



**FCC 47 CFR PART 15 SUBPART E  
INDUSTRY (ISED) CANADA RSS-247 ISSUE 1**

**CERTIFICATION TEST REPORT**

**FOR**

**WIRELESS ACCESS POINT**

**MODEL NUMBER: ACWAP0727**

**FCC ID: WPX-ACWAP  
IC: 8014A-ACWAP**

**REPORT NUMBER: 11387322-E2a**

**ISSUE DATE: 2016-11-01**

**Prepared for  
GOGO LLC  
111 N. CANAL ST.  
CHICAGO, ILLINOIS, 60606, USA**

**Prepared by  
UL LLC  
12 LABORATORY DR.  
RESEARCH TRIANGLE PARK, NC 27709 USA  
TEL: (919) 549-1400**



NVLAP Lab code: 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2016-10-05	Initial Issue.	Ron Reichard
2	2016-10-06	Revised model number.	Jeff Moser
3	2016-10-13	Revised the directional antenna gain calculation for legacy mode (802.11a).	Jeff Moser
4	2016-10-25	Added MCS0 data for 802.11nHT20 and nHT40. Revised model number.	Jeff Moser
5a	2016-11-01	Removed ISED Canada 5.2 GHz data. Note – 5.2 GHz data contained in this report pertains to FCC.	Jeff Moser

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS</b>	<b>5</b>
<b>2. TEST METHODOLOGY</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY</b>	<b>7</b>
4.1. MEASURING INSTRUMENT CALIBRATION	7
4.2. SAMPLE CALCULATION	7
4.3. MEASUREMENT UNCERTAINTY	7
<b>5. EQUIPMENT UNDER TEST</b>	<b>8</b>
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM OUTPUT POWER	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	10
5.4. SOFTWARE AND FIRMWARE	10
5.5. WORST-CASE CONFIGURATION AND MODE	11
5.6. DESCRIPTION OF TEST SETUP	12
<b>6. TEST AND MEASUREMENT EQUIPMENT</b>	<b>14</b>
<b>7. MEASUREMENT METHODS</b>	<b>17</b>
<b>8. ANTENNA PORT TEST RESULTS</b>	<b>18</b>
8.1. ON TIME AND DUTY CYCLE	18
8.1.1. ON TIME AND DUTY CYCLE RESULTS	18
8.1.2. DUTY CYCLE PLOTS	19
8.2. 802.11a MODE IN THE 5.2 GHz BAND	23
8.2.1. 26 dB BANDWIDTH	23
8.2.2. 99% BANDWIDTH	29
8.2.3. OUTPUT POWER AND PSD	35
8.3. 802.11n HT20 MODE IN THE 5.2 GHz BAND	44
8.3.1. 26 dB BANDWIDTH	44
8.3.2. 99% BANDWIDTH	50
8.3.3. OUTPUT POWER AND PSD	56
8.4. 802.11n HT40 MODE IN THE 5.2 GHz BAND	72
8.4.1. 26 dB BANDWIDTH	72
8.4.2. 99% BANDWIDTH	76
8.4.3. OUTPUT POWER AND PSD	80
8.5. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND	92
8.5.1. 26 dB BANDWIDTH	92
8.5.2. 99% BANDWIDTH	95
8.5.3. OUTPUT POWER AND PSD	98

8.6.	802.11a MODE IN THE 5.8 GHz BAND .....	108
8.6.1.	6 dB BANDWIDTH .....	108
8.6.2.	99% BANDWIDTH .....	114
8.6.3.	OUTPUT POWER .....	120
8.6.4.	MAXIMUM POWER SPECTRAL DENSITY (PSD) .....	122
8.7.	802.11n HT20 MODE IN THE 5.8 GHz BAND .....	129
8.7.1.	6 dB BANDWIDTH .....	129
8.7.2.	99% BANDWIDTH .....	135
8.7.3.	OUTPUT POWER .....	141
8.7.4.	MAXIMUM POWER SPECTRAL DENSITY (PSD) .....	144
8.8.	802.11n HT40 MODE IN THE 5.8 GHz BAND .....	157
8.8.1.	6 dB BANDWIDTH .....	157
8.8.2.	99% BANDWIDTH .....	161
8.8.3.	OUTPUT POWER .....	165
8.8.1.	MAXIMUM POWER SPECTRAL DENSITY (PSD) .....	168
8.9.	802.11ac VHT80 MODE IN THE 5.8 GHz BAND .....	177
8.9.1.	6 dB BANDWIDTH .....	177
8.9.2.	99% BANDWIDTH .....	180
8.9.3.	OUTPUT POWER .....	183
8.9.4.	MAXIMUM POWER SPECTRAL DENSITY (PSD) .....	186
9.	<b>RADIATED TEST RESULTS .....</b>	<b>193</b>
9.1.	LIMITS AND PROCEDURE .....	193
9.2.	TRANSMITTER 1-18 GHz.....	194
9.2.1.	1-18 GHz, 802.11a MODE IN THE 5.2 GHz BAND .....	194
9.2.2.	1-18 GHz, 802.11n HT20 MODE IN THE 5.2 GHz BAND.....	201
9.2.3.	1-18 GHz, 802.11n HT40 MODE IN THE 5.2 GHz BAND.....	215
9.2.4.	1-18 GHz, 802.11ac VHT80 MODE IN THE 5.2 GHz BAND .....	227
9.2.5.	1-18 GHz, 802.11a MODE IN THE 5.8 GHz BAND .....	237
9.2.6.	1-18 GHz, 802.11n HT20 MODE IN THE 5.8 GHz BAND.....	244
9.2.7.	1-18 GHz, 802.11n HT40 MODE IN THE 5.8 GHz BAND.....	258
9.2.8.	1-18 GHz, 802.11ac VHT80 MODE IN THE 5.8 GHz BAND .....	270
9.3.	WORST-CASE ABOVE 18GHz.....	280
9.4.	WORST-CASE BELOW 1 GHz .....	282
10.	<b>AC POWER LINE CONDUCTED EMISSIONS .....</b>	<b>285</b>
11.	<b>SETUP PHOTOS .....</b>	<b>286</b>

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** GOGO,LLC  
111 N. CANAL ST.  
CHICAGO, IL, 60606, USA

**EUT DESCRIPTION:** Wireless Access Point

**MODEL:** ACWAP0727, p/n P33206

**SERIAL NUMBER:** ENG001

**DATE TESTED:** 2016-06-20,  
2016-08-20 to 2016-10-24

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY (ISED) CANADA RSS-247 Issue 1	Pass
INDUSTRY (ISED) CANADA RSS-GEN Issue 4	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released  
For UL LLC By:



Jeffrey Moser  
EMC Program Manager  
UL – Consumer Technology Division

Prepared By:



Ronald Reichard  
WiSE Project Lead  
UL – Consumer Technology Division

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10:2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Suite B, Perimeter Park Drive, Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709	
<input type="checkbox"/>	Chamber A
<input type="checkbox"/>	Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560	
<input checked="" type="checkbox"/>	Chamber NORTH
<input checked="" type="checkbox"/>	Chamber SOUTH

The onsite chambers are covered under Industry (ISED) Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <http://www.nist.gov/nvlap/>

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Total RF power, conducted	± 0.45 dB
RF power density, conducted	± 1.50 dB
Spurious Emissions, conducted	± 2.94 dB
All emissions, radiated up to 40 GHz	± 5.36 dB
Temperature	± 0.07 °C
Humidity	± 2.26% RH
DC and low frequency voltages	± 1.27%
Conducted Emissions (0.150 – 30 MHz)	± 3.65 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n/ac 3x3 SDM Wireless Access Point for Commercial Aircraft that operates in the 2.4/5.2/5.8 GHz bands. Note – Does not operate in the 5.2 GHz band for ISSED Canada.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

FCC

Frequency Range (MHz)	Mode	Total Output Power (dBm)	Total Output Power (mW)
<b>5.2 Band</b>			
5180 - 5240	802.11a	17.21	52.60
5180 - 5240	802.11n HT20 (CDD)	18.63	72.95
5180 - 5240	802.11n HT20 (SDM)	18.96	78.70
5190 - 5230	802.11n HT40 (CDD)	18.71	74.30
5190 - 5230	802.11n HT40 (SDM)	19.09	81.10
5210	802.11ac VHT80 (CDD)	18.76	75.16
5210	802.11ac VHT80 (SDM)	18.94	78.34
<b>5.8 GHz Band</b>			
5745 - 5825	802.11a	20.44	110.66
5745 - 5825	802.11n HT20 (CDD)	20.09	102.09
5745 - 5825	802.11n HT20 (SDM)	20.49	111.94
5755 - 5795	802.11n HT40 (CDD)	19.88	97.27
5755 - 5795	802.11n HT40 (SDM)	20.12	102.80
5775	802.11ac VHT80 (CDD)	19.17	82.60
5775	802.11ac VHT80 (SDM)	19.68	92.90



Industry (ISED) Canada

Frequency Range (MHz)	Mode	Total Output Power (dBm)	Total Output Power (mW)
<b>5.8 GHz Band</b>			
5745 - 5825	802.11a	20.44	110.66
5745 - 5825	802.11n HT20 (CDD)	20.09	102.09
5745 - 5825	802.11n HT20 (SDM)	20.49	111.94
5755 - 5795	802.11n HT40 (CDD)	19.88	97.27
5755 - 5795	802.11n HT40 (SDM)	20.12	102.80
5775	802.11ac VHT80 (CDD)	19.17	82.60
5775	802.11ac VHT80 (SDM)	19.68	92.90

### **5.3. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes 3 omni-directional dome antennas, each with a maximum gain of:

Frequency Range (MHz)	Antenna Gain (dBi)
2400 - 2700	+6
4900 - 5935	+8

### **5.4. SOFTWARE AND FIRMWARE**

The firmware installed in the EUT during testing was ArubaOS version 6.4.2.0.

## 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Line conducted emissions was not performed since the EUT is intended for installation on an aircraft.

The fundamental of the EUT chassis with terminated antenna ports was investigated in three orthogonal orientations X,Y,Z, it was determined that X (flat) orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Additionally, the fundamental of the EUT antenna was investigated in two orthogonal orientations Horizontal and Vertical, it was determined that the horizontal orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT antenna in horizontal orientation.

Note – The antennas are omni-directional, therefore only horizontal and vertical orientations were investigated.

Based on the baseline scan, the worst-case data rates were:

802.11a mode: 6 Mbps  
802.11n HT20 CDD: MCS0  
802.11n HT20 SDM: MCS16  
802.11n HT40 CDD: MCS0  
802.11n HT40 SDM: MCS16  
802.11ac VHT80 CDD: MCS0 (Nss = 1)  
802.11ac VHT80 SDM: MCS0 (Nss = 3)

Note – 802.11n and 802.11ac Power, Radiated Band Edge and Radiated Spurious were performed at both CDD (MCS0 Nss = 1) and SDM (MCS16 or MCS0 Nss = 3) modes. All other tests were performed at SDM (MCS16).

Power will be limited as follows:

Nss < Nant: max power per chain constrained by CDD 3x3 MIMO, Nss = 1 power per chain.  
Nss = Nant: max power per chain constrained by SDM 3x3 MIMO power per chain.

Radiated emissions for EUT with antenna was performed and passed; therefore, restricted band antenna port spurious was not performed.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T440	N/A	N/A
Power Brick	Lenovo	ADLX65NLC2A	N/A	N/A

### I/O CABLES

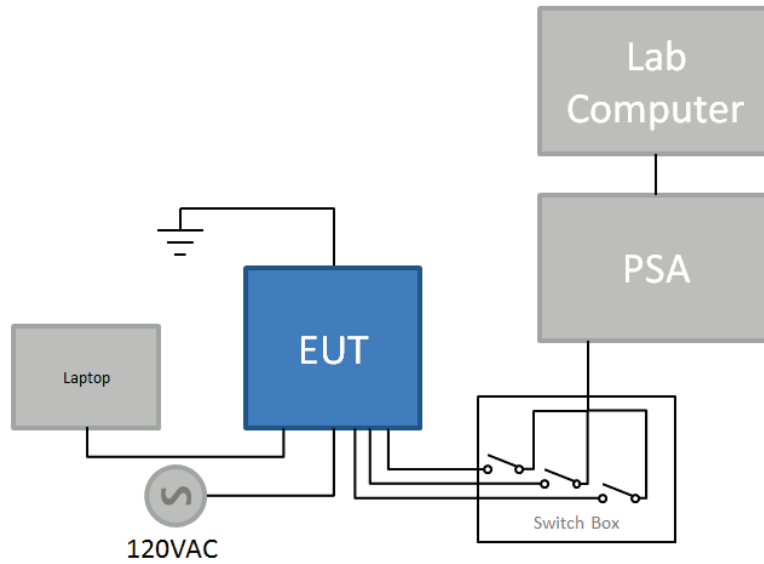
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Power	1	Proprietary	Proprietary	1.5	
2	Antenna	3	RF	Coaxial	1	
3	USB	1	USB	USB	1	Not permanently connected in the field
4	Ethernet	1	Quadrx	Shielded	35	Connected to laptop outside of chamber

### TEST SETUP

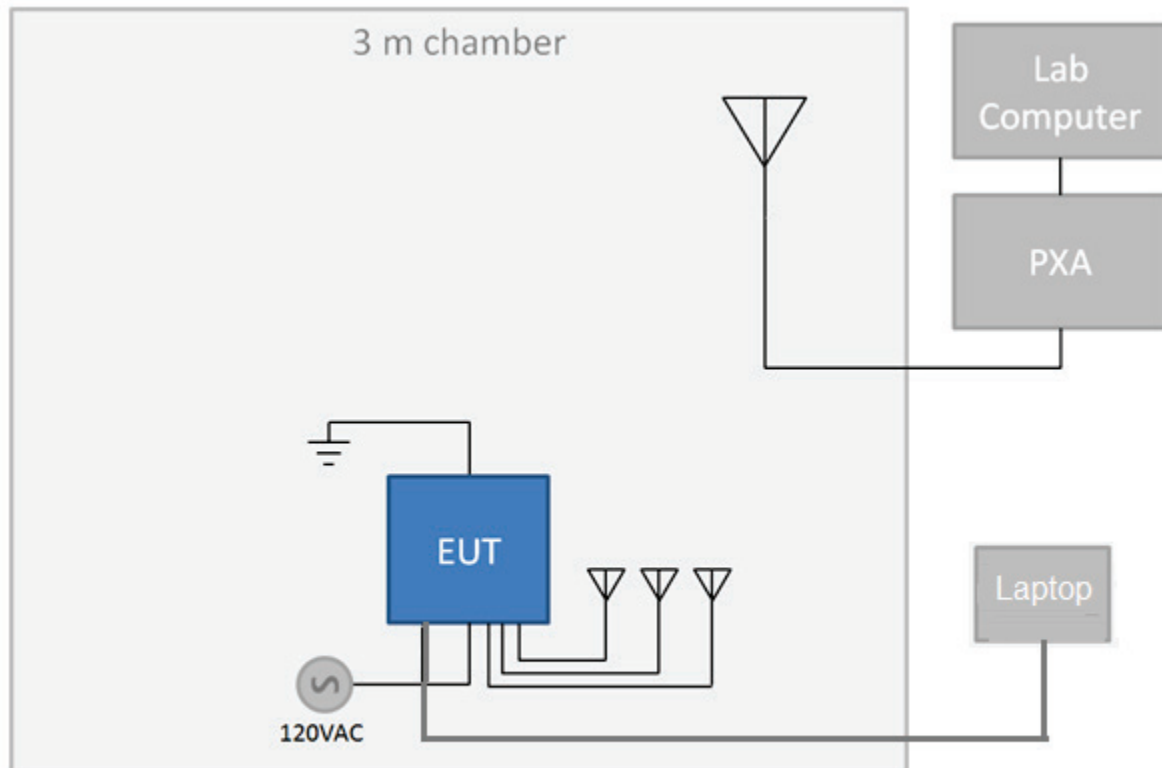
The EUT connected to a laptop to execute software to exercise the radio card.

## SETUP DIAGRAM FOR TESTS

### Conducted Measurements



### Radiated Measurements



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>0.009-30MHz</b>	<b>(Loop Ant.)</b>			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2015-12-08	2016-12-31
	<b>30-1000 MHz</b>				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-07	2017-06-30
	<b>1-18 GHz</b>				
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	<b>18-40 GHz</b>				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2016-09-06	2017-09-30
AT0077	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2016-09-06	2017-09-06
	<b>Gain-Loss Chains</b>				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2015-10-07	2016-10-31
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2016-06-26	2017-06-30
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-08-22, 2016-08-28	2016-08-31, 2017-08-28
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2016-08-28	2017-08-28
	<b>Receiver &amp; Software</b>				
SA0025	Spectrum Analyzer	Agilent	N9030A	2016-03-17	2017-03-31
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2016-02-24	2017-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	<b>Additional Equipment used</b>				
HI0078	Temp/Humid/Pressure Meter	Springfield Precision	PreciseTemp	2016-06-13	2017-06-13

Note – This test area was used from 2016-08-20 to 2016-09-30.

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>0.009-30MHz</b>	<b>(Loop Ant.)</b>			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2015-12-08	2016-12-31
	<b>30-1000 MHz</b>				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-27	2017-06-30
	<b>1-18 GHz</b>				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	<b>Gain-Loss Chains</b>				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2015-10-07	2016-10-31
N-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2016-06-26	2017-06-30
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-09-29, 2016-08-28	2016-09-30, 2017-08-28
	<b>Receiver &amp; Software</b>				
SA0027	Spectrum Analyzer	Agilent	N9030A	2016-02-08	2017-02-08
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	<b>Additional Equipment used</b>				
139844	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19

Note – Fundamental checks of the chassis were performed on 2016-06-20. All other testing in this test area was performed from 2016-08-23 to 2016-10-24.

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>Conducted Room 1</b>					
72822 (SA0019)	Spectrum Analyzer	Agilent Technologies	E4446A	2016-08-25	2017-08-25
PWM002	RF Power Meter	Keysight Technologies	N1911A	2016-06-22	2017-06-22
PWS002	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	N1921A	2016-06-22	2017-06-22
UL139843	Temp/Humid/Pressure Meter	Fisher Scientific	14-650-118	2016-02-19	2017-02-19
<b>Conducted Room 2</b>					
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2016-03-22	2017-03-31
PWM003	RF Power Meter	Keysight Technologies	N1911A	2016-06-21	2017-06-21
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2016-06-22	2017-06-30
UL139843	Temp/Humid/Pressure Meter	Fisher Scientific	14-650-118	2016-02-19	2017-02-19



## 7. MEASUREMENT METHODS

Duty Cycle: KDB 789033 D02 v01r03, Section B.

26 dB Emission BW: KDB 789033 D02 v01r03, Section C.

99% Occupied BW: KDB 789033 D02 v01r03, Section D.

Conducted Output Power: KDB 789033 D02 v01r03, Section E.3.b (Method PM-G).

Power Spectral Density: KDB 789033 D02 v01r03, Section F (Method SA-2).

Unwanted emissions in restricted bands: KDB 789033 D02 v01r03, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01r03, Sections G.3, G.4, and G.5.

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3-6.6

## 8. ANTENNA PORT TEST RESULTS

### 8.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

#### PROCEDURE

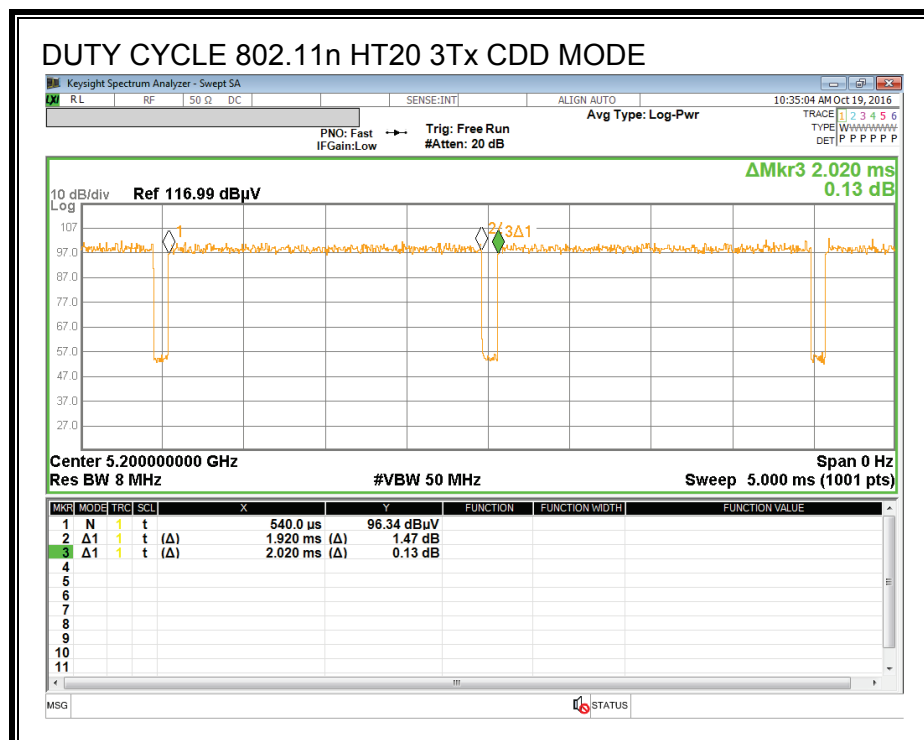
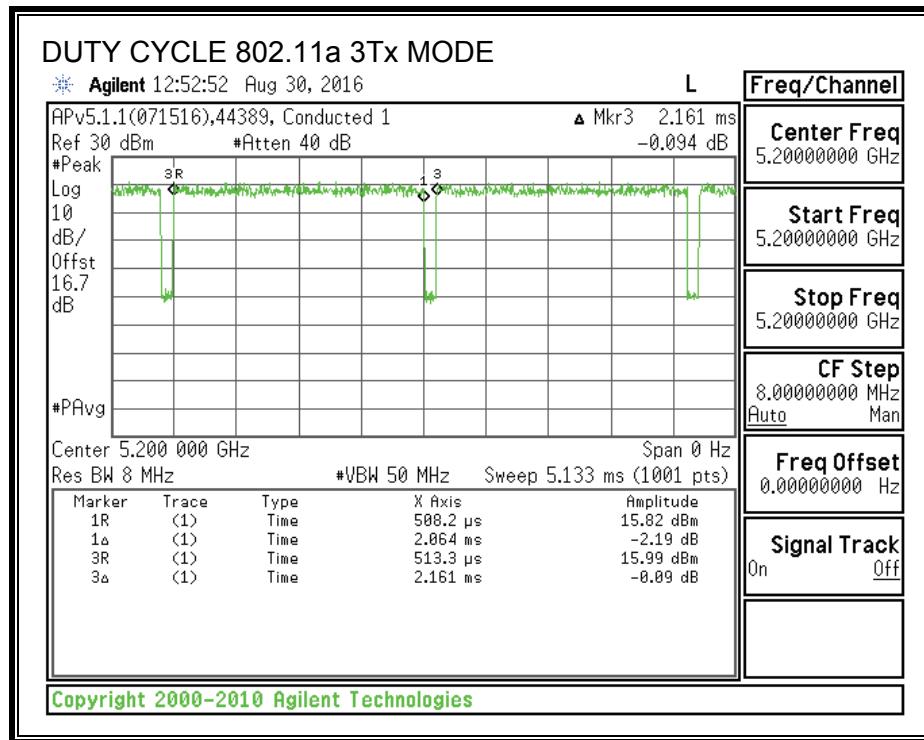
KDB 789033 Zero-Span Spectrum Analyzer Method.

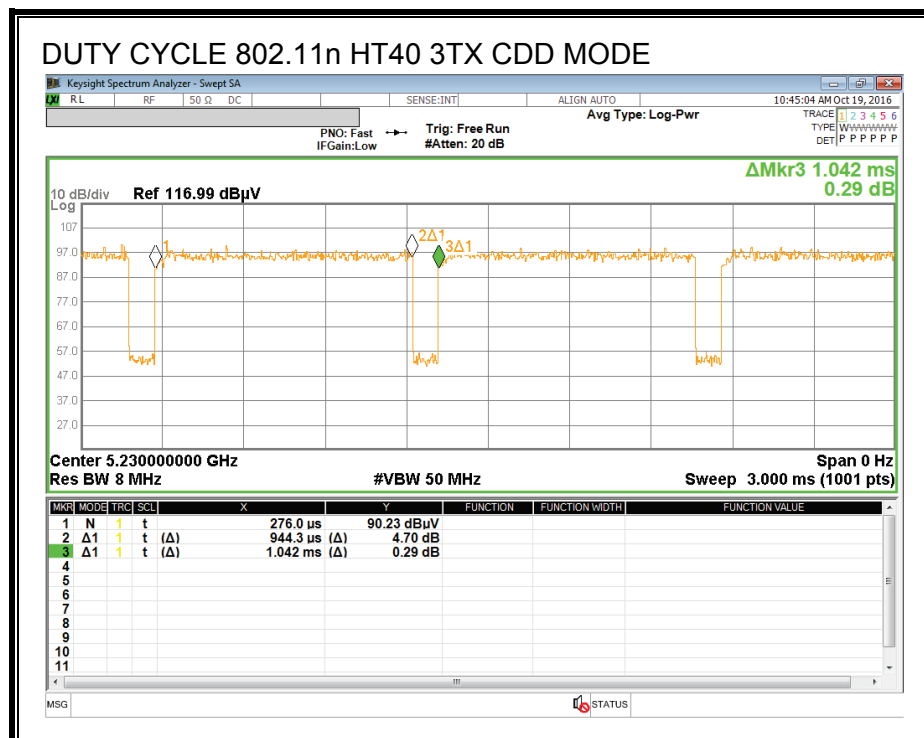
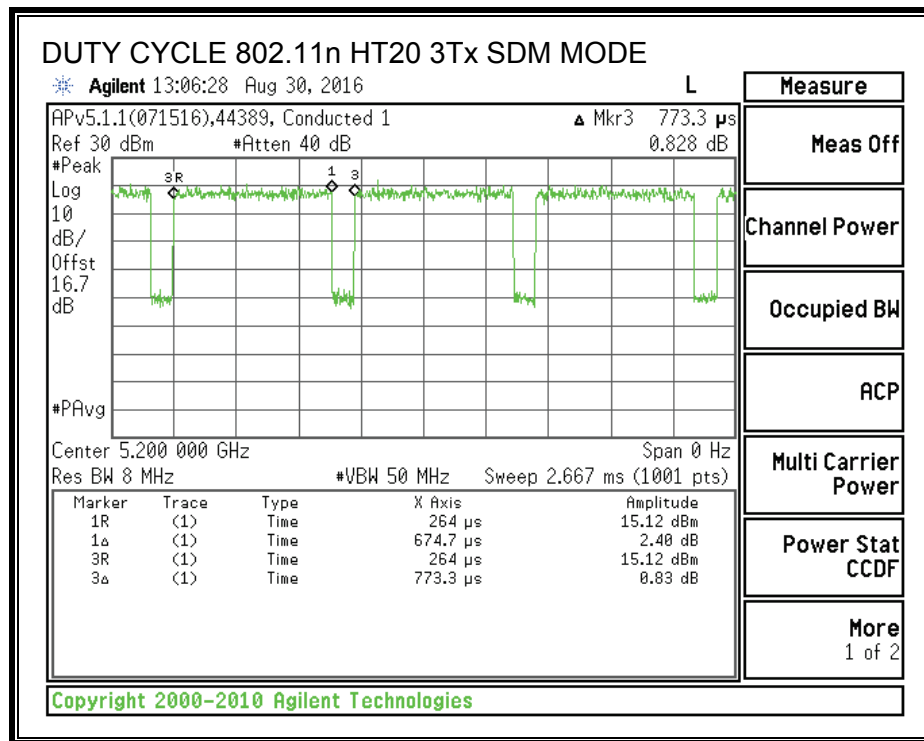
#### 8.1.1. ON TIME AND DUTY CYCLE RESULTS

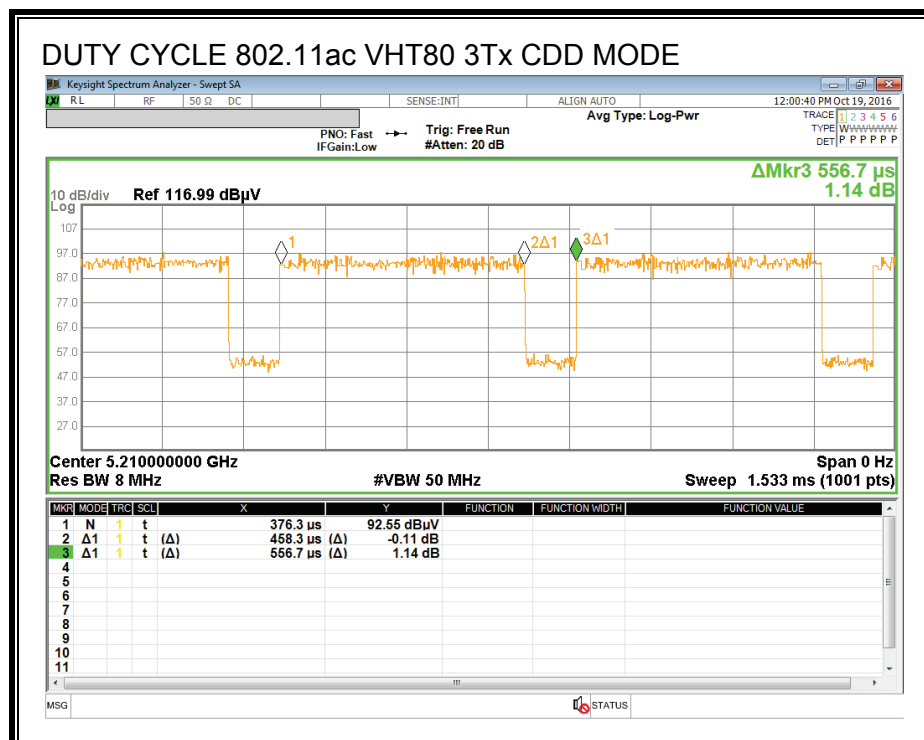
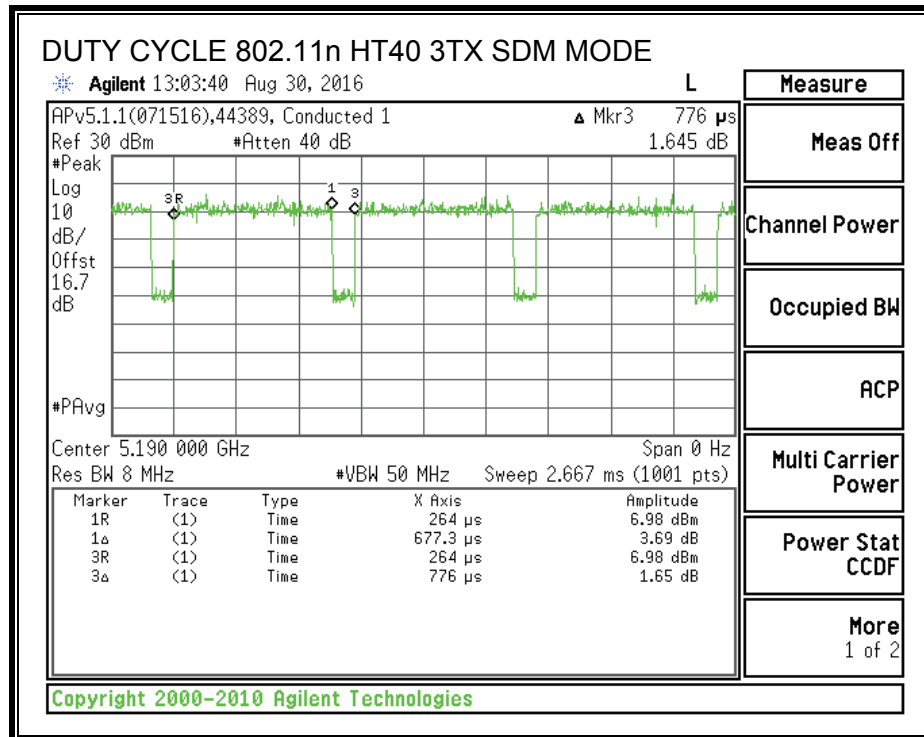
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a 3Tx	2.064	2.161	0.955	95.51%	0.20	0.484
802.11n HT20 3Tx (CDD)	1.920	2.020	0.950	95.05%	0.22	0.521
802.11n HT20 3Tx (SDM)	0.675	0.773	0.872	87.25%	0.59	1.482
802.11n HT40 3Tx (CDD)	0.944	1.042	0.906	90.62%	0.43	1.059
802.11n HT40 3Tx (SDM)	0.677	0.776	0.873	87.28%	0.59	1.476
802.11ac VHT80 3Tx (CDD)	0.458	0.557	0.823	82.32%	0.84	2.182
802.11ac VHT80 3Tx (SDM)	0.191	0.290	0.660	66.02%	1.80	5.230

Test Performed: Niklas Haydon / Jeff Cabrera, Mark Learner  
Test Date: 2016-08-30, 2016-10-19

## 8.1.2. DUTY CYCLE PLOTS









## 8.2. 802.11a MODE IN THE 5.2 GHz BAND

### 8.2.1. 26 dB BANDWIDTH

#### LIMITS

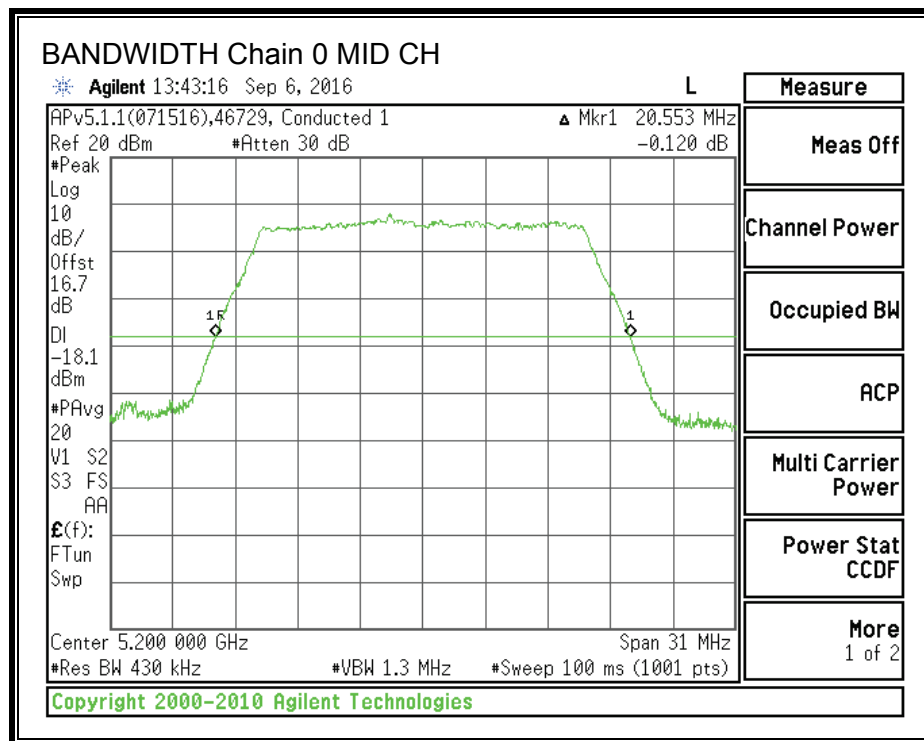
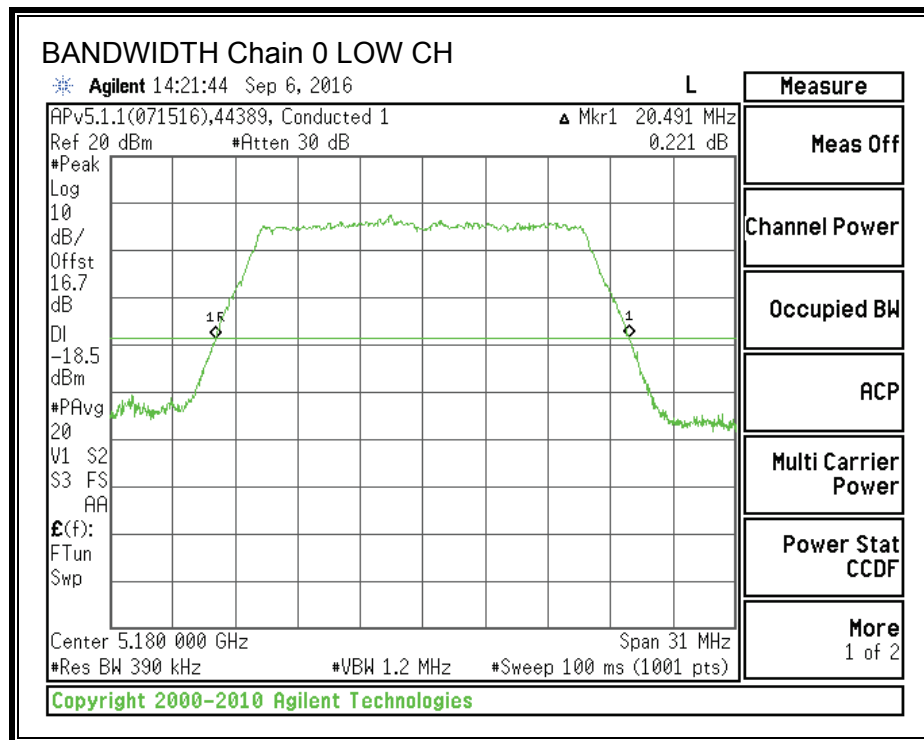
None; for reporting purposes only. Tested per FCC §15.403 (i)

#### RESULTS

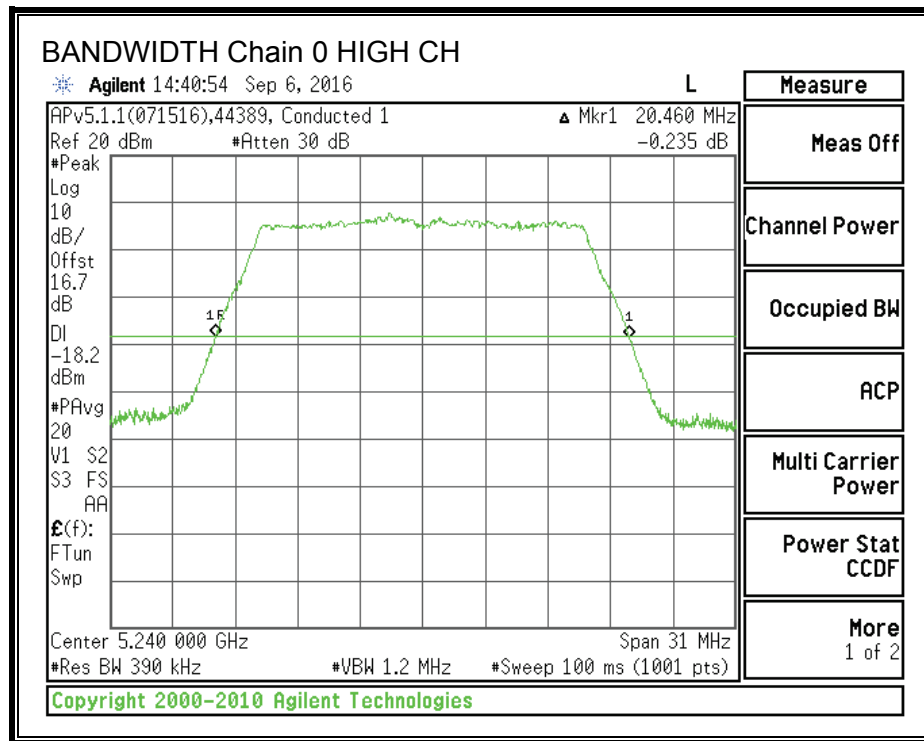
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5180	20.49	20.36	20.46
Mid	5200	20.55	20.36	20.49
High	5240	20.46	20.43	20.43

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-06, 2016-10-04

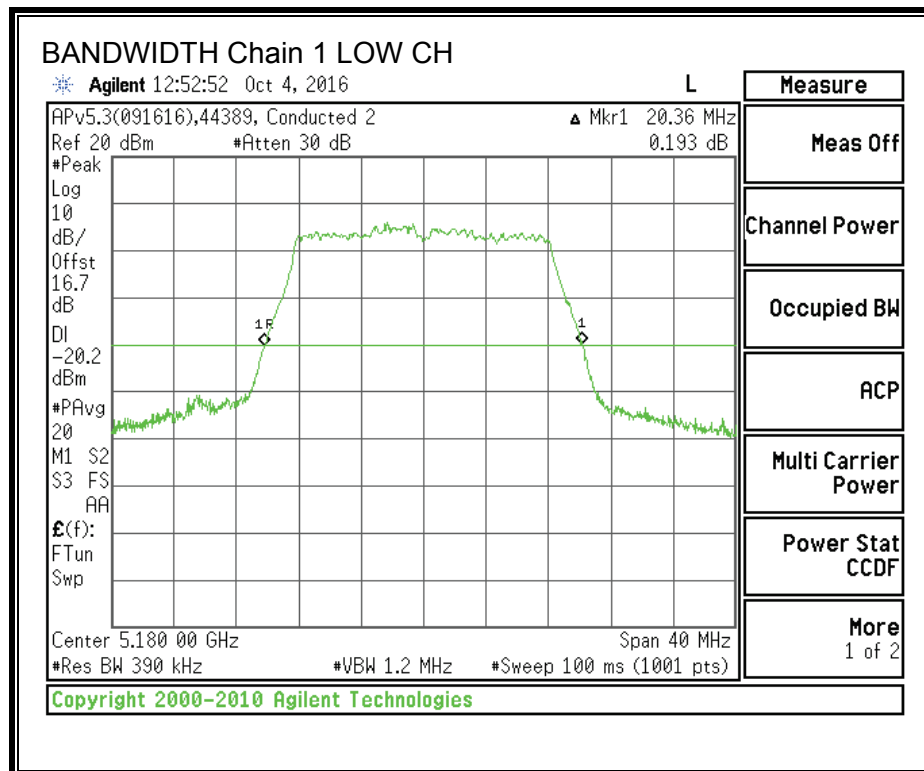
**26 dB BANDWIDTH, Chain 0**

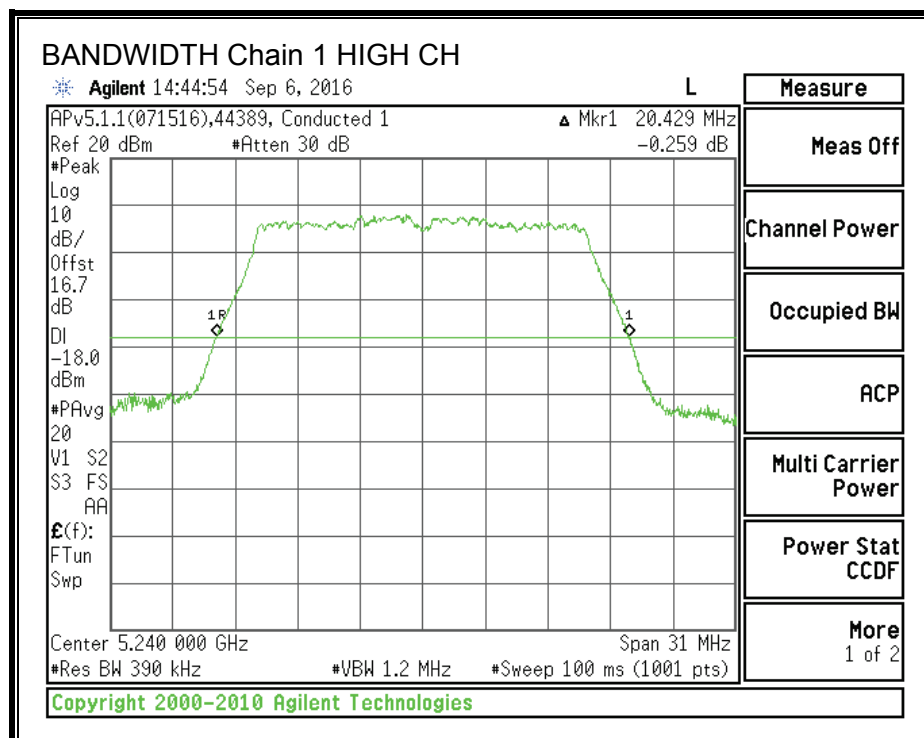
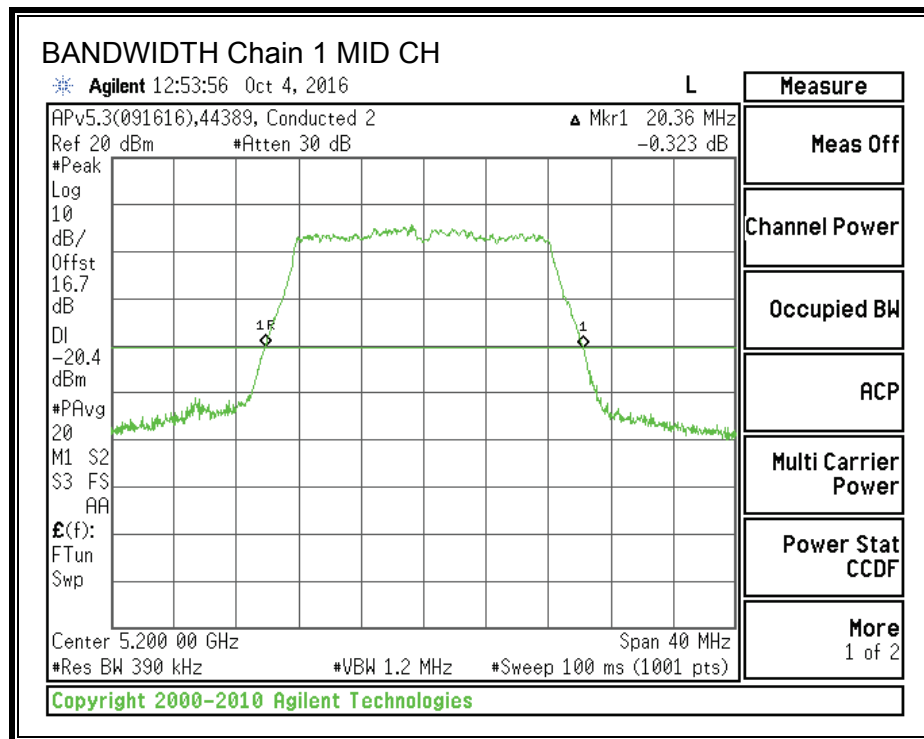




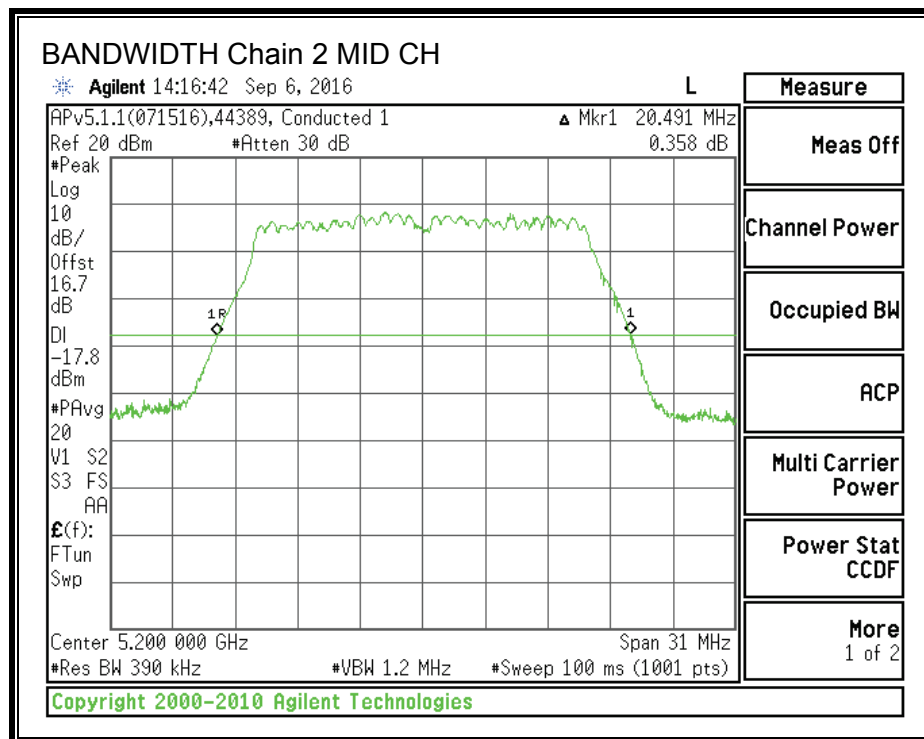
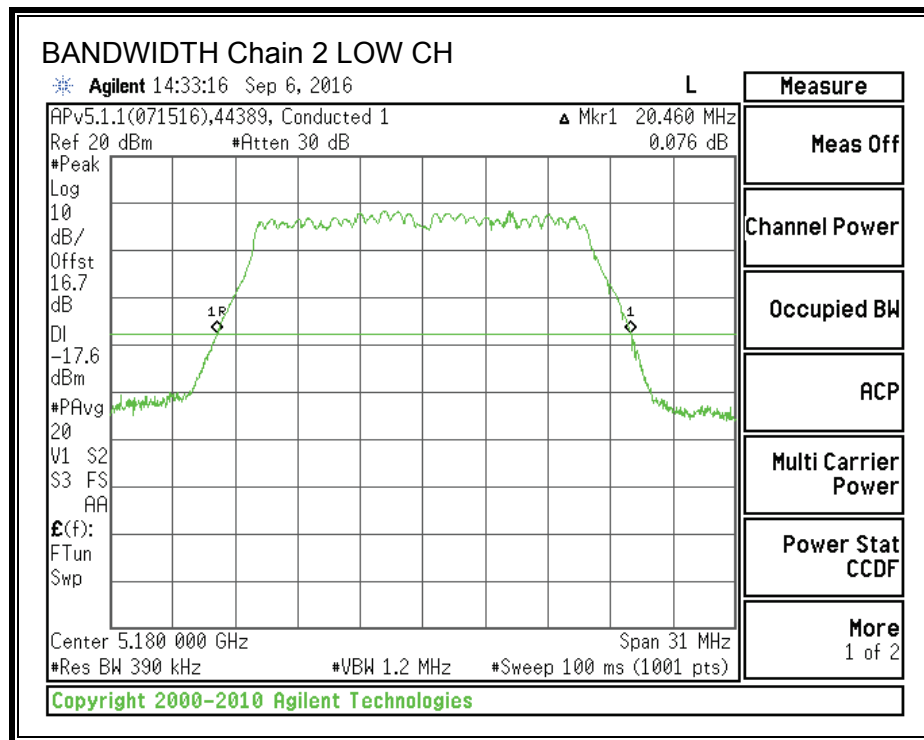


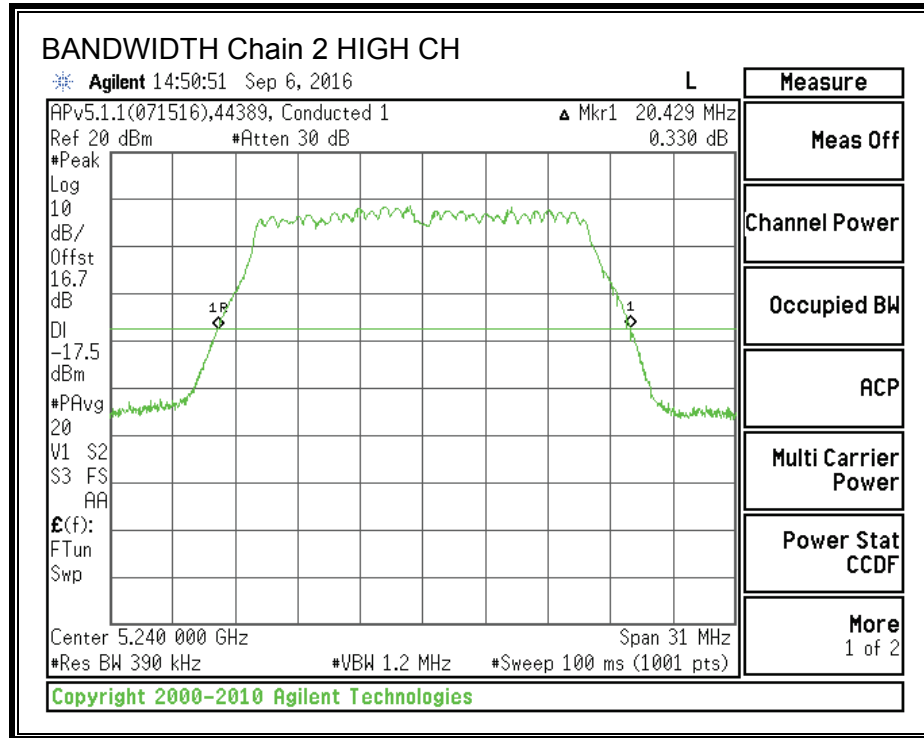
**26 dB BANDWIDTH, Chain 1**





**26 dB BANDWIDTH, Chain 2**





## 8.2.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only. Measured per ANSI C63.10:2013 Section 6.9.3.

### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5180	16.74	16.69	16.81
Mid	5200	16.75	16.67	16.79
High	5240	16.73	16.67	16.62

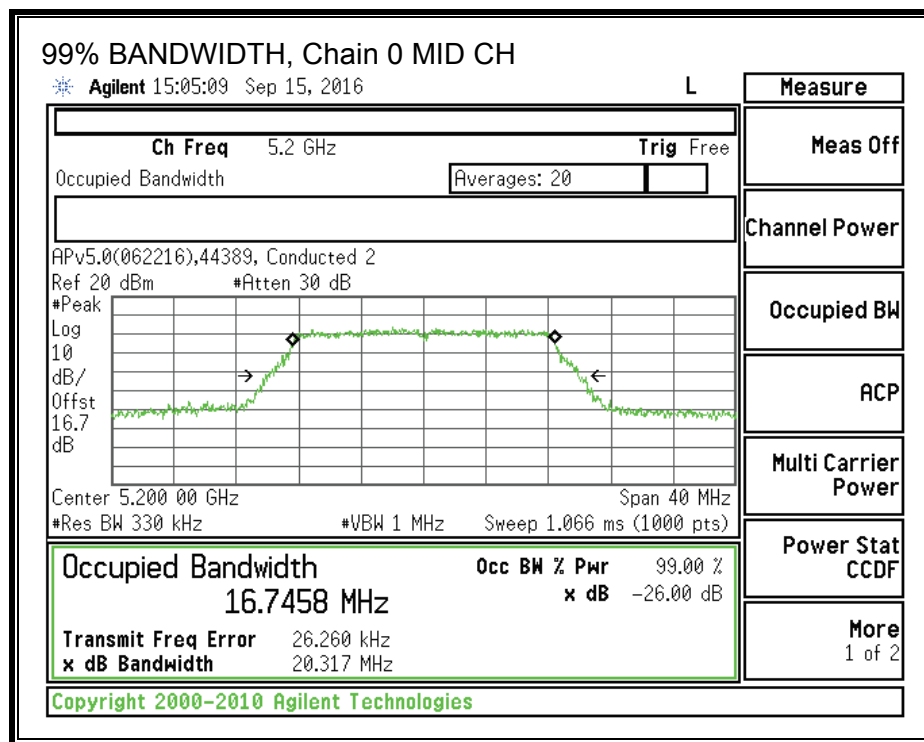
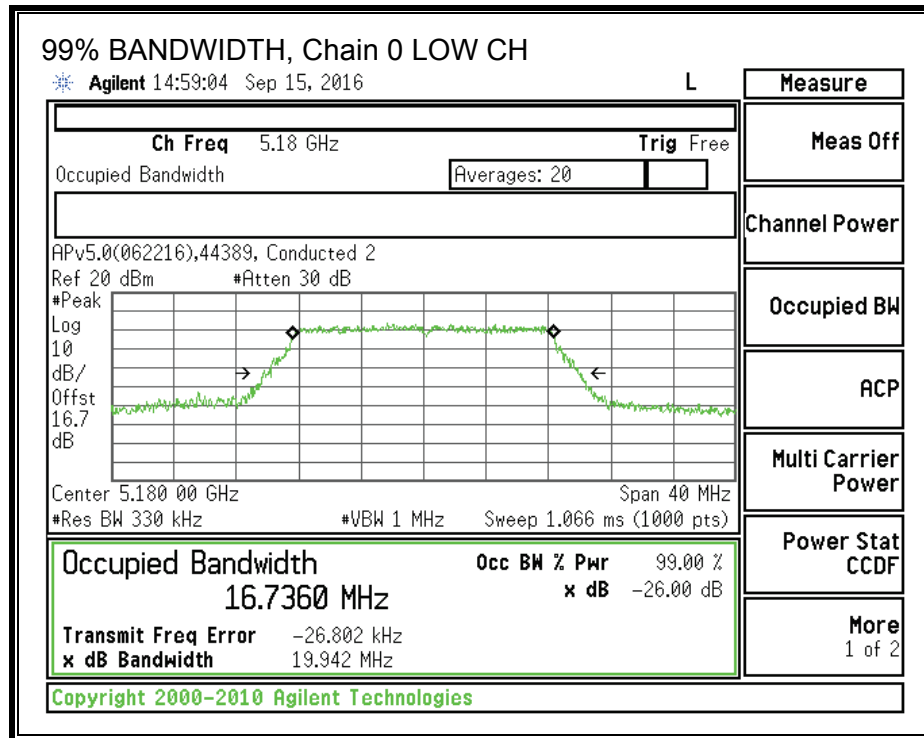
### Worst-Case

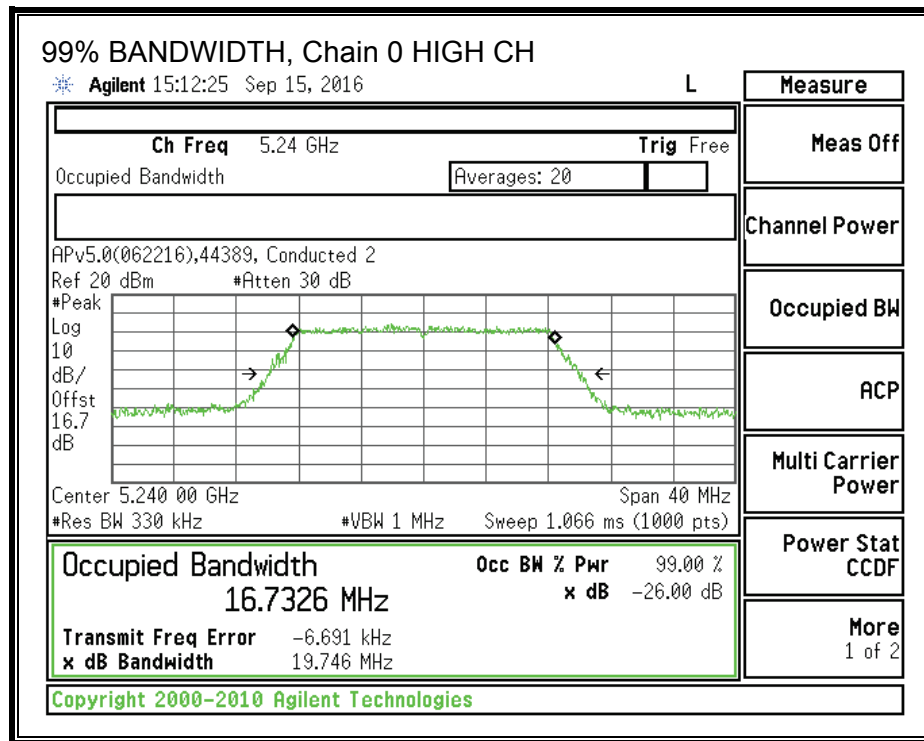
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Maximum Ch Freq	Does Ch. Freq. Fall in UNII 2A? Y/N
Low	5180	16.8100	5188.405	N
Mid	5200	16.7900	5208.395	N
High	5240	16.7300	5248.365	N

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-15

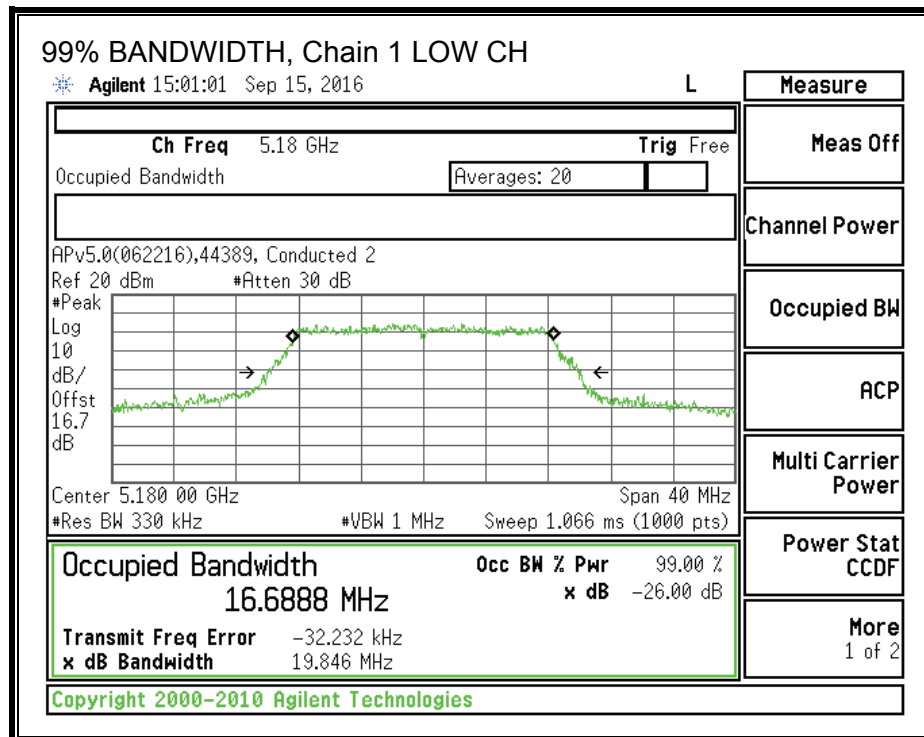
## 99% BANDWIDTH

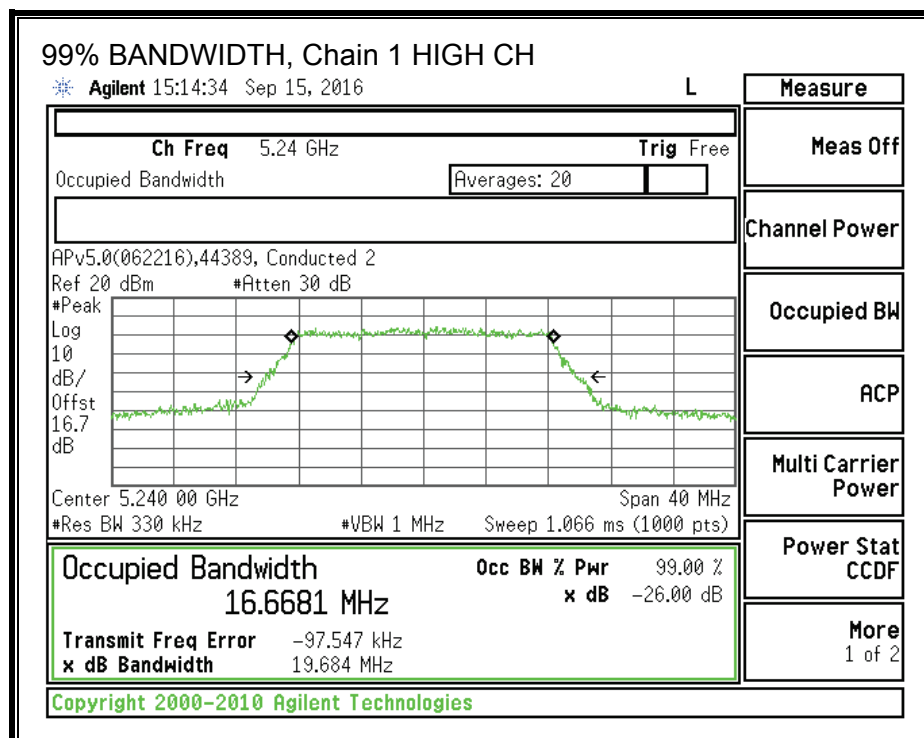
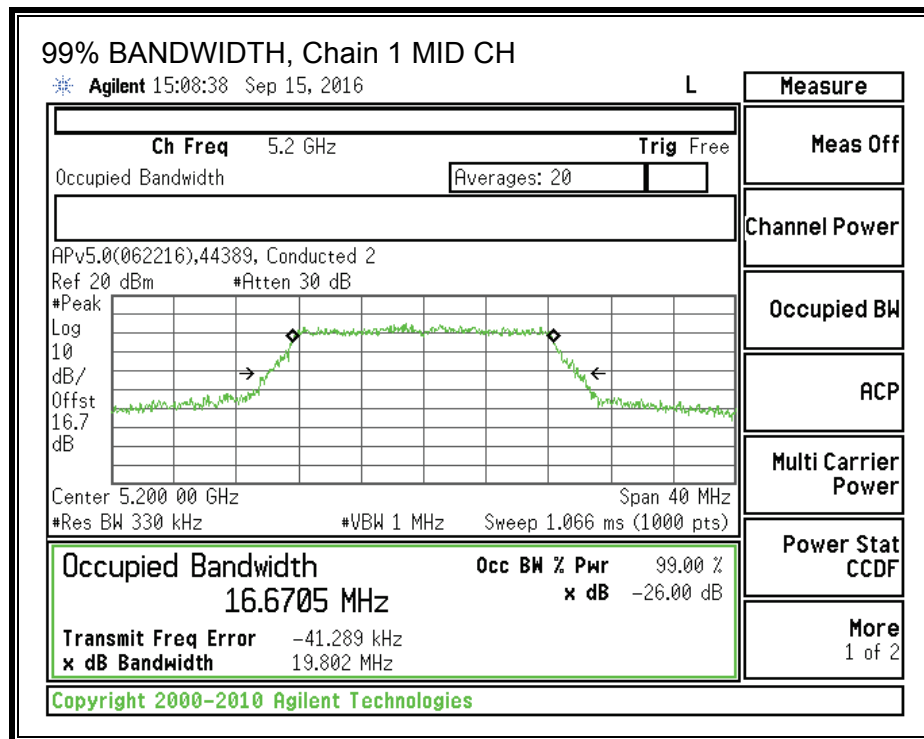
### 99% BANDWIDTH, Chain 0





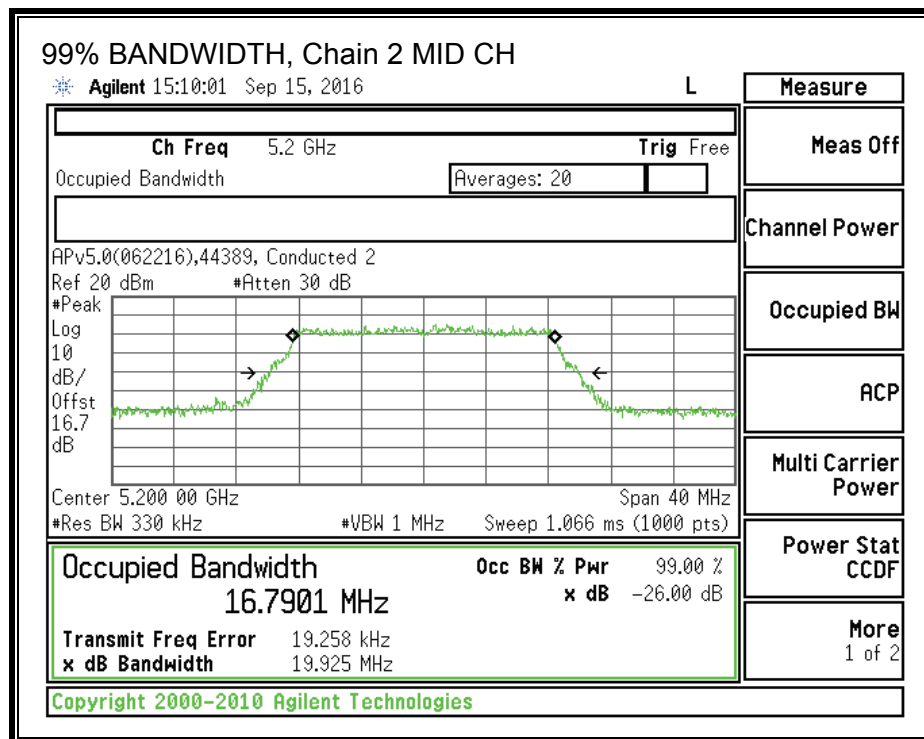
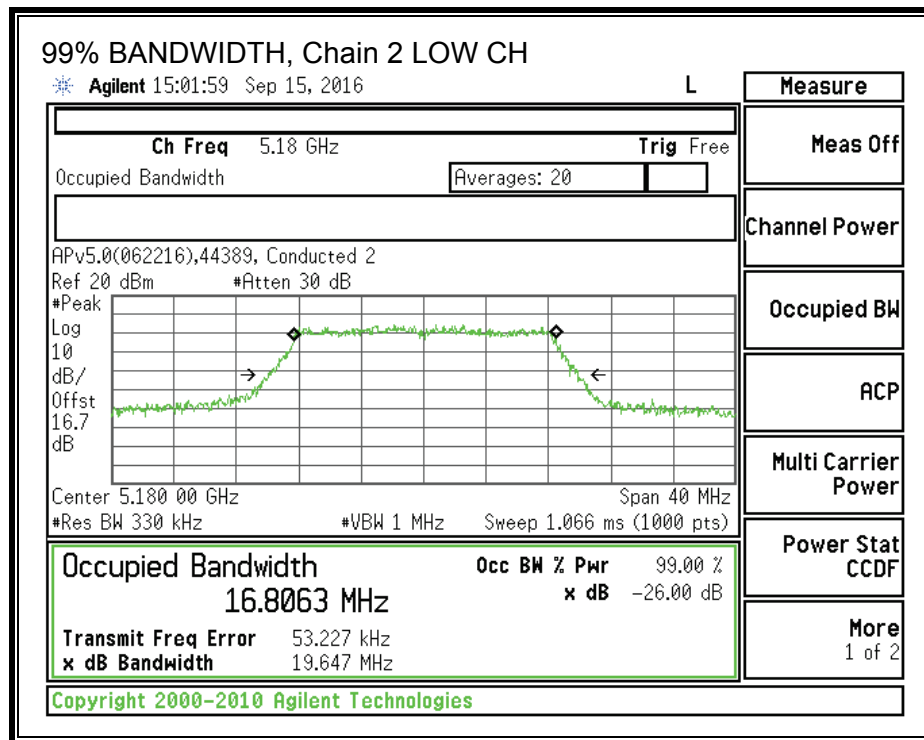
**99% BANDWIDTH, Chain 1**

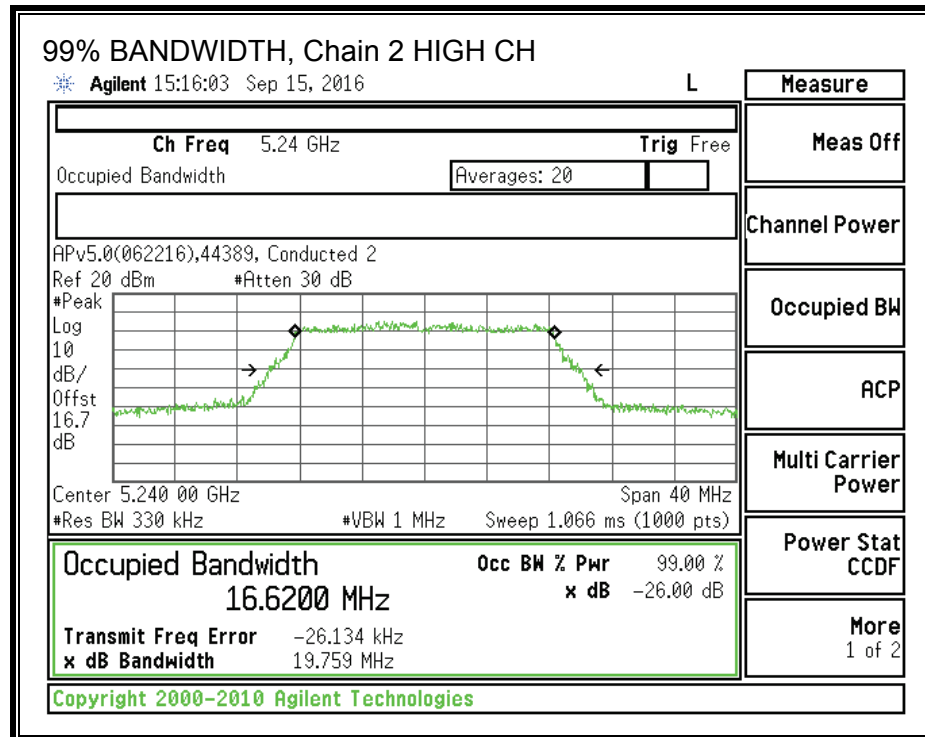






**99% BANDWIDTH, Chain 2**





### 8.2.3. OUTPUT POWER AND PSD

#### LIMITS

##### FCC §15.407 (a) (1)

(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 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 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 6 dBi.

(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.

## **DIRECTIONAL ANTENNA GAIN**

This EUT mode is 802.11a. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

### **802.11a Mode**

#### **Output Power**

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Chain 2 Antenna Gain (dBi)</b>	<b>Directional Gain (dBi)</b>
8.00	8.00	8.00	8.00

#### **PSD**

<b>Antenna Gain (dBi)</b>	<b>10 * Log (3 chains) (dB)</b>	<b>Directional Gain (dBi)</b>
8.00	4.77	12.77

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-06, 2016-10-03

## **RESULTS**

## **OUTPUT POWER RESULTS**

### **Antenna Gain and Limits**

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	8.00	12.77	28.00	10.23
Mid	5200	8.00	12.77	28.00	10.23
High	5240	8.00	12.77	28.00	10.23

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power</b>
---------------------------	------	---

### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	12.29	12.68	12.31	17.20	28.00	-10.80
Mid	5200	12.06	12.74	11.87	17.01	28.00	-10.99
High	5240	12.39	12.65	12.27	17.21	28.00	-10.79

Note - The above data represents gated average power measurements, as described in method PM-G.

## **PSD RESULTS**

### **Antenna Gain and Limits**

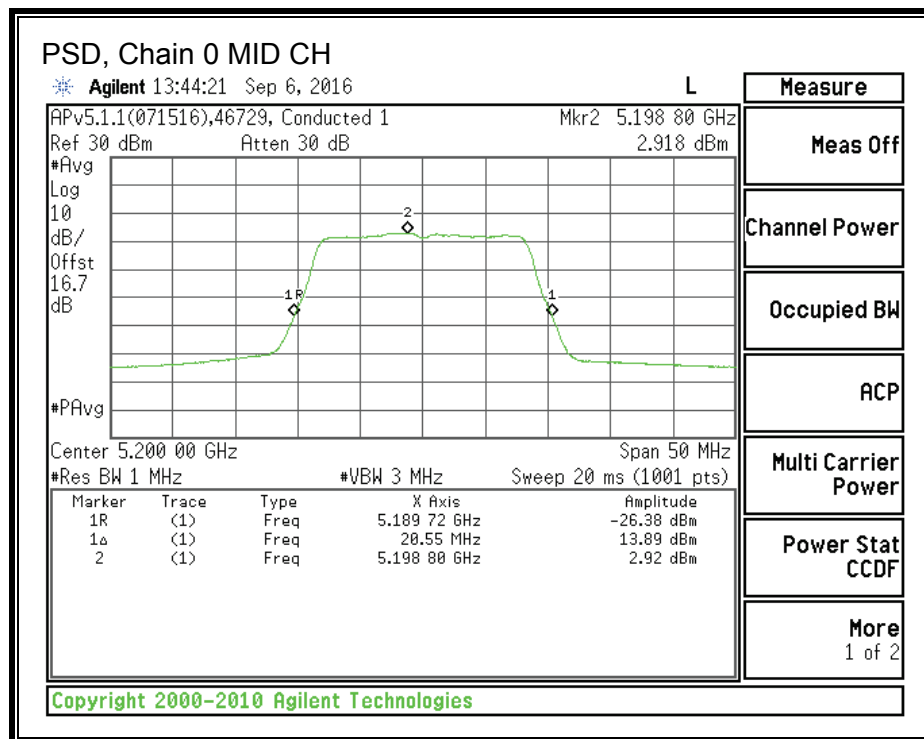
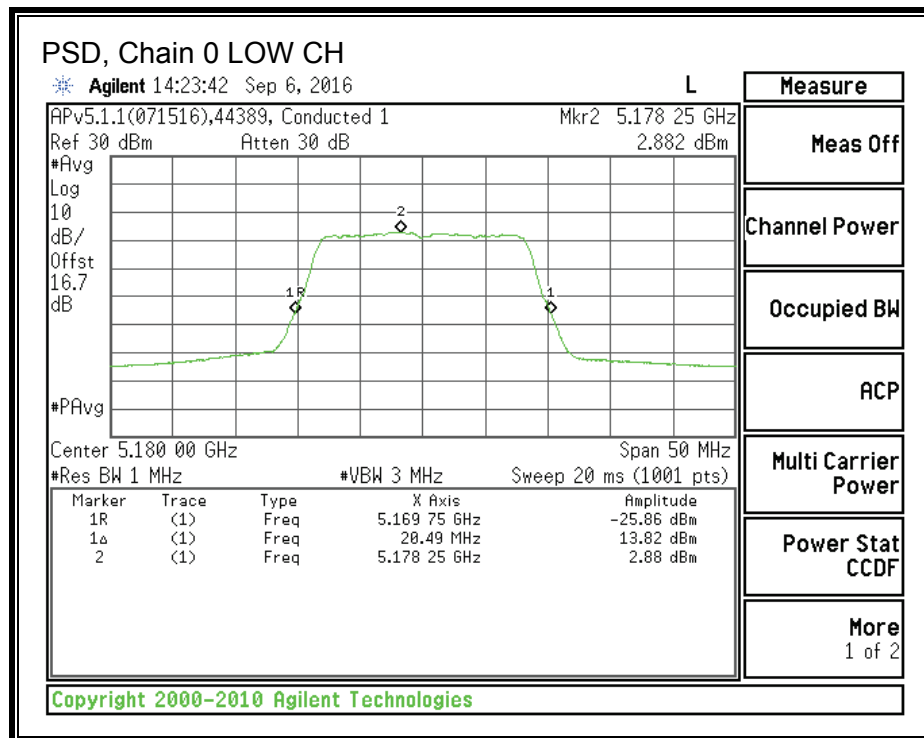
Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	8.00	12.77	28.00	10.23
Mid	5200	8.00	12.77	28.00	10.23
High	5240	8.00	12.77	28.00	10.23

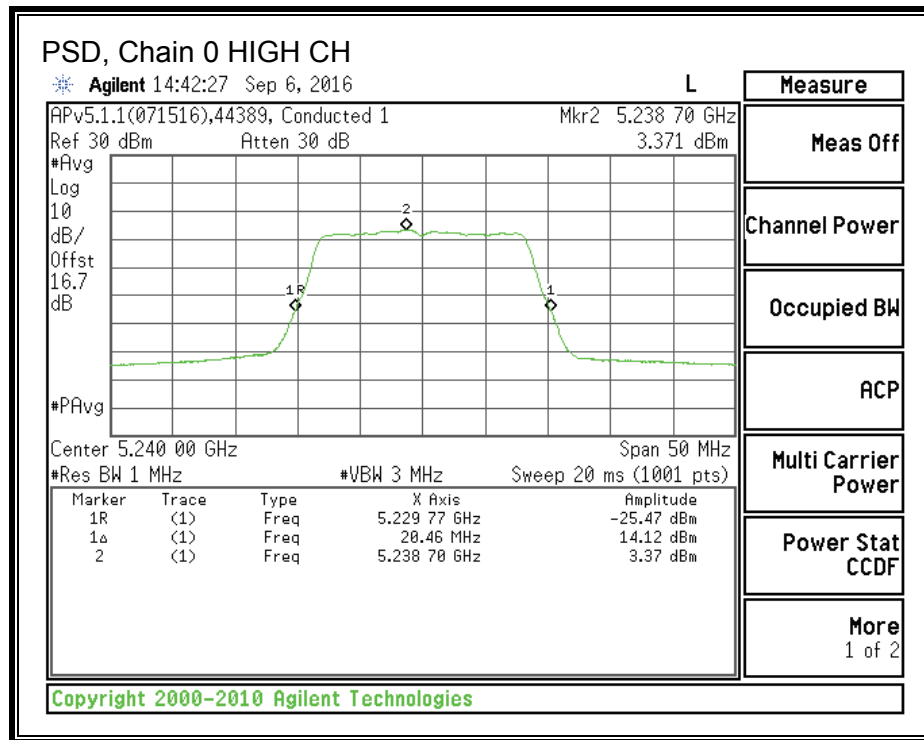
<b>Duty Cycle CF (dB)</b>	0.20	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

### **PSD Results**

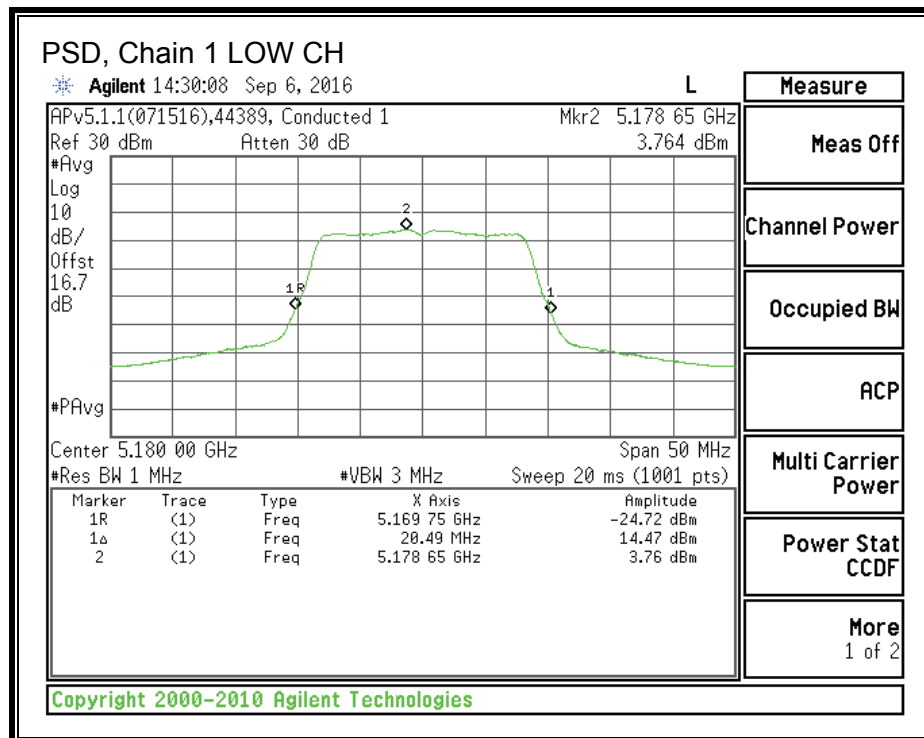
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	2.88	3.76	3.65	8.42	10.23	-1.81
Mid	5200	2.92	3.71	3.42	8.33	10.23	-1.90
High	5240	3.37	3.61	3.69	8.53	10.23	-1.70

**PSD, Chain 0**

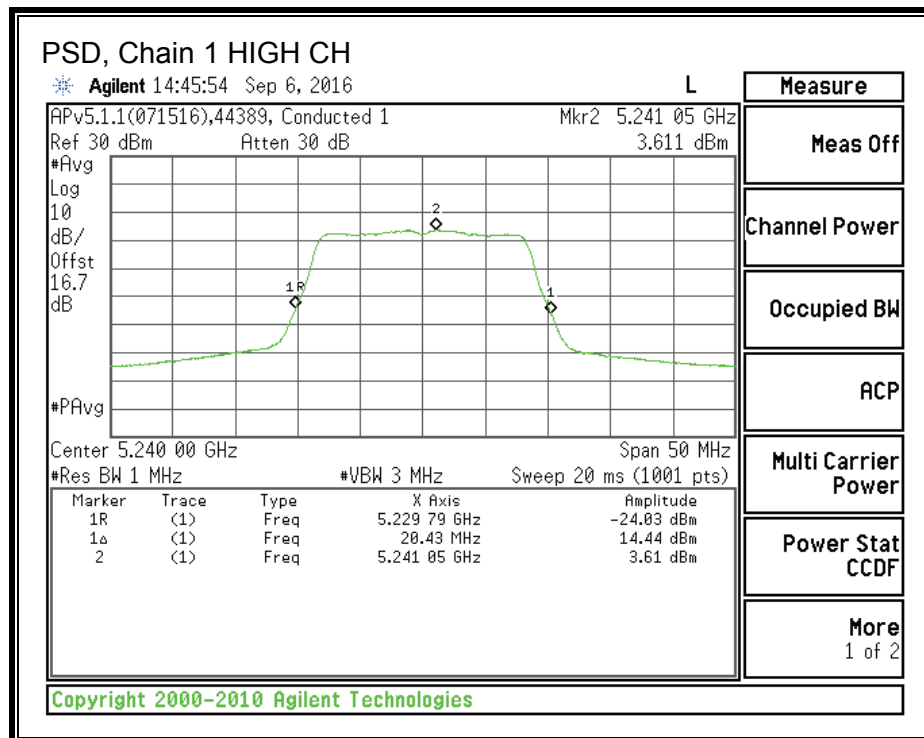
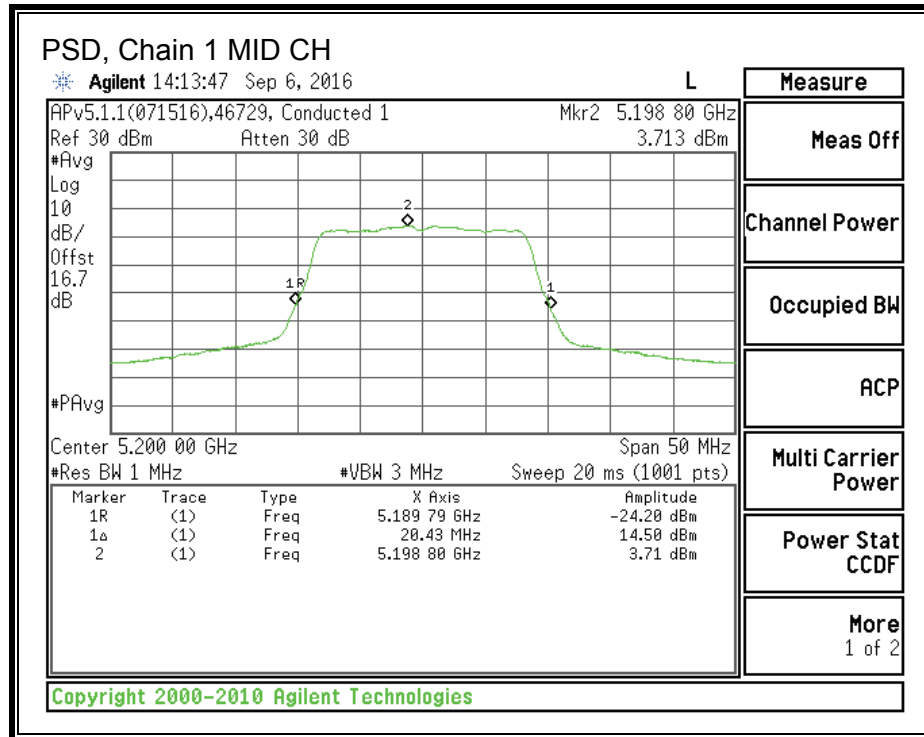




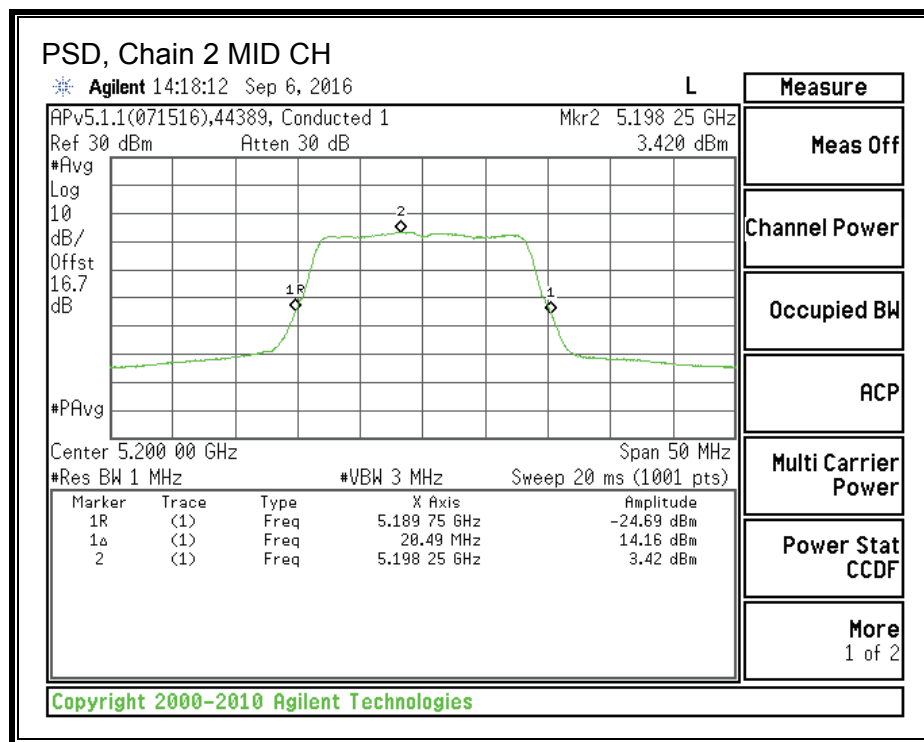
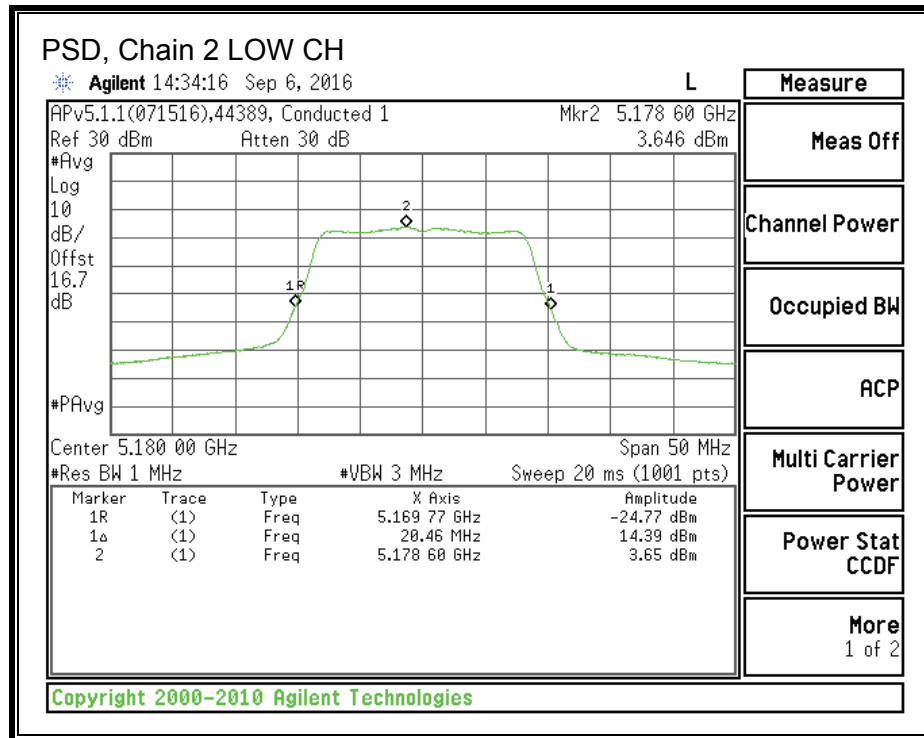
## PSD, Chain 1

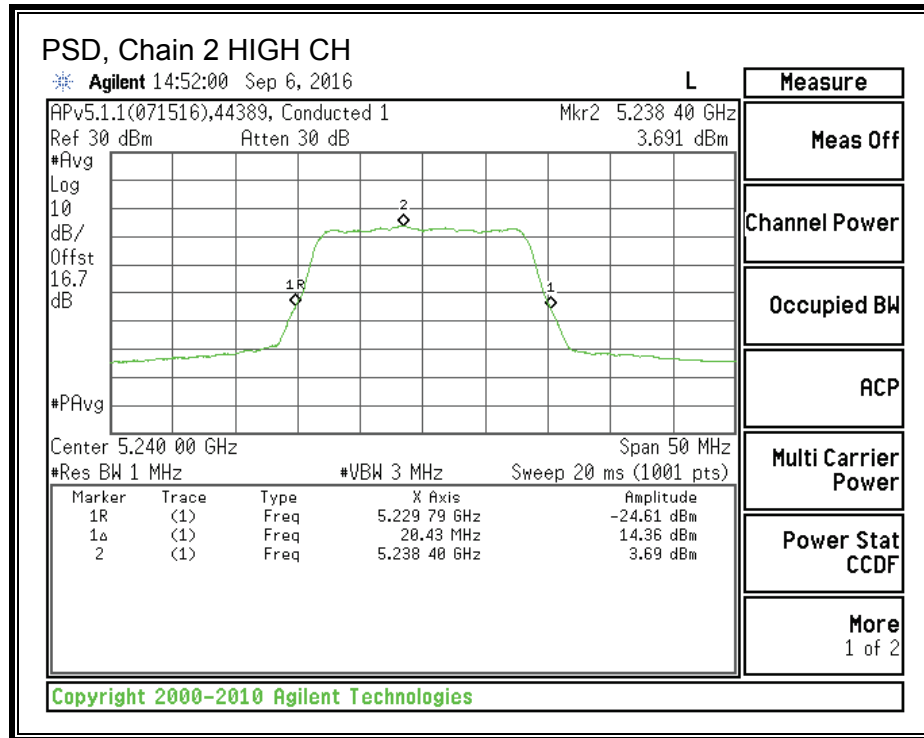






## PSD, Chain 2





### 8.3. 802.11n HT20 MODE IN THE 5.2 GHz BAND

#### 8.3.1. 26 dB BANDWIDTH

##### LIMITS

None; for reporting purposes only. Tested per FCC §15.403 (i)

##### RESULTS

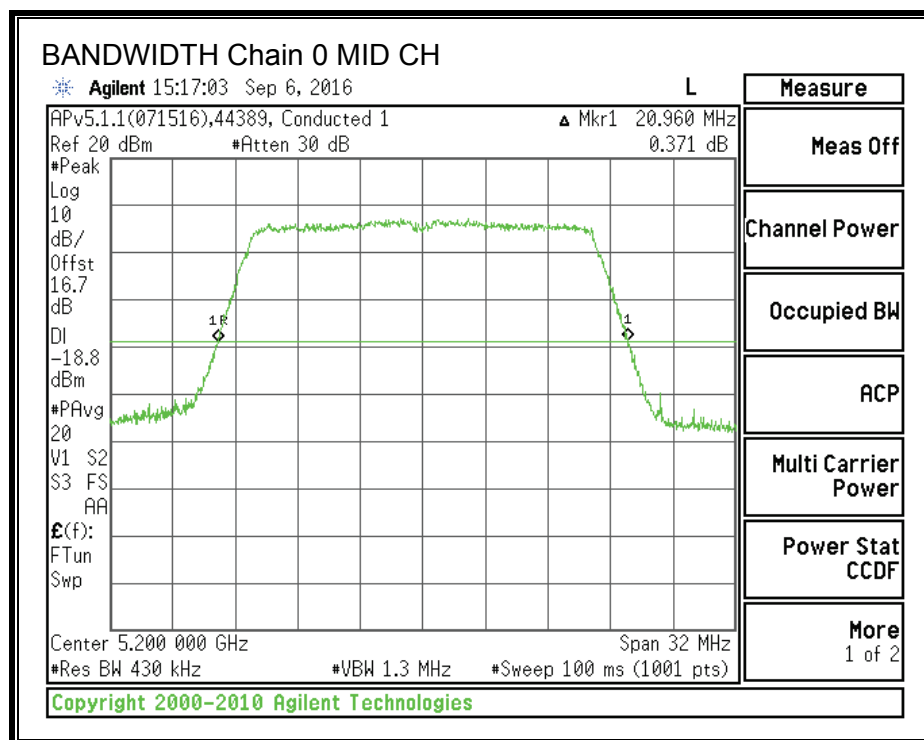
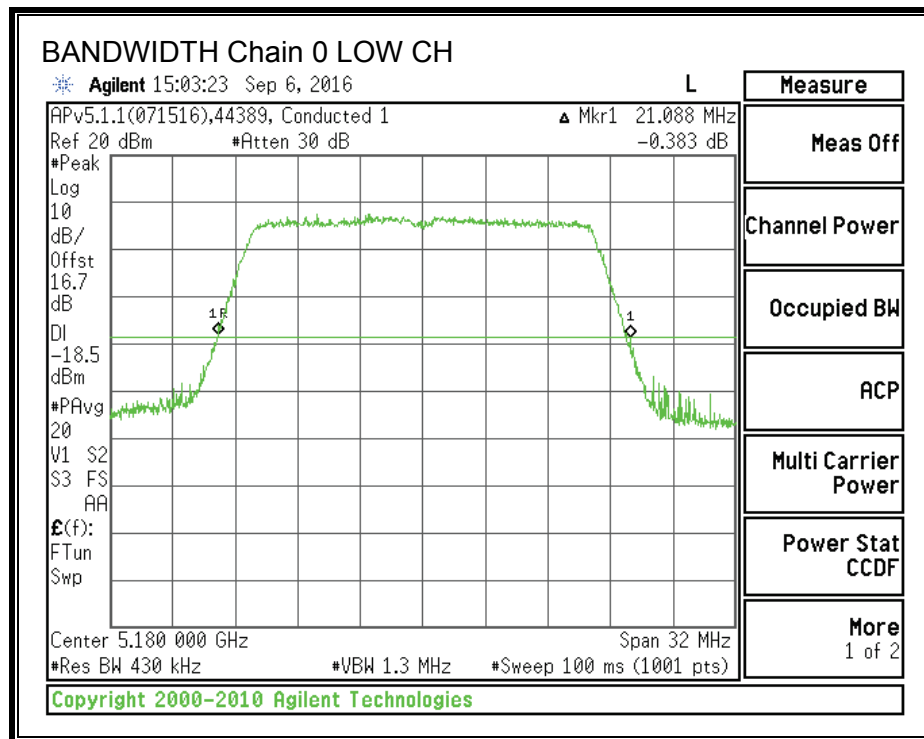
802.11n HT20 SDM (MCS16)

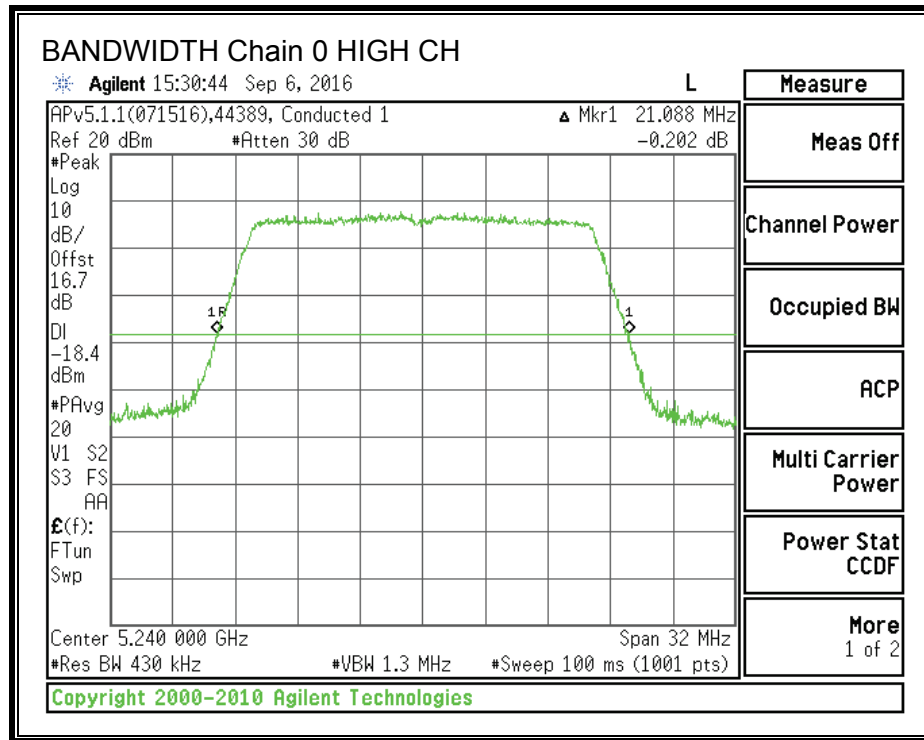
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5180	21.09	20.58	20.70
Mid	5200	20.96	20.55	20.65
High	5240	21.09	20.65	20.77

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-06

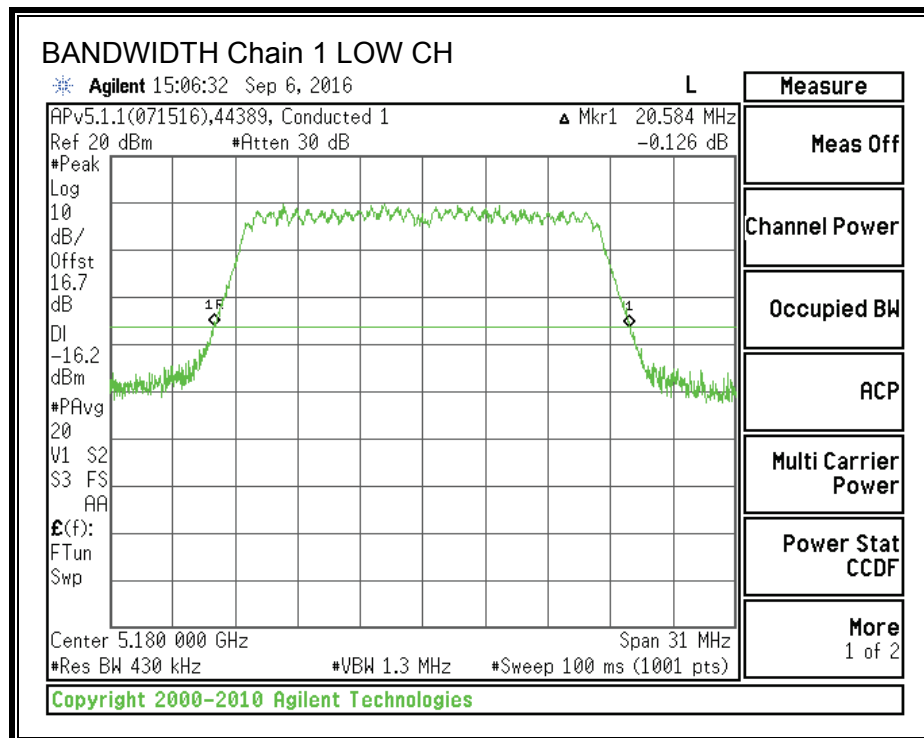
## 26 dB BANDWIDTH

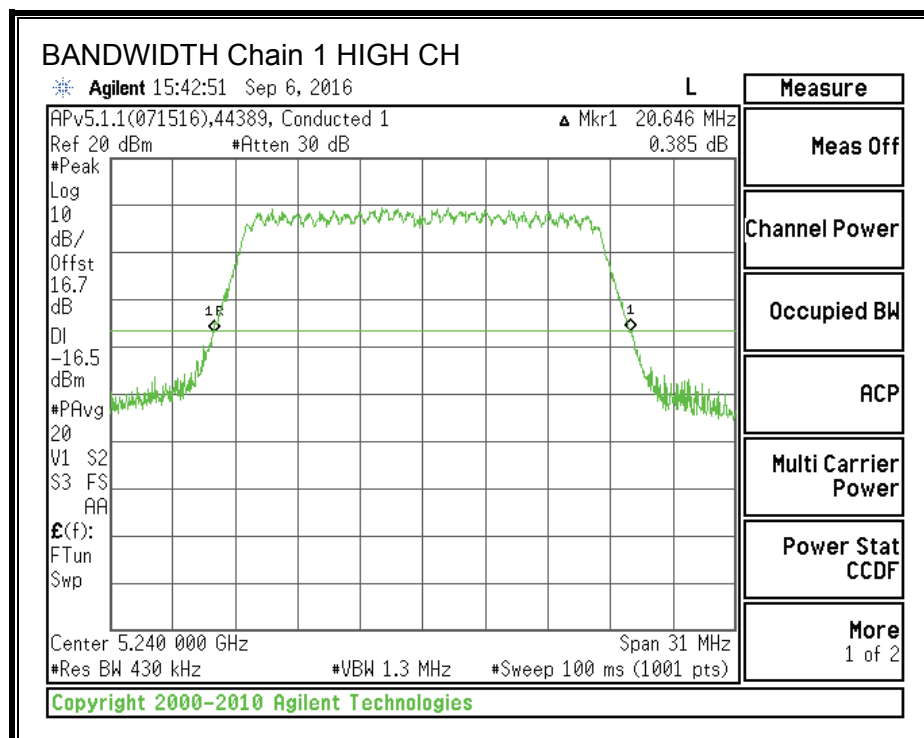
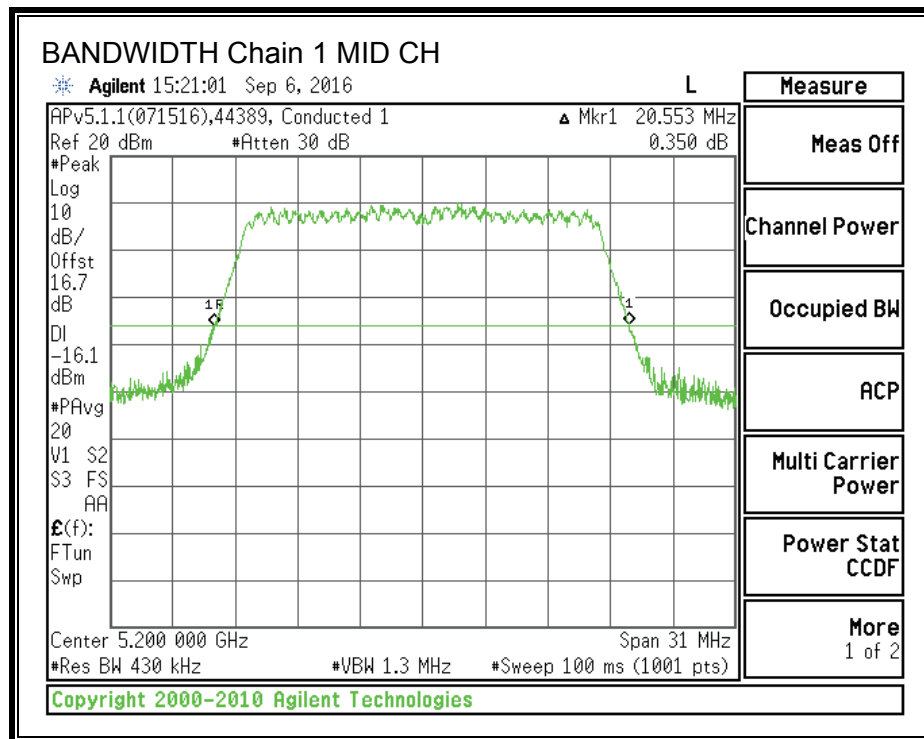
### 26 dB BANDWIDTH, Chain 0



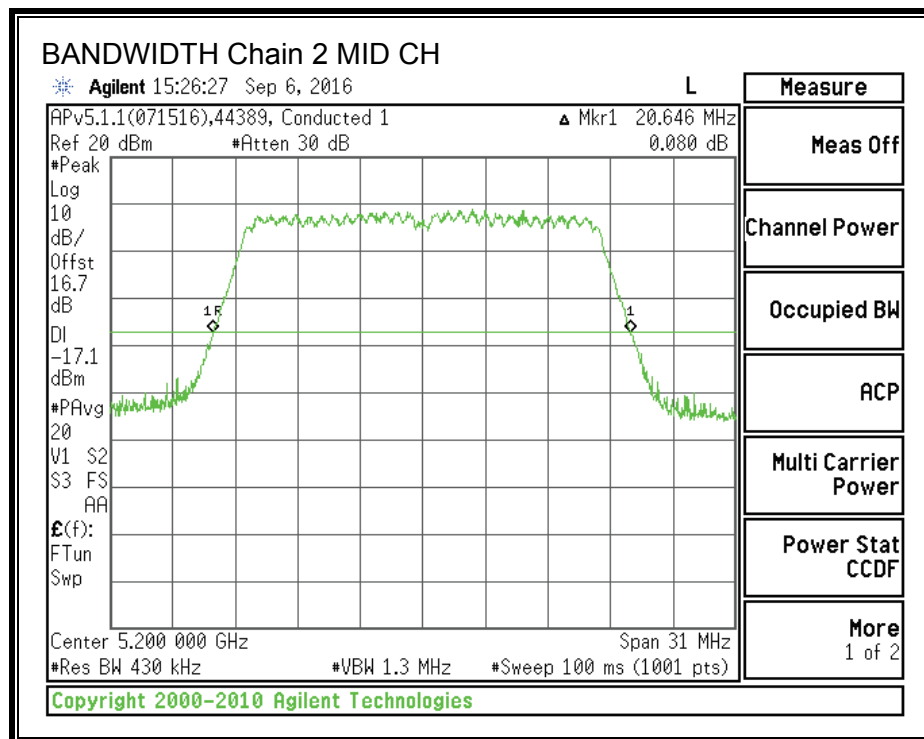
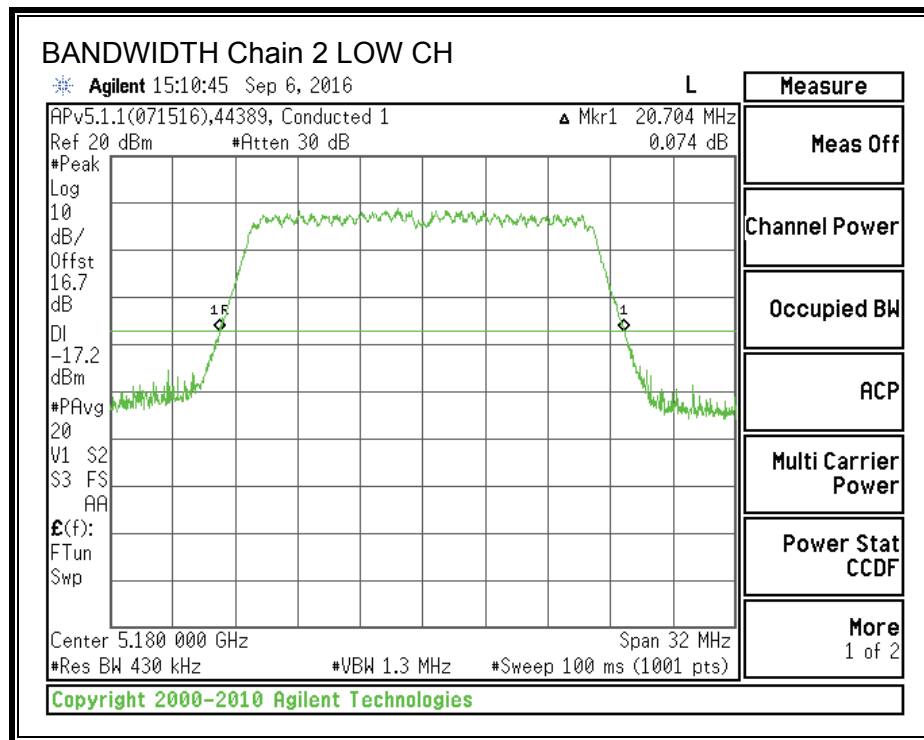


**26 dB BANDWIDTH, Chain 1**

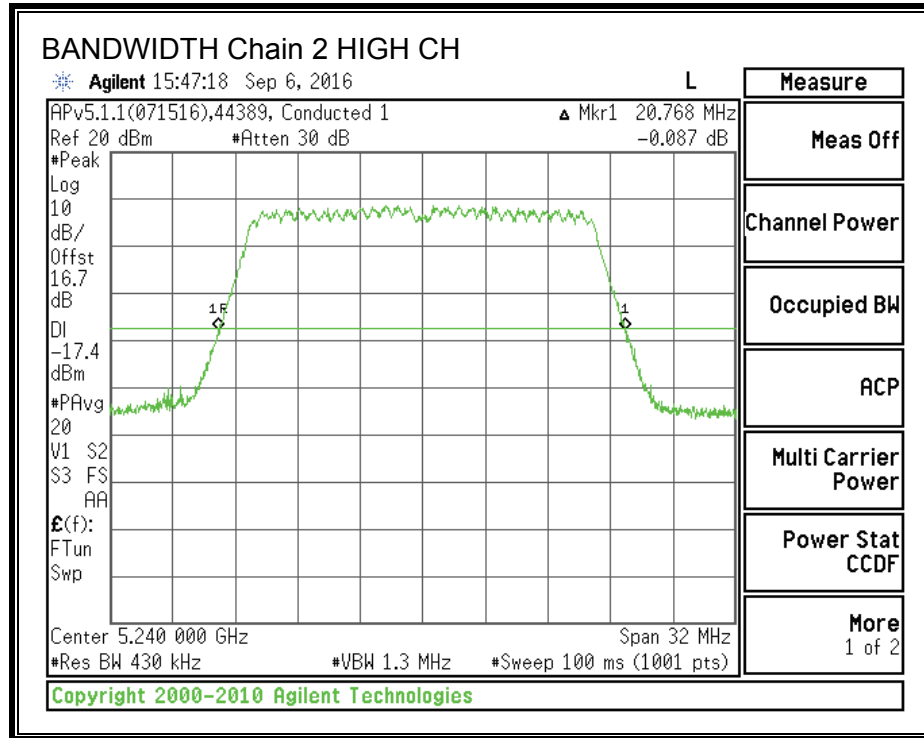




**26 dB BANDWIDTH, Chain 2**







### 8.3.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only. Measured per ANSI C63.10:2013 Section 6.9.3.

#### RESULTS

802.11n HT20 SDM (MCS16)

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5180	17.76	17.58	17.76
Mid	5200	17.60	17.74	17.84
High	5240	17.84	17.77	17.81

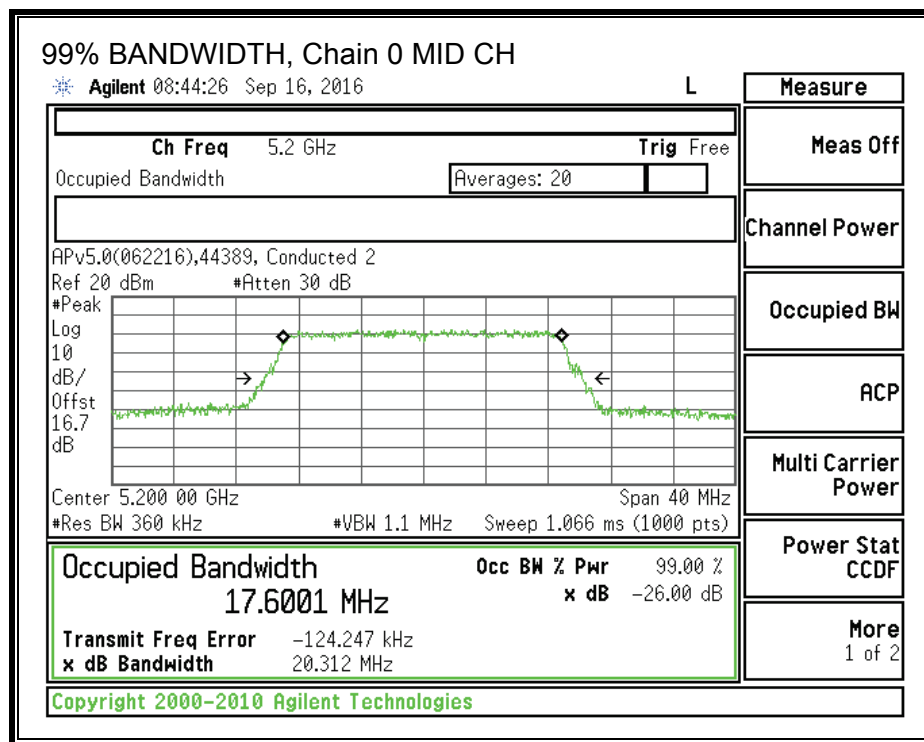
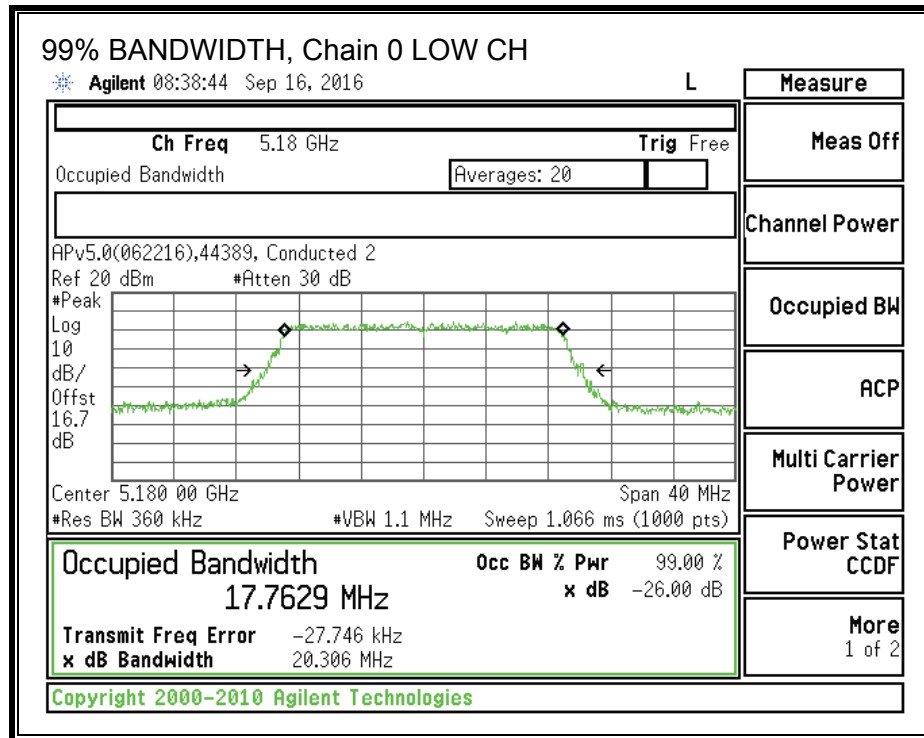
#### Worst-Case

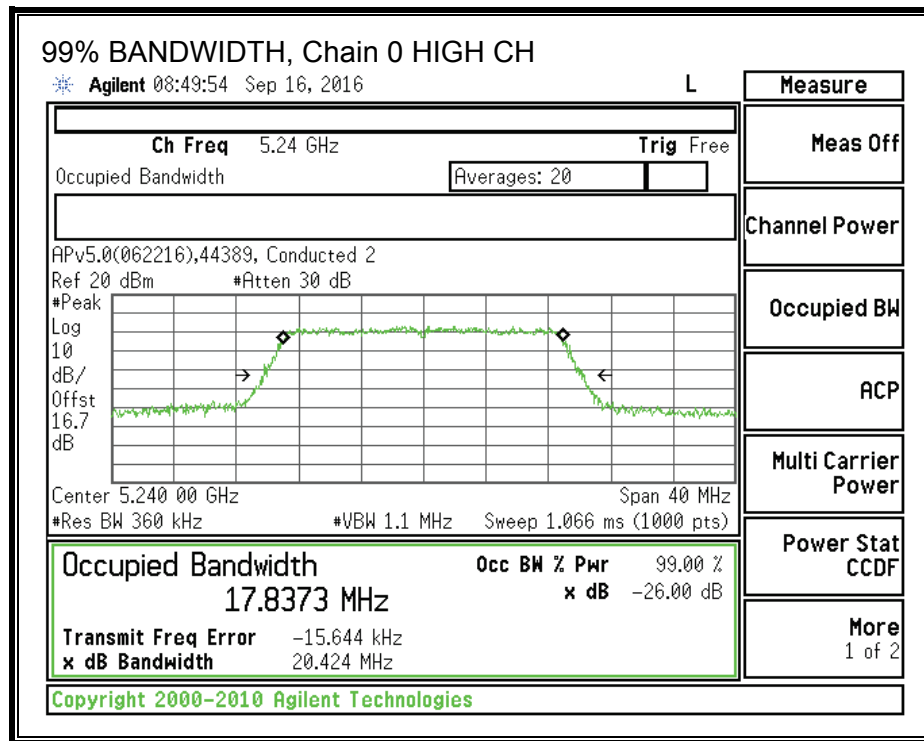
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Maximum Ch Freq	Does Ch. Freq. Fall in UNII 2A? Y/N
Low	5180	17.7600	5188.880	N
Mid	5200	17.8400	5208.920	N
High	5240	17.8400	5248.920	N

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-16

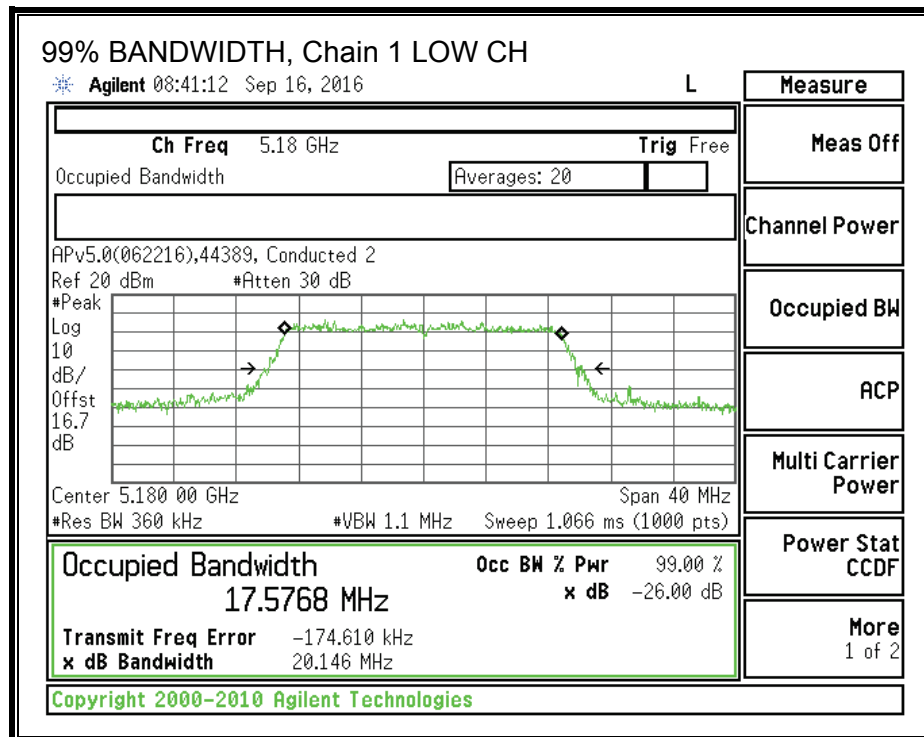
## 99% BANDWIDTH

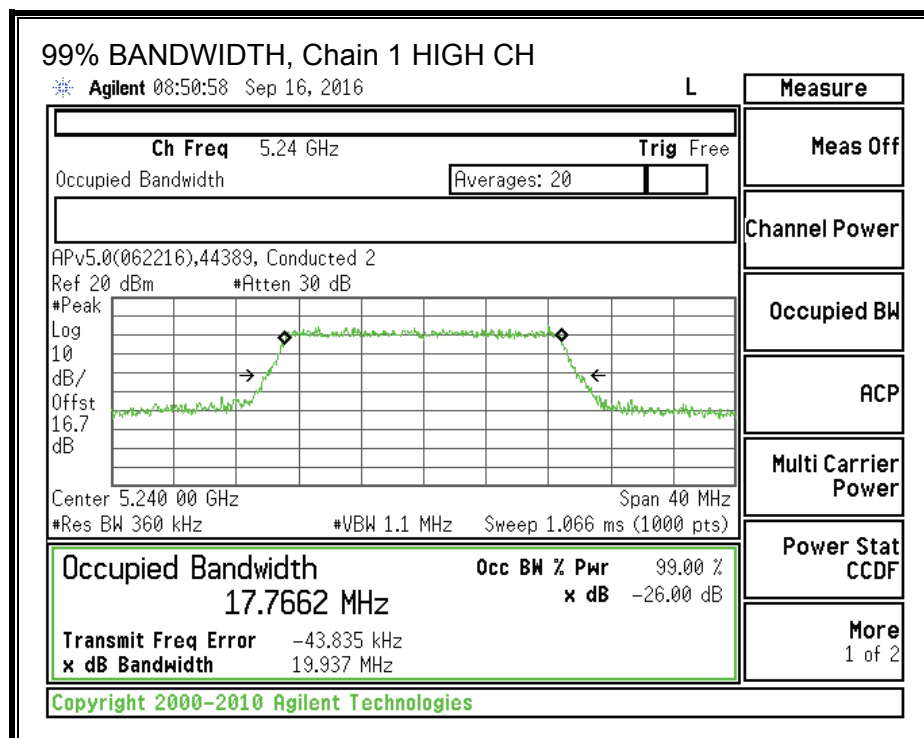
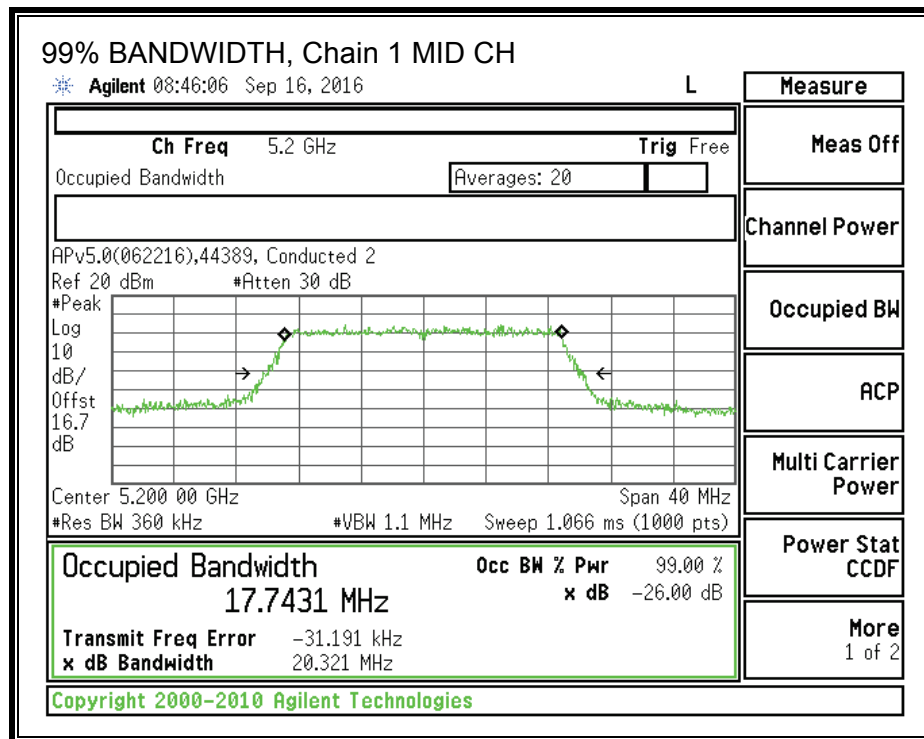
### 99% BANDWIDTH, Chain 0



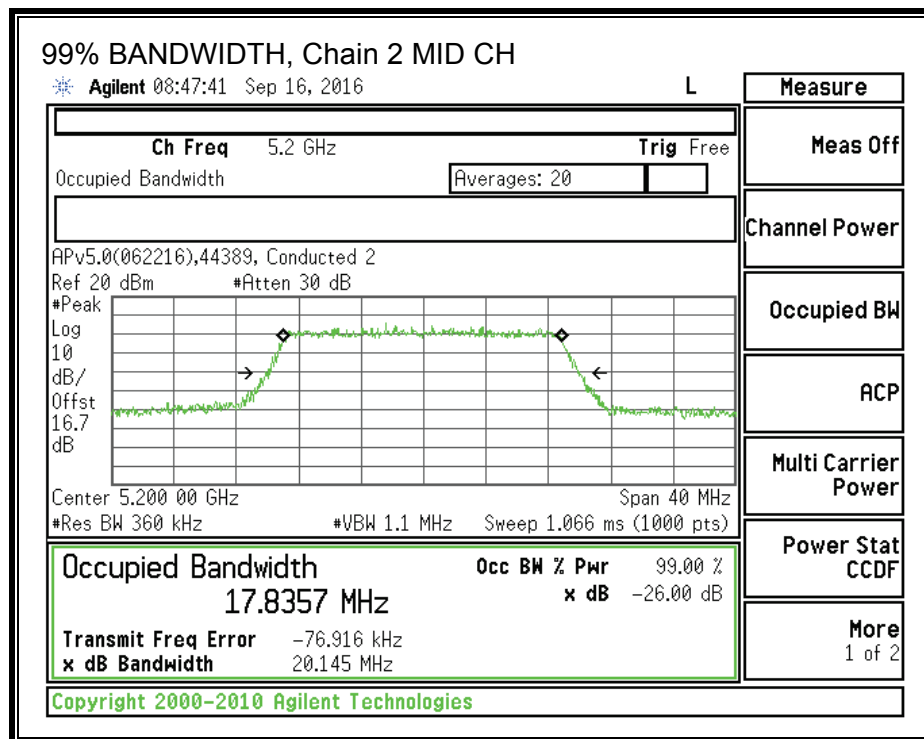
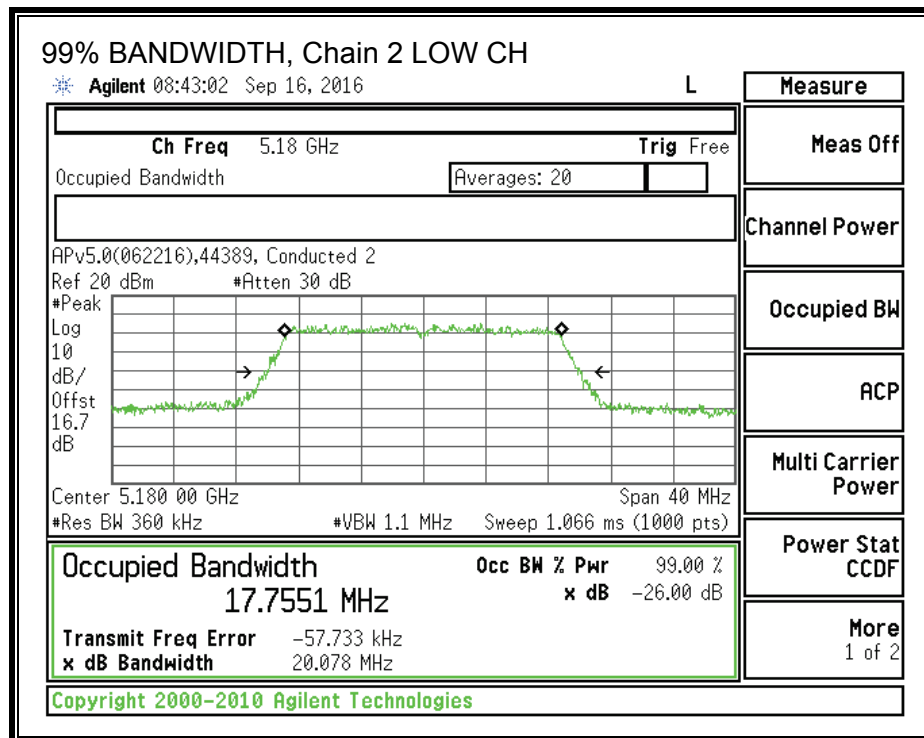


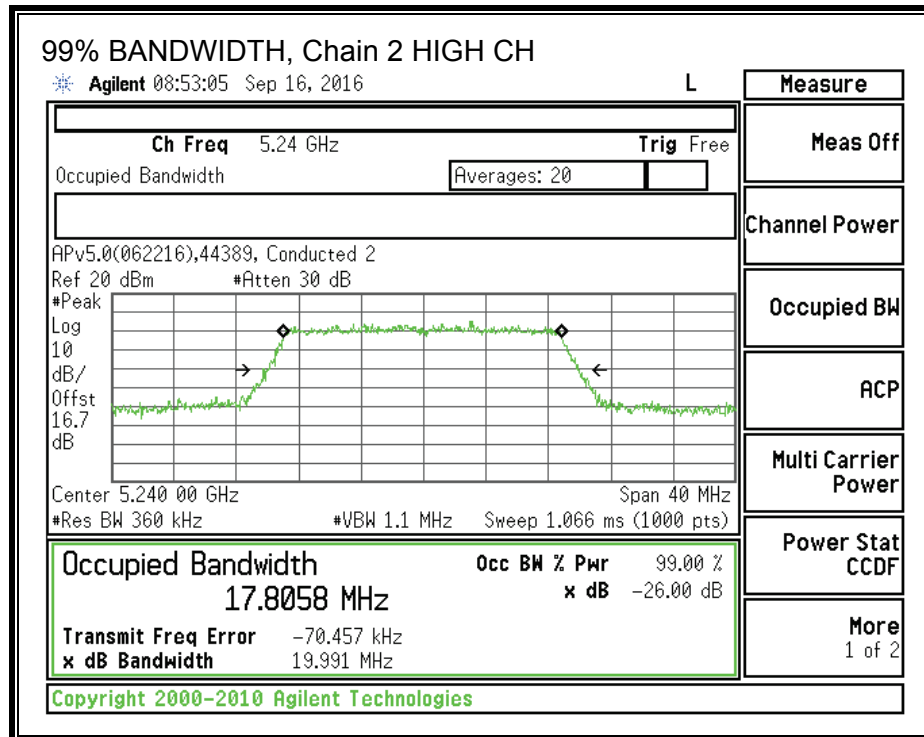
**99% BANDWIDTH, Chain 1**





**99% BANDWIDTH, Chain 2**





### 8.3.3. OUTPUT POWER AND PSD

#### LIMITS

##### FCC §15.407 (a) (1)

(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 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 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 6 dBi.

(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.



## DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

### 802.11n CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

### 802.11n SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera

Test Date: 2016-09-06, 2016-10-19

## RESULTS

### OUTPUT POWER – 802.11n HT20 CDD (MCS0)

#### Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	8.00	12.77	28.00	10.23
Mid	5200	8.00	12.77	28.00	10.23
High	5240	8.00	12.77	28.00	10.23

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

#### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	13.46	14.09	13.75	18.55	28.00	-9.45
Mid	5200	13.68	13.93	13.97	18.63	28.00	-9.37
High	5240	13.74	13.68	14.15	18.63	28.00	-9.37

Note - The above represents gated average power measurements, as described in method PM-G.

**PSD – 802.11n HT20 CDD (MCS0)**

**Antenna Gain and Limits**

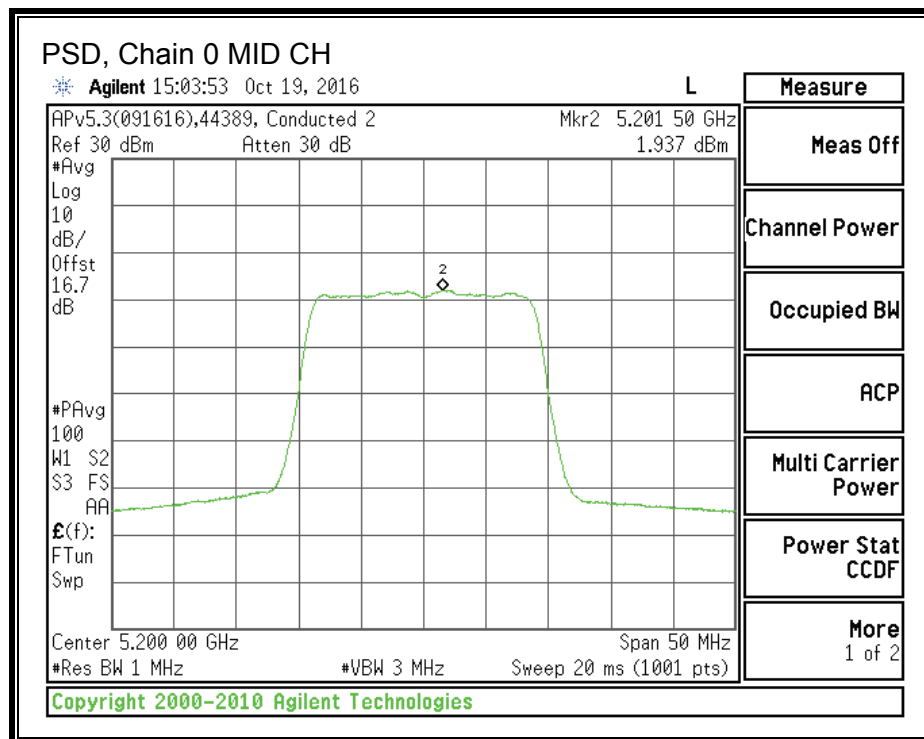
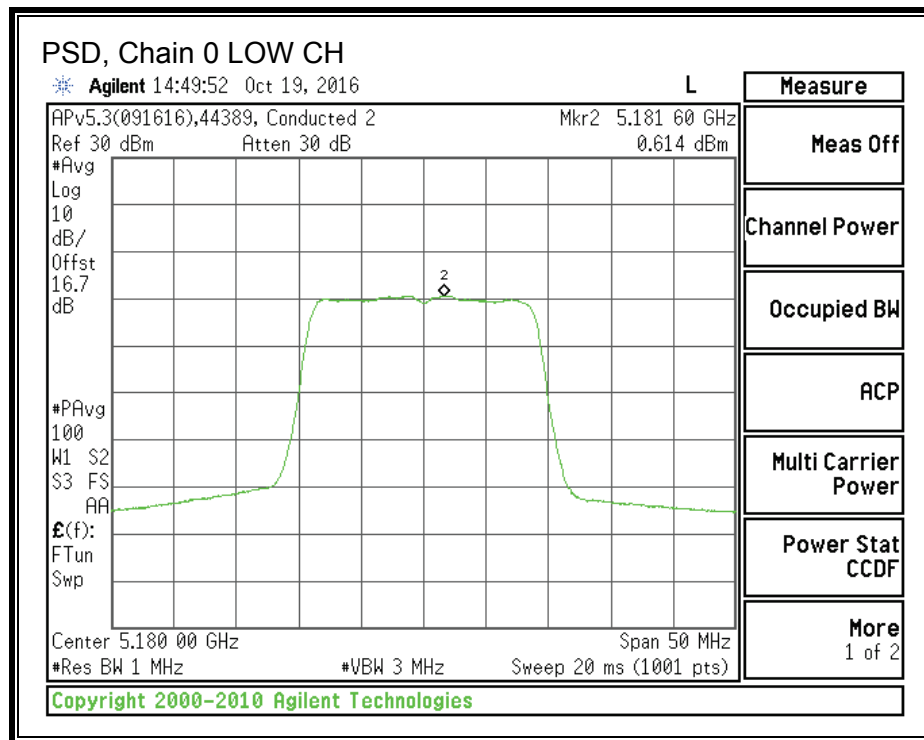
Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	8.00	12.77	28.00	10.23
Mid	5200	8.00	12.77	28.00	10.23
High	5240	8.00	12.77	28.00	10.23

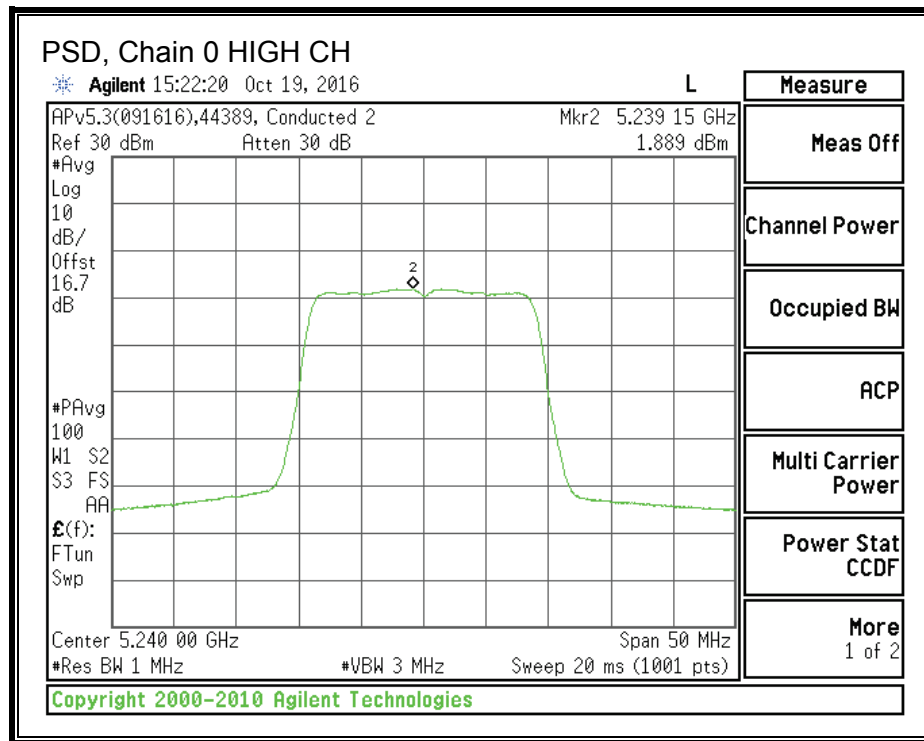
<b>Duty Cycle CF (dB)</b>	0.22	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

**PSD Results**

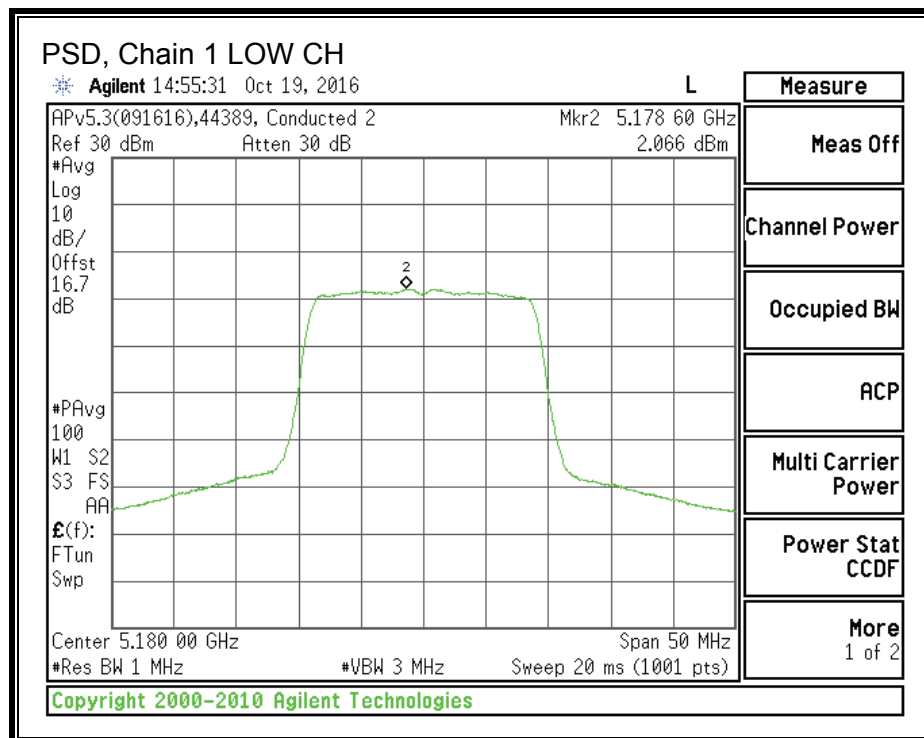
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	0.61	2.07	2.57	6.82	10.23	-3.41
Mid	5200	1.94	2.83	1.69	7.17	10.23	-3.06
High	5240	1.89	2.42	2.28	7.19	10.23	-3.04

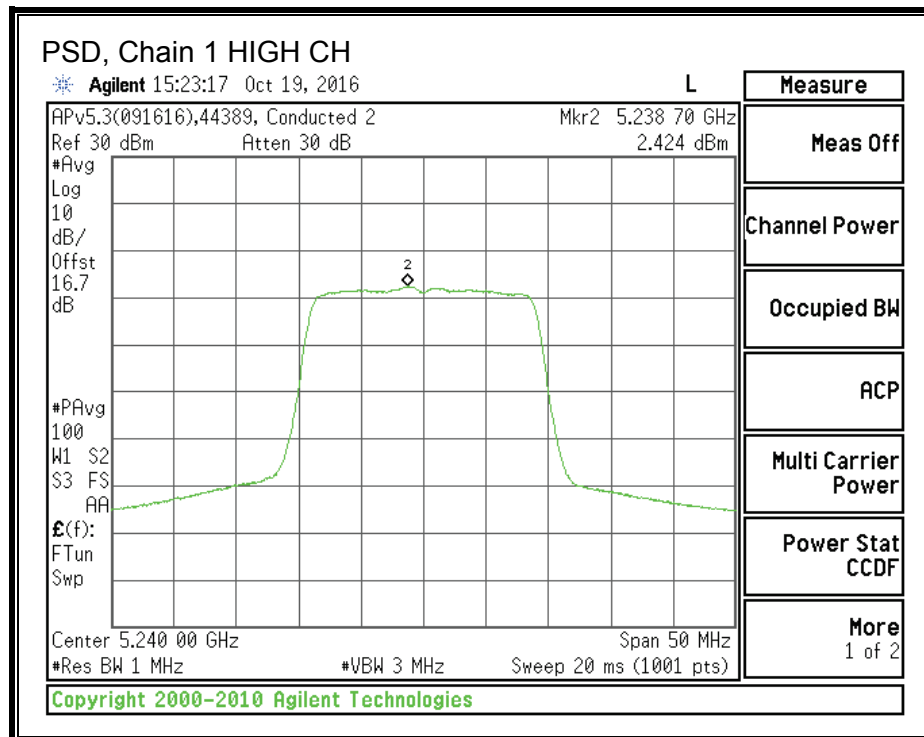
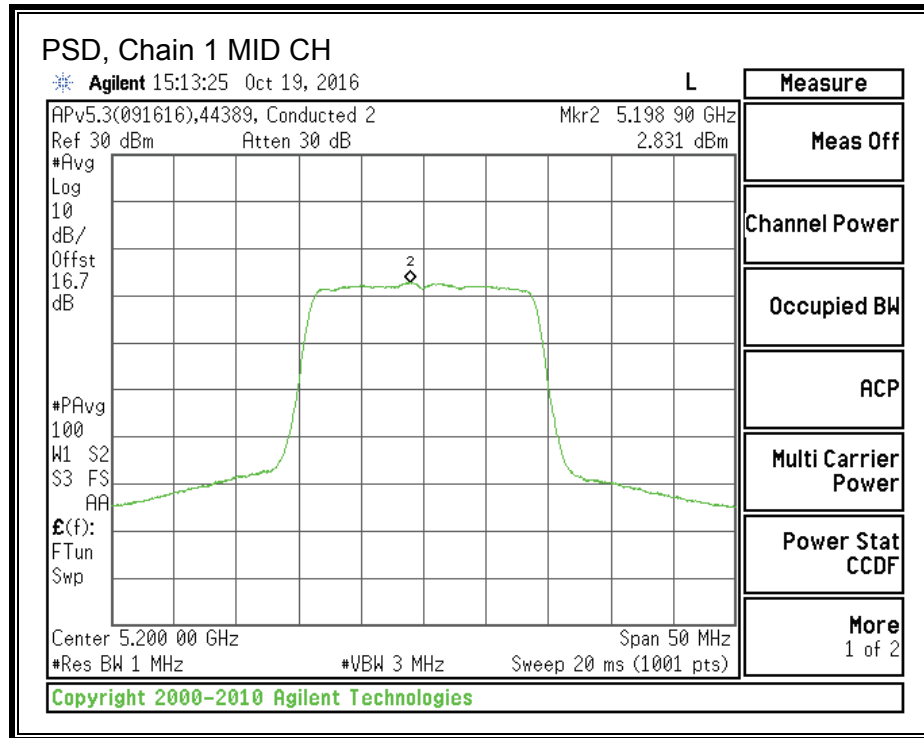
**PSD, Chain 0**



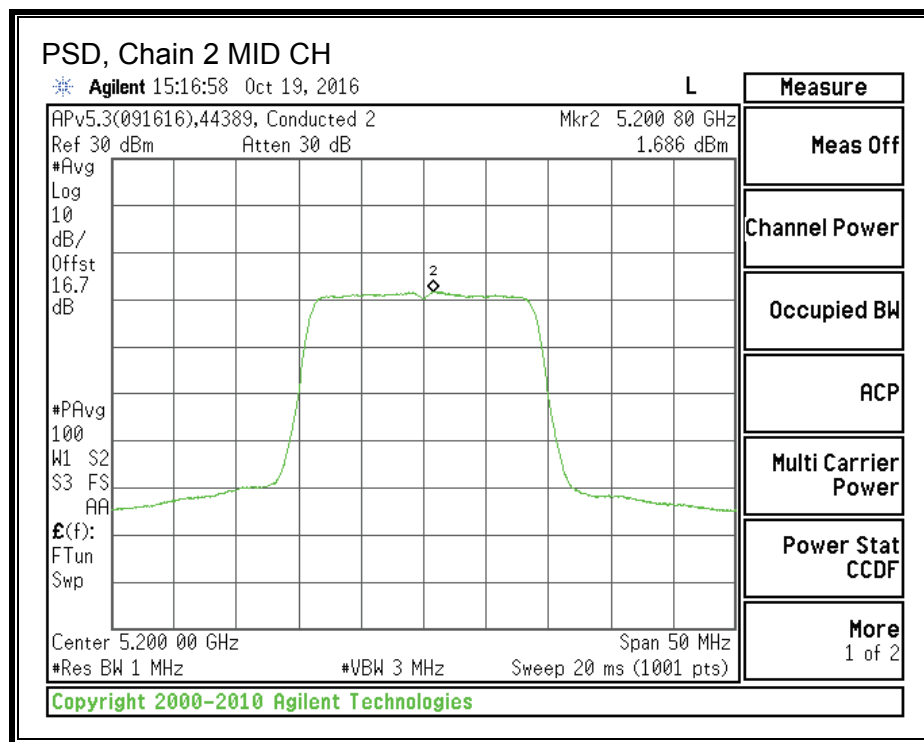
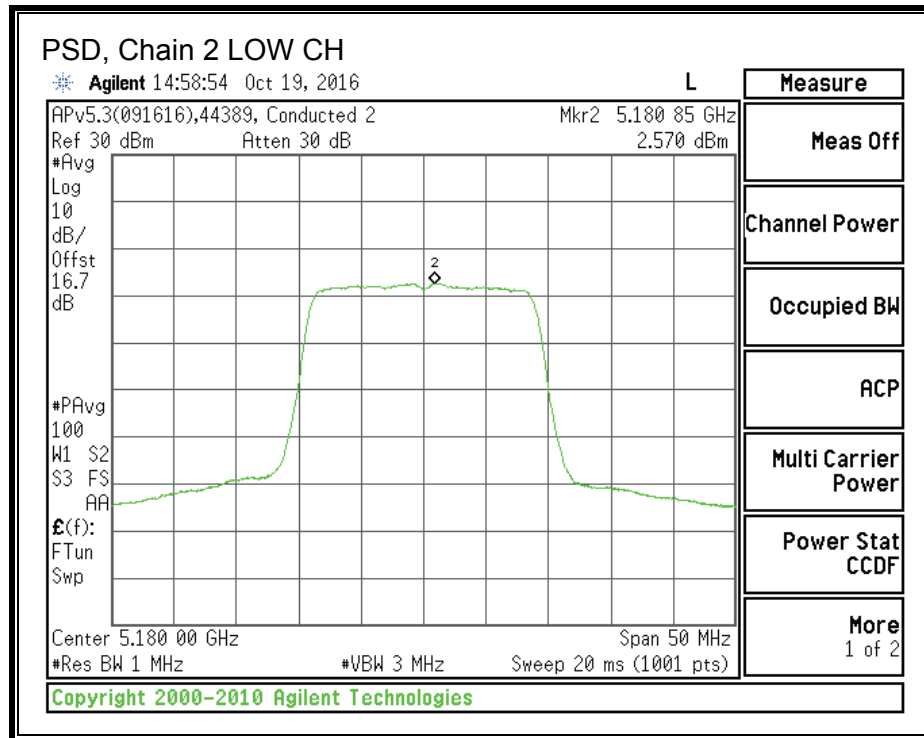


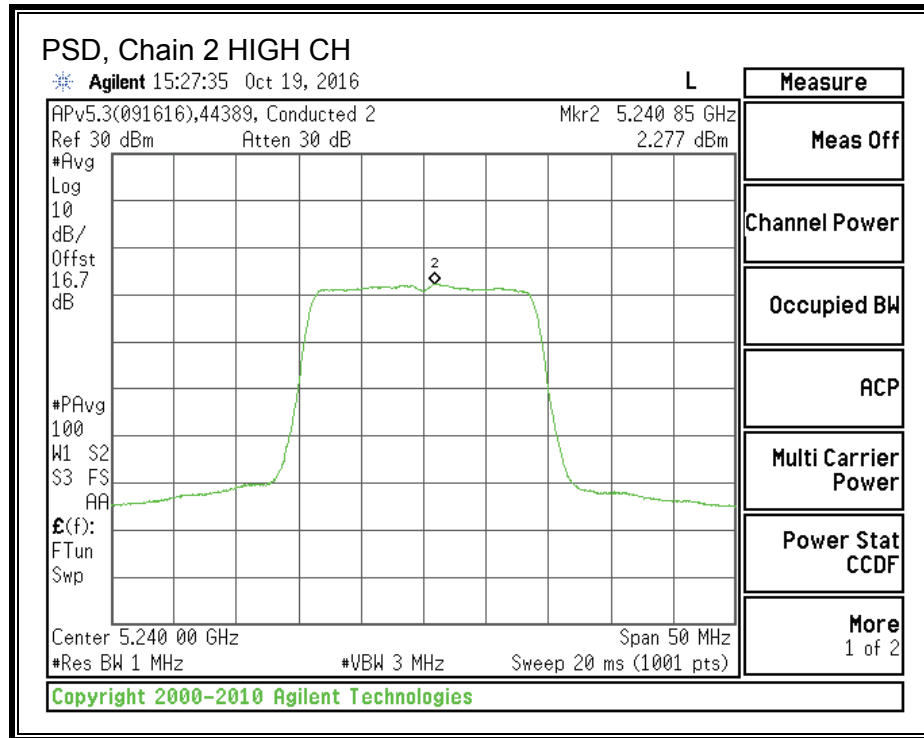
**PSD, Chain 1**





## PSD, Chain 2







**OUTPUT POWER – 802.11n HT20 SDM (MCS16)**

**Antenna Gain and Limits**

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	8.00	8.00	28.00	15.00
Mid	5200	8.00	8.00	28.00	15.00
High	5240	8.00	8.00	28.00	15.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	13.66	14.18	14.25	18.81	28.00	-9.19
Mid	5200	13.91	14.55	14.09	18.96	28.00	-9.04
High	5240	13.70	14.45	13.49	18.67	28.00	-9.33

Note - The above represents gated average power data, as described in method PM-G.

**PSD – 802.11n HT20 SDM (MCS16)**

**Antenna Gain and Limits**

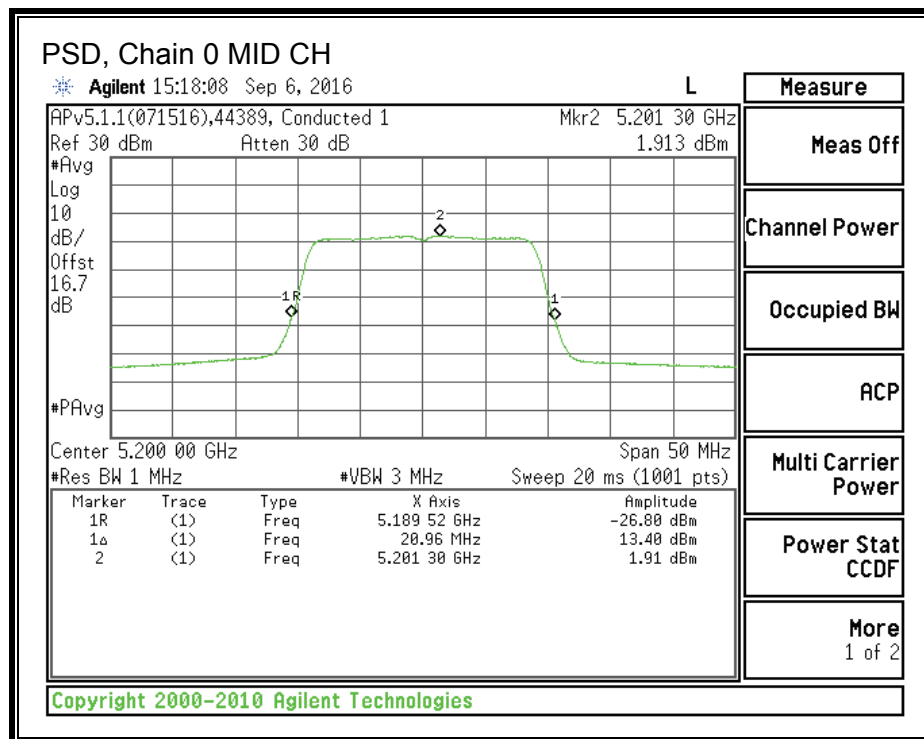
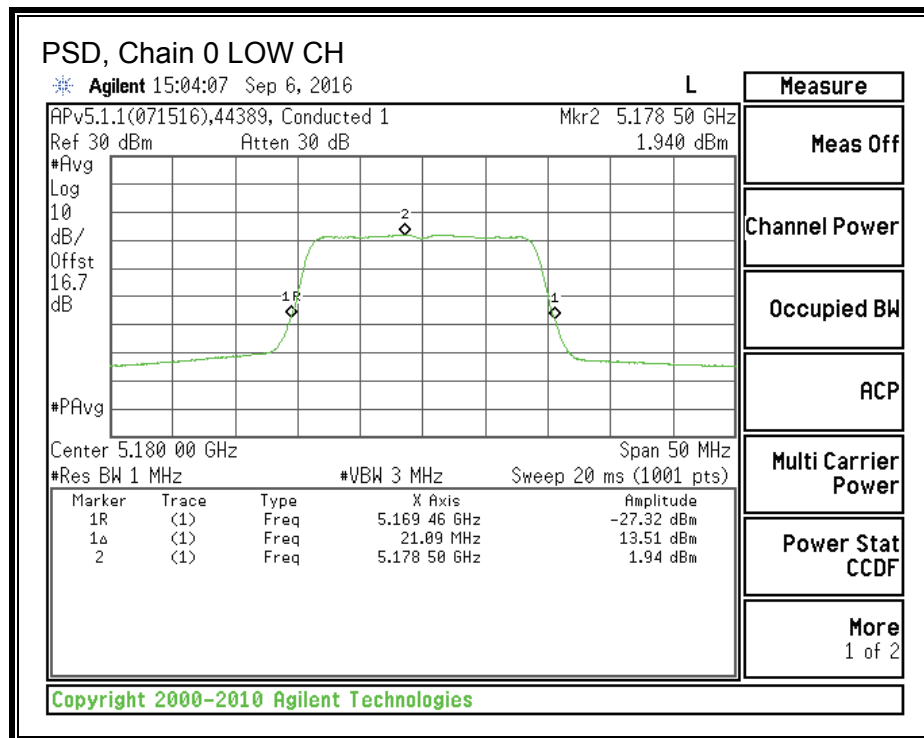
Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	8.00	8.00	28.00	15.00
Mid	5200	8.00	8.00	28.00	15.00
High	5240	8.00	8.00	28.00	15.00

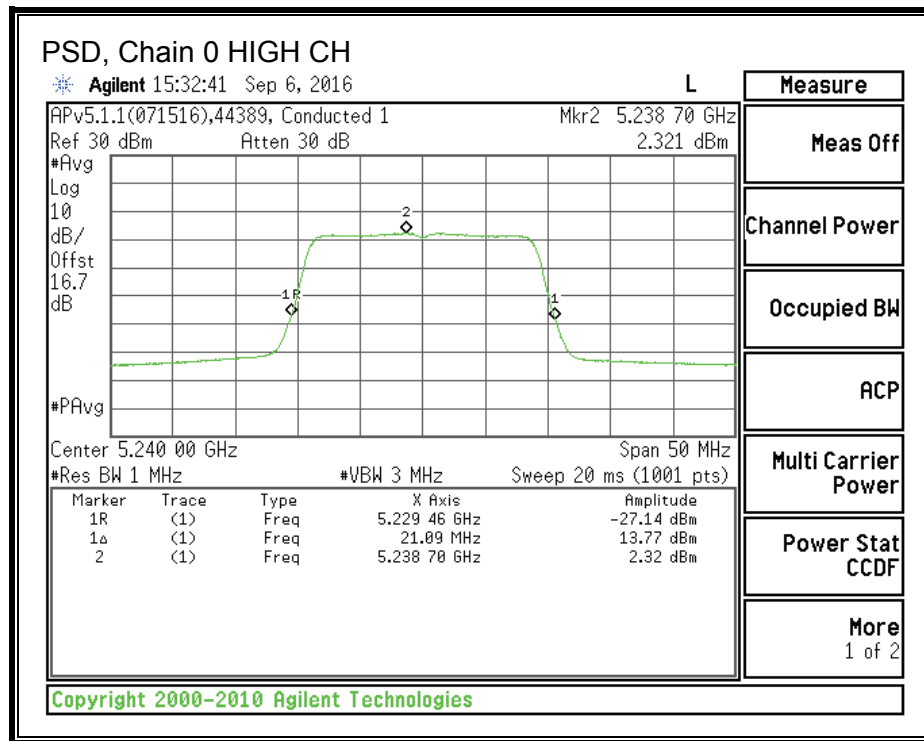
<b>Duty Cycle CF (dB)</b>	0.59	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

**PSD Results**

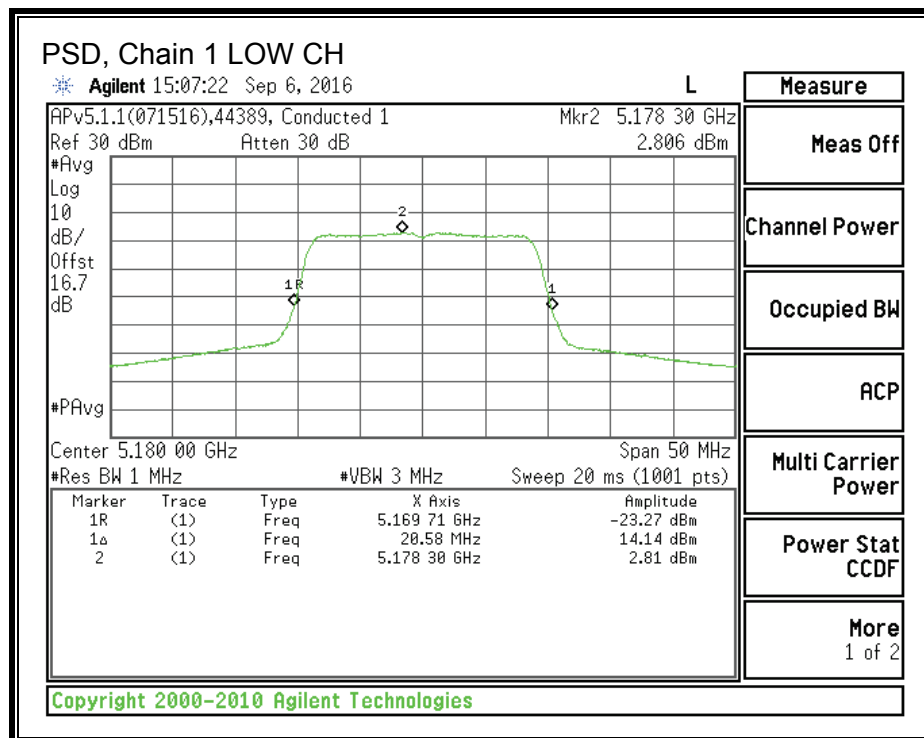
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	1.94	2.81	2.37	7.75	15.00	-7.25
Mid	5200	1.91	2.76	2.48	7.76	15.00	-7.24
High	5240	2.32	2.83	2.51	7.92	15.00	-7.08

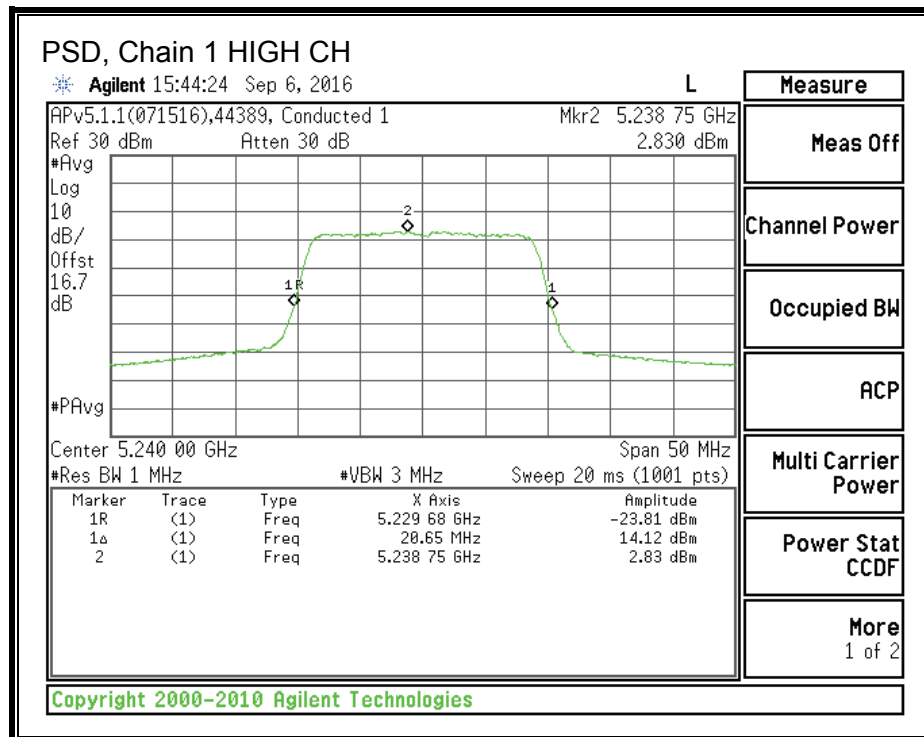
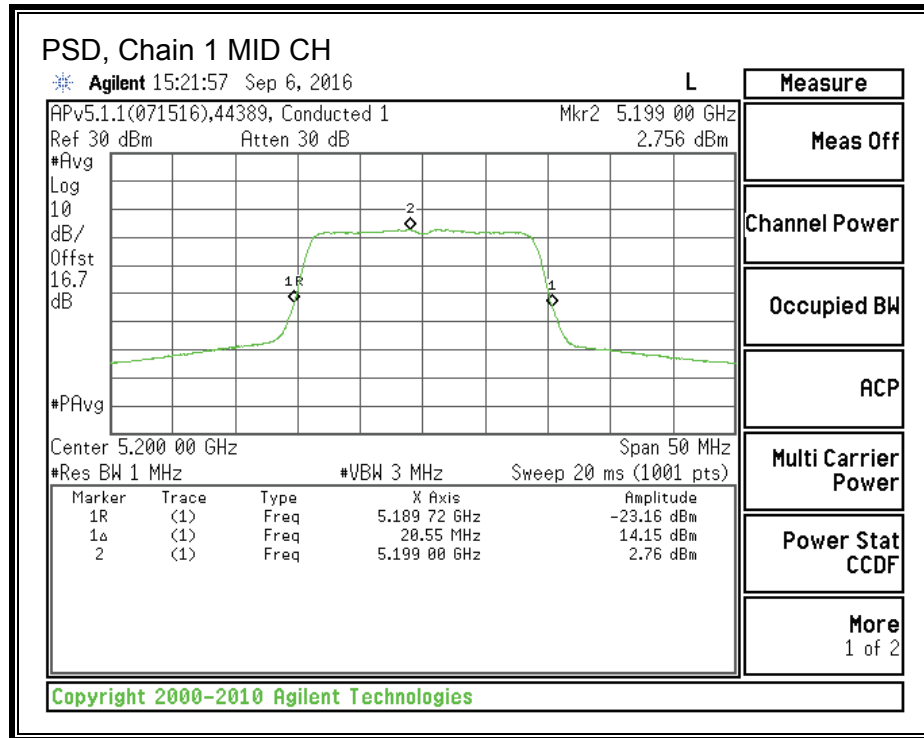
**PSD, Chain 0**



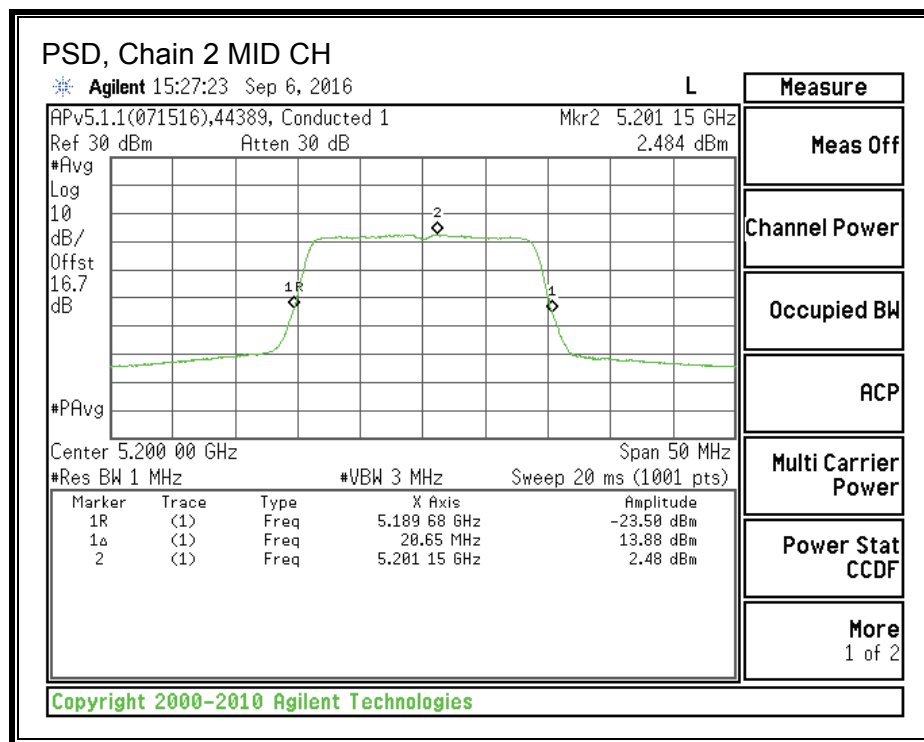
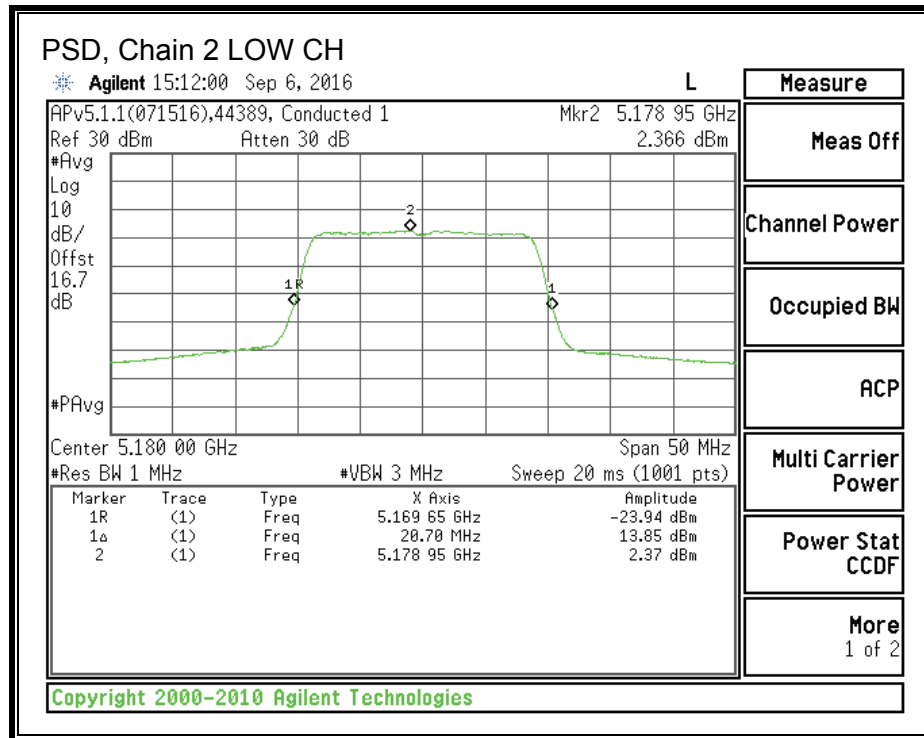


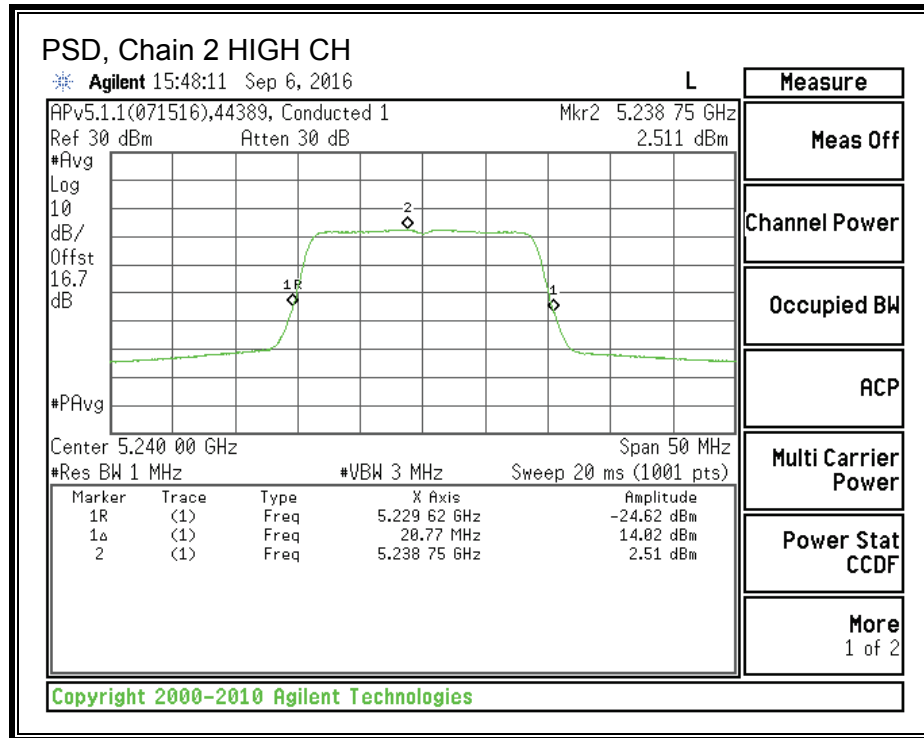
### PSD, Chain 1





**PSD, Chain 2**





## 8.4. 802.11n HT40 MODE IN THE 5.2 GHz BAND

### 8.4.1. 26 dB BANDWIDTH

#### LIMITS

None; for reporting purposes only. Tested per FCC §15.403 (i)

#### RESULTS

802.11n HT40 SDM (MCS16)

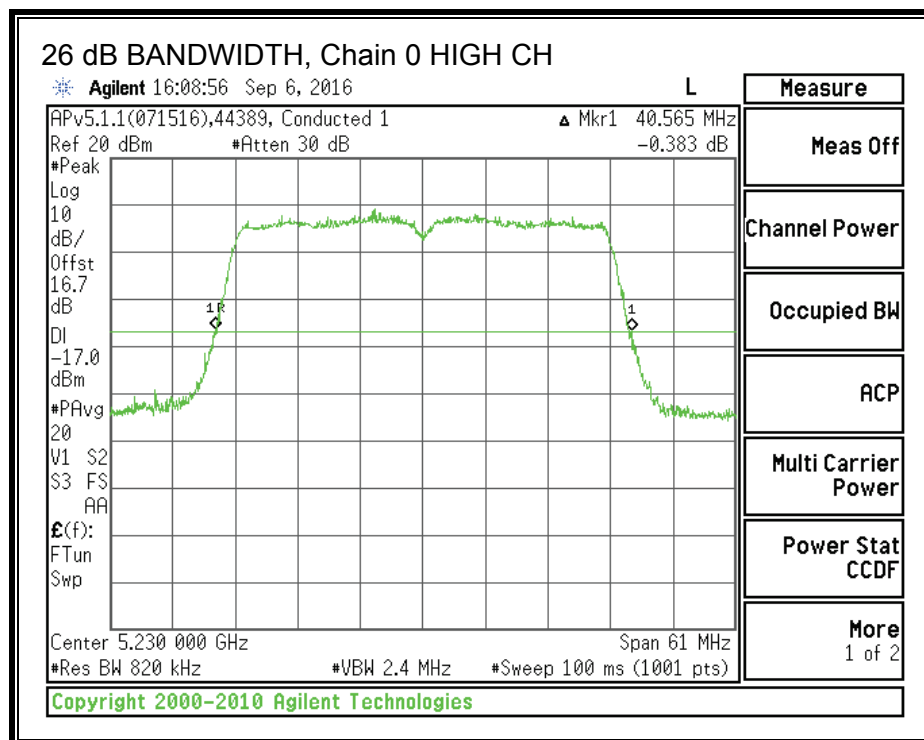
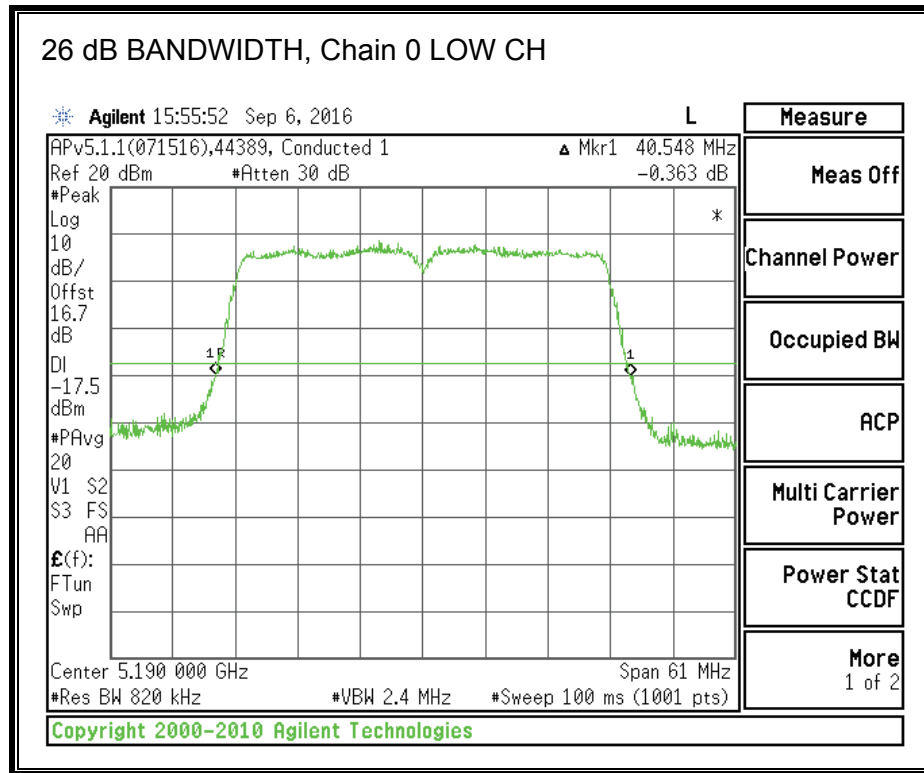
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Low	5190	40.55	40.26	40.20
High	5230	40.57	40.02	40.26

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-06

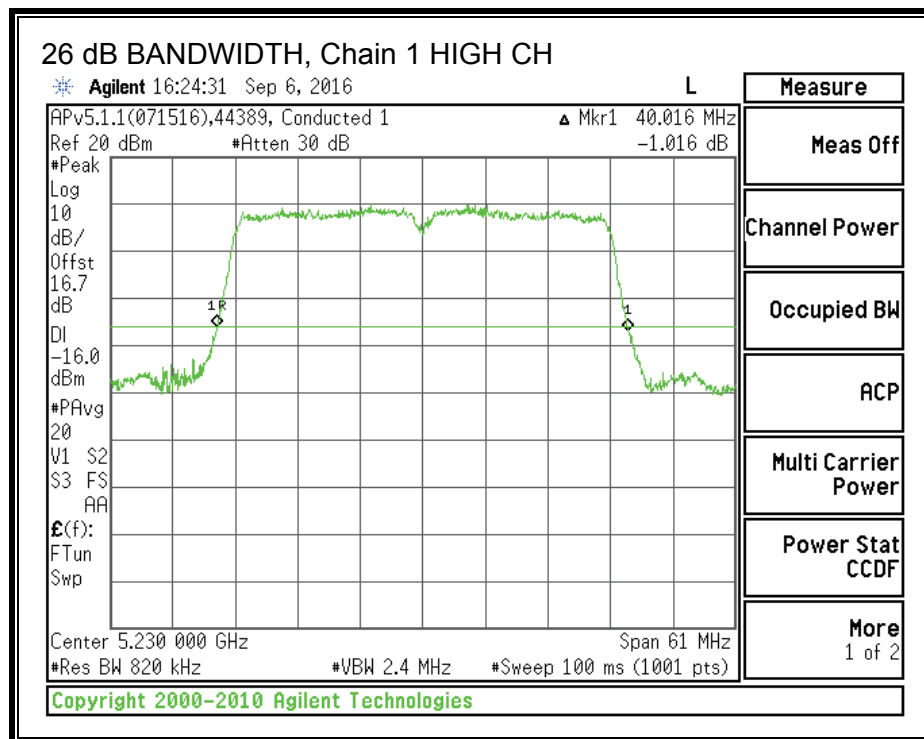
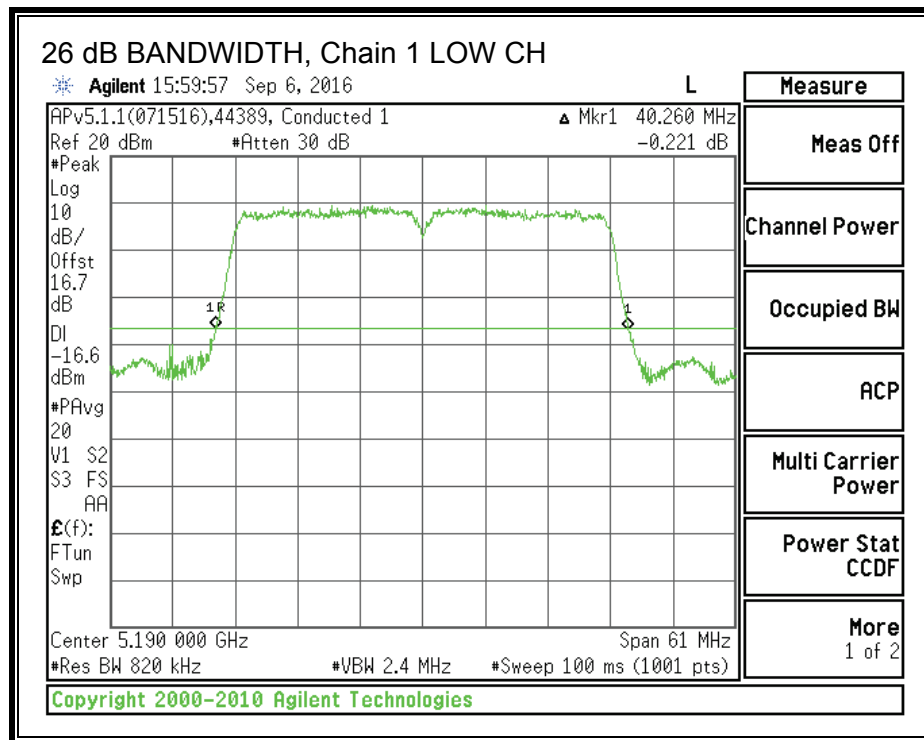


## 26 dB BANDWIDTH

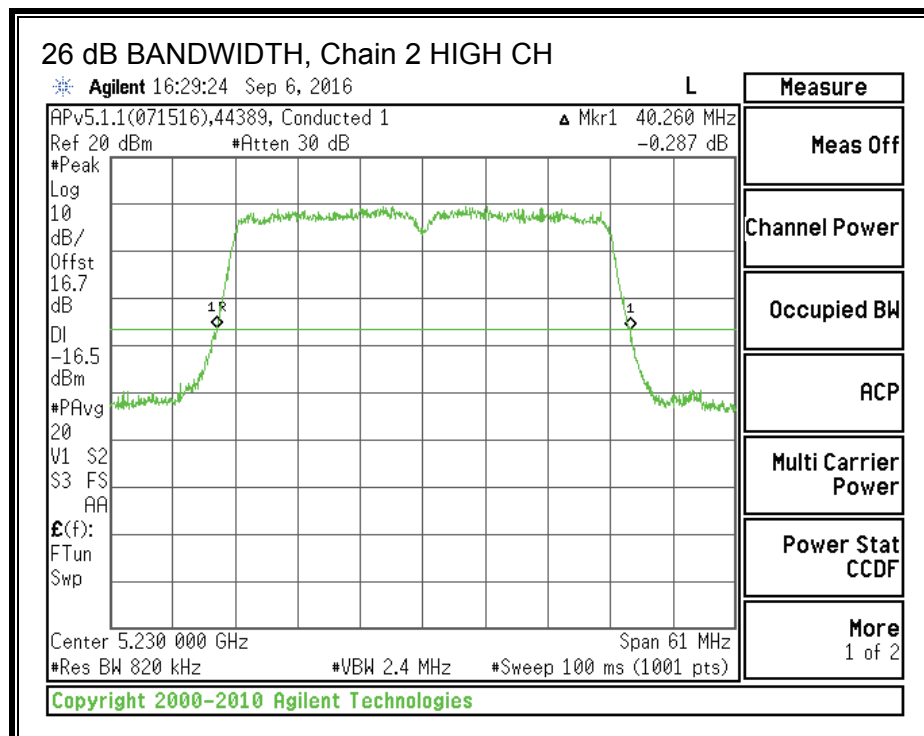
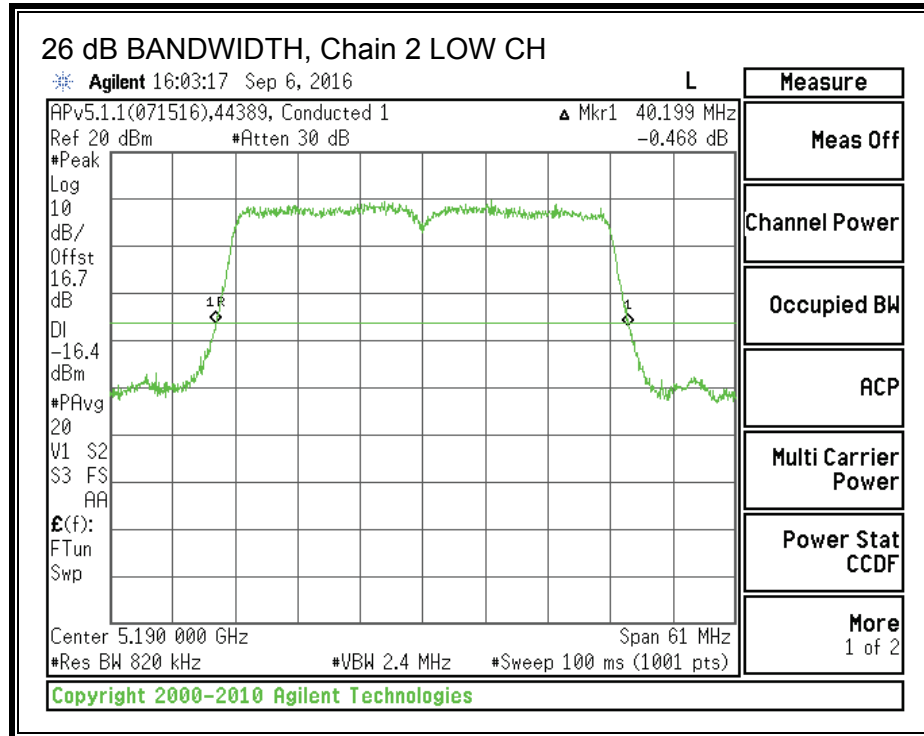
### 26 dB BANDWIDTH, Chain 0



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



## 8.4.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only. Measured per ANSI C63.10:2013 Section 6.9.3.

### RESULTS

802.11n HT40 SDM (MCS16)

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5190	36.34	35.80	36.32
High	5230	36.35	36.32	36.33

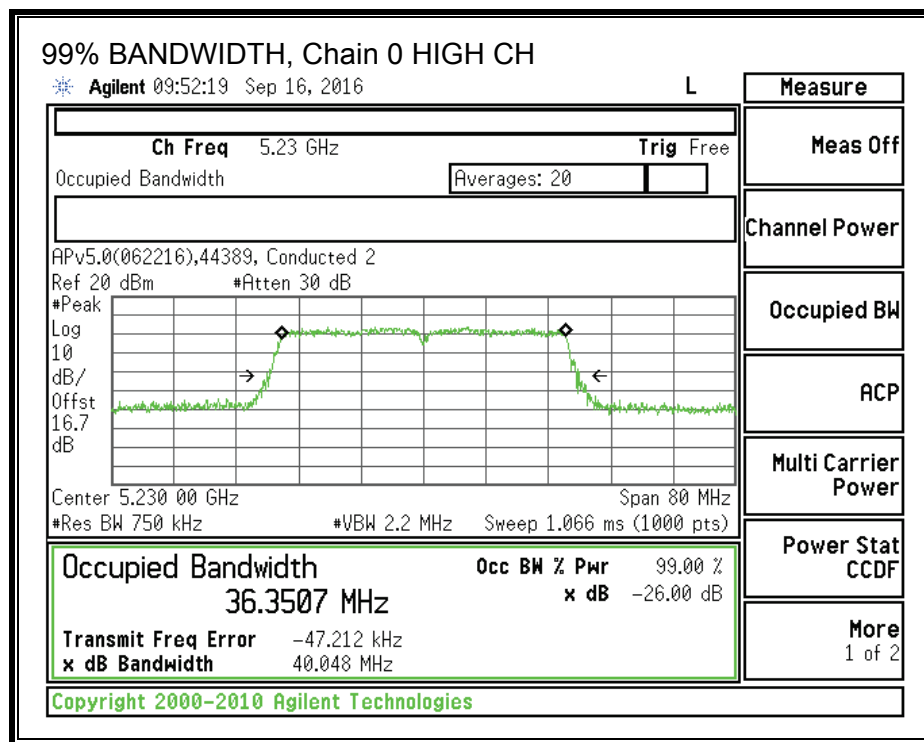
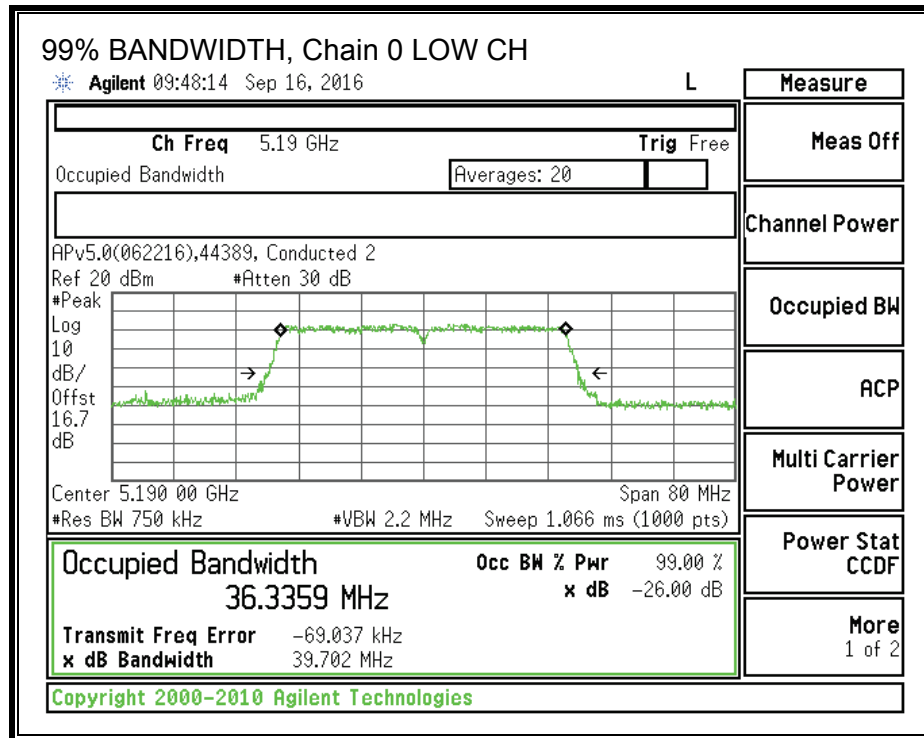
### Worst-Case

Channel	Frequency (MHz)	99% Bandwidth (MHz)	Maximum Ch Freq	Does Ch. Freq. Fall in UNII 2A? Y/N
Low	5190	36.3400	5208.170	N
High	5230	36.3500	5248.175	N

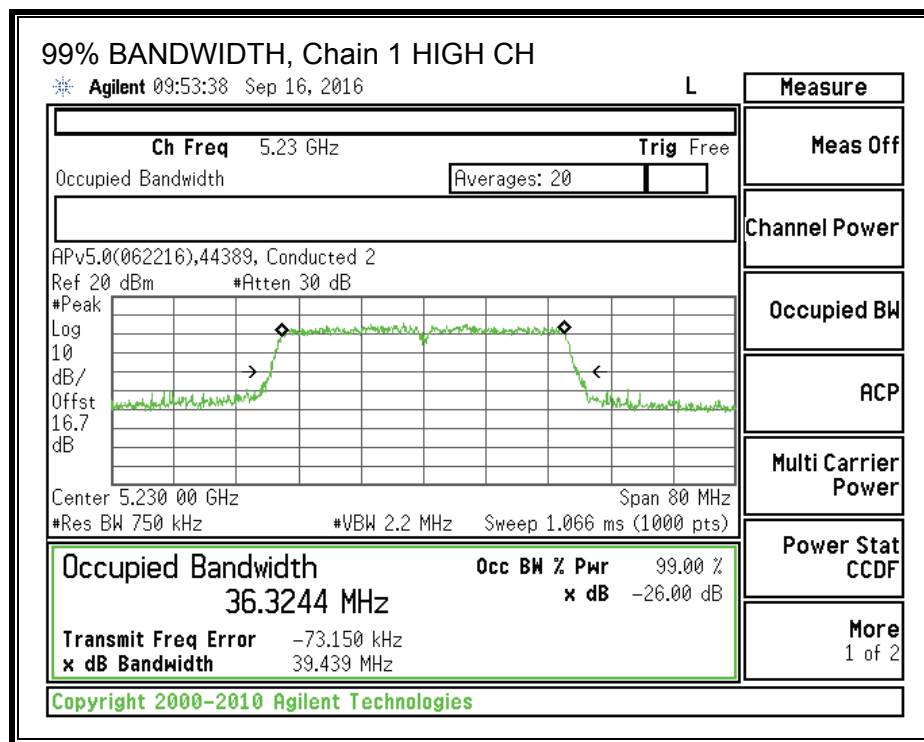
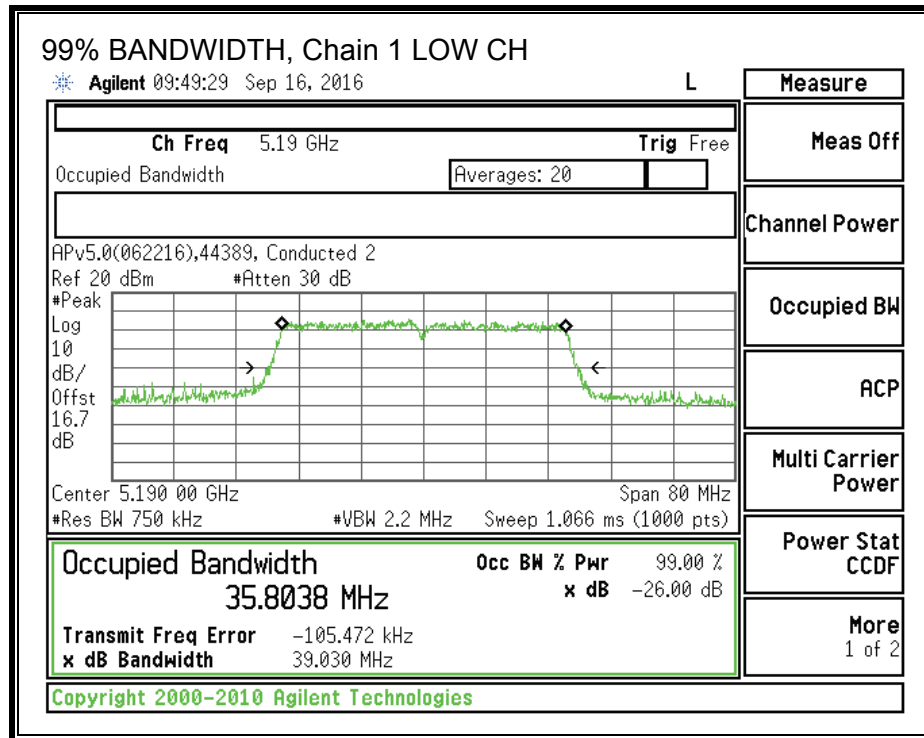
Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-16

## 99% BANDWIDTH

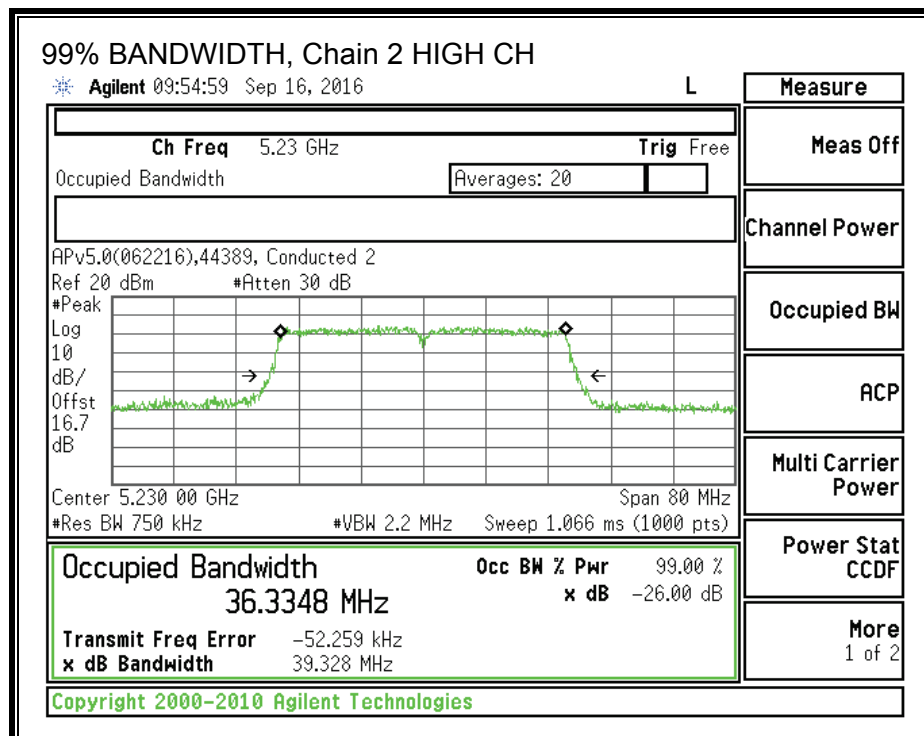
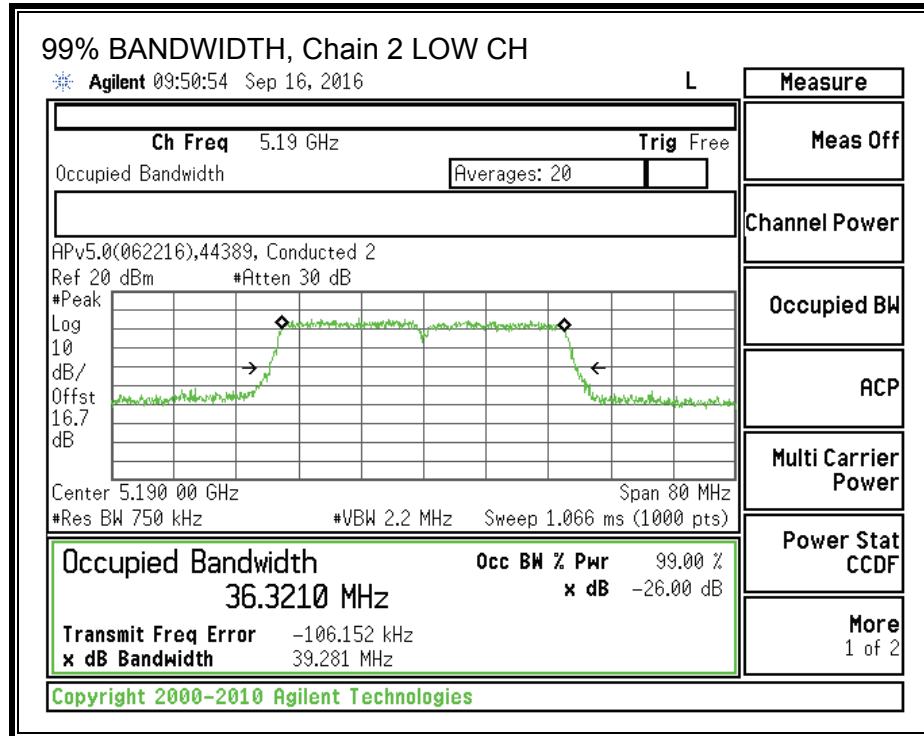
### 99% BANDWIDTH, Chain 0



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.4.3. OUTPUT POWER AND PSD

#### LIMITS

##### FCC §15.407 (a) (1)

(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 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 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 6 dBi.

(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.



## **DIRECTIONAL ANTENNA GAIN**

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

### **802.11n CDD Mode**

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

### **802.11n SDM Mode**

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-06, 2016-10-19 to 2016-10-20

## RESULTS

### OUTPUT POWER – 802.11n HT40 CDD (MCS0)

#### Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	8.00	12.77	28.00	10.23
High	5230	8.00	12.77	28.00	10.23

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

#### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.57	13.95	14.27	18.71	28.00	-9.29
High	5230	13.34	14.38	13.62	18.57	28.00	-9.43

Note – The above data represents gated power measurements, as described in method PM-G.

**PSD – 802.11n HT40 CDD (MCS0)**

**Antenna Gain and Limits**

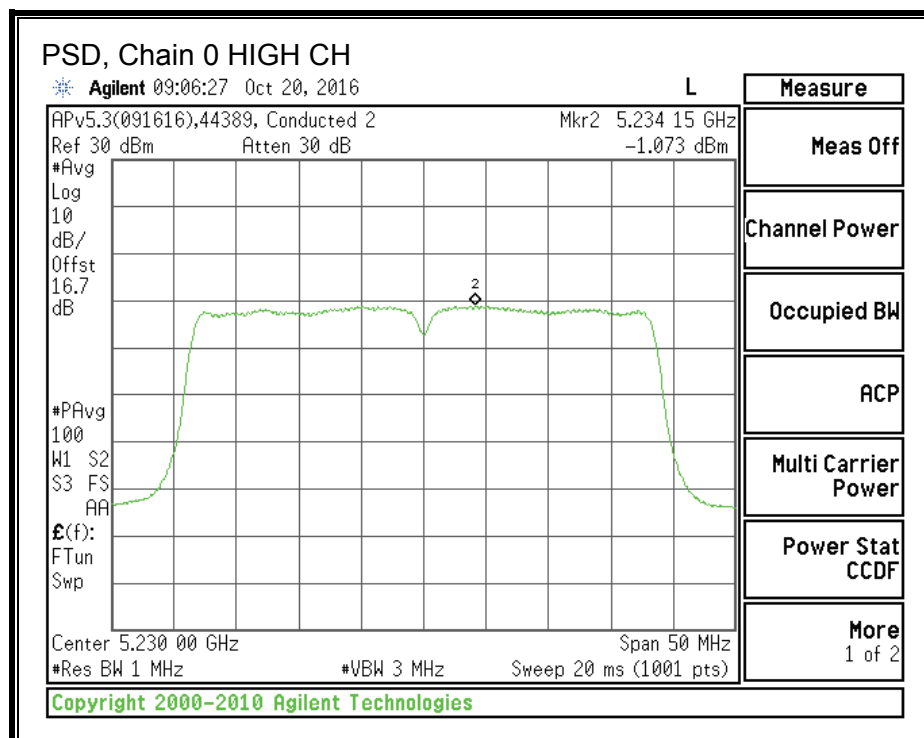
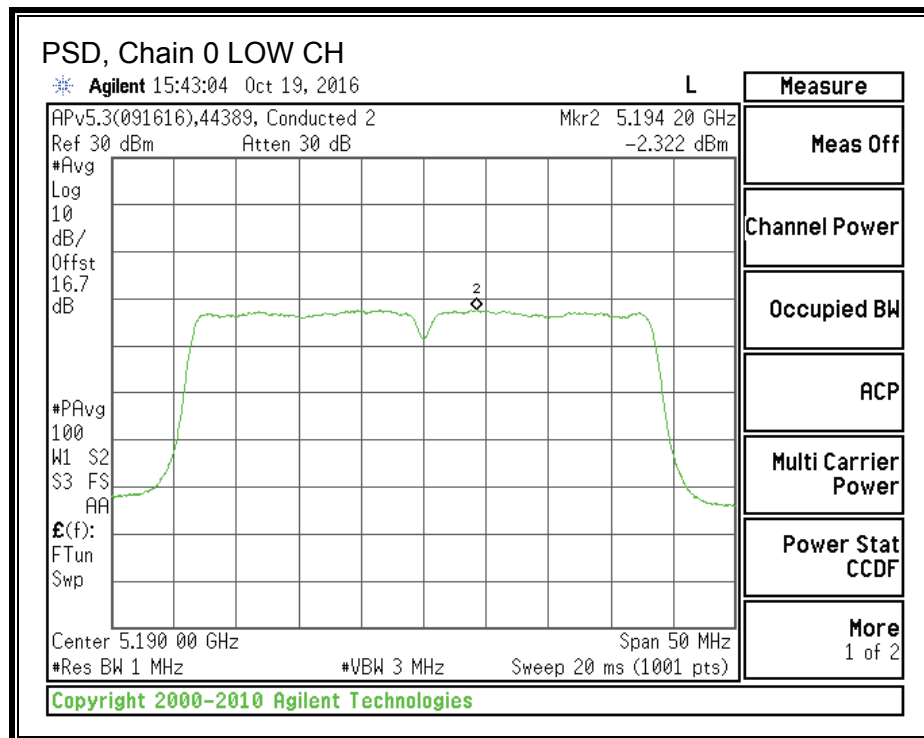
Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	8.00	12.77	28.00	10.23
High	5230	8.00	12.77	28.00	10.23

<b>Duty Cycle CF (dB)</b>	0.43	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

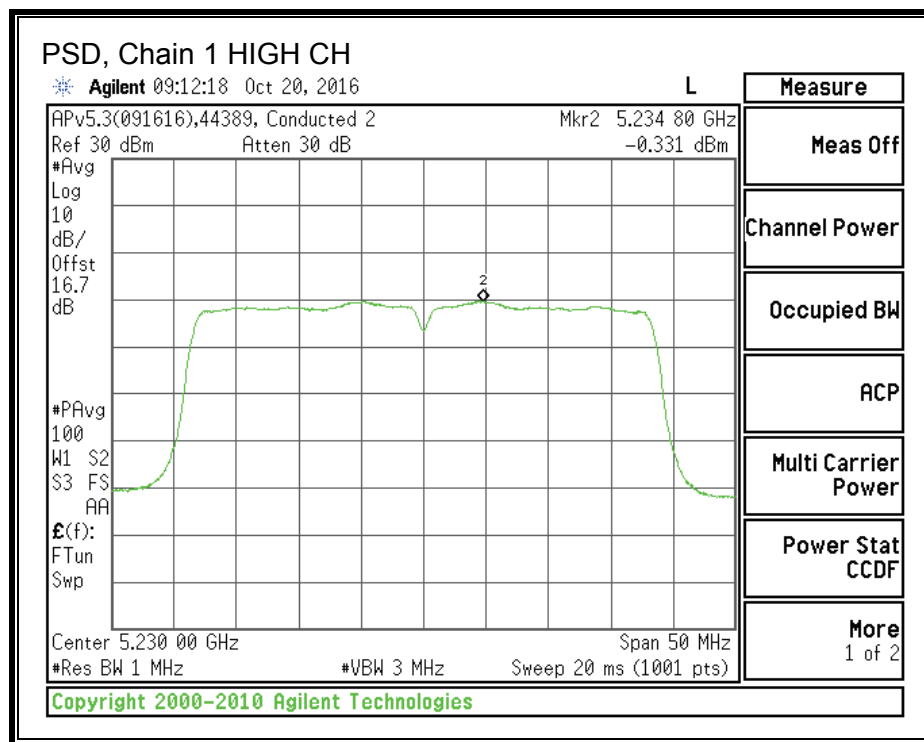
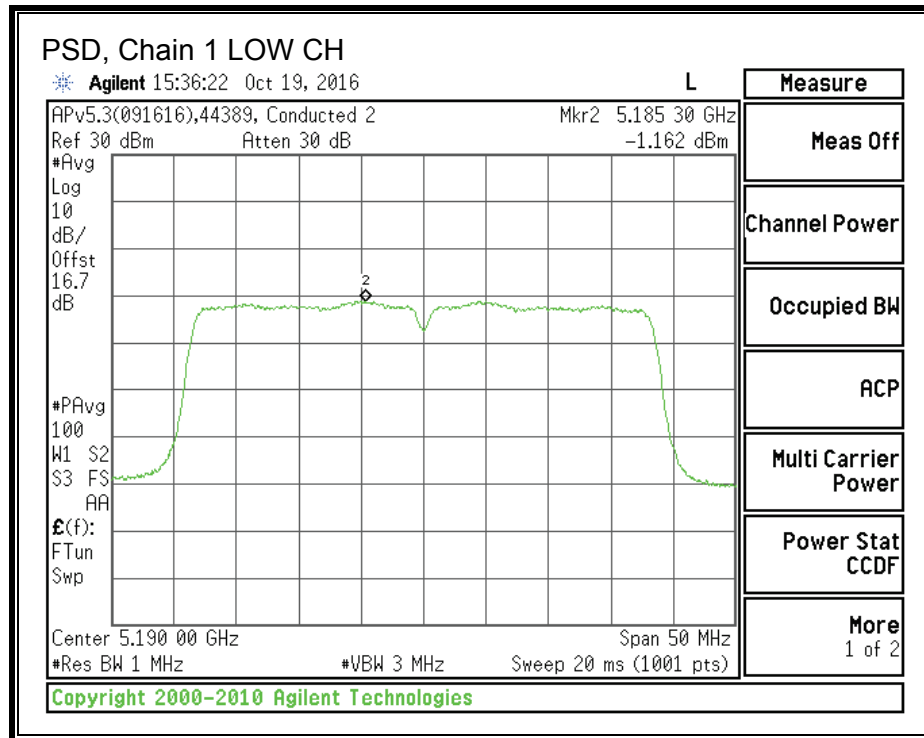
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	-2.32	-1.16	-1.42	3.60	10.23	-6.63
High	5230	-1.07	-0.33	-0.83	4.47	10.23	-5.76

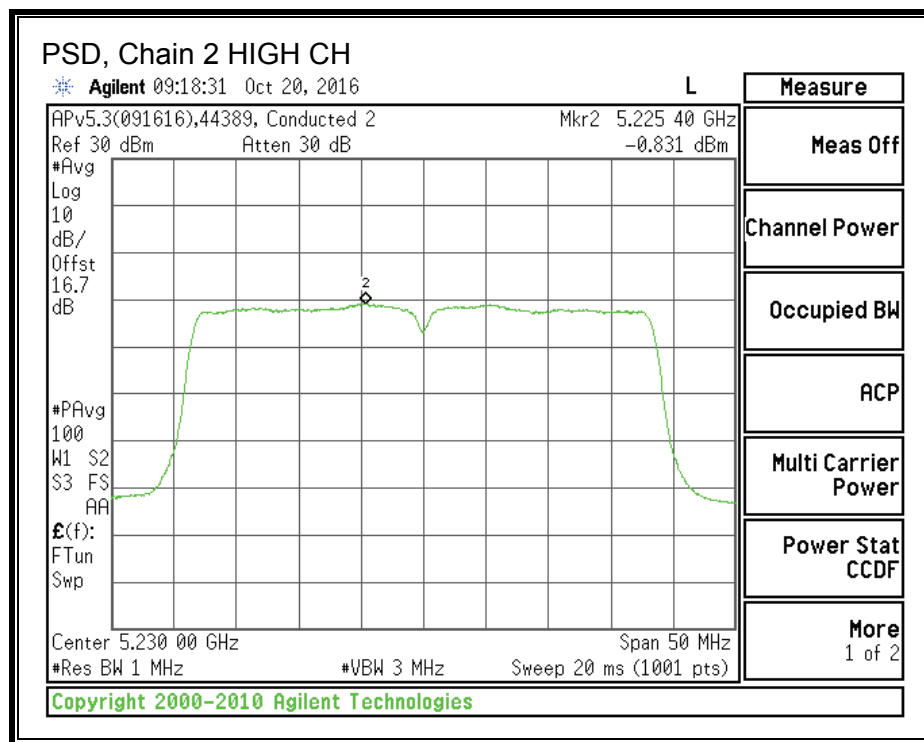
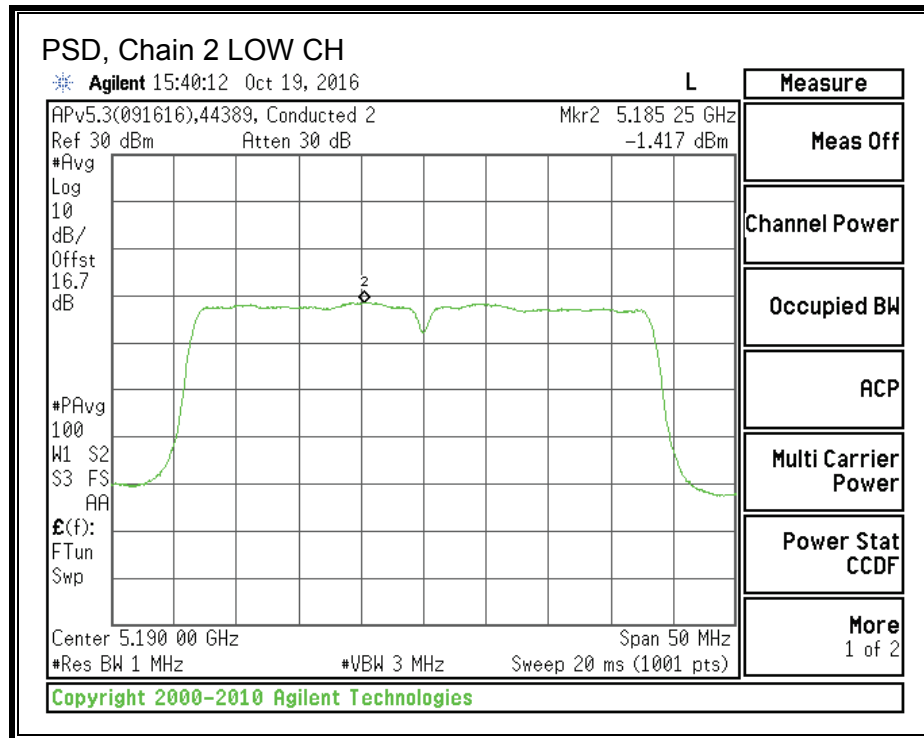
**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**



**OUTPUT POWER – 802.11n HT40 SDM (MCS16)**

**Antenna Gain and Limits**

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	8.00	8.00	28.00	15.00
High	5230	8.00	8.00	28.00	15.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.92	14.69	14.30	19.09	28.00	-8.91
High	5230	13.96	13.15	14.47	18.66	28.00	-9.34

Note – The above data represents gated power measurements, as described in method PM-G.

**PSD – 802.11n HT40 SDM (MCS16)**

**Antenna Gain and Limits**

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	8.00	8.00	28.00	15.00
High	5230	8.00	8.00	28.00	15.00

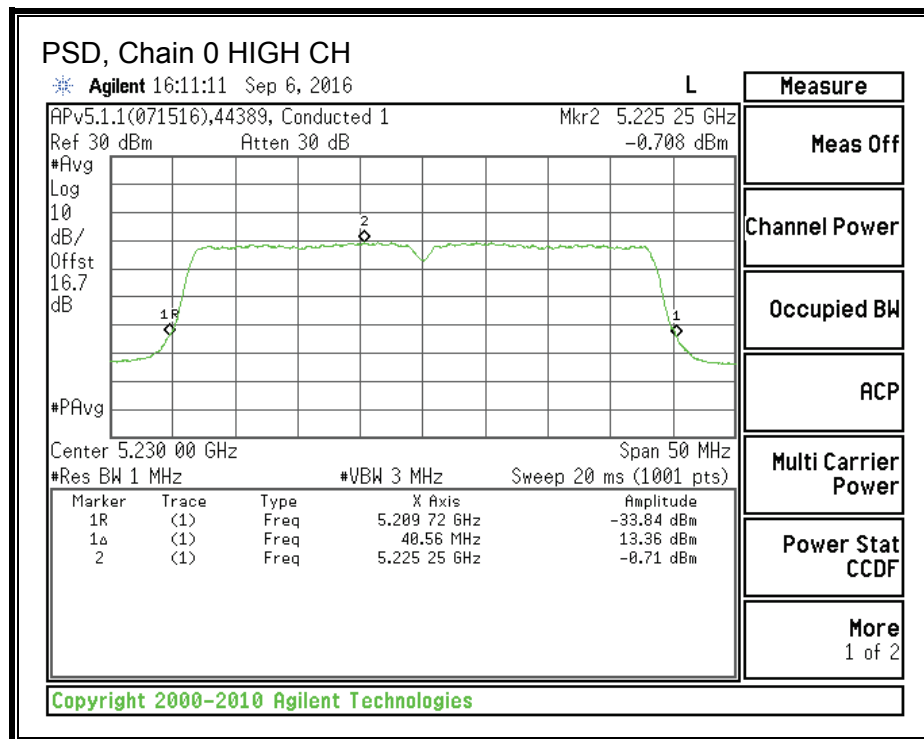
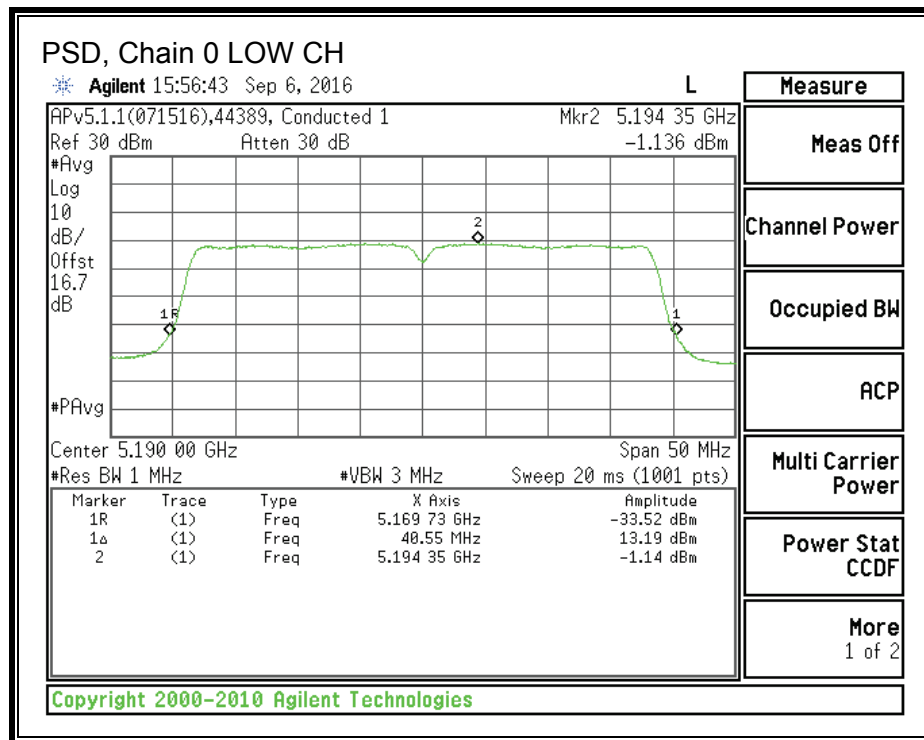
Duty Cycle CF (dB)	0.59	Included in Calculations of Corr'd Power & PSD
--------------------	------	--

**PSD Results**

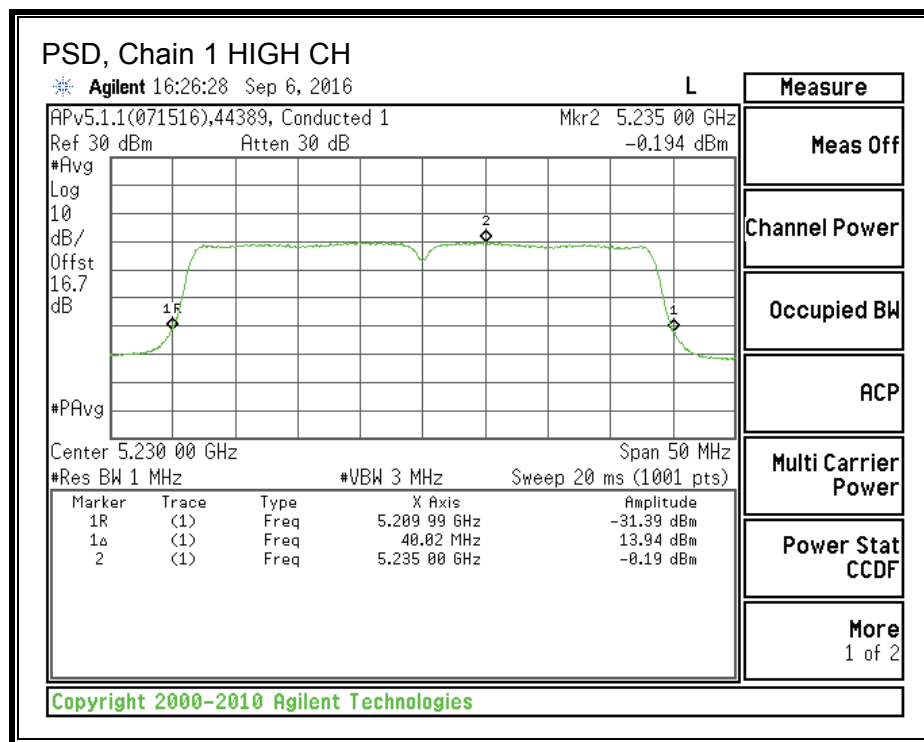
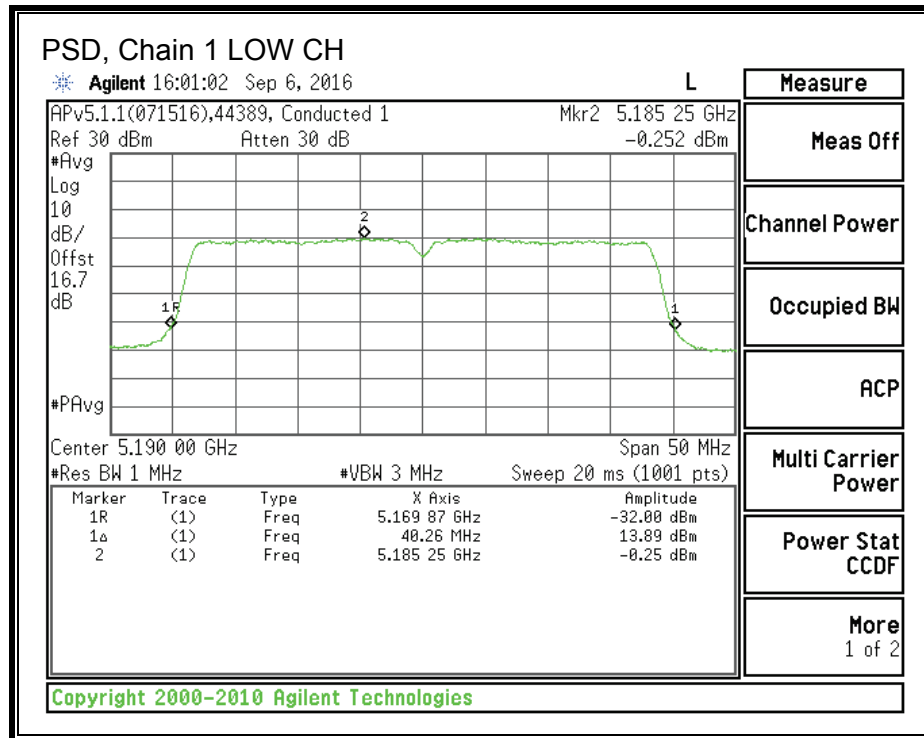
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	-1.14	-0.25	-0.78	4.65	15.00	-10.35
High	5230	-0.71	-0.19	-0.61	4.86	15.00	-10.14



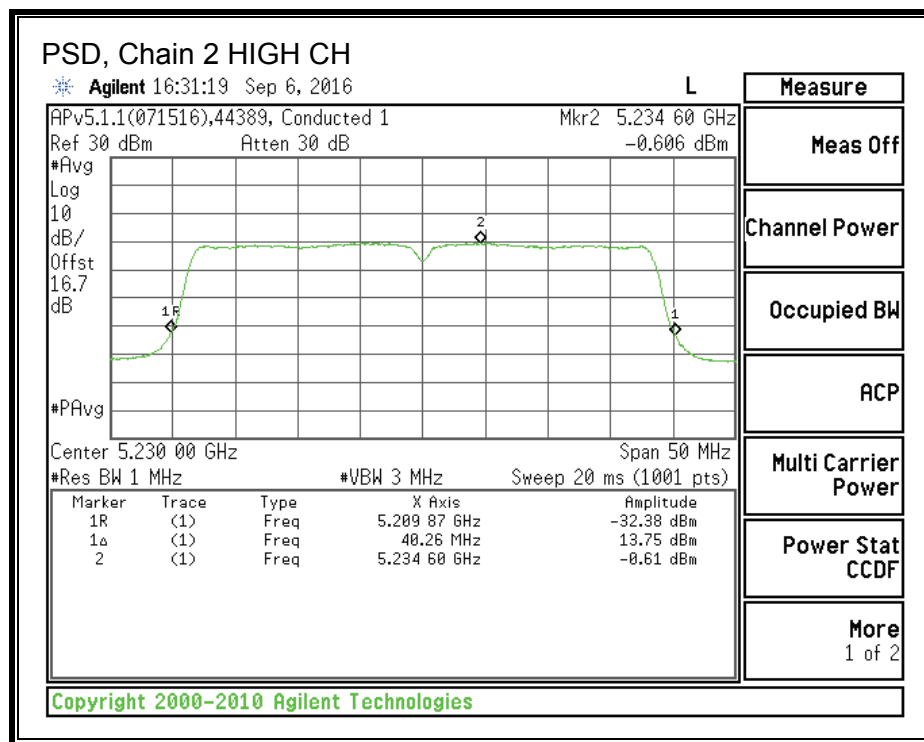
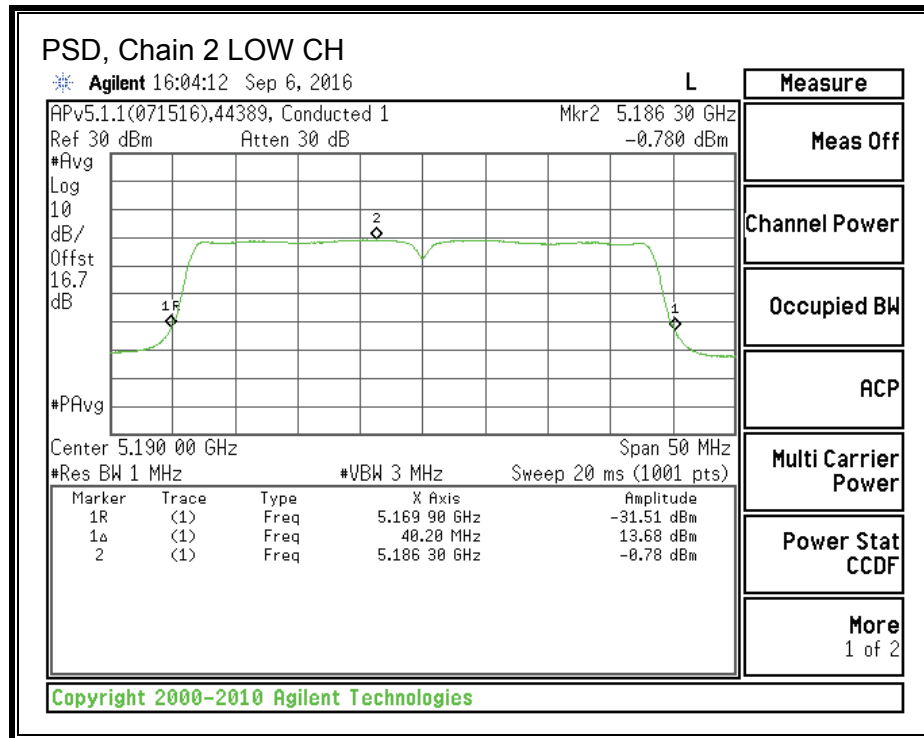
**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**



## 8.5. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

### 8.5.1. 26 dB BANDWIDTH

#### LIMITS

None; for reporting purposes only. Tested per FCC §15.403 (i)

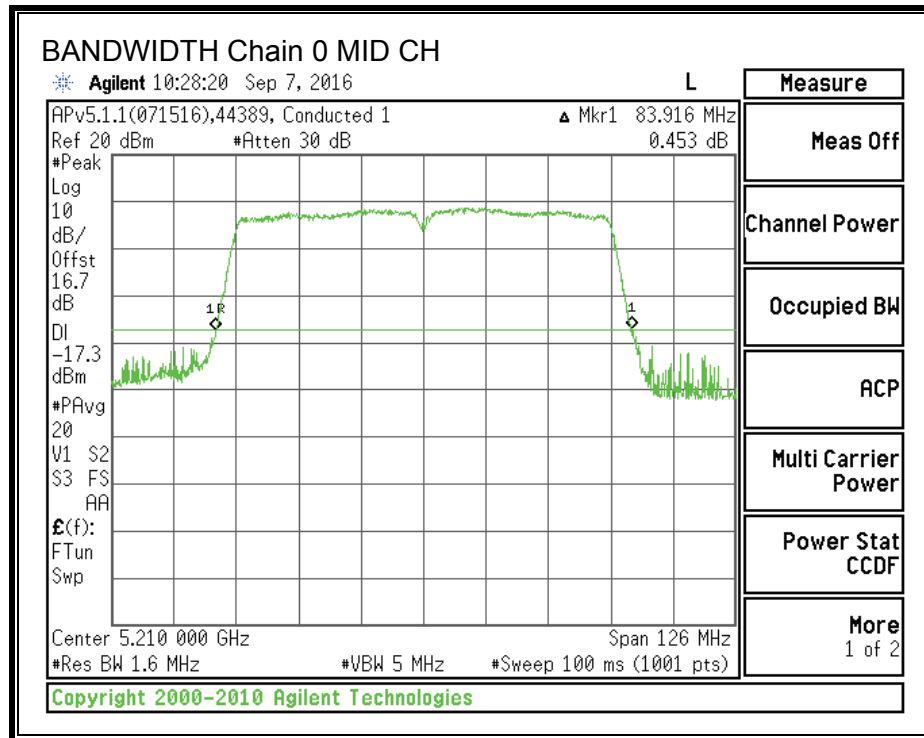
#### RESULTS

802.11ac VHT80 SDM (MCS0, Nss = 3)

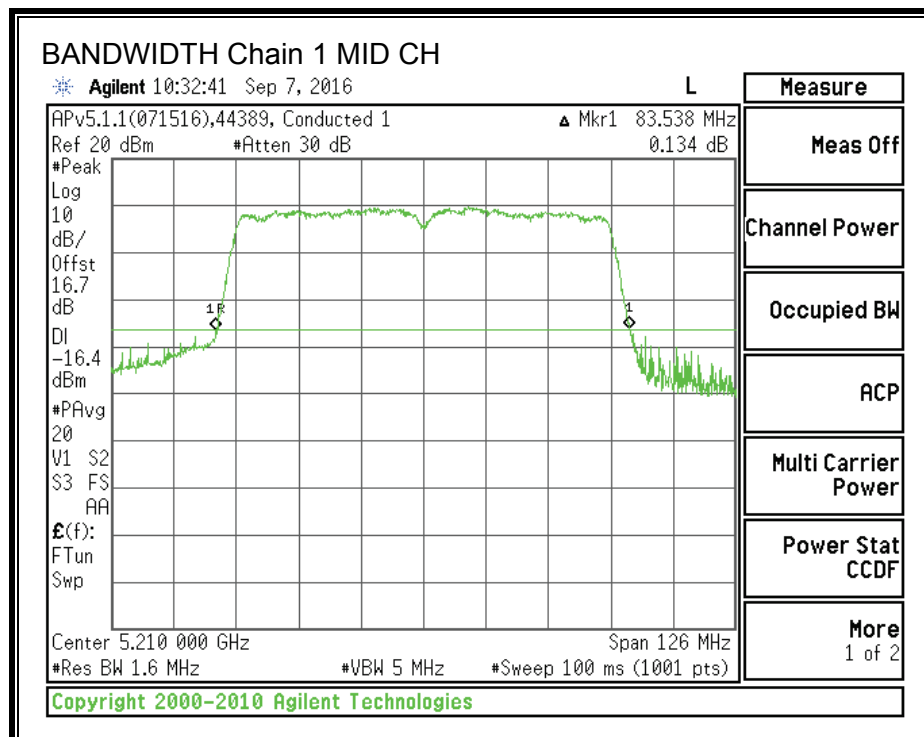
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)	26 dB BW Chain 2 (MHz)
Mid	5210	83.92	83.54	82.88

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-07

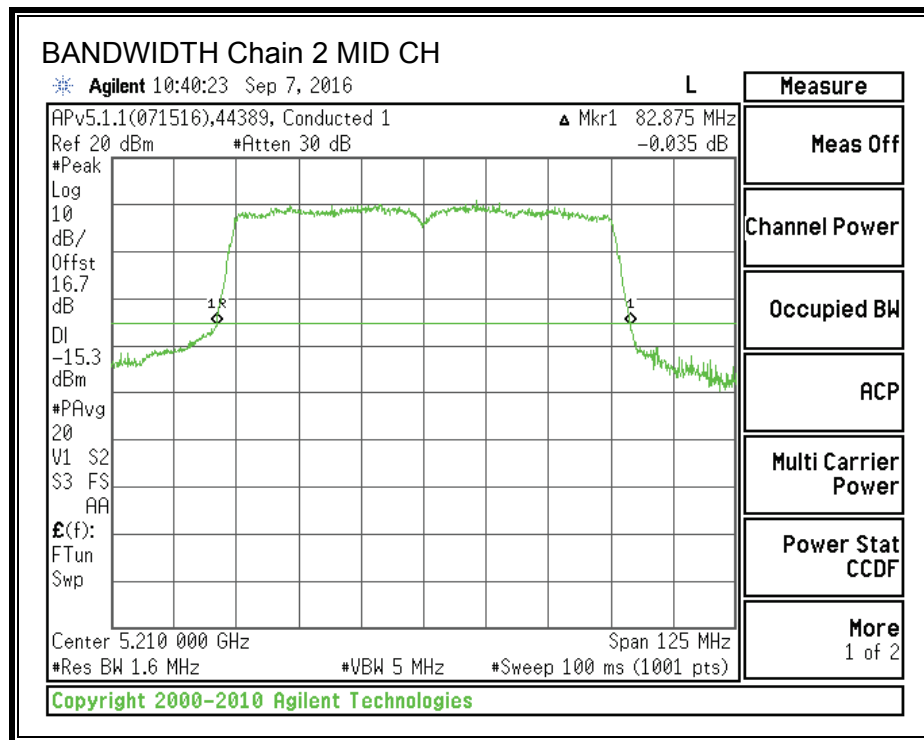
**26 dB BANDWIDTH, Chain 0**



**26 dB BANDWIDTH, Chain 1**



**26 dB BANDWIDTH, Chain 2**



### 8.5.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only. Measured per ANSI C63.10:2013 Section 6.9.3.

#### RESULTS

802.11ac VHT80 SDM (MCS0, Nss = 3)

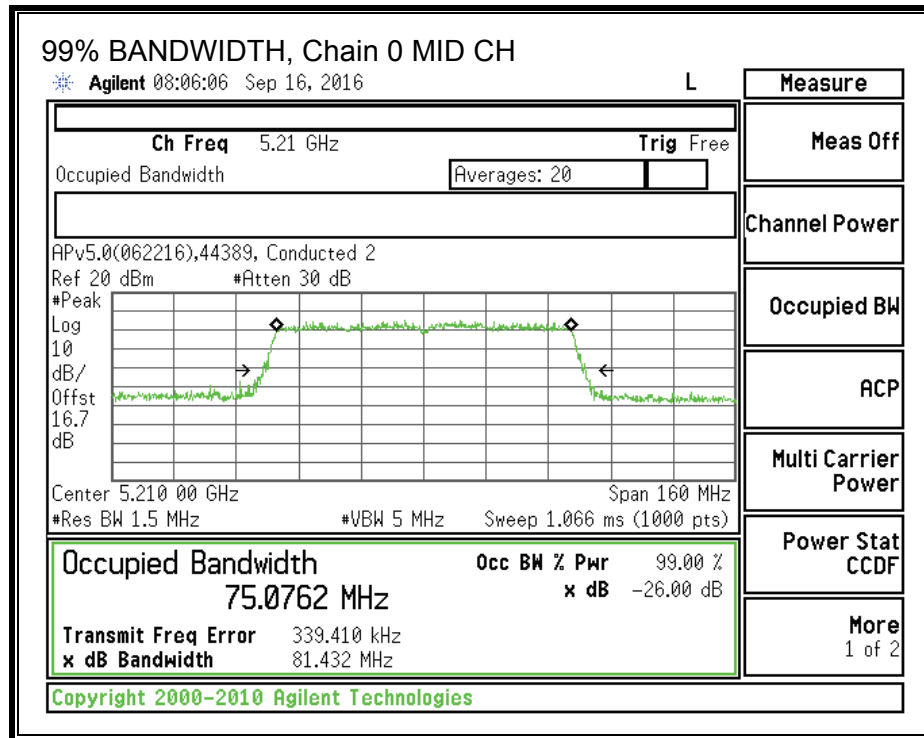
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Mid	5210	75.08	75.09	75.64

#### Worst-Case

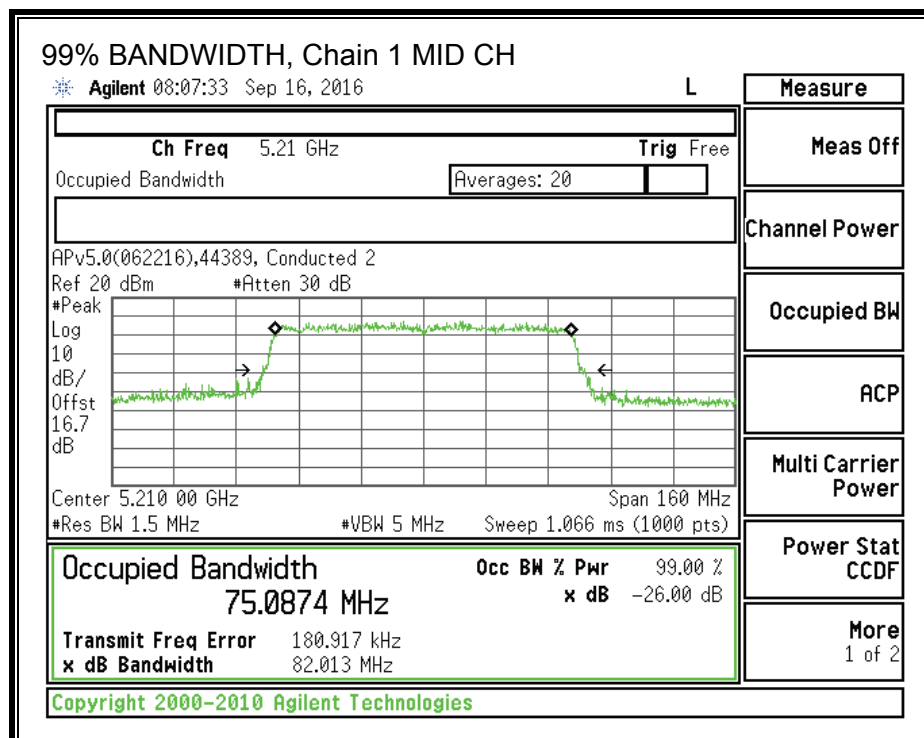
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Maximum Ch Freq	Does Ch. Freq. Fall in UNII 2A? Y/N
Mid	5210	75.6400	5247.820	N

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-16

**99% BANDWIDTH, Chain 0**

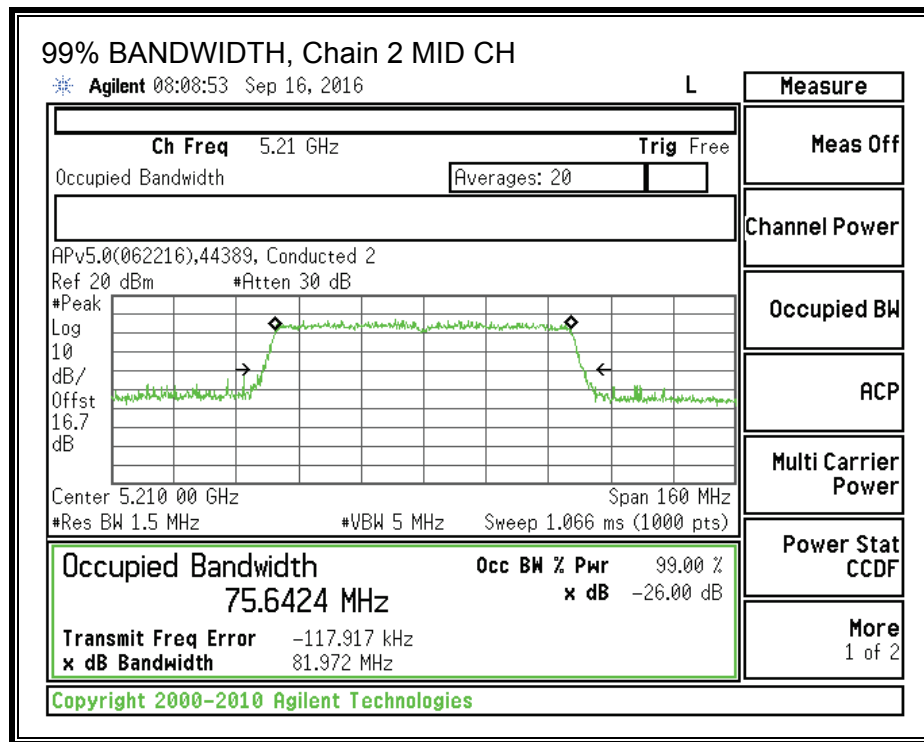


**99% BANDWIDTH, Chain 1**





**99% BANDWIDTH, Chain 2**



### 8.5.3. OUTPUT POWER AND PSD

#### LIMITS

##### FCC §15.407 (a) (1)

(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 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 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 6 dBi.

(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.

## **DIRECTIONAL ANTENNA GAIN**

This EUT mode is 802.11ac. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

### **802.11ac CDD Mode**

#### **Output Power**

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Chain 2 Antenna Gain (dBi)</b>	<b>Directional Gain (dBi)</b>
8.00	8.00	8.00	8.00

#### **PSD**

<b>Antenna Gain (dBi)</b>	<b>10 * Log (3 chains) (dB)</b>	<b>Directional Gain (dBi)</b>
8.00	4.77	12.77

### **802.11ac SDM Mode**

#### **Output Power and PSD**

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Chain 2 Antenna Gain (dBi)</b>	<b>Directional Gain (dBi)</b>
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-10-20 to 2016-10-24

## **RESULTS**

### **OUTPUT POWER – 802.11ac VHT80 CDD (MCS0, Nss = 1)**

#### **Antenna Gain and Limits**

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBi)	PSD Limit (dBi)
Mid	5210	8.00	12.77	28.00	10.23

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power</b>
---------------------------	------	---

#### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	14.21	13.79	13.96	18.76	28.00	-9.24

Note – The above data represents gated power measurements, as described in method PM-G.

**PSD – 802.11ac VHT80 CDD (MCS0, Nss = 1)**

**Antenna Gain and Limits**

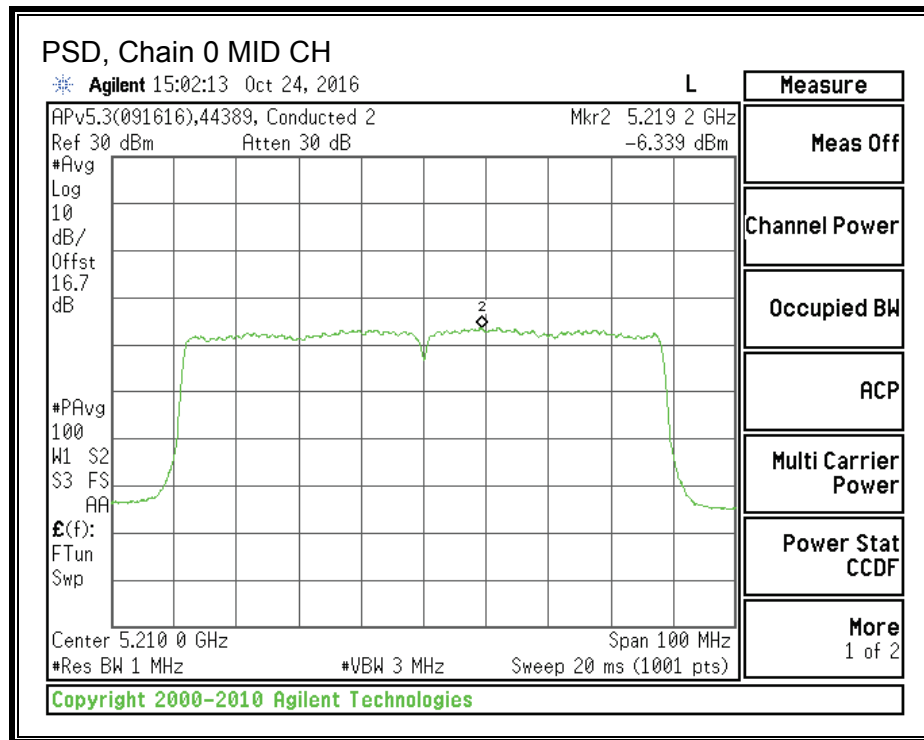
Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBi)	PSD Limit (dBi)
Mid	5210	8.00	12.77	28.00	10.23

<b>Duty Cycle CF (dB)</b>	0.84	<b>Included in Calculations of Corr'd PPSD</b>
---------------------------	------	--

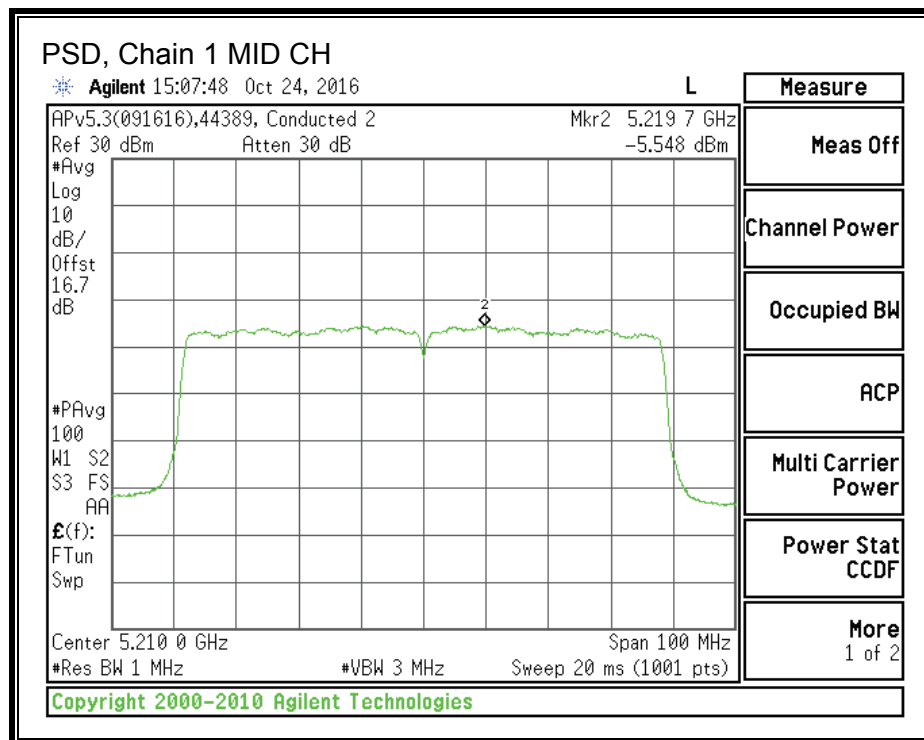
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5210	-6.34	-5.55	-5.50	-0.17	10.23	-10.40

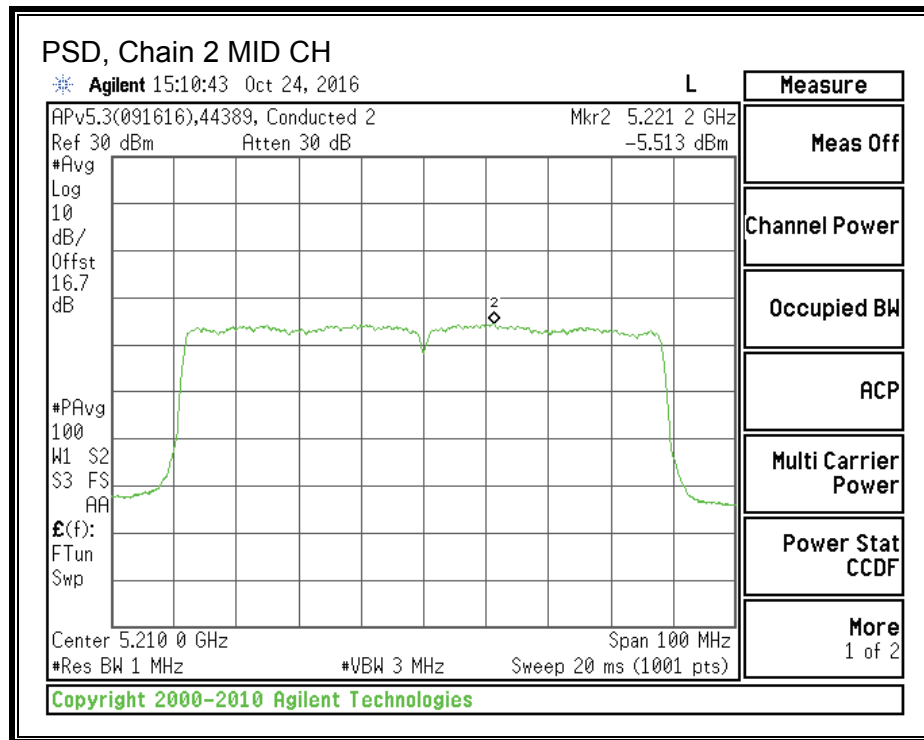
**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**



**OUTPUT POWER – 802.11ac VHT80 SDM (MCS0, Nss = 3)**

**Antenna Gain and Limits**

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBi)	PSD Limit (dBi)
Mid	5210	8.00	8.00	28.00	15.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	13.70	14.35	14.43	18.94	28.00	-9.06

Note – The above data represents gated power measurements, as described in method PM-G.



**PSD – 802.11ac VHT80 SDM (MCS0, Nss = 3)**

**Antenna Gain and Limits**

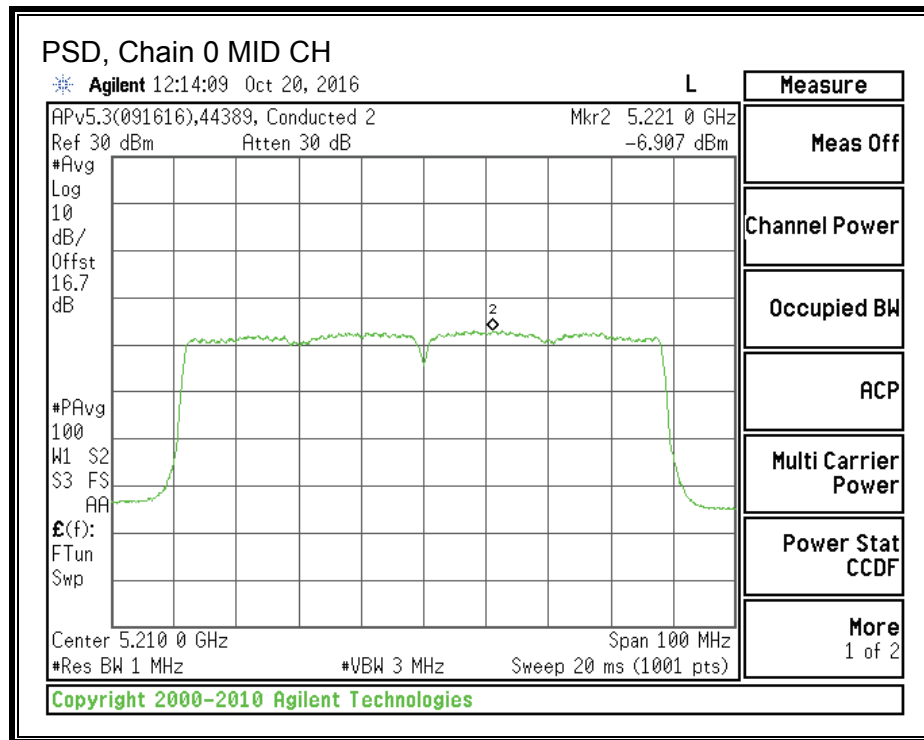
Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBi)	PSD Limit (dBi)
Mid	5210	8.00	8.00	28.00	15.00

<b>Duty Cycle CF (dB)</b>	1.80	<b>Included in Calculations of Corr'd PPSD</b>
---------------------------	------	--

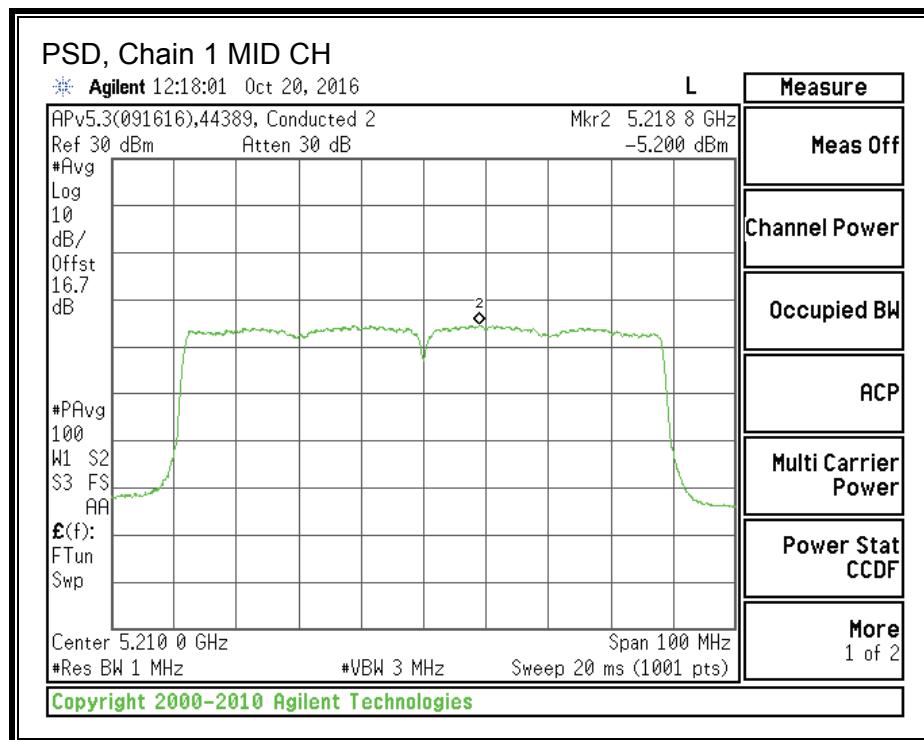
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5210	-6.91	-5.20	-5.18	0.88	15.00	-14.12

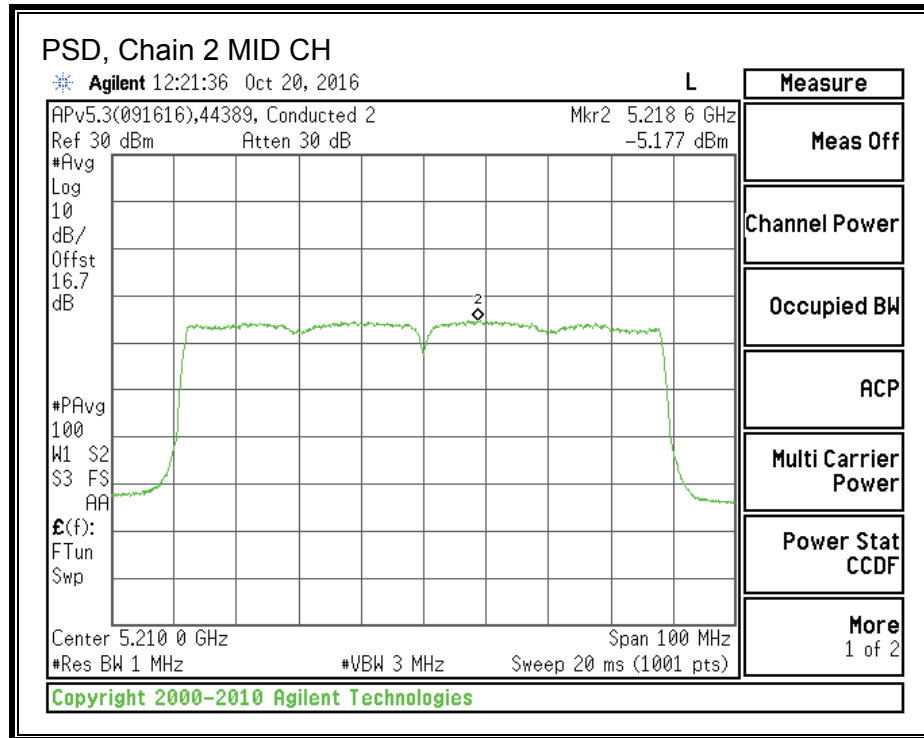
**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**



## 8.6. 802.11a MODE IN THE 5.8 GHz BAND

### 8.6.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.407 (e)

The minimum 6 dB bandwidth shall be at least 500 kHz.

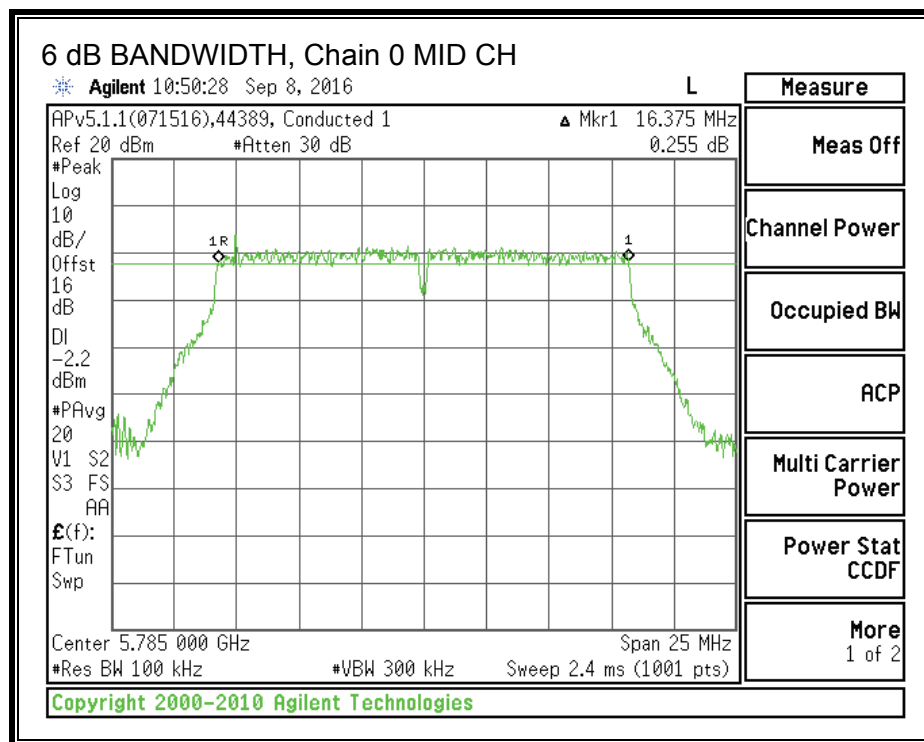
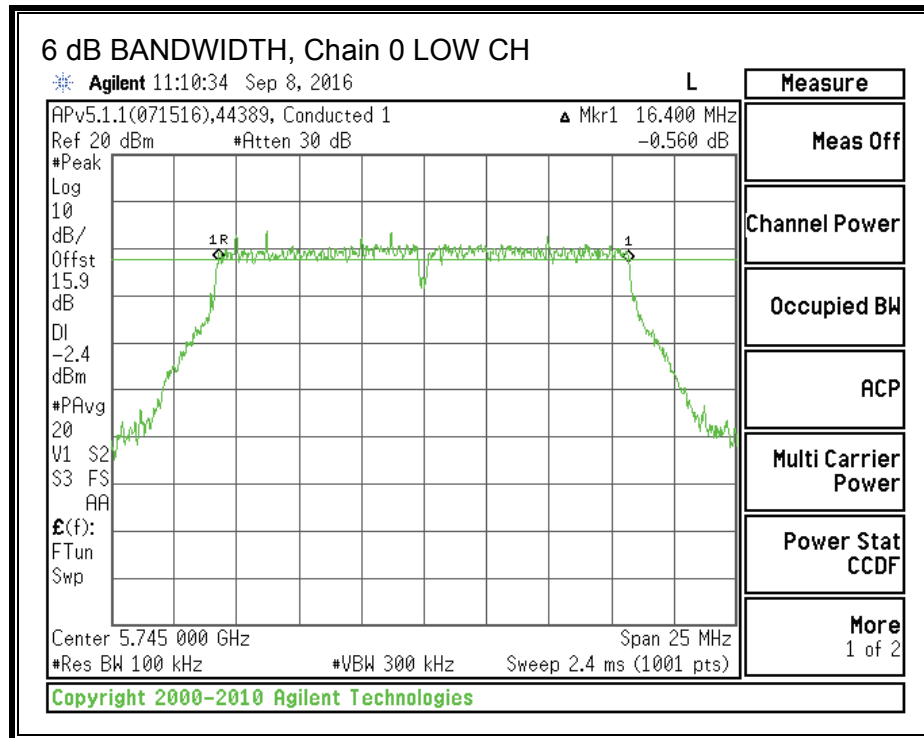
#### RESULTS

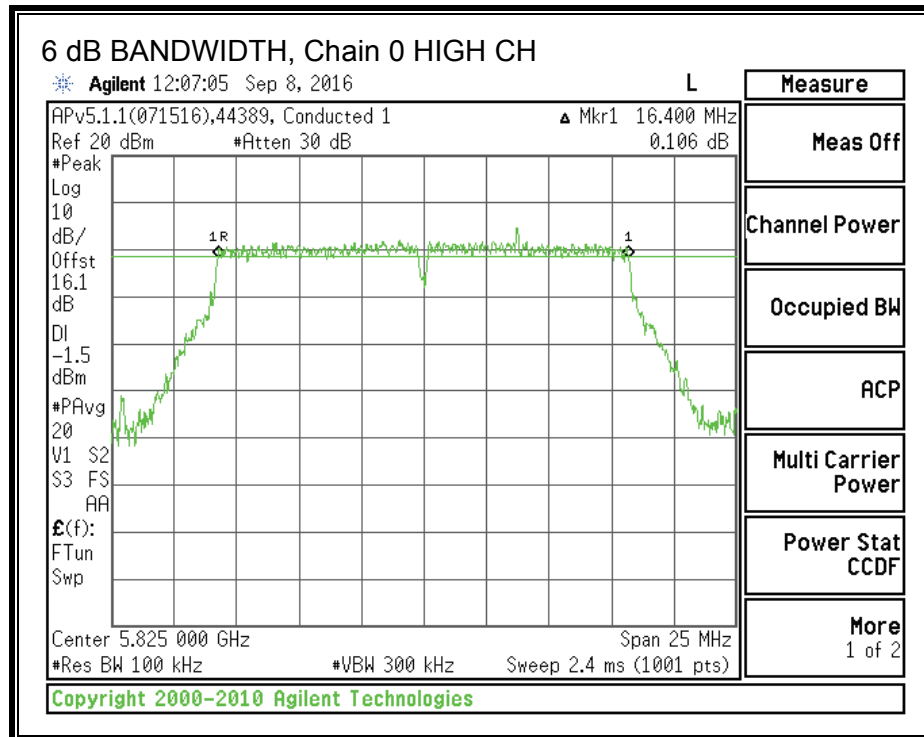
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	5745	16.40	16.40	16.45	0.5
Mid	5785	16.38	16.50	16.43	0.5
High	5825	16.40	16.43	16.45	0.5

Test Performed: Niklas Haydon / Jeff Cabrera

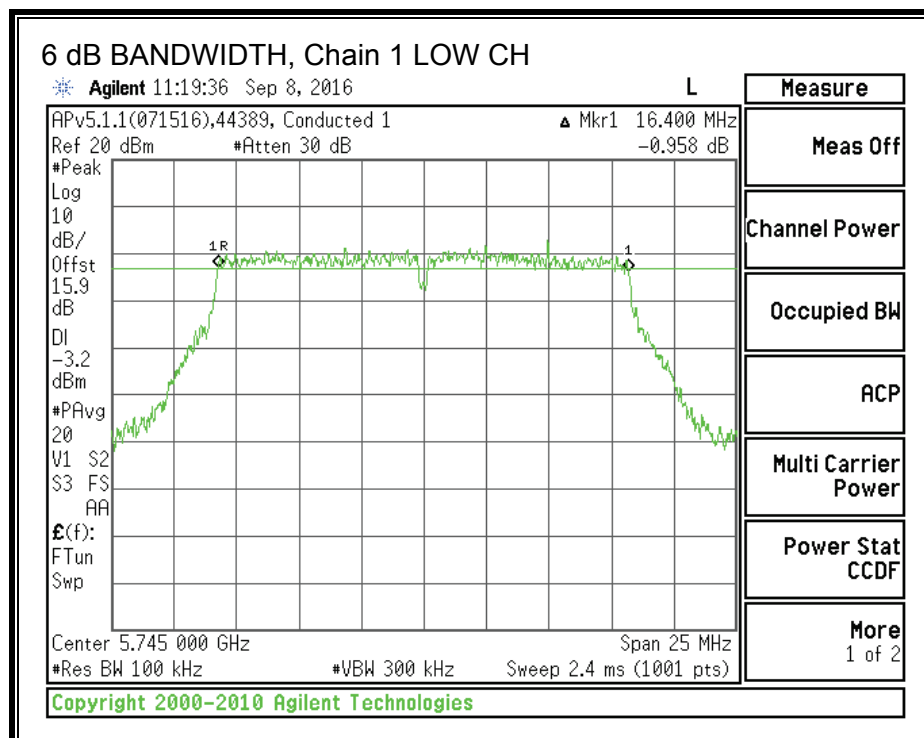
Test Date: 2016-09-08

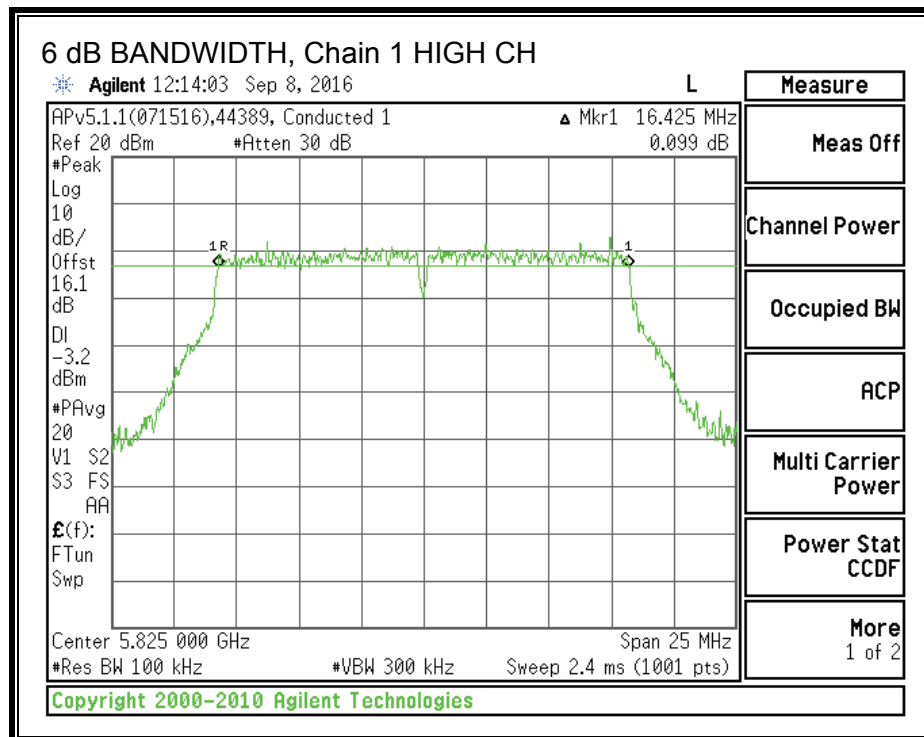
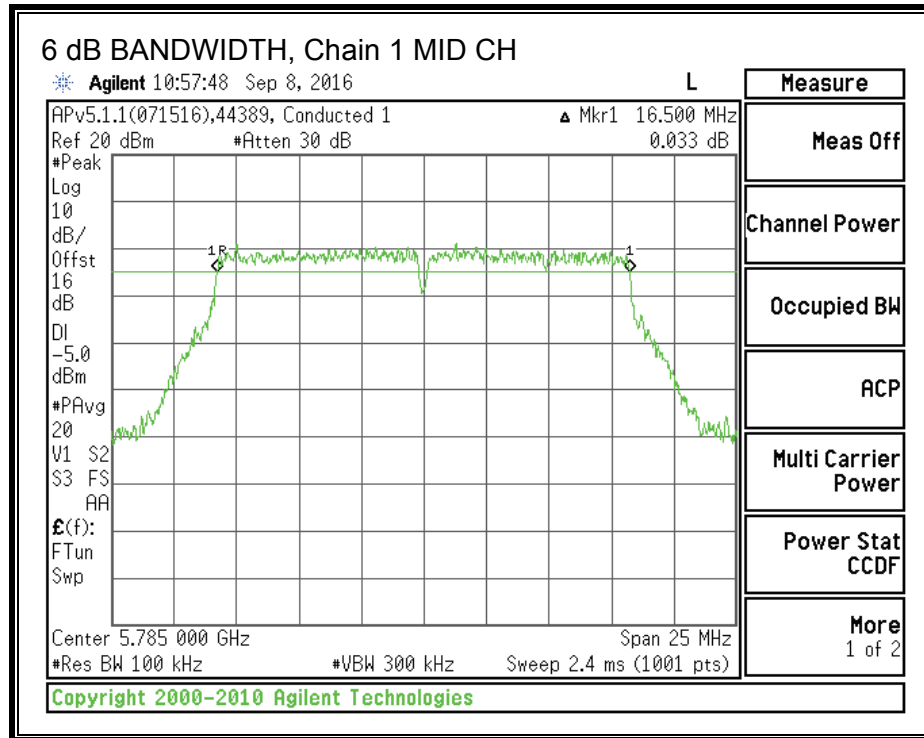
**6 dB BANDWIDTH, Chain 0**



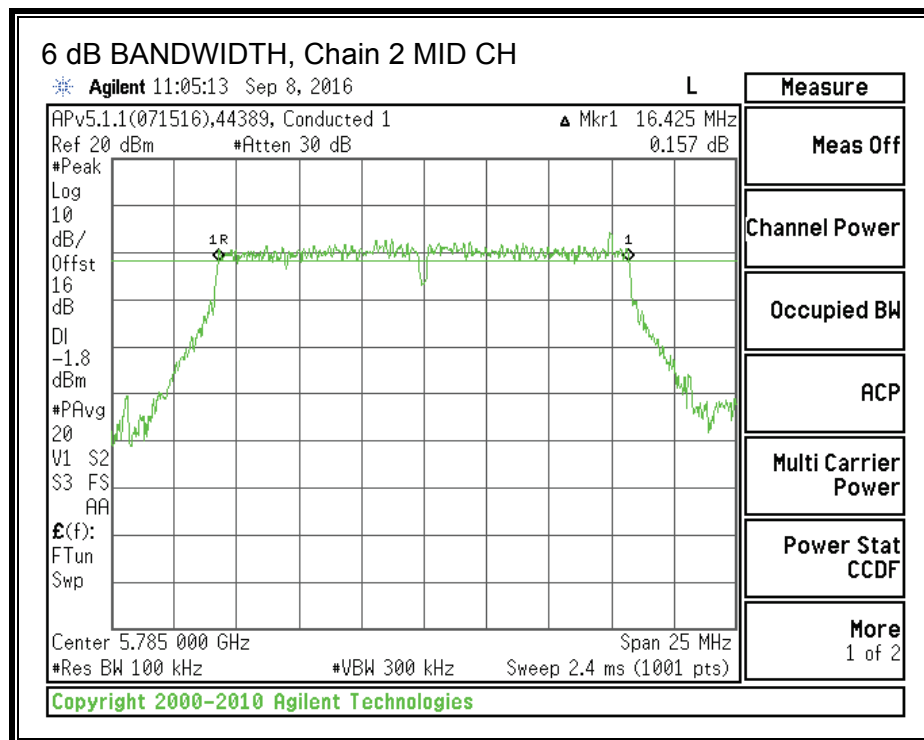
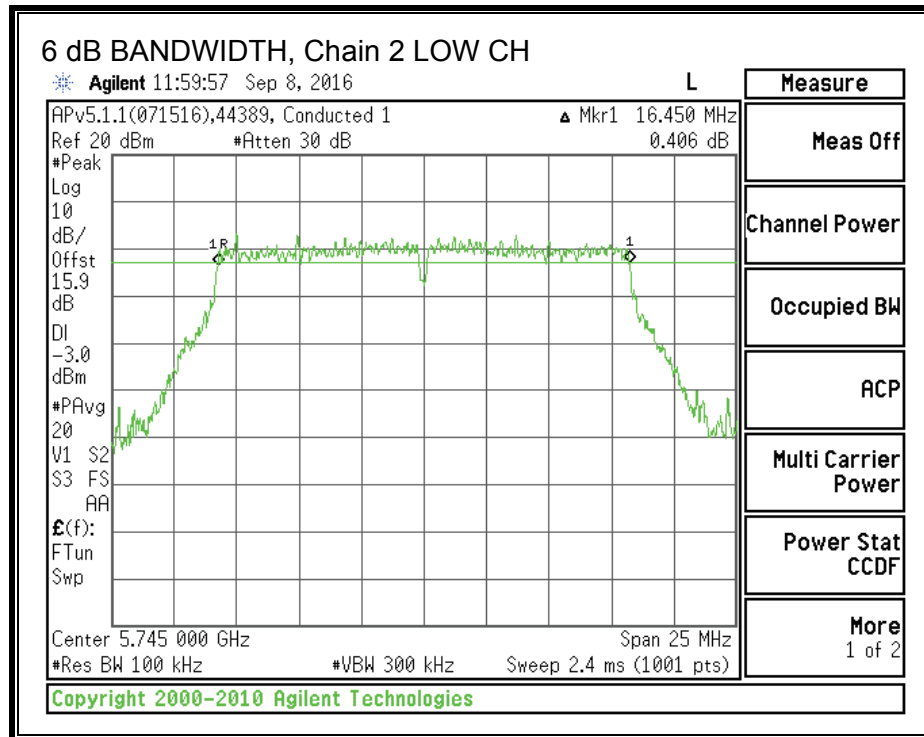


**6 dB BANDWIDTH, Chain 1**

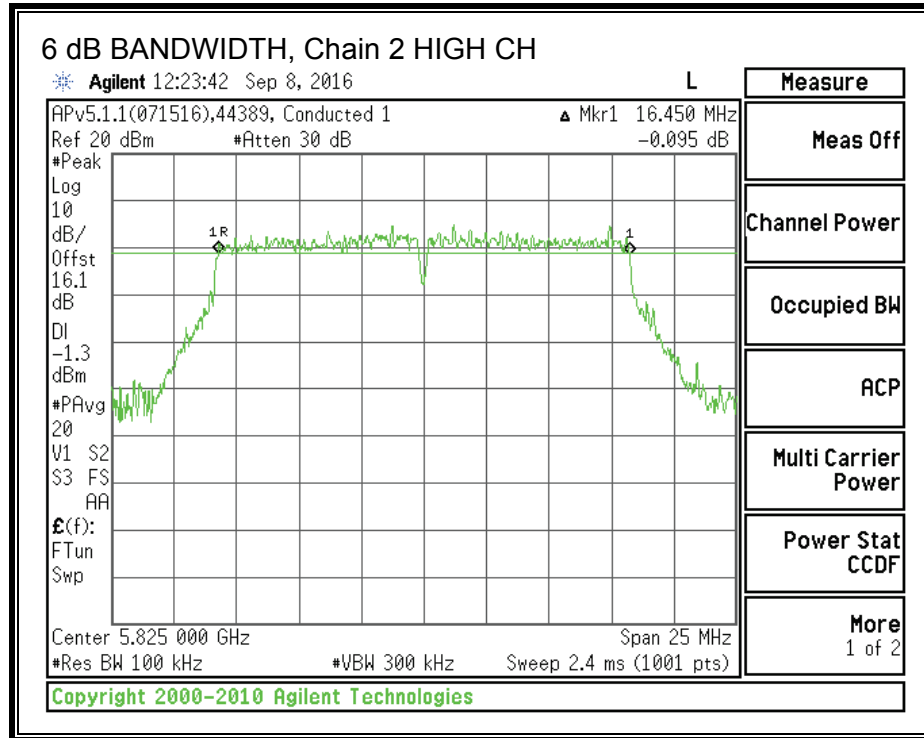




**6 dB BANDWIDTH, Chain 2**







## 8.6.2. 99% BANDWIDTH

### LIMITS

RSS-Gen Clause 6.6

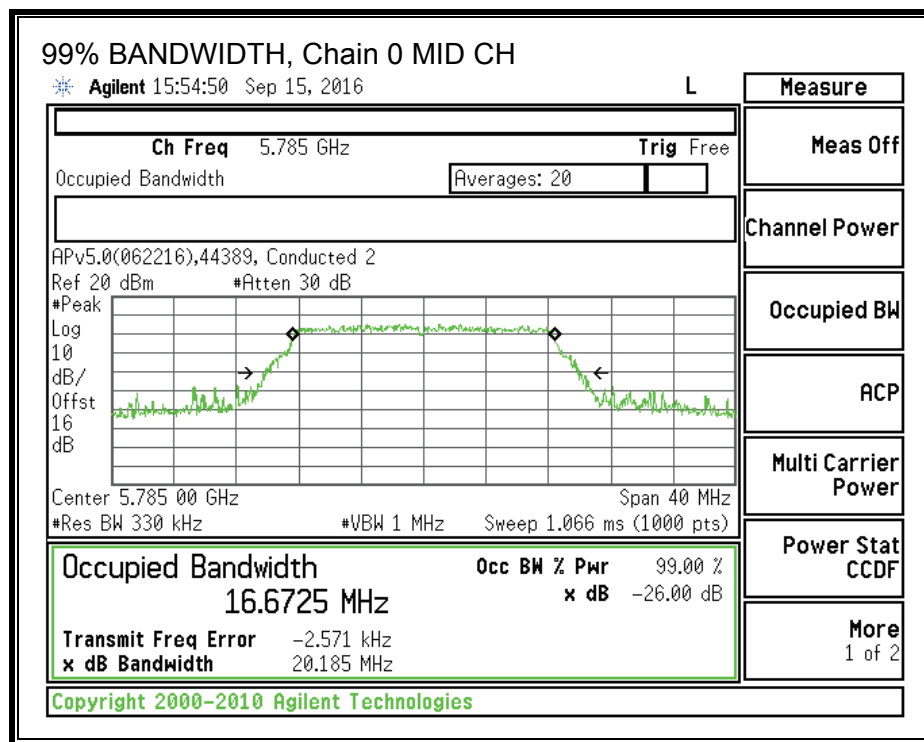
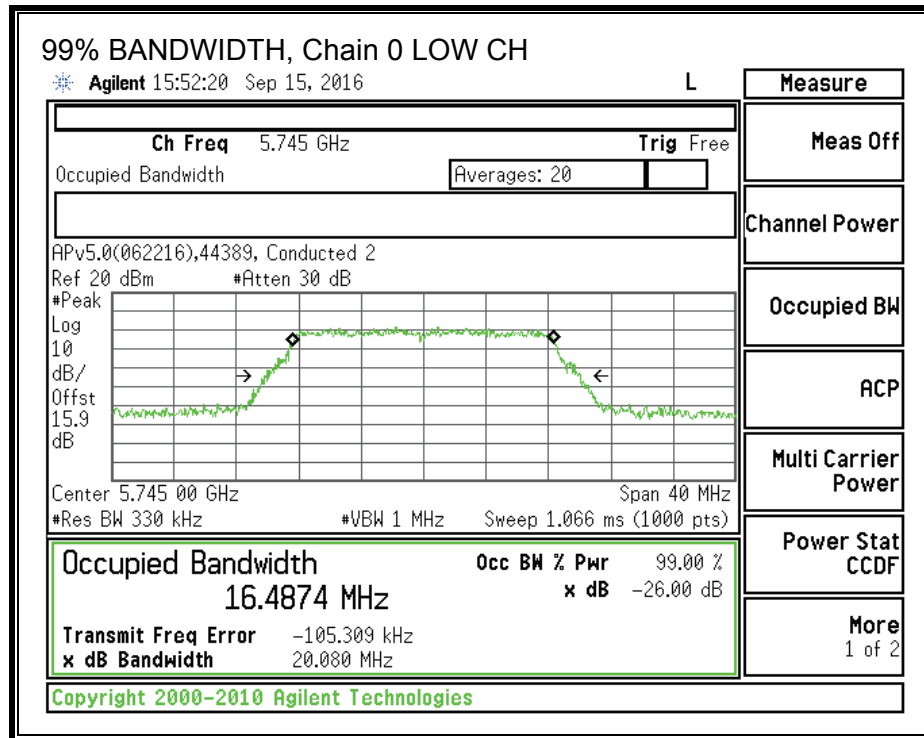
### RESULTS

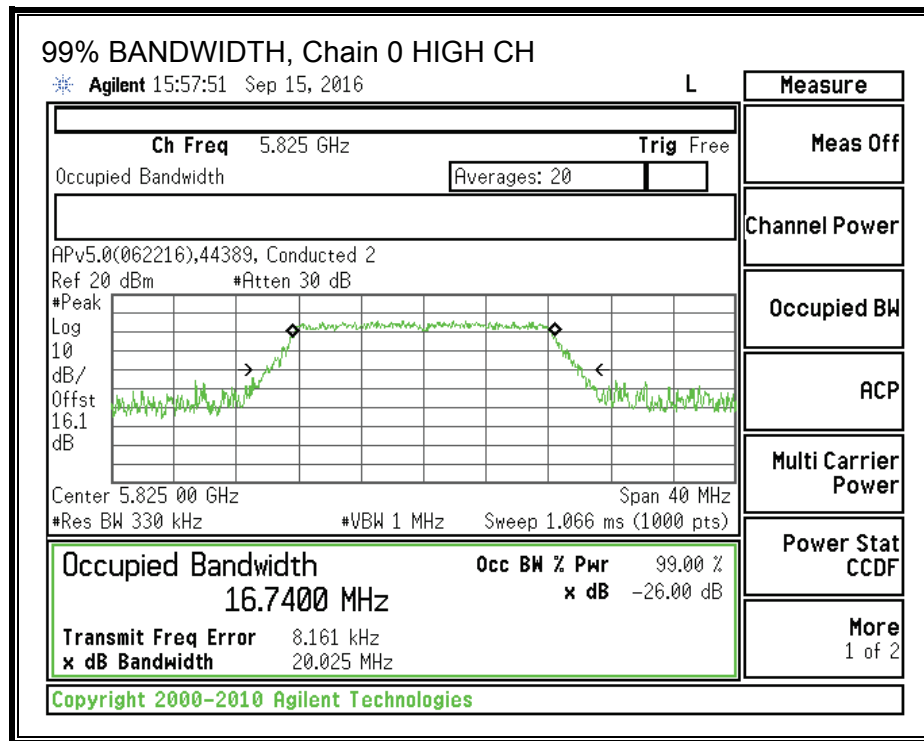
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5745	16.49	16.64	16.61
Mid	5785	16.67	16.68	16.53
High	5825	16.74	16.66	16.69

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-15

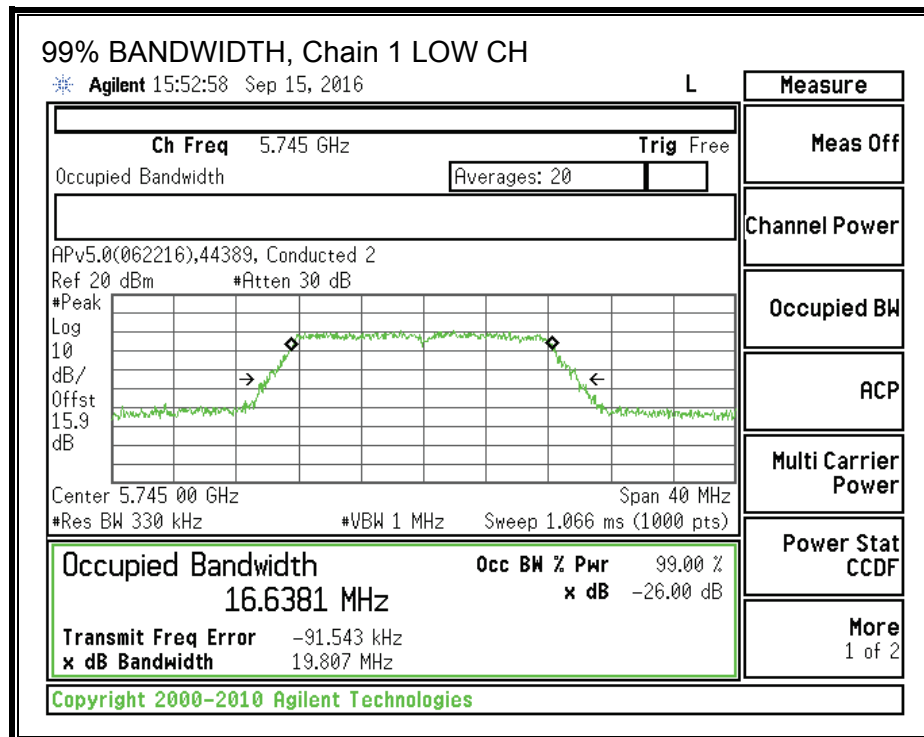
**99% BANDWIDTH**

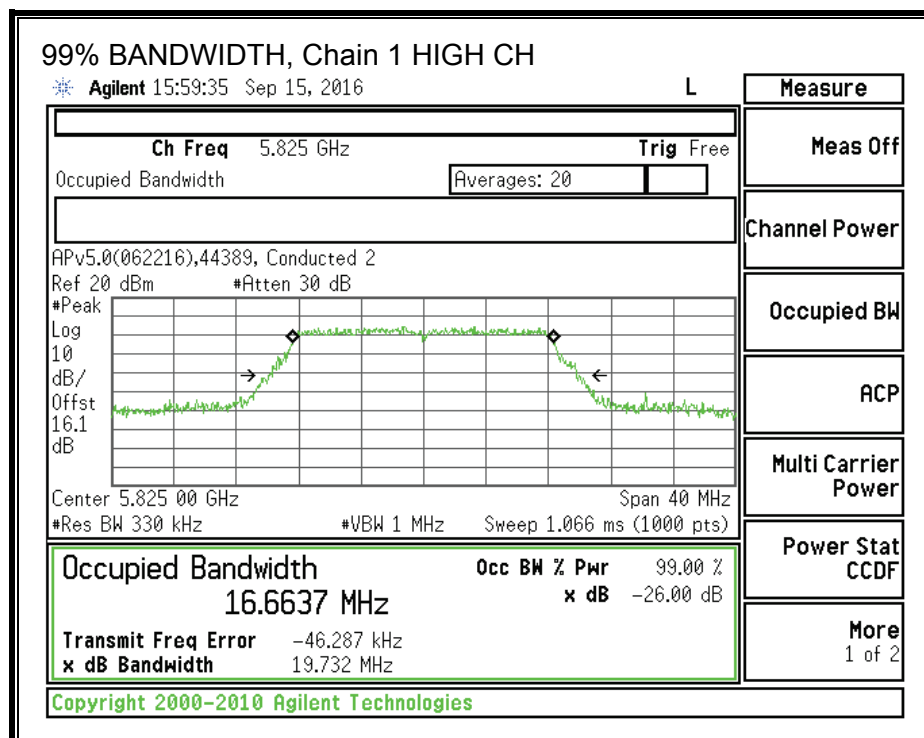
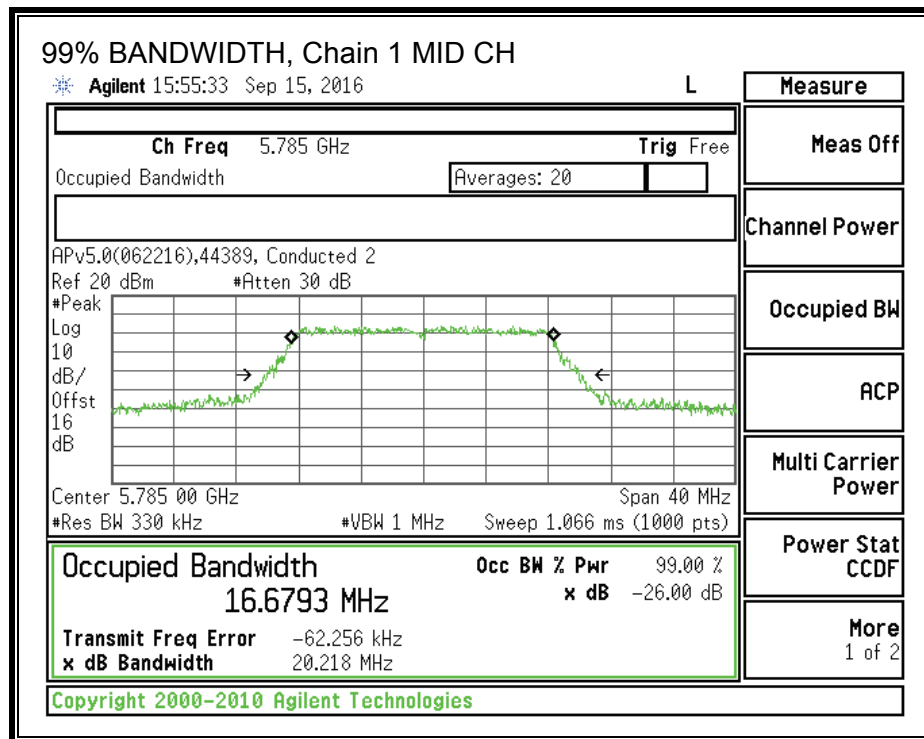
**99% BANDWIDTH, Chain 0**



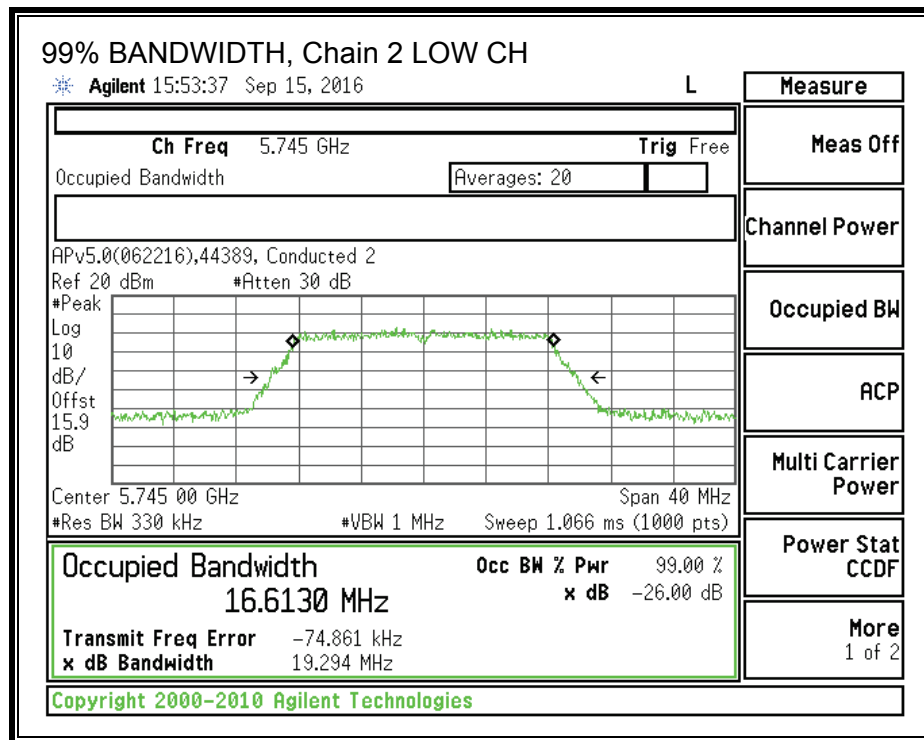


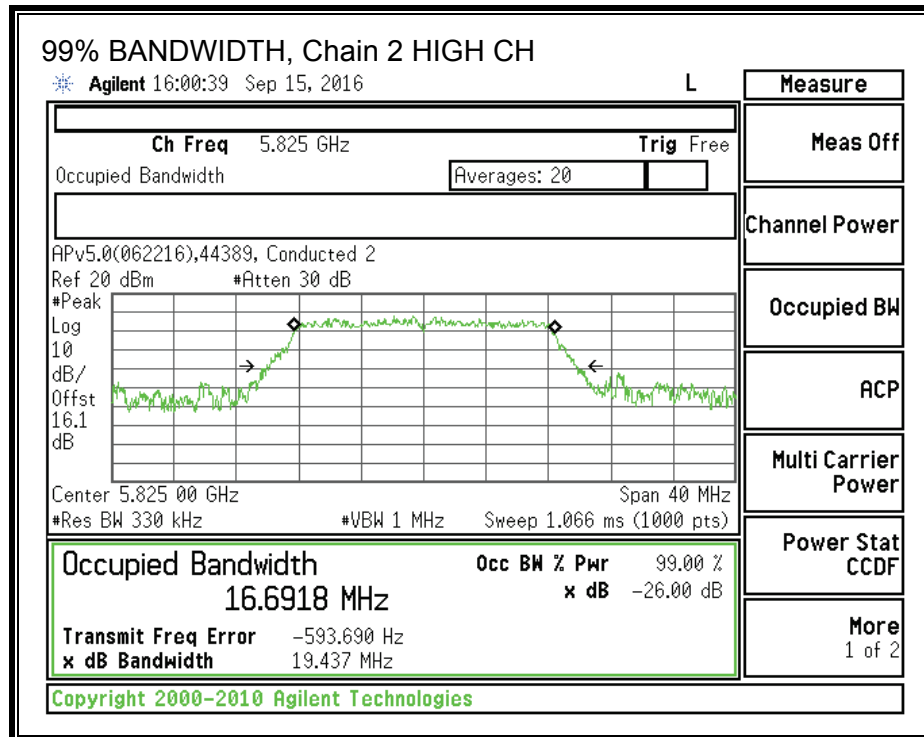
**99% BANDWIDTH, Chain 1**





**99% BANDWIDTH, Chain 2**





### 8.6.3. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

#### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11a. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11a Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

Test Performed: Niklas Haydon / Jeff Cabrera

Test Date: 2016-08-30



## RESULTS

### Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Low	5745	8.00	28.00
Mid	5785	8.00	28.00
High	5825	8.00	28.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

### Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	15.05	14.51	15.54	19.82	28.00	-8.18
Mid	5785	15.22	13.87	15.78	19.80	28.00	-8.20
High	5825	15.90	14.15	16.60	20.44	28.00	-7.56

Note – The above data represents gated power measurements, as described in method PM-G.

#### 8.6.4. MAXIMUM POWER SPECTRAL DENSITY (PSD)

##### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

##### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11a. Therefore, the TX chains are correlated and the antenna gain is the same for each chain. The directional gain is:

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Correlated Chains Directional Gain (dBi)
8.00	4.77	12.77

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-08

## **RESULTS**

### **Antenna Gain and Limit**

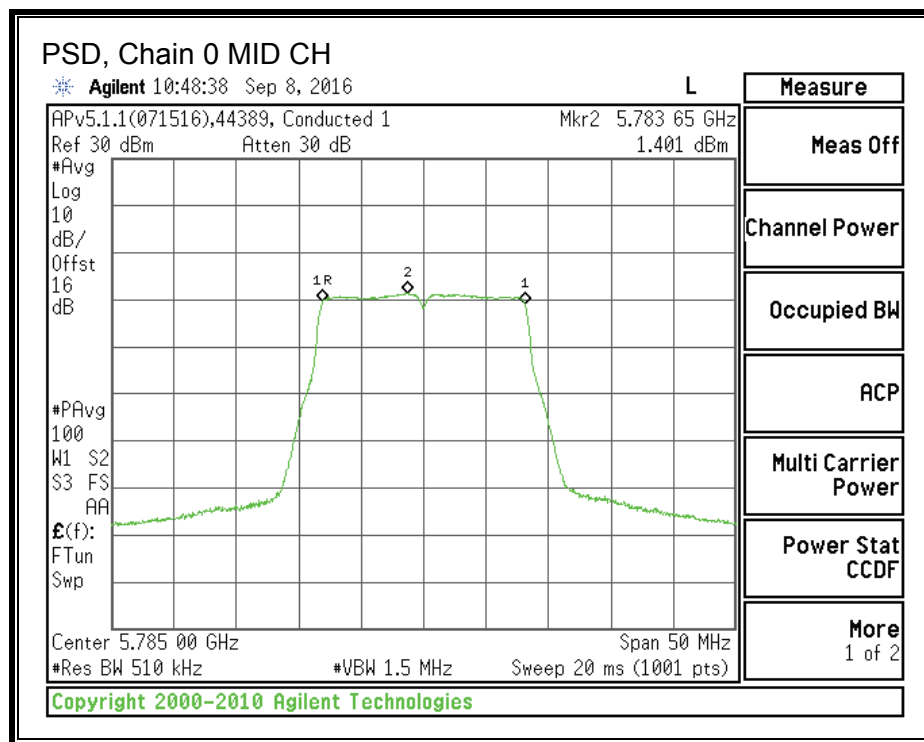
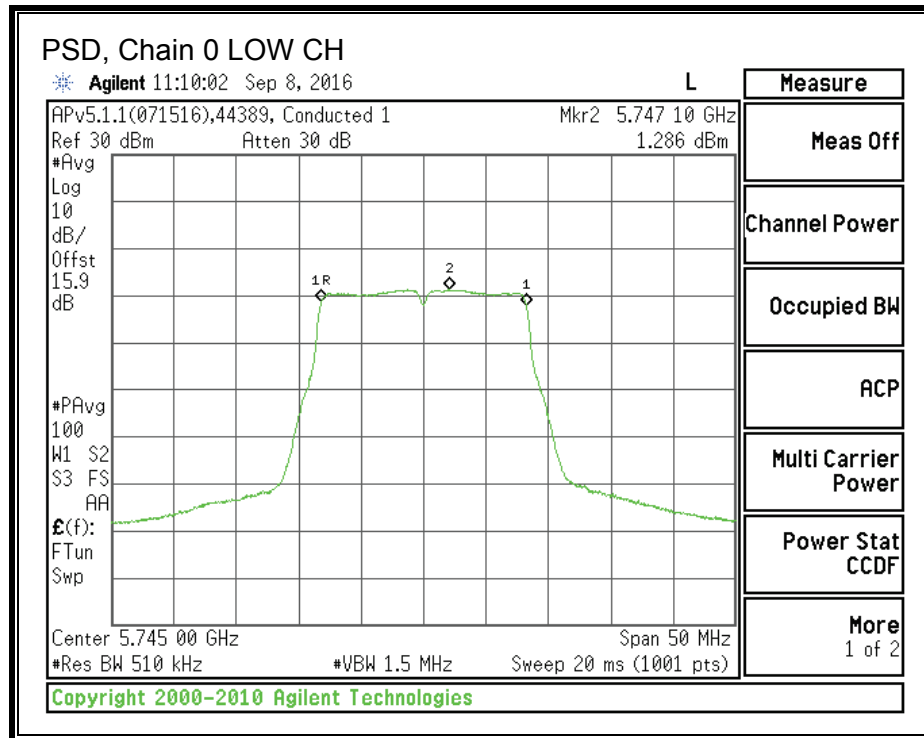
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	12.77	23.23
Mid	5785	12.77	23.23
High	5825	12.77	23.23

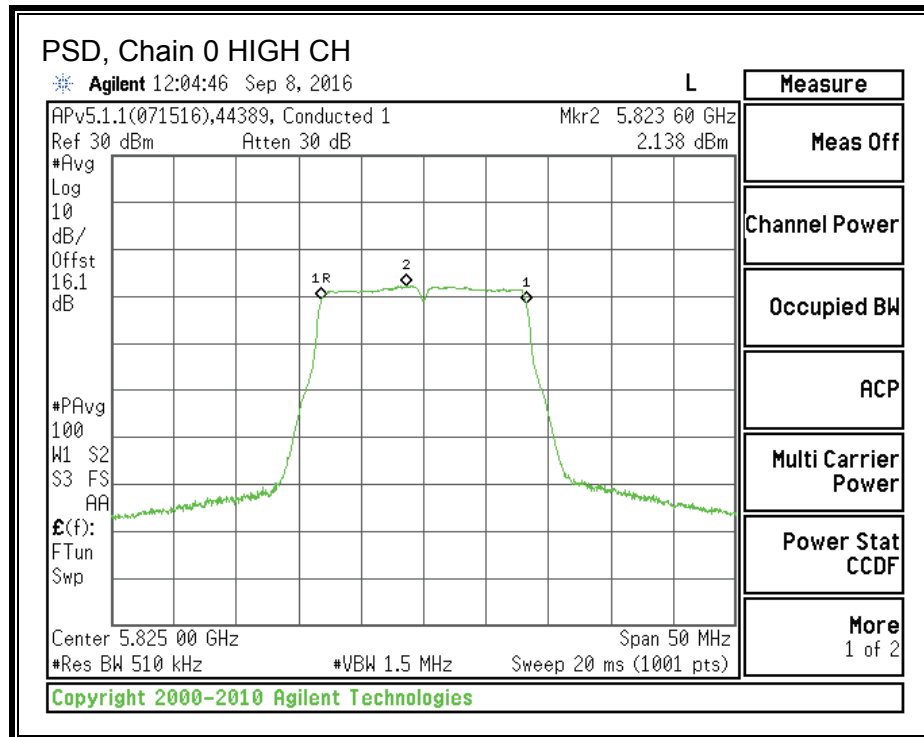
<b>Duty Cycle CF (dB)</b>	0.20	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

### **PSD Results**

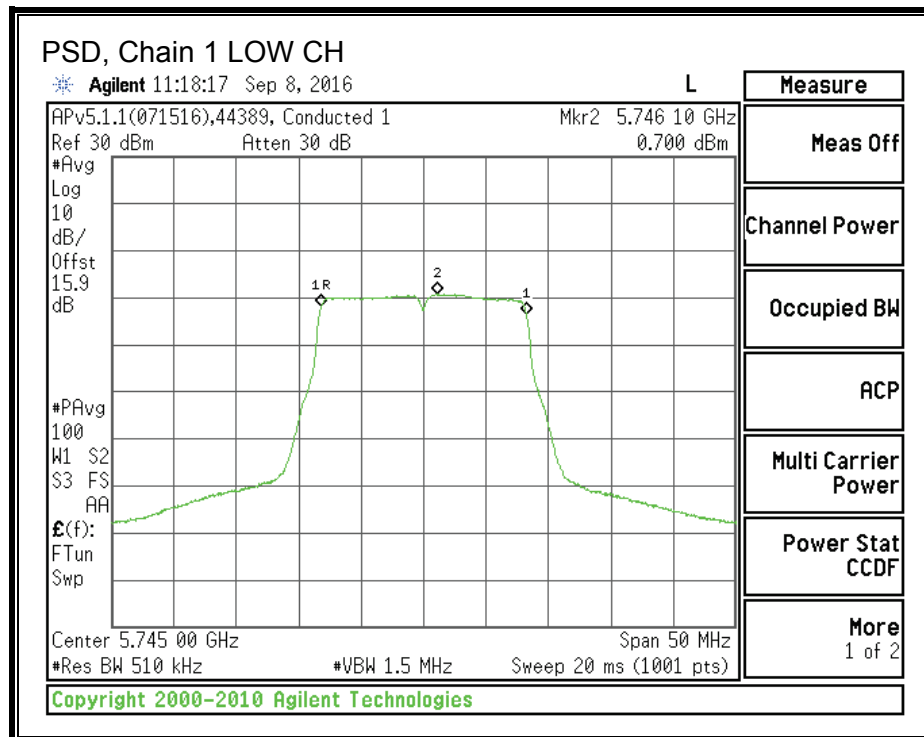
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	1.29	0.70	1.94	6.31	23.23	-16.92
Mid	5785	1.40	0.20	2.47	6.43	23.23	-16.80
High	5825	2.14	0.66	3.40	7.18	23.23	-16.05

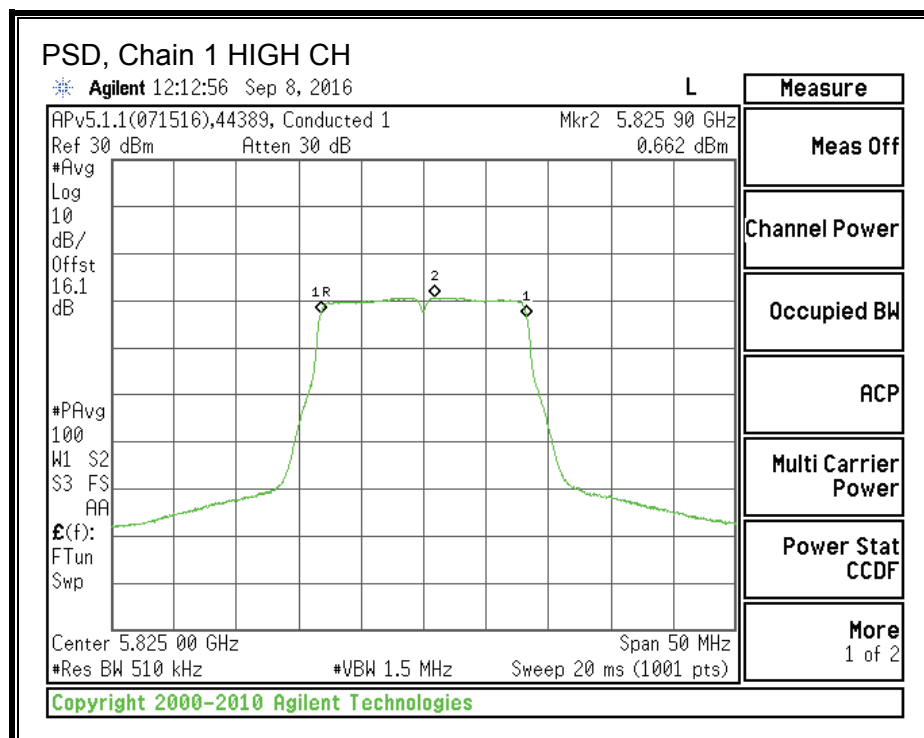
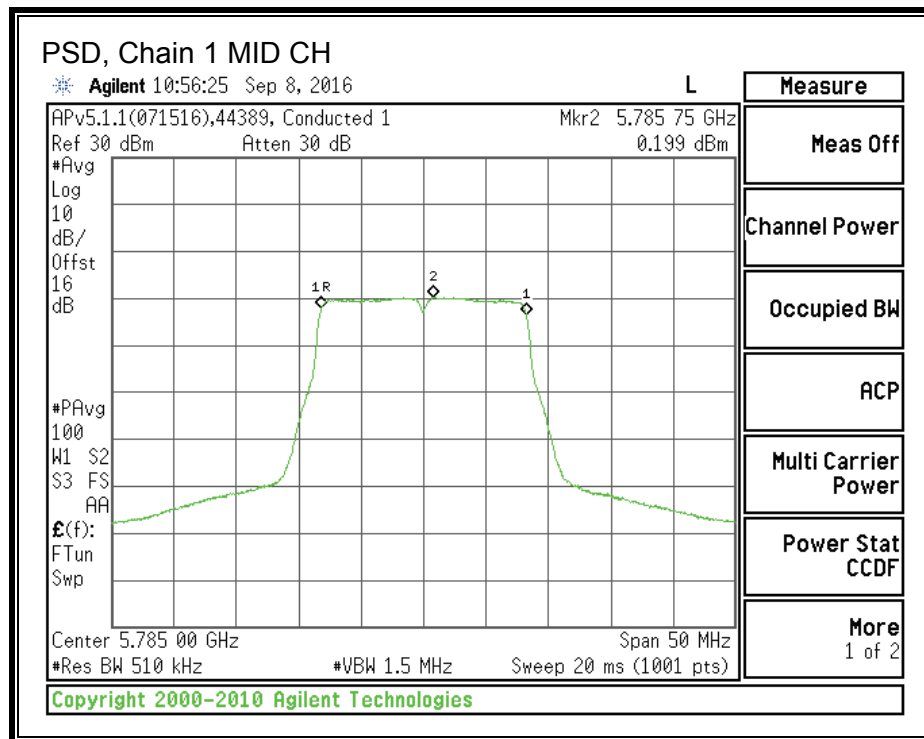
**PSD, Chain 0**



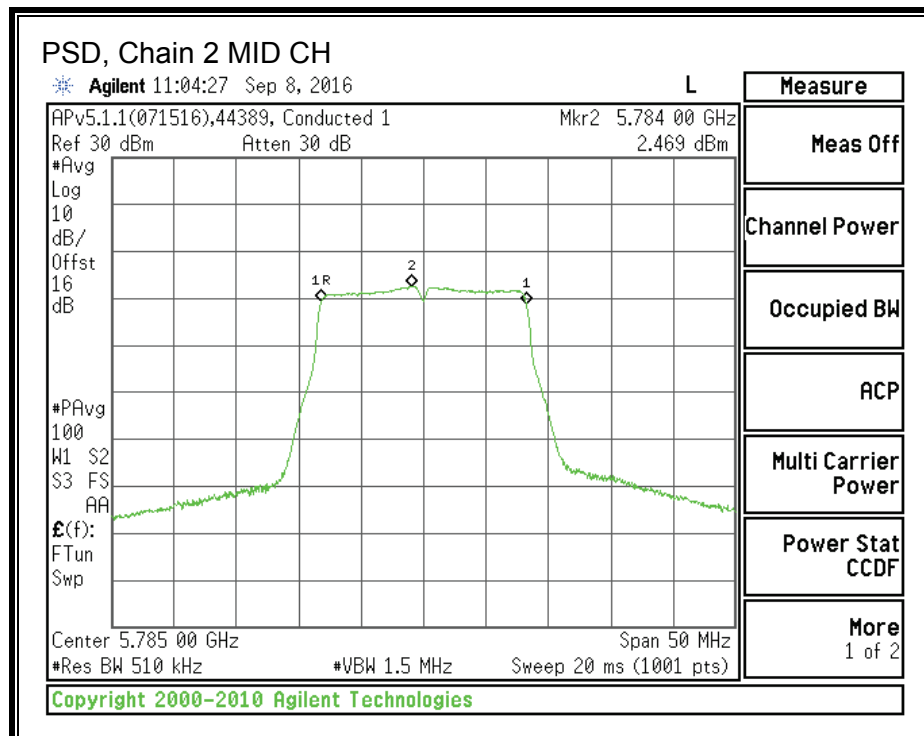
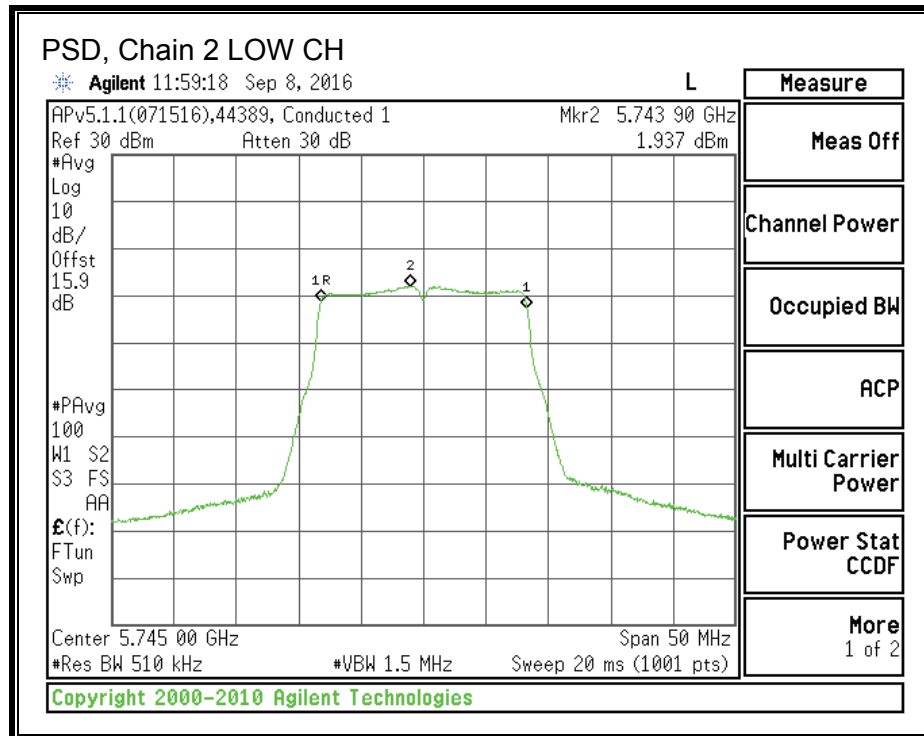


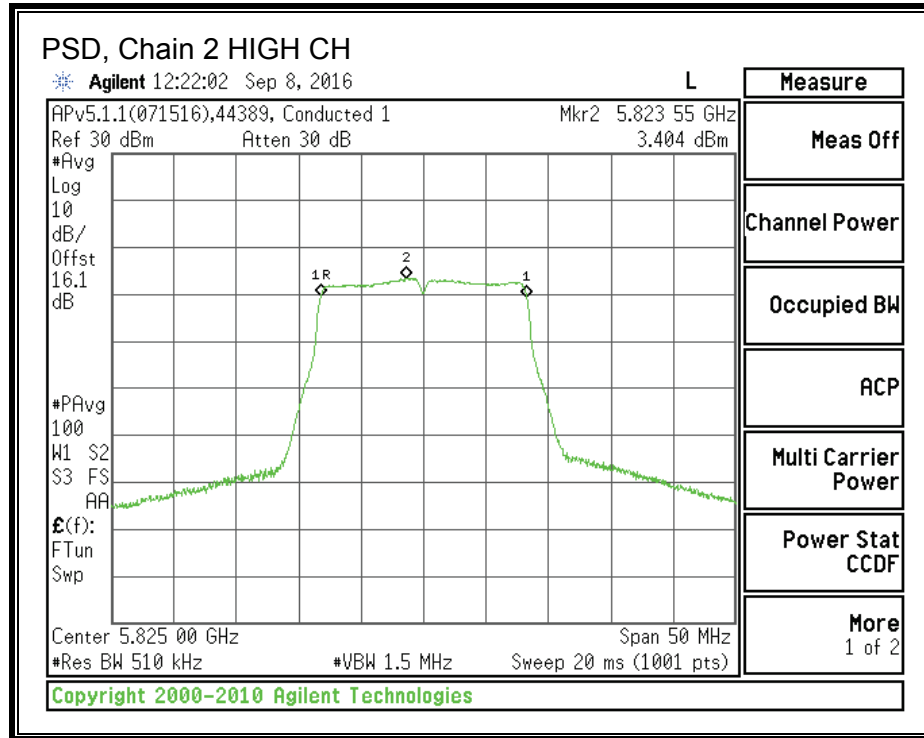
**PSD, Chain 1**





**PSD, Chain 2**







## 8.7. 802.11n HT20 MODE IN THE 5.8 GHz BAND

### 8.7.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.407 (e)

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

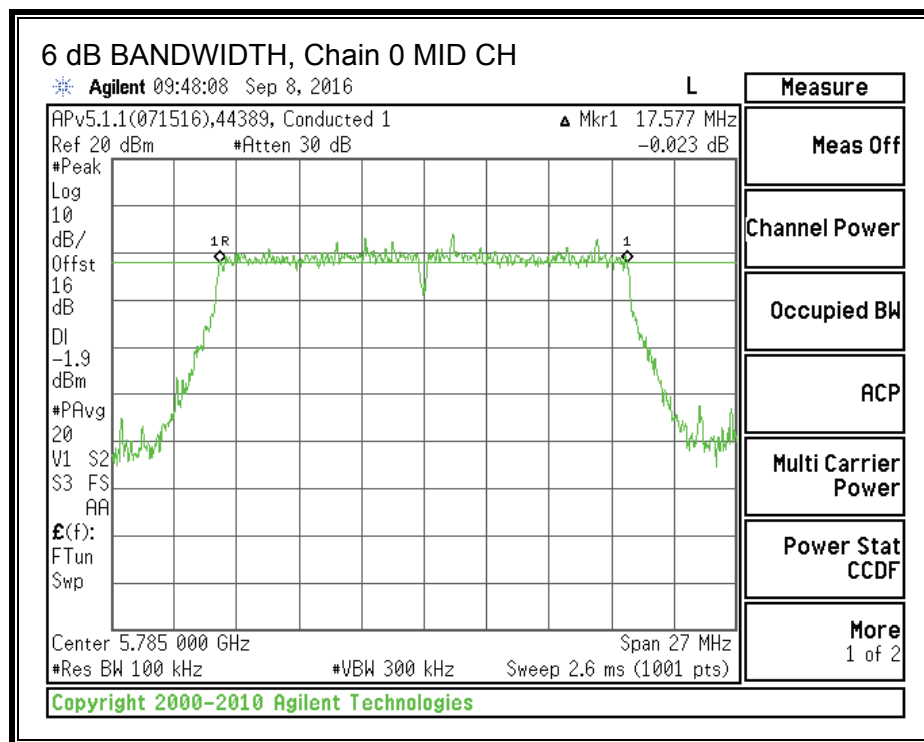
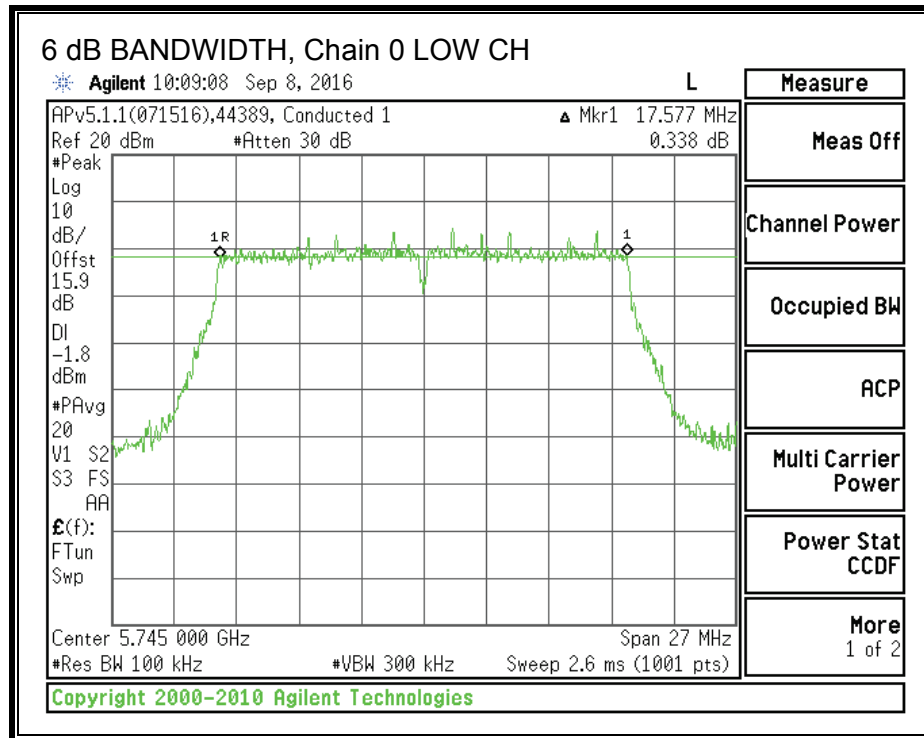
802.11n HT20 SDM (MCS16)

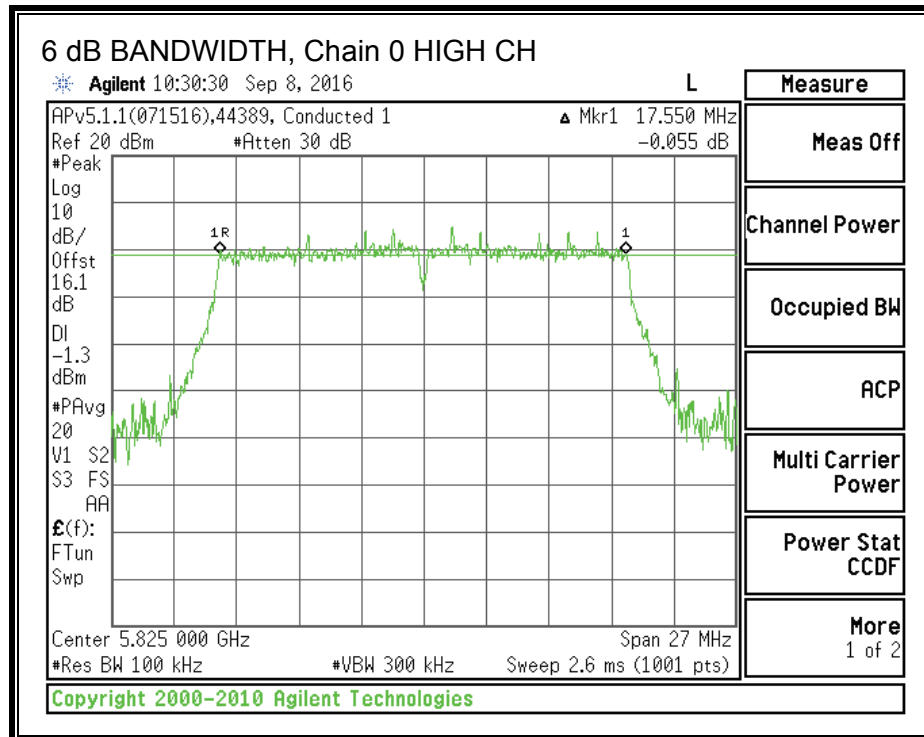
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	5745	17.58	17.60	17.60	0.5
Mid	5785	17.58	17.60	17.63	0.5
High	5825	17.55	17.66	17.66	0.5

Test Performed: Niklas Haydon / Jeff Cabrera

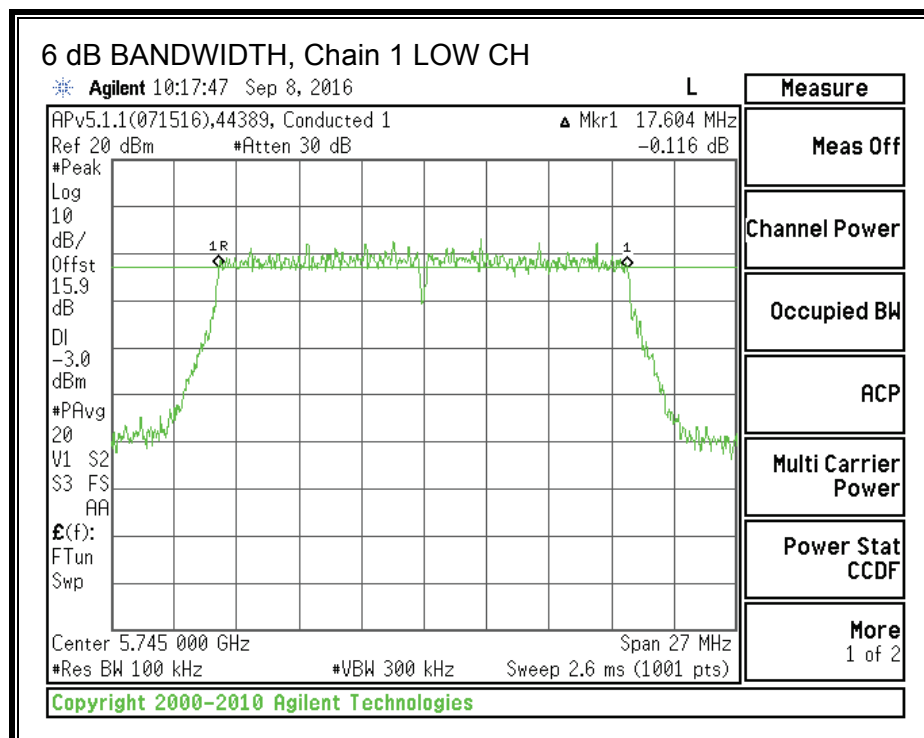
Test Date: 2016-09-08

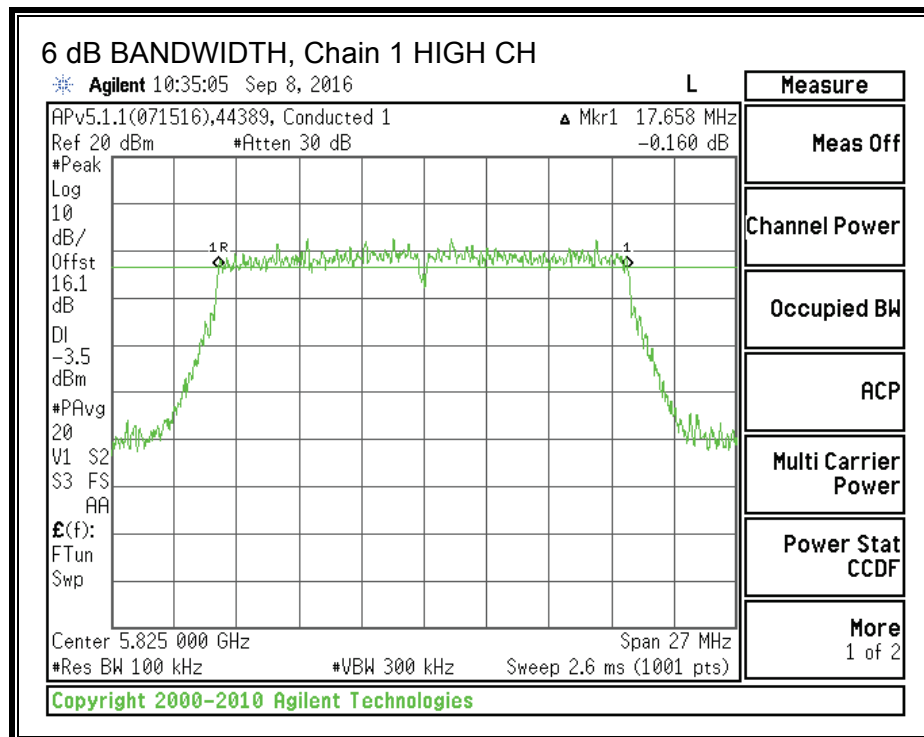
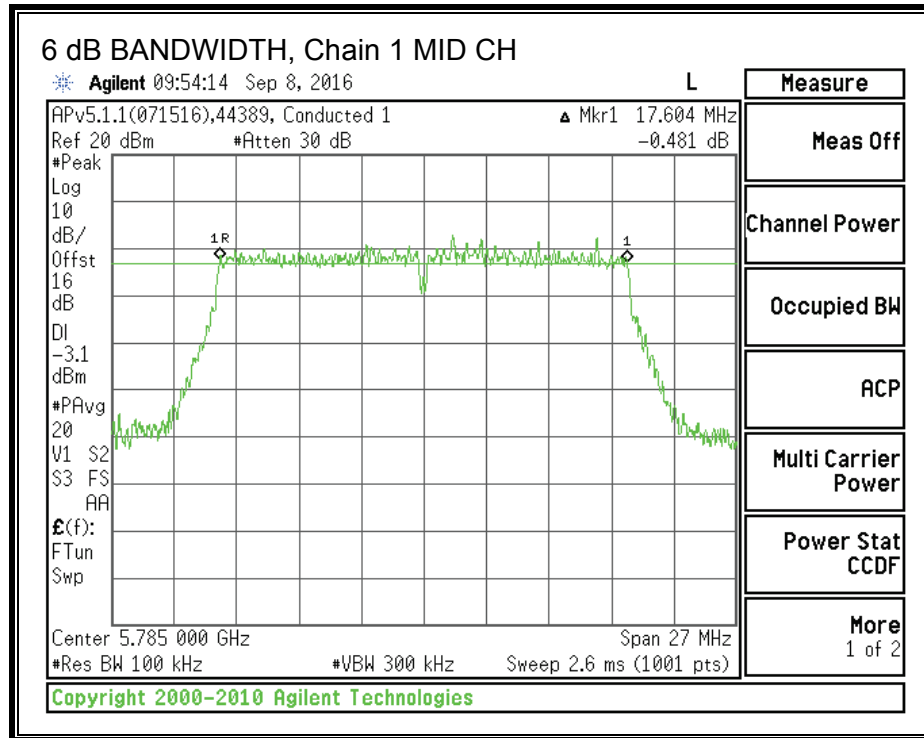
**6 dB BANDWIDTH, Chain 0**



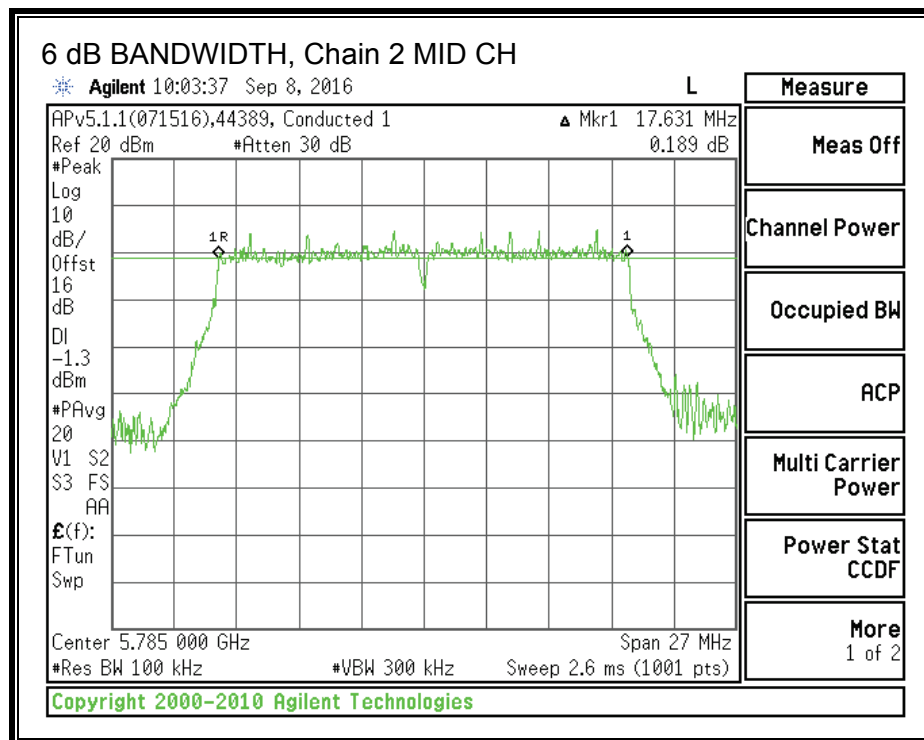
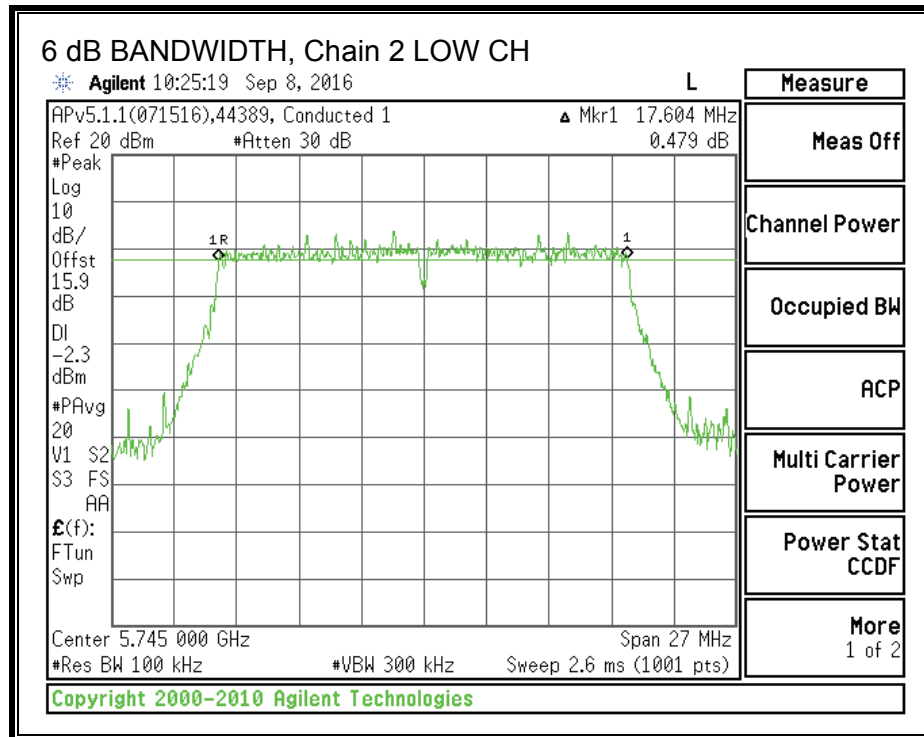


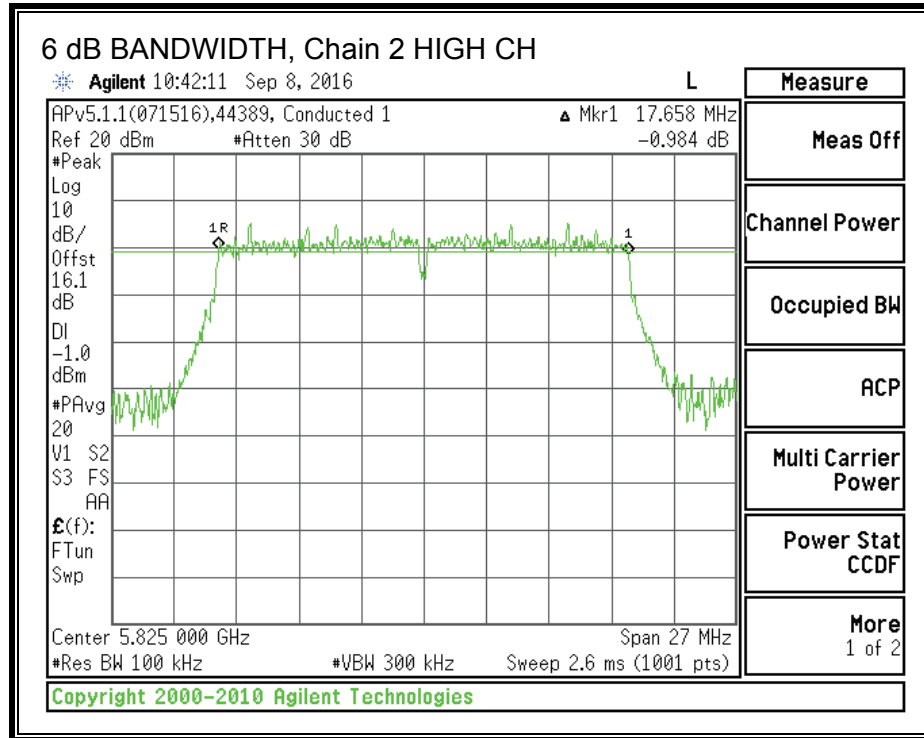
**6 dB BANDWIDTH, Chain 1**





## 6 dB BANDWIDTH, Chain 2





## 8.7.2. 99% BANDWIDTH

### LIMITS

RSS-Gen Clause 6.6

### RESULTS

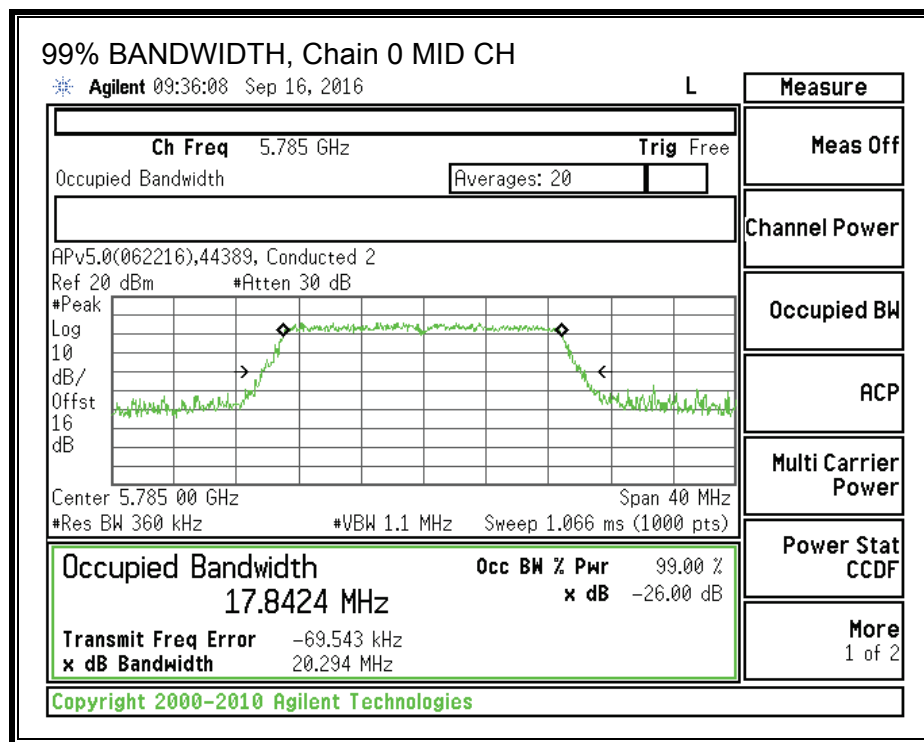
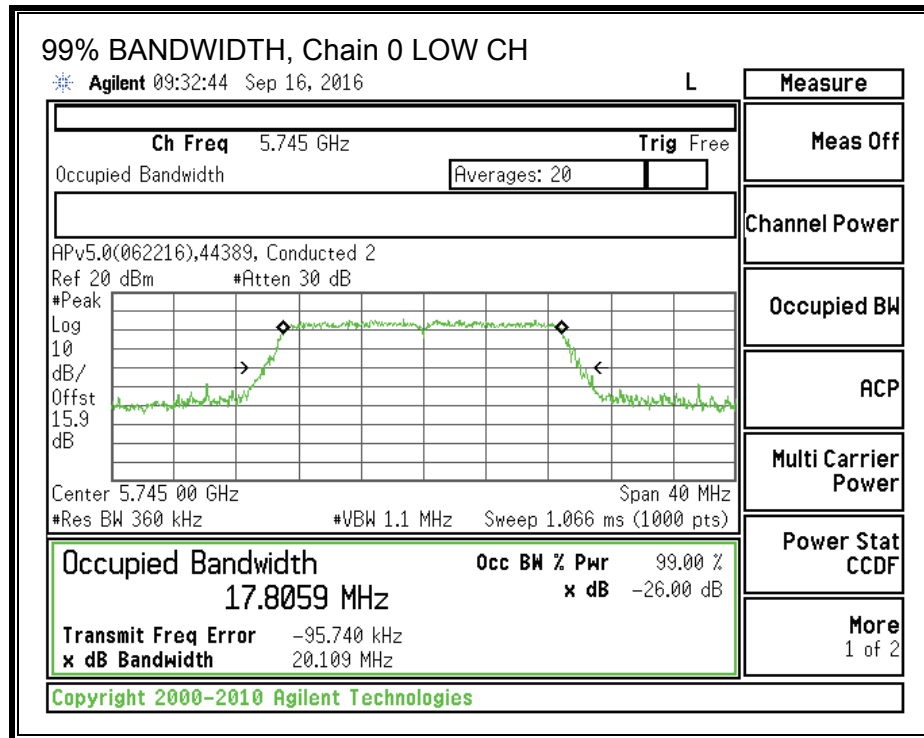
802.11n HT20 SDM (MCS16)

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5745	17.81	17.91	17.76
Mid	5785	17.84	17.72	17.82
High	5825	17.79	17.78	17.76

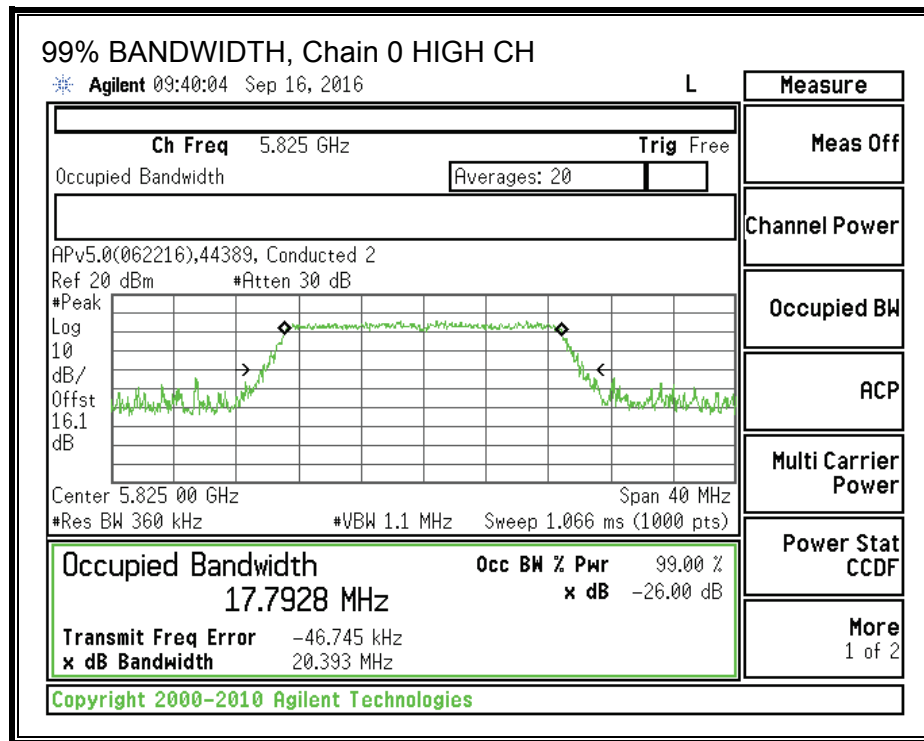
Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-16

## 99% BANDWIDTH

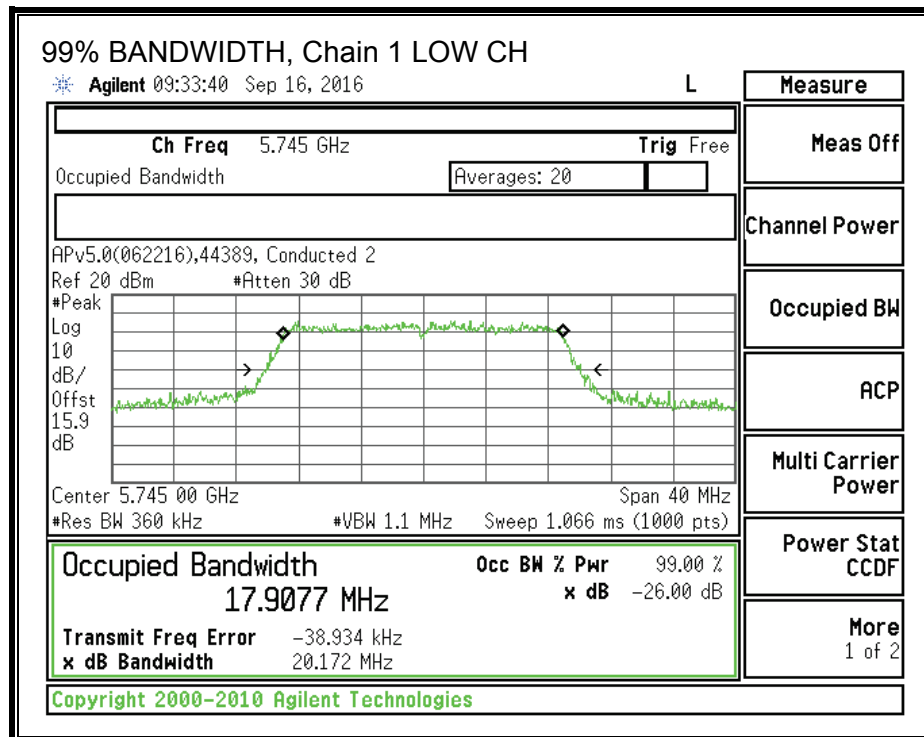
### 99% BANDWIDTH, Chain 0

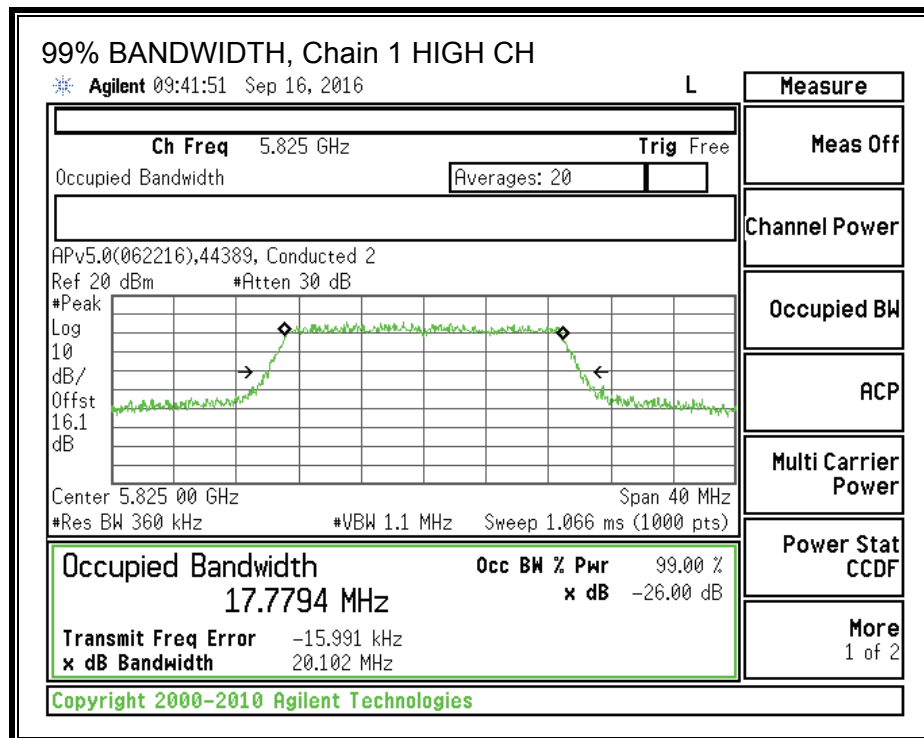
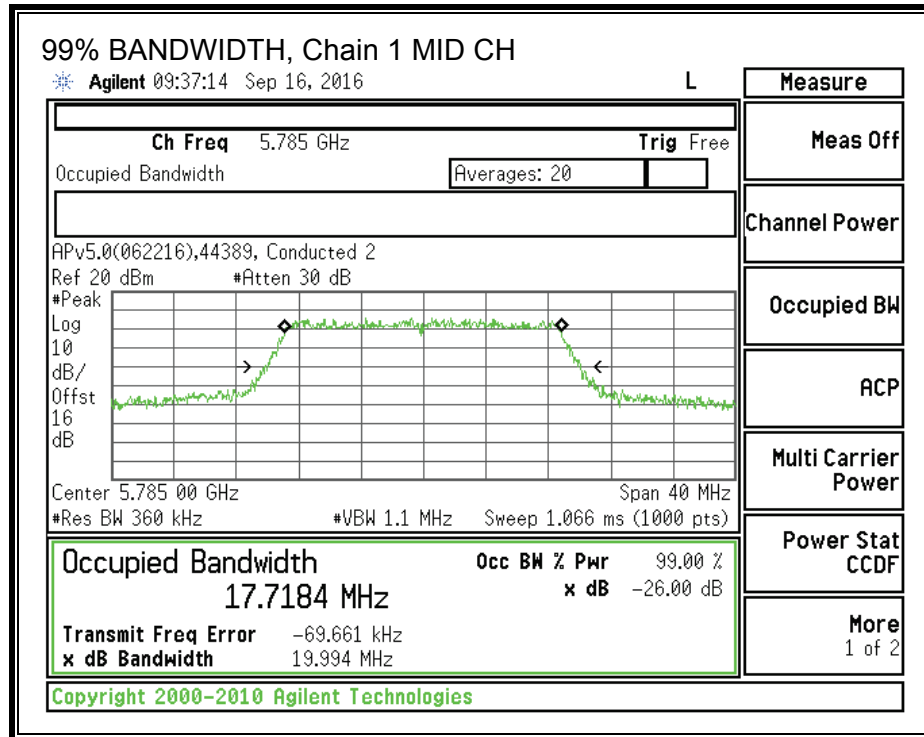




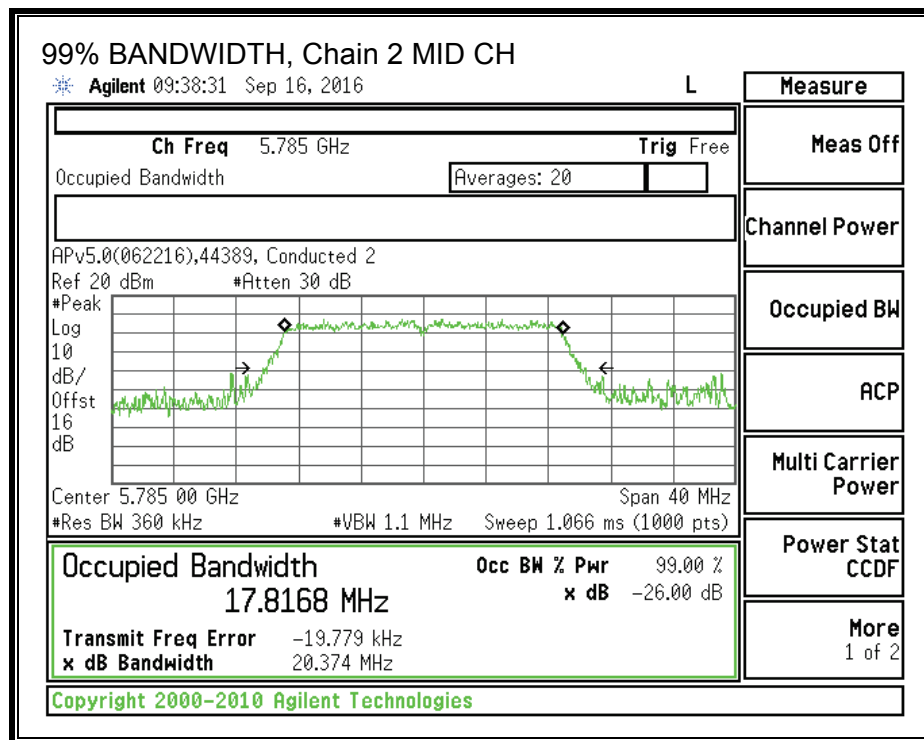
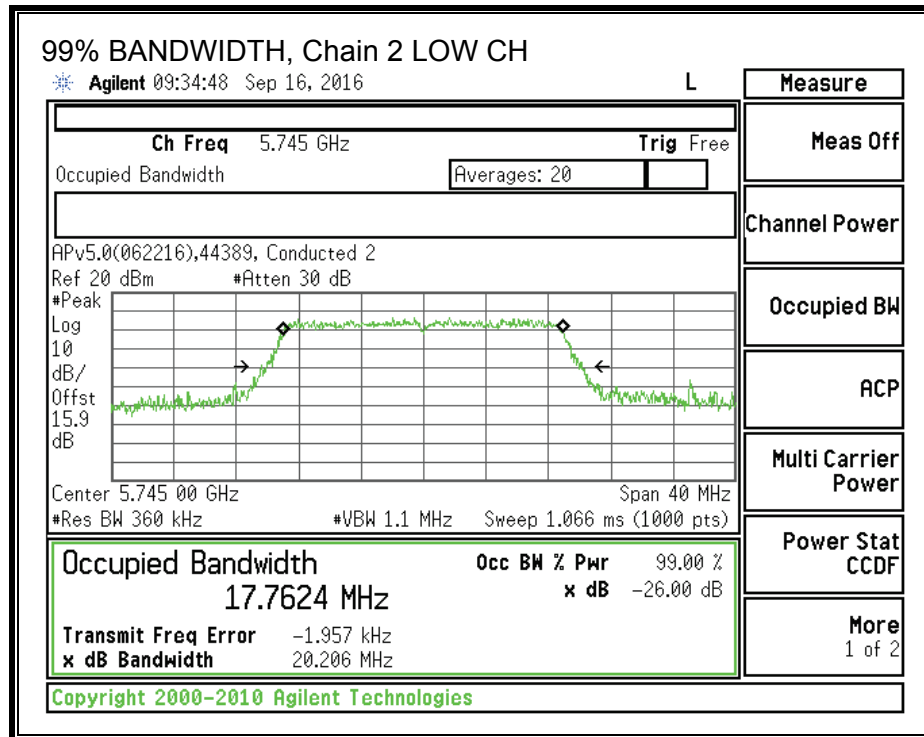


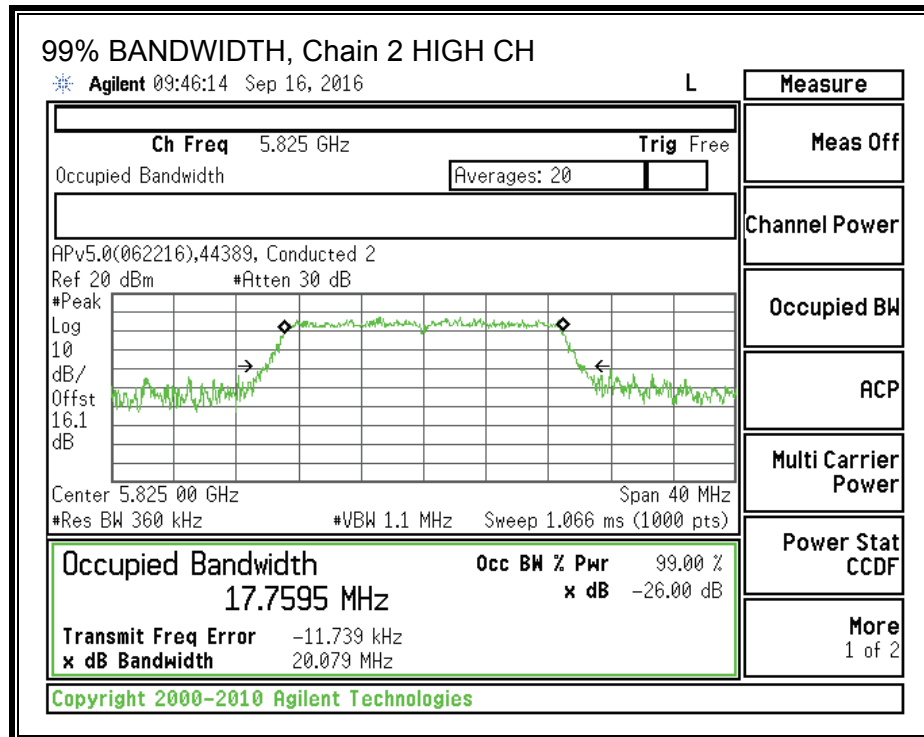
**99% BANDWIDTH, Chain 1**





### 99% BANDWIDTH, Chain 2





### 8.7.3. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

#### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11n CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

#### 802.11n SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-08-30, 2016-10-21

## **RESULTS**

802.11n HT20 CDD (MCS0)

### **Antenna Gain and Limit**

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Low	5745	8.00	28.00
Mid	5785	8.00	28.00
High	5825	8.00	28.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power</b>
---------------------------	------	---

### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	14.66	14.37	15.30	19.57	28.00	-8.43
Mid	5785	14.74	13.95	15.73	19.64	28.00	-8.36
High	5825	15.21	14.19	16.30	20.09	28.00	-7.91

Note – The above data represents gated power measurements, as described in method PM-G.

802.11n HT20 SDM (MCS16)

**Antenna Gain and Limit**

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Low	5745	8.00	28.00
Mid	5785	8.00	28.00
High	5825	8.00	28.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power</b>
---------------------------	------	---

**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	15.20	14.54	15.62	19.91	28.00	-8.09
Mid	5785	15.38	14.15	15.34	19.76	28.00	-8.24
High	5825	15.76	14.55	16.60	20.49	28.00	-7.51

Note – The above data represents gated power measurements, as described in method PM-G.

## 8.7.4. MAXIMUM POWER SPECTRAL DENSITY (PSD)

### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11n CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

#### 802.11n SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-08, 2016-10-21



## **RESULTS**

802.11n HT20 CDD (MCS0)

### **Antenna Gain and Limit**

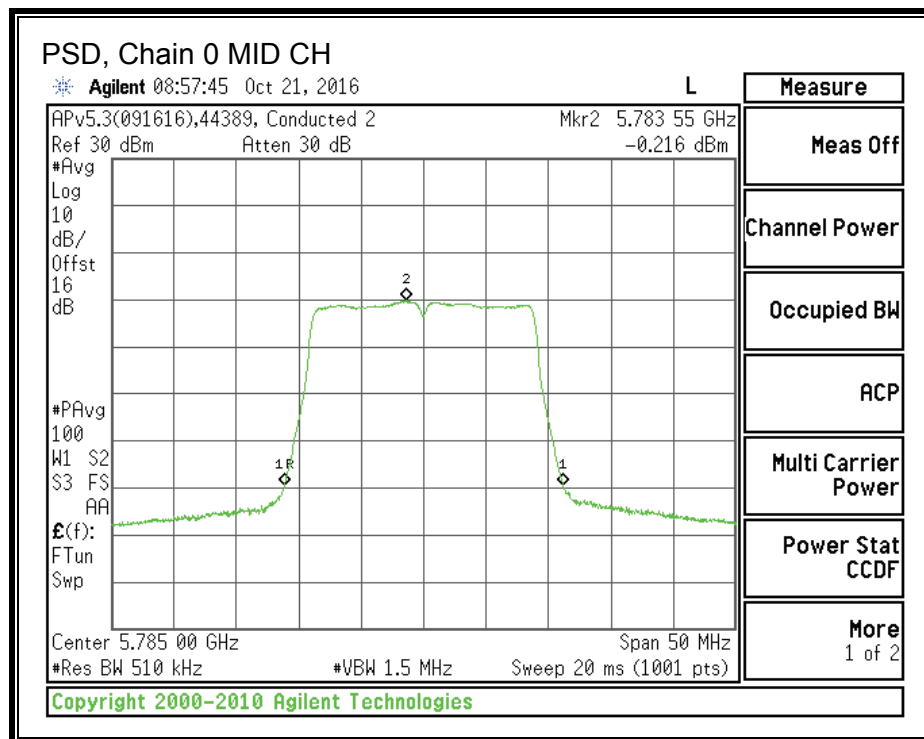
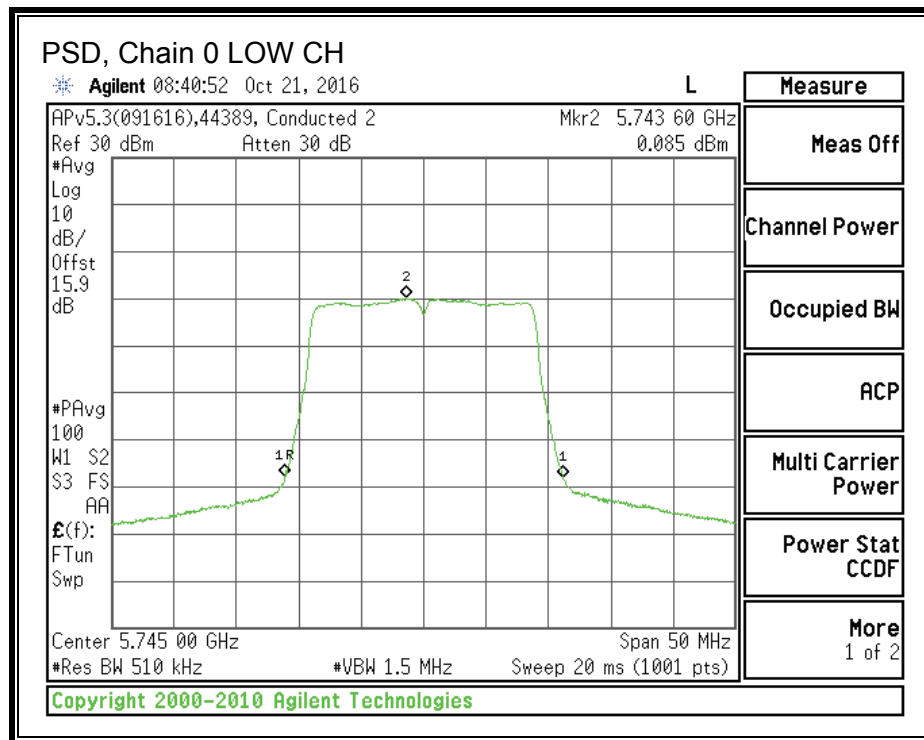
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	12.77	23.23
Mid	5785	12.77	23.23
High	5825	12.77	23.23

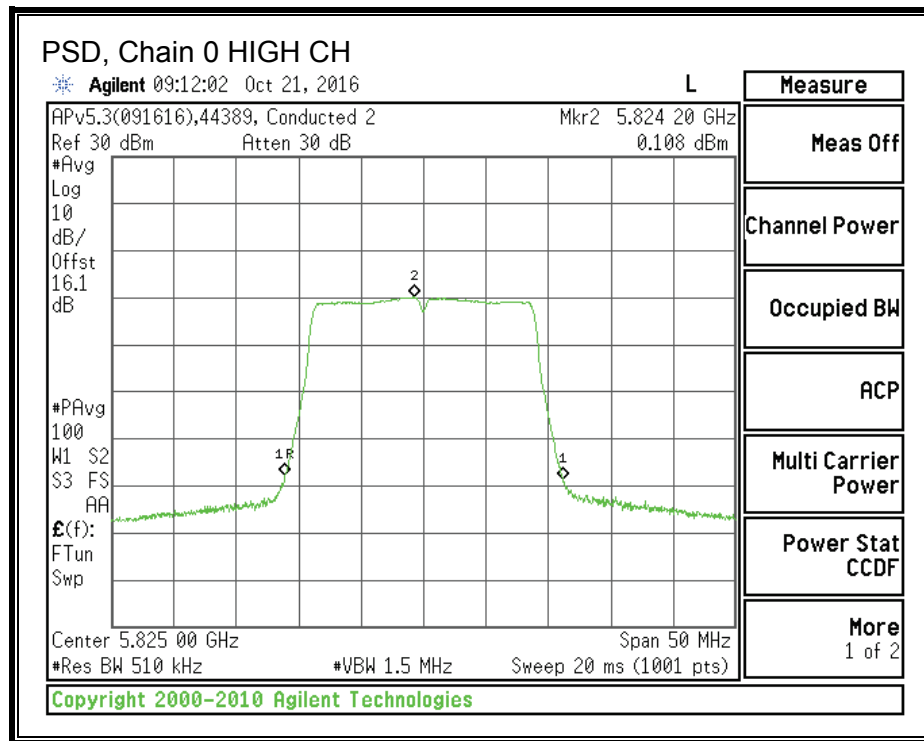
<b>Duty Cycle CF (dB)</b>	0.22	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

### **PSD Results**

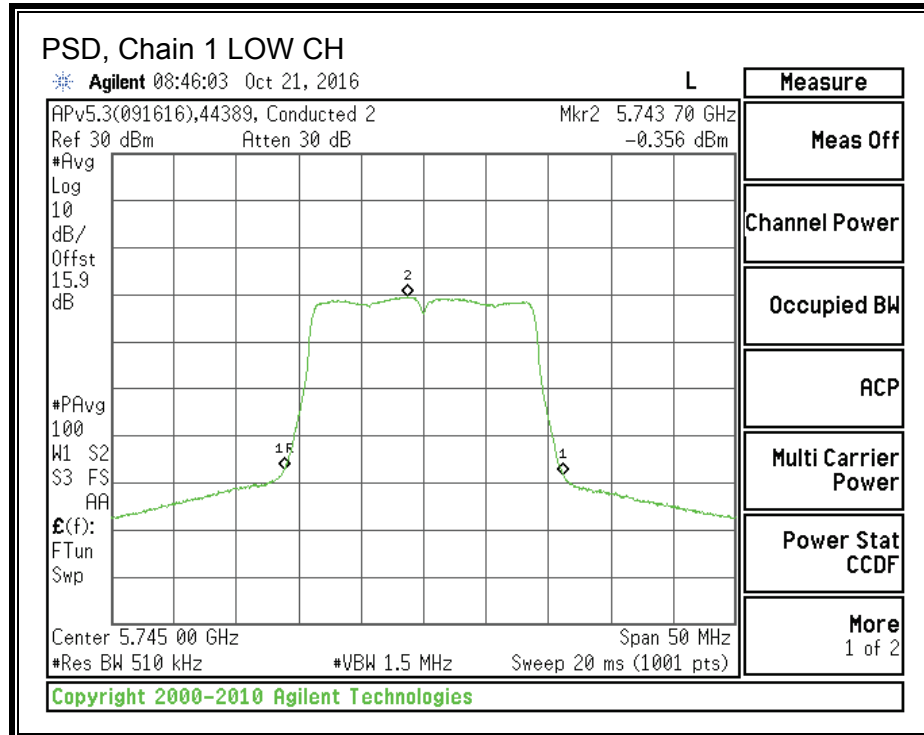
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	0.09	-0.36	-0.23	4.83	23.23	-18.40
Mid	5785	-0.22	-1.17	0.65	4.81	23.23	-18.42
High	5825	0.11	-1.01	1.80	5.45	23.23	-17.78

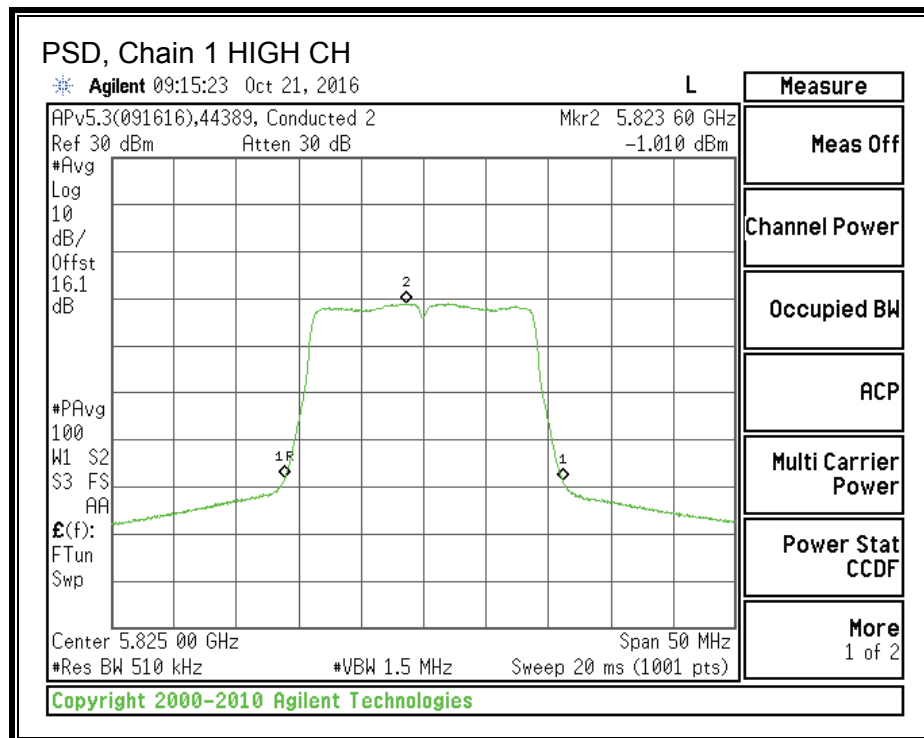
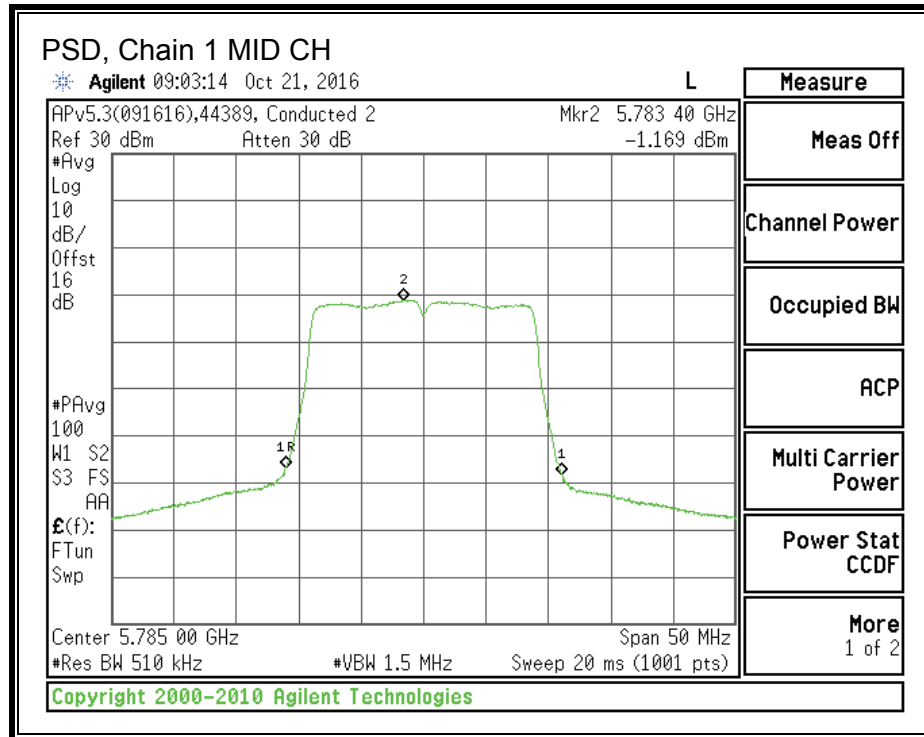
**PSD, Chain 0**



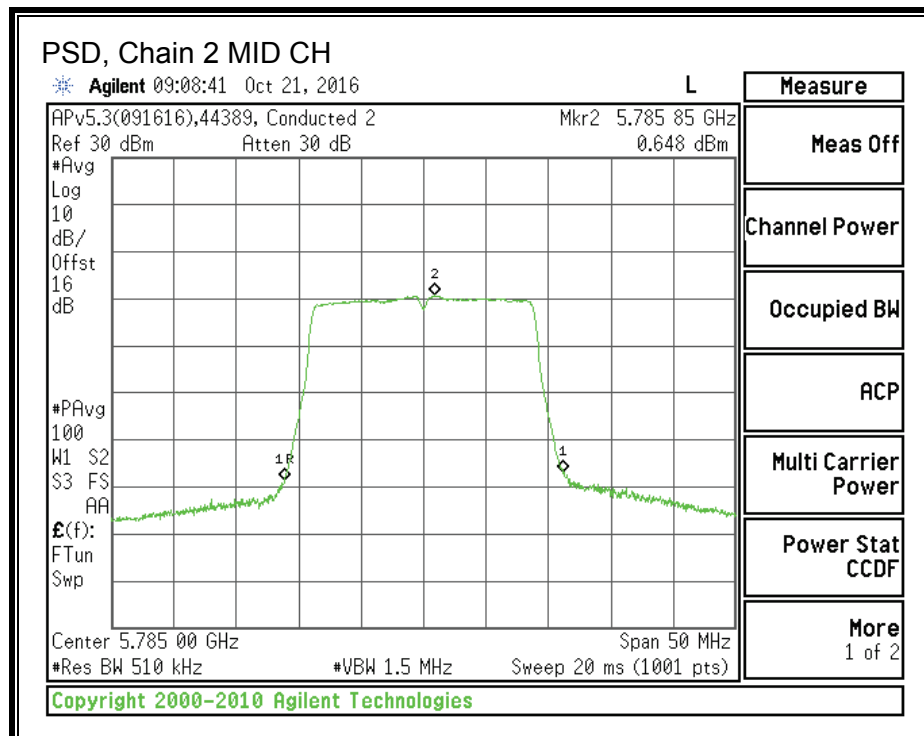
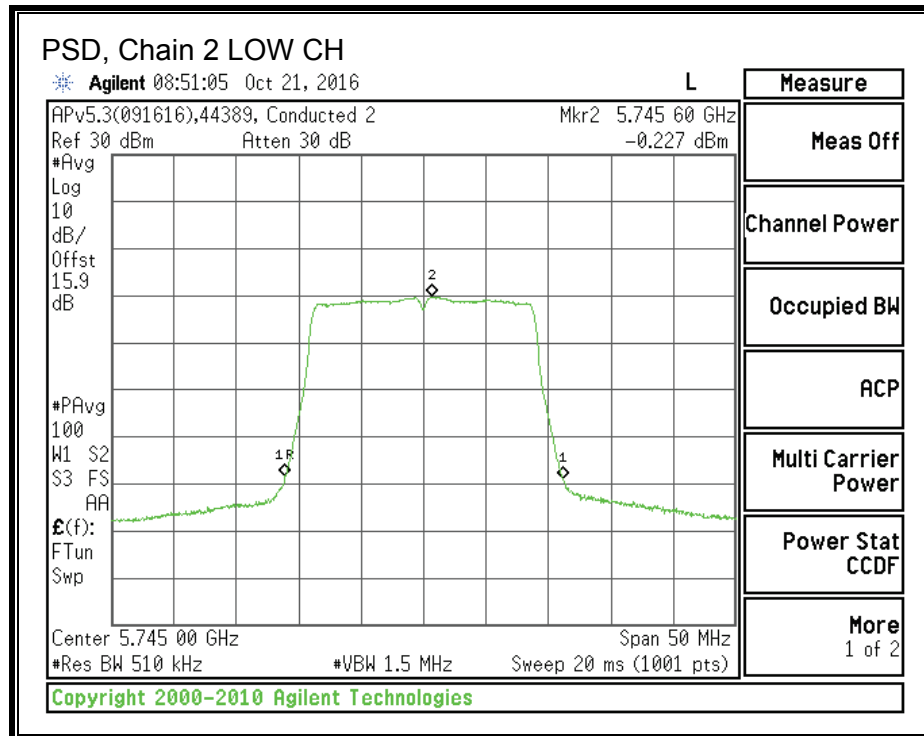


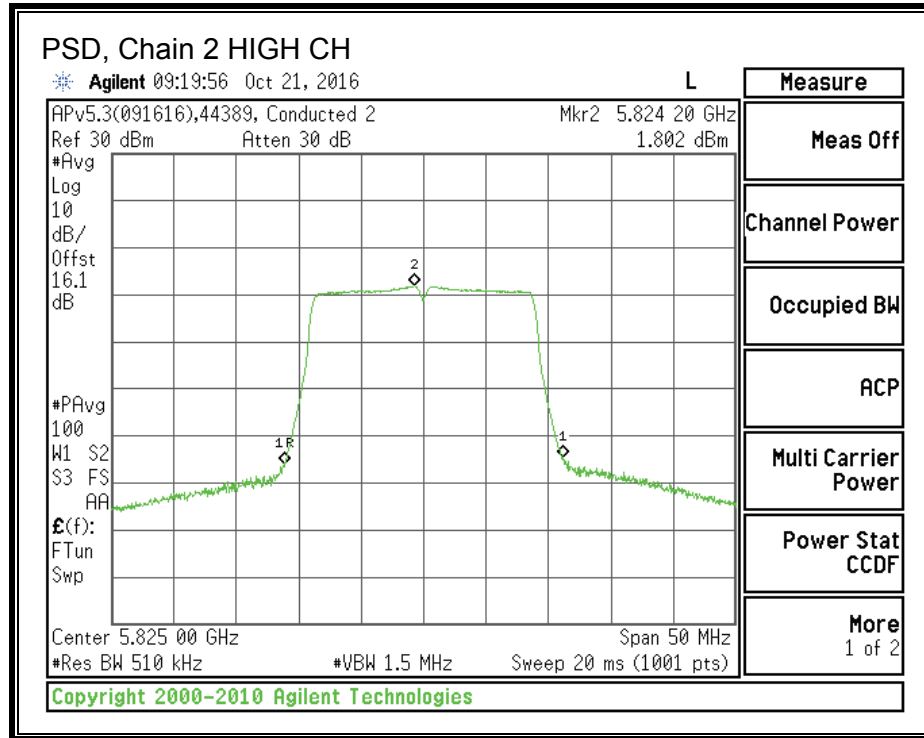
**PSD, Chain 1**





**PSD, Chain 2**





802.11n HT20 SDM (MCS16)

**Antenna Gain and Limit**

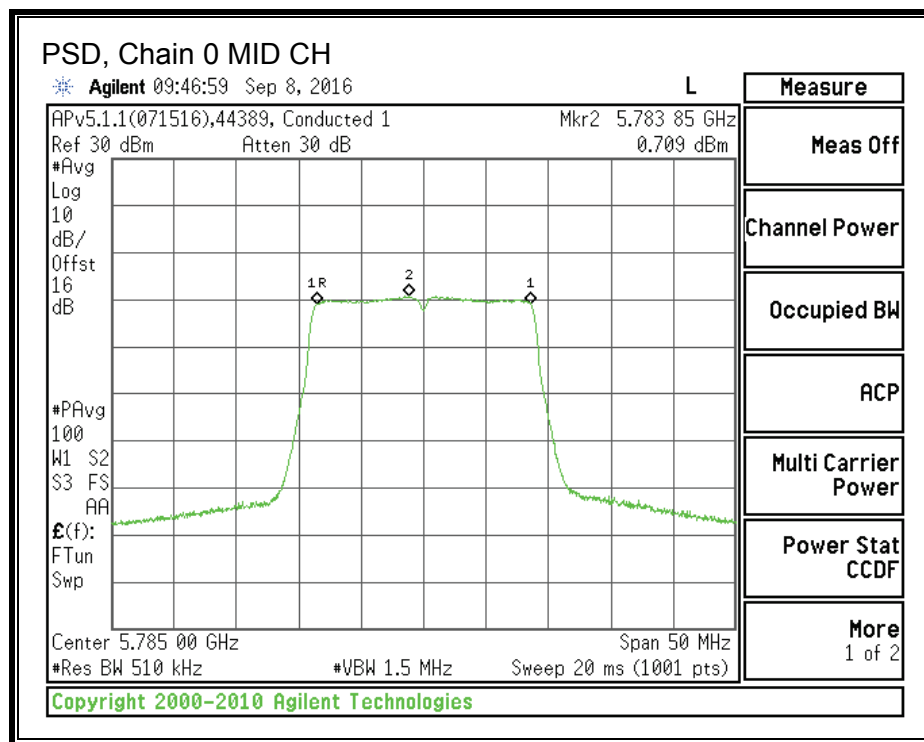
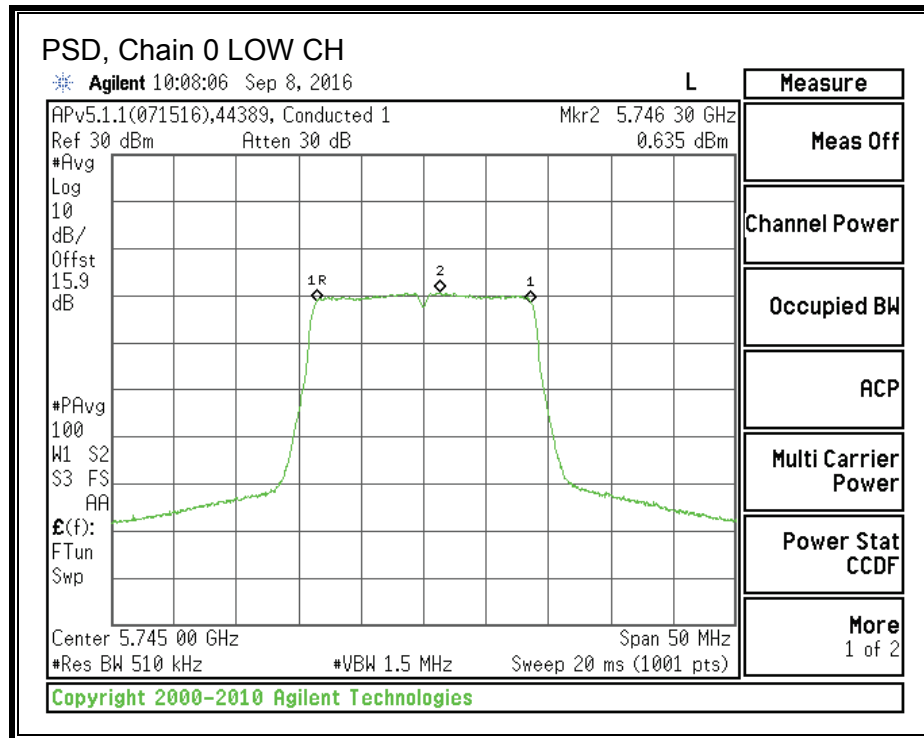
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	8.00	28.00
Mid	5785	8.00	28.00
High	5825	8.00	28.00

<b>Duty Cycle CF (dB)</b>	0.59	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

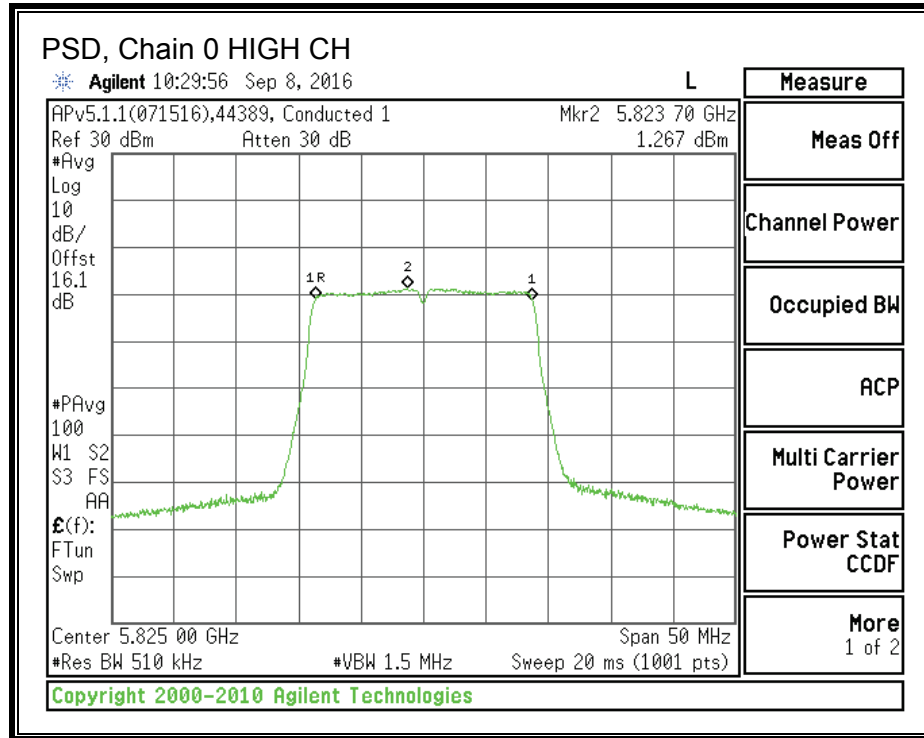
**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	0.64	-0.01	0.97	5.91	28.00	-22.09
Mid	5785	0.71	-0.40	1.53	6.04	28.00	-21.96
High	5825	1.27	-0.01	2.48	6.73	28.00	-21.27

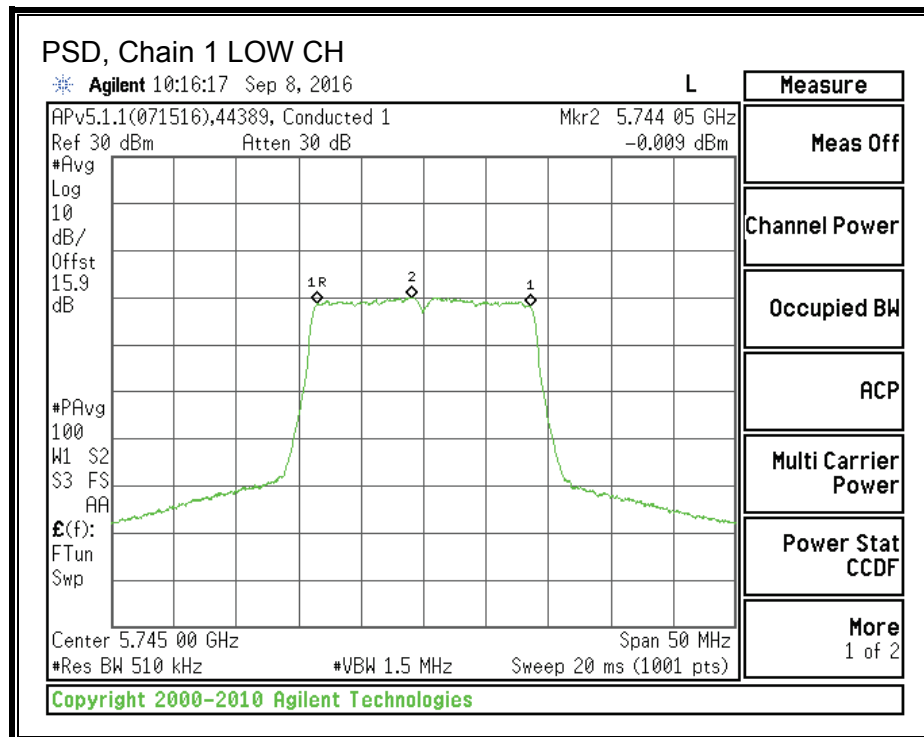
**PSD, Chain 0**

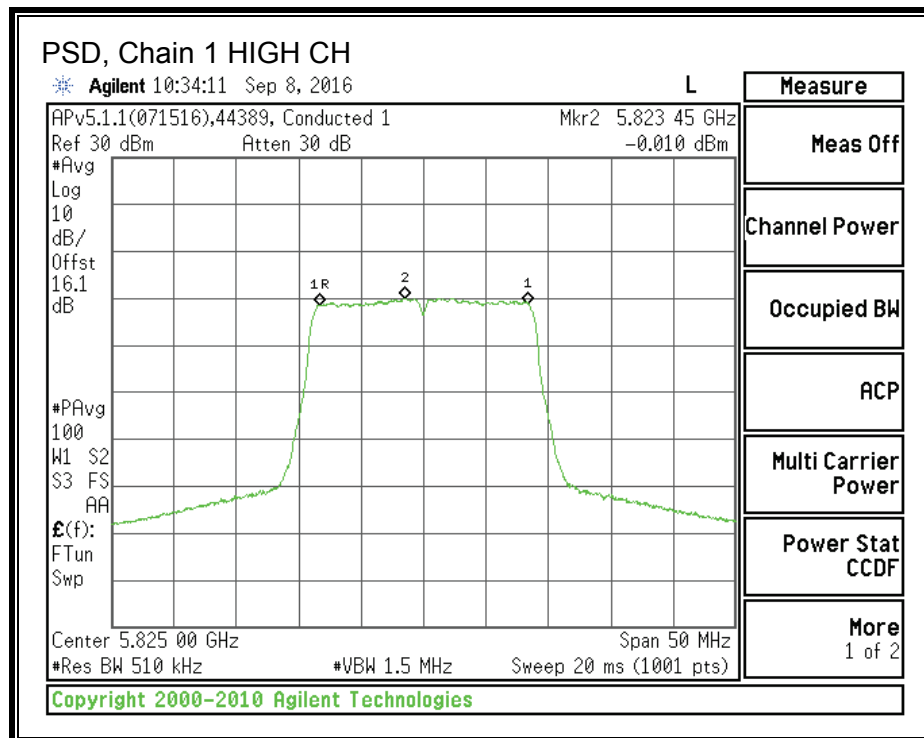
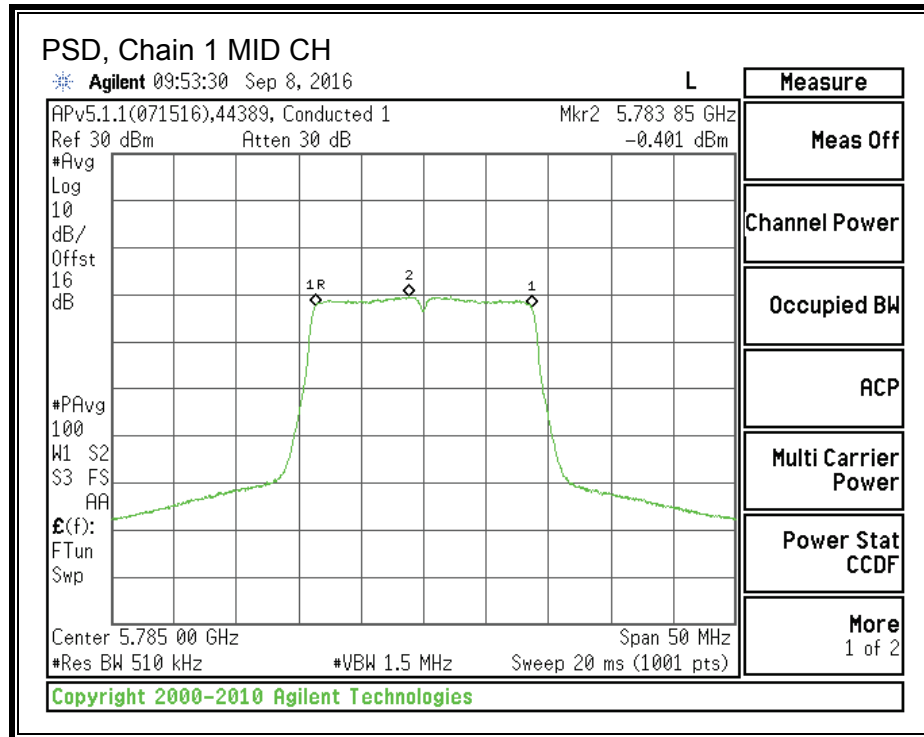




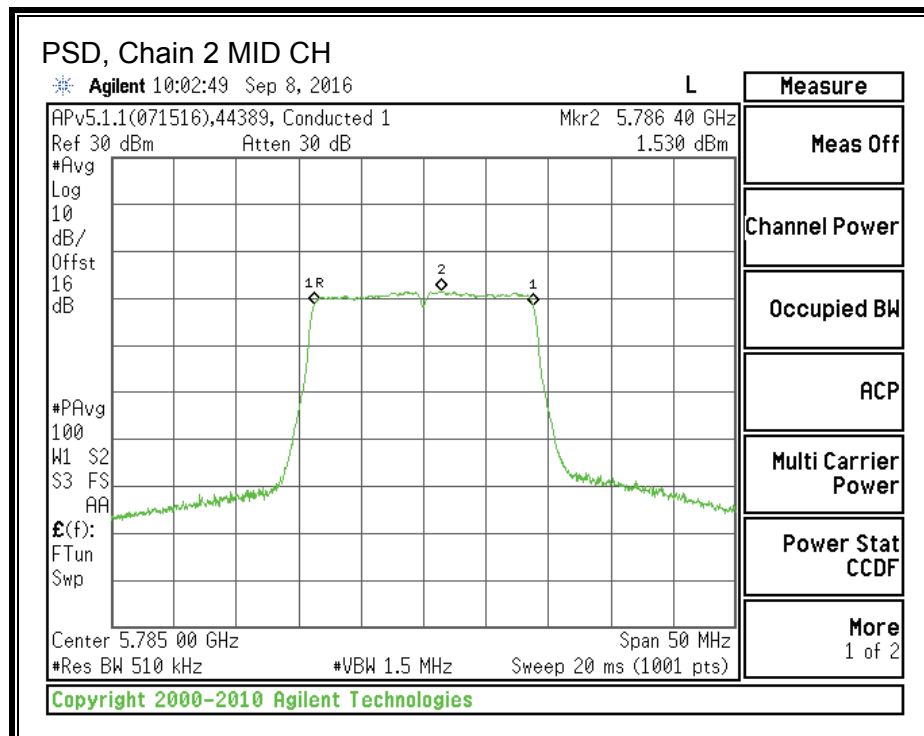
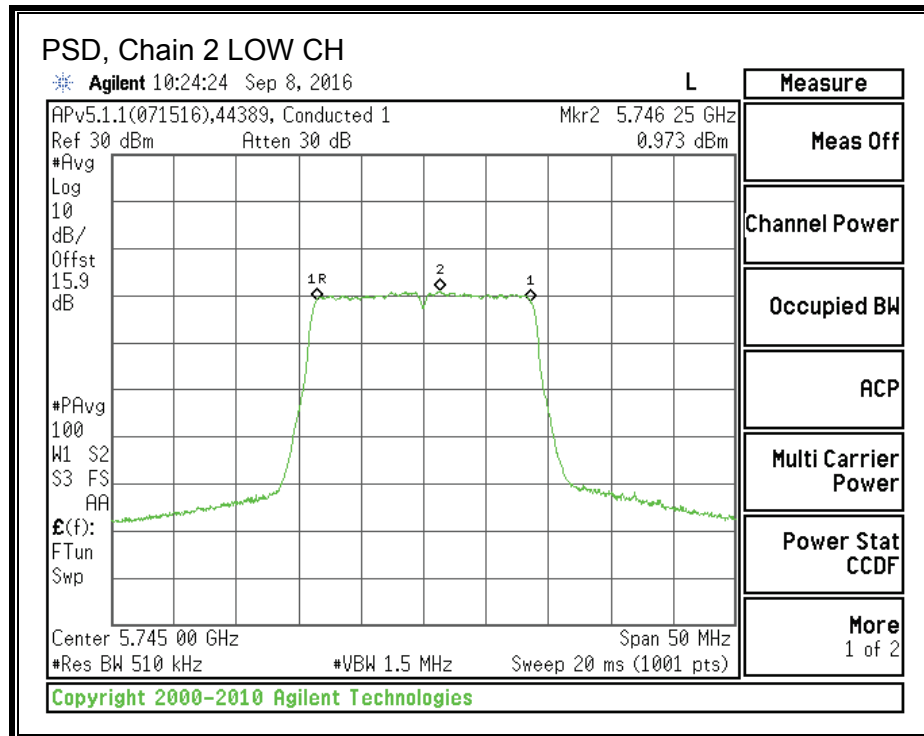


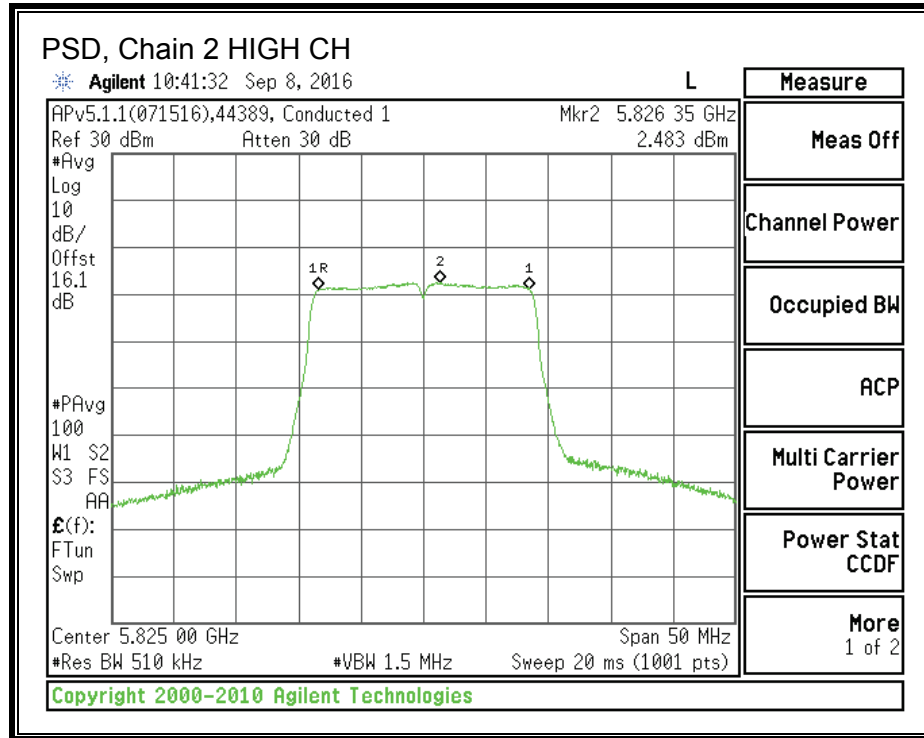
**PSD, Chain 1**





**PSD, Chain 2**





## 8.8. 802.11n HT40 MODE IN THE 5.8 GHz BAND

### 8.8.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.407 (e)

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

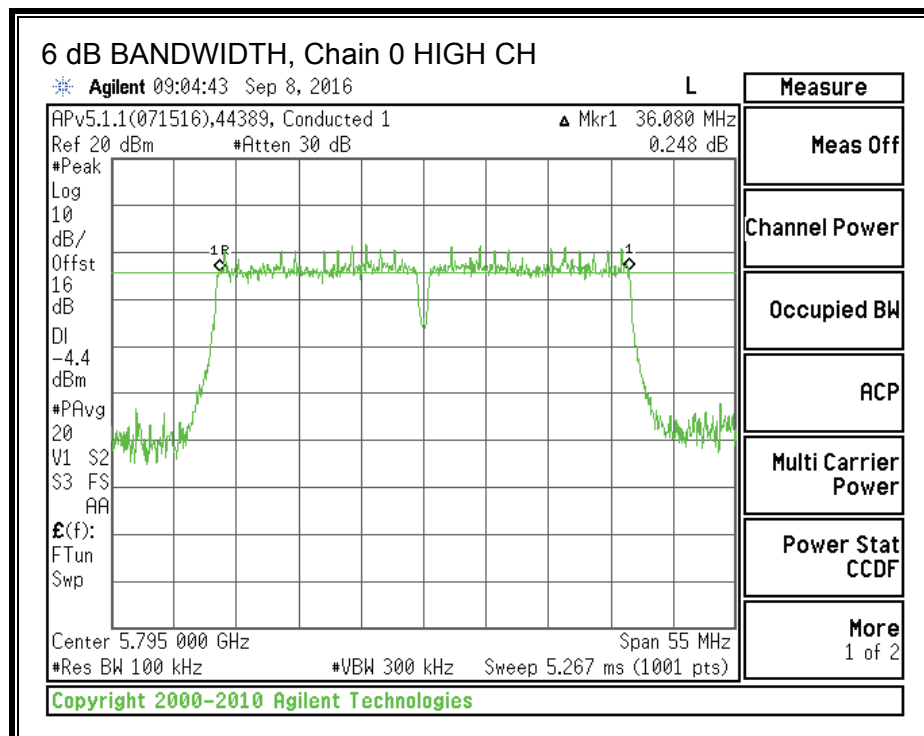
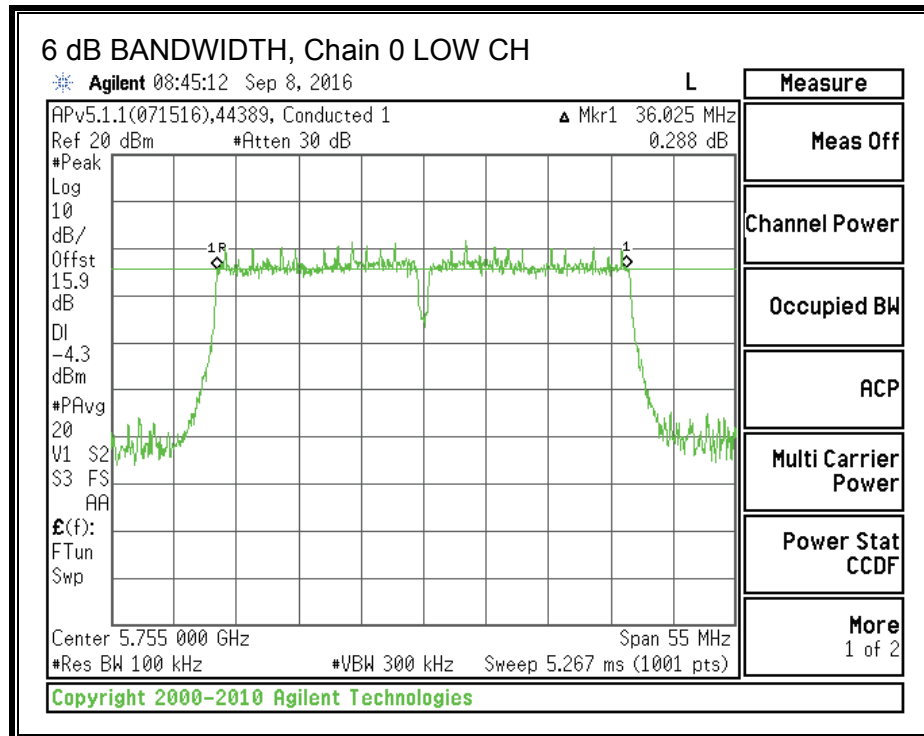
802.11n HT40 SDM (MCS16)

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	5755	36.03	36.36	36.36	0.5
High	5795	36.08	36.36	36.36	0.5

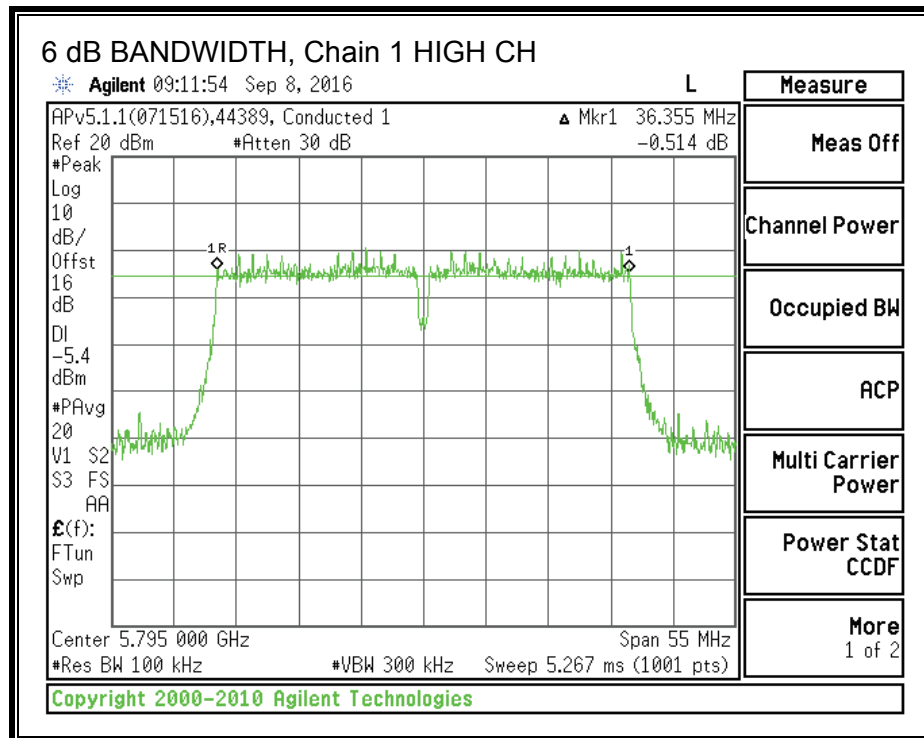
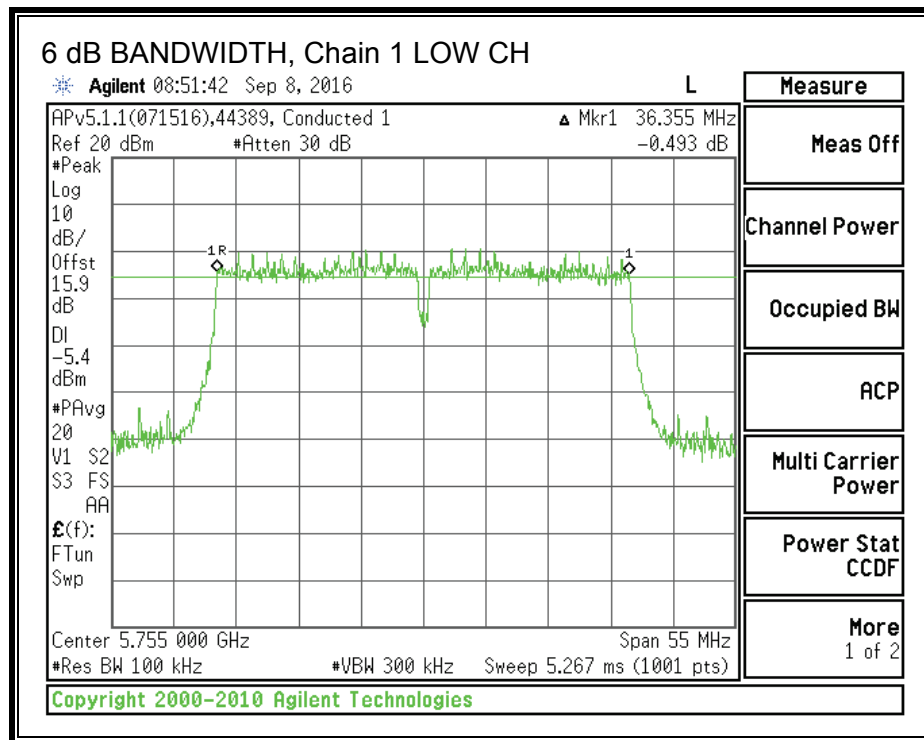
Test Performed: Niklas Haydon / Jeff Cabrera

Test Date: 2016-09-08

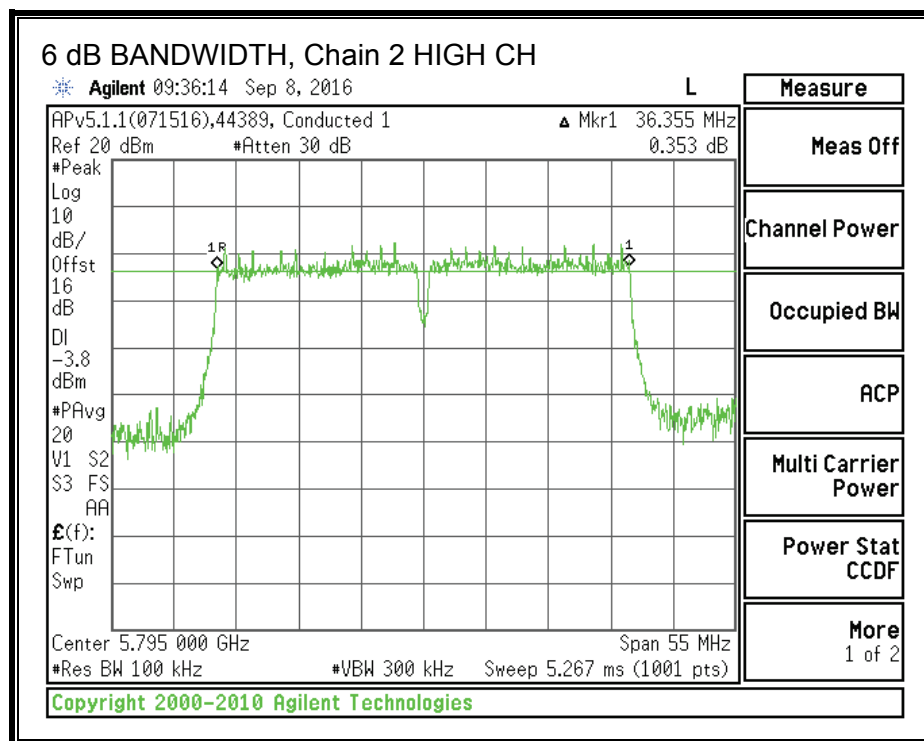
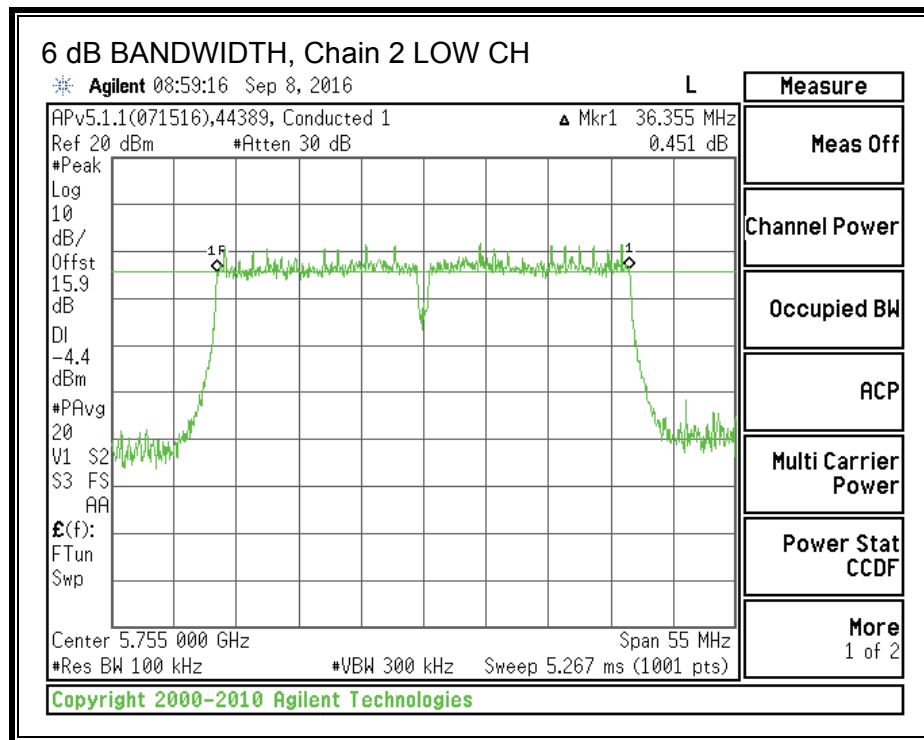
**6 dB BANDWIDTH, Chain 0**



**6 dB BANDWIDTH, Chain 1**



**6 dB BANDWIDTH, Chain 2**





## 8.8.2. 99% BANDWIDTH

### LIMITS

RSS-Gen Clause 6.6

### RESULTS

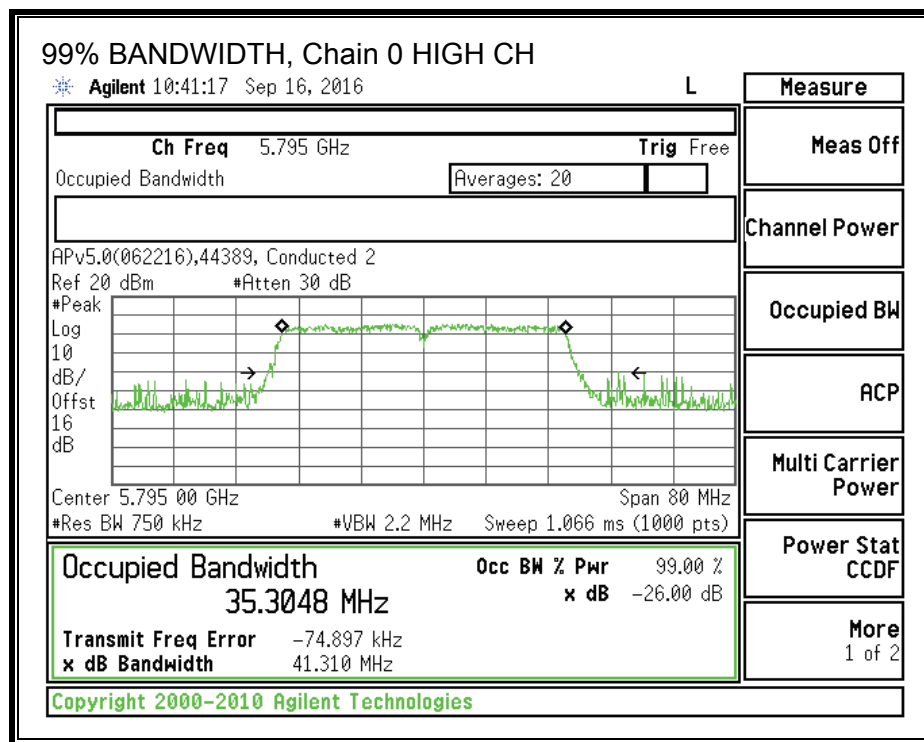
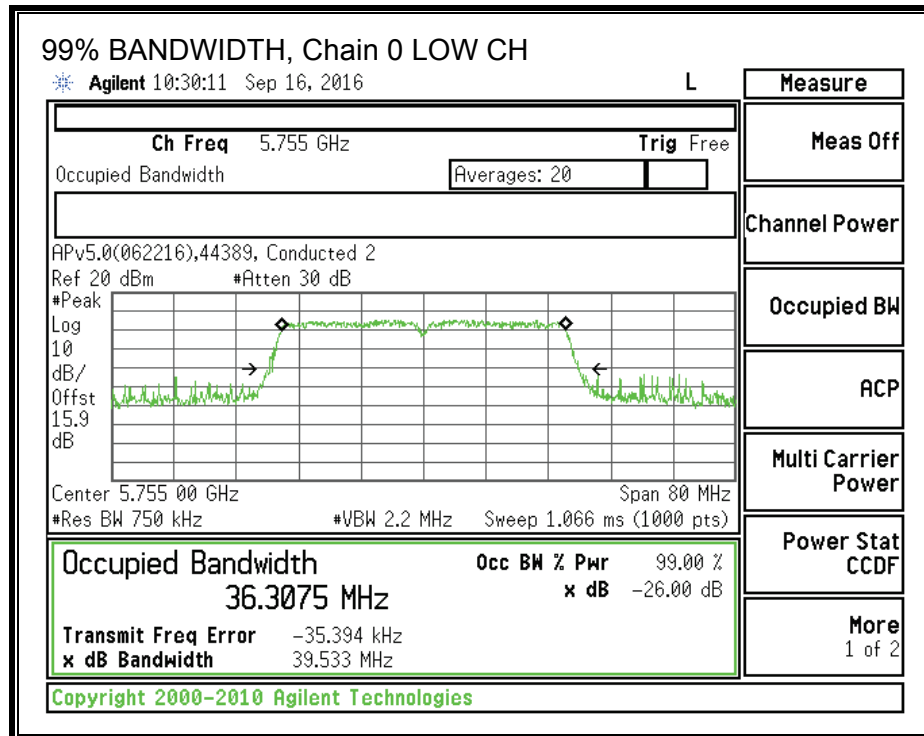
802.11n HT40 SDM (MCS16)

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5755	36.31	36.23	36.32
High	5795	35.30	35.80	36.38

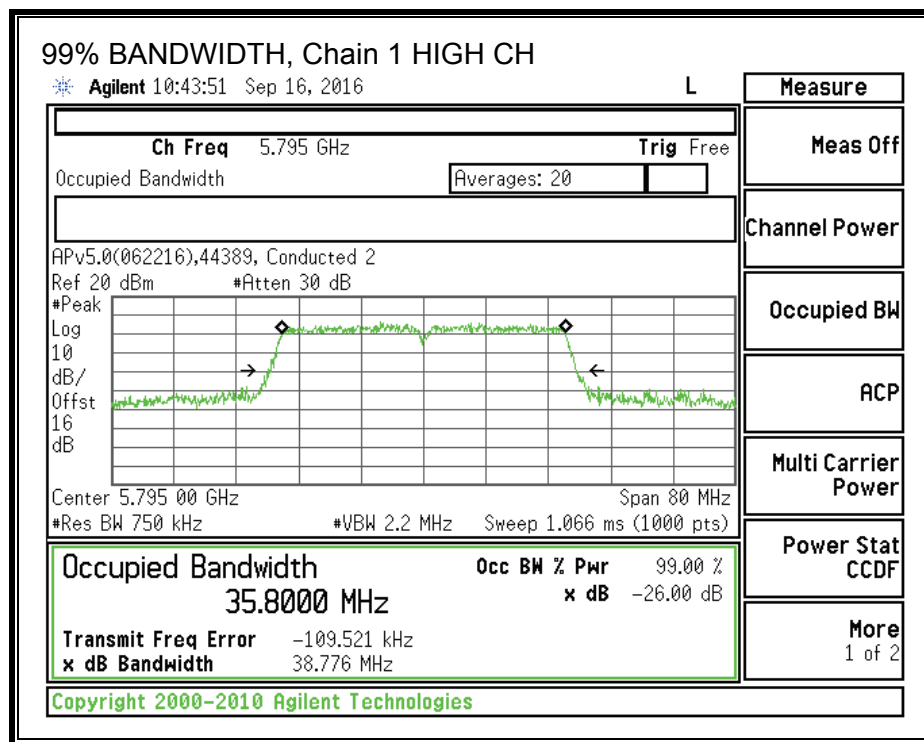
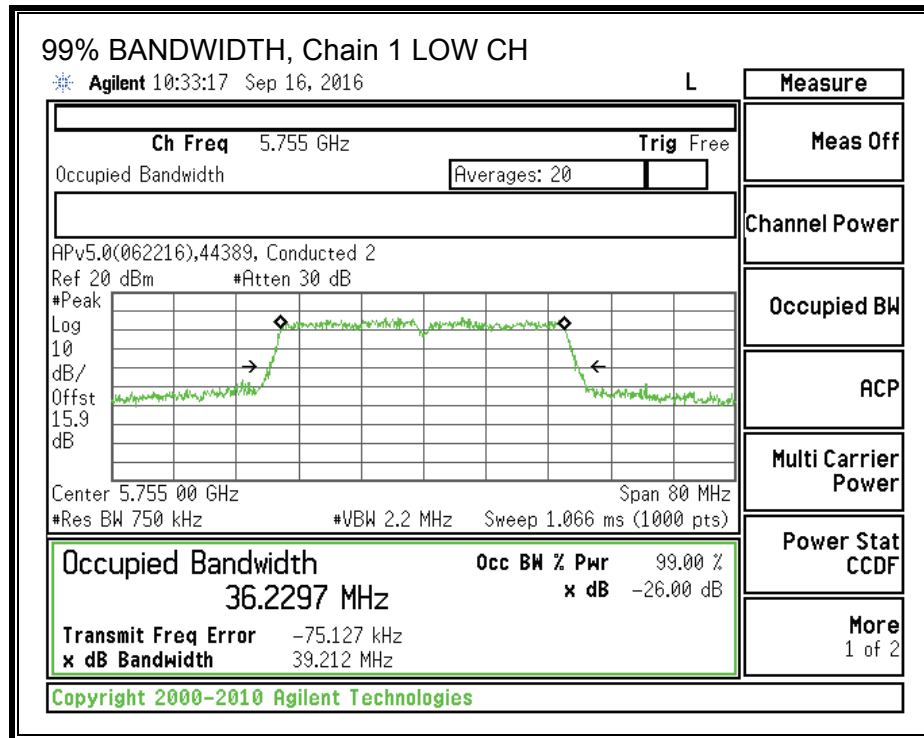
Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-16

## 99% BANDWIDTH

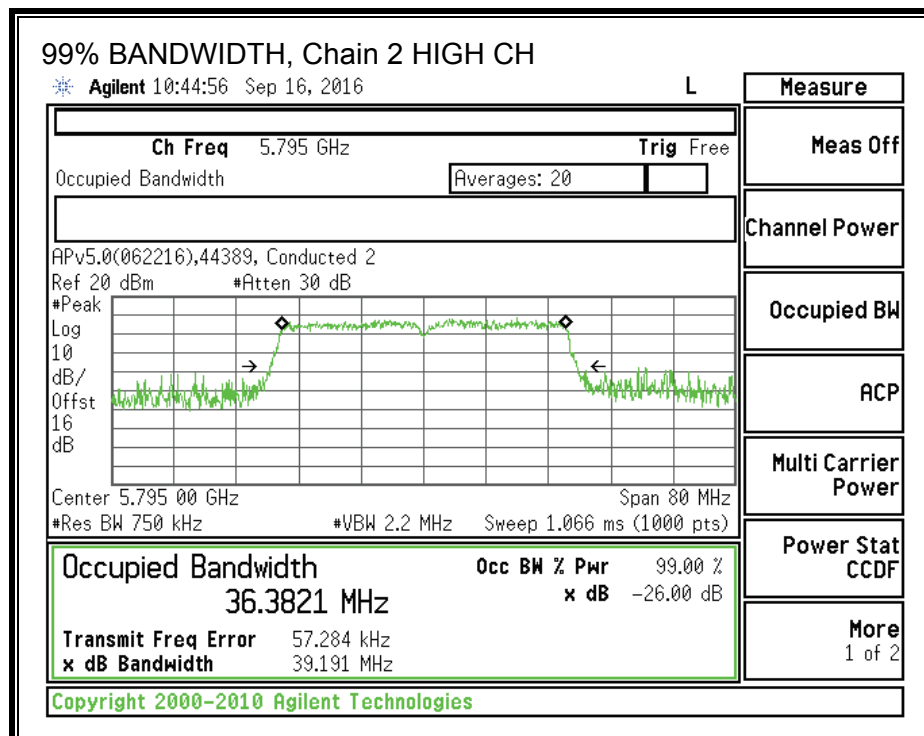
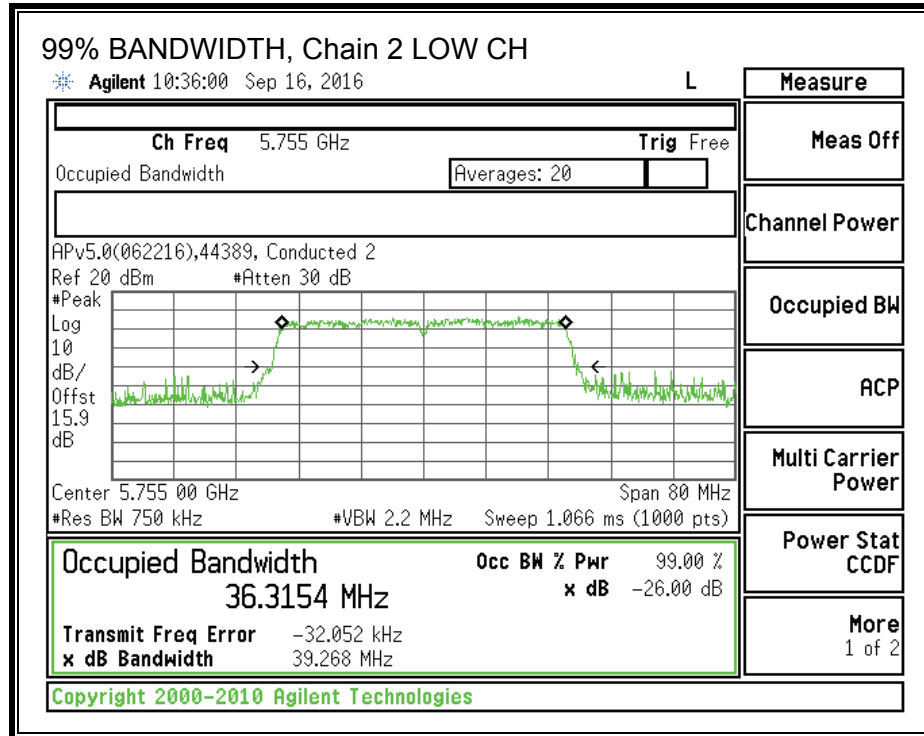
### 99% BANDWIDTH, Chain 0



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.8.3. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

#### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11n CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

#### 802.11n SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-08-30, 2016-10-20

## **RESULTS**

802.11n HT40 CDD (MCS0)

### **Antenna Gain and Limit**

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Low	5755	8.00	28.00
High	5795	8.00	28.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5755	14.84	14.21	15.08	19.50	28.00	-8.50
High	5795	15.03	14.02	16.03	19.88	28.00	-8.12

Note – The above data represents gated power measurements, as described in method PM-G.

802.11n HT40 SDM (MCS16)

**Antenna Gain and Limit**

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Low	5755	8.00	28.00
High	5795	8.00	28.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power</b>
---------------------------	------	---

**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5755	15.17	14.61	15.46	19.87	28.00	-8.13
High	5795	15.36	14.39	16.12	20.12	28.00	-7.88

Note – The above data represents gated power measurements, as described in method PM-G.

## 8.8.1. MAXIMUM POWER SPECTRAL DENSITY (PSD)

### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11n CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

#### 802.11n SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera

Test Date: 2016-09-08, 2016-10-20



## **RESULTS**

802.11n HT40 CDD (MCS0)

### **Antenna Gain and Limit**

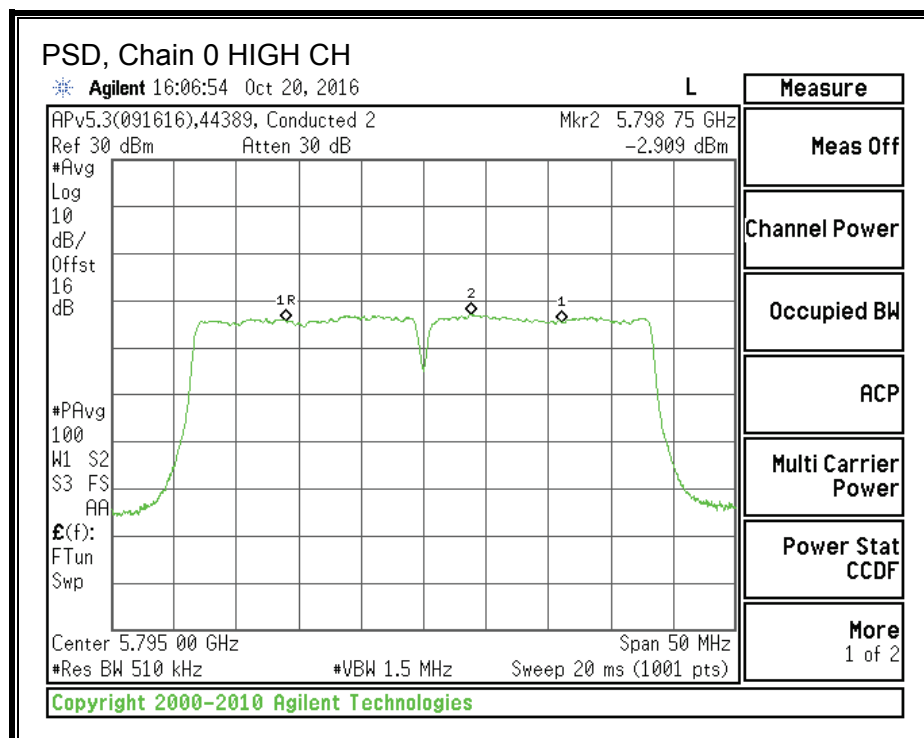
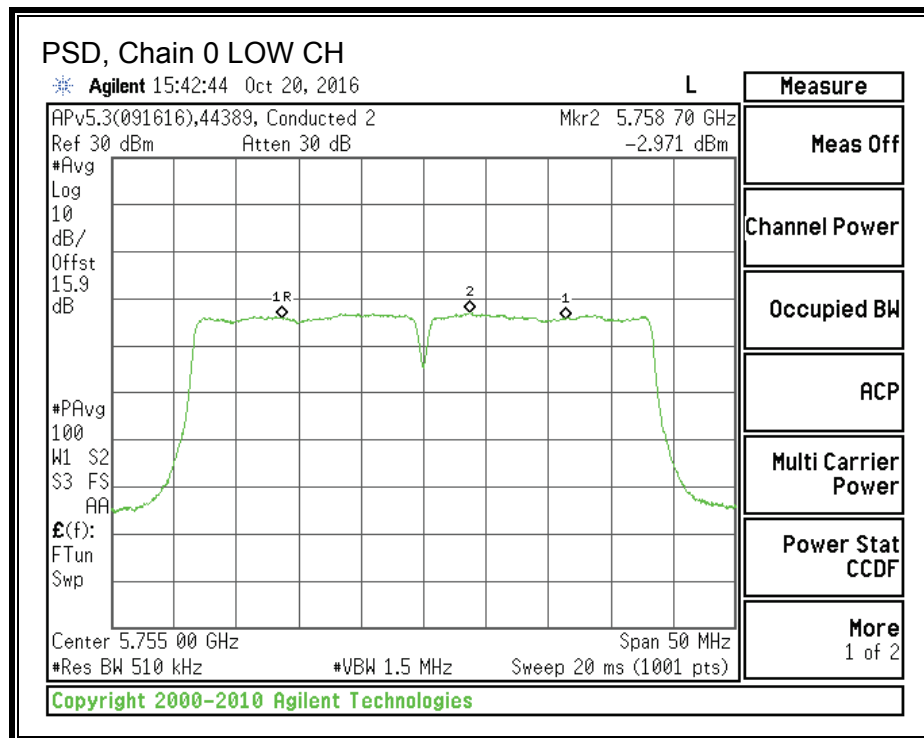
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5755	12.77	23.23
High	5795	12.77	23.23

Duty Cycle CF (dB)	0.43	Included in Calculations of Corr'd PSD
--------------------	------	--

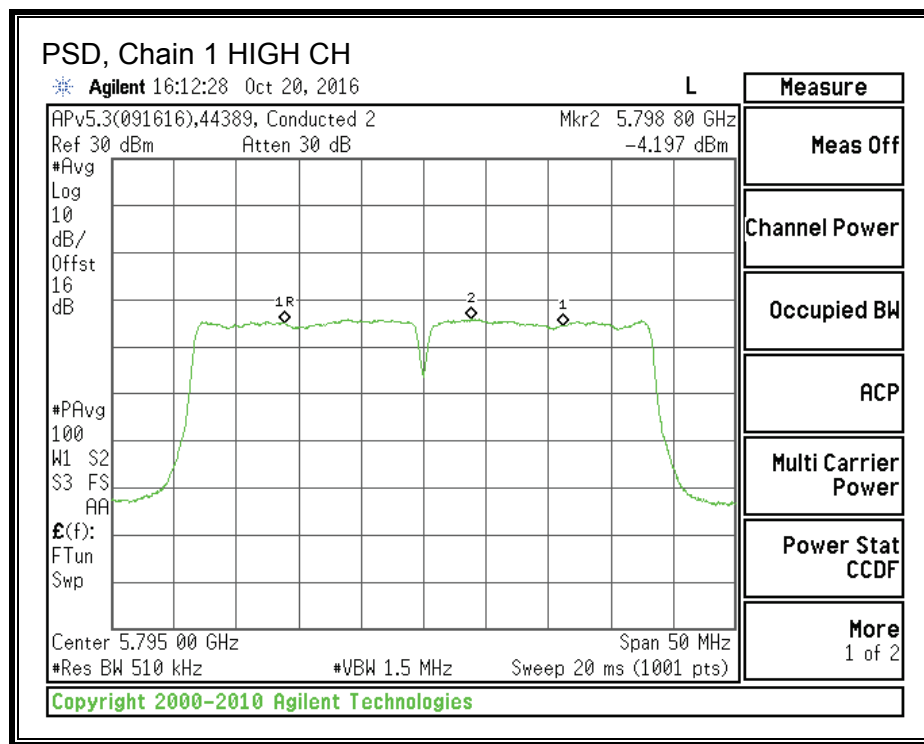
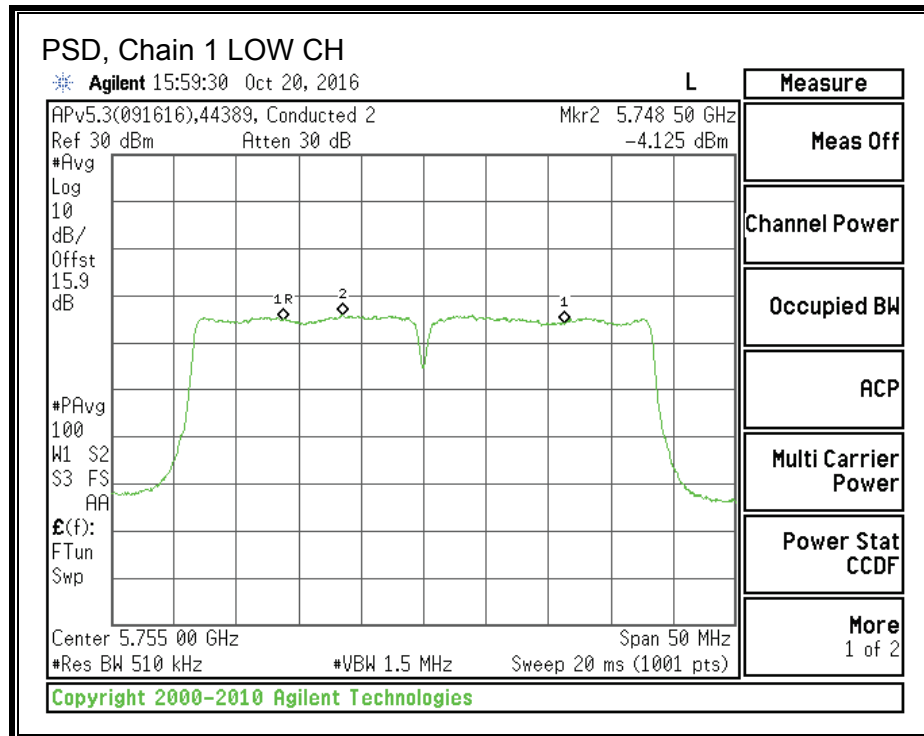
### **PPSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5755	-2.97	-4.13	-2.71	1.98	23.23	-21.25
High	5795	-2.91	-4.20	-1.43	2.50	23.23	-20.73

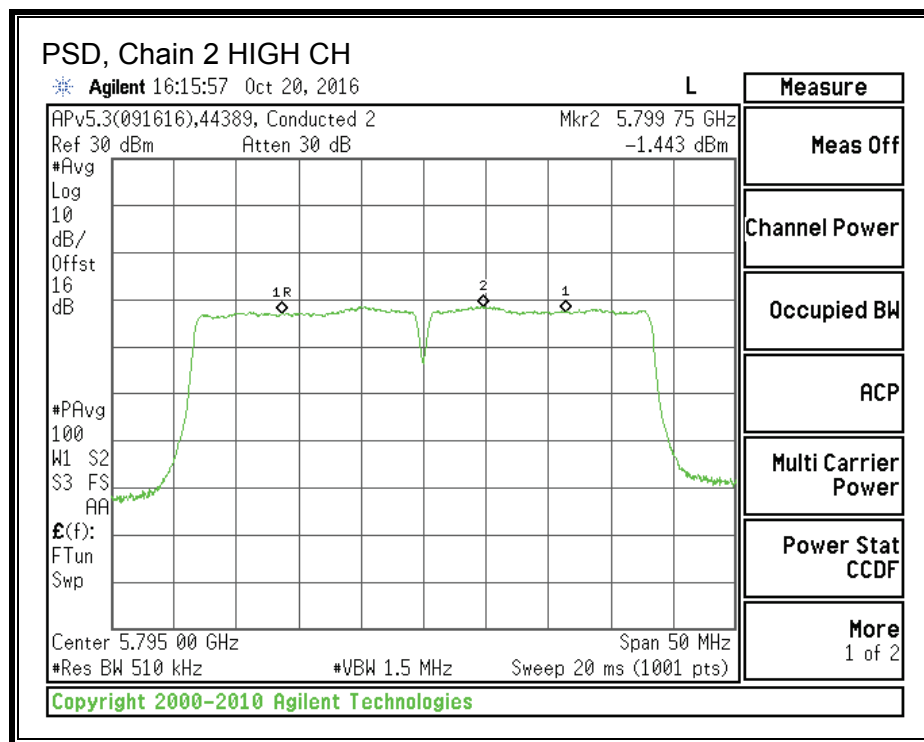
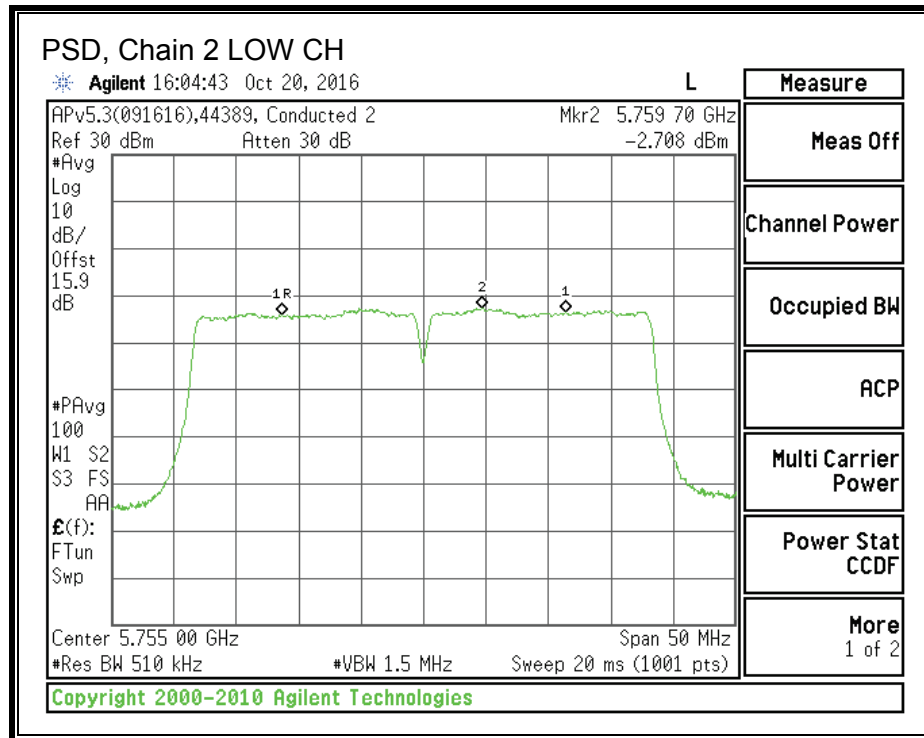
**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**



802.11n HT40 SDM (MCS16)

**Antenna Gain and Limit**

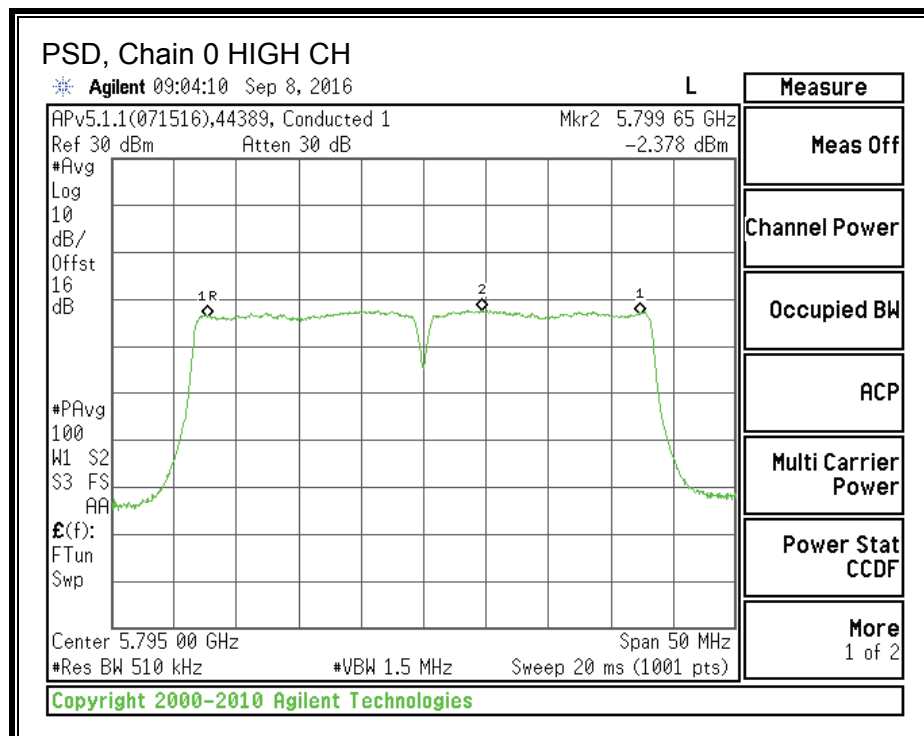
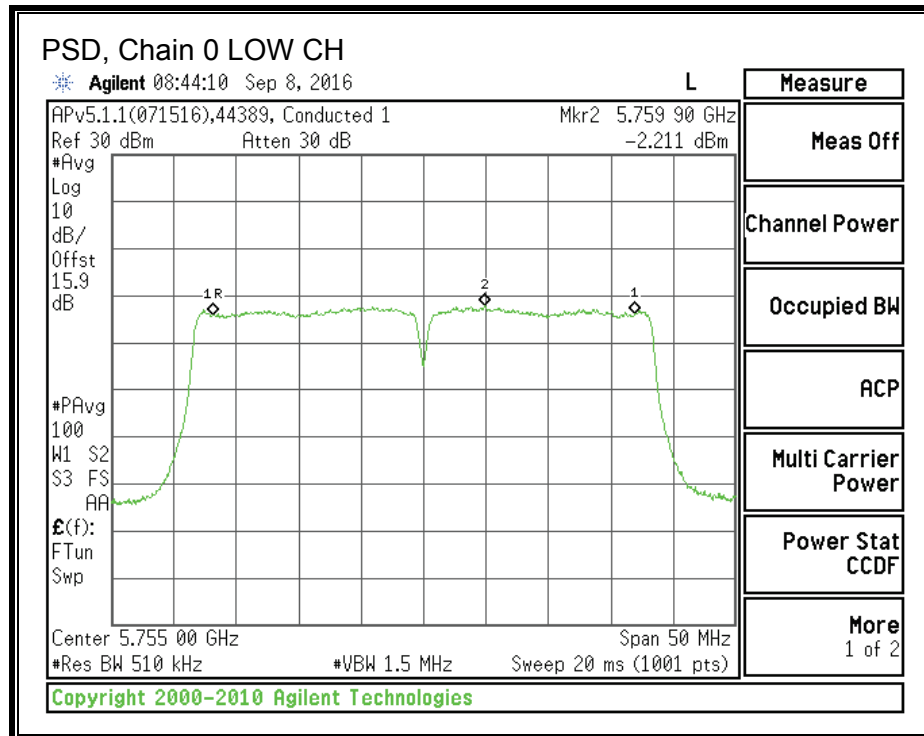
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5755	8.00	28.00
High	5795	8.00	28.00

<b>Duty Cycle CF (dB)</b>	0.59	<b>Included in Calculations of Corr'd PSD</b>
---------------------------	------	---

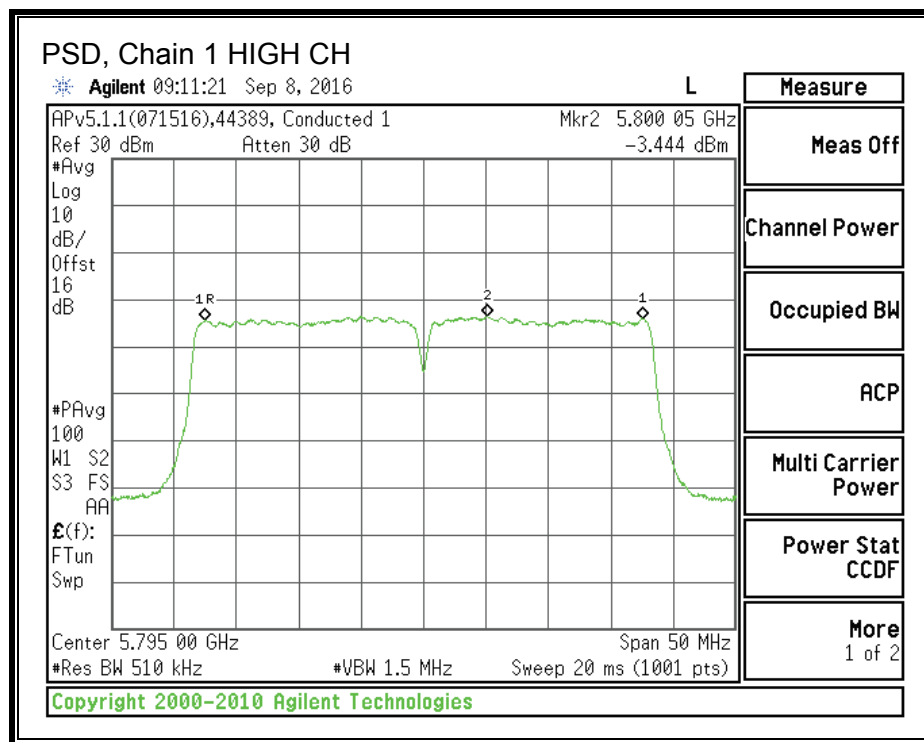
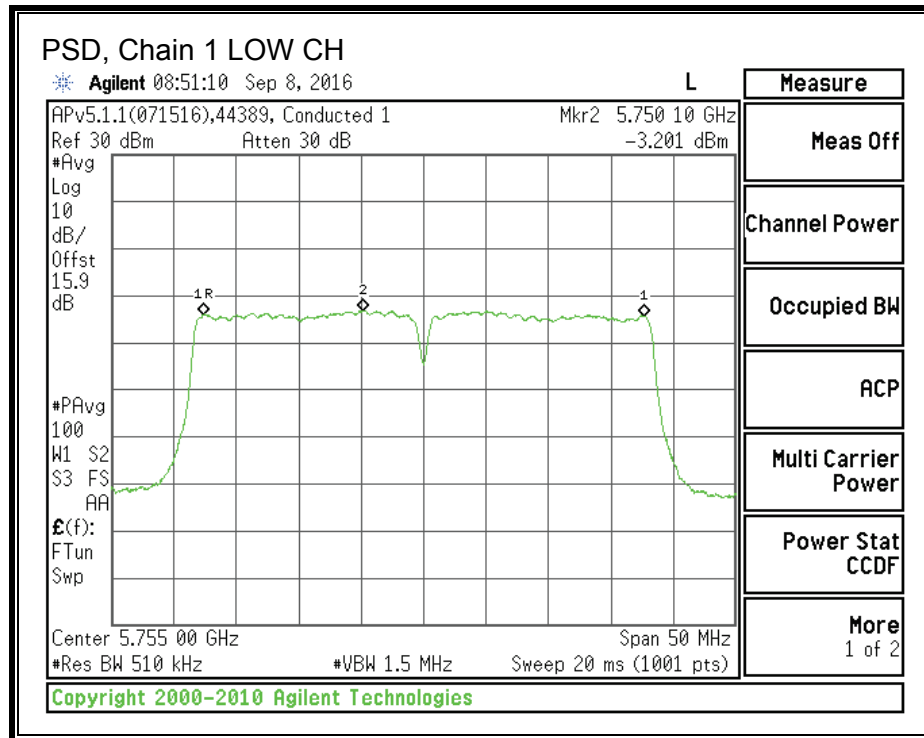
**PPSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5755	-2.21	-3.20	-2.15	2.87	28.00	-25.13
High	5795	-2.38	-3.44	-1.21	3.11	28.00	-24.89

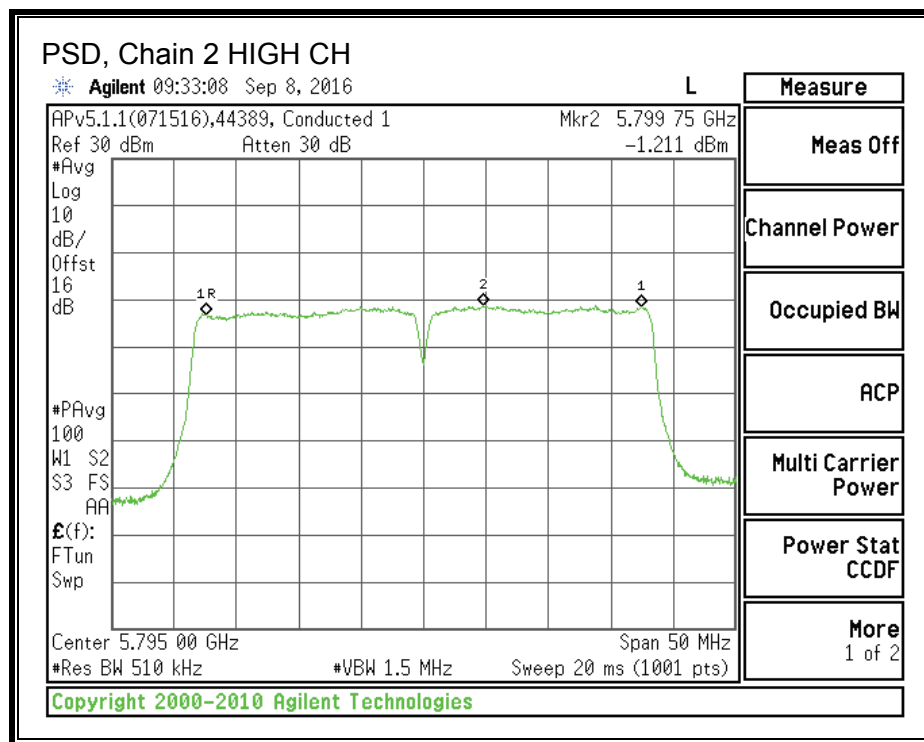
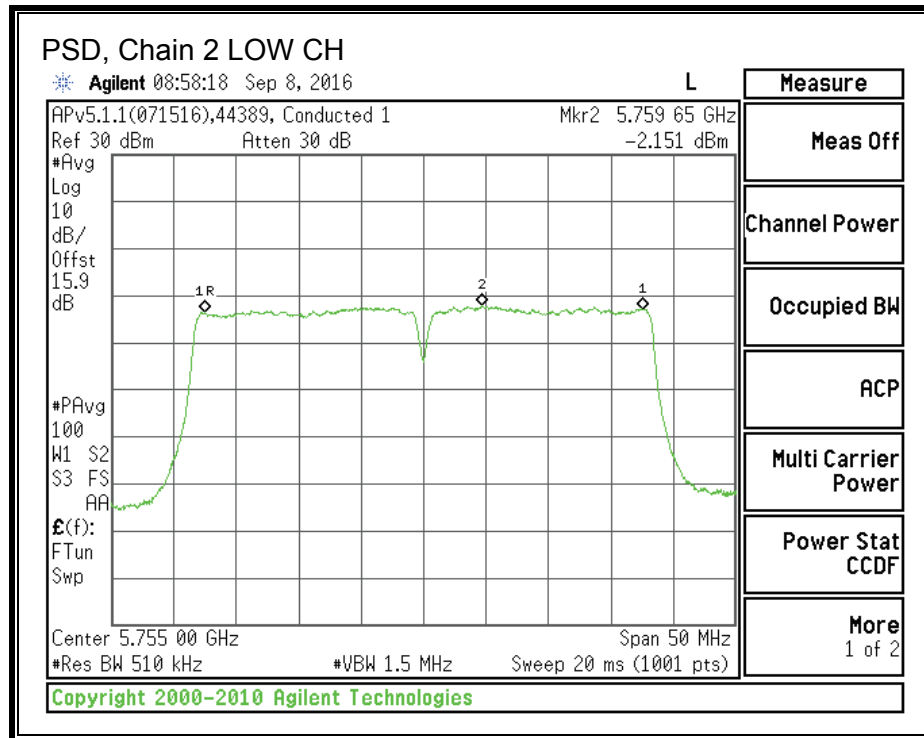
**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**





## 8.9. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

### 8.9.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.407 (e)

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

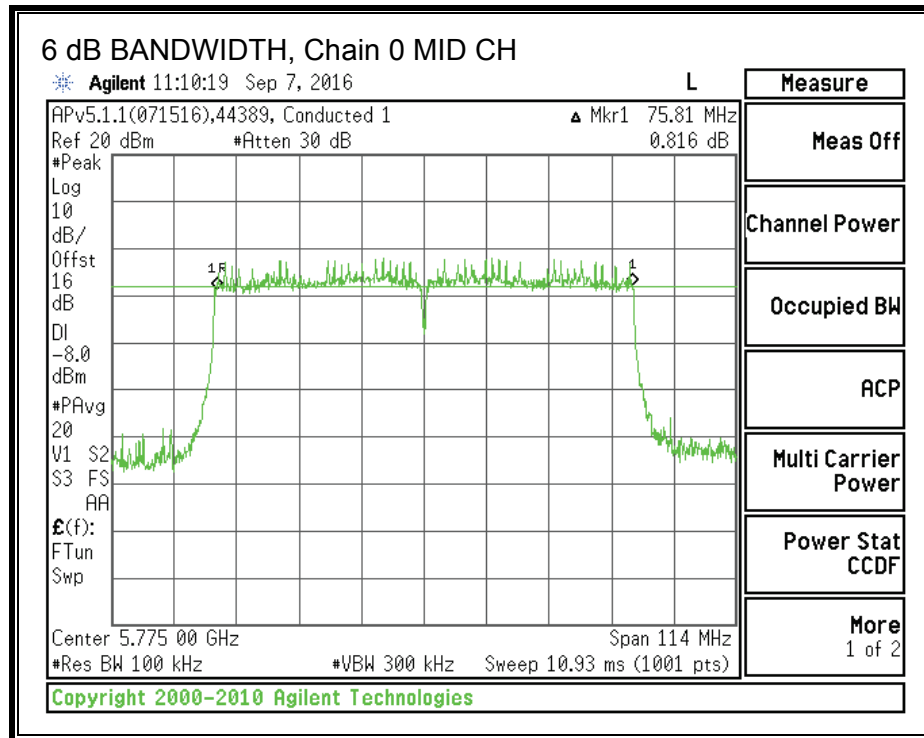
802.11ac VHT80 SDM (MCS0, Nss = 3)

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Mid	5775	75.81	76.36	75.70	0.5

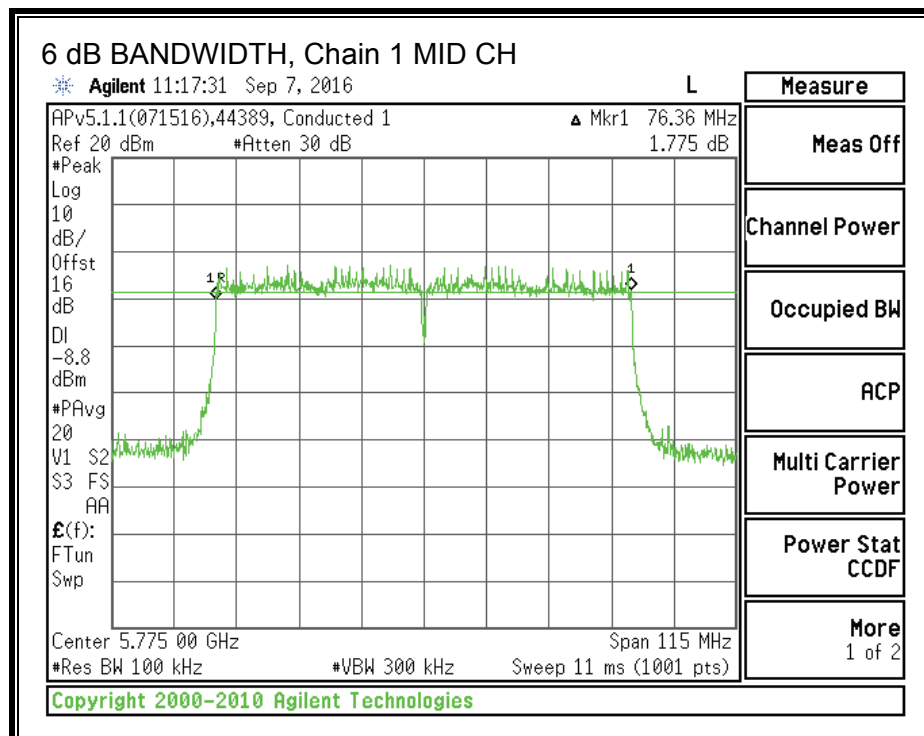
Test Performed: Niklas Haydon / Jeff Cabrera

Test Date: 2016-09-07

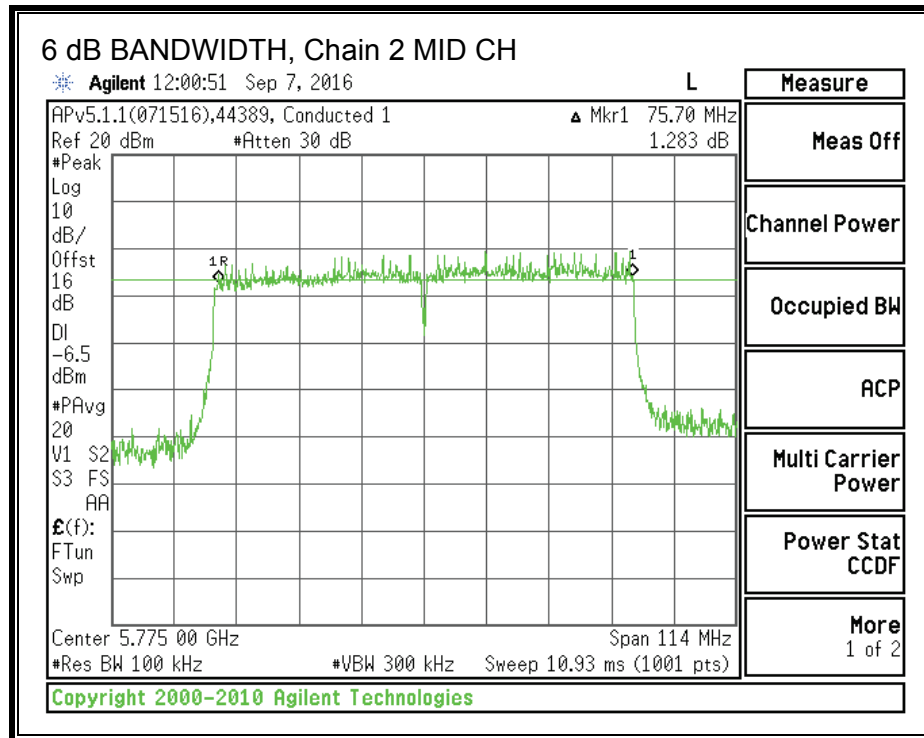
**6 dB BANDWIDTH, Chain 0**



**6 dB BANDWIDTH, Chain 1**



**6 dB BANDWIDTH, Chain 2**



## 8.9.2. 99% BANDWIDTH

### LIMITS

RSS-Gen Clause 6.6

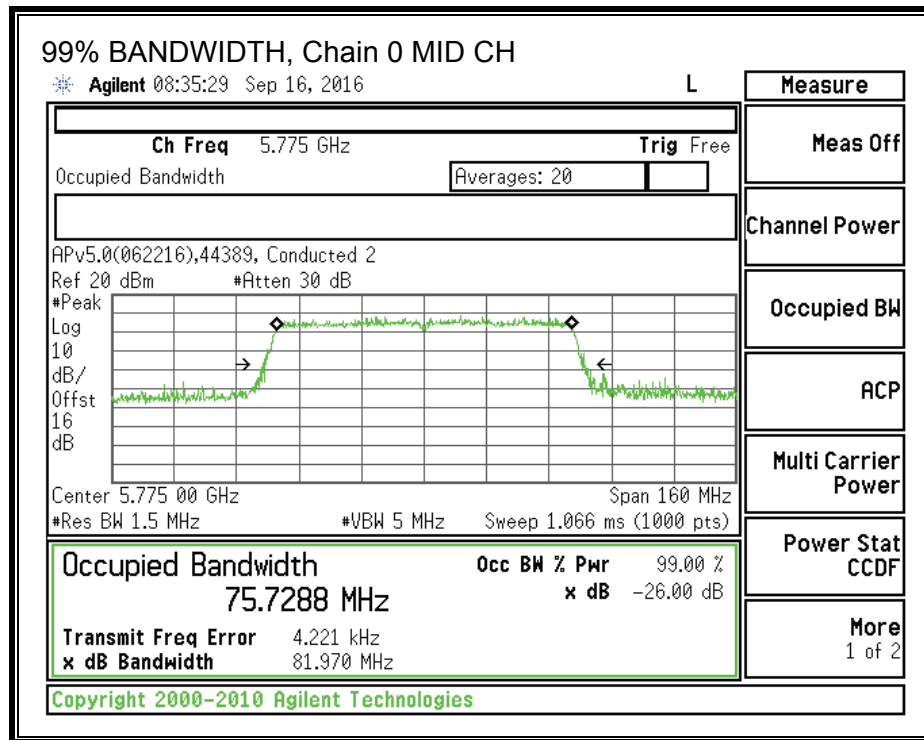
### RESULTS

802.11ac VHT80 SDM (MCS0, Nss = 3)

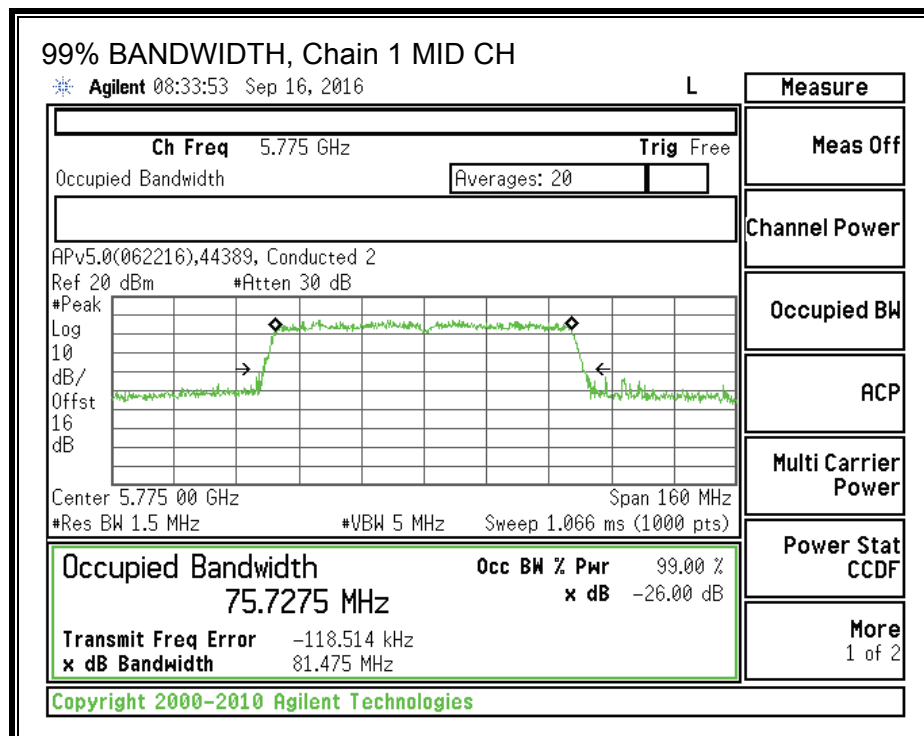
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Mid	5775	75.73	75.73	75.56

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-09-16

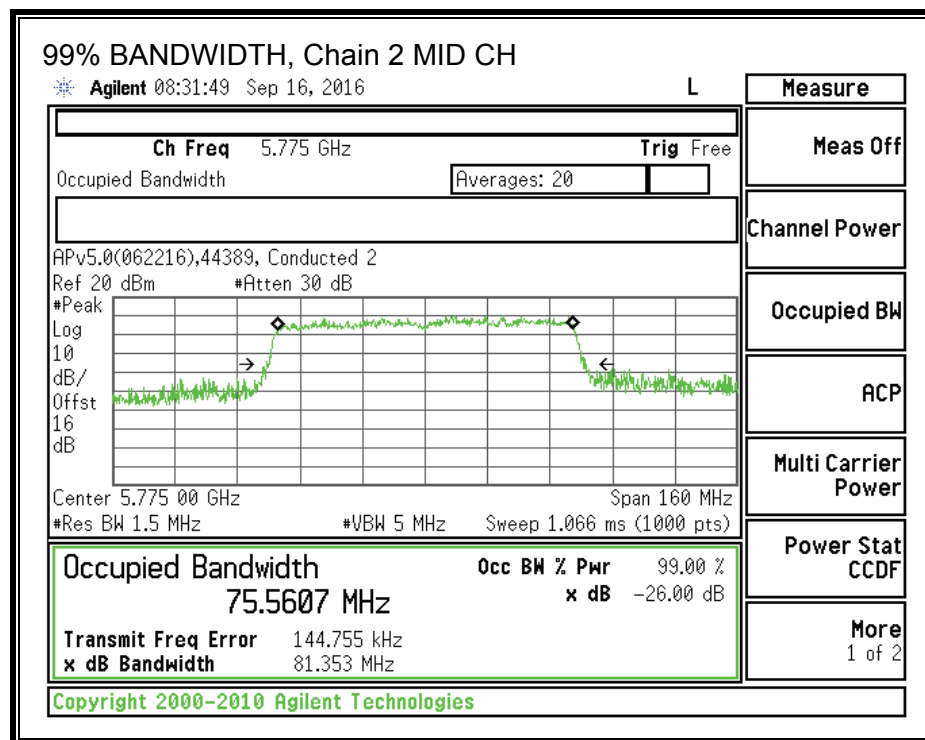
**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



**99% BANDWIDTH, Chain 2**



### 8.9.3. OUTPUT POWER

#### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

#### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11ac. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11ac CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

#### 802.11ac SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-10-24

## **RESULTS**

802.11ac VHT80 CDD (MCS0)

### **Antenna Gain and Limit**

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Mid	5775	8.00	28.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5775	13.86	13.98	15.22	19.17	28.00	-8.83

Note – The above data represents gated power measurements, as described in method PM-G.



802.11ac VHT80 SDM (MCS16)

**Antenna Gain and Limit**

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Mid	5775	8.00	28.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power
--------------------	------	--

**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5775	14.55	14.00	15.95	19.68	28.00	-8.32

Note – The above data represents gated power measurements, as described in method PM-G.

## 8.9.4. MAXIMUM POWER SPECTRAL DENSITY (PSD)

### LIMITS

FCC §15.407 (a) (3)

IC RSS-247 (6.2.4 [1])

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.

### DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11ac. Per KDB 662911, no array gain is added for power when  $N_{ANT} \leq 4$ . Therefore, the directional gains are as follows:

#### 802.11ac CDD Mode

Output Power

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

PSD

Antenna Gain (dBi)	10 * Log (3 chains) (dB)	Directional Gain (dBi)
8.00	4.77	12.77

#### 802.11ac SDM Mode

Output Power and PSD

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
8.00	8.00	8.00	8.00

Test Performed: Niklas Haydon / Jeff Cabrera  
Test Date: 2016-10-24

## **RESULTS**

802.11ac VHT80 CDD (MCS0)

### **Antenna Gain and Limit**

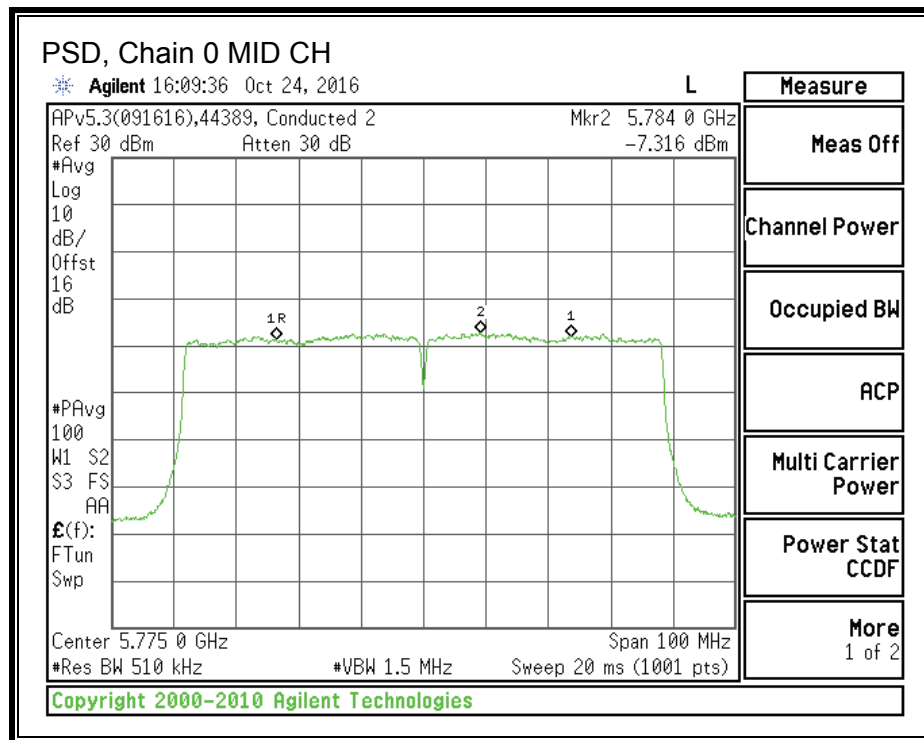
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Mid	5775	12.77	23.23

Duty Cycle CF (dB)	0.84	Included in Calculations of Corr'd PSD
--------------------	------	--

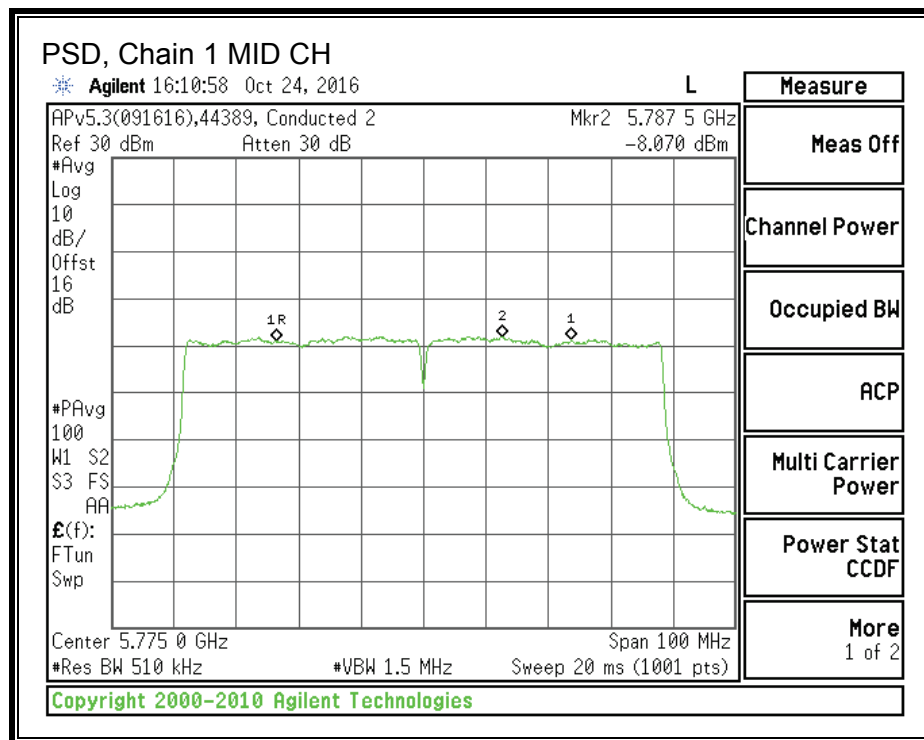
### **PPSD Results**

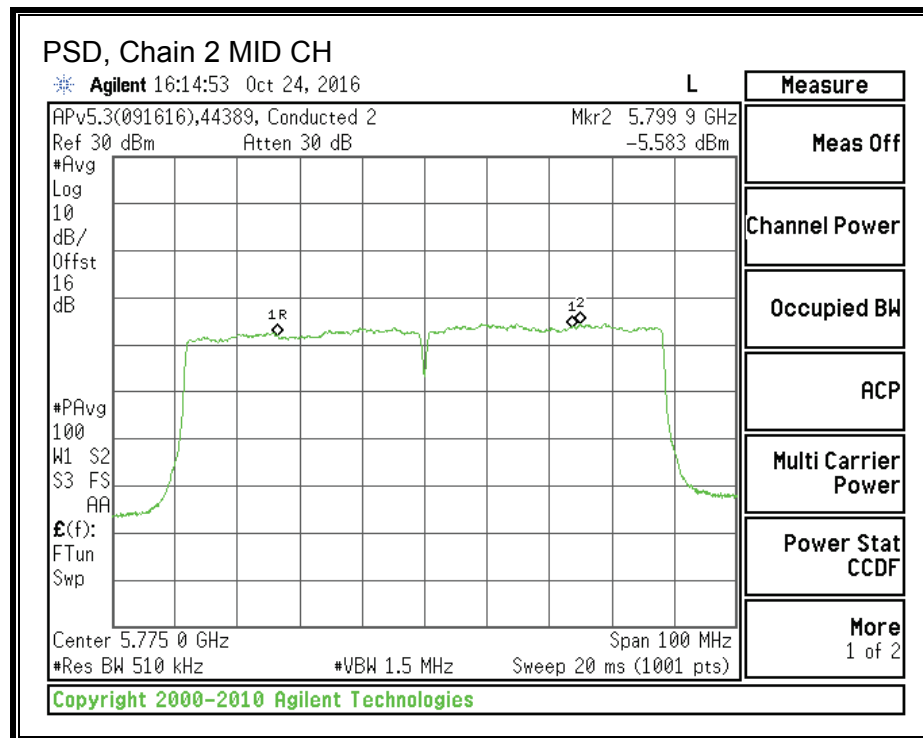
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5775	-7.32	-8.07	-5.58	-1.25	23.23	-24.48

**PSD, Chain 0**



**PSD, Chain 1**





802.11ac VHT80 SDM (MCS16)

**Antenna Gain and Limit**

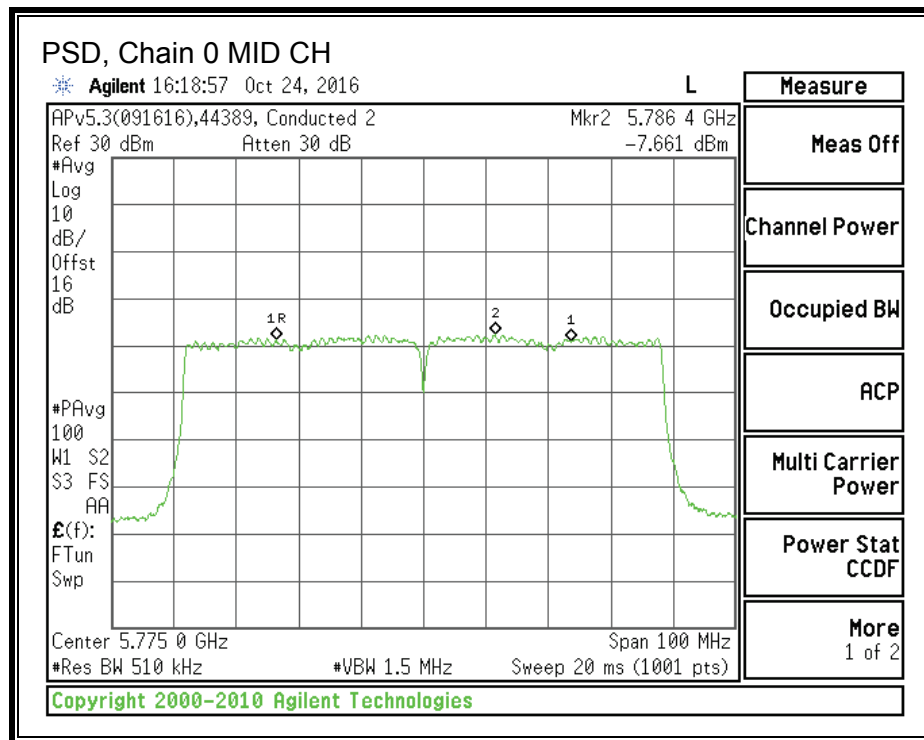
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Mid	5775	8.00	28.00

Duty Cycle CF (dB)	1.80	Included in Calculations of Corr'd PSD
--------------------	------	--

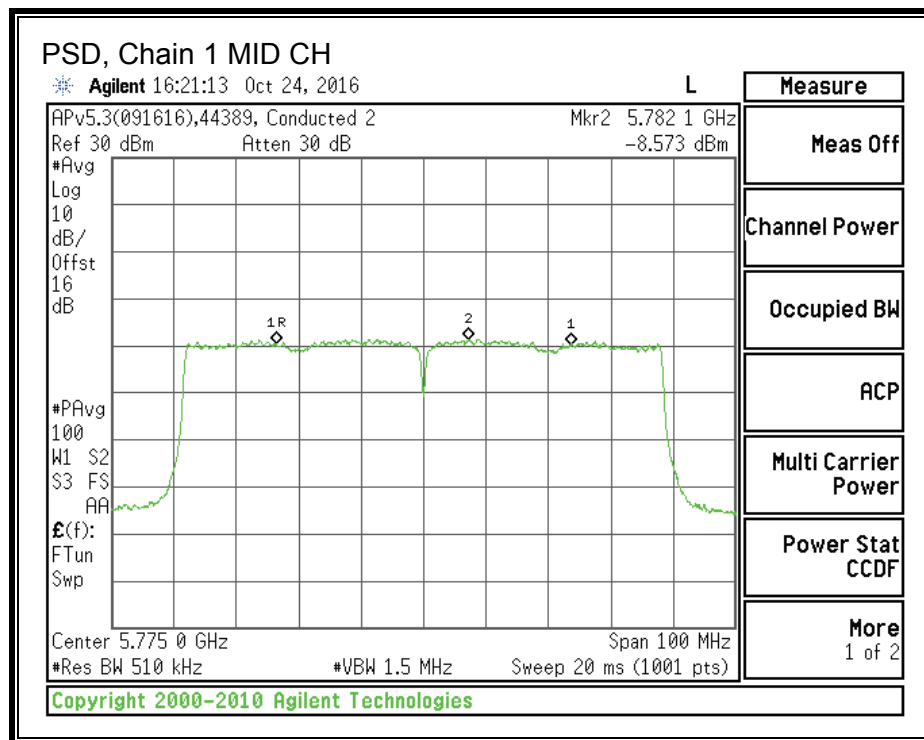
**PPSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Chain 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Mid	5775	-7.66	-8.57	-6.48	-0.91	28.00	-28.91

**PSD, Chain 0**



**PSD, Chain 1**



**PSD, Chain 2**

