

**FCC 47 CFR PART 15 SUBPART E
(Class II Permissive Change)**

TEST REPORT

For

Wireless-N Selectable-Band Access Point with PoE

Model: WAP321

Trade Name: Cisco

Issued to

Sercomm Corporation
8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
No.11, Wu-Gong 6th Rd., Wugu Industrial Park,
New Taipei City 248, Taiwan (R.O.C.)
<http://www.ccsrf.com>
service@ccsrf.com
Issued Date: July 23, 2015



Note: This report shall not be reproduced except in full, without the written approval of Compliance Certification Services Inc. This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document.

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 17, 2012	Initial Issue	ALL	Angel Cheng
01	July 23, 2015	Rev. (01)	ALL	Doris Chu

Rev. (01)

- 1. Applicant updates standard.*
- 2. Other information, please refer to the T111028201 and this test report.*
- 3. Update report in accordance with FCC new rule.*
- 4. Test data is same as the previous data.*

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION	4
2. EUT DESCRIPTION.....	5
3. TEST METHODOLOGY.....	6
3.1 EUT CONFIGURATION	6
3.2 EUT EXERCISE	6
3.3 GENERAL TEST PROCEDURES.....	6
3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS	7
3.5 DESCRIPTION OF TEST MODES.....	8
4. INSTRUMENT CALIBRATION	9
4.1 MEASURING INSTRUMENT CALIBRATION	9
4.2 MEASUREMENT EQUIPMENT USED	9
4.3 MEASUREMENT UNCERTAINTY.....	10
5. FACILITIES AND ACCREDITATIONS	11
5.1 FACILITIES.....	11
5.2 EQUIPMENT.....	11
5.3 TABLE OF ACCREDITATIONS AND LISTINGS.....	12
6. SETUP OF EQUIPMENT UNDER TEST	13
6.1 SETUP CONFIGURATION OF EUT	13
6.2 SUPPORT EQUIPMENT	13
7. FCC PART 15 REQUIREMENTS	14
7.1 26 DB EMISSION BANDWIDTH	14
7.2 MAXIMUM CONDUCTED OUTPUT POWER.....	38
7.3 BAND EDGES MEASUREMENT	41
7.4 PEAK POWER SPECTRAL DENSITY	57
7.5 RADIATED UNDESIRABLE EMISSION	80
7.6 POWERLINE CONDUCTED EMISSIONS.....	103
7.7 FREQUENCY STABILITY.....	106
APPENDIX I PHOTOGRAPHS OF TEST SETUP.....	113

1. TEST RESULT CERTIFICATION

Applicant: Sercomm Corporation
8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.

Equipment Under Test: Wireless-N Selectable-Band Access Point with PoE

Trade Name: Cisco

Model: WAP321

Date of Test: July 12, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart E	No non-compliance noted

We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

Reviewed by:



Miller Lee
Manager
Compliance Certification Services Inc.

Angel Cheng
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Wireless-N Selectable-Band Access Point with PoE			
Trade Name	Cisco			
Model Number	WAP321			
Model Discrepancy	N/A			
Received Date	June 22, 2015			
Power Adapter	1. Sunny/ SYS1381-121-W2C I/P: 100-240V~, 0.5A MAX, 50-60Hz O/P: 12V, 1.0A 2. LEADER / MU12-G120100-A2 I/P: 100-240V~, 50-60Hz, 0.5A O/P: 12V, 1A 3. Sunny/ SYS1381-1212-W2 I/P: 100-240V~, 0.5A MAX, 50-60Hz O/P: 12V, 1.0A 4. LEADER / MU12-G120100-A1 I/P: 100-240V~, 50-60Hz, 0.5A O/P: 12V, 1A			
Operating Frequency Range & Number of Channels	UNII Band I	Mode	Frequency Range (MHz)	Number of Channels
		IEEE 802.11a	5180 – 5240	4 Channels
		IEEE 802.11n HT 20 MHz	5180 – 5240	4 Channels
		IEEE 802.11n HT 40 MHz	5190 ~ 5230	2 Channels
Transmit Power	IEEE 802.11a mode: 13.41 dBm Mode 1: IEEE 802.11n HT 20 MHz Mode : 12.56 dBm IEEE 802.11n HT 40 MHz Mode: 12.35 dBm Mode 2: IEEE 802.11n HT 20 MHz Mode : 13.23 dBm IEEE 802.11n HT 40 MHz Mode: 13.27 dBm Mode 3: IEEE 802.11n HT 20 MHz Mode: 12.35 dBm IEEE 802.11n HT 40 MHz Mode: 12.76 dBm			
Modulation Technique	OFDM (QPSK, BPSK, 16-QAM, 64-QAM)			
Transmit Data Rate	IEEE 802.11a mode: 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT 20 mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps) IEEE 802.11n HT 40 mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)			
Antenna Specification	Antenna 1 (chain 0): 4.32 dBi Antenna 2 (chain 1): 4.67 dBi Antenna 3 (chain 2): 3.96 dBi			
Antenna Designation	PIFA Antenna			

Remark:

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **P27-WAP321** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2009 Radiated testing was performed at an antenna to EUT distance 3 meters.

The tests documented in this report were performed in accordance with ANSI C63.10: 2009, FCC CFR 47 Part 15.207, 15.209, 15.407 and KDB 789033 D02 General UNII Test Procedures New Rules v01.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

3.2 EUT EXERCISE

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in ANSI C63.10: 2009, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

Radiated Emissions

The EUT is placed on the turntable, which is 1.5 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2009.

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5 DESCRIPTION OF TEST MODES

The EUT (model: WAP321) comes with four types of power adapter (SYS1381-121-W2C, MU12-G120100-A2, SYS1381-1212-W2, MU12-G120100-A1) for sale. After the preliminary test, the EUT with power adapter (Model: MU12-G120100-A1) was found to emit the worst emissions and therefore had been tested under operating condition.

The EUT comes with three modes: mode 1 & mode 2 & mode 3.

“Mode 1” antenna 1 (chain 0), antenna 2 (chain 1)

“Mode 2” antenna 2 (chain 1), antenna 3 (chain 2)

“Mode 3” antenna 1 (chain 0), antenna 3 (chain 2)

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that Operate in double TX chains and double RX chains. The 2x2 configuration is implemented with Two outside TX & RX chains (Chain 0 and Chain 1)(Chain 1 and Chain 2)(Chain 0 and Chain 2)

Software used to control the EUT for staying in continuous transmitting and receiving mode was programmed.

After verification, all tests carried out are with the worst-case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode

IEEE 802.11a mode / 5180 ~ 5240MHz:

During the preliminary test, Chain 0, Chain 1, Chain 2 with IEEE 802.11a mode were pre-tested and found that Chain 1 emits the highest output power.

Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with chain 1 at 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz:

During the preliminary test, MCS0 : Chain 0, Chain 1, Chain 2 and MCS8 : Chain 0+Chain 1, Chain 1 +Chain 2, Chain 0 + chain 2 with IEEE 802.11n HT 20 MHz were pre-tested and found that Chain 0+Chain 1, Chain 1 +Chain 2, Chain 0 + chain 2 emits the highest output power.

Channel Low (5180MHz), Channel Mid (5220MHz) and Channel High (5240MHz) with chain 0 + chain 1 and chain 1 + chain 2 and chain 0 + chain 2 at MCS 8 data rate were chosen for full testing.

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz:

During the preliminary test, MCS0 : Chain 0, Chain 1, Chain 2 and MCS8 : Chain 0+Chain 1, Chain 1 +Chain 2, Chain 0 + chain 2 with IEEE 802.11n HT 40 MHz were pre-tested and found that Chain 0+Chain 1, Chain 1 +Chain 2, Chain 0 + chain 2 emits the highest output power.

Channel Low (5190MHz) and Channel High (5230MHz) with chain 0 + chain 1 and chain 1 + chain 2 and chain 0 + chain 2 at MCS 8 data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (Y axis) and the worst case was recorded.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	11/23/2015
Thermostatic/Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/07/2015
AC Power Source	EXTECH	6205	1140845	N.C.R
DC Power Supply	ABM	8301HD	D011531	N.C.R
Power Meter	Anritsu	ML2495A	1012009	06/07/2016
Power Sensor	Anritsu	MA2411A	0917072	06/08/2016
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/08/2016

Wugu 966 Chamber A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510268	09/18/2015
EMI Test Receiver	R&S	ESCI	100064	06/04/2016
Bilog Antenna	Sunol Sciences	JB3	A030105	08/19/2015
Horn Antenna	EMCO	3117	00055165	01/26/2016
Horn Antenna	EMCO	3116	26370	12/25/2015
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Pre-Amplifier	MITEQ	1652-3000	1490939	08/09/2016
Pre-Amplifier	EMC	EMC 01265	4035	06/04/2016
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	12/25/2015
Coaxial Cable	Huber+Suhner	102	29212/2	12/25/2015
Coaxial Cable	Huber+Suhner	102	29406/2	12/25/2015
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission room # B				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	R&S	ESCI	100234	06/09/2016
LISN (EUT)	FCC	FCC-LISN-50-32-2	08009	03/23/2016
LISN	SCHWARZBECK	NSLK 8127	8127382	12/30/2015
BNC CABLE	MIYAZAKI	5D-FB	BNC B3	08/04/2015
Pulse Limiter	R&S	ESH3-Z2	100374	01/05/2016
THERMO-HYGRO METER	WISEWIND	201A	1006	05/19/2016
Test S/W	CCS-3A1-CE			

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/-1.1089
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

Remark: The powerline conducted emissions test items was tested at Compliance Certification Services Inc. (Sindian Lab.) The test equipments were listed in page 10 and the test data, please refer page 104-105.

☒ No.11, Wu-Gong 6th Rd., Wugu Industrial Park, New Taipei City 248, Taiwan (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2009 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide, horn and/or Loop. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-247, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	

* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Equipment	Model No.	Serial No.	FCC ID	Brand Name	Data Cable	Power Cord
1	USB Mouse	M-UAE96	F93A90A5BU90L20	FCC DOC	HP	Shielded, 1.8m	N/A
2	USB Keyboard	KU-0316	BC3870FVBWH079	FCC DOC	HP	Shielded, 1.8m	N/A
3	Printer	Deskjet D2360	TH73C1492F	FCC DOC	HP	Shielded, 1.8m	Unshielded, 1.8m
4	Monitor	933SN+	CM19HVKS00002	FCC DOC	SAMSUNG	Shielded, 1.8m with two cores	Unshielded, 1.8m
5	Host PC	T3500	8X36VBX	FCC DOC	DELL	Unshielded, 1.5m	Unshielded, 1.8m
6	Modem	AL-56ERM	0MERM04A0224	FCC DOC	GALILEO	Shielded, 1.0m	Unshielded, 1.8m
7	Server PC	xw4400	N/A	FCC DOC	HP	N/A	Unshielded, 1.8m
8.	Notebook PC	dv6-1332TX	CNF9491GM9	PD9112BNHU	HP	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

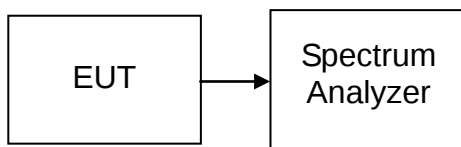
7. FCC PART 15 REQUIREMENTS

7.1 26 DB EMISSION BANDWIDTH

LIMIT

According to §15.303(c), for purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as $RBW > 1\%EBW$, $VBW > RBW$, $Span > 26dB$ bandwidth, and Sweep = auto.
4. Mark the peak frequency and $-26dB$ (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	20.795
Mid	5220	21.036
High	5240	22.939

Mode 1

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	21.444
Mid	5220	21.377
High	5240	21.205

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	20.855
Mid	5220	21.040
High	5240	20.994

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5190	40.751
High	5230	40.628

Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 1

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5190	40.294
High	5230	40.235

Mode 2

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	21.363
Mid	5220	21.322
High	5240	21.279

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	20.820
Mid	5220	20.900
High	5240	20.783

Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 1

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5190	40.390
High	5230	40.832

Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 2

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5190	40.352
High	5230	40.137

Mode 3

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	21.364
Mid	5220	21.380
High	5240	21.321

Test mode: IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5180	20.890
Mid	5220	20.849
High	5240	20.982

Test mode: IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5190	40.968
High	5230	40.938

Test mode: IEEE 802.11n HT 40 MHz mode/ 5190 ~ 5230MHz / Chain 2

Channel	Frequency (MHz)	26db Bandwidth (MHz)
Low	5190	40.155
High	5230	40.251

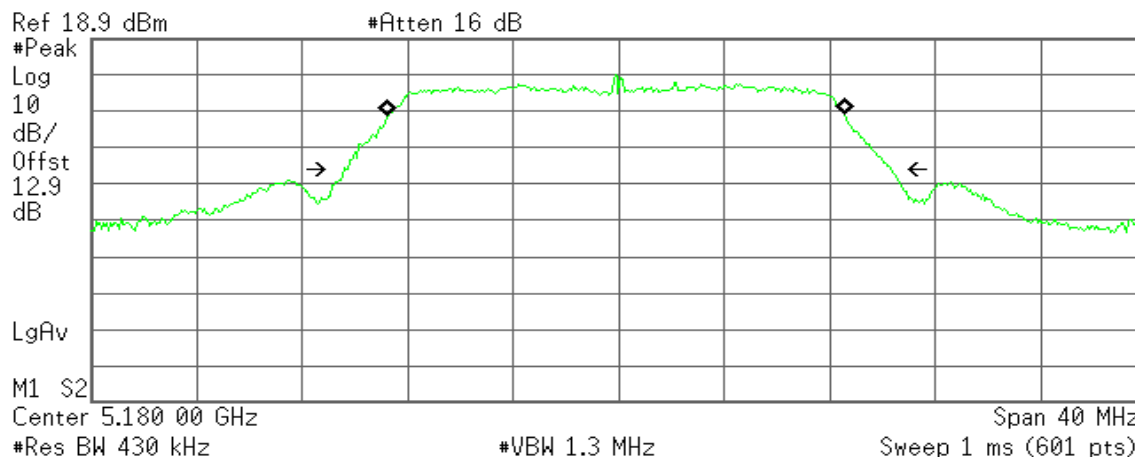
Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

CH Low

Agilent

R T



Occupied Bandwidth
17.3912 MHz

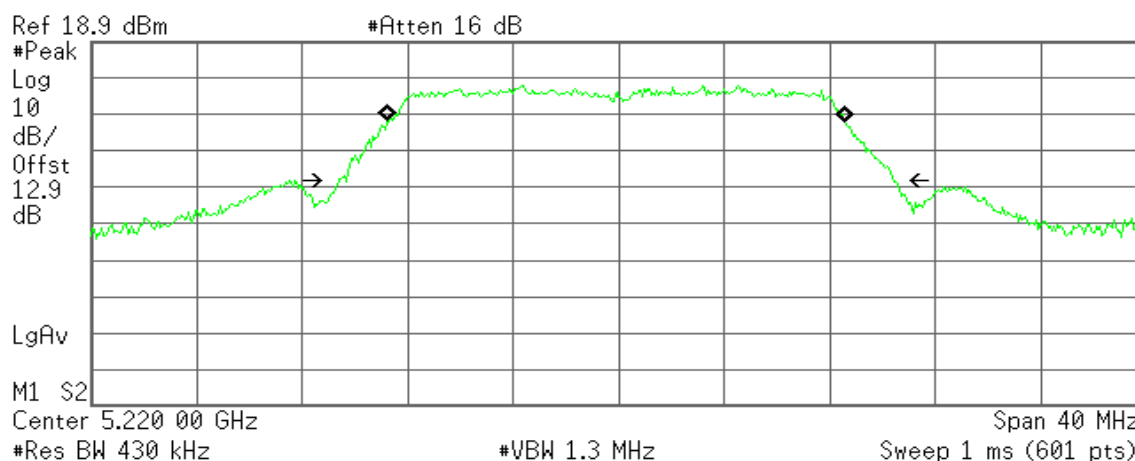
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -81.219 kHz
x dB Bandwidth 20.795 MHz

CH Mid

Agilent

R T



Occupied Bandwidth
17.3887 MHz

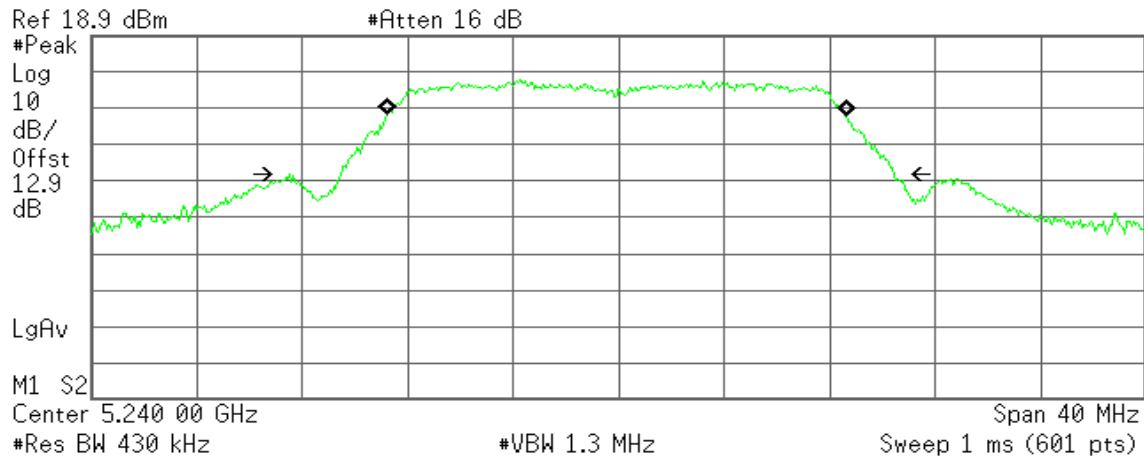
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -98.914 kHz
x dB Bandwidth 21.036 MHz

CH High

Agilent

R T



Occupied Bandwidth

17.4339 MHz

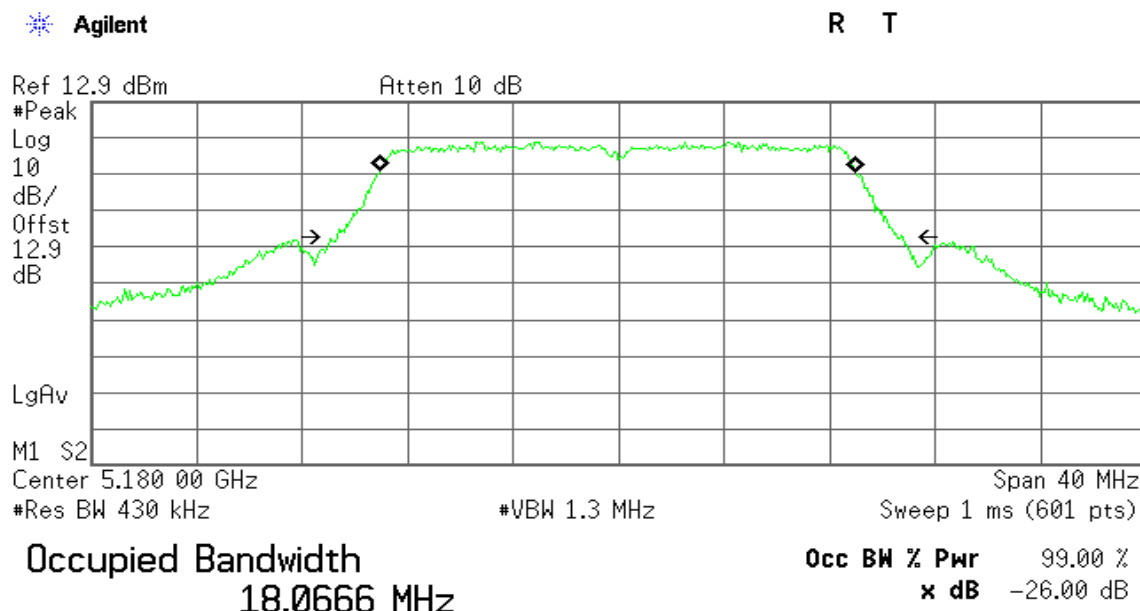
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -79.356 kHz
x dB Bandwidth 22.939 MHz

Mode 1

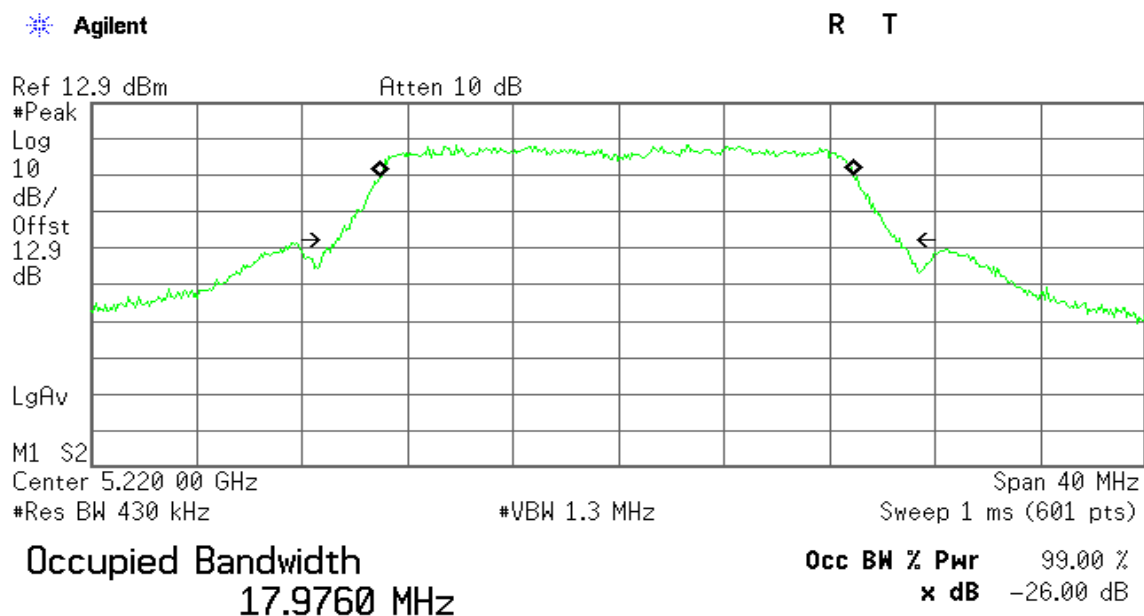
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

CH Low



Transmit Freq Error -17.753 kHz
x dB Bandwidth 21.444 MHz

CH Mid

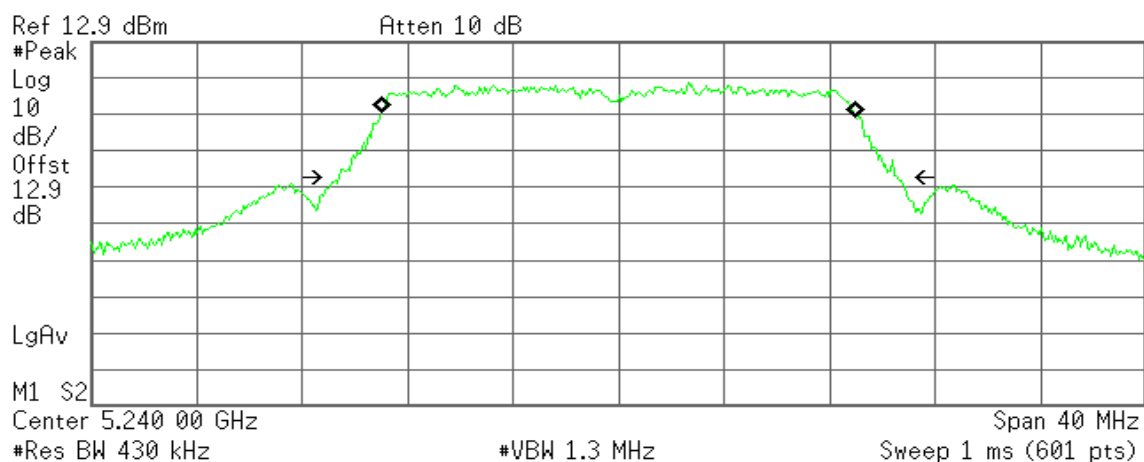


Transmit Freq Error -52.556 kHz
x dB Bandwidth 21.377 MHz

CH High

Agilent

R T



Occupied Bandwidth

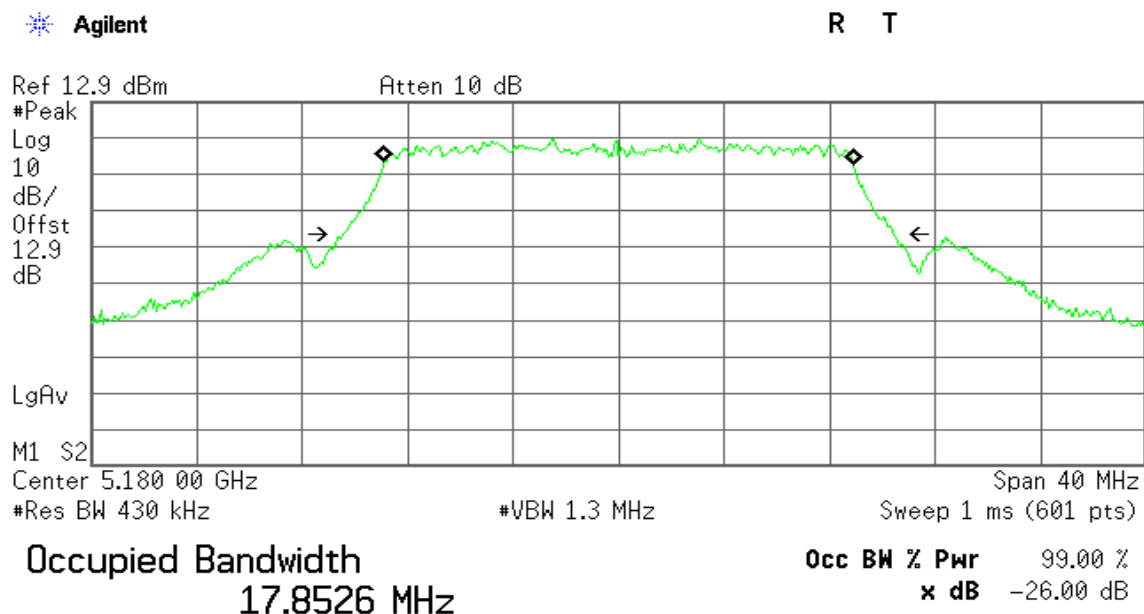
18.0096 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -1.427 kHz
x dB Bandwidth 21.205 MHz

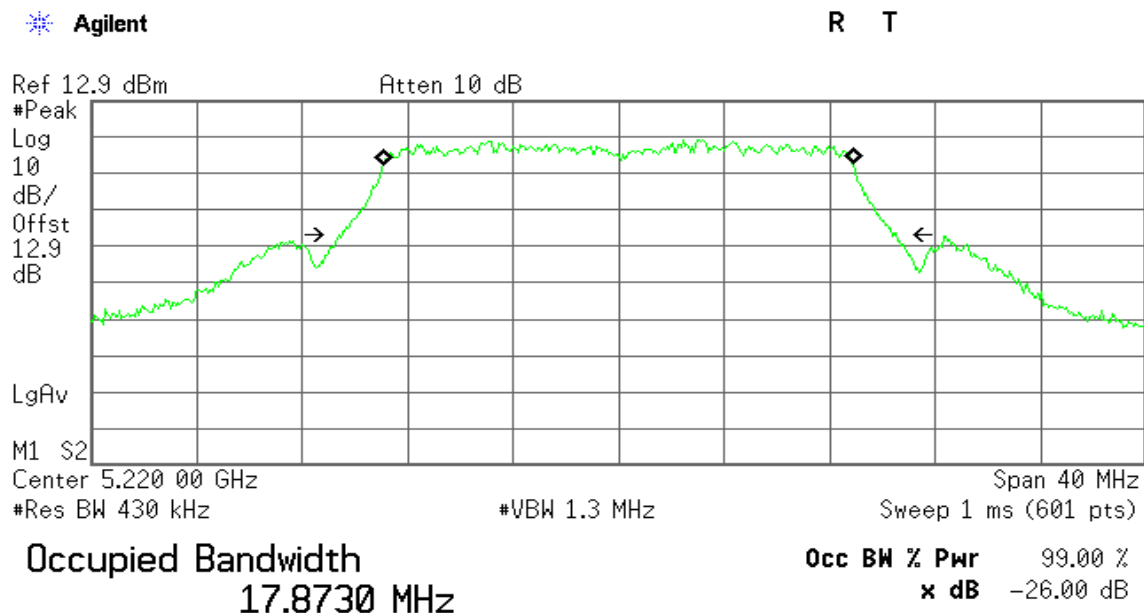
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

CH Low



Transmit Freq Error -4.380 kHz
x dB Bandwidth 20.855 MHz

CH Mid

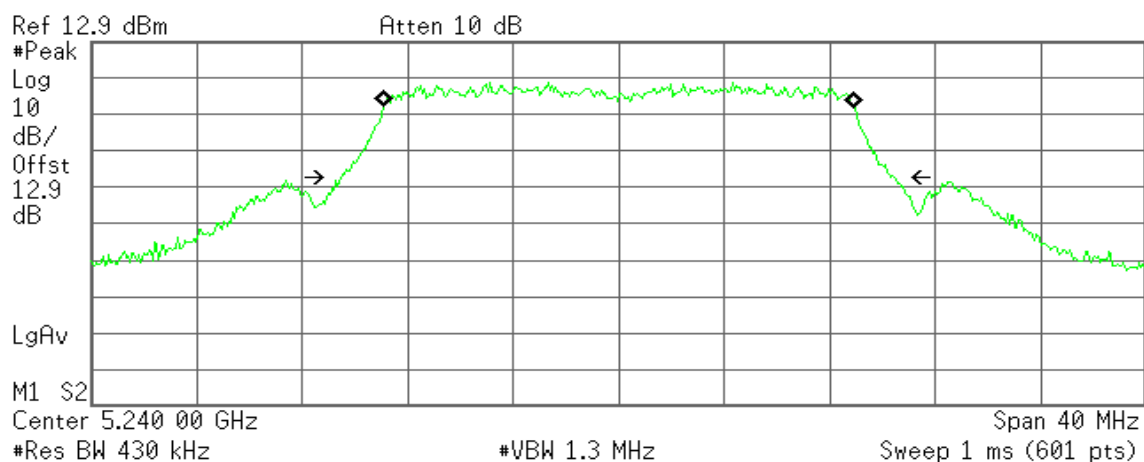


Transmit Freq Error -21.067 kHz
x dB Bandwidth 21.040 MHz

CH High

Agilent

R T



Occupied Bandwidth

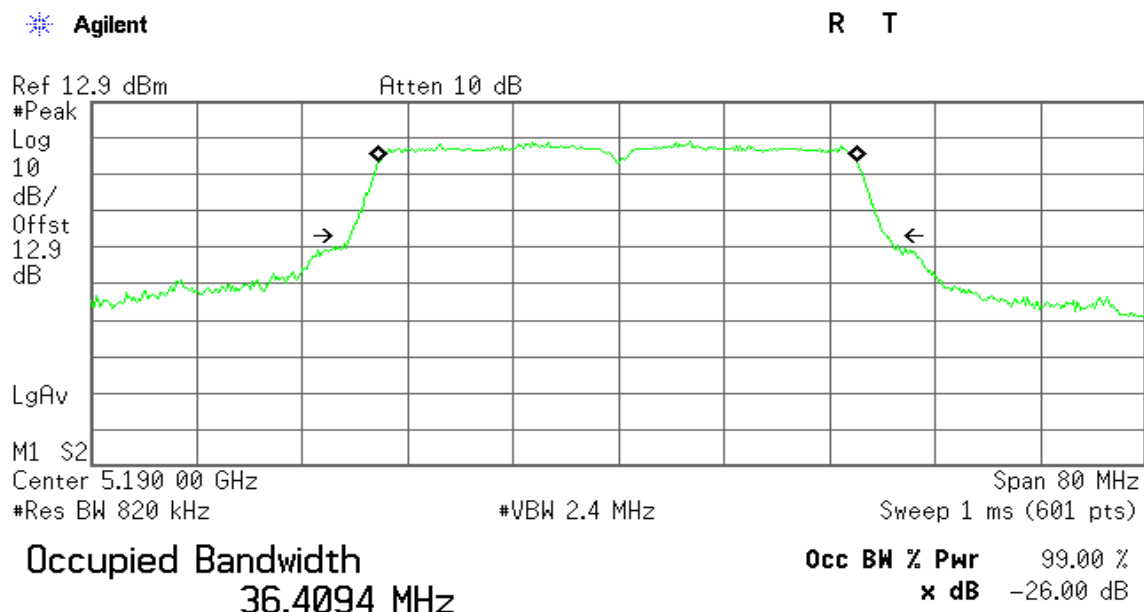
17.8978 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 3.573 kHz
x dB Bandwidth 20.994 MHz

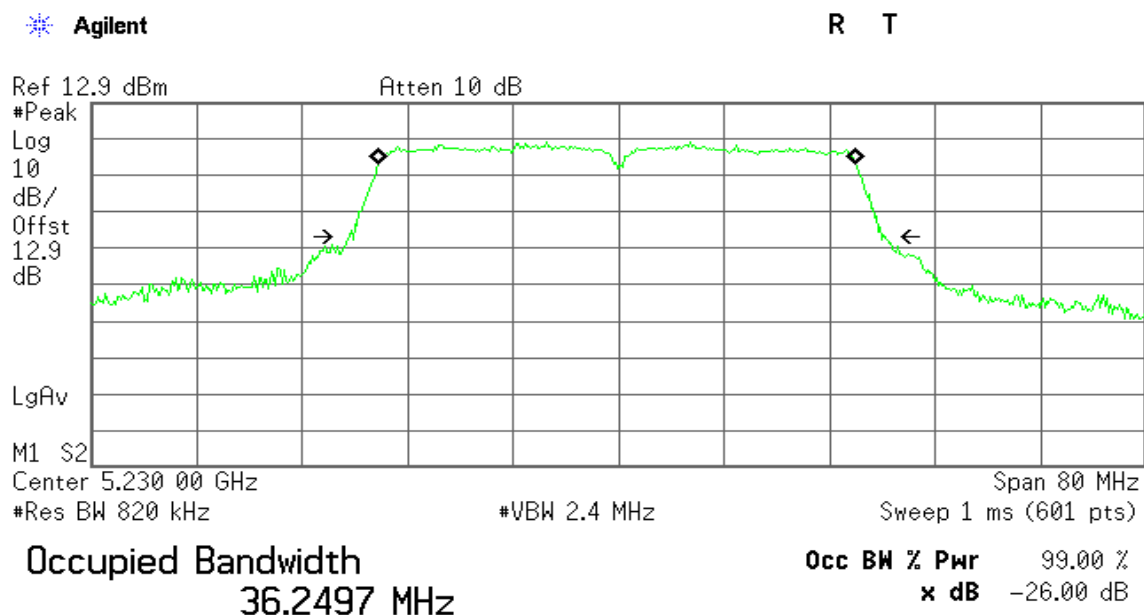
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

CH Low



Transmit Freq Error -45.722 kHz
x dB Bandwidth 40.751 MHz

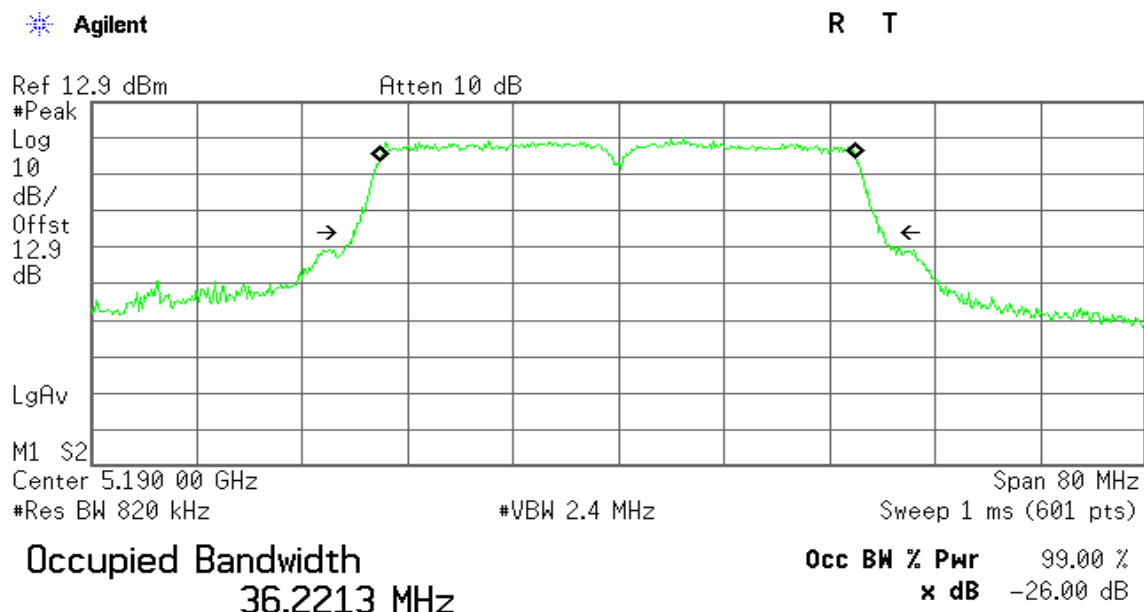
CH High



Transmit Freq Error -98.432 kHz
x dB Bandwidth 40.628 MHz

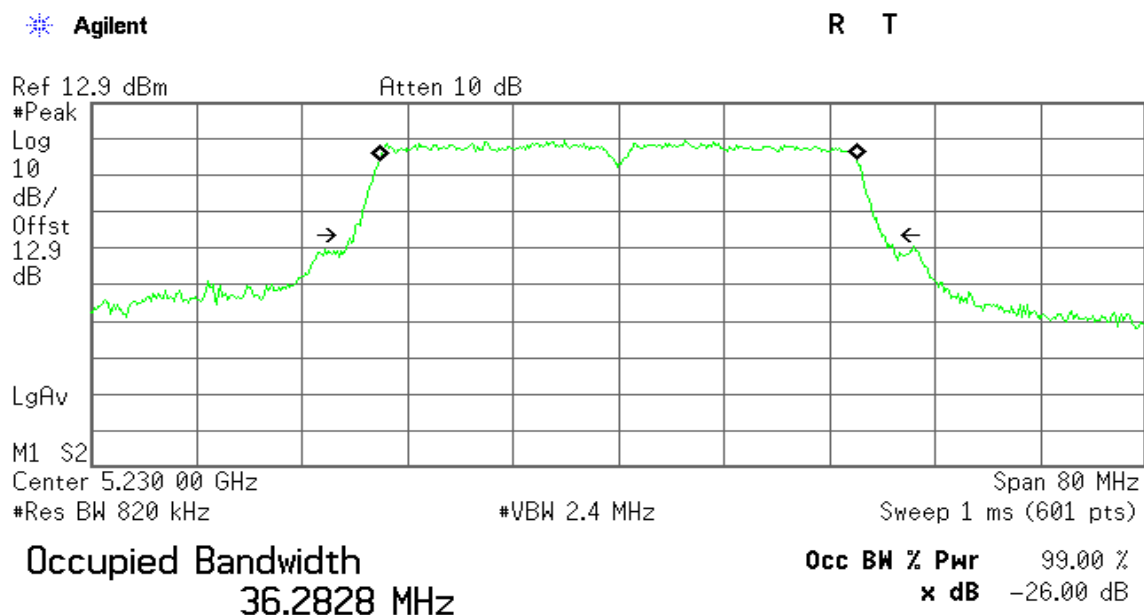
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

CH Low



Transmit Freq Error -58.194 kHz
x dB Bandwidth 40.294 MHz

CH High

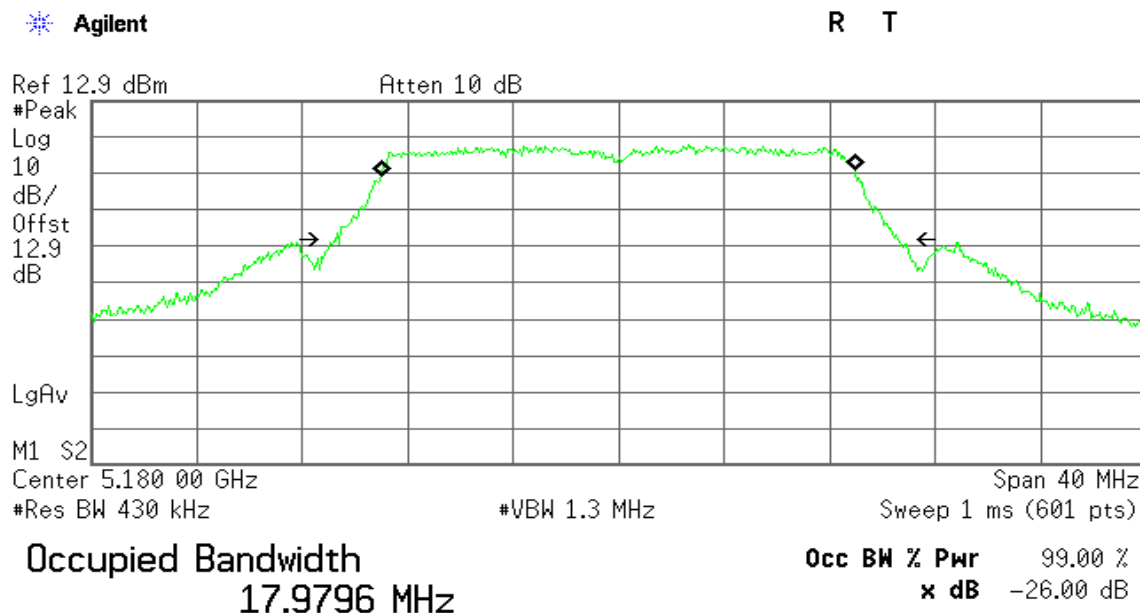


Transmit Freq Error -39.627 kHz
x dB Bandwidth 40.235 MHz

Mode 2

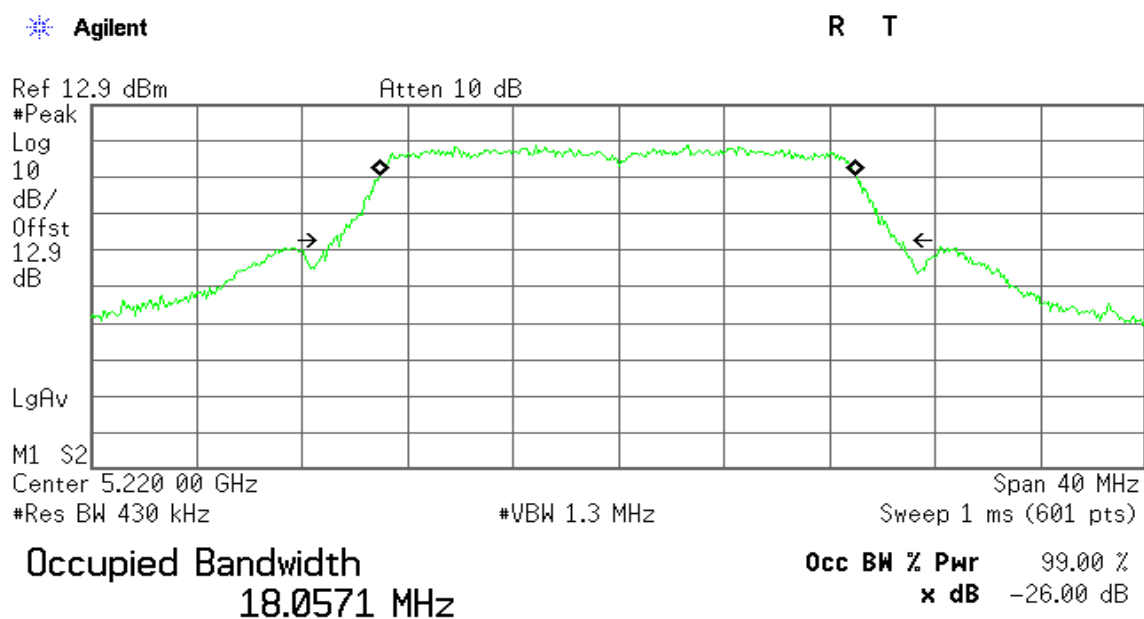
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 1

CH Low



Transmit Freq Error -18.289 kHz
x dB Bandwidth 21.363 MHz

CH Mid

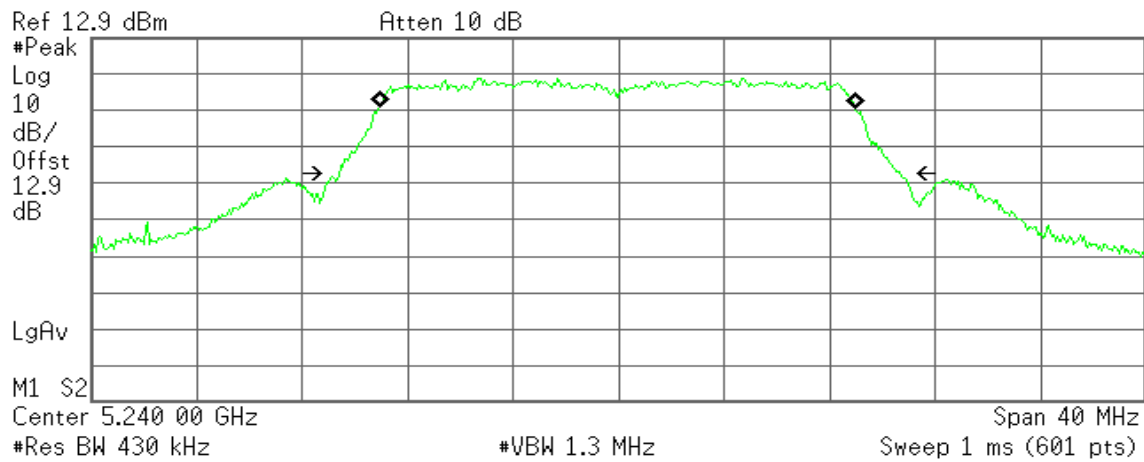


Transmit Freq Error -28.530 kHz
x dB Bandwidth 21.322 MHz

CH High

 Agilent

R T



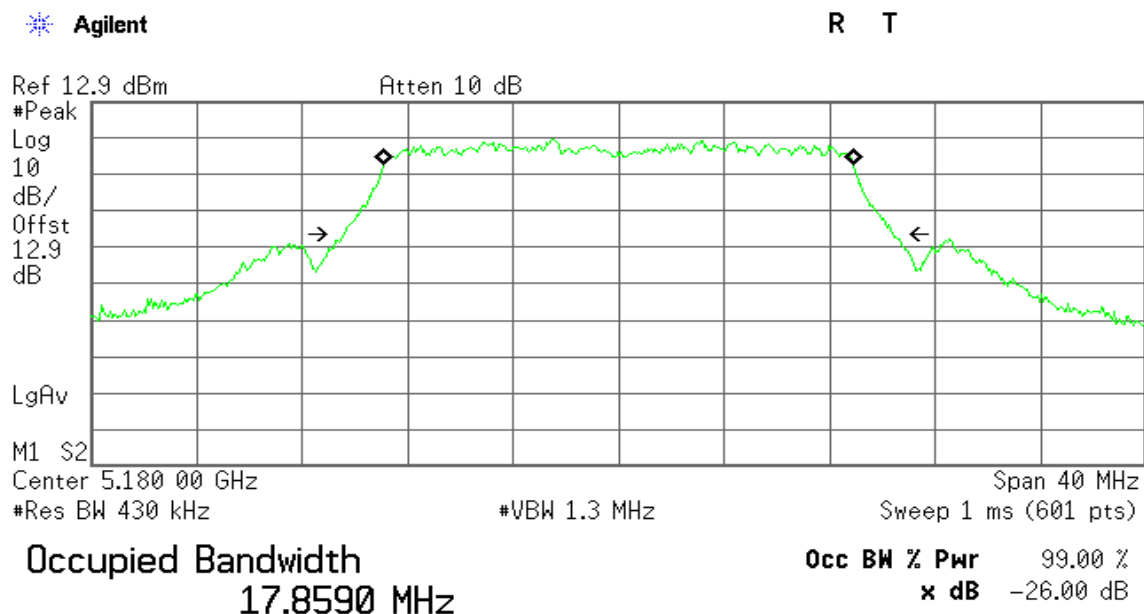
Occupied Bandwidth
18.0502 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -48.196 kHz
x dB Bandwidth 21.279 MHz

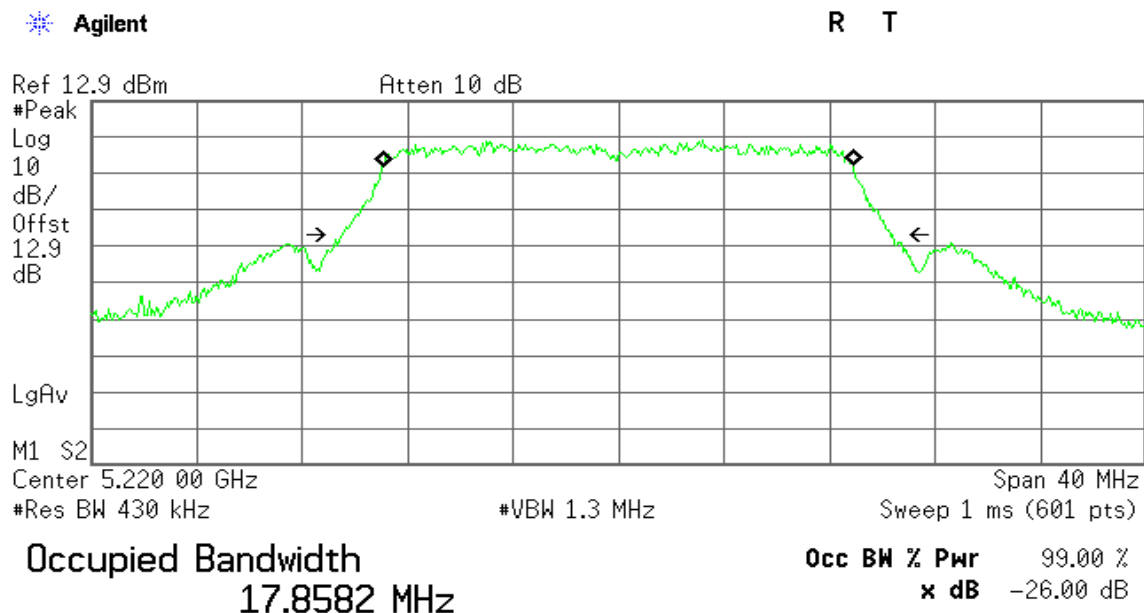
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

CH Low



Transmit Freq Error -2.817 kHz
x dB Bandwidth 20.820 MHz

CH Mid

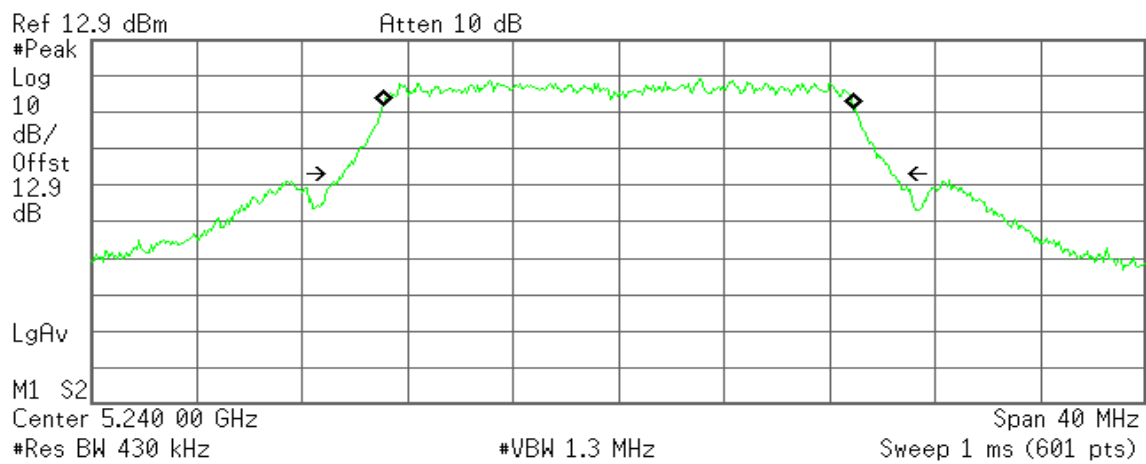


Transmit Freq Error -27.013 kHz
x dB Bandwidth 20.900 MHz

CH High

Agilent

R T



Occupied Bandwidth
17.8710 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

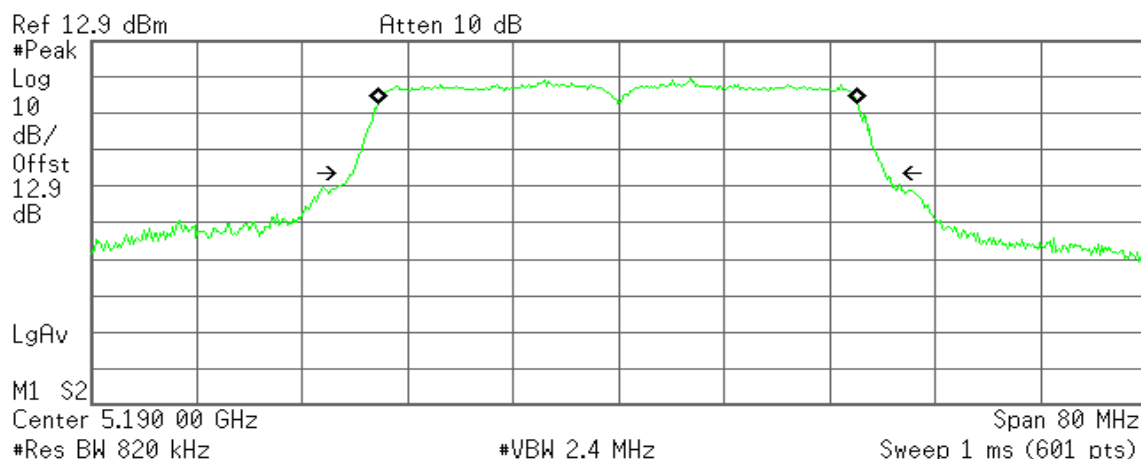
Transmit Freq Error -4.630 kHz
x dB Bandwidth 20.783 MHz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 1

CH Low

Agilent

R T



Occupied Bandwidth
36.3656 MHz

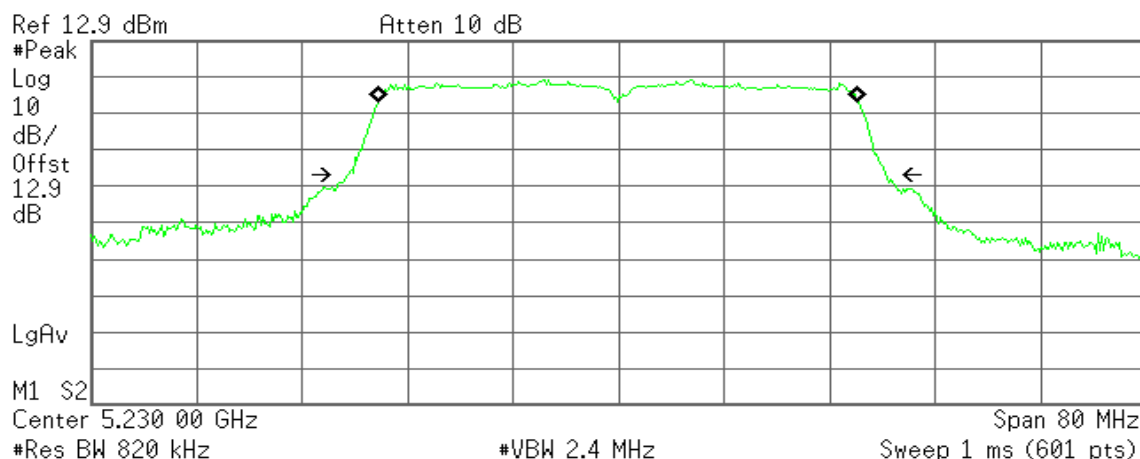
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -53.215 kHz
x dB Bandwidth 40.390 MHz

CH High

Agilent

R T



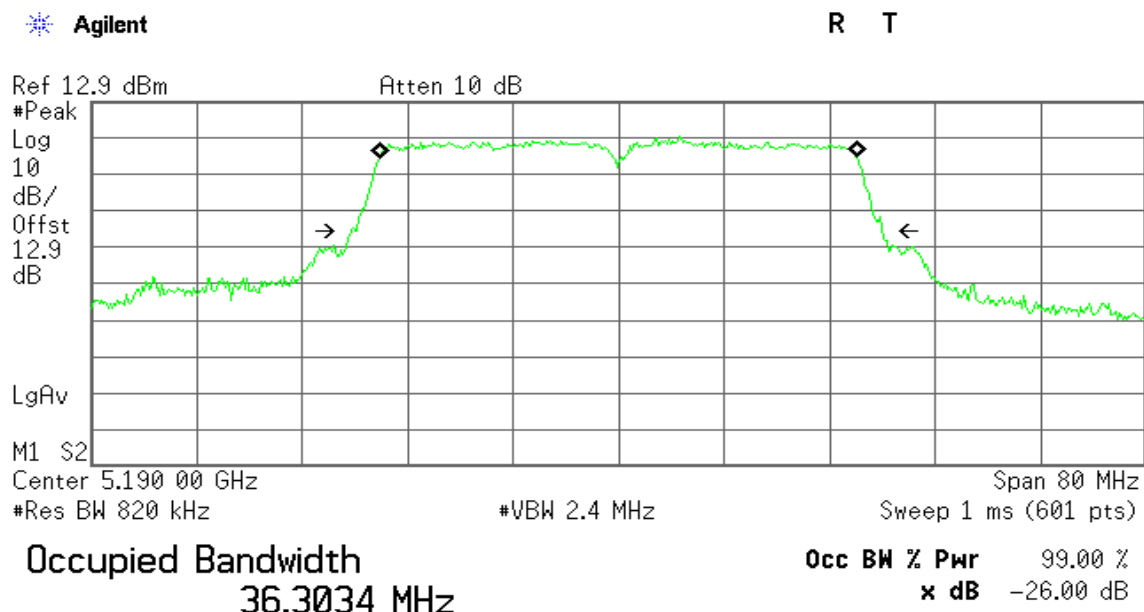
Occupied Bandwidth
36.4402 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -21.533 kHz
x dB Bandwidth 40.832 MHz

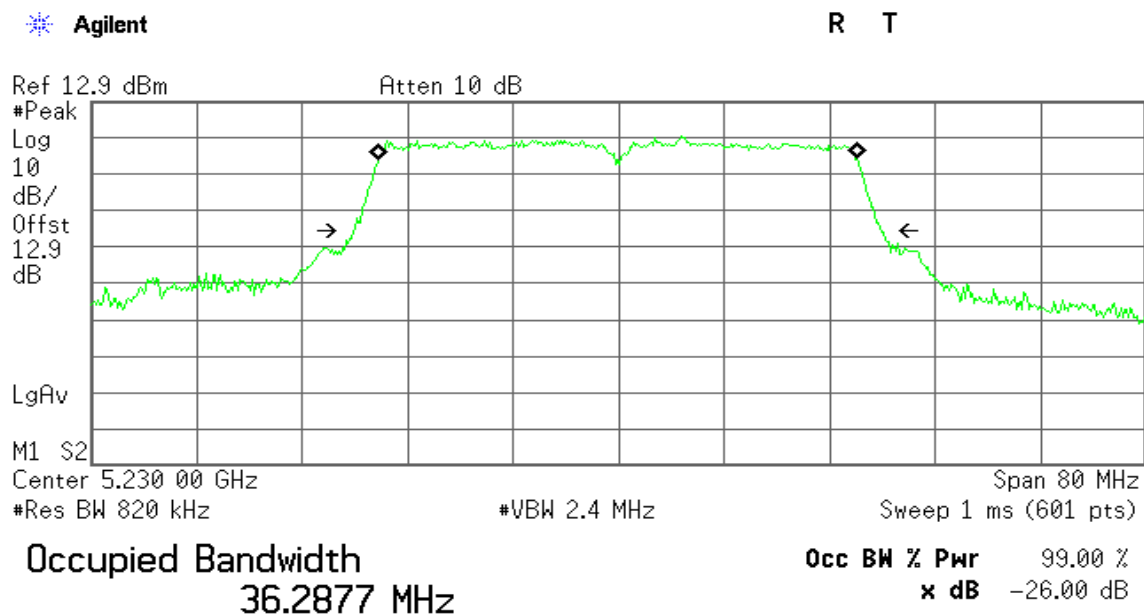
IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 2

CH Low



Transmit Freq Error -34.447 kHz
x dB Bandwidth 40.352 MHz

CH High

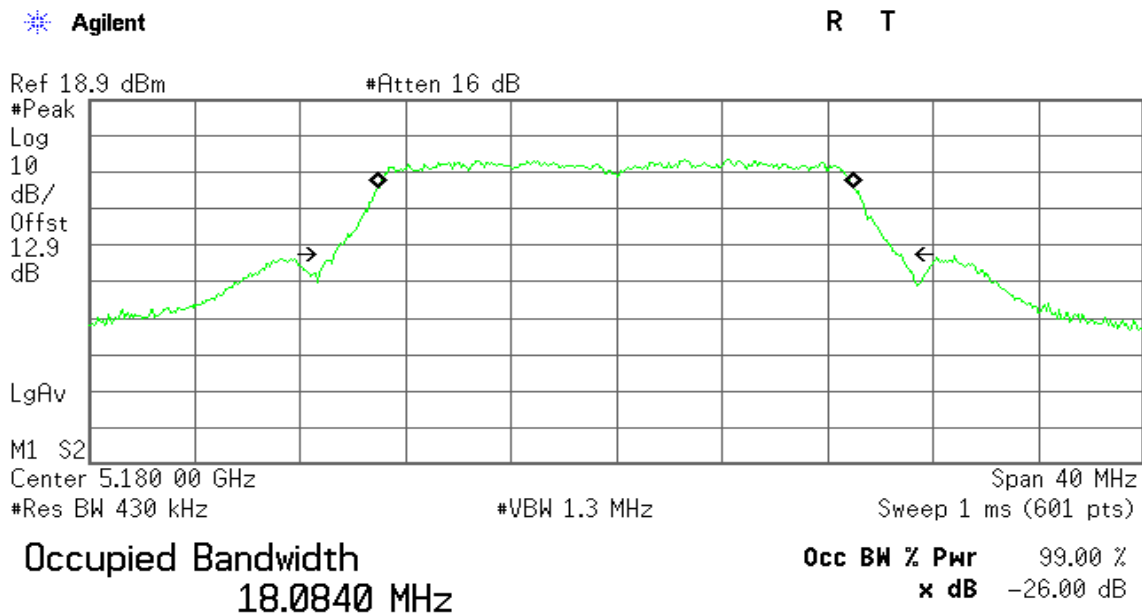


Transmit Freq Error -63.798 kHz
x dB Bandwidth 40.137 MHz

Mode 3

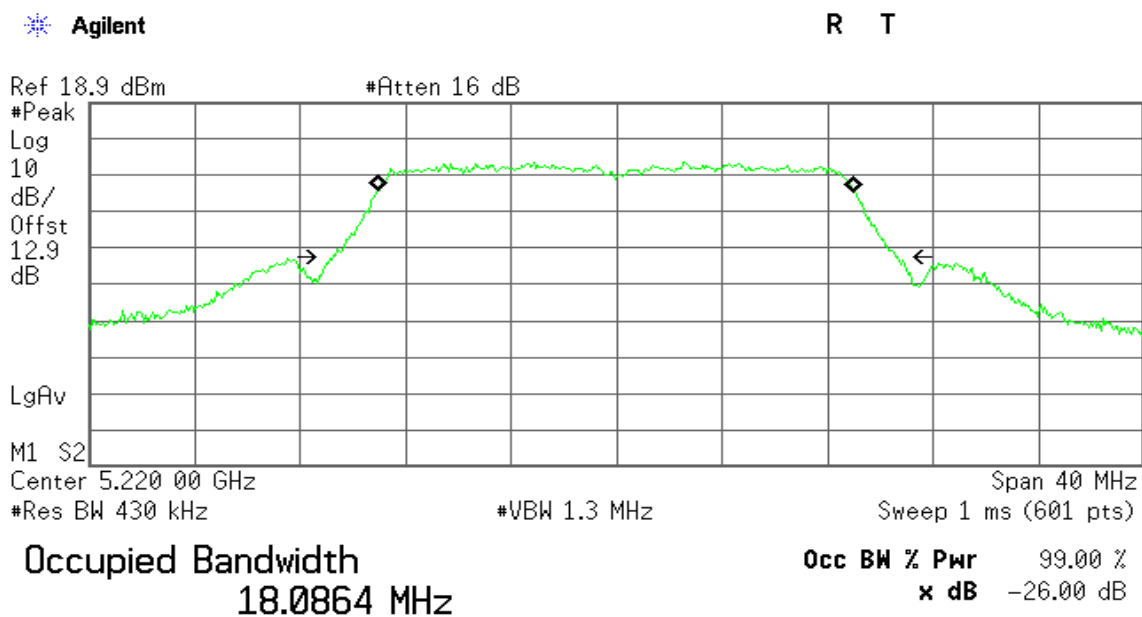
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 0

CH Low



Transmit Freq Error -10.076 kHz
x dB Bandwidth 21.364 MHz

CH Mid

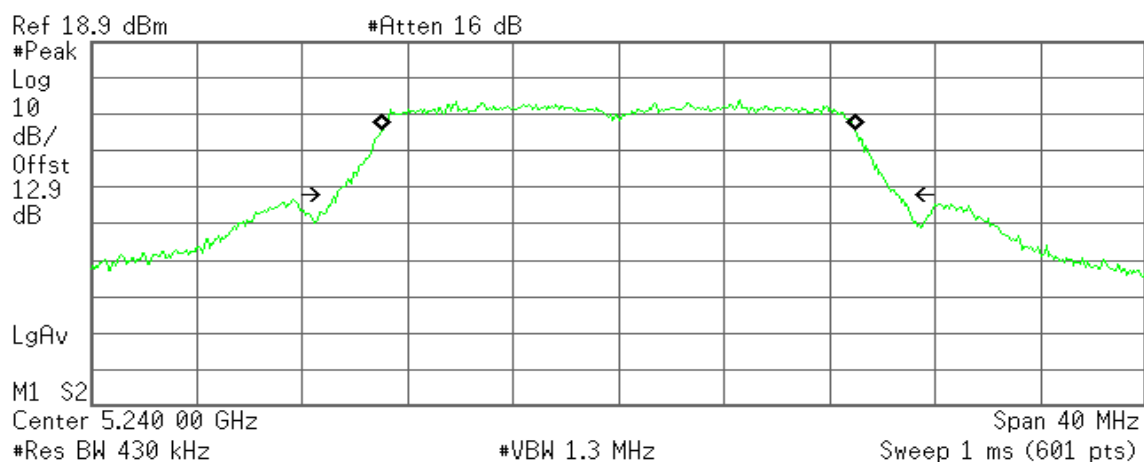


Transmit Freq Error -36.030 kHz
x dB Bandwidth 21.380 MHz

CH High

 Agilent

R T



Occupied Bandwidth

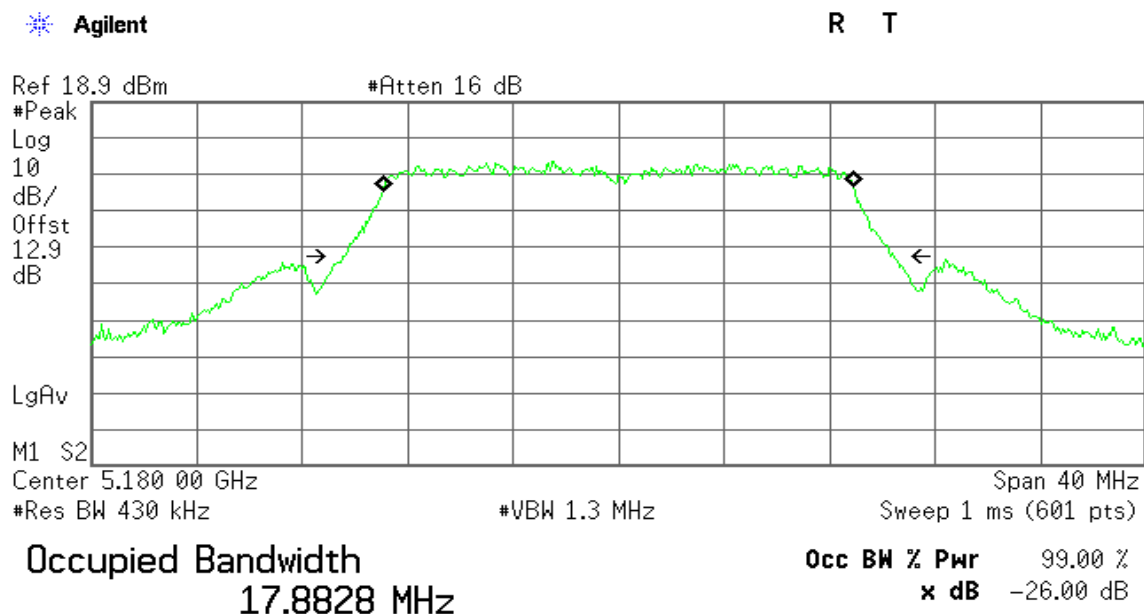
18.0308 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -12.319 kHz
x dB Bandwidth 21.321 MHz

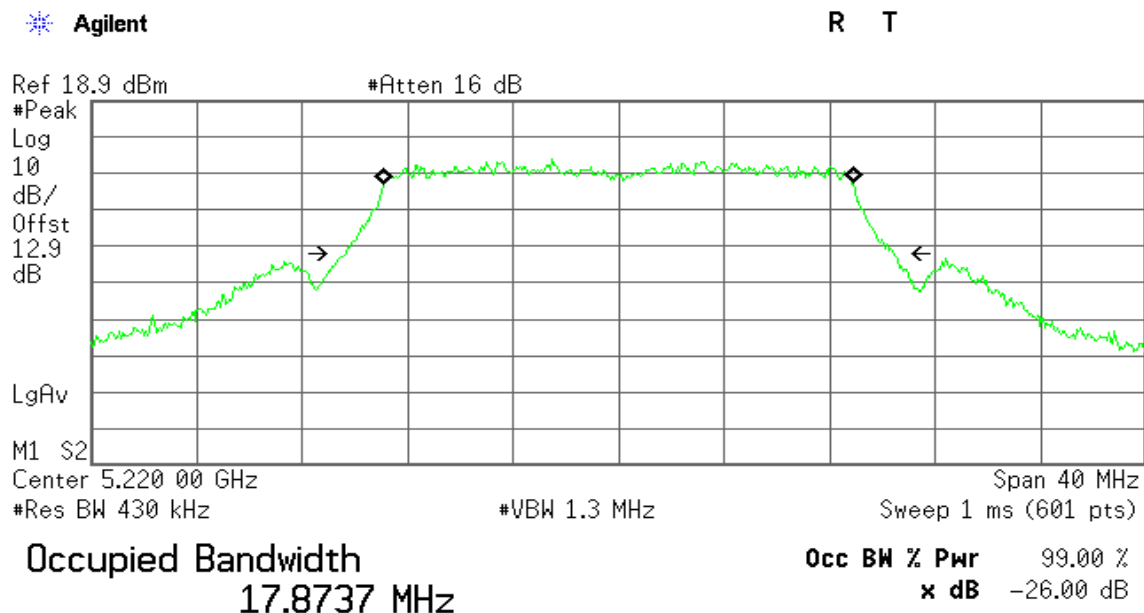
IEEE 802.11n HT 20 MHz mode / 5180 ~ 5240MHz / Chain 2

CH Low



Transmit Freq Error -7.949 kHz
x dB Bandwidth 20.890 MHz

CH Mid

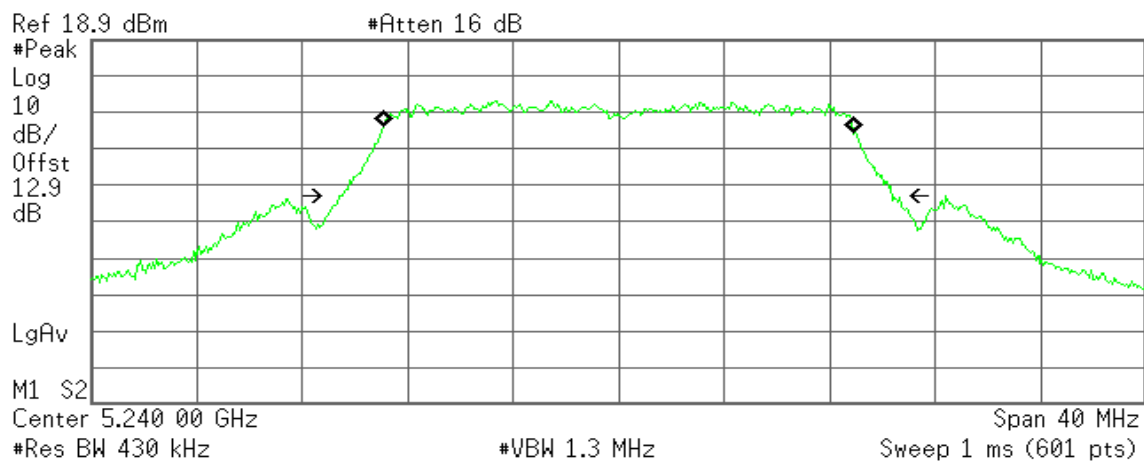


Transmit Freq Error -9.906 kHz
x dB Bandwidth 20.849 MHz

CH High

 Agilent

R T



Occupied Bandwidth
17.8706 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

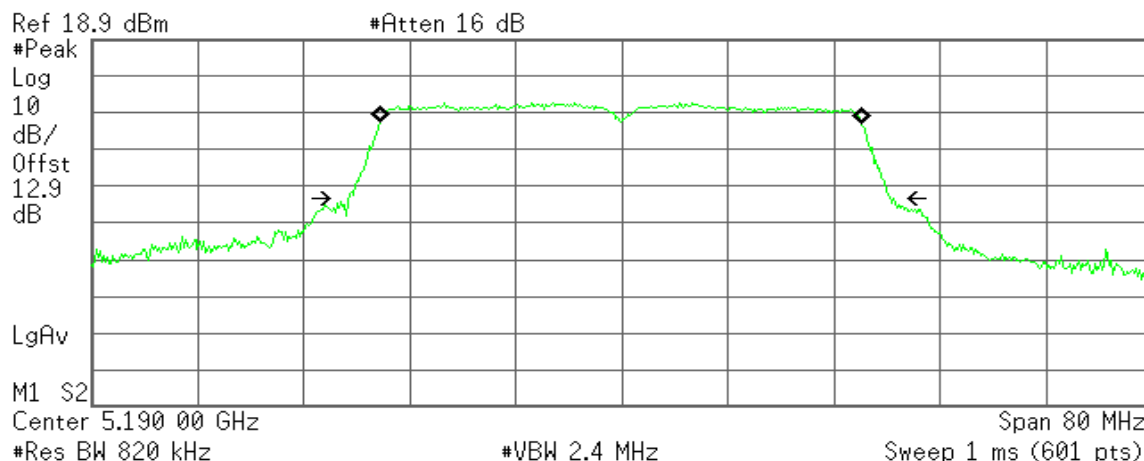
Transmit Freq Error -15.430 kHz
x dB Bandwidth 20.982 MHz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 0

CH Low

Agilent

R T



Occupied Bandwidth
36.3554 MHz

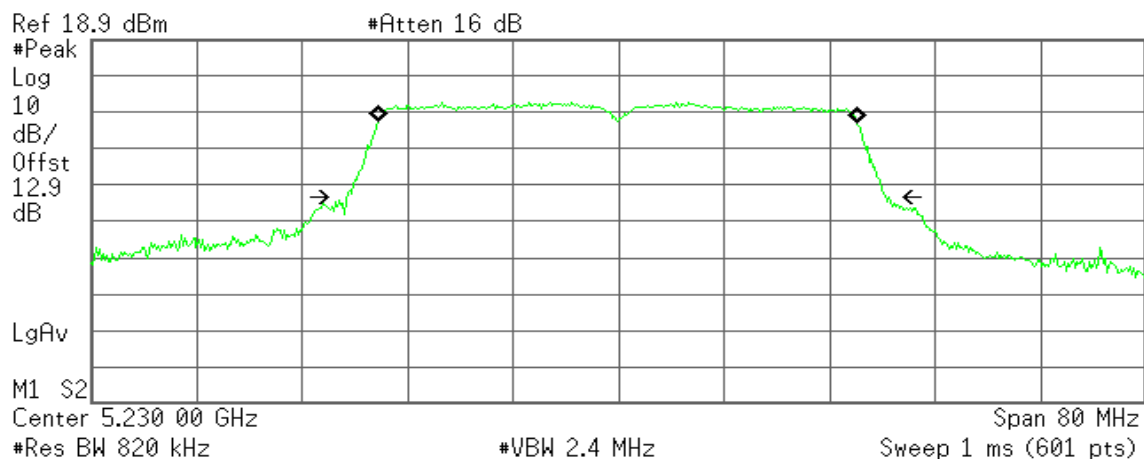
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -78.516 kHz
x dB Bandwidth 40.968 MHz

CH High

Agilent

R T



Occupied Bandwidth
36.3545 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

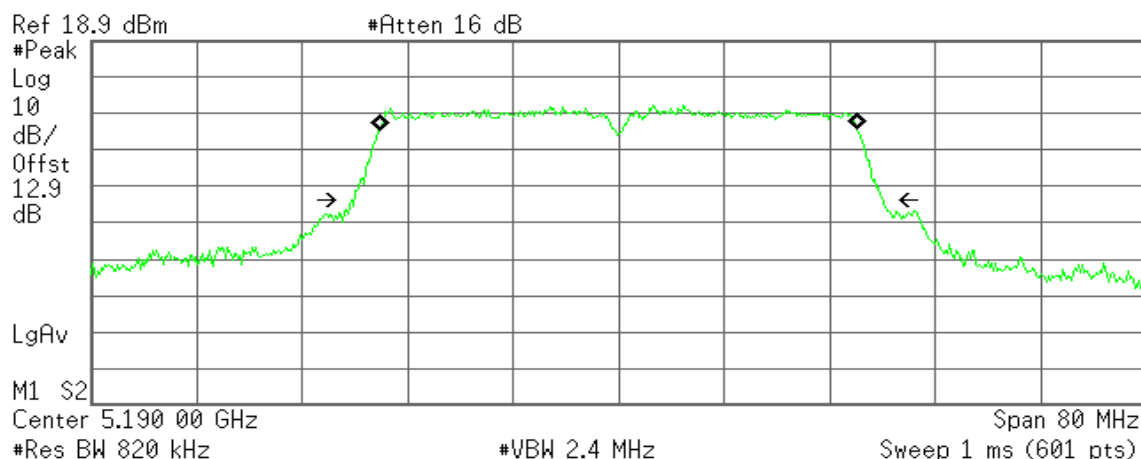
Transmit Freq Error -78.516 kHz
x dB Bandwidth 40.938 MHz

IEEE 802.11n HT 40 MHz mode / 5190 ~ 5230MHz / Chain 2

CH Low

Agilent

R T



Occupied Bandwidth
36.2352 MHz

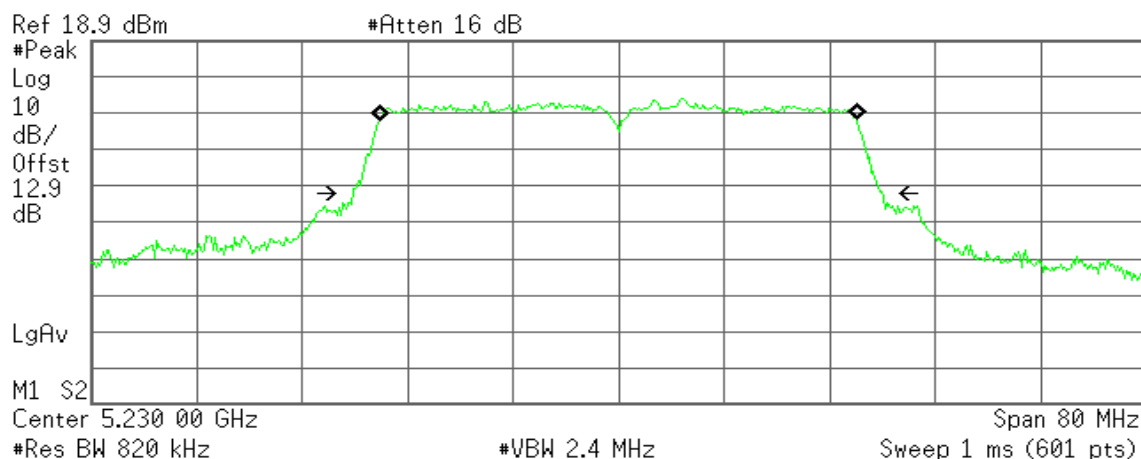
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -19.864 kHz
x dB Bandwidth 40.155 MHz

CH High

Agilent

R T



Occupied Bandwidth
36.2724 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -56.247 kHz
x dB Bandwidth 40.251 MHz

7.2 MAXIMUM CONDUCTED OUTPUT POWER

LIMIT

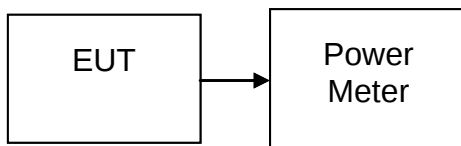
According to §15.407(a),

- (1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW, where B is the 26 dB emission bandwidth in MHz.
- (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW, where B is the 26 dB emission bandwidth in MHz.

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Specified Limit of the Maximum Output Power Test Configuration

The EUT was connected to a Power Meter through a 50Ω RF cable.



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the avg power detection. The EUT is configured to transmit continuously.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	13.17	30.00
Mid	5220	*13.41	30.00
High	5240	13.36	30.00

Mode 1

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	9.42	9.34	12.39	28.06
Mid	5220	9.67	9.39	12.54	28.06
High	5240	9.85	9.22	*12.56	28.06

Test mode: IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5190	8.54	9.78	12.22	28.06
High	5230	9.05	9.61	*12.35	28.06

Remark:

1. Total Output Power (w) = Chain 0 ($10^{(\text{Output Power} / 10) / 1000}$) + Chain 1 ($10^{(\text{Output Power} / 10) / 1000}$)
2. The maximum antenna gain is 7.94dBi; therefore the reduction due to antenna gain is 1.94dBi, so the limit is 28.06dBm.

Mode 2

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	9.64	10.66	13.19	28.13
Mid	5220	9.30	10.98	*13.23	28.13
High	5240	9.27	10.48	12.93	28.13

Test mode: IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5190	8.88	10.96	13.06	28.13
High	5230	8.95	11.26	*13.27	28.13

Remark:

1. Total Output Power (w) = Chain 1 ($10^{(\text{Output Power}/10)/1000}$) + Chain 2 ($10^{(\text{Output Power}/10)/1000}$)
2. The maximum antenna gain is 7.87dBi; therefore the reduction due to antenna gain is 1.87dBi, so the limit is 28.13dBm.

Mode 3

Test mode: IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5180	9.07	9.16	12.12	28.18
Mid	5220	9.16	9.17	12.17	28.18
High	5240	9.25	9.44	*12.35	28.18

Test mode: IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5190	9.02	10.04	12.57	28.18
High	5230	9.07	10.33	*12.76	28.18

Remark:

1. Total Output Power (w) = Chain 0 ($10^{(\text{Output Power}/10)/1000}$) + Chain 2 ($10^{(\text{Output Power}/10)/1000}$)
2. The maximum antenna gain is 7.82dBi; therefore the reduction due to antenna gain is 1.82dBi, so the limit is 28.18dBm.

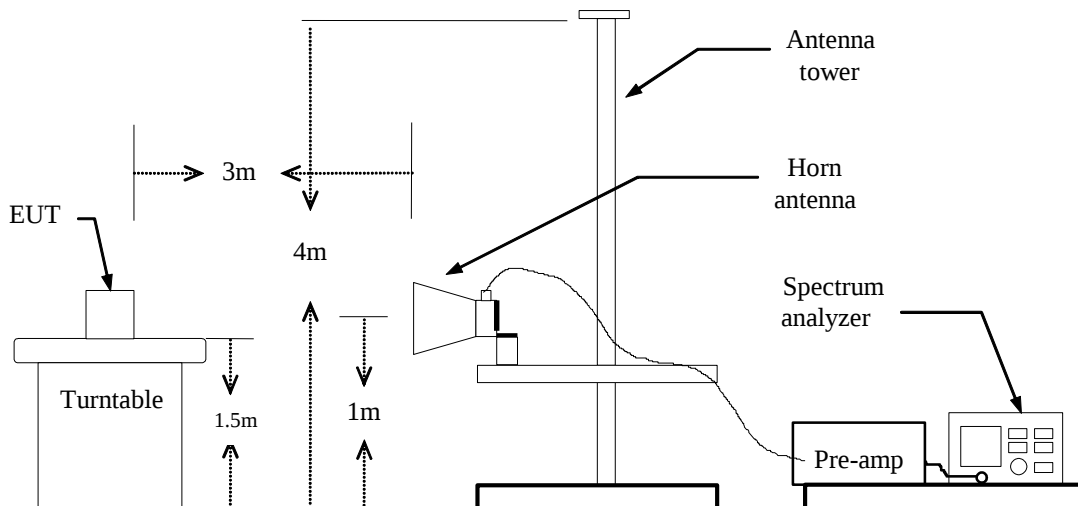
7.3 BAND EDGES MEASUREMENT

LIMIT

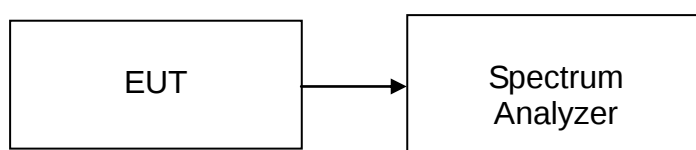
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration

For Radiated



For Conducted



TEST PROCEDURE

For Radiated

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz,
if duty cycle $\geq 98\%$, VBW=10Hz.
if duty cycle $< 98\%$ VBW=1/T.
IEEE 802.11a mode: = 95%, VBW=510Hz
IEEE 802.11n HT 20 MHz mode: = 92%, VBW=1.1KHz
IEEE 802.11n HT 40 MHz mode: = 85%, VBW=2.2KHz
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

For Conducted

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

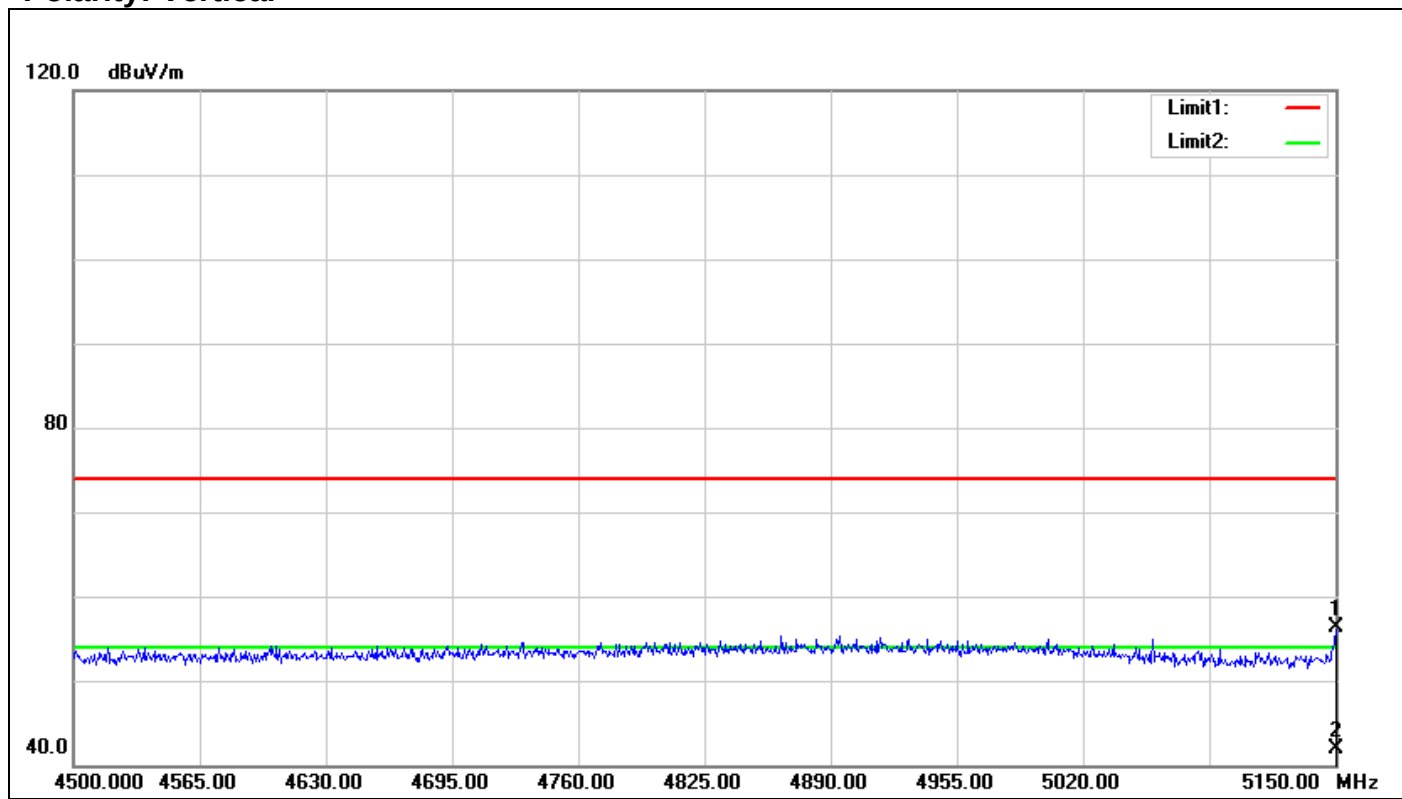
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

TEST RESULTS

Refer to attach spectrum analyzer data chart.

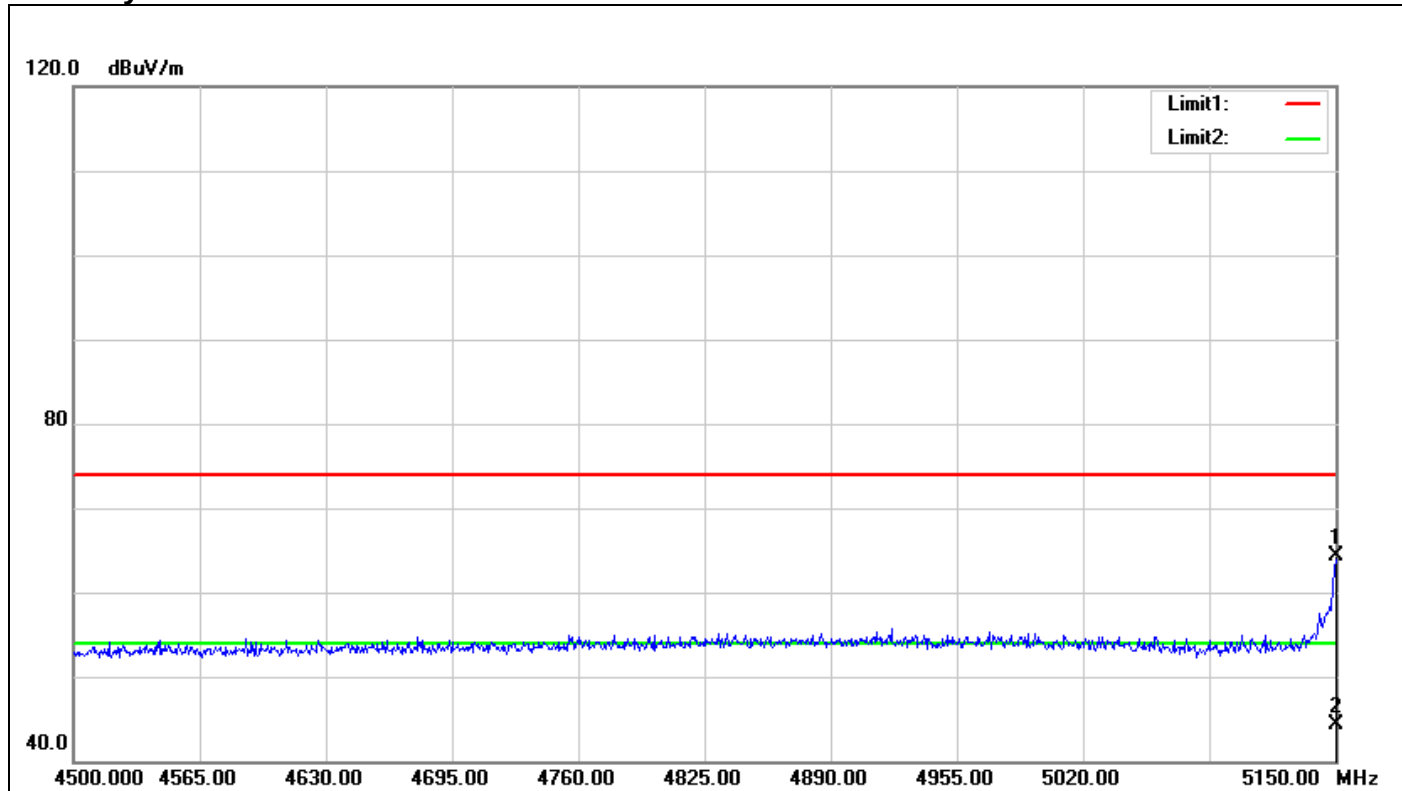
Band Edges (IEEE 802.11a mode / 5180 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5150.000	53.30	3.04	56.34	74.00	-17.66	100	284	peak
2	5150.000	38.95	3.04	41.99	54.00	-12.01	100	284	AVG

Polarity: Horizontal

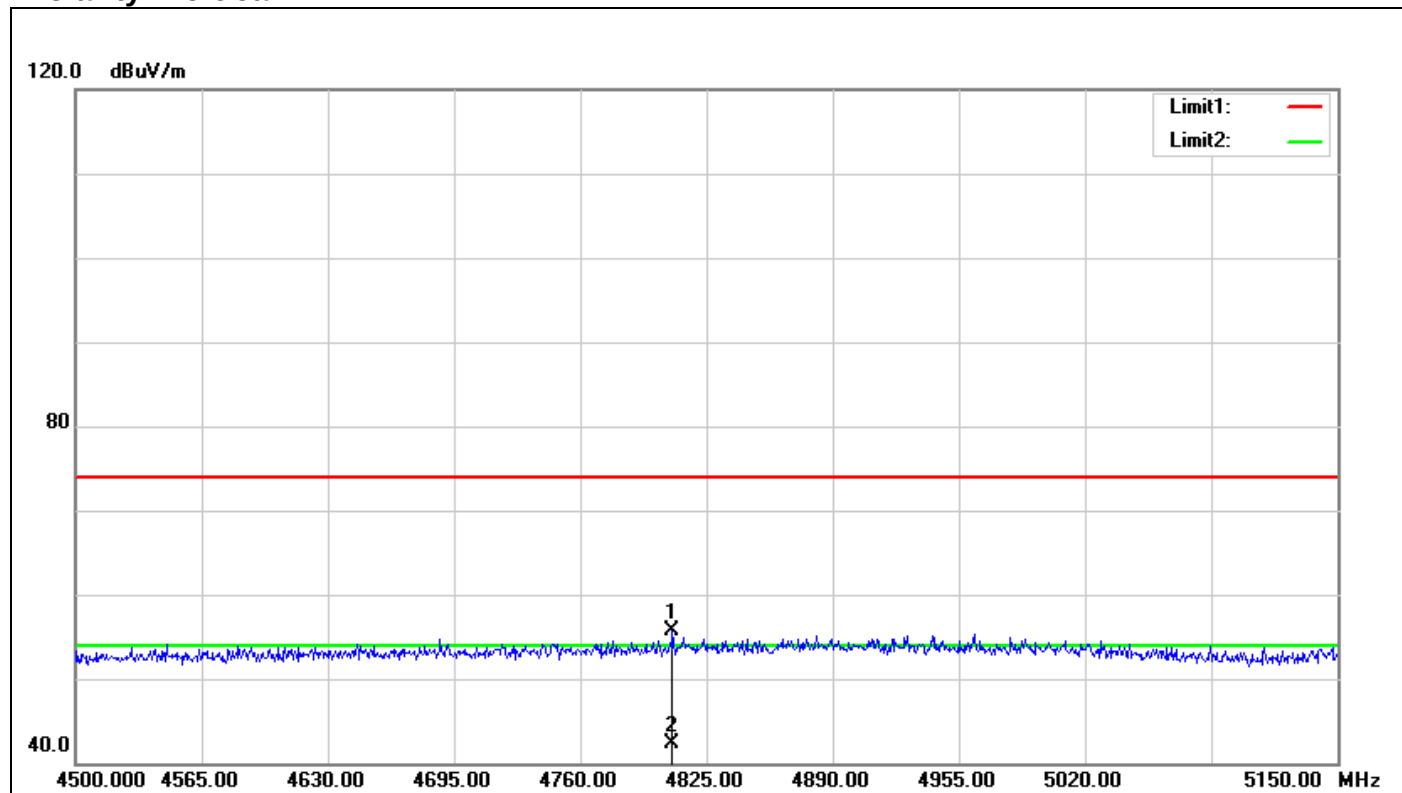


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5150.000	61.16	3.04	64.20	74.00	-9.80	100	215	peak
2	5150.000	41.30	3.04	44.34	54.00	-9.66	100	215	AVG

For Mode 1

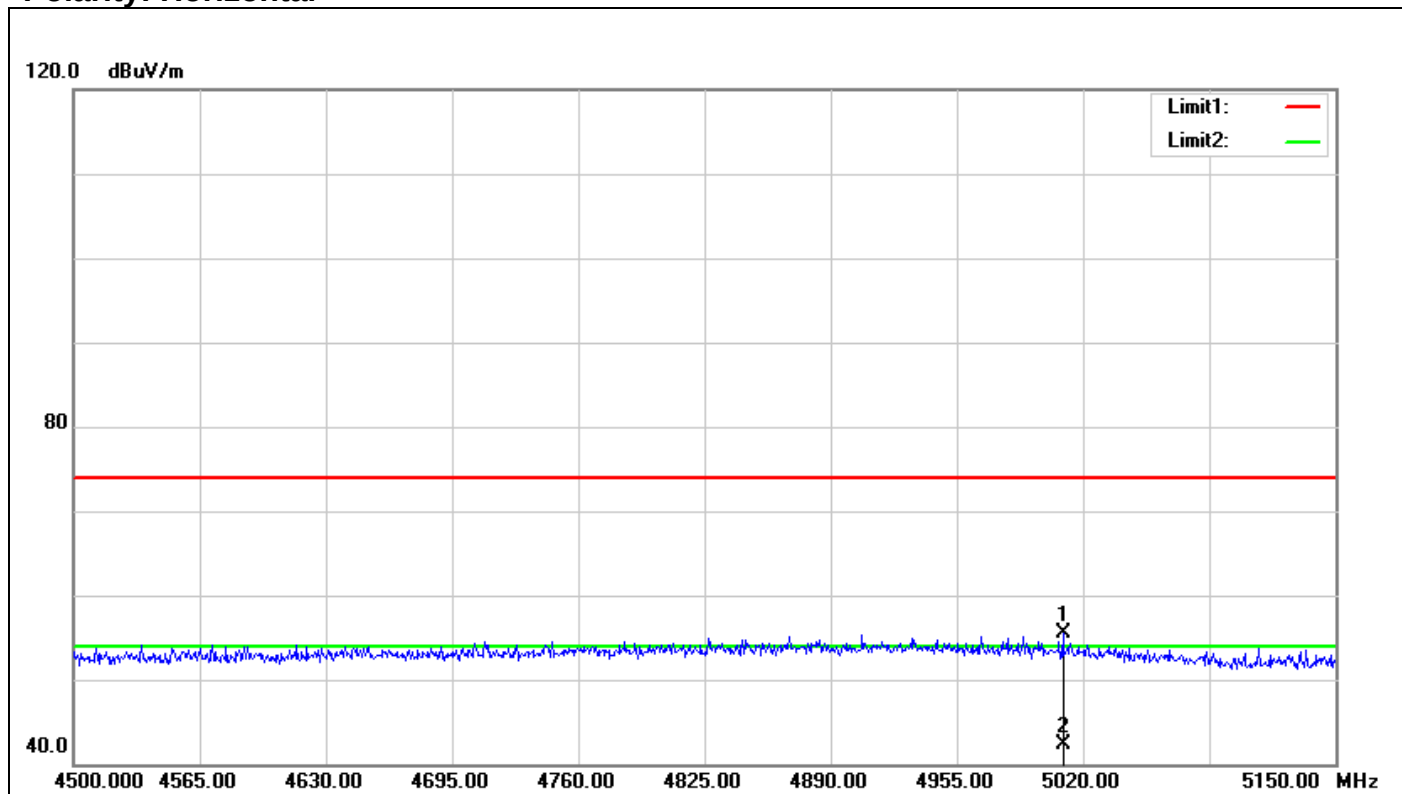
Band Edges (IEEE 802.11n HT 20 MHz / 5180 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4807.450	51.57	4.04	55.61	74.00	-18.39	100	191	peak
2	4807.450	38.28	4.04	42.32	54.00	-11.68	100	191	AVG

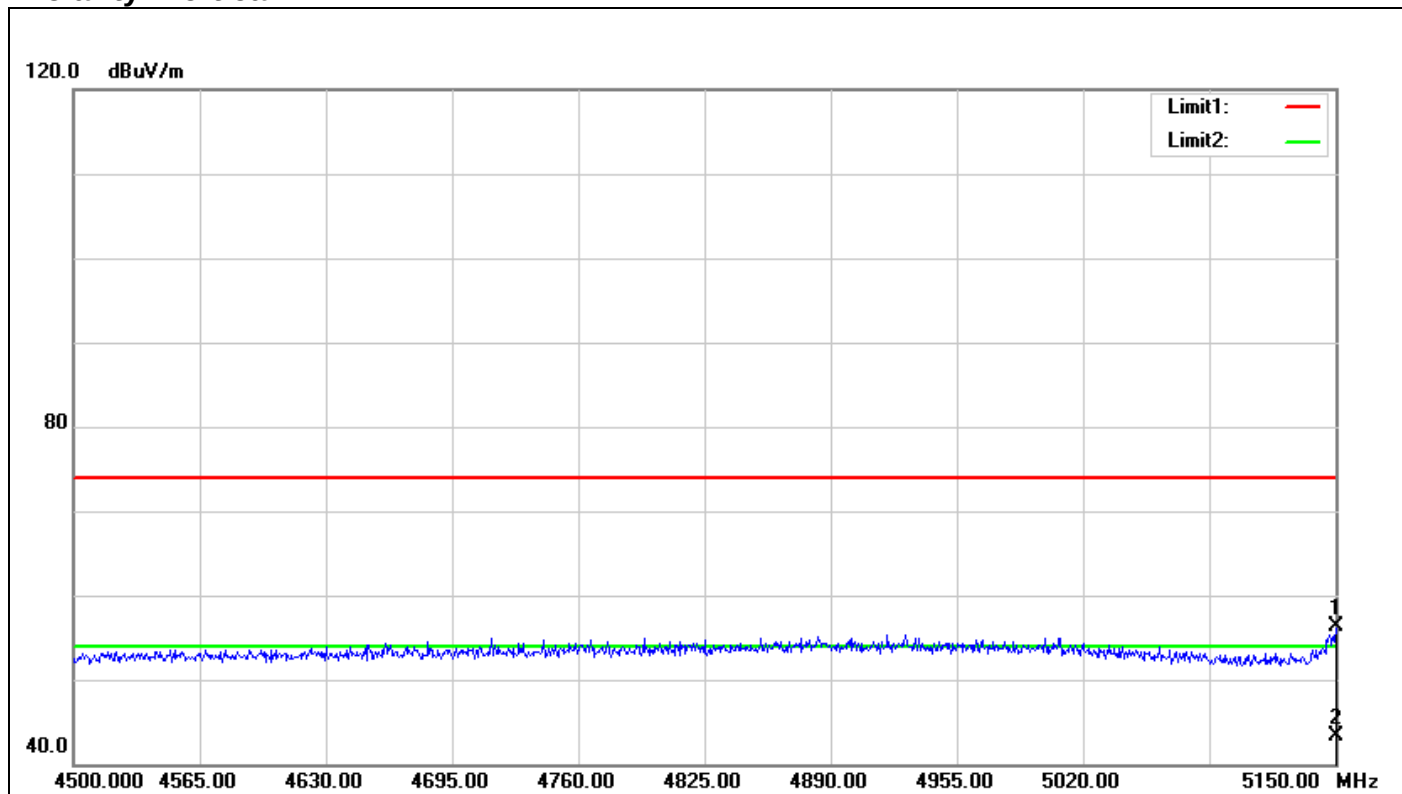
Polarity: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5009.600	51.70	3.84	55.54	74.00	-18.46	100	234	peak
2	5009.600	38.56	3.84	42.40	54.00	-11.60	100	234	AVG

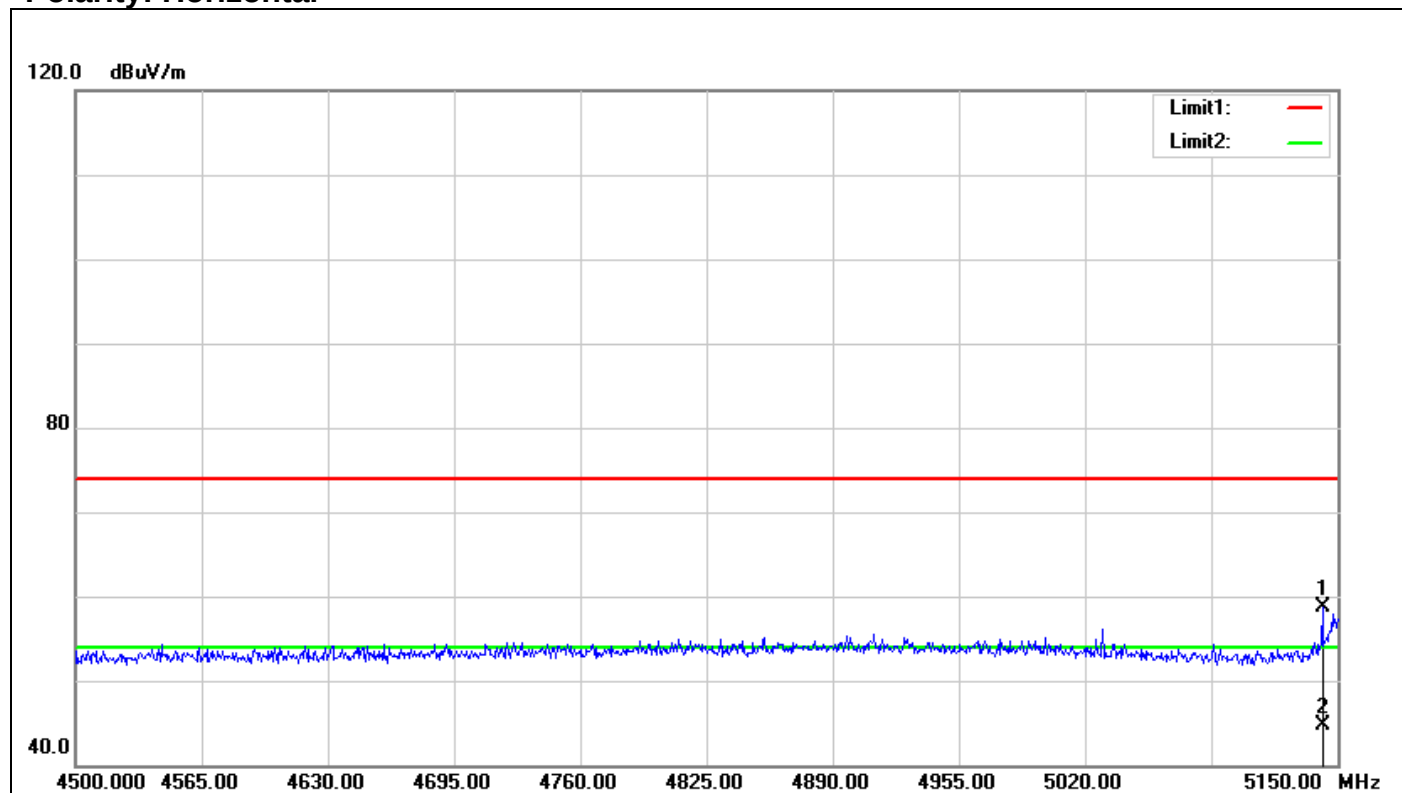
Band Edges (IEEE 802.11n HT 40 MHz / 5190 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5150.000	53.21	3.04	56.25	74.00	-17.75	100	248	peak
2	5150.000	40.28	3.04	43.32	54.00	-10.68	100	248	AVG

Polarity: Horizontal

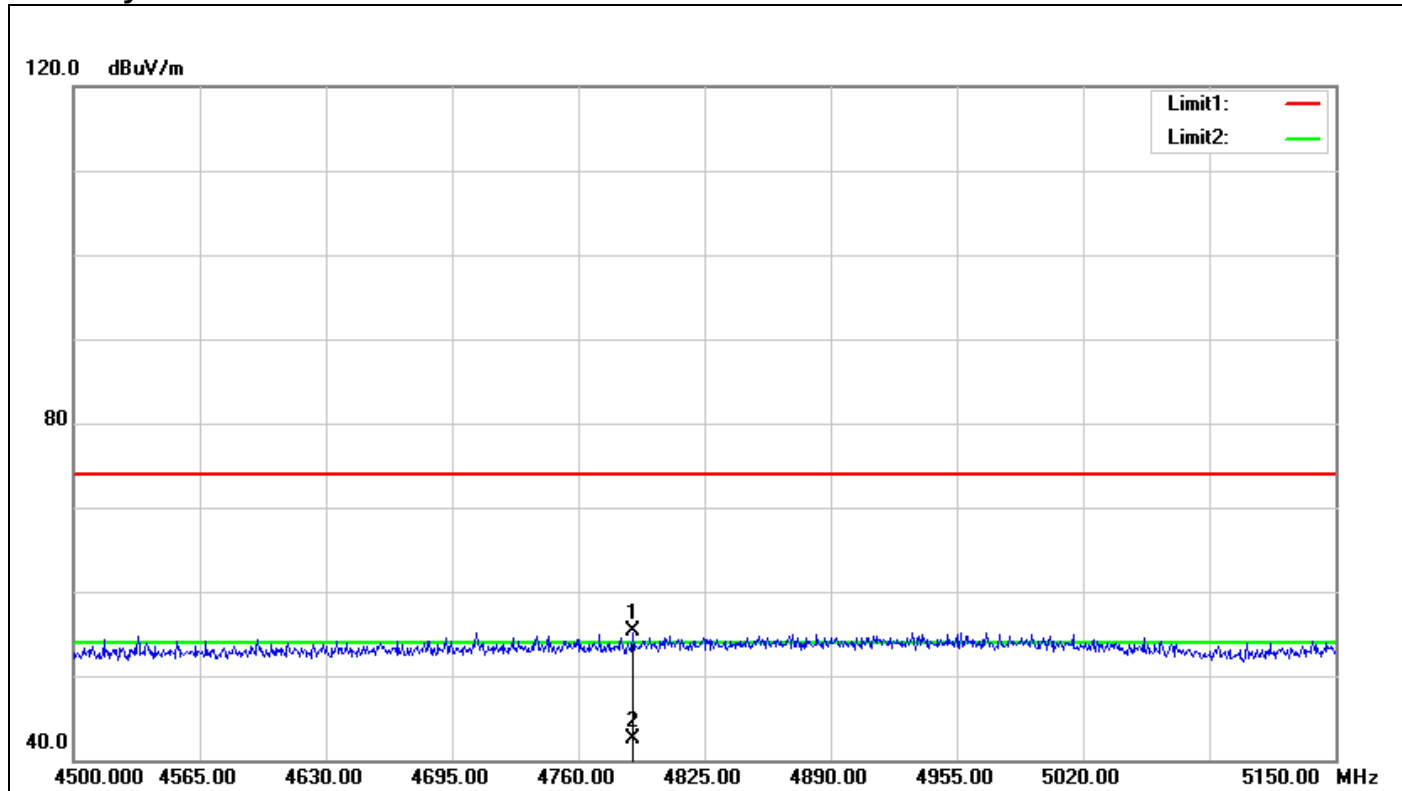


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5142.200	55.66	2.99	58.65	74.00	-15.35	100	359	peak
2	5142.200	41.75	2.99	44.74	54.00	-9.26	100	359	AVG

For Mode 2

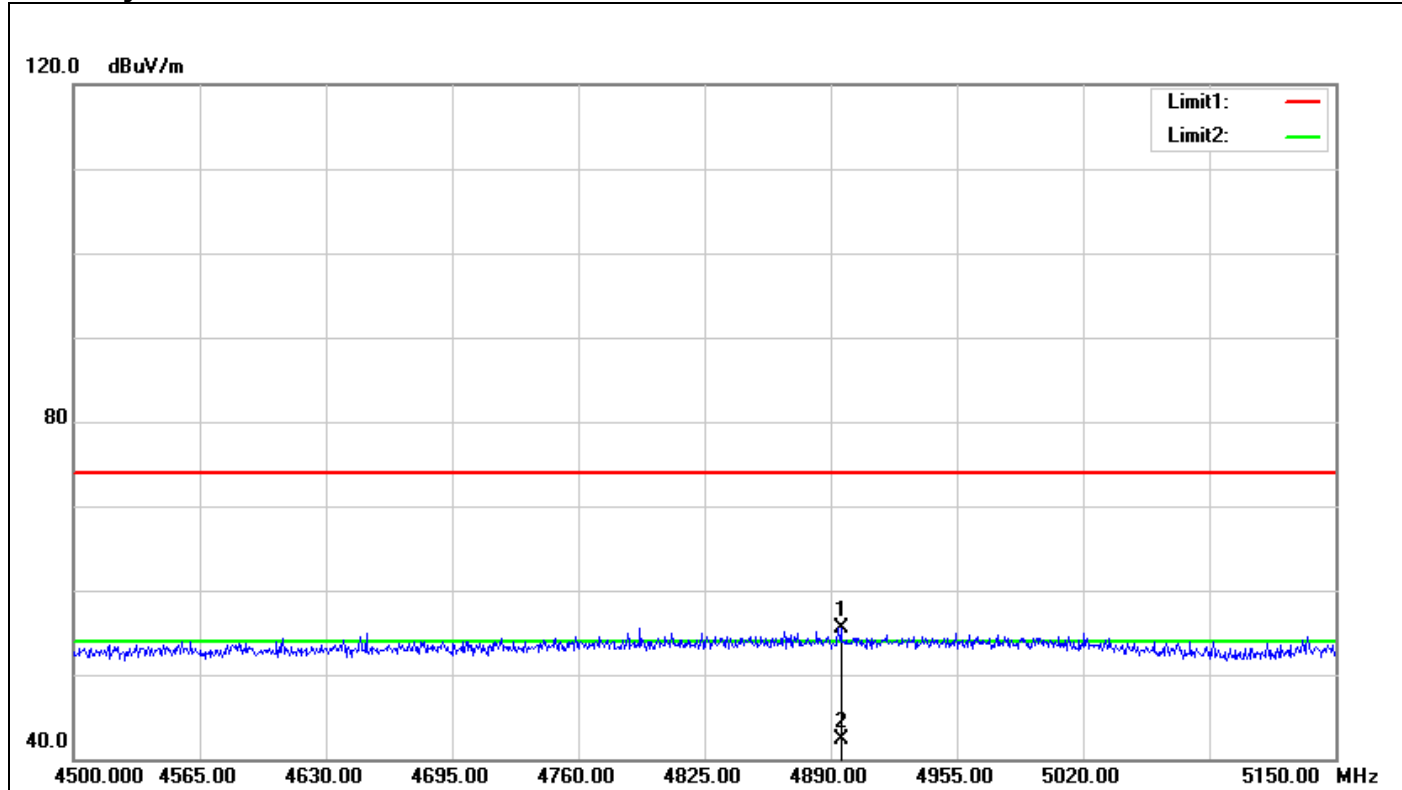
Band Edges (IEEE 802.11n HT 20 MHz / 5180 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4787.950	51.20	4.00	55.20	74.00	-18.80	100	46	peak
2	4787.950	38.52	4.00	42.52	54.00	-11.48	100	46	AVG

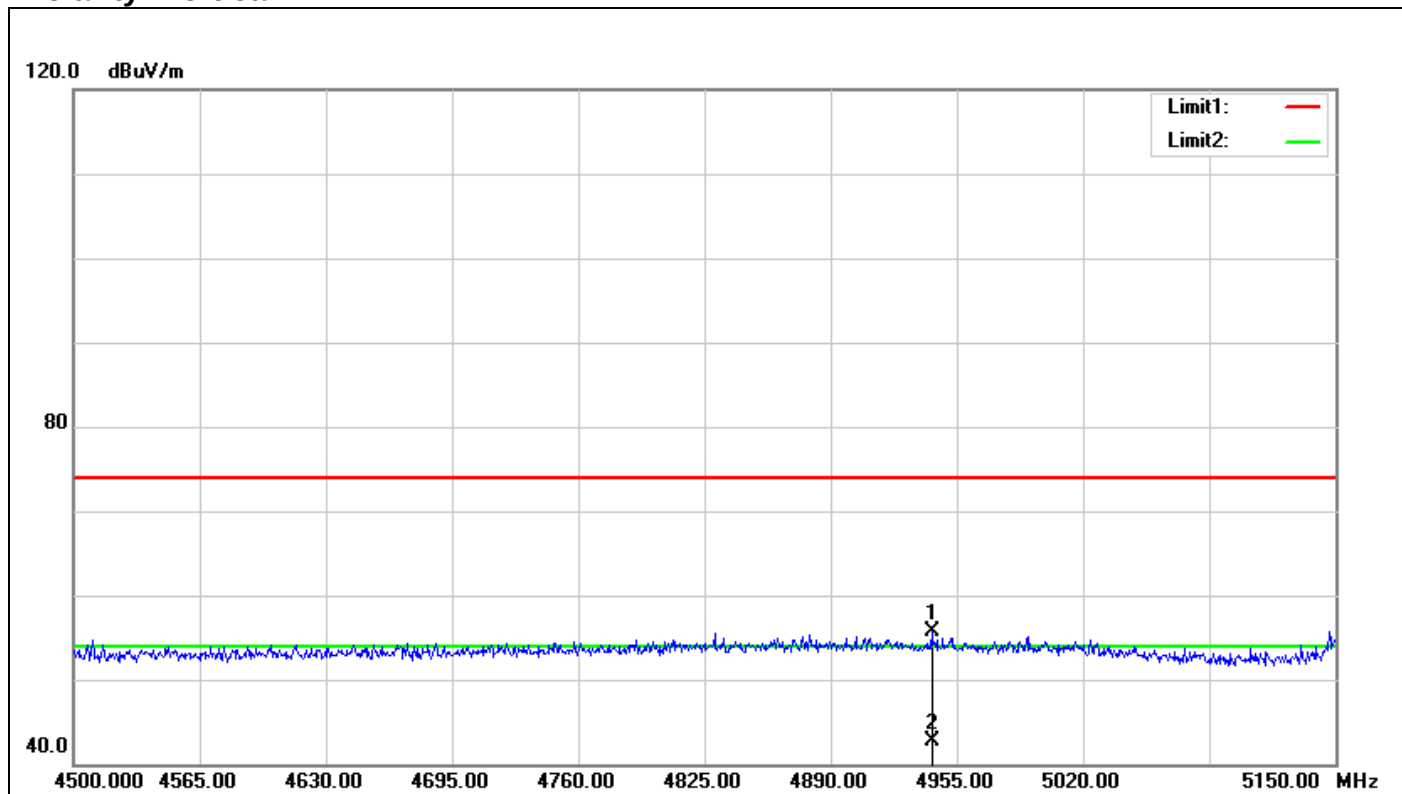
Polarity: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4895.200	51.67	3.89	55.56	74.00	-18.44	100	13	peak
2	4895.200	38.45	3.89	42.34	54.00	-11.66	100	13	AVG

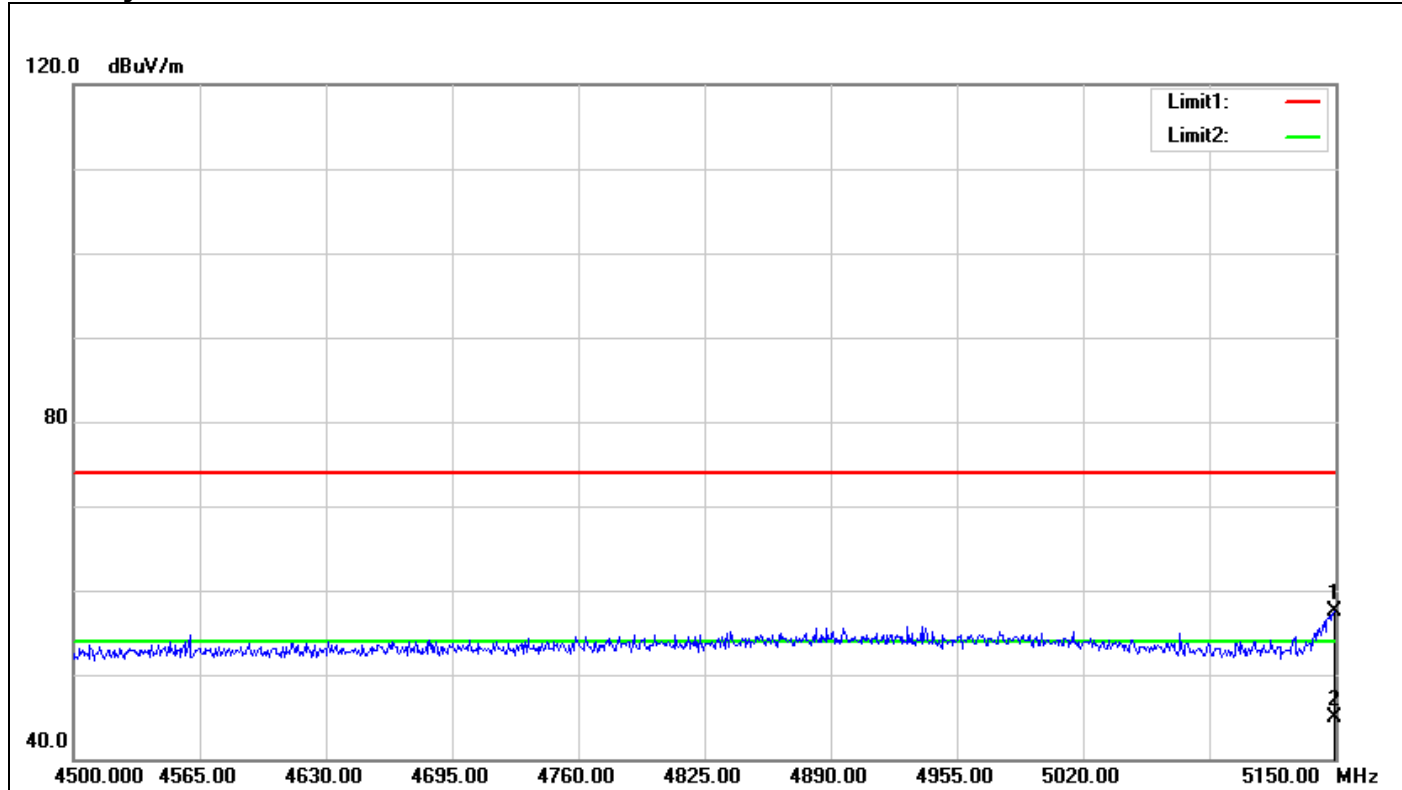
Band Edges (IEEE 802.11n HT 40 MHz / 5190 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4942.000	51.88	3.91	55.79	74.00	-18.21	100	45	peak
2	4942.000	38.80	3.91	42.71	54.00	-11.29	100	45	AVG

Polarity: Horizontal

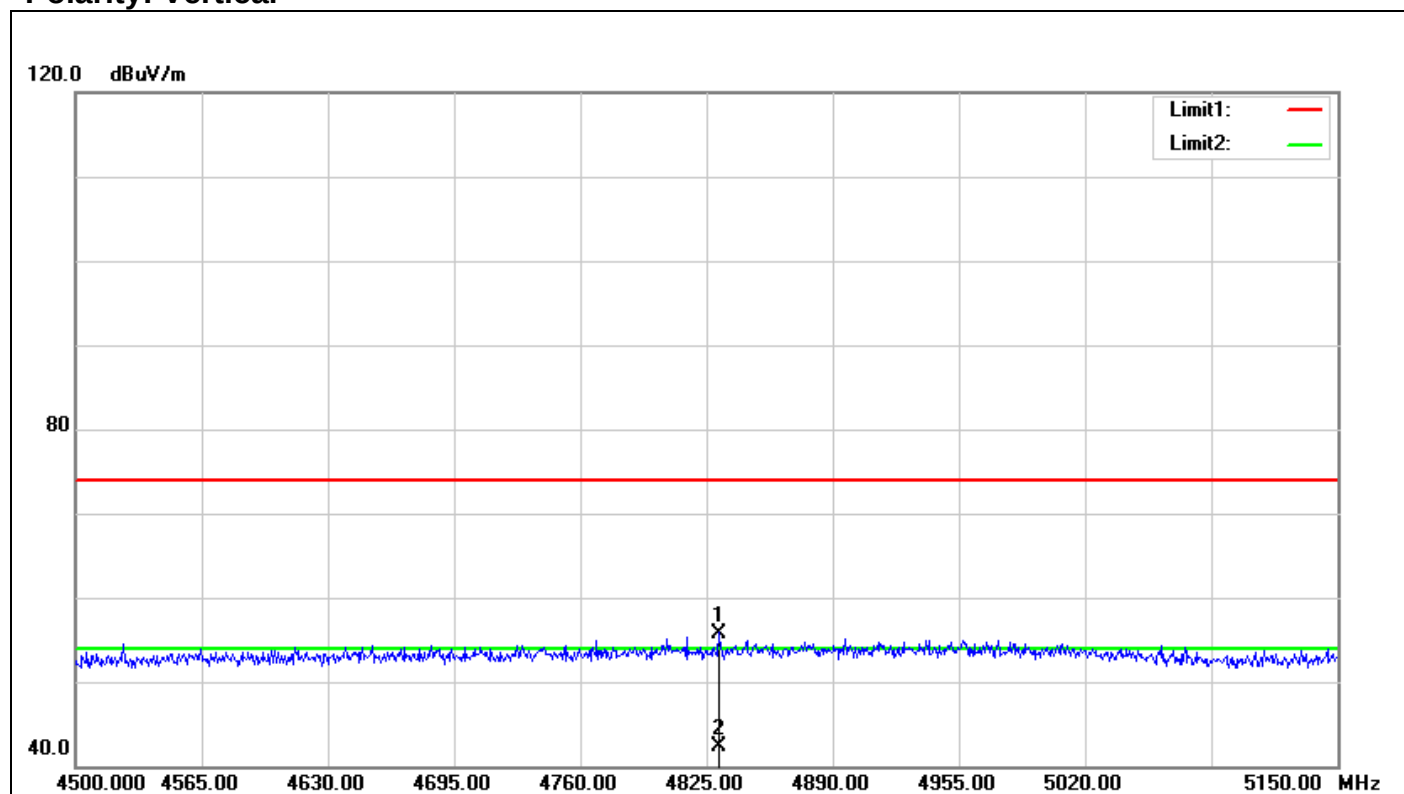


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5149.350	54.37	3.04	57.41	74.00	-16.59	100	359	peak
2	5149.350	41.80	3.04	44.84	54.00	-9.16	100	359	AVG

For Mode 3

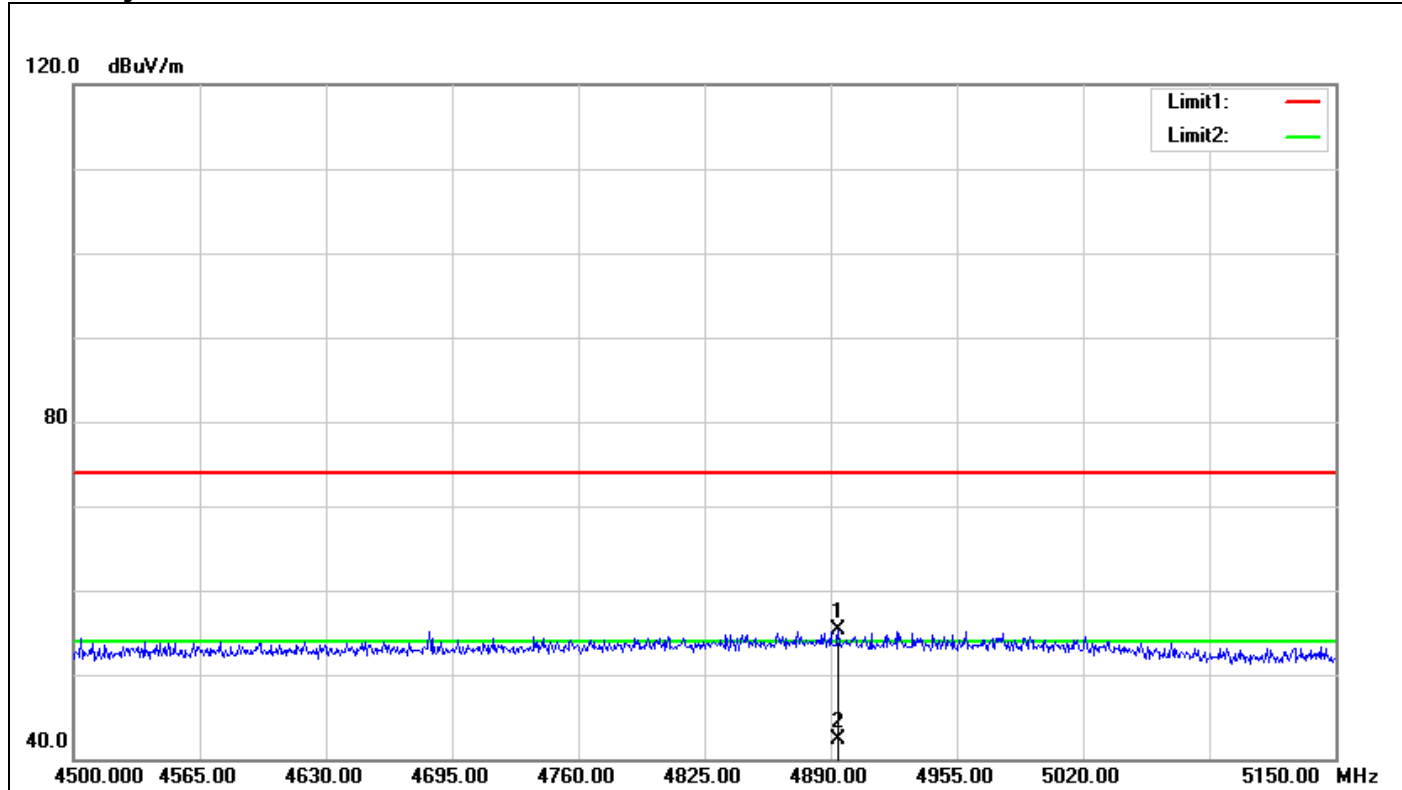
Band Edges (IEEE 802.11n HT 20 MHz / 5180 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4831.500	51.80	4.00	55.80	74.00	-18.20	100	137	peak
2	4831.500	38.34	4.00	42.34	54.00	-11.66	100	137	AVG

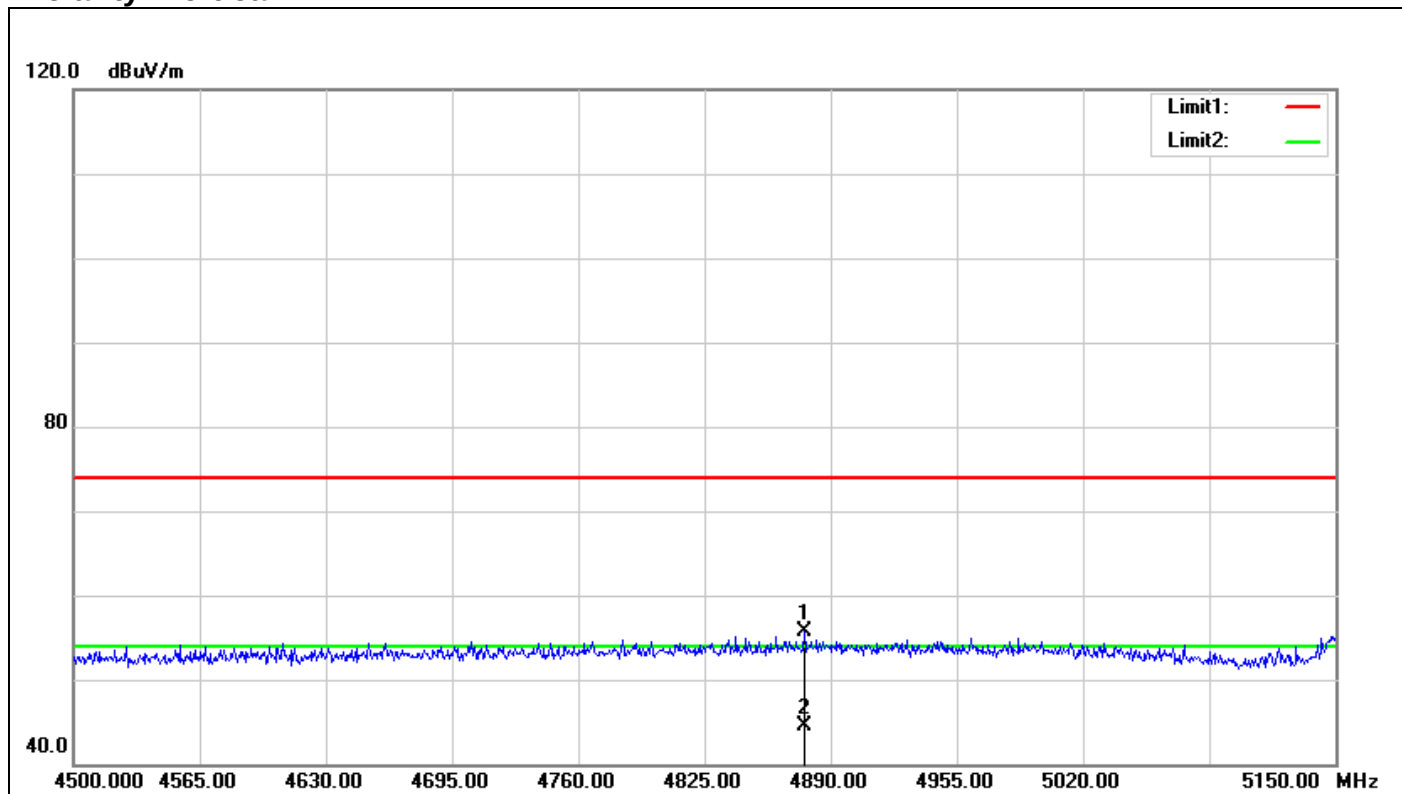
Polarity: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4893.900	51.34	3.89	55.23	74.00	-18.77	100	359	peak
2	4893.900	38.31	3.89	42.20	54.00	-11.80	100	359	AVG

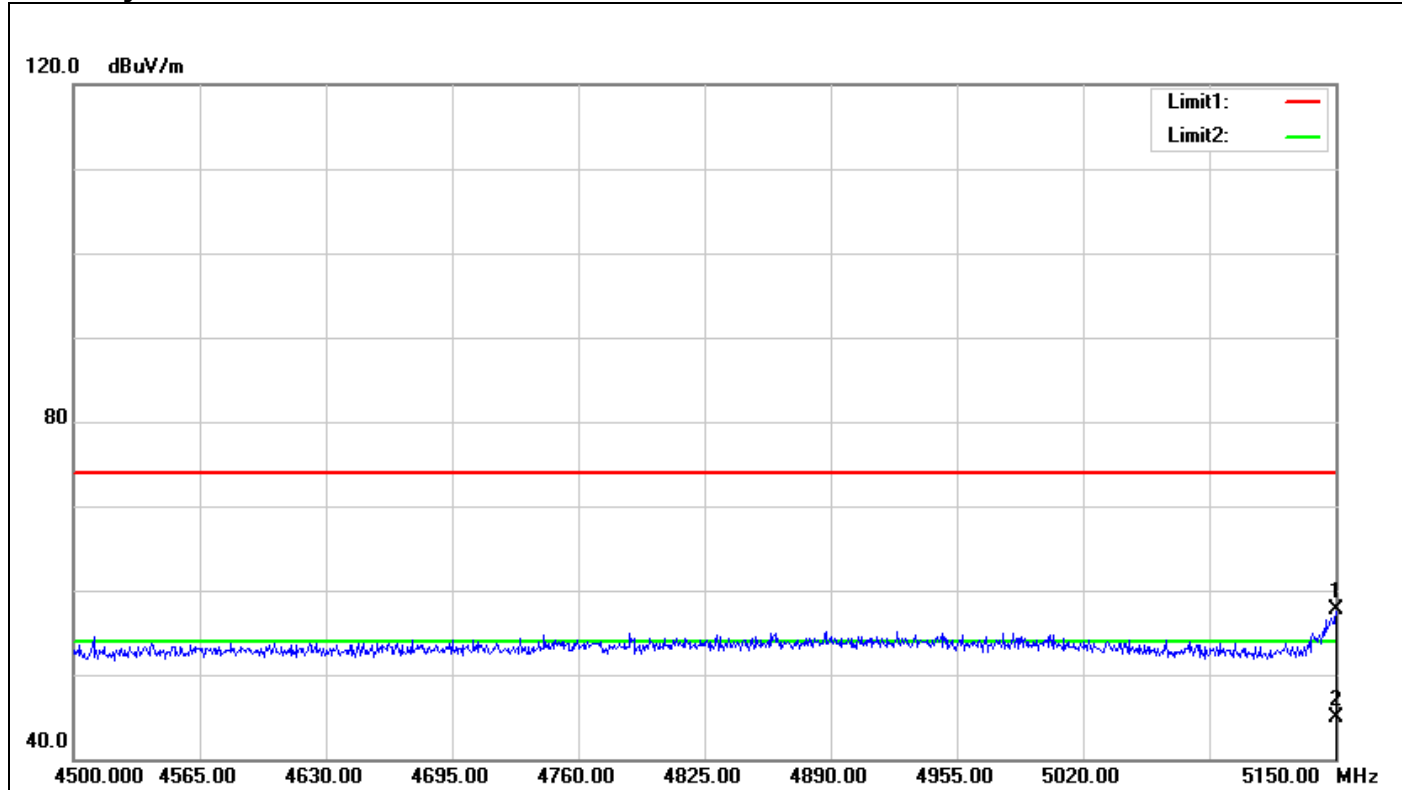
Band Edges (IEEE 802.11n HT 40 MHz / 5190 MHz)

Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	4876.350	51.72	3.92	55.64	74.00	-18.36	100	124	peak
2	4876.350	40.55	3.92	44.47	54.00	-9.53	100	124	AVG

Polarity: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	5150.000	54.72	3.04	57.76	74.00	-16.24	100	282	peak
2	5150.000	41.78	3.04	44.82	54.00	-9.18	100	282	AVG

7.4 PEAK POWER SPECTRAL DENSITY

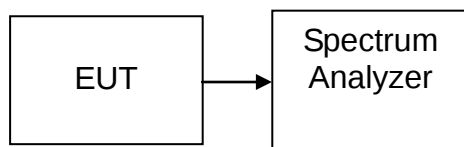
LIMIT

According to §15.407(a),

- (1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4dBm in any 1MHz band.
- (2) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11dBm in any 1MHz band.

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 1MHz, VBW = 3MHz, Span = Sweep= AUTO
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11a mode / 5180 ~ 5240MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-3.08	17.00	-20.08	PASS
Mid	5220	-2.78	17.00	-19.78	PASS
High	5240	-2.56	17.00	-19.56	PASS

Mode 1

Test mode: IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 0 PPSP (dBm)	Chain 1 PPSP (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-7.82	-1.97	-0.97	15.06	-16.03	PASS
Mid	5220	-6.57	-2.23	-0.87	15.06	-15.93	PASS
High	5240	-6.46	-2.28	-0.88	15.06	-15.94	PASS

Test mode: IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 0 PPSP (dBm)	Chain 1 PPSP (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5190	-5.54	-5.64	-2.58	15.06	-17.64	PASS
High	5230	-5.65	-5.52	-2.57	15.06	-17.63	PASS

Remark:

1. Total PPSP (dBm) = $10 \cdot \log(10^{(\text{Chain 0 PPSP} / 10)} + 10^{(\text{Chain 1 PPSP} / 10)})$
2. The maximum antenna gain is 7.94dBi; therefore the reduction due to antenna gain is 1.94dBi, so the limit is 15.06dBm.

Mode 2

Test mode: IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-2.46	-2.76	0.40	15.13	-14.73	PASS
Mid	5220	-2.89	-3.30	-0.08	15.13	-15.21	PASS
High	5240	-2.86	-3.89	-0.33	15.13	-15.46	PASS

Test mode: IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5190	-5.91	-5.50	-2.69	15.13	-17.82	PASS
High	5230	-5.63	-5.49	-2.55	15.13	-17.68	PASS

Remark:

1. Total PPSD (dBm) = $10^{(Chain\ 1\ PPSD / 10)} + 10^{(Chain\ 2\ PPSD / 10)}$
2. The maximum antenna gain is 7.87dBi; therefore the reduction due to antenna gain is 1.87dBi, so the limit is 15.13dBm.

Mode 3

Test mode: IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 2 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5180	-8.03	-4.26	-2.74	15.18	-17.92	PASS
Mid	5220	-7.78	-4.54	-2.85	15.18	-18.03	PASS
High	5240	-7.44	-4.60	-2.78	15.18	-17.96	PASS

Test mode: IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 2 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5190	-6.67	-5.37	-2.96	15.18	-18.14	PASS
High	5230	-8.10	-4.35	-2.82	15.18	-18.00	PASS

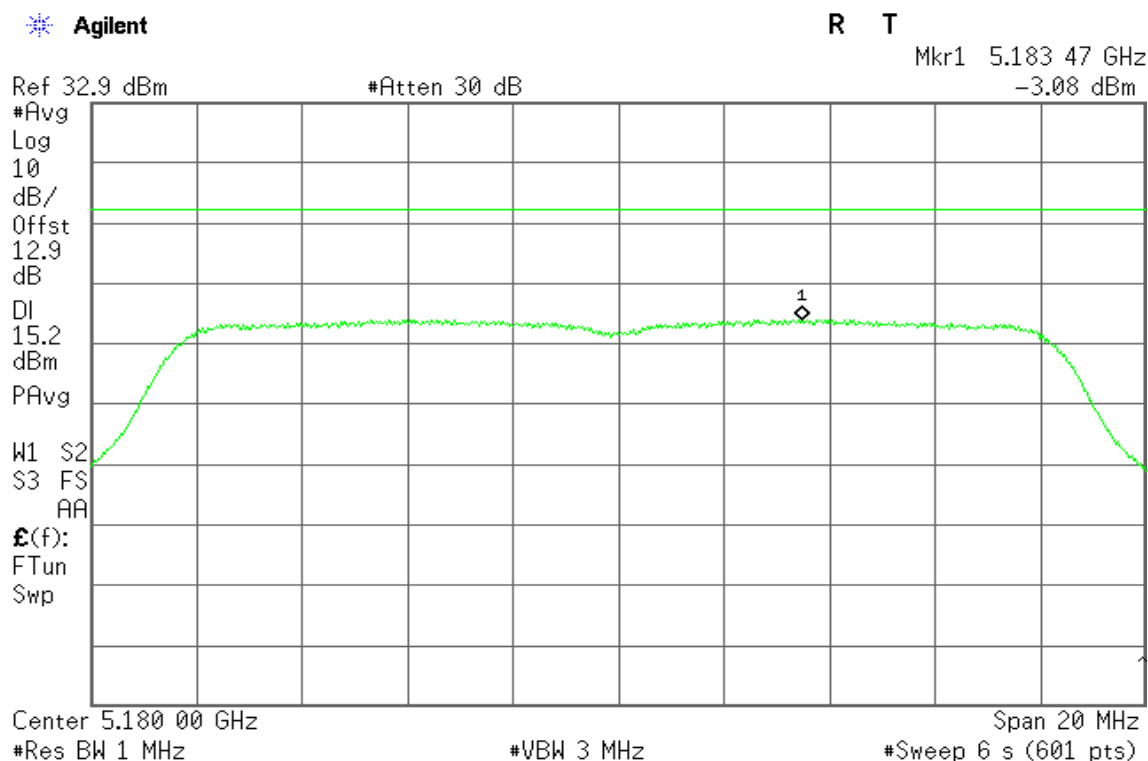
Remark:

1. Total PPSD (dBm) = $10 * \log(10^{(Chain\ 0\ PPSD / 10)} + 10^{(Chain\ 2\ PPSD / 10)})$
2. The maximum antenna gain is 7.82dBi; therefore the reduction due to antenna gain is 1.82dBi, so the limit is 15.18dBm.

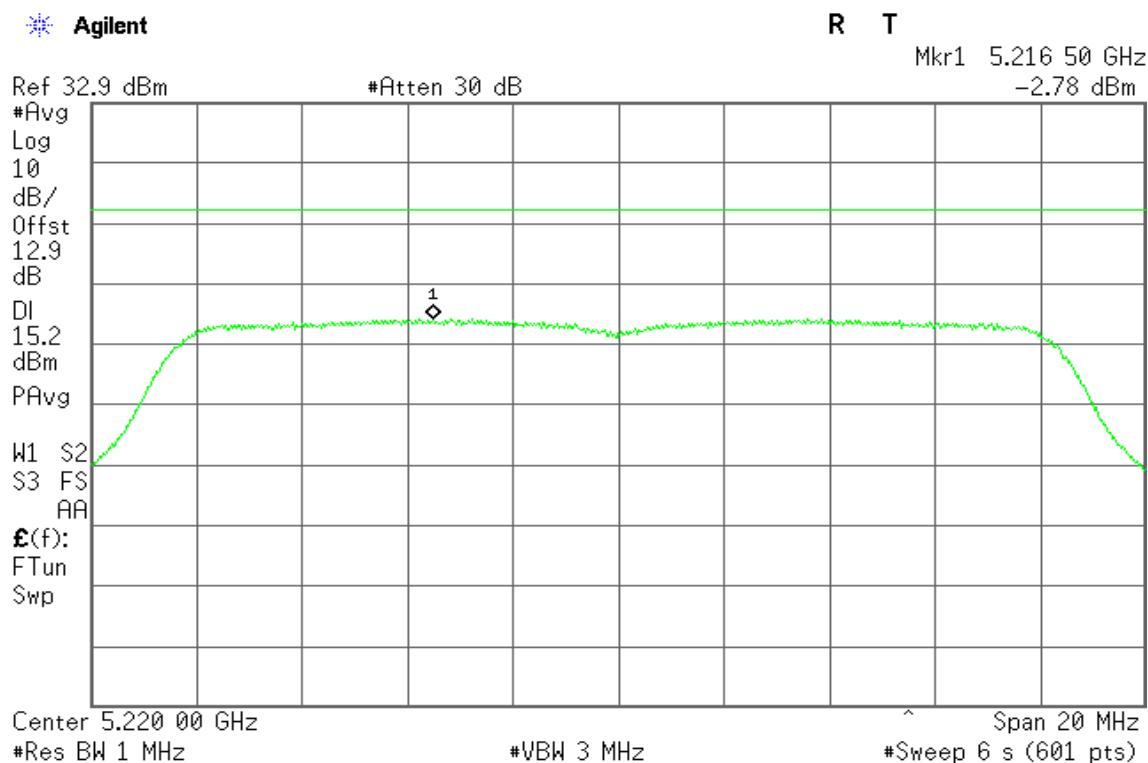
Test Plot

IEEE 802.11a mode / 5180 ~ 5240MHz

CH Low



CH Mid



CH High

Agilent

R T

Mkr1 5.243 30 GHz
-2.56 dBm

Ref 32.9 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

12.9

dB

DI

15.2

dBm

PAvg

W1 S2

S3 FS

AA

£(f):

FTun

Swp

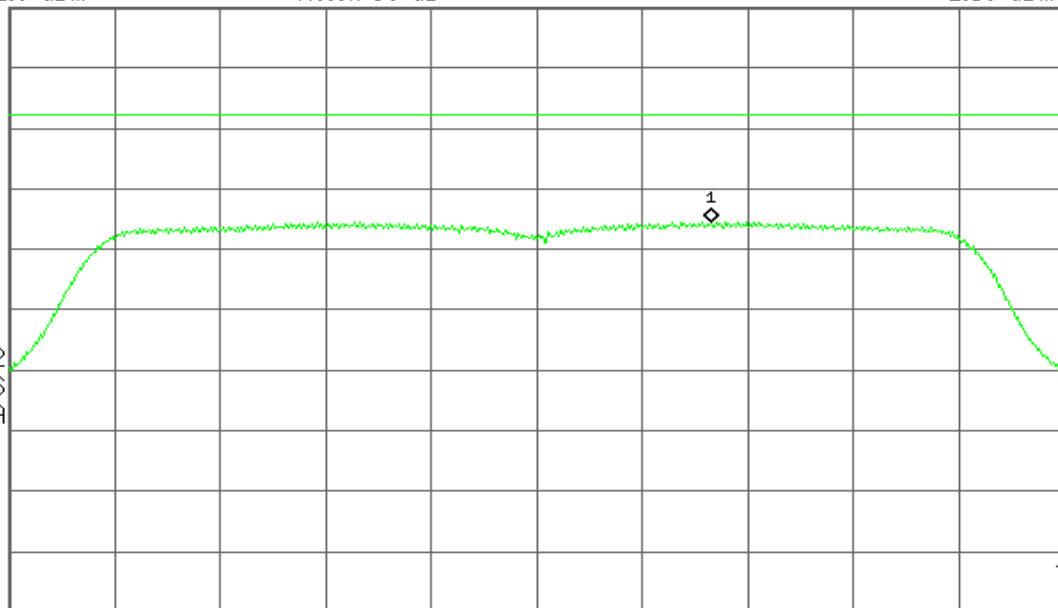
Center 5.240 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

Span 20 MHz

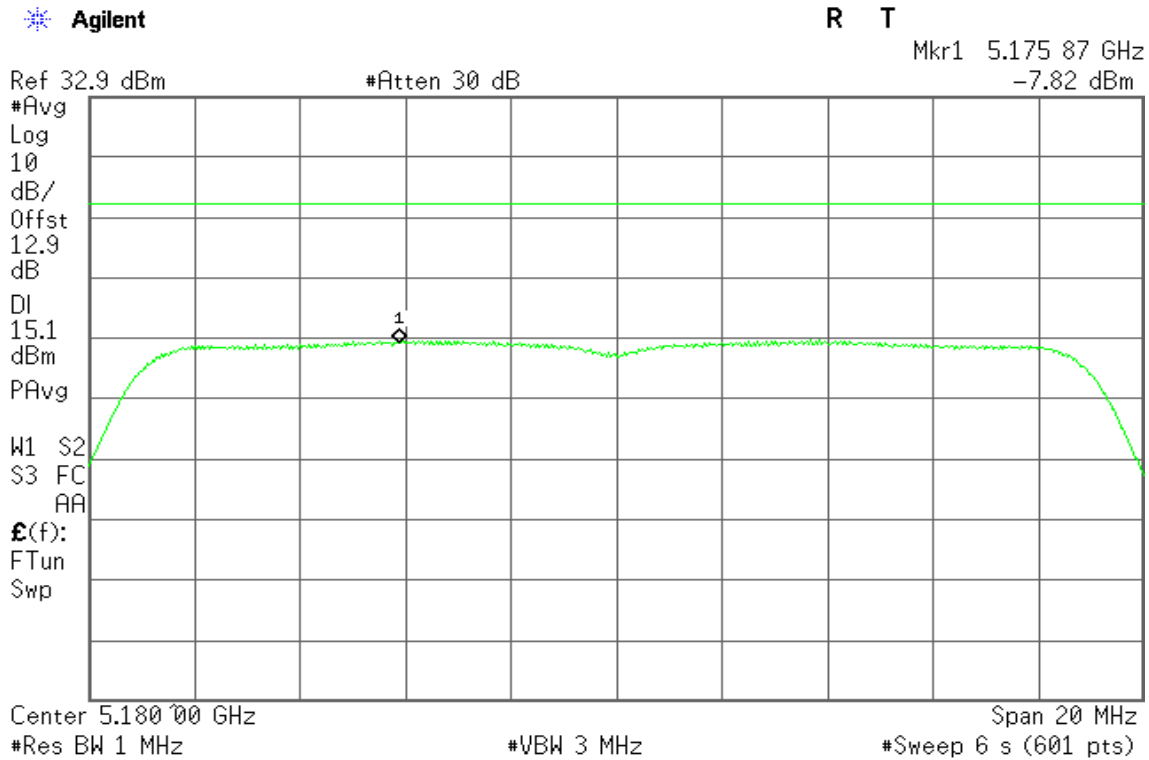
#Sweep 6 s (601 pts)



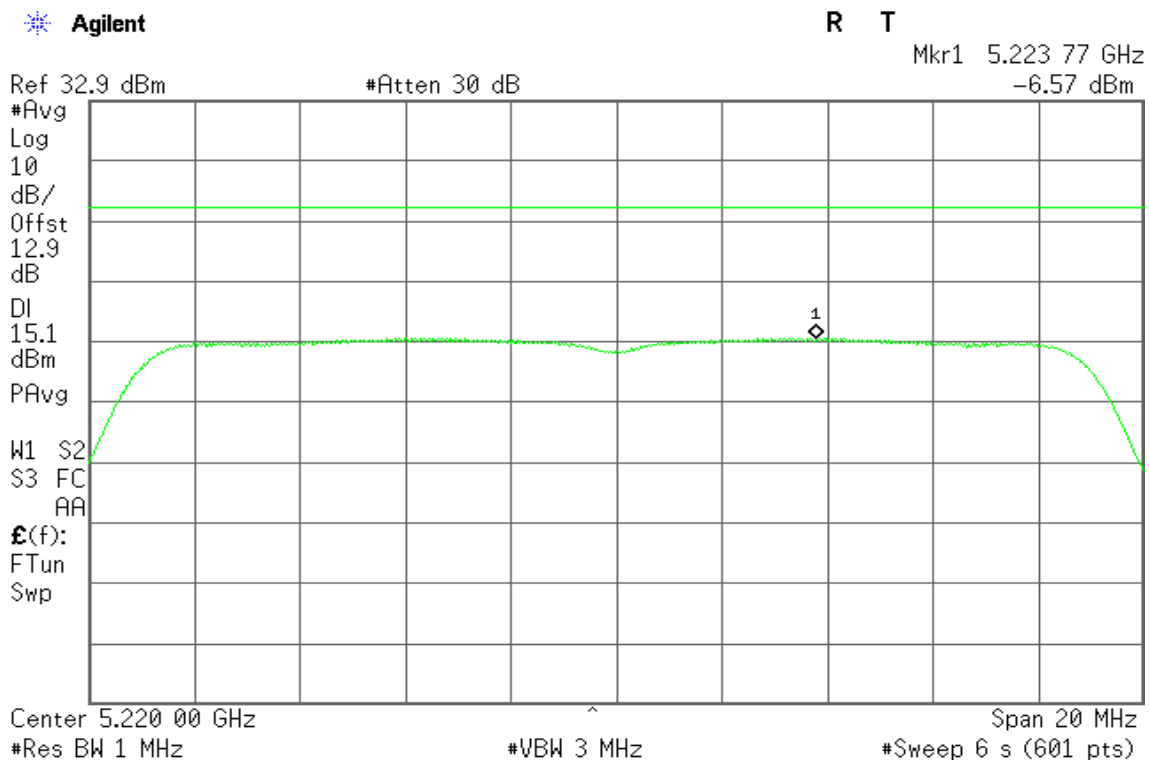
Mode 1

IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 0

CH Low



CH Mid



CH High

 Agilent

R T

Mkr1 5.243 30 GHz
-6.46 dBm

Ref 32.9 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

12.9

dB

DI

15.1

dBm

PAvg

W1 S2

S3 FC

AA

£(f):

FTun

Swp

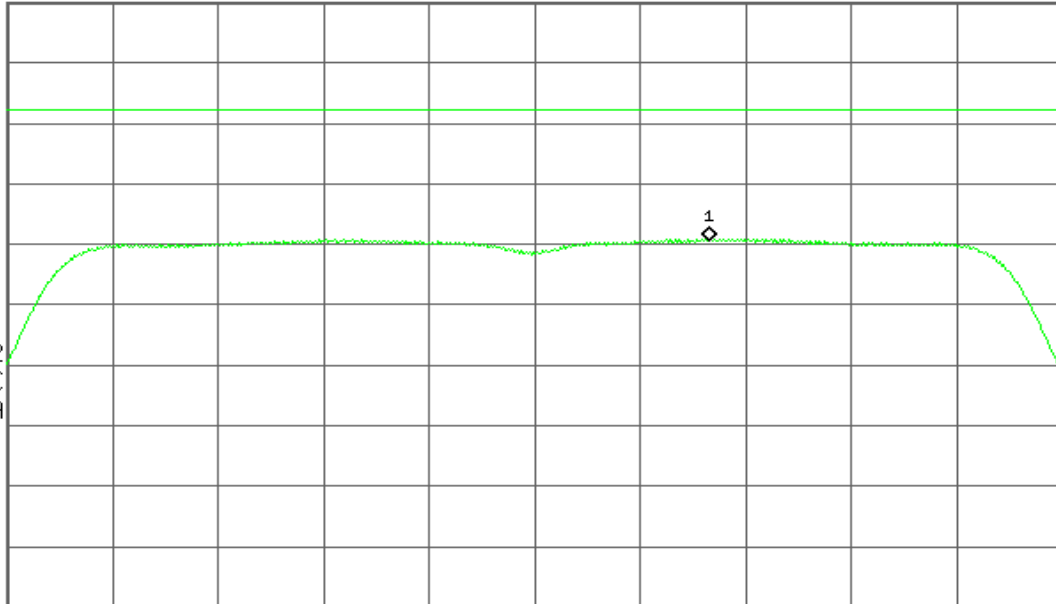
Center 5.240 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

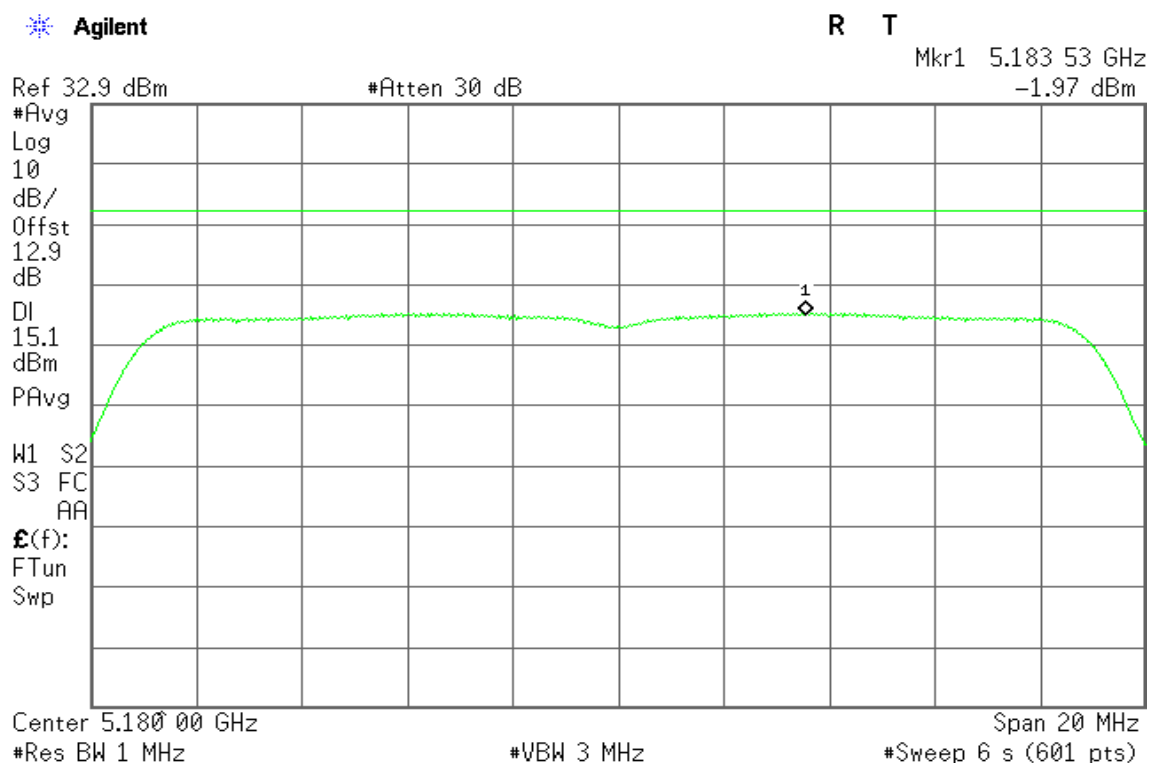
Span 20 MHz

#Sweep 6 s (601 pts)

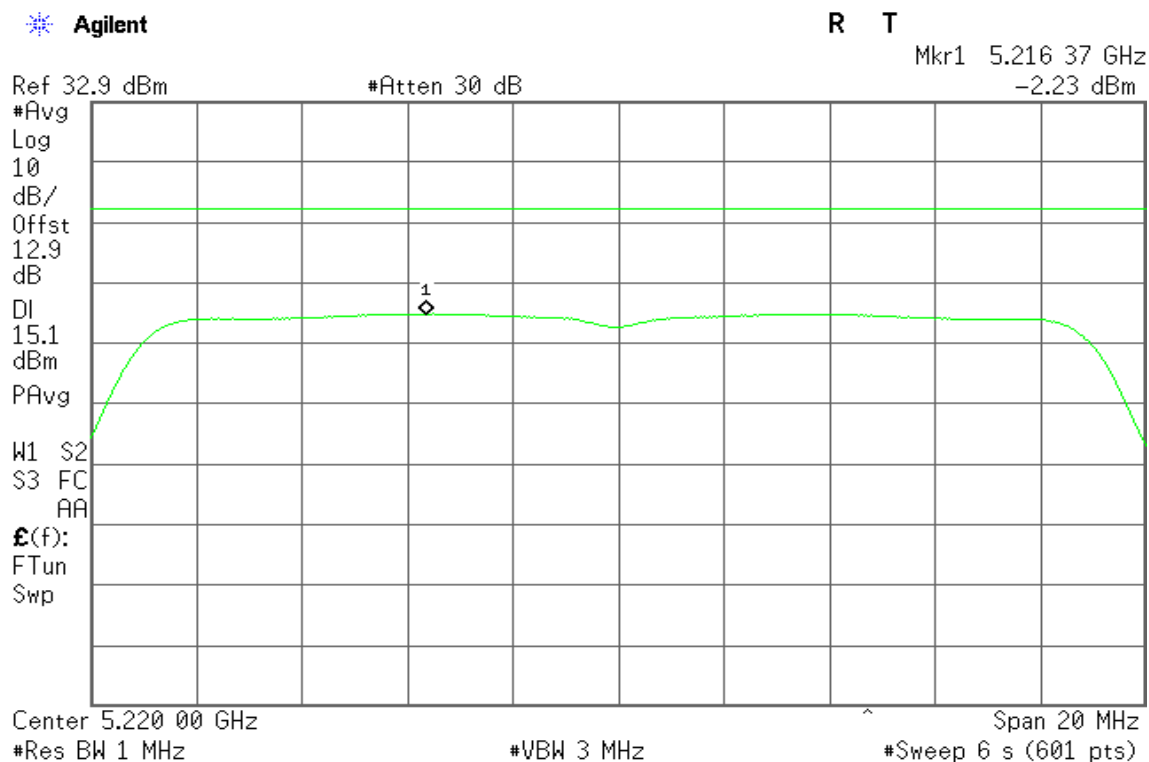


IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 1

CH Low



CH Mid

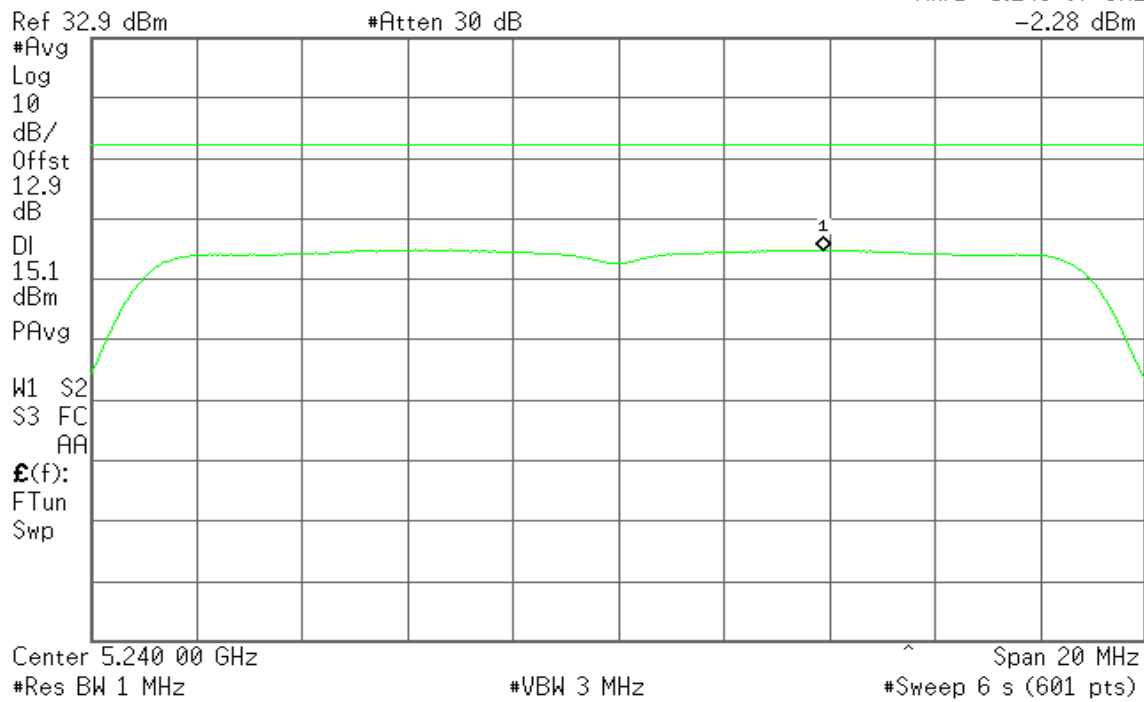


CH High

 Agilent

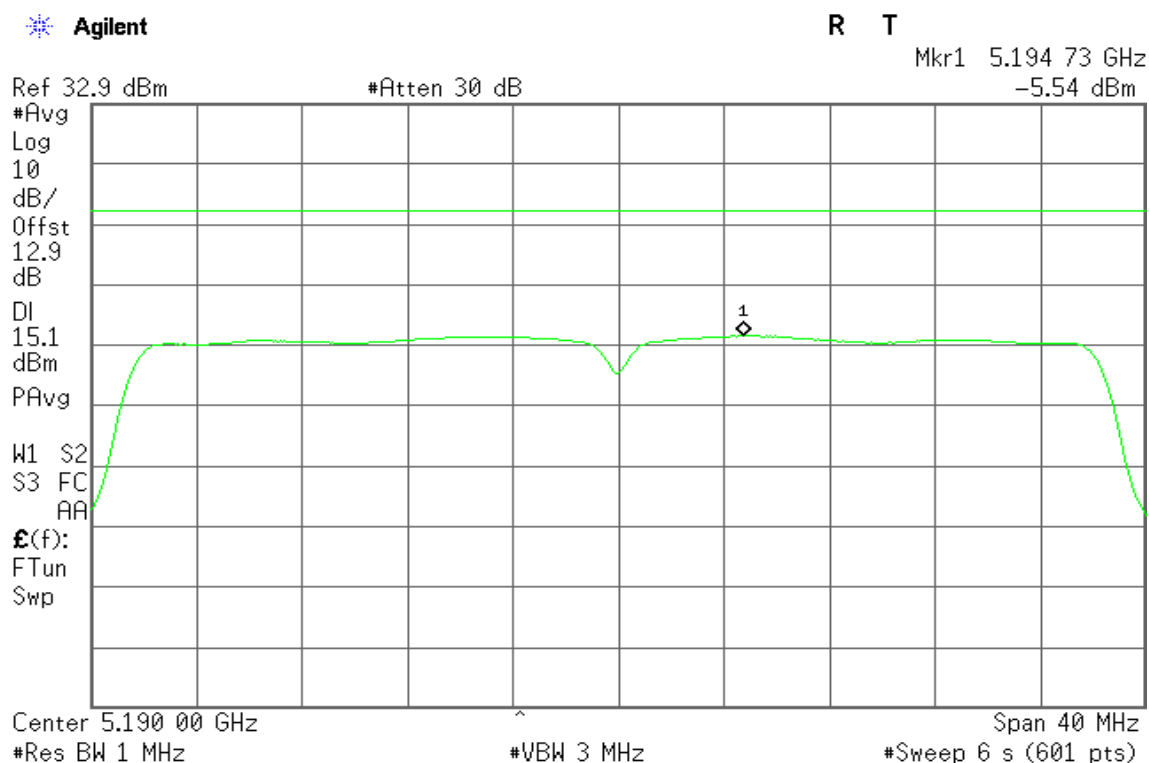
R T

Mkr1 5.243 87 GHz
-2.28 dBm

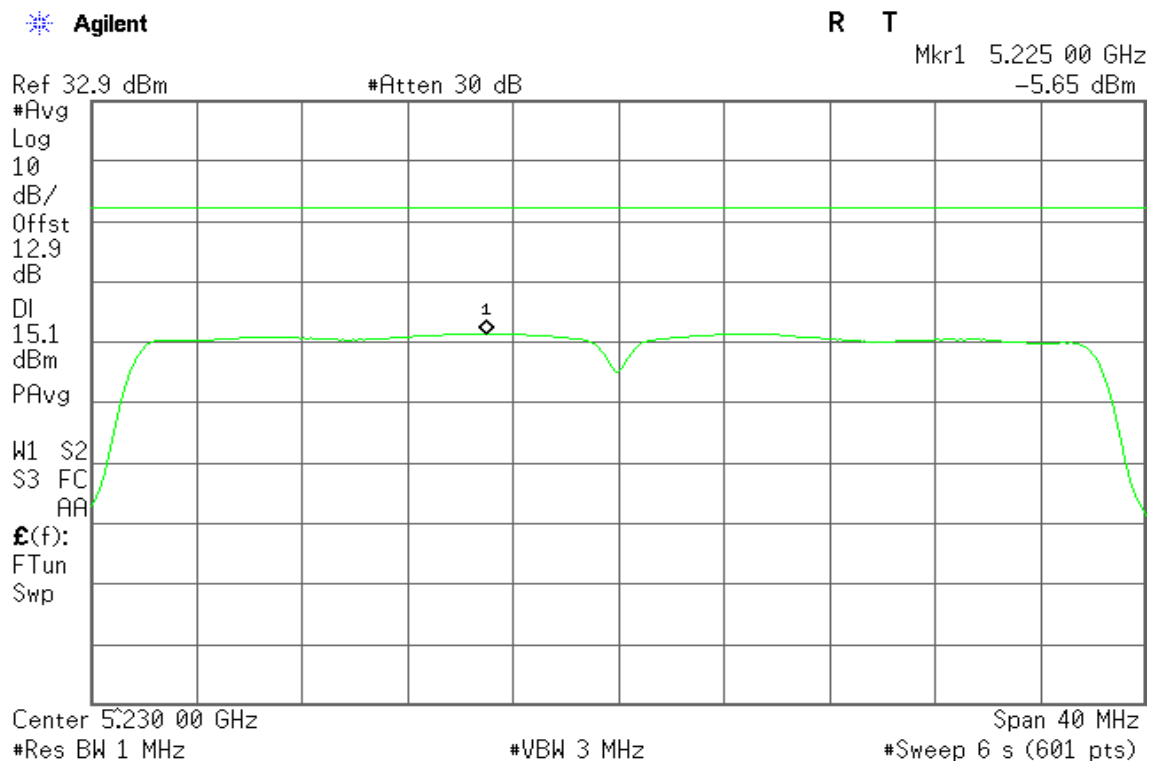


IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 0

CH Low

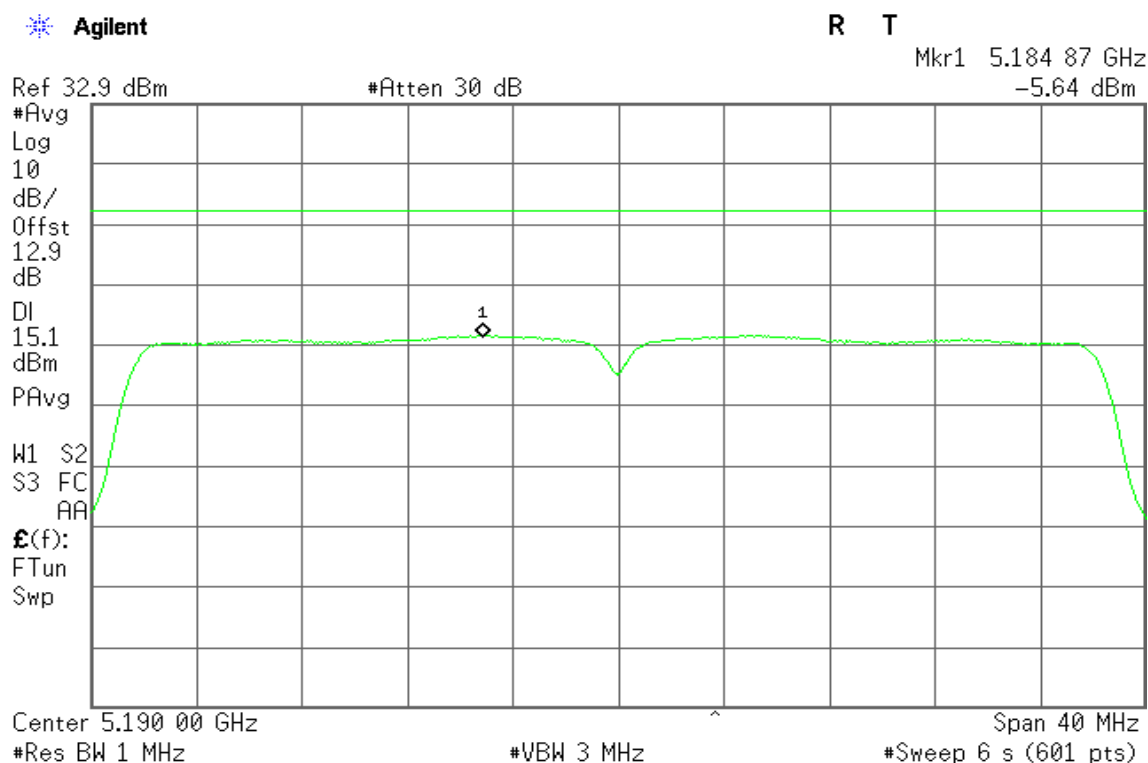


CH High

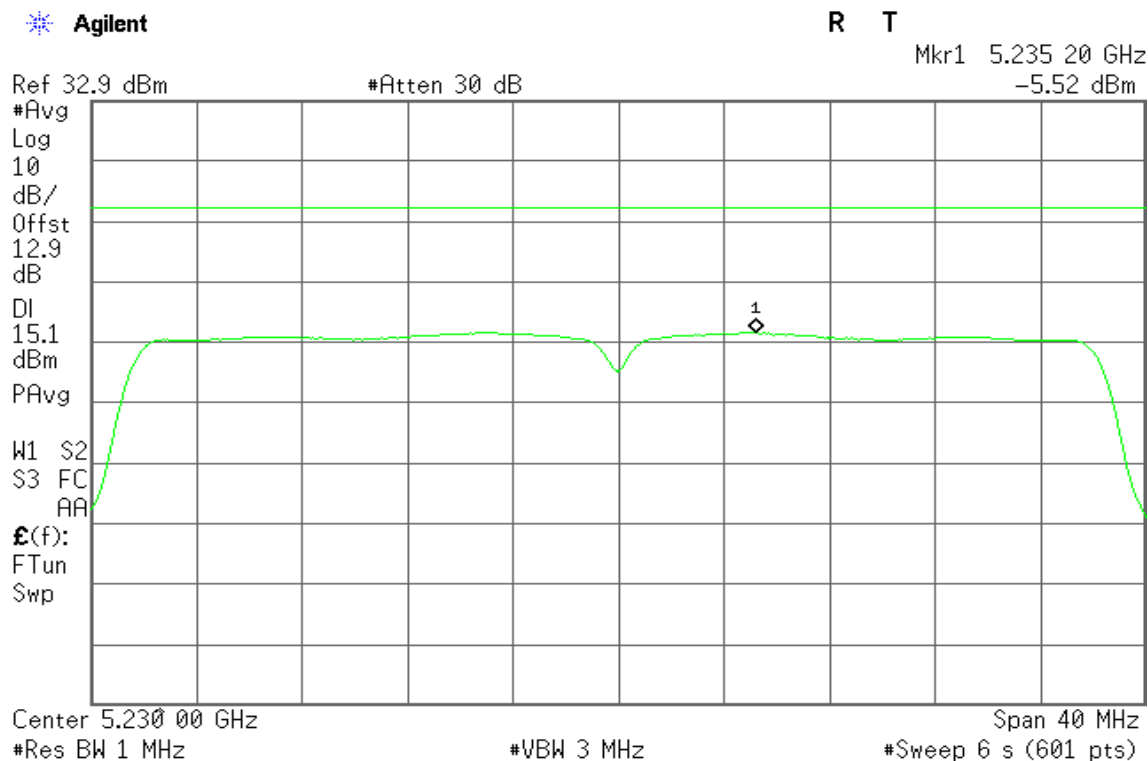


IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 1

CH Low



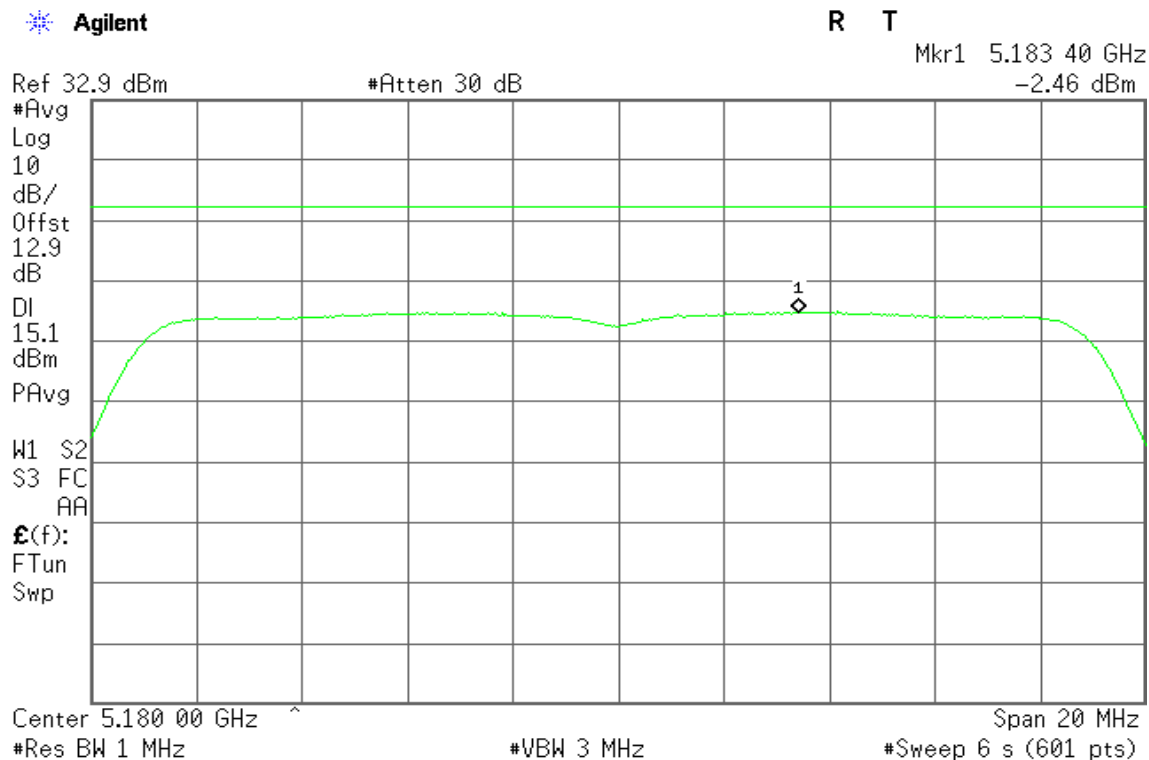
CH High



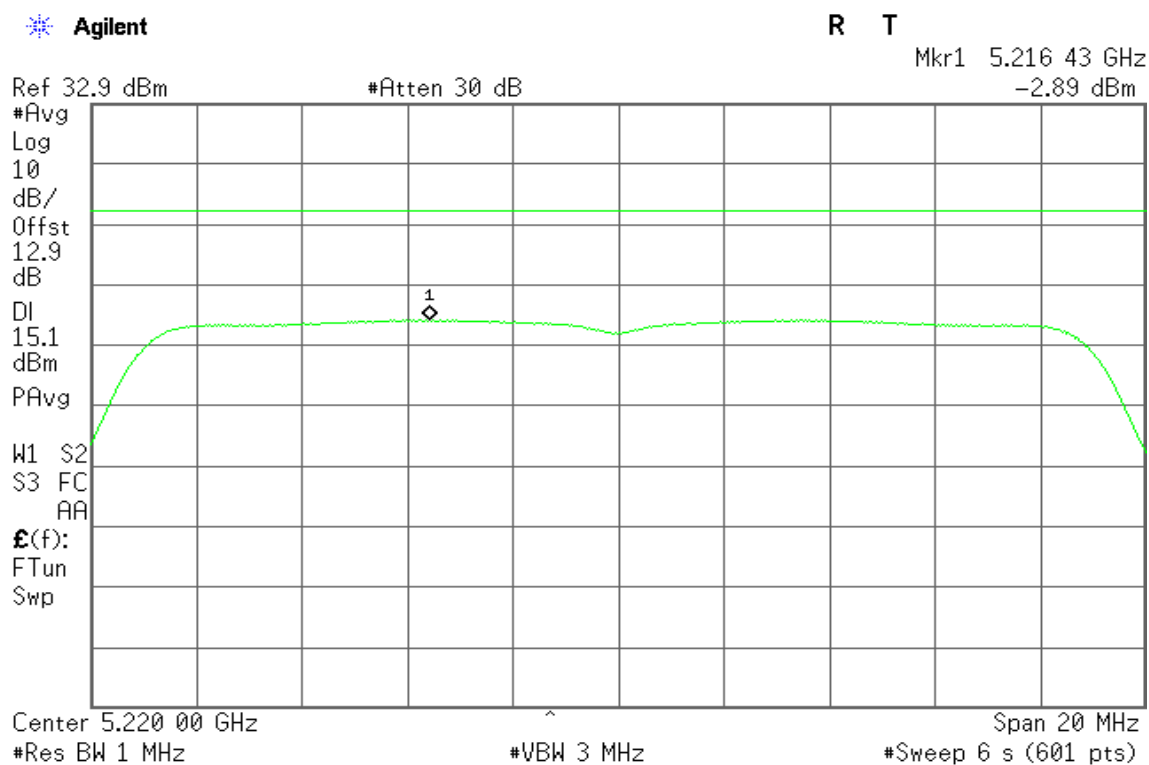
Mode 2

IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 1

CH Low



CH Mid



CH High

 Agilent

R T

Mkr1 5.243 67 GHz
-2.86 dBm

Ref 32.9 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

12.9

dB

DI

15.1

dBm

PAvg

W1 S2

S3 FC

AA

£(f):

FTun

Swp

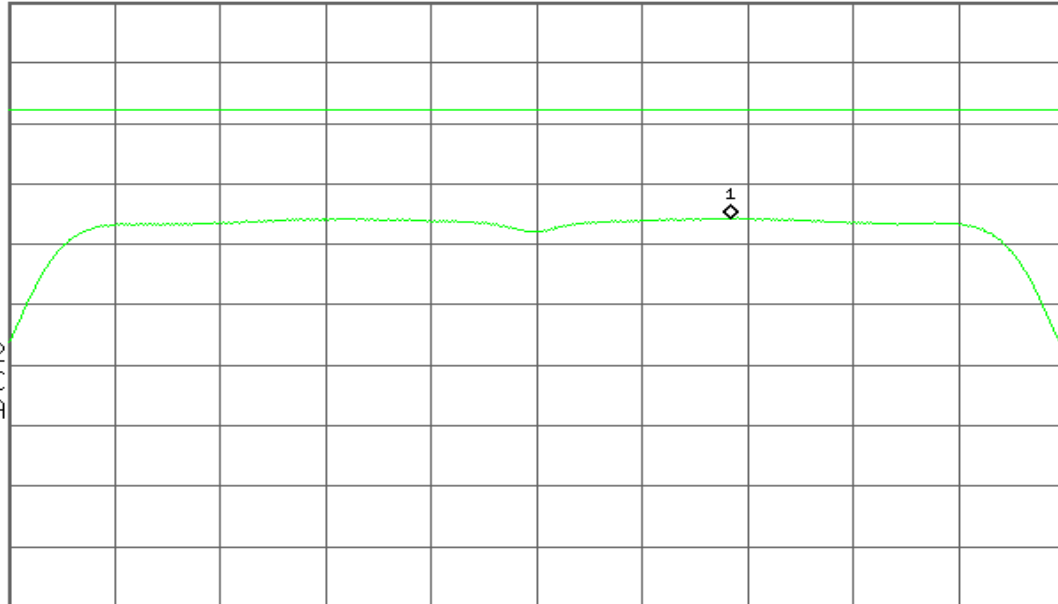
Center 5.240 00 GHz^

#Res BW 1 MHz

#VBW 3 MHz

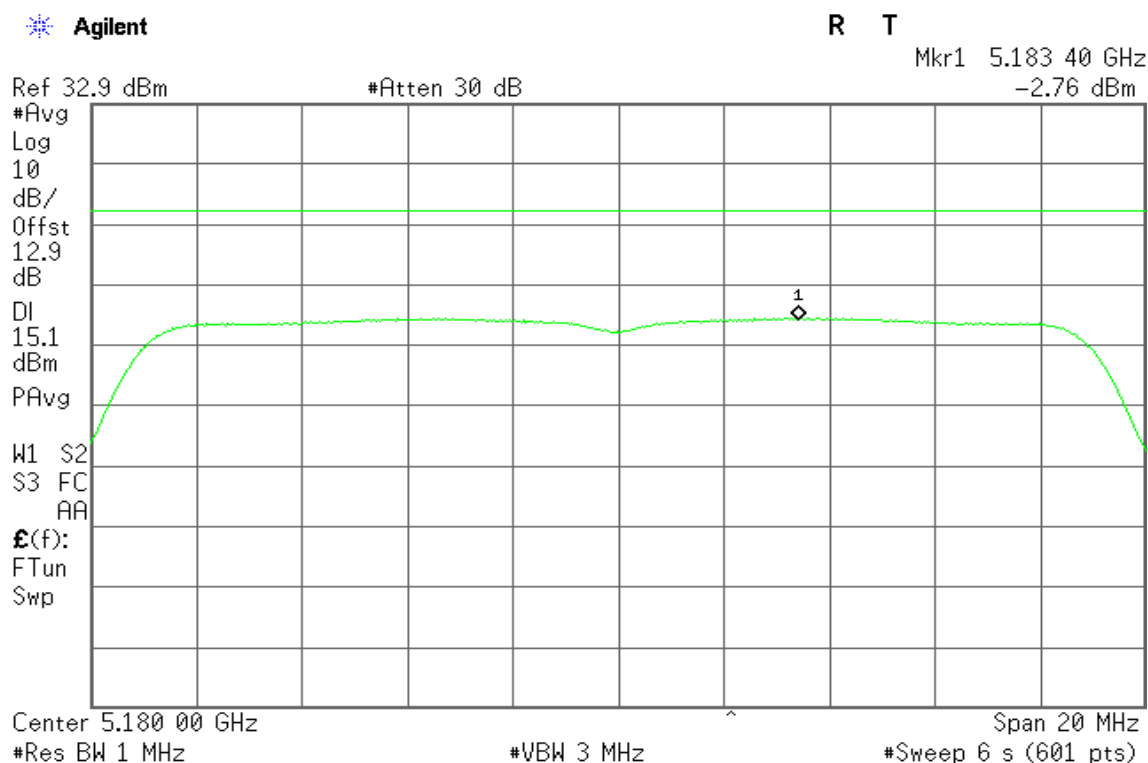
Span 20 MHz

#Sweep 6 s (601 pts)

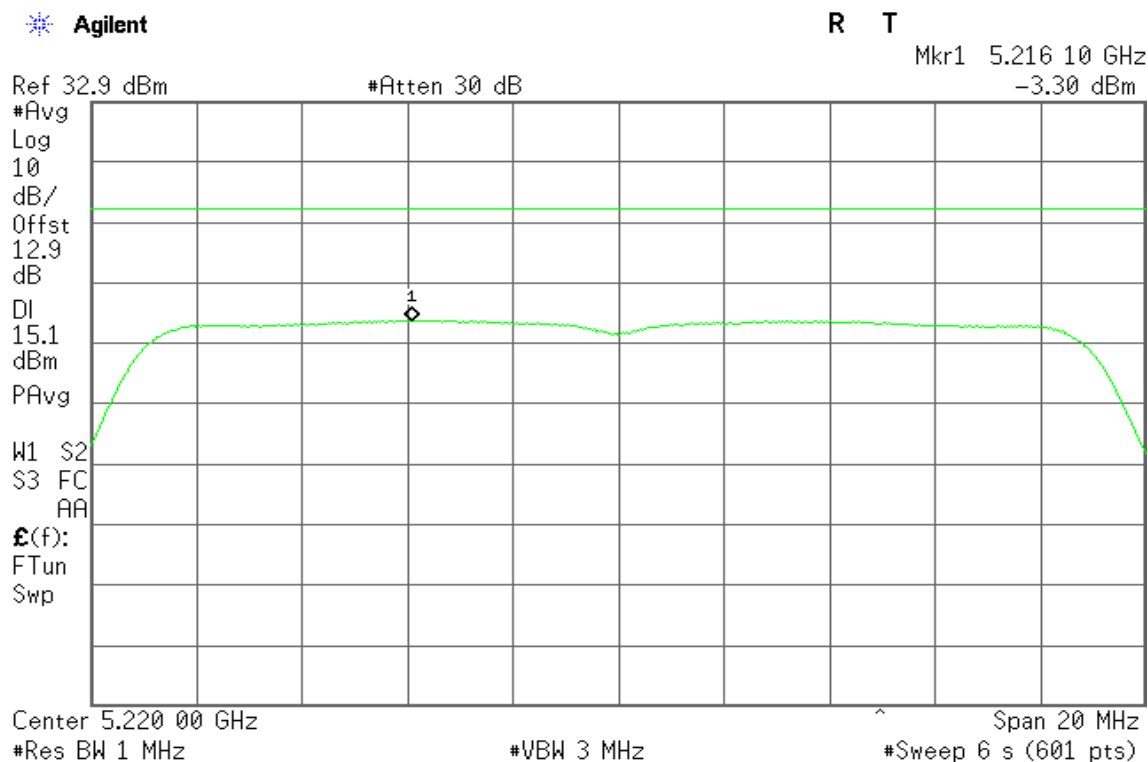


IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 2

CH Low



CH Mid



CH High

 Agilent

R T

Mkr1 5.236 40 GHz
-3.89 dBm

Ref 32.9 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

12.9

dB

DI

15.1

dBm

PAvg

W1 S2

S3 FC

AA

£(f):

FTun

Swp

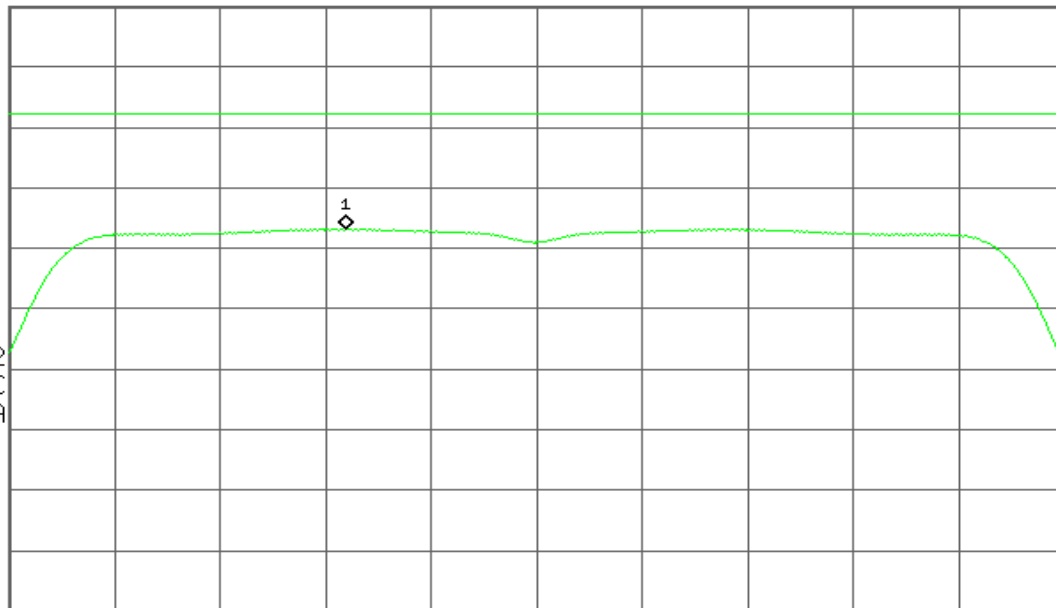
Center 5.240 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

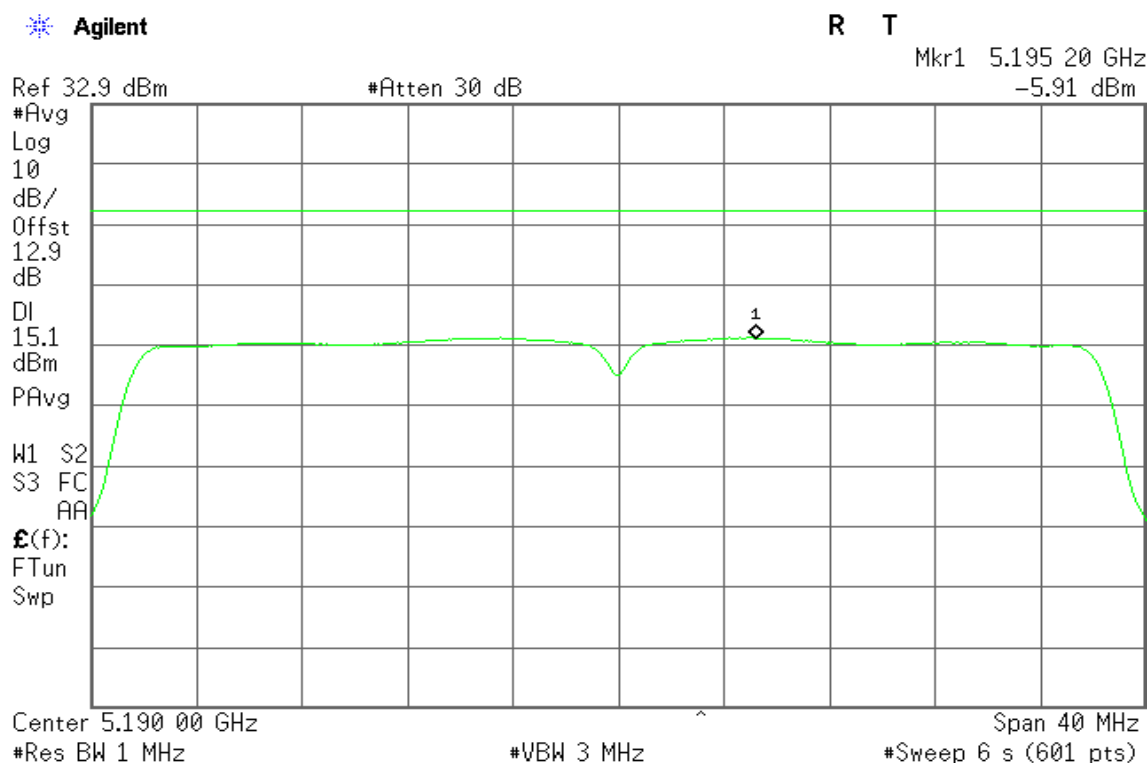
Span 20 MHz

#Sweep 6 s (601 pts)

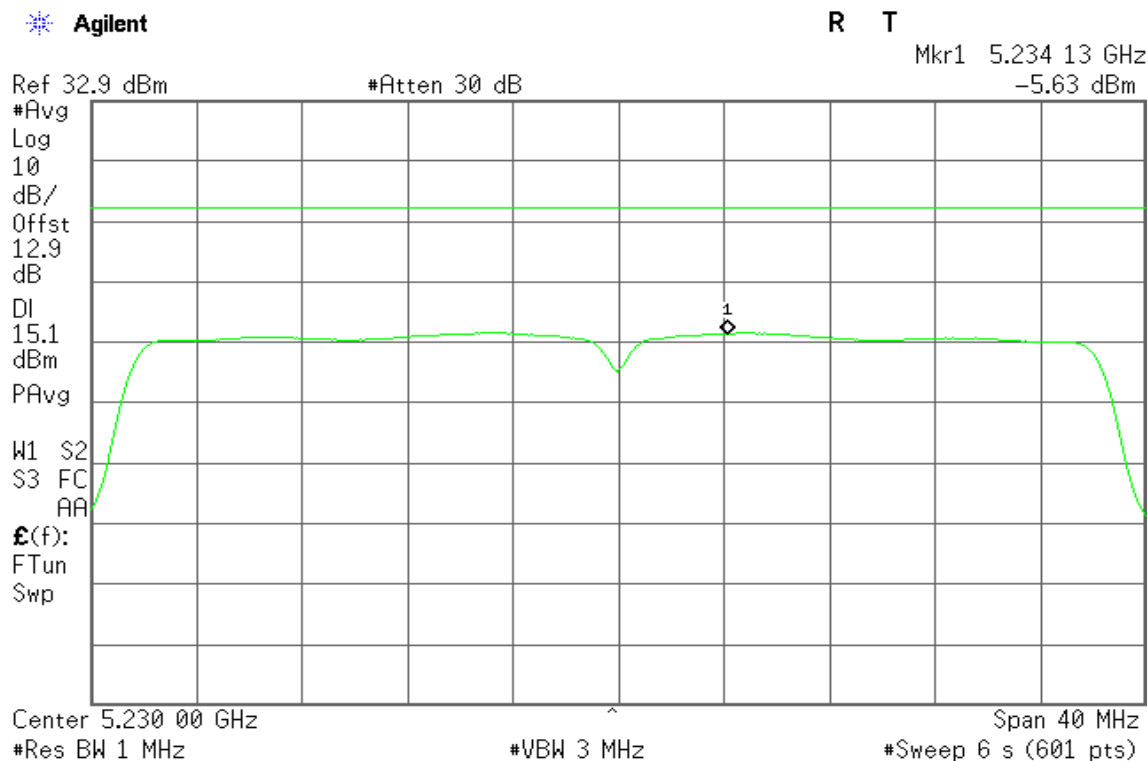


IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 1

CH Low

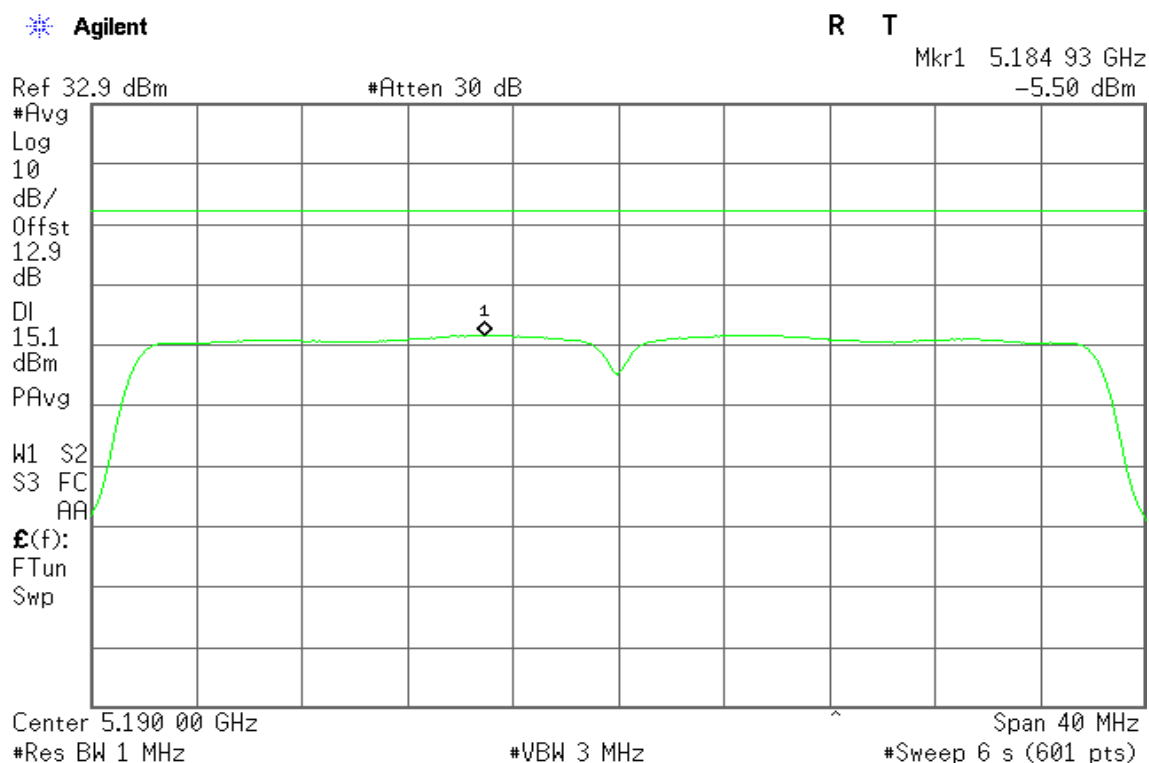


CH High

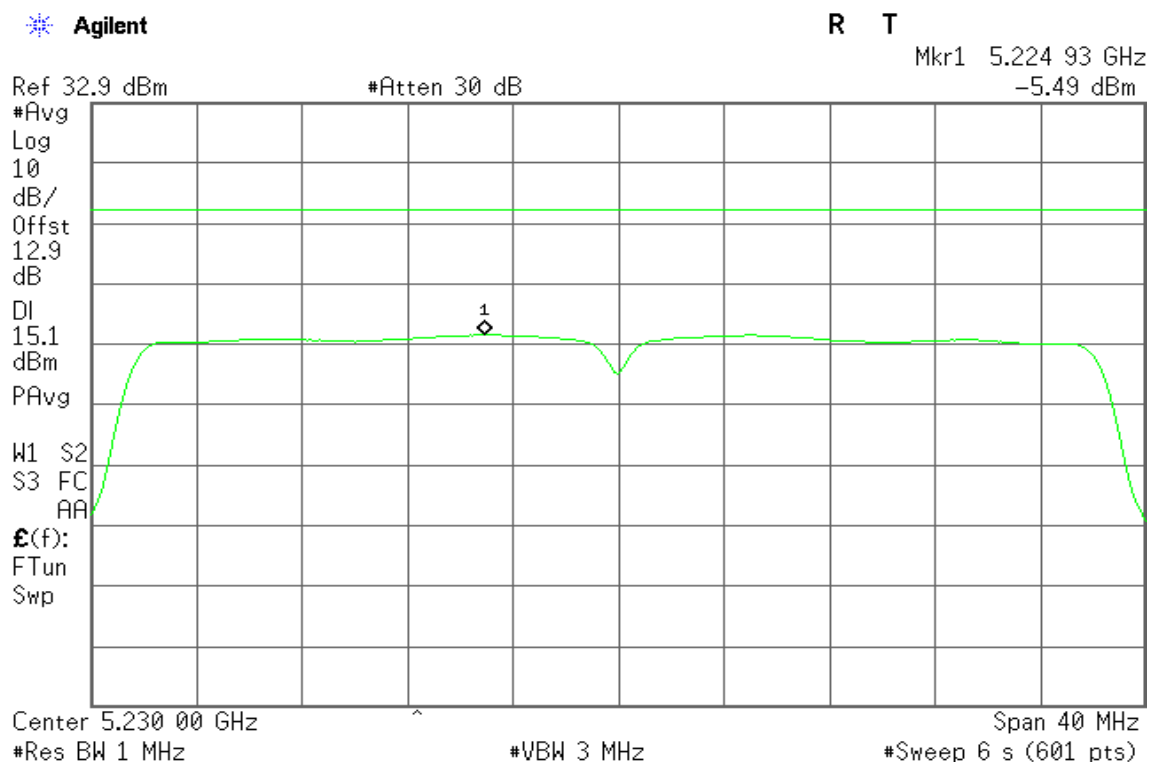


IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 2

CH Low



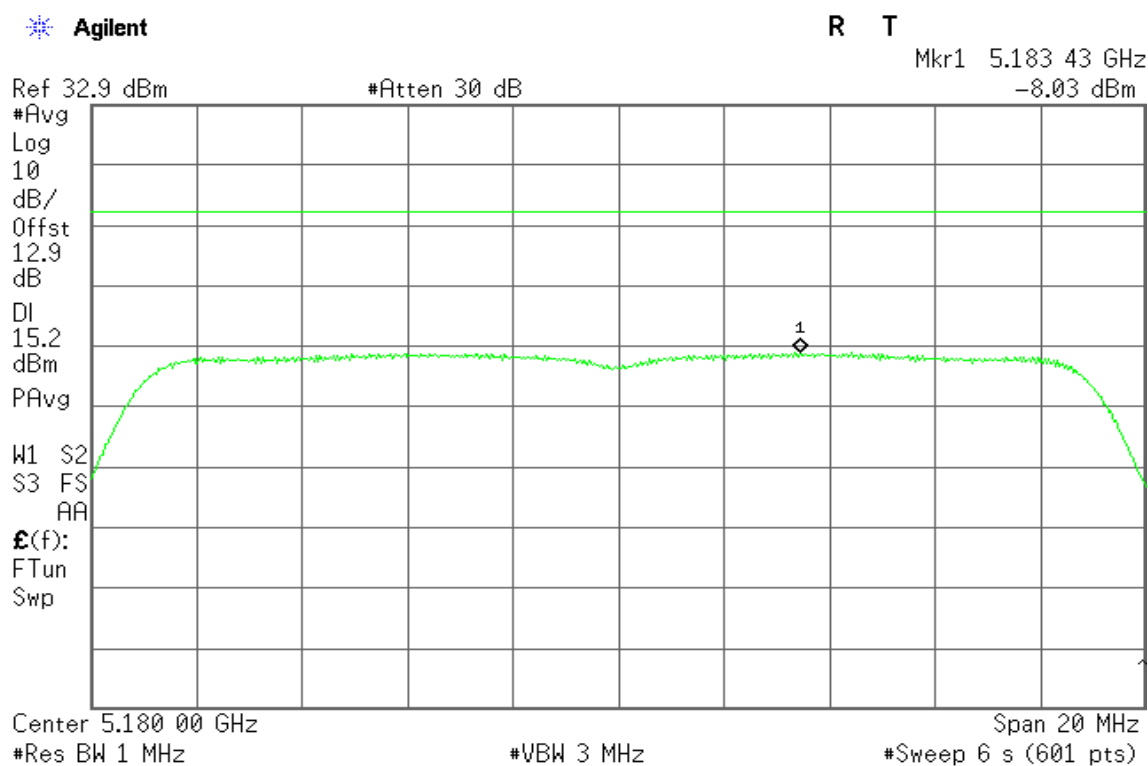
CH High



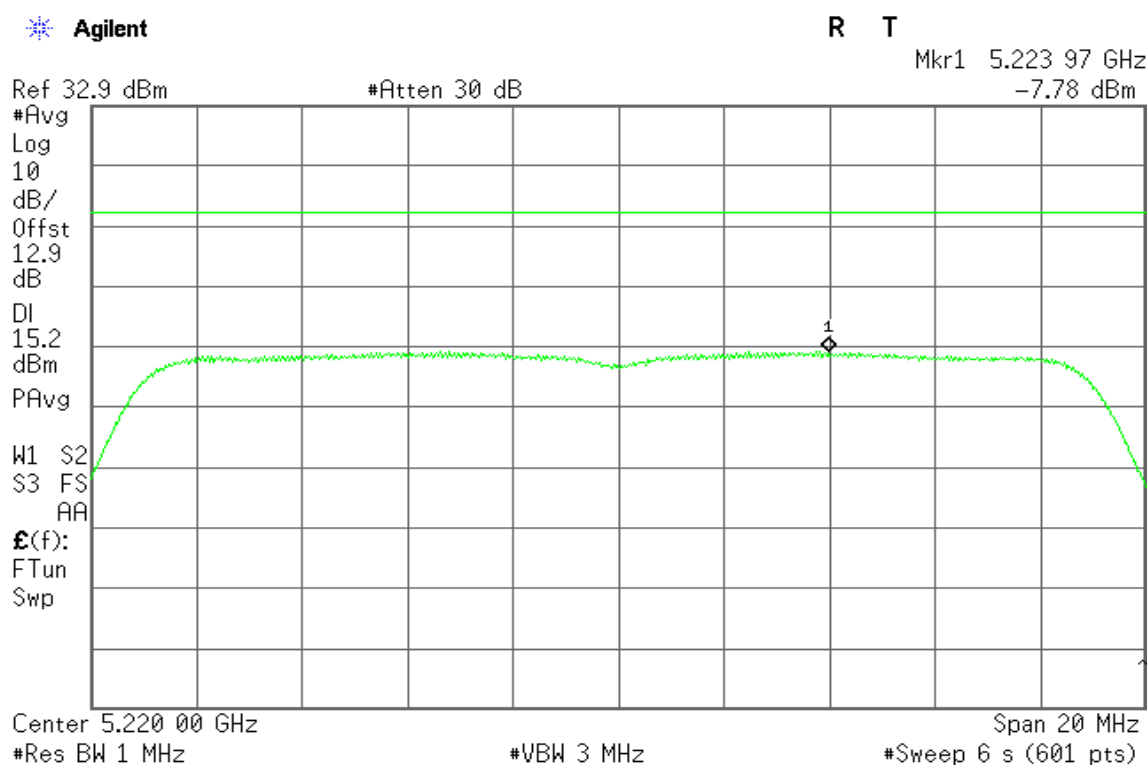
Mode 3

IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 0

CH Low



CH Mid



CH High

 Agilent

R T

Mkr1 5.243 33 GHz
-7.44 dBm

Ref 32.9 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

12.9

dB

DI

15.2

dBm

PAvg

W1 S2

S3 FS

AA

£(f):

FTun

Swp

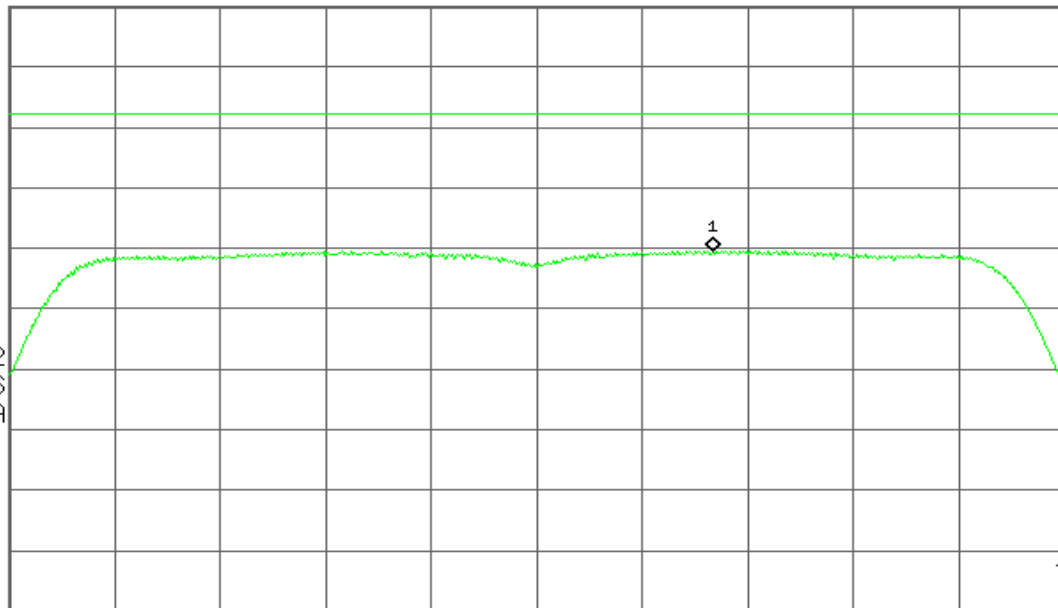
Center 5.240 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

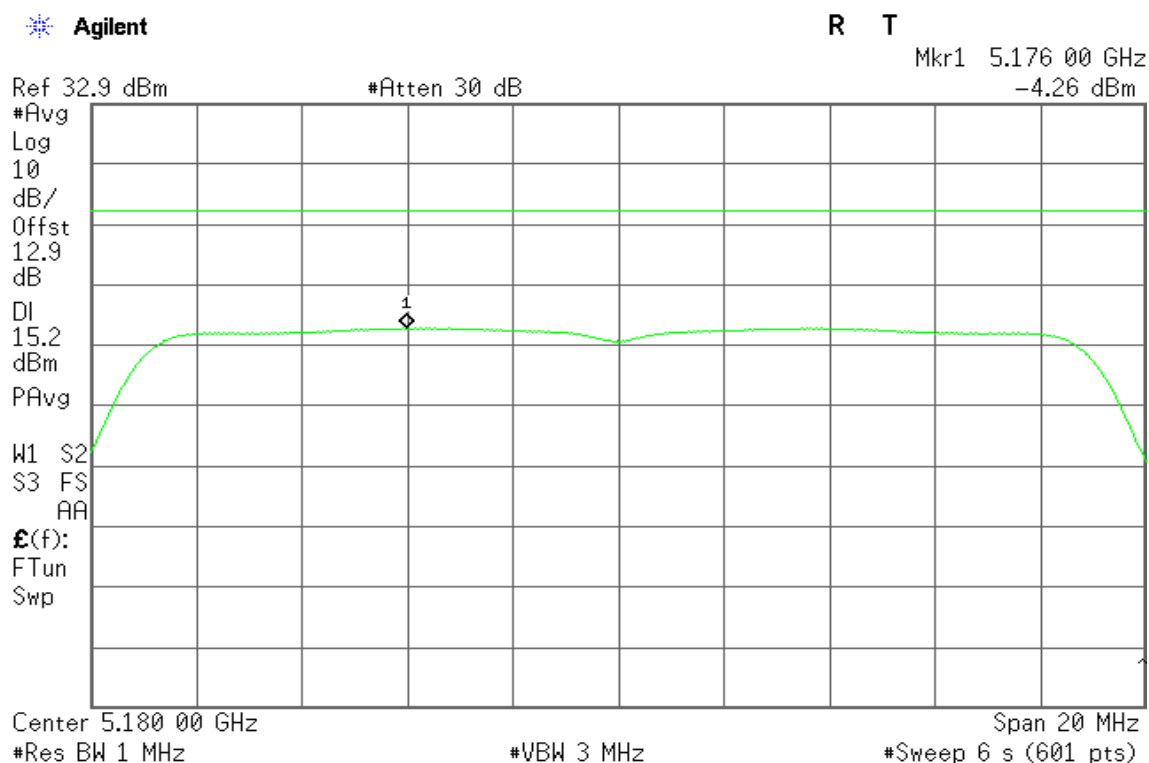
Span 20 MHz

#Sweep 6 s (601 pts)

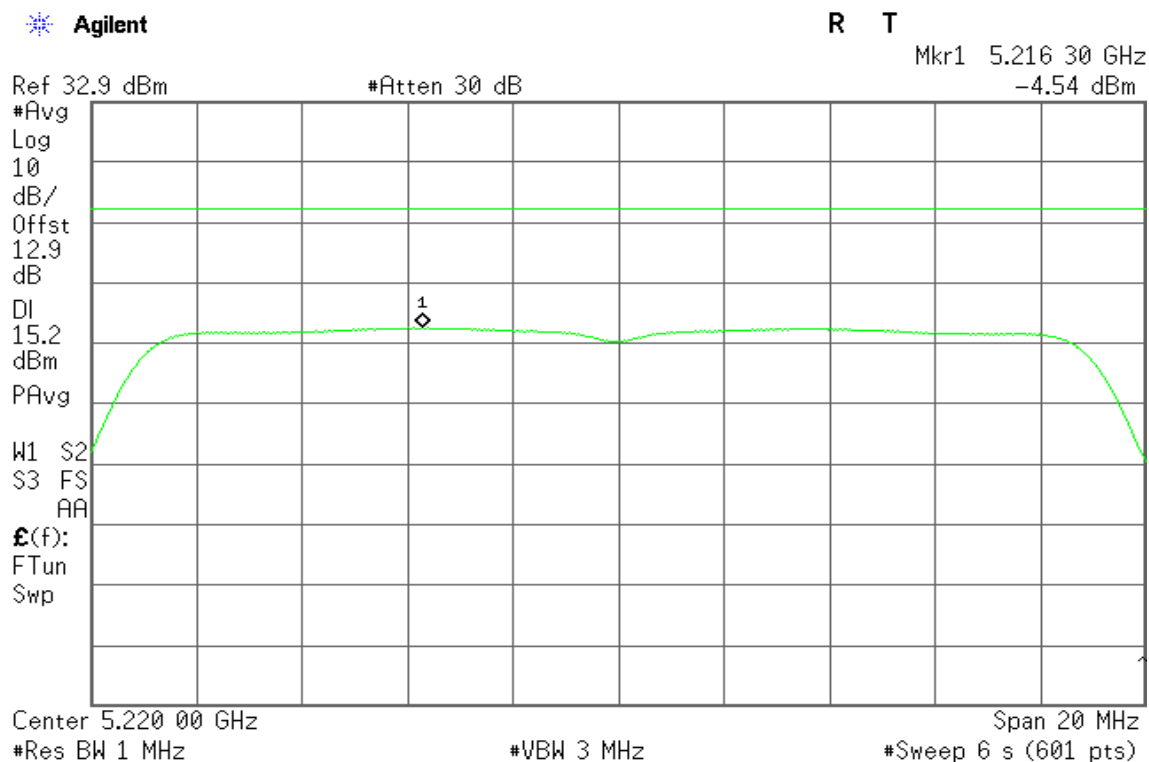


IEEE 802.11n HT 20 MHz / 5180 ~ 5240MHz / Chain 2

CH Low



CH Mid



CH High

 Agilent

R T

Mkr1 5.236 33 GHz
-4.60 dBm

Ref 32.9 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

12.9

dB

DI

15.2

dBm

PAvg

W1 S2

S3 FS

RA

£(f):

FTun

Swp

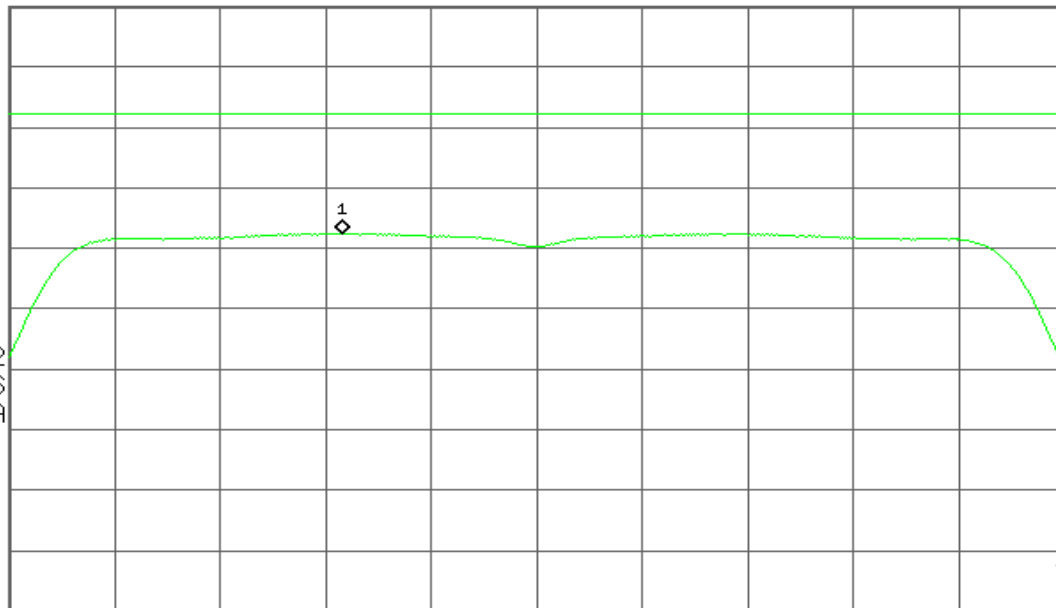
Center 5.240 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

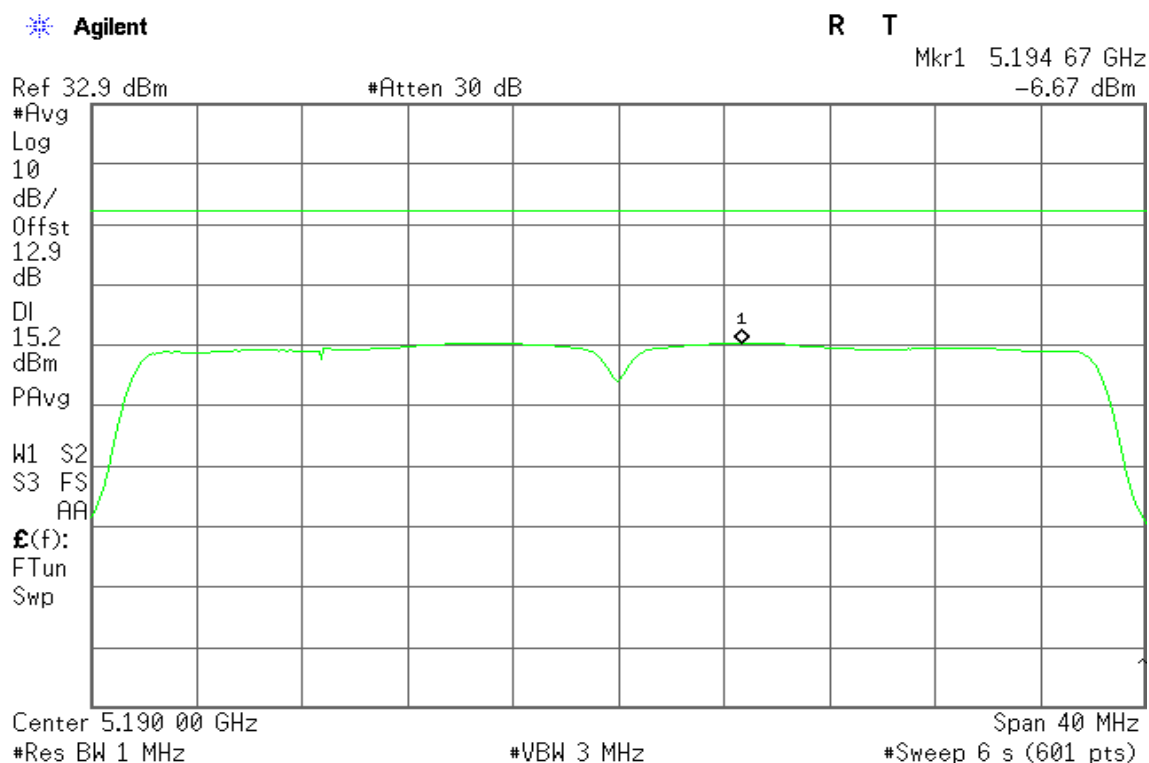
Span 20 MHz

#Sweep 6 s (601 pts)

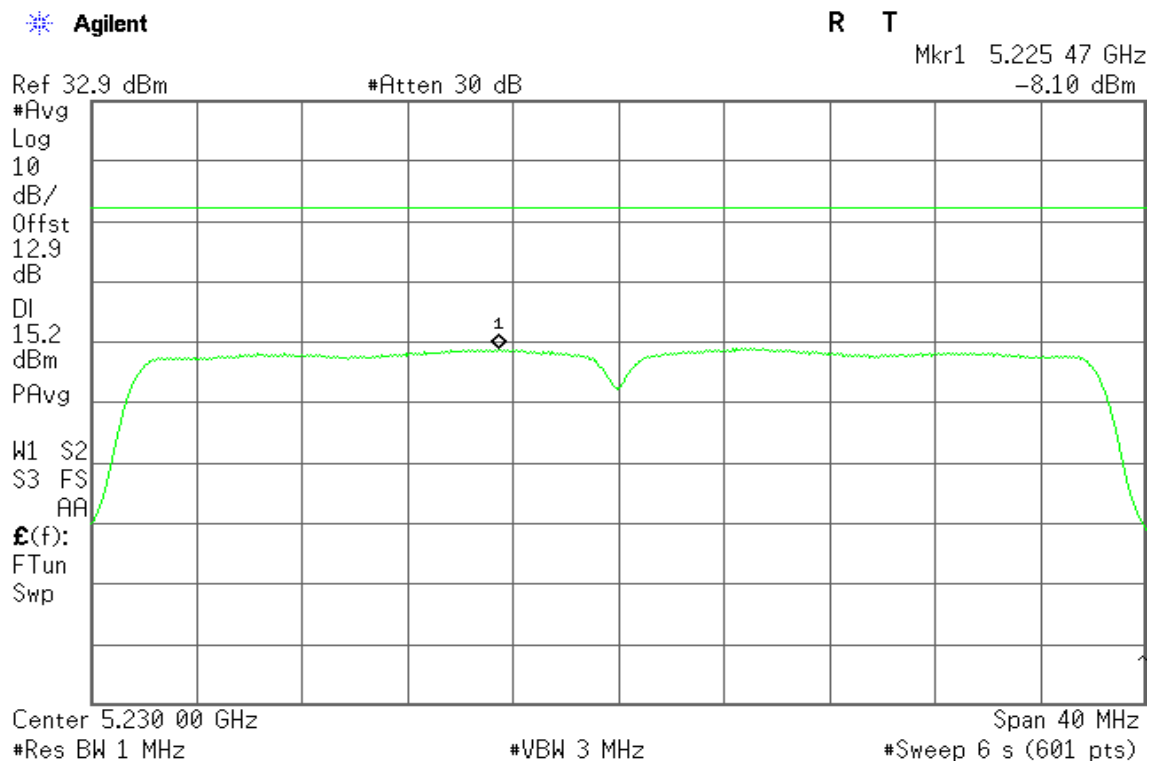


IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 0

CH Low

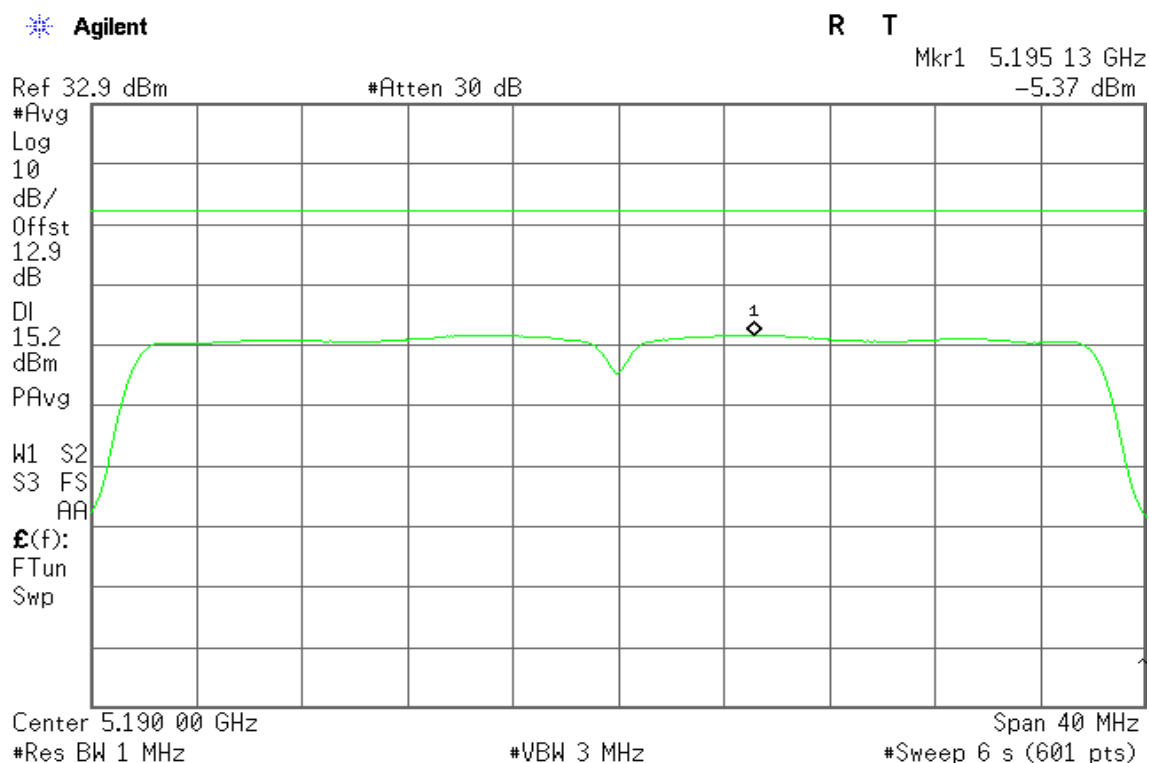


CH High

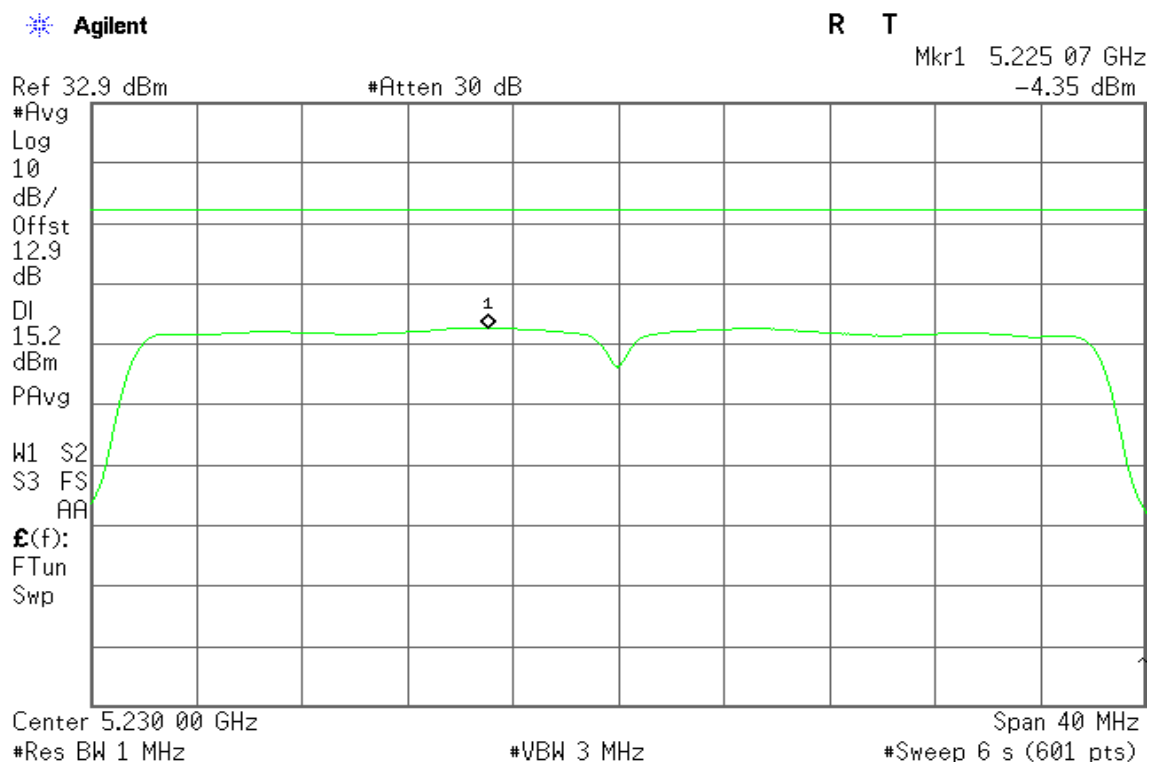


IEEE 802.11n HT 40 MHz / 5190 ~ 5230MHz / Chain 2

CH Low



CH High



7.5 RADIATED UNDESIRABLE EMISSION

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

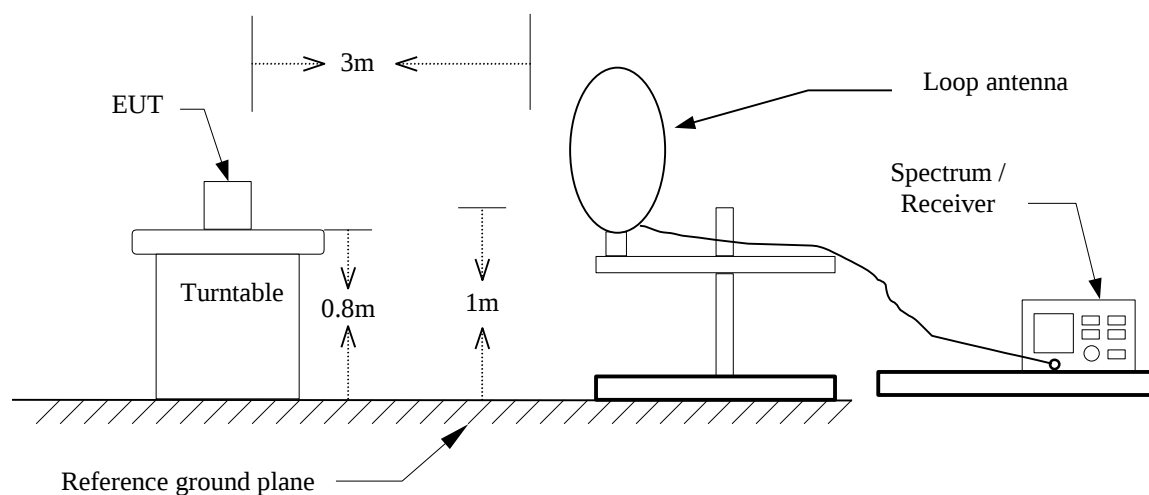
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

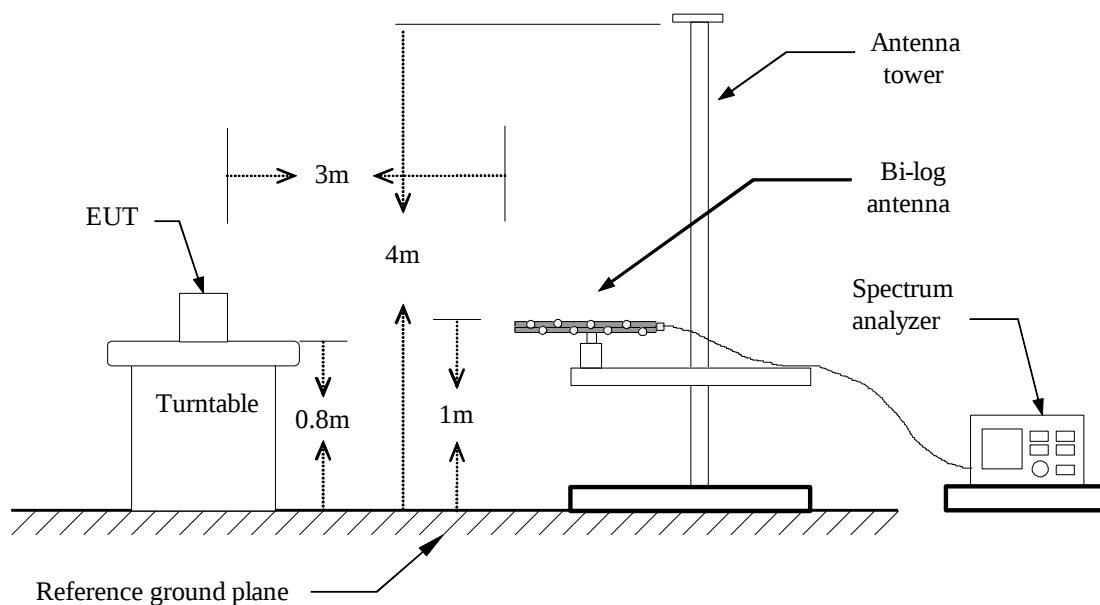
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

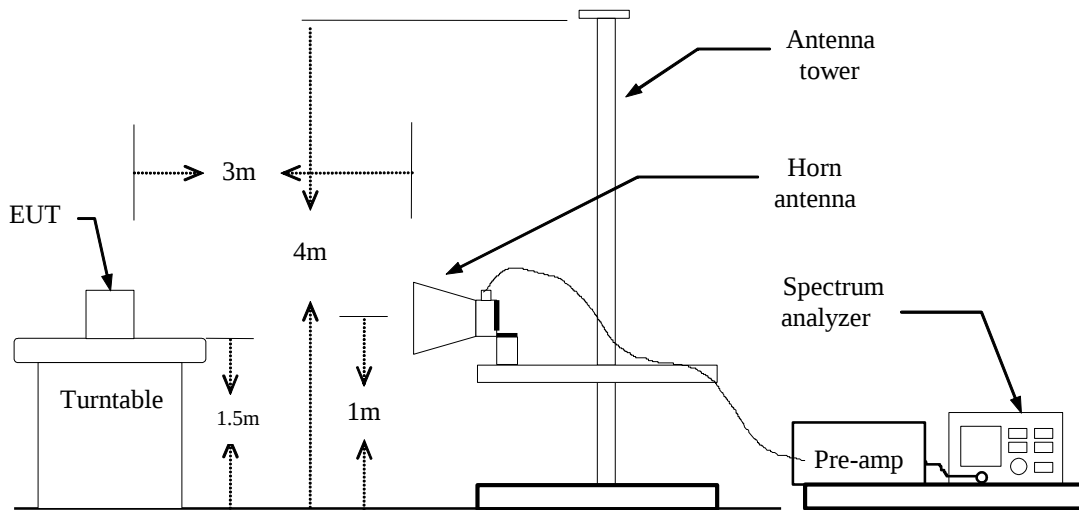
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz,
if duty cycle $\geq 98\%$, VBW=10Hz.
if duty cycle $< 98\%$ VBW=1/T.

IEEE 802.11a mode: = 95%, VBW=510Hz

IEEE 802.11n HT 20 MHz mode: = 92%, VBW=1.1KHz

IEEE 802.11n HT 40 MHz mode: = 85%, VBW=2.2KHz

7. Repeat above procedures until the measurements for all frequencies are complete.

Below 1 GHz

Operation Mode: Normal Link

Test Date: July 12, 2015

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

Frequency (MHz)	Reading (Peak/QP) (dBuV)	Correction Factor (dB/m)	Result (Peak/QP) (dBuV/m)	Limit (Peak/QP) (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
228.8500	53.94	-18.83	35.11	46.00	-10.89	peak	V
256.3333	48.07	-17.94	30.13	46.00	-15.87	peak	V
419.6167	47.34	-13.49	33.85	46.00	-12.15	peak	V
539.2500	42.98	-11.18	31.80	46.00	-14.20	peak	V
597.4500	39.26	-10.53	28.73	46.00	-17.27	peak	V
767.2000	38.75	-7.71	31.04	46.00	-14.96	peak	V
228.8500	58.81	-18.83	39.98	46.00	-6.02	Peak	H
259.5667	55.16	-17.71	37.45	46.00	-8.55	Peak	H
419.6167	44.02	-13.49	30.53	46.00	-15.47	Peak	H
618.4667	41.60	-10.07	31.53	46.00	-14.47	Peak	H
689.6000	38.37	-8.90	29.47	46.00	-16.53	Peak	H
768.8167	43.23	-7.69	35.54	46.00	-10.46	Peak	H

Remark:

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

Above 1 GHz

Operation Mode: Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Low
Test Date: July 12, 2015
Temperature: 27°C
Tested by: Jason Lu
Humidity: 53% RH
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2386.000	54.79	-3.81	50.98	74.00	-23.02	peak	V
N/A							
3289.000	52.35	-1.42	50.93	74.00	-23.07	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH Mid
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3527.000	51.58	-0.79	50.79	74.00	-23.21	peak	V
N/A							
3198.000	52.04	-1.63	50.41	74.00	-23.59	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11a mode / 5180 ~ 5240MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
4262.000	49.66	2.22	51.88	74.00	-22.12	peak	V
N/A							
4031.000	50.43	1.35	51.78	74.00	-22.22	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

For Mode 1

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Low **Test Date:** July 12, 2015
Temperature: 27°C **Tested by:** Jason Lu
Humidity: 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2393.000	52.48	-3.75	48.73	74.00	-25.27	peak	V
N/A							
1938.000	55.67	-5.21	50.46	74.00	-23.54	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Mid
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3863.000	50.95	0.64	51.59	74.00	-22.41	peak	V
N/A							
4227.000	49.55	2.09	51.64	74.00	-22.36	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3891.000	50.80	0.76	51.56	74.00	-22.44	peak	V
N/A							
4031.000	50.05	1.35	51.40	74.00	-22.60	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH Low
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3268.000	51.86	-1.47	50.39	74.00	-23.61	peak	V
N/A							
3317.000	51.62	-1.35	50.27	74.00	-23.73	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3863.000	50.45	0.64	51.09	74.00	-22.91	peak	V
N/A							
3912.000	49.58	0.85	50.43	74.00	-23.57	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

For Mode 2

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Low **Test Date:** July 12, 2015
Temperature: 27°C **Tested by:** Jason Lu
Humidity: 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2400.000	54.34	-3.69	50.65	74.00	-23.35	peak	V
N/A							
3604.000	51.71	-0.46	51.25	74.00	-22.75	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Mid
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3226.000	51.87	-1.57	50.30	74.00	-23.70	peak	V
N/A							
3793.000	50.78	0.34	51.12	74.00	-22.88	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2386.000	52.75	-3.81	48.94	74.00	-25.06	peak	V
N/A							
2400.000	54.52	-3.69	50.83	74.00	-23.17	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH Low
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
4017.000	49.88	1.29	51.17	74.00	-22.83	peak	V
N/A							
3324.000	51.44	-1.33	50.11	74.00	-23.89	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3331.000	51.87	-1.32	50.55	74.00	-23.45	peak	V
N/A							
3352.000	51.58	-1.27	50.31	74.00	-23.69	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

For Mode 3

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Low **Test Date:** July 12, 2015
Temperature: 27°C **Tested by:** Jason Lu
Humidity: 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3191.000	51.94	-1.65	50.29	74.00	-23.71	peak	V
N/A							
3205.000	51.73	-1.62	50.11	74.00	-23.89	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH Mid
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3275.000	52.73	-1.45	51.28	74.00	-22.72	peak	V
N/A							
3275.000	51.98	-1.45	50.53	74.00	-23.47	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 20 MHz Channel mode / 5180 ~ 5240MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3191.000	52.60	-1.65	50.95	74.00	-23.05	peak	V
N/A							
3275.000	52.20	-1.45	50.75	74.00	-23.25	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH Low
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3387.000	51.50	-1.18	50.32	74.00	-23.68	peak	V
N/A							
3261.000	51.84	-1.48	50.36	74.00	-23.64	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Operation Mode: Tx / IEEE 802.11n HT 40 MHz Channel mode / 5190 ~ 5230MHz / CH High
Temperature: 27°C
Humidity: 53% RH

Test Date: July 12, 2015
Tested by: Jason Lu
Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3310.000	51.38	-1.37	50.01	74.00	-23.99	peak	V
N/A							
3359.000	51.77	-1.25	50.52	74.00	-23.48	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

7.6 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

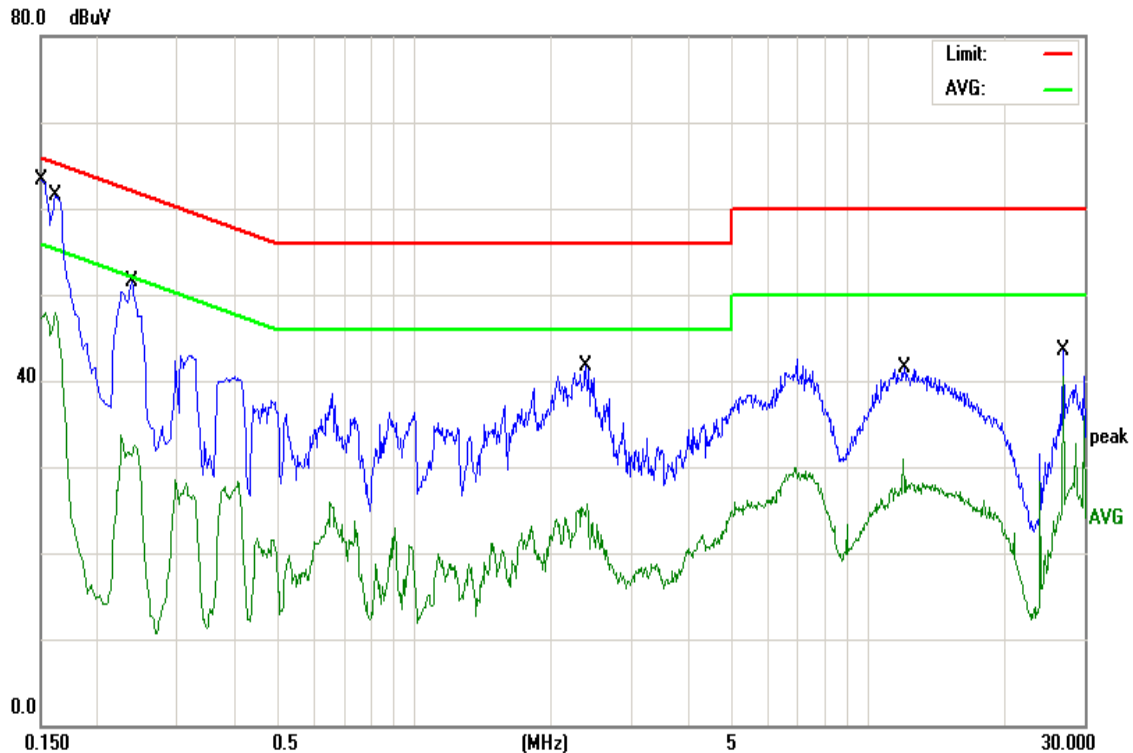
1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Operation Mode: Normal Link **Test Date:** July 14, 2015
Temperature: 24°C **Tested by:** Frank Liao
Humidity: 60% RH **Line** L1



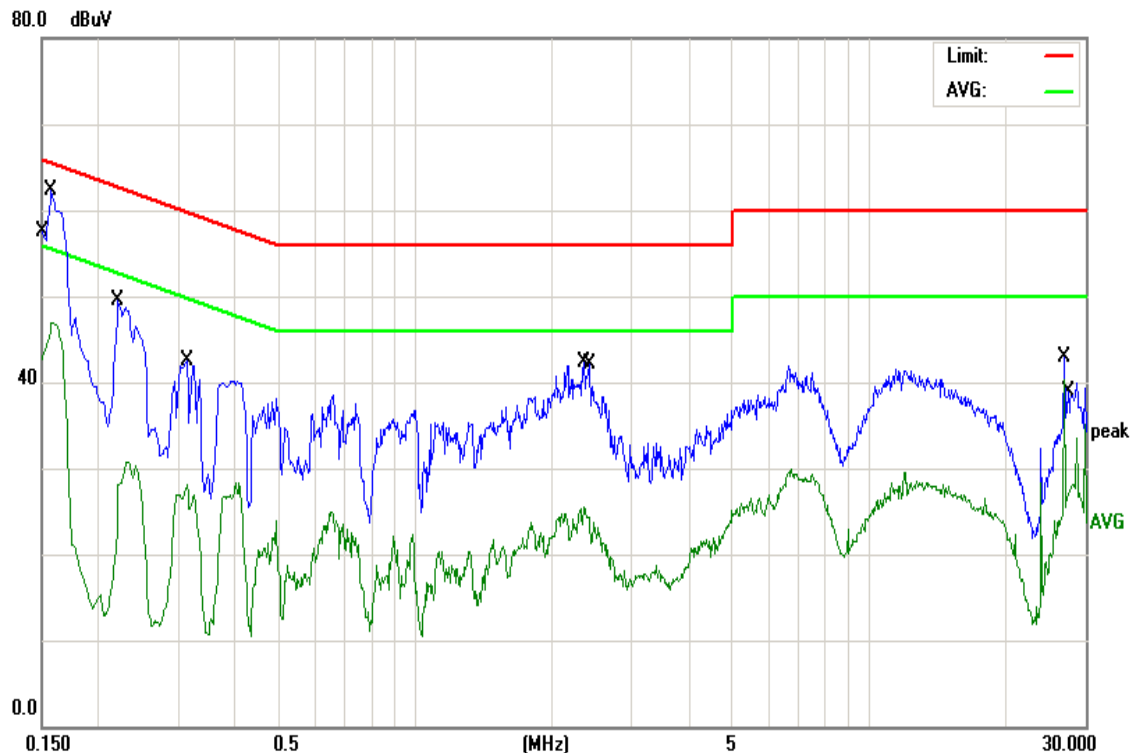
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	47.87	10.26	58.13	65.99	-7.86	QP
2	0.1500	36.96	10.26	47.22	55.99	-8.77	AVG
3	0.1620	36.29	10.23	46.52	65.36	-18.84	QP
4	0.1620	14.62	10.23	24.85	55.36	-30.51	AVG
5	0.2380	21.76	10.12	31.88	62.16	-30.28	QP
6	0.2380	3.11	10.12	13.23	52.16	-38.93	AVG
7	2.3900	27.55	10.03	37.58	56.00	-18.42	QP
8	2.3900	15.24	10.03	25.27	46.00	-20.73	AVG
9	12.0580	20.21	10.21	30.42	60.00	-29.58	QP
10	12.0580	16.97	10.21	27.18	50.00	-22.82	AVG
11	26.9340	30.21	10.56	40.77	60.00	-19.23	QP
12	26.9340	15.48	10.56	26.04	50.00	-23.96	AVG

Remark:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz.
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

Operation Mode: Normal Link
Temperature: 24°C
Humidity: 60% RH

Test Date: July 14, 2015
Tested by: Frank Liao
Line L2



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	47.44	10.09	57.53	65.99	-8.46	QP
2	0.1500	32.59	10.09	42.68	55.99	-13.31	AVG
3	0.1580	42.18	10.07	52.25	65.56	-13.31	QP
4	0.1580	36.76	10.07	46.83	55.56	-8.73	AVG
5	0.2220	30.56	10.00	40.56	62.74	-22.18	QP
6	0.2220	18.11	10.00	28.11	52.74	-24.63	AVG
7	0.3140	32.60	9.94	42.54	59.86	-17.32	QP
8	0.3140	18.11	9.94	28.05	49.86	-21.81	AVG
9	2.3580	32.36	9.94	42.30	56.00	-13.70	QP
10	2.3900	14.33	9.94	24.27	46.00	-21.73	AVG
11	26.9340	32.42	10.50	42.92	60.00	-17.08	QP
12	27.3780	15.96	10.50	26.46	50.00	-23.54	AVG

Remark:

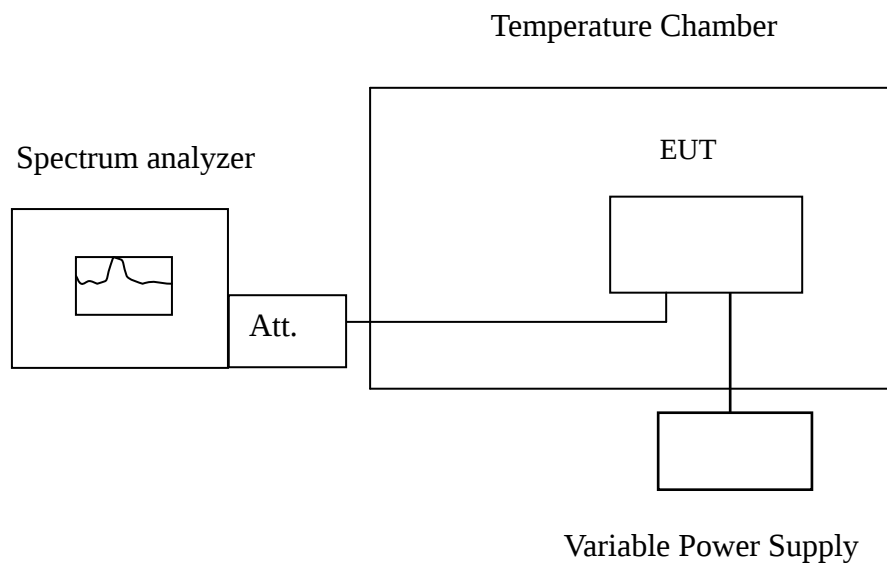
1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz.
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

7.7 FREQUENCY STABILITY

LIMIT

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Test Configuration



Remark: Measurement setup for testing on Antenna connector

TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST RESULTS

No non-compliance noted.

IEEE 802.11a mode / 5180 ~ 5240 MHz:

CH Low

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5180.008069	5150~5250	Pass
40	120	5179.979388	5150~5250	Pass
30	120	5179.999456	5150~5250	Pass
20	120	5180.018443	5150~5250	Pass
10	120	5180.010820	5150~5250	Pass
0	120	5180.002534	5150~5250	Pass
-10	120	5180.018997	5150~5250	Pass
-20	120	5179.971479	5150~5250	Pass

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	108	5180.009737	5150~5250	Pass
	120	5179.975147	5150~5250	Pass
	132	5179.985548	5150~5250	Pass

CH High

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5240.017597	5150~5250	Pass
40	120	5239.989365	5150~5250	Pass
30	120	5240.005376	5150~5250	Pass
20	120	5239.975195	5150~5250	Pass
10	120	5240.008279	5150~5250	Pass
0	120	5239.985528	5150~5250	Pass
-10	120	5240.002413	5150~5250	Pass
-20	120	5239.981400	5150~5250	Pass

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	108	5239.997143	5150~5250	Pass
	120	5239.983163	5150~5250	Pass
	132	5240.015898	5150~5250	Pass

IEEE 802.11n HT 20 MHz / 5180 ~ 5240 MHz:

CH Low

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5179.999227	5150~5250	Pass
40	120	5180.008547	5150~5250	Pass
30	120	5179.996451	5150~5250	Pass
20	120	5180.018148	5150~5250	Pass
10	120	5180.015381	5150~5250	Pass
0	120	5179.992953	5150~5250	Pass
-10	120	5179.981694	5150~5250	Pass
-20	120	5179.979523	5150~5250	Pass

Operating Frequency: 5180 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	108	5180.005194	5150~5250	Pass
	120	5179.987306	5150~5250	Pass
	132	5179.99221	5150~5250	Pass

CH High

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5239.999173	5150~5250	Pass
40	120	5239.975561	5150~5250	Pass
30	120	5240.006332	5150~5250	Pass
20	120	5240.011244	5150~5250	Pass
10	120	5240.016157	5150~5250	Pass
0	120	5240.010347	5150~5250	Pass
-10	120	5239.976576	5150~5250	Pass
-20	120	5239.985276	5150~5250	Pass

Operating Frequency: 5240 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	108	5239.975275	5150~5250	Pass
	120	5239.978235	5150~5250	Pass
	132	5240.010857	5150~5250	Pass

IEEE 802.11n HT 40 MHz / 5190 ~ 5230 MHz:

CH Low

Operating Frequency: 5190 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5189.976894	5150~5250	Pass
40	120	5189.976695	5150~5250	Pass
30	120	5190.000180	5150~5250	Pass
20	120	5190.005424	5150~5250	Pass
10	120	5189.989693	5150~5250	Pass
0	120	5190.004222	5150~5250	Pass
-10	120	5190.020994	5150~5250	Pass
-20	120	5189.975604	5150~5250	Pass

Operating Frequency: 5190 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	108	5190.008673	5150~5250	Pass
	120	5189.986866	5150~5250	Pass
	132	5189.986508	5150~5250	Pass

CH High

Operating Frequency: 5230 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5229.971337	5150~5250	Pass
40	120	5229.987898	5150~5250	Pass
30	120	5229.988175	5150~5250	Pass
20	120	5229.995861	5150~5250	Pass
10	120	5230.014015	5150~5250	Pass
0	120	5229.971852	5150~5250	Pass
-10	120	5230.005806	5150~5250	Pass
-20	120	5229.998456	5150~5250	Pass

Operating Frequency: 5230 MHz				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
20	108	5229.991501	5150~5250	Pass
	120	5230.011001	5150~5250	Pass
	132	5229.998871	5150~5250	Pass