

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-2016-01235-1
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.
Manufacturer Address : 129, Samsung-ro Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea, 16677
Contact Person : Kim, Young-Gyun / Senior Engineer
Telephone : +82-31-279-4443
Received Date : 2016-09-13
Test period : Start : 2016-09-21 End : 2016-10-12

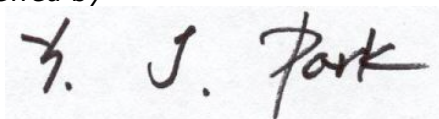
The test results presented in this report relate only to the object tested.

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-2016-01235-1)	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 2A : 5260 MHz – 5320 MHz (20 MHz_BW) 5270 MHz – 5310 MHz (40 MHz_BW) 5290 MHz (80 MHz_BW) UNII 2C : 5500 MHz – 5720 MHz (20 MHz_BW) 5510 MHz – 5710 MHz (40 MHz_BW) 5530 MHz – 5690 MHz (80 MHz_BW)					
RF output power :						
Band	Mode	Channel Bandwidth (MHz)	Frequency Range (MHz)	ANT1 (SISO)	ANT2 (SISO)	ANT1+2 (MIMO)
				RF output power (dBm)		
UNII 2A	802.11a	20	5260 – 5320	13.43	14.13	16.80
	802.11n	20	5260 – 5320	14.71	14.77	17.75
	802.11n	40	5270 – 5310	13.39	13.19	16.30
	802.11ac	20	5260 – 5320	16.01	16.08	19.06
	802.11ac	40	5270 – 5310	13.83	13.76	16.81
UNII 2C	802.11ac	80	5290	12.93	13.32	16.14
	802.11a	20	5500 – 5720	16.31	15.89	19.11
	802.11n	20	5500 – 5720	16.29	15.71	19.02
	802.11n	40	5510 – 5710	15.87	16.13	19.01
	802.11ac	20	5500 – 5720	16.52	16.02	19.29
	802.11ac	40	5510 – 5710	15.99	16.15	19.08
802.11ac	80	5530 – 5690	13.40	14.02	16.73	
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 2A	5260	5300	5320
UNII 2C	5500	5600	5720

802.11n_HT40, 802.11ac_VHT40

Frequency (MHz)	LOW	MID	HIGH
UNII 2A	5270	-	5310
UNII 2C	5510	5590	5710

802.11ac_VHT80

Frequency (MHz)	LOW	MID	HIGH
UNII 2A	5290	-	-
UNII 2C	5530	-	5690

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

Parameter	Part Section(s)	Limit	Test Condition	Status (note 1)
6 dB Bandwidth	FCC_15.407(e)	> 500 kHz	Conducted	C
	IC_RSS-Gen 4.6.1			
26 dB Bandwidth and 99% Bandwidth	FCC_15.407(a)	NA		C
	IC_RSS-Gen 4.6.1			
Conducted Output Power	FCC_15.407(a)(1)	< 250 mW (5250 – 5350 MHz) < 250 mW (5470 – 5725 MHz)		C
	IC_RSS-247 6.2.2(1), 6.2.3(1)			
Power Spectral Density	FCC_15.407(a)(1)	< 11 dBm/MHz (5250 – 5350 MHz) < 11 dBm/MHz (5470 – 5725 MHz)		C
	IC_RSS-247 6.2.2(1), 6.2.3(1)			
Frequency Stability	FCC_15.407(g)	NA		C
	IC_RSS-Gen 6.11			
Undesirable emission	FCC_15.407 (b)	< -27 dBm/MHz EIRP (5250 – 5350 MHz, 5470 – 5725 MHz) < -17 dBm/MHz EIRP (5715 – 5725 MHz)	Radiated	C
	IC_RSS-247 6.2.2(2), 6.2.3(2)			
Radiated Spurious Emission	FCC_15.205, 15.407 (b)(5),(6)	15.209(a)		C
	IC_RSS-Gen 6.13	IC_RSS-247 5.5		
AC Conducted Emissions	FCC_15.207	15.207(a)	Line Conducted	C
	IC_RSS-Gen 8.8	IC_RSS-Gen 8.8		
Receiver Spurious Emissions	IC_RSS-Gen 5	IC_RSS-Gen 7.1.2	Radiated	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

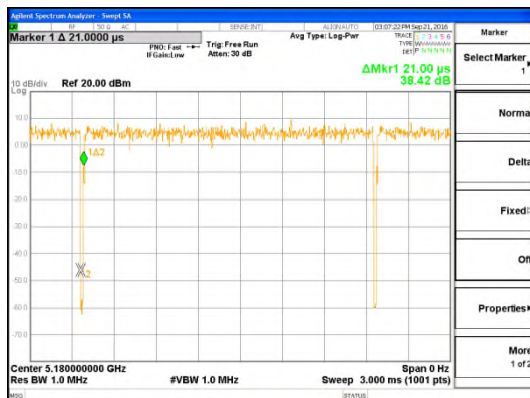
2.1.1 ON Time, Duty Cycle

Procedure:

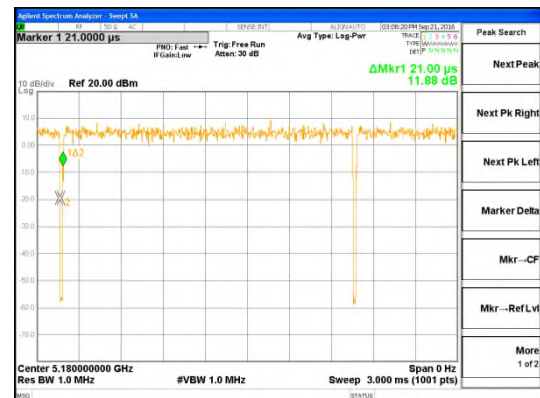
KDB 789033 Zero-Span Spectrum Analyzer Method.

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



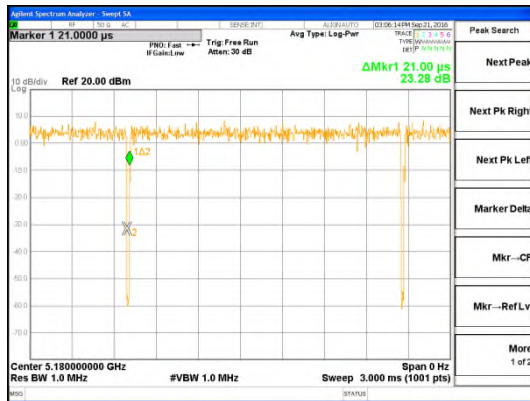
Duty Cycle_802.11a



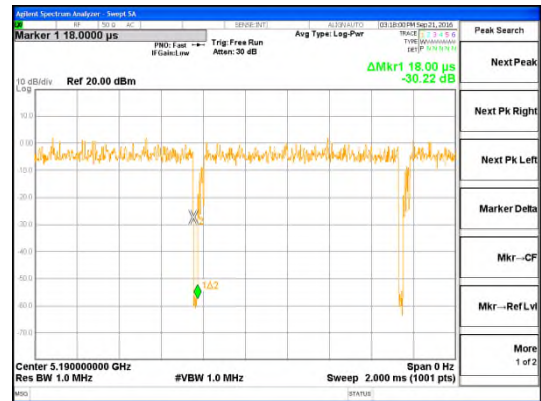
Duty Cycle_802.11n_HT20



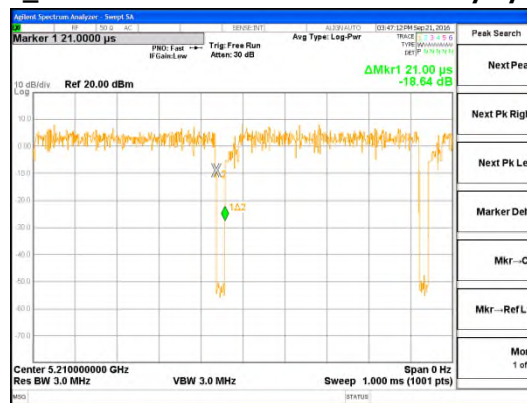
Duty Cycle_802.11n_HT40



Duty Cycle_802.11ac_VHT20



Duty Cycle_802.11ac_VHT40



Duty Cycle_802.11ac_VHT80

2.1.2 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%
5260 MHz	22.19	18.02	22.45	18.05	28.37	19.08
5300 MHz	22.48	18.04	22.34	18.13	29.00	19.03
5320 MHz	22.26	18.05	22.57	18.09	25.79	18.98
5500 MHz	28.51	18.35	29.23	18.27	36.12	19.27
5600 MHz	29.53	18.21	28.84	18.30	35.88	19.24
5720 MHz	27.50	18.30	29.32	18.27	34.36	19.22
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 %
5270 MHz	40.55	36.70	40.68	36.66
5310 MHz	40.76	36.61	40.55	36.70
5510 MHz	67.54	36.90	45.84	36.82
5590 MHz	54.75	36.91	46.46	36.76
5710 MHz	54.20	36.94	43.97	36.86
Measurement uncertainty	± 3 dB			

	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5290 MHz	81.74	75.73
5530 MHz	81.25	75.80
5690 MHz	81.86	75.83
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%
5260 MHz	22.67	18.08	22.53	18.21	29.96	19.12
5300 MHz	22.53	18.12	22.65	18.17	25.83	19.01
5320 MHz	22.60	18.03	22.56	18.15	29.83	19.15
5500 MHz	26.40	18.26	29.51	18.22	30.97	19.16
5600 MHz	27.16	18.33	29.49	18.25	33.92	19.18
5720 MHz	27.80	18.24	29.11	18.31	37.77	19.19
Measurement uncertainty	± 3 dB					

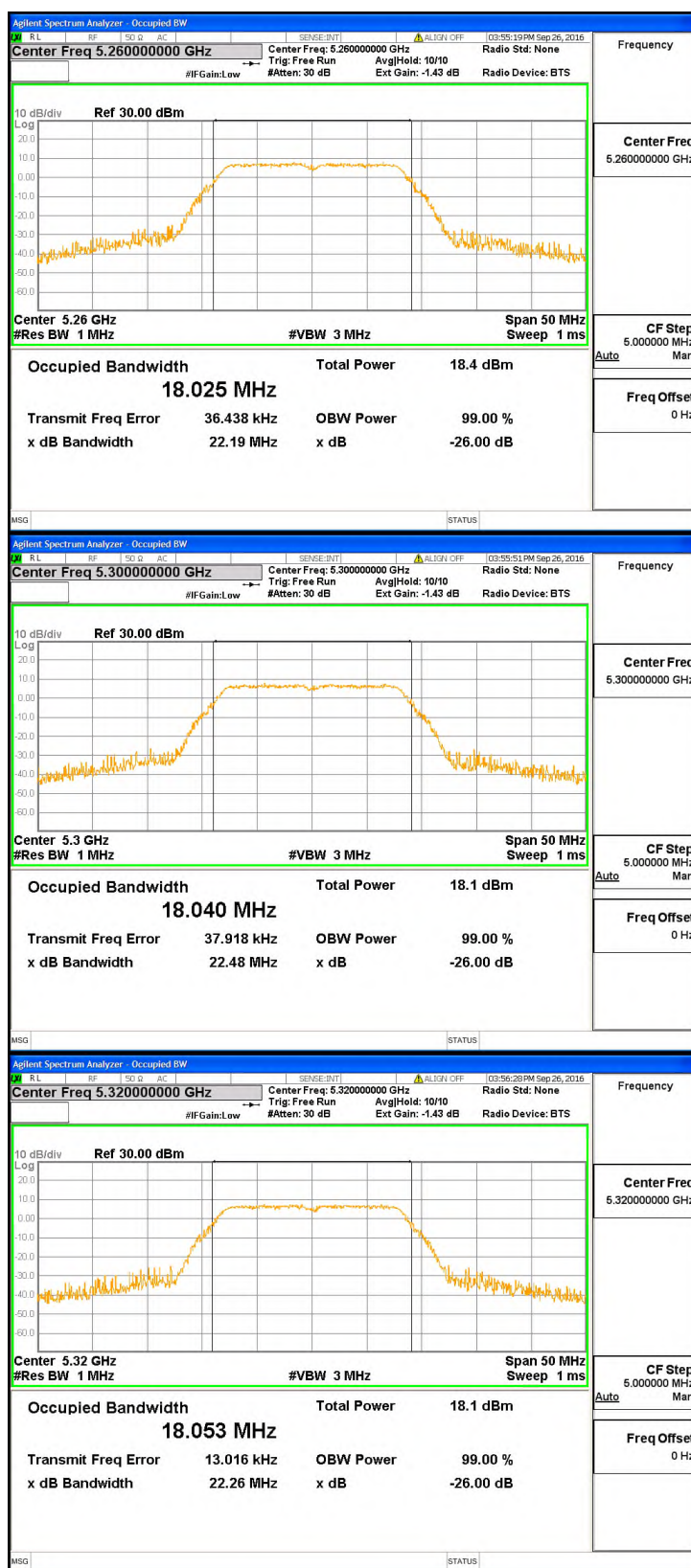
	26 dB Bandwidth and 99% Bandwidth (MHz)			
Mode	802.11n_HT40		802.11ac_VHT40	
Frequency	26 dB	99 %	26 dB	99 %
5270 MHz	40.75	36.77	40.22	36.72
5310 MHz	40.66	36.77	41.99	36.76
5510 MHz	64.69	36.97	59.87	36.96
5590 MHz	55.03	36.92	53.93	36.94
5710 MHz	66.53	36.91	50.62	36.89
Measurement uncertainty	± 3 dB			

	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5290 MHz	80.97	75.83
5530 MHz	81.71	75.83
5690 MHz	81.71	75.84
Measurement uncertainty	± 3 dB	

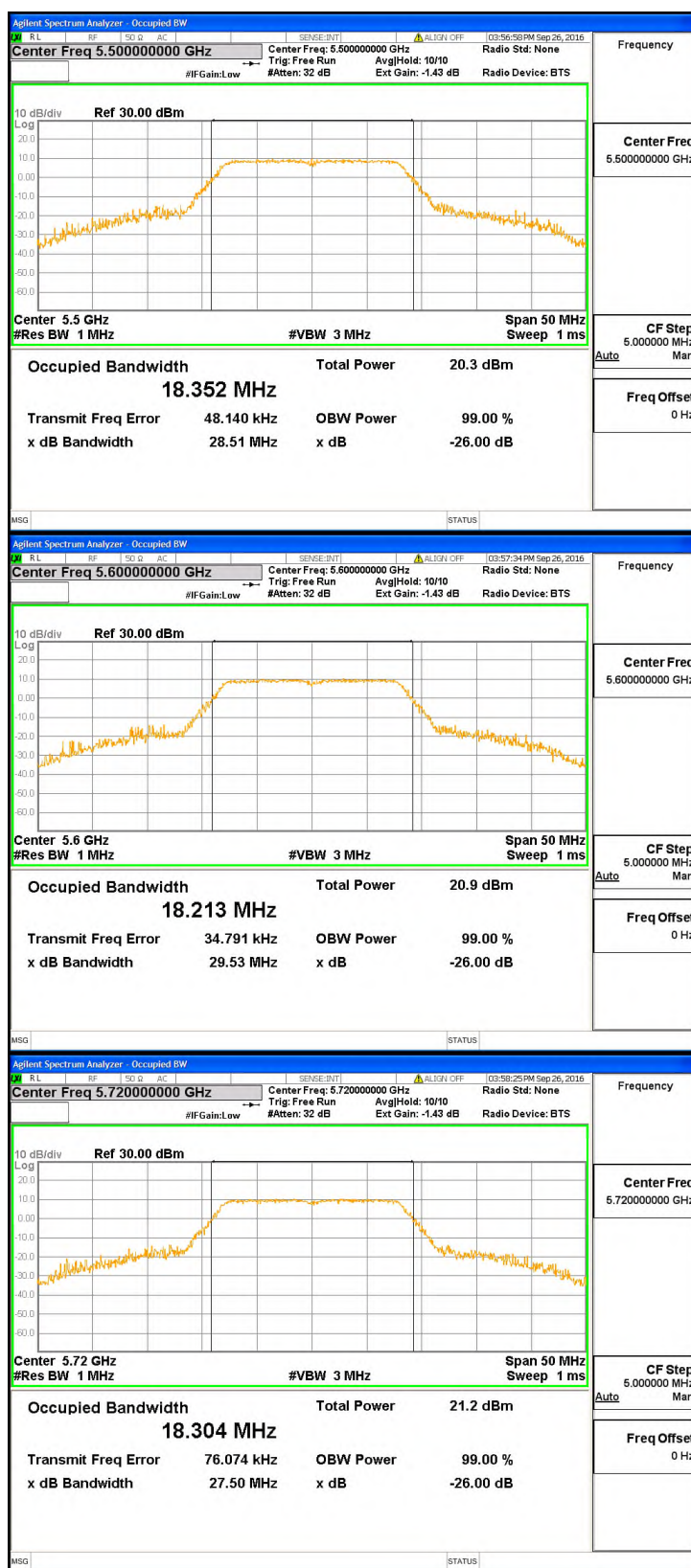
Minimum Standard:

6 dB Bandwidth > 500kHz

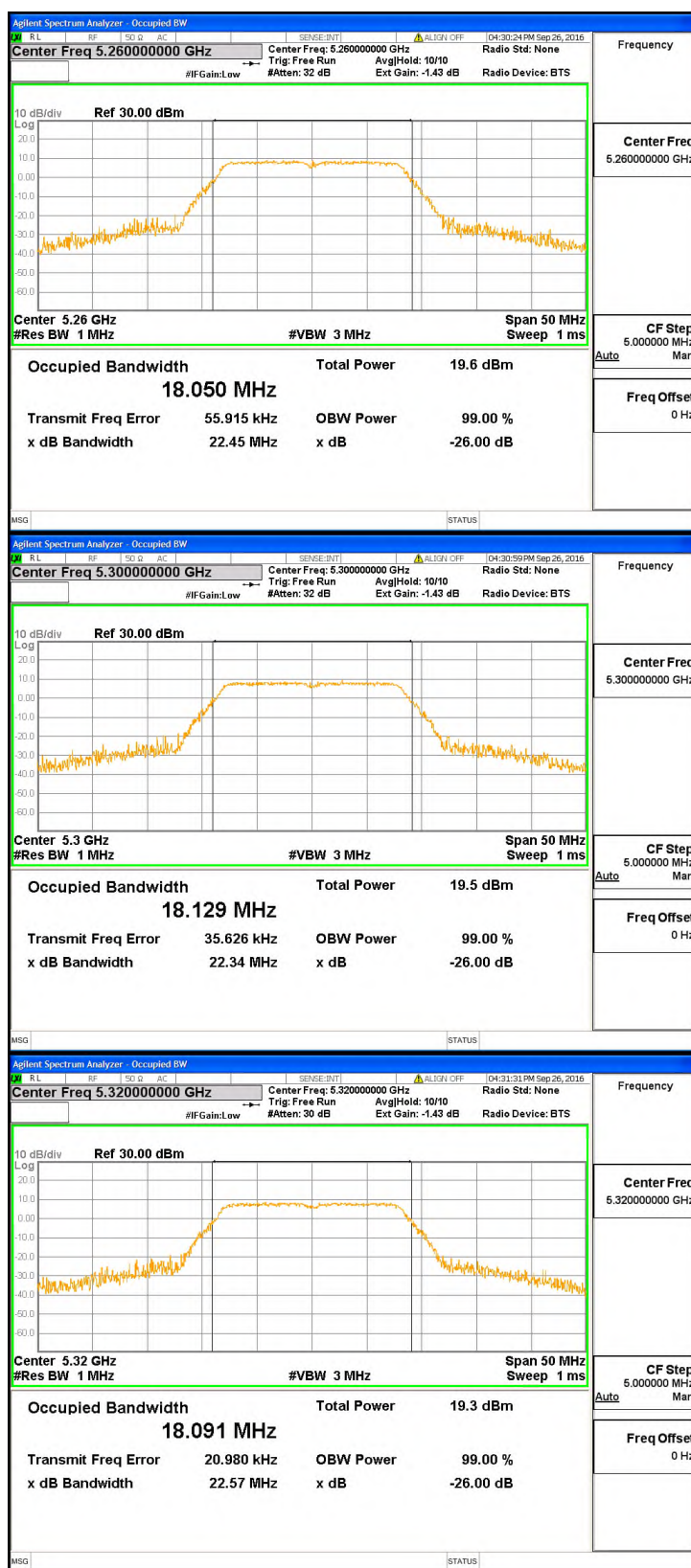
See next pages for actual measured spectrum plots.



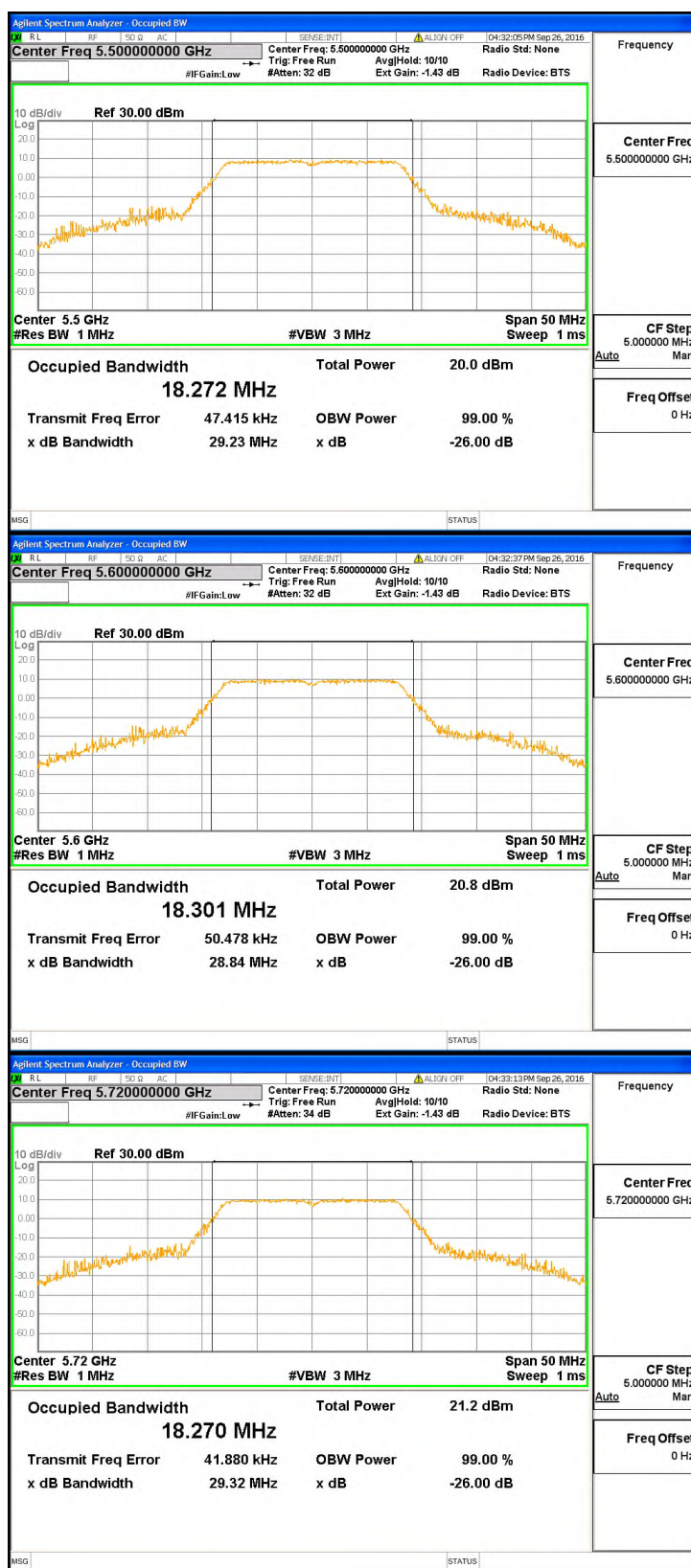
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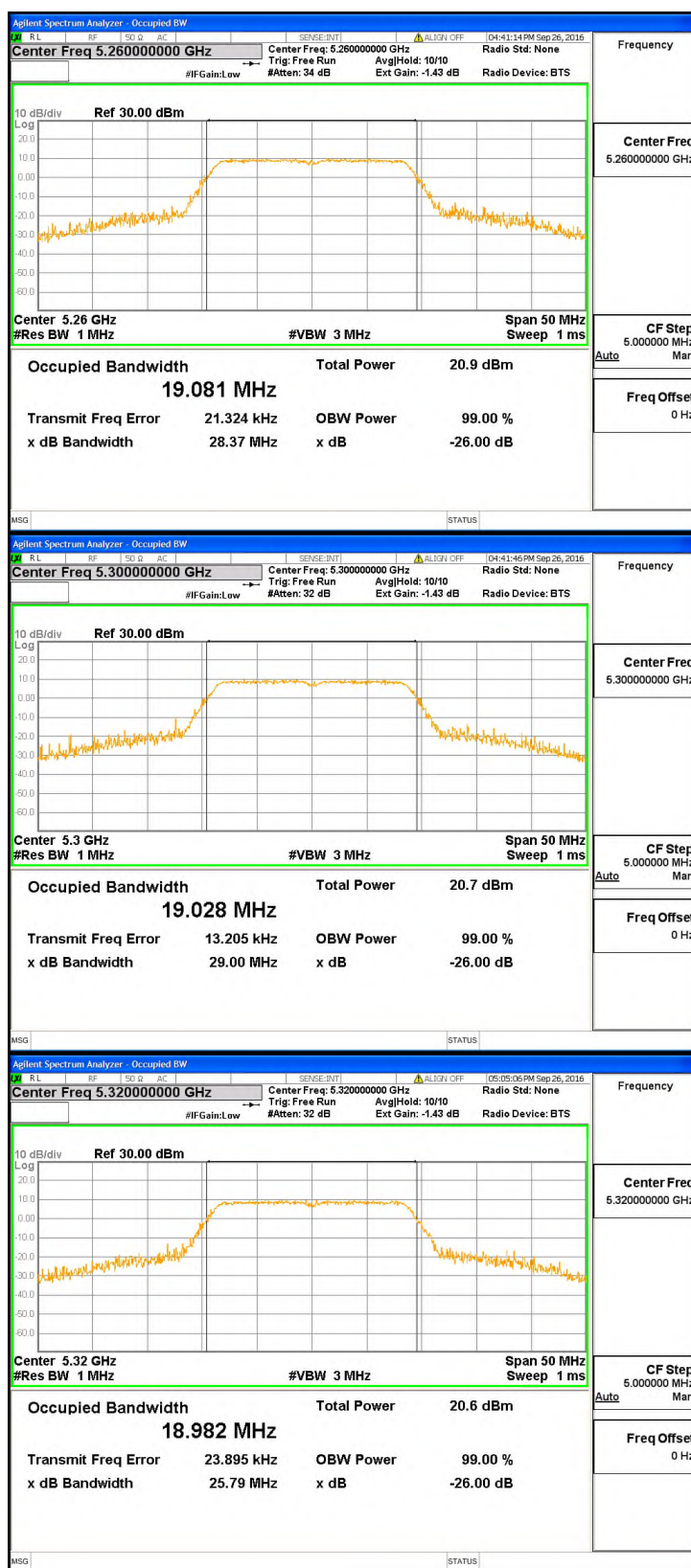


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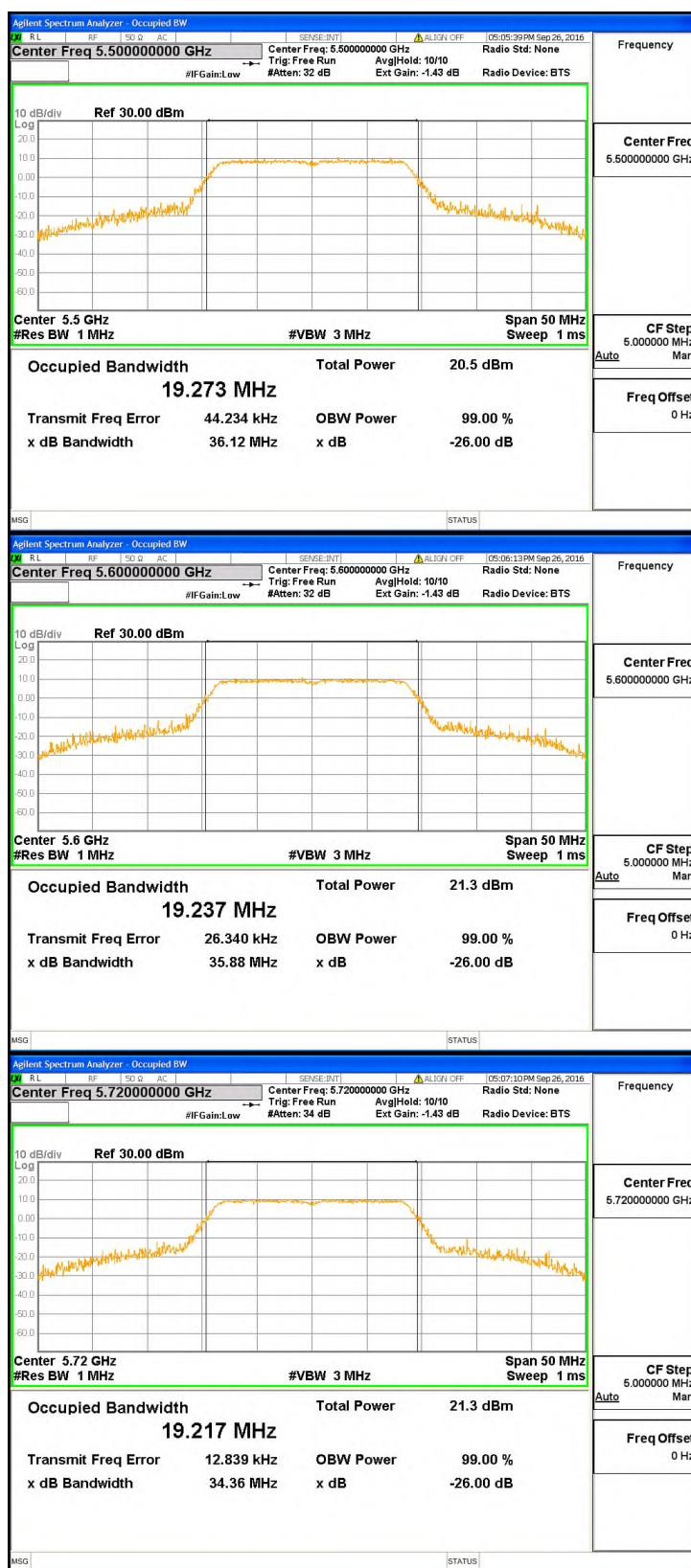


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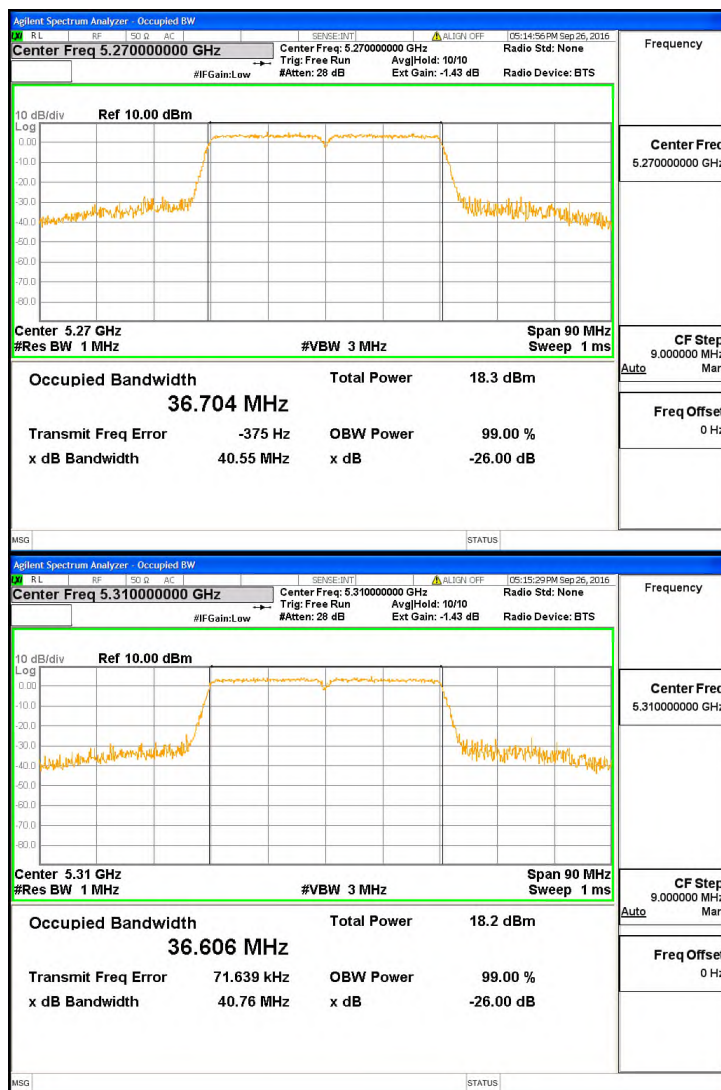




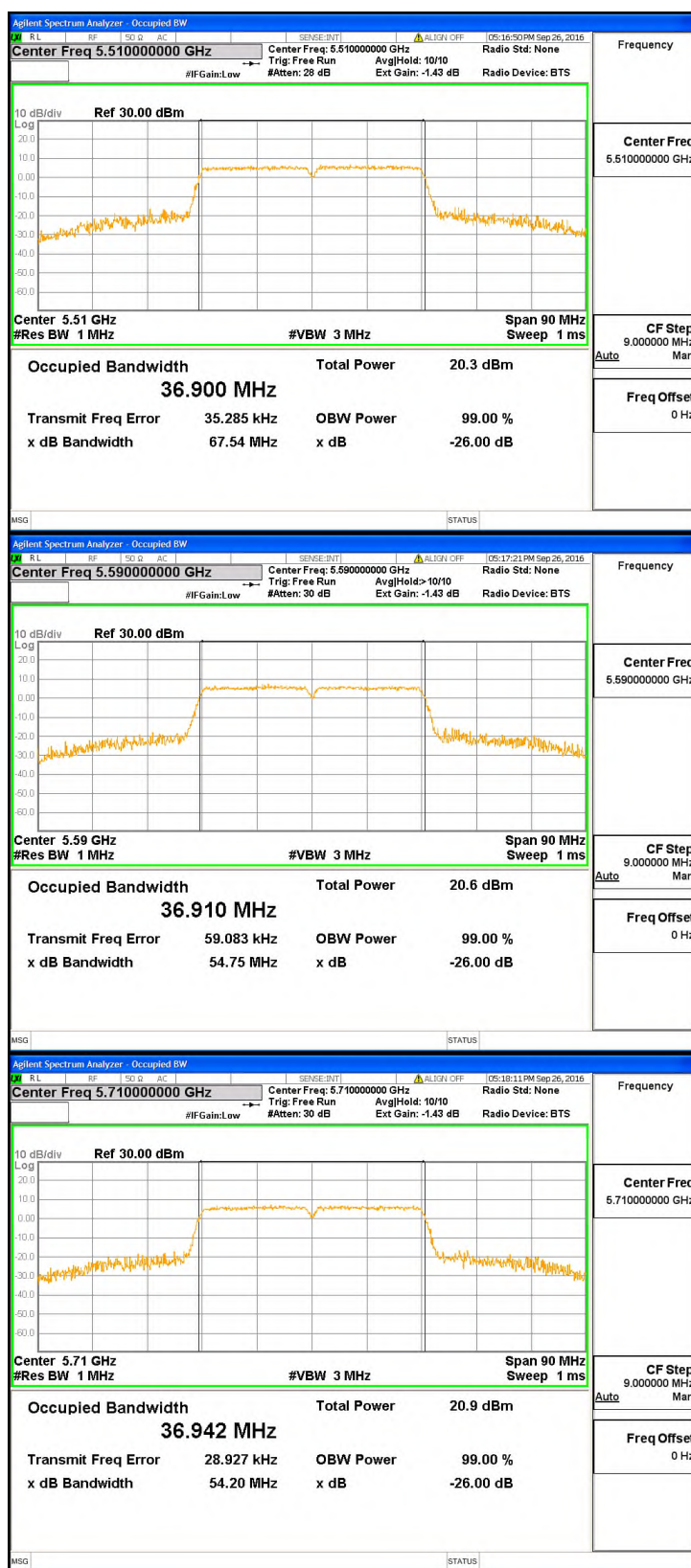
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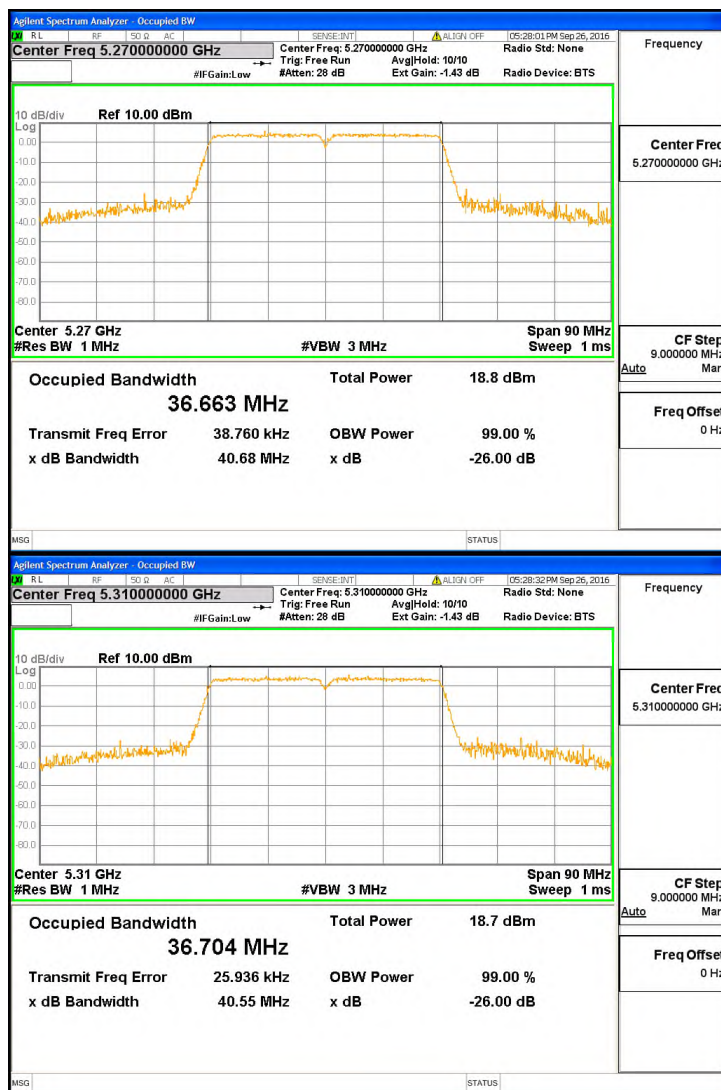
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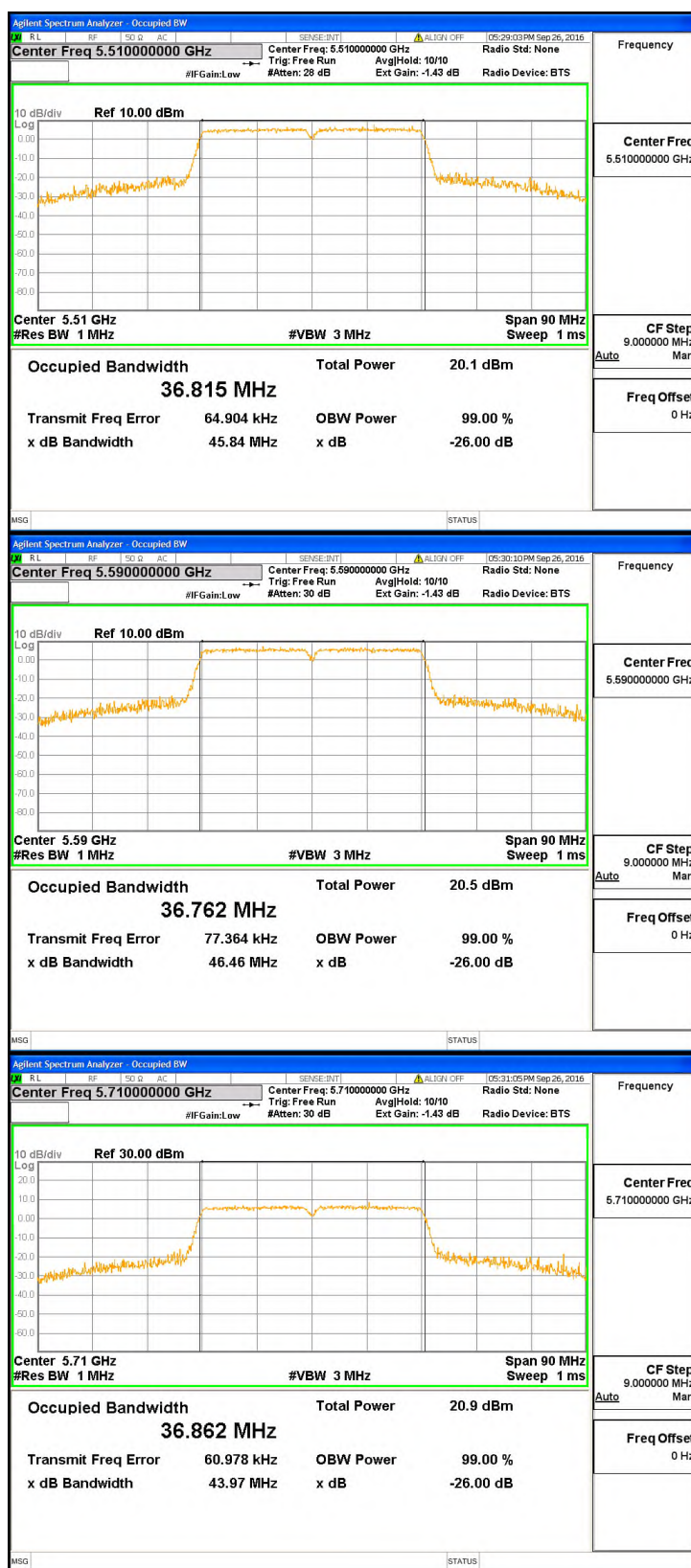
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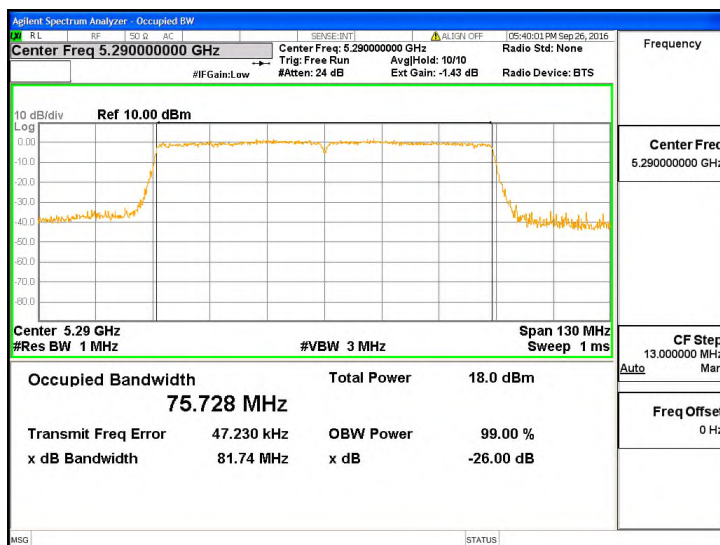
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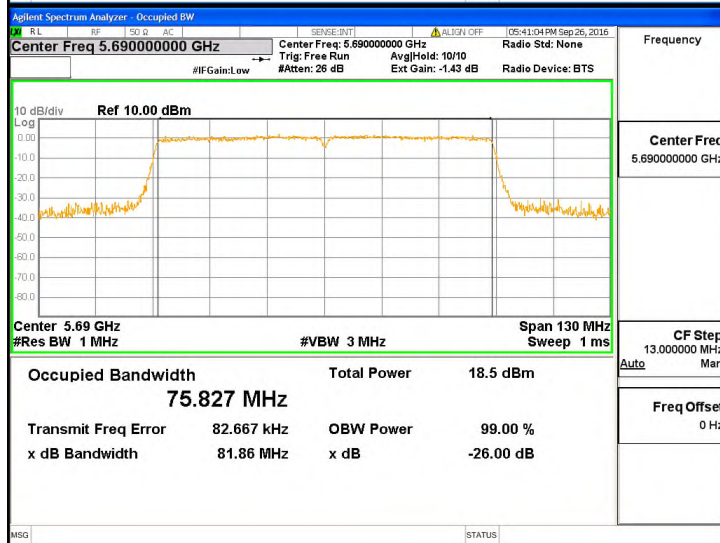
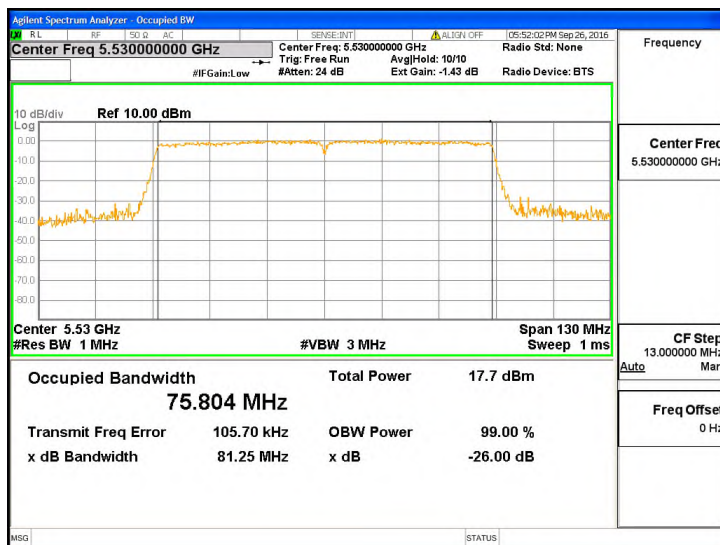
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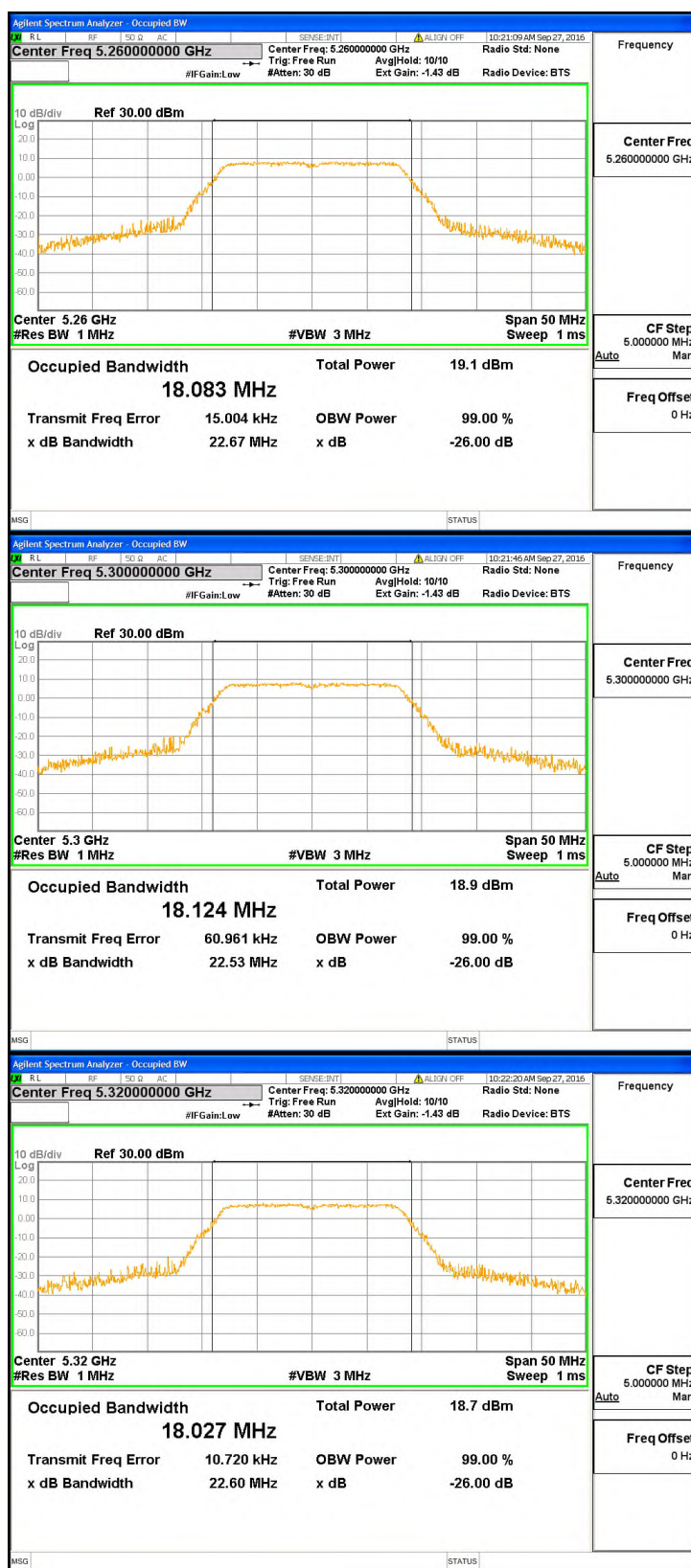
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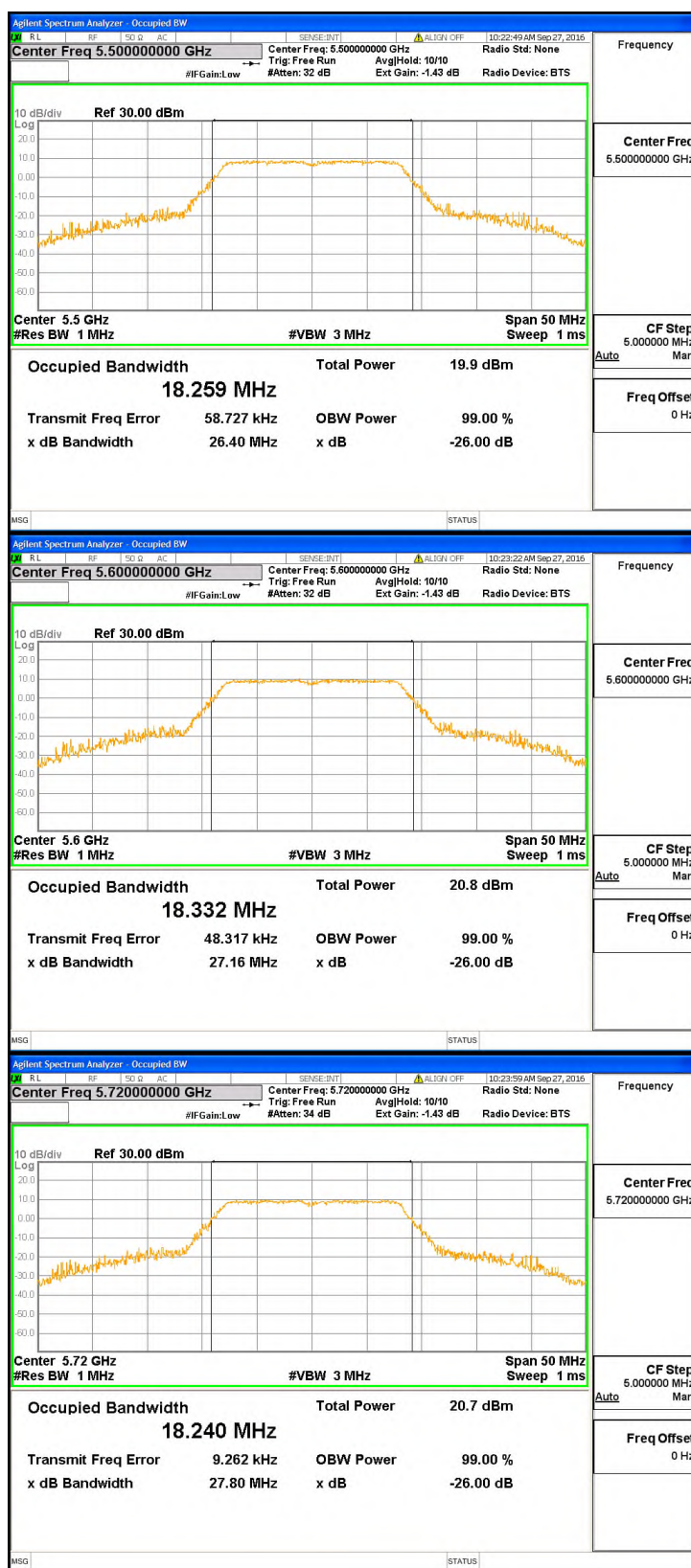
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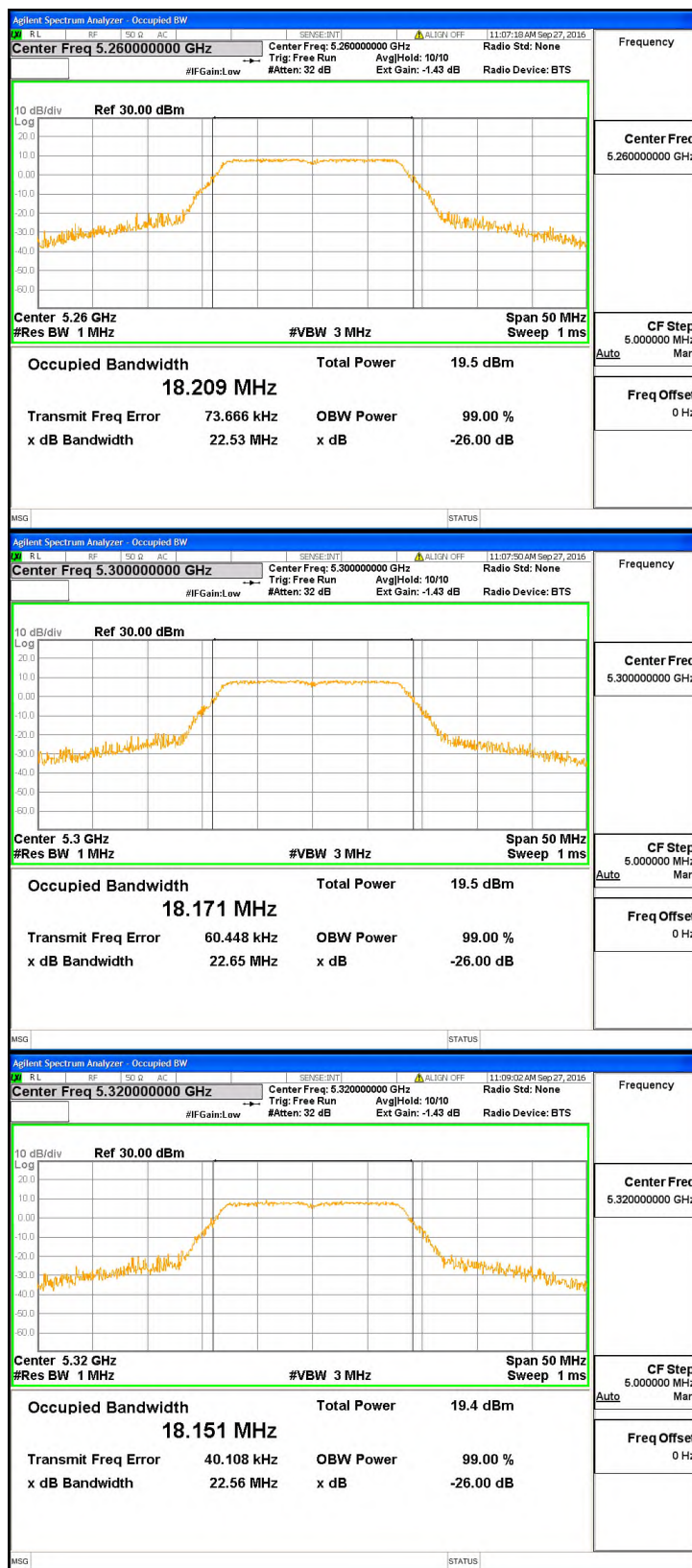
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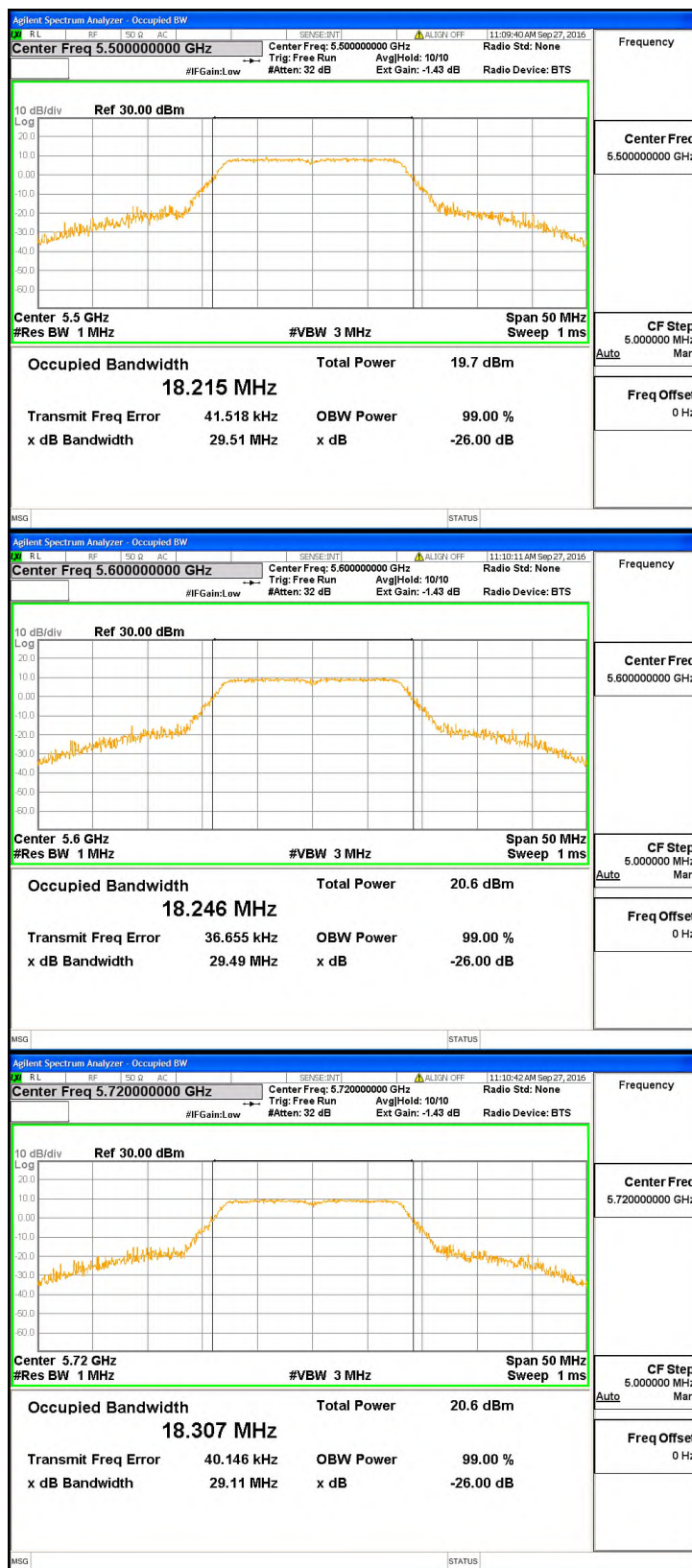
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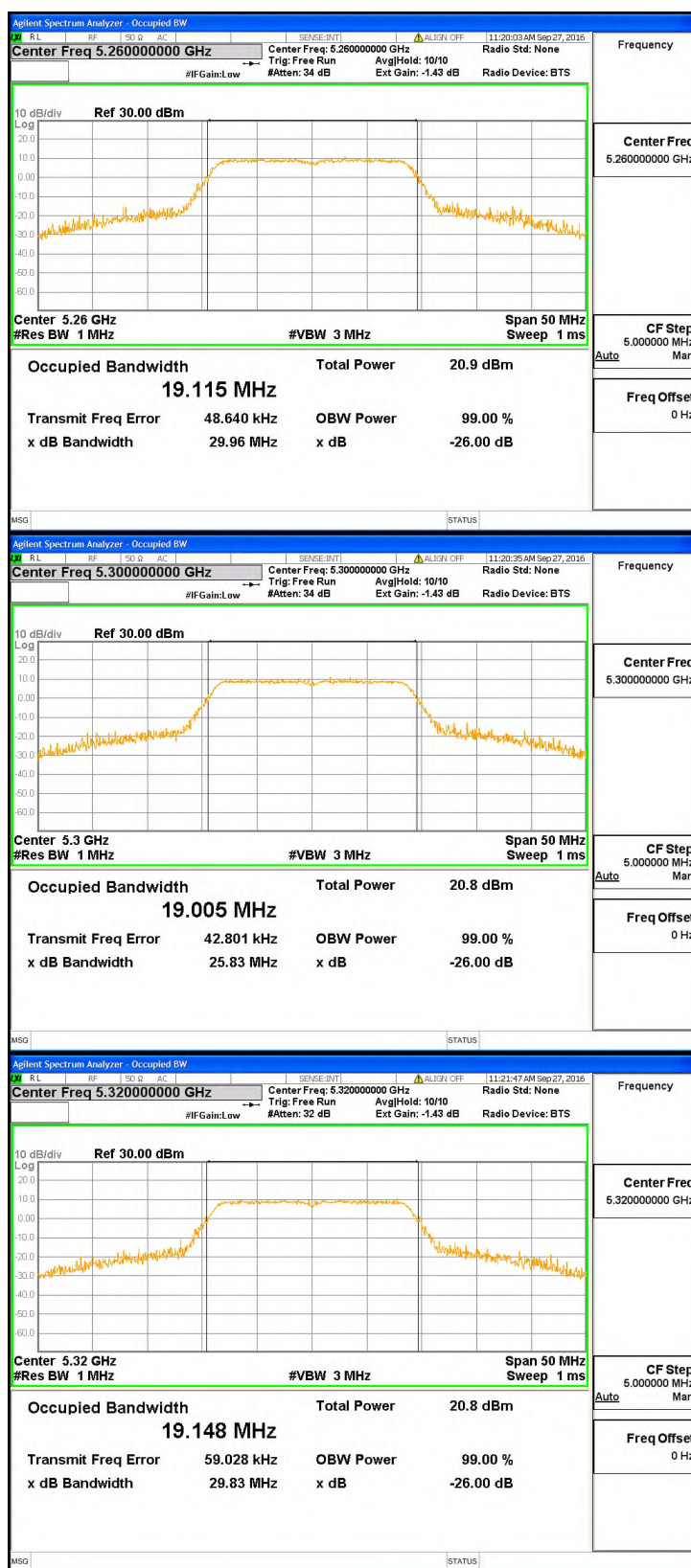
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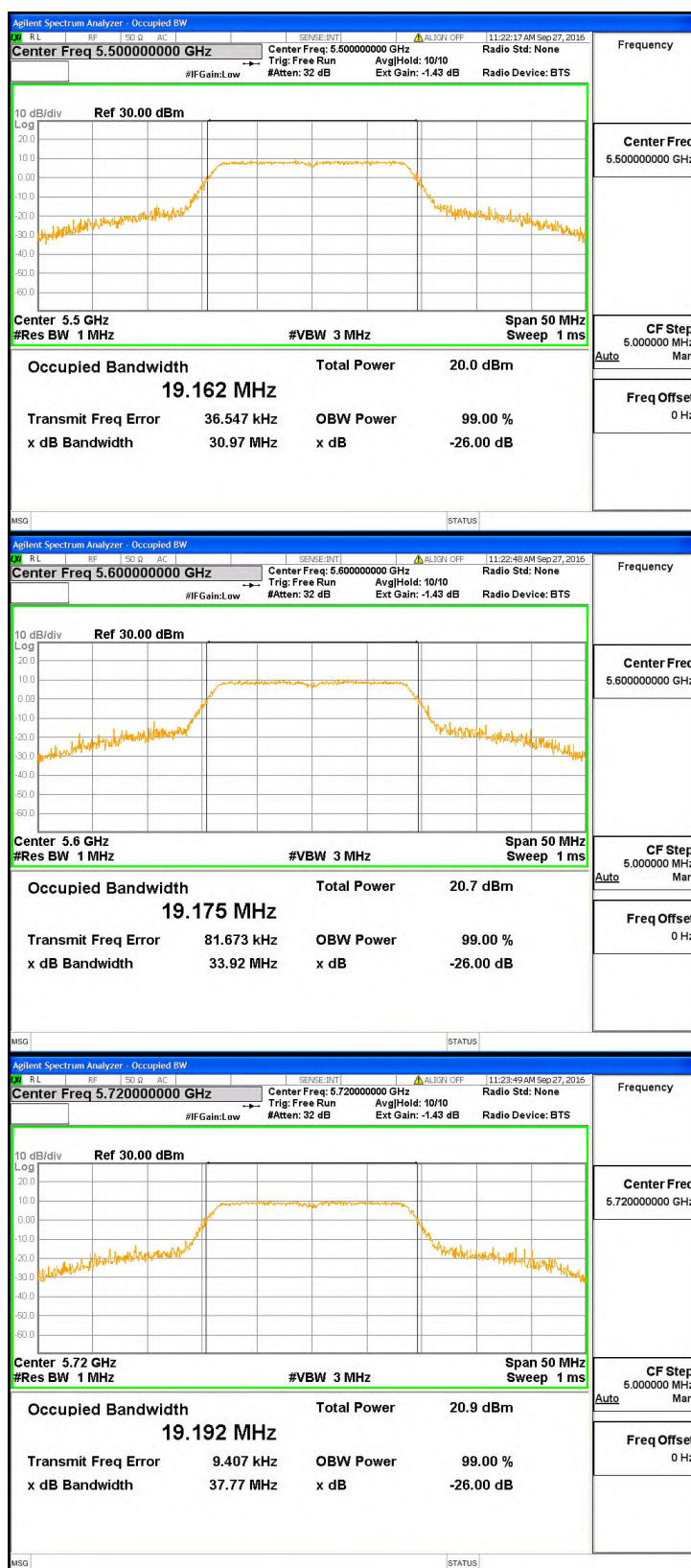
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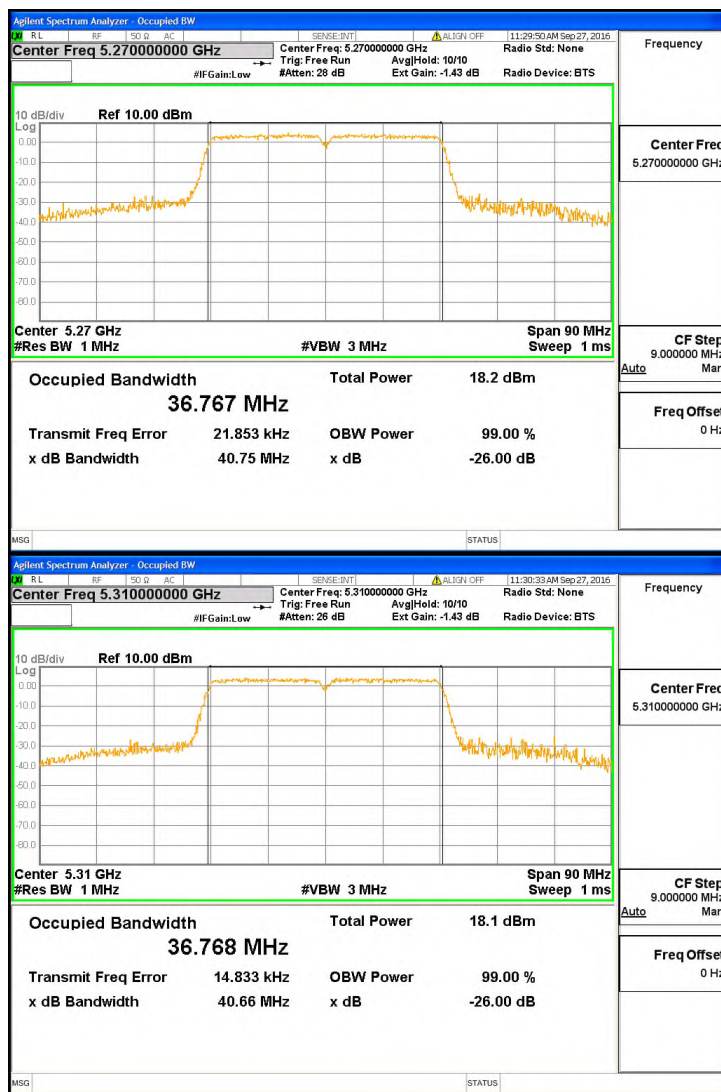
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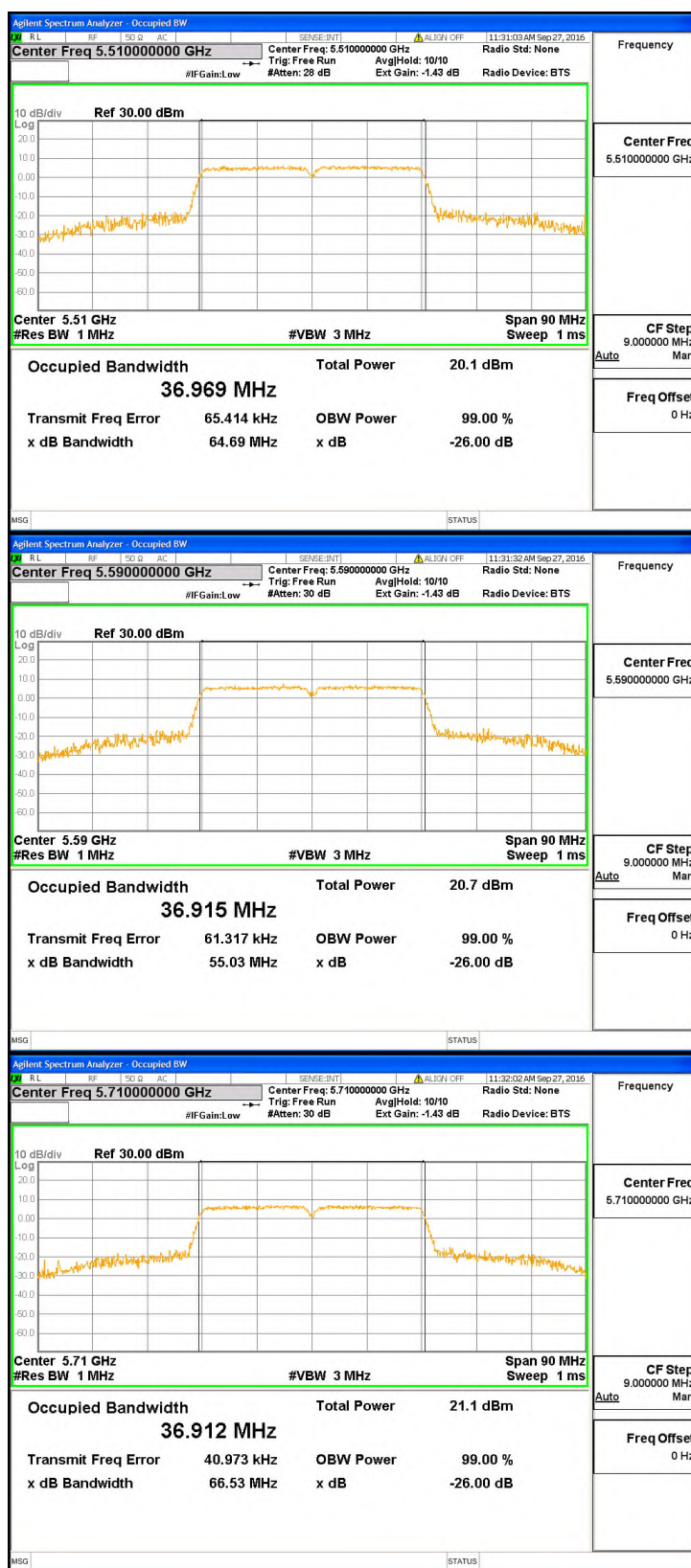
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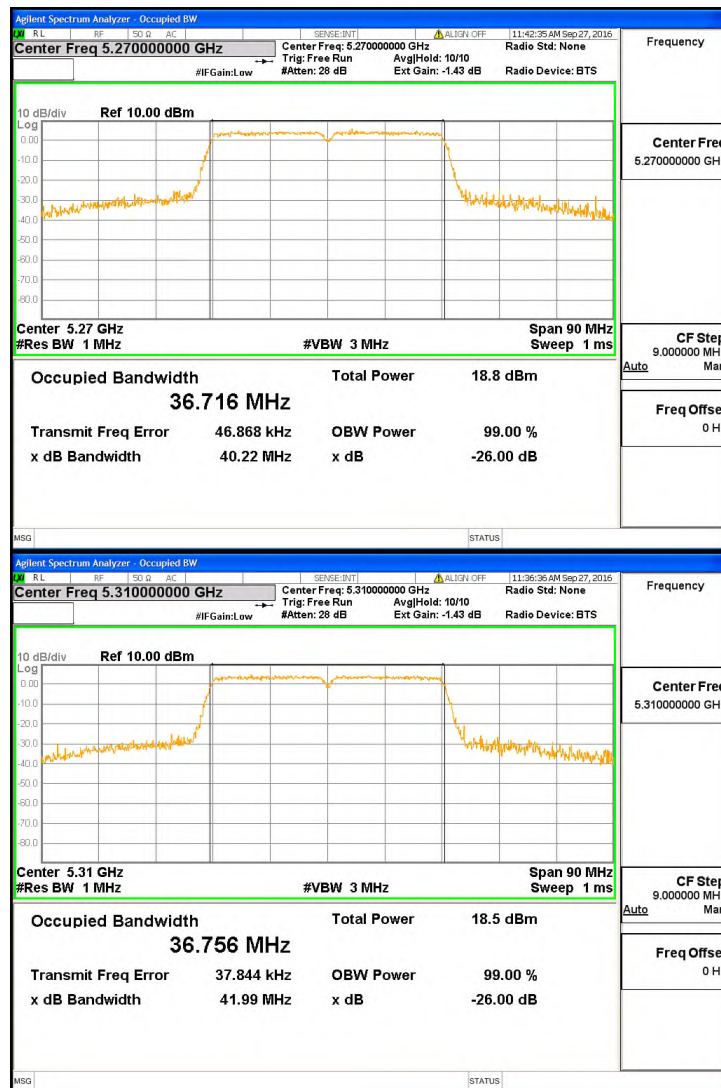
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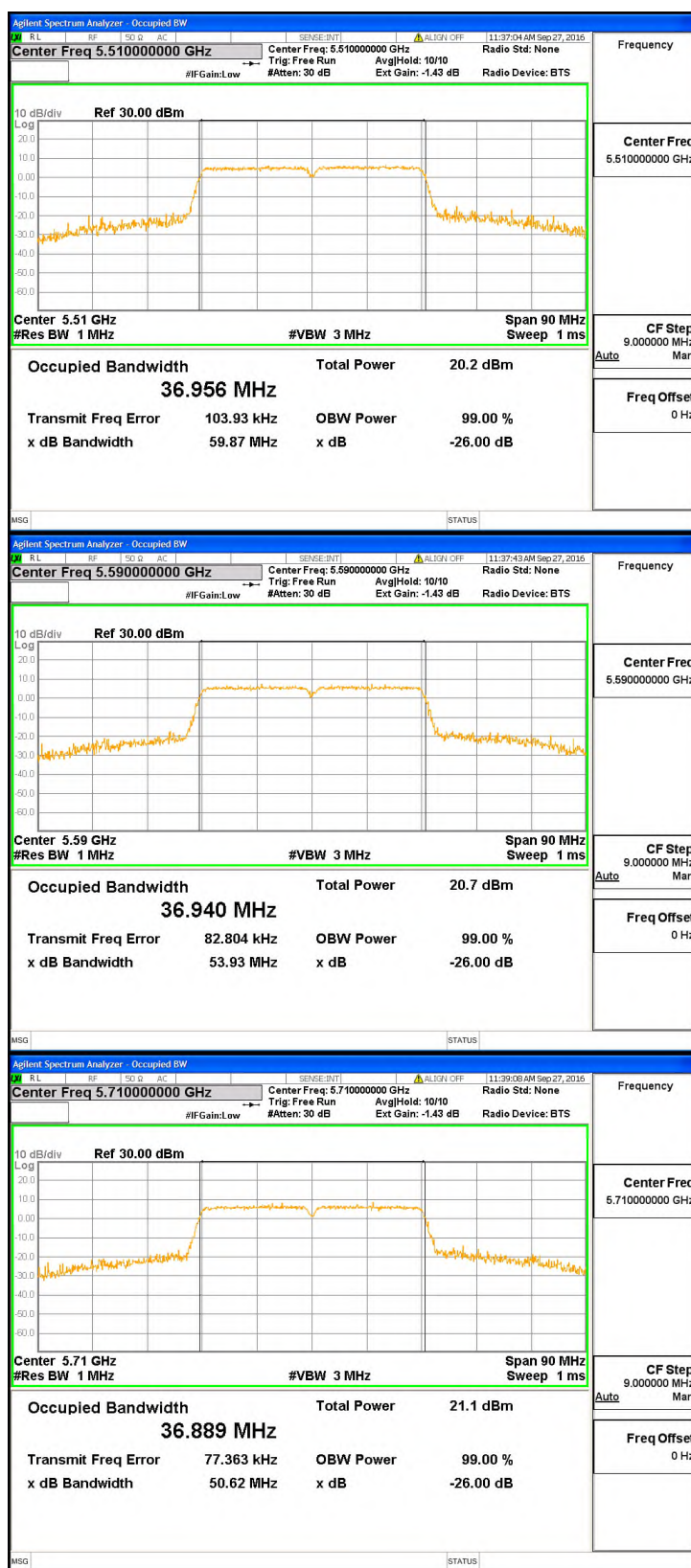
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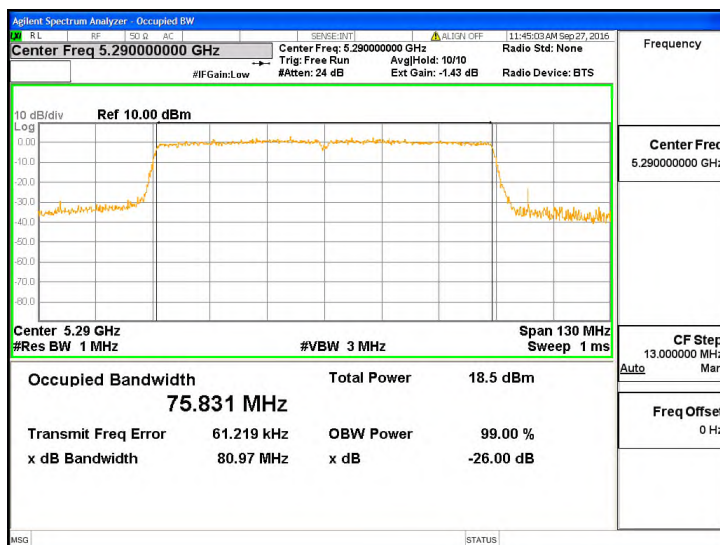
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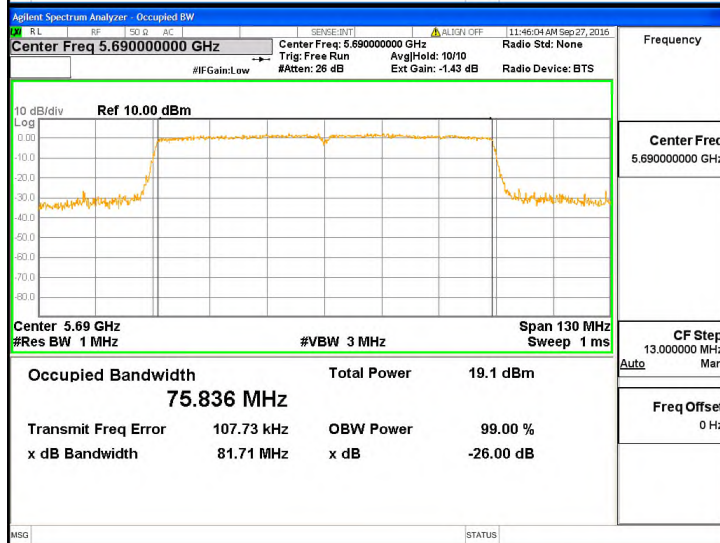
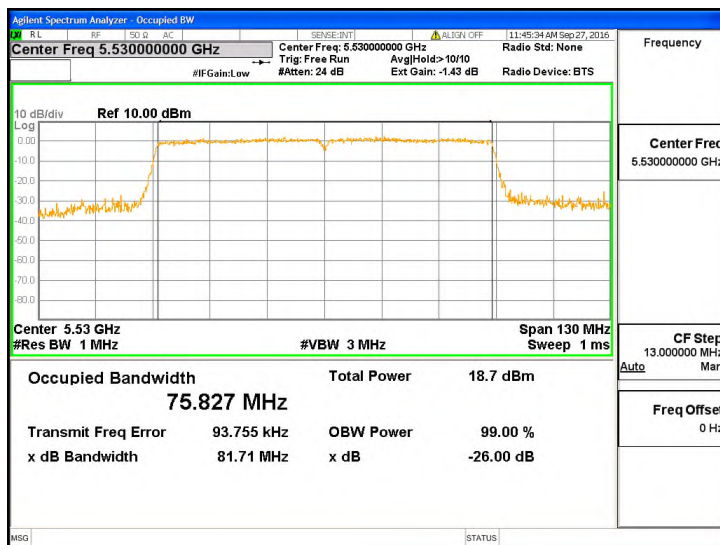
Ant : A2_802.11ac_VHT40_UNII 2A



Ant : A2_802.11ac_VHT40_UNII 2C



Ant : A2_802.11ac_VHT80_UNII 2A



Ant : A2_802.11ac_VHT80_UNII 2C

2.1.4 OUTPUT POWER

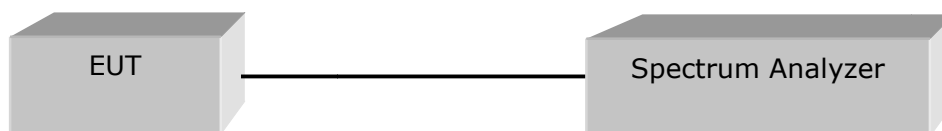
Test Location

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 2A	802.11a/n/ac	ANT1, ANT2	5.73	24	24
	UNII 2C				24	24
MIMO (2Tx)	UNII 2A	802.11a/n/ac	ANT1 + ANT2	8.74	20.99	20.99
	UNII 2C				20.99	20.99

Test Results

Ant : A1

	Measured Output Power (dBm)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5260 MHz	13.43	14.71	16.01
5300 MHz	13.24	14.61	15.80
5320 MHz	13.22	14.40	15.89
5500 MHz	15.44	15.19	15.57
5600 MHz	16.01	15.93	16.28
5720 MHz	16.31	16.29	16.52
Measurement uncertainty	± 3 dB		

Ant : A2

	Measured Output Power (dBm)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5260 MHz	14.13	14.77	16.08
5300 MHz	13.99	14.69	15.87
5320 MHz	13.81	14.52	15.92
5500 MHz	15.03	14.85	15.12
5600 MHz	15.89	15.69	15.82
5720 MHz	15.88	15.71	16.02
Measurement uncertainty	± 3 dB		

Ant : A1 + A2

	Measured Output Power (dBm)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5260 MHz	16.80	17.75	19.06
5300 MHz	16.64	17.66	18.85
5320 MHz	16.54	17.47	18.92
5500 MHz	18.25	18.03	18.36
5600 MHz	18.96	18.82	19.07
5720 MHz	19.11	19.02	19.29
Measurement uncertainty	± 3 dB		

Ant : A1

	Measured Output Power (dBm)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5270 MHz	13.39	13.83
5310 MHz	13.27	13.69
5510 MHz	15.17	15.05
5590 MHz	15.61	15.80
5710 MHz	15.87	15.99
Measurement uncertainty	± 3 dB	

Ant : A2

	Measured Output Power (dBm)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5270 MHz	13.19	13.76
5310 MHz	13.16	13.55
5510 MHz	15.24	15.22
5590 MHz	15.72	15.95
5710 MHz	16.13	16.15
Measurement uncertainty	± 3 dB	

Ant : A1 + A2

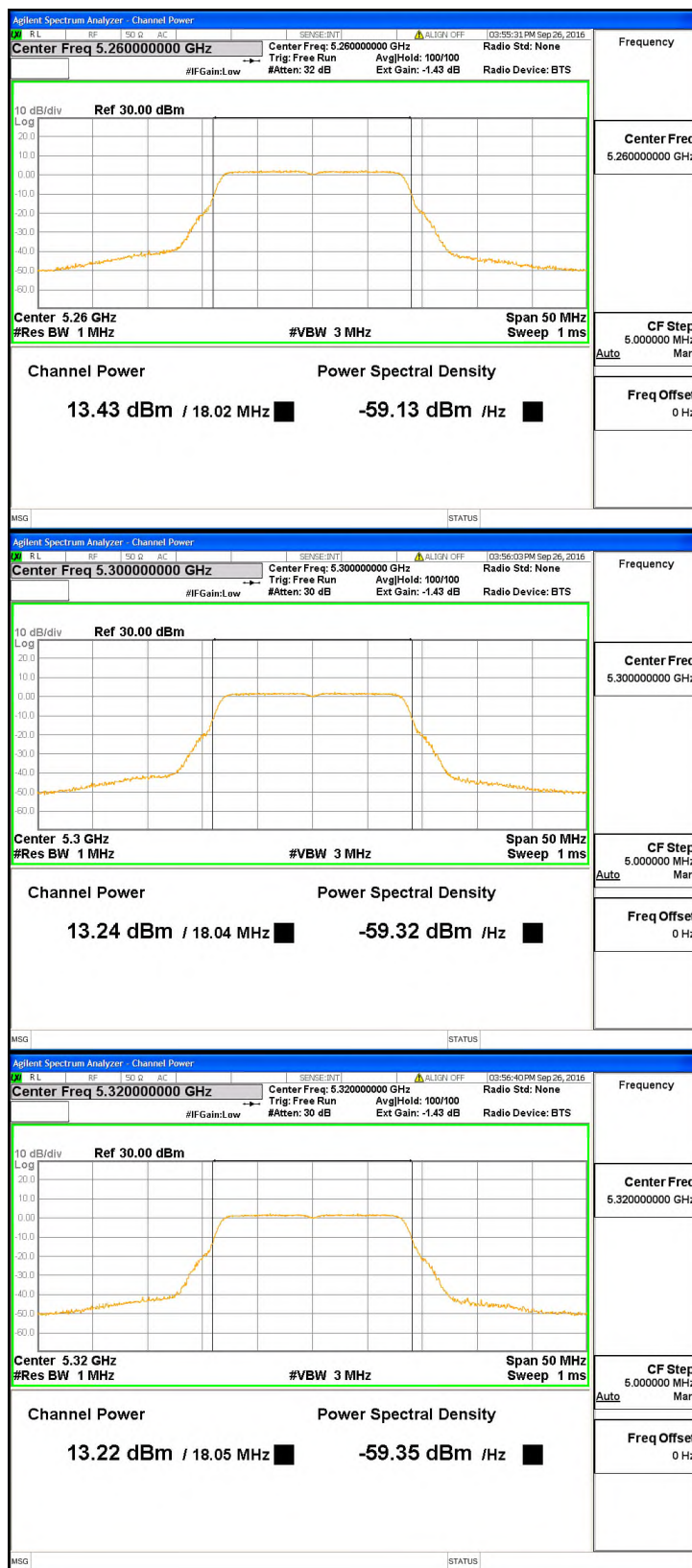
	Measured Output Power (dBm)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5270 MHz	16.30	16.81
5310 MHz	16.23	16.63
5510 MHz	18.22	18.15
5590 MHz	18.68	18.89
5710 MHz	19.01	19.08
Measurement uncertainty	± 3 dB	

Ant : A1, A2

	Measured Output Power (dBm)	
Mode	Ant : A1	Ant : A2
Frequency	802.11ac_VHT80	802.11ac_VHT80
5290 MHz	12.93	13.32
5530 MHz	12.56	13.50
5690 MHz	13.40	14.02
Measurement uncertainty	± 3 dB	

Ant : A1 + A2

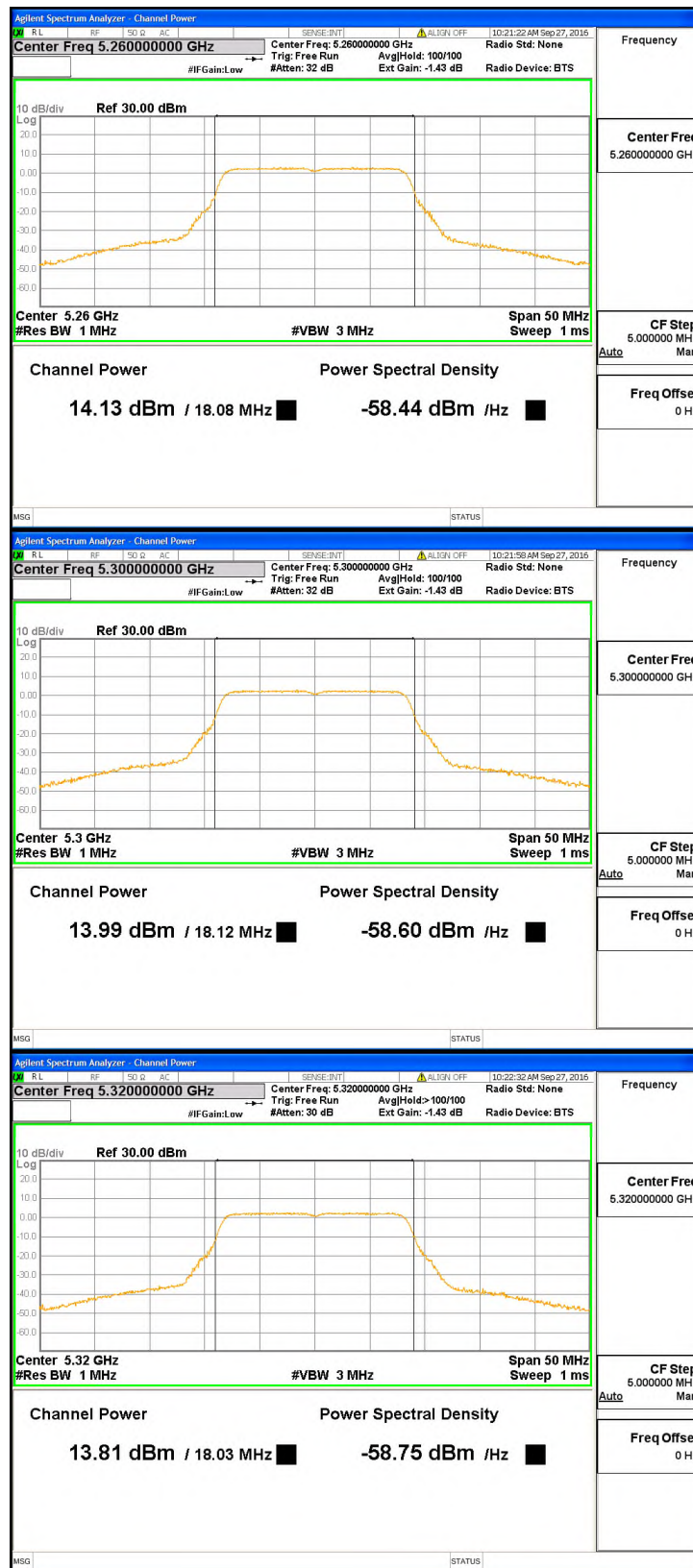
	Measured Output Power (dBm)
Mode	802.11ac_VHT80
Frequency	
5290 MHz	16.14
5530 MHz	16.07
5690 MHz	16.73
Measurement uncertainty	± 3 dB



Ant : A1_802.11a_UNII 2A



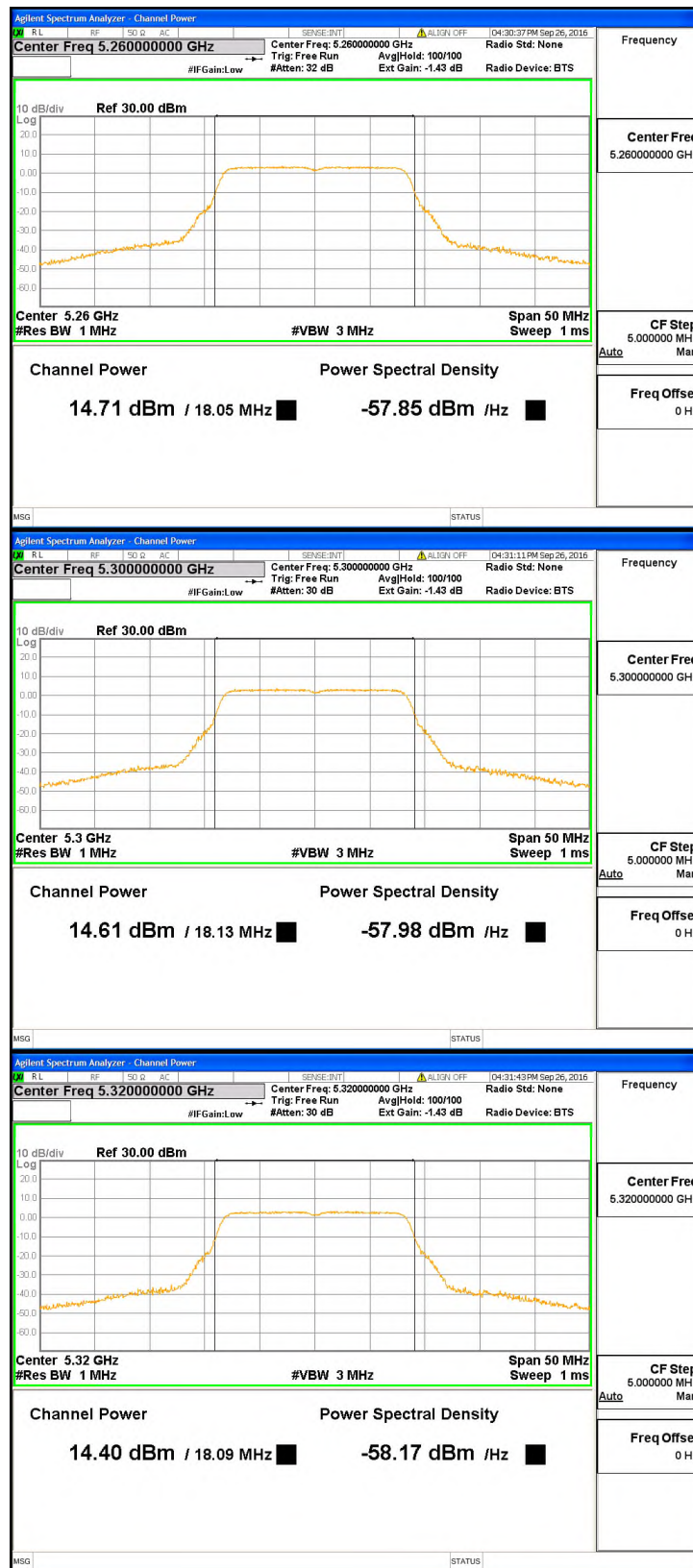
Ant : A1_802.11a_UNII 2C



Ant : A2_802.11a_UNII 2A



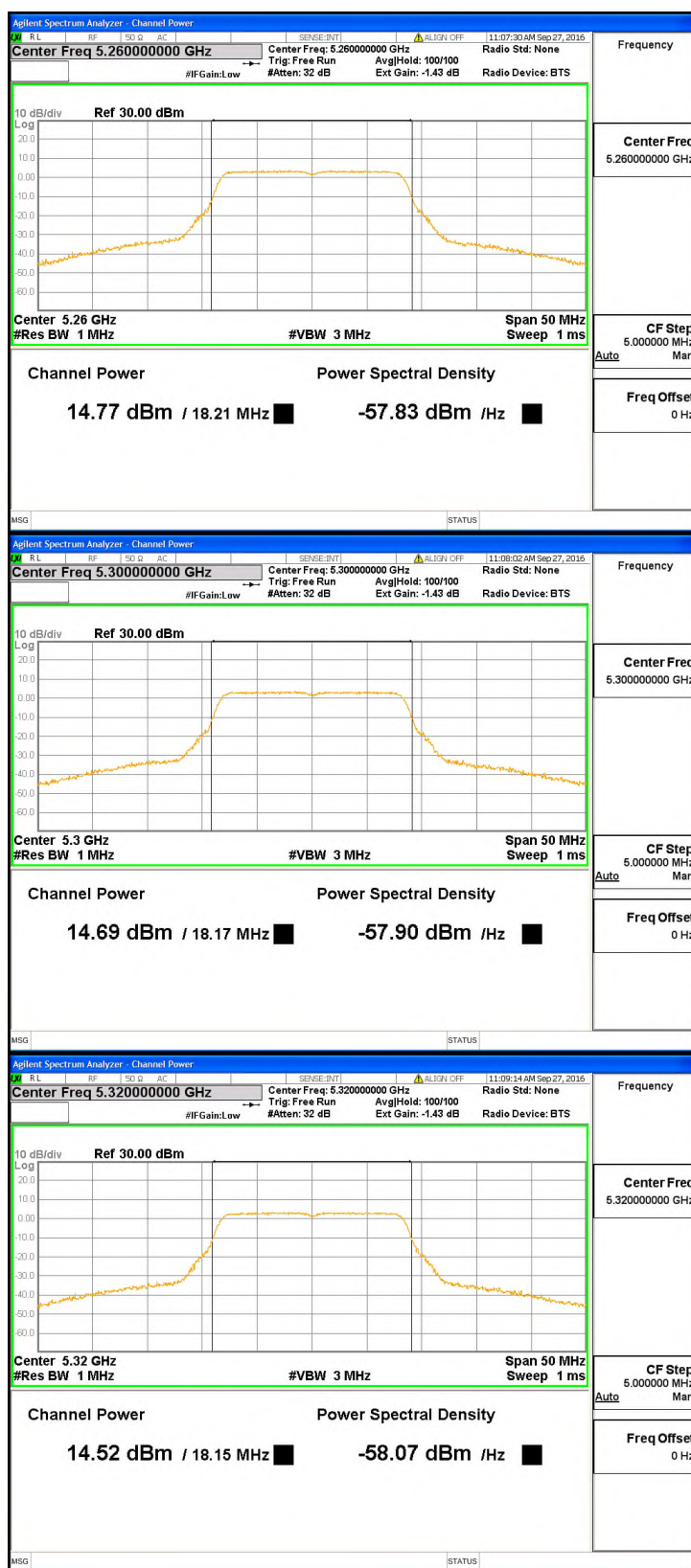
Ant : A2_802.11a_UNII 2C



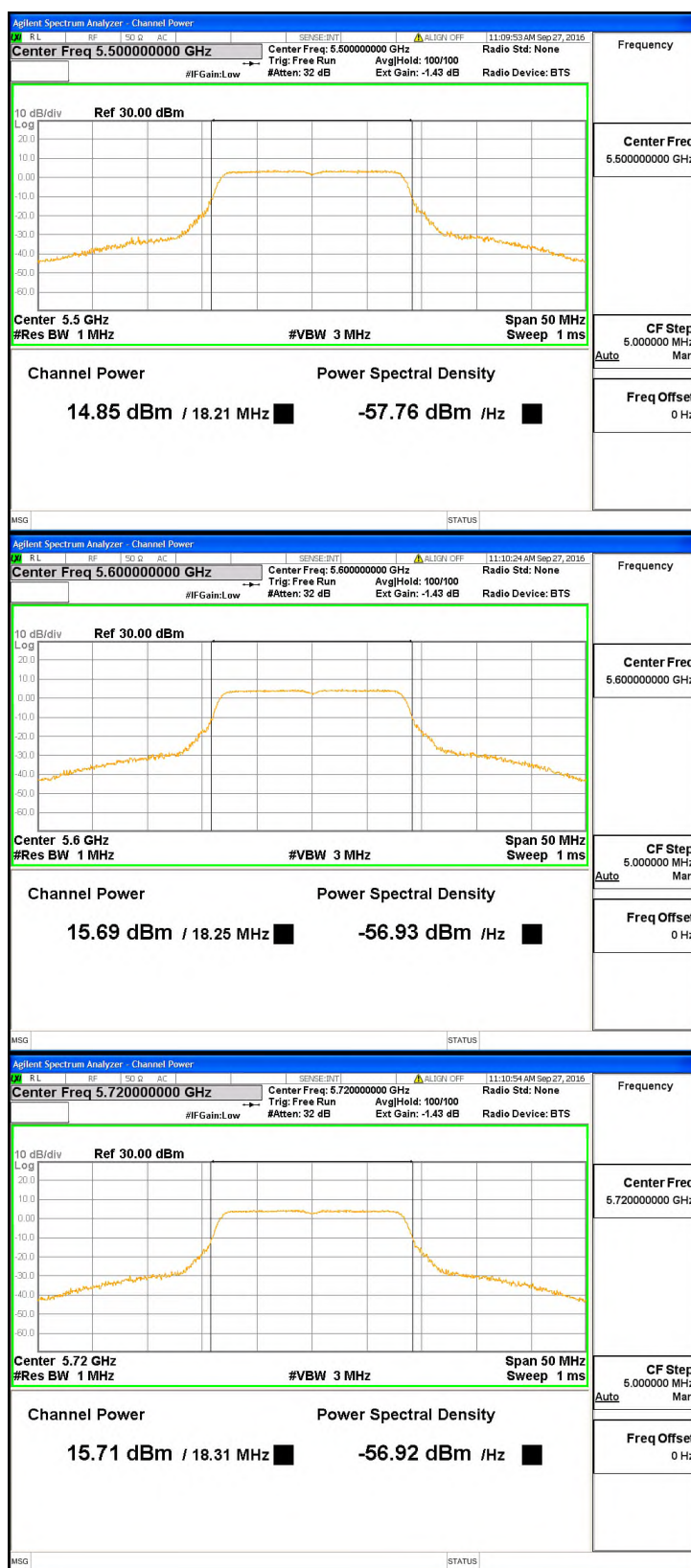
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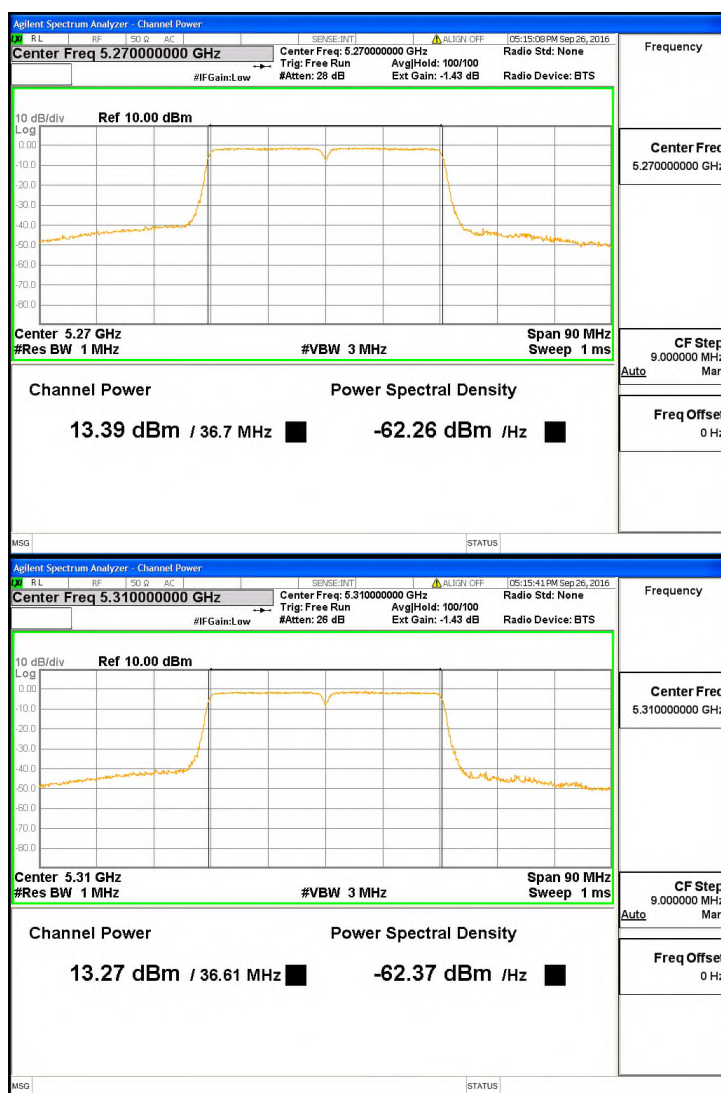
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Ant : A2_802.11n_HT20_UNII 2A



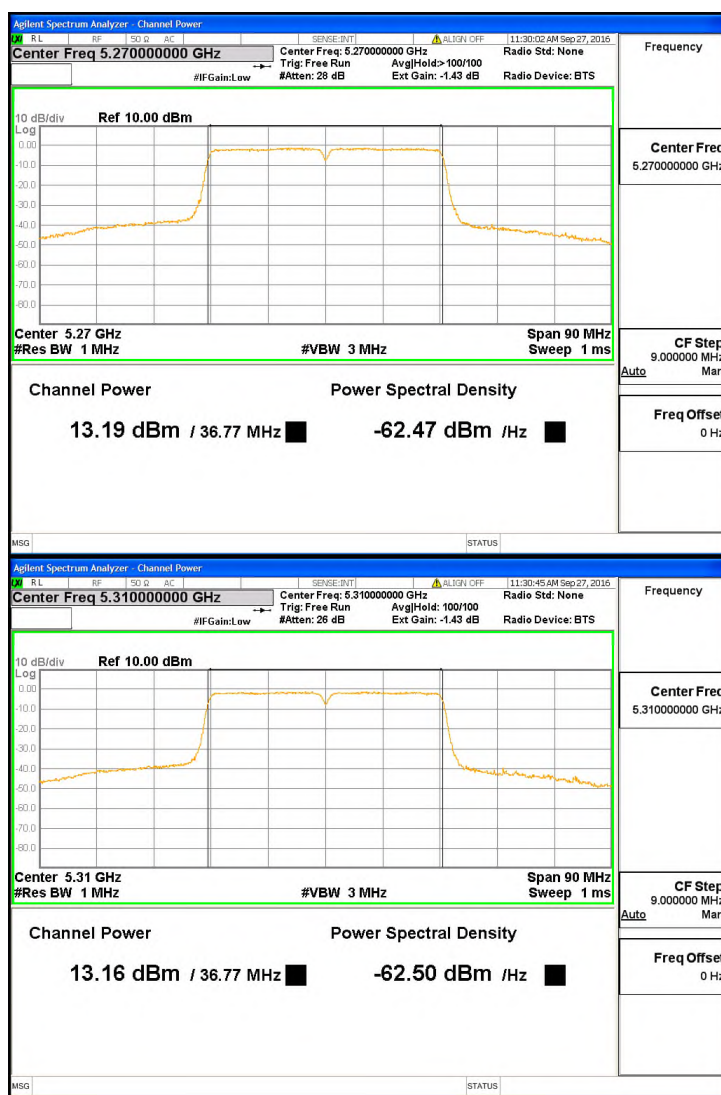
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Ant : A1_802.11n_HT40_UNII 2A



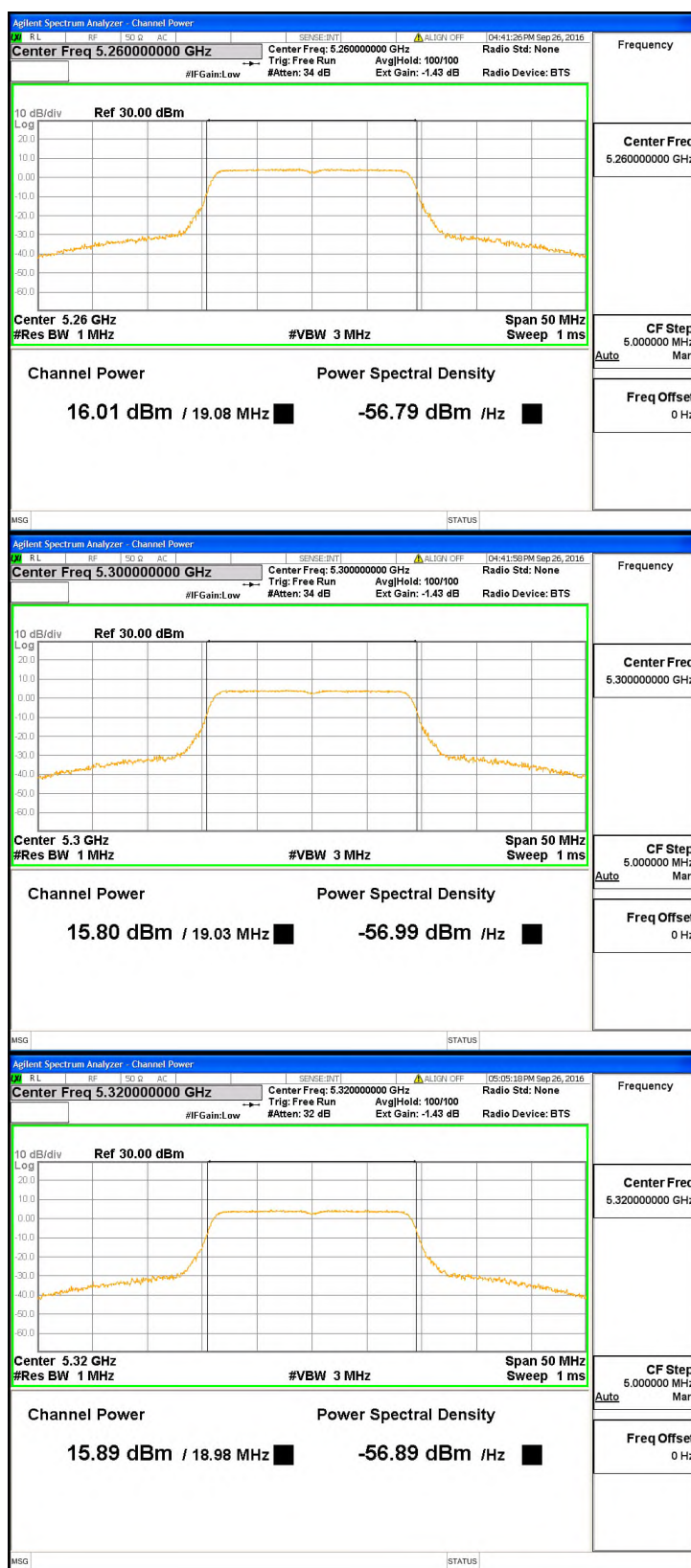
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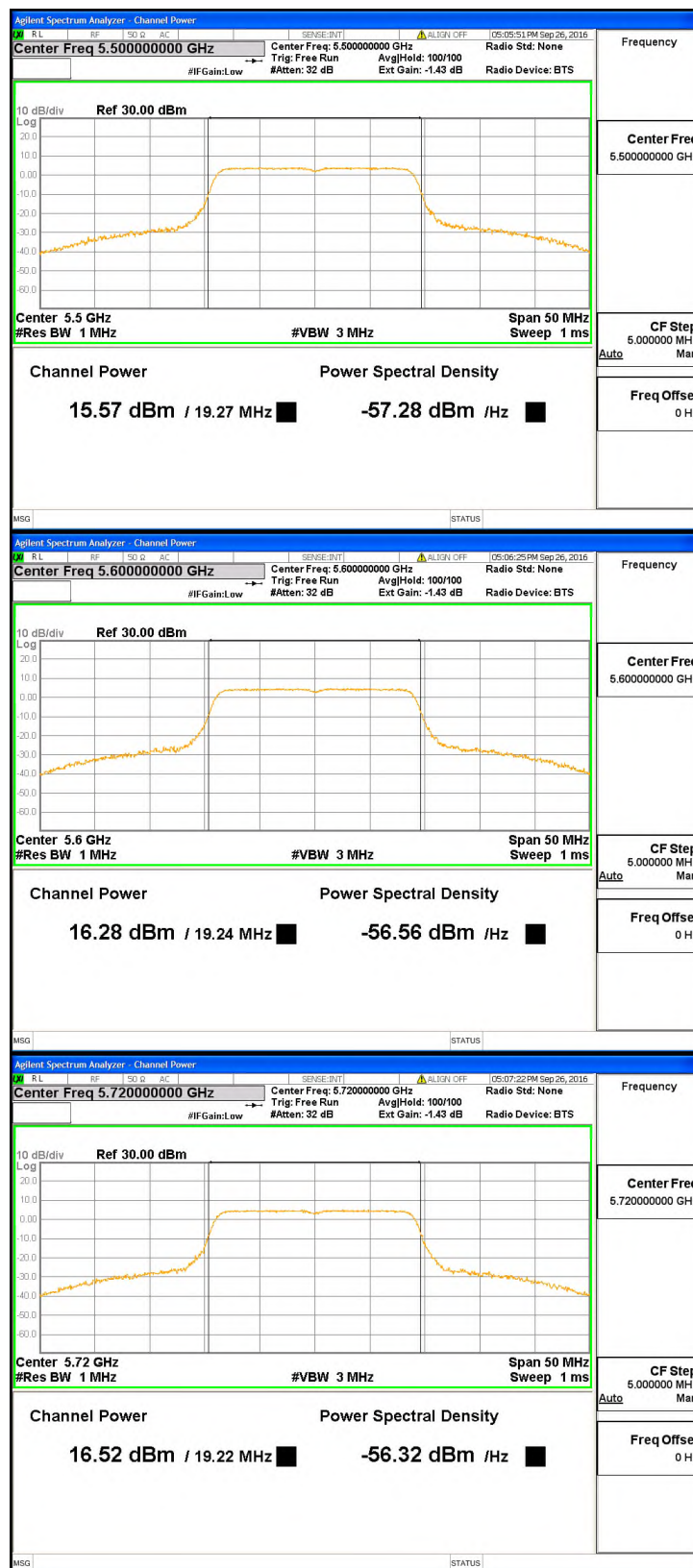
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Ant : A2_802.11n_HT40_UNII 2C



Ant : A1_802.11ac_VHT20_UNII 2A



Ant : A1_802.11ac_VHT20_UNII 2C



Ant : A2_802.11ac_VHT20_UNII 2A



Ant : A2_802.11ac_VHT20_UNII 2C