

TEST REPORT

 CTK Co., Ltd. The Power Leader of Global Regulatory Certification	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2024-00854 Page (1) / (157)	
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1. Applicant

- Name : SOLUM CO.,LTD.
- Address : 4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do,
Republic of Korea (Zip 16914)
- Date of Receipt : 2023-12-26

2. Manufacturer

- Name : SOLUM CO.,LTD.
- Address : 4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do,
Republic of Korea (Zip 16914)

3. Factory

- Name : DONGGUAN SOLUM ELECTRONICS CO., LTD.
- Address : Building 2/4/6, No.35, Tongzhen Road, Tongsha, Dongcheng District,
Dongguan City, Guangdong Province, 523127 People's Republic of China

4. Use of Report : For FCC Conformance

5. Test Sample / Model : Signage / WC37FAPBDU0/SM

6. Date of Test : 2024-02-27 to 2024-03-27

7. Test Standard(method) used : FCC 47 CFR part 15 subpart E 15.407

8. Testing Environment: Temp.: (23 ± 1) °C, Humidity: (36 ± 3) % R.H.

9. Test Results : Compliance

10. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

(Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea)

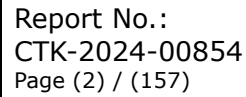
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This report cannot be reproduced or copied without the written consent of CTK

Approval	Tested by Bong-seok Kim: (Signature) 	Technical Manager Young-taek Lee: (Signature) 
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Remark. This report is not related to KOLAS accreditation and relevant regulation.

2024-03-27

CTK Co., Ltd.



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1. General Product Description

1.1 Applicant Information

Company	SOLUM CO.,LTD.
Contact Point	4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (Zip 16914)
Contact Person	Name : Ki Dong Lee E-mail : kdlee007@solu-m.com Tel : +82-31-8006-7677 Fax : -

1.2 Product Information

FCC ID	2AFWN-WC37FAPBDW0	
Product Description	Signage	
Model name	WC37FAPBDU0/SM	
Variant Model name	-	
Operating Frequency	UNII 1	5 180 MHz – 5 240 MHz(20 MHz_BW) 5 190 MHz – 5 230 MHz(40 MHz_BW) 5 210 MHz(80 MHz_BW)
	UNII 2A	5 260 MHz – 5 320 MHz(20 MHz_BW) 5 270 MHz – 5 310 MHz(40 MHz_BW) 5 290 MHz(80 MHz_BW)
	UNII 2C	5 500 MHz – 5 720 MHz(20 MHz_BW) 5 510 MHz – 5 710 MHz(40 MHz_BW) 5 530 MHz – 5 690 MHz(80 MHz_BW)
	UNII 3	5 745 MHz – 5 825 MHz(20 MHz_BW) 5 755 MHz – 5 795 MHz(40 MHz_BW) 5 775 MHz(80 MHz)
RF Output Power	802.11a : 13.02 dBm(20.045 mW) 802.11n_HT20 : 12.04 dBm(15.996 mW) 802.11n_HT40 : 12.17 dBm(16.482 mW) 802.11ac_VHT20 : 12.23 dBm(16.711 mW) 802.11ac_VHT40 : 12.44 dBm(17.539 mW) 802.11ac_VHT80 : 12.67 dBm(18.493 mW)	
Antenna Specification	Antenna type : PCB Antenna	
	UNII 1	Peak Gain : 2.80 dBi(ANT0), 2.80 dBi(ANT1)
	UNII 2A	Peak Gain : 2.94 dBi(ANT0), 2.94 dBi(ANT1)
	UNII 2C	Peak Gain : 3.61 dBi(ANT0), 3.61 dBi(ANT1)
Antenna Configurations	UNII 3	Peak Gain : 3.04 dBi(ANT0), 3.04 dBi(ANT1)
	802.11a : MIMO(ANT0+ANT1) 802.11n : MIMO(ANT0+ANT1) 802.11ac : MIMO(ANT0+ANT1)	
Type of Modulation	802.11a/n/ac : OFDM	
Data Rate	802.11a : 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps	
	802.11n : up to 300 Mbps	
	802.11ac : up to 867 Mbps	
Power Source	DC 19 V	
Hardware Rev	-	
Software Rev	-	
Dynamic Frequency Selection	-	

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1.3 Peripheral Devices

-For Conducted Measurement and Radiated Measurement

Device	Manufacturer	Model No.	Serial No.
Notebook	HP Inc.	HP Probook 455 G7	5CD0234DWM
AC Adapter	HP Inc.	PPP012D-S	677777-003

1.4 Model Differences

Not applicable

2. Accreditations

2.1 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	CN : 8737A CAB ID : KR0025
KOREA	NRRA	KR0025

2.2 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

FCC Part Section(s)	Requirement(s)	Limit	Status (Note 1)	Test Condition
15.407(e)	6 dB Bandwidth	> 500 kHz (5 725 – 5 850 MHz)	C	Conducted
15.407(a)	26 dB Bandwidth and 99% Bandwidth	NA	C	
15.407(a)(1)	Conducted Output Power	< 250 mW (5 150 – 5 250 MHz) < 250 mW (5 250 – 5 350 MHz, 5 470 – 5 725 MHz) < 1 W (5 725 – 5 850 MHz)	C	
15.407(a)(1)	Power Spectral Density	< 11 dBm/MHz (5 150 – 5 250 MHz) < 11 dBm/MHz (5 250 – 5 350 MHz, 5 470 – 5 725 MHz) < 30 dBm/500 KHz (5 725 – 5 850 MHz)	C	
15.407(g)	Frequency Stability	NA	C	
15.407 (b)	Undesirable emission	< -27 dBm/MHz EIRP (5 150 – 5 250 MHz, 5 250 – 5 350 MHz, 5 470 – 5 725 MHz) < -27 dBm/MHz EIRP < 10 dBm/MHz EIRP < 15.6 dBm/MHz EIRP < 27 dBm/MHz EIRP (5 725 – 5 850 MHz)	C	Radiated
15.205, 15.407 (b)(5),(6)	Radiated Spurious Emission	15.209(a)	C	
15.207	AC Conducted Emissions	15.207(a)	C	Line Conducted
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.				
<u>Note 3:</u> The sample was tested according to the following specification: FCC Part 15.407, ANSI C63.10-2013				
<u>Note 4:</u> The tests were performed according to the method of measurements prescribed in KDB No.789033.				

3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission.
For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit.
All modulation modes were tests. The results are only attached worst cases.

Test Frequency

- 802.11a, 802.11n_HT20, 802.11ac_VHT20

	Lowest channel	Middle channel	Highest channel
UNII 1	5 180 MHz	5 220 MHz	5 240 MHz
UNII 2A	5 260 MHz	5 300 MHz	5 320 MHz
UNII 2C	5 500 MHz	5 600 MHz	5 700 MHz, 5 720 MHz
UNII 3	5 745 MHz	5 785 MHz	5 825 MHz

- 802.11n_HT40, 802.11ac_VHT40

	Lowest channel	Middle channel	Highest channel
UNII 1	5 190 MHz	-	5 230 MHz
UNII 2A	5 270 MHz	-	5 310 MHz
UNII 2C	5 510 MHz	5 590 MHz	5 670 MHz, 5 710 MHz
UNII 3	5 755 MHz	-	5 795 MHz

- 802.11ac_VHT80

	Lowest channel	Middle channel	Highest channel
UNII 1	5 210 MHz	-	-
UNII 2A	5 290 MHz	-	-
UNII 2C	5 530 MHz	5 610 MHz	5 690 MHz
UNII 3	5 775 MHz	-	-

Test mode

Test mode	Modulation	Data rate	Duty Cycle(%)	Duty Cycle Factor (dB)
802.11a	OFDM	6 Mbps	79.69	0.99
802.11n_HT20	OFDM	MCS 0	89.62	0.48
802.11n_HT40	OFDM	MCS 0	85.19	0.70
802.11ac_VHT20	OFDM	MCS 0	92.38	0.34
802.11ac_VHT40	OFDM	MCS 0	83.93	0.76
802.11ac_VHT80	OFDM	MCS 0	67.65	1.70

3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor $k = 2$, Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	1.5 dB (C.L.: Approx. 95 %, $k = 2$)
Power Spectral Density	1.5 dB (C.L.: Approx. 95 %, $k = 2$)
Occupied Bandwidth	0.1 MHz (C.L.: Approx. 95 %, $k = 2$)
Unwanted Emission(conducted)	3.0 dB (C.L.: Approx. 95 %, $k = 2$)
Radiated Emissions ($f \leq 1$ GHz)	3.88 dB (C.L.: Approx. 95 %, $k = 2$)
Radiated Emissions ($f > 1$ GHz)	4.50 dB (C.L.: Approx. 95 %, $k = 2$)
Line Conducted Emission	2.08 dB (C.L.: Approx. 95 %, $k = 2$)

3.4 Test Software

Conducted Test	Ics Pro Ver. 6.0.3
Radiated Test	EP5RE Ver. 6.0.1.0, ES10 Ver. 10.001
Line Conducted Test	EMC32 Ver. 10.50.00

4. Technical Characteristic Test

4.1 6dB Bandwidth

Test Procedures

KDB 789033 – Section C.2
ANSI C63.10-2013 - Section 6.9.2

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW $\geq 3 \times$ RBW
- c) Detector = peak
- d) Trace mode = Max hold
- e) Sweep = auto couple
- f) Allow trace to fully stabilize
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Minimum Standard:

6 dB Bandwidth > 500 kHz

Test Data:

ANT0

	6 dB Bandwidth (MHz)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5 745 MHz	16.35	17.52	15.73
5 785 MHz	15.96	16.67	17.15
5 825 MHz	16.34	16.67	15.90

	6 dB Bandwidth (MHz)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5 755 MHz	33.88	35.00
5 795 MHz	35.10	35.33

	6 dB Bandwidth (MHz)
Mode	802.11ac_VHT80
Frequency	
5 775 MHz	73.80

ANT1

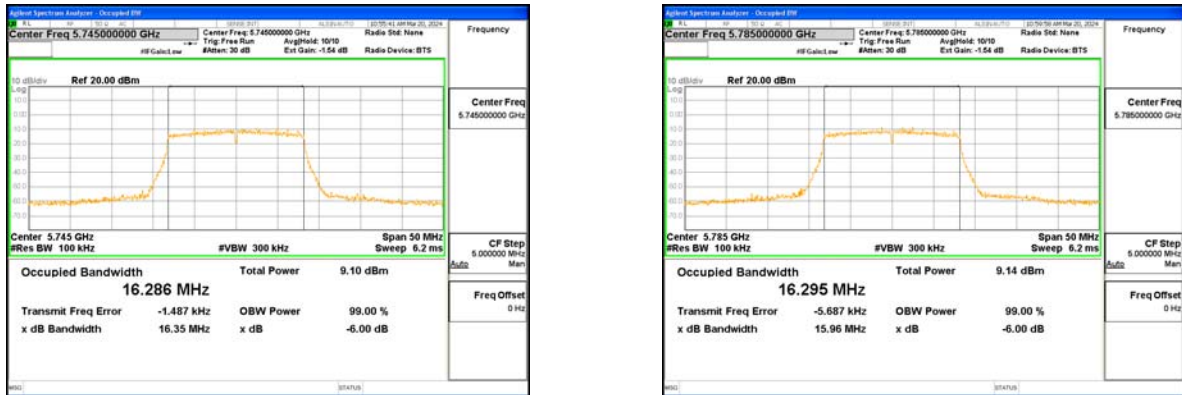
	6 dB Bandwidth (MHz)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5 745 MHz	16.33	15.53	16.25
5 785 MHz	16.29	15.53	16.58
5 825 MHz	16.34	15.36	15.63

	6 dB Bandwidth (MHz)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5 755 MHz	34.45	35.12
5 795 MHz	35.08	35.11

	6 dB Bandwidth (MHz)
Mode	802.11ac_VHT80
Frequency	
5 775 MHz	72.66

See next pages for actual measured spectrum plots.

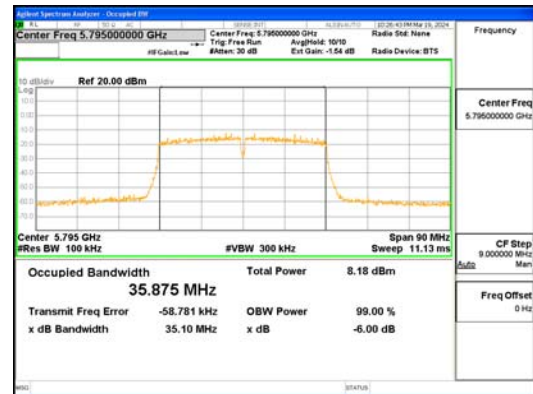
ANT0



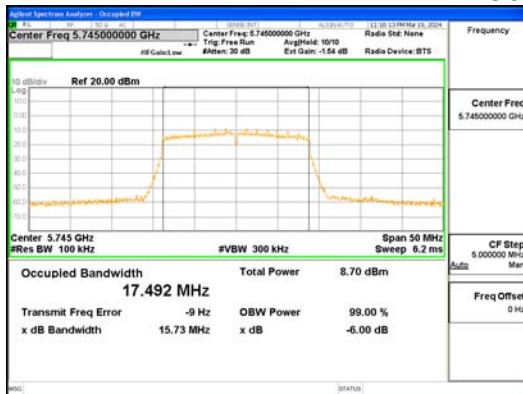
802.11a



802.11n_HT20



802.11n_HT40



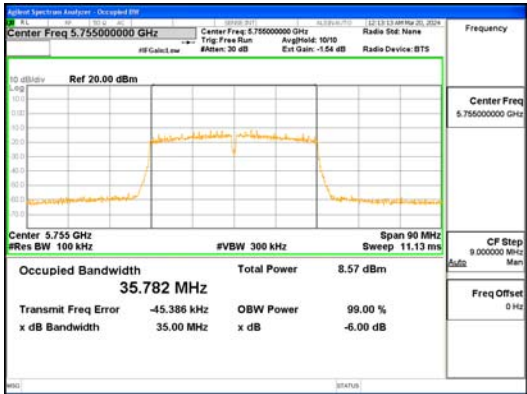
802.11ac_VHT20



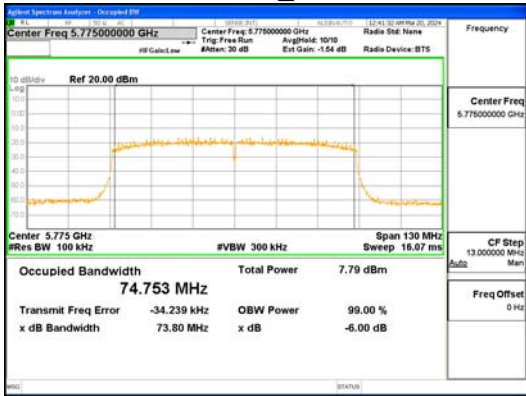
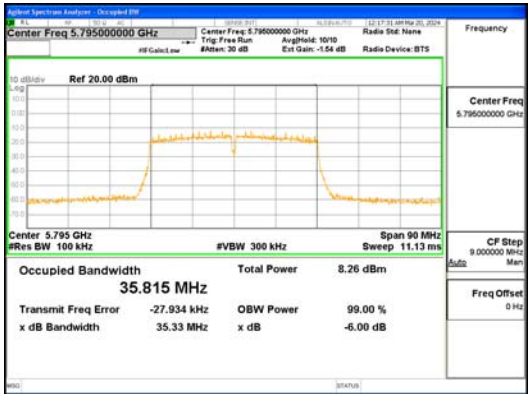


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802.11ac_VHT40



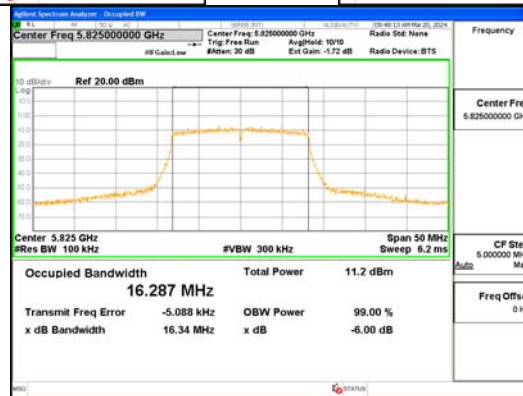
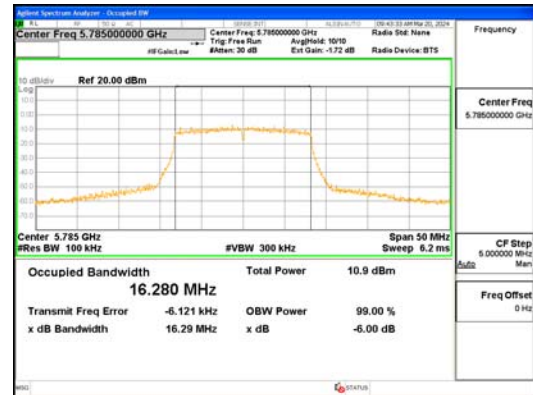
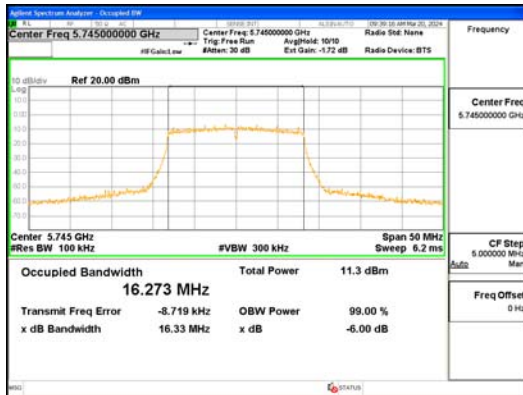
802.11ac_VHT80



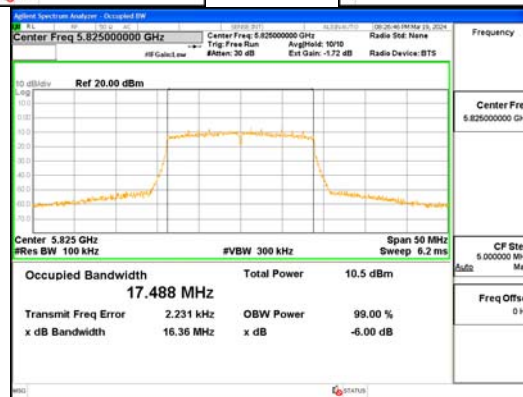
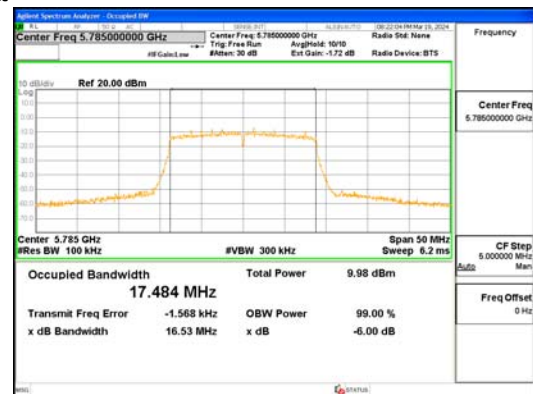
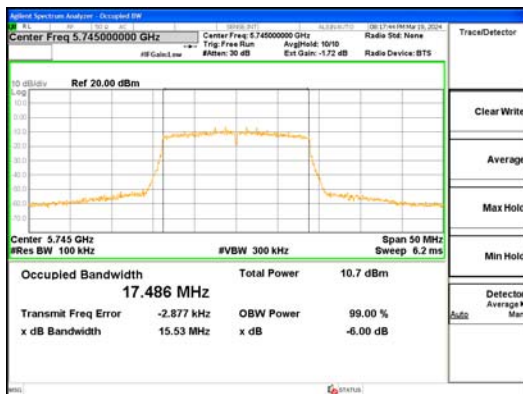
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ANT1



802.11a

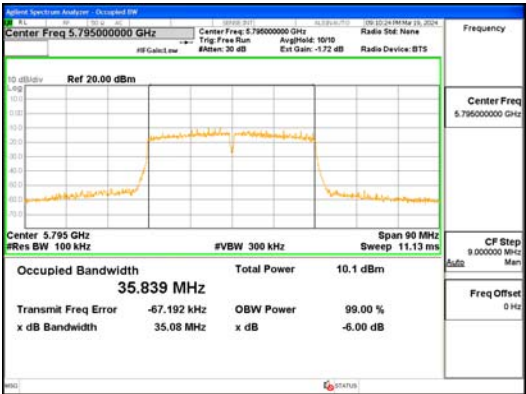
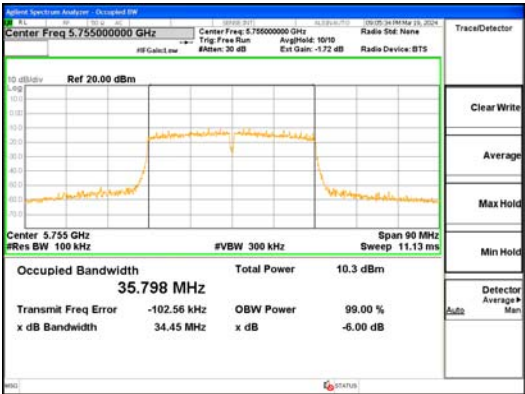


802.11n_HT20

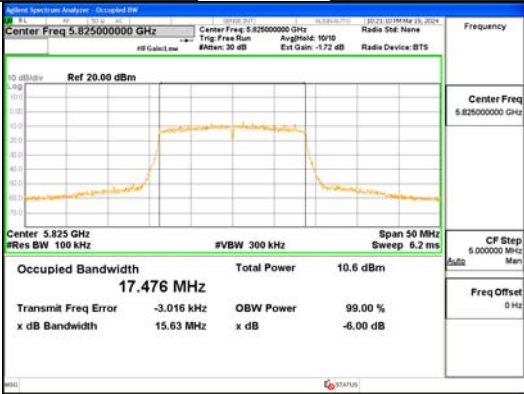
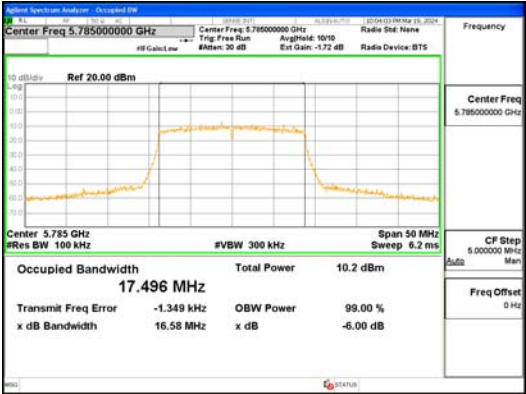
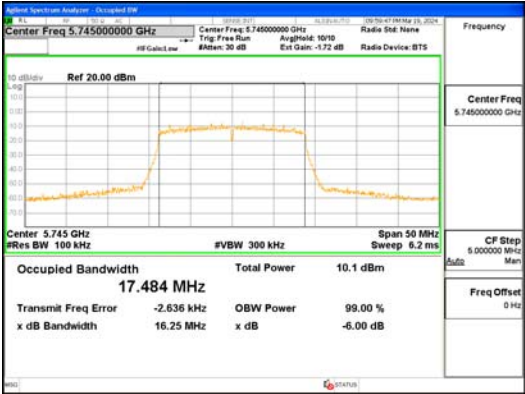


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802.11n_HT40

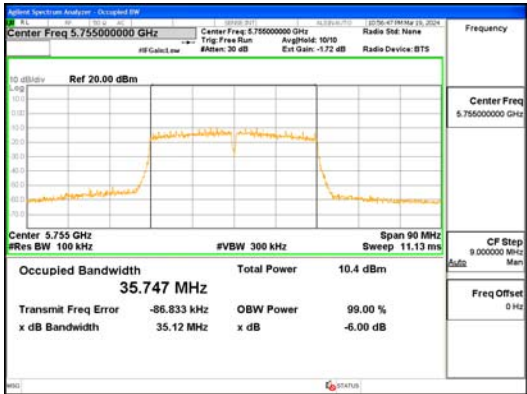


802.11ac_VHT20

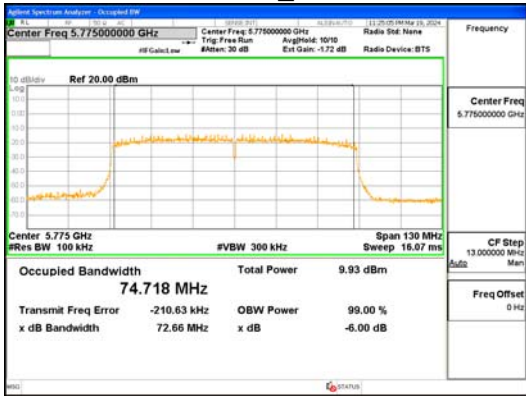
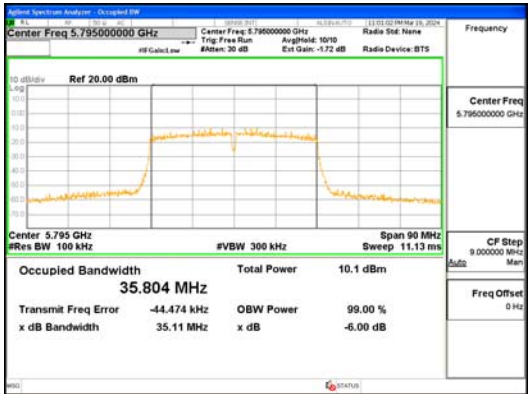


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802.11ac_VHT40



802.11ac_VHT80

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4.2 26 dB Bandwidth and 99 % Bandwidth

Test Procedures

KDB 789033 – Section C.1
ANSI C63.10-2013 - Section 6.9.2

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.

Test Procedures

KDB 789033 – Section C.1
ANSI C63.10-2013 - Section 6.9.3

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = approximately 1 % of the emission bandwidth
- b) VBW $\geq$ RBW
- c) Detector = peak
- d) Trace mode = Max hold
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Minimum Standard:

NA

Test Data:

ANT 0

	26 dB Bandwidth and 99% Bandwidth (MHz)					
Mode	802.11a		802.11n_HT20		802.11ac_VHT20	
Frequency	26 dB	99%	26 dB	99%	26 dB	99%
5 180 MHz	18.050	16.256	19.080	17.441	19.190	17.442
5 220 MHz	18.260	16.270	19.100	17.435	19.180	17.428
5 240 MHz	18.100	16.265	19.010	17.437	19.140	17.435
5 260 MHz	18.220	16.272	20.440	16.614	19.090	17.424
5 300 MHz	18.260	16.268	20.470	16.588	19.110	17.428
5 320 MHz	18.080	16.261	20.600	16.612	19.070	17.432
5 500 MHz	18.060	16.260	20.280	16.571	19.020	17.408
5 600 MHz	18.150	16.251	20.340	16.568	19.080	17.417
5 700 MHz	17.850	16.169	20.400	16.550	18.850	17.313
5 720 MHz	18.120	16.265	20.400	16.610	19.140	17.438
5 745 MHz	19.090	16.490	23.870	17.325	19.790	17.592
5 785 MHz	18.930	16.447	23.230	17.405	19.800	17.591
5 825 MHz	18.850	16.428	27.780	17.732	19.610	17.552

	26 dB Bandwidth and 99% Bandwidth (MHz)			
Mode	802.11n_HT40		802.11ac_VHT40	
Frequency	26 dB	99 %	26 dB	99 %
5 190 MHz	38.900	35.886	38.870	35.825
5 230 MHz	38.850	35.846	38.860	35.780
5 270 MHz	38.710	35.902	39.100	35.880
5 310 MHz	38.790	35.819	38.740	35.794
5 510 MHz	38.650	35.774	38.720	35.821
5 590 MHz	38.660	35.787	38.570	35.807
5 670 MHz	38.610	35.632	38.620	35.722
5 710 MHz	38.280	35.909	38.520	35.670
5 755 MHz	38.950	35.831	38.850	35.831
5 795 MHz	39.130	35.904	39.070	35.838



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	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5 210 MHz	81.340	75.123
5 290 MHz	81.380	75.236
5 530 MHz	80.480	74.683
5 610 MHz	81.550	74.943
5 690 MHz	91.930	75.104
5 775 MHz	80.160	74.592

ANT1

	26 dB Bandwidth and 99% Bandwidth (MHz)					
Mode	802.11a		802.11n_HT20		802.11ac_VHT20	
Frequency	26 dB	99%	26 dB	99%	26 dB	99%
5 180 MHz	18.020	16.273	19.100	17.424	19.090	17.418
5 220 MHz	18.170	16.276	19.140	17.412	19.140	17.407
5 240 MHz	18.190	16.276	19.040	17.430	19.220	17.428
5 260 MHz	17.980	16.273	19.000	17.419	19.050	17.410
5 300 MHz	18.110	16.277	19.130	17.431	19.170	17.427
5 320 MHz	18.110	16.272	19.070	17.415	19.140	17.417
5 500 MHz	18.040	16.263	19.110	17.434	19.110	17.429
5 600 MHz	17.970	16.269	19.060	17.407	19.050	17.409
5 700 MHz	17.930	16.192	18.860	17.314	18.860	17.299
5 720 MHz	18.060	16.266	19.110	17.418	19.110	17.420
5 745 MHz	18.620	16.439	19.930	17.572	19.810	17.607
5 785 MHz	18.500	16.403	19.630	17.577	19.770	17.582
5 825 MHz	18.640	16.428	19.720	17.586	19.600	17.563

	26 dB Bandwidth and 99% Bandwidth (MHz)			
Mode	802.11n_HT40		802.11ac_VHT40	
Frequency	26 dB	99 %	26 dB	99 %
5 190 MHz	38.760	35.831	38.840	35.854
5 230 MHz	38.860	35.843	38.910	35.810
5 270 MHz	38.640	35.770	38.860	35.748
5 310 MHz	39.020	35.860	38.680	35.844
5 510 MHz	38.800	35.898	38.770	35.859
5 590 MHz	38.600	35.847	38.820	35.857
5 670 MHz	38.480	35.615	38.610	35.664
5 710 MHz	38.400	35.596	38.400	35.652
5 755 MHz	38.990	35.854	38.880	35.810
5 795 MHz	38.960	35.841	39.030	35.851



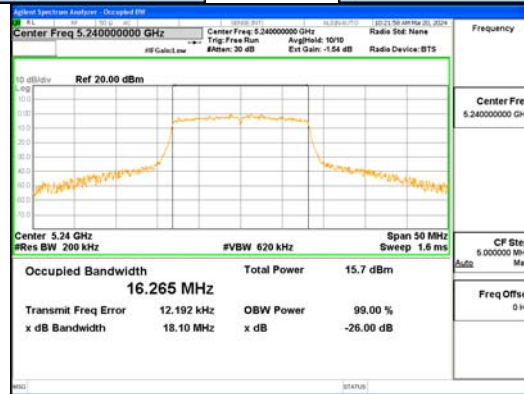
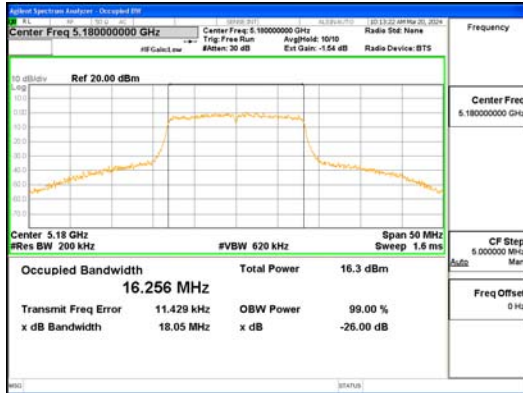
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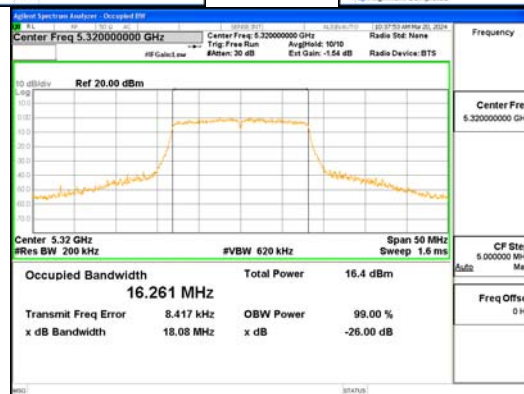
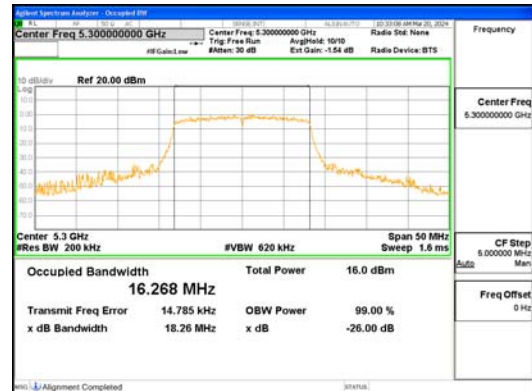
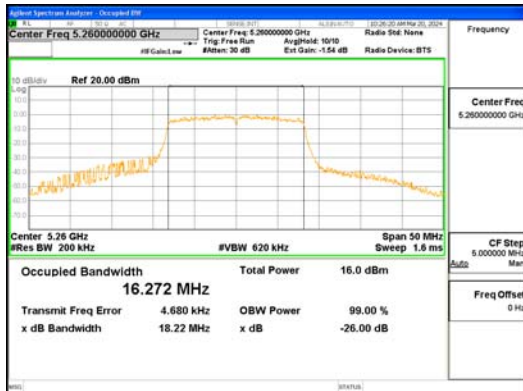
	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5 210 MHz	80.400	74.821
5 290 MHz	81.040	74.746
5 530 MHz	80.550	74.852
5 610 MHz	80.950	74.937
5 690 MHz	87.080	74.348
5 775 MHz	79.930	74.737

See next pages for actual measured spectrum plots.

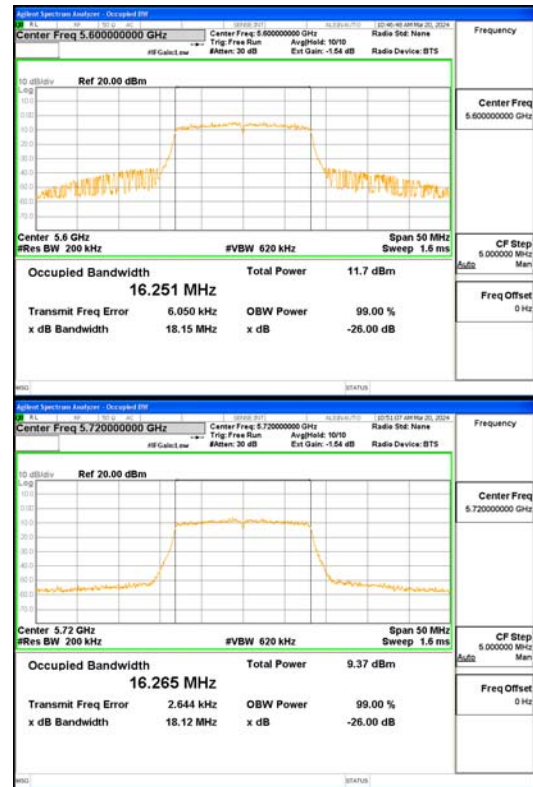
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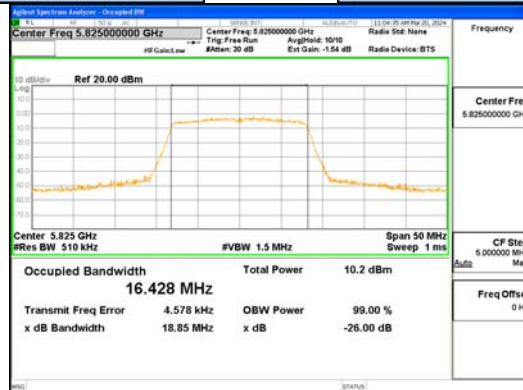
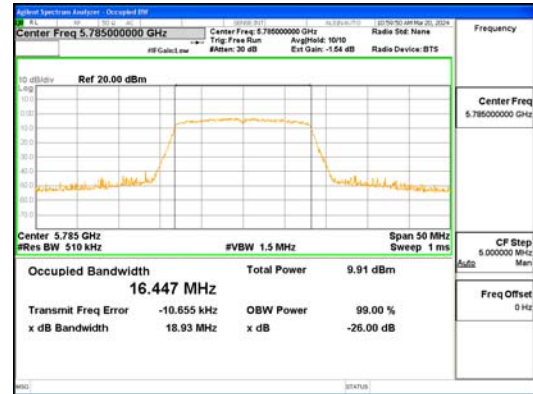
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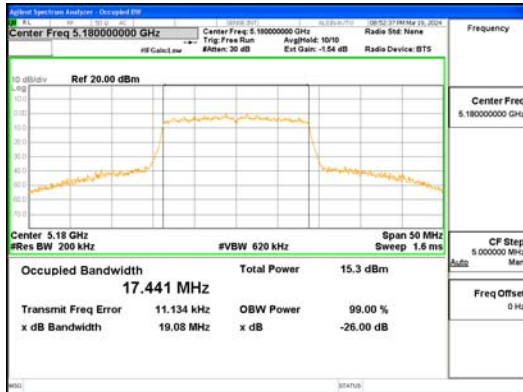
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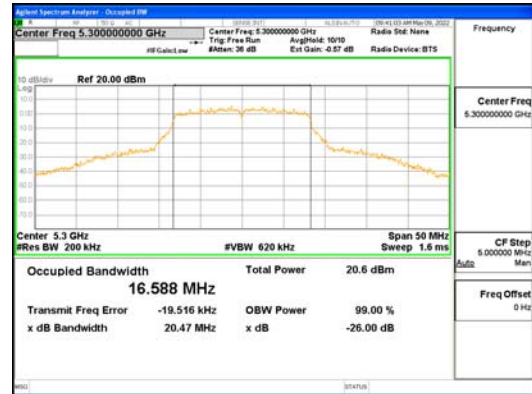
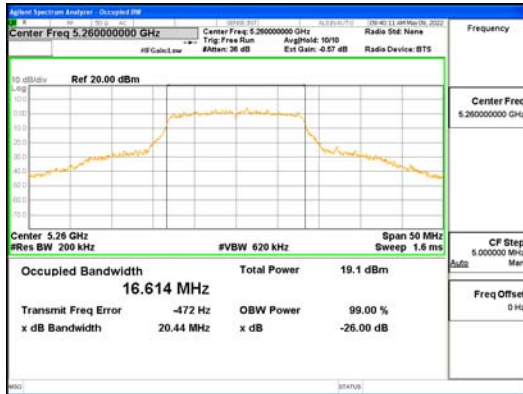
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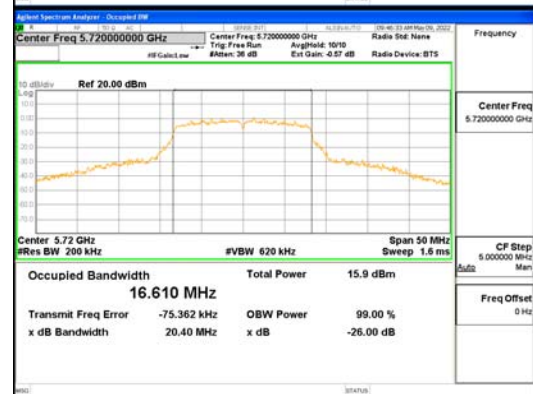
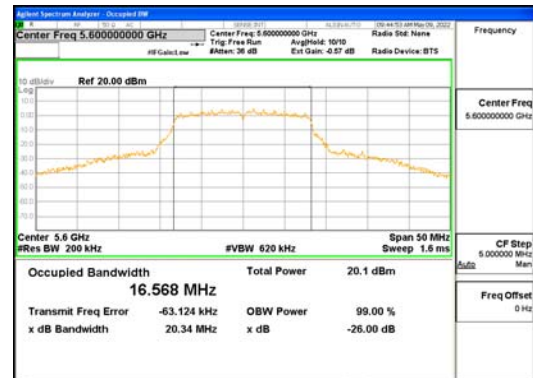
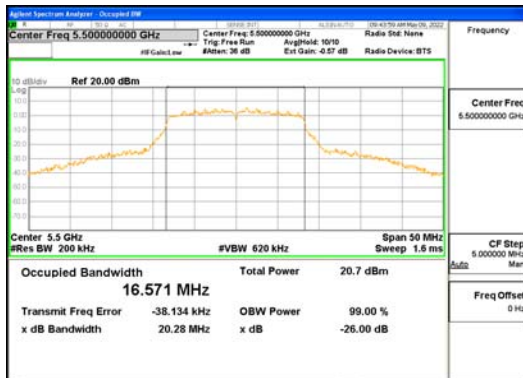
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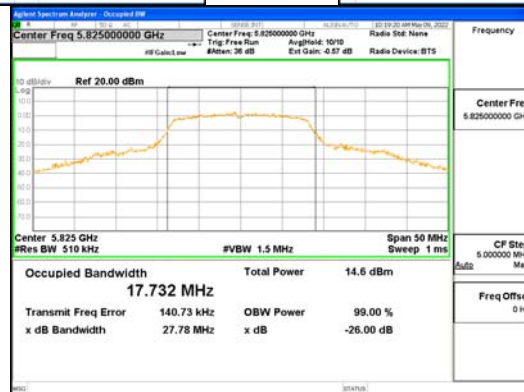
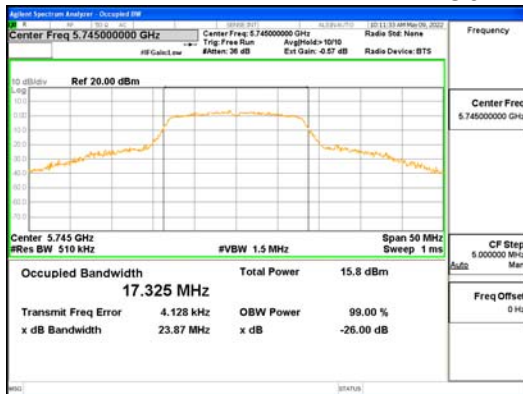
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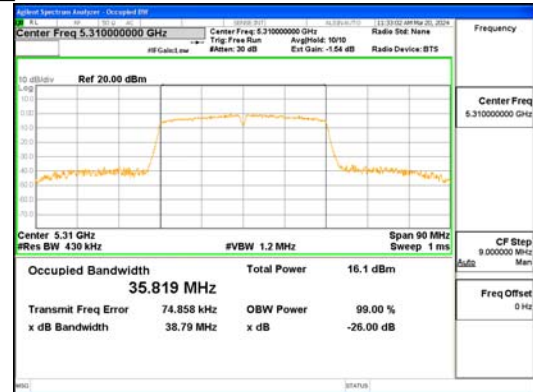
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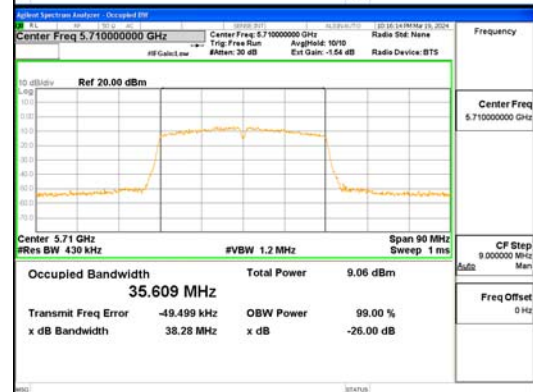
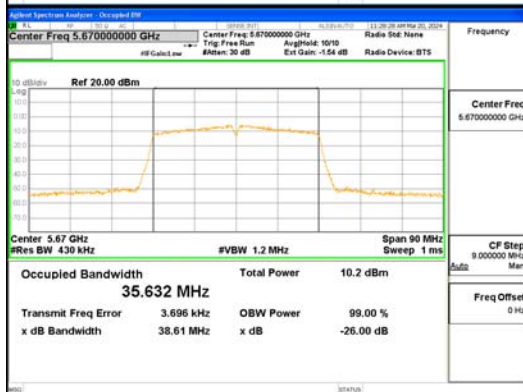
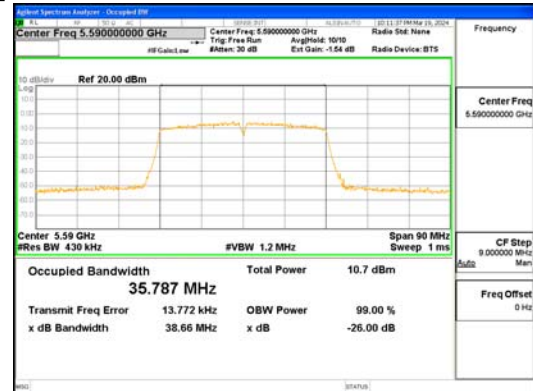
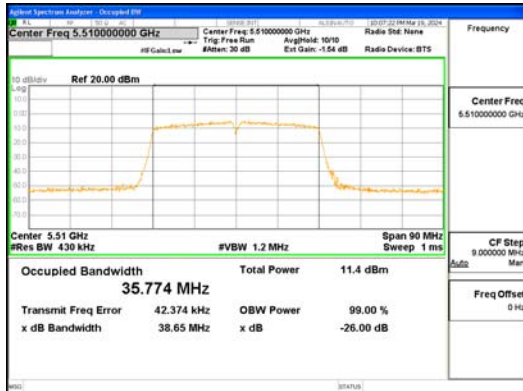
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802.11n_HT40_UNII 2A

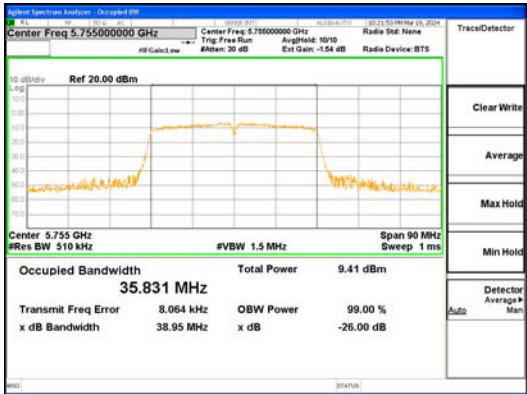


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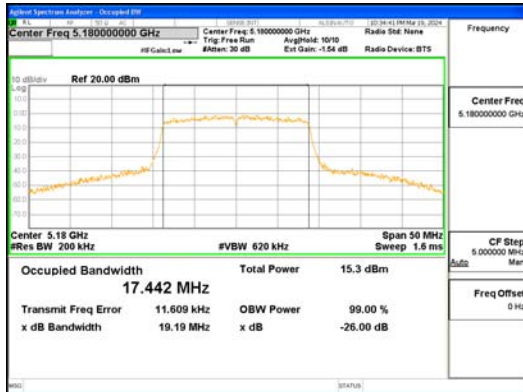


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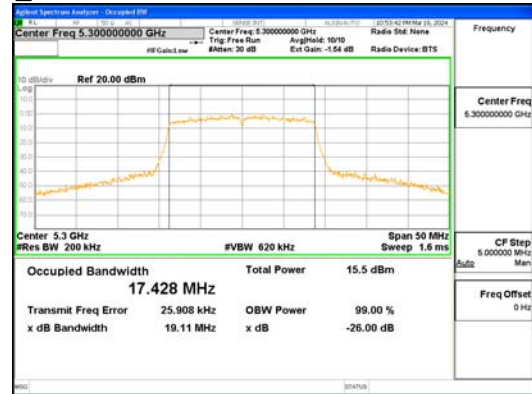
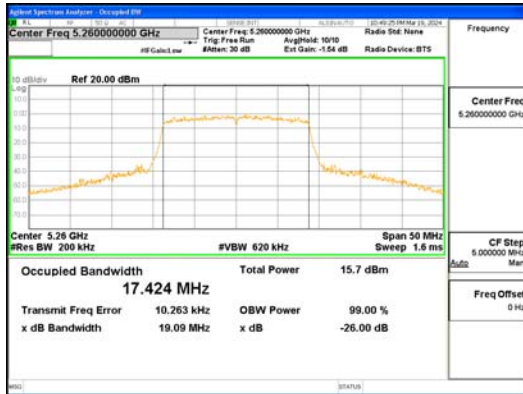
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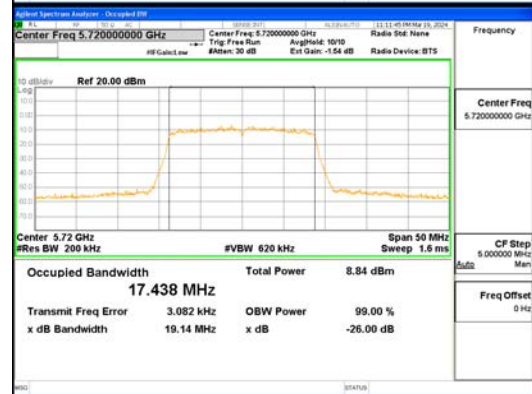
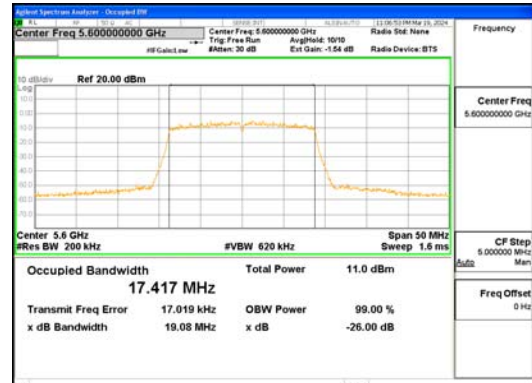
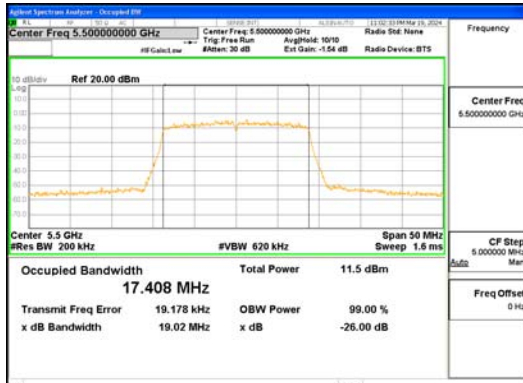
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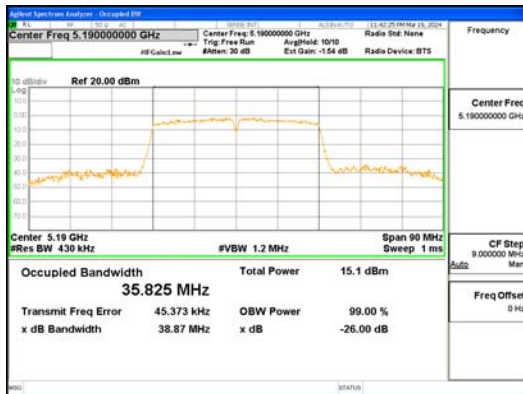
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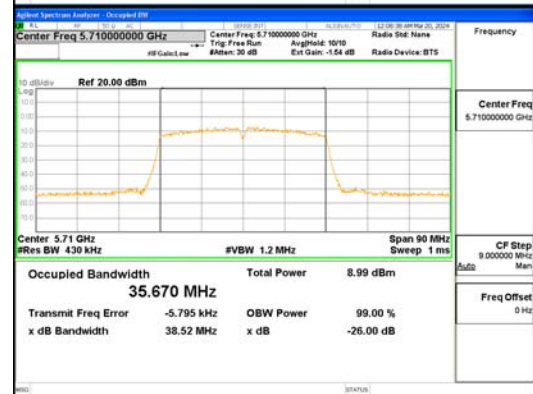
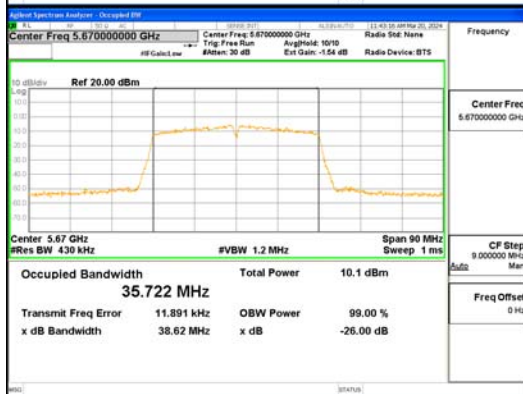
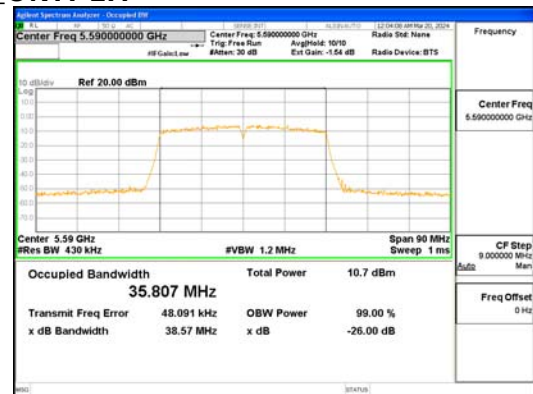
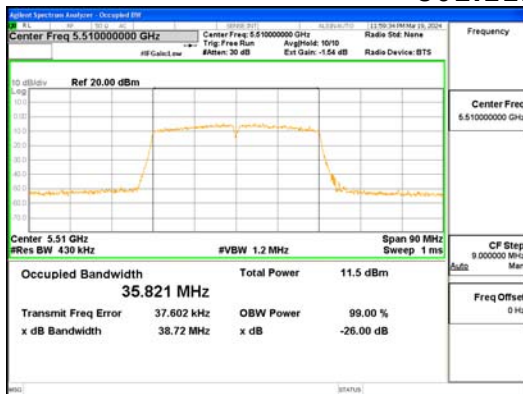
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802.11n_HT40_UNII 2A

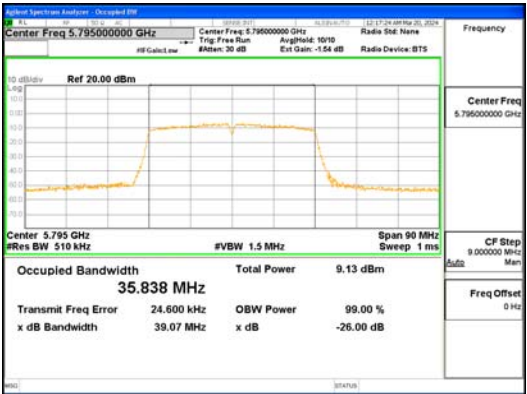
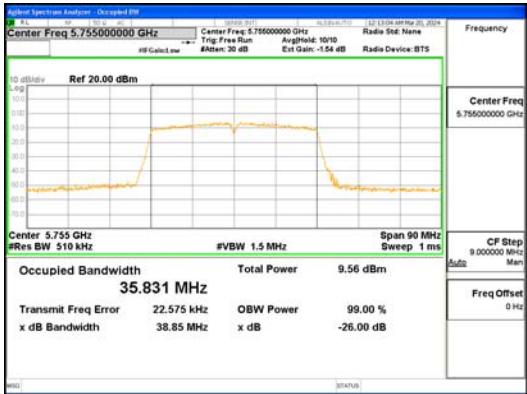


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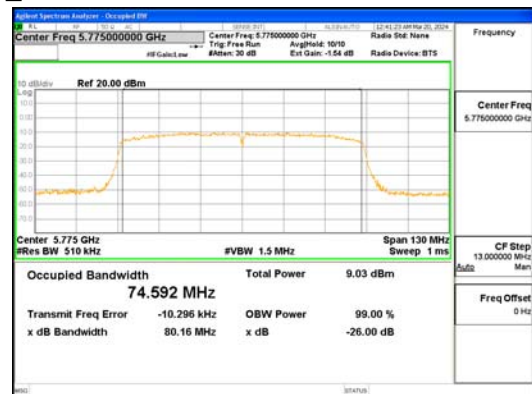
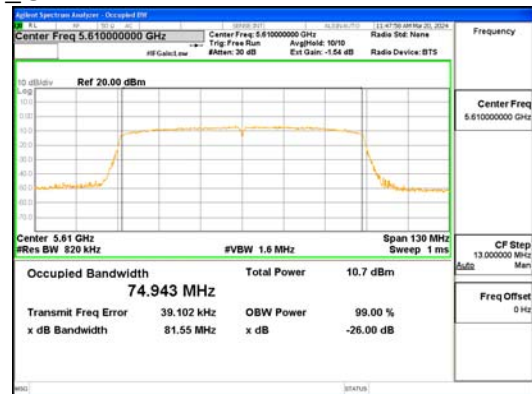
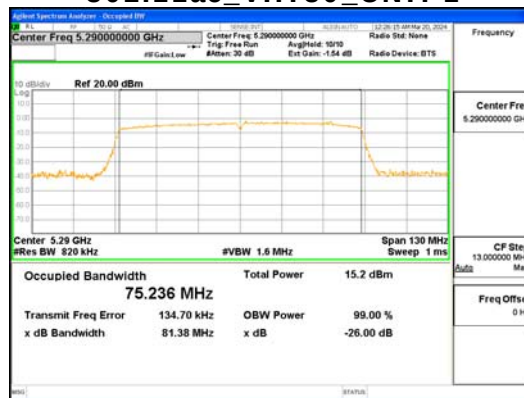


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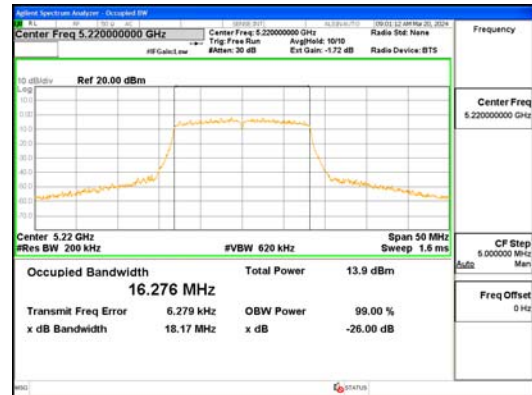
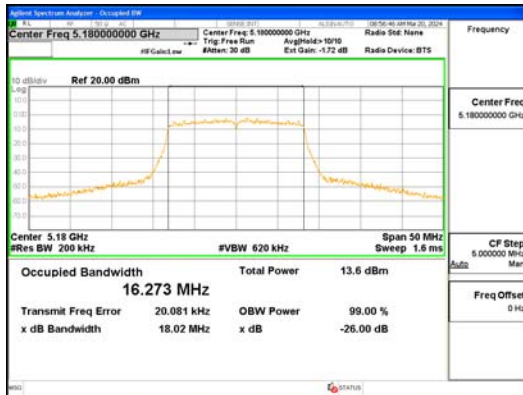
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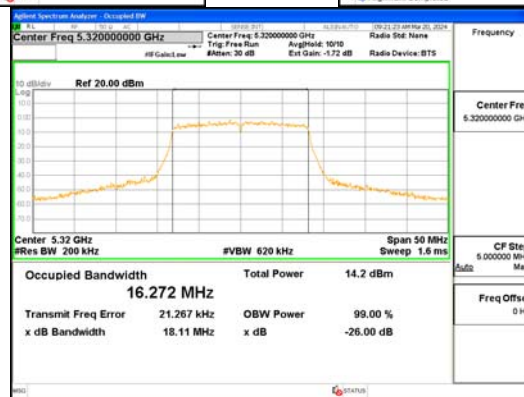
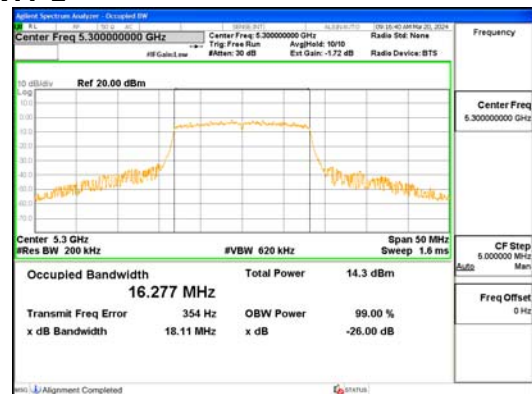
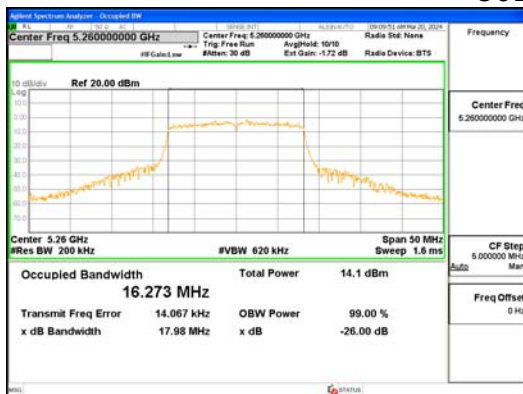
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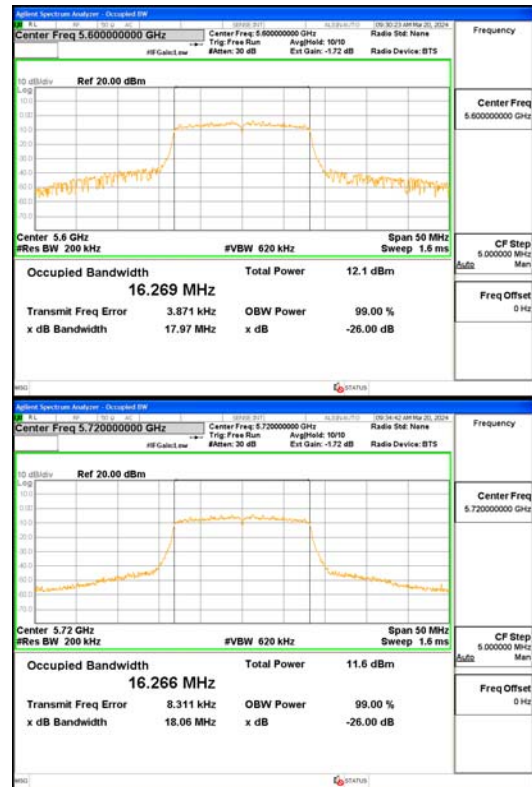
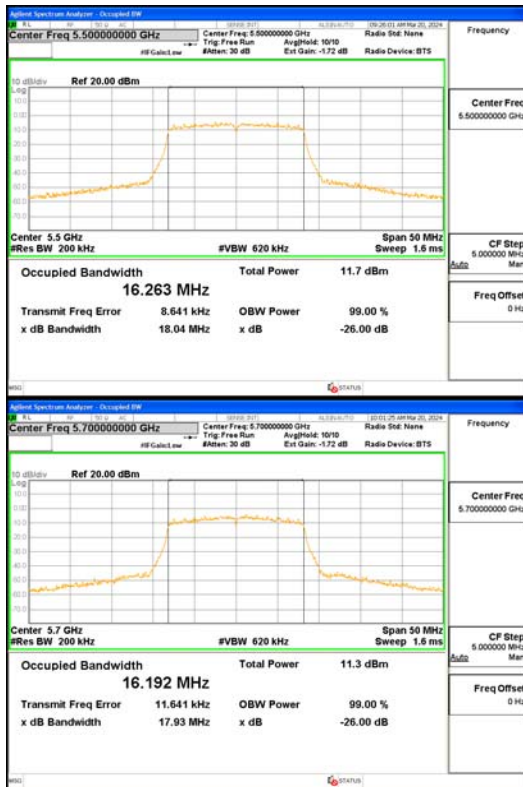
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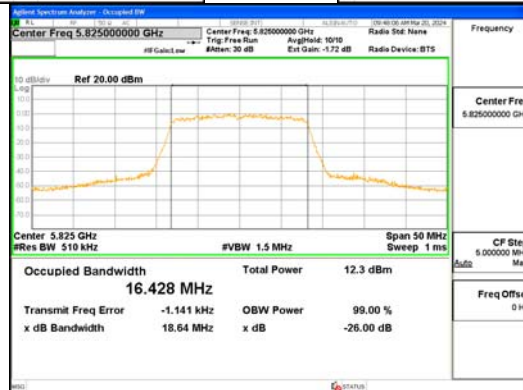
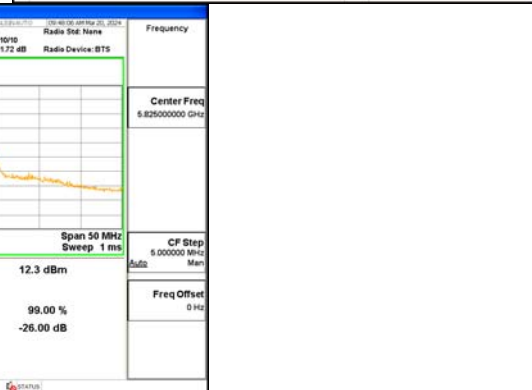
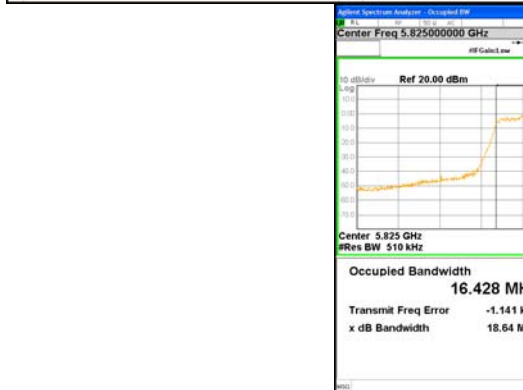
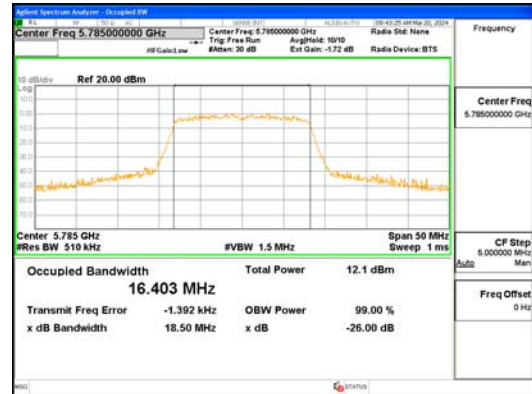
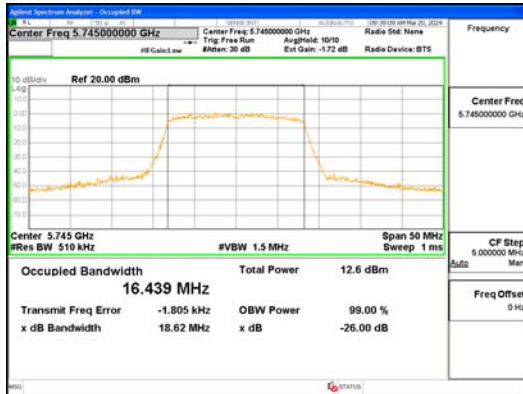
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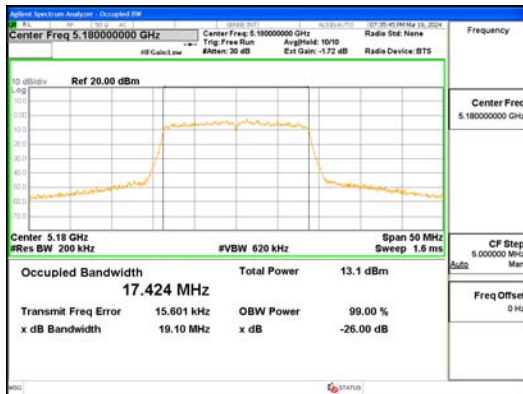
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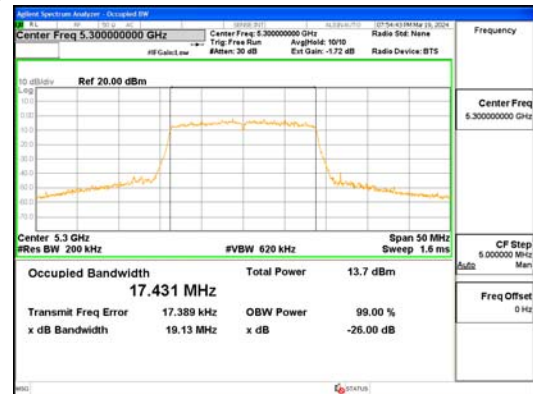
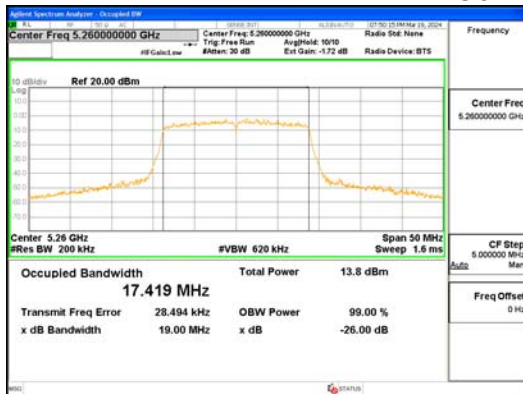
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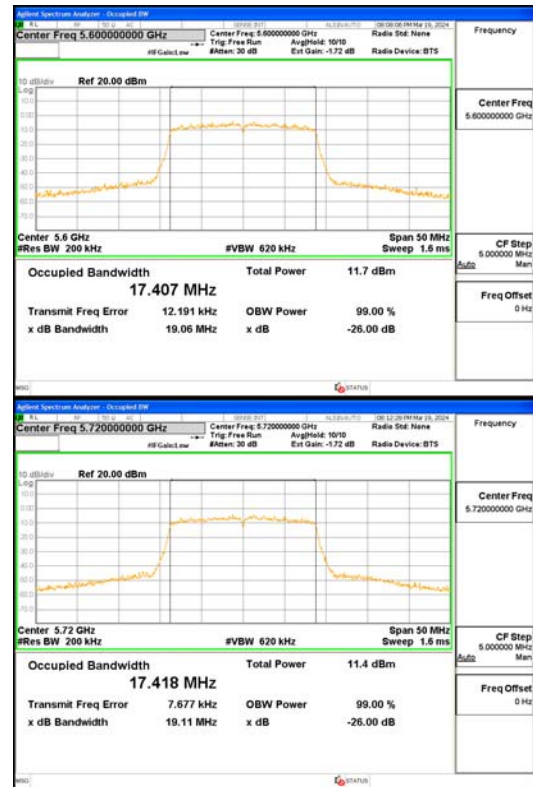
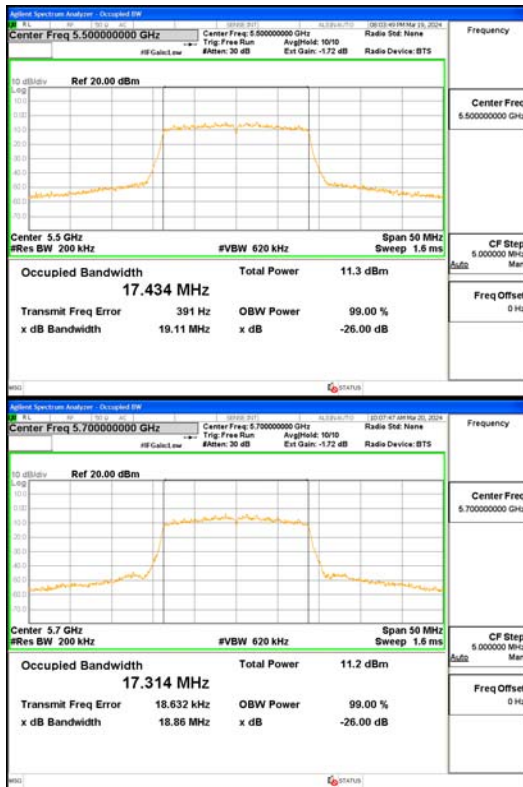
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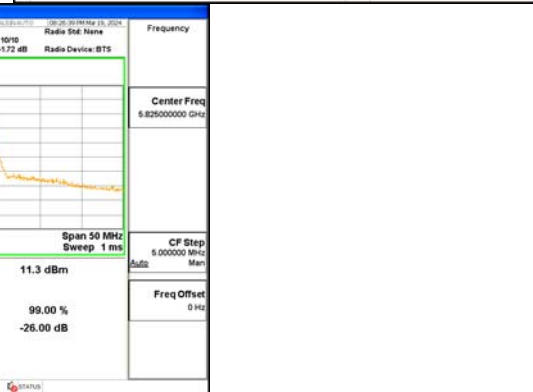
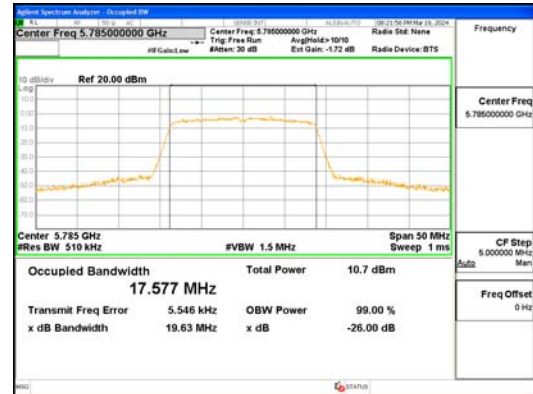
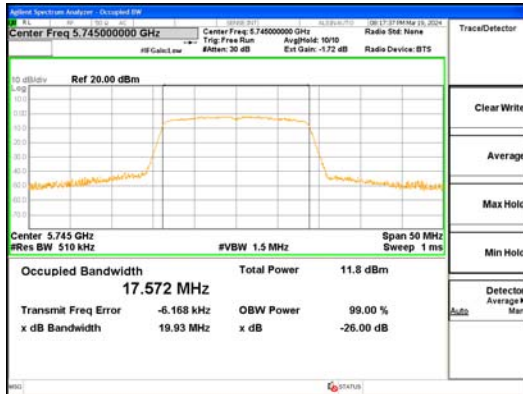
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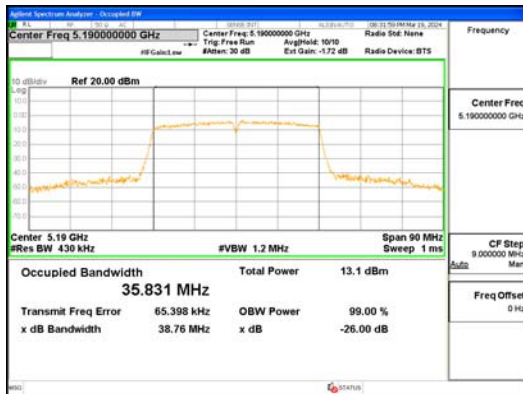


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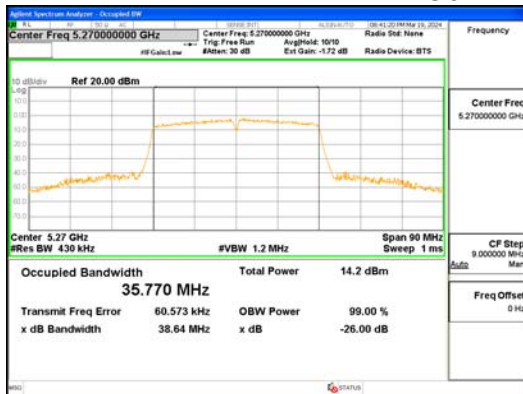


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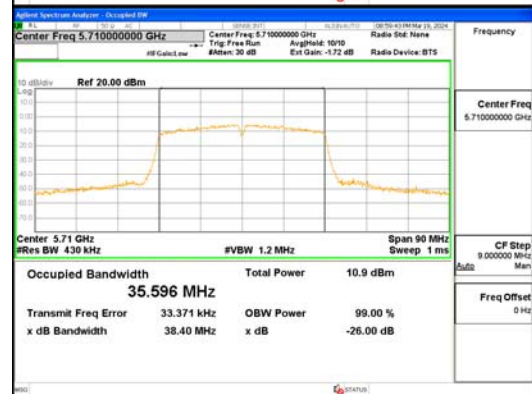
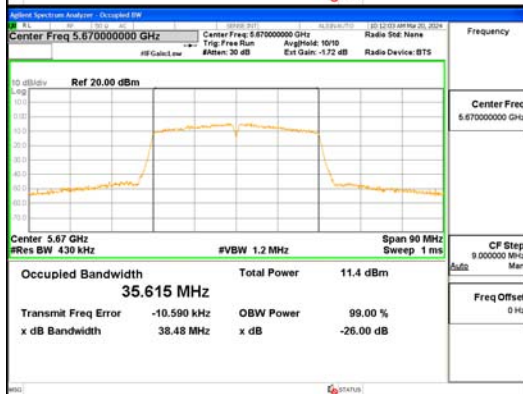
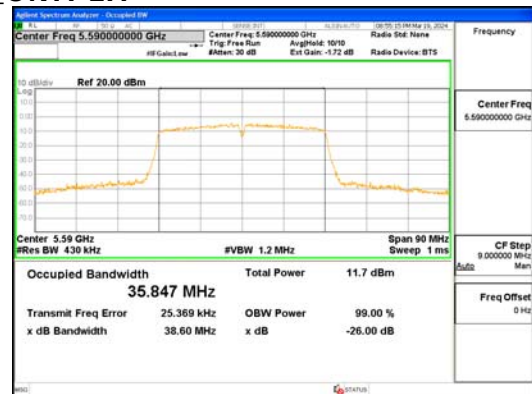
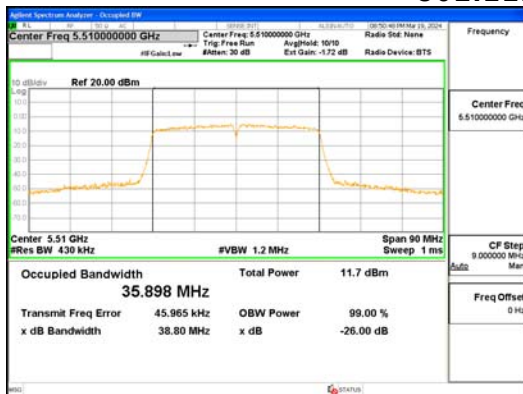




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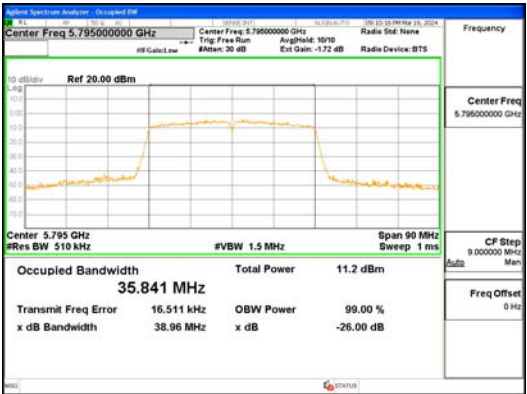


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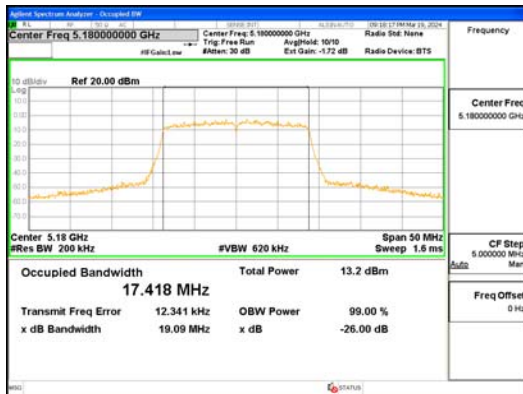


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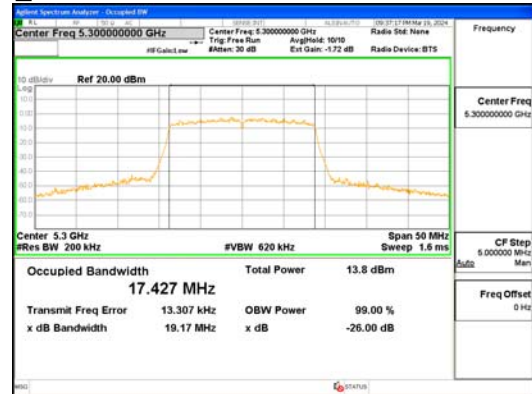
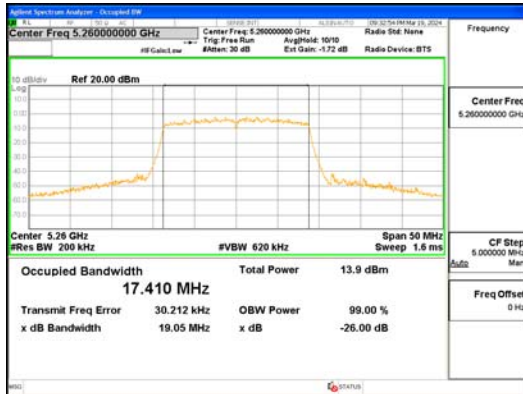
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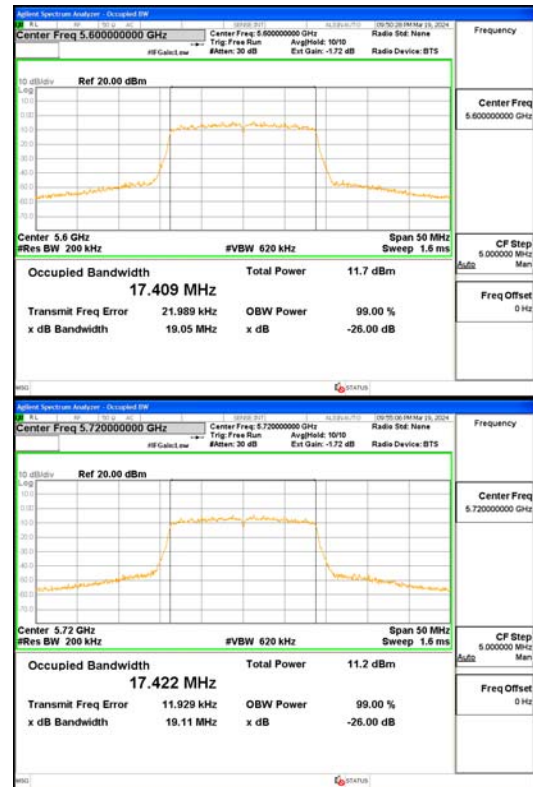
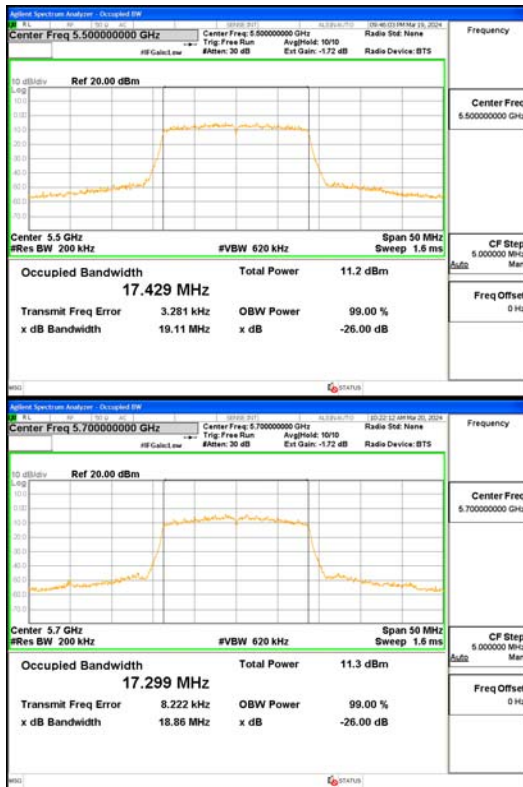
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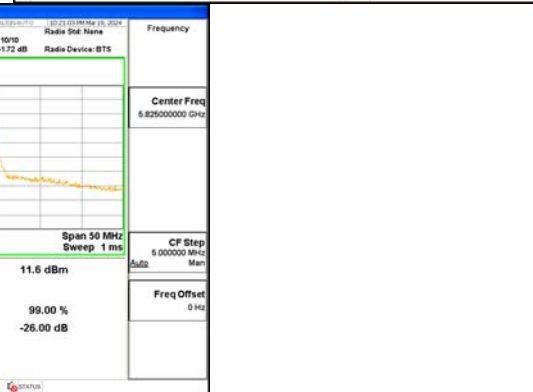
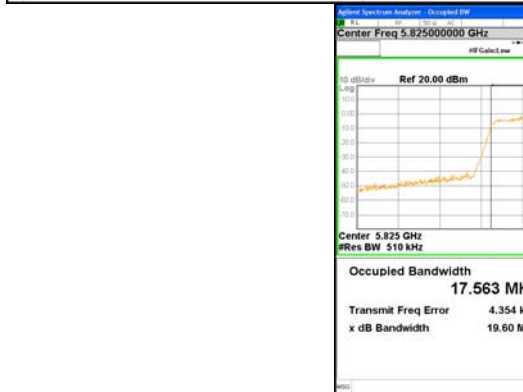
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802.11ac_VHT20_UNII 2C



802.11ac_VHT20_UNII 3

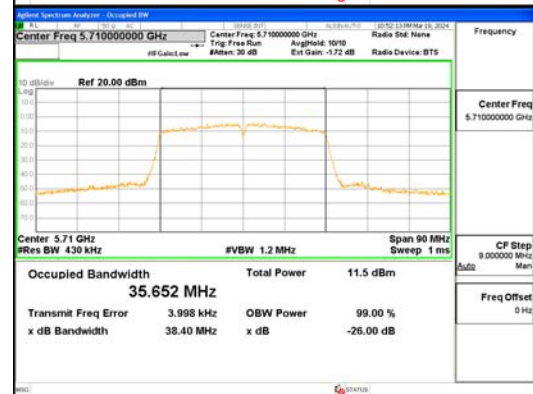
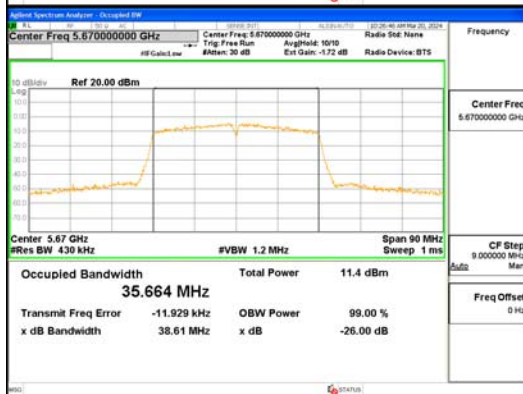
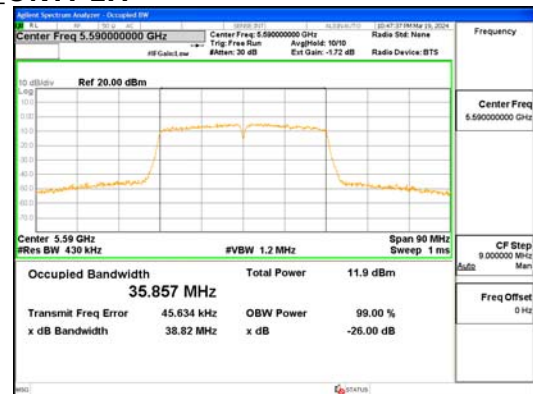
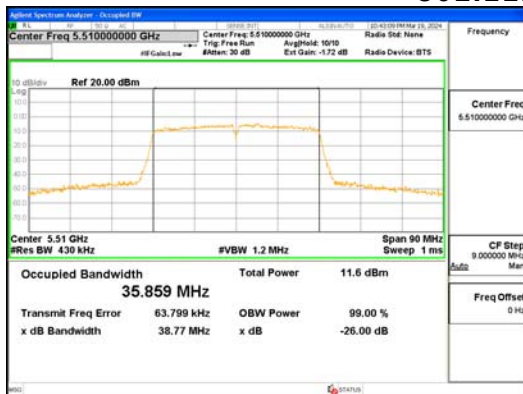




802.11n_HT40_UNII 1



802.11n_HT40_UNII 2A

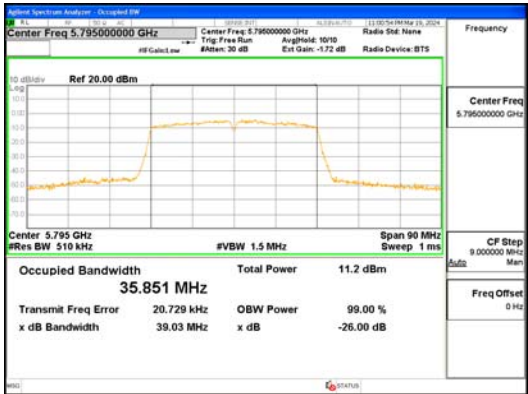
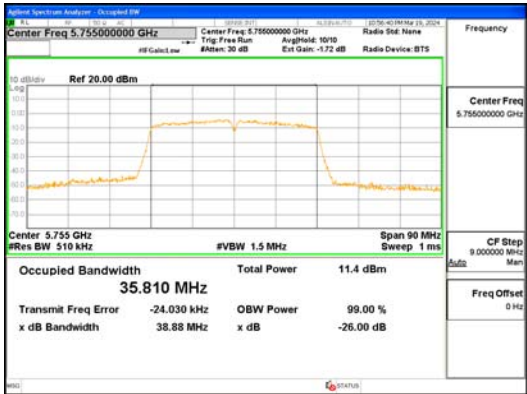


802.11n_HT40_UNII 2C



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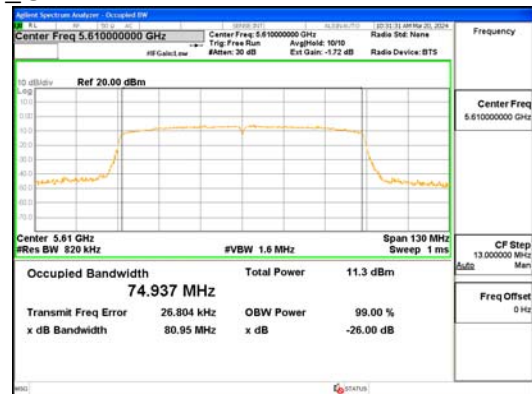
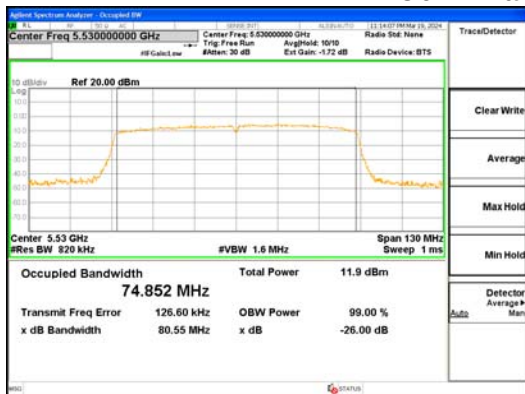
802.11n_HT40_UNII 3



802.11ac_VHT80_UNII 1



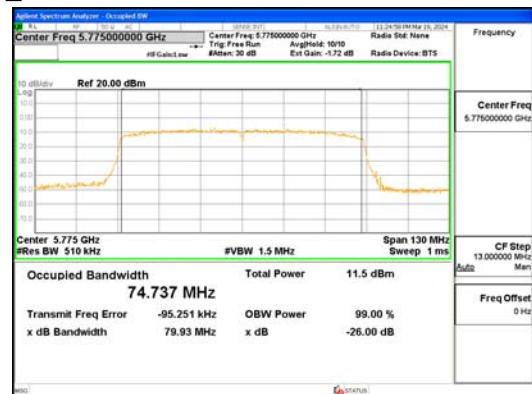
802.11ac_VHT80_UNII 2A



802.11ac_VHT80_UNII 2C



802.11ac_VHT80_UNII 2C



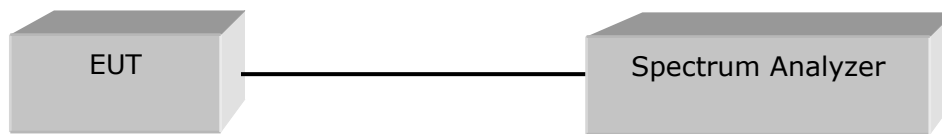
802.11ac_VHT80_UNII 3

4.3 OUTPUT POWER

Test Procedures

KDB 789033 – Section E.2.d (Method SA-2, Maximum Conducted Output Power)
KDB 662911 D01, D02 (Multiple Transmitter Output)

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.



Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 1 MHz
- b) VBW ≥ 3 x RBW
- c) Sweep time = auto
- d) Detector = power averaging (rms)
- e) Trace mode = Average at least 100
- f) Duty cycle factor = $10\log(1/x)$

Test mode	Duty Cycle Factor (dB)
802.11a	0.99
802.11n_HT20	0.48
802.11n_HT40	0.70
802.11ac_VHT20	0.34
802.11ac_VHT40	0.76
802.11ac_VHT80	1.70

Limit

Operating Mode	Band	Mode	ANT Configuration	ANT Gain (dBi)	Limit (dBm)
MIMO (2Tx)	UNII 1	802.11a 802.11n 802.11ac	ANT 0 + ANT 1	5.81	24.00
	UNII 2A			5.95	24.00
	UNII 2C			6.62	23.38
	UNII 3			6.05	29.95

Note :

Per KDB 662911, the MIMO directional gain is calculated using the following formula, Where GN is the gain of the nth antenna and N_{ANT}, the total number of antennas used.

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Test Data:

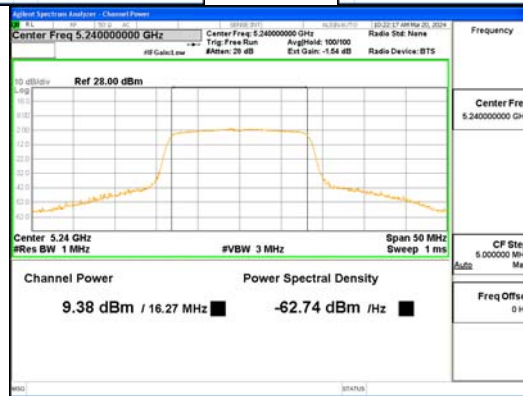
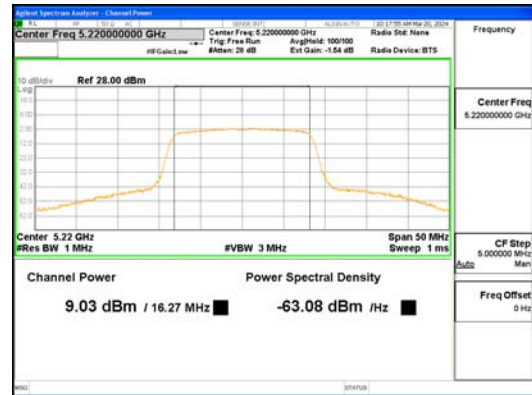
MIMO_ANT 0 + ANT 1

Test Mode	Frequency (MHz)	Measured Output Power (dBm)	Duty cycle Factor (dB)	Result Output Power (dBm)	Limit (dBm)	Margin (dB)
802.11a	5 180	11.32	0.99	12.31	24.00	11.69
	5 220	11.37	0.99	12.36	24.00	11.64
	5 240	11.53	0.99	12.52	24.00	11.48
	5 260	11.45	0.99	12.44	24.00	11.56
	5 300	11.78	0.99	12.77	24.00	11.23
	5 320	12.03	0.99	13.02	24.00	10.98
	5 500	8.56	0.99	9.55	23.38	13.83
	5 600	8.41	0.99	9.40	23.38	13.98
	5 700	7.36	0.99	8.35	23.38	15.03
	5 720	7.13	0.99	8.12	23.38	15.26
	5 745	7.79	0.99	8.78	29.95	21.17
	5 785	7.51	0.99	8.50	29.95	21.45
	5 825	7.60	0.99	8.59	29.95	21.36
802.11n _HT20	5 180	10.91	0.48	11.39	24.00	12.61
	5 220	11.23	0.48	11.71	24.00	12.29
	5 240	11.33	0.48	11.81	24.00	12.19
	5 260	11.45	0.48	11.93	24.00	12.07
	5 300	11.55	0.48	12.03	24.00	11.97
	5 320	11.56	0.48	12.04	24.00	11.96
	5 500	8.19	0.48	8.67	23.38	14.71
	5 600	7.87	0.48	8.35	23.38	15.03
	5 700	7.33	0.48	7.81	23.38	15.57
	5 720	7.11	0.48	7.59	23.38	15.79
	5 745	7.61	0.48	8.09	29.95	21.86
	5 785	6.95	0.48	7.43	29.95	22.52
	5 825	7.47	0.48	7.95	29.95	22.00
802.11ac _VHT20	5 180	10.94	0.34	11.28	24.00	12.72
	5 220	11.30	0.34	11.64	24.00	12.36
	5 240	11.56	0.34	11.90	24.00	12.10
	5 260	11.50	0.34	11.84	24.00	12.16
	5 300	11.68	0.34	12.02	24.00	11.98
	5 320	11.89	0.34	12.23	24.00	11.77
	5 500	7.89	0.34	8.23	23.38	15.15
	5 600	7.95	0.34	8.29	23.38	15.09
	5 700	6.99	0.34	7.33	23.38	16.05

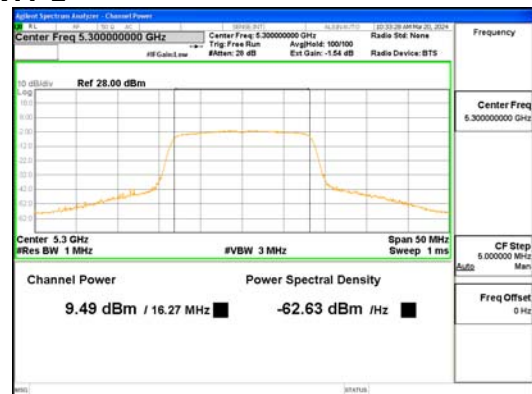
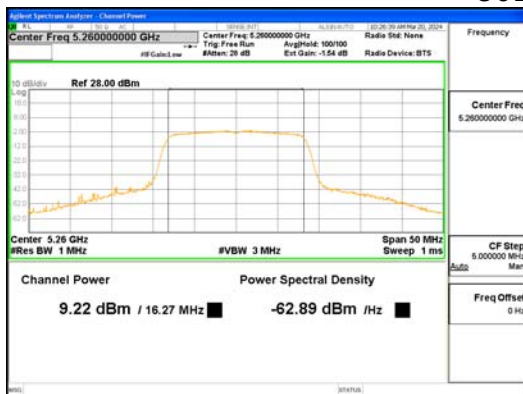
	5 720	6.97	0.34	7.31	23.38	16.07
	5 745	7.30	0.34	7.64	29.95	22.31
	5 785	7.38	0.34	7.72	29.95	22.23
	5 825	7.68	0.34	8.02	29.95	21.93
802.11n _HT40	5 190	10.56	0.70	11.26	24.00	12.74
	5 230	11.01	0.70	11.71	24.00	12.29
	5 270	11.47	0.70	12.17	24.00	11.83
	5 310	11.93	0.70	12.63	24.00	11.37
	5 510	8.15	0.70	8.85	24.00	15.15
	5 590	7.60	0.70	8.30	23.38	15.08
	5 670	7.32	0.70	8.02	23.38	15.36
	5 710	6.68	0.70	7.38	23.38	16.00
	5 755	7.19	0.70	7.89	29.95	22.06
	5 795	7.04	0.70	7.74	29.95	22.21
802.11ac _VHT40	5 190	10.70	0.76	11.46	24.00	12.54
	5 230	11.16	0.76	11.92	24.00	12.08
	5 270	11.41	0.76	12.17	24.00	11.83
	5 310	11.68	0.76	12.44	24.00	11.56
	5 510	8.24	0.76	9.00	24.00	15.00
	5 590	7.80	0.76	8.56	23.38	14.82
	5 670	7.26	0.76	8.02	23.38	15.36
	5 710	6.89	0.76	7.65	23.38	15.73
	5 755	7.17	0.76	7.93	29.95	22.02
	5 795	6.89	0.76	7.65	29.95	22.30
802.11ac _VHT80	5 210	10.31	1.70	12.01	24.00	11.99
	5 290	10.97	1.70	12.67	24.00	11.33
	5 530	8.10	1.70	9.80	23.38	13.58
	5 610	7.51	1.70	9.21	23.38	14.17
	5 690	4.28	1.70	5.98	23.38	17.40
	5 775	6.49	1.70	8.19	29.95	21.76

See next pages for actual measured spectrum plots.

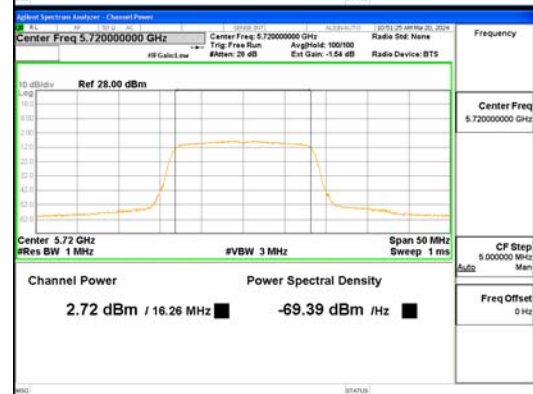
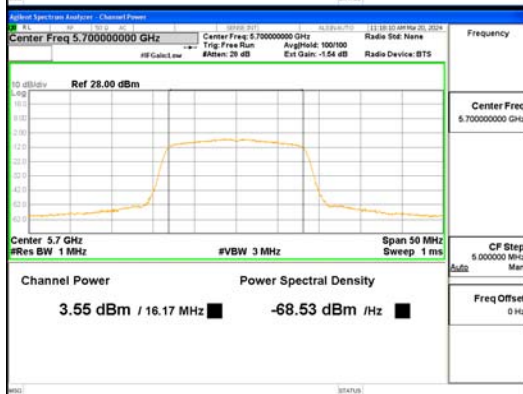
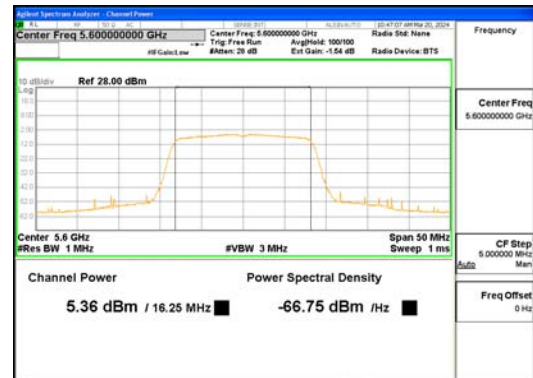
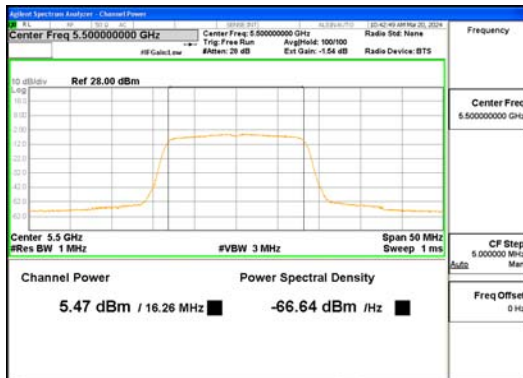
ANT0



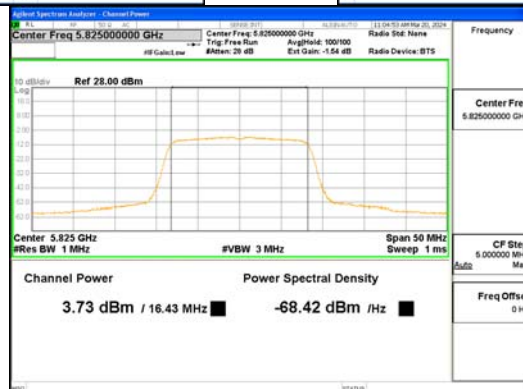
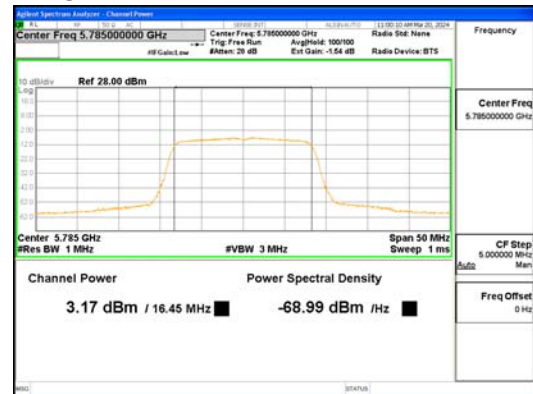
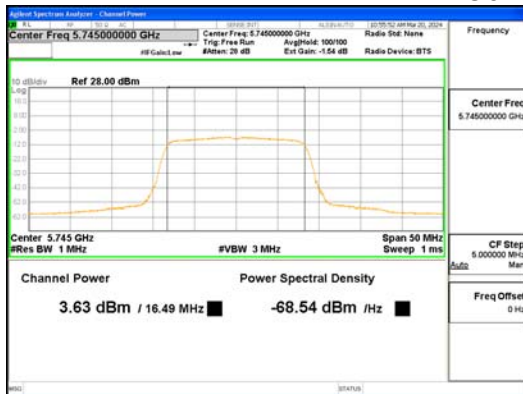
802.11a_UNII 1



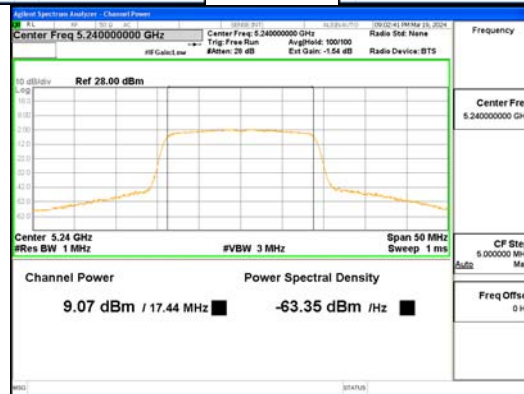
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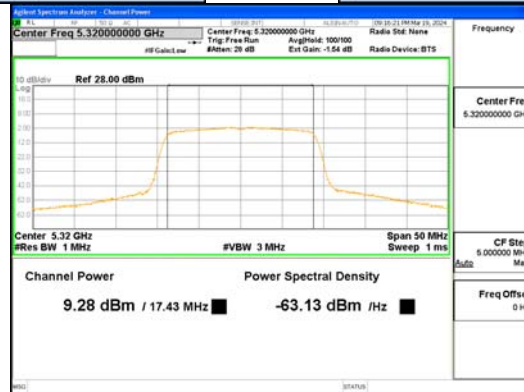
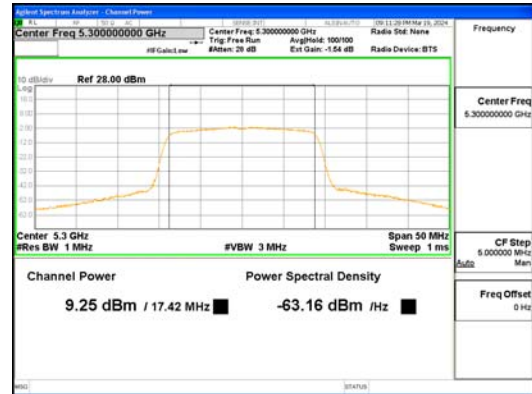
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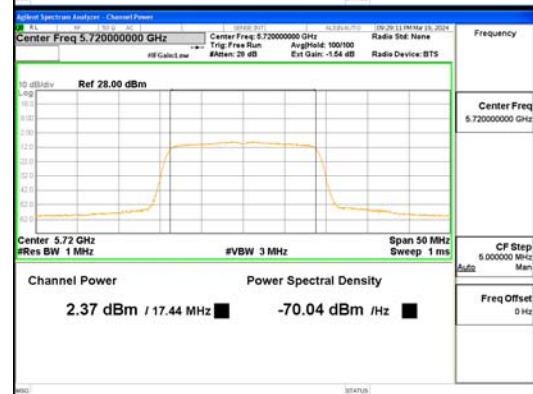
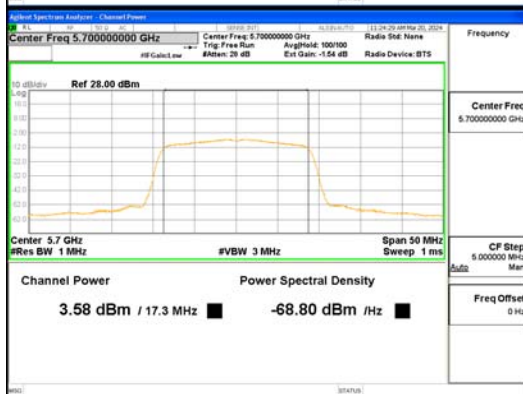
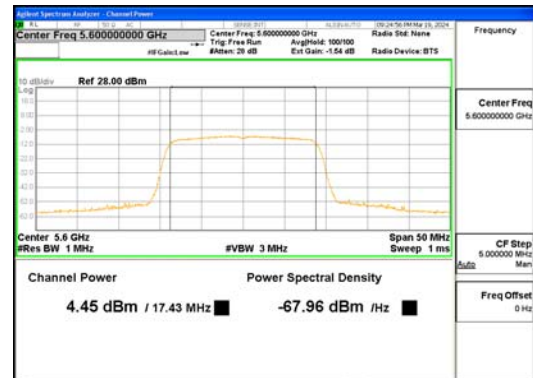
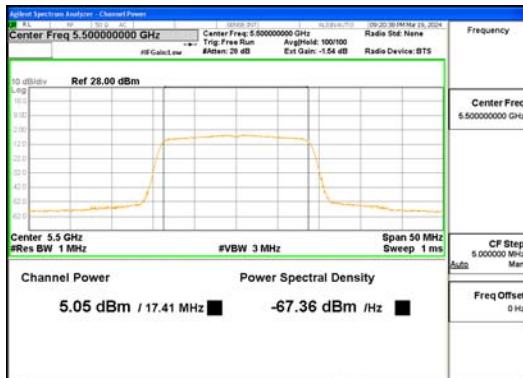
802.11a_UNII 3



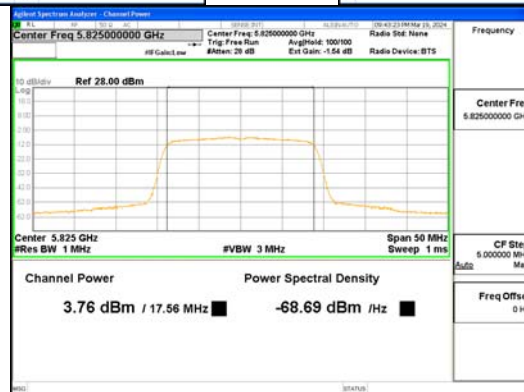
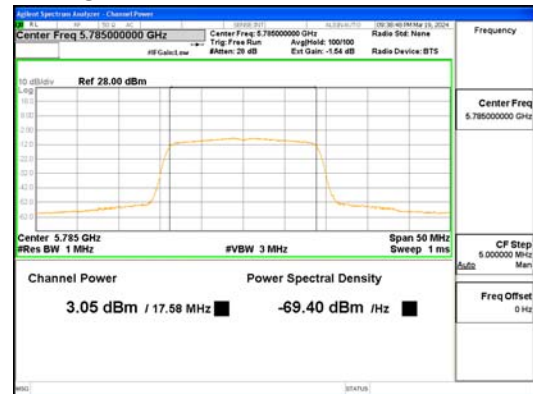
802.11n20_UNII 1



802.11n20_UNII 2A



802.11n20_UNII 2C



802.11n20_UNII 3