

TEST REPORT For FCC

FCC Standards : FCC 47CFR part 15 subpart E
Industry Canada Standards :RSS-247 Issue 1 & RSS-GEN Issue 4

Test Report No. : CTK-2016-01235
Date of Issue : 2016-10-13
FCC ID : A3LWEA412H
Certification Number IC : 649E-WEA412H
Model/Type No. : WEA412h
Kind of Product : WLAN Access Point
Applicant : Samsung Electronics Co., Ltd.
Applicant Address : 129, Samsung-ro Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea, 16677
Manufacturer : Samsung Electronics Co., Ltd.
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Telephone : +82-31-279-4443
Received Date : 2016-09-13
Test period : Start : 2016-09-21 End : 2016-10-12

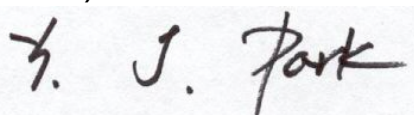
The test results presented in this report relate only to the object tested.

Tested by



Won-Jae, Hwang
Test Engineer
Date: 2016-10-13

Reviewed by



Young-Joon, Park
Technical Manager
Date: 2016-10-13

REPORT REVISION HISTORY

Date	Revision	Page No
2016-10-13	Issued (CTK-2016-01235)	All

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1.0 General Product Description

Equipment model name	WEA412h					
Serial number	Prototype					
EUT condition	Pre-production, not damaged					
Frequency Range	UNII 1 : 5180 MHz – 5240 MHz (20 MHz_BW) 5190 MHz – 5230 MHz (40 MHz_BW) 5210 MHz (80 MHz_BW) UNII 3 : 5745 MHz – 5825 MHz (20 MHz_BW) 5755 MHz – 5795 MHz (40 MHz_BW) 5775 MHz (80 MHz)					
RF output power :						
Band	Mode	Channel Bandwidth (MHz)	Frequency Range (MHz)	ANT1 (SISO)	ANT2 (SISO)	ANT1+2 (MIMO)
				RF output power (dBm)		
UNII 1	802.11a	20	5180 – 5240	14.98	15.01	18.01
	802.11n	20	5180 – 5240	14.96	14.74	17.80
	802.11n	40	5190 – 5230	14.52	14.22	17.38
	802.11ac	20	5180 – 5240	15.37	15.10	18.25
	802.11ac	40	5190 – 5230	14.55	14.20	17.39
	802.11ac	80	5210	13.81	14.10	16.97
UNII 3	802.11a	20	5745 – 5825	14.70	14.93	17.80
	802.11n	20	5745 – 5825	15.14	15.47	18.27
	802.11n	40	5755 – 5795	15.48	15.44	18.47
	802.11ac	20	5745 – 5825	14.47	14.89	17.70
	802.11ac	40	5755 – 5795	15.41	15.37	18.40
	802.11ac	80	5775	13.66	13.71	16.70
Transfer Rate	802.11a : 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n : up to 270 Mbps 802.11ac : up to 867 Mbps					
Type of Modulation	OFDM					
Power Source	DC 48 V(Adaptor,PoE)					
Duty Cycle	802.11a : 98.6 % 802.11n_HT20 : 98.6 % 802.11n_HT40 : 98.0 % 802.11ac_VHT20 : 98.6 % 802.11ac_VHT40 : 98.2 % 802.11ac_VHT80 : 96.0 %					
Antenna Type	PCB antenna					
Antenna Gain*	3.38 dBi(Ant1), 2.89 dBi(Ant2) @2.4GHz 5.73 dBi(Ant1), 4.85 dBi(Ant2) @5GHz					
Hardware Rev	PCS01C					
Software Rev	V4.4.6.R					

* This EUT is supported the two antenna port. Worst case is Ant1. So the worst data of Ant1 are shown.

1.1 Test mode

Test Item	Modulation	Data Rate
6 dB/26 dB/99% Bandwidth	802.11a	6 Mbps
Conducted Output Power	802.11n and 802.11ac	MCS 0
Power Spectral Density		
Frequency Stability		
Undesirable emission		
Radiated Emissions Above 1GHz	Nomal Mode	Auto
Radiated Emissions Below 1GHz		
AC Conducted Emissions		

1.2 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

1.3 Tested Frequency

802.11a, 802.11n_HT20, 802.11ac_VHT20

Frequency (MHz)	LOW	MID	HIGH
UNII 1	5180	5200	5240
UNII 3	5745	5785	5825

802.11n_HT40, 802.11ac_VHT40

Frequency (MHz)	LOW	MID	HIGH
UNII 1	5190	-	5230
UNII 3	5755	-	5795

802.11ac_VHT80

Frequency (MHz)	LOW	MID	HIGH
UNII 1	5210	-	-
UNII 3	5775	-	-

1.4 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.5 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	ProBook 650 G1	5CG5114KD2
AC/DC Adapter	HP	PPP012D-S	-
PoE Switch	DVR C&C Co., Ltd.	DS-SW04-TP60	-
AC/DC ADAPTOR	ACT CO.,LTD	AP36-48	-

1.6 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.

1.7 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 m & 10 m SAC and Conducted Test Site to perform FCC Part 15/18 measurements	 805871
JAPAN	VCCI	3 m & 10 m SAC and Conducted Test Site	 R-948, C-986, T-1843
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	 No. 51, KR0025
International	KOLAS	EMC	

2.0 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.407(e)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.407(a)	26 dB Bandwidth and 99% Bandwidth	NA		C
15.407(a)(1)	Conducted Output Power	< 1 W (5150 – 5250 MHz) < 1 W (5725 – 5850 MHz)		C
15.407(a)(1)	Power Spectral Density	< 17 dBm/MHz (5150 – 5250 MHz) < 30 dBm/500KHz (5725 – 5850 MHz)		C
15.407(g)	Frequency Stability	NA		C
15.407 (b)	Undesirable emission	< -27 dBm/MHz EIRP (5150 – 5250 MHz) < -17 dBm/MHz EIRP (5850 – 5860 MHz) < -27 dBm/MHz EIRP outside (5715 - 5850 MHz)	Radiated	C
15.205, 15.407 (b)(5),(6)	Radiated Spurious Emission	15.209(a)		C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:

- FCC Part 15.407, ANSI C63.10-2013

The tests were performed according to the method of measurements prescribed in

KDB No.789033

2.1 Technical Characteristic Test

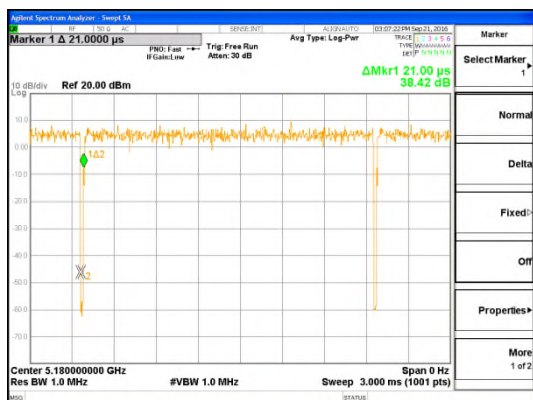
2.1.1 ON Time, Duty Cycle

Procedure:

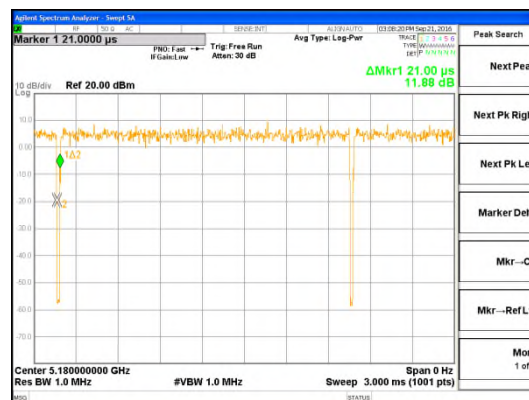
KDB 789033 Zero-Span Spectrum Analyzer Method.

Measurement Data:

	ON Time (ms)	Period (ms)	TX OFF (ms)	Duty Cycle (linear)	Duty Cycle (%)
802.11a	2.958	3.000	0.042	0.986	98.6
802.11n_HT20	2.958	3.000	0.042	0.986	98.6
802.11n_HT40	1.960	2.000	0.040	0.980	98.0
802.11ac_VHT20	2.958	3.000	0.042	0.986	98.6
802.11ac_VHT40	1.964	2.000	0.036	0.982	98.2
802.11ac_VHT80	0.958	1.000	0.042	0.960	96.0



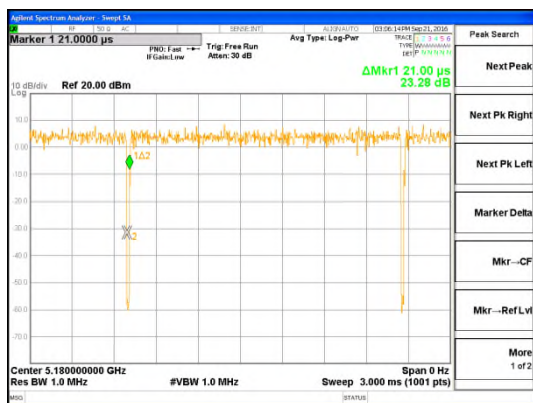
Duty Cycle_802.11a



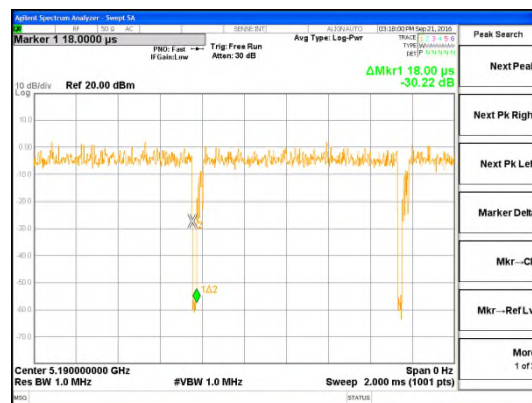
Duty Cycle_802.11n_HT20



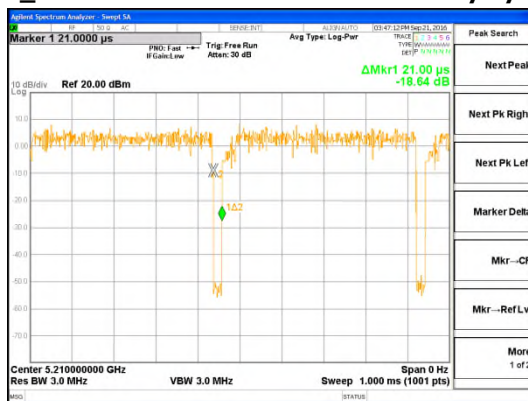
Duty Cycle_802.11n_HT40



Duty Cycle_802.11ac_VHT20



Duty Cycle_802.11ac_VHT40



Duty Cycle_802.11ac_VHT80

2.1.2 6 dB Bandwidth

Procedure:

The bandwidth at 6 dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

Span = 1.5 time > RBW

VBW = 300 kHz

Sweep = auto

Trace = max hold

Detector function = peak

Measurement Data:

Ant : A1

	6 dB Bandwidth (MHz)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5745 MHz	16.44	16.43	17.67
5785 MHz	16.41	16.41	17.67
5825 MHz	16.42	16.38	17.63
Measurement uncertainty	± 3 dB		

	6 dB Bandwidth (MHz)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5755 MHz	36.36	36.41
5795 MHz	36.38	36.43
Measurement uncertainty	± 3 dB	

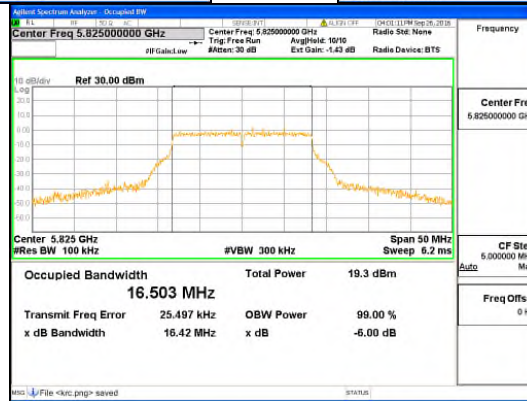
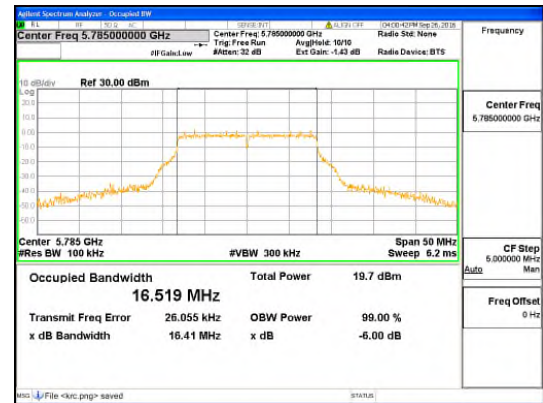
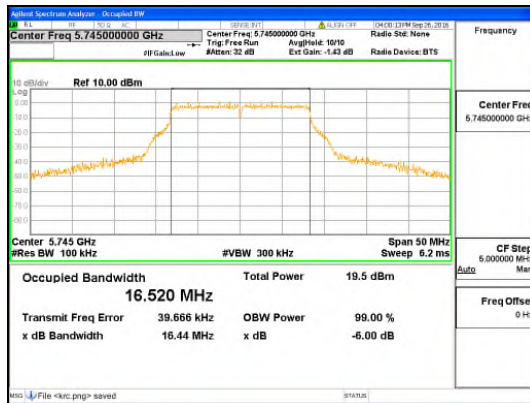
	6 dB Bandwidth (MHz)
Mode	802.11ac_VHT80
Frequency	
5775 MHz	76.26
Measurement uncertainty	± 3 dB

Ant : A2

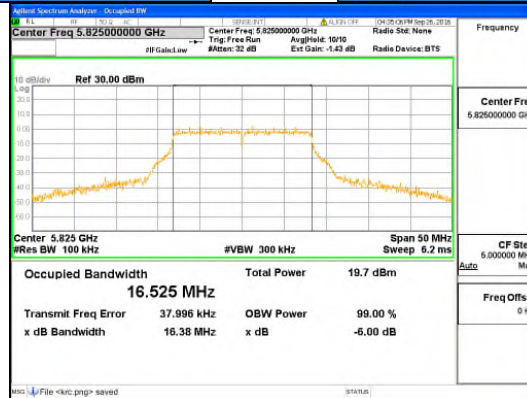
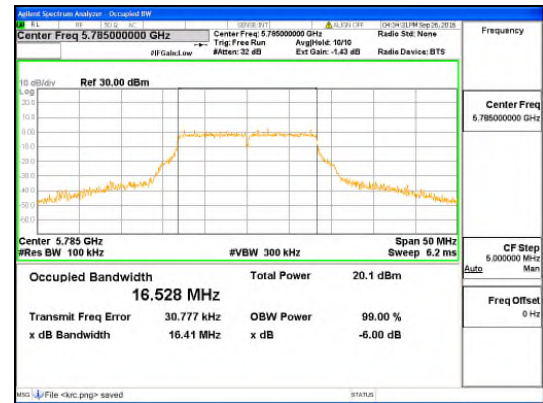
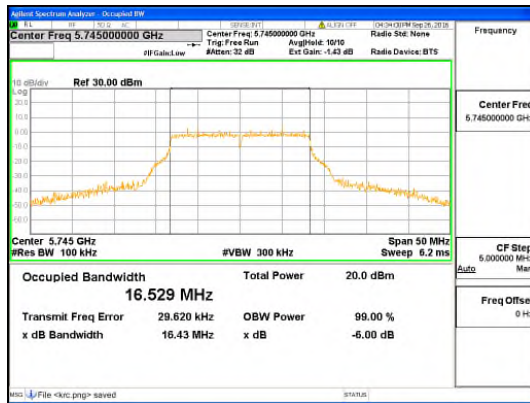
	6 dB Bandwidth (MHz)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5745 MHz	16.40	16.41	17.64
5785 MHz	16.43	16.40	17.65
5825 MHz	16.42	16.42	17.64
Measurement uncertainty	± 3 dB		

	6 dB Bandwidth (MHz)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5755 MHz	36.35	36.40
5795 MHz	36.39	36.38
Measurement uncertainty	± 3 dB	

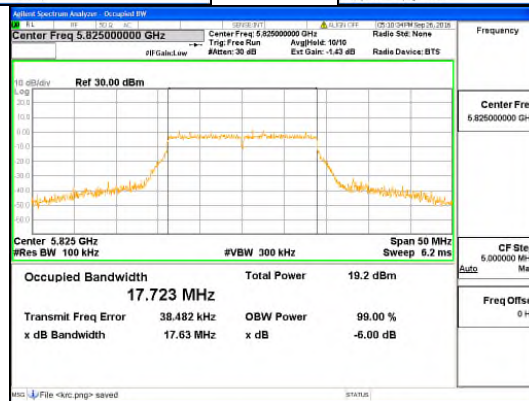
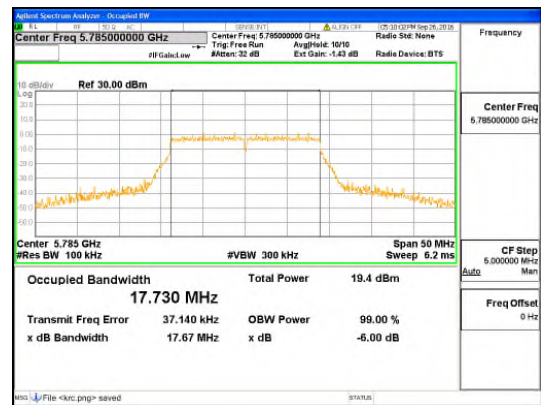
	6 dB Bandwidth (MHz)
Mode	802.11ac_VHT80
Frequency	
5775 MHz	76.08
Measurement uncertainty	± 3 dB



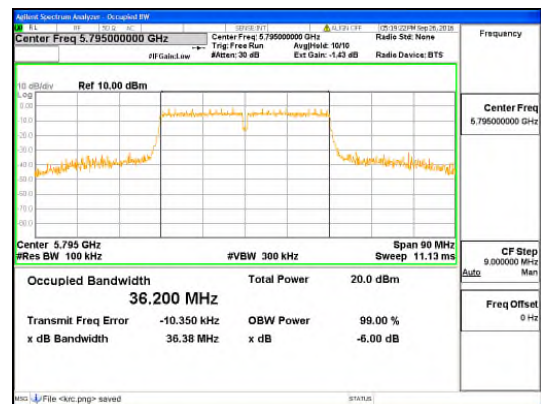
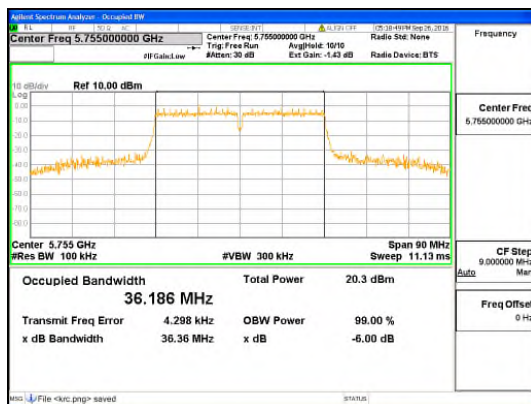
Ant : A1_802.11a



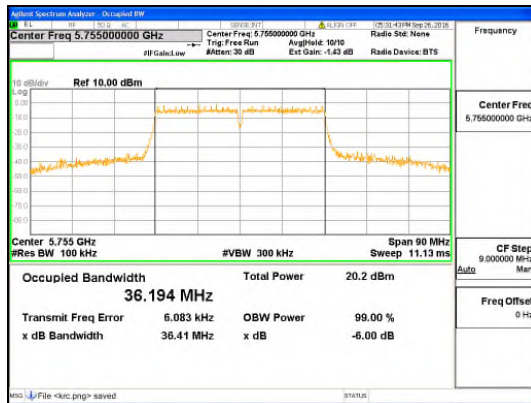
Ant : A1_802.11n_HT20



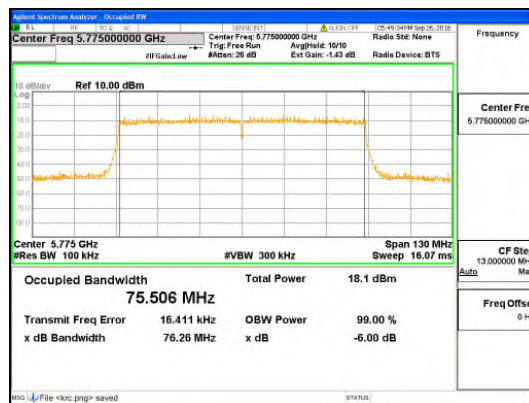
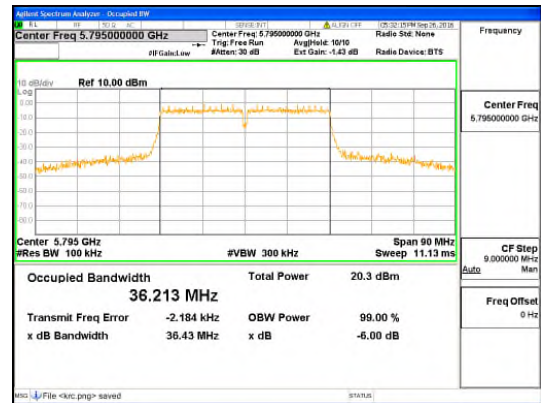
Ant : A1_802.11ac_VHT20



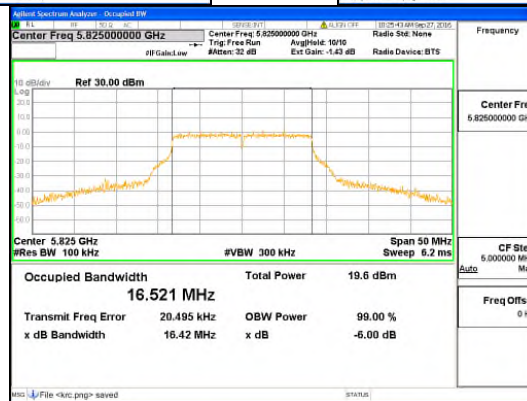
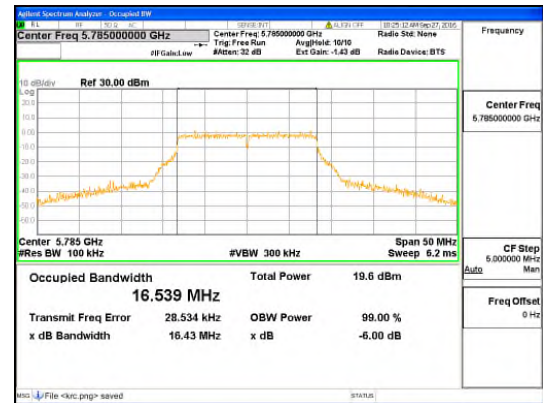
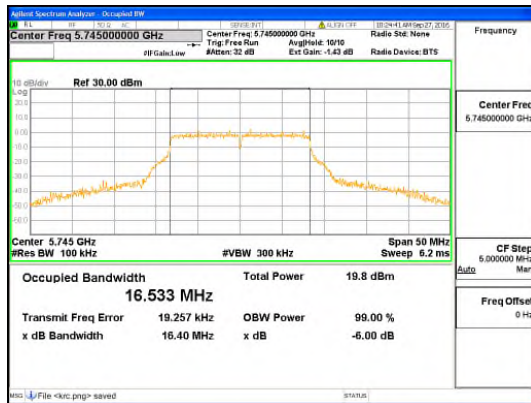
Ant : A1_802.11n_HT40



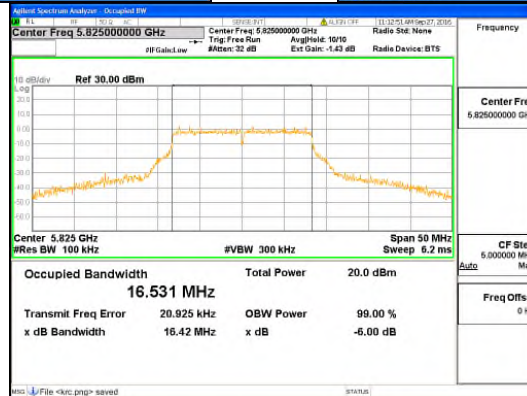
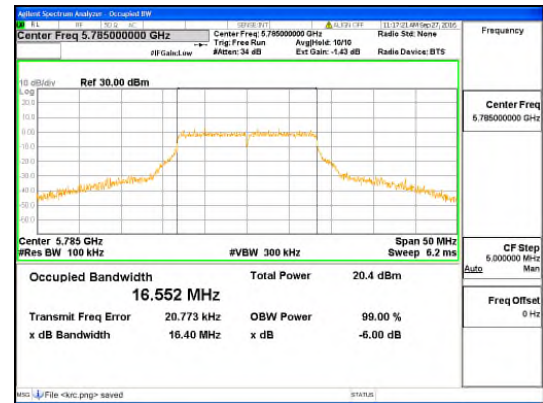
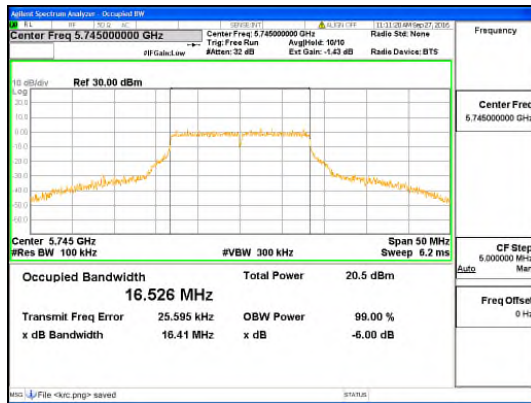
Ant : A1_802.11ac_VHT40



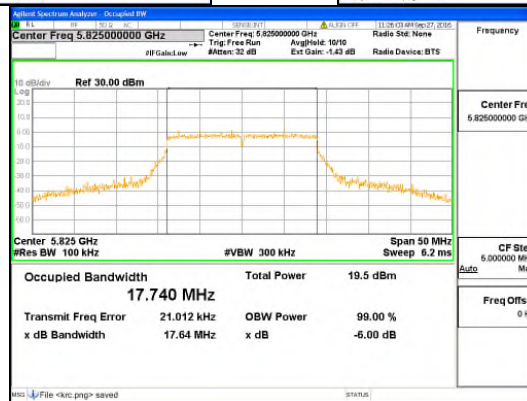
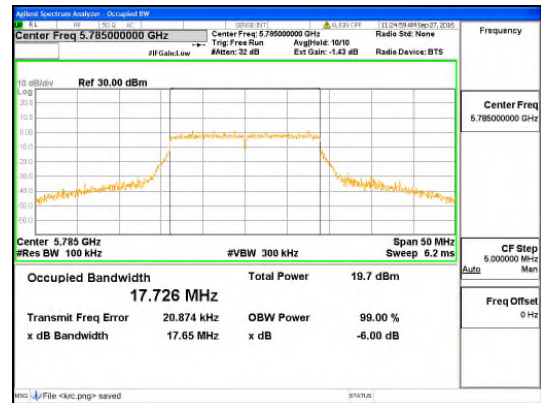
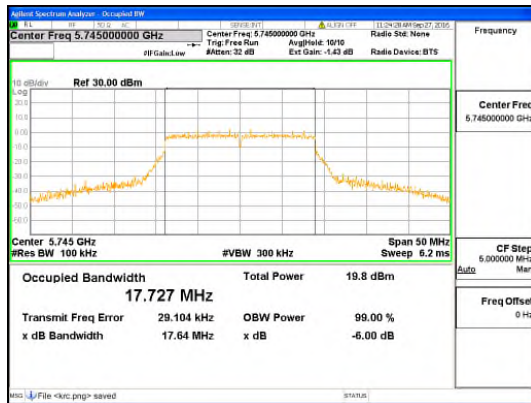
Ant : A1_802.11ac_VHT80



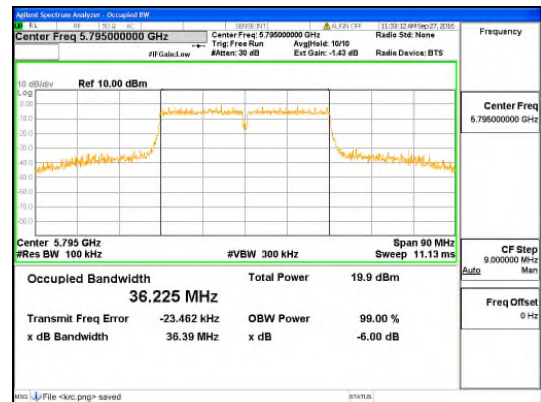
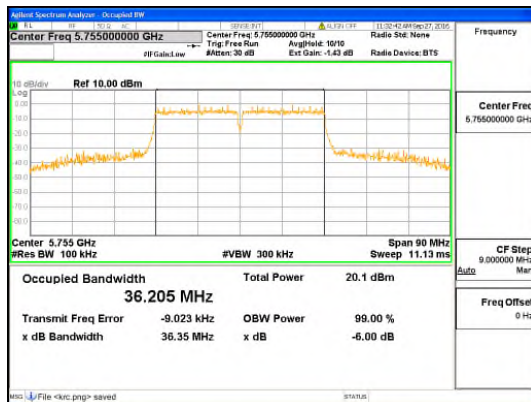
Ant : A2_802.11a



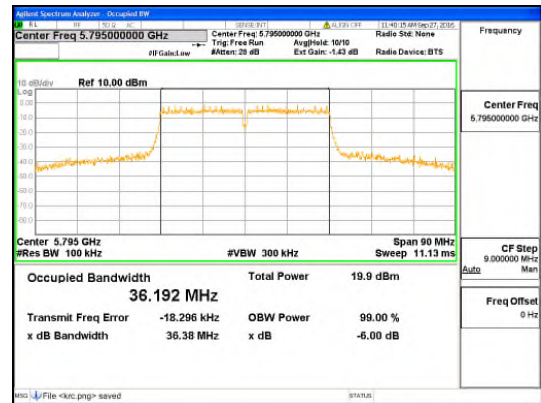
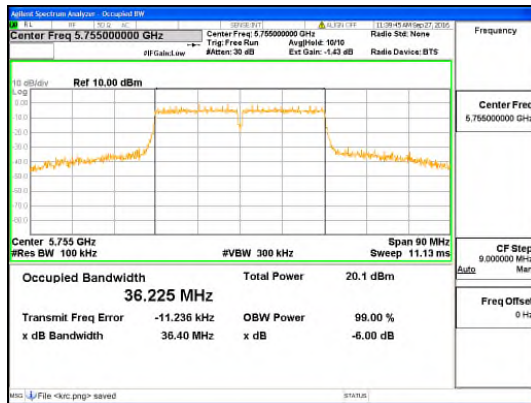
Ant : A2_802.11n_HT20



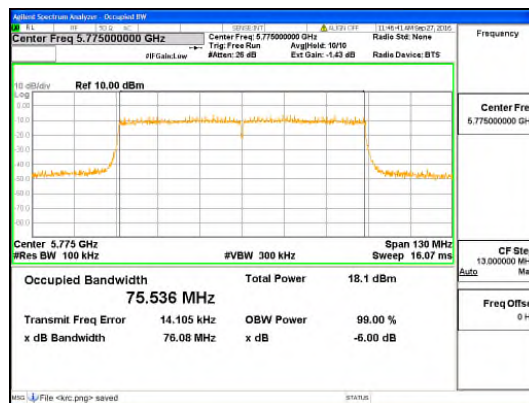
Ant : A2_802.11ac_VHT20



Ant : A2_802.11n_HT40



Ant : A2_802.11ac_VHT40



Ant : A2_802.11ac_VHT80

2.1.3 26 dB Bandwidth and 99% Bandwidth

Procedure:

The bandwidth at 26 dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 26 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 26 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = approximately 1 % of the emission bandwidth Span = 1.5 time > RBW

VBW = VBW > RBW

Sweep = auto

Trace = max hold

Detector function = peak

Measurement Data:

Ant : A1

	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%
5180 MHz	22.43	18.08	22.32	18.06	22.84	18.96
5200 MHz	22.46	18.11	22.45	18.07	25.10	18.98
5240 MHz	22.53	18.00	22.50	17.99	22.58	19.01
5745 MHz	21.83	17.50	21.93	17.54	23.63	18.50
5785 MHz	21.77	17.44	22.07	17.48	21.78	18.48
5825 MHz	21.94	17.46	22.01	17.53	22.57	18.46
Measurement uncertainty	± 3 dB					

	26 dB Bandwidth and 99% Bandwidth (MHz)			
Mode	802.11n_HT40		802.11ac_VHT40	
Frequency	26 dB	99 %	26 dB	99 %
5190 MHz	40.50	36.74	40.60	36.65
5230 MHz	40.64	36.70	40.62	36.73
5755 MHz	45.89	36.44	40.07	36.48
5795 MHz	42.67	36.43	45.88	36.41
Measurement uncertainty	± 3 dB			

	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5210 MHz	80.65	75.75
5775 MHz	80.81	75.68
Measurement uncertainty	± 3 dB	

Ant : A2

	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%
5180 MHz	22.60	18.10	22.51	18.09	25.63	18.98
5200 MHz	22.49	18.01	22.46	18.08	22.92	19.00
5240 MHz	22.51	18.19	22.70	18.14	22.66	18.91
5745 MHz	22.01	17.50	23.52	17.61	25.27	18.47
5785 MHz	22.05	17.45	23.91	17.57	23.87	18.50
5825 MHz	21.85	17.58	21.90	17.52	22.49	18.47
Measurement uncertainty	± 3 dB					

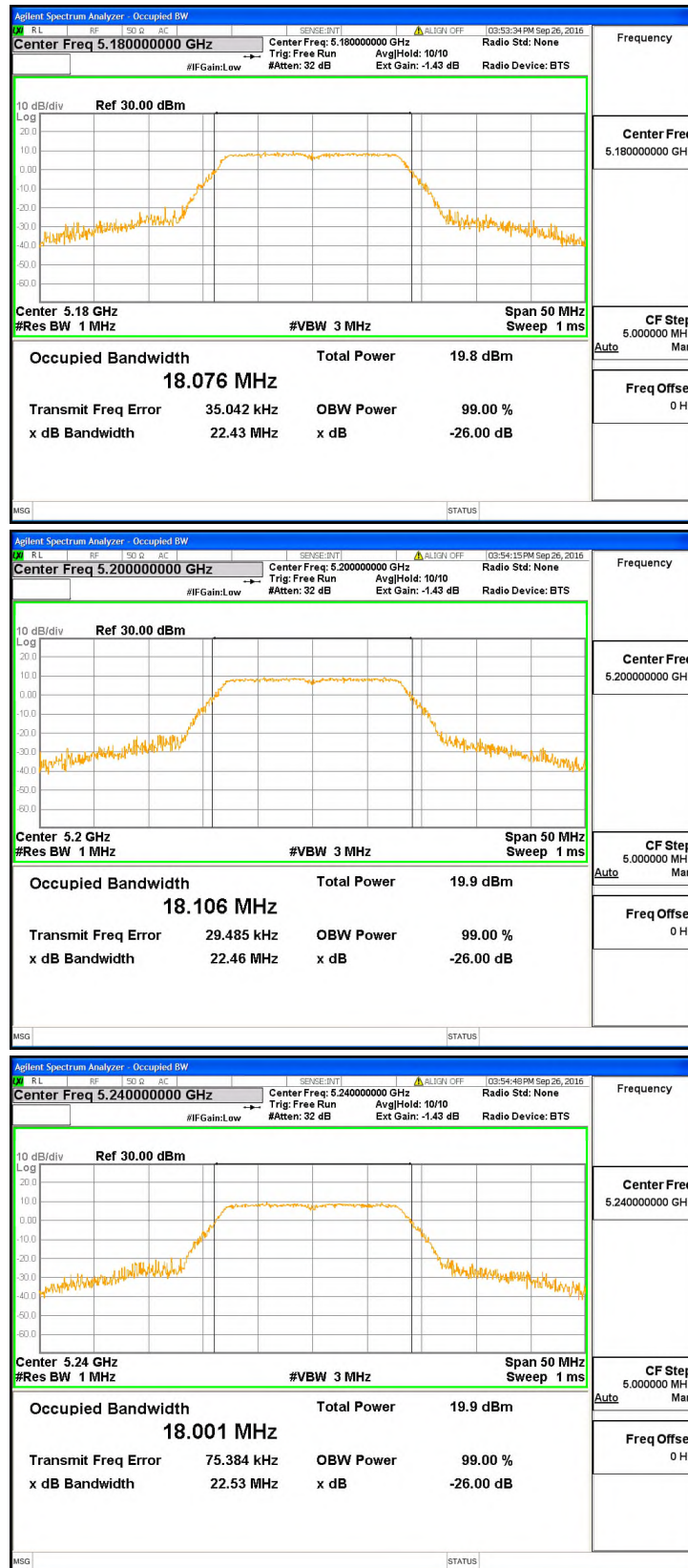
	26 dB Bandwidth and 99% Bandwidth (MHz)			
Mode	802.11n_HT40		802.11ac_VHT40	
Frequency	26 dB	99 %	26 dB	99 %
5190 MHz	42.58	36.77	40.97	36.68
5230 MHz	40.60	36.71	40.70	36.73
5755 MHz	58.26	36.47	42.47	36.46
5795 MHz	40.16	36.43	39.93	36.42
Measurement uncertainty	± 3 dB			

	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5210 MHz	81.09	75.88
5775 MHz	80.57	75.66
Measurement uncertainty	± 3 dB	

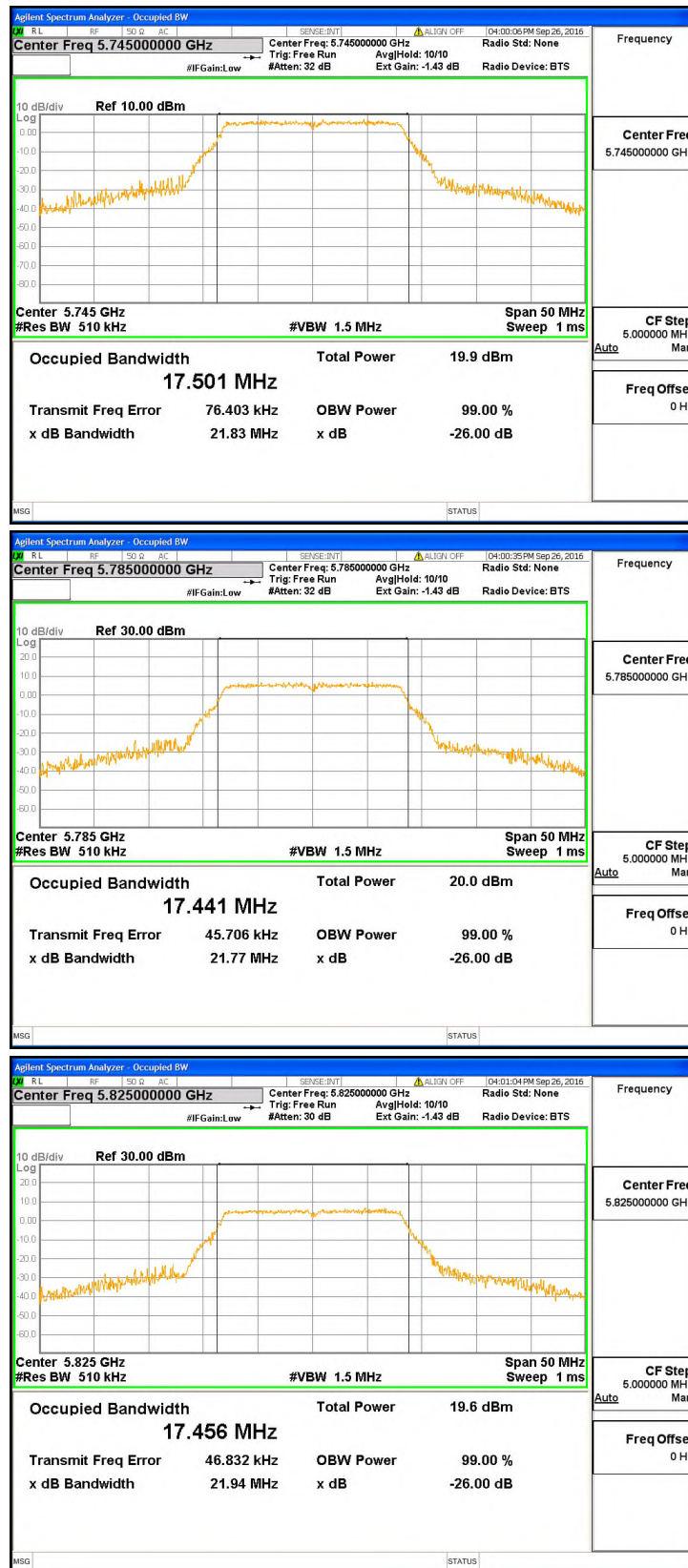
Minimum Standard:

6 dB Bandwidth > 500kHz

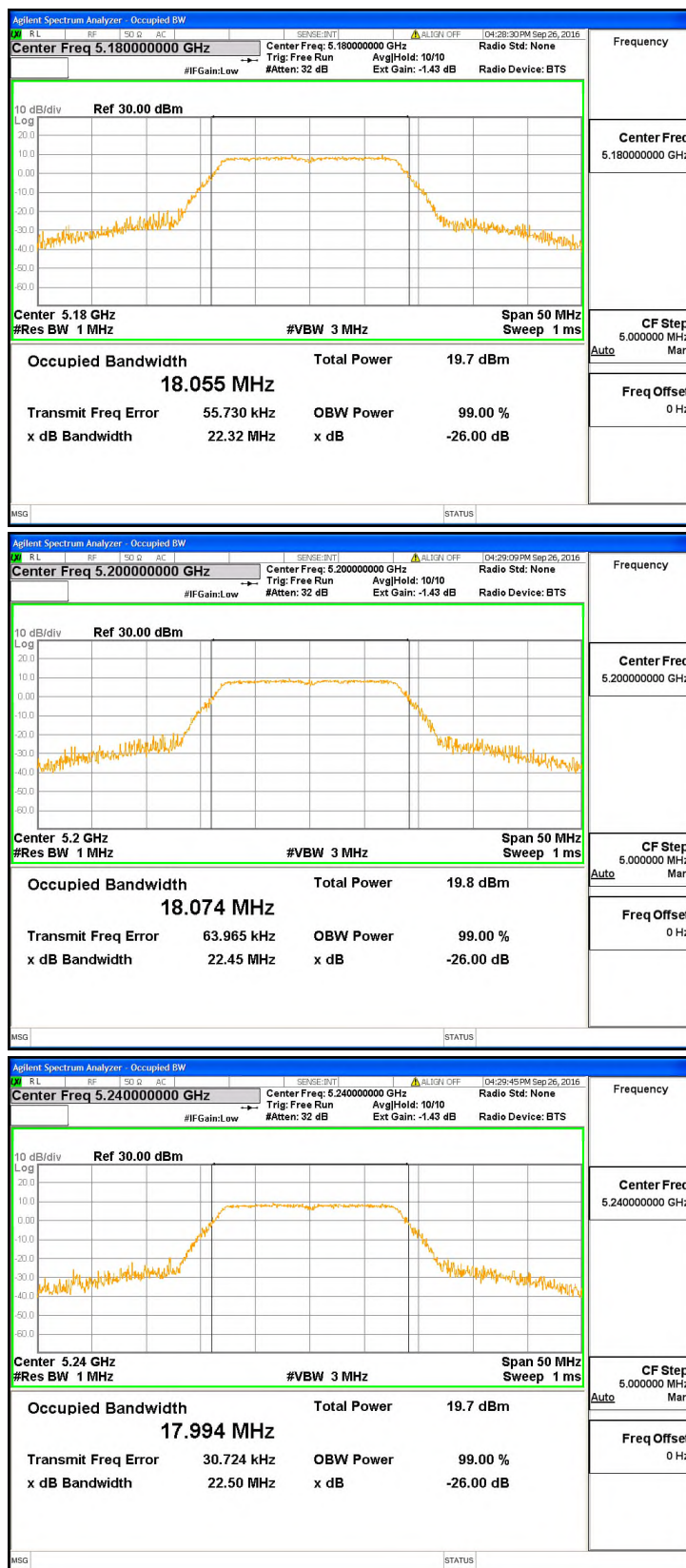
See next pages for actual measured spectrum plots.



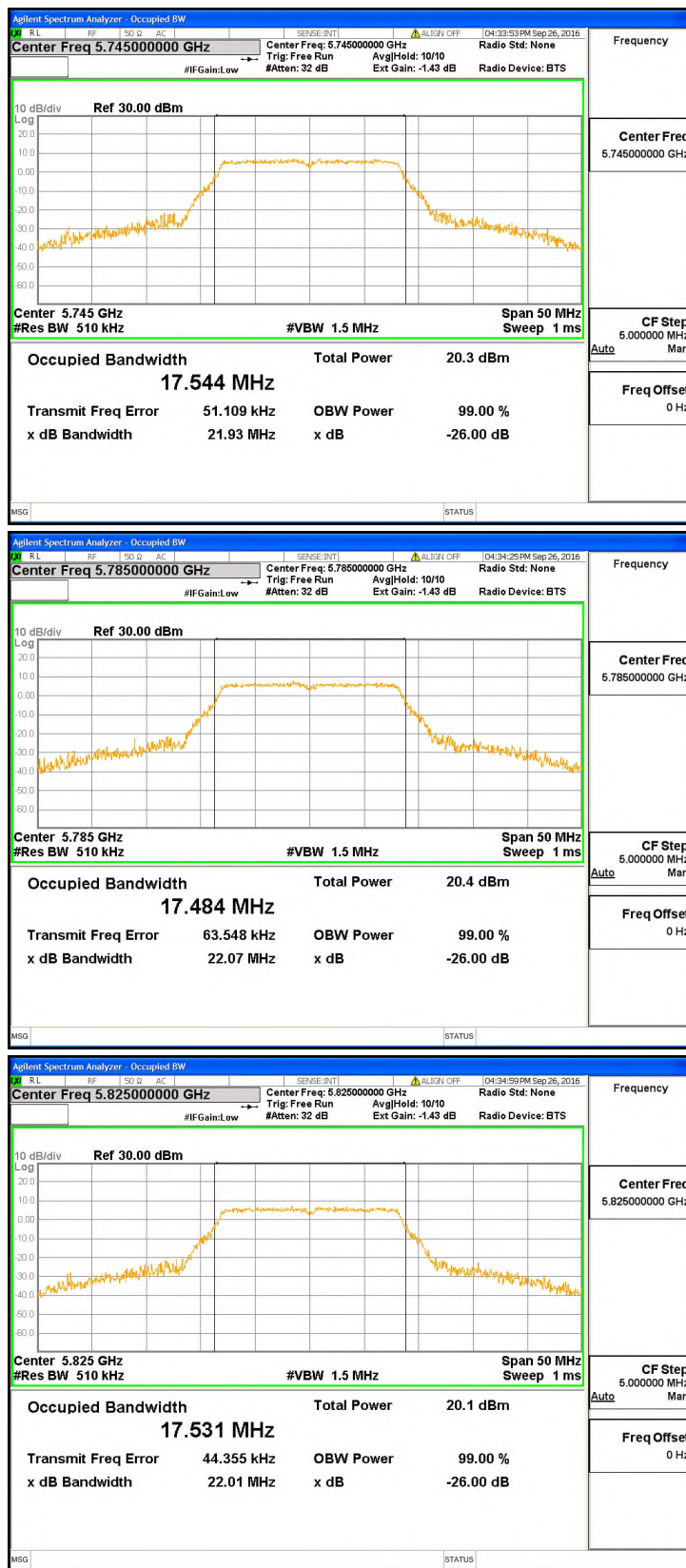
Ant : A1_802.11a_UNII-1



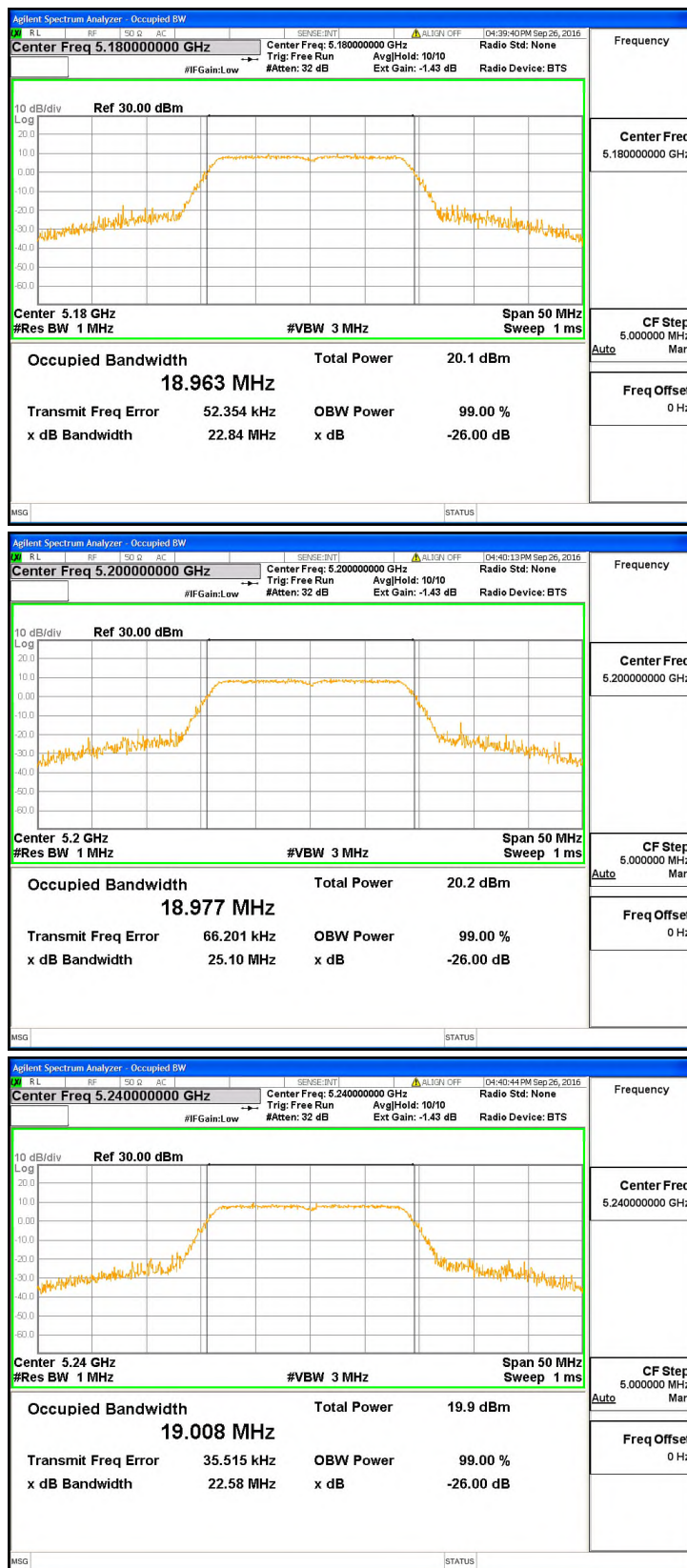
Ant : A1_802.11a_UNII-3



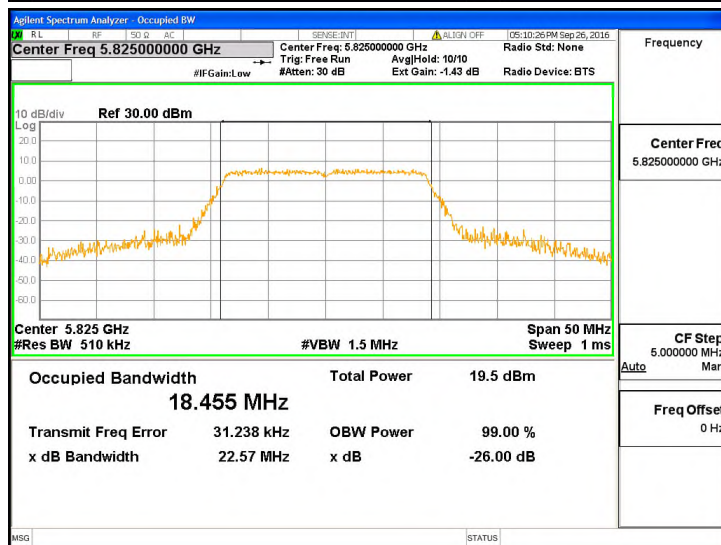
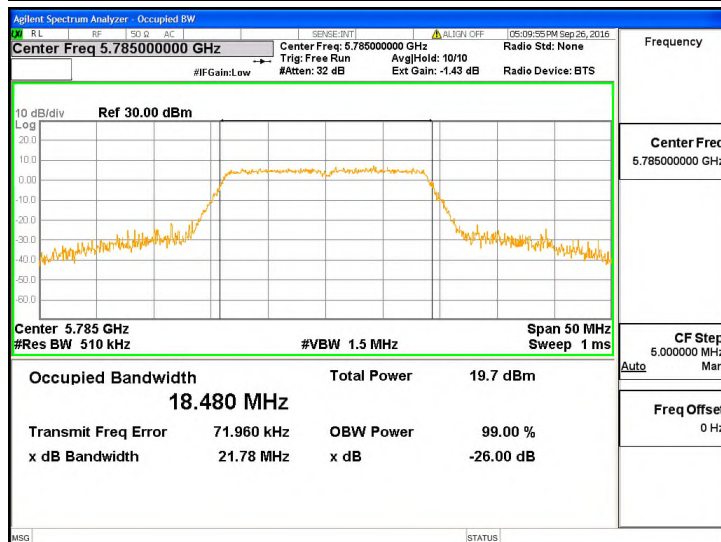
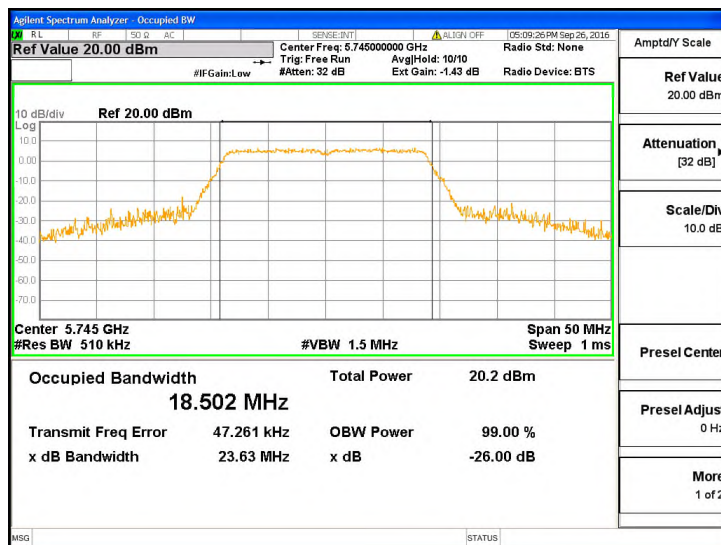
Ant : A1_802.11n_HT20_UNII-1



Ant : A1_802.11n_HT20_UNII-3



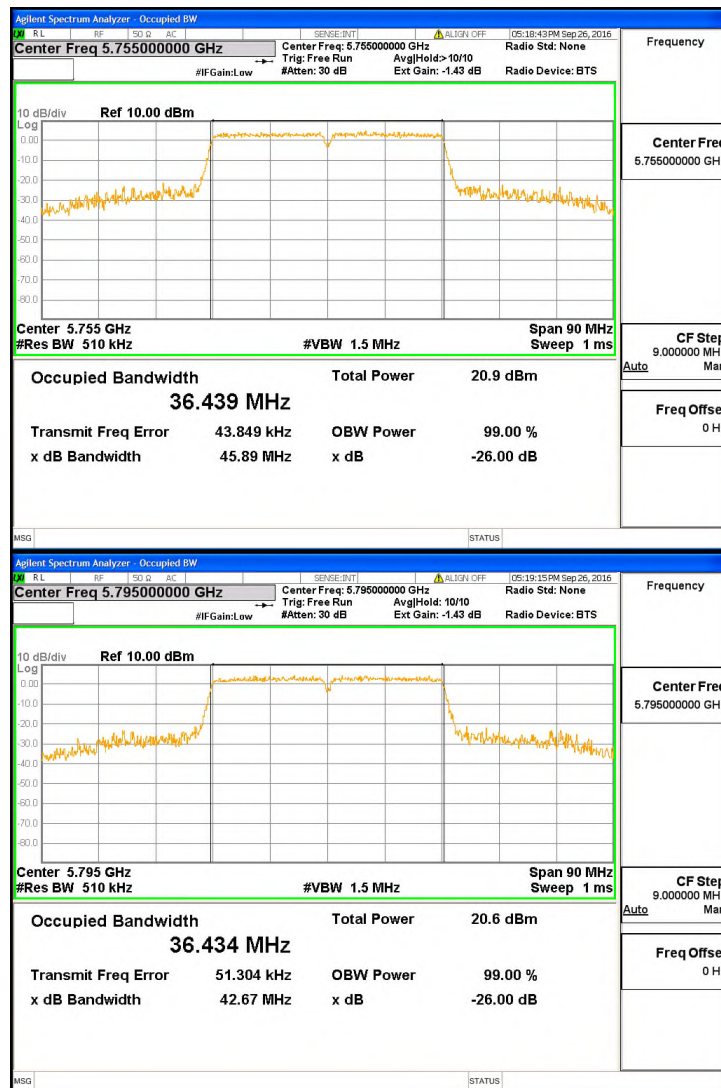
Ant : A1_802.11ac_VHT20_UNII-1



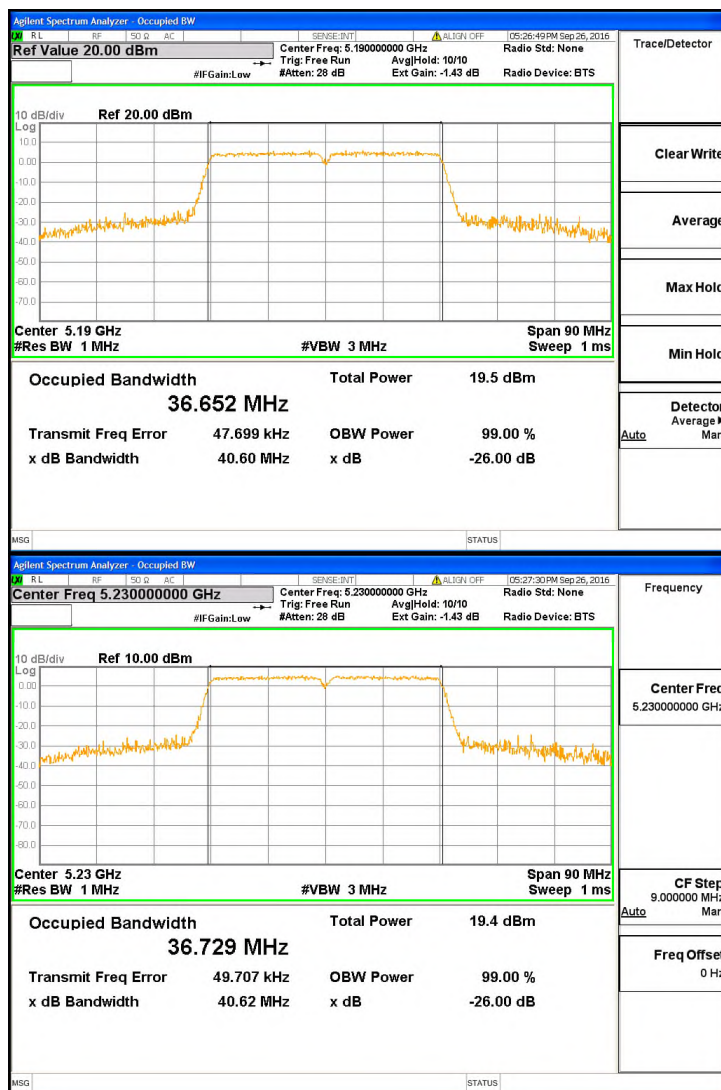
Ant : A1_802.11ac_VHT20_UNII-3



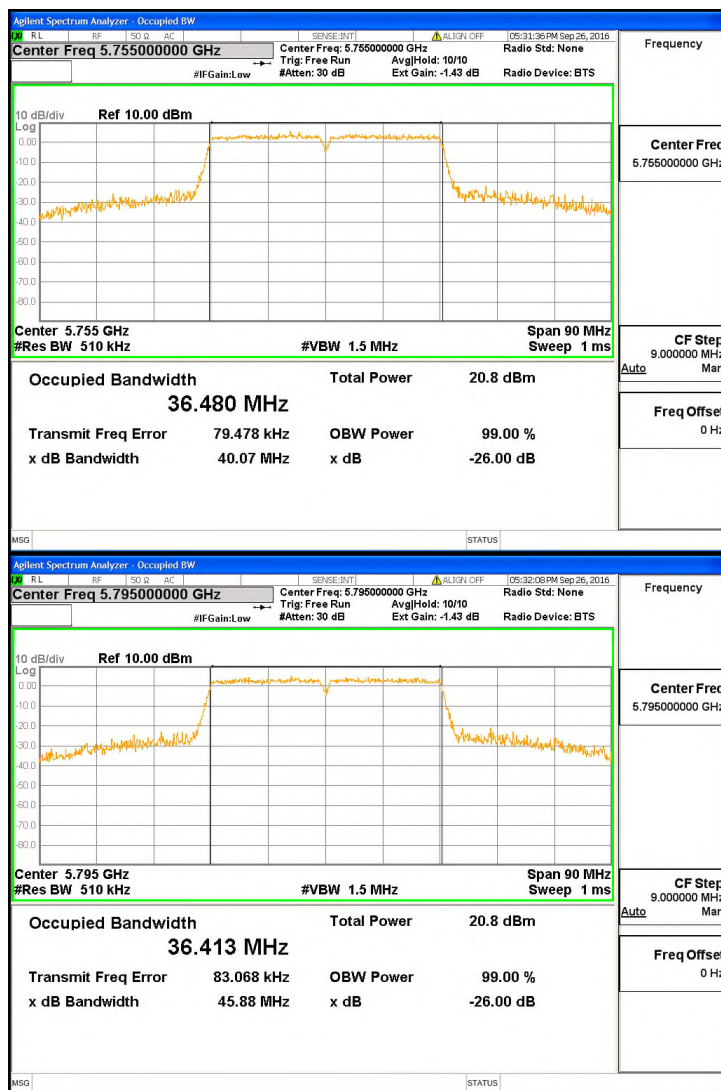
Ant : A1_802.11n_HT40_UNII-1



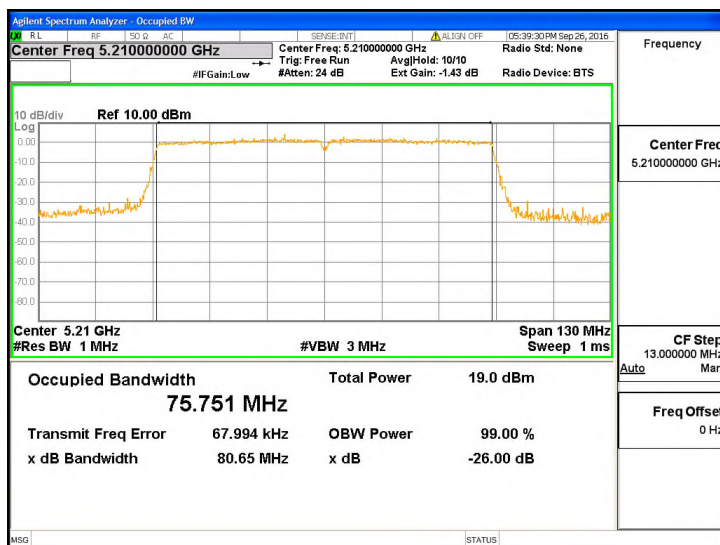
Ant : A1_802.11n_HT40_UNII-3



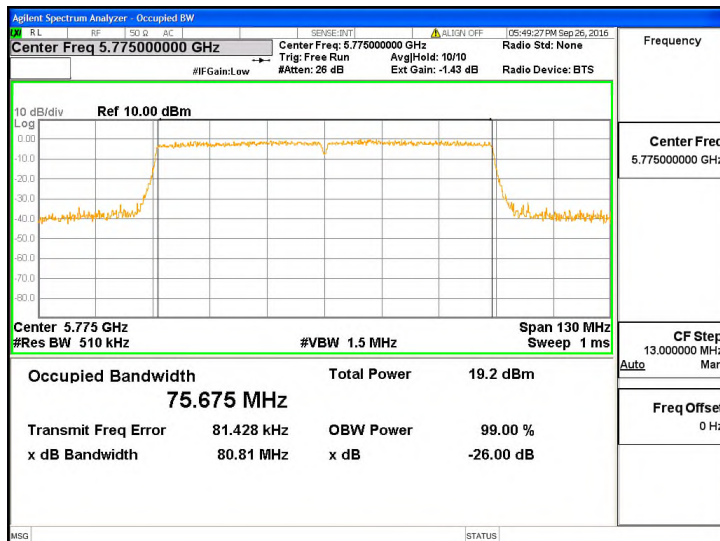
Ant : A1_802.11ac_VHT40_UNII-1



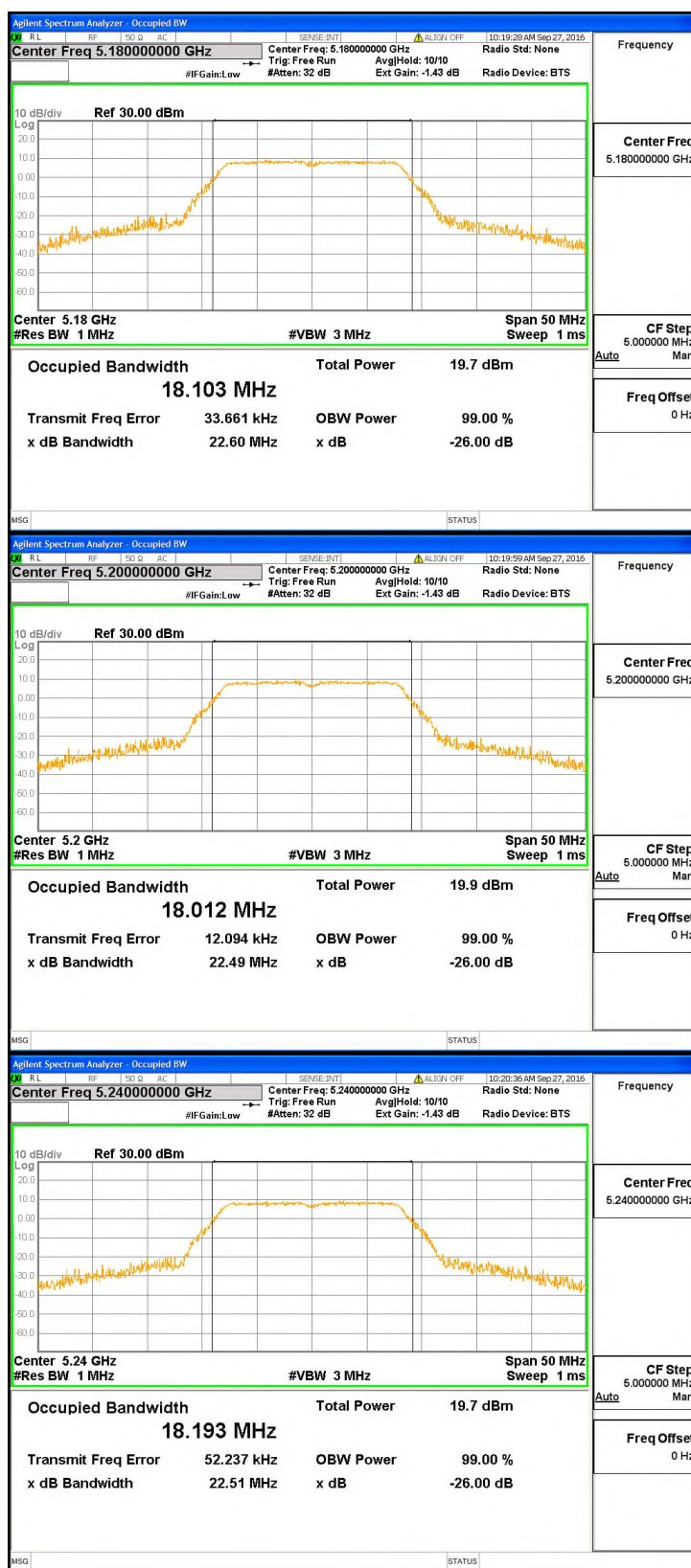
Ant : A1_802.11ac_VHT40_UNII-3



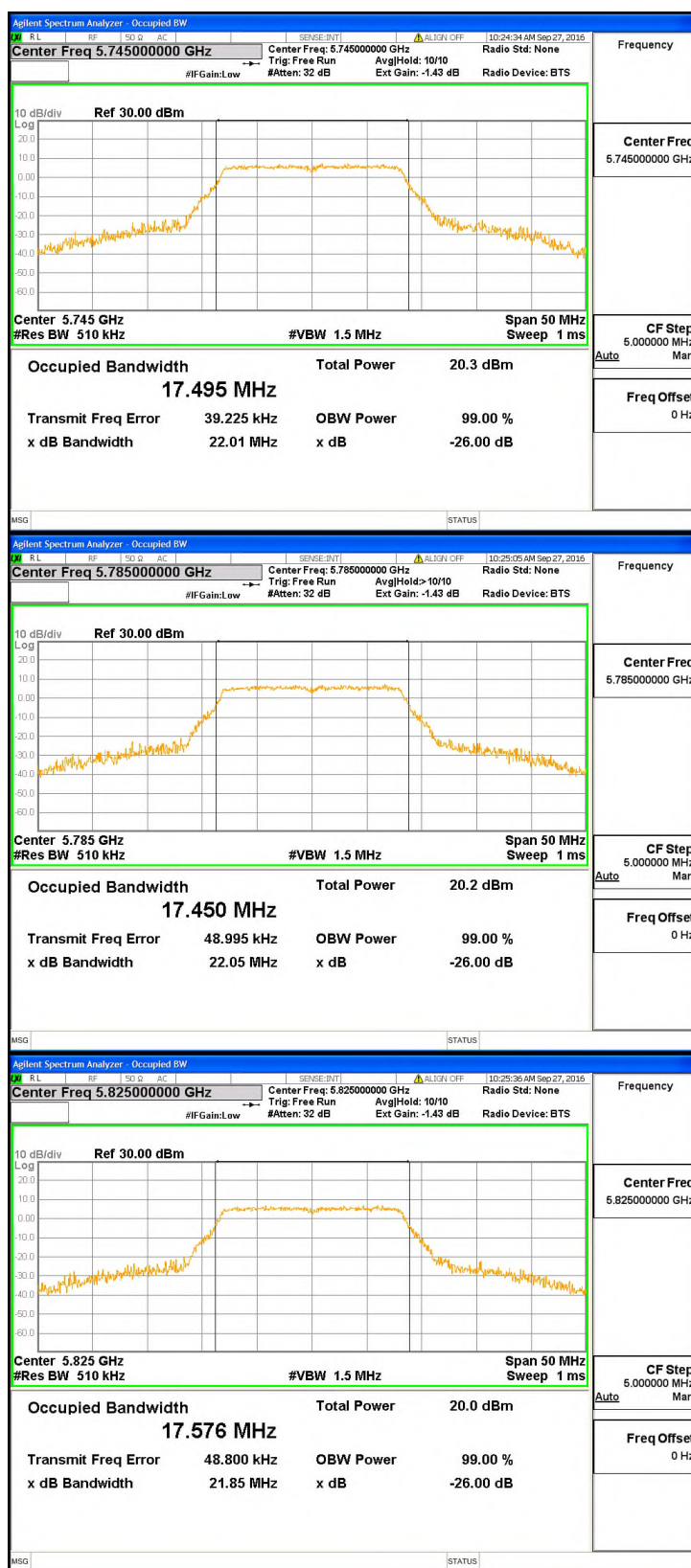
Ant : A1_802.11ac_VHT80_UNII-1



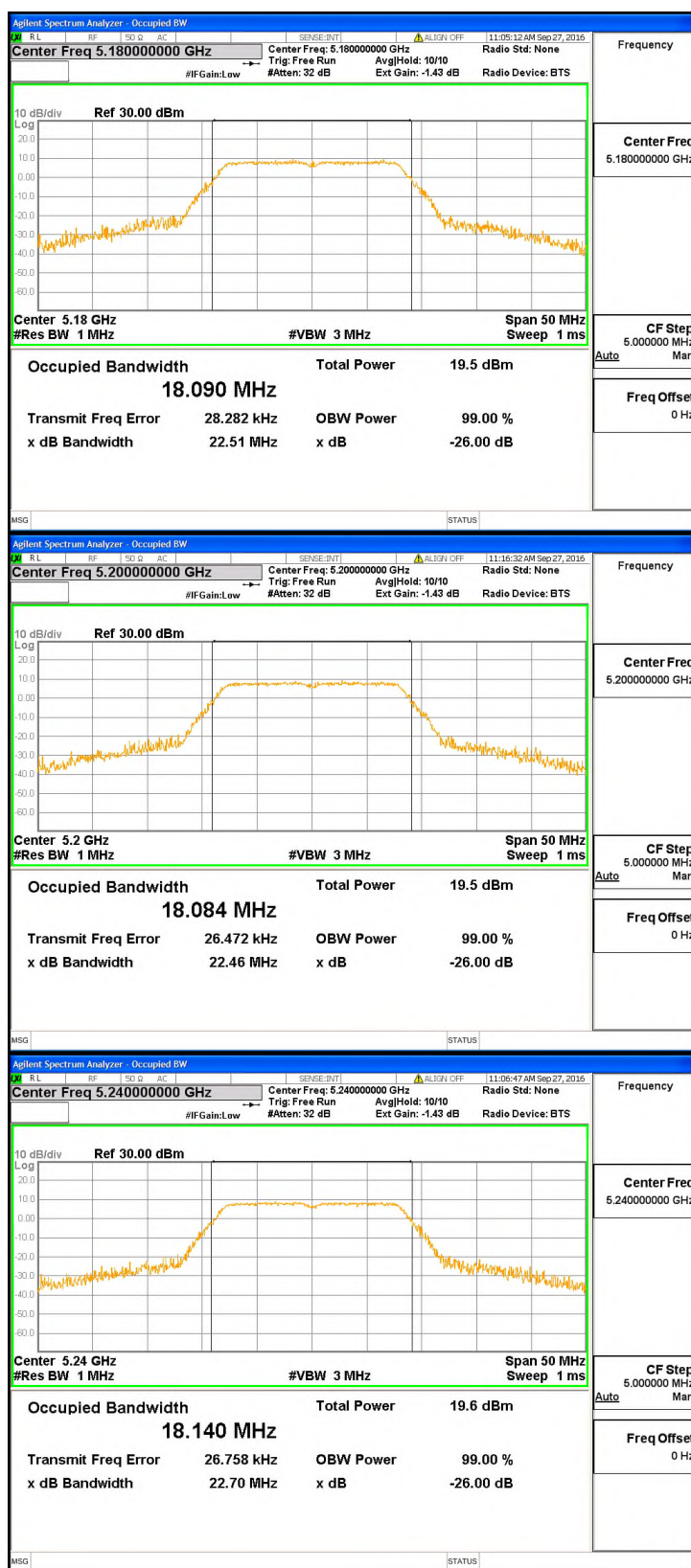
Ant : A1_802.11ac_VHT80_UNII-3



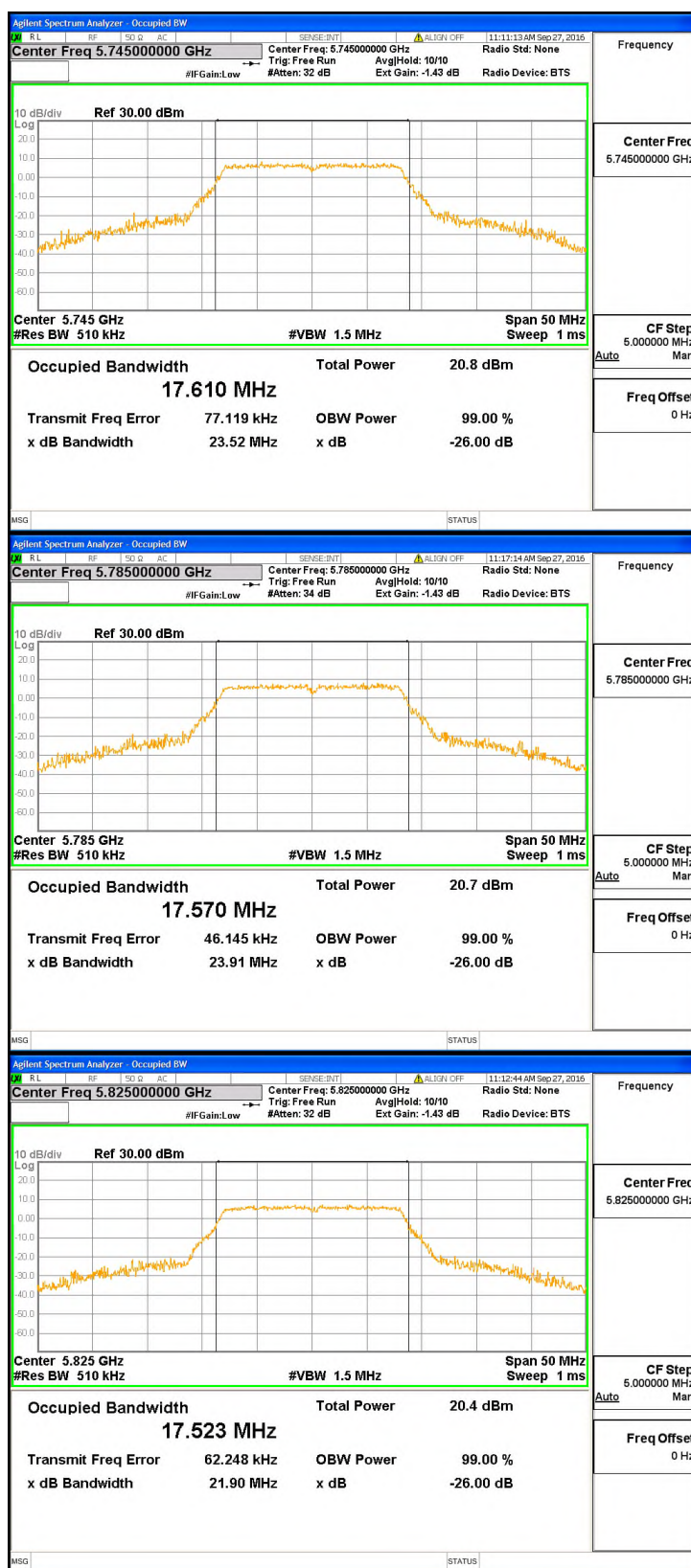
Ant : A2_802.11a_UNII-1



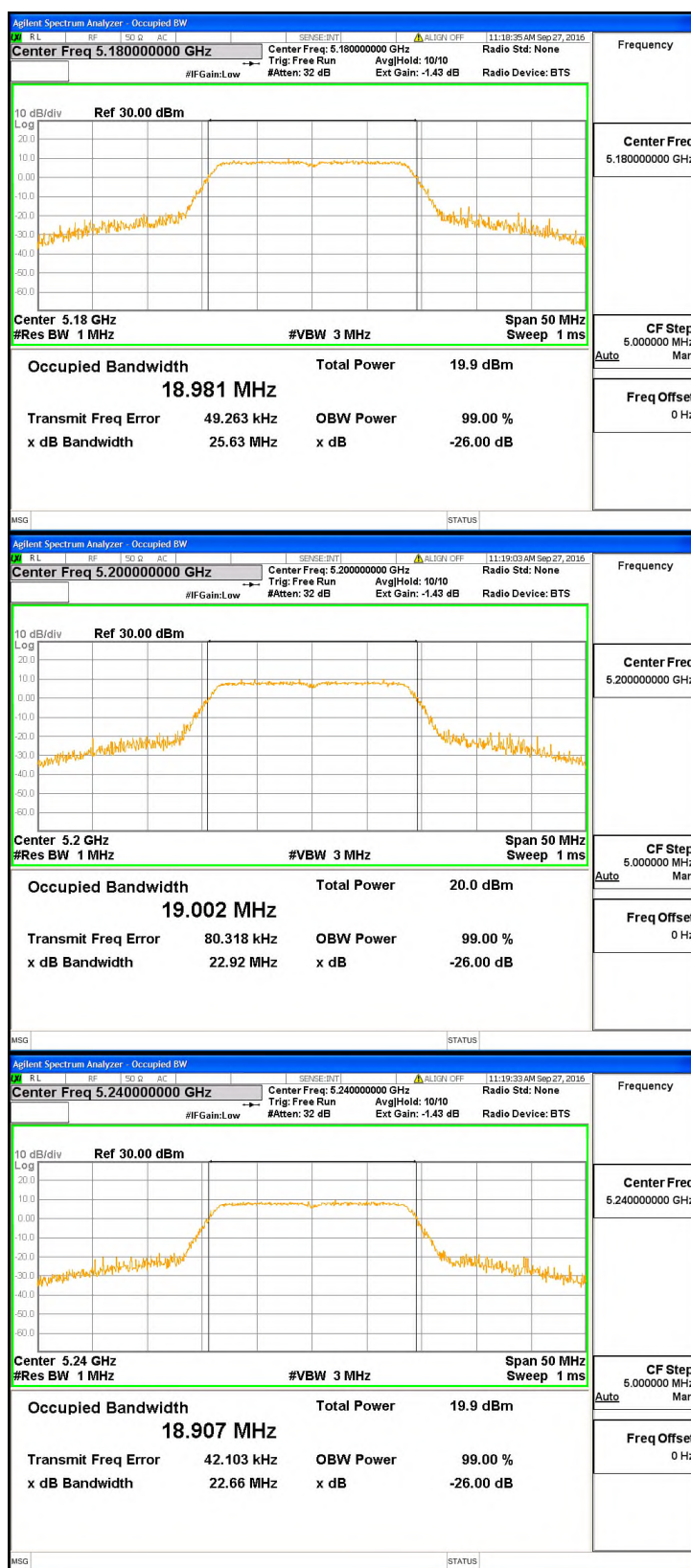
Ant : A2_802.11a_UNII-3



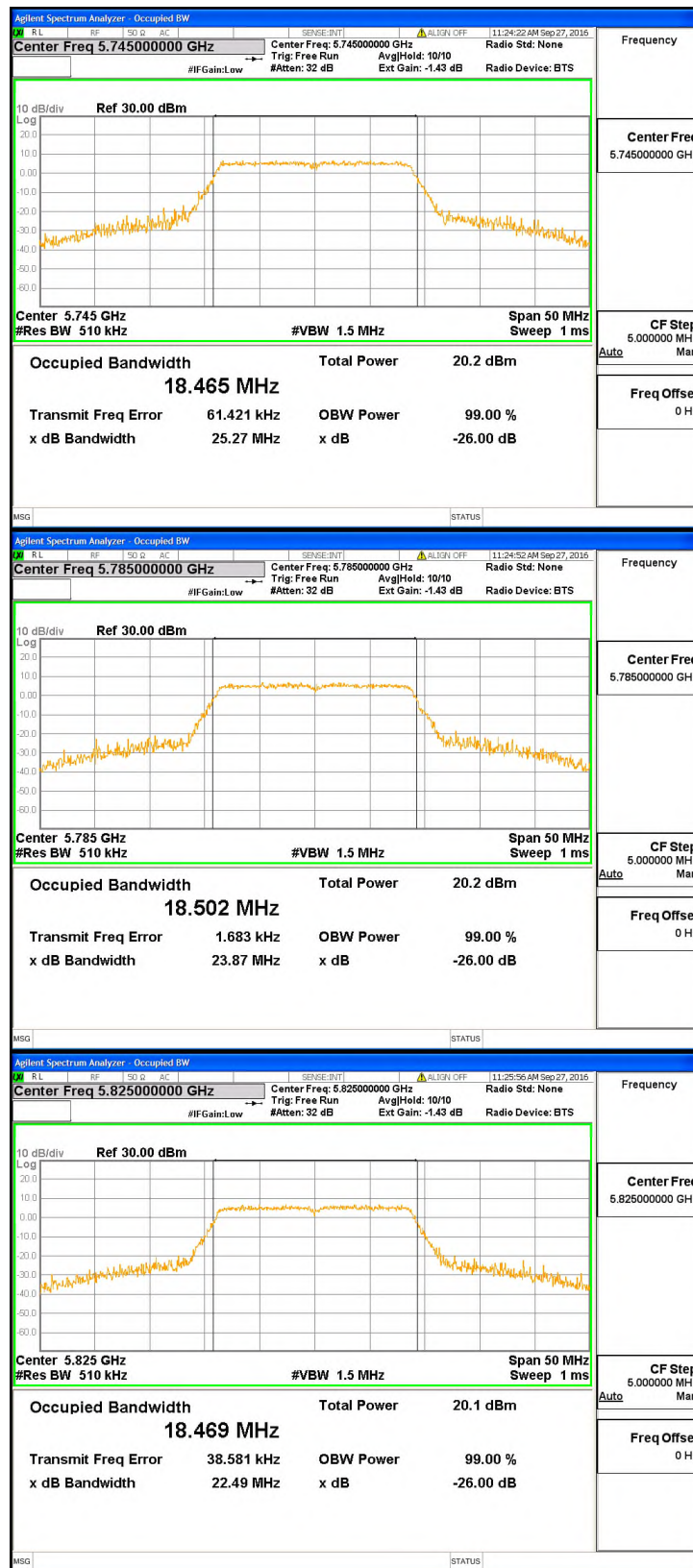
Ant : A2_802.11n_HT20_UNII-1



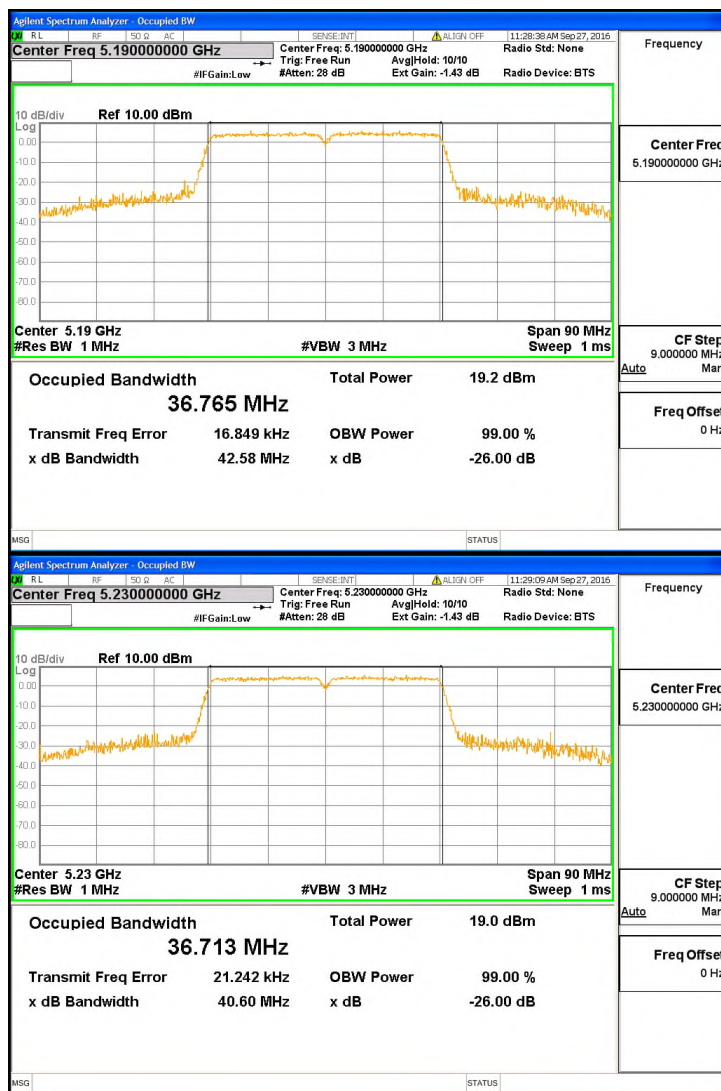
Ant : A2_802.11n_HT20_UNII-3



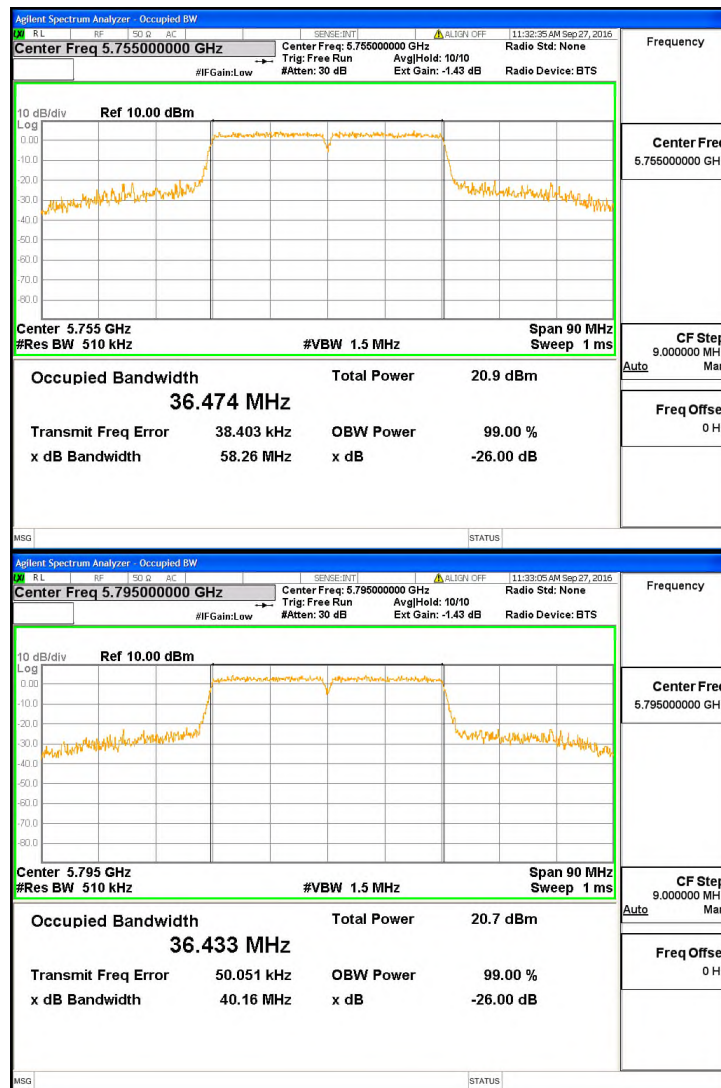
Ant : A2_802.11ac_VHT20_UNII-1



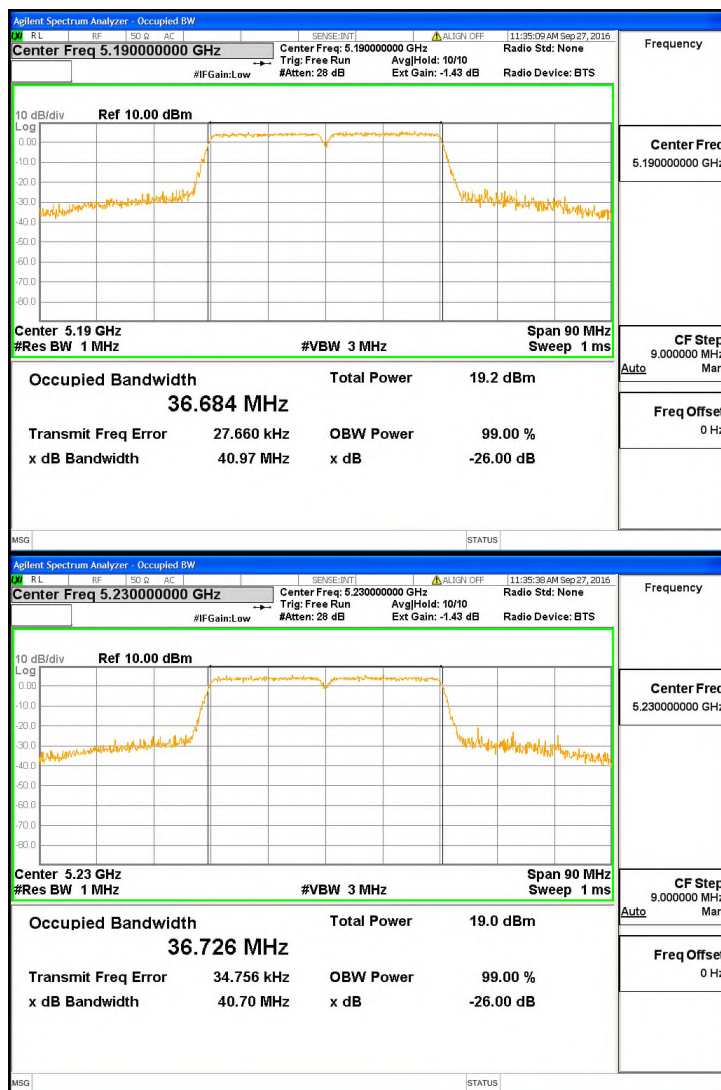
Ant : A2_802.11ac_VHT20_UNII-3



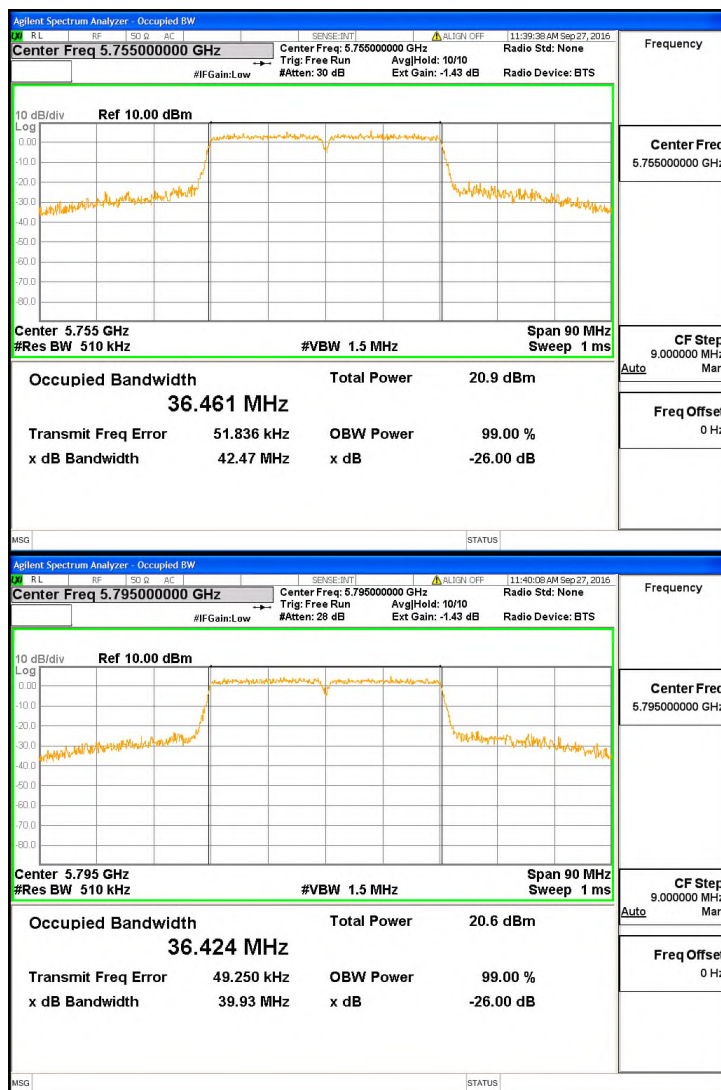
Ant : A2_802.11n_HT40_UNII-1



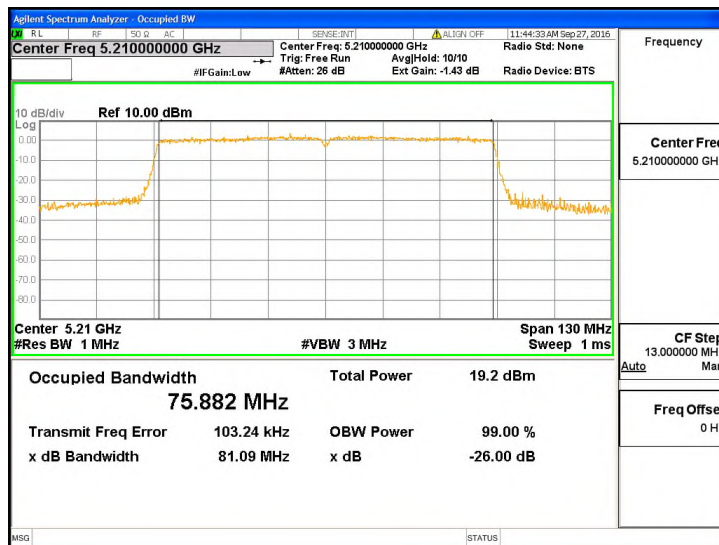
Ant : A2_802.11n_HT40_UNII-3



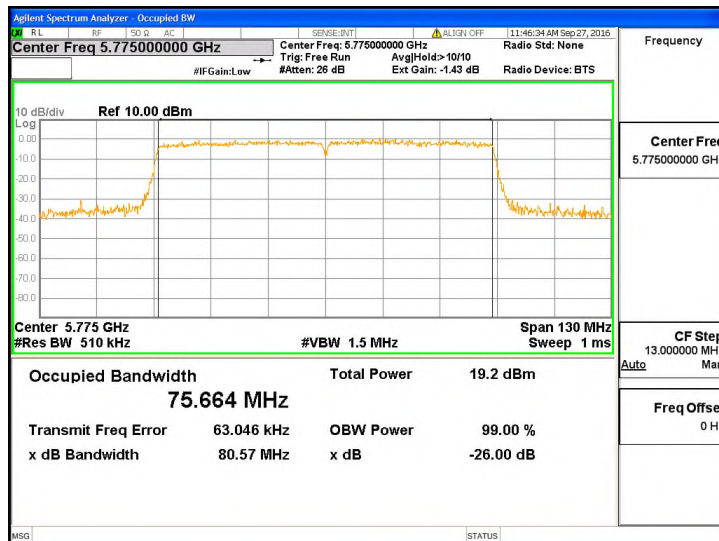
Ant : A2_802.11ac_VHT40_UNII-1



Ant : A2_802.11ac_VHT40_UNII-3



Ant : A2_802.11ac_VHT80_UNII-1



Ant : A2_802.11ac_VHT80_UNII-3

2.1.4 OUTPUT POWER

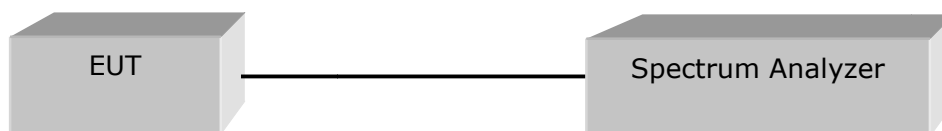
Test Location

RF Test Room

Test Procedures

Maximum Conducted Output Power(KDB 789033, Method SA-1)

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.



The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 1 MHz

VBW = 3 MHz (3 x RBW)

Trace = average at least 100

Sweep = auto

Detector function = RMS

Limit

Operating Mode	Band	Mode	ANT Configuration	ANT Gain (dBi)	Limit (dBm)	
					FCC	IC
SISO	UNII 1	802.11a/n/ac	ANT1, ANT2	5.73	30	23
	UNII 3				30	30
MIMO (2Tx)	UNII 1	802.11a/n/ac	ANT1 + ANT2	8.74	26.99	19.99
	UNII 3				26.99	26.99

Test Results

Ant : A1

	Measured Output Power (dBm)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5180 MHz	14.88	14.79	15.27
5200 MHz	14.98	14.96	15.37
5240 MHz	14.93	14.78	15.00
5745 MHz	14.56	15.04	14.47
5785 MHz	14.70	15.14	14.35
5825 MHz	14.31	14.78	14.14
Measurement uncertainty	± 3 dB		

Ant : A2

	Measured Output Power (dBm)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5180 MHz	14.79	14.74	15.07
5200 MHz	15.01	14.61	15.10
5240 MHz	14.87	14.71	15.04
5745 MHz	14.93	15.47	14.89
5785 MHz	14.87	15.34	14.78
5825 MHz	14.75	15.16	14.66
Measurement uncertainty	± 3 dB		

Ant : A1 + A2

	Measured Output Power (dBm)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5180 MHz	17.85	17.78	18.18
5200 MHz	18.01	17.80	18.25
5240 MHz	17.91	17.76	18.03
5745 MHz	17.76	18.27	17.70
5785 MHz	17.80	18.25	17.58
5825 MHz	17.55	17.98	17.42
Measurement uncertainty	± 3 dB		

Ant : A1

	Measured Output Power (dBm)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5190 MHz	14.52	14.55
5230 MHz	14.51	14.38
5755 MHz	15.48	15.41
5795 MHz	15.16	15.34
Measurement uncertainty	± 3 dB	

Ant : A2

	Measured Output Power (dBm)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5190 MHz	14.22	14.20
5230 MHz	14.03	13.95
5755 MHz	15.44	15.37
5795 MHz	15.16	15.14
Measurement uncertainty	± 3 dB	

Ant : A1 + A2

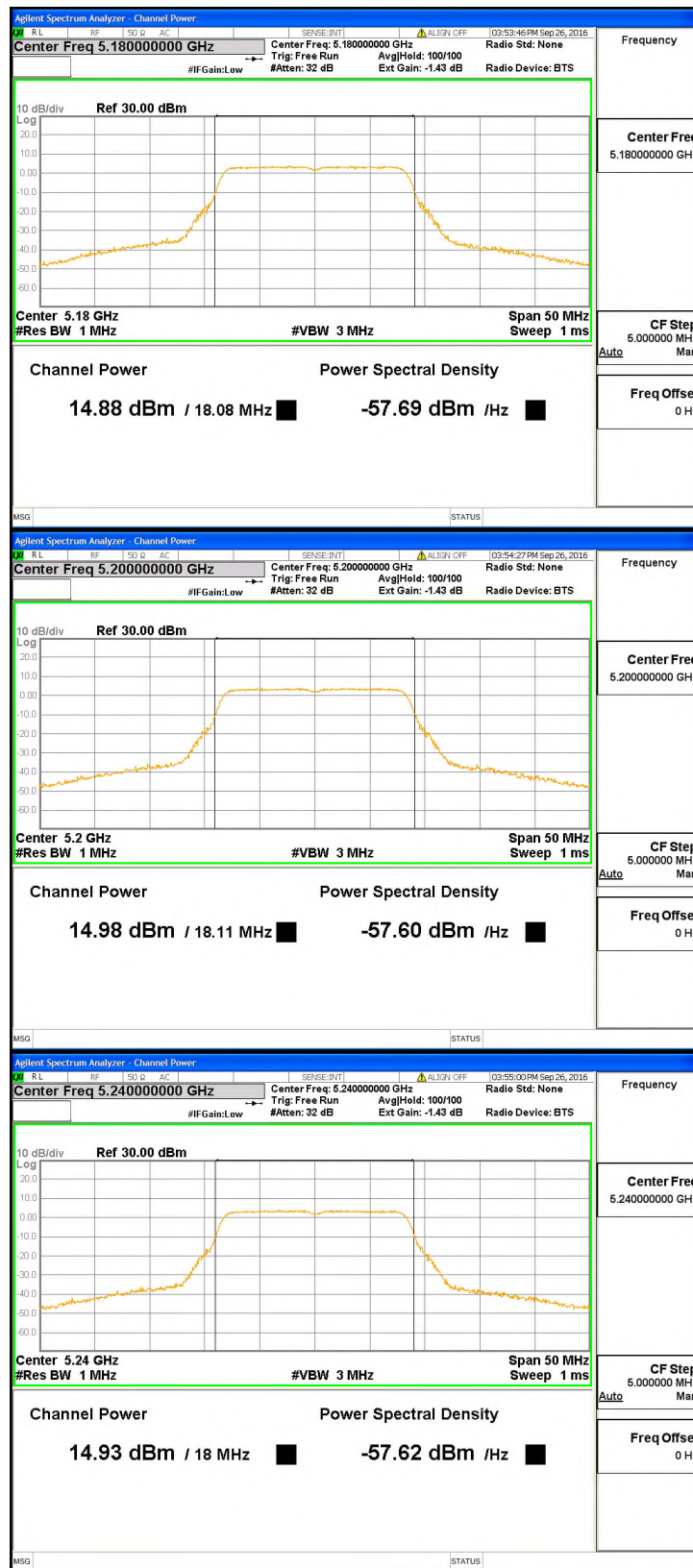
	Measured Output Power (dBm)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5190 MHz	17.38	17.39
5230 MHz	17.29	17.18
5755 MHz	18.47	18.40
5795 MHz	18.17	18.25
Measurement uncertainty	± 3 dB	

Ant : A1, A2

	Measured Output Power (dBm)	
Mode	Ant : A1	Ant : A2
Frequency	802.11ac_VHT80	802.11ac_VHT80
5210 MHz	13.81	14.10
5775 MHz	13.66	13.71
Measurement uncertainty	± 3 dB	

Ant : A1 + A2

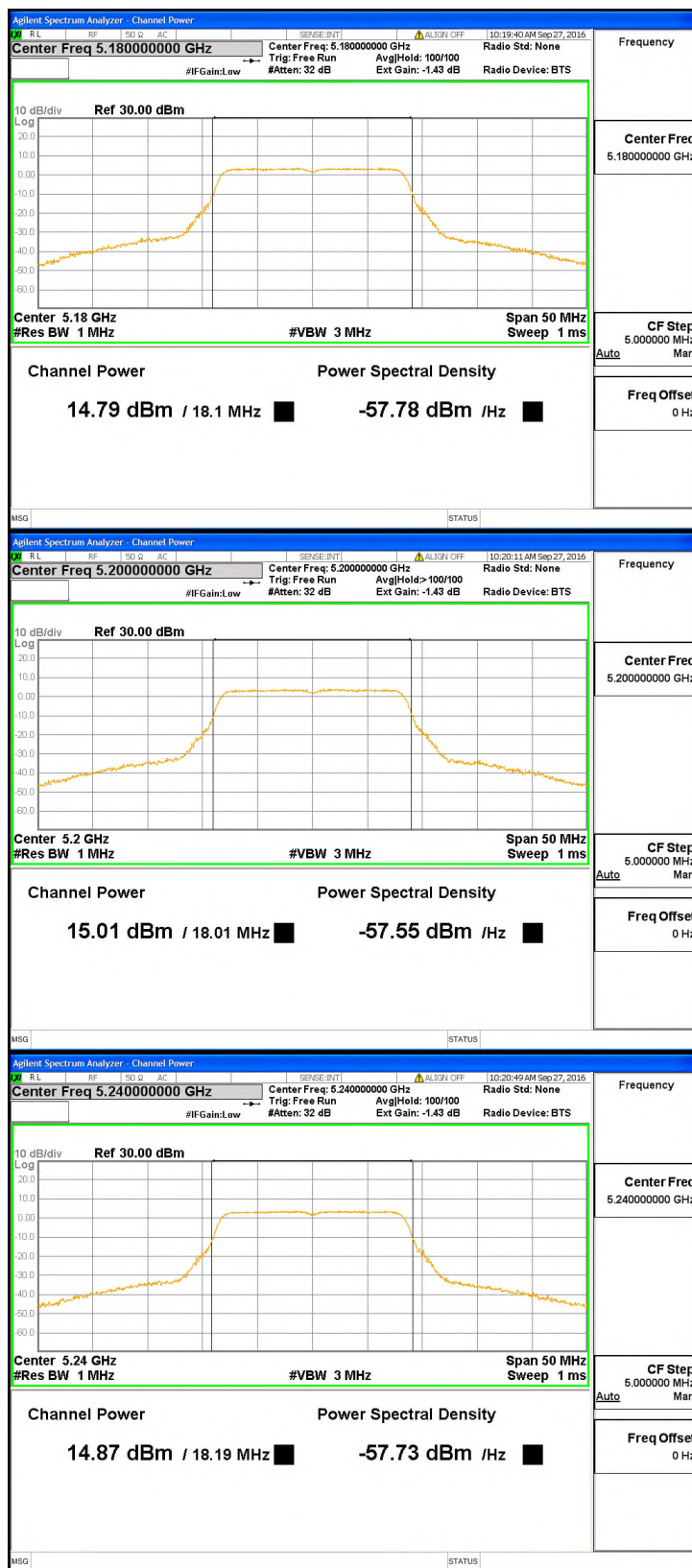
	Measured Output Power (dBm)
Mode	802.11ac_VHT80
Frequency	
5210 MHz	16.97
5775 MHz	16.70
Measurement uncertainty	± 3 dB



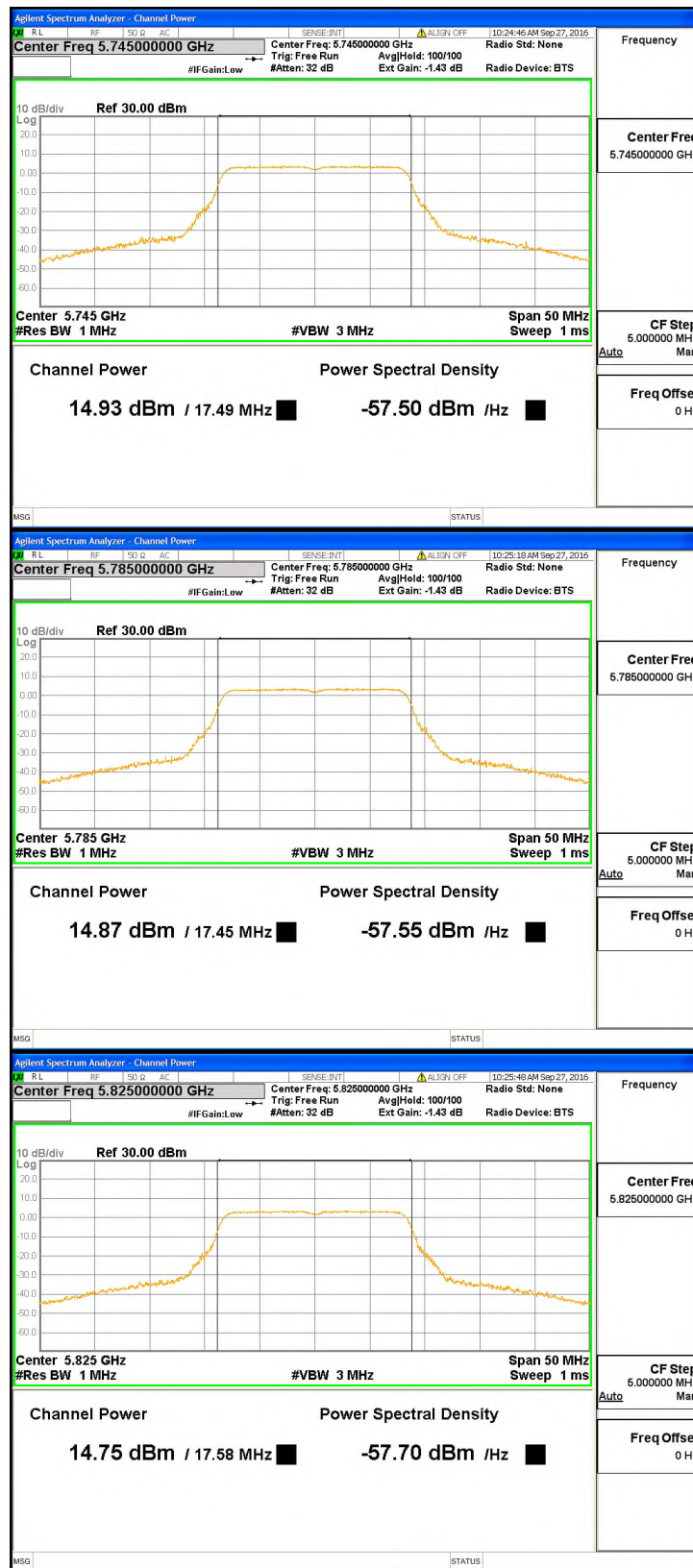
Ant : A1_802.11a_UNII-1



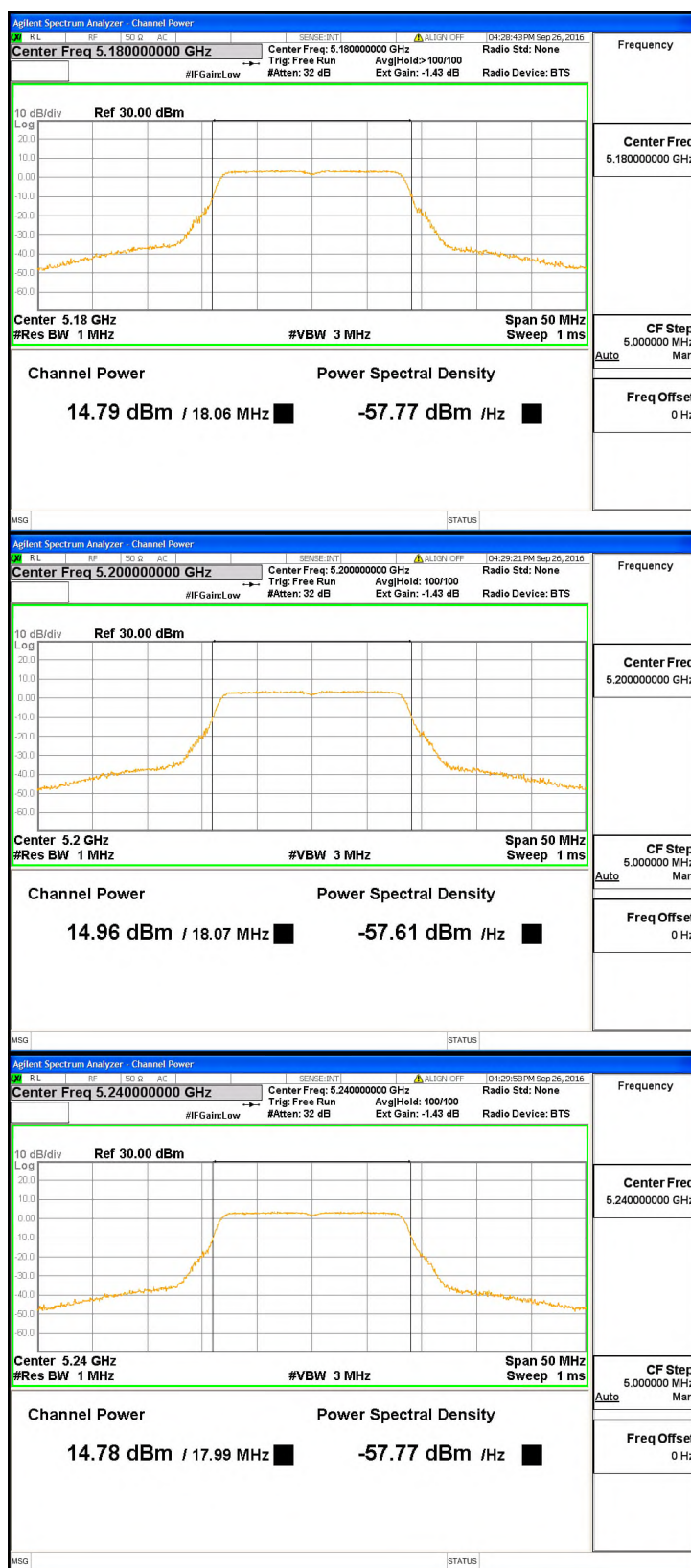
Ant : A1_802.11a_UNII-3



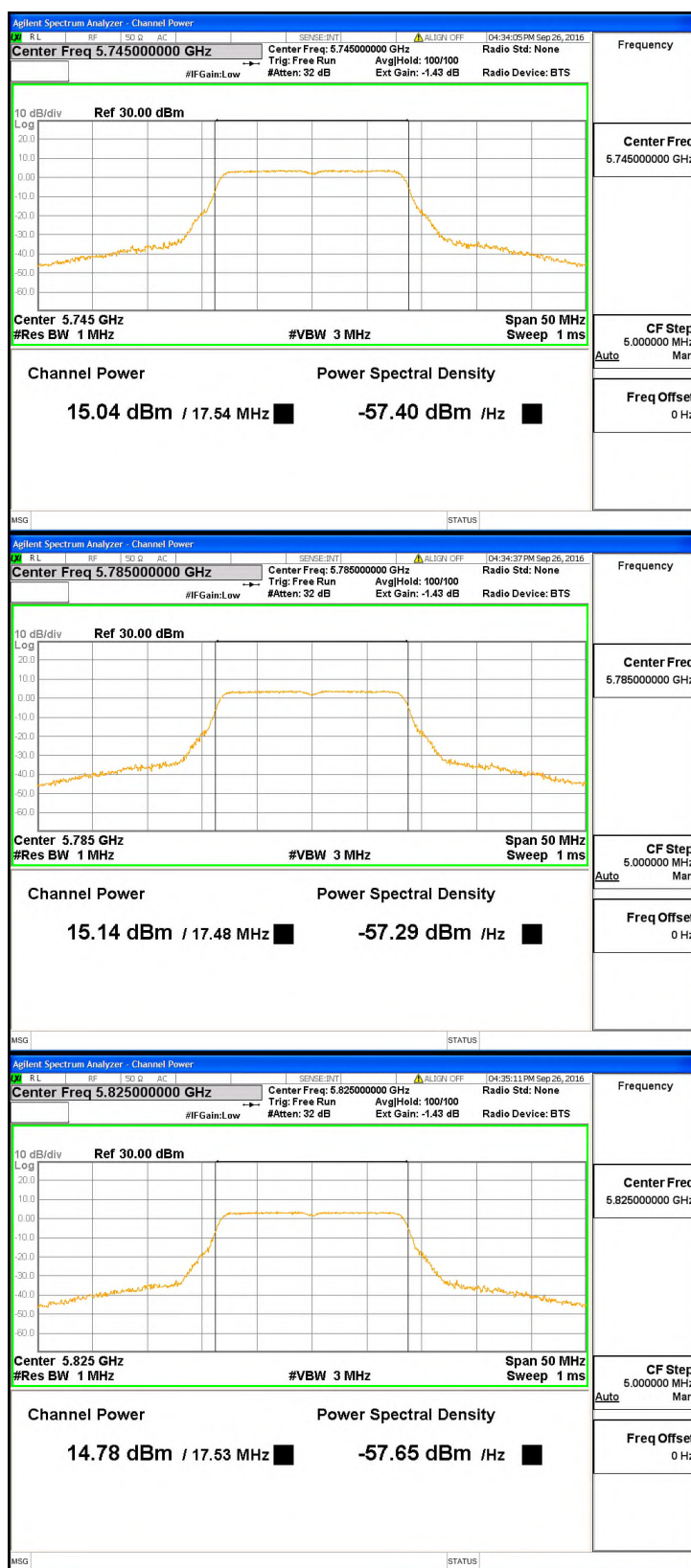
Ant : A2_802.11a_UNII-1



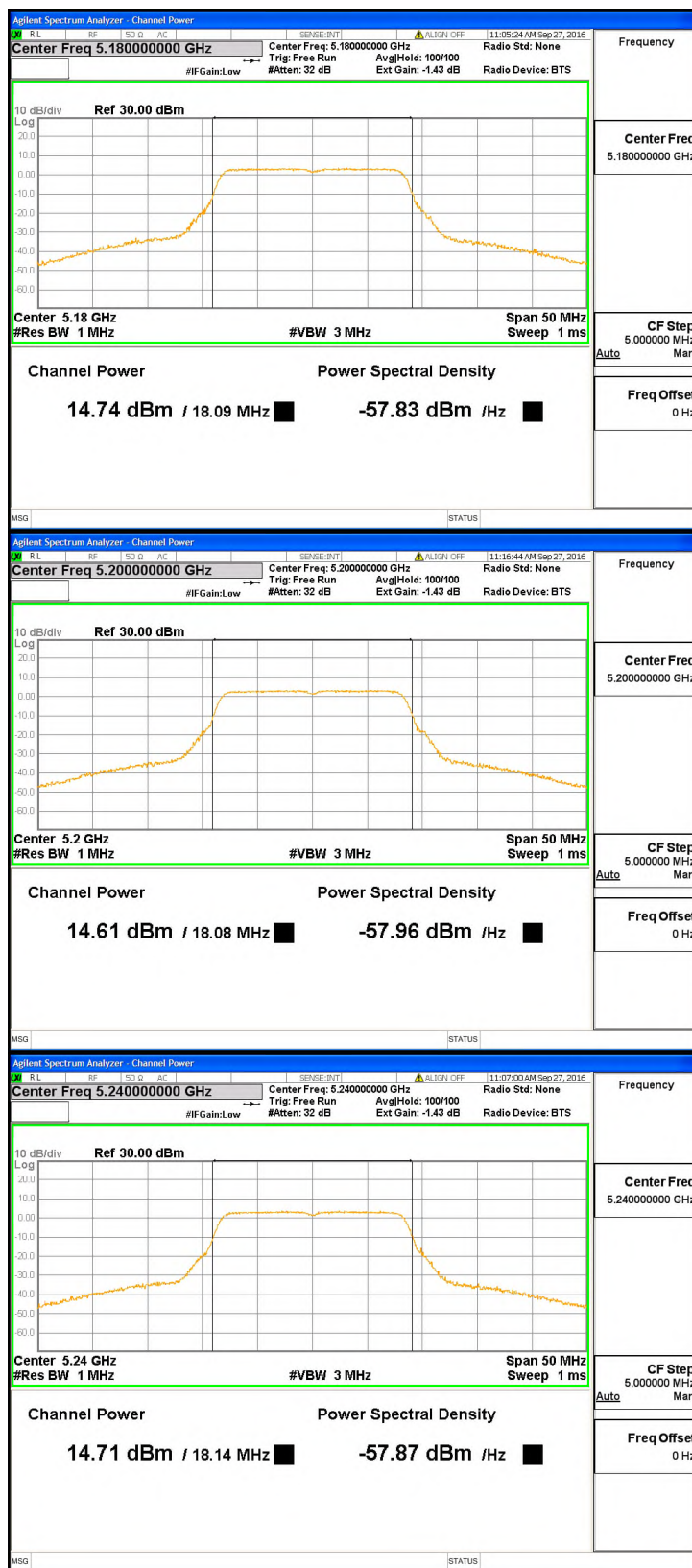
Ant : A2_802.11a_UNII-3



Ant : A1_802.11n_HT20_UNII-1



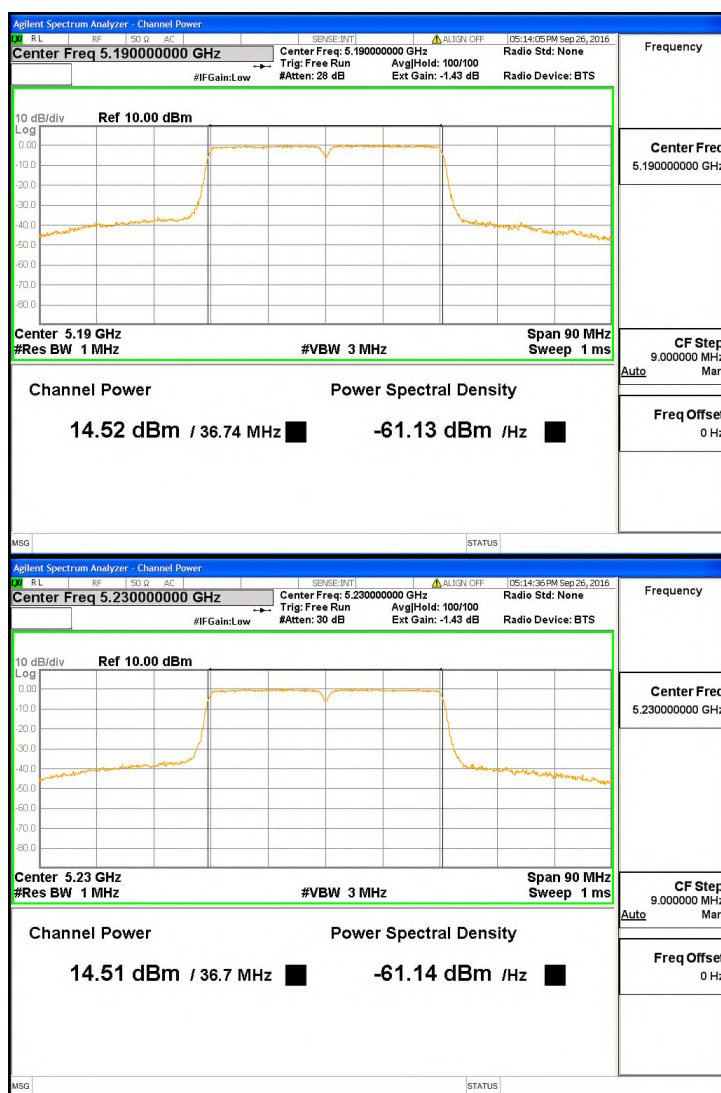
Ant : A1_802.11n_HT20_UNII-3



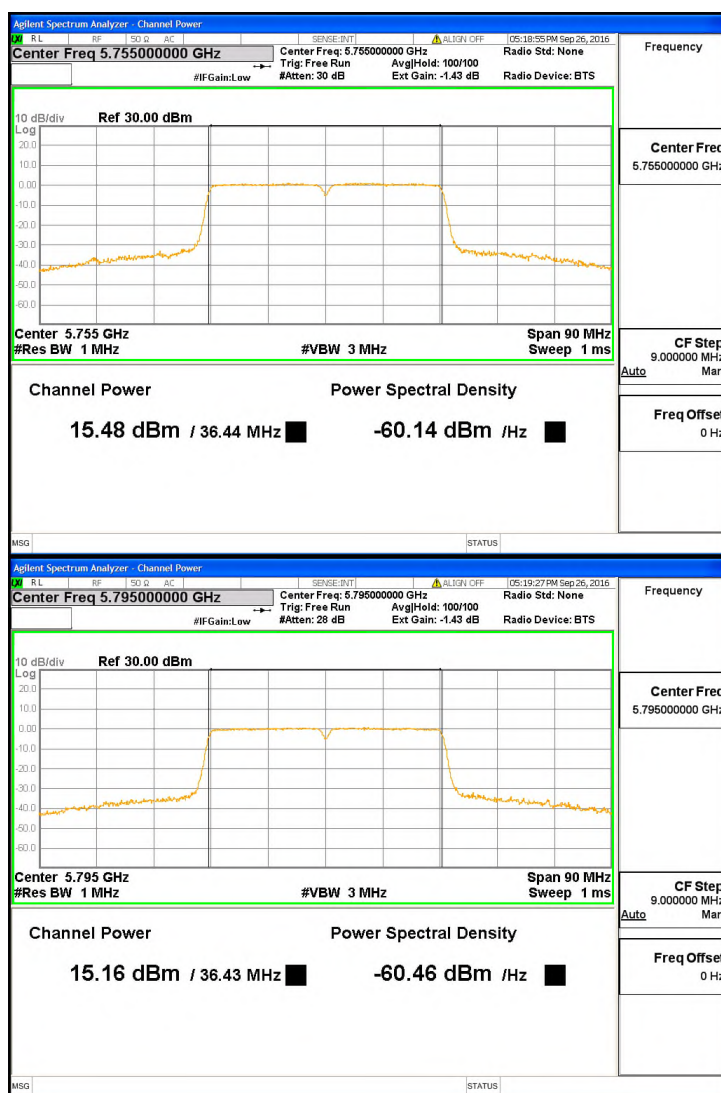
Ant : A2_802.11n_HT20_UNII-1



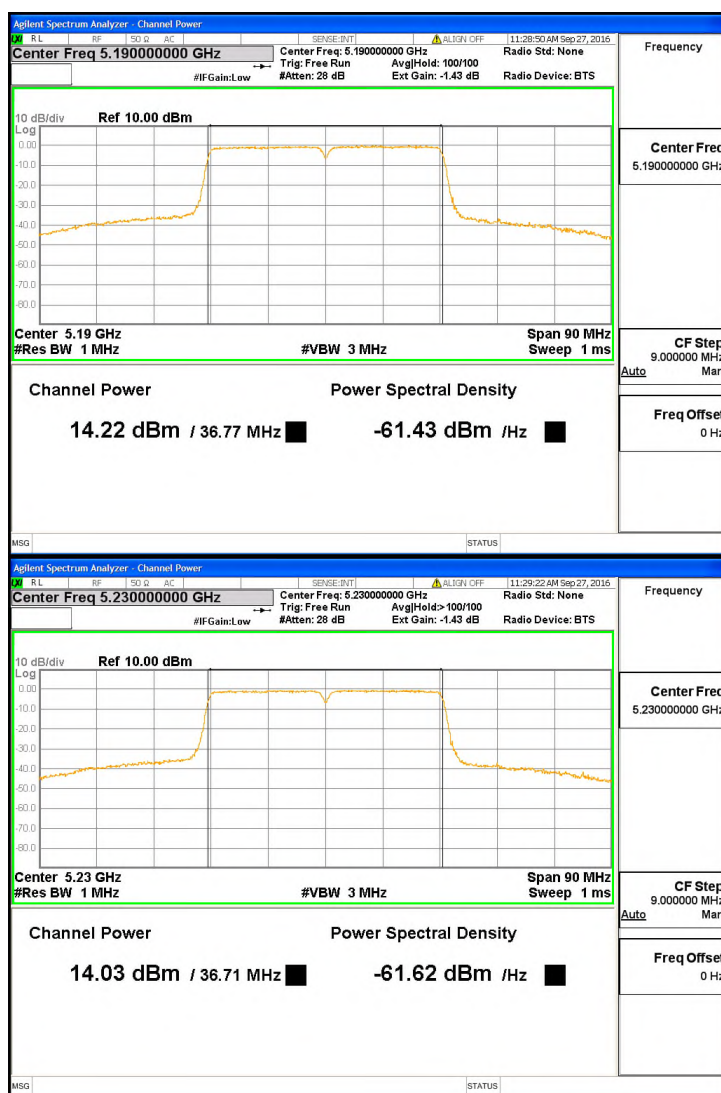
Ant : A2_802.11n_HT20_UNII-3



Ant : A1_802.11n_HT40_UNII-1



Ant : A1_802.11n_HT40_UNII-3



Ant : A2_802.11n_HT40_UNII-1