



**FCC 47 CFR PART 15 SUBPART E**

**CERTIFICATION TEST REPORT  
CLASS II PERMISSIVE CHANGE**

**FOR**

**TABLET WITH CELLULAR GSM/GPRS/EGPRS/WCDMA/HSPA+/DC- HSDPA/LTE IEEE  
802.11A/B/G/N (MIMO 2X2) AND BLUETOOTH RADIO**

**MODEL NUMBER: A1476**

**FCC ID: BCGA1476**

**REPORT NUMBER: 15U21850-E19V2**

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	11/16/2015	Initial Issue	M. Mekuria
V2	12/02/2015	Revised report to address TCB's questions	T. Chu

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## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** TABLET WITH CELLULAR GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE/IEEE 802.11A/B/G/N (MIMO 2X2) AND BLUETOOTH RADIO

**MODEL:** A1476

**SERIAL NUMBER:** DLXLJ0BFFR6R (Conducted); DLXLP027FVJ0 (Radiated)

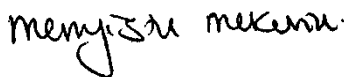
**DATE TESTED:** NOVEMBER 09 -13, 2015

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.

Approved & Released For  
UL Verification Services Inc. By:



MENGISTU MEKURIA  
SENIOR ENGINEER  
UL VERIFICATION SERVICES INC.

Tested By:



ERIC YU  
EMC LAB ENGINEER  
UL VERIFICATION SERVICES INC.

## 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 v01, 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 type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input checked="" type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input checked="" 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 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:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

Tablet with cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA, LTE/IEEE 802.11a/b/g/n (MIMO 2x2) and Bluetooth radio.

### 5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

Upgrade EUT to 5.8GHz band new rule per FCC KDB 789033 D02 v01.

### 5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

#### 5.8GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a 1TX	16.00	39.81
5745 - 5825	802.11n HT20 SISO	Covered by 802.11a	
5745 - 5825	802.11a 2TX CDD	Covered by 802.11n HT20 CDD 2TX	
5745 - 5825	802.11n HT20 CDD 2TX	18.89	77.45
5745 - 5825	802.11n HT20 STBC/SDM 2TX	Covered by 802.11n HT20 CDD 2TX	
5755 - 5795	802.11n HT40 1TX	15.95	39.36
5755 - 5795	802.11n HT40 CDD 2TX	18.85	76.74
5755 - 5795	802.11n HT40 STBC/SDM 2TX	Covered by 802.11n HT40 CDD 2TX	



#### 5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain	
	Chain 0	Chain 1
5.8	4.21	3.92

#### 5.5. SOFTWARE AND FIRMWARE

The test utility software used during testing was Broadcom WL Tool Version 6.25.86.

#### 5.6. WORST-CASE CONFIGURATION AND MODE

There are two vendors of the WiFi/Bluetooth radio modules: BOM #1, vender1 and BOM #2, vender 2, and they have the same mechanical outline, same on board antenna, matching circuit, antenna structure and same specification and baseline was performed on both vendors to determine the worst case.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation for 5GHz; therefore, all final radiated testing was performed with the EUT in Z orientation for 5GHz.

Worst-Case data rates, as provided by the client, were as follows:

802.11a mode: 6 Mbps  
802.11n HT20mode: MCS0  
802.11n HT40mode: MCS0

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was including headset, AC charger and the mode and channel with the highest output power.

For all modes with single chain, chain 0 was selected per the software provided by the client. Based on the client a preliminary investigation was performed on the two chains and chain 0 was found to be worst-case.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	N/A
Laptop	Lenovo	7659	L3-AL664 08/03	N/A
Earphone	Apple	N/A	N/A	N/A
EUT AC/CD adapter	Apple	A1385	D293062F3WVDHLHCF	N/A

### 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
None Used						

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

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	3	N/A

**I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER)**

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	3	N/A

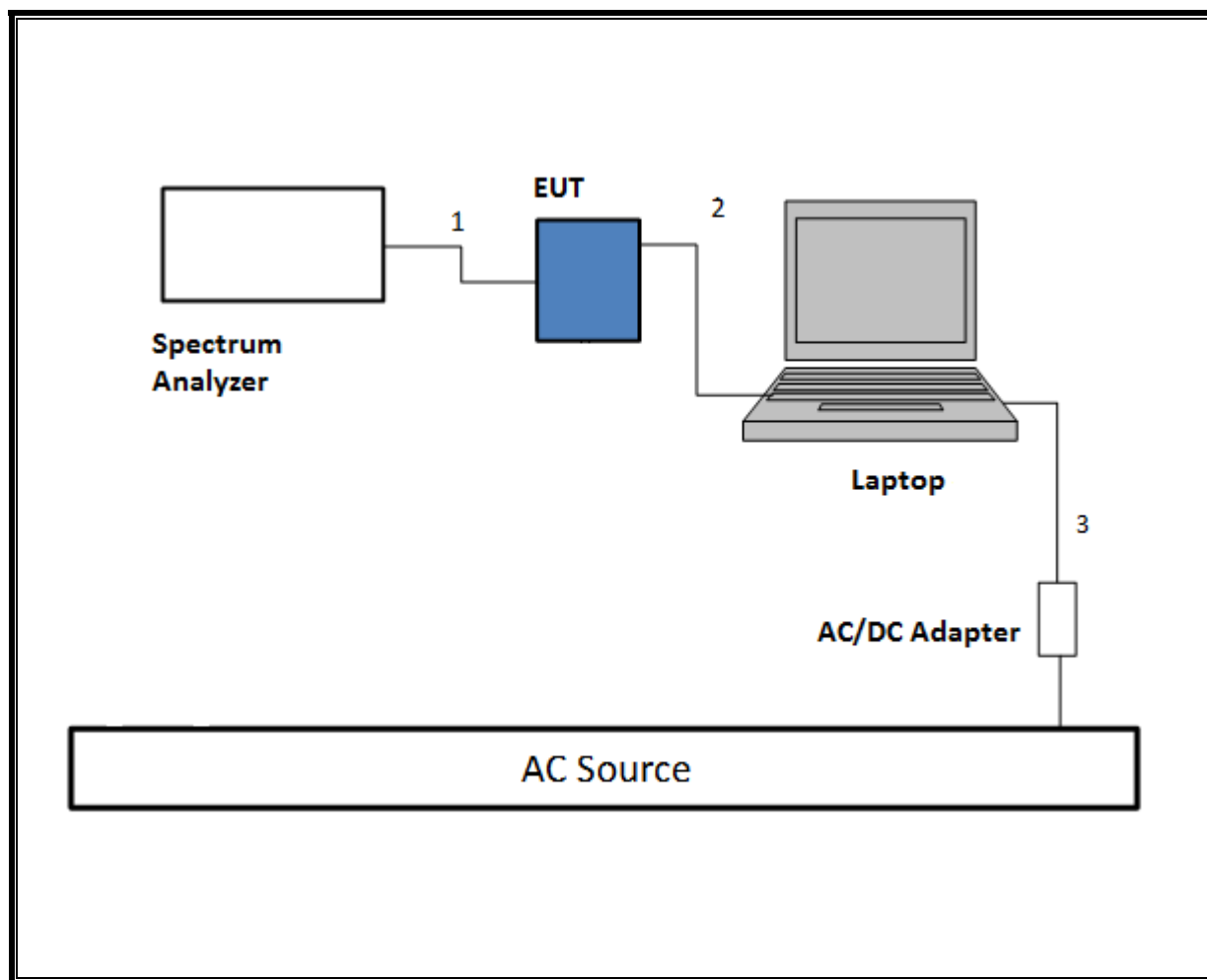
**I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)**

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	3	N/A

### **TEST SETUP - CONDUCTED TESTS**

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

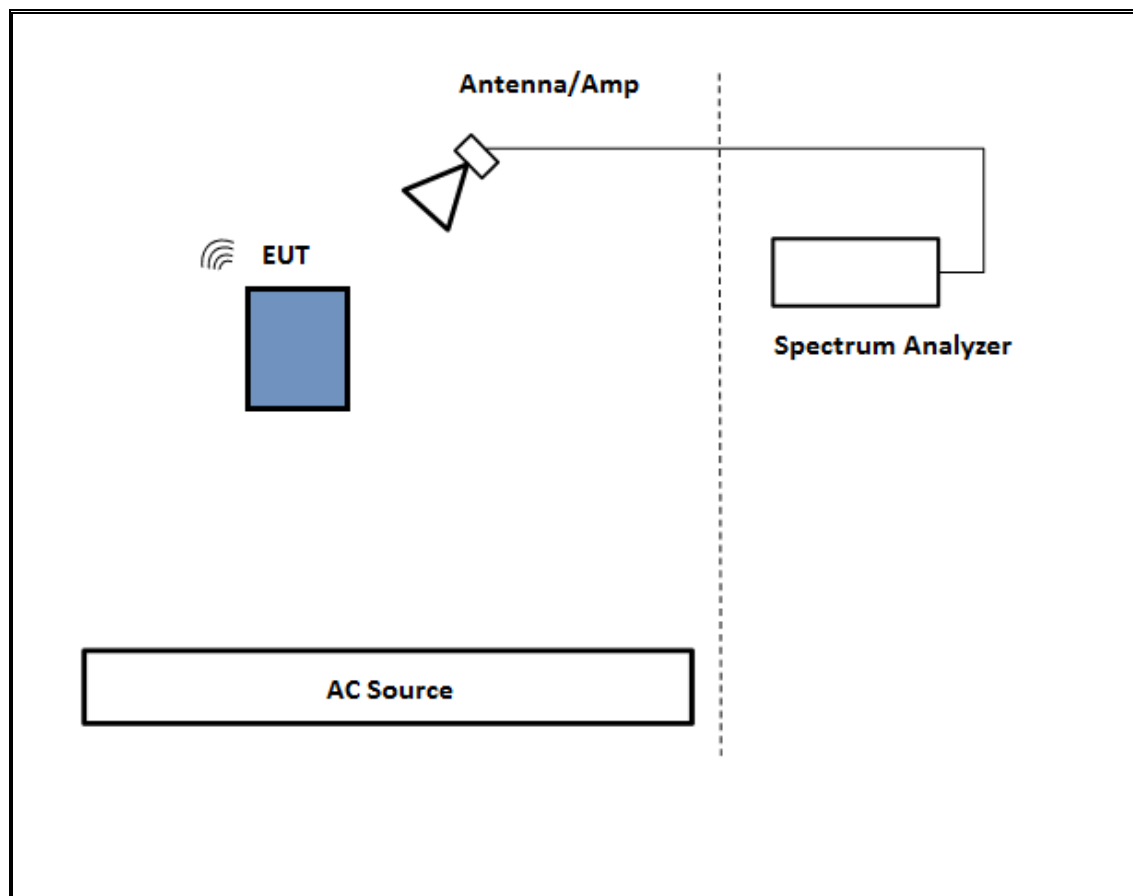
### **SETUP DIAGRAM**



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

The EUT was tested battery powered. Test software exercised the EUT.

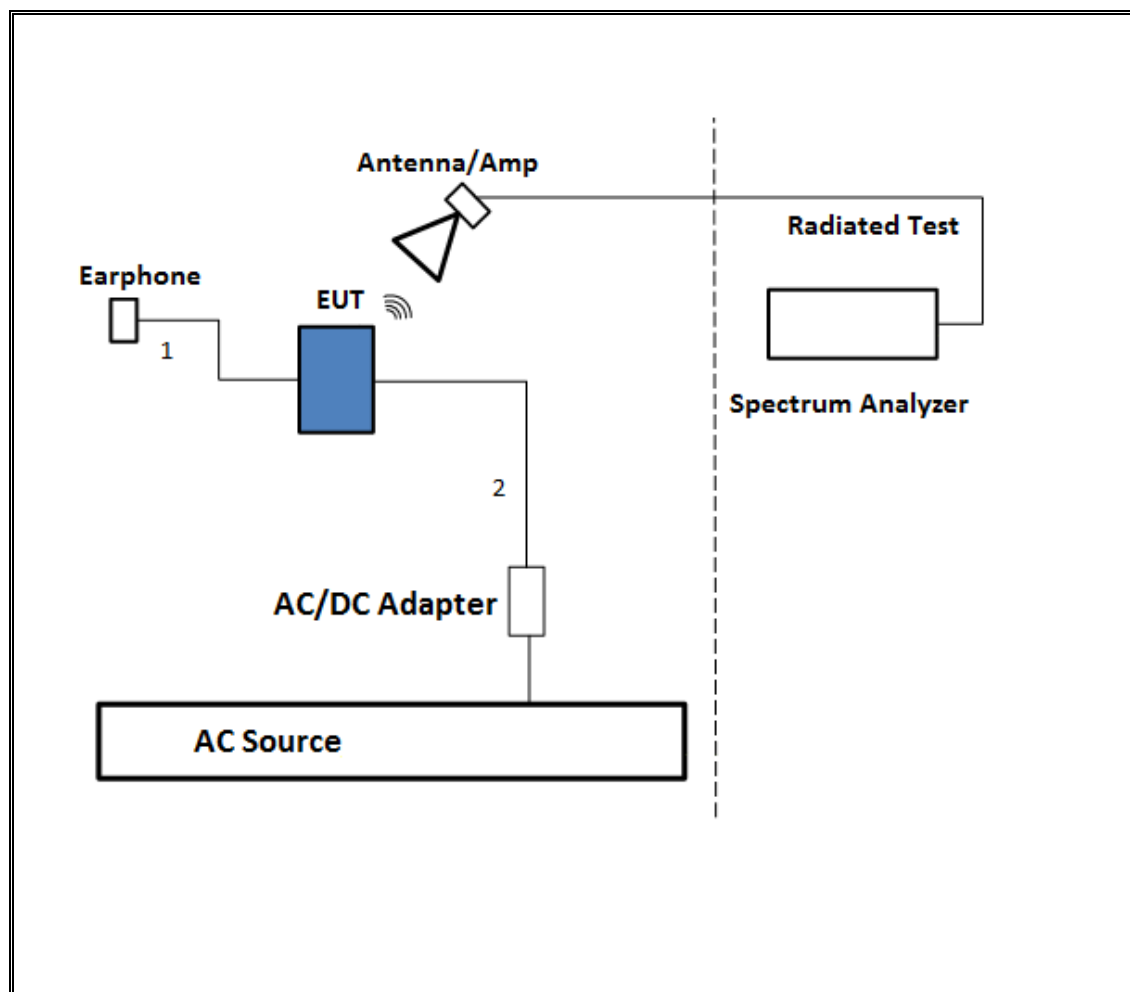
**SETUP DIAGRAM**



### TEST SETUP- BELOW 1GHz

The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

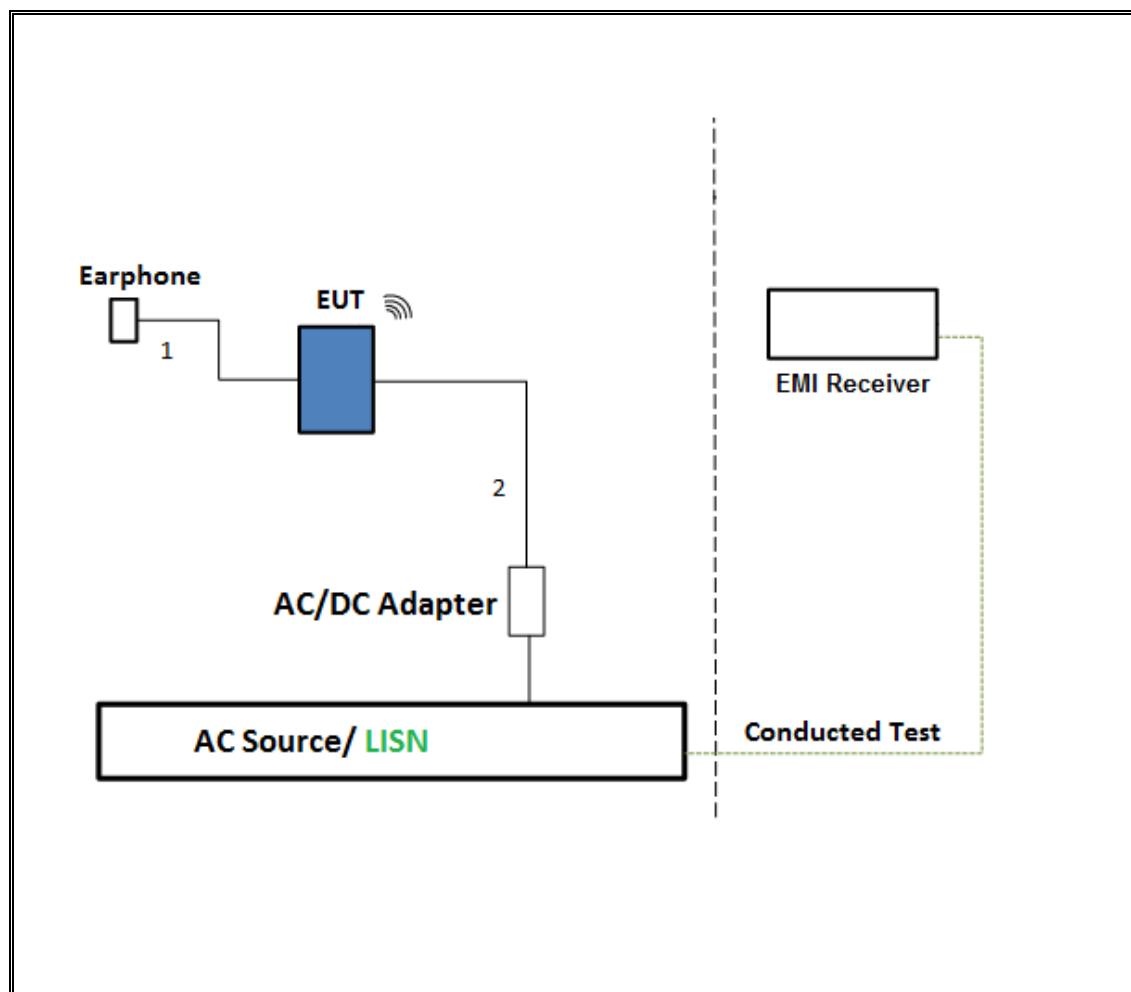
### SETUP DIAGRAM



**TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER**

The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. Test software exercised the EUT.

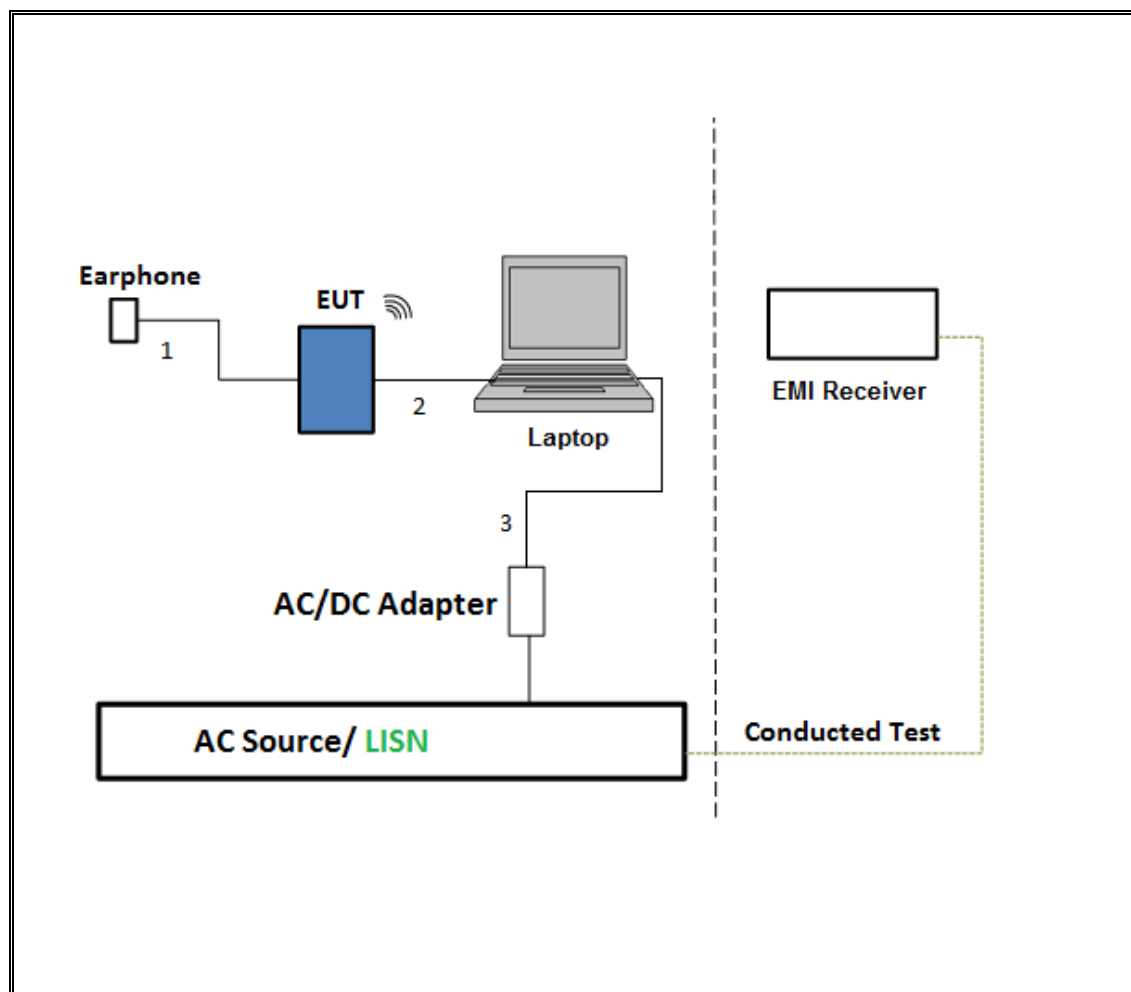
**SETUP DIAGRAM**



**TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION**

The EUT was tested with earphone connected and powered by host PC via USB cable. 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	A022813-2	3/5/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/26/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323562	5/7/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	MY52350675	11/12/2015
Antenna, Horn 1-18GHz	ETS Lindgren	3117	00143449	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/14/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323561	6/8/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	MY54490254	12/10/2015
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	MY55200002	3/6/2016
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	MY55200004	5/6/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	12/17/2015
Horn Antenna, 40GHz	ARA	MWH-2640/B	1029	7/28/2016
Spectrum Analyzer, 40 GHz	Agilent	8564E	3943A01643	8/6/2016
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	3008A04710	6/29/2016
Amplifier, 26 - 40GHz	Miteq	NSP4000-SP2	924343	4/7/2016
AC Line Conducted				
EMI Test Receiver 9KHz-7GHz	Rohde & Schwarz	ESCI7	100773	8/7/2016
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	7/28/2016
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	

Note: \* indicates automation software version used in the compliance certification testing

## 7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

### 7.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

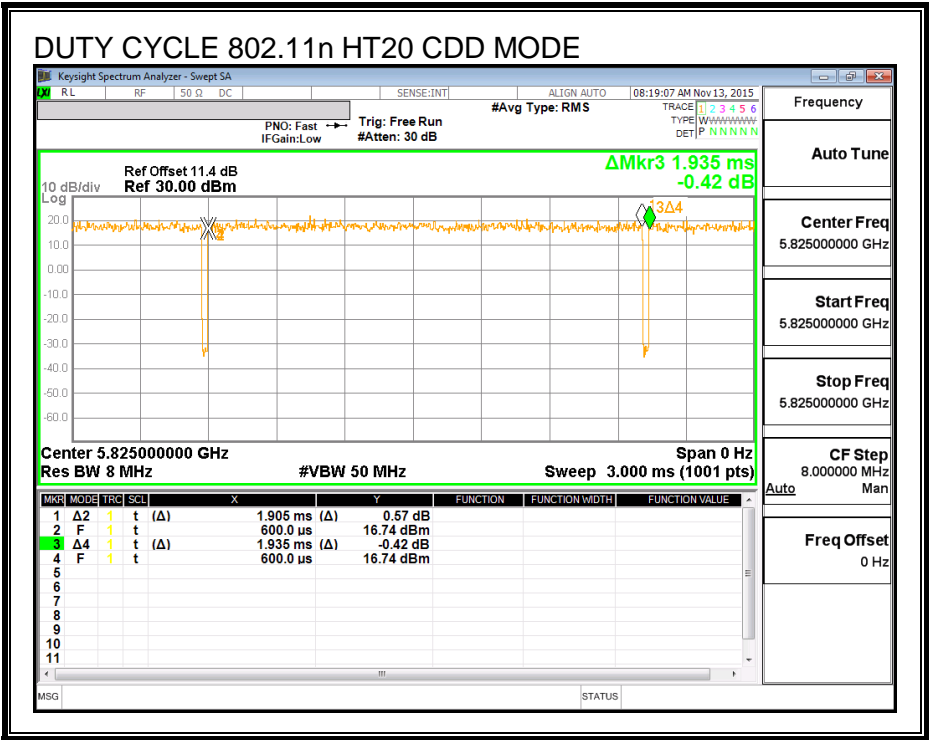
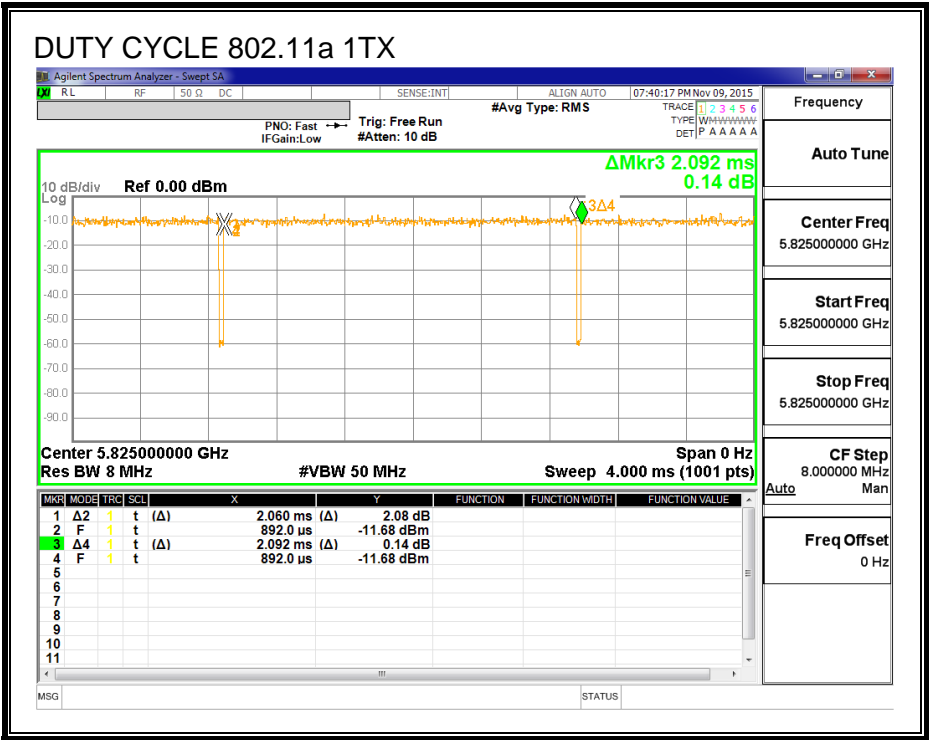
#### PROCEDURE

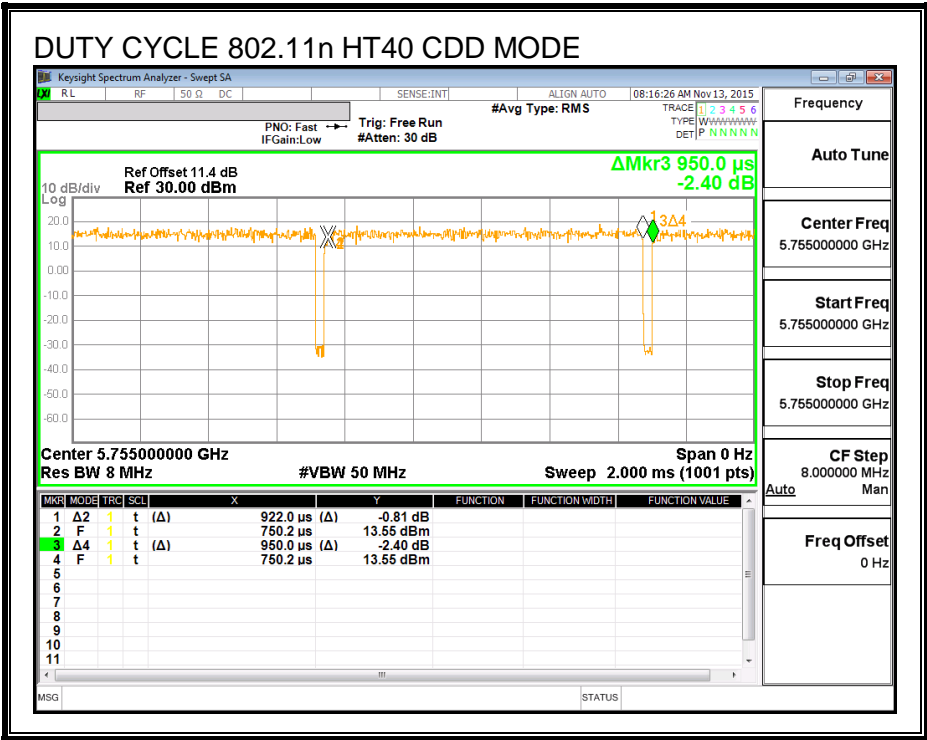
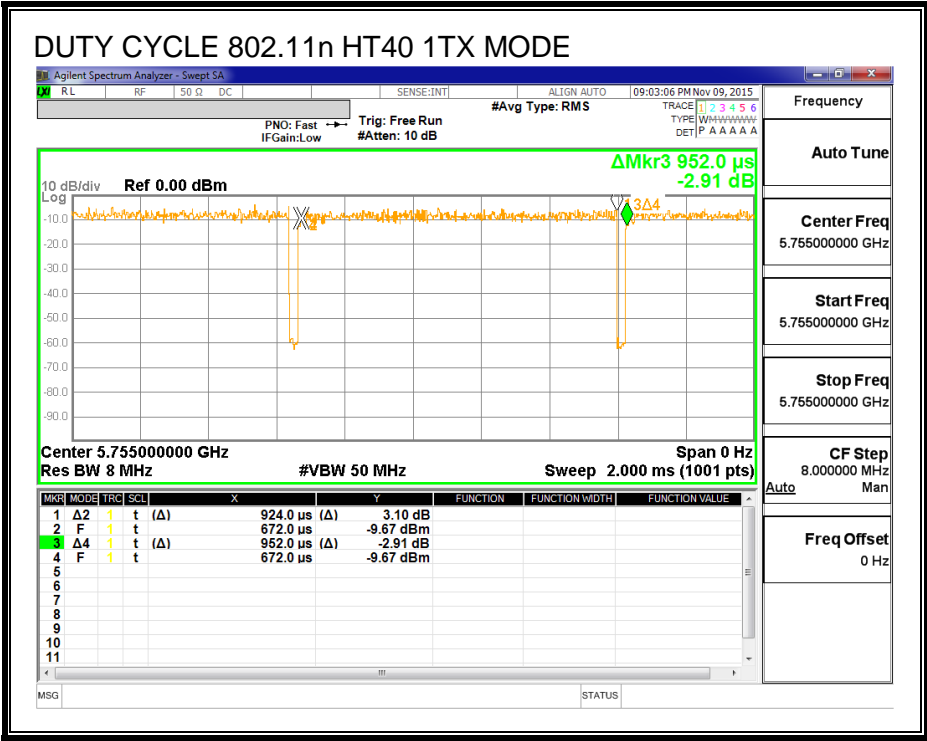
KDB 789033 Zero-Span Spectrum Analyzer Method.

#### RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a 1TX	2.060	2.092	0.985	98.47%	0.00	0.010
802.11n HT20 CDD	1.905	1.935	0.984	98.45%	0.00	0.010
802.11n HT40 1TX	0.924	0.952	0.971	97.06%	0.13	1.082
802.11n HT40 CDD	0.922	0.950	0.971	97.05%	0.13	1.085

DUTY CYCLE PLOTS





## **7.2. MEASUREMENT METHODS**

26 dB Emission BW & 6 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.b (Method PM-G).

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. 802.11a 1Tx MODE IN THE 5.8 GHz BAND

#### 8.1.1. 6 dB BANDWIDTH

##### LIMITS

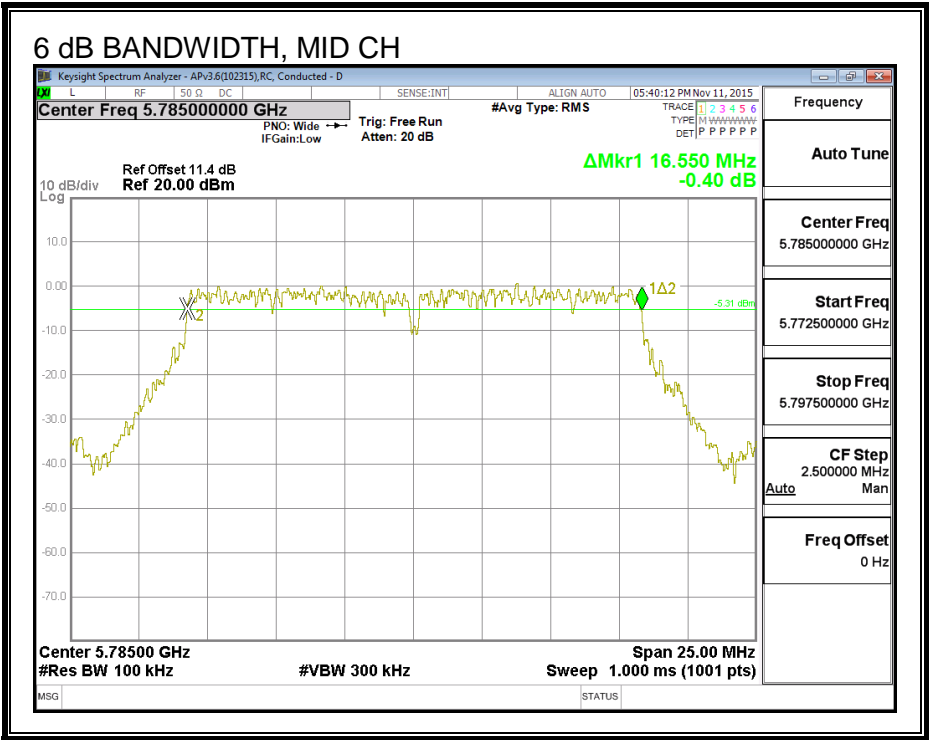
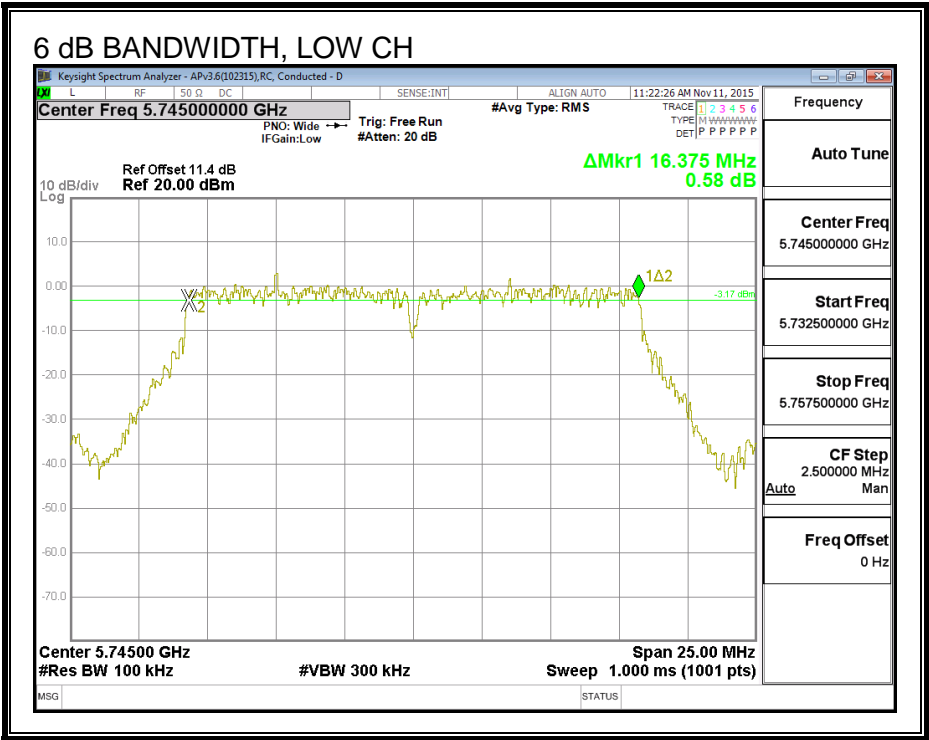
FCC §15.407 (e)

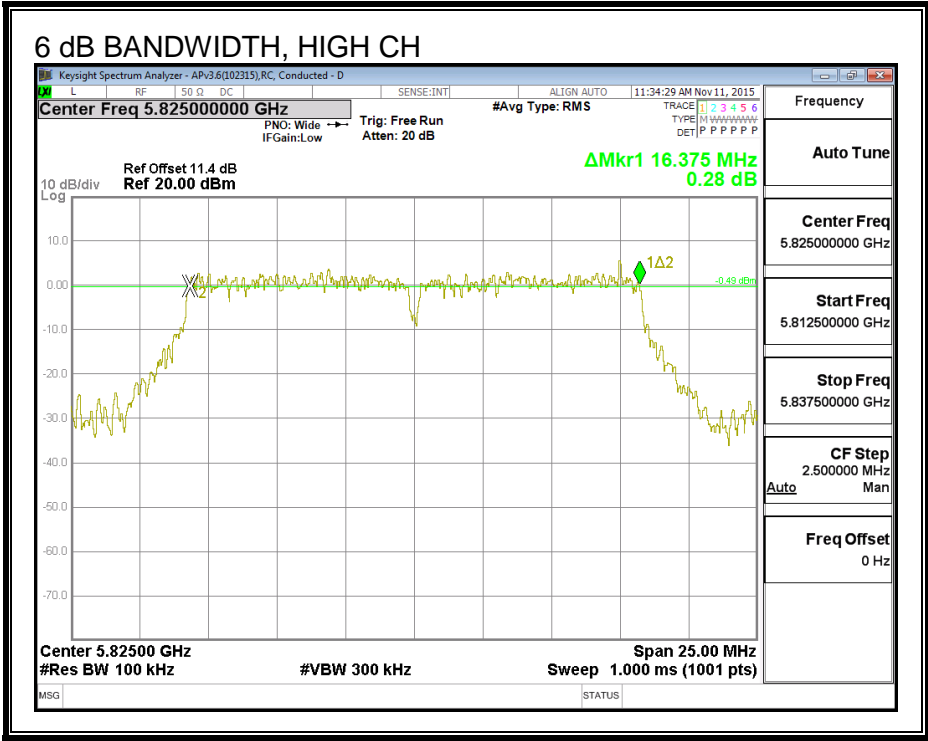
The minimum 6 dB bandwidth shall be at least 500 kHz.

##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.38	0.5
Mid	5785	16.55	0.5
High	5825	16.38	0.5

6 dB BANDWIDTH







### 8.1.2. 26 dB BANDWIDTH

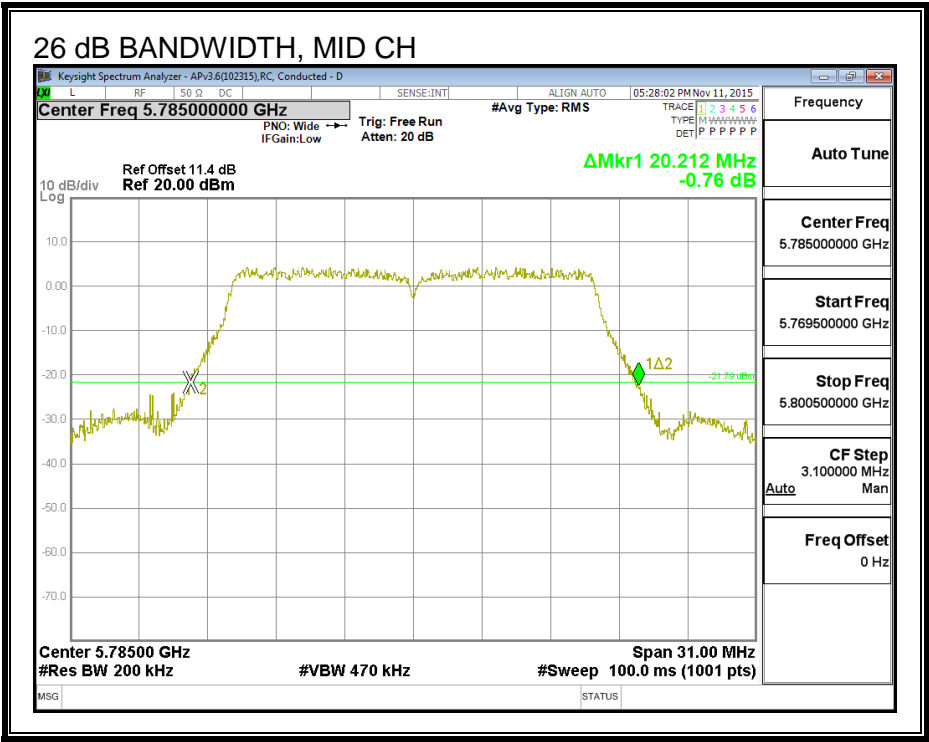
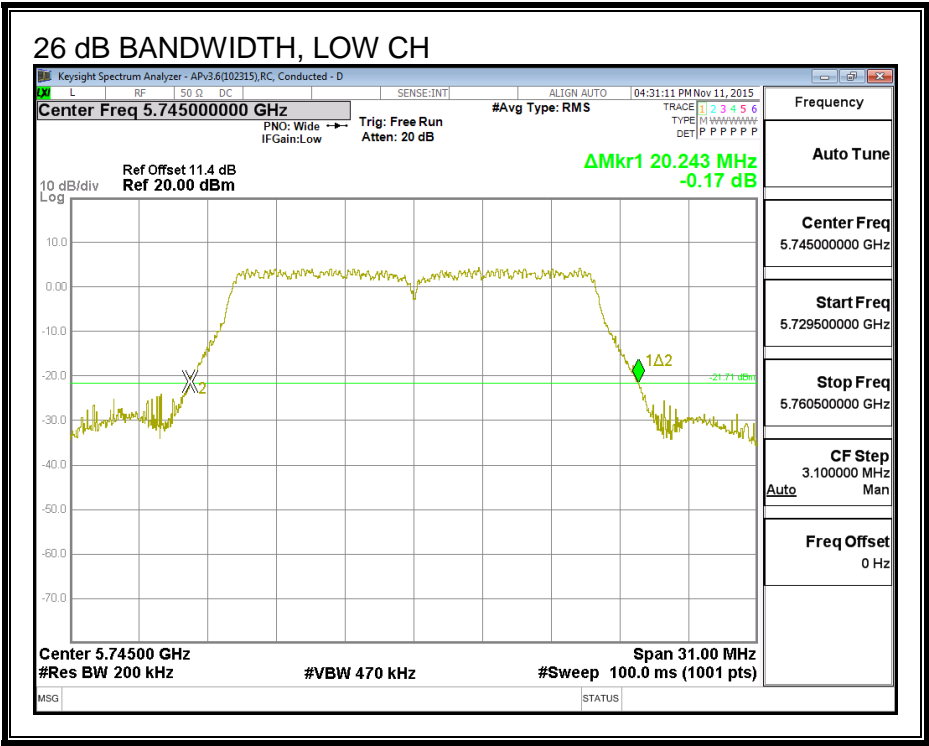
#### LIMITS

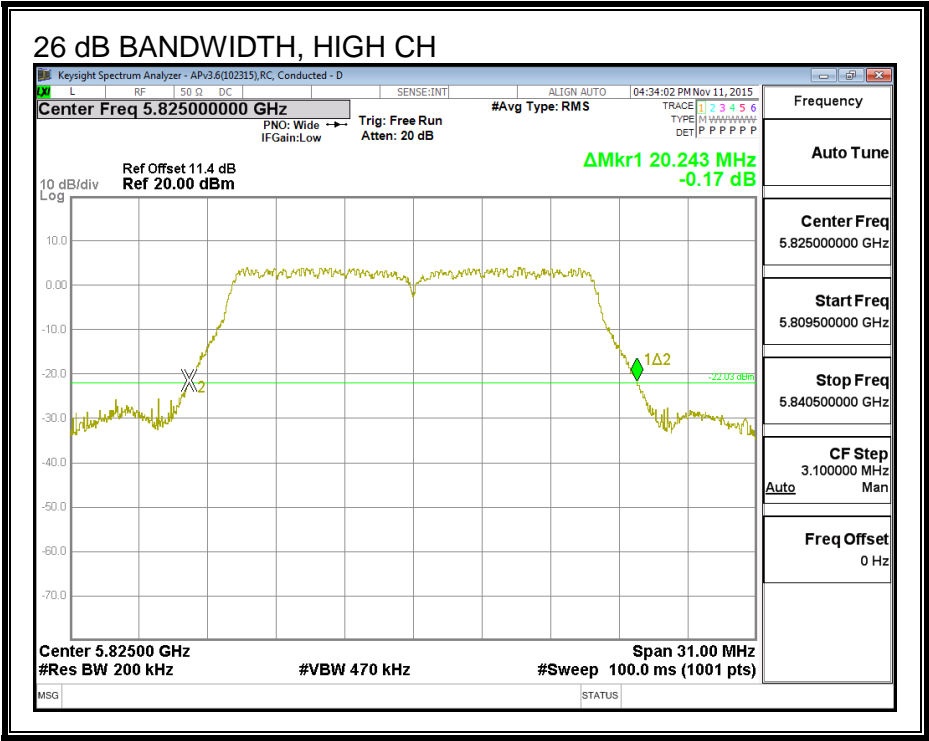
None, for reporting purposes only

#### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5745	20.243
Mid	5785	20.212
High	5825	20.243

26 dB BANDWIDTH





### 8.1.3. 99% BANDWIDTH

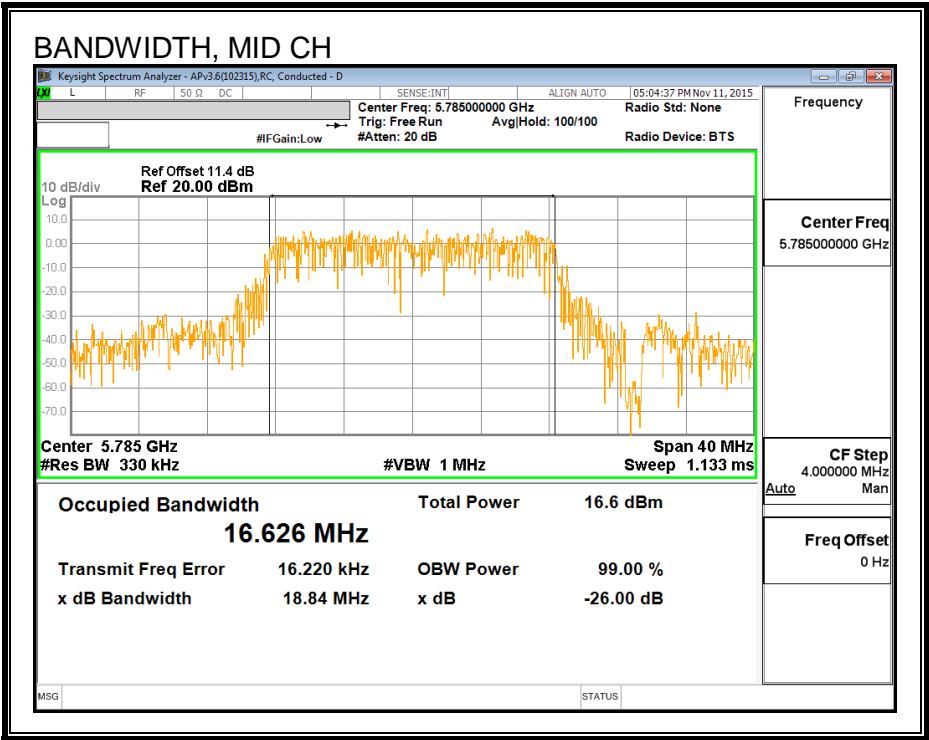
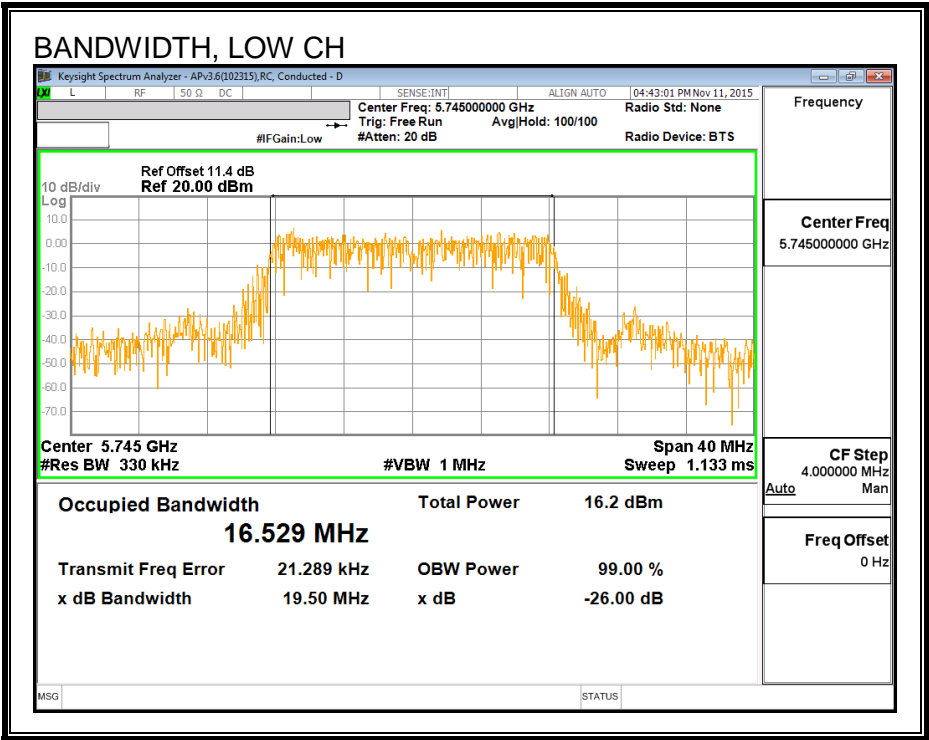
#### LIMITS

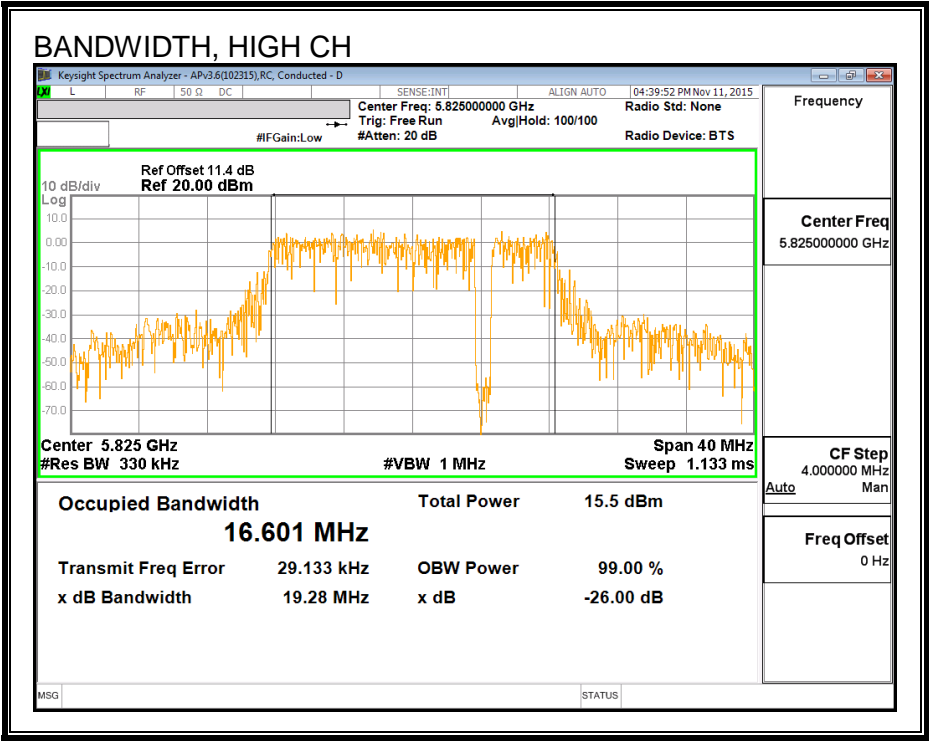
None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.529
Mid	5785	16.626
High	5825	16.601

99% BANDWIDTH





#### 8.1.4. AVERAGE POWER

##### LIMITS

None; for reporting purposes only.

##### Test Procedure

Measurements perform using a wideband gated RF power meter.

##### RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5745	15.35
Mid	5785	16.00
High	5825	15.95

## **8.1.5. OUTPUT POWER**

### **LIMITS**

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Test Procedure**

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

### **DIRECTIONAL ANTENNA GAIN**

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



## **RESULTS**

### **Antenna Gain and Limit**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Directional Gain for Power (dBi)</b>	<b>Power Limit (dBm)</b>
Low	5745	4.21	30.00
Mid	5785	4.21	30.00
High	5825	4.21	30.00

### **Output Power Results**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Meas Power (dBm)</b>	<b>Total Corr'd Power (dBm)</b>	<b>Power Limit (dBm)</b>	<b>Power Margin (dB)</b>
Low	5745	15.35	15.35	30.00	-14.65
Mid	5785	16.00	16.00	30.00	-14.00
High	5825	15.95	15.95	30.00	-14.05

## 8.1.6. PSD

### LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### DIRECTIONAL ANTENNA GAIN

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

### RESULTS

#### Antenna Gain and Limits

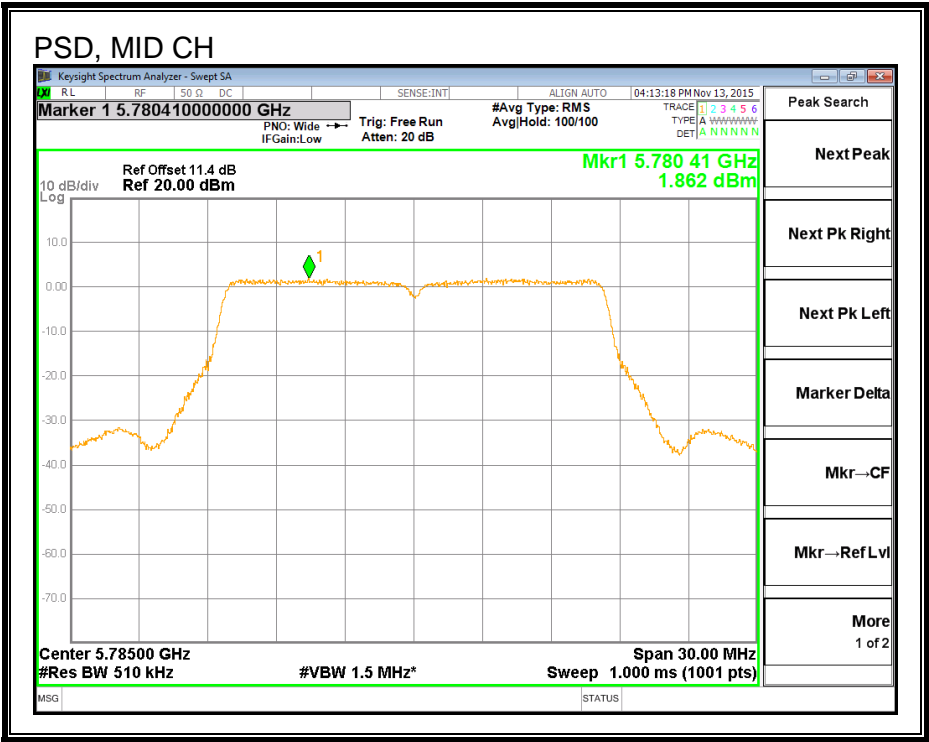
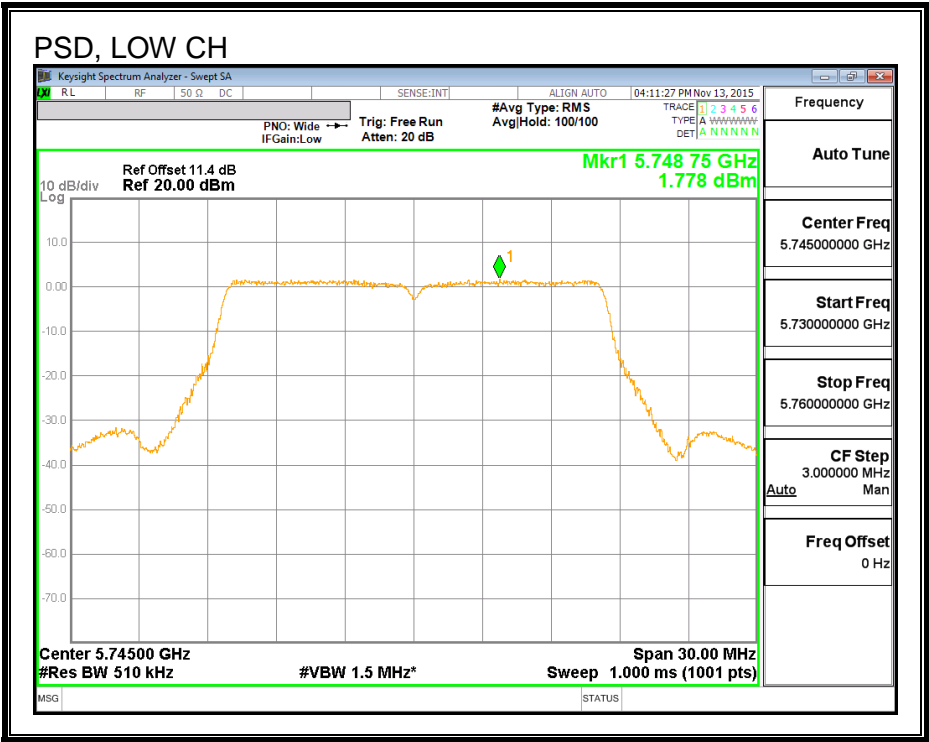
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	4.21	30.00
Mid	5785	4.21	30.00
High	5825	4.21	30.00

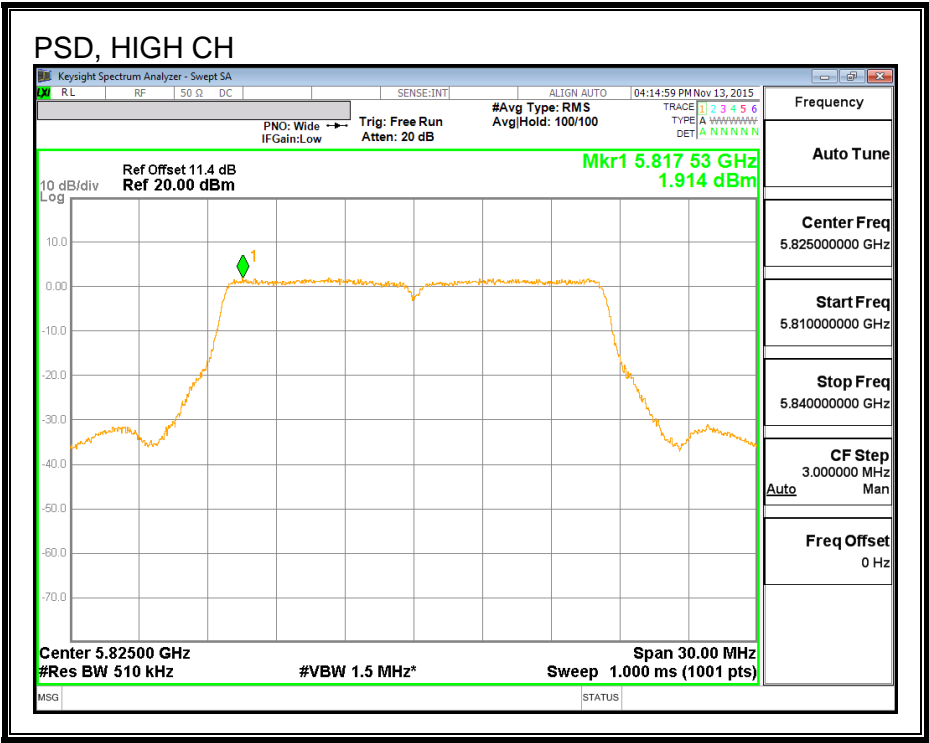
Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD
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#### PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	1.778	1.78	30.00	-28.22
Mid	5785	1.862	1.86	30.00	-28.14
High	5825	1.914	1.91	30.00	-28.09

PSD,





## **8.2. 802.11n HT20 2Tx CDD MODE IN THE 5.8 GHz BAND**

### **8.2.1. 6 dB BANDWIDTH**

#### **LIMITS**

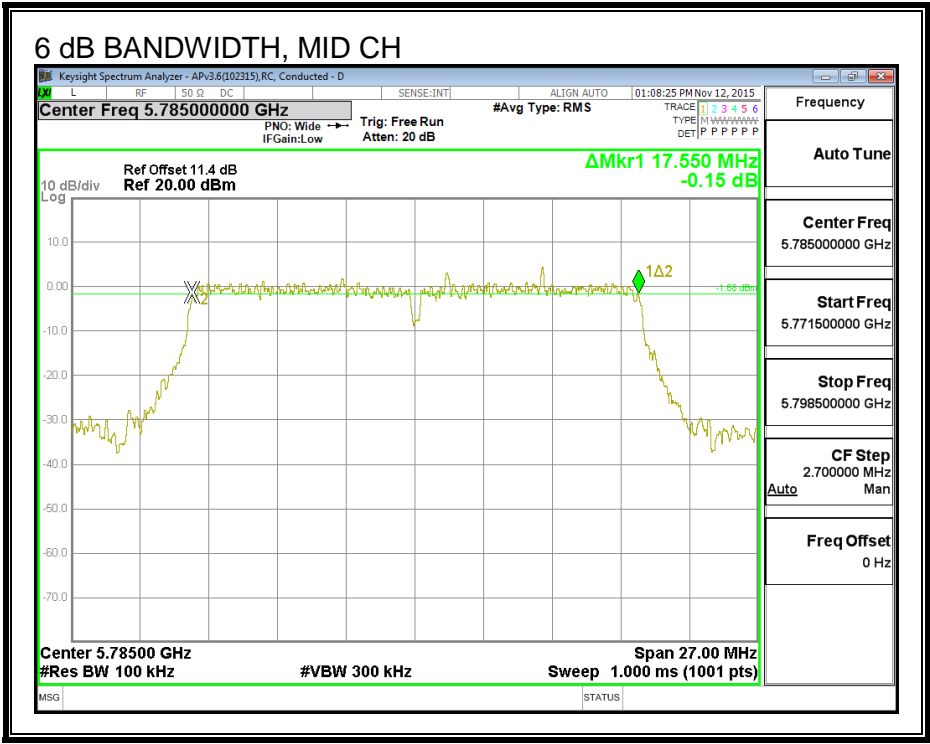
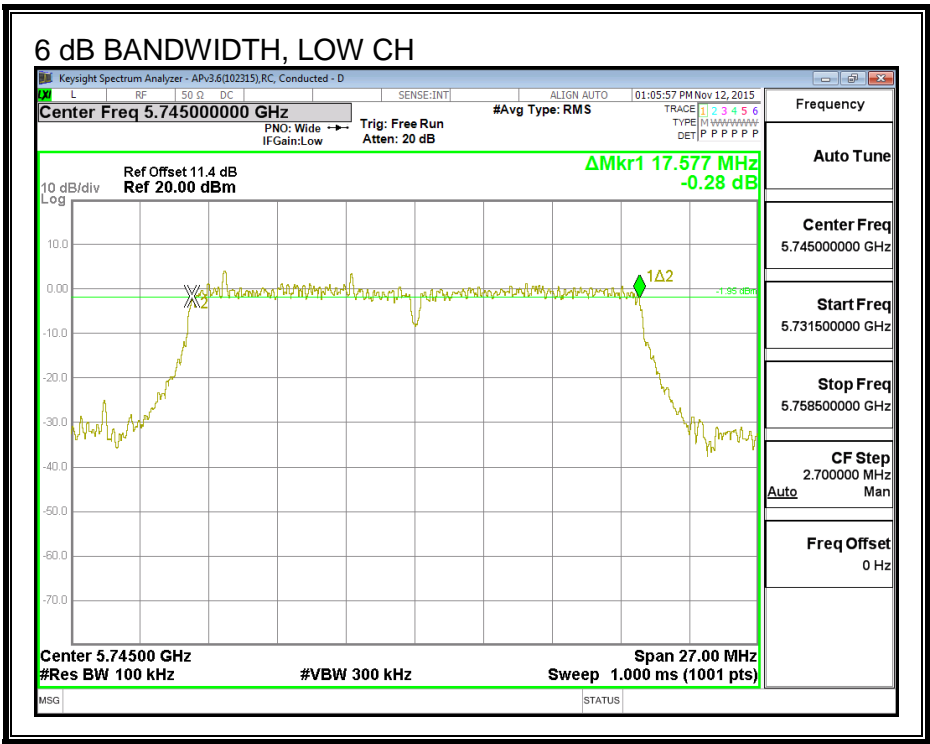
FCC §15.407 (e)

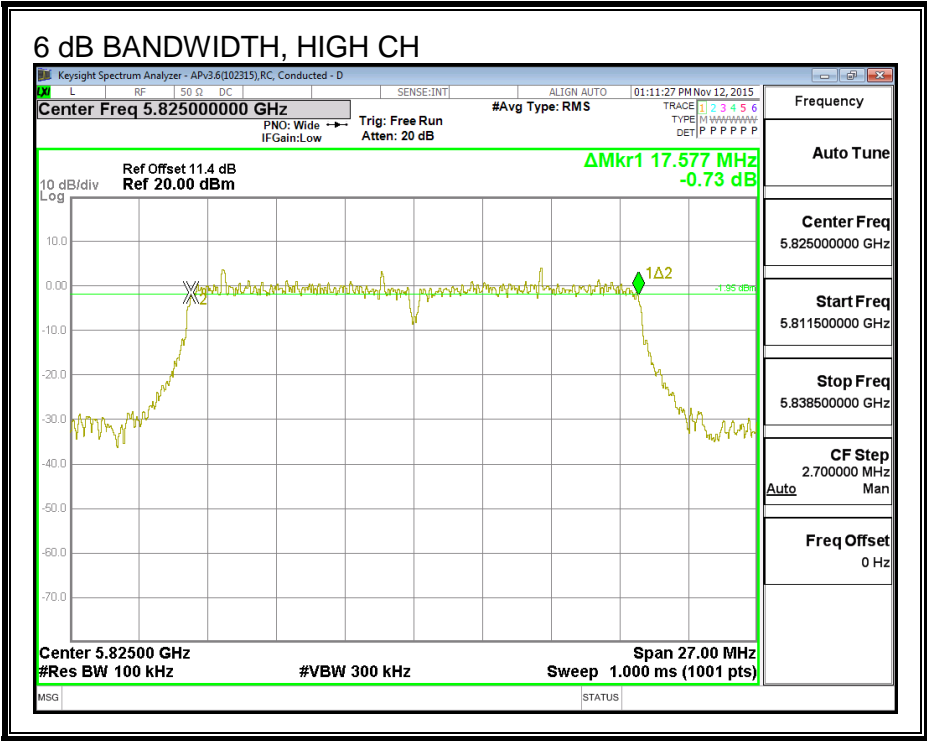
The minimum 6 dB bandwidth shall be at least 500 kHz.

#### **RESULTS**

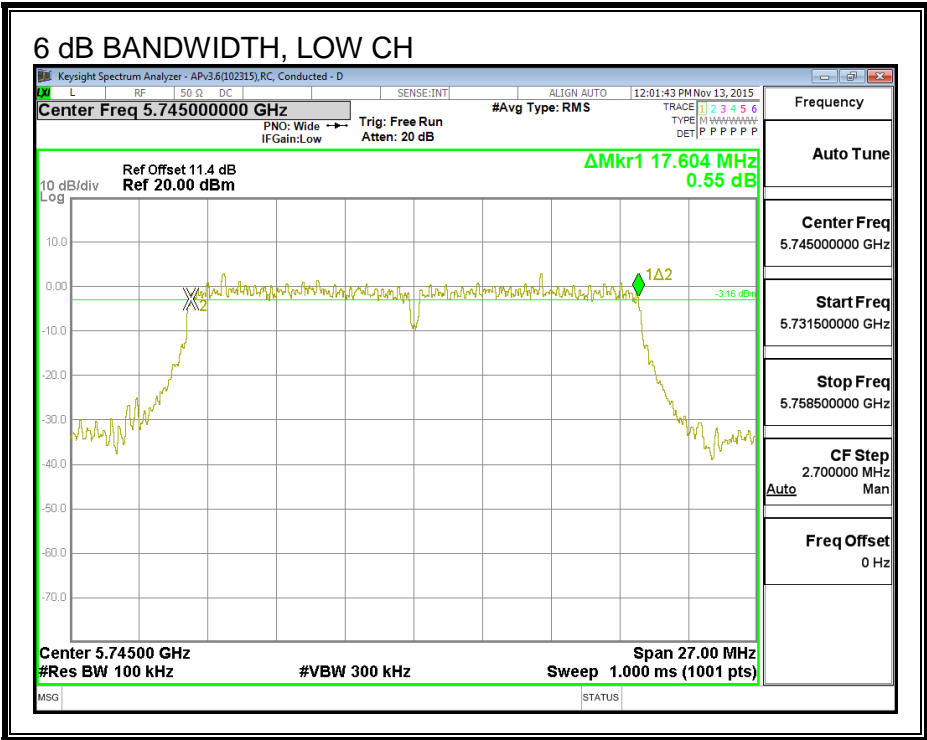
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	5745	17.577	17.604	0.5
Mid	5785	17.550	17.604	0.5
High	5825	17.577	17.577	0.5

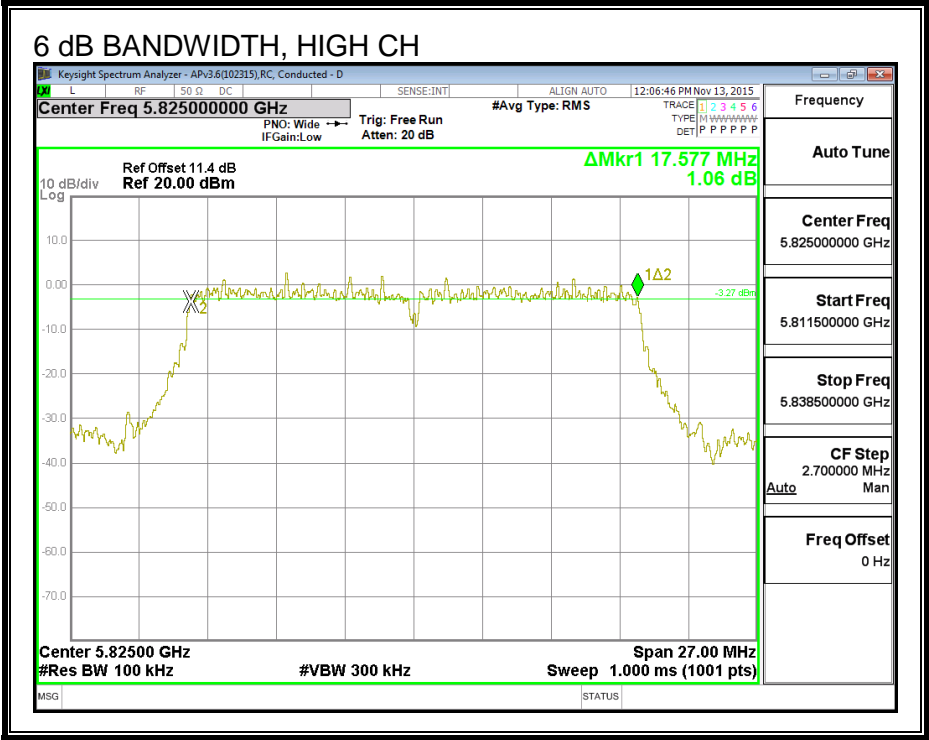
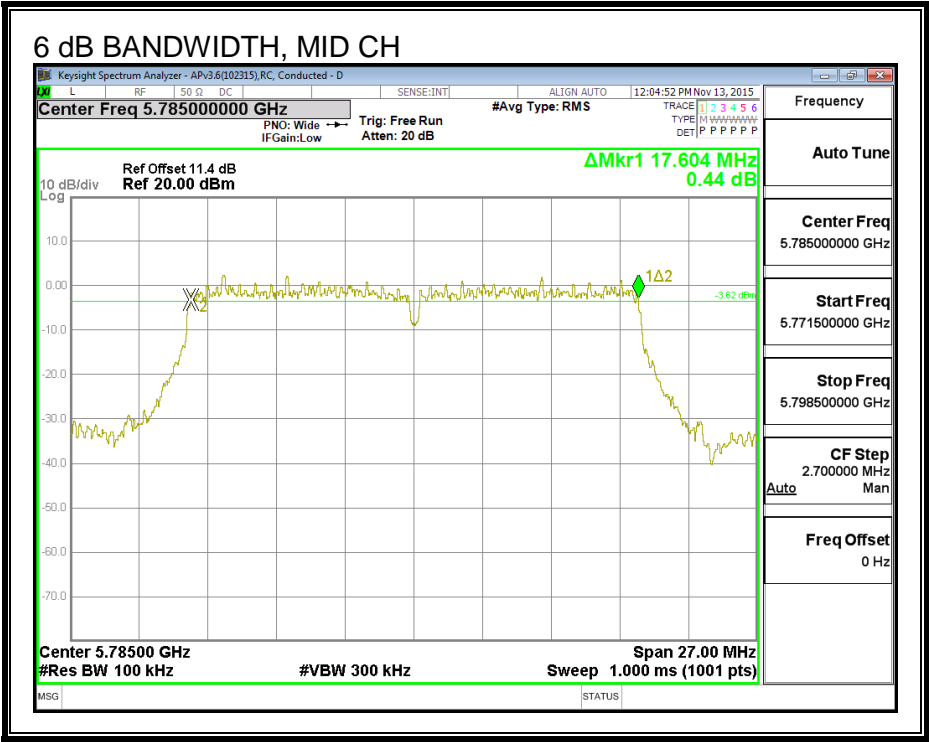
6 dB BANDWIDTH, CHAIN 0





6 dB BANDWIDTH, CHAIN 1







### 8.2.2. 26 dB BANDWIDTH

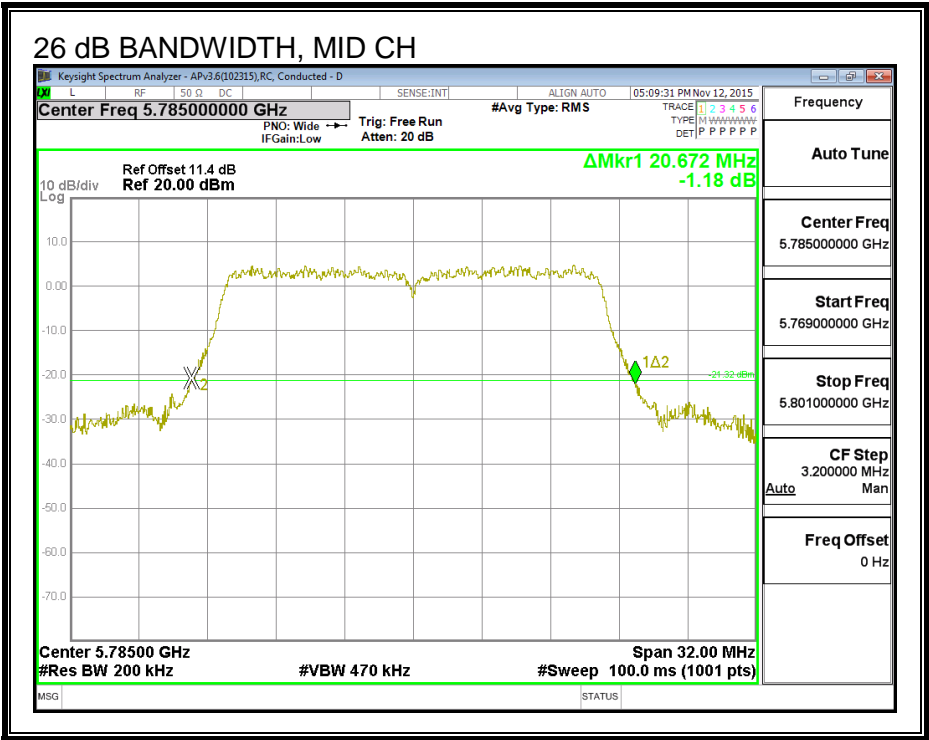
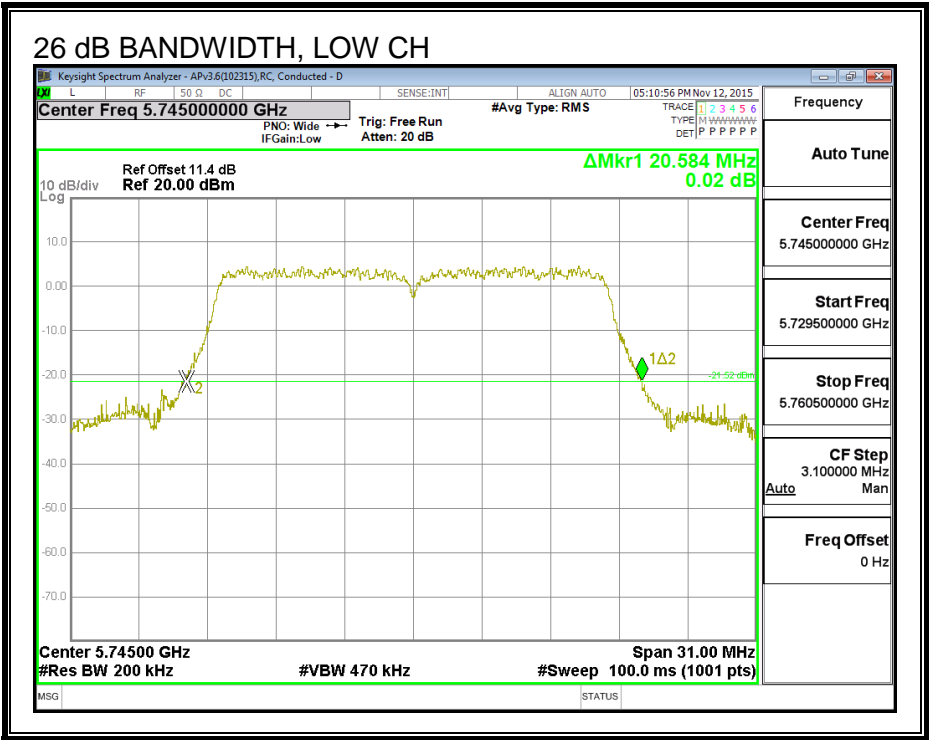
#### LIMITS

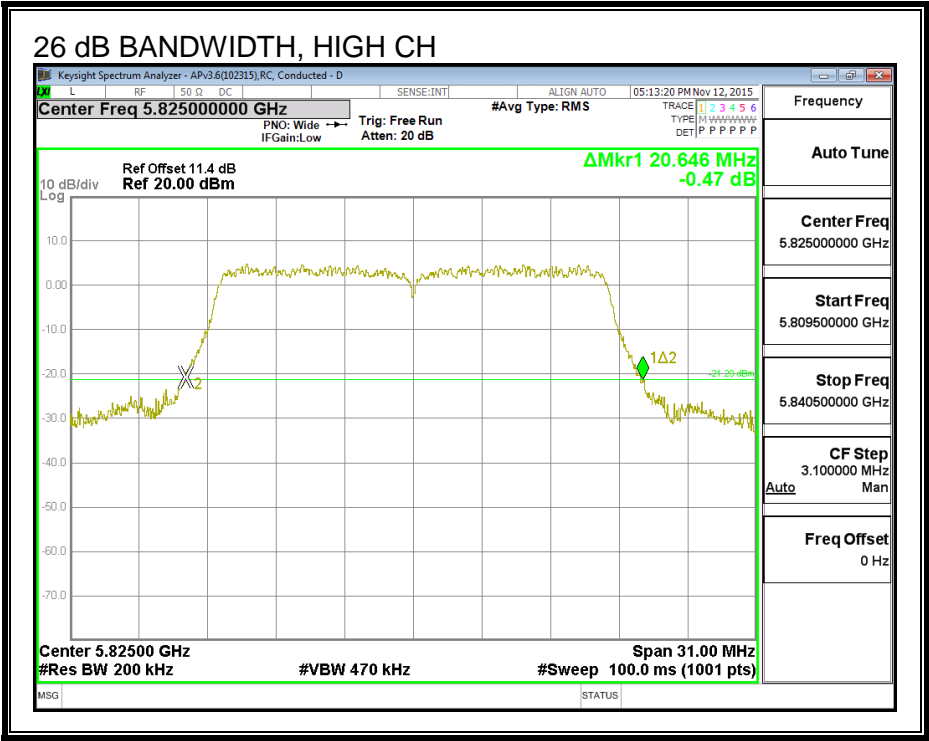
None, for reporting purposes only.

#### RESULTS

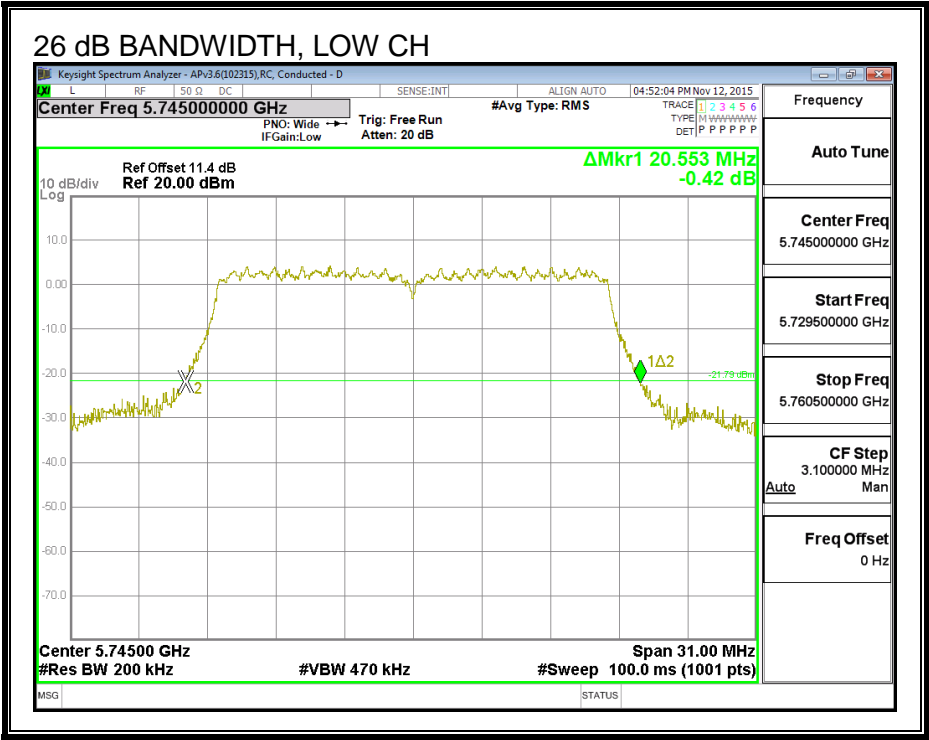
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5745	20.584	20.553
Mid	5785	20.672	20.615
High	5825	20.646	20.553

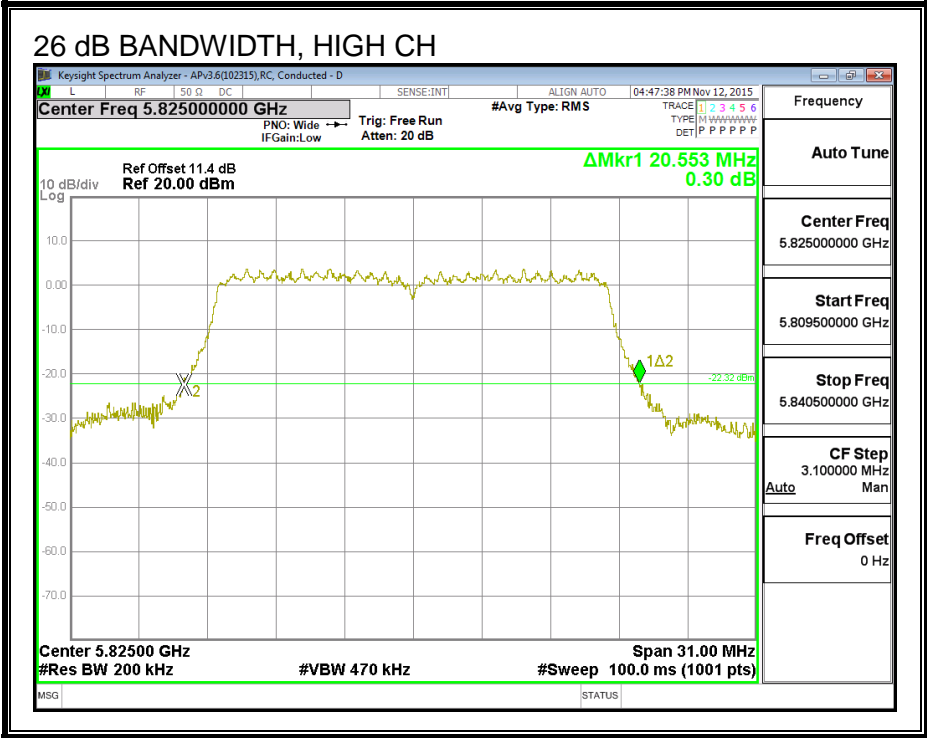
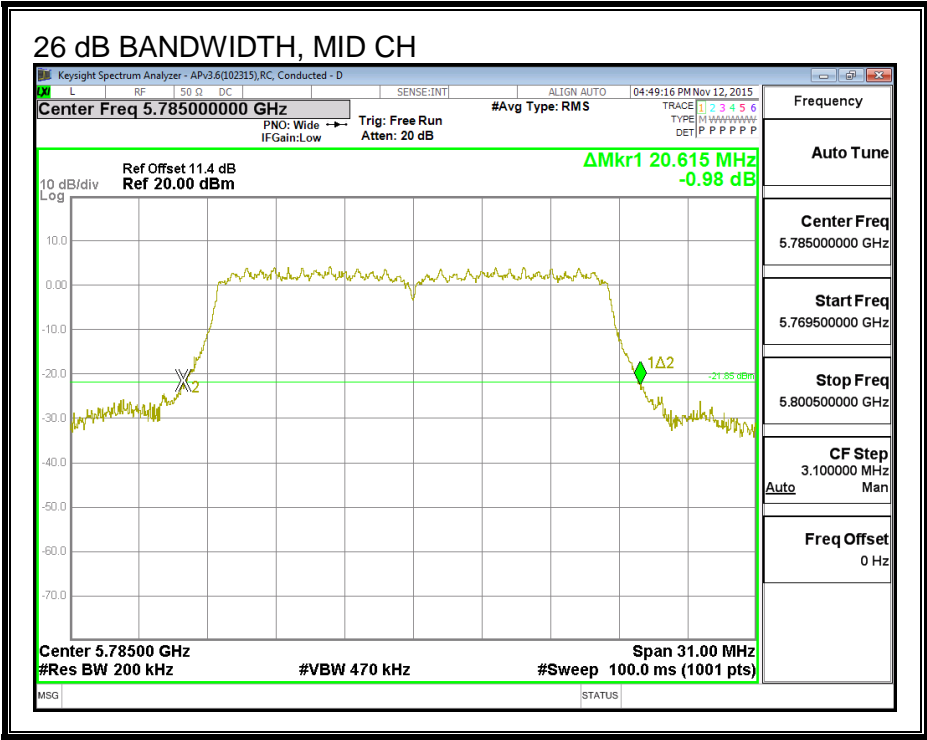
26 dB BANDWIDTH, CHAIN 0





26 dB BANDWIDTH, CHAIN 1





### 8.2.3. 99% BANDWIDTH

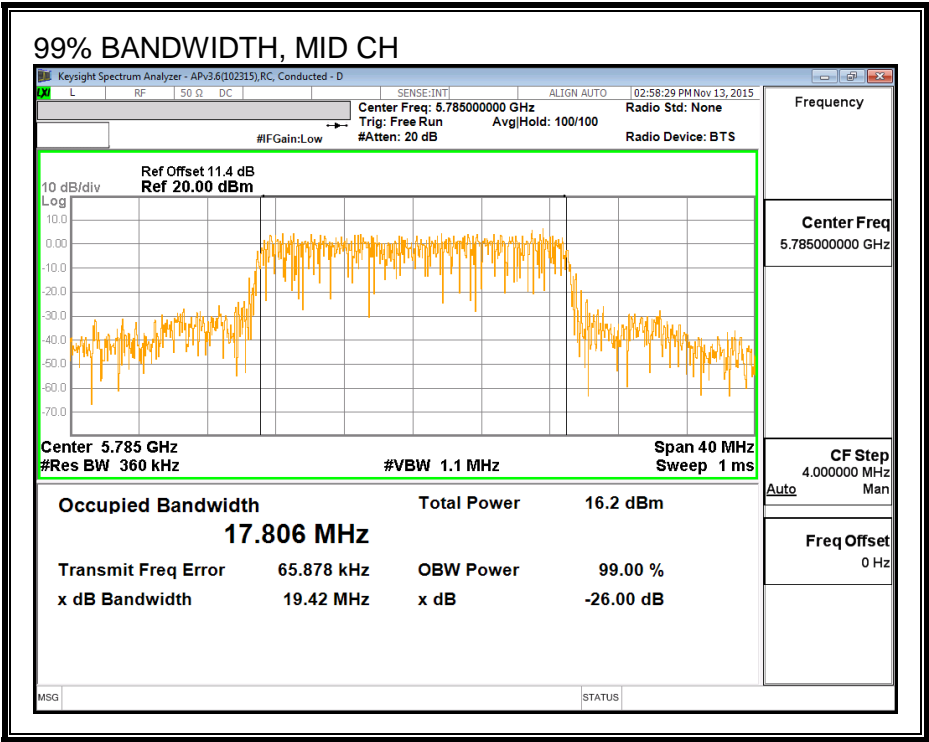
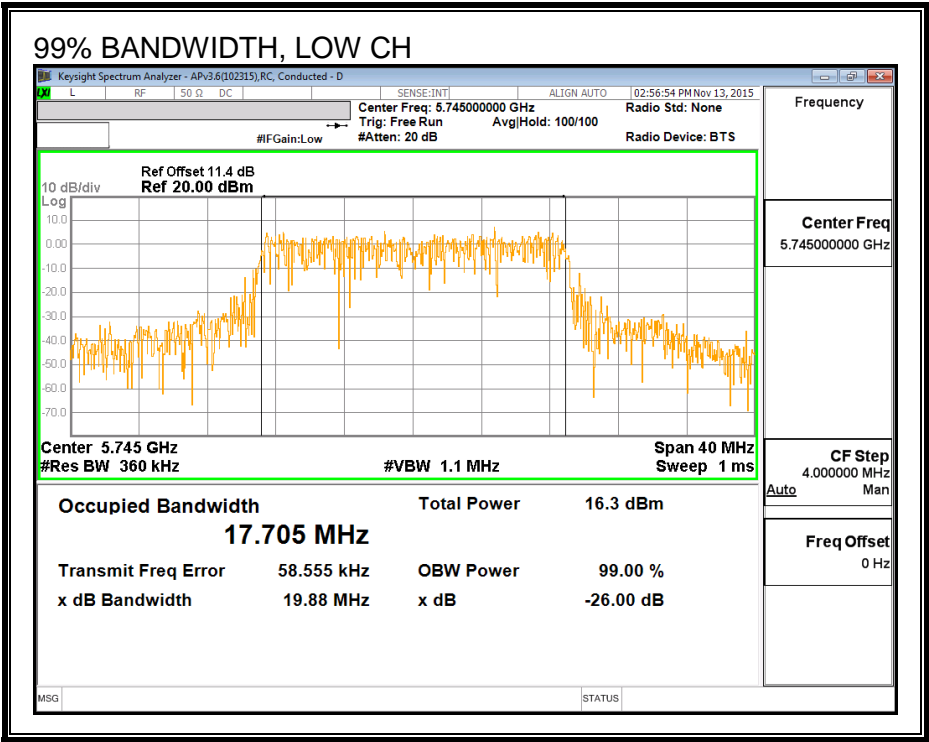
#### LIMITS

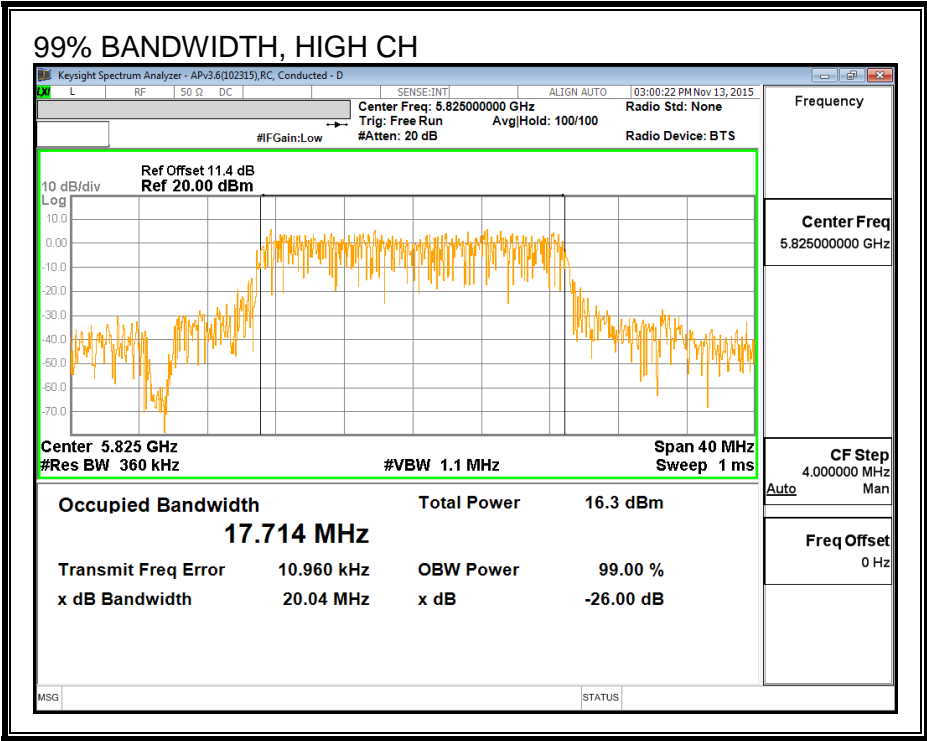
None; for reporting purposes only.

#### RESULTS

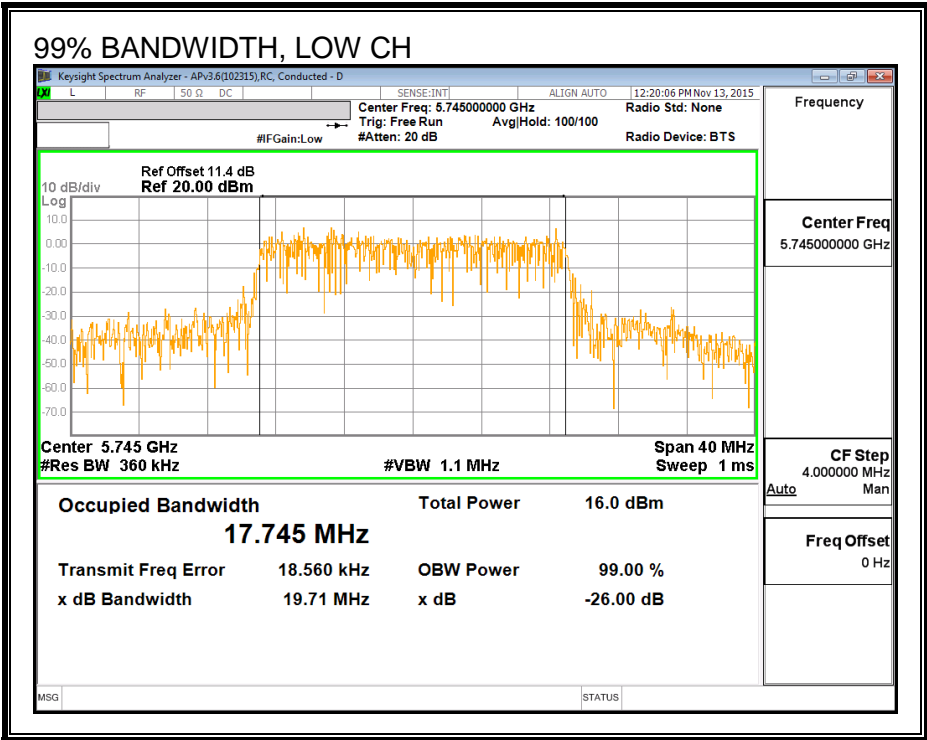
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5745	17.705	17.745
Mid	5785	17.806	17.643
High	5825	17.714	17.714

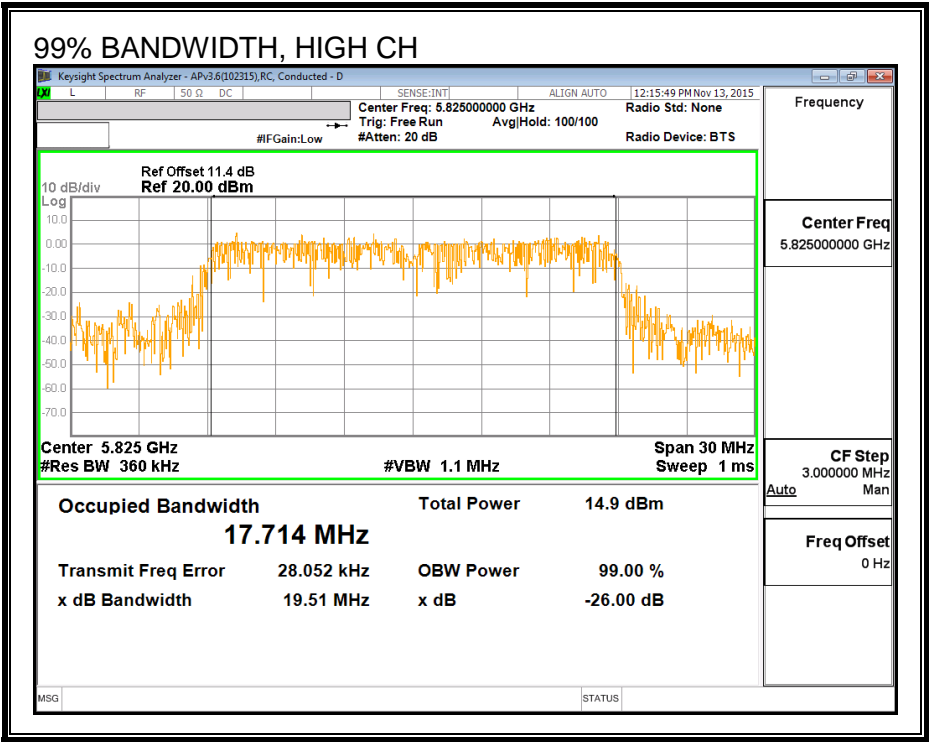
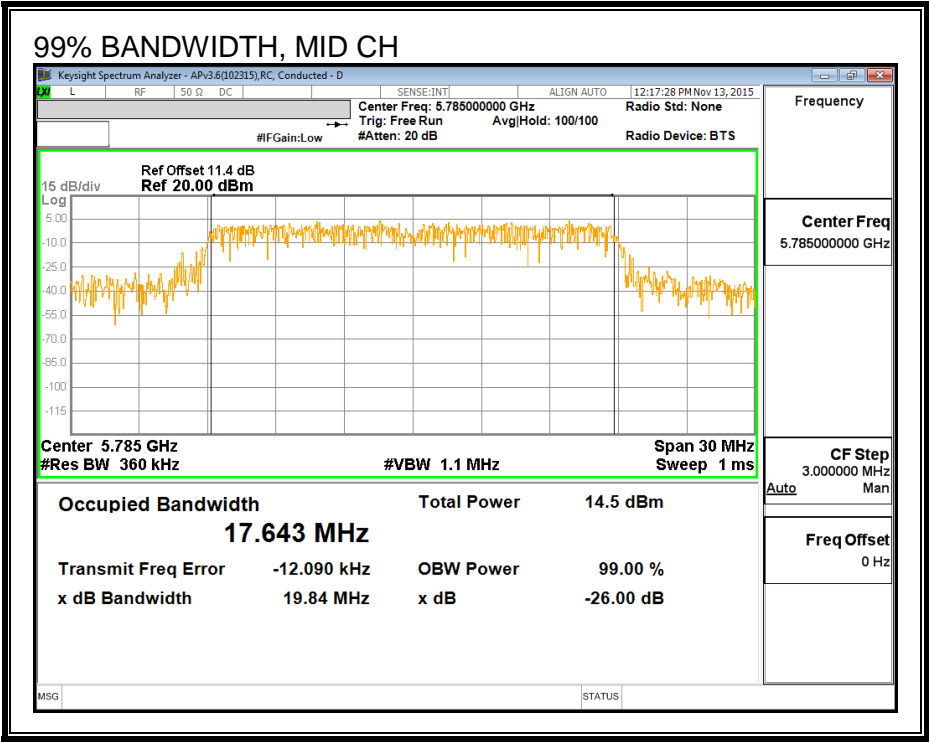
99% BANDWIDTH, CHAIN 0





99% BANDWIDTH, CHAIN 1







## 8.2.4. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### Test Procedure

Measurements perform using a wideband gated RF power meter.

### RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5745	13.05	12.96	16.02
Mid	5785	15.86	15.90	18.89
High	5825	15.73	15.35	18.55

## 8.2.5. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### Test Procedure

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

### DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
4.21	3.92	4.07

## **RESULTS**

### **Antenna Gain and Limit**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Directional Gain for Power (dBi)</b>	<b>Power Limit (dBm)</b>
Low	5745	4.07	30.00
Mid	5785	4.07	30.00
High	5825	4.07	30.00

### **Output Power Results**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Chain 0 Meas Power (dBm)</b>	<b>Chain 1 Meas Power (dBm)</b>	<b>Total Corr'd Power (dBm)</b>	<b>Power Limit (dBm)</b>	<b>Power Margin (dB)</b>
Low	5745	13.05	12.96	16.02	30.00	-13.98
Mid	5785	15.86	15.90	18.89	30.00	-11.11
High	5825	15.73	15.35	18.55	30.00	-11.45

## 8.2.6. PSD

### LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
4.21	3.92	7.08

## RESULTS

### Antenna Gain and Limits

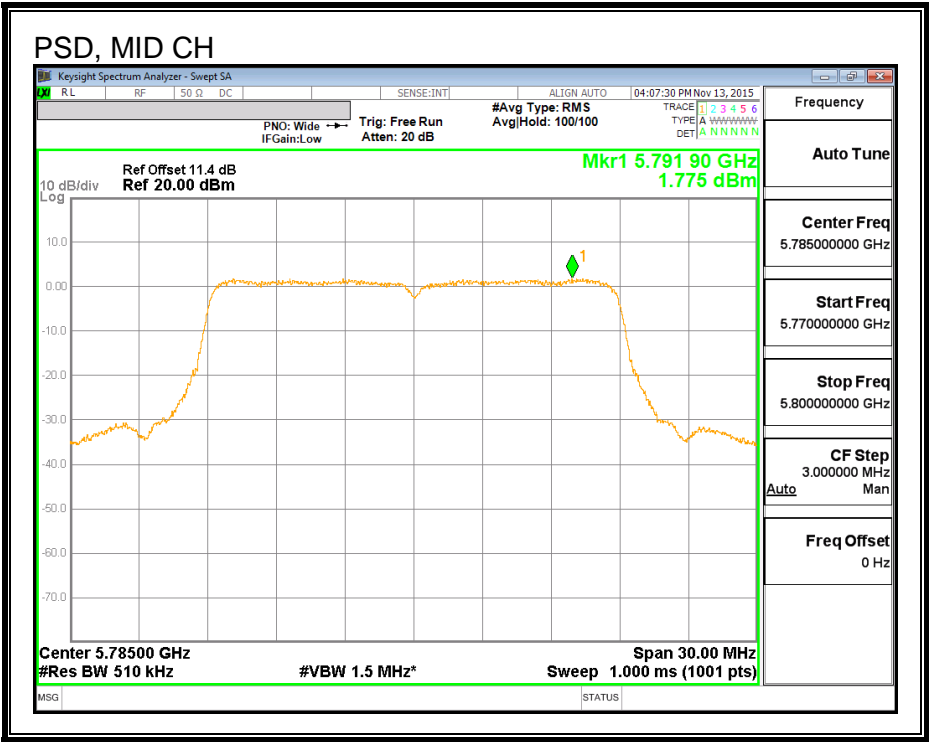
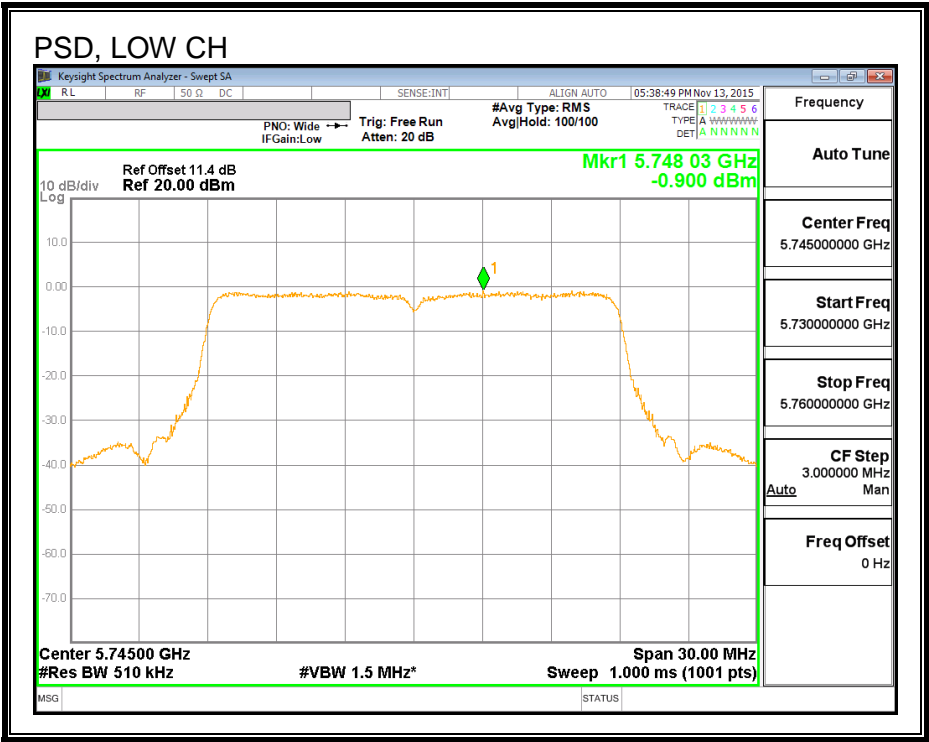
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	7.08	28.92
Mid	5785	7.08	28.92
High	5825	7.08	28.92

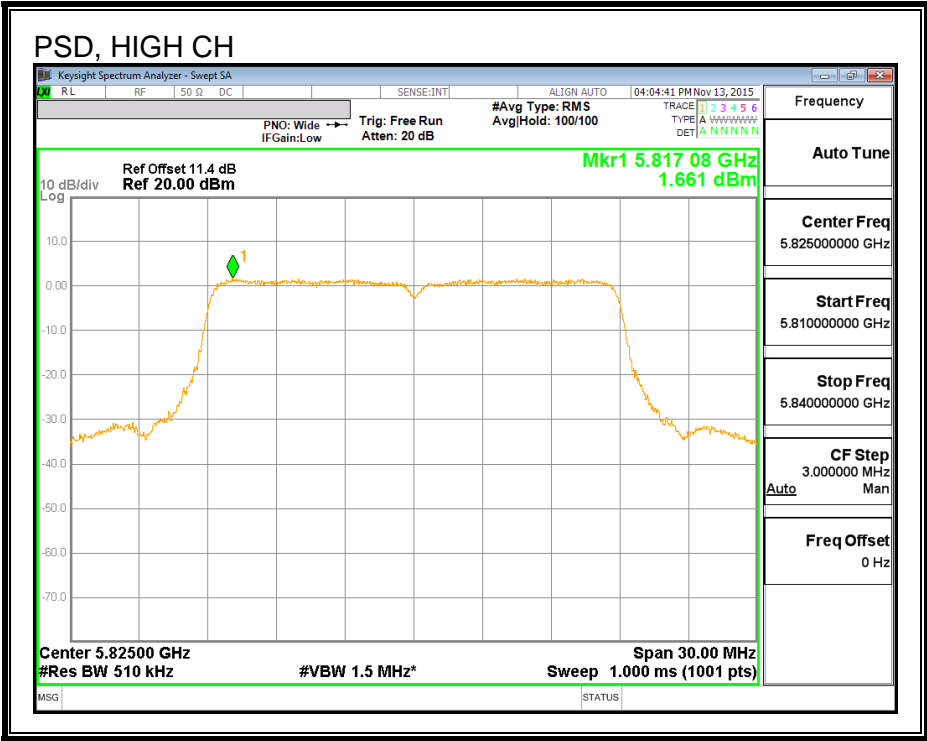
Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD
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### PSD Results

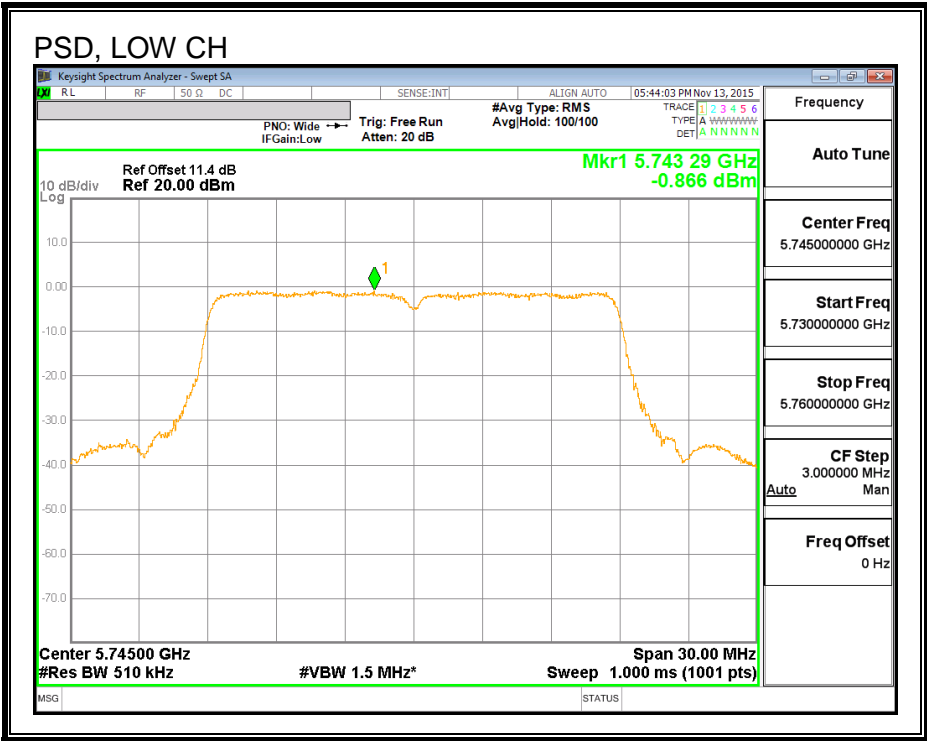
Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	-0.90	-0.87	2.13	28.92	-26.79
Mid	5785	1.78	1.68	4.74	28.92	-24.18
High	5825	1.66	1.21	4.45	28.92	-24.47

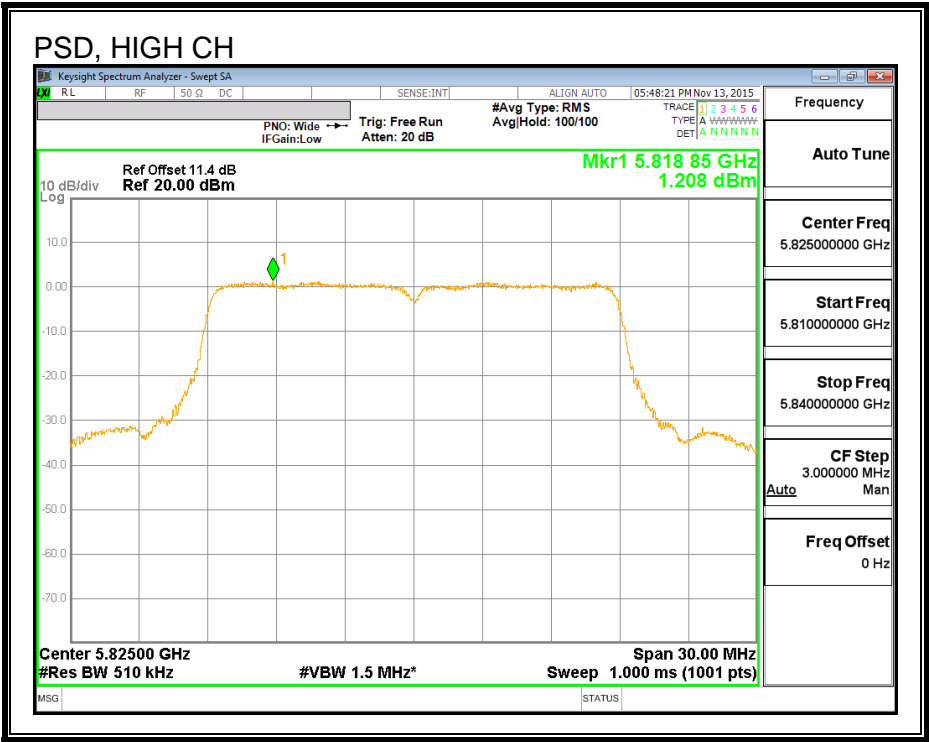
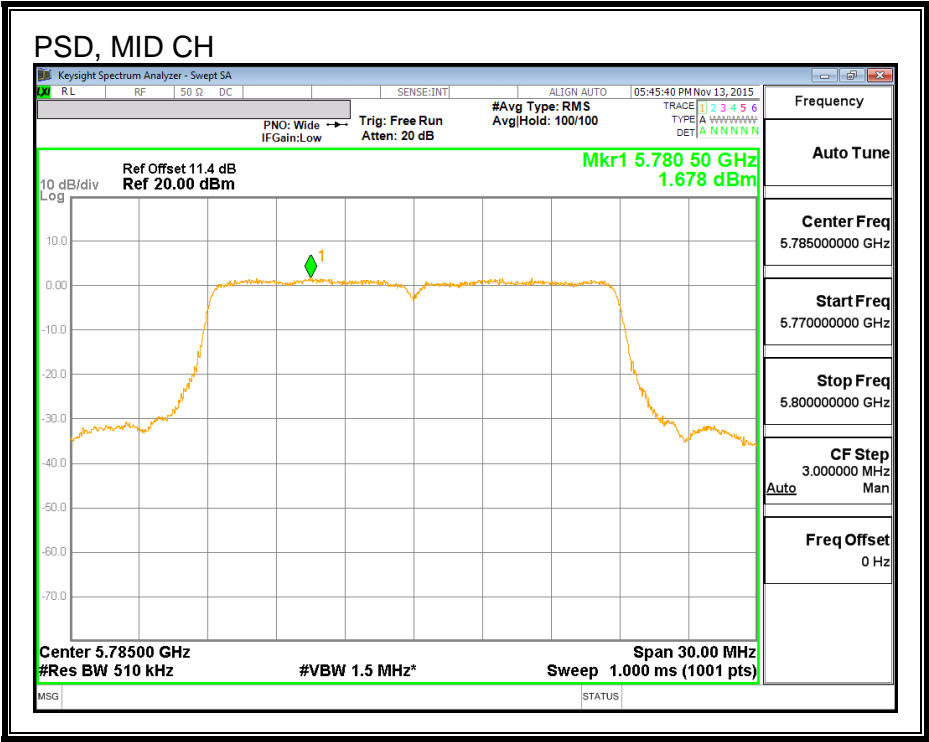
PSD, CHAIN 0





PSD, CHAIN 1







### **8.3. 802.11n HT40 1Tx MODE IN THE 5.8 GHz BAND**

#### **8.3.1. 6 dB BANDWIDTH**

##### **LIMITS**

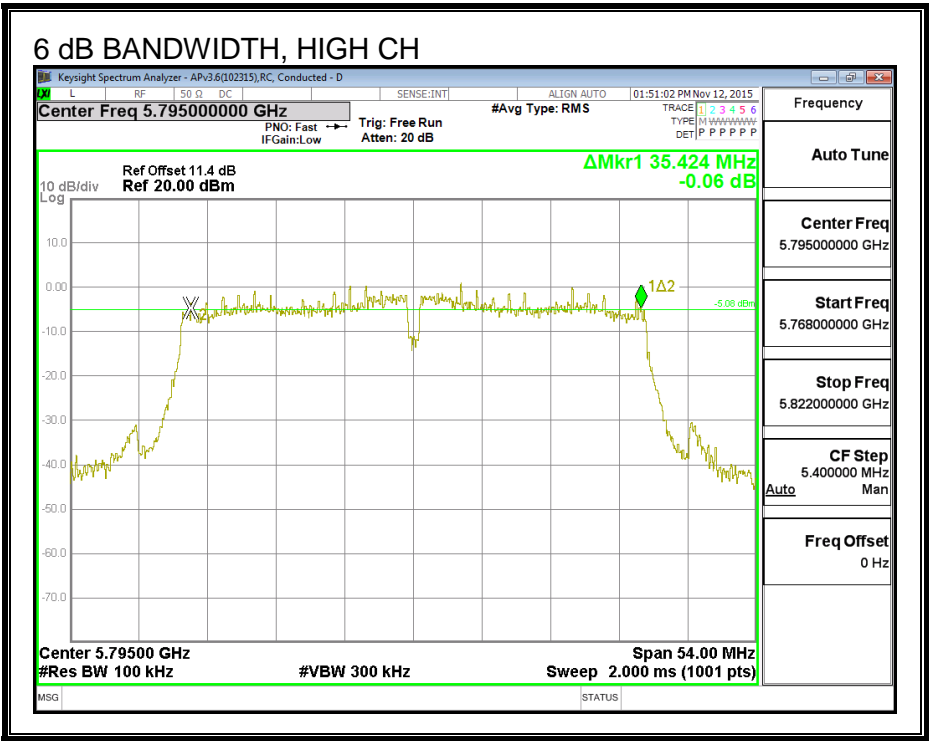
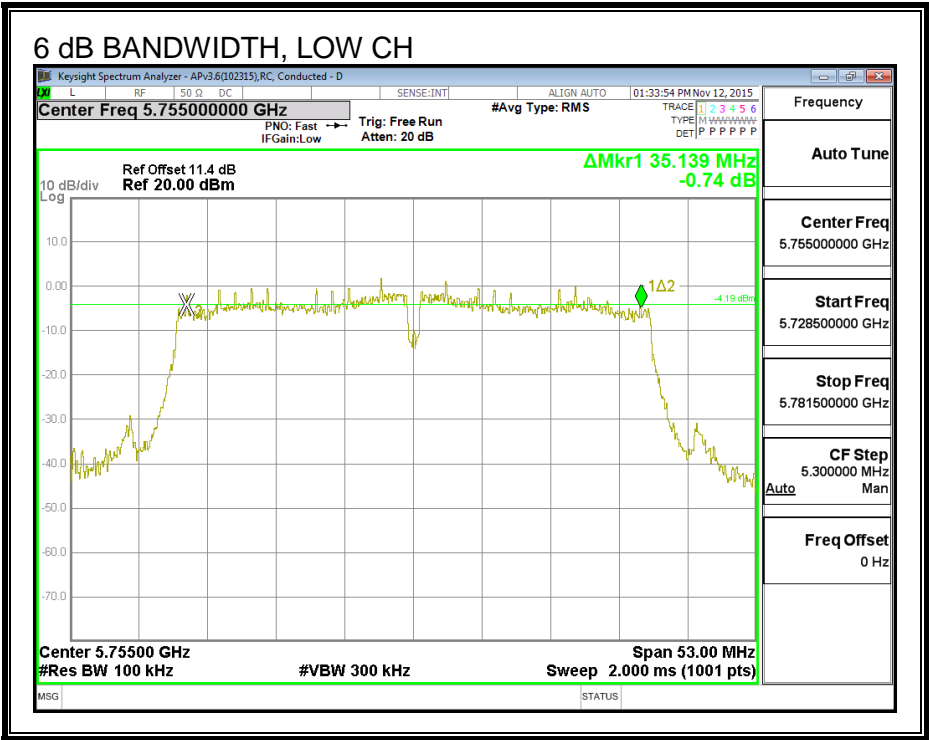
FCC §15.407 (e)

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

##### **RESULTS**

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5755	35.139	0.5
High	5795	35.424	0.5

6 dB BANDWIDTH



### 8.3.2. 26 dB BANDWIDTH

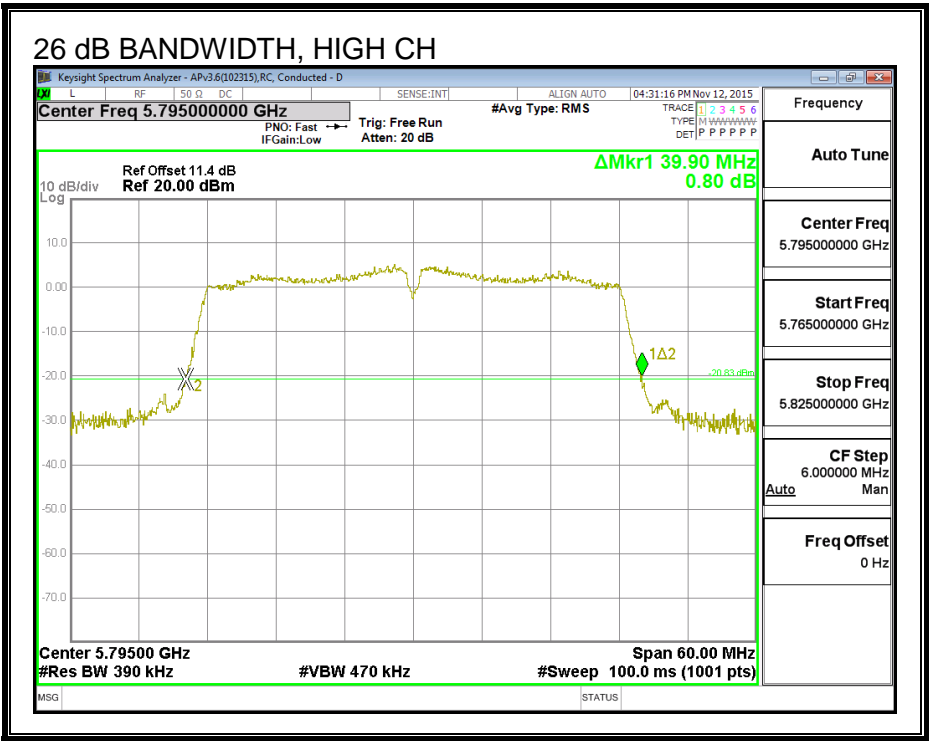
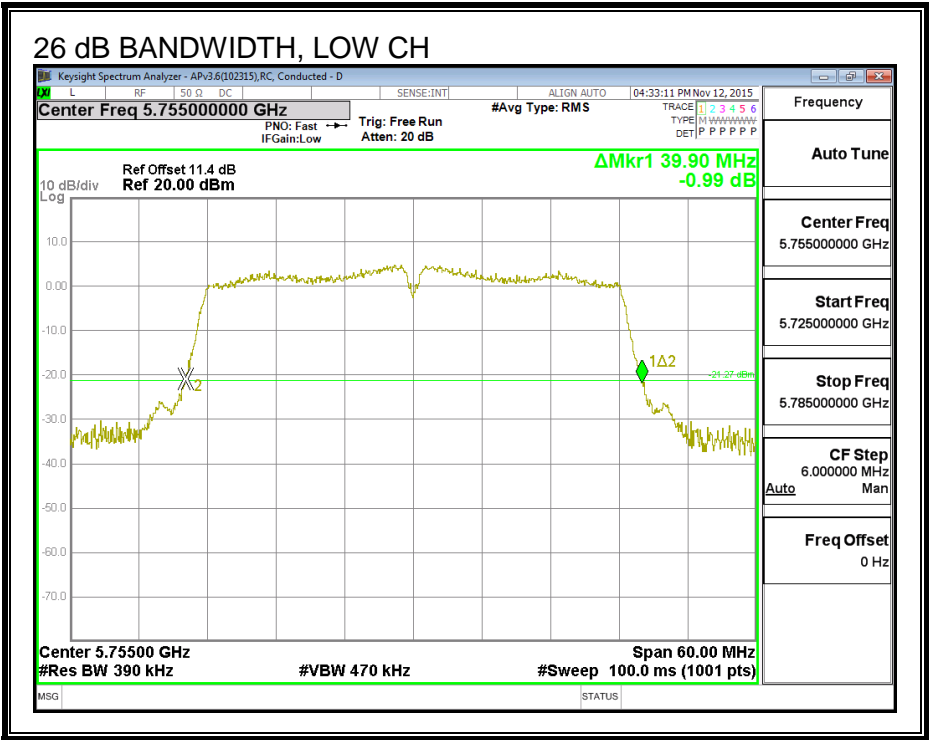
#### LIMITS

None, for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5755	39.90
High	5795	39.90

26 dB BANDWIDTH



### 8.3.3. 99% BANDWIDTH

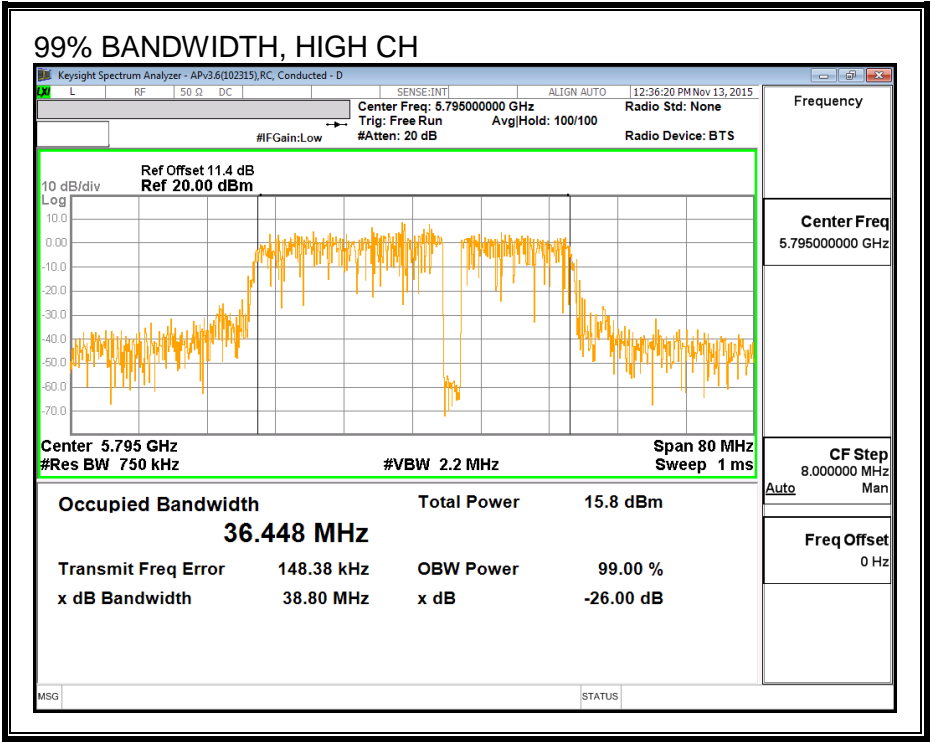
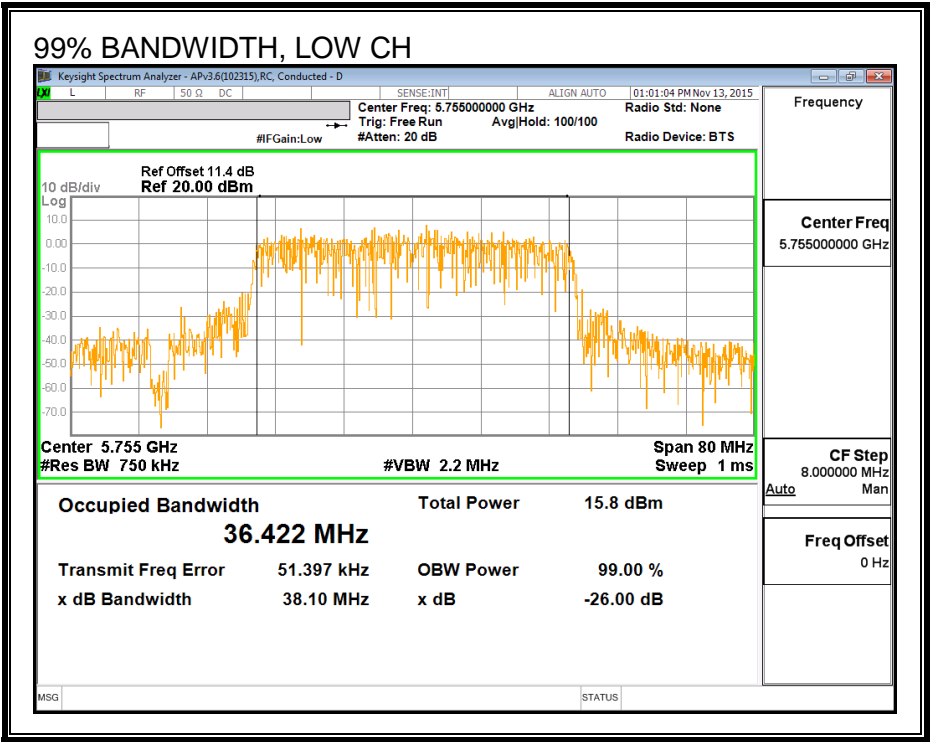
#### LIMITS

None; for reporting purposes only.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	36.422
High	5795	36.448

99% BANDWIDTH



### 8.3.4. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### Test Procedure

Measurements perform using a wideband gated RF power meter.

#### RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5755	11.43
High	5795	15.95

### **8.3.5. OUTPUT POWER**

#### **LIMITS**

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **Test Procedure**

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

#### **DIRECTIONAL ANTENNA GAIN**

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



## **RESULTS**

### **Antenna Gain and Limit**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Directional Gain (dBi)</b>	<b>Power Limit (dBm)</b>
Low	5755	4.21	30.00
High	5795	4.21	30.00

### **Output Power Results**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Meas Power (dBm)</b>	<b>Total Corr'd Power (dBm)</b>	<b>Power Limit (dBm)</b>	<b>Power Margin (dB)</b>
Low	5755	11.43	11.43	30.00	-18.57
High	5795	15.95	15.95	30.00	-14.05

### **8.3.6. PSD**

#### **LIMITS**

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **DIRECTIONAL ANTENNA GAIN**

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

## RESULTS

### Antenna Gain and Limits

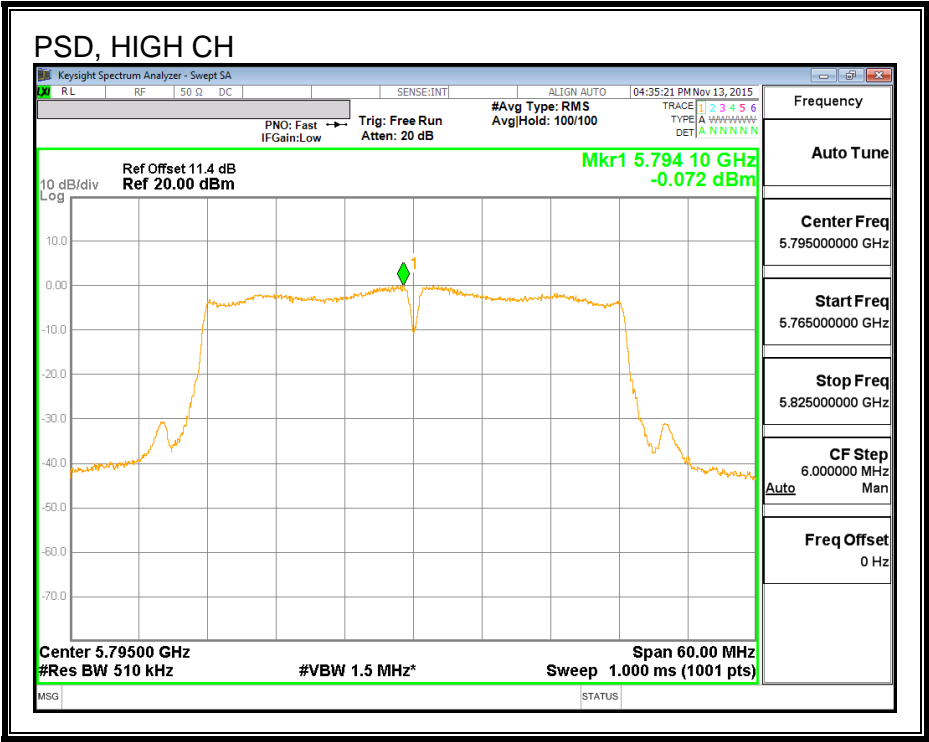
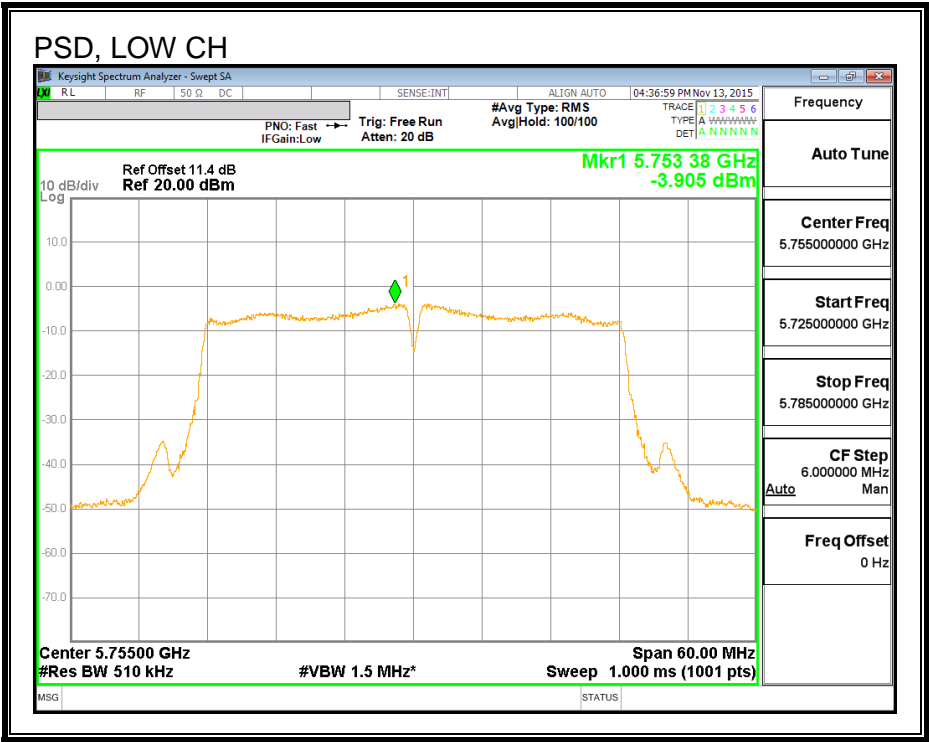
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5755	4.21	30.00
High	5795	4.21	30.00

Duty Cycle CF (dB)	0.13	Included in Calculations of Corr'd PSD
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### PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5755	-3.91	-3.78	30.00	-33.78
High	5795	-0.07	0.06	30.00	-29.94

PSD



## **8.4. 802.11n HT40 2Tx CDD MODE IN THE 5.8 GHz BAND**

### **8.4.1. 6 dB BANDWIDTH**

#### **LIMITS**

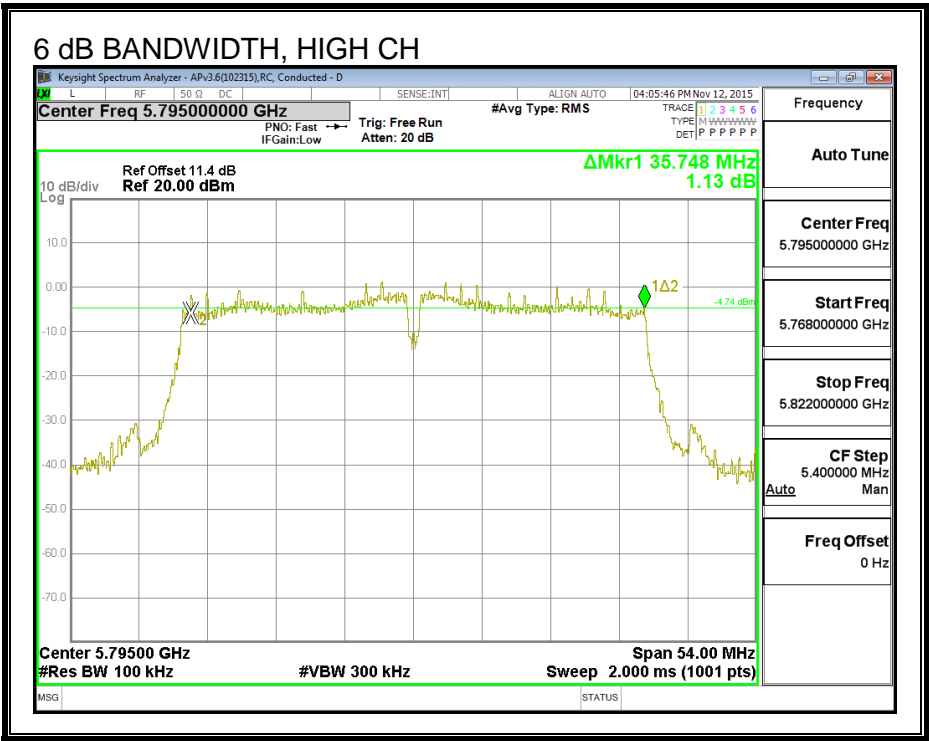
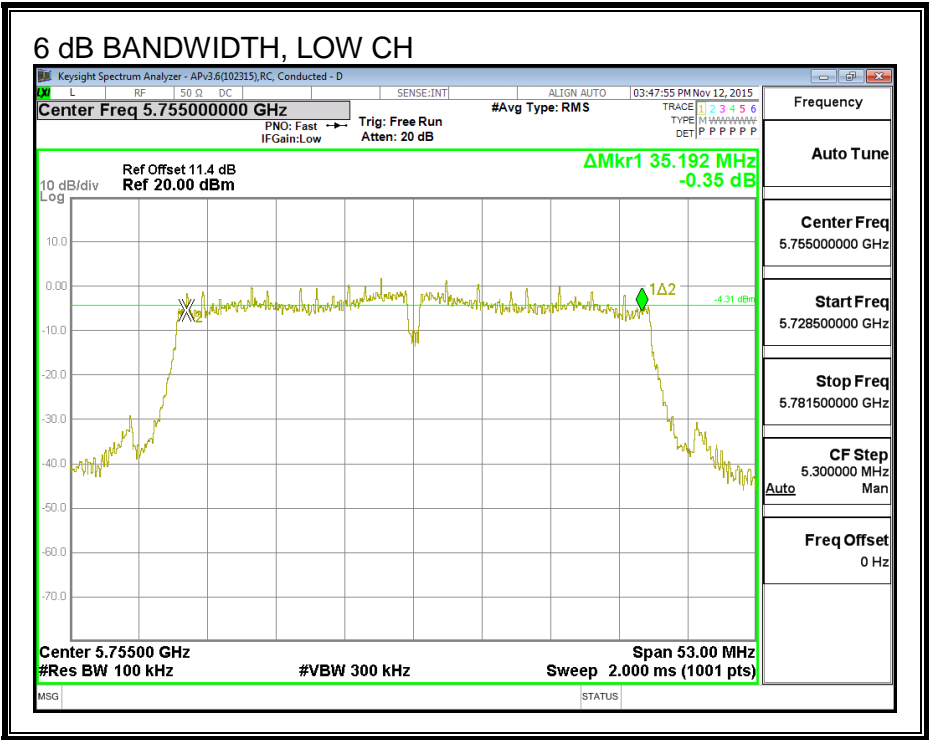
FCC §15.407 (e)

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

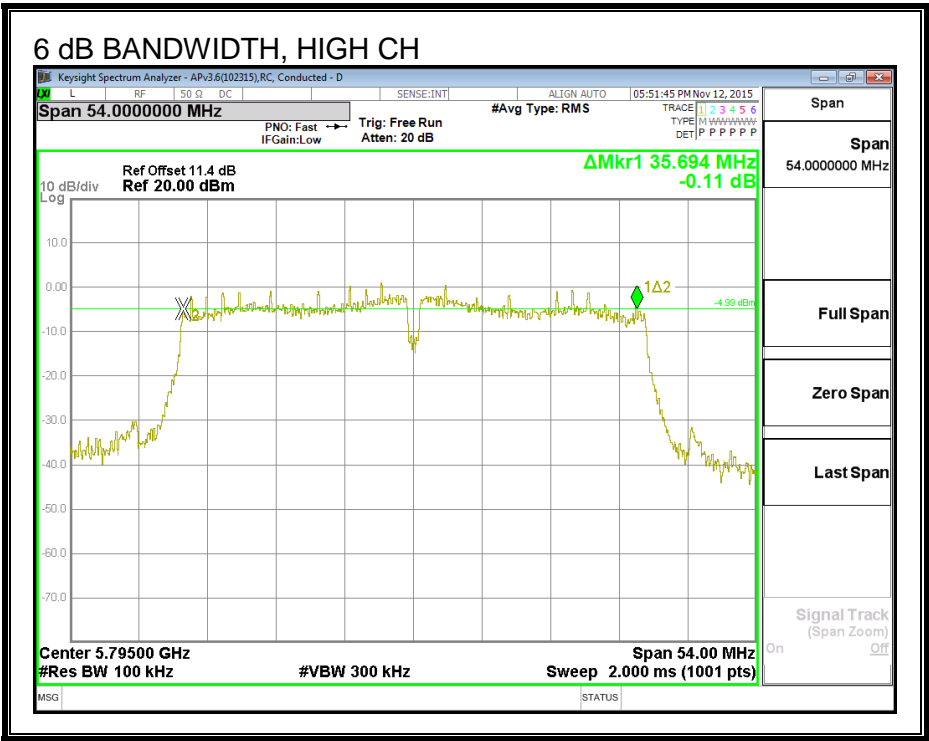
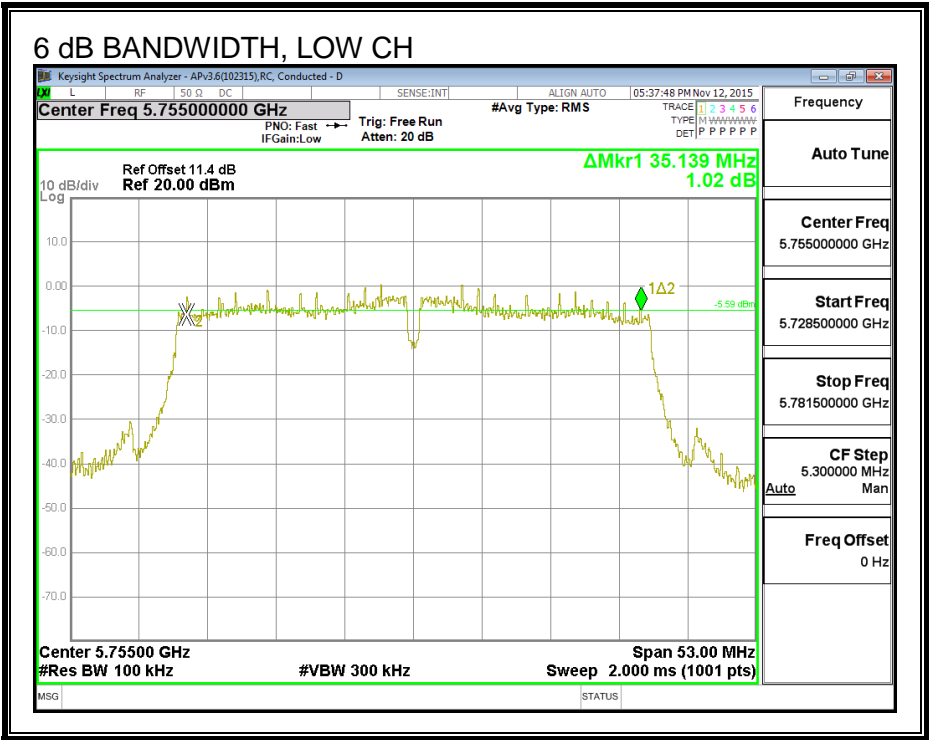
#### **RESULTS**

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	5755	35.192	35.139	0.5
High	5795	35.748	35.694	0.5

6 dB BANDWIDTH, CHAIN 0



6 dB BANDWIDTH, CHAIN 1



### 8.4.2. 26 dB BANDWIDTH

#### LIMITS

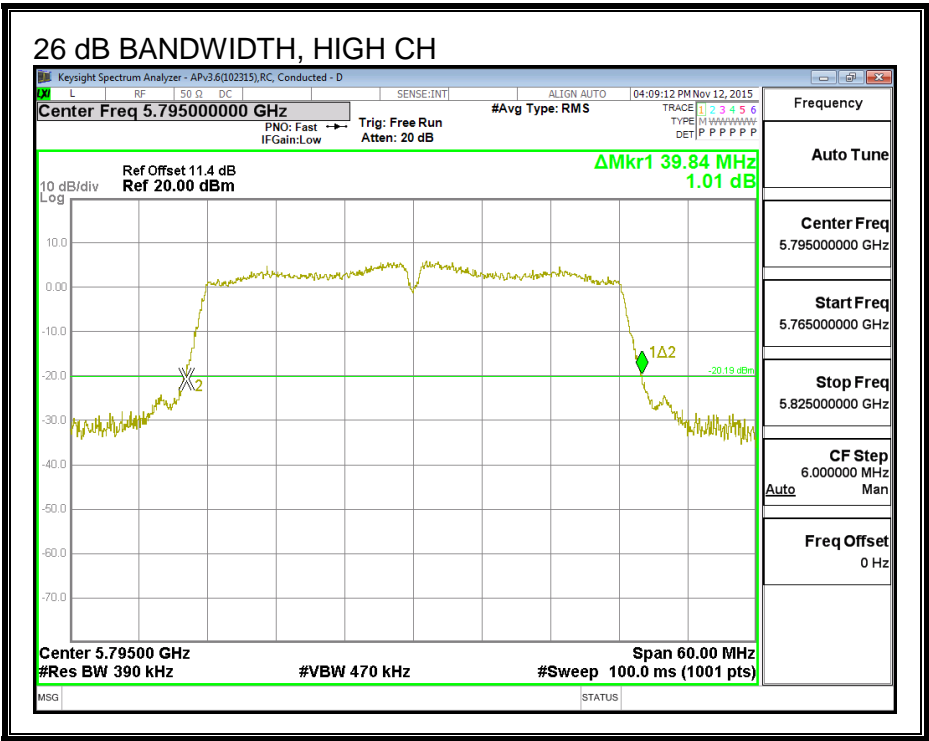
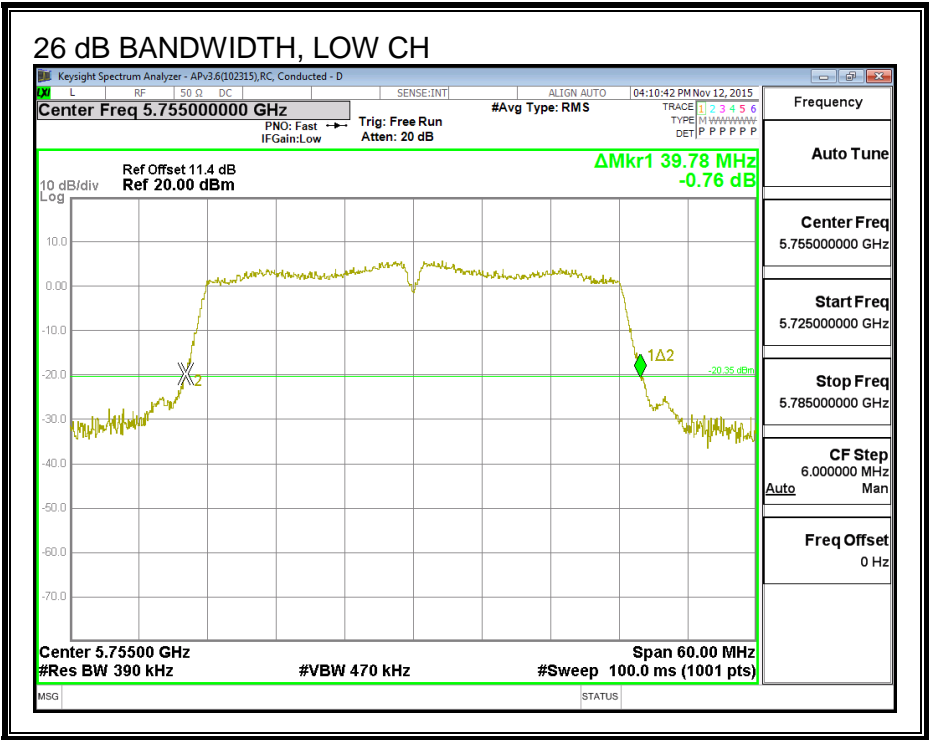
None, for reporting purposes only.

#### RESULTS

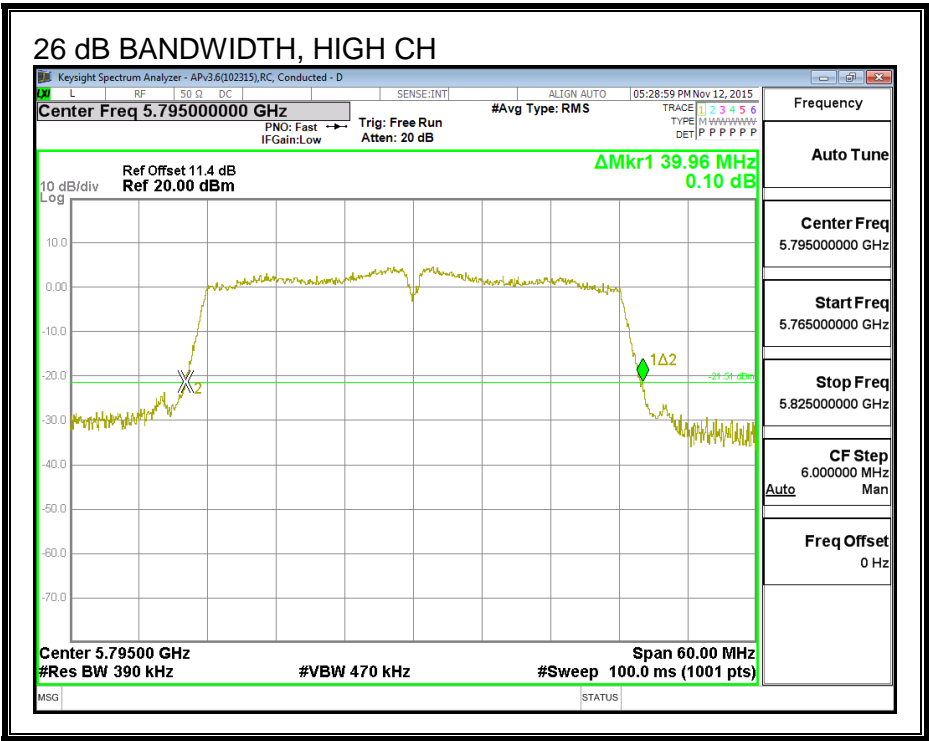
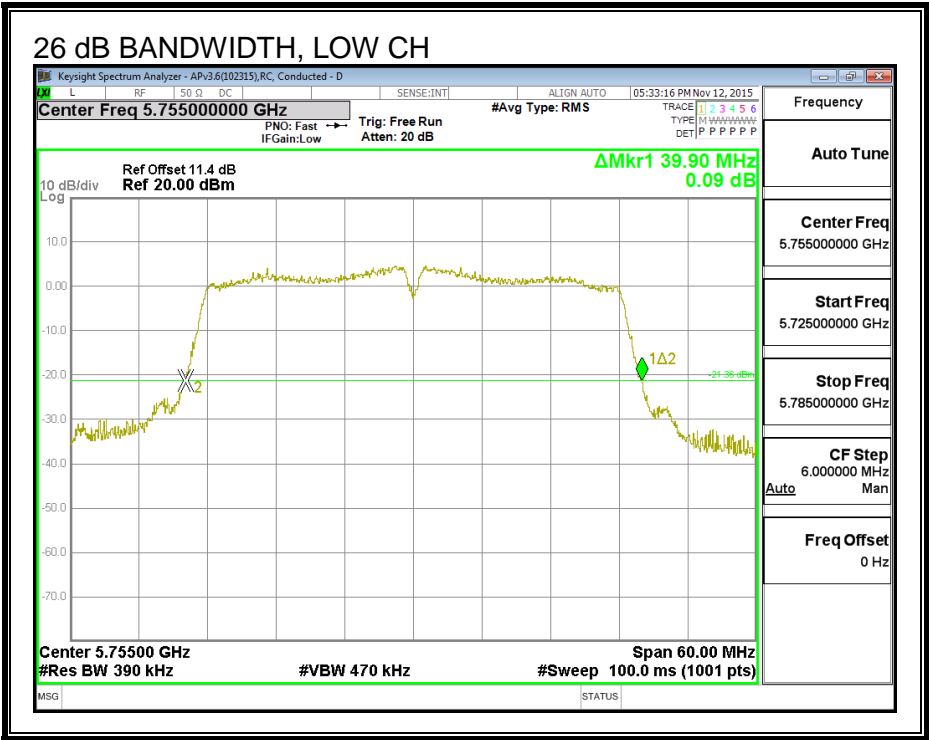
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5755	39.78	39.90
High	5795	39.84	39.96



26 dB BANDWIDTH, CHAIN 0



26 dB BANDWIDTH, CHAIN 1



### 8.4.3. 99% BANDWIDTH

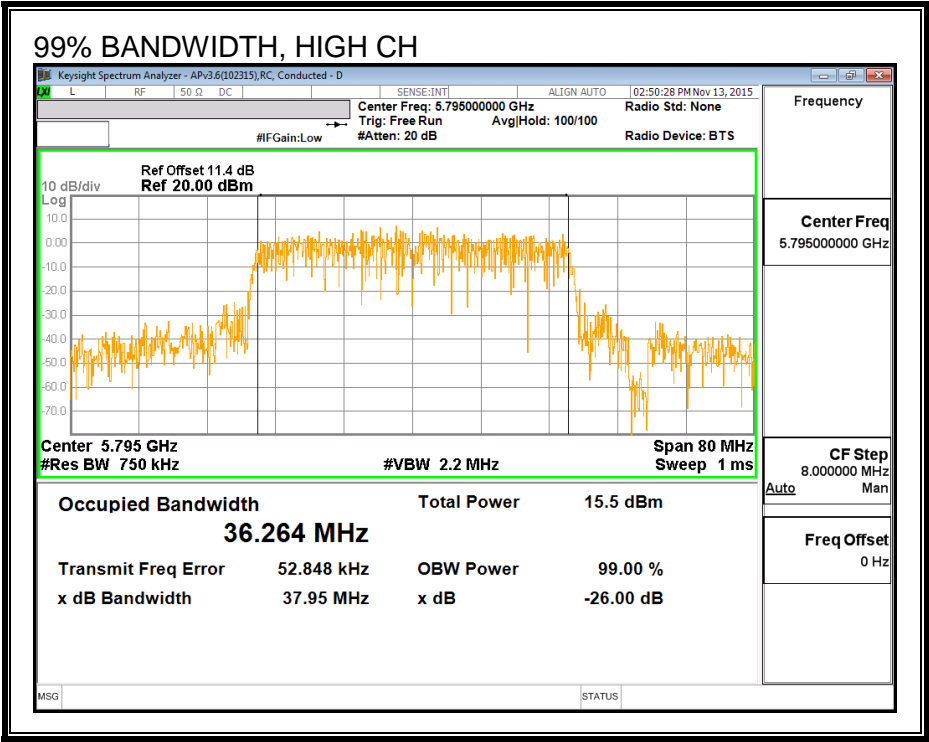
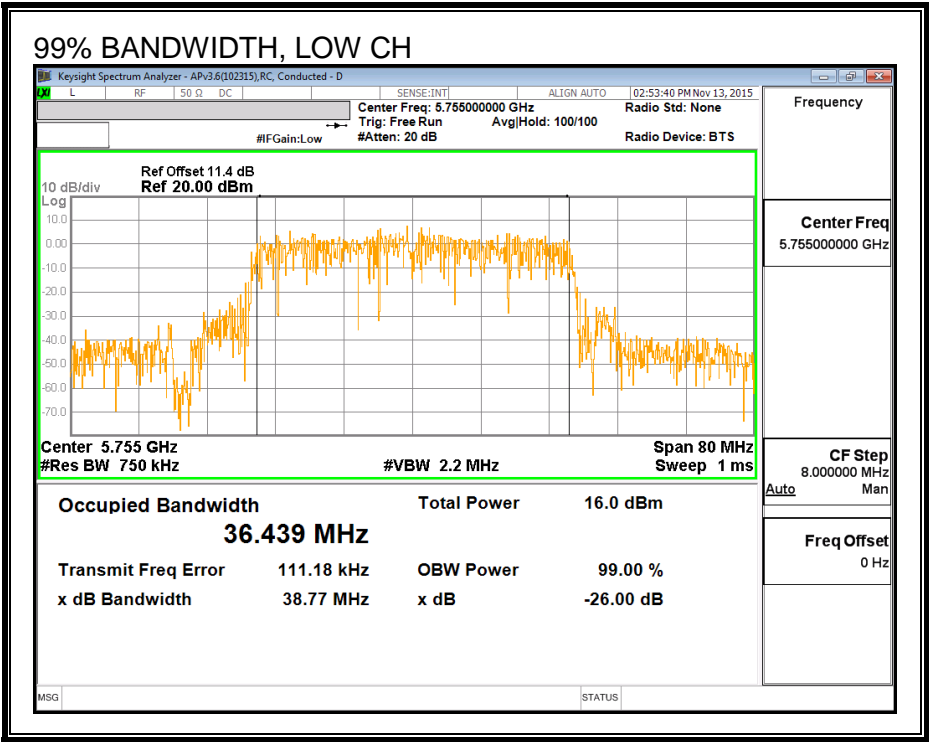
#### LIMITS

None; for reporting purposes only.

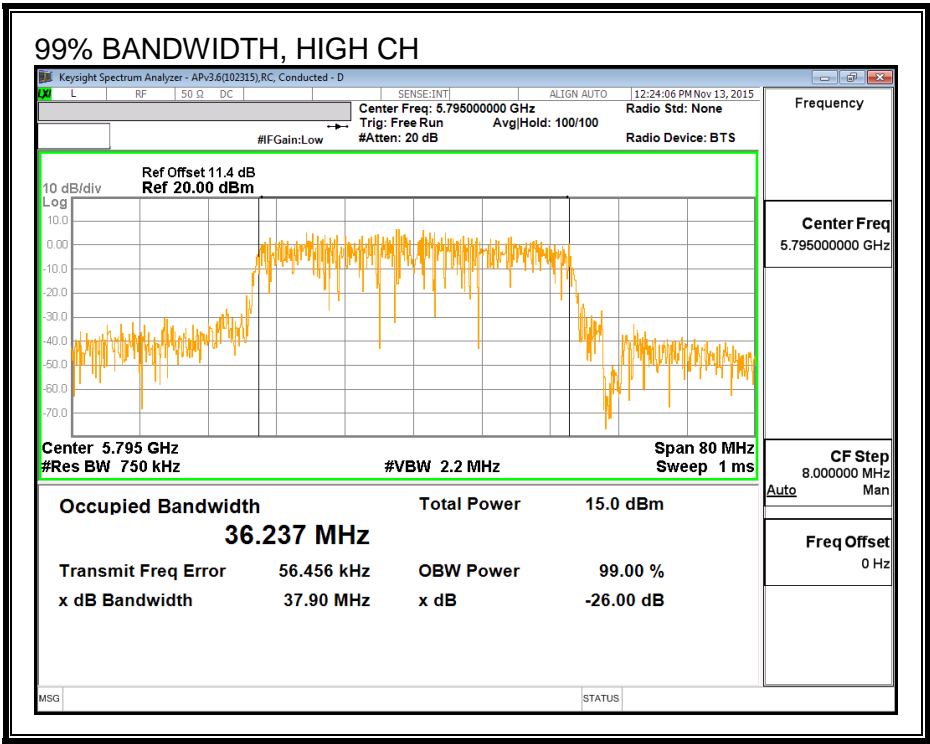
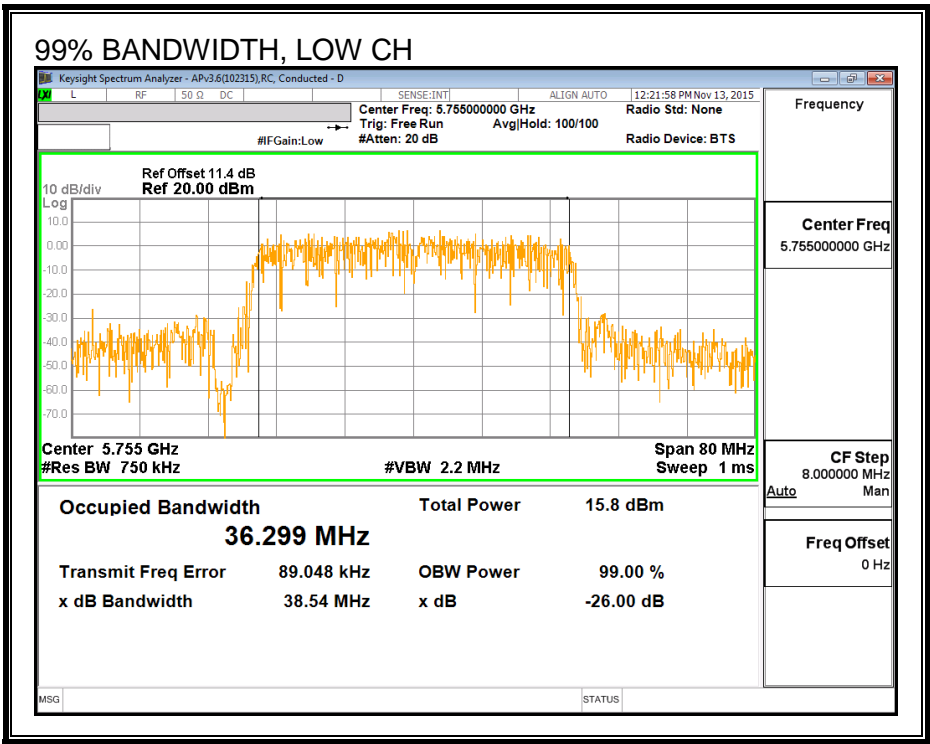
#### RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5755	36.439	36.299
High	5795	36.264	36.237

99% BANDWIDTH, CHAIN 0



99% BANDWIDTH, CHAIN 1



#### 8.4.4. AVERAGE POWER

##### LIMITS

None; for reporting purposes only.

##### Test Procedure

Measurements perform using a wideband gated RF power meter.

##### RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5755	10.71	10.53	13.63
High	5795	15.91	15.77	18.85

## 8.4.5. OUTPUT POWER

### LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### Test Procedure

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

### DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
4.21	3.92	4.07

## **RESULTS**

### **Antenna Gain and Limit**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Directional Gain (dBi)</b>	<b>Power Limit (dBm)</b>
Low	5755	4.07	30.00
High	5795	4.07	30.00

### **Output Power Results**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Chain 0 Meas Power (dBm)</b>	<b>Chain 1 Meas Power (dBm)</b>	<b>Total Corr'd Power (dBm)</b>	<b>Power Limit (dBm)</b>	<b>Power Margin (dB)</b>
Low	5755	10.71	10.53	13.63	30.00	-16.37
High	5795	15.91	15.77	18.85	30.00	-11.15



#### 8.4.6. PSD

##### LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

##### DIRECTIONAL ANTENNA GAIN

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

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
4.21	3.92	7.08

## RESULTS

### Antenna Gain and Limit

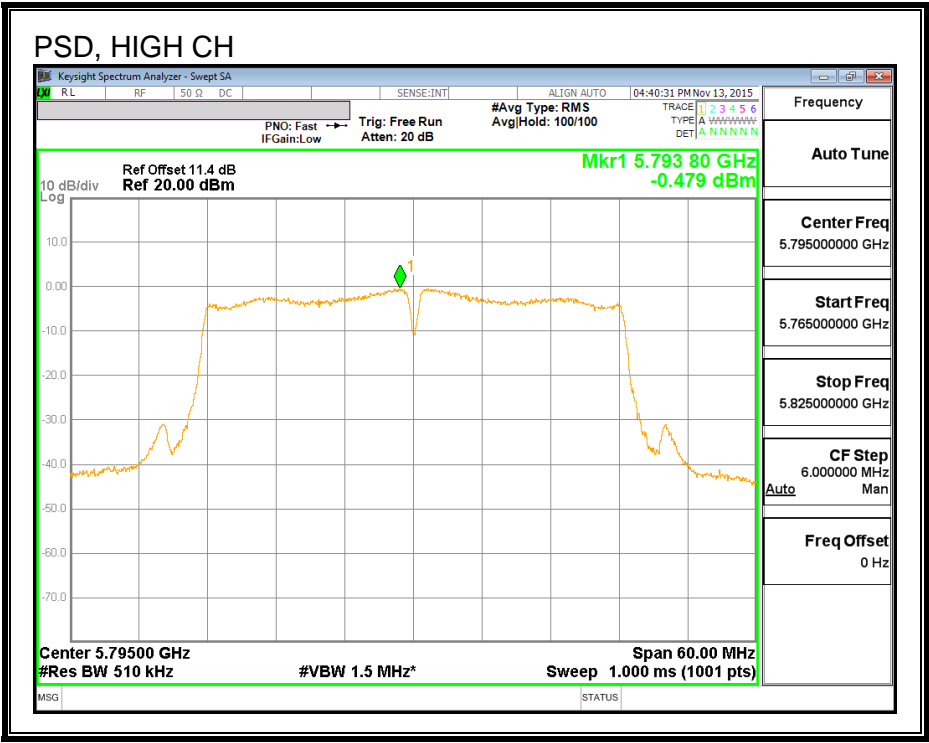
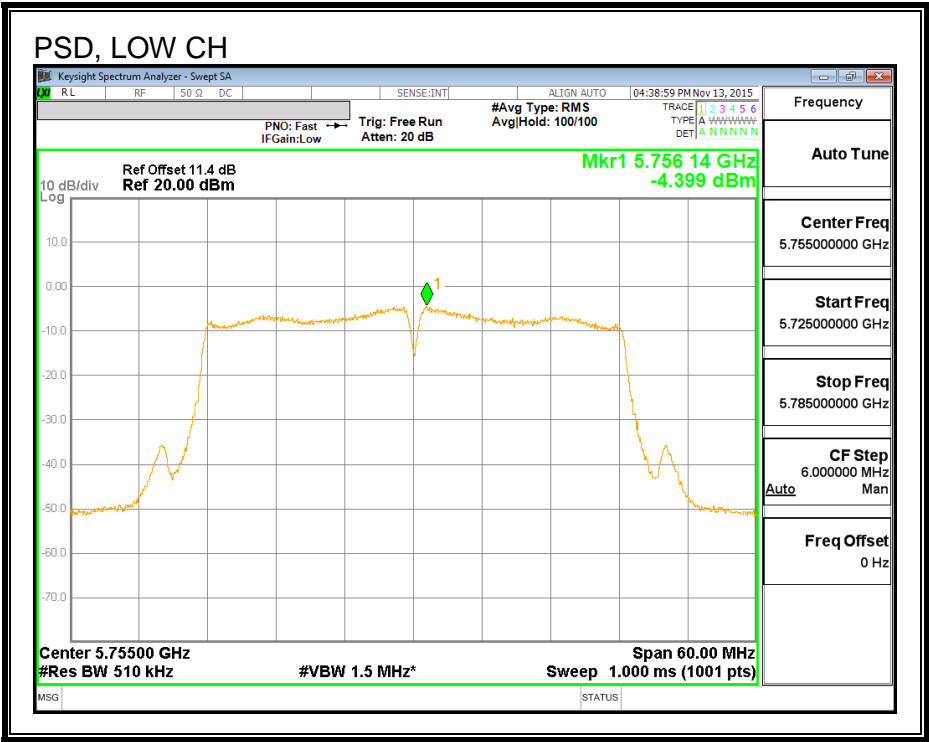
Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5755	7.08	28.92
High	5795	7.08	28.92

Duty Cycle CF (dB)	0.13	Included in Calculations of Corr'd PSD
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### 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	5755	-4.40	-4.83	-1.47	28.92	-30.39
High	5795	-0.48	-0.48	2.66	28.92	-26.26

PSD, CHAIN 0



PSD, CHAIN 1

