FCC & IC TEST REPORT for UNII Device (5.1G & 5.8G Band)

No. 150601698SHA-002

Applicant	:	Zhone Technologies, Inc. 7195 Oakport St. Oakland, California, USA 94621
Manufacturer	:	TDG Technology Co., Ltd. No.1 Yatai Road, Jiaxing City, Zhejiang Province, P.R.C.
Product Name	:	Optical Network Terminal (ONT)
Type/Model	:	WAW-F-021WRP-A-G-E, ZNID-GPON-2815P-WAC, WAW-F-021WRP-D-G-E, ZNID-GPON-2815P-WDC, WAW-F-021WP-A-G-E, ZNID-GPON-2814P-WAC, WAW-F-021WP-D-G-E, ZNID-GPON-2814P-WDC, WAW-F-021WP-A-E-E, ZNID-GE-2814P-WAC, WAW-F-021WP-D-E-E, ZNID-GE-2814P-WDC
TEST RESULT	**:**	**PASS**

SUMMARY

The equipment complies with the requirements according to the following standard(s):

The equipment complies with the requirements according to the following standard(s) or specification:

47CFR Part 15 (2014): Radio Frequency Devices

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-Gen (Issue 4, November 2014): General Requirements for Compliance of Radio Apparatus

RSS-247 (Issue 1, 2015): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Date of issue: Aug 21, 2015

Prepared by: Reviewed by:

Wakeyou Wang (*Project Engineer*) Daniel Zhao (*Reviewer*)

Description of Test Facility

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Content

1. General Information

1.1 Applicant Information

Applicant	:	Zhone Technologies, Inc. 7195 Oakport St. Oakland, California, USA 94621
Name of contact	:	Doron Paz
Tel	:	+1 510 777-7143
Fax	:	/
Email	:	dpaz@ zhone.com
Manufacturer	:	TDG Technology Co., Ltd. No.1 Yatai Road, Jiaxing City, Zhejiang Province, P.R.C.

1.2 Identification of the EUT

Product Name	:	Optical Network Terminal (ONT)
Type/model	:	WAW-F-021WRP-A-G-E, ZNID-GPON-2815P-WAC, WAW-F-021WRP-D-G-E, ZNID-GPON-2815P-WDC, WAW-F-021WP-A-G-E, ZNID-GPON-2814P-WAC, WAW-F-021WP-D-G-E, ZNID-GPON-2814P-WDC, WAW-F-021WP-A-E-E, ZNID-GE-2814P-WAC, WAW-F-021WP-D-E-E, ZNID-GE-2814P-WDC,
Description of EUT	:	EUT has serial models with three kinds of input power: for Adaptor (HKA08054015-6A); POE (S24G0Z-480A050-04) and AC input. They are electrically identical except for different power supply or with/without RFV. We test ZNIDGE-2814P-WAC, ZNID-GE-2814P-WDC, ZNID-GPON-2815P-WAC and ZNID-GPON-2815P-WDC as typical modes and list the worst data.

WAW-F-021WRP-A-G-E	ZNID-GPON-2815P-WAC	1 POTS + 2 GE LAN with PoE + dual-mode Wi-Fi + RFV, AC
WAW-F-021WRP-D-G-E	ZNID-GPON-2815P-WDC	1 POTS + 2 GE LAN with PoE + dual-mode Wi-Fi + RFV, DC
WAW-F-021WP-A-G-E	ZNID-GPON-2814P-WAC	1 POTS + 2 GE LAN with PoE + dual-mode Wi-Fi, AC
WAW-F-021WP-D-G-E	ZNID-GPON-2814P-WDC	1 POTS + 2 GE LAN with PoE + dual-mode Wi-Fi, DC
WAW-F-021WP-A-E-E	ZNID-GE-2814P-WAC	1 POTS + 2 GE LAN with PoE + dual-mode Wi-Fi, AC
WAW-F-021WP-D-E-E	ZNID-GE-2814P-WDC	1 POTS + 2 GE LAN with PoE + dual-mode Wi-Fi, DC

FCC ID : PJZ281XP

1.3 Technical specification

Operation Frequency Band	:	5150 - 5250MHz, 5725 - 5850MHz
Type of Modulation	:	DBPSK, DQPSK, CCK, BPSK QPSK, 16-QAM, 64-QAM
EUT Modes of Modulation	:	802.11a/n20/n40
Channel Number	:	4 Channel for 5180~5240MHz for 11a/n20; 2 Channel for 5190~5230MHz for 11n40; 5 Channel for 5745~5825MHz for 11a/n20; 2 Channel for 5755~5795MHz for 11n40;
Antenna	:	6.0dBi max., un-detachable
Rating		36-56VDC , 1.0A Max for Adaptor; 36-56VDC , 1.0A Max for POE 100~240VAC 50/60Hz
Category of EUT	:	Class B
EUT type	:	☒ Table top ☐ Floor standing
Sample received date	:	July 3, 2015
Sample Identification No	:	/
Date of test	:	July 3, 2015 ~ Aug 13, 2015

MIMO Function Description:

Modulation	Transmission / Idle		Beam forming	Beam forming gain
	Port 0	Port 1		
802.11a	Transmission	NO	NO	0 dBi
802.11 n20	Transmission	Transmission	NO	0 dBi
802.11 n40	Transmission	Transmission	NO	0 dBi

Note: the graphs showed in the report under 802.11 n20 & 802.11 n40 is the first one for port 0 while second one for port 1.

2. Test Specification

2.1 Standards or specification

47CFR Part 15 (2014)
RSS-Gen (Issue 4, November 2014)
RSS-247 (Issue 1, 2015)
ANSI C63.10 (2013)
KDB789033 D02 General UNII Test Procedures New Rules v01

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	PC	HP ProBook 6450b	/
2	POE Adapter	Xingjin S24G0Z-480A050-04	Non-Shielded, 1.8m
3	Adapter	Huntkey HKA08054015-6A	Non-Shielded, 1.8m

2.5 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2014-10-21	2015-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2014-10-20	2015-10-19
Test Receiver	ESCI 7	R&S	EC4501	2014-12-25	2015-12-24
Semi-anechoic chamber	-	Albatross project	EC 3048	2015-5-11	2016-5-10
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2015-1-8	2016-1-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2015-1-8	2016-1-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2015-1-8	2016-1-7
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2015-1-8	2016-1-7
RF cable	SUCOFLEX 104	HUBER+SUHNER	/	2015-2-13	2016-2-12
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2015-4-27	2016-4-26
Horn antenna	HF 906	R&S	EC 3049	2015-4-27	2016-4-26
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2015-4-20	2016-4-19
Spectrum analyzer	E7402A	Agilent	EC2254	2014-08-16	2015-08-15

2.6 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Maximum Conducted Output Power & EIRP	15.407(a)	RSS-247 Issue 1 Annex 6.2	Pass
Power spectral density	15.407(a)	RSS-247 Issue 1 Annex 6.2	Pass
Minimum 6dB Bandwidth	15.407(e)	RSS-247 Issue 1 Annex 6.2.4	Pass
Radiated emission	15.407(b), 15.209	RSS-Gen Issue 4 Clause 8.10; RSS-247 Issue 1 Annex 6.2	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	Pass
99% Bandwidth & 26dBc check for 5.2GHz Device	/	RSS-Gen Issue 4 Clause 6.6 RSS-247 Issue 1 Annex 6.2.1	Pass

3. Maximum Conducted Output Power & EIRP

Test result: Pass

3.1 Test limit

☐ For outdoor access point operating in 5150-5250MHz: 30dBm,
Maximum EIRP at any elevation angle above 30 degrees ≤21dBm;

☒ For indoor access point operating in 5150-5250MHz: 30dBm (FCC limit);

☒ For device operating in 5150-5250MHz: 200 mW or 10 + 10 lgB whichever power is less (IC limit);

☐ For fixed point-to-point access point operating in 5150-5250MHz: 30dBm;

☐ For mobile and portable client devices operating in 5150-5250MHz: 24dBm;

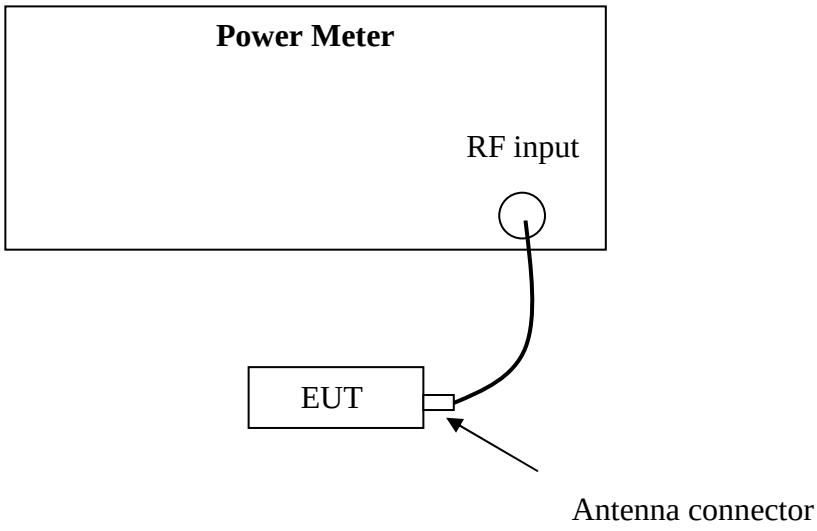
☐ For device operating in 5.25-5.35 GHz and 5.47-5.725 GHz: 24dBm or 11dBm + 10logB (B is 26dB bandwidth);

☒ For device operating in 5.725-5.85 GHz: 30dBm

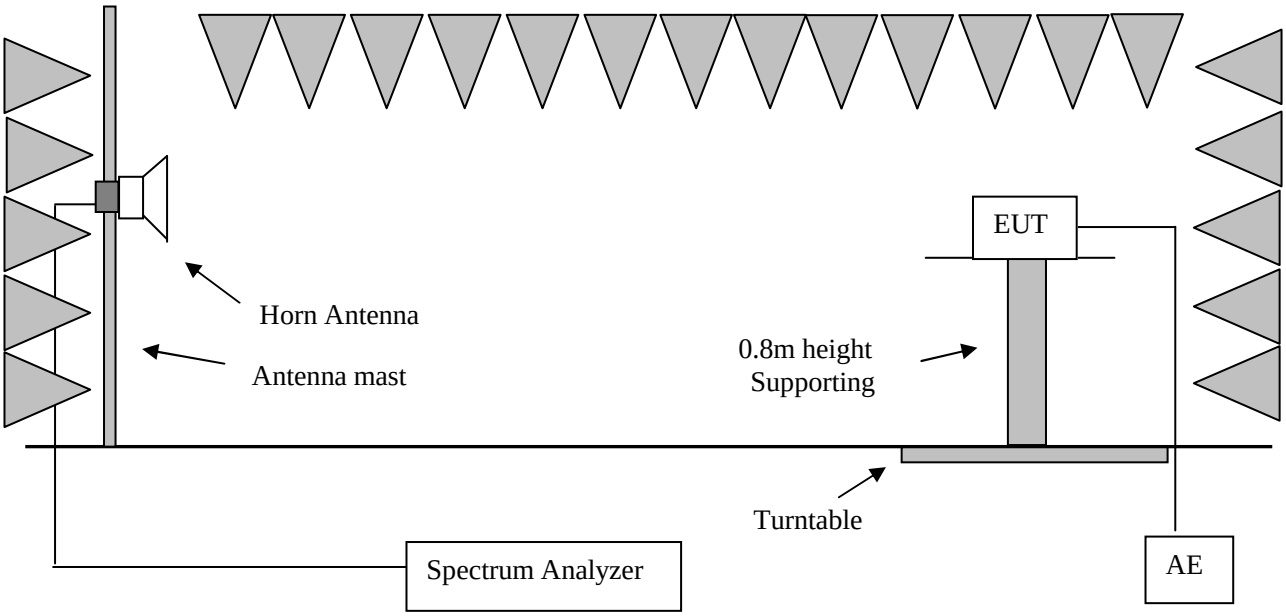
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beamforming type, the limit should be the less of original and original + 6 –antenna gain-beamforming gain.

3.2 Test Configuration

☒ Maximum Conducted Output Power test



☐ Maximum EIRP test



3.3 Test procedure and test setup

The power output per FCC §15.407(a) was measured on the EUT using a 50 ohm RF cable connected to spectrum analyzer and the measurement method refer to KDB 789033D02: Method PM.
The EIRP test is conducted at any elevation angle above 30 degrees as measured from the horizon.

3.4 Test protocol

Temperature : 25°C
Relative Humidity : 55 %

IC limit is 200 mW or 10 + 10 lgB whichever power is less:

Modulation	Min. 99% Bandwidth (MHz)	10 + 10 lgB (dBm)	200mW
802.11a	16.42	22.20	23.00
802.11n20	17.54	22.40	23.00
802.11n40	36.43	25.60	23.00

Maximum Conducted Output Power

Mode	Freq (MHz)	Factor (dB)	Reading (dBm)		Total power (dBm)	Limit (dBm)
			Port 0	Port 1		
802.11a	5180	2.50	11.90	/	11.90	22.20
	5200	2.50	11.50	/	11.50	22.20
	5240	2.50	11.30	/	11.30	22.20
	5745	2.50	11.50	/	11.50	30.00
	5785	2.50	11.40	/	11.40	30.00
	5825	2.50	11.10	/	11.10	30.00
802.11n20	5180	2.80	9.60	9.04	12.34	22.40
	5200	2.80	9.65	8.82	12.27	22.40
	5240	2.80	9.58	8.81	12.22	22.40
	5745	2.80	9.46	8.42	11.98	30.00
	5785	2.80	9.20	8.81	12.02	30.00
	5825	2.80	8.84	8.77	11.82	30.00
802.11n40	5190	3.40	8.15	7.76	10.97	23.00
	5230	3.40	8.49	7.38	10.98	23.00

	5755	3.40	7.98	7.62	10.81	30.00
	5795	3.40	7.77	7.37	10.58	30.00

Note: 1. Factor = Cable loss + duty cycle correction.
2. For antenna gain = 6dBi and without beamforming, the limit needn't to be corrected.
3. Total power = $10 * \lg(10^{\text{port 0} / 10} + 10^{\text{port 1} / 10})$

4. Power spectral density

Test result: **Pass**

4.1 Test limit

☐ For outdoor access point operating in 5150-5250MHz: 17dBm/MHz;

☒ For indoor access point operating in 5150-5250MHz: 17dBm/MHz (for FCC);

☒ For indoor access point operating in 5150-5250MHz: 10dBm/MHz (for IC);

☐ For fixed point-to-point access point operating in 5150-5250MHz: 17dBm/MHz;

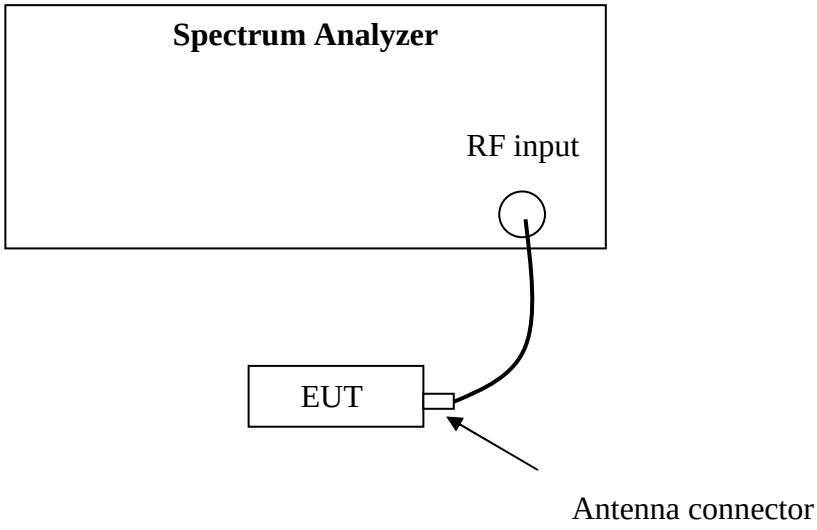
☐ For mobile and portable client devices operating in 5150-5250MHz: 11dBm/MHz;

☐ For device operating in 5.25-5.35 GHz and 5.47-5.725 GHz: 11dBm/MHz;

☒ For device operating in 5.725-5.85 GHz: 30dBm/500kHz;

If the transmitting antenna of directional gain greater than 6dBi is used, the PSD shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.
If there have a beamforming type, the limit should be the less of original and original + 6 – antenna gain-beamforming gain.

4.2 Test Configuration



4.3 Test procedure and test setup

The power spectral density per FCC §15.407(a) was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 1MHz, the video bandwidth set >RBW (measurement method refer to KDB 789033D02: section F).

4.4 Test Protocol

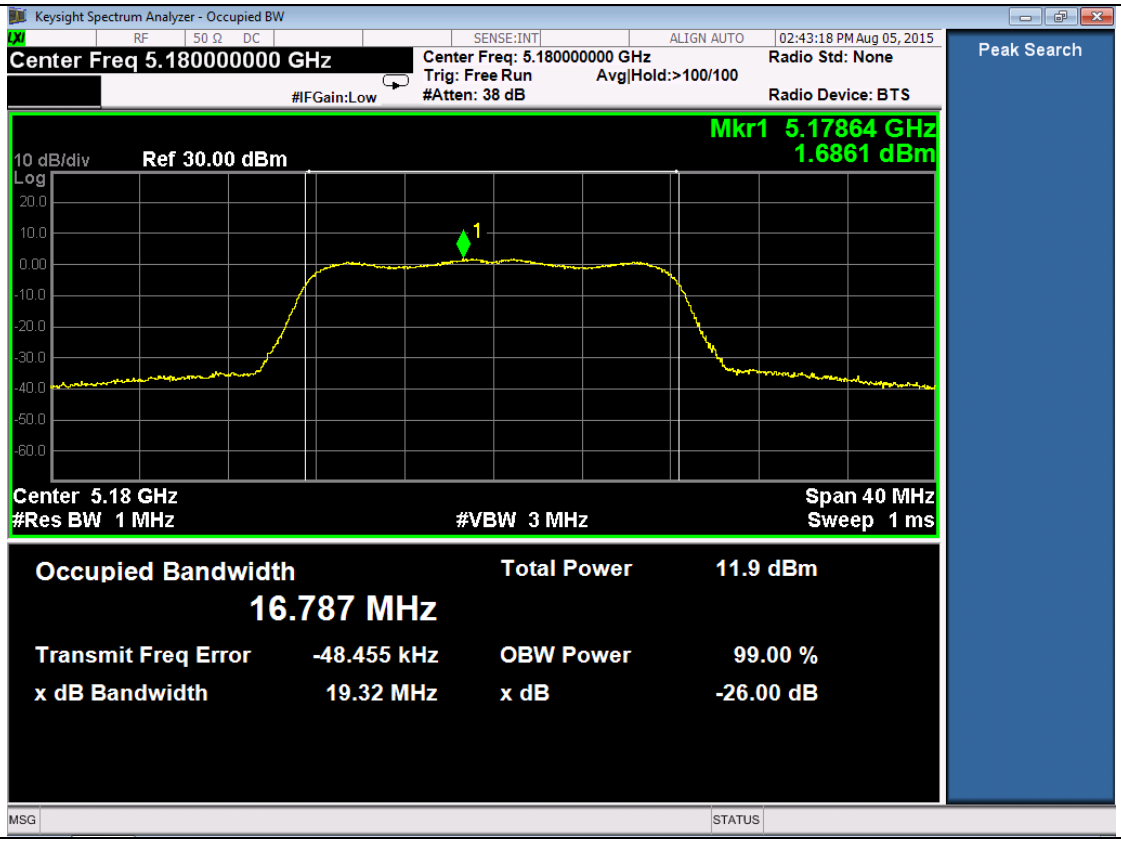
Temperature : 25°C
Relative Humidity : 55 %

Mode	Freq (MHz)	Factor (dB)	Reading (dBm/MHz)		Total PSD (dBm/MHz)	Limit (dBm/MHz)
			Port 0	Port 1		
802.11a	5180	2.50	1.69	/	1.69	10
	5200	2.50	1.53	/	1.53	10
	5240	2.50	1.22	/	1.22	10
802.11n20	5180	2.80	-0.55	-0.98	2.25	10
	5200	2.80	-0.52	-1.44	2.05	10
	5240	2.80	-0.50	-1.72	1.94	10
802.11n40	5190	3.40	-4.90	-5.50	-2.18	10
	5230	3.40	-4.95	-5.69	-2.29	10

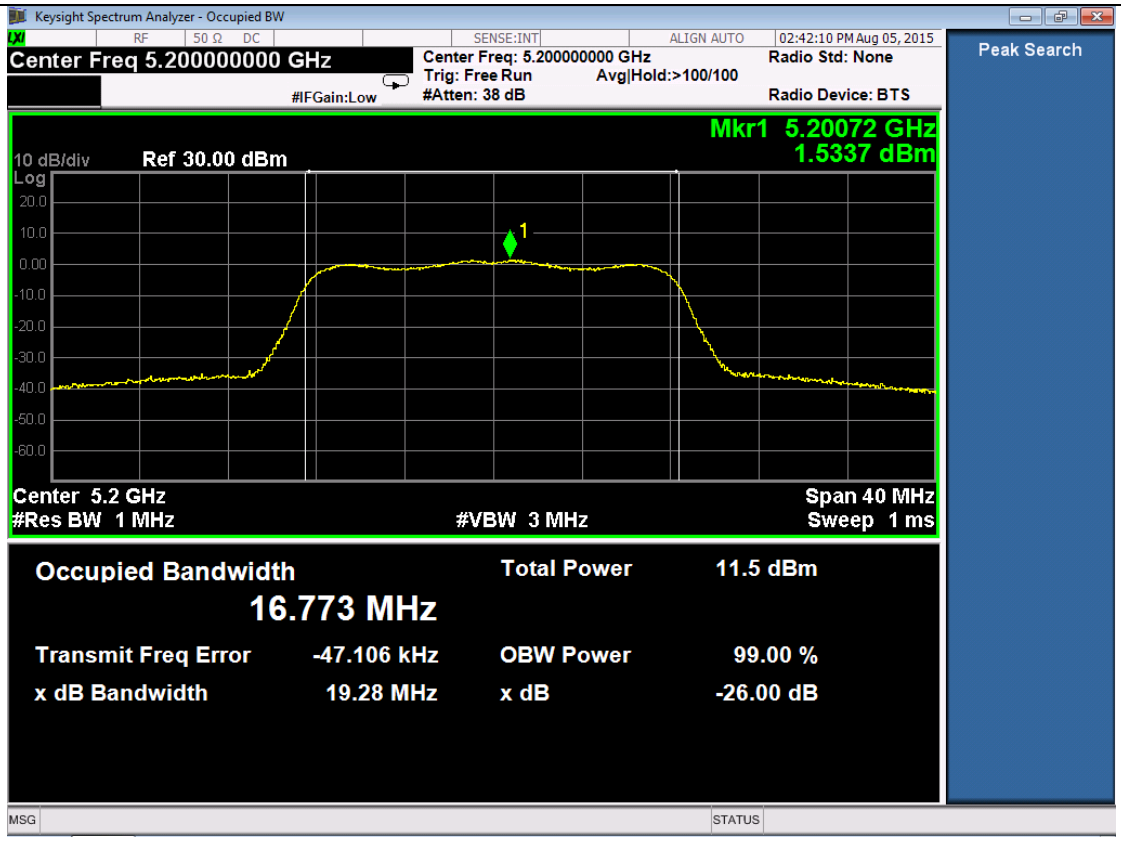
Mode	Freq (MHz)	Factor (dB)	Reading (dBm/MHz)		Total PSD (dBm/MHz)	Limit (dBm/ 500kHz)
			Port 0	Port 1		
802.11a	5745	2.50	1.50	/	1.50	30
	5785	2.50	1.56	/	1.56	30
	5825	2.50	0.95	/	0.95	30
802.11n20	5745	2.80	-0.55	-1.68	1.93	30
	5785	2.80	-0.98	-1.17	1.94	30
	5825	2.80	-1.13	-1.33	1.78	30
802.11n40	5755	3.40	-4.95	-5.70	-2.30	30
	5795	3.40	-5.43	-5.84	-2.62	30

Note: 1. Factor = Cable loss + duty cycle correction.
2. For antenna gain = 6dBi and without beamforming, the limit needn't to be corrected.
3. Total PSD = $10 * \lg(10^{\text{port 0} / 10} + 10^{\text{port 1} / 10})$

802.11a-5180



802.11a-5200



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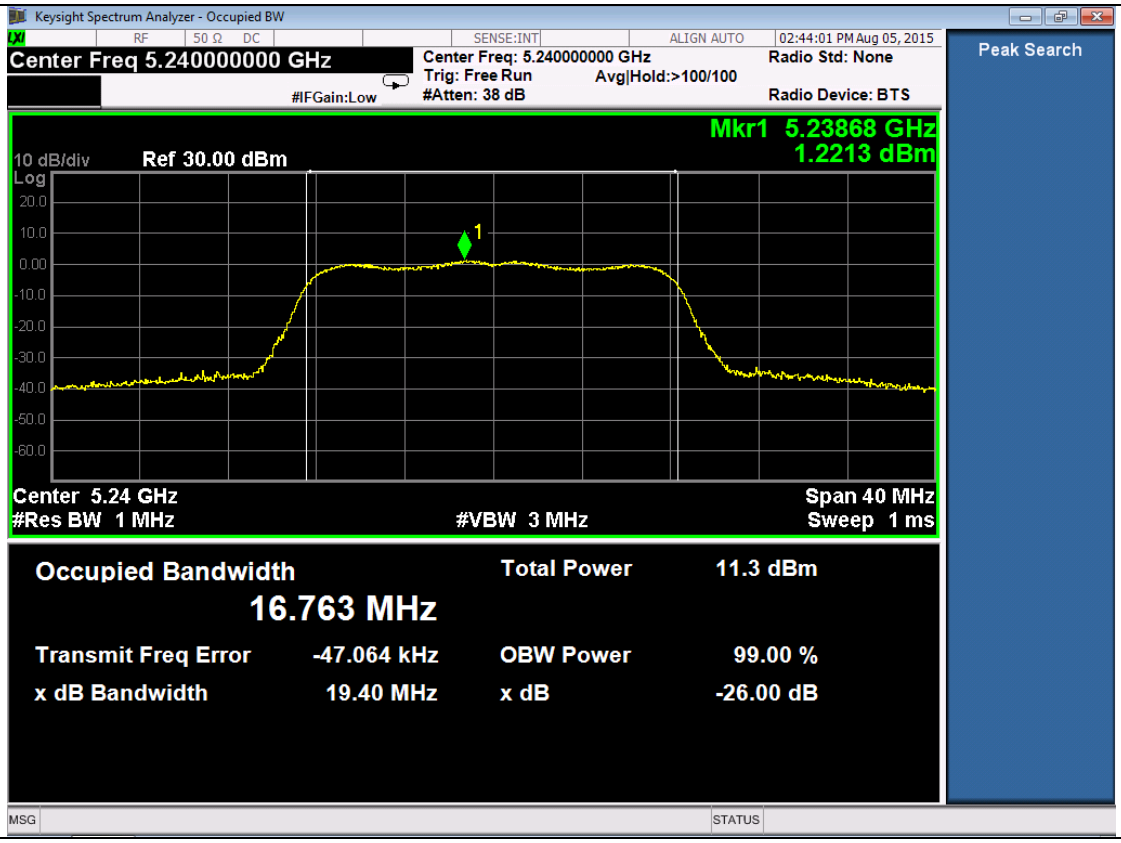

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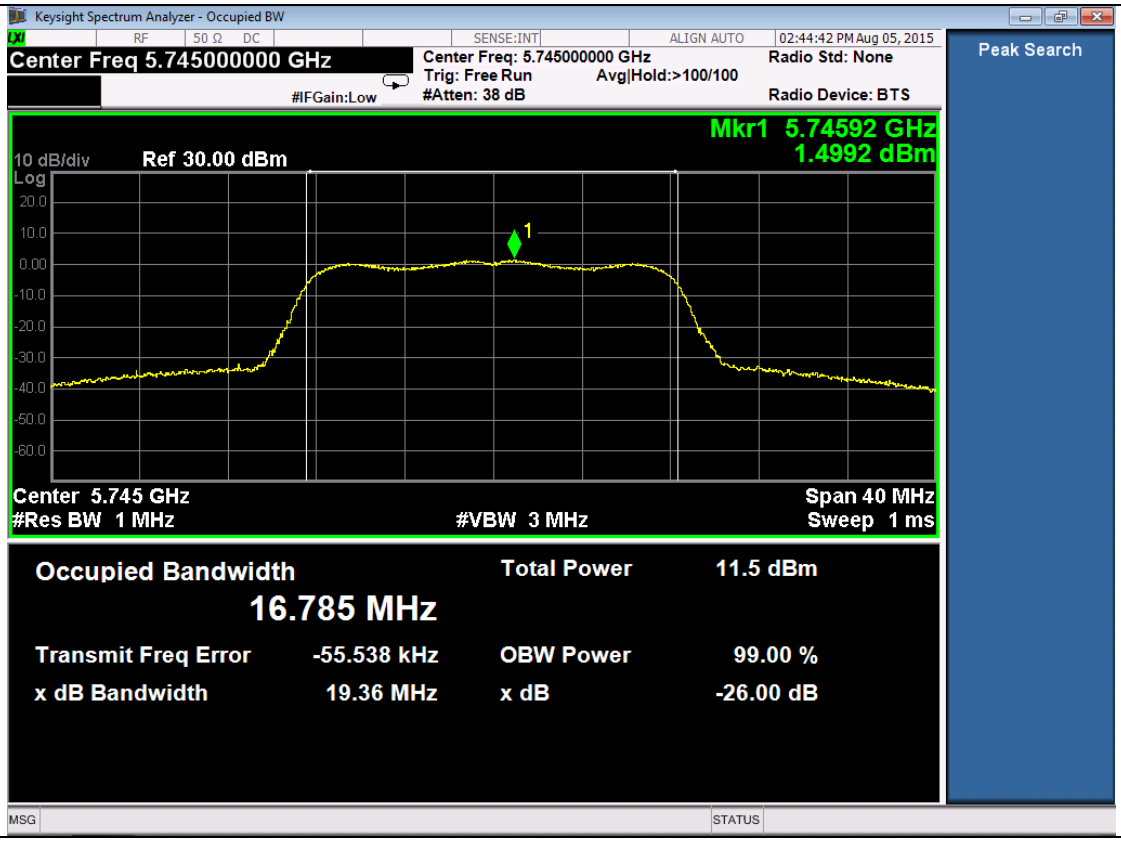

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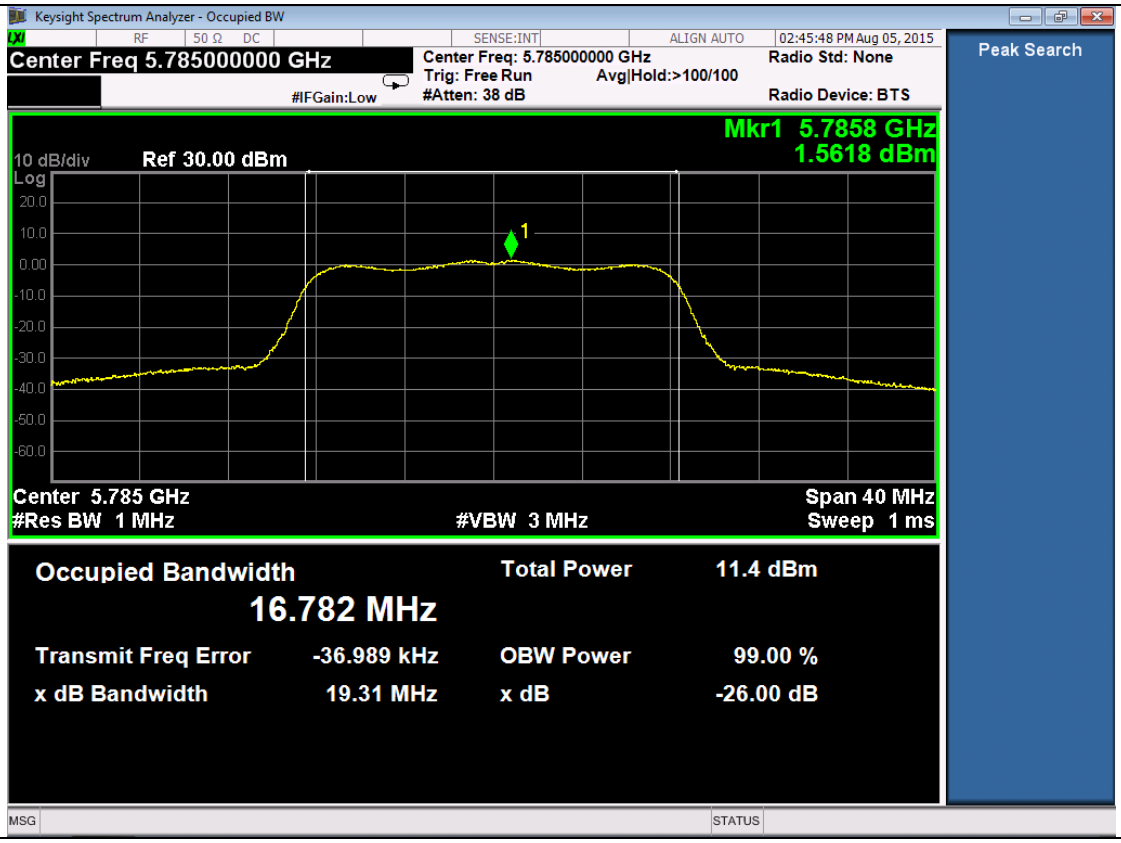

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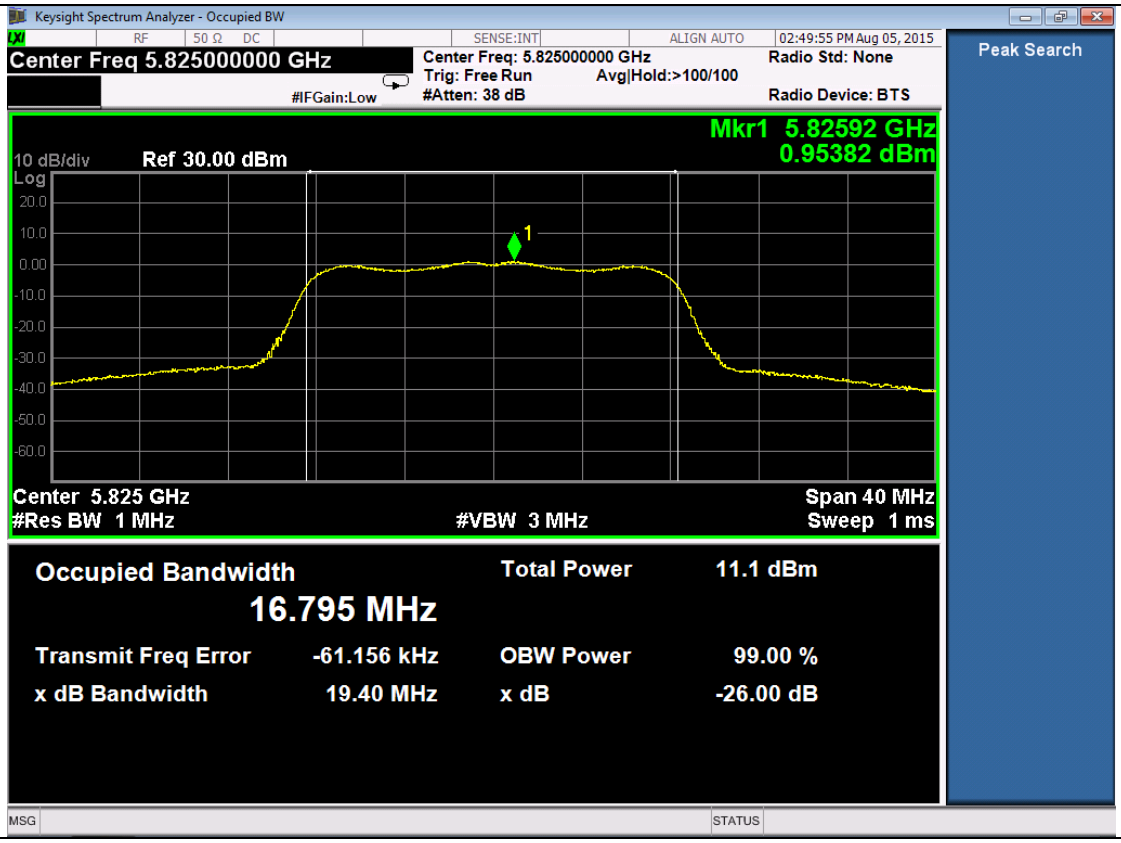

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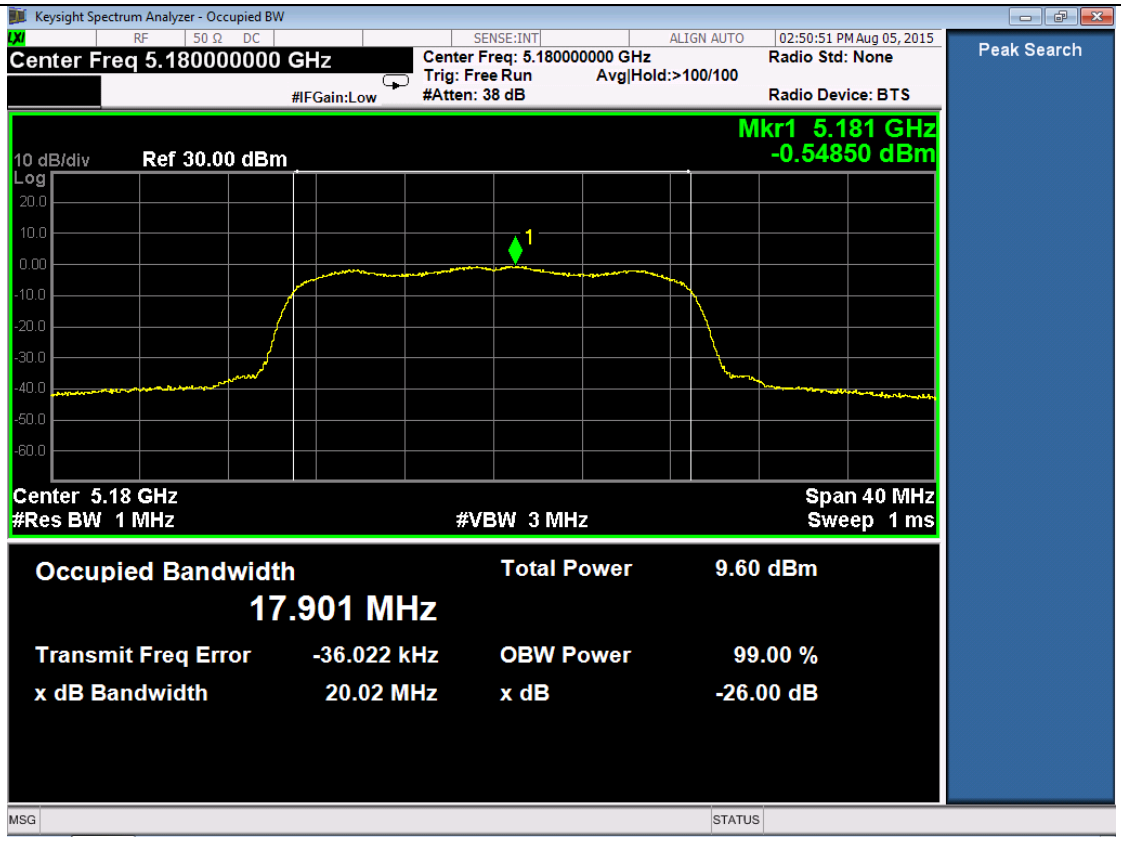
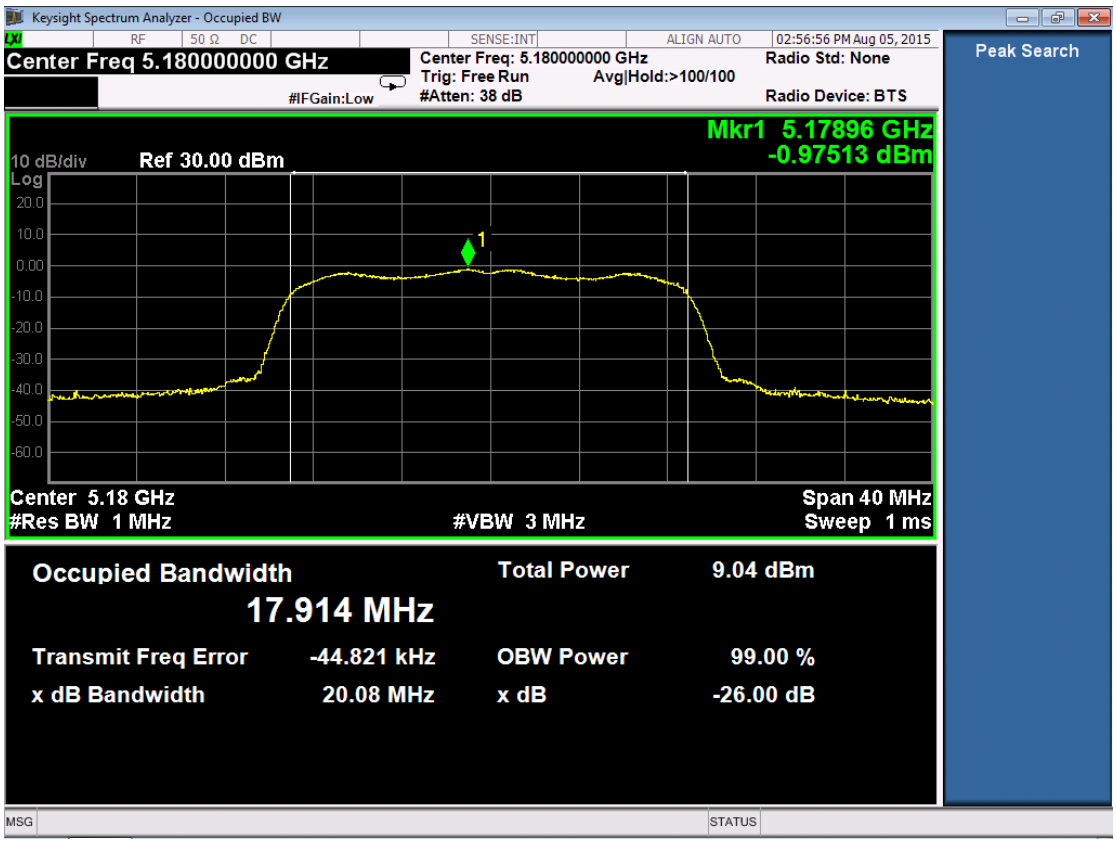
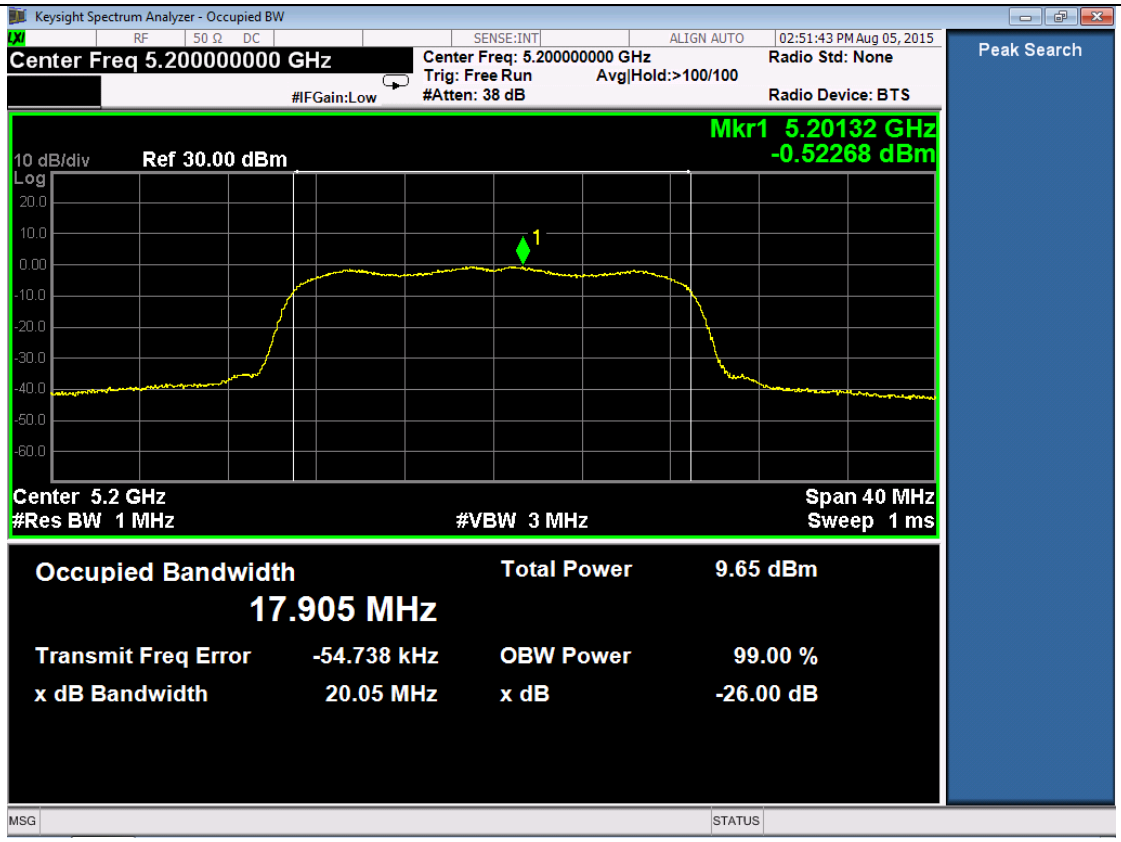
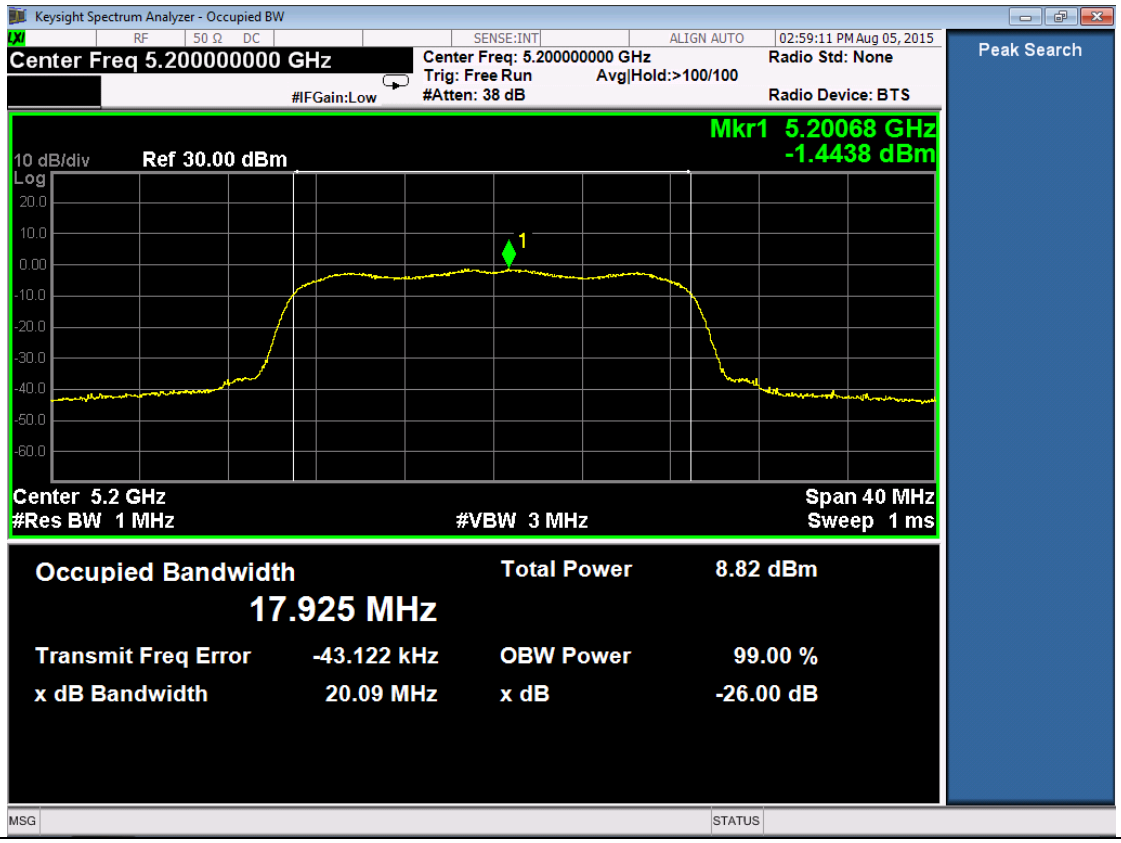




802.11 n20-5200





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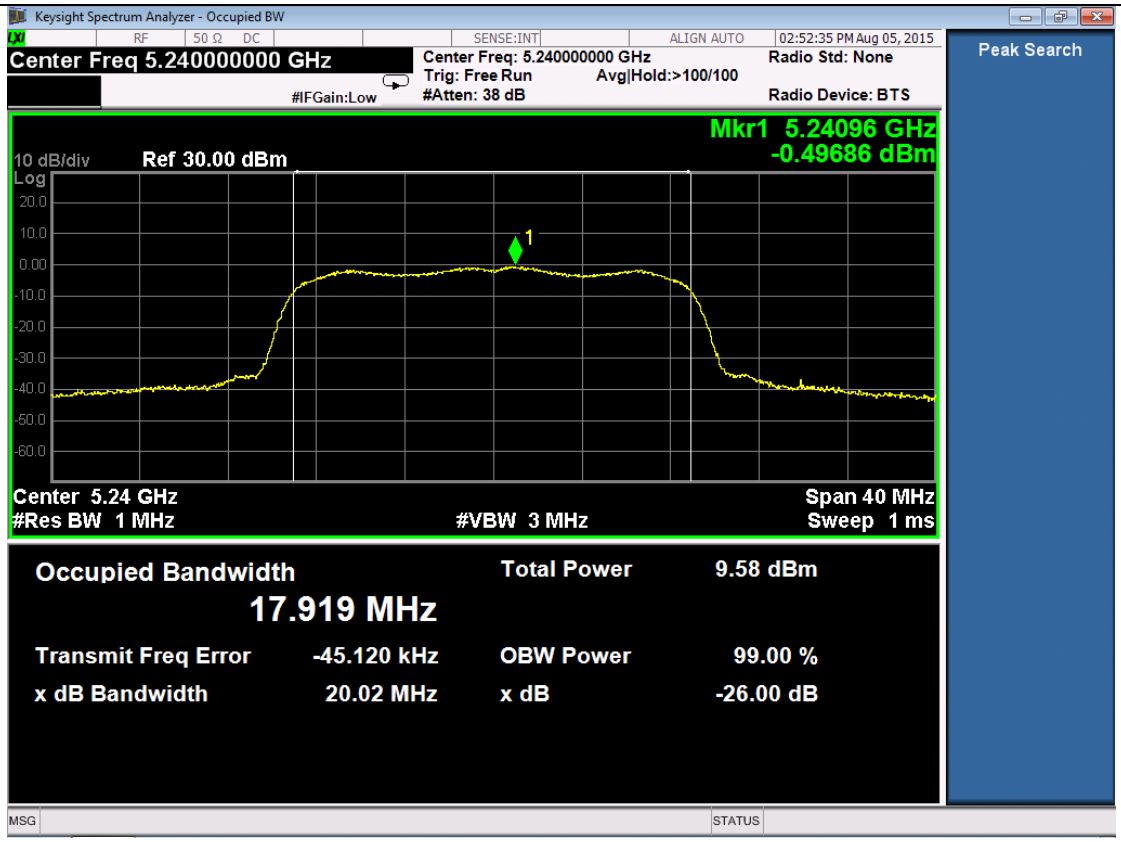

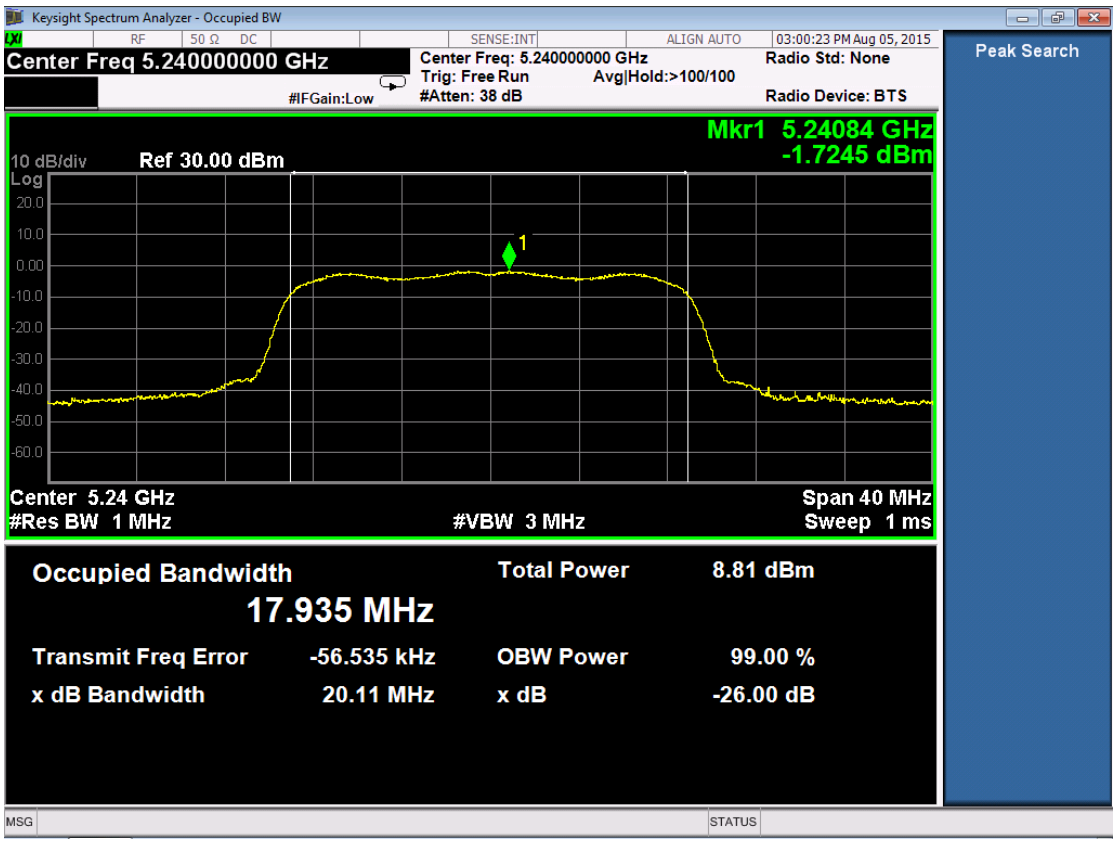

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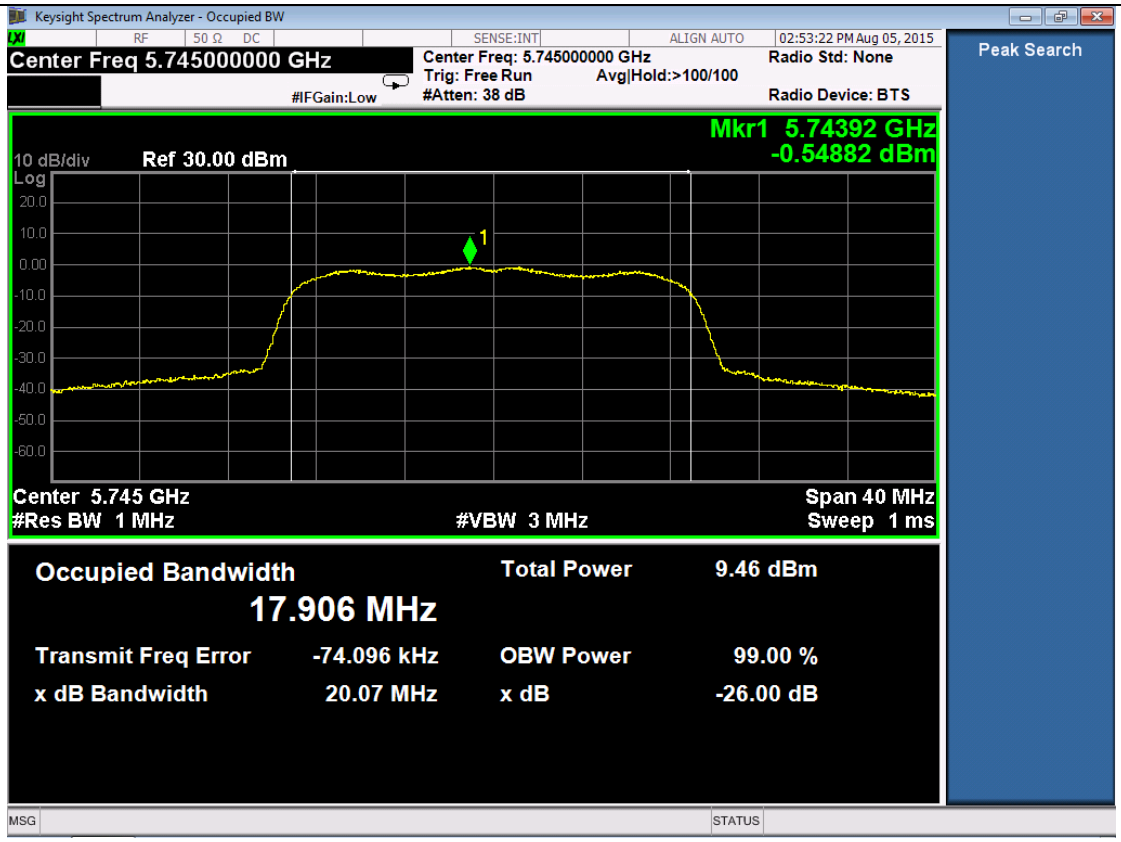

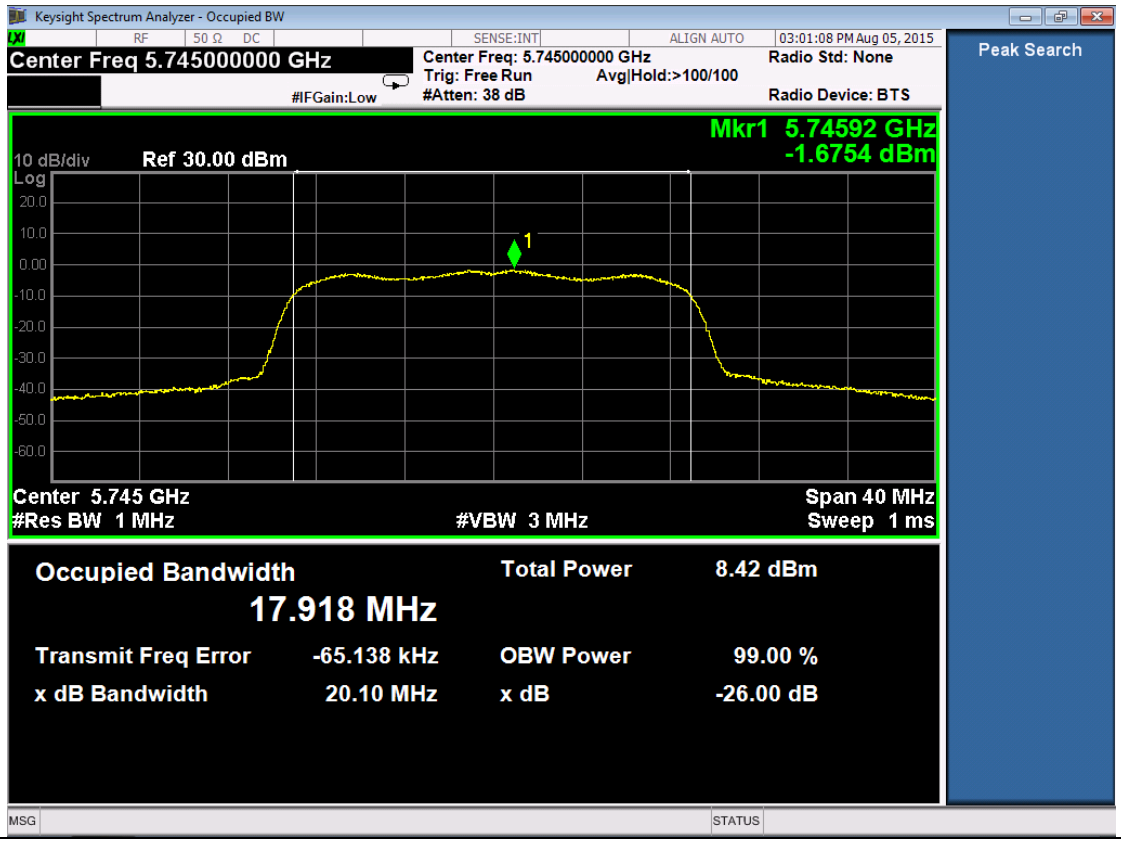

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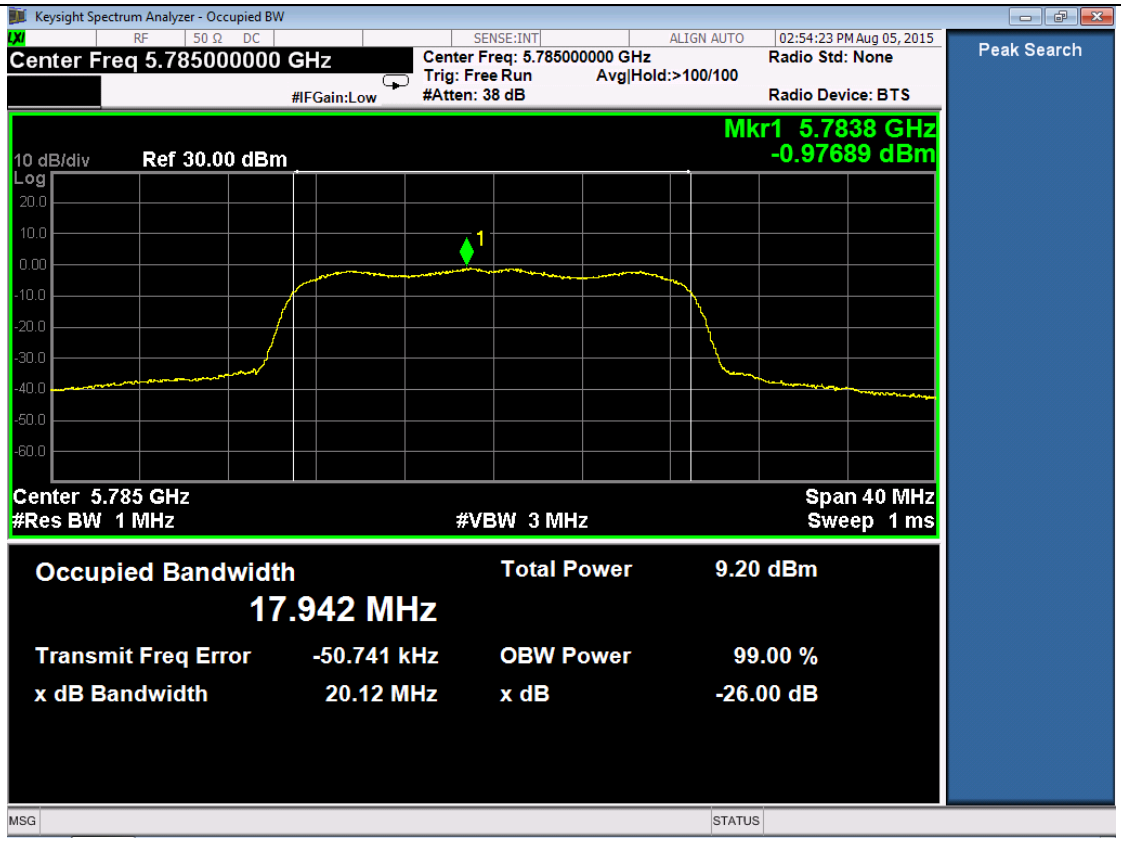

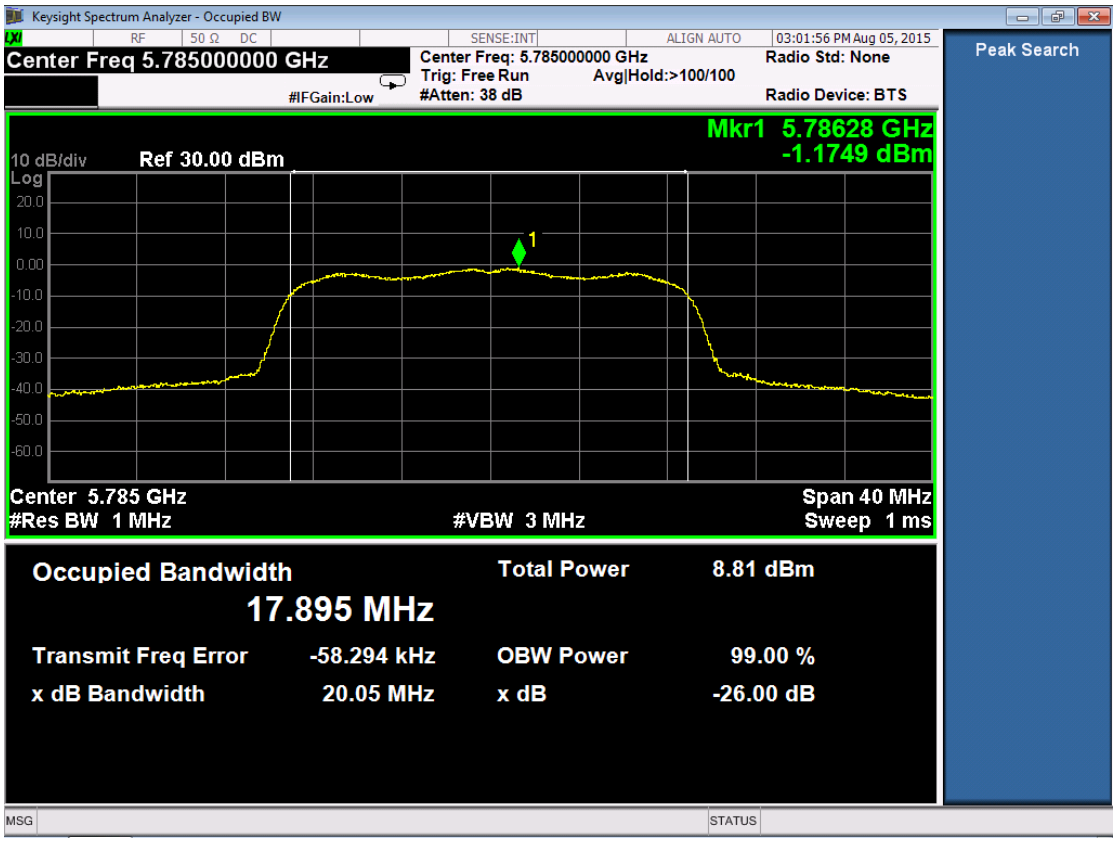

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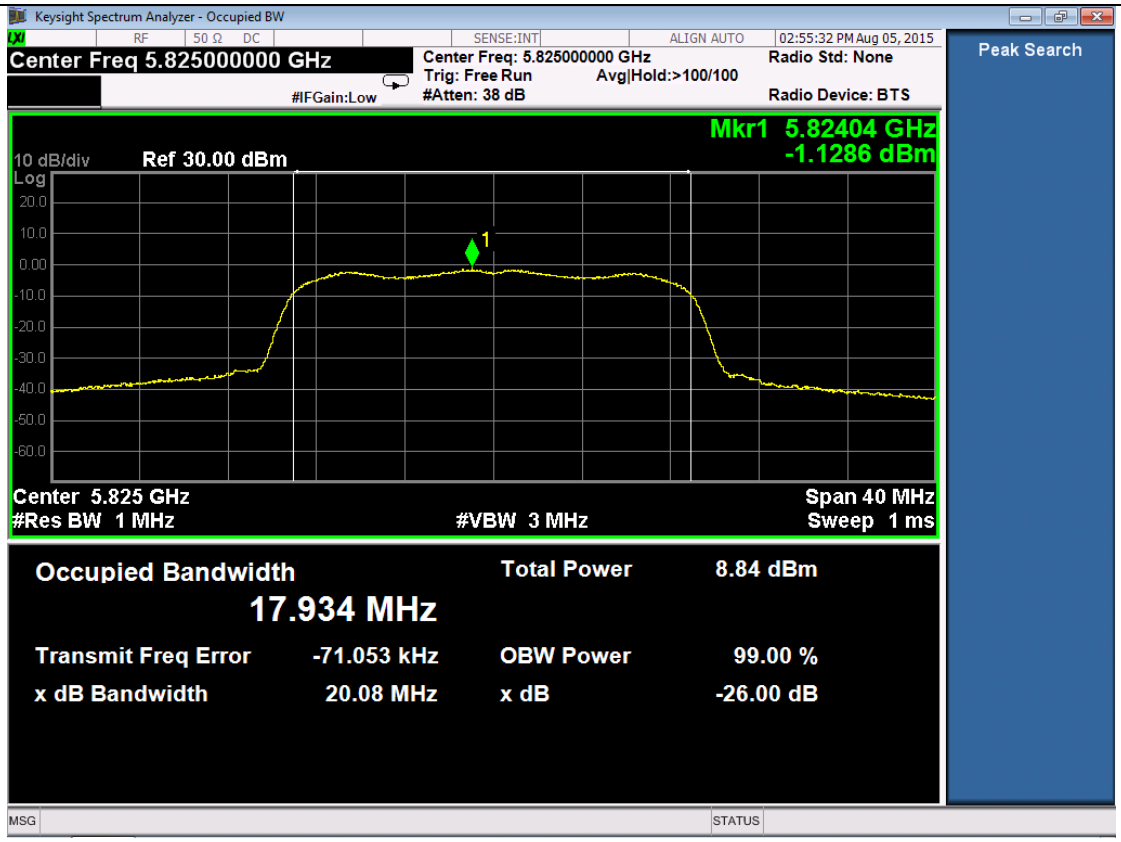

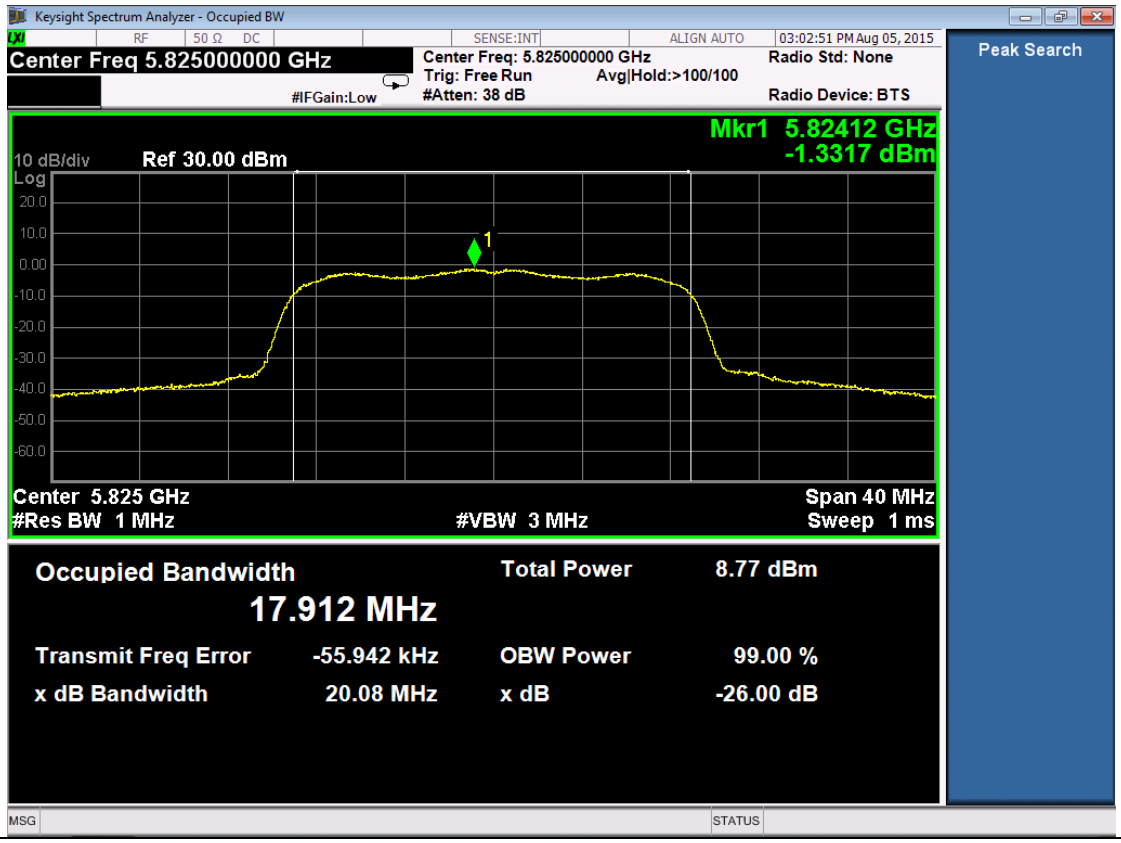

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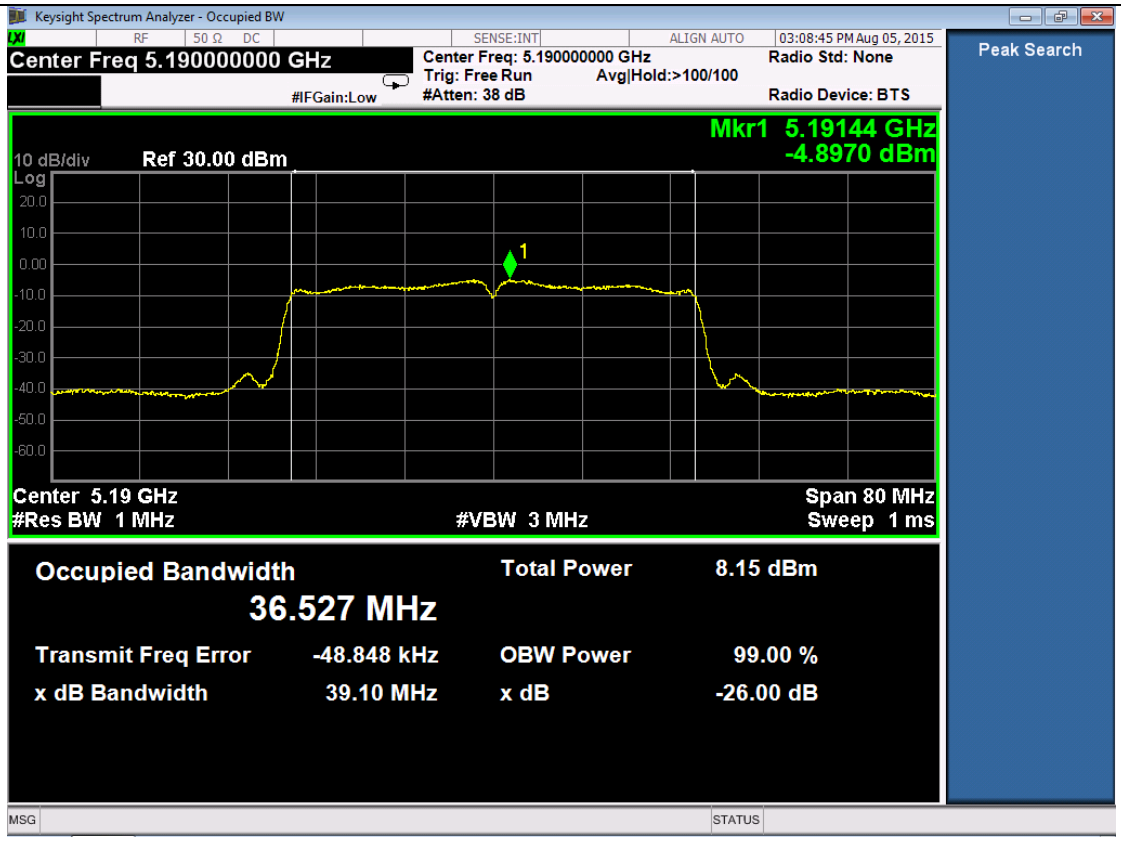

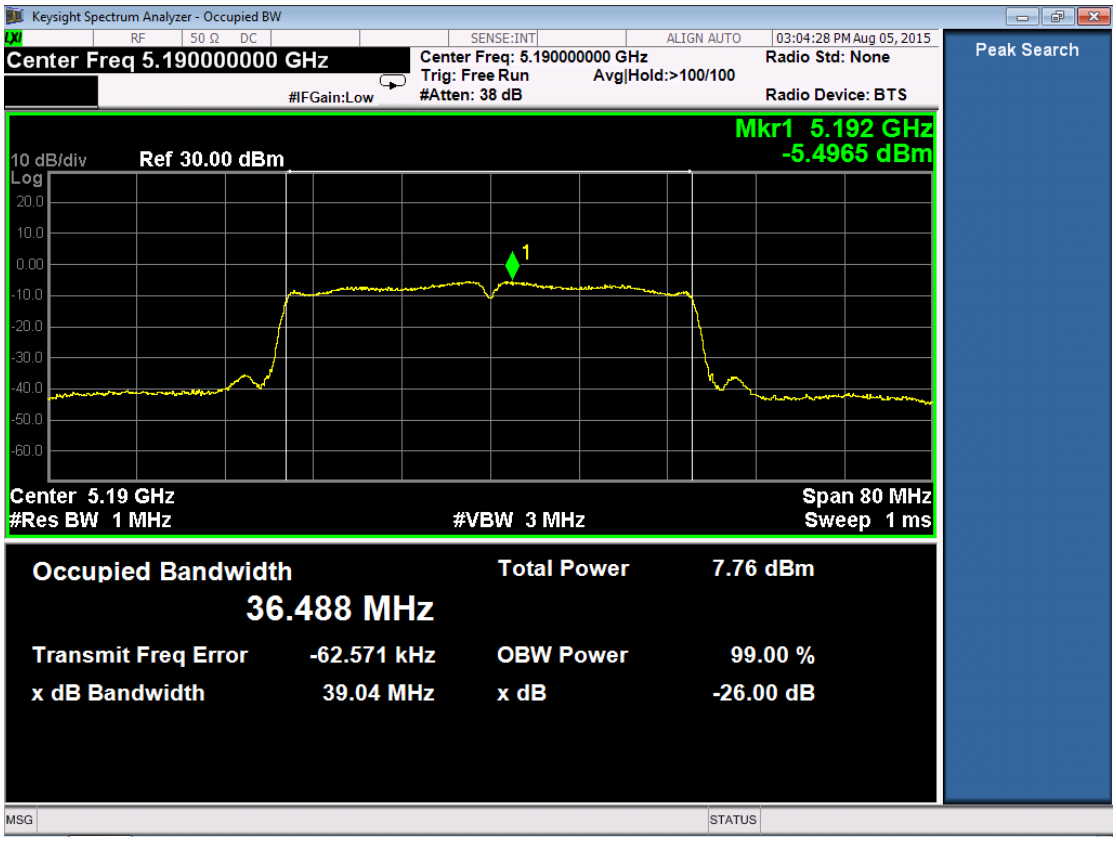

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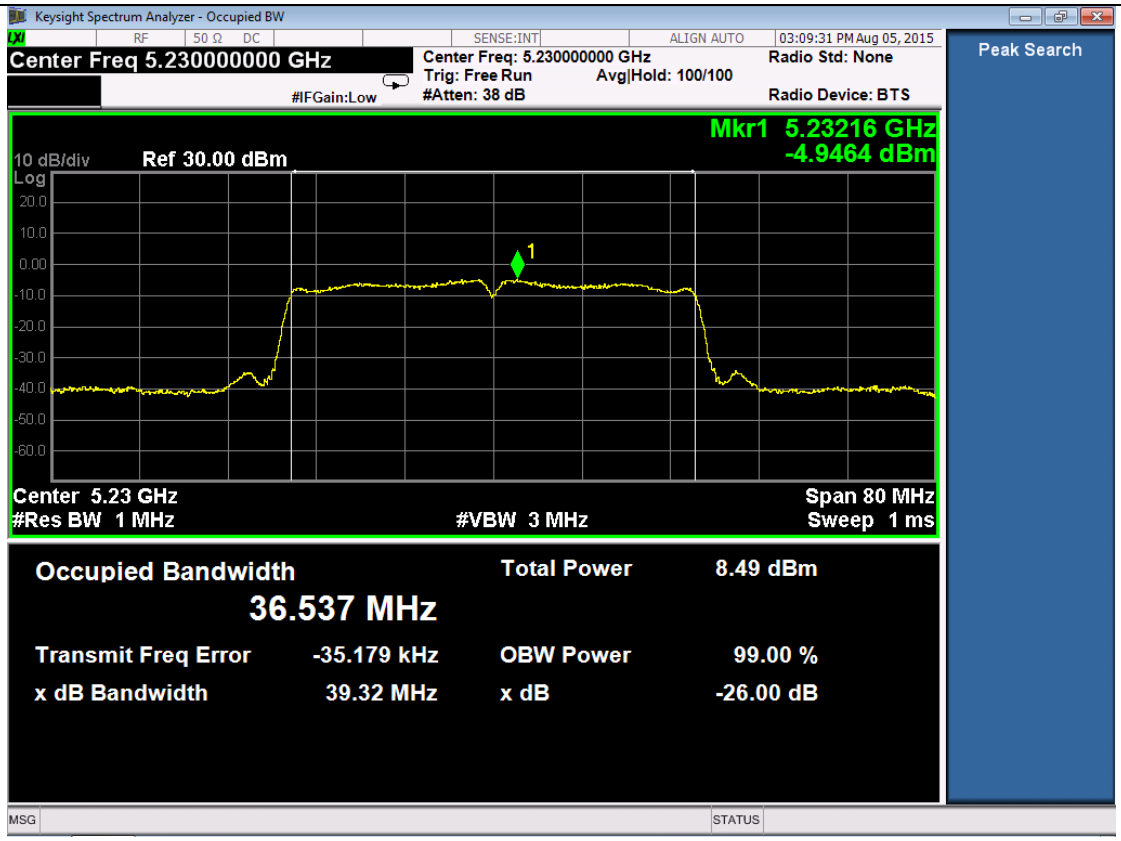
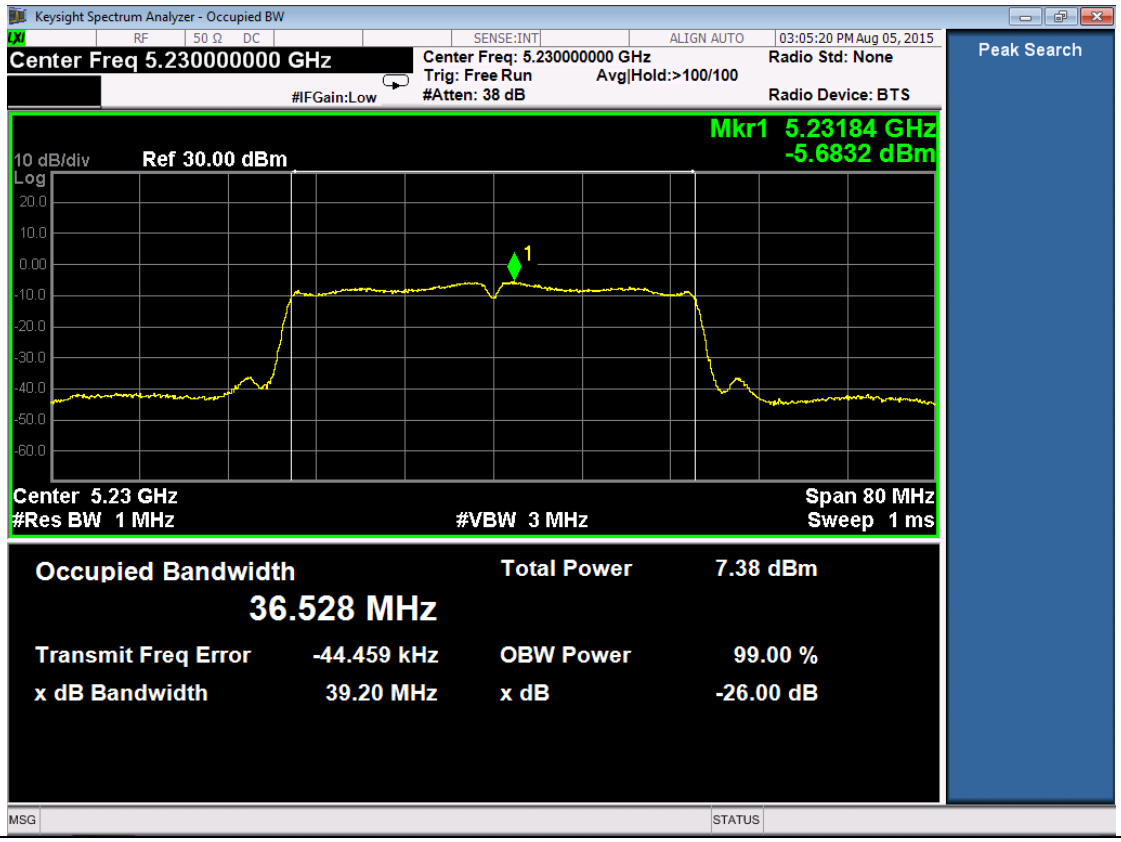
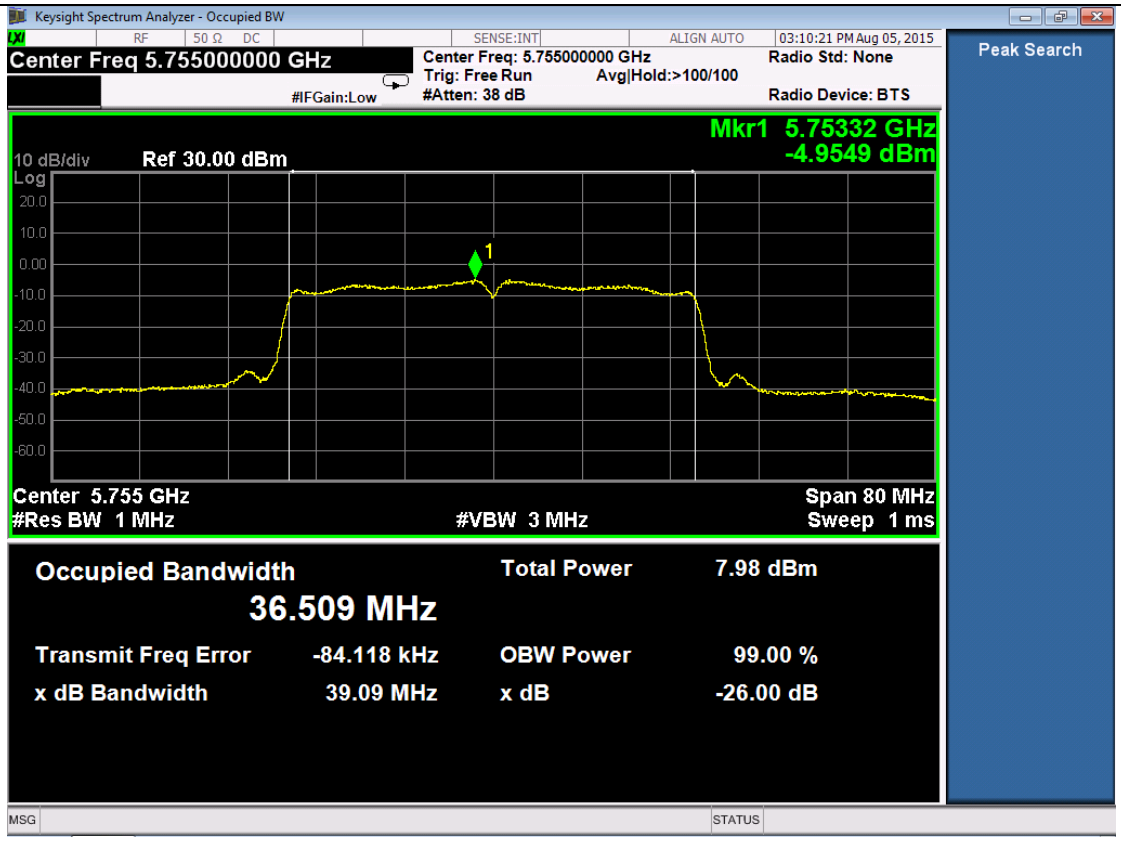
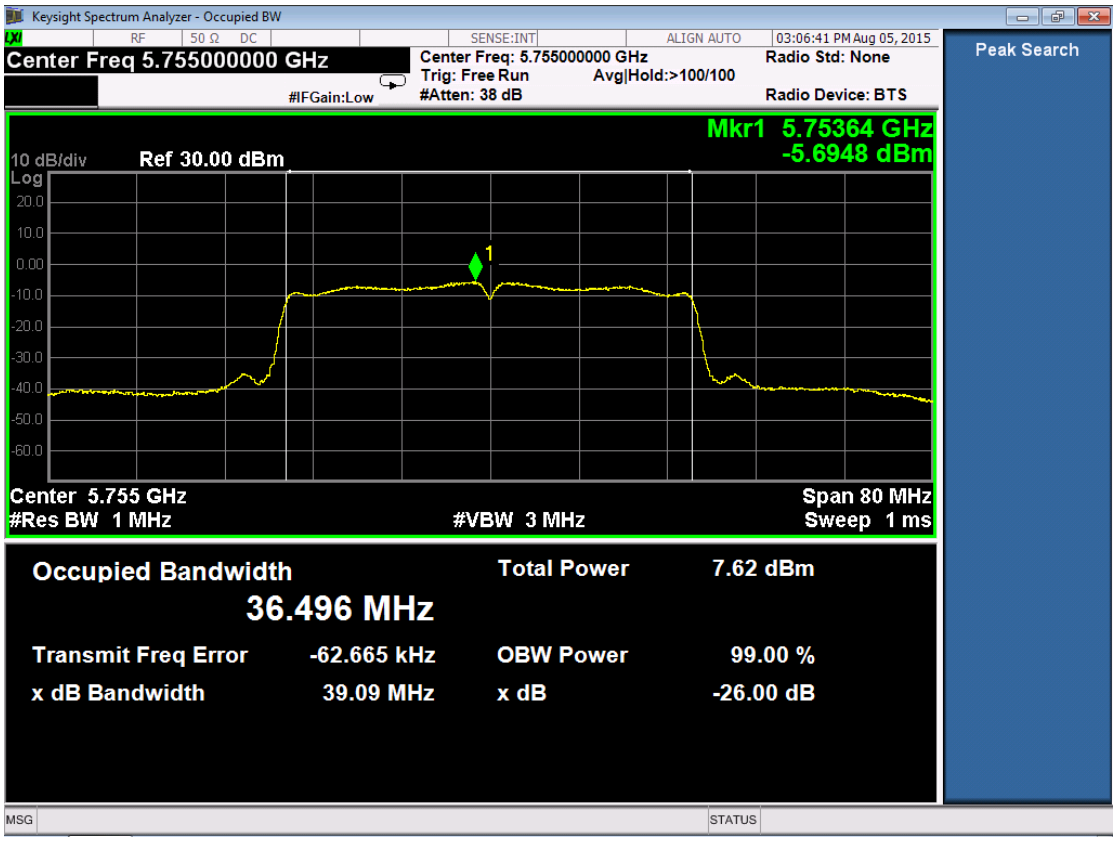


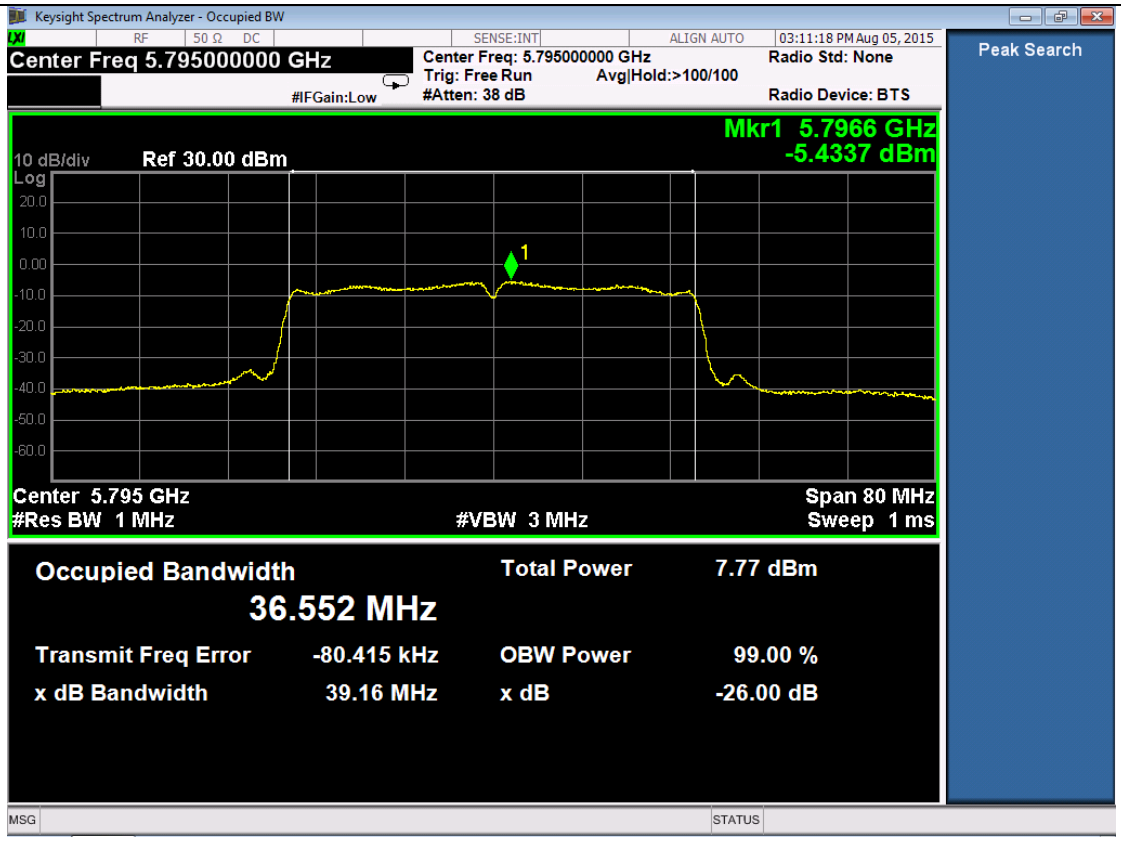


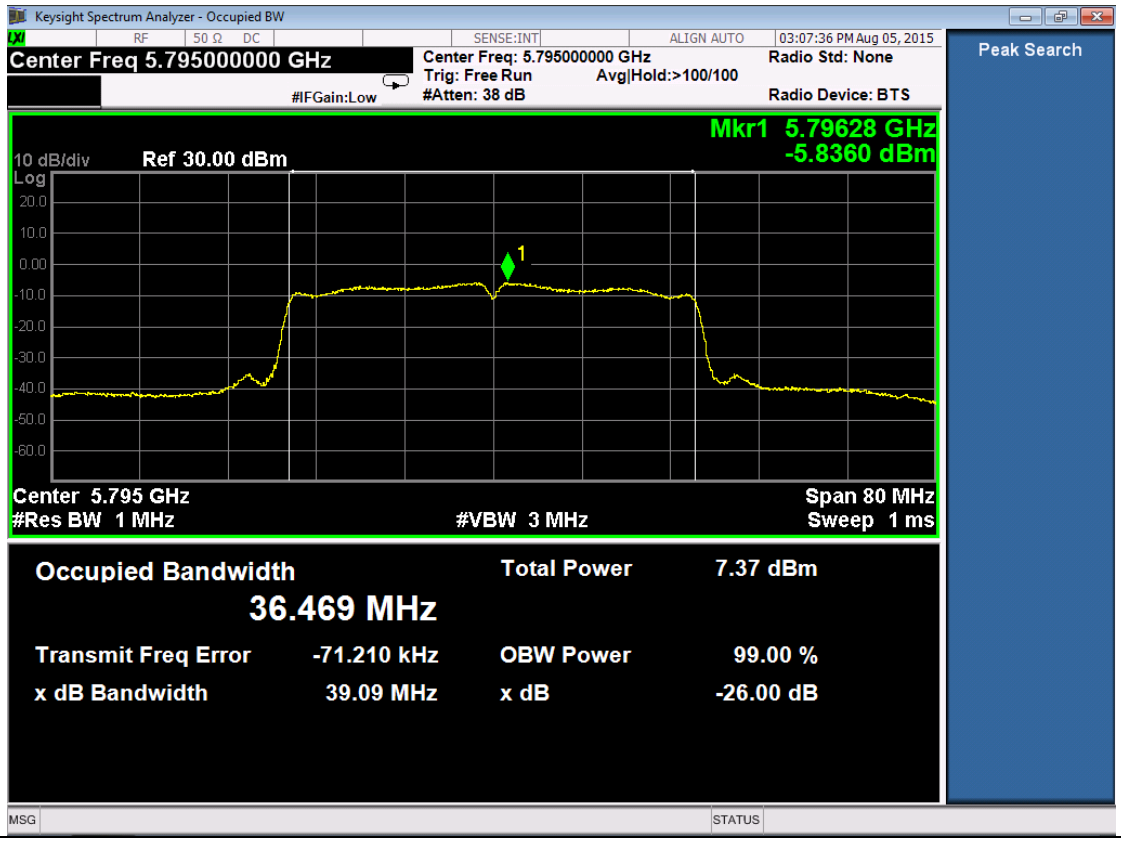
802.11n40-5755





802.11n40-5795





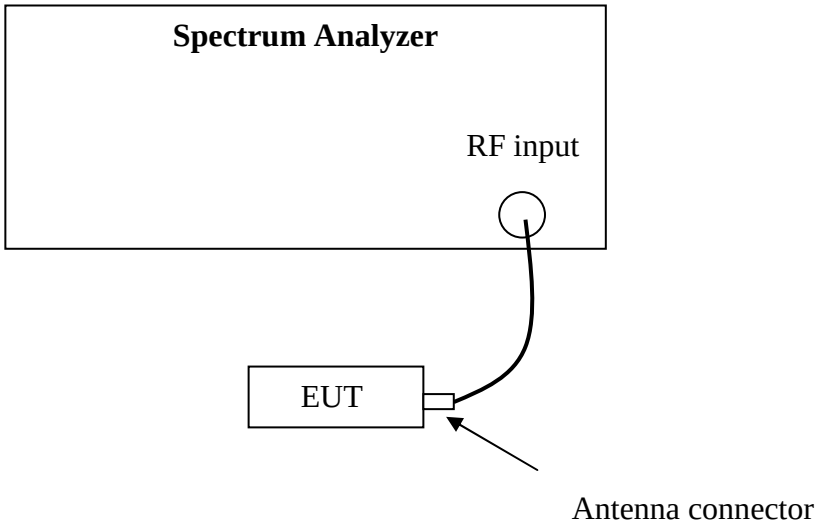
5. Minimum 6dB Bandwidth

Test result: PASS

5.1 Limit

For systems using digital modulation techniques that may operate in the 5725 - 5850 MHz band, the minimum 6 dB bandwidth shall be at least 500 kHz.

5.2 Test Configuration



5.3 Test Procedure and test setup

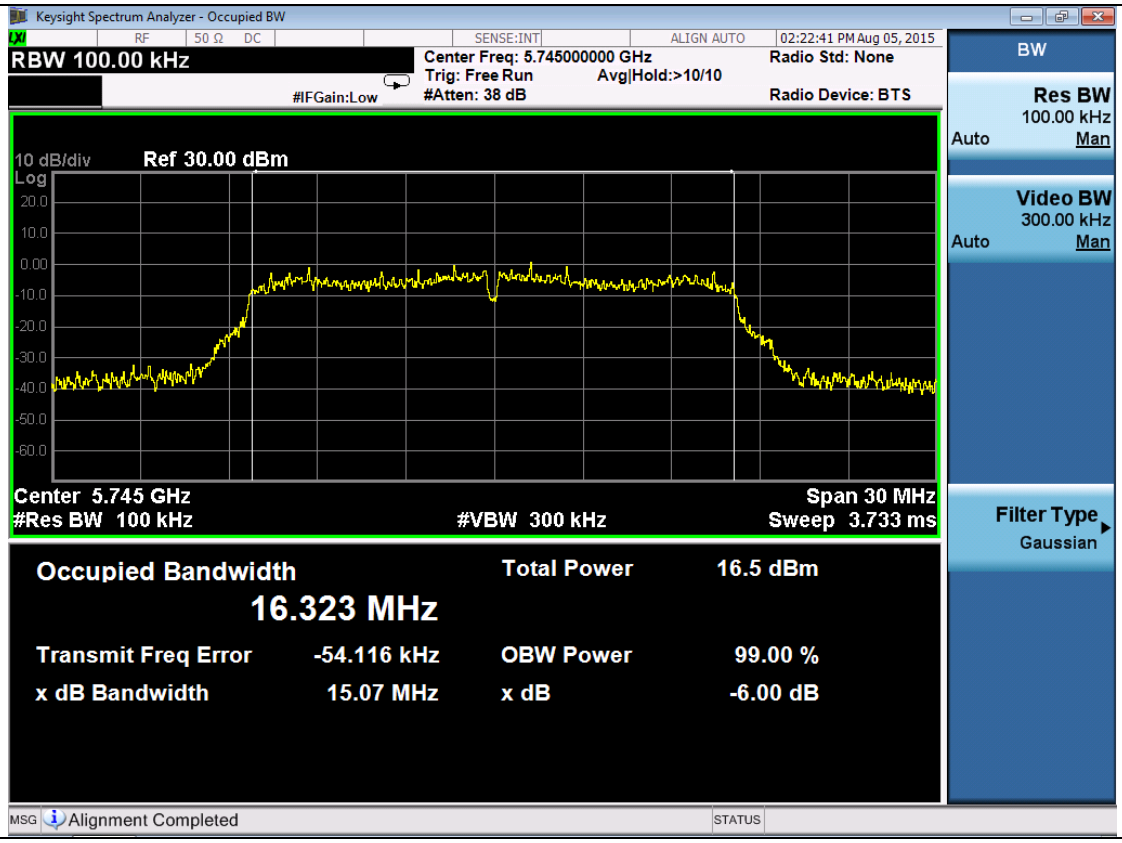
The power spectrum density per FCC §15.407(a)(6) was measured from the antenna port of the EUT. Using a 50ohm spectrum analyzer (measurement method refers to KDB 789033D02: Section C).

5.4 Test Protocol

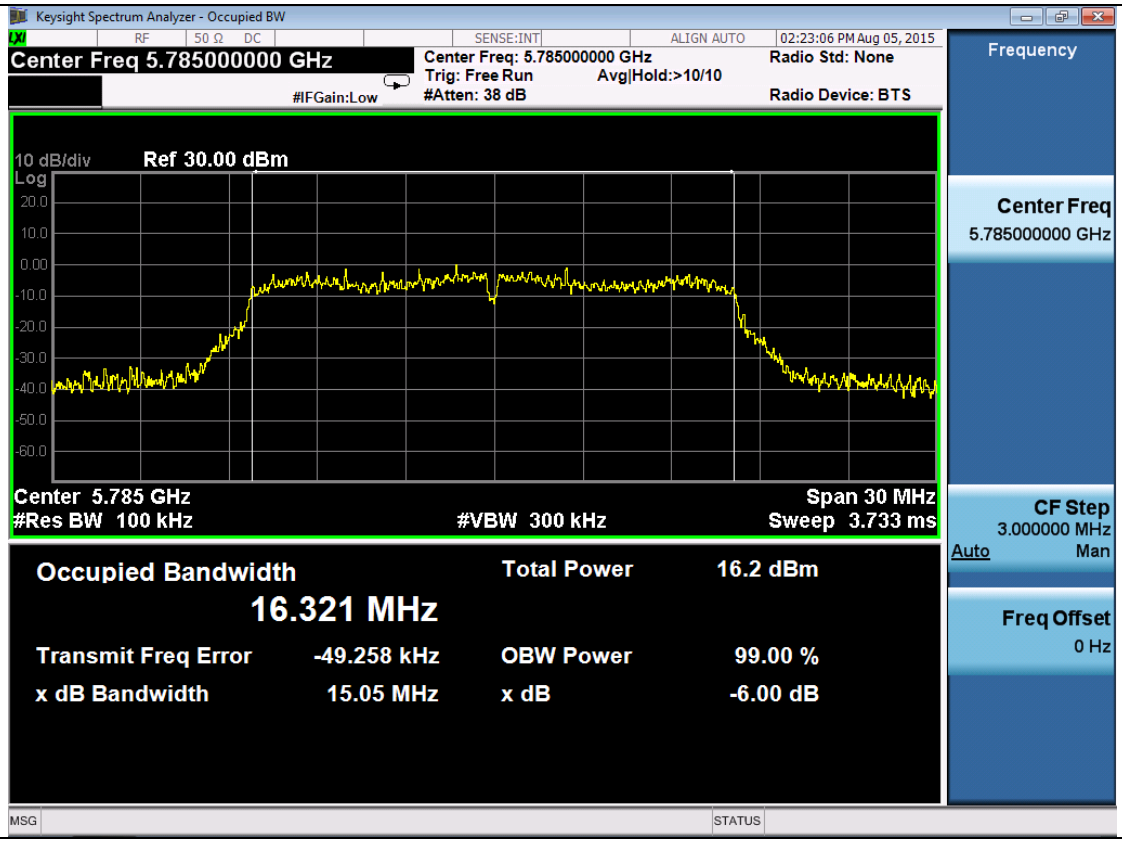
Temperature : 25°C
Relative Humidity : 55 %

Modulation	Frequency (MHz)	Minimum 6dB Bandwidth (MHz)		Limits (MHz)
		Port0	Port 1	
802.11a	5745	15.07	/	> 0.5
	5785	15.05	/	> 0.5
	5825	15.46	/	> 0.5
802.11n20	5745	15.07	15.88	> 0.5
	5785	15.07	15.44	> 0.5
	5825	14.75	15.69	> 0.5
802.11n40	5755	36.28	35.55	> 0.5
	5795	36.30	36.27	> 0.5

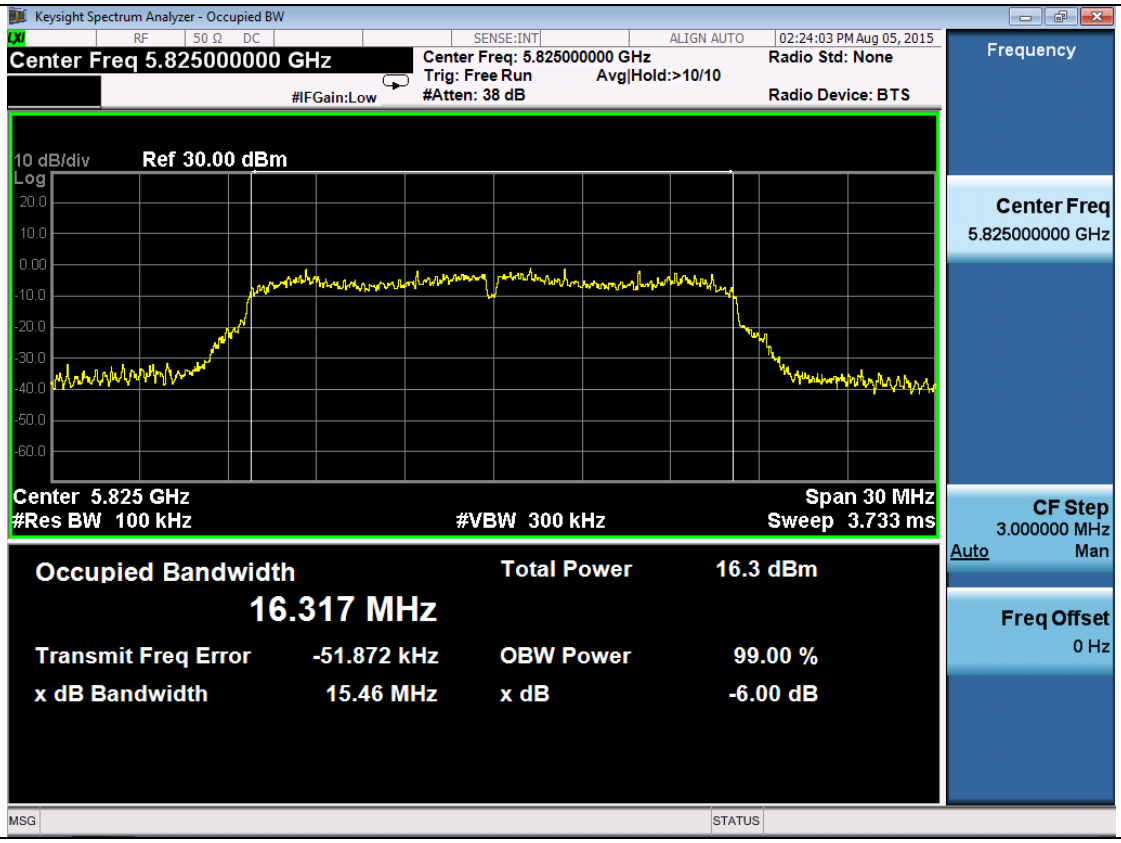
802.11a-5745



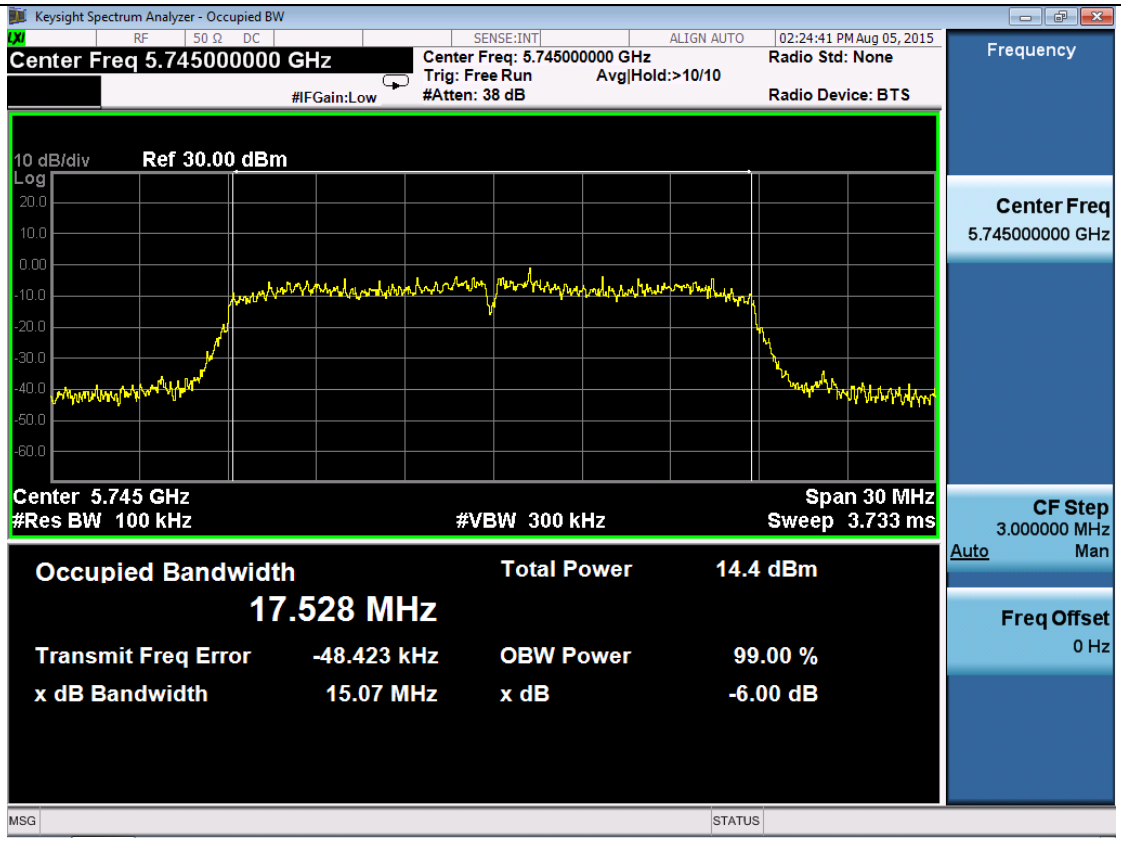
802.11a-5785

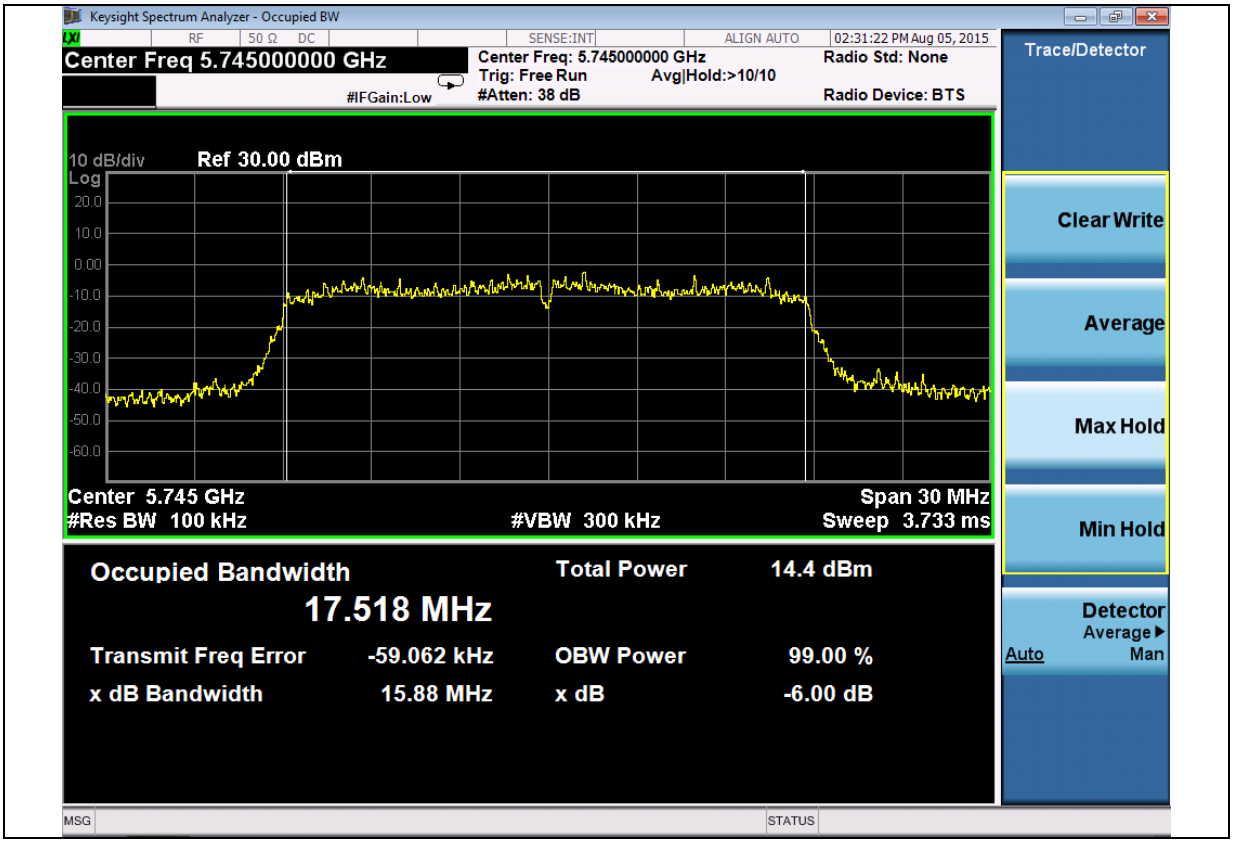


802.11a-5825

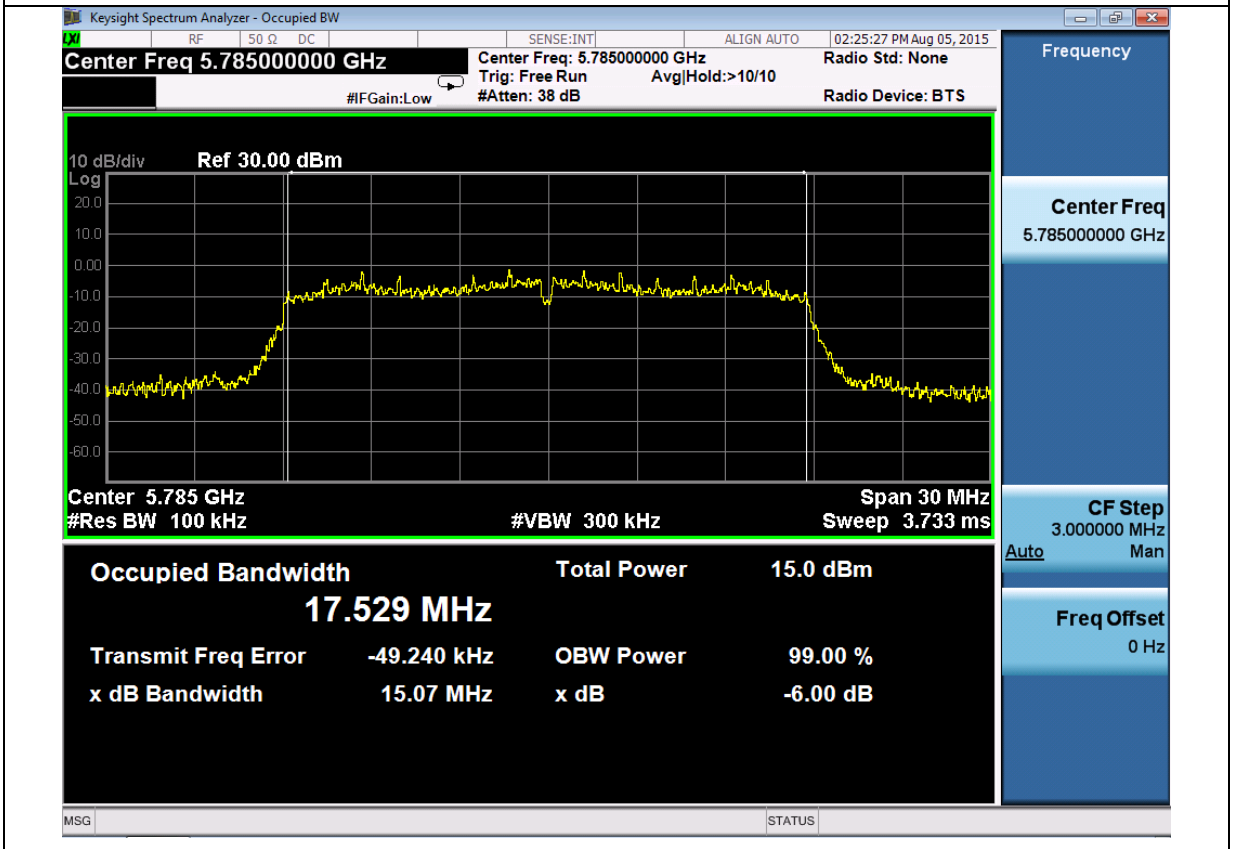


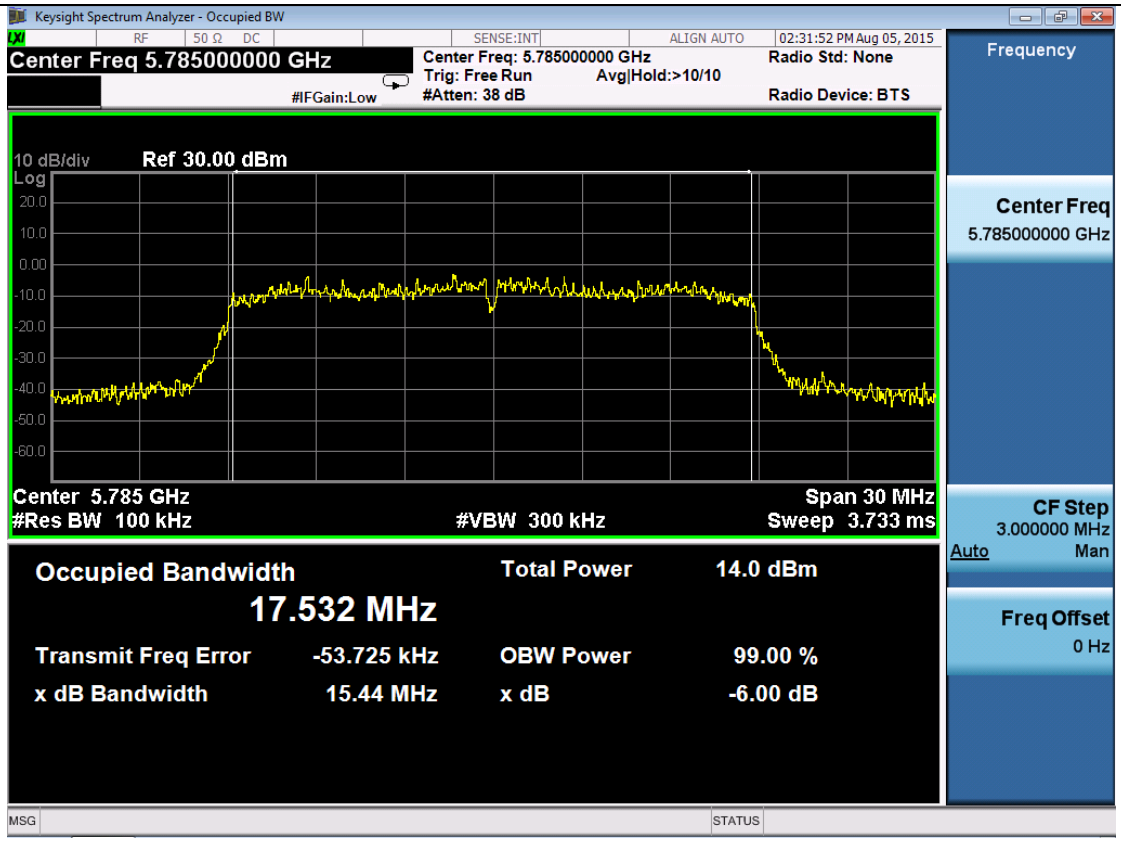
802.11 n20-5745



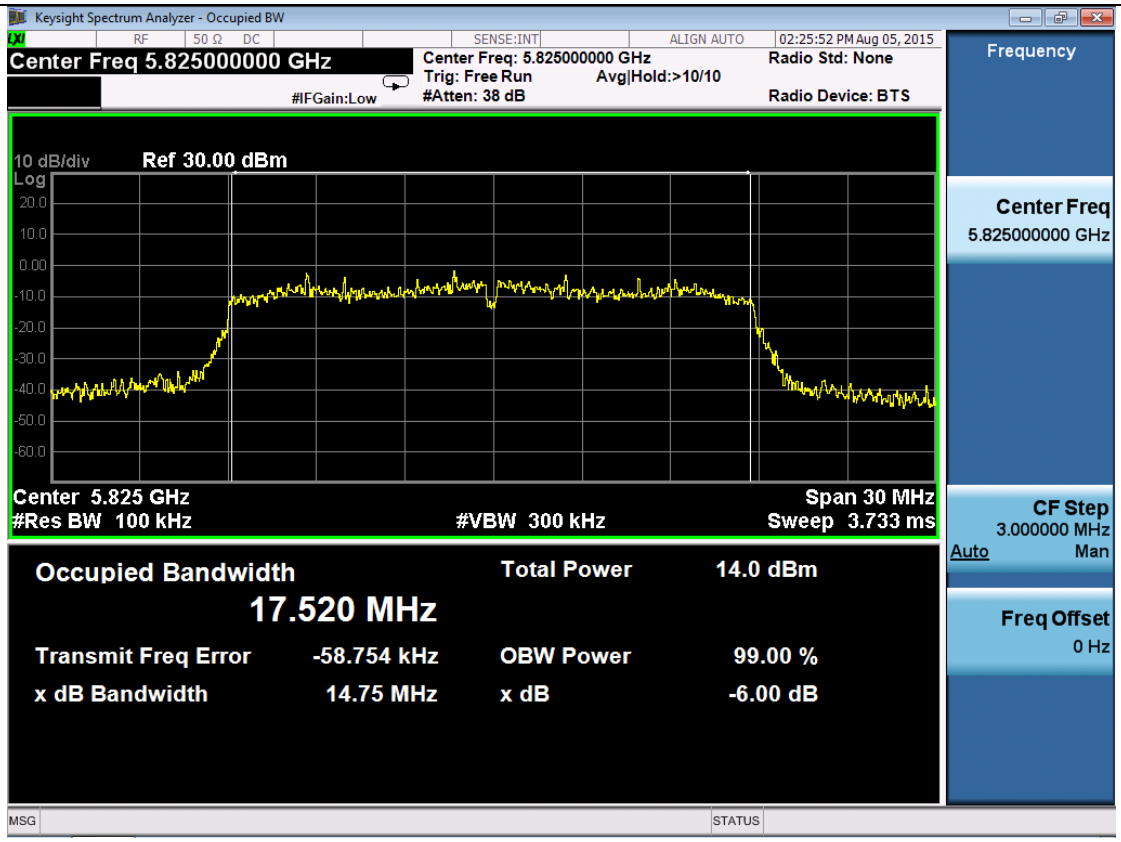


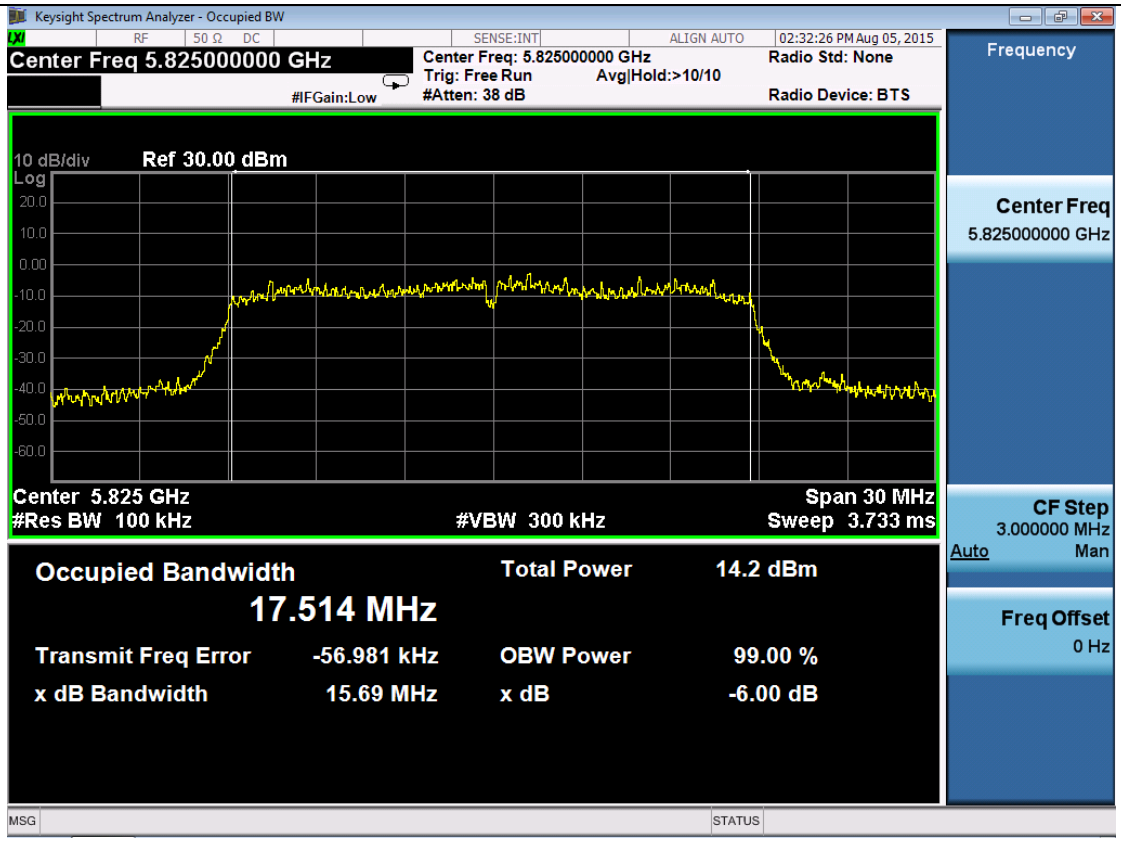
802.11 n20-5785



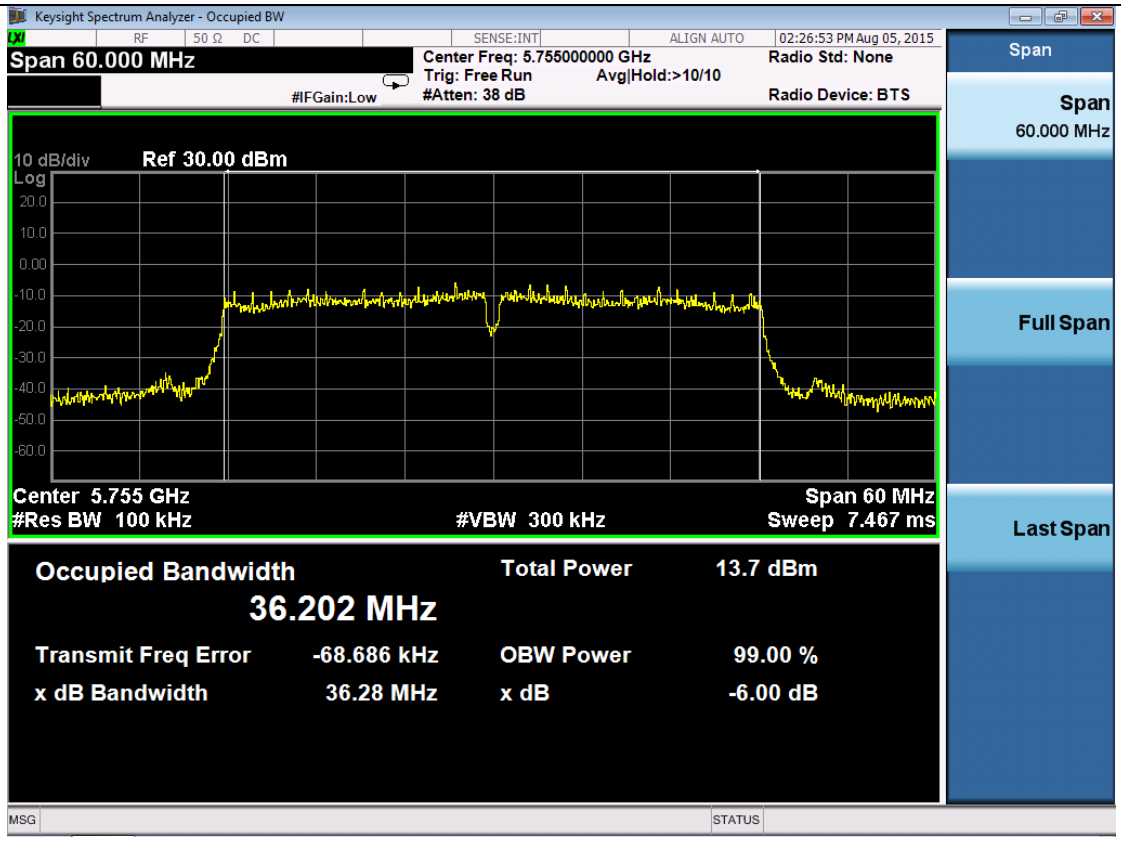


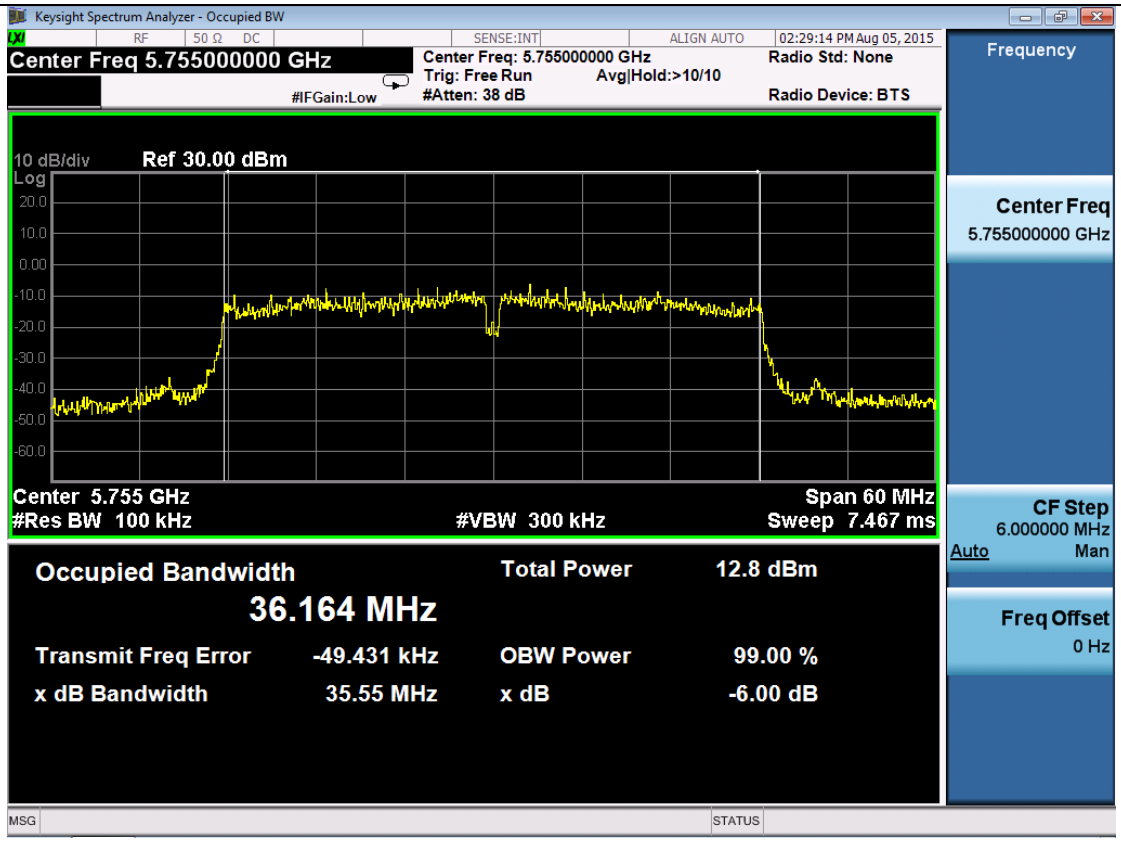
802.11 n20-5825



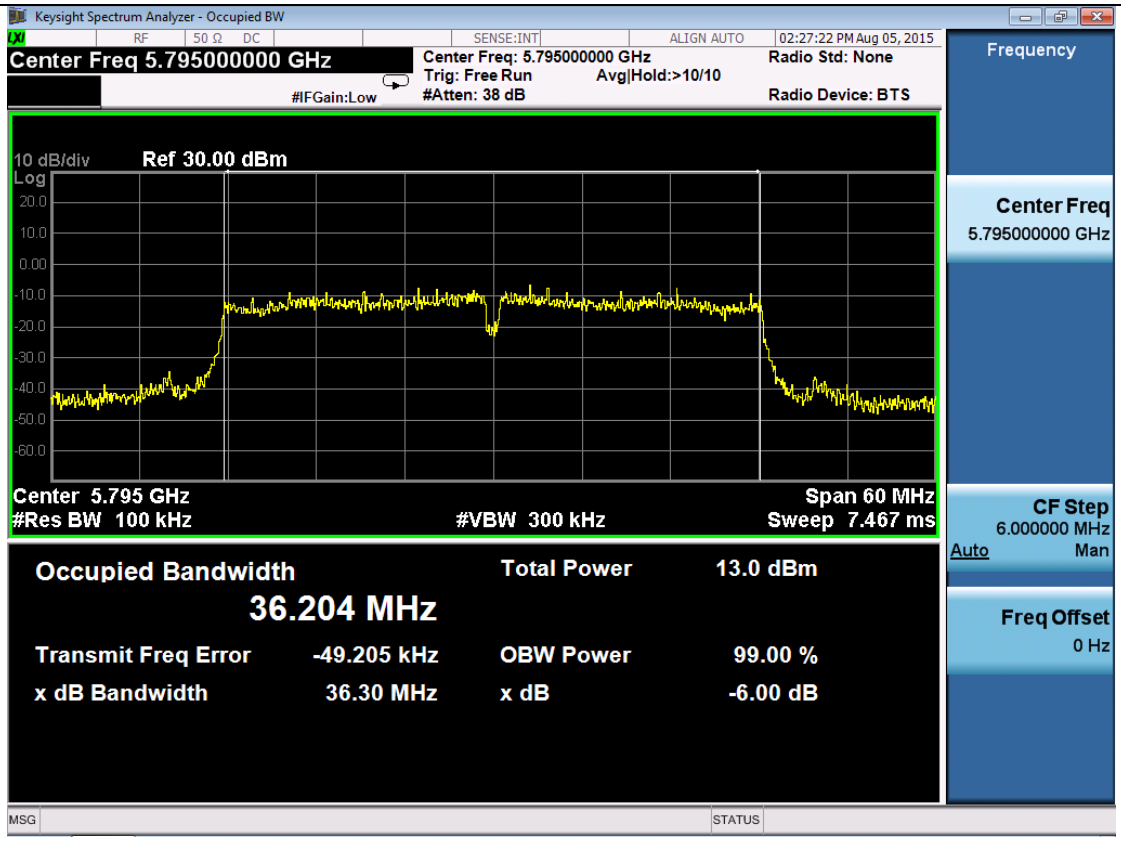


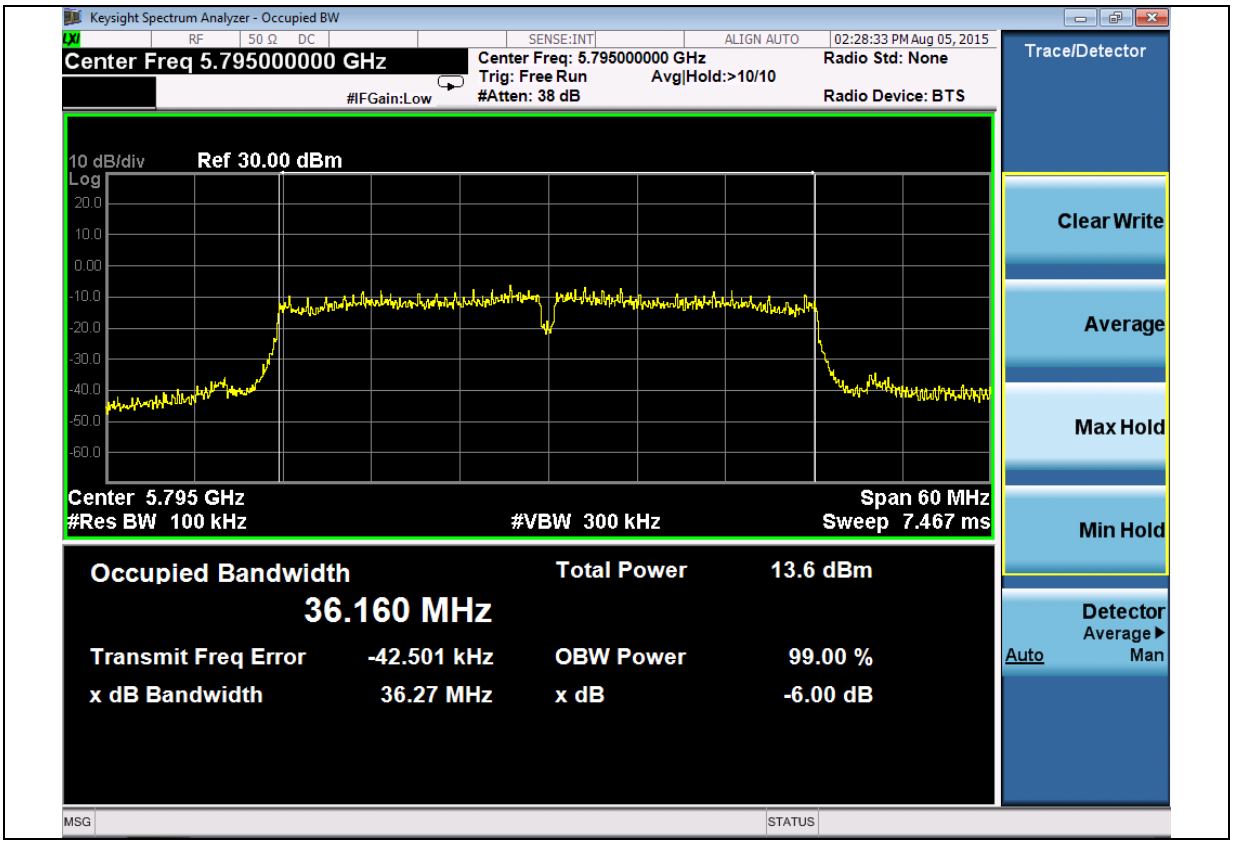
802.11n40-5755





802.11n40-5795




Keysight Spectrum Analyzer - Occupied BW
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
02:28:33 PM Aug 05, 2015
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 38 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 7.467 ms
Occupied Bandwidth
36.160 MHz
Total Power
13.6 dBm
Transmit Freq Error
-42.501 kHz
OBW Power
99.00 %
x dB Bandwidth
36.27 MHz
x dB
-6.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS

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

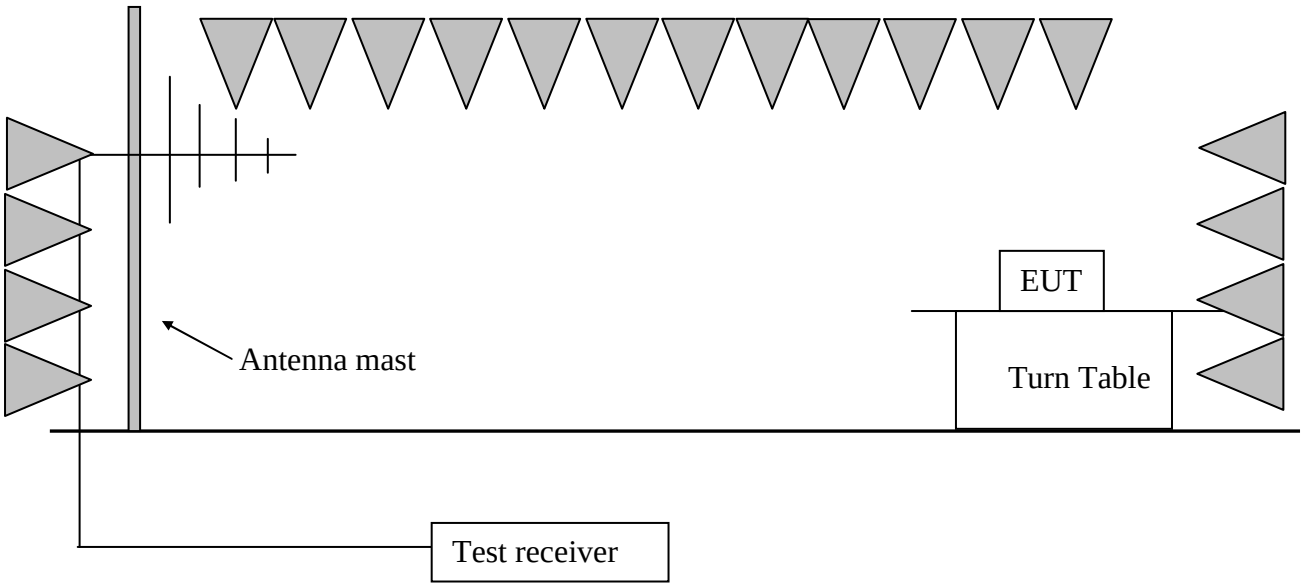
☒ For transmitters operating in the 5.15–5.25 / 5.25 – 5.35 / 5.47 – 5.725 GHz band: assessed with 15.209(a):

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

☒ 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

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 = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);
RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

Remark:
1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = Limit – Measured level
4. If the PK measured level is lower than AV limit, the AV test can be elided.

Example:

Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Measured level = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m,
Measured level = 10.20dBuV/m, then Margin = 54 - 10.20 = 43.80dBuV/m.

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
5180	V	5178.95	42.80	110.60	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5150.00	42.80	70.00	74.00	4.00	PK
	V	5150.00	42.80	52.40	54.00	1.60	AV
	V	10367.00	6.20	45.90	54.00	8.10	PK
	V	15540.00	11.80	45.50	54.00	8.50	PK
5200	V	5200.49	42.80	110.10	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	10400.00	6.30	45.30	54.00	8.70	PK
	V	15600.00	11.90	45.70	54.00	8.30	PK
5240	V	5242.90	42.90	110.10	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	10480.00	6.50	45.60	54.00	8.40	PK

	H	15720.00	12.10	46.20	54.00	7.80	PK
5745	V	5745.22	43.80	108.70	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5725.00	43.80	72.20	78.20	6.00	PK
	V	5715.00	43.80	66.10	68.20	2.10	PK
	V	11489.00	7.30	46.30	54.00	7.70	PK
	H	17235.00	12.50	46.40	54.00	7.60	PK
5785	V	5786.53	43.80	108.40	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	H	11547.00	7.80	45.30	54.00	8.70	PK
	H	17355.00	12.90	45.70	54.00	8.30	PK
5825	V	5823.67	43.90	108.50	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5850.00	43.90	66.50	78.20	11.70	PK
	V	5860.00	43.90	64.20	68.20	4.00	PK
	H	11659.00	7.80	45.40	54.00	8.60	PK
	V	17415.00	13.40	45.80	54.00	8.20	PK

Mode 802.11n20

Freq (MHz)	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
5180	V	5180.96	42.80	110.50	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK

	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5150.00	42.80	70.10	74.00	3.90	PK
	V	5150.00	42.80	52.20	54.00	1.80	AV
	V	10367.00	6.20	45.60	54.00	8.40	PK
	V	15540.00	11.80	45.70	54.00	8.30	PK
5200	V	5199.14	42.80	109.80	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	10400.00	6.30	45.60	54.00	8.40	PK
	V	15600.00	11.90	45.50	54.00	8.50	PK
5240	V	5241.66	42.90	109.60	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	10480.00	6.50	45.70	54.00	8.30	PK
	H	15720.00	12.10	46.00	54.00	8.00	PK
5745	V	5743.47	43.80	107.90	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5725.00	43.80	71.50	78.20	6.70	PK
	V	5715.00	43.80	66.80	68.20	1.40	PK
	V	11489.00	7.30	46.20	54.00	7.80	PK
	H	17235.00	12.50	45.90	54.00	8.10	PK
5785	V	5788.50	43.80	107.40	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	H	11547.00	7.80	45.40	54.00	8.60	PK

	H	17355.00	12.90	45.60	54.00	8.40	PK
5825	V	5822.94	43.90	107.30	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5850.00	43.90	69.00	78.20	9.20	PK
	V	5860.00	43.90	64.60	68.20	3.60	PK
	H	11659.00	7.80	45.60	54.00	8.40	PK
	V	17415.00	13.40	46.10	54.00	7.90	PK

Mode 802.11n40

Freq (MHz)	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
5190	V	5191.78	42.80	106.40	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5150.00	42.80	73.10	74.00	0.90	PK
	V	5150.00	42.80	53.40	54.00	0.60	AV
	V	10380.00	6.30	45.20	54.00	8.80	PK
	V	15570.00	11.90	45.30	54.00	8.70	PK
5230	V	5229.63	42.90	106.10	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	10460.00	6.50	45.70	54.00	8.30	PK
	H	15690.00	12.10	46.20	54.00	7.80	PK
5755	V	5756.26	43.80	104.20	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK

	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5721.68	43.80	73.60	78.20	4.60	PK
	V	5715.00	43.80	67.80	68.20	0.40	PK
	V	11510.00	7.40	45.90	54.00	8.10	PK
	H	17265.00	12.70	46.40	54.00	7.60	PK
5795	V	5796.36	43.90	104.50	/	/	PK
	V	30.00	22.30	38.90	40.00	1.10	PK
	V	179.67	12.40	42.20	43.50	1.30	PK
	H	249.65	13.20	45.00	46.00	1.00	PK
	V	5850.00	43.90	66.10	78.20	12.10	PK
	V	5860.00	43.90	64.30	68.20	3.90	PK
	H	11591.00	7.60	45.80	54.00	8.20	PK
	V	17358.00	13.10	46.00	54.00	8.00	PK

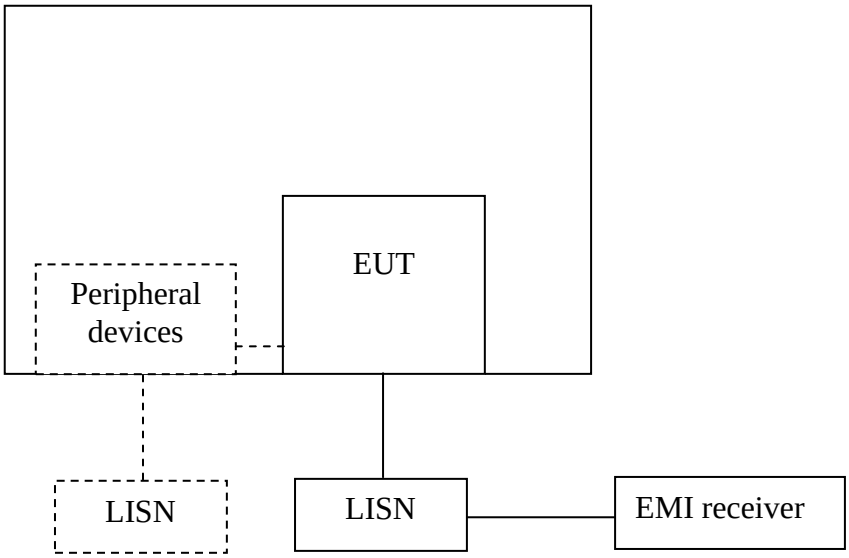
7. Power line conducted emission

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.

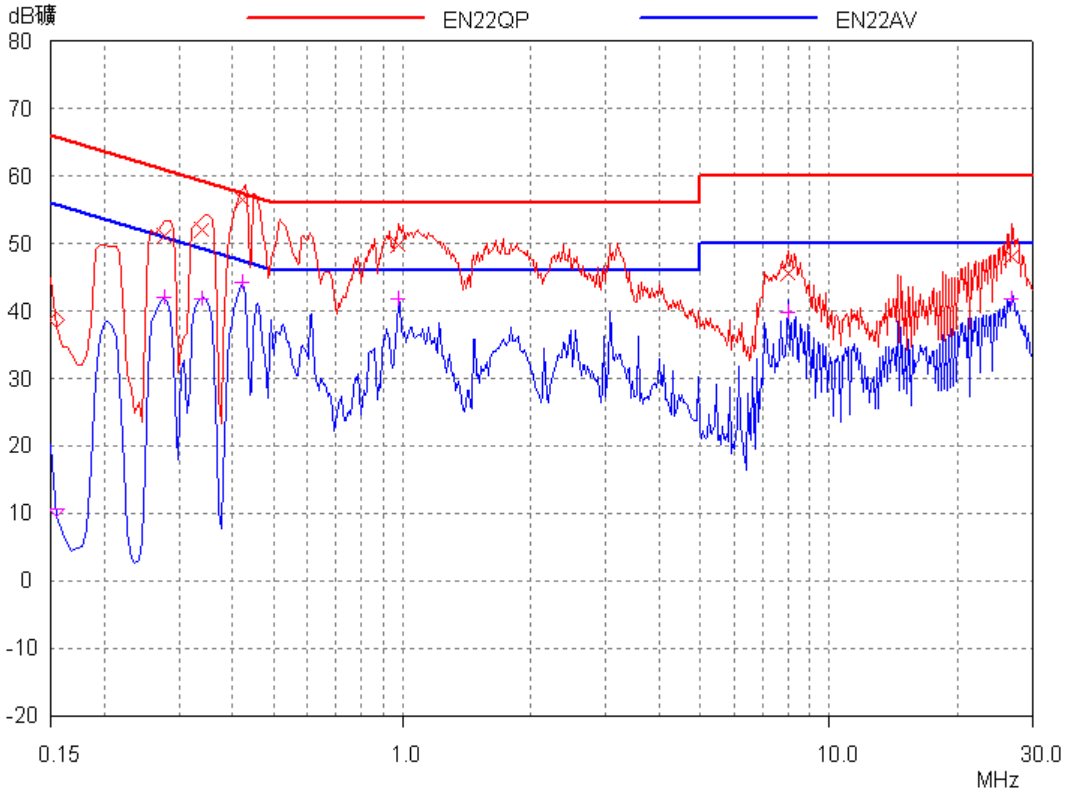
7.3 Test procedure and test set up

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

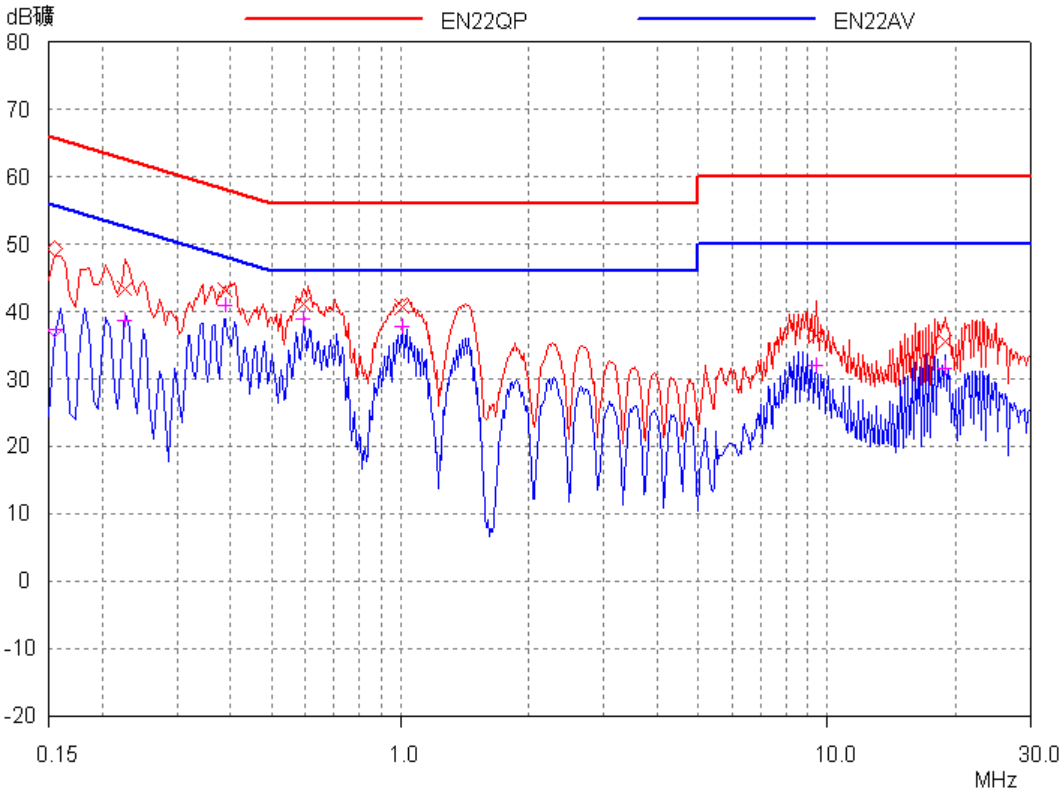
Temperature : 25 °C
Relative Humidity : 55 %

AC powered



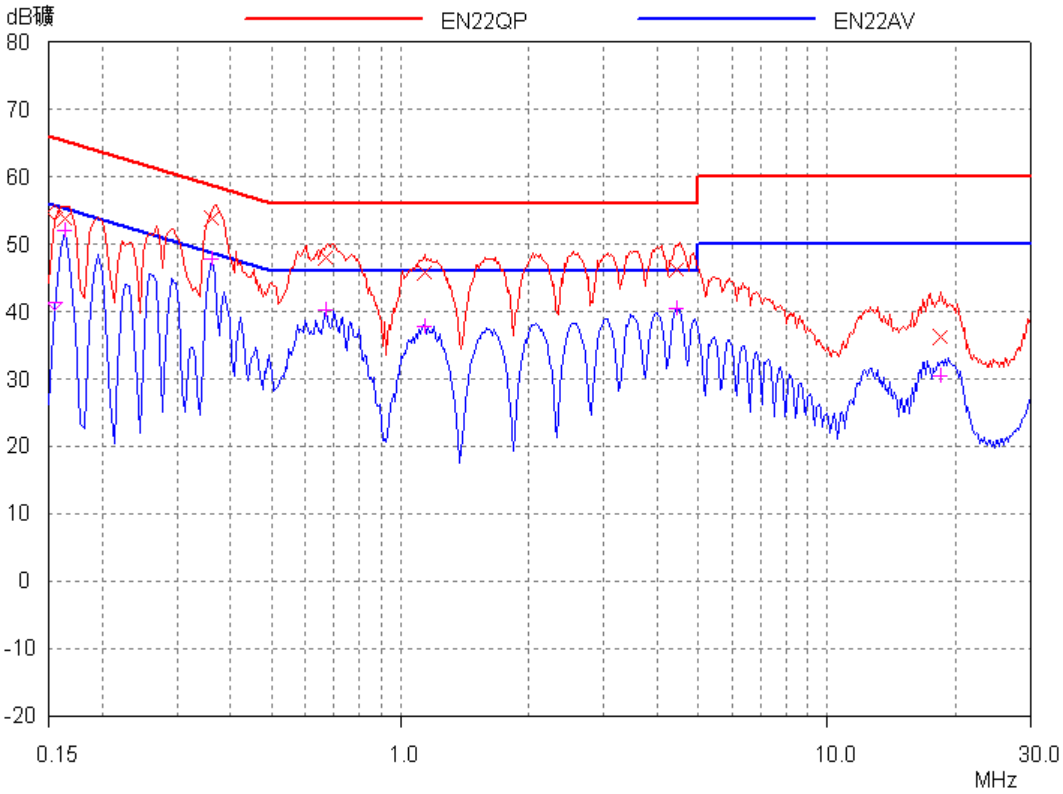
Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.28 (L)	3.00	51.11	41.97	60.94	50.94	9.83	8.97
0.34 (L)	3.00	52.08	41.76	59.23	49.23	7.15	7.47
0.42 (N)	3.00	56.44	44.25	57.45	47.45	1.01	3.20
0.98 (L)	3.00	49.86	41.87	56.00	46.00	6.14	4.13
7.95 (N)	3.00	45.55	39.73	60.00	50.00	14.45	10.27
26.61 (L)	3.00	47.96	41.78	60.00	50.00	12.04	8.22
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

Adaptor powered



Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.23 (N)	3.00	43.31	38.67	62.58	52.58	19.27	13.91
0.39 (L)	3.00	43.13	40.86	58.10	48.10	14.97	7.24
0.59 (L)	3.00	41.14	38.99	56.00	46.00	14.86	7.01
1.01 (L)	3.00	40.59	37.86	56.00	46.00	15.41	8.14
9.38 (N)	3.00	36.42	31.90	60.00	50.00	23.58	18.10
18.76 (L)	3.00	35.50	31.59	60.00	50.00	24.50	18.41
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

POE Adaptor powered



Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.16 (N)	3.00	53.92	51.95	65.28	55.28	11.36	3.33
0.36 (L)	3.00	53.75	47.79	58.69	48.69	4.94	0.90
0.67 (L)	3.00	48.03	40.25	56.00	46.00	7.97	5.75
1.14 (N)	3.00	45.77	37.70	56.00	46.00	10.23	8.30
4.43 (N)	3.00	46.17	40.53	56.00	46.00	9.83	5.47
18.33 (L)	3.00	36.23	30.54	60.00	50.00	23.77	19.46
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

8. Occupied Bandwidth & 26dBc Check for 5.2GHz Device

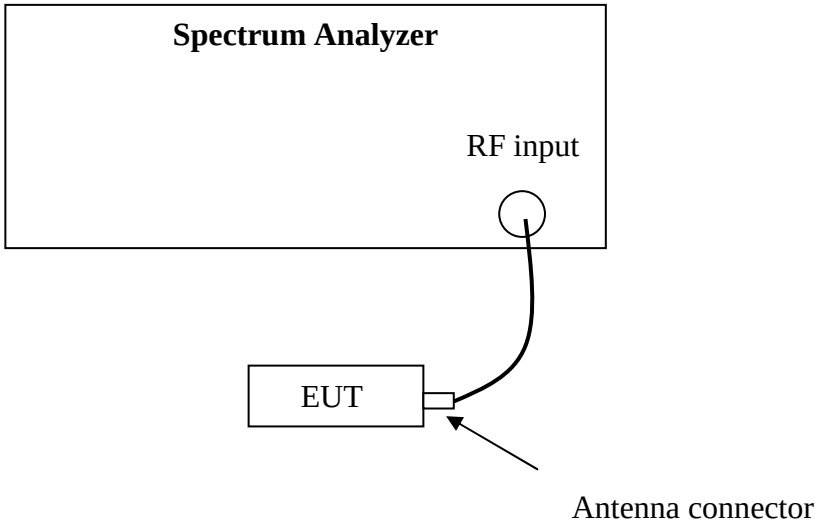
Test Status: Pass

8.1 Test limit

For occupied bandwidth: None

26dBc Check for 5.2GHz Device: any unwanted emissions of a 5150-5250 MHz device that fall into the band 5250-5350 MHz must be 26dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz.

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.

26dBc Check for 5.2GHz Device: confirm if the 26dBc is fall above 5250MHz.

8.4 Test protocol

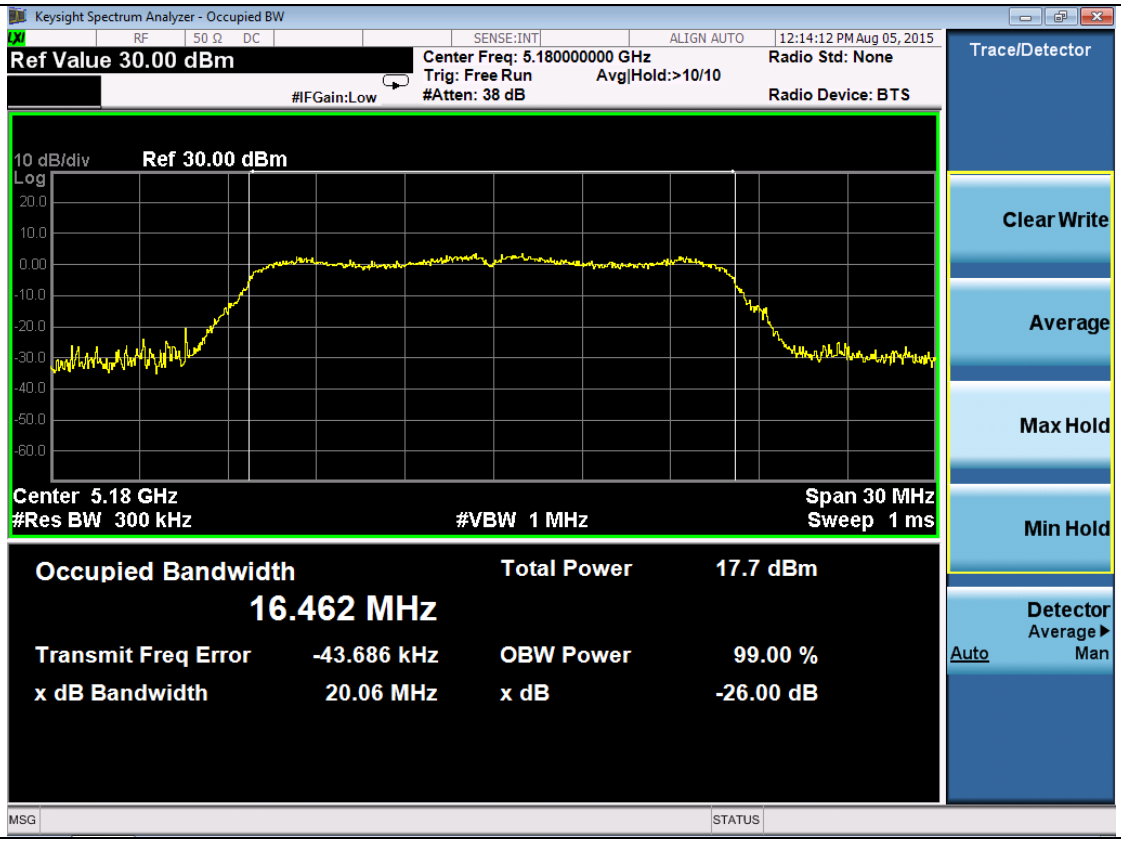
Temperature : 25 °C

Relative Humidity : 55 %

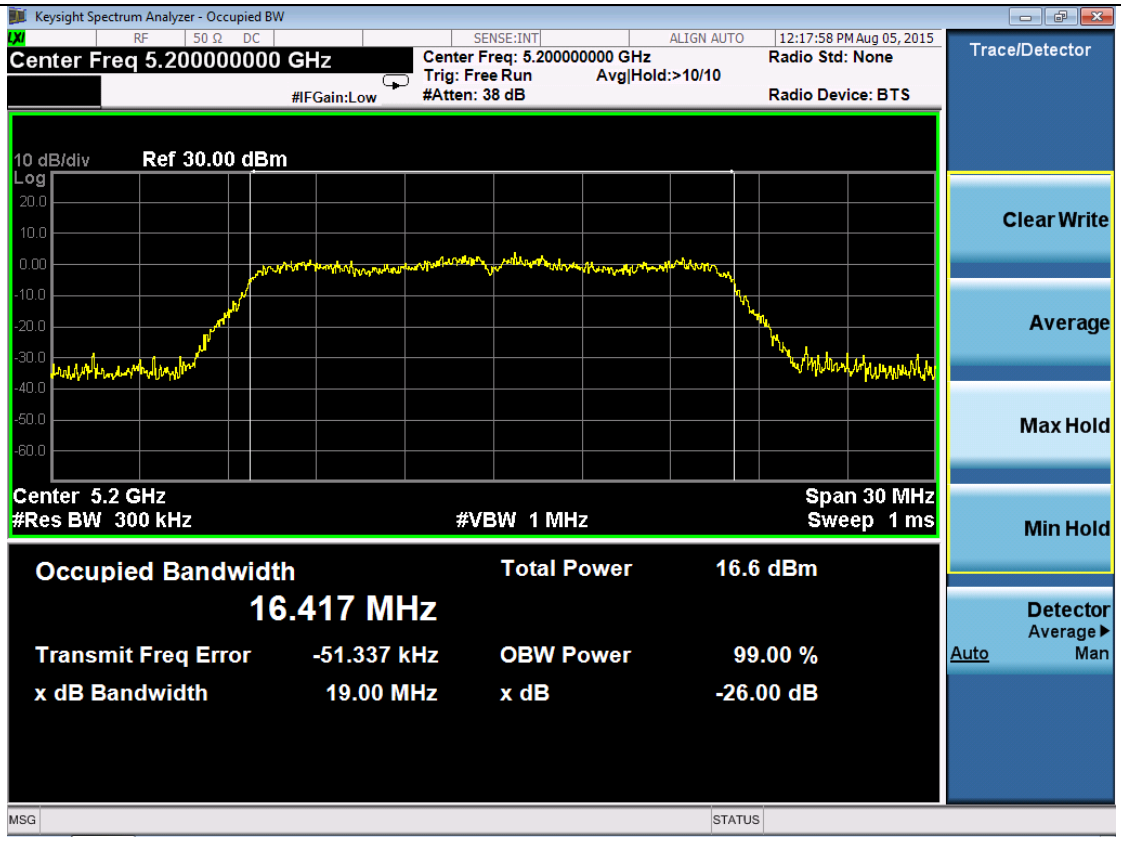
Modulation	Frequency (MHz)	99% Bandwidth(MHz)	
		Port 0	Port 1
802.11a	5180	16.46	/
	5200	16.42	/
	5240	16.45	/
	5745	16.32	/
	5785	16.32	/
	5825	16.32	/
802.11n20	5180	17.58	17.56
	5200	17.58	17.54
	5240	17.55	17.63
	5745	17.53	17.52
	5785	17.53	17.53
	5825	17.52	17.51
802.11n40	5190	36.58	36.65
	5230	36.51	36.43
	5755	36.20	36.16
	5795	36.20	36.16

Modulation	Frequency (MHz)	26dBc Check for 5.2GHz Device
802.11a	5180	Lower than 5.25GHz
	5200	Lower than 5.25GHz
	5240	Lower than 5.25GHz
802.11n20	5180	Lower than 5.25GHz
	5200	Lower than 5.25GHz
	5240	Lower than 5.25GHz
802.11n40	5190	Lower than 5.25GHz
	5230	Lower than 5.25GHz

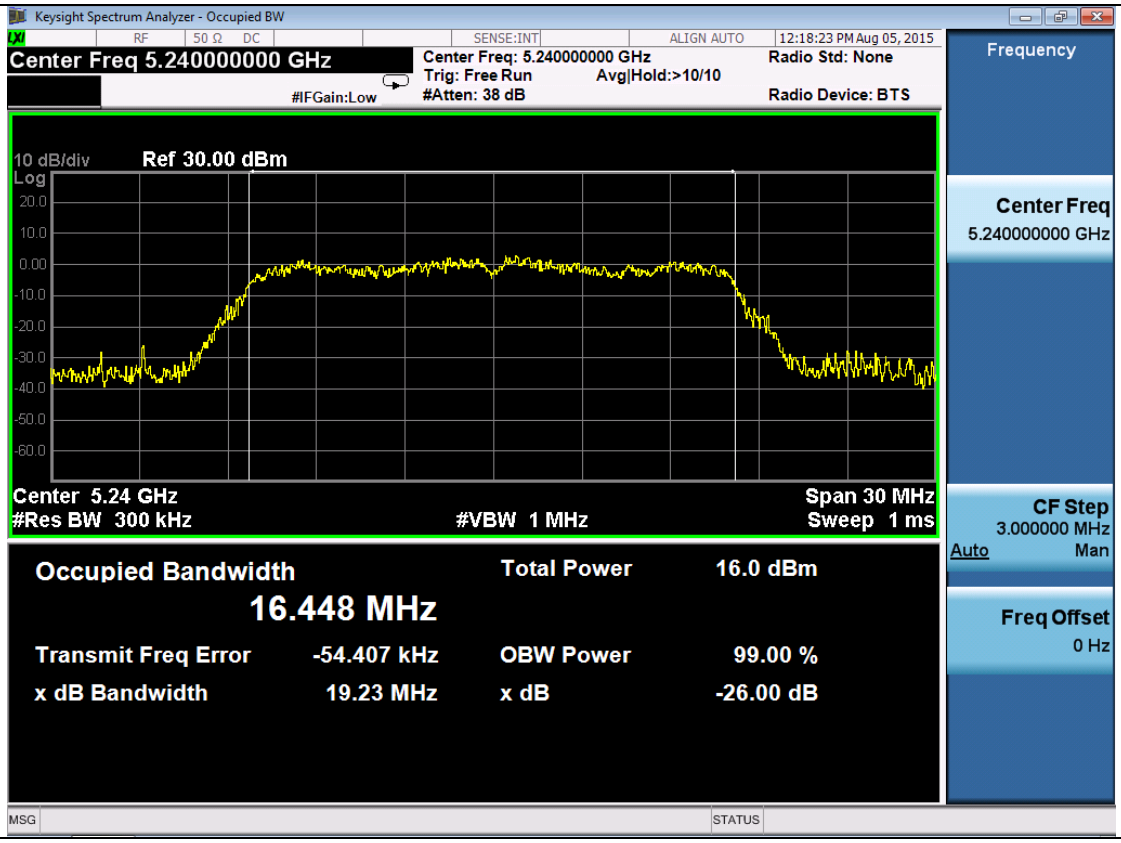
802.11a-5180



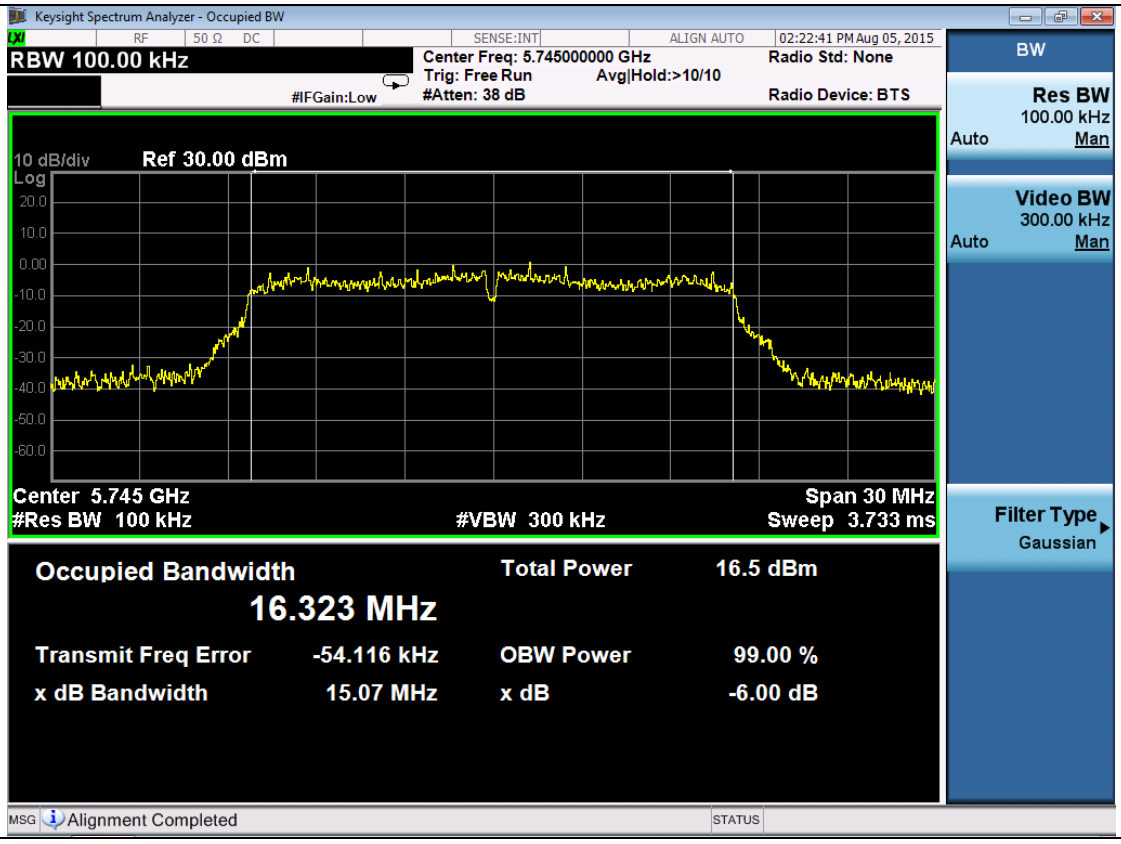
802.11a-5200



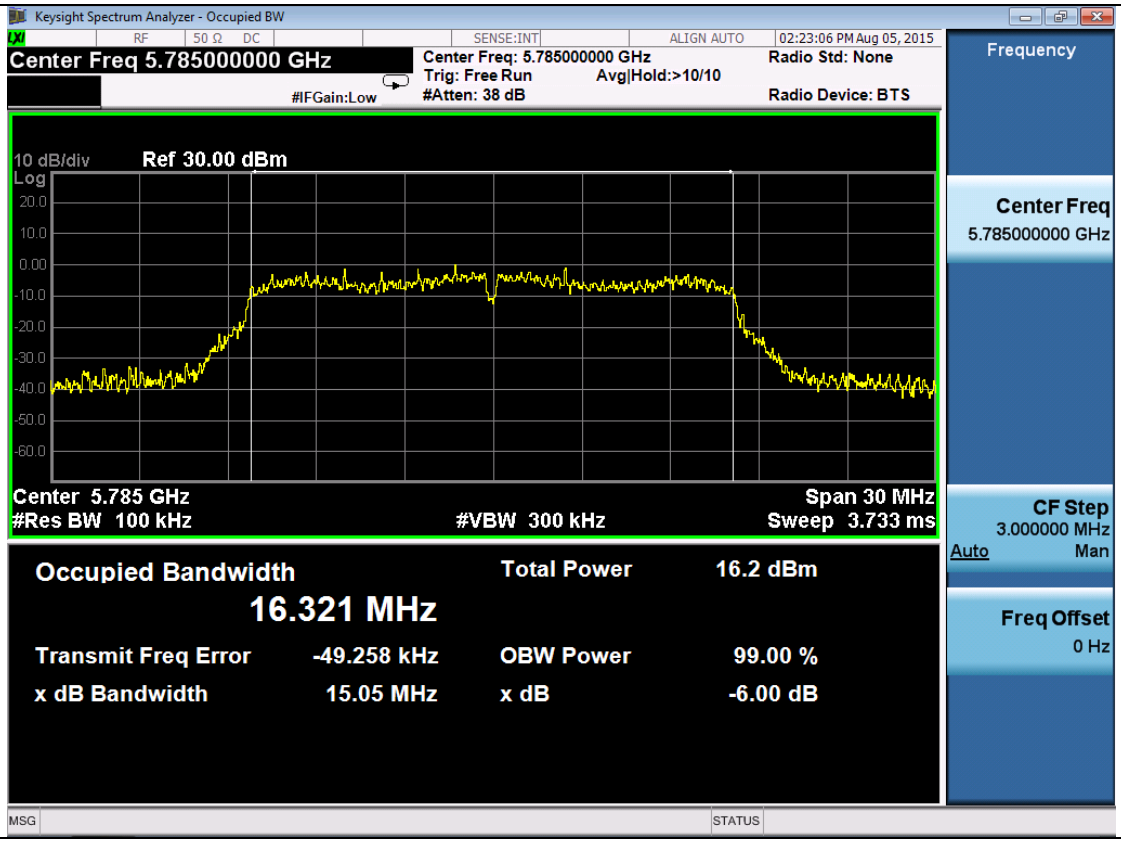
802.11a-5240



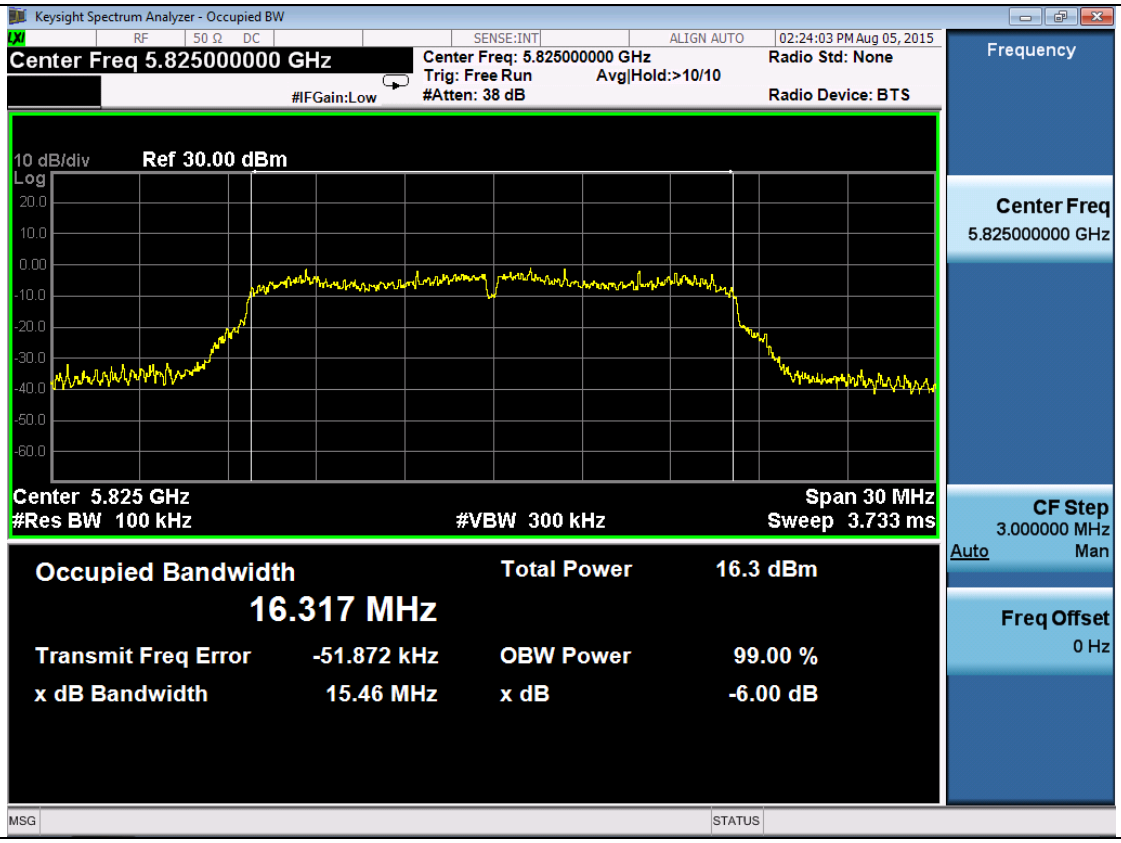
802.11a-5745



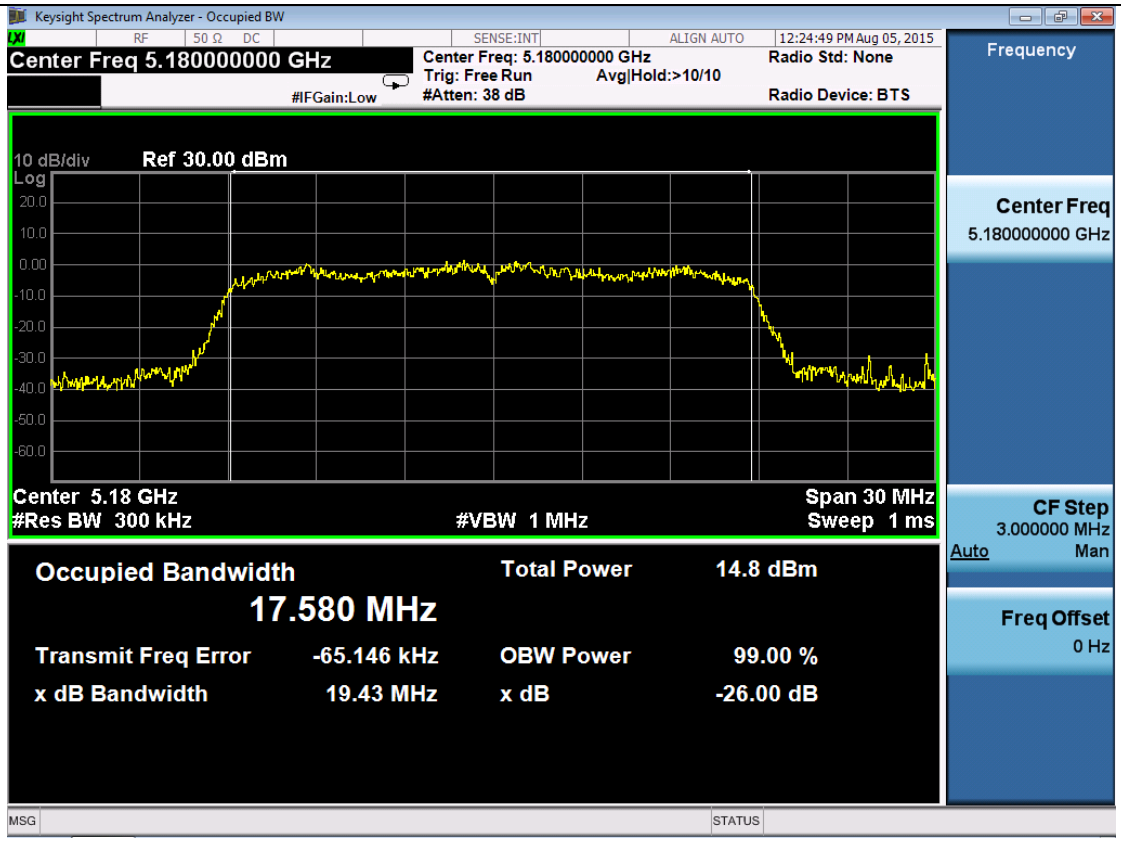
802.11a-5785

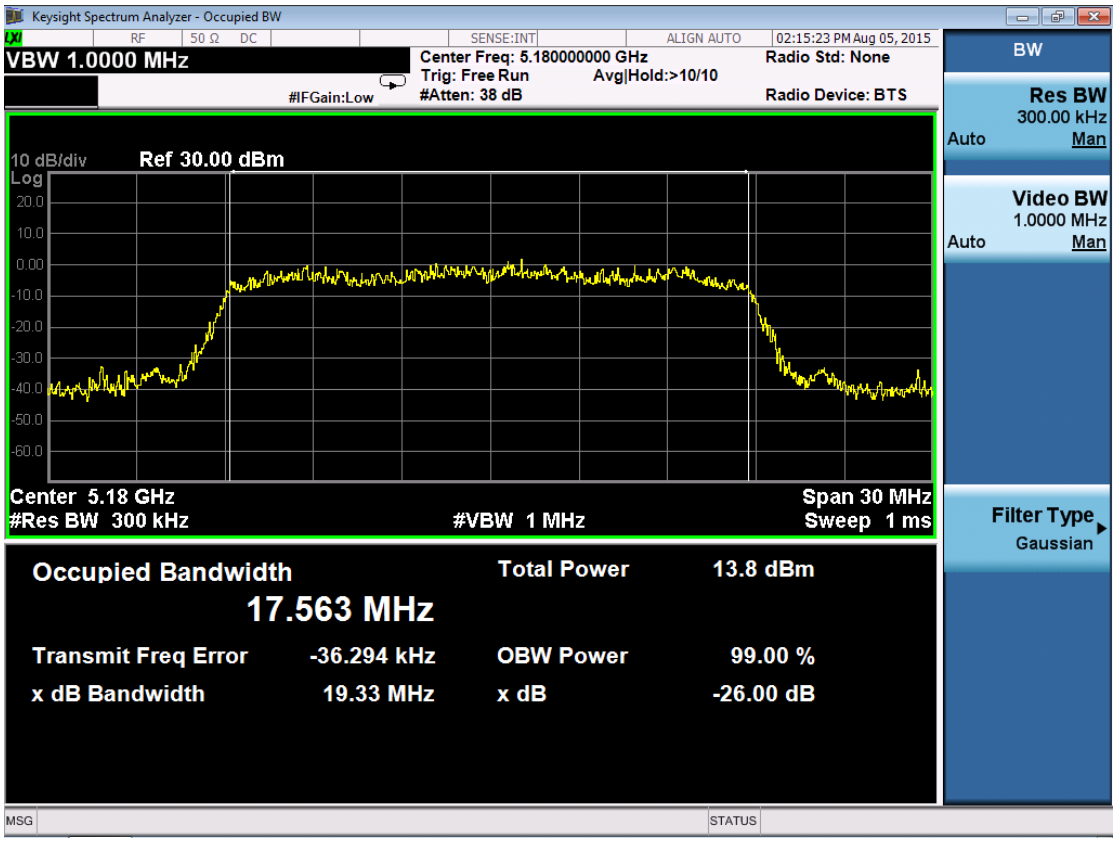


802.11a-5825

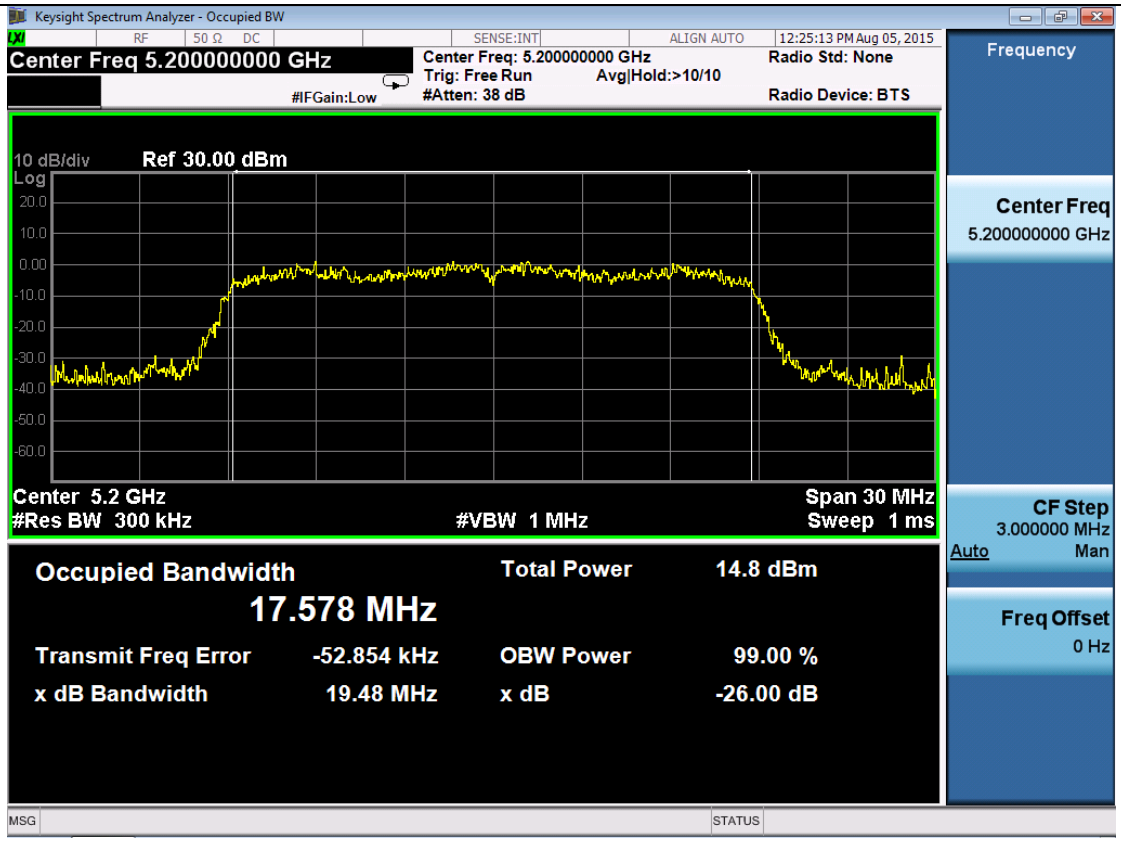


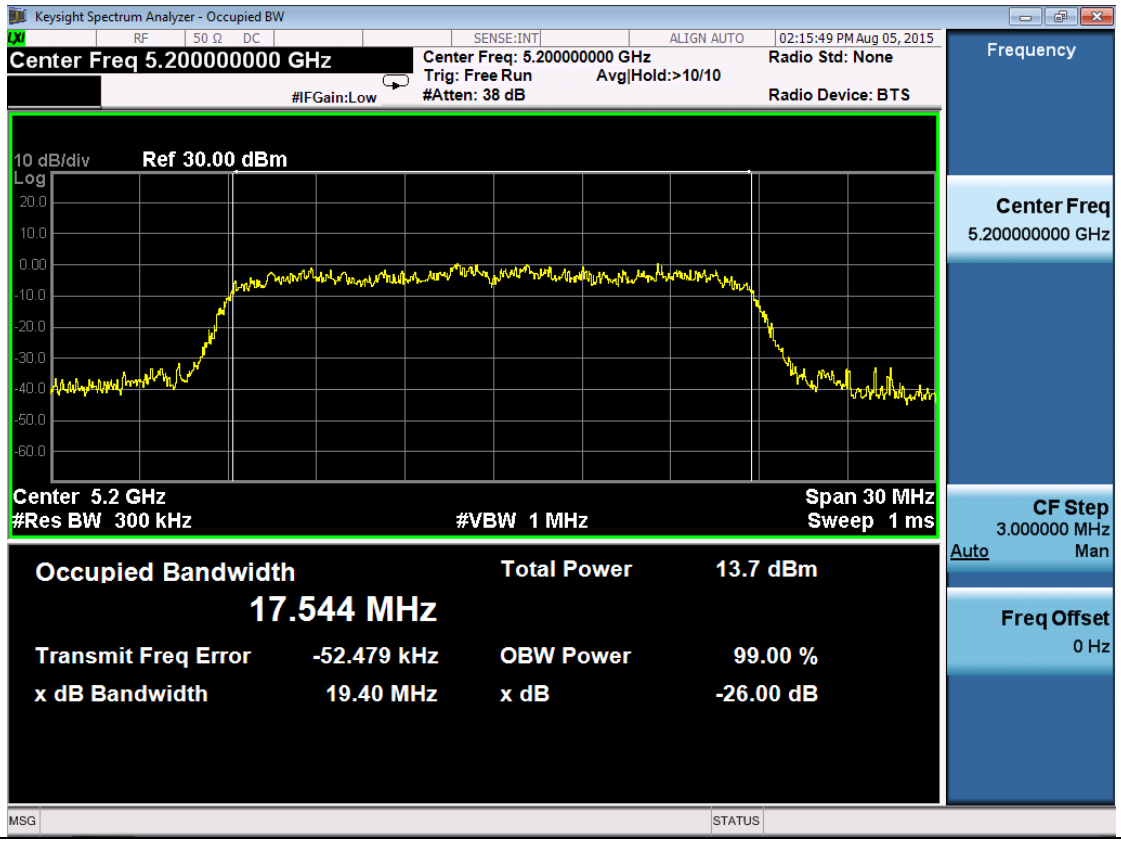
802.11n20-5180



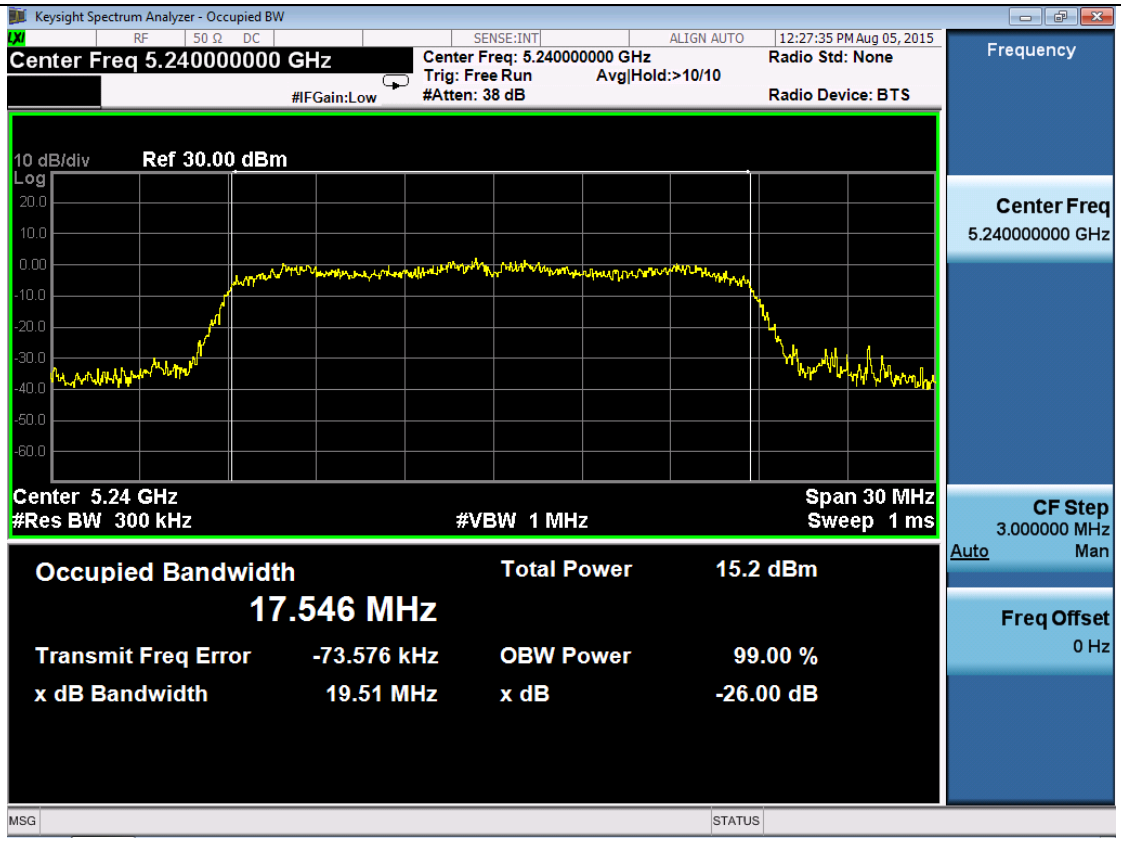


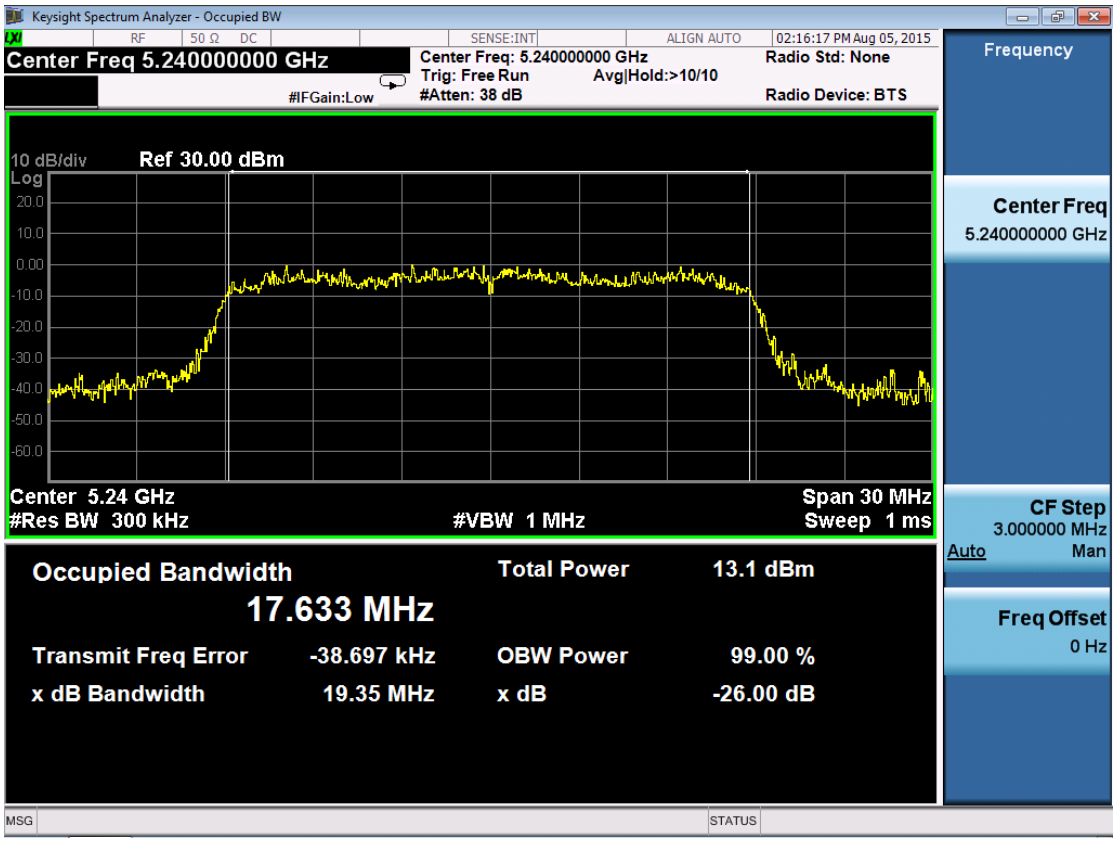
802.11 n20-5200





802.11 n20-5240





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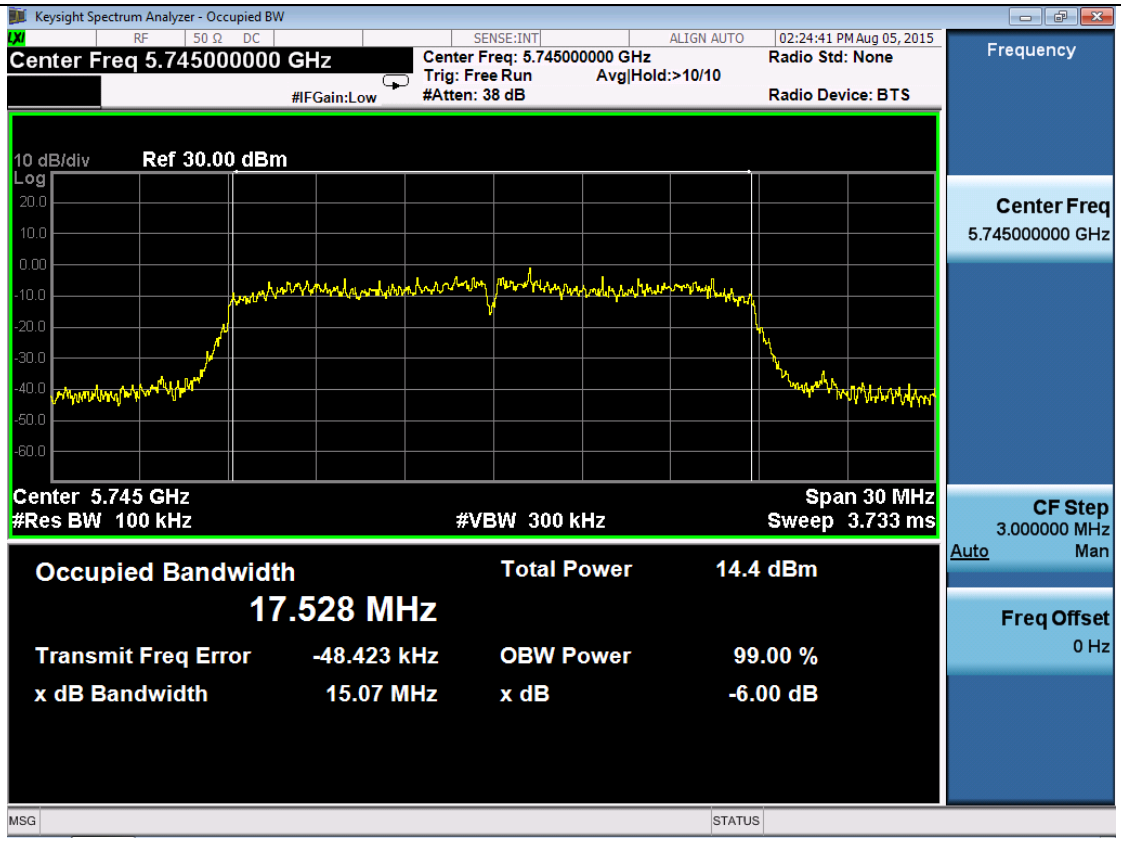

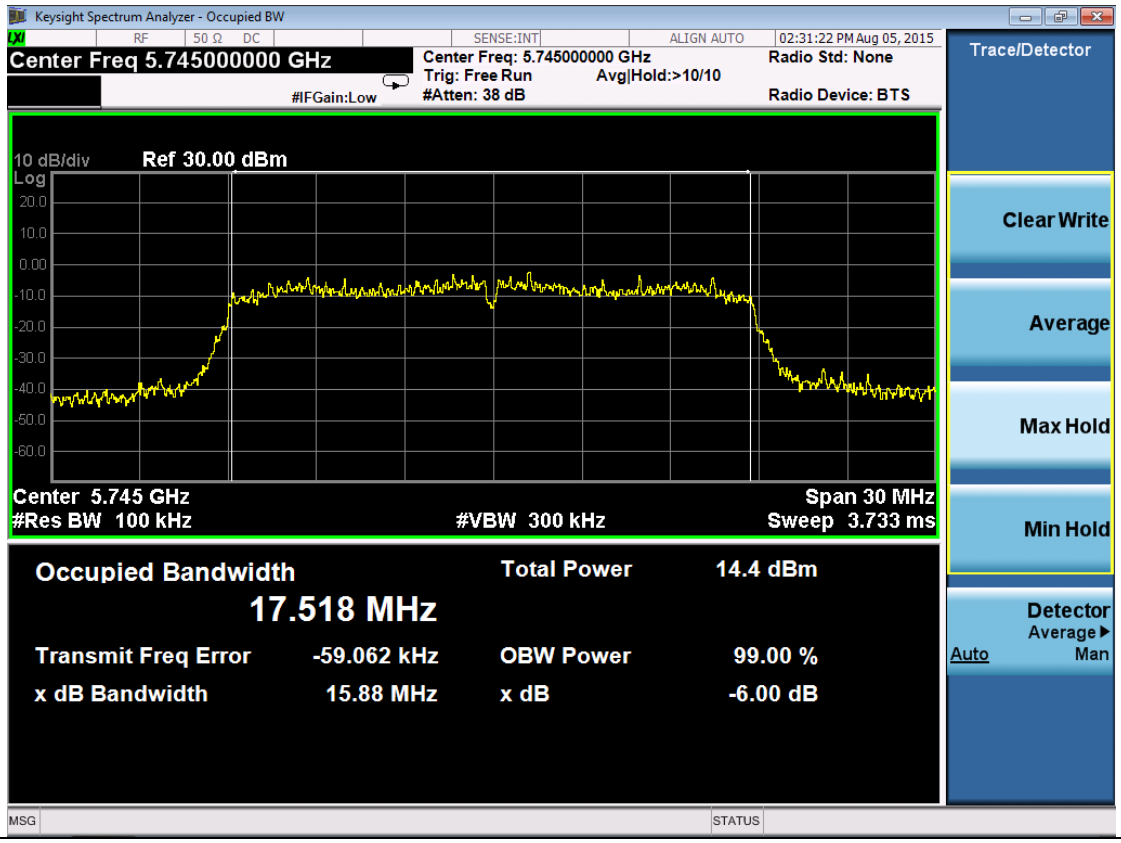

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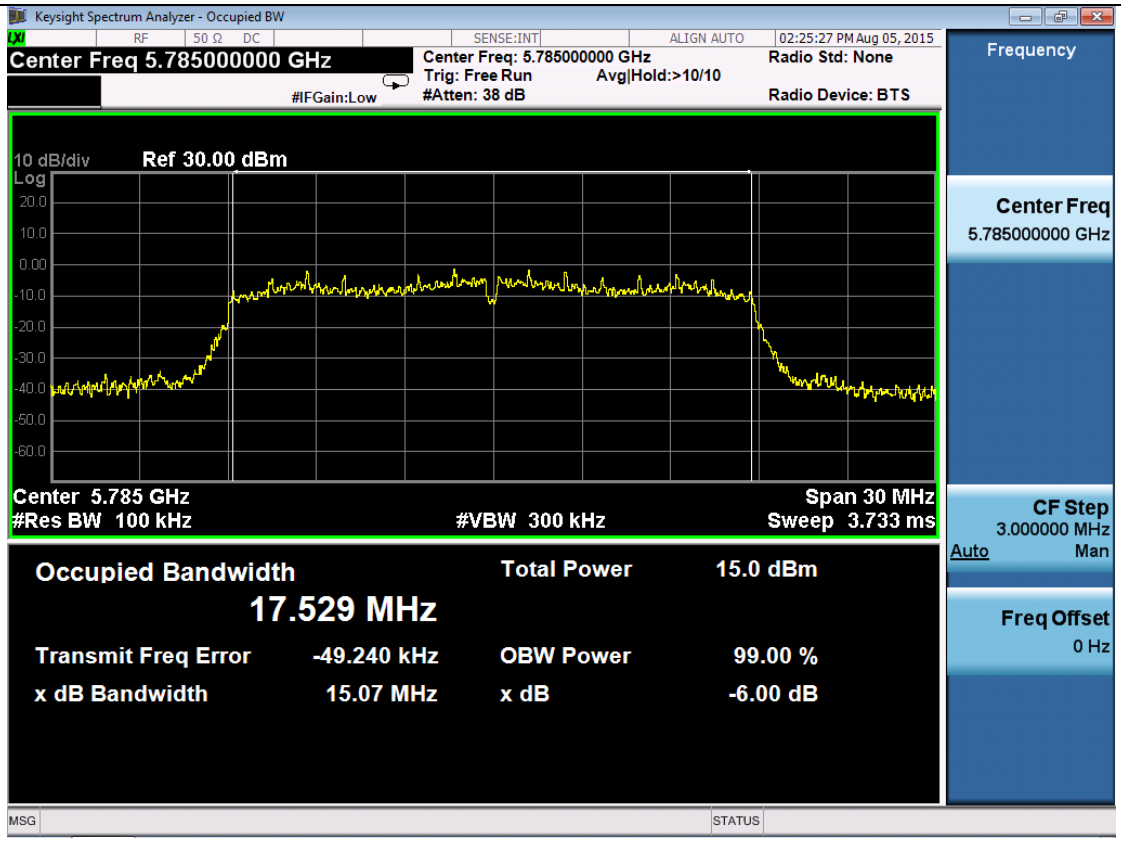

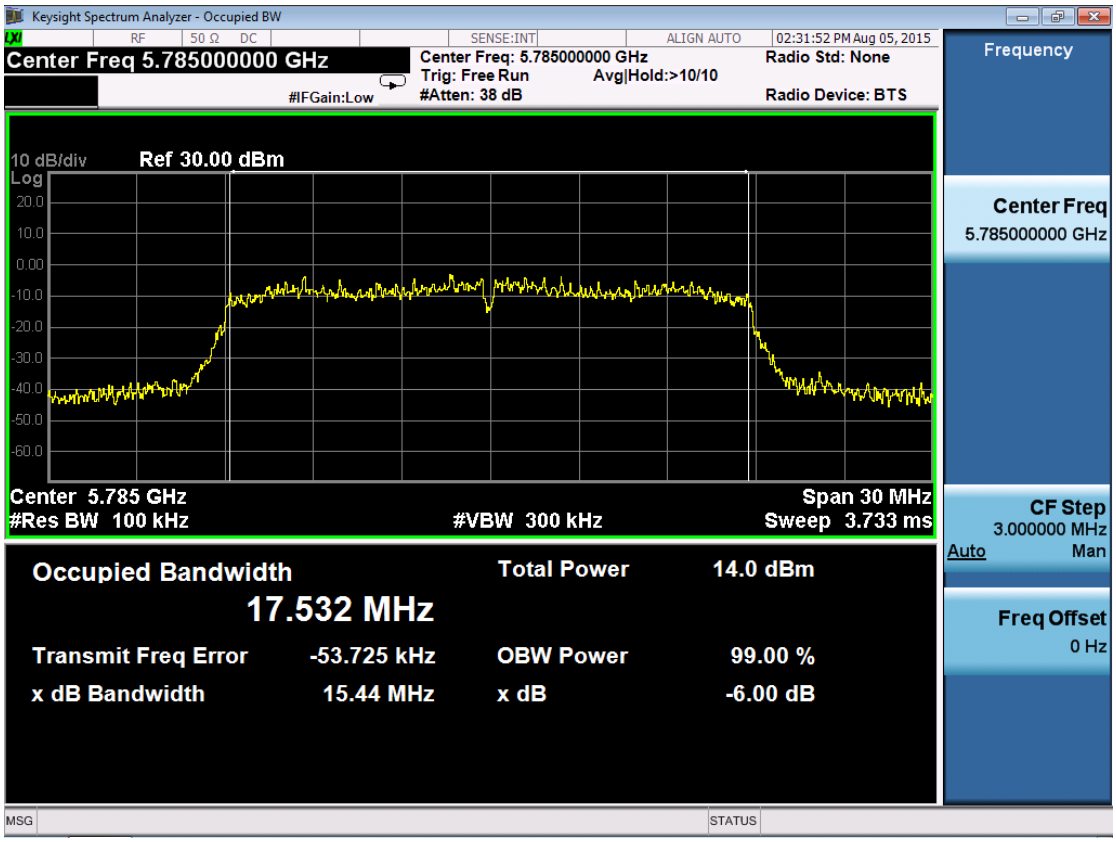

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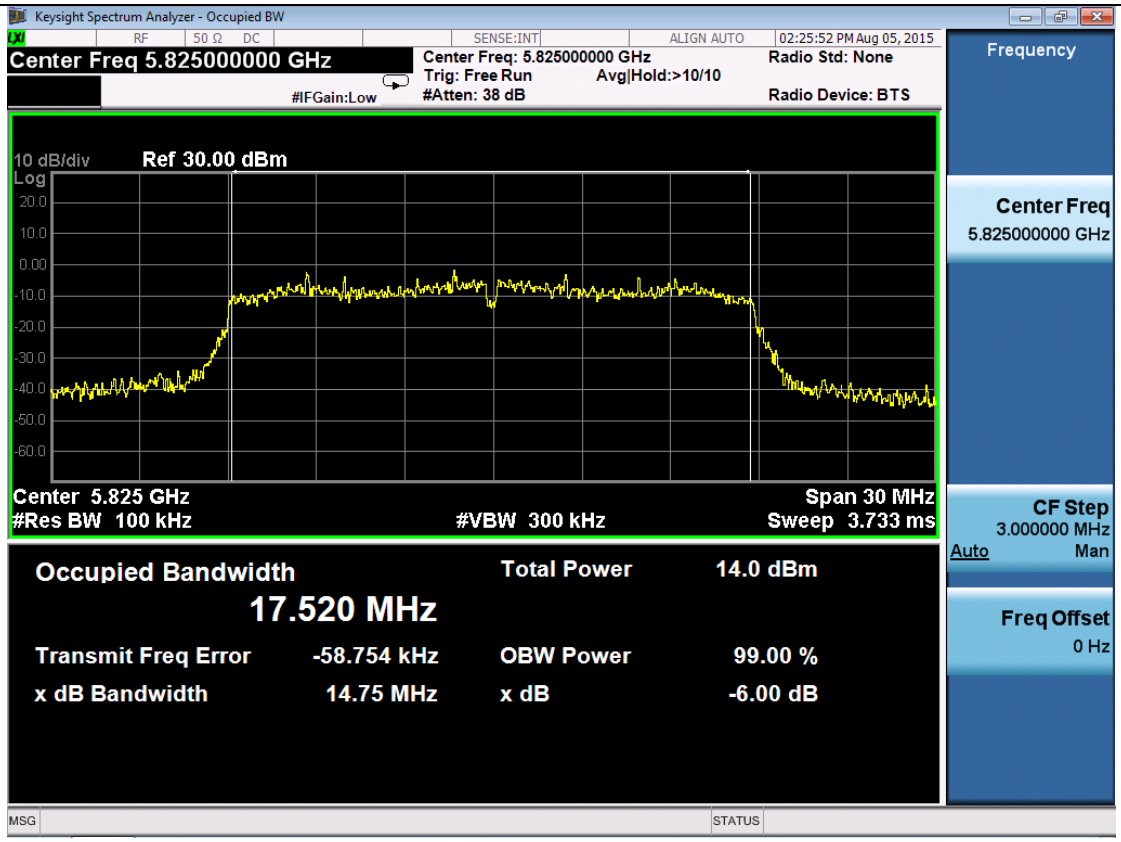

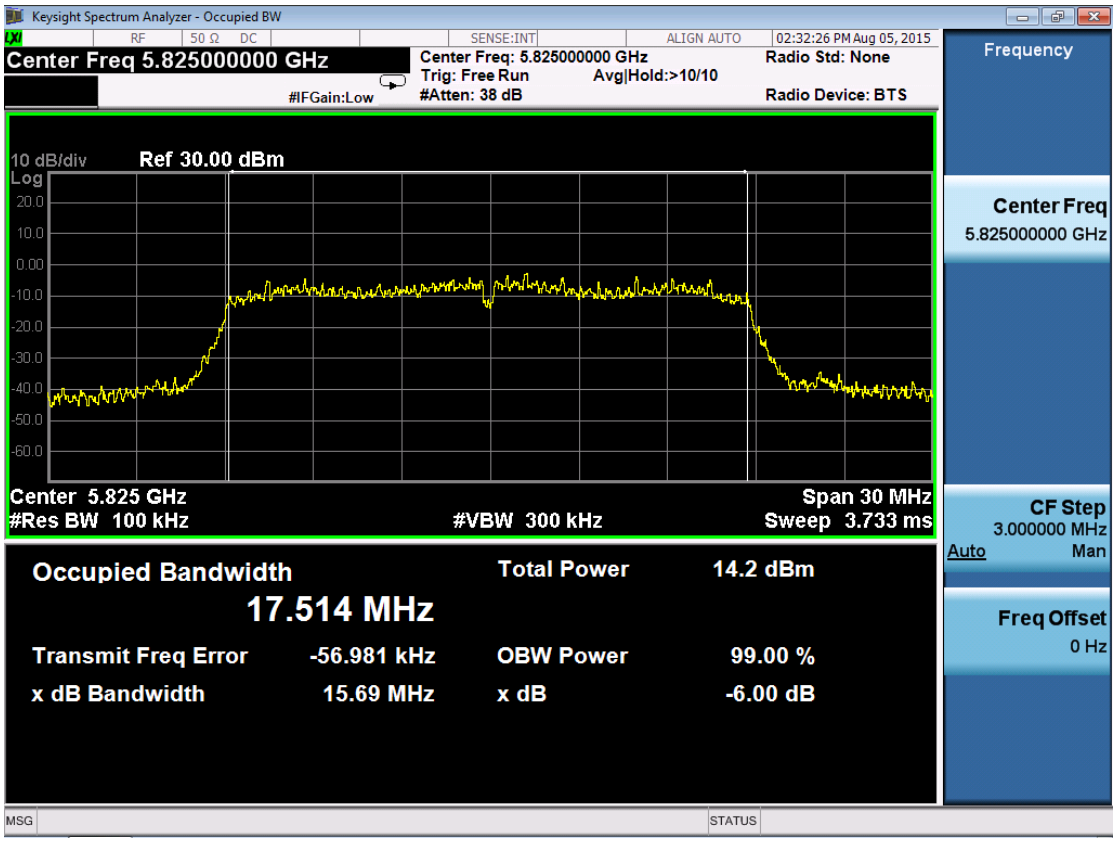

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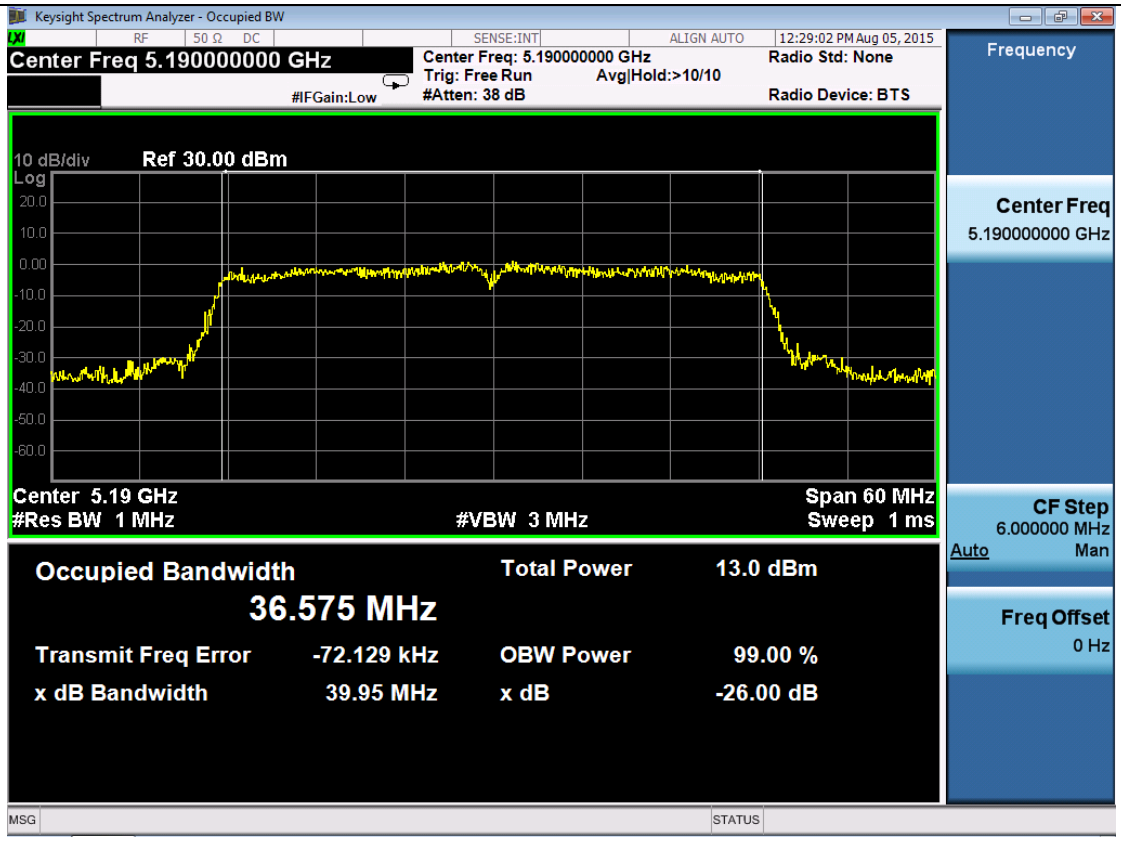
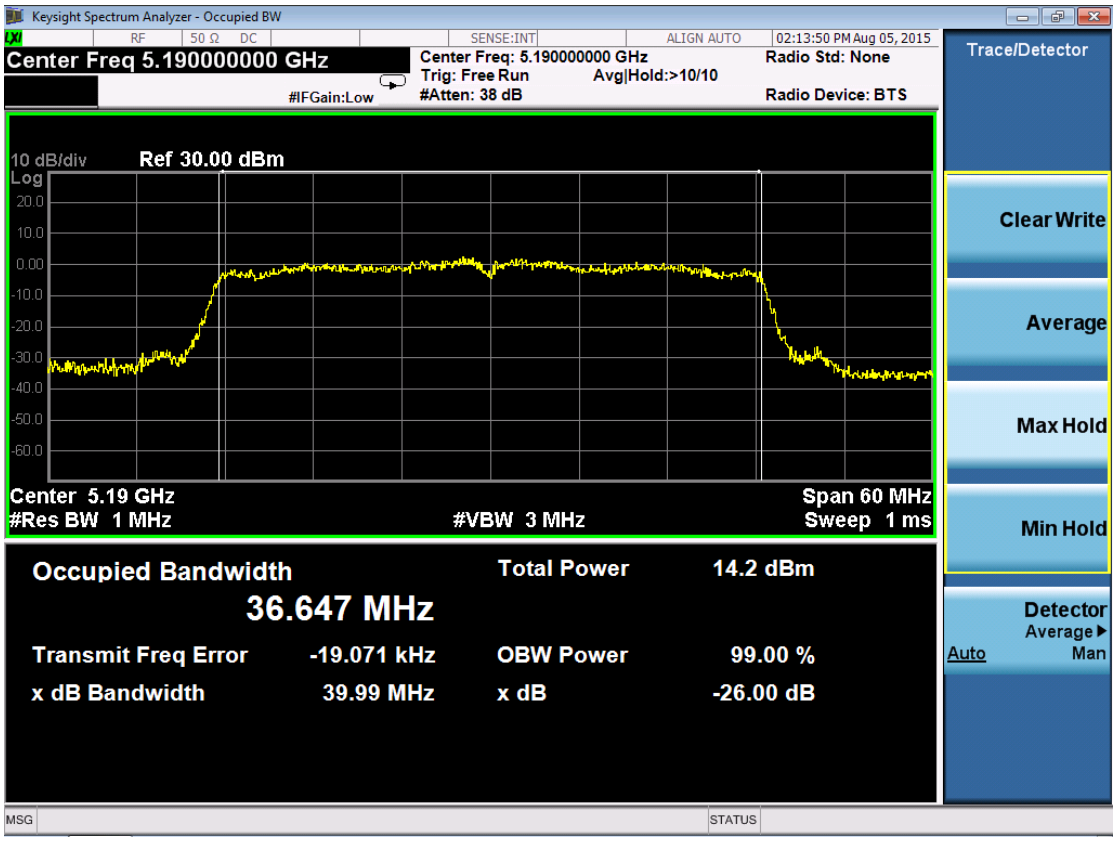
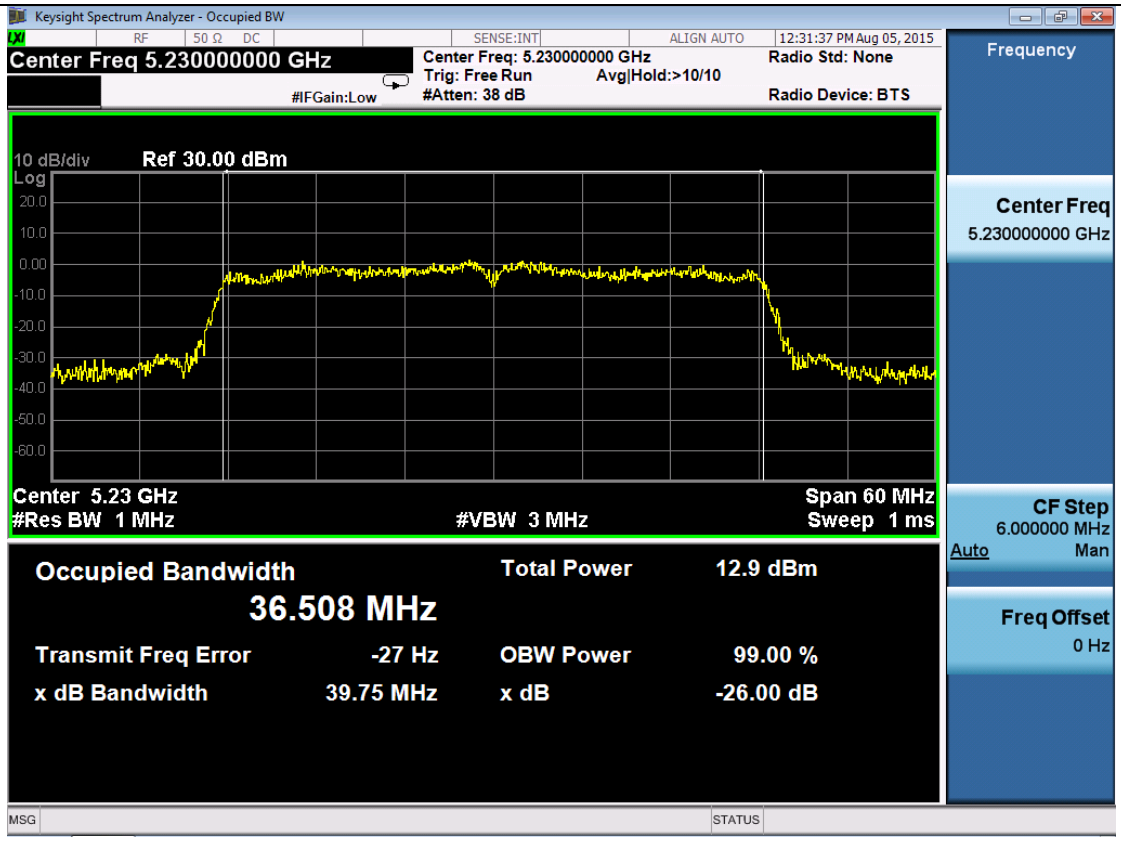
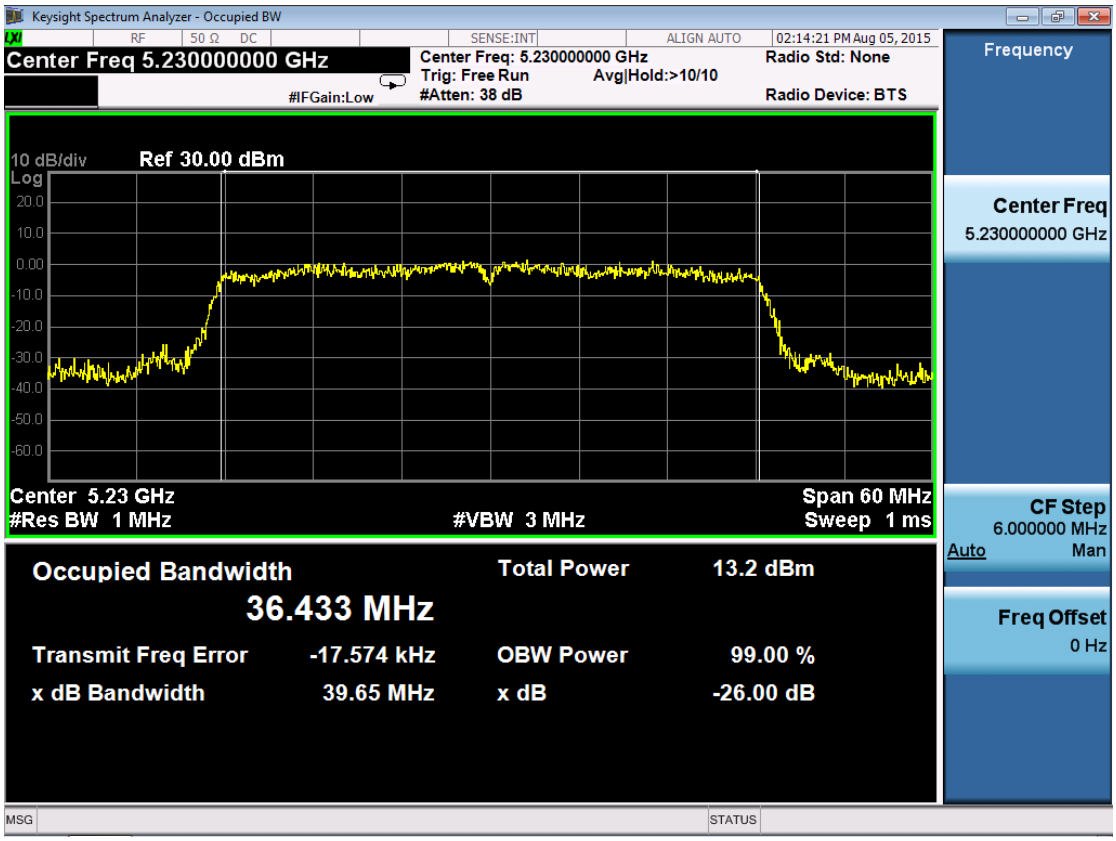




802.11n40-5230





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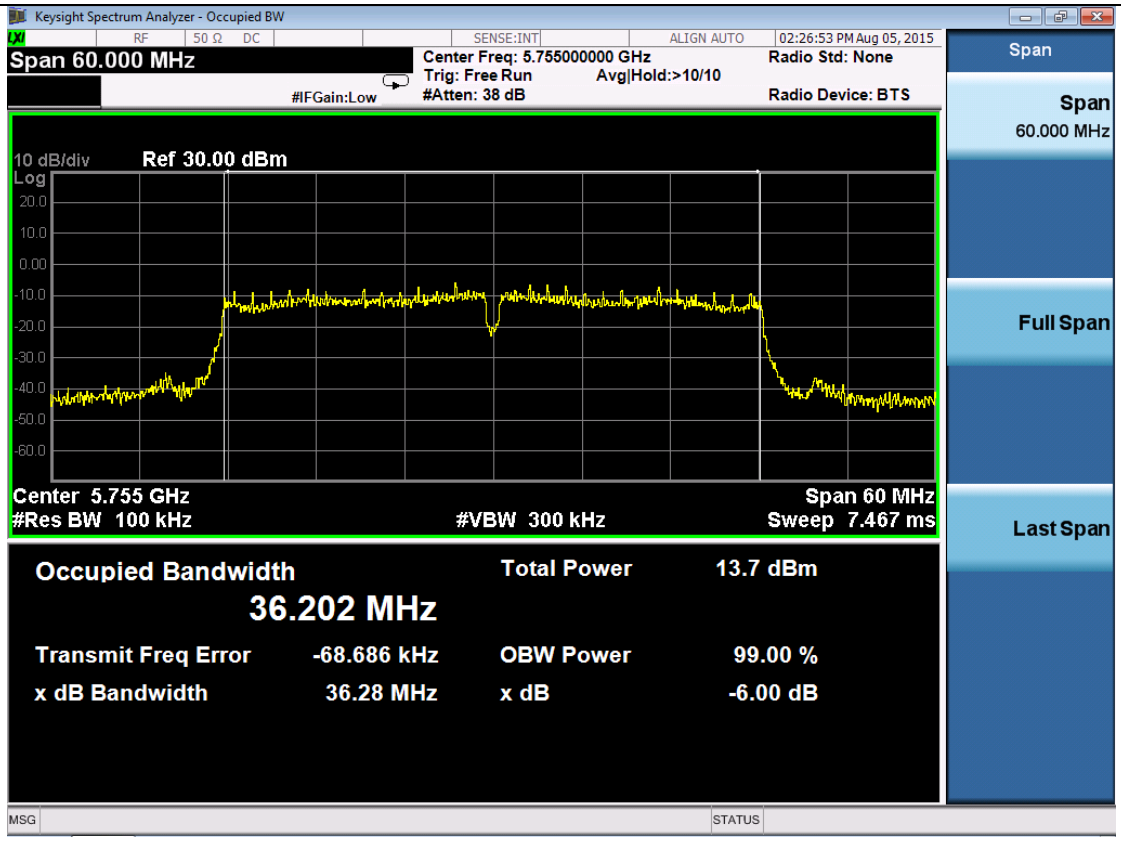

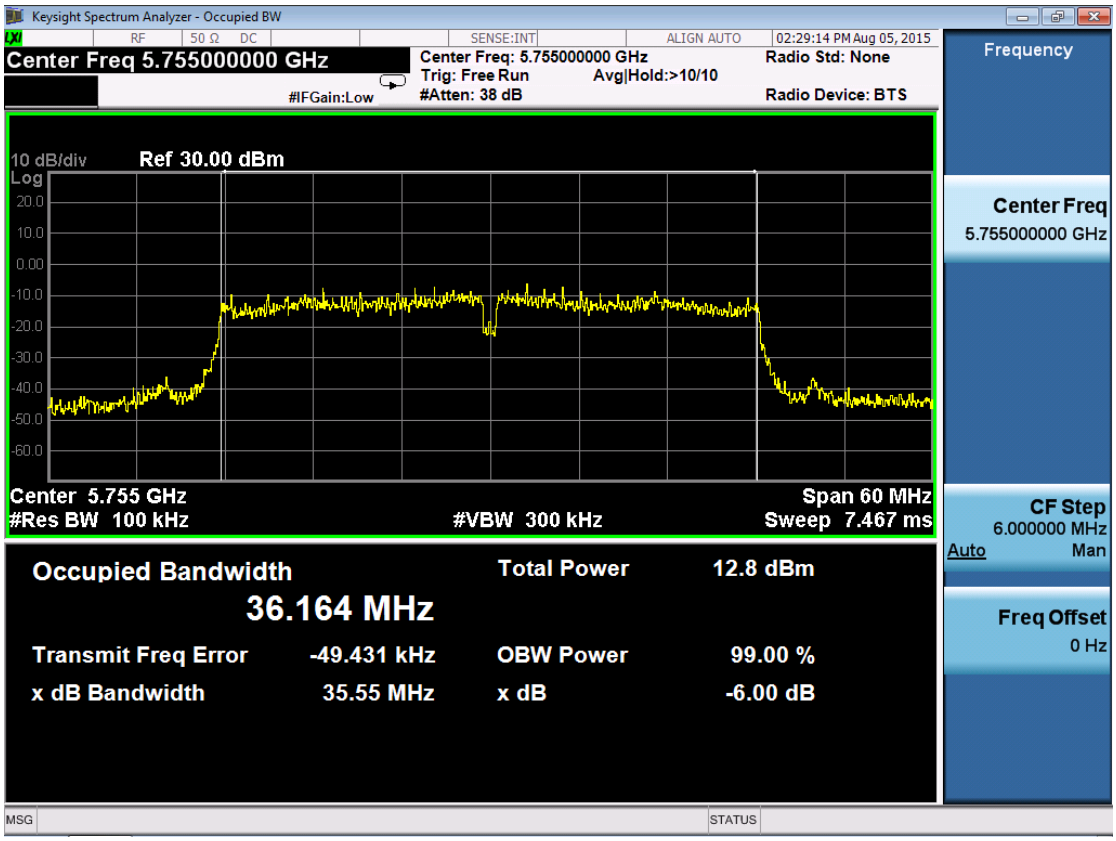

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