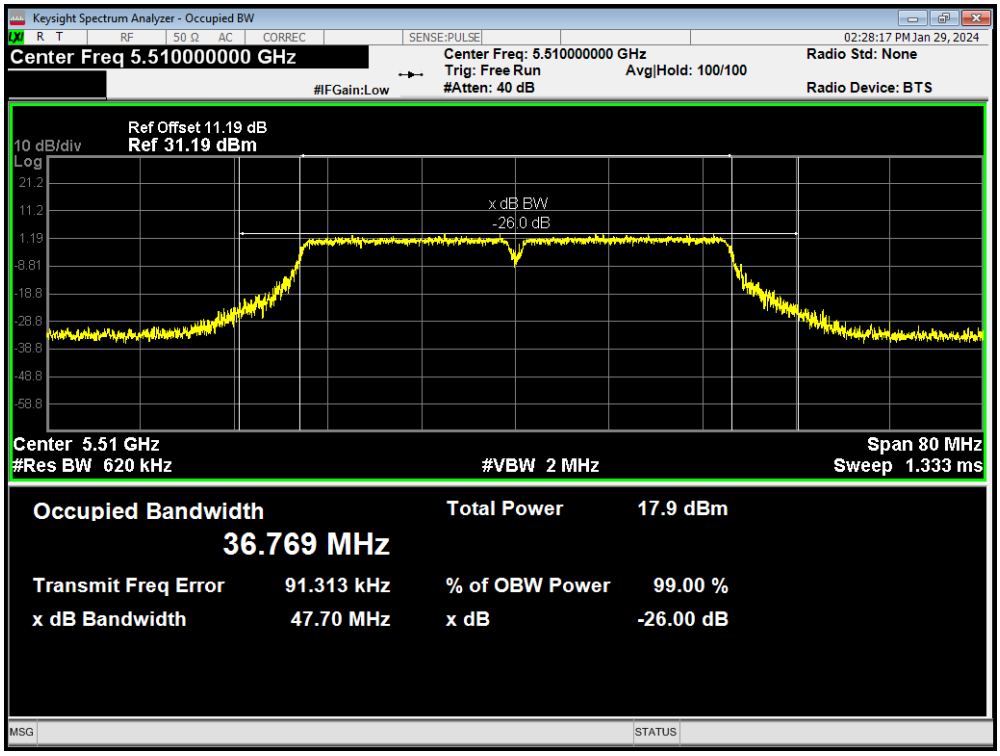
OBW 802.11ac(VHT20) 5700MHz



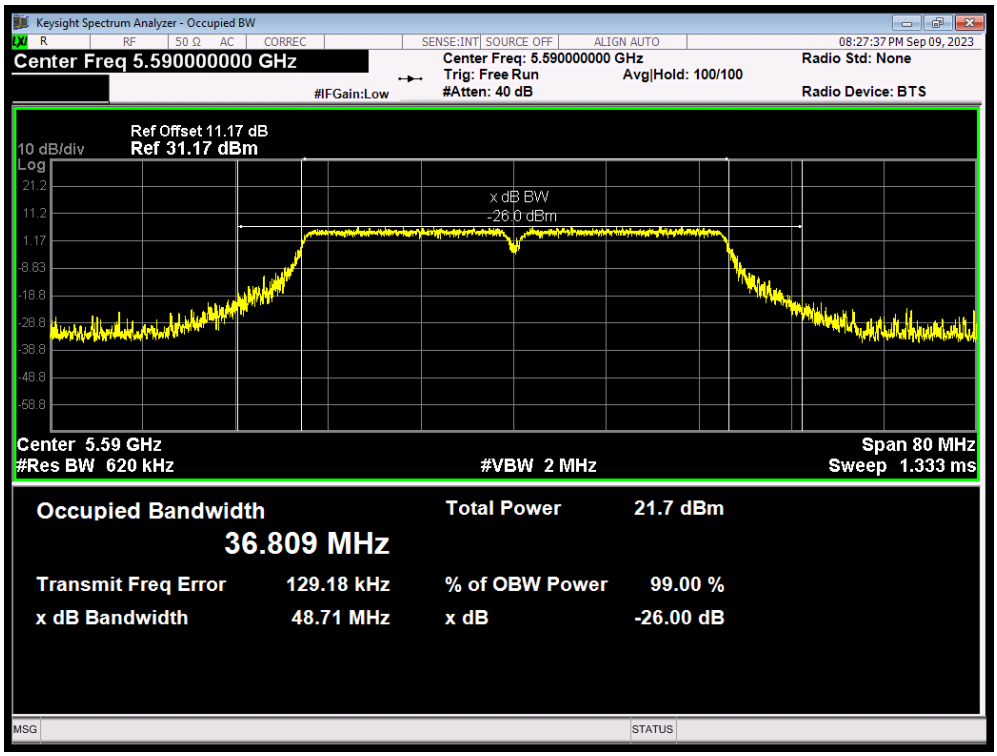
OBW 802.11ac(VHT20) 5720MHz



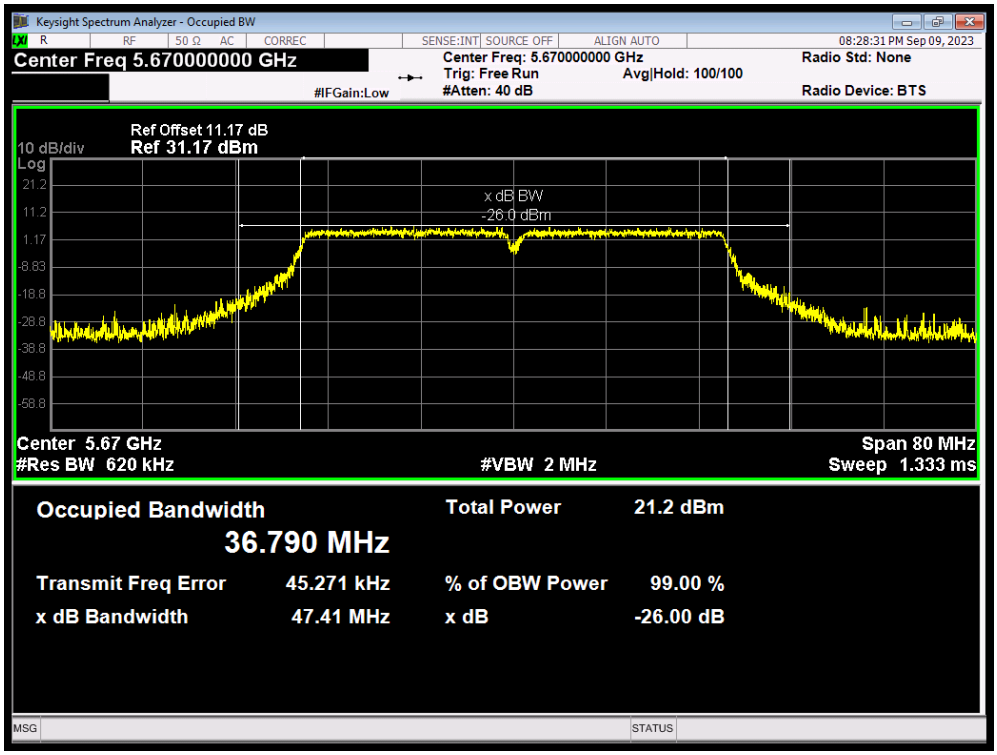
OBW 802.11ac(VHT40) 5510MHz



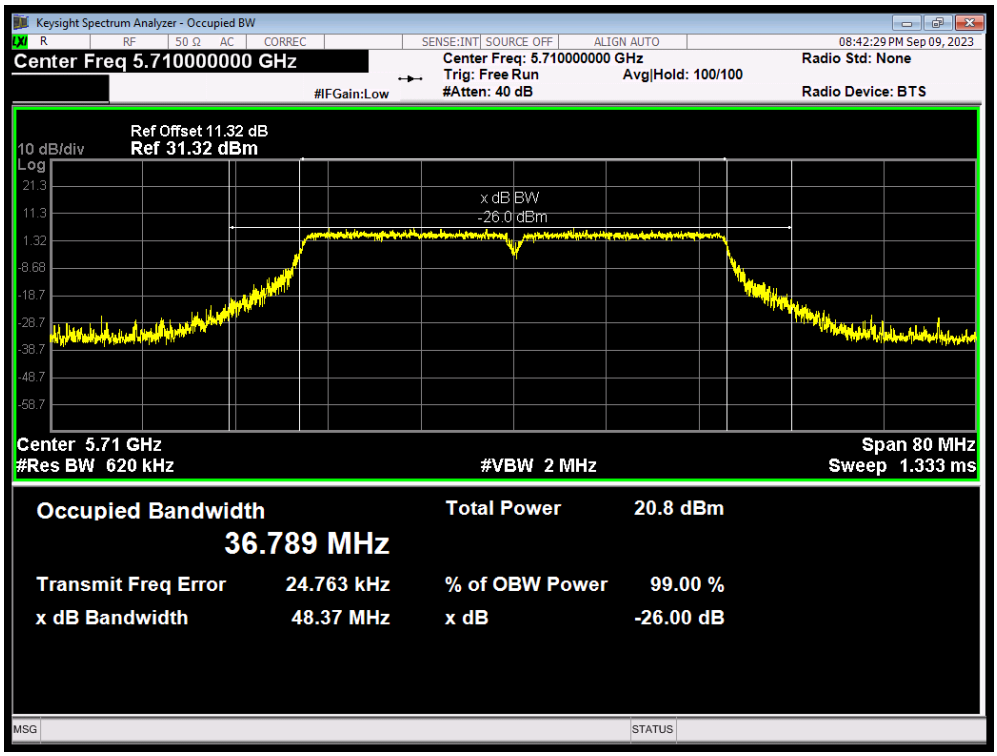
OBW 802.11ac(VHT40) 5590MHz



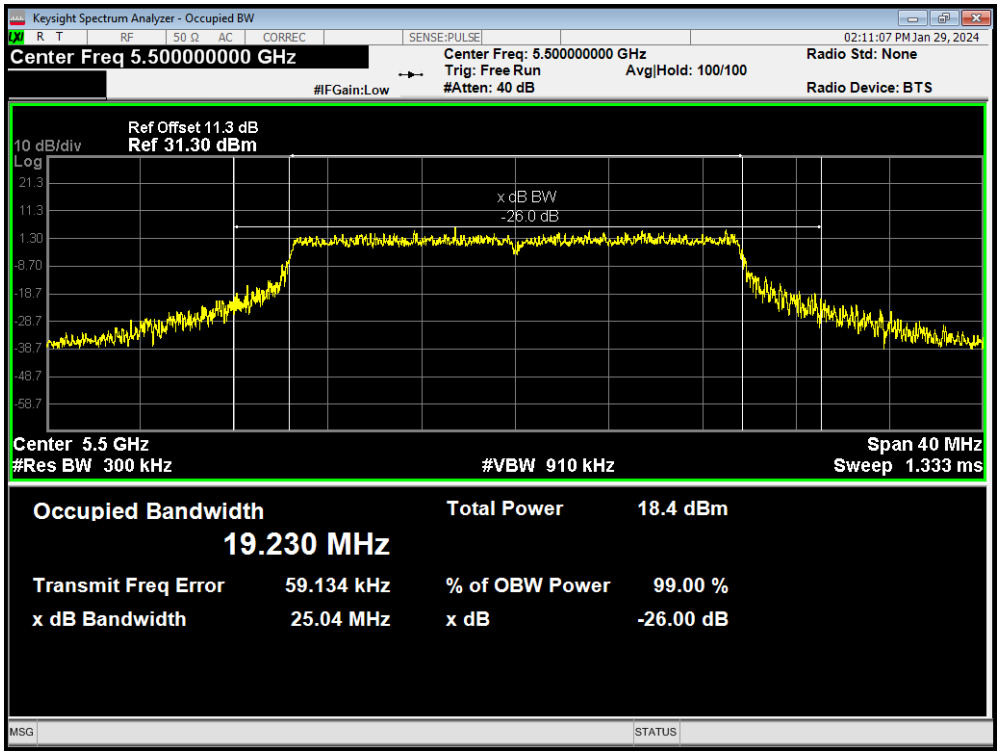
OBW 802.11ac(VHT40) 5670MHz



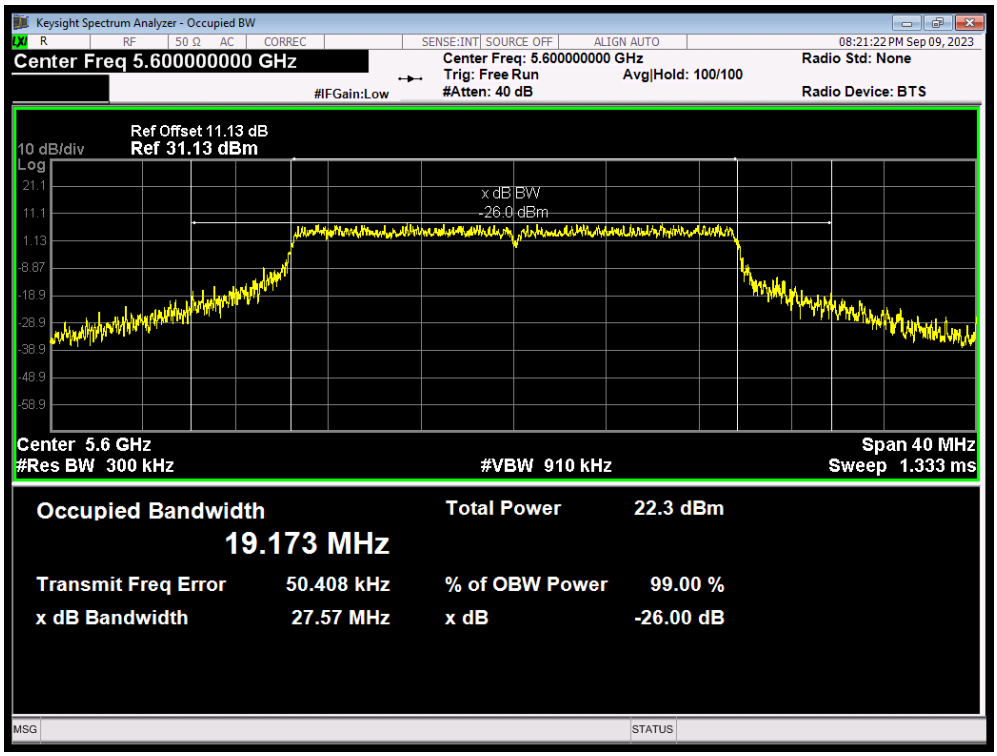
OBW 802.11ac(VHT40) 5710MHz



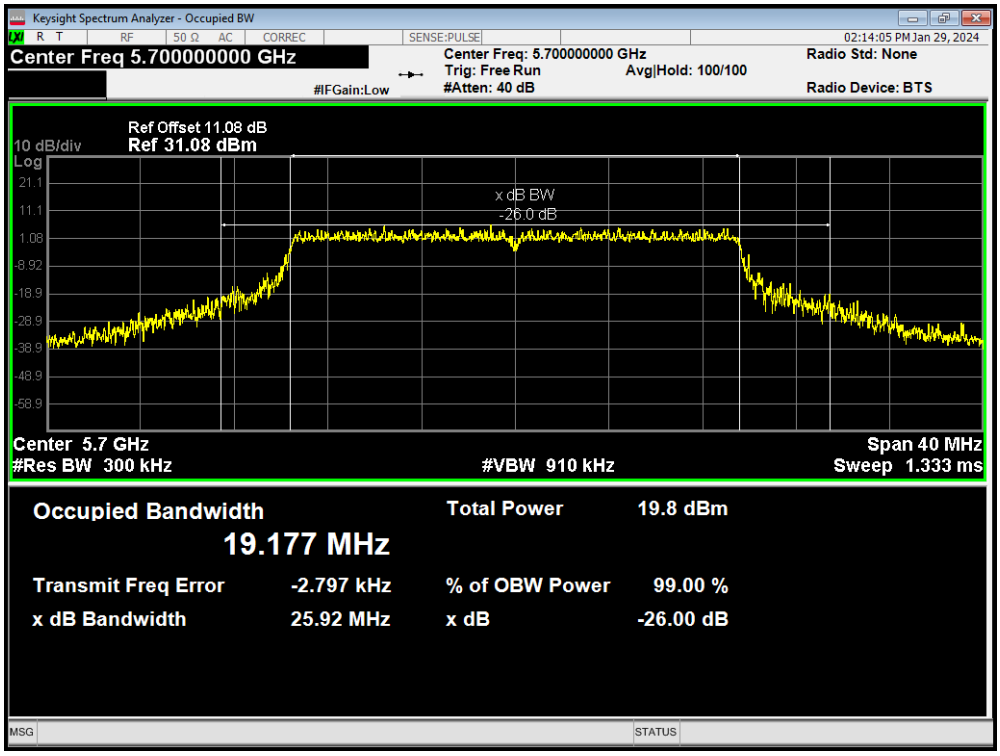
OBW 802.11ax(HE20) 5500MHz



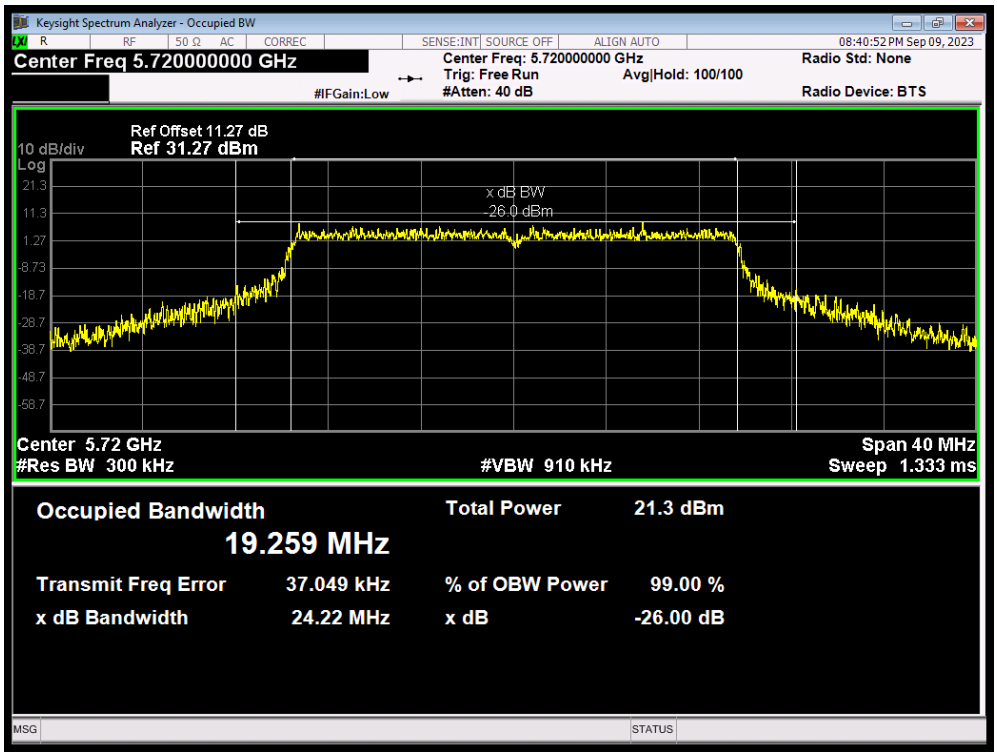
OBW 802.11ax(HE20) 5600MHz



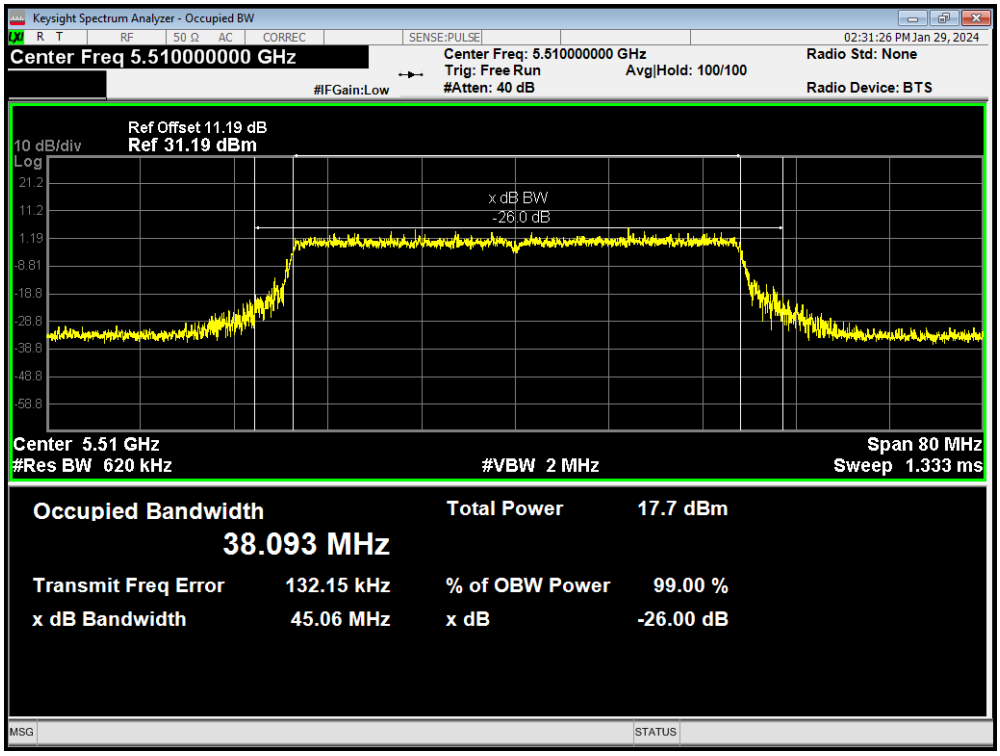
OBW 802.11ax(HE20) 5700MHz



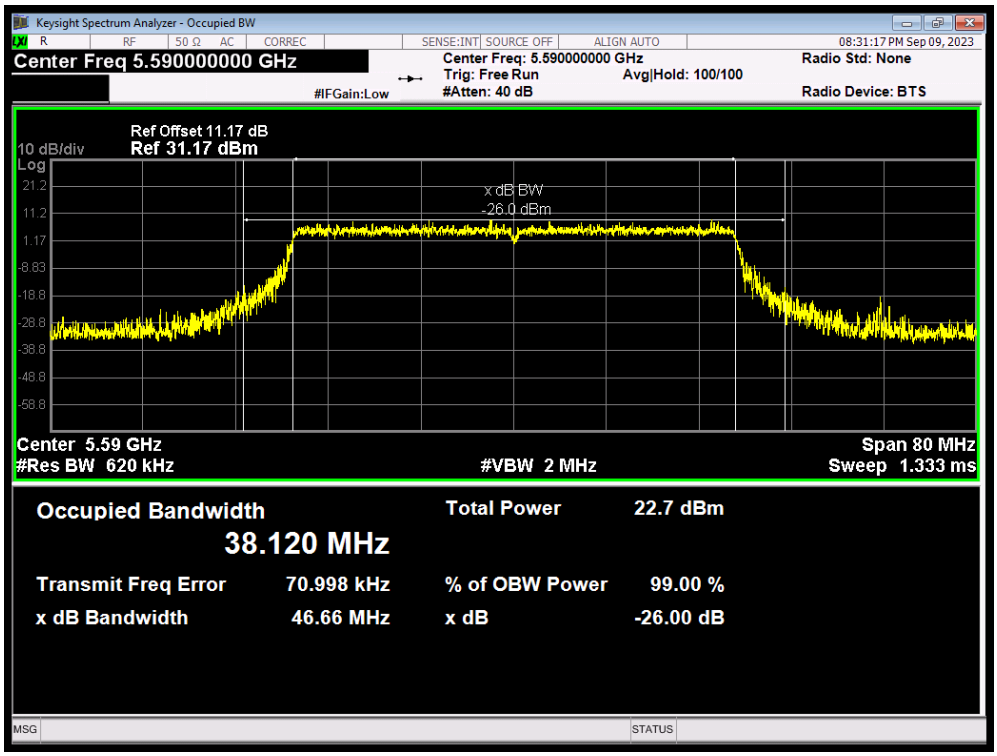
OBW 802.11ax(HE20) 5720MHz



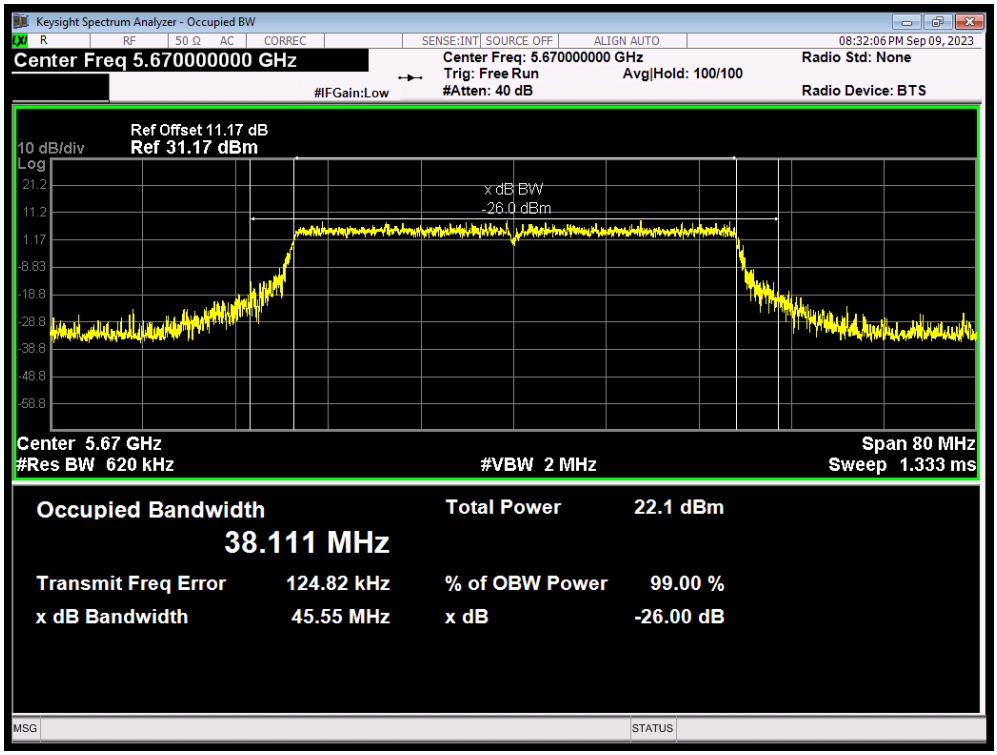
OBW 802.11ax(HE40) 5510MHz



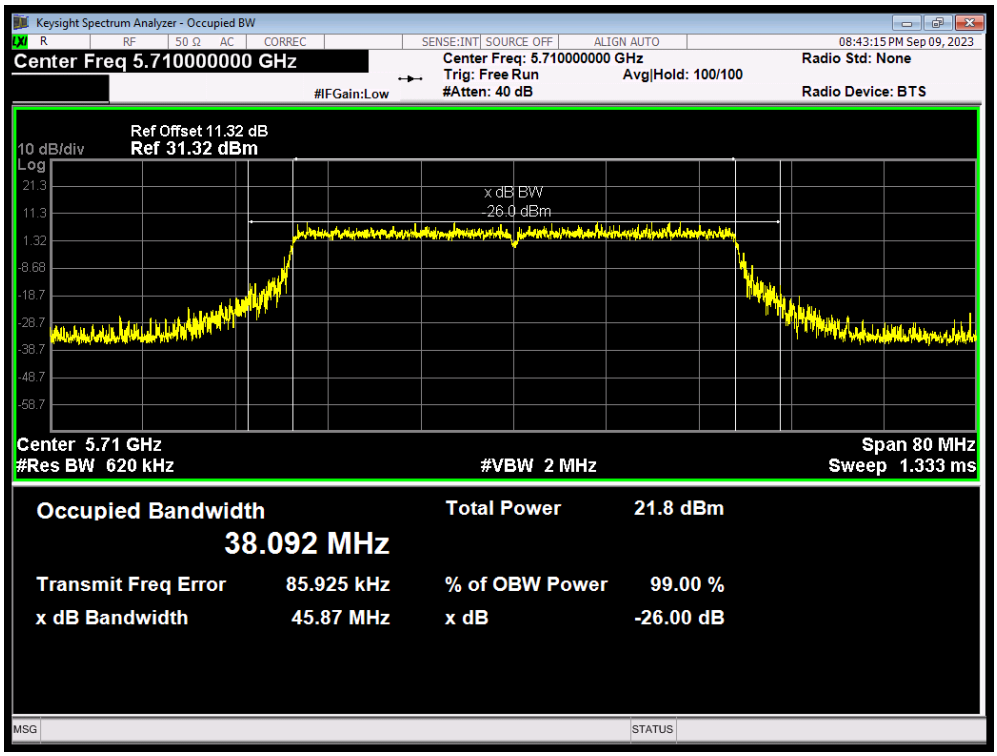
OBW 802.11ax(HE40) 5590MHz



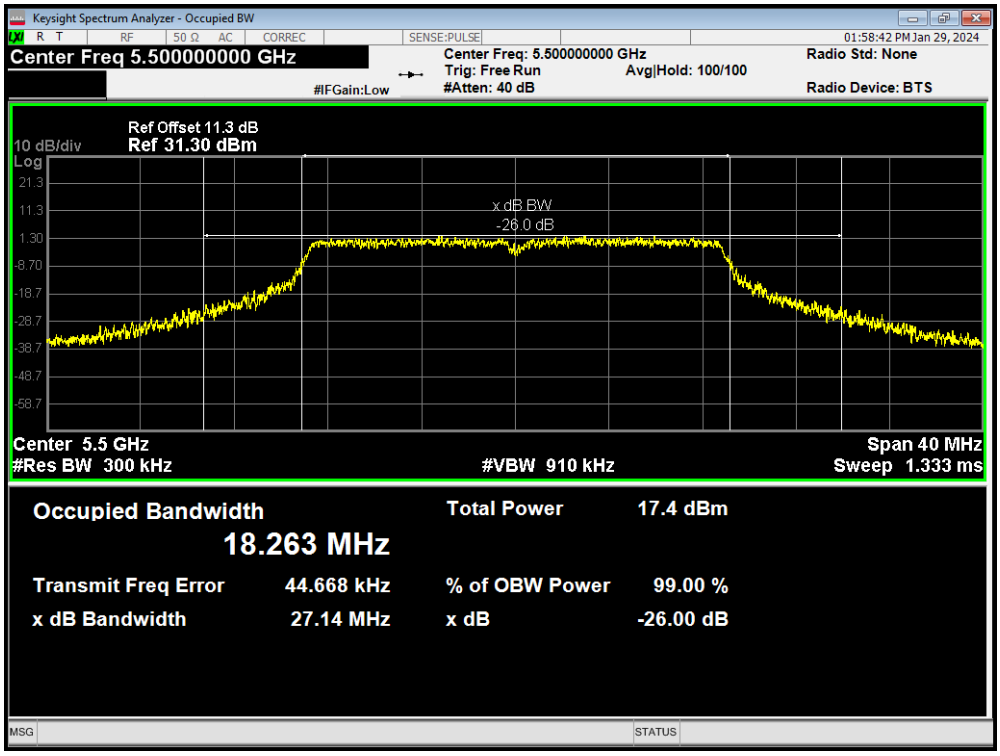
OBW 802.11ax(HE40) 5670MHz



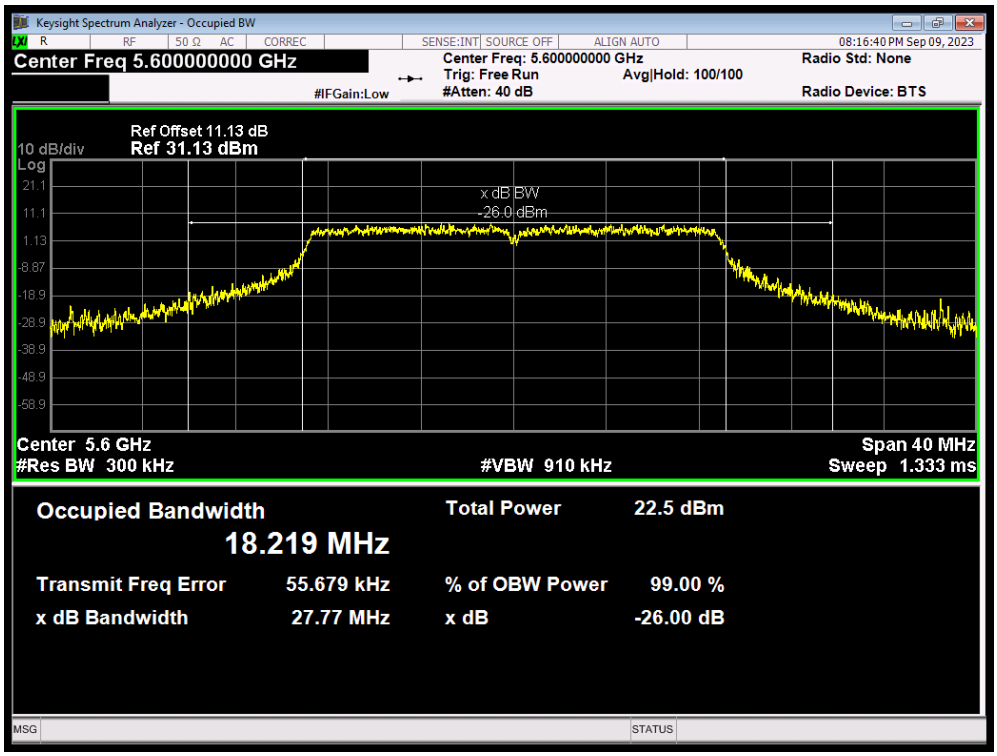
OBW 802.11ax(HE40) 5710MHz



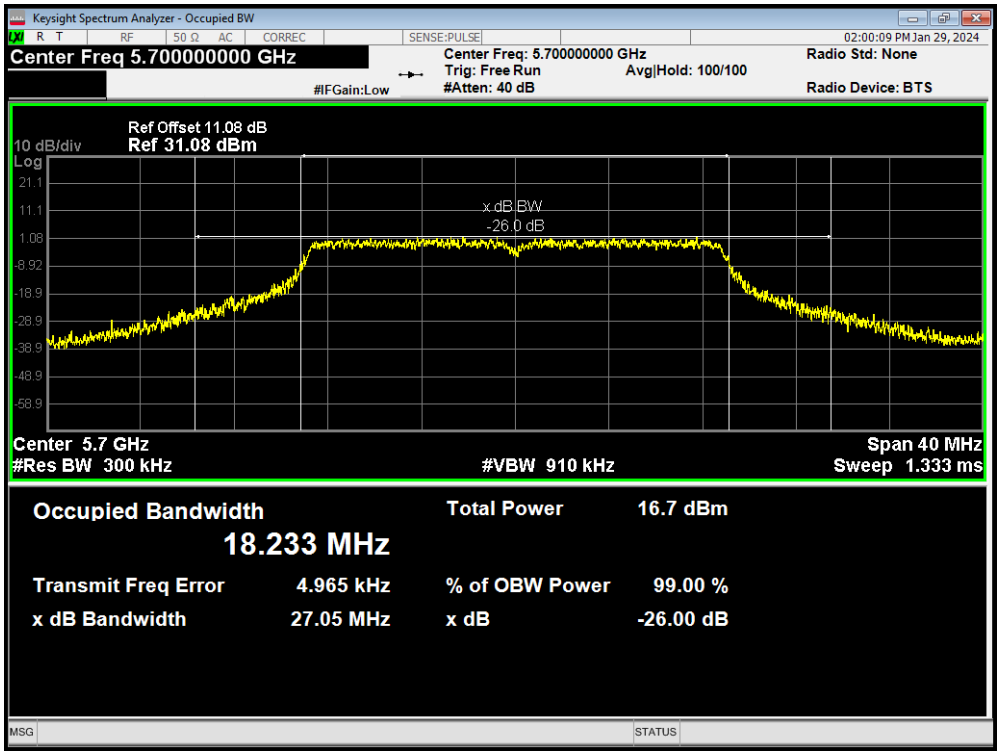
OBW 802.11n(HT20) 5500MHz



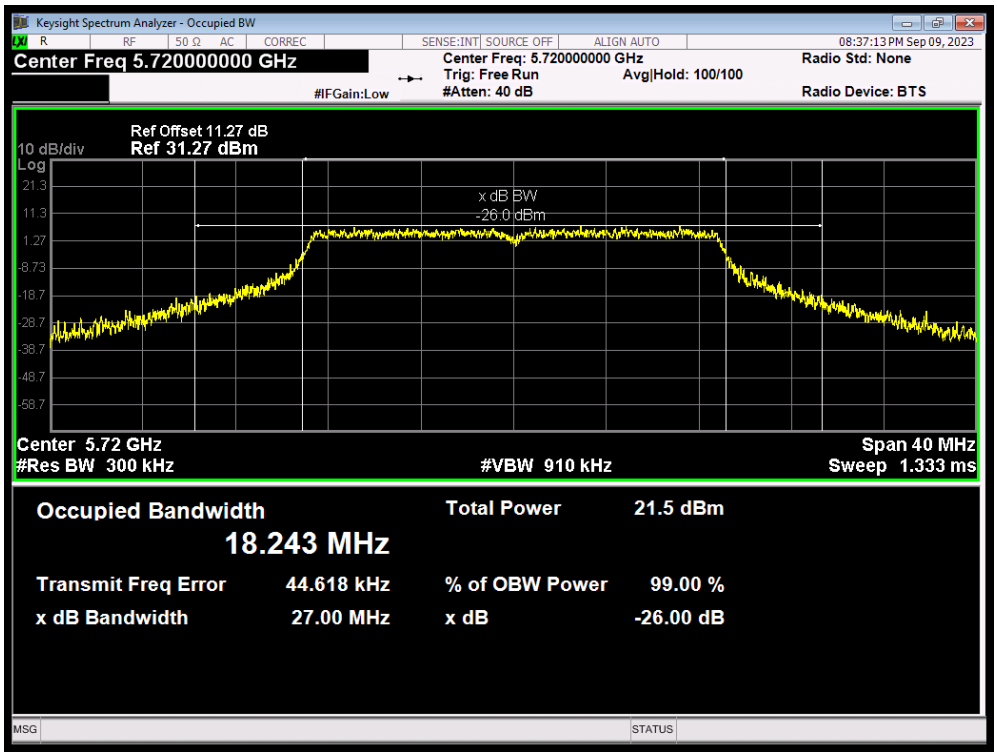
OBW 802.11n(HT20) 5600MHz



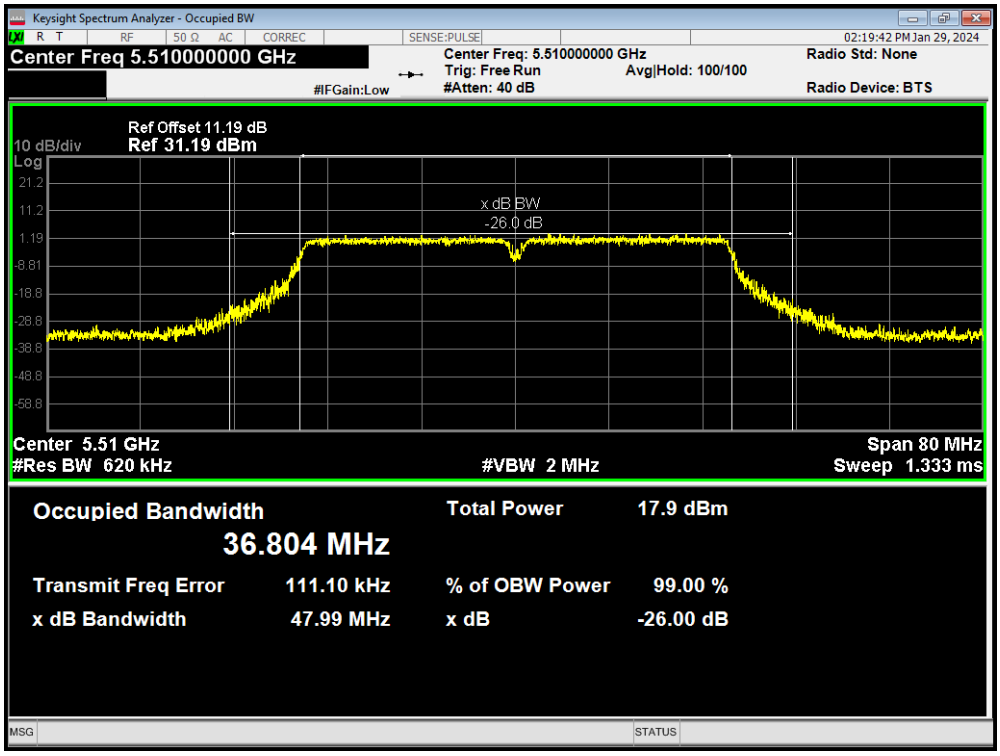
OBW 802.11n(HT20) 5700MHz



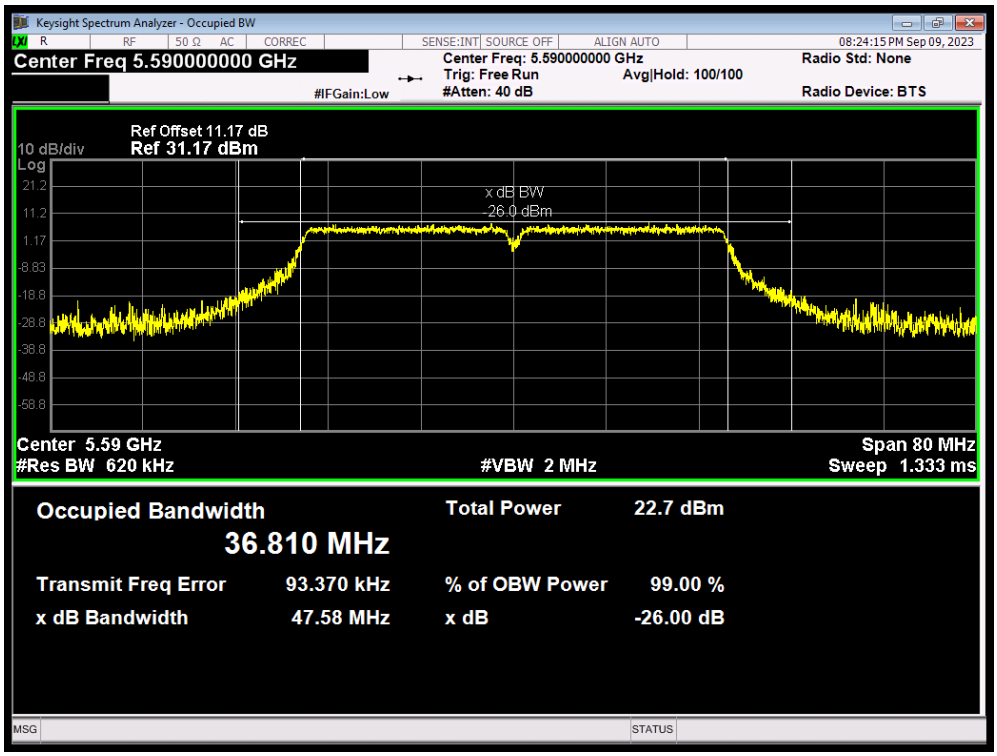
OBW 802.11n(HT20) 5720MHz



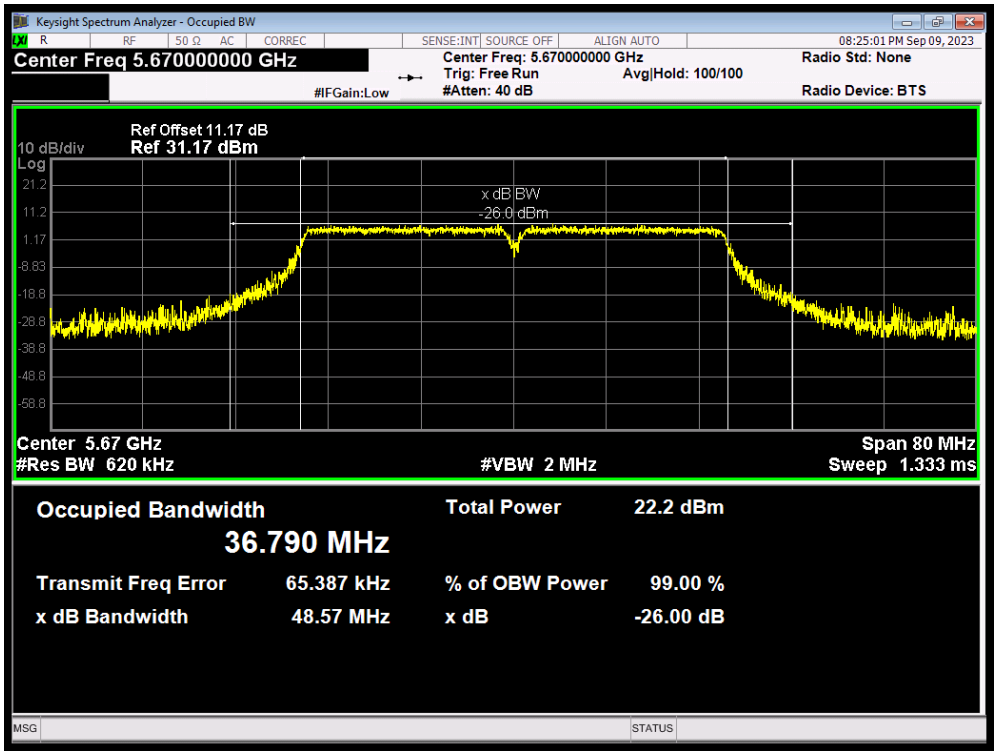
OBW 802.11n(HT40) 5510MHz



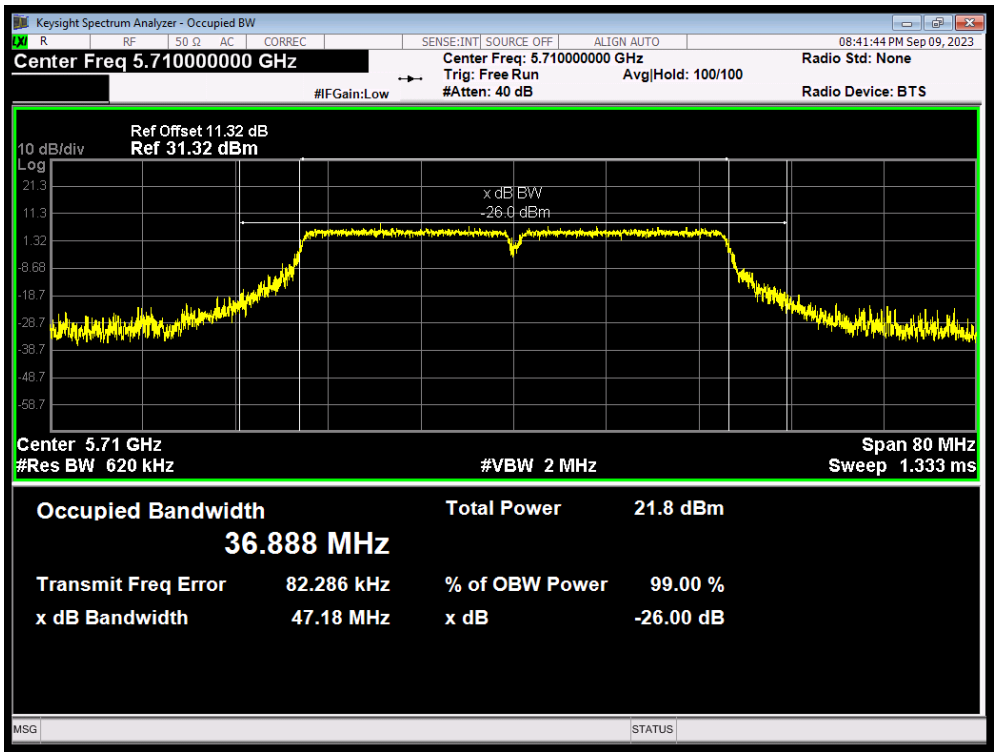
OBW 802.11n(HT40) 5590MHz



OBW 802.11n(HT40) 5670MHz

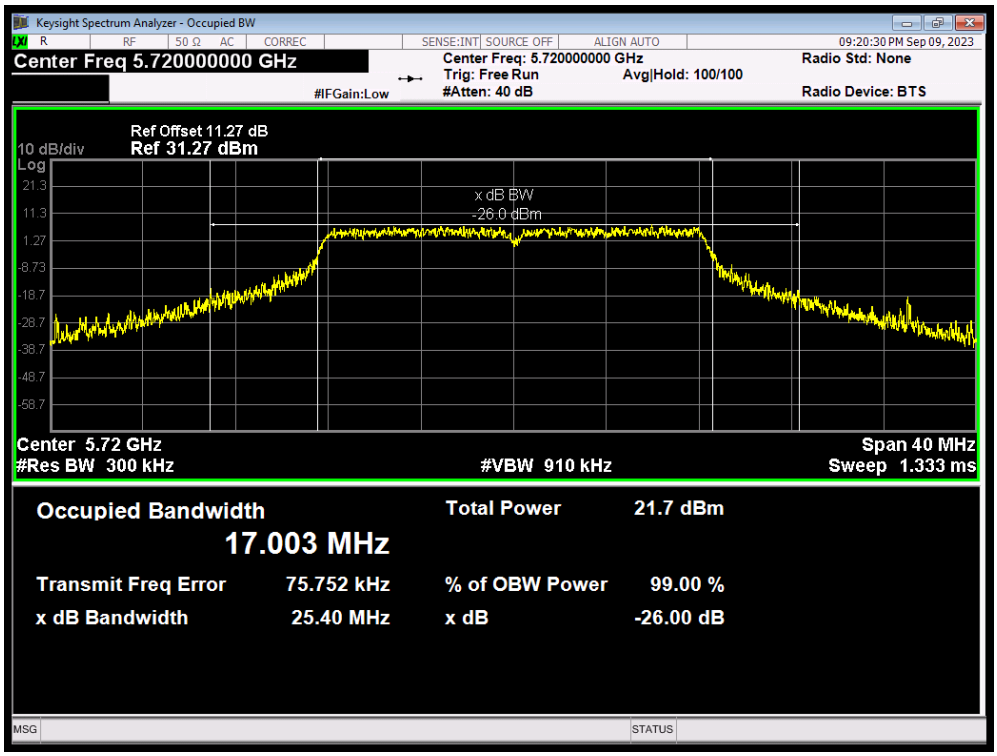


OBW 802.11n(HT40) 5710MHz

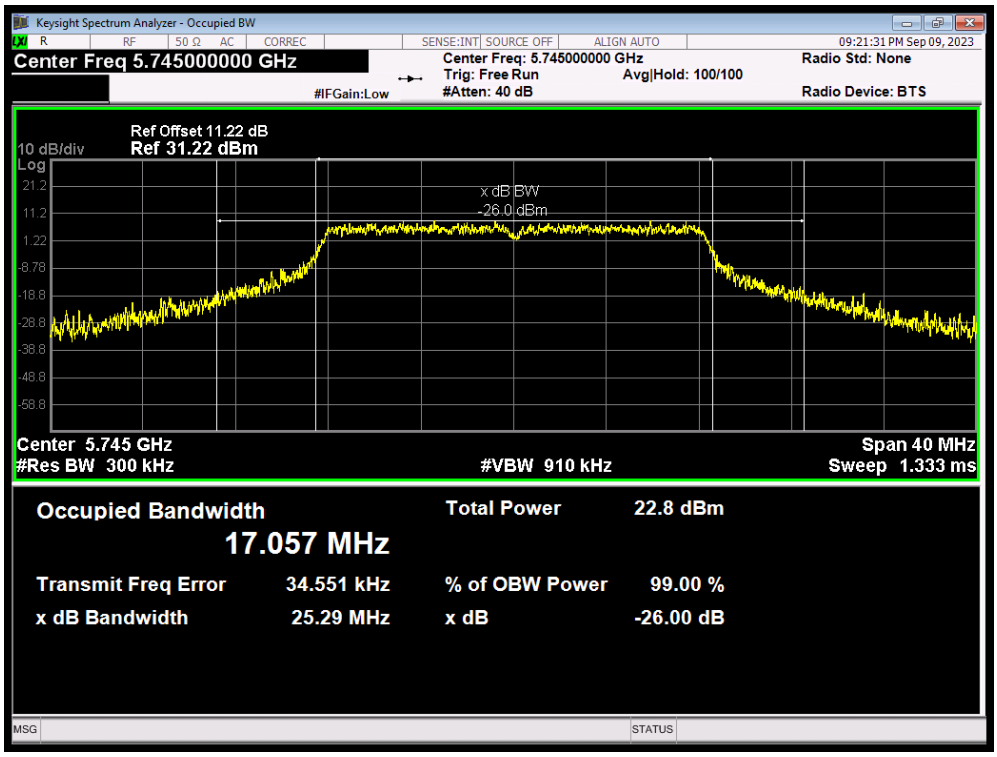


U-NII-3

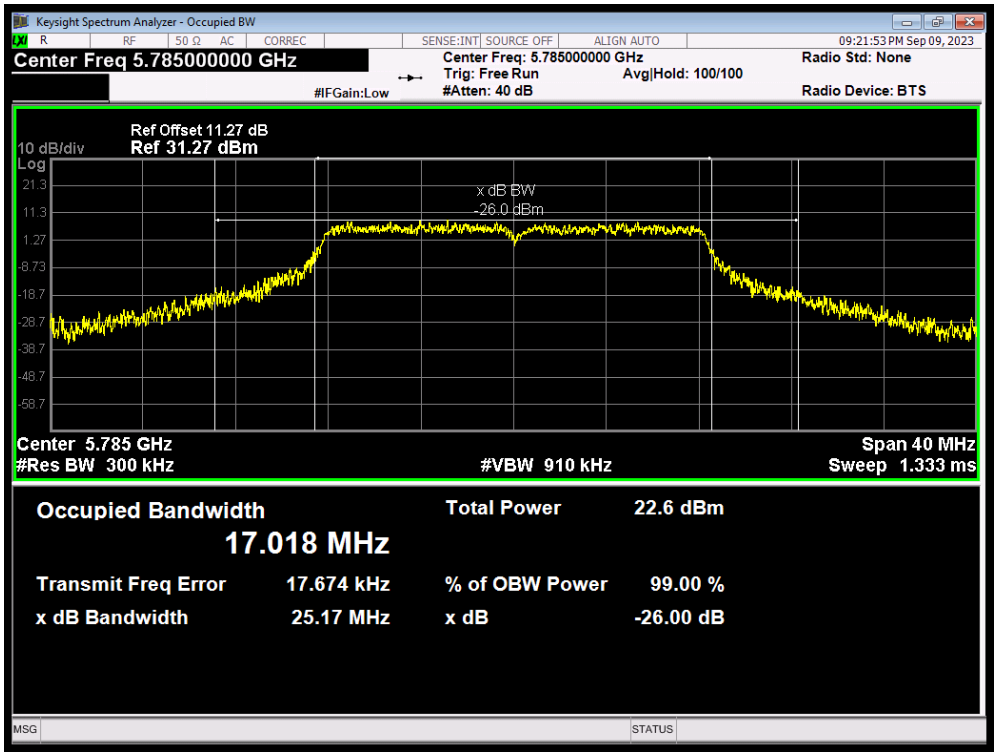
OBW 802.11a 5720MHz



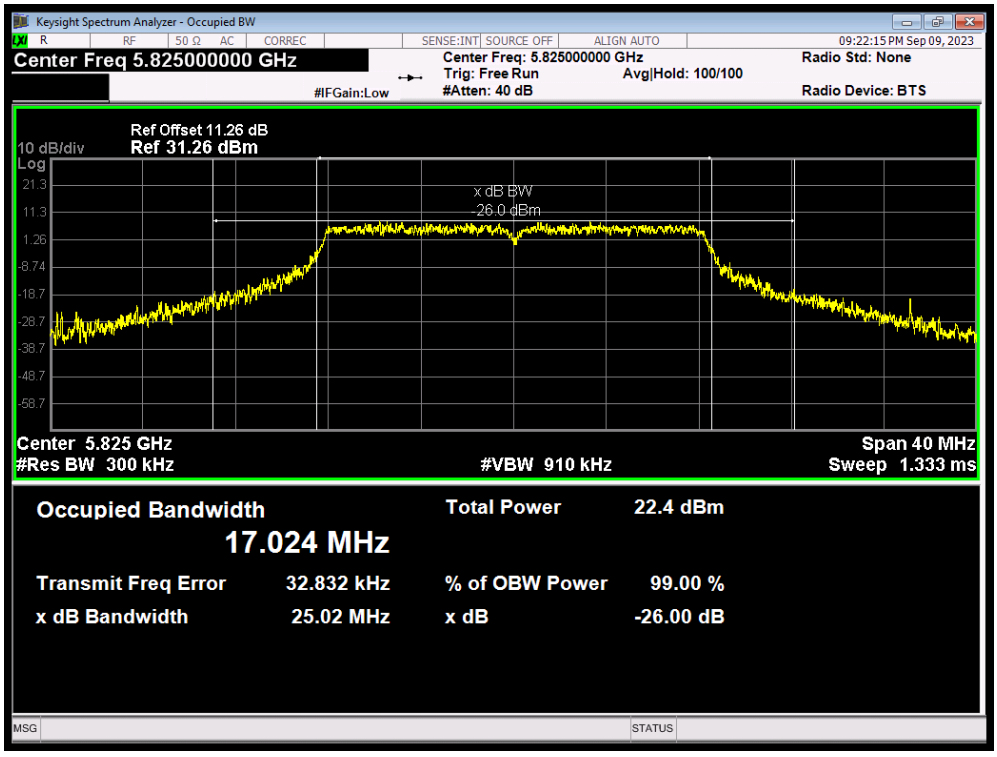
OBW 802.11a 5745MHz



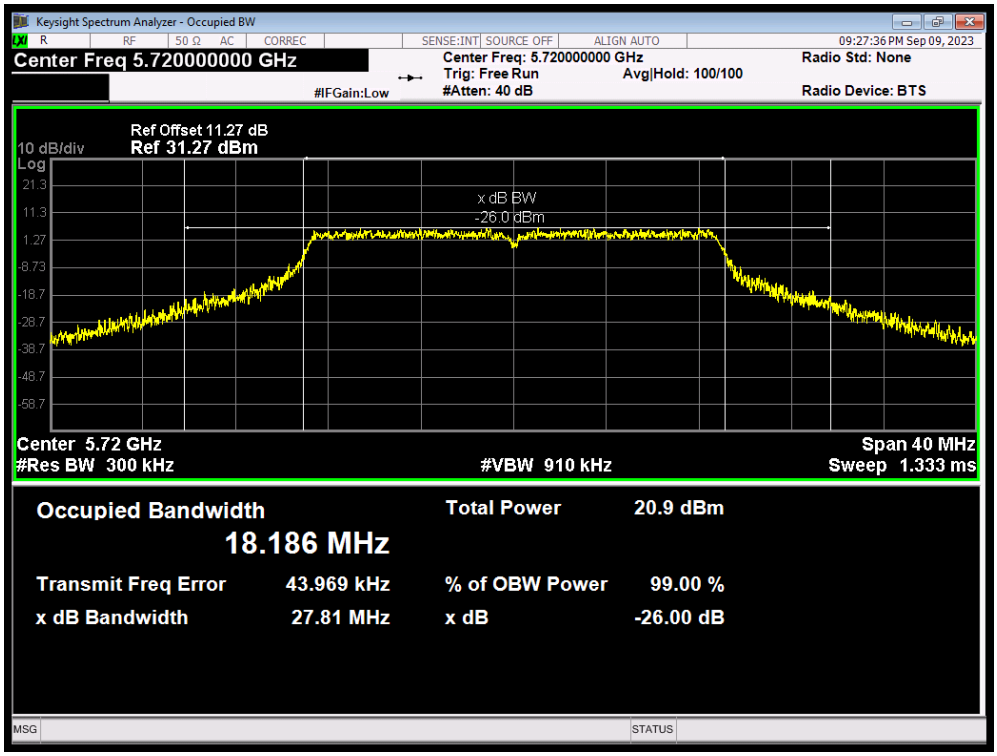
OBW 802.11a 5785MHz



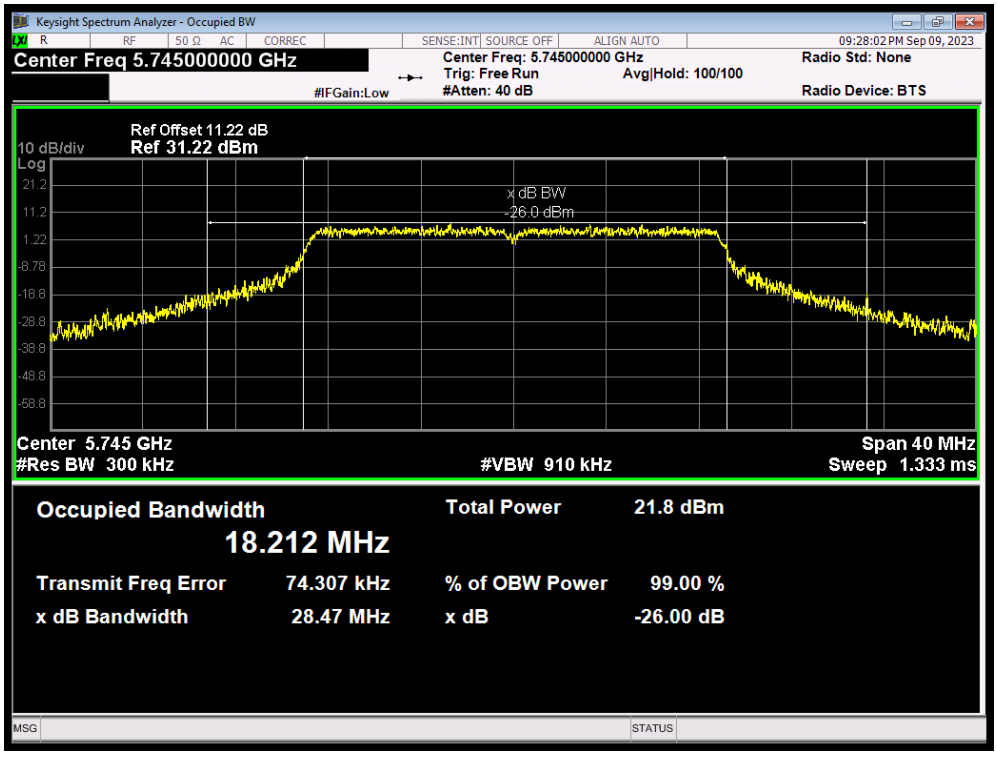
OBW 802.11a 5825MHz



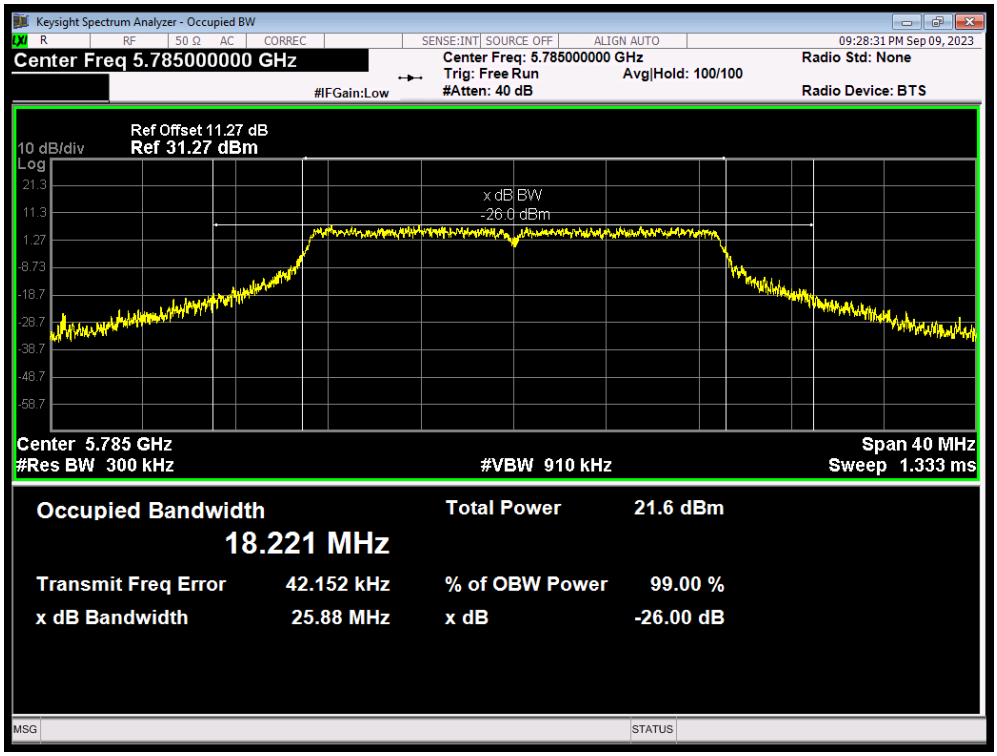
OBW 802.11ac(VHT20) 5720MHz



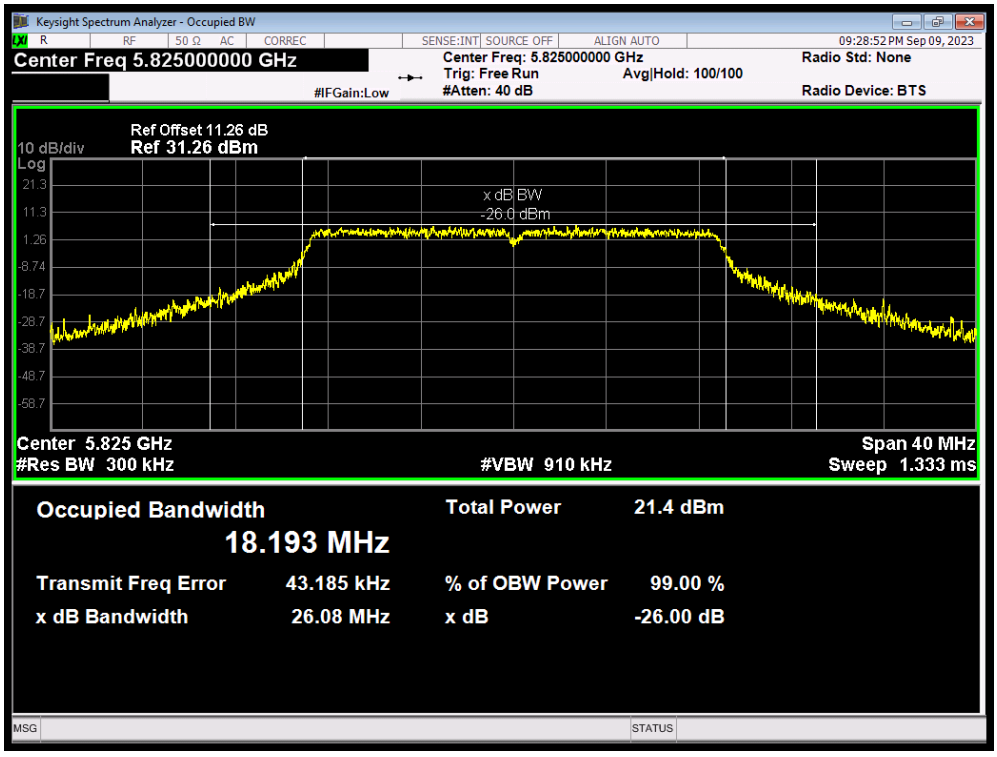
OBW 802.11ac(VHT20) 5745MHz



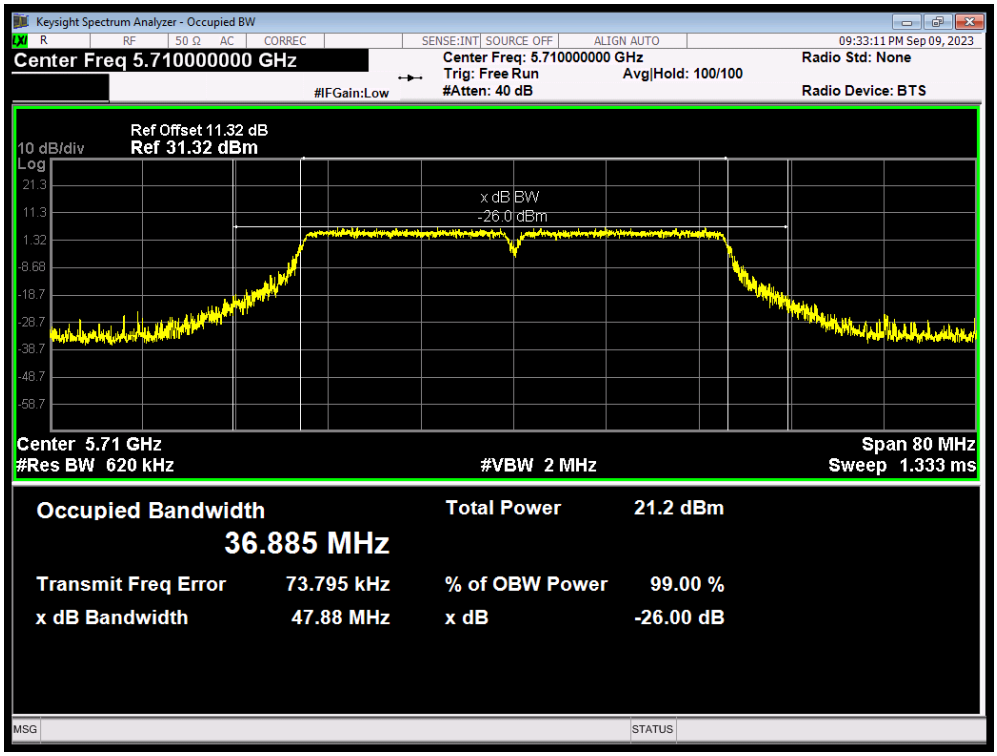
OBW 802.11ac(VHT20) 5785MHz



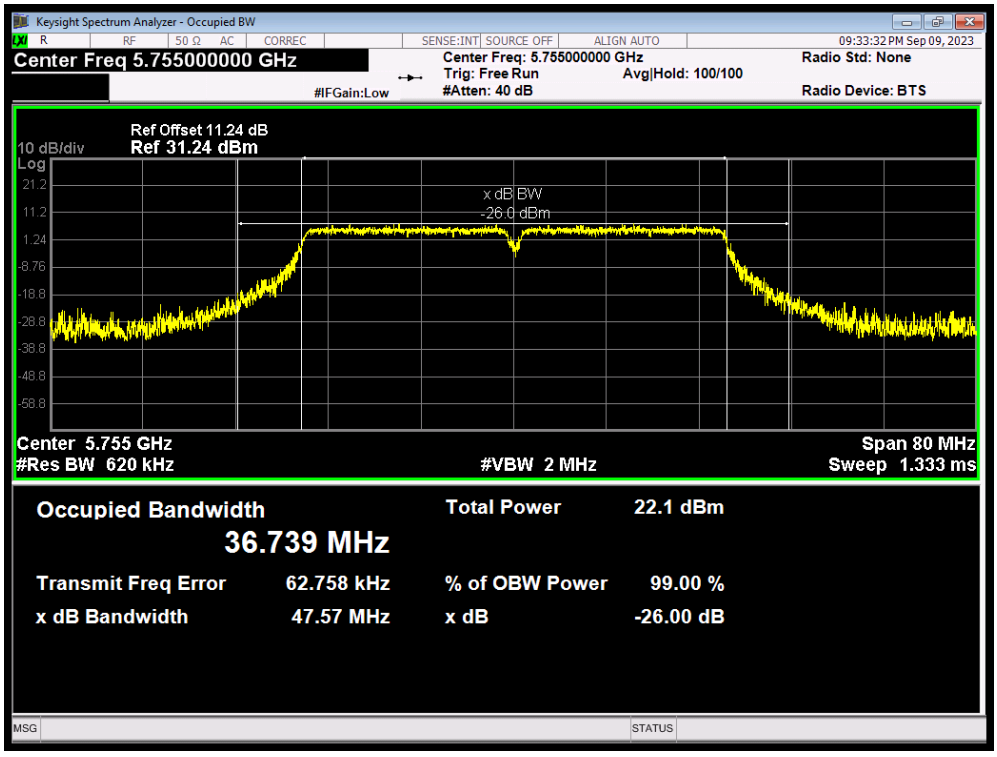
OBW 802.11ac(VHT20) 5825MHz



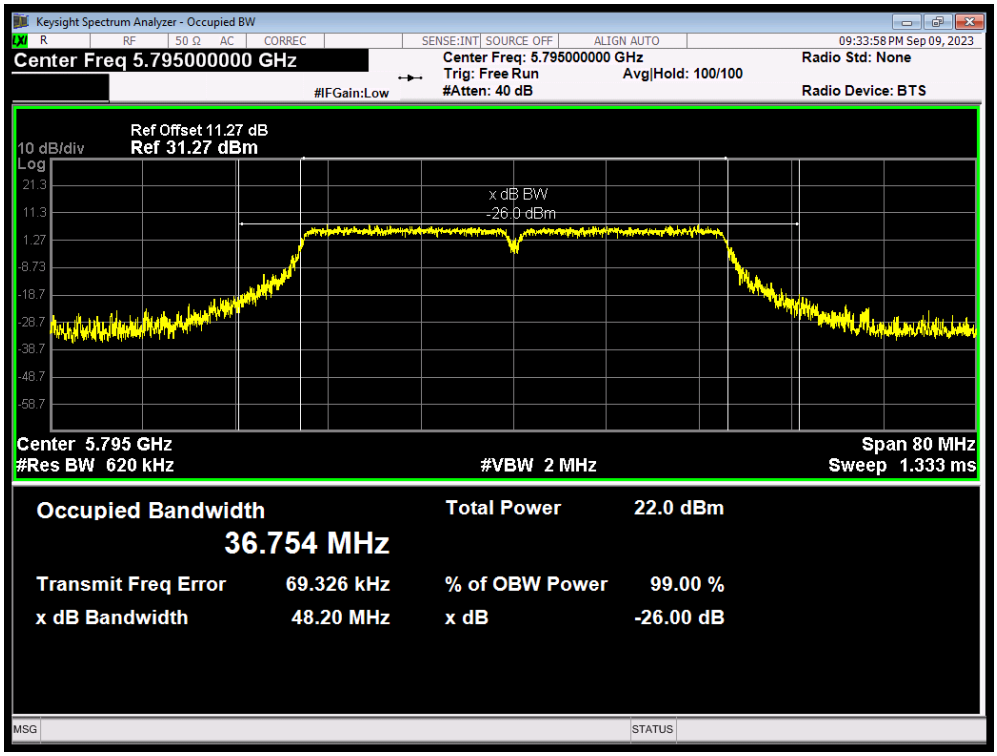
OBW 802.11ac(VHT40) 5710MHz



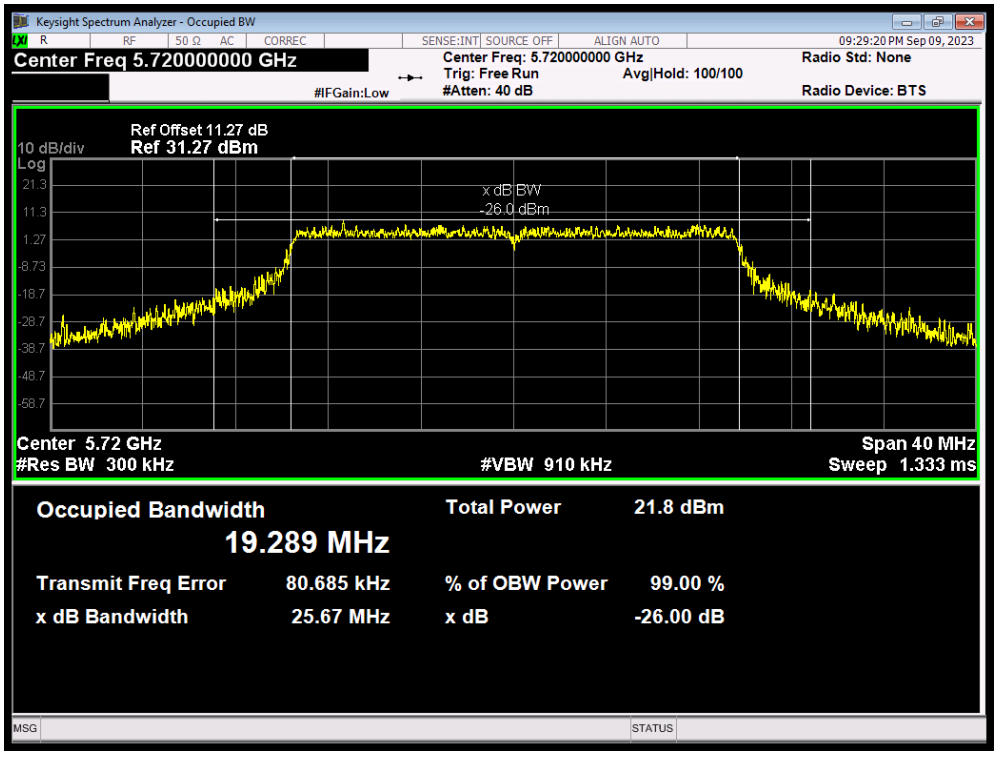
OBW 802.11ac(VHT40) 5755MHz



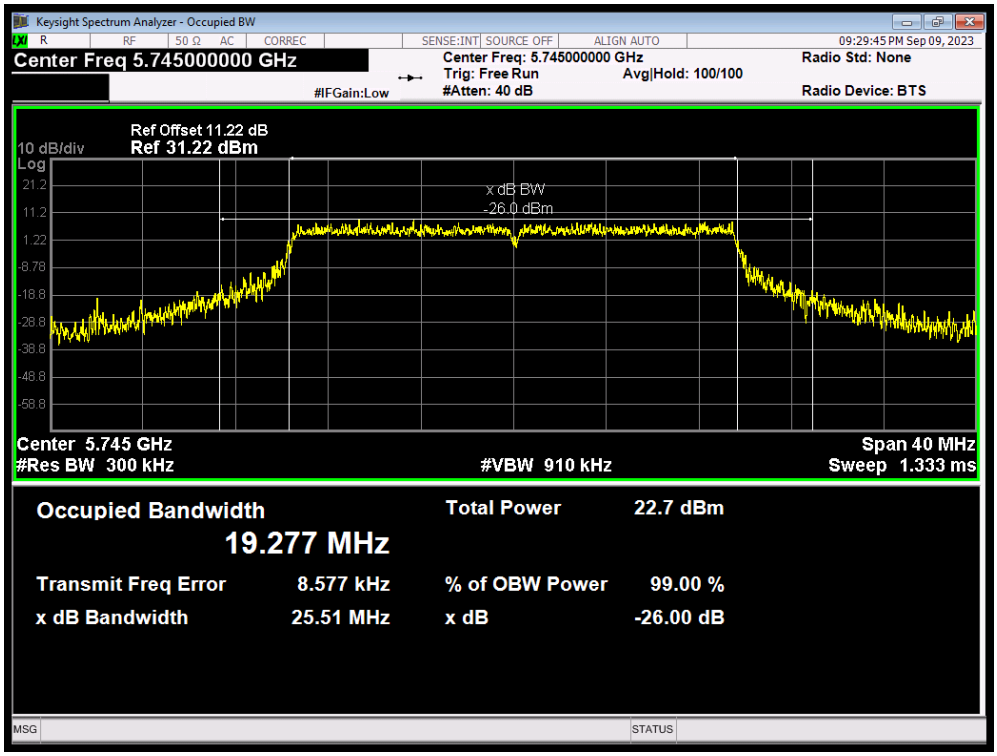
OBW 802.11ac(VHT40) 5795MHz



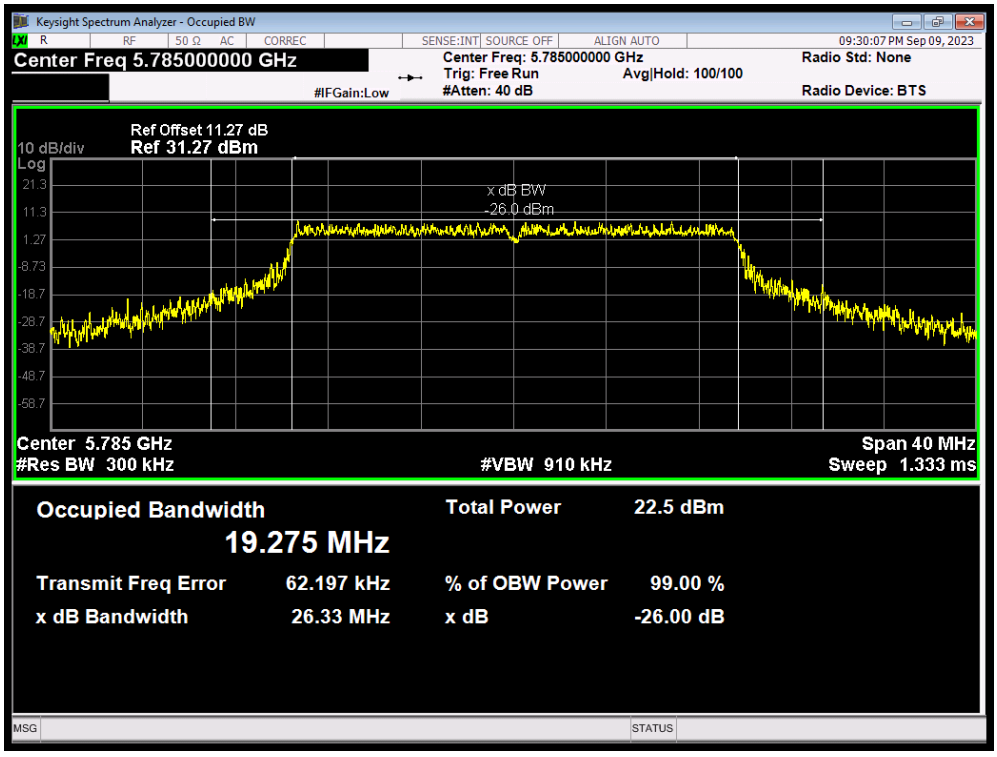
OBW 802.11ax(HE20) 5720MHz



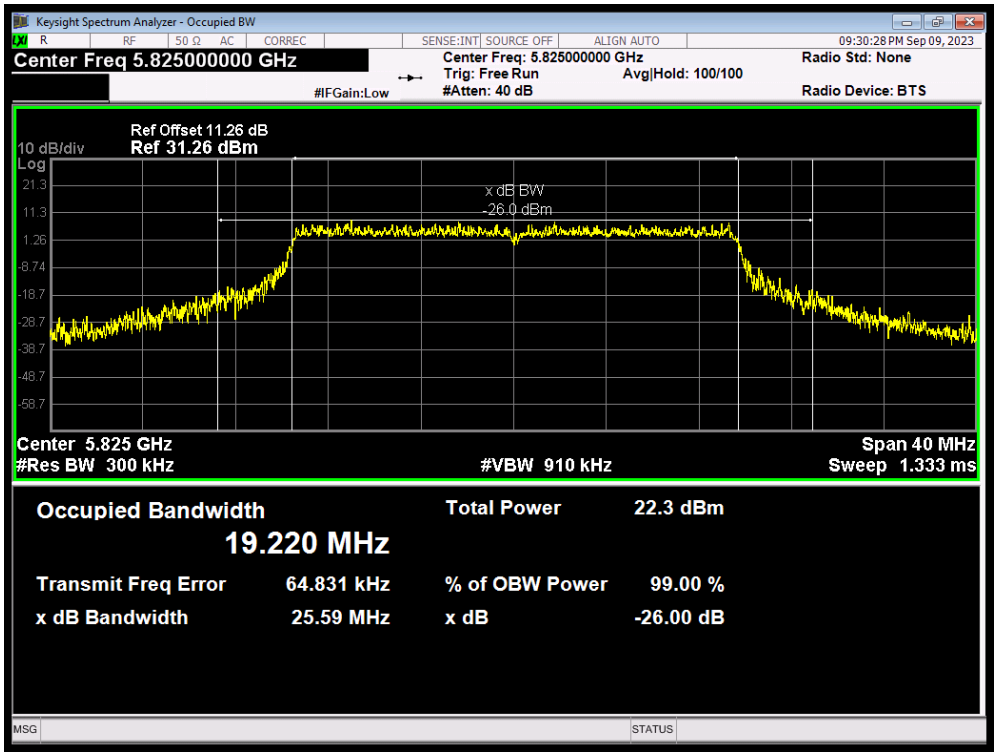
OBW 802.11ax(HE20) 5745MHz



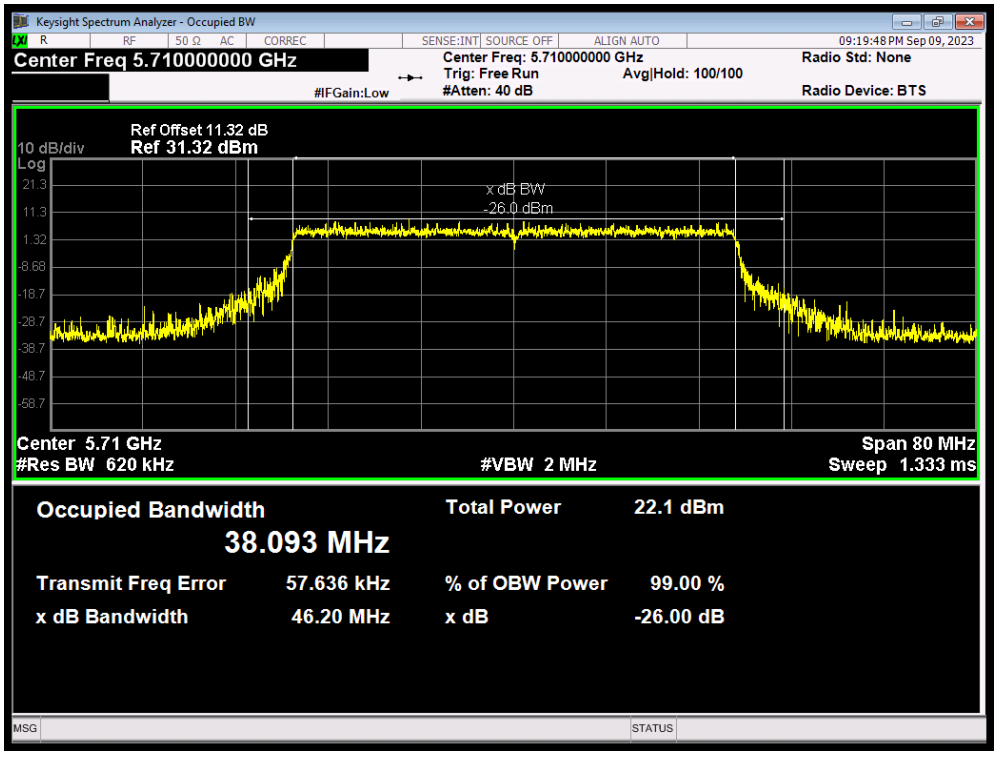
OBW 802.11ax(HE20) 5785MHz



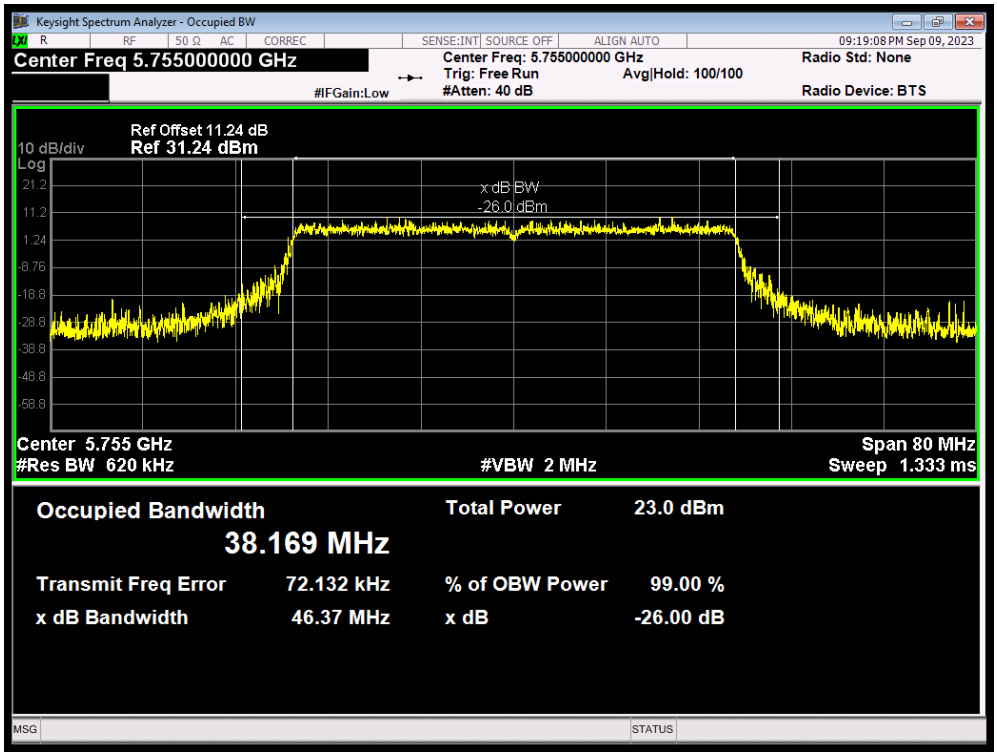
OBW 802.11ax(HE20) 5825MHz



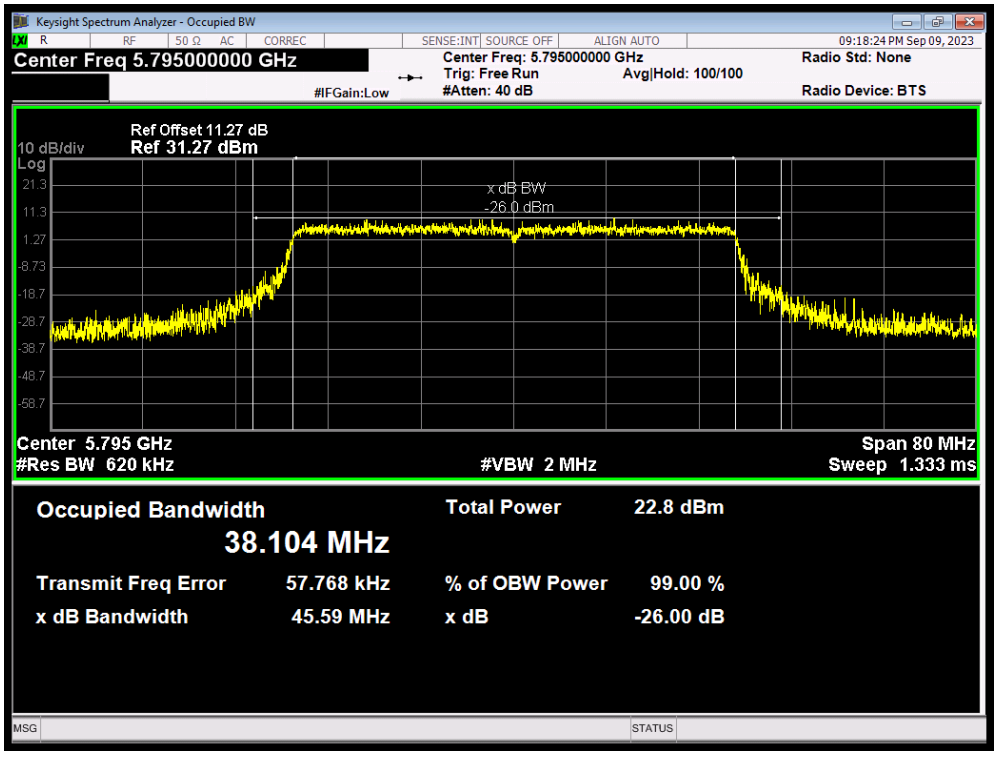
OBW 802.11ax(HE40) 5710MHz



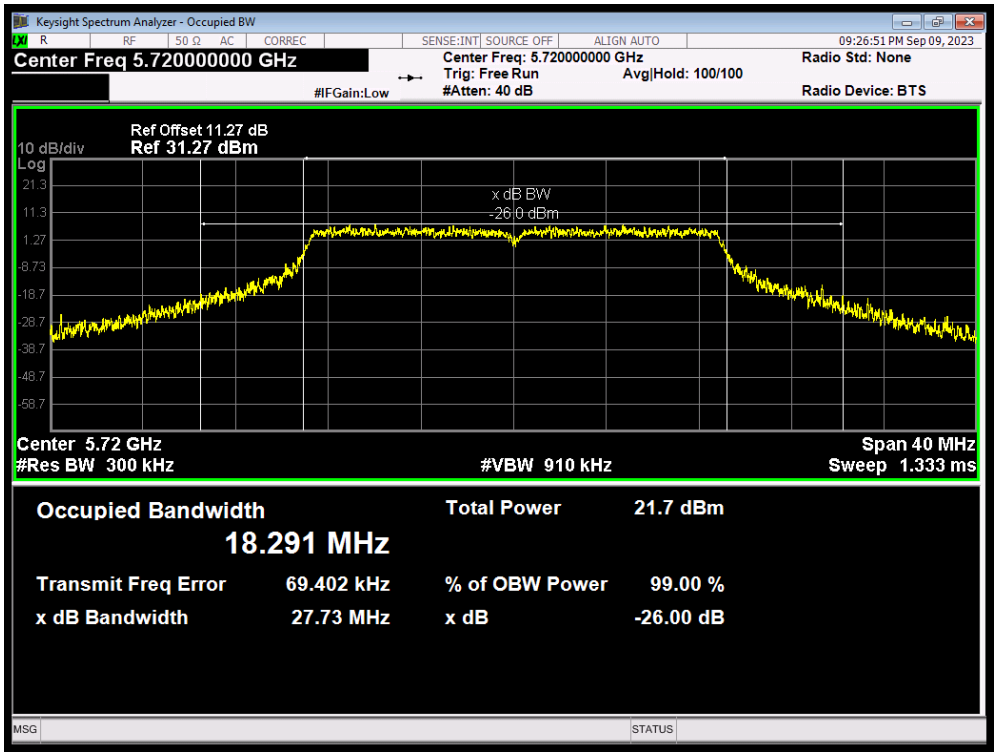
OBW 802.11ax(HE40) 5755MHz



OBW 802.11ax(HE40) 5795MHz



OBW 802.11n(HT20) 5720MHz



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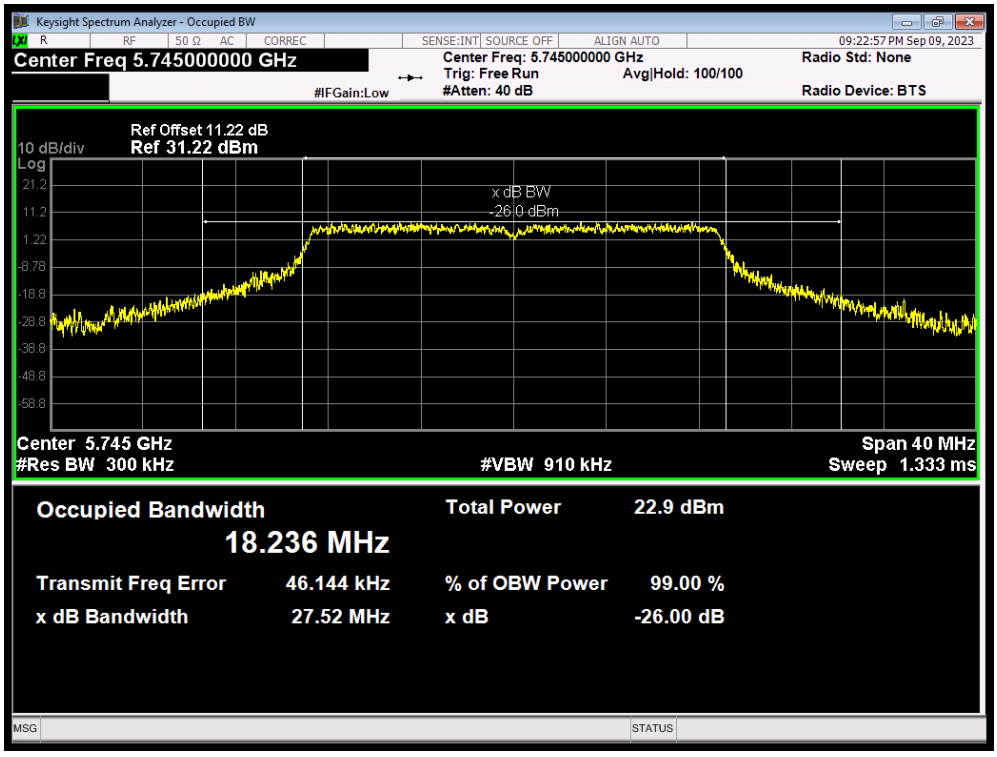
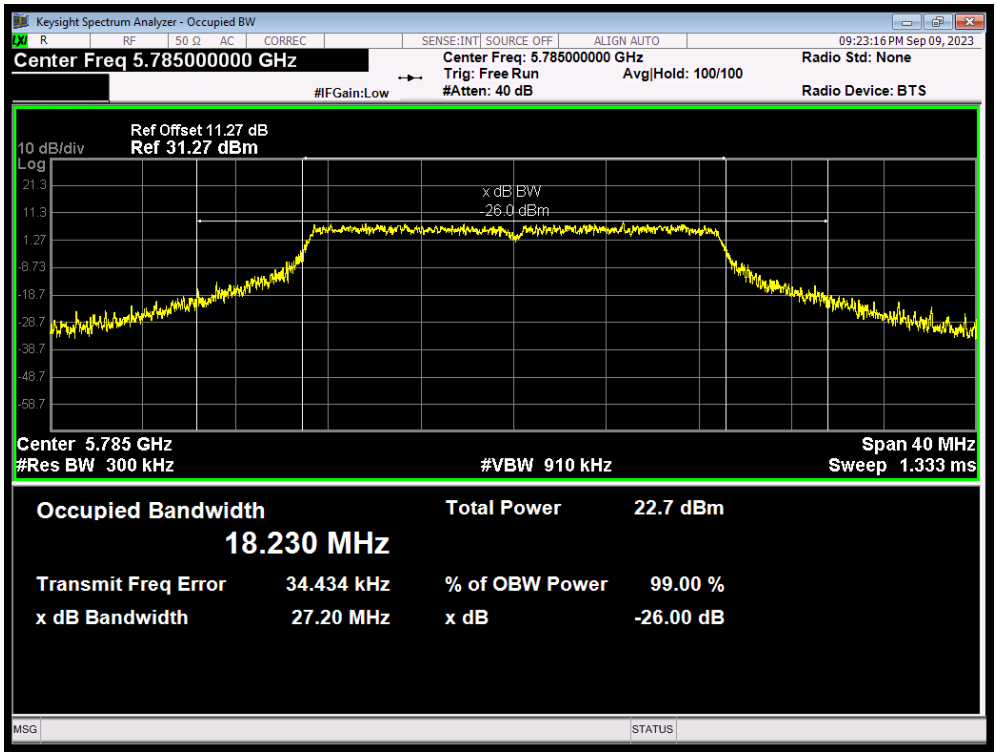
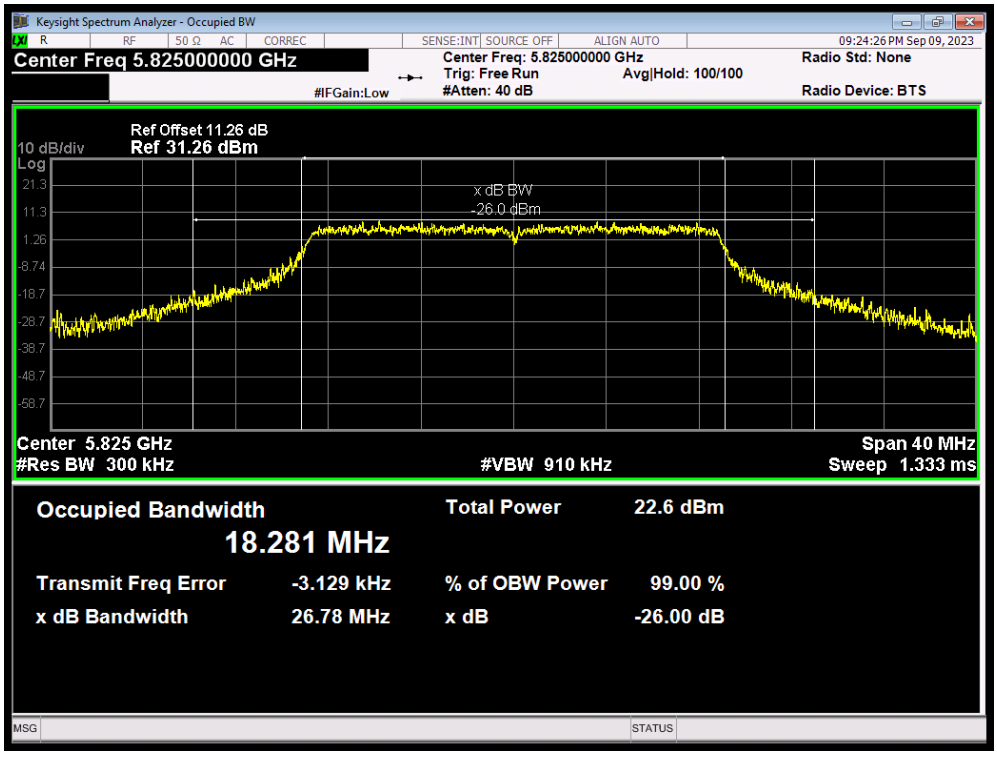


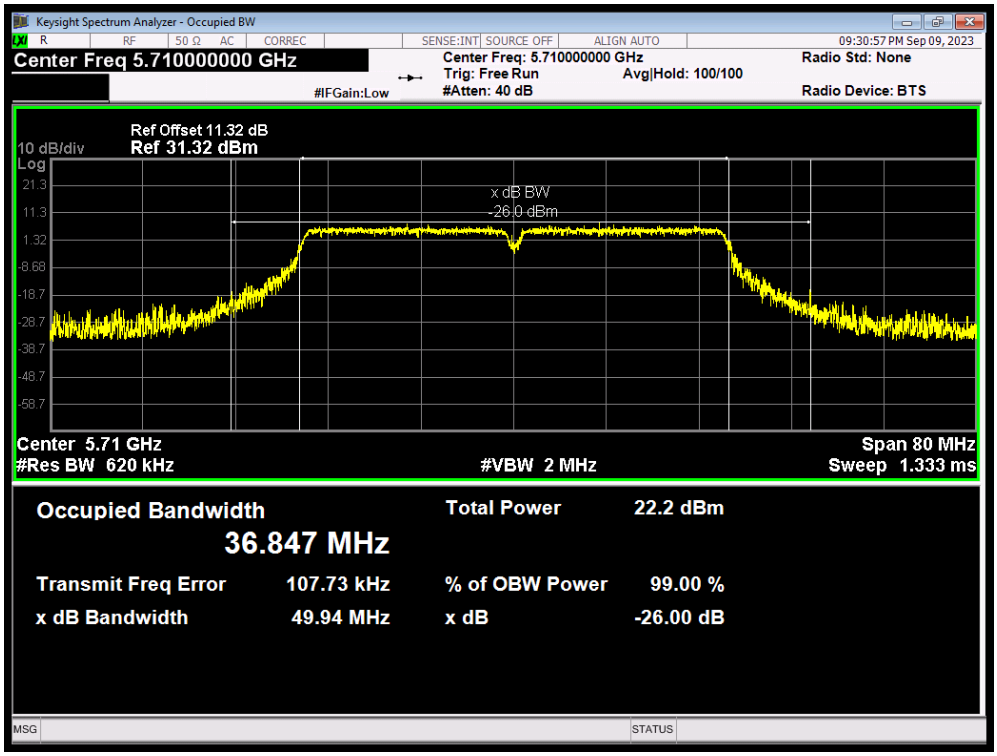
OBW 802.11n(HT20) 5785MHz



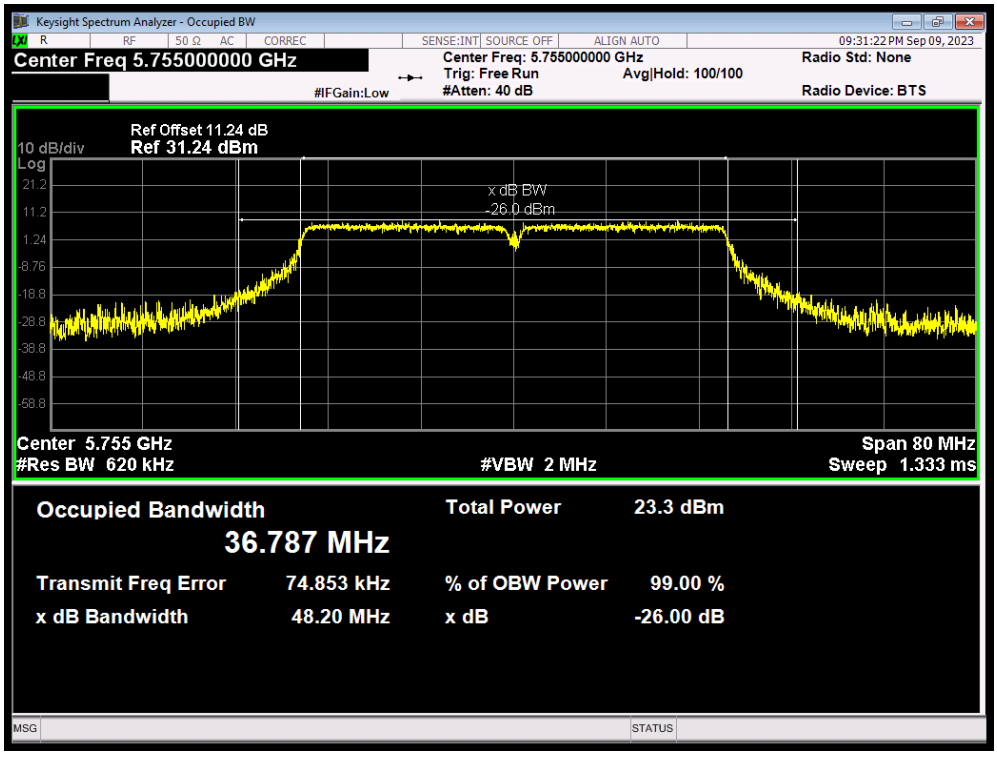
OBW 802.11n(HT20) 5825MHz



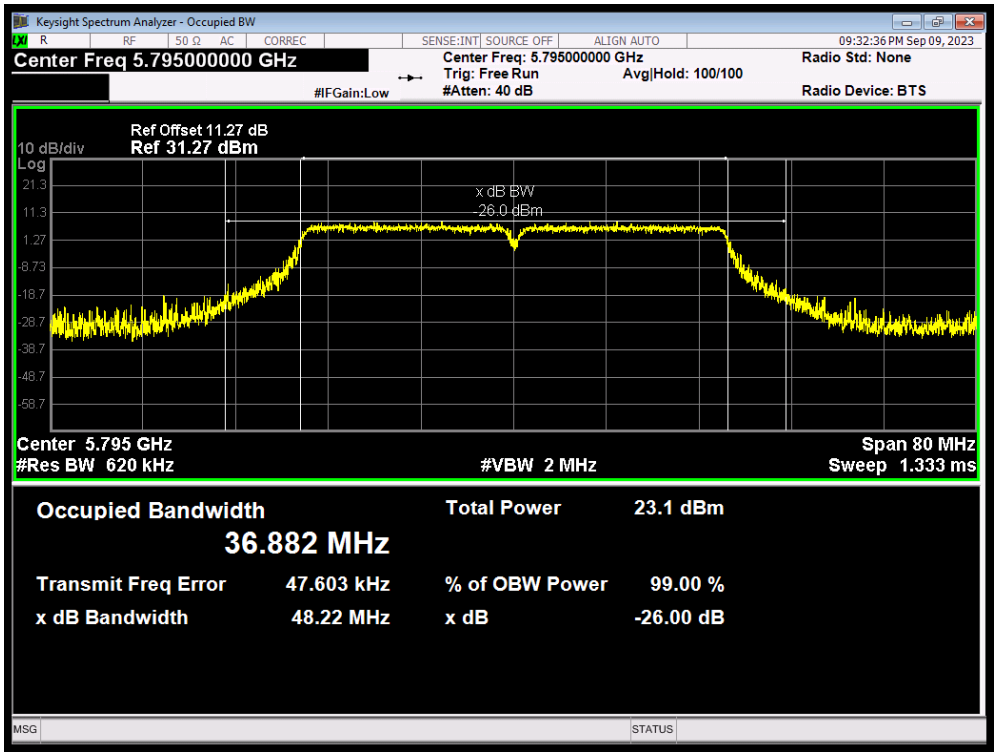
OBW 802.11n(HT40) 5710MHz



OBW 802.11n(HT40) 5755MHz



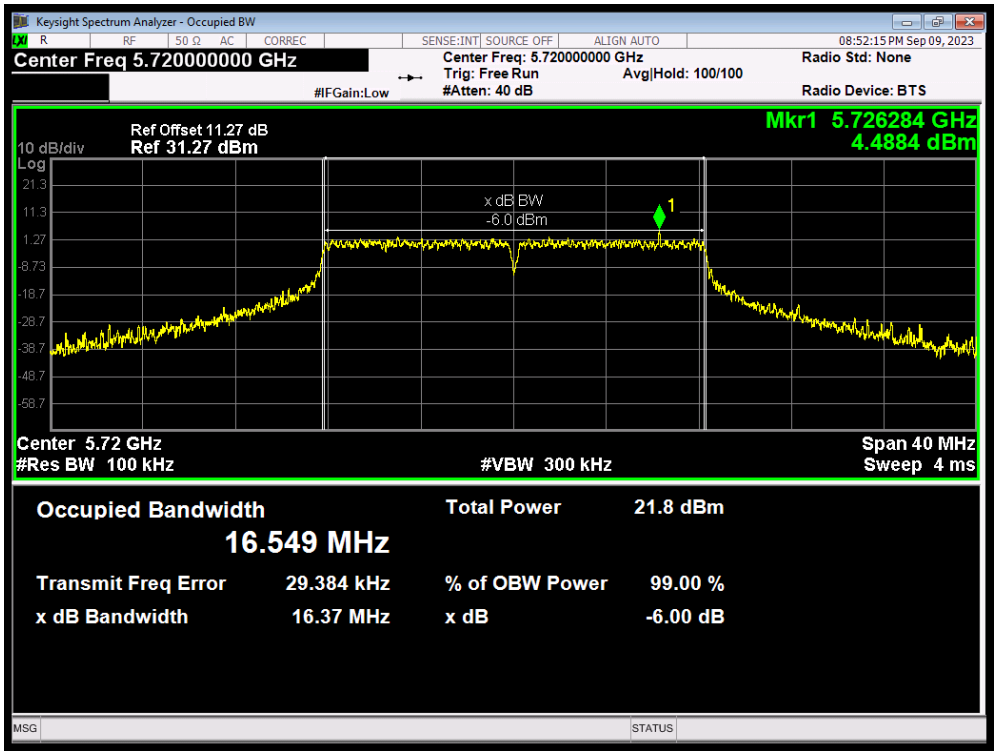
OBW 802.11n(HT40) 5795MHz



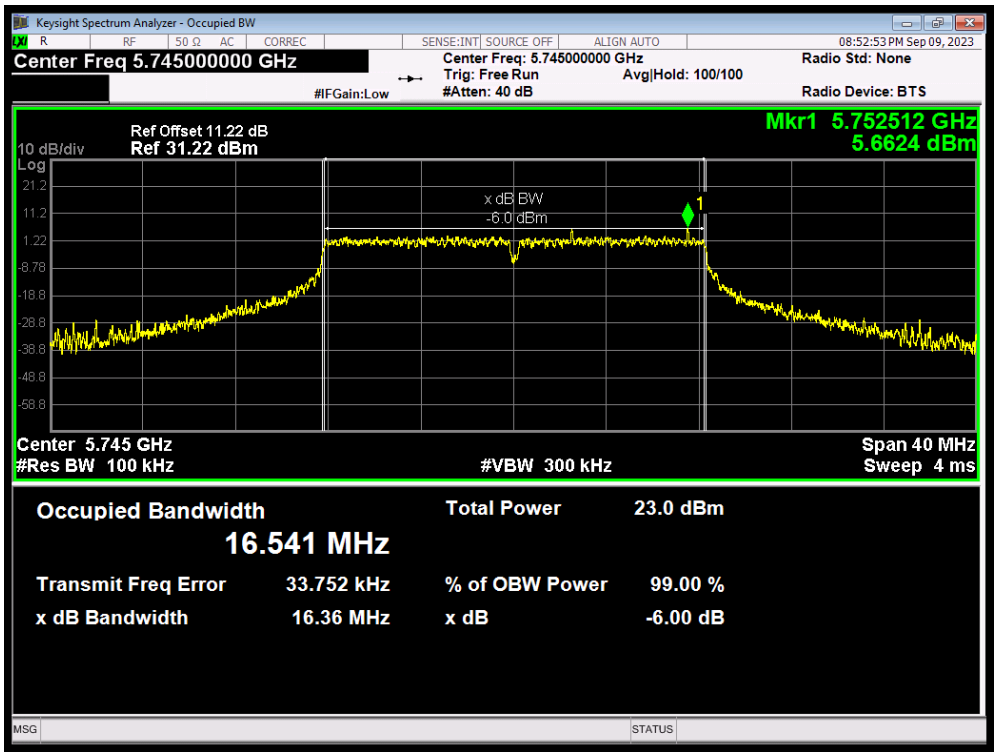
Minimum 6 dB bandwidth

U-NII-3

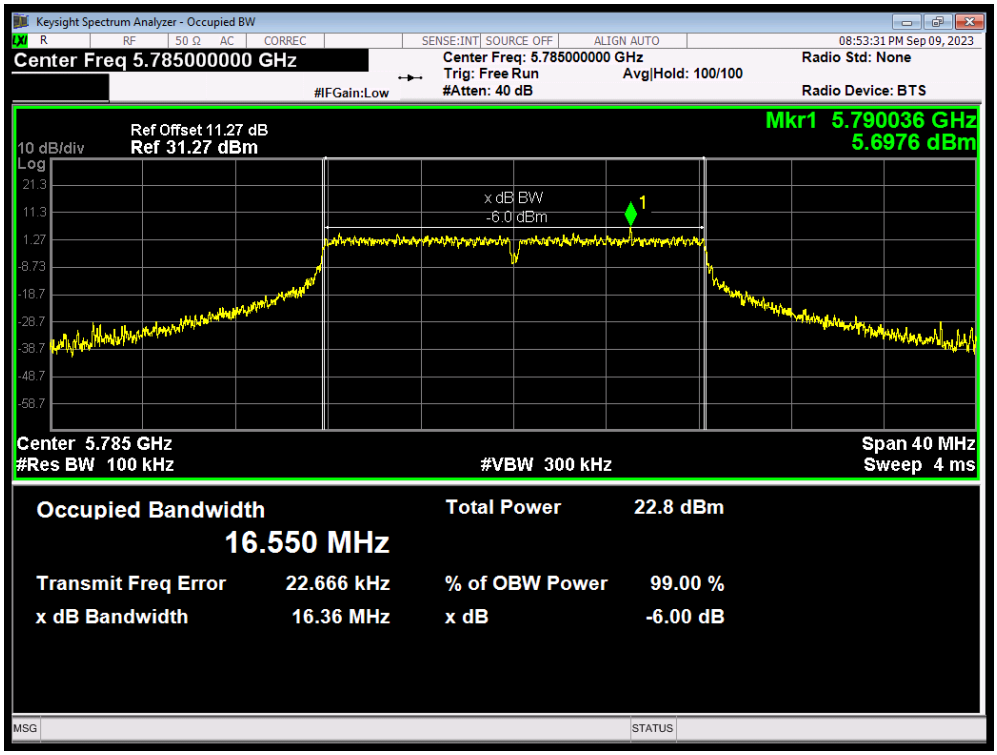
-6dB Bandwidth 802.11a 5720MHz



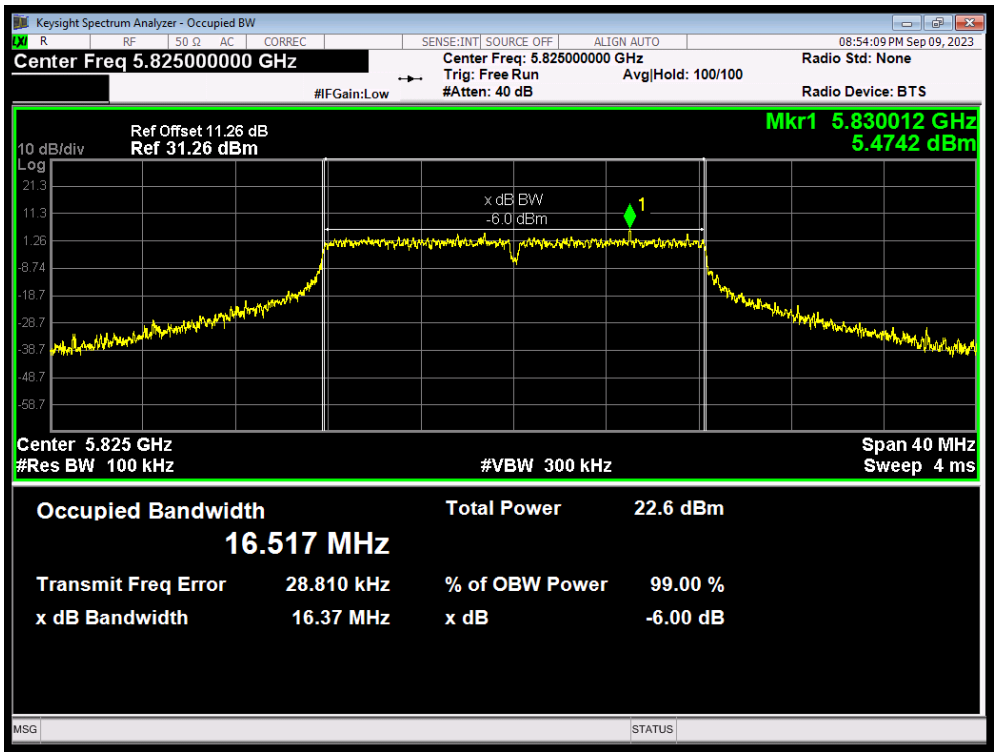
-6dB Bandwidth 802.11a 5745MHz



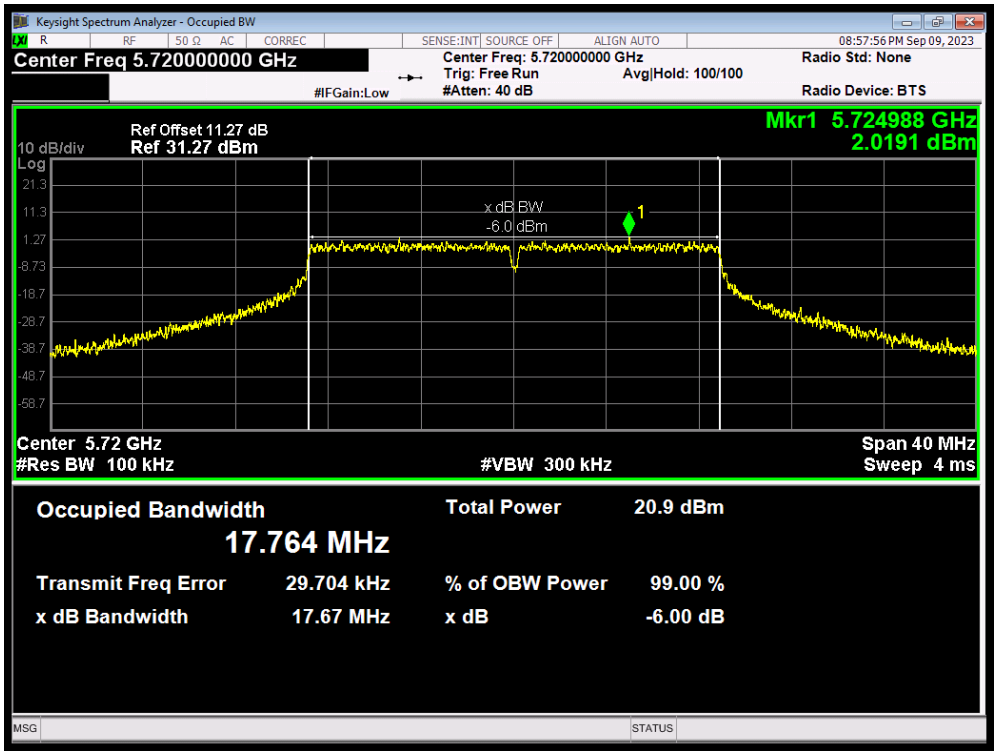
-6dB Bandwidth 802.11a 5785MHz



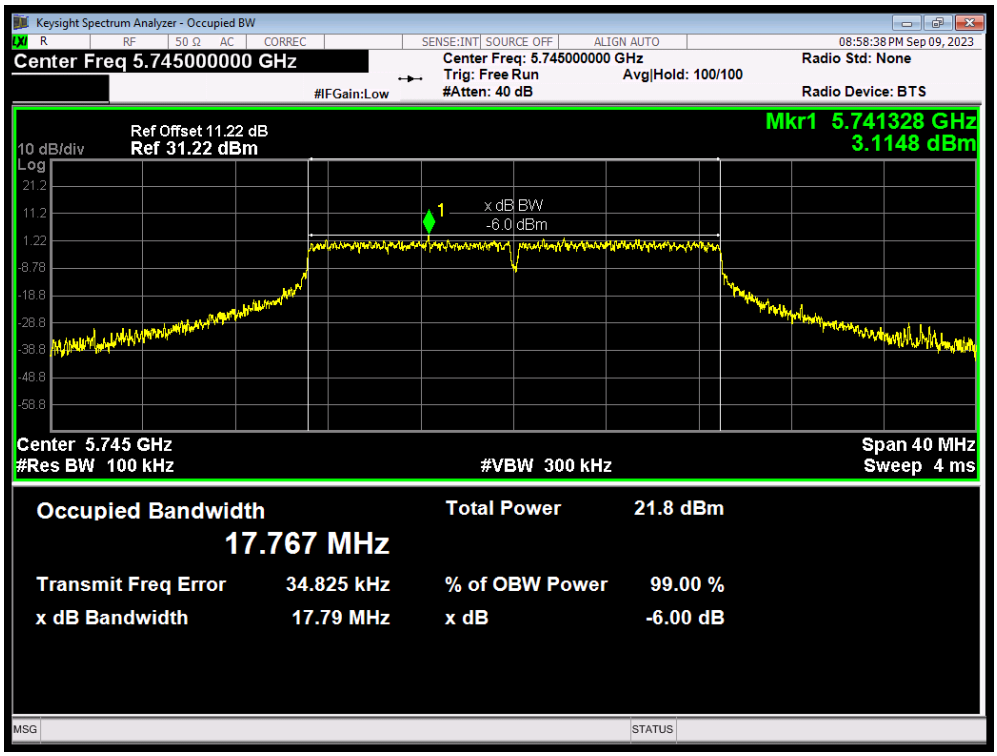
-6dB Bandwidth 802.11a 5825MHz



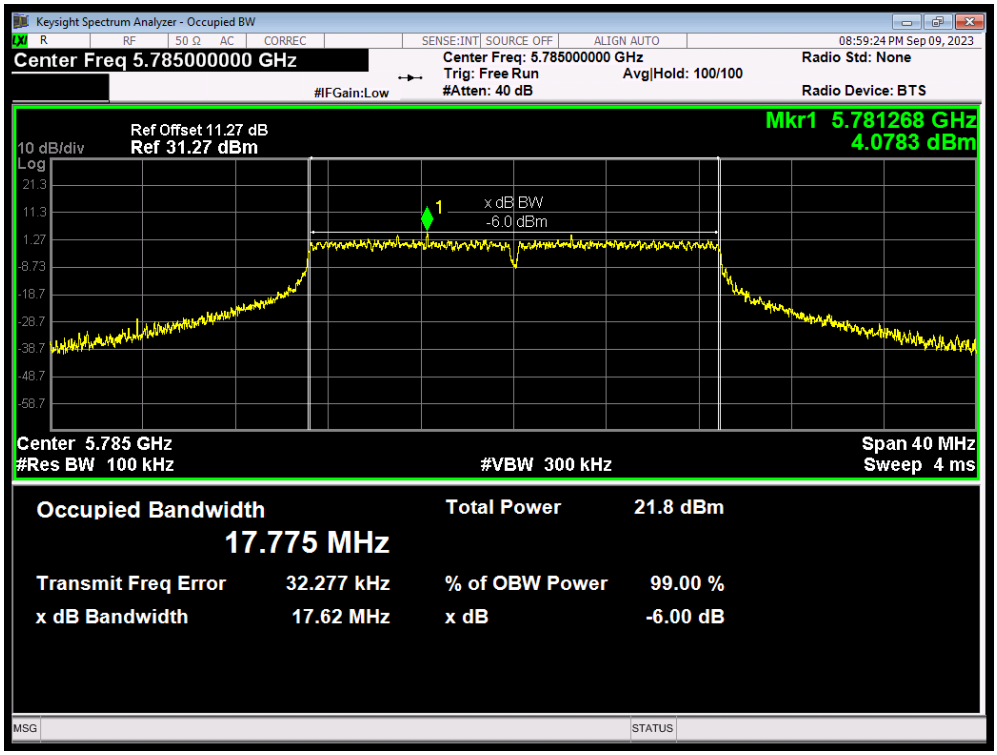
-6dB Bandwidth 802.11ac(VHT20) 5720MHz



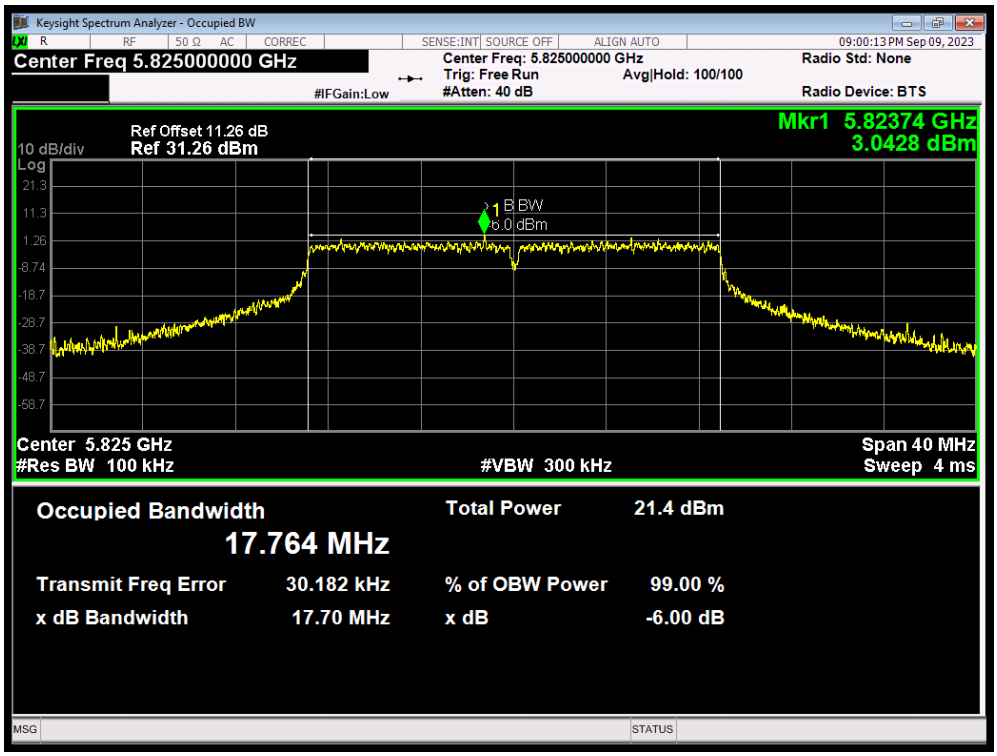
-6dB Bandwidth 802.11ac(VHT20) 5745MHz



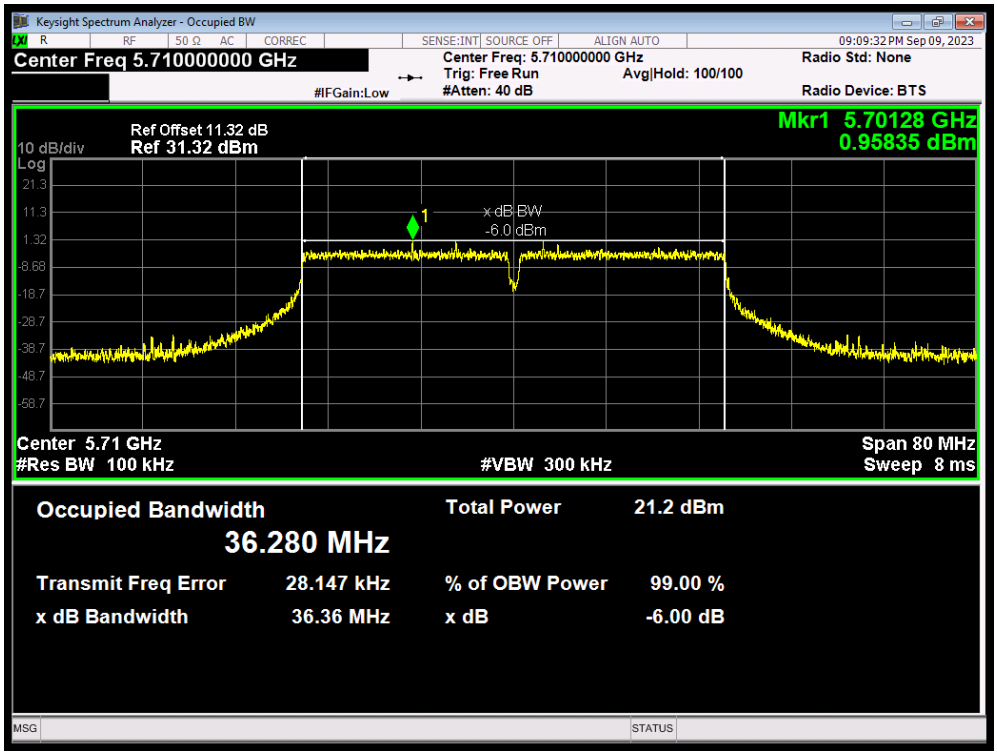
-6dB Bandwidth 802.11ac(VHT20) 5785MHz



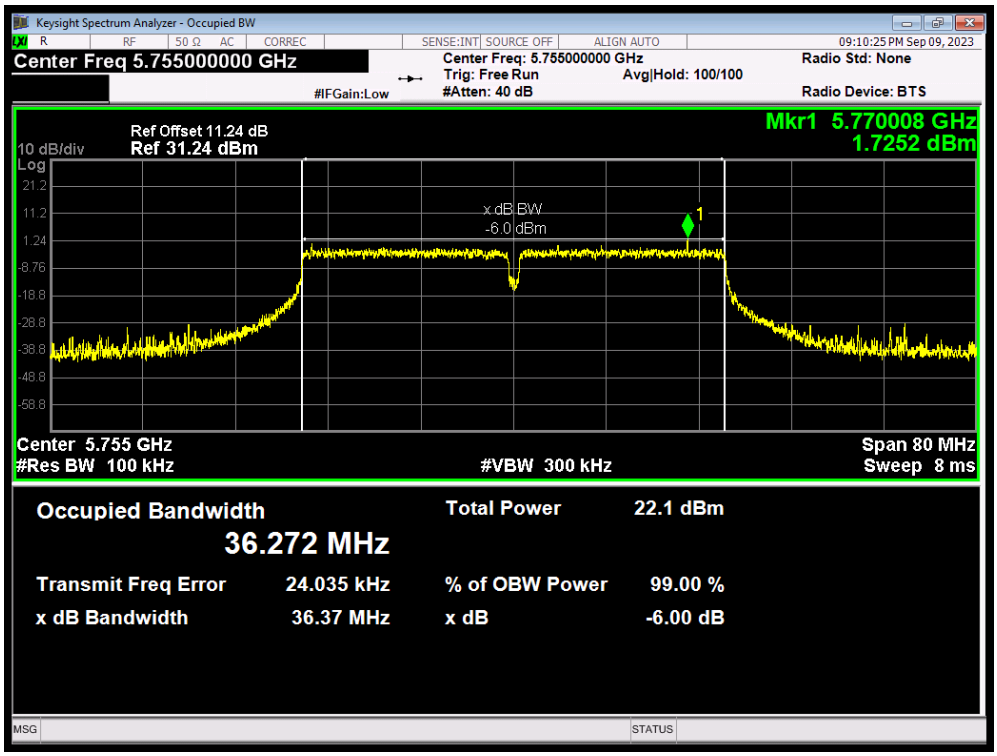
-6dB Bandwidth 802.11ac(VHT20) 5825MHz



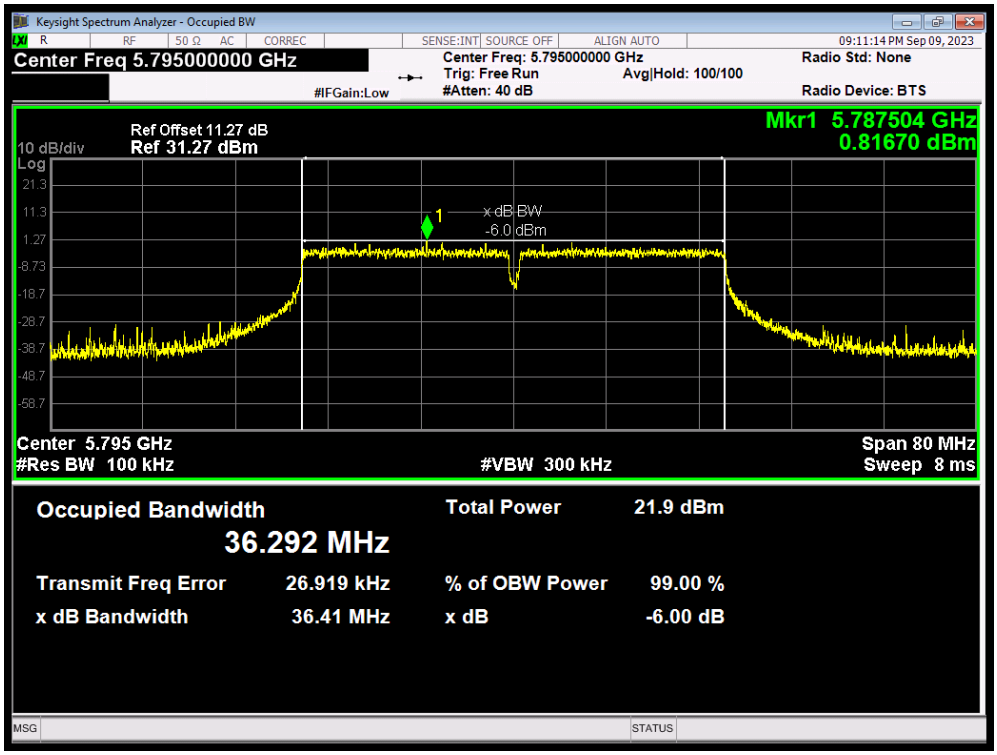
-6dB Bandwidth 802.11ac(VHT40) 5710MHz



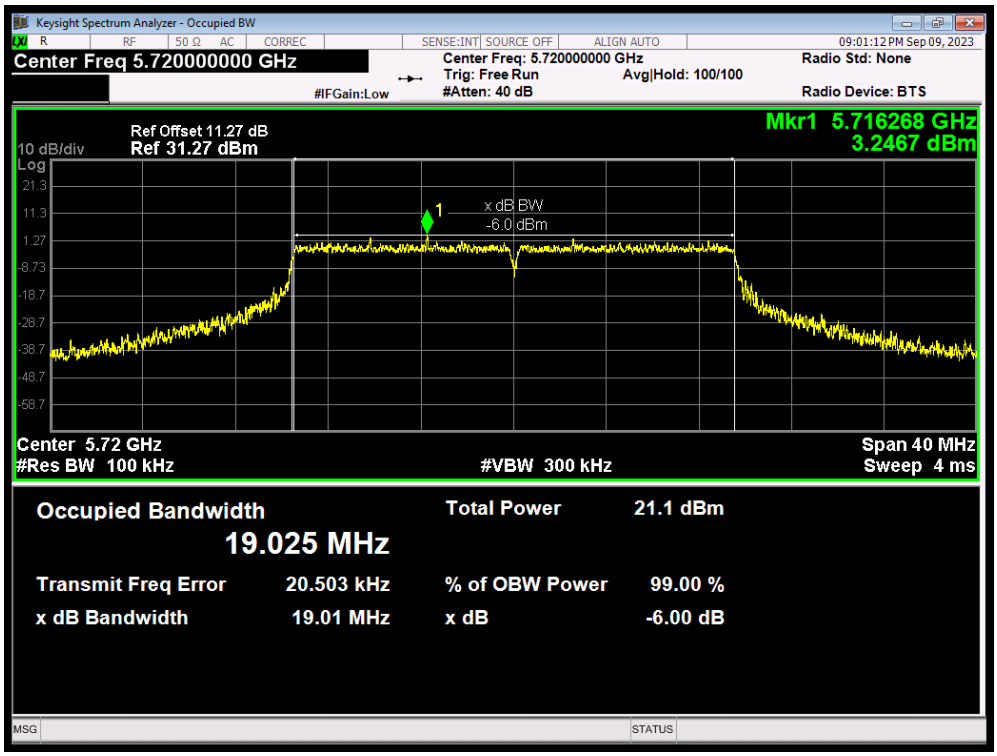
-6dB Bandwidth 802.11ac(VHT40) 5755MHz



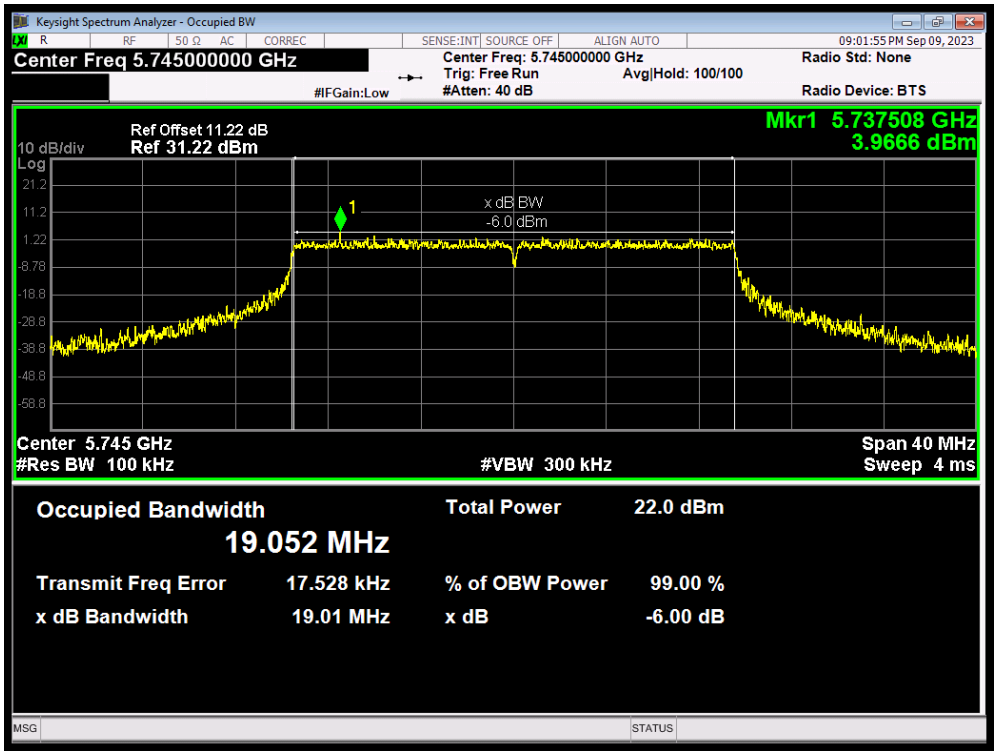
-6dB Bandwidth 802.11ac(VHT40) 5795MHz



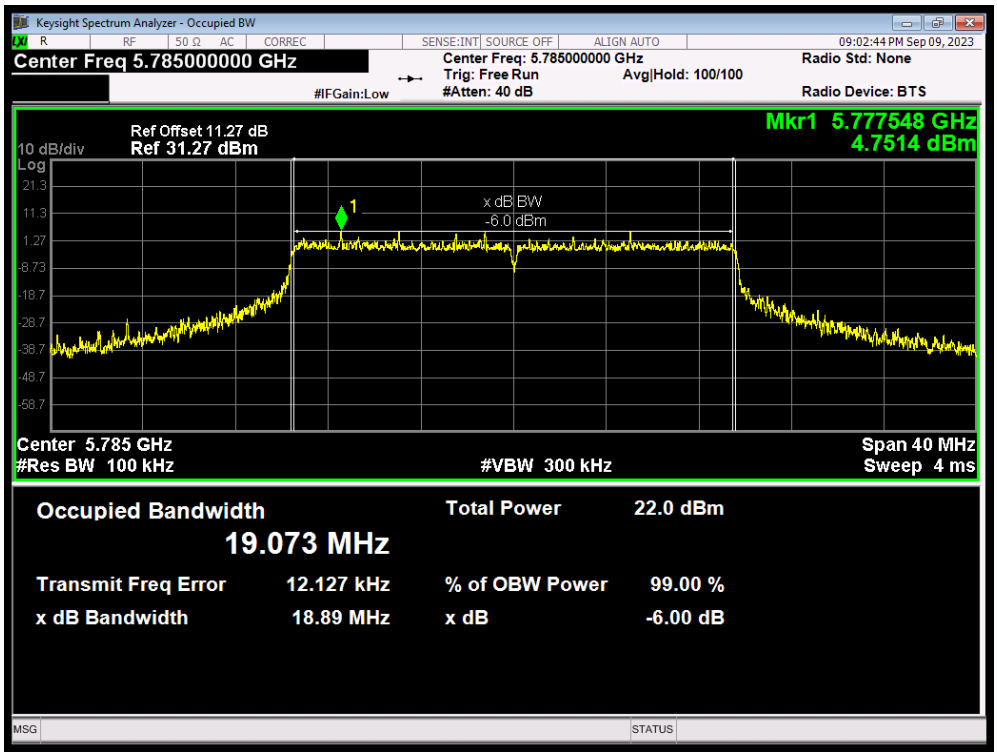
-6dB Bandwidth 802.11ax(HE20) 5720MHz



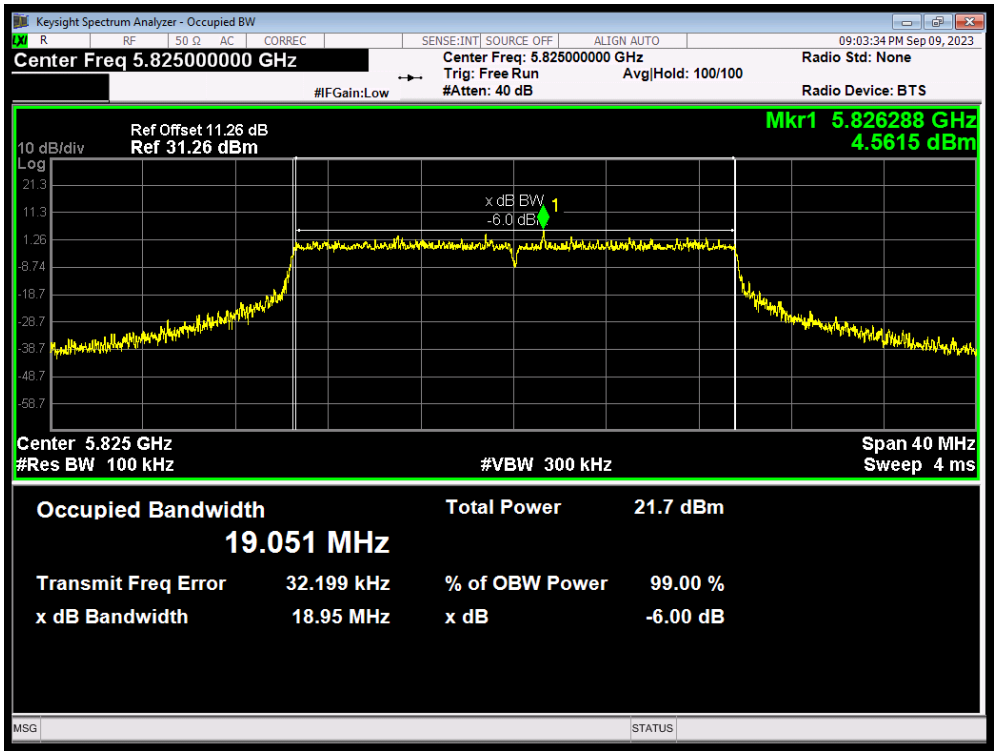
-6dB Bandwidth 802.11ax(HE20) 5745MHz



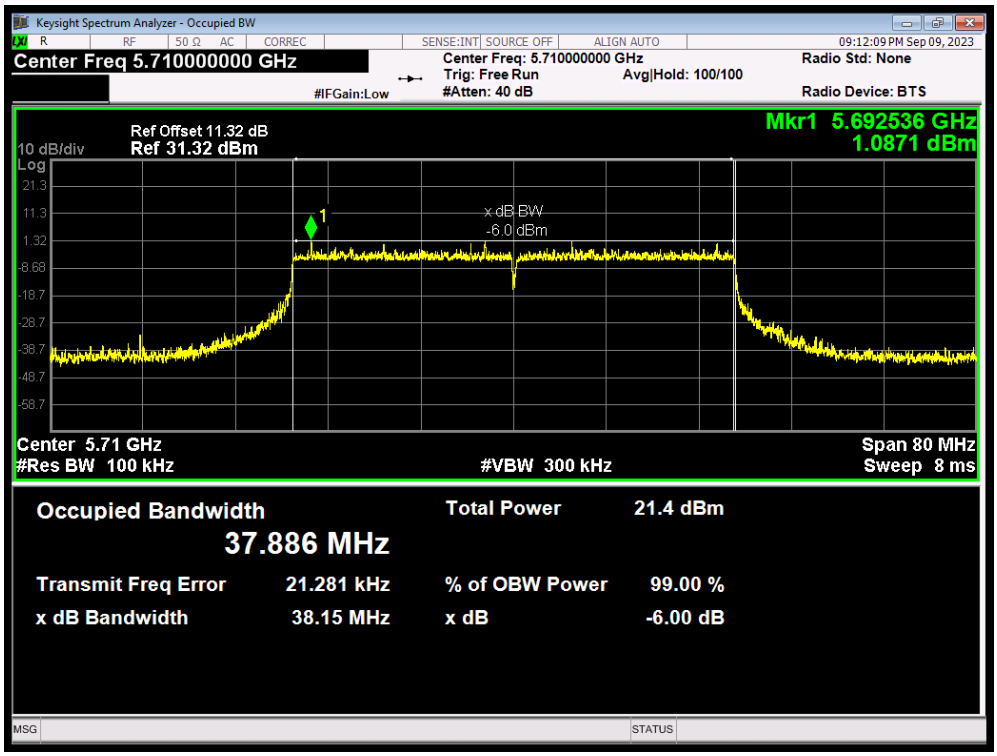
-6dB Bandwidth 802.11ax(HE20) 5785MHz



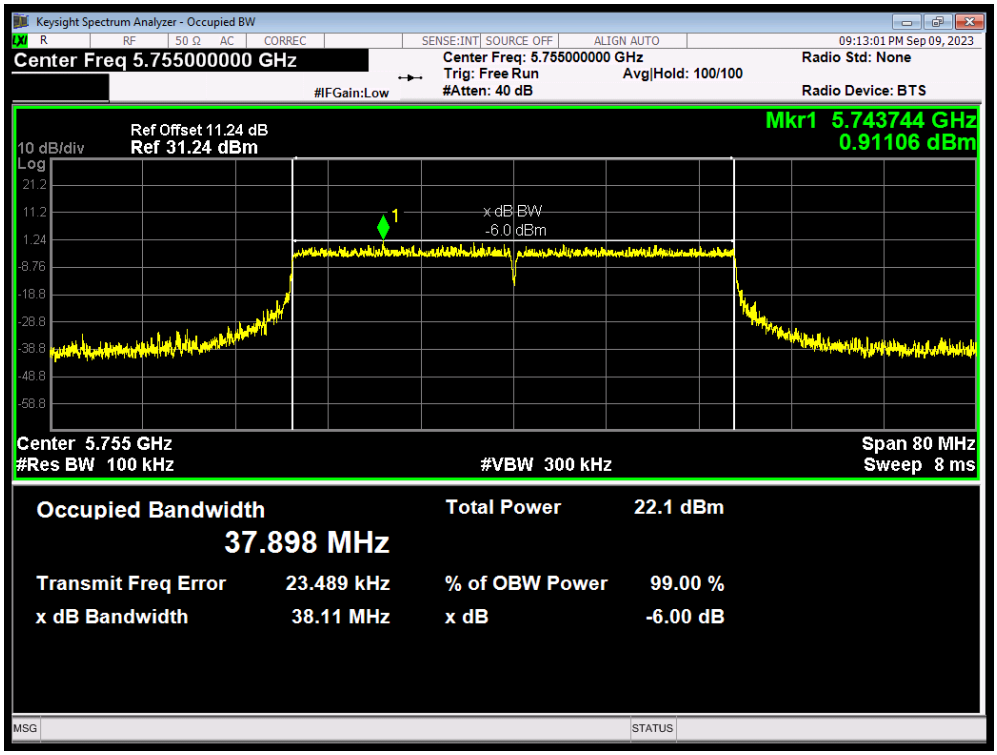
-6dB Bandwidth 802.11ax(HE20) 5825MHz



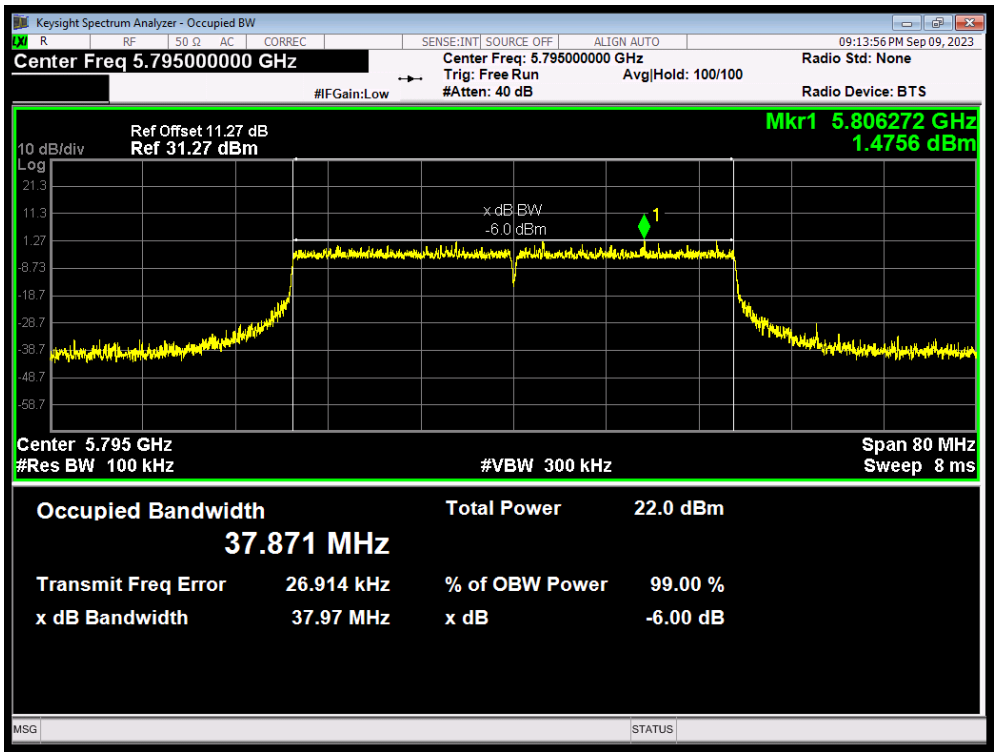
-6dB Bandwidth 802.11ax(HE40) 5710MHz



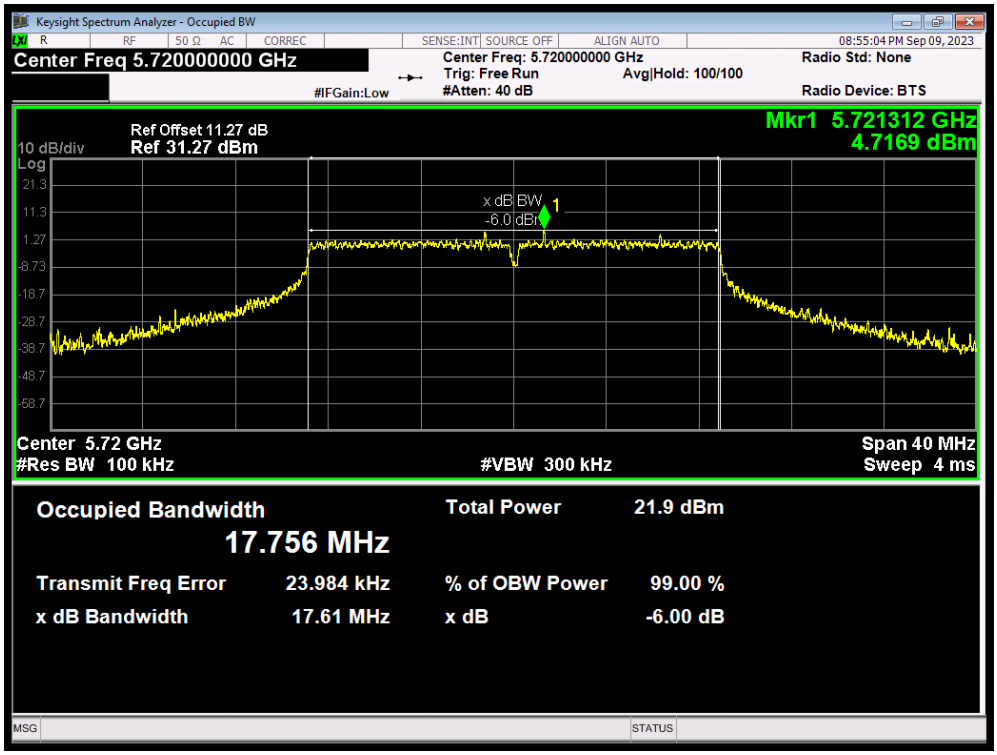
-6dB Bandwidth 802.11ax(HE40) 5755MHz



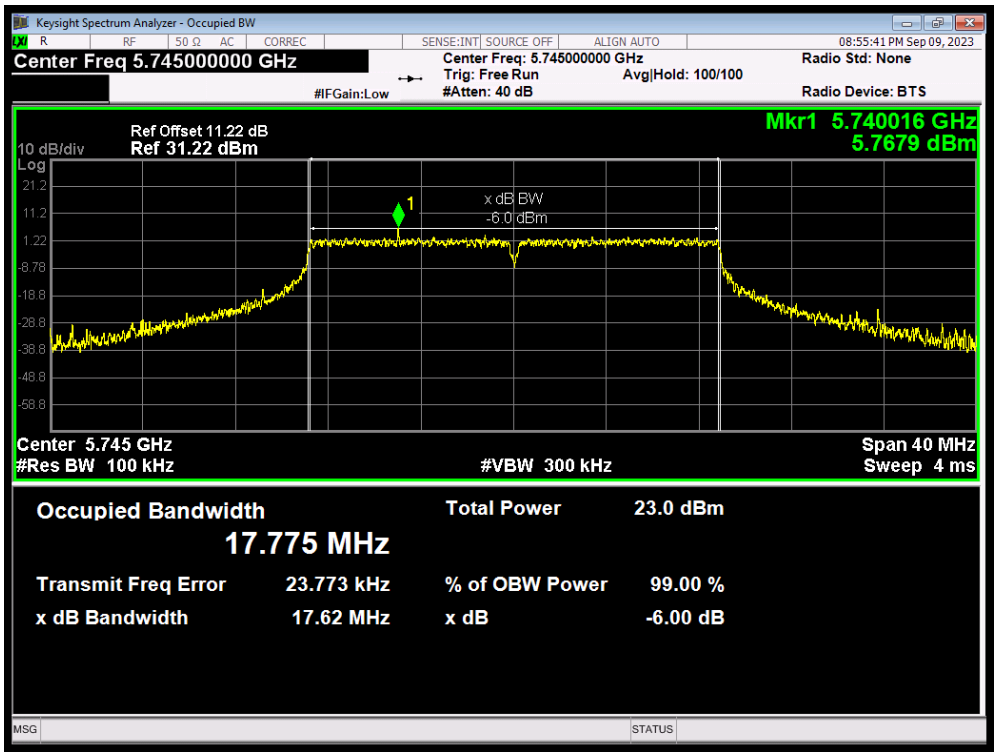
-6dB Bandwidth 802.11ax(HE40) 5795MHz



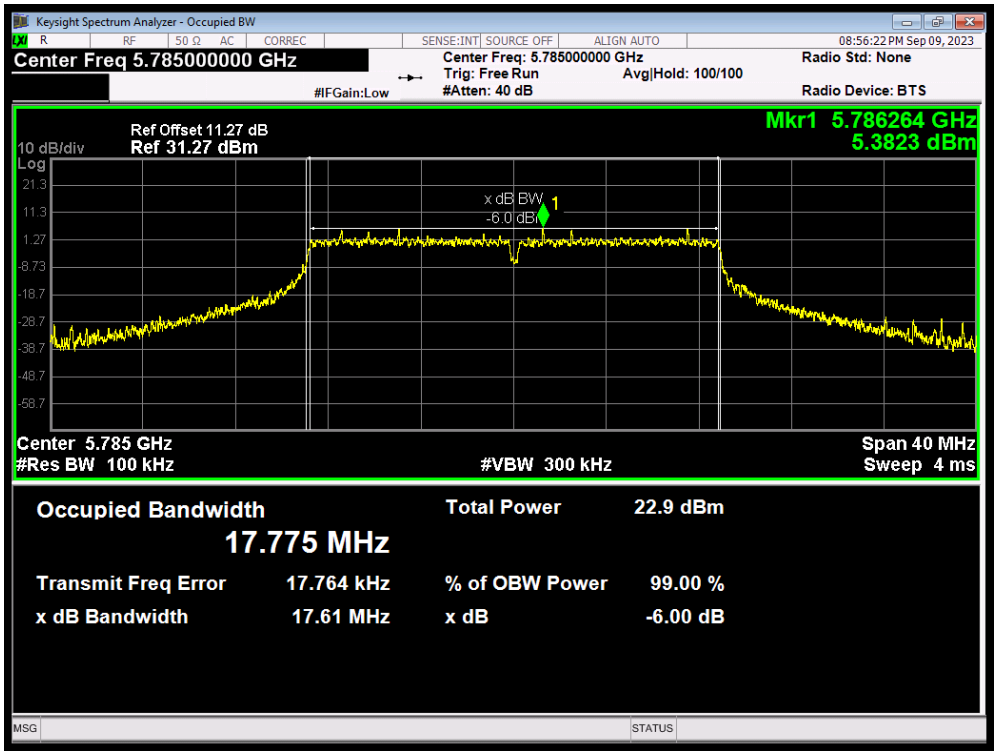
-6dB Bandwidth 802.11n(HT20) 5720MHz



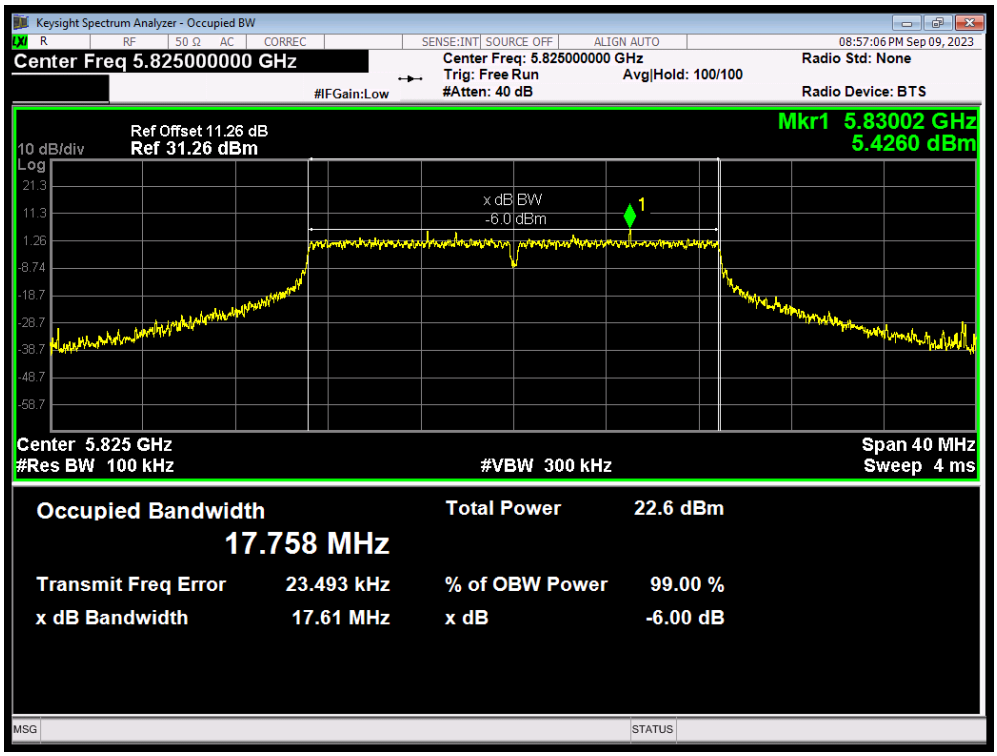
-6dB Bandwidth 802.11n(HT20) 5745MHz



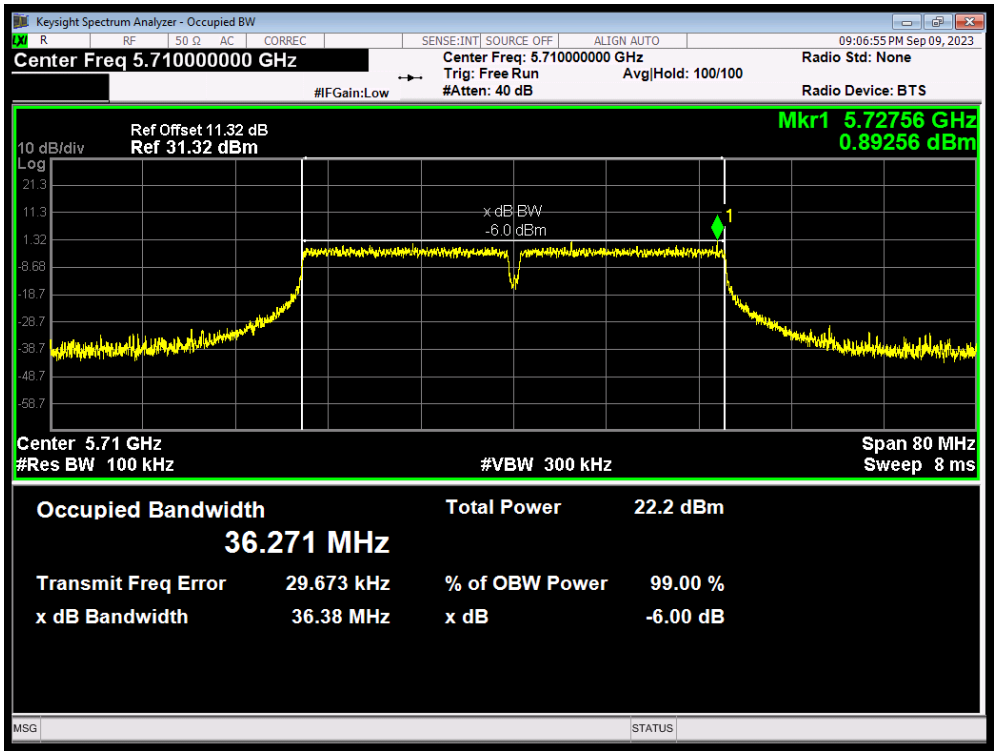
-6dB Bandwidth 802.11n(HT20) 5785MHz



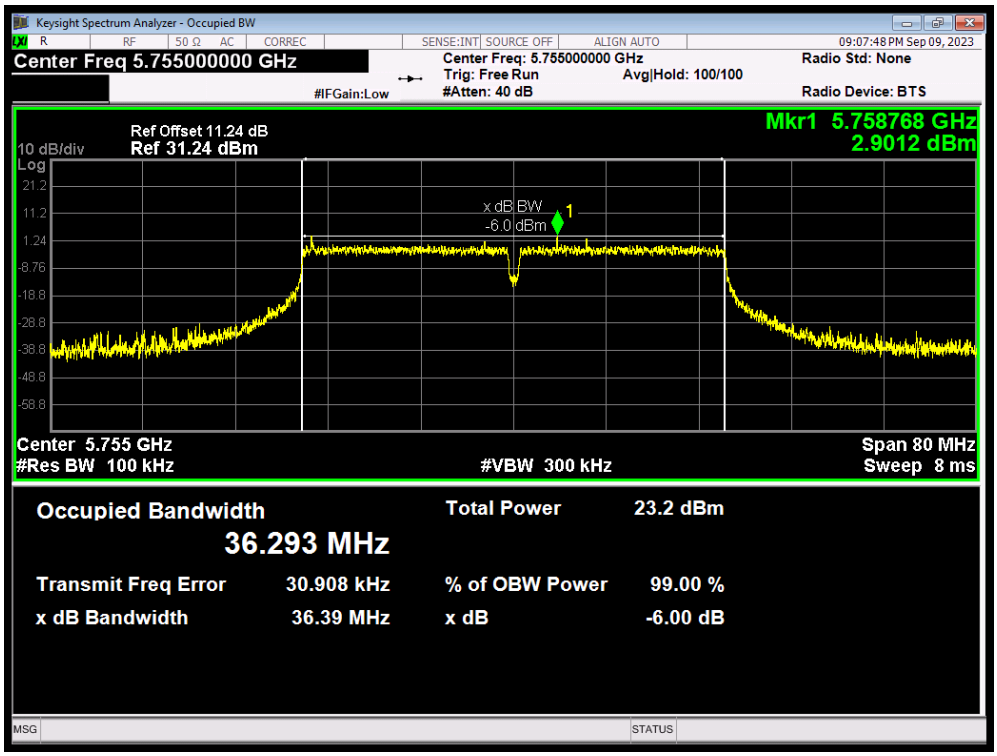
-6dB Bandwidth 802.11n(HT20) 5825MHz



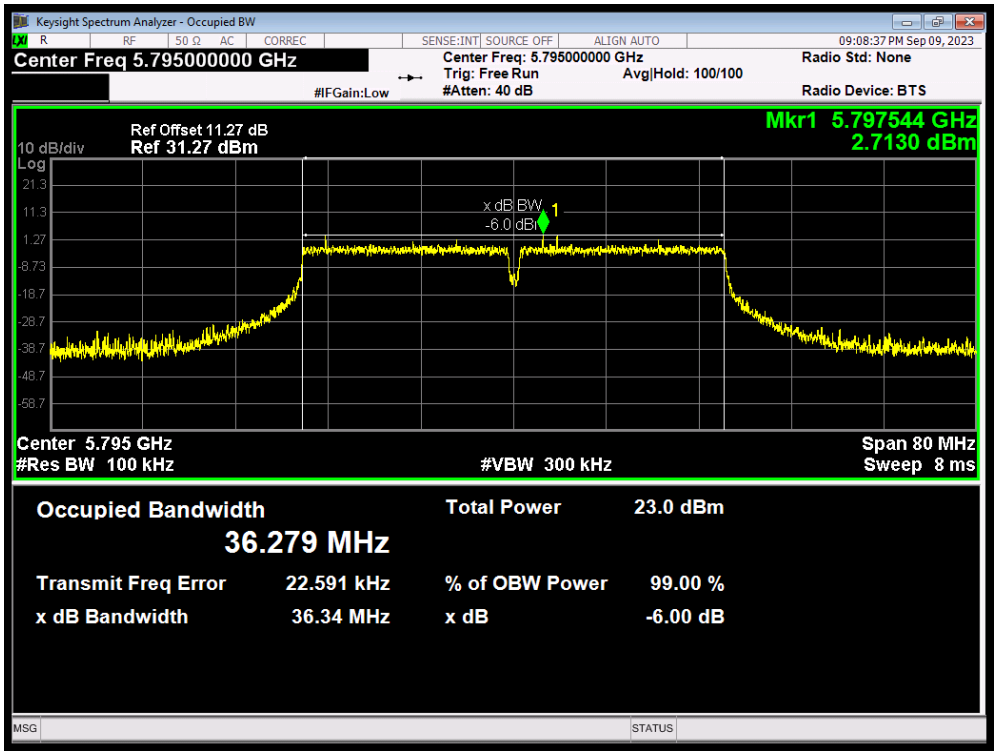
-6dB Bandwidth 802.11n(HT40) 5710MHz



-6dB Bandwidth 802.11n(HT40) 5755MHz



-6dB Bandwidth 802.11n(HT40) 5795MHz



5.2. Average Power Output

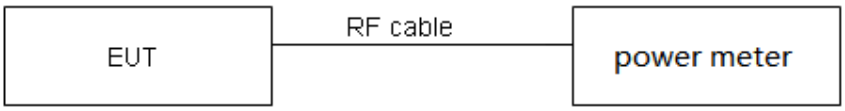
Ambient condition

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

Test Setup



Limits

Rule FCC Part 15.407(a)(1) / FCC Part 15.407(a) (2) / 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 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(3)For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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	0.578	2.370
802.11n HT20	0.834	0.790
802.11n HT40	0.828	0.820
802.11ac VHT20	0.834	0.790
802.11ac VHT40	0.828	0.820
802.11ax HE20	0.792	1.010
802.11ax HE40	0.792	1.010
Note: when Duty cycle≥0.98, Duty cycle correction Factor not required.		

Power Index								
Channel	802.11a	802.11n HT20	802.11ac VHT20	802.11ax HE20	Channel	802.11n HT40	802.11ac VHT40	802.11ax HE40
CH36	15	16	16	16	CH38	17	16	16
CH40	17	17	16	16	CH46	17	16	16
CH48	17	17	16	16	CH54	17	16	16
CH52	17	17	16	16	CH62	17	16	16
CH60	17	17	16	16	CH102	13	13	12
CH64	17	17	16	16	CH118	17	16	16
CH100	12	13	13	13	CH134	17	16	16
CH120	17	17	16	16	CH142	17	16	16
CH140	14	13	13	15	CH151	17	16	16
CH144	17	17	16	16	CH159	17	16	16
CH149	17	17	16	16	/	/	/	/
CH157	17	17	16	16	/	/	/	/
CH165	17	17	16	16	/	/	/	/

Test Mode		Channel/ Frequency (MHz)	B=26 dB bandwidth (MHz)	Limit 11 dBm + 10 log B (dBm)	Final Limit (dBm)
U-NII-2A	802.11a	52/5260	29.07	25.63>24	24
		60/5300	25.35	25.04>24	24
		64/5320	25.08	24.99>24	24
	802.11n HT20	52/5260	27.72	25.43>24	24
		60/5300	25.10	25.00>24	24
		64/5320	29.35	25.68>24	24
	802.11n HT40	54/5270	51.59	28.13 >24	24
		62/5310	50.43	28.03>24	24
	802.11ac VHT20	52/5260	25.90	25.13>24	24
		60/5300	25.62	25.08>24	24
		64/5320	25.46	25.06>24	24
	802.11ac VHT40	54/5270	47.87	27.80>24	24
		62/5310	49.22	27.92>24	24
	802.11ax HE20	52/5260	24.70	24.93>24	24
		60/5300	25.11	25.00>24	24
		64/5320	25.11	25.00>24	24
	802.11ax HE40	54/5270	43.27	27.36>24	24
		62/5310	44.69	27.50>24	24
U-NII-2C	802.11a	100/5500	25.81	25.12>24	24
		120/5600	24.99	24.98>24	24
		140/5700	25.40	25.05>24	24
		144/5720	24.73	24.93>24	24
	802.11n HT20	100/5500	27.14	25.34>24	24
		120/5600	27.77	25.44>24	24
		140/5700	27.05	25.32>24	24
		144/5720	27.00	25.31>24	24
	802.11n HT40	102/5510	47.99	27.81>24	24
		118/5590	47.58	27.77>24	24
		134/5670	48.57	27.86>24	24
		142/5710	47.18	27.74>24	24
	802.11ac VHT20	100/5500	26.06	25.16>24	24
		120/5600	26.94	25.30>24	24
		140/5700	26.51	25.23>24	24
		144/5720	25.53	25.07>24	24
	802.11ac VHT40	102/5510	47.70	27.79>24	24
		118/5590	48.71	27.88>24	24
		134/5670	47.41	27.76>24	24
		142/5710	48.37	27.85>24	24
	802.11ax HE20	100/5500	25.04	24.99>24	24

		120/5600	27.57	25.40>24	24
		140/5700	25.92	25.14>24	24
		144/5720	24.22	24.84>24	24
	802.11ax HE40	102/5510	45.07	27.54>24	24
		118/5590	46.66	27.69>24	24
		134/5670	45.55	27.58>24	24
		142/5710	45.87	27.62>24	24
Note: 250mW=24dBm					

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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	11.32	13.69	24	PASS
	40/5200	15.16	17.53	24	PASS
	48/5240	15.38	17.75	24	PASS
802.11n HT20	36/5180	14.50	15.29	24	PASS
	40/5200	16.57	17.36	24	PASS
	48/5240	16.62	17.41	24	PASS
802.11n HT40	38/5190	16.32	17.14	24	PASS
	46/5230	16.36	17.18	24	PASS
802.11ac VHT20	36/5180	15.22	16.01	24	PASS
	40/5200	15.44	16.23	24	PASS
	48/5240	15.66	16.45	24	PASS
802.11ac VHT40	38/5190	15.35	16.17	24	PASS
	46/5230	15.47	16.29	24	PASS
802.11ax HE20	36/5180	15.13	16.15	24	PASS
	40/5200	15.15	16.17	24	PASS
	48/5240	15.25	16.26	24	PASS
802.11ax HE40	38/5190	15.06	16.07	24	PASS
	46/5230	15.42	16.43	24	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

U-NII-2A

Test Mode	Channel/ Frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	52/5260	15.38	17.75	24	PASS
	60/5300	15.90	18.27	24	PASS
	64/5320	15.79	18.16	24	PASS
802.11n HT20	52/5260	16.94	17.73	24	PASS
	60/5300	17.09	17.88	24	PASS
	64/5320	16.94	17.73	24	PASS
802.11n HT40	54/5270	16.88	17.70	24	PASS
	62/5310	16.91	17.72	24	PASS
802.11ac VHT20	52/5260	15.81	16.60	24	PASS
	60/5300	16.08	16.87	24	PASS
	64/5320	16.08	16.87	24	PASS
802.11ac VHT40	54/5270	15.74	16.56	24	PASS
	62/5310	15.91	16.73	24	PASS
802.11ax HE20	52/5260	15.47	16.48	24	PASS
	60/5300	15.68	16.69	24	PASS
	64/5320	16.18	17.19	24	PASS
802.11ax HE40	54/5270	15.55	16.56	24	PASS
	62/5310	15.79	16.80	24	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

U-NII-2C

Test Mode	Channel/ Frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	100/5500	8.43	10.80	24	PASS
	120/5600	14.36	16.73	24	PASS
	140/5700	10.11	12.48	24	PASS
	144/5720	12.61	14.98	24	PASS
802.11n HT20	100/5500	11.06	11.85	24	PASS
	120/5600	16.14	16.93	24	PASS
	140/5700	10.45	11.24	24	PASS
	144/5720	13.91	14.70	24	PASS
802.11n HT40	102/5510	11.33	12.15	24	PASS
	118/5590	16.13	16.95	24	PASS
	134/5670	15.58	16.40	24	PASS
	142/5710	14.75	15.57	24	PASS
802.11ac VHT20	100/5500	11.01	11.80	24	PASS
	120/5600	15.21	16.00	24	PASS
	140/5700	10.62	11.41	24	PASS
	144/5720	13.07	13.86	24	PASS
802.11ac VHT40	102/5510	11.22	12.04	24	PASS
	118/5590	15.03	15.85	24	PASS
	134/5670	14.45	15.27	24	PASS
	142/5710	13.72	14.54	24	PASS
802.11ax HE20	100/5500	11.02	12.04	24	PASS
	120/5600	14.78	15.79	24	PASS
	140/5700	12.58	13.59	24	PASS
	144/5720	12.45	13.47	24	PASS
802.11ax HE40	102/5510	10.07	11.08	24	PASS
	118/5590	14.89	15.90	24	PASS
	134/5670	14.37	15.38	24	PASS
	142/5710	13.49	14.50	24	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	144/5720	7.15	9.52	30	PASS
	149/5745	15.22	17.59	30	PASS
	157/5785	14.94	17.31	30	PASS
	165/5825	14.62	16.99	30	PASS
802.11n HT20	144/5720	8.86	9.65	30	PASS
	149/5745	16.52	17.31	30	PASS
	157/5785	16.36	17.15	30	PASS
	165/5825	16.07	16.86	30	PASS
802.11n HT40	142/5710	4.80	5.62	30	PASS
	151/5755	16.58	17.40	30	PASS
	159/5795	15.75	16.57	30	PASS
802.11ac VHT20	144/5720	7.94	8.73	30	PASS
	149/5745	12.55	13.34	30	PASS
	157/5785	15.23	16.02	30	PASS
	165/5825	14.99	15.78	30	PASS
802.11ac VHT40	142/5710	3.54	4.36	30	PASS
	151/5755	15.49	16.31	30	PASS
	159/5795	13.33	14.15	30	PASS
802.11ax HE20	144/5720	7.87	8.88	30	PASS
	149/5745	15.05	16.07	30	PASS
	157/5785	14.69	15.71	30	PASS
	165/5825	14.62	15.64	30	PASS
802.11ax HE40	142/5710	4.26	5.27	30	PASS
	151/5755	15.25	16.26	30	PASS
	159/5795	15.23	16.24	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

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
3.3	-30	5199.995669	5199.994781	5199.987809	5199.982610
3.3	-20	5200.000592	5199.985673	5199.981046	5199.976468
3.3	-10	5200.004939	5199.978503	5199.978340	5199.970185
3.3	0	5199.996356	5199.985301	5199.974725	5199.970695
3.3	10	5199.993296	5199.977004	5199.970373	5199.966212
3.3	20	5199.986019	5199.969787	5199.968789	5199.964310
3.3	30	5199.982454	5199.960096	5199.964918	5199.963902
3.3	40	5199.977228	5199.950845	5199.958477	5199.960240
3.3	50	5199.968650	5199.941679	5199.950676	5199.955409
3	20	5199.960759	5199.938279	5199.942704	5199.950768
3.6	20	5199.958794	5199.934470	5199.940885	5199.945976
Max. ΔMHz		-0.041206	-0.065530	-0.059115	-0.054024
PPM		-7.924231	-12.601923	-11.368269	-10.389231

Voltage (V)	Temperature (°C)	U-NII-2A Test Results			
		5300MHz			
		1min	2min	5min	10min
3.3	-30	5299.993181	5299.985416	5299.983357	5299.974430
3.3	-20	5299.986936	5299.975733	5299.982172	5299.970060
3.3	-10	5299.980221	5299.965898	5299.980052	5299.960848
3.3	0	5299.985953	5299.975220	5299.979149	5299.964871
3.3	10	5299.982062	5299.972589	5299.977113	5299.962770
3.3	20	5299.979982	5299.972392	5299.967957	5299.961358
3.3	30	5299.977840	5299.963576	5299.962787	5299.959812
3.3	40	5299.977485	5299.961258	5299.953538	5299.956627
3.3	50	5299.975607	5299.959434	5299.943746	5299.955344
3	20	5299.974811	5299.958963	5299.942659	5299.947719
3.6	20	5299.967121	5299.954219	5299.933646	5299.937908
Max. ΔMHz		-0.032879	-0.045781	-0.066354	-0.062092
PPM		-6.203585	-8.637925	-12.519623	-11.715472

Voltage (V)	Temperature (°C)	U-NII-2C Test Results			
		5580MHz			
		1min	2min	5min	10min
3.3	-30	5579.993981	5579.992876	5579.988939	5579.984164
3.3	-20	5579.991781	5579.983416	5579.980501	5579.976524
3.3	-10	5579.991243	5579.974661	5579.973104	5579.975676
3.3	0	5579.991508	5579.977008	5579.973313	5579.969412
3.3	10	5579.984610	5579.969891	5579.964124	5579.960296
3.3	20	5579.976043	5579.963603	5579.959159	5579.959861
3.3	30	5579.968373	5579.960367	5579.950129	5579.950724
3.3	40	5579.960663	5579.952391	5579.942370	5579.948359
3.3	50	5579.950693	5579.951097	5579.935349	5579.940120
3	20	5579.942110	5579.942518	5579.929173	5579.933950
3.6	20	5579.935276	5579.936697	5579.927130	5579.930310
Max. ΔMHz		-0.064724	-0.063303	-0.072870	-0.069690
PPM		-11.599283	-11.344624	-13.059140	-12.489247

Voltage (V)	Temperature (°C)	U-NII-3 Test Results			
		5785MHz			
		1min	2min	5min	10min
3.3	-30	5784.993789	5784.990978	5784.990202	5784.988644
3.3	-20	5784.989837	5784.990449	5784.981275	5784.982045
3.3	-10	5784.983361	5784.983764	5784.975382	5784.980738
3.3	0	5784.988438	5784.990364	5784.973932	5784.981533
3.3	10	5784.985929	5784.985684	5784.965088	5784.971787
3.3	20	5784.977567	5784.982256	5784.956319	5784.965437
3.3	30	5784.975833	5784.977178	5784.946701	5784.960310
3.3	40	5784.967811	5784.967374	5784.944481	5784.952822
3.3	50	5784.960718	5784.966261	5784.940013	5784.944267
3	20	5784.952041	5784.957641	5784.935238	5784.935892
3.6	20	5784.942889	5784.955489	5784.925944	5784.934572
Max. ΔMHz		-0.057111	-0.044511	-0.074056	-0.065428
PPM		-9.872256	-7.694209	-12.801383	-11.309939