CERTIFICATION TEST REPORT

Report Number. : 16U23816-E4V4

Applicant	:	APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.
Model	:	A1671, A1821
FCC ID	:	BCGA1671
EUT Description	:	TABLET DEVICE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART E

Date Of Issue:
March 09, 2017

Prepared by:
UL Verification Services Inc.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	02/21/2017	Initial Issue	Chin Pang
V2	02/27/2017	Updated 5.3G antenna A to 4.11 & EUT description under the DFS Section antenna.	Joe Vang
V3	02/28/2017	Addressed TCB Questions	Francisco Guarnero
V4	03/09/2017	Addressed TCB Questions	Mengistu Mekuria

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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 DEVICE

MODEL: A1671, A1821

SERIAL NUMBER: DLXST016HPJQ (CONDUCTED); DLXST00NHPJQ (RADIATED)
DLXST013HPJQ (DFS)

DATE TESTED: NOVEMBER 28, 2016 – FEBRUARY 14, 2017

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:

CHIN PANG
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Prepared By:

JOE VANG
EMC WISE 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 v02/D03 v01r02/D06 v02/ D07 v02, FCC KDB 789033 D02 v01r03, FCC KDB 644545 D03 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
☐ Chamber A (IC:2324B-1)	☒ Chamber D (IC:2324B-4)
☐ Chamber B (IC:2324B-2)	☒ Chamber E (IC:2324B-5)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:2324B-6)
	☐ Chamber G (IC:2324B-7)
	☐ Chamber H (IC:2324B-8)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance,1000 to 18000 MHz	4.32 dB
Radiated Disturbance,18000 to 26000 MHz	4.45 dB
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, model number A1671, A1821 is a tablet with multimedia functions (music, application support, and video), Cellular GSM/GPRS/EGPRS/CDMA2000 1xRTT/1x Advanced/EVDO Rev.A/WCDMA /HSPA+/DC- HSDPA/LTE FDD & Carrier Aggregation/TDD/TD-SCDMA radio, IEEE 802.11a/b/g/n/ac radio, and Bluetooth radio. The rechargeable battery is not user accessible.

5.2. DESCRIPTION OF MODELS DIFFERENCES

Both Model A1671 and A1821 have identical PCB layout, design and functionality, except that A1671 supports second electronic-UICC based SIM or "soft SIM" (called eSIM) beside the regular UICC based SIM and A1821 will come with eSIM removed. RF and electromagnetic characteristic are independent of the eSIM element. Both Models have exactly same technology and band support. Model A1671 is used for EMC/RSE Testing and that data will be used for both Models

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum average conducted output power as follows:
NOTE: Covered modes are test reduction modes. The output powers on the "covered modes are equal to or less than the mode referenced and use the same modulation.

5.2GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	16.96	49.66
	802.11a 2TX CDD	Covered by 802.11n HT20 2TX CDD	
	802.11n HT20 2TX CDD	18.45	69.98
	802.11n HT20 2TX STBC	19.52	89.54
	802.11ac VHT20 2TX STBC	Covered by 802.11n HT20 2TX CDD	
	802.11n HT20 2TX SDM	Covered by 802.11n HT20 2TX CDD	
	802.11ac VHT20 2TX SDM	Covered by 802.11n HT20 2TX CDD	
5190 - 5230	802.11n HT40 SISO	16.92	49.20
	802.11n HT40 2TX CDD	19.46	88.31
	802.11n HT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
	802.11ac VHT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
	802.11n HT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
	802.11ac VHT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
5210	802.11ac VHT80 SISO	13.45	22.13
	802.11ac VHT80 2TX CDD	14.96	31.33
	802.11ac VHT80 2TX STBC	Covered by 802.11ac VHT80 2TX CDD	
	802.11ac VHT80 2TX SDM	Covered by 802.11ac VHT80 2TX CDD	

5.3GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5260 - 5320	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	15.98	39.63
	802.11a 2TX CDD	Covered by 802.11n HT20 2TX CDD	
	802.11n HT20 2TX CDD	17.97	62.66
	802.11n HT20 2TX STBC	18.99	79.25
	802.11ac VHT20 2TX STBC	Covered by 802.11n HT20 2TX STBC	
	802.11n HT20 2TX SDM	Covered by 802.11n HT20 2TX STBC	
	802.11ac VHT20 2TX SDM	Covered by 802.11n HT20 2TX STBC	
5270 - 5310	802.11n HT40 SISO	15.90	38.90
	802.11n HT40 2TX CDD	18.96	78.70
	802.11n HT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
	802.11ac VHT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
	802.11n HT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
	802.11ac VHT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
5290	802.11ac VHT80 SISO	13.48	22.28
	802.11ac VHT80 2TX CDD	14.49	28.12
	802.11ac VHT80 2TX STBC	Covered by 802.11ac VHT80 2TX CDD	
	802.11ac VHT80 2TX SDM	Covered by 802.11ac VHT80 2TX CDD	

5.6GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5500 - 5700	802.11a	Covered by 802.11n HT20 SISO	
5500 - 5700	802.11n HT20 SISO	14.98	31.48
5720	802.11ac VHT20 SISO (based on UNII-2C band output power)	12.46	17.62
5500 - 5700	802.11a 2TX CDD	Covered by 802.11n HT20 2TX CDD	
5500 - 5700	802.11n HT20 2TX CDD	16.98	49.89
5720	802.11ac VHT20 2TX CDD (based on UNII-2C band output power)	14.55	28.51
5500 - 5700	802.11n HT20 2TX STBC	18.00	63.10
5720	802.11ac VHT20 2TX STBC (based on UNII-2C band output power)	16.89	48.87
5500 - 5700	802.11n HT20 2TX SDM	Covered by 802.11n HT20 2TX STBC	
5720	802.11ac VHT20 2TX SDM (based on UNII-2C band output power)	Covered by 802.11n HT20 2TX STBC	
5510 - 5670	802.11n HT40 SISO	14.96	31.33
5710	802.11ac VHT40 SISO (based on UNII-2C band output power)	13.15	20.65
5510 - 5670	802.11n HT40 2TX CDD	17.98	62.81
5710	802.11ac VHT40 2TX CDD (based on UNII-2C band output power)	16.14	41.11
5510 - 5670	802.11n HT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
5710	802.11ac VHT40 2TX STBC (based on UNII-2C band output power)	Covered by 802.11n HT40 2TX CDD	
5510 - 5670	802.11n HT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
5710	802.11ac VHT40 2TX SDM (based on UNII-2C band output power)	Covered by 802.11n HT40 2TX CDD	
5530-5610	802.11ac VHT80 SISO	14.99	31.55
5690	802.11ac VHT80 SISO (based on UNII-2C band output power)	13.65	23.17
5530-5610	802.11ac VHT80 2TX CDD	17.97	62.66
5690	802.11ac VHT80 2TX CDD (based on UNII-2C band output power)	16.63	46.03
5530-5610	802.11ac VHT80 2TX STBC	Covered by 802.11ac VHT80 2TX CDD	
5690	802.11ac VHT80 2TX STBC(based on UNII-2C band output power)	Covered by 802.11ac VHT80 2TX CDD	
5530-5610	802.11ac VHT80 2TX SDM	Covered by 802.11ac VHT80 2TX CDD	

5.8GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	15.49	35.40
	802.11a 2TX CDD	Covered by 802.11n HT20 2TX CDD	
	802.11n HT20 2TX CDD	18.25	66.83
	802.11n HT20 2TX STBC	18.24	66.68
	802.11ac VHT20 2TX STBC	Covered by 802.11n HT20 2TX STBC	
	802.11n HT20 2TX SDM	Covered by 802.11n HT20 2TX STBC	
	802.11ac VHT20 2TX SDM	Covered by 802.11n HT20 2TX STBC	
5755 - 5795	802.11n HT40 SISO	15.49	35.40
	802.11n HT40 2TX CDD	18.23	66.53
	802.11n HT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
	802.11ac VHT40 2TX STBC	Covered by 802.11n HT40 2TX CDD	
	802.11n HT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
	802.11ac VHT40 2TX SDM	Covered by 802.11n HT40 2TX CDD	
5775	802.11ac VHT80 SISO	15.49	35.40
	802.11ac VHT80 2TX CDD	18.24	66.68
	802.11ac VHT80 2TX STBC	Covered by 802.11ac VHT80 2TX CDD	
	802.11ac VHT80 2TX SDM	Covered by 802.11ac VHT80 2TX CDD	

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain (dBi)	
	Antenna A (WF1)	Antenna B(WF2)
5.2	3.48	3.33
5.3	4.11	3.36
5.5	5.41	5.17
5.8	4.20	4.32

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 14E232.

5.6. WORST-CASE CONFIGURATION AND MODE

For radiated harmonics spurious below 1GHz, 18-40GHz and power line conducted emissions were performed with the EUT set at the CDD or STBC mode at highest power setting among the CDD/STBC/SDM modes as worst-case scenario.

The output power for PSD and spurious tests was set higher than maximum for the purposes of testing only.

For SISO modes, there are two transmission antennas. The antenna used in any given time can be either Antenna A, or Antenna B. All antenna ports have the same power; output power and PSD measurement for SISO modes on both antennas are reported. For 2TX MIMO modes, Antenna A/Antenna B, used at the same time.

The fundamental of the EUT was investigated in three orthogonal orientations X (Flatbed), Y (Landscape), Z (Portrait), it was determined that (see table below) was worst-case orientations. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency Band (GHz)	Mode	Antenna Port	Worst-case Orientation
5.2-5.8	1TX SISO	Antenna A	Z (Portrait)
		Antenna B	Z (Portrait)
	2TX MIMO	Antenna A + Antenna B	Z (Portrait)

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

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

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

802.11 ac VHT20 and VHT40 are covered by 802.11n HT20 and HT40 measurement data.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

For simultaneous transmission of multiple channels from the same antenna in BT/BLE and WLAN 5 GHz bands. Baseline testing was performed on various configurations to determine the worst case on radiated emissions.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	A1286	730374GJAGW	N/A
Laptop AC/DC adapter	Apple	A1343	NA	N/A
Earphone	Apple	NA	NA	N/A
EUT AC/DC adapter	Apple	A1357	W010A051	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	2	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 (RADAITED BELOW 1 GHZ / 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	2	N/A

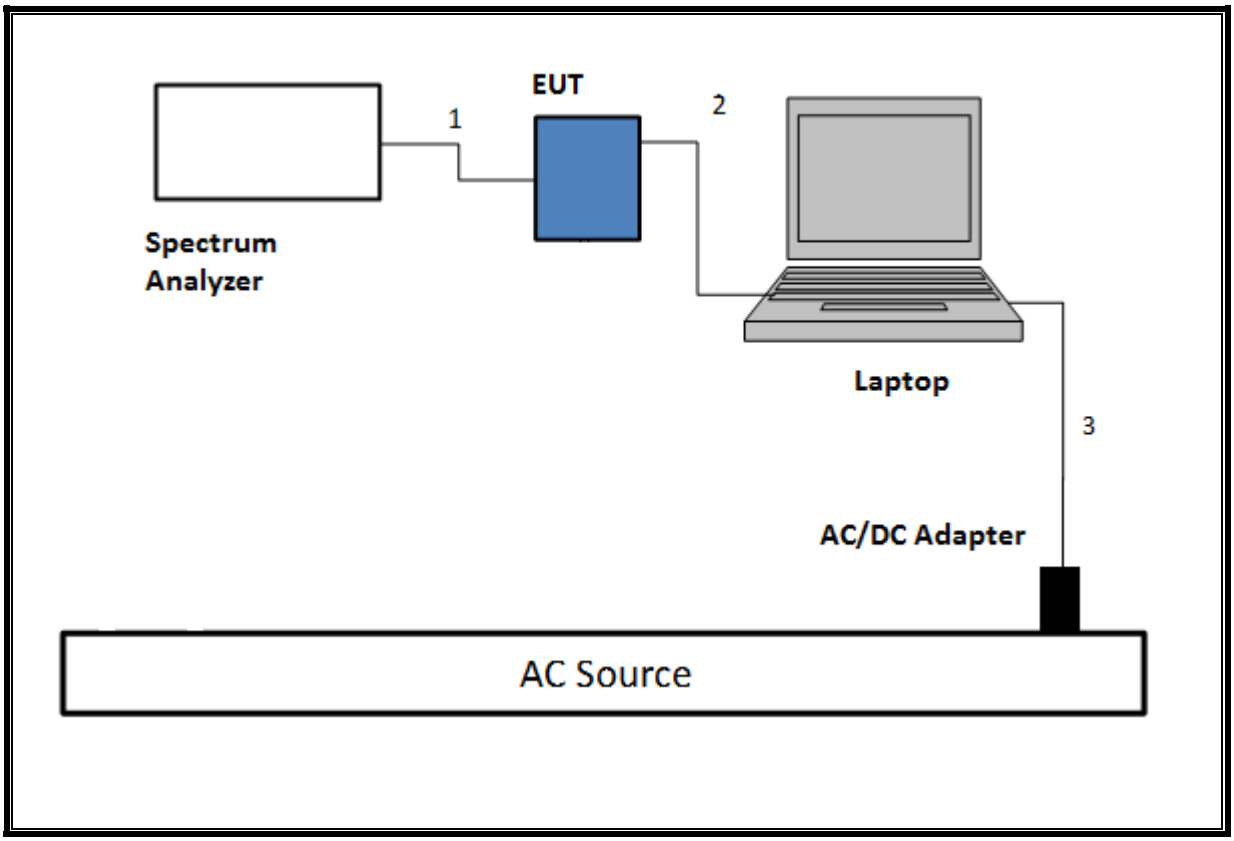
I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)

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	2	N/A

TEST SETUP - CONDUCTED TESTS

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

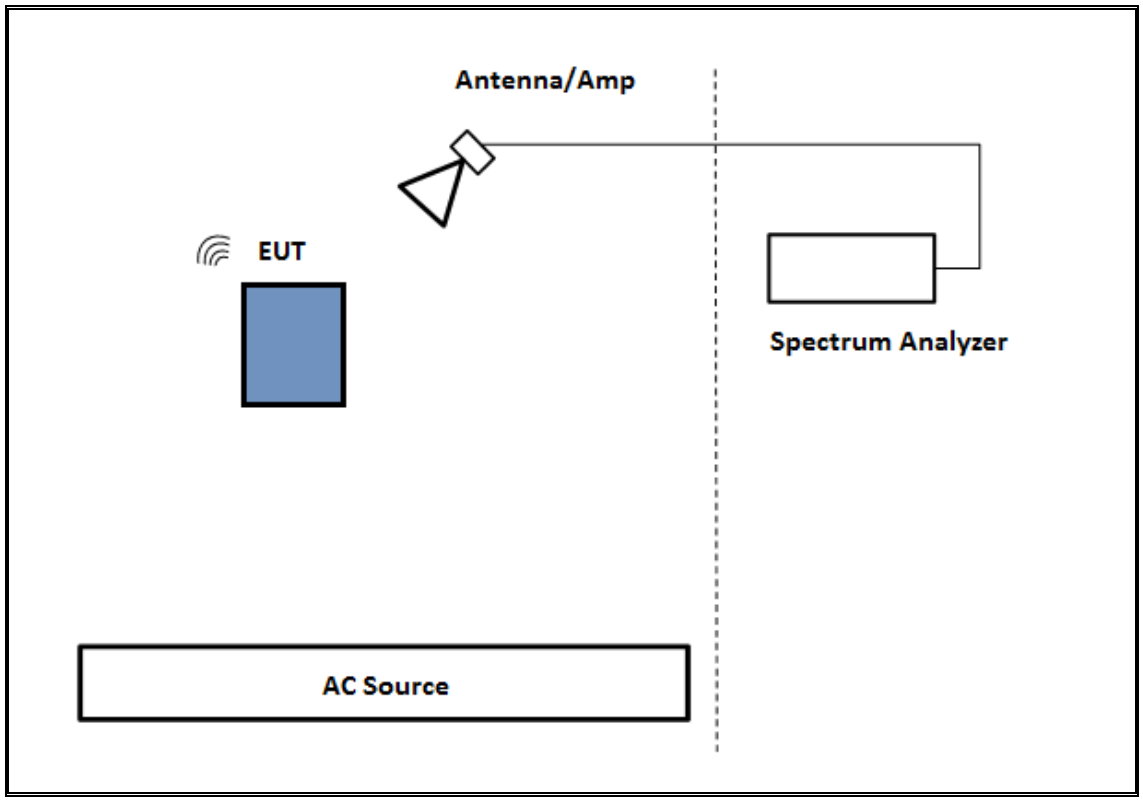
SETUP DIAGRAM



TEST SETUP- RADIATED-ABOVE 1 GHZ

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

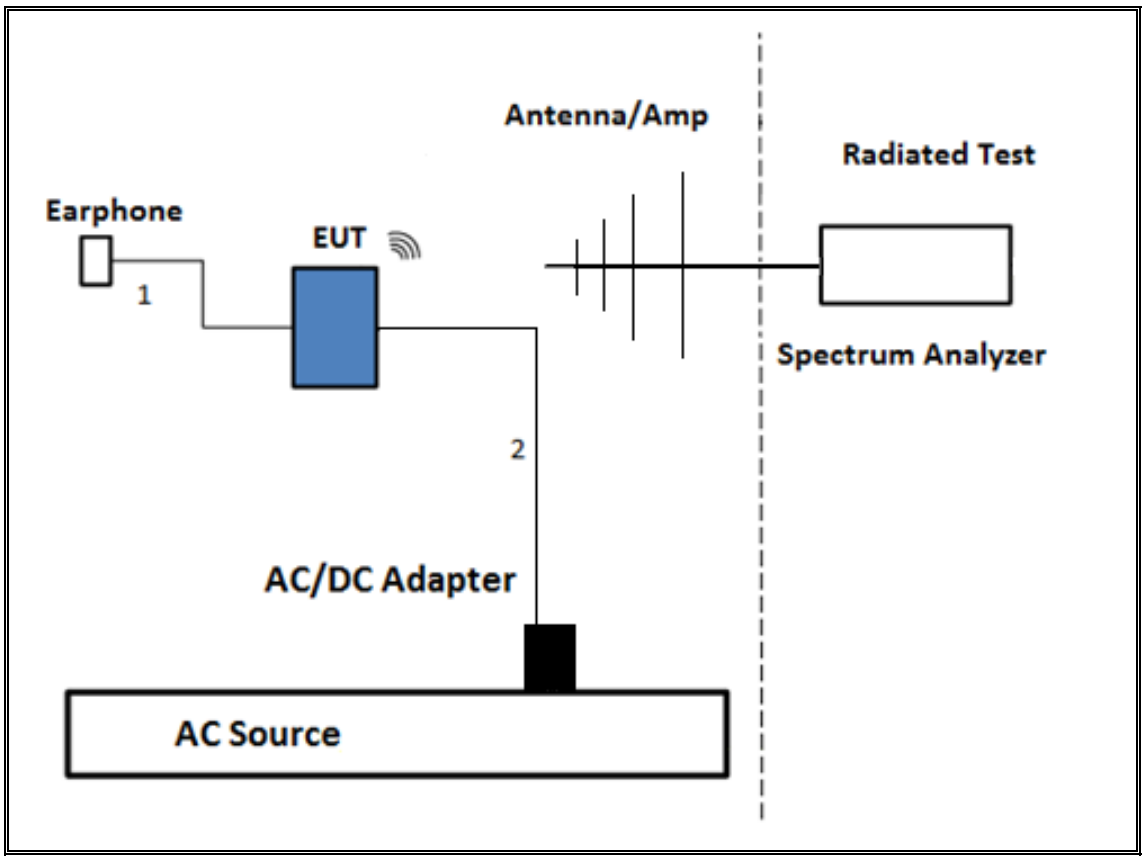
SETUP DIAGRAM



TEST SETUP- BELOW 1GHz

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

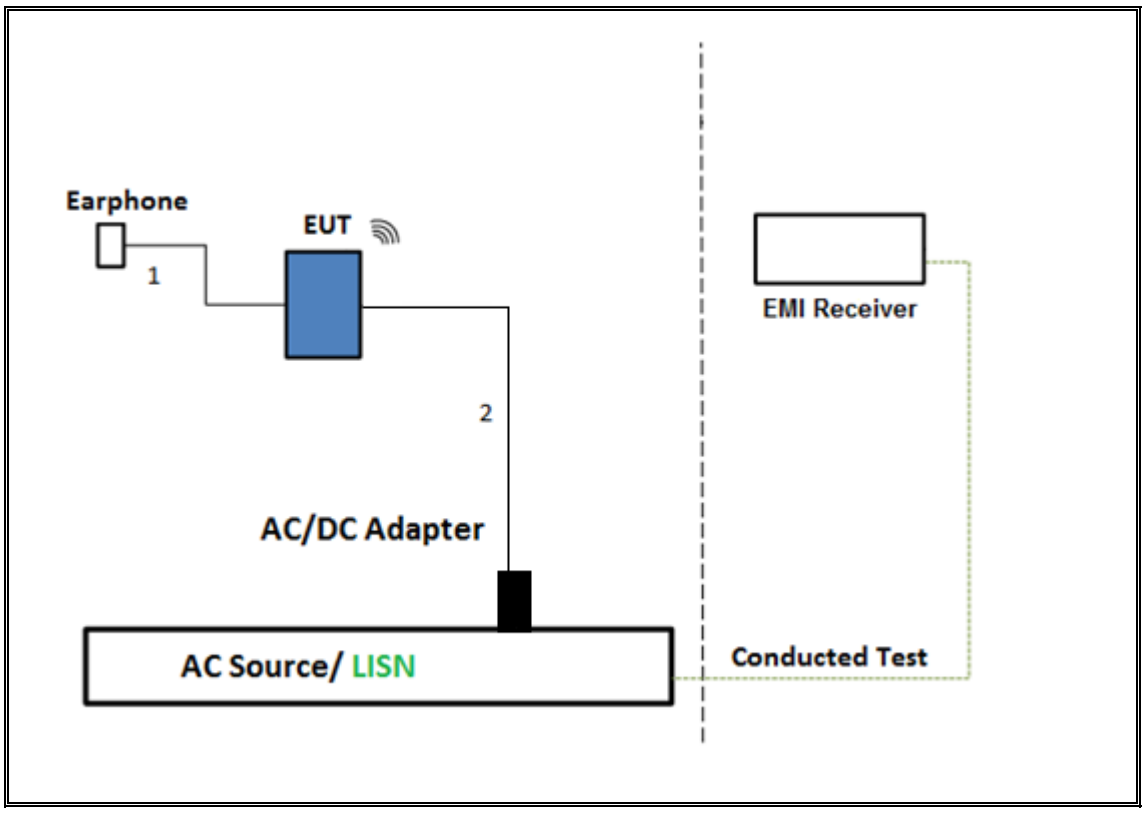
SETUP DIAGRAM



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.

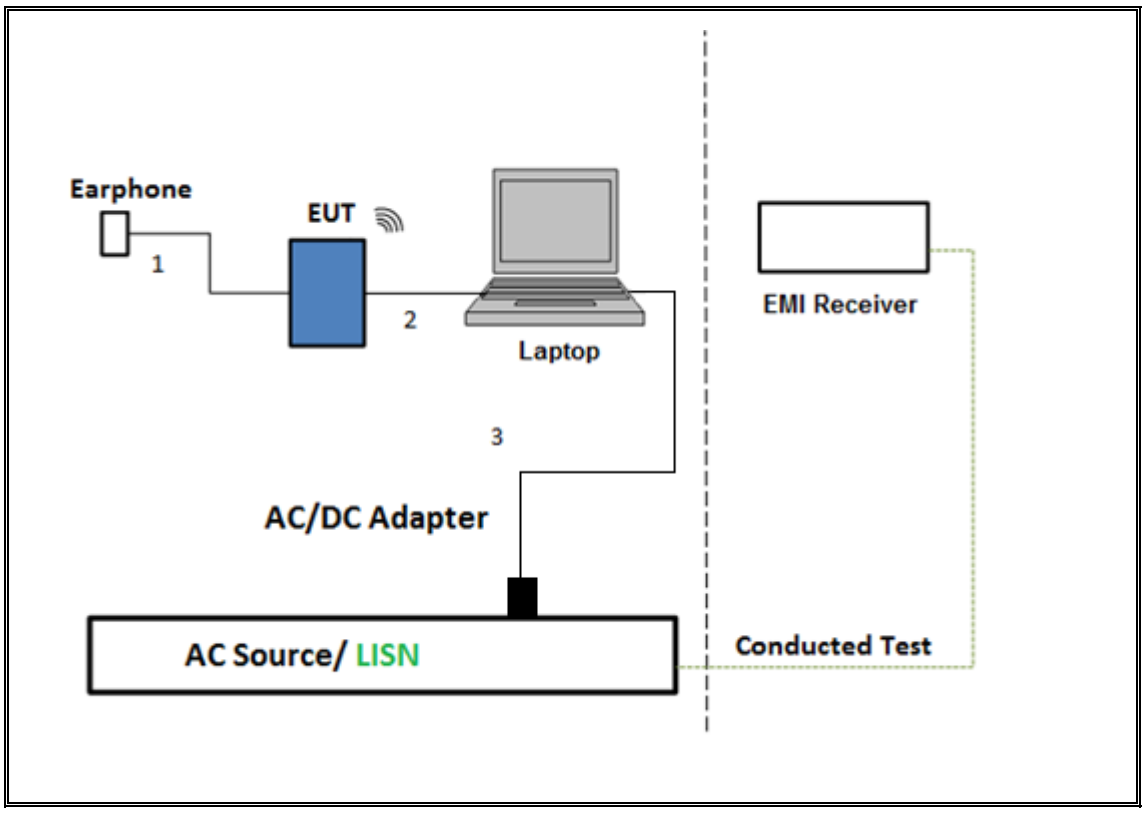
SETUP DIAGRAM



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**
Power Meter, P-series single channel	Agilent	N1911A	T227	10/11/2017
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	T1228	06/20/2017
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T344	02/22/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T407	04/04/2017
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T740	11/29/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma Instrument	310	T286	05/04/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T905	06/21/2017
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T346	02/22/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T408	11/10/2017
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T1131	09/23/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma Instrument	310	T285	06/20/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T459	06/13/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1210	06/30/2017
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	06/16/2017
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	T402	07/05/2017
Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640/B	T446	05/25/2017
Amplifier, 26.5GHz to 40GHz	Miteq	NSP 4000 SP2	T88	04/07/2017
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	12/19/2016
* LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/08/2017
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016	
Conducted Software	UL	UL EMC	Ver 5.4, October 13, 2016	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 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

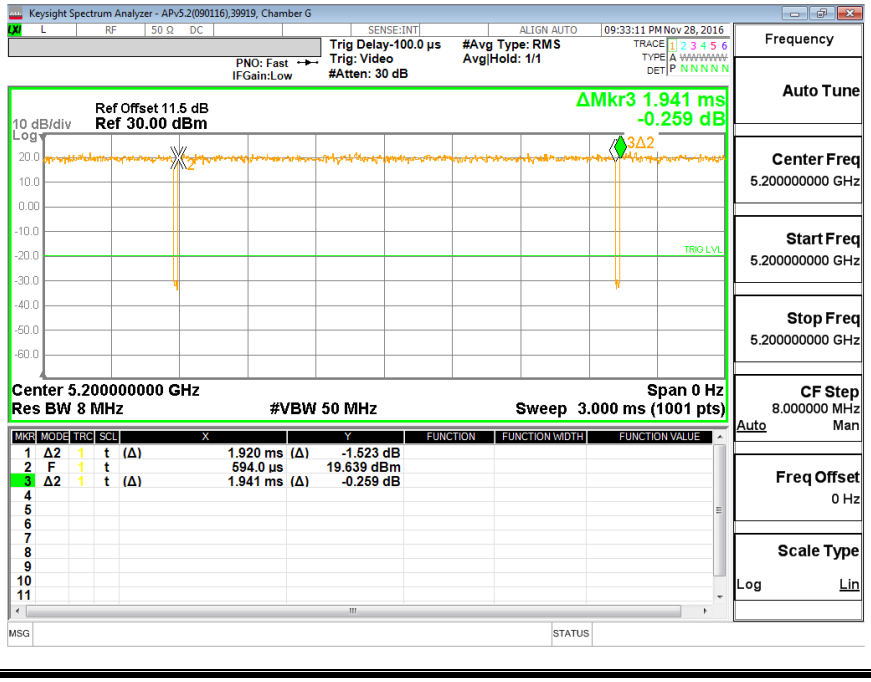
KDB 789033 Zero-Span Spectrum Analyzer Method.

RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11n HT20 1TX	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT20 CDD 2TX	1.920	1.944	0.988	98.77%	0.00	0.010
802.11n HT40 1TX	0.942	0.966	0.975	97.52%	0.11	1.062
802.11n HT40 CDD 2TX	0.945	0.966	0.978	97.77%	0.10	1.059
802.11ac VHT80 1TX	0.459	0.481	0.954	95.43%	0.20	2.179
802.11ac VHT80 CDD 2TX	0.459	0.482	0.952	95.23%	0.21	2.179

DUTY CYCLE PLOTS

DUTY CYCLE 802.11n HT20 1TX MODE

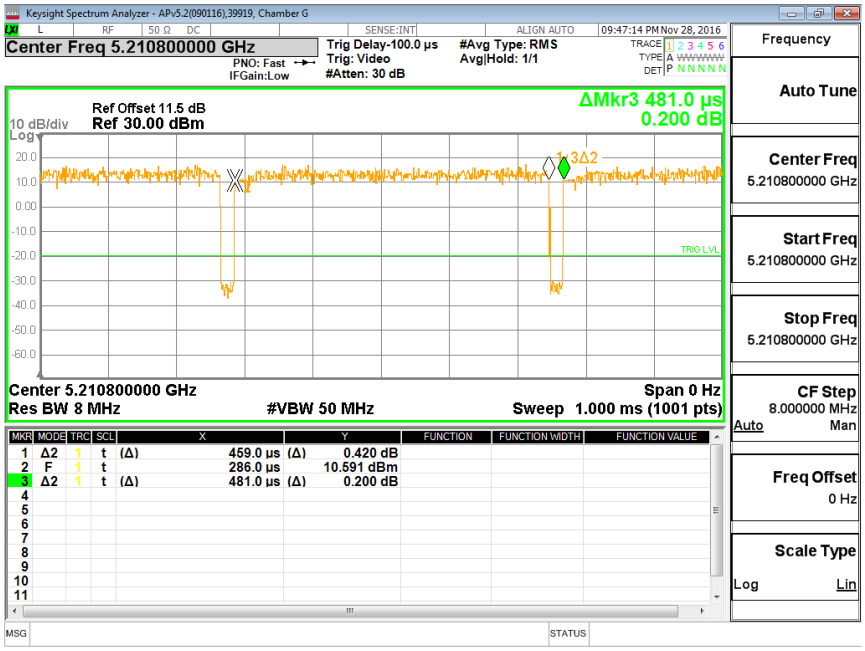


DUTY CYCLE 802.11n HT20 CDD 2TX MODE

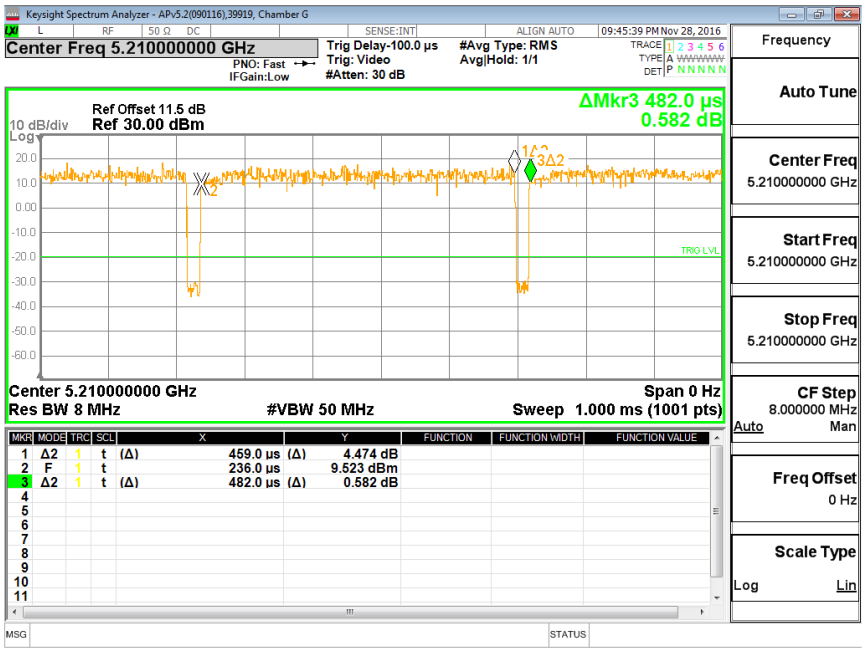
DUTY CYCLE 802.11n HT40 1TX MODE

DUTY CYCLE 802.11n HT40 CDD 2TX MODE

DUTY CYCLE 802.11ac VHT80 1TX MODE



DUTY CYCLE 802.11ac VHT80 CDD 2TX MODE



7.2. MEASUREMENT METHODS

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

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

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

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

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

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

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

8. ANTENNA PORT TEST RESULTS

8.1. 802.11n HT20 Antenna A MODE IN THE 5.2 GHz BAND

8.1.1. 26 dB BANDWIDTH

LIMITS

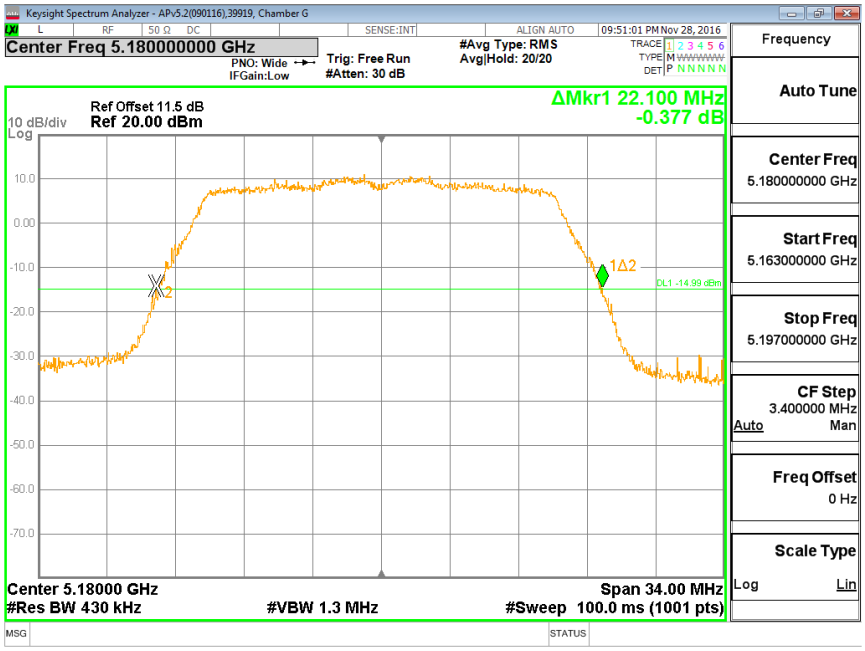
None; for reporting purposes only.

RESULTS

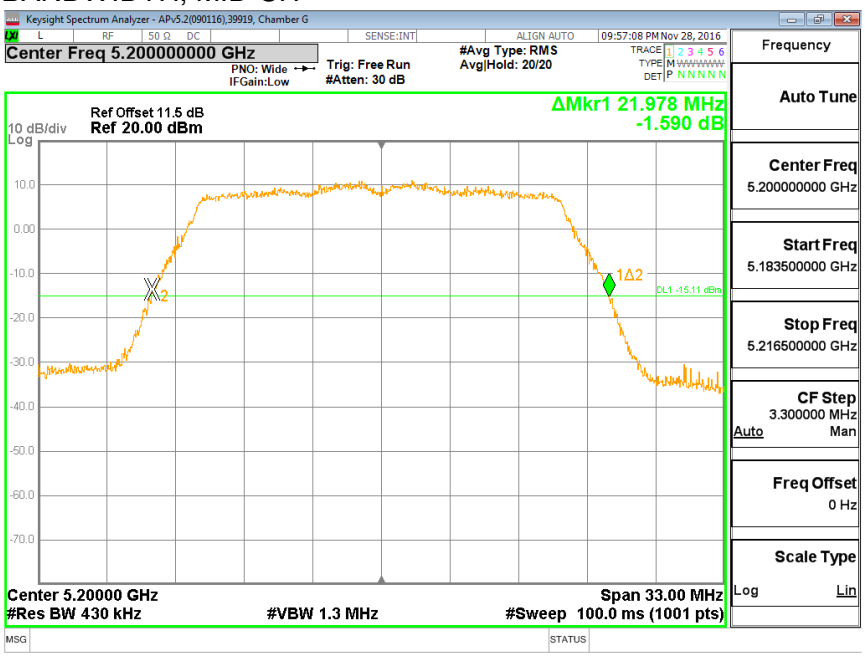
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	22.100
Mid	5200	21.978
High	5240	22.100

26 dB BANDWIDTH

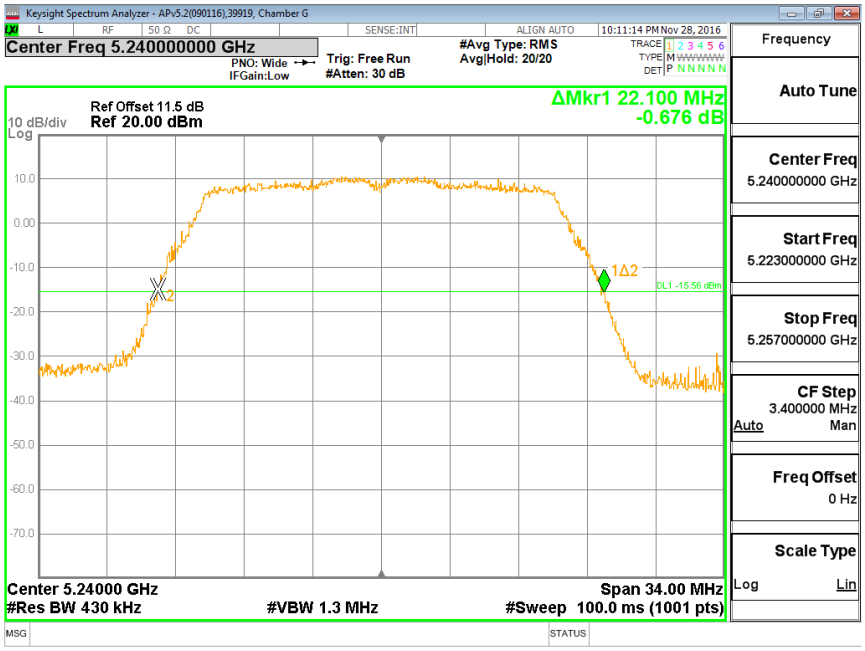
BANDWIDTH, LOW CH



BANDWIDTH, MID CH



BANDWIDTH, HIGH CH



8.1.2. 99% BANDWIDTH

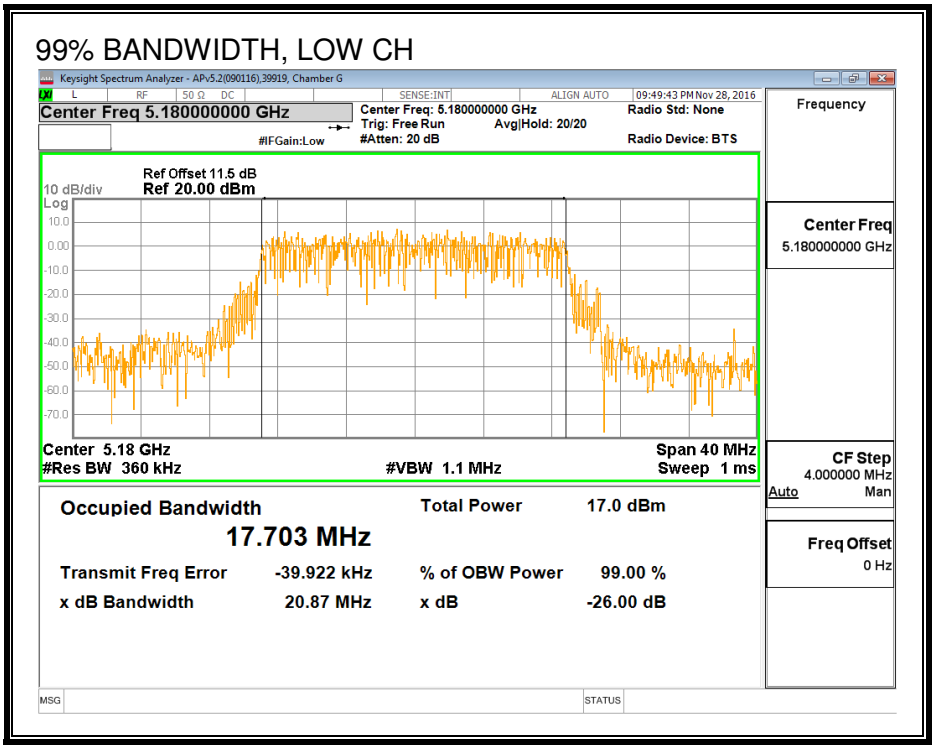
LIMITS

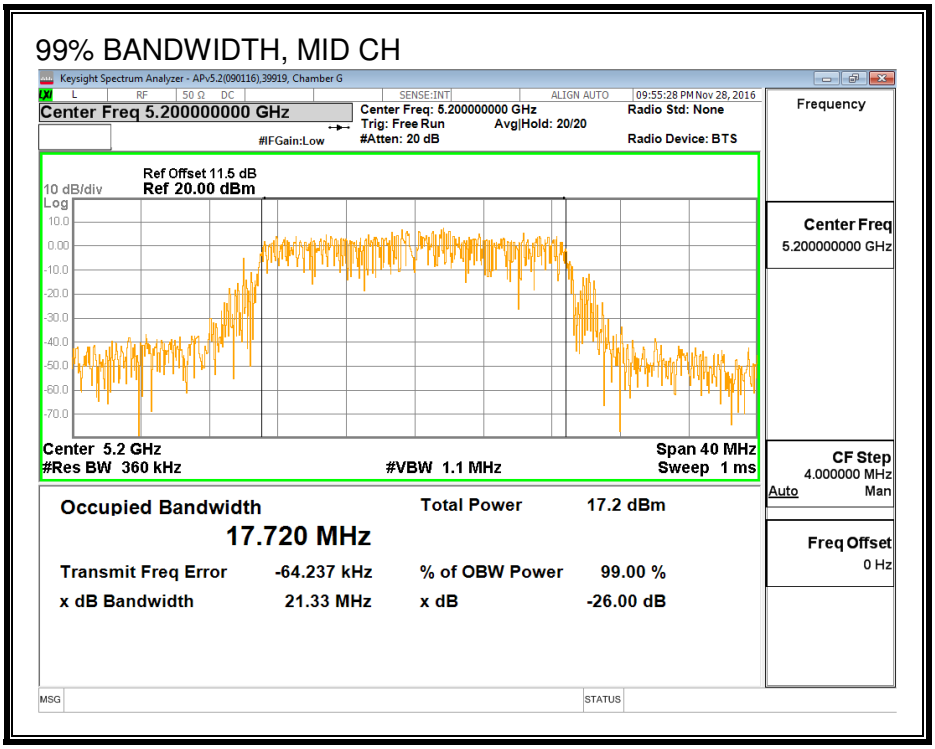
None; for reporting purposes only.

RESULTS

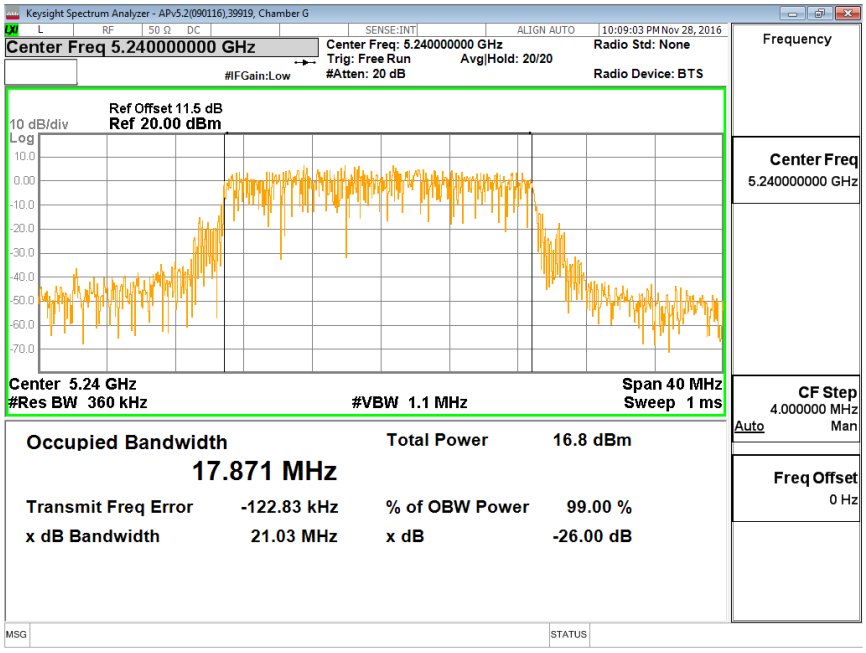
Channel	Frequency (MHz)	99% BW (MHz)
Low	5180	17.703
Mid	5200	17.720
High	5240	17.871

99% BANDWIDTH





99% BANDWIDTH, HIGH CH



8.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	45256	Date:	1/31/17

Channel	Frequency (MHz)	Power (dBm)
Low	5180	15.92
Mid	5200	16.96
High	5240	16.95

8.1.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407 (a) (1)

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

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

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

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

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

ID:	45256	Date:	1/31/17

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	3.48	3.48	24.00	11.00
Mid	5200	3.48	3.48	24.00	11.00
High	5240	3.48	3.48	24.00	11.00

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

Output Power Results

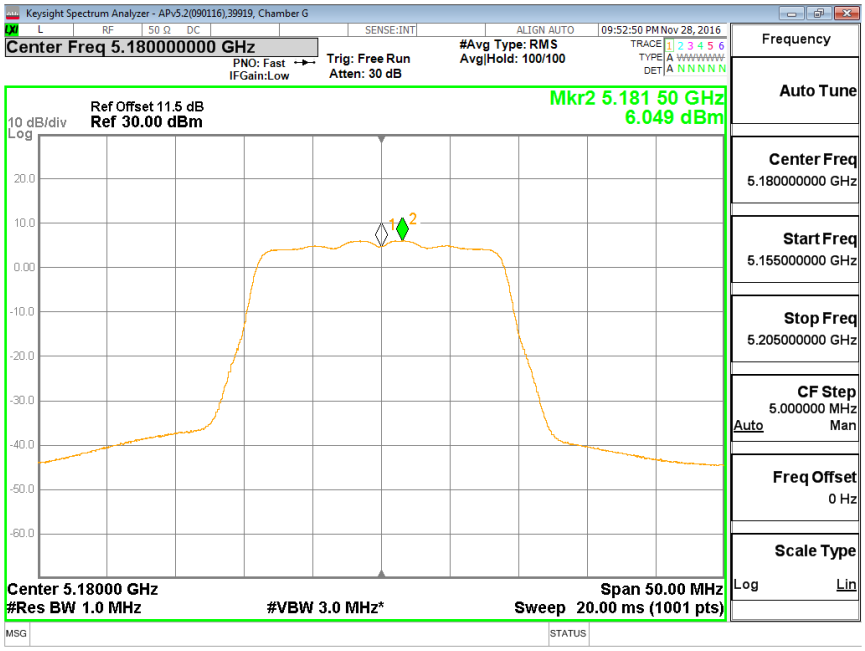
Channel	Frequency (MHz)	Antenna A Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	15.92	15.92	24.00	-8.08
Mid	5200	16.96	16.96	24.00	-7.04
High	5240	16.95	16.95	24.00	-7.05

PSD Results

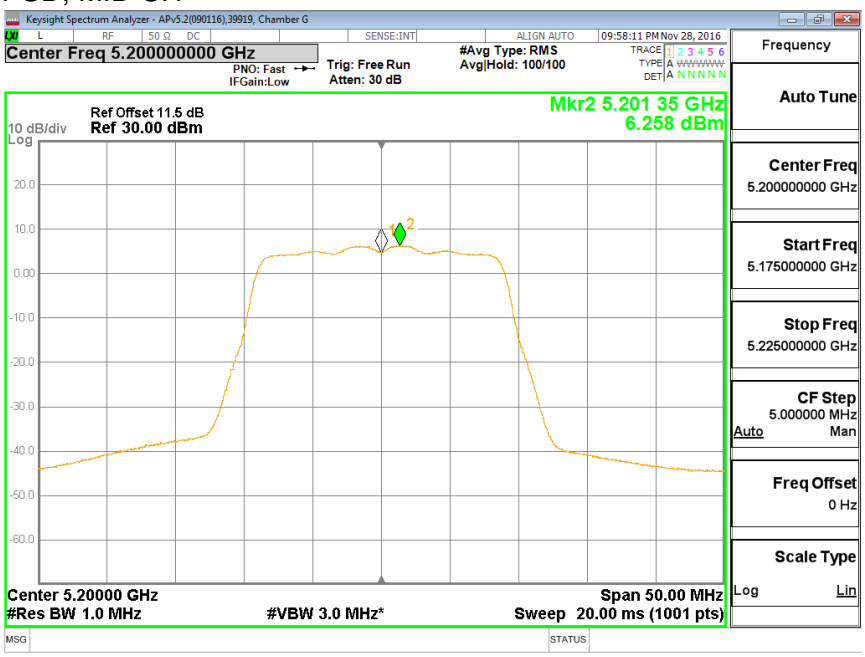
Channel	Frequency (MHz)	Antenna A Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.05	6.05	11.00	-4.95
Mid	5200	6.26	6.26	11.00	-4.74
High	5240	6.24	6.24	11.00	-4.76

PSD

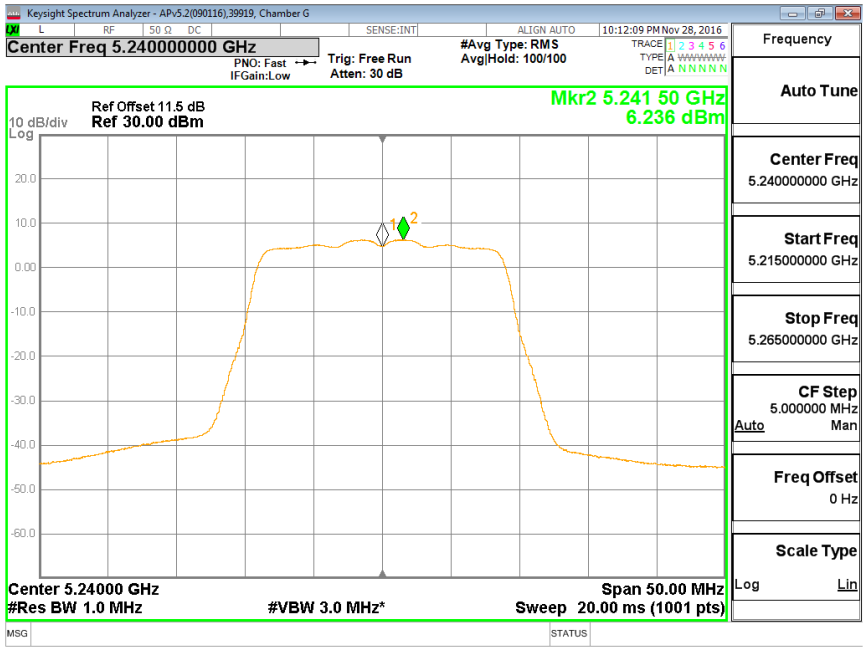
PSD, LOW CH



PSD, MID CH



PSD, HIGH CH



8.2. 802.11n HT20 Antenna B MODE IN THE 5.2 GHz BAND

8.2.1. 26 dB BANDWIDTH

LIMITS

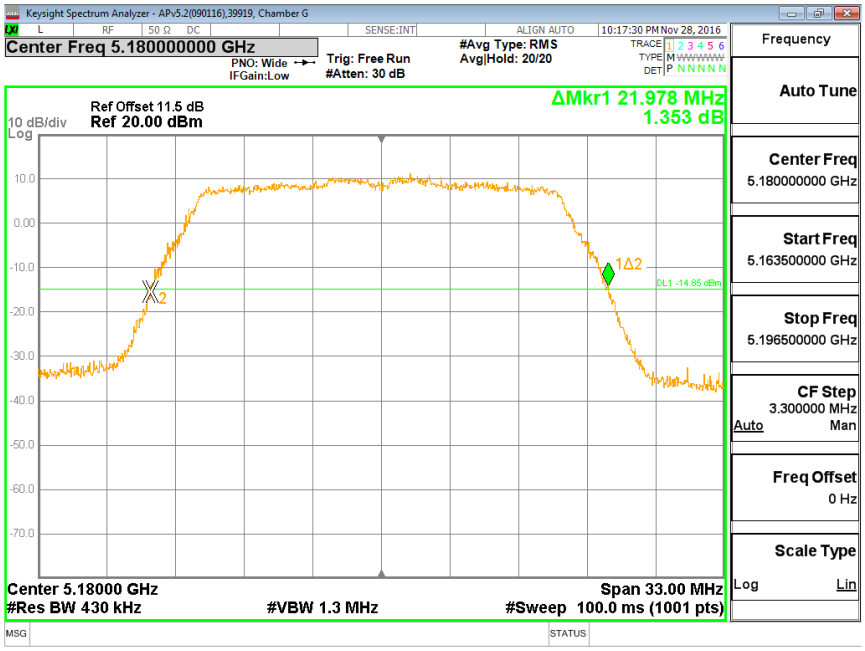
None; for reporting purposes only.

RESULTS

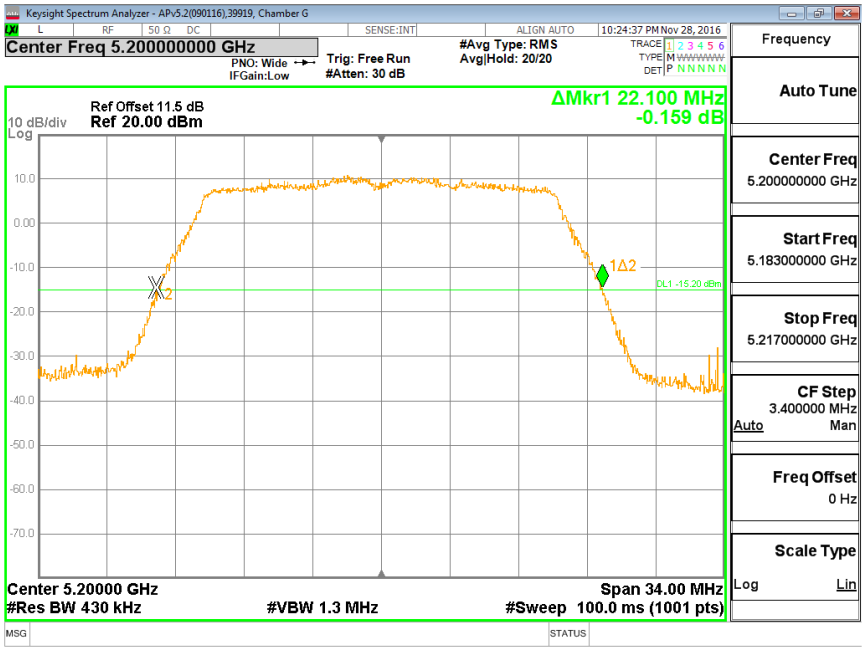
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	21.978
Mid	5200	22.100
High	5240	22.134

26 dB BANDWIDTH

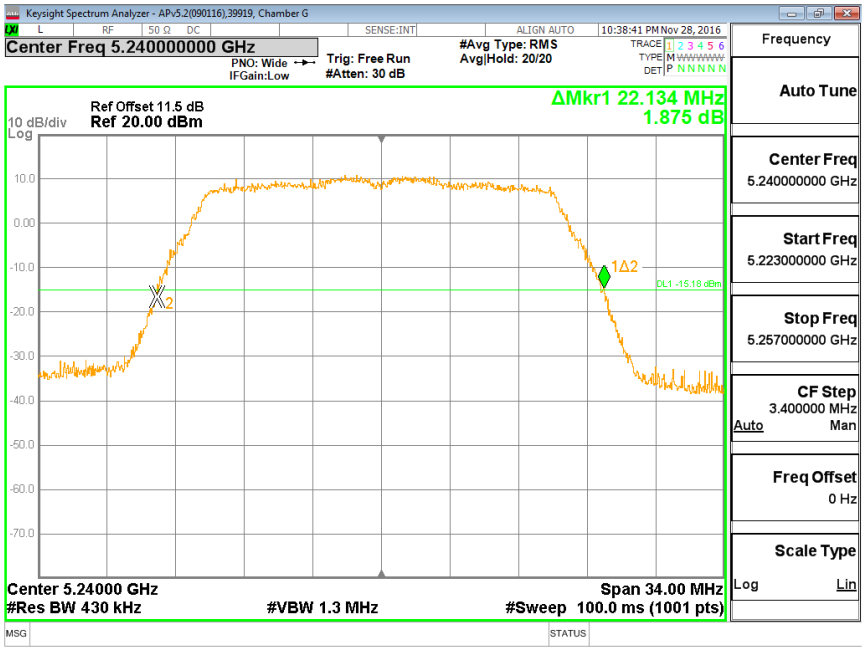
BANDWIDTH, LOW CH



BANDWIDTH, MID CH



BANDWIDTH, HIGH CH



8.2.2. 99% BANDWIDTH

LIMITS

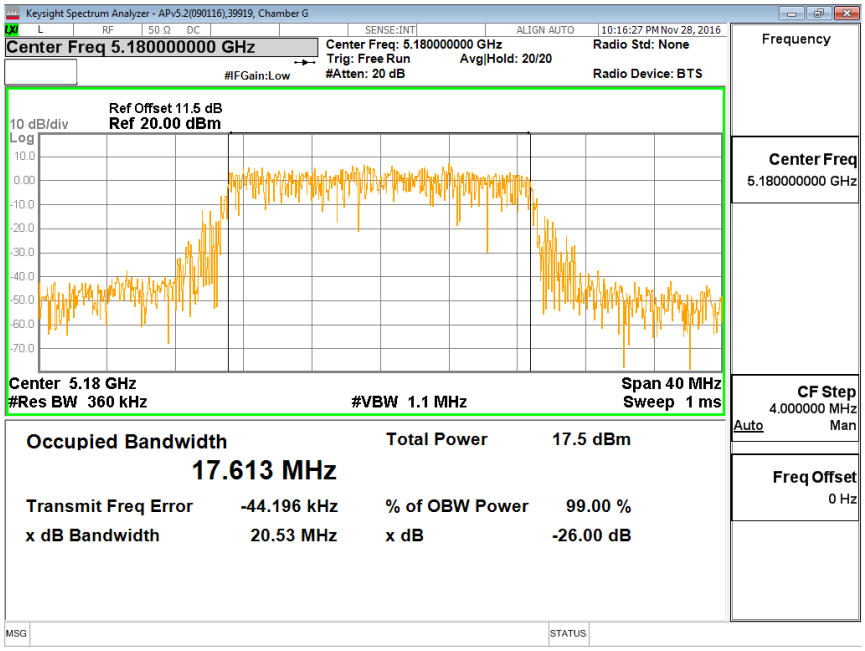
None; for reporting purposes only.

RESULTS

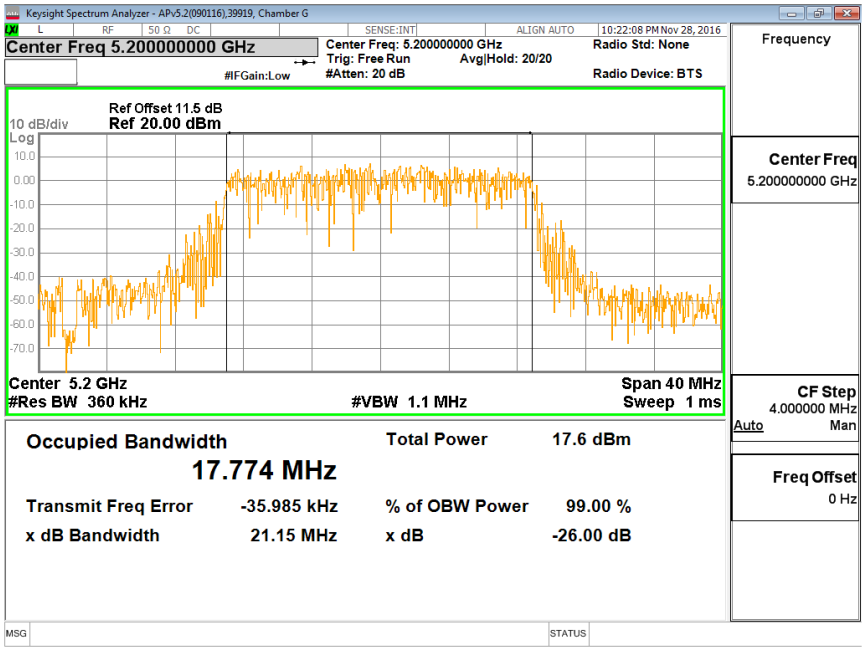
Channel	Frequency (MHz)	99% BW (MHz)
Low	5180	17.613
Mid	5200	17.774
High	5240	17.698

99% BANDWIDTH

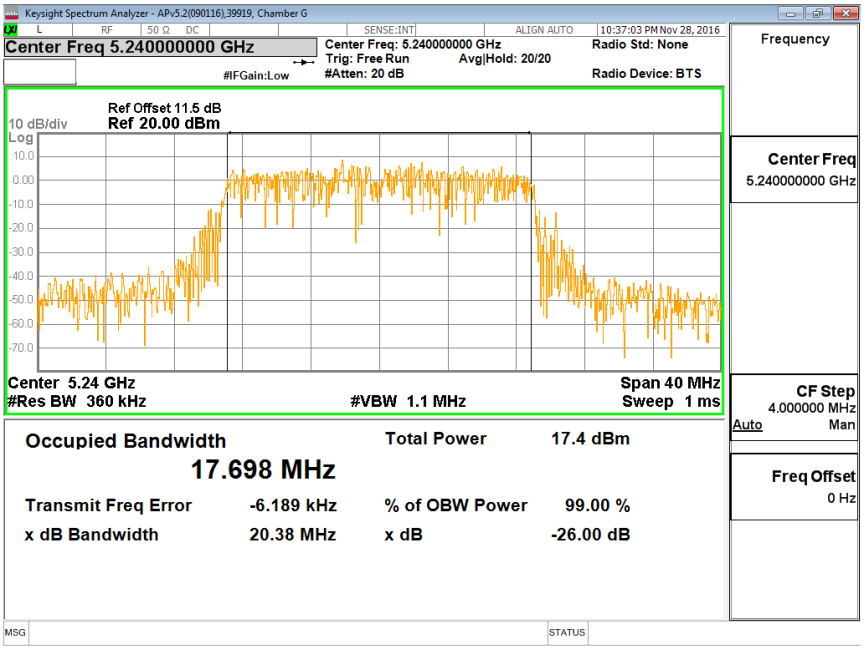
99% BANDWIDTH, LOW CH



99% BANDWIDTH, MID CH



99% BANDWIDTH, HIGH CH



8.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	45256	Date:	1/31/17

Channel	Frequency (MHz)	Power (dBm)
Low	5180	15.89
Mid	5200	15.91
High	5240	15.92

8.2.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407 (a) (1)

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

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

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

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

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

ID:	45256	Date:	1/31/17

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	3.33	3.33	24.00	11.00
Mid	5200	3.33	3.33	24.00	11.00
High	5240	3.33	3.33	24.00	11.00

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

Output Power Results

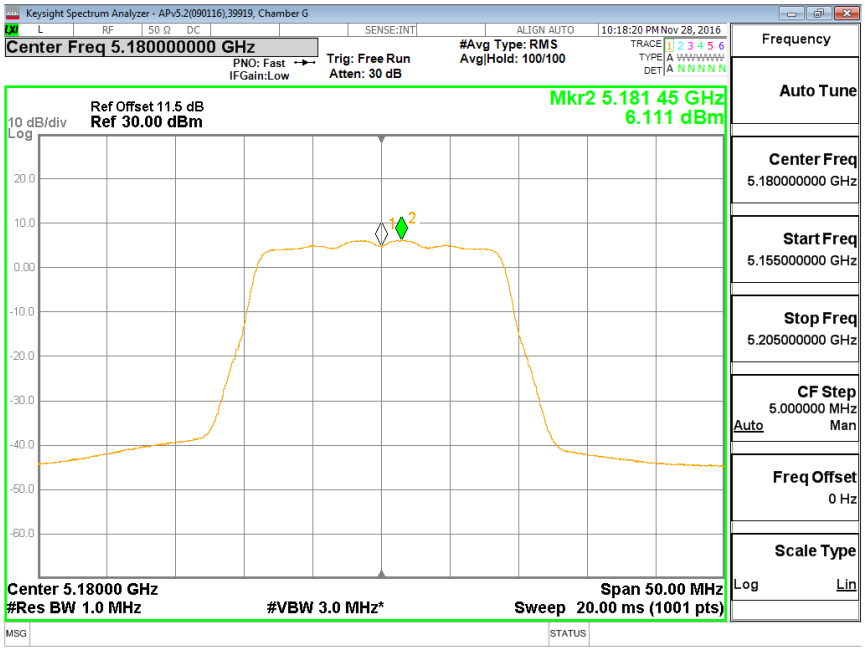
Channel	Frequency (MHz)	Antenna B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	15.89	15.89	24.00	-8.11
Mid	5200	15.91	15.91	24.00	-8.09
High	5240	15.92	15.92	24.00	-8.08

PSD Results

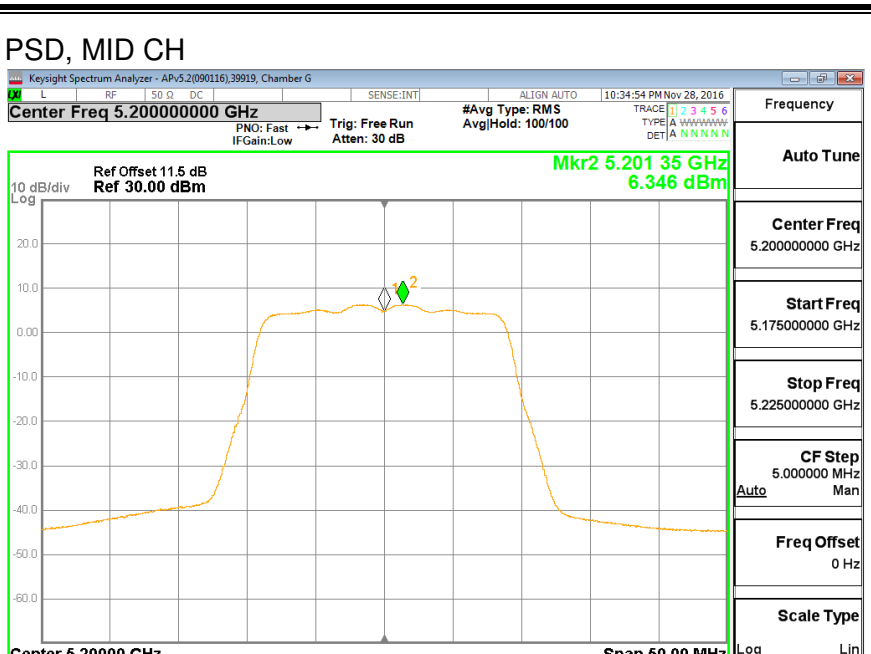
Channel	Frequency (MHz)	Antenna B Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.11	6.11	11.00	-4.89
Mid	5200	6.35	6.35	11.00	-4.65
High	5240	6.38	6.38	11.00	-4.62

PSD

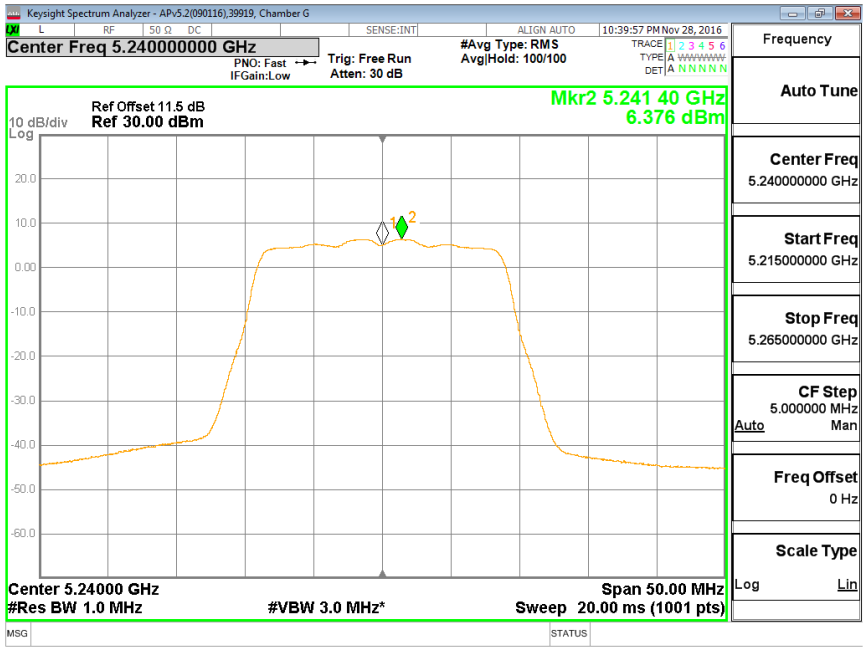
PSD, LOW CH



PSD, MID CH



PSD, HIGH CH



8.3. 802.11n HT20 2Tx (Antenna A + Antenna B) CDD MODE IN THE 5.2 GHz BAND

8.3.1. 26 dB BANDWIDTH

LIMITS

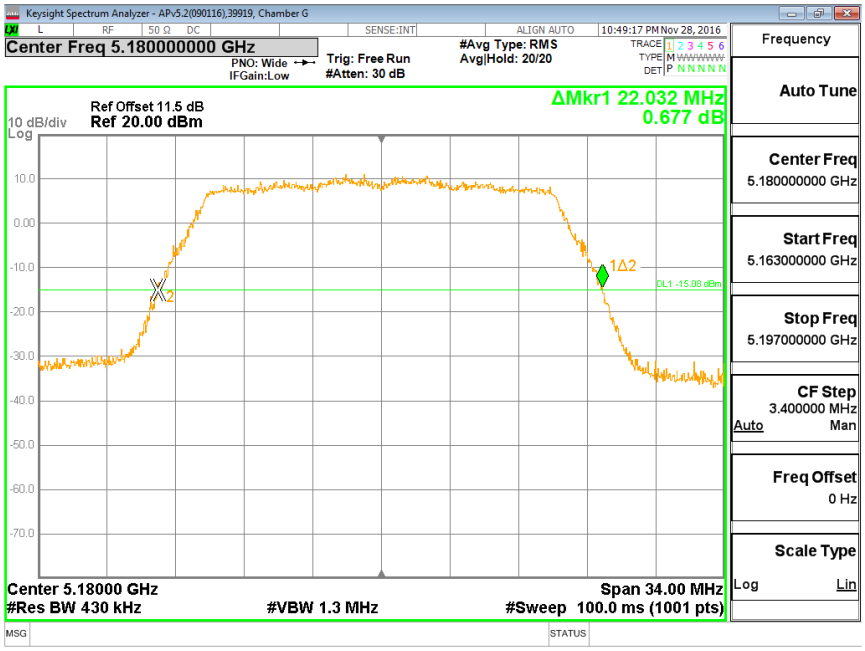
None; for reporting purposes only.

RESULTS

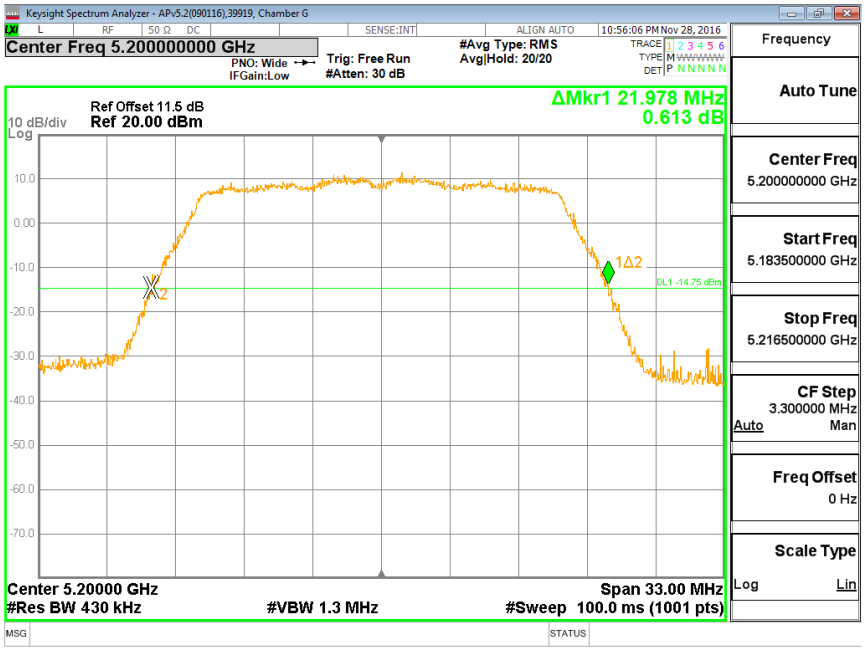
Channel	Frequency (MHz)	26 dB BW Antenna A (MHz)	26 dB BW Antenna B (MHz)
Low	5180	22.032	21.648
Mid	5200	21.978	21.648
High	5240	21.945	21.582

26 DB BANDWIDTH, ANTENNA A

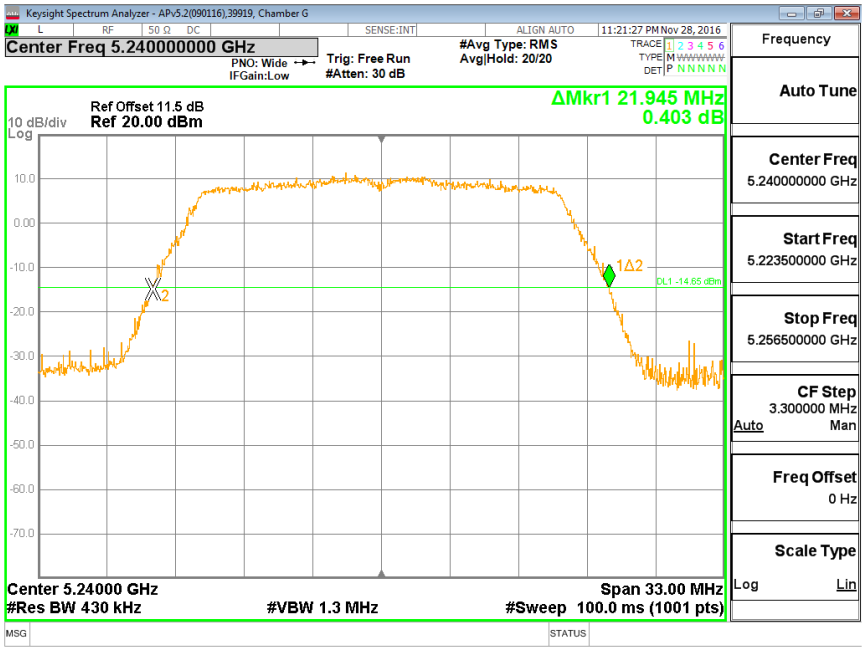
BANDWIDTH, LOW CH



BANDWIDTH, MID CH

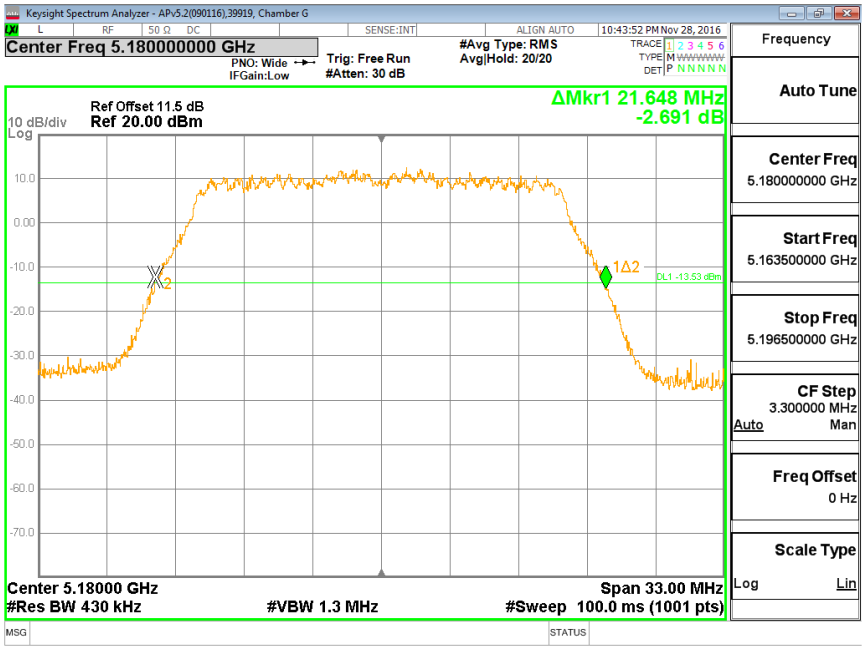


BANDWIDTH, HIGH CH

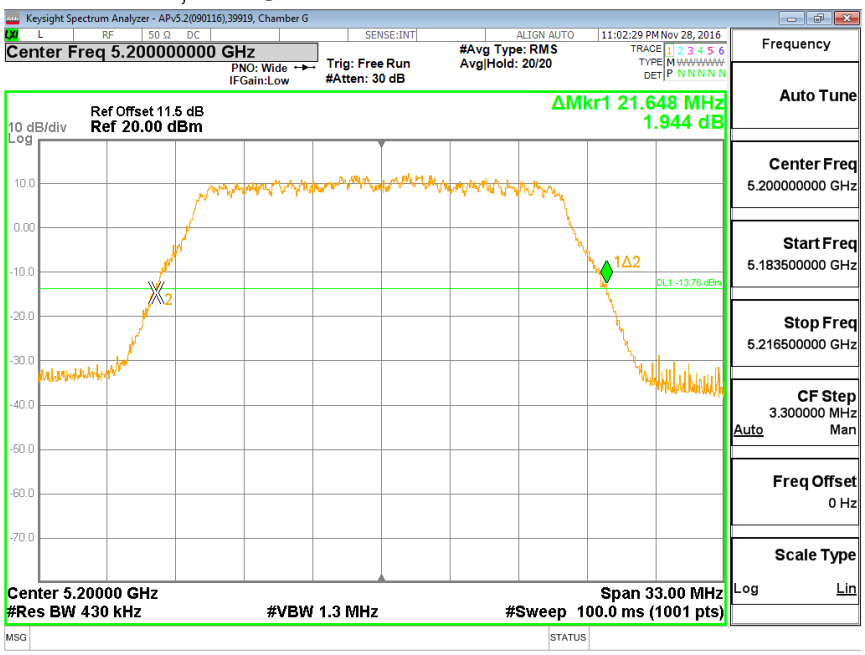


26 DB BANDWIDTH, ANTENNA B

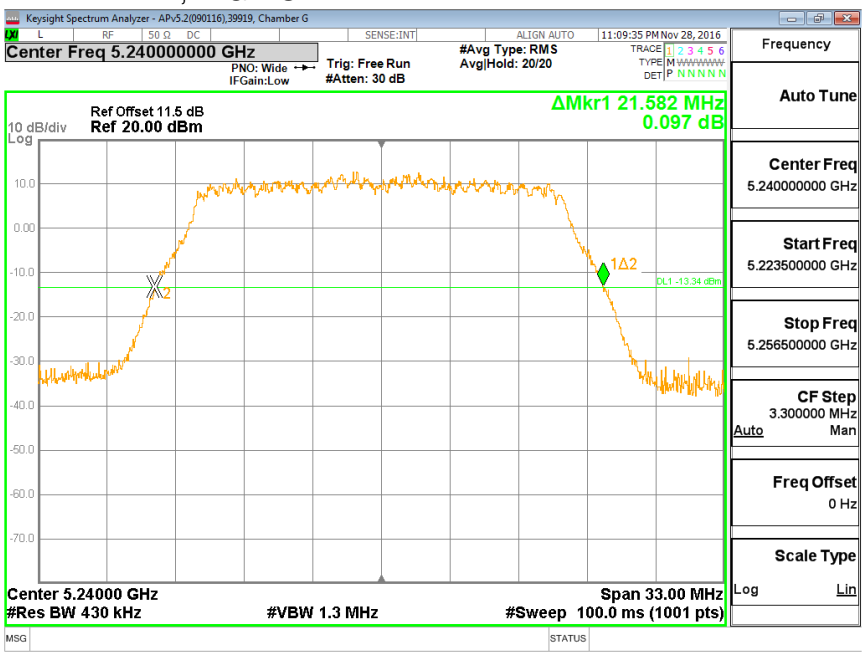
BANDWIDTH, LOW CH



BANDWIDTH, MID CH



BANDWIDTH, HIGH CH



8.3.2. 99% BANDWIDTH

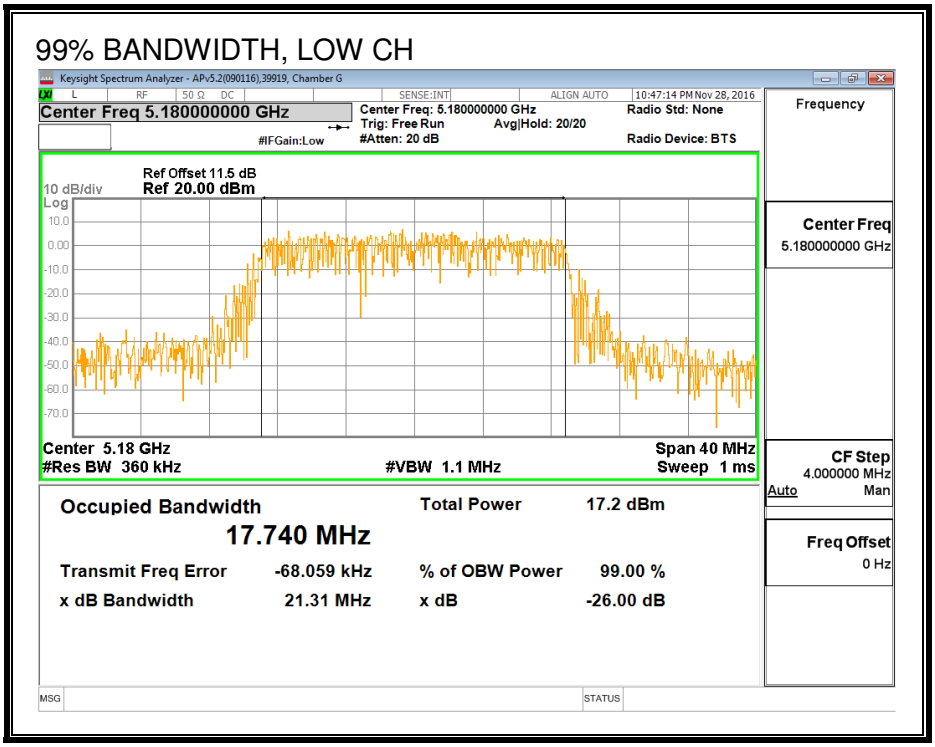
LIMITS

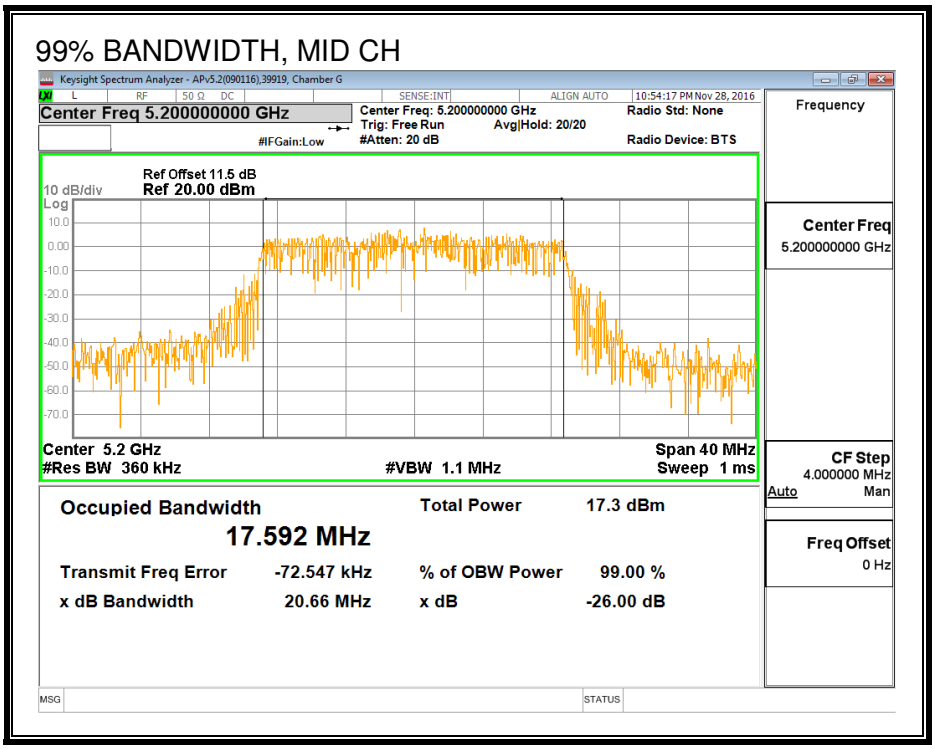
None; for reporting purposes only.

RESULTS

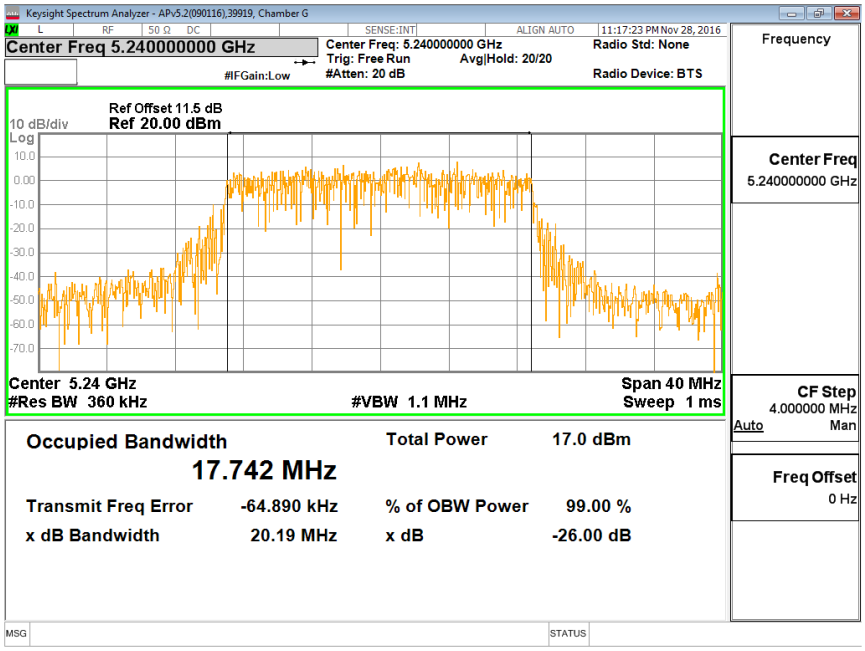
Channel	Frequency (MHz)	99% BW Antenna A (MHz)	99% BW Antenna B (MHz)
Low	5180	17.740	17.894
Mid	5200	17.592	17.760
High	5240	17.742	17.689

99% BANDWIDTH, ANTENNA A



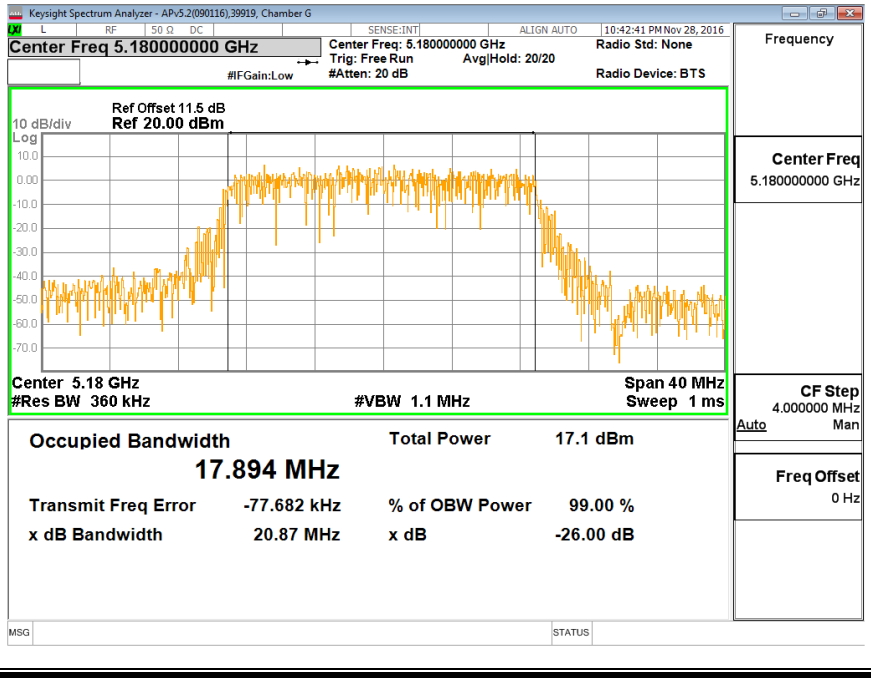


99% BANDWIDTH, HIGH CH

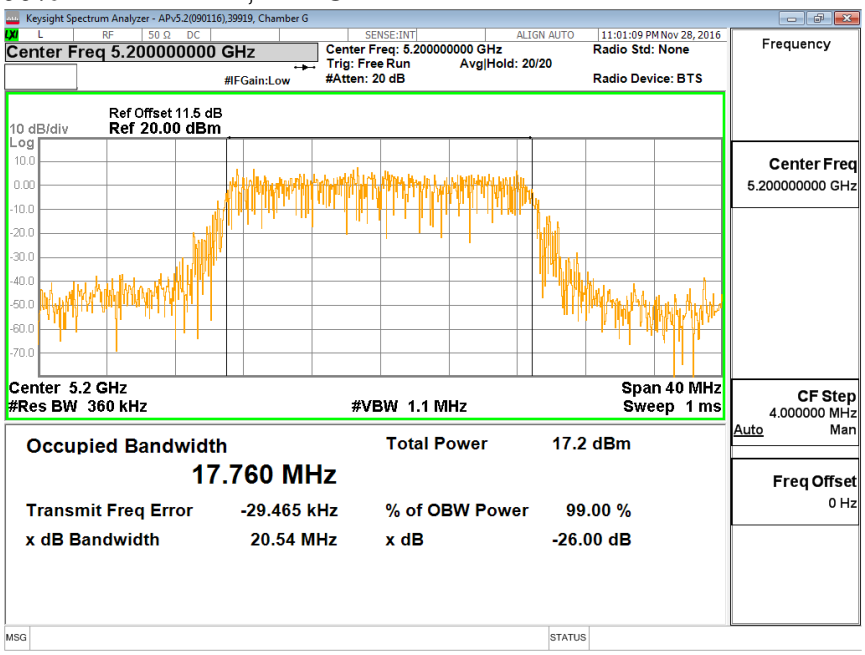


99% BANDWIDTH, ANTENNA B

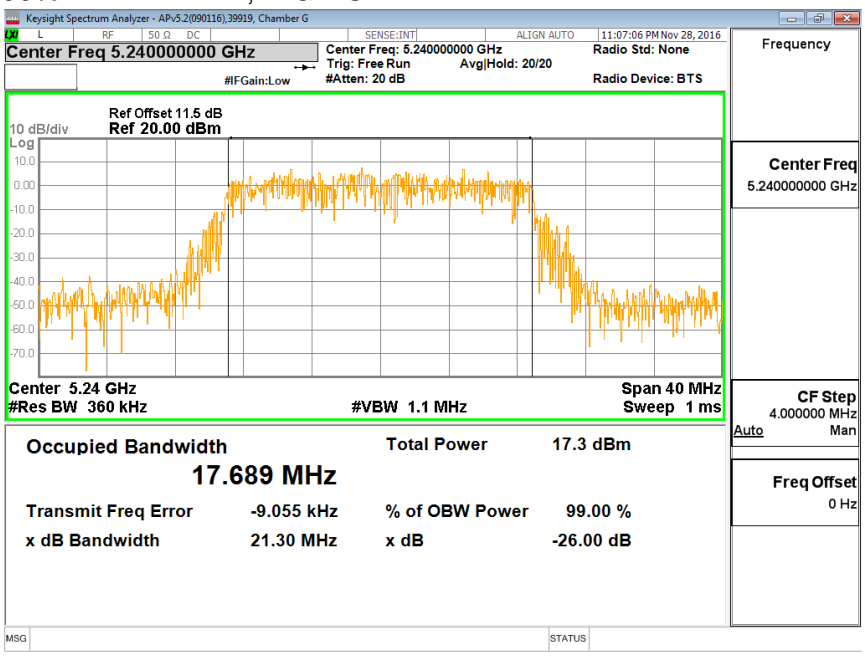
99% BANDWIDTH, LOW CH



99% BANDWIDTH, MID CH



99% BANDWIDTH, HIGH CH



8.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	45256	Date:	1/31/17

Average Power Results

Channel	Frequency (MHz)	Antenna A Power (dBm)	Antenna B Power (dBm)	Total Power (dBm)
Low	5180	14.95	14.97	17.97
Mid	5200	15.41	15.45	18.44
High	5240	15.48	15.39	18.45

8.3.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407 (a) (1)

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

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

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

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

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:

Antenna A Gain (dBi)	Anteena B Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.48	3.33	3.41

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

Antenna A Gain (dBi)	Antenna B Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.48	3.33	6.42

RESULTS

ID:	45256	Date:	1/31/17

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	3.41	6.42	24.00	10.58
Mid	5200	3.41	6.42	24.00	10.58
High	5240	3.41	6.42	24.00	10.58

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

Output Power Results

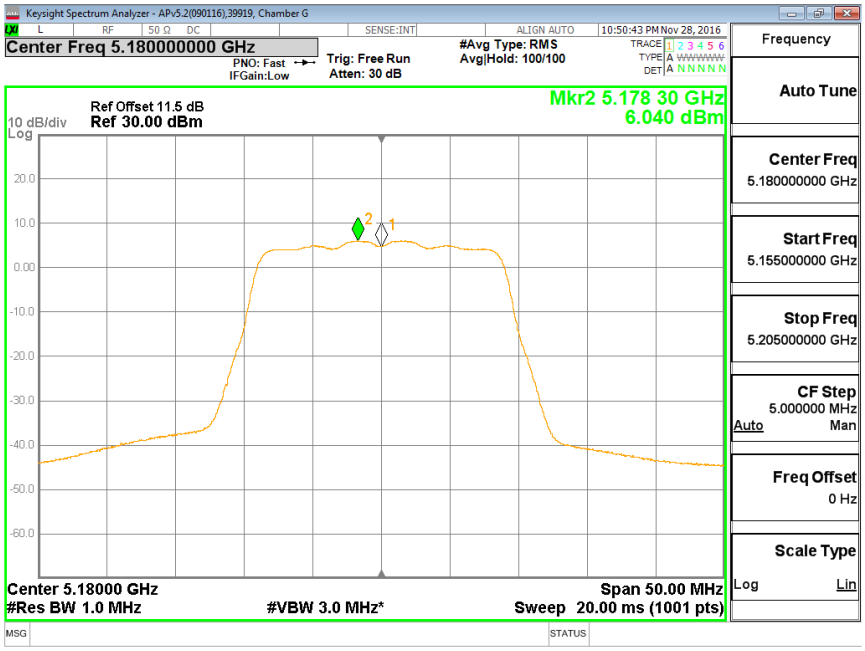
Channel	Frequency (MHz)	Antenna A Meas Power (dBm)	Antenna B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.95	14.97	17.97	24.00	-6.03
Mid	5200	15.41	15.45	18.44	24.00	-5.56
High	5240	15.48	15.39	18.45	24.00	-5.55

PSD Results

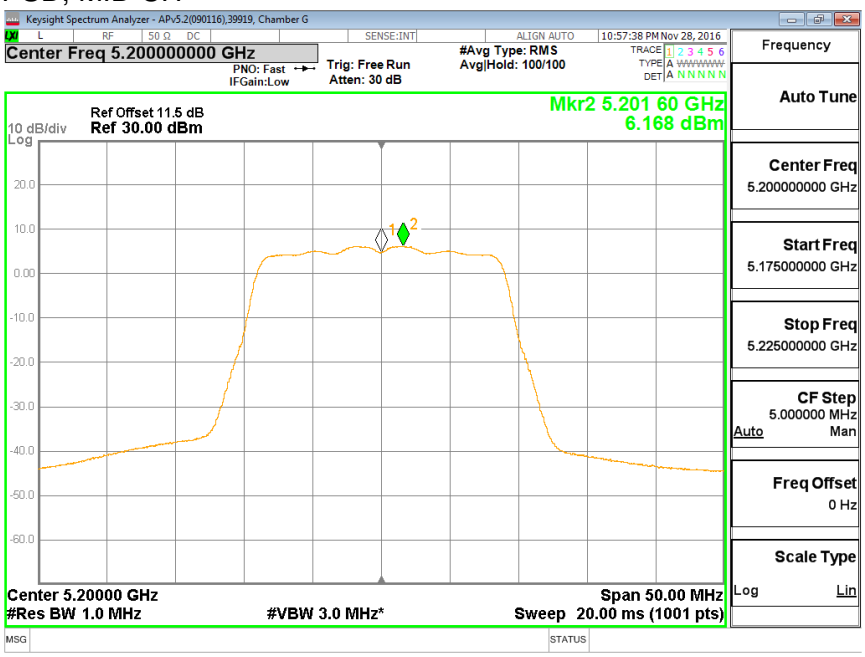
Channel	Frequency (MHz)	Antenna A Meas PSD (dBm)	Antenna B Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.04	6.15	9.10	10.58	-1.48
Mid	5200	6.17	6.32	9.26	10.58	-1.32
High	5240	6.44	6.41	9.44	10.58	-1.14

PSD, Antenna A

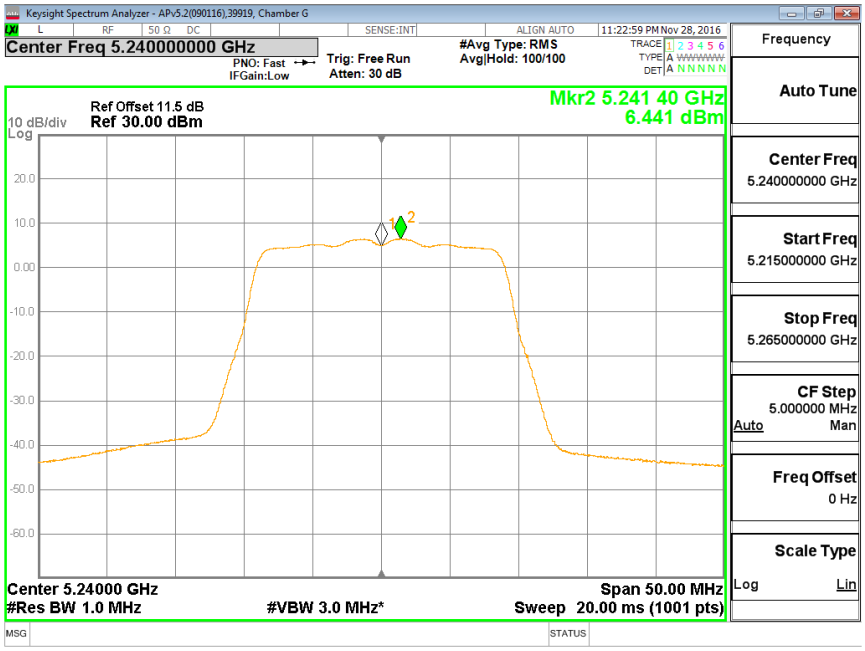
PSD, LOW CH



PSD, MID CH

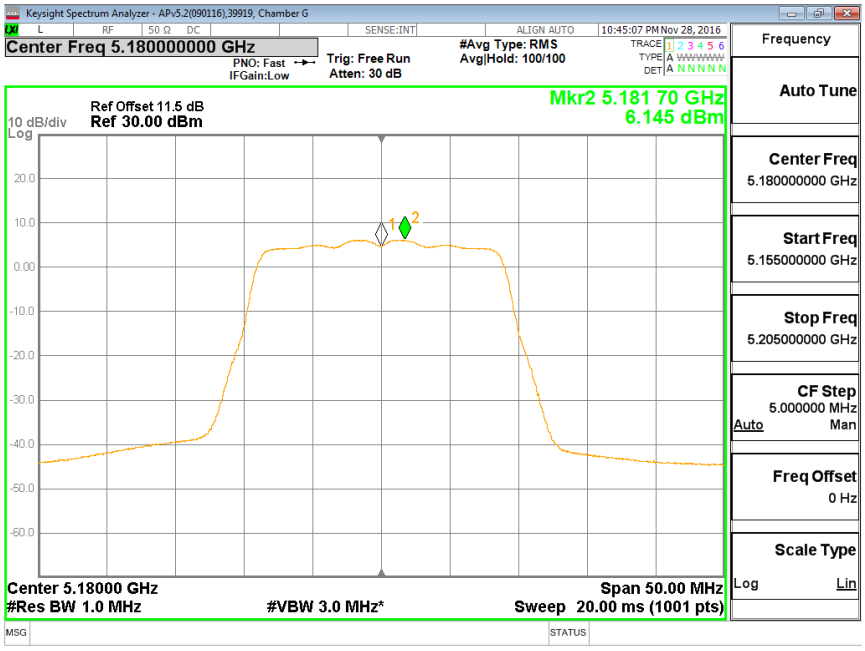


PSD, HIGH CH

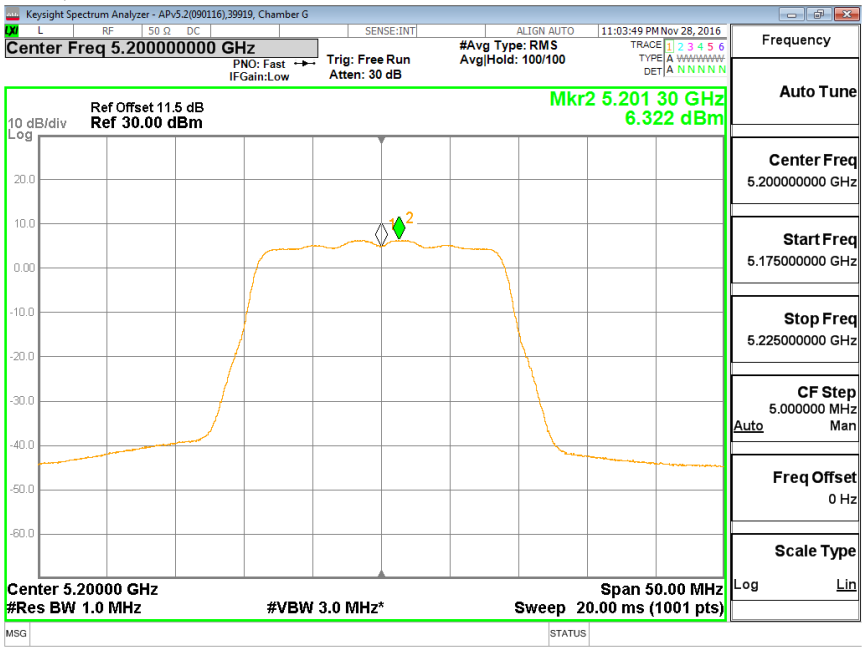


PSD, Antenna B

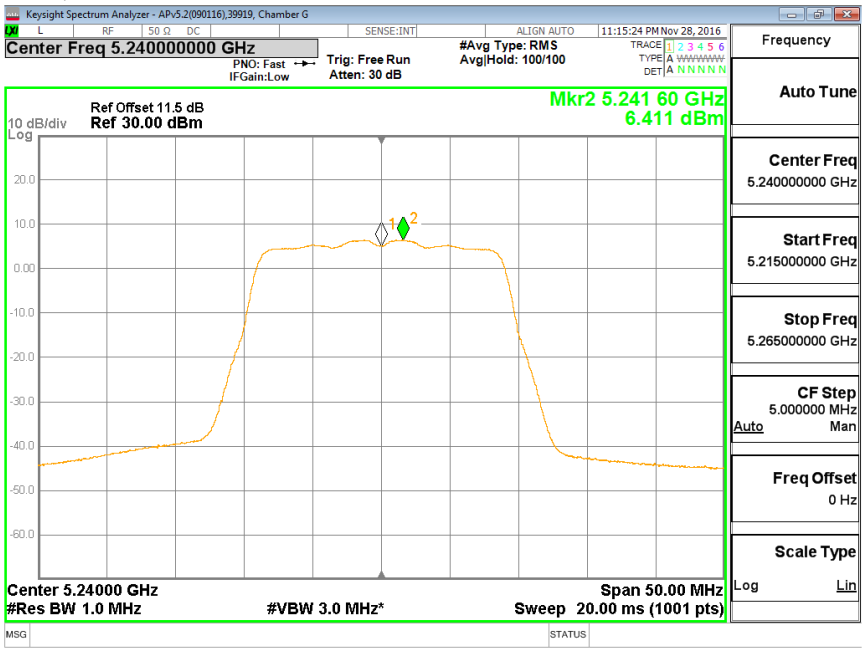
PSD, LOW CH



PSD, MID CH



PSD, HIGH CH



8.4. 802.11n HT20 2Tx (Ant A + Ant B) STBC MODE IN THE 5.2 GHz BAND

8.4.1. 26 dB BANDWIDTH

LIMITS

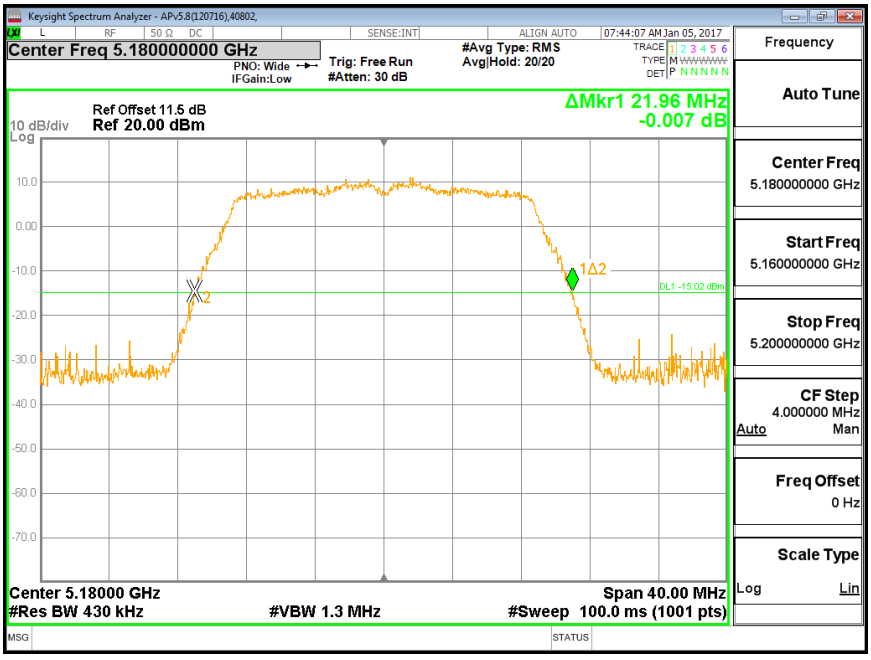
None; for reporting purposes only.

RESULTS

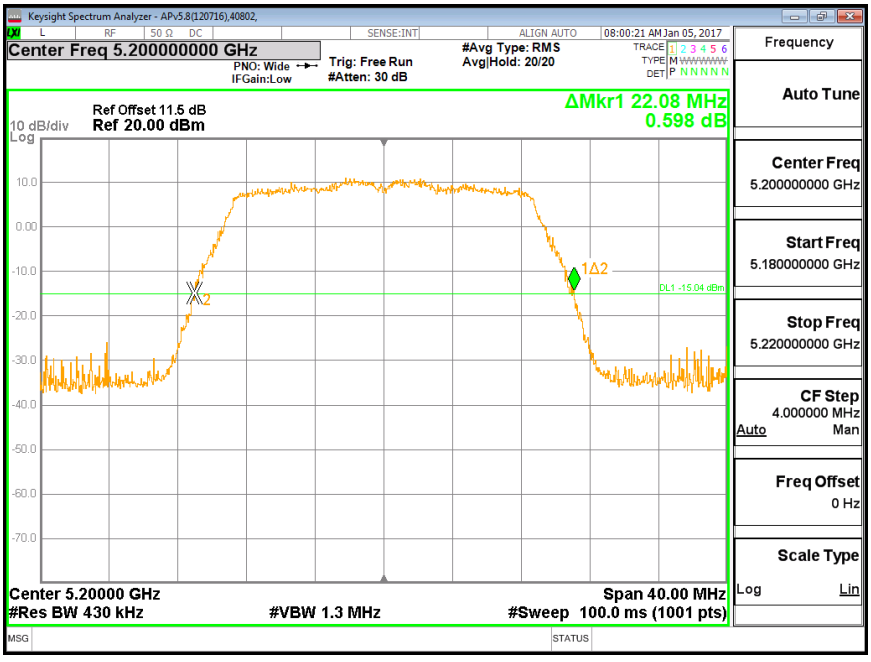
Channel	Frequency (MHz)	26 dB BW Antenna A (MHz)	26 dB BW Antenna B (MHz)
Low	5180	21.960	21.800
Mid	5200	22.080	21.640
High	5240	22.000	21.680

26 dB BANDWIDTH, Antenna A

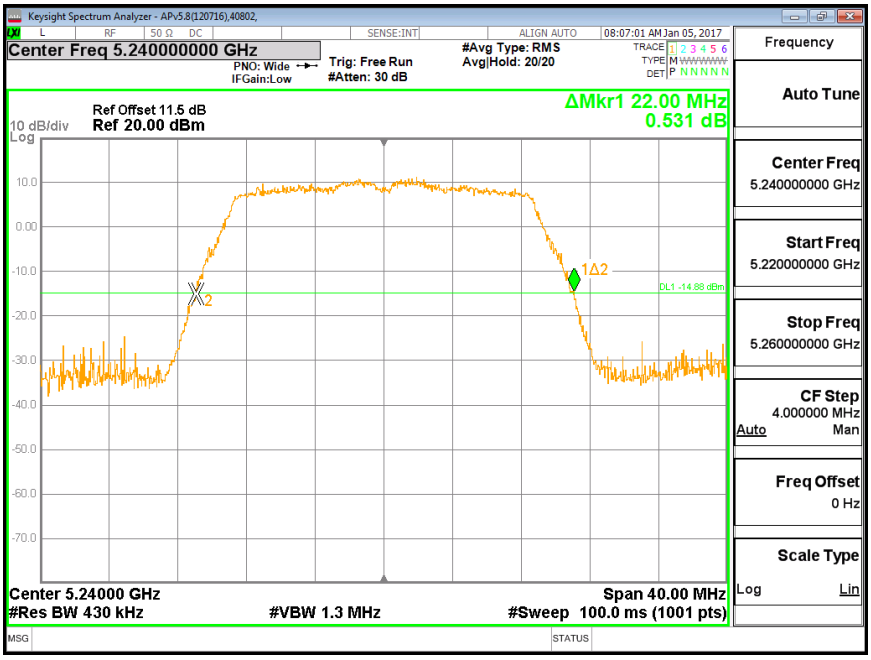
BANDWIDTH Antenna A LOW CH



BANDWIDTH Antenna A MID CH

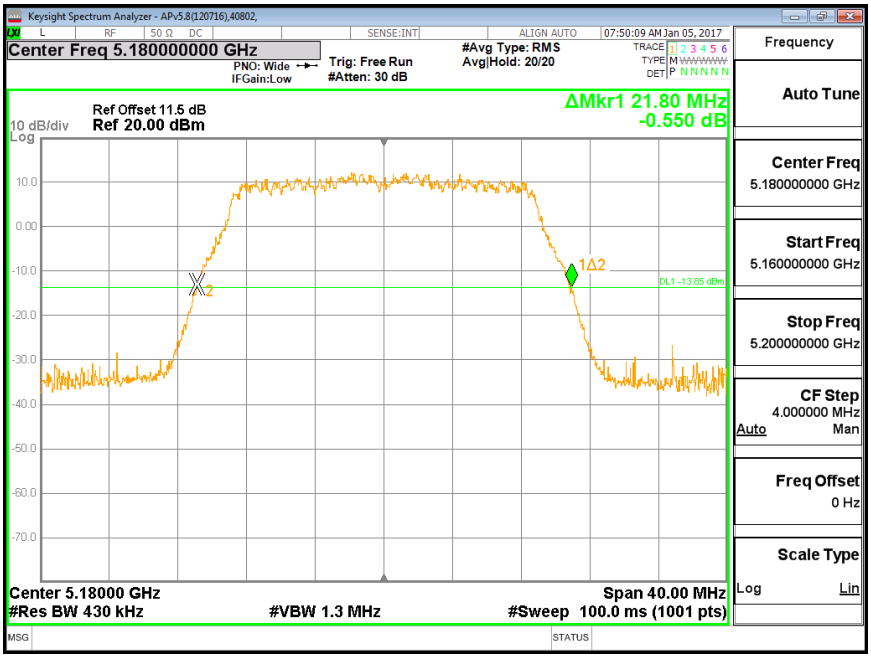


BANDWIDTH Antenna A HIGH CH

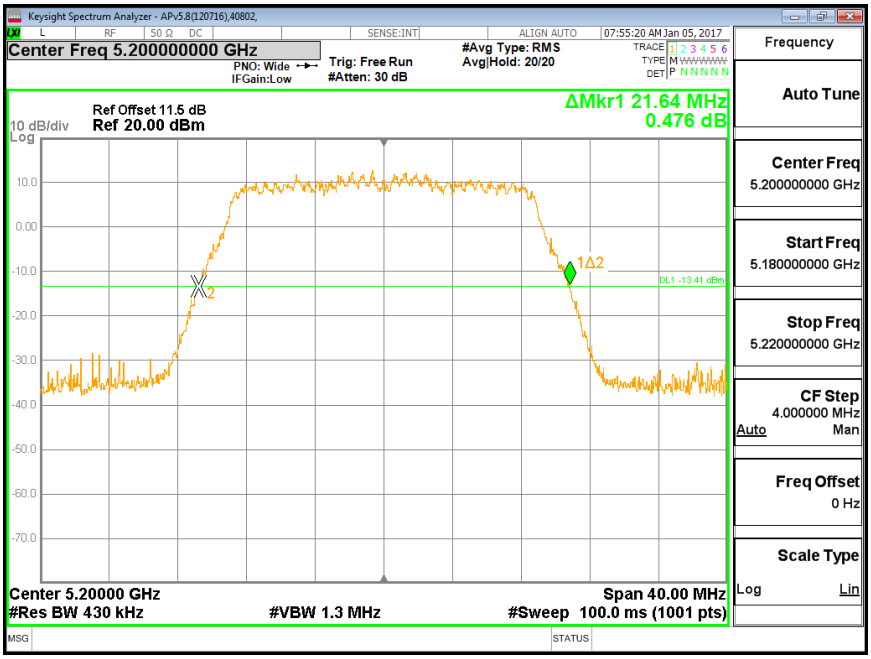


26 dB BANDWIDTH, Antenna B

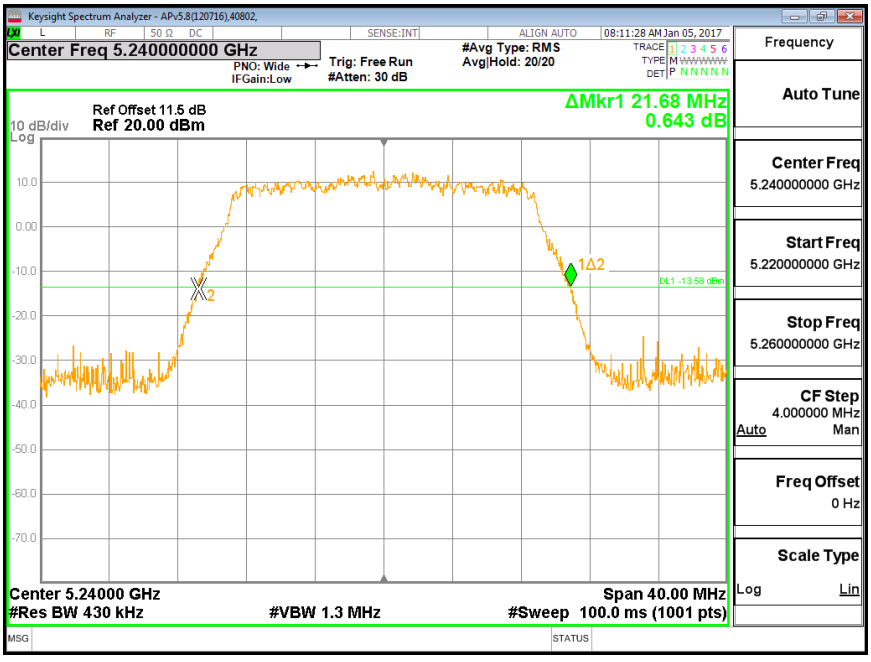
BANDWIDTH Antenna B LOW CH



BANDWIDTH Antenna B MID CH



BANDWIDTH Antenna B HIGH CH



8.4.2. 99% BANDWIDTH

LIMITS

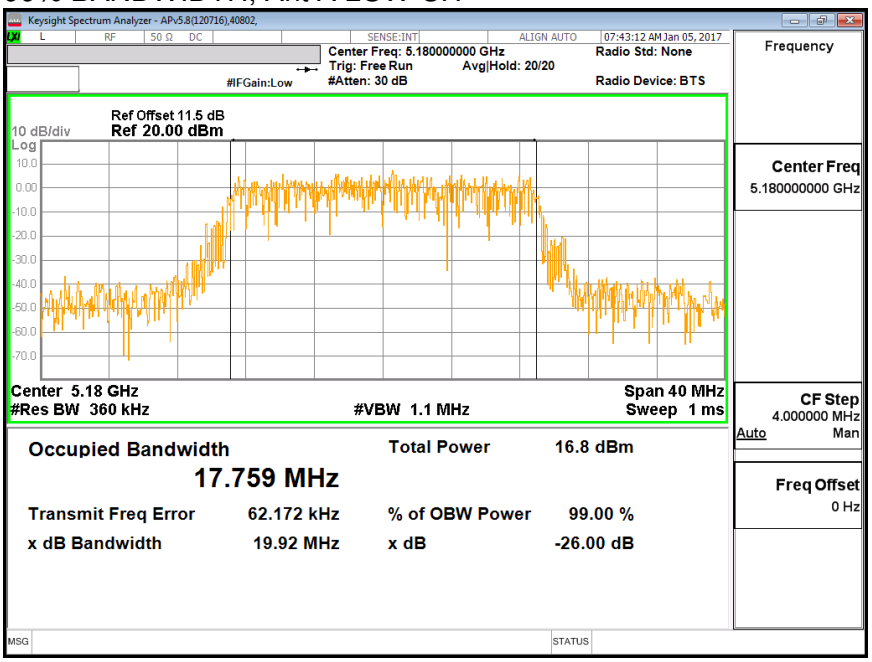
None; for reporting purposes only.

RESULTS

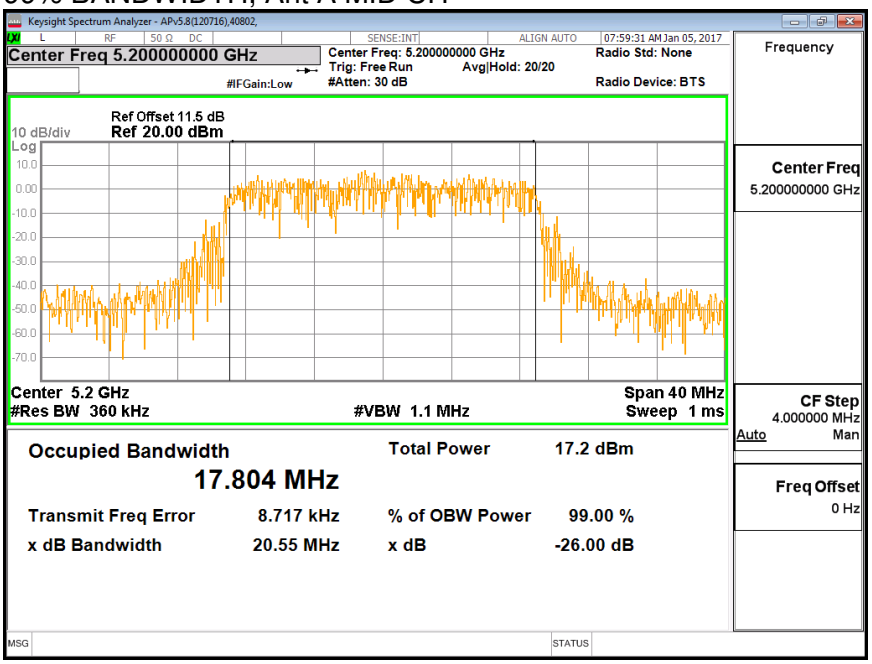
Channel	Frequency (MHz)	99% BW Antenna A (MHz)	99% BW Antenna B (MHz)
Low	5180	17.759	17.656
Mid	5200	17.804	17.836
High	5240	17.744	17.772

99% BANDWIDTH, Antenna A

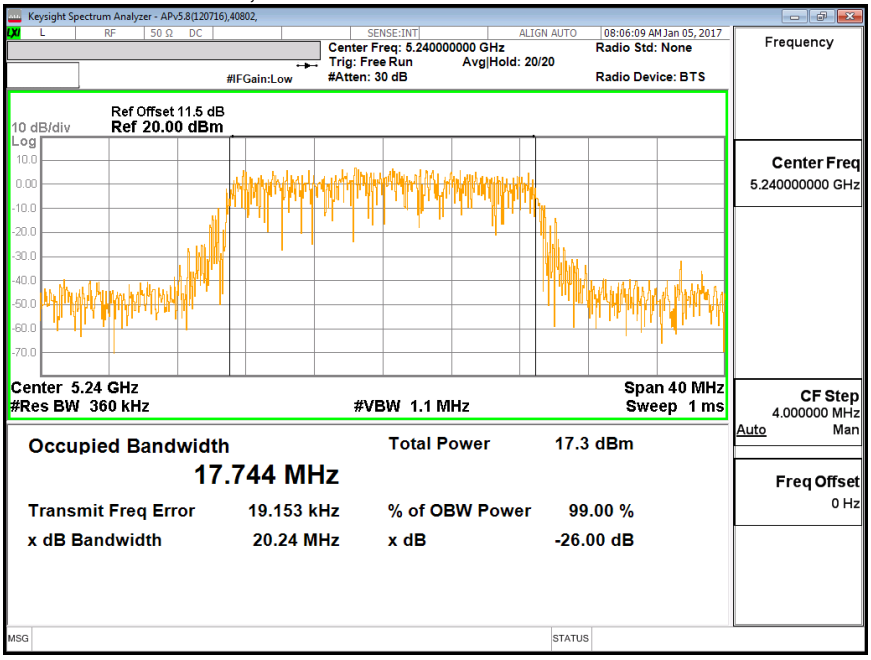
99% BANDWIDTH, Ant A LOW CH



99% BANDWIDTH, Ant A MID CH

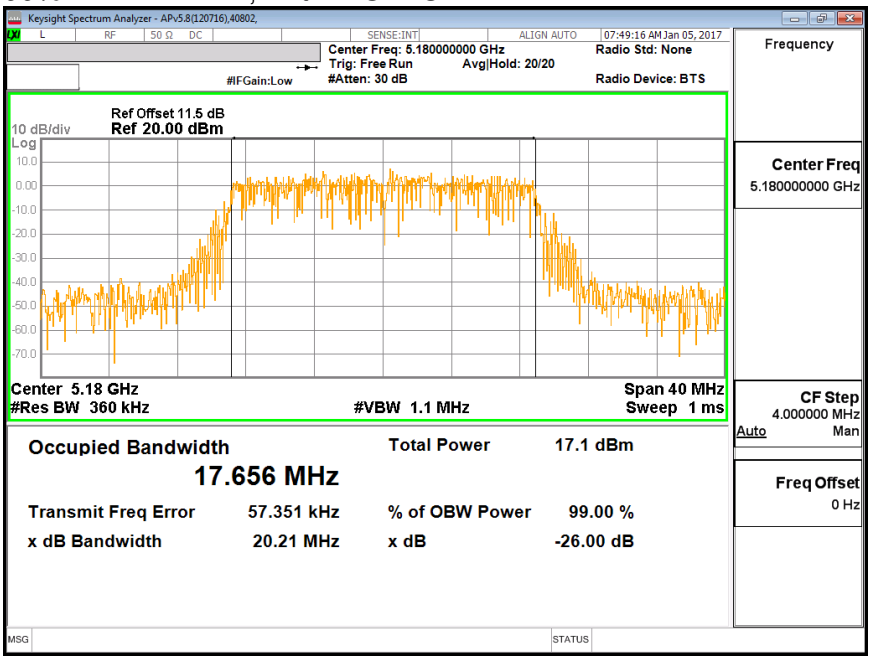


99% BANDWIDTH, Ant A HIGH CH

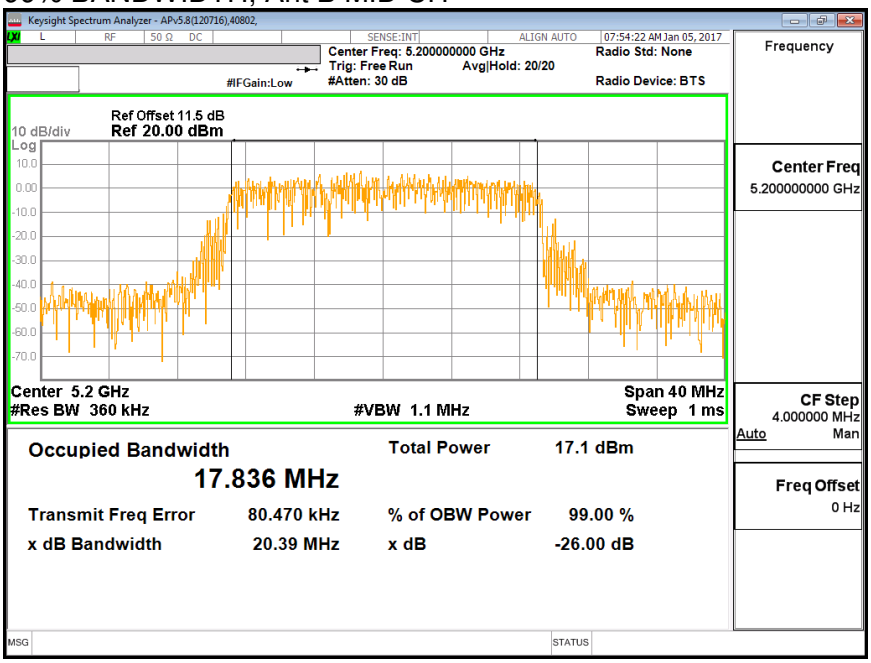


99% BANDWIDTH, Antenna B

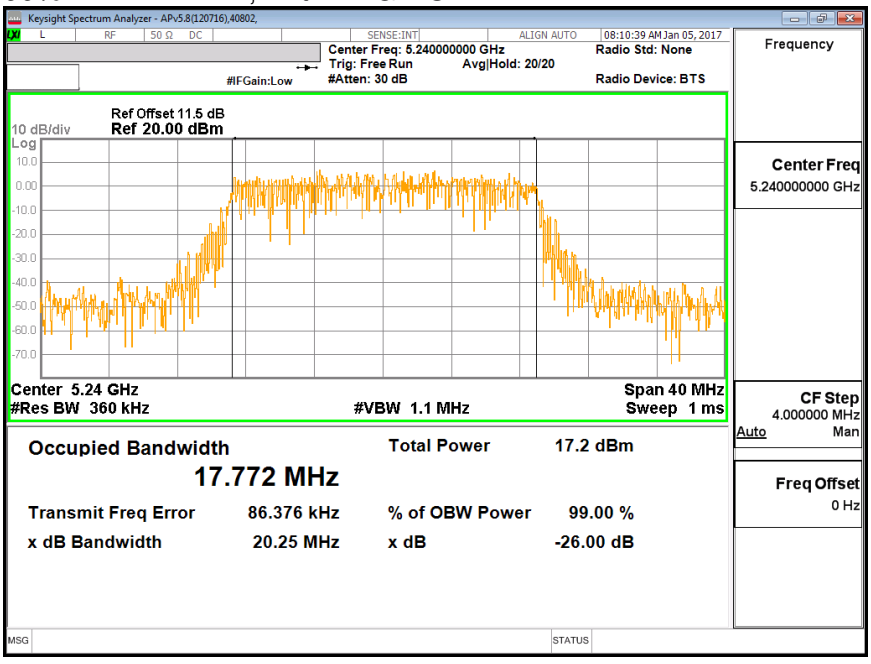
99% BANDWIDTH, Ant B LOW CH



99% BANDWIDTH, Ant B MID CH



99% BANDWIDTH, Ant B HIGH CH



8.4.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

ID:	45256	Date:	1/31/17

Average Power Results

Channel	Frequency (MHz)	Antenna A Power (dBm)	Antenna B Power (dBm)	Total Power (dBm)
Low	5180	15.00	14.90	17.96
Mid	5200	16.96	16.00	19.52
High	5240	17.00	15.90	19.50

8.4.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407 (a) (1)

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

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

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

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

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is the same for each chain. The directional gain is equal to the antenna gain.

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

Use this table for uncorrelated chains and unequal antenna gain

Antenna A Gain (dBi)	Antenna B Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.48	3.33	3.41

Antenna A Gain (dBi)	Antenna B Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.48	3.33	6.42

RESULTS

ID:	45256	Date:	1/31/17

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	3.41	6.42	24.00	10.58
Mid	5200	3.41	6.42	24.00	10.58
High	5240	3.41	6.42	24.00	10.58

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

Output Power Results

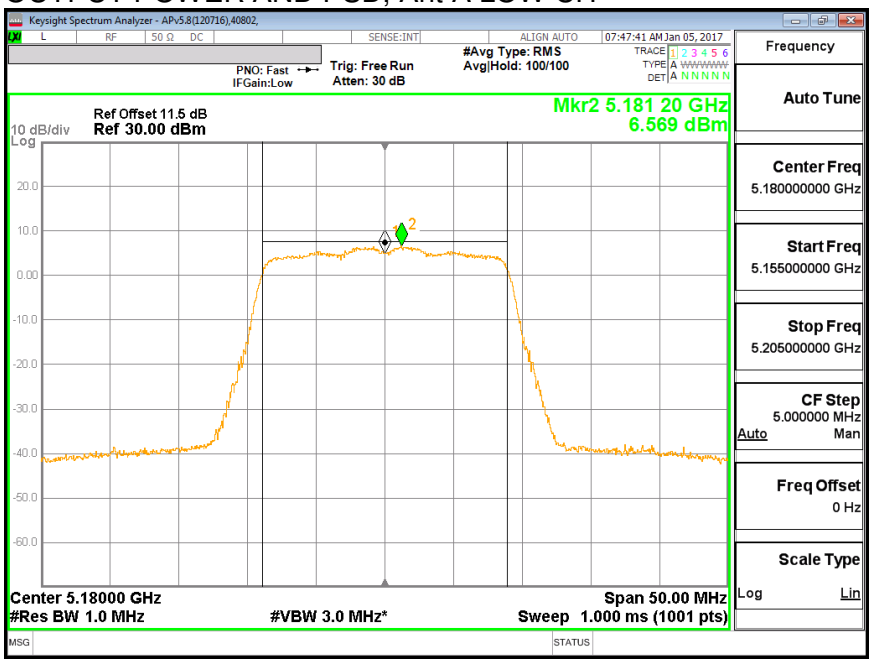
Channel	Frequency (MHz)	Antenna A Meas Power (dBm)	Antenna B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	15.00	14.90	17.96	24.00	-6.04
Mid	5200	16.96	16.00	19.52	24.00	-4.48
High	5240	17.00	15.90	19.50	24.00	-4.50

PSD Results

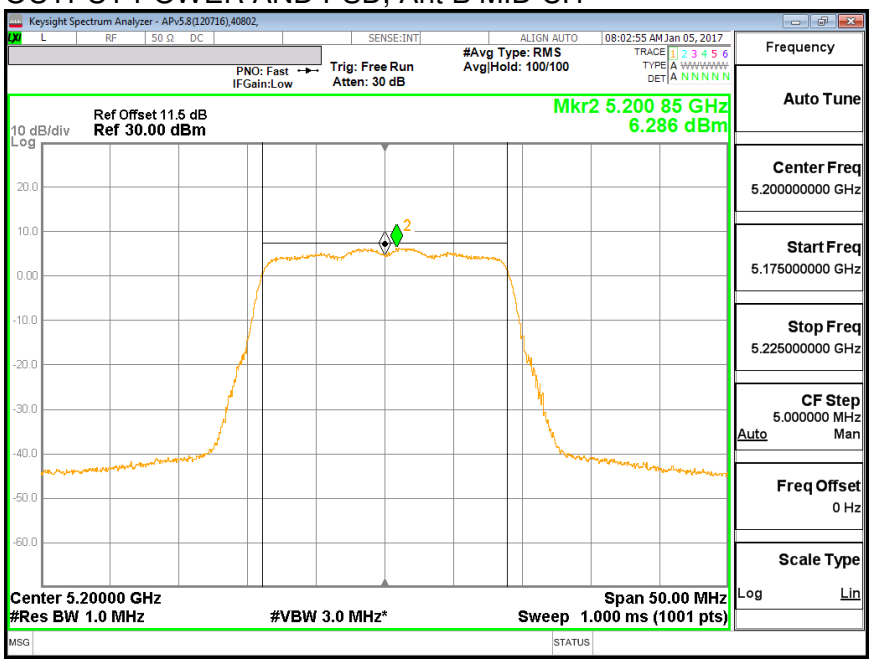
Channel	Frequency (MHz)	Antenna A Meas PSD (dBm)	Antenna B Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.57	6.64	9.62	10.58	-0.96
Mid	5200	6.29	6.45	9.38	10.58	-1.20
High	5240	6.65	6.47	9.57	10.58	-1.01

OUTPUT POWER AND PSD, Antenna A

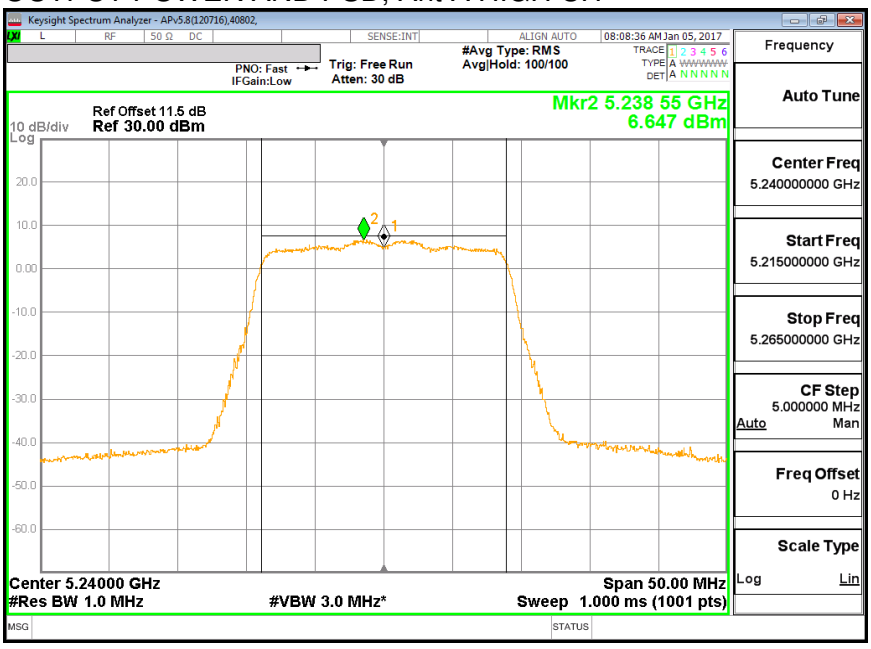
OUTPUT POWER AND PSD, Ant A LOW CH



OUTPUT POWER AND PSD, Ant B MID CH

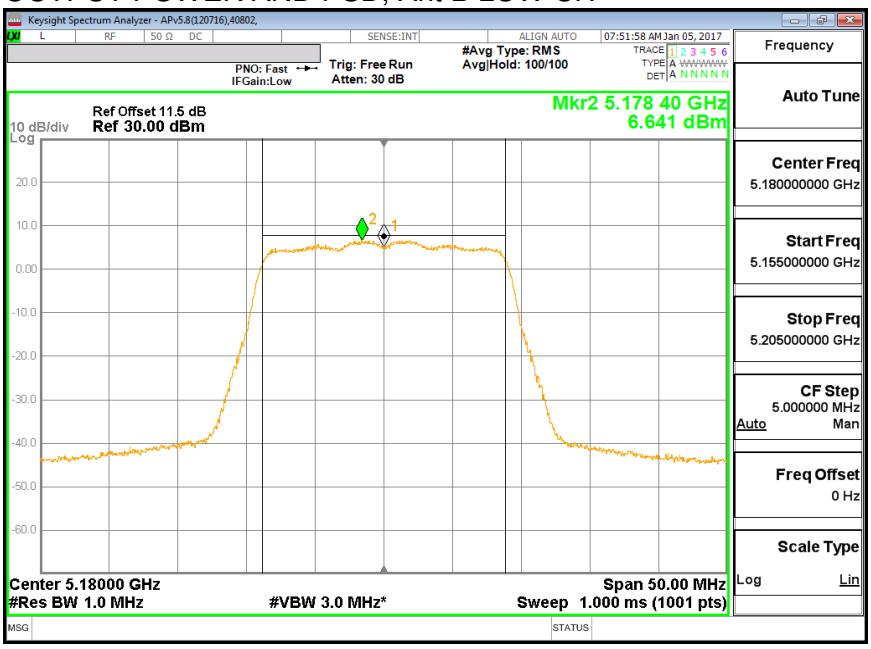


OUTPUT POWER AND PSD, Ant A HIGH CH

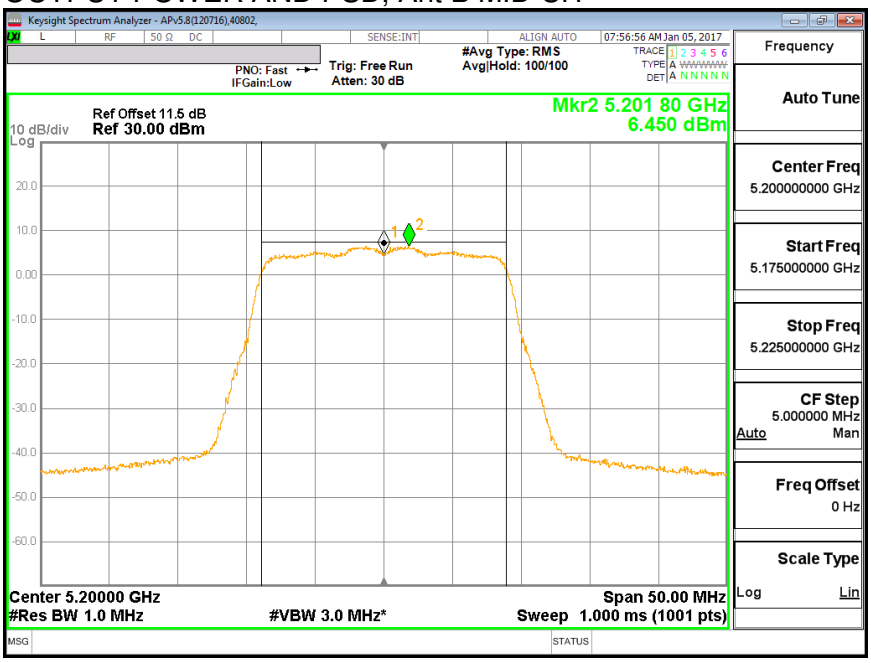


OUTPUT POWER AND PSD, Antenna B

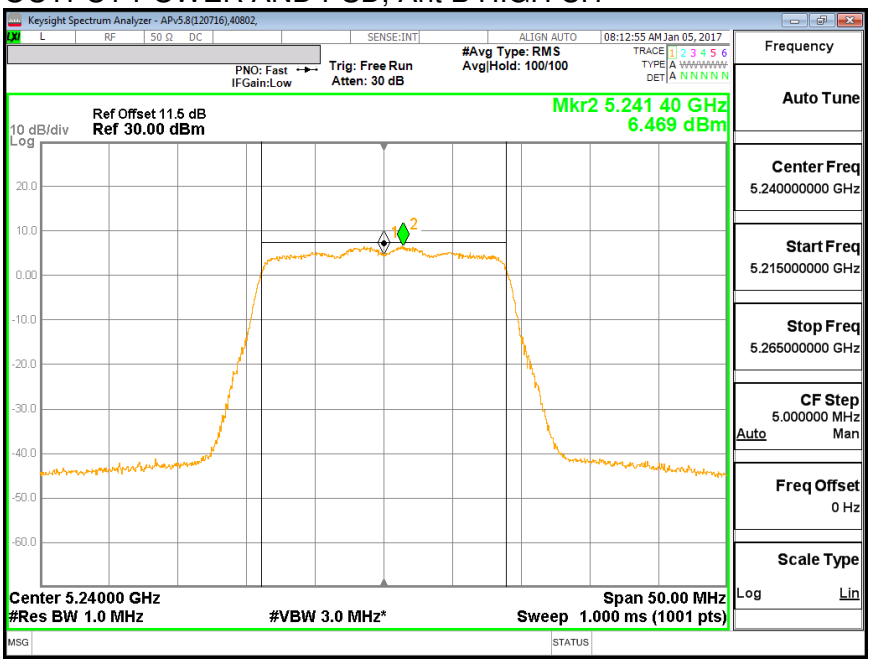
OUTPUT POWER AND PSD, Ant B LOW CH



OUTPUT POWER AND PSD, Ant B MID CH



OUTPUT POWER AND PSD, Ant B HIGH CH



8.5. 802.11n HT40 Antenna A MODE IN THE 5.2 GHz BAND

8.5.1. 26 dB BANDWIDTH

LIMITS

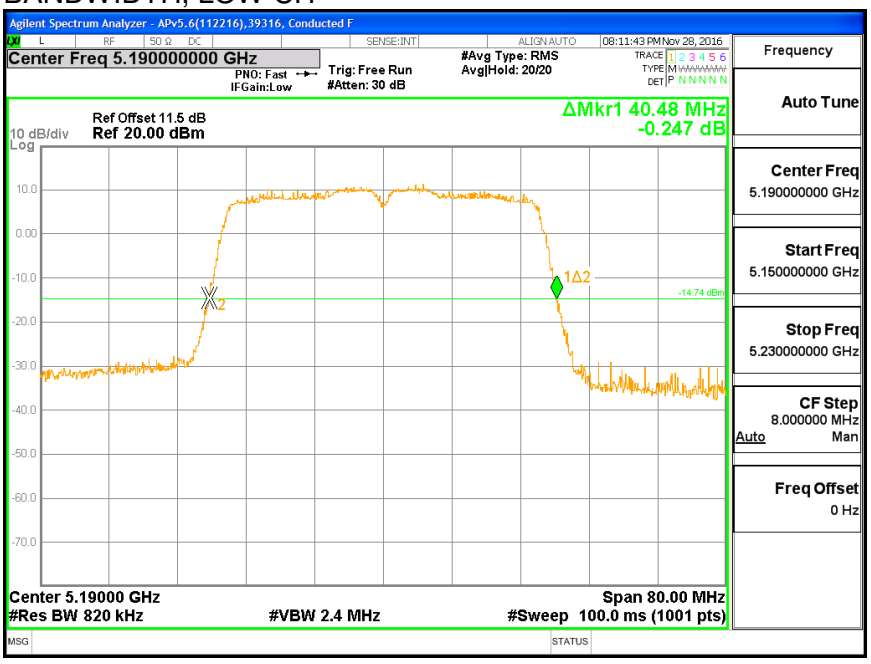
None; for reporting purposes only.

RESULTS

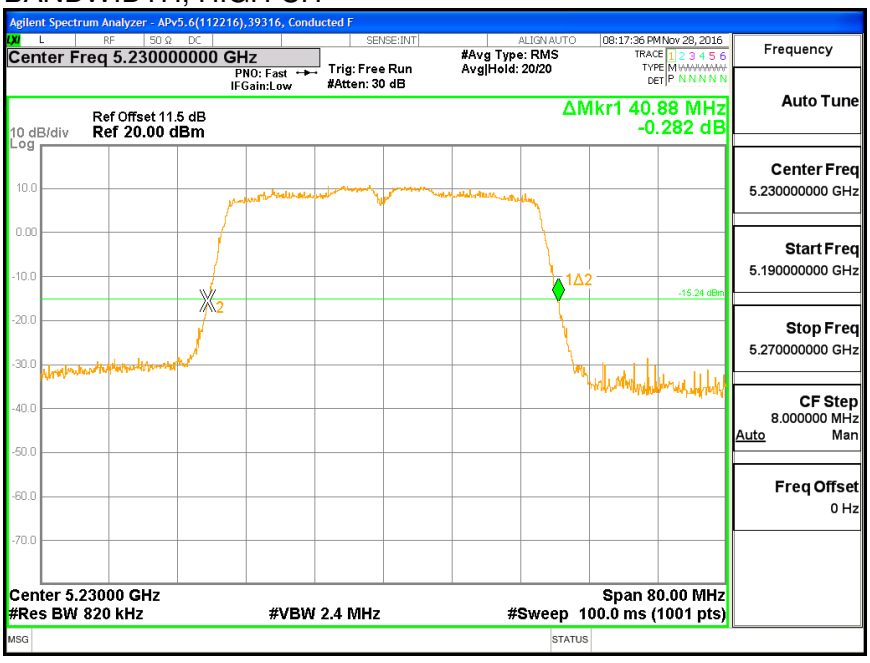
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	40.480
High	5230	40.880

26 dB BANDWIDTH

BANDWIDTH, LOW CH



BANDWIDTH, HIGH CH



8.5.2. 99% BANDWIDTH

LIMITS

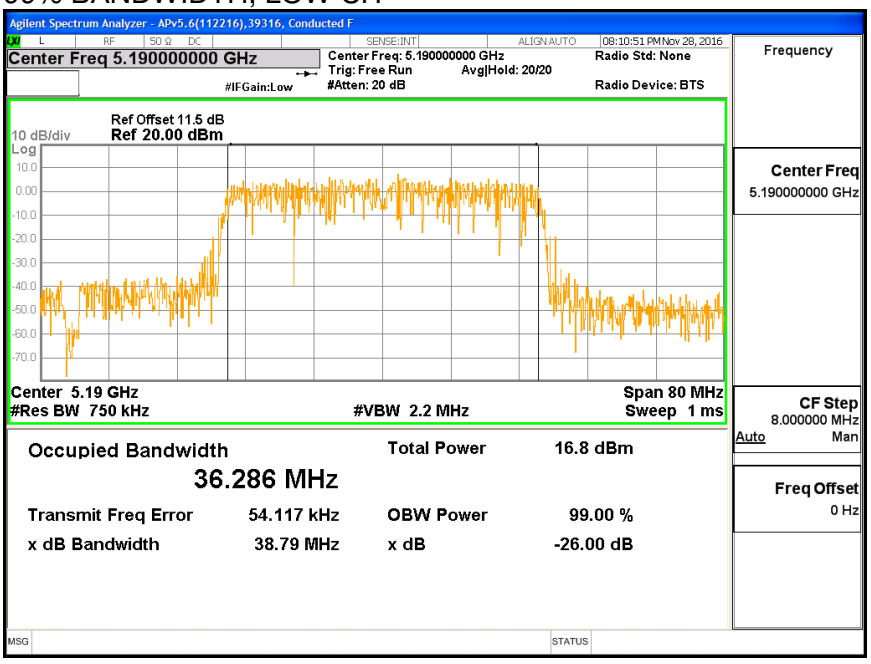
None; for reporting purposes only.

RESULTS

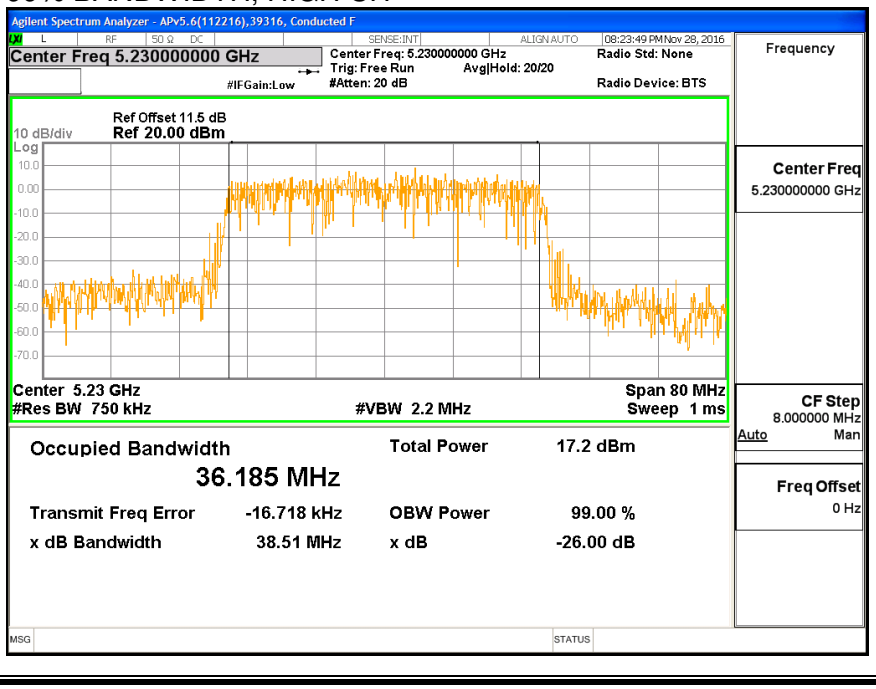
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5190	36.286
High	5230	36.185

99% BANDWIDTH

99% BANDWIDTH, LOW CH



99% BANDWIDTH, HIGH CH



8.5.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	45256	Date:	1/31/17

Channel	Frequency (MHz)	Power (dBm)
Low	5190	13.94
High	5230	16.92

8.5.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407 (a) (1)

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

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

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

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

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

ID:	45256	Date:	1/31/17

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	3.48	3.48	24.00	11.00
High	5230	3.48	3.48	24.00	11.00

Duty Cycle CF (dB)	0.11	Included in Calculations of Corr'PSD

Output Power Results

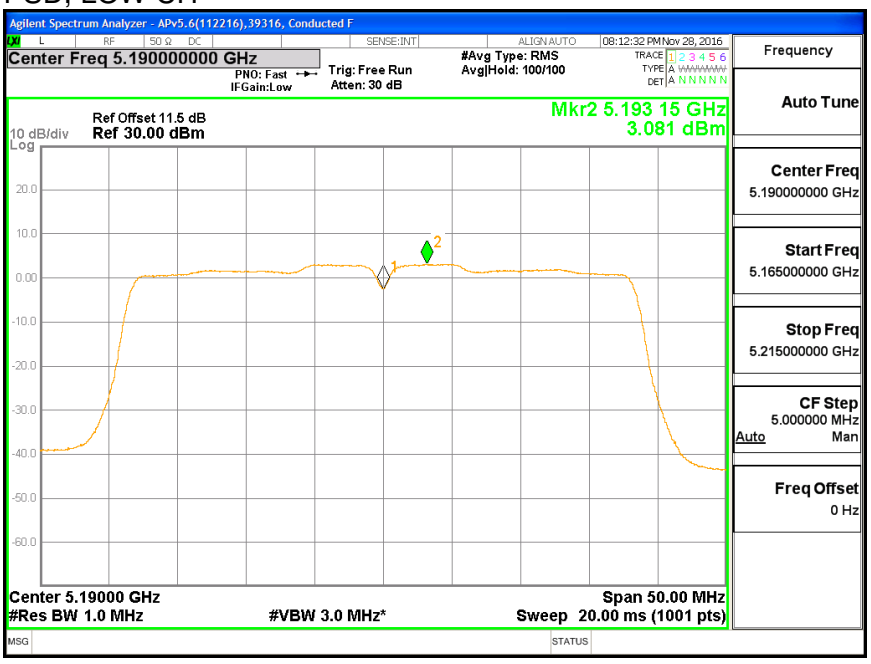
Channel	Frequency (MHz)	Antenna A Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.94	13.94	24.00	-10.06
High	5230	16.92	16.92	24.00	-7.08

PSD Results

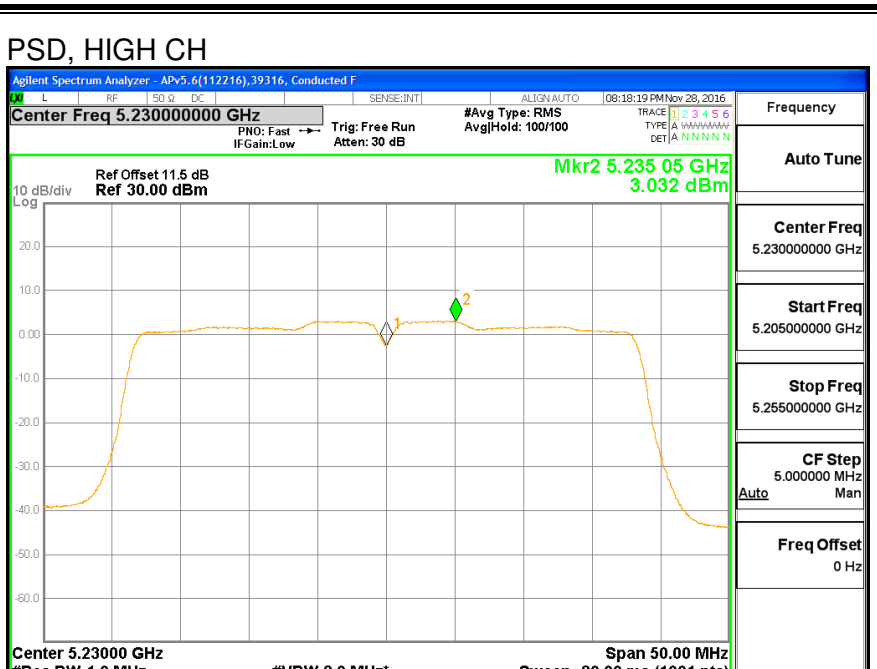
Channel	Frequency (MHz)	Antenna A Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	3.08	3.19	11.00	-7.81
High	5230	3.03	3.14	11.00	-7.86

PSD

PSD, LOW CH



PSD, HIGH CH



8.6. 802.11n HT40 Antenna B MODE IN THE 5.2 GHz BAND

8.6.1. 26 dB BANDWIDTH

LIMITS

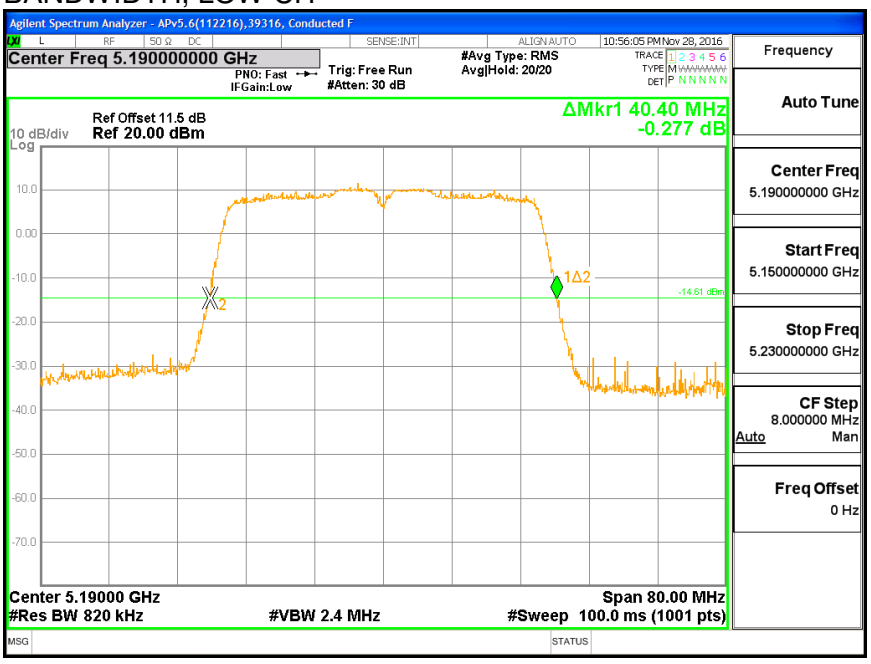
None; for reporting purposes only.

RESULTS

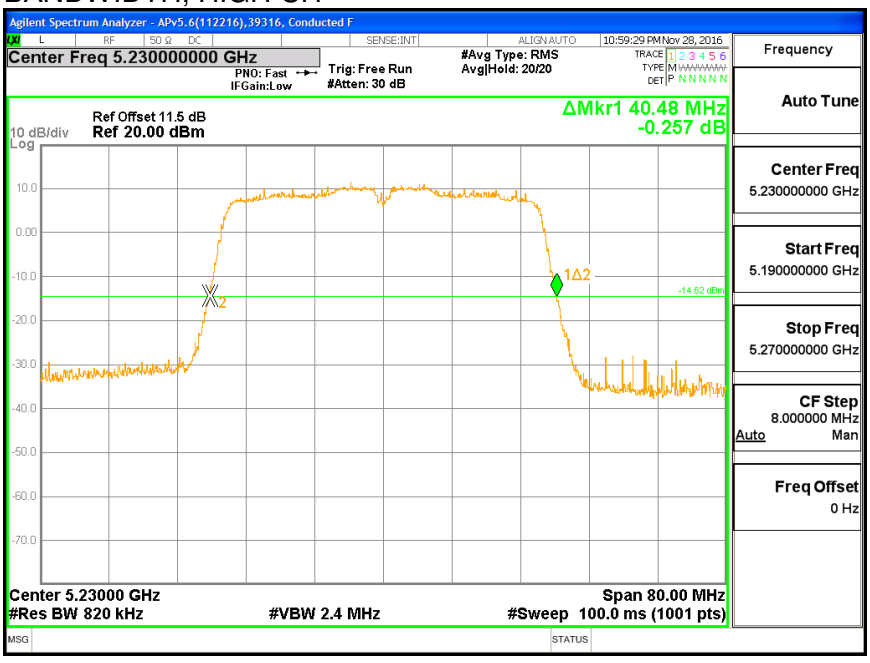
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	40.400
High	5230	40.480

26 dB BANDWIDTH

BANDWIDTH, LOW CH



BANDWIDTH, HIGH CH



8.6.2. 99% BANDWIDTH

LIMITS

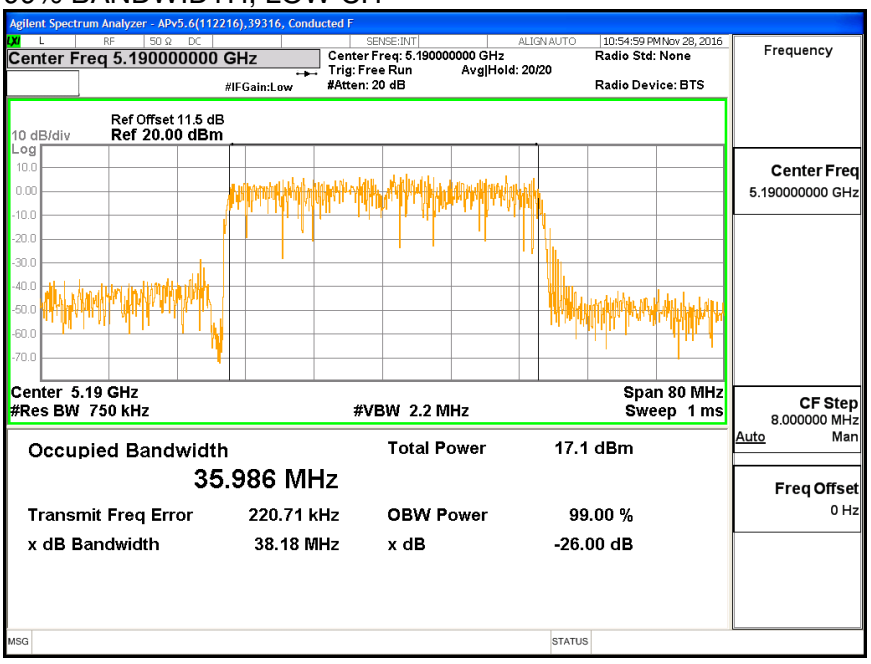
None; for reporting purposes only.

RESULTS

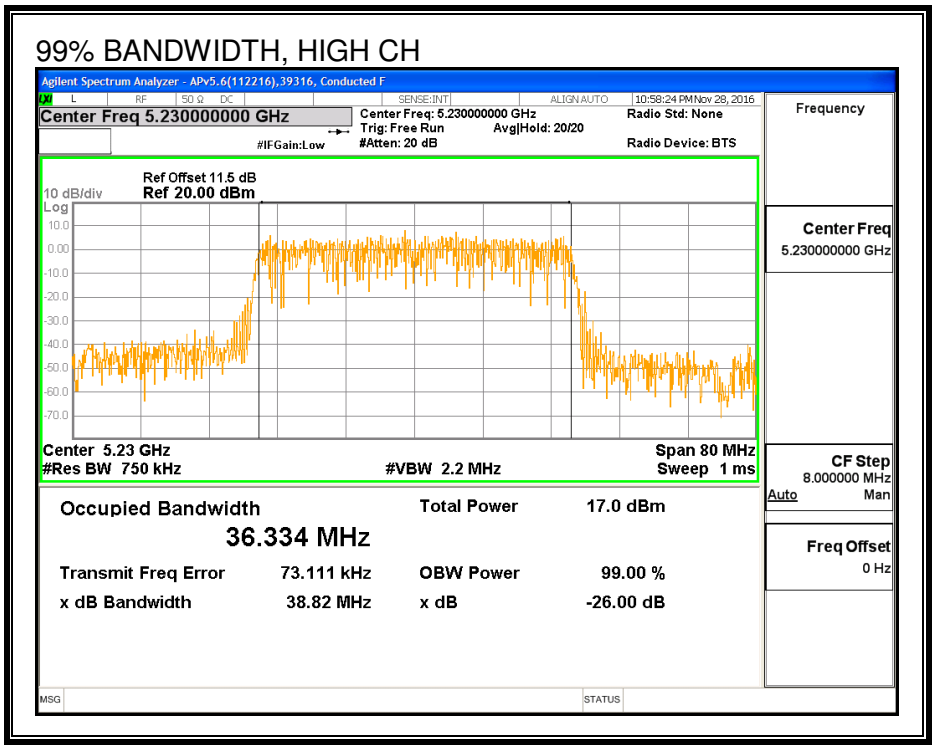
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5190	35.986
High	5230	36.334

99% BANDWIDTH

99% BANDWIDTH, LOW CH



99% BANDWIDTH, HIGH CH



8.6.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	45256	Date:	1/31/17

Channel	Frequency (MHz)	Power (dBm)
Low	5190	13.98
High	5230	15.96

8.6.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407 (a) (1)

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

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

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

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

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

ID:	45256	Date:	1/31/17

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	3.33	3.33	24.00	11.00
High	5230	3.33	3.33	24.00	11.00

Duty Cycle CF (dB)	0.11	Included in Calculations of Corr'd PSD

Output Power Results

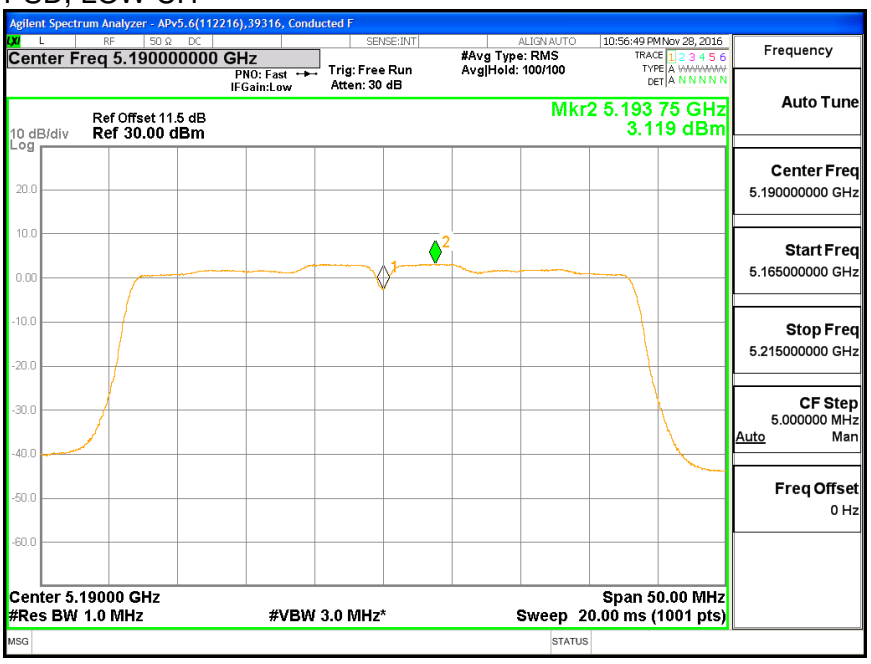
Channel	Frequency (MHz)	Antenna B Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.98	13.98	24.00	-10.02
High	5230	15.96	15.96	24.00	-8.04

PSD Results

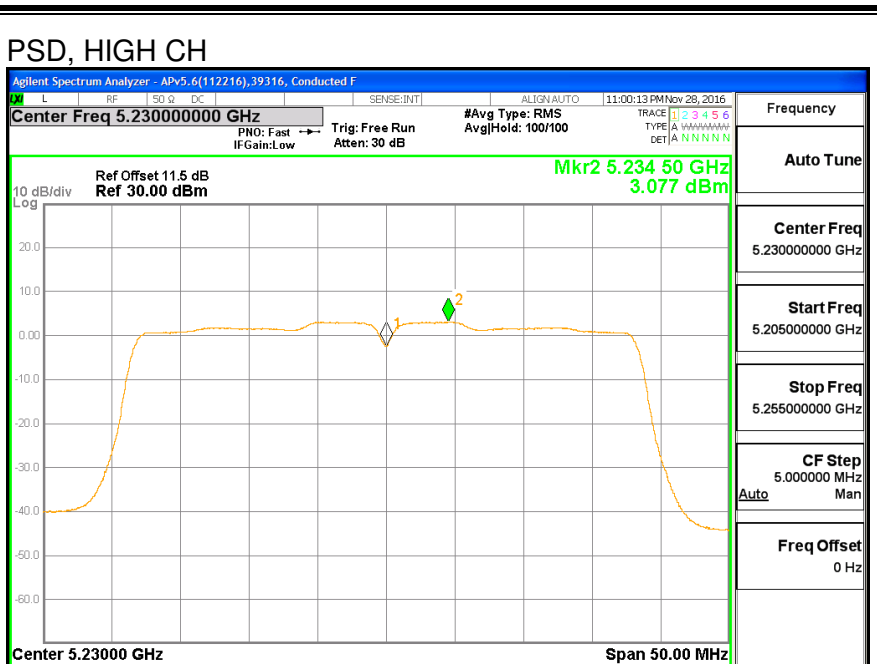
Channel	Frequency (MHz)	Antenna B Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	3.12	3.23	11.00	-7.77
High	5230	3.08	3.19	11.00	-7.81

PSD

PSD, LOW CH



PSD, HIGH CH



8.7. 802.11n HT40 2Tx (Antenna A + Antenna B) CDD MODE IN THE 5.2 GHz BAND

8.7.1. 26 dB BANDWIDTH

LIMITS

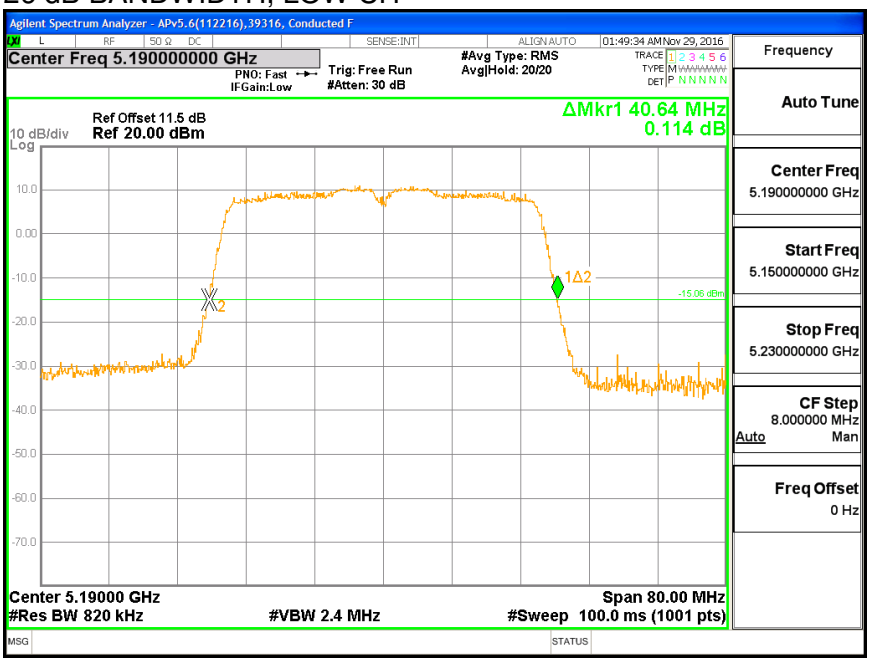
None; for reporting purposes only.

RESULTS

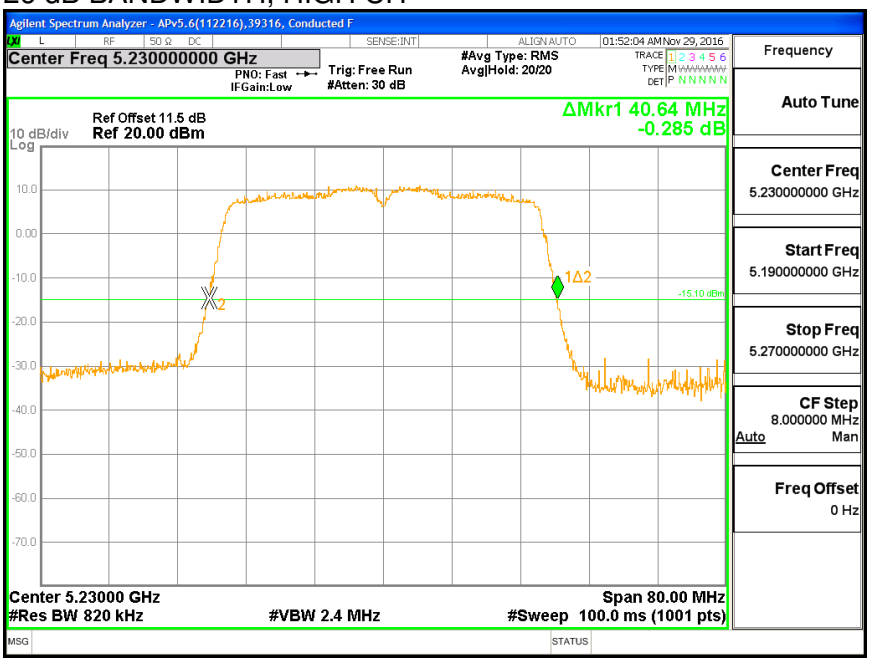
Channel	Frequency (MHz)	26 dB BW Antenna A (MHz)	26 dB BW Antenna B (MHz)
Low	5190	40.640	40.240
High	5230	40.640	40.160

26 DB BANDWIDTH, Antenna A

26 dB BANDWIDTH, LOW CH

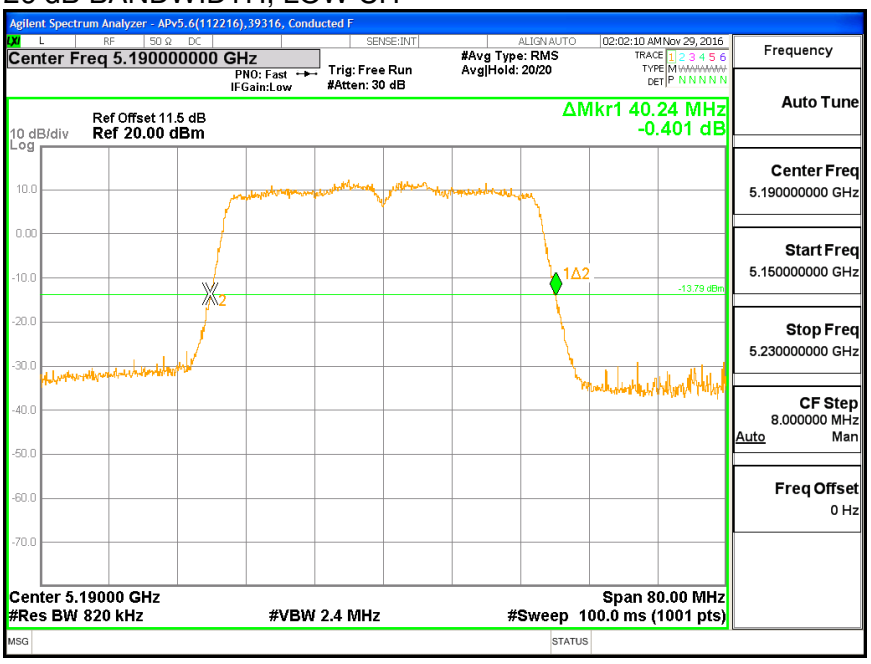


26 dB BANDWIDTH, HIGH CH



26 DB BANDWIDTH, Antenna B

26 dB BANDWIDTH, LOW CH



26 dB BANDWIDTH, HIGH CH