FCC 47 CFR PART 15 SUBPART C & INDUSTRY CANADA RSS-210

TEST REPORT

For

Dual-Band Wireless VPN Router with GbE Switch

Model: RV220W

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,
Taipei Hsien 248, Taiwan (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com

Testing Laboratory
1309

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Applicant:	SerComm Corporation 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.
Manufacturer:	SerComm Corporation 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.
Equipment Under Test:	Dual-Band Wireless VPN Router with GbE Switch
Trade Name:	CISCO
Model:	RV220W
Date of Test:	January 23 ~ April 12, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C & INDUSTRY CANADA RSS-210	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 and Industry Canada RSS-210.

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

Approved by:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Gina Lo
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Dual-Band Wireless VPN Router with GbE Switch
Trade Name	CISCO
Model Number	RV220W
Model Discrepancy	N/A
Power Adapter	1. Trade Name / Model Number: LEADER / MU12-G120100-A1 I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1.0A 2. Trade Name / Model Number: Sunny / SYS1381-1212-W2 I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1.0A 3. Trade Name / Model Number: LEADER / IU18-2120100-WP I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1.0A 4. Trade Name / Model Number: LEADER / MU12-G120100-A2 I/P: 100-240V, 50-60Hz, 0.5A O/P: 12V, 1.0A
Frequency Range	IEEE 802.11a: 5.745~5.825 GHz IEEE 802.11b/g mode: 2.412~2.462 GHz
Transmit Power	IEEE 802.11a: 23.92 dBm draft 802.11n Standard-20 MHz Channel mode: 24.52 dBm draft 802.11n Wide-40 MHz Channel mode: 23.82 dBm IEEE 802.11b: 19.26 dBm IEEE 802.11g: 20.74 dBm draft 802.11n Standard-20 MHz Channel mode: 20.65 dBm draft 802.11n Wide-40 MHz Channel mode: 18.79 dBm
Modulation Technique & Transmit Data Rate	IEEE 802.11a: OFDM (QPSK, BPSK, 16-QAM, 64-QAM) (54, 48, 36, 24, 18, 12, 9, 6 Mbps) draft 802.11n Standard-20 MHz Channel 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) draft 802.11n Wide-40 MHz Channel 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) IEEE 802.11b mode: DSSS (1, 2, 5.5 and 11 Mpbs) IEEE 802.11g mode: OFDM (6, 9, 12, 18, 24, 36, 48 and 54 Mpbs) draft 802.11n Standard-20 MHz Channel 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) draft 802.11n Wide-40 MHz Channel 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)
Number of Channels	IEEE 802.11a mode: 5 Channels draft 802.11n Standard-20 MHz Channel mode : 5 Channels draft 802.11n Wide-40 MHz Channel mode: 3 Channels IEEE 802.11b/g mode: 11 Channels draft 802.11n Standard-20 MHz Channel mode: 11 Channels draft 802.11n Wide-40 MHz Channel mode: 7 Channels
Antenna Specification	1. Dipole Antenna / 2 dBi MIMO: 2dBi + 10 log (2) = 5 dBi (Numeric gain: 3.16) 2. PIFA Antenna / 6.6 dBi (RX only)

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **P27RV220W** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

The tests documented in this report were performed in accordance with IC RSS-210, IC RSS-Gen, IC RSS-102, IC RSS-212, and ANSI C63.4.

This submittal(s) (test report) is intended for IC Certification with Industry Canada RSS-210.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

The tests documented in this report were performed in accordance with IC RSS-210, IC RSS-Gen, IC RSS-102, and ANSI C63.4.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

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: RV220W) comes with four power adaptors for sale. After the preliminary test, the EUT with the Model: MU12-G120100-A2 was found to emit the worst emissions and therefore had been tested under operating condition.

The EUT is a 2x3 configuration spatial MIMO (2Tx & 3Rx) without beam forming function that operate in double TX chains and triple RX chains. The 2x3 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

Software used to control the EUT for staying in continuous transmitting 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 and receiving radiated spurious emission above 1GHz, which worst case was in CH Mid mode only.

IEEE 802.11a mode:
Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) with 6Mbps data rate were chosen for full testing.

draft 802.11n Standard-20 MHz Channel mode:
Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) with 6.5Mbps data rate were chosen for full testing.

draft 802.11n Wide-40 MHz Channel mode:
Channel Low(5755MHz) and Channel High(5795MHz) with 13.5Mbps data rate were chosen for full testing.

IEEE 802.11b:
Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate and were chosen for full testing.

IEEE 802.11g:
Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate and were chosen for full testing.

draft 802.11n Standard-20 MHz Channel mode:
Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

draft 802.11n Wide-40 MHz Channel mode:
Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.

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	MY43360131	03/03/2011

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	09/09/2010
Test Receiver	Rohde&Schwarz	ESCI	100064	11/28/2010
Switch Controller	TRC	Switch Controller	SC94050010	05/02/2010
4 Port Switch	TRC	4 Port Switch	SC94050020	05/02/2010
Loop Antenna	EMCO	6502	8905/2356	05/28/2010
Horn-Antenna	TRC	HA-0502	06	06/03/2010
Horn-Antenna	TRC	HA-0801	04	06/18/2010
Horn-Antenna	TRC	HA-1201A	01	08/10/2010
Horn-Antenna	TRC	HA-1301A	01	08/10/2010
Bilog- Antenna	Sunol Sciences	JB3	A030205	03/26/2011
Loop Antenna	EMCO	6502	8905/2356	05/28/2010
Turn Table	Max-Full	MFT-120S	T120S940302	N.C.R.
Antenna Tower	Max-Full	MFA-430	A440940302	N.C.R.
Controller	Max-Full	MF-CM886	CC-C-1F-13	N.C.R.
Site NSA	CCS	N/A	FCC MRA: TW1039 IC: 2324G-1/-2	10/17/2010 11/04/2010
Test S/W	LABVIEW (V 6.1)			

Powerline Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESHS20	840455/006	02/28/2011
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	12/16/2010
LISN	SCHWARZBECK	NSLK 8127	8127526	12/16/2010
BNC CABLE	MIYAZAKI	5D-FB	BNC A5	02/01/2011
THERMO-HYGRO METER	TECPEL	DTM-303	NO.3	11/23/2010
Test S/W	EZ-EMC (CCS-3A1RE)			

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	± 1.0717
3M Semi Anechoic Chamber / 30M~200M	+/-3.9944
3M Semi Anechoic Chamber / 200M~1000M	+/-3.9285
3M Semi Anechoic Chamber / 1G~8G	+/-2.4734
3M Semi Anechoic Chamber / 8G~18G	+/-2.4878
3M Semi Anechoic Chamber / 18G~26G	+/-2.6215
3M Semi Anechoic Chamber / 26G~40G	+/-2.8603

***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. (Hsintien Lab.) The test equipments were listed in page 8 and the test data, please refer page 189-190.*

☒ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

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

☐ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan

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

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 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, and/or ridged waveguide, horn. 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.”

5.3LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 0824-01 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324G-1 for 3M Semi Anechoic Chamber A, 2324G-2 for 3M Semi Anechoic Chamber B.

5.4 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-210, 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	TAF Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	Canada IC 2324G-1 IC 2324G-2

** 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 II for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

Wugu Lab:

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	Notebook PC	IBM	2672 (X31)	99PBTKB	FCC DoC	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Hsintien Lab:

No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Trade Name	Data Cable	Power Cord
1-3	LAN Cable	N/A	N/A	N/A	N/A	Unshielded, 2.5m	N/A
4	USB Mouse	MOC5UO	H1606PRO	DOC BSMI: R41108	Dell	Shielded, 1.8m	N/A
5	USB Keyboard	SK-8115	N/A	DOC BSMI: T3A002	Dell	Shielded, 1.8m with a core	N/A
6	Printer	C20SX	N/A	BSMI ID: 3902E004	EPSON	Unshielded, 2.0m	Unshielded, 1.8m
7	Monitor	710V	GS17H9NXA05853A	DOC BSMI: R33475	SAMSUNG	Shielded, 1.8m with two cores	Unshielded, 1.8m
8	Host PC	DCSM	HBQHY1S	BSMI: R33002	DELL	Unshielded, 0.3m	Unshielded, 1.8m
9	Modem	5JEG4033MKO	N/A	5RJTAI-35500-M5-E	TOP-SOLUTION	Unshielded, 1.8m	Unshielded, 1.8m
10	Server Notebook	2210B	CNV7472KG5	DOC BSMI: R33001	HP	Unshielded, 10m	Unshielded, 1.8m

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. APPLICABLE RULES FOR INDUSTRY CANADA RSS-210

RSS-210 §2 General Certification Requirements and Specifications

RSS-210 §2.1 Frequency Stability

When the carrier frequency stability is not specified, it need not be tested, provided that the carrier frequency is chosen such that the fundamental modulation products (meaning the nominal bandwidth) lie totally within the bands listed in Tables 2, 3, 4 and 5 and do not fall into any restricted band listed in Table 1. Due account shall be taken of carrier frequency drift as a result of aging, temperature, humidity, and supply voltage variations when using frequencies near the band edges.

RSS-210 §2.2 Restricted Bands and Unwanted Emission Frequencies

Restricted bands, identified in Table 1, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy, and some government uses. Except where otherwise indicated, the following restrictions apply:
(a) Fundamental components of modulation of LPDs shall not fall within the restricted bands of Table 1.
(b) Unwanted emissions falling into restricted bands of Table 1 shall meet Tables 2 and 3 limits. It should also be noted that unwanted emissions falling in non-restricted bands do not need to be suppressed to a level lower than the Table 2 and 3 limits.
(c) Unwanted emissions not falling within restricted frequency bands may also use the limits specified in the applicable annex.

RSS-210 §2.3 Licence-exempt Receivers

Category I licence-exempt receivers are required to have their spurious emissions comply with Section 7.2.3 of RSS-Gen.

RSS-210 §2.6 General Field Strength Limits

Table 2 and 3 list the permissible levels of unwanted emissions of transmitters and receivers. However, transmitters with field strengths that do not exceed the limits in these tables may also operate in these frequency bands, other than the restricted bands of Table 1 and the TV bands (i.e. unwanted emissions of transmitters and receivers are permitted to fall into Table 1 and TV frequencies but intentional emissions are prohibited). See the note of Table 2 for further details.

RSS-210 §2.7 Tables

RSS-210 Table 1: Restricted Frequency Bands (Note)

MHz	MHz	MHz	MHz	GHz
0.090-0.110	8.37625-8.38675	--	1718.8-1722.2	9.0-9.2
--	8.41425-8.41475	156.52475-156.52525	2200-2300	9.3-9.5
2.1735-2.1905	12.29-12.293	156.7-156.9	2310-2390	10.6-12.7
3.020-3.026	12.51975-12.52025	--	--	13.25-13.4
4.125-4.128	12.57675-12.57725	--	2655-2900	14.47-14.5
4.17725-4.17775	13.36-13.41	240-285	3260-3267	15.35-16.2
4.20725-4.20775	16.42-16.423	322-335.4	3332-3339	17.7-21.4
5.677-5.683	16.69475-16.69525	399.9-410	3345.8-3358	22.01-23.12
6.215-6.218	16.80425-16.80475	608-614	3500-4400	23.6-24.0
6.26775-6.26825	25.5-25.67	960-1427	4500-5150	31.2-31.8
6.31175-6.31225	37.5-38.25	1435-1626.5	5350-5460	36.43-36.5
8.291-8.294	73-74.6; 74.8-75.2	1645.5-1646.5	7250-7750	Above 38.6
8.362-8.366	108-138	1660-1710	8025-8500	

Note: *Certain frequency bands listed in Table 2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard as well as RSS-310.*

RSS-210 Table 2: General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz (Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: *Transmitting devices are not permitted in Table 1 bands or in TV bands (54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz, and 614-806 MHz). Prohibition of operation in TV bands does not apply to momentary devices, or to medical telemetry devices in the band 174-216 MHz, and to perimeter protection systems in the bands 54-72 and 76-88 MHz. The perimeter protection devices are to meet Table 3 field strengths limits.*

RSS-210 Table 3: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency (fundamental or spurious)	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in Hz)	300
490-1.705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Note: *The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average detector.*

RSS-210 §Annex 8: Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands

This section applies to systems that employ frequency hopping (FH) and digital modulation technology in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. Systems in these bands may employ frequency hopping, digital modulation and or a combination (hybrid) of both techniques.
A frequency hopping system that synchronizes with another or several other systems (to avoid frequency collision among them) via off-air sensing or via connecting cables is not hopping randomly and therefore is not in compliance with RSS-210.

RSS-210 §A8.1 Frequency Hopping Systems

Frequency hopping systems are spread spectrum systems in which the carrier is modulated with coded information in a conventional manner causing a conventional spreading of the RF energy about the carrier frequency. The frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence.
Frequency hopping systems are not required to employ all available hopping frequencies during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream.
Incorporation of intelligence into a frequency hopping system that enables it to recognize other users of the band and to avoid occupied frequencies is permitted, provided that the frequency hopping system does it individually, and independently chooses or adapts its hopset. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.
The following applies to frequency hopping systems in each of the three bands.
(a) The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long term distribution appears evenly distributed.

(b) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
(d) Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

RSS-210 §A8.2 Digital Modulation Systems

These include systems employing digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to all three bands.

RSS-210 §A8.4 Transmitter Output Power and e.i.r.p. Requirements

(4) For systems employing digital modulation techniques operating in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands, the maximum peak conducted power shall not exceed 1 W. Except as provided in Section A8.4(5), the e.i.r.p. shall not exceed 4 W.
As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power (see RSS-Gen)
(5) Point-to-point systems in the bands 2400-2483.5 MHz and 5725-5850 MHz are permitted to have an e.i.r.p. higher than 4 W, provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omni-directional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p. However, remote stations of point-to-multipoint systems shall be allowed to operate at greater than 4 W e.i.r.p, under the same conditions as for point-to- point systems.
Note: “Fixed, point-to-point operation”, excludes point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information.

RSS-210 §A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

RSS-210 §Annex 9: Local Area Network Devices

This annex provides standards for licence-exempt local area network (LE-LAN) devices operating in the 5150-5350 MHz and 5470-5825 MHz bands.
Devices operating in the 5250-5350 MHz which do not comply with the provisions in this annex but only with the requirements in RSS-210, Issue 5 will be allowed to be certified until May 1, 2008. After that date, devices operating in this band shall be certified only if they comply with the provisions in this annex.
Within the band 5150-5250 MHz, LE-LAN devices are restricted to indoor operation only.

RSS-210 §A9.2 Transmitter power and e.i.r.p. Limits

(1) For the band 5150-5250 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) shall not exceed 200 mW or 10 + 10 Log_{10} B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.
(2) For the band 5250-5350 MHz and 5470-5725 MHz, the maximum conducted output power shall not exceed 250 mW or 11 + 10 Log_{10} B, dBm, whichever power is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 Log_{10} B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
In addition, devices with maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.
In addition to the above requirements, devices operating in the 5250-5350 MHz band with maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. elevation mask where θ is the angle above the local horizontal plane (of the earth) as shown below:

- -13 dB(W/MHz) for $0^\circ \leqq \theta < 8^\circ$
- -13 – 0.716 (θ-8) dB(W/MHz) for $8^\circ \leqq \theta < 40^\circ$
- -35.9 – 1.22 (θ-40) dB(W/MHz) for $40^\circ \leqq \theta \leqq 45^\circ$
- -42 dB(W/MHz) for $\theta > 45^\circ$

(3) For the band 5725-5825 MHz, the maximum conducted output power shall not exceed 1.0 W or 17 + 10 Log_{10} B, dBm, whichever power is less. The power spectral density shall not exceed 17 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 4.0 W or 23 + 10 Log_{10} B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
Fixed point-to-point devices for this band are permitted up to 200 W e.i.r.p. by employing higher gain antennas, but not higher transmitter output powers. Point-to-multipoint systems, omni-directional applications and multiple co-located transmitters transmitting the same information are prohibited under this high e.i.r.p. category. However, remote stations of point-to-multipoint systems shall be permitted to operate at the point-to-point e.i.r.p. limit provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers.

RSS-210 §A9.3 Out-of-band Emissions Limits

(1) For transmitters operating in the 5150-5250 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p.
(2) For transmitters operating in the 5250-5350 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band shall not exceed an out-of-band emission limit of -27 dBm/MHz e.i.r.p. in the 5150-5250 MHz band in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within 5150-5250 MHz band and shall be labelled “for indoor use only”.
(3) For transmitters operating in the 5470-5725 MHz, all emissions outside the 5470-5725 MHz band shall not exceed -27 dBm/MHz e.i.r.p.
(4) For transmitters operating in the 5725-5825 MHz, all emissions within the frequency range from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p. For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed -27 dBm/MHz.

RSS-210 §A9.5 Other Requirements for All Bands

(a) Digital modulation shall be used. The power measurements (transmitter output power and e.i.r.p., or unwanted emissions) are in terms of average value (i.e. using an averaging meter). If the transmission is in bursts, Section 4.3 (Pulsed Operation) of RSS-Gen applies.
(b) Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average (10 Log_{10} B) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.
A measurement resolution bandwidth narrower than 1.0 MHz is permitted provided that power integration over 1.0 MHz is performed. On the other hand, if the emission bandwidth of the signal is less than 1.0 MHz, the measurement bandwidth should be reduced to that of the emission bandwidth to obtain the proper power spectral density; alternatively, the measured value could be normalized to 1.0 MHz. (**Note:** B has been defined above as the 99% emission bandwidth).
(c) The outermost carrier frequencies or channels, as permitted by the design of the equipment, shall be used when measuring unwanted emissions. Such carrier or channel centre frequencies are to be indicated in the test report.
(d) The device shall automatically discontinue transmission in case of absence of information to transmit, or operational failure. A description on how this is done shall accompany the application for equipment certification. Note that this is not intended to prohibit transmission of control or signalling information or the use of repetitive codes where required by the technology.

(e) The transmitter frequency stability shall be better than ±10 ppm. Alternatively, the applicant can show that the unwanted emission masks of the outermost channels are complied with when tested under all conditions of normal operation as specified in the user manual.
(f) Mobile Satellite Service operators may monitor emissions from LE-LAN devices in the 5150-5250 MHz band and, if emissions approach the 10 W/MHz aggregate ground level emission, may request that Industry Canada reassess the technical parameters of LE-LAN devices. The aggregation may be from all devices within the footprint of the MSS satellite antenna beam and not just from Canadian devices.
(g) User Manual
The user manual of local area network devices shall contain clear instructions on the restrictions mentioned above, namely:

· that the device for the band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems;

· the maximum antenna gain permitted (for devices in the 5250-5350 MHz and 5470-5725 MHz bands) to comply with the e.i.r.p. limit; and

· the maximum antenna gain permitted (for devices in the 5725-5825 MHz band) to comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate, as stated in section A9.2(3).

In addition, users should also be cautioned to take note that high power radars are allocated as primary users (meaning they have priority) of 5250-5350 MHz and 5650-5850 MHz and these radars could cause interference and/or damage to LE-LAN devices.

RSS-Gen §2 General Information

Unless otherwise indicated, radiocommunications equipment is subject to licensing pursuant to subsection 4(1) of the *Radiocommunication Act.*

RSS-Gen §2.1.2 Category II Equipment

Category II equipment comprises radio devices where a standard has been prescribed but for which a TAC is not required, that is, equipment certification by Industry Canada or a Certification Body (CB) is not required (certification exempt), pursuant to subsection 4(3) of the *Radiocommunication Act*. The manufacturer or importer shall nevertheless ensure that the standards are complied with. A test report shall be available on request and the device shall be properly labelled.

RSS-Gen §2.2 Receivers

Radiocommunication receivers are defined as Category I equipment or Category II equipment by the characteristics outlined below.

RSS-Gen §2.2.1 Category I Equipment Receivers

A receiver is classified as Category I equipment if it meets one of the following conditions:
(a) is a stand-alone receiver that is tunable to any frequency in the band 30-960 MHz;
(b) is a receiver that is associated with Category I transmitters; or
(c) is a scanner receiver.

Except for scanner receivers, which have their own RSSs, Category I receivers shall comply with the limits for receiver spurious emissions set out in Section 6 of this RSS-Gen, and shall be certified under the RSS applicable to the transmitter type with which the receiver is associated or designed to operate (NOT under RSS-Gen).

RSS-Gen §2.2.2 Category II Equipment Receivers

A receiver is classified as Category II equipment if it is not meeting the conditions of Section 2.2.1.

RSS-Gen §2.2.3 Licence-exempt Receivers

Paging receivers, "receive-only" earth stations operating with satellites approved by Industry Canada, and stand-alone receivers which are exempted from licensing, can be classified as either Category I or Category II. These receivers shall comply with the requirements of RSS-210 or RSS-310, respectively.

RSS-Gen §2.3 Licence-exempt Low-power Radiocommunication Devices (LPDs)

Licence-exempt low-power radiocommunication devices are devices which have intentional and unwanted emissions of very low signal levels such that they can co-exist with licensed radio services. LPDs are required to operate on a **"no-interference no-protection"** basis (i.e. they may not cause radio interference and cannot claim protection from interference). The requirements for LPDs are generally described in Section 7.

RSS-Gen §5.5 Exposure of Humans to RF Fields

Before equipment certification is granted, the applicable requirements of RSS-102 shall be met.

RSS-Gen §6 Receiver Spurious Emission Standard

The following receiver spurious emission limits shall be complied with:
(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

RSS-Gen Table 1 - Spurious Emission Limits for Receivers

Frequency (MHz)	Field Strength microvolts/m at 3 metres
30-88	100
88-216	150
216-960	200
Above 960	500

(b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

RSS-Gen §7.1.4 Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.
When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

RSS-Gen §7.2.2 Transmitter and Receiver AC Power Lines Conducted Emission Limits

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

RSS-Gen Table 2 – AC Power Lines Conducted Emission Limits

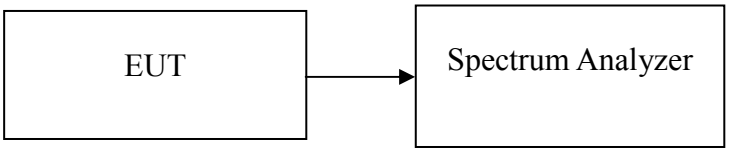
Frequency Range (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

**Decreases with the logarithm of the frequency.*

8. FCC PART 15.247 REQUIREMENTS & RSS-210 REQUIREMENTS

8.199% BANDWIDTH

Test Configuration



TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold.

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	13.2469
Mid	2437	13.5422
High	2462	13.2505

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.5683
Mid	2437	17.4669
High	2462	17.5563

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	18.1797
Mid	2437	18.1516
High	2462	18.1550

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.9969
Mid	2437	17.9813
High	2462	18.0036

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	36.2527
Mid	2437	36.2108
High	2452	36.2222

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	36.2328
Mid	2437	36.2515
High	2452	36.1940

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	23.4640
Mid	5785	26.0705
High	5825	18.9620

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	18.6525
Mid	5785	18.1366
High	5825	18.5510

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	18.3100
Mid	5785	18.0703
High	5825	18.4308

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	36.1803
High	5795	36.2594

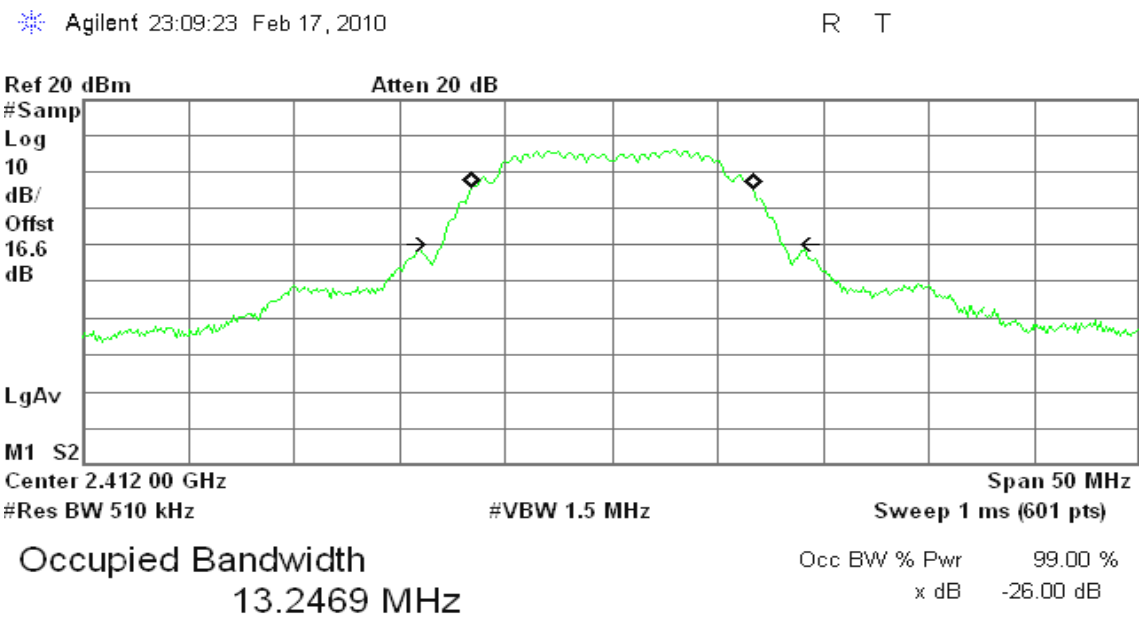
Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	36.1364
High	5795	36.1888

Test Plot

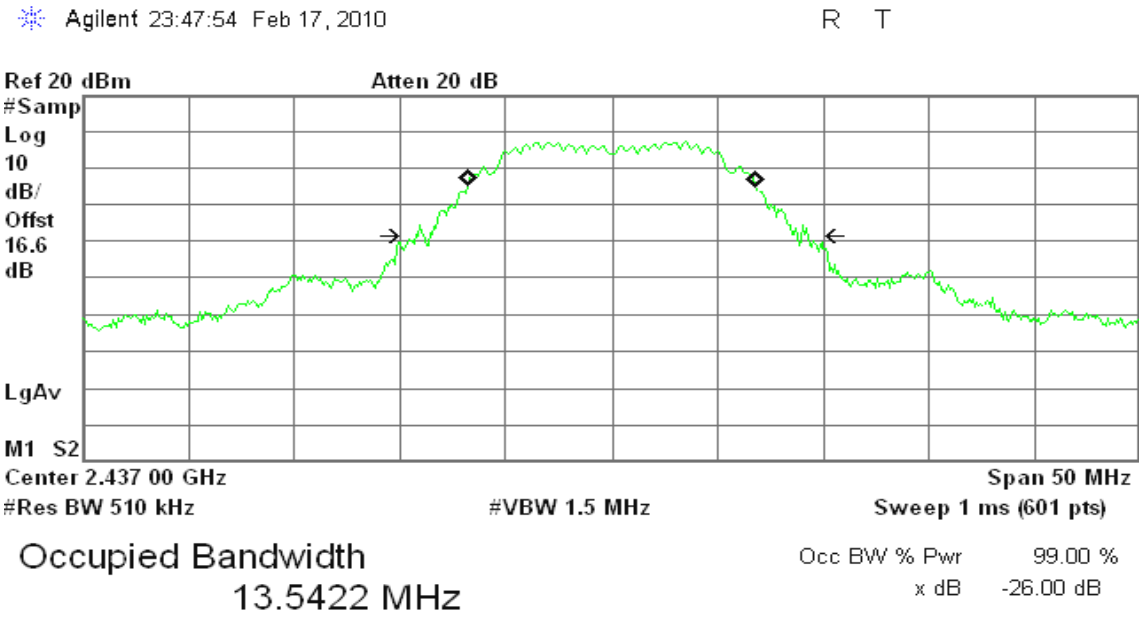
IEEE 802.11b mode

99% Bandwidth (CH Low)



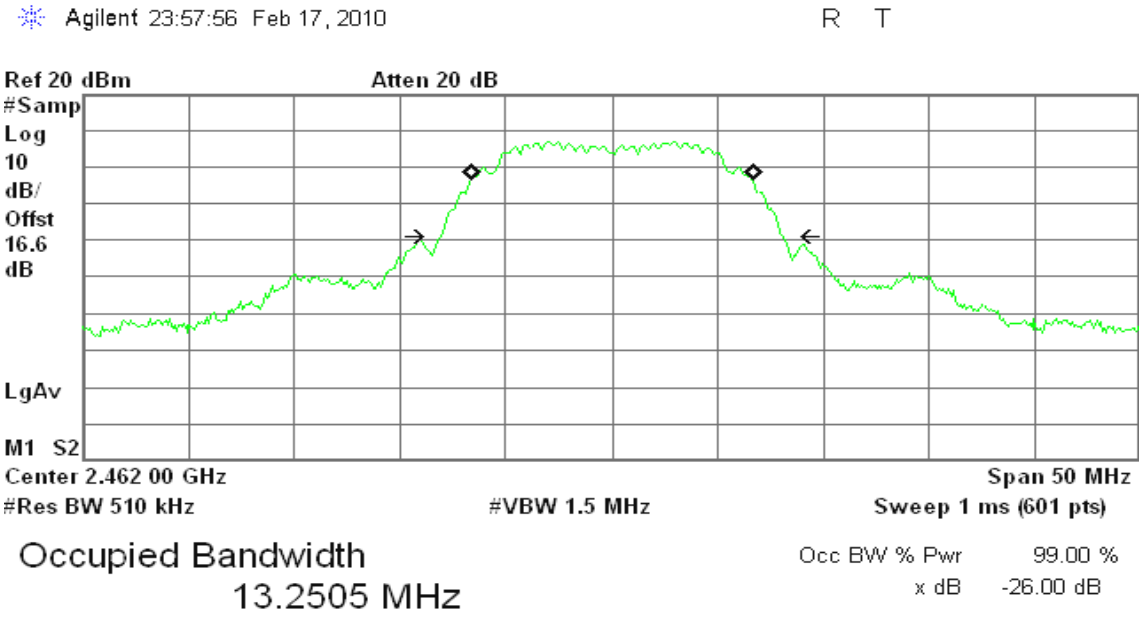
Transmit Freq Error	34.921 kHz
x dB Bandwidth	16.010 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	18.413 kHz
x dB Bandwidth	18.441 MHz*

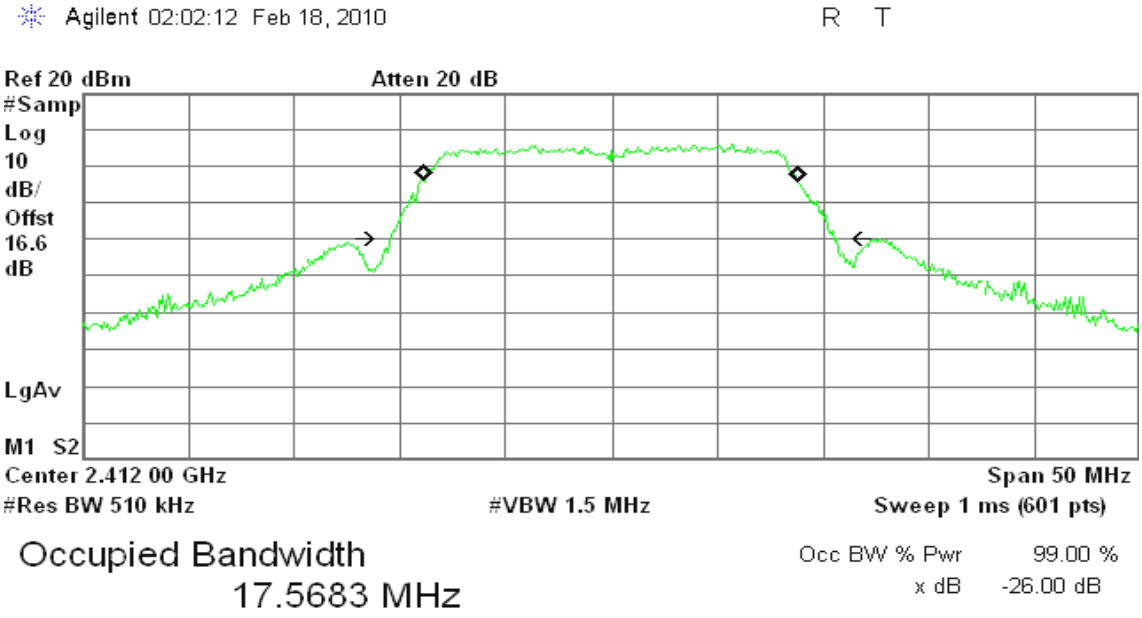
99% Bandwidth (CH High)



Transmit Freq Error	8.875 kHz
x dB Bandwidth	16.064 MHz*

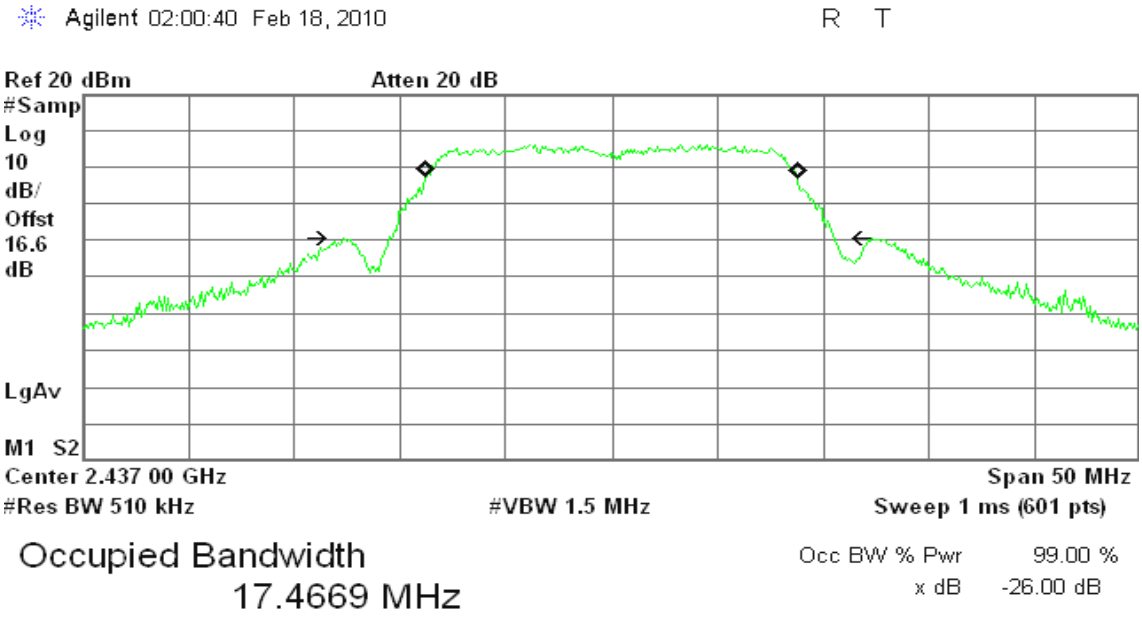
IEEE 802.11g mode

99% Bandwidth (CH Low)



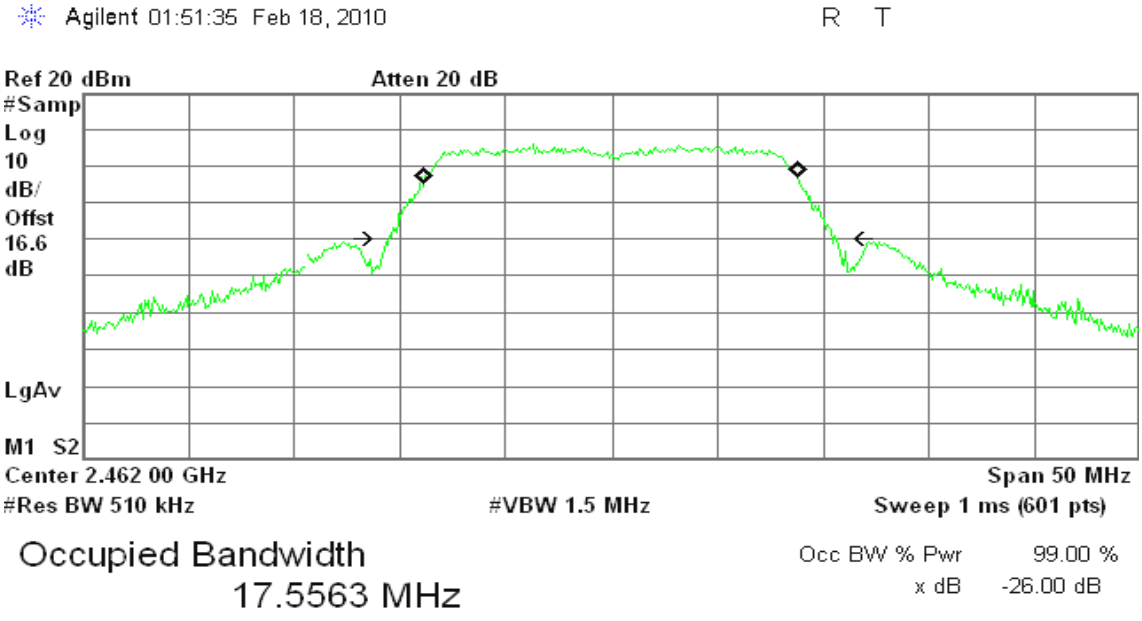
Transmit Freq Error	-17.372 kHz
x dB Bandwidth	21.007 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	2.633 kHz
x dB Bandwidth	23.260 MHz*

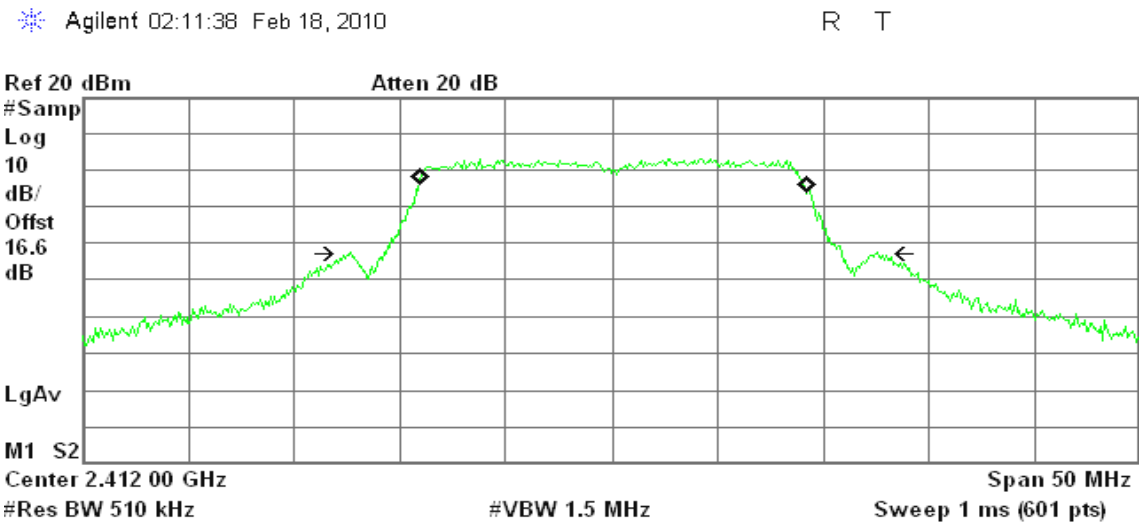
99% Bandwidth (CH High)



Transmit Freq Error	-15.738 kHz
x dB Bandwidth	21.162 MHz*

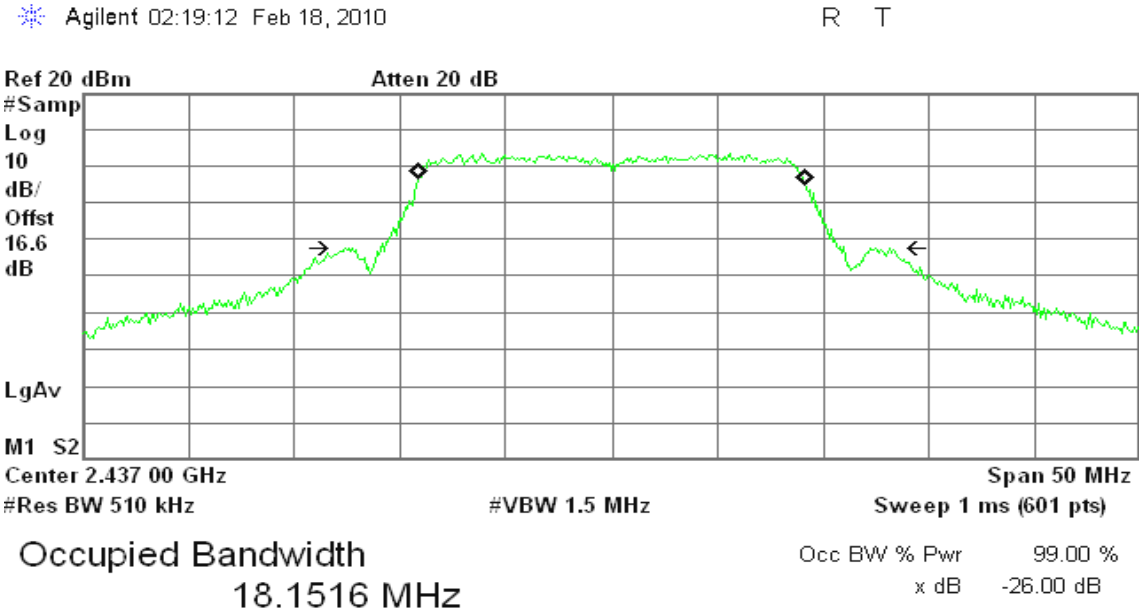
draft 802.11n Standard-20 MHz Channel mode / Chain 0

99% Bandwidth (CH Low)



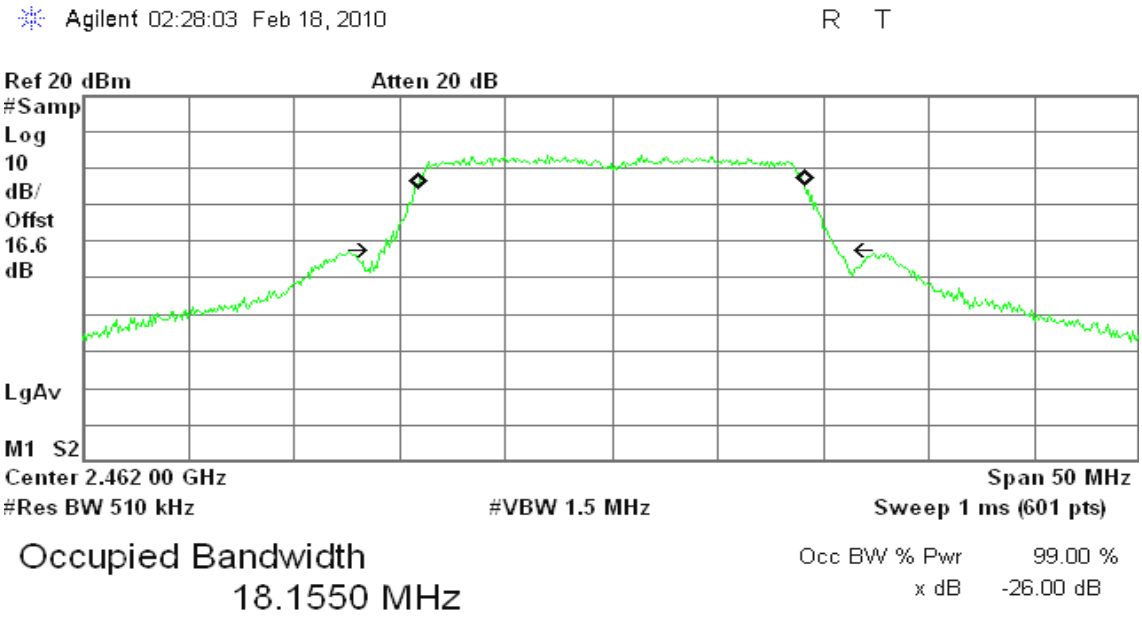
Transmit Freq Error	67.674 kHz
x dB Bandwidth	24.960 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	25.522 kHz
x dB Bandwidth	25.770 MHz*

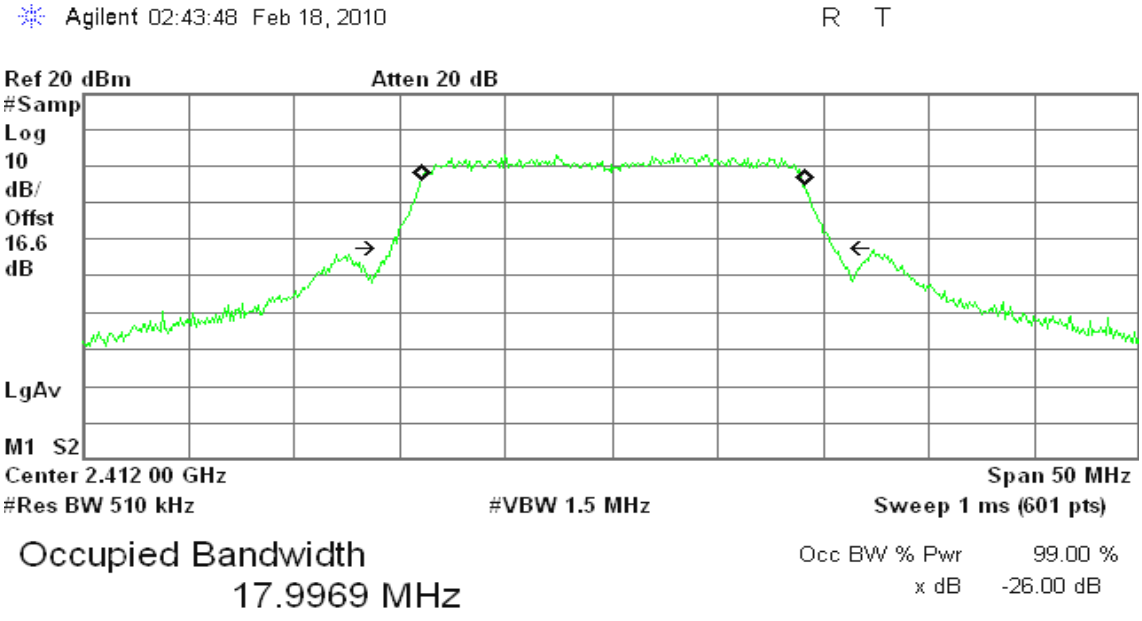
99% Bandwidth (CH High)



Transmit Freq Error	-3.662 kHz
x dB Bandwidth	21.441 MHz*

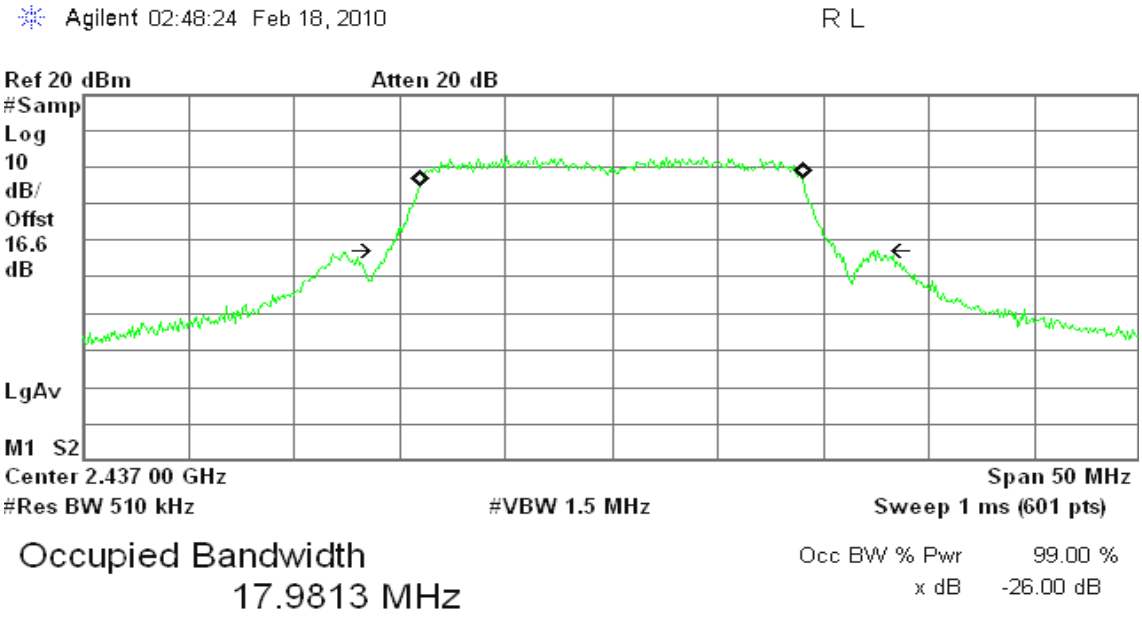
draft 802.11n Standard-20 MHz Channel mode / Chain 1

99% Bandwidth (CH Low)



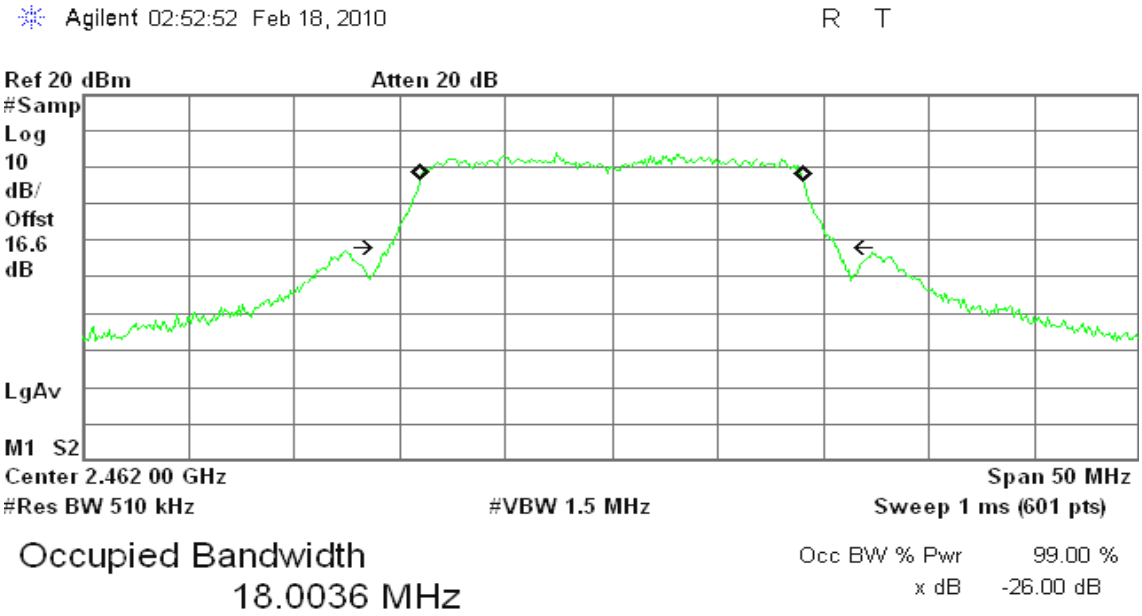
Transmit Freq Error	46.439 kHz
x dB Bandwidth	20.973 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	21.746 kHz
x dB Bandwidth	23.034 MHz*

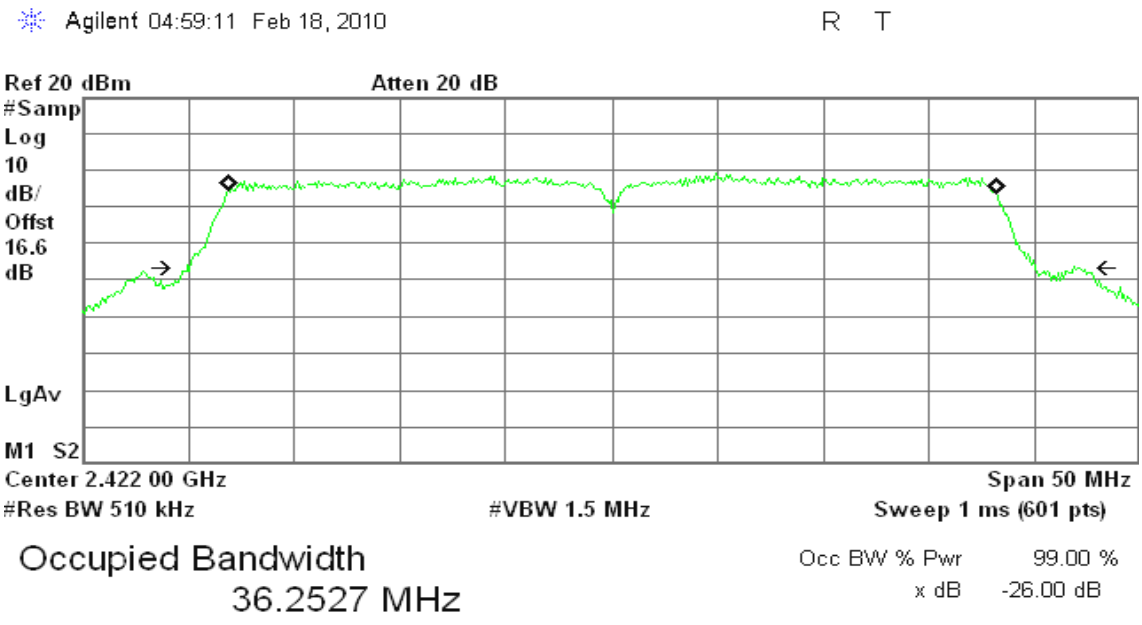
99% Bandwidth (CH High)



Transmit Freq Error	15.497 kHz
x dB Bandwidth	21.232 MHz

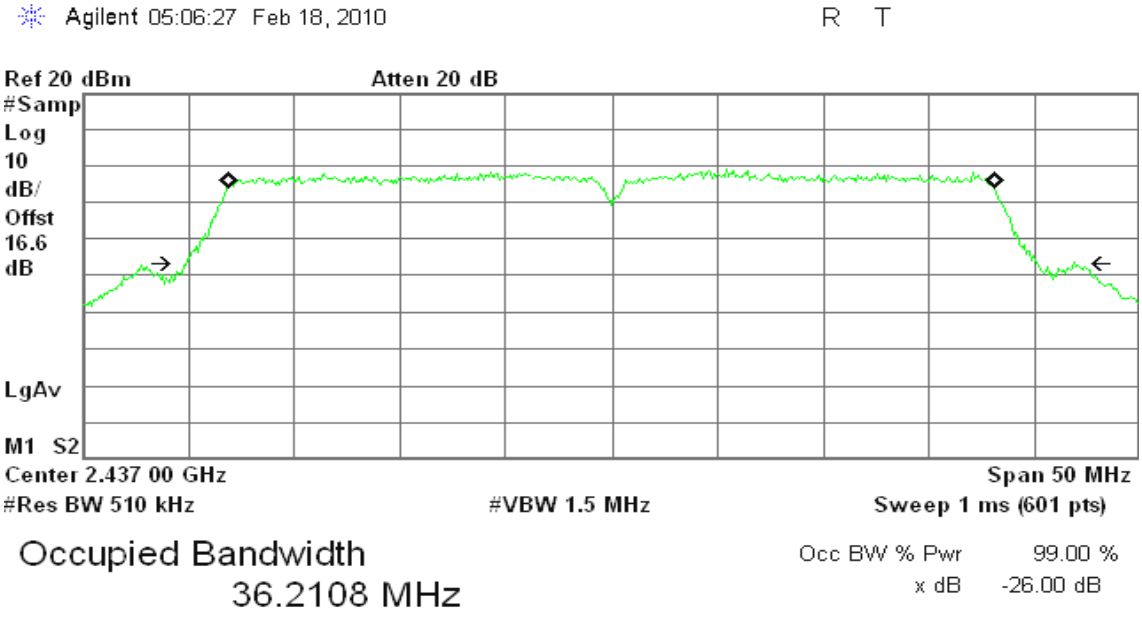
draft 802.11n Wide-40 MHz Channel mode / Chain 0

99% Bandwidth (CH Low)



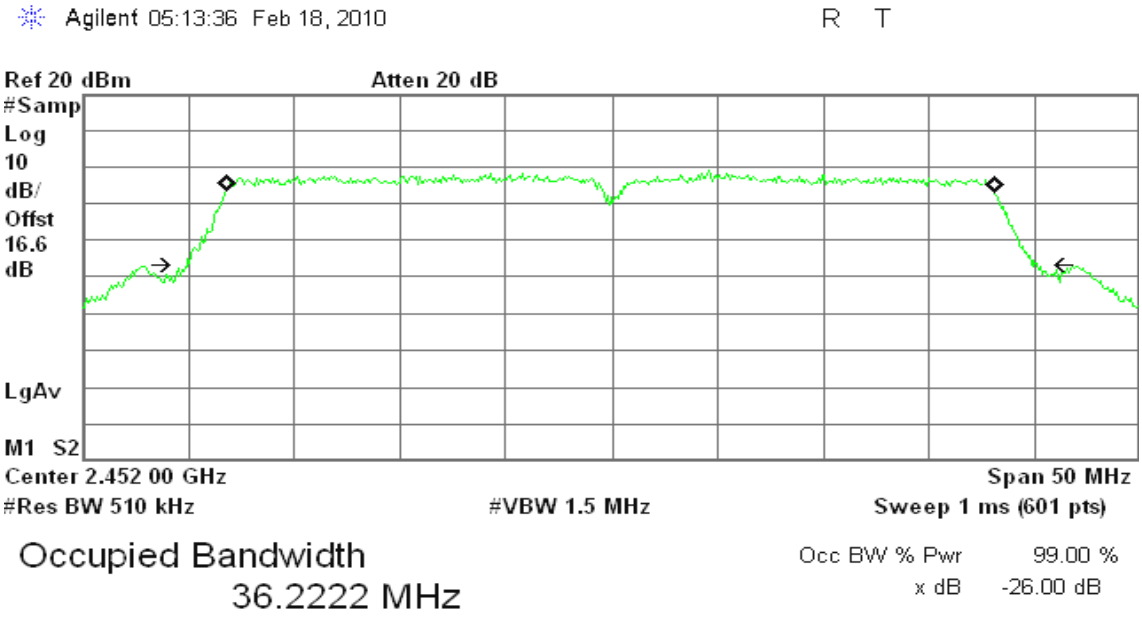
Transmit Freq Error	25.968 kHz
x dB Bandwidth	42.219 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	-13.691 kHz
x dB Bandwidth	42.075 MHz*

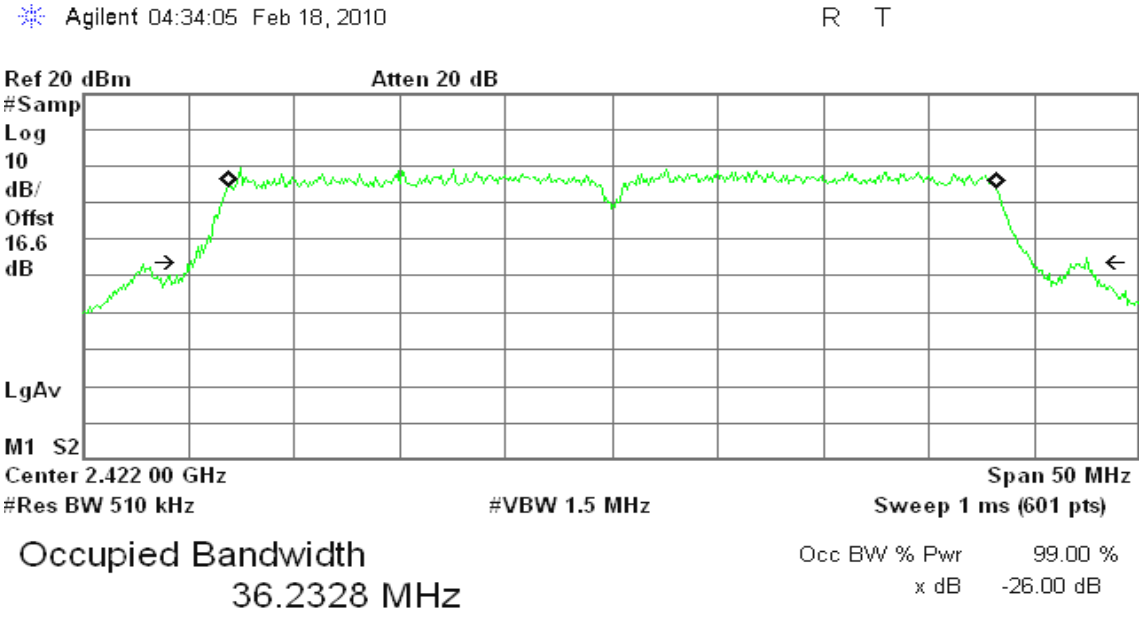
99% Bandwidth (CH High)



Transmit Freq Error	-32.318 kHz
x dB Bandwidth	40.276 MHz*

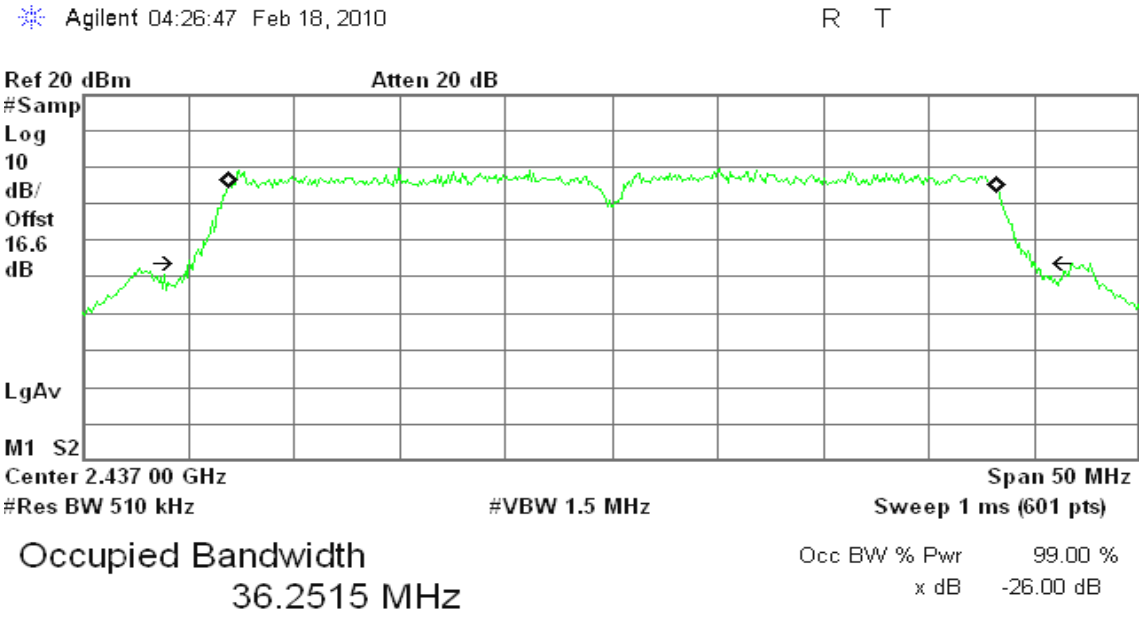
draft 802.11n Wide-40 MHz Channel mode / Chain 1

99% Bandwidth (CH Low)



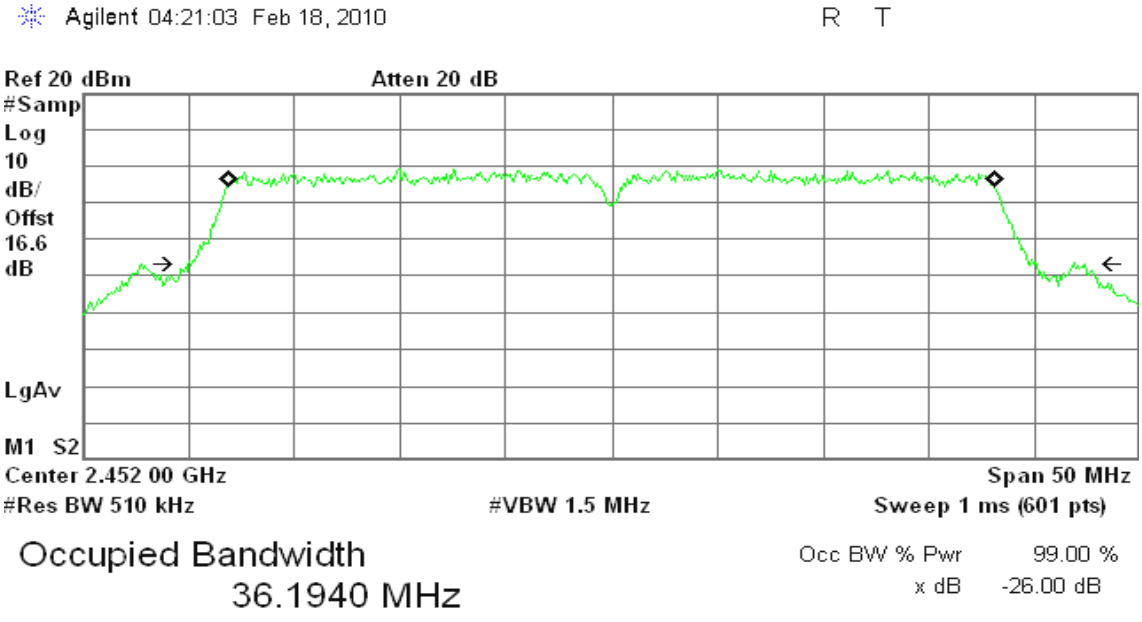
Transmit Freq Error	23.202 kHz
x dB Bandwidth	42.407 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	35.522 kHz
x dB Bandwidth	40.050 MHz*

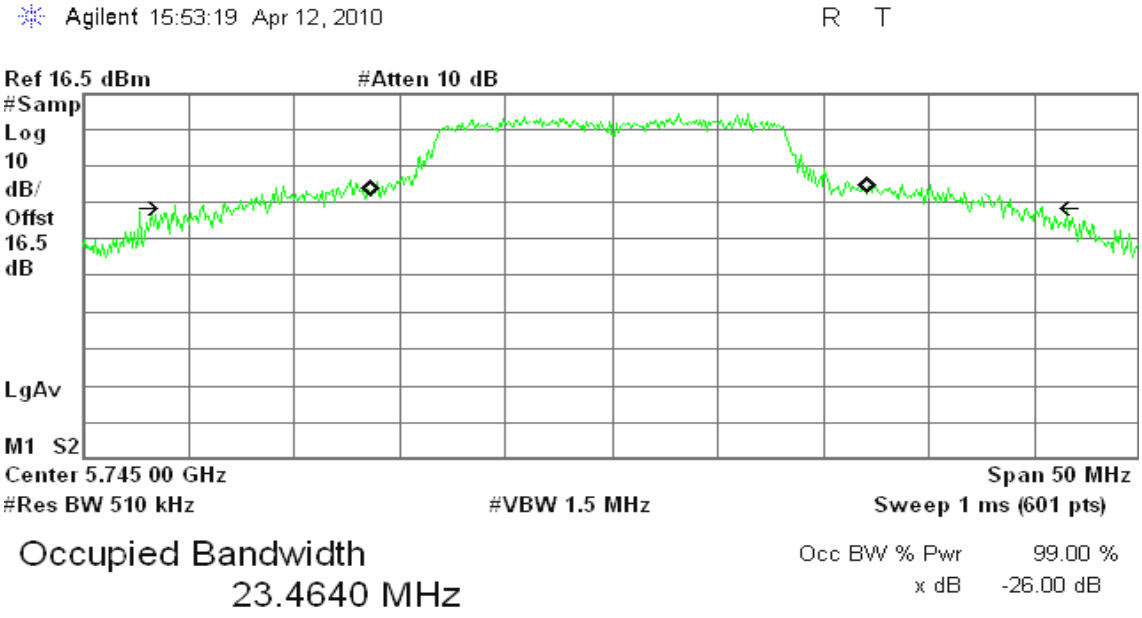
99% Bandwidth (CH High)



Transmit Freq Error	2.520 kHz
x dB Bandwidth	42.379 MHz*

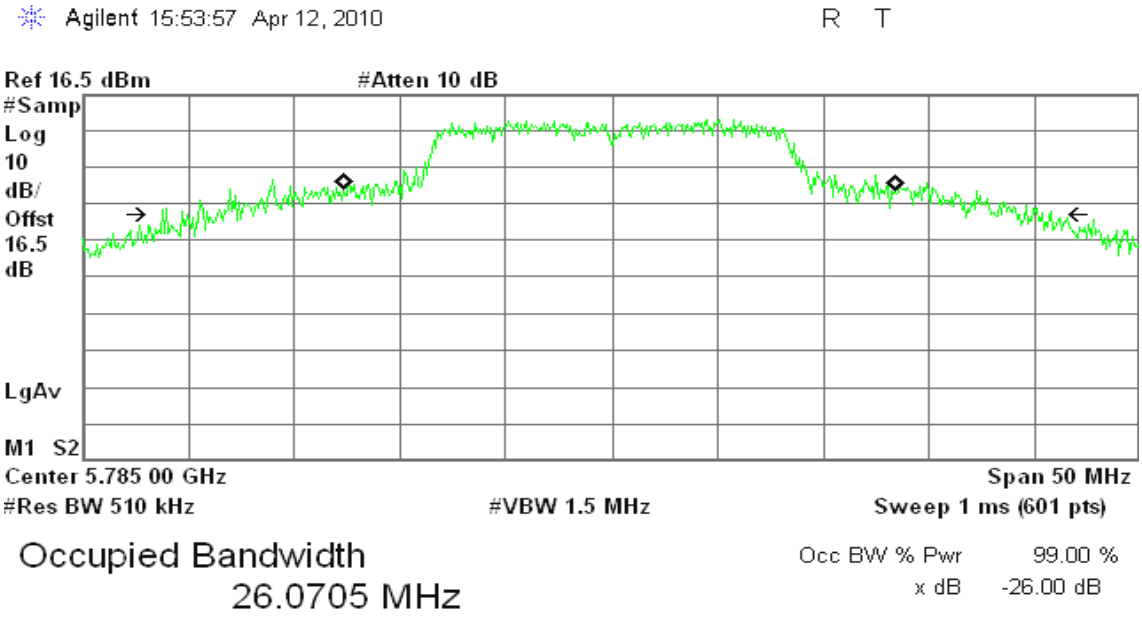
IEEE 802.11a mode

99% Bandwidth (CH Low)



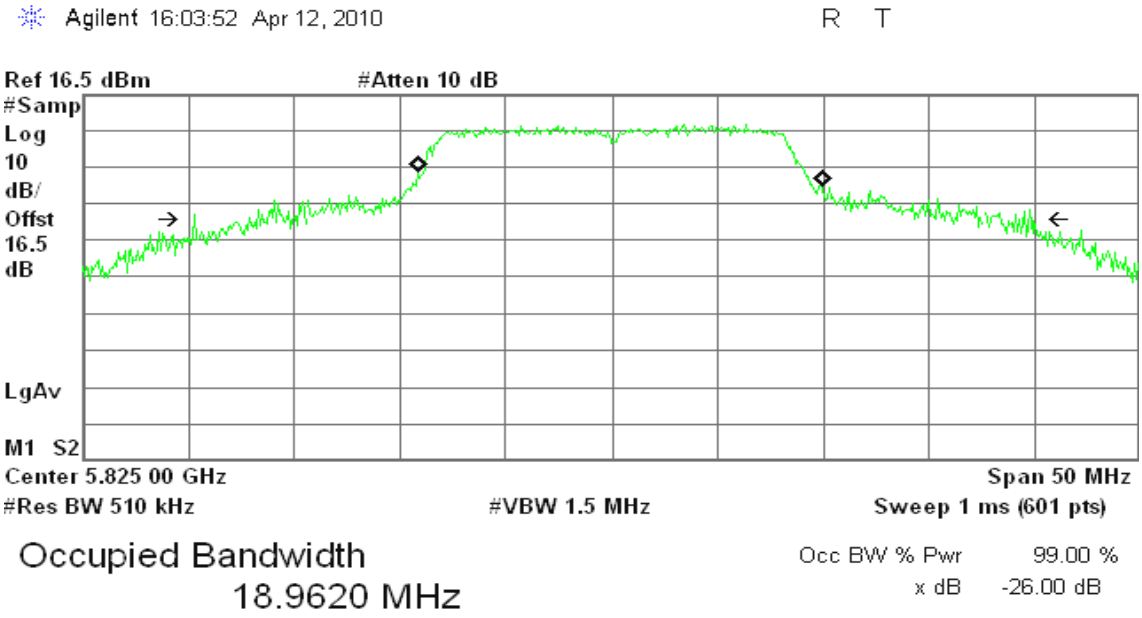
Transmit Freq Error	325.395 kHz
x dB Bandwidth	41.124 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	371.120 kHz
x dB Bandwidth	42.125 MHz*

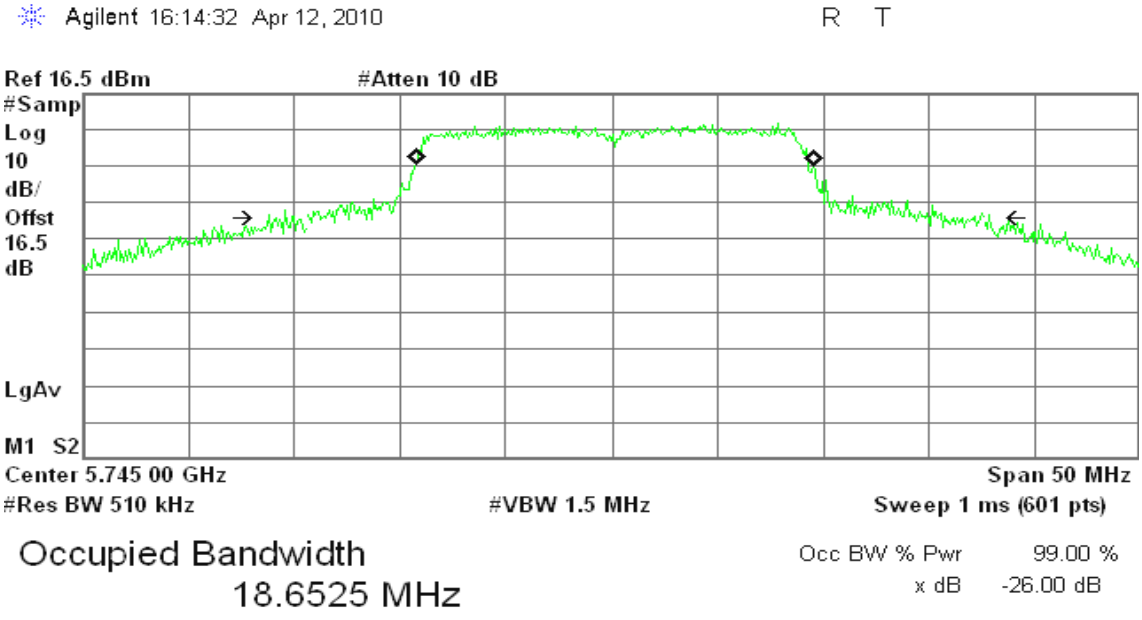
99% Bandwidth (CH High)



Transmit Freq Error	394.990 kHz
x dB Bandwidth	39.498 MHz*

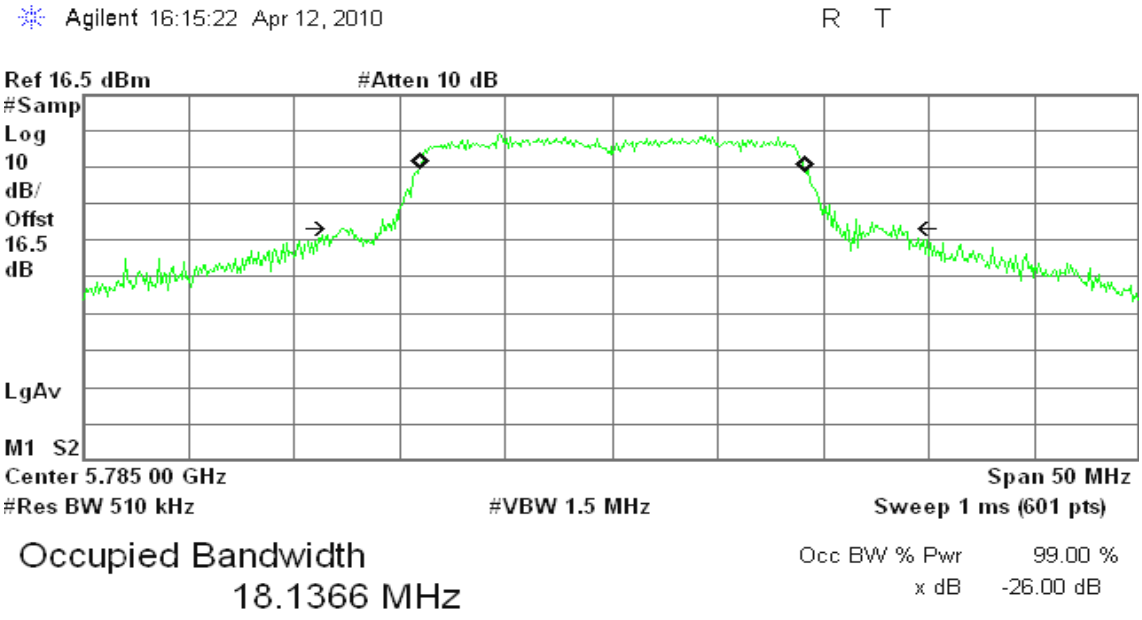
draft 802.11n Standard-20 MHz Channel mode / Chain 0

99% Bandwidth (CH Low)



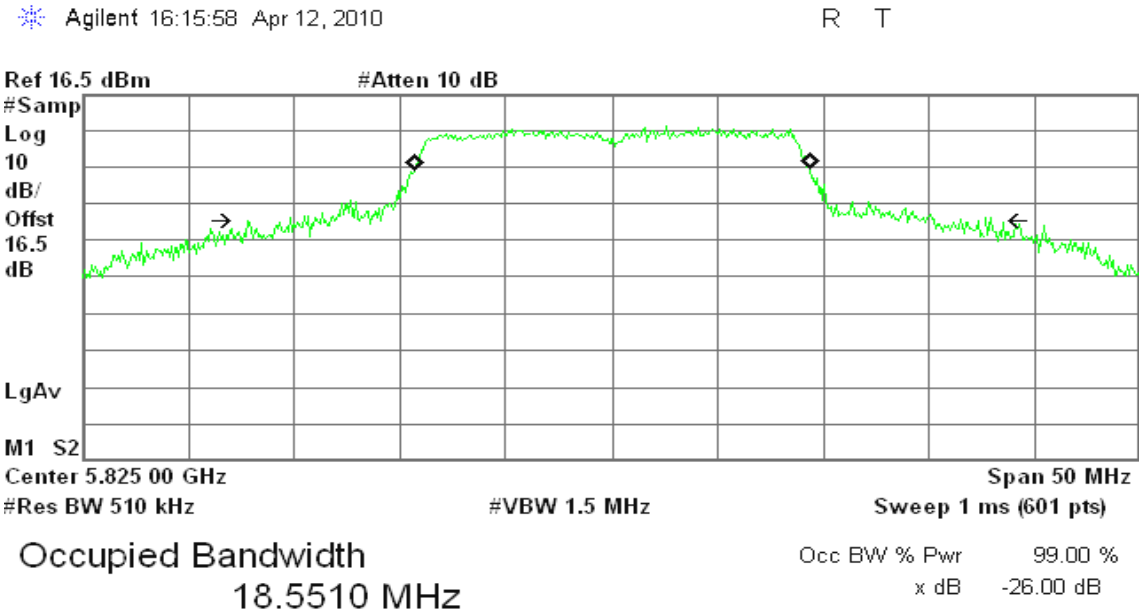
Transmit Freq Error	153.722 kHz
x dB Bandwidth	34.071 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	42.313 kHz
x dB Bandwidth	26.464 MHz*

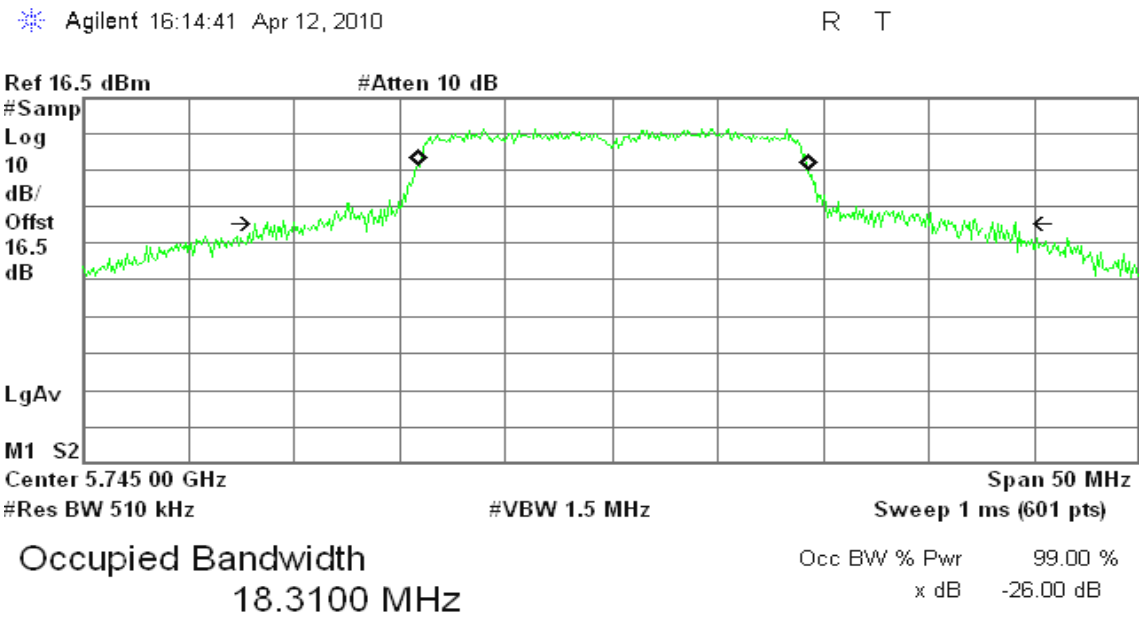
99% Bandwidth (CH High)



Transmit Freq Error	44.982 kHz
x dB Bandwidth	35.111 MHz*

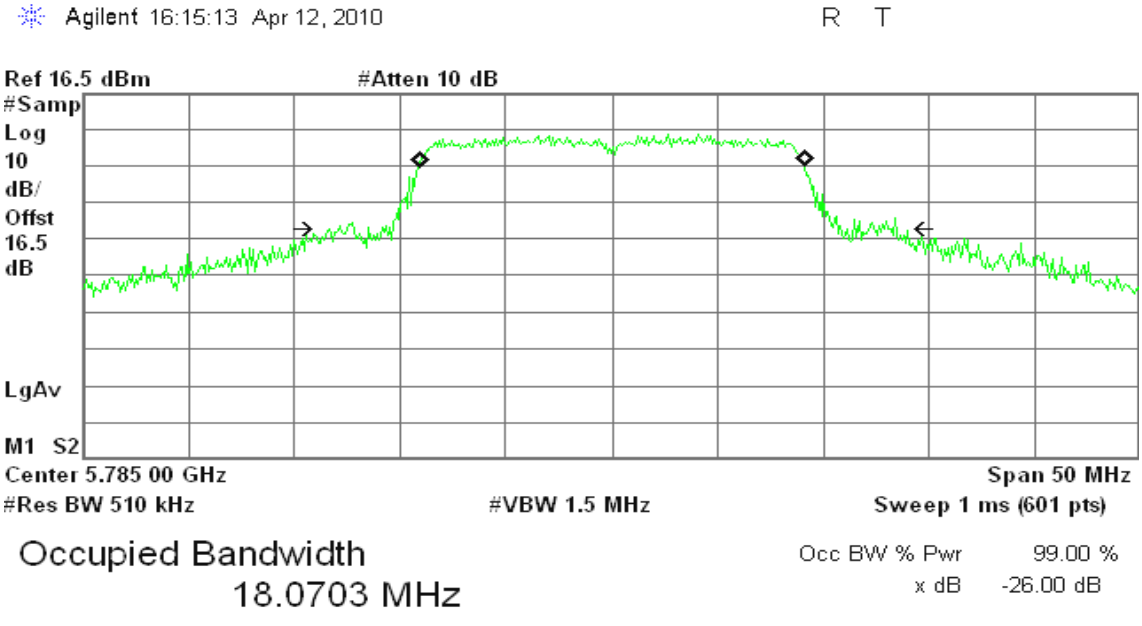
draft 802.11n Standard-20 MHz Channel mode / Chain 1

99% Bandwidth (CH Low)



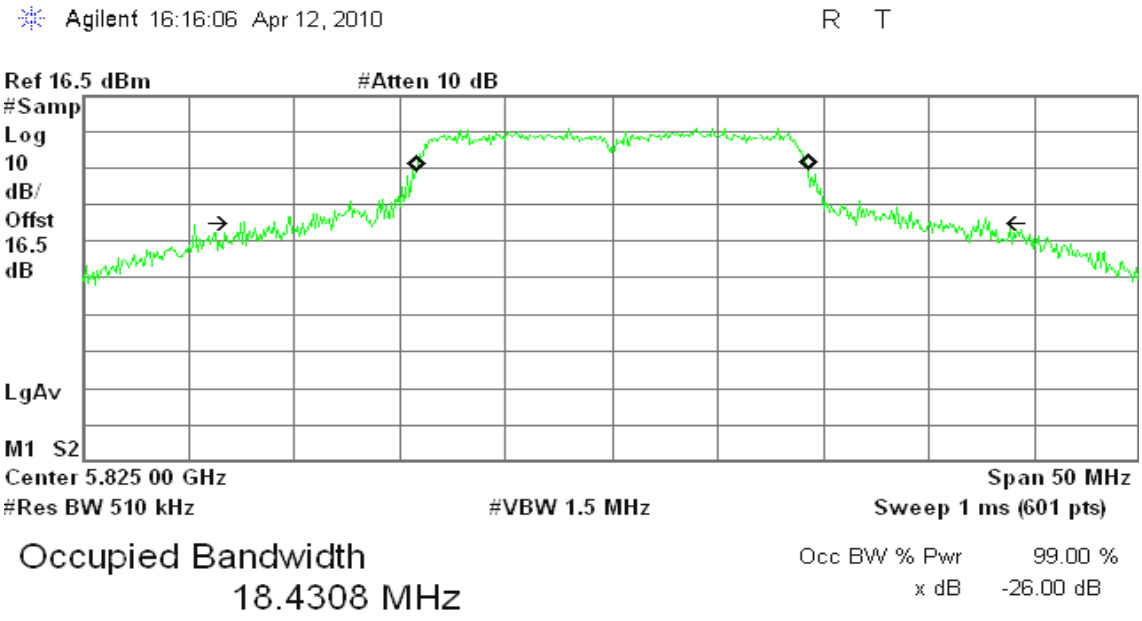
Transmit Freq Error	68.441 kHz
x dB Bandwidth	35.359 MHz*

99% Bandwidth (CH Mid)



Transmit Freq Error	20.054 kHz
x dB Bandwidth	26.823 MHz*

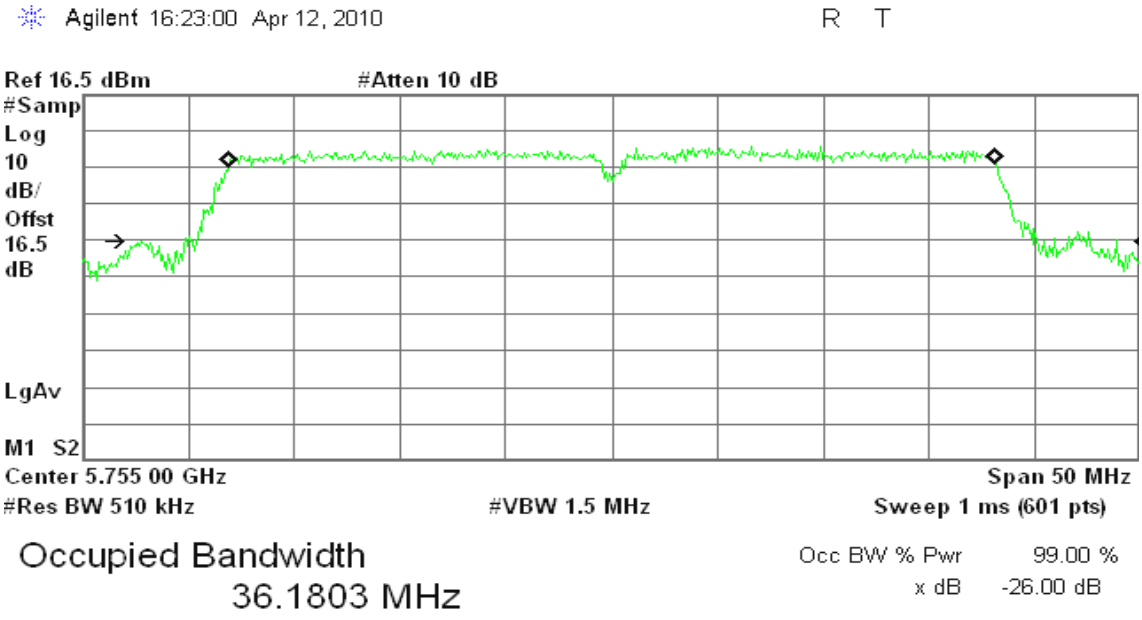
99% Bandwidth (CH High)



Transmit Freq Error	34.498 kHz
x dB Bandwidth	35.181 MHz*

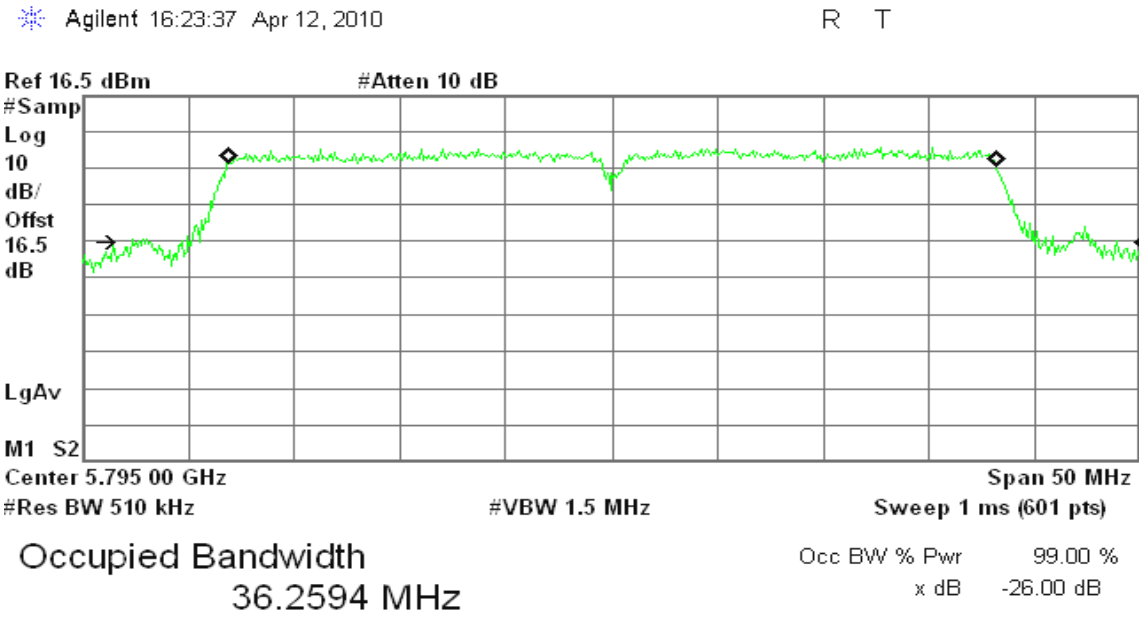
draft 802.11n Wide-40 MHz Channel mode / Chain 0

99% Bandwidth (CH Low)



Transmit Freq Error	29.353 kHz
x dB Bandwidth	46.210 MHz*

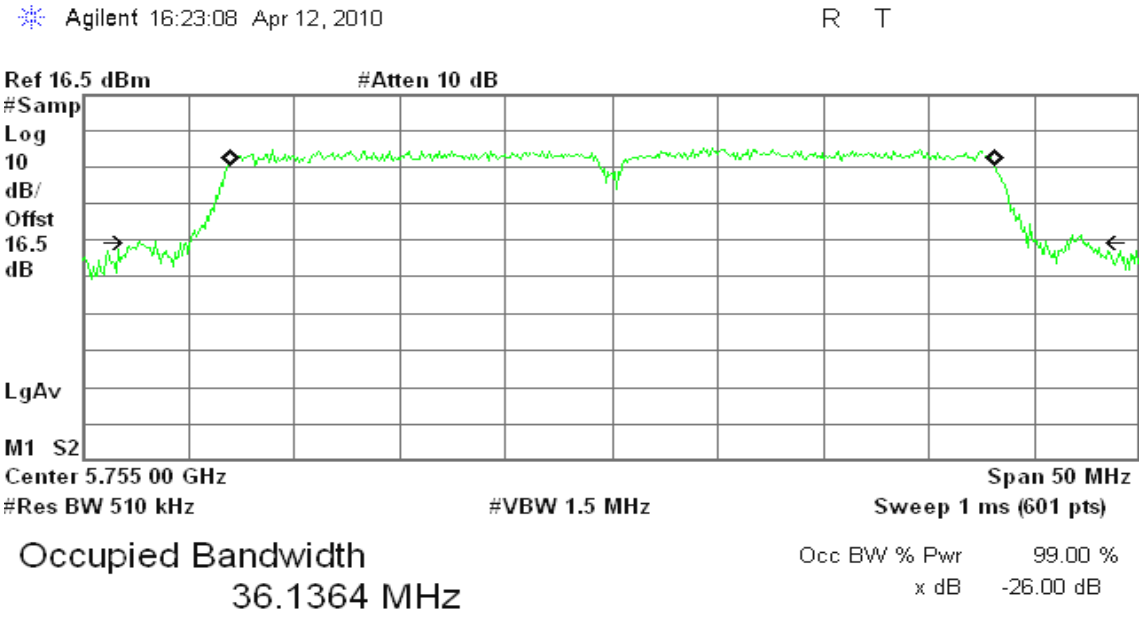
99% Bandwidth (CH High)



Transmit Freq Error	16.515 kHz
x dB Bandwidth	46.626 MHz*

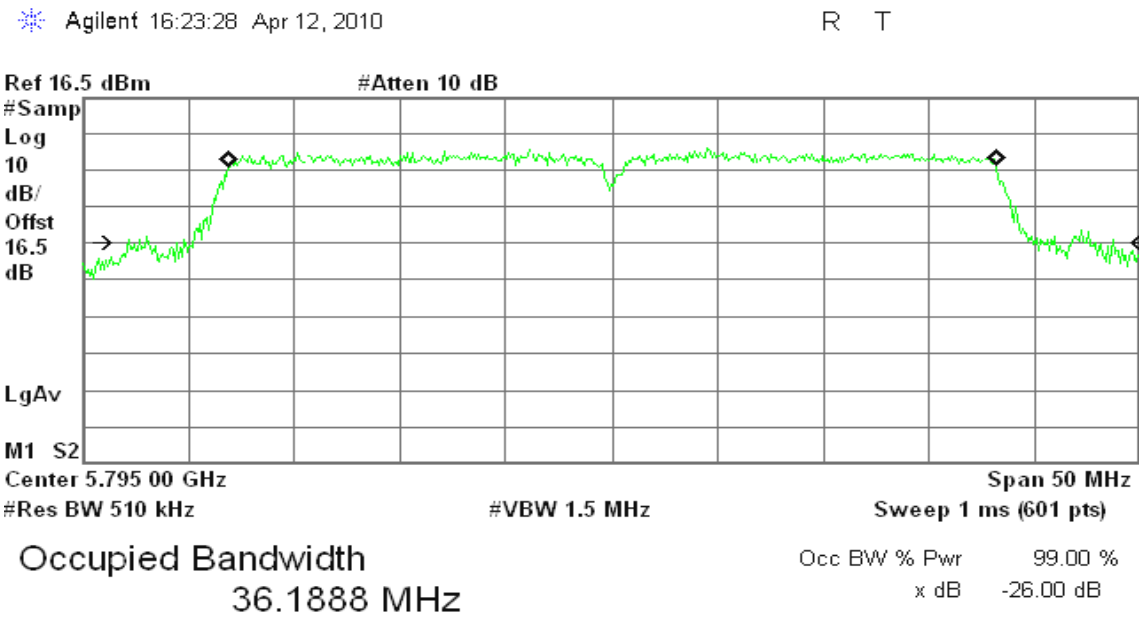
draft 802.11n Wide-40 MHz Channel mode / Chain 1

99% Bandwidth (CH Low)



Transmit Freq Error	37.945 kHz
x dB Bandwidth	44.951 MHz*

99% Bandwidth (CH High)



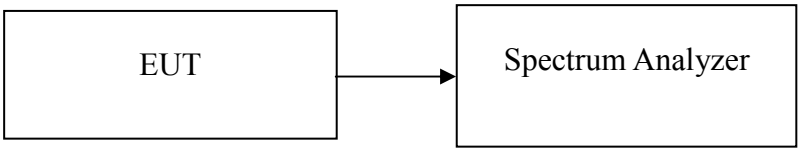
Transmit Freq Error	39.011 kHz
x dB Bandwidth	46.635 MHz*

8.2 6DB BANDWIDTH

LIMIT

According to §15.247(a)(2) & RSS-210 §A8.2(a), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

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 = 100 kHz, VBW = RBW, Span = 50 MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.17	>500	PASS
Mid	2437	10.08		PASS
High	2462	10.08		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.58	>500	PASS
Mid	2437	16.58		PASS
High	2462	16.42		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.67	>500	PASS
Mid	2437	17.67		PASS
High	2462	17.67		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.83	>500	PASS
Mid	2437	17.67		PASS
High	2462	17.67		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	35.75	>500	PASS
Mid	2437	36.33		PASS
High	2452	36.33		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	35.92	>500	PASS
Mid	2437	36.08		PASS
High	2452	35.92		PASS

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Test Result
Low	5745	16.42	>500	PASS
Mid	5785	16.42		PASS
High	5825	16.50		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	5745	17.67	>500	PASS
Mid	5785	17.58		PASS
High	5825	17.75		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	5745	17.75	>500	PASS
Mid	5785	17.67		PASS
High	5825	17.58		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 0

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	5755	33.67	>500	PASS
High	5795	35.83		PASS

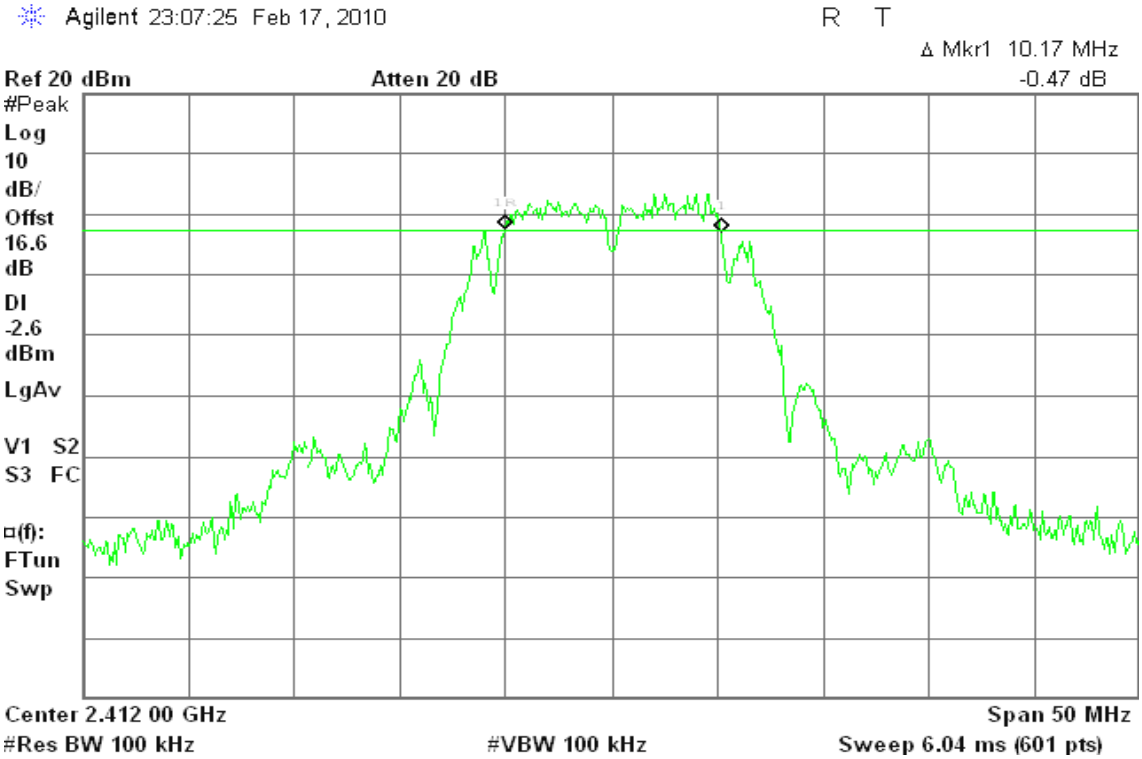
Test mode: draft 802.11n Wide-40 MHz Channel mode / Chain 1

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	5755	35.25	>500	PASS
High	5795	35.17		PASS

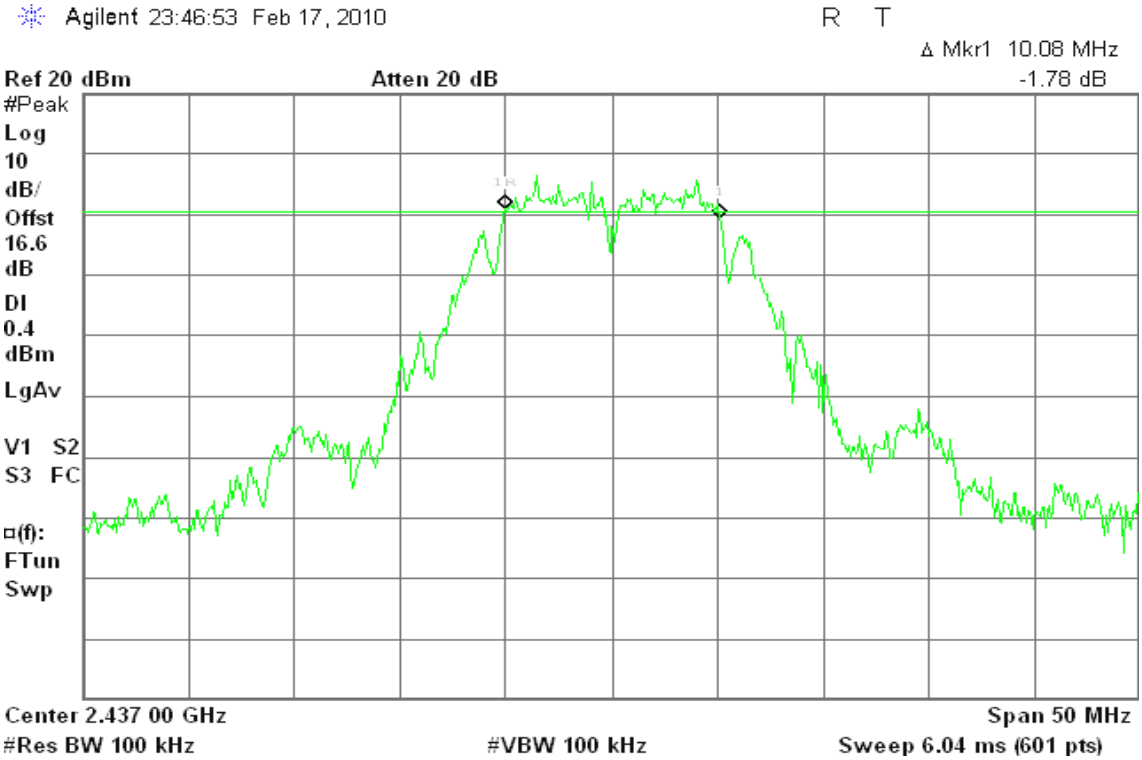
Test Plot

IEEE 802.11b mode

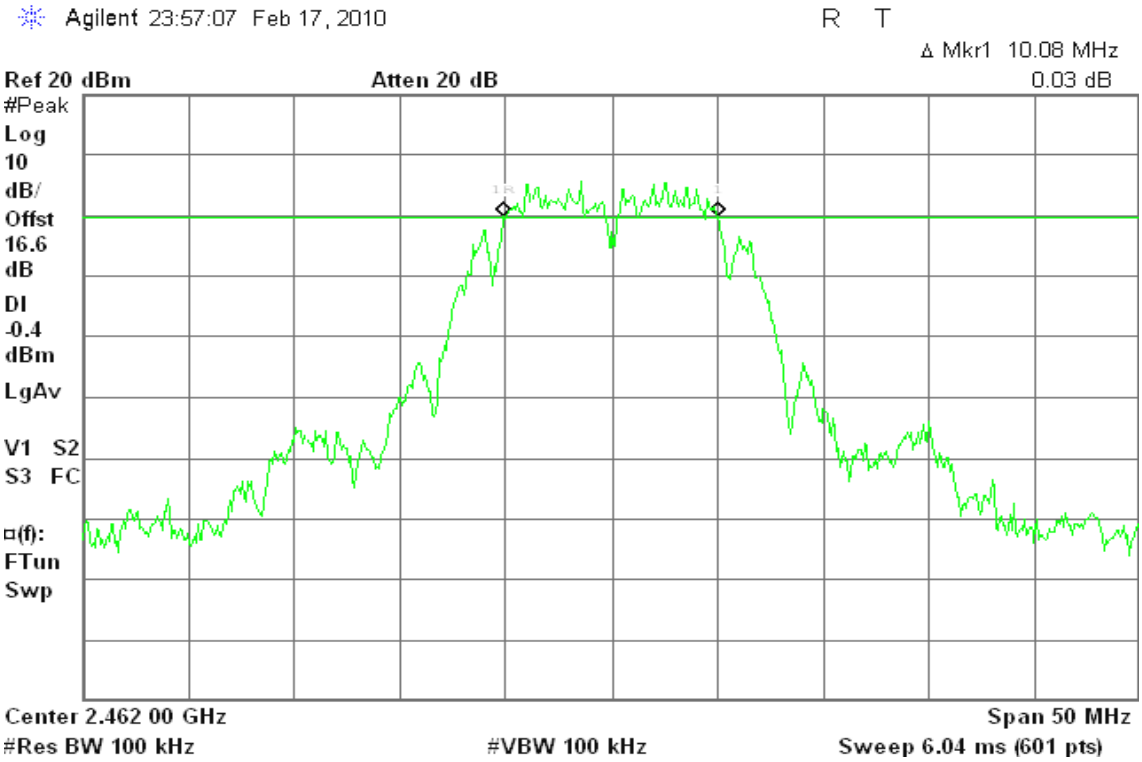
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

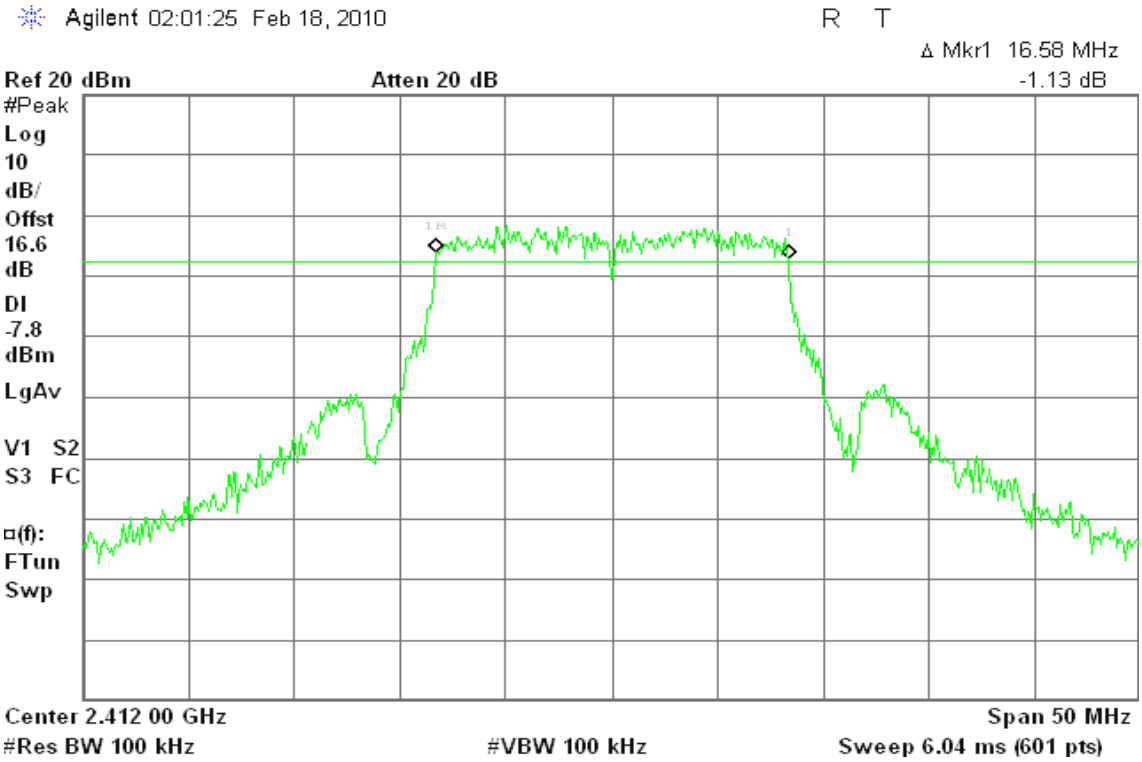


6dB Bandwidth (CH High)

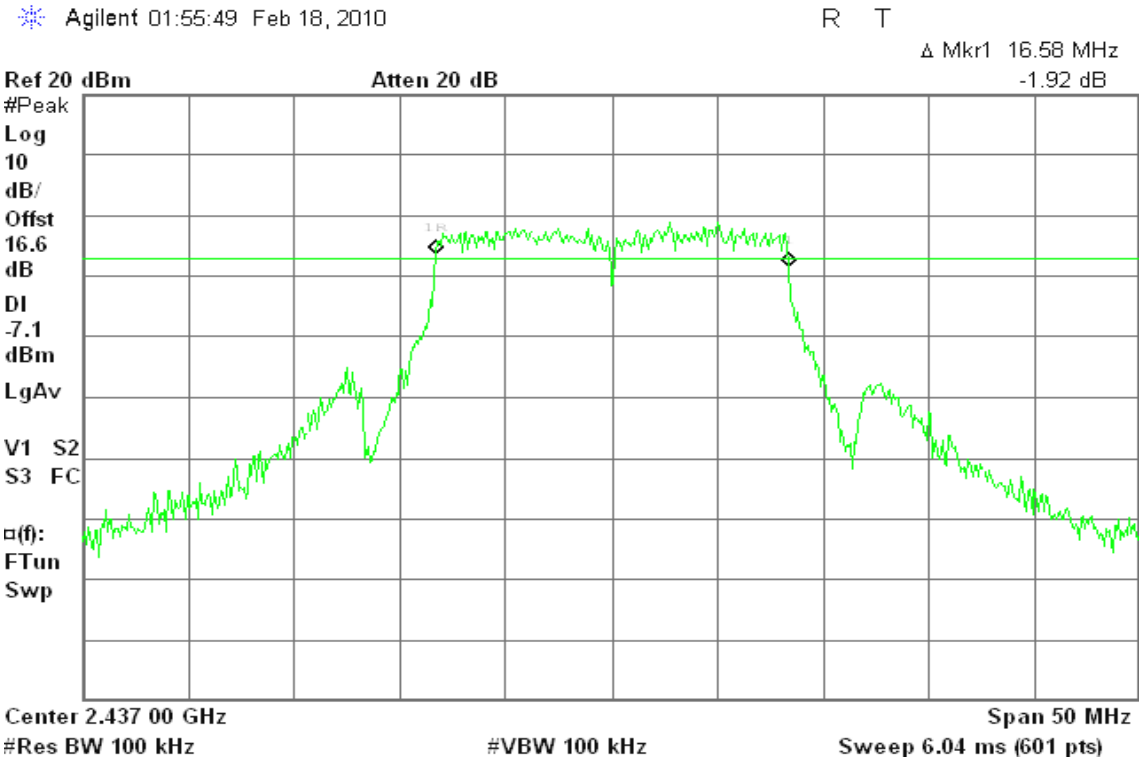


IEEE 802.11g mode

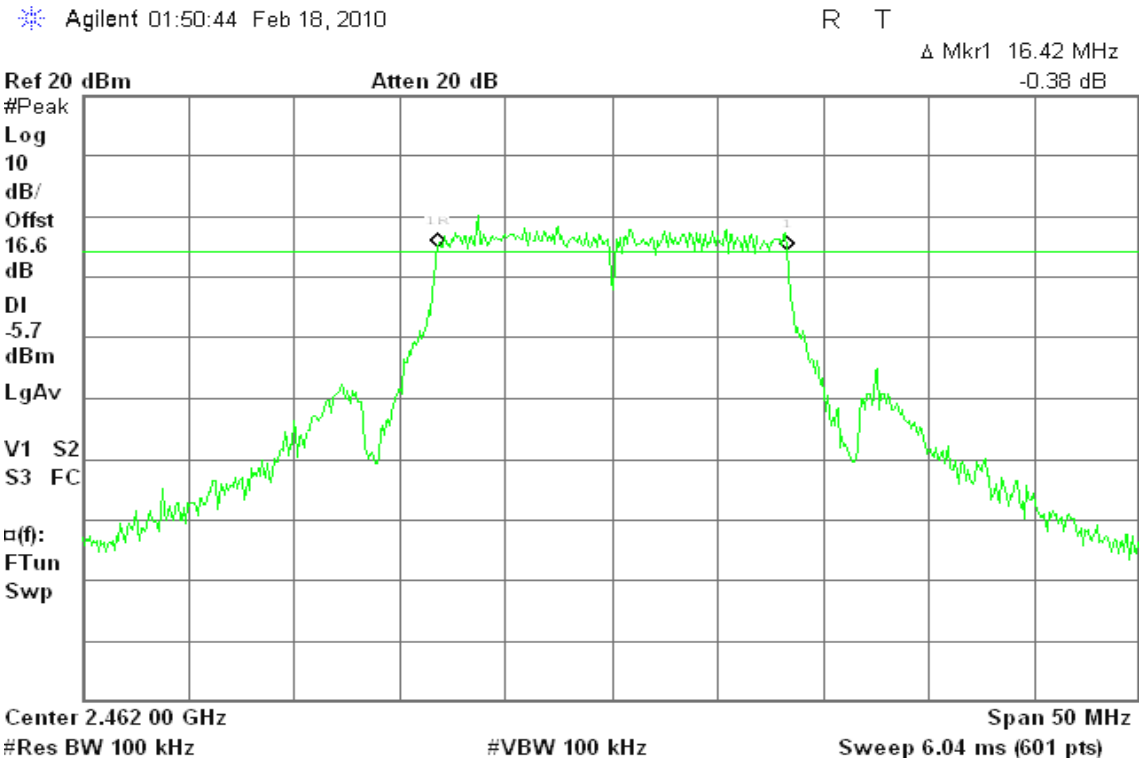
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

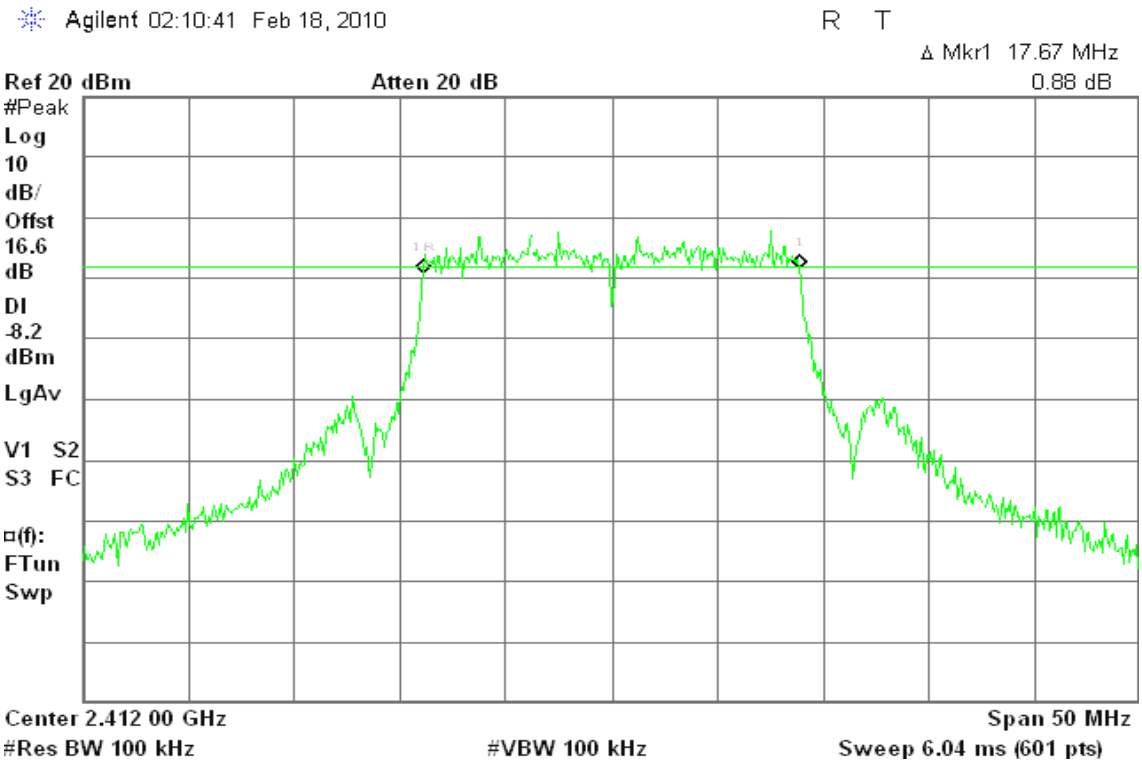


6dB Bandwidth (CH High)

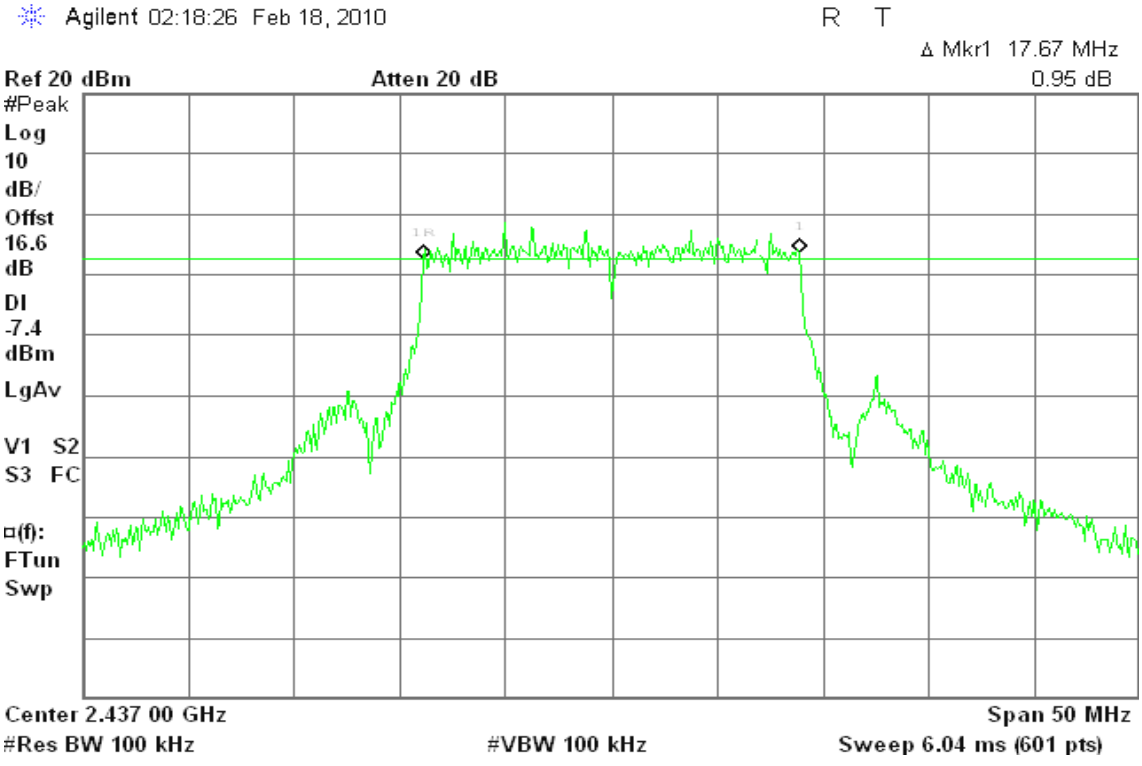


draft 802.11n Standard-20 MHz Channel mode / Chain 0

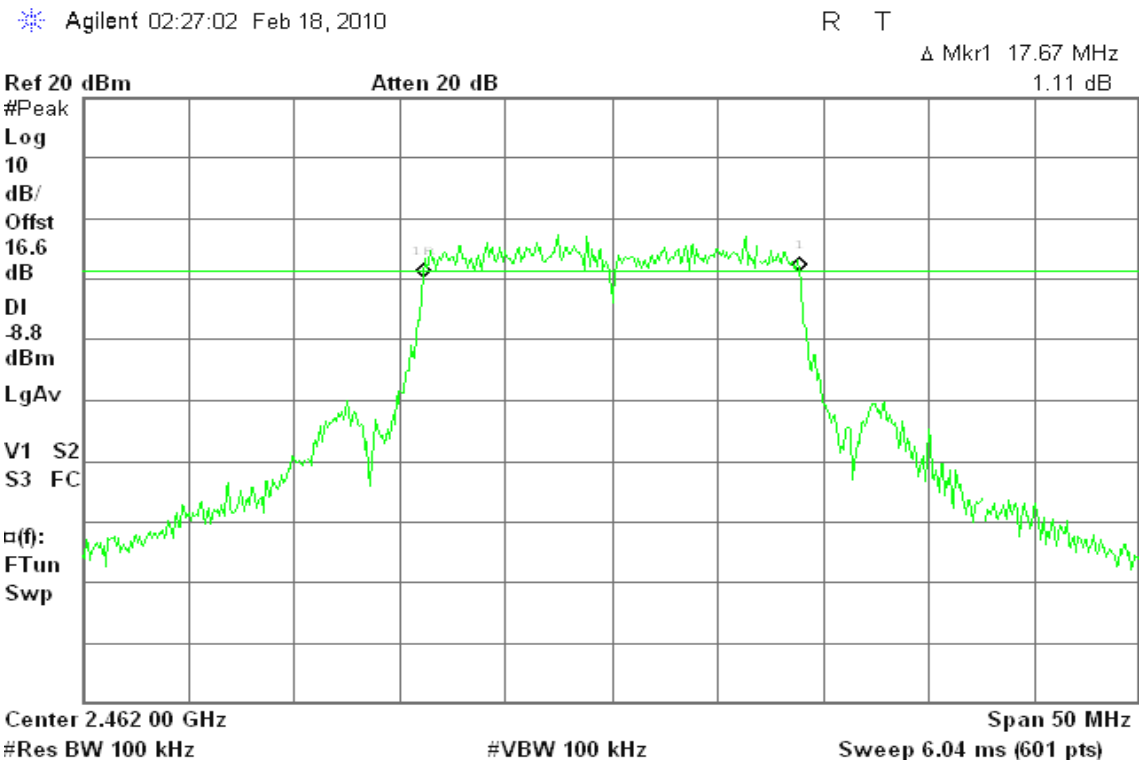
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

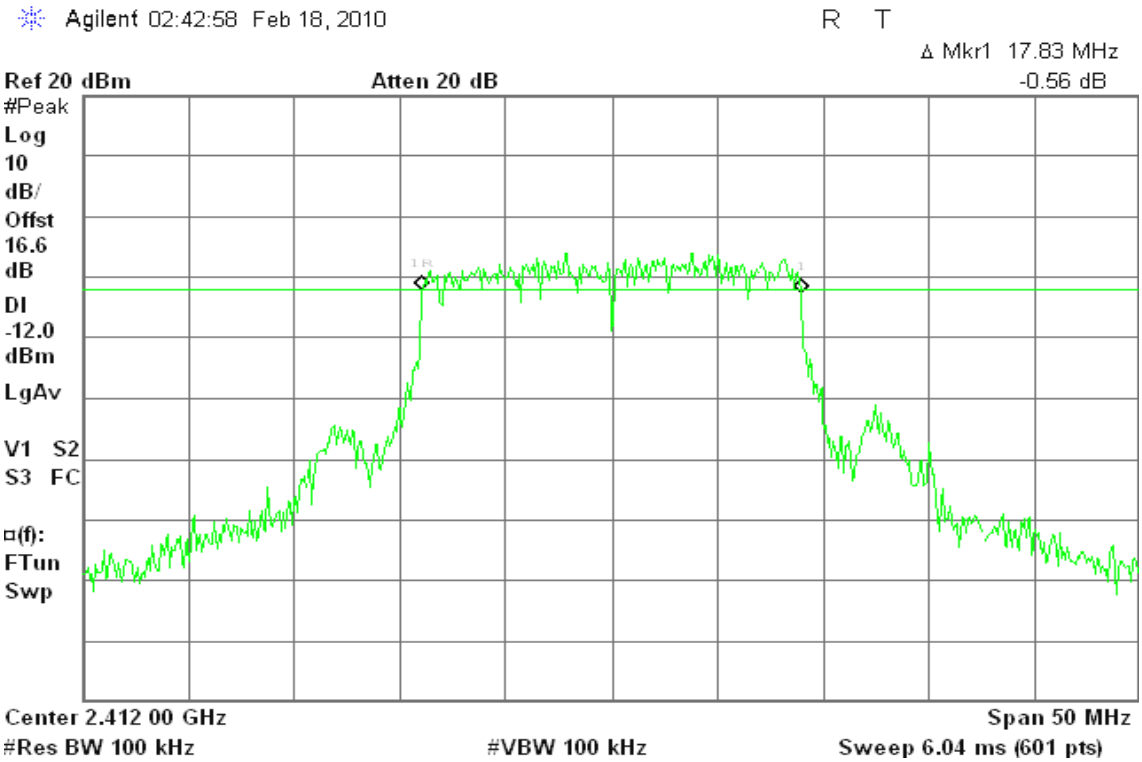


6dB Bandwidth (CH High)

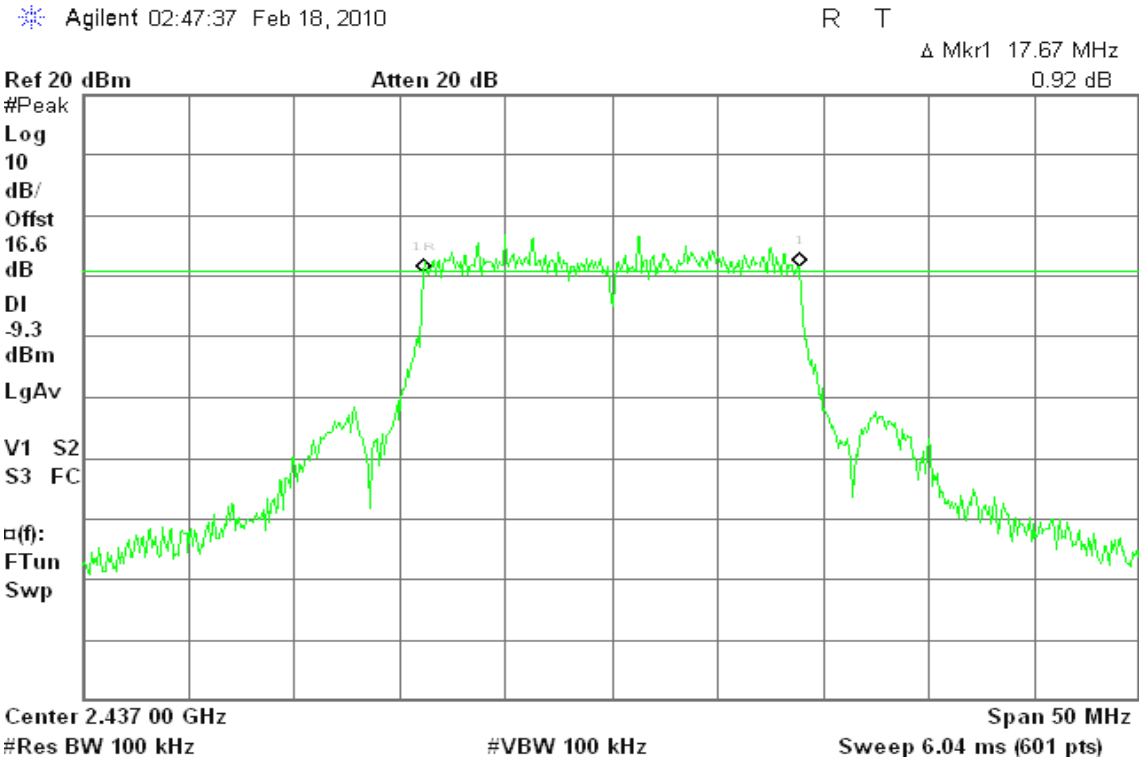


draft 802.11n Standard-20 MHz Channel mode / Chain 1

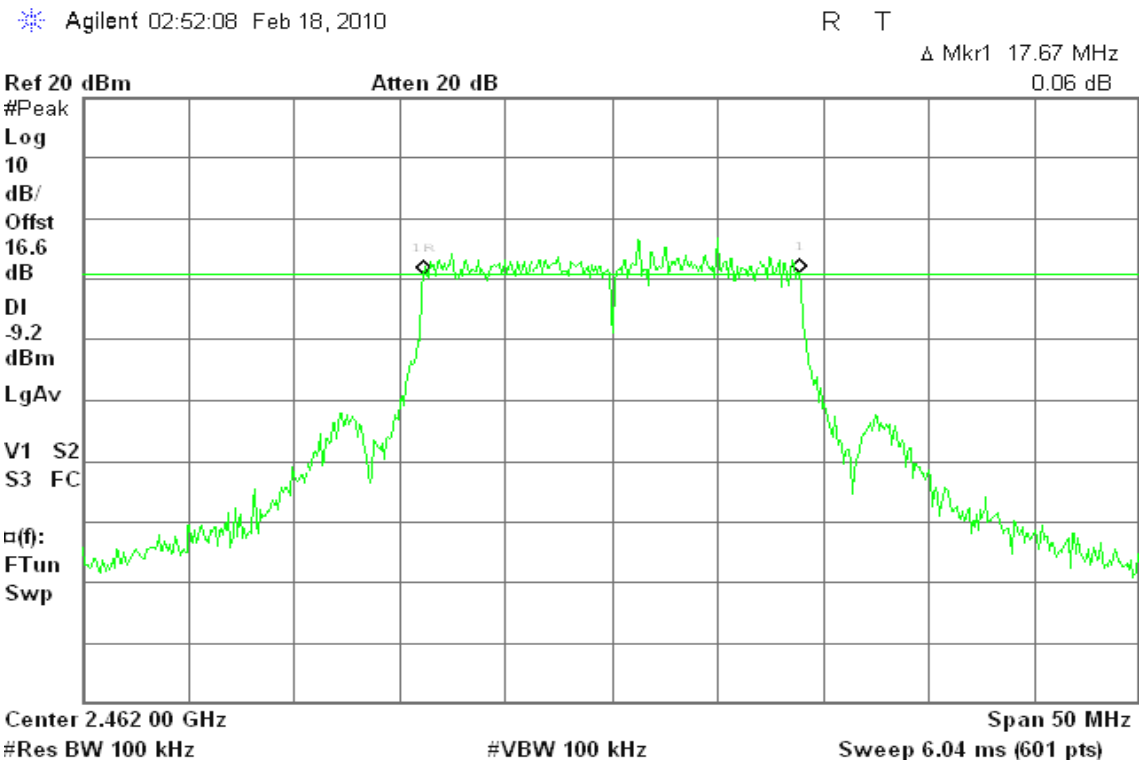
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

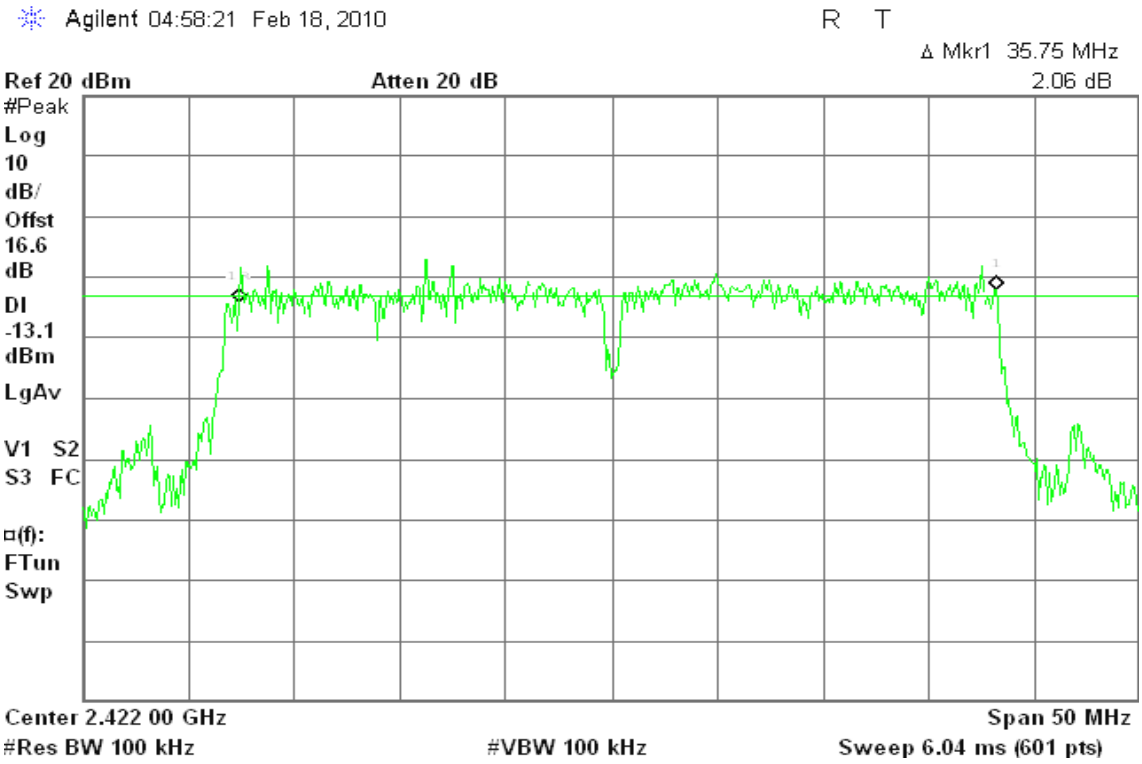


6dB Bandwidth (CH High)

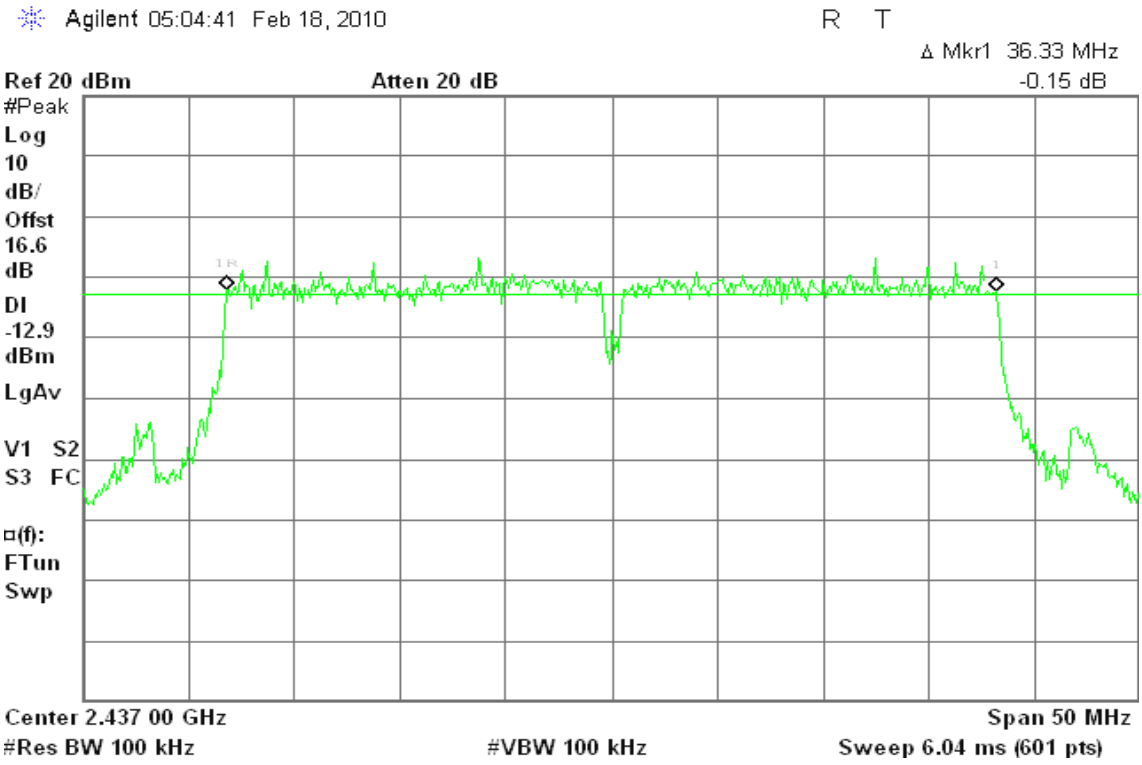


draft 802.11n Wide-40 MHz Channel mode / Chain 0

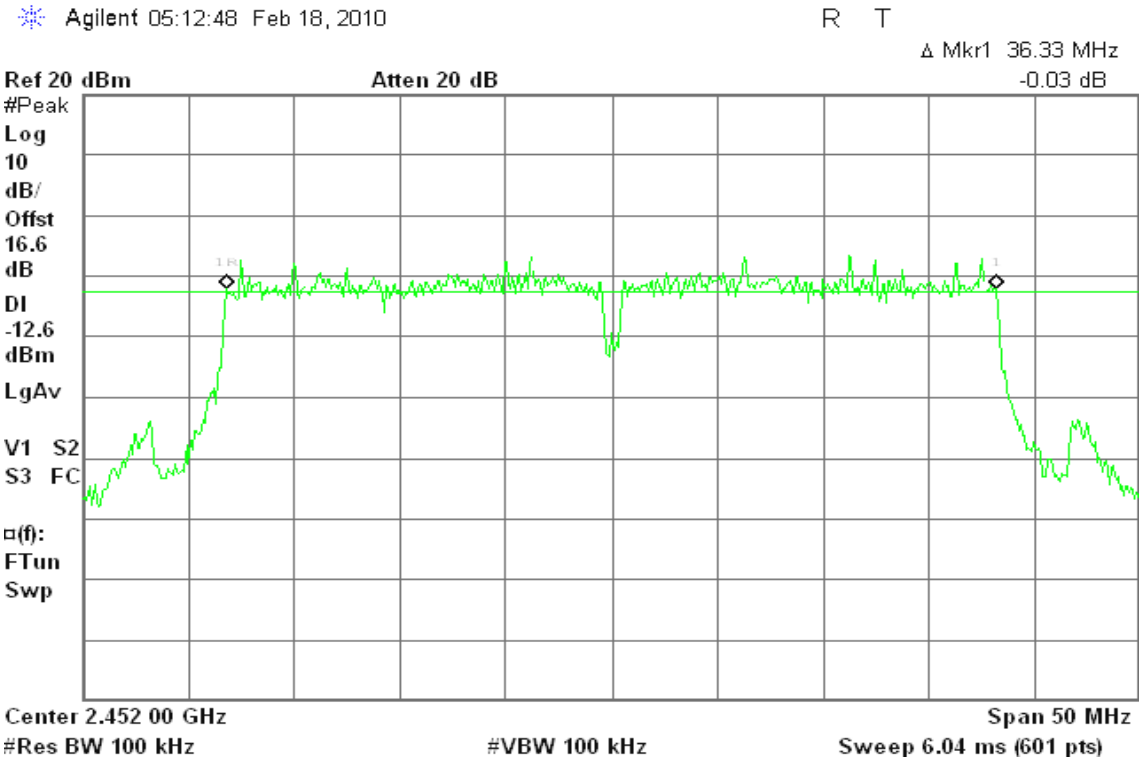
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

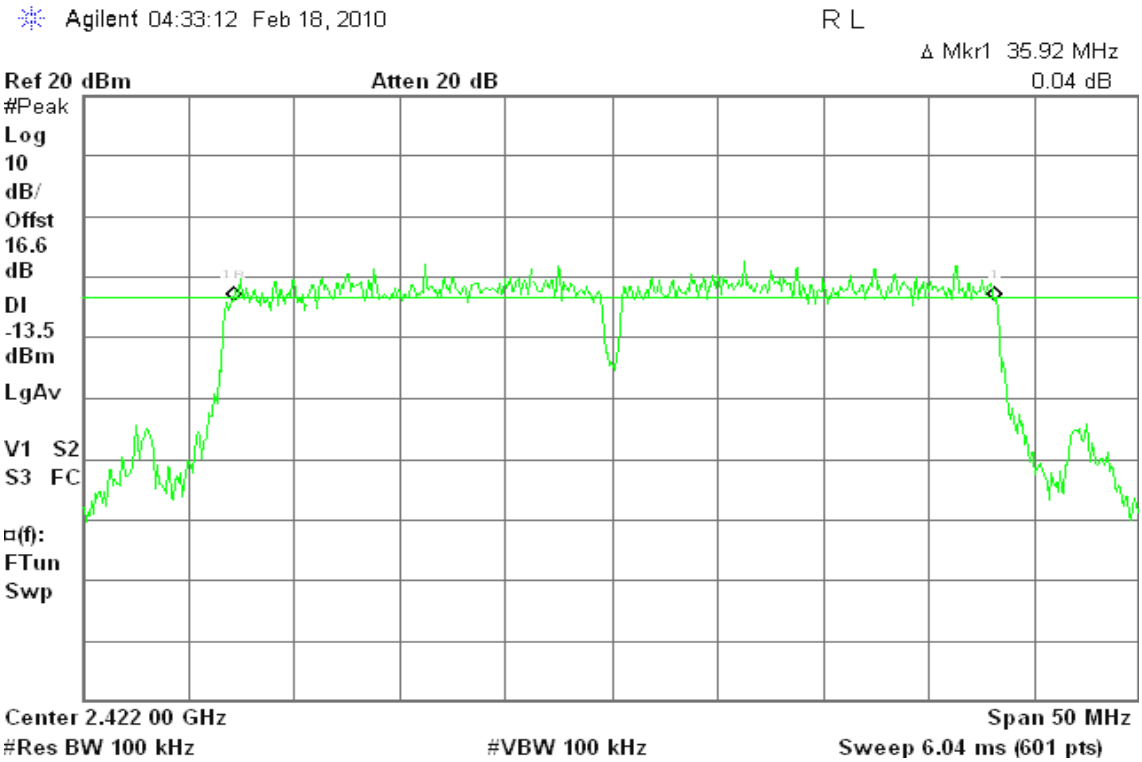


6dB Bandwidth (CH High)

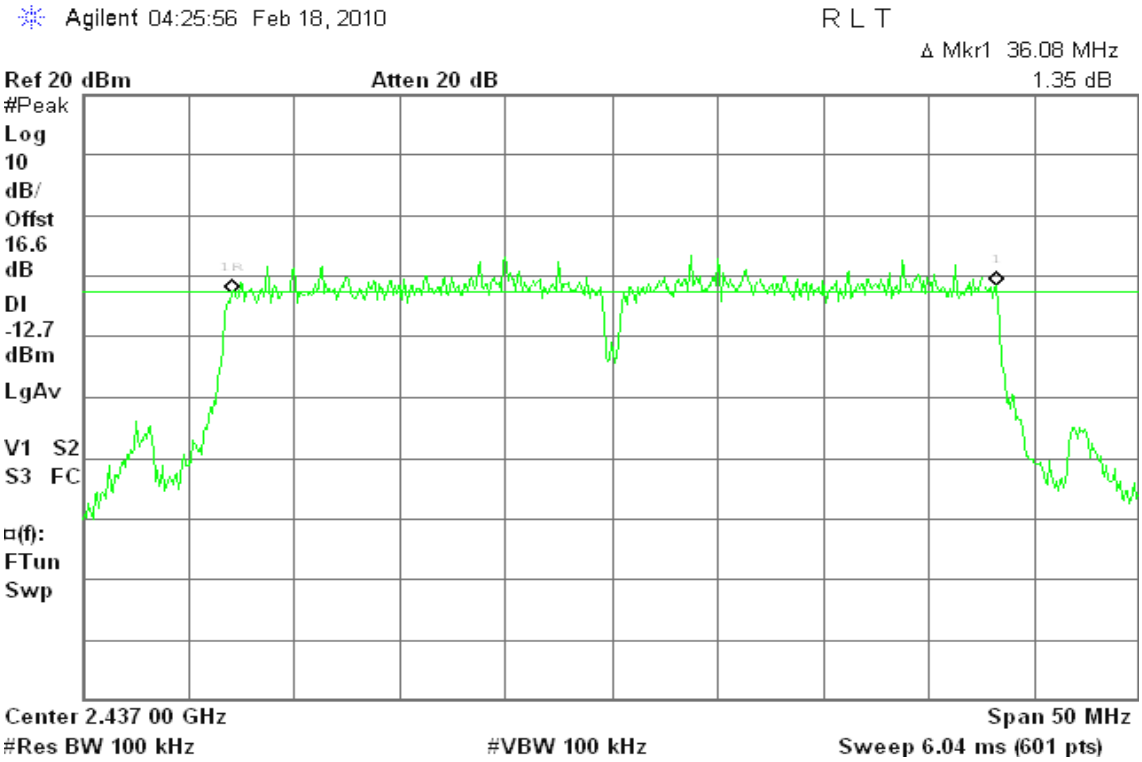


draft 802.11n Wide-40 MHz Channel mode / Chain 1

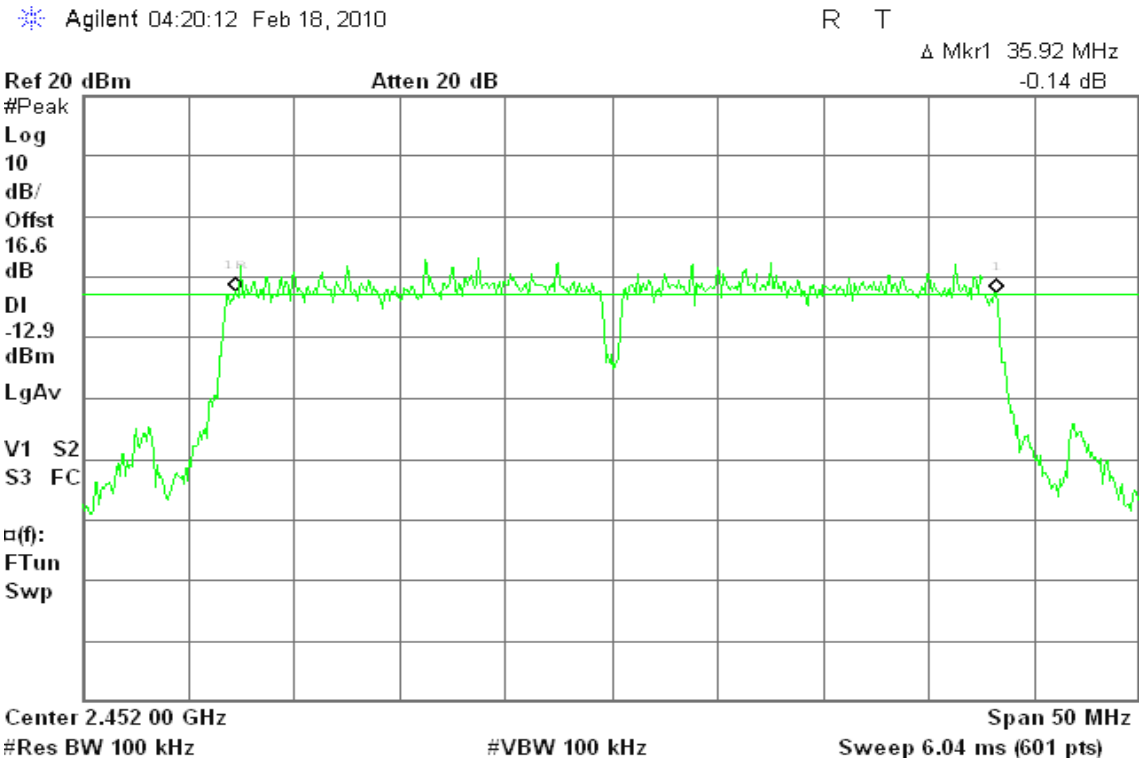
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

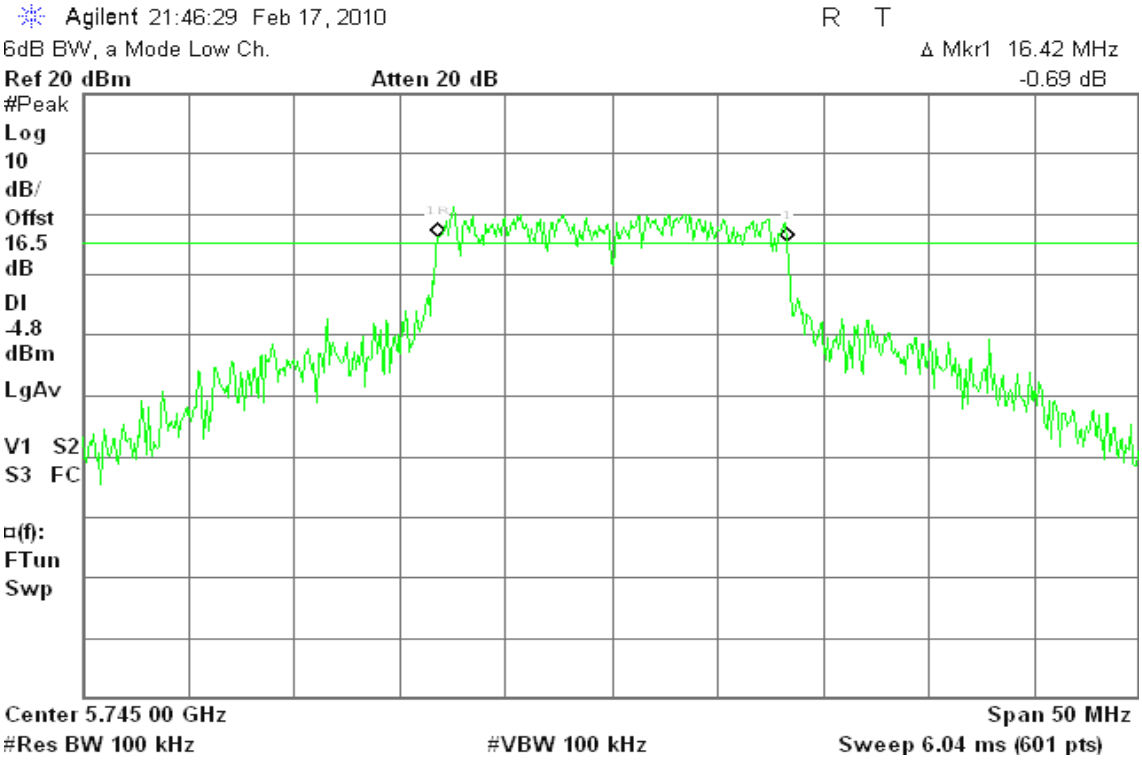


6dB Bandwidth (CH High)

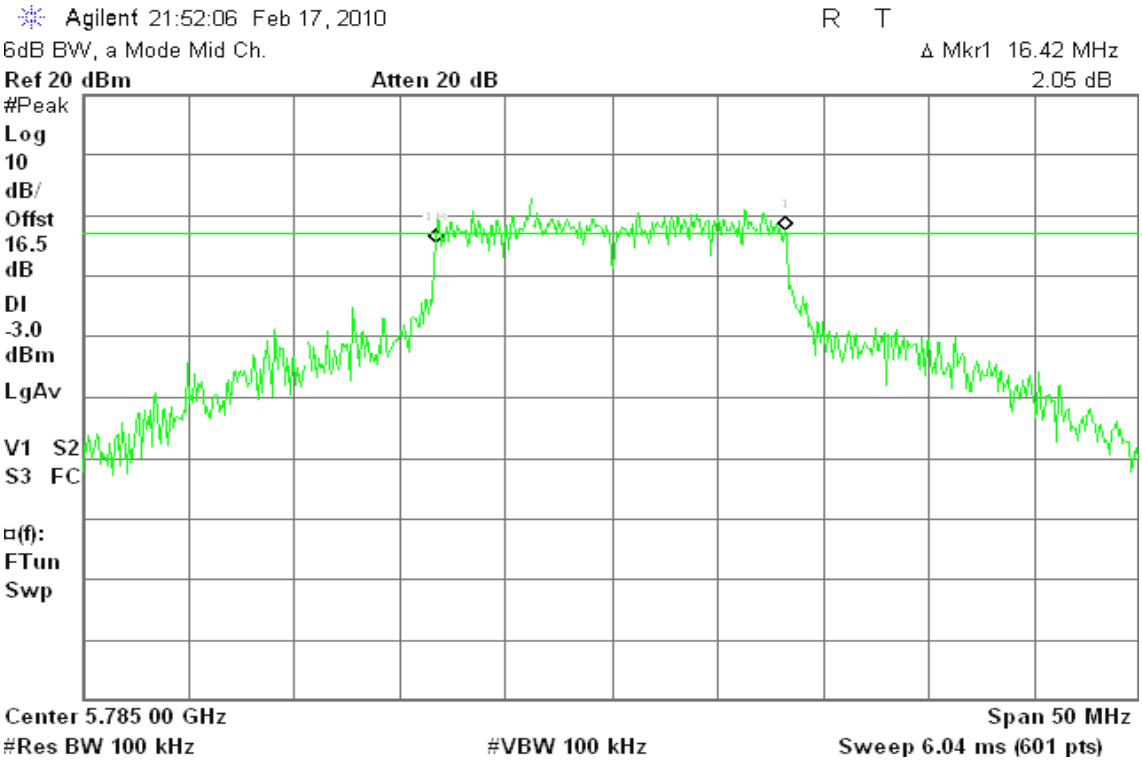


IEEE 802.11a mode:

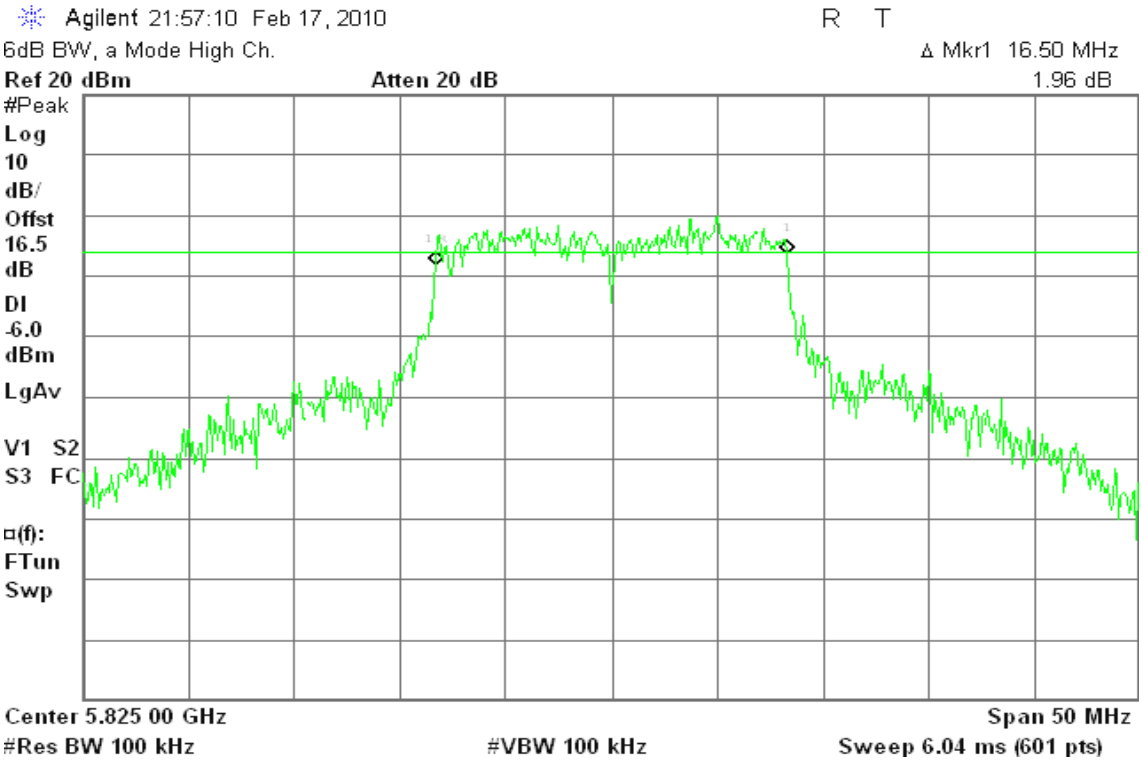
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

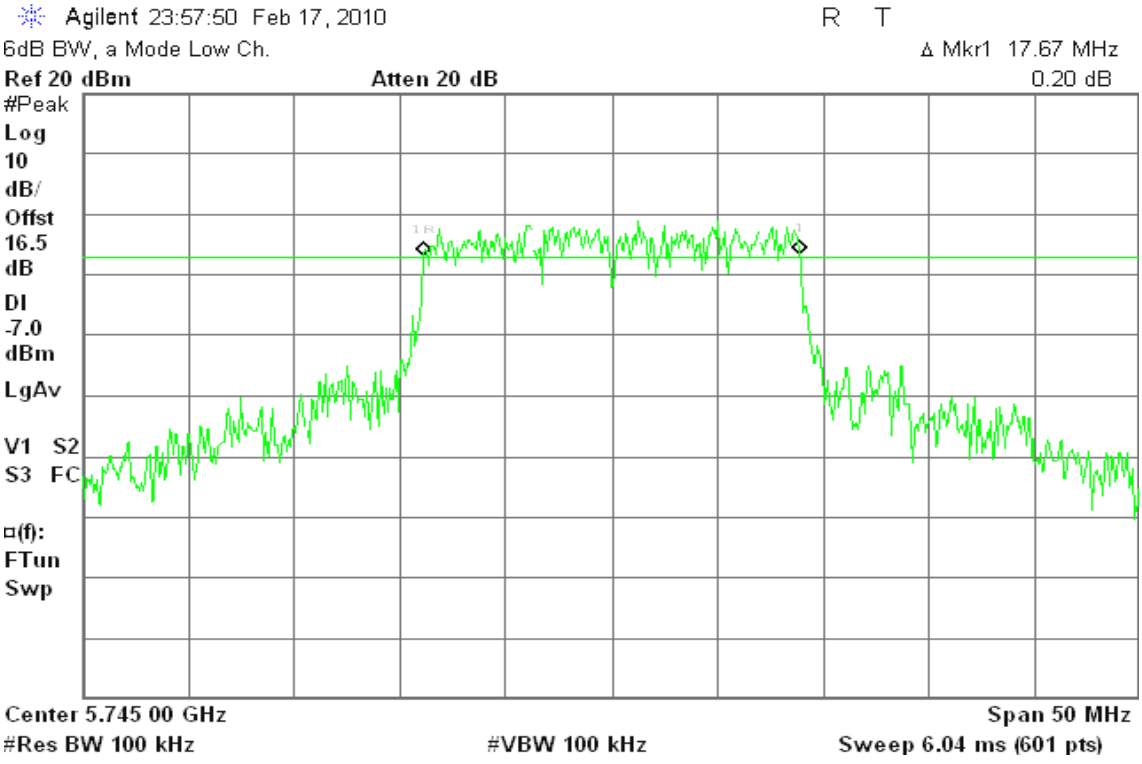


6dB Bandwidth (CH High)

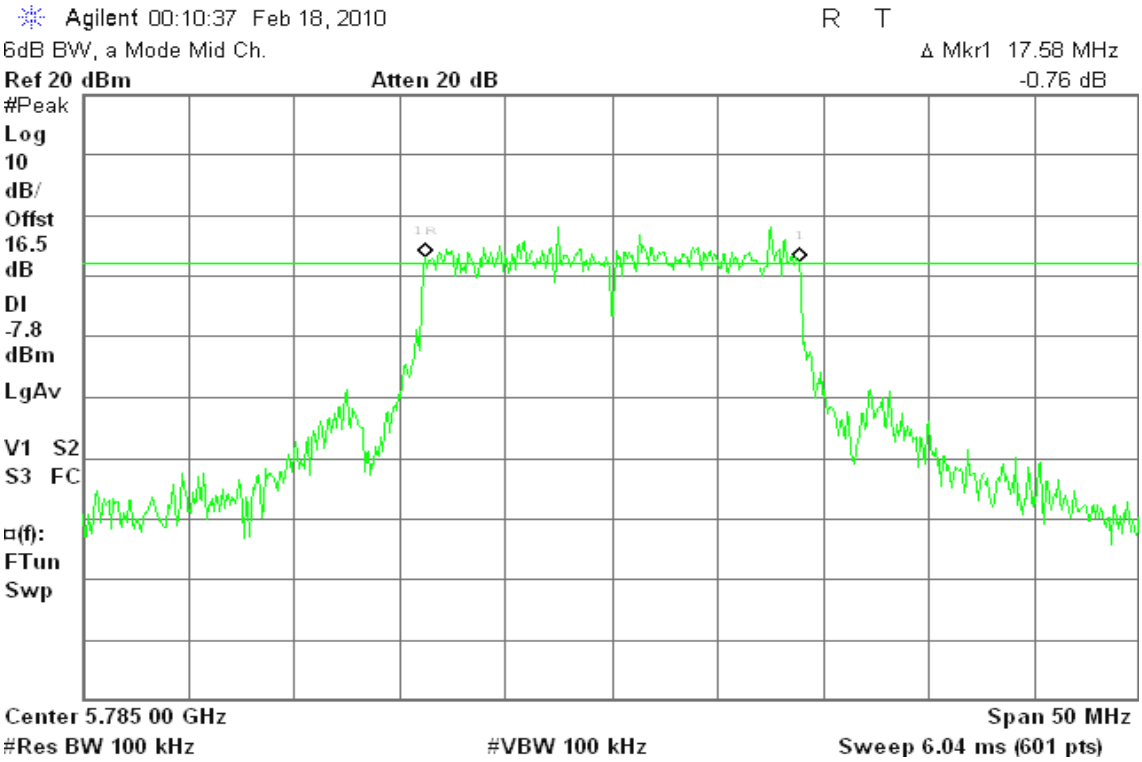


draft 802.11n Standard-20 MHz Channel mode / Chain 0

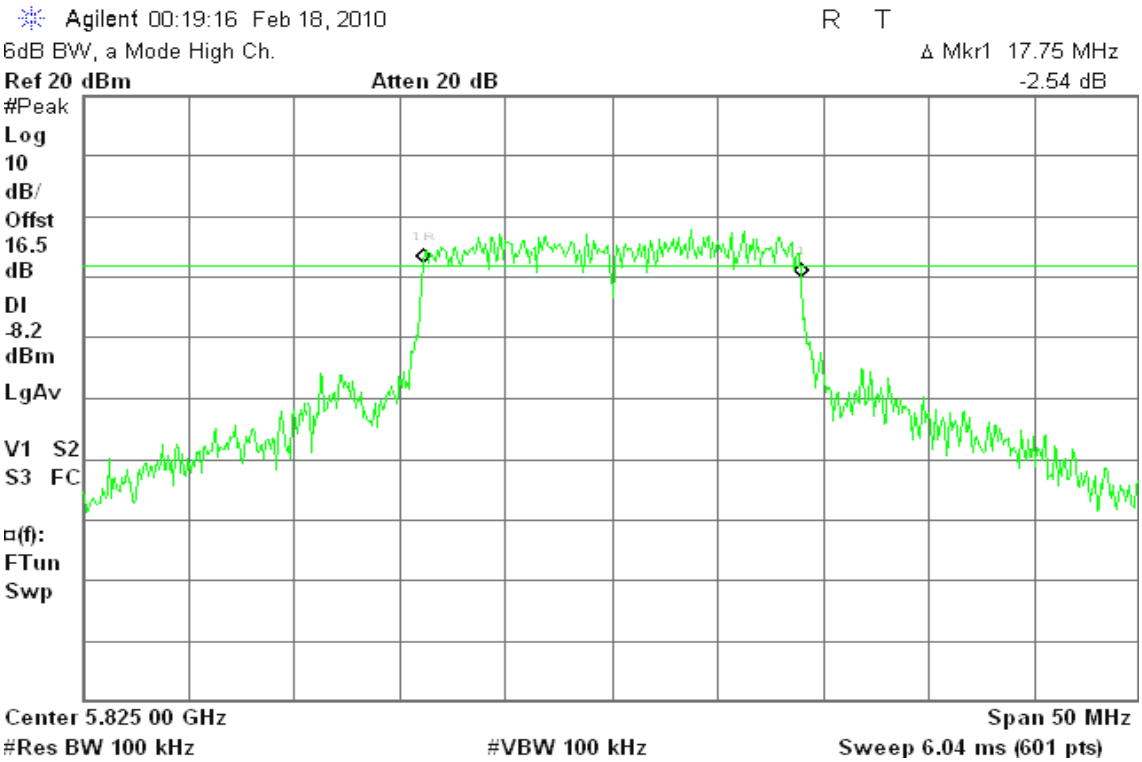
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

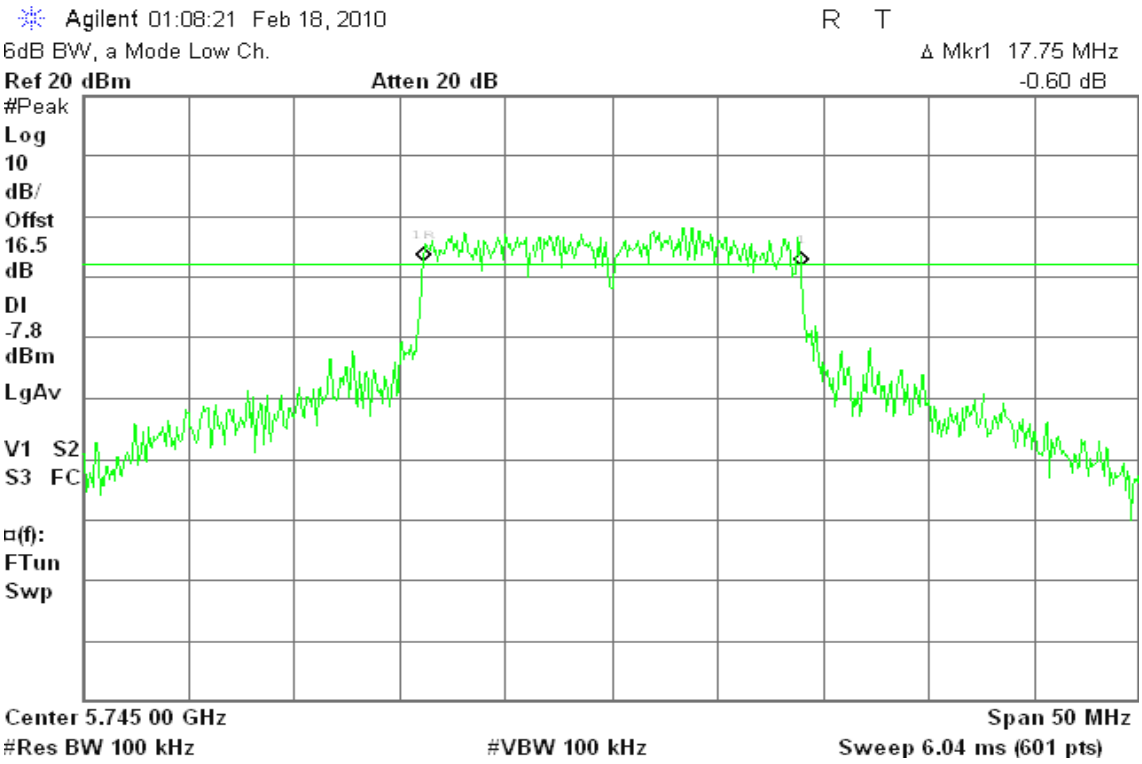


6dB Bandwidth (CH High)

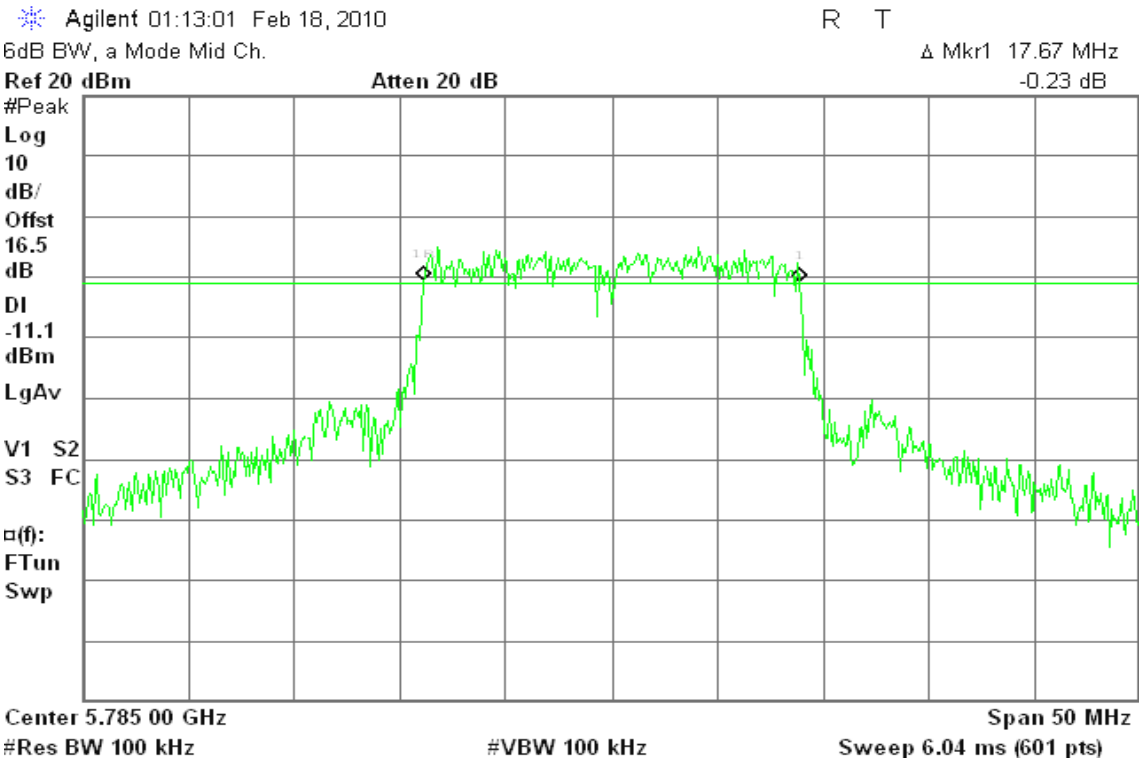


draft 802.11n Standard-20 MHz Channel mode / Chain 1

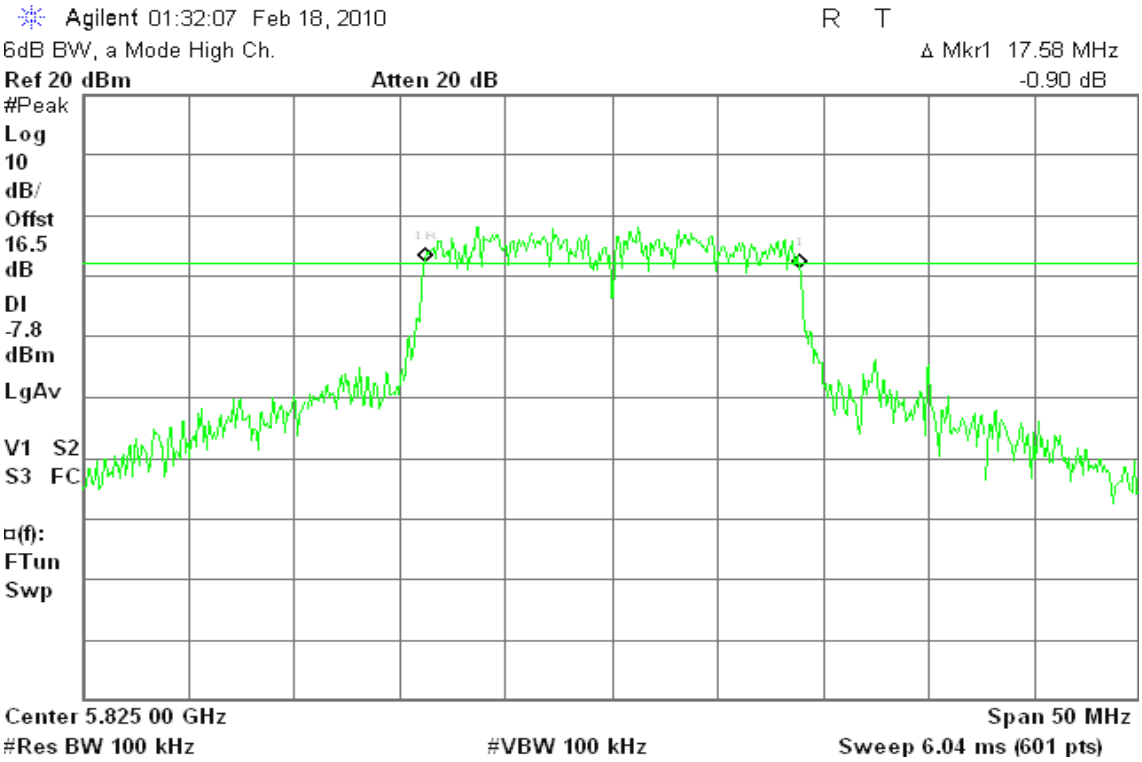
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

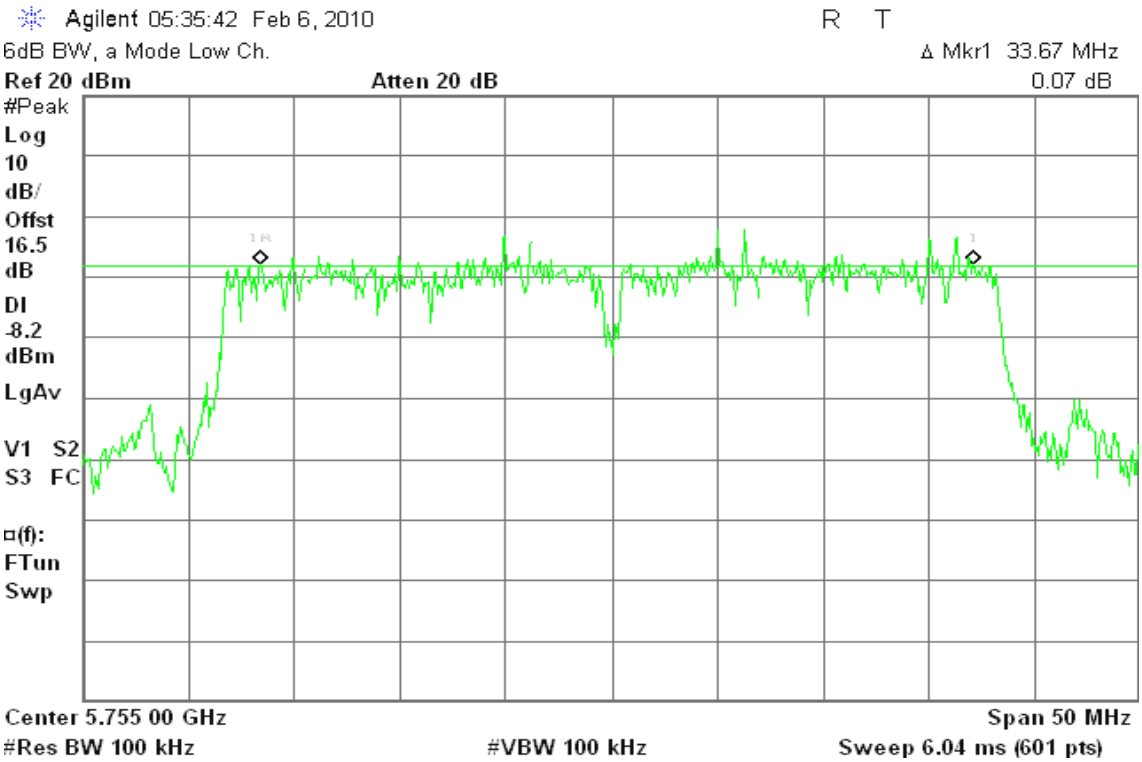


6dB Bandwidth (CH High)

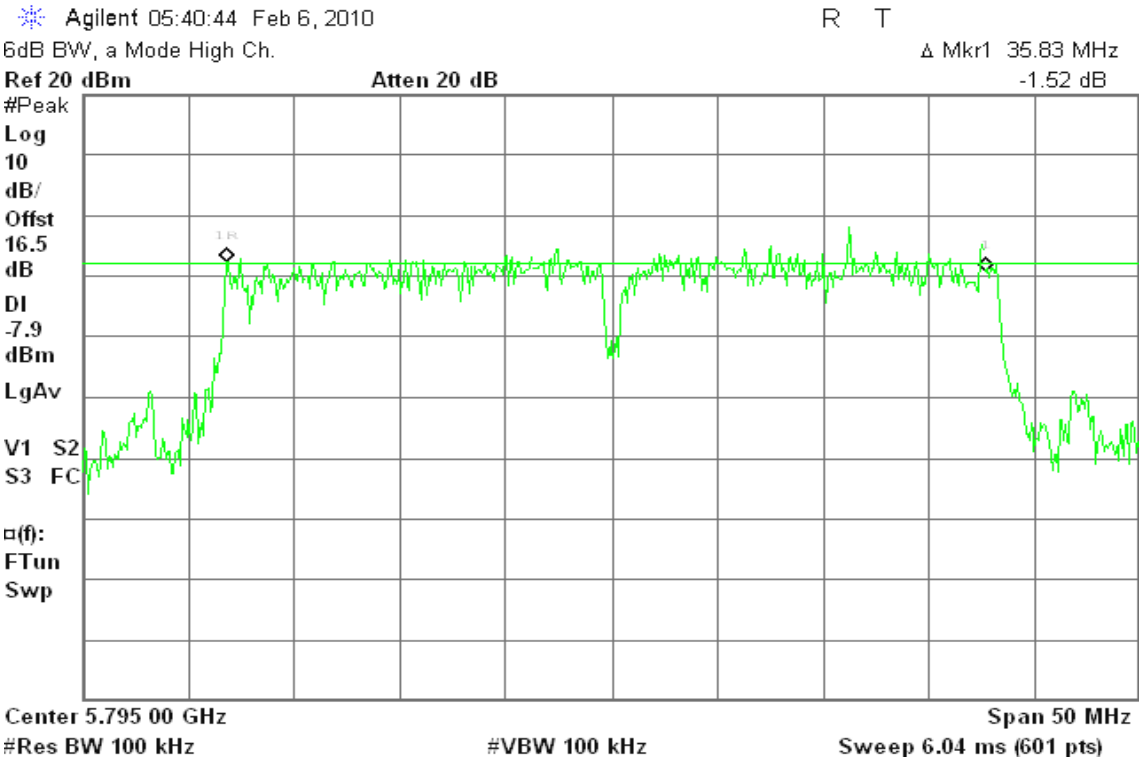


draft 802.11n Wide-40 MHz Channel mode / Chain 0

6dB Bandwidth (CH Low)

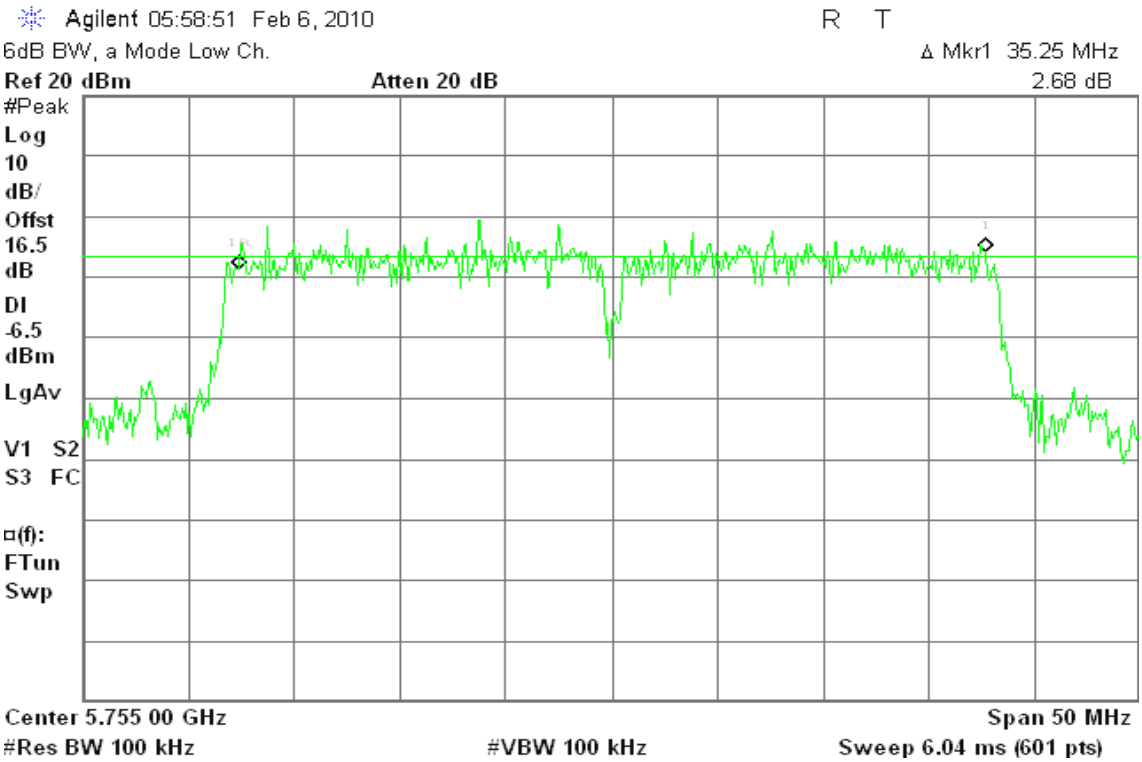


6dB Bandwidth (CH High)

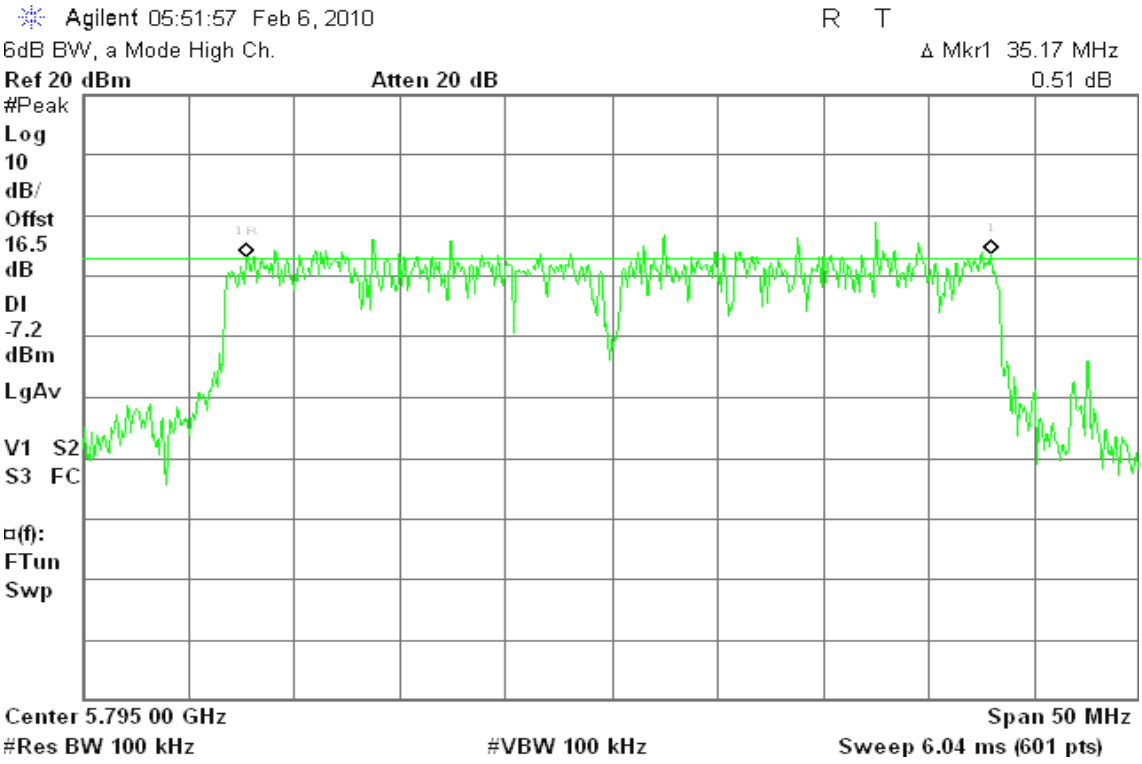


draft 802.11n Wide-40 MHz Channel mode / Chain 1

6dB Bandwidth (CH Low)



6dB Bandwidth (CH High)



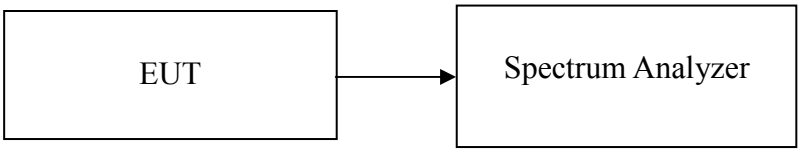
8.3 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3) & RSS-210 §A8.4(4), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Configuration



TEST PROCEDURE

1. Peak power is measured using the spectrum analyzer's internal channel power integration function.
2. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.98	0.0628	1.00	PASS
Mid	2437	19.26	0.0843		PASS
High	2462	19.13	0.0818		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	20.37	0.1089	1.00	PASS
Mid	2437	20.74	0.1186		PASS
High	2462	20.44	0.1107		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	17.99	16.50	20.32	0.1076	1.00	PASS
Mid	2437	18.07	17.17	20.65	0.1162		PASS
High	2462	17.85	17.14	20.52	0.1127		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2422	15.82	15.59	18.72	0.0744	1.00	PASS
Mid	2437	15.85	15.59	18.73	0.0747		PASS
High	2452	16.16	15.37	18.79	0.0757		PASS

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)*

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	5745	23.92	0.2466	1.00	PASS
Mid	5785	23.22	0.2099		PASS
High	5825	20.94	0.1242		PASS

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	5745	21.57	21.44	24.52	0.2829	1.00	PASS
Mid	5785	18.54	18.67	21.62	0.1451		PASS
High	5825	20.26	20.46	23.37	0.2173		PASS

Test mode: draft 802.11n Wide-40 MHz Channel mode

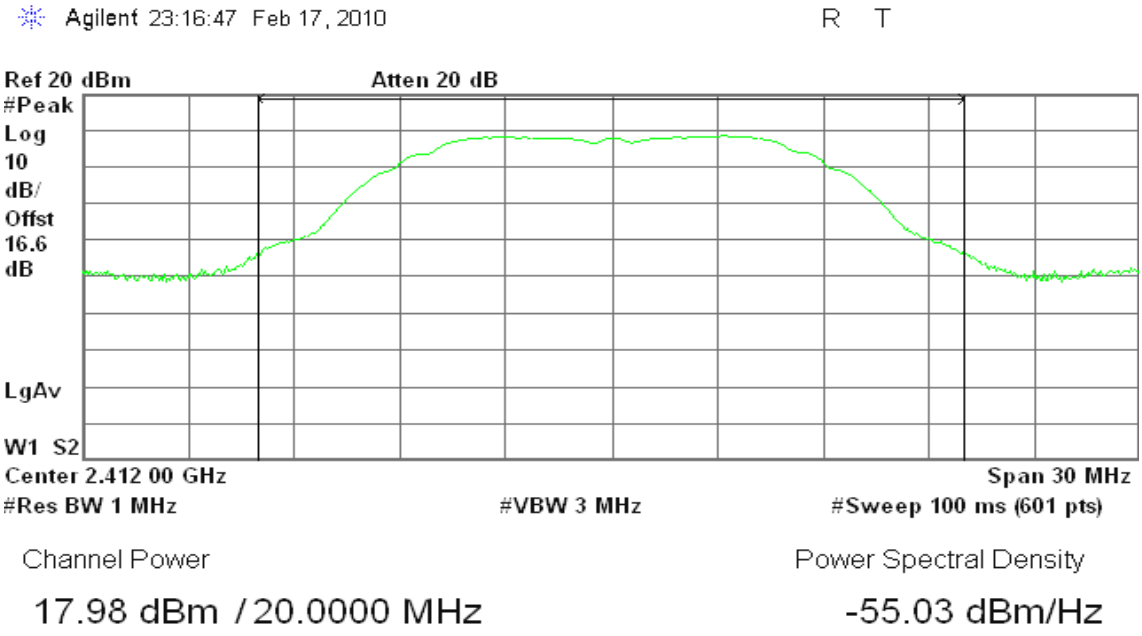
Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	5755	20.07	21.45	23.82	0.2413	1.00	PASS
High	5795	20.17	21.26	23.76	0.2377		PASS

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)*

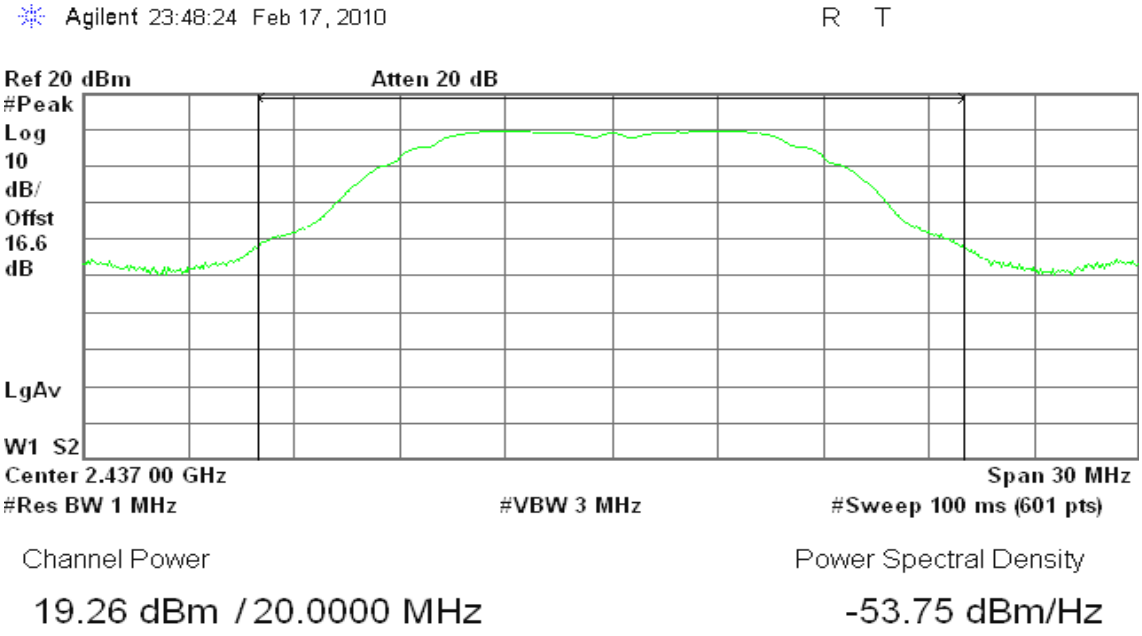
Test Plot

IEEE 802.11b mode

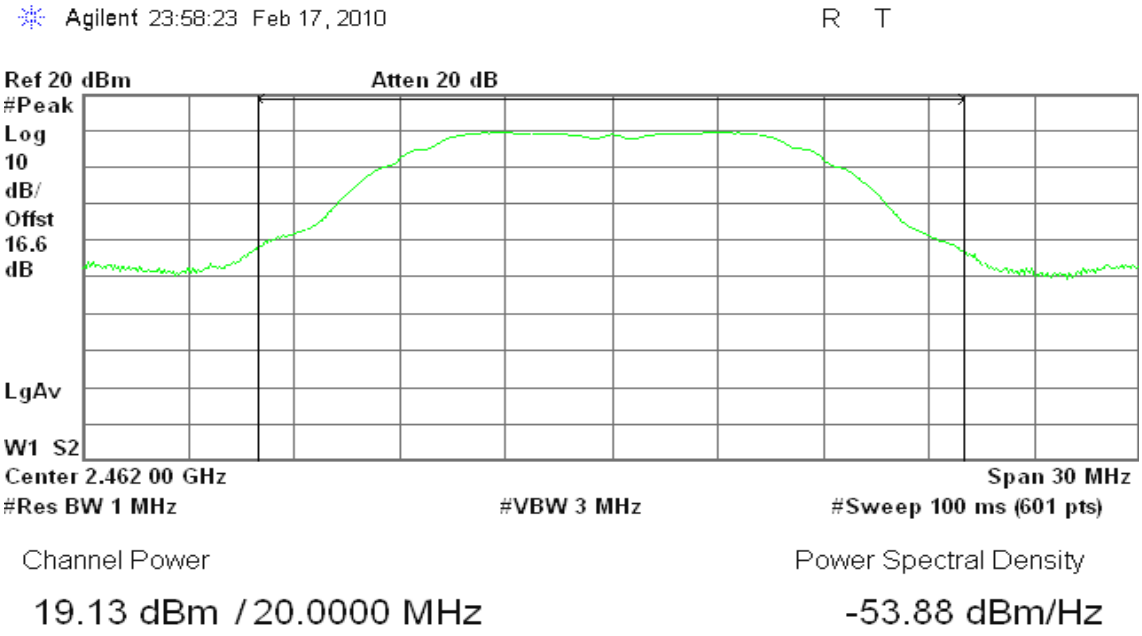
Peak Power (CH Low)



Peak Power (CH Mid)

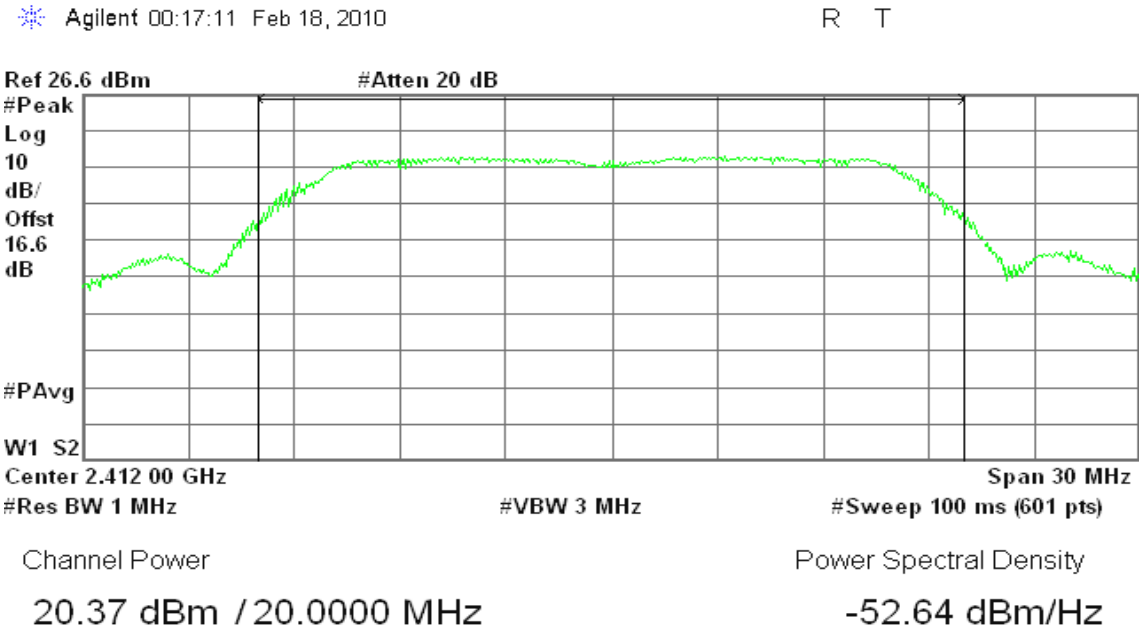


Peak Power (CH High)

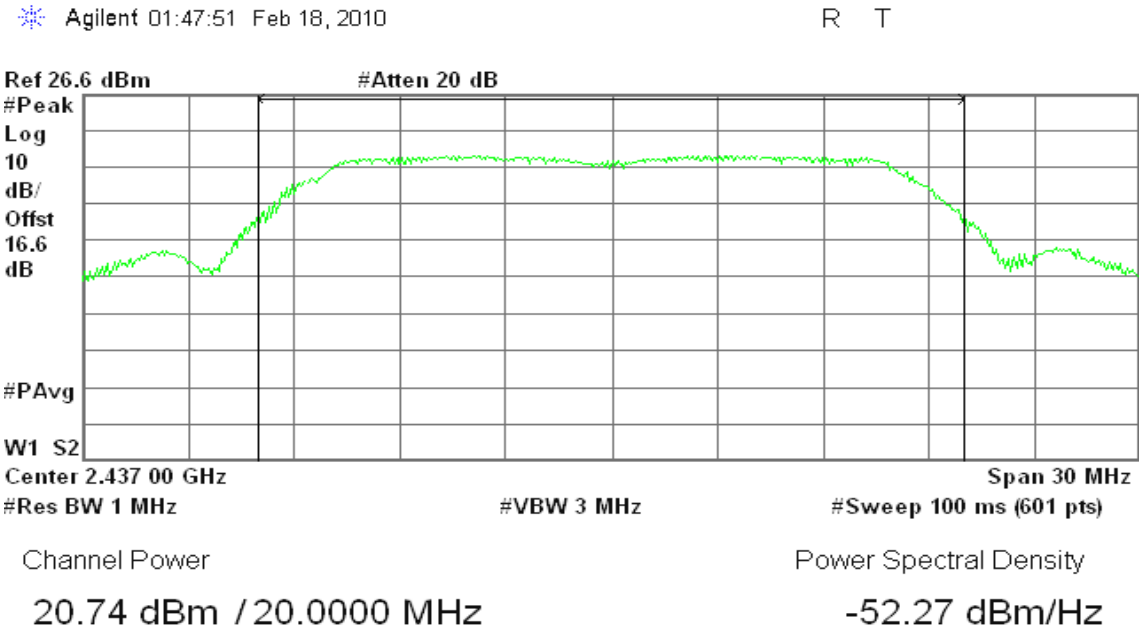


IEEE 802.11g mode

Peak Power (CH Low)



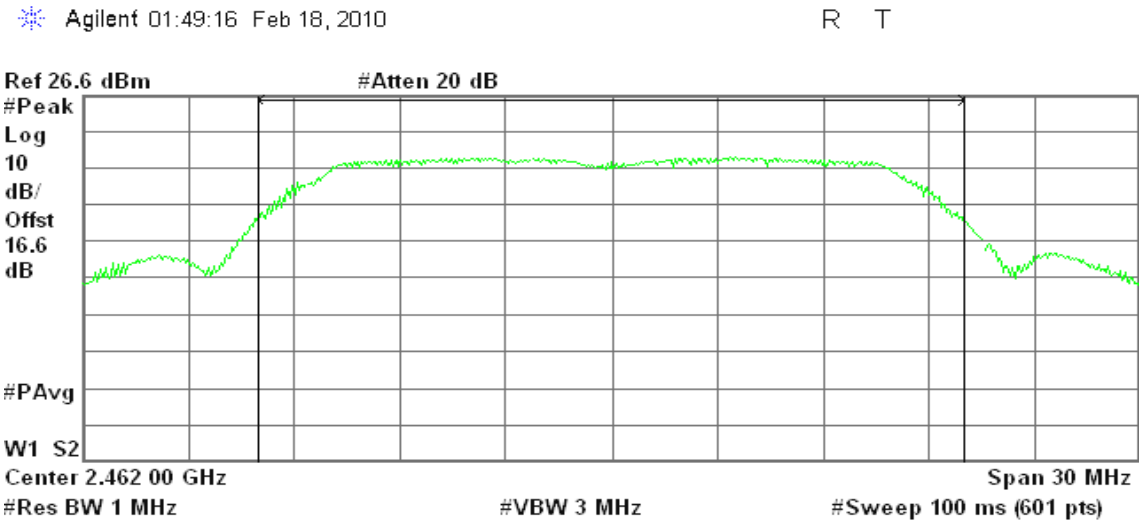
Peak Power (CH Mid)



Channel Power
20.74 dBm / 20.0000 MHz

Power Spectral Density
-52.27 dBm/Hz

Peak Power (CH High)

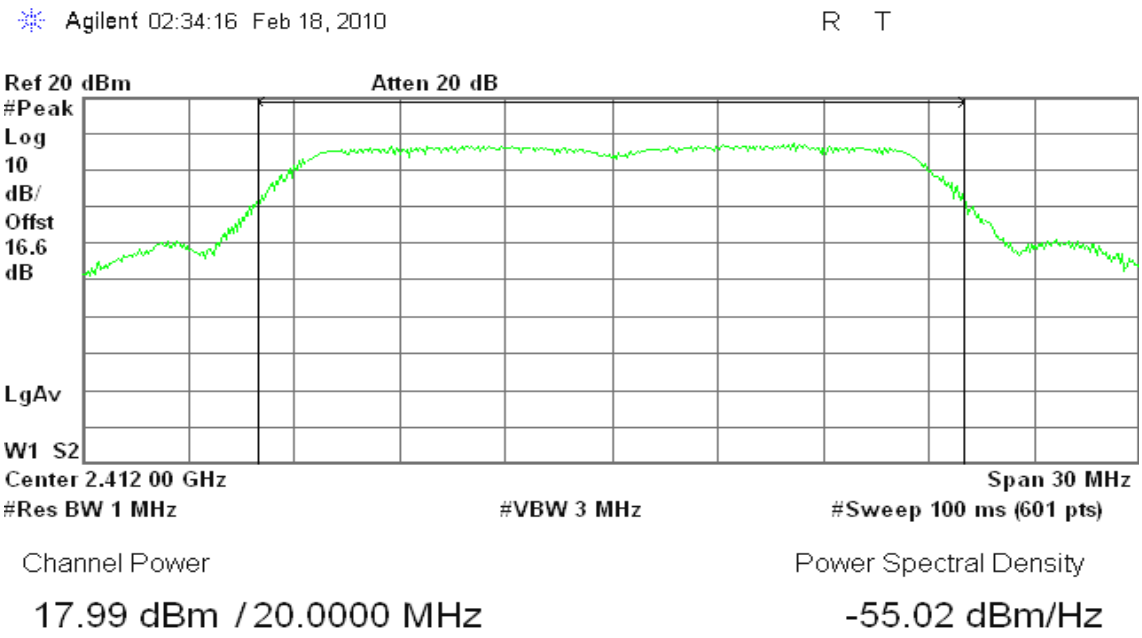


Channel Power
20.44 dBm / 20.0000 MHz

Power Spectral Density
-52.57 dBm/Hz

draft 802.11n Standard-20 MHz Channel mode / Chain 0

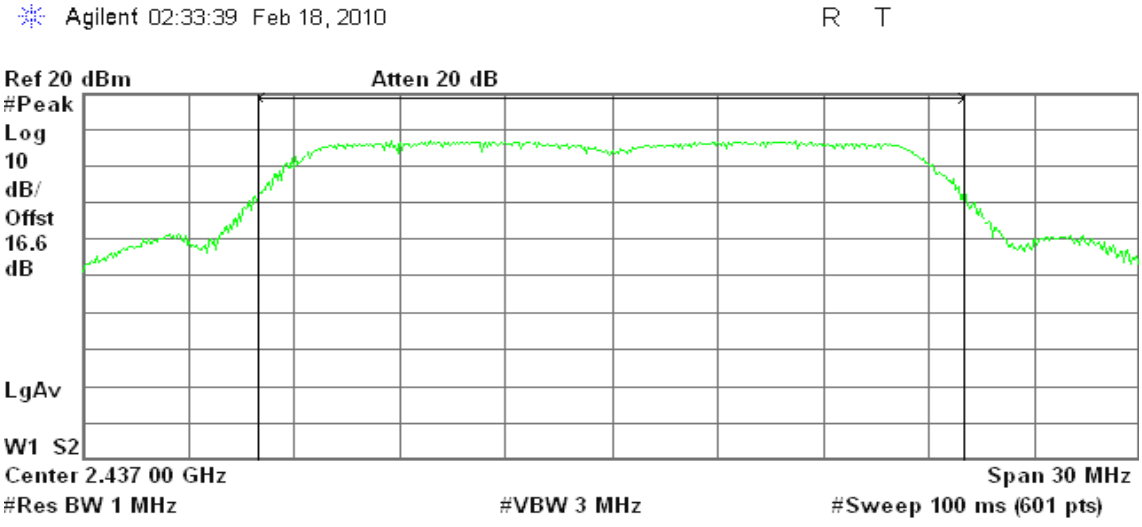
Peak Power (CH Low)



Channel Power
17.99 dBm / 20.0000 MHz

Power Spectral Density
-55.02 dBm/Hz

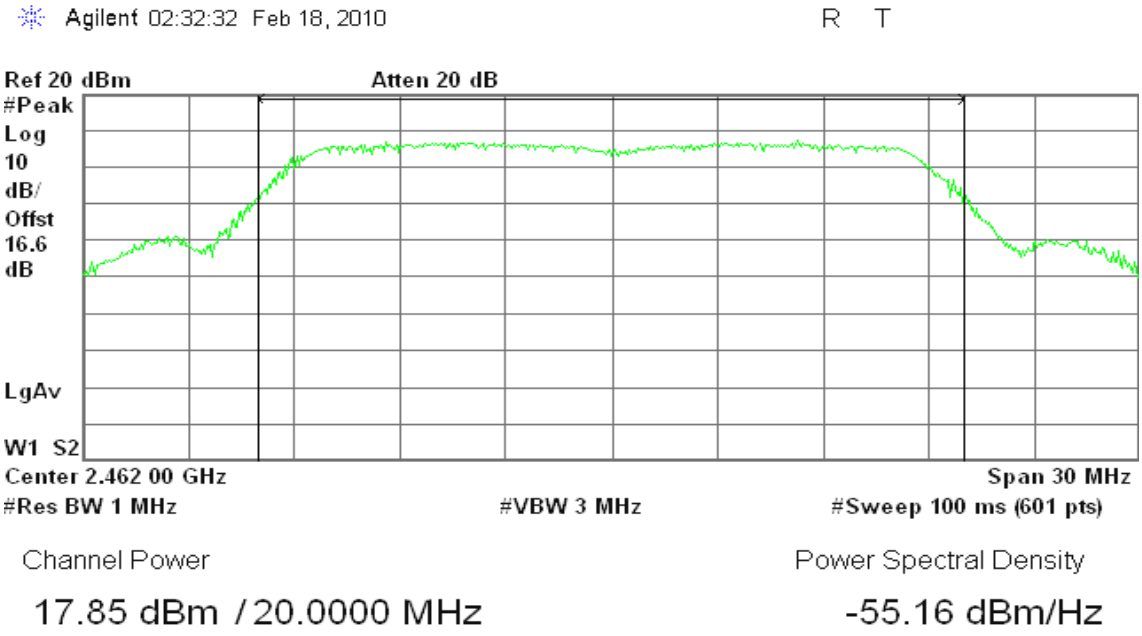
Peak Power (CH Mid)



Channel Power
18.07 dBm / 20.0000 MHz

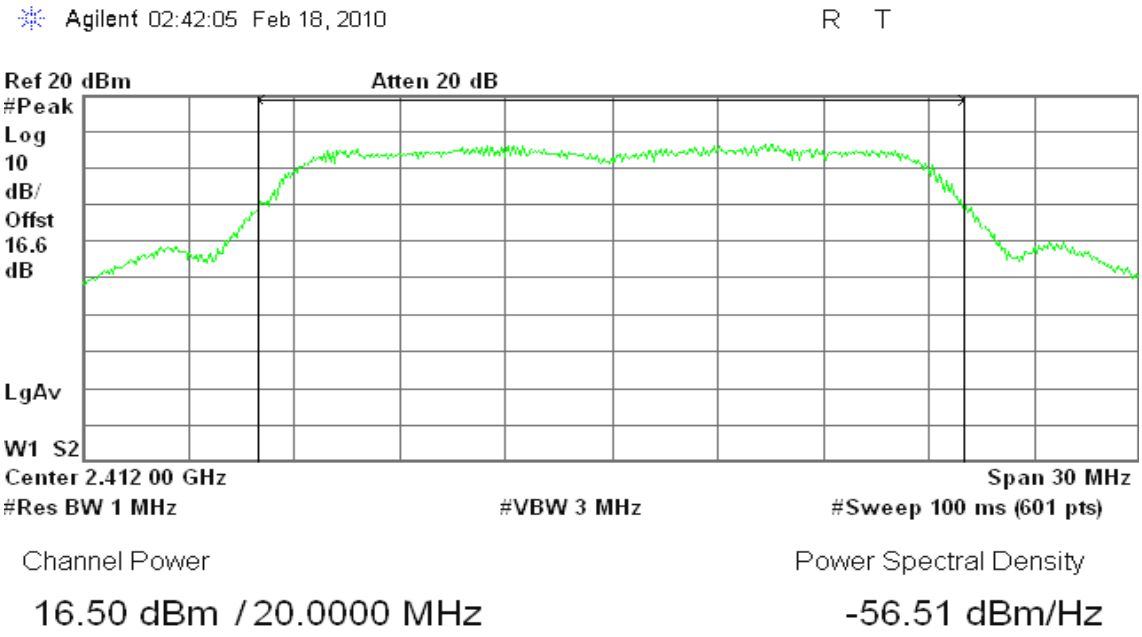
Power Spectral Density
-54.94 dBm/Hz

Peak Power (CH High)

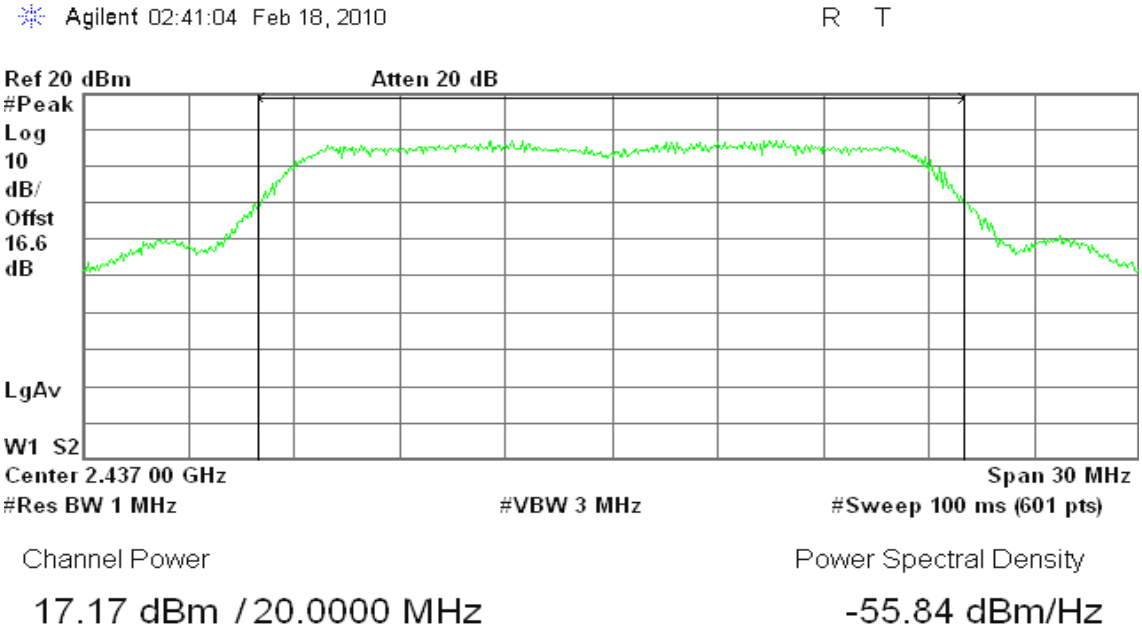


draft 802.11n Standard-20 MHz Channel mode / Chain 1

Peak Power (CH Low)



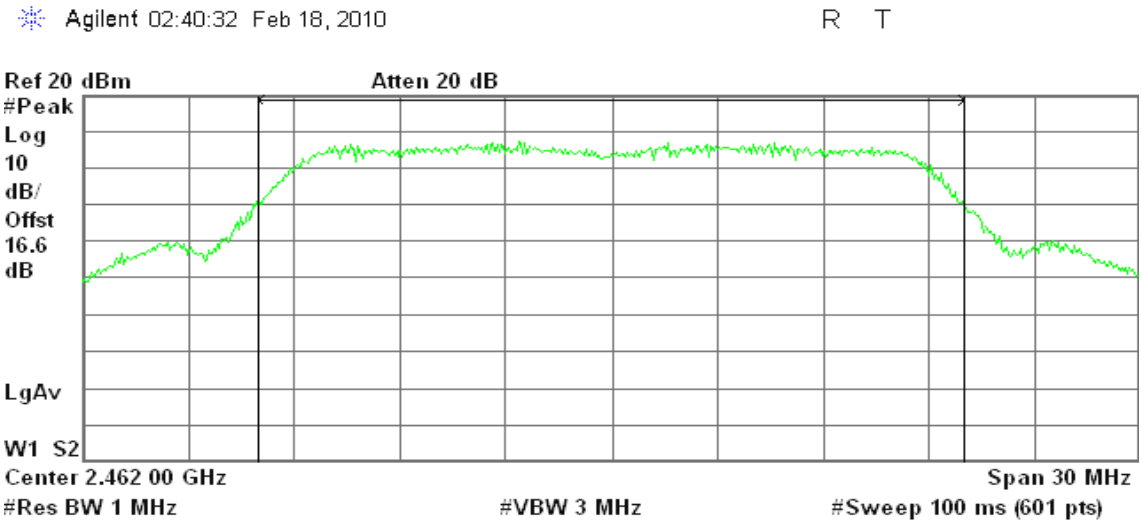
Peak Power (CH Mid)



Channel Power
17.17 dBm / 20.0000 MHz

Power Spectral Density
-55.84 dBm/Hz

Peak Power (CH High)

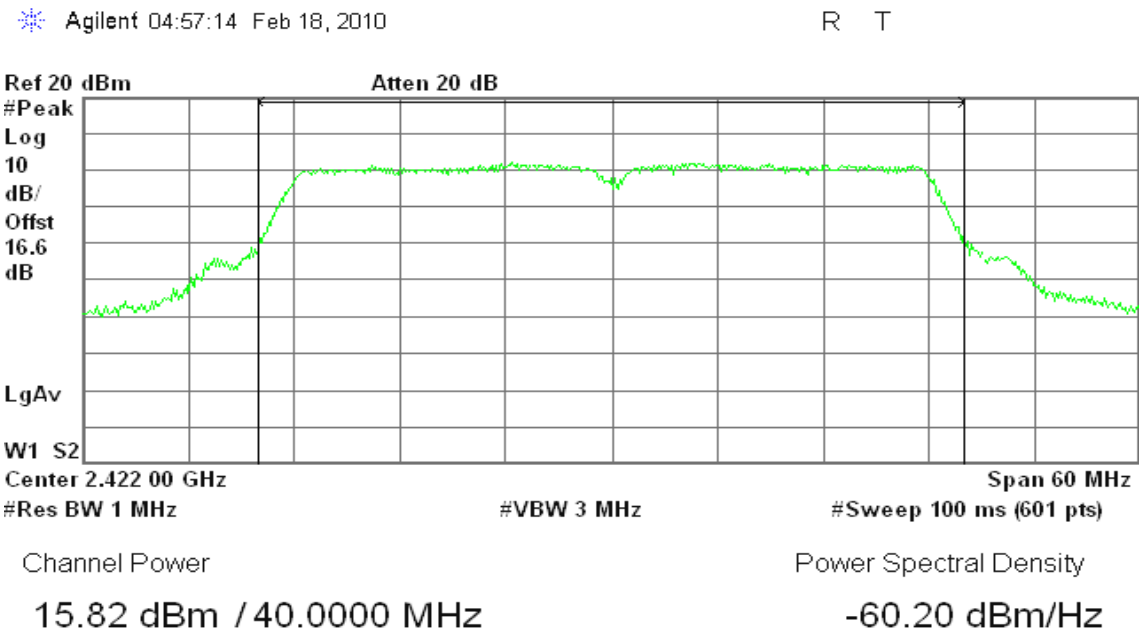


Channel Power
17.14 dBm / 20.0000 MHz

Power Spectral Density
-55.87 dBm/Hz

draft 802.11n Wide-40 MHz Channel mode / Chain 0

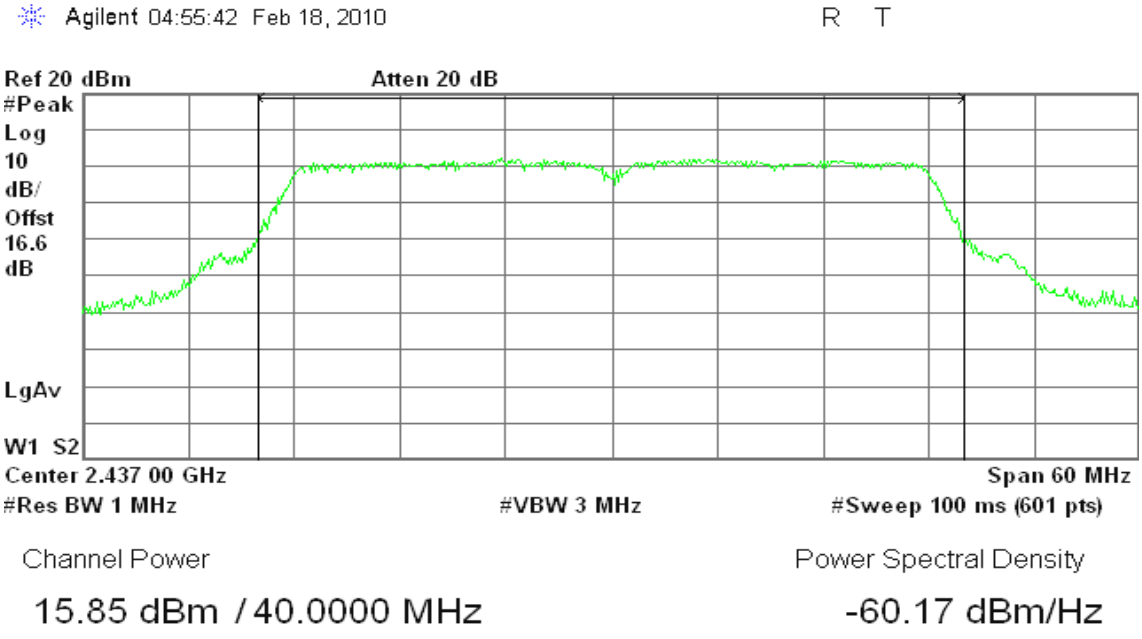
Peak Power (CH Low)



Channel Power
15.82 dBm / 40.0000 MHz

Power Spectral Density
-60.20 dBm/Hz

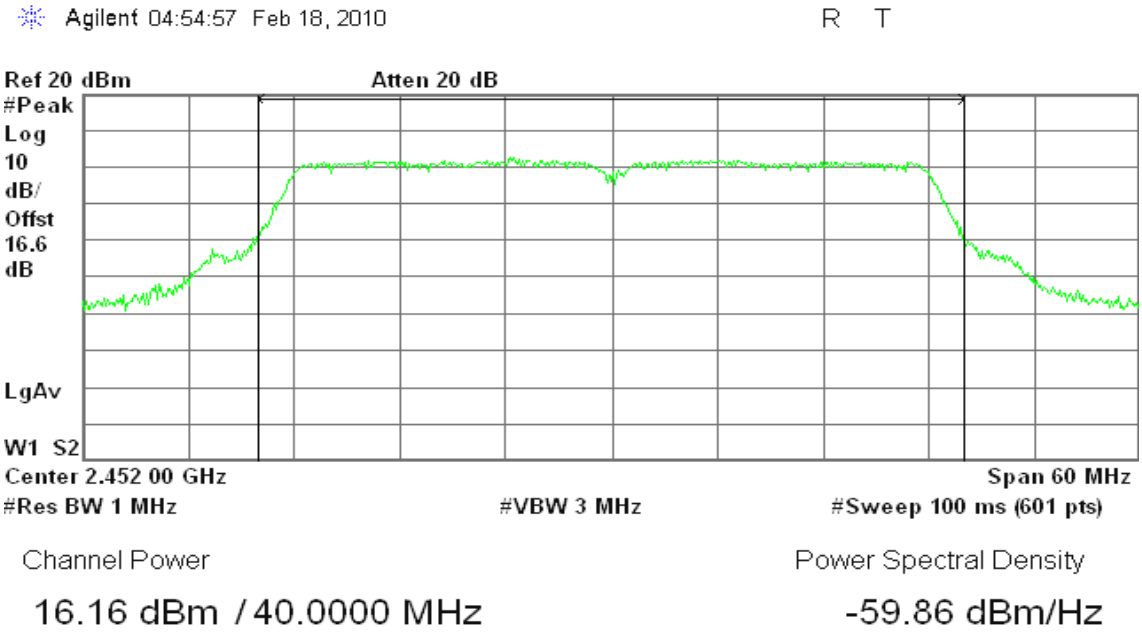
Peak Power (CH Mid)



Channel Power
15.85 dBm / 40.0000 MHz

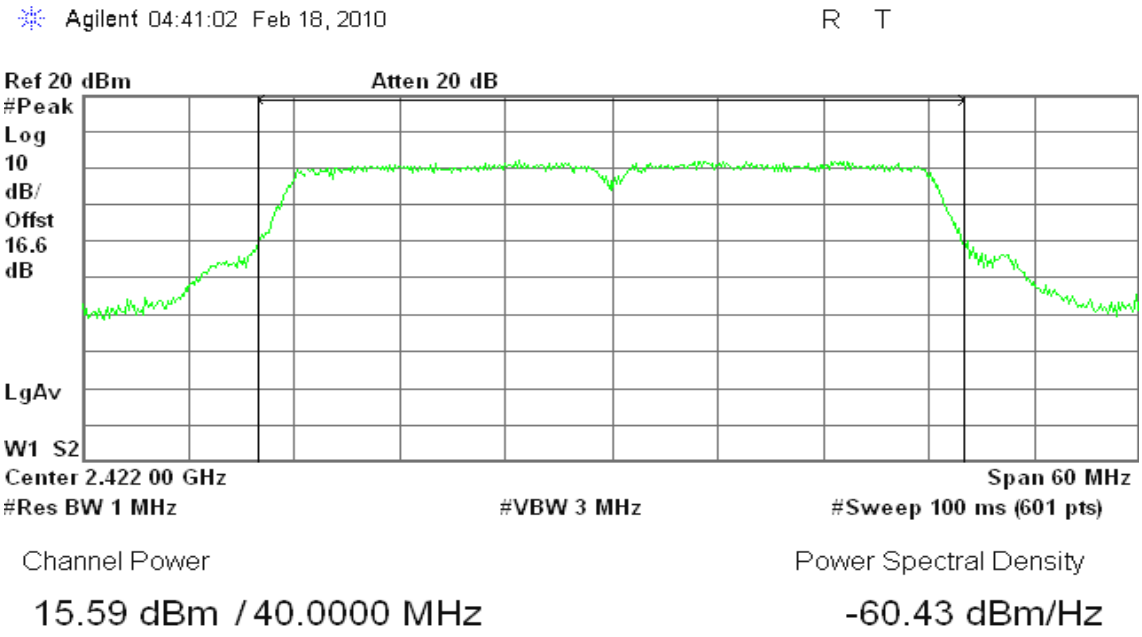
Power Spectral Density
-60.17 dBm/Hz

Peak Power (CH High)

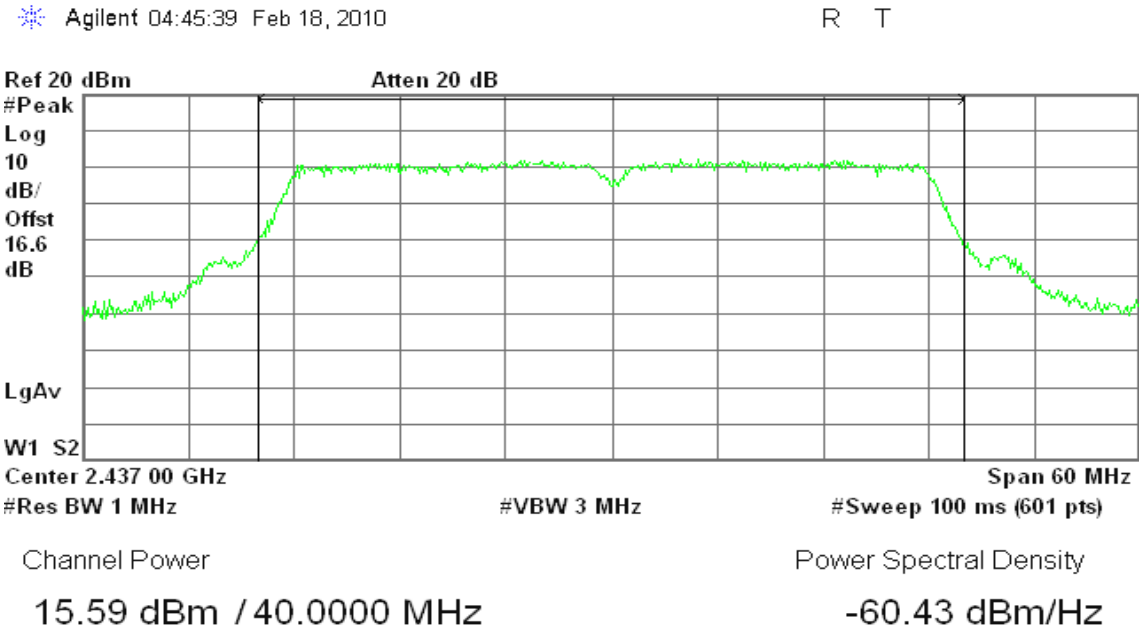


draft 802.11n Wide-40 MHz Channel mode / Chain 1

Peak Power (CH Low)



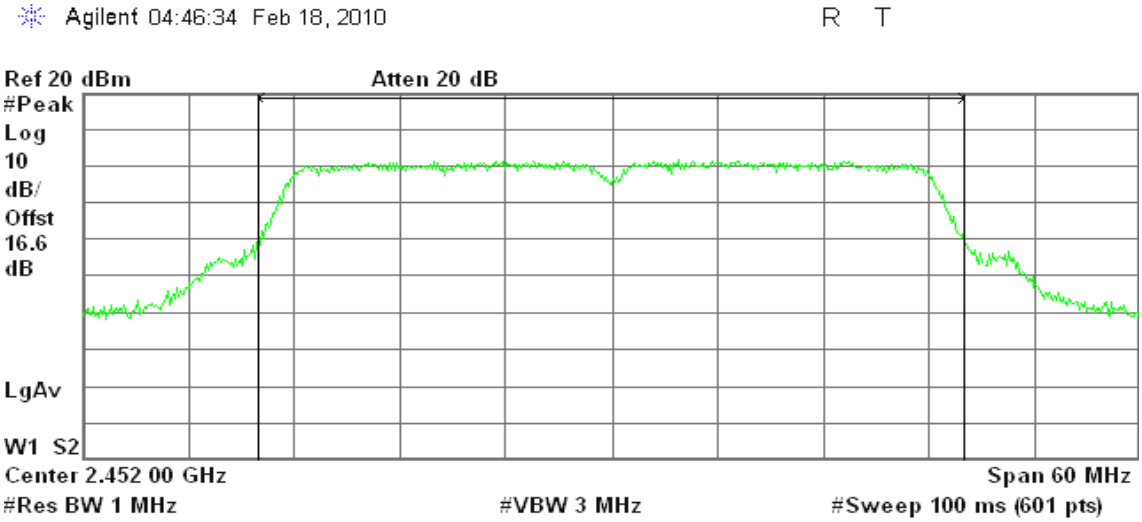
Peak Power (CH Mid)



Channel Power
15.59 dBm / 40.0000 MHz

Power Spectral Density
-60.43 dBm/Hz

Peak Power (CH High)

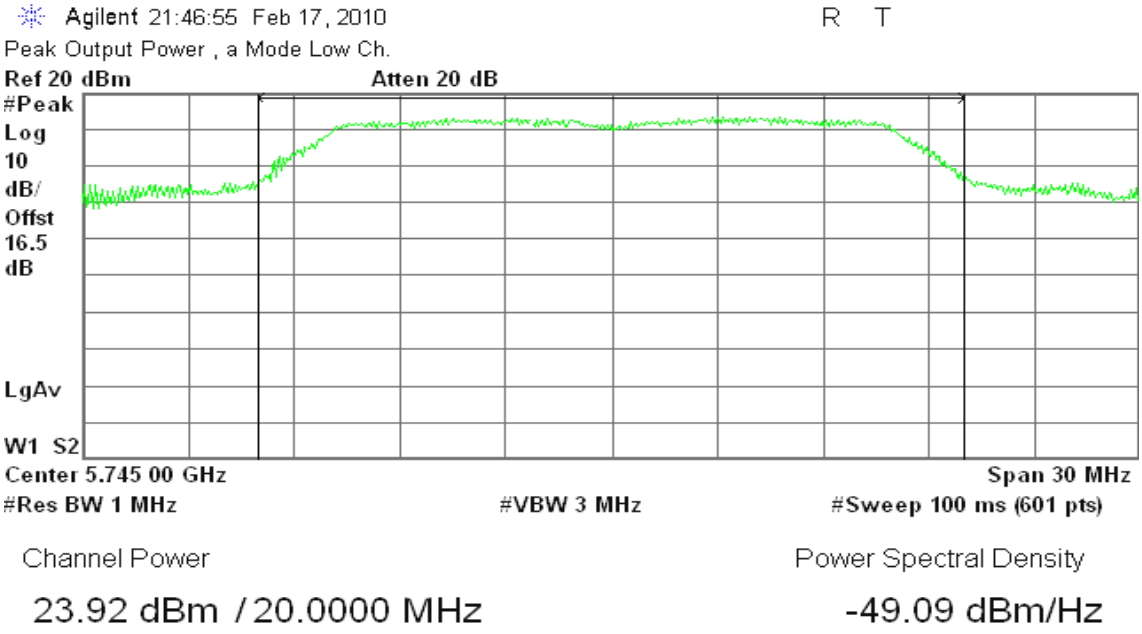


Channel Power
15.37 dBm / 40.0000 MHz

Power Spectral Density
-60.65 dBm/Hz

IEEE 802.11a mode:

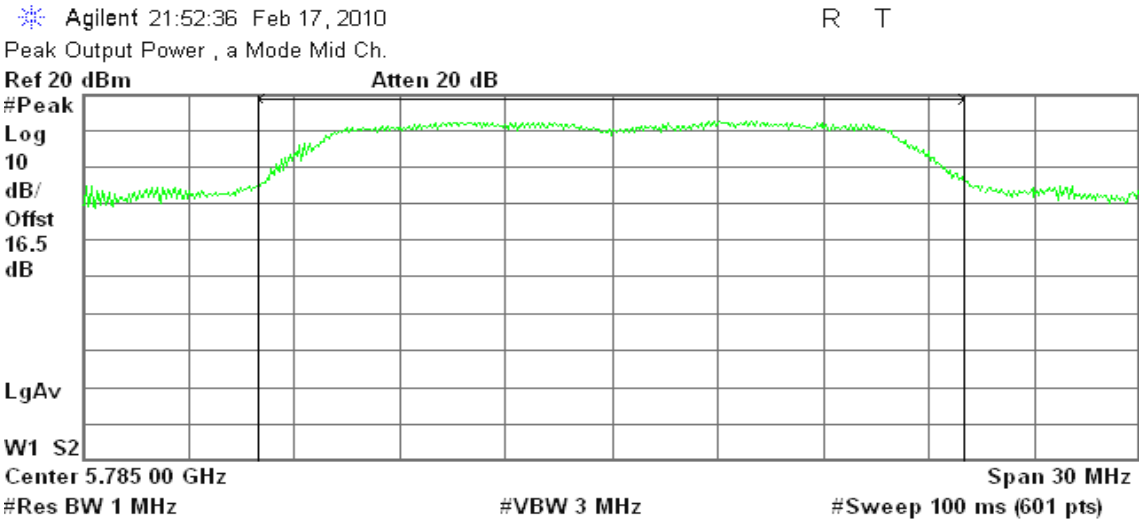
CH Low



Channel Power
23.92 dBm / 20.0000 MHz

Power Spectral Density
-49.09 dBm/Hz

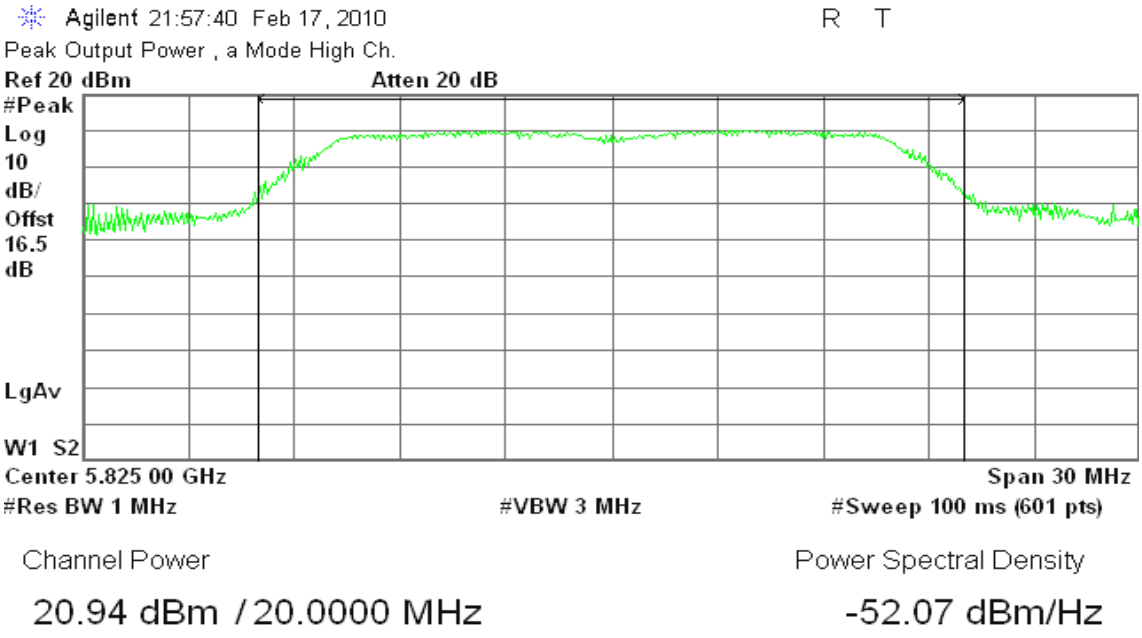
CH Mid



Channel Power
23.22 dBm / 20.0000 MHz

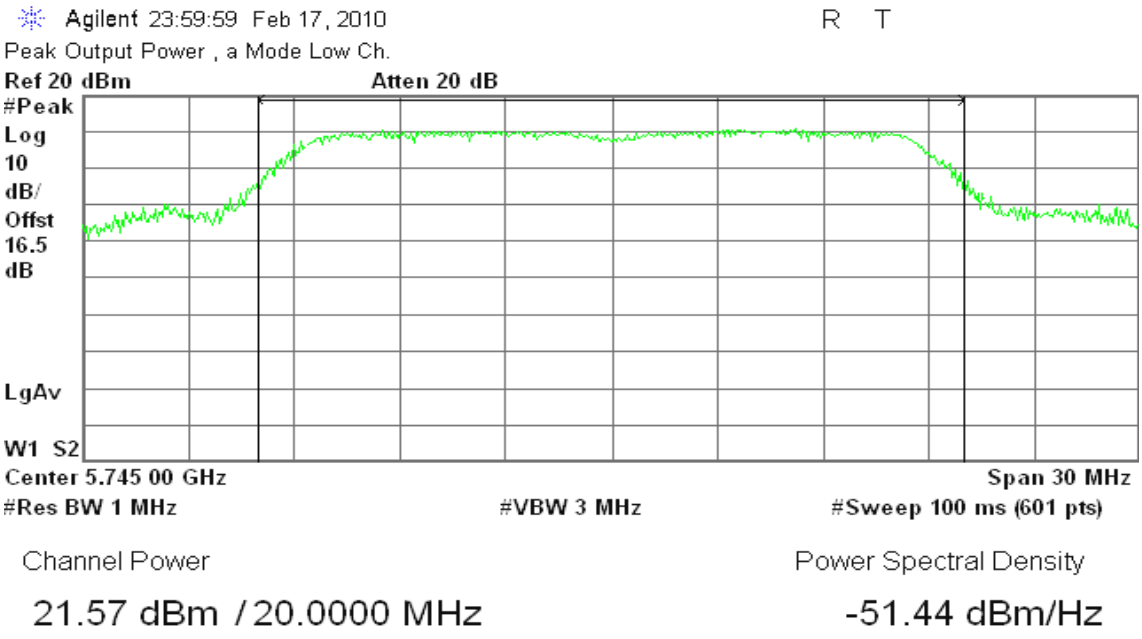
Power Spectral Density
-49.79 dBm/Hz

CH High

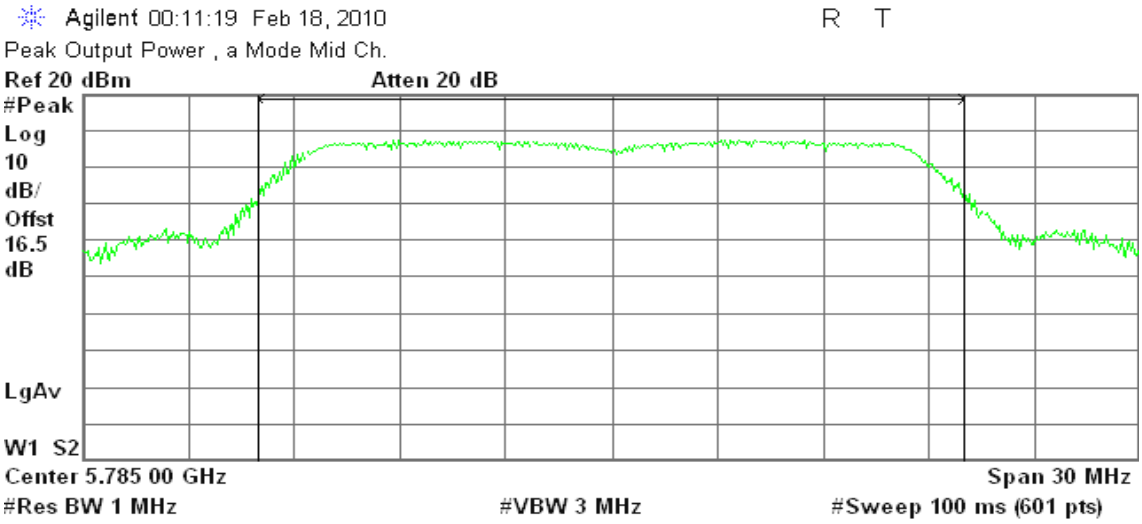


draft 802.11n Standard-20 MHz Channel mode / Chain 0

Peak Power (CH Low)



Peak Power (CH Mid)



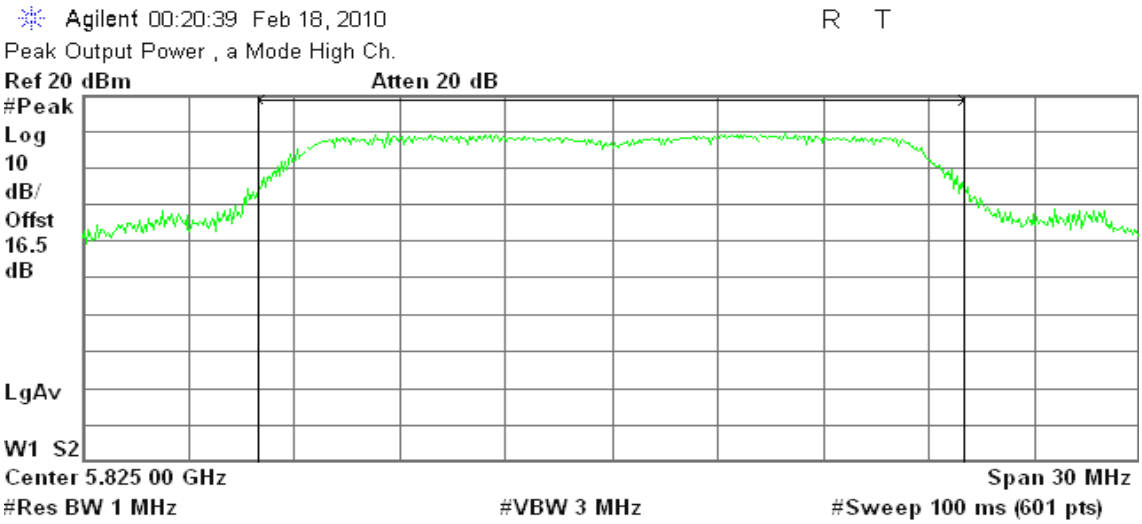
Channel Power

18.54 dBm / 20.0000 MHz

Power Spectral Density

-54.47 dBm/Hz

Peak Power (CH High)



Channel Power

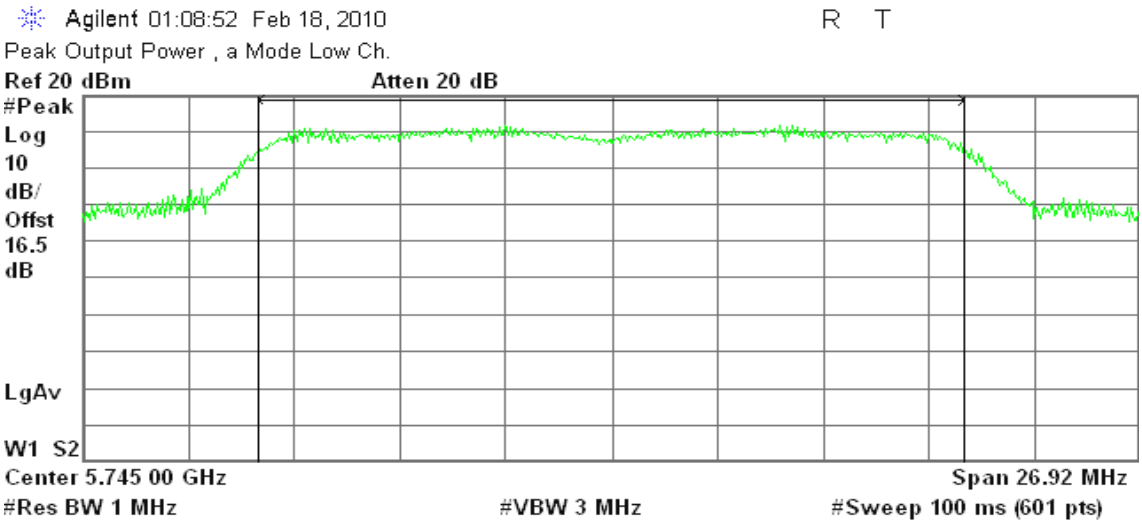
20.26 dBm / 20.0000 MHz

Power Spectral Density

-52.75 dBm/Hz

draft 802.11n Standard-20 MHz Channel mode / Chain 1

Peak Power (CH Low)



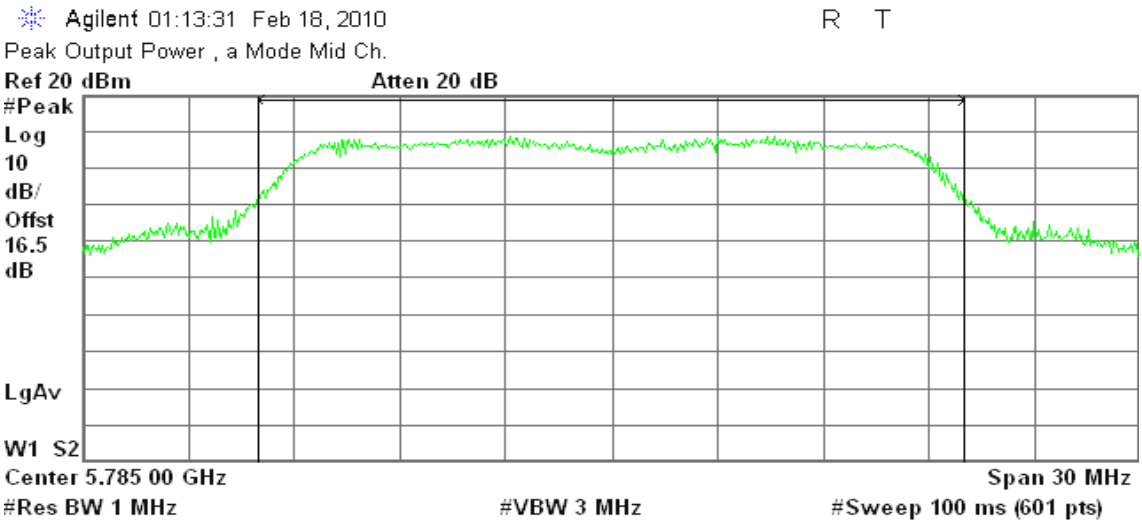
Channel Power

21.44 dBm / 17.9470 MHz

Power Spectral Density

-51.10 dBm/Hz

Peak Power (CH Mid)



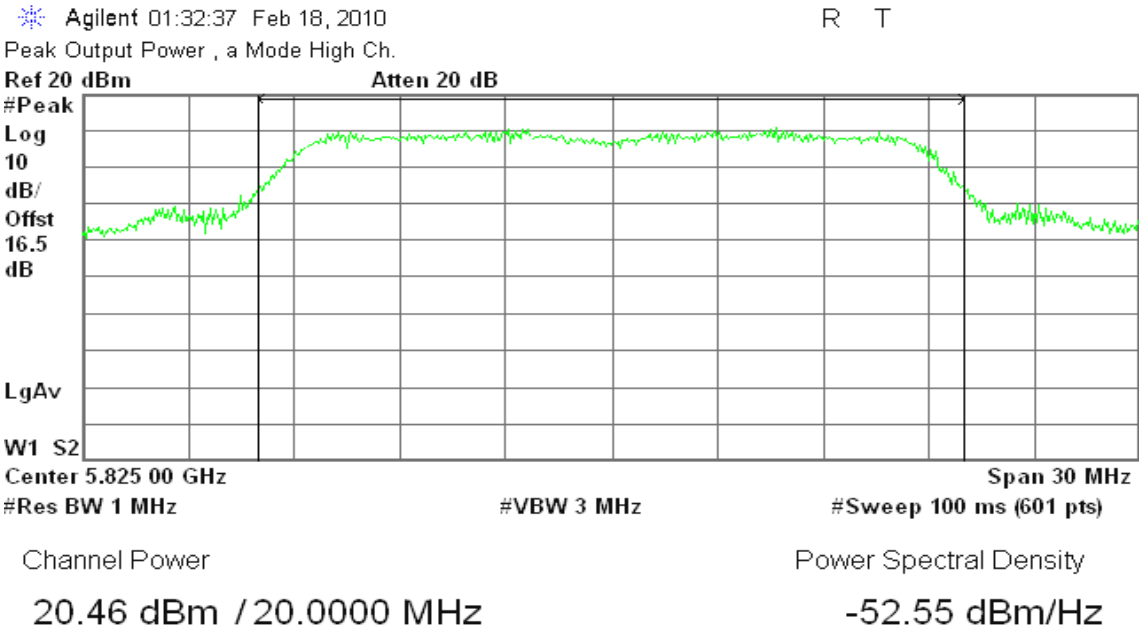
Channel Power

18.67 dBm / 20.0000 MHz

Power Spectral Density

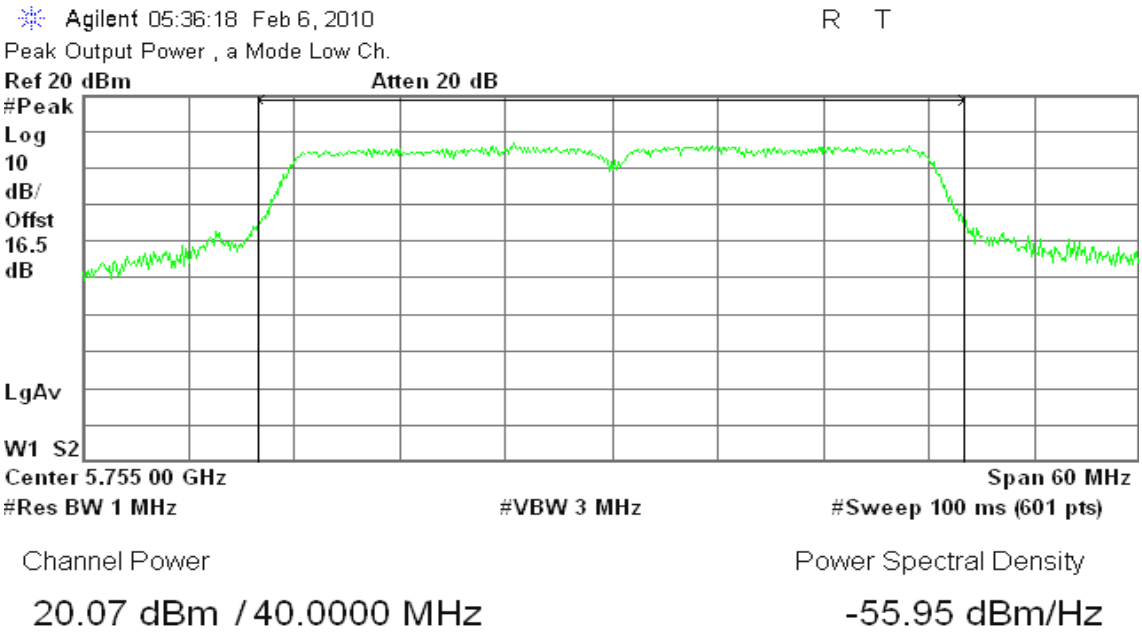
-54.34 dBm/Hz

Peak Power (CH High)

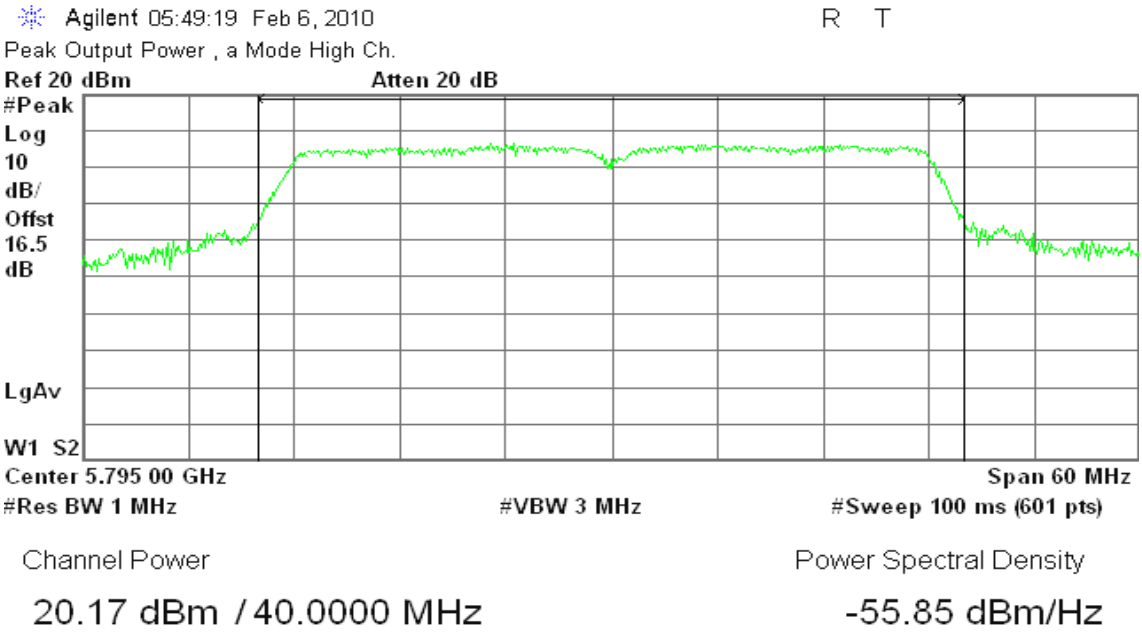


draft 802.11n Wide-40 MHz Channel mode / Chain 0

Peak Power (CH Low)

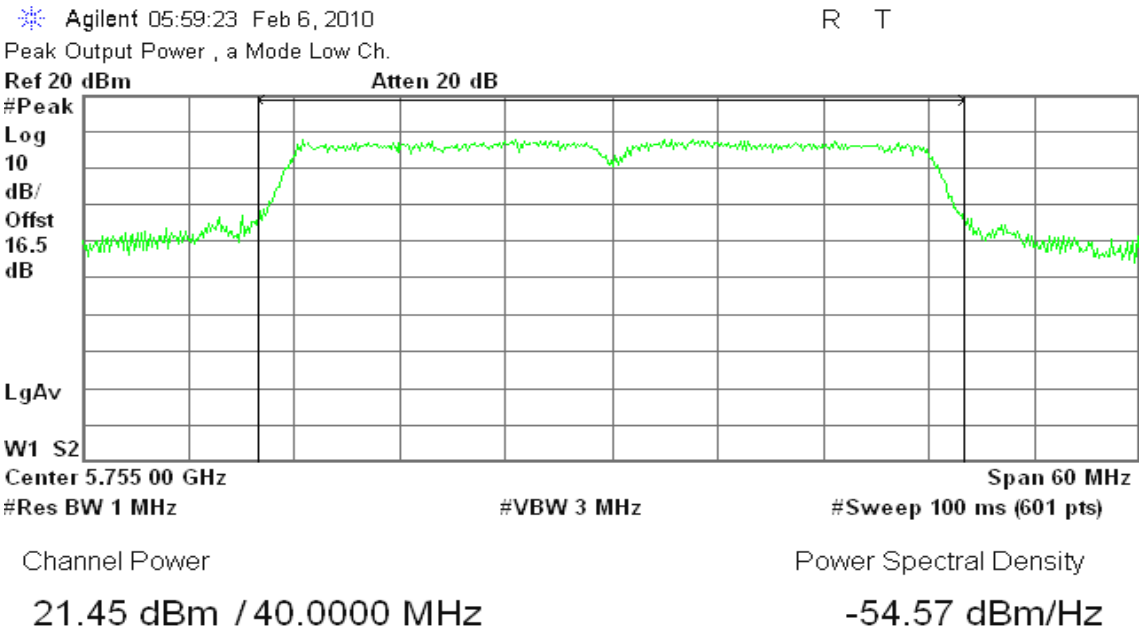


Peak Power (CH High)

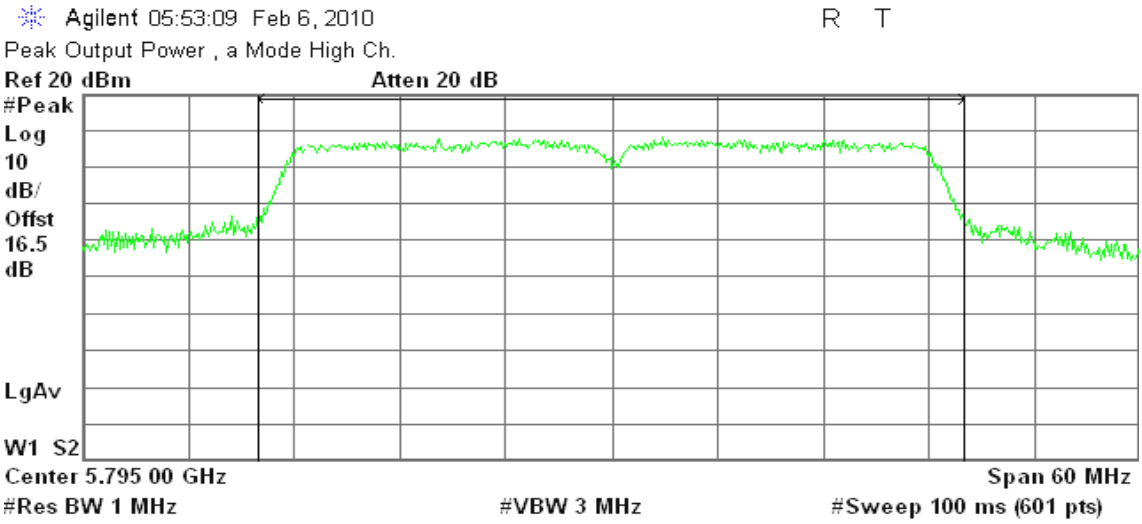


draft 802.11n Wide-40 MHz Channel mode / Chain 1

Peak Power (CH Low)



Peak Power (CH High)



Channel Power

21.26 dBm / 40.0000 MHz

Power Spectral Density

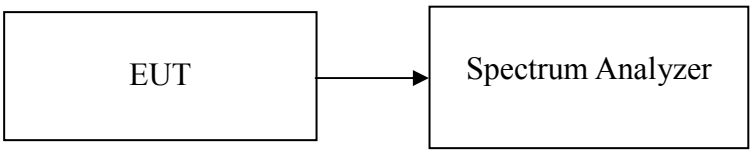
-54.76 dBm/Hz

8.4 AVERAGE POWER

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the average power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.84	0.0305
Mid	2437	16.13	0.0410
High	2462	16.12	0.0409

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	12.89	0.0195
Mid	2437	13.09	0.0204
High	2462	12.63	0.0183

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Low	2412	10.09	8.62	12.43	0.0175
Mid	2437	10.87	9.03	13.06	0.0202
High	2462	10.65	9.02	12.92	0.0196

Test mode: draft 802.11n Wide-40 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Low	2422	7.92	7.36	10.66	0.0116
Mid	2437	8.02	7.60	10.83	0.0121
High	2452	8.04	7.21	10.66	0.0116

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)*

Test mode: IEEE 802.11a mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	15.99	0.0397
Mid	5785	15.72	0.0373
High	5825	13.04	0.0201

Test mode: draft 802.11n Standard-20 MHz Channel mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Low	5745	13.79	13.54	16.68	0.0465
Mid	5785	10.52	10.15	13.35	0.0216
High	5825	12.11	12.15	15.14	0.0327

Test mode: draft 802.11n Wide-40 MHz Channel mode

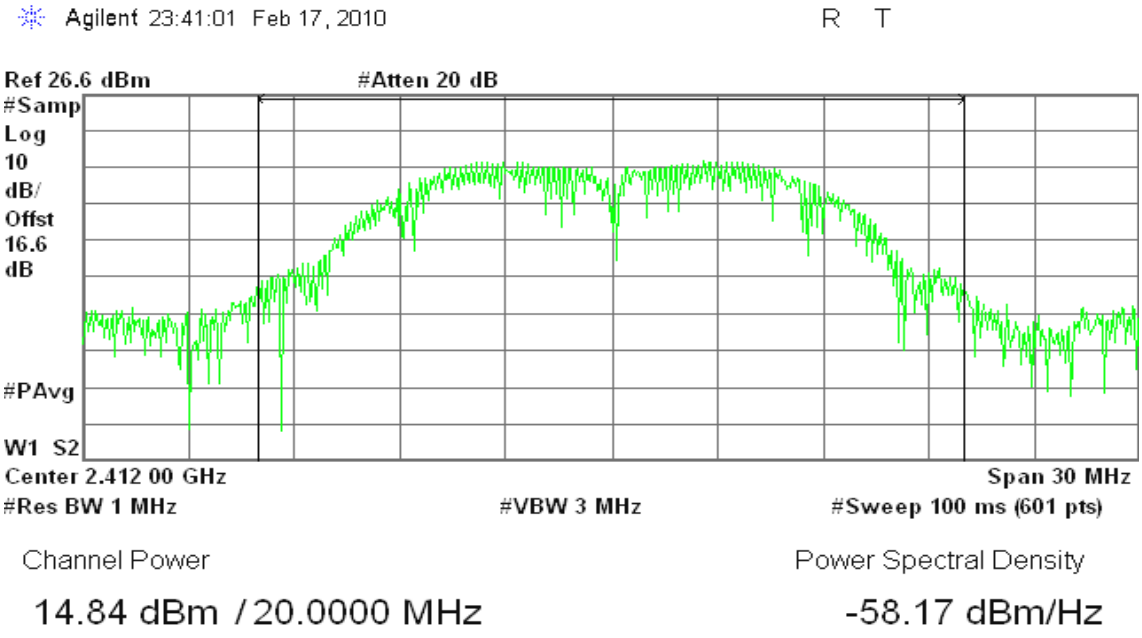
Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Output Power (dBm)	Output Power (W)
Low	5755	11.93	13.28	15.67	0.0369
High	5795	12.22	13.23	15.76	0.0377

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)*

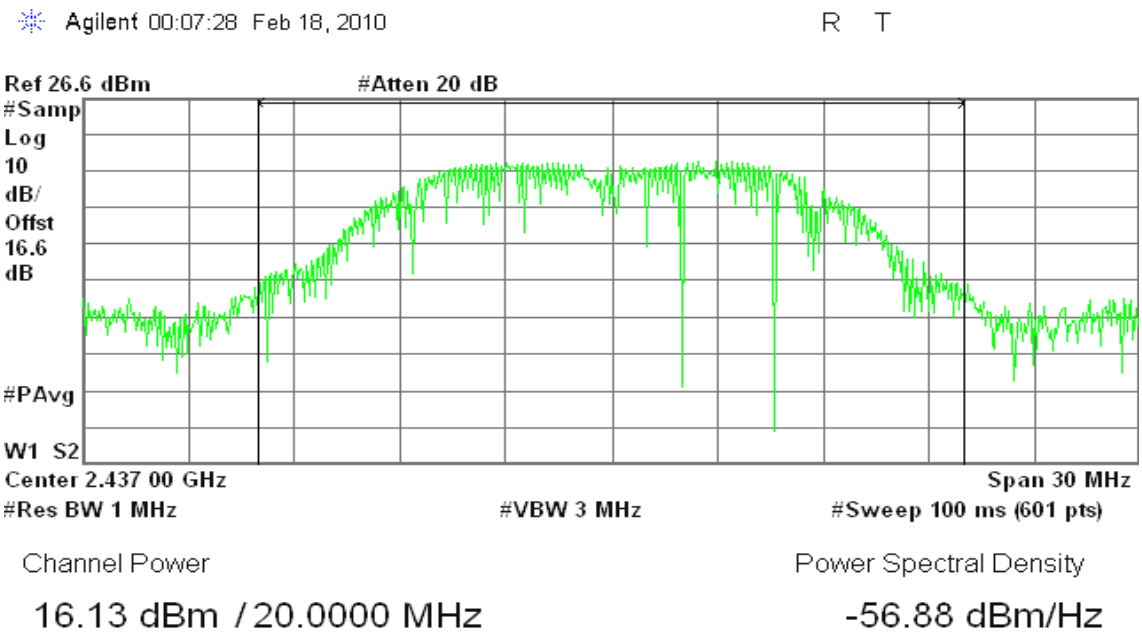
Test Plot

IEEE 802.11b mode

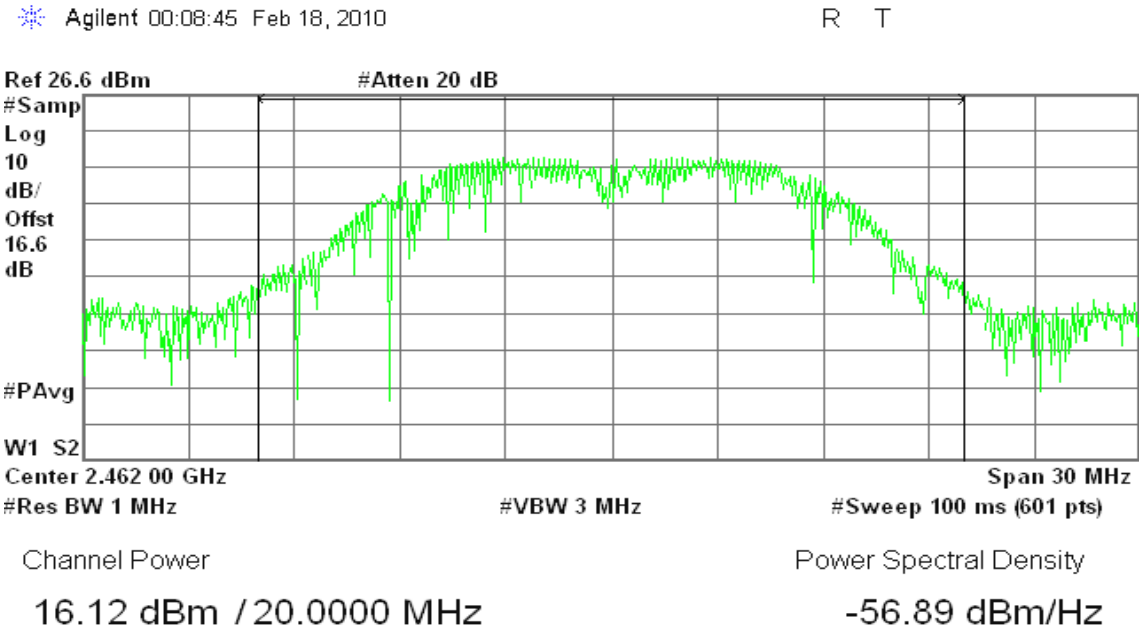
Average Power (CH Low)



Average Power (CH Mid)

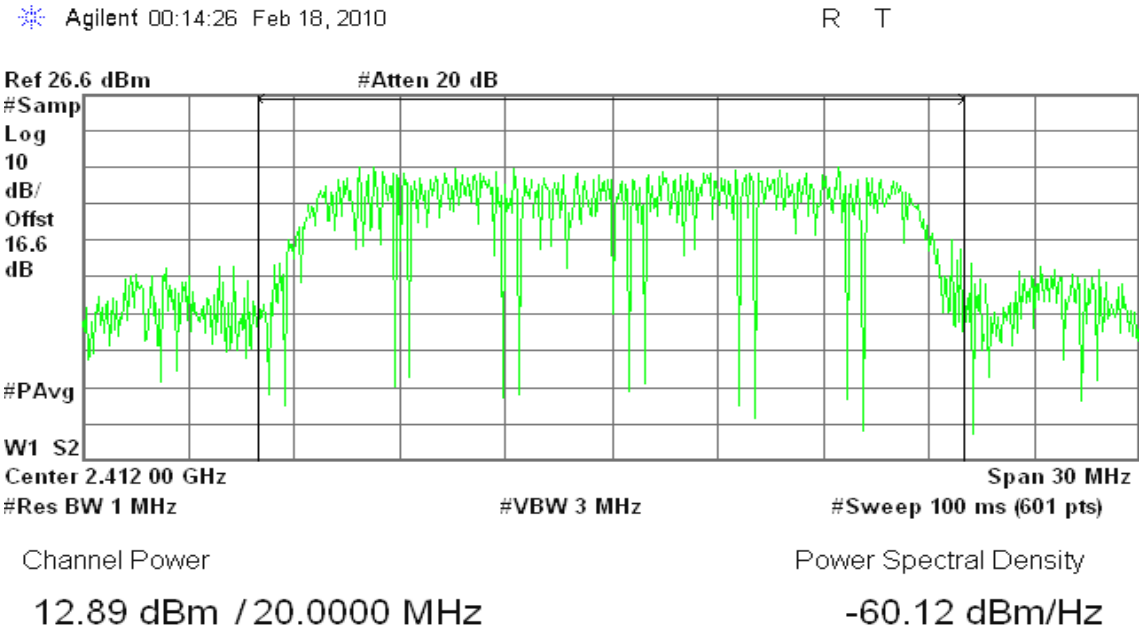


Average Power (CH High)

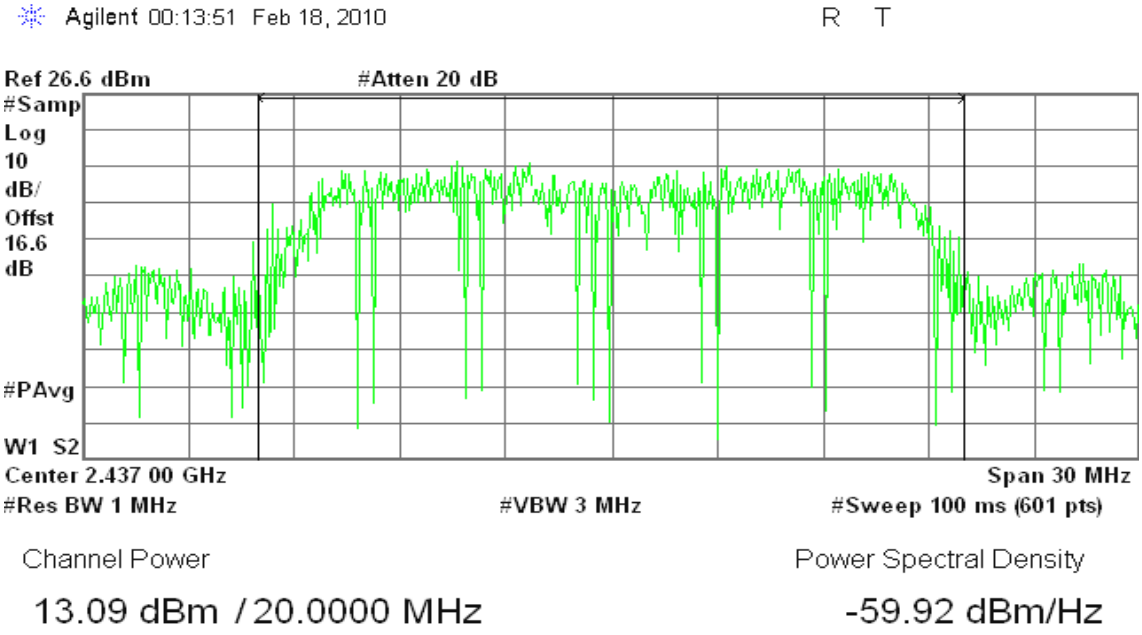


IEEE 802.11g mode

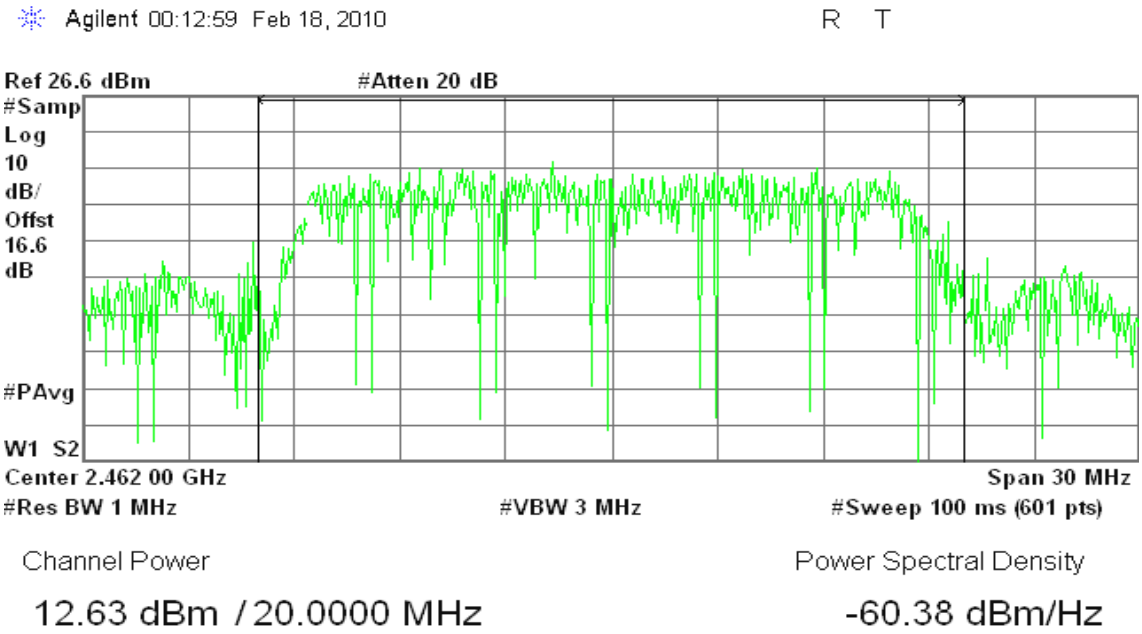
Average Power (CH Low)



Average Power (CH Mid)

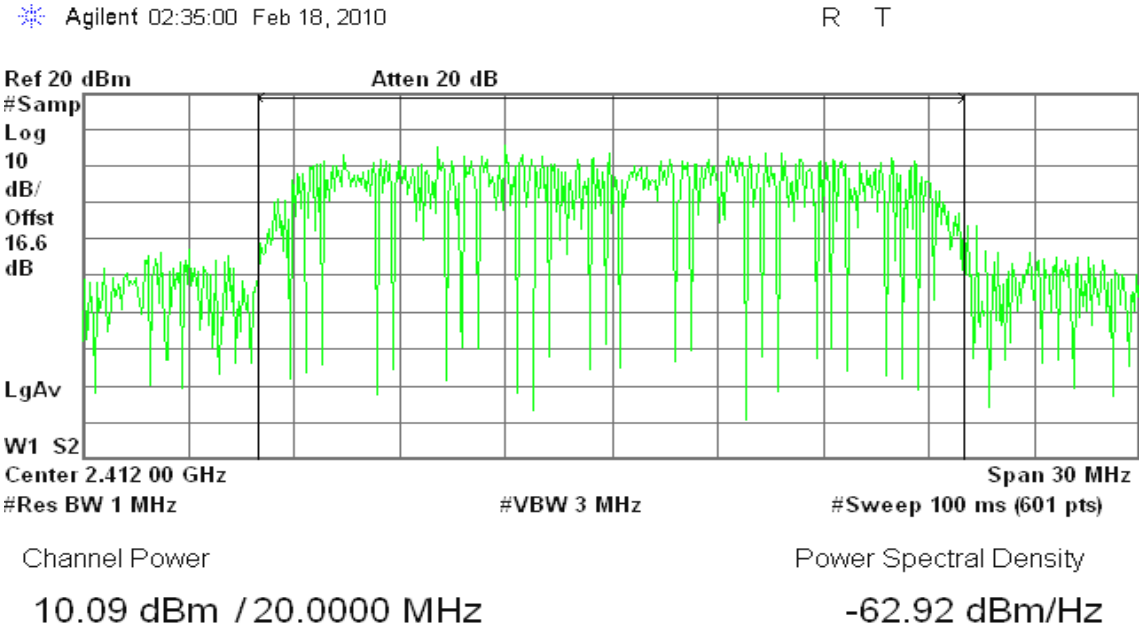


Average Power (CH High)



draft 802.11n Standard-20 MHz Channel mode / Chain 0

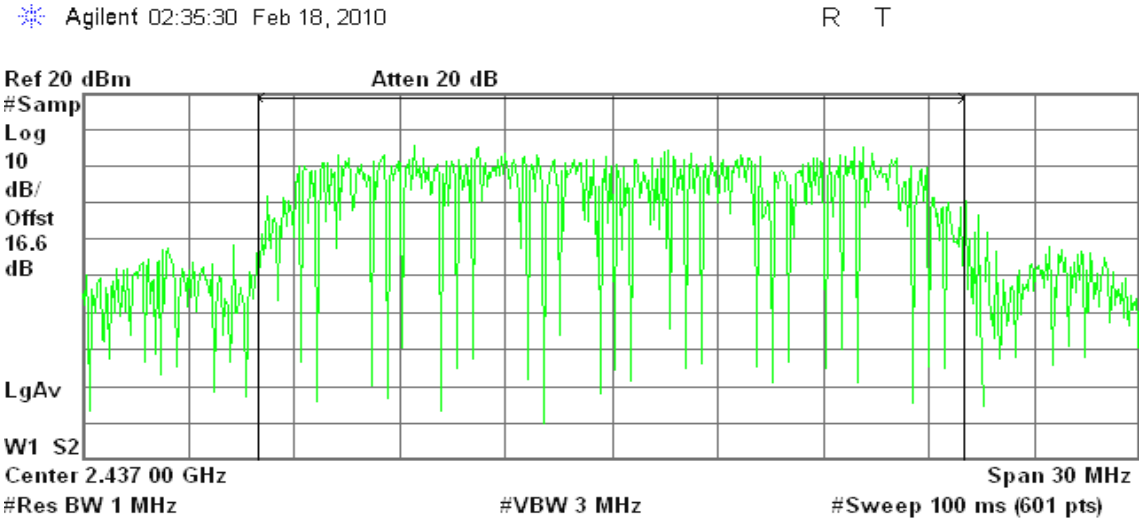
Average Power (CH Low)



Channel Power
10.09 dBm / 20.0000 MHz

Power Spectral Density
-62.92 dBm/Hz

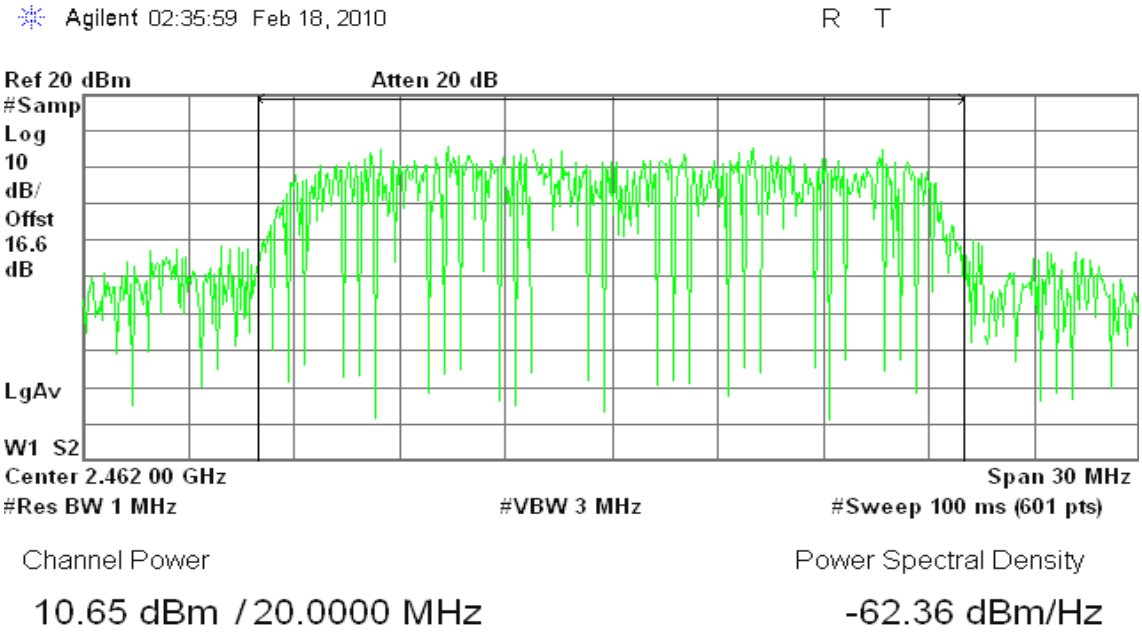
Average Power (CH Mid)



Channel Power
10.87 dBm / 20.0000 MHz

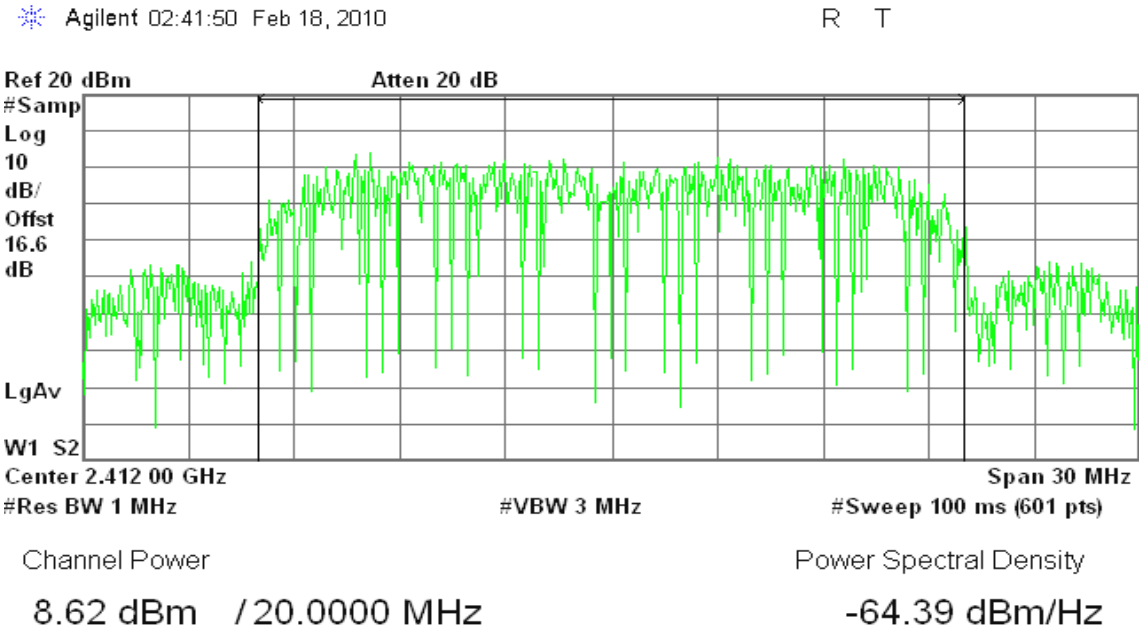
Power Spectral Density
-62.14 dBm/Hz

Average Power (CH High)

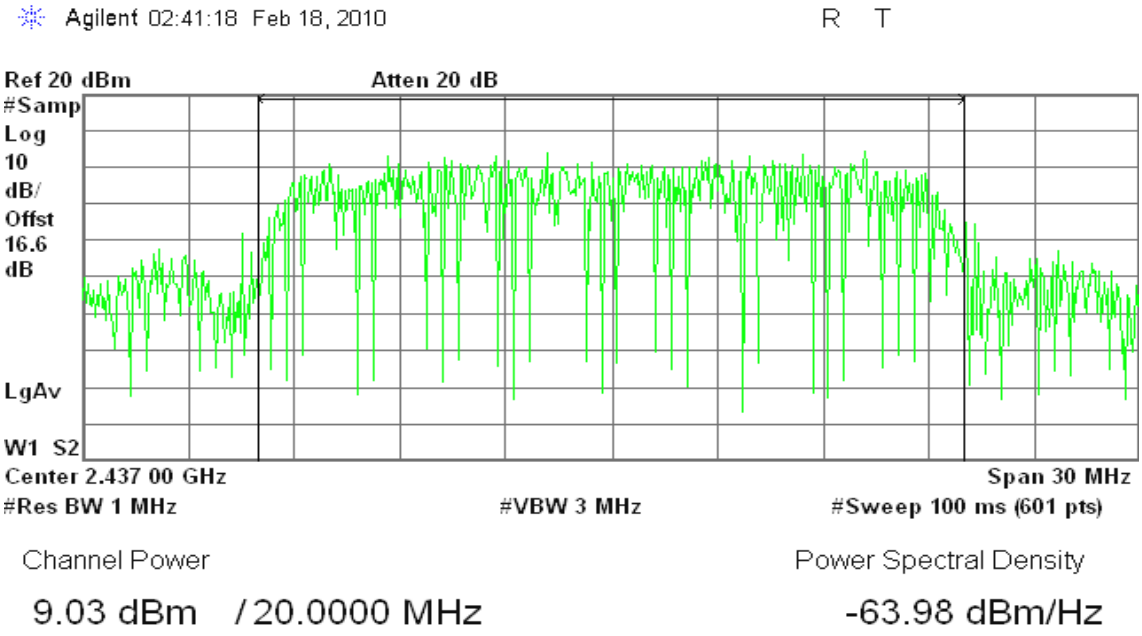


draft 802.11n Standard-20 MHz Channel mode / Chain 1

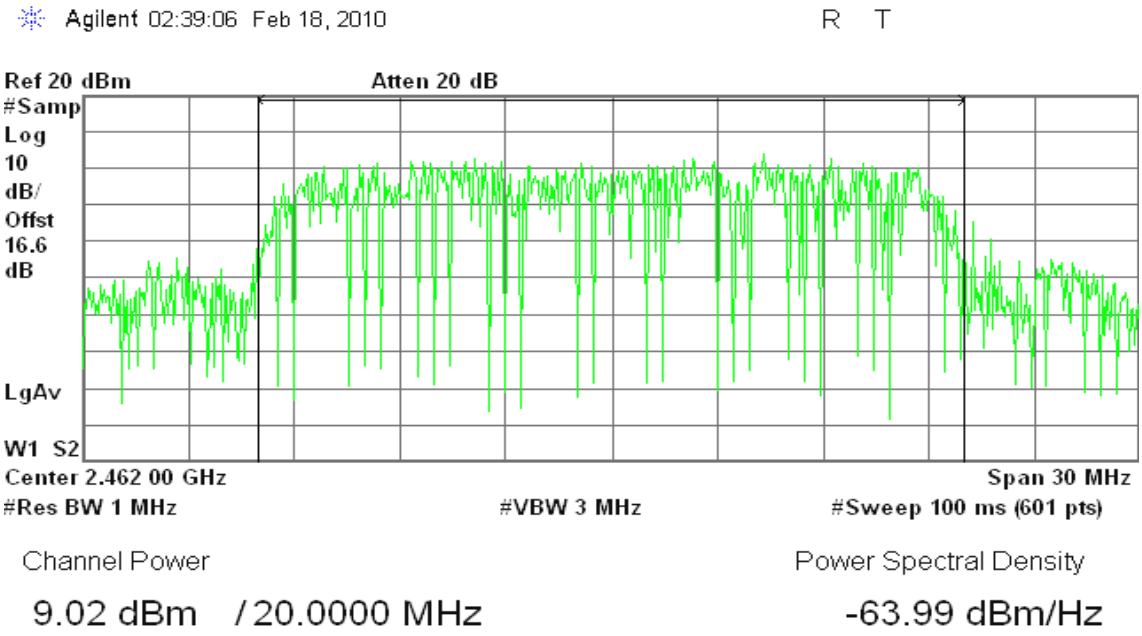
Average Power (CH Low)



Average Power (CH Mid)

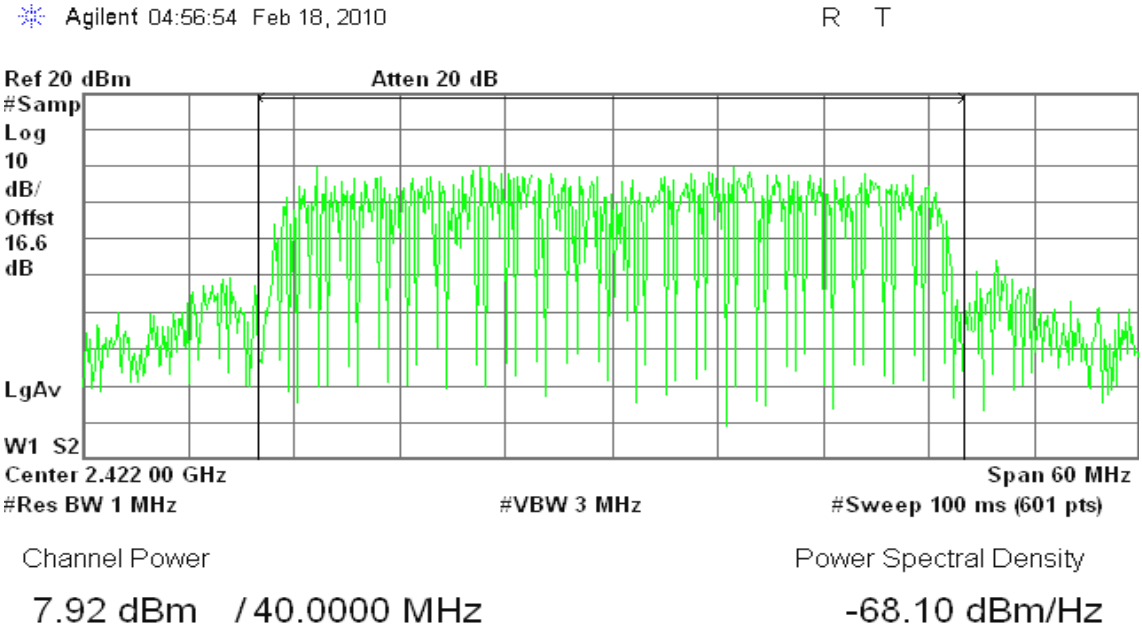


Average Power (CH High)

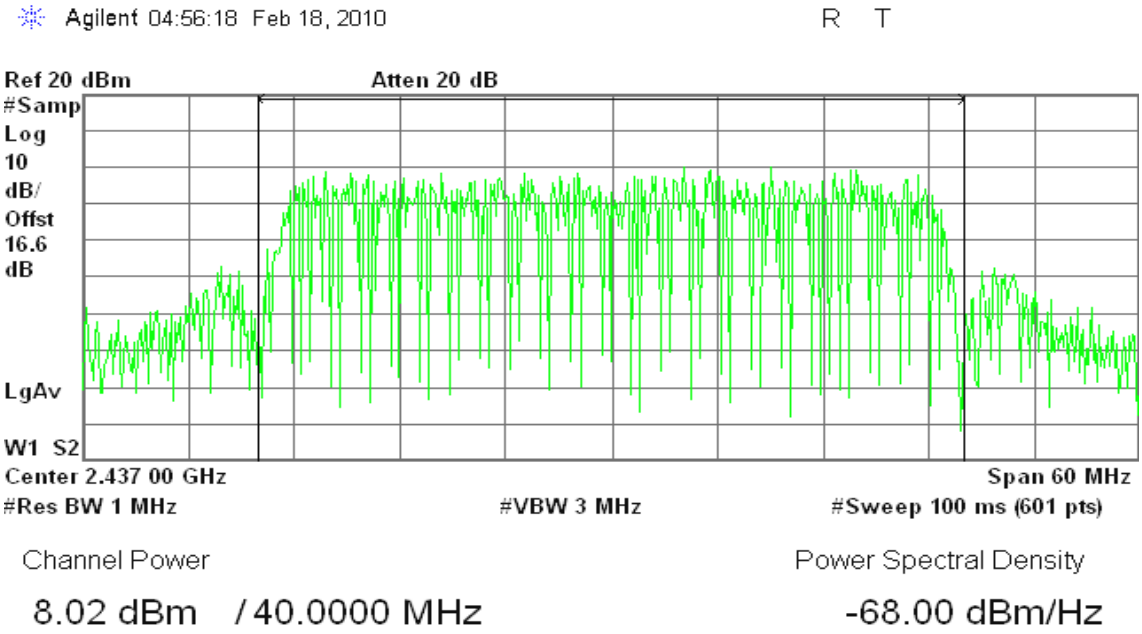


draft 802.11n Wide-40 MHz Channel mode / Chain 0

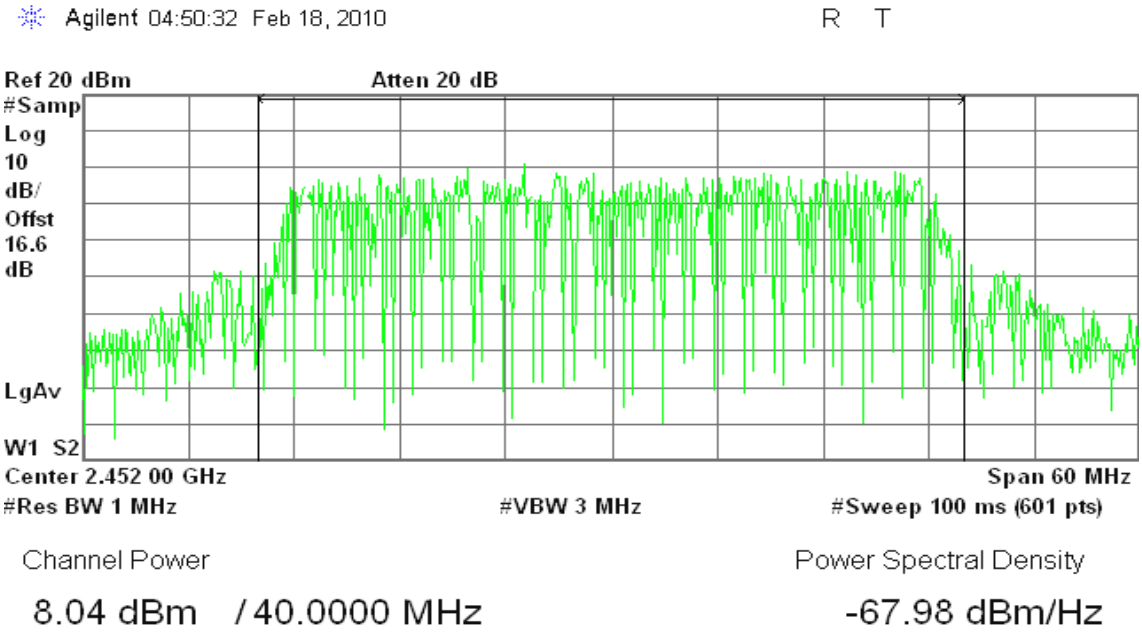
Average Power (CH Low)



Average Power (CH Mid)

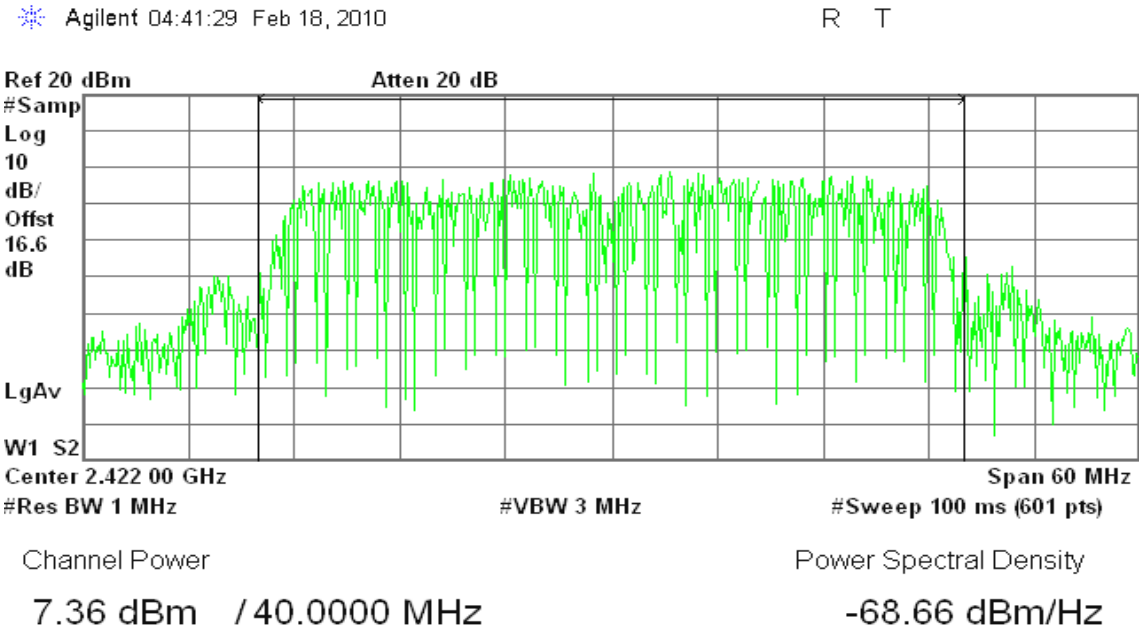


Average Power (CH High)

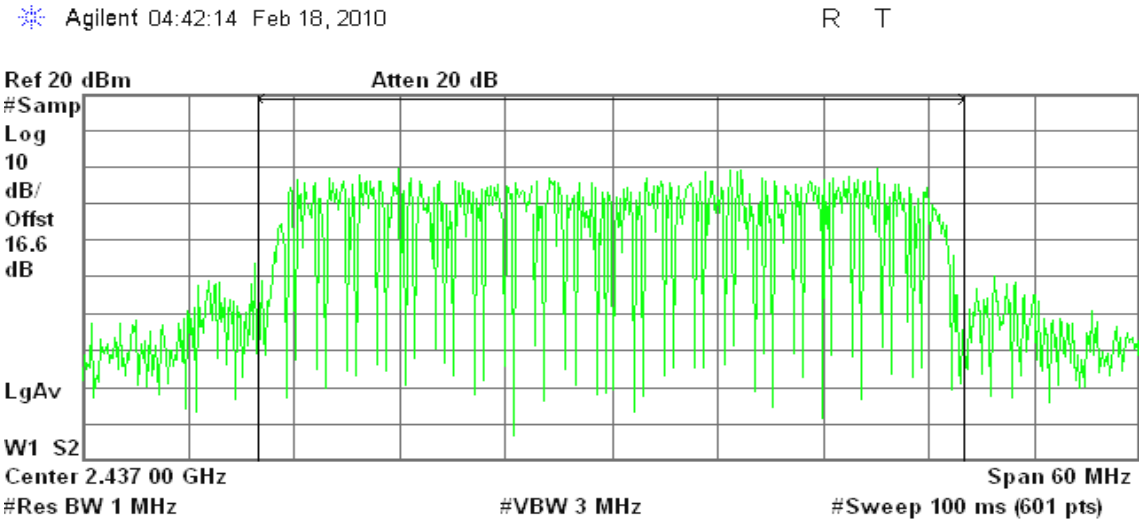


draft 802.11n Wide-40 MHz Channel mode / Chain 1

Average Power (CH Low)



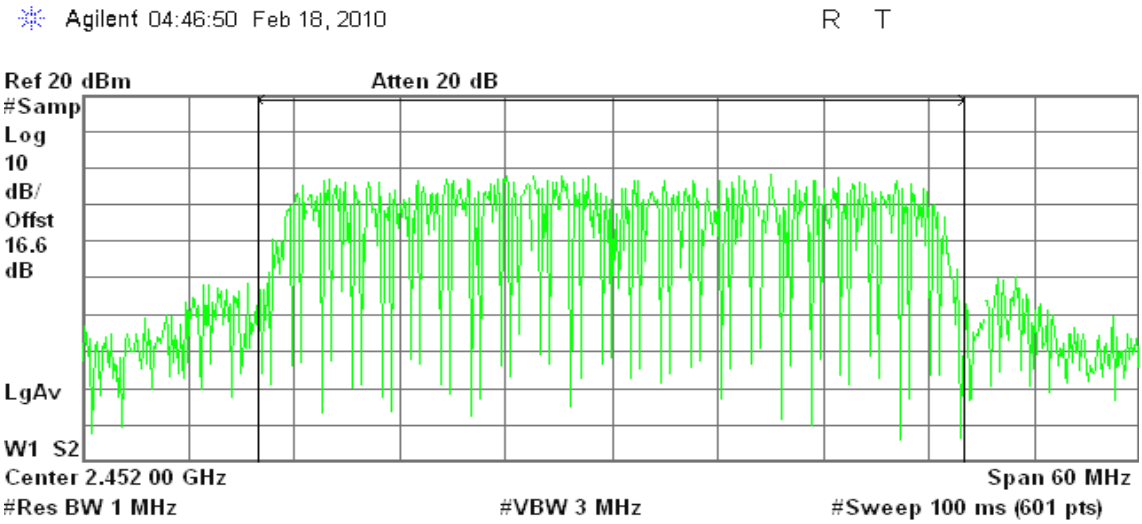
Average Power (CH Mid)



Channel Power
7.60 dBm /40.0000 MHz

Power Spectral Density
-68.42 dBm/Hz

Average Power (CH High)

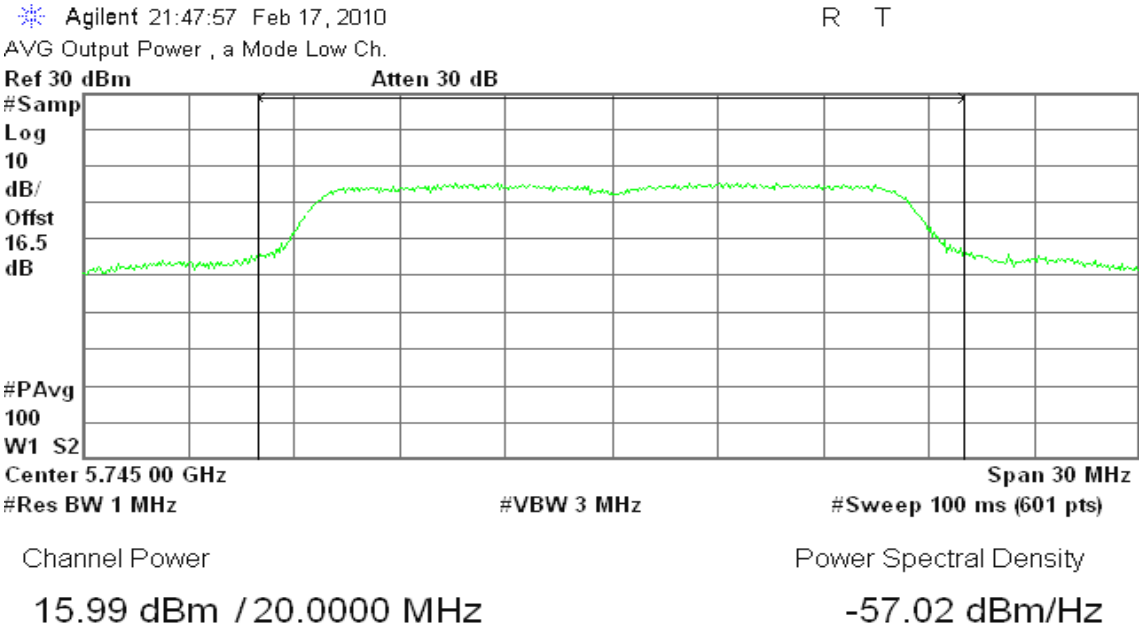


Channel Power
7.21 dBm /40.0000 MHz

Power Spectral Density
-68.81 dBm/Hz

IEEE 802.11a mode:

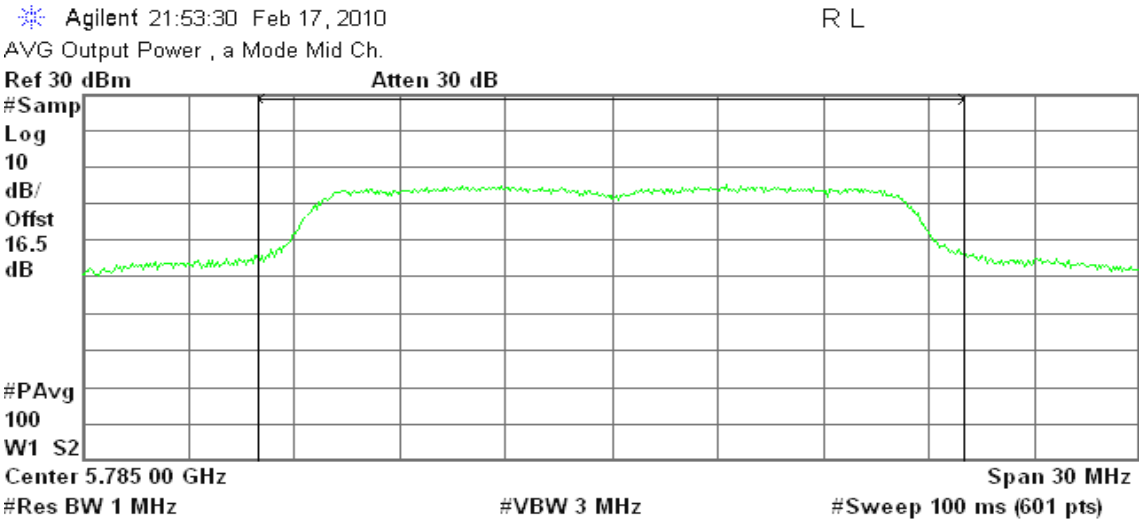
Average Power (CH Low)



Channel Power
15.99 dBm / 20.0000 MHz

Power Spectral Density
-57.02 dBm/Hz

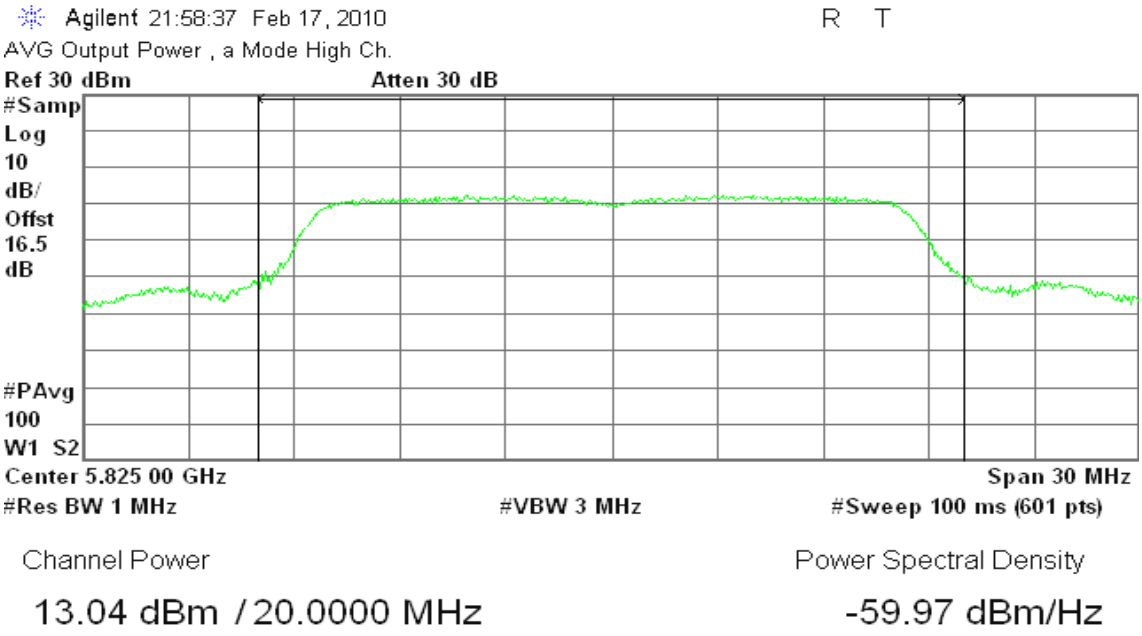
Average Power (CH Mid)



Channel Power
15.72 dBm / 20.0000 MHz

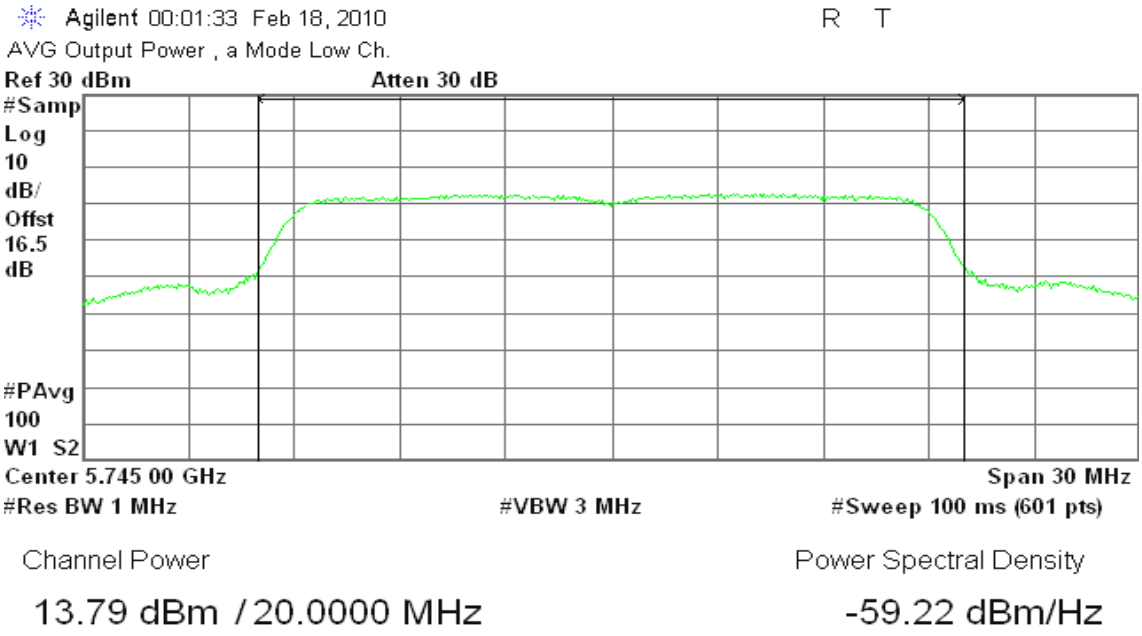
Power Spectral Density
-57.29 dBm/Hz

Average Power (CH High)

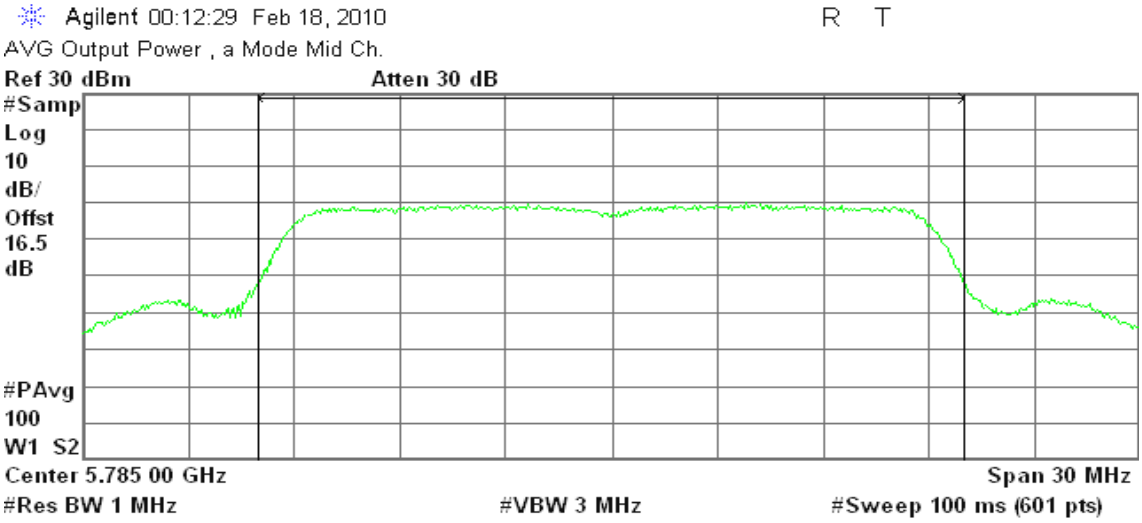


draft 802.11n Standard-20 MHz Channel mode / Chain 0

Average Power (CH Low)



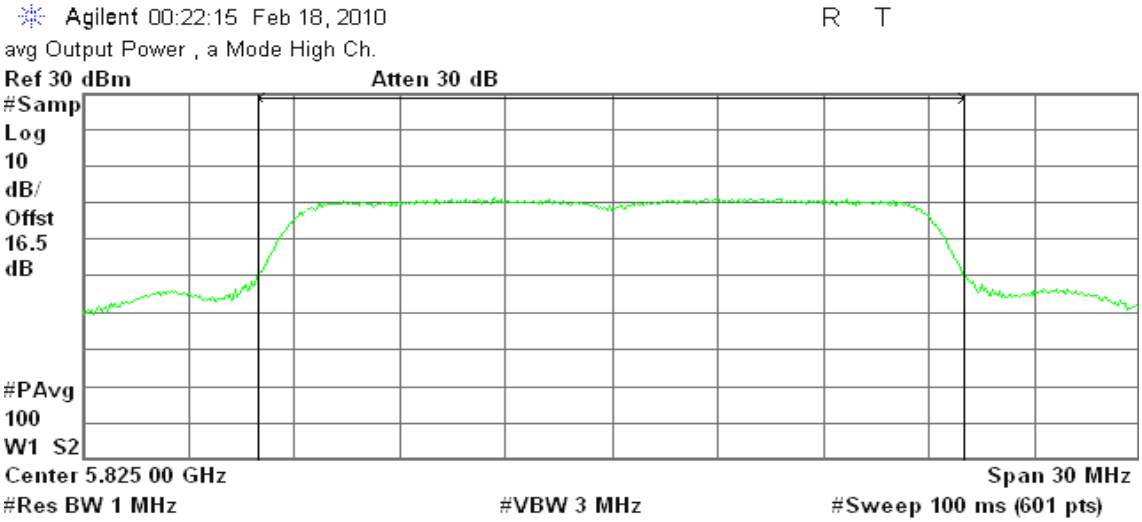
Average Power (CH Mid)



Channel Power
10.52 dBm / 20.0000 MHz

Power Spectral Density
-62.49 dBm/Hz

Average Power (CH High)

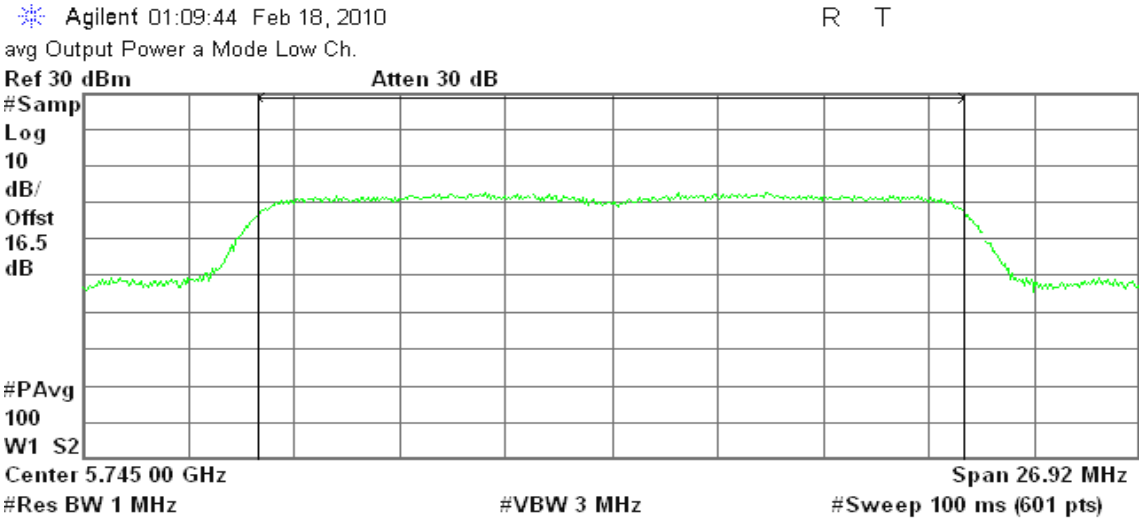


Channel Power
12.11 dBm / 20.0000 MHz

Power Spectral Density
-60.90 dBm/Hz

draft 802.11n Standard-20 MHz Channel mode / Chain 1

Average Power (CH Low)



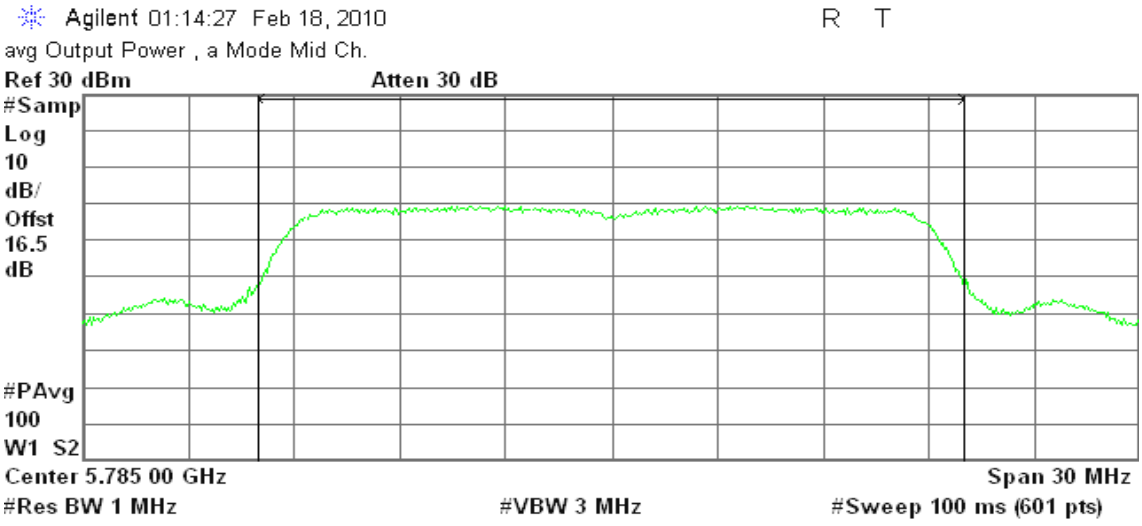
Channel Power

13.54 dBm / 17.9470 MHz

Power Spectral Density

-59.00 dBm/Hz

Average Power (CH Mid)



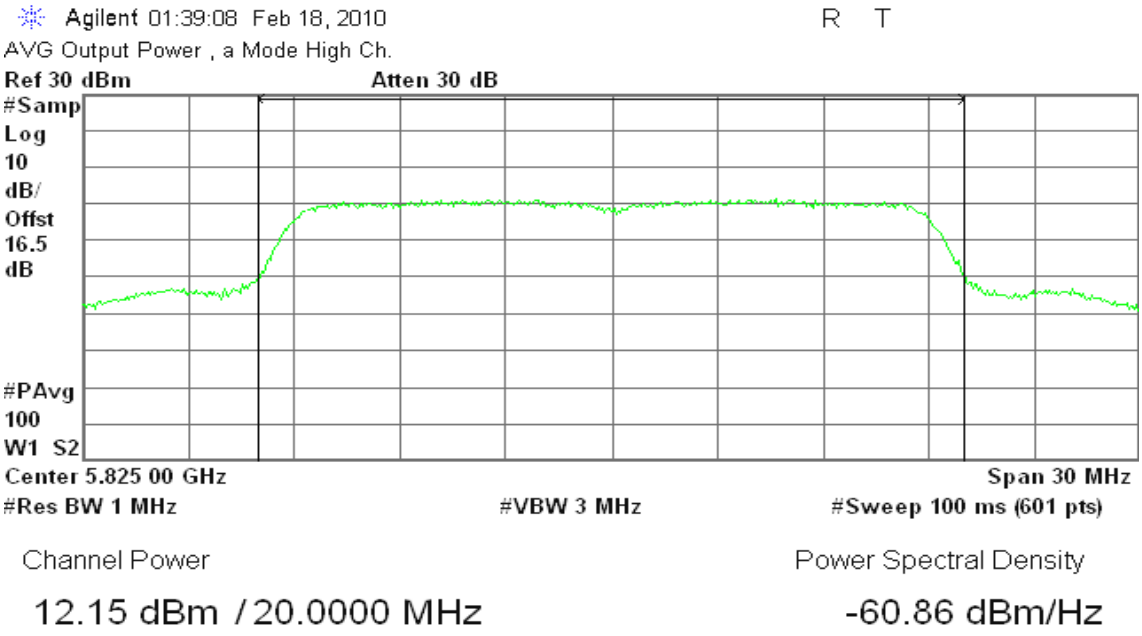
Channel Power

10.15 dBm / 20.0000 MHz

Power Spectral Density

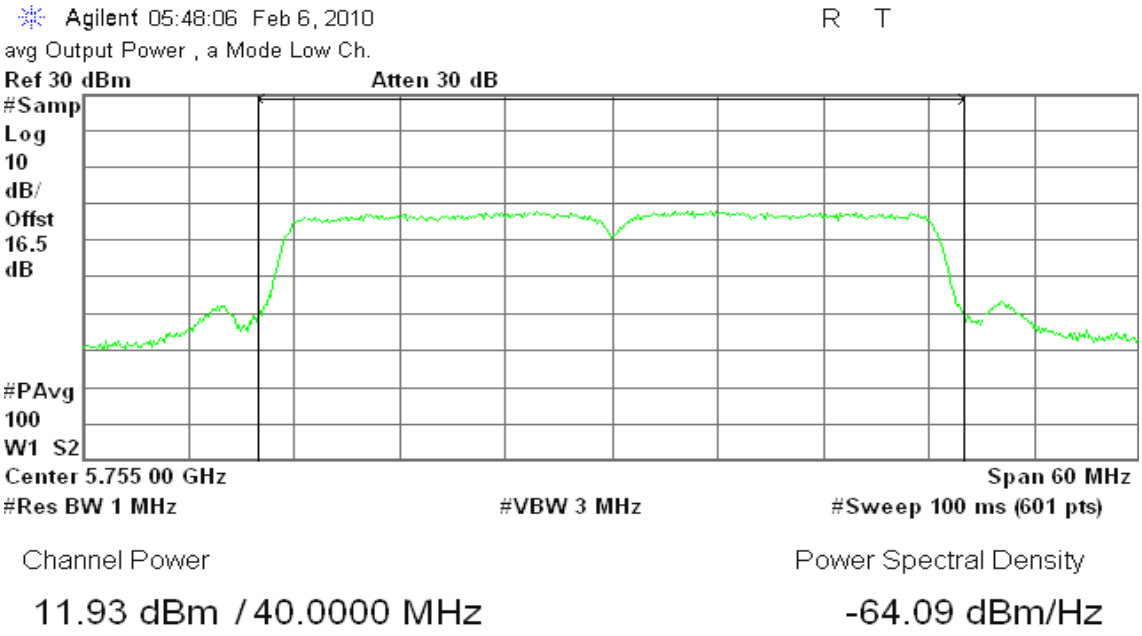
-62.86 dBm/Hz

Average Power (CH High)

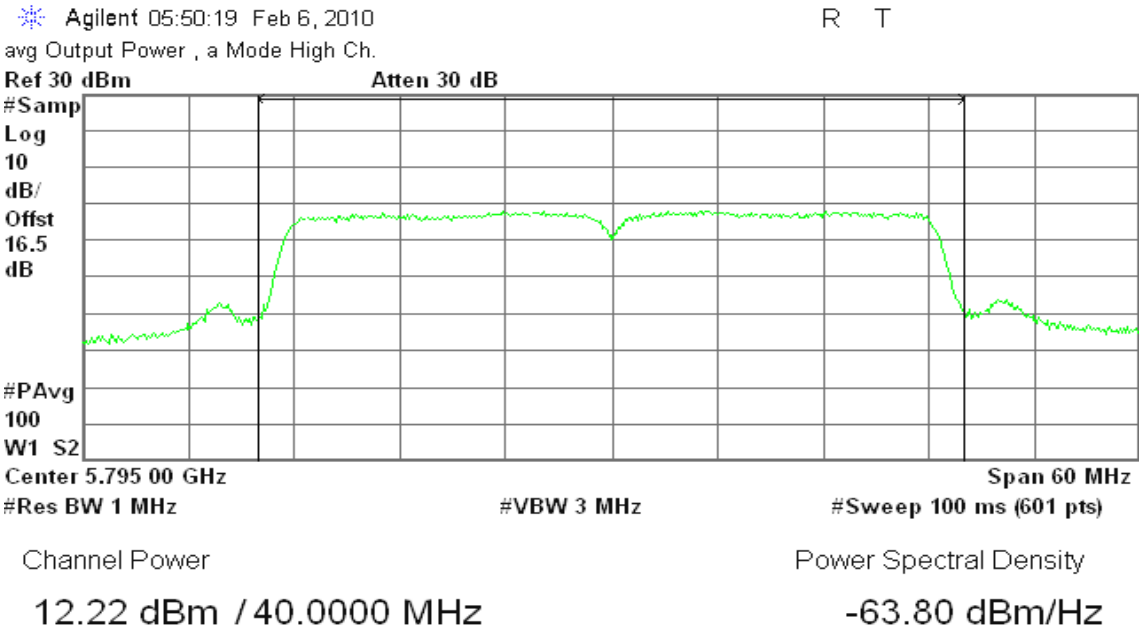


draft 802.11n Wide-40 MHz Channel mode / Chain 0

Average Power (CH Low)

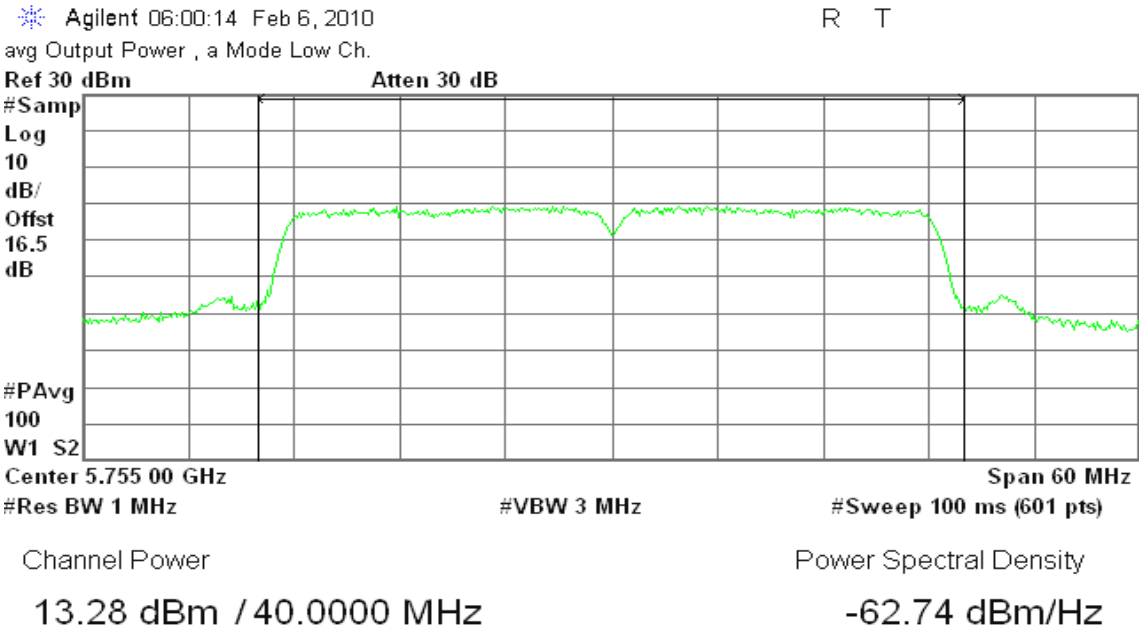


Average Power (CH High)

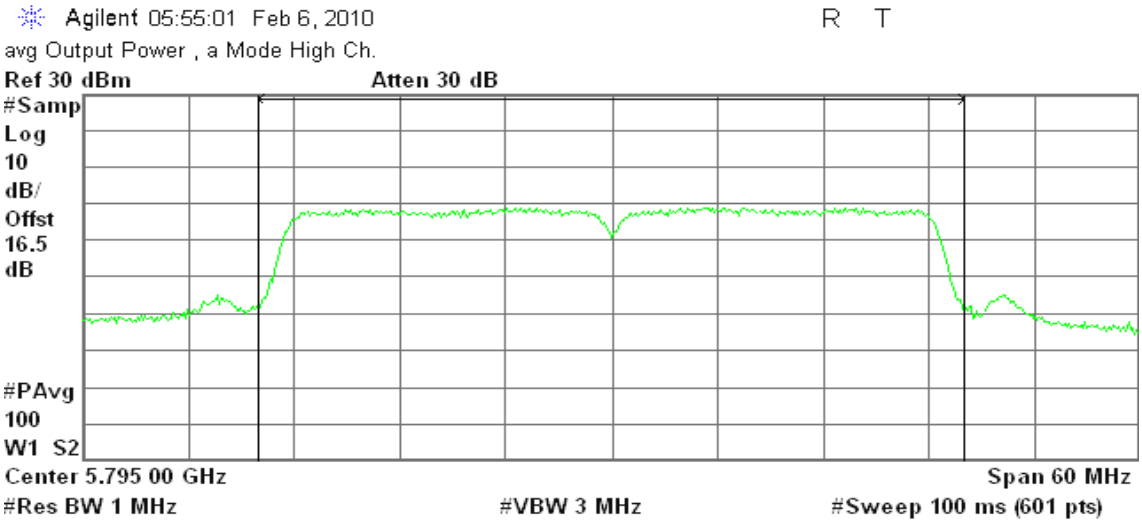


draft 802.11n Wide-40 MHz Channel mode / Chain 1

Average Power (CH Low)



Average Power (CH High)



Channel Power	Power Spectral Density
13.23 dBm / 40.0000 MHz	-62.79 dBm/Hz