6. Radiated emission

Test result: PASS

6.1 Test limit

6.1.1 The radiated emissions which are lower than 1GHz or fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.1.2 The emission which is outside the restrict bands, should comply with the EIRP limit as below:

☒ For transmitters operating in the 5.15–5.25 / 5.25 – 5.35 / 5.47 – 5.725 GHz band: all emissions outside of the 5.15 – 5.35 / 5.47 – 5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.

EIRP Limit (dBm)	Equivalent Field Strength (3m) (dBμV/m)
-27	68.20

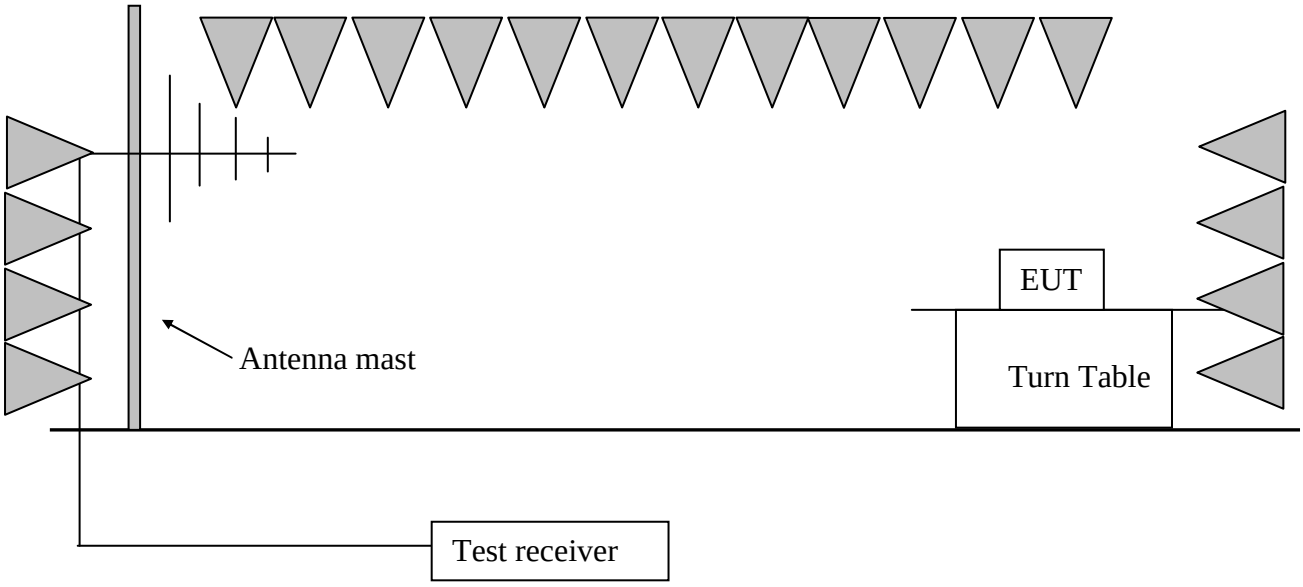
☐ For transmitters operating in the 5.725 – 5.85GHz band: emission among 5.715 – 5.725GHz & 5.85 – 5.86GHz shall not exceed an EIRP of -17dBm/MHz all emissions outside band shall not exceed an EIRP of -27dBm/MHz.

EIRP Limit (dBm)	Equivalent Field Strength (3m) (dBμV/m)
-27	68.20
-17	78.20

☐ Assessed with 15.209(a):

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.2 Test Configuration



6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.
The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.
The EUT was tested according to KDB 789033D02: Section G.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

6.4 Test protocol

Temperature : 25 °C
Relative Humidity : 55 %

Mode 802.11a

Freq (MHz)	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
5260	V	5262.24	40.80	107.50	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	10520.00	15.08	40.70	54.00	13.30	PK
	H	10557.00	15.21	46.50	54.00	7.50	PK
	H	15780.00	23.70	43.80	54.00	10.20	PK
5300	V	5298.30	40.80	107.70	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	H	10600.00	15.12	40.50	54.00	13.50	PK
	V	10800.00	15.45	42.30	54.00	11.70	PK
	V	15900.00	23.58	44.20	54.00	9.80	PK
5320	V	5321.37	40.80	108.10	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5350.00	40.80	49.10	68.20	19.10	PK
	V	10640.00	15.16	40.60	54.00	13.40	PK
	H	15960.00	23.52	43.10	54.00	10.90	PK
5500	V	5502.54	40.80	107.70	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK

	V	5470.00	40.80	53.60	68.20	14.60	PK
	H	11000.00	16.25	40.70	54.00	13.30	PK
	H	16500.00	22.46	42.40	54.00	11.60	PK
5600	V	5581.22	40.80	108.20	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	11160.00	16.78	41.20	54.00	12.80	PK
	H	11250.00	16.89	42.70	54.00	11.30	PK
	H	16740.00	22.73	45.60	54.00	8.40	PK
5700	V	5705.33	40.80	108.50	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5725.00	40.80	52.50	68.20	15.70	PK
	H	11400.00	17.08	40.00	54.00	14.00	PK
	V	17100.00	24.04	45.30	54.00	8.70	PK
5720	V	5722.31	40.80	108.70	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	H	11440.00	17.08	40.20	54.00	13.80	PK
	V	17160.00	24.04	45.40	54.00	8.60	PK

Mode 802.11n20

Freq (MHz)	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
5260	V	5261.95	40.80	105.20	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK

	H	170.57	12.10	20.90	43.50	22.60	PK
	V	10520.00	15.08	40.40	54.00	13.60	PK
	H	10557.00	15.21	46.20	54.00	7.80	PK
	H	15780.00	23.70	43.40	54.00	10.60	PK
5300	V	5303.06	40.80	104.90	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	H	10600.00	15.12	40.50	54.00	13.50	PK
	V	10800.00	15.45	42.30	54.00	11.70	PK
	V	15900.00	23.58	44.20	54.00	9.80	PK
5320	V	5322.23	40.80	104.80	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	H	5350.00	40.80	48.90	68.20	19.30	PK
	V	10640.00	15.16	40.40	54.00	13.60	PK
	H	15960.00	23.52	42.70	54.00	11.30	PK
5500	V	5502.72	40.80	104.50	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5470.00	40.80	53.40	68.20	14.80	PK
	H	11000.00	16.25	40.70	54.00	13.30	PK
	H	16500.00	22.46	42.40	54.00	11.60	PK
5600	V	5582.07	40.80	104.60	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	11160.00	16.78	41.10	54.00	12.90	PK

	H	11250.00	16.89	42.40	54.00	11.60	PK
	H	16740.00	22.73	45.30	54.00	8.70	PK
5700	V	5702.60	40.80	104.30	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5725.00	48.80	62.10	68.20	6.10	PK
	H	11400.00	17.08	40.30	54.00	13.70	PK
	V	17100.00	24.04	45.50	54.00	8.50	PK
5720	V	5722.31	40.80	104.70	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	H	11440.00	17.08	40.30	54.00	13.70	PK
	V	17160.00	24.04	45.40	54.00	8.60	PK

Mode 802.11n40

Freq (MHz)	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
5270	V	5278.49	40.80	104.90	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	10540.00	15.07	41.60	54.00	12.40	PK
	V	10700.00	15.24	42.10	54.00	11.90	PK
	H	15810.00	23.56	43.40	54.00	10.60	PK
5310	V	5318.55	40.80	105.30	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK

	V	5350.00	40.80	54.50	68.20	13.70	PK
	V	10620.00	15.18	41.20	54.00	12.80	PK
	V	15930.00	23.52	42.70	54.00	11.30	PK
5510	V	5513.00	40.80	104.20	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5470.00	40.80	54.20	68.20	14.00	PK
	H	11020.00	16.30	40.00	54.00	14.00	PK
	V	16530.00	22.44	43.40	54.00	10.60	PK
5590	V	5553.51	40.80	104.40	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	11100.00	16.66	40.30	54.00	13.70	PK
	V	11300.00	16.84	41.90	54.00	12.10	PK
	V	16650.00	22.50	44.30	54.00	9.70	PK
5670	V	5675.50	40.80	105.10	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5725.00	40.80	50.60	68.20	17.60	PK
	V	11340.00	16.98	40.20	54.00	13.80	PK
	H	17010.00	23.68	44.90	54.00	9.10	PK
5710	V	5710.95	40.80	105.20	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	H	11420.00	17.08	40.30	54.00	13.70	PK
	V	17130.00	24.04	45.20	54.00	8.80	PK

Mode 802.11ac80

Freq (MHz)	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
5290	V	5302.70	40.80	105.60	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5350.00	40.80	64.10	68.20	4.10	PK
	V	10580.00	15.07	40.30	54.00	13.70	PK
	H	15870.00	23.63	42.40	54.00	11.60	PK
5530	V	5542.65	40.80	105.30	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5470.00	40.80	65.10	68.20	3.10	PK
	V	11060.00	16.51	41.20	54.00	12.80	PK
	H	16590.00	22.49	43.50	54.00	10.50	PK
5610	V	5612.47	40.80	105.00	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	5725.00	40.80	49.20	68.20	19.00	PK
	V	11220.00	16.73	41.30	54.00	12.70	PK
	H	16830.00	23.65	43.90	54.00	10.10	PK
5690	V	5690.82	40.80	105.30	/	/	PK
	V	115.53	13.40	31.00	43.50	12.50	PK
	H	163.24	13.80	29.30	43.50	14.20	PK
	H	170.57	12.10	20.90	43.50	22.60	PK
	V	11380.00	16.73	41.30	54.00	12.70	PK
	H	17070.00	23.65	43.70	54.00	10.30	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit – Corrected Reading
4. The emission outside band 5.15 – 5.35 / 5.47 – 5.725MHz is assessed with the limit of EIRP of -27dBm (68.20dBuV/m).

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 = 32.20dB/m; Corrected Reading = 10dBuV + 32.20dB/m = 42.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 42.20dBuV/m, then Margin = 54 -42.20 = 11.80dBuV/m

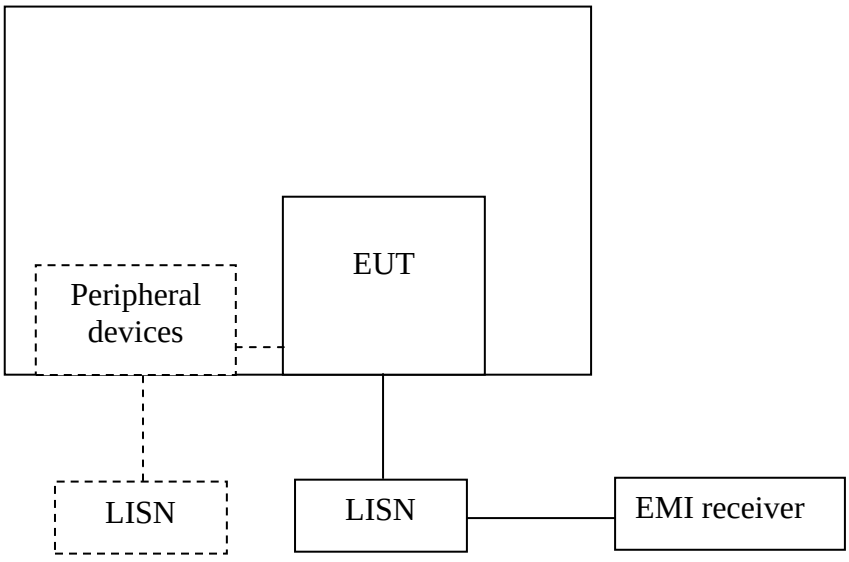
7. Power line conducted emission

Test result: **Pass**

7.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

7.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

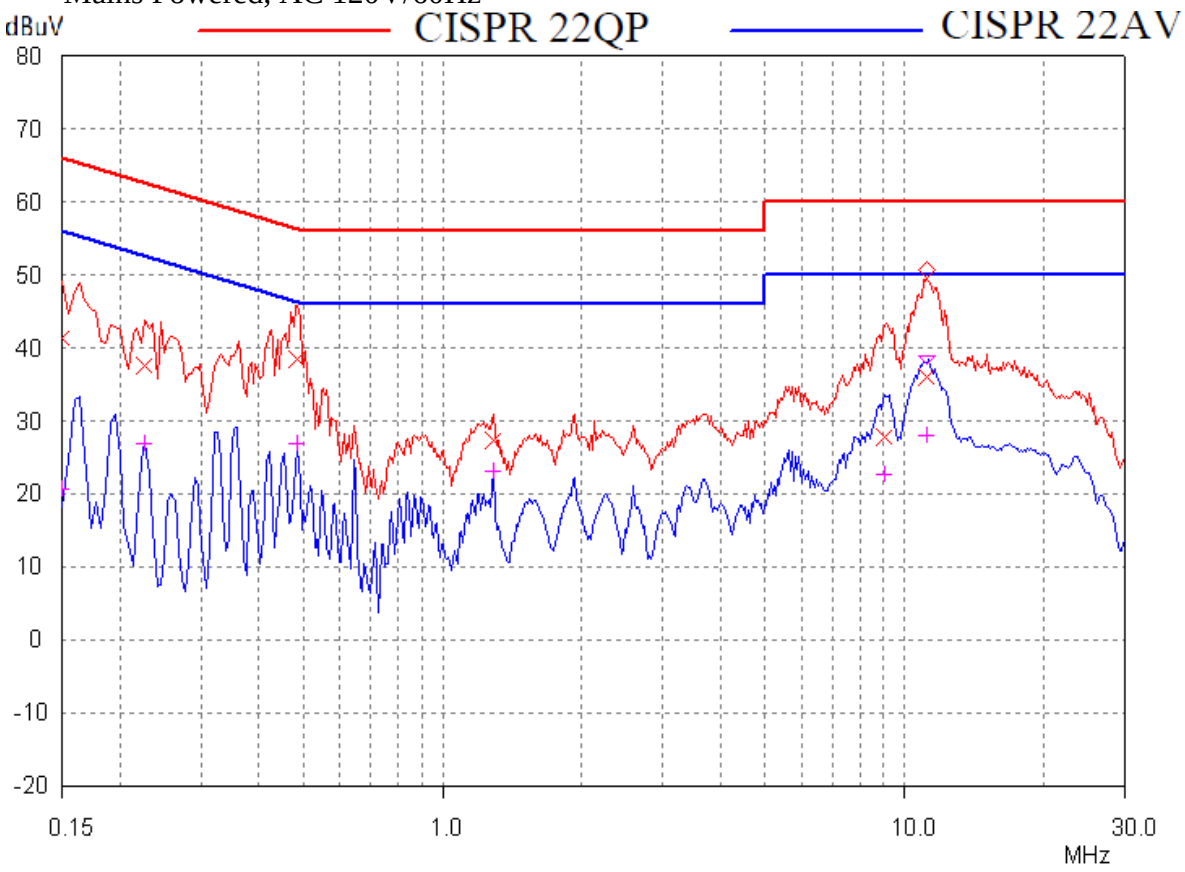
7.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.

7.4 Test protocol

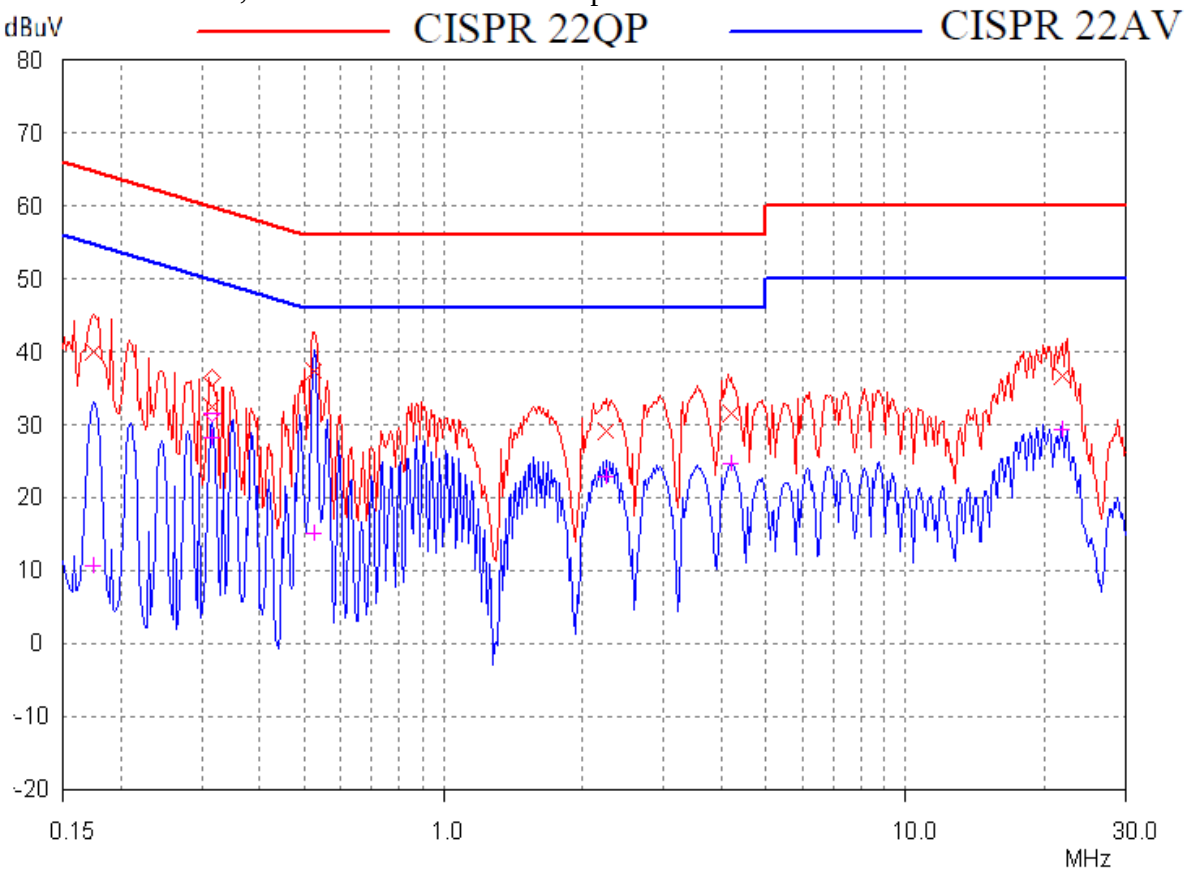
Temperature : 25°C
Relative Humidity : 55 %

Mains Powered, AC 120V/60Hz



Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.15 (N)	3.00	41.26	20.57	66.00	56.00	24.74	35.43
0.23 (L)	3.00	37.59	26.81	62.58	52.58	24.99	25.77
0.48 (L)	3.00	38.38	26.89	56.29	46.29	17.91	19.40
1.28 (N)	3.00	27.30	23.10	56.00	46.00	28.70	2.90
8.98 (L)	3.00	27.79	22.60	60.00	50.00	32.21	27.40
11.09 (L)	3.00	35.96	27.99	60.00	50.00	24.04	22.01
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

POE Powered, AC 120V/60Hz at POE input



Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.17 (N)	3.00	40.00	10.70	64.77	54.77	24.77	44.07
0.31 (N)	3.00	32.35	28.26	59.87	49.87	27.52	21.61
0.52 (L)	3.00	37.35	15.20	56.00	46.00	18.65	30.80
2.24 (N)	3.00	29.05	22.85	56.00	46.00	26.95	23.15
4.17 (L)	3.00	31.54	24.63	56.00	46.00	24.46	21.37
21.78 (N)	3.00	36.60	29.40	60.00	50.00	23.40	20.60
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

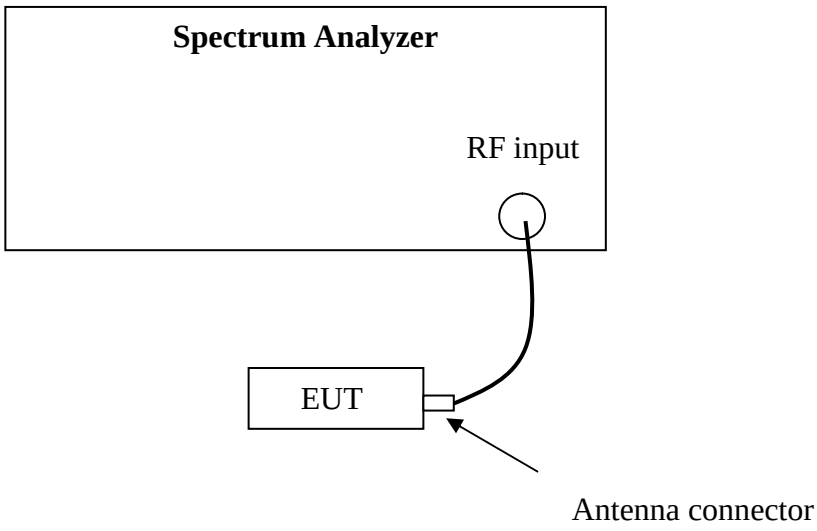
8. Occupied Bandwidth & 26dB Emission Bandwidth

Test Status: Tested

8.1 Test limit

None

8.2 Test Configuration



8.3 Test procedure and test setup

Occupied bandwidth: the trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the 99% occupied bandwidth.
The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal

8.4 Test protocol

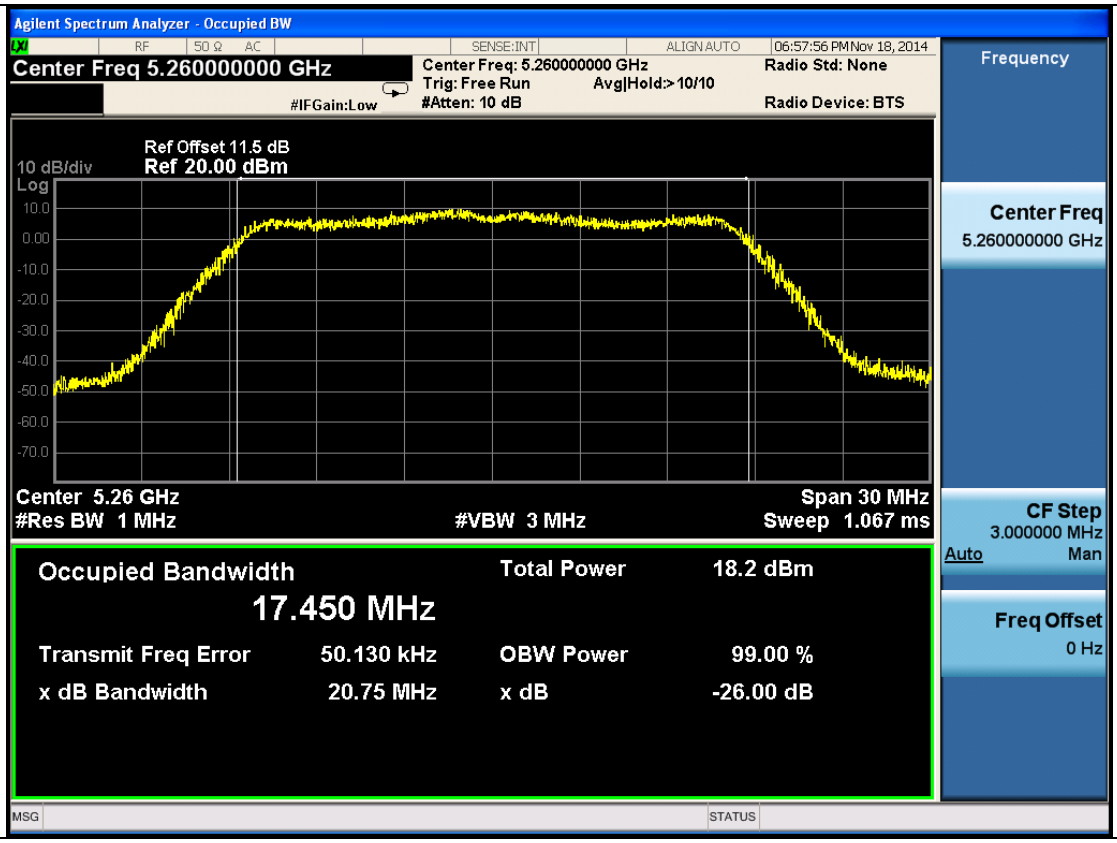
Temperature : 25 °C Relative Humidity :55 %

Mode	Freq (MHz)	Occupied Bandwidth (MHz)			26dB Emission Bandwidth (MHz)		
		Port 0	Port 1	Port 2	Port 0	Port 1	Port 2
802.11a	5260	17.45	17.50	17.48	20.75	20.84	20.78
	5300	17.49	17.43	17.48	20.96	20.89	20.85
	5320	17.55	17.62	17.45	20.89	21.11	20.96
	5500	17.48	17.40	17.57	20.83	21.16	21.00
	5600	17.11	17.07	17.06	20.29	20.08	20.14
	5720	17.49	17.45	17.54	20.81	21.05	21.03
802.11n20	5260	18.31	18.35	18.26	21.22	21.23	21.15
	5300	18.34	18.35	18.26	21.18	21.22	21.19
	5320	18.30	18.28	18.34	21.15	21.16	21.18
	5500	18.35	18.34	18.25	21.29	21.00	21.19
	5600	18.17	18.22	18.15	20.30	20.53	20.43
	5720	18.34	18.34	18.38	21.27	21.10	21.27
802.11n40	5270	36.47	36.64	36.50	40.63	40.44	40.17
	5310	36.52	36.61	36.65	40.58	40.31	40.59
	5510	36.53	36.62	36.59	40.75	40.28	40.33
	5590	36.46	36.38	36.50	39.26	39.36	39.31
	5710	36.49	36.64	36.55	40.28	39.83	40.01
802.11ac80	5290	75.76	75.84	75.74	81.59	81.95	81.61
	5530	75.77	75.89	75.72	81.93	82.88	82.11
	5610	75.64	75.78	75.69	79.93	80.06	79.13
	5690	75.67	75.84	75.65	79.20	80.43	79.59

Note: the red color reading is the maximum data for each mode; the blue color reading is the minimum data for each mode.

Port 0

802.11a-5260



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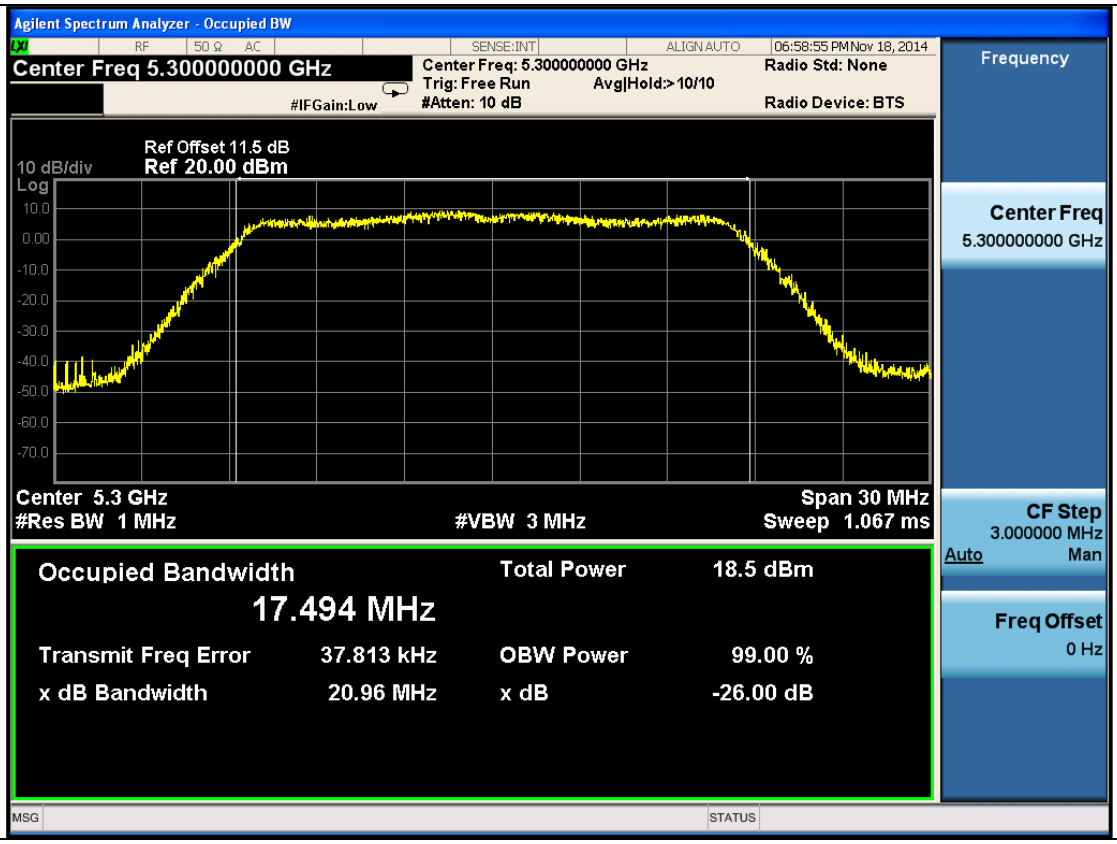
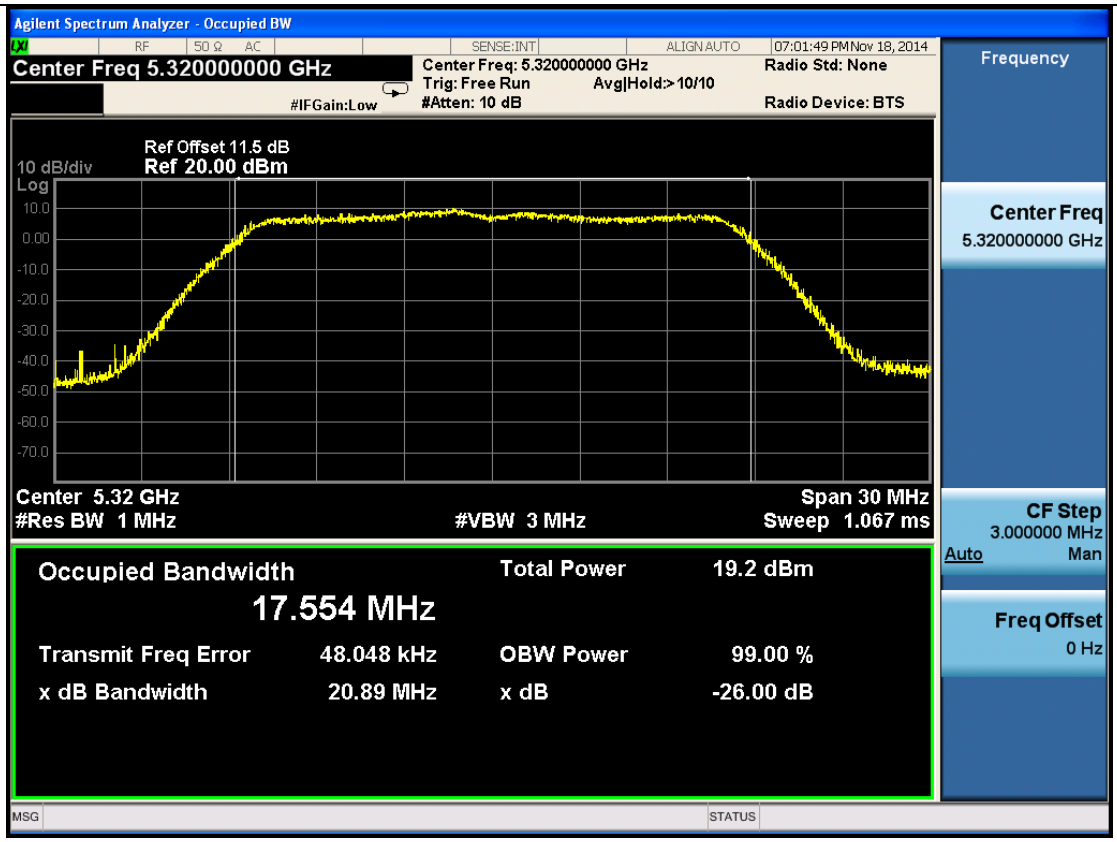


802.11a-5320



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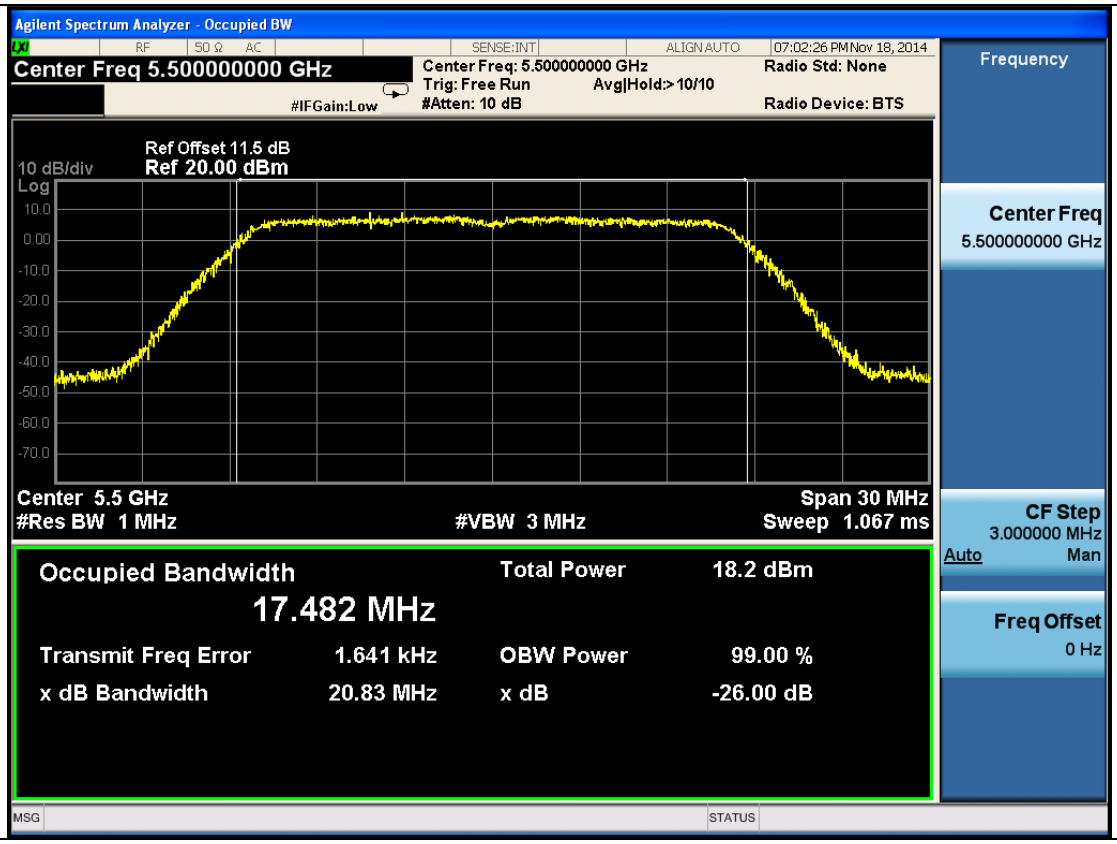

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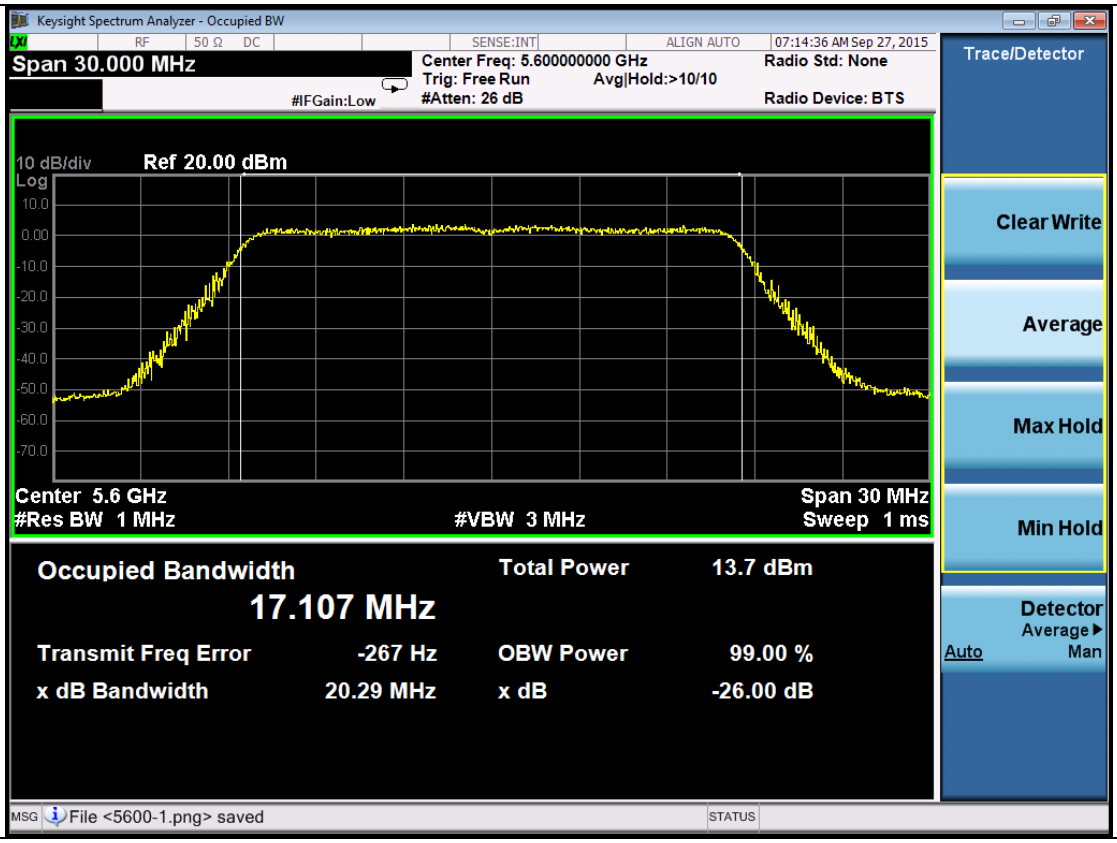

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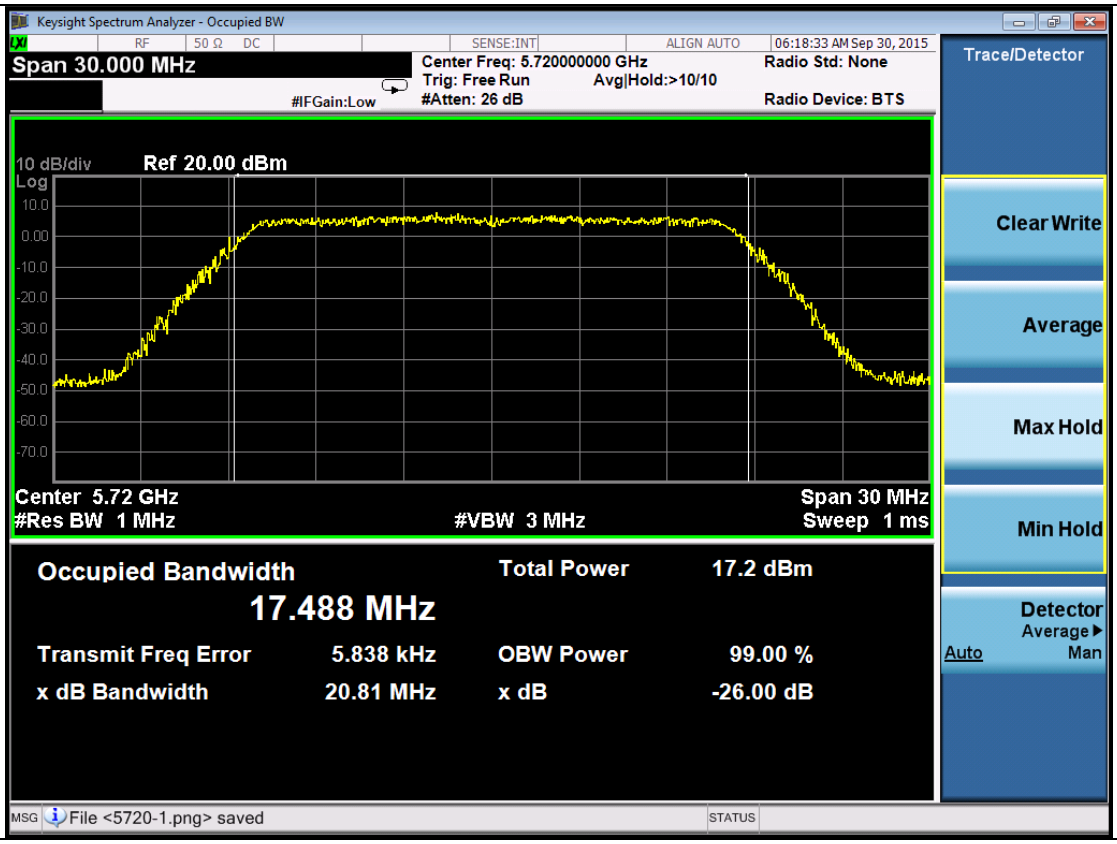

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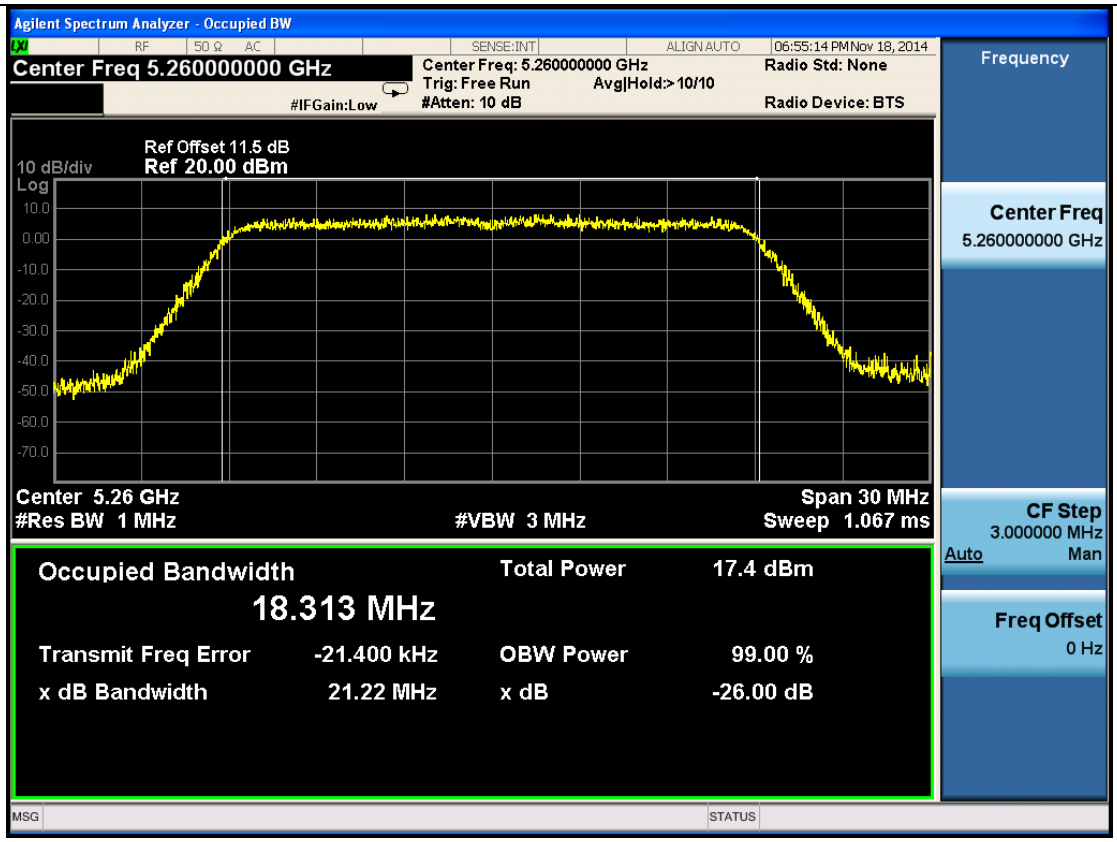

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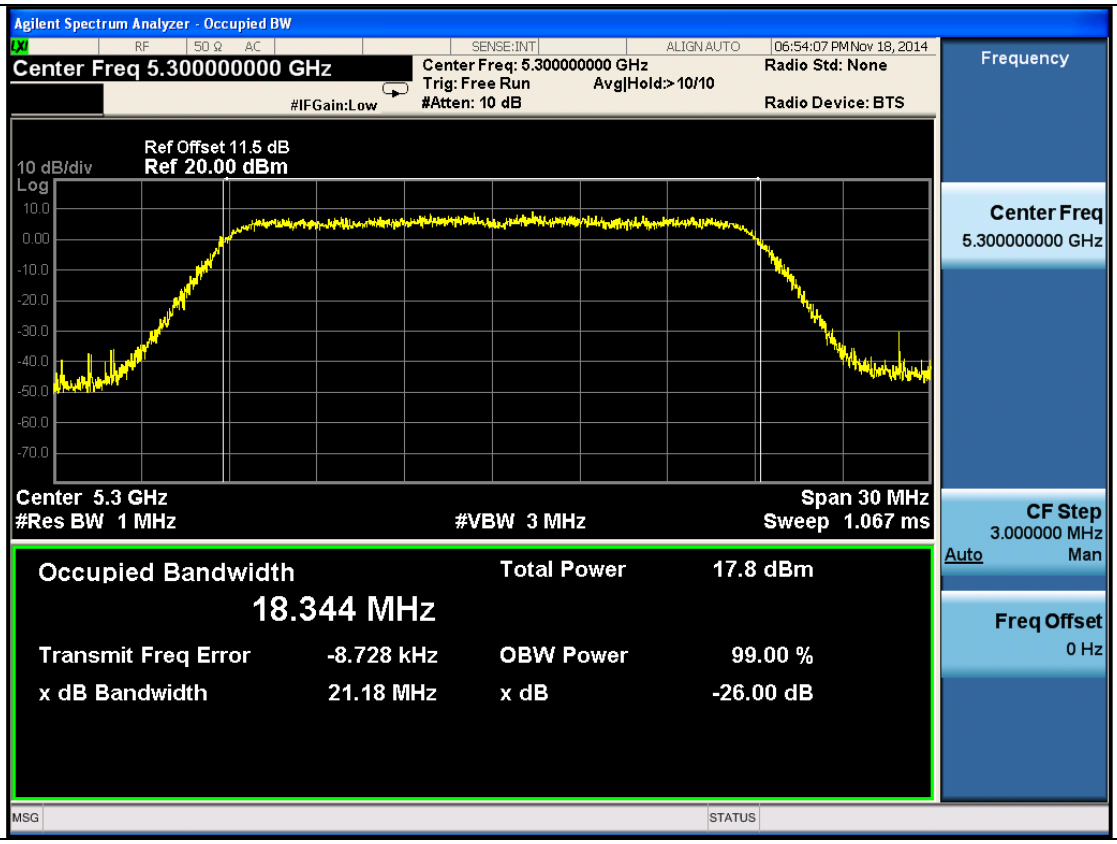

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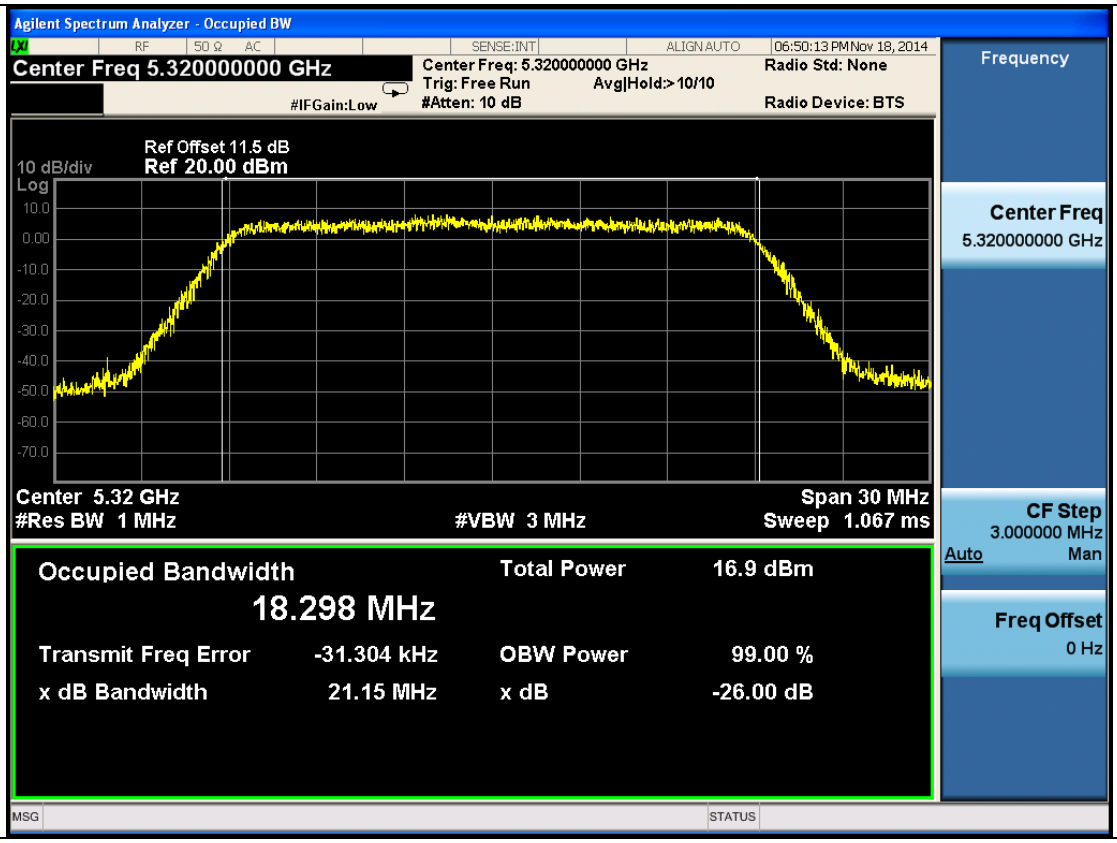

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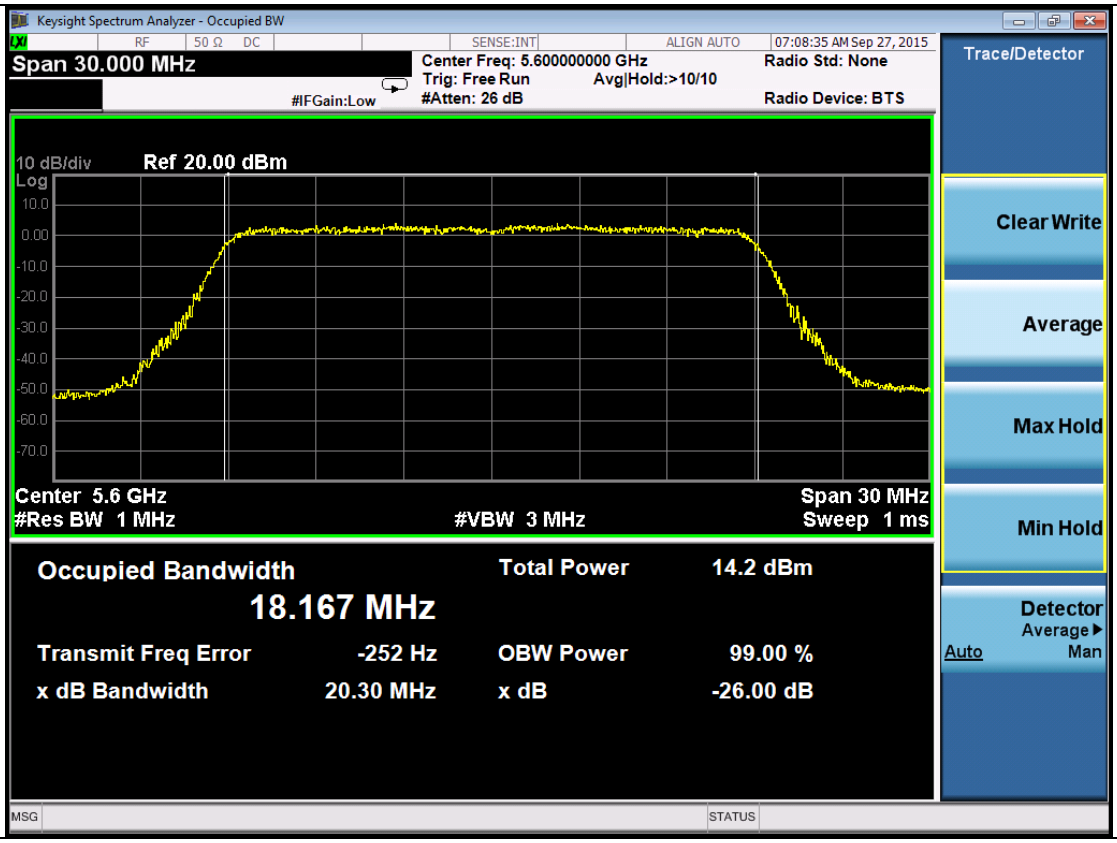
802.11 n20-5600



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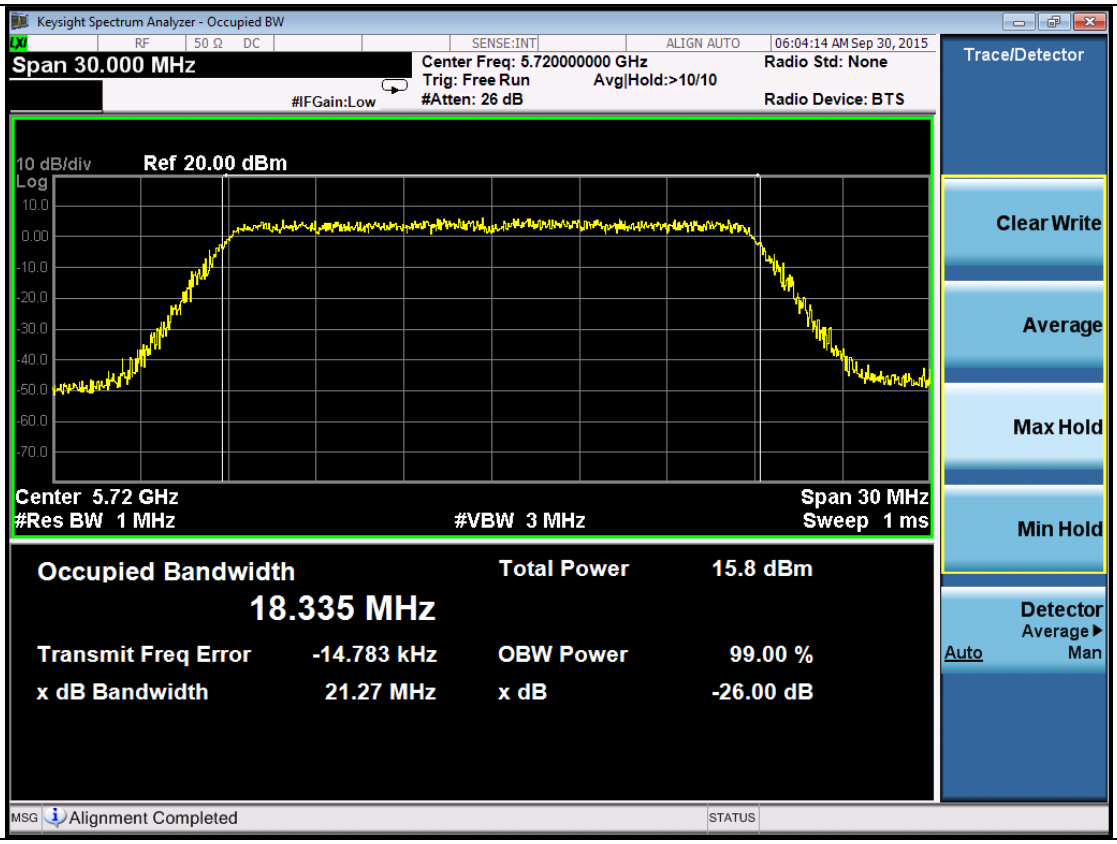
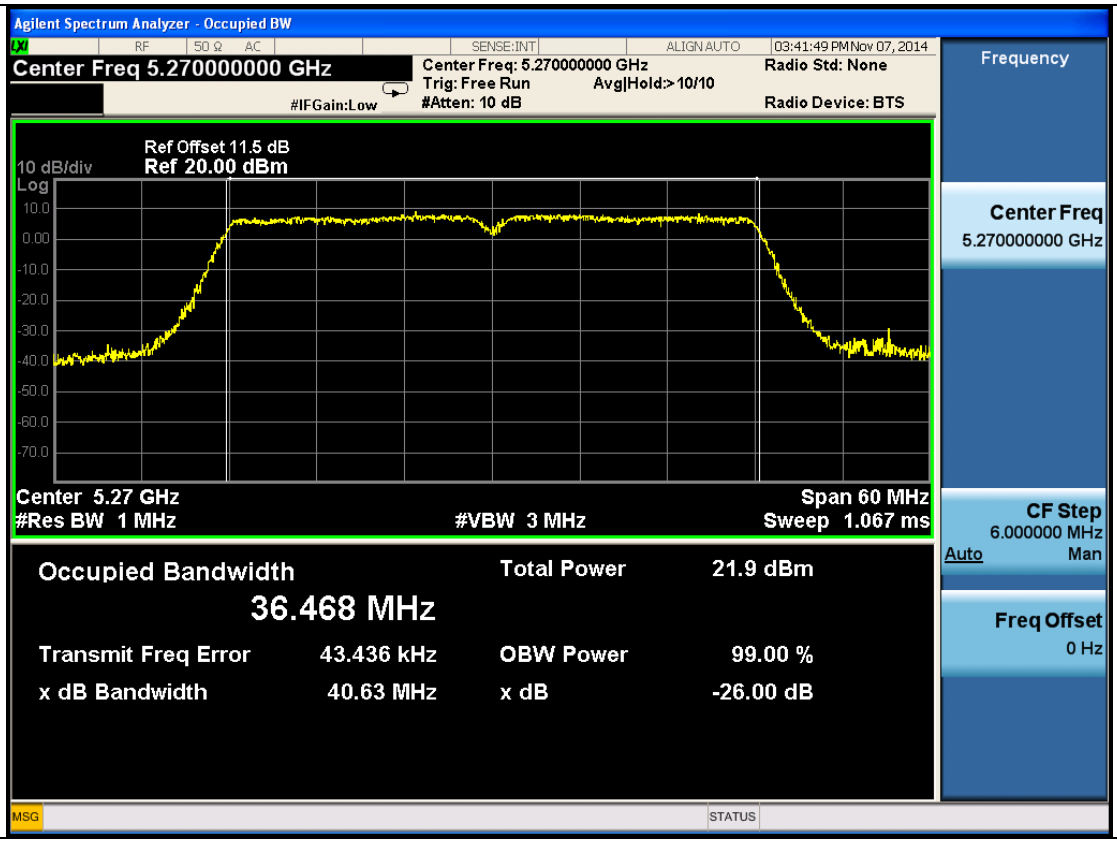


802.11n40-5270



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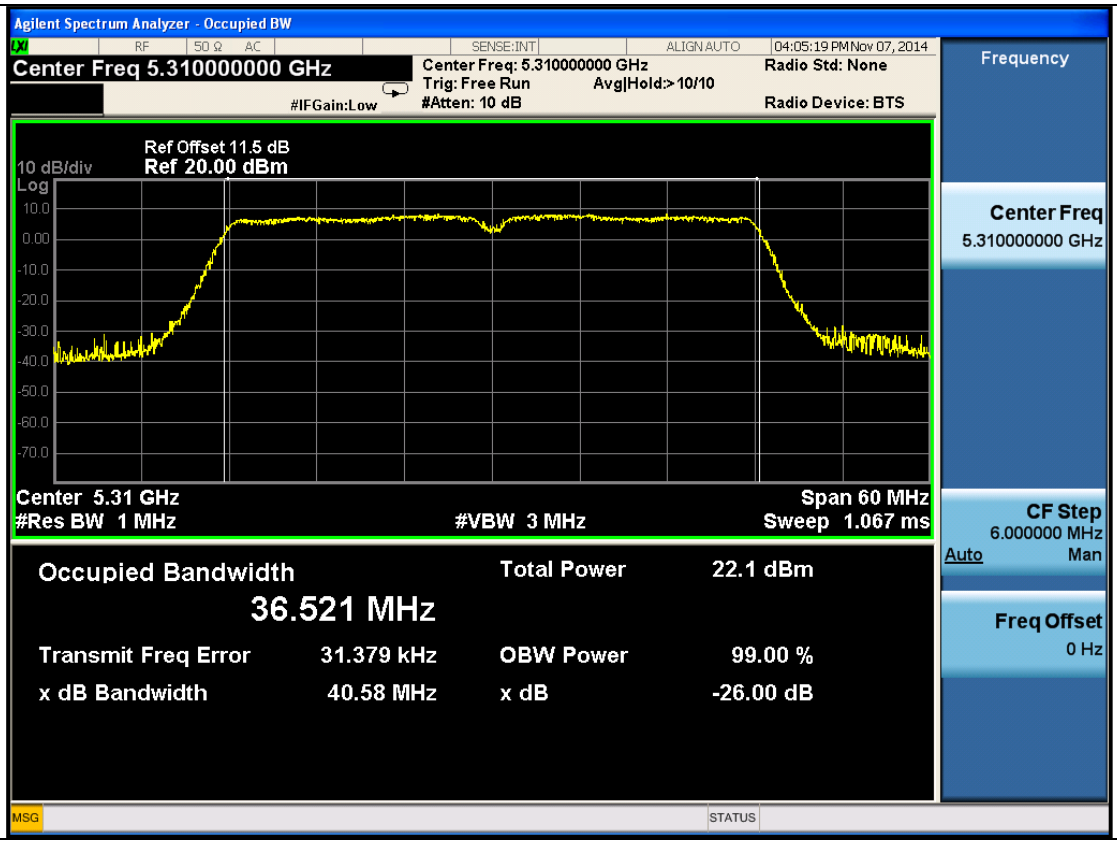

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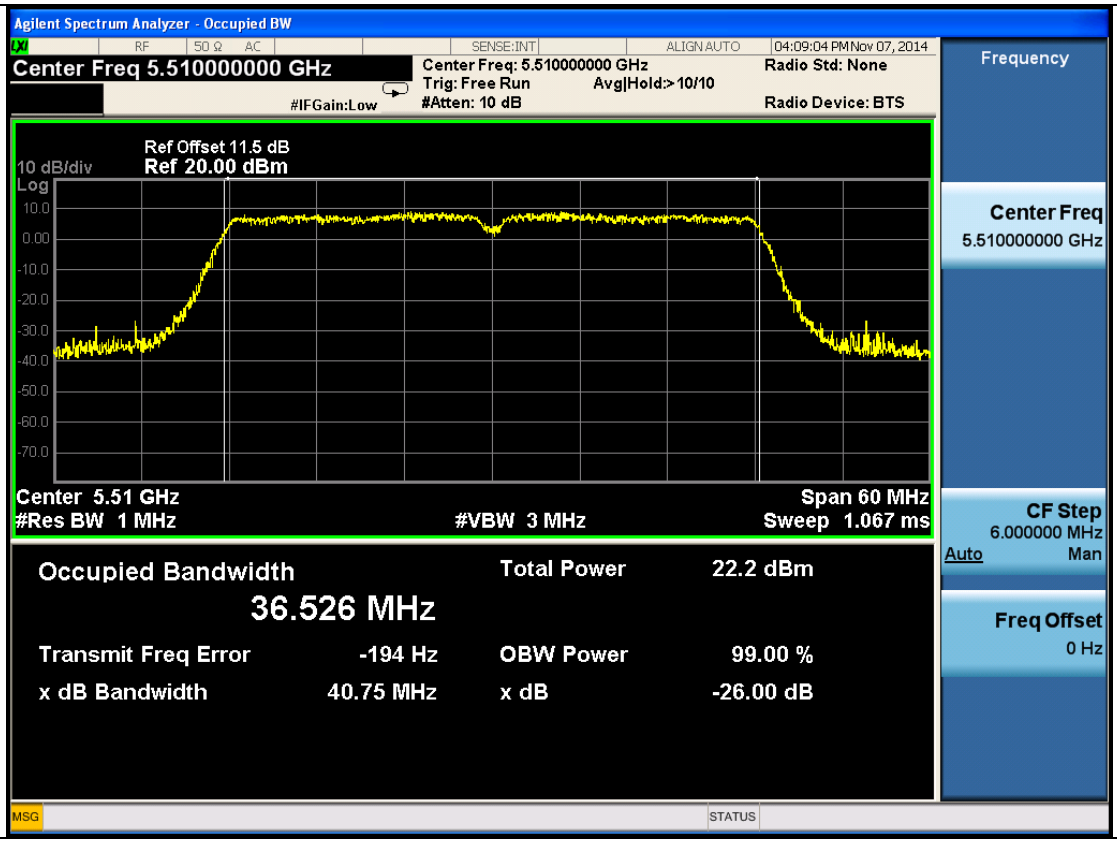

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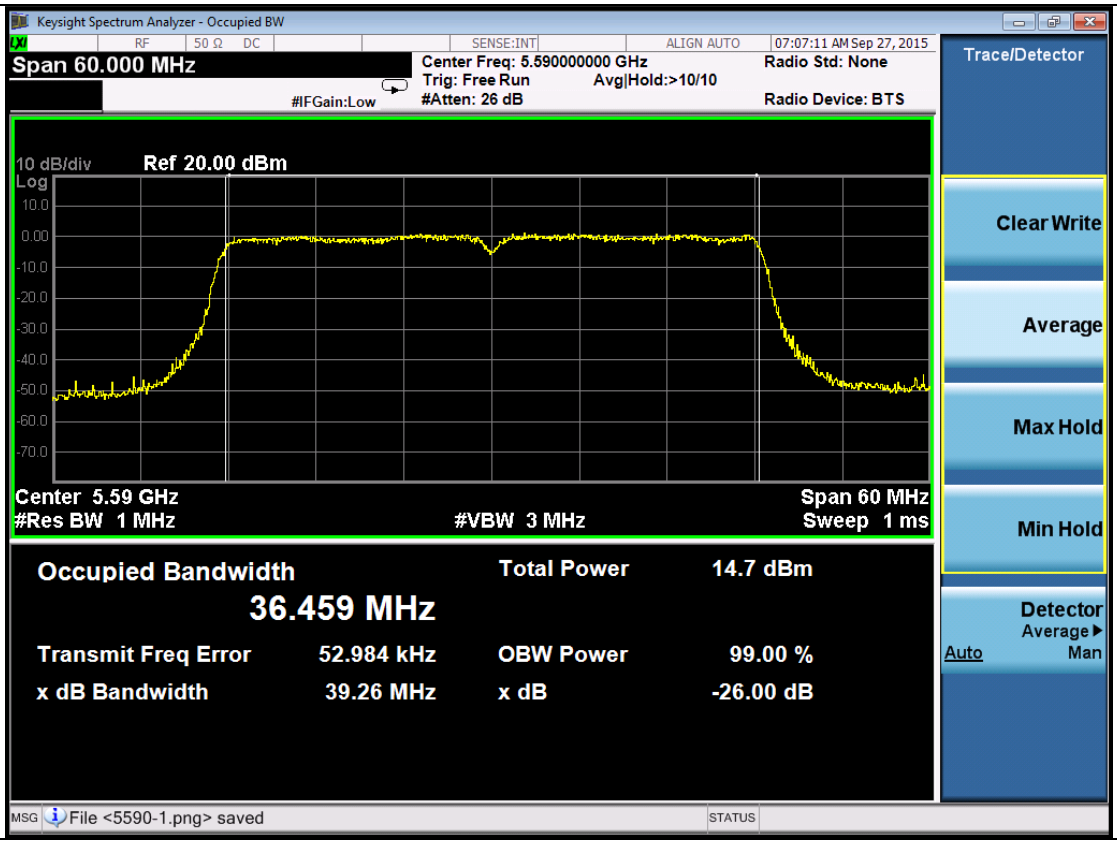

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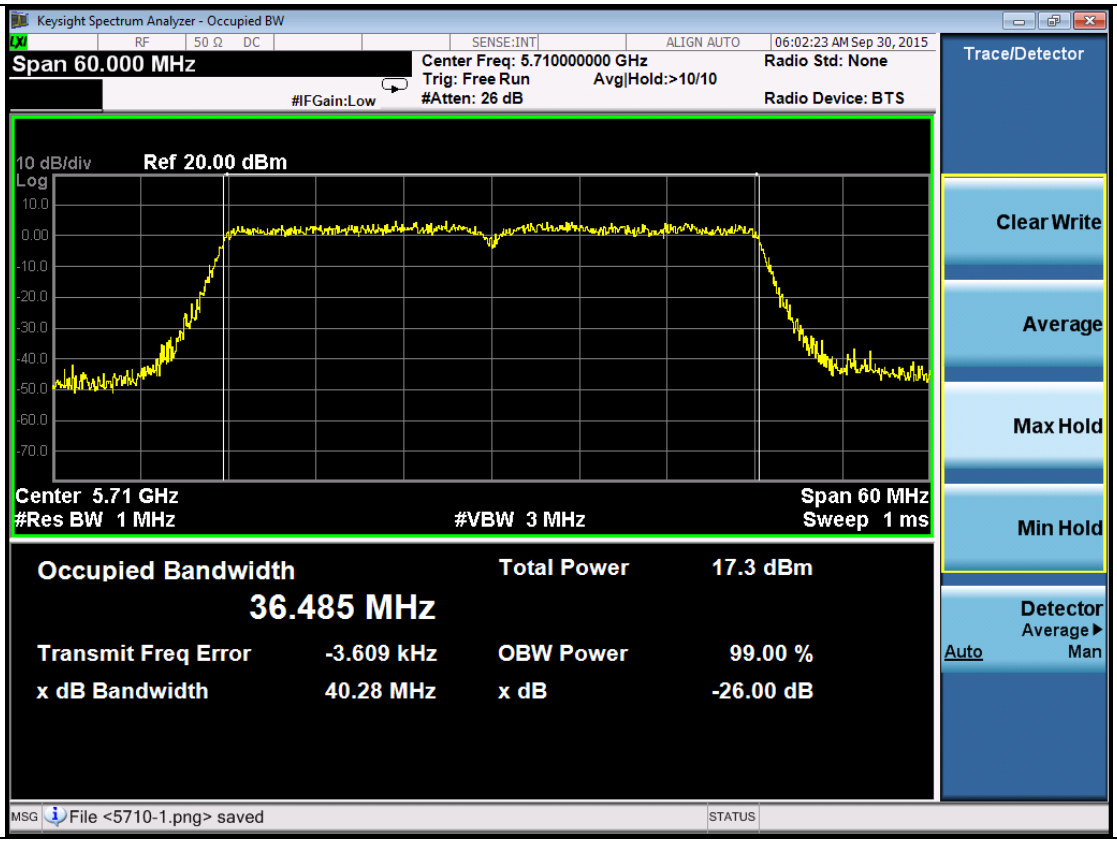
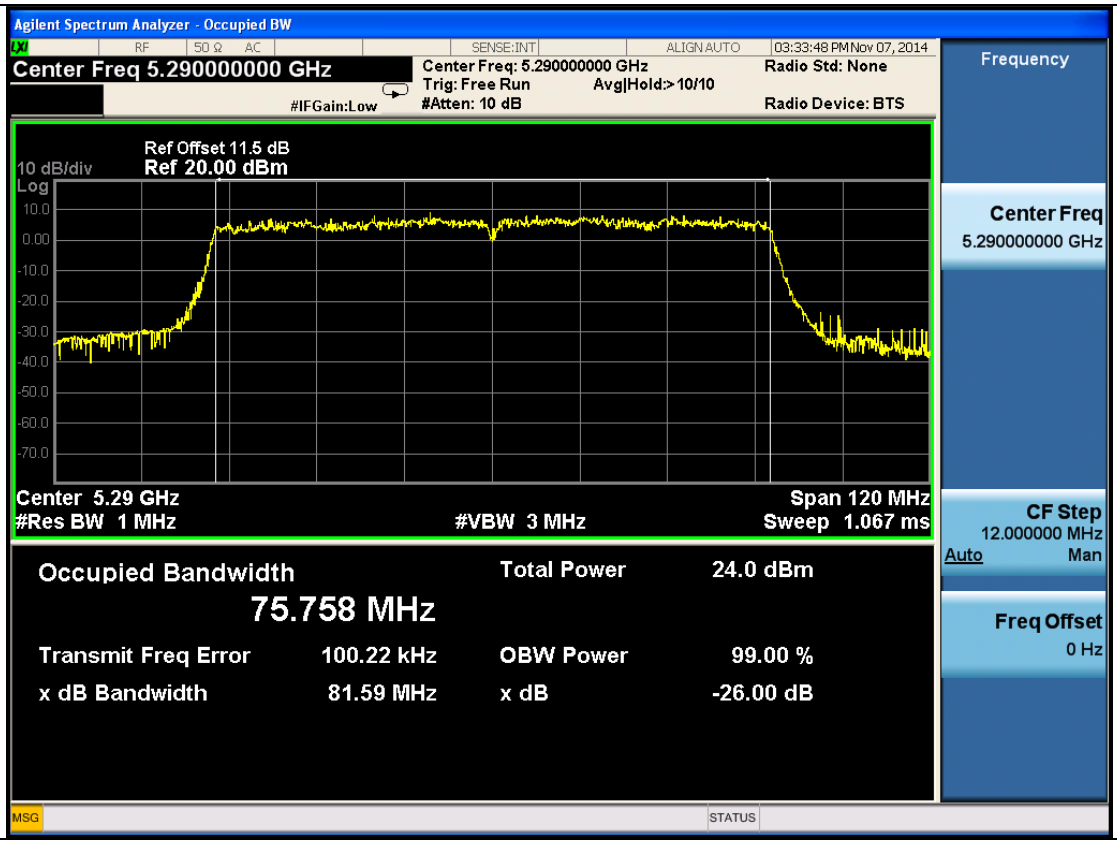


802.11ac80-5290



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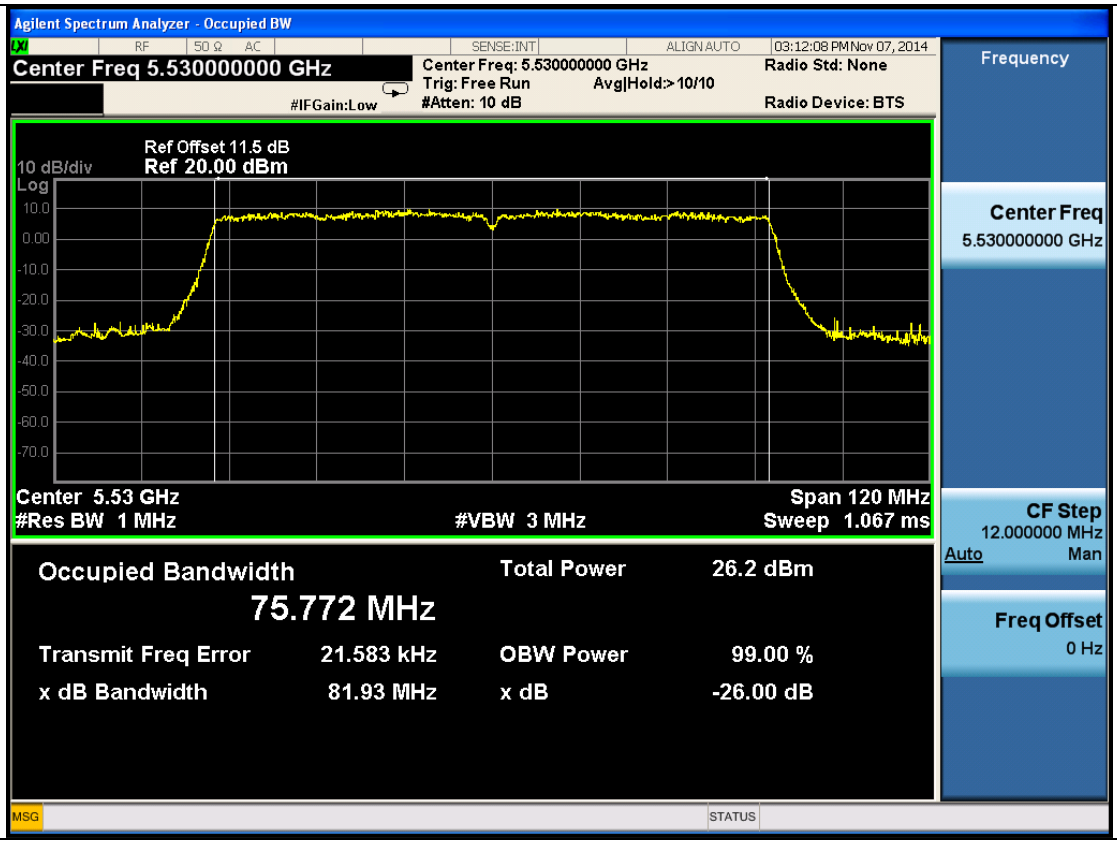

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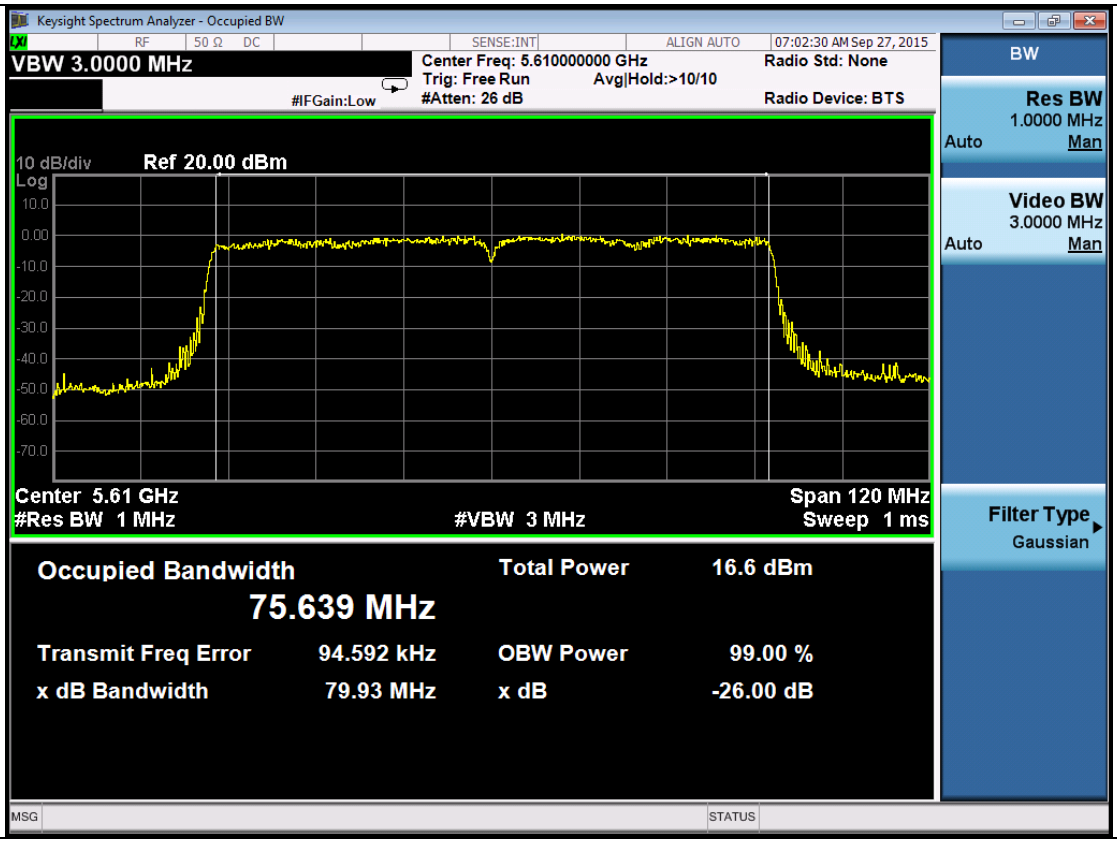

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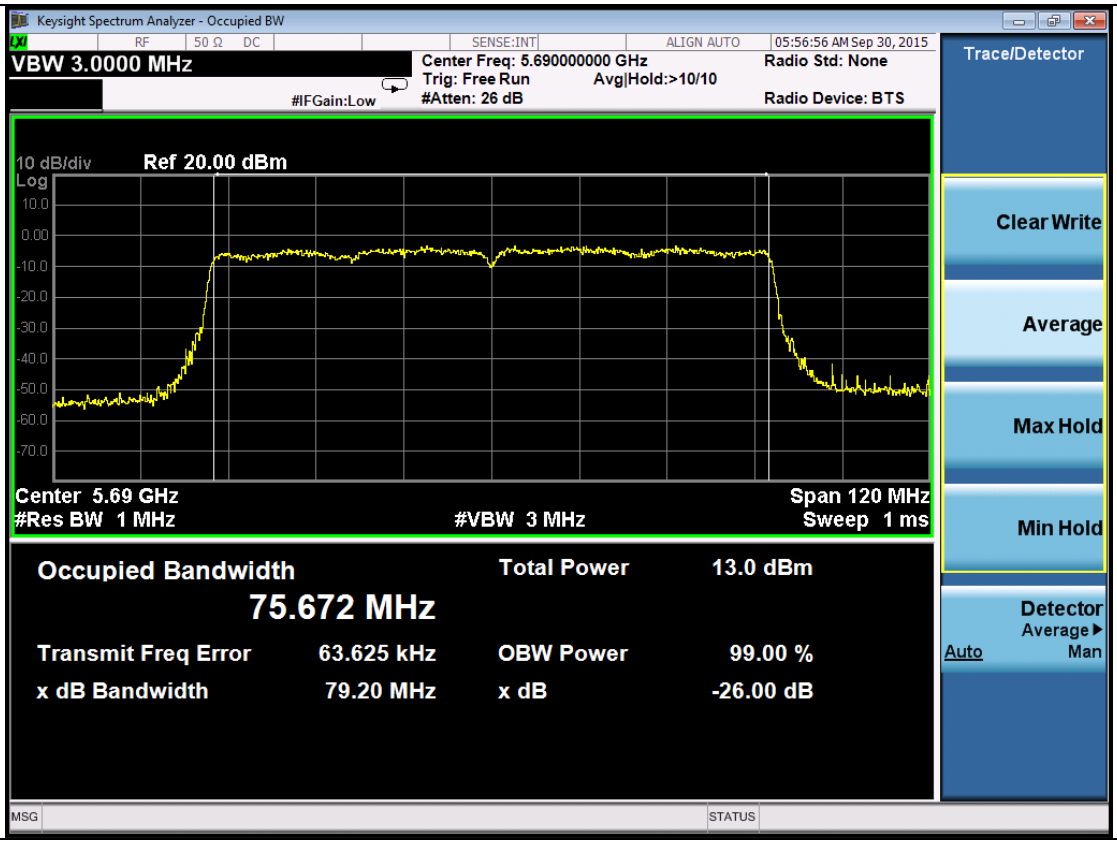
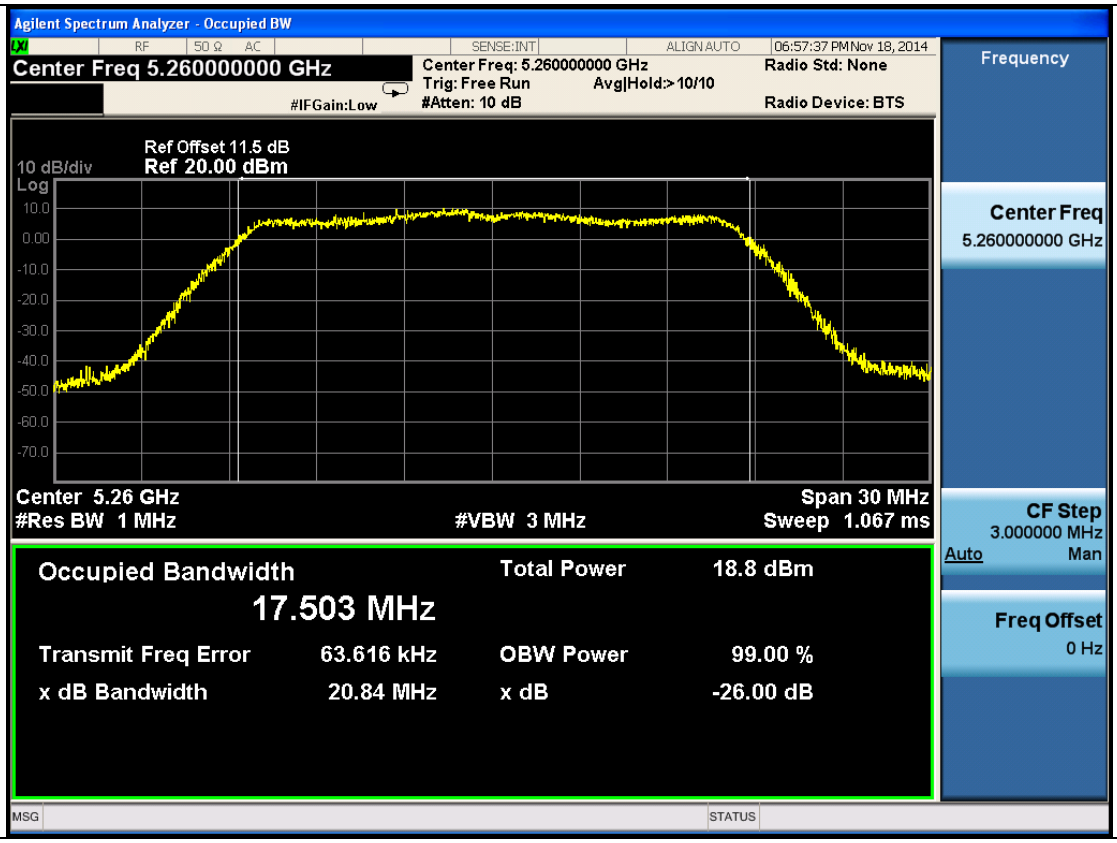
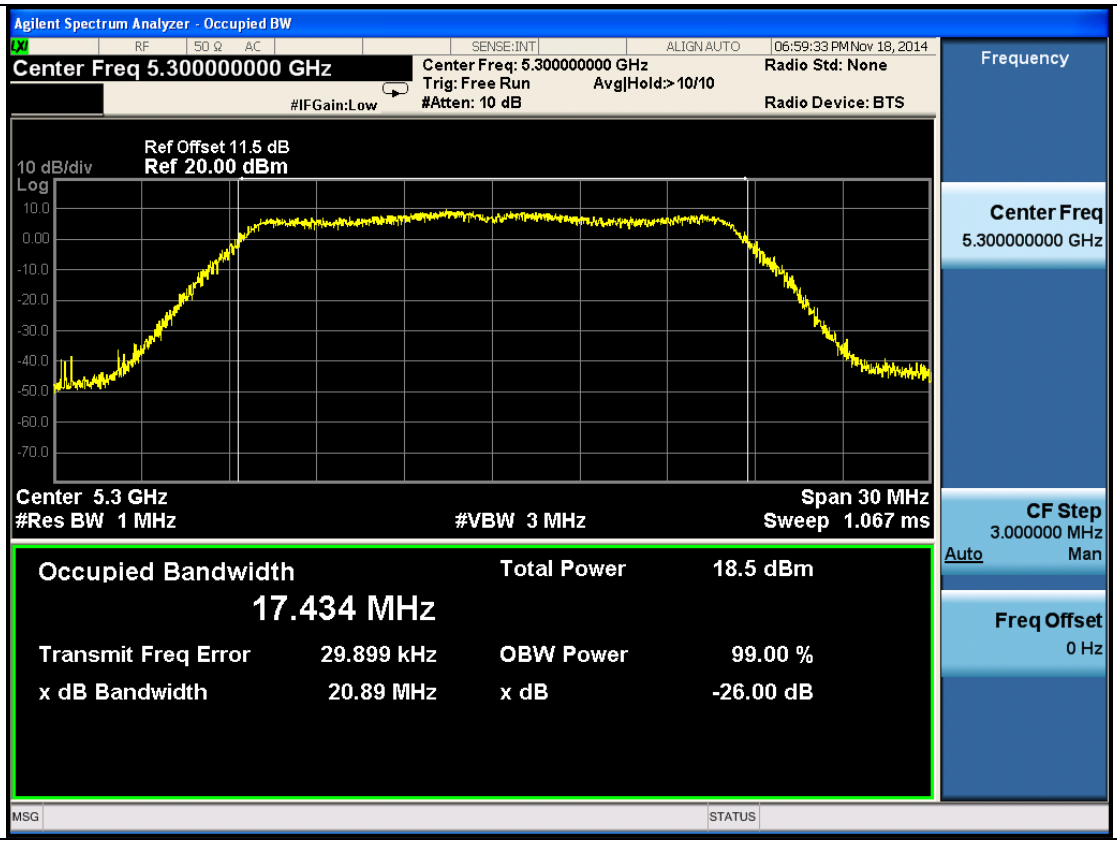


Port 1

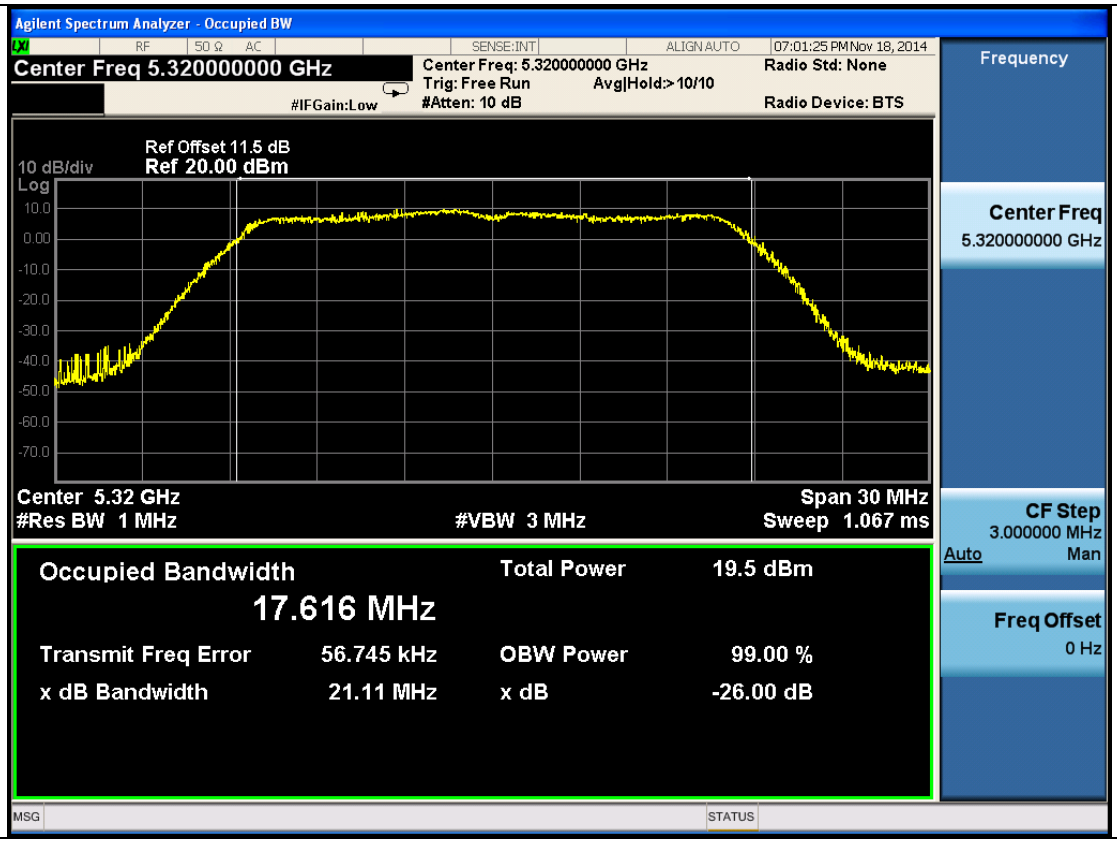
802.11a-5260



802.11a-5300



802.11a-5320



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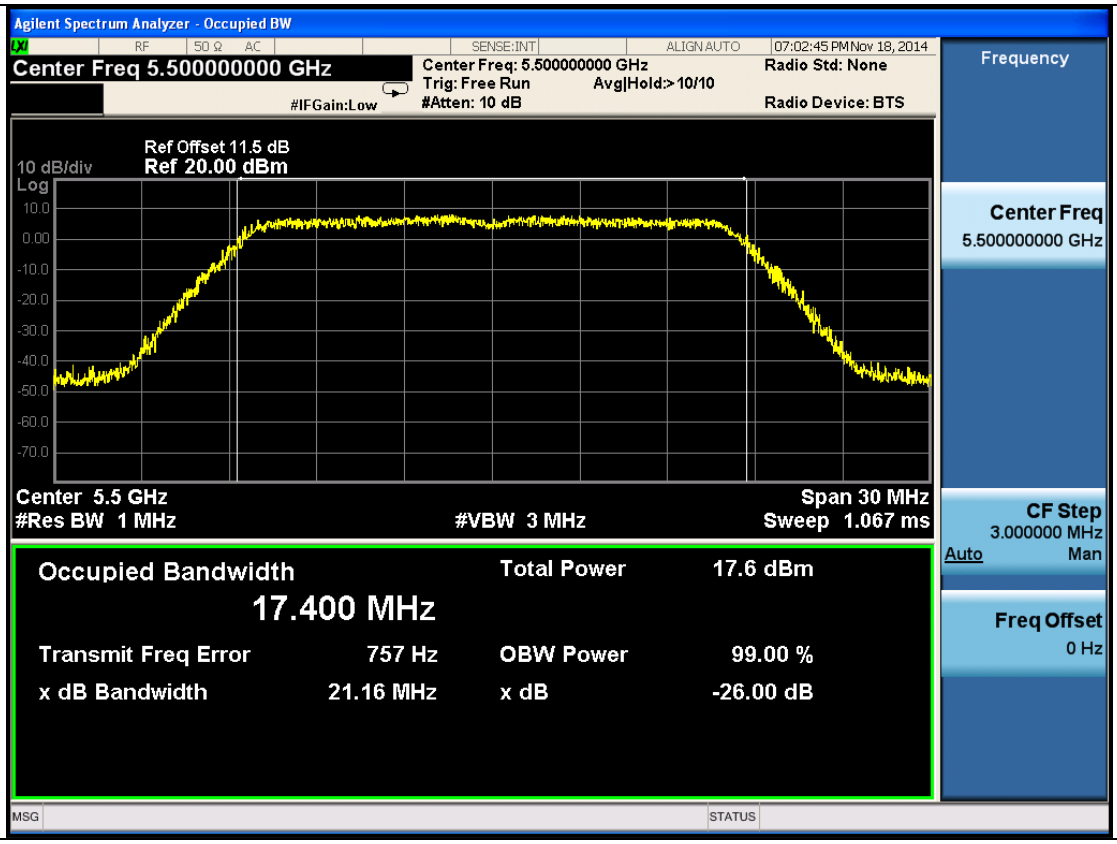

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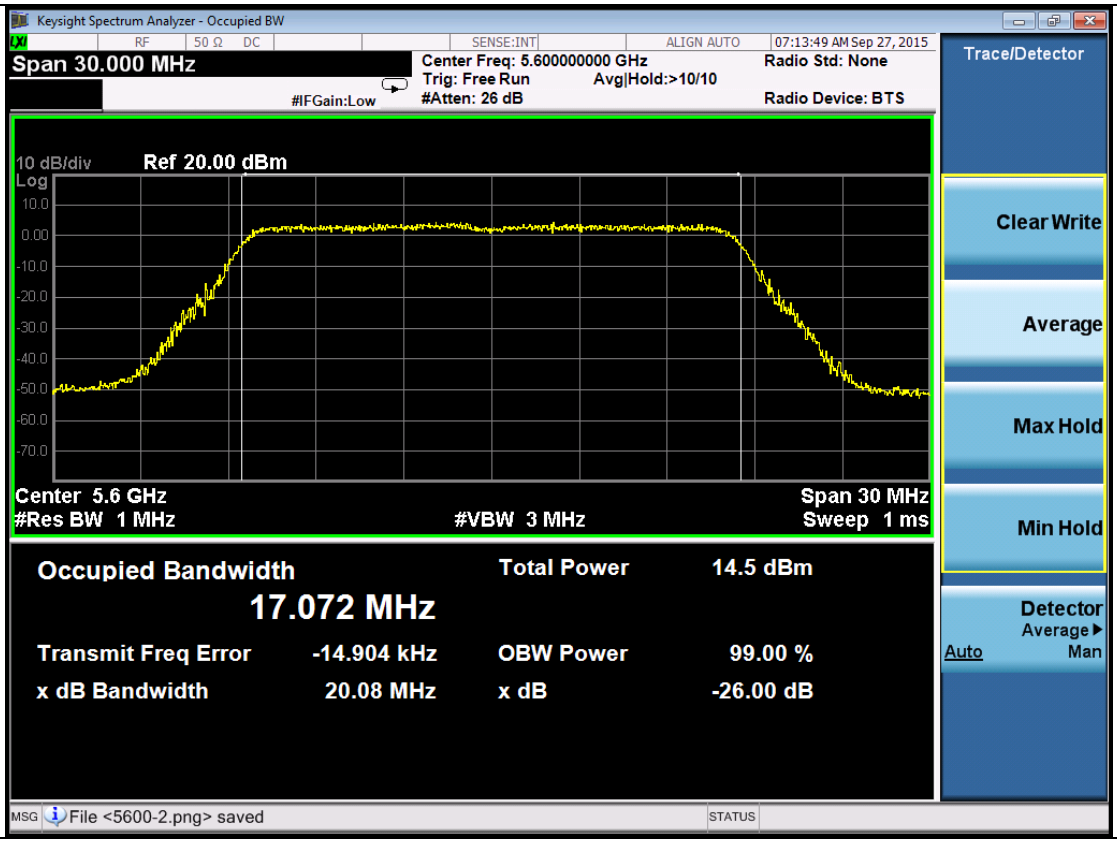
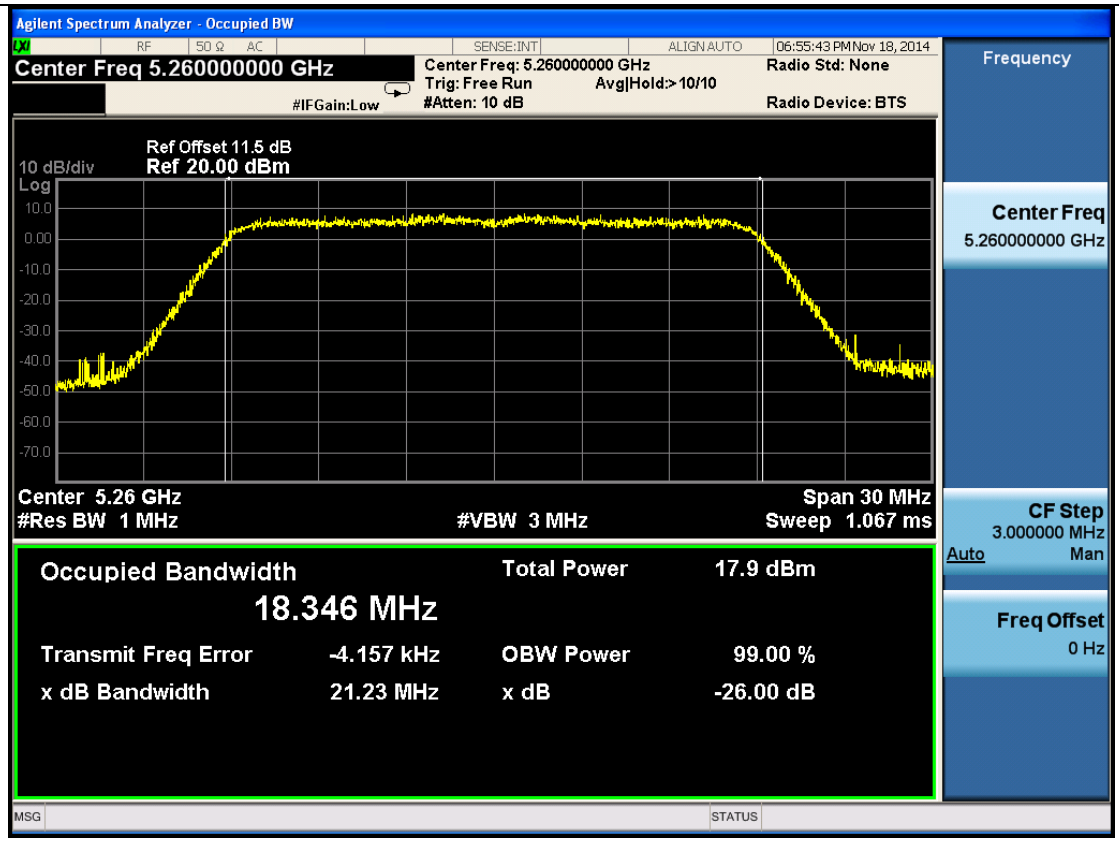


802.11a-5720

802.11n20-5260



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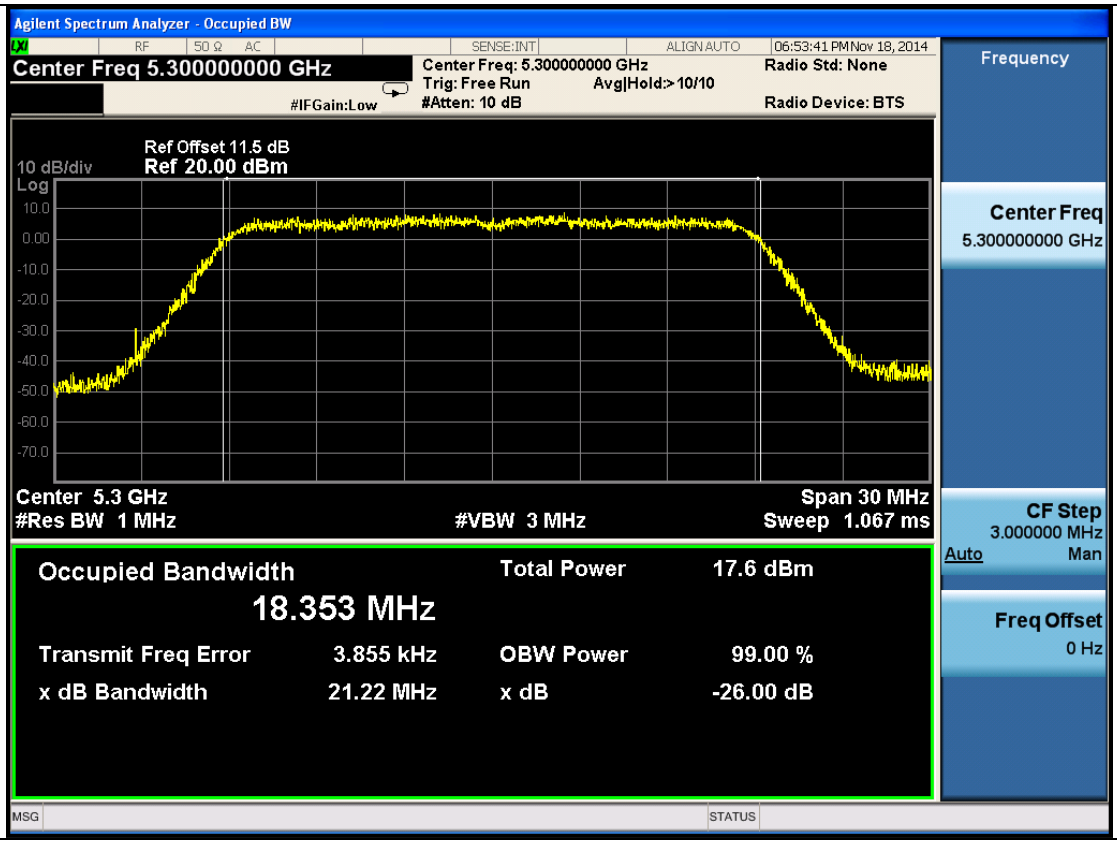

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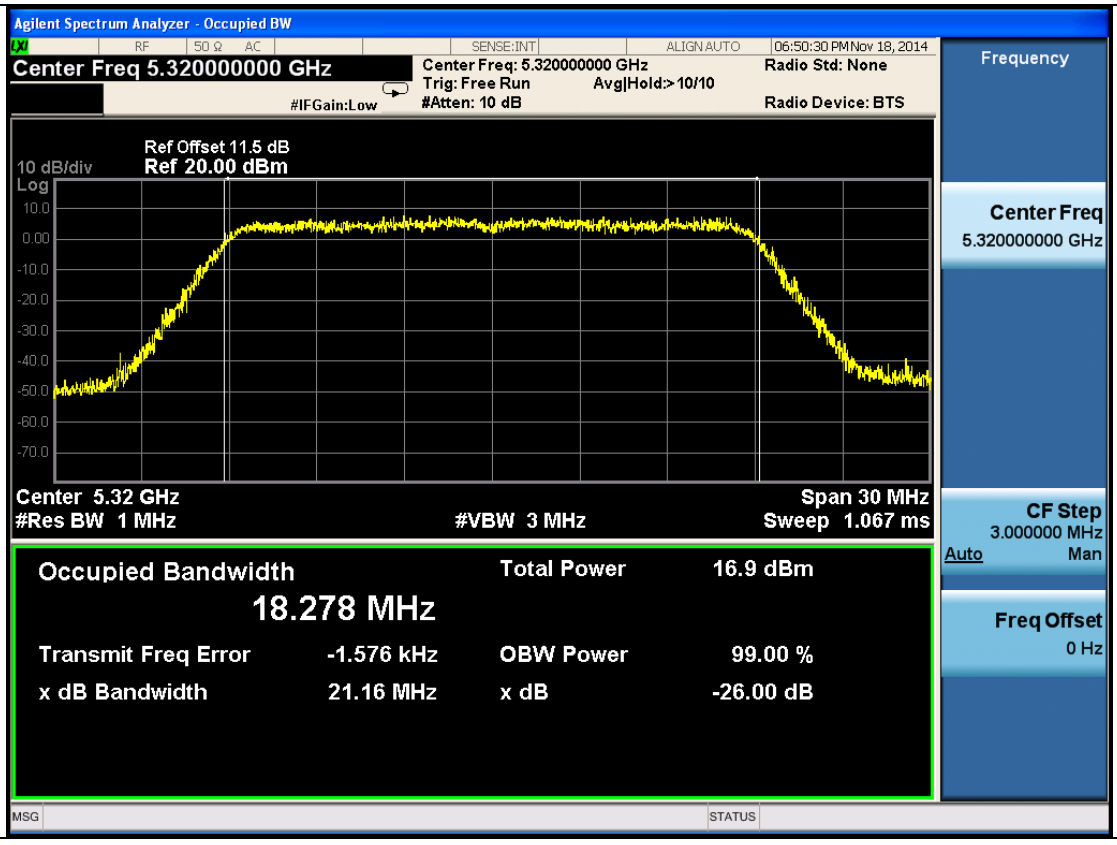

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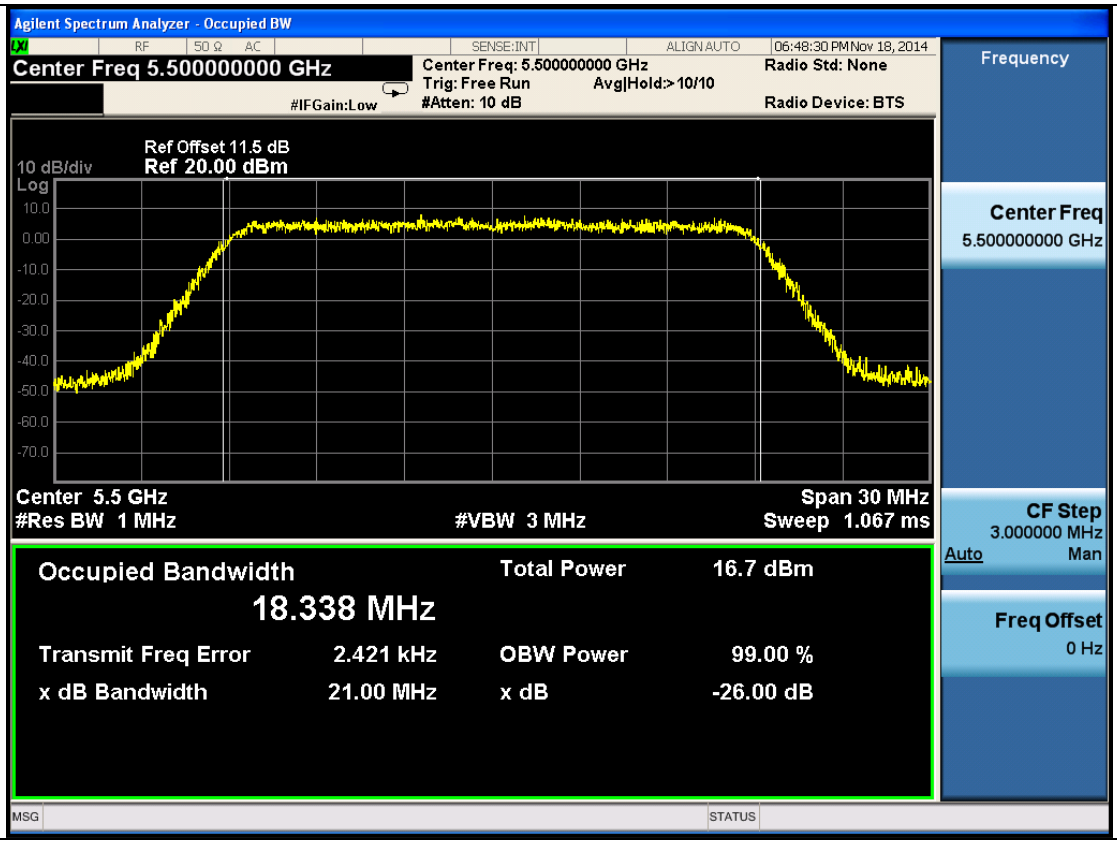

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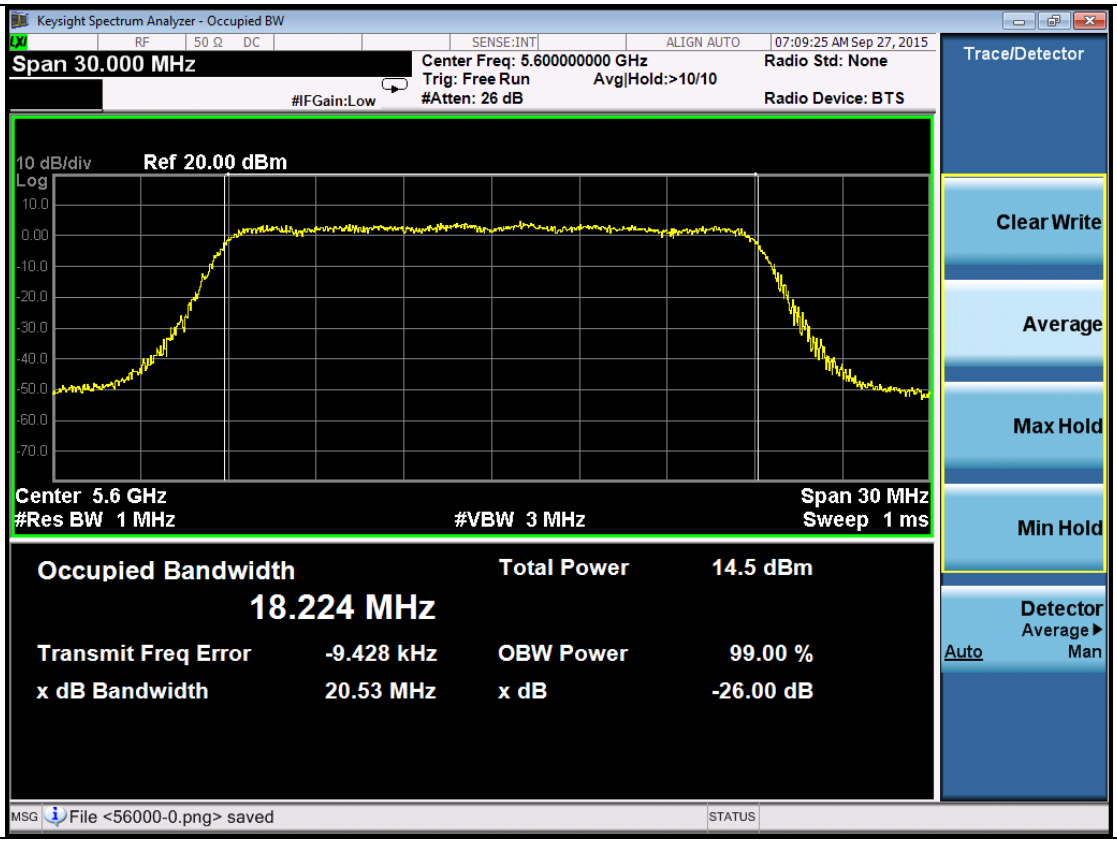

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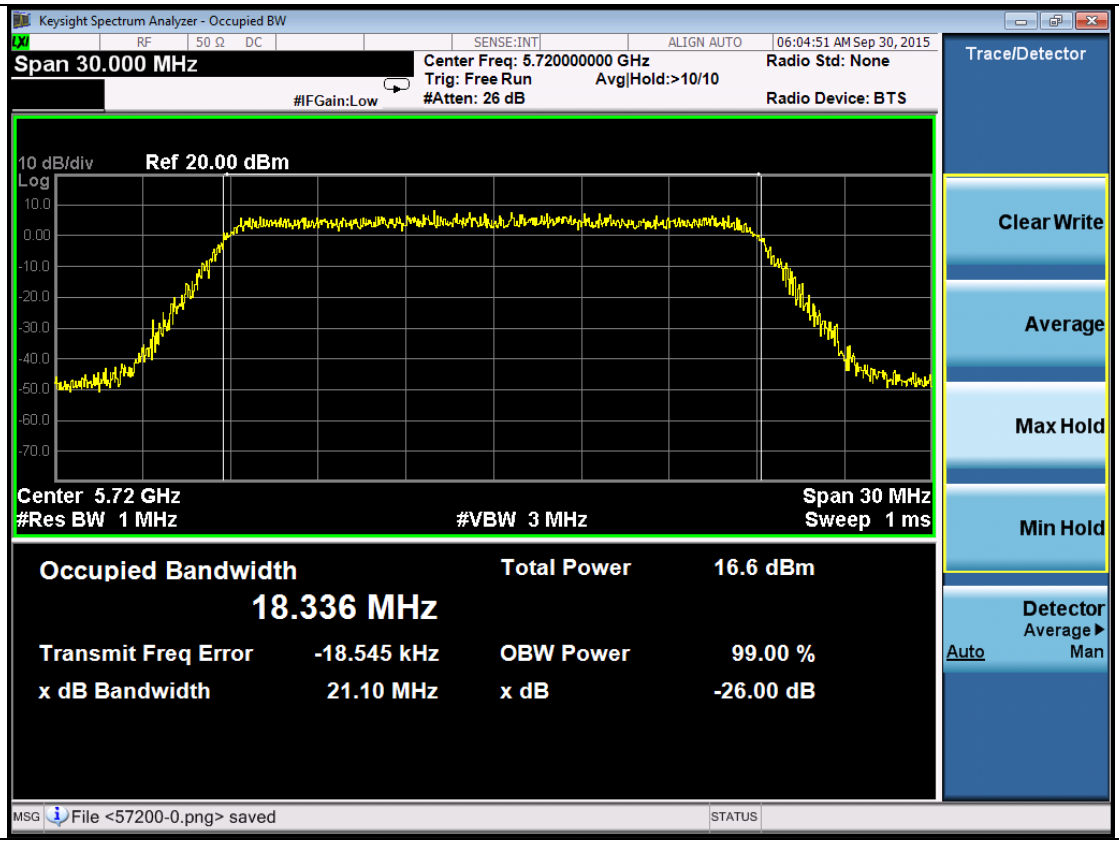

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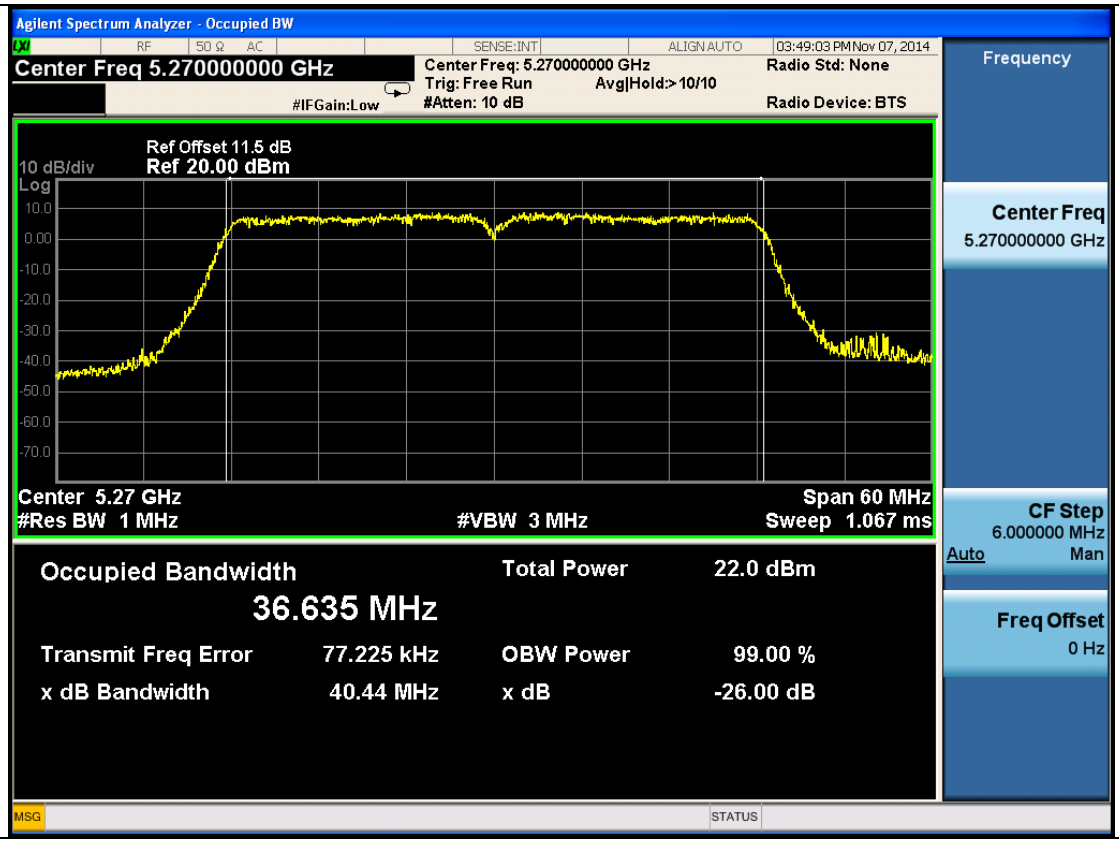

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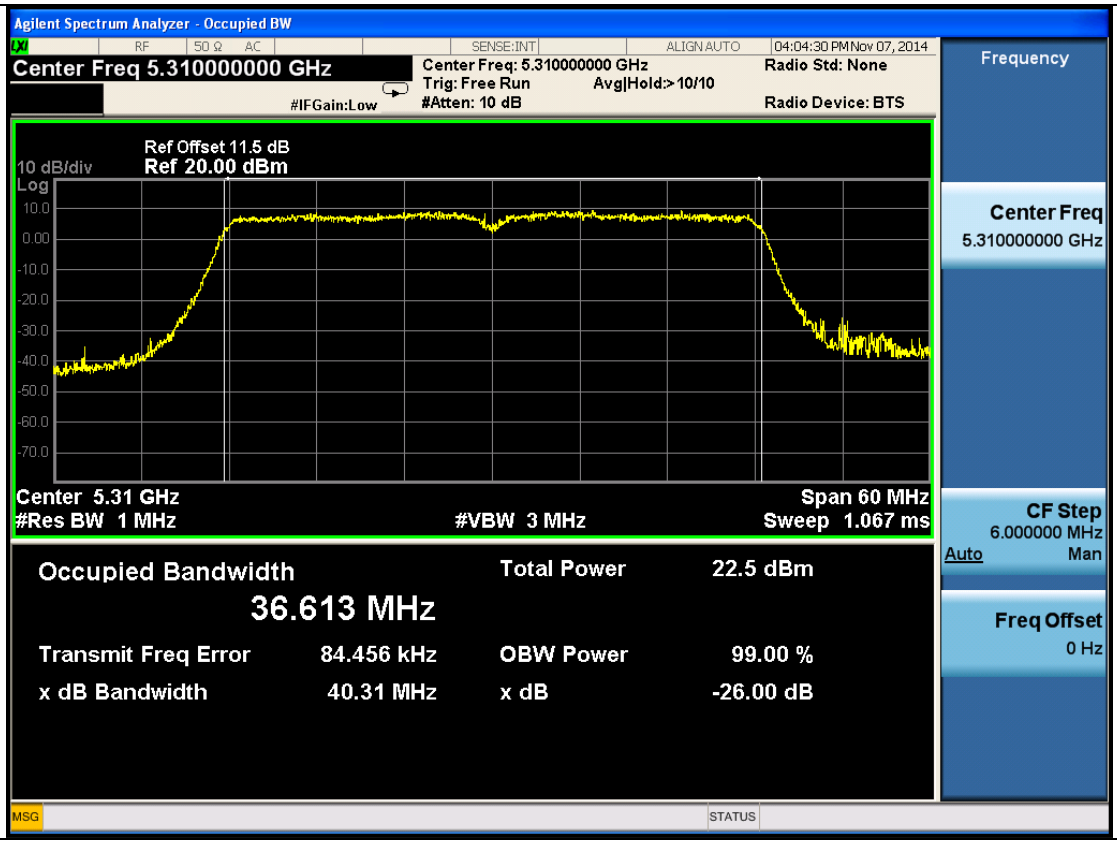

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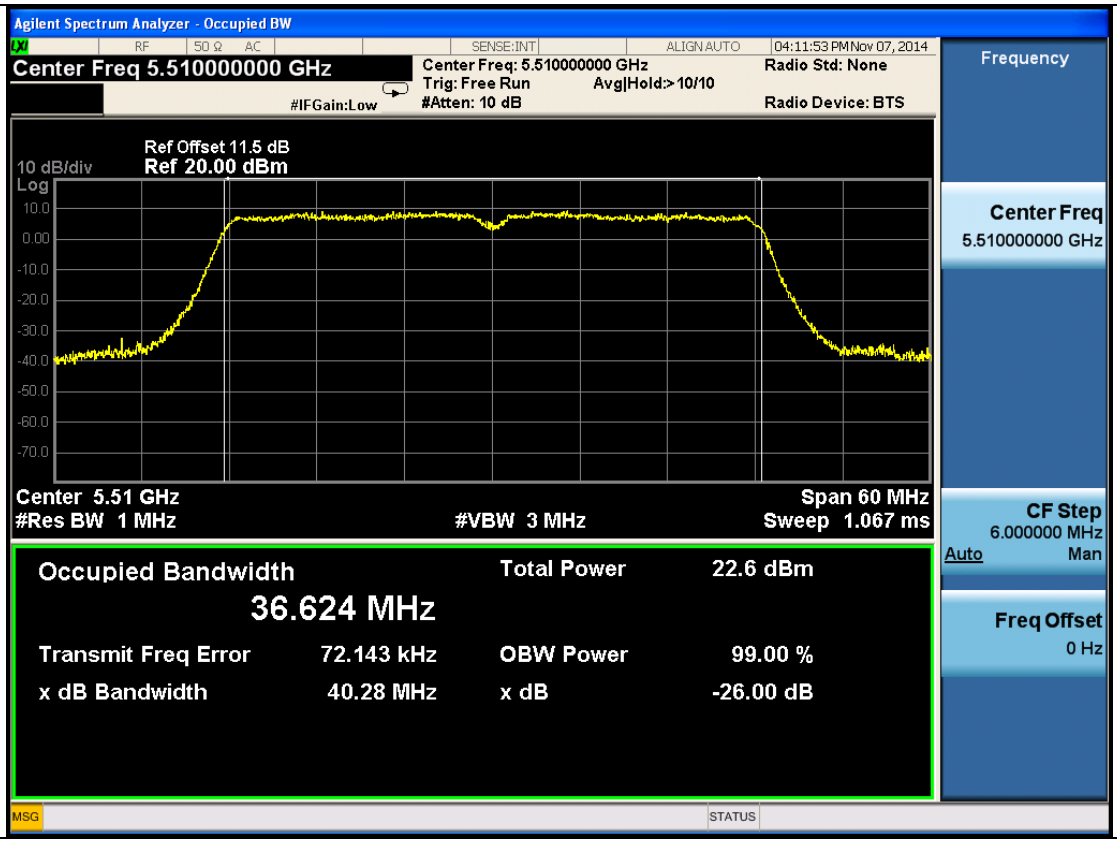
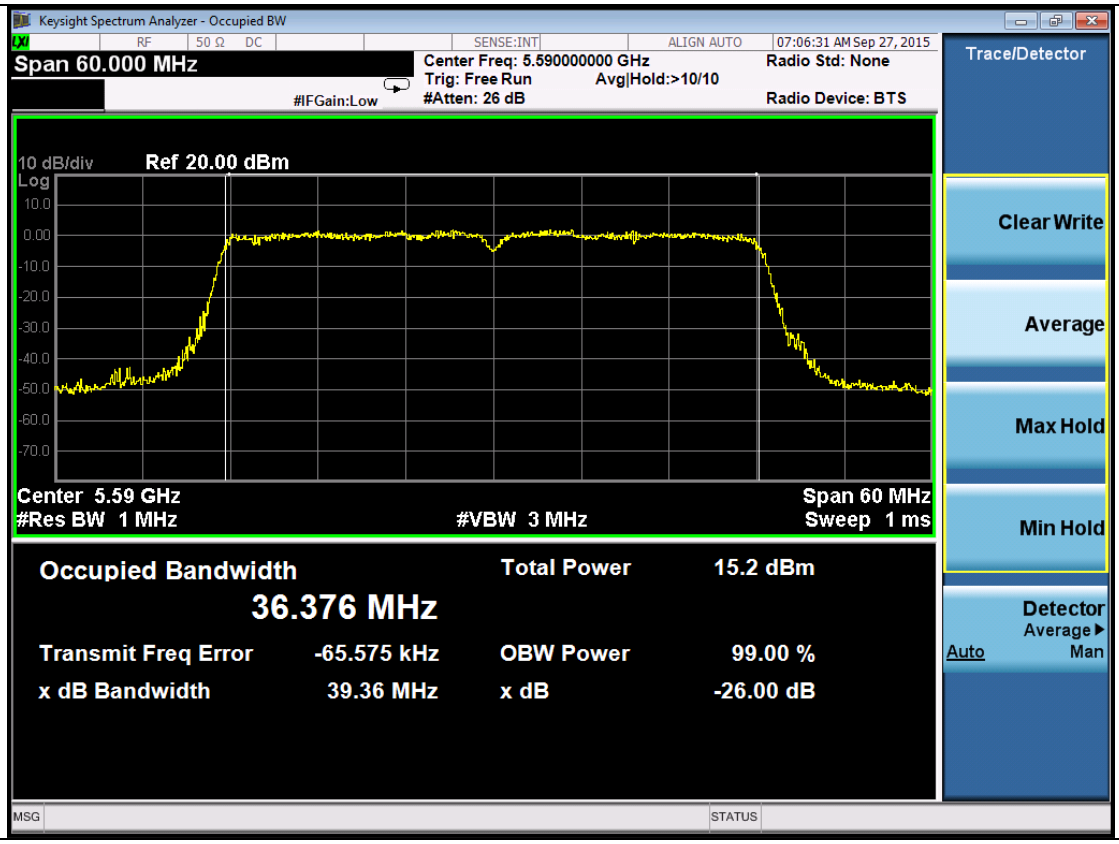
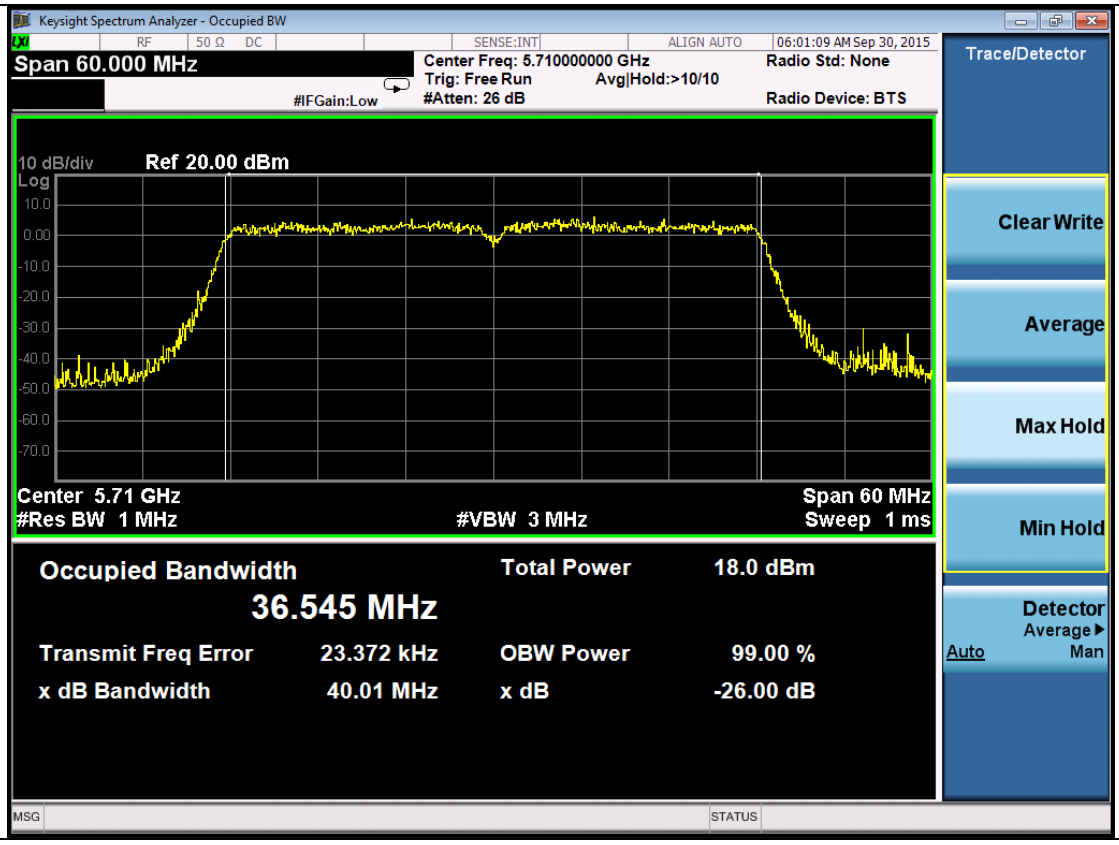


802.11n40-5590



802.11n40-5710



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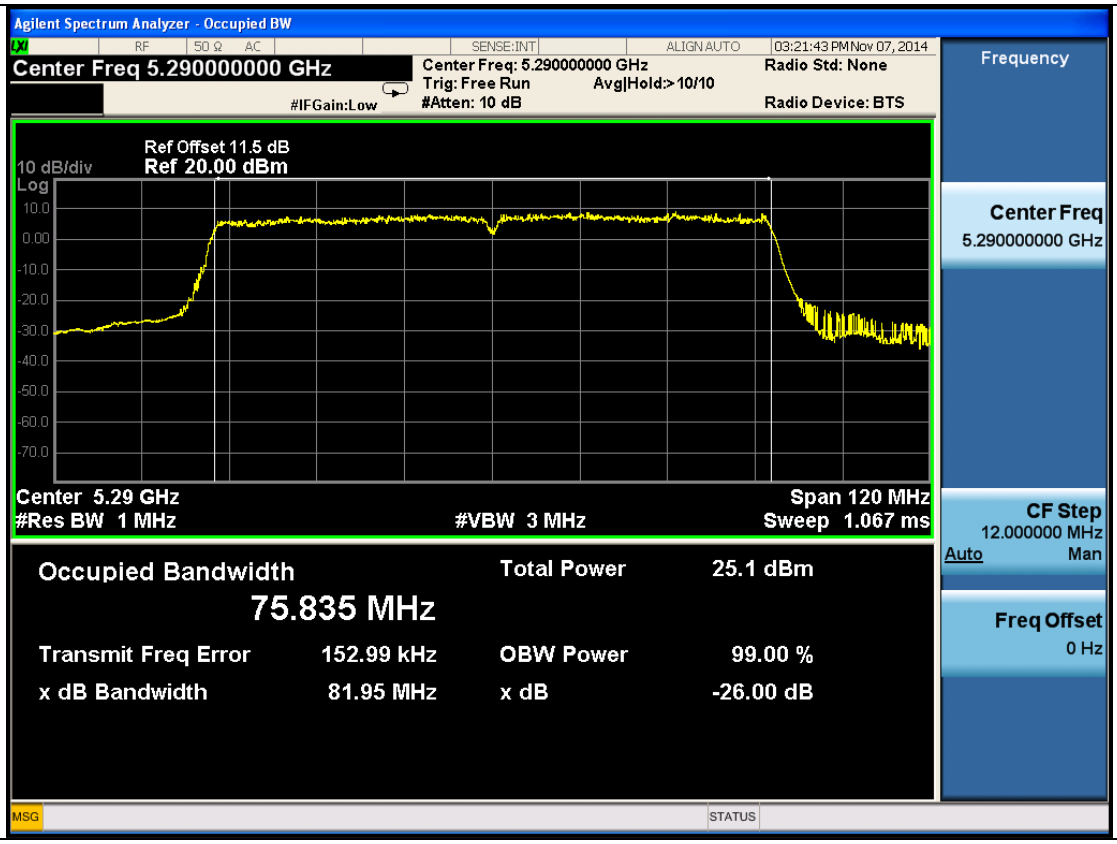
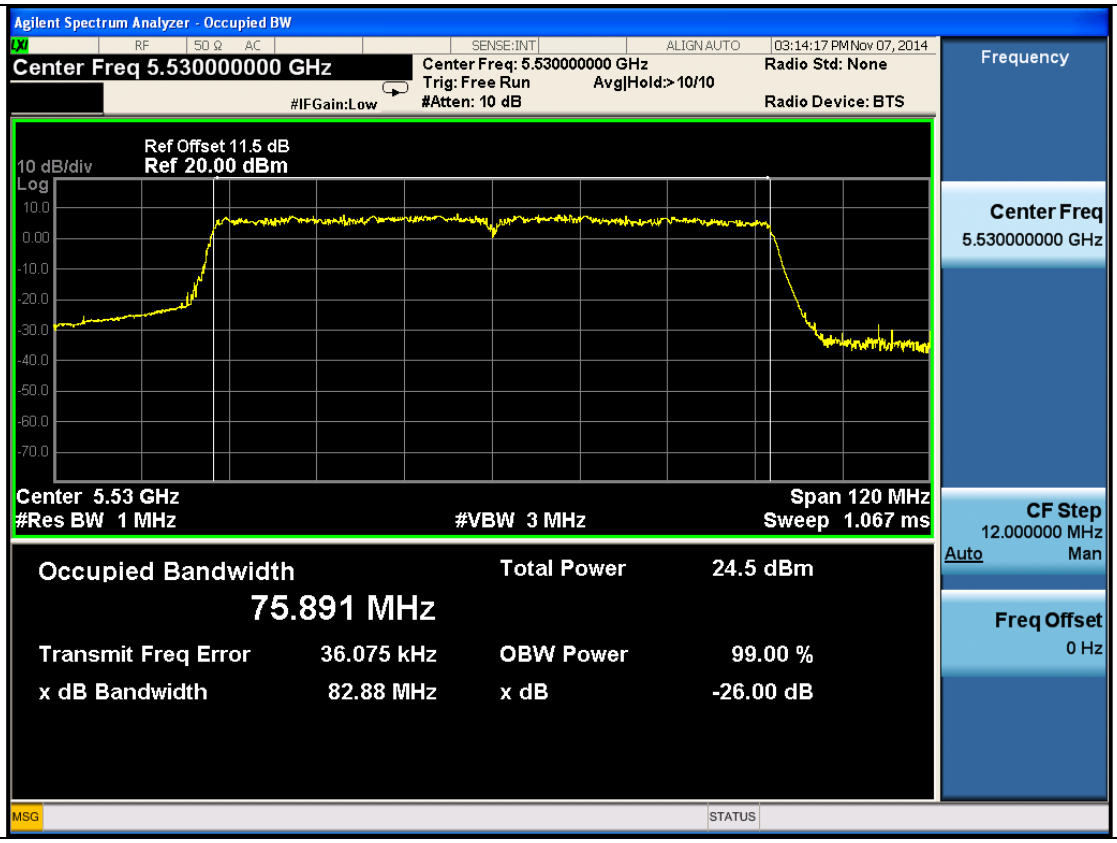


802.11ac80-5530



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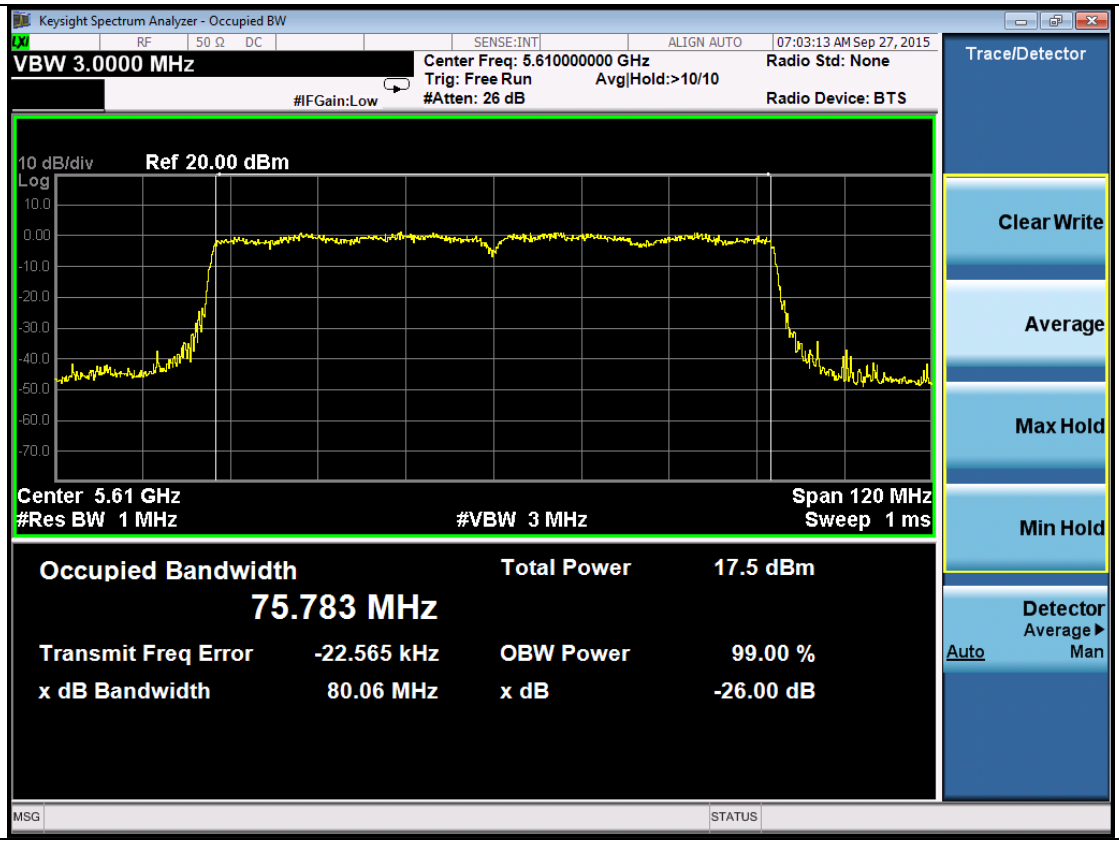
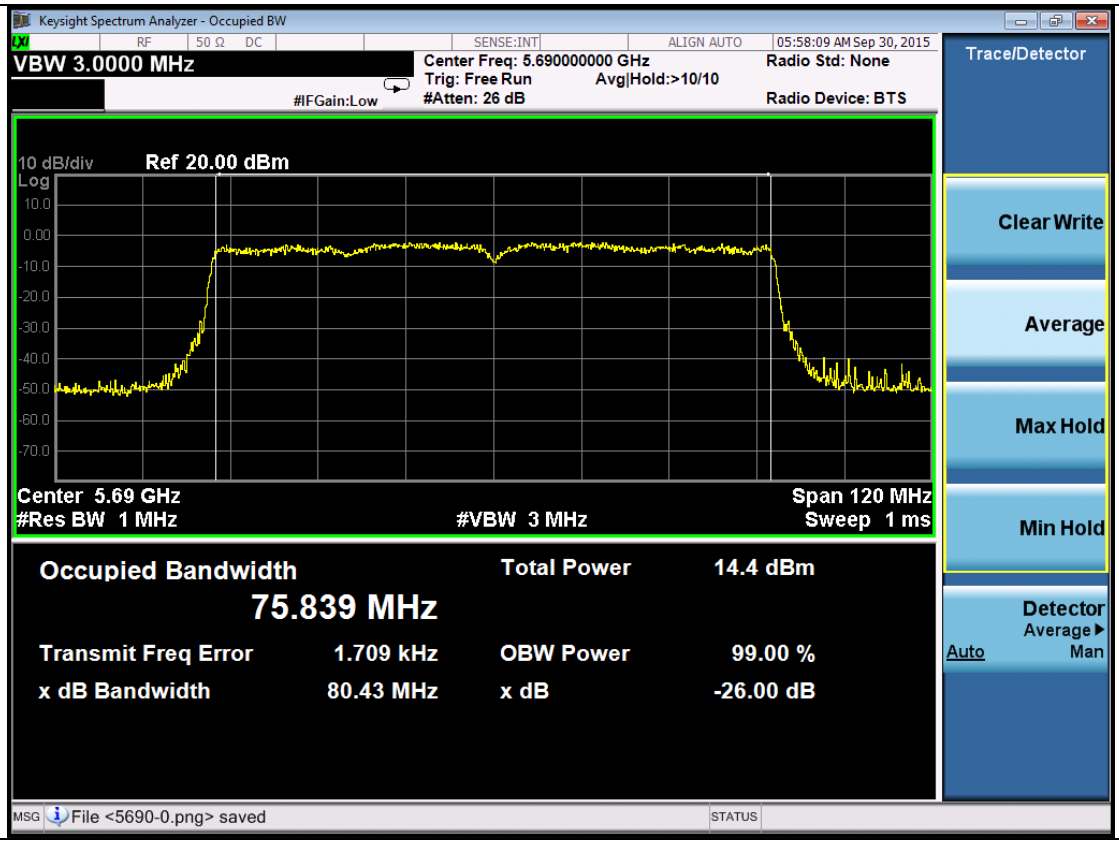
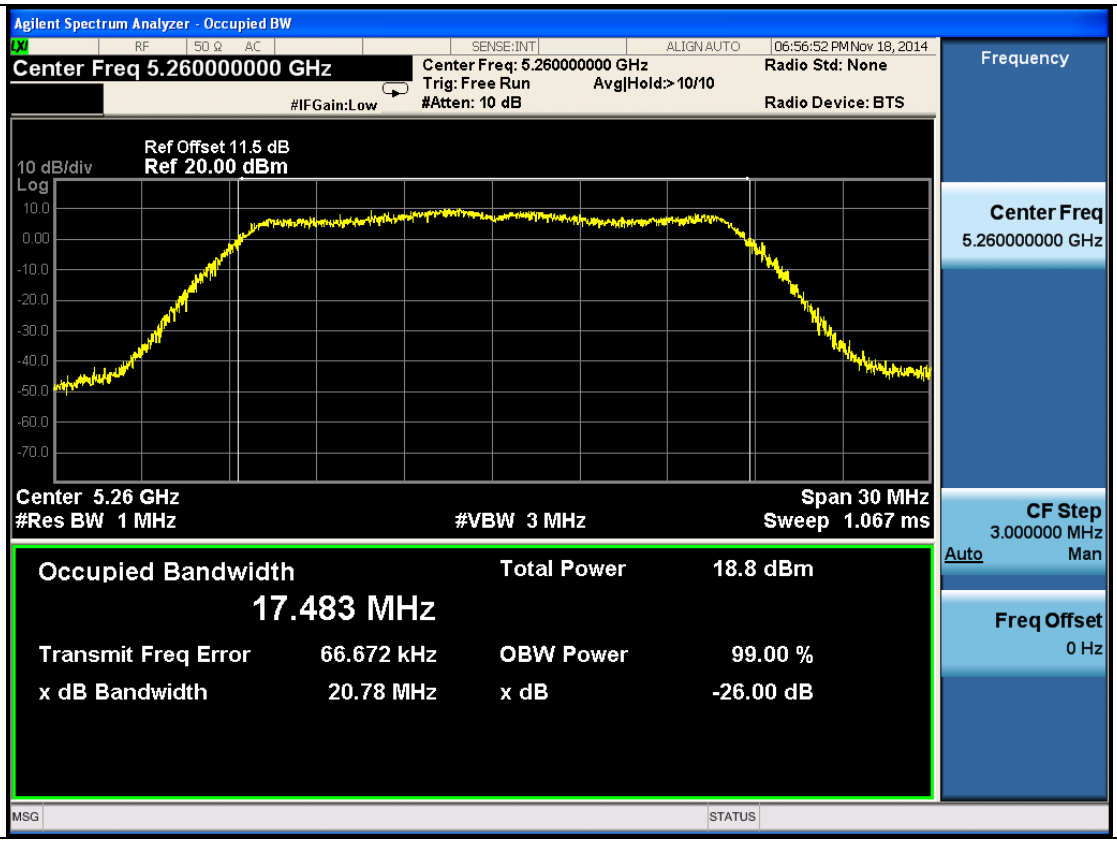


802.11ac80-5690

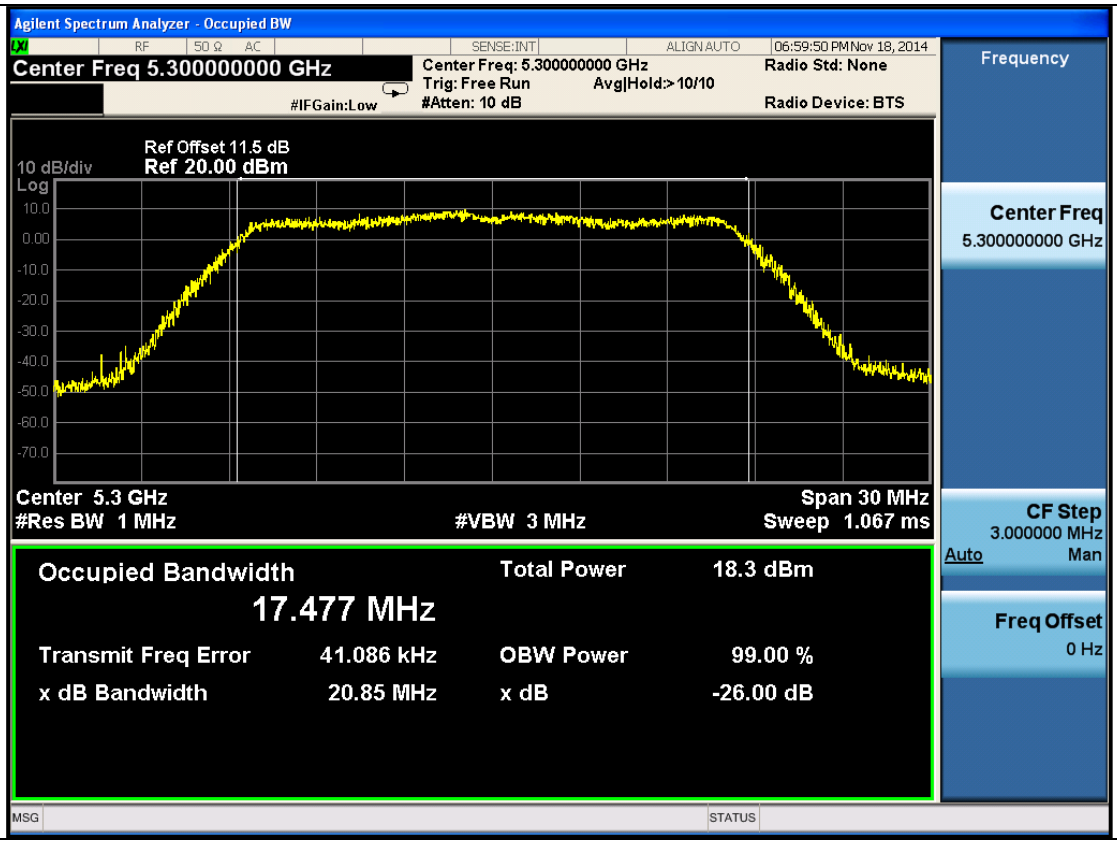


Port 2

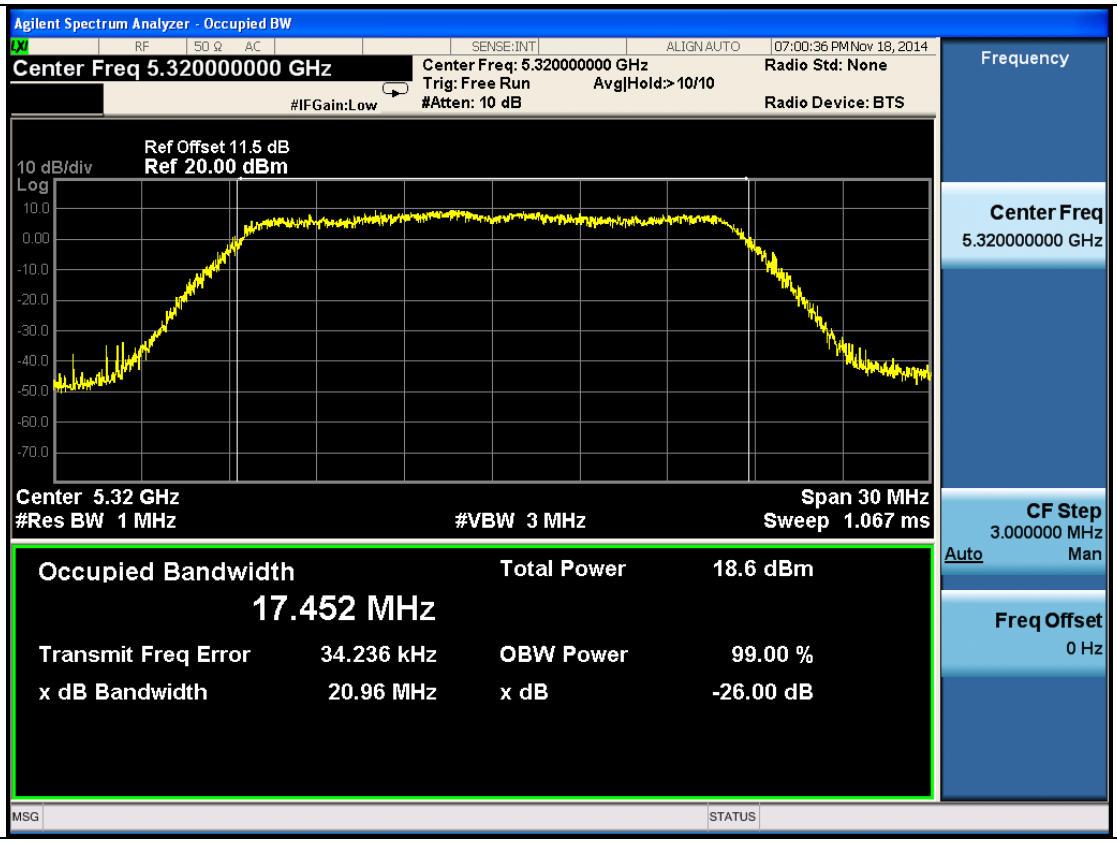
802.11a-5260



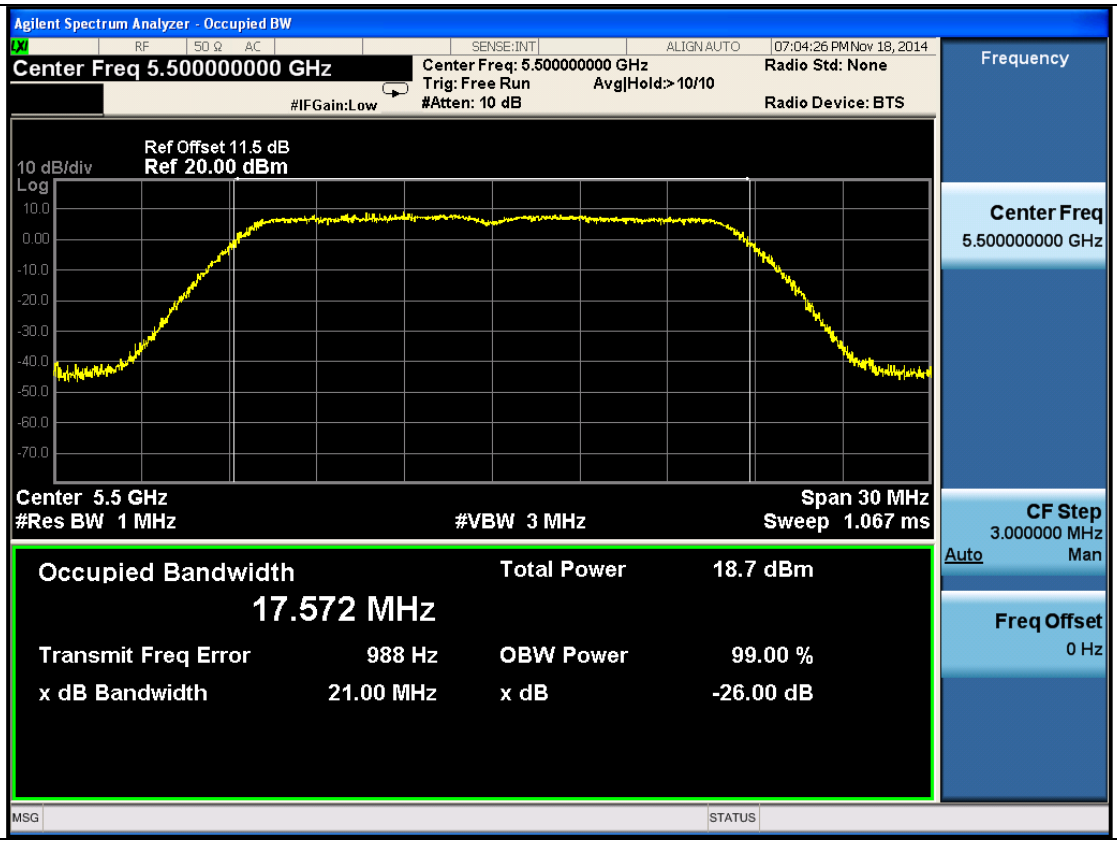
802.11a-5300



802.11a-5320



802.11a-5500



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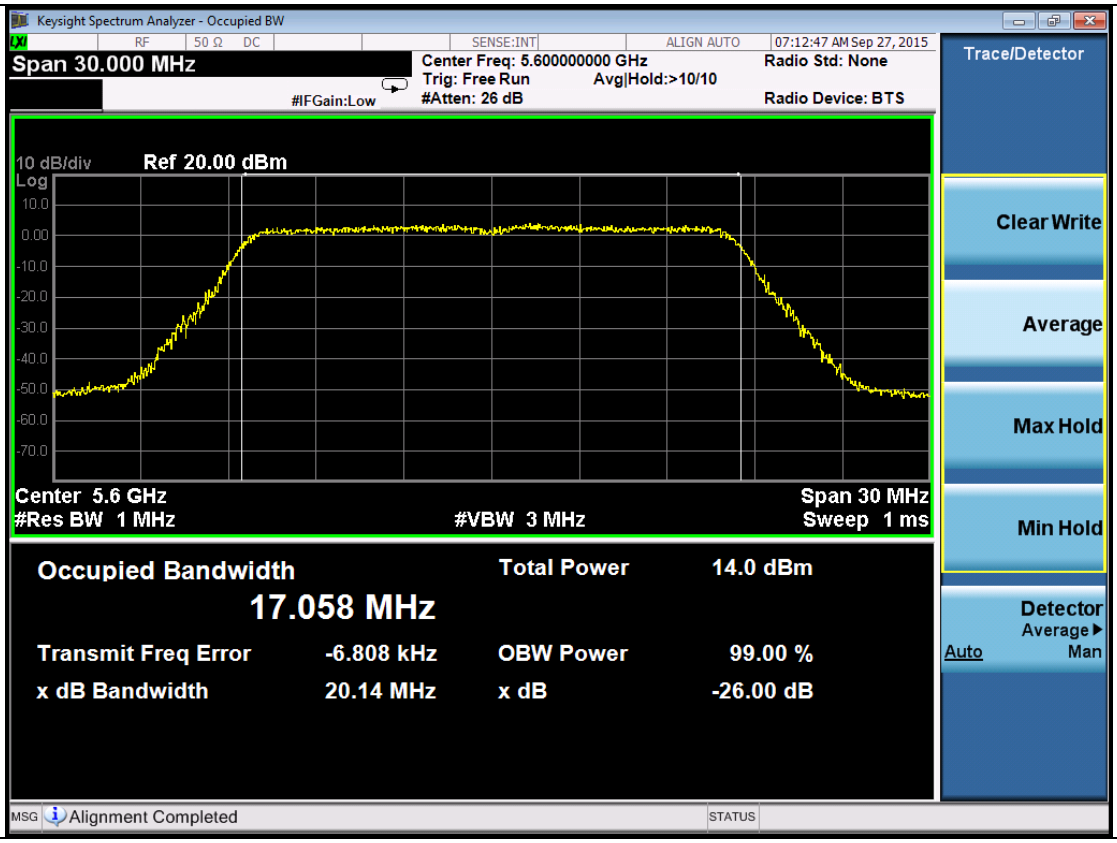
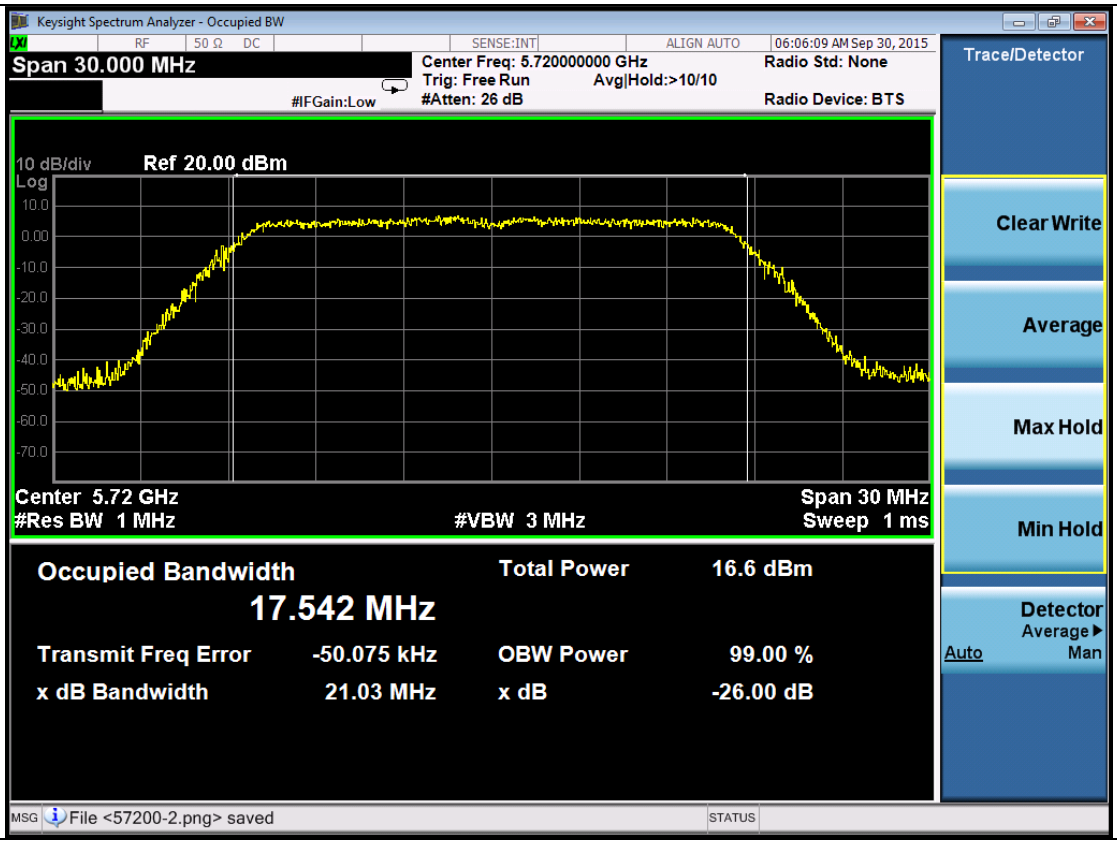
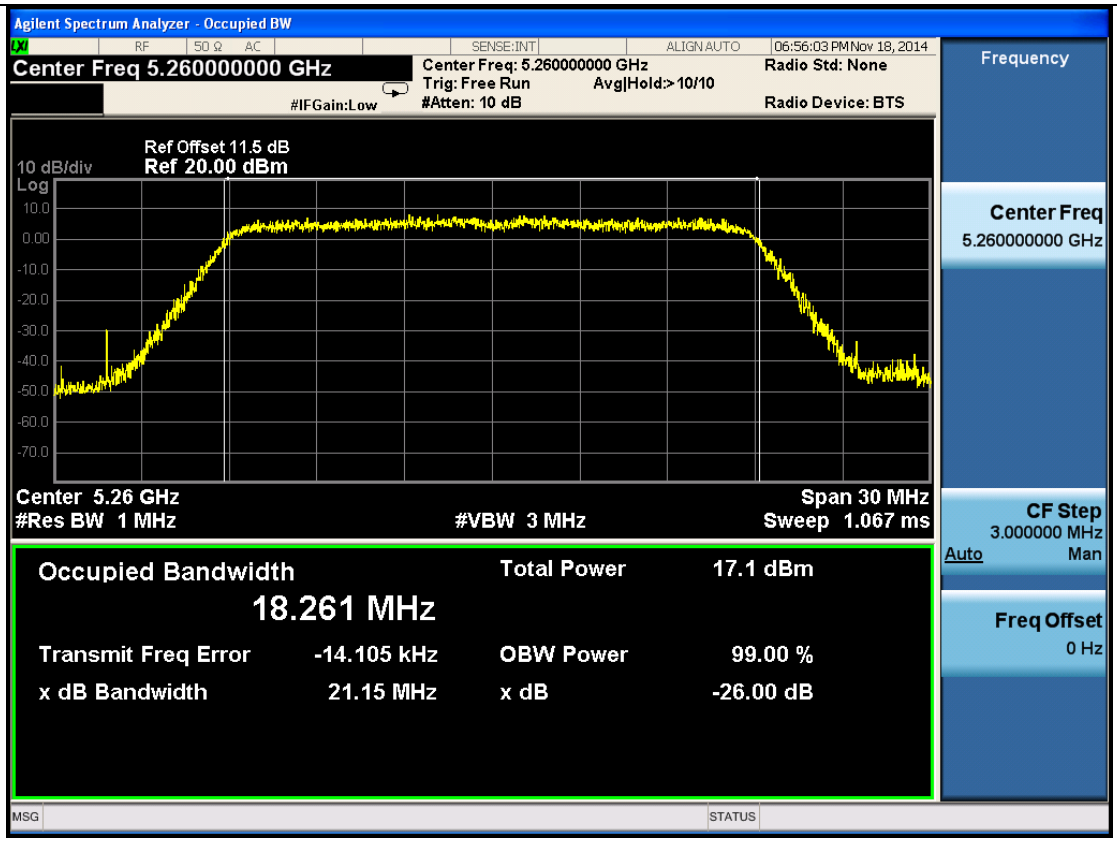


802.11a-5720



802.11n20-5260



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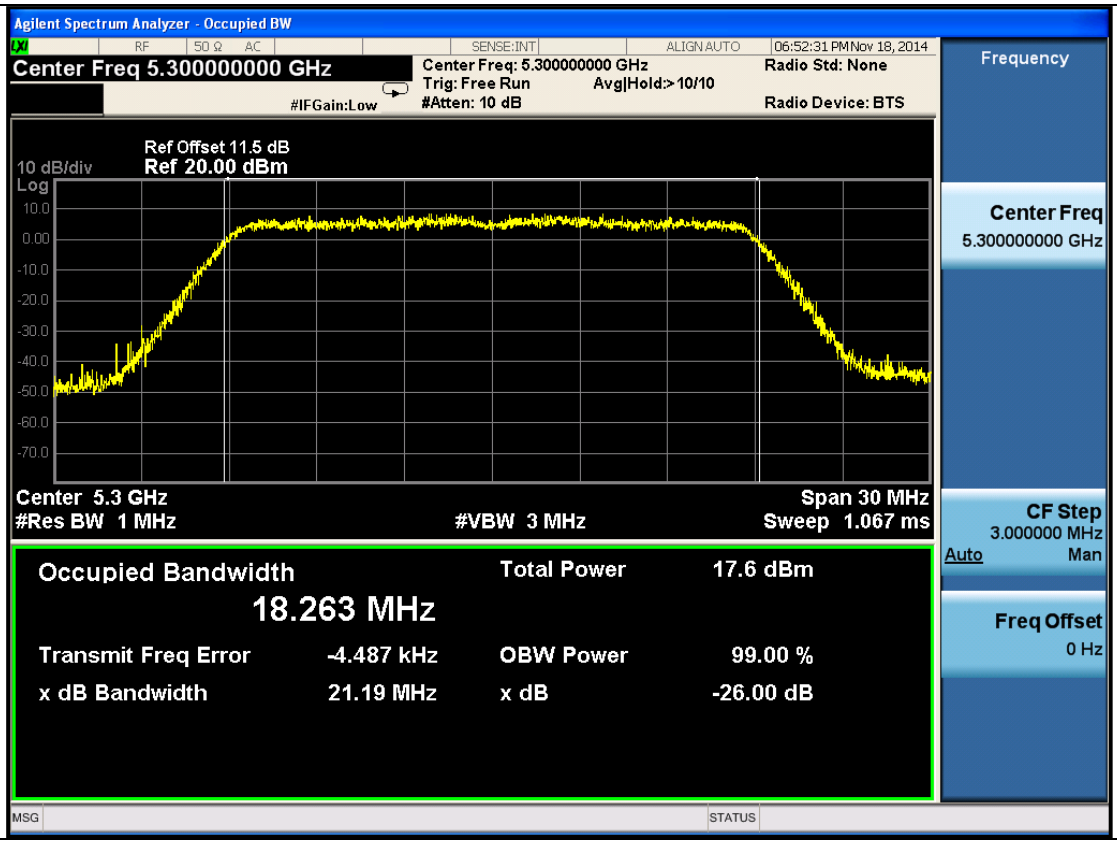

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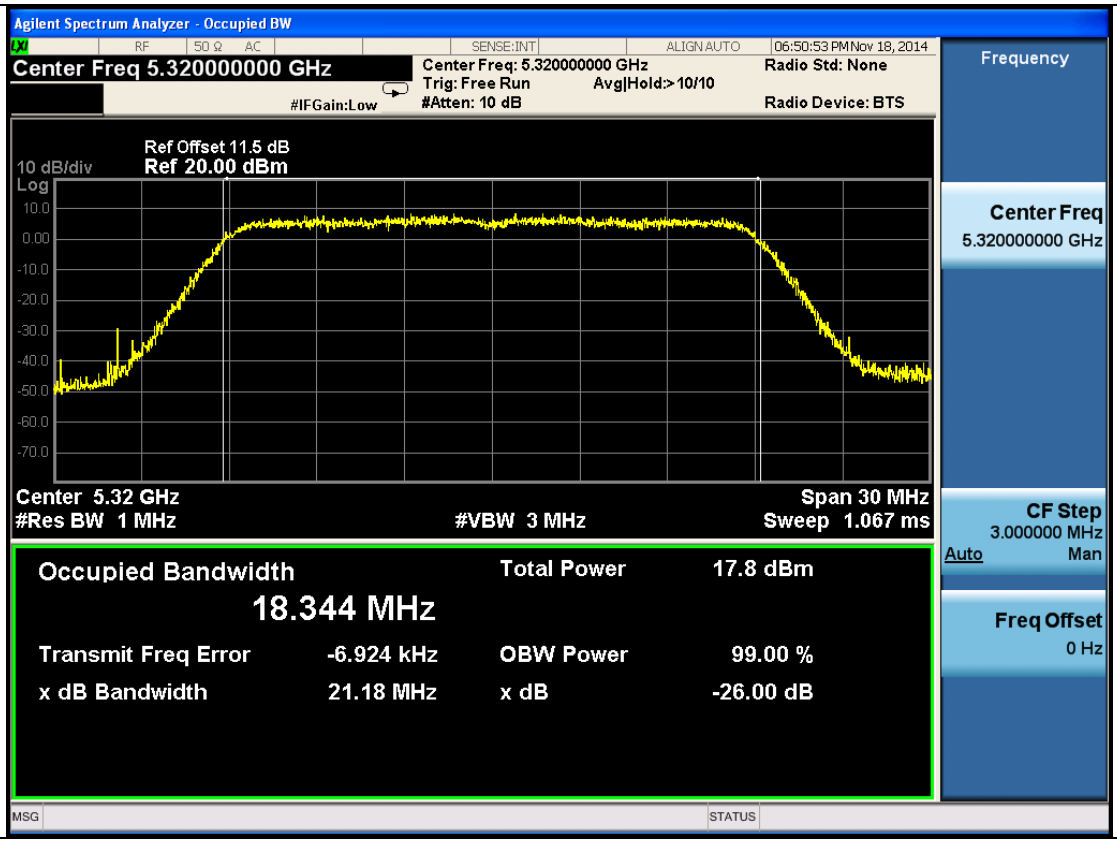

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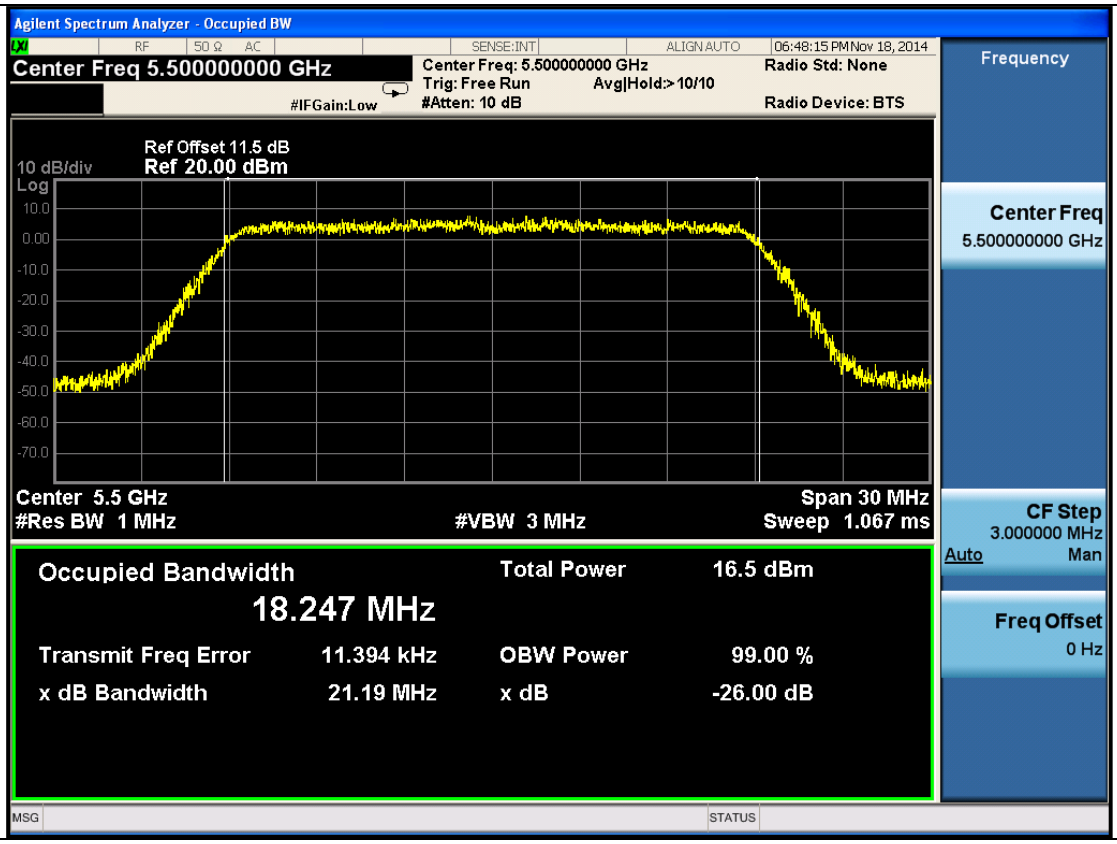

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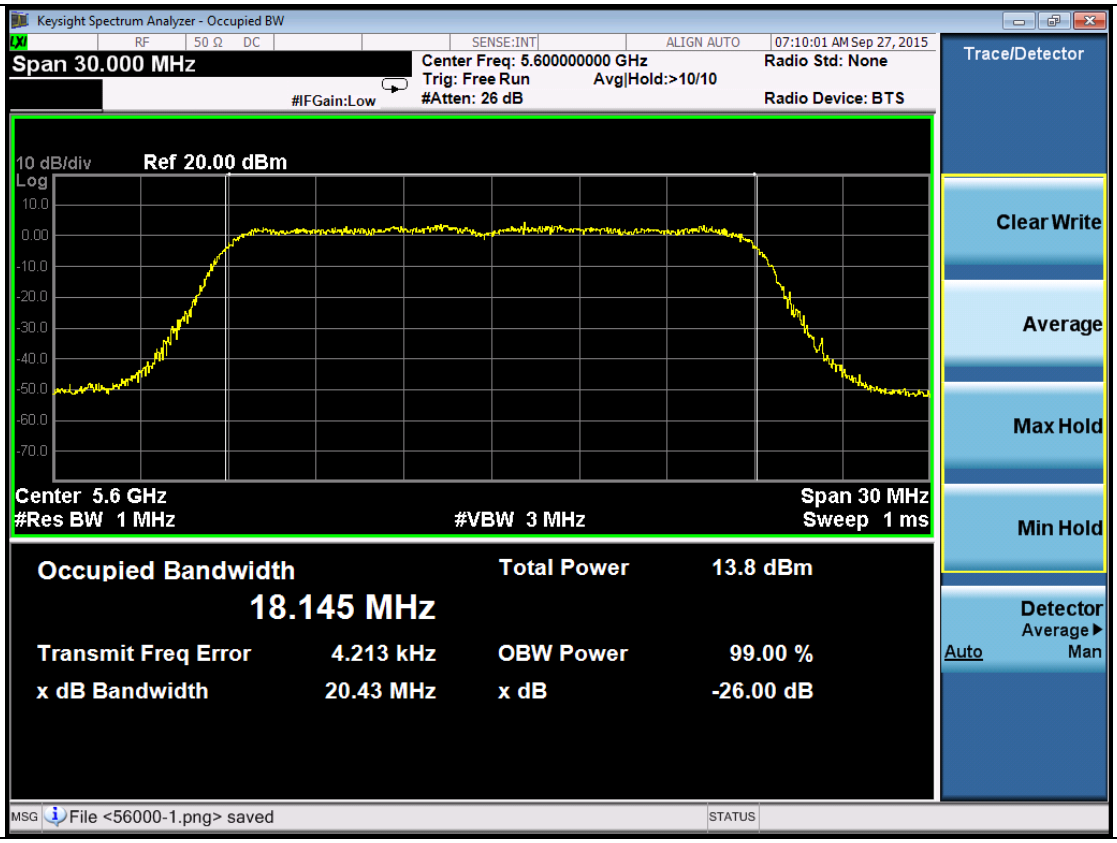
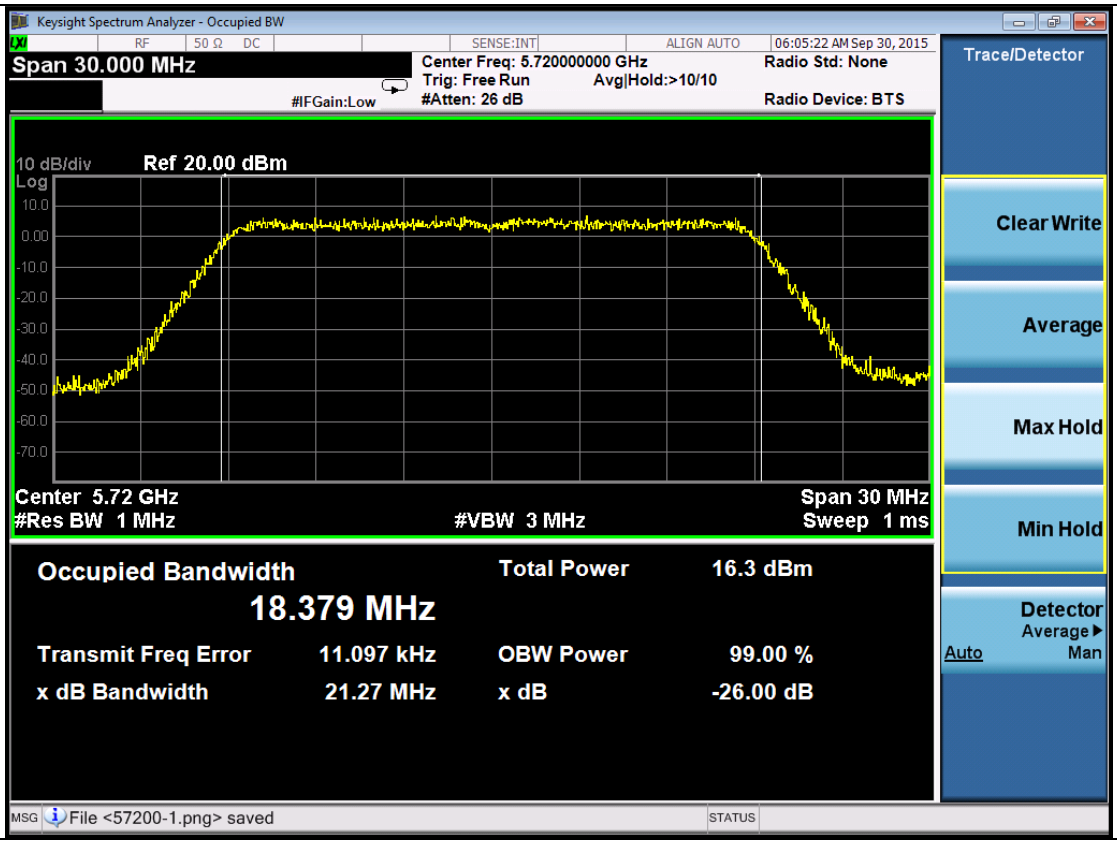
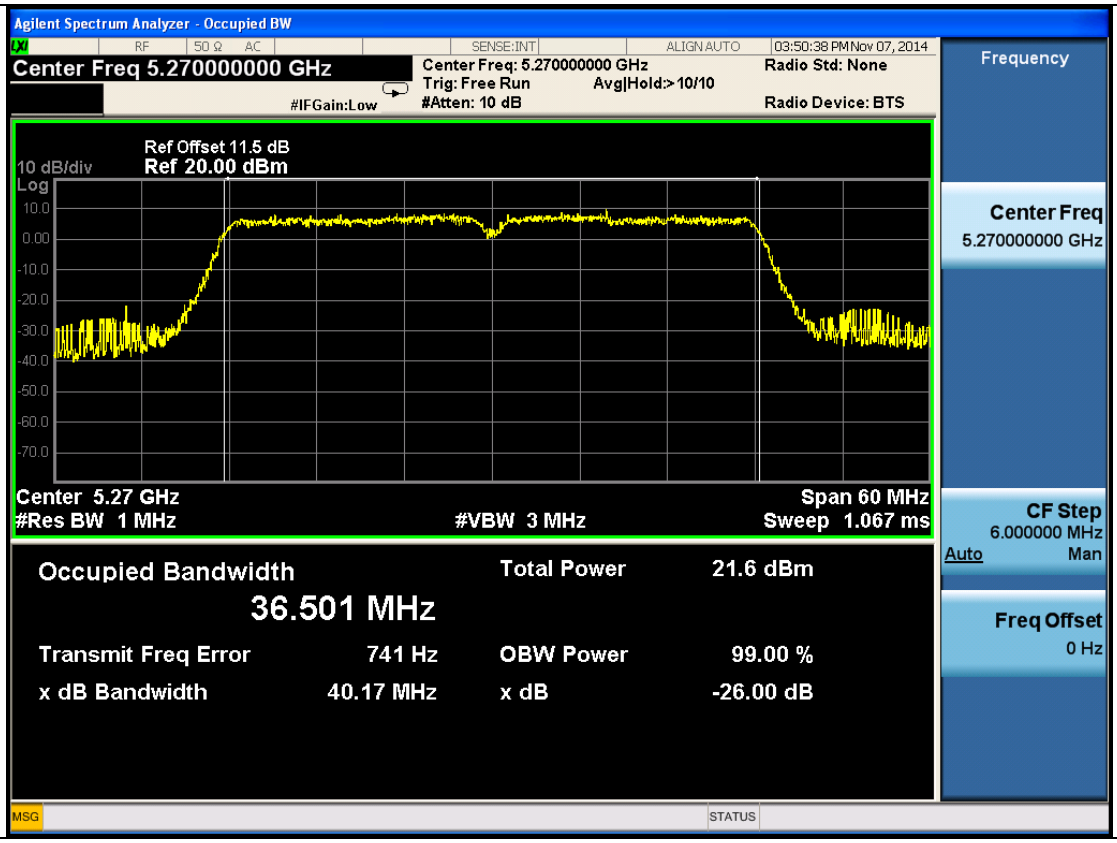


802.11 n20-5720



802.11n40-5270



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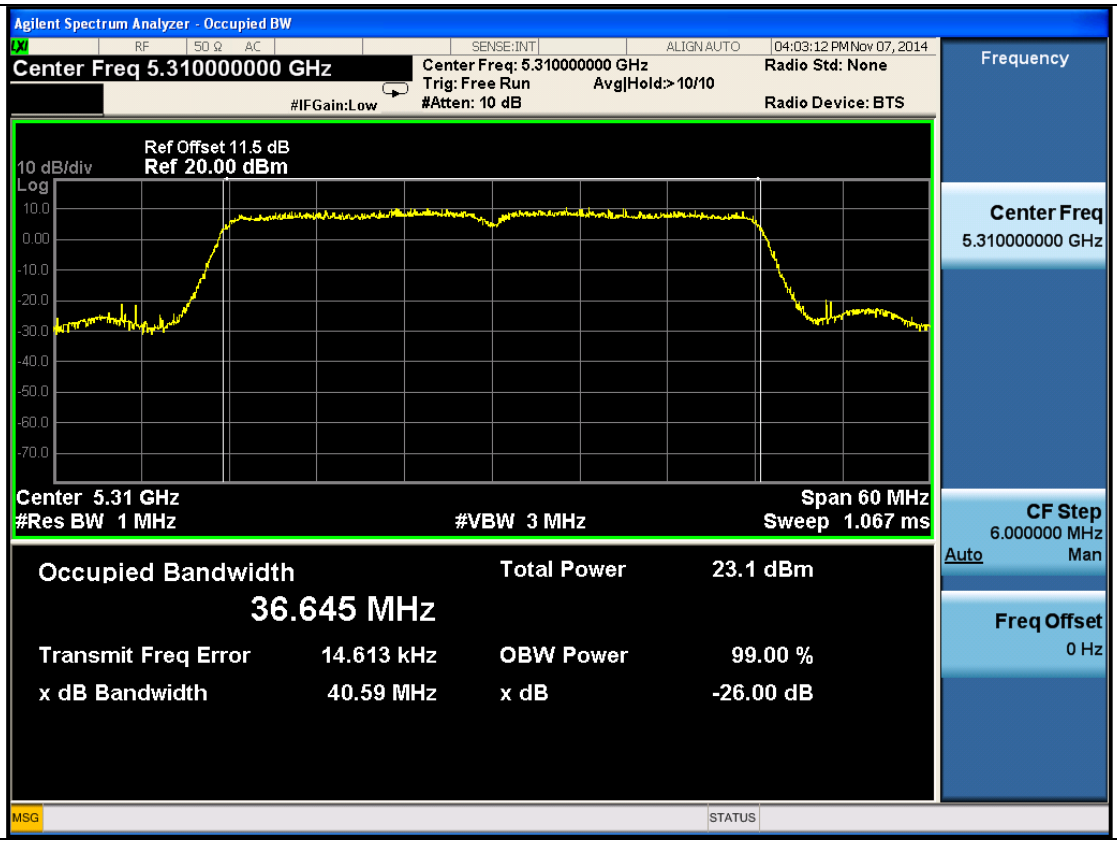
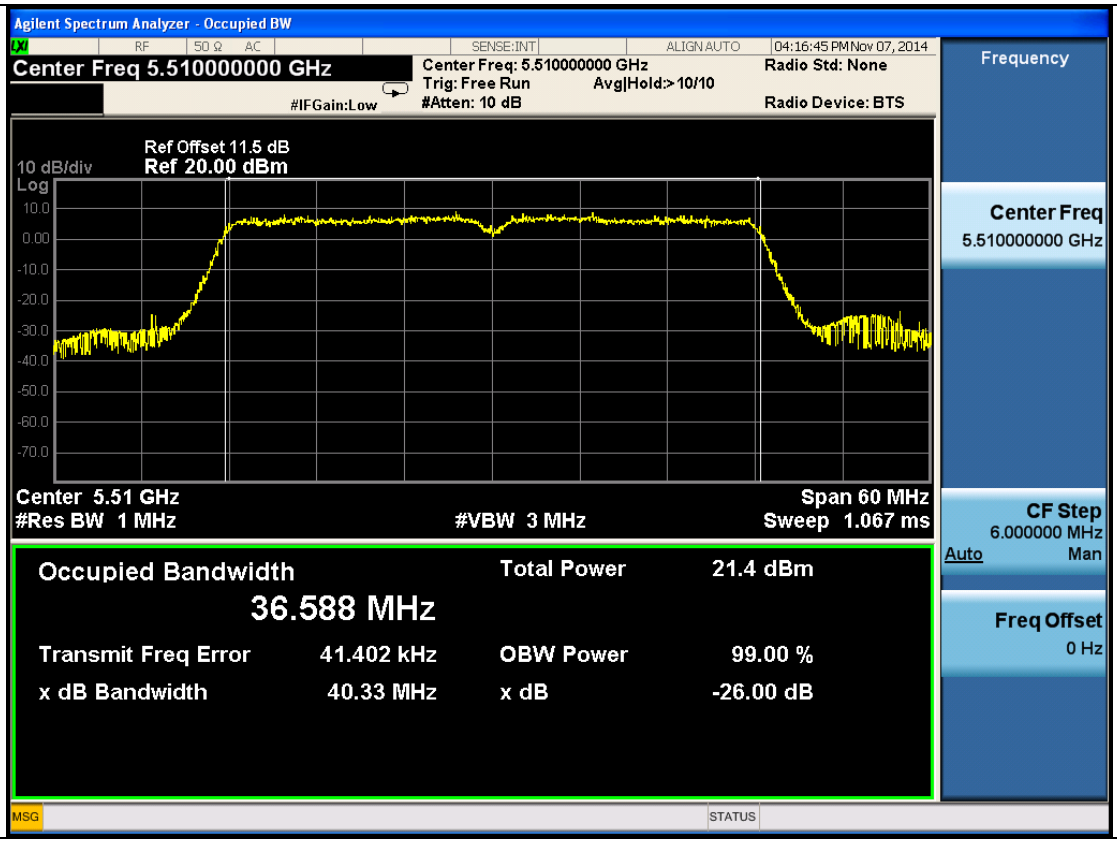


802.11n40-5510



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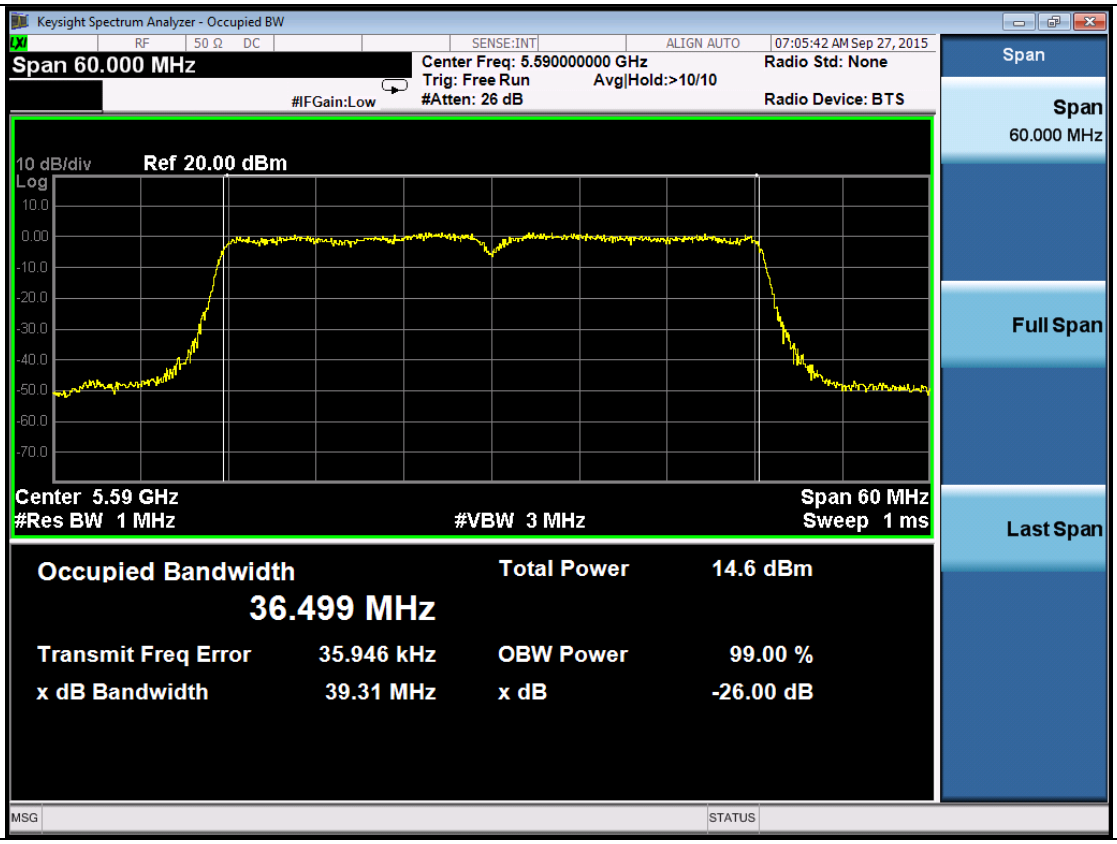

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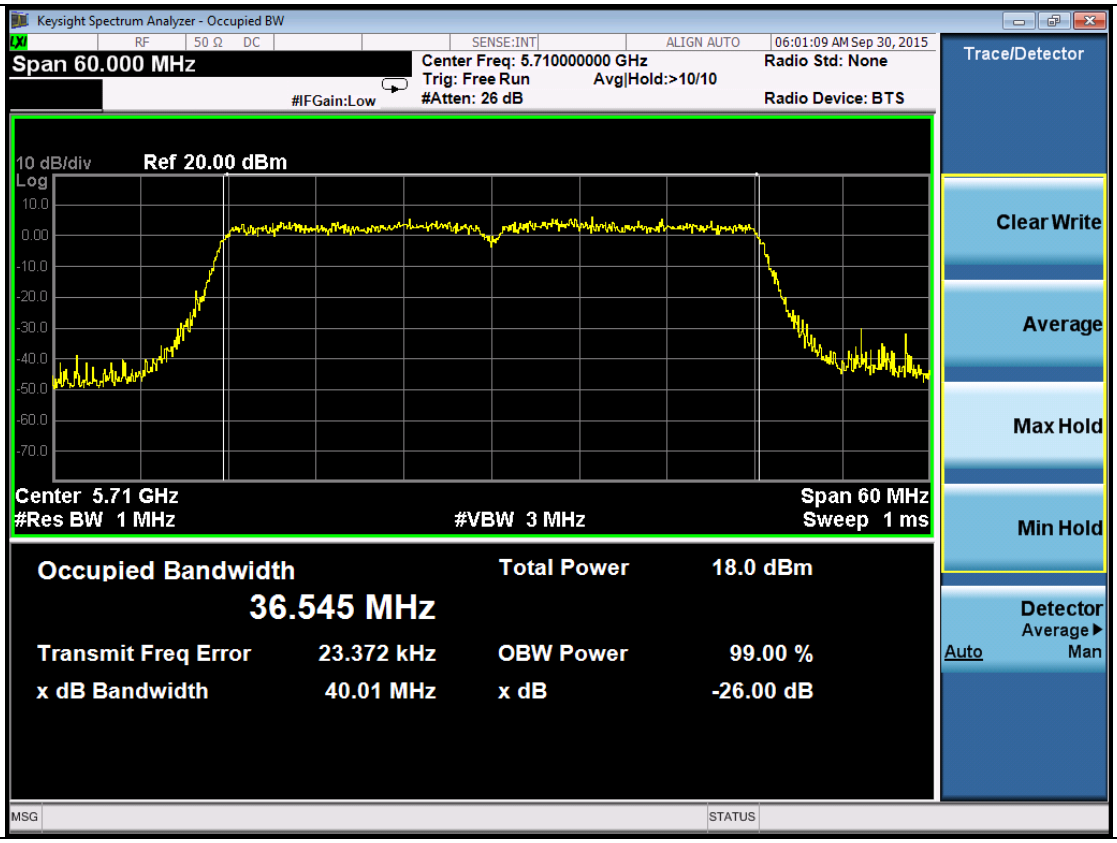

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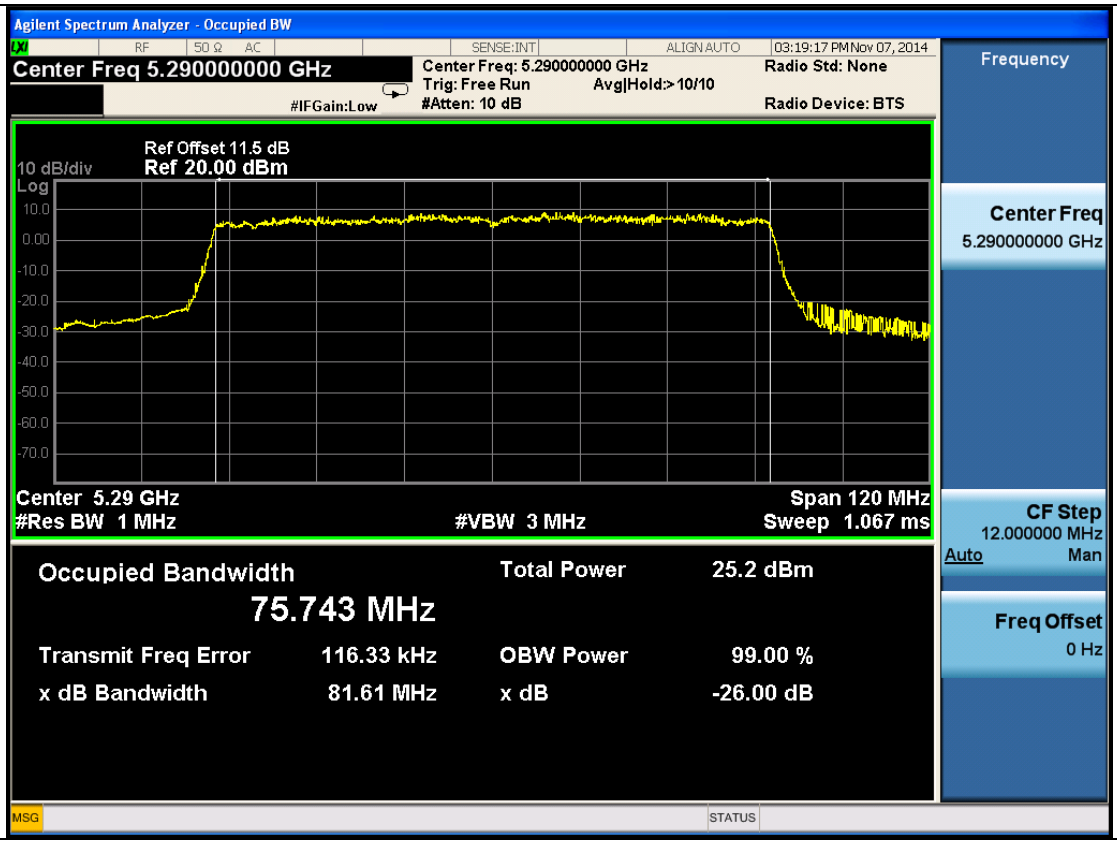

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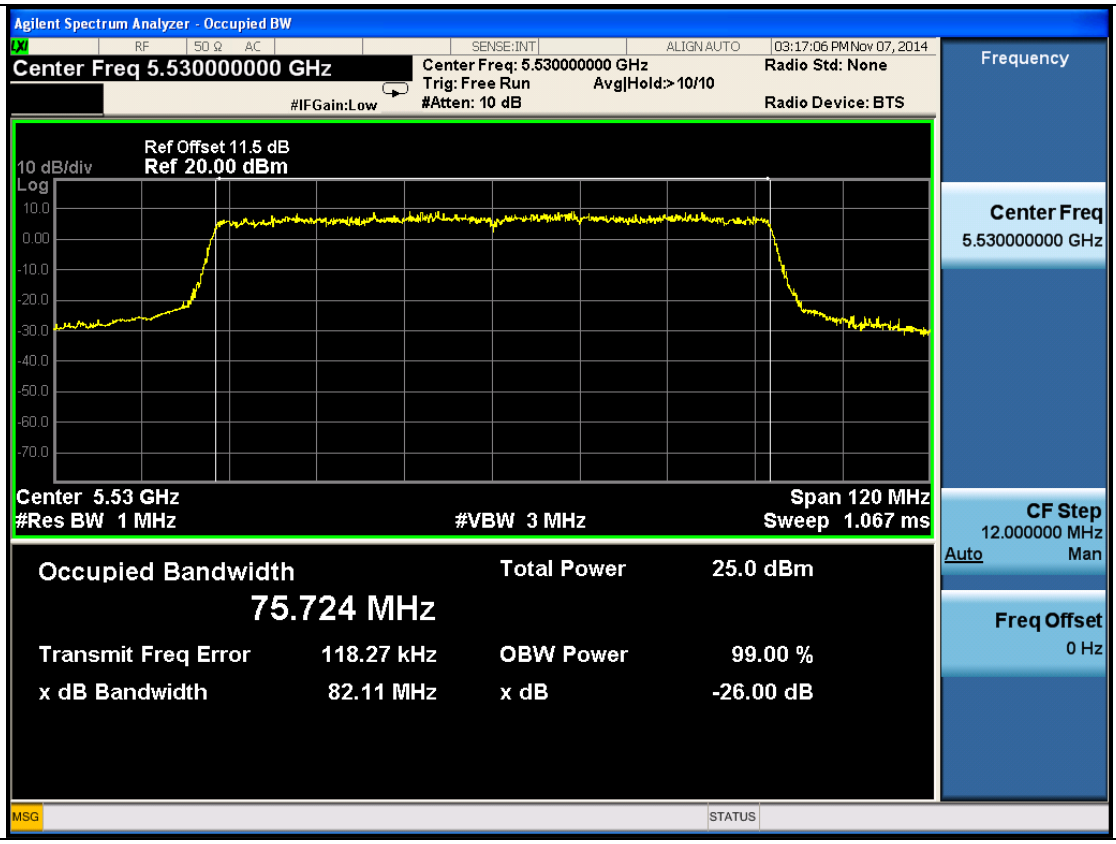

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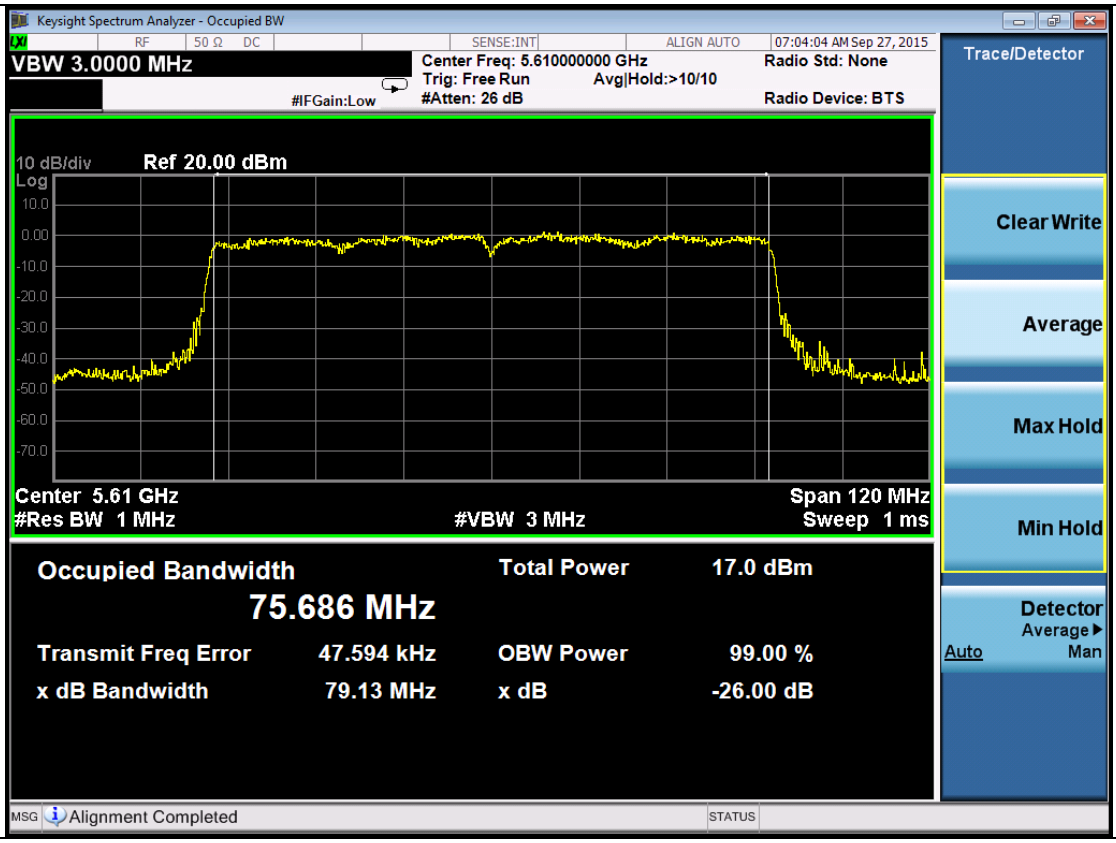

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