



REPORT No.: SZ18020069W04

TEST REPORT

APPLICANT : Amino Communications Ltd

PRODUCT NAME : HD IPTV Receiver

MODEL NAME : Amigo 7X (main test model)
Amigo 7XYEzzzzzzzz (X,Y, can be
0~9; zzzzzzzz can be combination of
A~Z, a~z, 0~9, "- ", "/ ", " " blank"
for marketing purpose)

BRAND NAME : Amino

FCC ID : XVG50-0112-RT-22

STANDARD(S) : 47 CFR Part 15 Subpart E

TEST DATE : 2018-03-06 to 2018-03-22

ISSUE DATE : 2018-05-30

Tested by:

Su Hang
Su Hang (Test Engineer)

Approved by:

Andy Yeh
Andy Yeh (Technical Director)

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MORLAB

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REPORT No.: SZ18020069W04

Change History		
Issue	Date	Reason for change
1.0	2018-05-30	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Amino Communications Ltd
Applicant Address:	Buckingway Business Park, Anderson Road, Swavesey, Cambridge CB24 4UQ United Kingdom
Manufacturer:	Amino Communications Ltd
Manufacturer Address:	Buckingway Business Park, Anderson Road, Swavesey, Cambridge CB24 4UQ United Kingdom

1.2. Equipment Under Test (EUT) Description

Product Name:	HD IPTV Receiver
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	V1.0
Software Version:	190118
Modulation Type:	OFDM
Modulation Mode:	802.11a, 802.11n(HT20), 802.11n(HT40) 802.11ac(VHT20), 802.11ac(VHT40), 802.11ac(VHT80),
Operating Frequency Range:	5.180GHz- 5.240GHz; 5.260GHz- 5.320GHz; 5.500GHz- 5.720GHz ; 5.745GHz- 5.825GHz
Channel Number:	Refer to 1.3
Antenna Type:	FPC Antenna
Antenna Gain:	Ant J3: 3.0 dBi; Ant J4: 3.0 dBi ^{Note6}
Directional Gain:	6.01 dBi ^{Note 3}

Note 1: The EUT has two antennas and supports a MIMO function. Physically, the EUT provides two completed transmitters and two receivers for 802.11n and 802.11ac modulation mode.

Modulation Mode:	TX Function
802.11a	1TX
802.11n	2TX
802.11ac	2TX

Note 2: According to KDB 662911 D01, the directional gain = $G_{ANT} + 10\log(N_{ANT})$ dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

Note 3: During test, the duty cycle of the EUT was setting to 100%.



Note 4: All radiation test items for 802.11n and 802.11ac modulation modes operate at MIMO mode during the test. Other modulation mode operate at SISO mode, both of the two antennas were tested separately, we only recorded the worst test result(ANT J4) in this report.

Note 5: According to the certificate holder, Amino Communications Ltd, they declared that: Amigo 7XYEzzzzzzzz (X,Y, can be 0~9; zzzzzzzz can be combination of A~Z, a~z, 0~9, "-", "/", "blank" for marketing purpose). Only the model name is different, The Bluetooth and WIFI module are the same. The main measuring model is Amigo 7X, only the results for Amigo 7X were recorded in this report.

Note 6: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



1.3. The channel number and frequency of EUT

Frequency Range: 5180MHz-5240MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	36	5180	40	5200
	44	5220	48	5240
40MHz	38	5190	46	5230
80MHz	42	5210		
Frequency Range: 5260MHz-5320MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	52	5260	56	5280
	60	5300	64	5320
40MHz	54	5270	62	5310
80MHz	58	5290		
Frequency Range: 5500MHz-5720MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	100	5500	105	5520
	108	5540	112	5560
	116	5580	120	5600
	124	5620	128	5640
	132	5660	136	5680
	140	5700	144	5720
40MHz	102	5510	110	5550
	118	5590	126	5630
	134	5670	142	5710
80MHz	106	5530	122	5610
	138	5690		
Frequency Range: 5745-5825MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	149	5745	153	5765
	157	5785	161	5805
	165	5825		
40MHz	151	5775	159	5795
80MHz	155	5775		



1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart E (UNII band) for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15 (5-1-14 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	ANSI C63.10	Duty Cycle of the test signal	Mar 08, 2018	Su Hang	PASS
3	15.407(a) (e)	Emission Bandwidth	Mar 08, 2018	Su Hang	PASS
4	15.407(a)	Maximum conducted output Power	Mar 08, 2018	Su Hang	PASS
5	15.407(a)	Peak Power spectral density	Mar 06, 2018	Su Hang	PASS
6	15.205,15.209 15.407(b)	Restricted Frequency Bands	Mar 21, 2018	Wang Dalong	PASS
7	15.207	Conducted Emission	Mar 10, 2018	Wang Dalong	PASS
8	15.407(b)	Radiated Emission	Mar 22, 2018	Wang Dalong	PASS

Note1: EUT is a Client Device Without Radar Detection, WIFI hotspot does not support U-NII band; A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Note2: The DFS test report was documented in a separate report (Report No.: SZ18020069W05).

Note3: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

Note4: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 General UNII Test Procedures New Rules v01r03, KDB662911 D01 Multiple Transmitter Output v02r01.

1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106



2.47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. 2.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Duty Cycle of the test signal

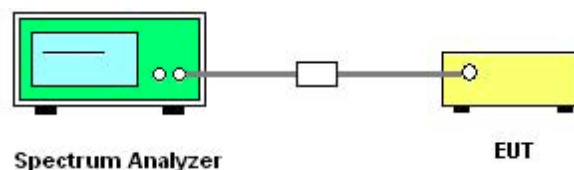
2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than $\pm 2\%$; otherwise, the duty cycle is considered to be nonconstant.

2.2.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Test Procedure

KDB 789033 Section B was used in order to prove compliance.

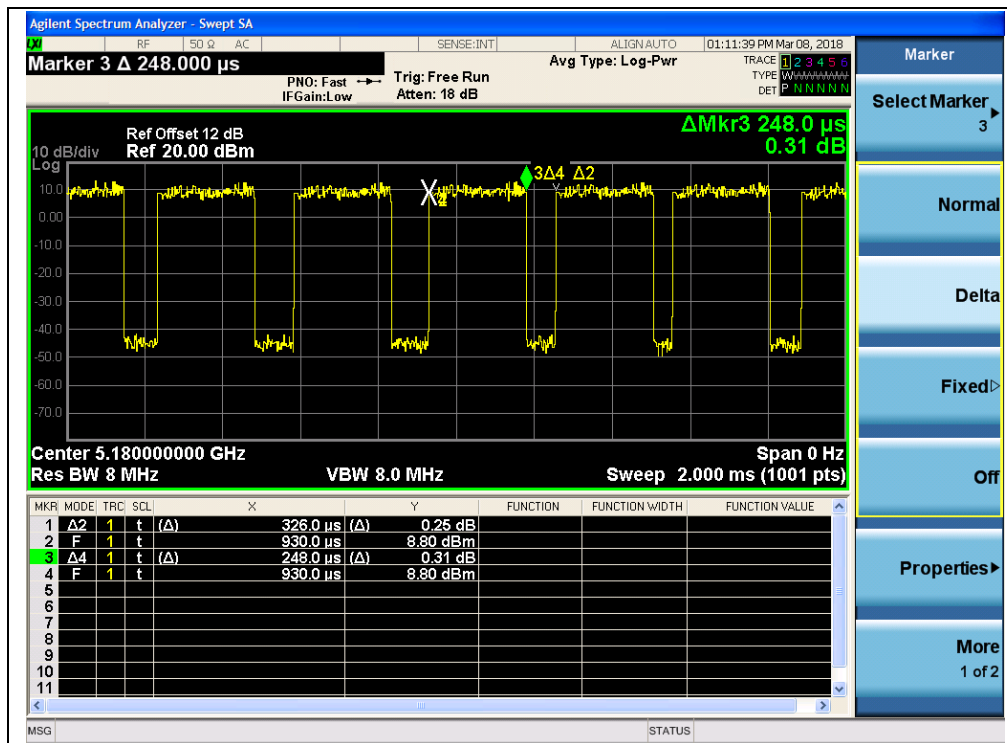


2.2.3. Test Result

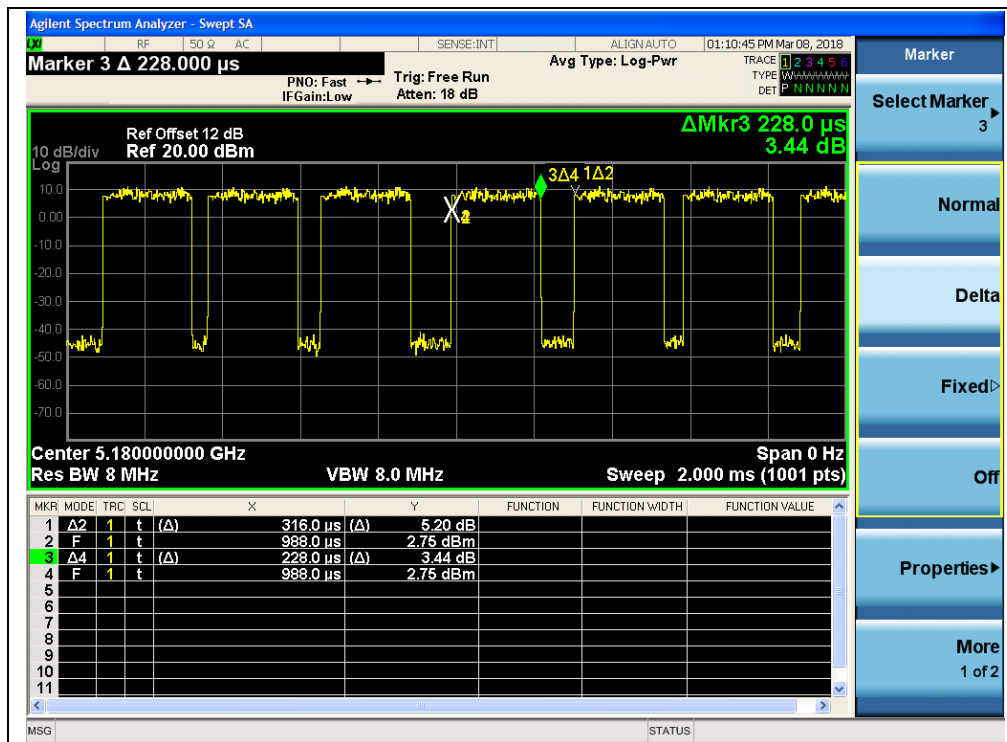
A. Test Verdict:

Test Mode	ANT J3		ANT J4	
	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	76.07	1.19	74.25	1.29
802.11n20	72.15	1.42	71.25	1.47
802.11n40	69.46	1.58	66.96	1.74
802.11ac20	55.65	2.55	59.26	2.27
802.11ac40	63.11	2.00	62.86	2.02
802.11ac80	52.17	2.83	51.85	2.85

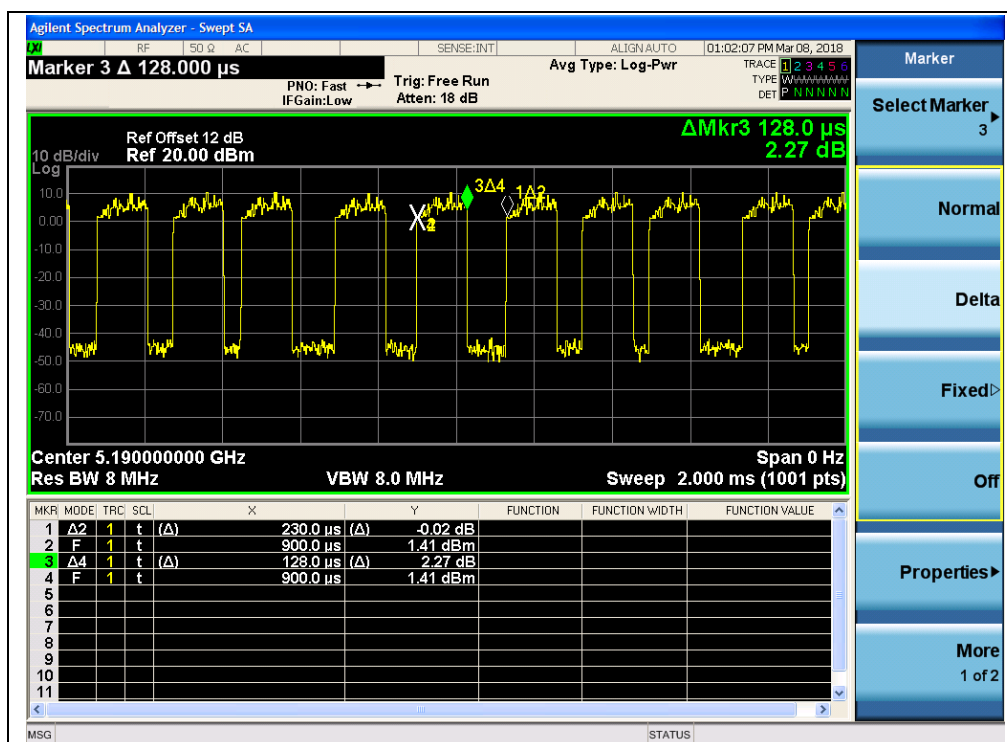
B. Test Plots



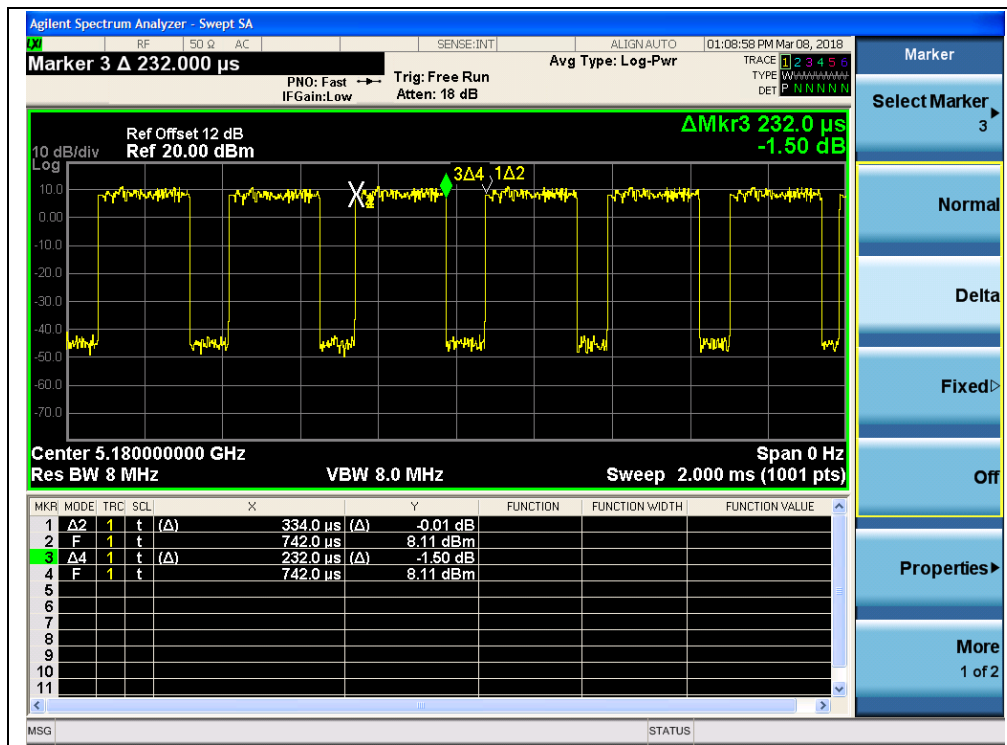
(ANT J3_802.11a)



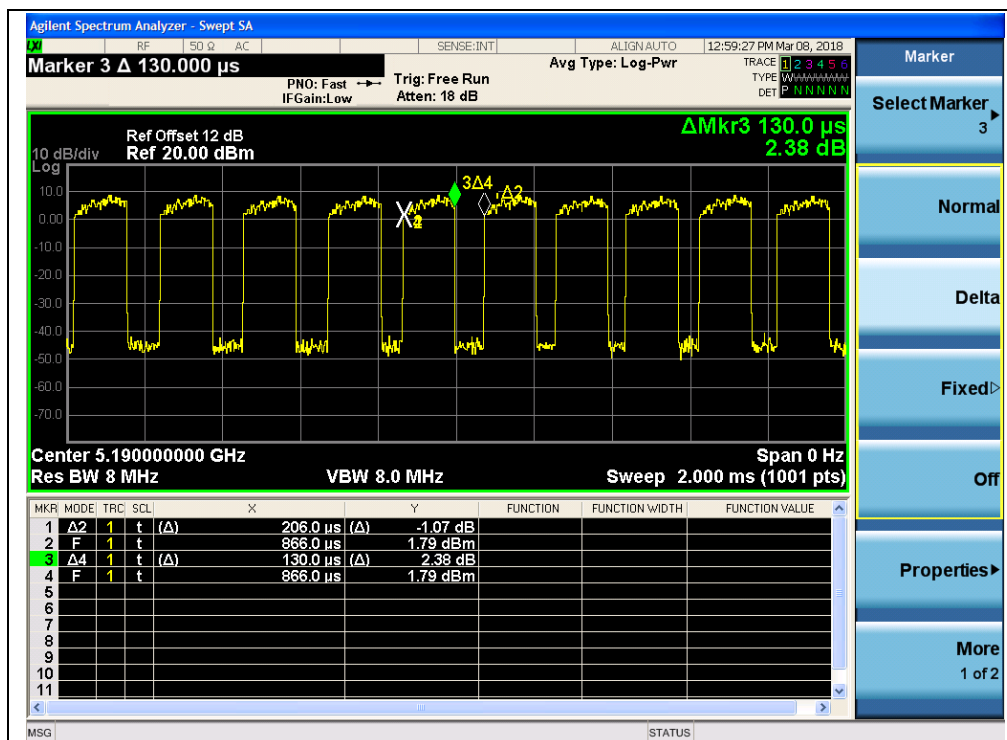
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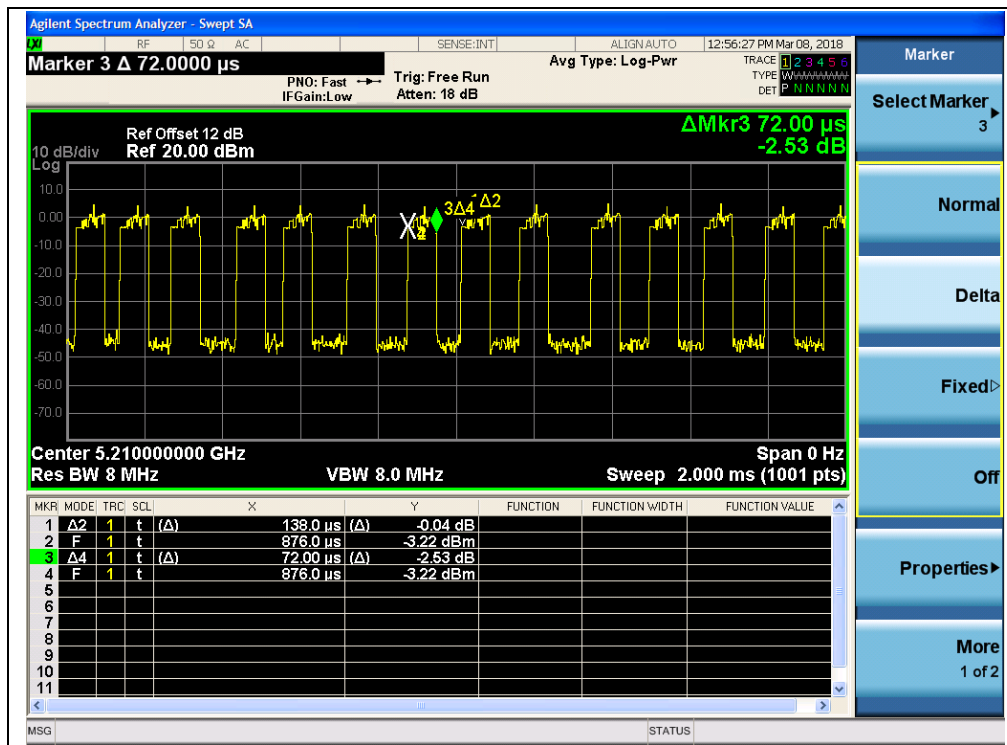
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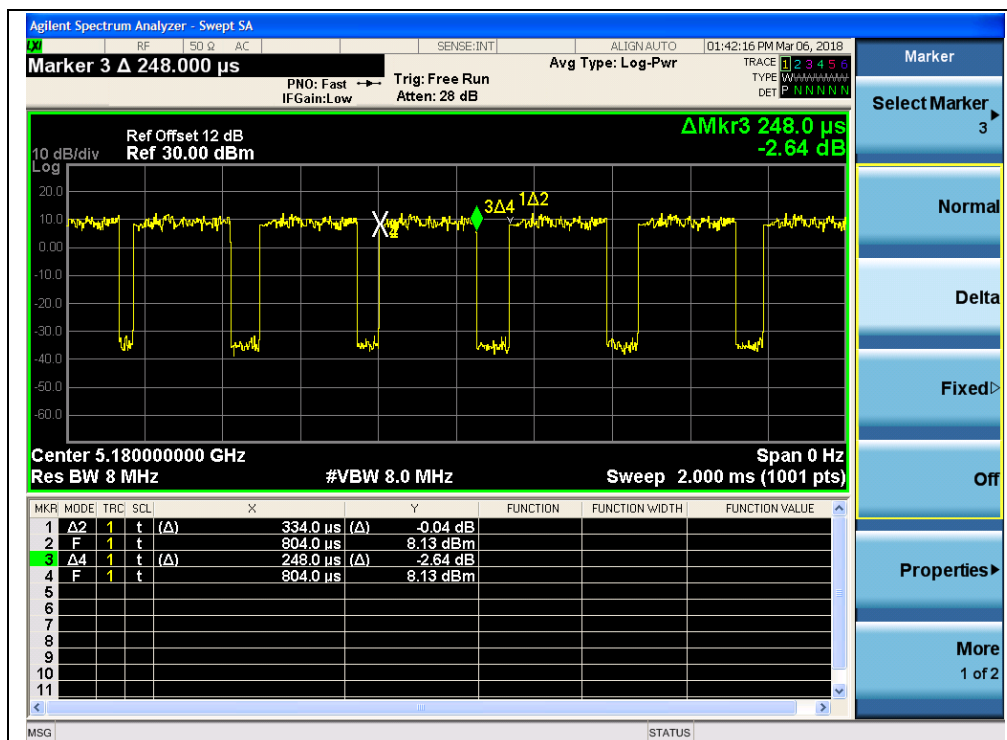
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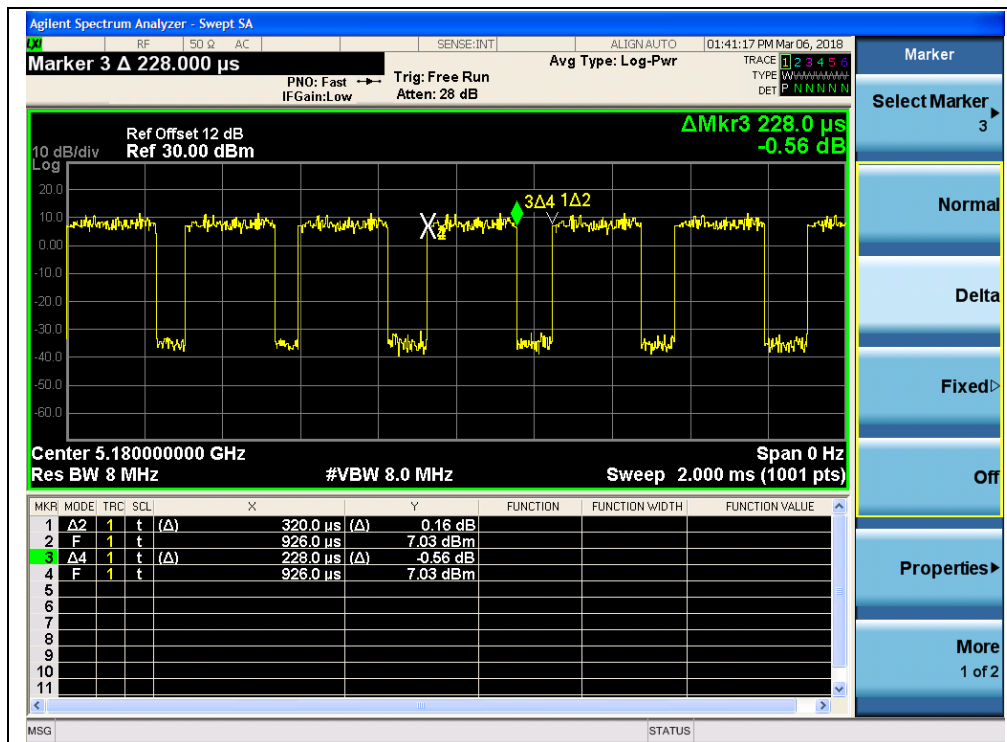
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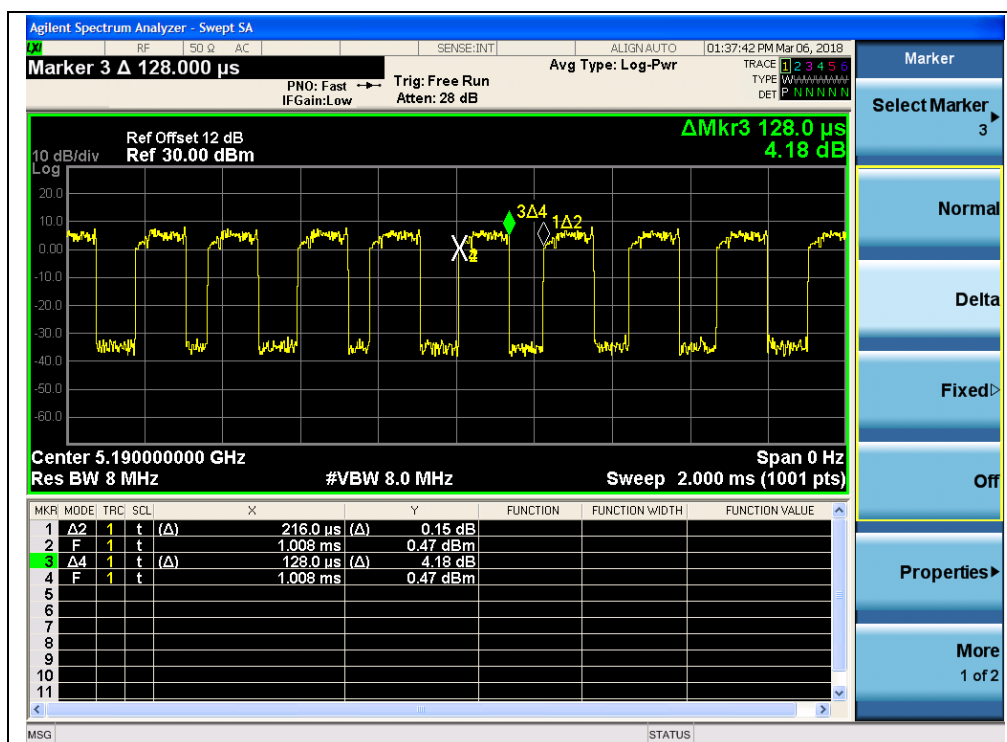
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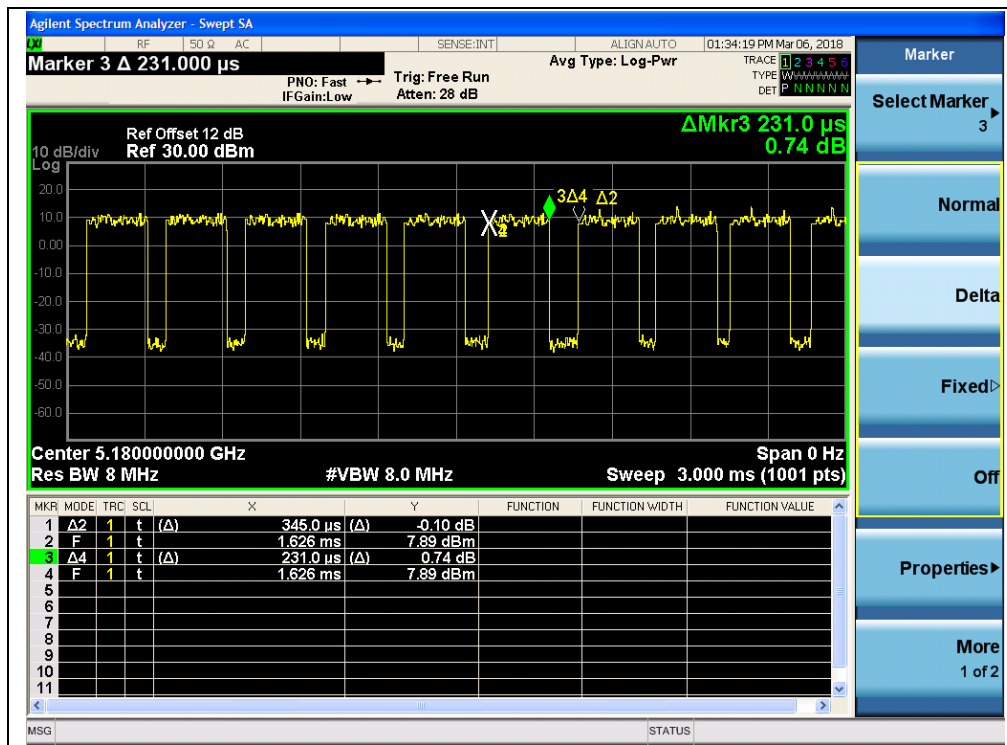
(ANT J4_802.11a)



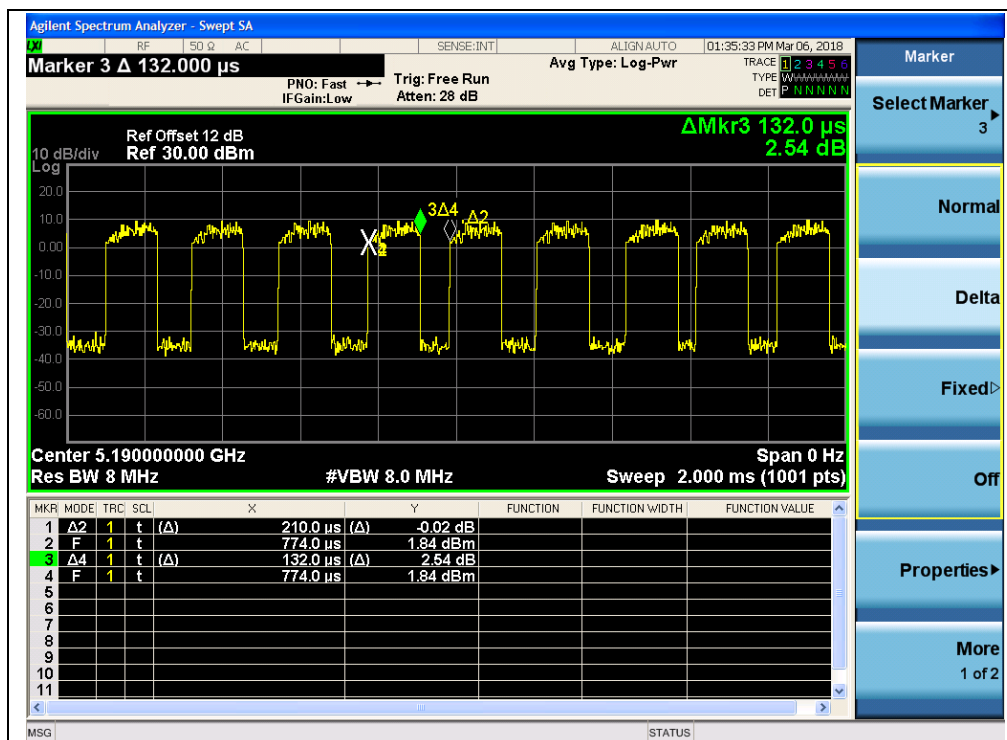
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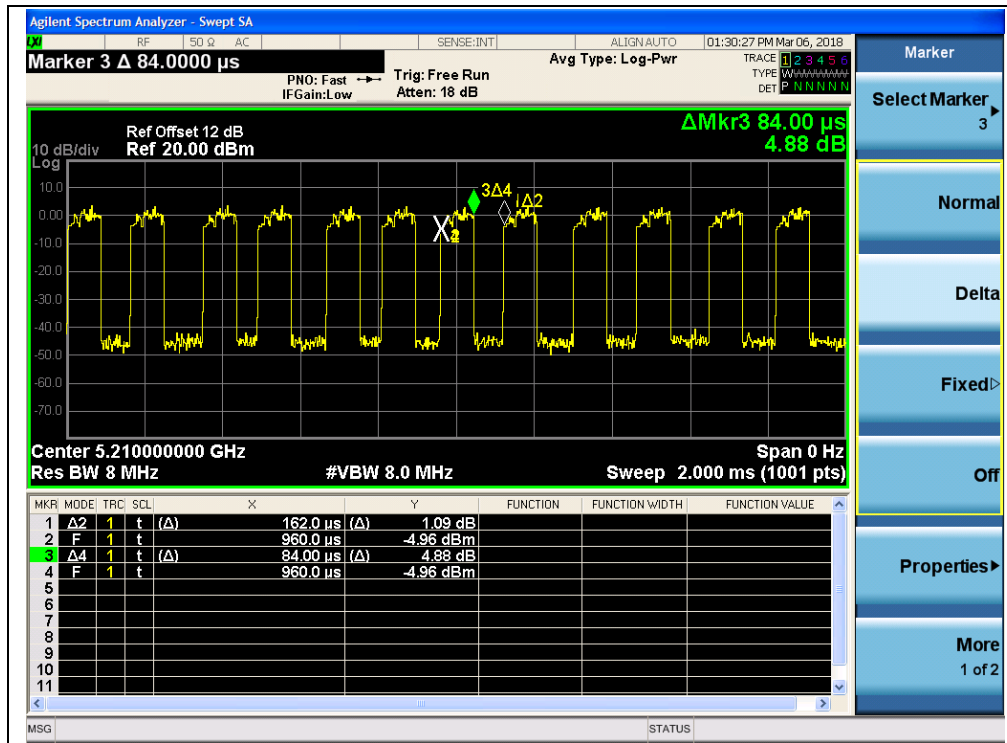
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(ANT J4_802.11ac20)



(ANT J4_802.11ac40)



(ANT J4_802.11ac80)

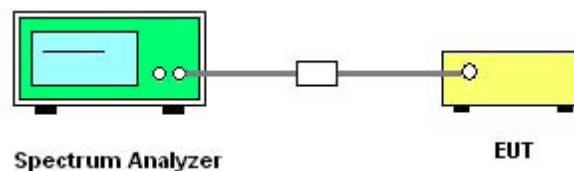
2.3. Emission Bandwidth

2.3.1. Requirement

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

2.3.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading.

B. Test Procedure

1. KDB 789033 Section C) 1) Emission Bandwidth was used in order to prove compliance
 - a) Set RBW = approximately 1% of the emission bandwidth.
 - b) Set the VBW > RBW.
 - c) Detector = Peak.
 - d) Trace mode = max hold.
 - e) Measure the maximum width of the emission that is 26 dB down from the peak of the emission.
Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
2. KDB 789033 Section C) 2) minimum emission bandwidth for the band 5.725-5.85GHz was used in order to prove compliance.
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
 - a) Set RBW = 100 kHz.
 - b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
 - c) Detector = Peak.



- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

2.3.3. Test Result

802.11a Test mode

A. Test Verdict:

Channel	Frequency (MHz)	ANT J3 26 dB Bandwidth (MHz)	ANT J4 26 dB Bandwidth (MHz)
36	5180	20.06	19.78
44	5220	20.34	19.35
48	5240	20.58	19.65
52	5260	20.50	19.60
60	5300	19.62	19.59
64	5320	20.04	19.84
100	5500	19.55	20.14
120	5600	19.16	19.61
144	5720	19.40	20.23
Channel	Frequency (MHz)	ANT J3 6dB Bandwidth (MHz)	ANT J4 6dB Bandwidth (MHz)
149	5745	16.35	16.48
157	5785	16.39	16.47
165	5825	16.37	16.39



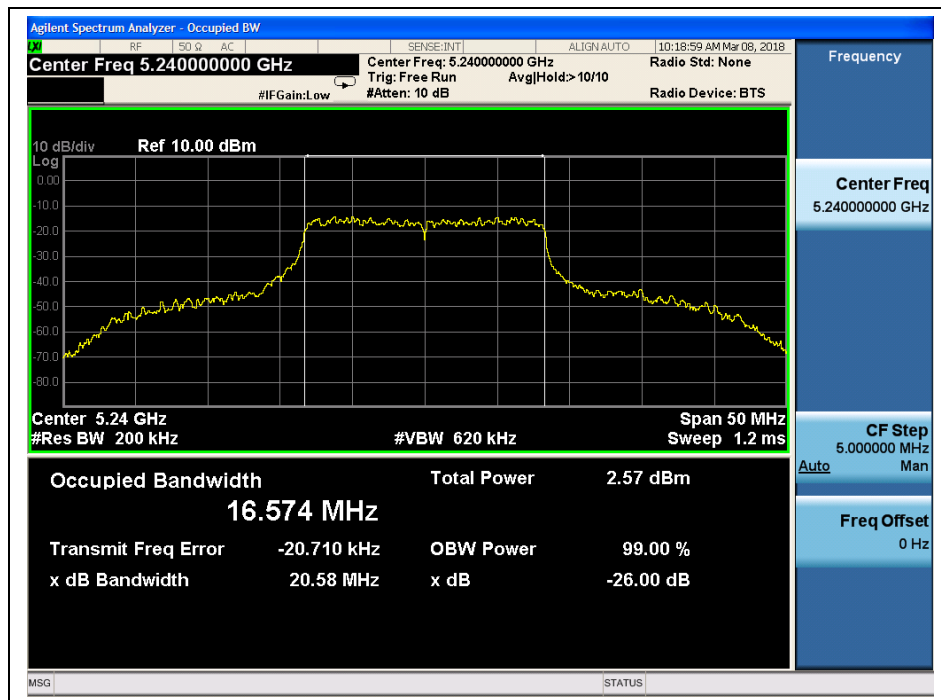
B. Test Plots



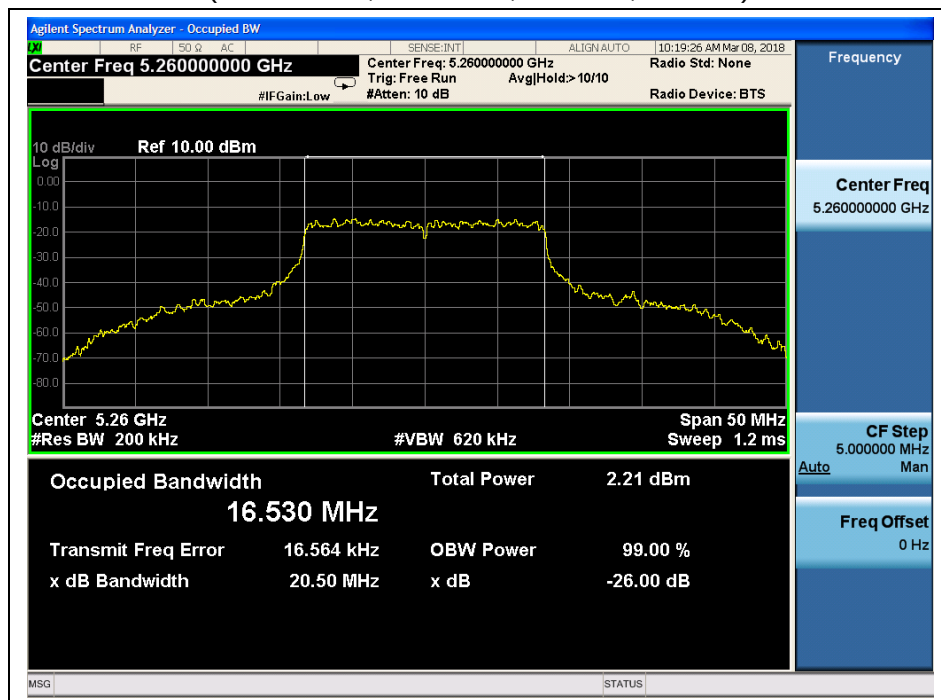
(Channel 36, 5180MHz, 802.11a, ANT J3)



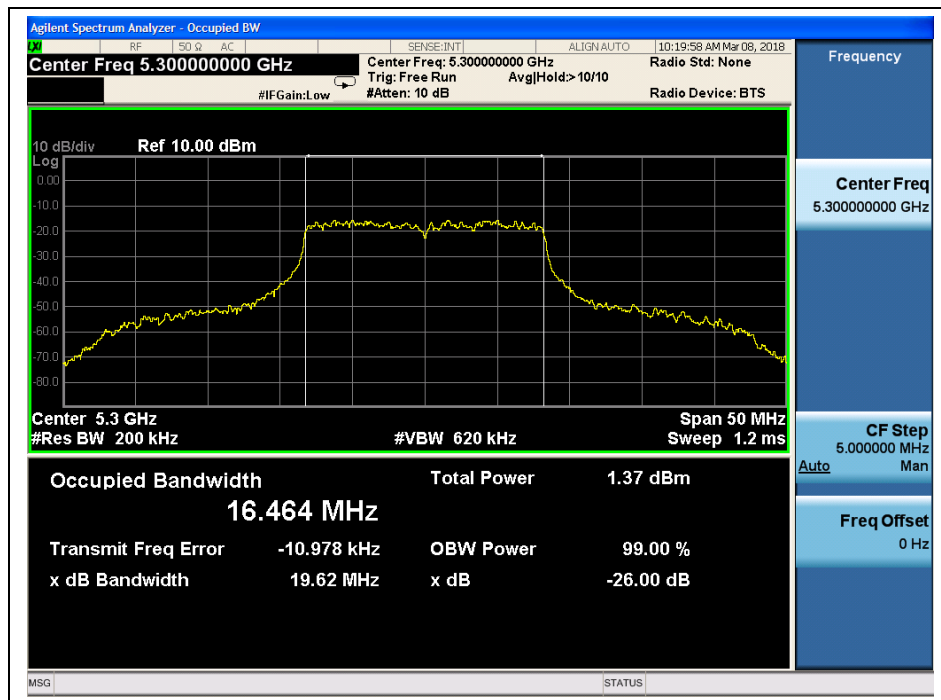
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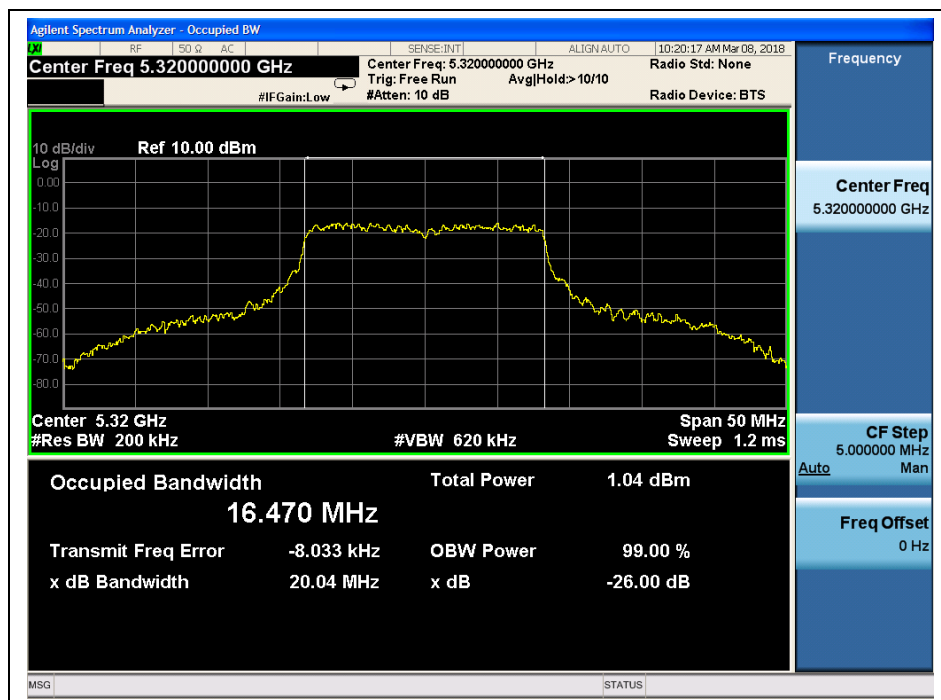
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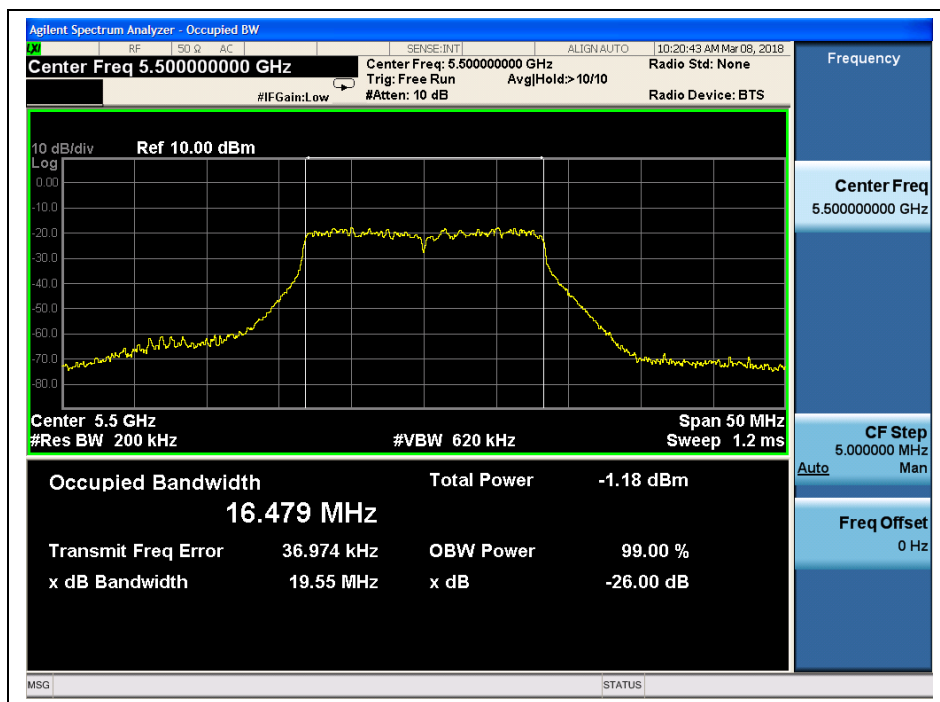
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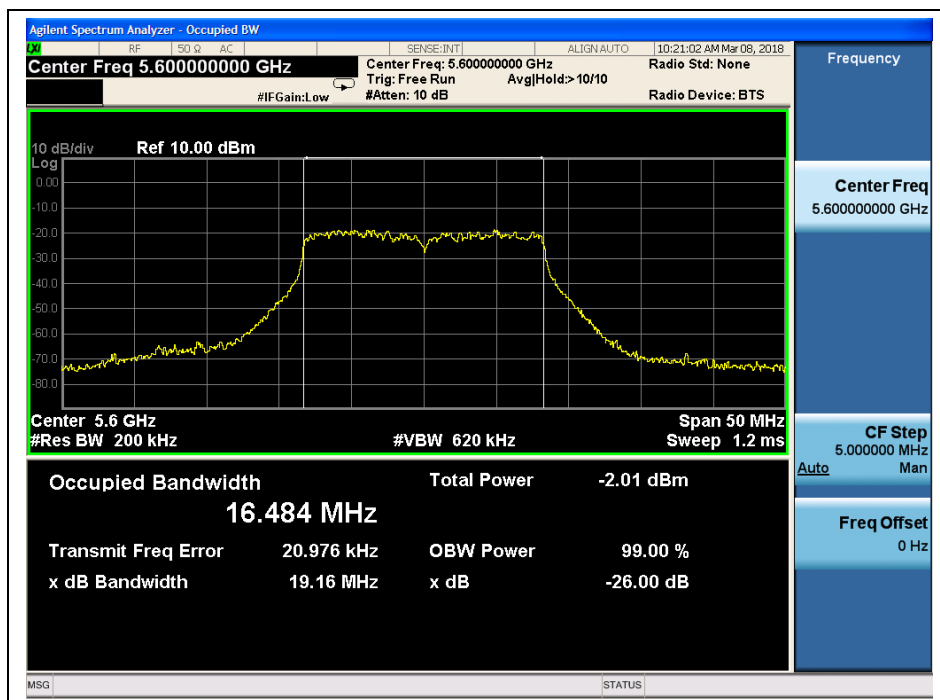
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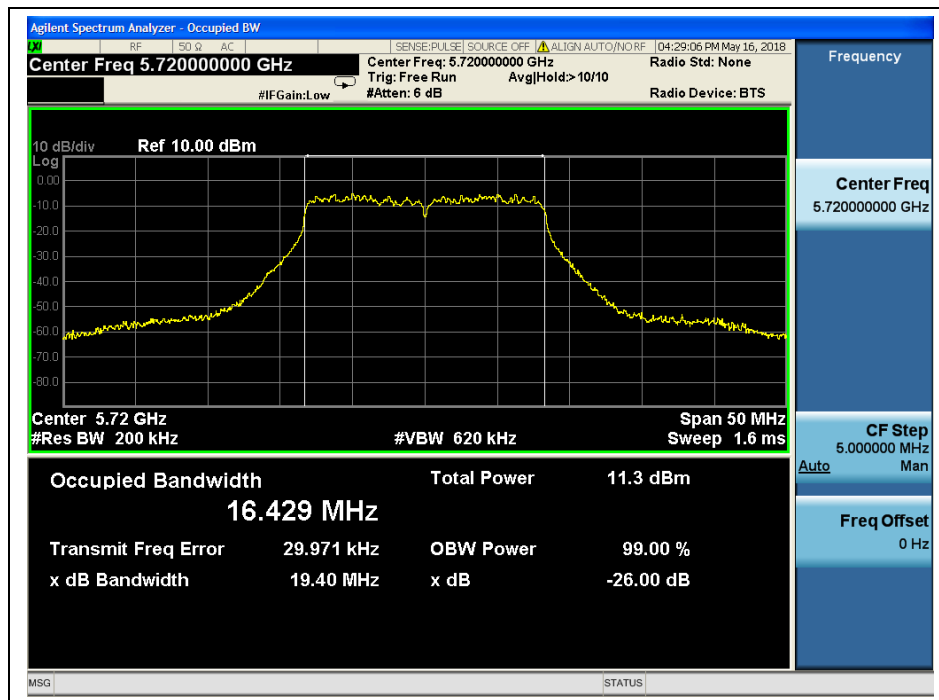
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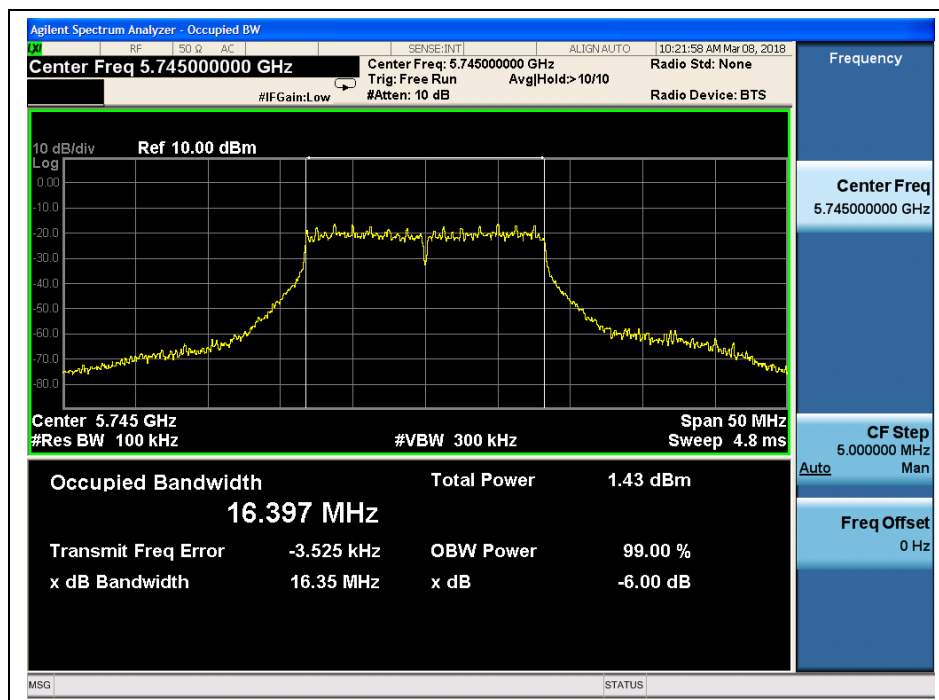
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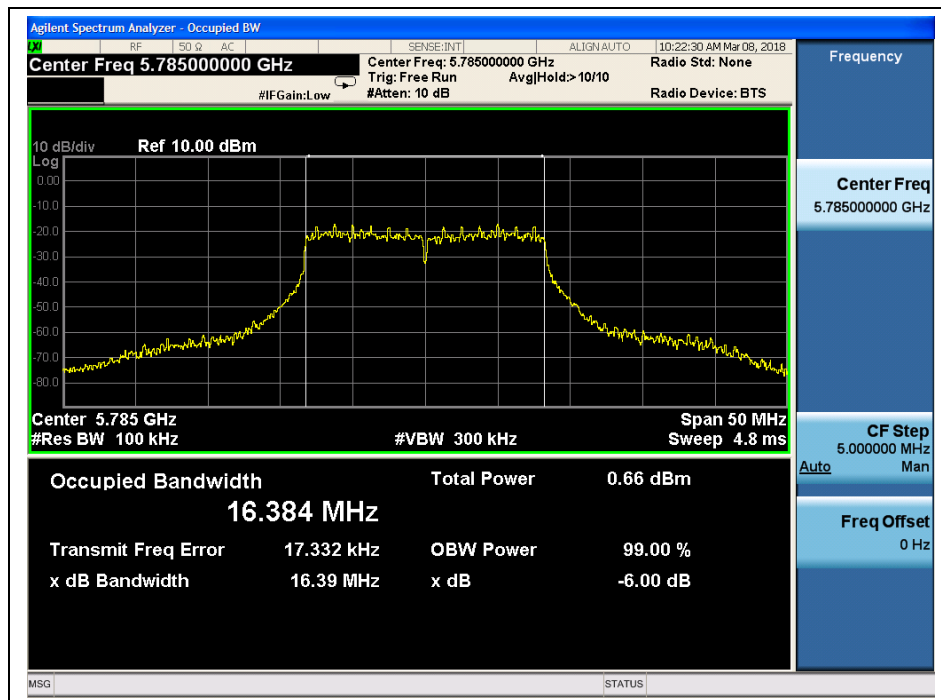
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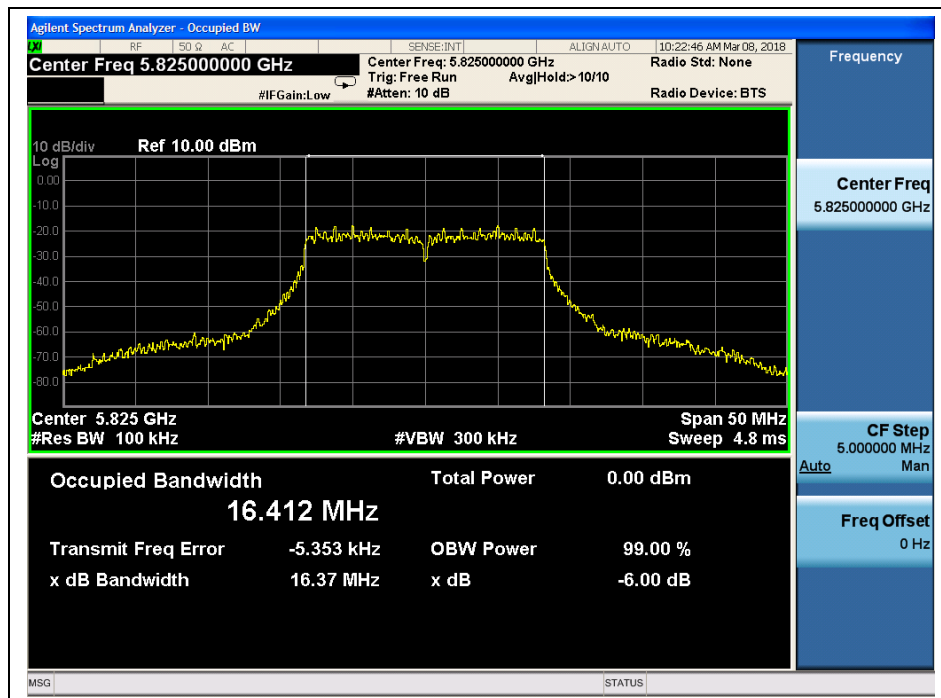
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(Channel 149, 5745MHz, 802.11a, ANT J3)



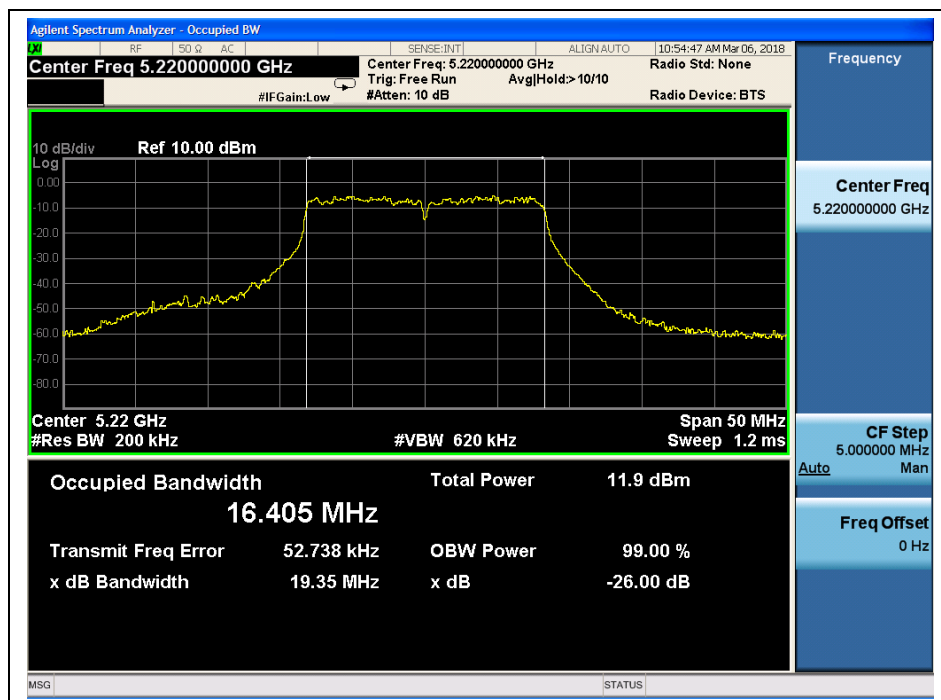
(Channel 157, 5785MHz, 802.11a, ANT J3)



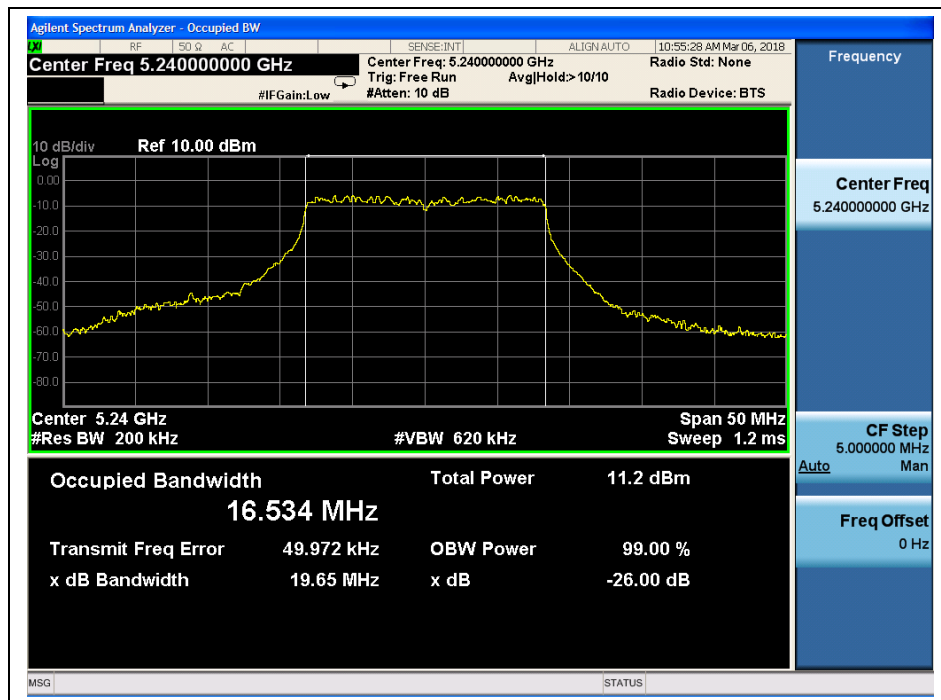
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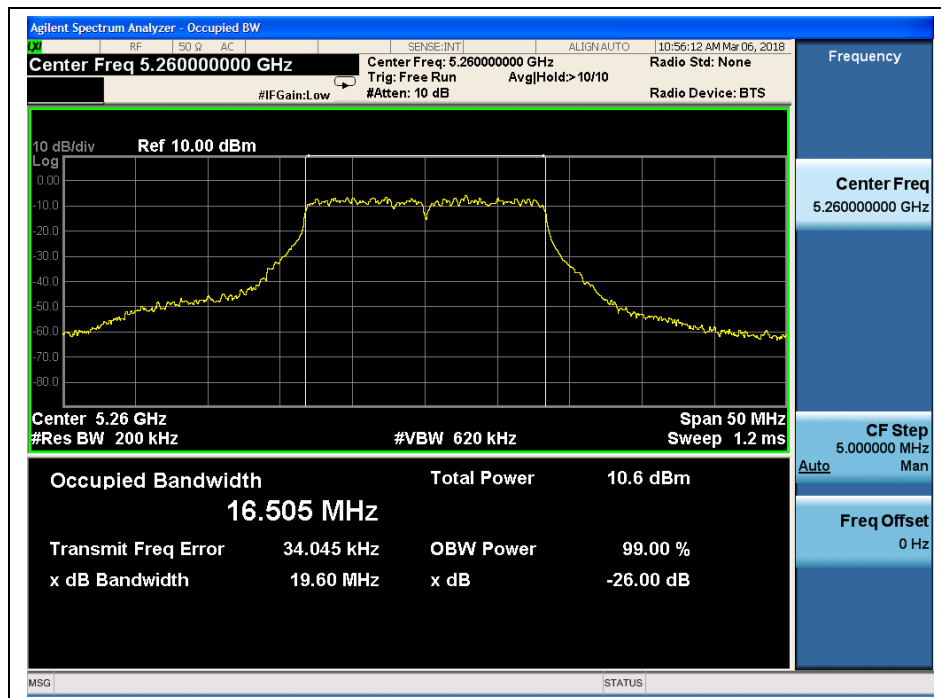
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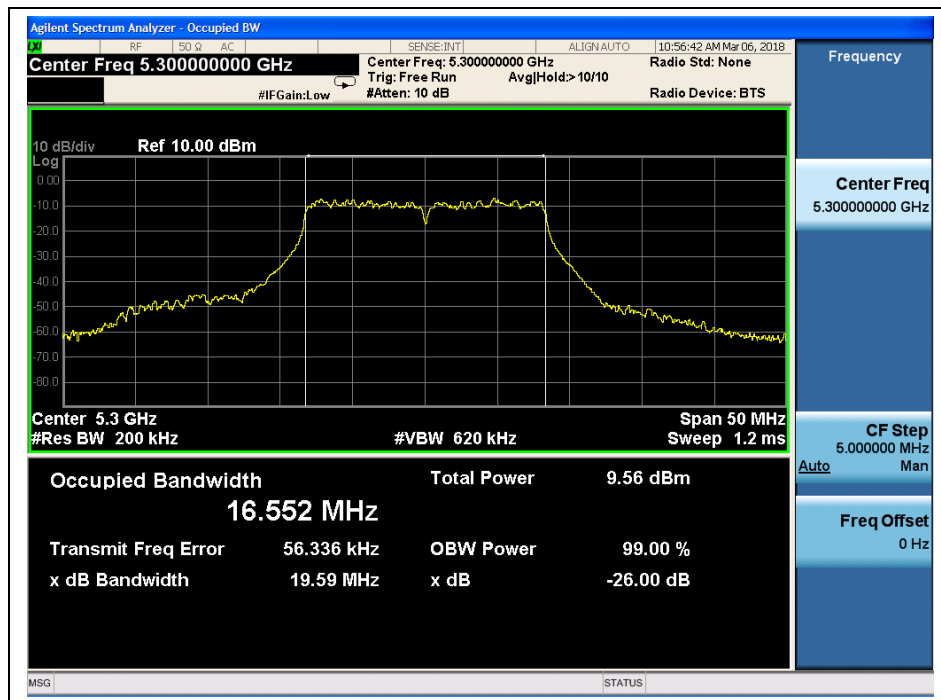
(Channel 44, 5220 MHz, 802.11a, ANT J4)



(Channel 48, 5240MHz, 802.11a, ANT J4)



(Channel 52, 5260MHz, 802.11a, ANT J4)



(Channel 60, 5300 MHz, 802.11a, ANT J4)



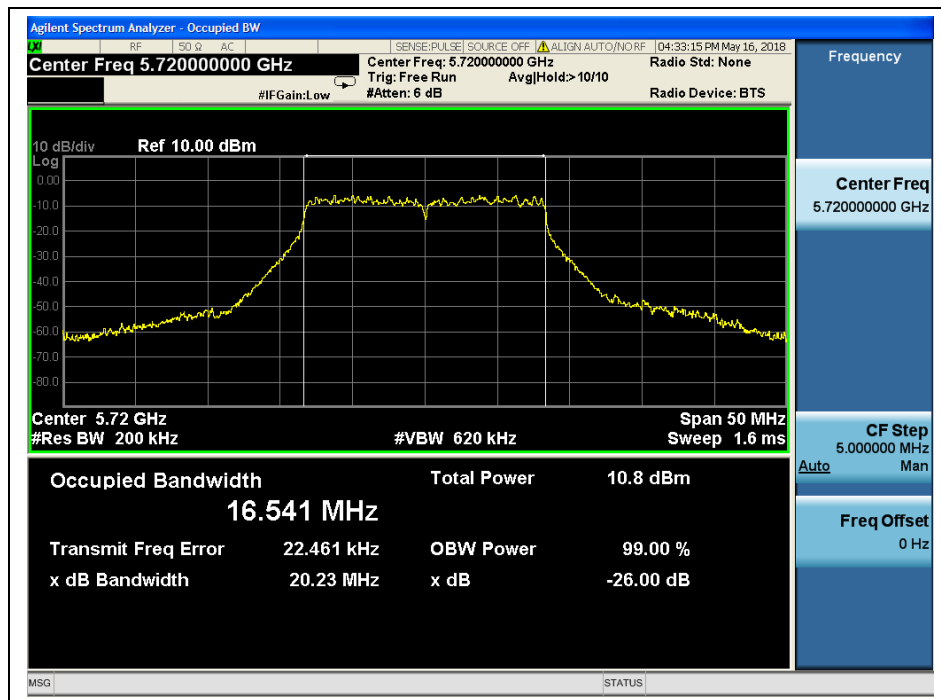
(Channel 64, 5320MHz, 802.11a, ANT J4)



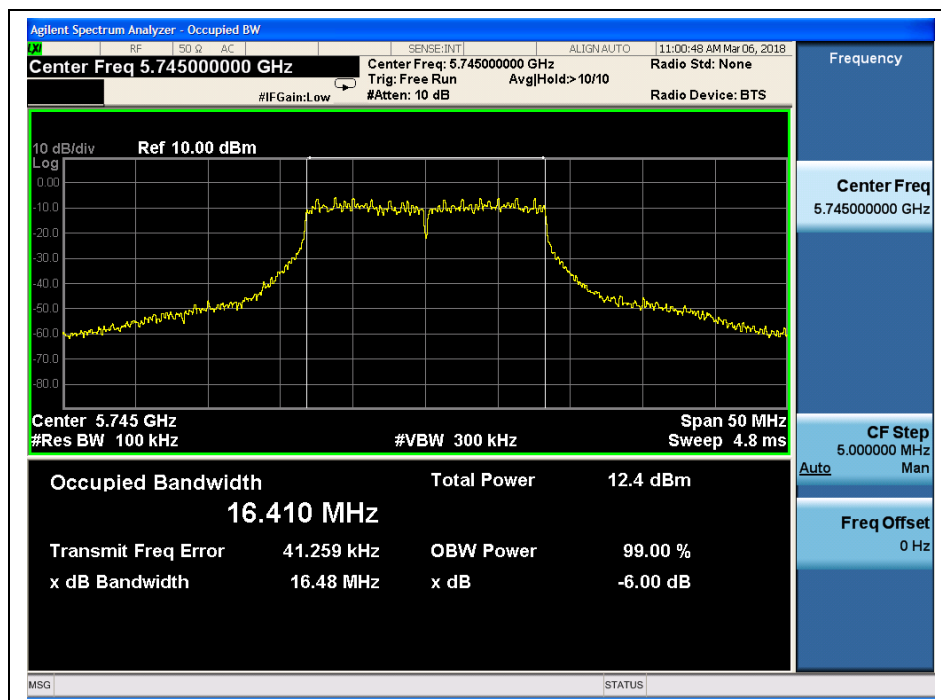
(Channel 100, 5500MHz, 802.11a, ANT J4)



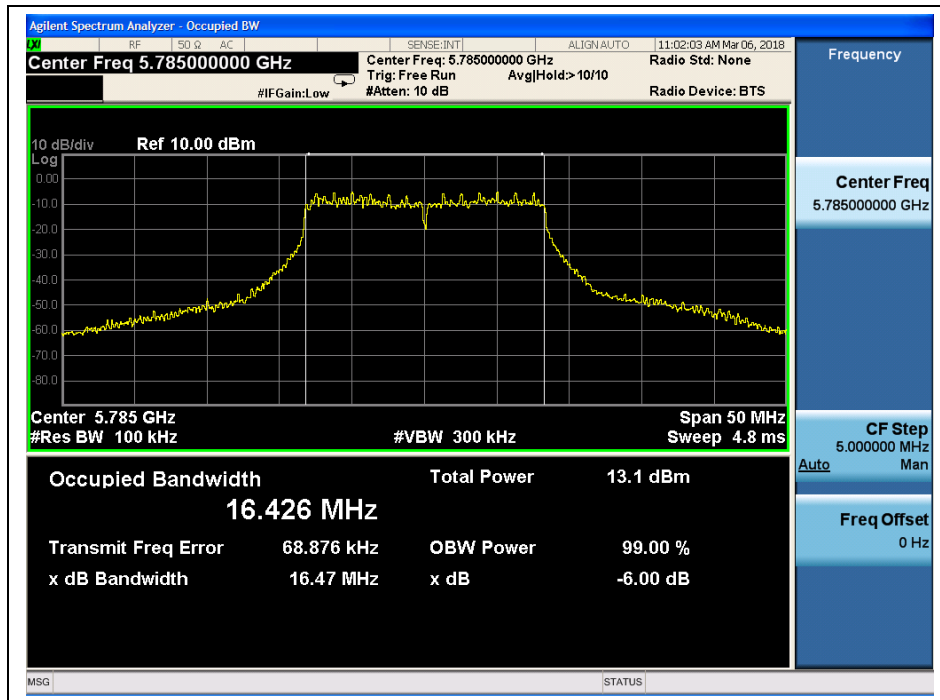
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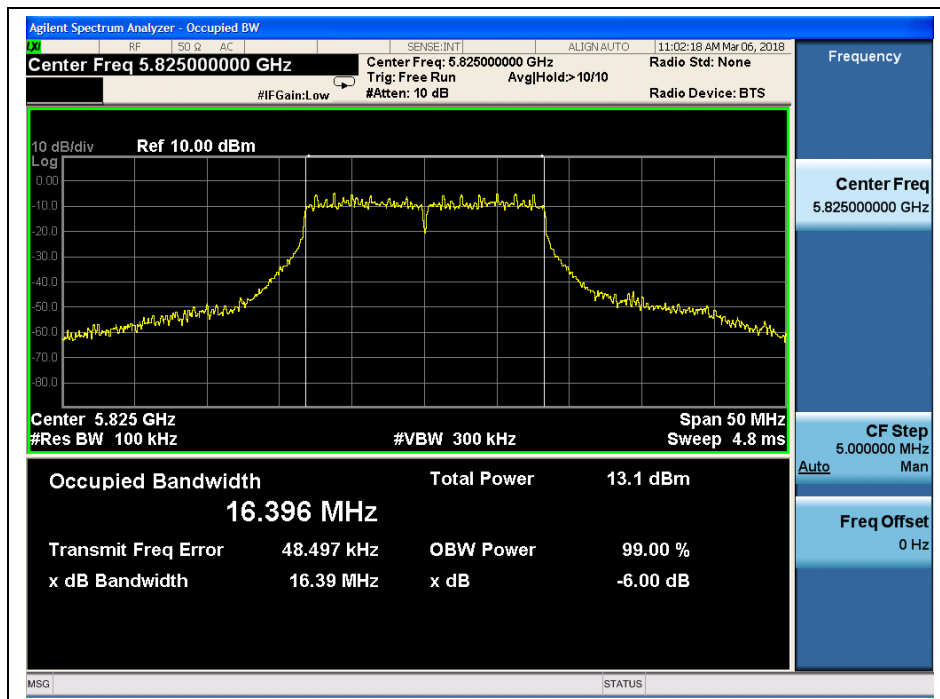
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(Channel 149, 5745MHz, 802.11a, ANT J4)



(Channel 157, 5785MHz, 802.11a, ANT J4)



(Channel 165, 5825MHz, 802.11a, ANT J4)

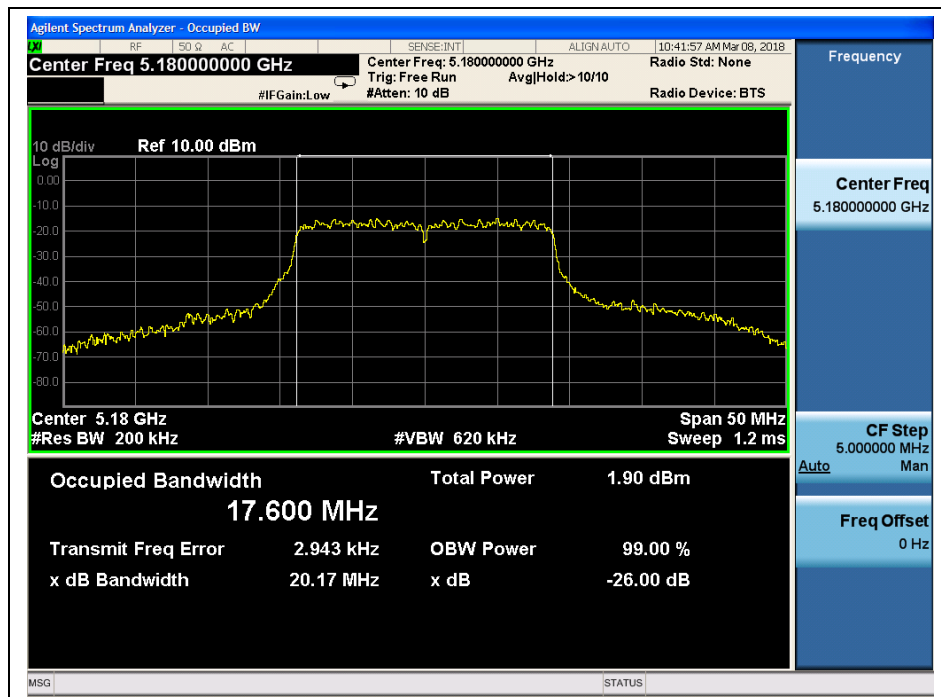


802.11n (HT20) Test mode

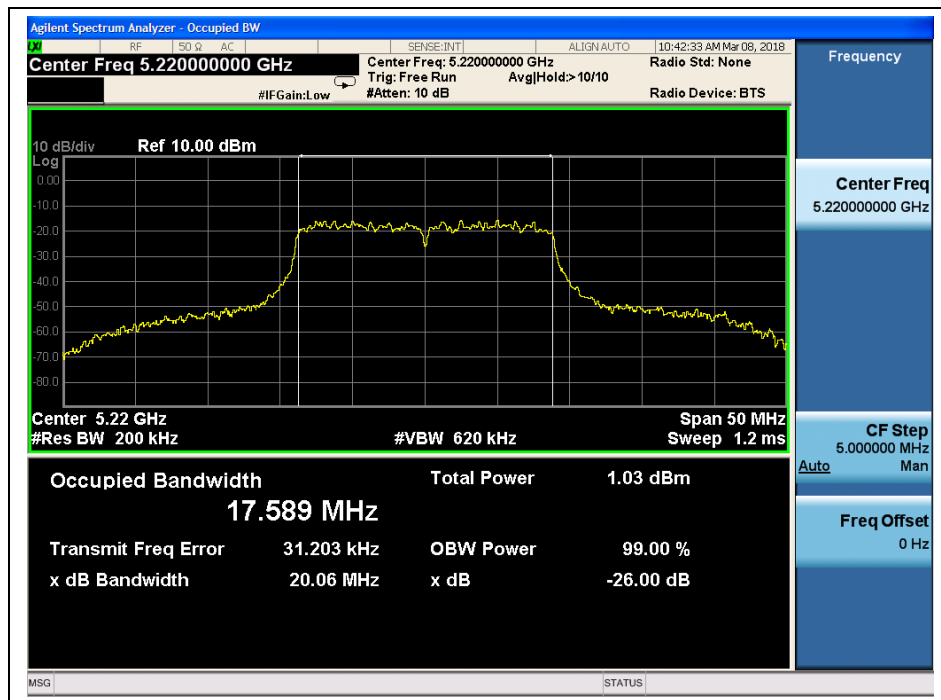
A. Test Verdict:

Channel	Frequency (MHz)	ANT J3 26 dB Bandwidth (MHz)	ANT J4 26 dB Bandwidth (MHz)
36	5180	20.17	20.03
44	5220	20.06	20.77
48	5240	20.13	20.06
52	5260	19.84	19.87
60	5300	19.81	20.09
64	5320	20.12	20.25
100	5500	20.07	20.38
120	5600	19.97	20.21
144	5720	20.05	20.20
Channel	Frequency (MHz)	ANT J3 6dB Bandwidth (MHz)	ANT J4 6dB Bandwidth (MHz)
149	5745	16.98	17.59
157	5785	17.08	16.95
165	5825	17.56	17.41

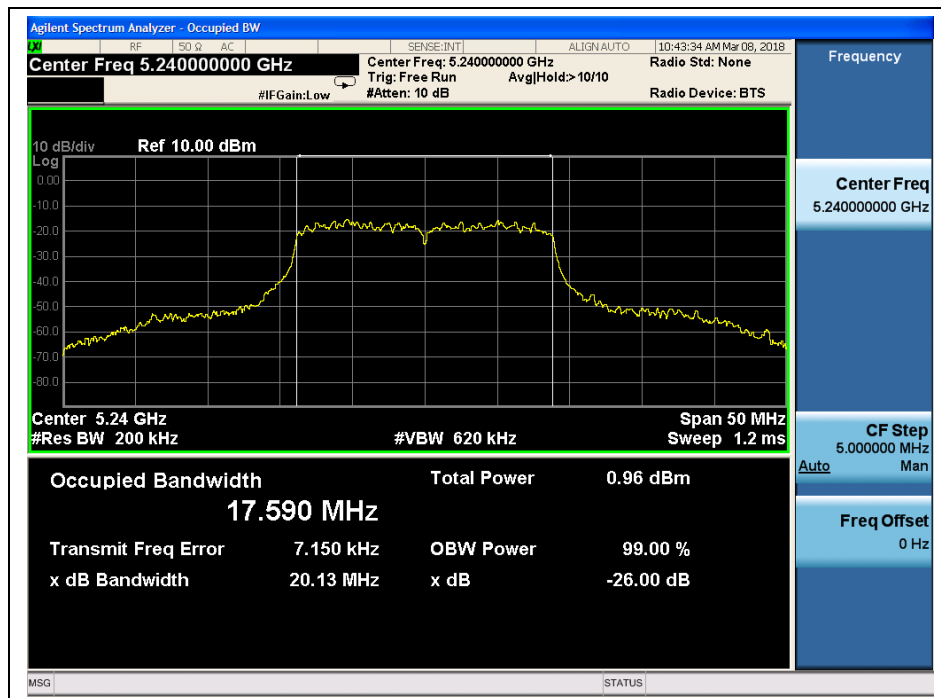
B. Test Plots



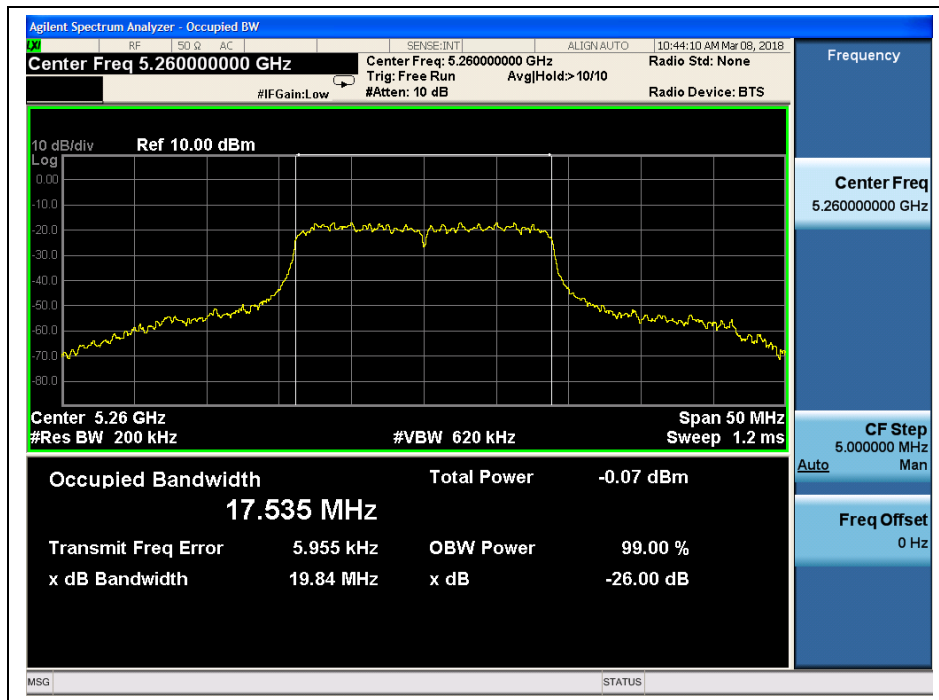
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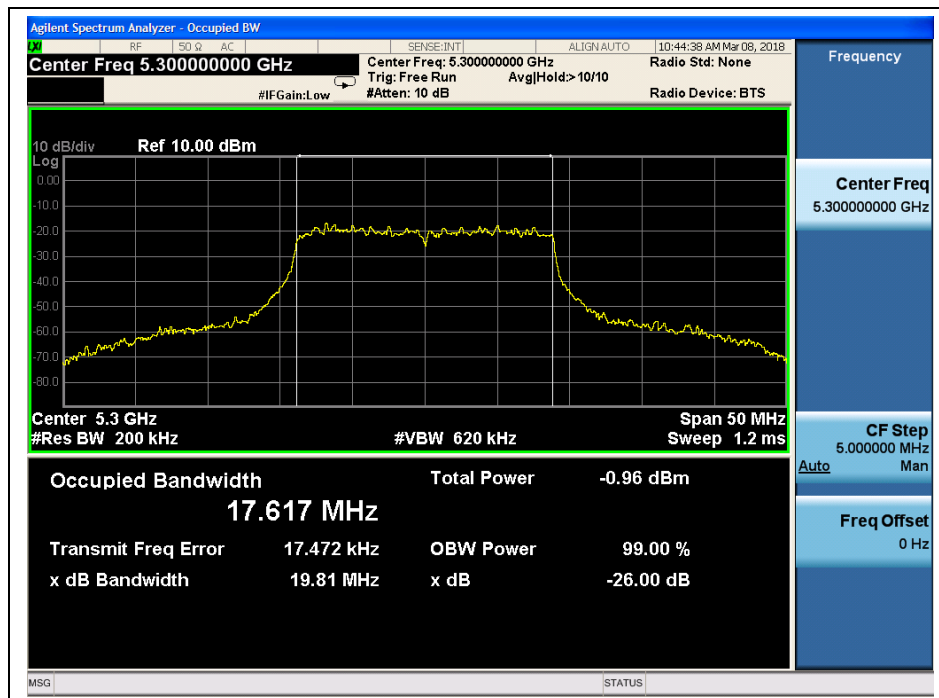
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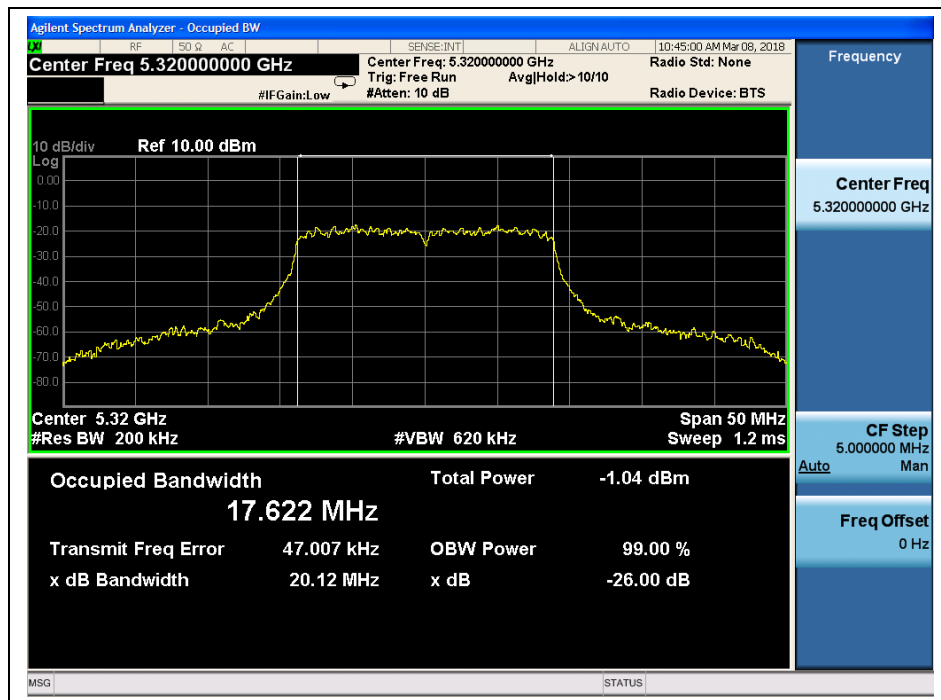
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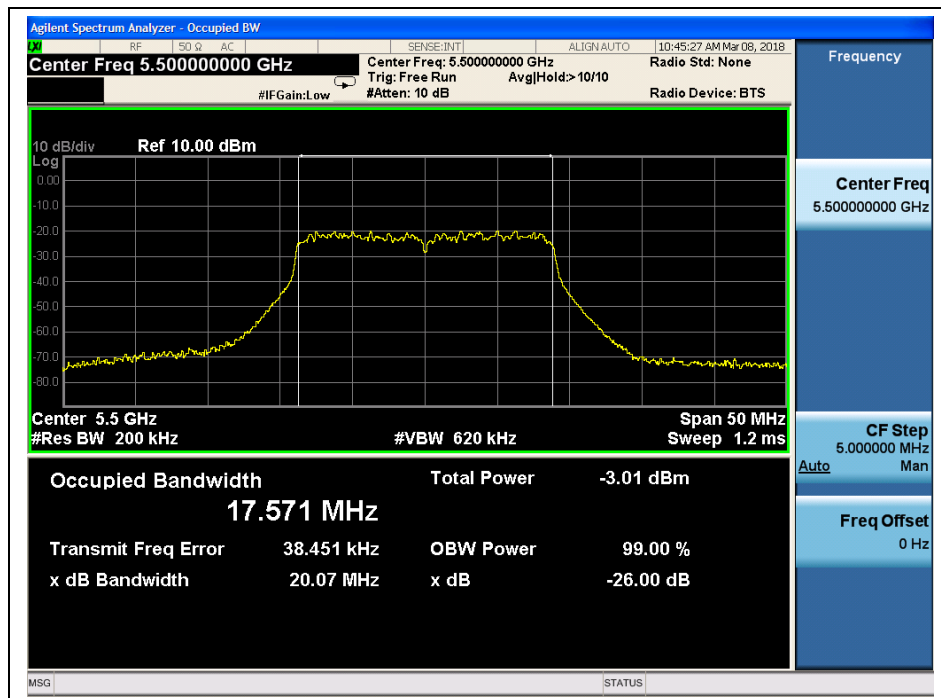
(Channel 52, 5260MHz, 802.11n (HT20), ANT J3)



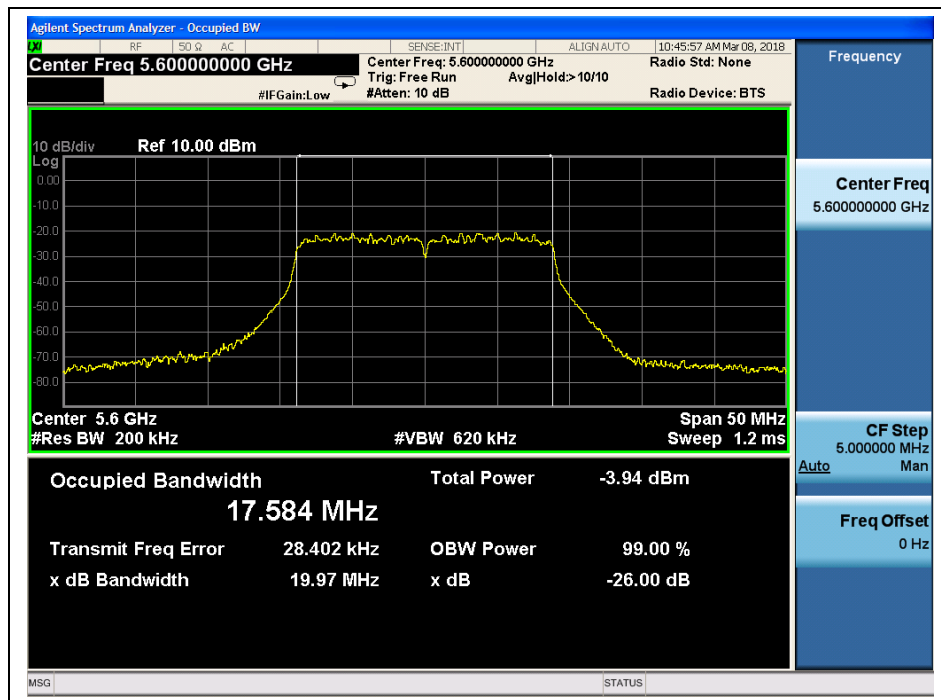
(Channel 60, 5300 MHz, 802.11n (HT20), ANT J3)



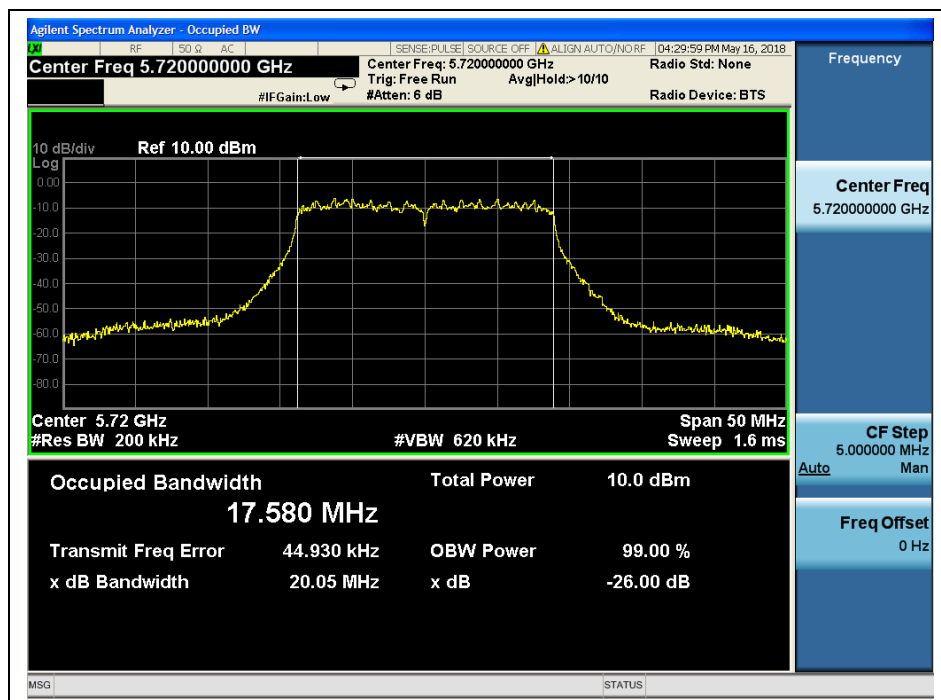
(Channel 64, 5320MHz, 802.11 n (HT20), ANT J3)



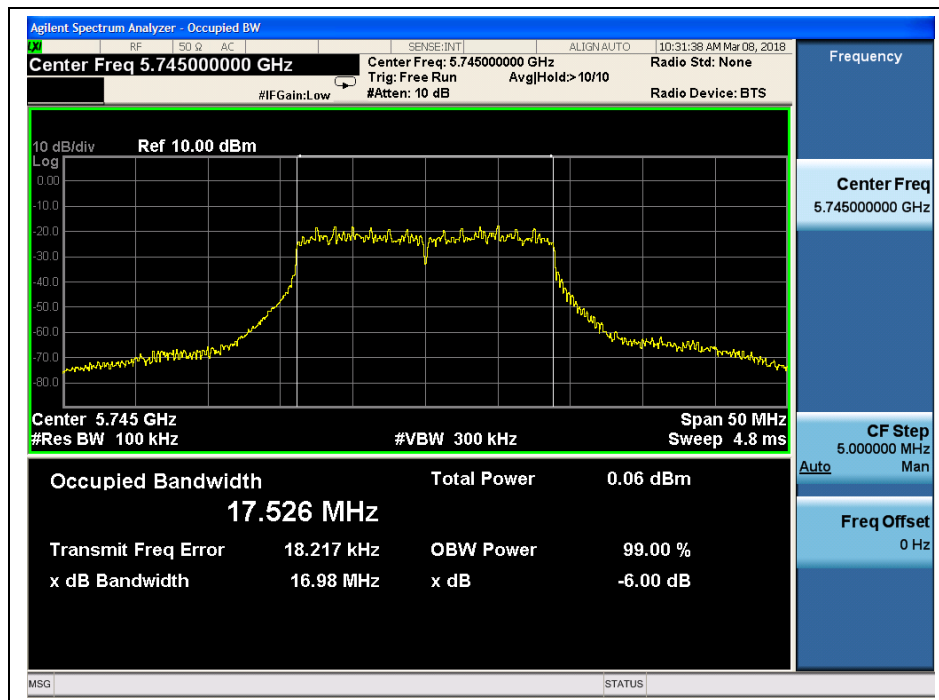
(Channel 100, 5500MHz, 802.11n (HT20), ANT J3)



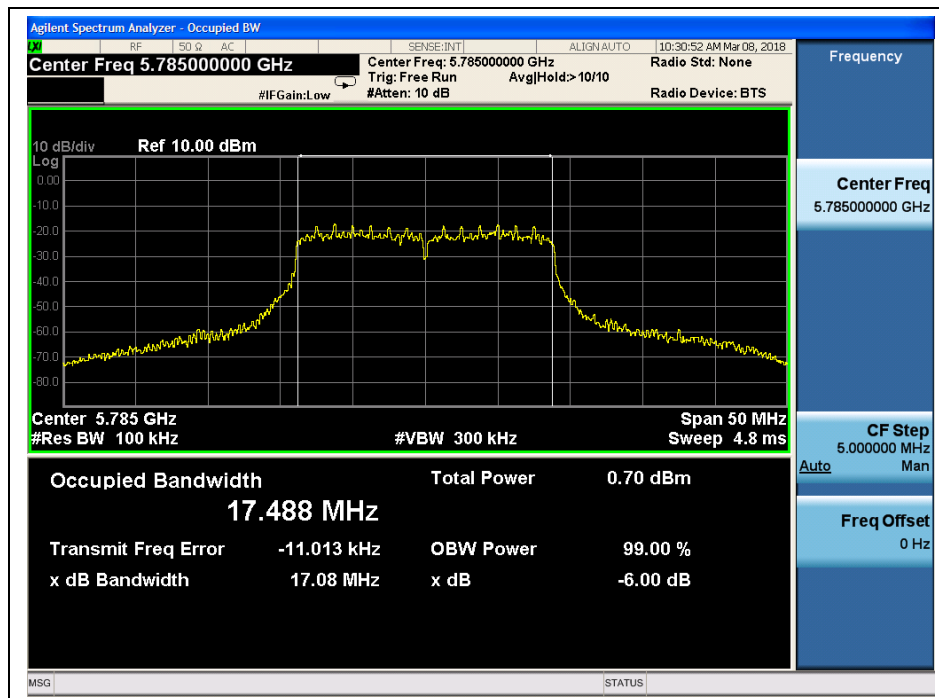
(Channel 120, 5600 MHz, 802.11n (HT20), ANT J3)



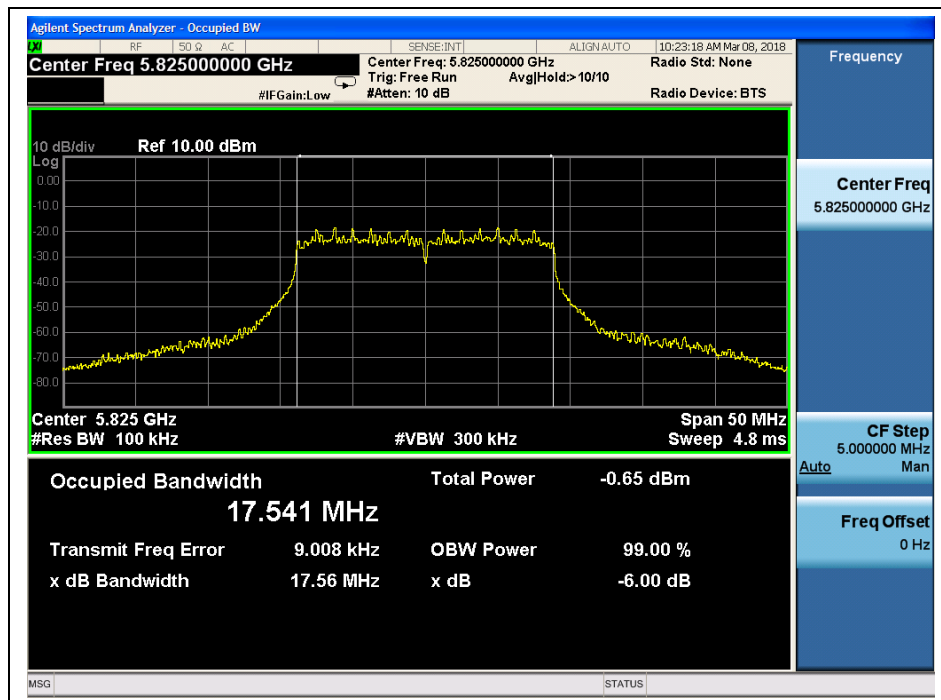
(Channel 144, 5720MHz, 802.11 n (HT20), ANT J3)



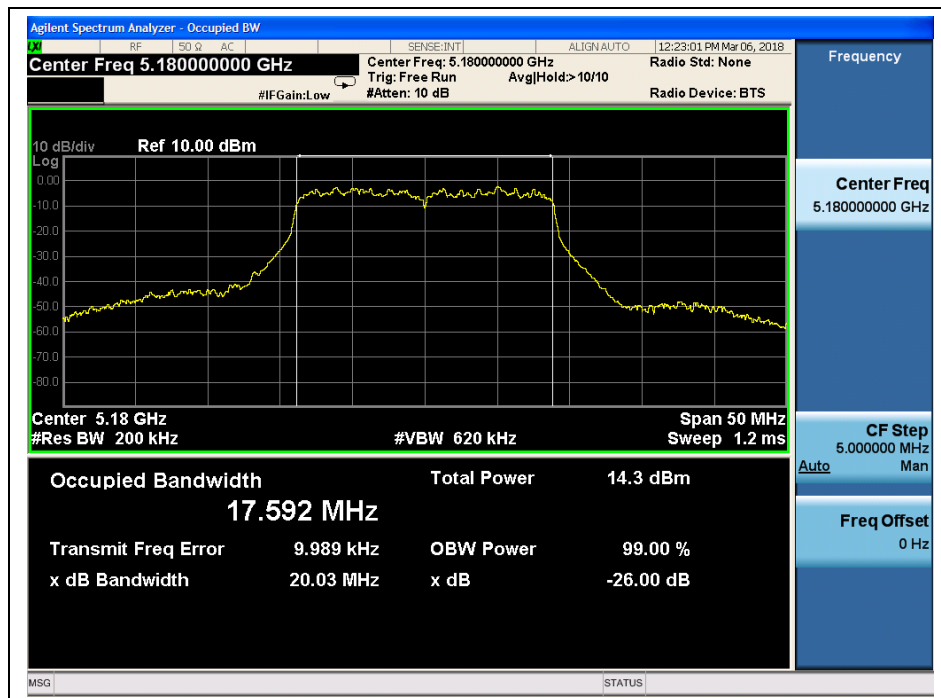
(Channel 149, 5745MHz, 802.11 n (HT20), ANT J3)



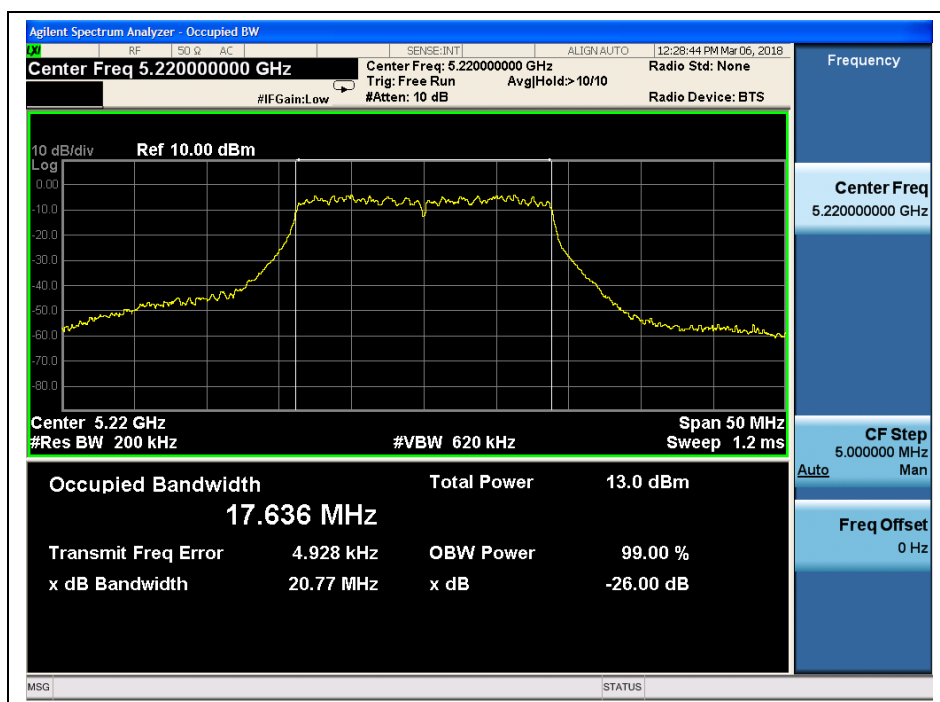
(Channel 157, 5785MHz, 802.11 n (HT20), ANT J3)



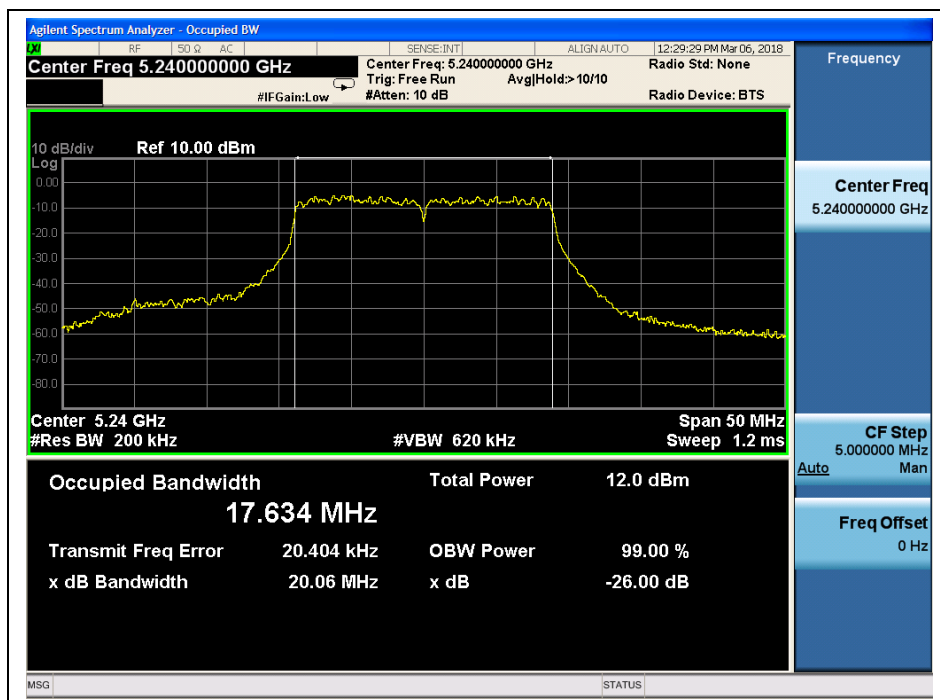
(Channel 165, 5825MHz, 802.11 n (HT20), ANT J3)



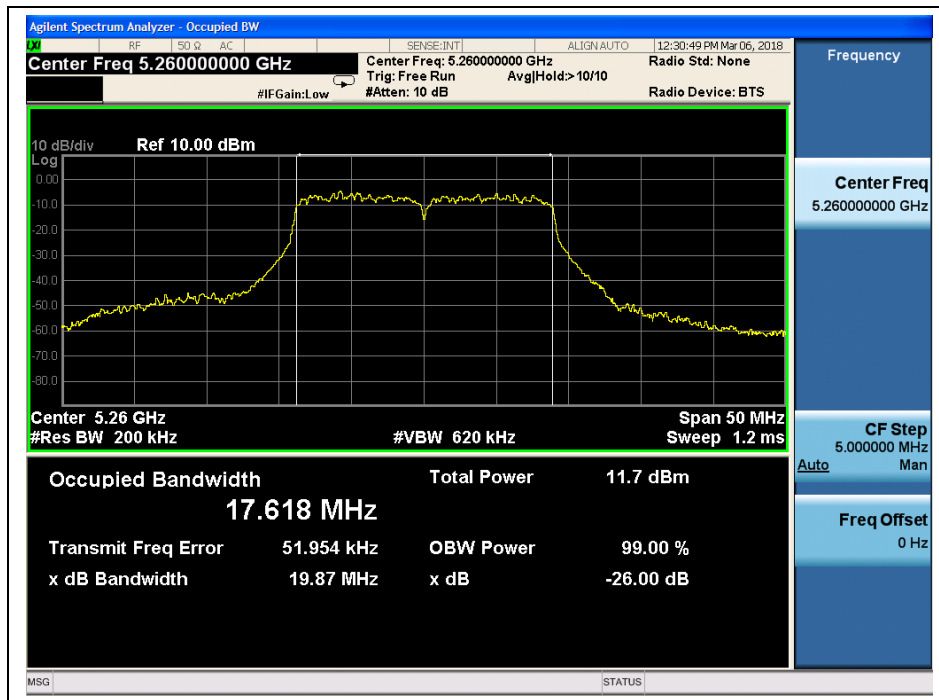
(Channel 36, 5180MHz, 802.11 n (HT20), ANT J4)



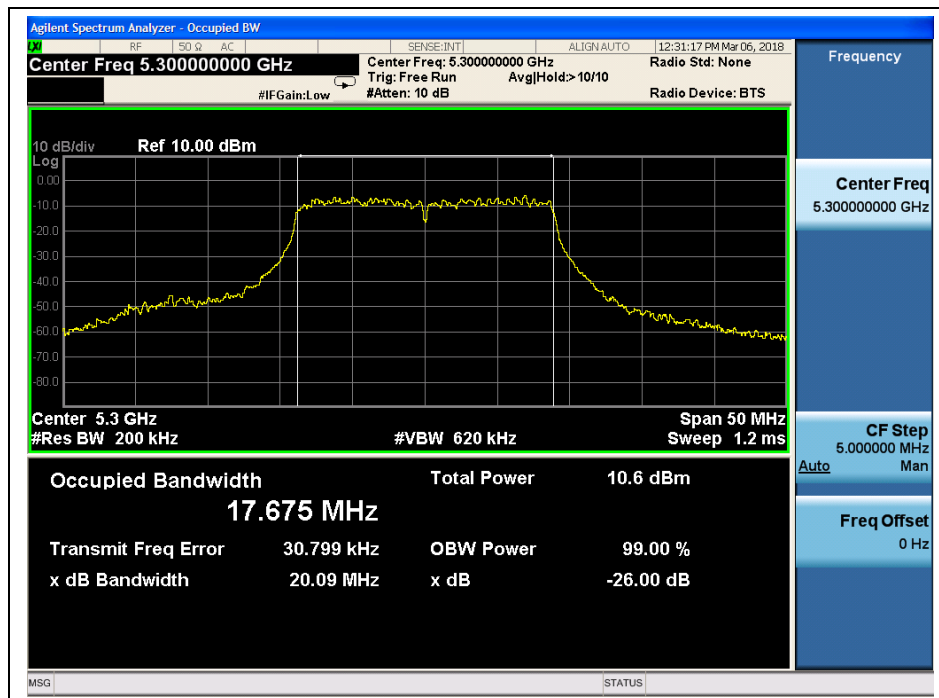
(Channel 44, 5220 MHz, 802.11 n (HT20), ANT J4)



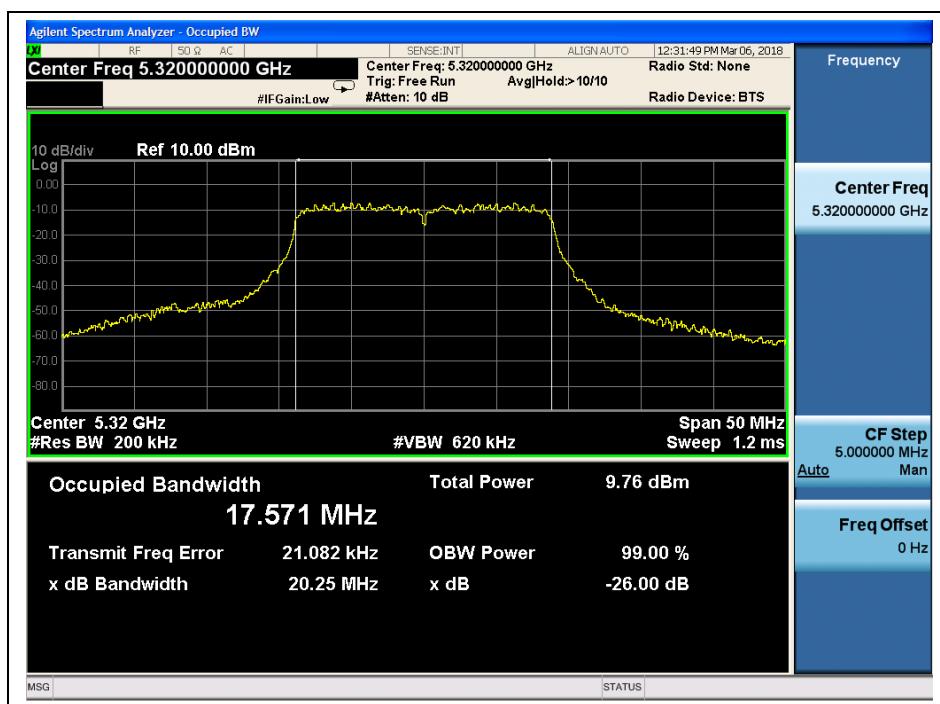
(Channel 48, 5240MHz, 802.11 n (HT20), ANT J4)



(Channel 52, 5260MHz, 802.11n (HT20), ANT J4)



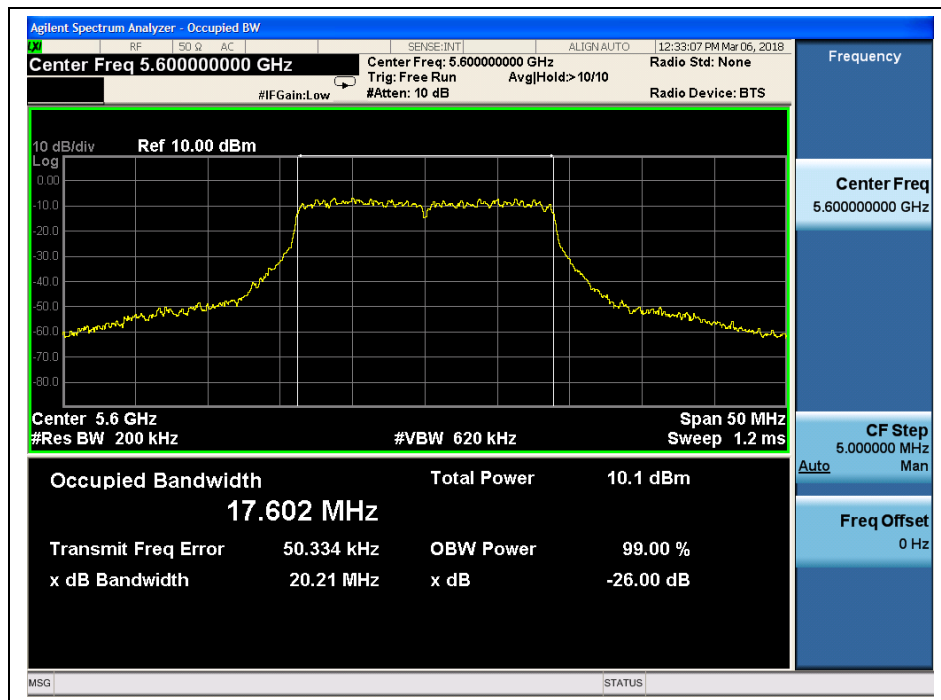
(Channel 60, 5300 MHz, 802.11n (HT20), ANT J4)



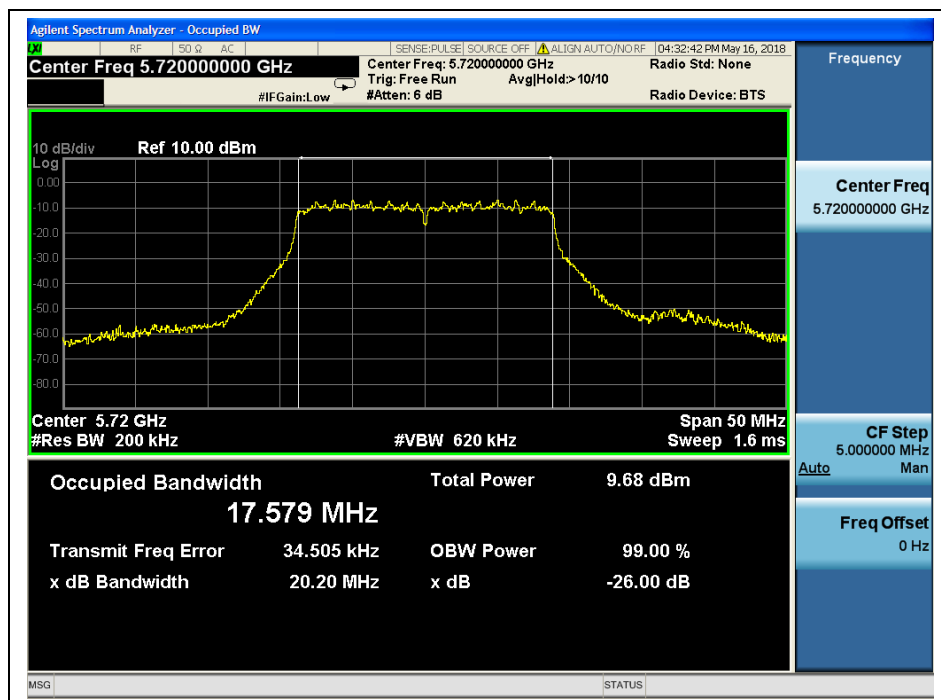
(Channel 64, 5320MHz, 802.11 n (HT20), ANT J4)



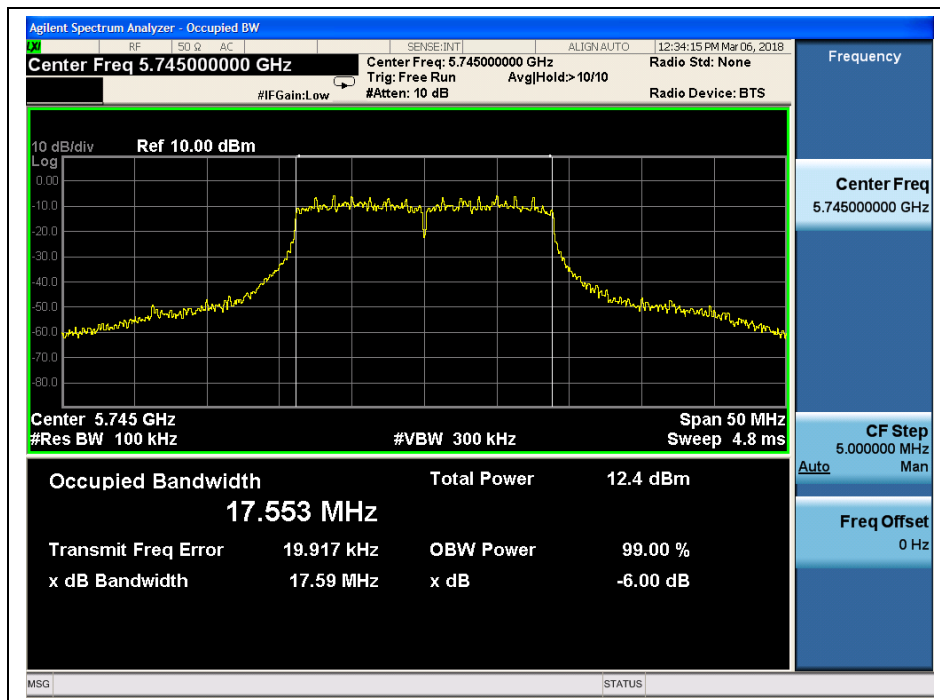
(Channel 100, 5500MHz, 802.11n (HT20), ANT J4)



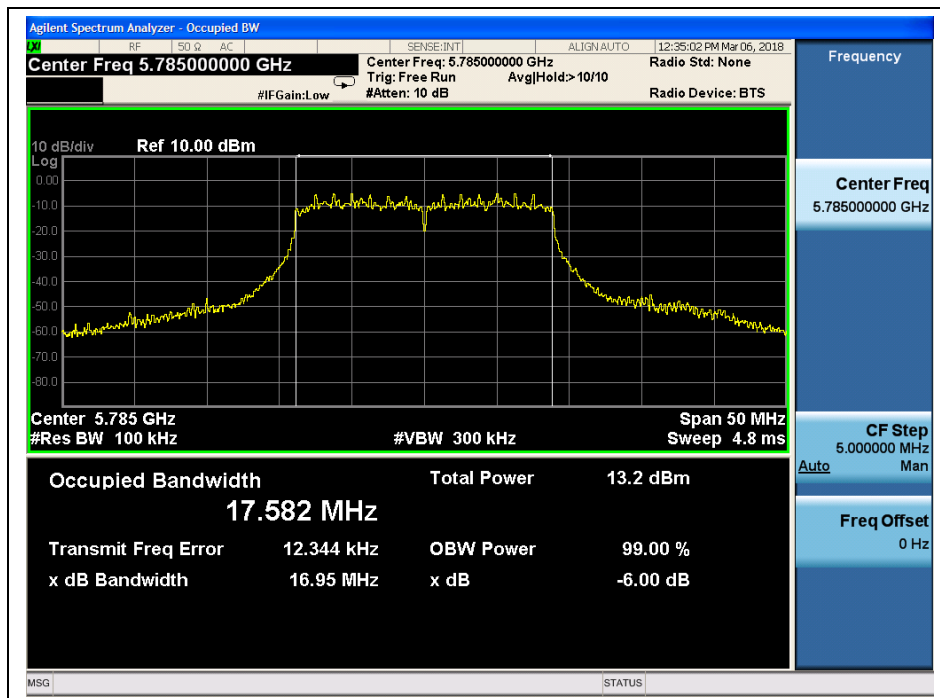
(Channel 120, 5600 MHz, 802.11n (HT20), ANT J4)



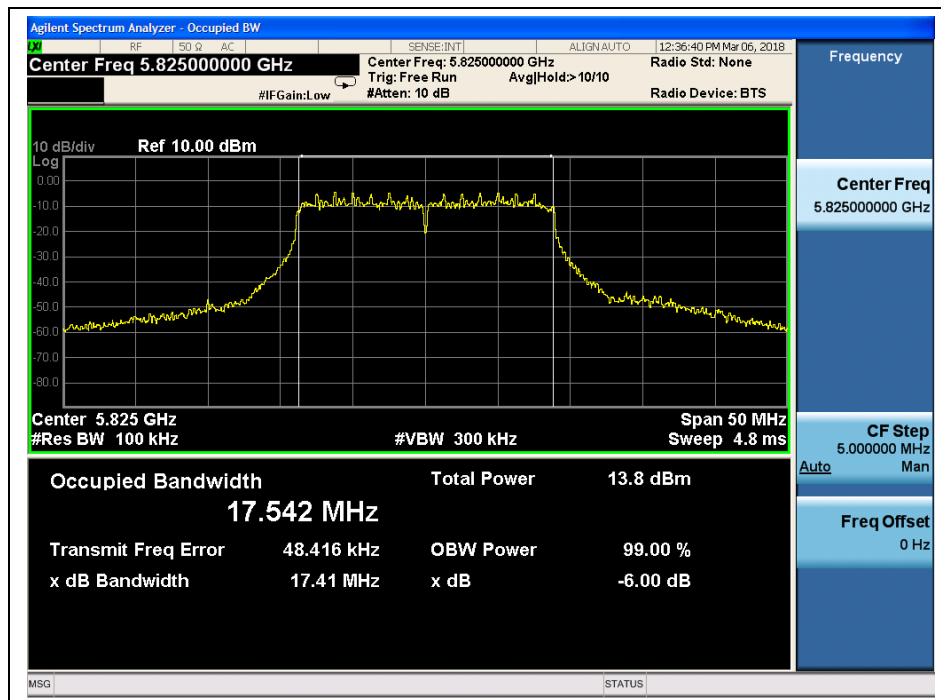
(Channel 144, 5720MHz, 802.11 n (HT20), ANT J4)



(Channel 149, 5745MHz, 802.11 n (HT20), ANT J4)



(Channel 157, 5785MHz, 802.11 n (HT20), ANT J4)



(Channel 165, 5825MHz, 802.11 n (HT20), ANT J4)

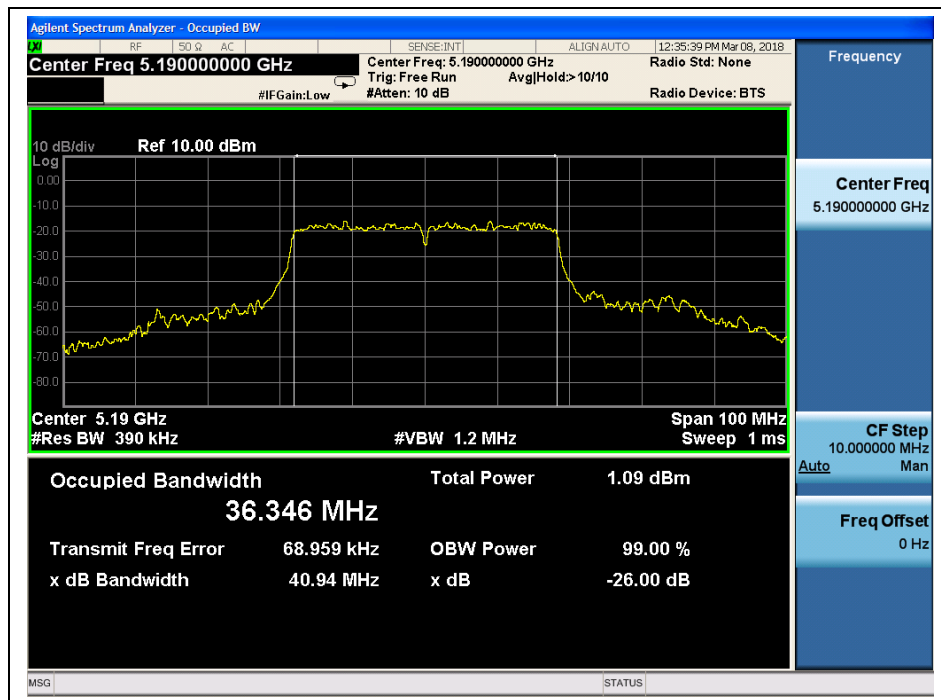


802.11n (HT40) Test mode

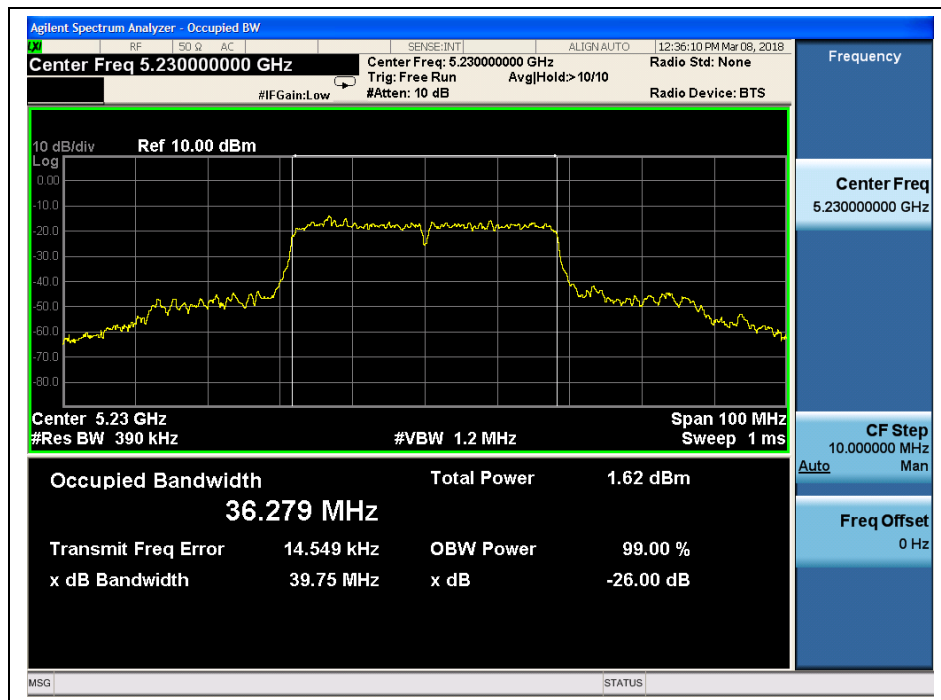
A. Test Verdict:

Channel	Frequency (MHz)	ANT J3 26 dB Bandwidth (MHz)	ANT J4 26 dB Bandwidth (MHz)
38	5190	40.94	41.34
46	5230	39.75	41.39
54	5270	41.61	40.84
62	5310	40.89	41.00
102	5510	40.23	41.13
126	5630	40.33	40.63
142	5710	40.34	40.17
Channel	Frequency (MHz)	ANT J3 6dB Bandwidth (MHz)	ANT J4 6dB Bandwidth (MHz)
151	5755	35.70	35.57
159	5795	35.62	35.80

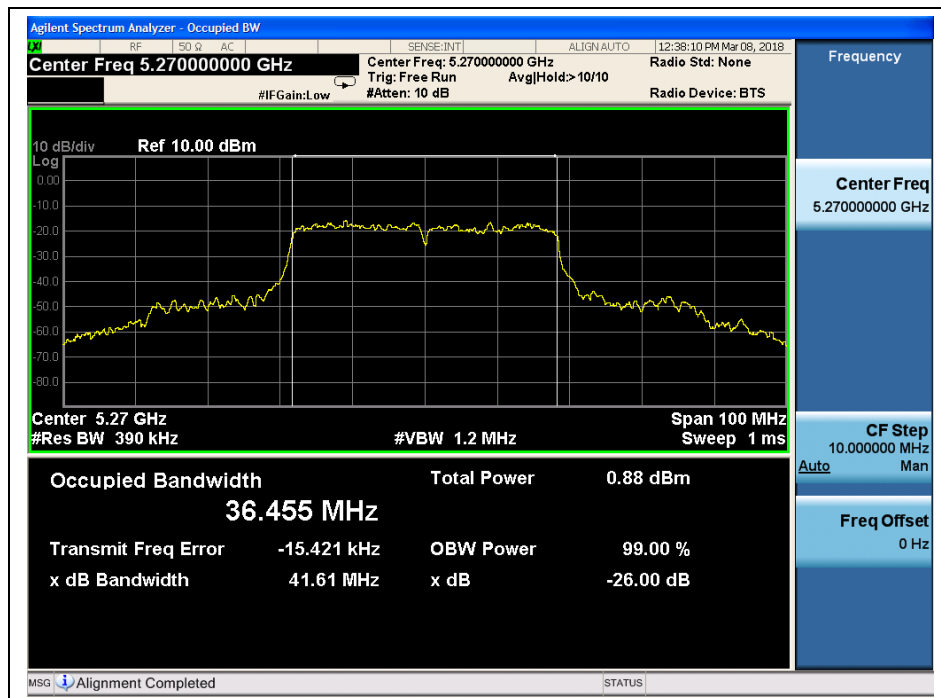
B. Test Plots



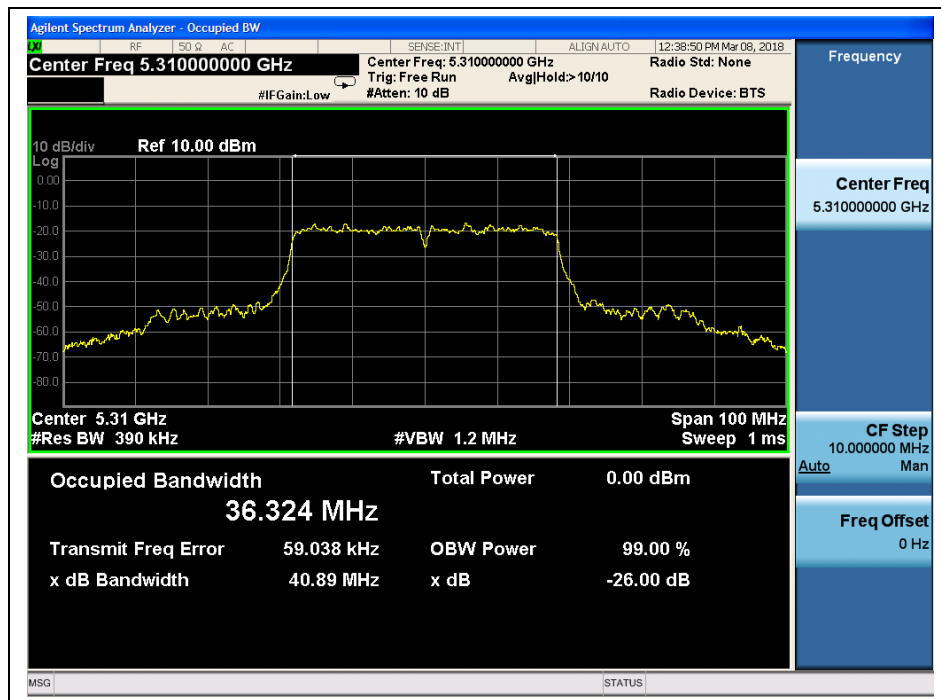
(Channel 38, 5190MHz, 802.11n (HT40), ANT J3)



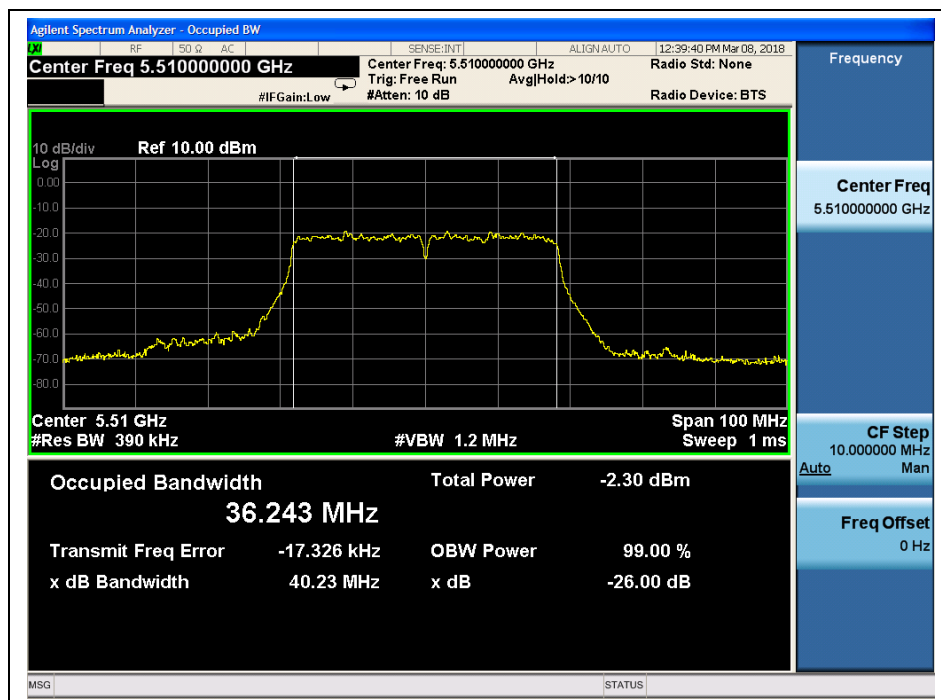
(Channel 46, 5230 MHz, 802.11n (HT40), ANT J3)



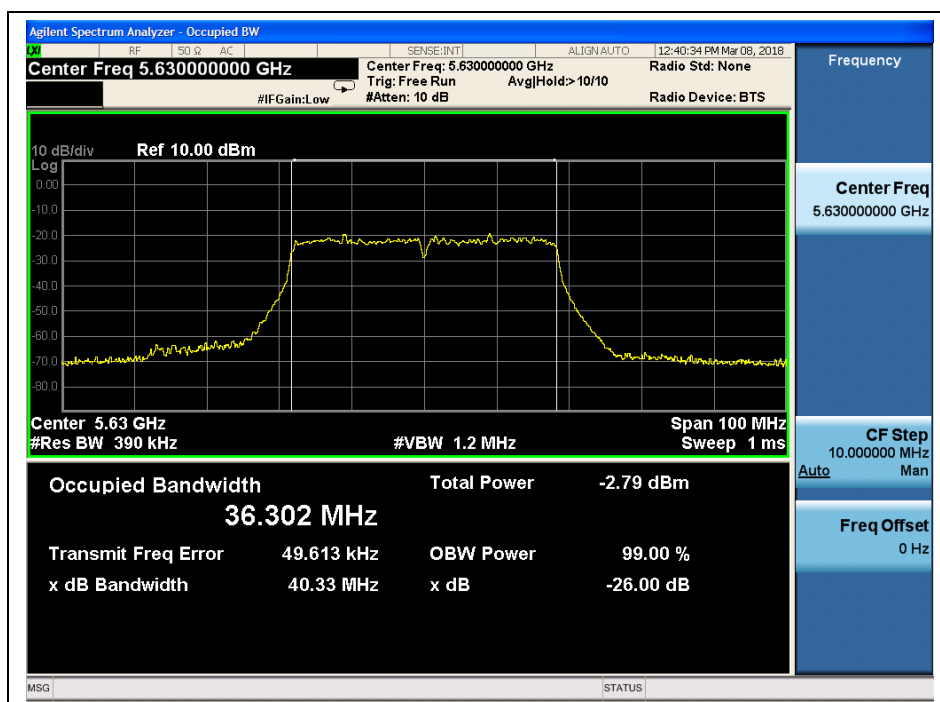
(Channel 54, 5270MHz, 802.11n (HT40), ANT J3)



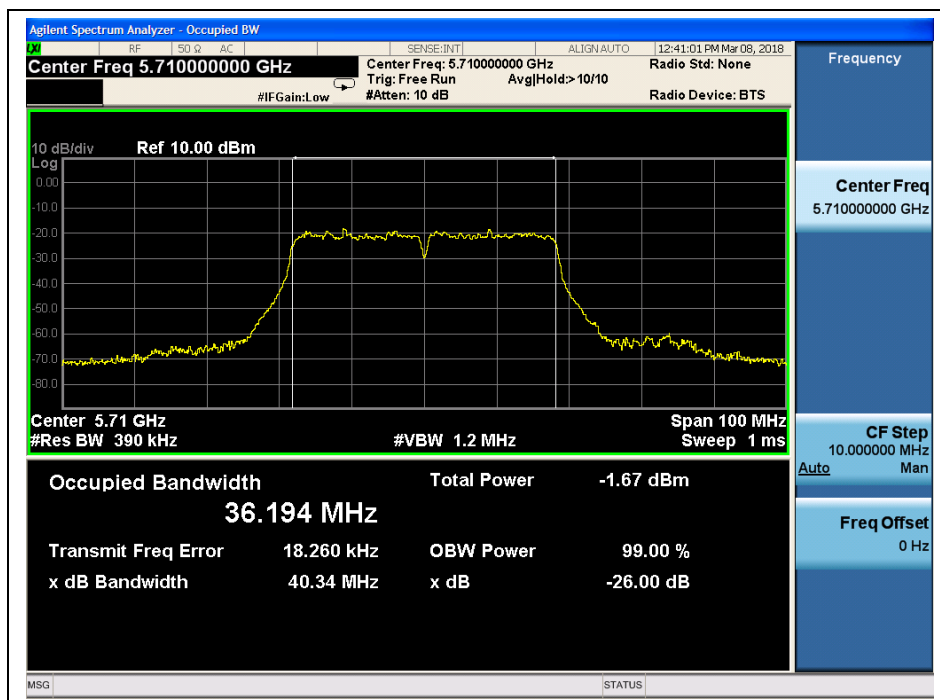
(Channel 62, 5310 MHz, 802.11n (HT40), ANT J3)



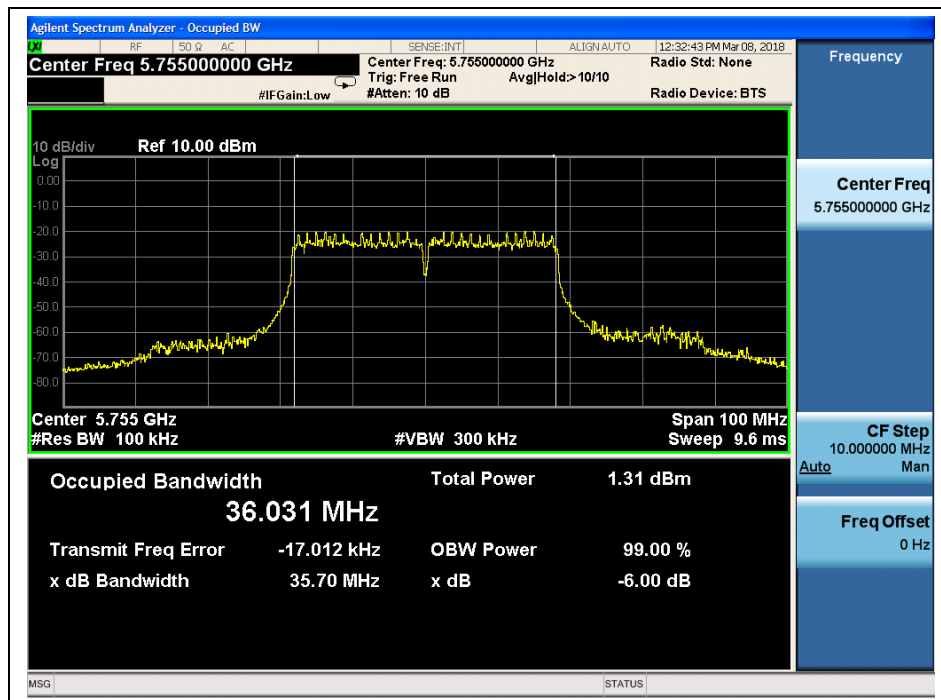
(Channel 102, 5510 MHz, 802.11n (HT40), ANT J3)



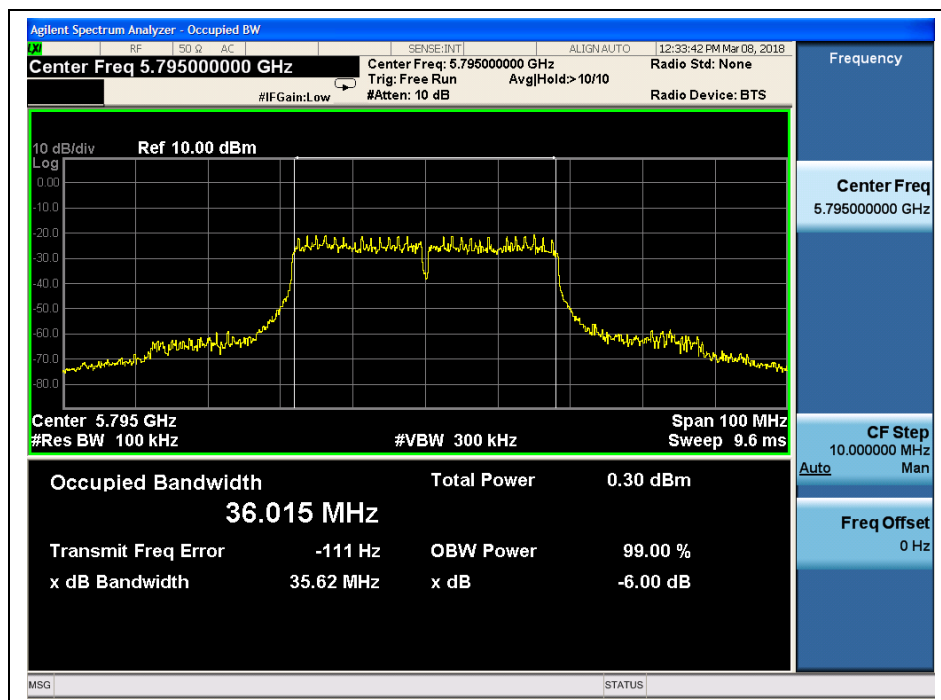
(Channel 126, 5630MHz, 802.11n (HT40), ANT J3)



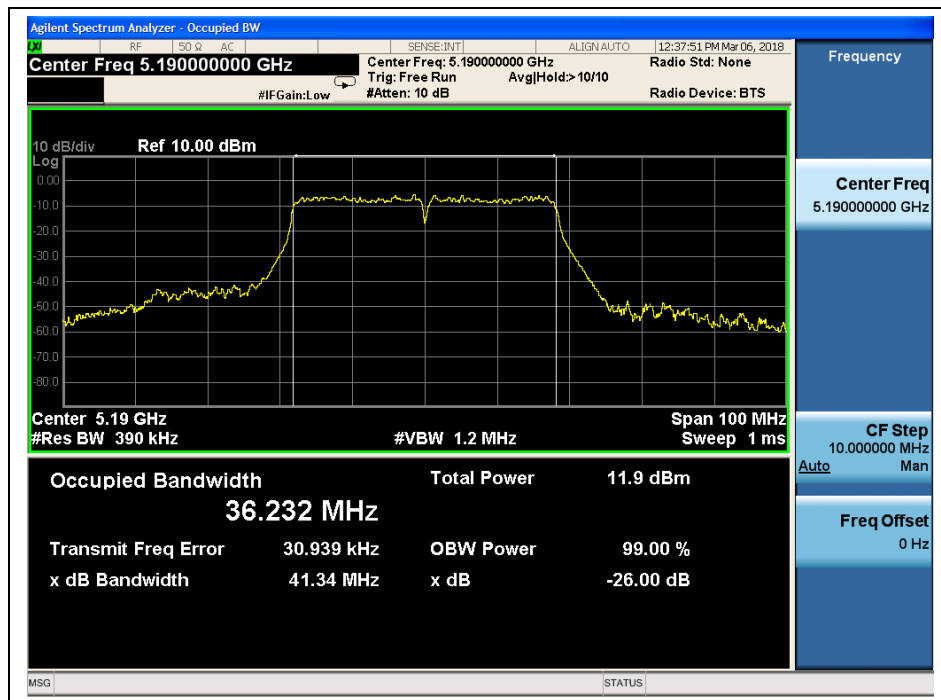
(Channel 142, 5710MHz, 802.11n (HT40), ANT J3)



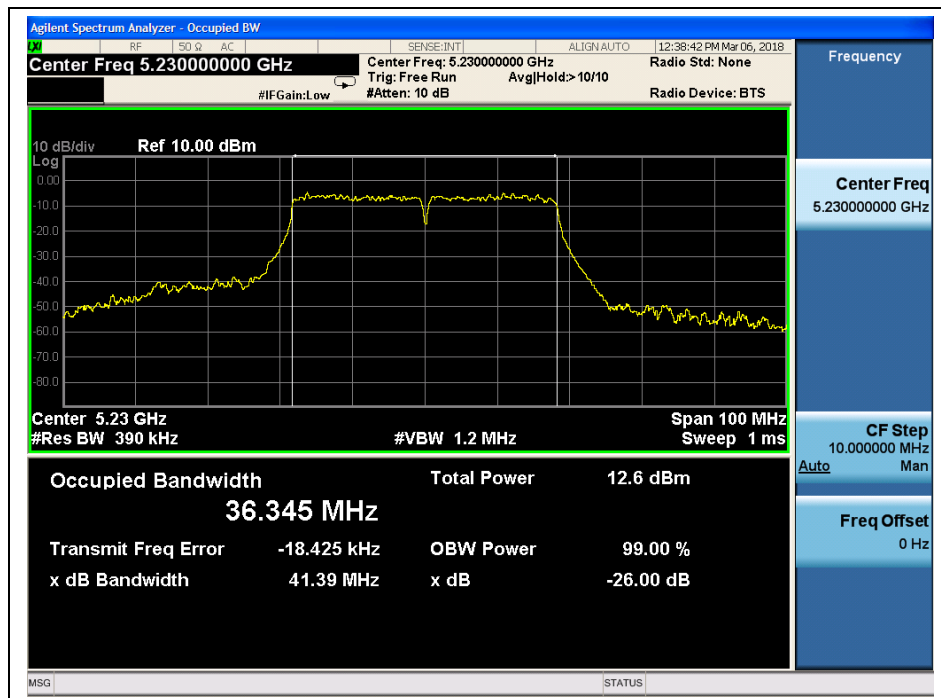
(Channel 151, 5755 MHz, 802.11n (HT40), ANT J3)



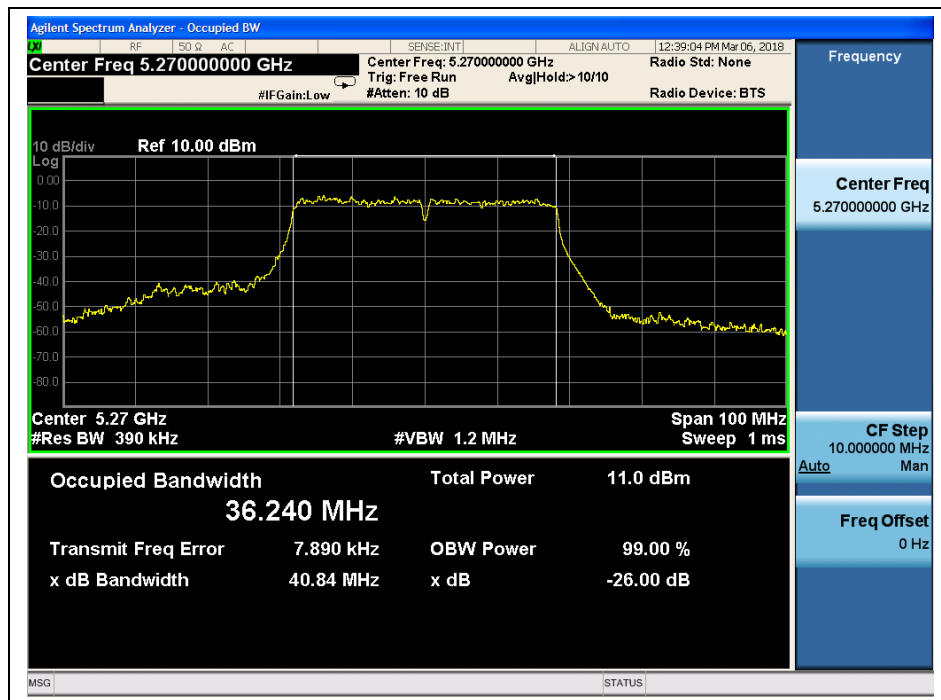
(Channel 159, 5795MHz, 802.11n (HT40), ANT J3)



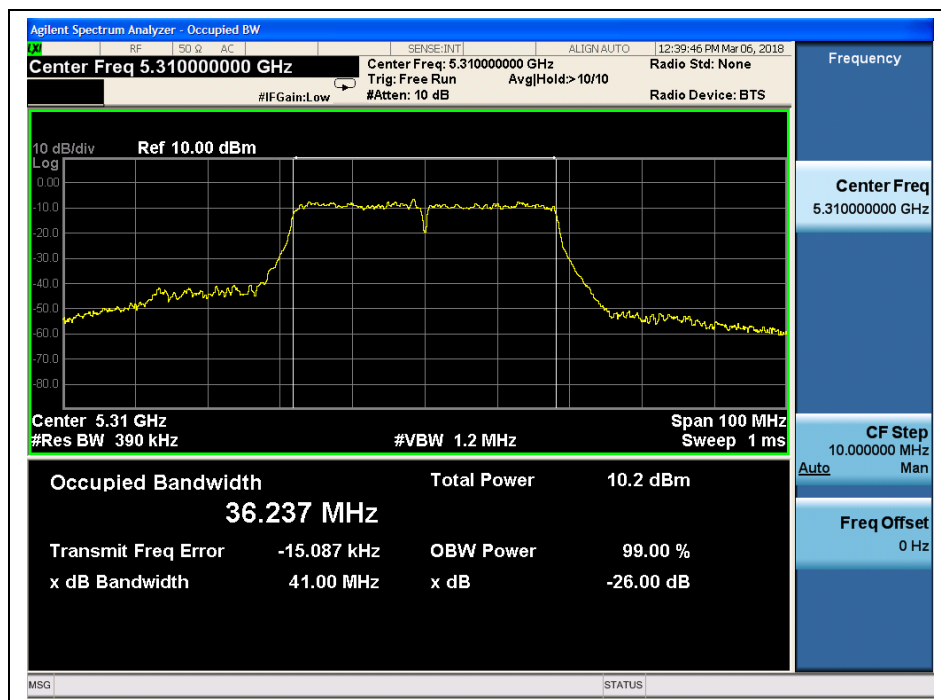
(Channel 38, 5190MHz, 802.11n (HT40), ANT J4)



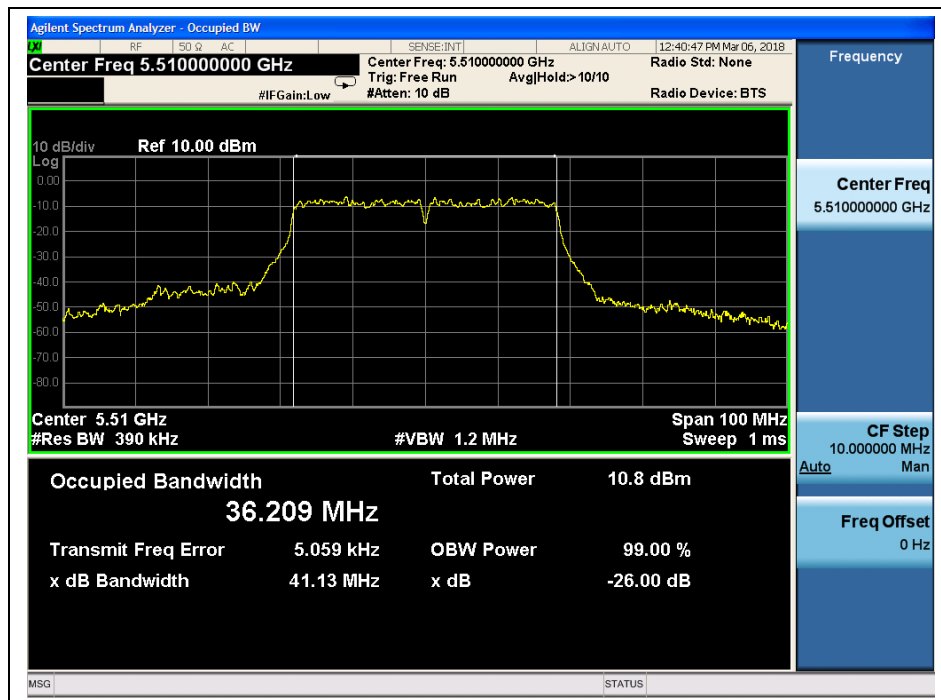
(Channel 46, 5230 MHz, 802.11n (HT40), ANT J4)



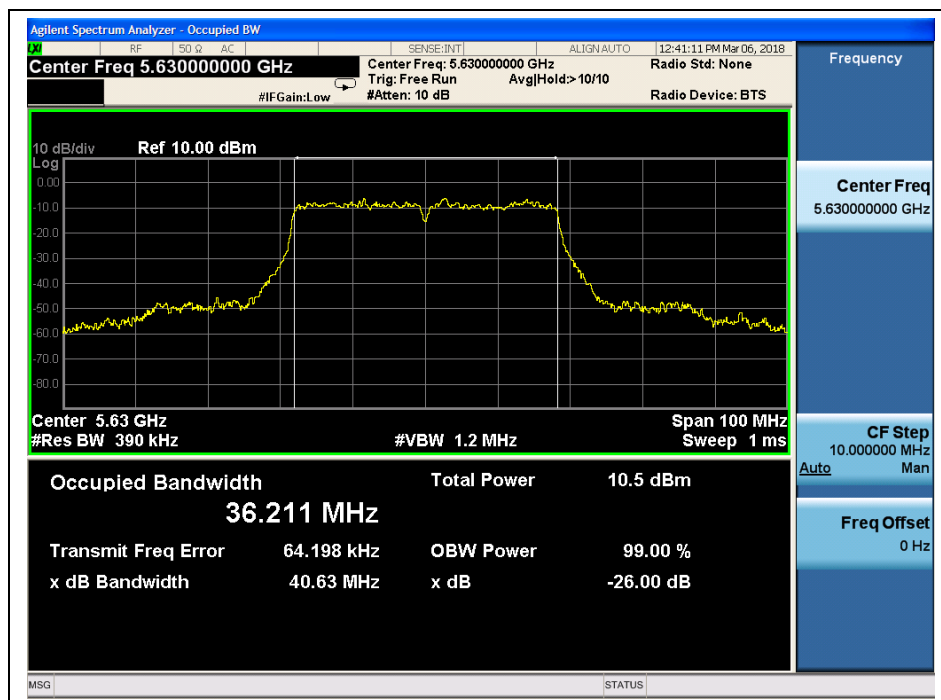
(Channel 54, 5270MHz, 802.11n (HT40), ANT J4)



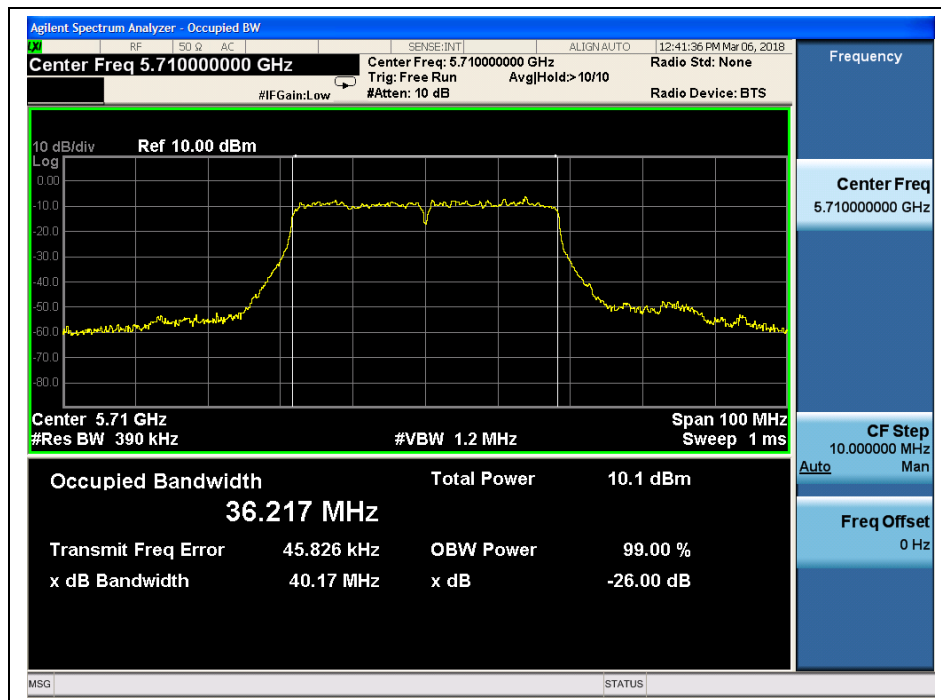
(Channel 62, 5310 MHz, 802.11n (HT40), ANT J4)



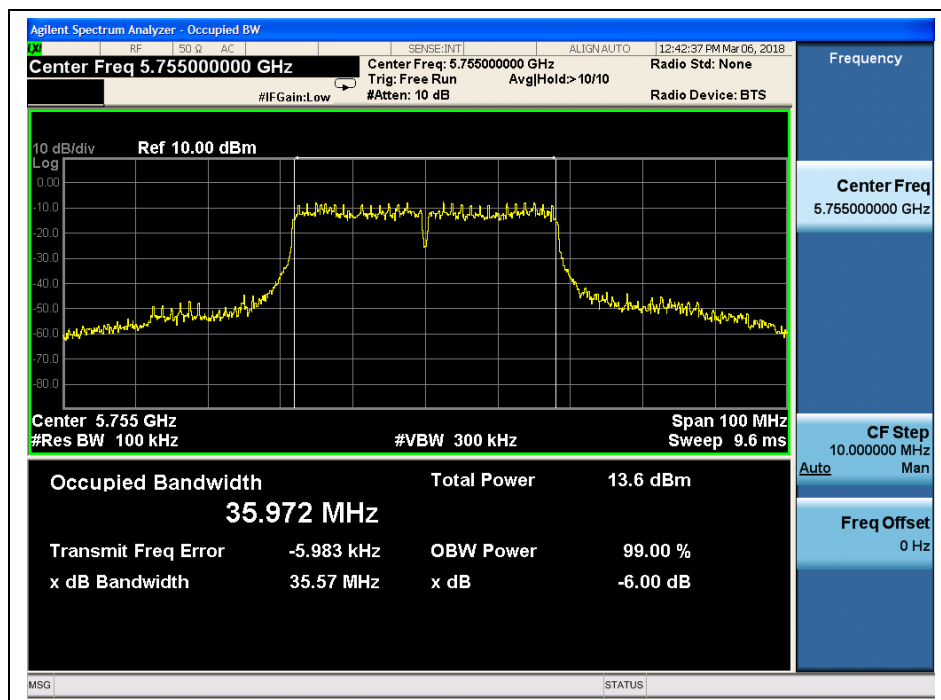
(Channel 102, 5510 MHz, 802.11n (HT40), ANT J4)



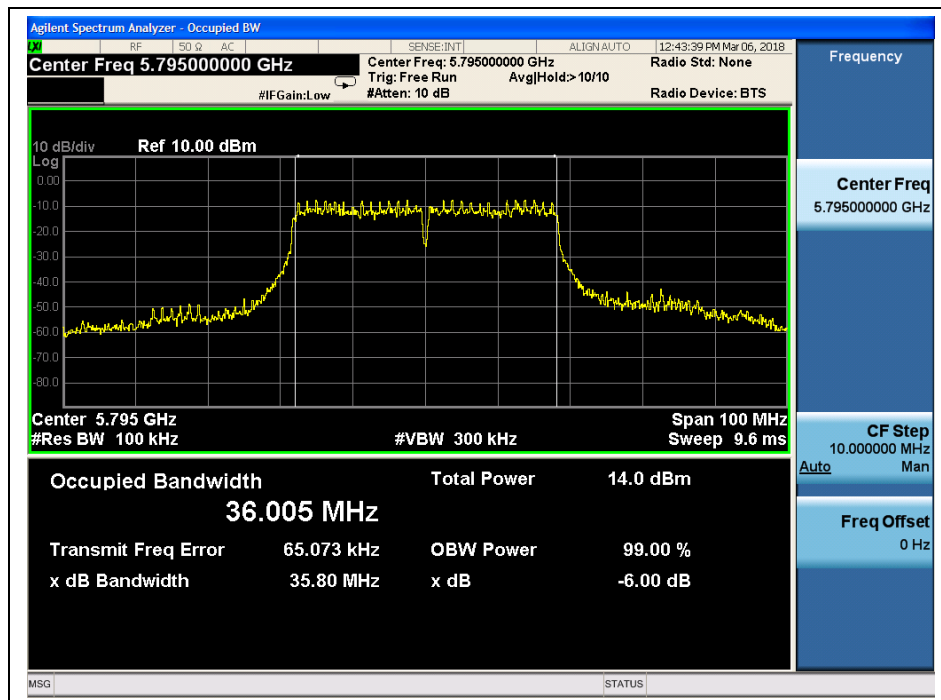
(Channel 126, 5630MHz, 802.11n (HT40), ANT J4)



(Channel 142, 5710MHz, 802.11n (HT40), ANT J4)



(Channel 151, 5755 MHz, 802.11n (HT40), ANT J4)



(Channel 159, 5795MHz, 802.11n (HT40), ANT J4)

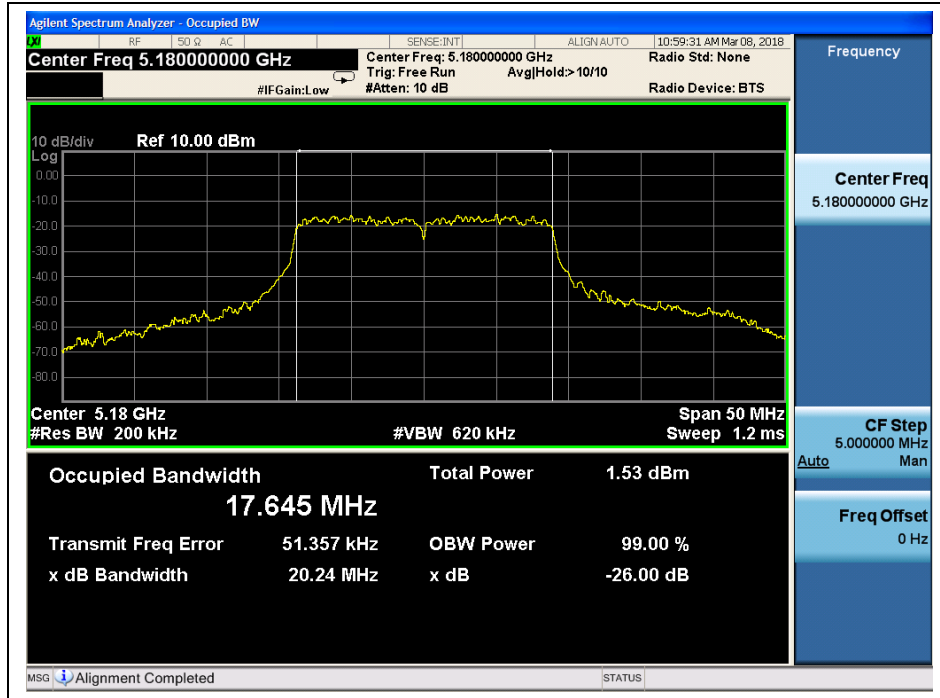
802.11ac (VHT20) Test mode**A. Test Verdict:**

Channel	Frequency (MHz)	ANT J3 26 dB Bandwidth (MHz)	ANT J4 26 dB Bandwidth (MHz)
36	5180	20.24	20.27
44	5220	20.21	19.79
48	5240	20.28	19.99
52	5260	21.09	20.20
60	5300	20.68	20.19
64	5320	20.05	20.10
100	5500	20.28	19.94
120	5600	19.90	20.13
144	5720	19.84	20.25
Channel	Frequency (MHz)	ANT J3 6dB Bandwidth (MHz)	ANT J4 6dB Bandwidth (MHz)
149	5745	17.25	17.44
157	5785	17.14	17.61

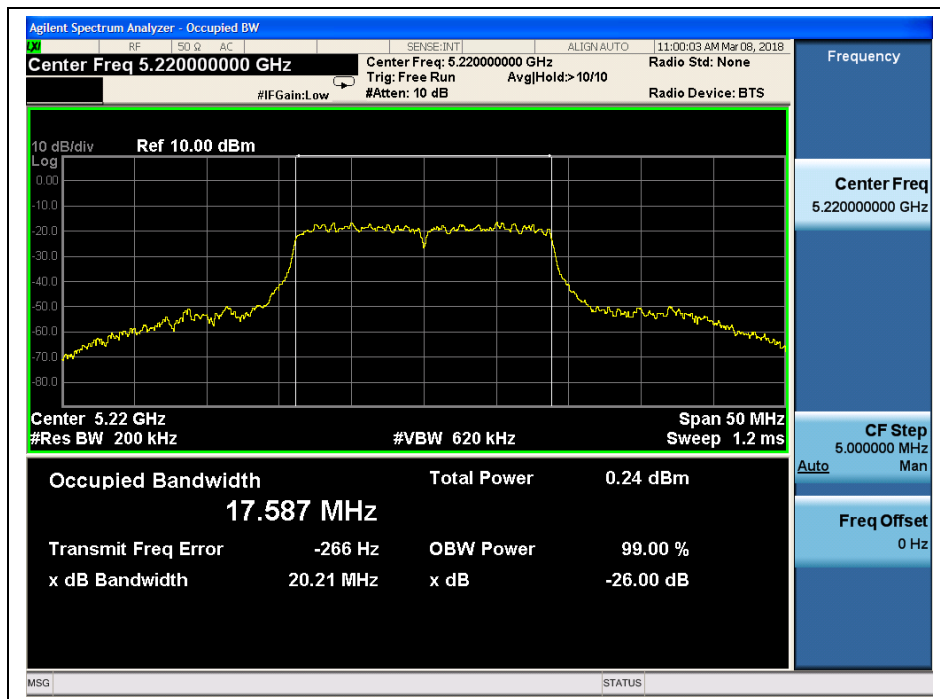


Channel	Frequency (MHz)	ANT J3 26 dB Bandwidth (MHz)	ANT J4 26 dB Bandwidth (MHz)
165	5825	16.71	17.06

B. Test Plots

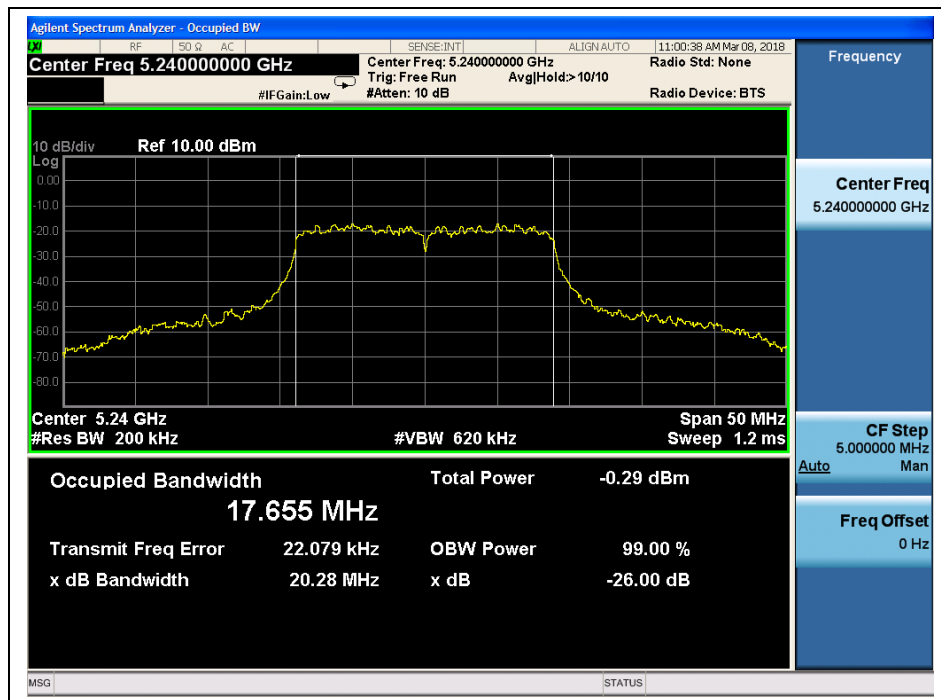


(Channel 36, 5180MHz, 802.11ac (VHT20), ANT J3)

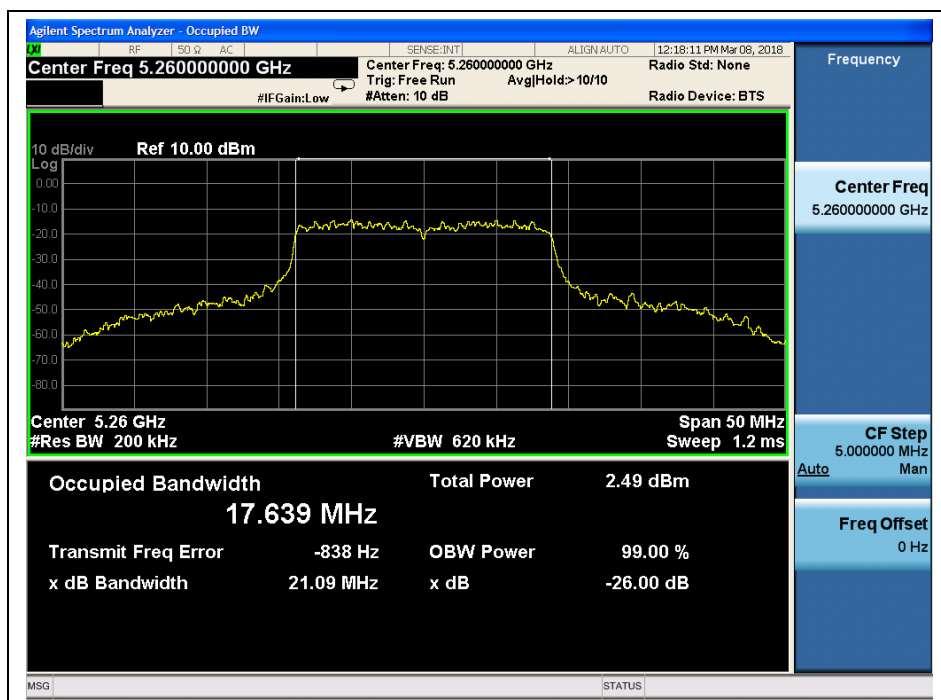




(Channel 44, 5220 MHz, 802.11ac (VHT20), ANT J3)

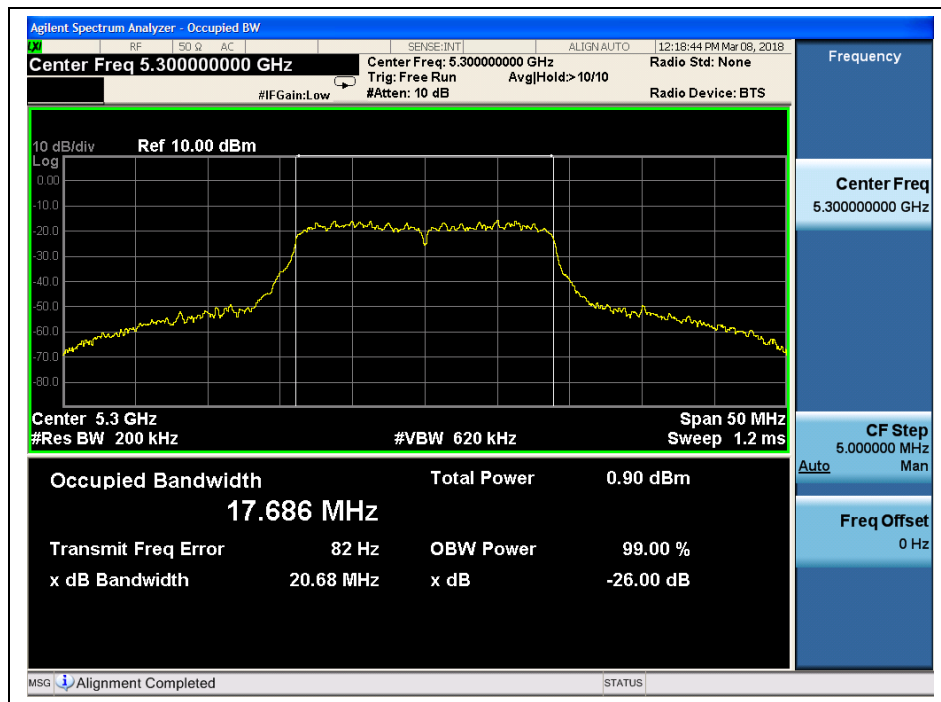


(Channel 48, 5240MHz, 802.11 ac (VHT20), ANT J3)

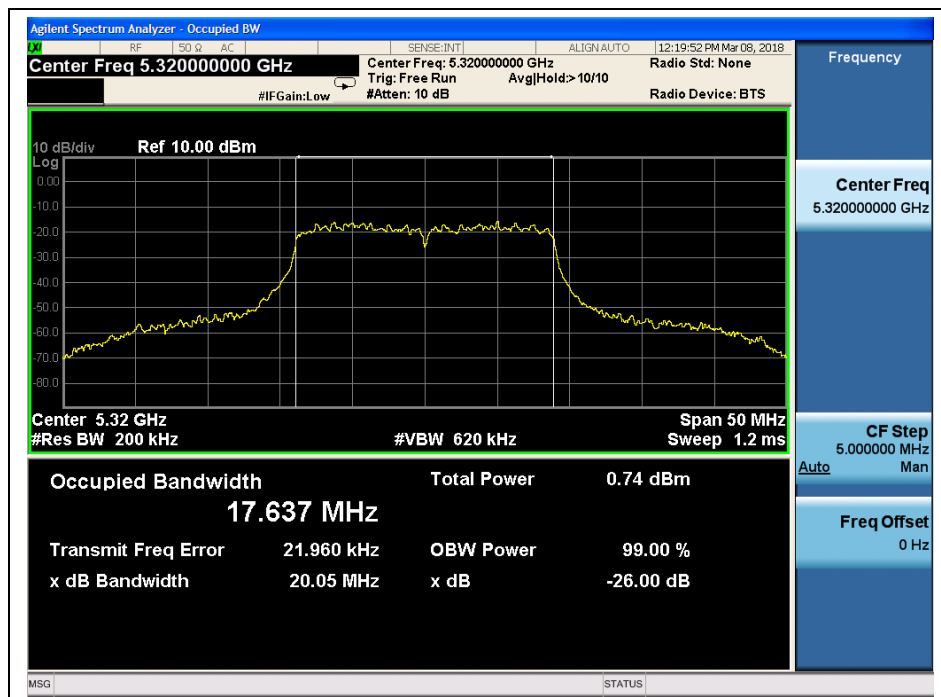




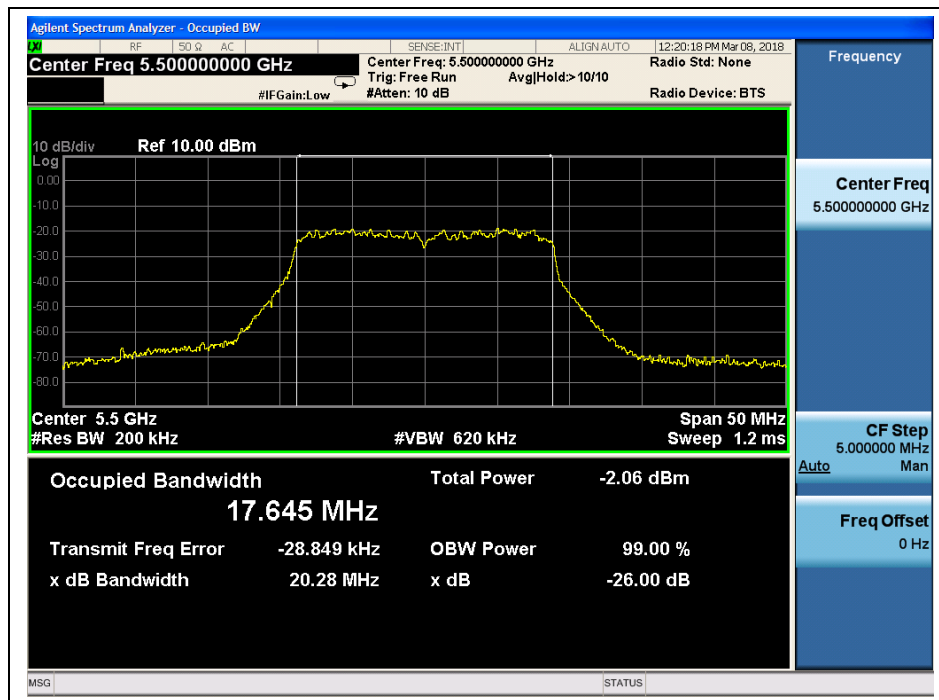
(Channel 52, 5260MHz, 802.11ac (VHT20), ANT J3)



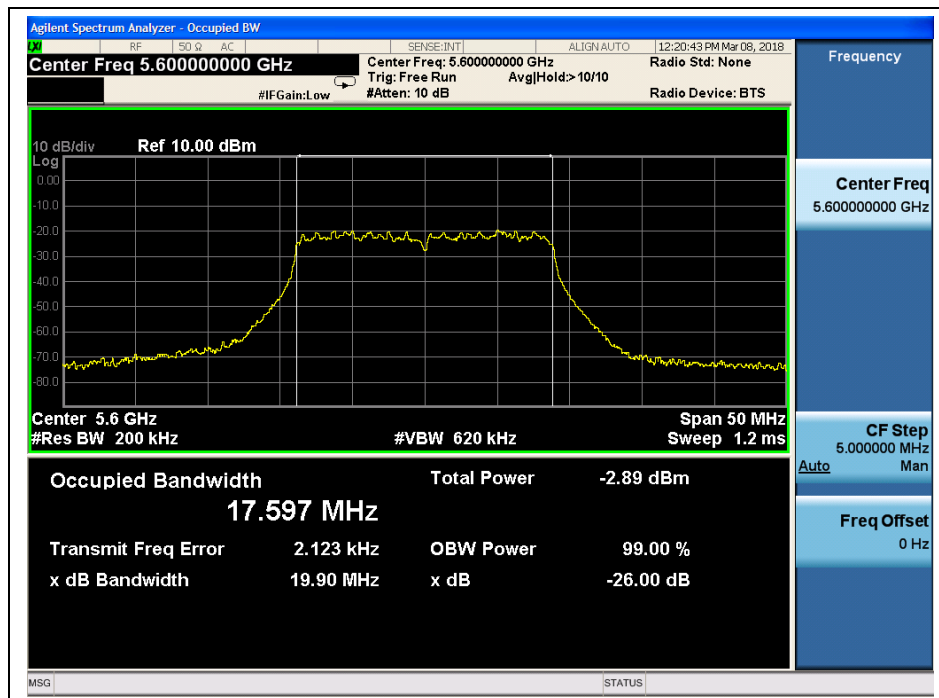
(Channel 60, 5300 MHz, 802.11ac (VHT20), ANT J3)



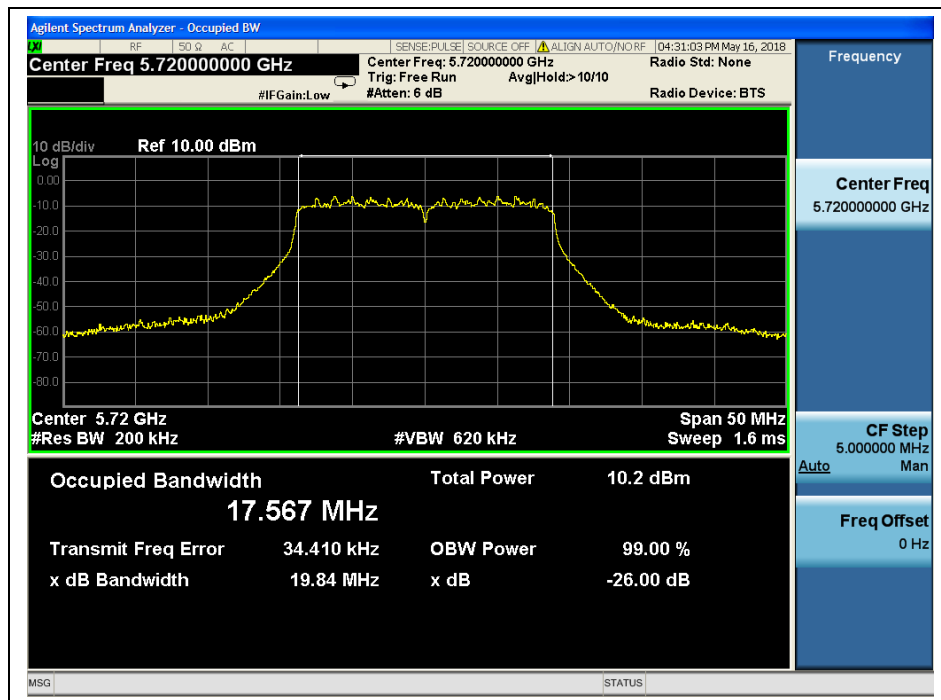
(Channel 64, 5320MHz, 802.11 ac (VHT20), ANT J3)



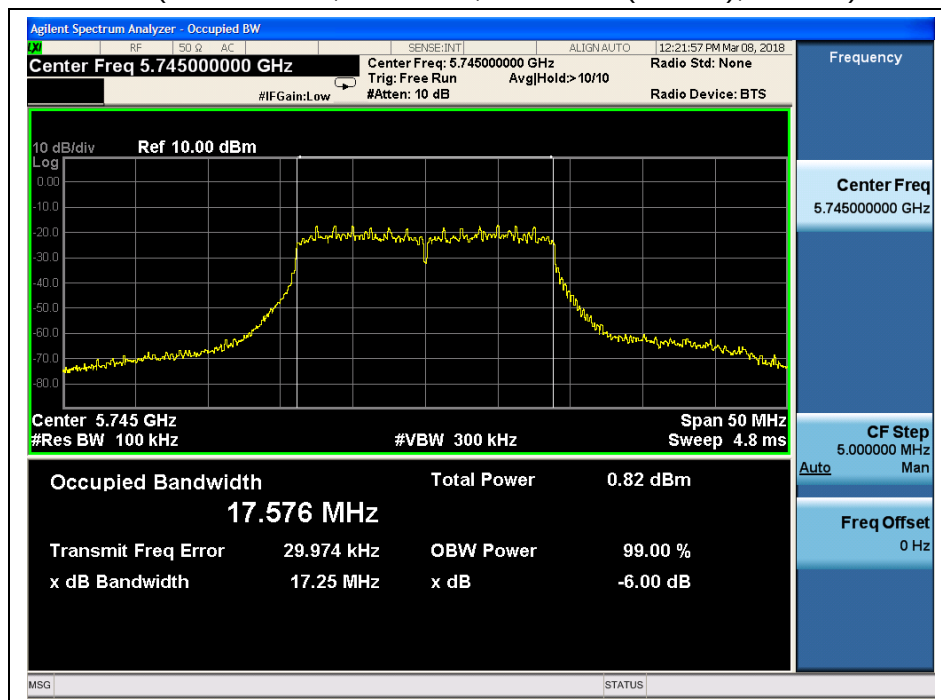
(Channel 100, 5500MHz, 802.11ac (VHT20), ANT J3)



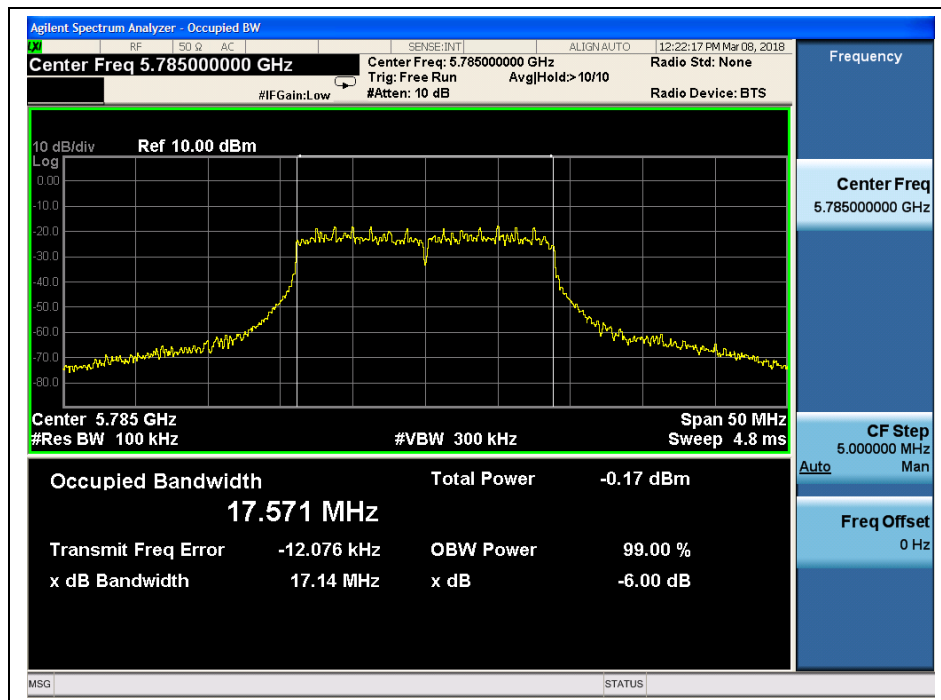
(Channel 120, 5600 MHz, 802.11ac (VHT20), ANT J3)



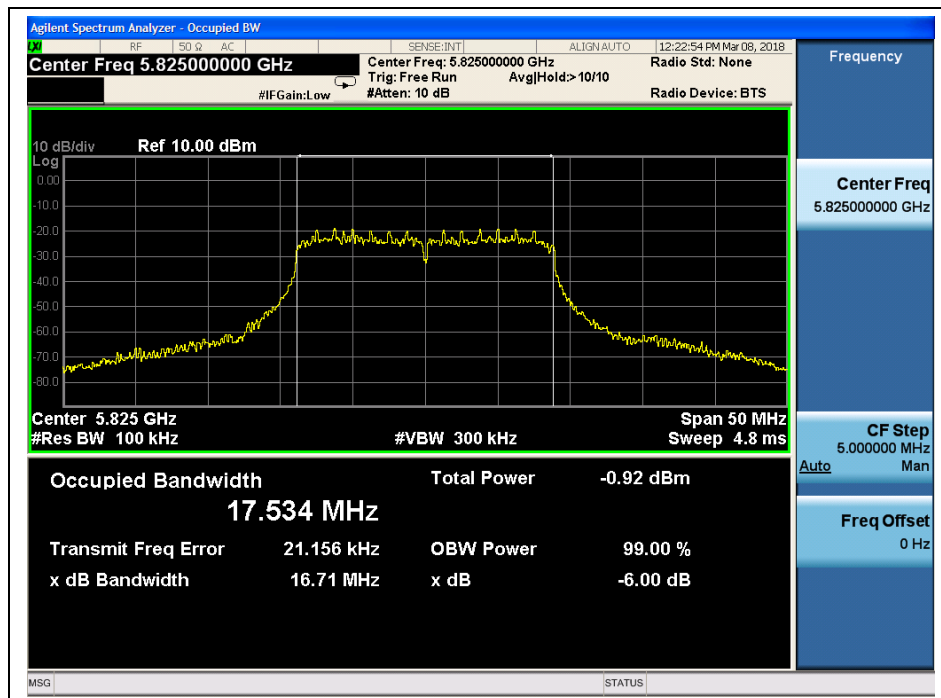
(Channel 144, 5720MHz, 802.11 ac (VHT20), ANT J3)



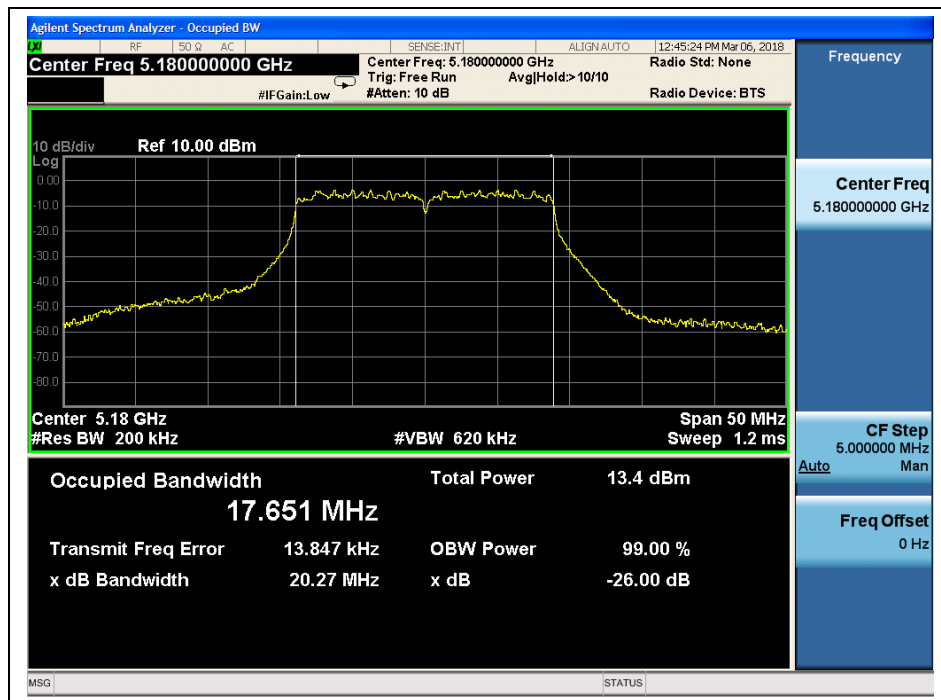
(Channel 149, 5745MHz, 802.11 ac (VHT20), ANT J3)



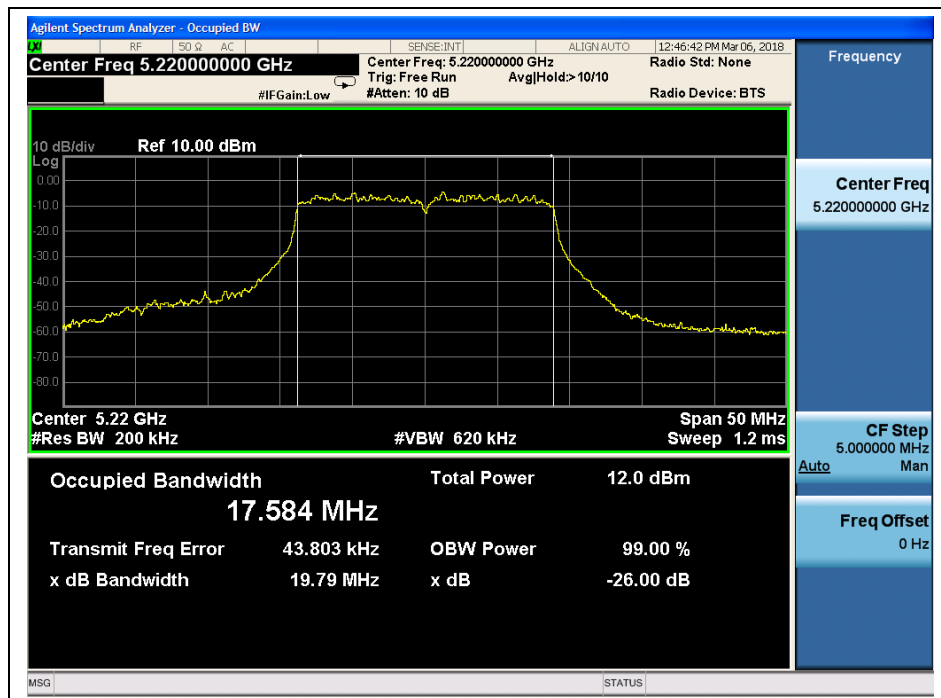
(Channel 157, 5785MHz, 802.11 ac (VHT20), ANT J3)



(Channel 165, 5825MHz, 802.11 ac (VHT20), ANT J3)



(Channel 36, 5180MHz, 802.11 ac (VHT20), ANT J4)



(Channel 44, 5220 MHz, 802.11 ac (VHT20), ANT J4)