



**FCC 47 CFR PART 15 SUBPART E**

**CERTIFICATION TEST REPORT**

**FOR**

**APPLE TV**

**MODEL NUMBER: A1625**

**FCC ID: BCGA1625**

**REPORT NUMBER: 15U20087-E5, REVISION E**

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
1 INFINITE LOOP  
CUPERTINO, CA 95014, U.S.A.

**EUT DESCRIPTION:** APPLE TV

**MODEL:** A1625

**SERIAL NUMBER:** C07NW001GFM5; C07NW003GFM5 (DFS)

**DATE TESTED:** FEBRUARY 28 – MAY 06, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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.

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 14-30, FCC KDB 662911 D01 v02r01, FCC KDB 905462 D02 v01r01/D03 v01r01/D06 v01, FCC KDB 789033 D02, FCC KDB 644545 D03 v01 and ANSI C63.10- 2013.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input type="checkbox"/> Chamber A	<input checked="" type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input checked="" type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input checked="" type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input checked="" type="checkbox"/> Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B - 1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable

Loss (dB) – Preampl Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The Apple TV device is a digital media receiver designed to play internet content onto a TV through an HDMI port. It incorporates Wi-Fi and Bluetooth radios.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

#### 5.2GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	17.85	60.95
	802.11n HT20 CDD 2TX	19.42	87.50
	802.11n HT20 2TX STBC	19.98	99.54
5190 - 5230	802.11n HT40 SISO	17.00	50.12
	802.11n HT40 CDD 2TX	19.44	87.90
	802.11n HT40 2TX STBC	19.98	99.54
5210	802.11ac VHT80 SISO	10.65	11.61
	802.11ac VHT80 2TX CDD	13.22	20.99
	802.11ac VHT80 2TX STBC/SDM	Covered by 802.11n HT80 CDD 2TX	

#### 5.3GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5260 - 5320	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	17.90	61.66
	802.11n HT20 2TX CDD	20.01	100.23
	802.11n HT20 2TX STBC	19.95	98.86
5270 - 5310	802.11n HT40 SISO	17.00	50.12
	802.11n HT40 2TX CDD	19.51	89.33
	802.11n HT40 2TX STBC	19.86	96.83
5290	802.11ac VHT80 SISO	10.99	12.56
	802.11ac VHT80 2TX CDD	14.15	26.00
	802.11ac VHT80 2TX STBC/SDM	Covered by 802.11n HT80 CDD 2TX	

**5.6GHz Band**

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5500 - 5700	802.11a	Covered by 802.11n HT20 SISO	
5720	802.11a	Covered by 802.11n HT20 SISO	
5500 - 5700	802.11n HT20 SISO	18.00	63.10
5720	802.11n HT20 SISO	16.91	49.09
5500 - 5700	802.11n HT20 2TX CDD	18.45	69.98
5720	802.11n HT20 2TX CDD	17.51	56.36
5500 - 5700	802.11n HT20 2TX STBC	19.95	98.86
5720	802.11n HT20 2TX STBC	Covered by 802.11n HT20 CDD 2TX	
5510 - 5670	802.11n HT40 SISO	17.00	50.12
5710	802.11n HT40 SISO	16.52	44.87
5510 - 5670	802.11n HT40 2TX CDD	17.97	62.66
5710	802.11n HT40 2TX CDD	16.98	49.89
5510 - 5670	802.11n HT40 2TX STBC	20.01	100.23
5710	802.11n HT40 STBC/SDM 2TX	17.77	59.84
5530-5610	802.11ac VHT80 SISO	16.50	44.67
5690	802.11ac VHT80 SISO	16.32	42.85
5530-5610	802.11ac VHT80 CDD 2TX	19.72	93.76
5690	802.11ac VHT80 CDD 2TX	18.47	70.31
5530-5610	802.11ac VHT80 2TX STBC	Covered by 802.11n VHT80 CDD 2TX	
5690	802.11ac VHT80 2TX STBC	Covered by 802.11n VHT80 CDD 2TX	

**5.8GHz Band**

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a	Covered by 802.11n HT20 SISO	
5745 - 5825	802.11n HT20 SISO	17.77	59.84
5745 - 5825	802.11a 2TX CDD	Covered by 802.11n HT20 CDD 2TX	
5745 - 5825	802.11n HT20 CDD 2TX	20.94	124.17
5745 - 5825	802.11n HT20 STBC/SDM 2TX	20.85	121.62
5755 - 5795	802.11n HT40 SISO	16.90	48.98
5755 - 5795	802.11n HT40 CDD 2TX	18.93	78.16
5755 - 5795	802.11n HT40 STBC/SDM 2TX	Covered by 802.11n HT40 CDD 2TX	
5775	802.11ac VHT80 SISO	14.50	28.18
5775	802.11ac VHT80 CDD 2TX	16.50	44.67
5775	802.11ac VHT80 STBC/SDM 2TX	Covered by 802.11n VHT80 CDD 2TX	

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain	
	Antenna 1	Antenna 2
5.2	4.00	1.01
5.3	4.09	1.25
5.5	4.13	2.49
5.8	3.99	2.41

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Version 7.16.170.5

## 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

For 1Tx modes, both chains have the same power; output power and PSD measurement for 1Tx modes are reported only for the point with higher antenna gain.

The fundamental of the EUT was investigated in three orthogonal orientations X/Y/Z, it was determined that Y-landscape orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y-landscape orientation.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps  
802.11n HT20 mode: MCS0  
802.11n HT40 mode: MCS0  
802.11ac VHT20 mode: MCS0  
802.11ac VHT40 mode: MCS0  
802.11ac VHT80 mode: MCS0

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages and have the same power settings.

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

For the co-location test, no other emissions were found after the conducted measurement with all different combination frequencies between BT & 5GHz bands were investigated.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	NA
Laptop	Lenovo	7659	L3-AL664 08/03	NA
Dongle	N/A	N/A	HDG1409226823	NA

### I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	3	N/A

### I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	3	N/A

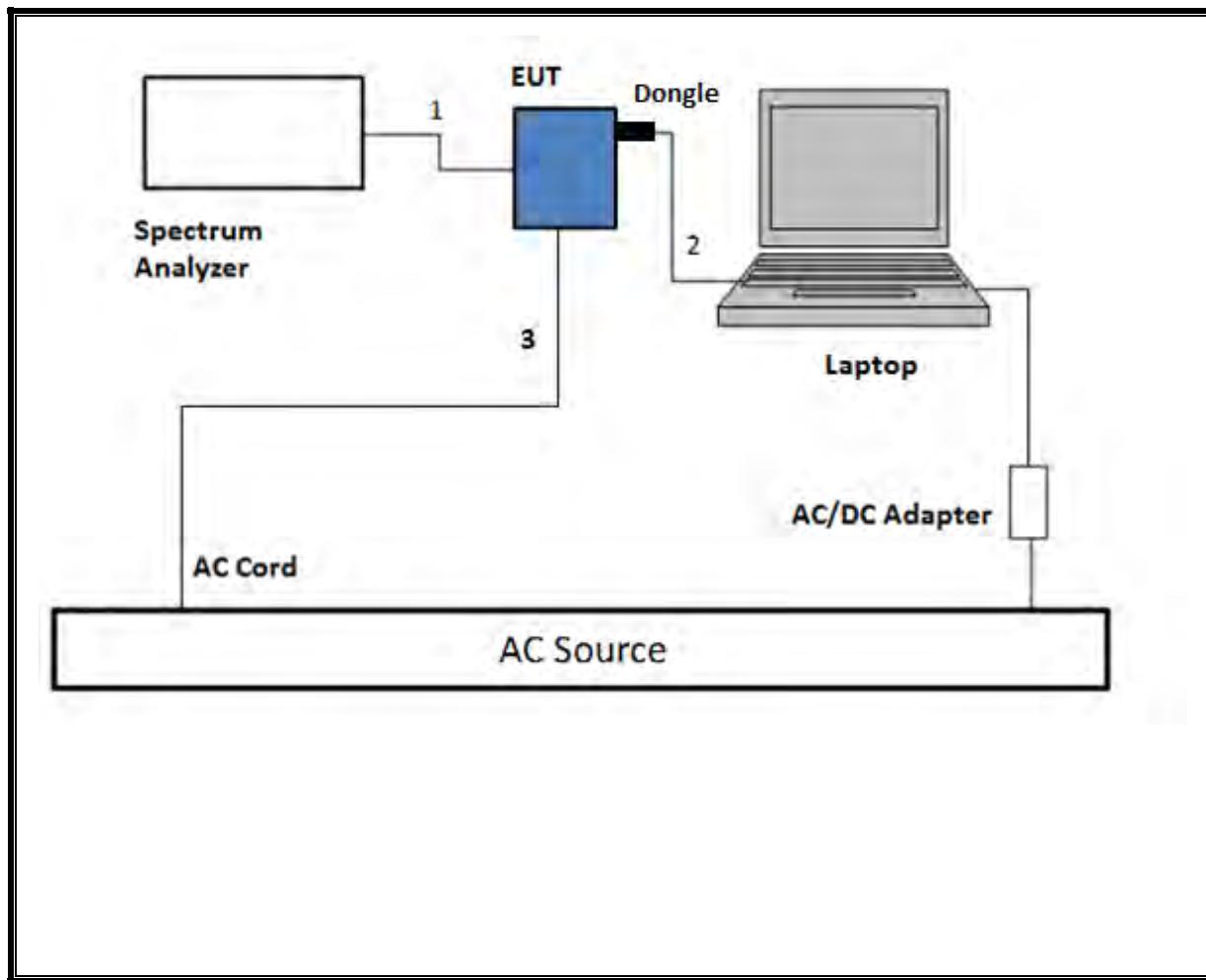
### I/O CABLES (AC POWER CONDUCTED TEST AND BELOW 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	3	N/A

## TEST SETUP

The EUT was powered by AC cord. Test software exercised the radio card.

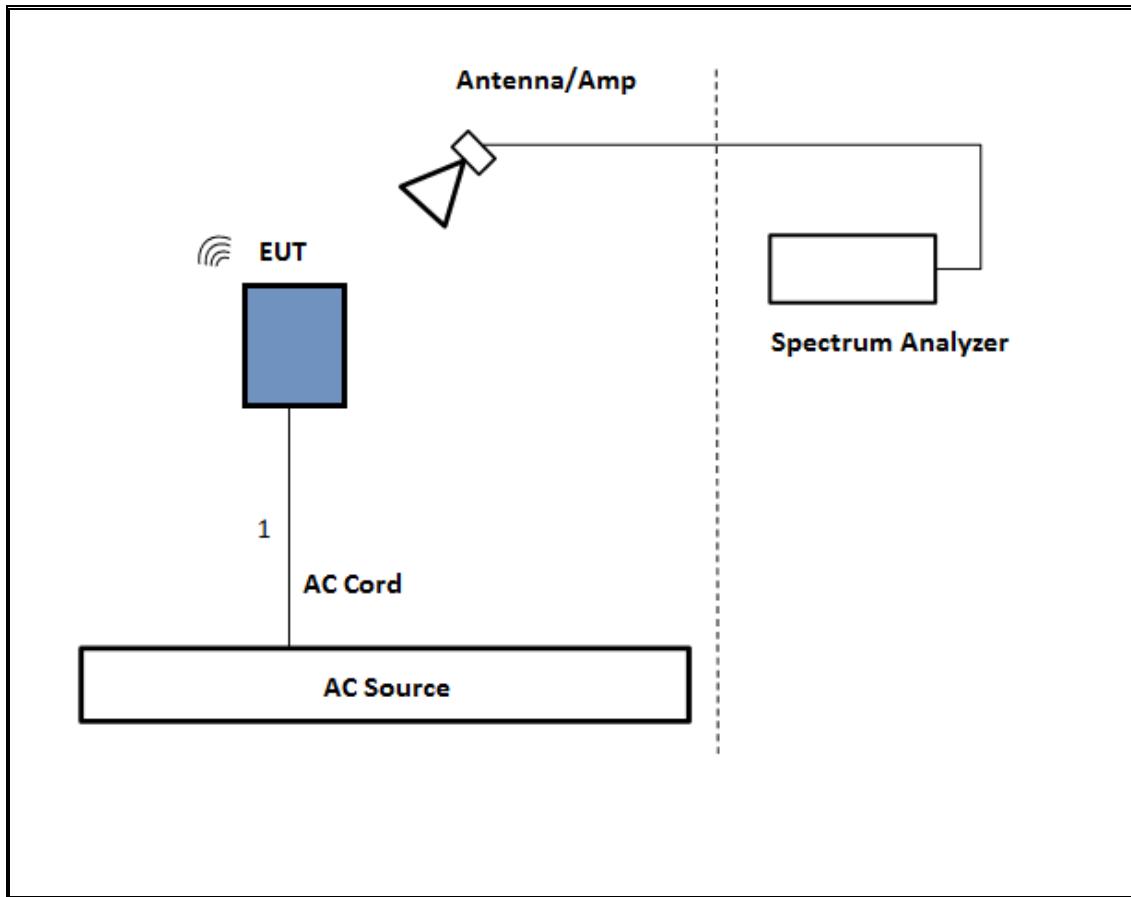
## SETUP DIAGRAM



**TEST SETUP- RADIATED-ABOVE 1 GHZ**

The EUT was powered by AC cord. Test software exercised the EUT.

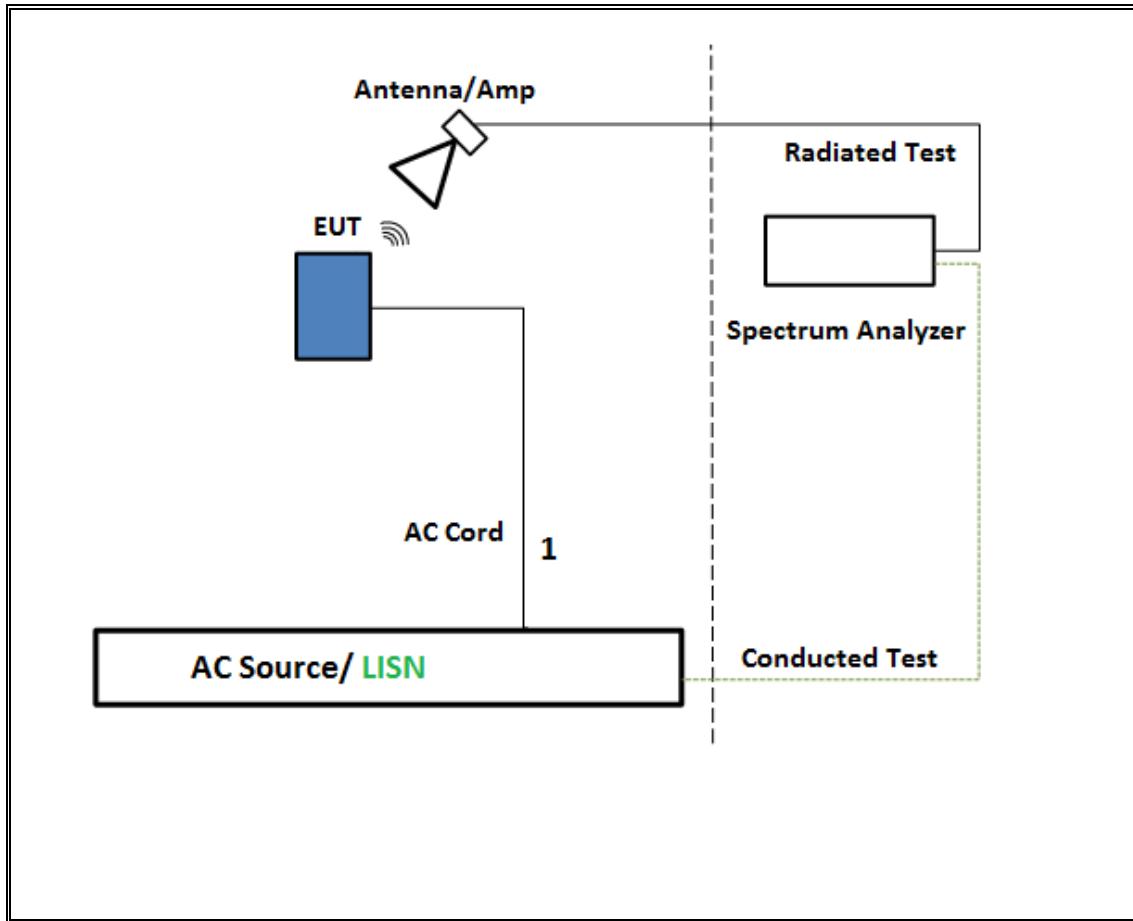
**SETUP DIAGRAM**



### TEST SETUP- BELOW 1GHZ & AC LINE CONDUCTED TESTS

The EUT was powered by AC cord. Test software exercised the EUT.

### SETUP DIAGRAM



## 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	00143448	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/26/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323561	5/28/2015
Spectrum Analyzer, PXA, 3Hz to 50GHz	Agilent	N9030A	MY52350427	9/13/2015
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	325117	6/5/2015
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	MY53310959	5/7/2015
Power Meter, P-series single channel	Agilent	N1911A	GB45100212	10/9/2015
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	MY53260010	7/12/2015
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	12/17/2015
Horn Antenna, 40GHz	ARA	MWH-2640/B	1029	7/15/2015
Spectrum Analyzer, 40 GHz	Agilent	8564E	3943A01643	8/6/2015
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	3008A01114	10/4/2015
Amplifier, 26 to 40GHz	Miteq	NSP4000-SP2	1029	9/3/2015
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	100935	9/16/2015
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	114	1/16/2016
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	N/A	7/28/2015
UL SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014	
Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, April 3, 2015	

## 7. MEASUREMENT METHODS

26 dB Emission BW: KDB 789033 D02 v01, Section C.

99% Occupied BW: KDB 789033 D02 v01, Section D.

Conducted Output Power: KDB 789033 D02 v01, Section E.3.a (Method PM).

Power Spectral Density: KDB 789033 D02 v01, Section F.

Unwanted emissions in restricted bands: KDB 789033 D02 v01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01, Sections G.3, G.4, and G.5.

## 8. ANTENNA PORT TEST RESULTS

### 8.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

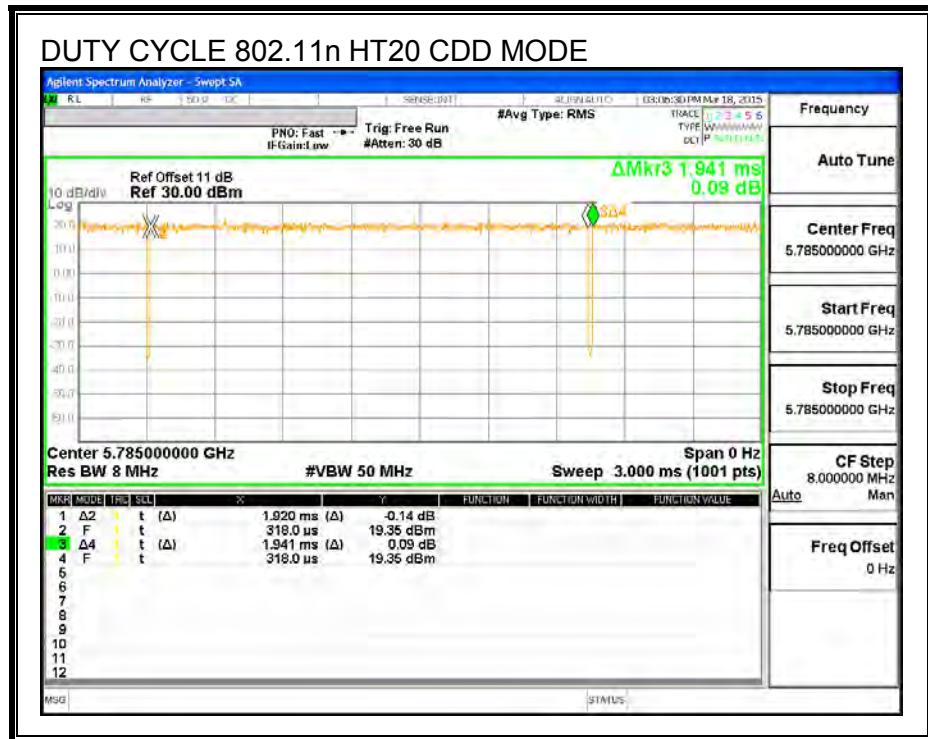
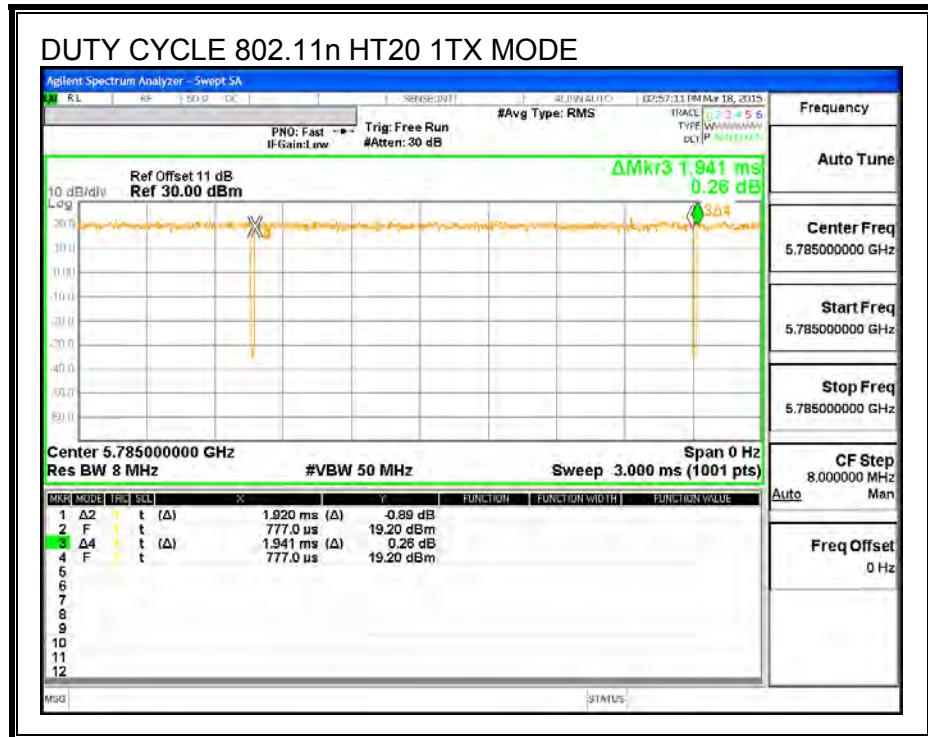
#### PROCEDURE

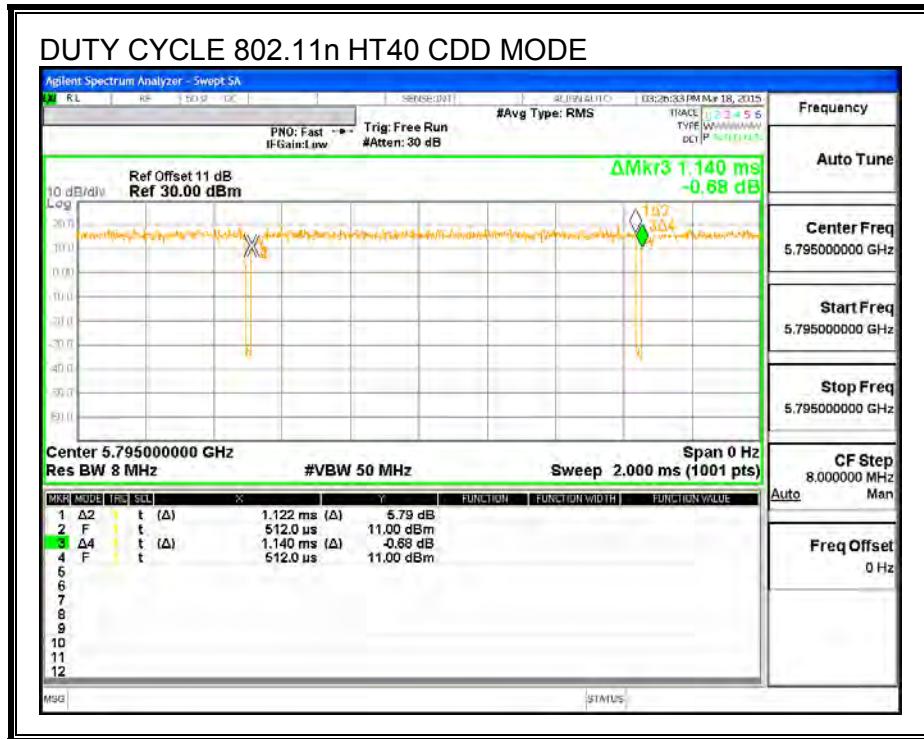
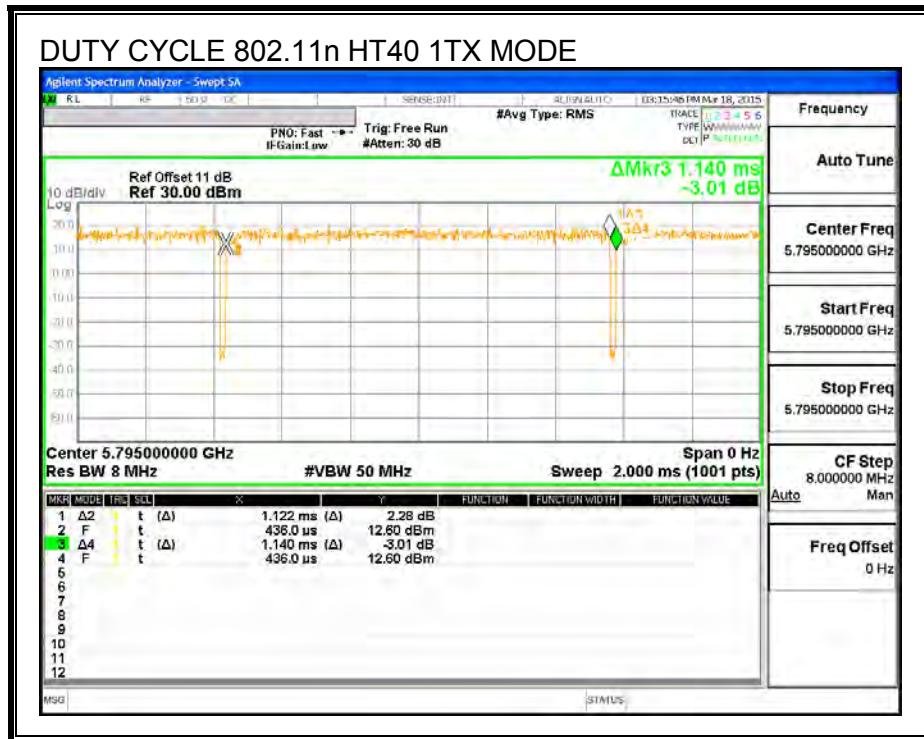
KDB 789033 Zero-Span Spectrum Analyzer Method.

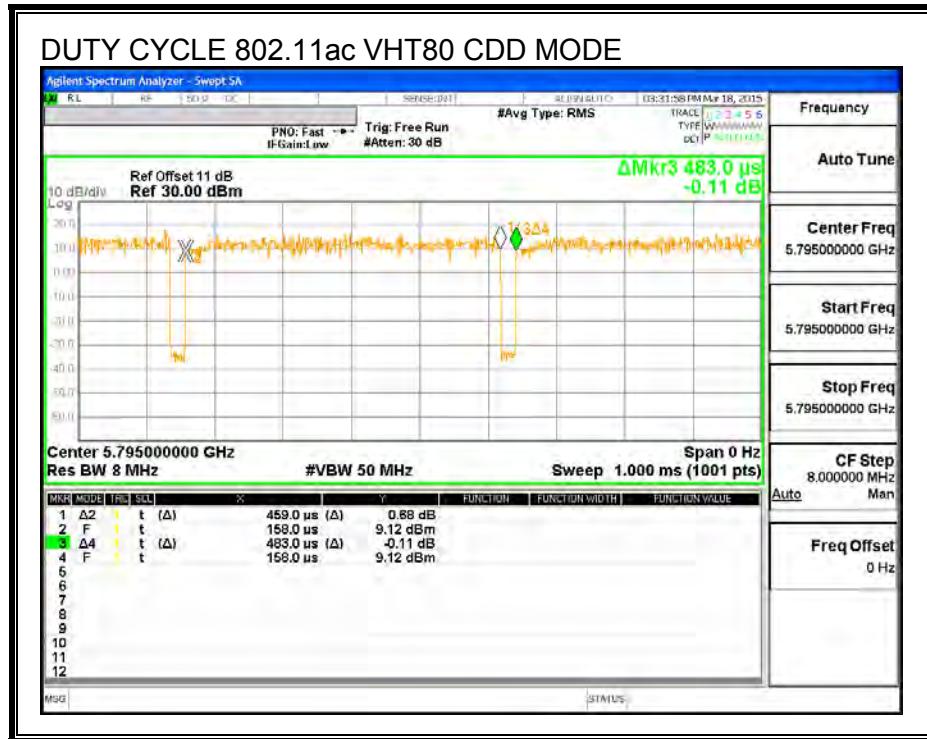
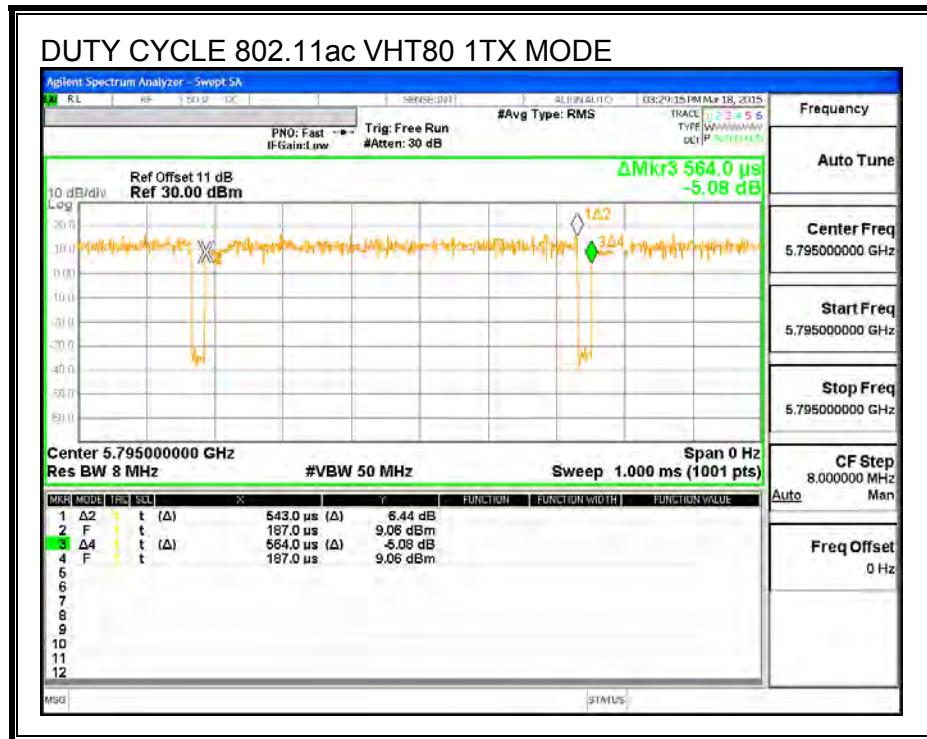
#### RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11n HT20 1TX	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT20 CDD	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT40 1TX	1.122	1.140	0.984	98.42%	0.00	0.010
802.11n HT40 CDD	1.122	1.140	0.984	98.42%	0.00	0.010
802.11ac VHT80 1TX	0.543	0.564	0.963	96.28%	0.16	1.842
802.11ac VHT80 CDD	0.459	0.483	0.950	95.03%	0.22	2.179

## DUTY CYCLE PLOTS







## 8.2. 802.11n HT20 SISO MODE IN THE 5.2 GHz BAND

### 8.2.1. 26 dB BANDWIDTH

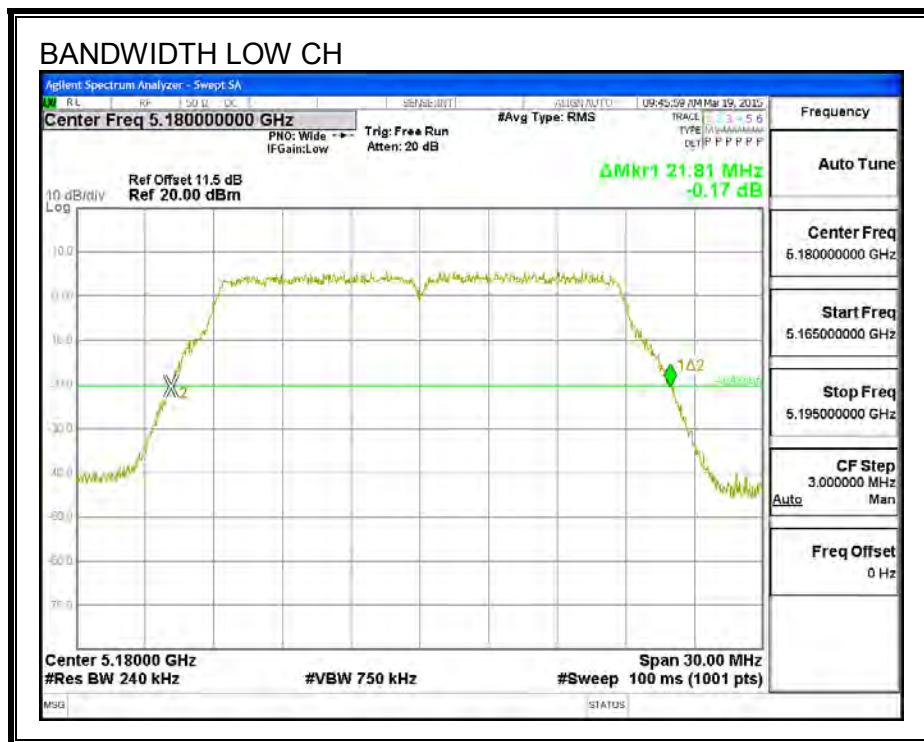
## LIMITS

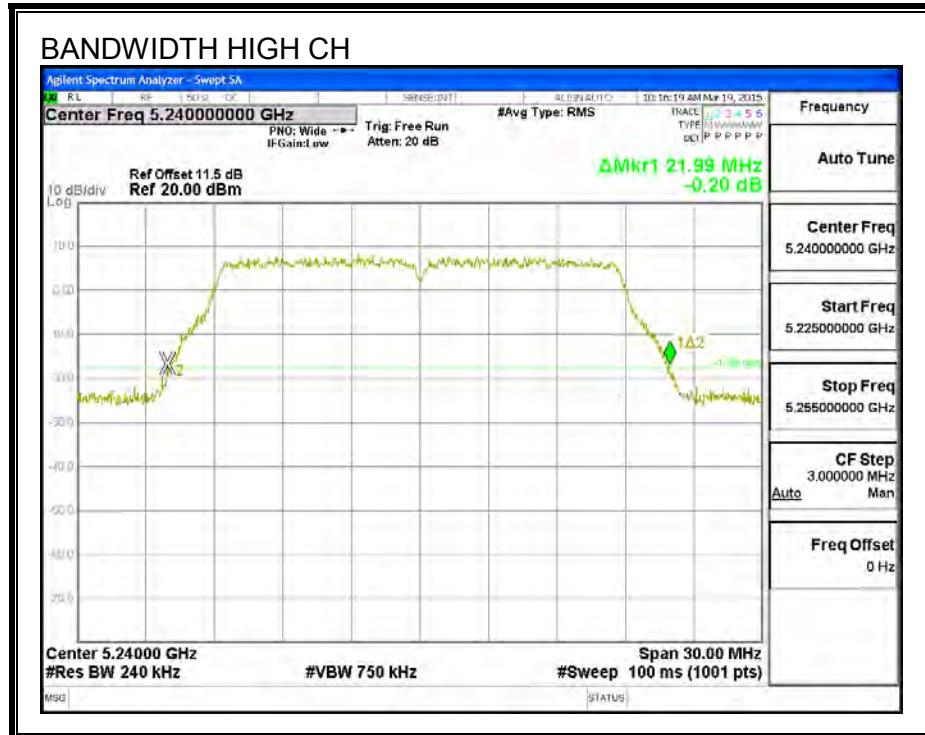
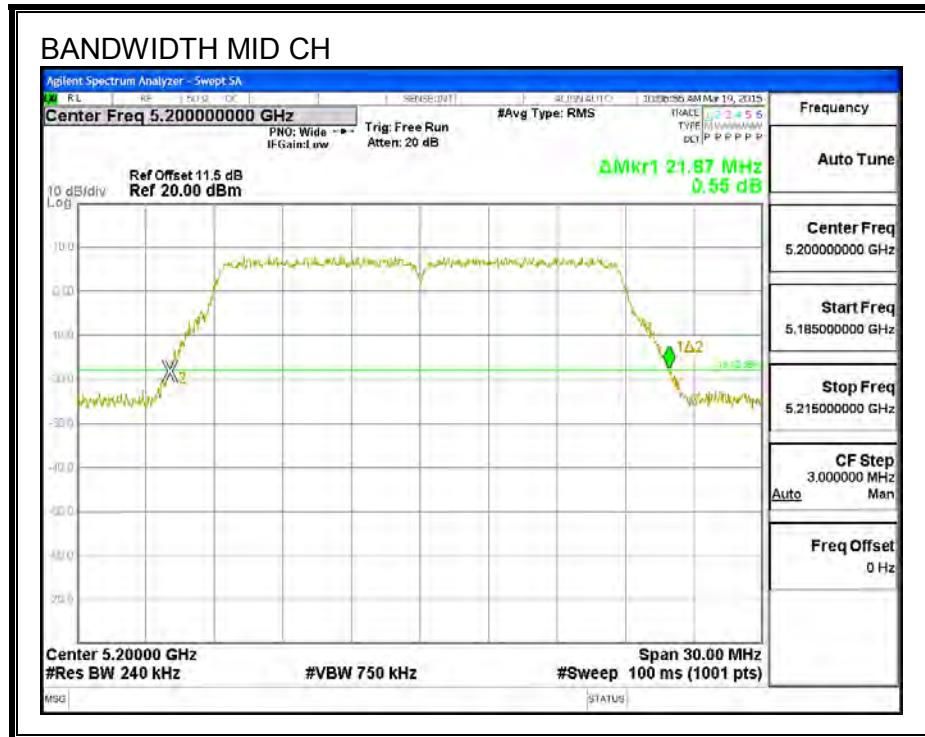
None; for reporting purposes only.

## **RESULTS**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	21.81
Mid	5200	21.87
High	5240	21.99

## **26 dB BANDWIDTH**





### 8.2.2. 99% BANDWIDTH

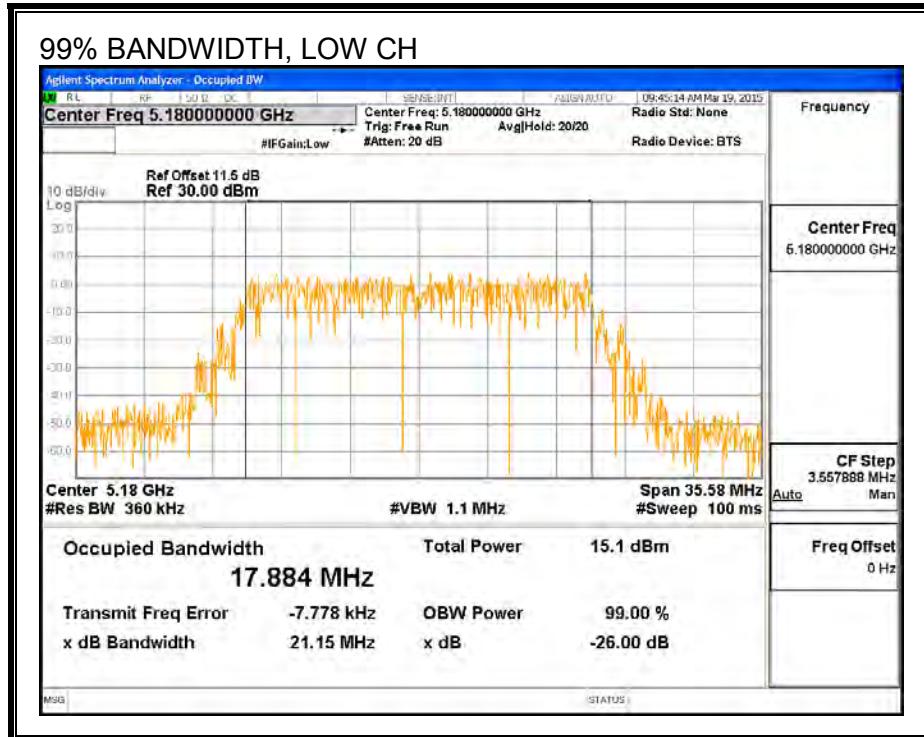
#### LIMITS

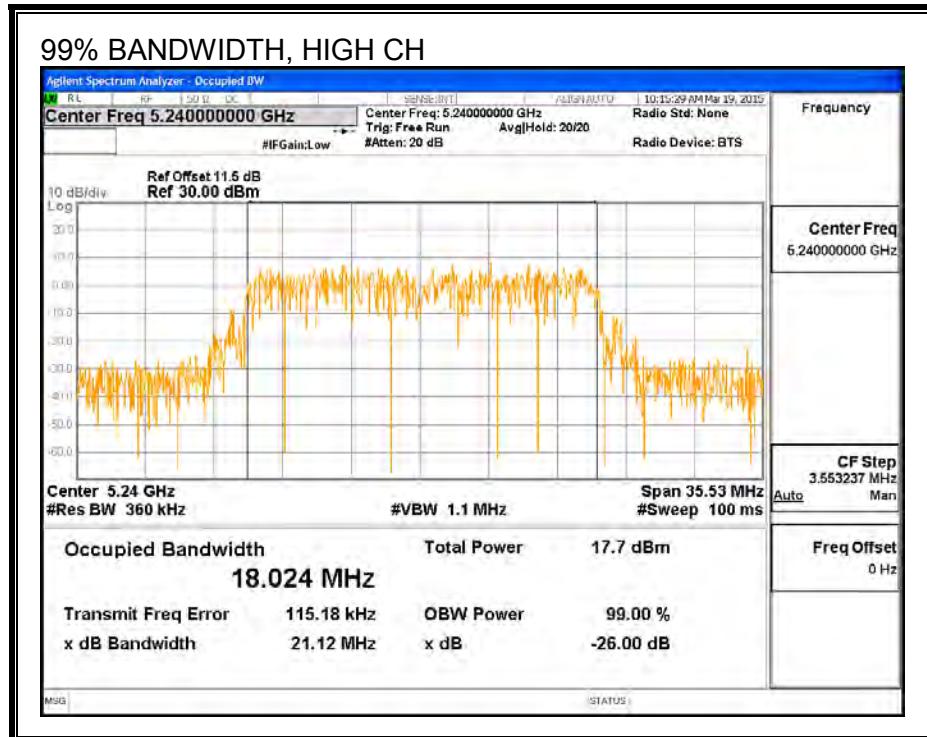
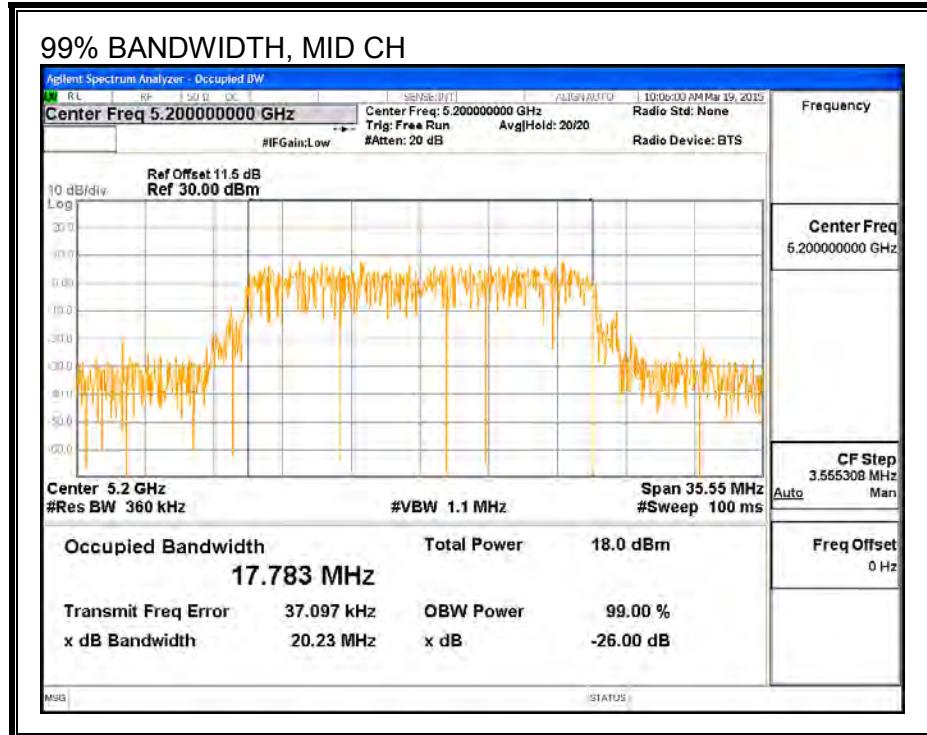
None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% BW (MHz)
Low	5180	17.8840
Mid	5200	17.7830
High	5240	18.0240

#### 99% BANDWIDTH, Chain 1





### 8.2.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5180	14.87
Mid	5200	17.84
High	5240	17.85

## 8.2.4. 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

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

### 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	4.00	4.00	24.00	11.00
Mid	5200	4.00	4.00	24.00	11.00
High	5240	4.00	4.00	24.00	11.00

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

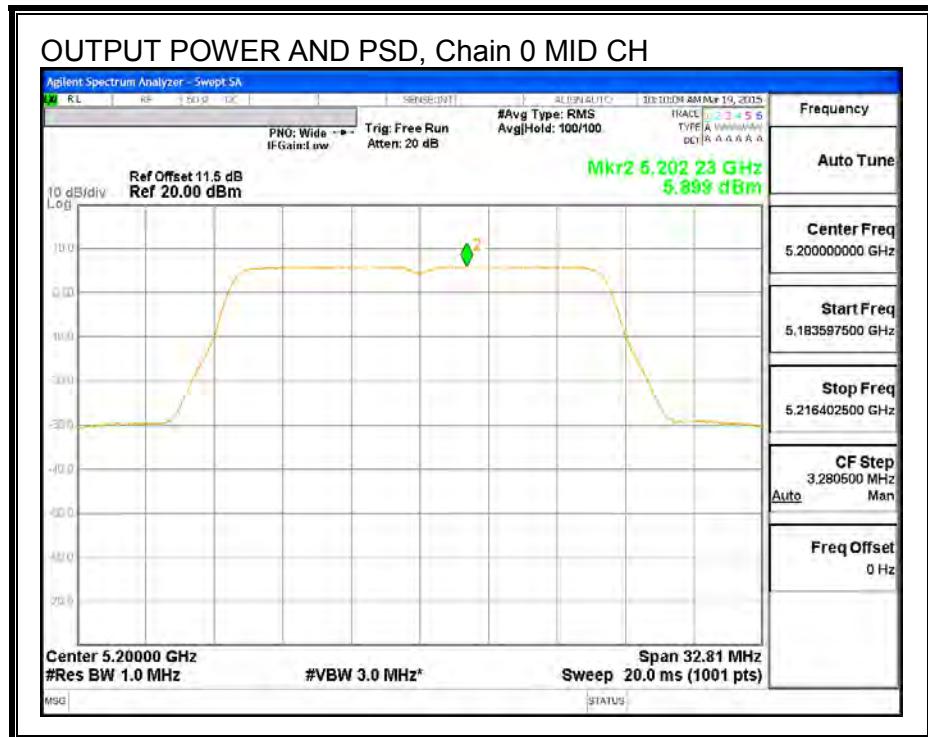
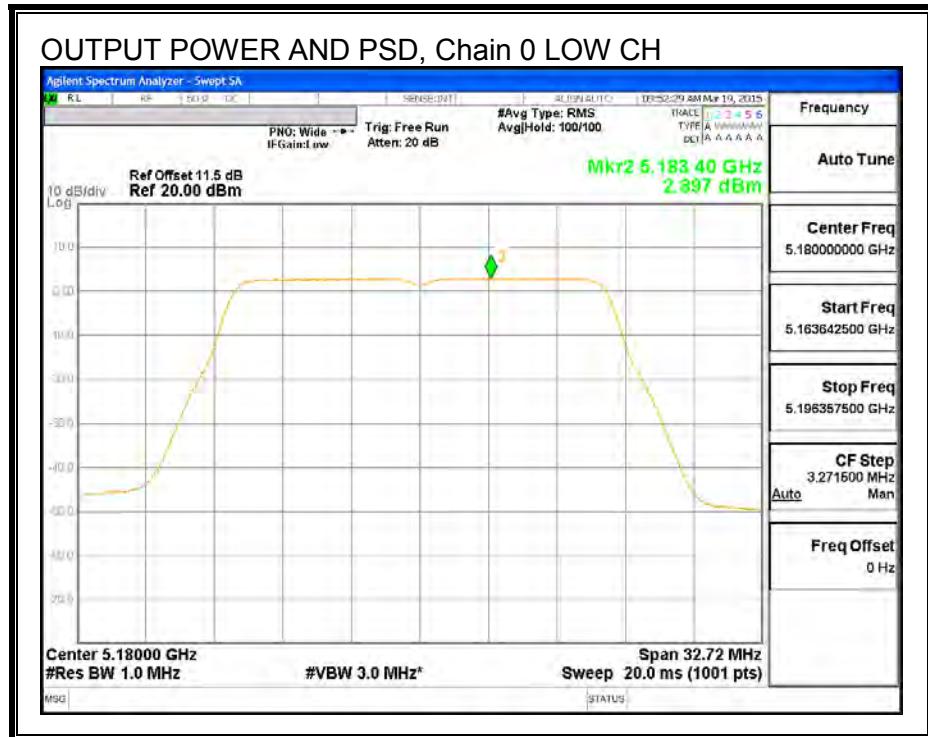
**Output Power Results**

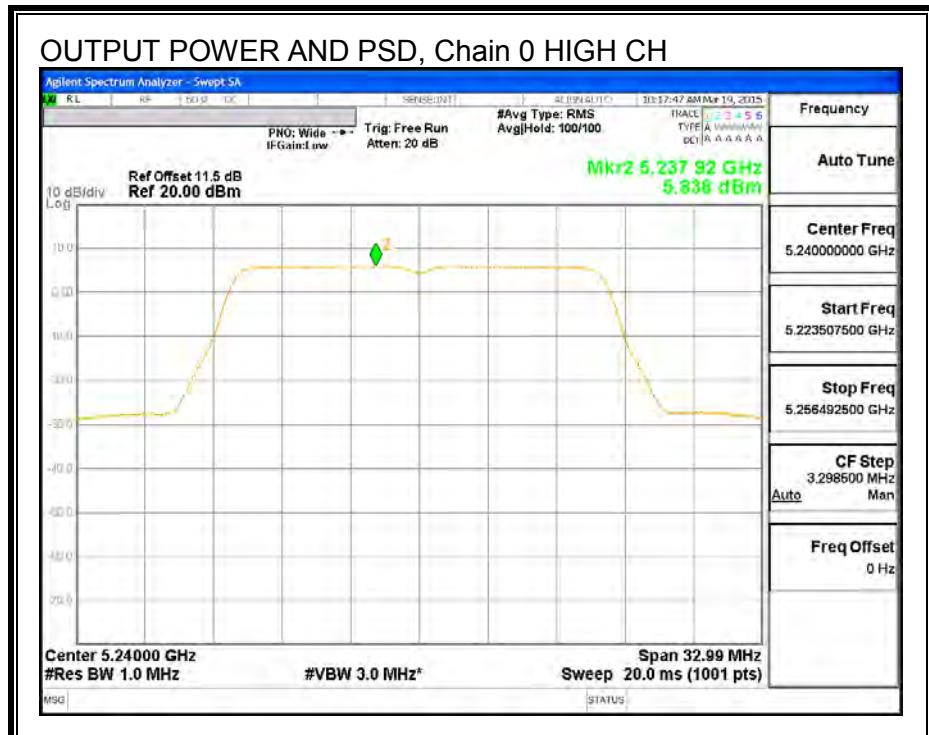
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.87	14.87	24.00	-9.13
Mid	5200	17.84	17.84	24.00	-6.16
High	5240	17.85	17.85	24.00	-6.15

**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	2.90	2.90	11.00	-8.10
Mid	5200	5.90	5.90	11.00	-5.10
High	5240	5.84	5.84	11.00	-5.16

## **OUTPUT POWER AND PSD, Chain 0**





### 8.3. 802.11n HT20 2Tx CDD MODE IN THE 5.2 GHz BAND

#### 8.3.1. 26 dB BANDWIDTH

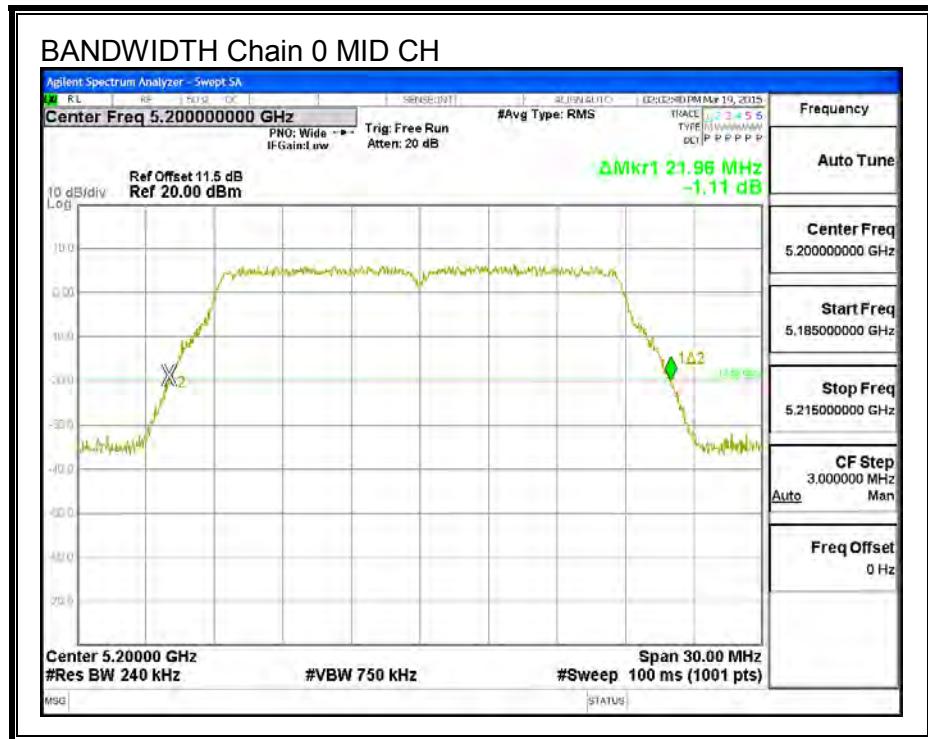
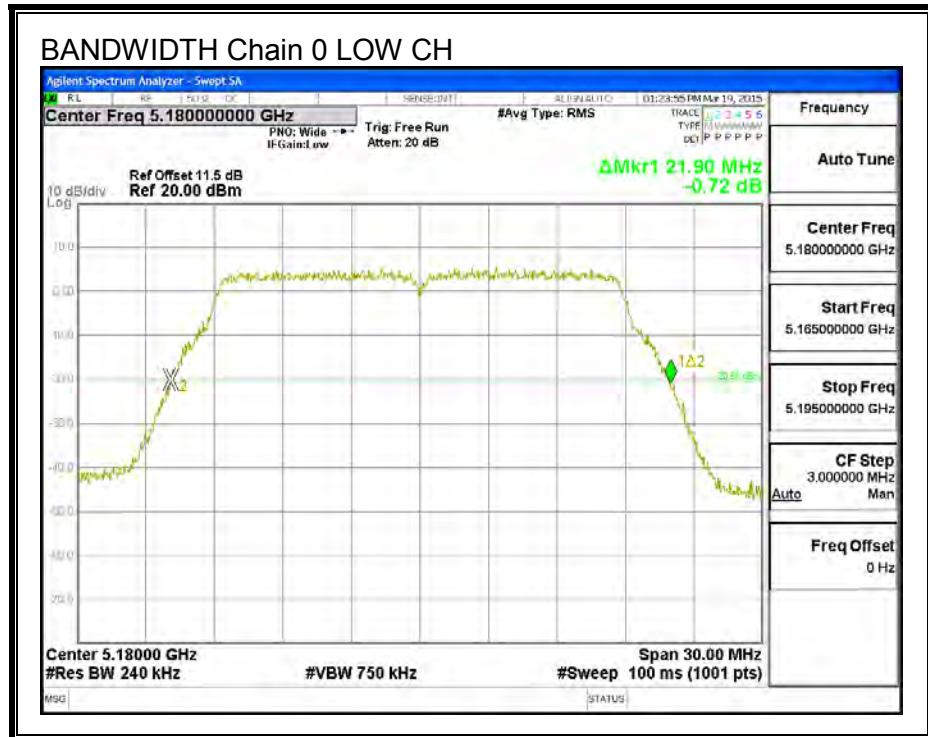
##### LIMITS

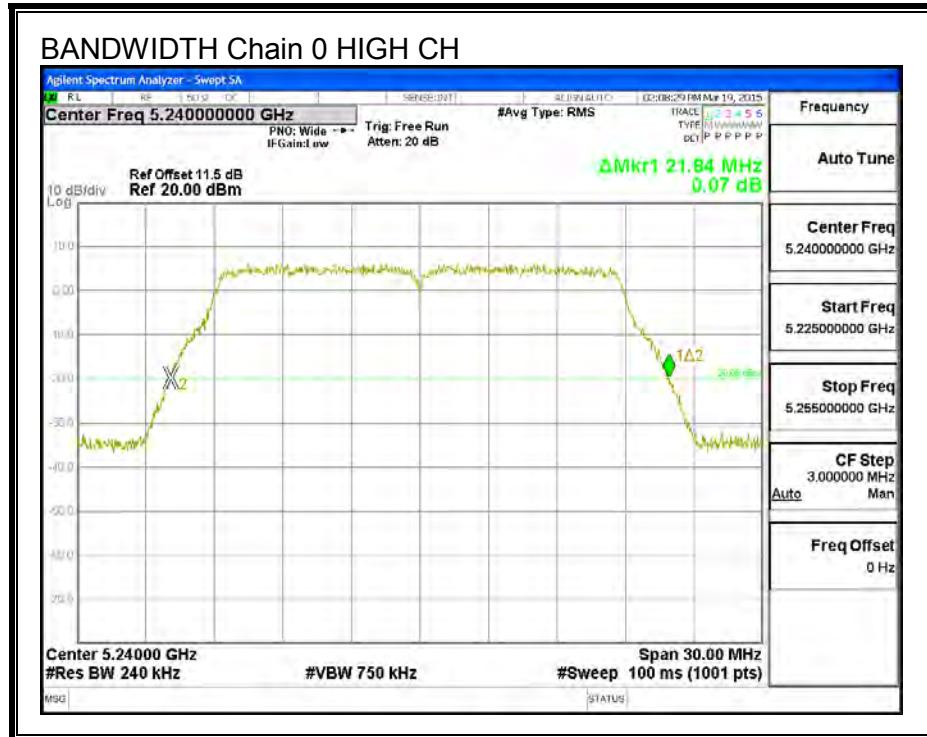
None; for reporting purposes only.

##### RESULTS

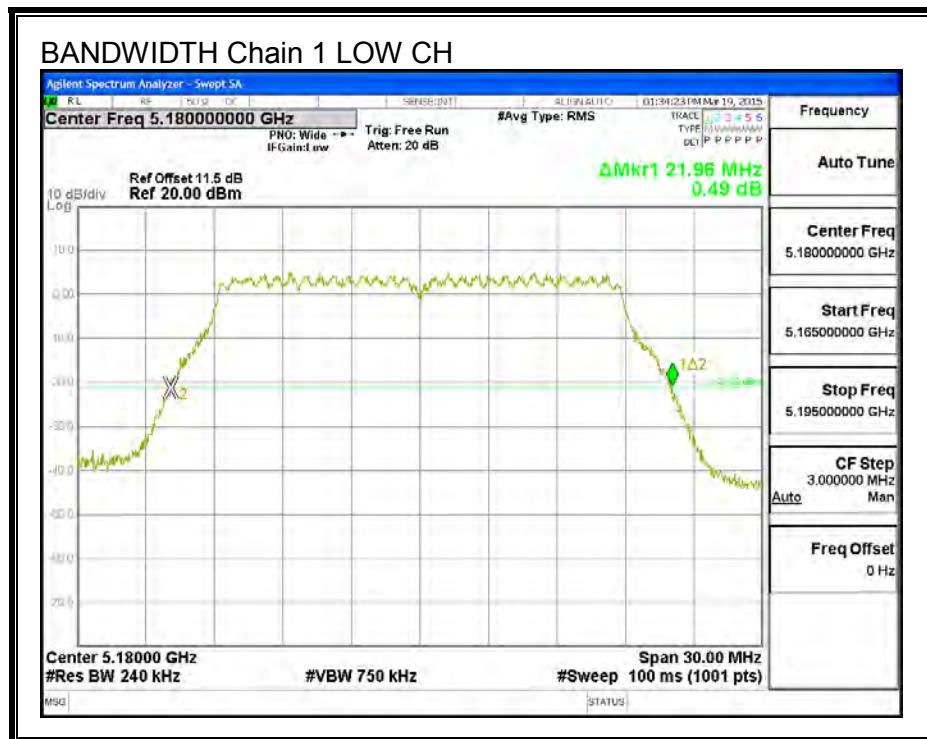
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	21.90	21.96
Mid	5200	21.96	21.84
High	5240	21.84	21.84

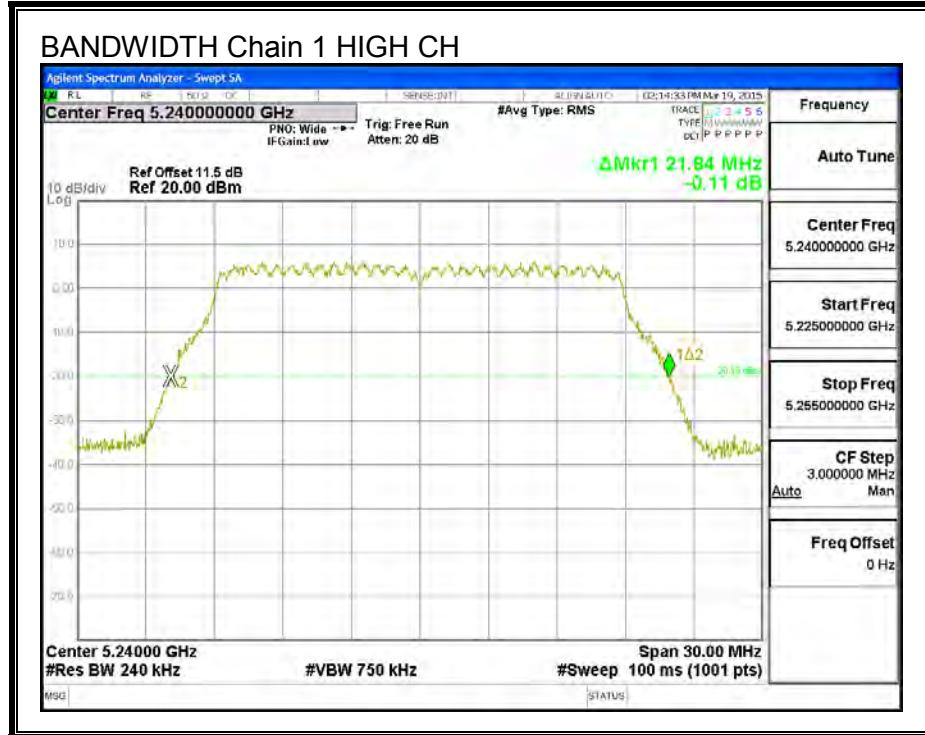
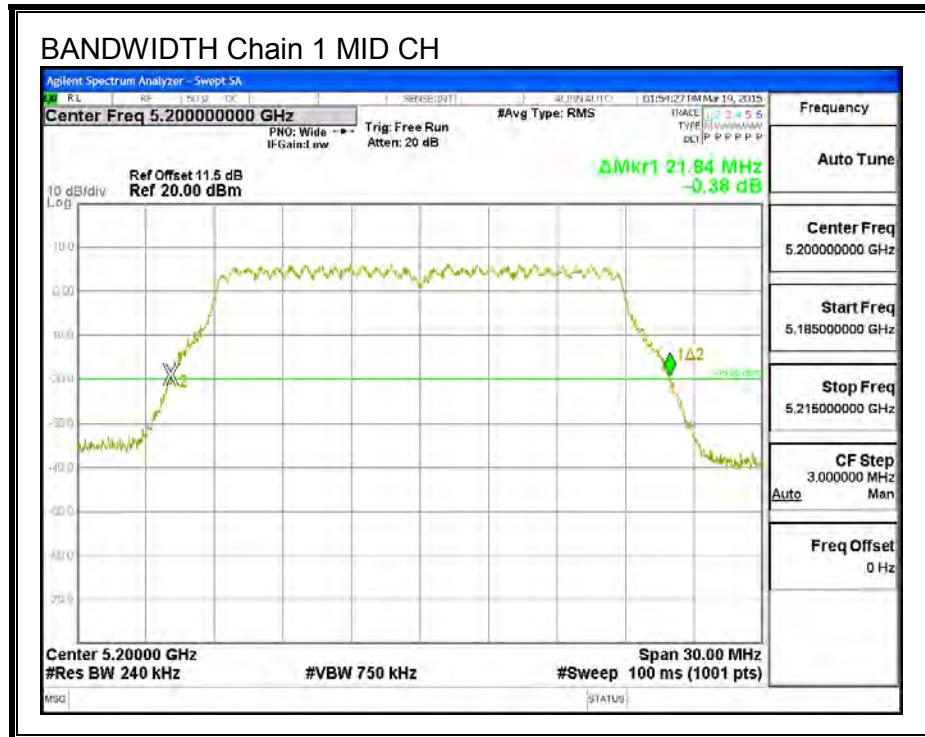
**26 dB BANDWIDTH, Chain 0**





## 26 dB BANDWIDTH, Chain 1





### 8.3.2. 99% BANDWIDTH

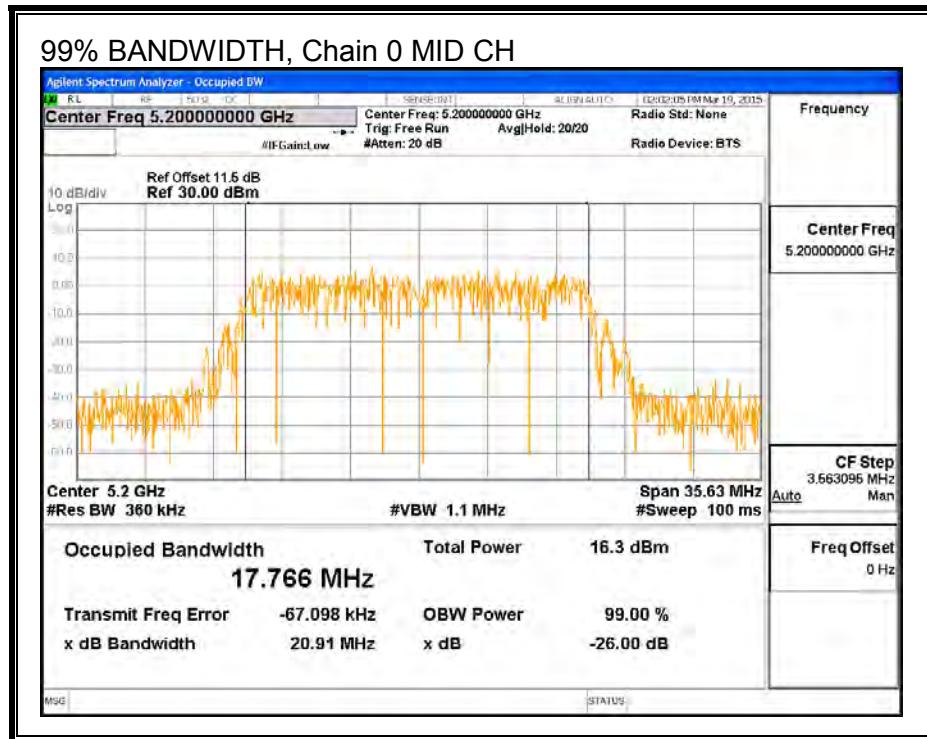
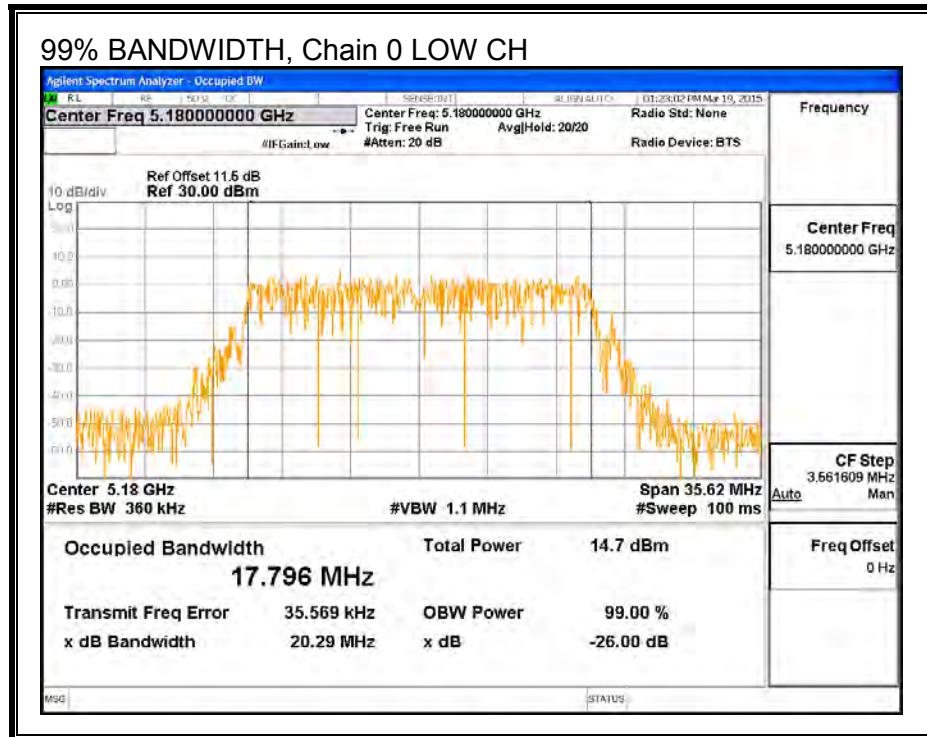
#### LIMITS

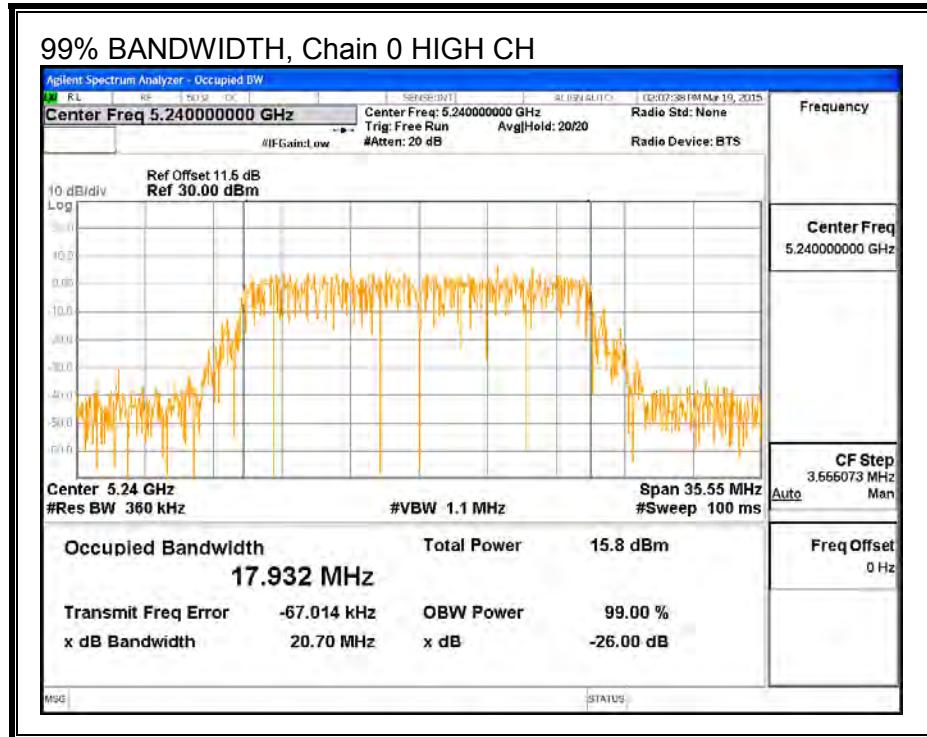
None; for reporting purposes only.

#### RESULTS

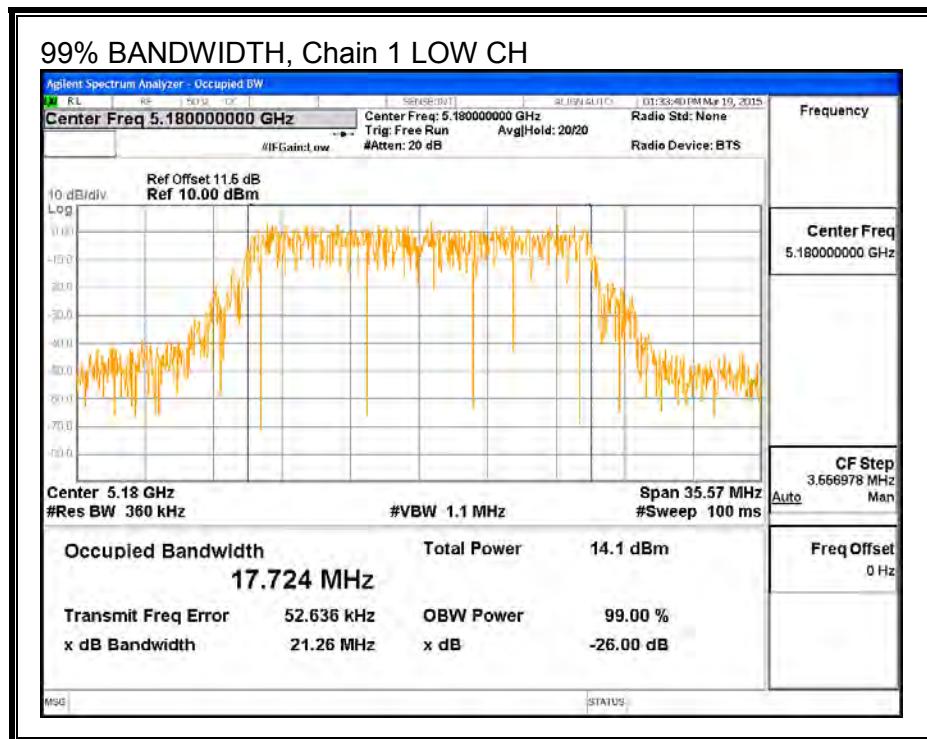
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.796	17.724
Mid	5200	17.766	17.850
High	5240	17.932	17.895

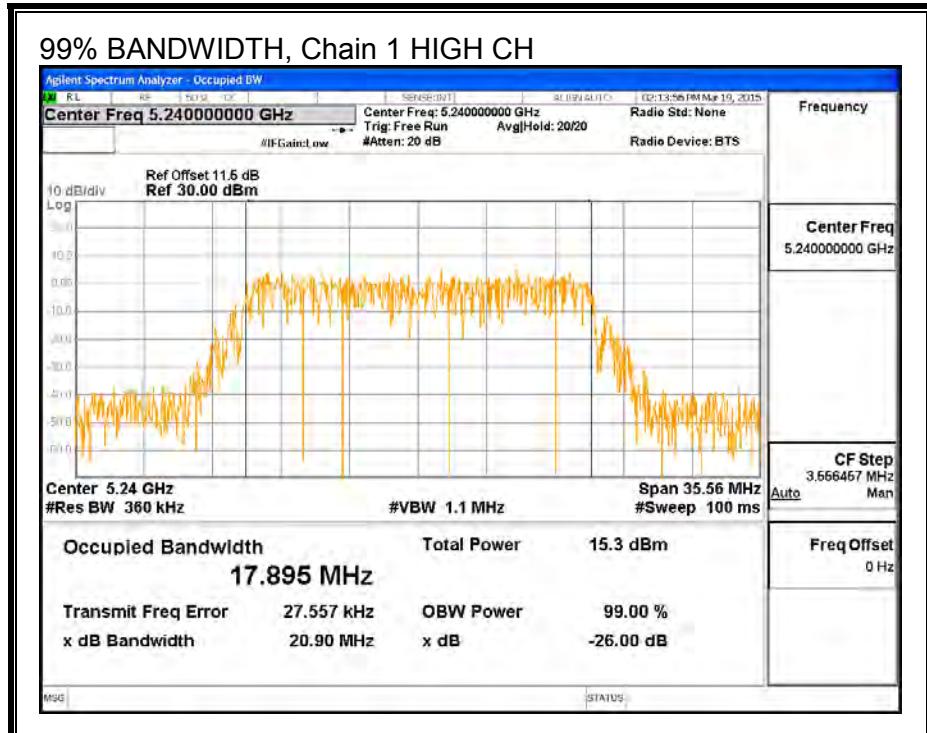
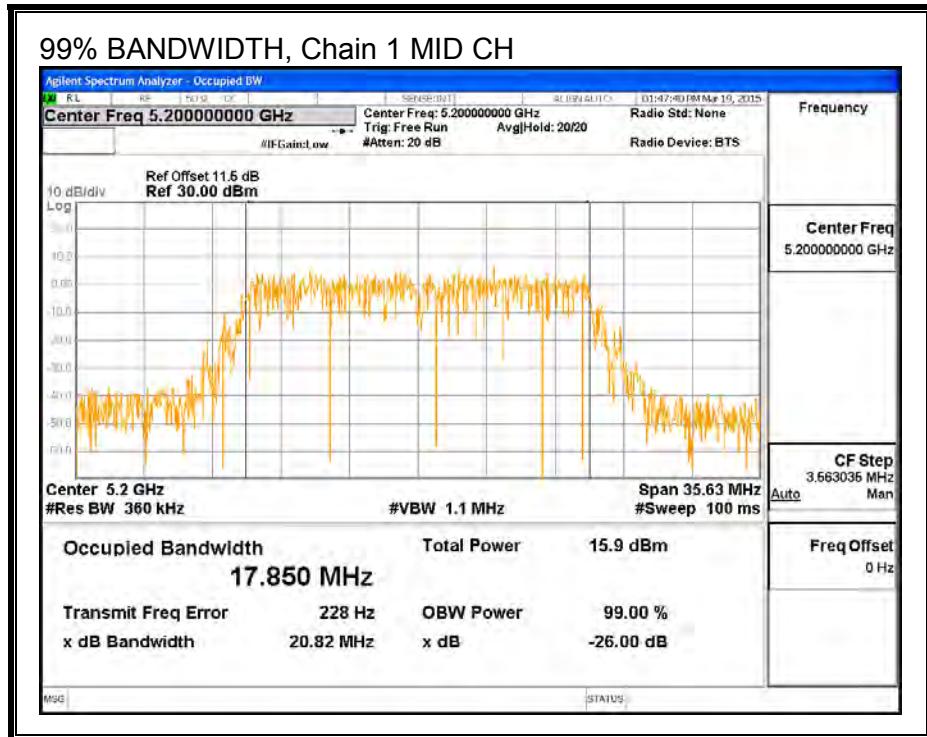
**99% BANDWIDTH, Chain 0**





**99% BANDWIDTH, Chain 1**





### 8.3.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

**Average Power Results**

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5180	15.00	14.90	17.96
Mid	5200	16.42	16.39	19.42
High	5240	16.46	16.35	19.42

### 8.3.4. 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

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Uncorrelated Chains Directional Gain (dBi)</b>
4.00	1.01	2.76

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Correlated Chains Directional Gain (dBi)</b>
4.00	1.01	5.64

## 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	2.76	5.64	24.00	11.00
Mid	5200	2.76	5.64	24.00	11.00
High	5240	2.76	5.64	24.00	11.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PSD
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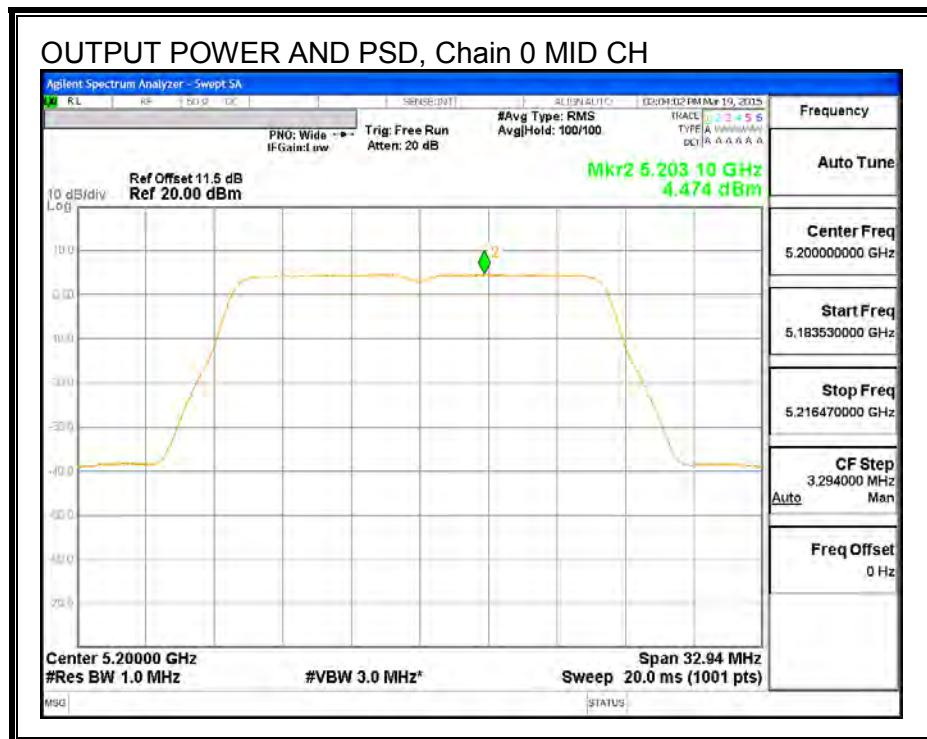
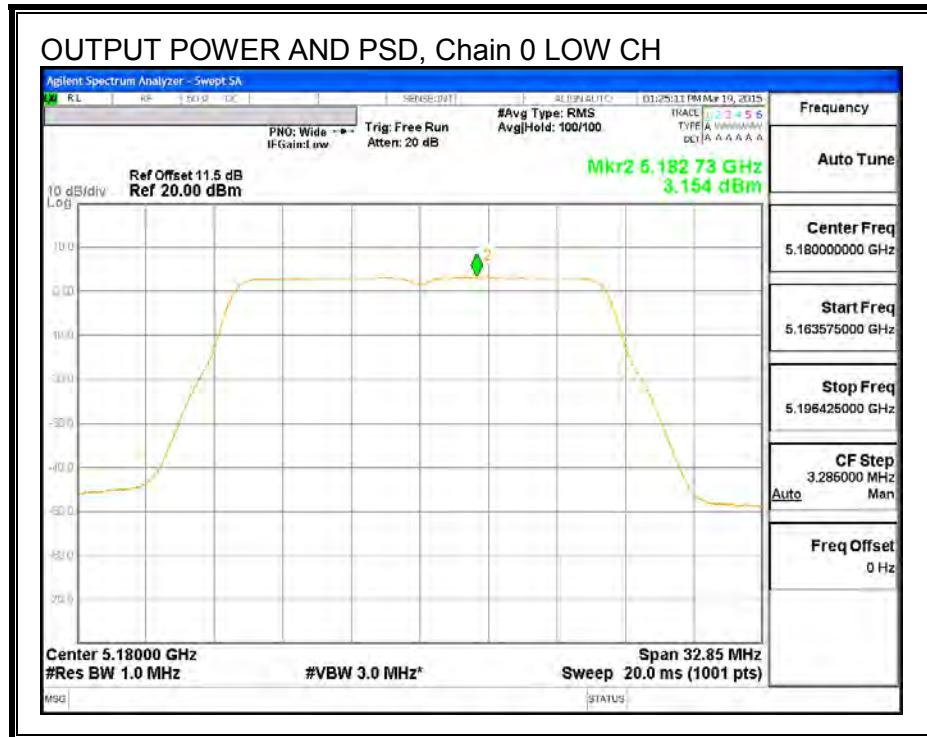
### Output Power Results

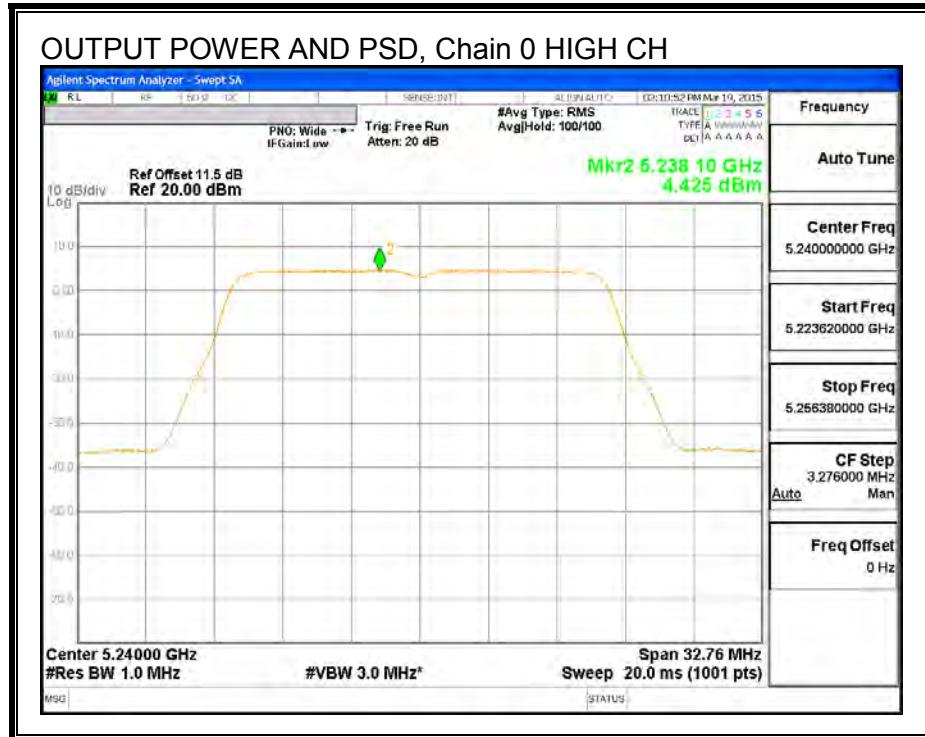
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	15.00	14.90	17.96	24.00	-6.04
Mid	5200	16.42	16.39	19.42	24.00	-4.58
High	5240	16.46	16.35	19.42	24.00	-4.58

### PSD Results

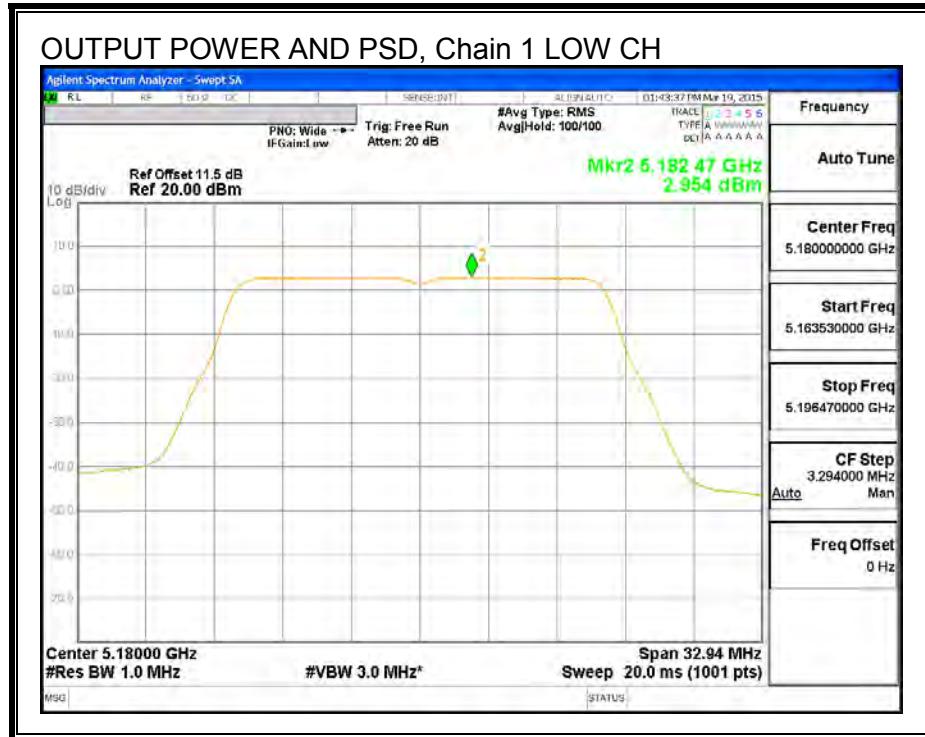
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	3.15	2.95	6.07	11.00	-4.93
Mid	5200	4.47	4.45	7.47	11.00	-3.53
High	5240	4.43	4.42	7.43	11.00	-3.57

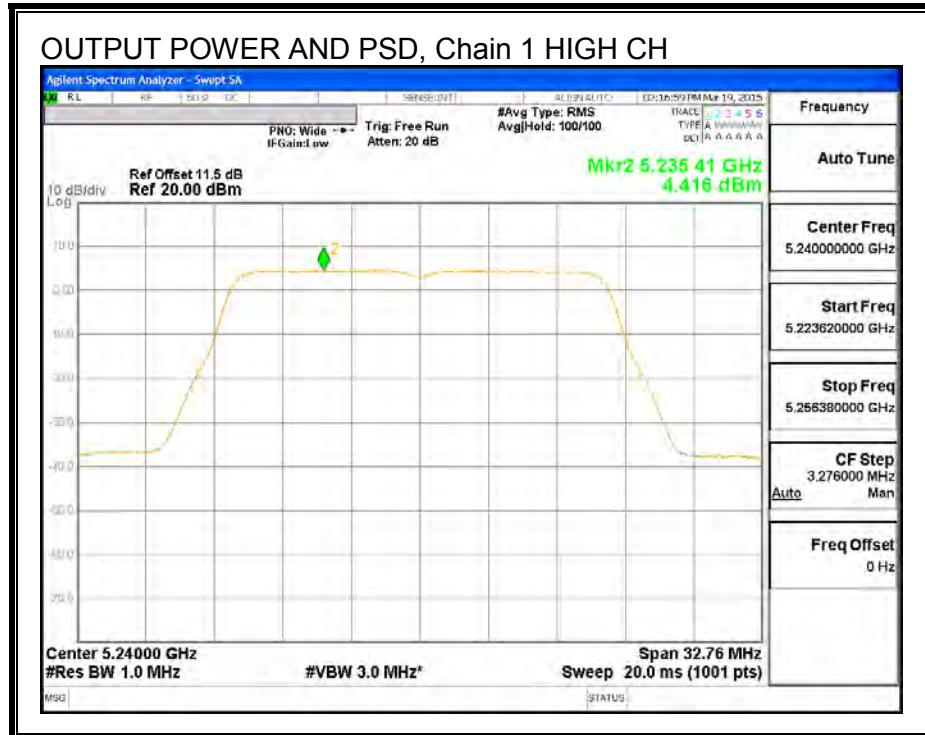
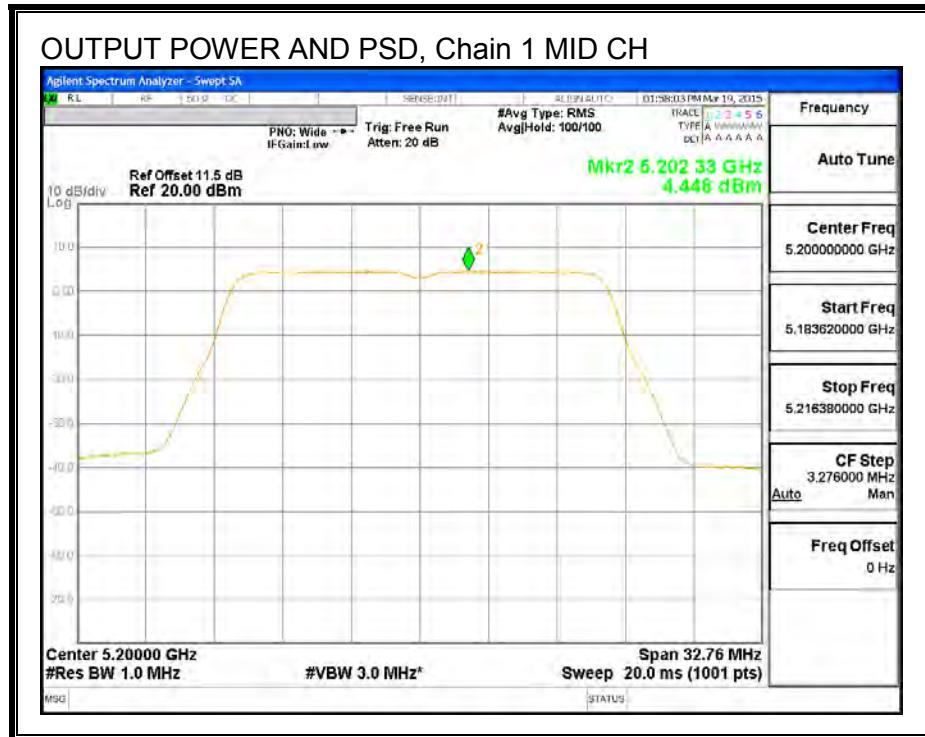
**OUTPUT POWER AND PSD, Chain 0**





### OUTPUT POWER AND PSD, Chain 1





## 8.4. 802.11n HT20 2Tx STBC MODE IN THE 5.2 GHz BAND

### 8.4.1. 26 dB BANDWIDTH

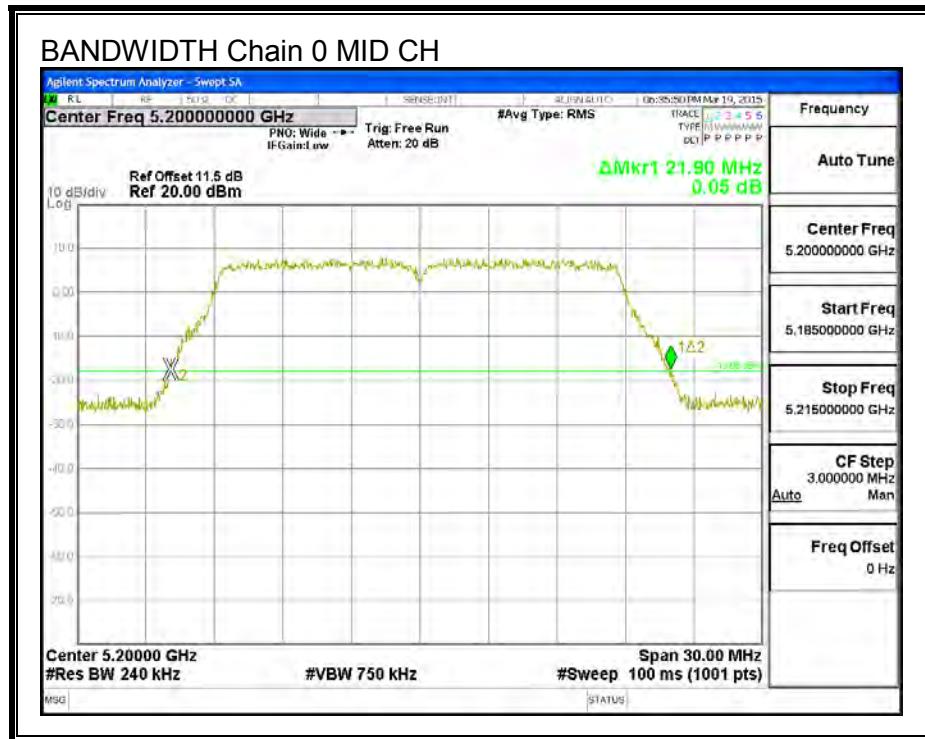
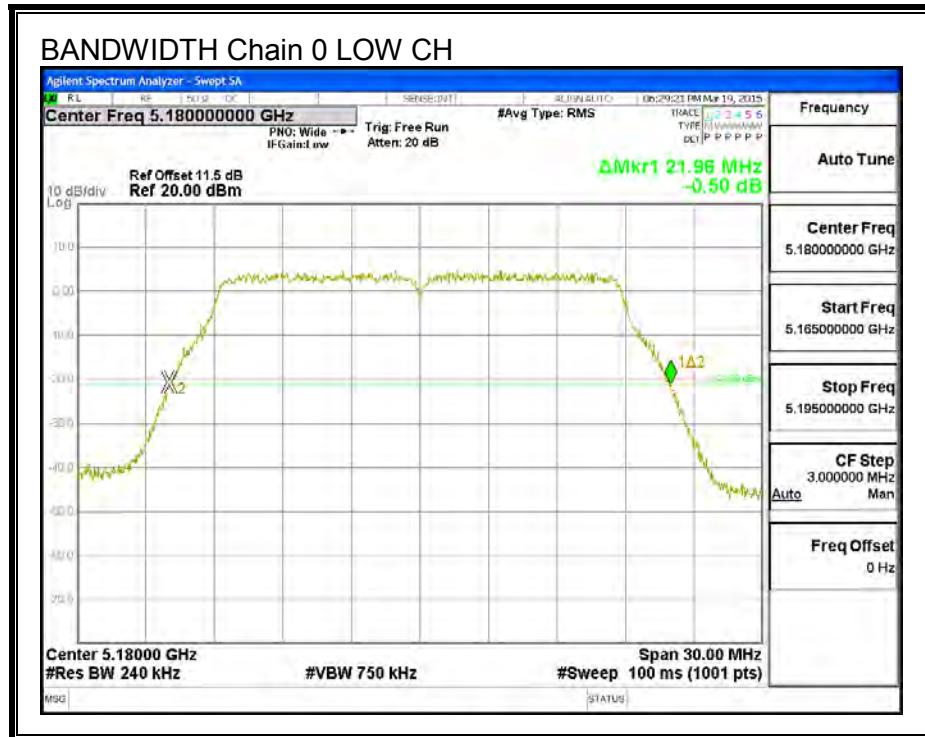
#### LIMITS

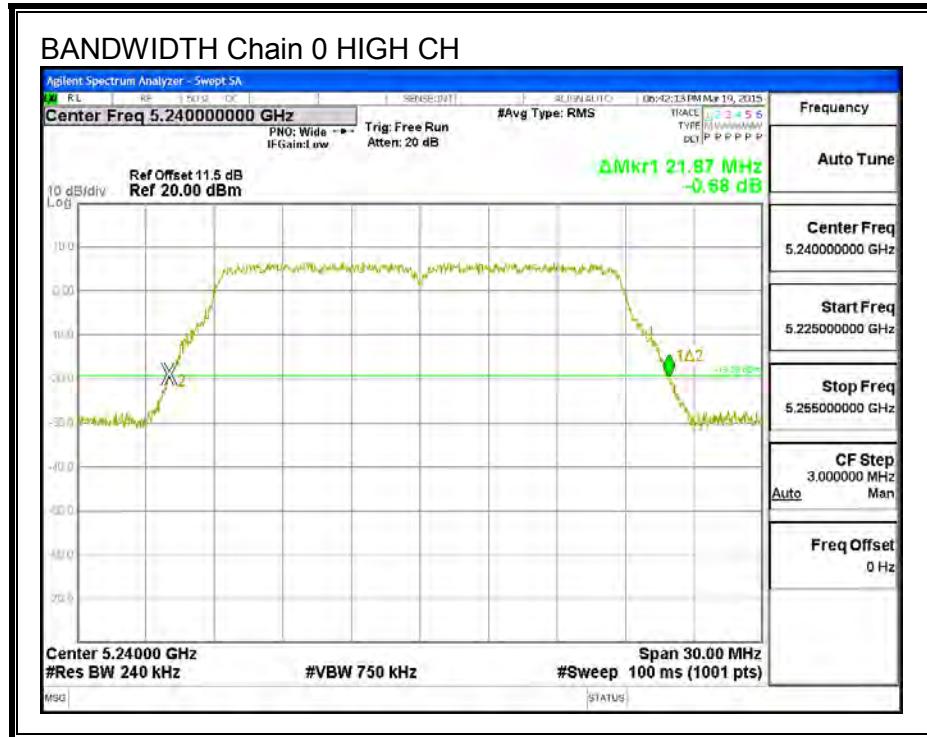
None; for reporting purposes only.

#### RESULTS

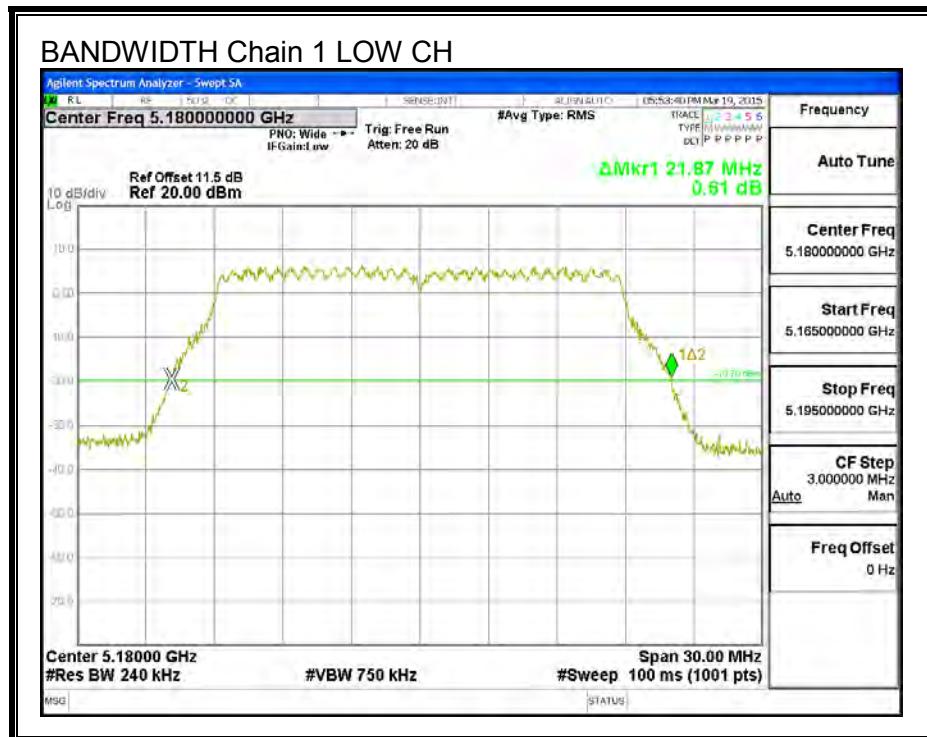
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	21.96	21.87
Mid	5200	21.90	21.93
High	5240	21.87	21.69

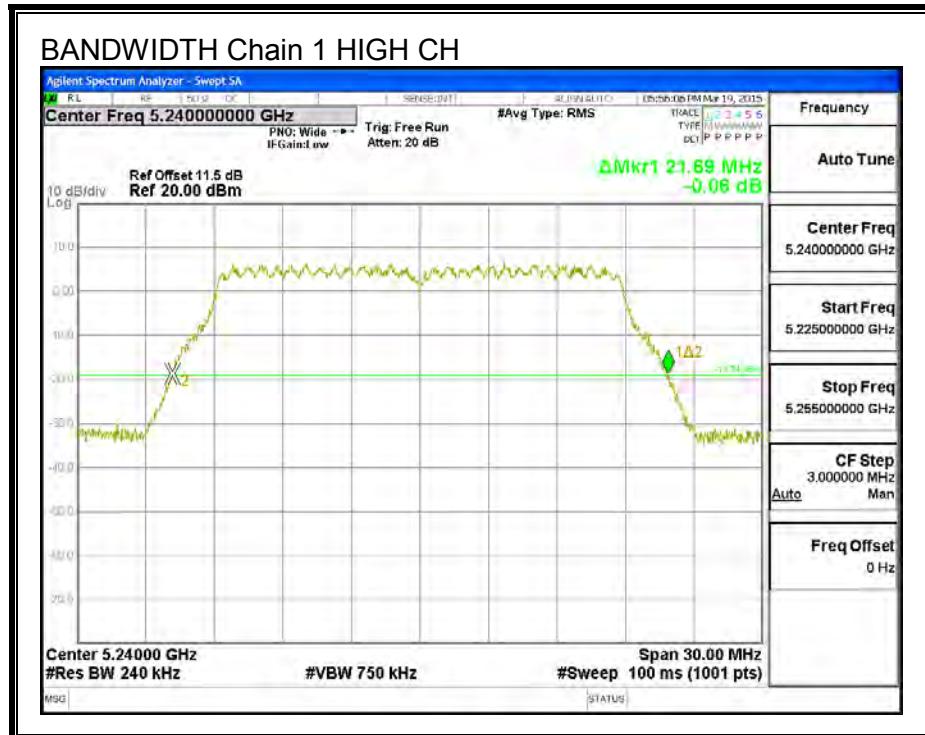
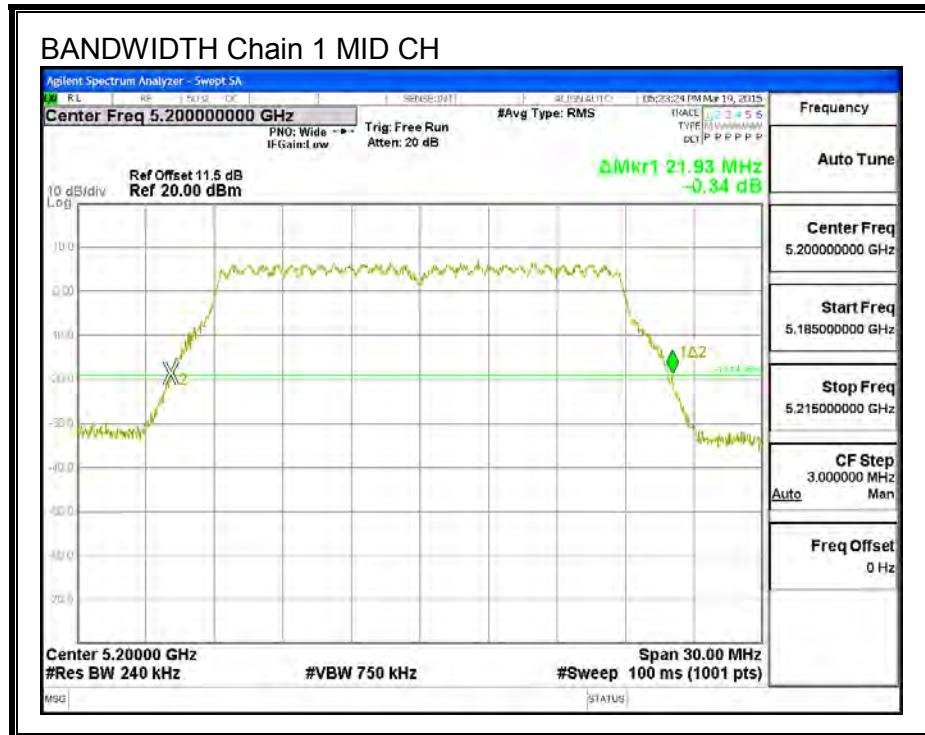
**26 dB BANDWIDTH, Chain 0**





## 26 dB BANDWIDTH, Chain 1





#### 8.4.2. 99% BANDWIDTH

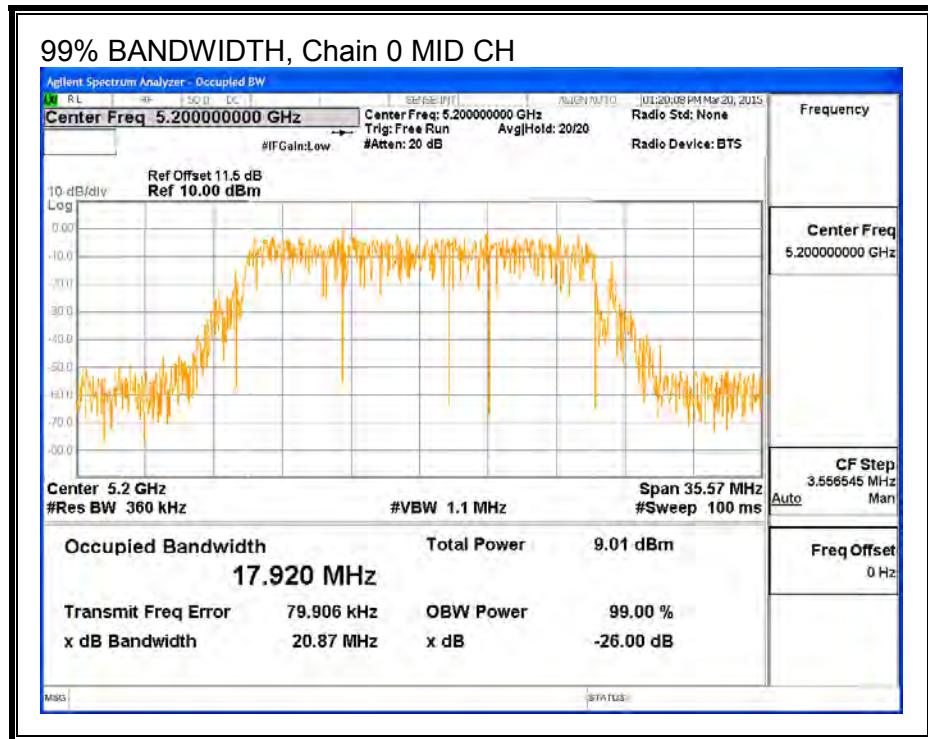
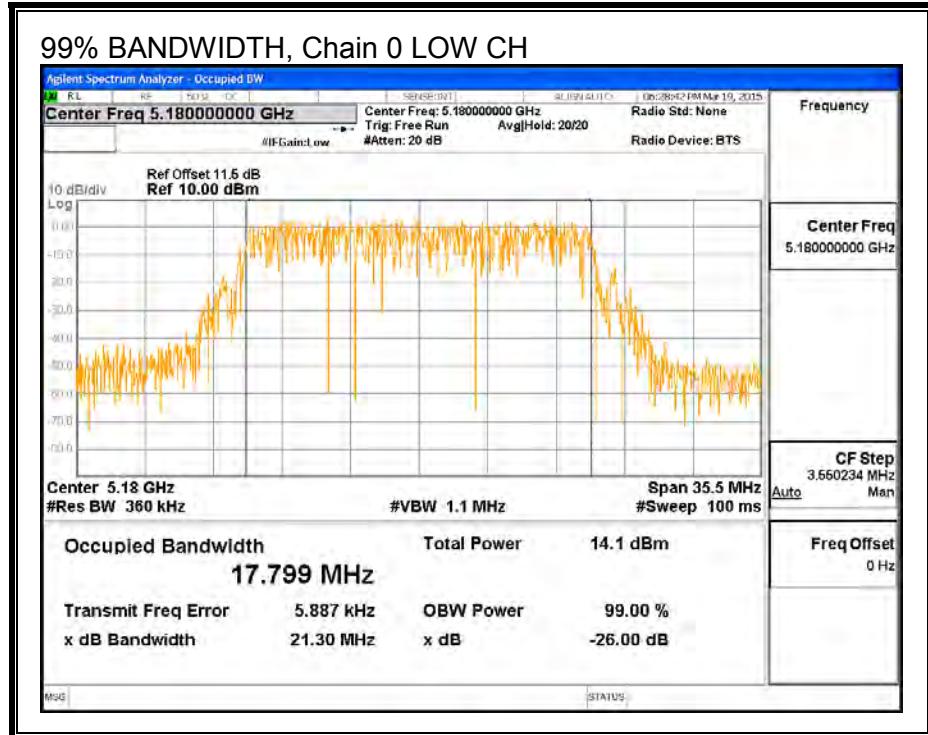
##### LIMITS

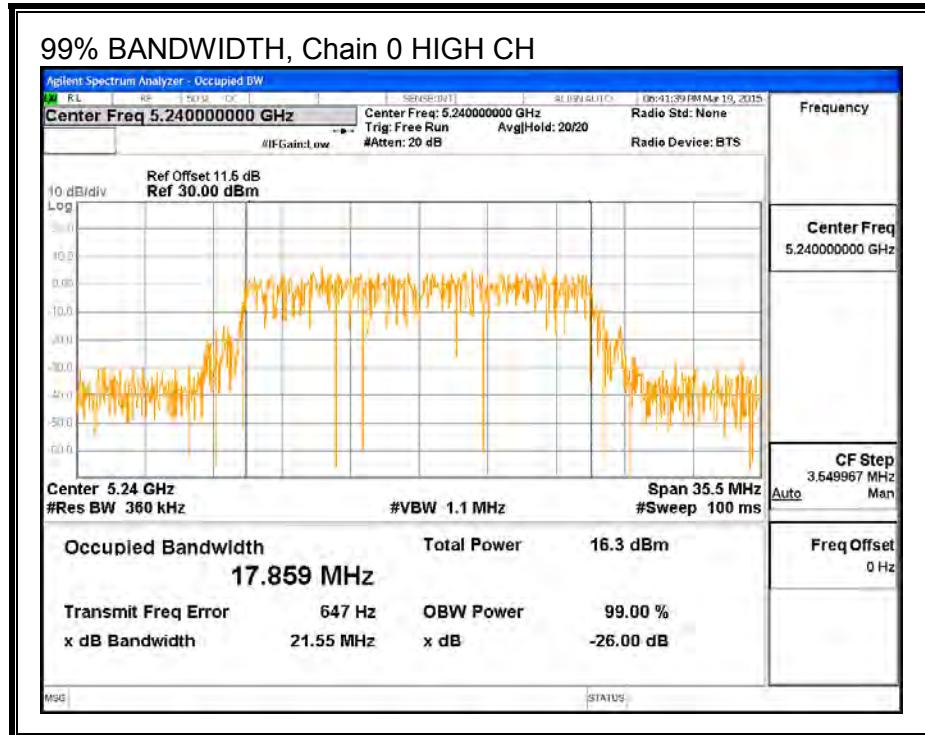
None; for reporting purposes only.

##### RESULTS

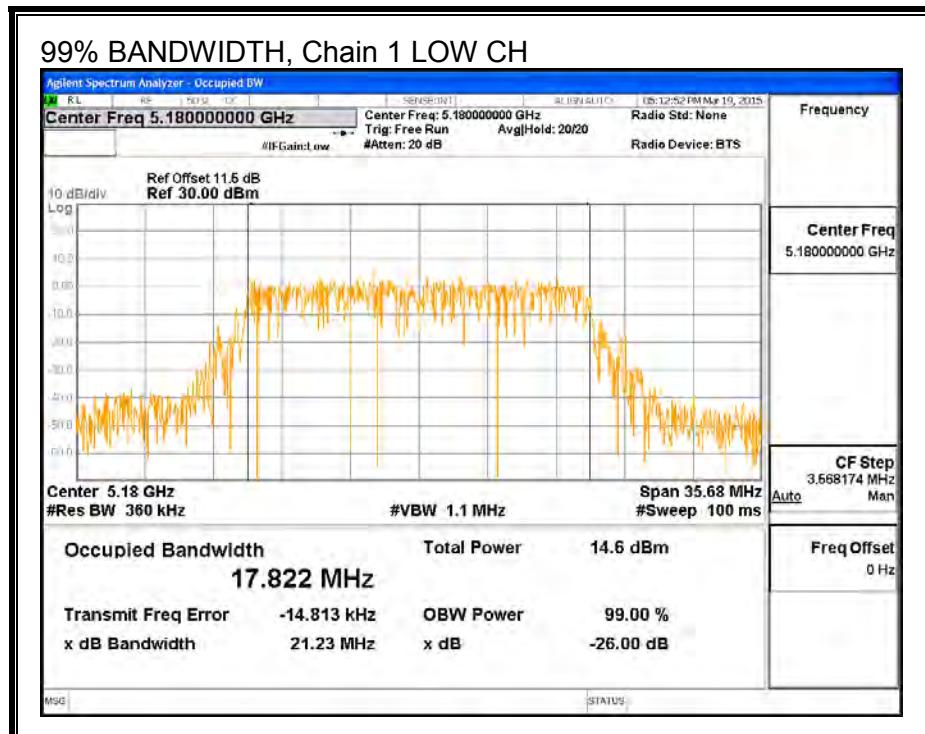
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	17.799	17.822
Mid	5200	17.920	17.872
High	5240	17.859	17.741

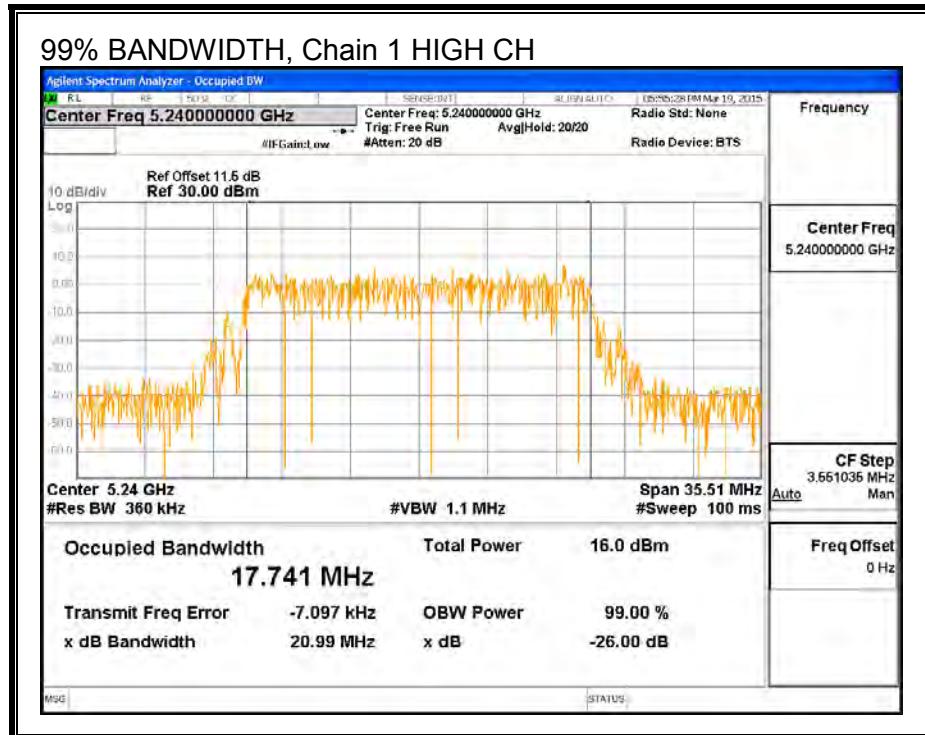
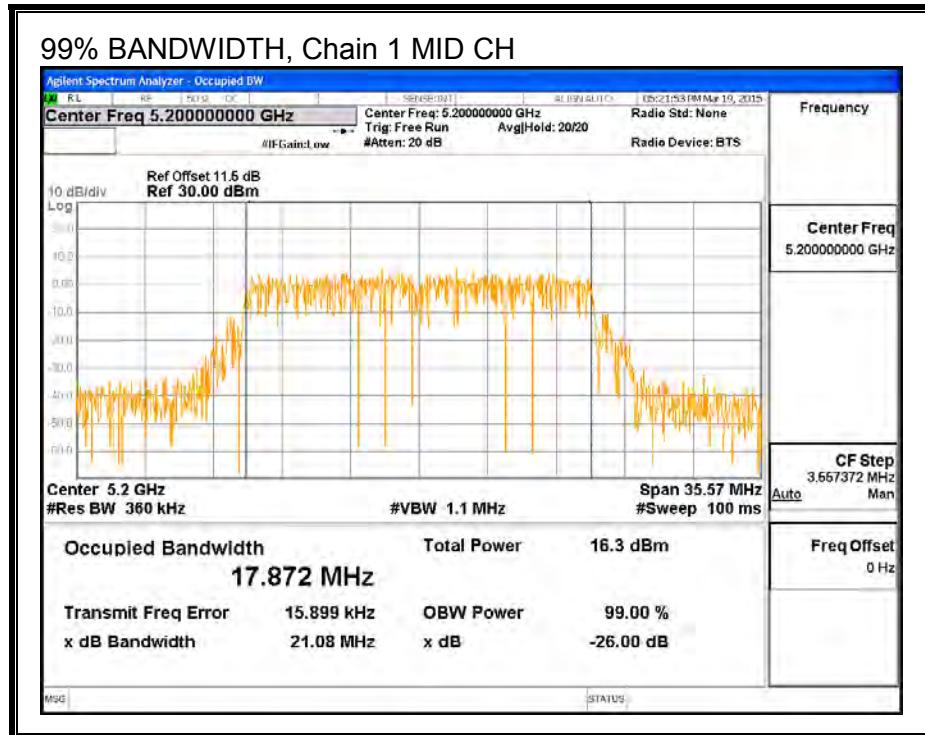
## 99% BANDWIDTH, Chain 0





**99% BANDWIDTH, Chain 1**





### 8.4.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

**Average Power Results**

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5180	14.99	15.00	18.01
Mid	5200	17.00	16.94	19.98
High	5240	16.85	16.74	19.80

#### 8.4.4. 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

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Uncorrelated Chains Directional Gain (dBi)</b>
4.00	1.01	2.76

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Correlated Chains Directional Gain (dBi)</b>
4.00	1.01	5.64

## **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	2.76	5.64	24.00	11.00
Mid	5200	2.76	5.64	24.00	11.00
High	5240	2.76	5.64	24.00	11.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
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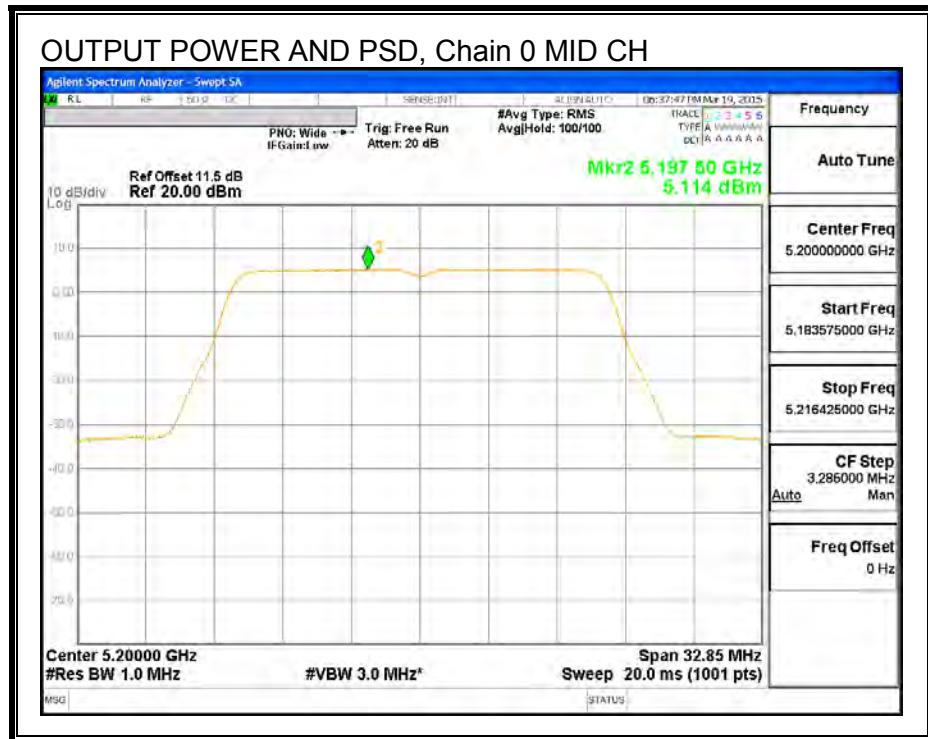
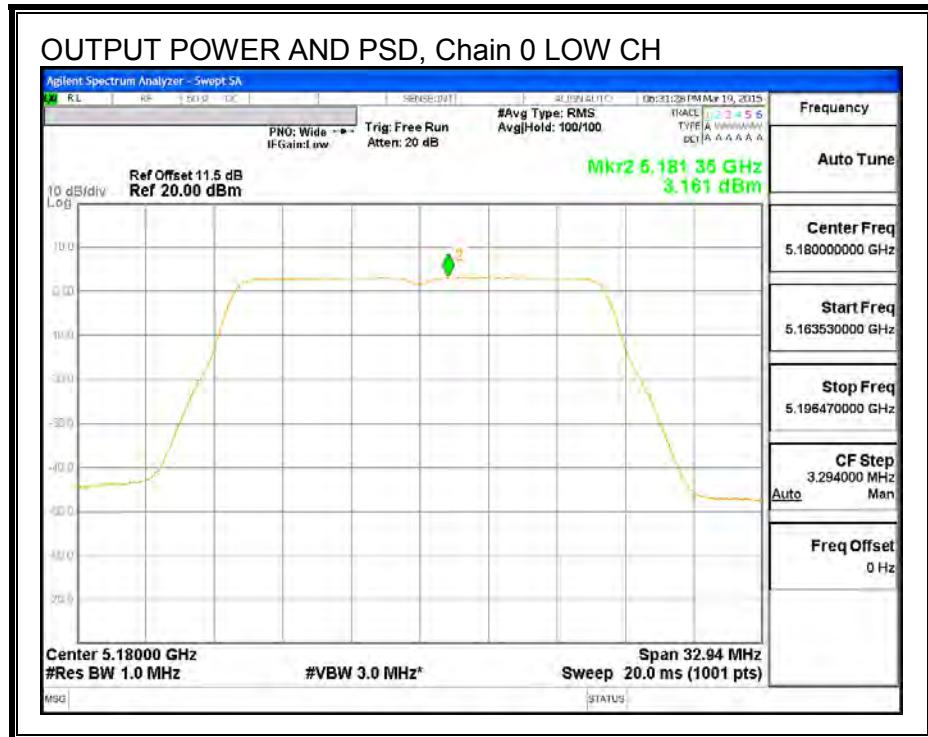
### **Output Power Results**

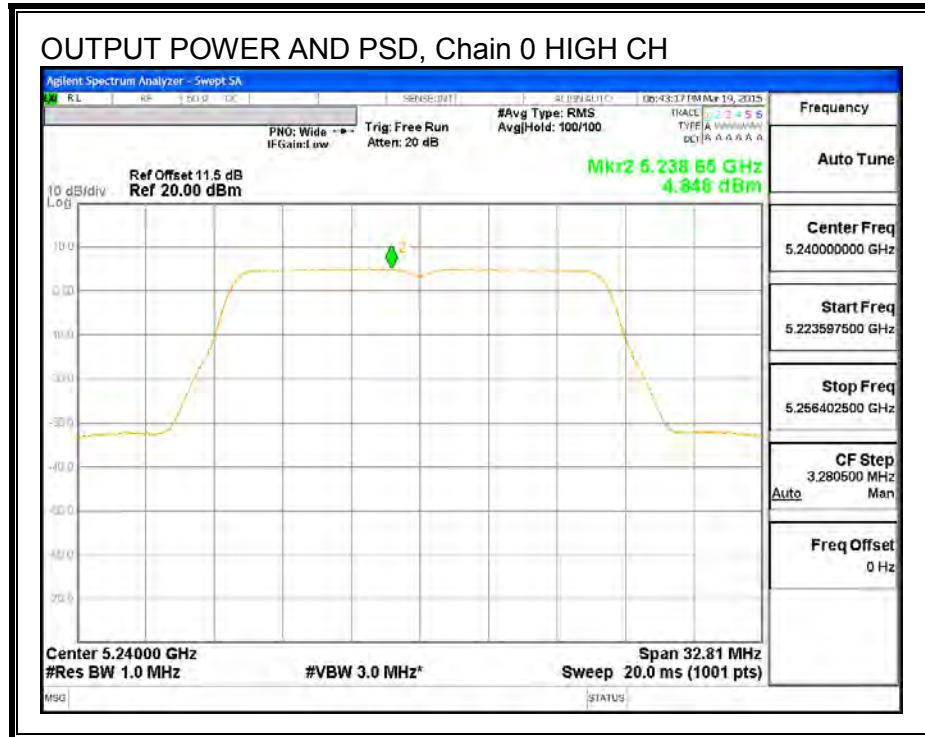
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.99	15.00	18.01	24.00	-5.99
Mid	5200	17.00	16.94	19.98	24.00	-4.02
High	5240	16.85	16.74	19.80	24.00	-4.20

### **PSD Results**

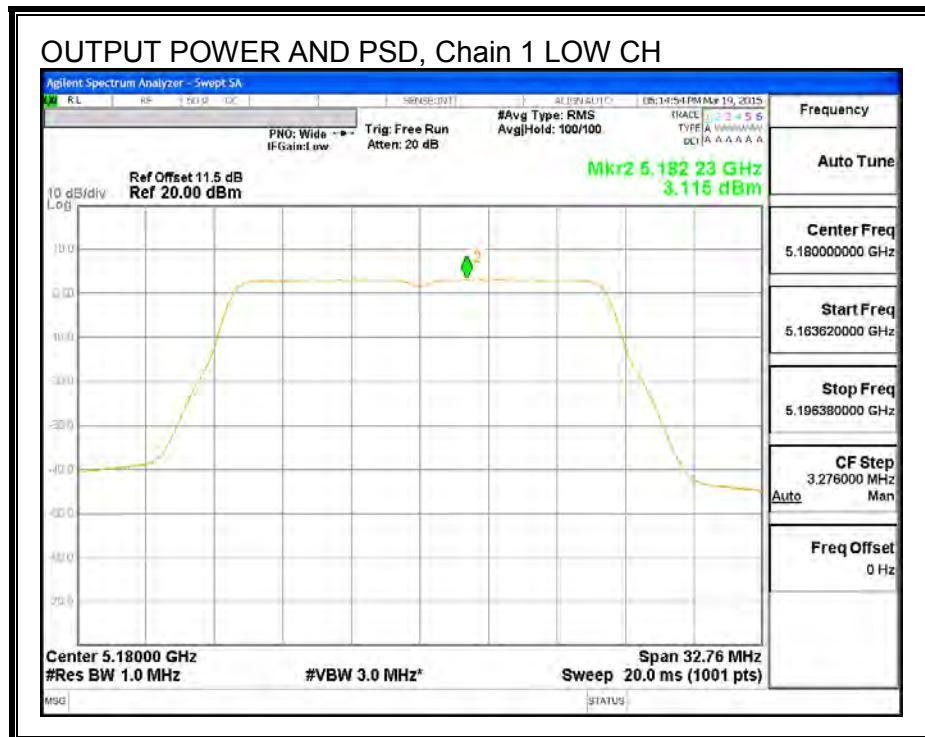
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	3.16	3.12	3.15	11.00	-7.85
Mid	5200	5.11	4.96	4.96	11.00	-6.04
High	5240	4.85	4.38	4.38	11.00	-6.62

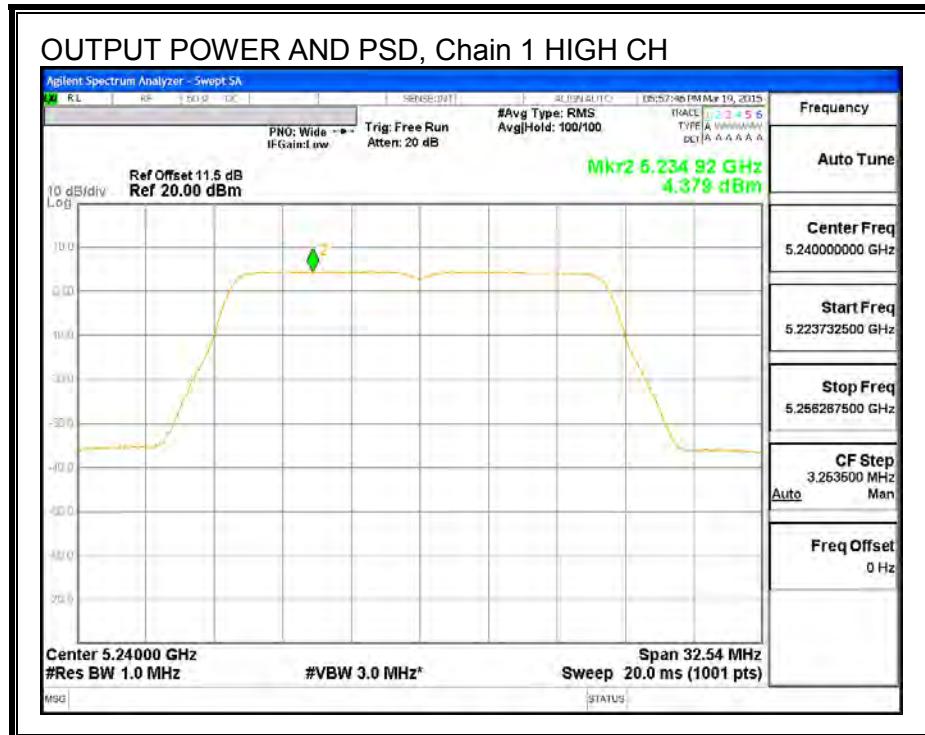
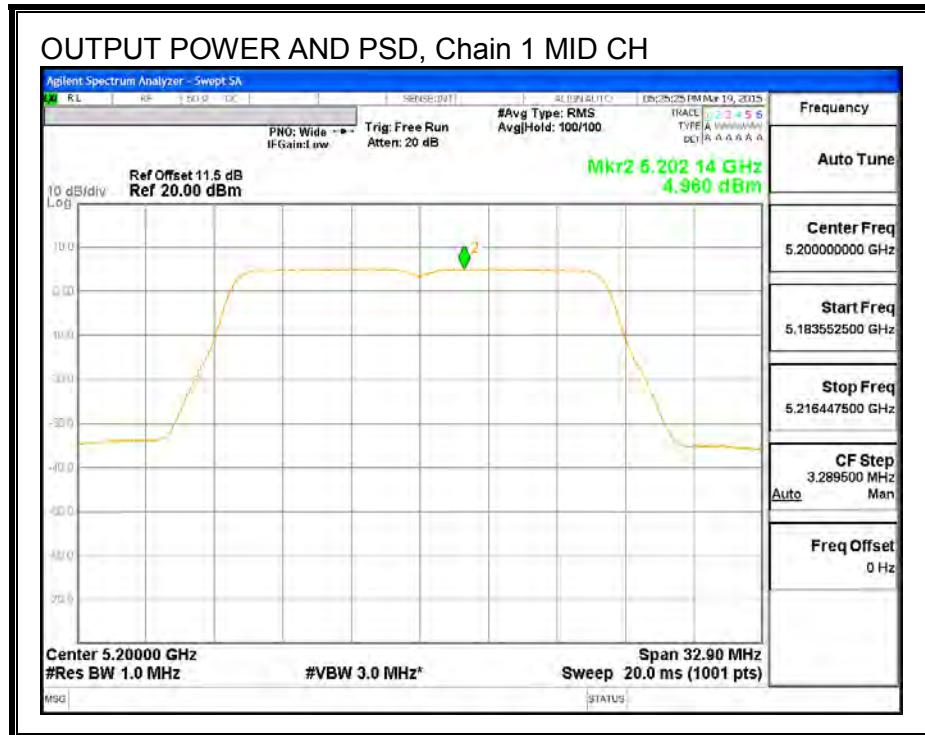
**OUTPUT POWER AND PSD, Chain 0**





### OUTPUT POWER AND PSD, Chain 1





## 8.5. 802.11n HT40 SISO MODE IN THE 5.2 GHz BAND

### 8.5.1. 26 dB BANDWIDTH

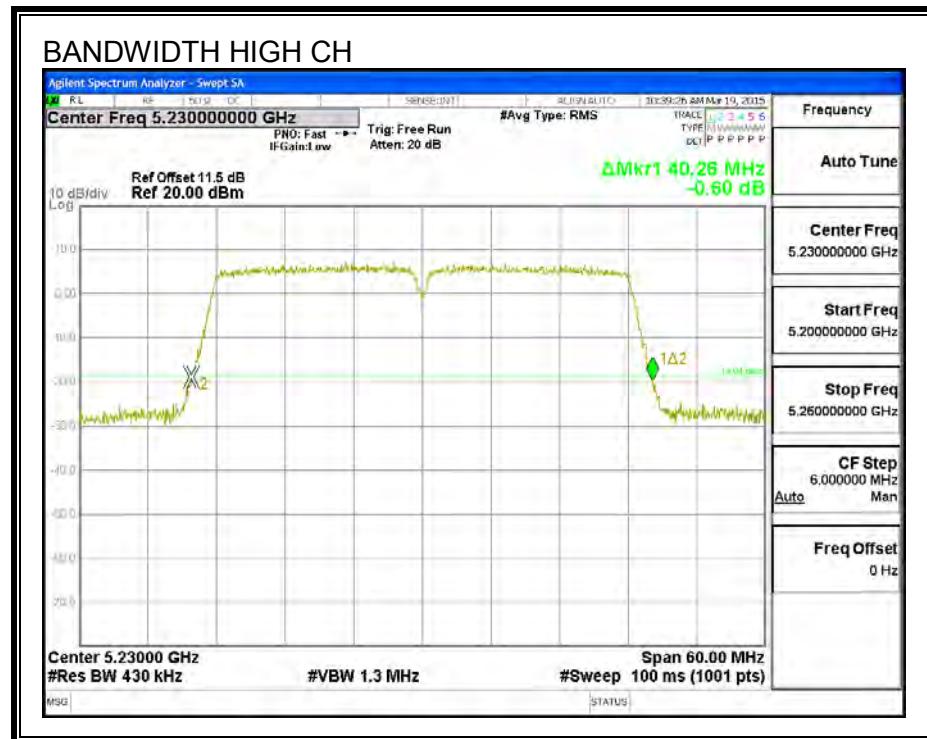
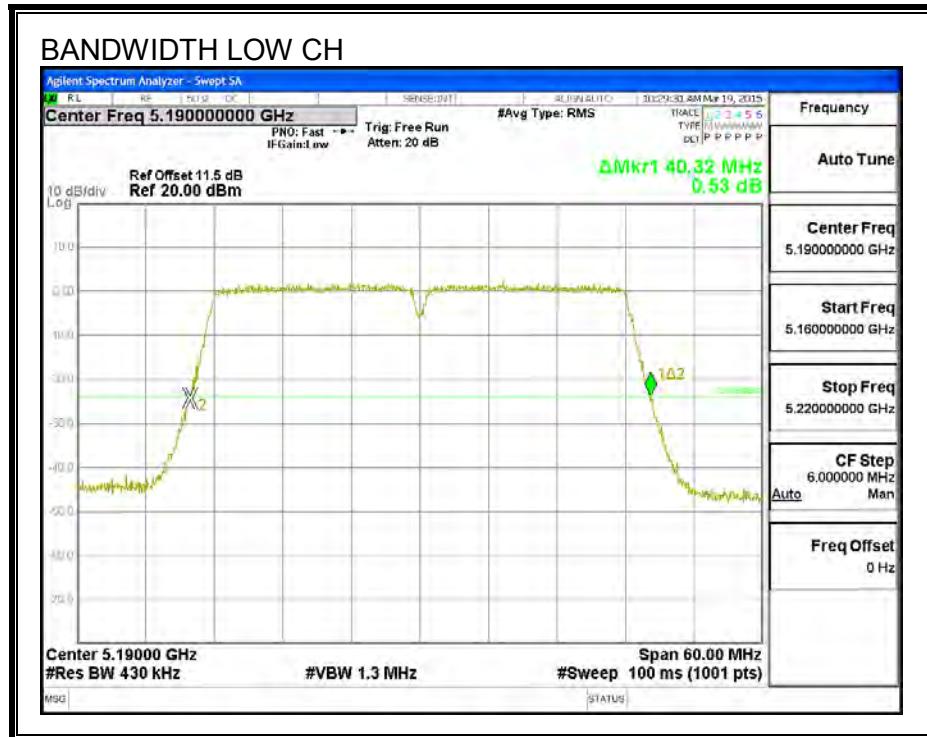
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	40.32
High	5230	40.26

## 26 dB BANDWIDTH



### 8.5.2. 99% BANDWIDTH

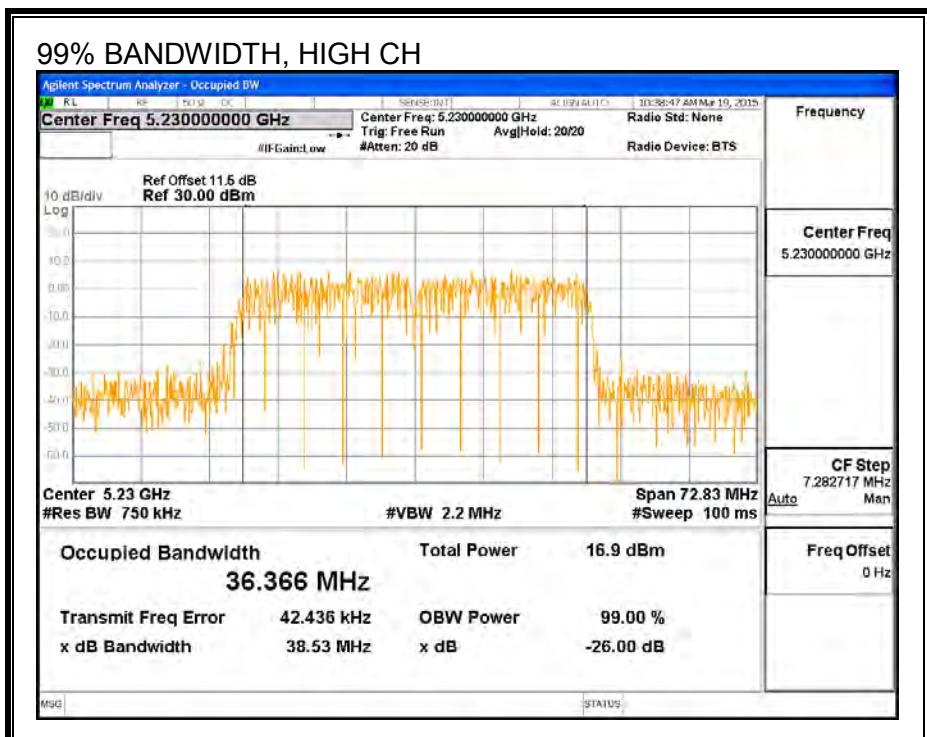
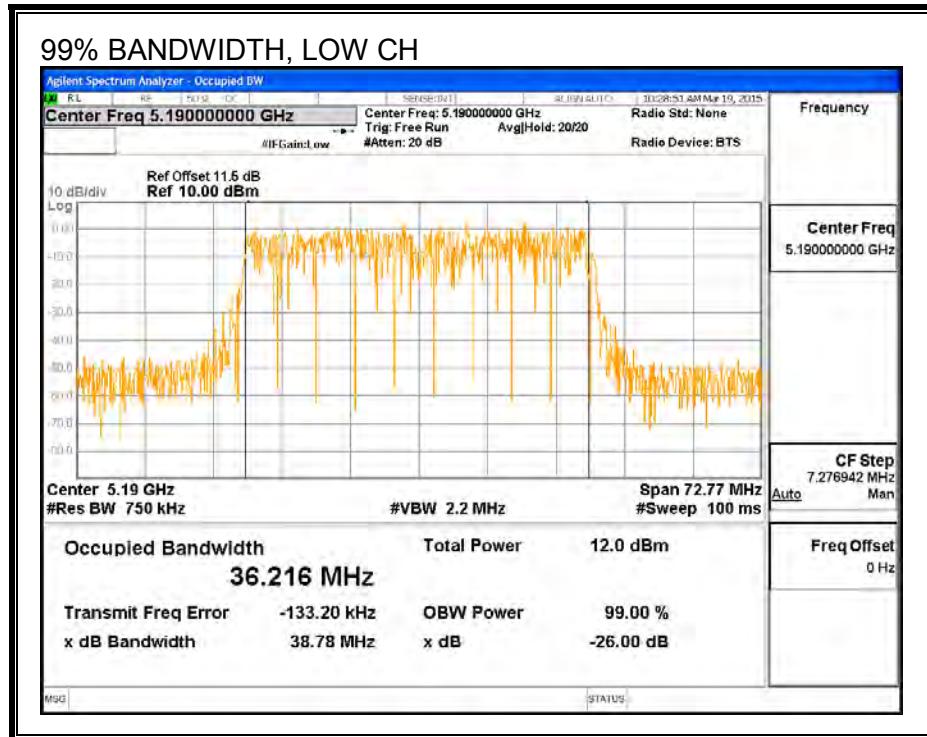
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5190	36.216
High	5230	36.366

**99% BANDWIDTH**



### 8.5.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5190	13.31
High	5230	17.00

### 8.5.4. 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

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

#### 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	5190	4.00	4.00	24.00	11.00
High	5230	4.00	4.00	24.00	11.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
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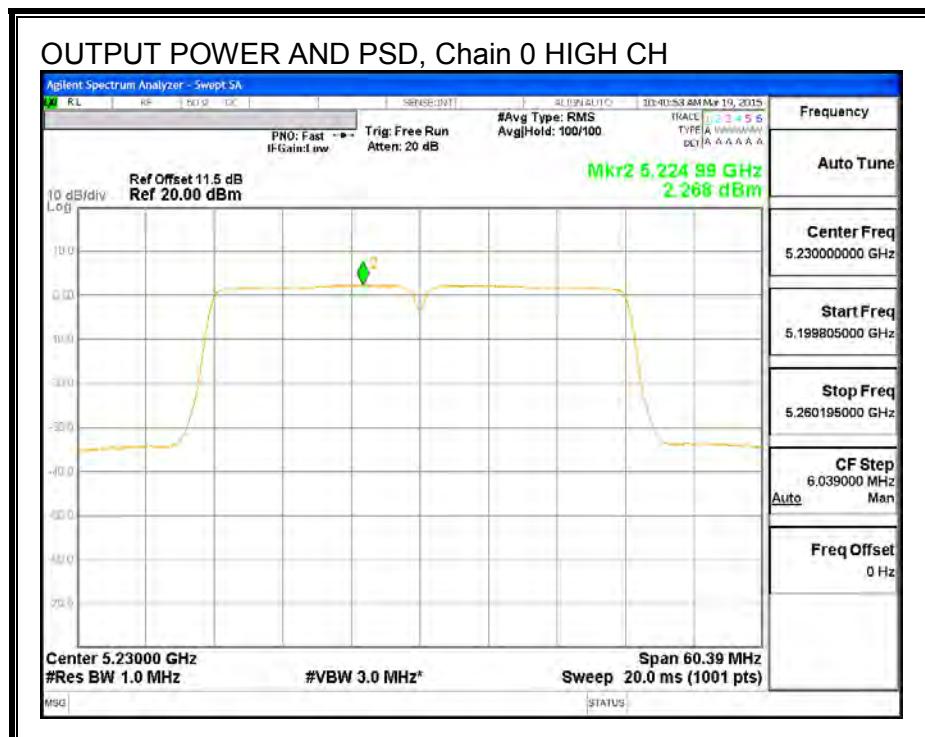
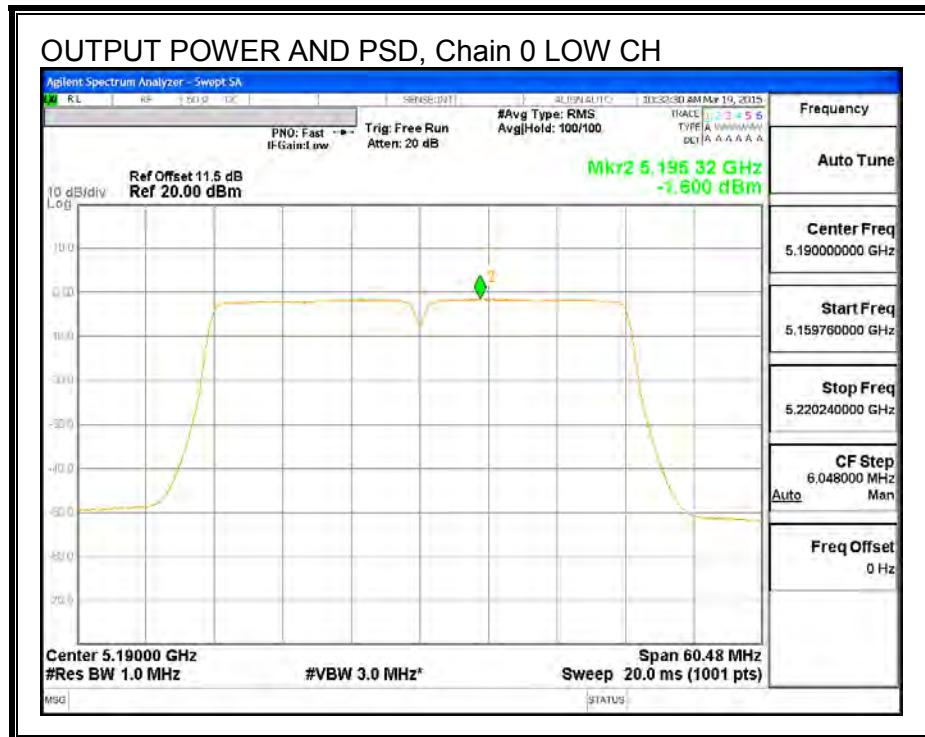
**Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.31	13.31	24.00	-10.69
High	5230	17.00	17.00	24.00	-7.00

**PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	-1.60	-1.60	11.00	-12.60
High	5230	2.27	2.27	11.00	-8.73

## OUTPUT POWER AND PSD, Chain 0



## 8.6. 802.11n HT40 2Tx CDD MODE IN THE 5.2 GHz BAND

### 8.6.1. 26 dB BANDWIDTH

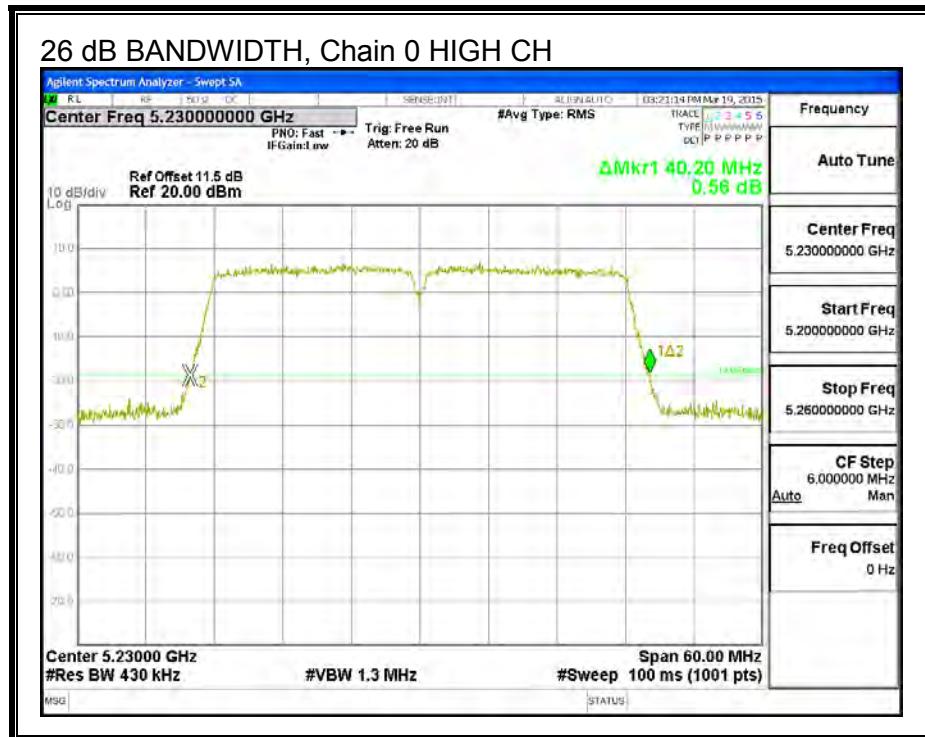
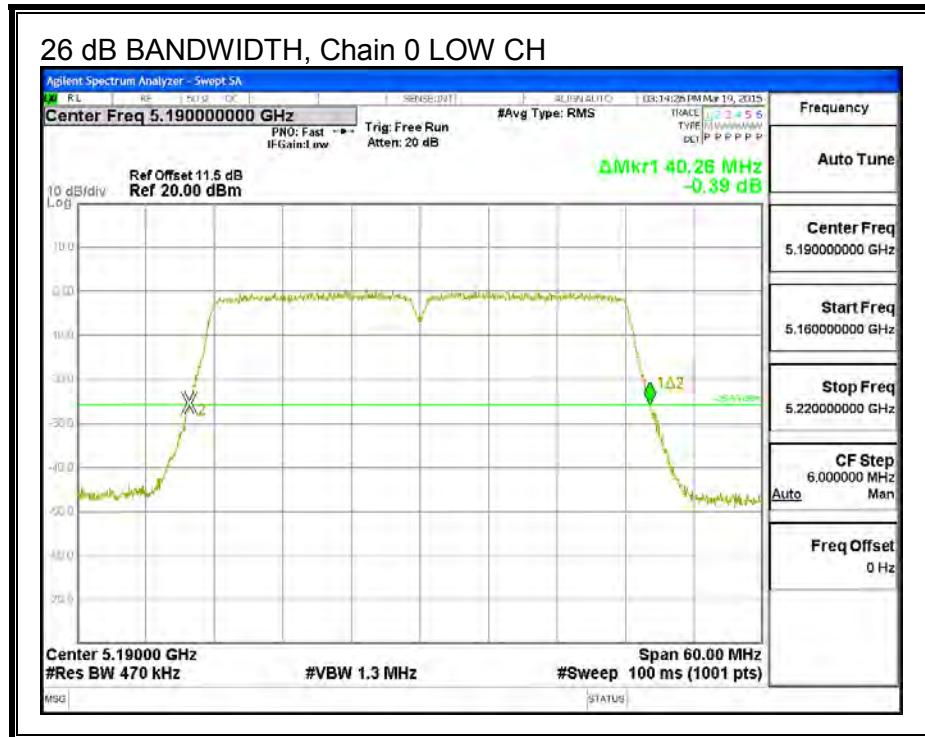
#### LIMITS

None; for reporting purposes only.

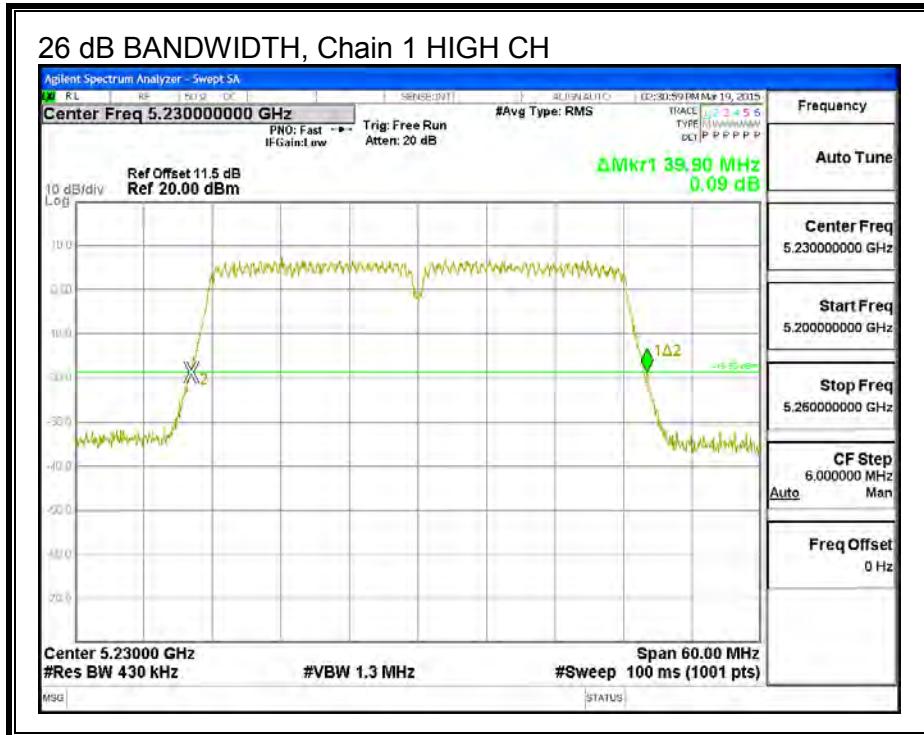
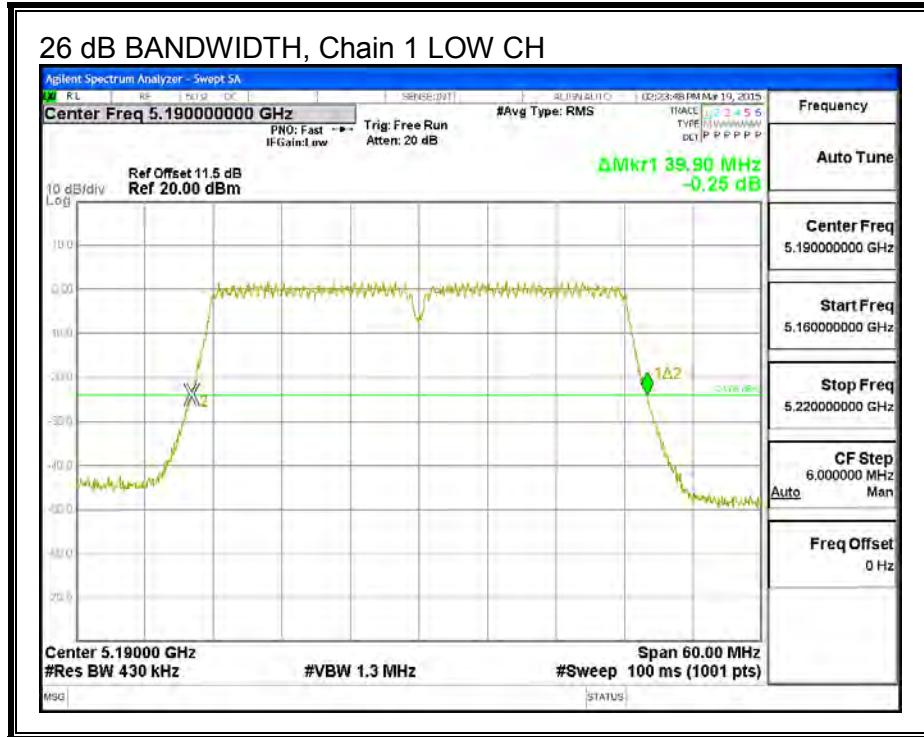
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5190	40.26	39.90
High	5230	40.20	39.90

**26 dB BANDWIDTH, Chain 0**



26 dB BANDWIDTH, Chain 1



### 8.6.2. 99% BANDWIDTH

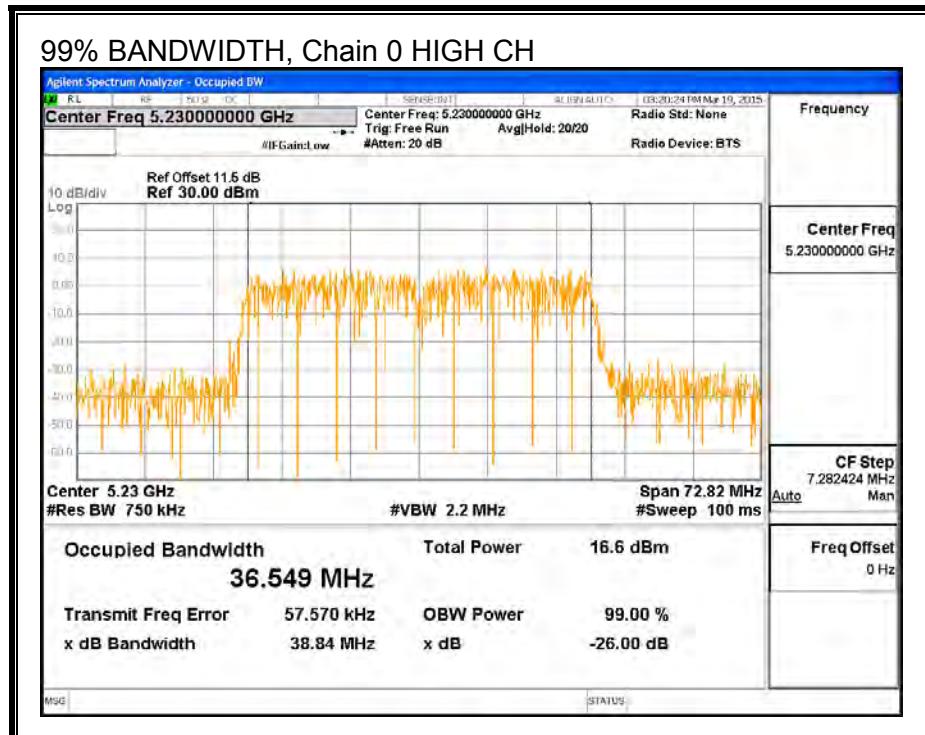
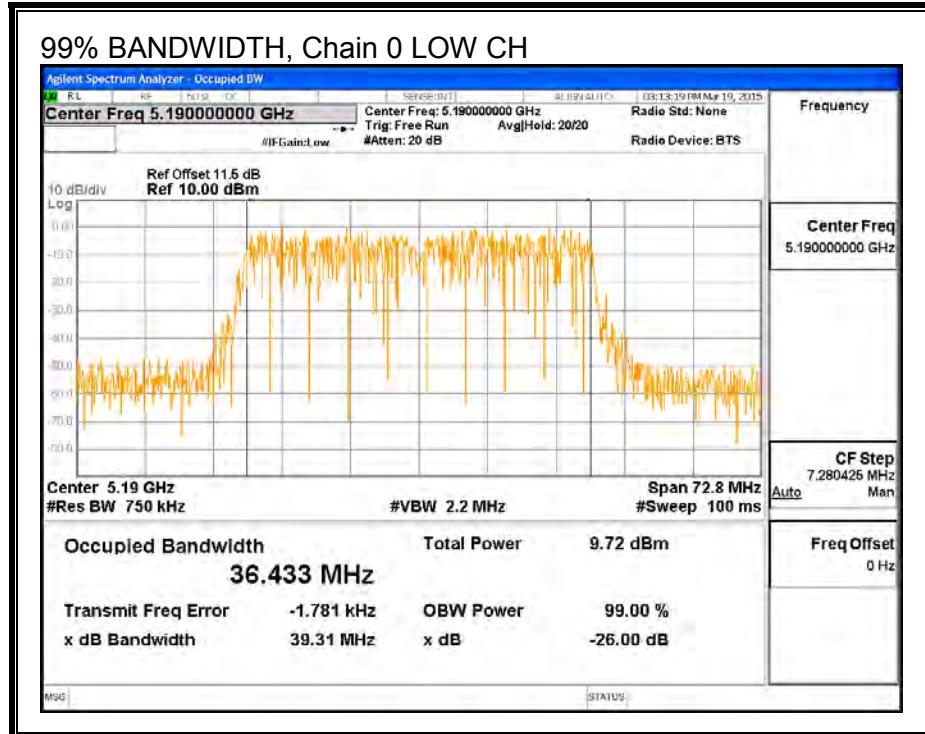
#### LIMITS

None; for reporting purposes only.

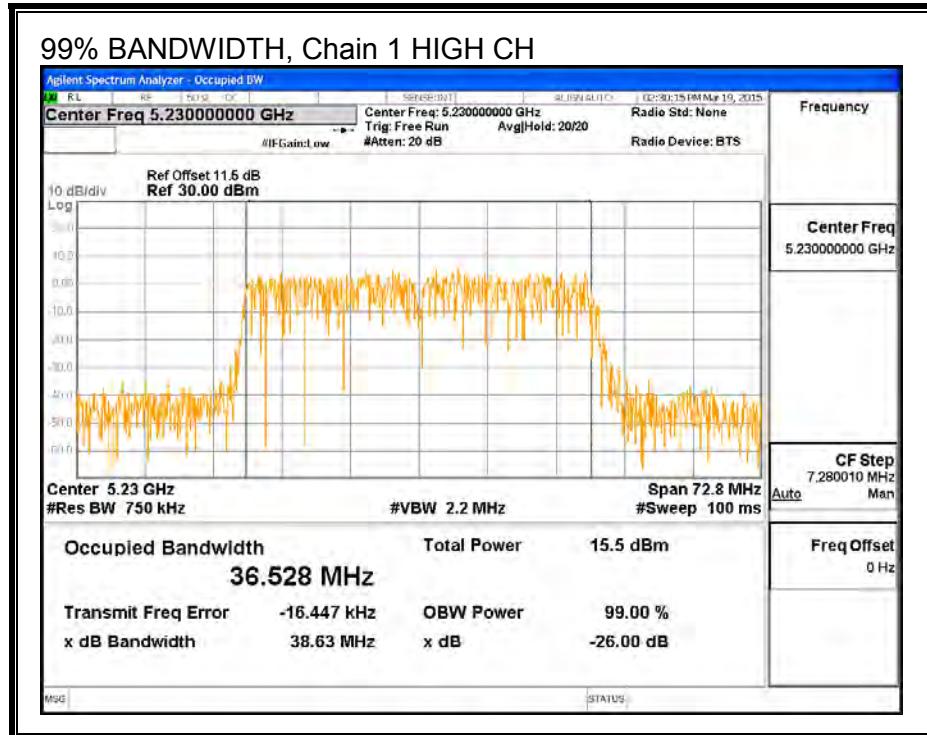
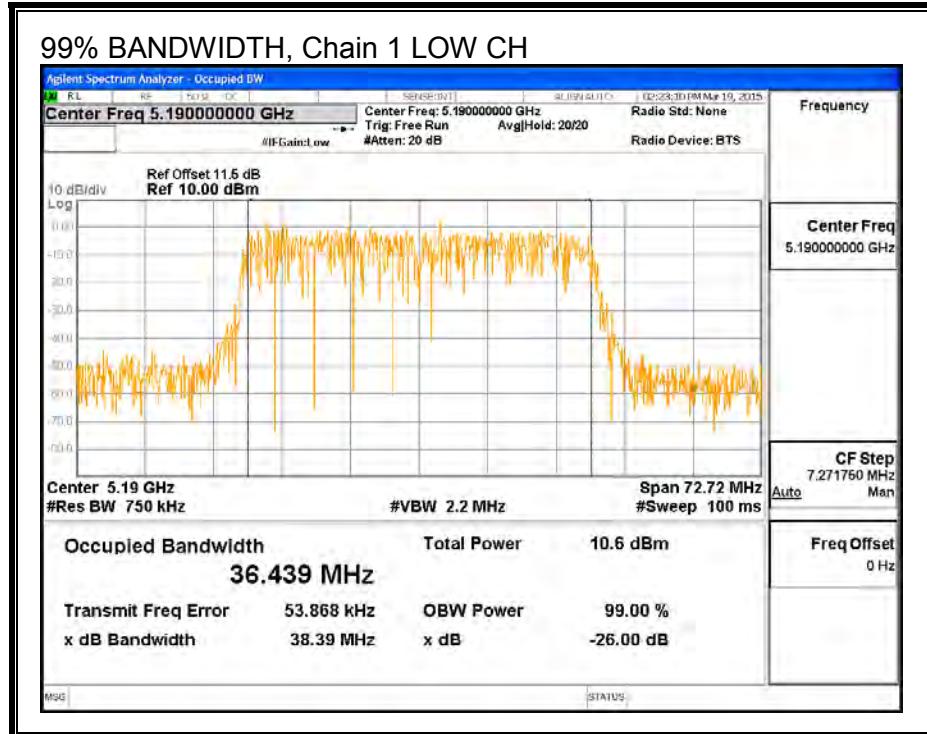
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5190	36.43	36.44
High	5230	36.55	36.53

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 8.6.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

**Average Power Results**

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5190	11.00	10.87	13.94
High	5230	16.35	16.50	19.44

#### 8.6.4. 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

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Uncorrelated Chains Directional Gain (dBi)</b>
4.00	1.01	2.76

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Correlated Chains Directional Gain (dBi)</b>
4.00	1.01	5.64

## **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	5190	2.76	5.64	24.00	11.00
High	5230	2.76	5.64	24.00	11.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
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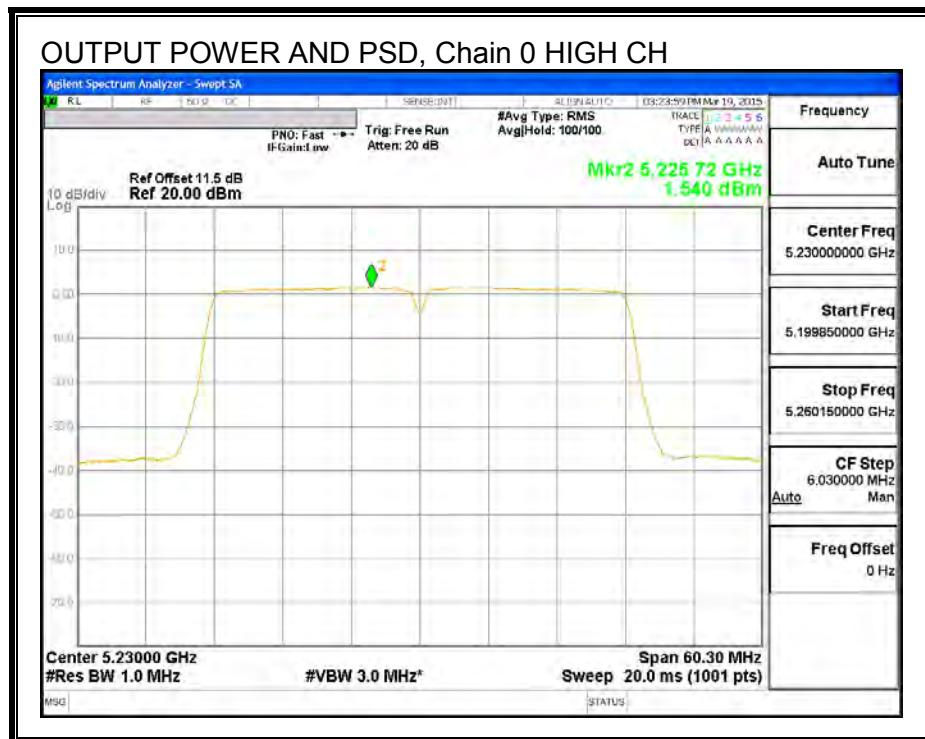
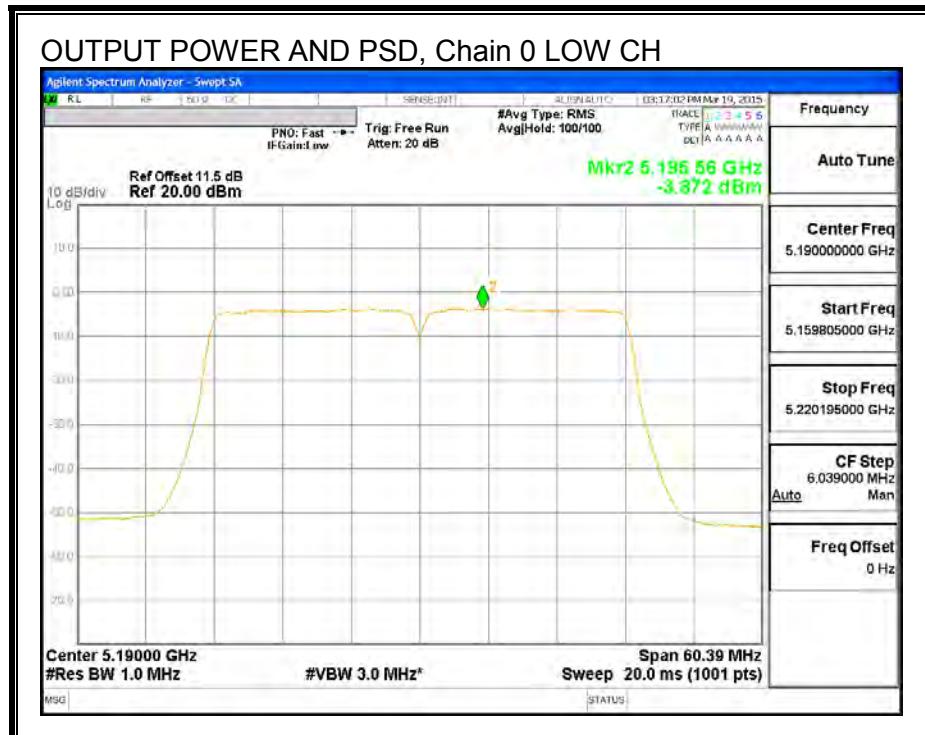
### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	11.00	10.87	13.94	24.00	-10.06
High	5230	16.35	16.50	19.44	24.00	-4.56

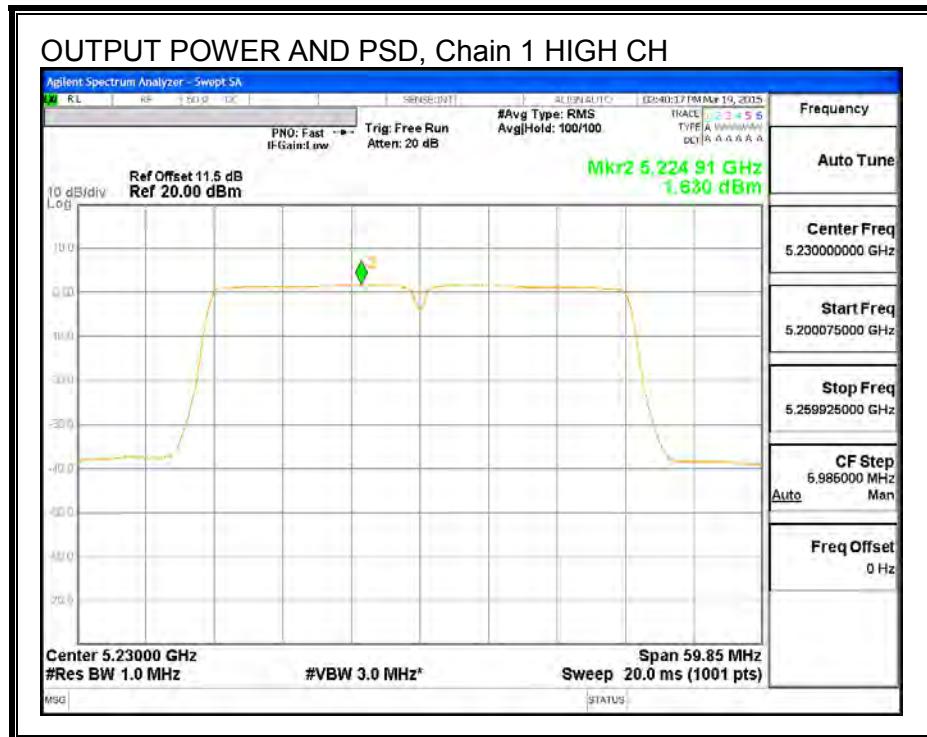
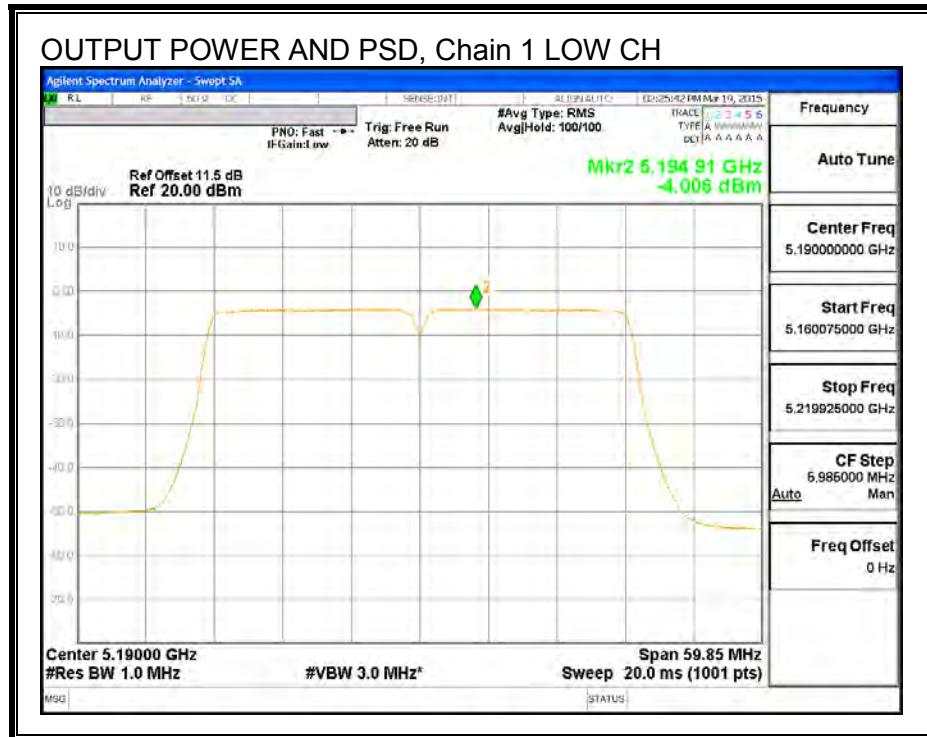
### **PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	-3.87	-4.01	-0.93	11.00	-11.93
High	5230	1.54	1.63	4.60	11.00	-6.40

OUTPUT POWER AND PSD, Chain 0



**OUTPUT POWER AND PSD, Chain 1**



## 8.7. 802.11n HT40 2Tx STBC MODE IN THE 5.2 GHz BAND

### 8.7.1. 26 dB BANDWIDTH

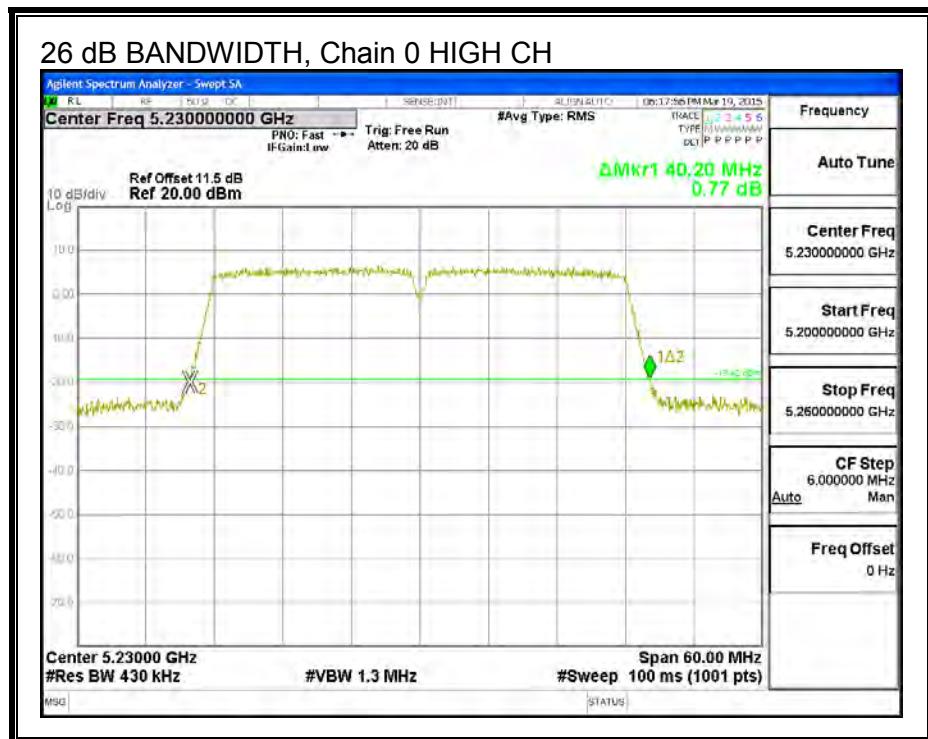
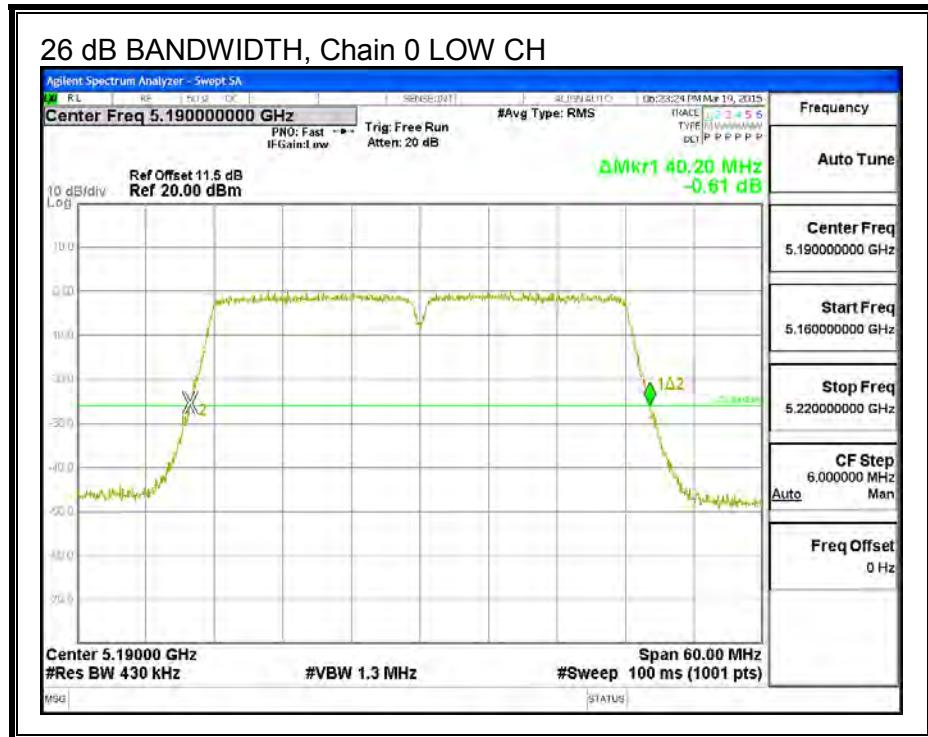
#### LIMITS

None; for reporting purposes only.

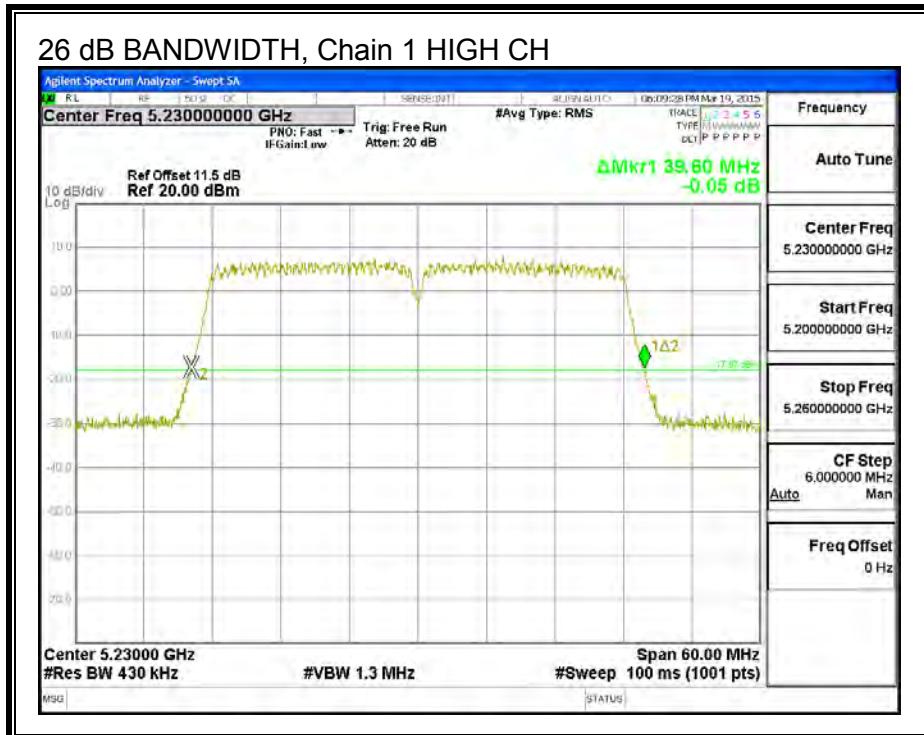
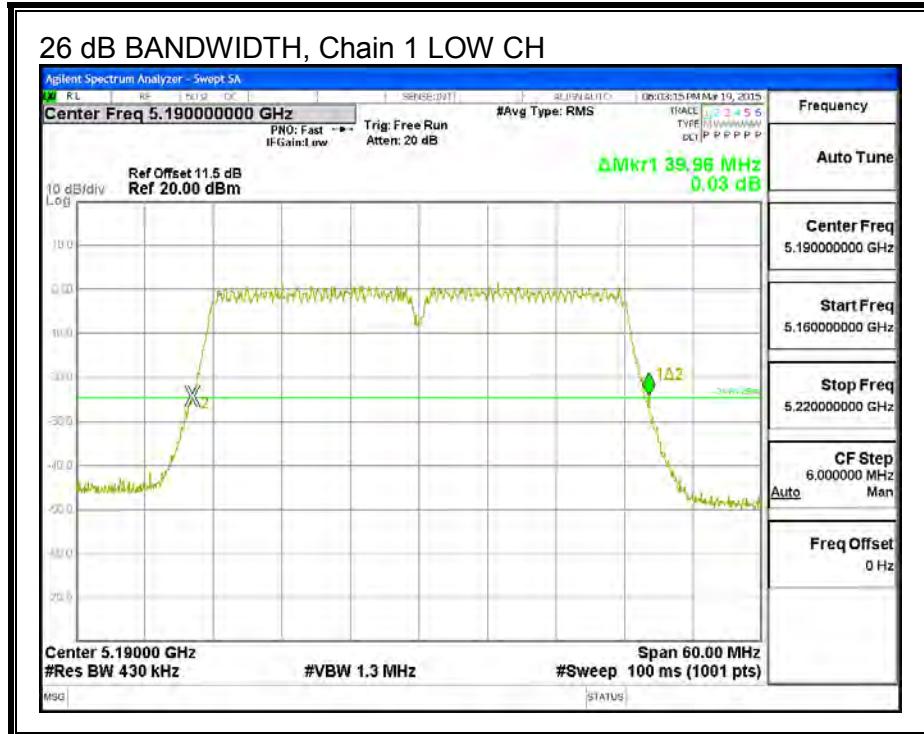
#### RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5190	40.20	39.96
High	5230	40.20	39.60

**26 dB BANDWIDTH, Chain 0**



26 dB BANDWIDTH, Chain 1



### 8.7.2. 99% BANDWIDTH

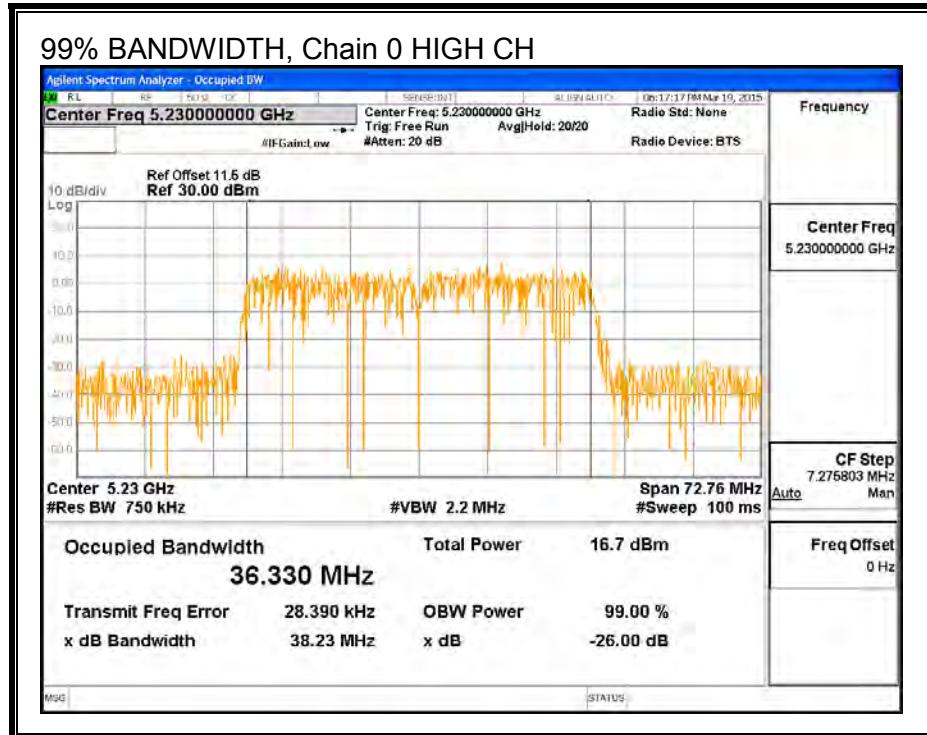
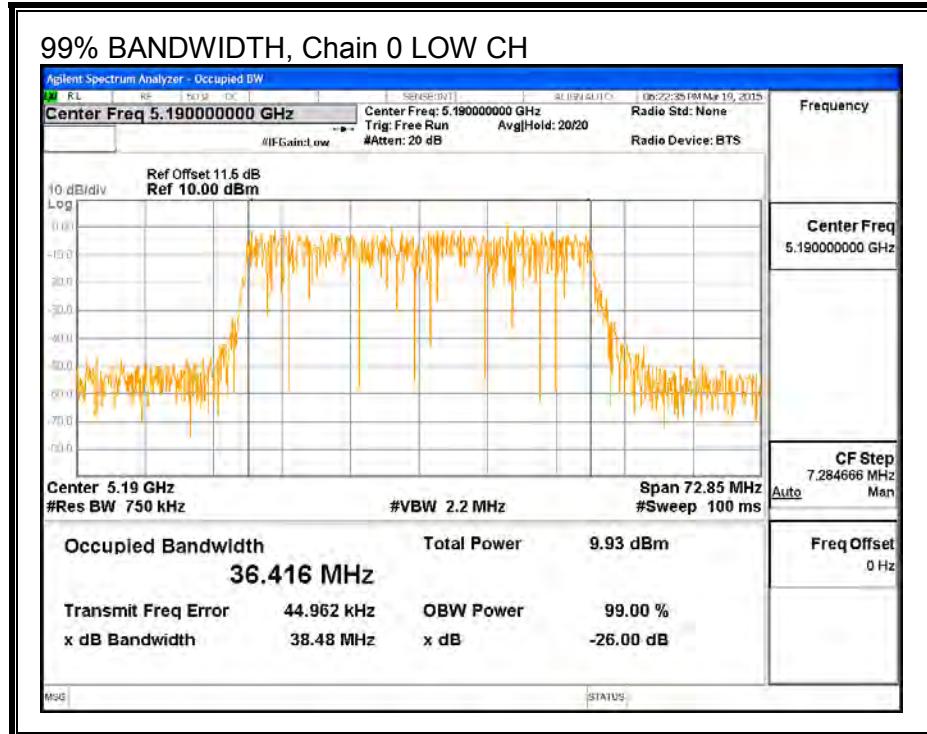
#### LIMITS

None; for reporting purposes only.

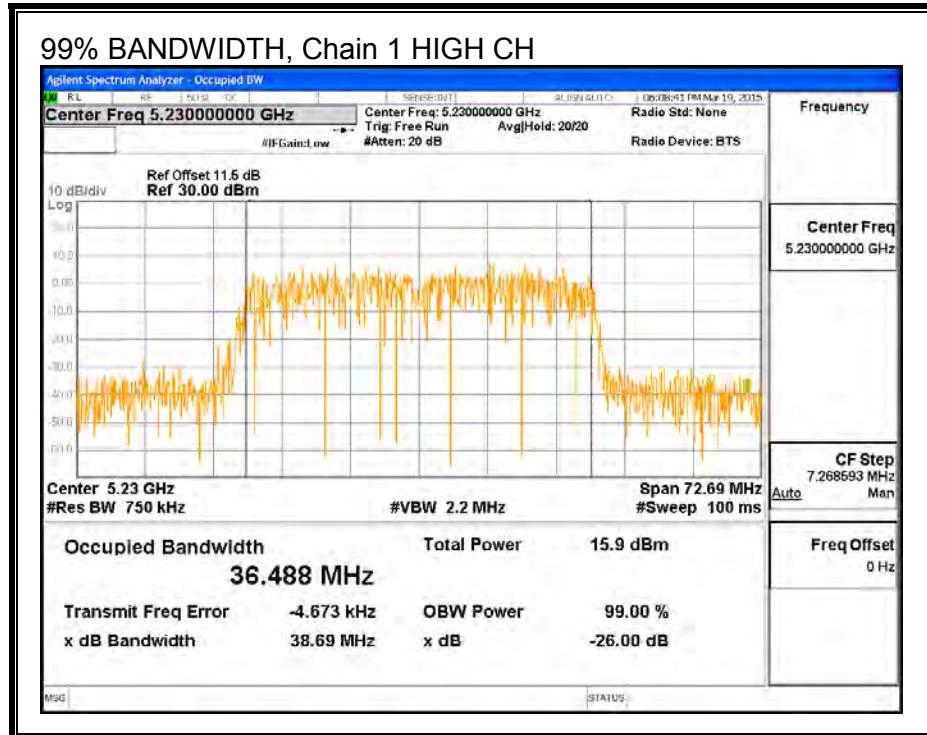
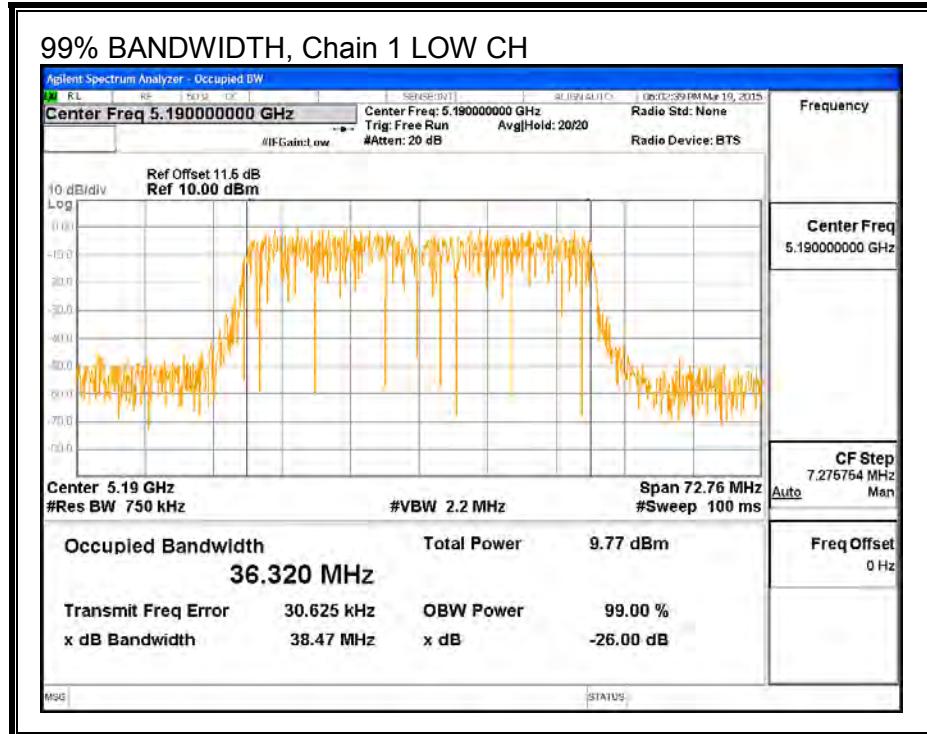
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5190	36.42	36.32
High	5230	36.33	36.49

**99% BANDWIDTH, Chain 0**



**99% BANDWIDTH, Chain 1**



### 8.7.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

##### Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5190	11.00	10.83	13.93
High	5230	17.00	16.94	19.98

#### 8.7.4. 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

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Uncorrelated Chains Directional Gain (dBi)</b>
4.00	1.01	2.76

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

<b>Chain 0 Antenna Gain (dBi)</b>	<b>Chain 1 Antenna Gain (dBi)</b>	<b>Correlated Chains Directional Gain (dBi)</b>
4.00	1.01	5.64

## **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	5190	2.76	5.64	24.00	11.00
High	5230	2.76	5.64	24.00	11.00

<b>Duty Cycle CF (dB)</b>	0.00	<b>Included in Calculations of Corr'd Power &amp; PSD</b>
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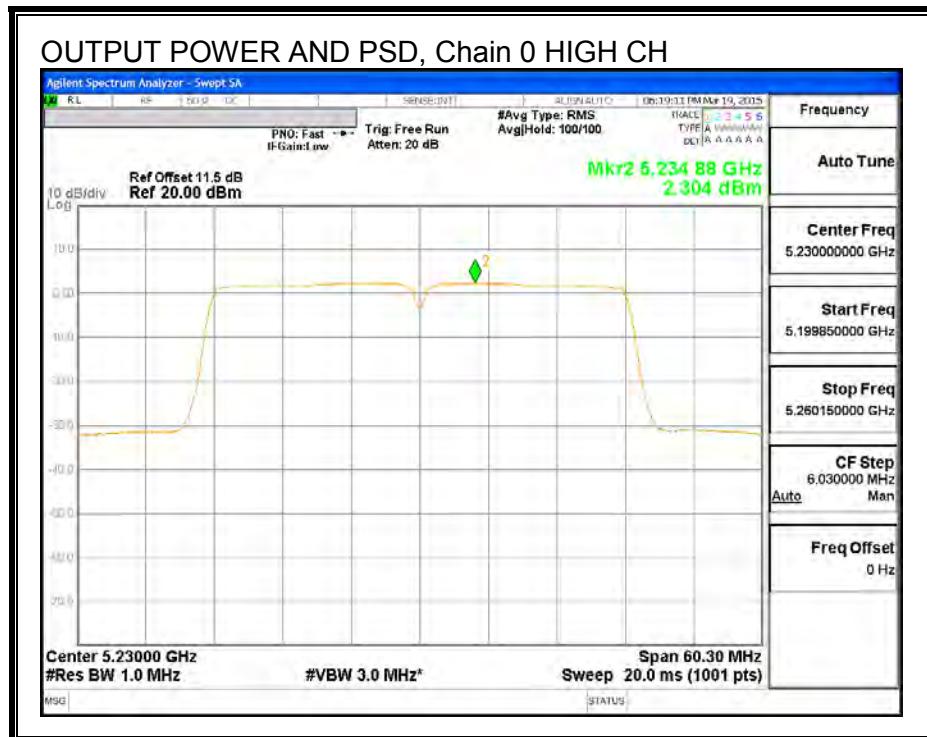
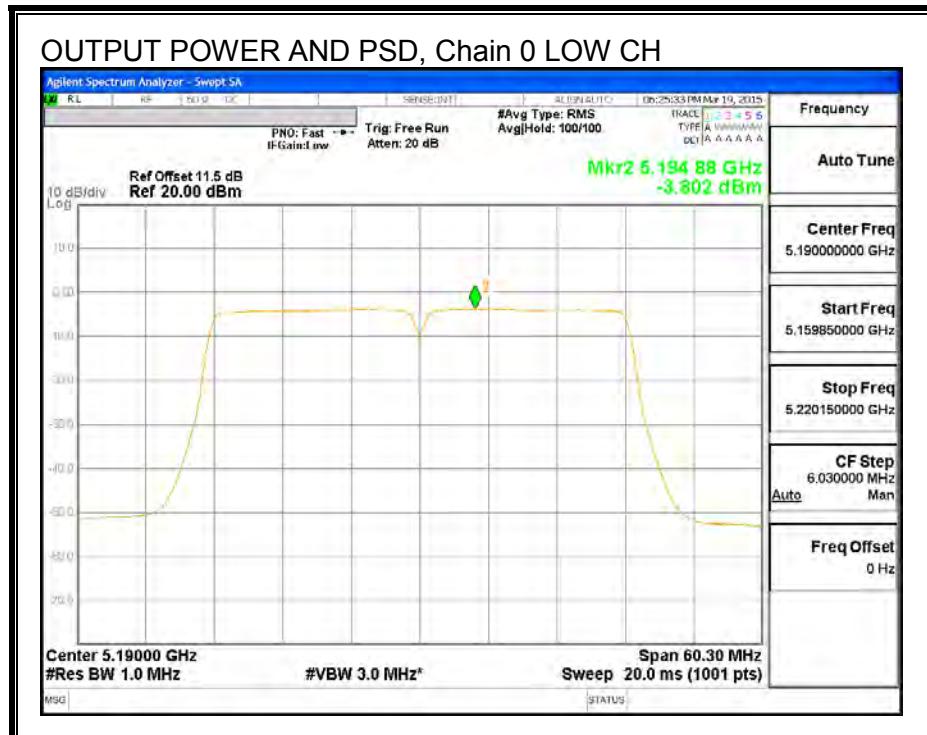
### **Output Power Results**

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	11.00	10.83	13.93	24.00	-10.07
High	5230	17.00	16.94	19.98	24.00	-4.02

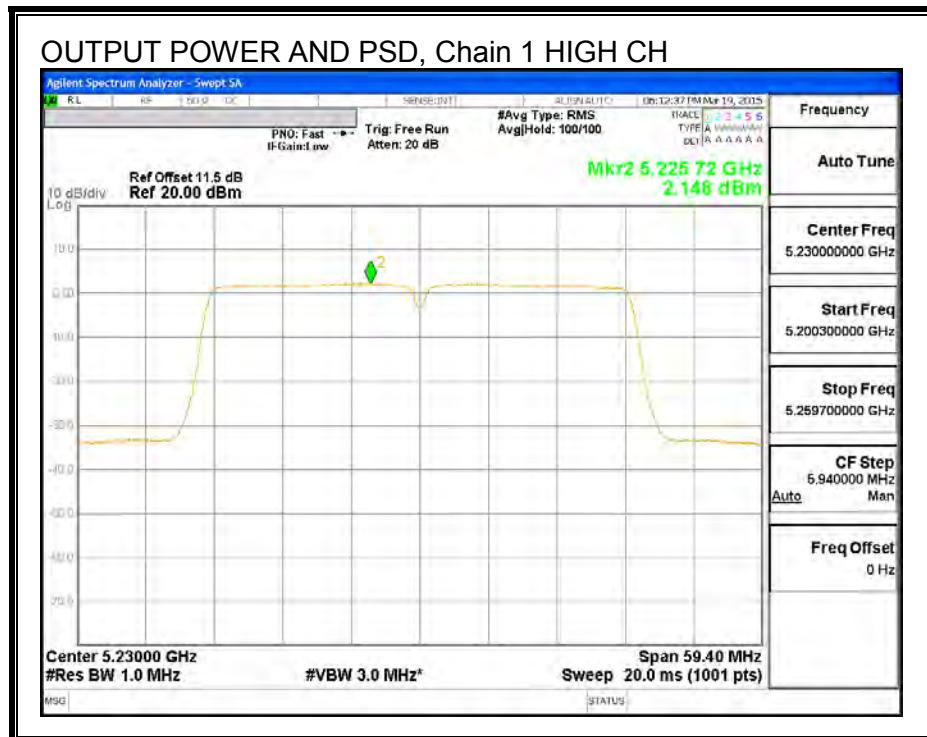
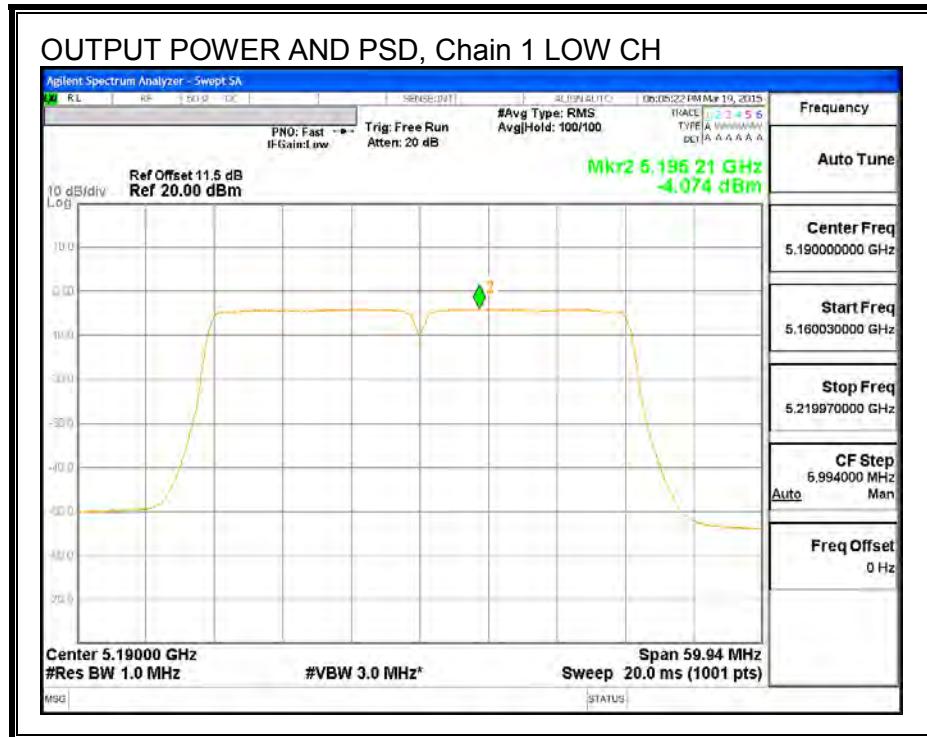
### **PSD Results**

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	-3.80	-4.07	-0.93	11.00	-11.93
High	5230	2.30	2.15	5.24	11.00	-5.76

OUTPUT POWER AND PSD, Chain 0



**OUTPUT POWER AND PSD, Chain 1**



## 8.8. 802.11ac VHT80 SISO MODE IN THE 5.2 GHz BAND

### 8.8.1. 26 dB BANDWIDTH

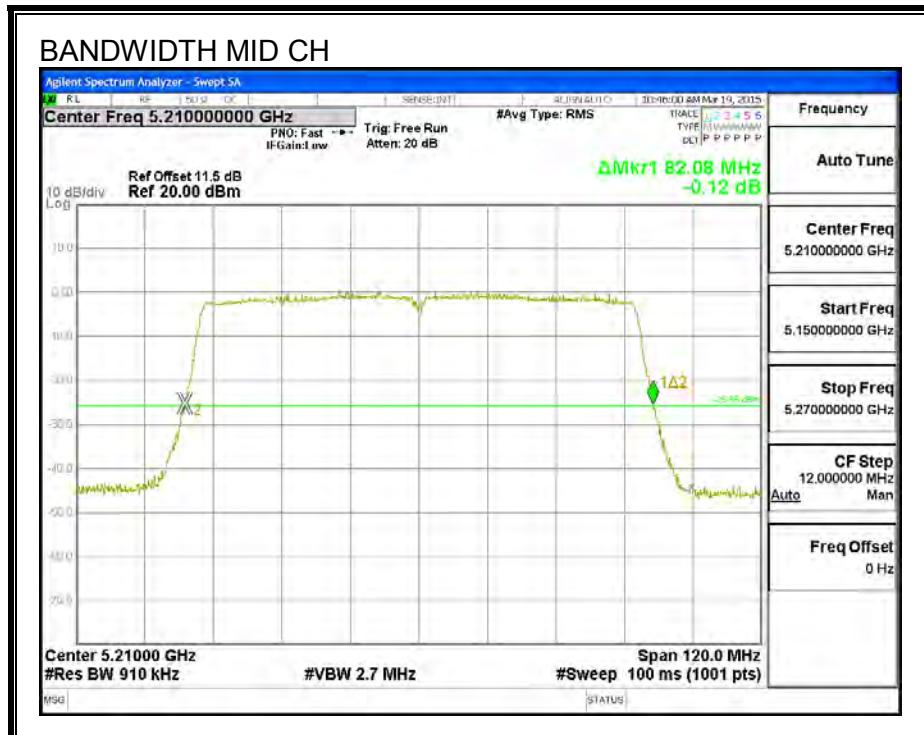
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Mid	5210	82.08

#### 26 dB BANDWIDTH



### 8.8.2. 99% BANDWIDTH

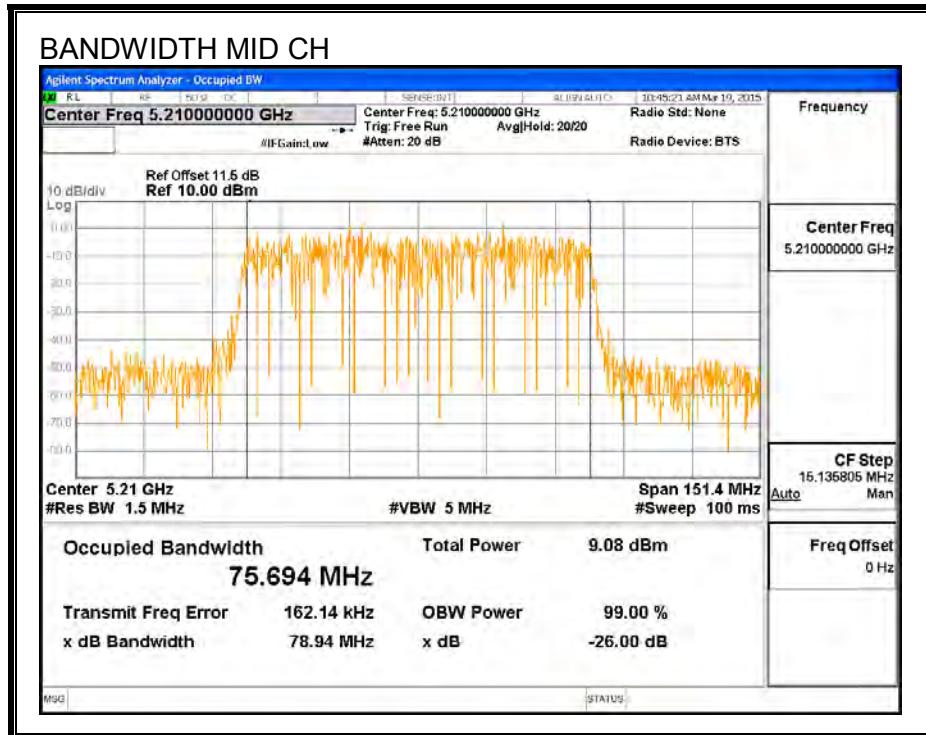
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Mid	5210	75.6940

#### 99% BANDWIDTH



### 8.8.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	Power (dBm)
Mid	5210	10.49

#### 8.8.4. 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

There is only one transmitter output therefore the directional gain is equal to the antenna gain.