FCC 47 CFR PART 15 SUBPART E AND ANSI C63.10:2013 TEST REPORT

For

Moca AP cable Modem

Model: CGNVM-3589

Data Applies To : CGNVM-3580, CGNVM-3582

Issued for

Hitron Technologies,Inc.

No. 1-8,Lihsin 1st Rd.,HsinChu Science Park,HisnChu,Taiwan 300,R.O.C.

Issued by

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	06/21/2016	Initial Issue	All Page 203	Gloria Chang

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1. TEST REPORT CERTIFICATION

Applicant	：	Hitron Technologies,Inc.
Address	：	No. 1-8,Lihsin 1st Rd.,HsinChu Science Park,HisnChu,Taiwan 300,R.O.C.
Equipment Under Test	：	Moca AP cable Modem
Model	：	CGNVM-3589
Data Applies To	：	CGNVM-3580, CGNVM-3582
Tested Date	：	March 24 ~ May 09, 2016

APPLICABLE STANDARD	
Standard	**Test Result**
FCC Part 15 Subpart E AND ANSI C63.10:2013	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Sb. Lu
Sr. Engineer

Reviewed by:

Gundam Lin
Sr. Engineer

2. EUT DESCRIPTION

Product Name	Moca AP cable Modem
Model Number	CGNVM-3589
Data Applies To	CGNVM-3580, CGNVM-3582
Identify Number	T160324S01
Received Date	March 24, 2016
Frequency Range	UNII Band 1 : IEEE 802.11a, 802.11ac VHT20 Mode : 5180 MHz ~ 5240 MHz IEEE 802.11ac VHT40 Mode : 5190 MHz ~ 5230 MHz IEEE 802.11ac VHT80 Mode : 5210 MHz UNII Band 3 : IEEE 802.11a, 802.11ac VHT20 Mode : 5745 MHz ~ 5825 MHz IEEE 802.11ac VHT40 Mode : 5755 MHz ~ 5795 MHz IEEE 802.11ac VHT80 Mode : 5775 MHz
Transmit Power	For Non-beamforming : UNII Band 1 : IEEE 802.11a Mode : 24.45 dBm (0.2786W) IEEE 802.11ac VHT20 Mode : 24.74 dBm (0.2979 W) IEEE 802.11ac VHT40 Mode : 24.70 dBm (0.2951 W) IEEE 802.11ac VHT80 Mode : 16.24 dBm (0.0421 W) UNII Band 3 : IEEE 802.11a Mode : 24.39 dBm (0.2748 W) IEEE 802.11ac VHT20 Mode : 24.99 dBm (0.3155 W) IEEE 802.11ac VHT40 Mode : 24.86 dBm (0.3062 W) IEEE 802.11ac VHT80 Mode : 13.10 dBm (0.0204 W) For Beamforming : UNII Band 1 : IEEE 802.11ac VHT20 Mode : 20.71 dBm (0.1178 W) IEEE 802.11ac VHT40 Mode : 23.80 dBm (0.2399 W) IEEE 802.11ac VHT80 Mode : 16.94 dBm (0.0494 W) UNII Band 3 : IEEE 802.11ac VHT20 Mode : 22.06 dBm (0.1607 W) IEEE 802.11ac VHT40 Mode : 22.05 dBm (0.1603 W) IEEE 802.11ac VHT80 Mode : 17.26 dBm (0.0532 W)

Channel Spacing	IEEE 802.11a, 802.11ac VHT20 Mode : 20MHz IEEE 802.11ac VHT40 Mode : 40MHz IEEE 802.11ac VHT80 Mode : 80MHz
Channel Number	IEEE 802.11a, 802.11ac VHT20 Mode : 5150MHz ~ 5250MHz : 4 Channels 5725MHz ~ 5850MHz : 5 Channels IEEE 802.11ac VHT40 Mode : 5150MHz ~ 5250MHz : 2 Channels 5725MHz ~ 5850MHz : 2 Channels IEEE 802.11ac VHT80 Mode : 5150MHz ~ 5250MHz : 1 Channels 5725MHz ~ 5850MHz : 1 Channels
Transmit Data Rate	IEEE 802.11a Mode: up to 54 Mbps IEEE 802.11ac VHT20 Mode (800ns GI) : up to 312.00 Mbps IEEE 802.11ac VHT20 Mode (400ns GI) : up to 346.80 Mbps IEEE 802.11ac VHT40 Mode (800ns GI) : up to 720.00 Mbps IEEE 802.11ac VHT40 Mode (400ns GI) : up to 800.00 Mbps IEEE 802.11ac VHT80 Mode (800ns GI) : up to 1560.00 Mbps IEEE 802.11ac VHT80 Mode (400ns GI) : up to 1733.20 Mbps
Type of Modulation	IEEE 802.11a Mode : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT20/40/80 Mode : OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Type	PIFA Antenna × 4, Ant. 5 (Chain 0), Antenna Gain : 4.3 dBi Ant. 6 (Chain 1), Antenna Gain : 5.0 dBi Ant. 7 (Chain 2), Antenna Gain : 4.6 dBi Ant. 8 (Chain 3), Antenna Gain : 5.1 dBi
Power Rating	100-120Vac, 0.5A, 50-60Hz 11.1Vdc, 5Ah, 55Wh (For Battery)
Test Voltage	120Vac, 60Hz
AC Power Cord Type	Non-shielded cable, 1.8 m × 1 (Detachable)
I/O Port	RJ-45 Port × 4, RJ-11 Port × 2, USB Port × 2, Coaxial Port × 1, Power Port × 1
Signal Cable	Non-shielded RJ-45 cable, 1.5m × 1 (Detachable)

The difference of the series model

Model Number	Difference				
	MoCA	USB	Voice	Enclosure	Battery
CGNVM-3589	V	V	V	Long	V
CGNVM-3582	V	V	X	Short	X
CGNVM-3580	X	V	X	Short	X
Note： "V" means all the same and "X" means the difference.					

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *For more details, please refer to the User's manual of the EUT.*
3. *This submittal(s) (test report) is intended for FCC ID: U4P-CGNVM358 filing to comply with Section 15.207, 15.209 and 15.407 of the FCC Part 15, Subpart E Rules.*
4. *The model CGNVM-3589 was considered the main model for testing.*

3. DESCRIPTION OF TEST MODES

The EUT (Moca AP cable Modem) had been tested under operating condition.

For IEEE 802.11a, 802.11ac VHT20/VHT40/VHT80 Mode (4TX / 4RX):

Ant. 5 / Chain 0 & Ant. 6 / Chain 1 & Ant. 7 / Chain 2 & Ant. 8 / Chain 3 transmit/receive.

Mode	IEEE 802.11a	IEEE 802.11ac VHT20	IEEE 802.11ac VHT40	IEEE 802.11ac VHT80
Non-beamforming	V	V	V	V
Beamforming		V	V	V

Conducted Emission / Radiated Emission Test (Below 1 GHz)

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	TX Mode
2	Normal Operating Mode (Full Function)

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	Mode 2
	Radiated Emission	Mode 2

Remark: *Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.*

Conducted / Radiated Emission Test (Above 1 GHz)

IEEE 802.11a, 802.11ac VHT20 Mode

The EUT had been tested under operating condition.

Following channel(s) was (were) selected for the final test as listed below:

UNII Band	Channel	Frequency (MHz)
Band 1	Low	5180
	Middle	5200
	High	5240
Band 3	Low	5745
	Middle	5785
	High	5825

IEEE 802.11a Mode: 6Mbps data rate (worst case) was chosen for full testing.
IEEE 802.11ac VHT20 Mode: 6.5Mbps data rate (worst case) was chosen for full testing.

IEEE 802.11ac VHT40 Mode:

The EUT had been tested under operating condition.

Following channel(s) was (were) selected for the final test as listed below:

UNII Band	Channel	Frequency (MHz)
Band 1	Low	5190
	High	5230
Band 3	Low	5755
	High	5795

IEEE 802.11ac VHT40 Mode: 13.5Mbps data rate (worst case) was chosen for full testing.

IEEE 802.11ac VHT80 Mode

The EUT had been tested under operating condition.

Following channel(s) was (were) selected for the final test as listed below:

UNII Band	Channel	Frequency (MHz)
Band 1	Low	5210
Band 3	Low	5775

IEEE 802.11ac VHT80 Mode: 29.3 Mbps data rate (worst case) was chosen for full testing.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10:2013 and FCC CFR 47, 15.207, 15.209 and 15. 407.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.989-1, Wenshan Rd., Shangshan Village,
Qionglin Township, Hsinchu County 30741, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.10:2013 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5.

5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Taiwan	TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	INDUSTRY CANADA
Japan	VCCI
Taiwan	BSMI
USA	FCC MRA

Copies of granted accreditation certificates are available for downloading from our web site, http:///www.ccsrf.com

Remark: *FCC Designation Number TW1027.*

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 30 to 1000 MHz	+/- 3.97
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 1 to 18GHz	+/- 3.58
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 26 to 40 GHz	+/- 3.81
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
Consistent with industry standard (e.g. CISPR 22, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.
The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.
1	Notebook PC	TOSHIBA	PORTEGE R30-A	1E101235H
2	Notebook PC	TOSHIBA	PORTEGE R30-A	4E087535H
3	Notebook PC	TOSHIBA	PORTEGE R30-A	7F097011H
4	Notebook PC	TOSHIBA	PORTEGE R30-A	7F097009H
5	CMTS	ARRIS	C3 CMTS DOCSIS2. OS/N 5157 5186	---
6	Telephone	Panasonic	KX-TS500MXW	4CCLL563640
7	Telephone	Panasonic	KX-TS500MXW	4CCLL563636
8	USB	Kingston	DTSE9	---
9	USB	Kingston	DTSE9	---

No.	Signal Cable Description
1	Non-shielded RJ-45 cable, 10m × 2
2	Non-shielded RJ-45 cable, 1.5m × 2
3	Shielded coaxial cable, 10m × 1
4	Non-shielded RJ-11 cable, 1m × 2

Battery :

Manufacturer	Model No.	Power Rating
GETAC TECH CORP.	HM32 3S2P Battery Pack (PoHS)	11.1Vdc, 5Ah, 55Wh

SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

EUT OPERATING CONDITION

1. EUT & peripherals setup diagram is shown in appendix setup photos.
2. TX Mode:

⇨ **TX Data Rate:** 6Mbps Bandwidth 20 (IEEE 802.11a Mode)
6.5Mbps Bandwidth 20 (IEEE 802.11ac VHT20 Mode)
13.5Mbps Bandwidth 40 (IEEE 802.11ac VHT40 Mode)
29.3 Mbps Bandwidth 80 (IEEE 802.11ac VHT80 Mode)

⇨ **Power control (Non-Beamforming)**

IEEE 802.11a Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5180	0/1/2/3	14.5
	Middle	5200	0/1/2/3	14
	High	5240	0/1/2/3	14.5
Band 3	Low	5745	0/1/2/3	11
	Middle	5785	0/1/2/3	15.5
	High	5825	0/1/2/3	15.5

IEEE 802.11ac VHT20 Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5180	0/1/2/3	14.5
	Middle	5200	0/1/2/3	14.5
	High	5240	0/1/2/3	15
Band 3	Low	5745	0/1/2/3	11.5
	Middle	5785	0/1/2/3	16.5
	High	5825	0/1/2/3	14.5

IEEE 802.11ac VHT40 Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5190	0/1/2/3	8
	High	5230	0/1/2/3	14
Band 3	Low	5755	0/1/2/3	4
	High	5795	0/1/2/3	16

IEEE 802.11ac VHT80 Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5210	0/1/2/3	6
Band 3	Low	5775	0/1/2/3	4

⇨ **Power control (Beamforming)**

IEEE 802.11ac VHT20 Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5180	0/1/2/3	22
	Middle	5200	0/1/2/3	25
	High	5240	0/1/2/3	25
Band 3	Low	5745	0/1/2/3	25
	Middle	5785	0/1/2/3	25
	High	5825	0/1/2/3	25

IEEE 802.11ac VHT40 Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5190	0/1/2/3	20.5
	High	5230	0/1/2/3	25
Band 3	Low	5755	0/1/2/3	22.5
	High	5795	0/1/2/3	25

IEEE 802.11ac VHT80 Mode

UNII Band	Channel	Frequency (MHz)	Chain	Power Set
Band 1	Low	5210	0/1/2/3	19
Band 3	Low	5775	0/1/2/3	20

3. All of the functions are under run.
4. Start test.

Normal Mode :

1. EUT & peripherals setup diagram is shown in appendix setup photos.
2. Turn on the power of all equipments.
3. EUT RJ-45 port link to Notebook PC 1(DHCP).
4. EUT RJ-45 port link to Notebook PC 2(DHCP).
5. EUT link to Notebook PC 3 with WiFi 2.4G.
6. EUT link to Notebook PC 4 with WiFi 5G.
7. EUT coaxial port link to CMTS.
8. Notebook PC 1/2/3/4 ping CMTS IP 192.168.10.254.
9. Telnet EUT 192.168.0.1 set telephone voice on.
10. All of the functions are under run.
11. Start test.

7. FCC PART 15.407 REQUIREMENTS

7.1 DUTY CYCLE MEASUREMENT

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Non-beamfoming	Temp. & Humidity	25°C, 53%

Mode	TX on (ms)	TX on + off (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
IEEE 802.11a	2.065	2.134	96.77	0.14	0.484
IEEE 802.11ac VHT20	5.010	5.082	98.58	0.06	0.010
IEEE 802.11ac VHT40	2.429	2.499	97.20	0.12	0.412
IEEE 802.11ac VHT80	2.064	2.134	96.72	0.14	0.484

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Beamfoming	Temp. & Humidity	25°C, 53%

Mode	TX on (ms)	TX on + off (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
IEEE 802.11ac VHT20	1.838	2.011	91.40%	0.39	0.544
IEEE 802.11ac VHT40	1.929	2.109	91.47%	0.39	0.518
IEEE 802.11ac VHT80	1.627	1.816	89.59%	0.48	0.615

7.2 6dB BANDWIDTH

LIMITS

According to§ 15.407 (e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/15/2017
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Non-beamforming	Temp. & Humidity	25°C, 53%

IEEE 802.11a Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5745	15.75	16.34	16.05	16.34	500
	Middle	5785	16.25	16.45	16.42	16.27	500
	High	5825	15.92	16.53	15.51	16.02	500

IEEE 802.11ac VHT20 Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5745	17.60	17.58	17.58	17.60	500
	Middle	5785	17.70	17.69	17.60	17.58	500
	High	5825	17.66	17.57	17.59	17.66	500

IEEE 802.11ac VHT40 Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5755	36.31	35.67	35.33	36.29	500
	High	5795	33.02	36.18	36.32	36.03	500

IEEE 802.11ac VHT80 Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5745	74.80	72.74	75.68	58.78	500

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/14
Test Mode	TX Mode / Beamforming	Temp. & Humidity	24°C, 65%

IEEE 802.11ac VHT20 Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5745	17.63	17.66	17.56	17.66	500
	Middle	5785	16.54	17.57	17.27	17.58	500
	High	5825	17.65	17.63	16.61	17.48	500

IEEE 802.11ac VHT40 Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5755	36.33	36.33	36.31	35.06	500
	High	5795	36.06	36.30	35.03	36.32	500

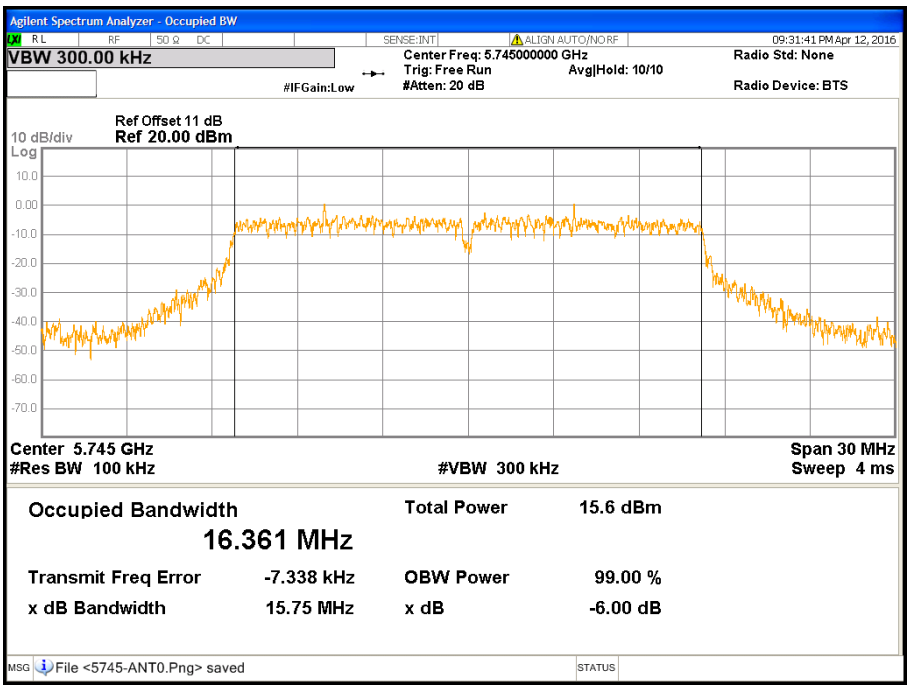
IEEE 802.11ac VHT80 Mode (4TX)

UNII Band	Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
Band 3	Low	5745	71.58	70.66	73.84	73.74	500

6dB BANDWIDTH

Non-beamforming

CH Low (IEEE 802.11a Mode / Band 3 / Chain 0)



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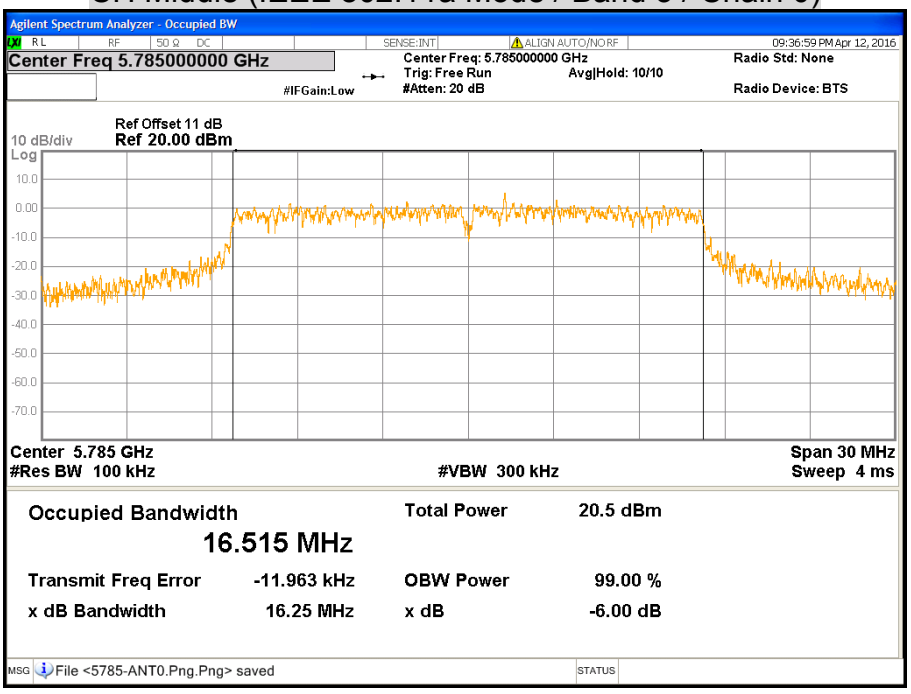

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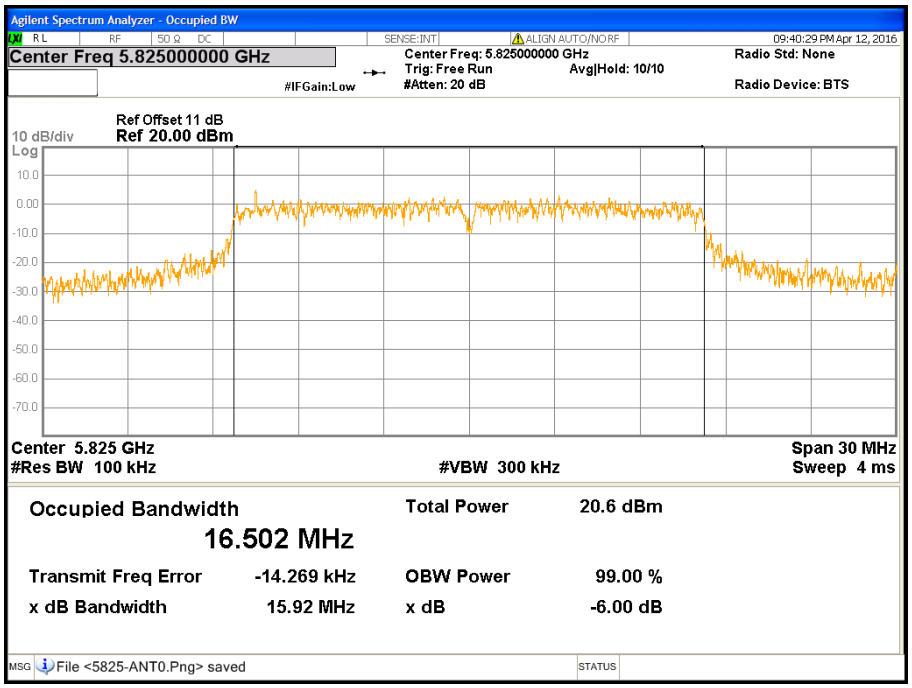

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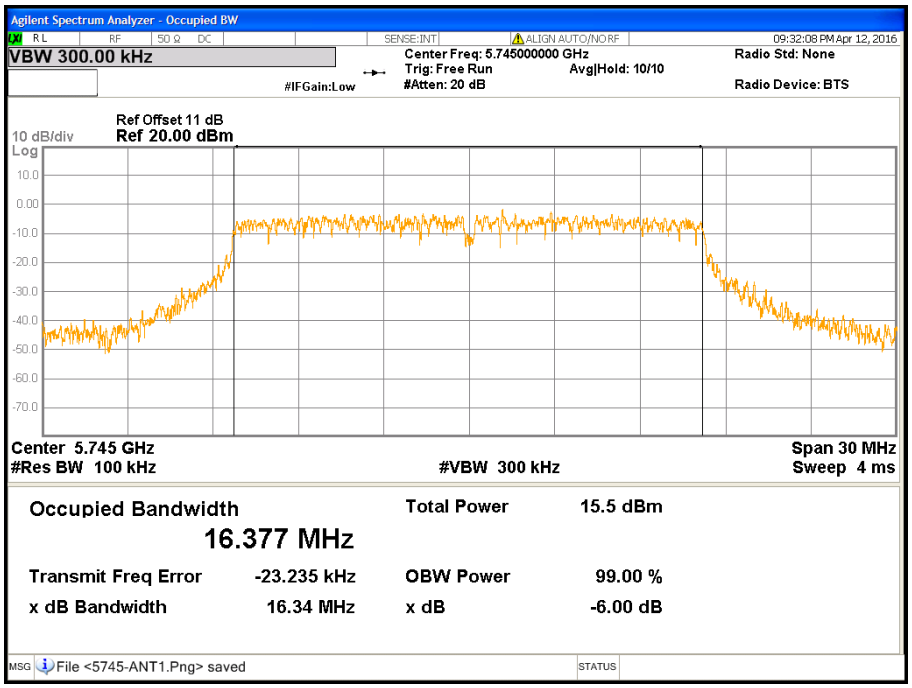

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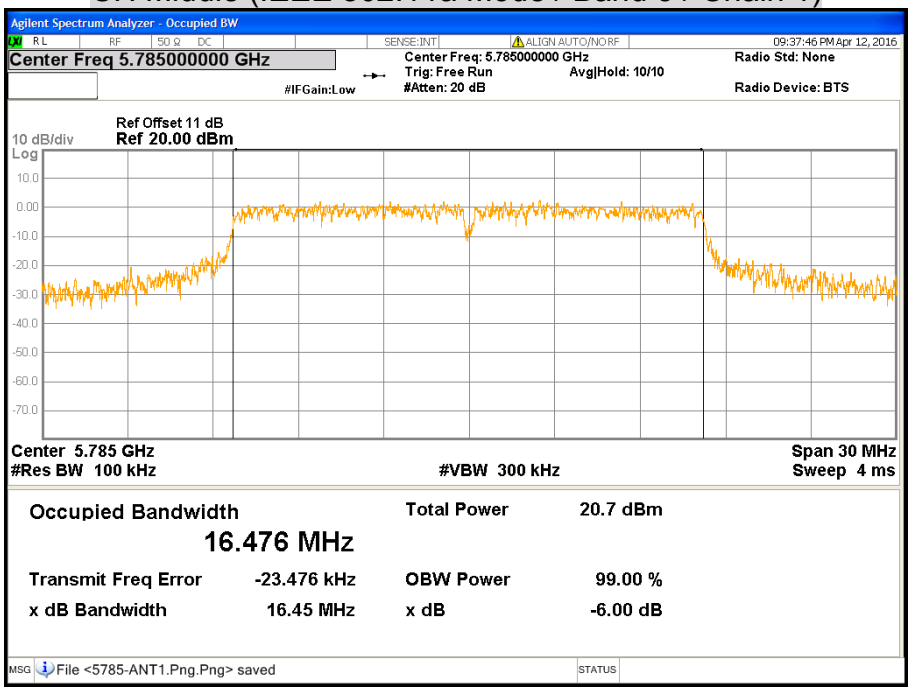

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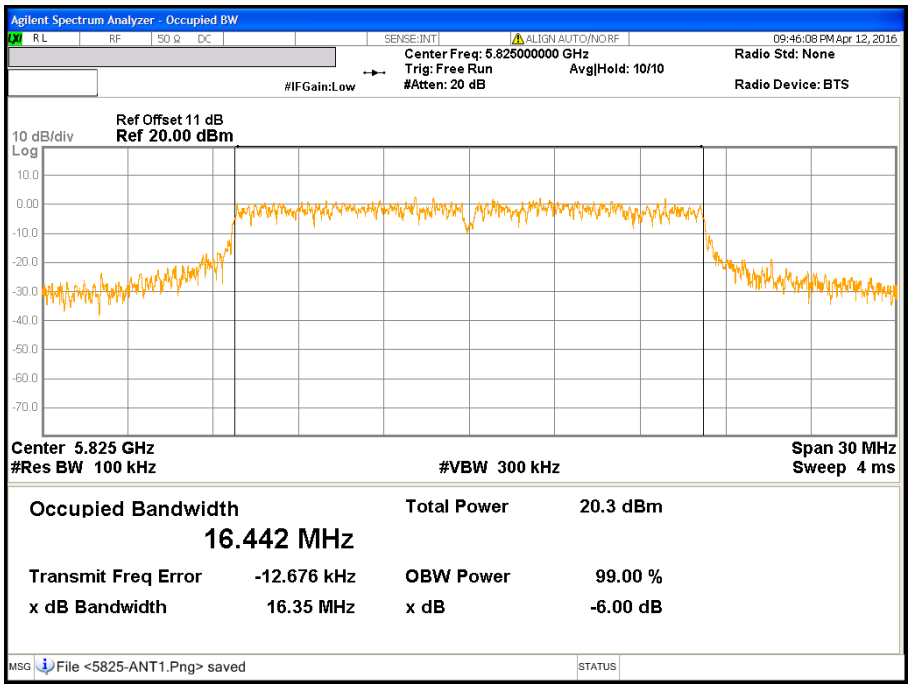

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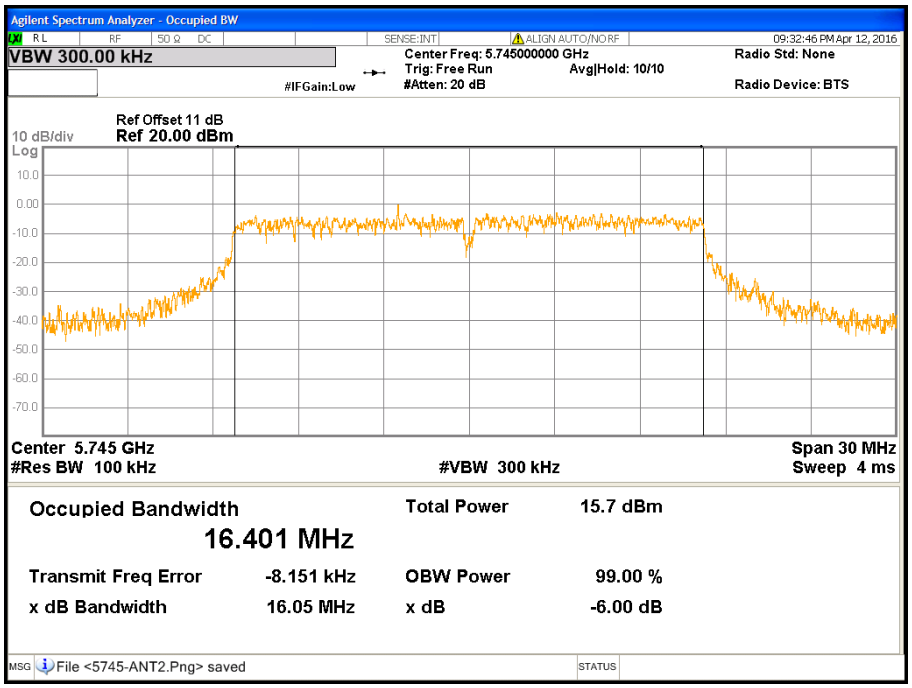

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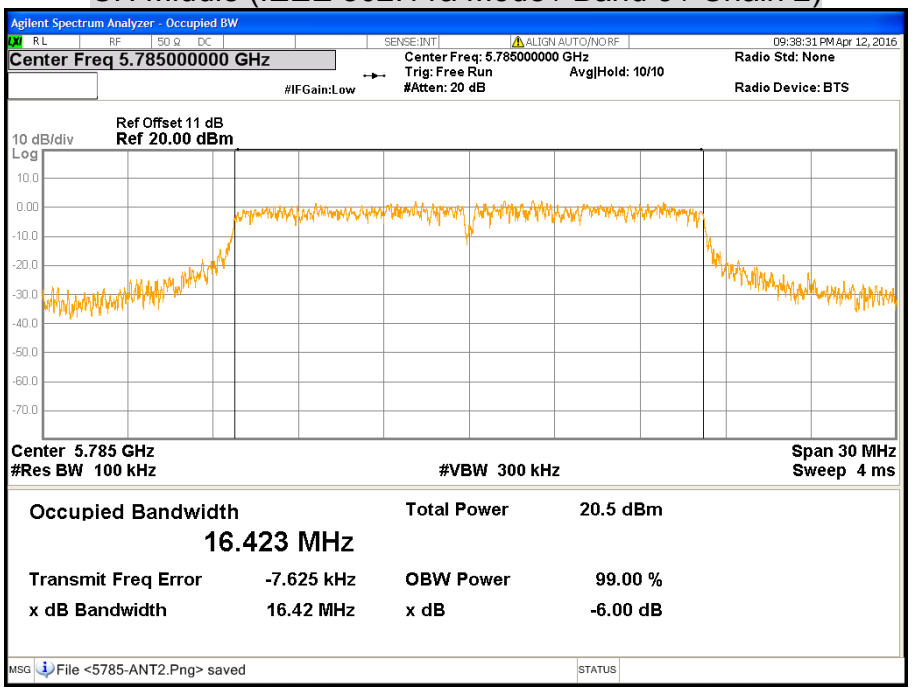

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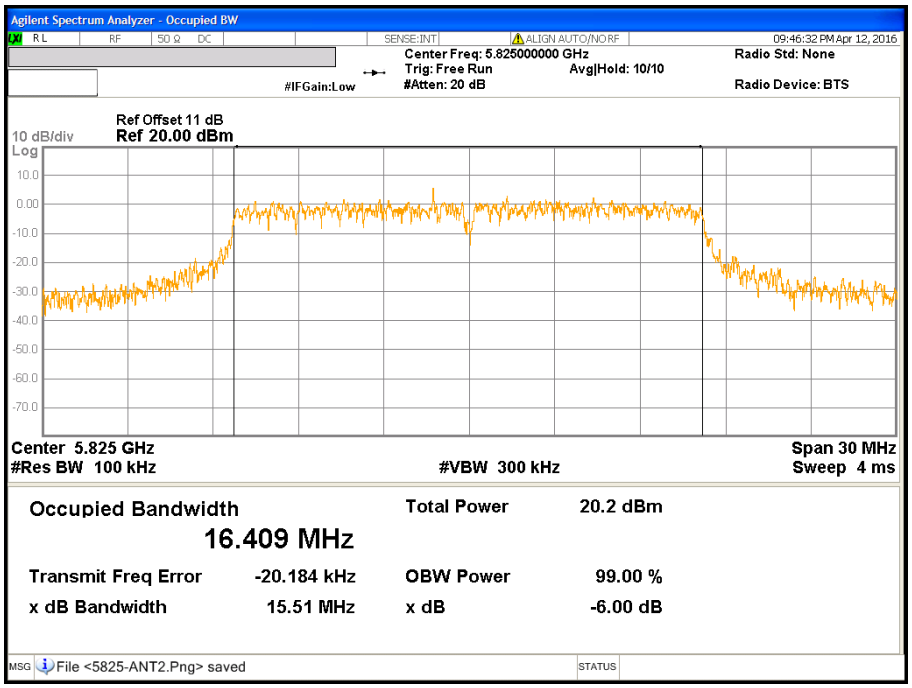

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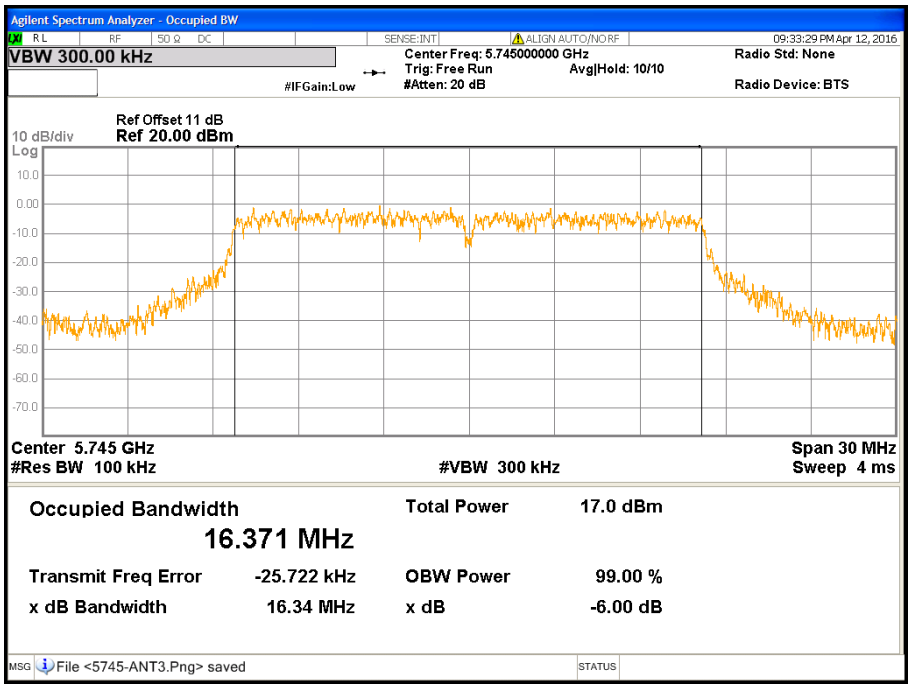
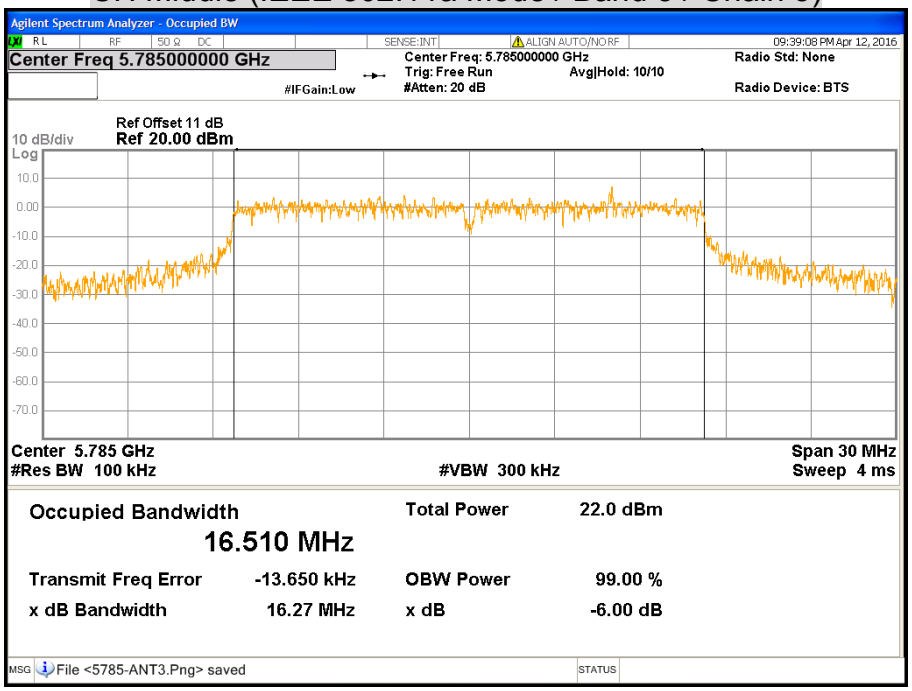
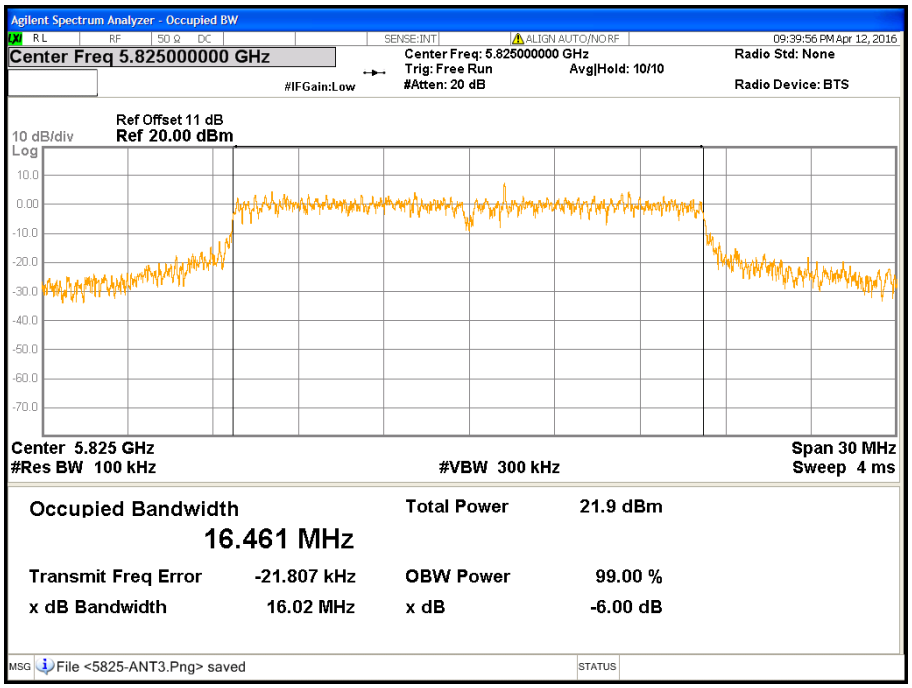


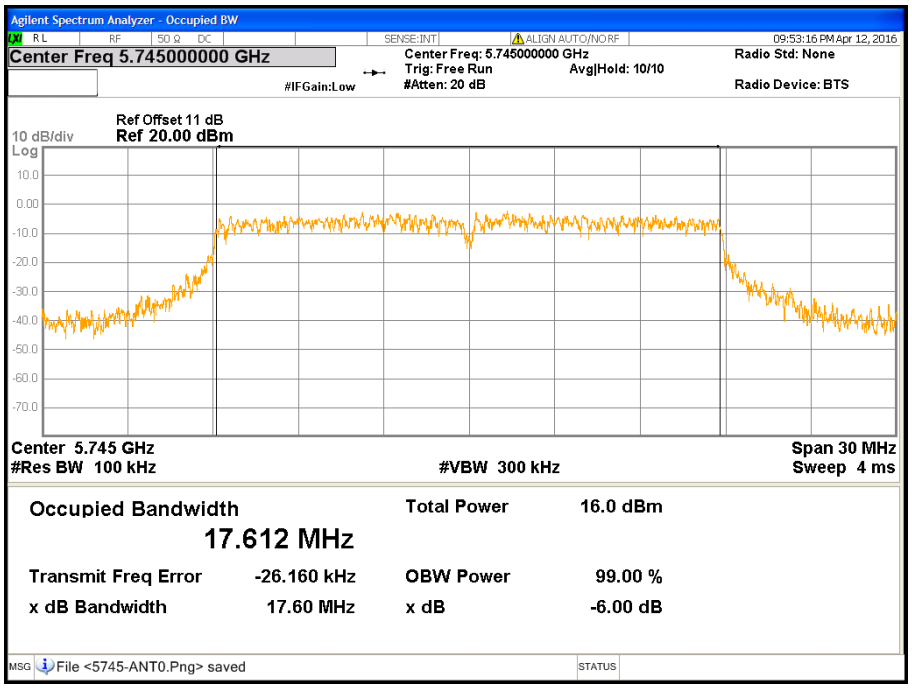
CH Middle (IEEE 802.11a Mode / Band 3 / Chain 3)



CH High (IEEE 802.11a Mode / Band 3 / Chain 3)



CH Low (IEEE 802.11ac VHT20 Mode / Band 3 / Chain 0)



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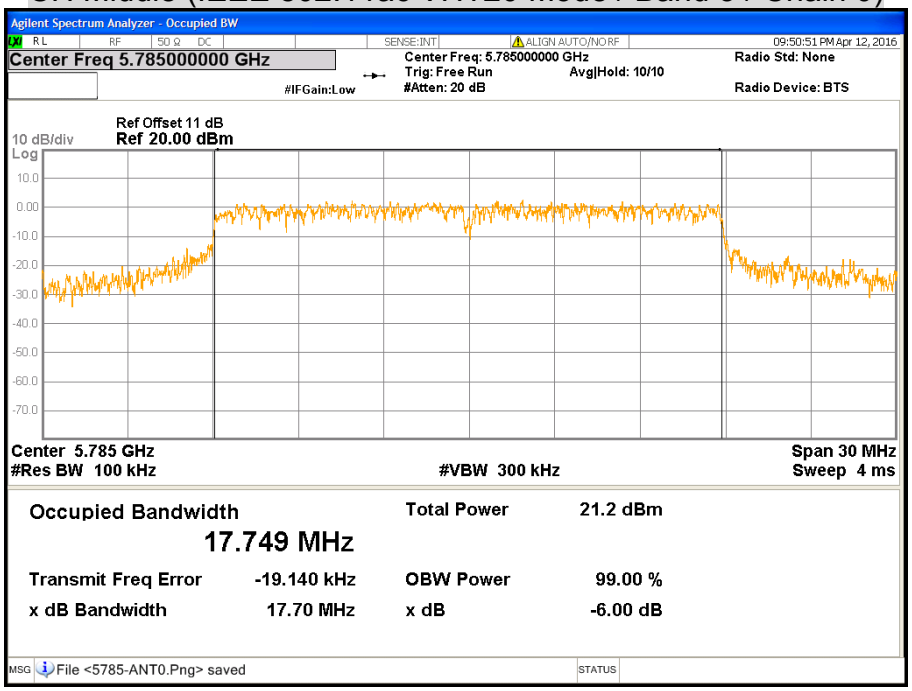

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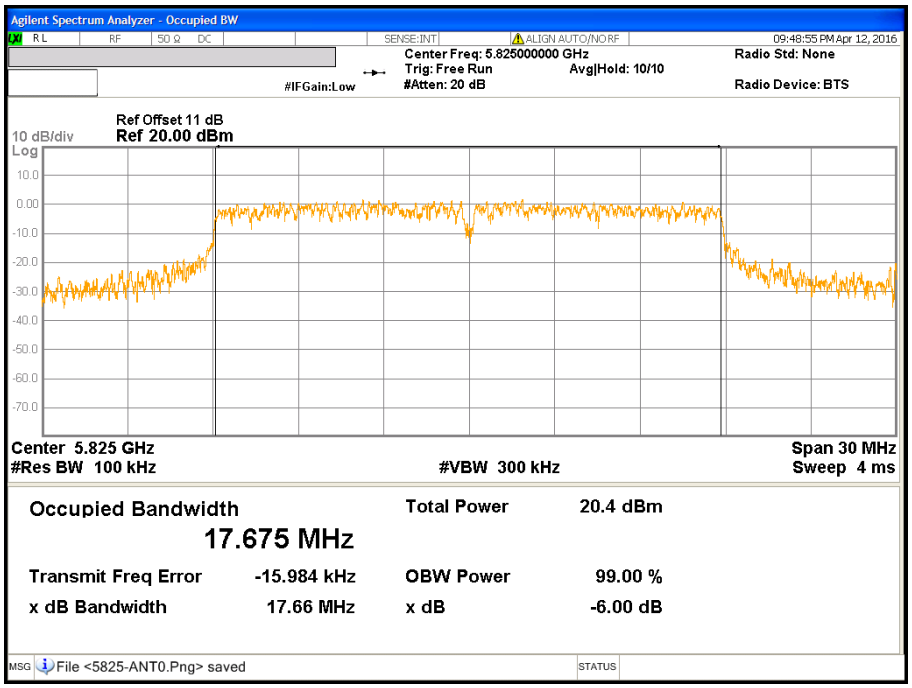

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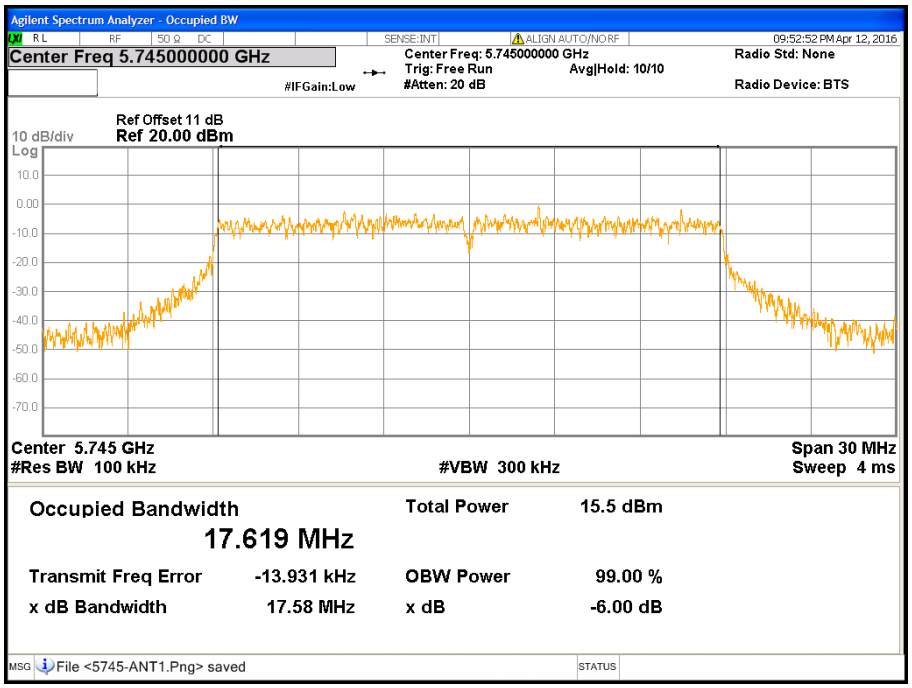

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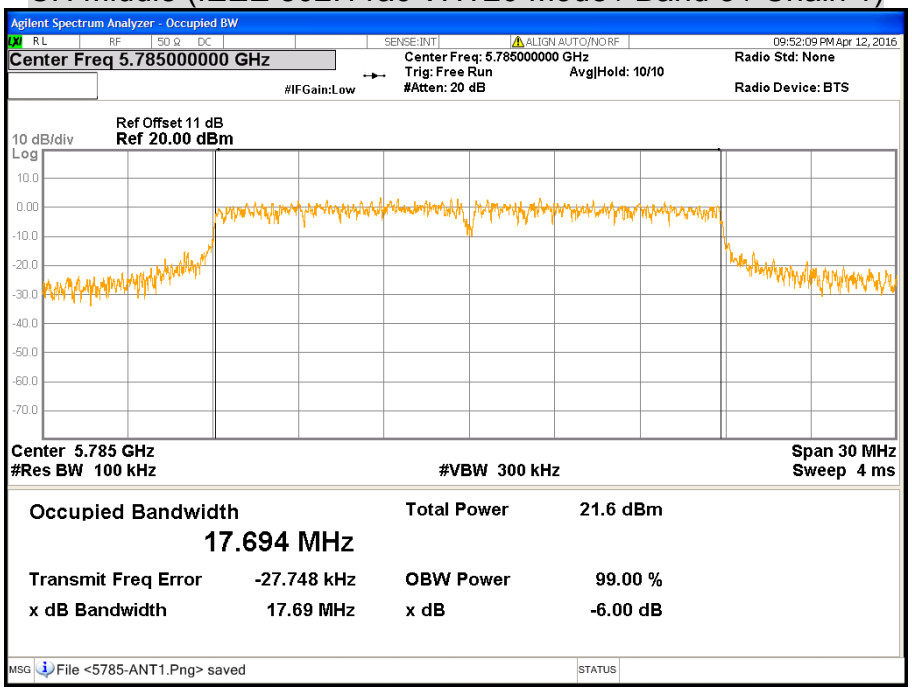

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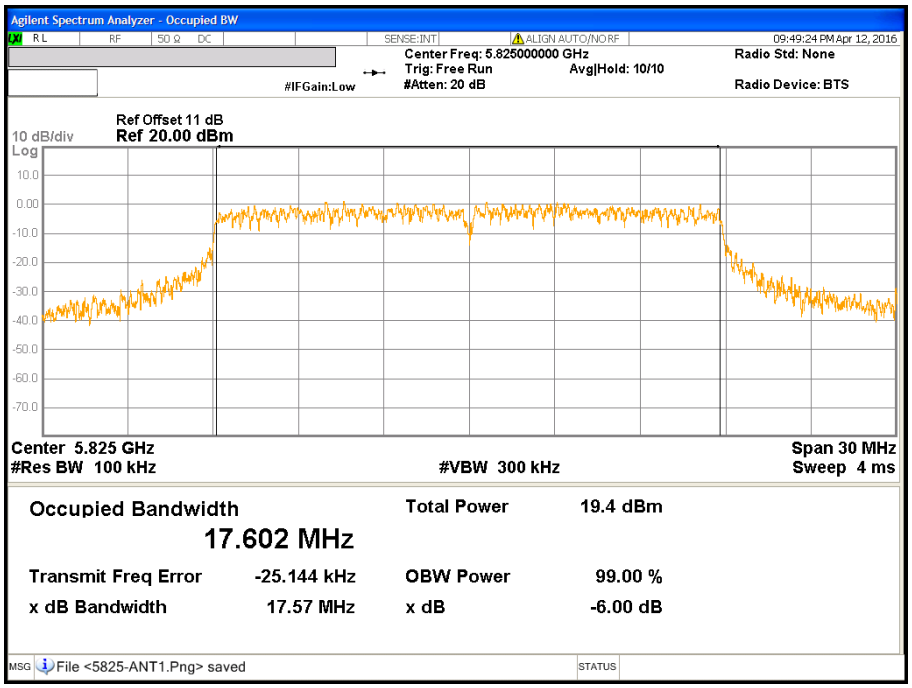

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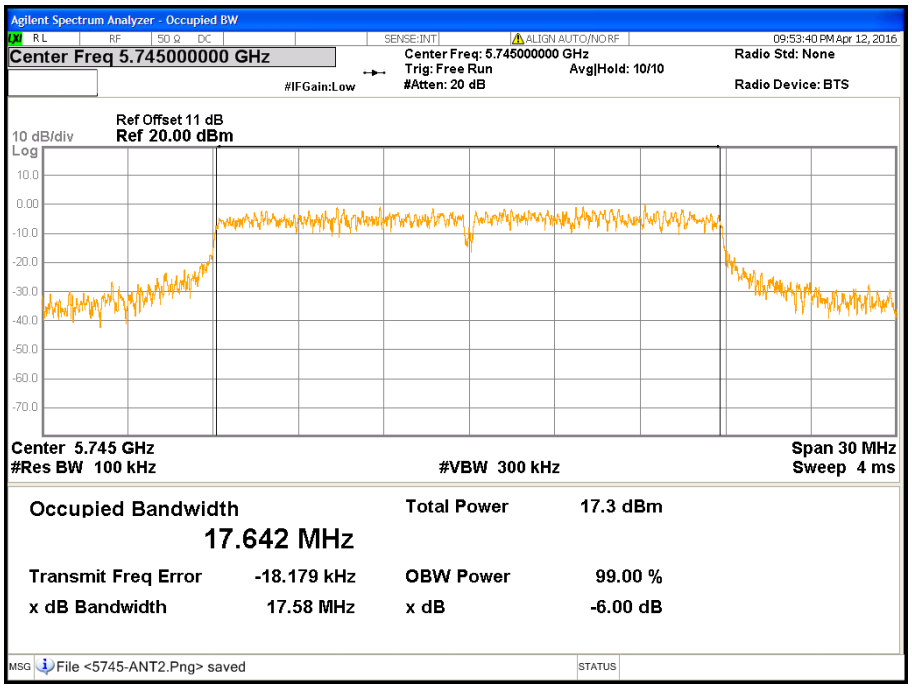

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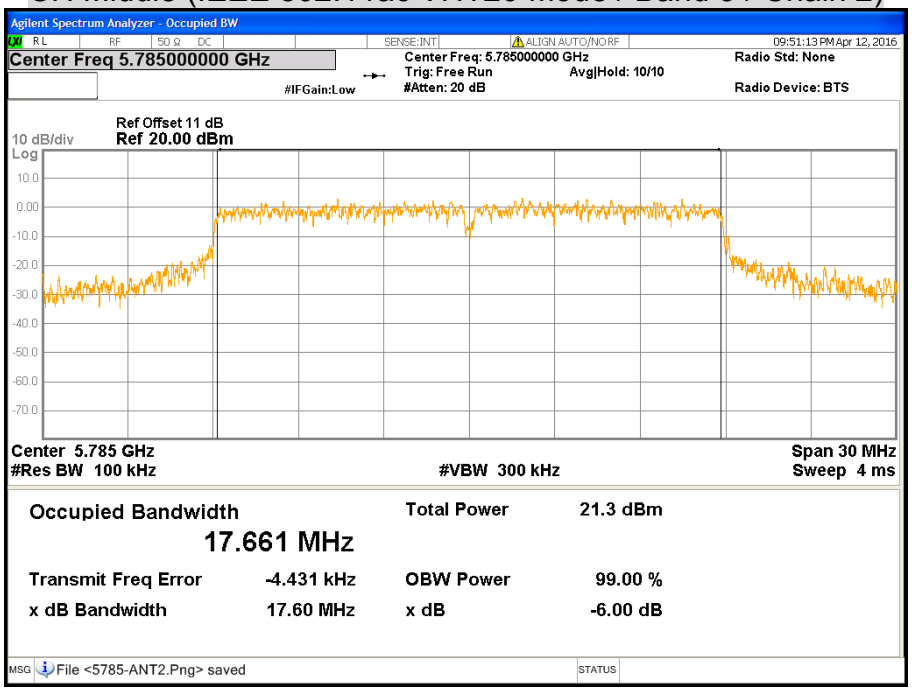

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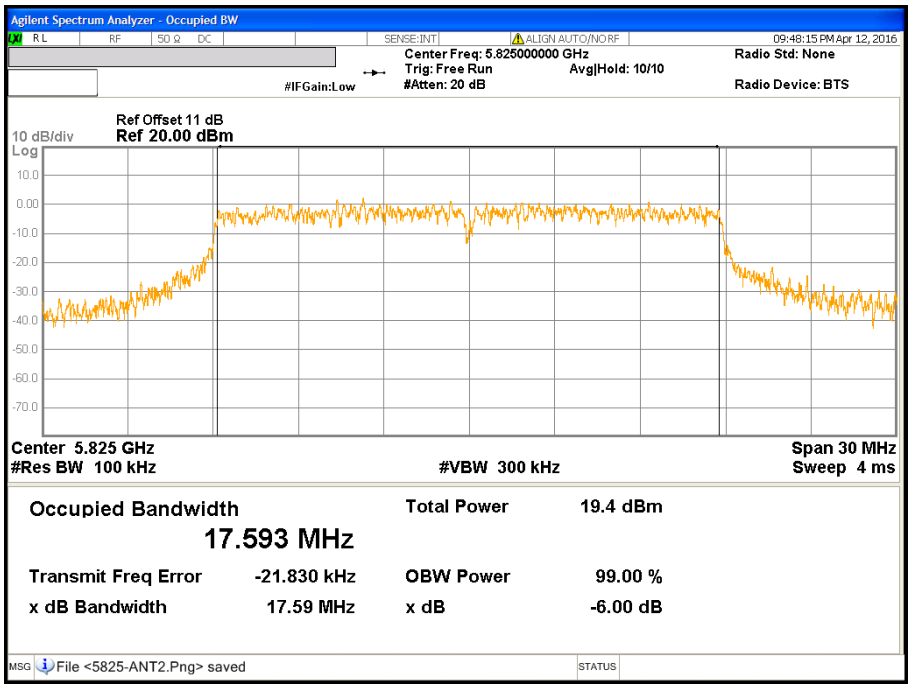

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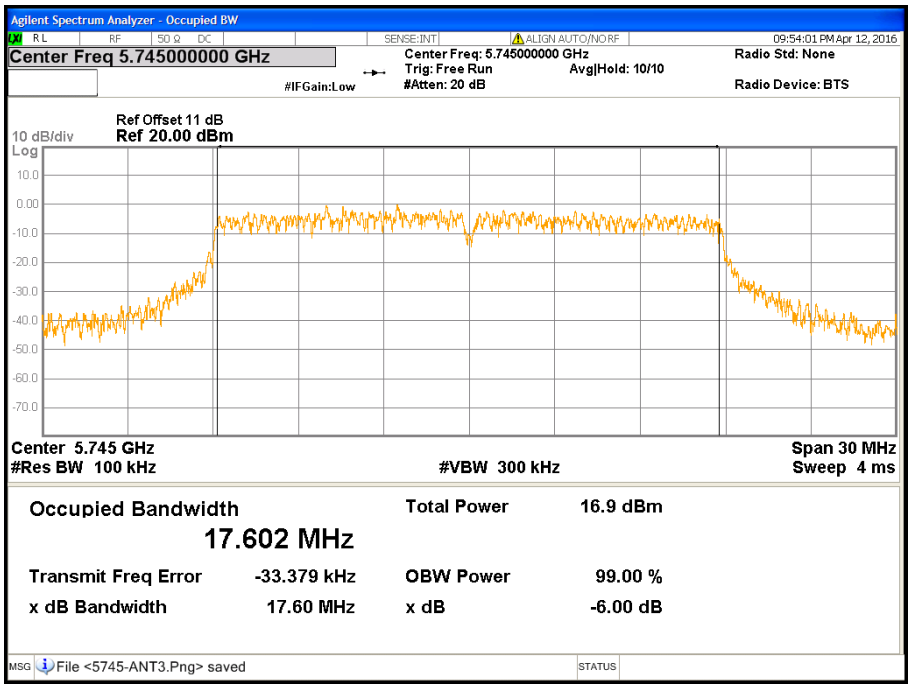

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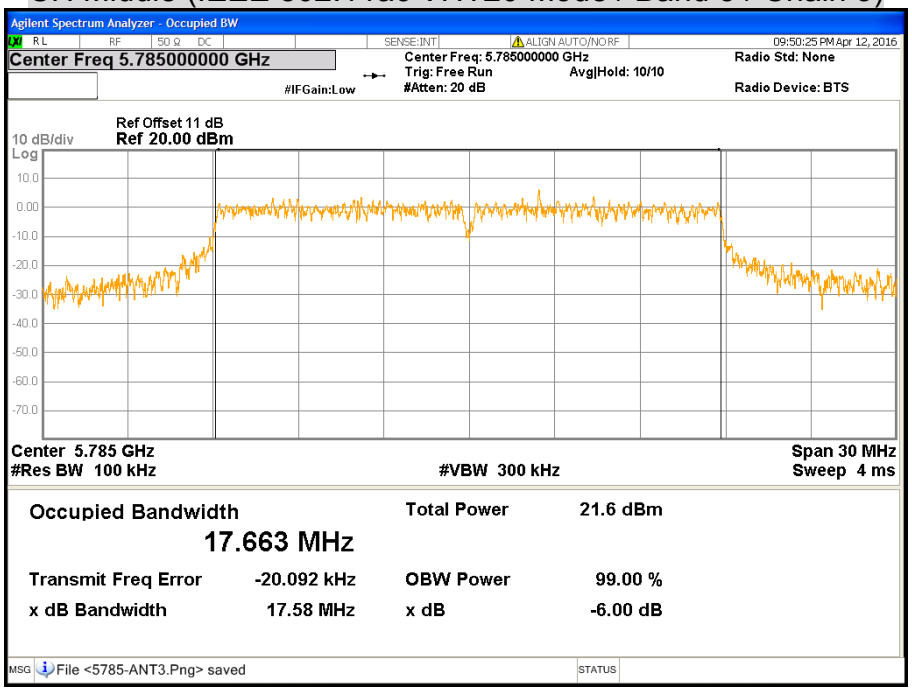

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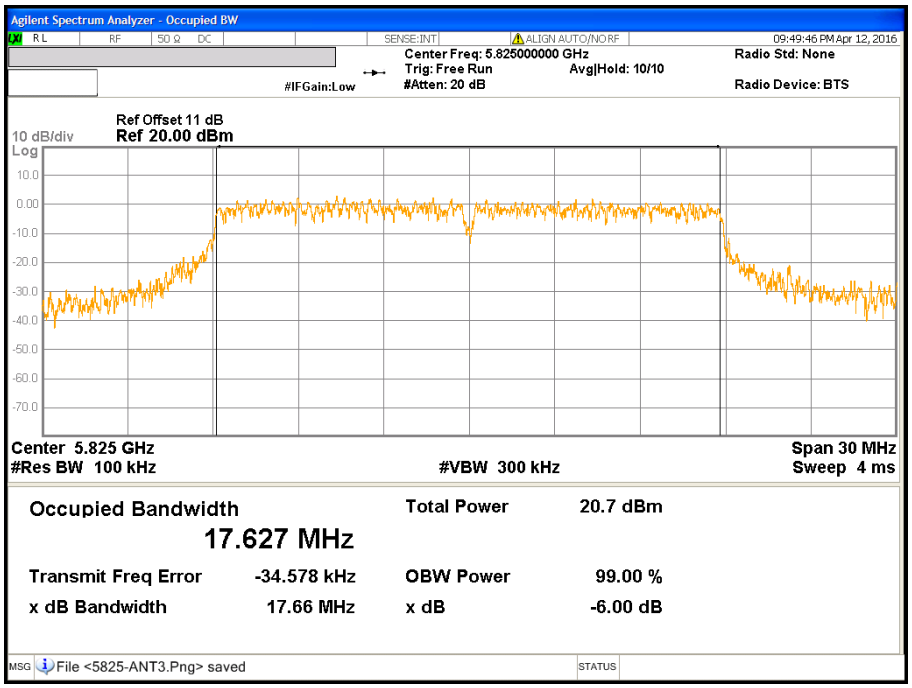

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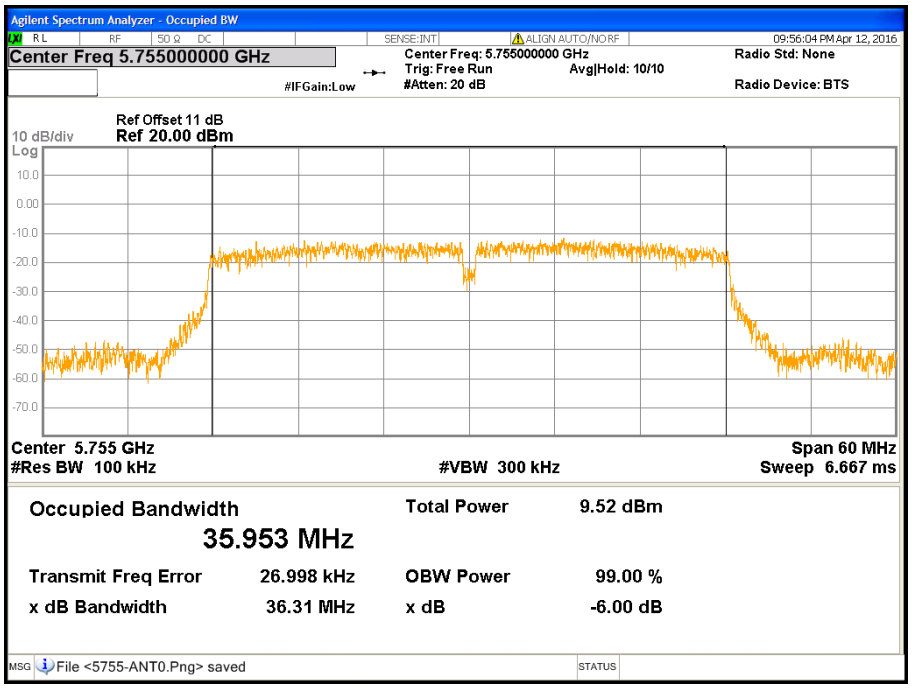

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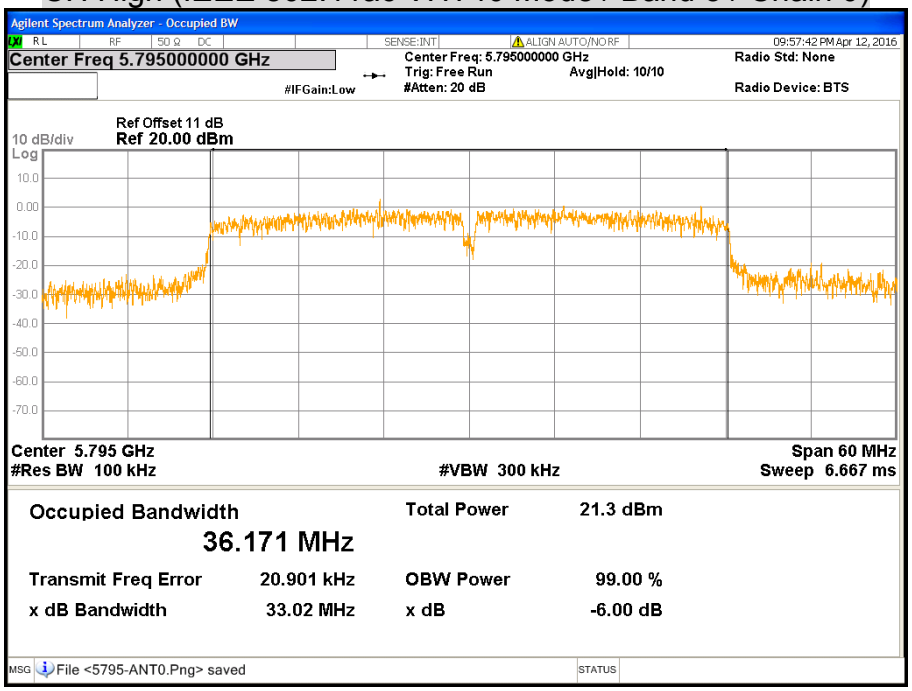
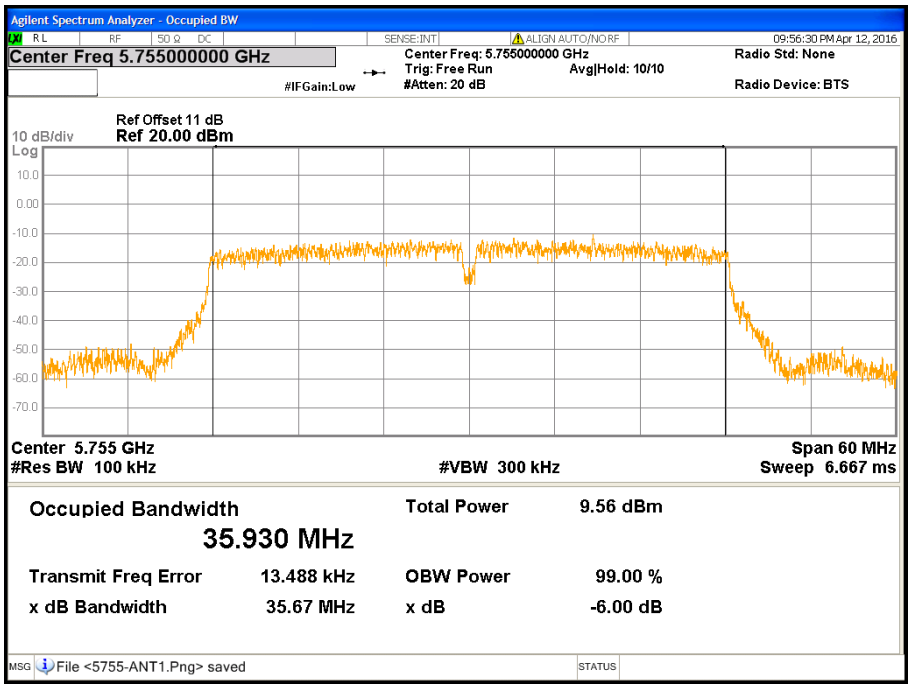


CH Low (IEEE 802.11ac VHT40 Mode / Band 3 / Chain 1)



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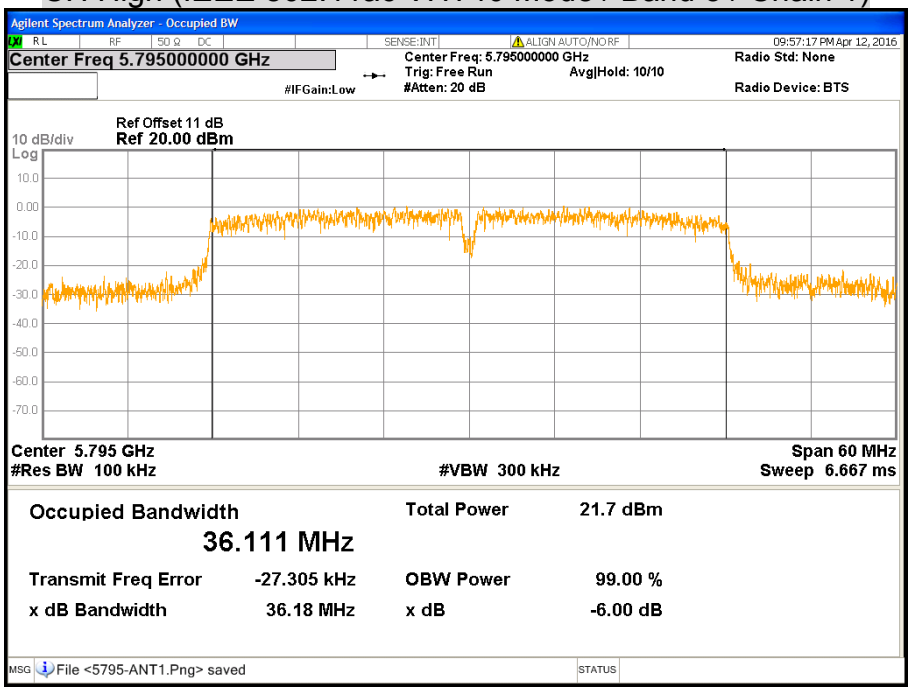

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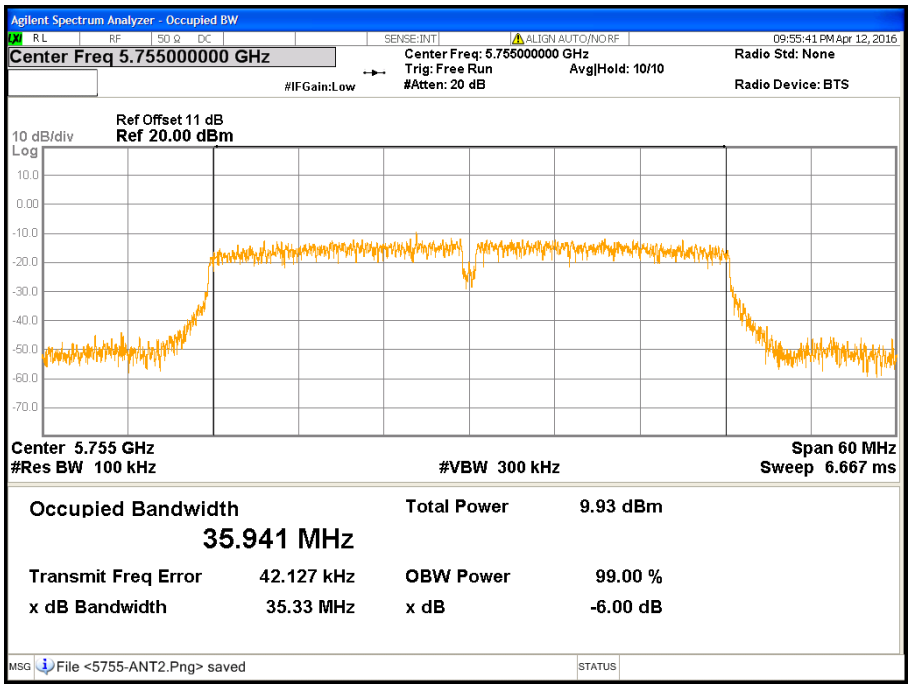

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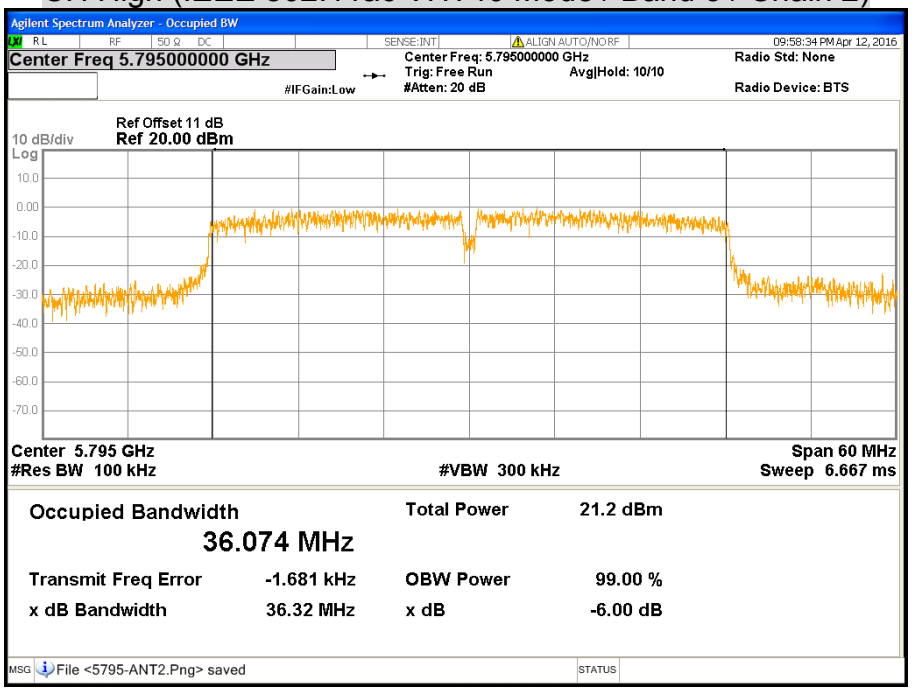
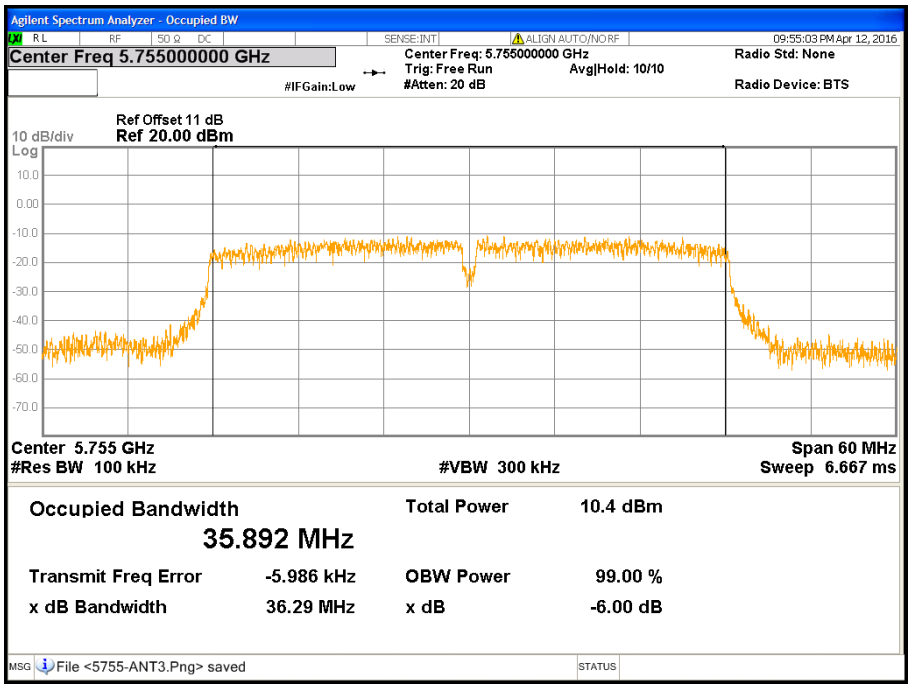


CH Low (IEEE 802.11ac VHT40 Mode / Band 3 / Chain 3)



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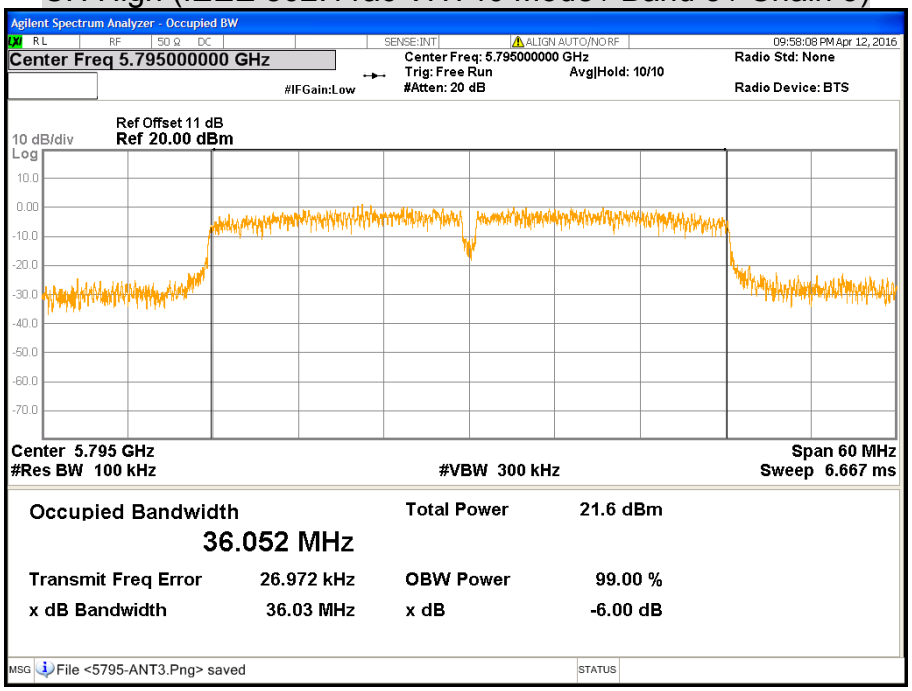
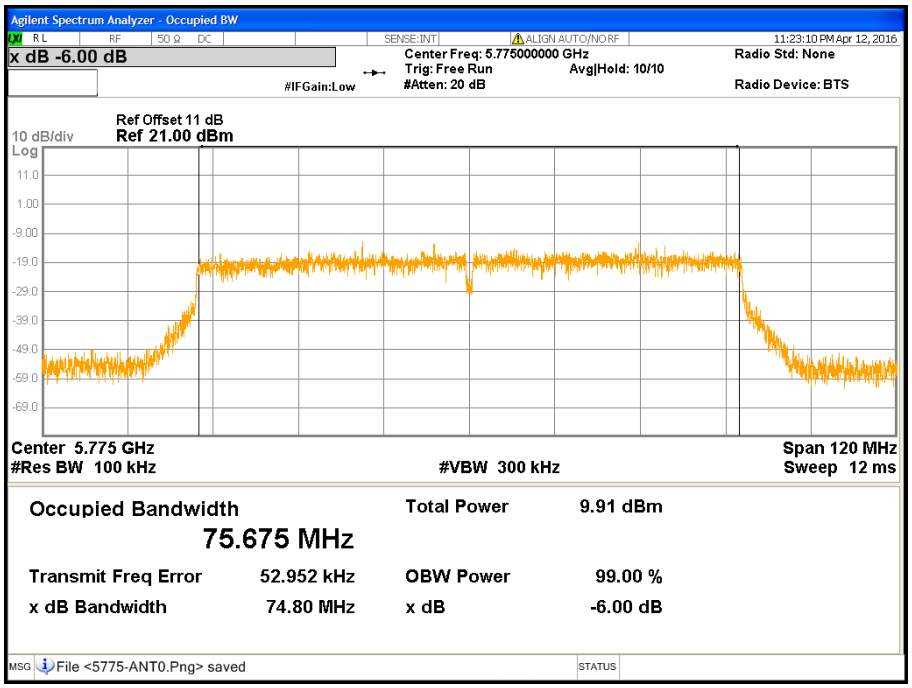
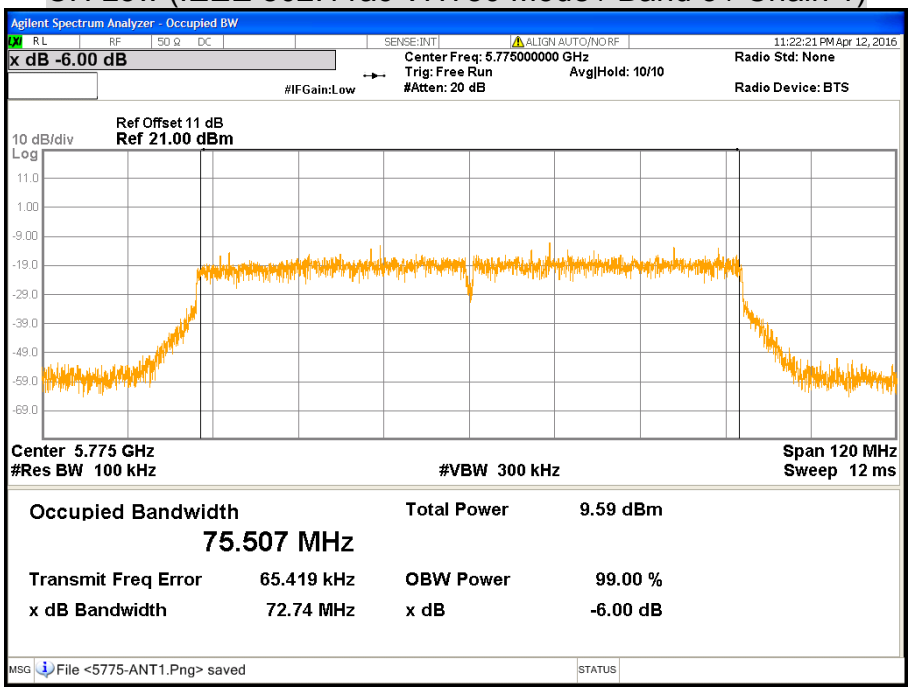


CH Low (IEEE 802.11ac VHT80 Mode / Band 3 / Chain 0)



CH Low (IEEE 802.11ac VHT80 Mode / Band 3 / Chain 1)



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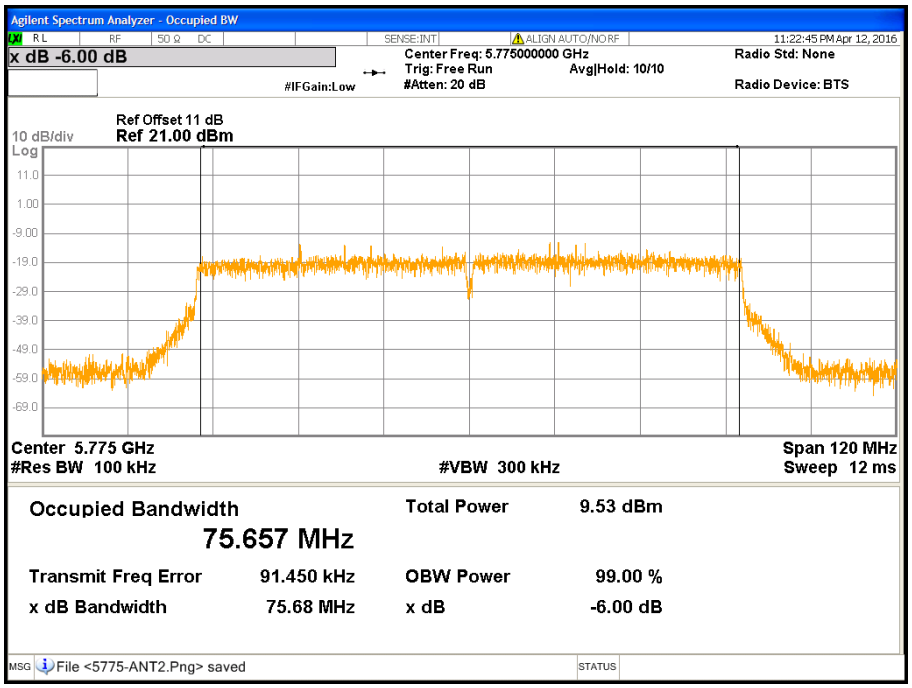
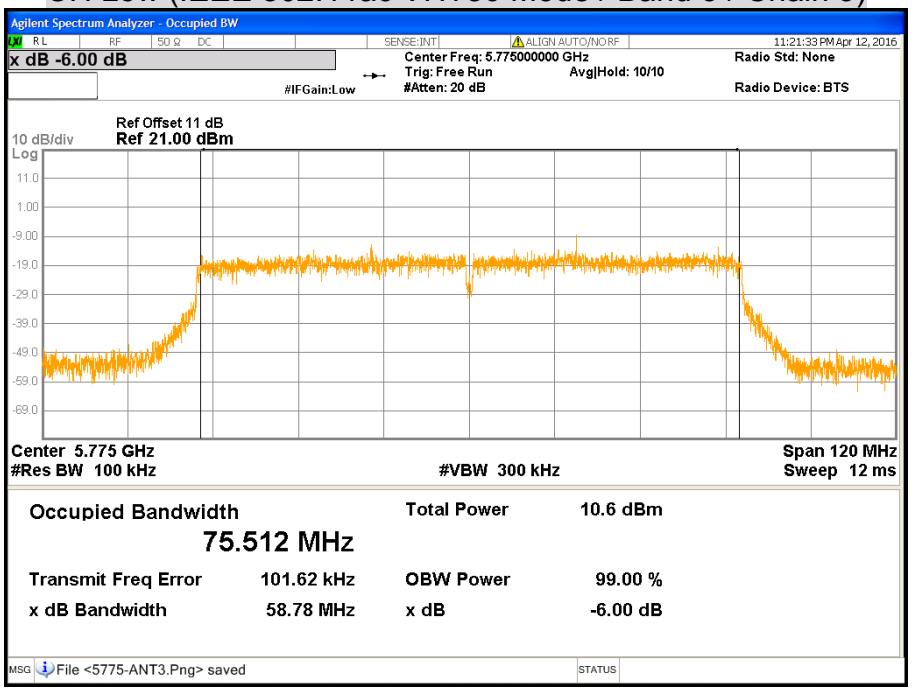
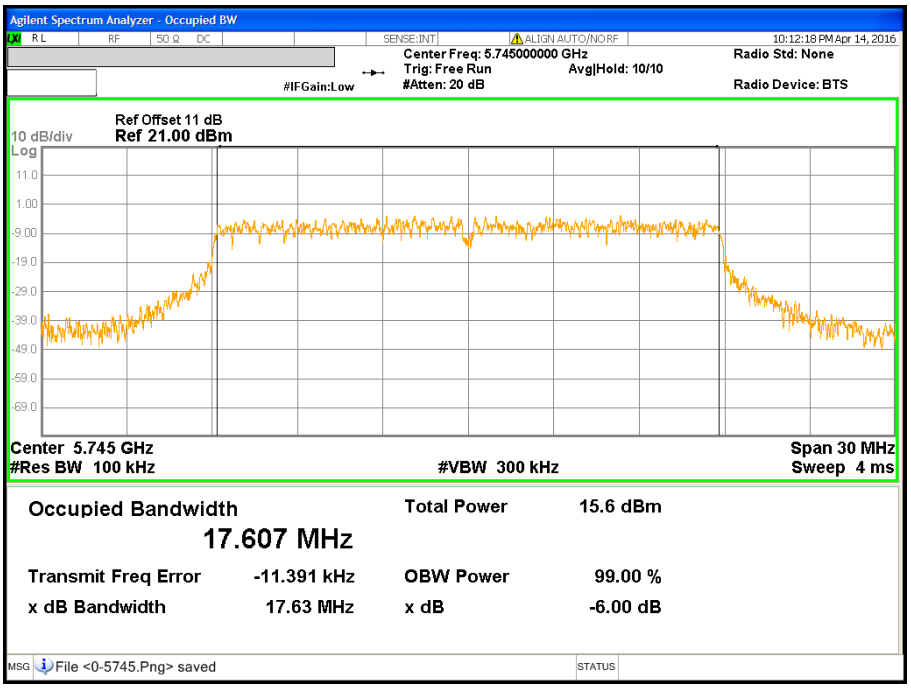


CH Low (IEEE 802.11ac VHT80 Mode / Band 3 / Chain 3)

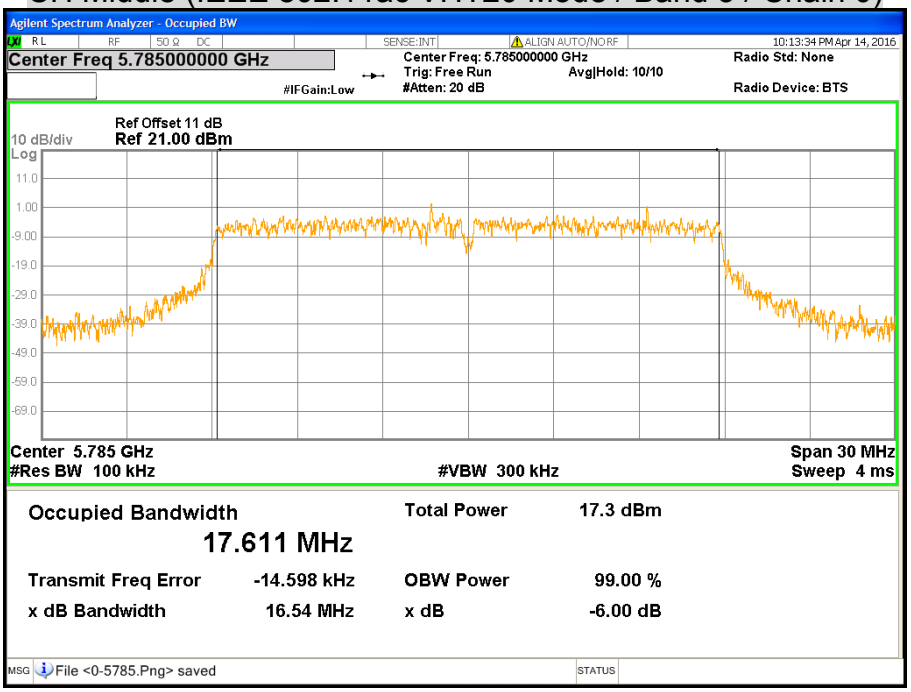


Beamforming

CH Low (IEEE 802.11ac VHT20 Mode / Band 3 / Chain 0)



CH Middle (IEEE 802.11ac VHT20 Mode / Band 3 / Chain 0)



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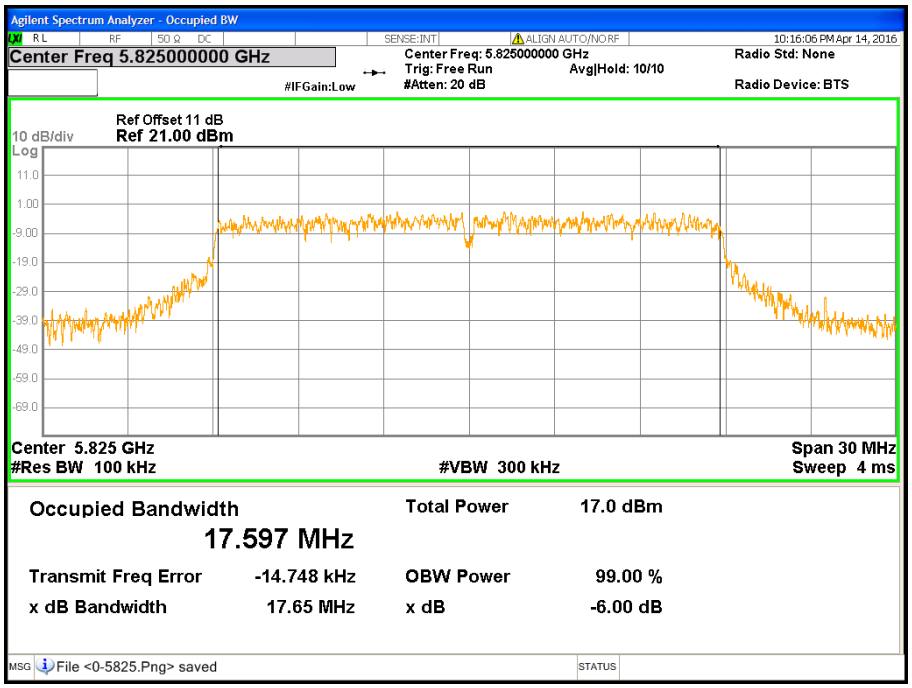
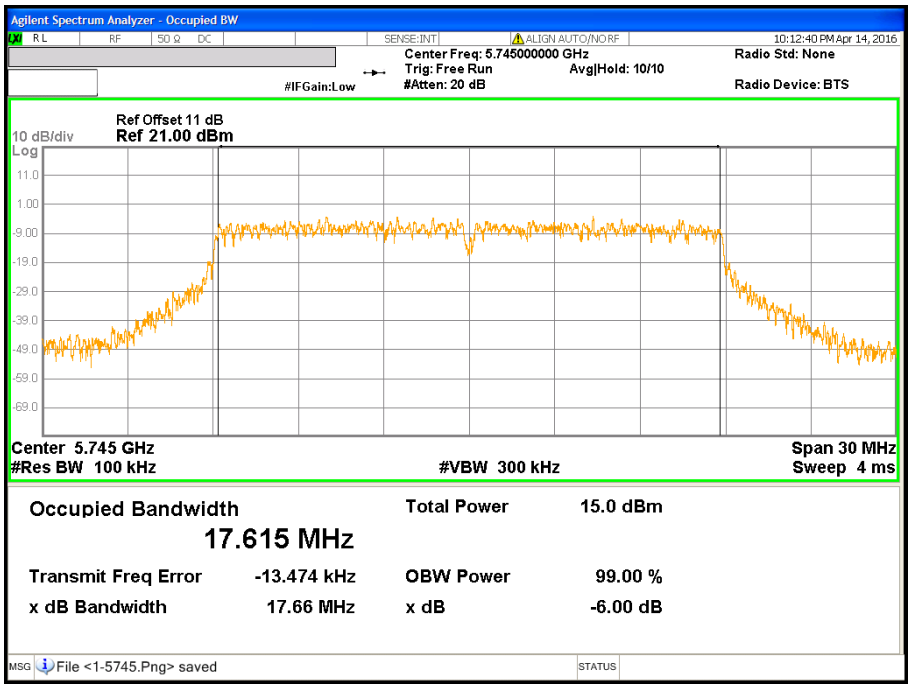


CH Low (IEEE 802.11ac VHT20 Mode / Band 3 / Chain 1)



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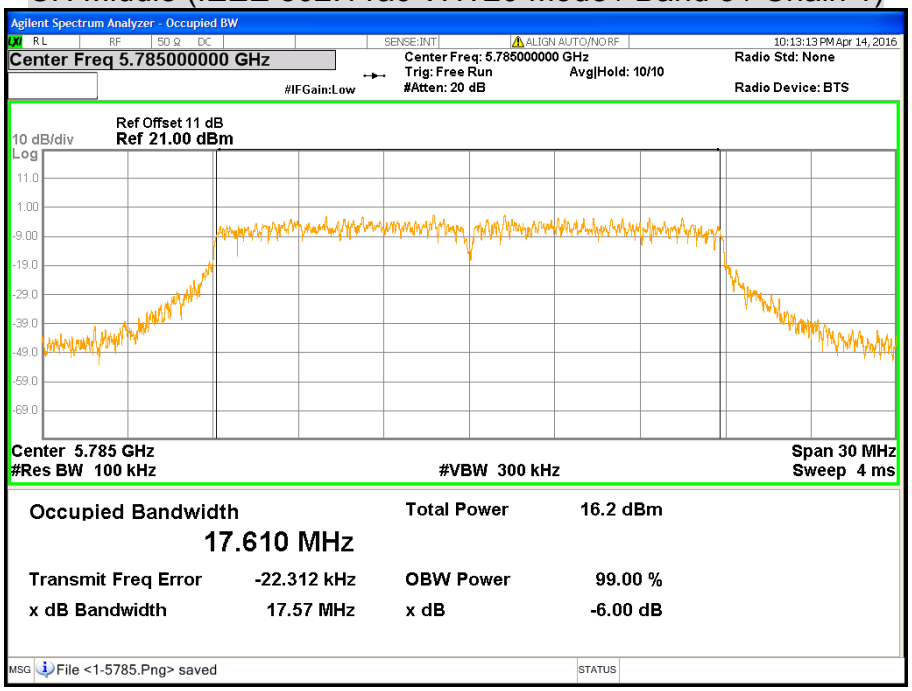

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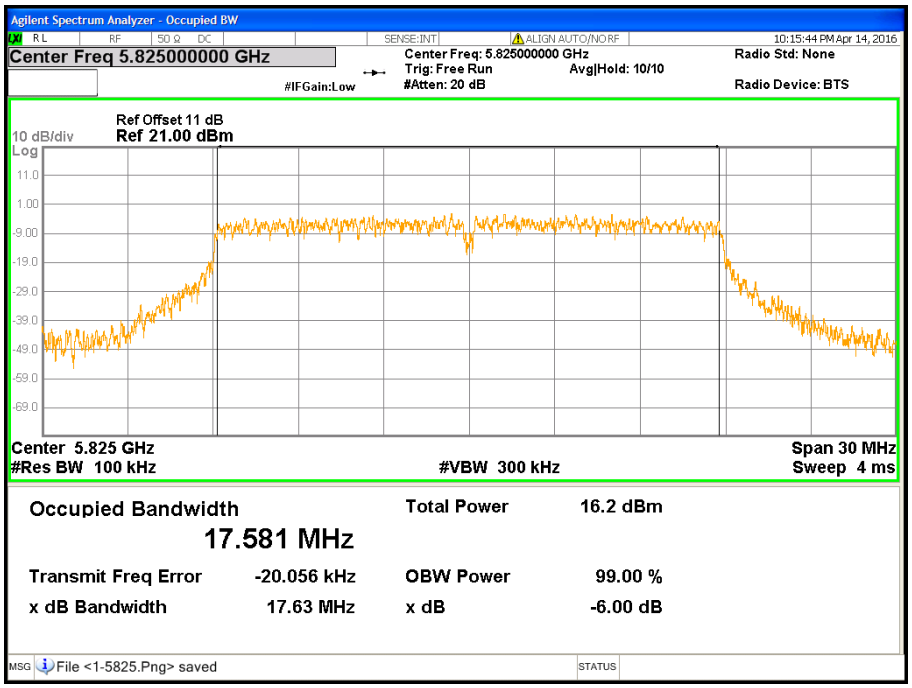

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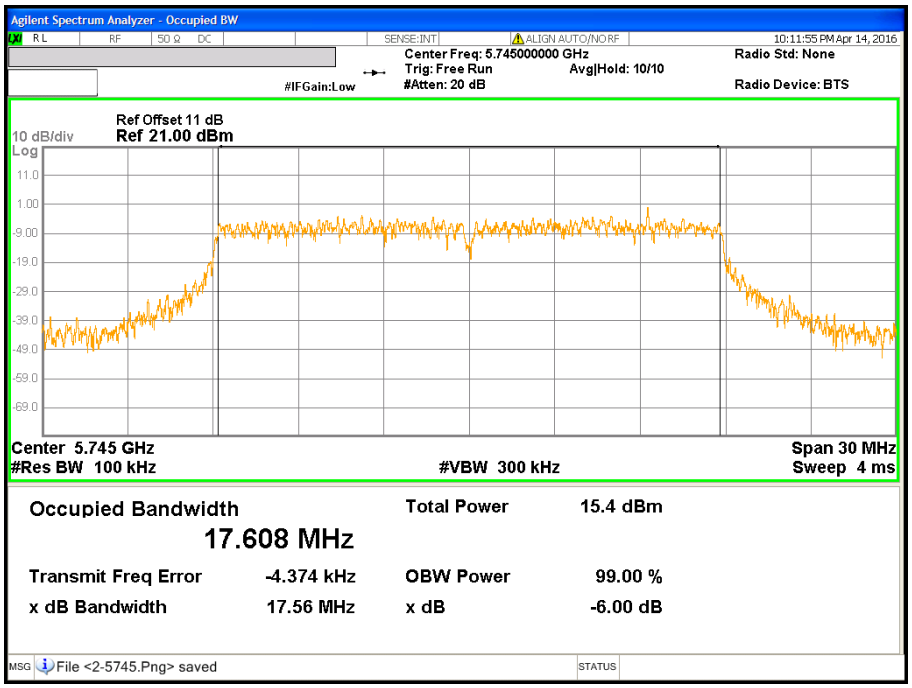

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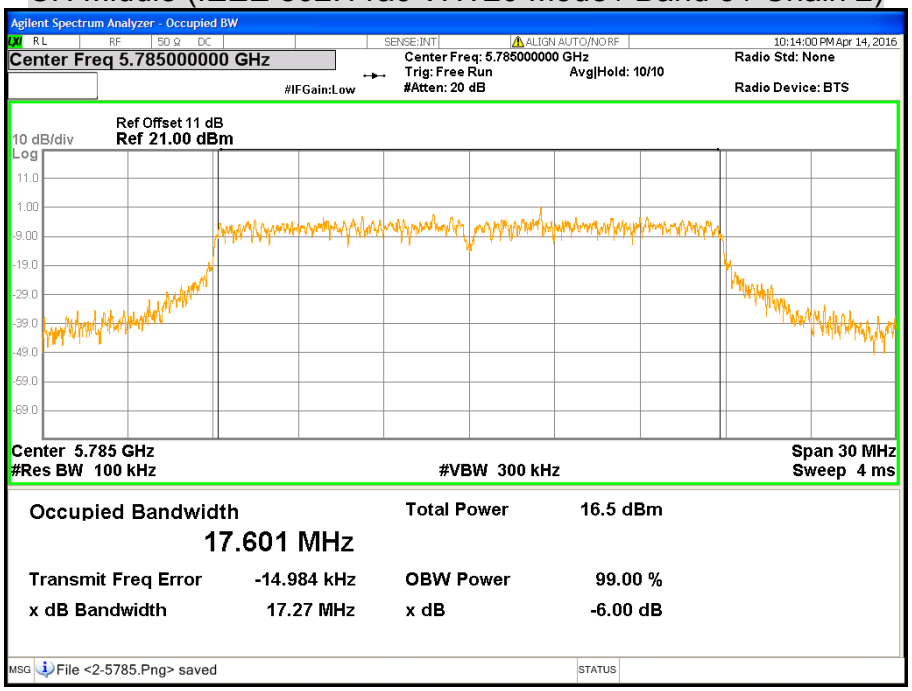

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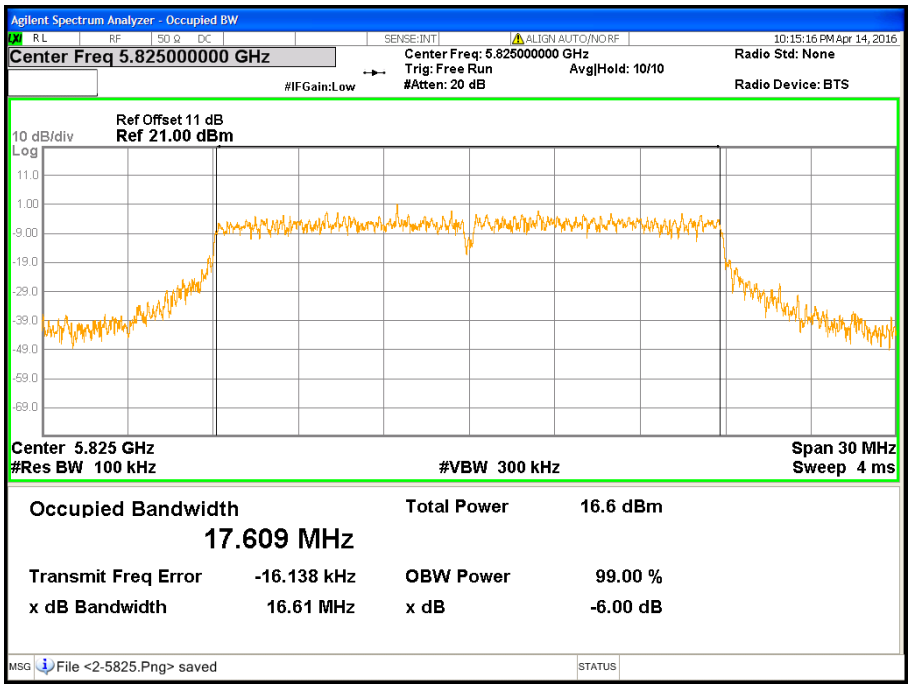

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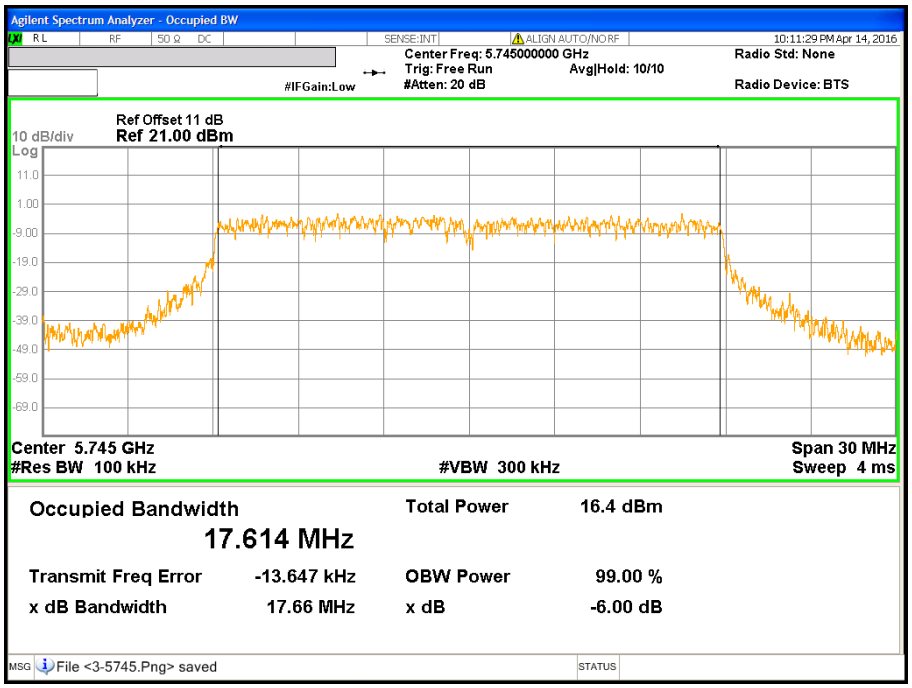

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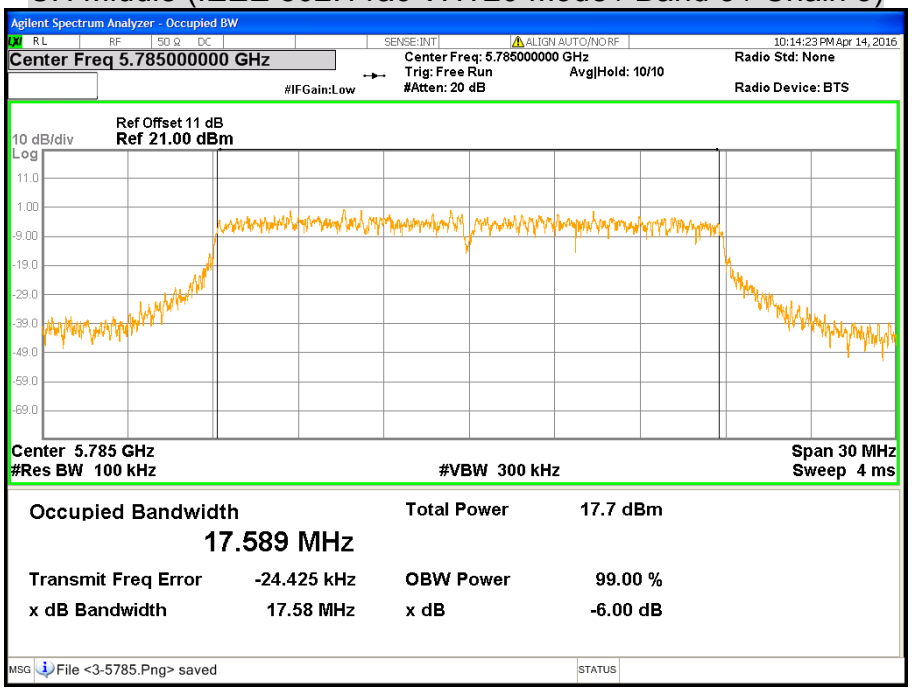

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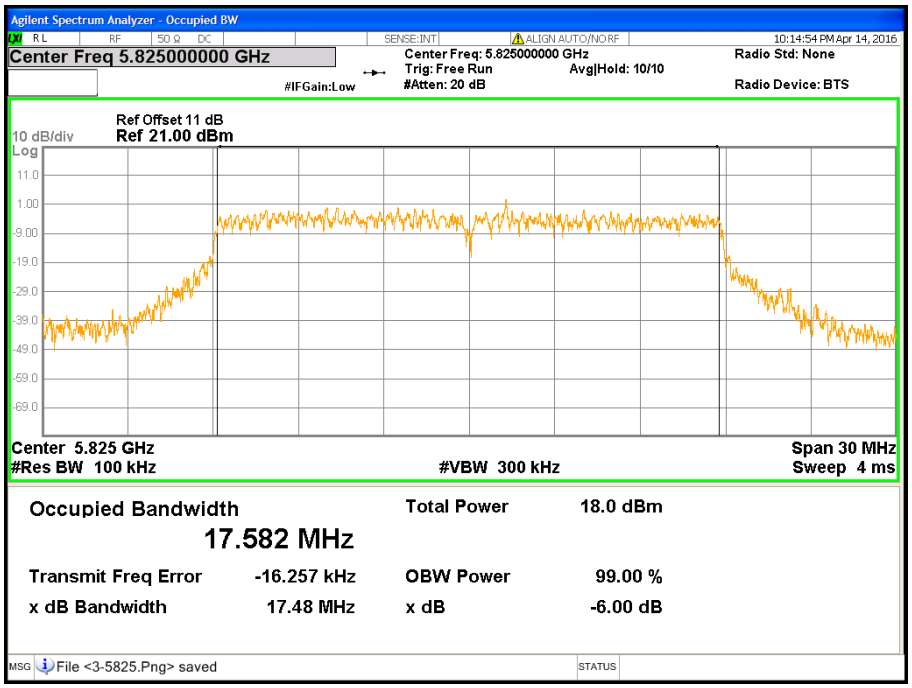
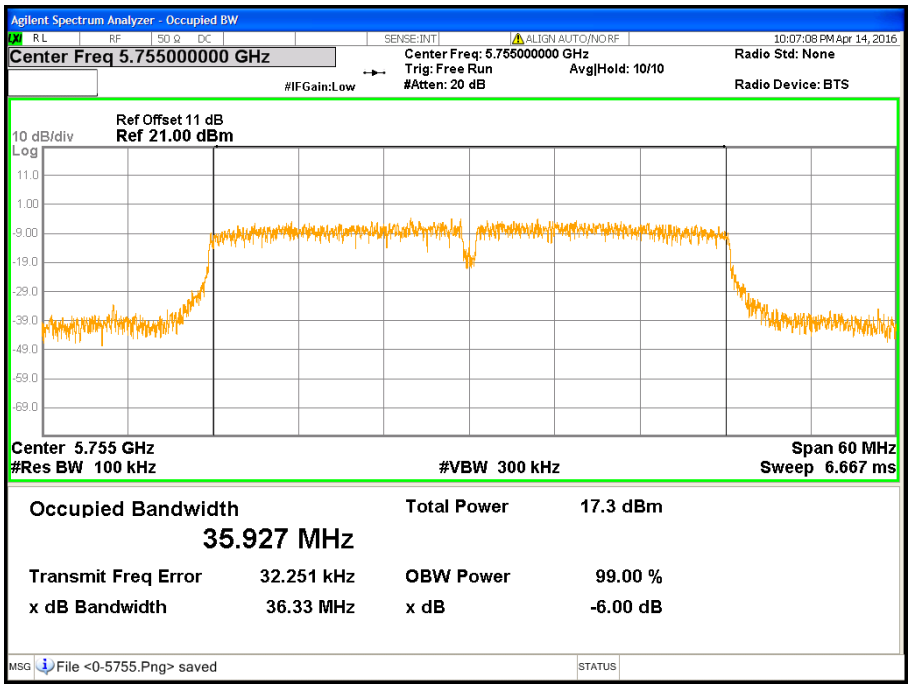


CH Low (IEEE 802.11ac VHT40 Mode / Band 3 / Chain 0)



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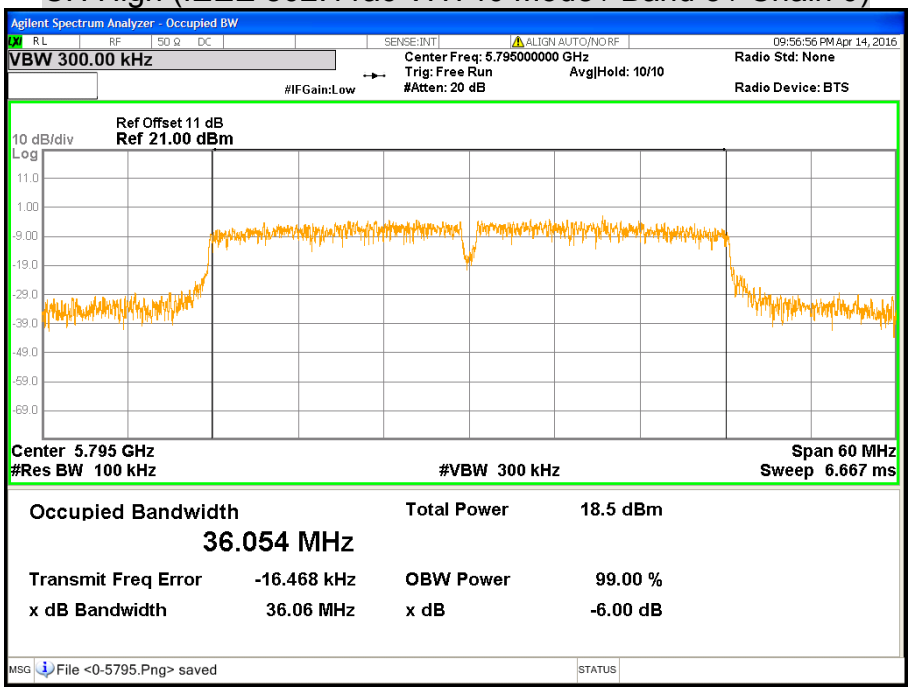
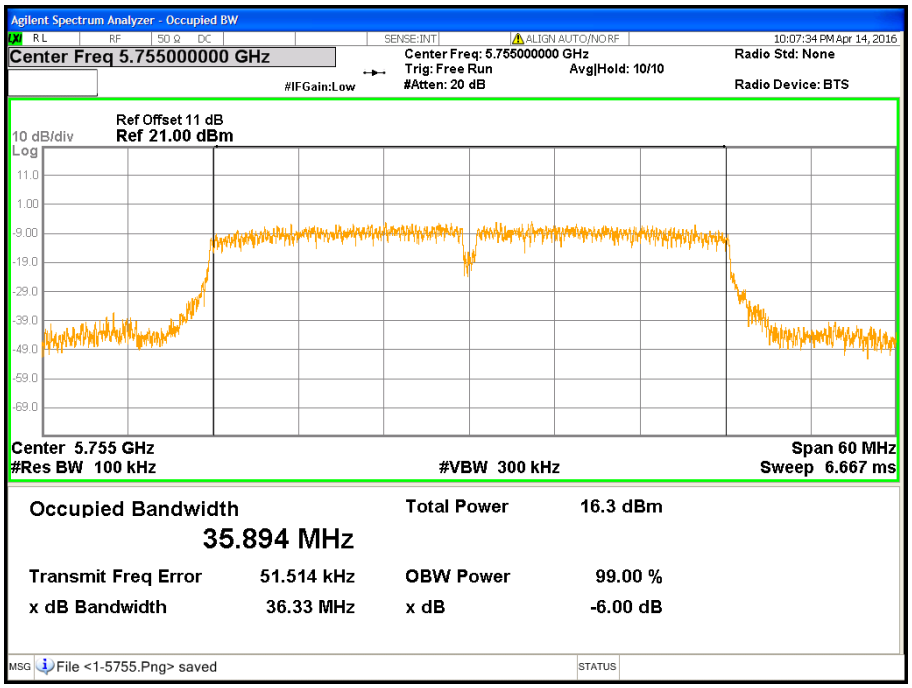


CH Low (IEEE 802.11ac VHT40 Mode / Band 3 / Chain 1)



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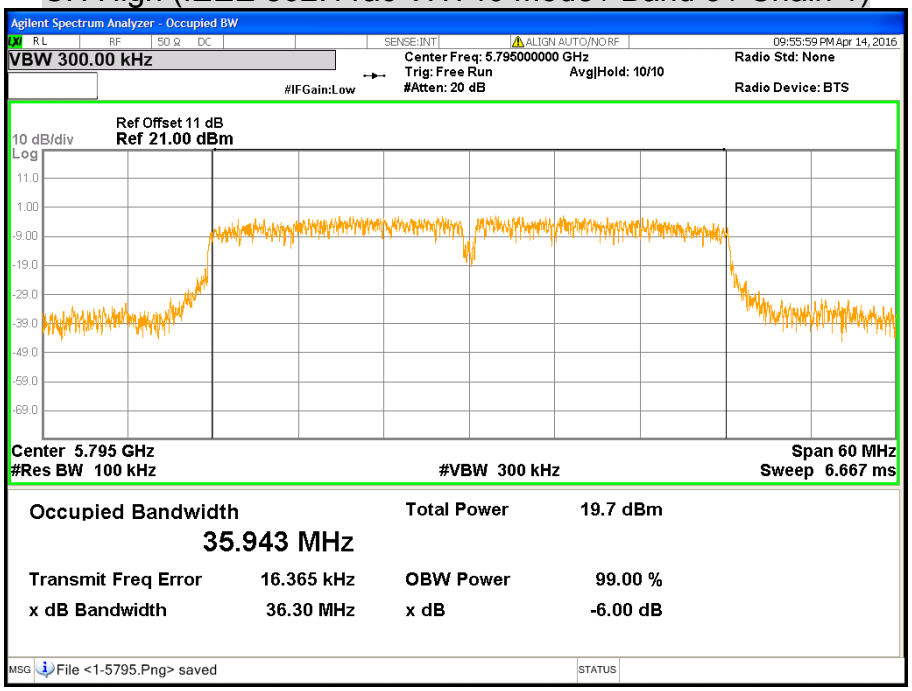

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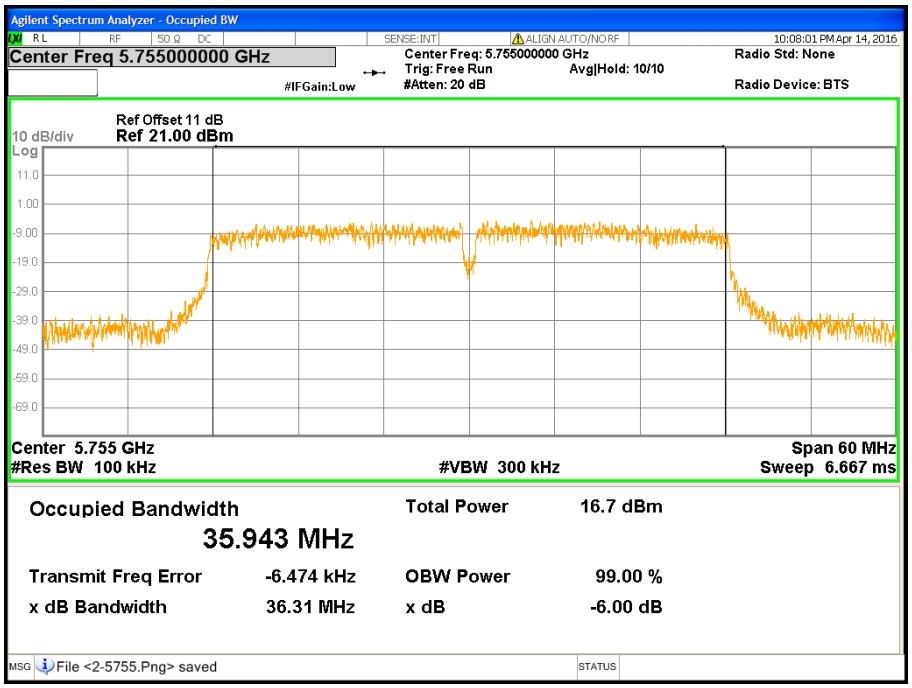

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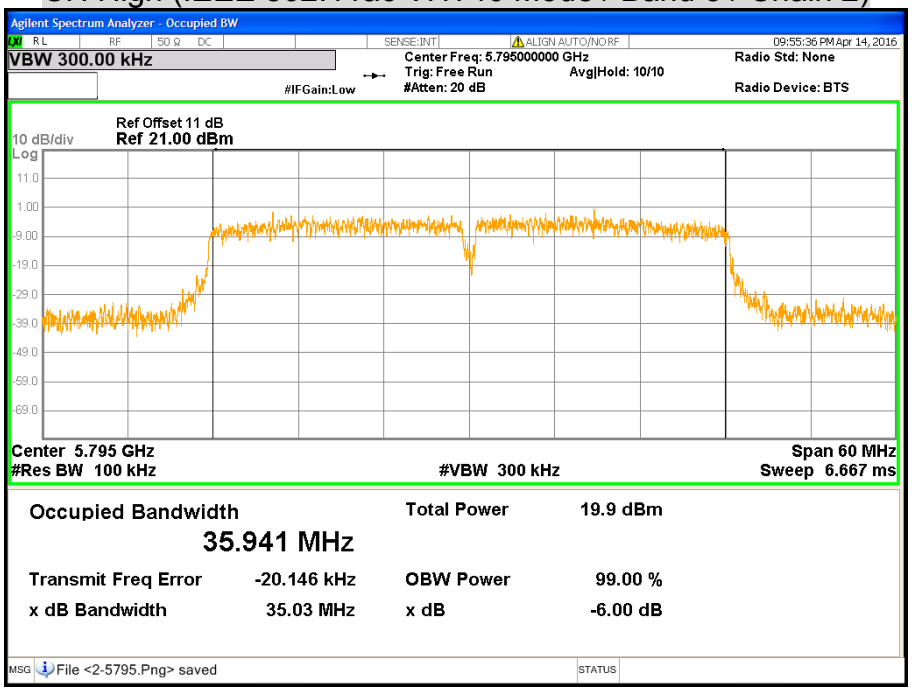

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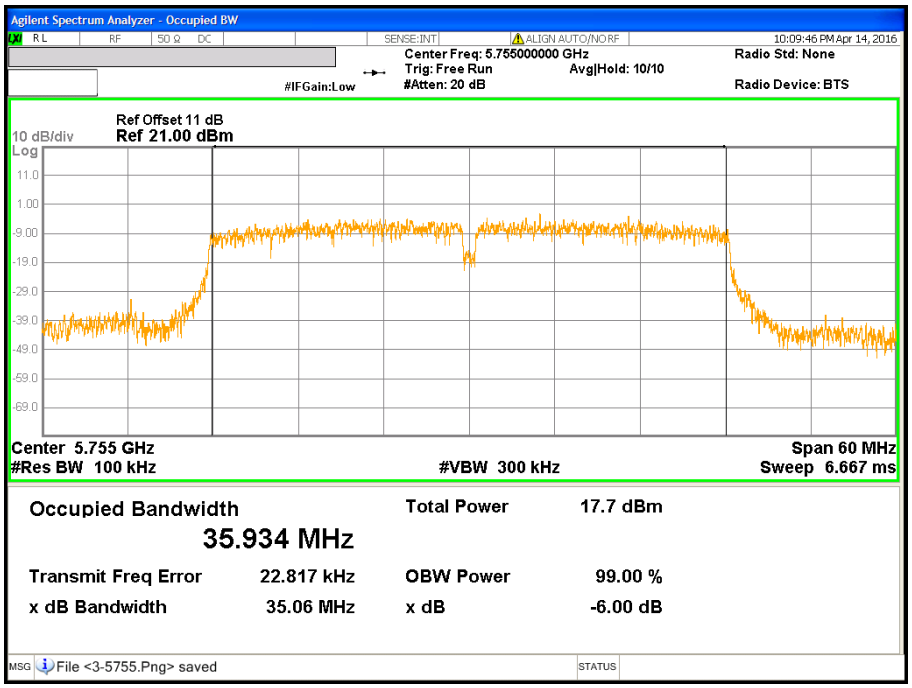

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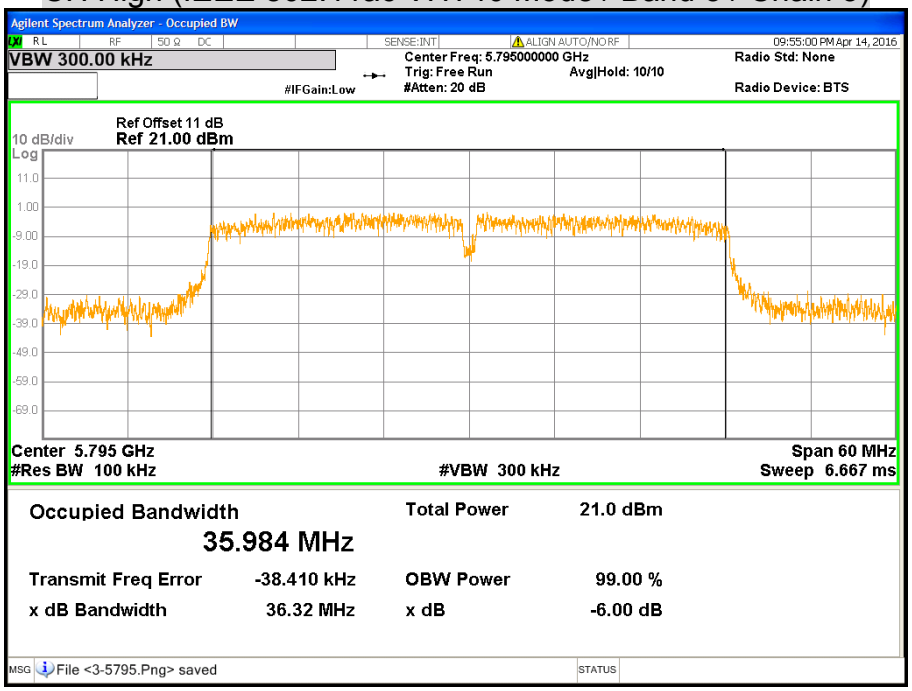
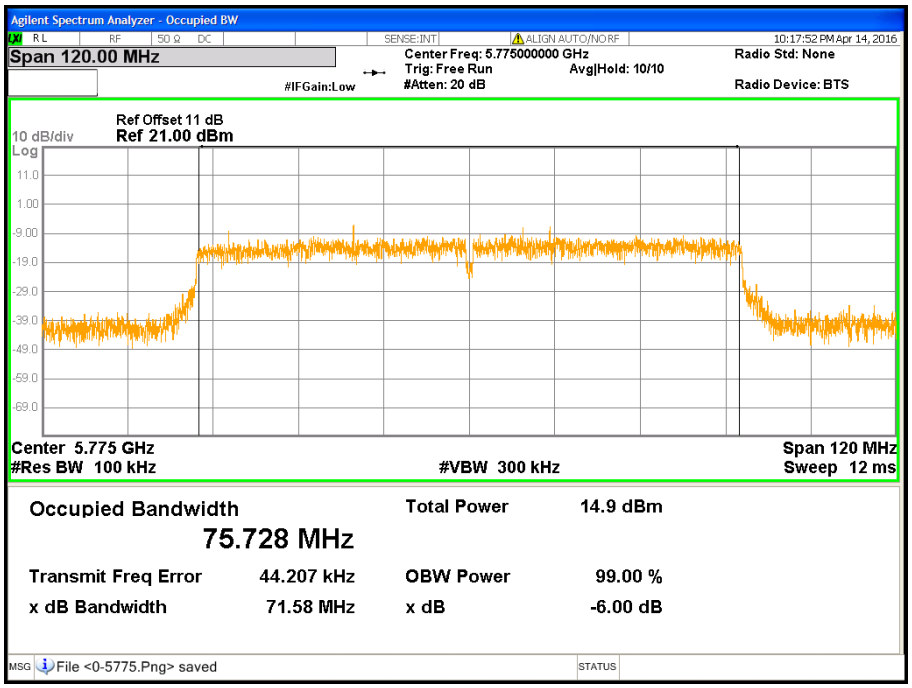


CH Low (IEEE 802.11ac VHT80 Mode / Band 3 / Chain 0)



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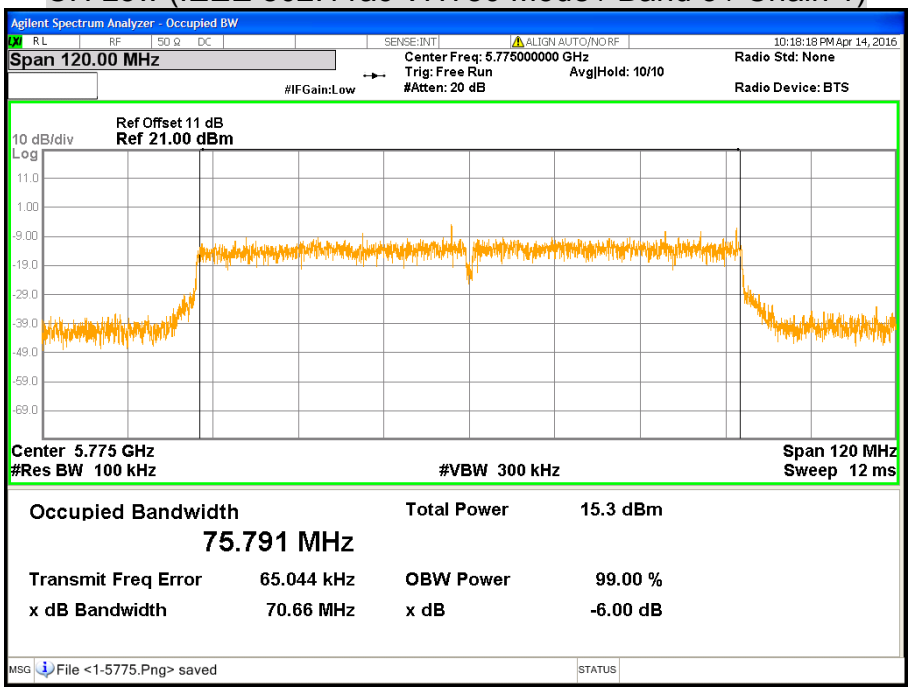

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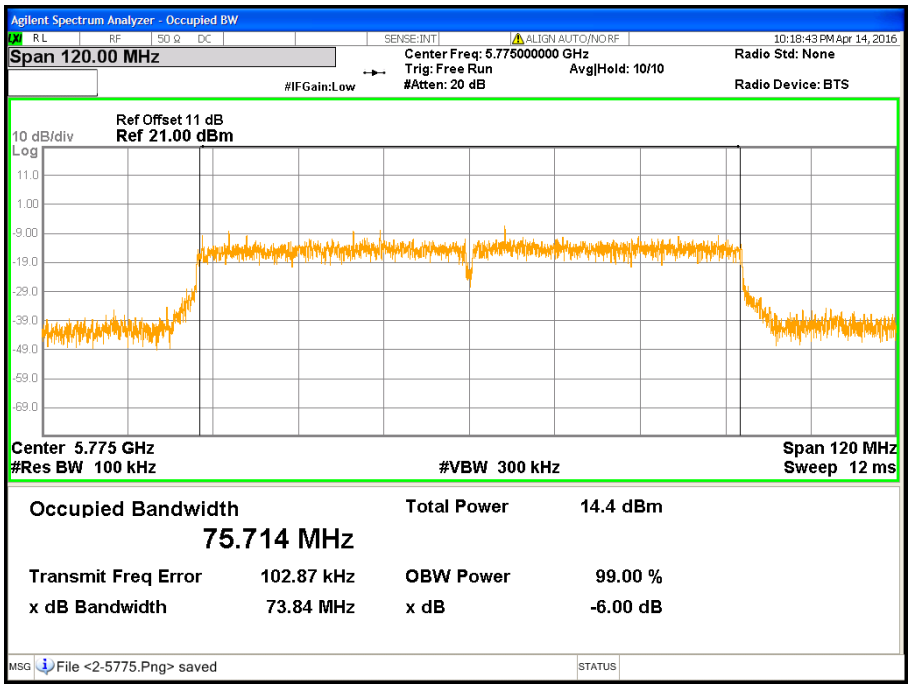

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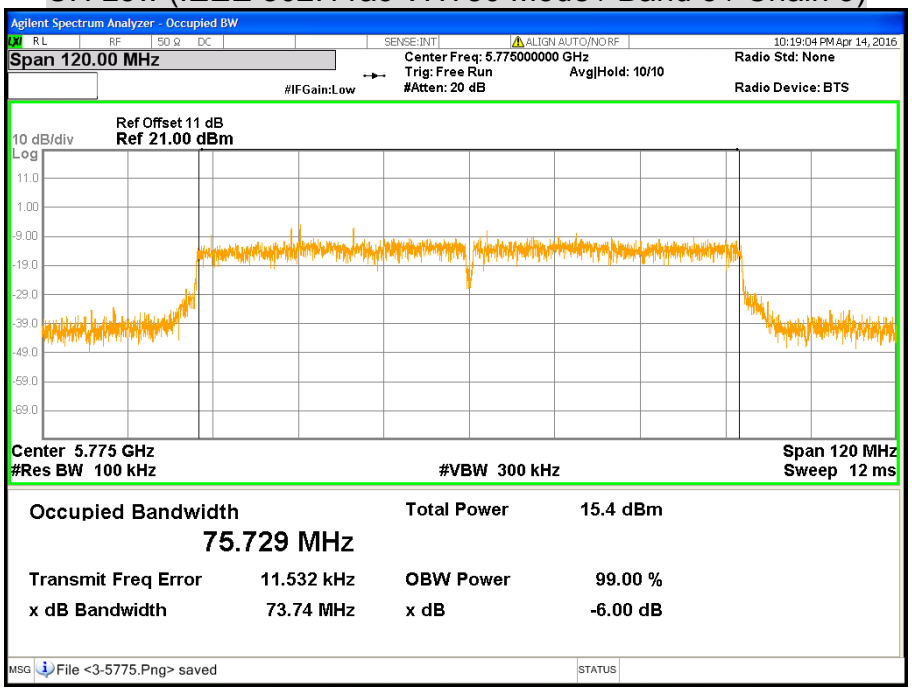


7.3 MAXIMUM CONDUCTED OUTPUT POWER

LIMITS

§ 15.407(a)

(1) For the band 5.15-5.25 GHz,

(I) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(II) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(III) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(IV) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

§ KDB 662911:

If all antennas have the same gain, GANT, Directional gain = GANT + Array Gain, where Array Gain is as follows.

For power measurements on IEEE 802.11 devices

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream:

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1149001	12/08/2016
Power Sensor	Anritsu	MA2411B	1126148	12/08/2016
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

The transmitter output is connected to the power meter. The power meter is set to the power detection.

TEST RESULTS

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Non-beamforming	Temp. & Humidity	25°C, 53%

IEEE 802.11a Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5180	18.32	18.15	18.16	18.23	24.24	0.2655	30.00	1	PASS
	Middle	5200	17.26	17.03	17.12	17.68	23.30	0.2138	30.00	1	PASS
	High	5240	18.78	18.15	18.22	18.52	24.45	0.2786	30.00	1	PASS
Band 3	Low	5745	13.75	13.42	13.47	13.89	19.66	0.0925	30.00	1	PASS
	Middle	5785	17.76	18.52	17.89	16.29	23.71	0.2350	30.00	1	PASS
	High	5825	18.32	18.33	18.05	18.74	24.39	0.2748	30.00	1	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The maximum antenna gain is 5.1dBi which is less than 6dBi, the limit should be 1W.*
4. *Total power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT20 Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5180	18.32	17.98	18.14	17.84	24.09	0.2564	30.00	1	PASS
	Middle	5200	17.42	17.25	16.90	17.98	23.43	0.2203	30.00	1	PASS
	High	5240	19.15	18.62	18.42	18.66	24.74	0.2979	30.00	1	PASS
Band 3	Low	5745	14.07	13.72	13.86	14.14	19.97	0.0993	30.00	1	PASS
	Middle	5785	18.92	18.74	18.96	19.24	24.99	0.3155	30.00	1	PASS
	High	5825	17.78	17.03	17.06	17.82	23.46	0.2218	30.00	1	PASS

Remark:

1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The maximum antenna gain is 5.1dBi which is less than 6dBi, the limit should be 1W.*
4. *Total power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT40 Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5190	12.58	12.63	12.52	12.31	18.53	0.0713	30.00	1	PASS
	High	5230	19.21	18.78	18.81	17.79	24.70	0.2951	30.00	1	PASS
Band 3	Low	5755	7.58	7.31	7.08	4.94	12.86	0.0193	30.00	1	PASS
	High	5795	18.49	19.27	18.72	18.84	24.86	0.3062	30.00	1	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The maximum antenna gain is 5.1dBi which is less than 6dBi, the limit should be 1W.*
4. *Total peak power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT80 Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5210	10.28	10.19	10.23	10.18	16.24	0.0421	30.00	1	PASS
Band 3	Low	5775	7.29	7.04	6.62	7.33	13.10	0.0204	30.00	1	PASS

Remark:

1. *At finial test to get the worst-case emission at 29.3 Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The maximum antenna gain is 5.1dBi which is less than 6dBi, the limit should be 1W.*
4. *Total power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Beamforming	Temp. & Humidity	25°C, 53%

IEEE 802.11ac VHT20 Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5180	13.75	13.46	13.64	13.75	19.67	0.0927	25.22	0.3327	PASS
	Middle	5200	14.53	14.64	14.52	14.98	20.69	0.1172	25.22	0.3327	PASS
	High	5240	14.55	14.89	14.36	14.92	20.71	0.1178	25.22	0.3327	PASS
Band 3	Low	5745	15.87	15.79	15.86	16.49	22.03	0.1596	25.22	0.3327	PASS
	Middle	5785	15.58	15.23	16.06	16.04	21.76	0.1500	25.22	0.3327	PASS
	High	5825	15.72	15.33	16.53	16.47	22.06	0.1607	25.22	0.3327	PASS

Remark:
1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 0.3327W.*
4. *Total power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT40 Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5190	12.37	12.26	12.19	12.96	18.48	0.0705	25.22	0.3327	PASS
	High	5230	17.88	17.46	17.38	18.32	23.80	0.2399	25.22	0.3327	PASS
Band 3	Low	5755	13.44	13.38	13.03	14.01	19.50	0.0891	25.22	0.3327	PASS
	High	5795	16.15	15.87	15.14	16.81	22.05	0.1603	25.22	0.3327	PASS

Remark:
1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 0.3327W.*
4. *Total power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT80 Mode

UNII Band	CH.	Channel Frequency (MHz)	Maximum Conducted Output Power								Result
			(dBm)				(dBm)	(W)	(dBm)	(W)	
			Chain 0	Chain 1	Chain 2	Chain 3	Total		Limit		
Band 1	Low	5210	11.06	10.77	10.63	11.21	16.94	0.0494	25.22	0.3327	PASS
Band 3	Low	5775	11.34	11.43	10.69	11.44	17.26	0.0532	25.22	0.3327	PASS

Remark:

1. *At finial test to get the worst-case emission at 29.3 Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 0.3327W.*
4. *Total power = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

7.4 PEAK POWER SPECTRAL DENSITY

LIMITS

§ 15.407 (a)

(1) For the band 5.15-5.25 GHz

(I) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(II) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(III) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/15/2017
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 1MHz, VBW = 3MHz, Span = Sweep= AUTO
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Non-beamforming	Temp. & Humidity	25°C, 53%

IEEE 802.11a Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5180	6.04	5.65	5.65	6.04	11.87	12.22	PASS
	Middle	5200	5.77	5.46	5.92	6.33	11.90	12.22	PASS
	High	5240	6.13	5.69	5.73	6.27	11.98	12.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5745	-1.25	-1.92	-1.45	-0.59	4.75	25.22	PASS
	Middle	5785	3.21	3.15	3.74	4.29	9.64	25.22	PASS
	High	5825	2.73	2.87	3.06	4.11	9.25	25.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT20 Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5180	5.13	5.22	4.99	5.41	11.21	12.22	PASS
	Middle	5200	5.92	5.79	5.91	6.39	12.03	12.22	PASS
	High	5240	6.28	5.69	5.98	6.20	12.07	12.22	PASS

Remark:
1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5745	-0.93	-1.15	0.20	-1.02	5.33	25.22	PASS
	Middle	5785	3.83	4.17	3.35	4.21	9.92	25.22	PASS
	High	5825	2.69	2.21	2.19	3.40	8.67	25.22	PASS

Remark:
1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT40 Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5190	-2.61	-2.62	-2.86	-2.46	3.39	12.22	PASS
	High	5230	3.58	3.00	3.54	3.72	9.49	12.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3..*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5755	-10.05	-10.67	-10.65	-9.58	-4.19	25.22	PASS
	High	5795	0.83	0.96	0.57	1.08	6.89	25.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT80 Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5210	-8.33	-8.65	-8.21	-8.36	-2.36	12.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 29.3 Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5775	-13.44	-14.13	-14.23	-12.91	-7.62	25.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 29.3 Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

Product Name	Moca AP cable Modem	Test By	Davis Tseng
Test Model	CGNVM-3589	Test Date	2016/04/12
Test Mode	TX Mode / Beamforming	Temp. & Humidity	25°C, 53%

IEEE 802.11ac VHT20 Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5180	1.25	1.22	1.21	1.73	7.38	12.22	PASS
	Middle	5200	2.46	2.26	2.21	2.91	8.49	12.22	PASS
	High	5240	2.43	2.22	2.07	2.97	8.46	12.22	PASS

Remark:
1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5745	3.17	3.45	2.58	3.90	9.32	25.22	PASS
	Middle	5785	3.34	3.54	3.05	3.79	9.46	25.22	PASS
	High	5825	3.46	2.83	3.11	3.74	9.32	25.22	PASS

Remark:
1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT40 Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5190	-2.48	-2.40	-2.24	-1.65	3.84	12.22	PASS
	High	5230	2.84	2.48	2.79	3.00	8.80	12.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3..*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5755	-1.44	-2.32	-1.85	-0.68	4.49	25.22	PASS
	High	5795	0.12	1.05	1.31	2.54	7.36	25.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

IEEE 802.11ac VHT80 Mode

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 1	Low	5210	-5.94	-6.18	-5.99	-5.87	0.03	12.22	PASS

Remark:

1. *At finial test to get the worst-case emission at 29.3 Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 12.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

UNII Band	CH.	Channel Frequency (MHz)	Peak Power Spectral Density (dBm/500kHz)						Result
			Chain 0	Chain 1	Chain 2	Chain 3	Total	Limit	
Band 3	Low	5775	-7.27	-6.86	-8.05	-6.59	-1.14	25.22	PASS

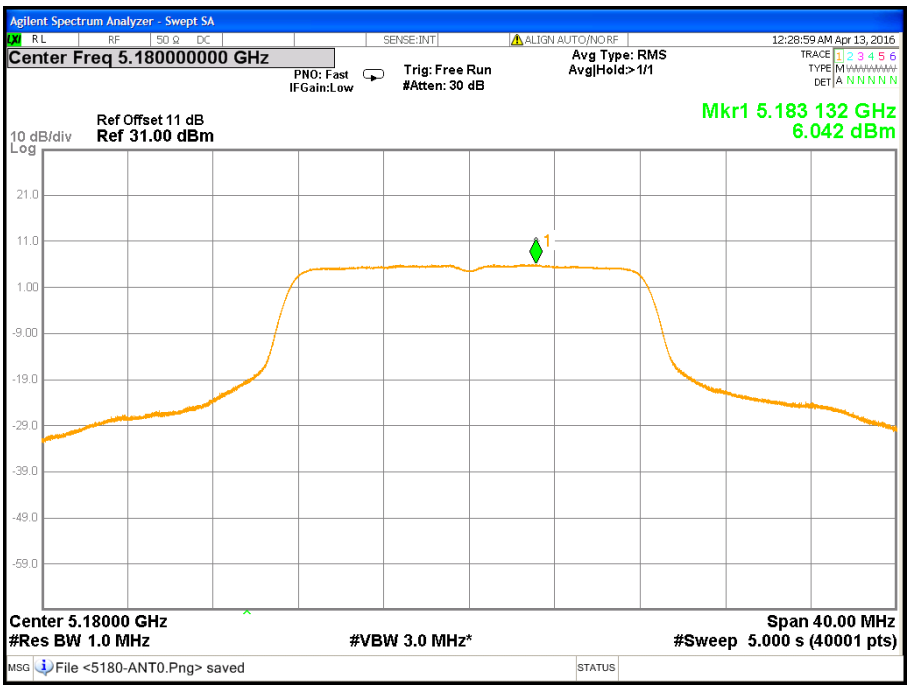
Remark:

1. *At finial test to get the worst-case emission at 29.3 Mbps.*
2. *The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.*
3. *The directional gain is 10.78dBi which is more than 6dBi, the limit should be 25.22dBm.*
4. *Total power spectral density = Chain 0 + Chain 1 + Chain 2 + Chain 3.*

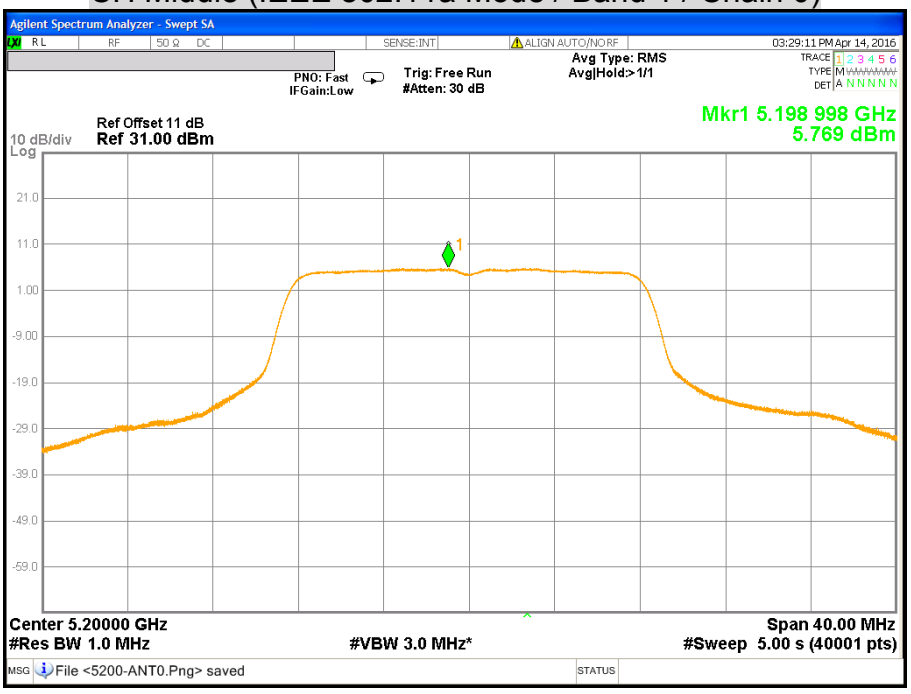
POWER SPECTRAL DENSITY

Non-beamforming

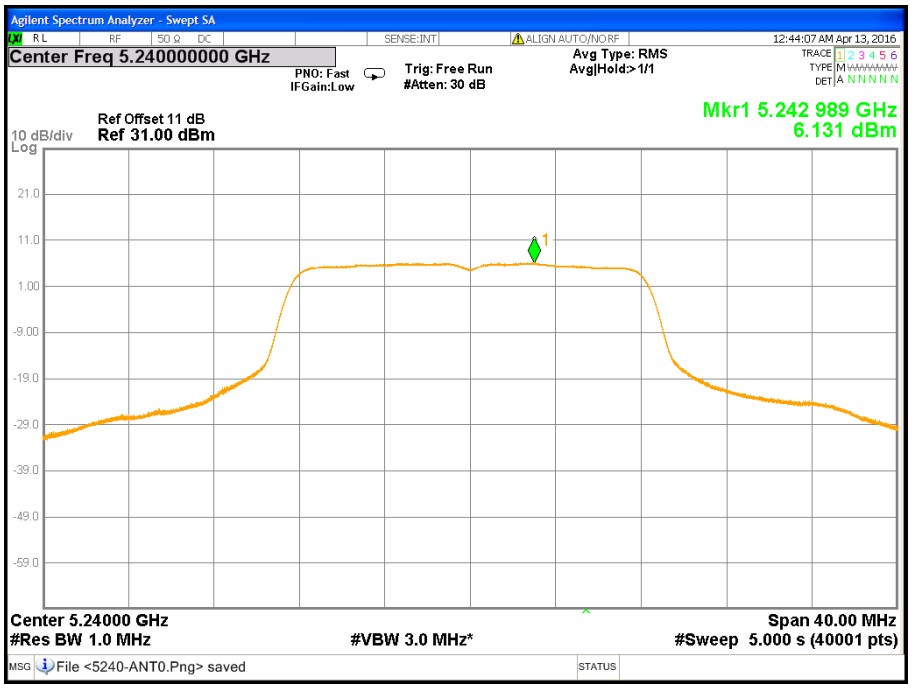
CH Low (IEEE 802.11a Mode / Band 1 / Chain 0)



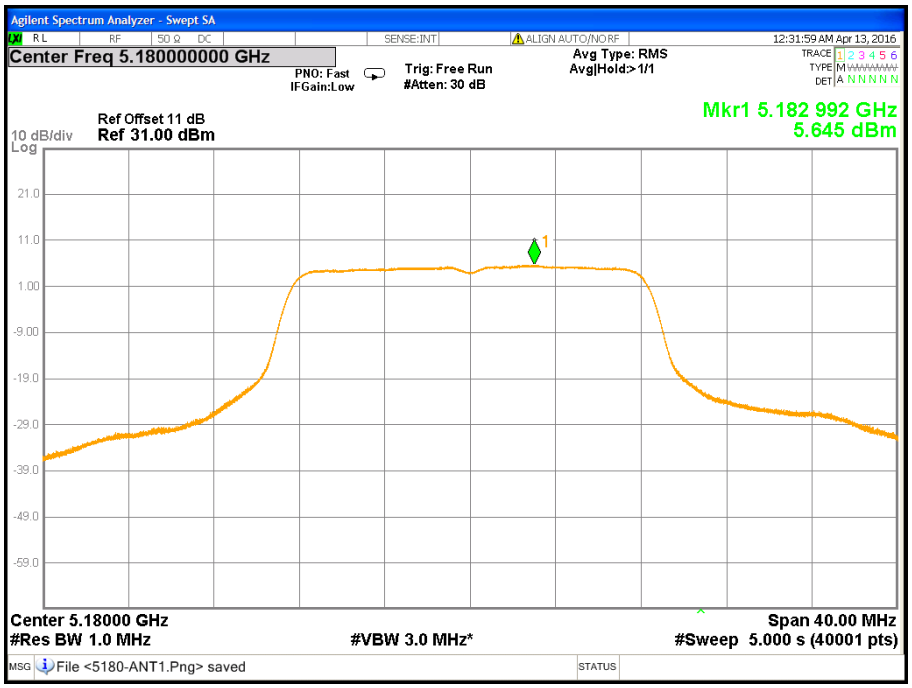
CH Middle (IEEE 802.11a Mode / Band 1 / Chain 0)



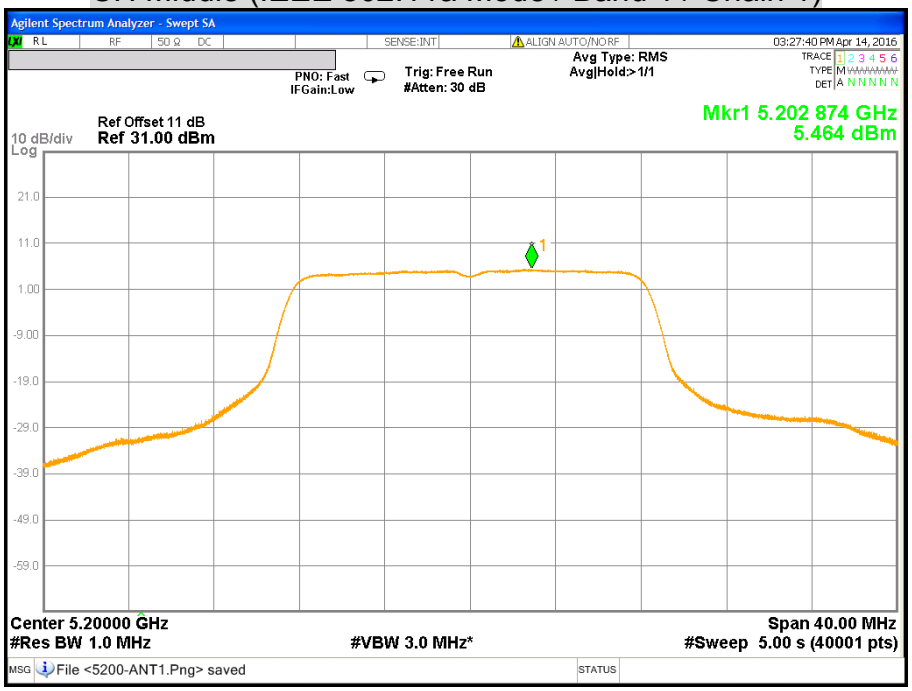
CH High (IEEE 802.11a Mode / Band 1 / Chain 0)



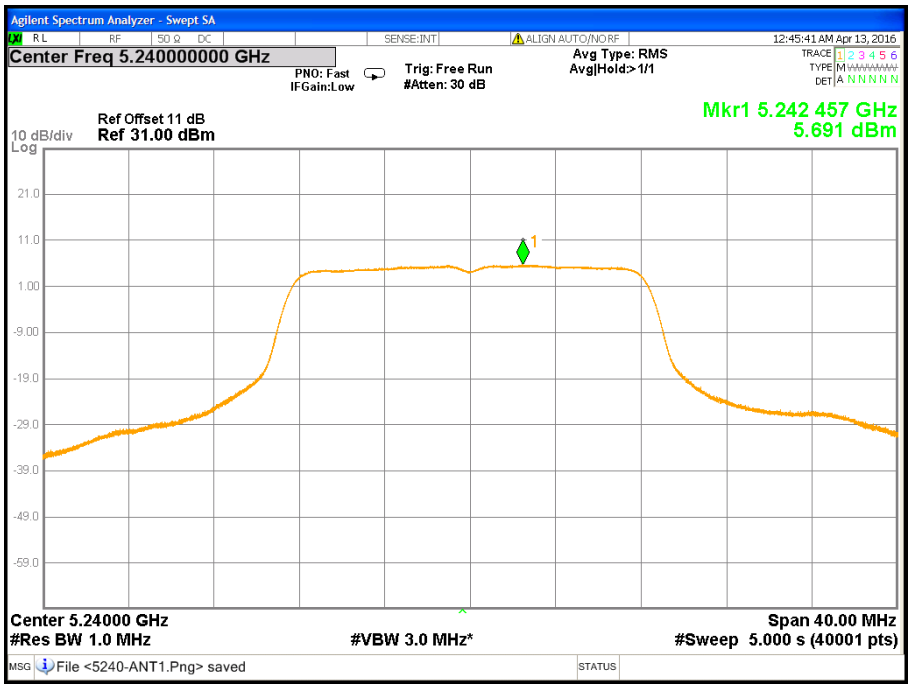
CH Low (IEEE 802.11a Mode / Band 1 / Chain 1)



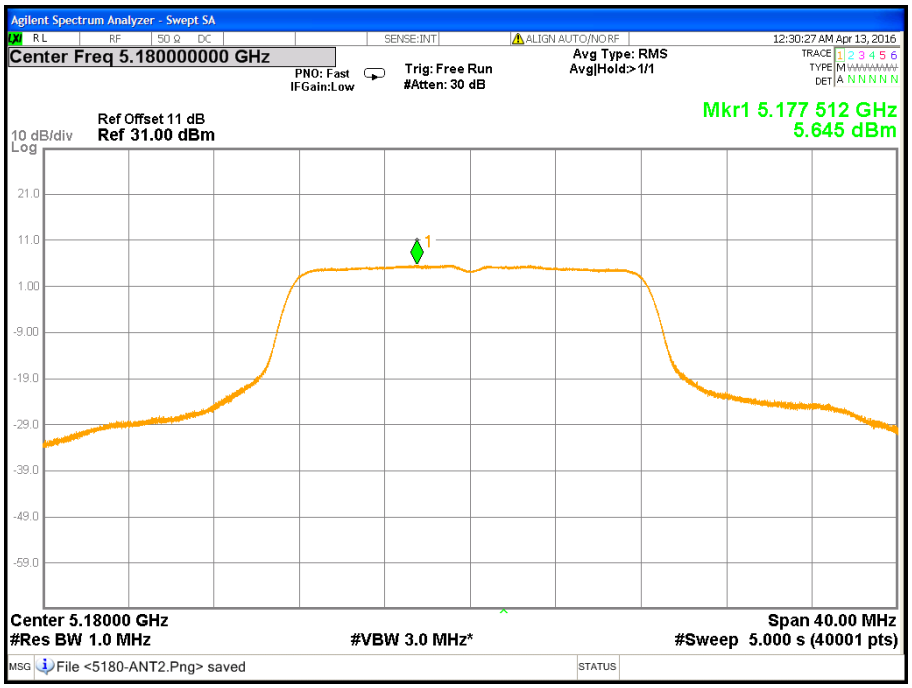
CH Middle (IEEE 802.11a Mode / Band 1 / Chain 1)



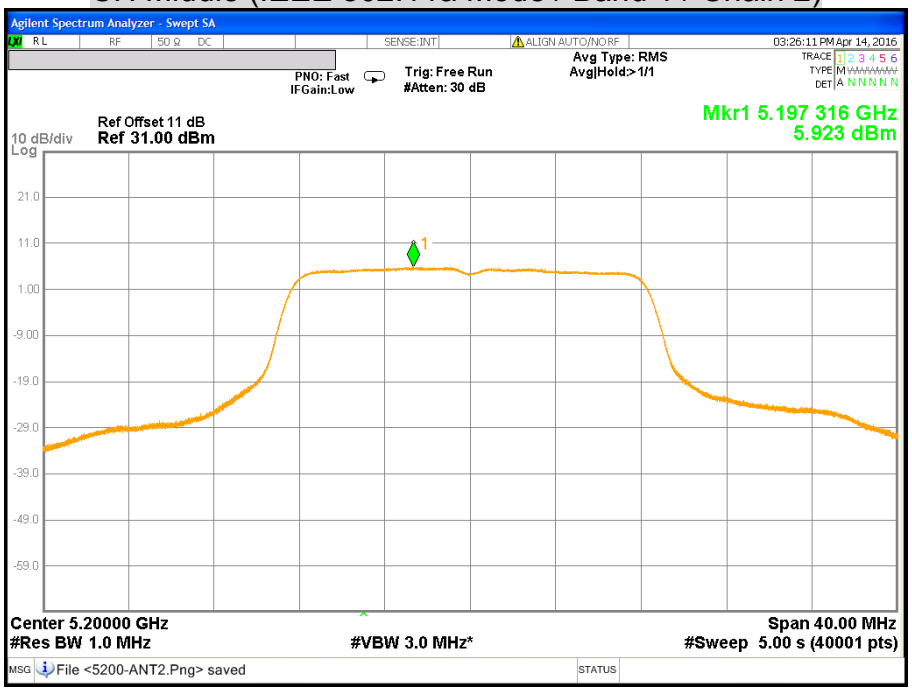
CH High (IEEE 802.11a Mode / Band 1 / Chain 1)



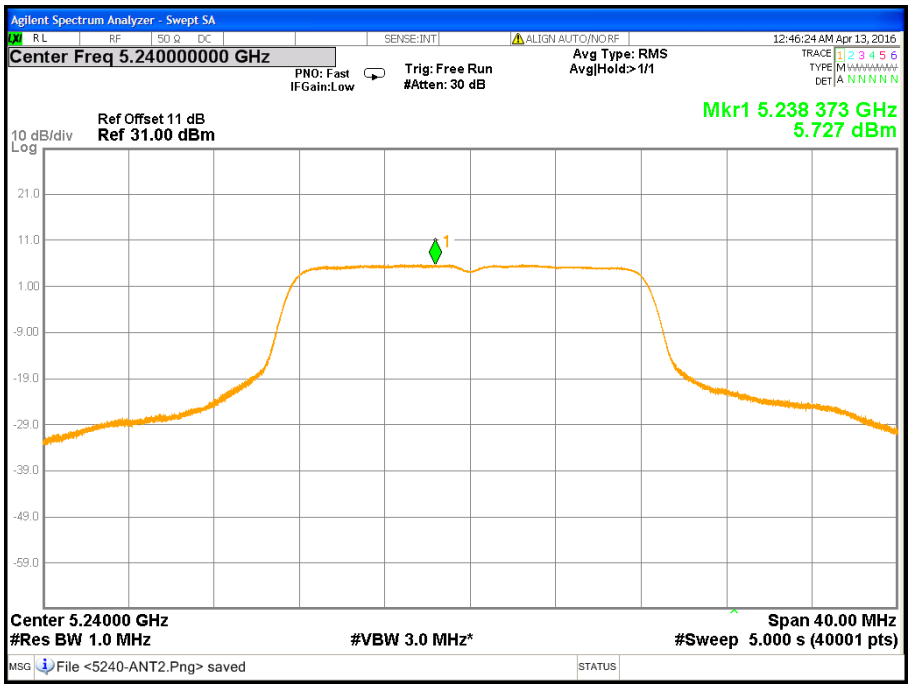
CH Low (IEEE 802.11a Mode / Band 1 / Chain 2)



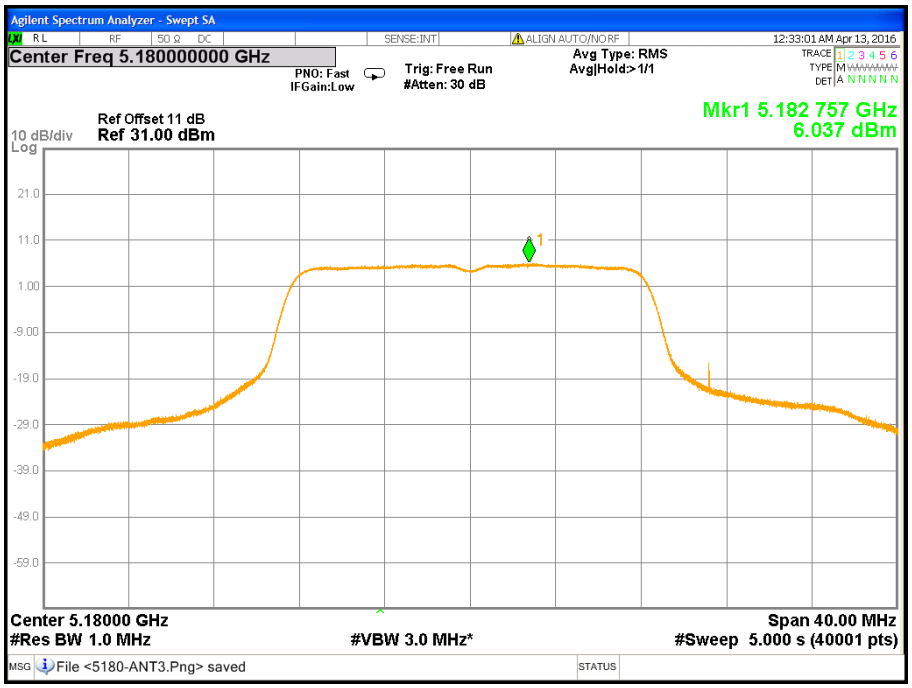
CH Middle (IEEE 802.11a Mode / Band 1 / Chain 2)



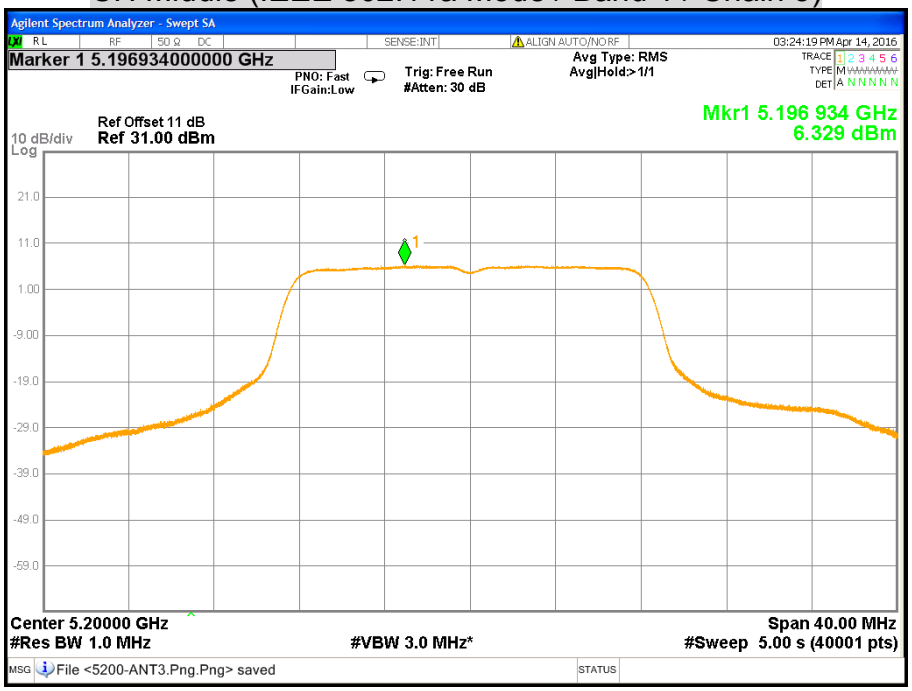
CH High (IEEE 802.11a Mode / Band 1 / Chain 2)



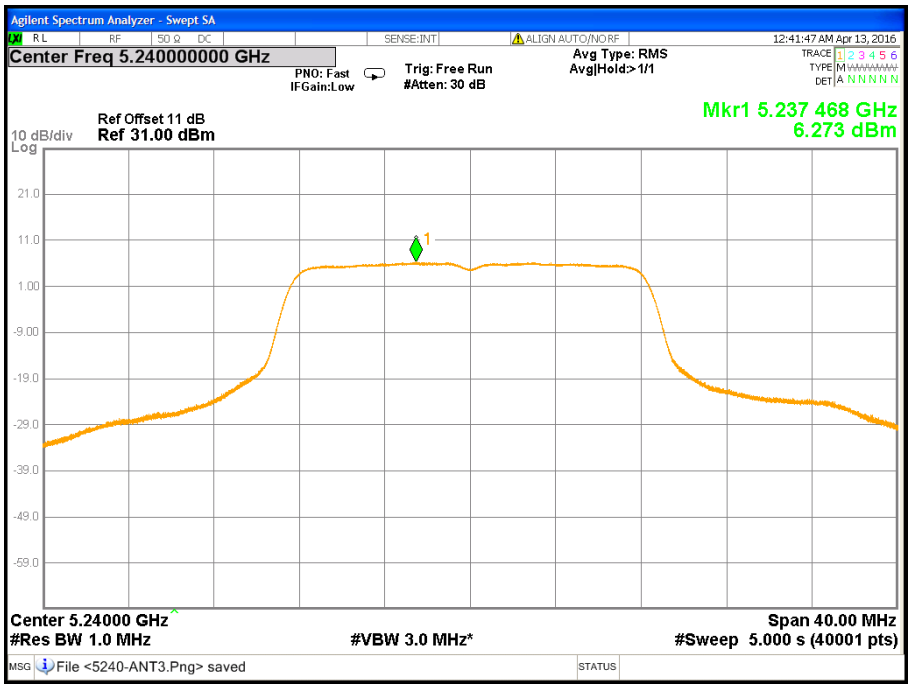
CH Low (IEEE 802.11a Mode / Band 1 / Chain 3)



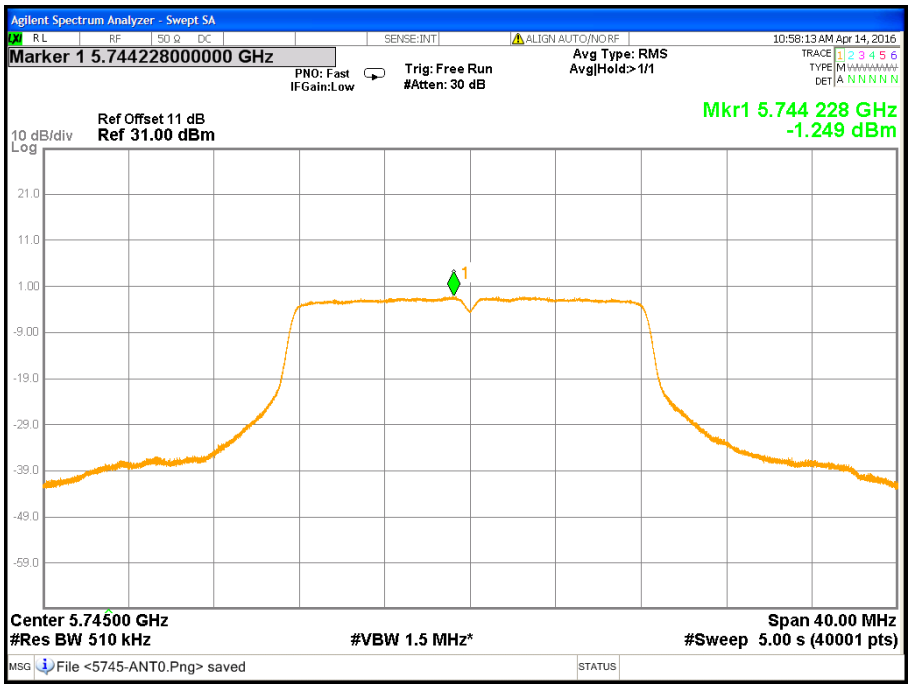
CH Middle (IEEE 802.11a Mode / Band 1 / Chain 3)



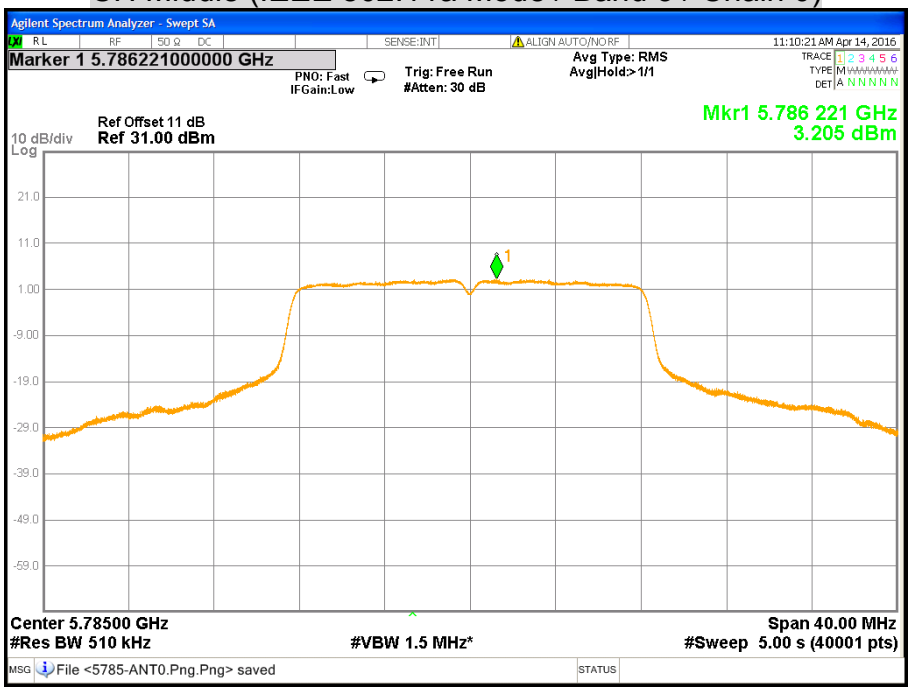
CH High (IEEE 802.11a Mode / Band 1 / Chain 3)



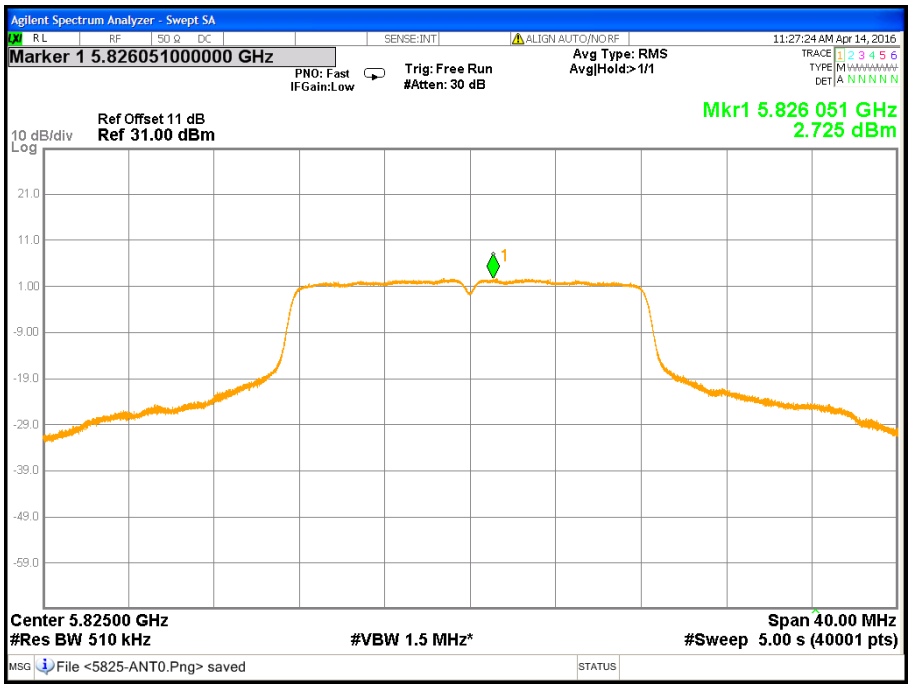
CH Low (IEEE 802.11a Mode / Band 3 / Chain 0)



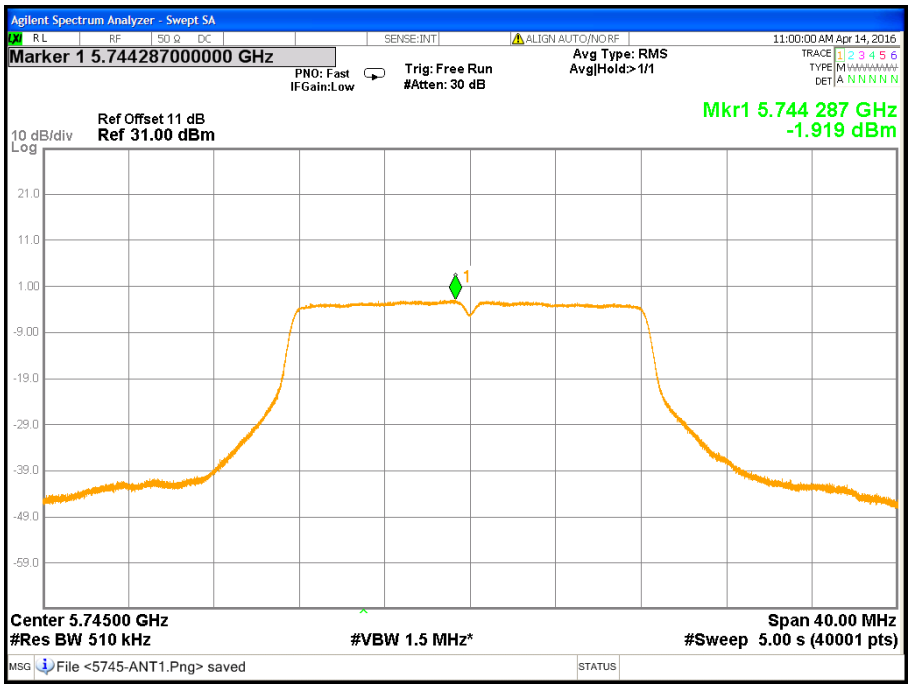
CH Middle (IEEE 802.11a Mode / Band 3 / Chain 0)



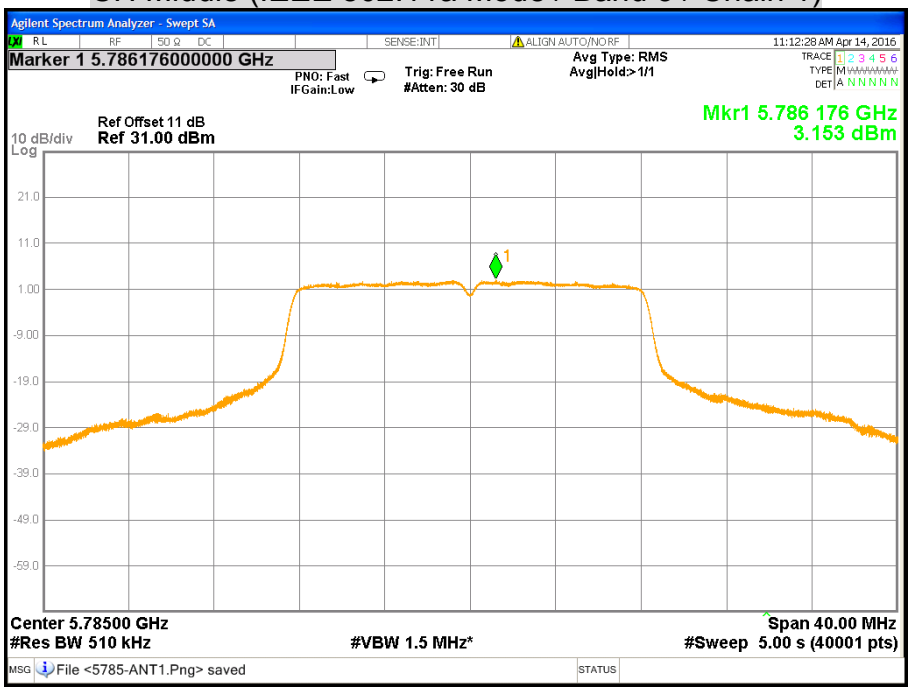
CH High (IEEE 802.11a Mode / Band 3 / Chain 0)



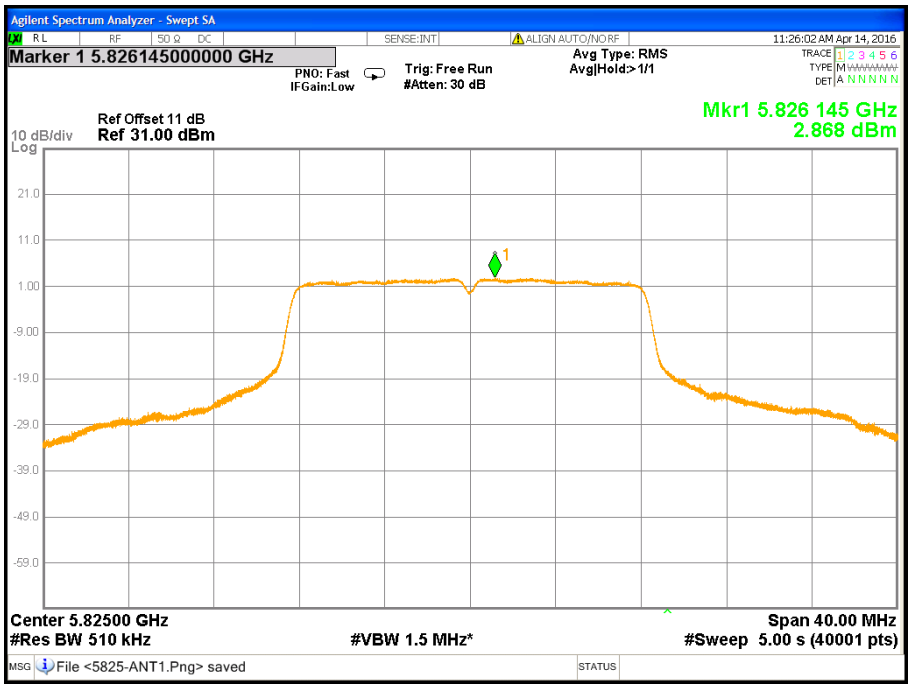
CH Low (IEEE 802.11a Mode / Band 3 / Chain 1)



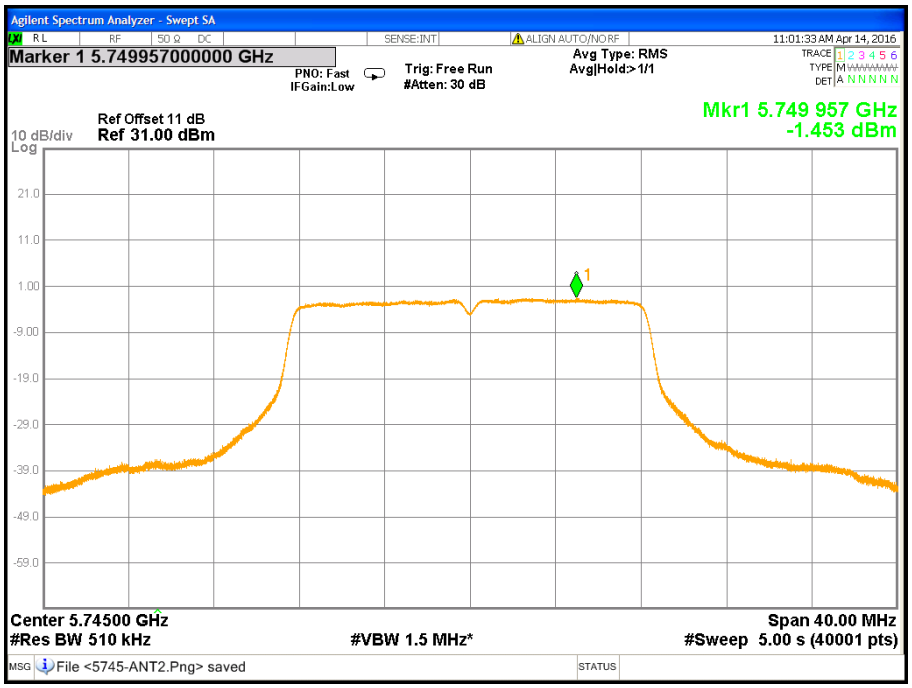
CH Middle (IEEE 802.11a Mode / Band 3 / Chain 1)



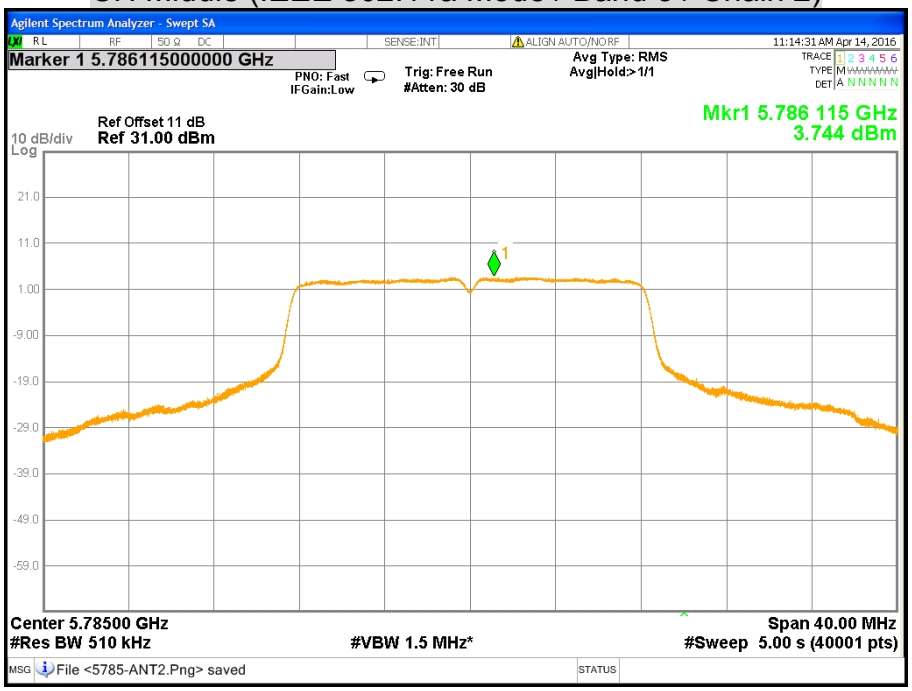
CH High (IEEE 802.11a Mode / Band 3 / Chain 1)



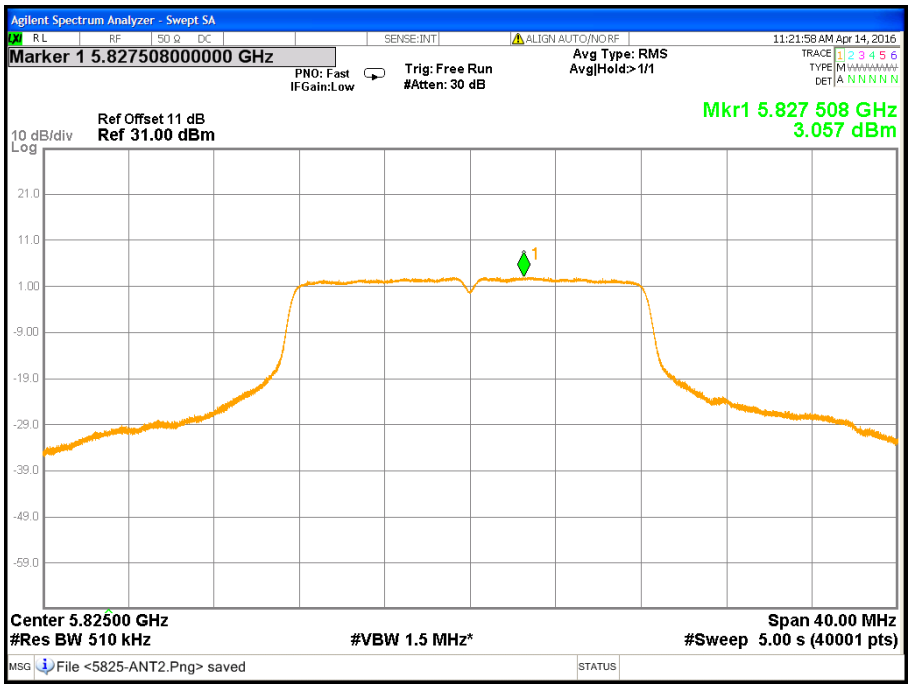
CH Low (IEEE 802.11a Mode / Band 3 / Chain 2)



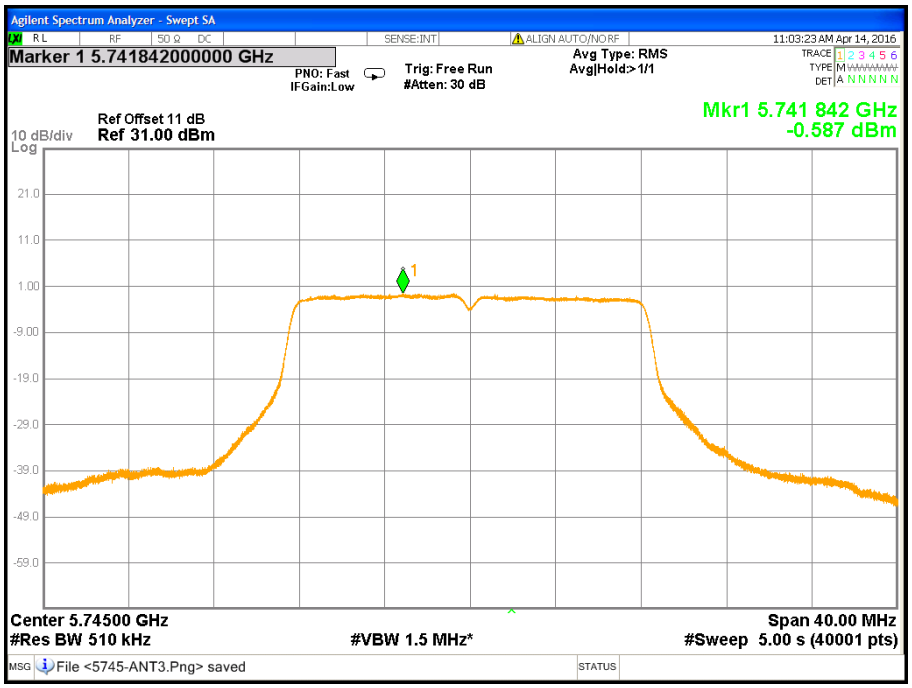
CH Middle (IEEE 802.11a Mode / Band 3 / Chain 2)



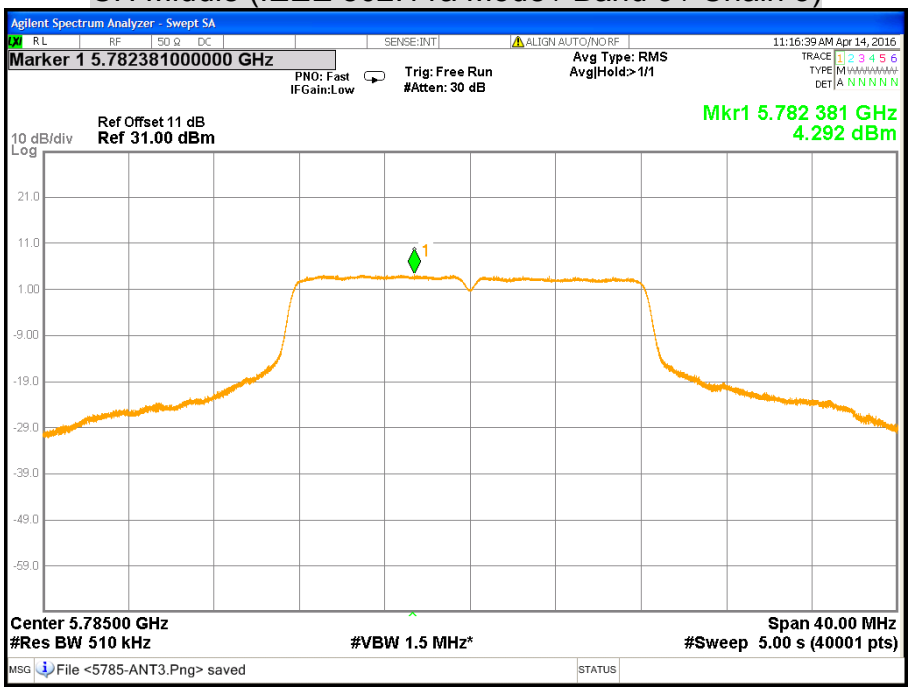
CH High (IEEE 802.11a Mode / Band 3 / Chain 2)



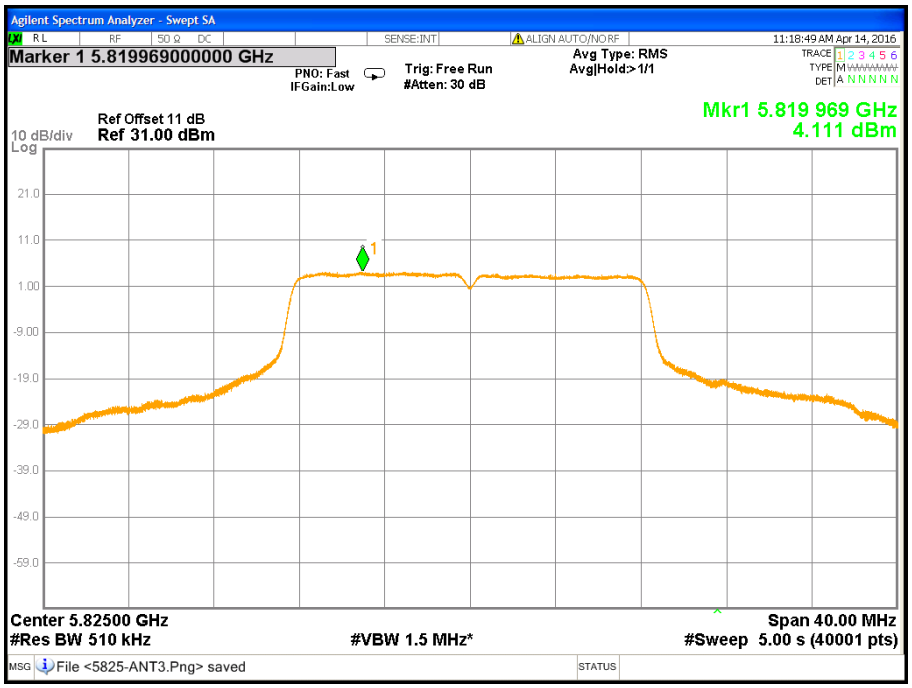
CH Low (IEEE 802.11a Mode / Band 3 / Chain 3)



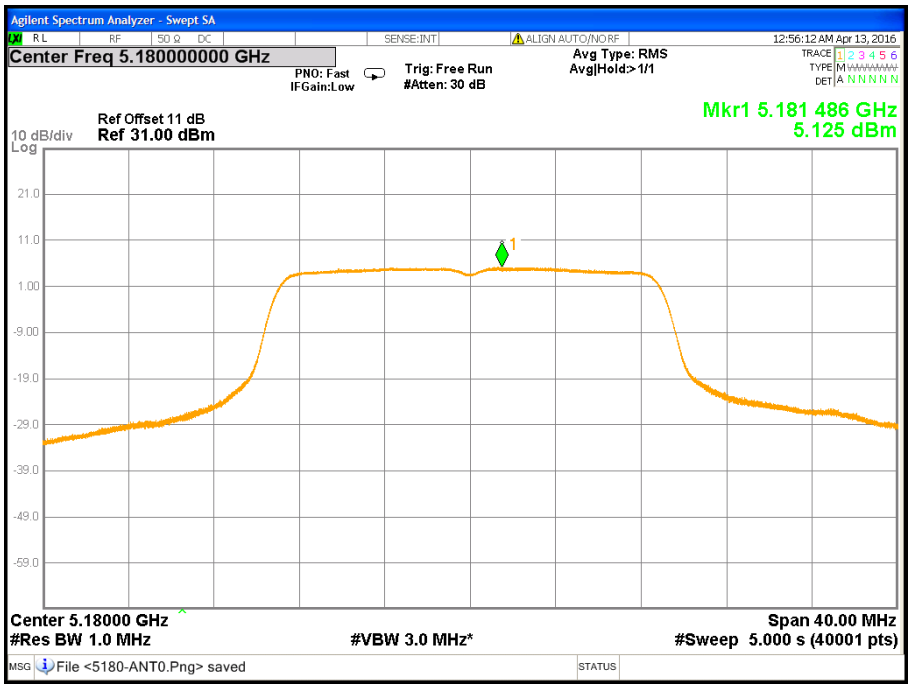
CH Middle (IEEE 802.11a Mode / Band 3 / Chain 3)



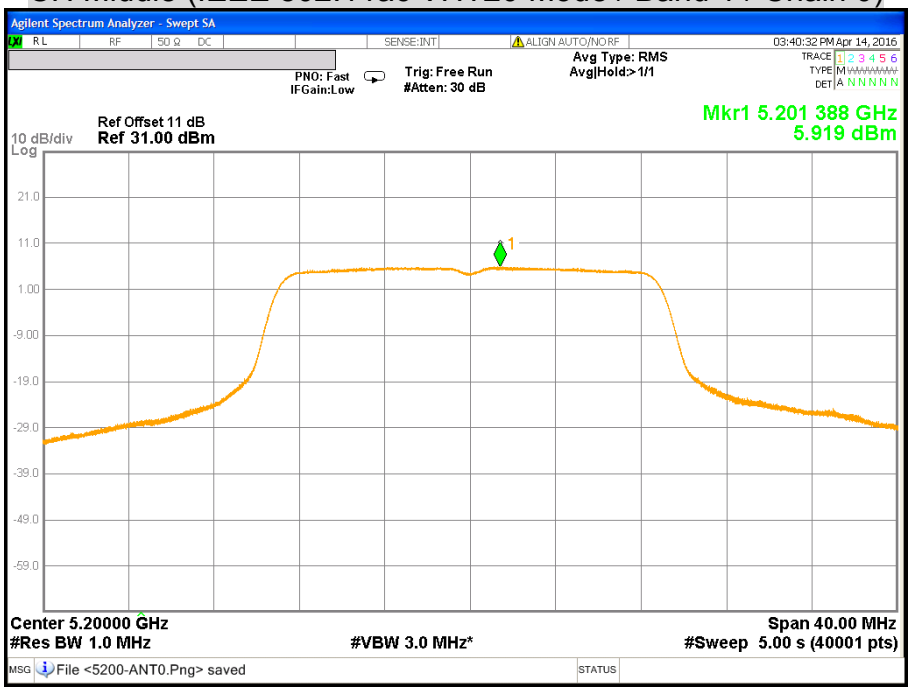
CH High (IEEE 802.11a Mode / Band 3 / Chain 3)



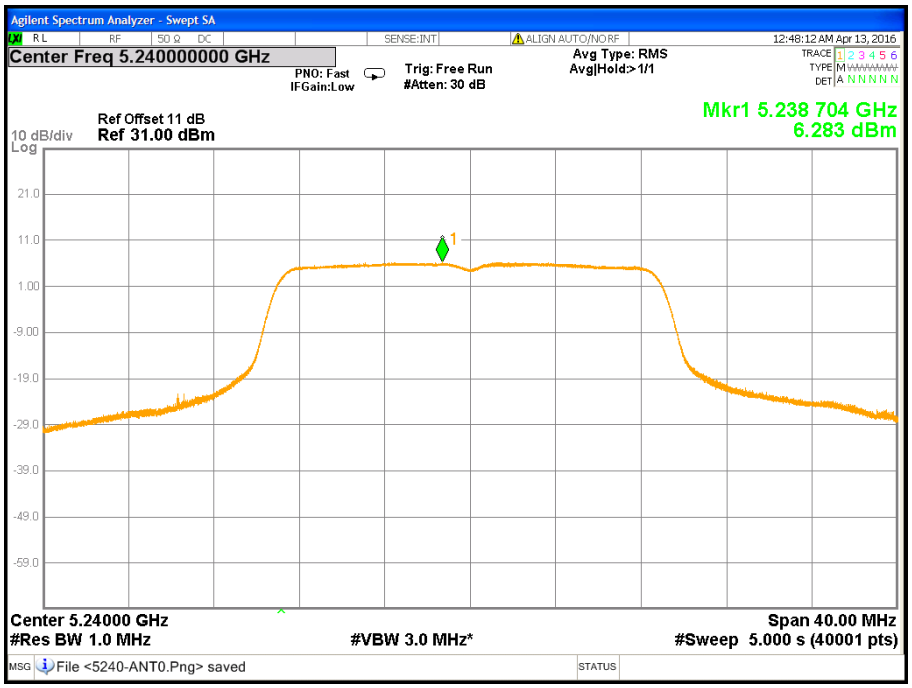
CH Low (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 0)



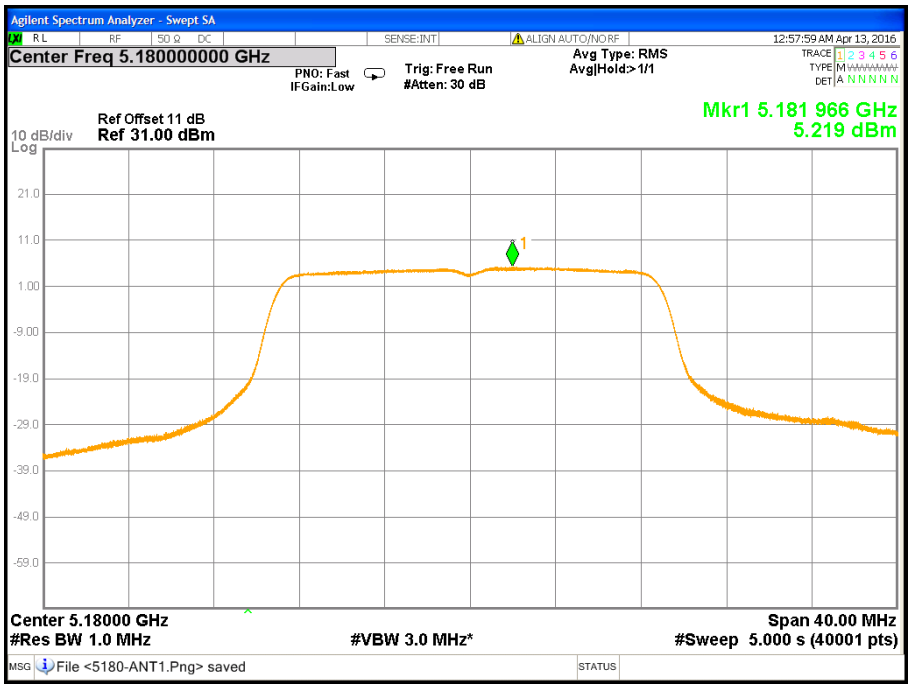
CH Middle (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 0)



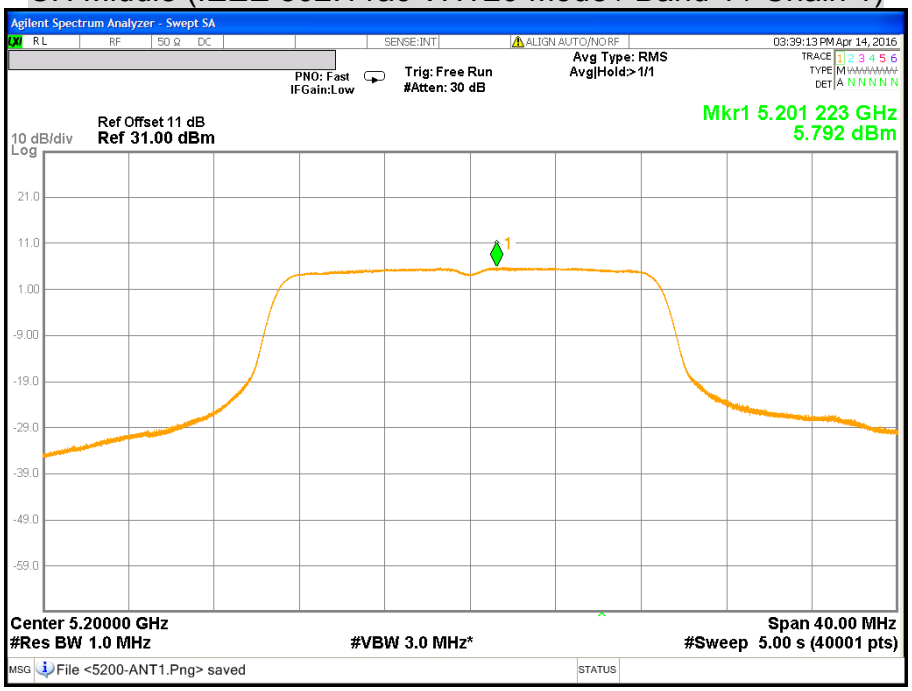
CH High (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 0)



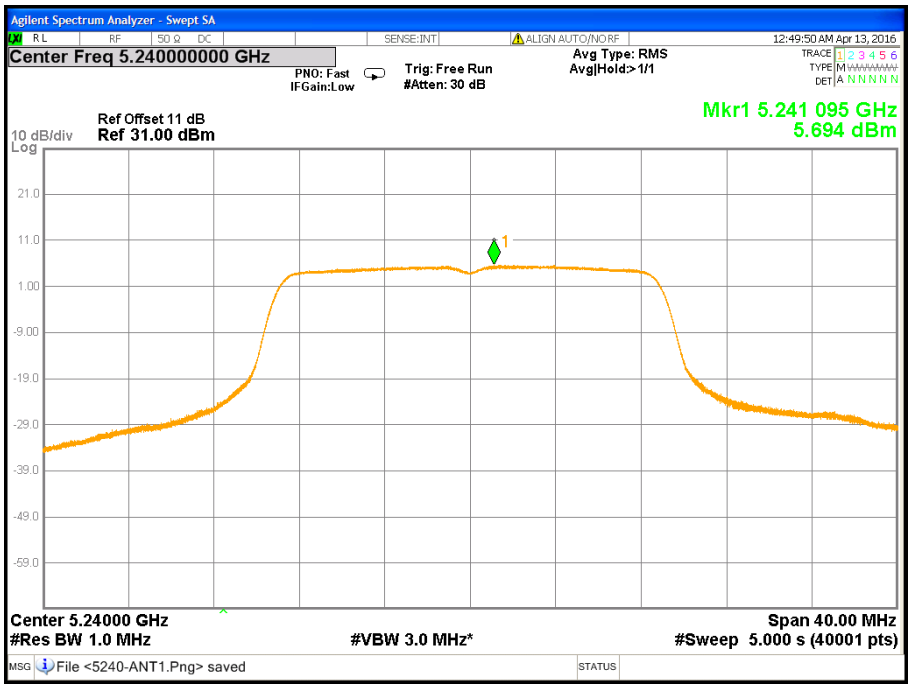
CH Low (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 1)



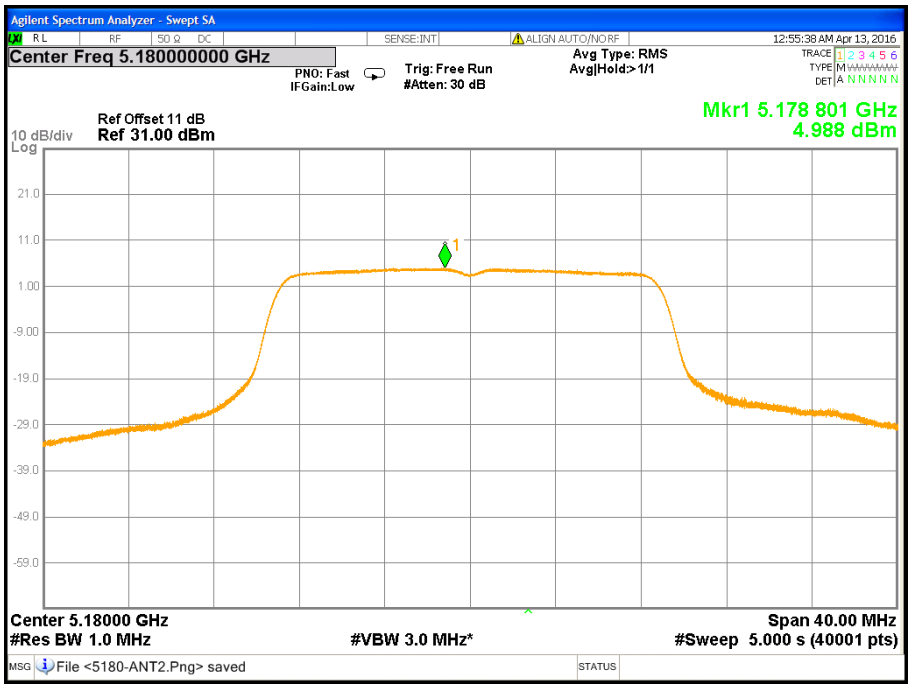
CH Middle (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 1)



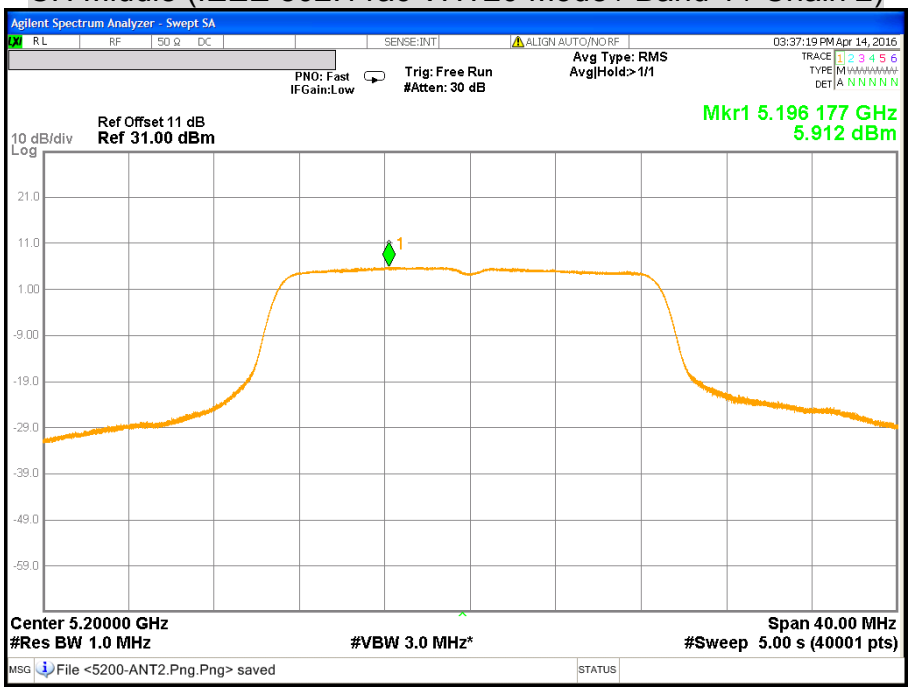
CH High (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 1)



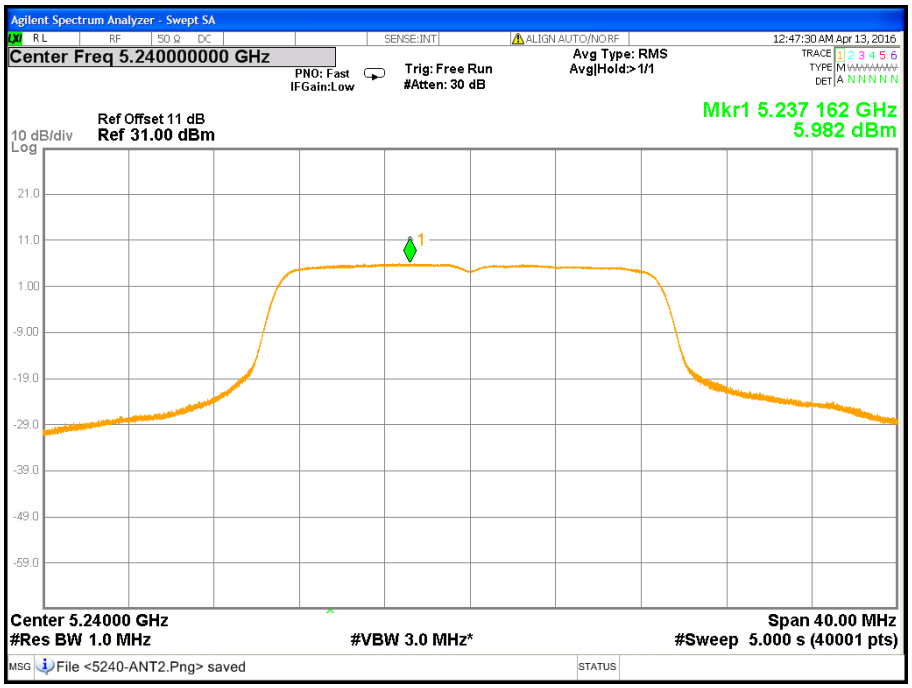
CH Low (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 2)



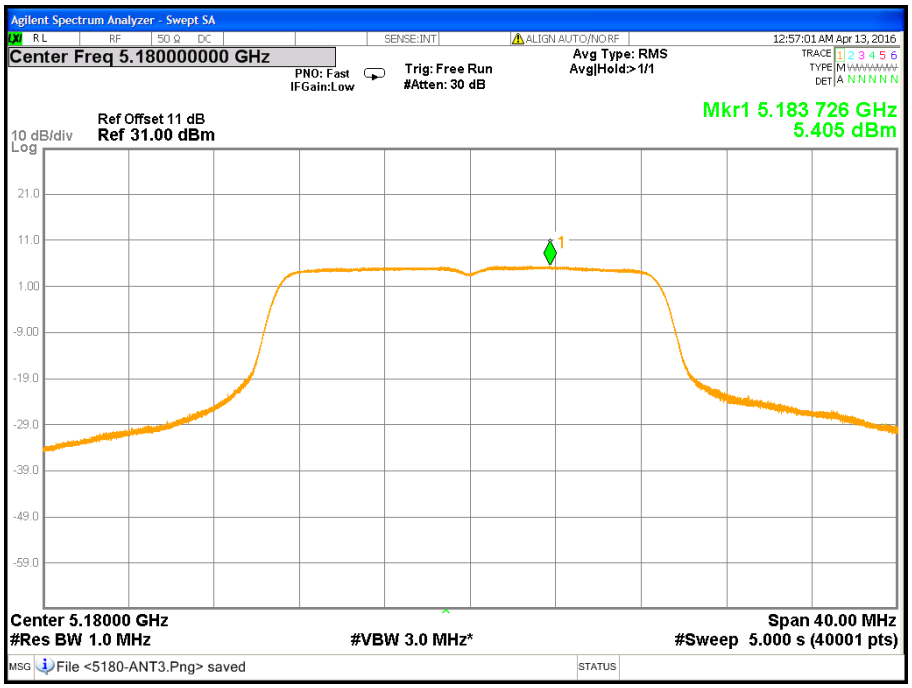
CH Middle (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 2)



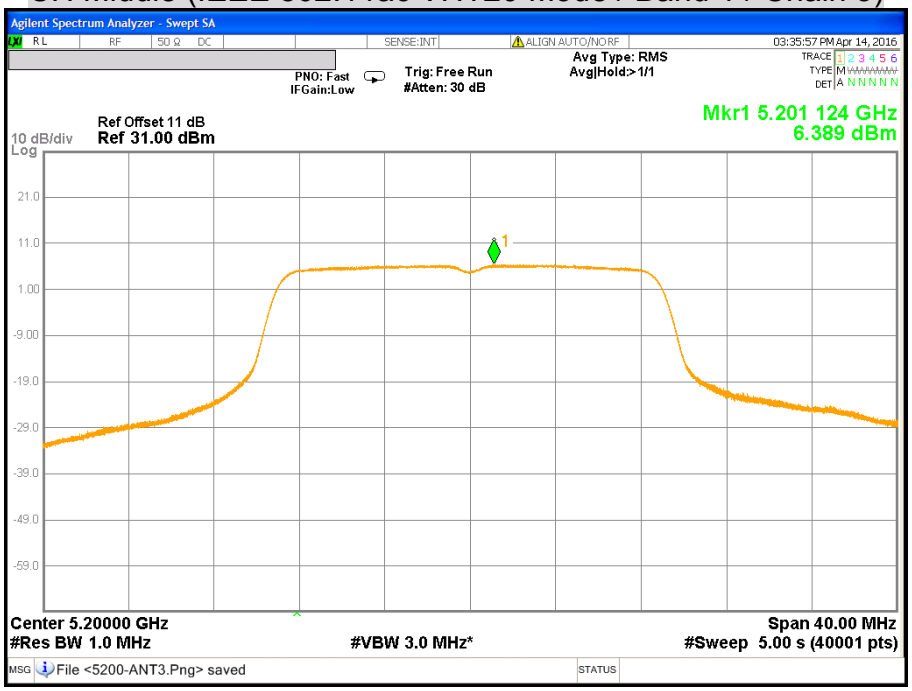
CH High (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 2)



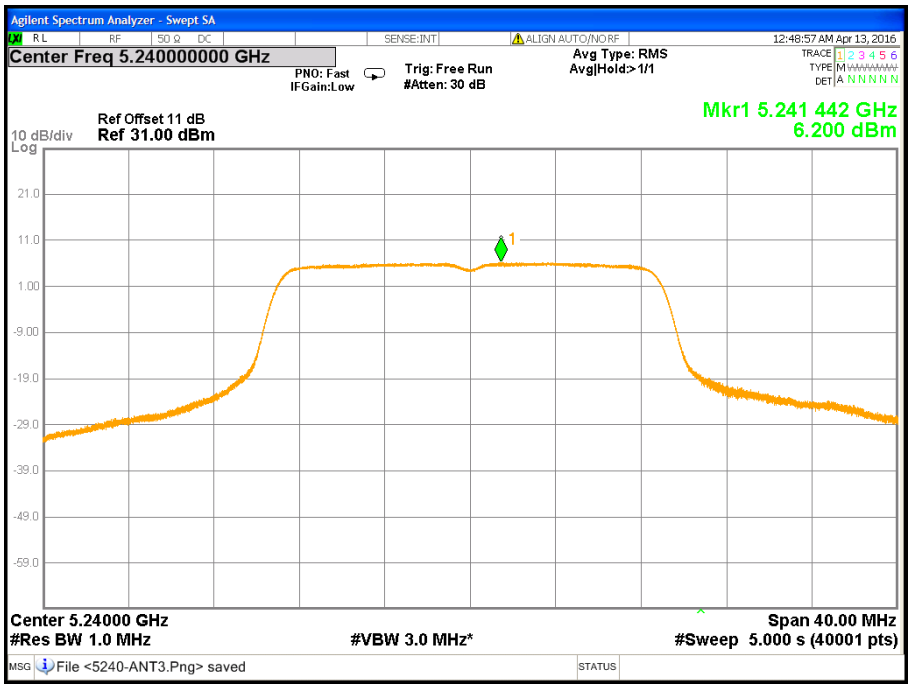
CH Low (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 3)



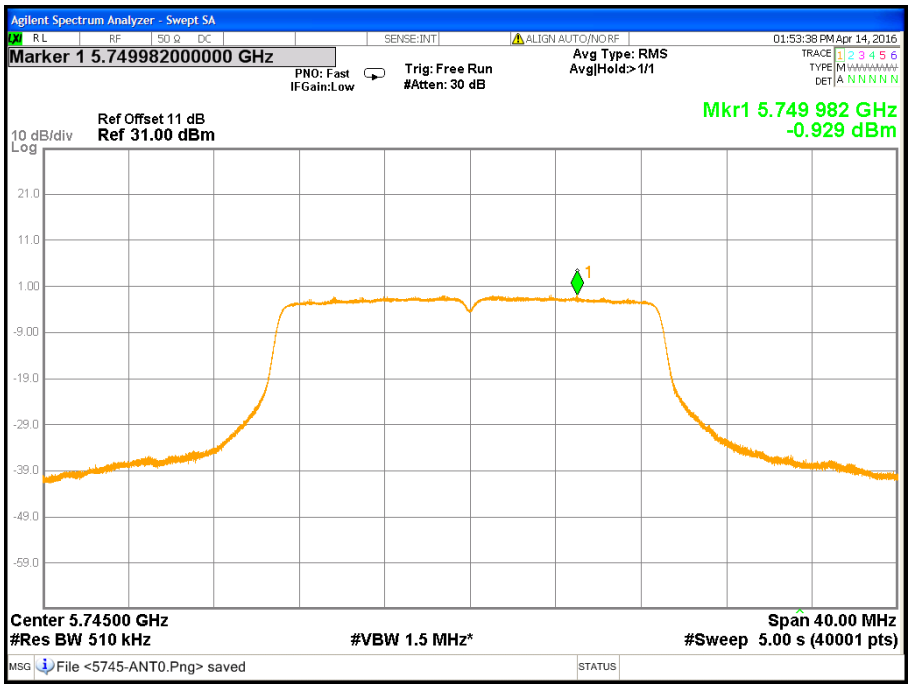
CH Middle (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 3)



CH High (IEEE 802.11ac VHT20 Mode / Band 1 / Chain 3)



CH Low (IEEE 802.11ac VHT20 Mode / Band 3 / Chain 0)



CH Middle (IEEE 802.11ac VHT20 Mode / Band 3 / Chain 0)