



# **CERTIFICATION TEST REPORT**

**Report Number. :** 11735596-E2V2

**Applicant :** MICROSOFT CORP  
ONE MICROSOFT WAY  
REDMOND, WA 98052, U.S.A.

**Model :** 1832

**FCC ID :** C3K1832

**IC :** 3048A-1832

**EUT Description :** PORTABLE COMPUTING DEVICE

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART E  
INDUSTRY CANADA RSS - 247 ISSUE 2

**Date Of Issue:**  
September 28, 2017

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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	09/18/17	Initial release	--
V2	09/28/17	- Changed Chain 0 to Chain A and Chain 1 to Chain B - Updated antenna gains in section 9.9.3 and 9.13.4	C. Susa

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** MICROSOFT CORP  
ONE MICROSOFT WAY  
REDMOND, WA 98052, U.S.A.

**EUT DESCRIPTION:** PORTABLE COMPUTING DEVICE

**MODEL:** 1832

**SERIAL NUMBER:** Radiated: 012813672657  
Conducted: 009698372657

**DATE TESTED:** August 16<sup>th</sup>, 2017 – August 24<sup>th</sup> 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-247 Issue 2	Pass
INDUSTRY CANADA RSS-GEN Issue 4	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 the U.S. 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 v02/D03 v01r02/D06 v02, FCC KDB 789033 D02 v01r04, FCC KDB 644545 D03 v01, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

## 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 checked="" type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input checked="" type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input type="checkbox"/> Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, 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:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

Parameter	Uncertainty
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a portable computing device with 802.11 2x2, a/b/g/n/ac WLAN, Bluetooth, Bluetooth LE.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

#### 5.2 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>2TX</b>			
5180 - 5240	802.11a	11.33	13.58
5180 - 5240	802.11n HT20	11.59	14.42
5190 - 5230	802.11n HT40	14.27	26.73
5210	802.11ac VHT80	10.56	11.38

#### 5.3 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>2TX</b>			
5260 - 5320	802.11a	16.40	43.65
5260 - 5320	802.11n HT20	16.43	43.95
5270 - 5310	802.11n HT40	15.28	33.73
5290	802.11ac VHT80	9.61	9.14

#### 5.6 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>2TX</b>			
5500 - 5700	802.11a	16.28	42.46
5500 - 5700	802.11n HT20	16.28	42.46
5510 - 5670	802.11n HT40	15.23	33.34
5530 - 5610	802.11ac VHT80	14.41	27.61

**5.8 GHz BAND**

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>2TX</b>			
5745 - 5825	802.11a	15.20	33.11
5745 - 5825	802.11n HT20	15.12	32.51
5755 - 5795	802.11n HT40	15.31	33.96
5775	802.11ac VHT80	9.33	8.57

**STRADDLE CHANNELS**

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>2TX (Channels overlapping UNII-2C and UNII-3)</b>			
5720 (Whole Fundamental)	802.11a	17.19	52.33
5720 (Whole Fundamental)	802.11n HT20	17.28	53.51
5710 (Whole Fundamental)	802.11n HT40	16.27	42.37
5690 (Whole Fundamental)	802.11ac VHT80	15.29	33.83

**List of test reduction**

Antenna Port Testing		
Band	Mode	Covered by
5 GHz band	802.11a 1TX	802.11a 2TX
5 GHz band	802.11n HT20 1TX	802.11n HT20 2TX
5 GHz band	802.11n HT40 1TX	802.11n HT40 2TX
5 GHz band	802.11ac VHT 80 1TX	802.11ac VHT 80 2TX

Note: 802.11n VHT20 and VHT40 modes are leveraged from 802.11n HT20 and HT40.

**5.3. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes an integrated antenna, with a maximum gain as follows:

Frequency Band (GHz)	Antenna Gain (dBi)	
	Chain 0 (A)	Chain 1 (B)
5.2	5.38	3.63
5.3	5.38	3.63
5.5	4.89	3.77
5.8	2.51	2.38

## **5.4. SOFTWARE AND FIRMWARE**

The EUT firmware installed during testing was 14.2.201.159

The test utility software used during testing was WIFI tool v2.7.5

## **5.5. WORST-CASE CONFIGURATION AND MODE**

For below 1GHz 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.

The fundamental of the EUT was investigated in four orientations X/Y/Z and display tilted at 45degrees, it was determined that Y orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y 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 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.

For MIMO modes, the 2Tx emission testing was considered as a worst case scenario and was performed at power levels, per transmit chain, greater than or equal to the maximum power in any 1Tx mode.

## 5.6. DESCRIPTION OF TEST SETUP

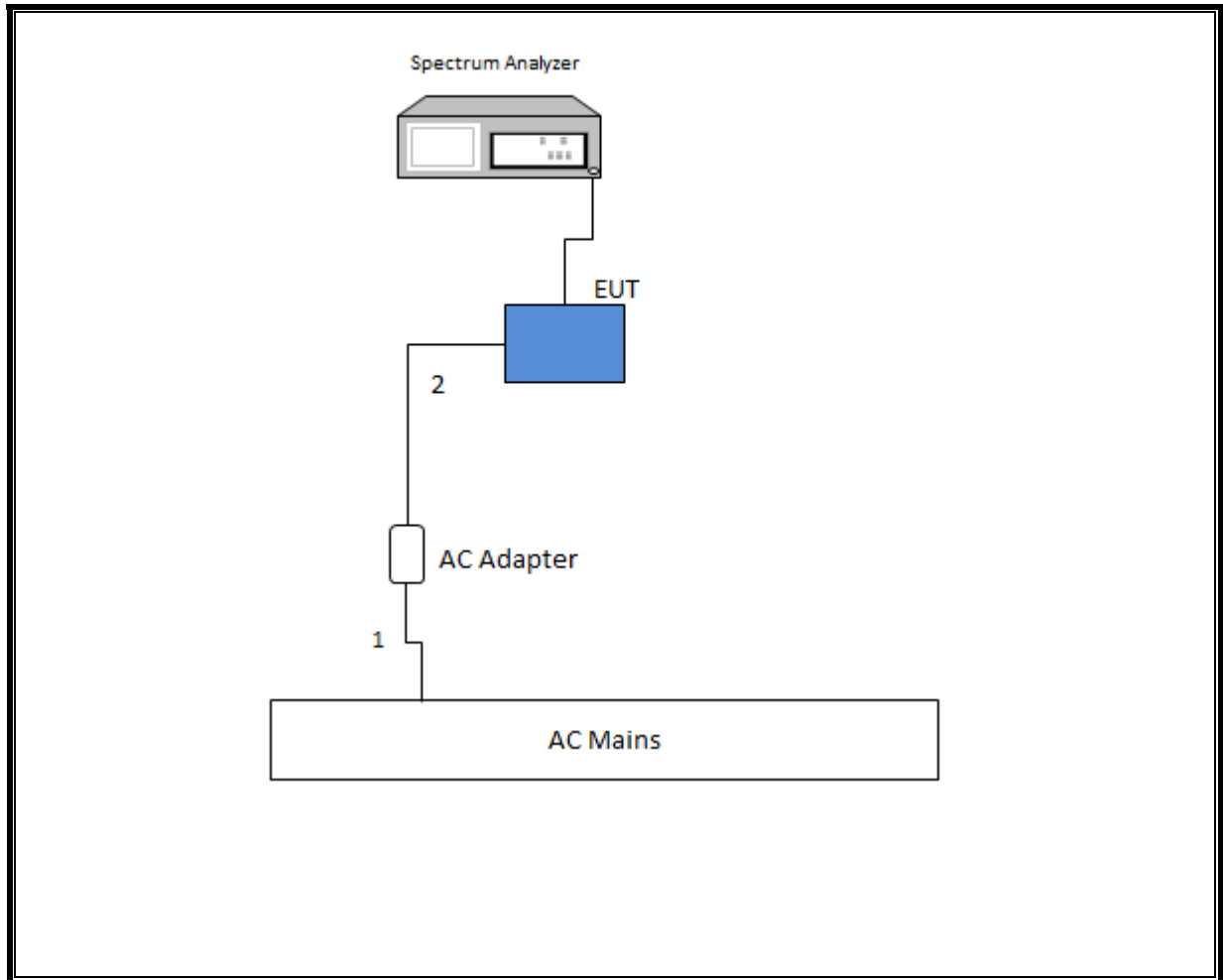
### I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	Un-Shielded	0.17	
2	DC	1	Proprietary	Un-Shielded	1.75	

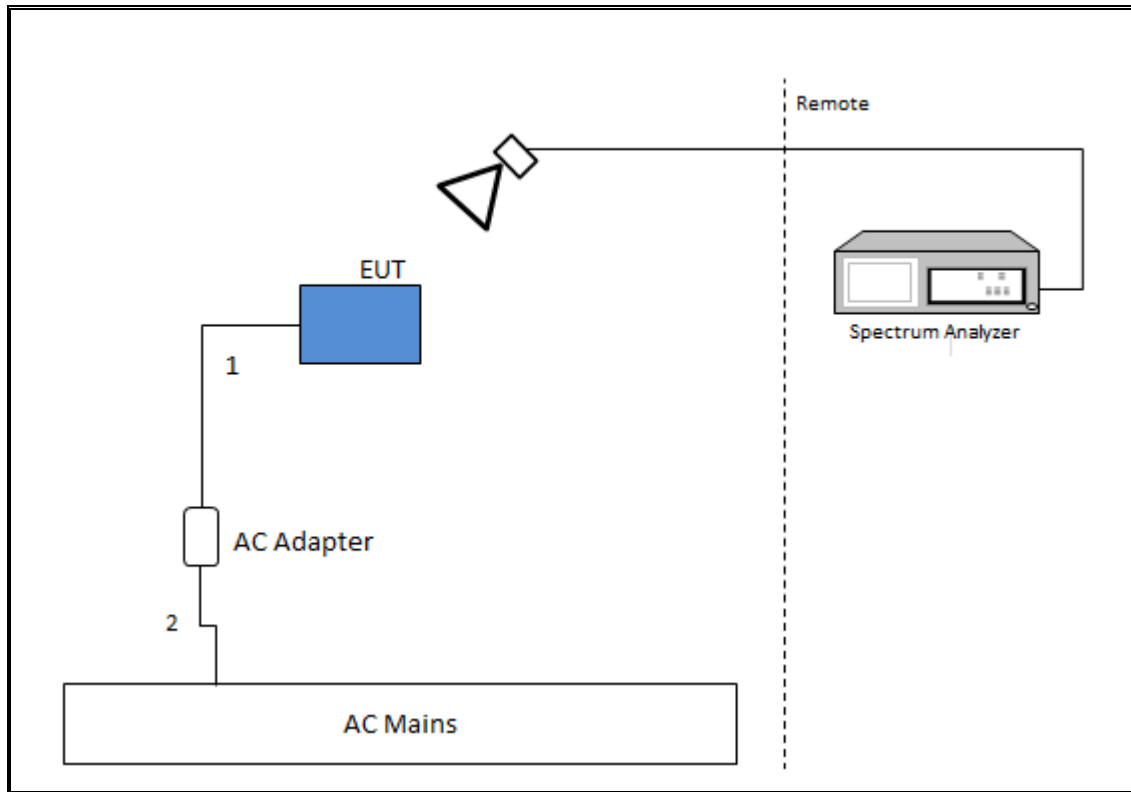
### TEST SETUP

Test software is installed on the EUT that exercises the radio. During all tests the EUT is connected to the AC adapter.

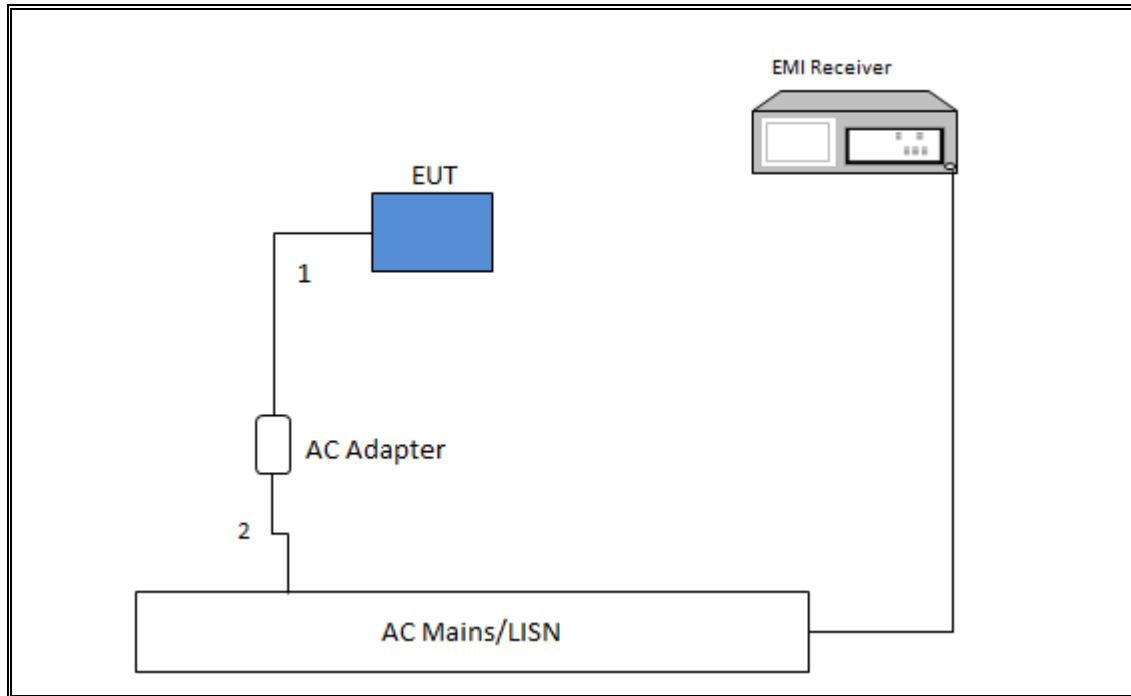
**SETUP DIAGRAM FOR ANTENNA PORT CONDUCTED TESTS**



**SETUP DIAGRAM FOR RADIATED TESTS**



**SETUP DIAGRAM FOR AC LINE CONDUCTED TESTS**





## 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
Spectrum Analyzer	Keysight	N9030A	T1210	07/17/18
Spectrum Analyzer	Keysight	N9030A	T1466	04/11/18
Antenna, Biconolog, 30-1GHz	Sunol Sciences	JB1	T130	09/23/17
RF Preamplifier, 10kHz – 1GHz	Sonoma	310N	T300	11/10/17
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T862	06/09/18
RF Preamplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	T1165	06/24/18
RF Preamplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1573	06/24/18
Low Pass Filter, 5GHz	Micro-Tronics	LPS17541	T481	06/24/18
High Pass Filter, 6GHz	Micro-Tronics	HPS17542	T484	06/24/18
Spectrum Analyzer	Keysight	N9030A	T907	01/23/18
RF Preamplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	T493	02/15/18
RF Preamplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1156	02/15/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T863	06/09/18
Low Pass Filter, 5GHz	Micro-Tronics	LPS17541	T482	02/15/18
High Pass Filter, 6GHz	Micro-Tronics	HPS17542	T483	02/15/18
Antenna, Horn, 18-26GHz	ARA	MWH-1826/B	T449	06/12/18
RF Preamplifier, 1-26GHz	Agilent	8499B	T404	07/23/18
Antenna, Horn, 26-40GHz	ARA	MWH-2640	T90	08/25/18
RF Preamplifier, 26-40GHz	Miteq	NSP4000-SP2	T88	04/29/18
Spectrum Analyzer	Keysight	N9030A	T1454	12/15/17
EMI Receiver	Rohde & Schwarz	ESR	T1436	01/06/18
LISN	Fischer Custom Communications	FCC-LSN-50/250-25-2-01	T1310	06/15/18

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	9.5, 12/01/16
Antenna Port Software	UL	UL RF	7.1, 8/6/17
Conducted Emissions Software	UL	UL EMC	9.5, 5/26/15

## 7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 789033 D02 v01r04, Section B.

26 dB Emission BW: KDB 789033 D02 v01r04, Section C.

99% Occupied BW: KDB 789033 D02 v01r04, Section D.

Conducted Output Power: KDB 789033 D02 v01r04, Section E.3.b (Method PM-G) and KDB 789033 D02 v01r04, Section E.2.b (Method SA-1)

Power Spectral Density: KDB 789033 D02 v01r04, Section F

Unwanted emissions in restricted bands: KDB 789033 D02 v01r04, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01r04, Sections G.3, G.4, and G.5.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

## 8. ON TIME, DUTY CYCLE

### LIMITS

None; for reporting purposes only.

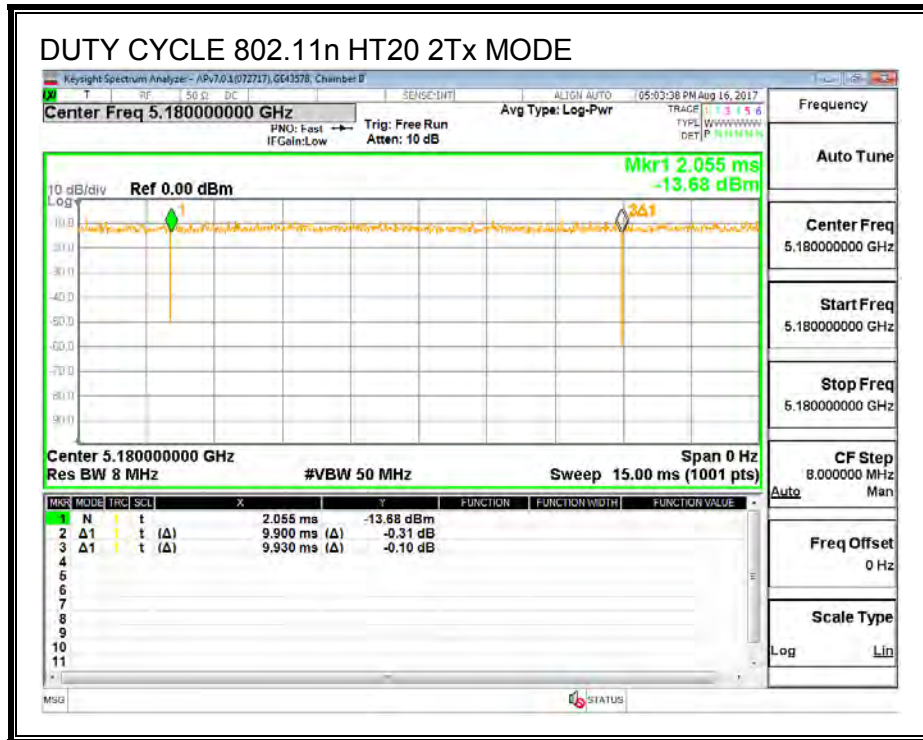
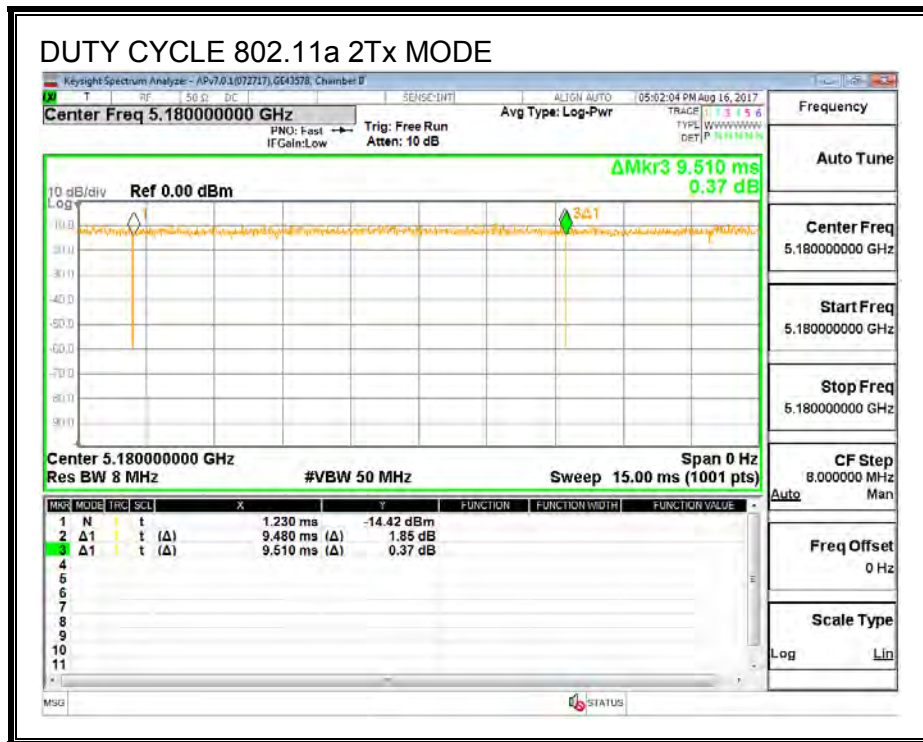
### PROCEDURE

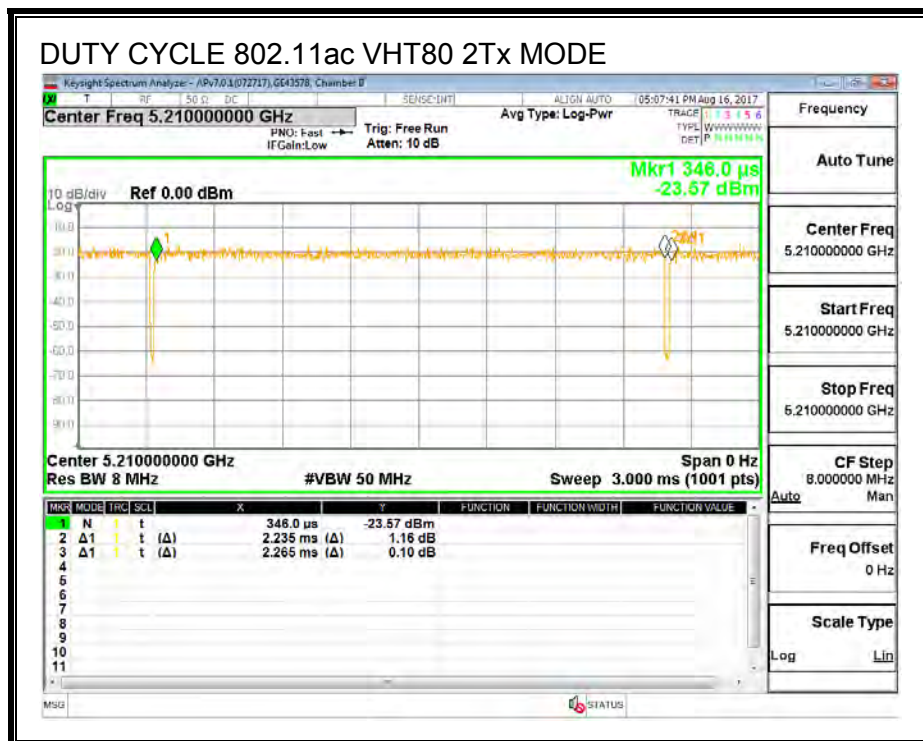
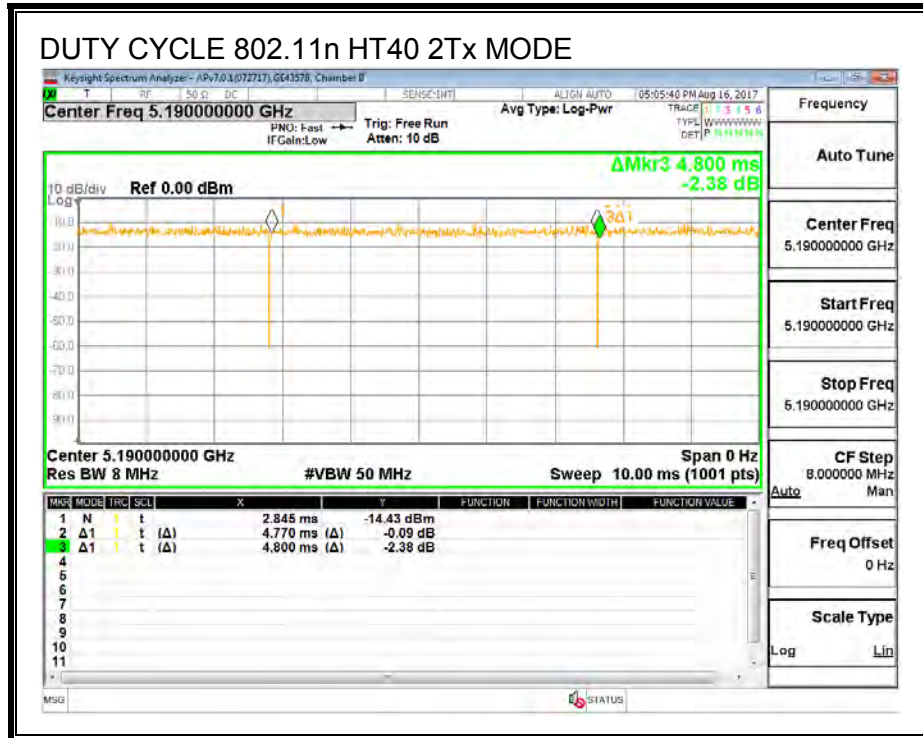
KDB 789033 Zero-Span Spectrum Analyzer Method.

### RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11a 2Tx	9.480	9.510	0.997	99.7%	0.00	0.010
802.11n HT20 2Tx	9.900	9.930	0.997	99.7%	0.00	0.010
802.11n HT40 2Tx	4.770	4.800	0.994	99.4%	0.00	0.010
802.11ac HT80 2Tx	2.235	2.265	0.987	98.7%	0.00	0.010

**DUTY CYCLE PLOTS**





## 9. ANTENNA PORT TEST RESULTS

### 9.1. 11a 2TX MODE IN THE 5.2GHz BAND

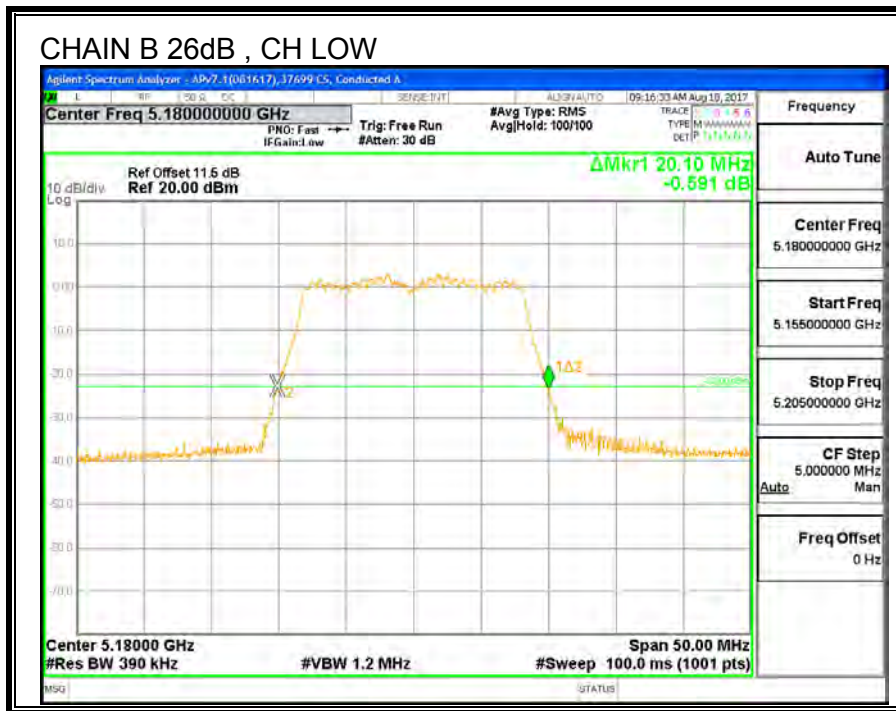
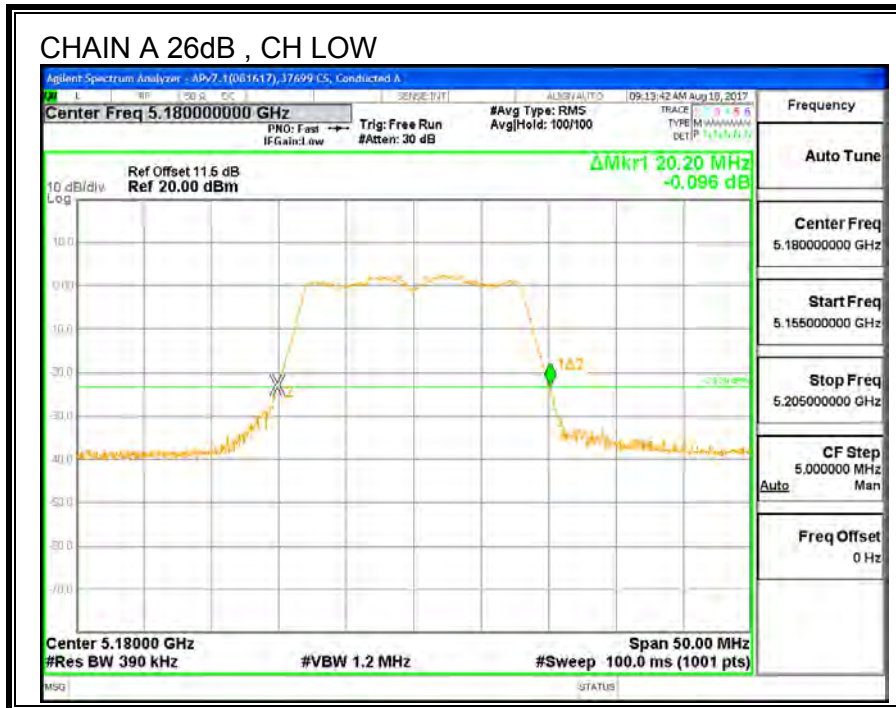
#### 9.1.1. 26 dB BANDWIDTH

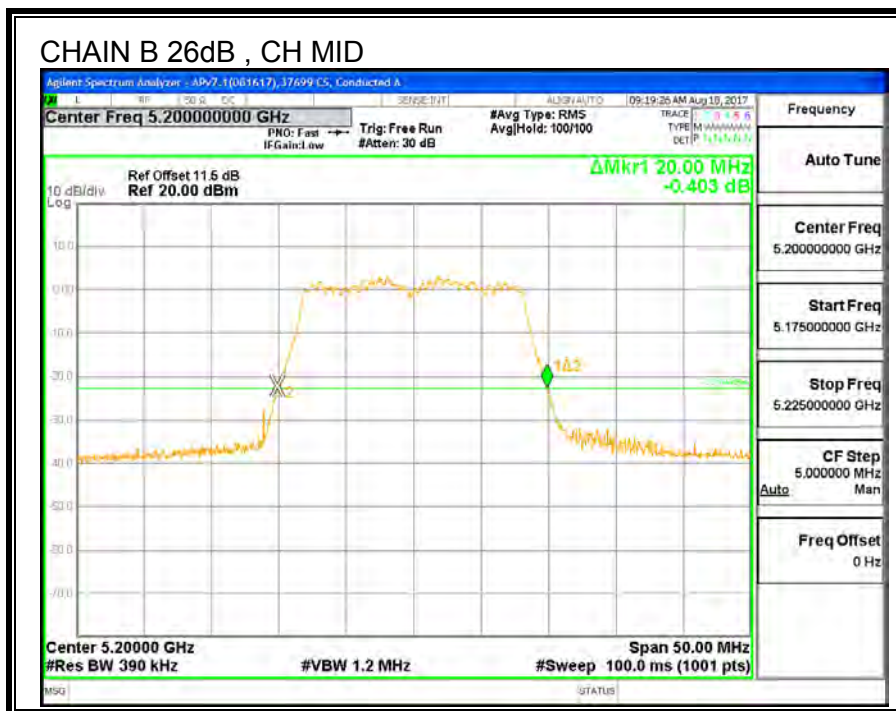
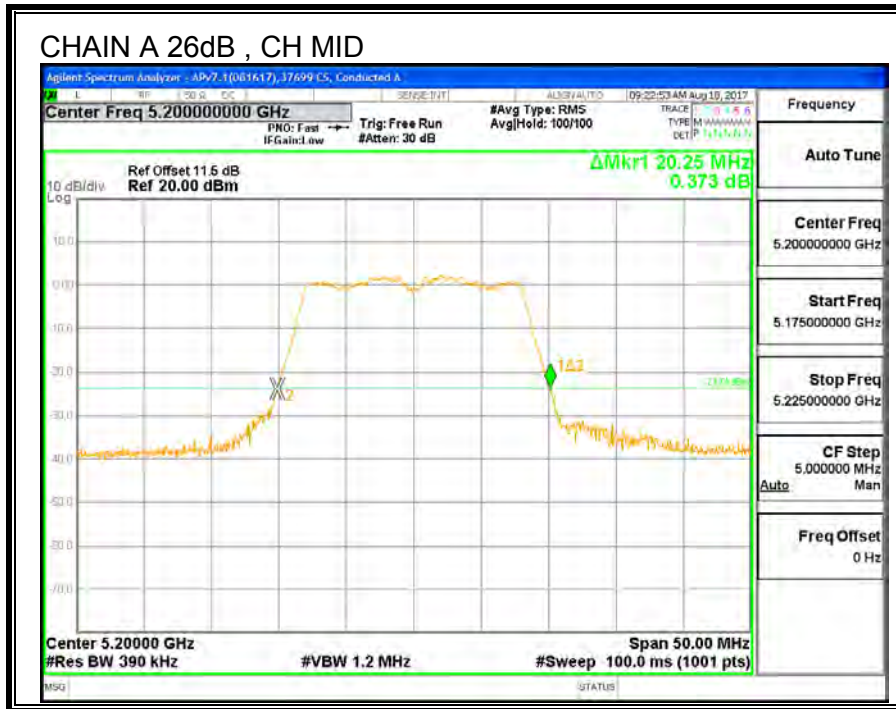
##### LIMITS

None; for reporting purposes only.

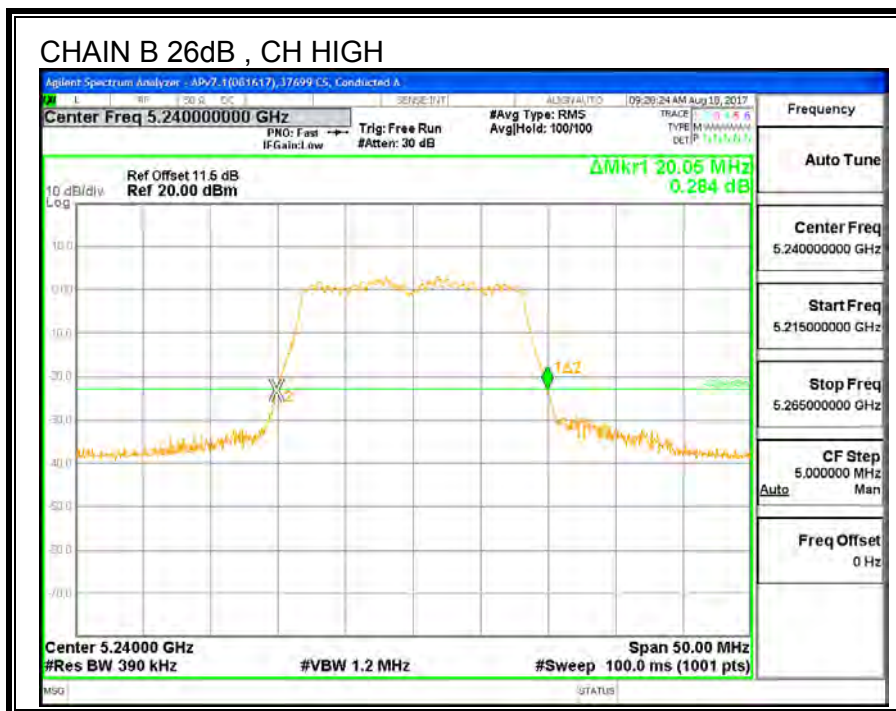
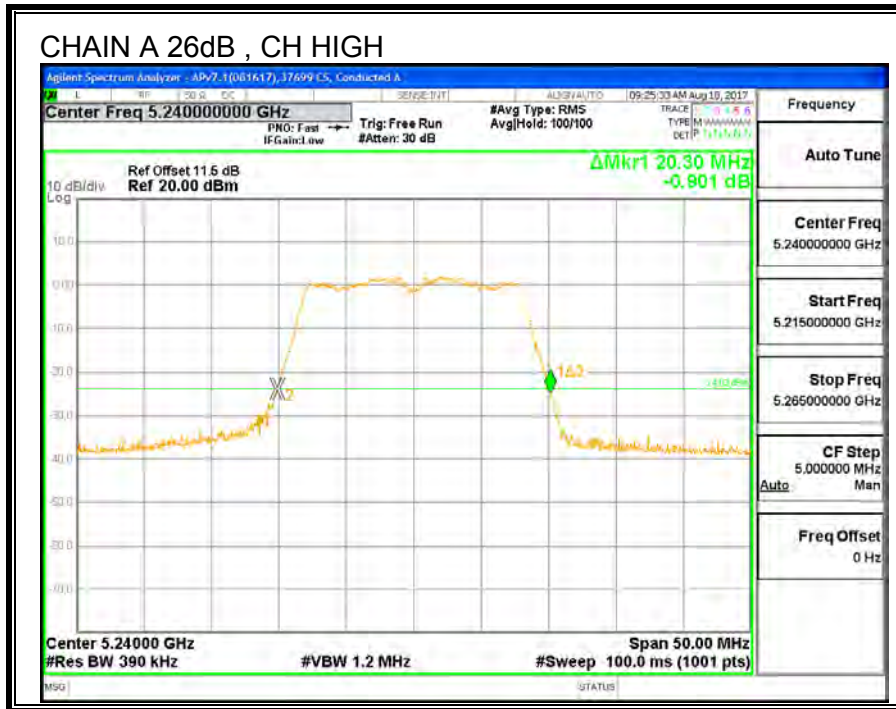
##### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5180	20.20	20.10
Mid	5200	20.25	20.00
High	5240	20.30	20.05









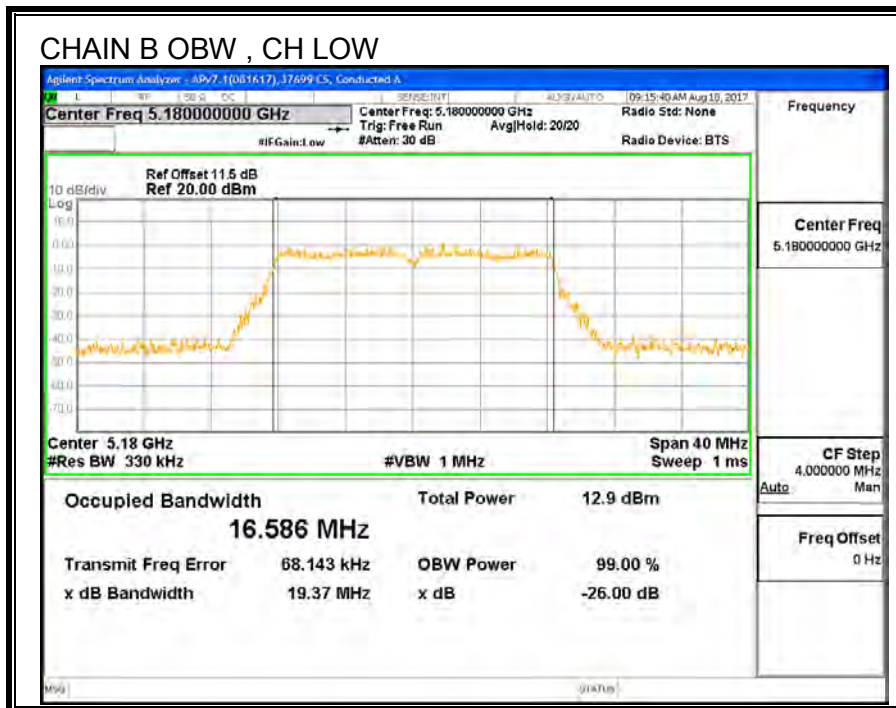
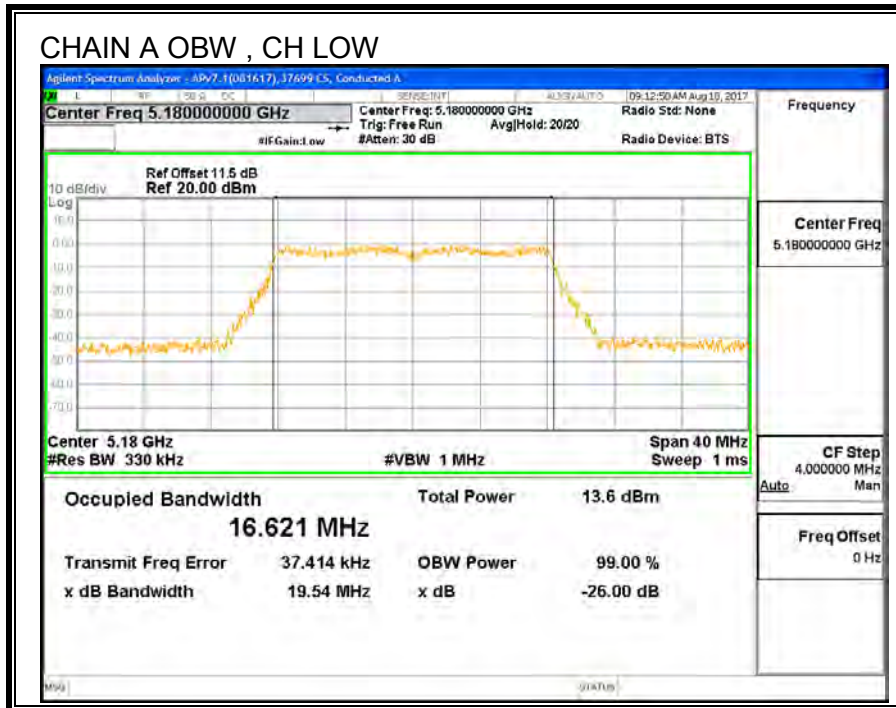
### 9.1.2. 99% BANDWIDTH

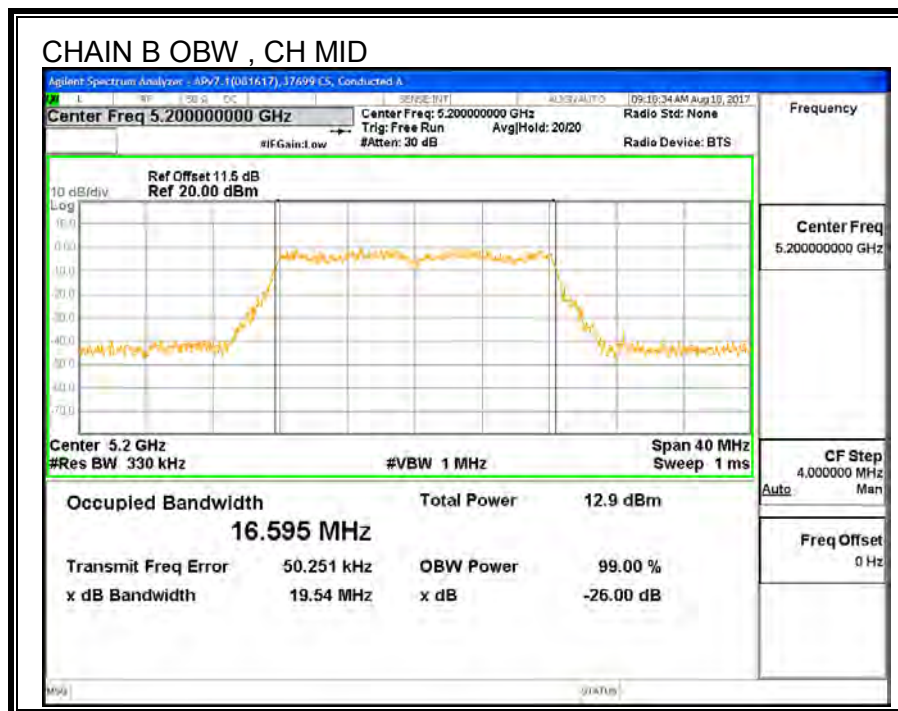
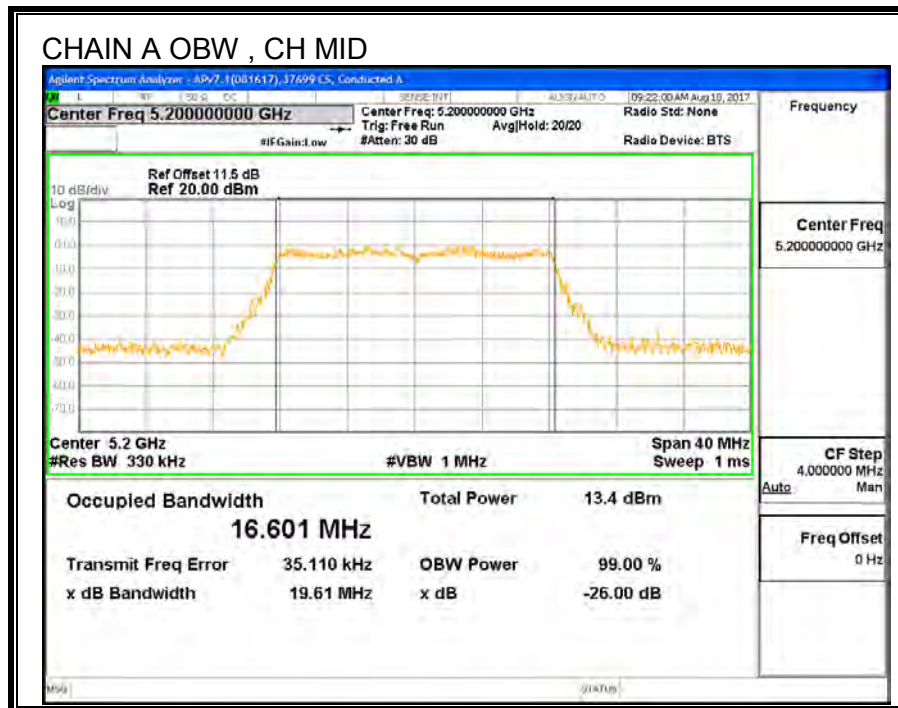
#### LIMITS

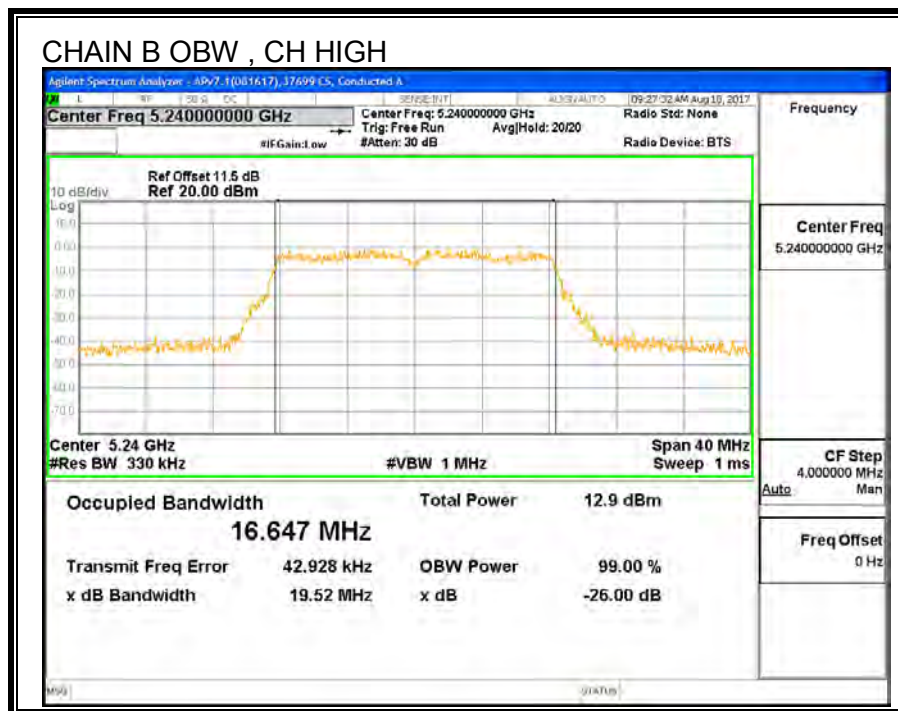
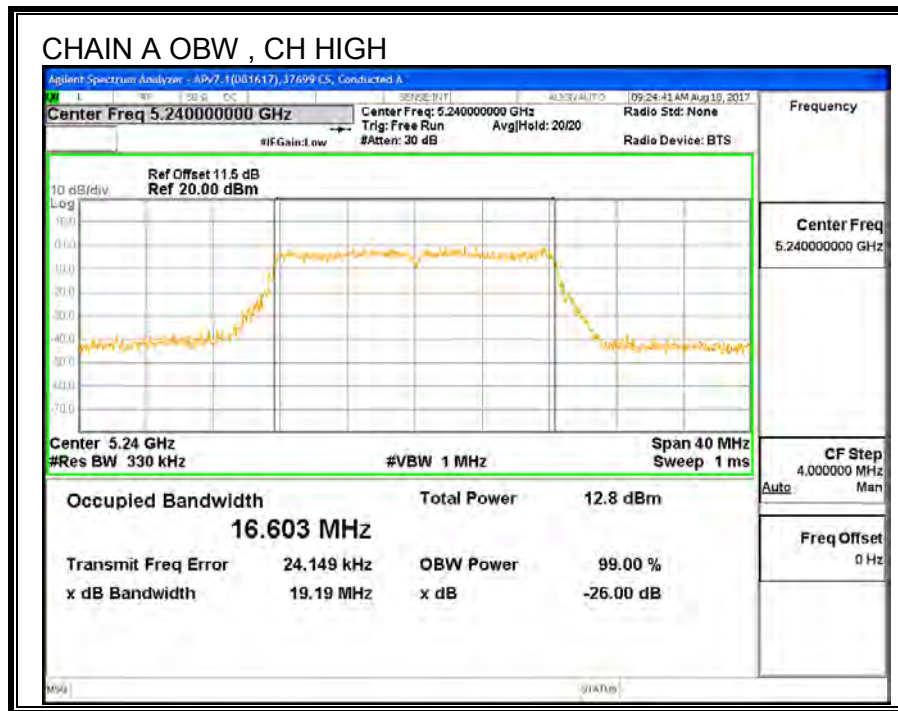
None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5180	16.621	16.586
Mid	5200	16.601	16.595
High	5240	16.603	16.647







### 9.1.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

RSS-247 6.2.1(1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.38	3.63	4.59	7.56

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	8/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5180	20.10	16.59	4.59	7.56
Mid	5200	20.00	16.60	4.59	7.56
High	5240	50.05	16.60	4.59	7.56

**Limits**

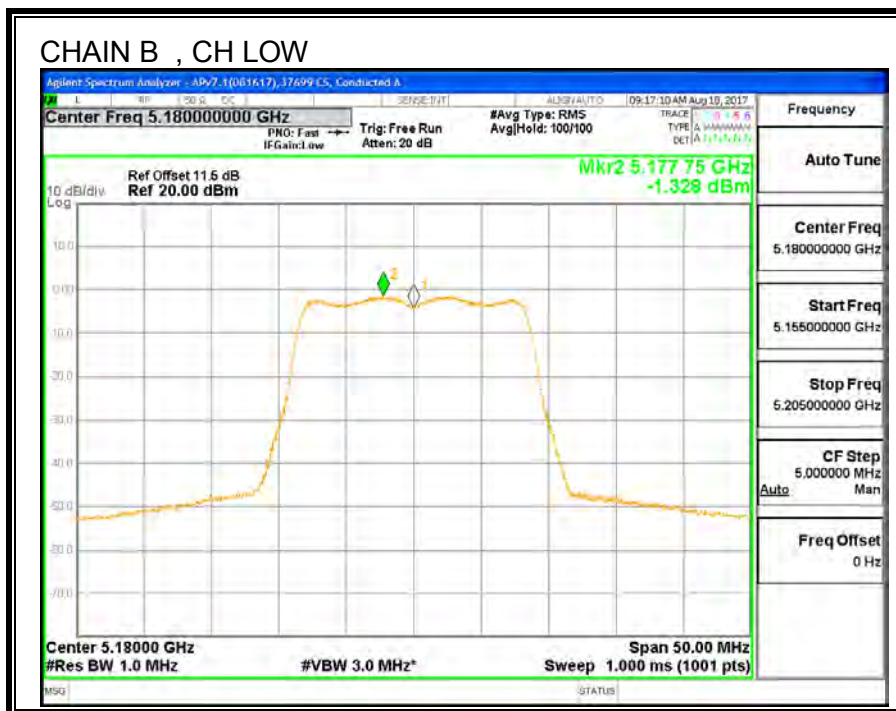
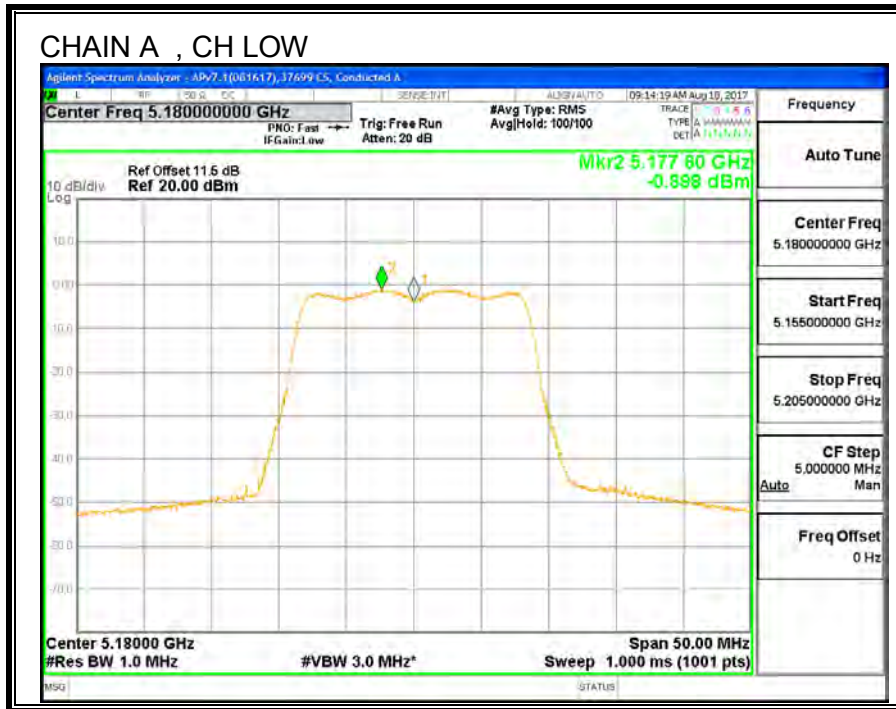
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED EIRP Limit (dBm)	Max ISED Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	24.00	22.20	17.60	17.60	9.44	10.00	2.44
Mid	5200	24.00	22.20	17.61	17.61	9.44	10.00	2.44
High	5240	24.00	22.20	17.61	17.61	9.44	10.00	2.44

**Output Power Results**

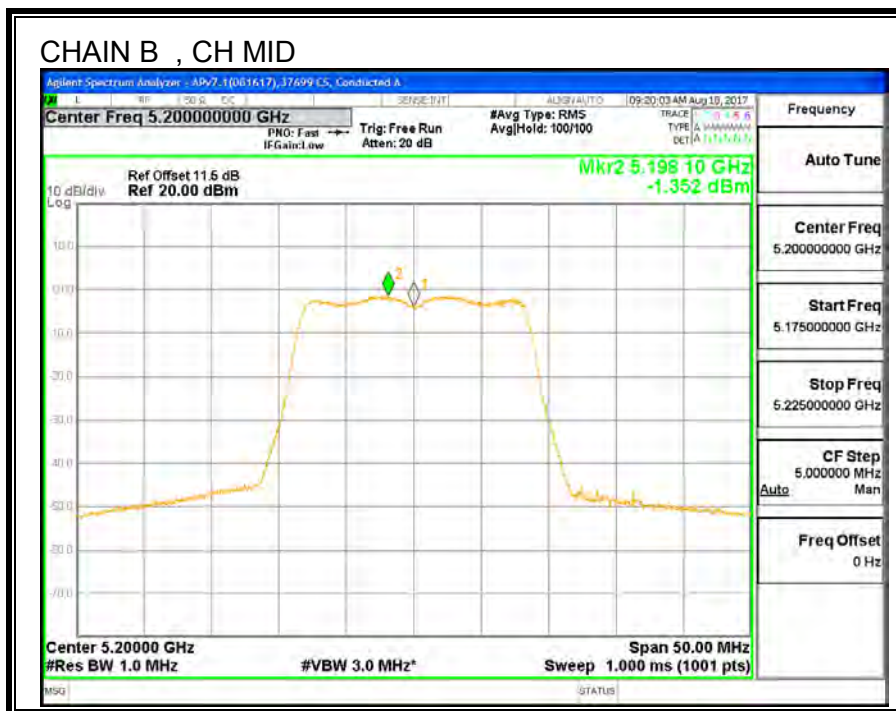
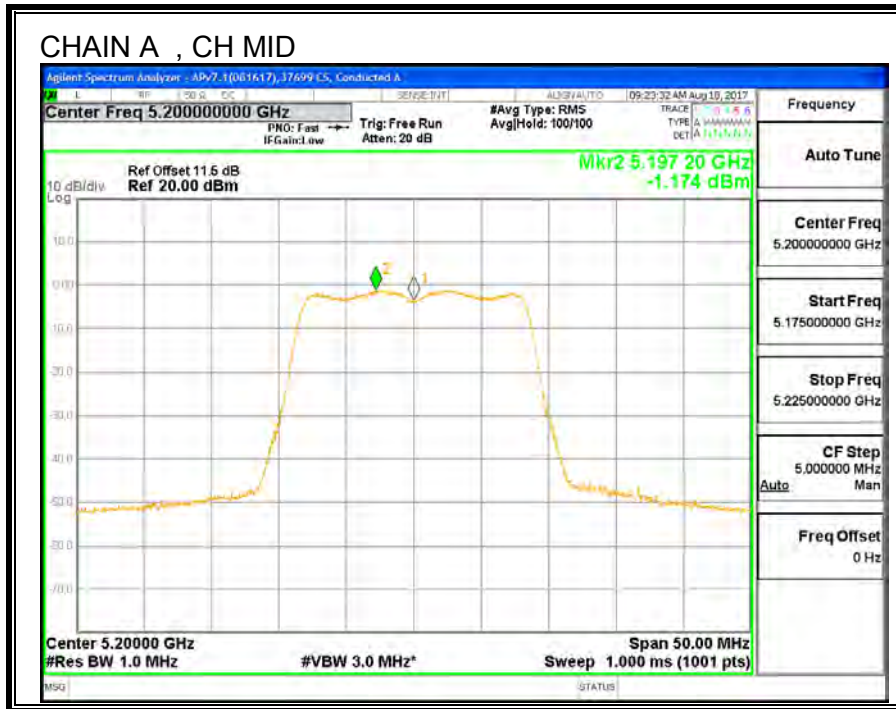
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	8.46	8.18	11.33	17.60	-6.27
Mid	5200	8.47	8.17	11.33	17.61	-6.27
High	5240	8.37	8.13	11.26	17.61	-6.35

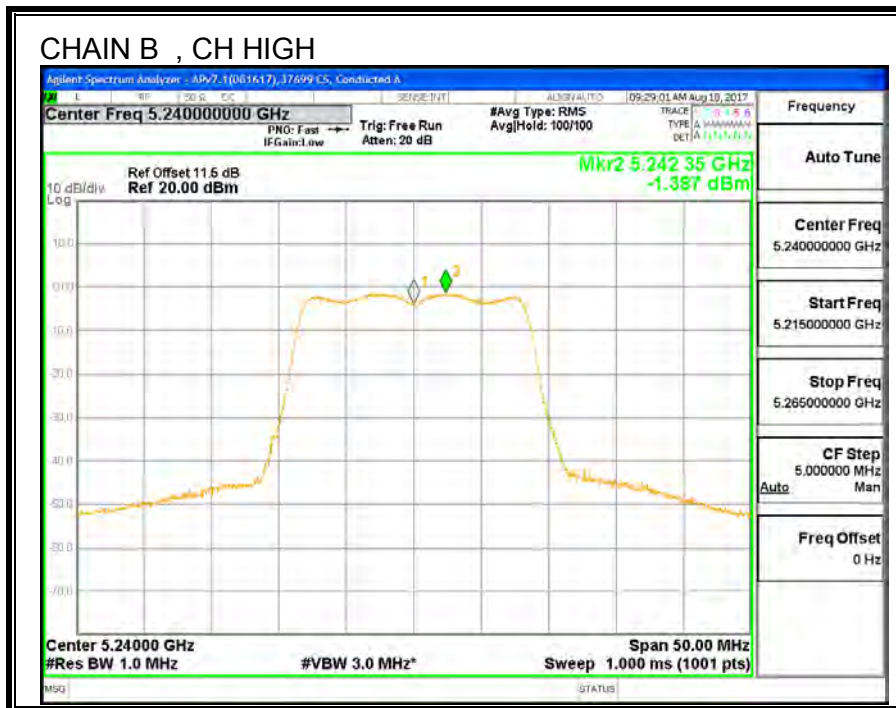
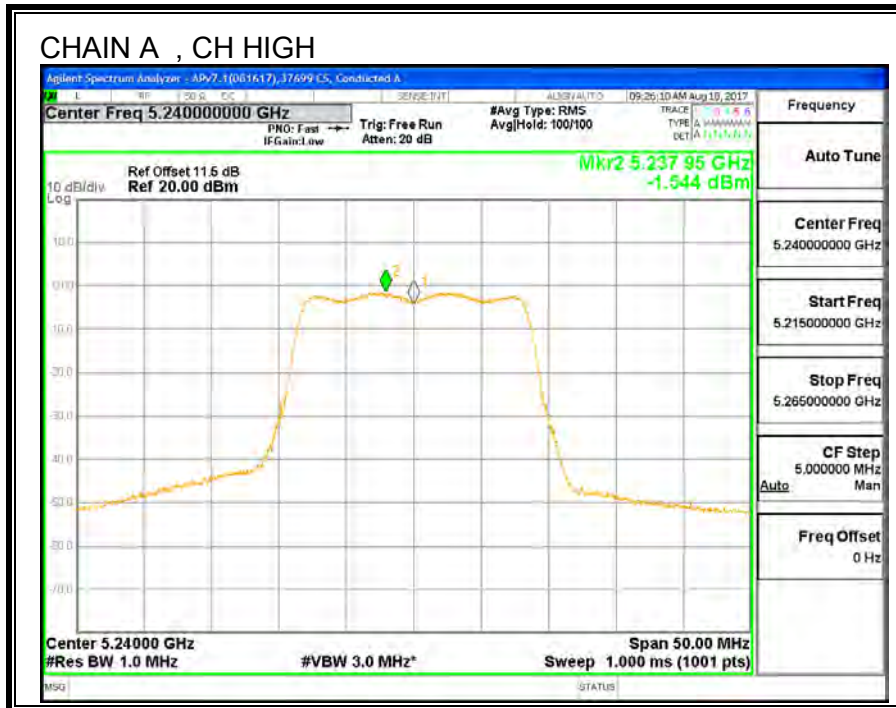
**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-0.90	-1.33	1.90	2.44	-0.54
Mid	5200	-1.17	-1.35	1.75	2.44	-0.69
High	5240	-1.54	-1.39	1.55	2.44	-0.90









## 9.2. 11n HT20 2TX MODE IN THE 5.2GHz BAND

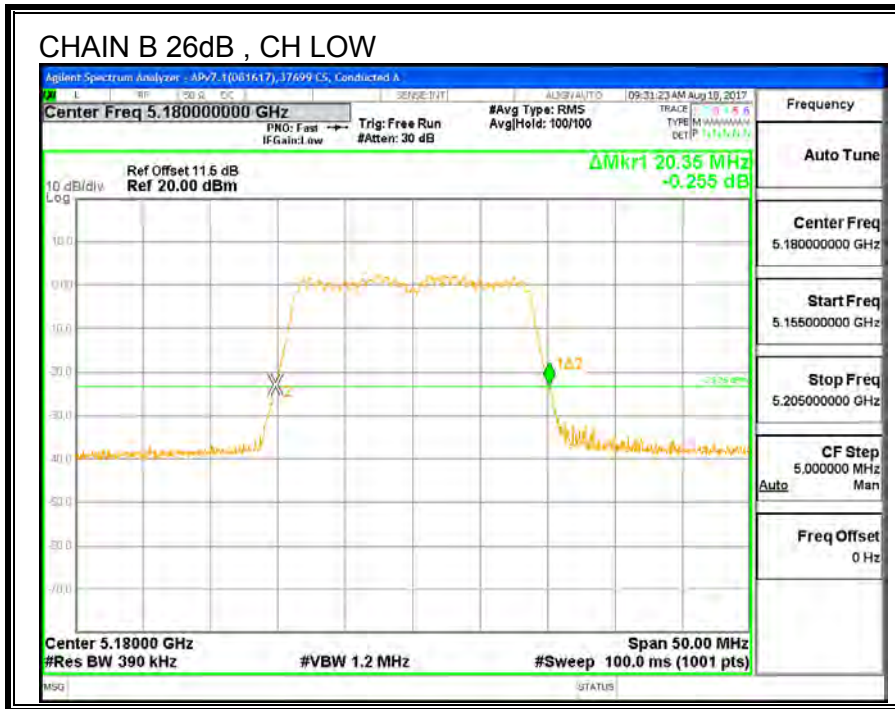
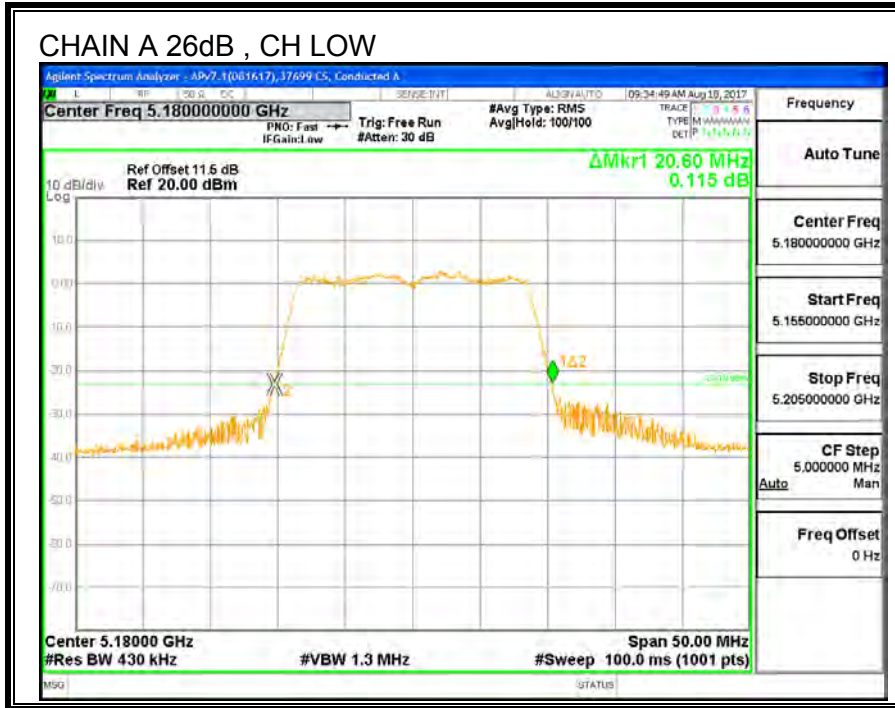
### 9.2.1. 26 dB BANDWIDTH

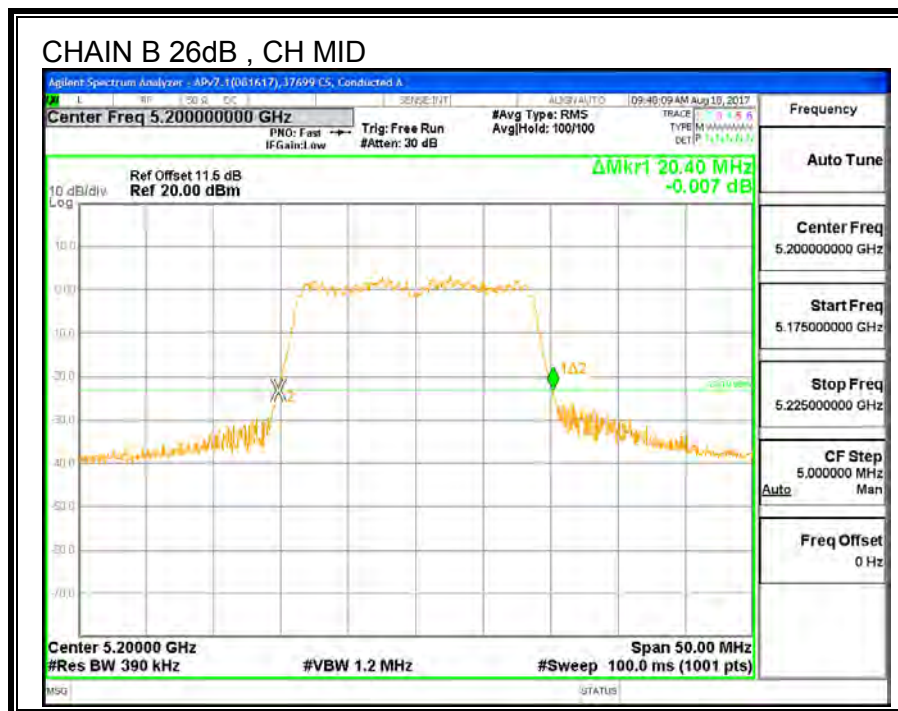
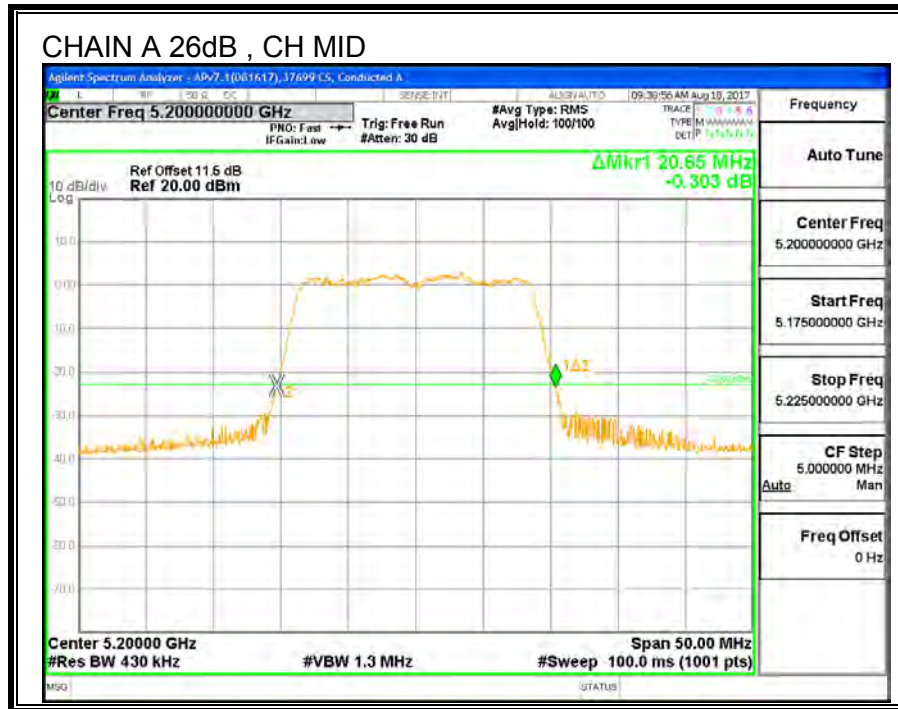
#### LIMITS

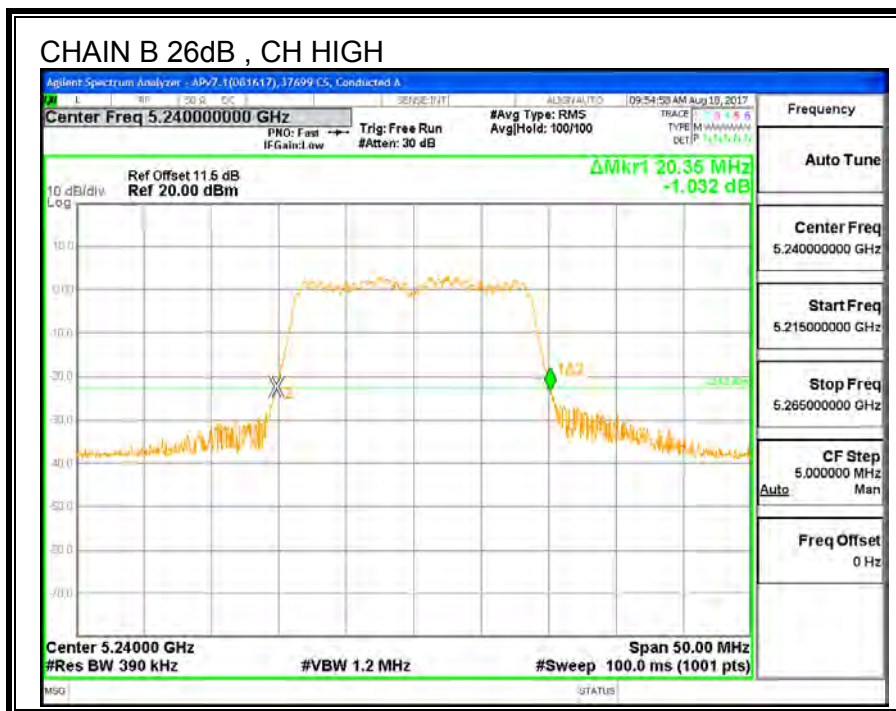
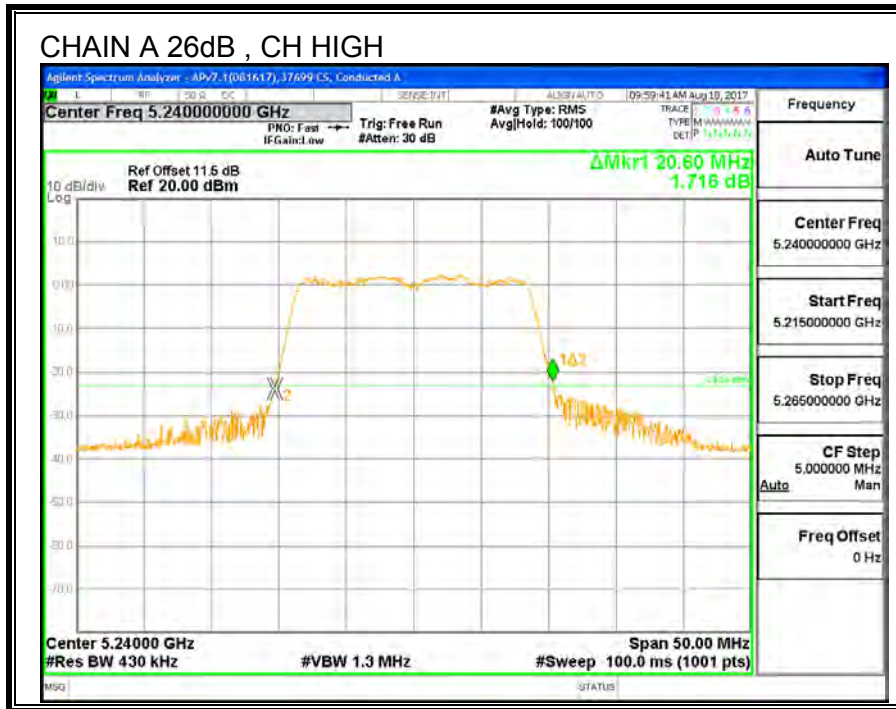
None; for reporting purposes only.

#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5180	20.60	20.35
Mid	5200	20.65	20.40
High	5240	20.60	20.35







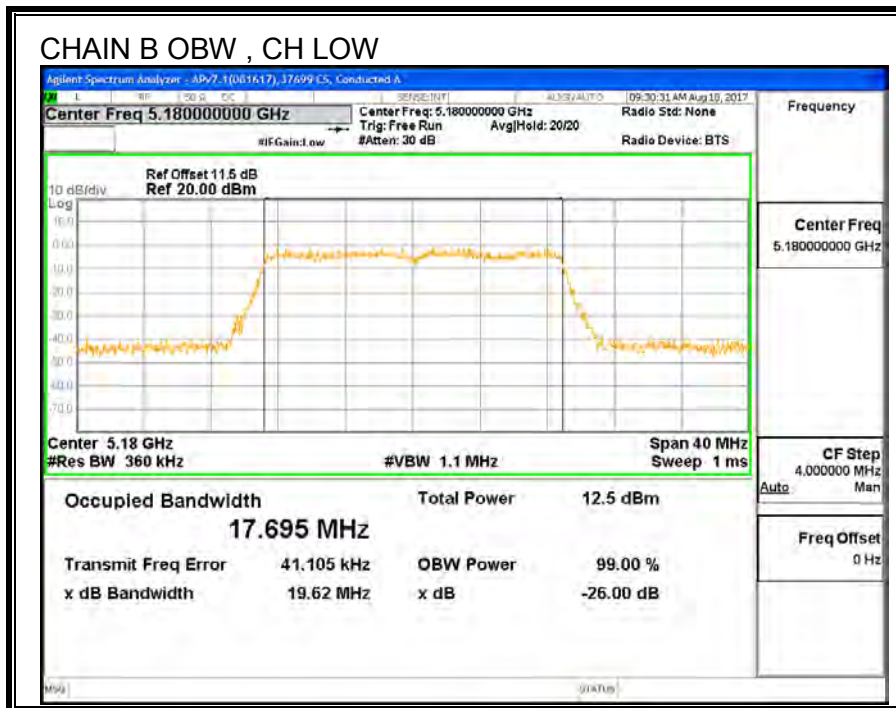
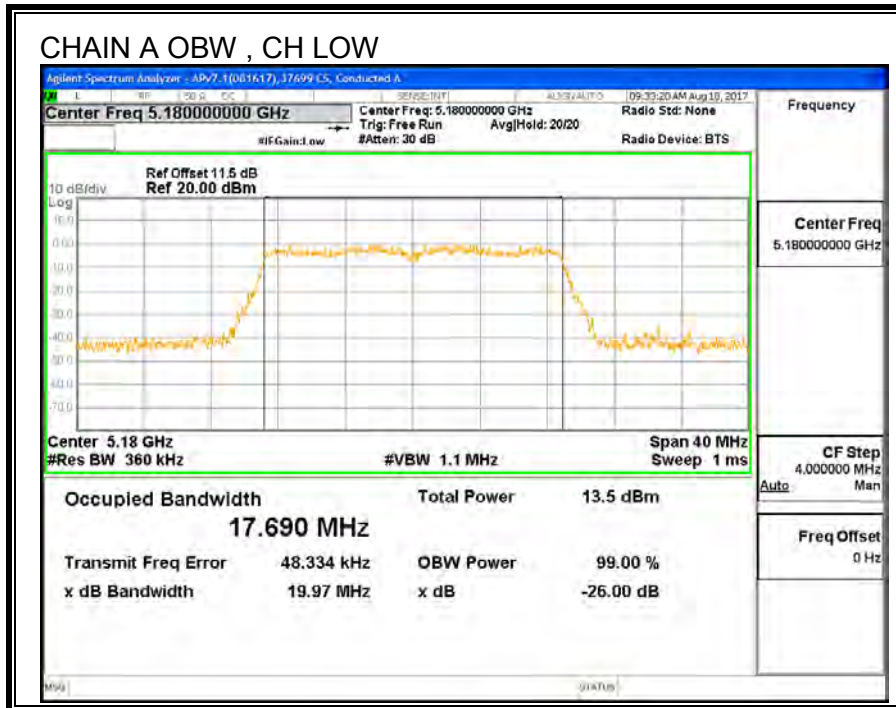
### 9.2.2. 99% BANDWIDTH

#### LIMITS

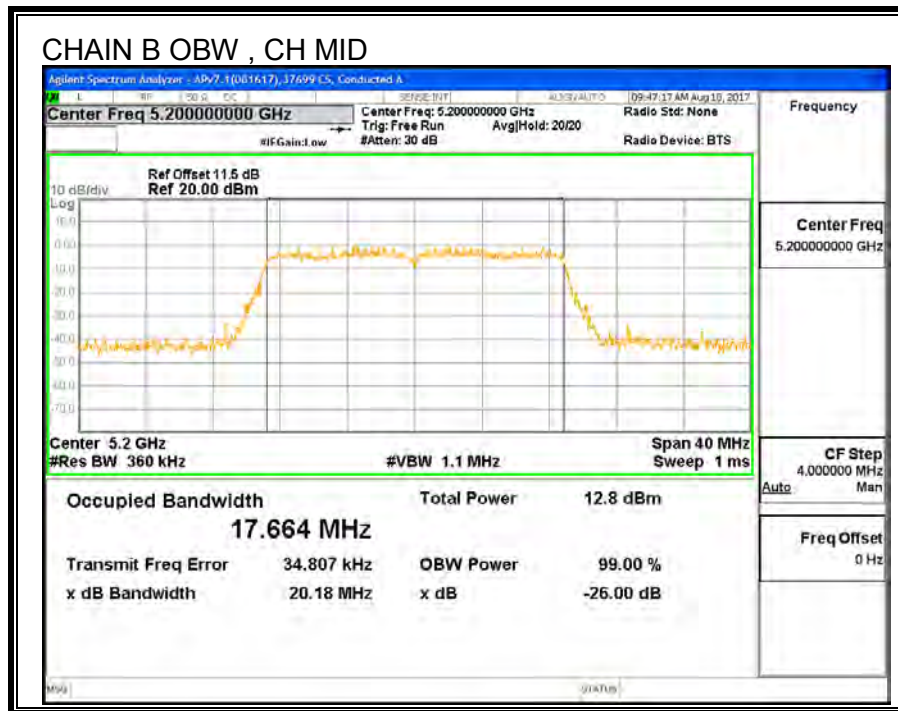
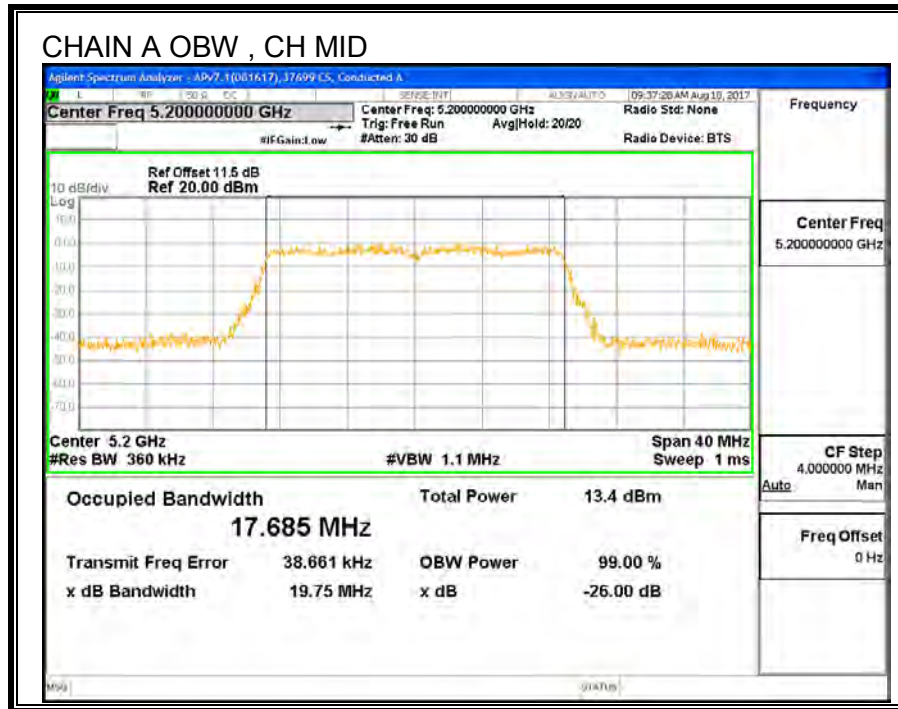
None; for reporting purposes only.

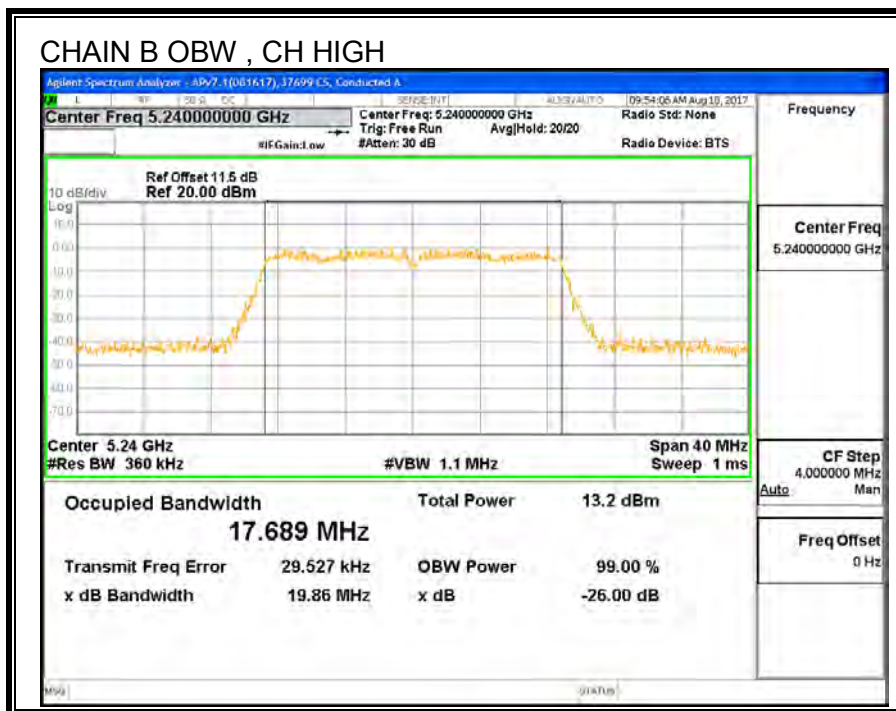
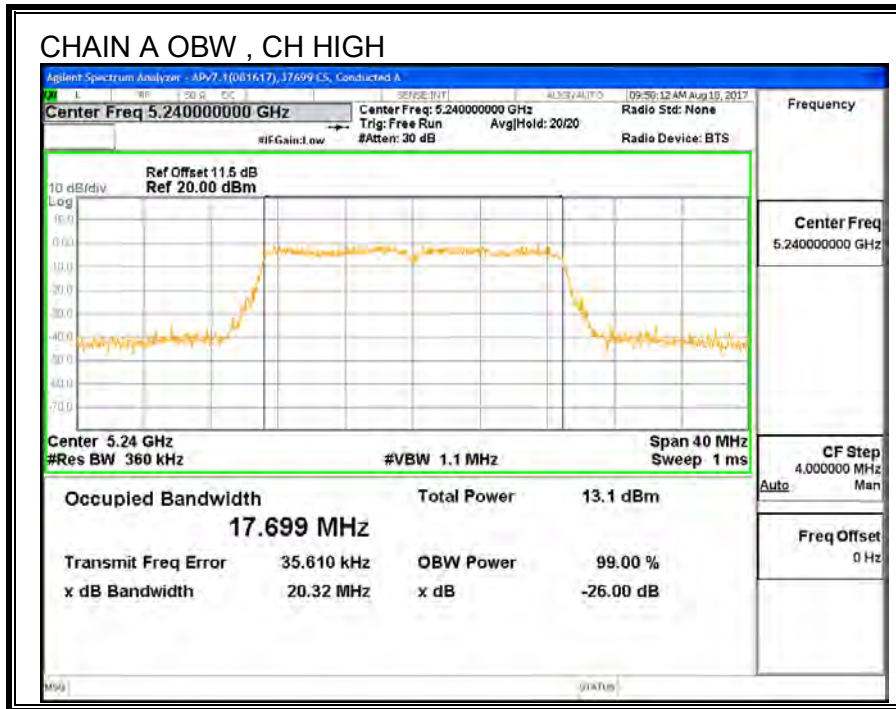
#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5180	17.690	17.695
Mid	5200	17.685	17.664
High	5240	17.699	17.689









### 9.2.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

RSS-247 6.2.1(1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.38	3.63	4.59	7.56

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5180	20.35	17.69	4.59	7.56
Mid	5200	20.40	17.66	4.59	7.56
High	5240	20.35	17.69	4.59	7.56

**Limits**

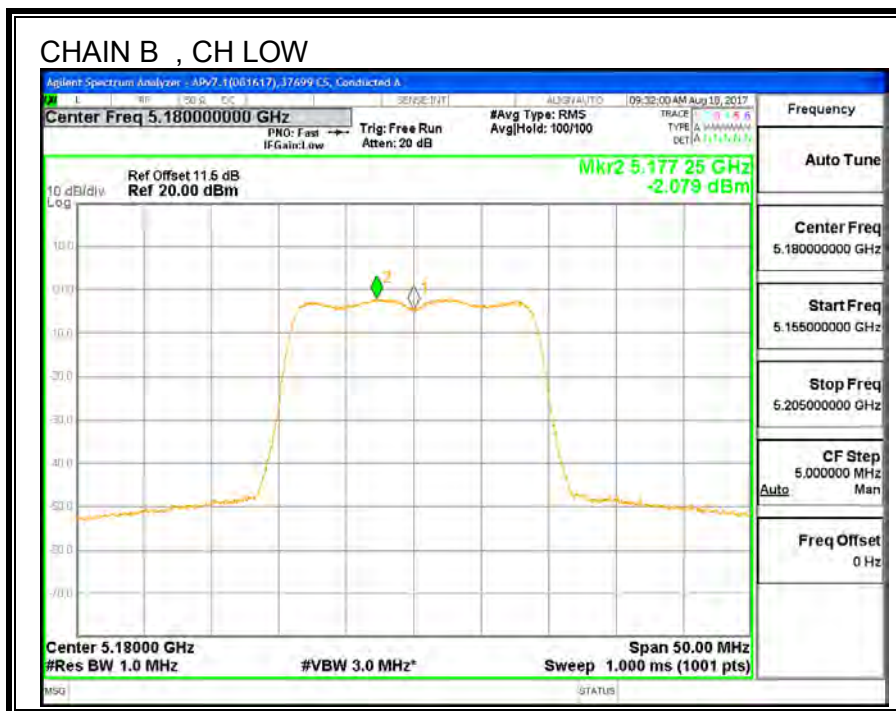
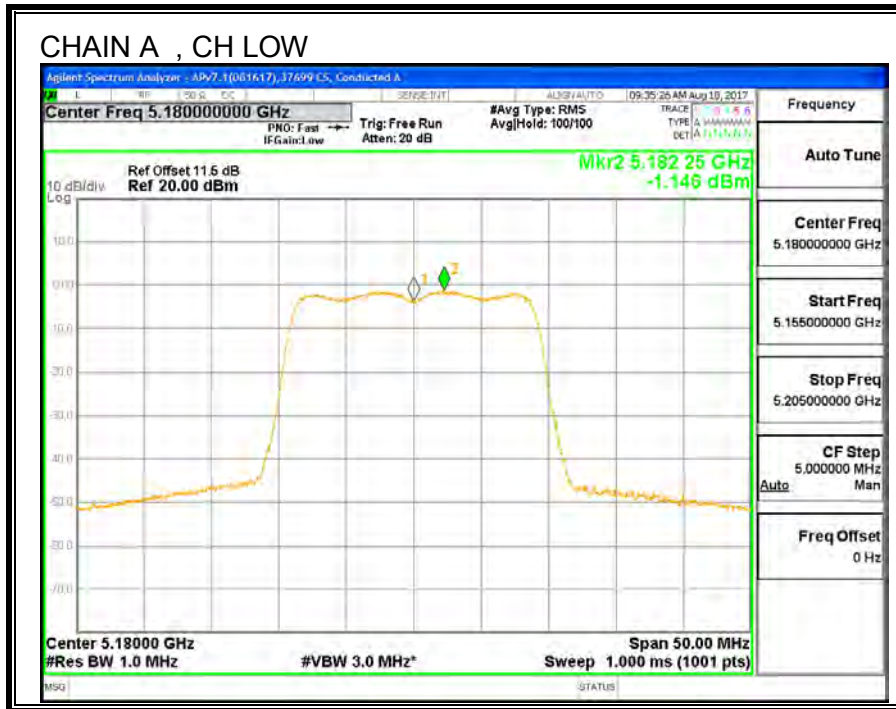
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED EIRP Limit (dBm)	Max ISED Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	24.00	22.48	17.88	17.88	9.44	10.00	2.44
Mid	5200	24.00	22.47	17.88	17.88	9.44	10.00	2.44
High	5240	24.00	22.48	17.88	17.88	9.44	10.00	2.44

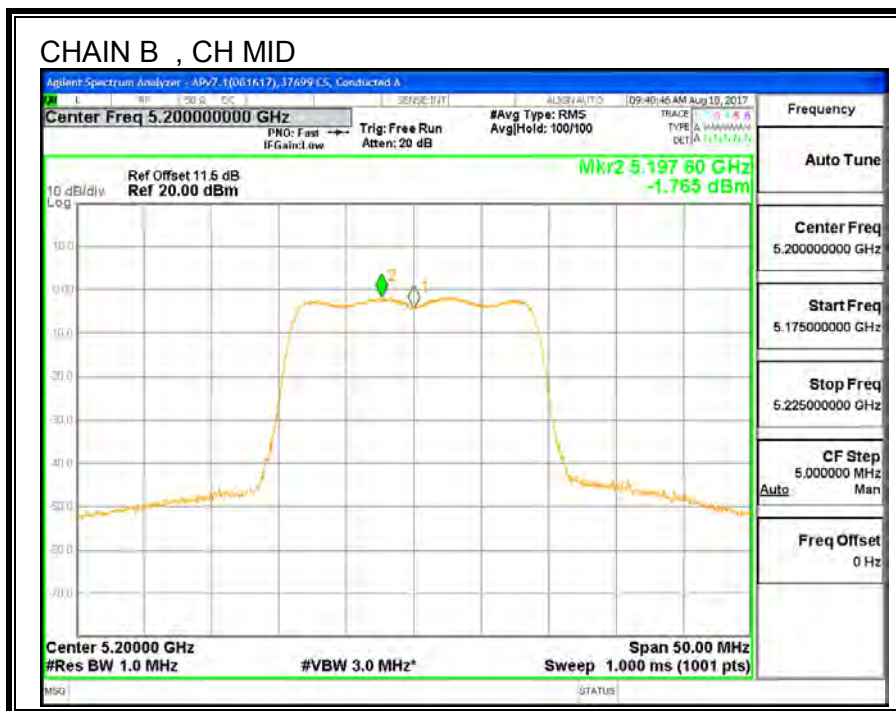
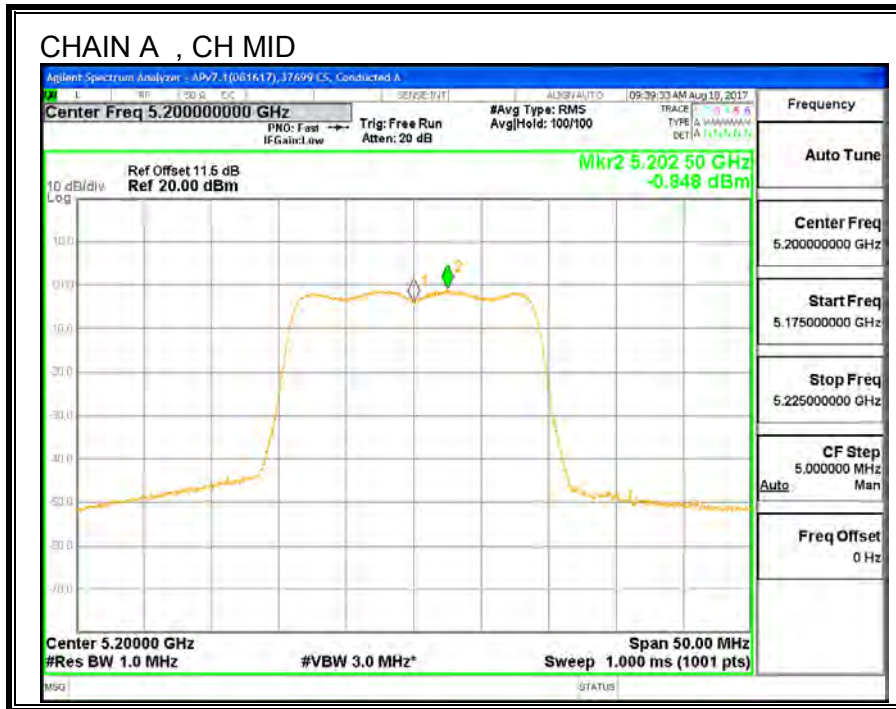
**Output Power Results**

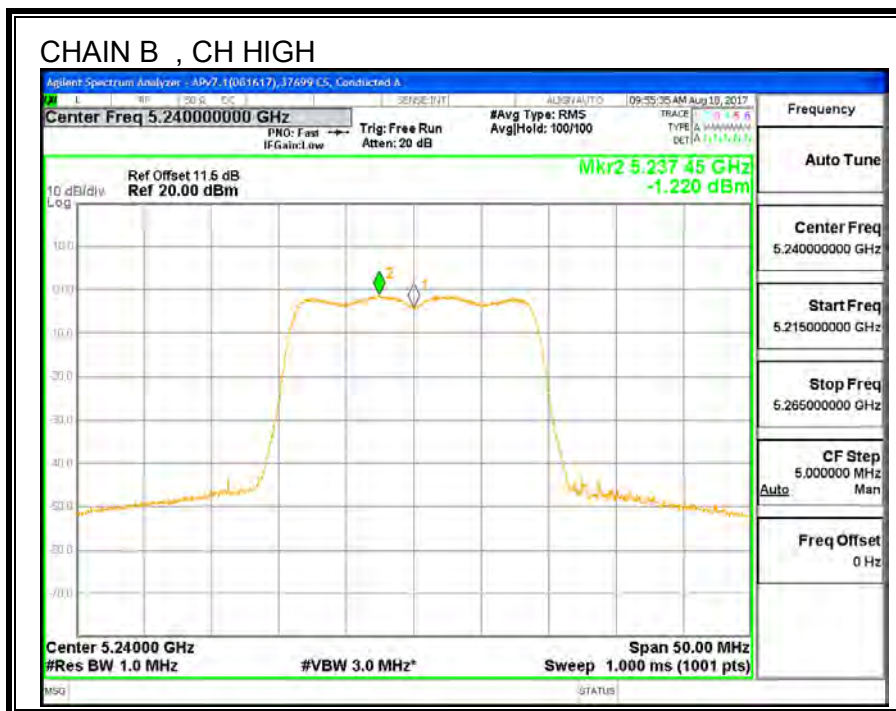
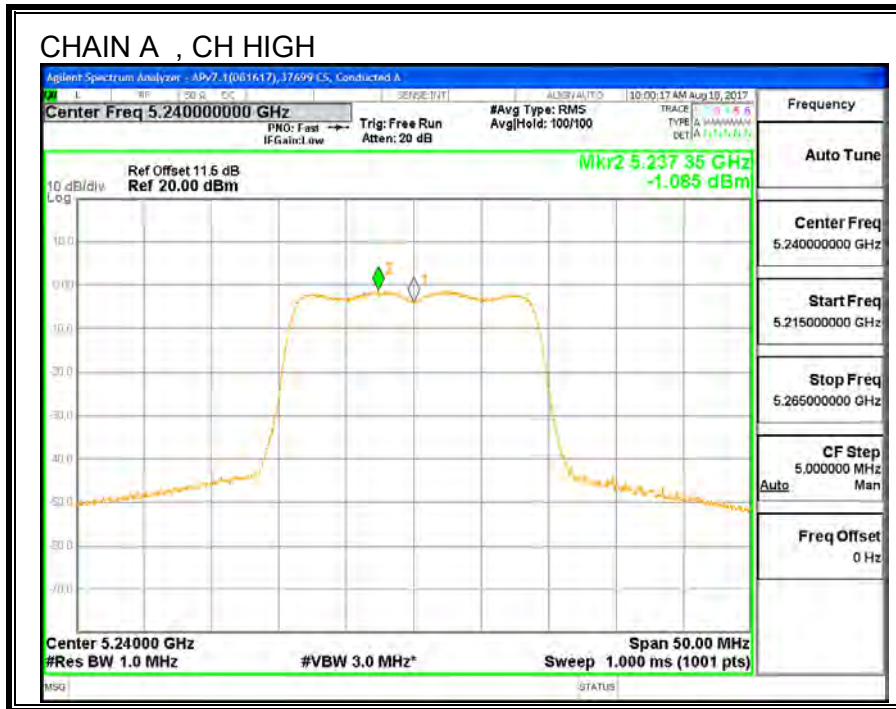
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	8.73	8.42	11.59	17.88	-6.30
Mid	5200	8.25	8.45	11.36	17.88	-6.52
High	5240	8.21	8.31	11.27	17.88	-6.61

**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-1.15	-2.08	1.42	2.44	-1.02
Mid	5200	-0.85	-1.77	1.73	2.44	-0.71
High	5240	-1.09	-1.22	1.86	2.44	-0.58







### 9.3. 11n HT40 2TX MODE IN THE 5.2GHz BAND

#### 9.3.1. 26 dB BANDWIDTH

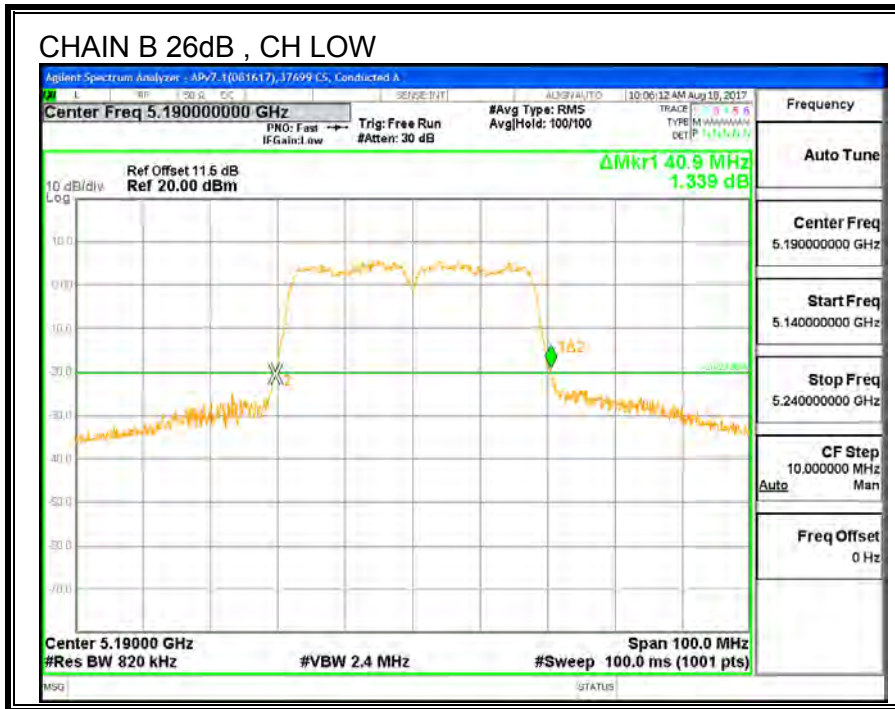
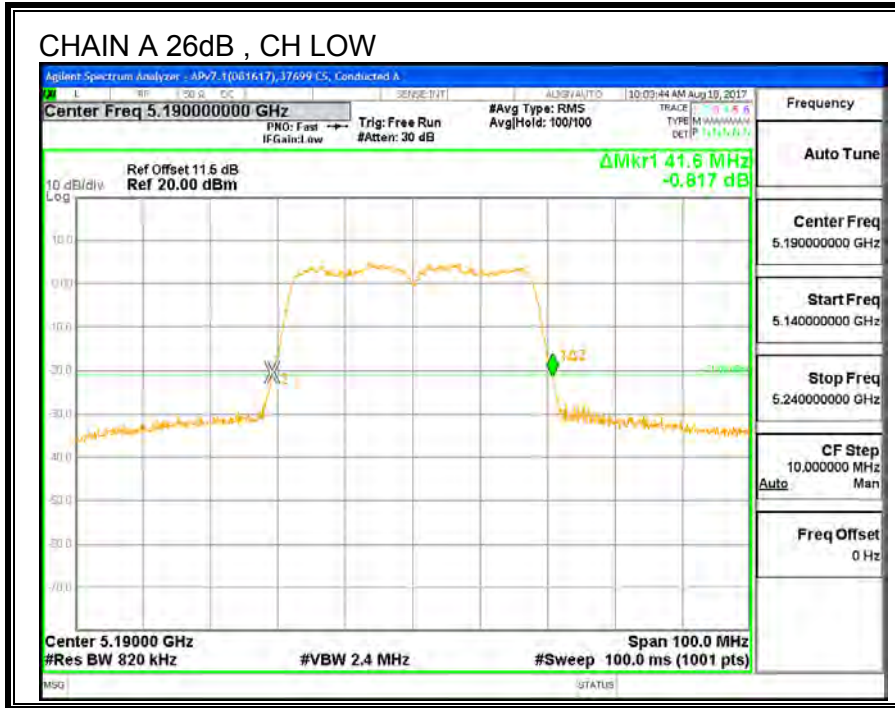
##### LIMITS

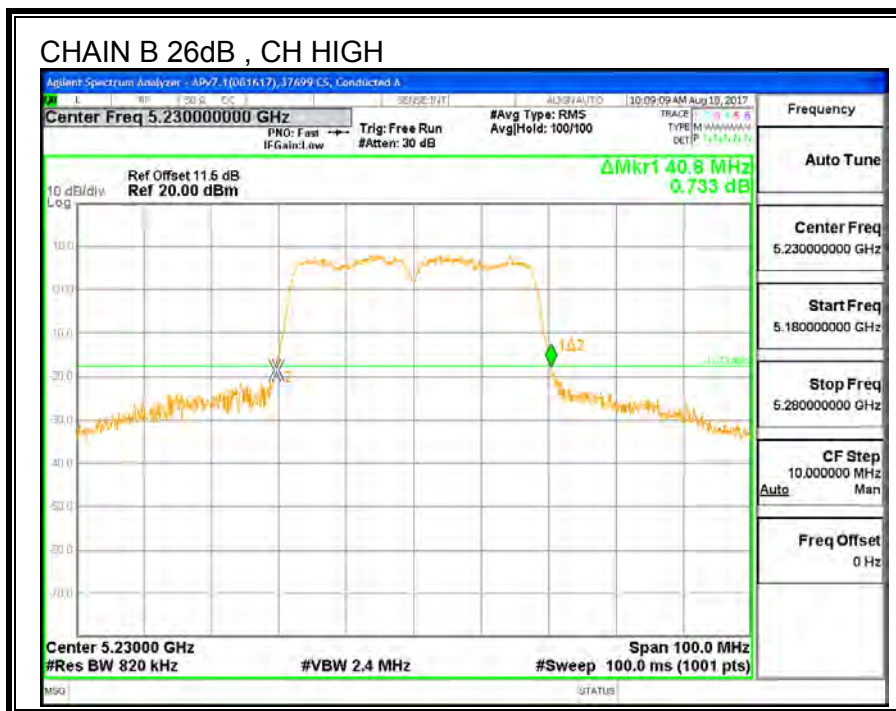
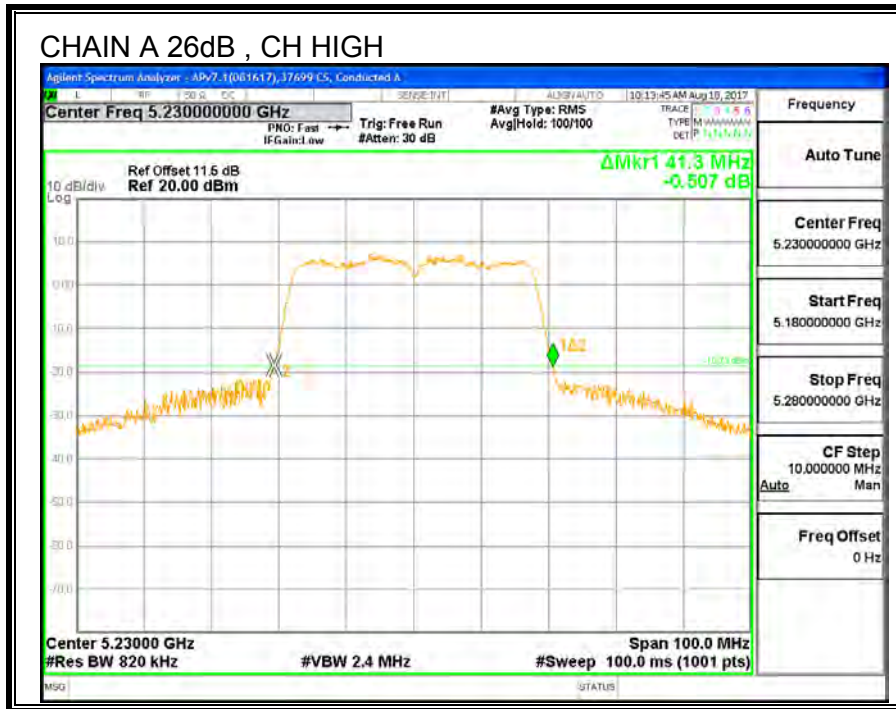
None; for reporting purposes only.

##### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5190	41.6	40.9
High	5230	41.3	40.8







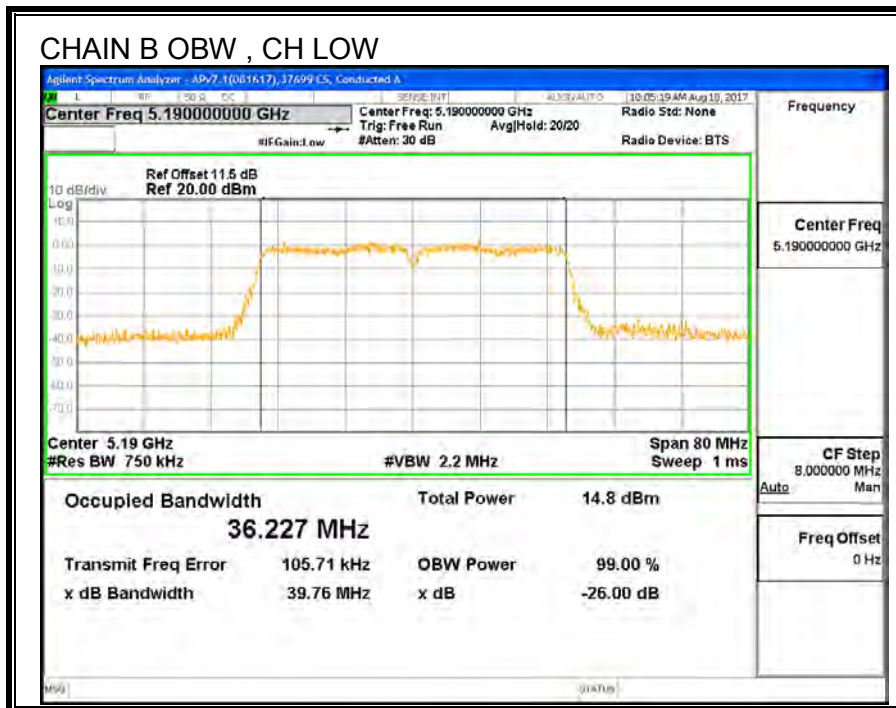
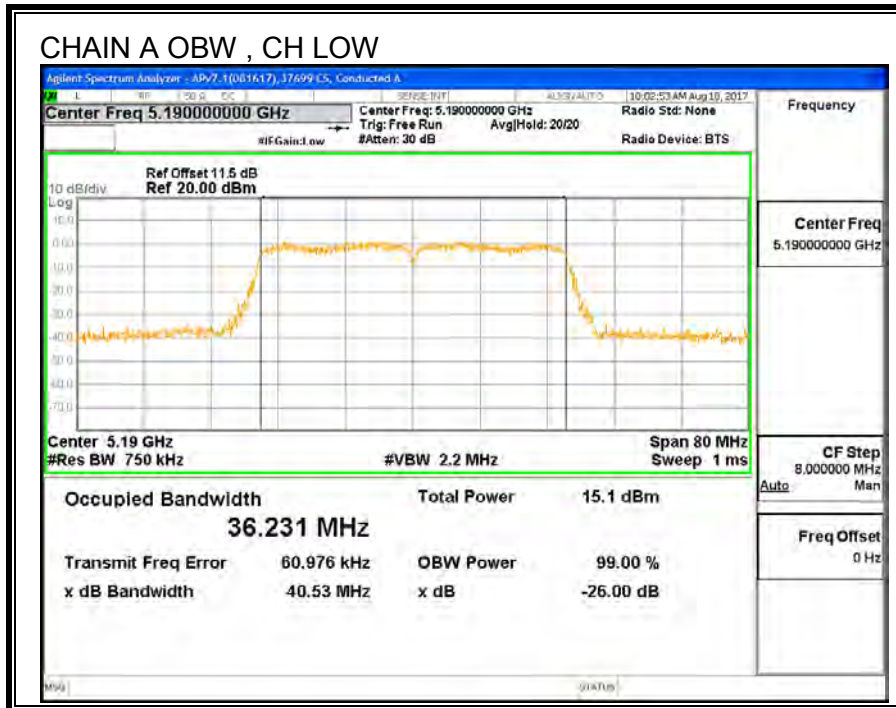
### 9.3.2. 99% BANDWIDTH

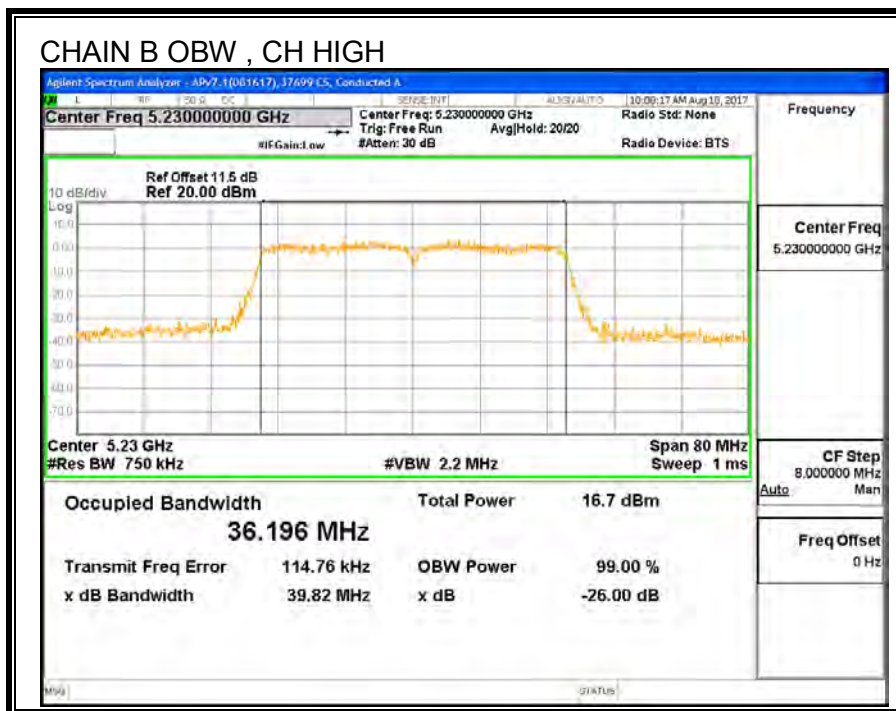
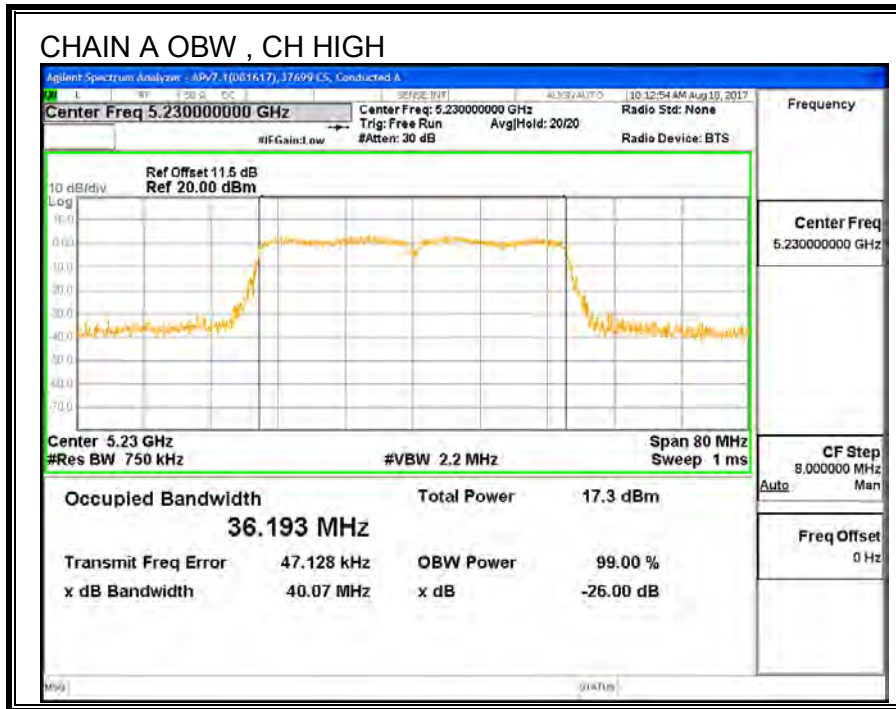
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5190	36.231	36.227
High	5230	36.193	36.196





### 9.3.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

RSS-247 6.2.1(1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.38	3.63	4.59	7.56

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5190	40.9	36.227	4.59	7.56
High	5230	40.8	36.193	4.59	7.56

**Limits**

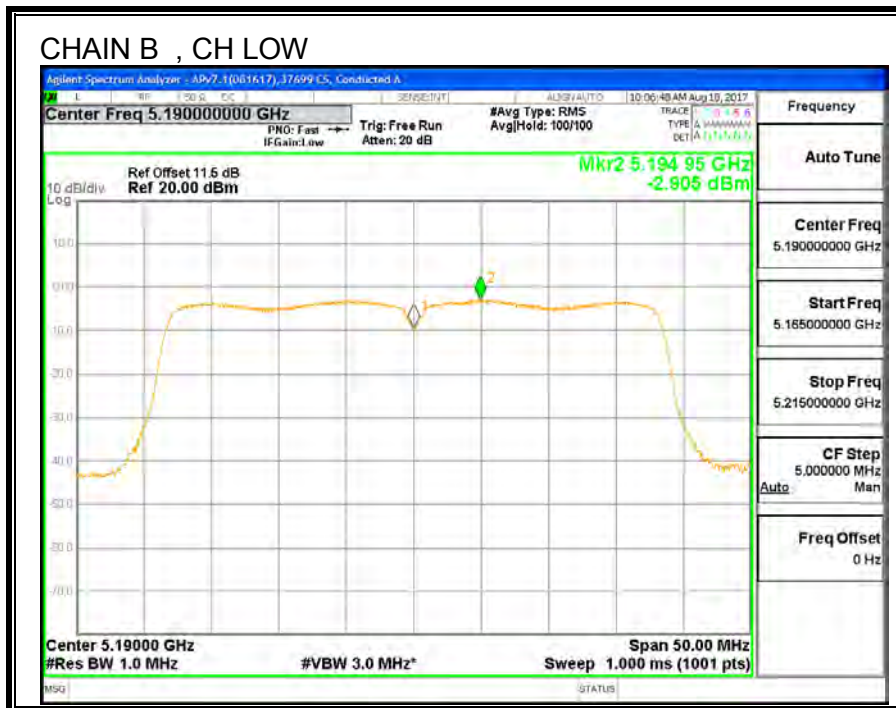
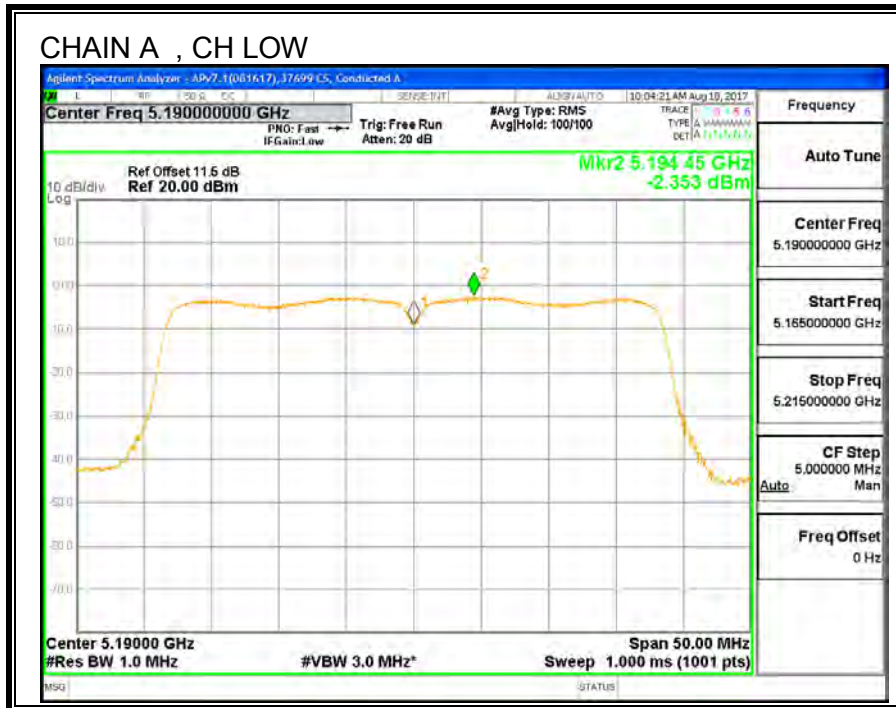
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED EIRP Limit (dBm)	Max ISED Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5190	24.00	23.00	18.41	18.41	9.44	10.00	2.44
High	5230	24.00	23.00	18.41	18.41	9.44	10.00	2.44

**Output Power Results**

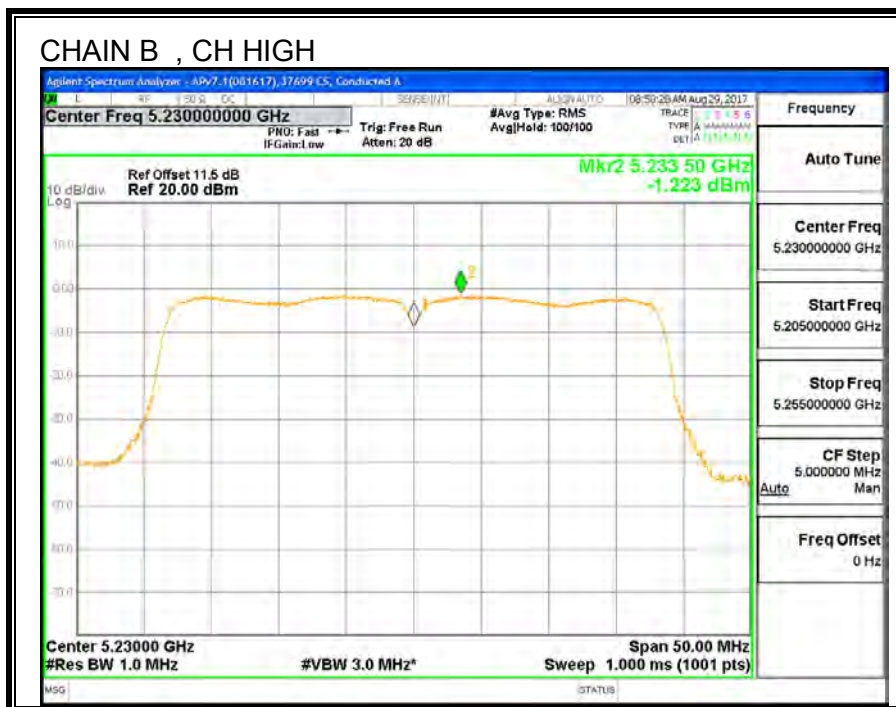
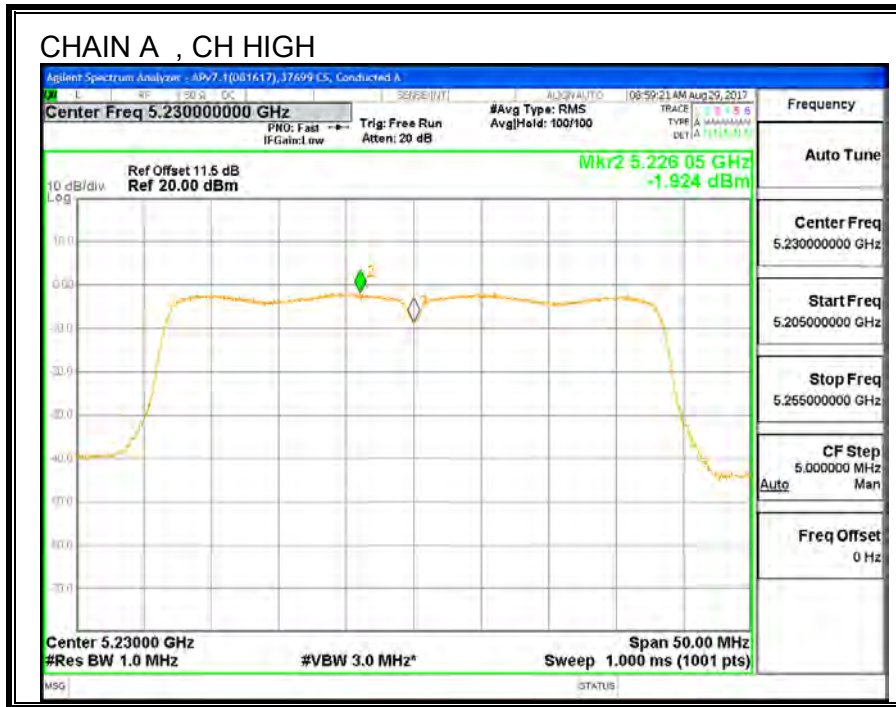
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	10.19	10.06	13.14	18.41	-5.27
High	5230	11.52	10.98	14.27	18.41	-4.14

**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5190	-2.35	-2.91	0.39	2.44	-2.05
High	5230	-1.92	-1.22	1.45	2.44	-0.99







## 9.4. 11ac VHT80 2TX MODE IN THE 5.2GHz BAND

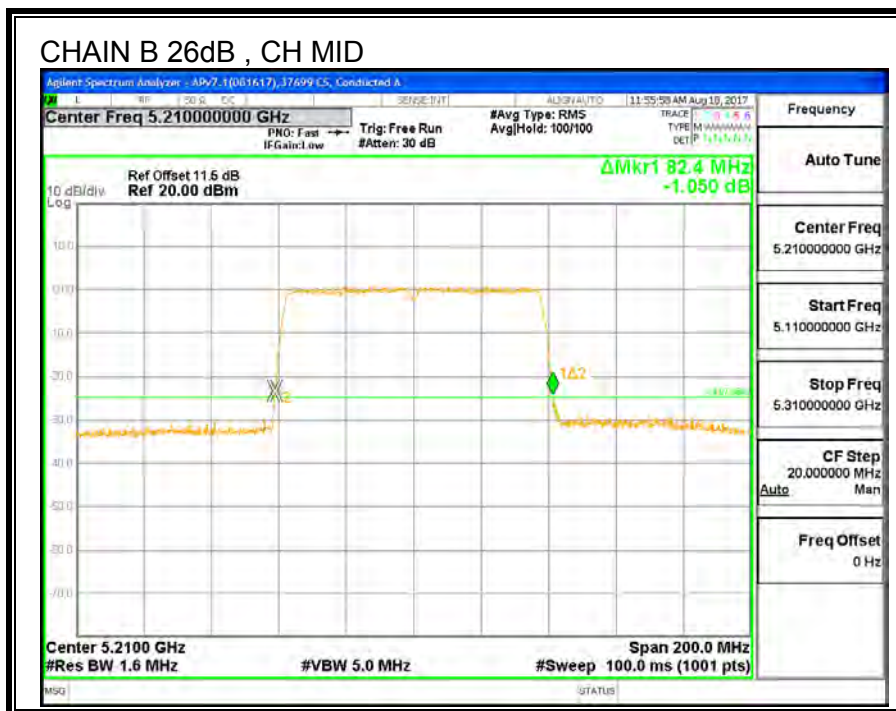
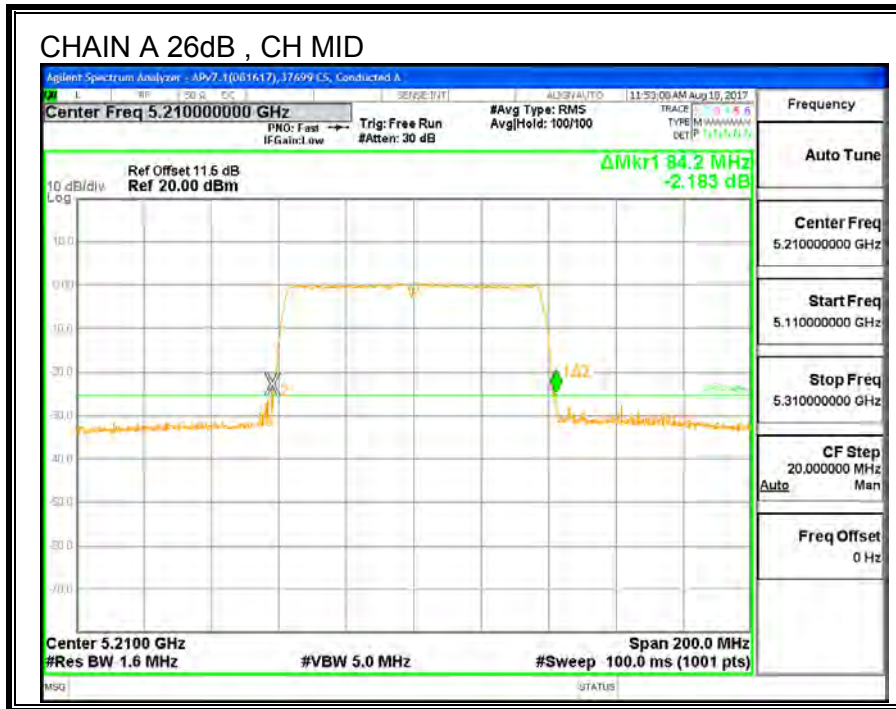
### 9.4.1. 26 dB BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Mid	5210	84.2	82.4



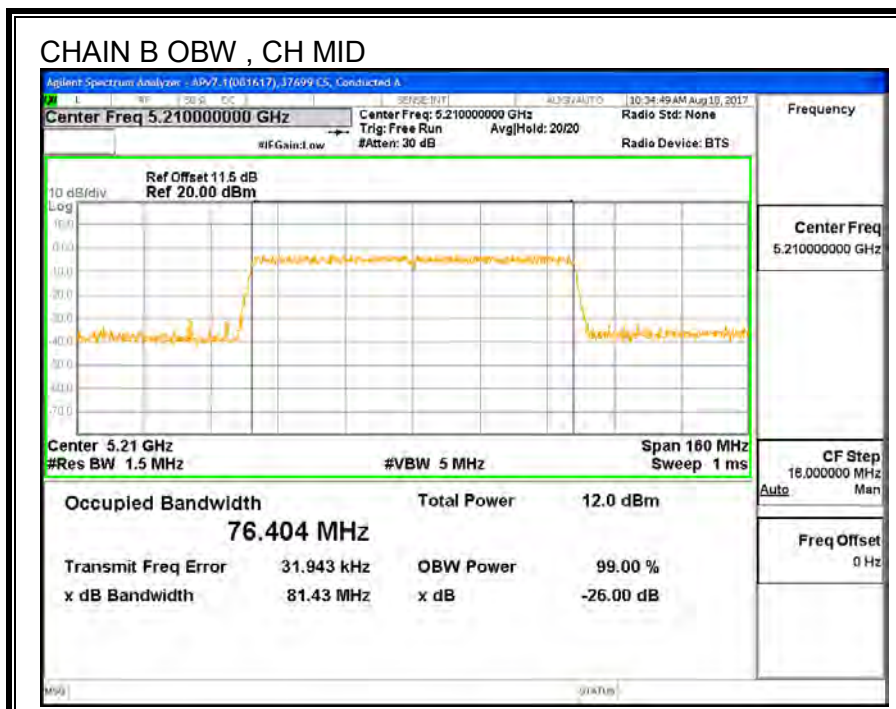
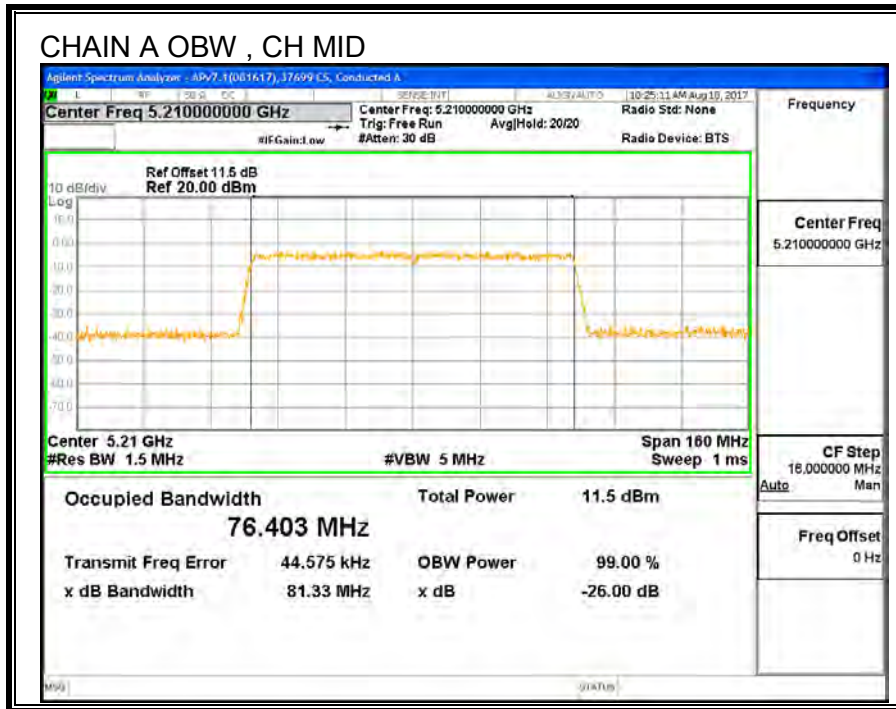
### 9.4.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Mid	5210	76.403	76.404



### 9.4.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (1)

(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.

RSS-247 6.2.1(1)

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

#### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.38	3.63	4.59	7.56

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5210	82.40	76.40	4.59	7.56

**Limits**

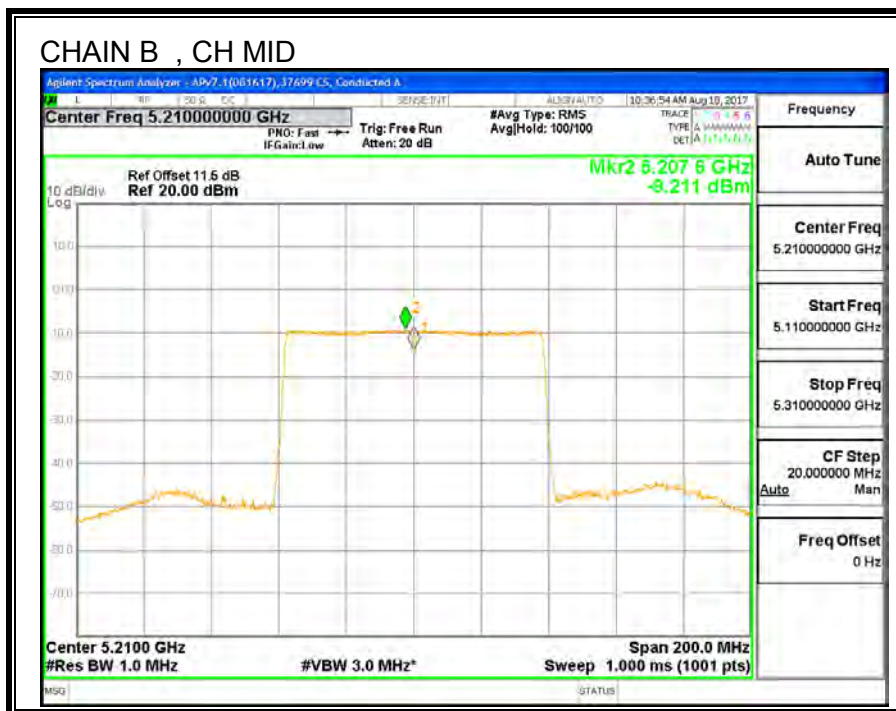
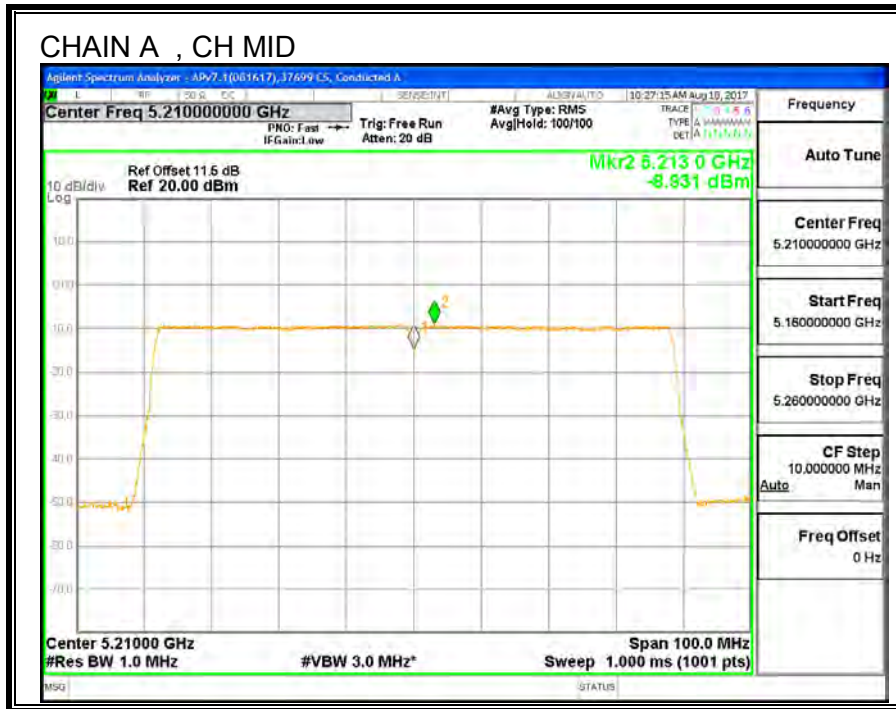
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED EIRP Limit (dBm)	Max ISED Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5210	24.00	23.00	18.41	18.41	9.44	10.00	2.44

**Output Power Results**

Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5210	7.43	7.66	10.56	18.41	-7.85

**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5210	-8.93	-9.21	-6.06	2.44	-8.50





## 9.5. 11a 2TX MODE IN THE 5.3GHz BAND

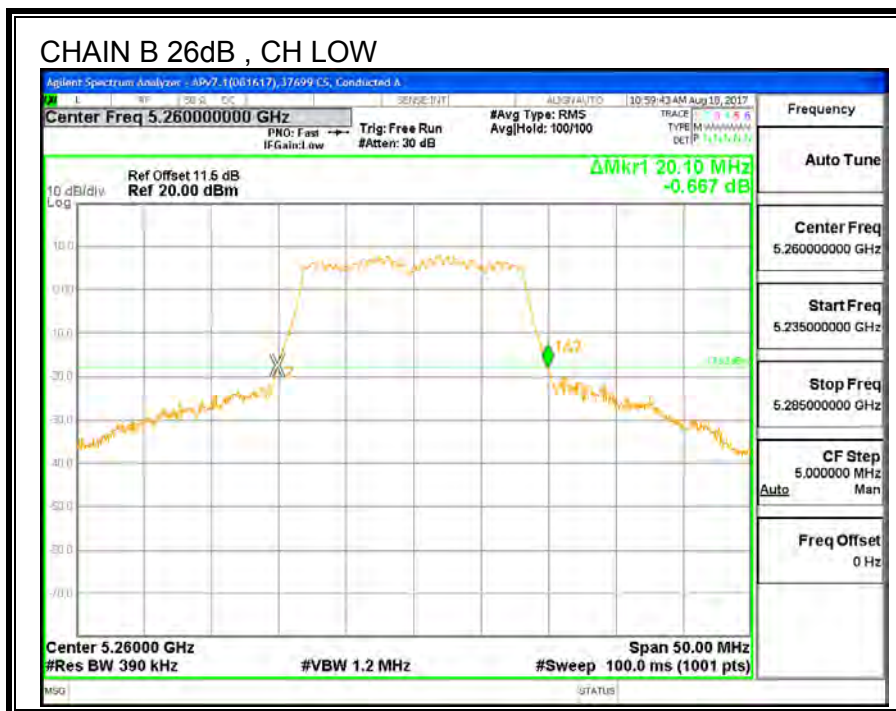
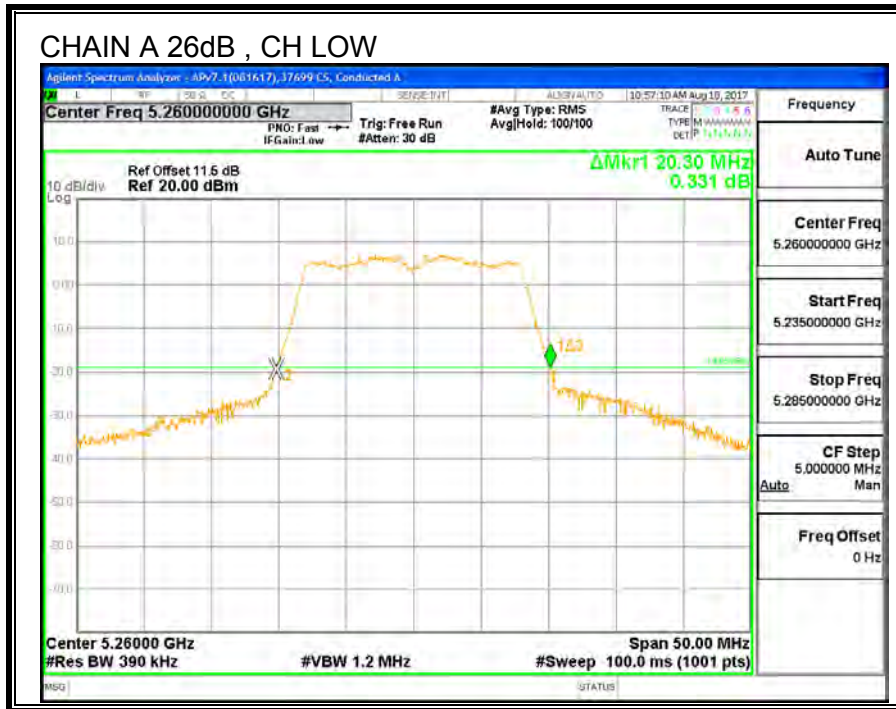
### 9.5.1. 26 dB BANDWIDTH

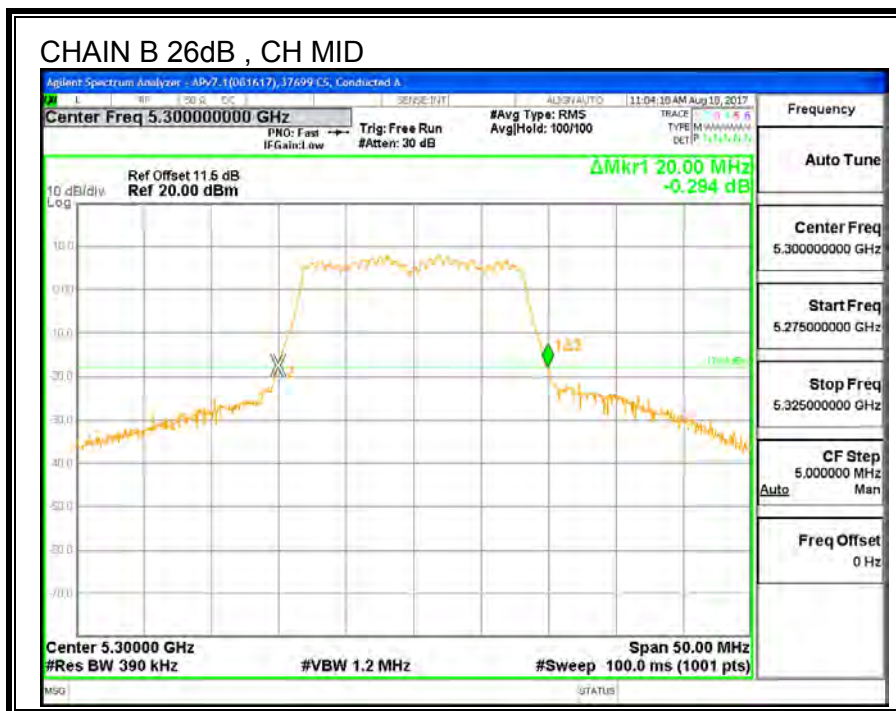
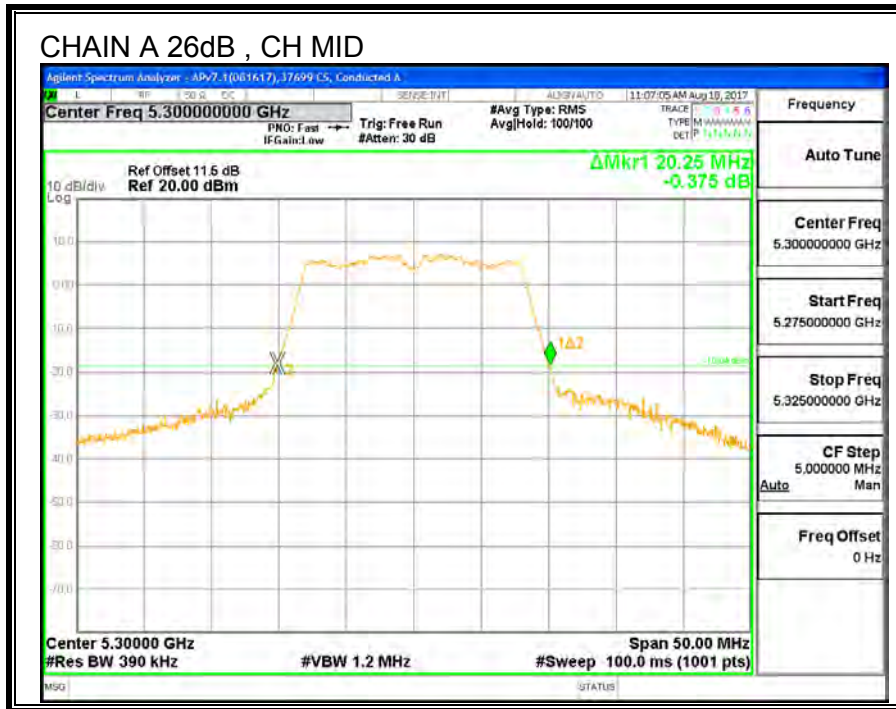
#### LIMITS

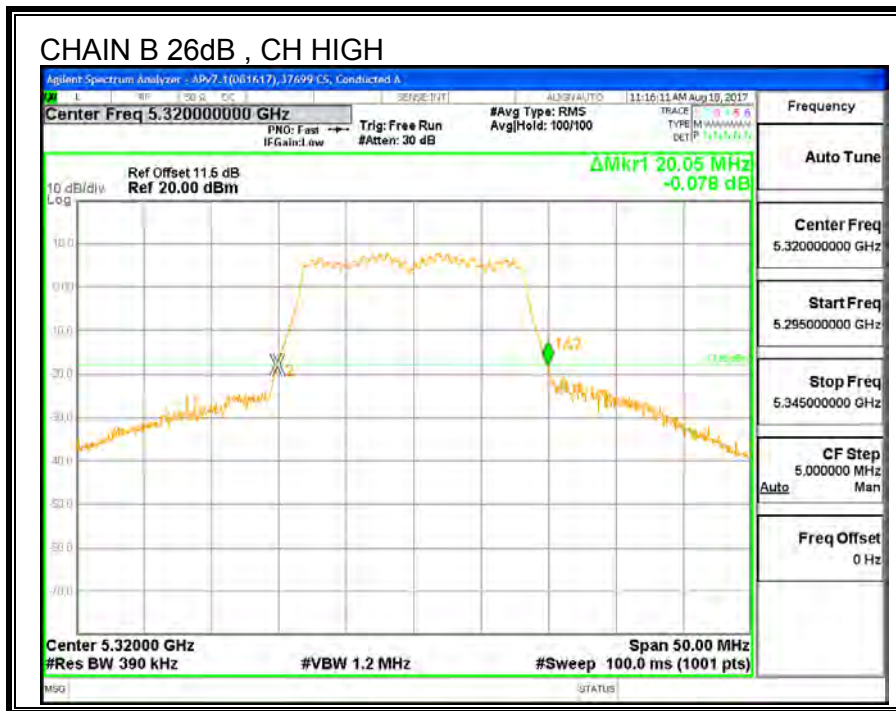
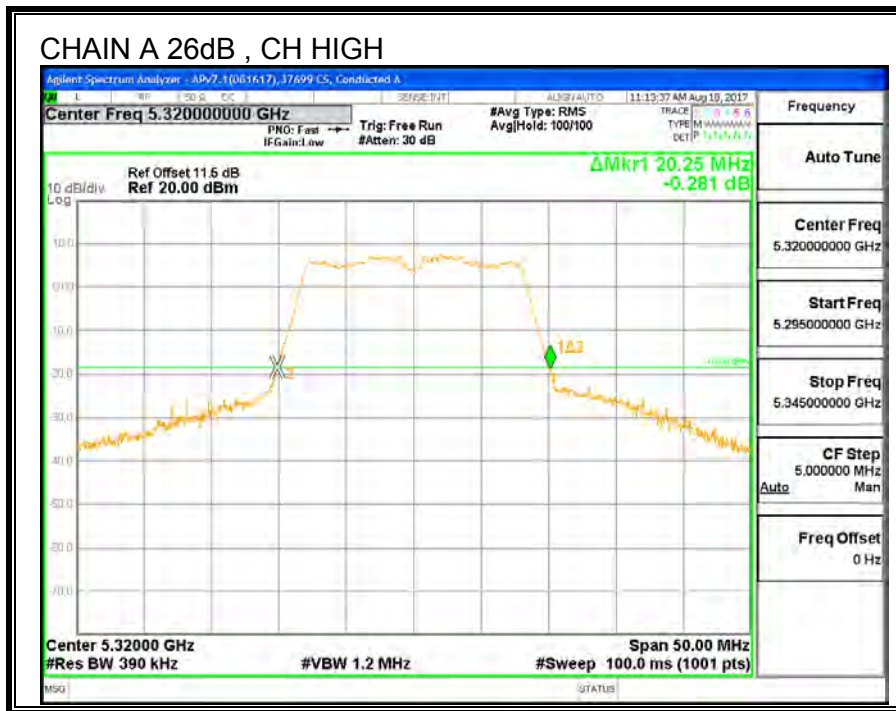
None; for reporting purposes only.

#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5260	20.30	20.10
Mid	5300	20.25	20.00
High	5320	20.25	20.05







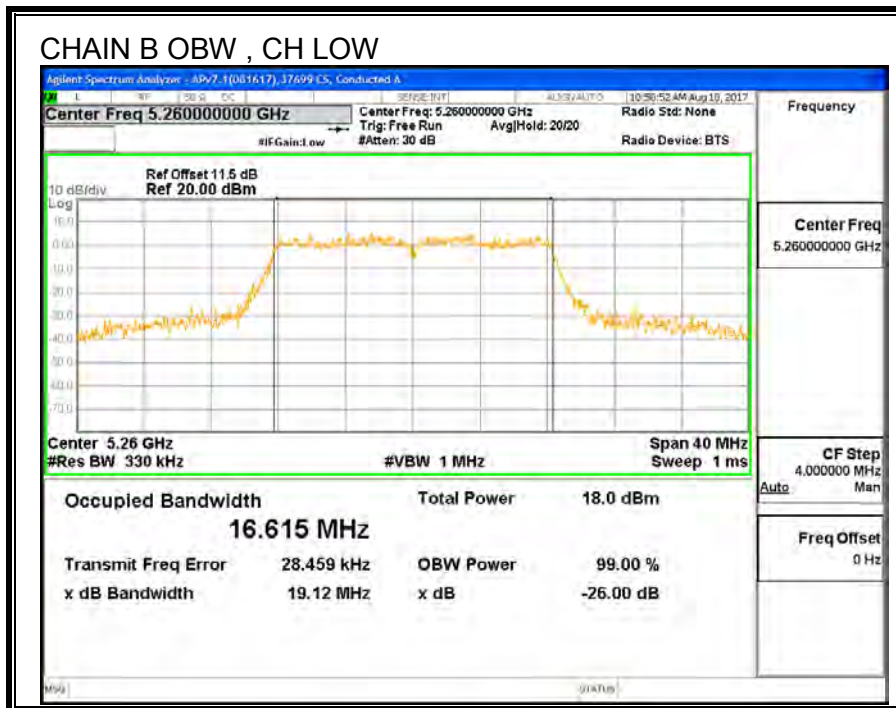
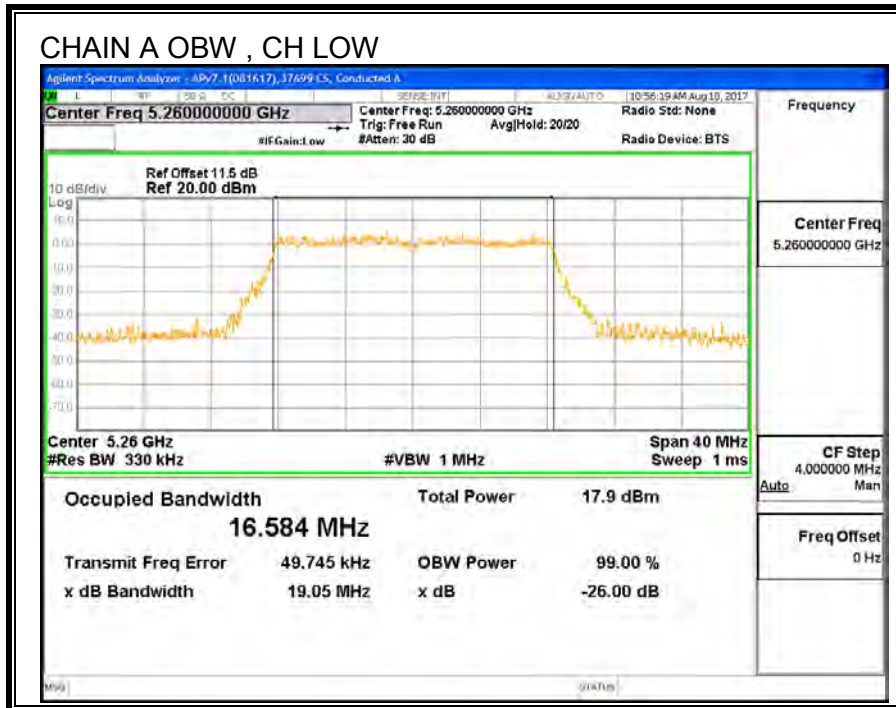
### 9.5.2. 99% BANDWIDTH

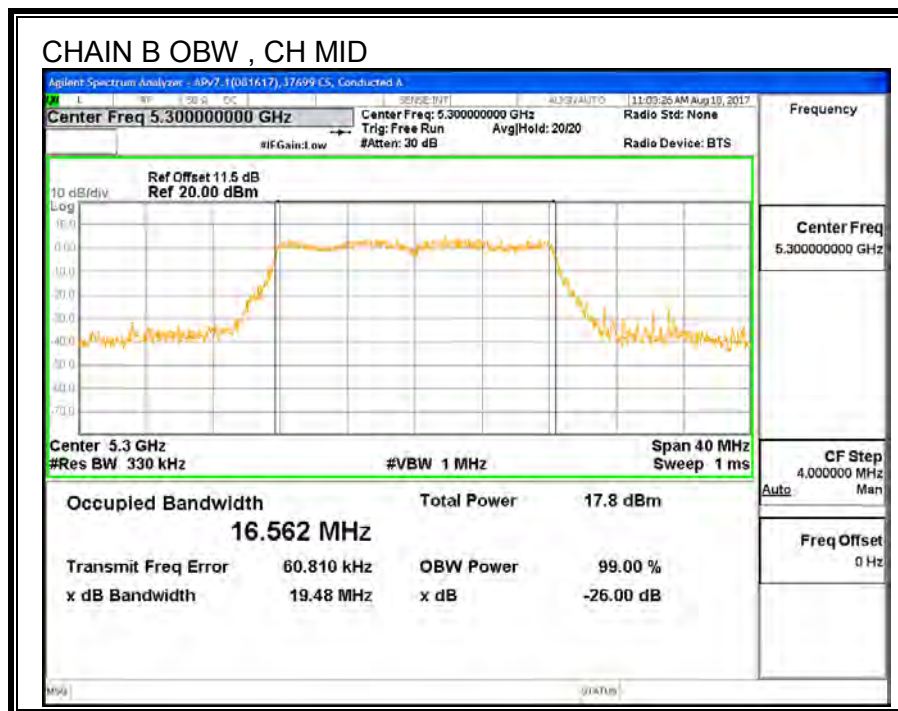
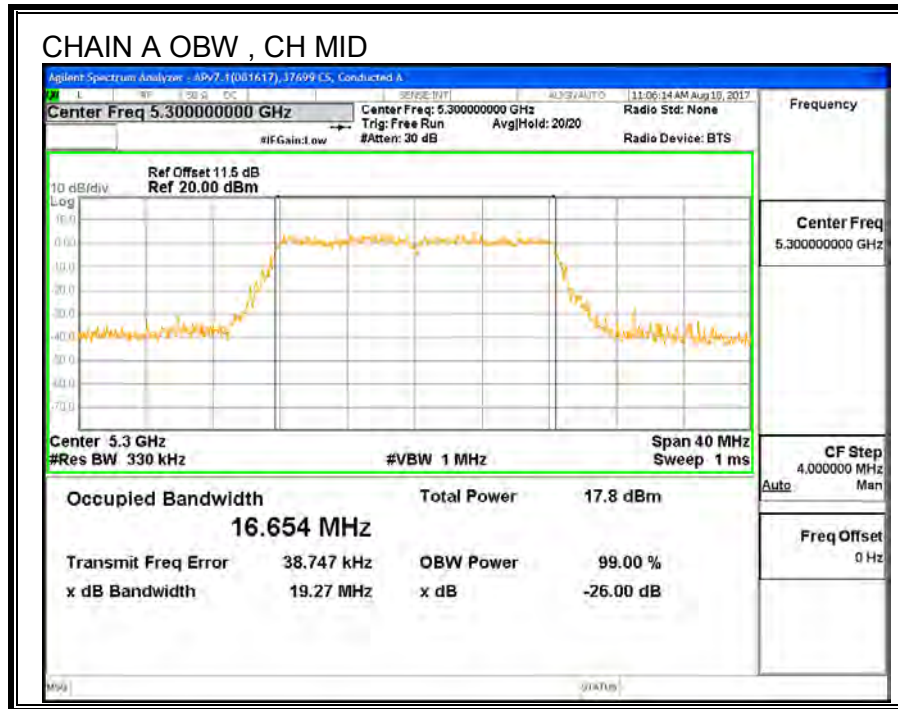
#### LIMITS

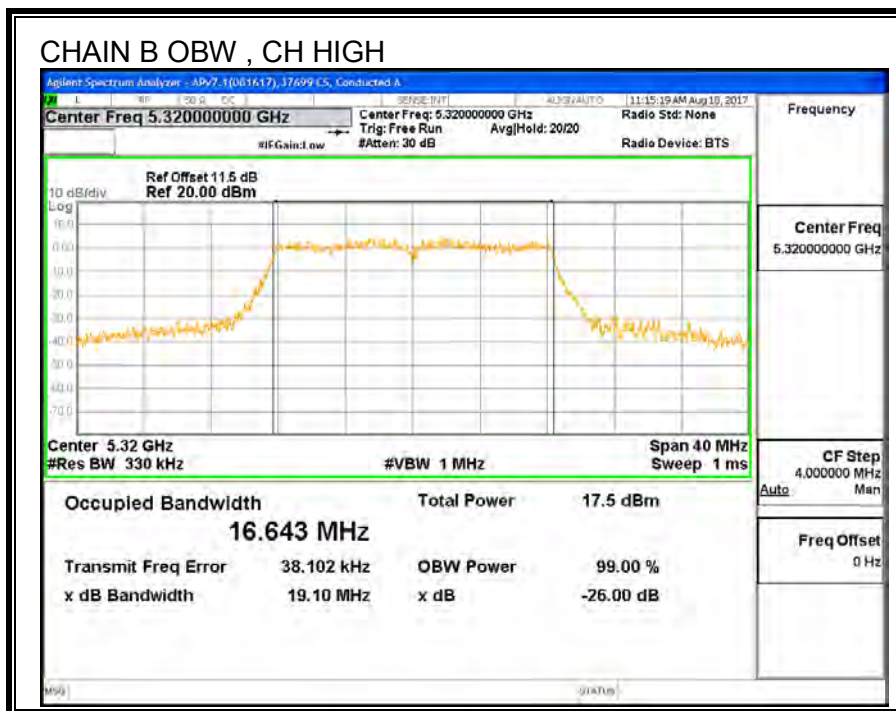
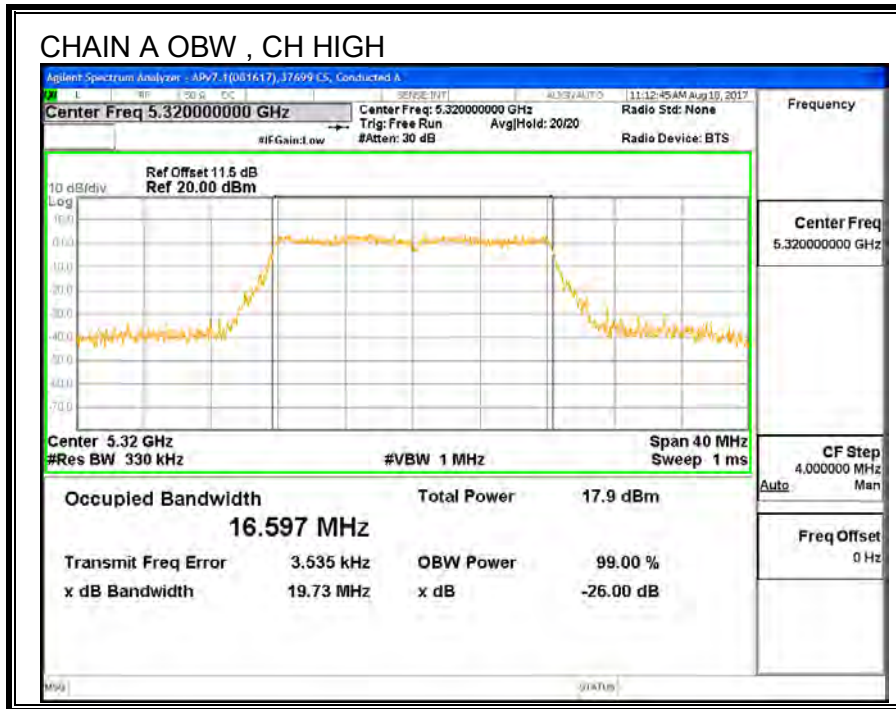
None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5260	16.584	16.615
Mid	5300	16.654	16.562
High	5320	16.597	16.643









### 9.5.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 (6.2.2) (1)

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.38	3.63	4.59	7.56

**RESULTS**

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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5260	20.1	16.584	4.59	7.56
Mid	5300	20	16.562	4.59	7.56
High	5320	20.05	16.60	4.59	7.56

**Limits**

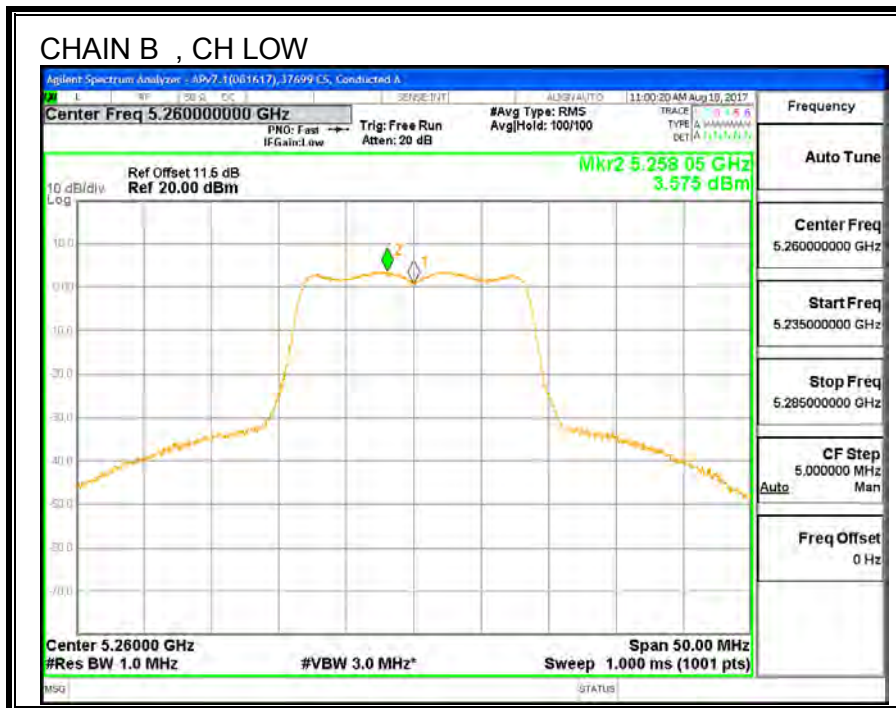
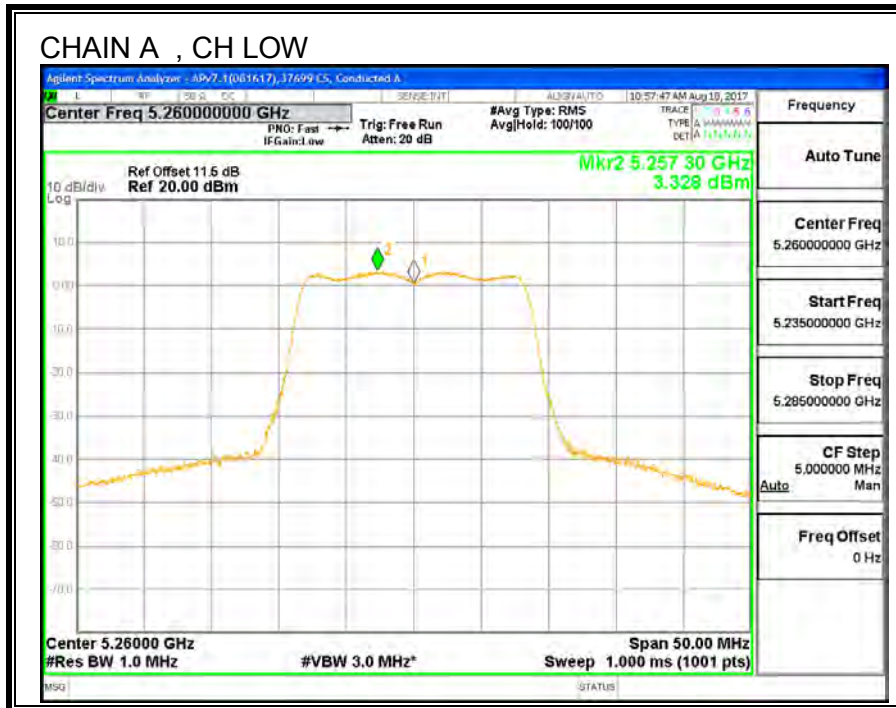
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED PSD Limit (dBm)	PPSD Limit (dBm)
Low	5260	24.00	23.20	29.20	23.20	9.44	11.00	9.44
Mid	5300	24.00	23.19	29.19	23.19	9.44	11.00	9.44
High	5320	24.00	23.20	29.20	23.20	9.44	11.00	9.44

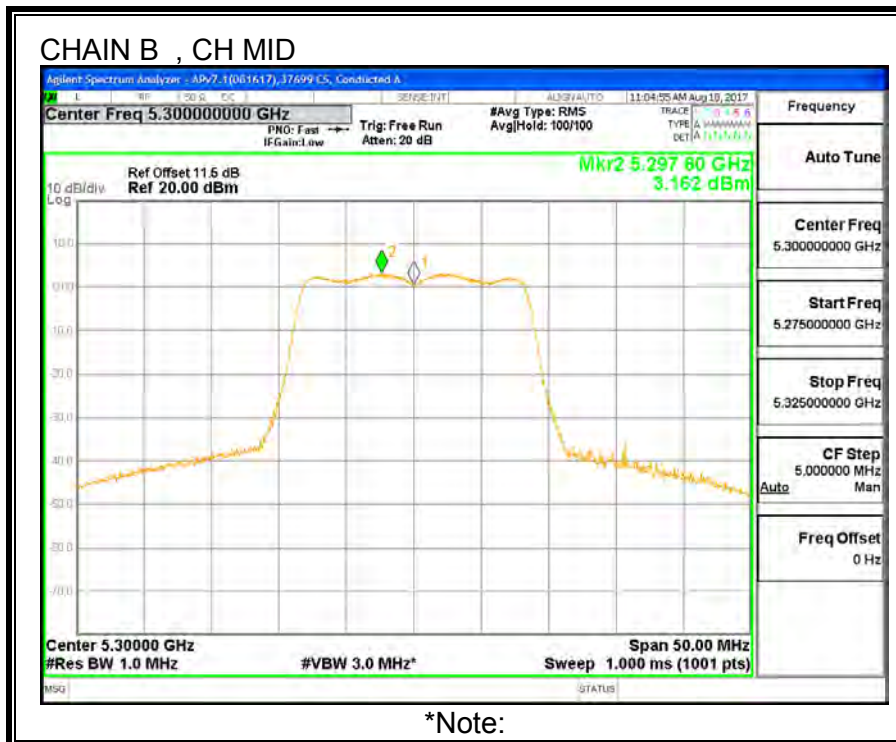
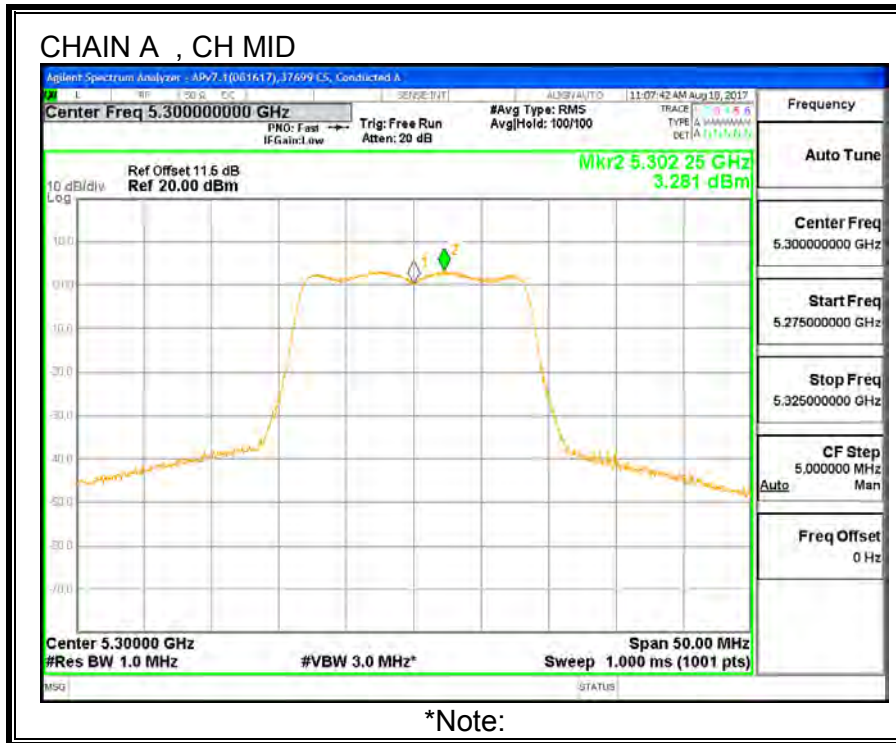
**Output Power Results**

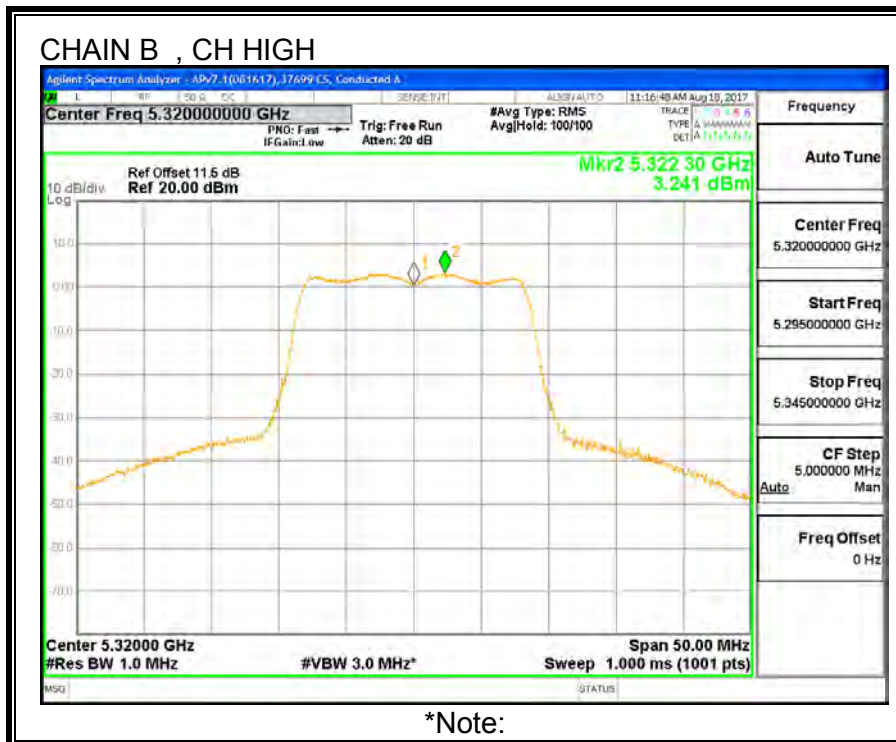
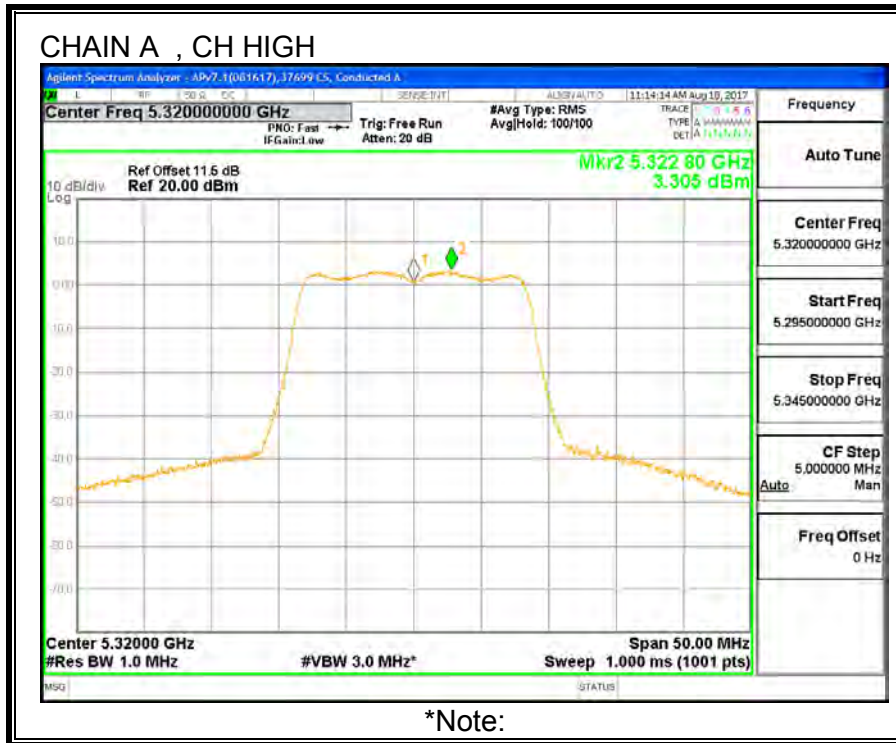
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	13.13	13.63	16.40	23.20	-6.80
Mid	5300	13.07	13.55	16.33	23.19	-6.86
High	5320	13.38	13.26	16.33	23.20	-6.87

**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5260	3.33	3.58	6.46	9.44	-2.98
Mid	5300	3.28	3.16	6.23	9.44	-3.21
High	5320	3.31	3.24	6.28	9.44	-3.16







## 9.6. 11n HT20 2TX MODE IN THE 5.3GHz BAND

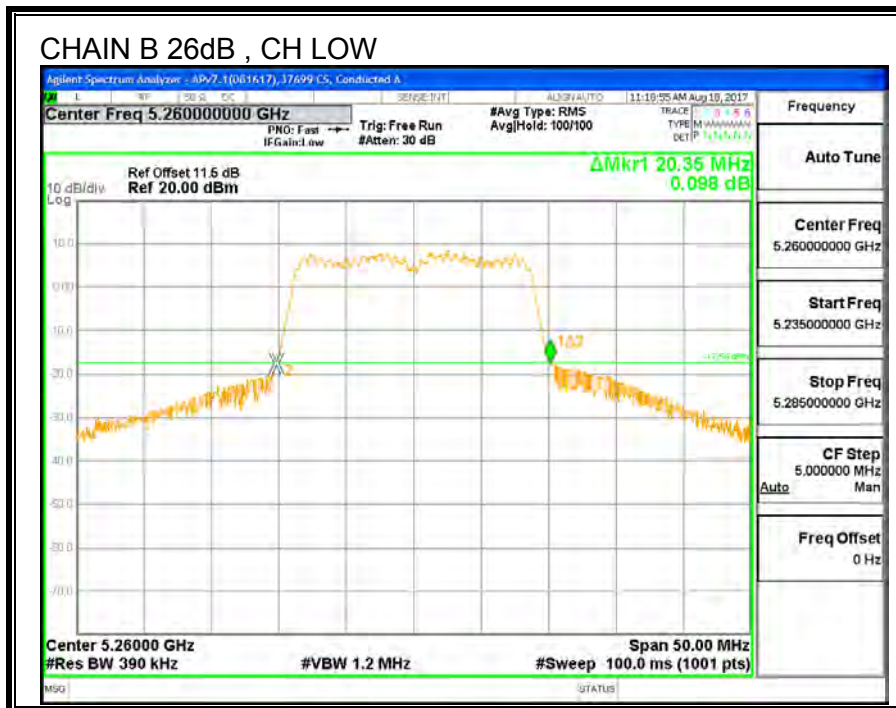
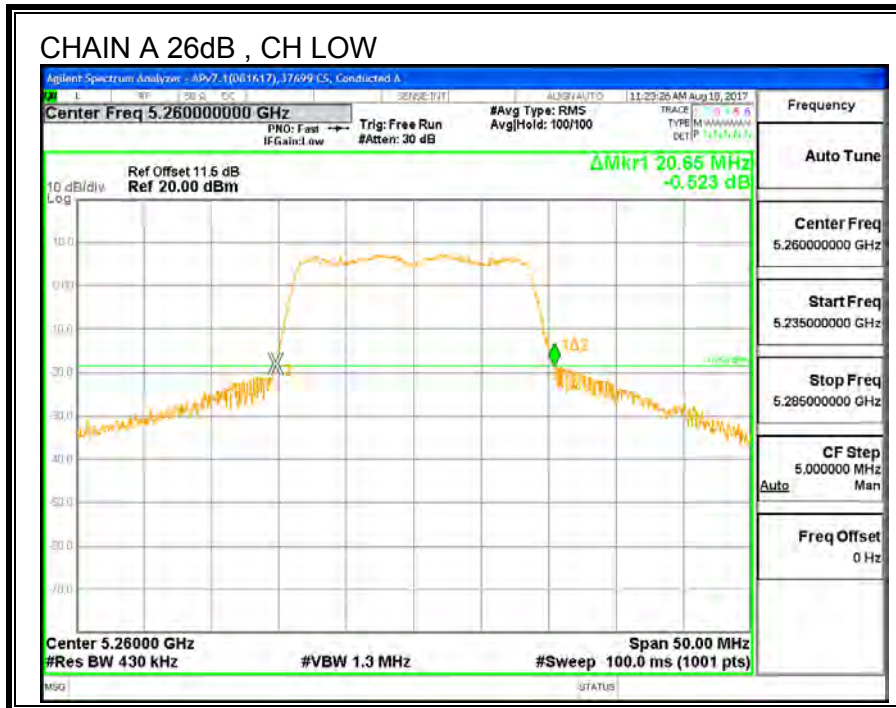
### 9.6.1. 26 dB BANDWIDTH

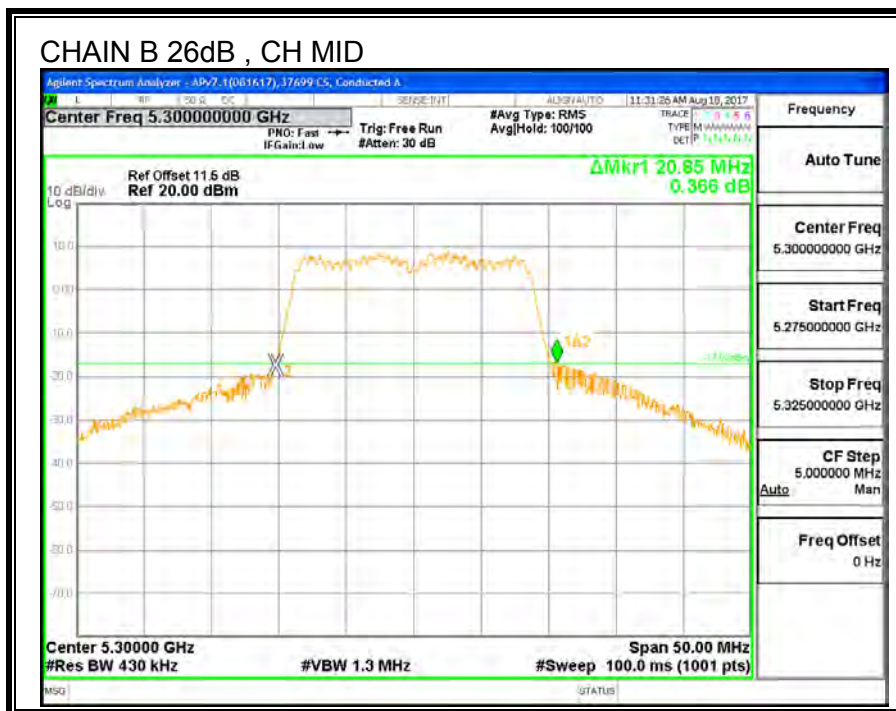
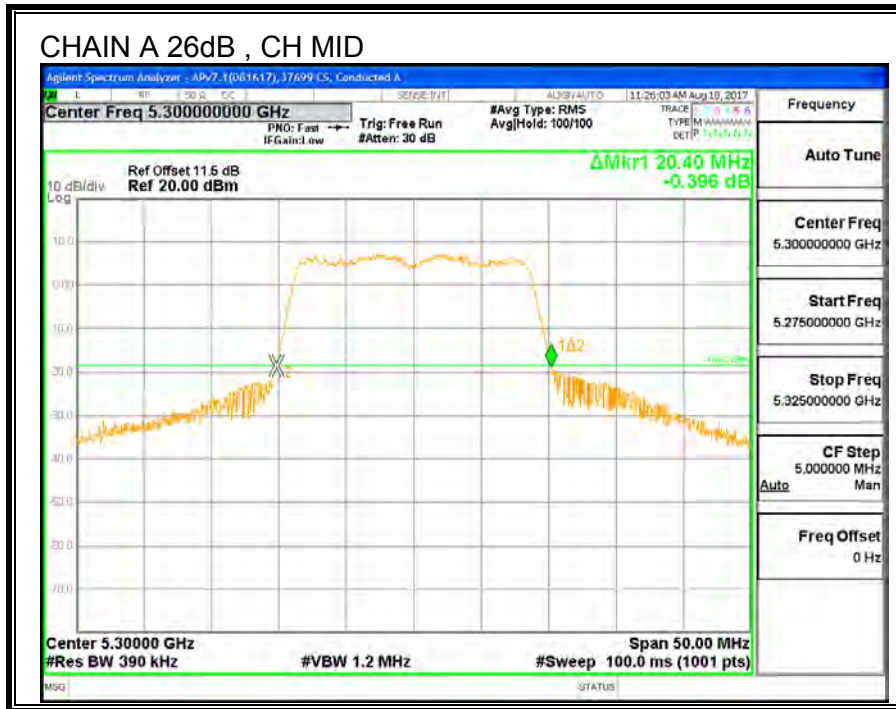
#### LIMITS

None; for reporting purposes only.

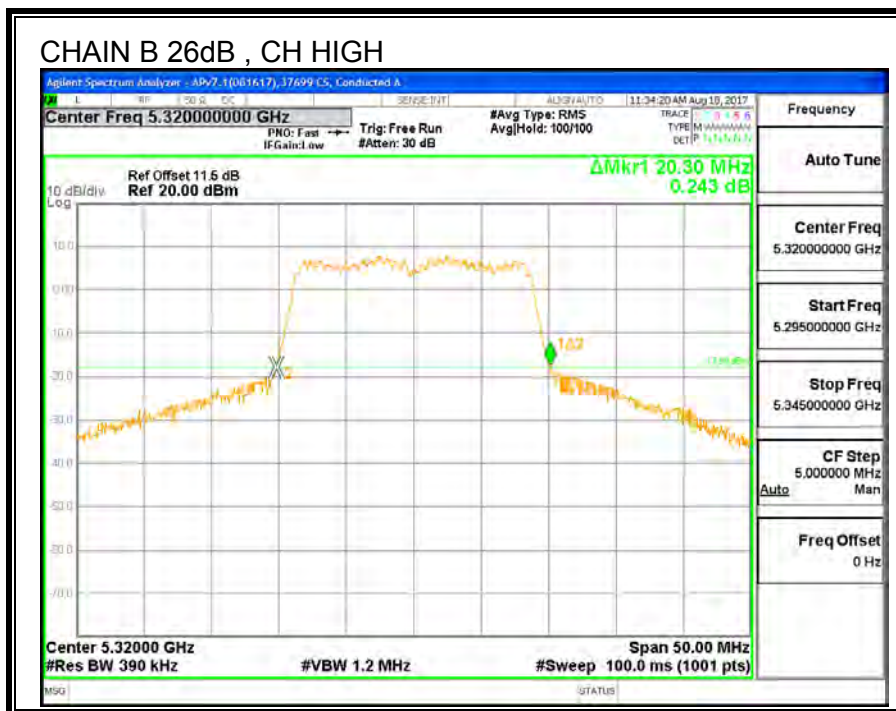
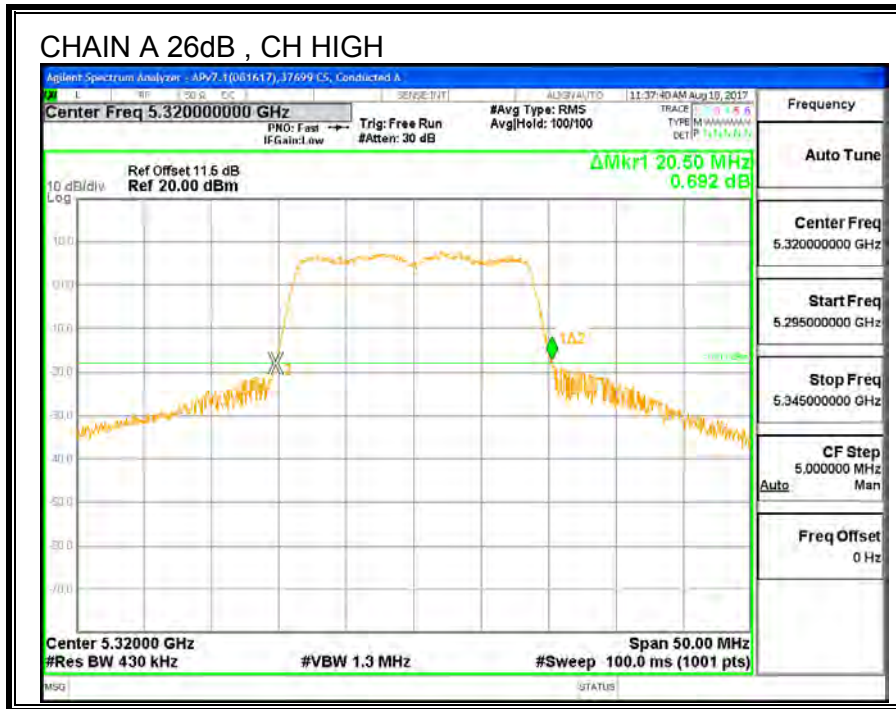
#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5260	20.65	20.35
Mid	5300	20.40	20.85
High	5320	20.50	20.30









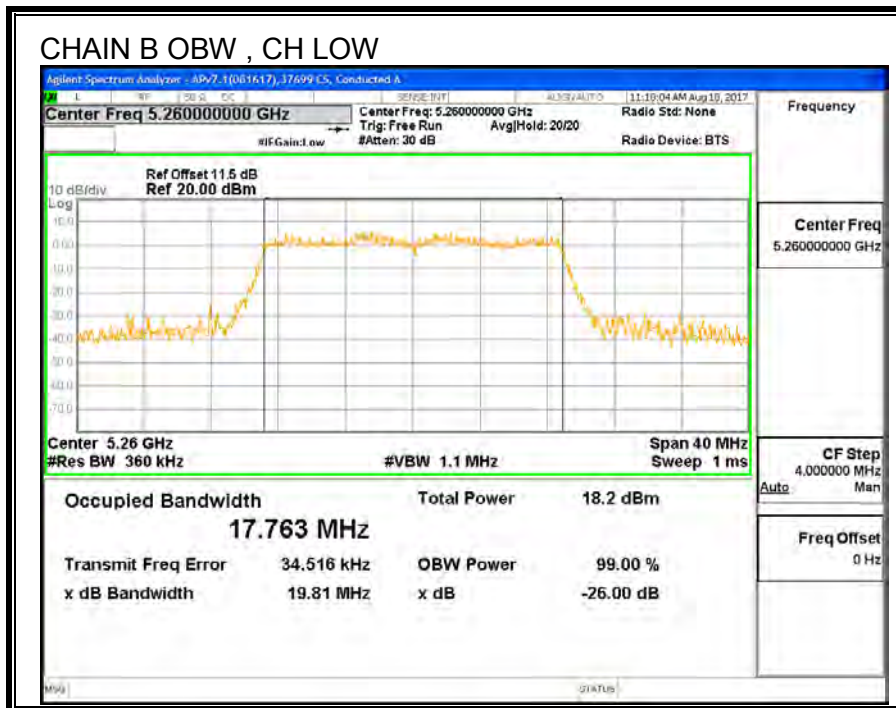
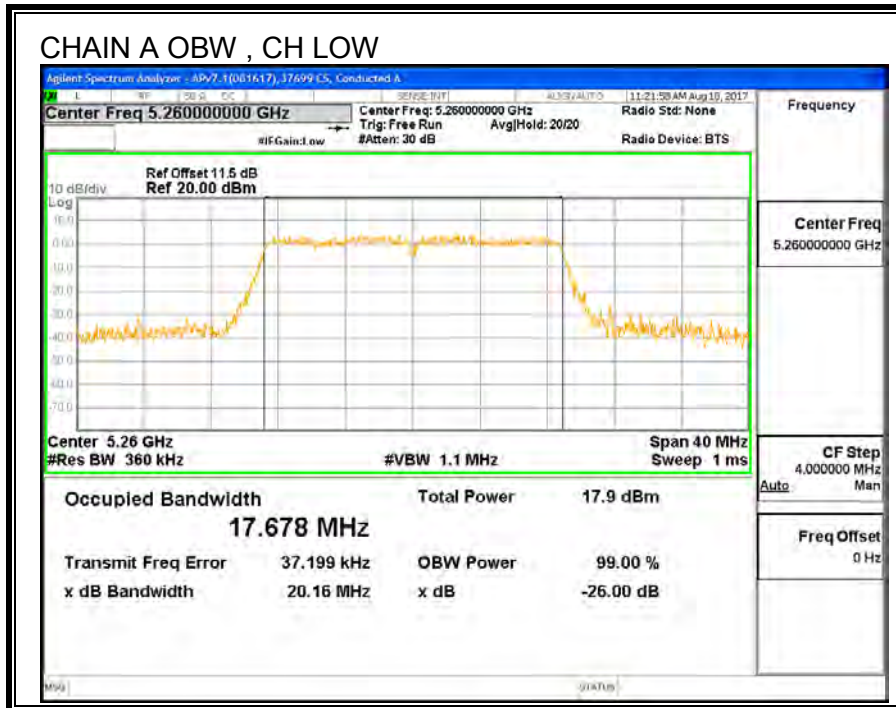
### 9.6.2. 99% BANDWIDTH

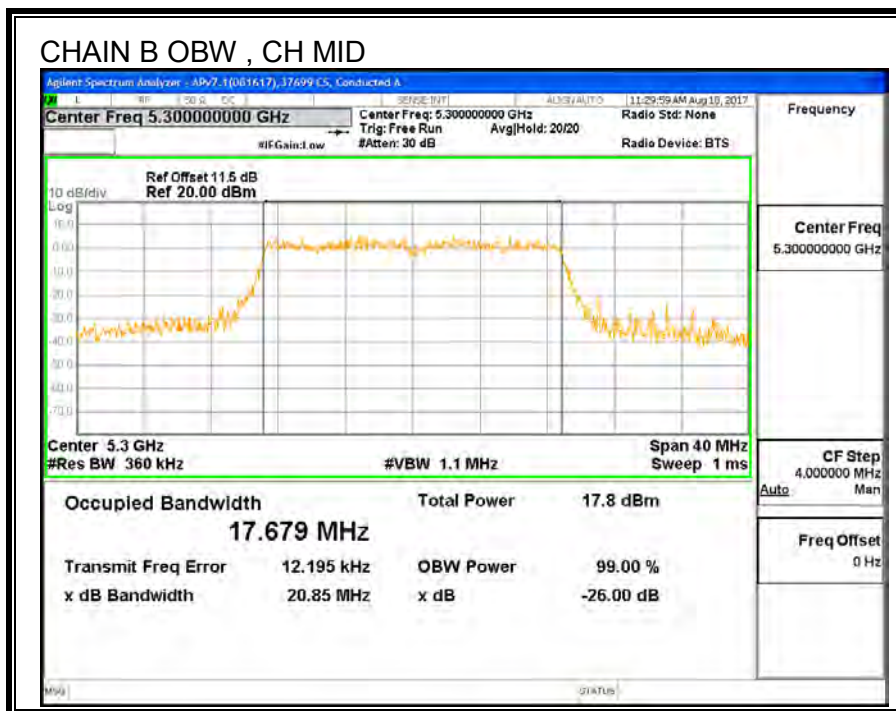
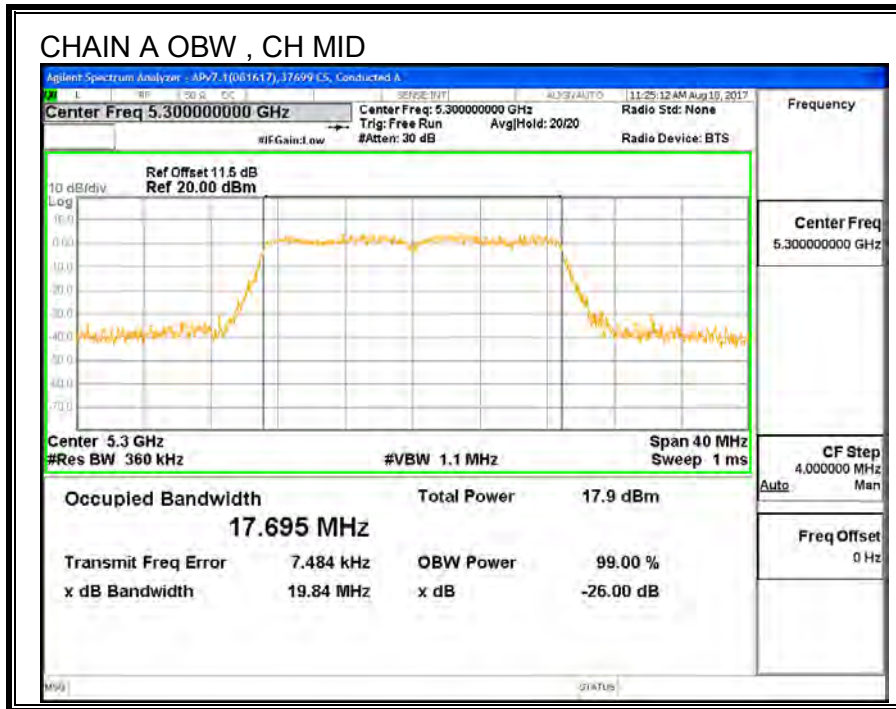
#### LIMITS

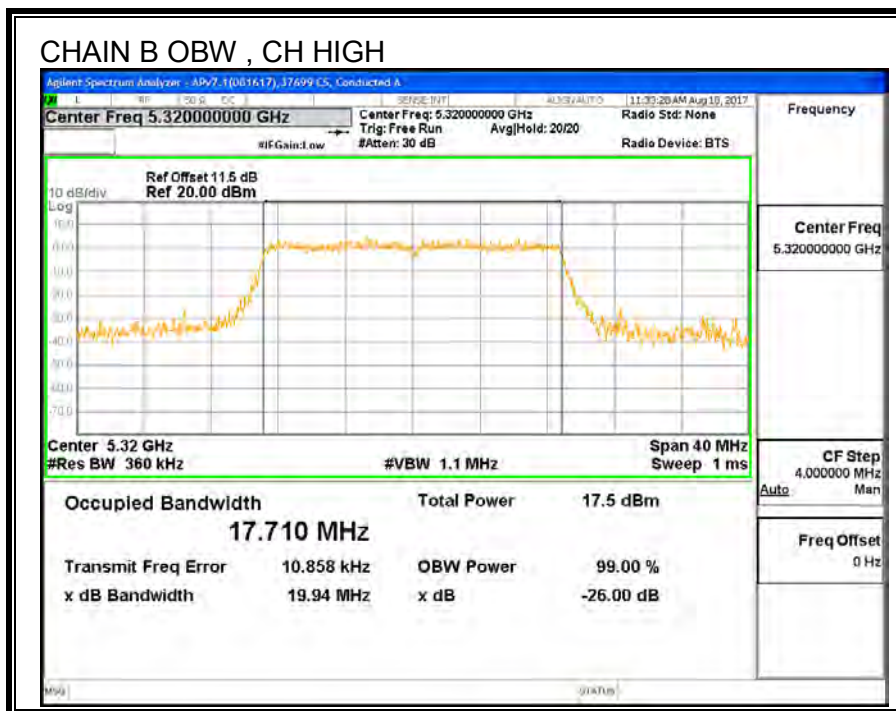
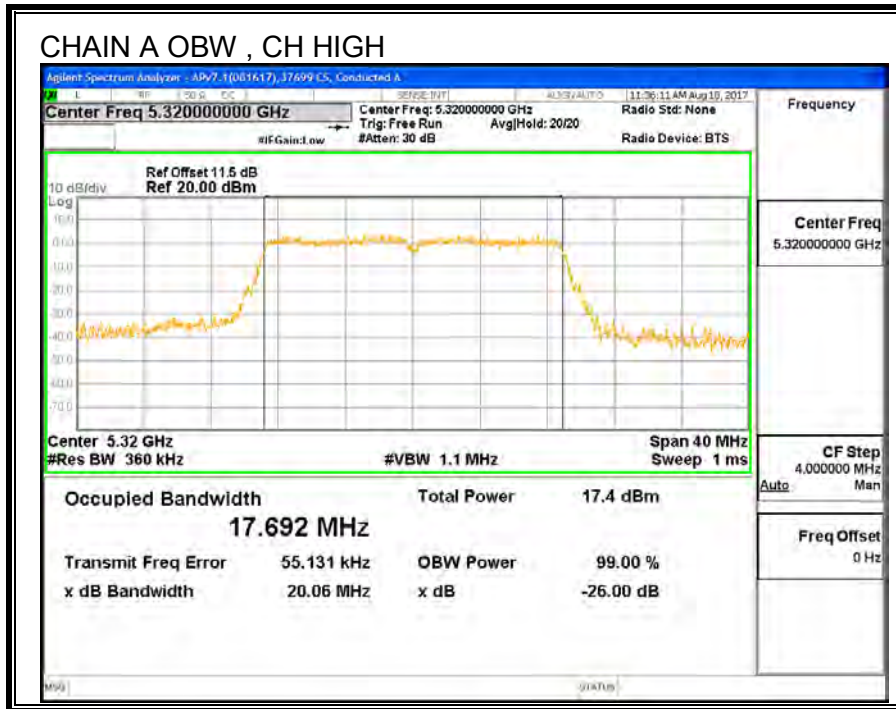
None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5260	17.678	17.763
Mid	5300	17.695	17.679
High	5320	17.692	17.710







### 9.6.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 (6.2.2) (1)

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
5.38	3.63	4.59	7.56

**RESULTS**

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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5260	20.35	17.678	4.59	7.56
Mid	5300	20.4	17.679	4.59	7.56
High	5320	20.3	17.692	4.59	7.56

**Limits**

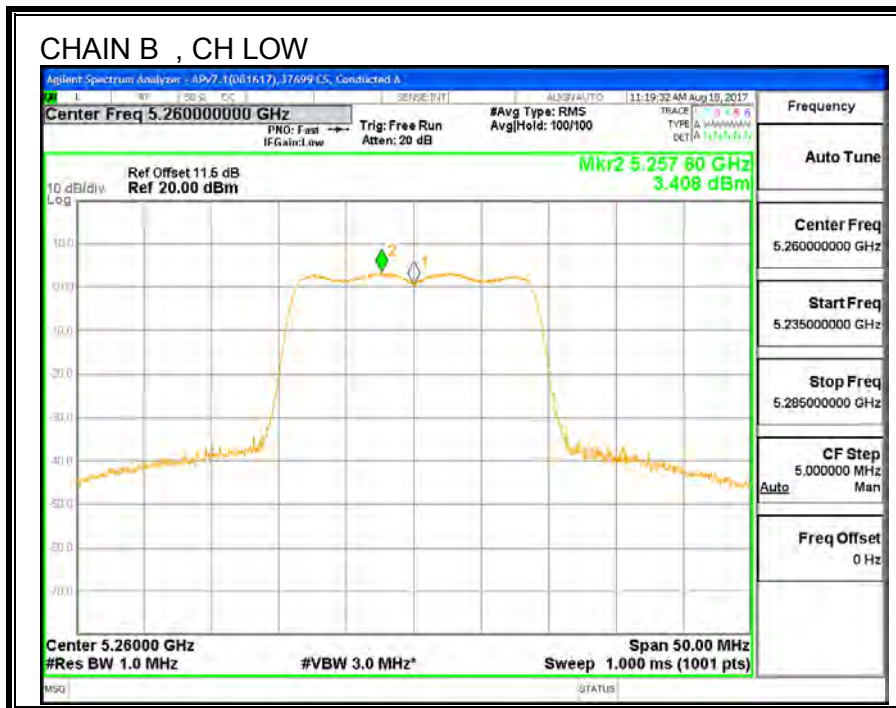
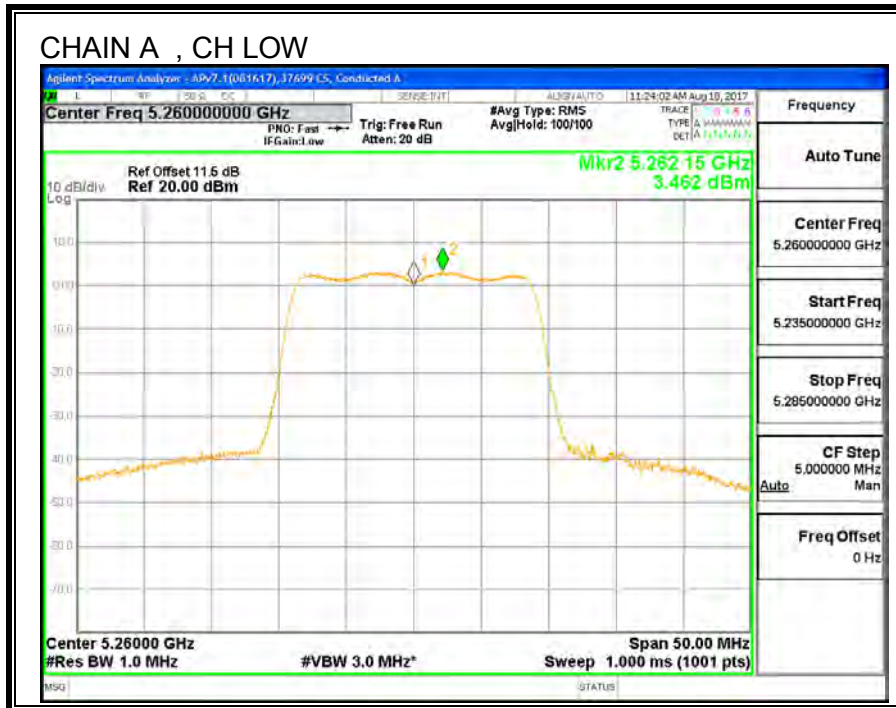
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED PSD Limit (dBm)	PPSD Limit (dBm)
Low	5260	24.00	23.47	29.47	23.47	9.44	11.00	9.44
Mid	5300	24.00	23.47	29.47	23.47	9.44	11.00	9.44
High	5320	24.00	23.48	29.48	23.48	9.44	11.00	9.44

**Output Power Results**

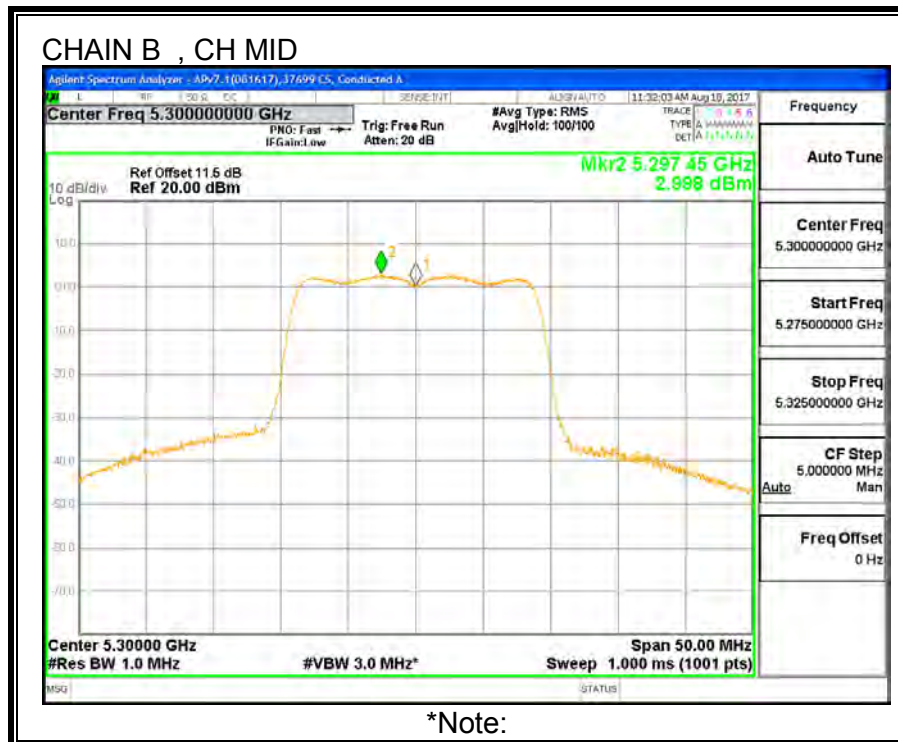
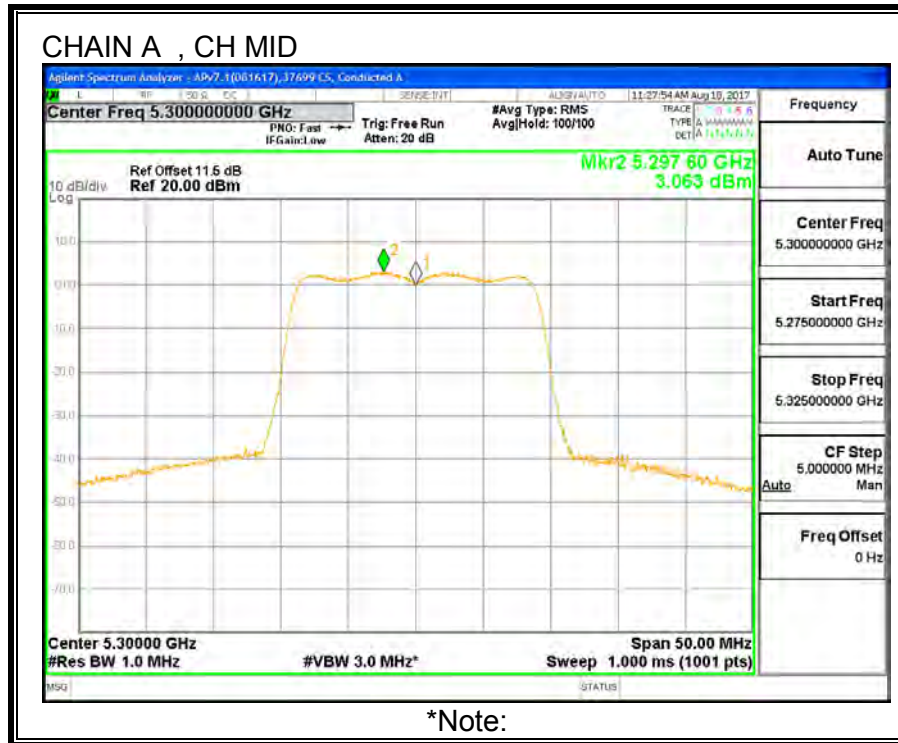
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	13.27	13.52	16.41	23.47	-7.07
Mid	5300	13.24	13.35	16.31	23.47	-7.17
High	5320	13.47	13.37	16.43	23.48	-7.05

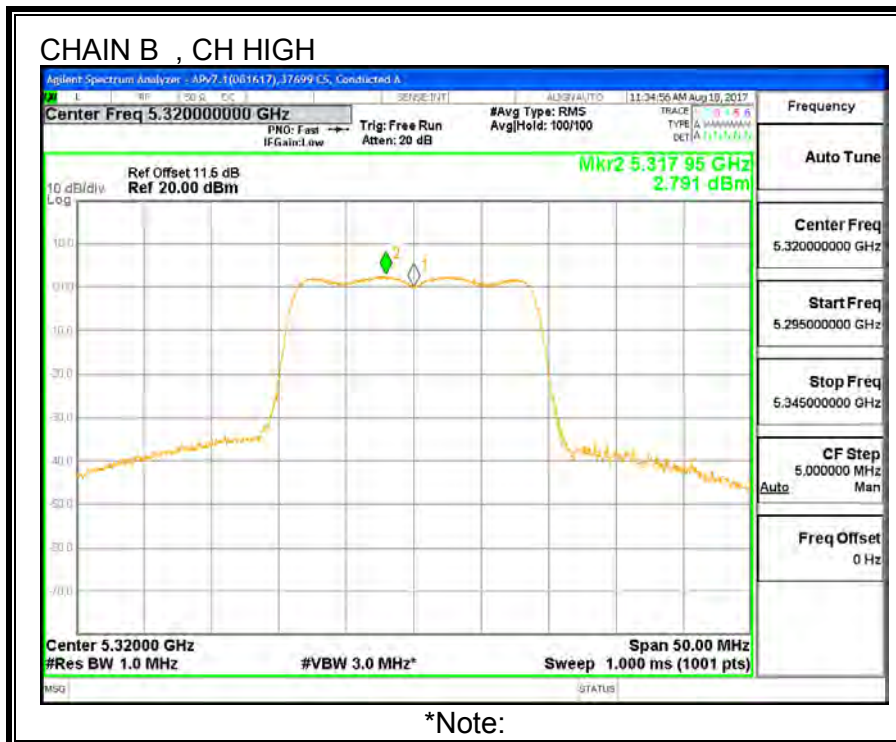
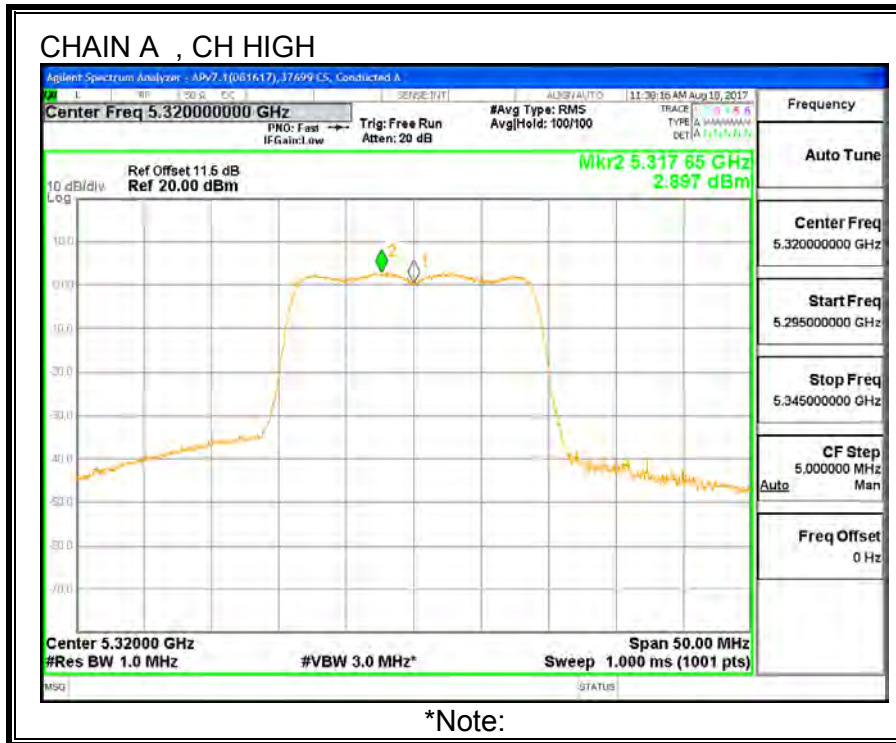
**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5260	3.46	3.41	6.45	9.44	-3.00
Mid	5300	3.06	3.00	6.04	9.44	-3.40
High	5320	2.99	2.79	5.90	9.44	-3.54









## 9.7. 11n HT40 2TX MODE IN THE 5.3GHz BAND

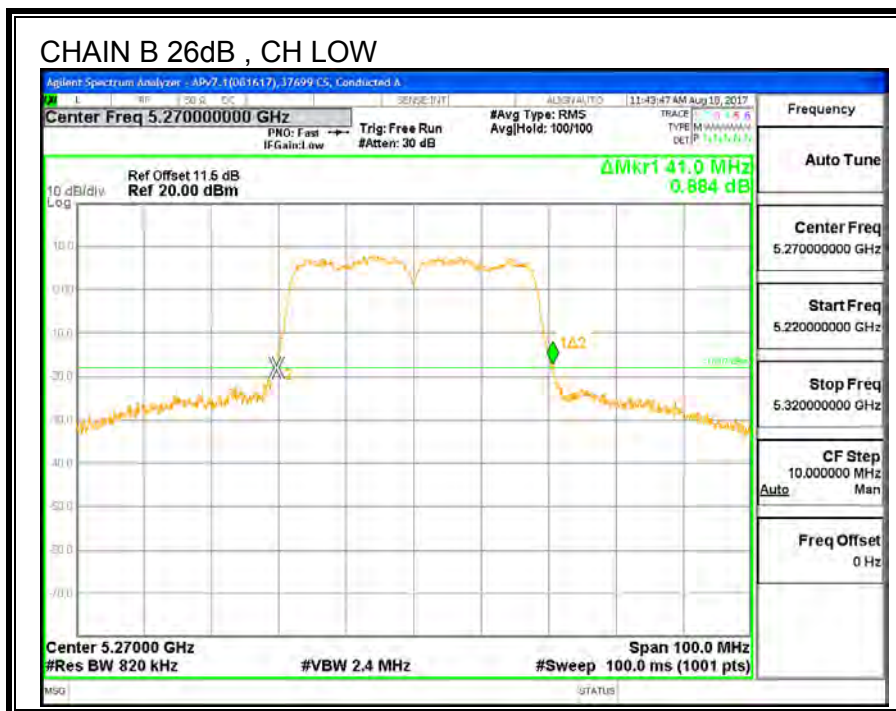
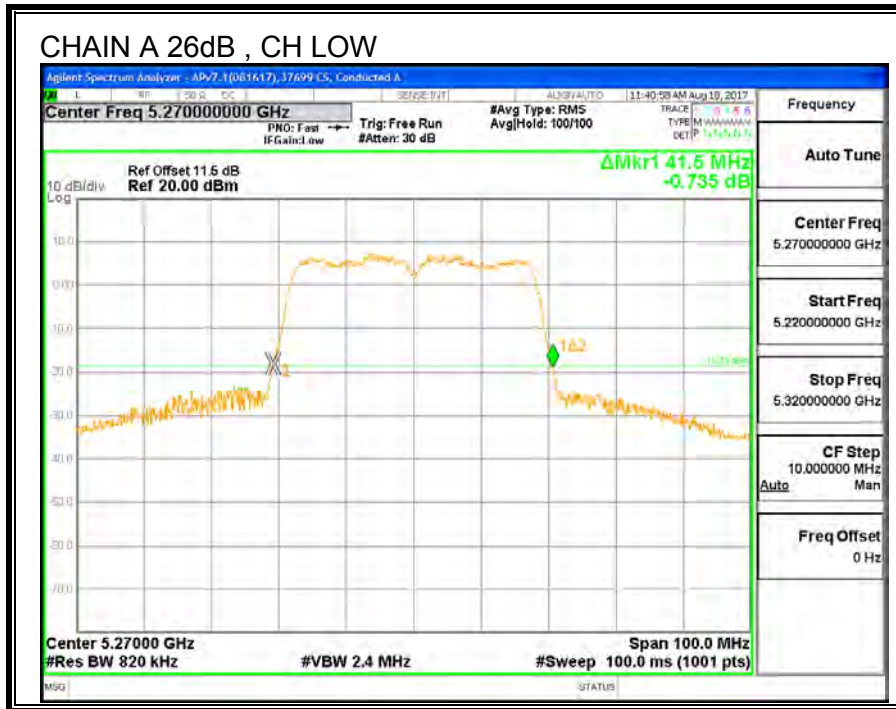
### 9.7.1. 26 dB BANDWIDTH

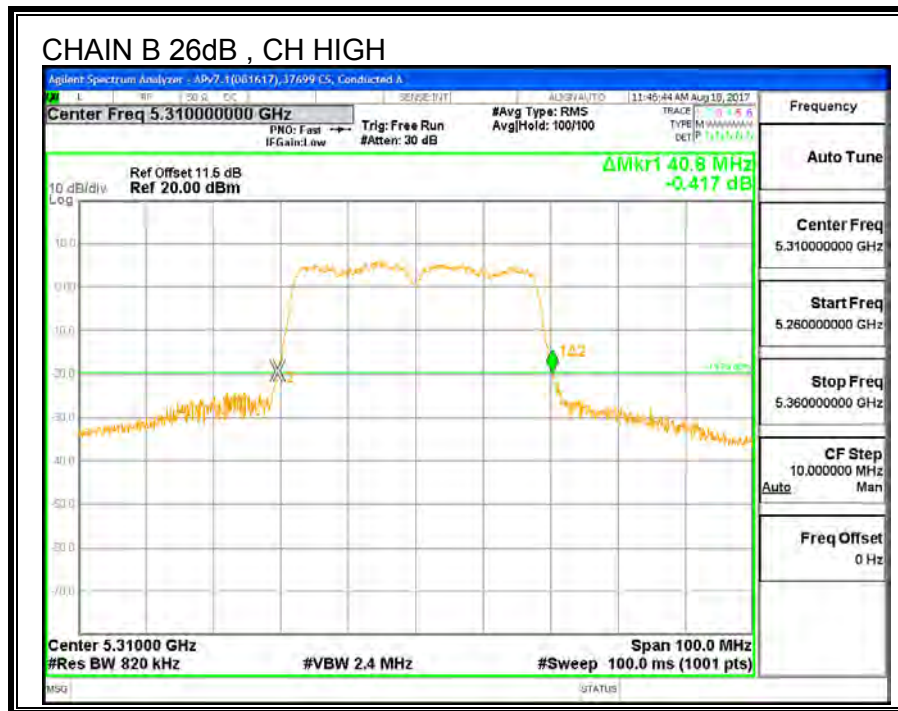
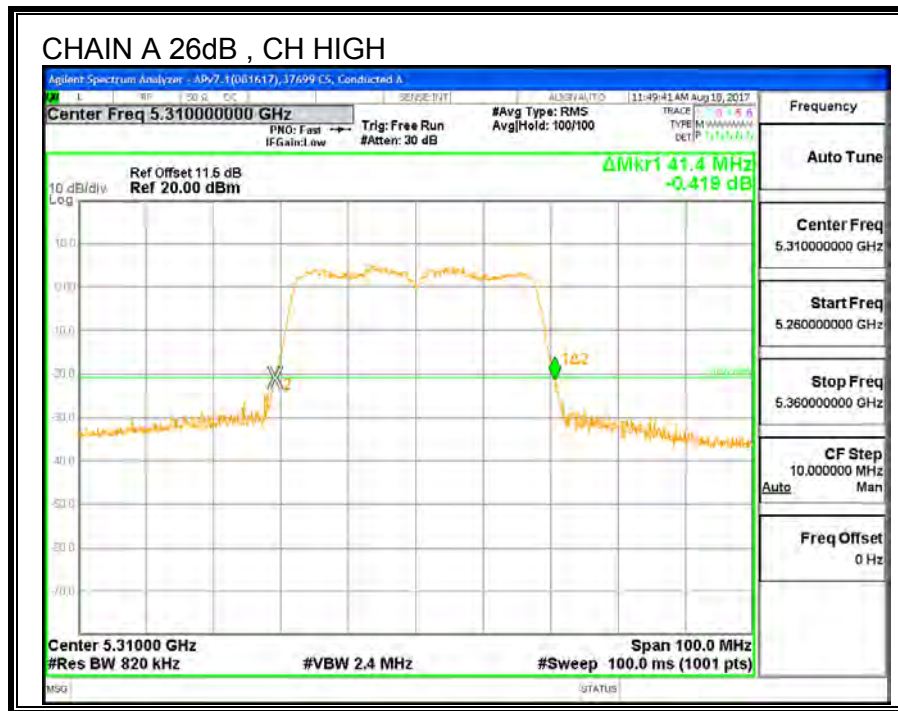
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5270	41.5	41.0
High	5310	41.4	40.8





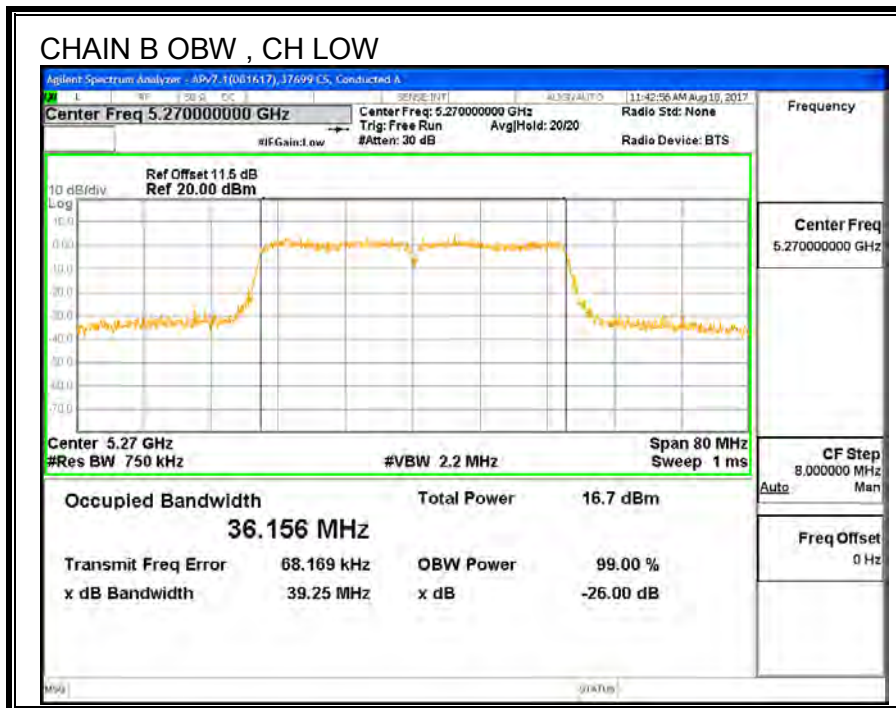
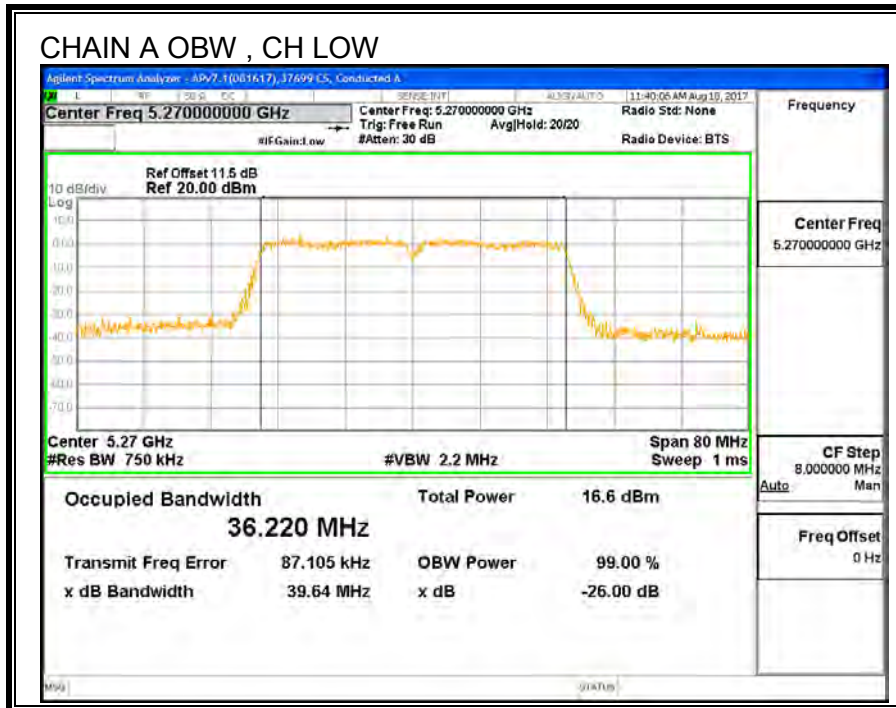
### 9.7.2. 99% BANDWIDTH

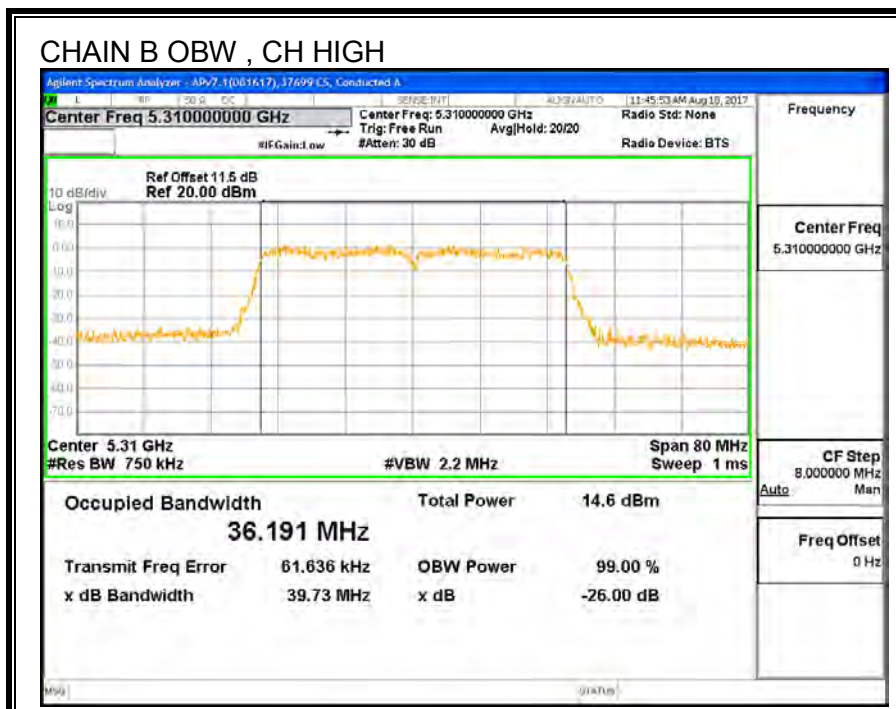
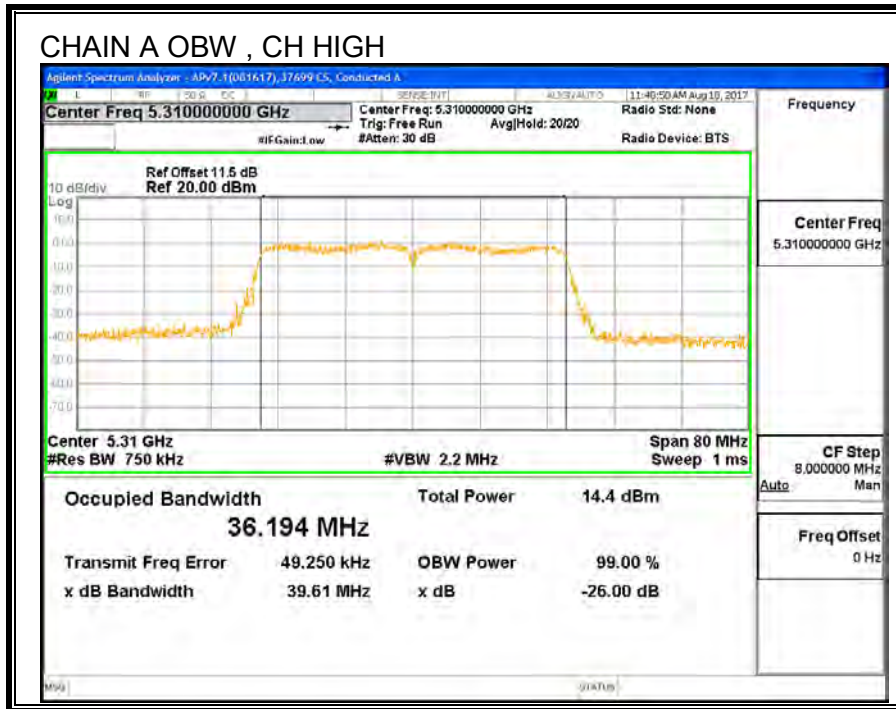
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5270	36.220	36.156
High	5310	36.194	36.191







### 9.7.3. OUTPUT POWER AND PPSD

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 (6.2.2) (1)

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### **TEST PROCEDURE**

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### **DIRECTIONAL ANTENNA GAIN**

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

<b>Chain A Antenna Gain (dBi)</b>	<b>Chain B Antenna Gain (dBi)</b>	<b>Uncorrelated Chains Directional Gain (dBi)</b>	<b>Correlated Chains Directional Gain (dBi)</b>
5.38	3.63	4.59	7.56

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5270	41	36.156	4.59	7.56
High	5310	40.8	36.191	4.59	7.56

**Limits**

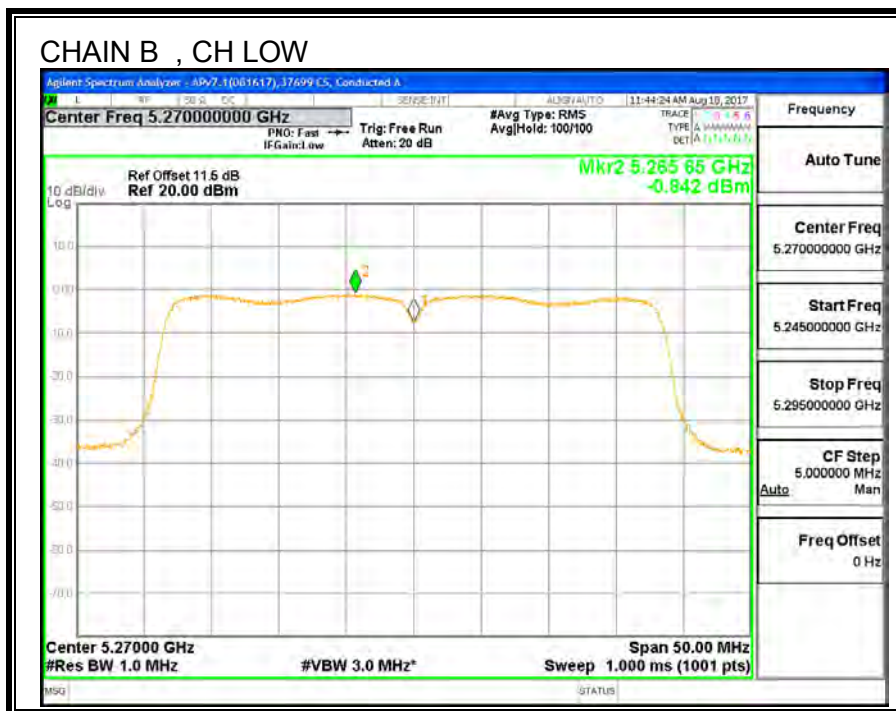
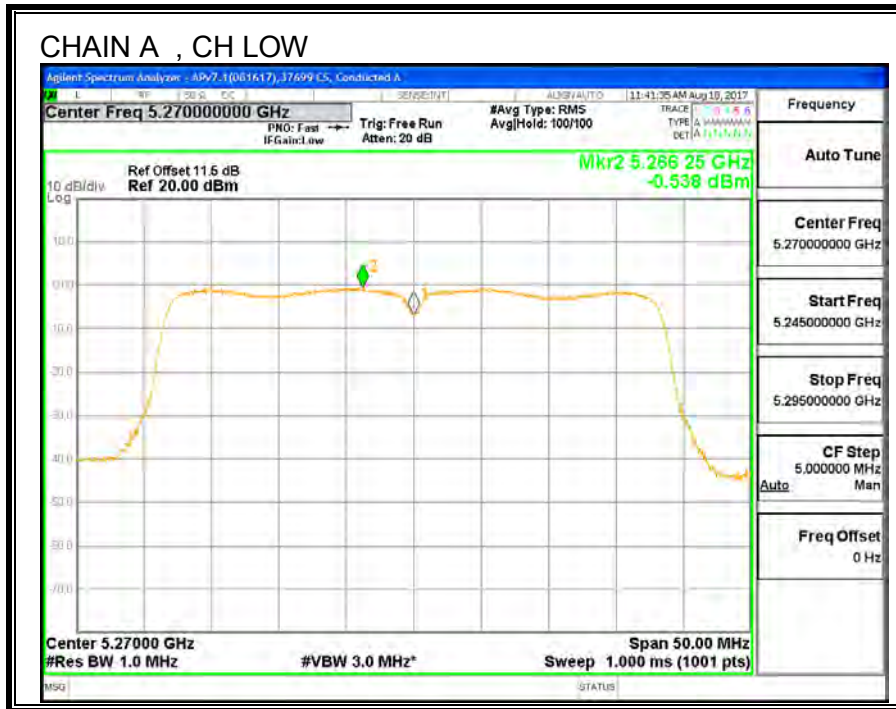
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED PSD Limit (dBm)	PPSD Limit (dBm)
Low	5270	24.00	24.00	30.00	24.00	9.44	11.00	9.44
High	5310	24.00	24.00	30.00	24.00	9.44	11.00	9.44

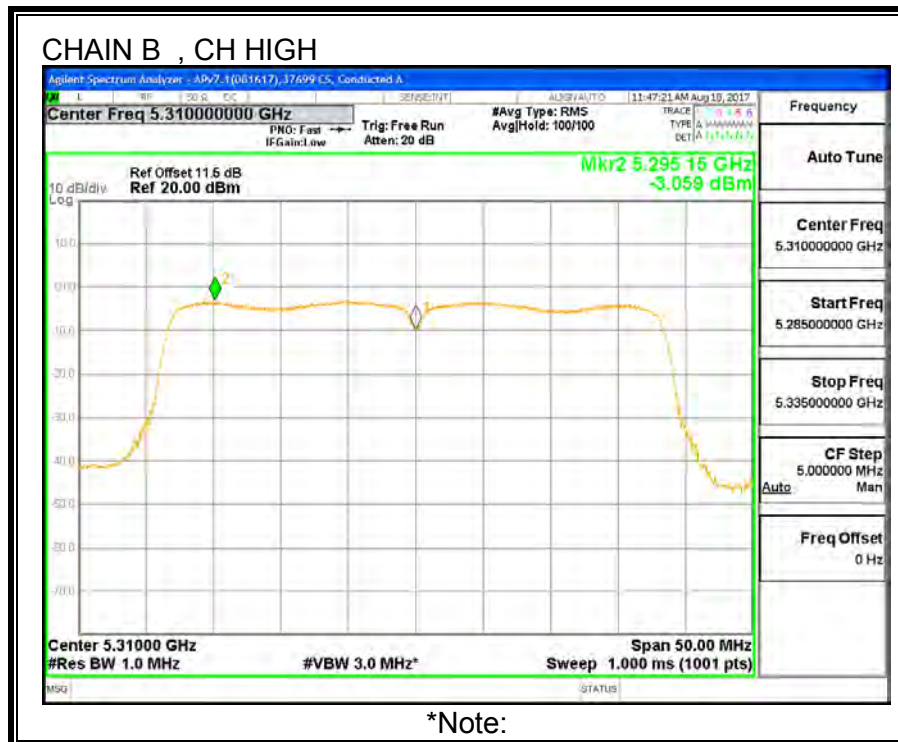
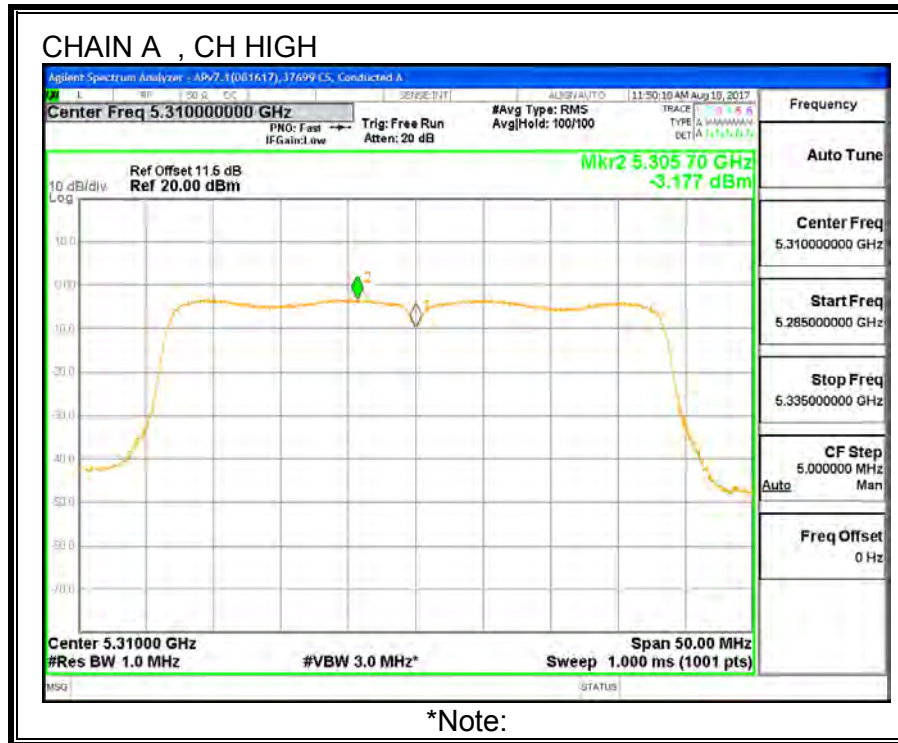
**Output Power Results**

Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5270	12.54	11.98	15.28	24.00	-8.72
High	5310	10.43	10.31	13.38	24.00	-10.62

**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5270	-0.54	-0.84	2.32	9.44	-7.12
High	5310	-3.18	-3.06	-0.11	9.44	-9.55





## 9.8. 11ac VHT80 2TX MODE IN THE 5.3GHz BAND

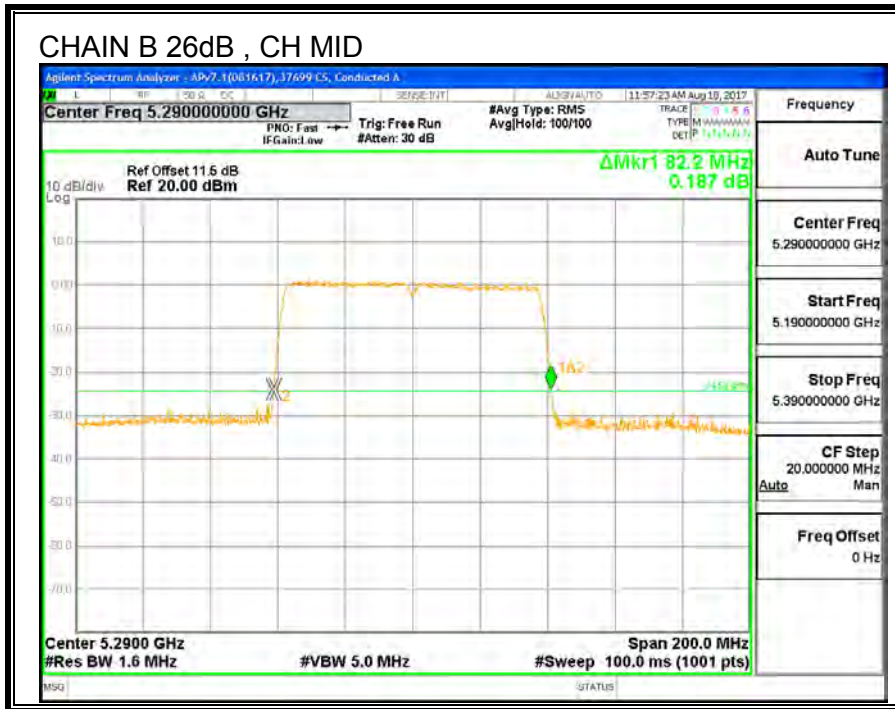
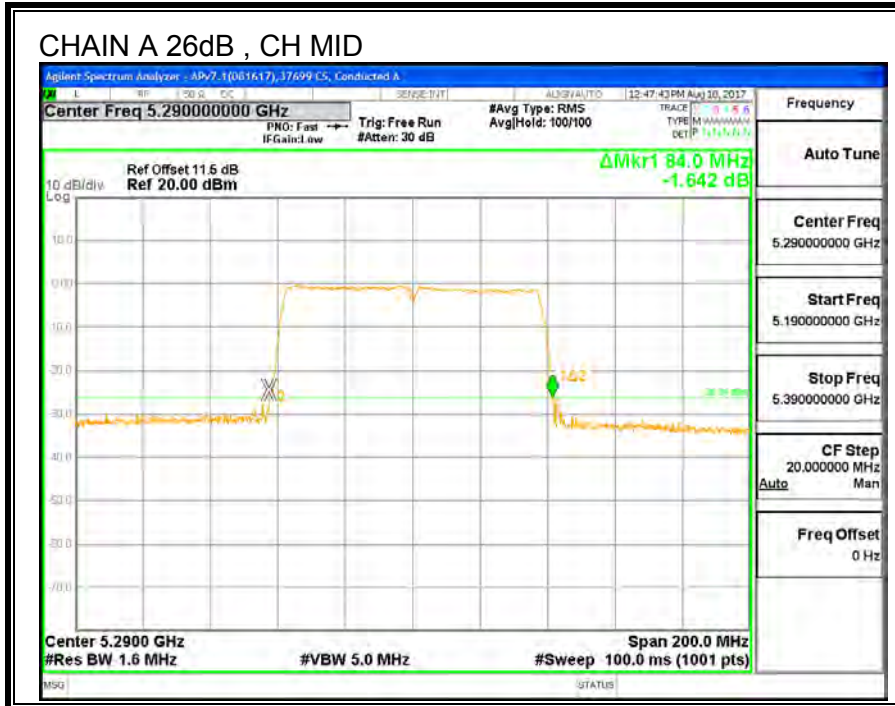
### 9.8.1. 26 dB BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Mid	5290	84.00	82.2



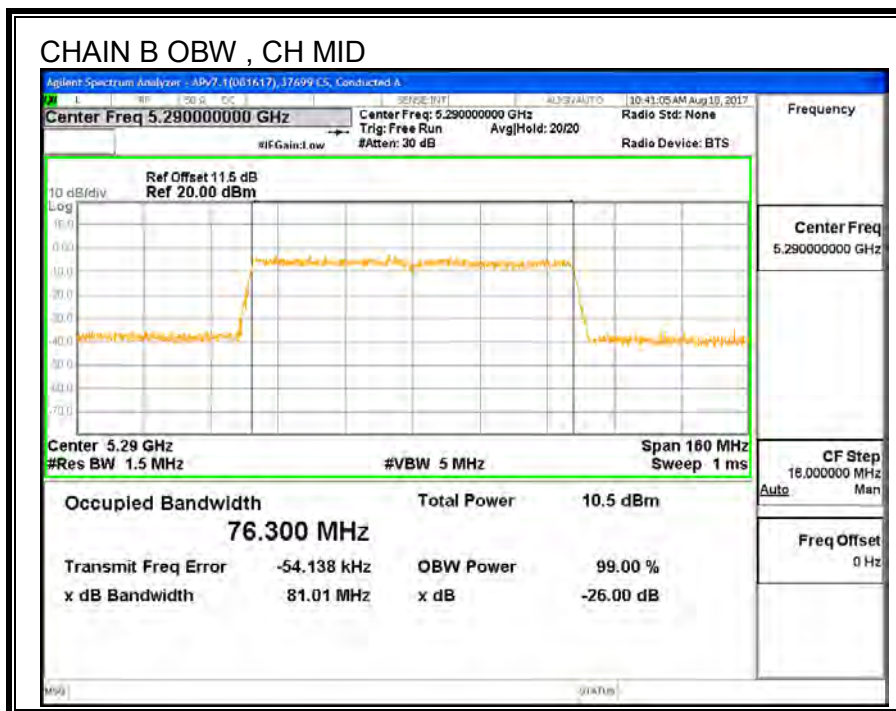
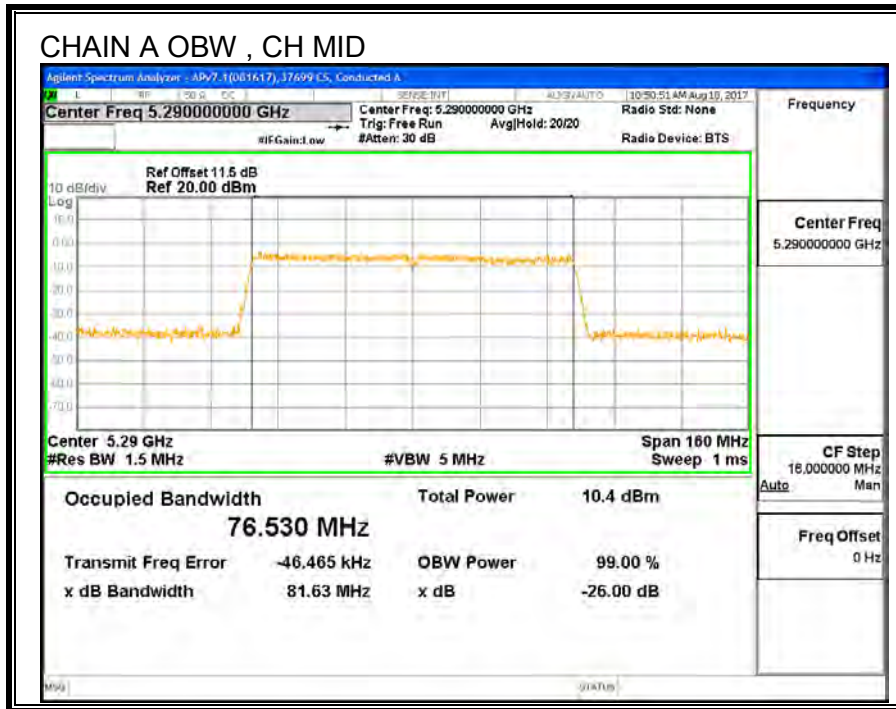
### 9.8.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Mid	5290	76.530	76.300





### 9.8.3. OUTPUT POWER AND PPSD

FCC §15.407 (a) (2)

For the band 5.25–5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 (6.2.2) (1)

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### **TEST PROCEDURE**

The measurement method used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G)

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### **DIRECTIONAL ANTENNA GAIN**

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

<b>Chain A Antenna Gain (dBi)</b>	<b>Chain B Antenna Gain (dBi)</b>	<b>Uncorrelated Chains Directional Gain (dBi)</b>	<b>Correlated Chains Directional Gain (dBi)</b>
5.38	3.63	4.59	7.56

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5530	82.20	76.30	4.59	7.56

**Limits**

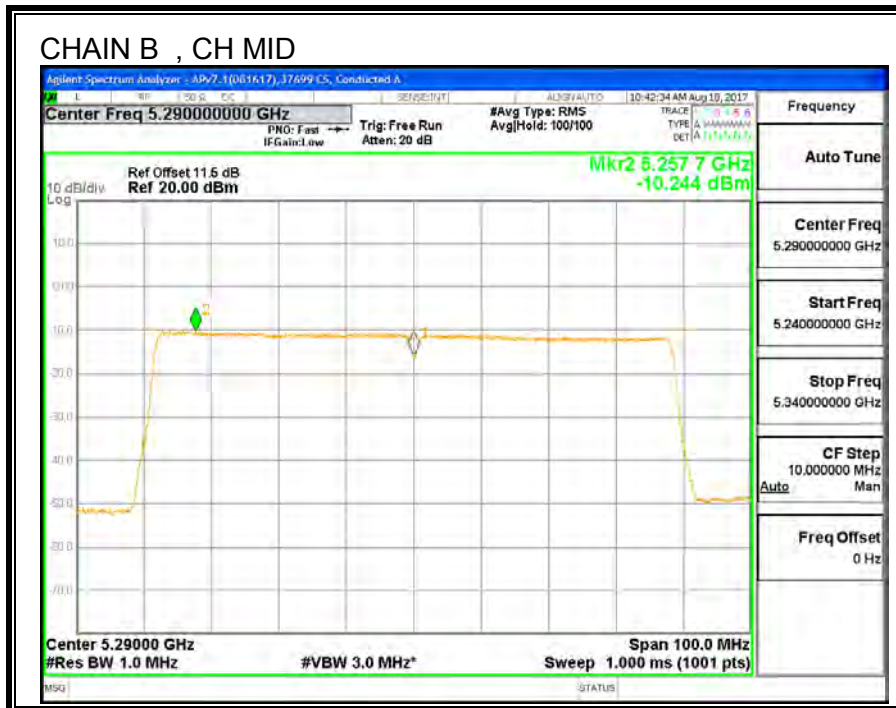
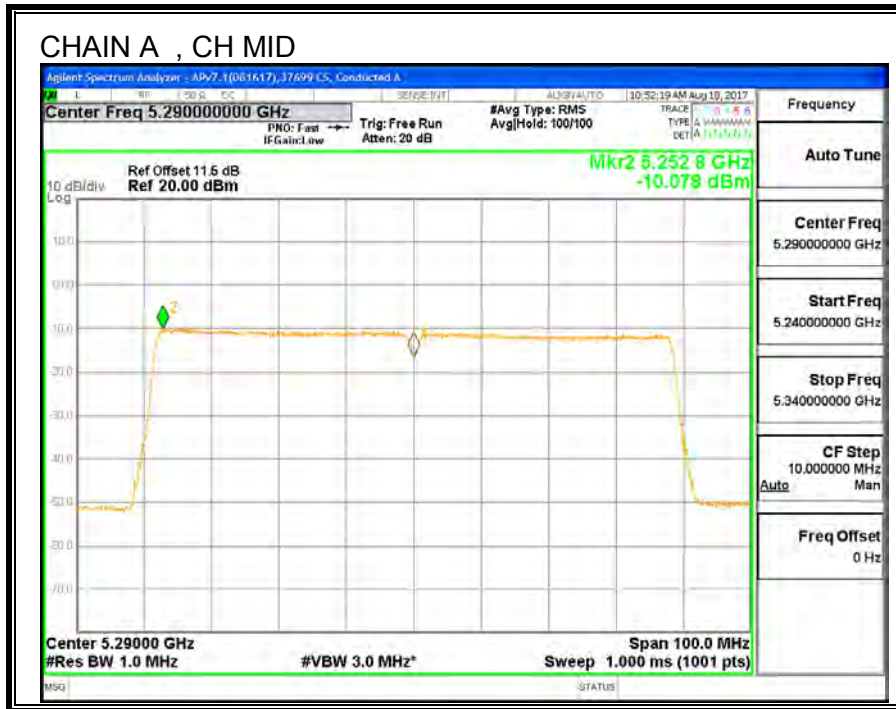
Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED PSD Limit (dBm)	PPSD Limit (dBm)
Low	5530	24.00	24.00	30.00	24.00	9.44	11.00	9.44

**Output Power Results**

Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5530	6.36	6.82	9.61	24.00	-14.39

**PPSD Results**

Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5530	-10.08	-10.24	-7.15	9.44	-16.59



## 9.9. 11a 2TX MODE IN THE 5.6GHz BAND

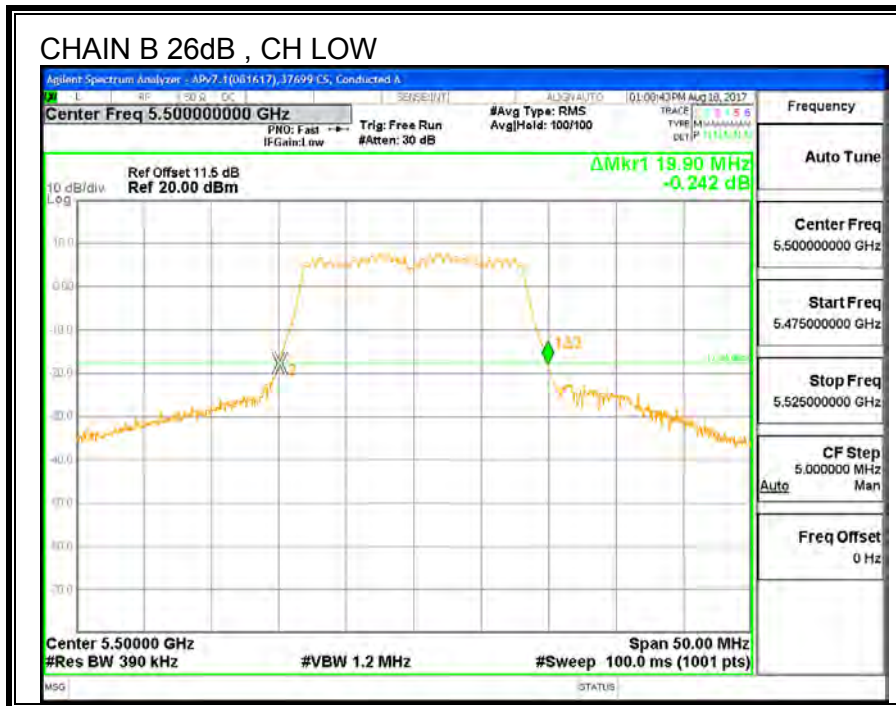
### 9.9.1. 26 dB BANDWIDTH

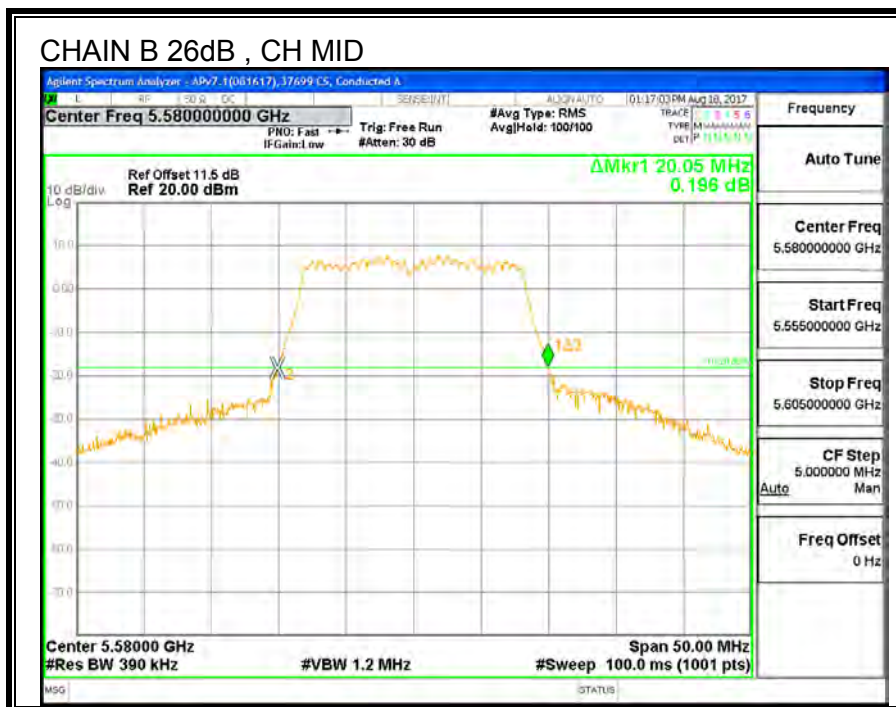
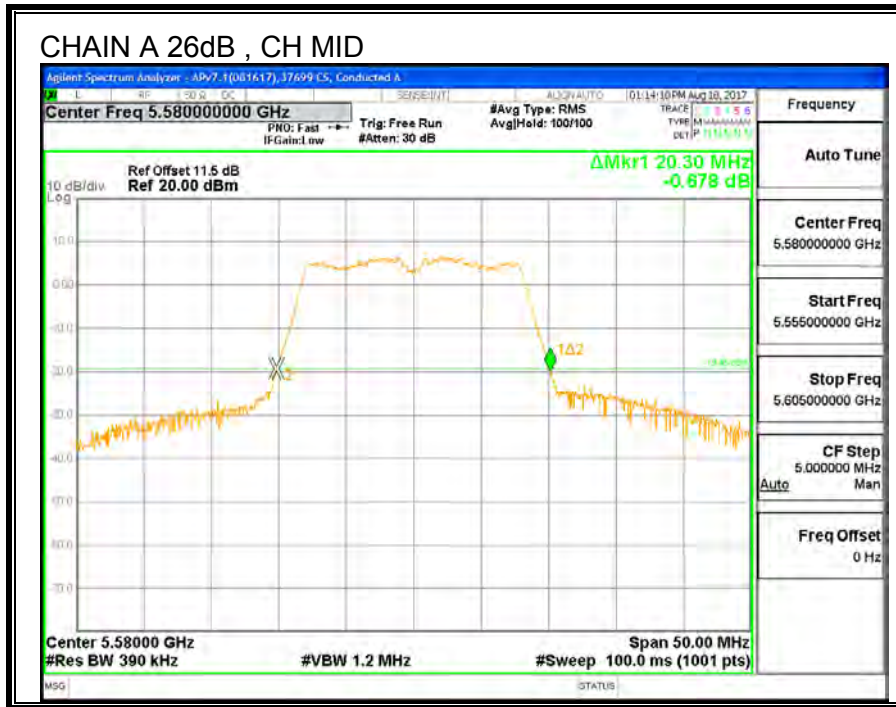
#### LIMITS

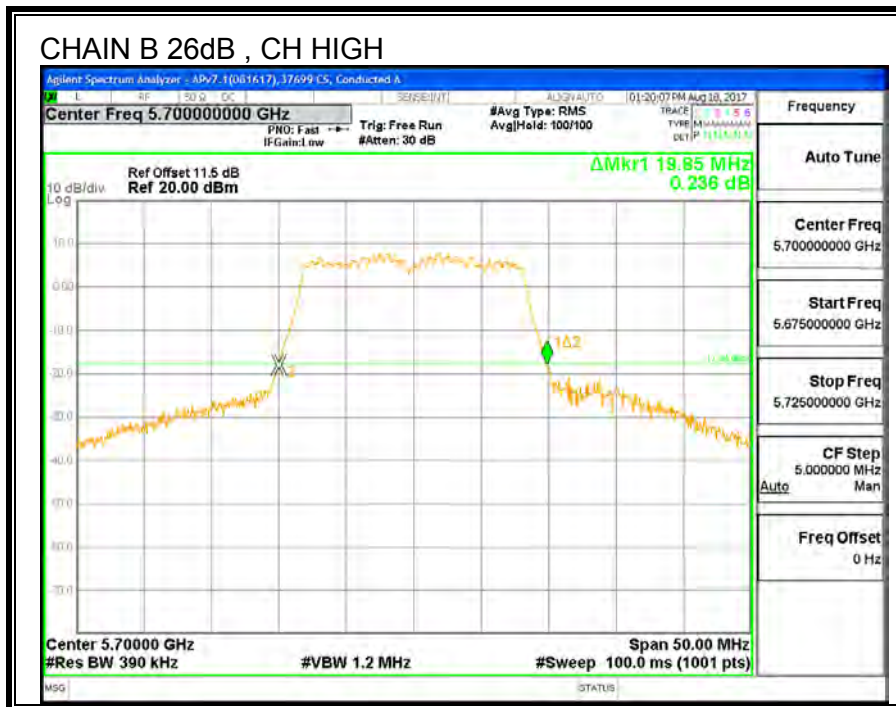
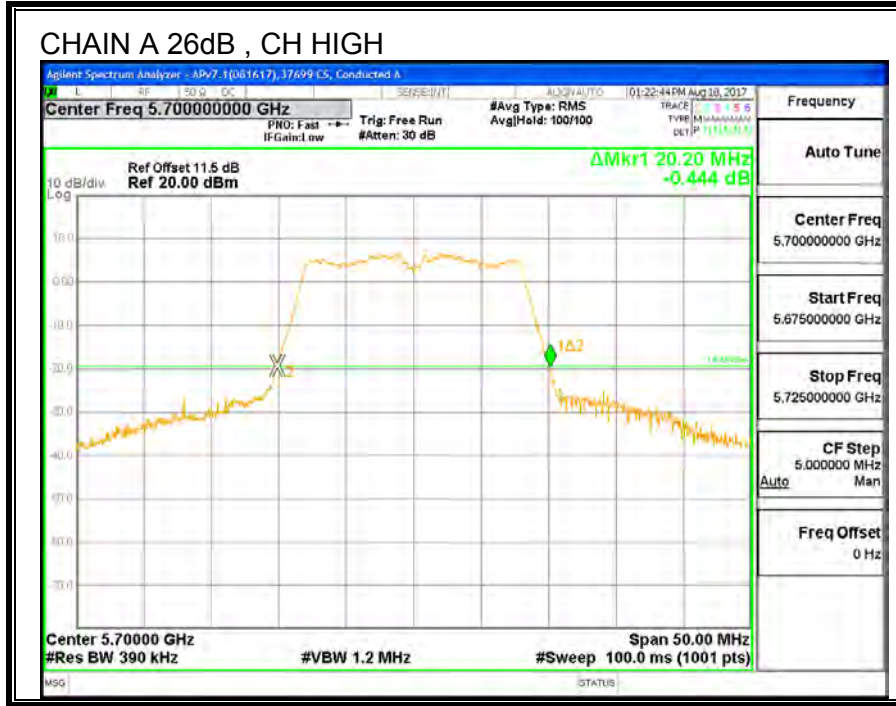
None; for reporting purposes only.

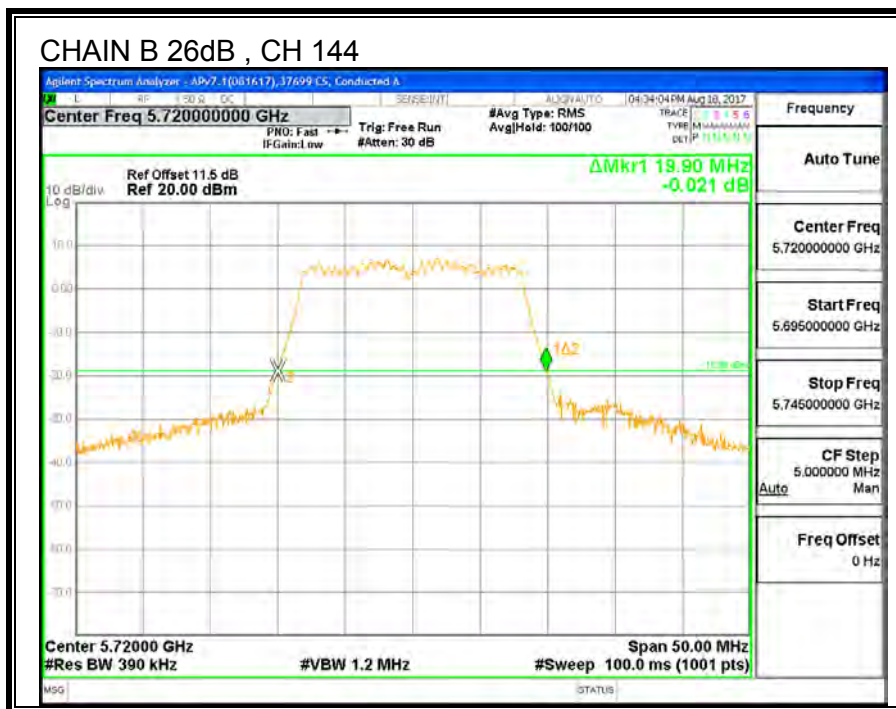
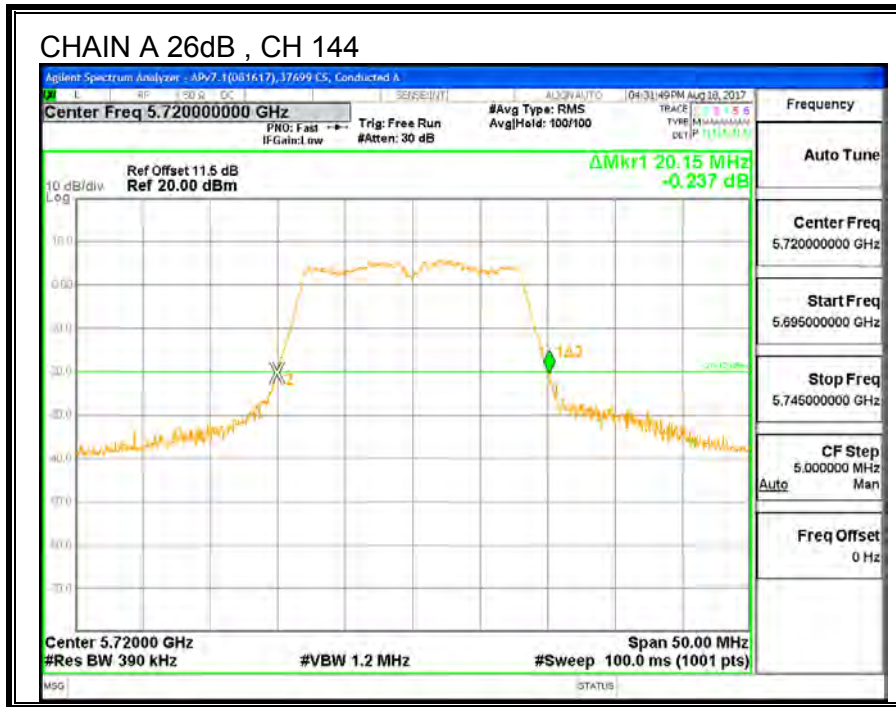
#### RESULTS

Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5500	20.15	19.90
Mid	5580	20.30	20.05
High	5700	20.20	19.85
144	5720	20.15	19.90











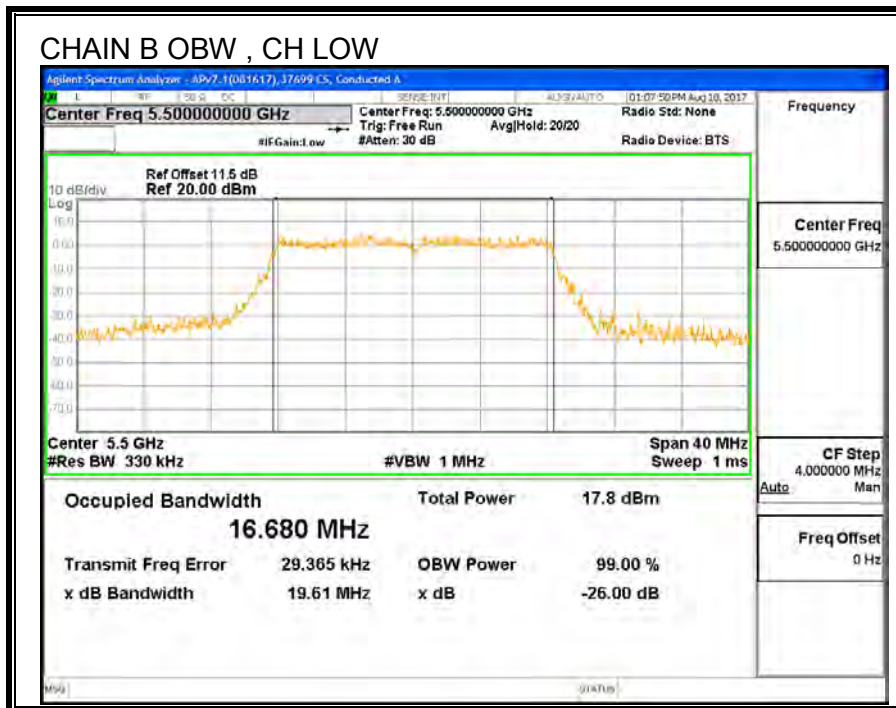
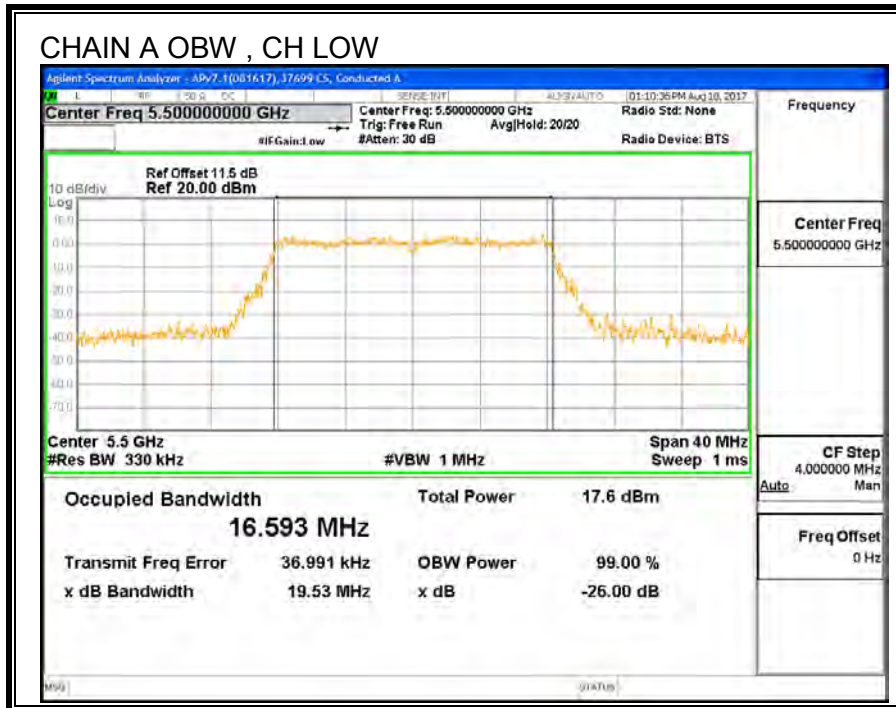
### 9.9.2. 99% BANDWIDTH

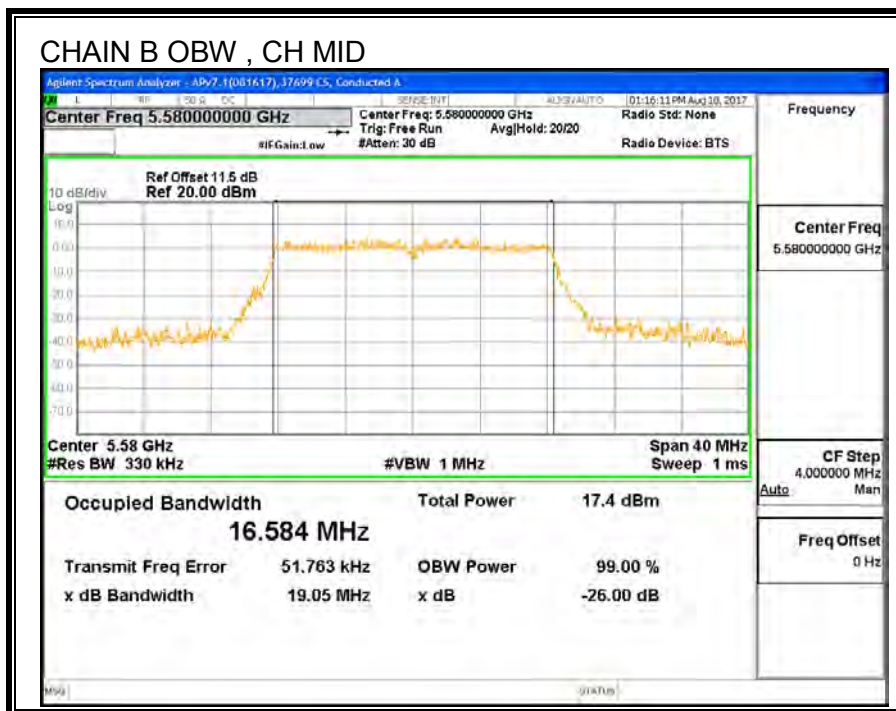
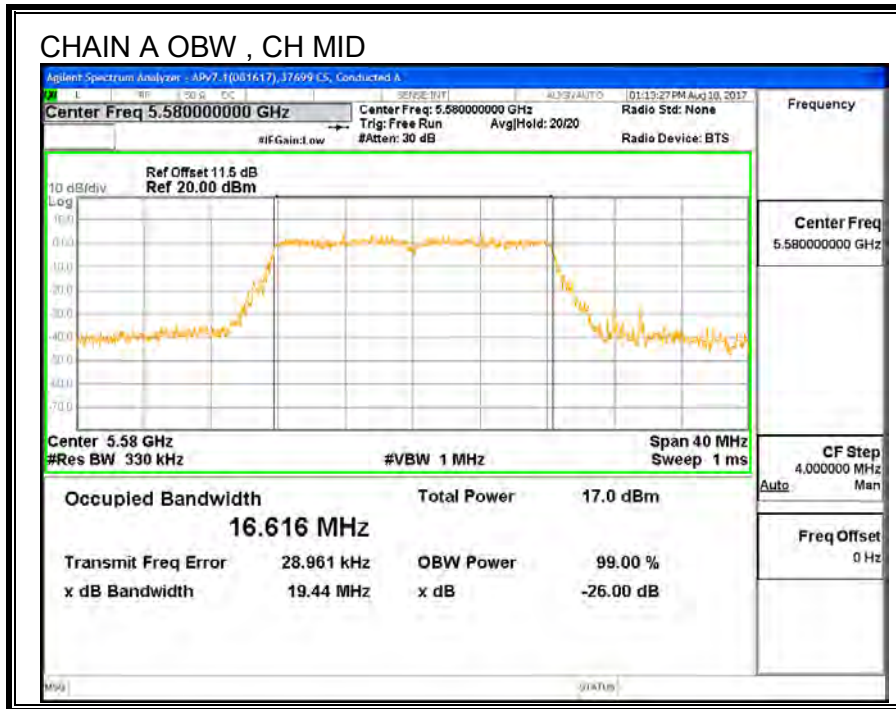
#### LIMITS

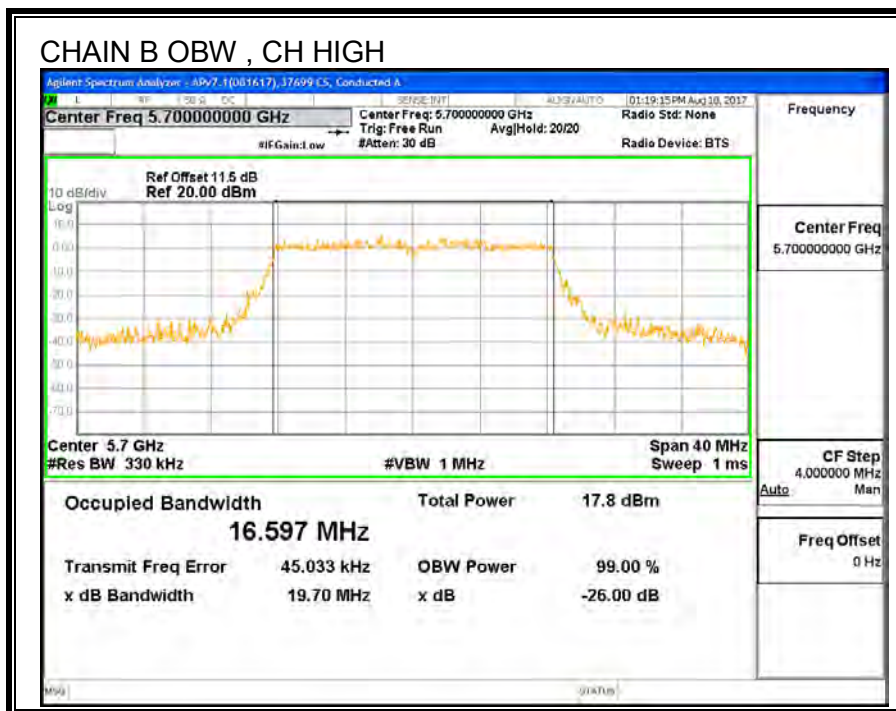
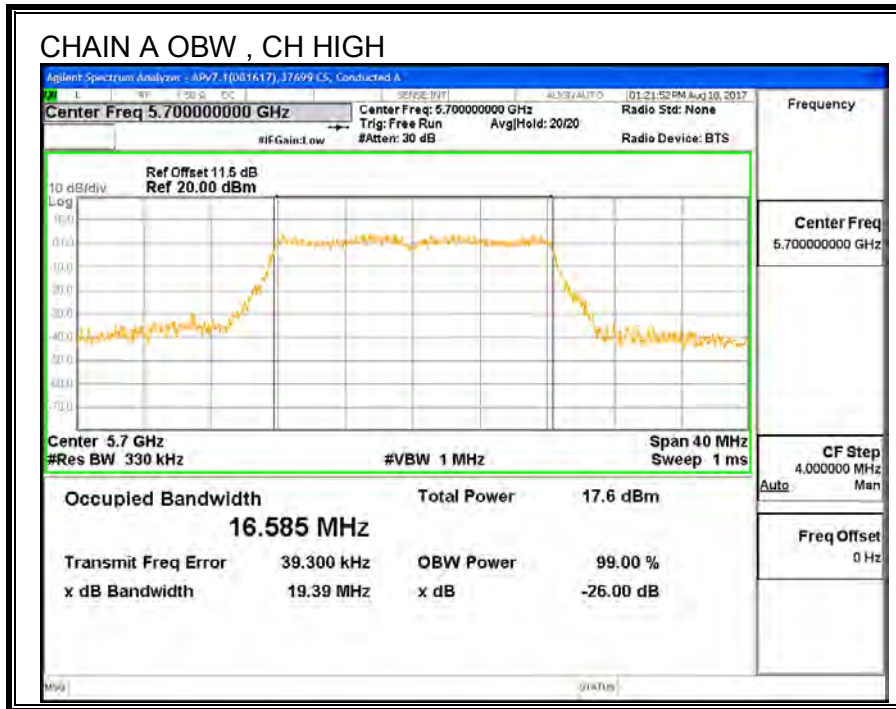
None; for reporting purposes only.

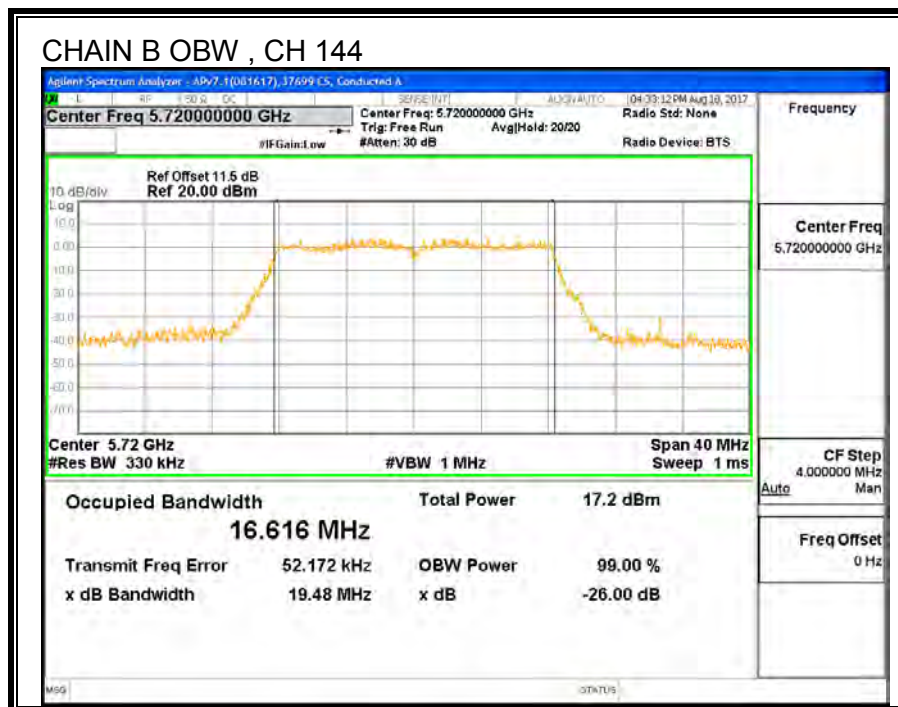
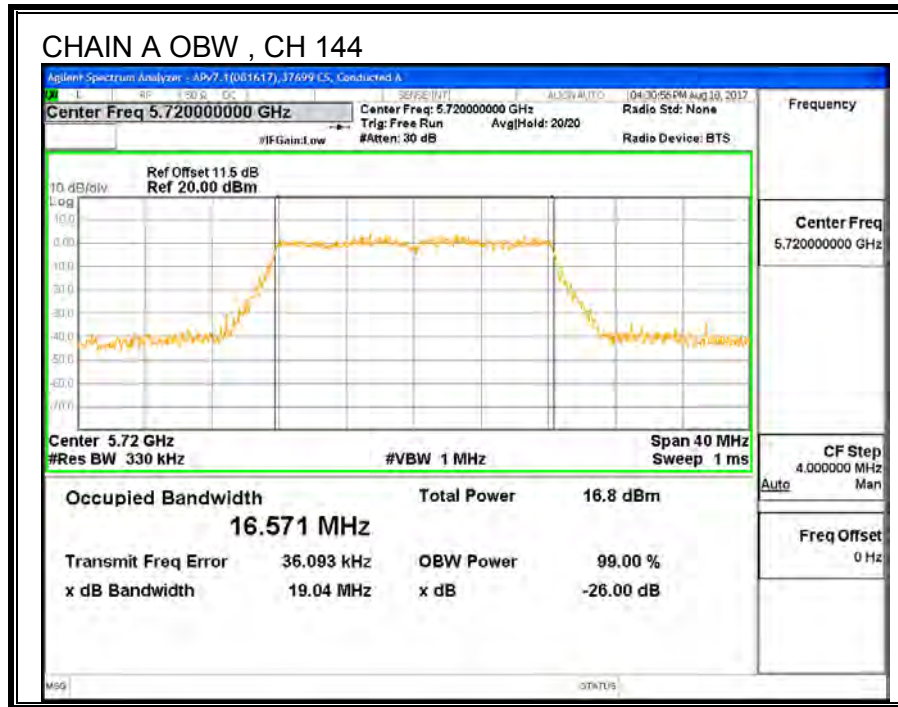
#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5500	16.593	16.680
Mid	5580	16.616	16.584
High	5700	16.585	16.597
144	5720	16.571	16.616









### 9.9.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.47–5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 (6.2.3) (1)

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### TEST PROCEDURE

The measurement methods used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G) and for straddles channels KDB 789033 D02 v01r04, Section E.2.b (Method SA-1) was used.

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
4.89	3.77	4.37	7.36

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5500	19.9	16.59	4.37	7.36
Mid	5580	20.05	16.58	4.37	7.36
High	5700	19.85	16.59	4.37	7.36
144	5720	14.95	13.29	4.37	7.36

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED PSD Limit (dBm)	PPSD Limit (dBm)
Low	5500	23.99	23.20	29.20	23.20	9.64	11.00	9.64
Mid	5580	24.00	23.20	29.20	23.20	9.64	11.00	9.64
High	5700	23.98	23.20	29.20	23.20	9.64	11.00	9.64
144	5720	22.75	22.23	28.23	22.23	9.64	11.00	9.64

**Output Power Results**

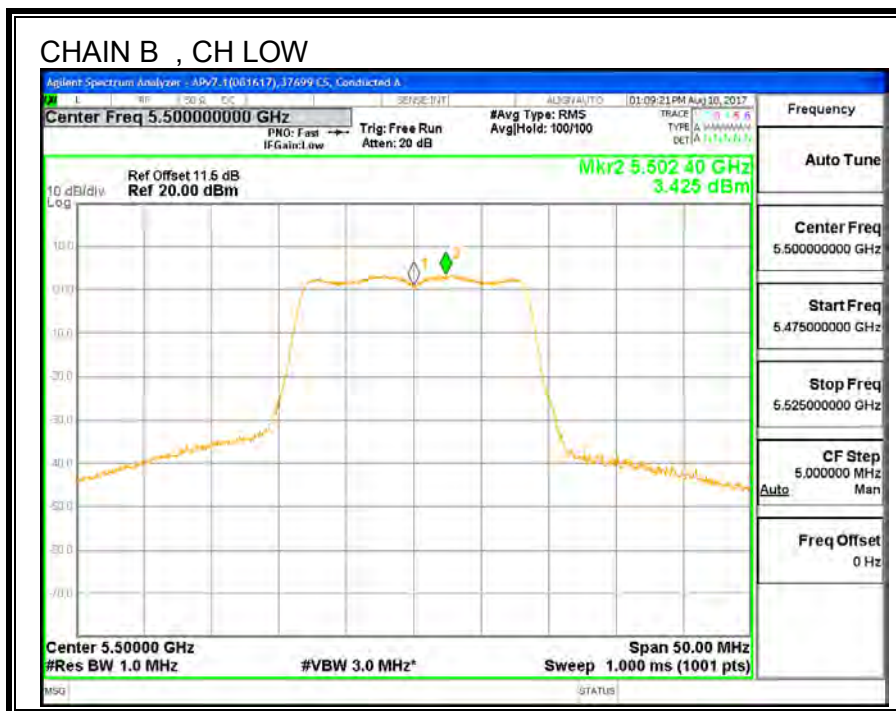
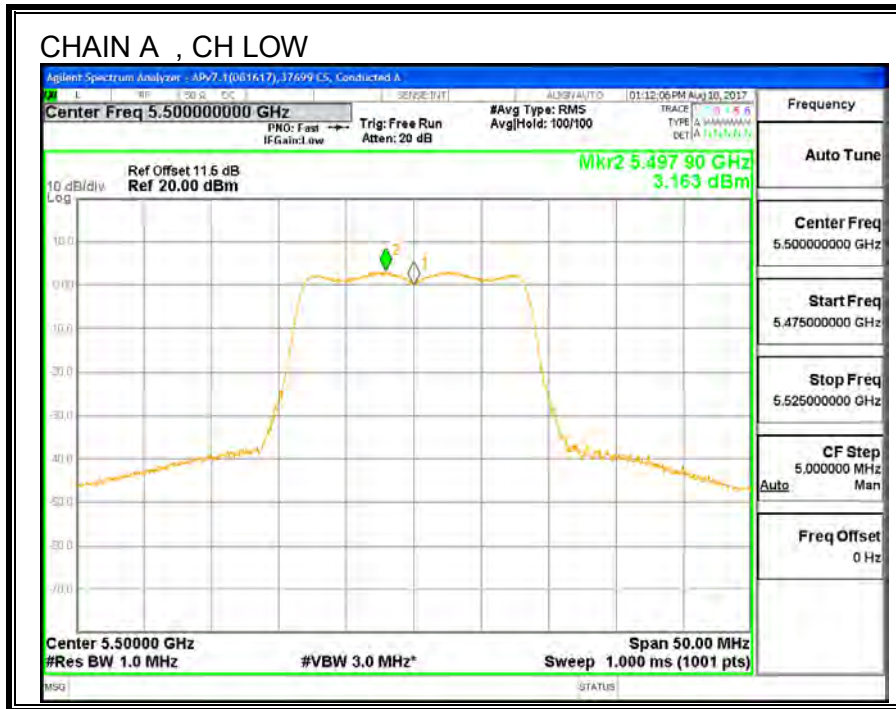
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5500	12.89	13.61	16.28	23.20	-6.92
Mid	5580	12.97	13.41	16.21	23.20	-6.99
High	5700	13.05	13.34	16.21	23.20	-6.99
144	5720	12.90	13.54	16.24	22.23	-5.99

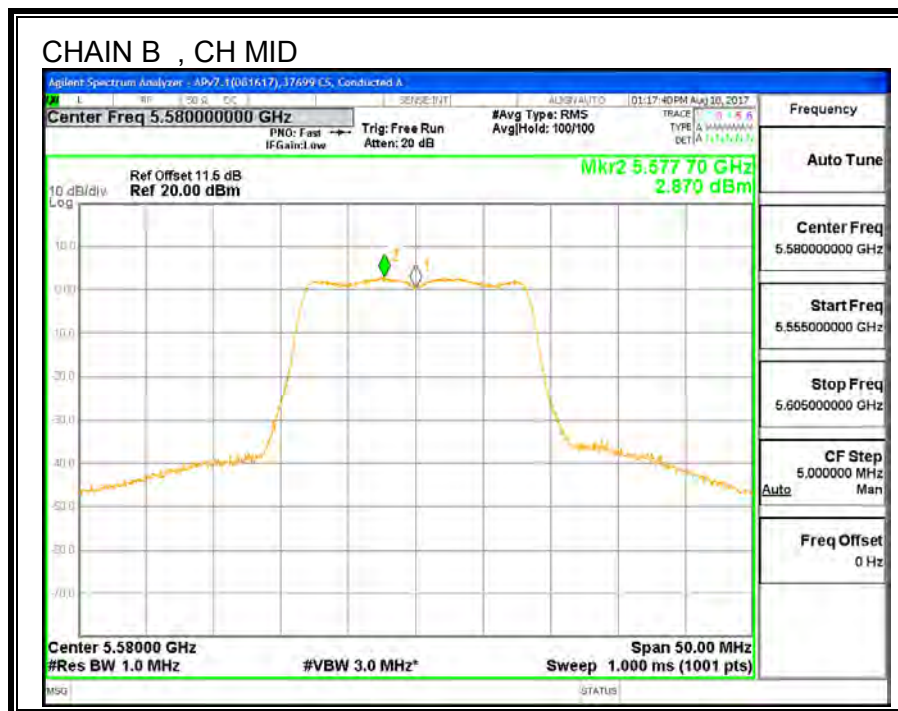
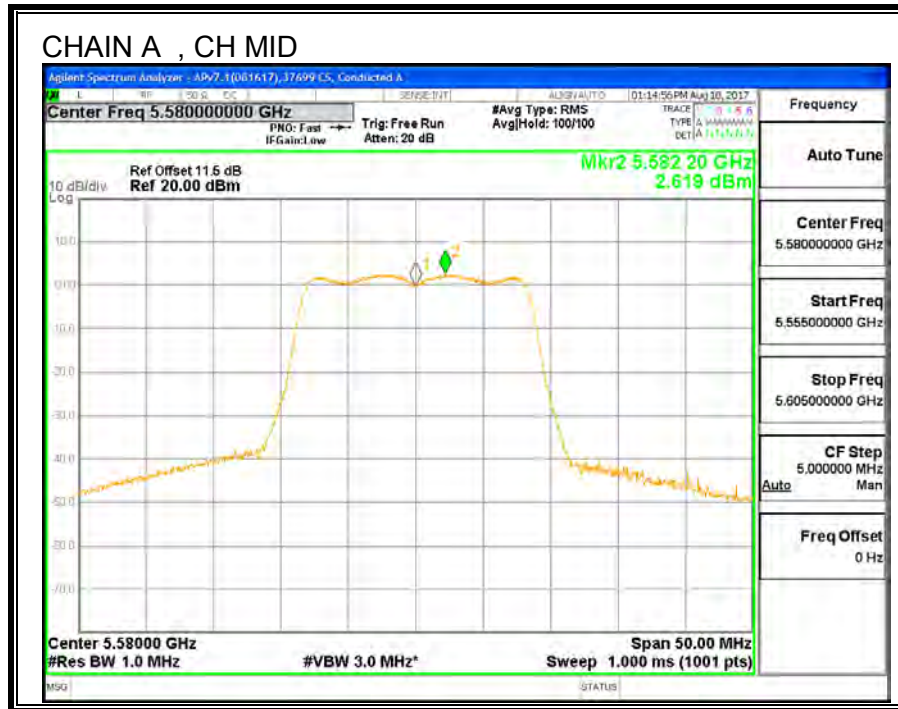
**PPSD Results**

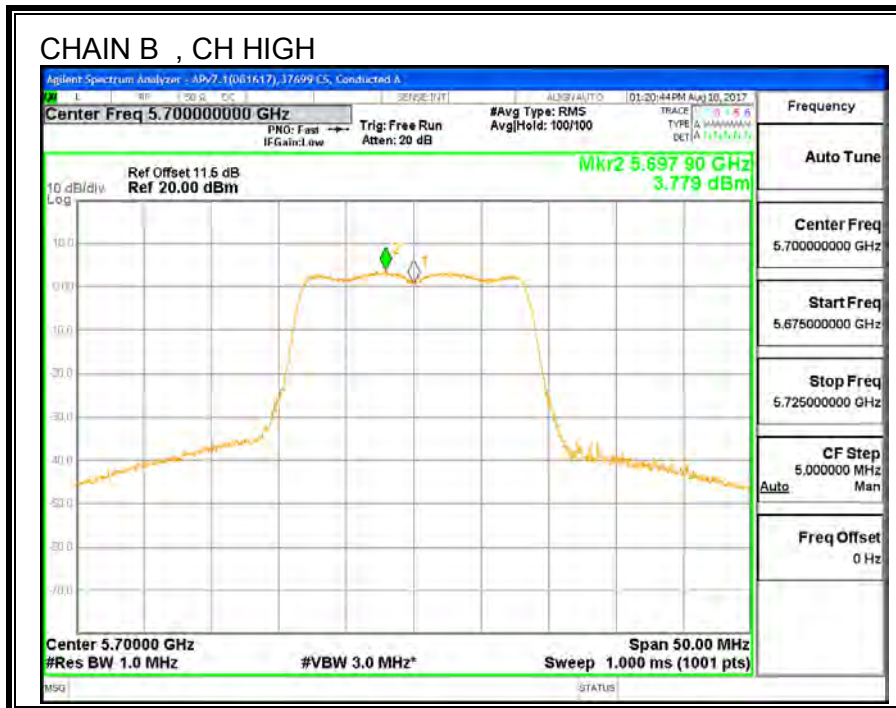
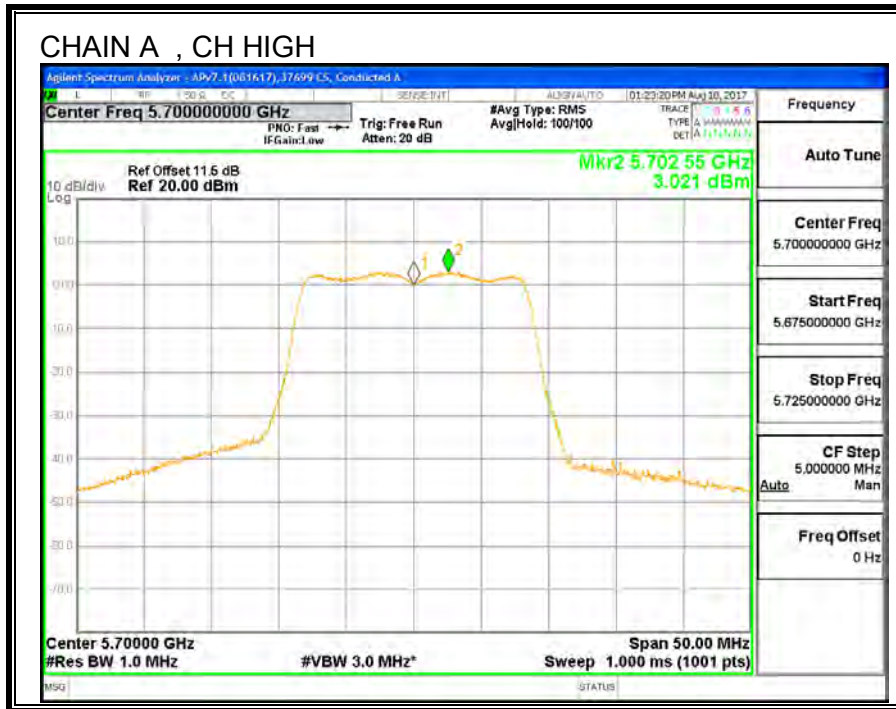
Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5500	3.16	3.43	6.31	9.64	-3.34
Mid	5580	2.62	2.87	5.76	9.64	-3.89
High	5700	3.02	3.78	6.43	9.64	-3.21
144	5720	3.18	3.95	6.59	9.64	-3.05

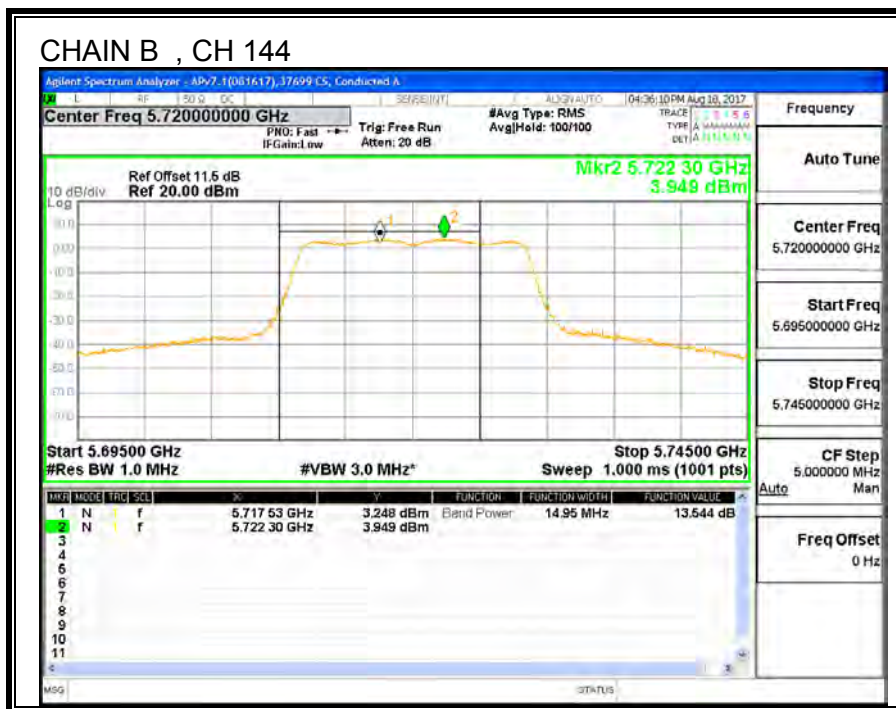
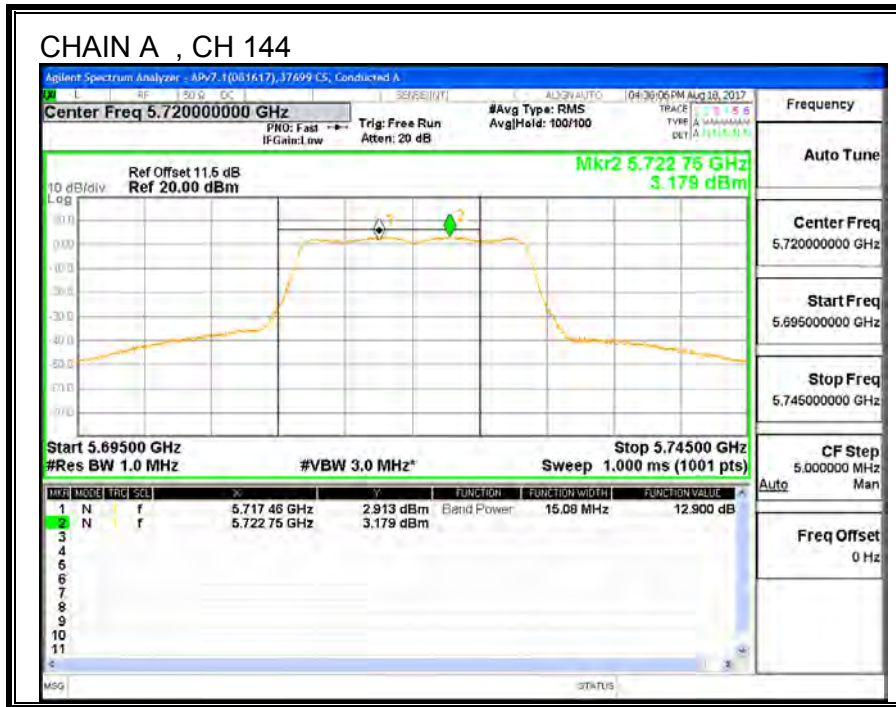












## 9.10. 11n HT20 2TX MODE IN THE 5.6GHz BAND

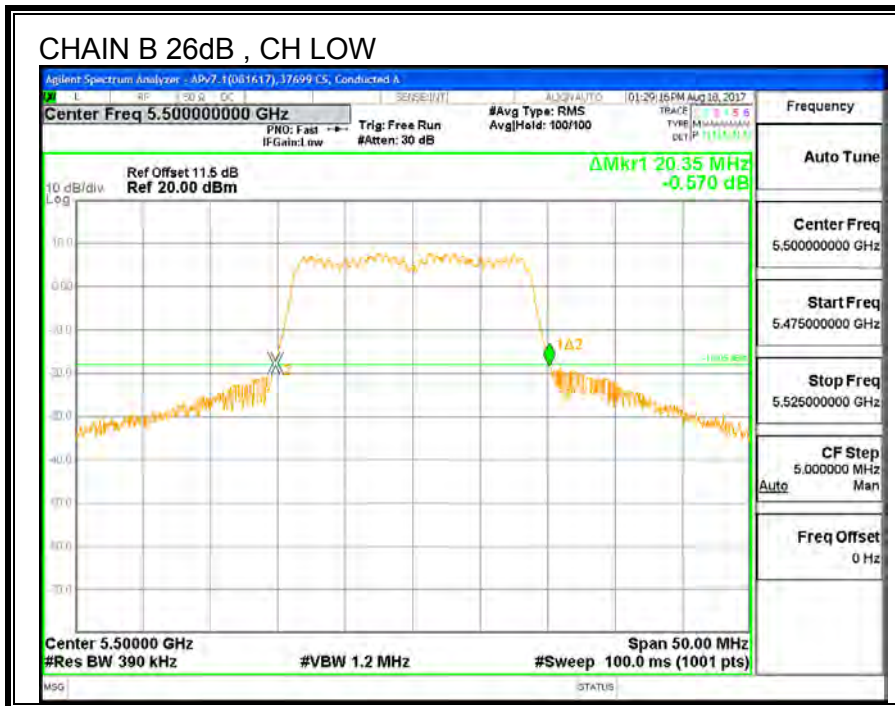
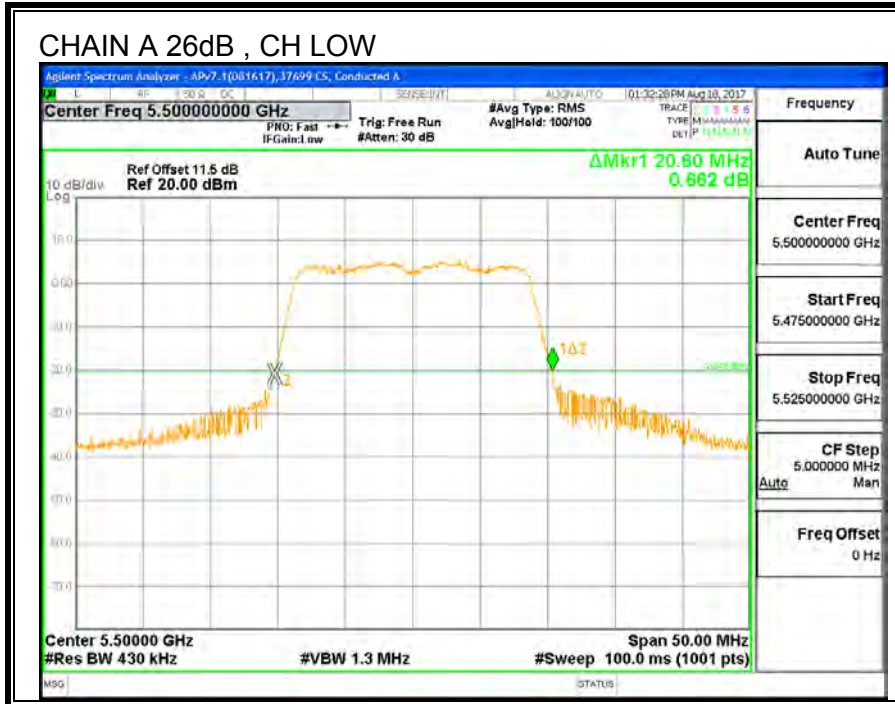
### 9.10.1. 26 dB BANDWIDTH

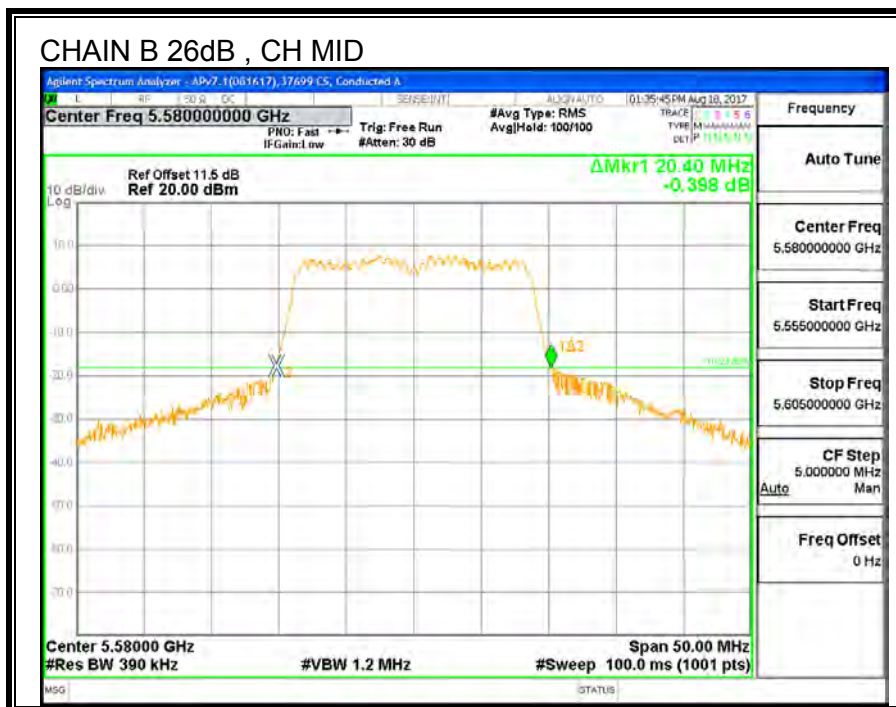
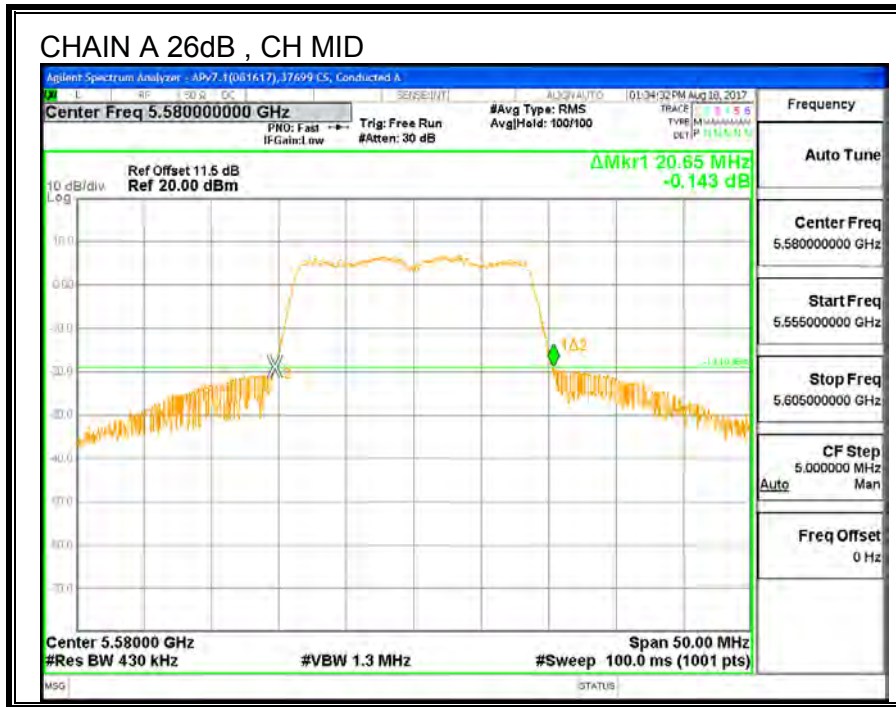
#### LIMITS

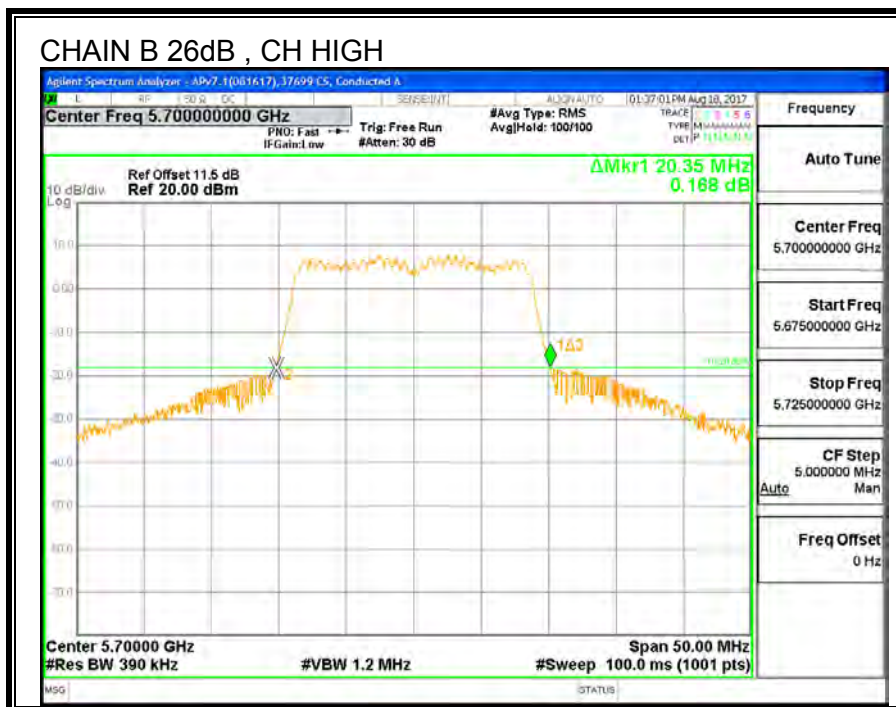
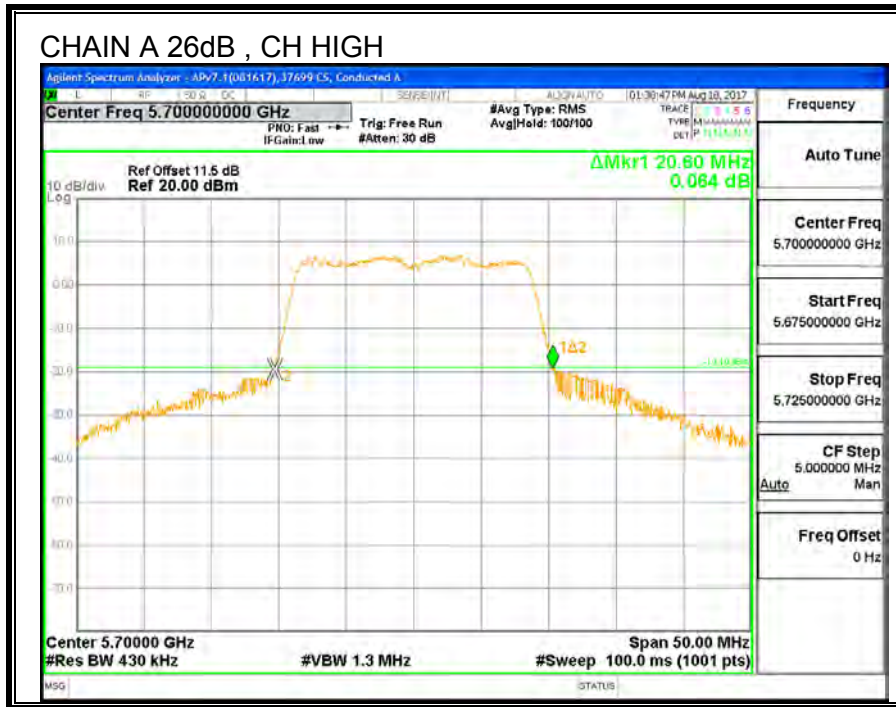
None; for reporting purposes only.

#### RESULTS

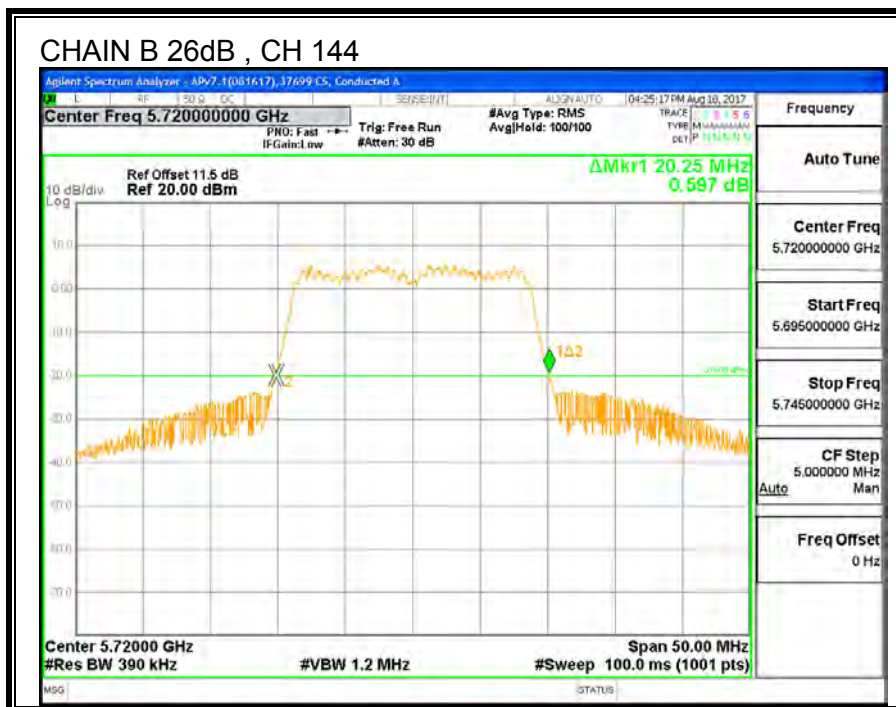
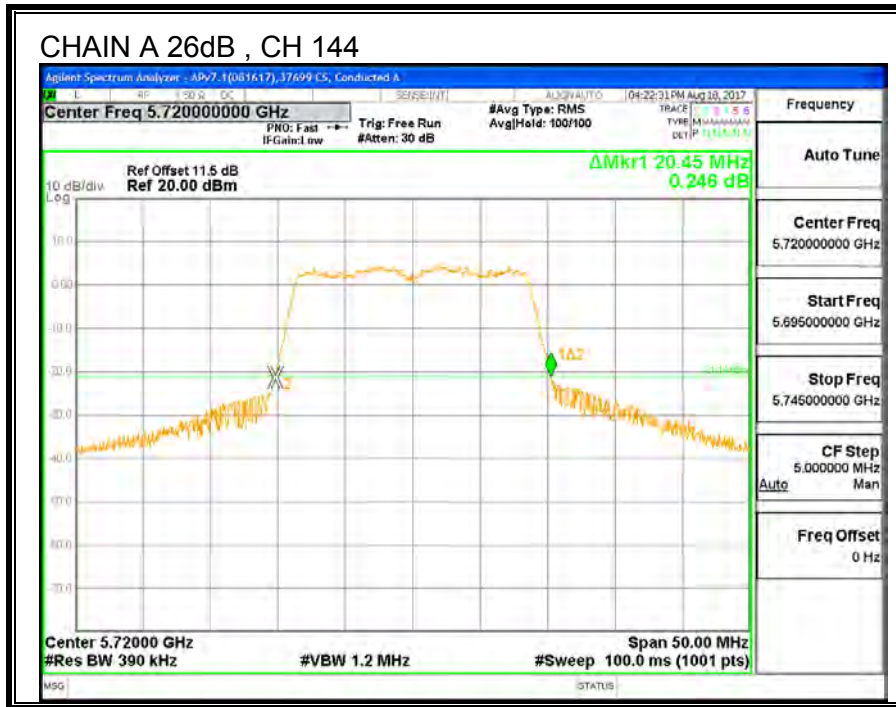
Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5500	20.60	20.35
Mid	5580	20.65	20.40
High	5700	20.60	20.35
144	5720	20.45	20.25











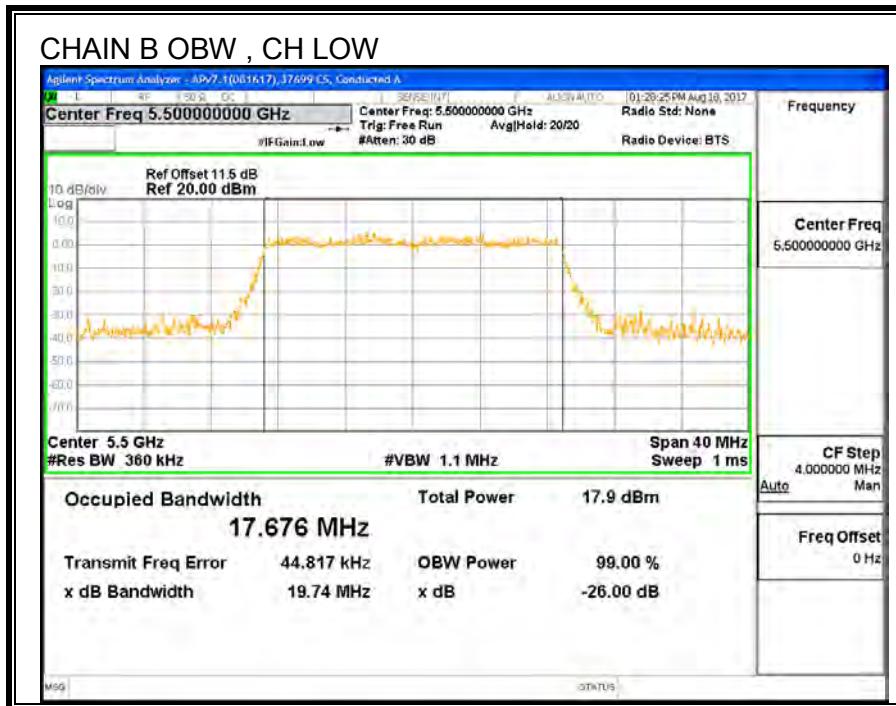
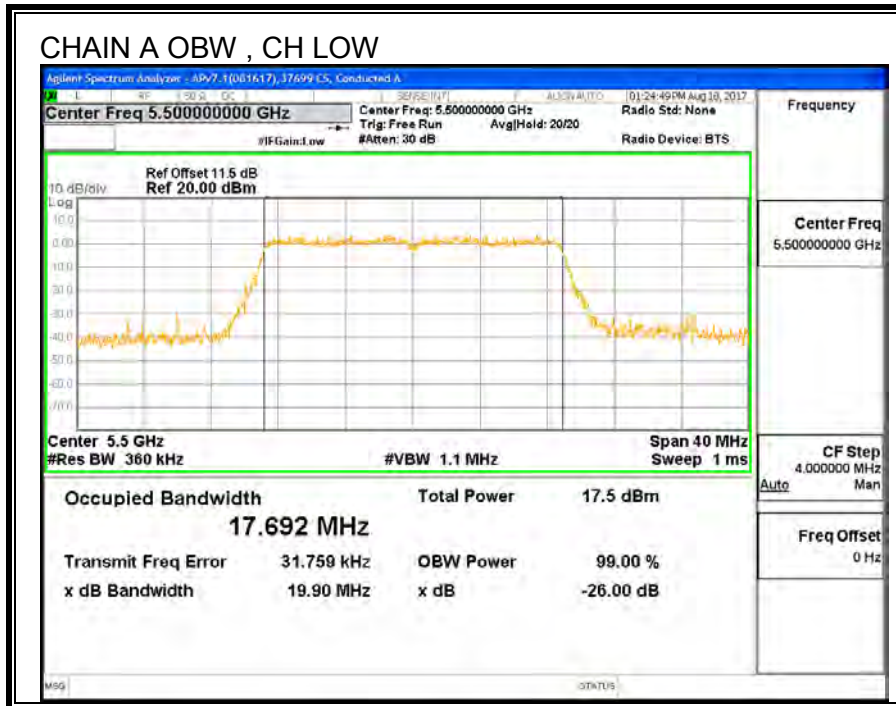
### 9.10.2. 99% BANDWIDTH

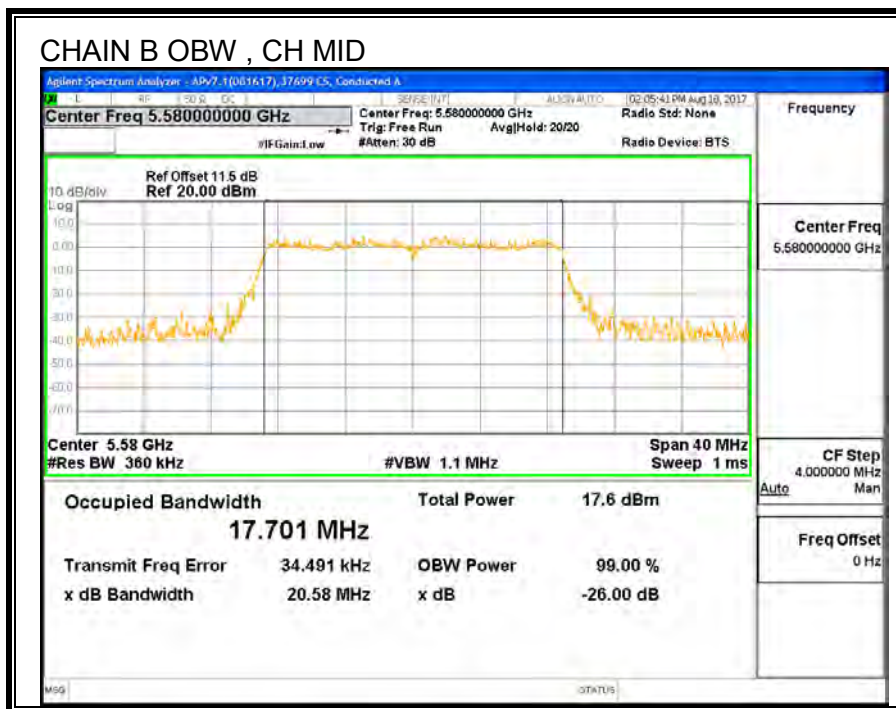
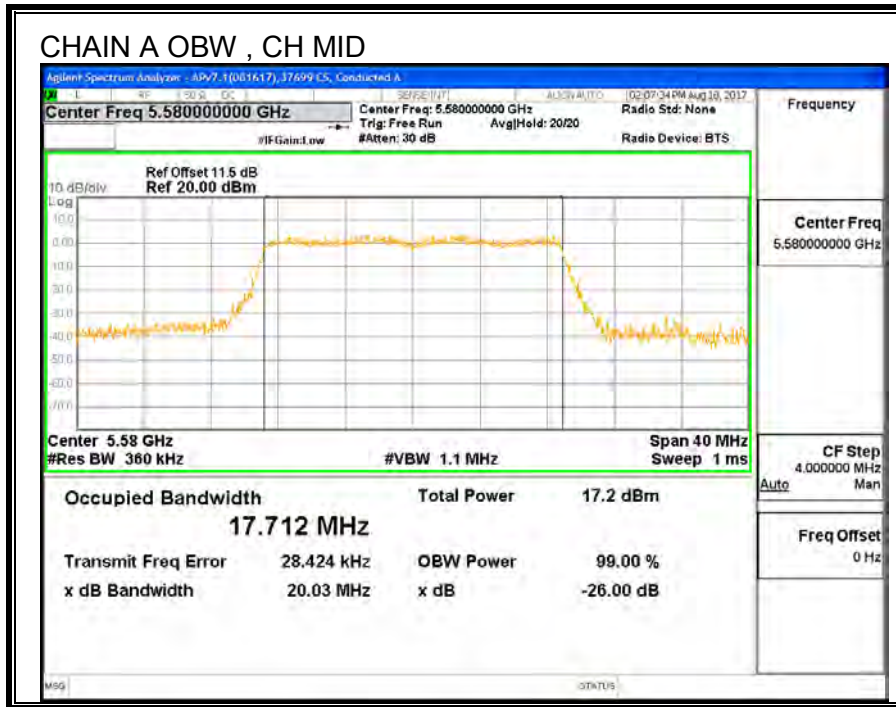
#### LIMITS

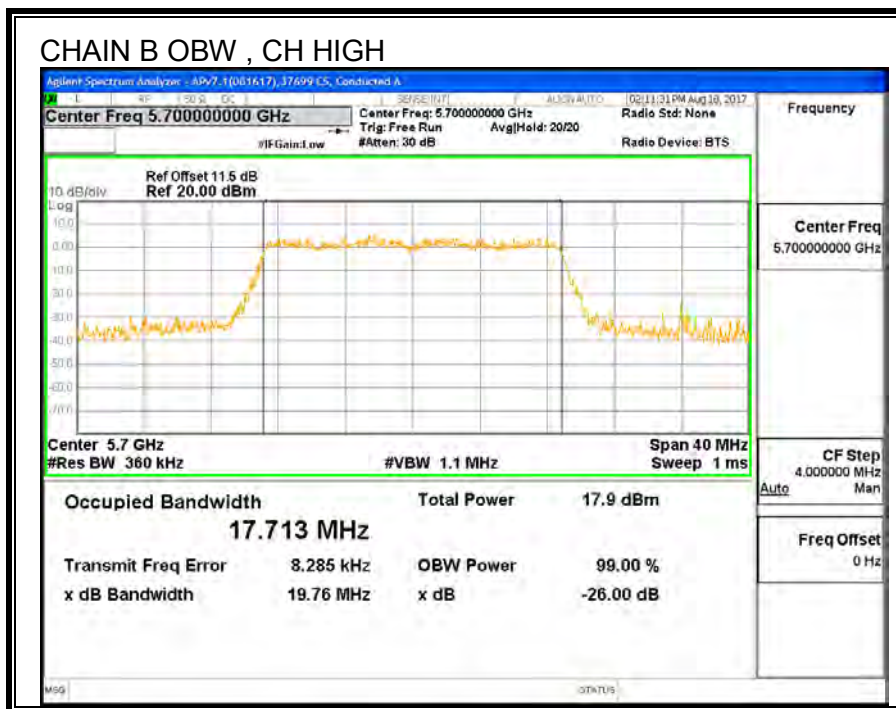
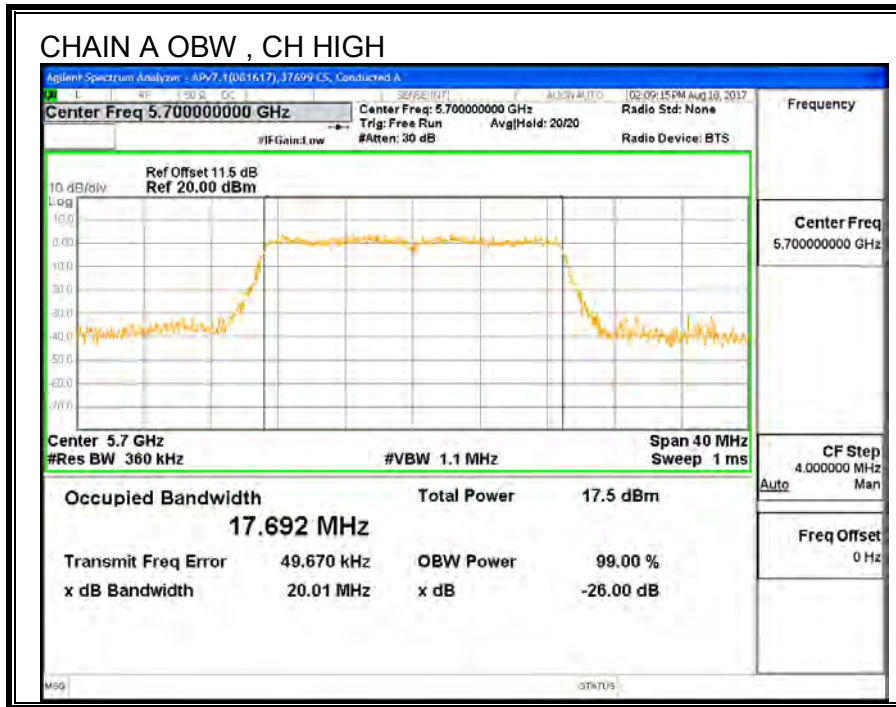
None; for reporting purposes only.

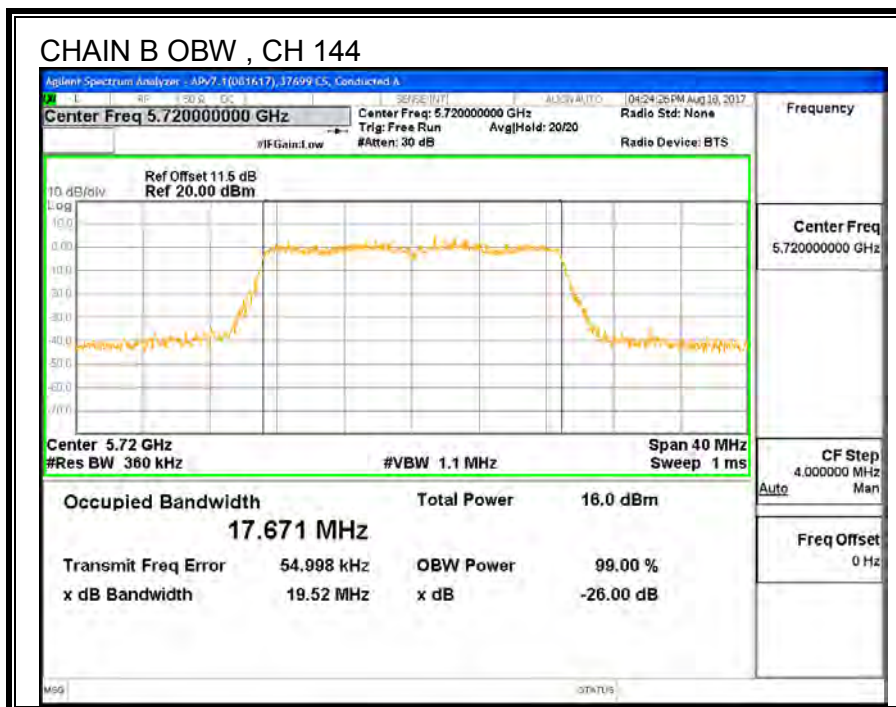
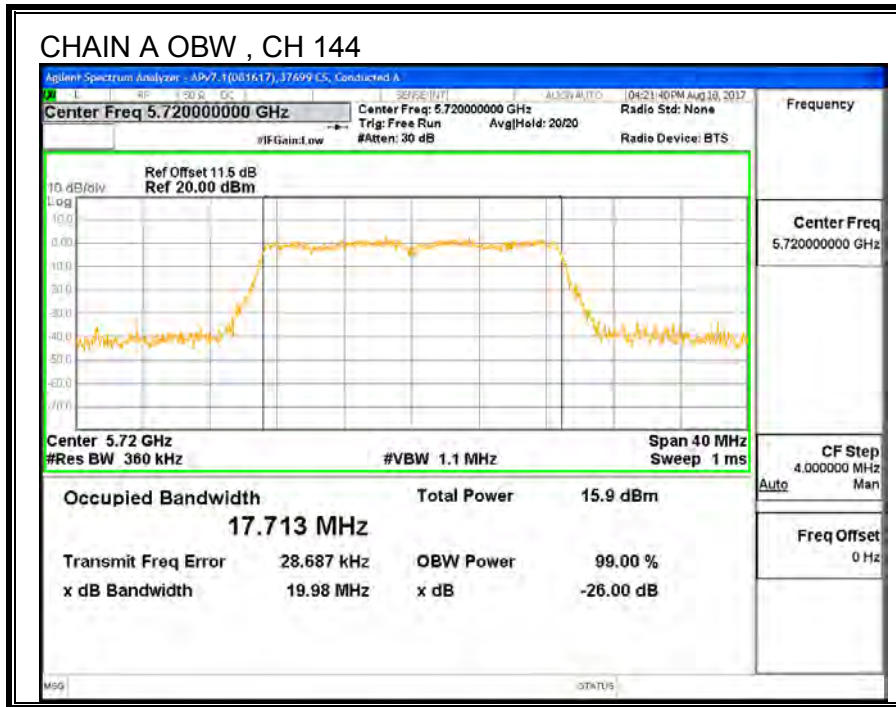
#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5500	17.692	17.676
Mid	5580	17.712	17.701
High	5700	17.692	17.713
144	5720	17.713	17.671









### 9.10.3. OUTPUT POWER AND PPSD

#### LIMITS

FCC §15.407 (a) (2)

For the band 5.47–5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26–dB emission bandwidth in MHz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 (6.2.3) (1)

The maximum conducted output power shall not exceed 250 mW or  $11 + 10 \log_{10} B$ , dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

#### TEST PROCEDURE

The measurement methods used for output power is KDB 789033 D02 v01r04, Section E.3.b (Method PM-G) and for straddles channels KDB 789033 D02 v01r04, Section E.2.b (Method SA-1) was used.

The measurement method used for power spectral density is KDB 789033 D02 v01r04, Section F

#### DIRECTIONAL ANTENNA GAIN

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

Chain A Antenna Gain (dBi)	Chain B Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
4.89	3.77	4.37	7.36

**RESULTS**

<b>ID:</b>	37699 CS	<b>Date:</b>	08/18/2017
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**Bandwidth and Antenna Gain**

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain for Power (dBi)	Directional Gain for PPSD (dBi)
Low	5500	20.35	17.68	4.37	7.36
Mid	5580	20.4	17.70	4.37	7.36
High	5700	20.35	17.69	4.37	7.36
144	5720	15.13	13.84	4.37	7.36

**Limits**

Channel	Frequency (MHz)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	ISED PSD Limit (dBm)	PPSD Limit (dBm)
Low	5500	24.00	23.47	29.47	23.47	9.64	11.00	9.64
Mid	5580	24.00	23.48	29.48	23.48	9.64	11.00	9.64
High	5700	24.00	23.48	29.48	23.48	9.64	11.00	9.64
144	5720	22.80	22.41	28.41	22.41	9.64	11.00	9.64

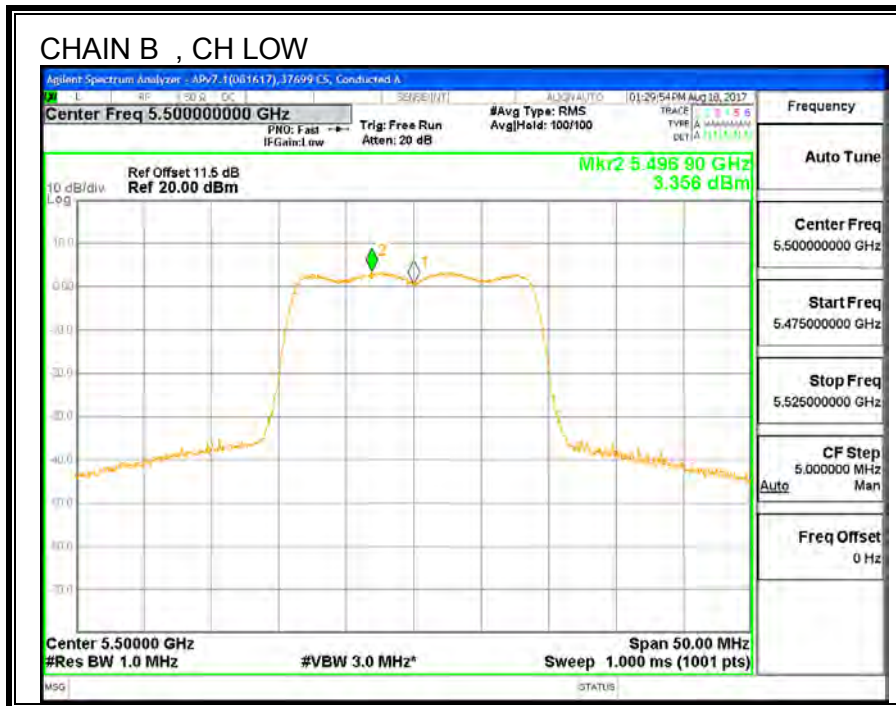
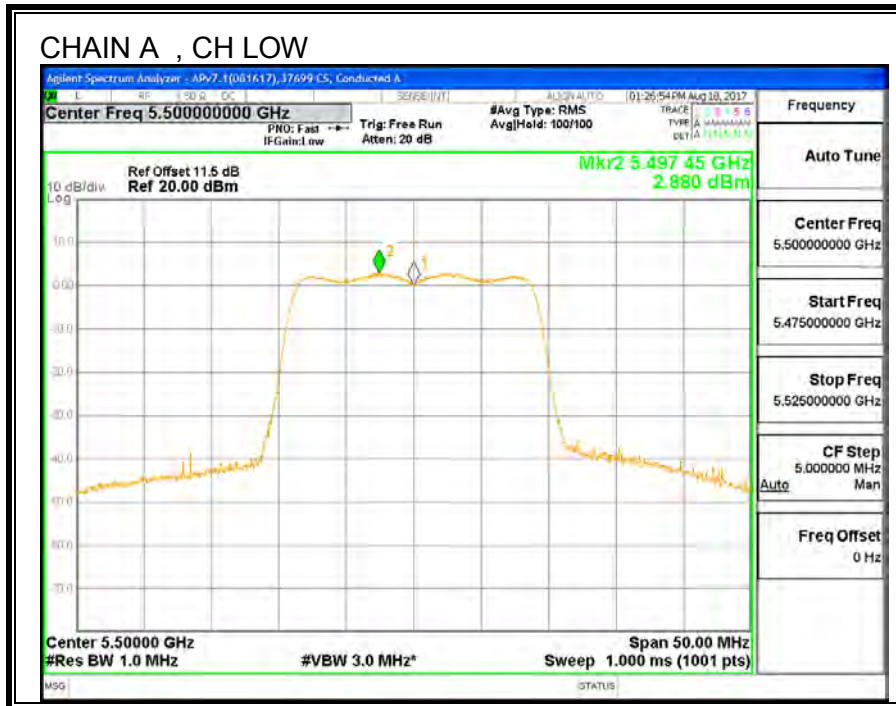
**Output Power Results**

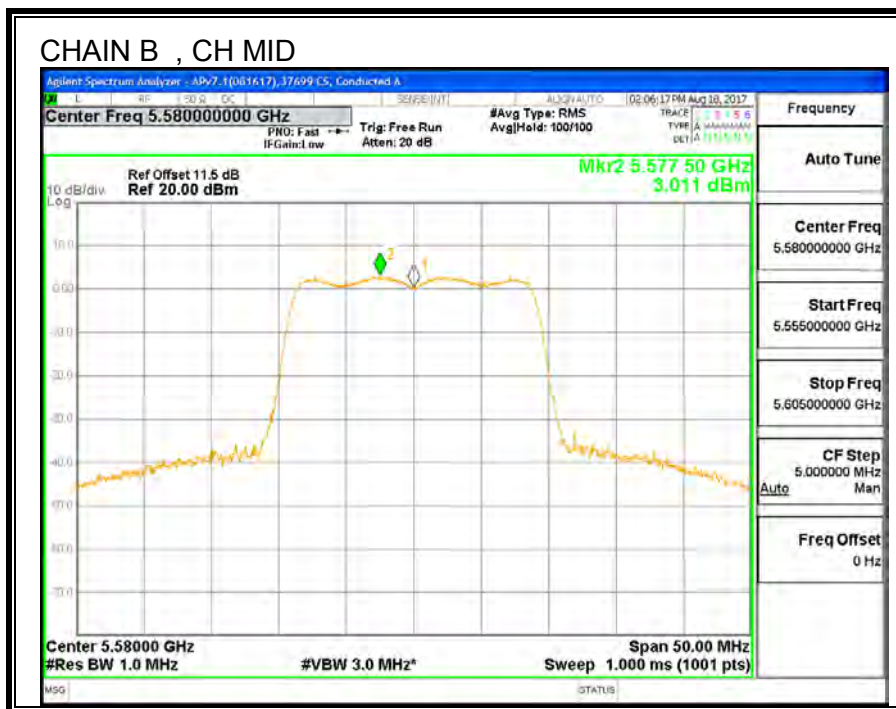
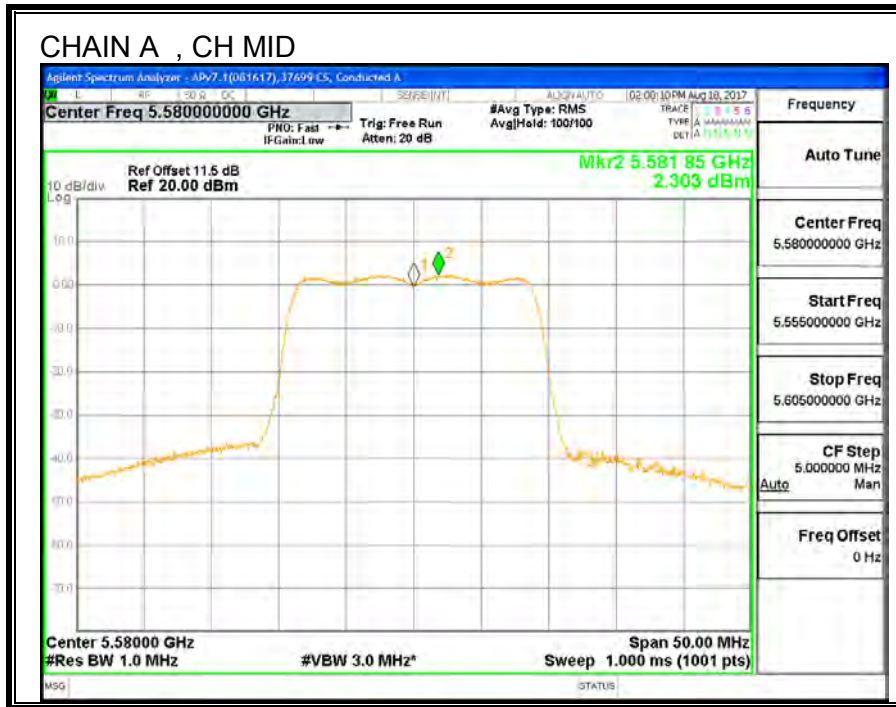
Channel	Frequency (MHz)	Chain A Meas Power (dBm)	Chain B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5500	12.97	13.44	16.22	23.47	-7.25
Mid	5580	12.98	13.55	16.28	23.48	-7.20
High	5700	12.78	13.31	16.06	23.48	-7.41
144	5720	12.99	13.44	16.23	22.41	-6.18

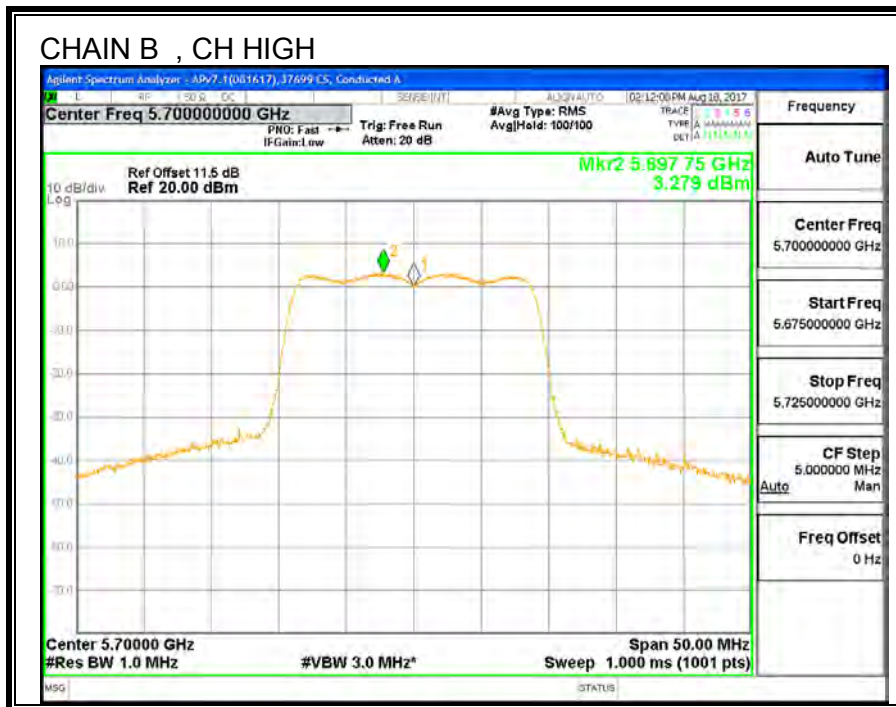
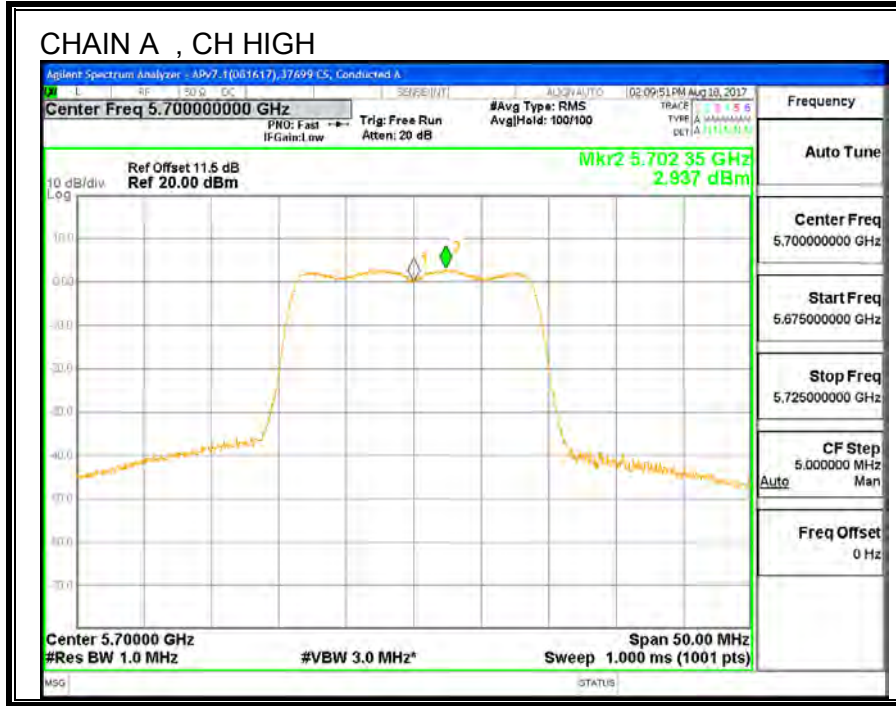
**PPSD Results**

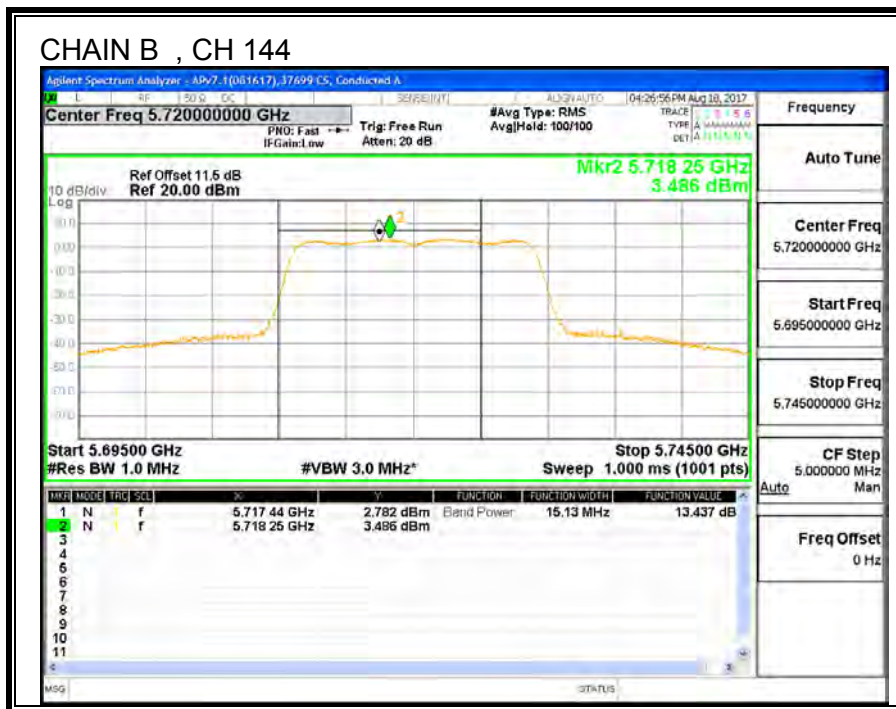
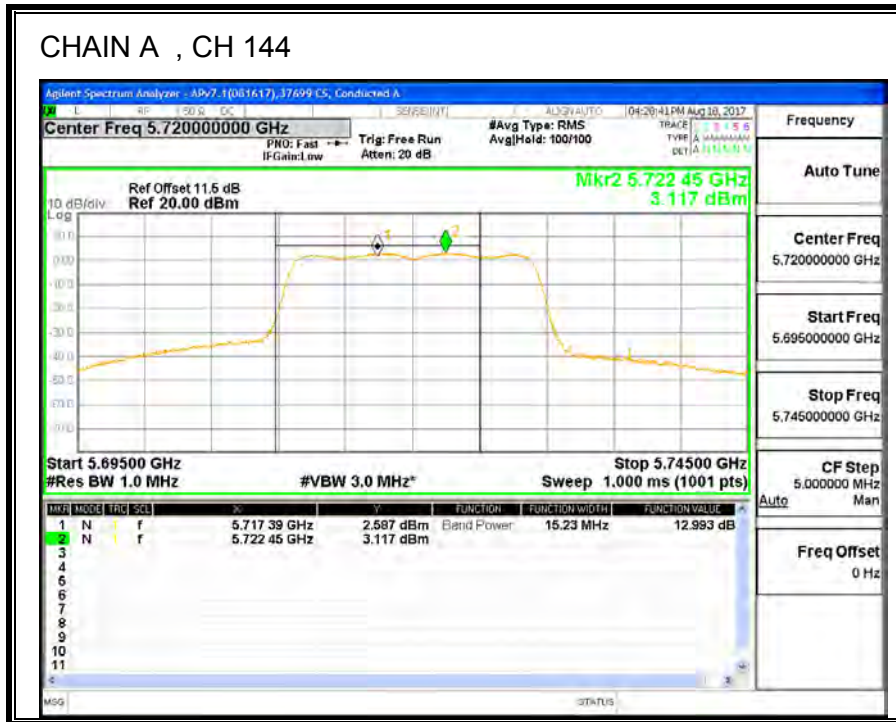
Channel	Frequency (MHz)	Chain A Meas PPSD (dBm)	Chain B Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5500	2.88	3.36	6.13	9.64	-3.51
Mid	5580	2.30	3.01	5.68	9.64	-3.96
High	5700	2.94	3.28	6.12	9.64	-3.52
144	5720	3.12	3.49	6.32	9.64	-3.33











## 9.11. 11n HT40 2TX MODE IN THE 5.6GHz BAND

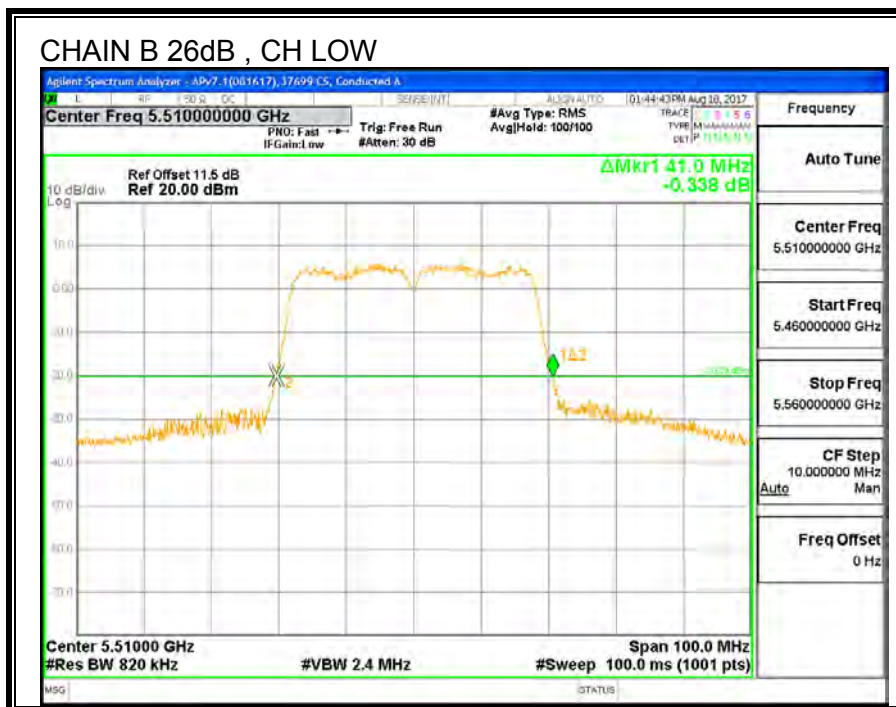
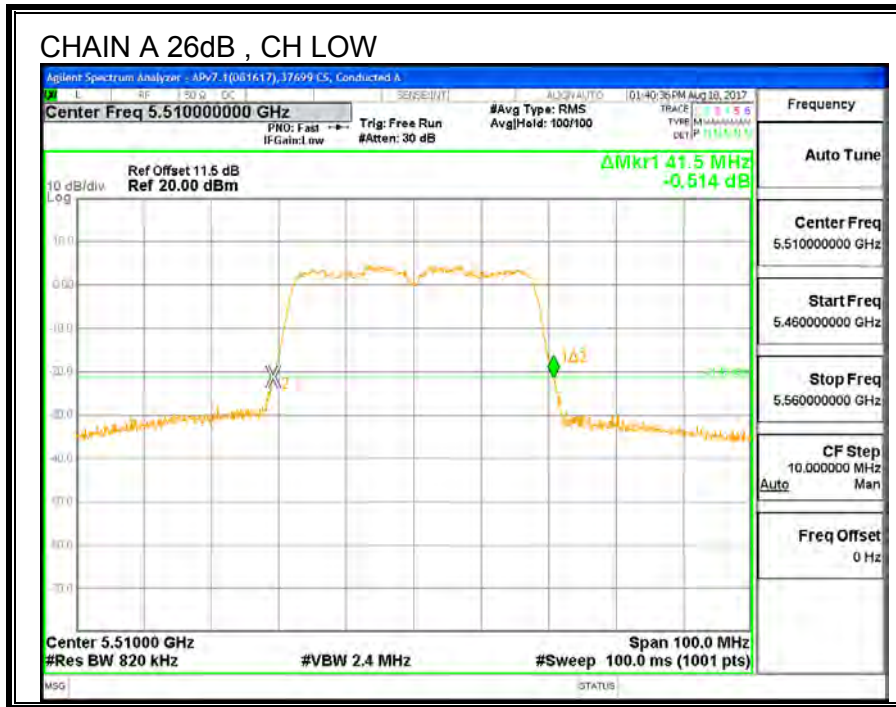
### 9.11.1. 26 dB BANDWIDTH

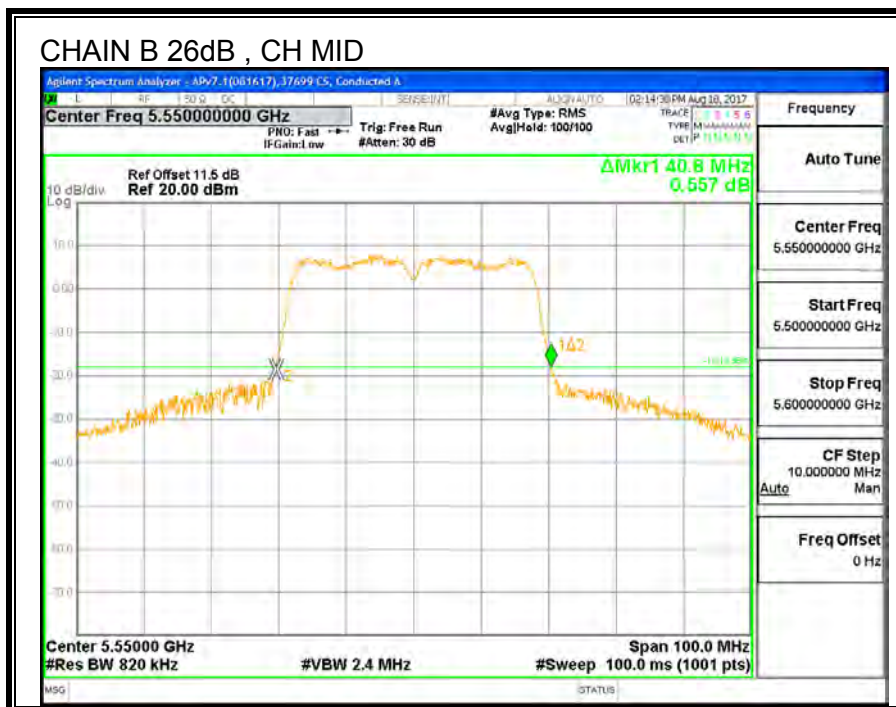
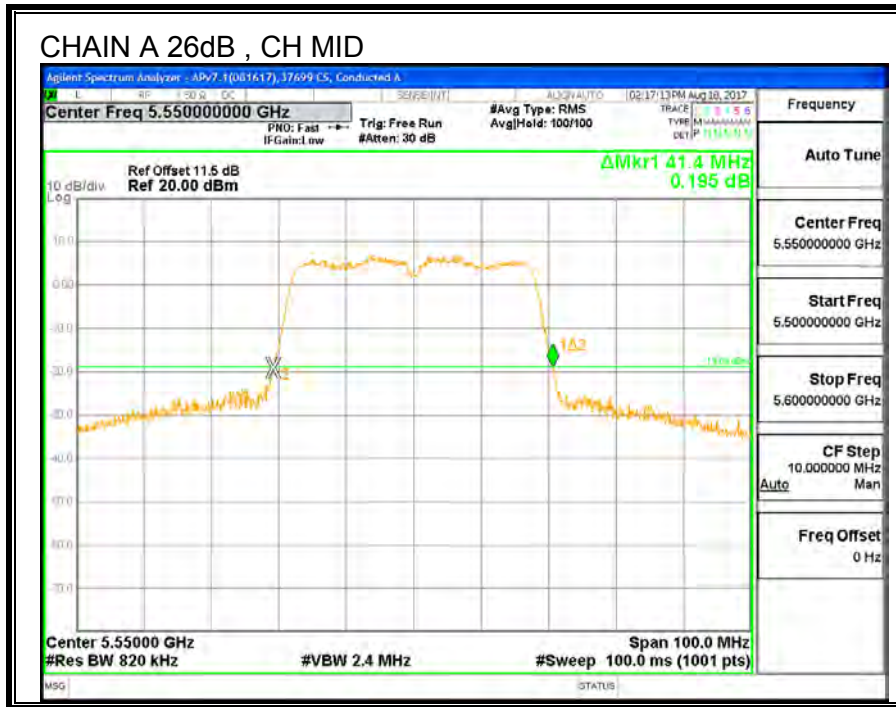
#### LIMITS

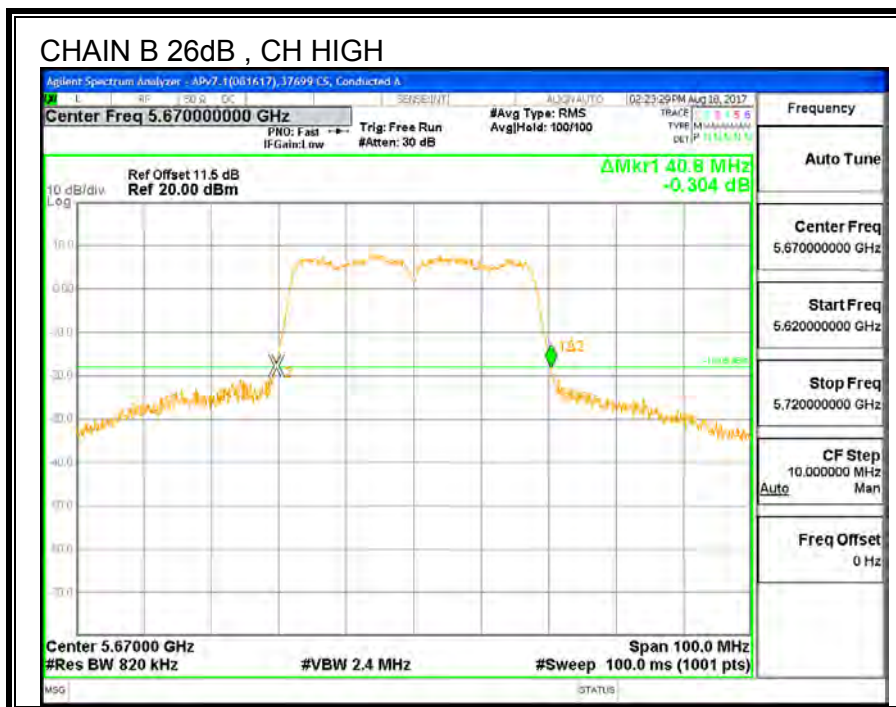
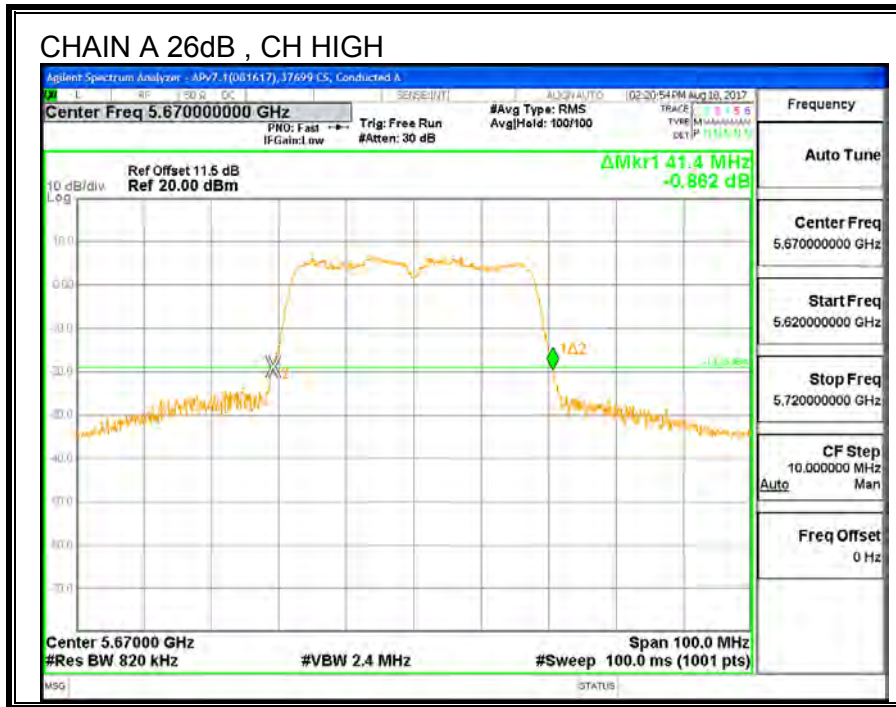
None; for reporting purposes only.

#### RESULTS

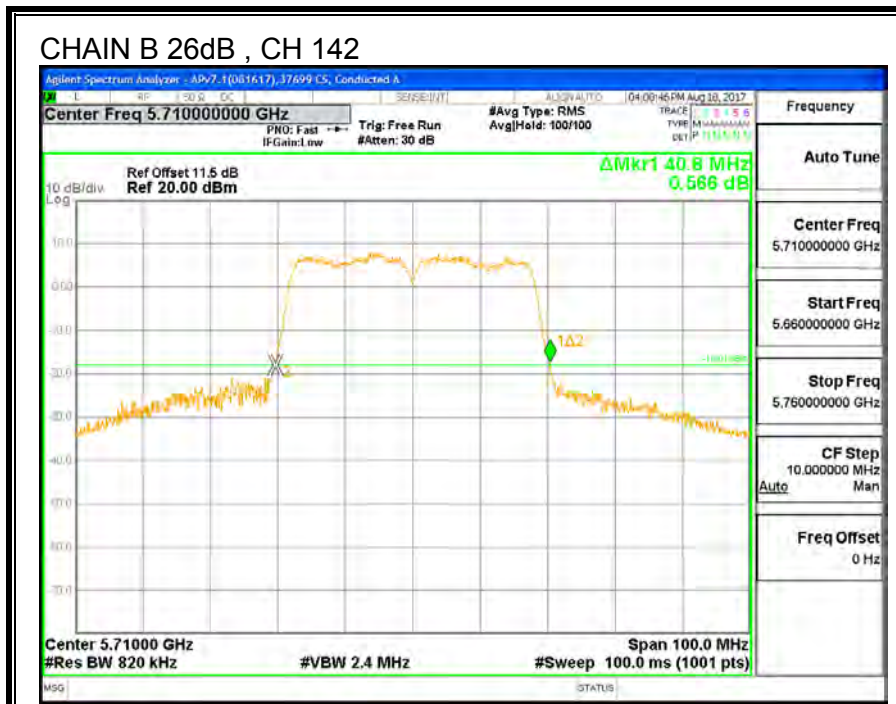
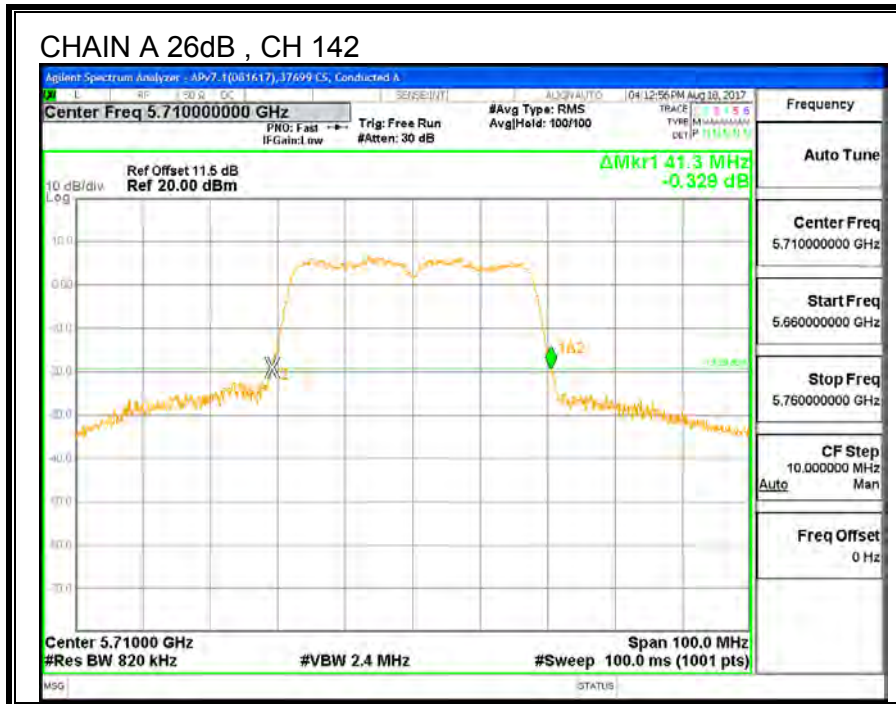
Channel	Frequency	26 dB BW CHAIN A (MHz)	26 dB BW CHAIN B (MHz)
Low	5510	41.5	41.0
Mid	5550	41.4	40.8
High	5670	41.4	40.8
142	5710	41.3	40.8











### 9.11.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency	99% BW CHAIN A (MHz)	99% BW CHAIN B (MHz)
Low	5510	36.264	36.209
Mid	5550	36.175	36.242
High	5670	36.247	36.240
142	5710	36.199	36.227

