

FCC PART 15 SUBPART 407

MEASUREMENT AND TEST REPORT

For

Buffalo Inc.

4-15, Shibata Hondori, Minsmi-ku,
Nagoya 457-8520, Japan

FCC ID: FDI-09101479-0

Model: WZR-AG300NH-US

This Report Concerns: ☒ Original Report		Product type: Wireless Router , 802.11a/b/g/n(draft)
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Report No.:	R0610231-407	
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GENERAL INFORMATION

This measurement and test report has been prepared on behalf of *Buffalo Inc.* and their product, *FCC ID: FDI-09101479-0, model: WZR-AG300NH-US.* The **WZR-AG300NH-US** or the EUT as referred to in the rest of this report is a wireless router marketed as “*Air Station Draft-N Nfinit Access Point*” which supports 802.11 a/b/g/n(draft) wireless data protocols. The EUT is designed for home or office and or commercial uses and is compatible with all client cards that employ 802.11 a, b, g or draft n connectivity.

EUT Photo



Additional EUT photos in Exhibit C

Mechanical Description

This Air Station Draft-N Nfiniti Wireless Router & AP supports 802.11a, 802.11b, 802.11g and 802.11n Draft Specification 1.0 wireless networks, allowing a notebook computer to wirelessly access the Internet, e-mail, transfer files and more. The dimensions of the EUT are approximately 176 mmL x 215 mmH x 80 mmW.

** The test data gathered are from production sample, with the radio's serial number: 0016016F0105, provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *Buffalo Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, C and E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Maximum Output Power, Antenna Requirements, 26 dB Bandwidth, peak power spectral density, Peak excursion , Band Edges Measurement, Conducted and Radiated Spurious Emissions.

Related Submittal(s)/Grant(s)

No Related Submittals.

Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at it's facility in Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

SYSTEM TEST CONFIGURATION

Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst-case* results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

EUT Exercise Software

The EUT is programmed with the following data rate settings that were used during testing:

For 5150 – 5250 MHz (W52)

20MHz rate/channel:

	<u>5180MHz</u>	<u>5220MHz</u>	<u>5240MHz</u>
802.11a Data rate	9 Mbps	9 Mbps	9 Mbps
802.11n Data rate	MCS 0	MCS 0	MCS 0

40MHz rate/channel:

	<u>5190MHz</u>	<u>5230MHz</u>
802.11a Data rate	9 Mbps	9 Mbps
802.11n Data rate	MCS 0	MCS 0

Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IBM	Laptop	T42	23736UU

SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.407 (f) §2.1091	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§ 15.207 (a)	Conducted Emissions	Compliant
§ 15.407 (b)(1) & (b)(2)	Spurious Emissions at Antenna Port	Compliant
§15.205	Restricted Band	Compliant
§15.209 (a) & §15.407(a)(1) & (a)(2)	Spurious Radiated Emissions	Compliant
§15.247 (a)(2)	99% & 26 dB Bandwidth	N/R
§15.407 (a)(1) & (a)(2)	Maximum Peak Output Power	Compliant
§ 15.407 (a)(6)	Peak Excursion	Compliant
§15.407 (a)(1) & (a)(2)	Power Spectral Density	Compliant
§15.407 (h)	DFS	N/R

§ 15.407 (f) and § 2.1091 - RF EXPOSURE

According to §15.407(f) and §2.1091, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

802.11n mode:

Maximum peak output power at antenna input terminal: 16.95 (dBm)

Maximum peak output power at antenna input terminal: 49.54 (mW)

Prediction distance: 20 (cm)

Predication frequency: 5230(MHz)

Antenna Gain (typical): 2.38 (dBi)

antenna gain: 1.73 (numeric)

Power density at predication frequency at 20 cm: 0.0171(mW/cm²)

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm²)

802.11a mode:

Maximum peak output power at antenna input terminal: 16.88 (dBm)
Maximum peak output power at antenna input terminal: 48.75 (mW)
Prediction distance: 20 (cm)
Predication frequency: 5230(MHz)
Antenna Gain (typical): 2.38 (dBi)
antenna gain: 1.73 (numeric)
Power density at predication frequency at 20 cm: 0.0168(mW/

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm²)

Test Result

The Power Density Level at 20 cm for 802.11a/n mode is:

802.11n mode = 0.0171 mW/cm²

802.11a mode = 0.0168 mW/cm²

which is below the uncontrolled exposure limit of 1.0mW/cm² at 5230 MHz.

§15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to § 15.407 (a)(1) and (a)(2), if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Result: The antenna for this device is two integral antennas with the gain of:

2.4GHz Band:

Antenna A: **1.58** dBi (Vertical), 1.52 dBi (Horizontal)

5.2GHz Band:

Antenna B: **2.38** dBi (Vertical), 2.33 dBi (Horizontal)



§15.207 (a) - CONDUCTED EMISSIONS

Section 15.207 Conducted limits:

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 of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4 – 2003 measurement procedure. The specification used was FCC Class B limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with LISN-1.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2005-11-14
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2006-03-13

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

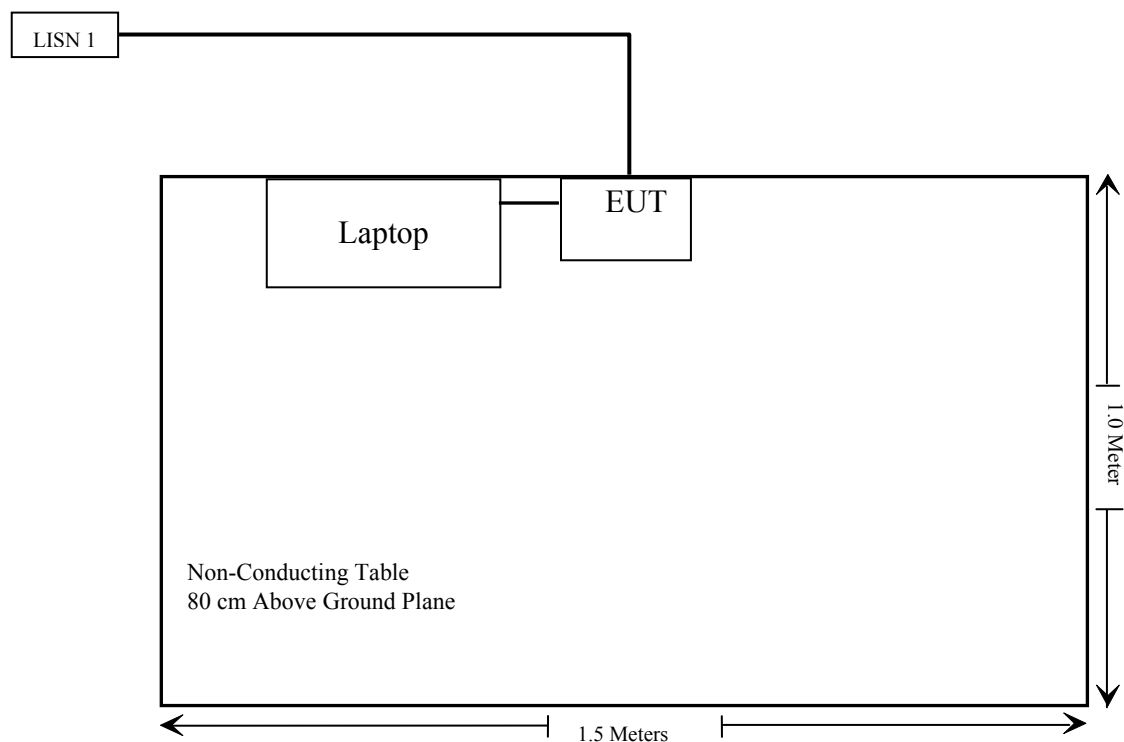
Test Procedure

During the conducted emissions test, the power cord of the EUT was connected to the mains outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP”. Average readings are distinguished with an “Ave”.

Test Setup Diagram



Environmental Conditions

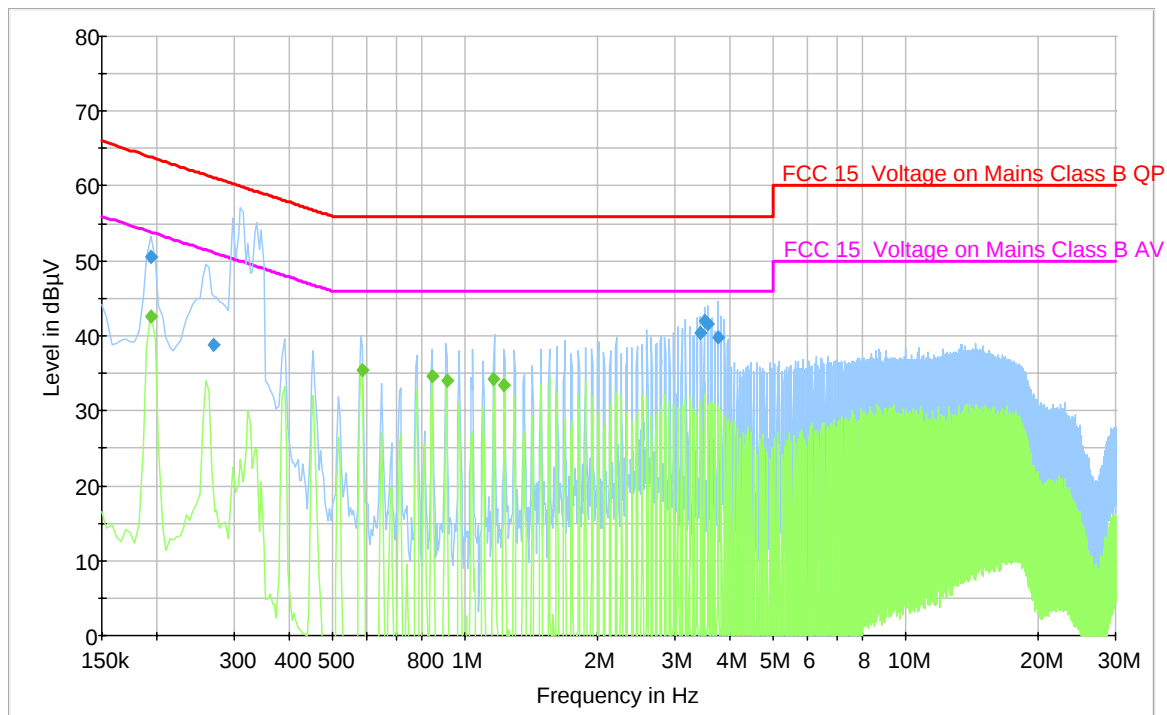
Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

**The testing was performed by Dan Corona from 2006-11-08 to 2006-11-28*

Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits for Class B devices, with the *worst* margin reading of:

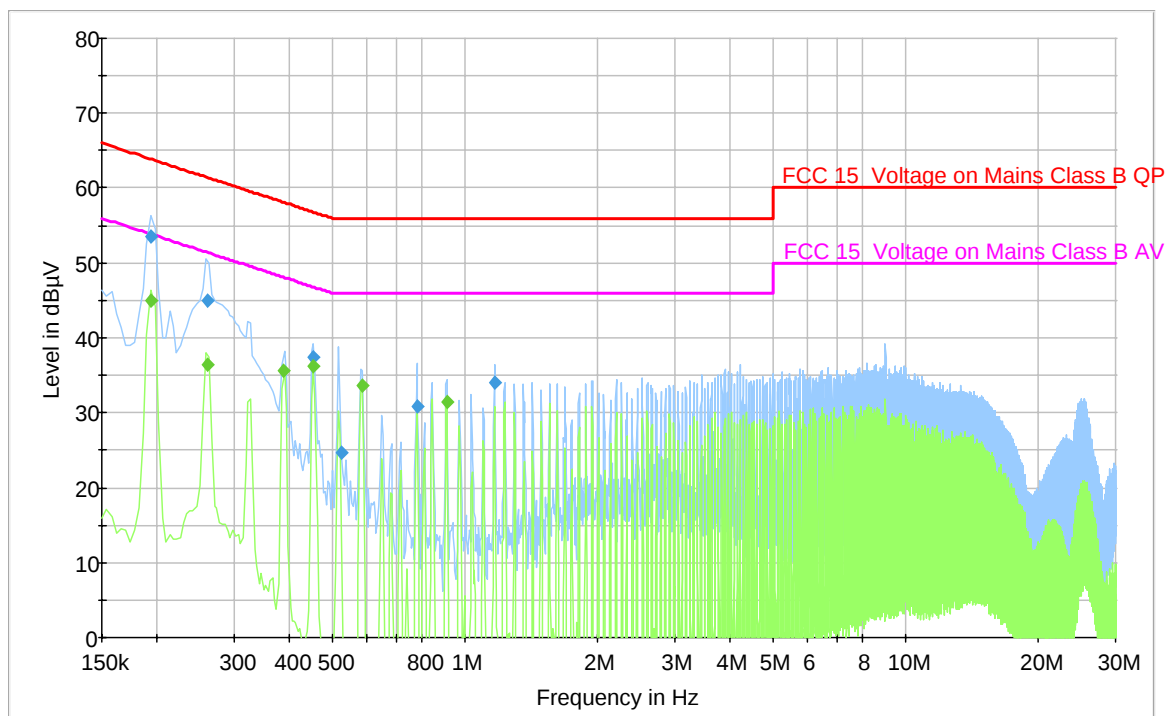
-8.9 dB at 0.1940 MHz in the Neutral conductor mode

120V/60 Hz Line:**Final Measurement Quasi-Peak Detector**

Frequency (MHz)	Quasi Peak (dBμV)	Line	Corr. (dB)	Limit (dBμV)	Margin (dB)
0.194000	50.5	L	0.2	63.9	-13.4
3.497000	42.0	L	0.3	56.0	-14.0
3.565000	41.5	L	0.3	56.0	-14.5
3.433000	40.4	L	0.3	56.0	-15.6
3.757000	39.8	L	0.3	56.0	-16.2
0.269000	38.8	L	0.2	61.1	-22.3

Final Measurement Average Detector

Frequency (MHz)	Average (dBμV)	Line	Corr. (dB)	Limit (dBμV)	Margin (dB)
0.585000	35.5	L	0.3	46.0	-10.5
0.194000	42.6	L	0.2	53.9	-11.3
0.841000	34.7	L	0.3	46.0	-11.4
1.165000	34.2	L	0.3	46.0	-11.8
0.909000	34.1	L	0.3	46.0	-11.9
1.229000	33.5	L	0.3	46.0	-12.5

120V/60 Hz Neutral:**Final Measurement Quasi-Peak Detector**

Frequency (MHz)	Quasi Peak (dBµV)	Line	Corr. (dB)	Limit (dBµV)	Margin (dB)
0.194000	53.6	N	0.2	63.9	-10.3
0.261000	44.9	N	0.2	61.4	-16.5
0.453000	37.4	N	0.3	56.8	-19.4
1.169000	34.1	N	0.3	56.0	-21.9
0.781000	30.9	N	0.3	56.0	-25.2
0.525000	24.7	N	0.3	56.0	-31.3

Final Measurement Average Detector

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Limit (dBµV)	Margin (dB)
0.194000	45.0	N	0.2	53.9	-8.9
0.261000	36.4	N	0.2	51.4	-15.0
0.389000	35.6	N	0.4	48.1	-12.5
0.453000	36.1	N	0.3	46.8	-10.7
0.585000	33.7	N	0.3	46.0	-12.3
0.909000	31.4	N	0.3	46.0	-14.6

§2.1051 & §15.407(b) (1) & (b) (2) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

For §15.407 (b)(1) & (b)(2), transmitters operating in the 5.15-5.35 GHz band: all emissions outside 5.15 – 5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1057.

Measurement Procedure

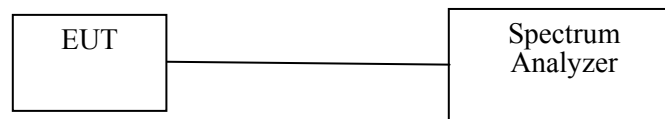
The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

* **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

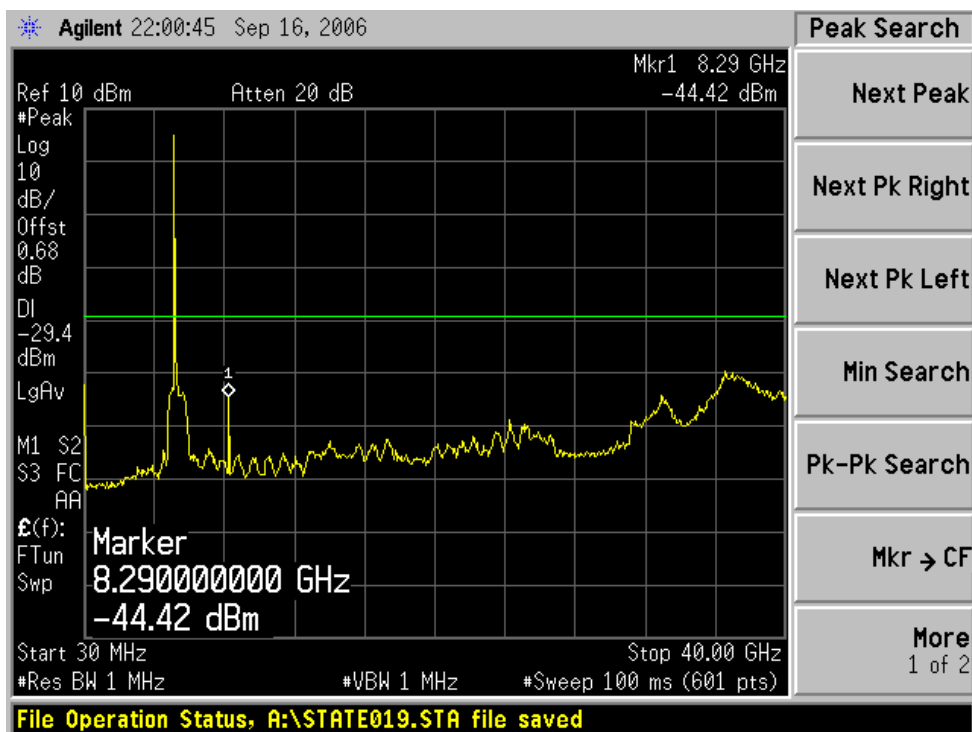
* The testing was performed by Dan Corona from 2006-11-08 to 2006-11-28

Measurement Result

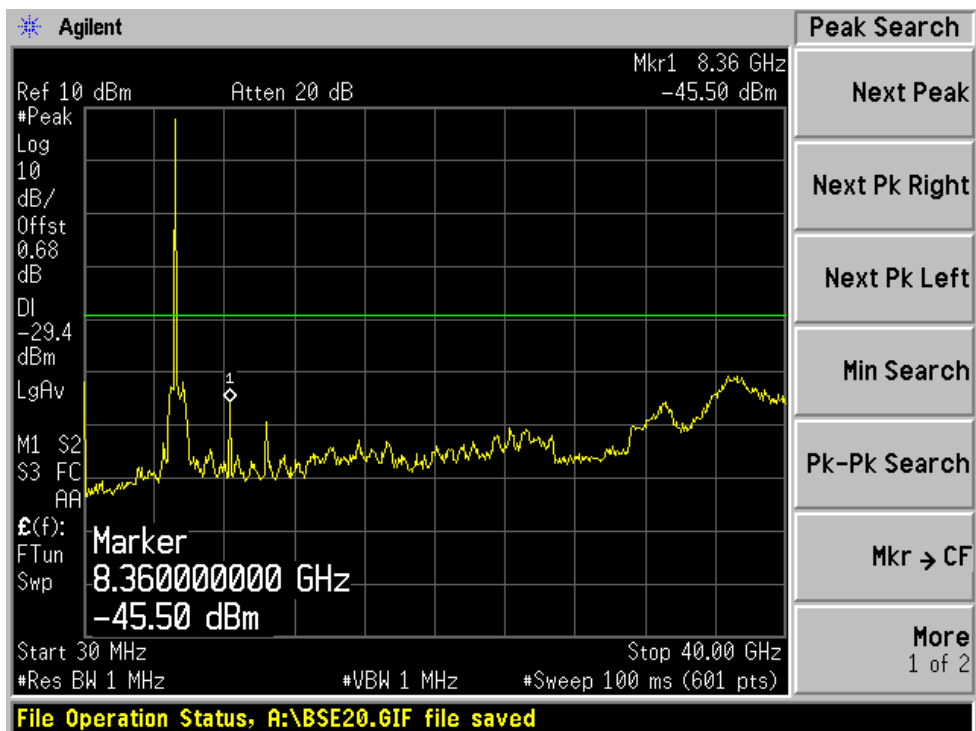
Please refer to following pages for plots of spurious emissions.

5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel, Chain A**

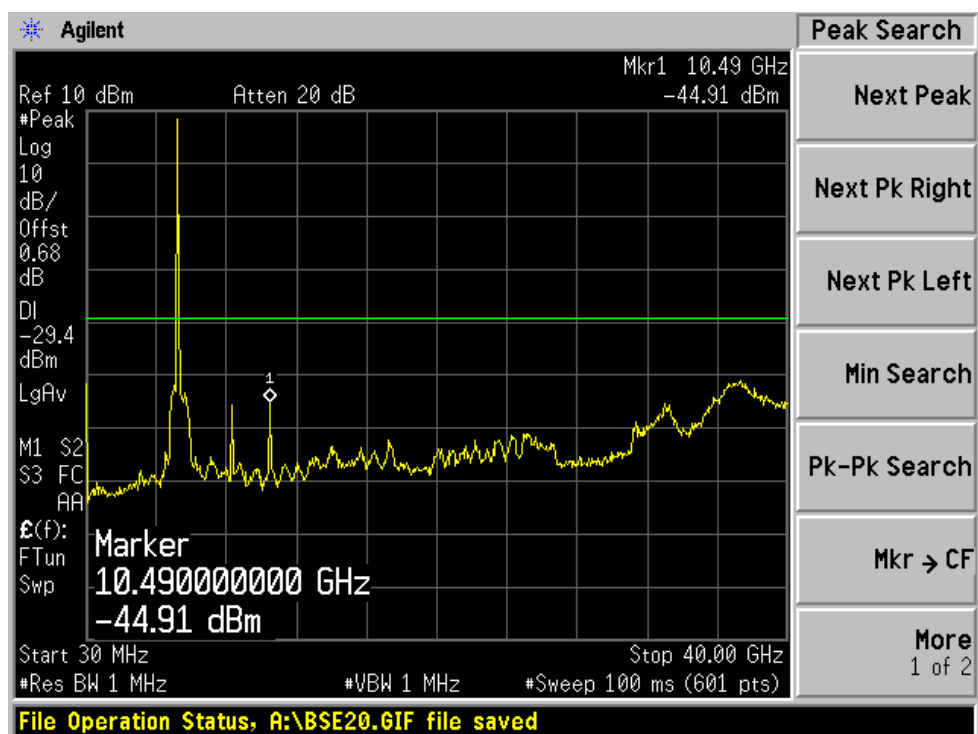
Low Channel



Middle Channel

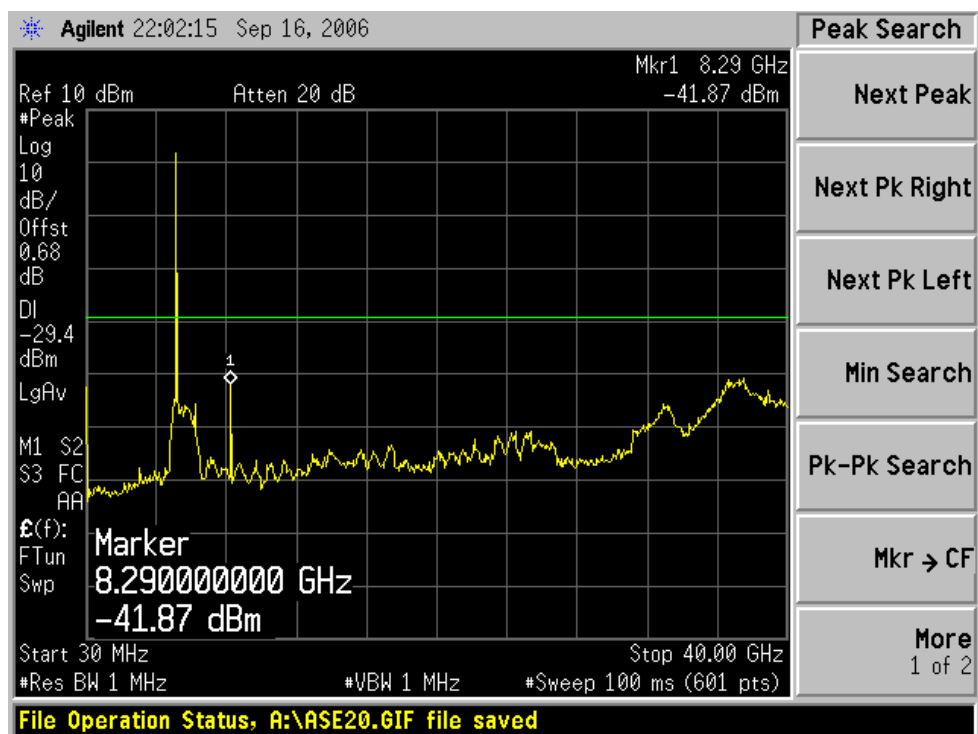


High Channel

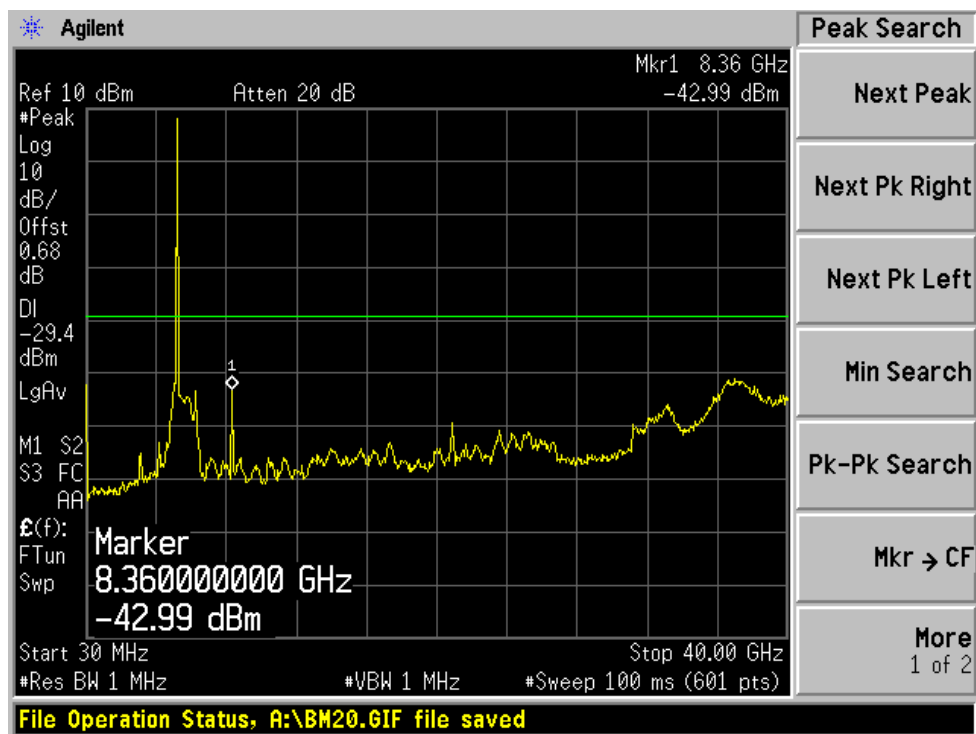


802.11n: 20MHz rate/channel, Chain B

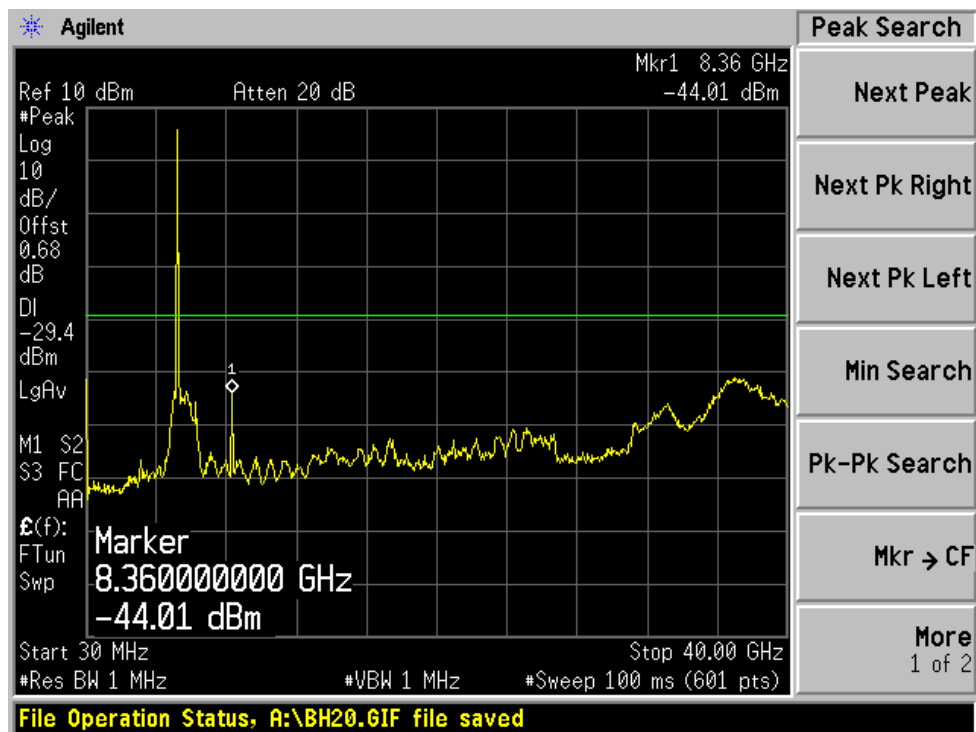
Low Channel



Middle Channel

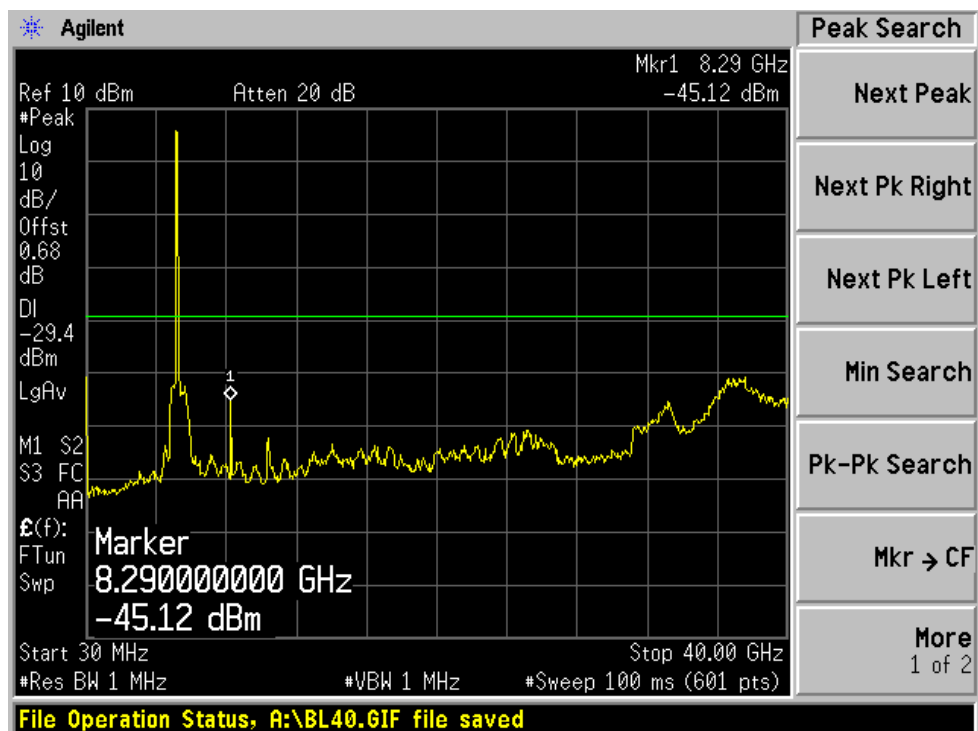


High Channel

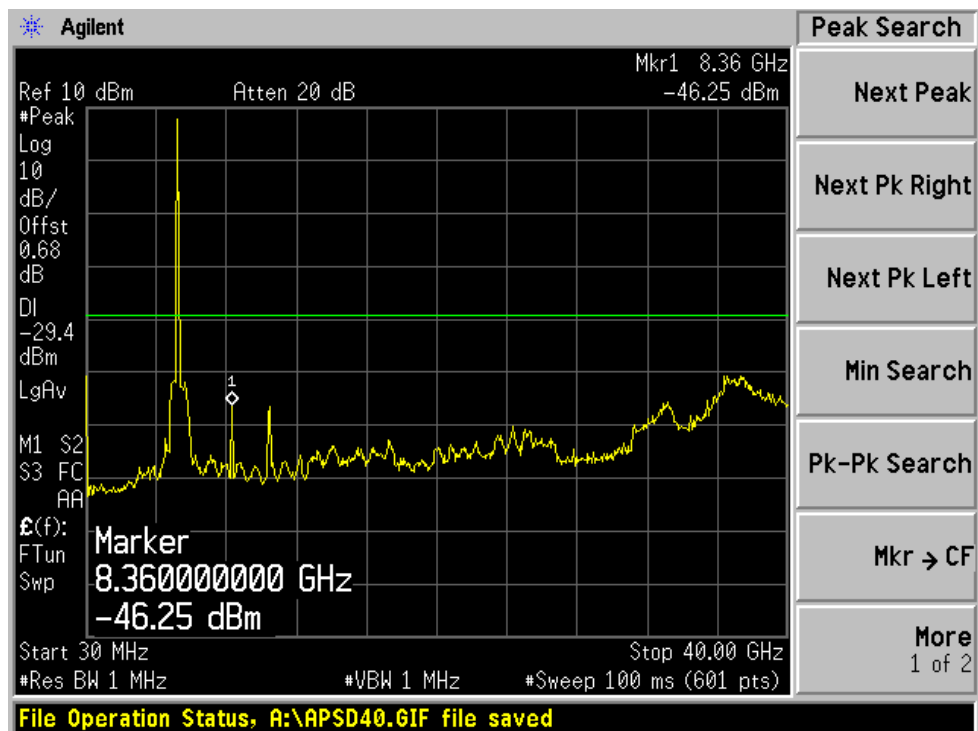


802.11n: 40MHz rate/channel, Chain A

Low Channel

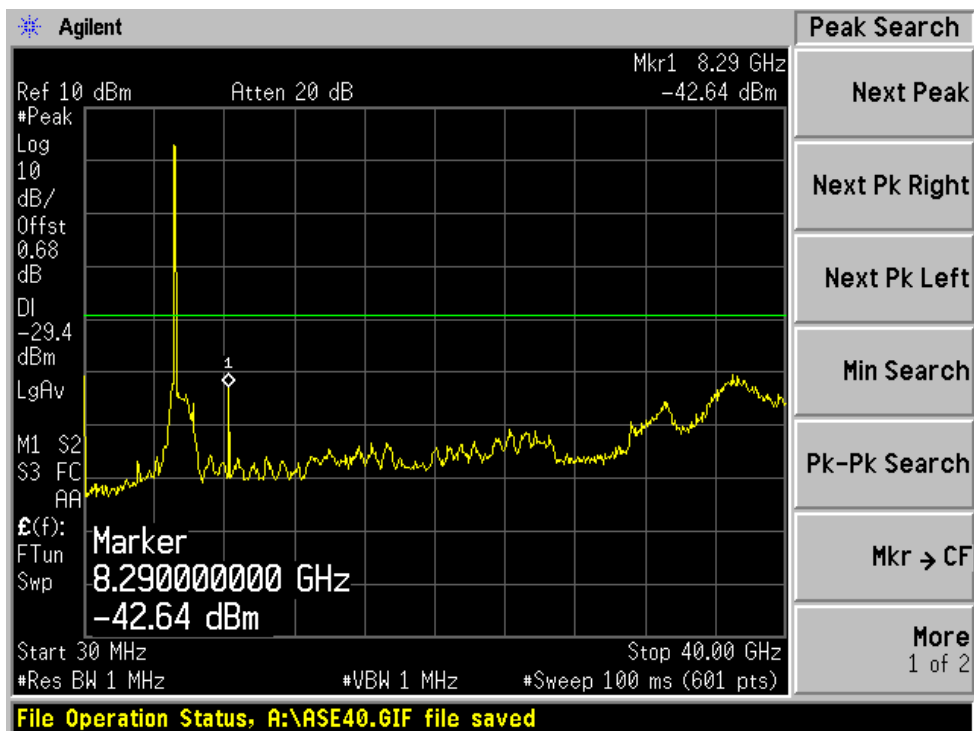


High Channel

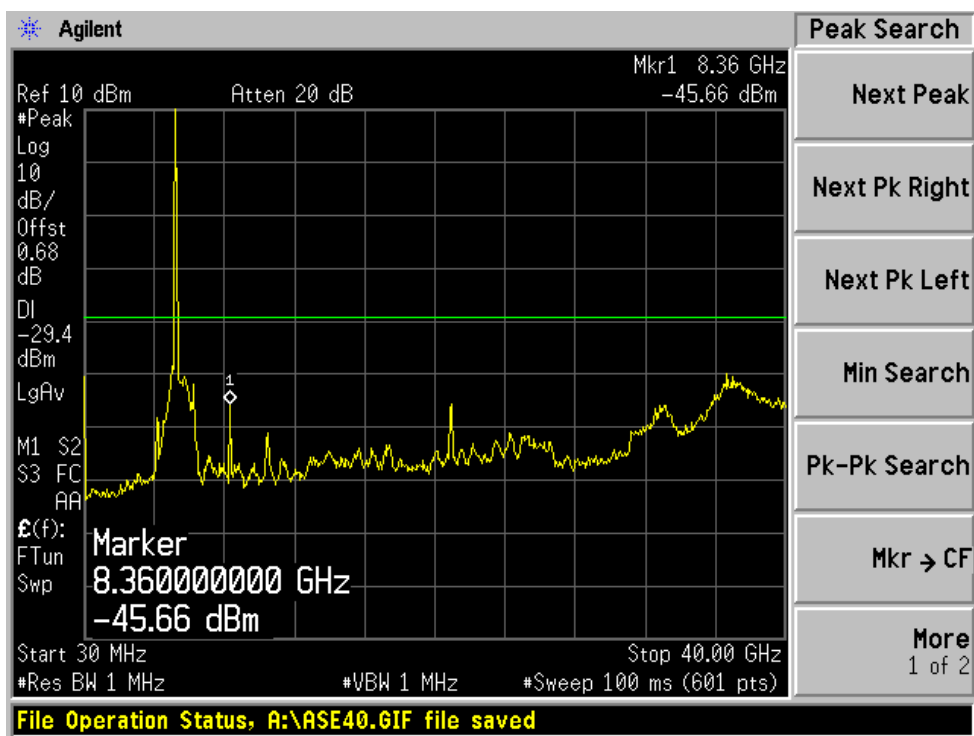


802.11n: 40MHz rate/channel, Chain B

Low Channel

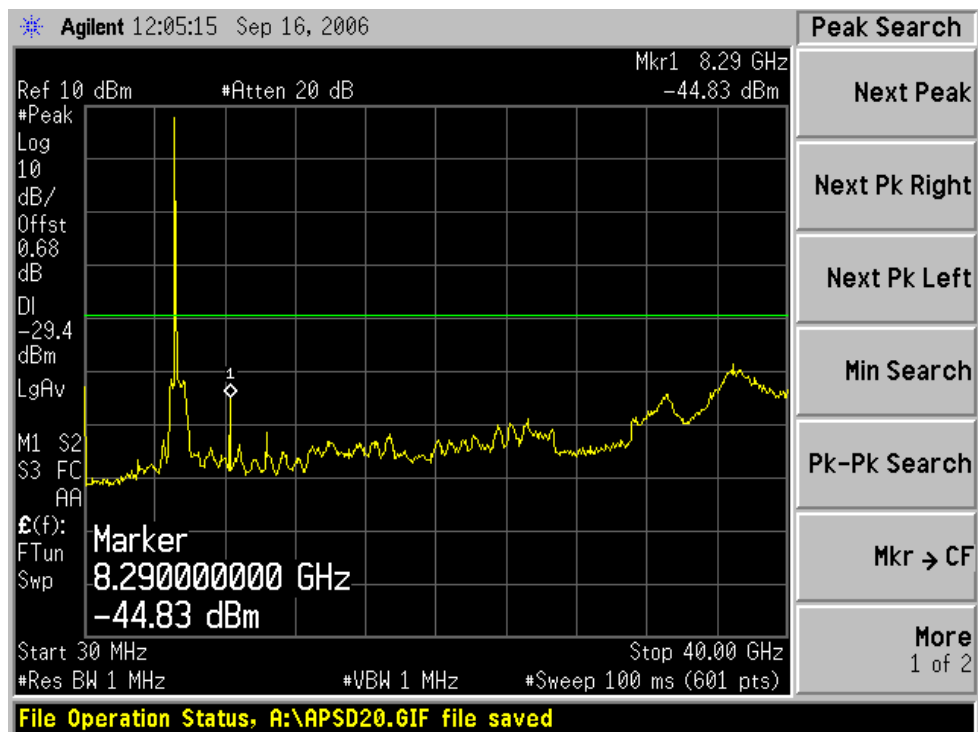


High Channel

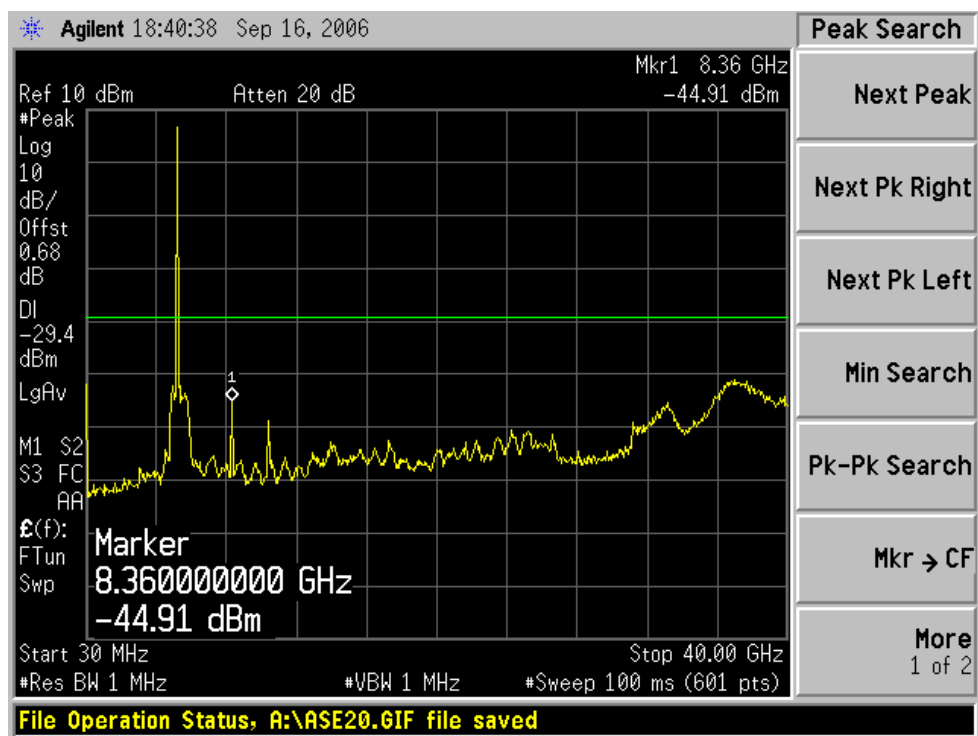


802.11a: 20MHz rate/channel, Chain A

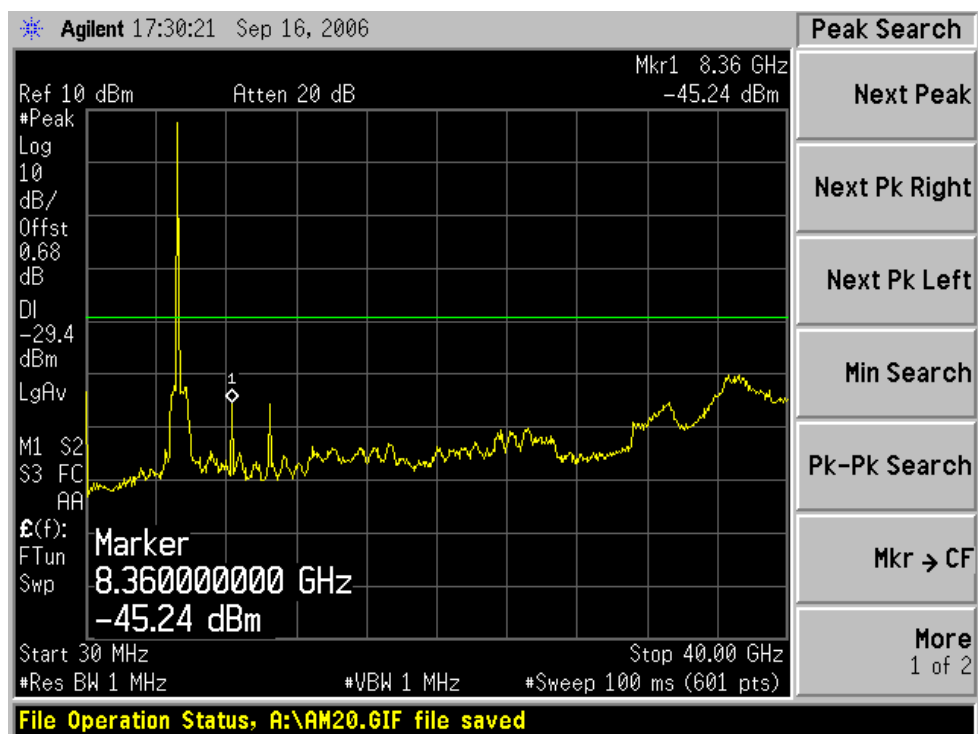
Low Channel



Middle Channel

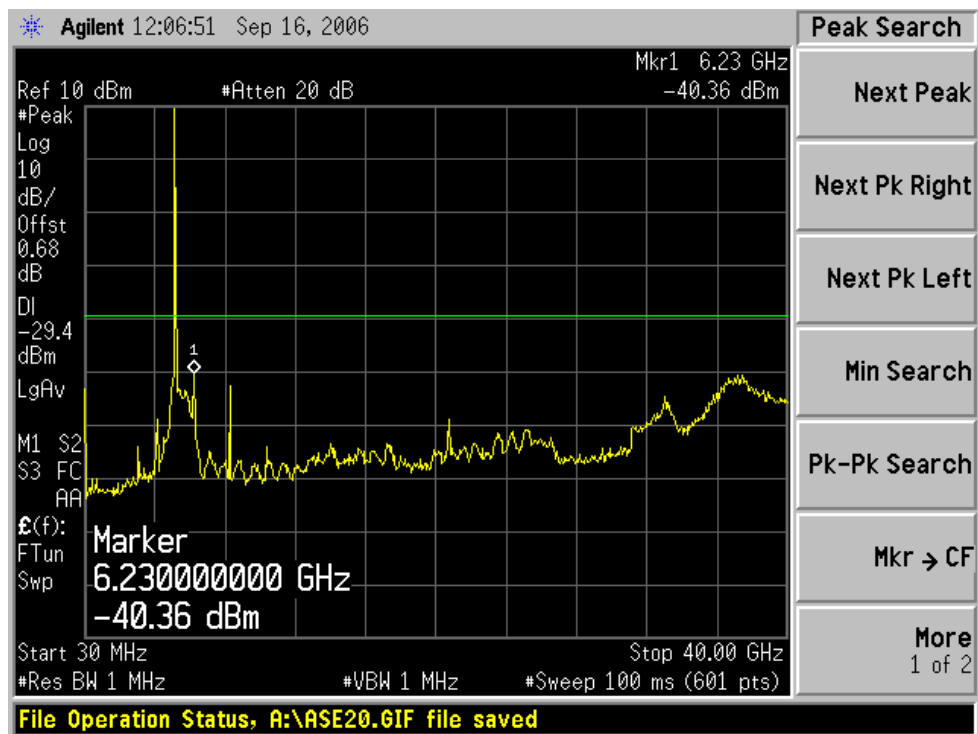


High Channel

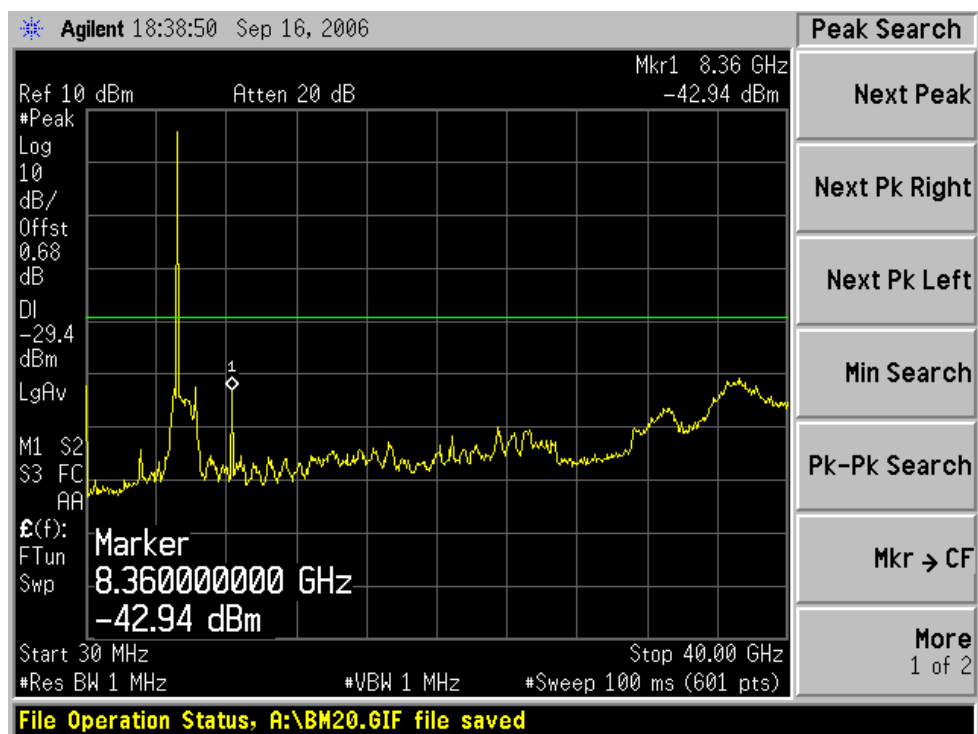


802.11a: 20MHz rate/channel, Chain B

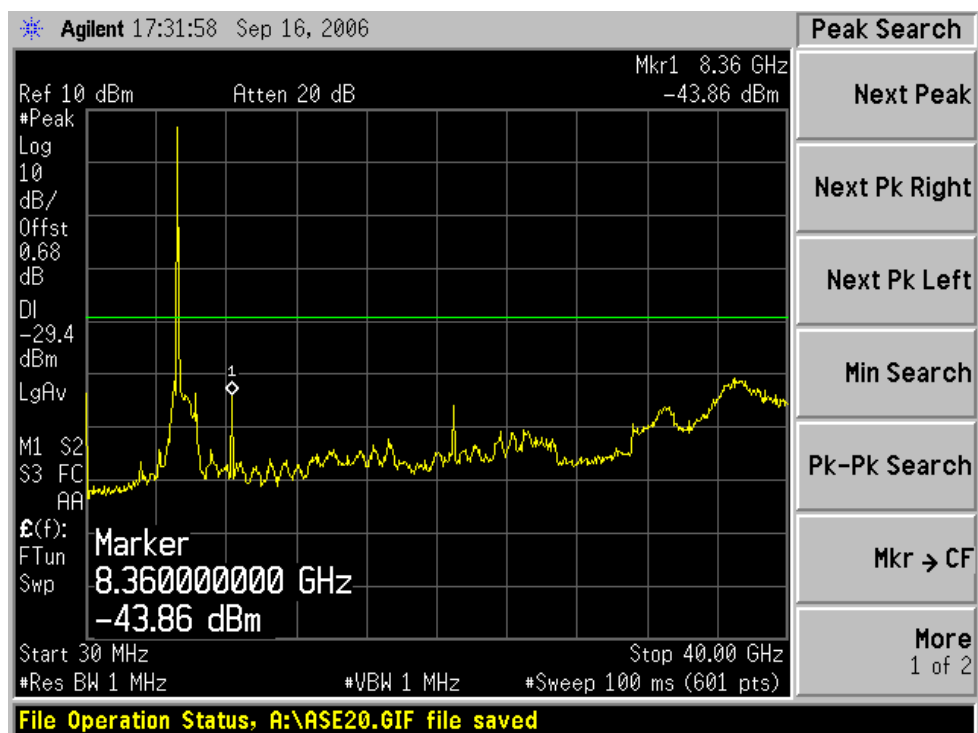
Low Channel



Middle Channel

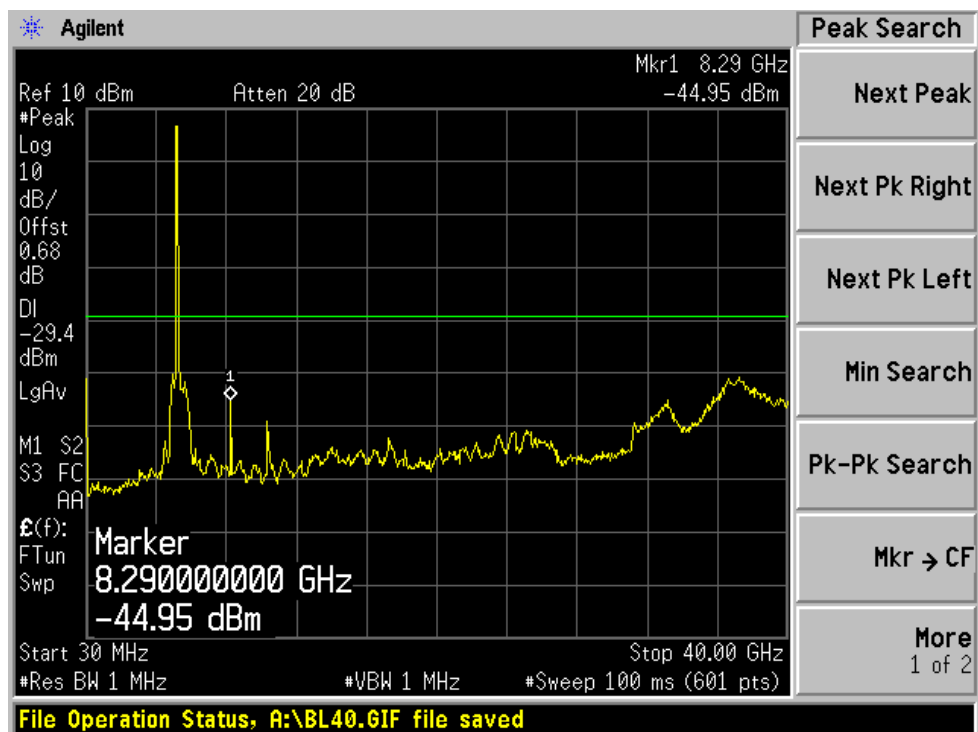


High Channel

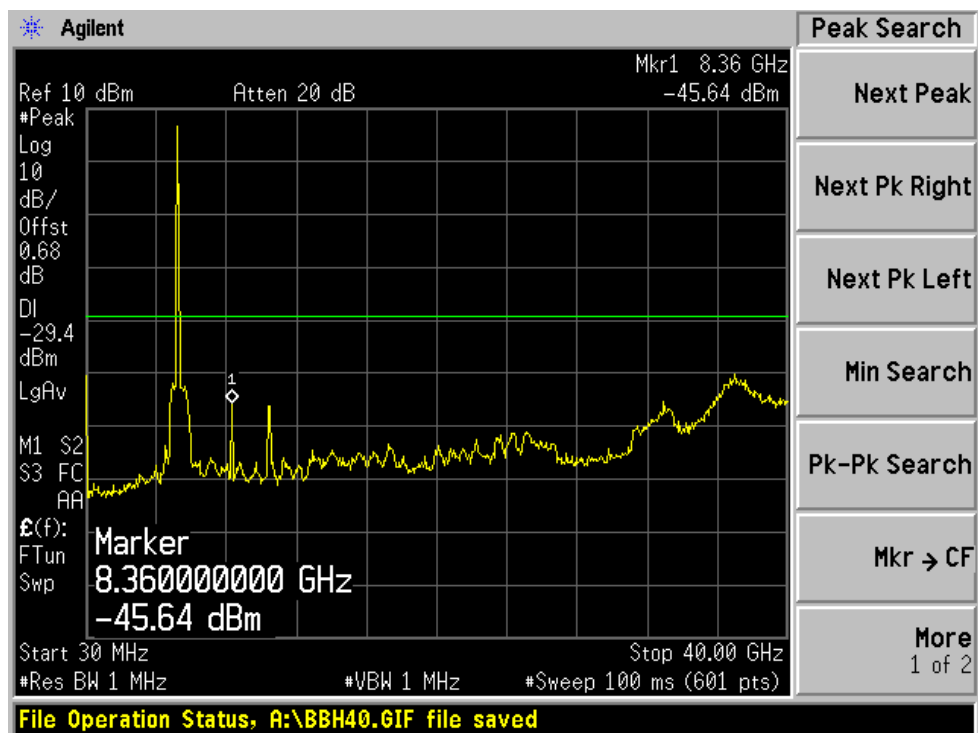


802.11a: 40MHz rate/channel, Chain A

Low Channel

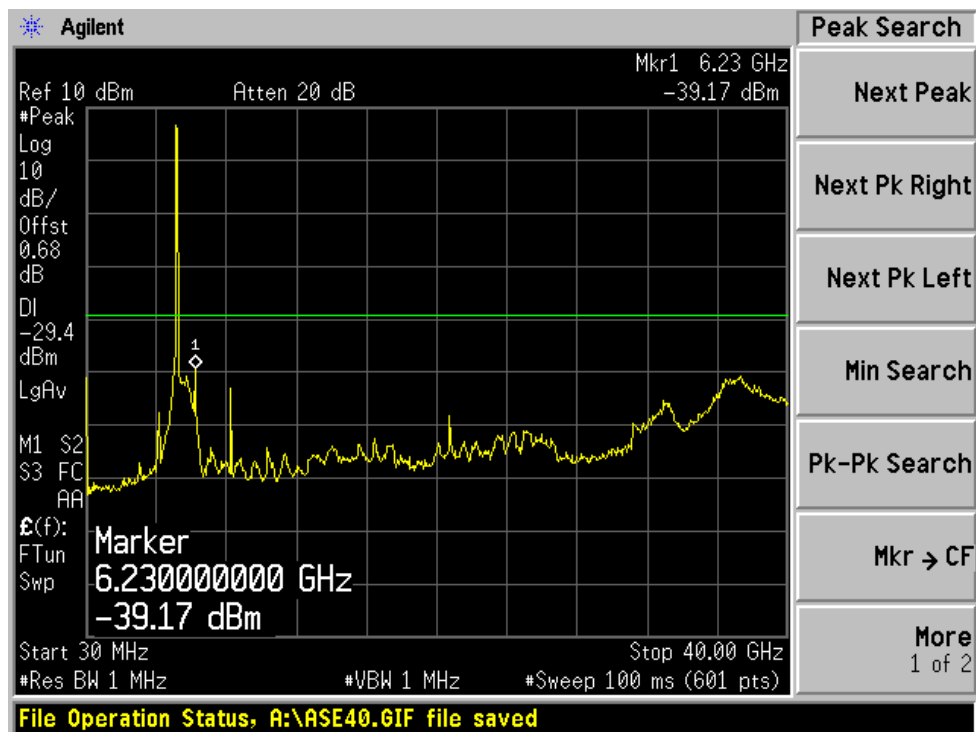


High Channel

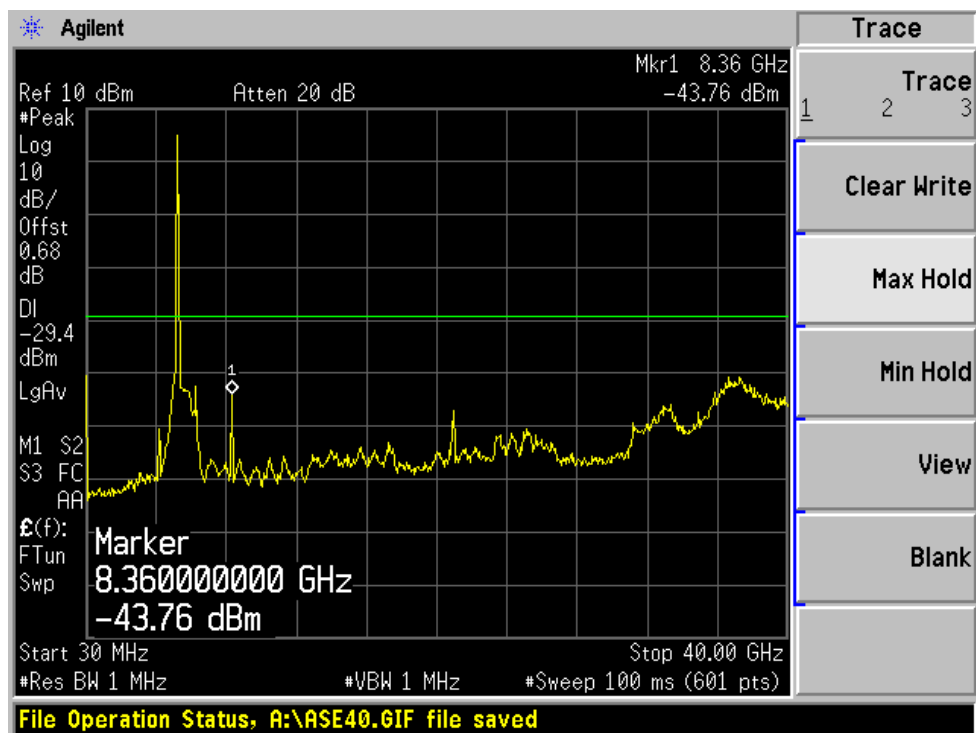


802.11a: 40MHz rate/channel, Chain B

Low Channel



High Channel



§15.109, §15.205, §15.209 & §15.247(c) - RADIATED SPURIOUS EMISSIONS

Applicable Standard

As per 15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per 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 (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** 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.

As Per 15.407(a)(1) & (a)(2): for the 5.15-5.35 GHz band, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

As Per 15.205(a) except as show 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	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C and E limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Sonoma Instruments	Pre amplifier	317	260408	2006-03-02
Agilent	Pre amplifier	8449B	3008A01978	2006-08-10
Sunol Science Corp	Combination Antenna	JB3 Antenna	A020106-3	2006-02-14
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	20-174821	2006-02-24
Sunol Science Corp	System Controller	S9V	113005-1	N/R
Agilent	Spectrum Analyzer	E4446A	US44300386	2006-03-06
A.R.A	Antenna Horn	DRG-118/A	1132	2006-08-17
Agilent	Spectrum Analyzer	8565EC	3946A00131	2006-01-11
Rohde & Schwarz	Spectrum Analyzer	FSEM	DE23840	2005-12-21

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000MHz:

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

Above 1000MHz:

- (1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
- (2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

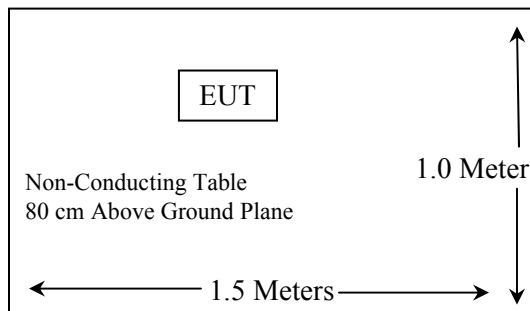
$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.

The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{FCC Limit}$$

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

** The testing was performed by Dan Coronia from 2006-11-08 to 2006-11-28*

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15 section 15.205, 15.209 and Subpart E 15.407, and had the worst margin of:

5150-5250 MHz Band (W52)

802.11n: 20MHz rate/channel

- 0.5 dB at 10360.0000 MHz in the **Horizontal** polarization for Low Channel, 1GHz – 40GHz
- 1.2 dB at 15660.0000 MHz in the **Horizontal** polarization for Middle Channel, 1GHz – 40GHz
- 2.3 dB at 15720.0000 MHz in the **Horizontal** polarization for High Channel, 1GHz – 40GHz

802.11n: 40MHz rate/channel

- 4.4 dB at 15570.0000 MHz in the **Vertical** polarization for Low Channel, 1GHz – 40GHz
- 1.3 dB at 15690.0000 MHz in the **Vertical** polarization for High Channel, 1GHz – 40GHz

802.11a: 20MHz rate/channel

- 2.4 dB at 15540.0000 MHz in the **Vertical** polarization for Low Channel, 1GHz – 40GHz
- 1.2 dB at 10440.0000 MHz in the **Vertical** polarization for Middle Channel, 1GHz – 40GHz
- 3.4 dB at 15720.0000 MHz in the **Vertical** polarization for High Channel, 1GHz – 40GHz

802.11a: 40MHz rate/channel

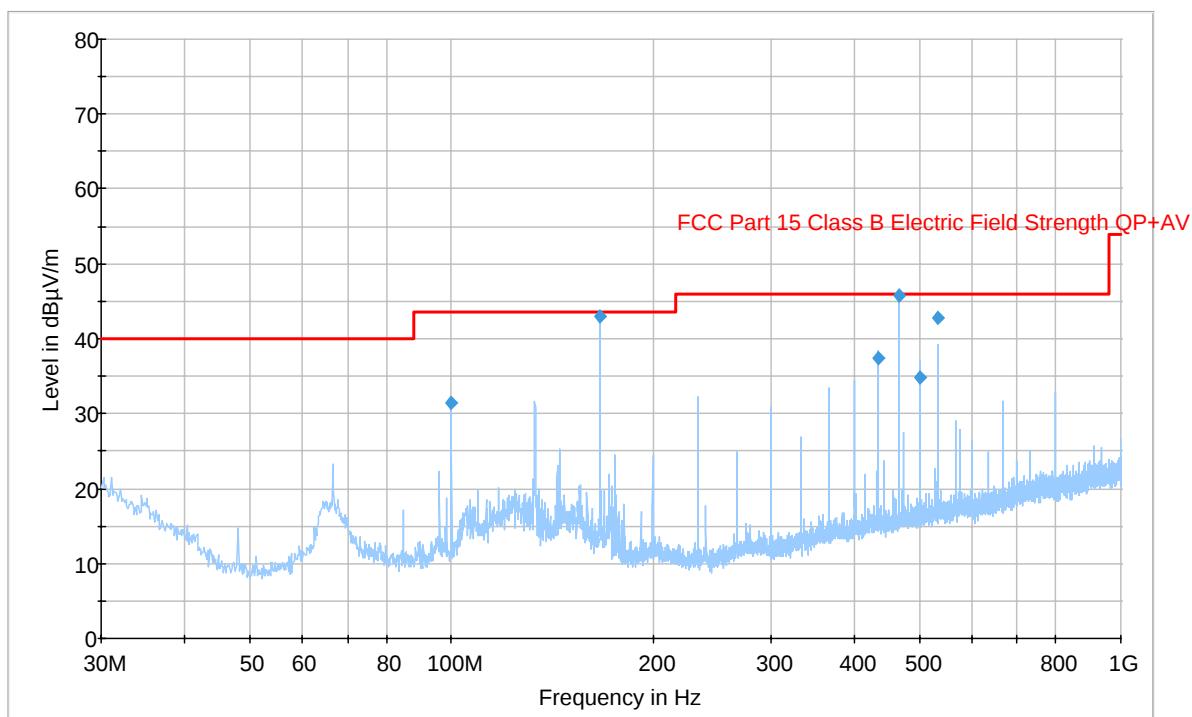
- 3.0 dB at 15570.0000 MHz in the **Vertical** polarization for Low Channel, 1GHz – 40GHz
- 1.8 dB at 10460.0000 MHz in the **Vertical** polarization for High Channel, 1GHz – 40GHz

30-1000MHz

- 0.2 dB at 466.662500 MHz in the **Vertical** polarization 30-1000MHz

Radiated Emissions Test plot & data

Primary scan 30MHz -1GHz



Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Limit (dBμV/m)	Margin (dB)
466.662500	45.8	102.0	V	243.0	-18.5	46.0	-0.2
166.648750	43.0	248.0	H	69.0	-24.1	43.5	-0.5
533.310000	42.8	102.0	H	296.0	-17.8	46.0	-3.2
433.318750	37.5	122.0	V	242.0	-19.1	46.0	-8.5
499.966250	34.8	282.0	H	267.0	-17.9	46.0	-11.2
100.001250	31.5	102.0	V	337.0	-25.5	43.5	-12.0

5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel**

Low channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5180.0000	103.2	259	1.3	V	34.0	3.9	34.9	106.2	-	-	Fund/Peak
5180.0000	102.3	343	1.3	H	34.0	3.9	34.9	105.3	-	-	Fund/Peak
5180.0000	93.8	259	1.3	V	34.0	3.9	34.9	96.8	-	-	Ave
5180.0000	92.5	343	1.3	H	34.0	3.9	34.9	95.5	-	-	Ave
10360.0000	46.0	295	1.3	H	38.0	5.7	36.8	52.9	54	-0.5	Ave
15540.0000	37.3	325	1.5	H	40.4	7.3	33.2	51.7	54	-2.3	Ave
15540.0000	35.1	215	1.5	V	40.4	7.3	33.2	49.5	54	-4.5	Ave
10360.0000	39.6	254	1.2	V	38.0	5.7	36.8	46.5	54	-7.2	Ave
10360.0000	60.1	295	1.3	H	38.0	5.7	36.8	67.0	74	-6.2	Peak
15540.0000	50.7	325	1.5	H	40.4	7.3	33.2	65.1	74	-8.9	Peak
15540.0000	48.6	215	1.5	V	40.4	7.3	33.2	63.0	74	-11.0	Peak
10360.0000	53.7	254	1.2	V	38.0	5.7	36.8	60.6	74	-12.2	Peak

Mid channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5220.0000	102.2	230	1.3	V	34.0	4.0	34.4	105.8	-	-	Fund/Peak
5220.0000	101.5	257	1.4	H	34.0	4.0	34.4	105.1	-	-	Fund/Peak
5220.0000	92.0	230	1.3	V	34.0	4.0	34.4	95.6	-	-	Ave
5220.0000	91.6	257	1.4	H	34.0	4.0	34.4	95.2	-	-	Ave
15660.0000	38.4	310	1.5	H	40.4	7.2	33.2	52.8	54	-1.2	Ave
10440.0000	44.6	270	1.5	H	38.0	5.8	36.8	51.6	54	-2.4	Ave
15660.0000	36.8	330	1.3	V	40.4	7.2	33.2	51.2	54	-2.8	Ave
10440.0000	38.2	240	1.2	V	38.0	5.8	36.8	45.2	54	-8.8	Ave
10440.0000	59.8	270	1.5	H	38.0	5.8	36.8	66.8	74	-7.2	Peak
15660.0000	51.2	310	1.5	H	40.4	7.2	33.2	65.6	74	-8.4	Peak
15660.0000	50.0	340	1.3	V	40.4	7.2	33.2	64.4	74	-9.6	Peak
10440.0000	52.3	240	1.2	V	38.0	5.8	36.8	59.3	74	-14.7	Peak

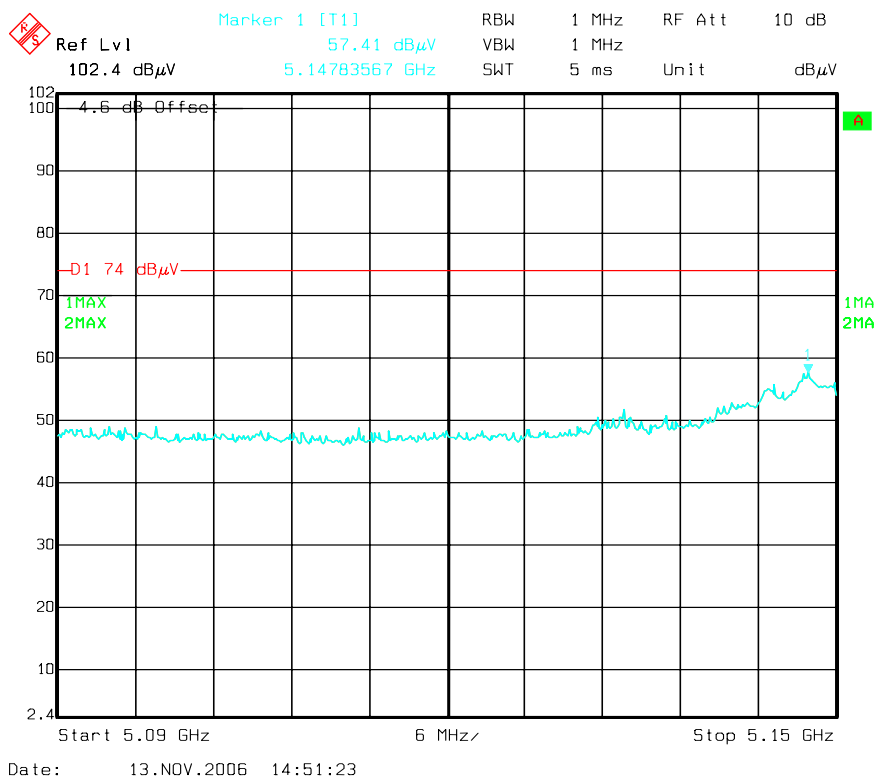
High channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5240.0000	102.4	247	1.1	V	34.0	4.0	34.4	106.0	-	-	Fund/Peak
5240.0000	101.8	239	1.2	H	34.0	4.0	34.4	105.3	-	-	Fund/Peak
5240.0000	93.4	247	1.1	V	34.0	4.0	34.4	97.0	-	-	Ave
5240.0000	93.2	239	1.2	H	34.0	4.0	34.4	96.7	-	-	Ave
15720.0000	37.3	320	1.2	H	40.4	7.3	33.2	51.7	54	-2.3	Ave
15720.0000	36.1	300	1.3	V	40.4	7.3	33.2	50.5	54	-3.5	Ave
10480.0000	42.6	230	1.4	H	38.0	5.8	36.8	49.6	54	-4.4	Ave
10480.0000	38.4	245	1.1	V	38.0	5.8	36.8	45.4	54	-8.6	Ave
15720.0000	53.4	320	1.2	H	40.4	7.3	33.2	67.8	74	-6.2	Peak
15720.0000	51.5	300	1.3	V	40.4	7.3	33.2	65.9	74	-8.1	Peak
10480.0000	53.6	230	1.3	H	38.0	5.8	36.8	60.6	74	-13.4	Peak
10480.0000	52.1	245	1.1	V	38.0	5.8	36.8	59.1	74	-14.9	Peak

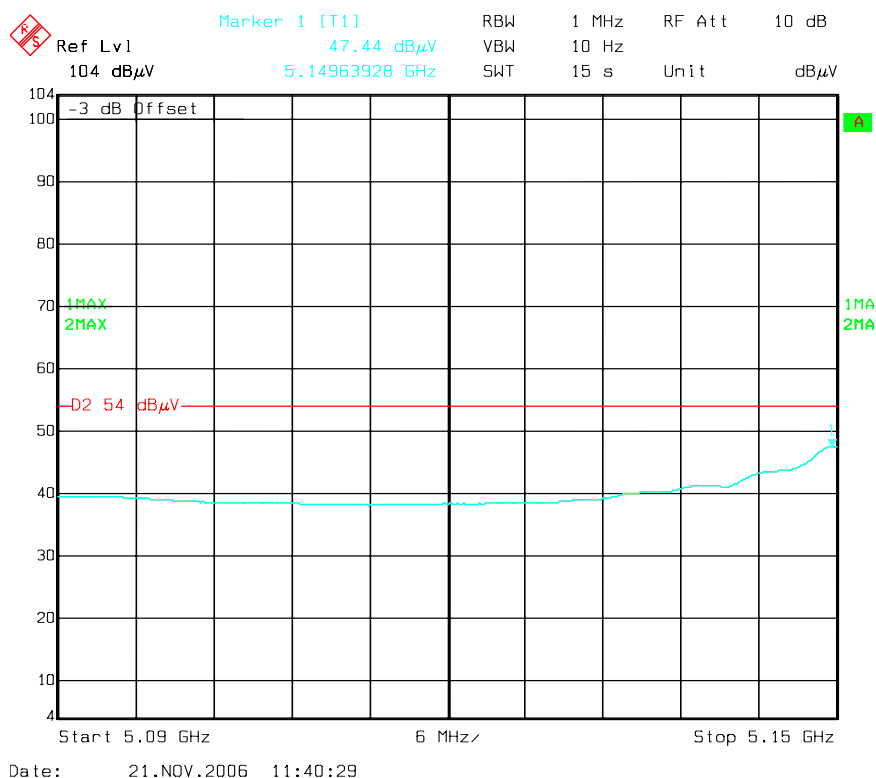
Restricted band edge

Low channel

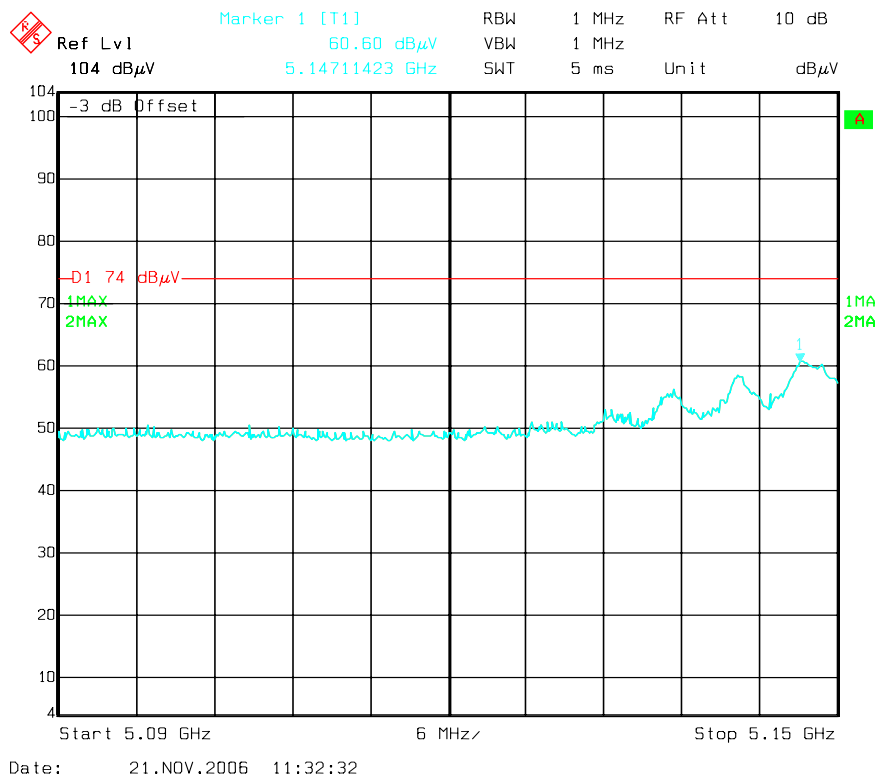
Peak, Horizontal



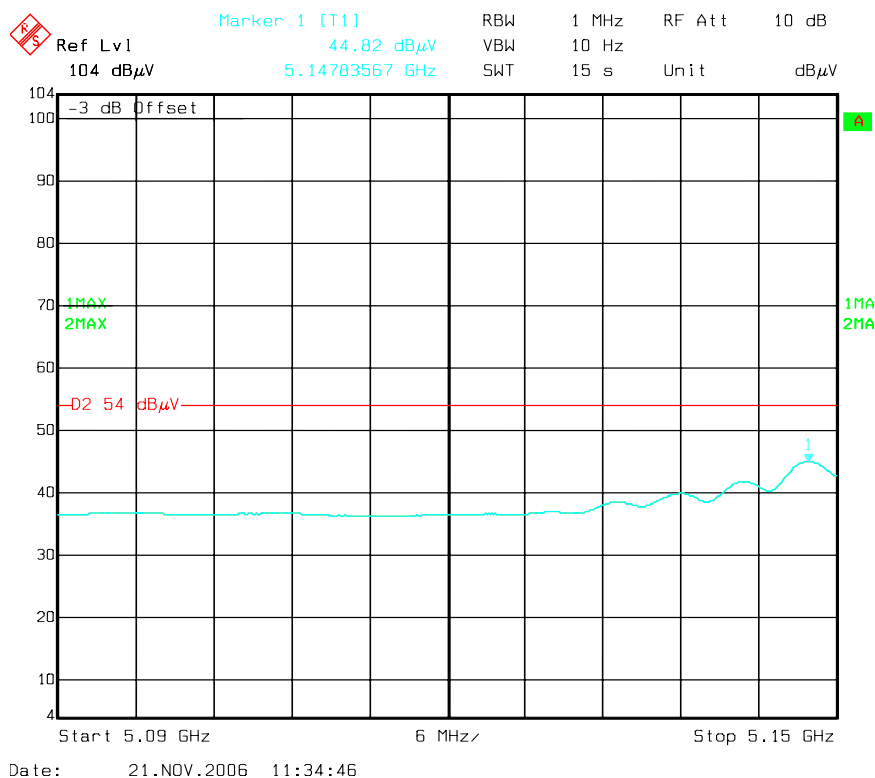
Average, Horizontal



Peak, Vertical



Average, Vertical



802.11n: 40MHz rate/channel

Low channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5190.0000	99.6	257	1.0	V	34.0	3.9	34.9	102.6	-	-	Fund/Peak
5190.0000	96.8	338	1.1	H	34.0	3.9	34.9	99.8	-	-	Fund/Peak
5190.0000	90.2	257	1.0	V	34.0	3.9	34.9	93.2	-	-	Ave
5190.0000	88.7	338	1.1	H	34.0	3.9	34.9	91.8	-	-	Ave
15570.0000	35.2	200	1.4	V	40.4	7.3	33.2	49.6	54	-4.4	Ave
15570.0000	34.9	240	1.4	H	40.4	7.3	33.2	49.3	54	-4.7	Ave
10380.0000	40.1	250	1.4	H	38.0	5.7	36.8	47.0	54	-7.0	Ave
10380.0000	34.0	230	1.2	V	38.0	5.7	36.8	40.9	54	-13.1	Ave
15570.0000	49.1	200	1.4	V	40.4	7.3	33.2	63.5	74	-10.5	Peak
10380.0000	52.8	250	1.4	H	38.0	5.7	36.8	59.7	74	-14.3	Peak
15570.0000	43.4	240	1.3	H	40.4	7.3	33.2	57.8	74	-16.2	Peak
10380.0000	46.9	230	1.2	V	38.0	5.7	36.8	53.8	74	-20.2	Peak

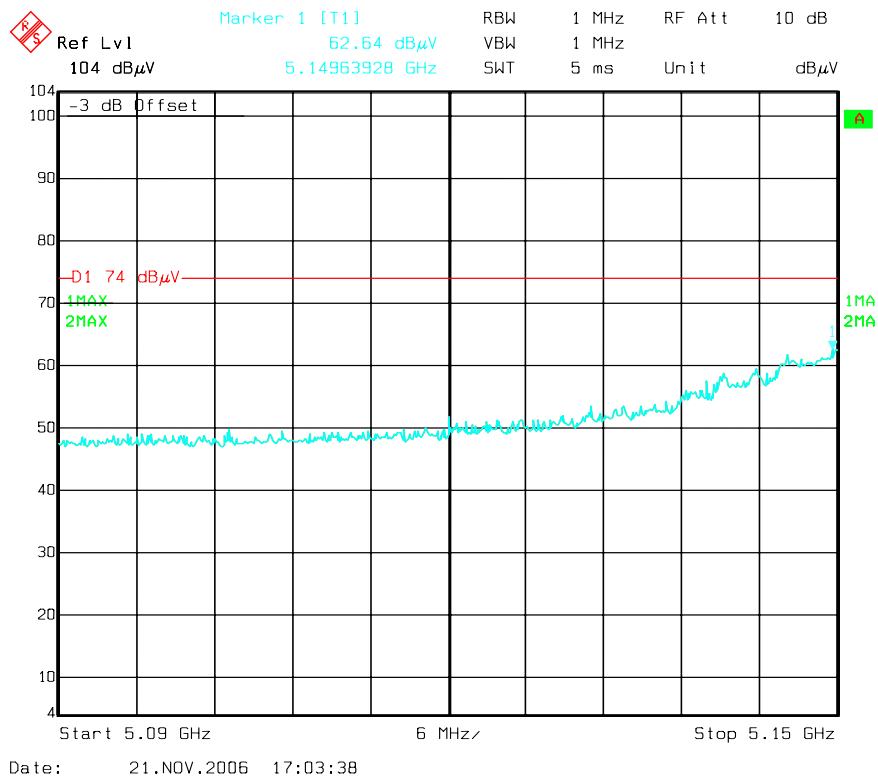
High channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5230.0000	104.8	223	1.4	V	34.0	4.0	34.4	108.3	-	-	Fund/Peak
5230.0000	103.6	255	1.3	H	34.0	4.0	34.4	107.1	-	-	Fund/Peak
5230.0000	95.3	223	1.4	V	34.0	4.0	34.4	98.9	-	-	Ave
5230.0000	94.7	255	1.3	H	34.0	4.0	34.4	98.2	-	-	Ave
15690.0000	38.3	265	1.0	V	40.4	7.2	33.2	52.7	54	-1.3	Ave
10460.0000	45.0	268	1.1	V	38.0	5.8	36.8	52.0	54	-2.0	Ave
15690.0000	37.2	276	1.1	H	40.4	7.2	33.2	51.6	54	-2.4	Ave
10460.0000	42.0	248	1.6	H	38.0	5.8	36.8	49.0	54	-5.0	Ave
15690.0000	51.4	265	1.0	V	40.4	7.2	33.2	65.7	74	-8.3	Peak
15690.0000	48.4	276	1.1	H	40.4	7.2	33.2	62.8	74	-11.2	Peak
10460.0000	55.3	268	1.1	V	38.0	5.8	36.8	62.3	74	-11.7	Peak
10460.0000	52.1	248	1.6	H	38.0	5.8	36.8	59.1	74	-14.9	Peak

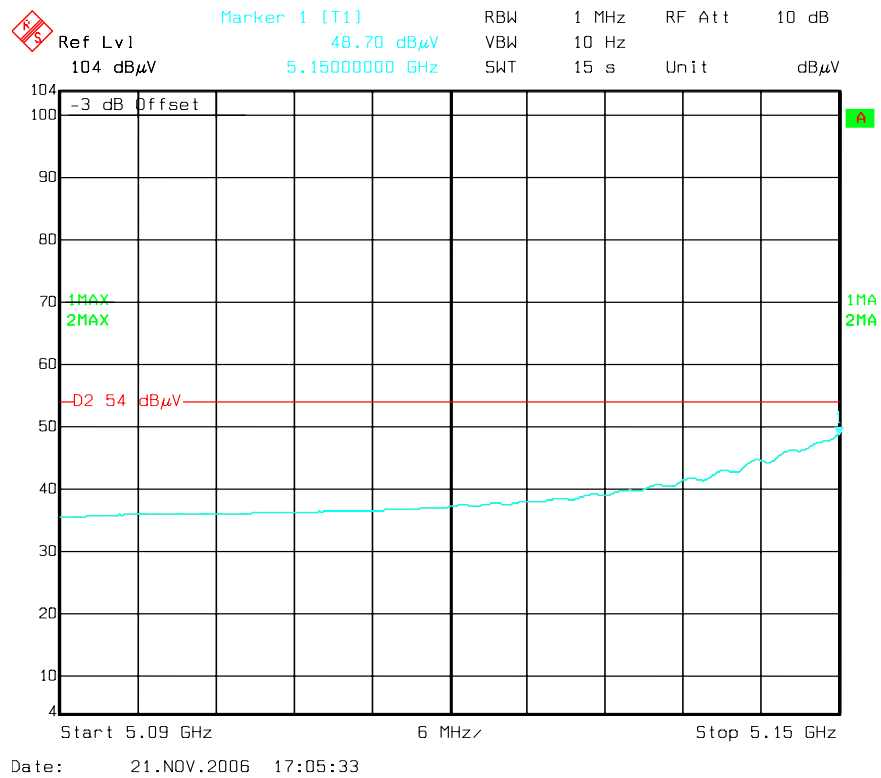
Restricted band edge

Low channel

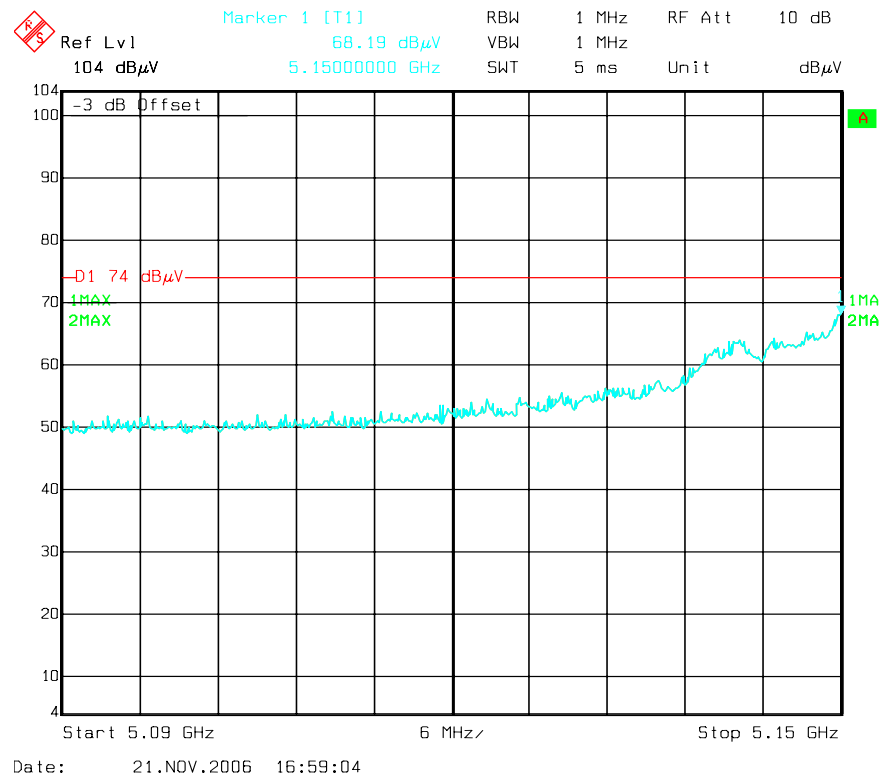
Peak, Horizontal



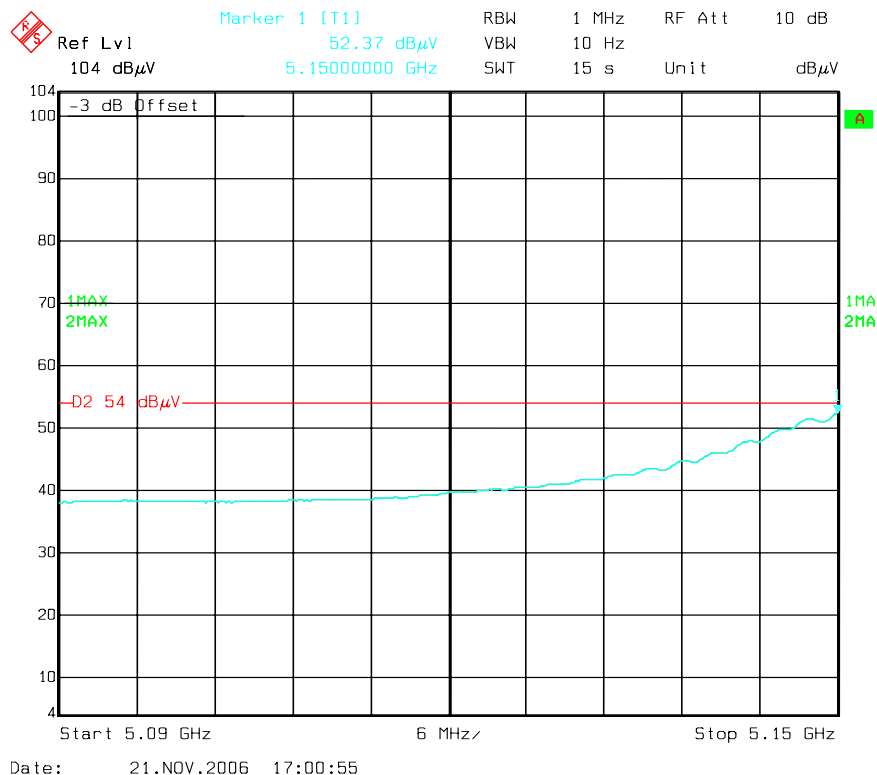
Average, Horizontal



Peak, Vertical



Average, Vertical



802.11a: 20MHz rate/channel

Low channel

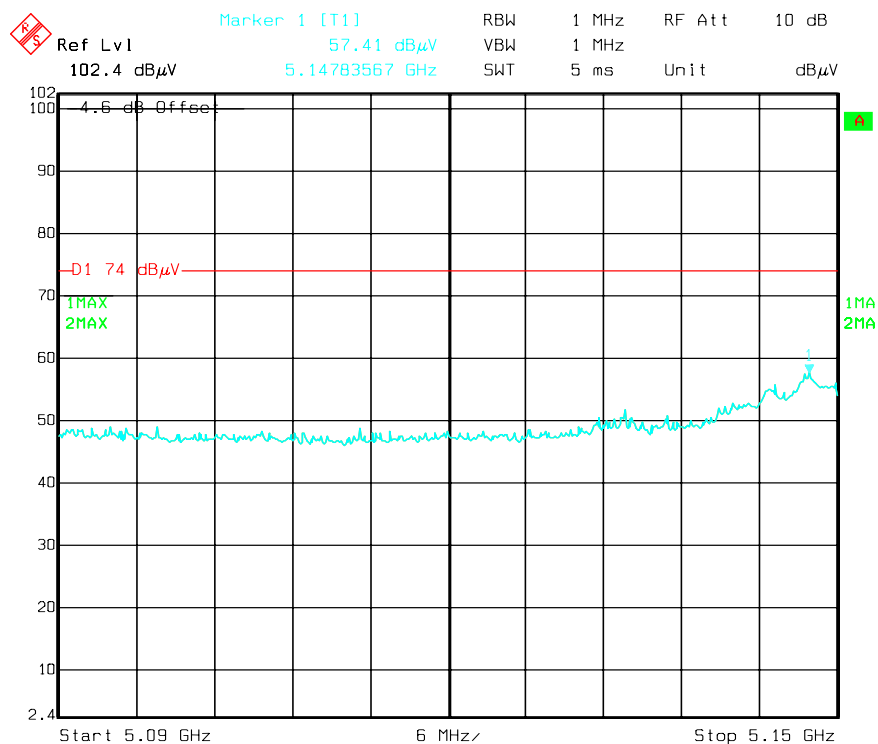
Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5180.0000	102.1	144	2.2	V	34.0	3.9	34.9	105.1	-	-	Fund/Peak
5180.0000	101.1	100	1.2	H	34.0	3.9	34.9	104.1	-	-	Fund/Peak
5180.0000	91.7	144	2.2	V	34.0	3.9	34.9	94.7	-	-	Ave
5180.0000	92.7	100	1.2	H	34.0	3.9	34.9	95.7	-	-	Ave
15540.0000	37.2	291	1.0	V	40.4	7.3	33.2	51.6	54	-2.4	Ave
15540.0000	33.2	297	1.0	H	40.4	7.3	33.2	47.6	54	-6.4	Ave
10360.0000	42.9	262	1.3	V	38.0	5.7	36.8	49.9	54	-4.1	Ave
10360.0000	40.6	200	1.3	H	38.0	5.7	36.8	47.5	54	-6.5	Ave
15540.0000	52.2	291	1.0	V	40.4	7.3	33.2	66.6	74	-7.4	Peak
15540.0000	47.2	297	1.0	H	40.4	7.3	33.2	61.6	74	-12.4	Peak
10360.0000	56.1	262	1.3	V	38.0	5.7	36.8	63.0	74	-11.0	Peak
10360.0000	53.3	200	1.3	H	38.0	5.7	36.8	60.3	74	-13.7	Peak

Mid channel

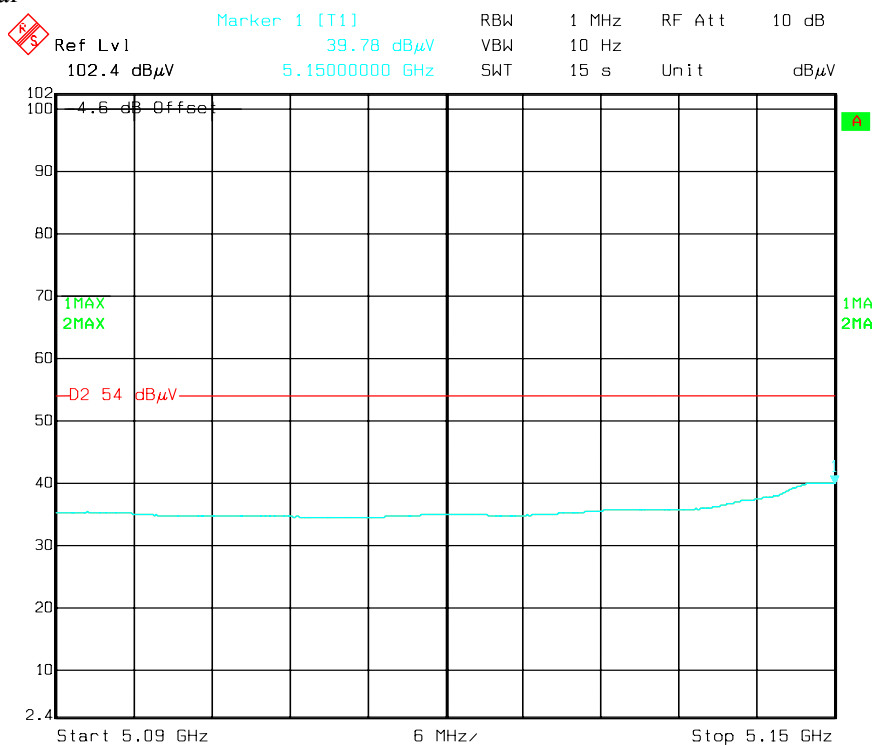
Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5220.0000	106.9	175	1.0	V	34.0	4.0	34.4	110.4	-	-	Fund/Peak
5220.0000	105.2	187	1.4	H	34.0	4.0	34.4	108.7	-	-	Fund/Peak
5220.0000	97.1	175	1.0	V	34.0	4.0	34.4	100.7	-	-	Ave
5220.0000	95.5	187	1.4	H	34.0	4.0	34.4	99.1	-	-	Ave
10440.0000	45.8	270	1.2	V	38.0	5.8	36.8	52.8	54	-1.2	Ave
15660.0000	38.1	270	1.0	V	40.4	7.2	33.2	52.5	54	-1.5	Ave
10440.0000	43.3	202	1.7	H	38.0	5.8	36.8	50.3	54	-3.7	Ave
15660.0000	35.9	267	1.0	H	40.4	7.2	33.2	50.2	54	-3.8	Ave
10440.0000	61.9	270	1.2	V	38.0	5.8	36.8	68.9	74	-5.1	Peak
15660.0000	52.9	270	1.0	V	40.4	7.2	33.2	67.2	74	-6.8	Peak
15660.0000	49.1	267	1.0	H	40.4	7.2	33.2	63.5	74	-10.5	Peak
10440.0000	56.1	202	1.7	H	38.0	5.8	36.8	63.0	74	-11.0	Peak

High channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5240.0000	102.4	227	1.7	V	34.0	4.0	34.4	105.9	-	-	Fund/Peak
5240.0000	101.7	230	1.7	H	34.0	4.0	34.4	105.2	-	-	Fund/Peak
5240.0000	92.7	227	1.7	V	34.0	4.0	34.4	96.2	-	-	Ave
5240.0000	92.5	230	1.7	H	34.0	4.0	34.4	96.0	-	-	Ave
15720.0000	36.2	301	1.0	V	40.4	7.3	33.2	50.6	54	-3.4	Ave
10480.0000	43.3	273	1.2	V	38.0	5.8	36.8	50.3	54	-3.7	Ave
10480.0000	42.5	300	1.2	H	38.0	5.8	36.8	49.5	54	-4.5	Ave
15720.0000	33.8	320	1.4	H	40.4	7.3	33.2	48.2	54	-5.8	Ave
15720.0000	54.6	301	1.0	V	40.4	7.3	33.2	69.0	74	-5.0	Peak
10480.0000	60.1	273	1.2	V	38.0	5.8	36.8	67.0	74	-7.0	Peak
15720.0000	50.3	320	1.4	H	40.4	7.3	33.2	64.7	74	-9.3	Peak
10480.0000	54.0	300	1.2	H	38.0	5.8	36.8	61.0	74	-13.0	Peak

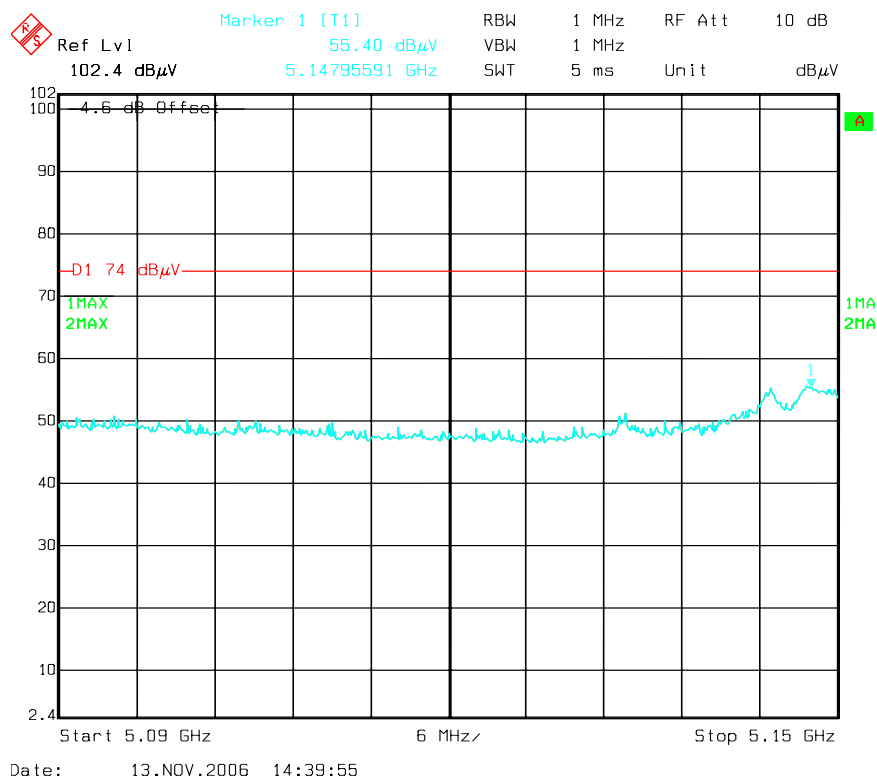
Restricted band edge**Low channel**
Peak, Horizontal

Date: 13.NOV.2006 14:51:23

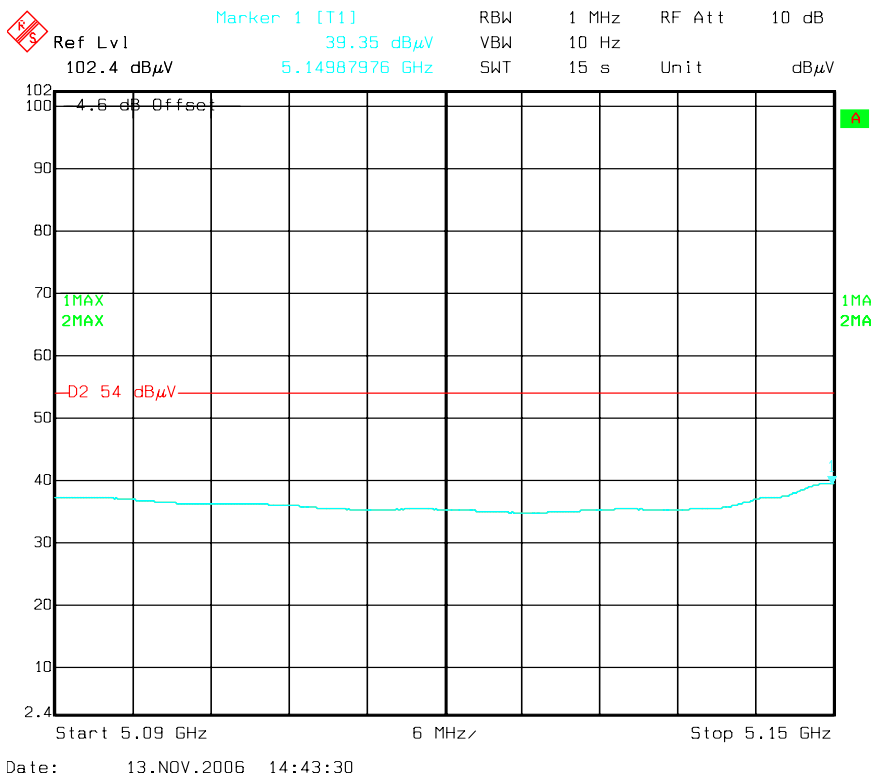
Average, Horizontal

Date: 13.NOV.2006 14:54:05

Peak, Vertical



Average, Vertical



802.11a: 40MHz rate/channel

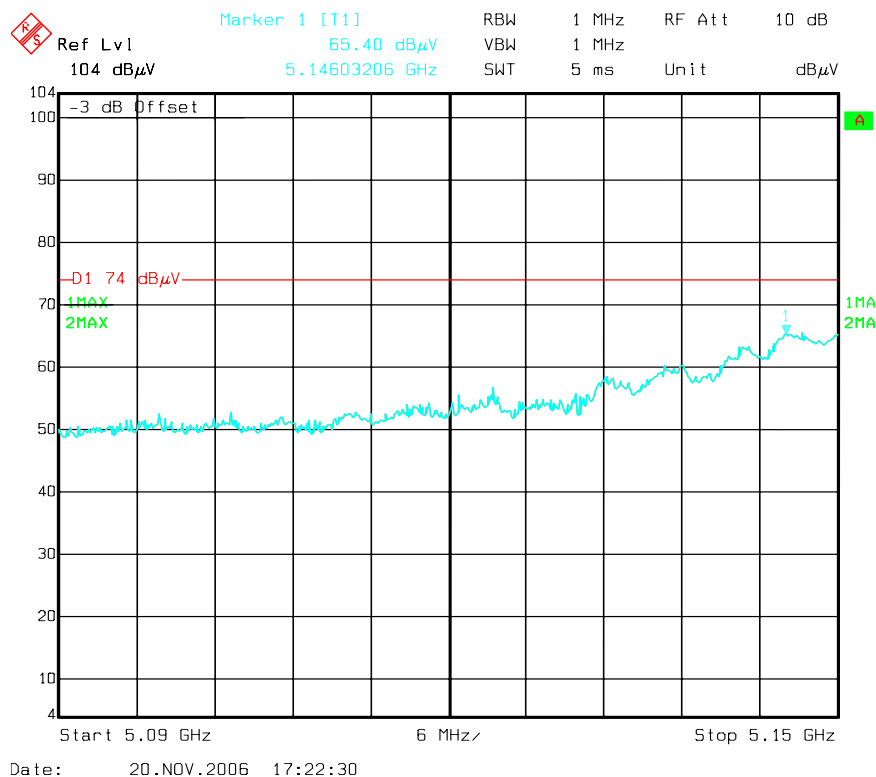
Low channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5190.0000	99.9	231	1.3	V	34.0	3.9	34.9	102.9	-	-	Fund/Peak
5190.0000	98.8	246	1.3	H	34.0	3.9	34.9	101.8	-	-	Fund/Peak
5190.0000	89.6	231	1.3	V	34.0	3.9	34.9	92.6	-	-	Ave
5190.0000	88.7	246	1.3	H	34.0	3.9	34.9	91.7	-	-	Ave
15570.0000	36.6	297	1.1	V	40.4	7.3	33.2	51.0	54	-3.0	Ave
10380.0000	42.9	271	1.2	V	38.0	5.7	36.8	49.8	54	-4.2	Ave
10380.0000	39.3	209	1.1	H	38.0	5.7	36.8	46.2	54	-7.8	Ave
15570.0000	28.5	280	1.1	H	40.4	7.3	33.2	42.9	54	-11.1	Ave
15570.0000	50.6	297	1.1	V	40.4	7.3	33.2	65.1	74	-8.9	Peak
10380.0000	53.6	271	1.2	V	38.0	5.7	36.8	60.5	74	-13.5	Peak
10380.0000	50.5	209	1.1	H	38.0	5.7	36.8	57.4	74	-16.6	Peak
15570.0000	41.3	280	1.1	H	40.4	7.3	33.2	55.7	74	-18.3	Peak

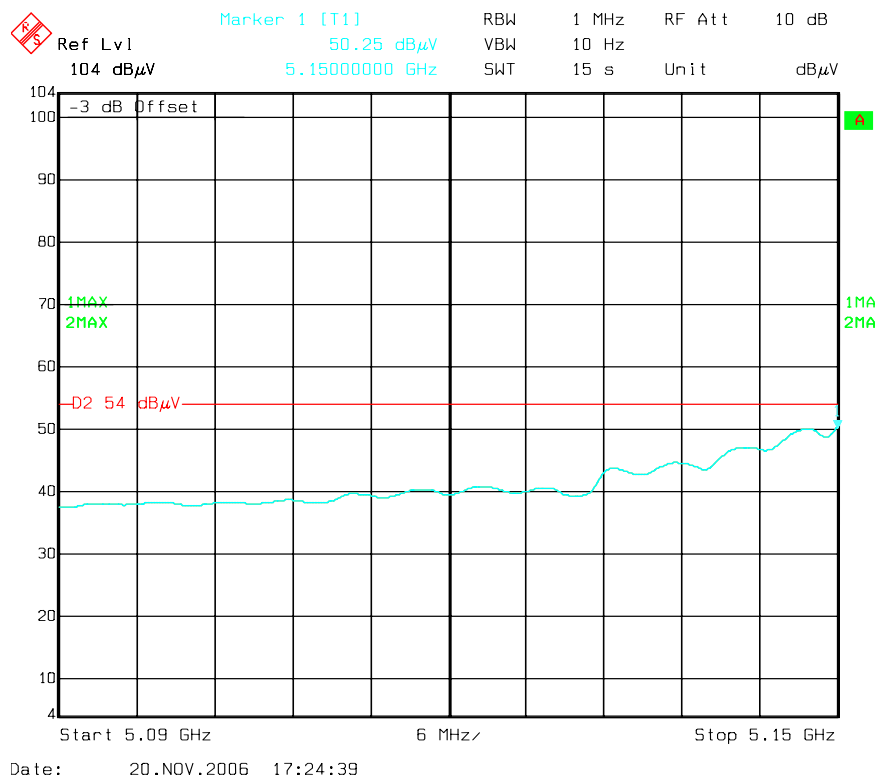
High channel

Frequency MHz	Reading dBuV/m	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Correction Factor dBuV/m	Limit dBuV/m	Margin dB	Comments
5230.0000	101.1	223	1.2	V	34.0	4.0	34.4	104.6	-	-	Fund/Peak
5230.0000	100.4	249	1.3	H	34.0	4.0	34.4	103.9	-	-	Fund/Peak
5230.0000	91.9	223	1.2	V	34.0	4.0	34.4	95.5	-	-	Ave
5230.0000	91.7	249	1.3	H	34.0	4.0	34.4	95.2	-	-	Ave
10460.0000	45.2	277	1.2	V	38.0	5.8	36.8	52.2	54	-1.8	Ave
15690.0000	37.5	273	1.0	V	40.4	7.2	33.2	51.9	54	-2.1	Ave
15690.0000	35.0	280	1.2	H	40.4	7.2	33.2	49.4	54	-4.6	Ave
10460.0000	39.2	307	1.5	H	38.0	5.8	36.8	46.1	54	-7.9	Ave
10460.0000	57.9	277	1.2	V	38.0	5.8	36.8	64.8	74	-9.2	Peak
15690.0000	49.4	273	1.0	V	40.4	7.2	33.2	63.8	74	-10.2	Peak
15690.0000	47.0	280	1.2	H	40.4	7.2	33.2	61.3	74	-12.7	Peak
10460.0000	49.9	307	1.4	H	38.0	5.8	36.8	56.9	74	-17.1	Peak

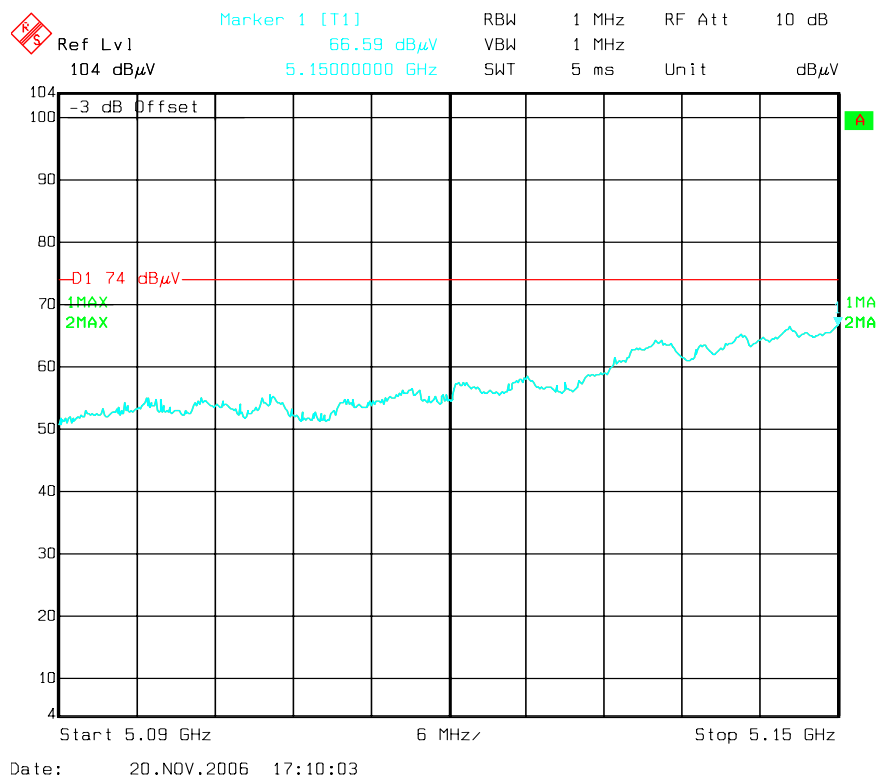
Restricted band edge

Low channel
Peak, Horizontal

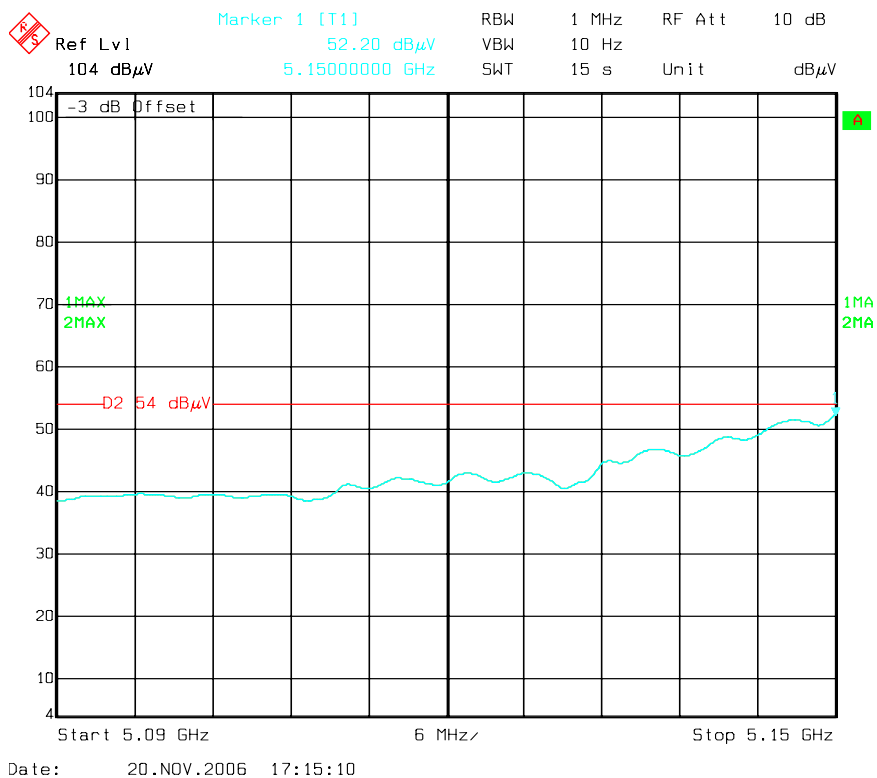
Average, Horizontal



Peak, Vertical



Average, Vertical



§15.407 – 26 dB & 99% BANDWIDTH

Applicable Standard

No limit, for reporting purpose only.

Measurement Procedure

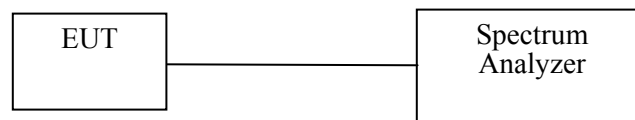
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 26 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

* **Statement of Traceability:** **BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

* The testing was performed by Dan Corona from 2006-11-08 to 2006-11-28

Test Results:**5150-5250 MHz Band (W52)**

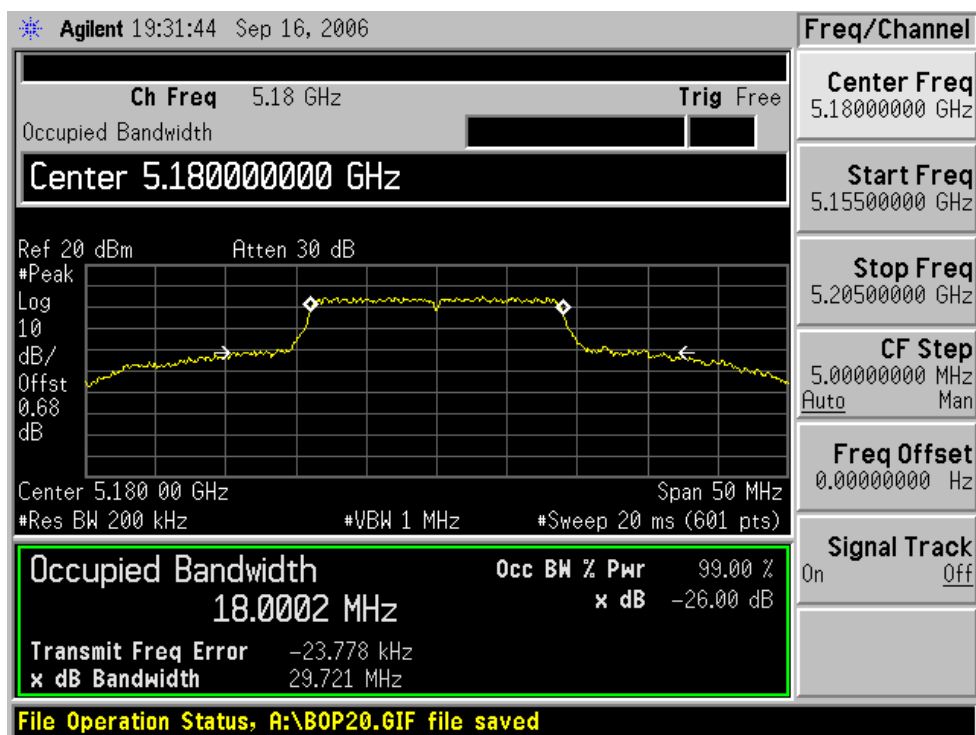
Channel	Frequency (MHz)	26 dB BW Chain A (kHz)	26 dB BW Chain B (kHz)	Worst case 10 log 26 dB BW (dB)
802.11 n 20MHz				
Low	5180	29721	27463	14.73
Middle	5220	20891	20792	13.20
High	5240	20808	22755	13.57
802.11 n 40MHz				
Low	5190	36320	36316	15.60
High	5230	36455	36381	15.61
802.11 a 20 MHz				
Low	5180	20369	25974	14.15
Middle	5220	23586	20310	13.73
High	5240	20962	26113	14.17
802.11a 40MHz				
Low	5190	59942	47088	17.78
High	5230	43874	43562	16.42

5150-5250 MHz Band (W52)

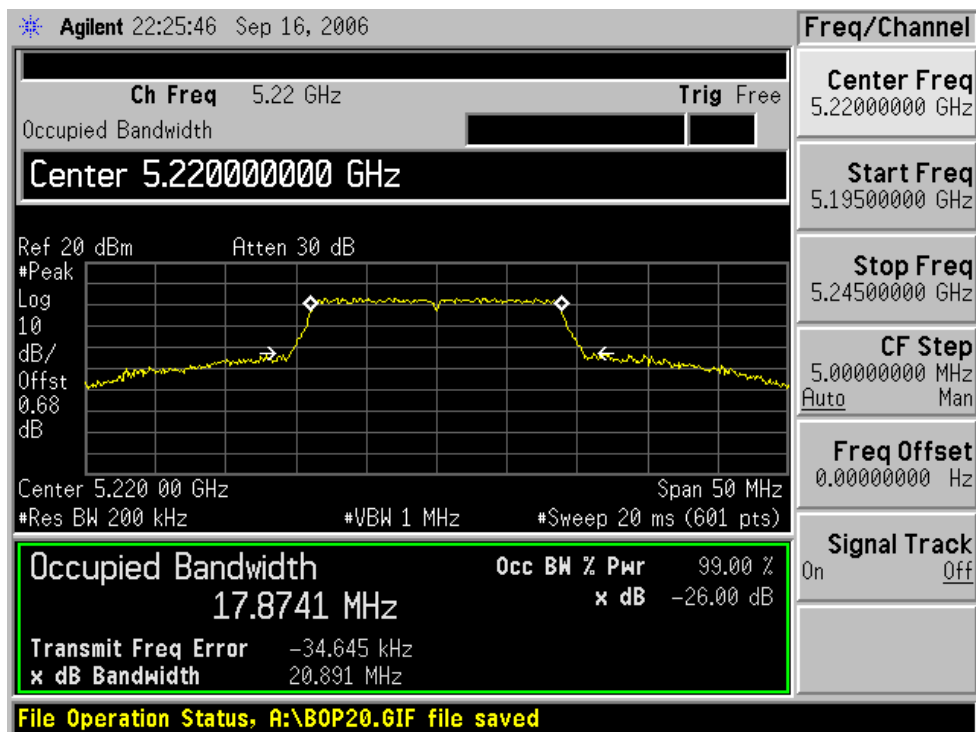
Channel	Frequency (MHz)	99% BW Chain A (MHz)	99% BW Chain B (MHz)
802.11 n 20MHz			
Low	5180	18.0002	17.9419
Middle	5220	17.8741	17.8426
High	5240	17.8808	18.0811
802.11 n 40MHz			
Low	5190	36.3201	36.3164
High	5230	36.4551	36.3814
802.11 a 20 MHz			
Low	5180	16.8196	17.1277
Middle	5220	16.8886	16.7300
High	5240	16.8808	17.0805
802.11a 40MHz			
Low	5190	36.9259	36.9421
High	5230	36.9277	36.8320

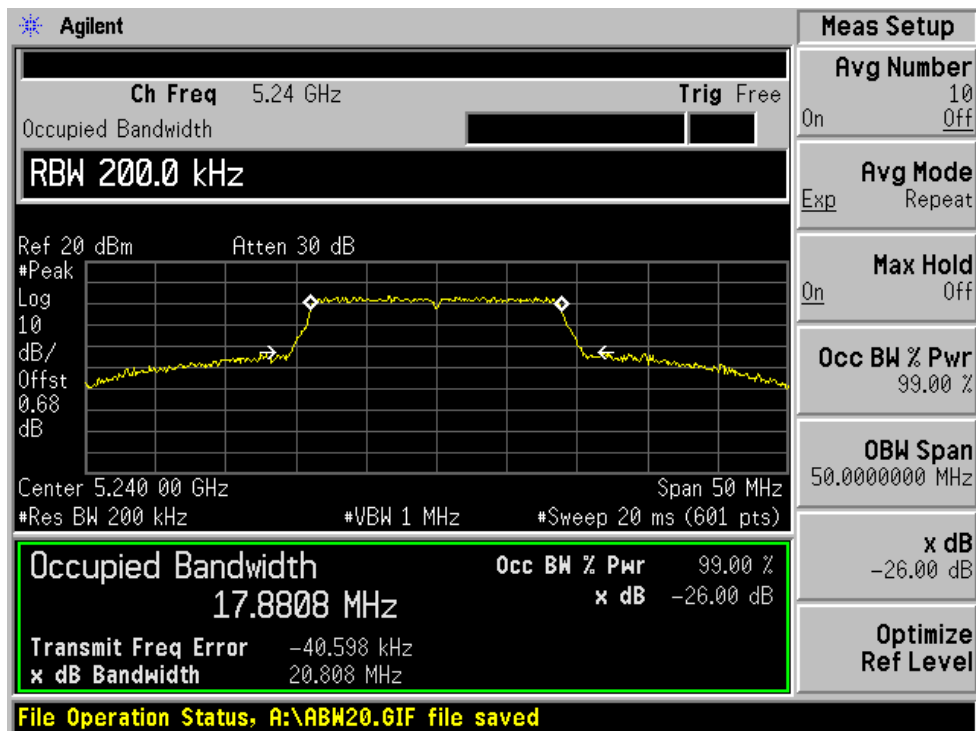
5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel, Chain A**

Low Channel



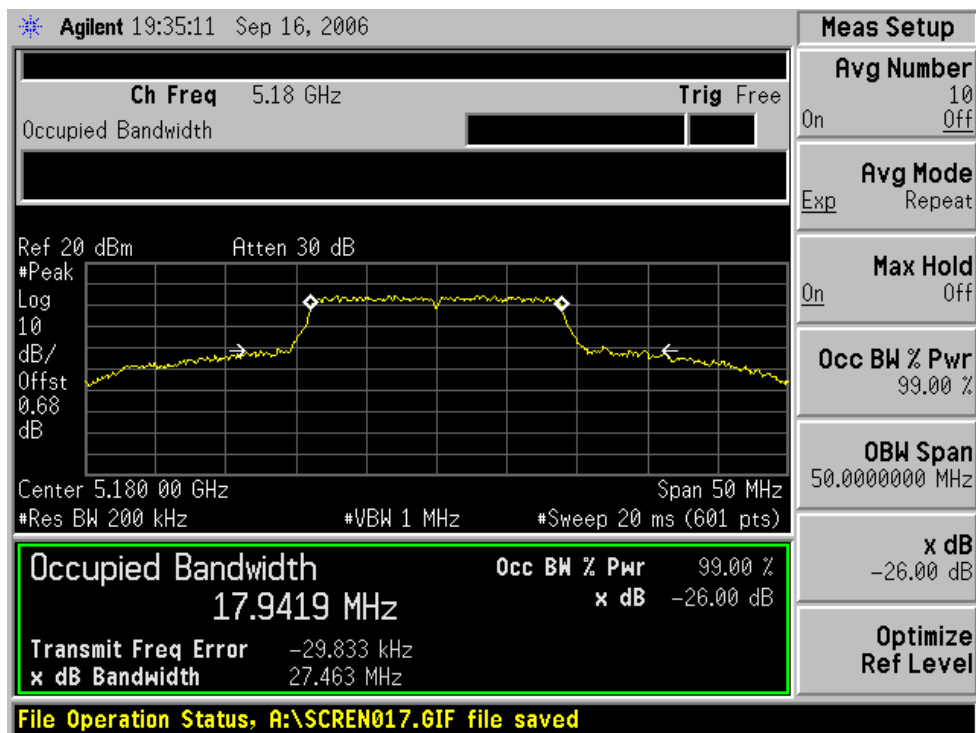
Middle Channel



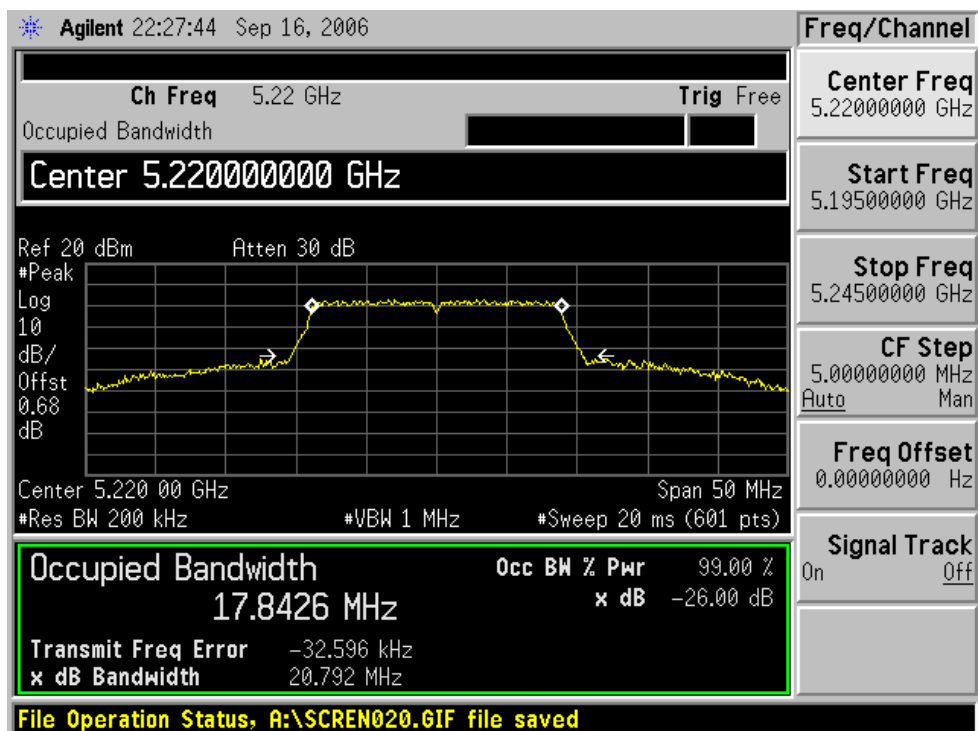


802.11n: 20MHz rate/channel, Chain B

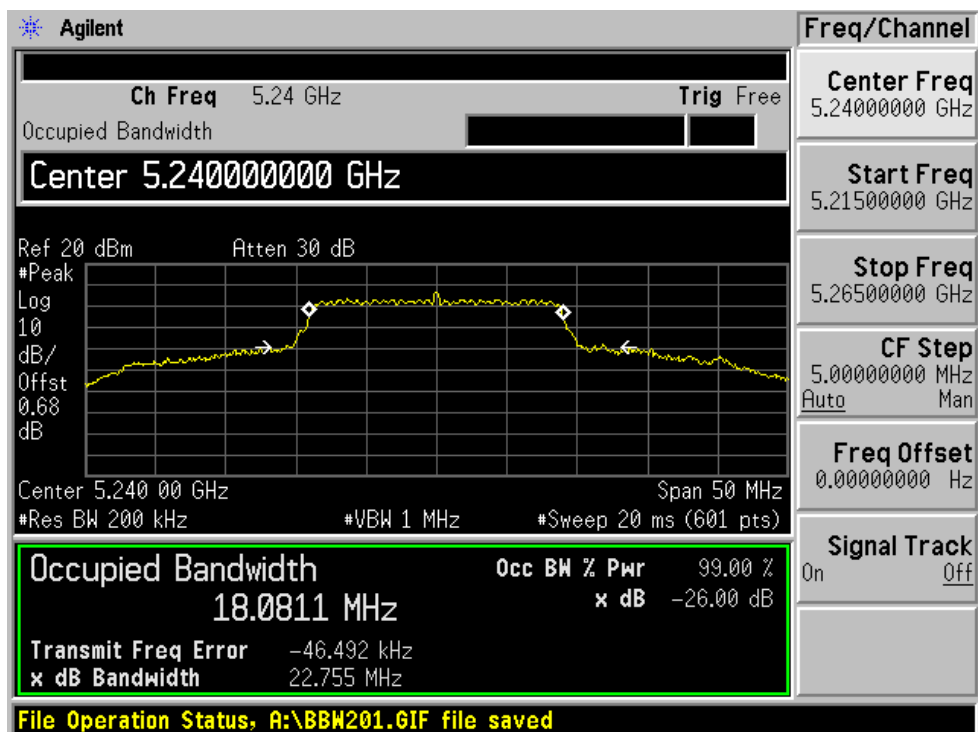
Low Channel



Middle Channel

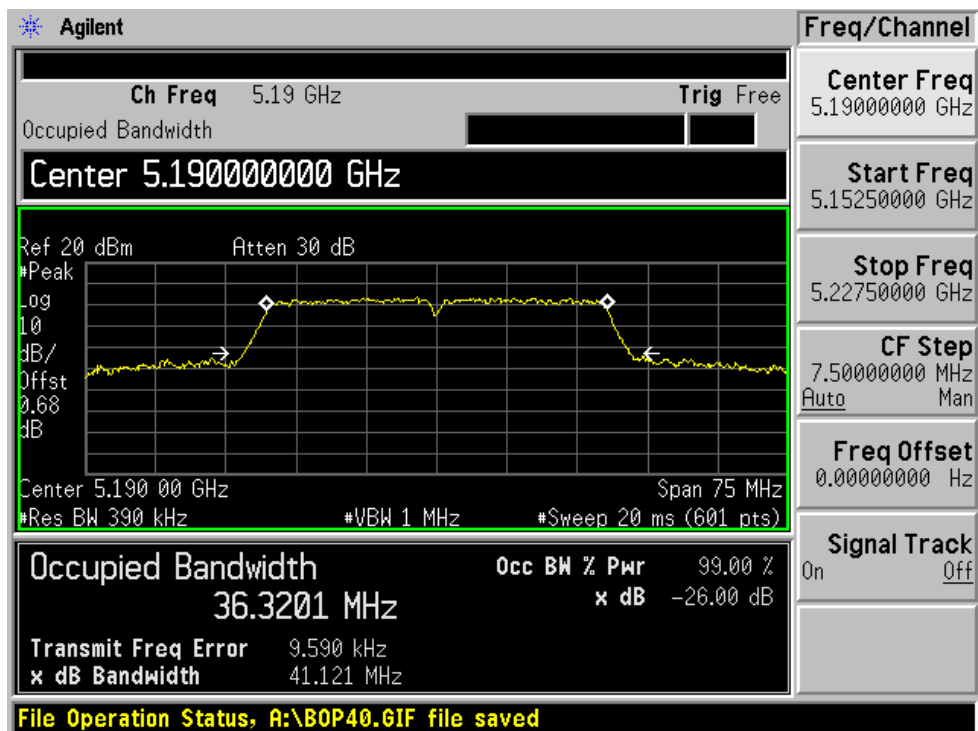


High Channel

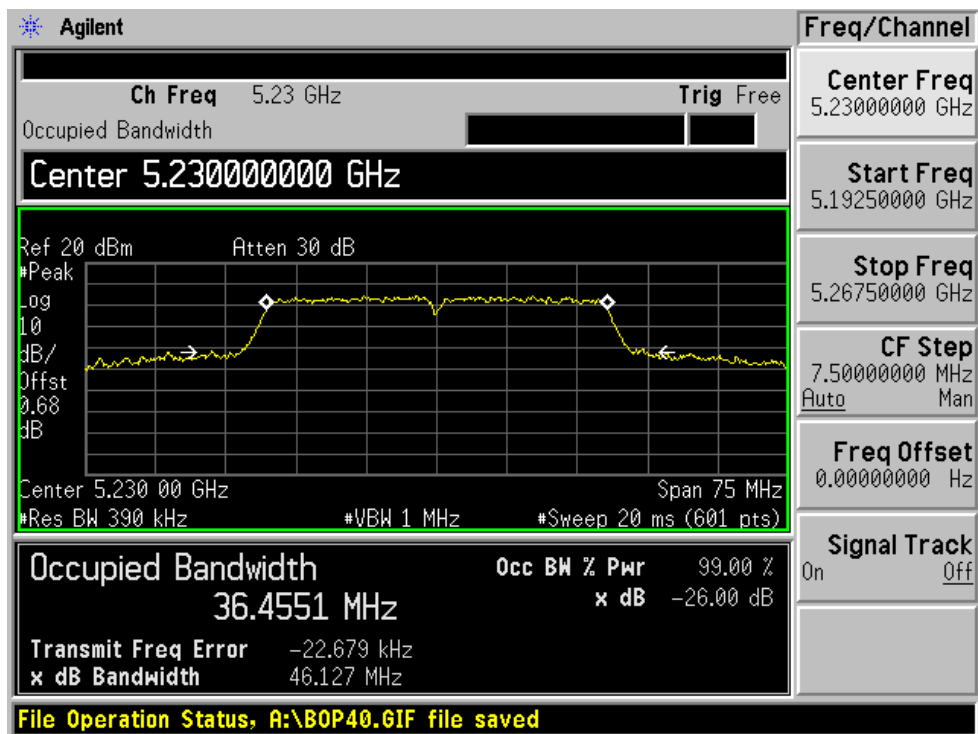


802.11n: 40MHz rate/channel, Chain A

Low Channel

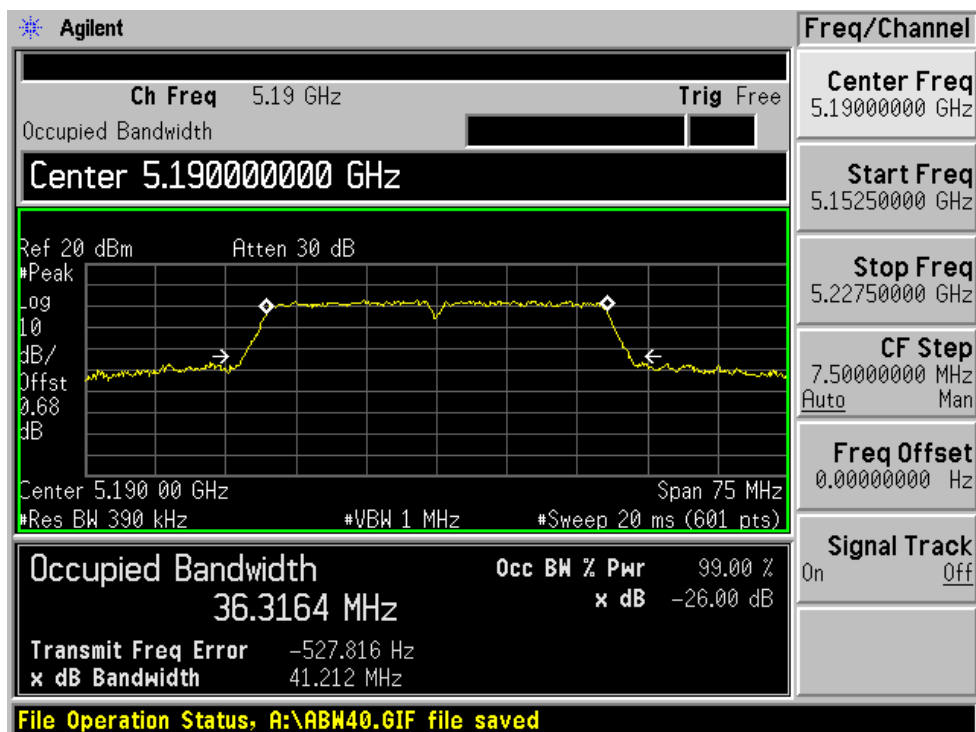


High Channel

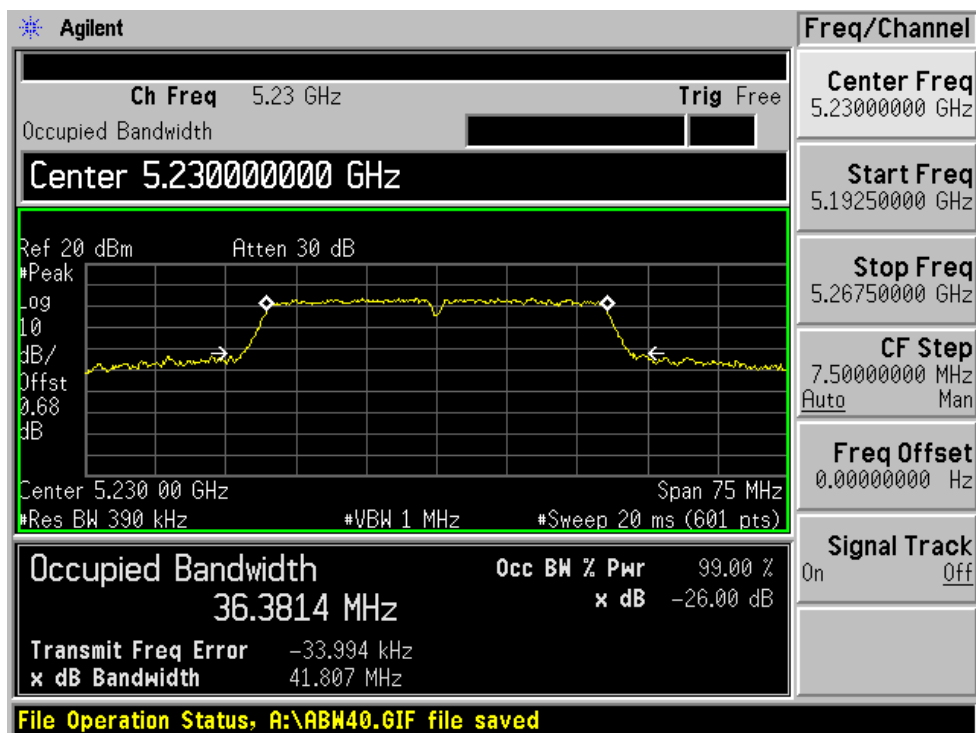


802.11n: 40MHz rate/channel, Chain B

Low Channel

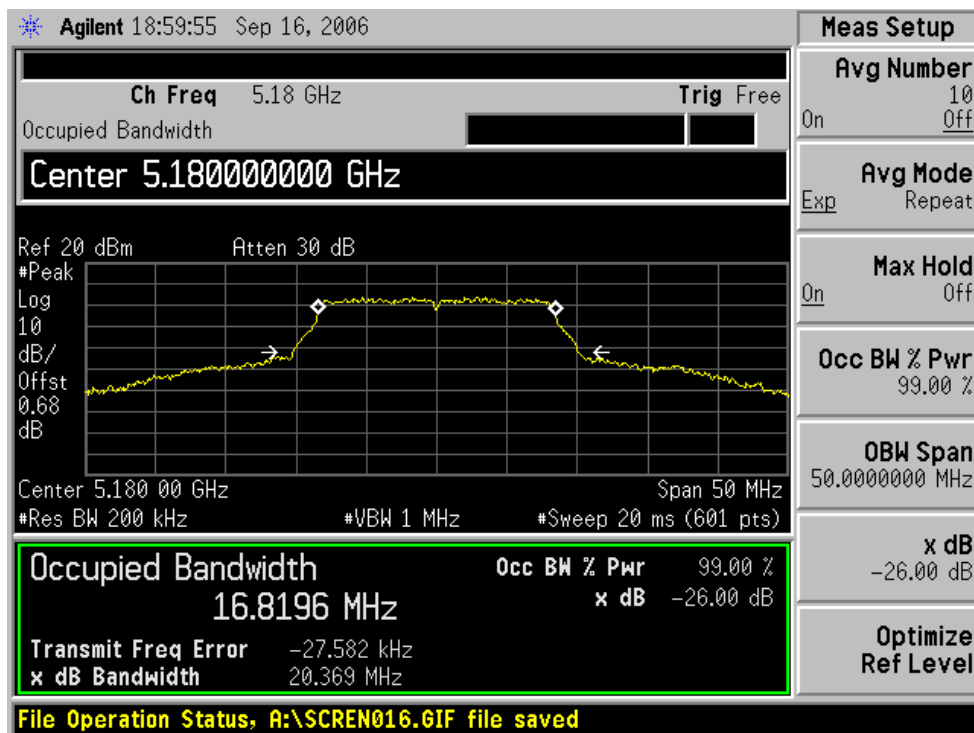


High Channel

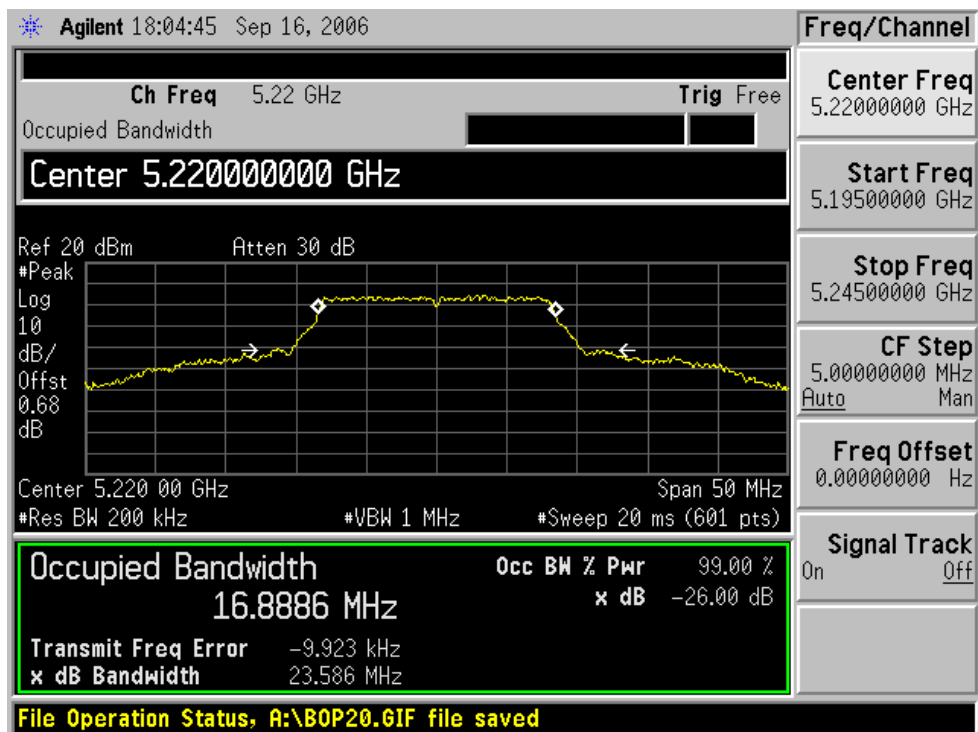


802.11a: 20MHz rate/channel, Chain A

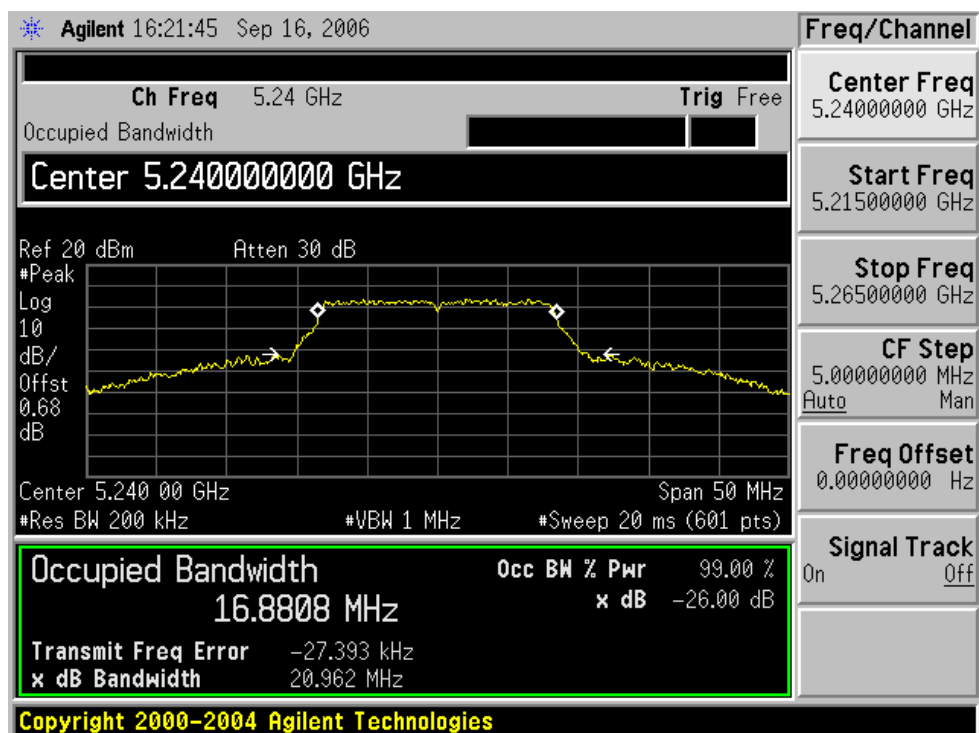
Low Channel



Middle Channel

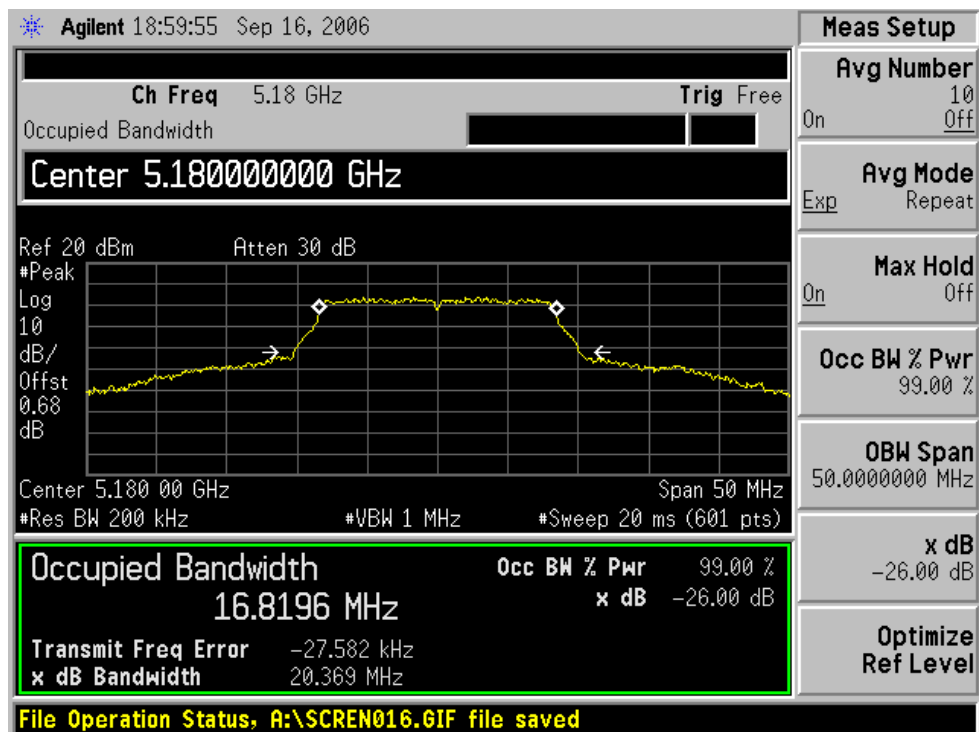


High Channel

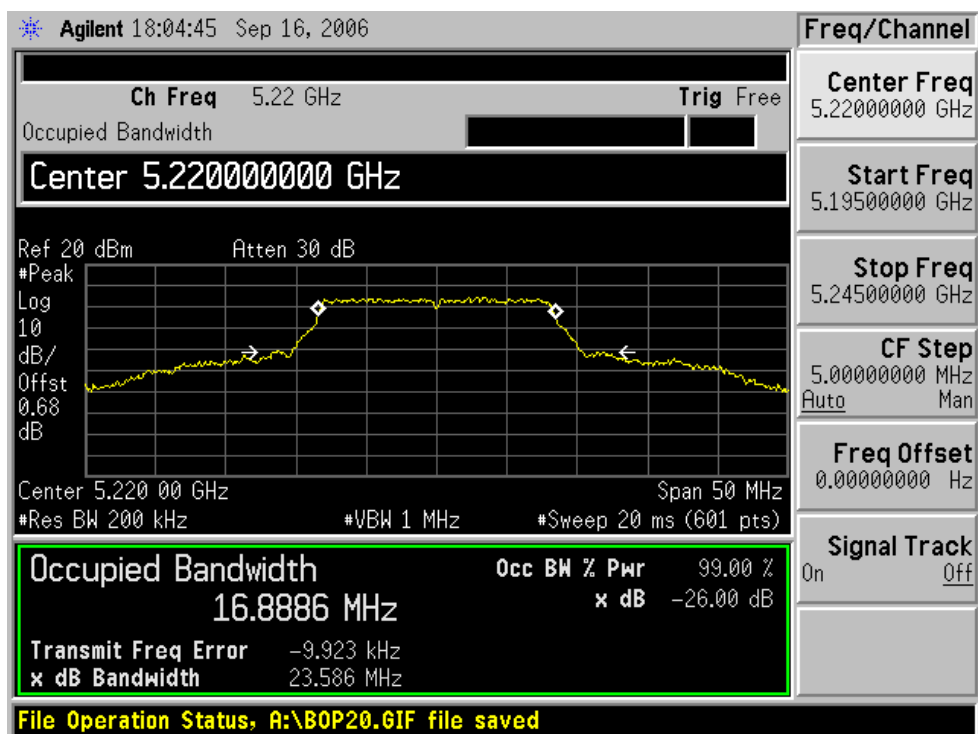


802.11a: 20MHz rate/channel, Chain B

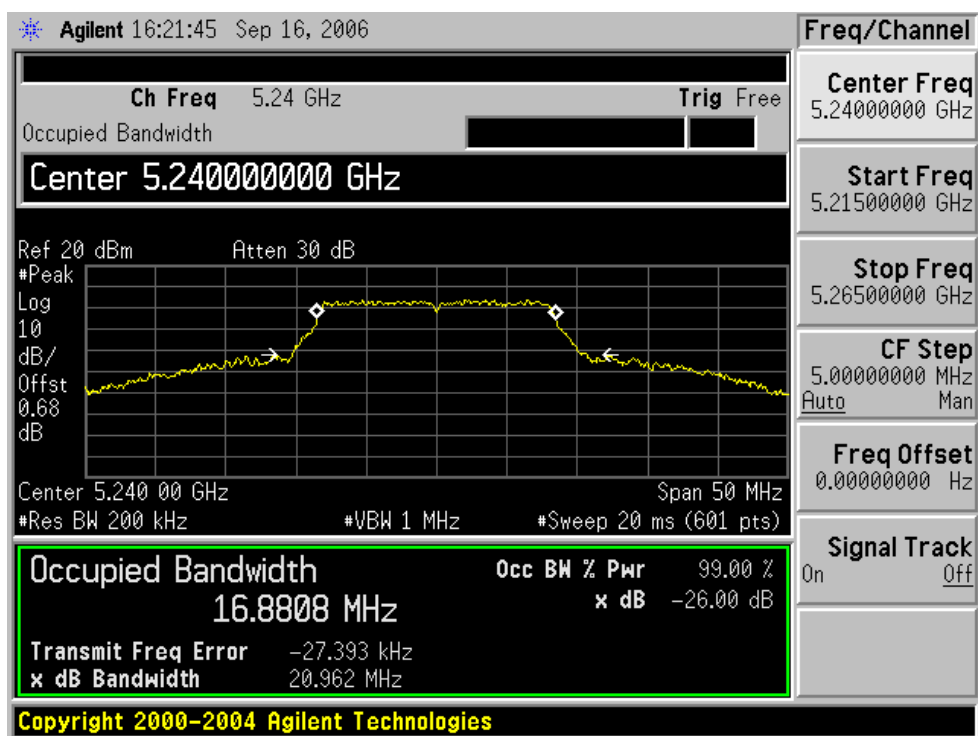
Low Channel



Middle Channel

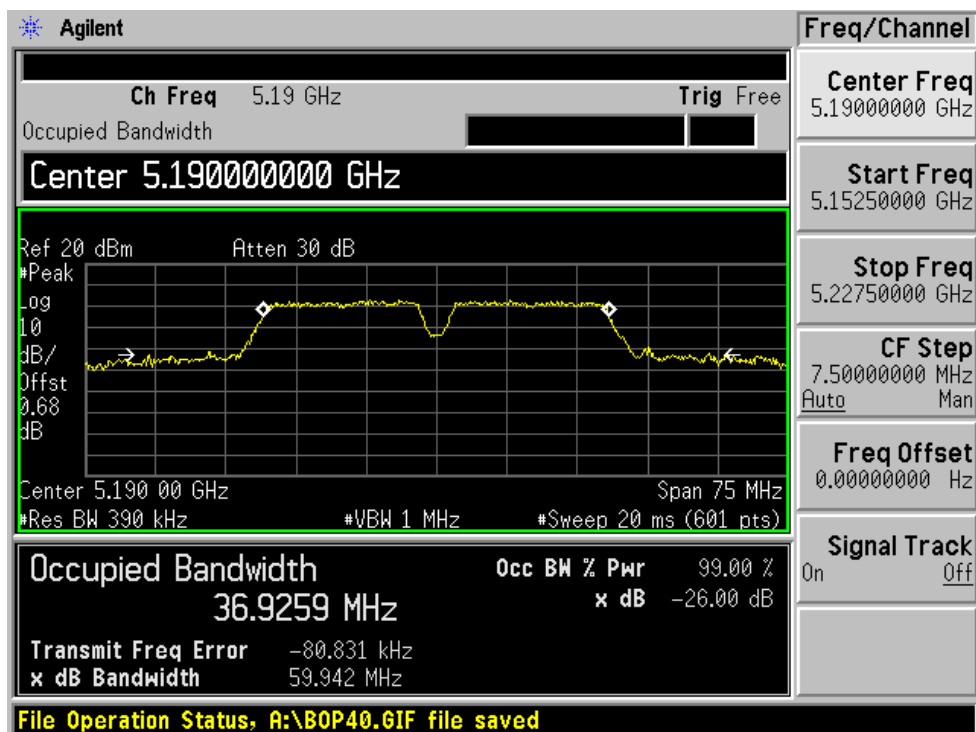


High Channel

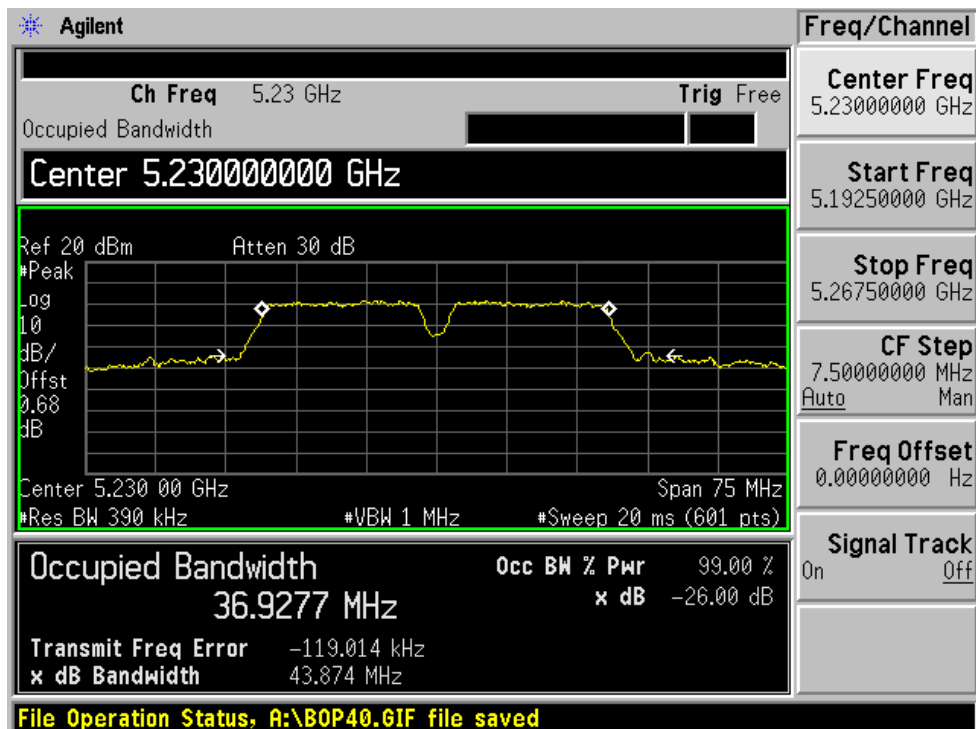


802.11a: 40MHz rate/channel, Chain A

Low Channel

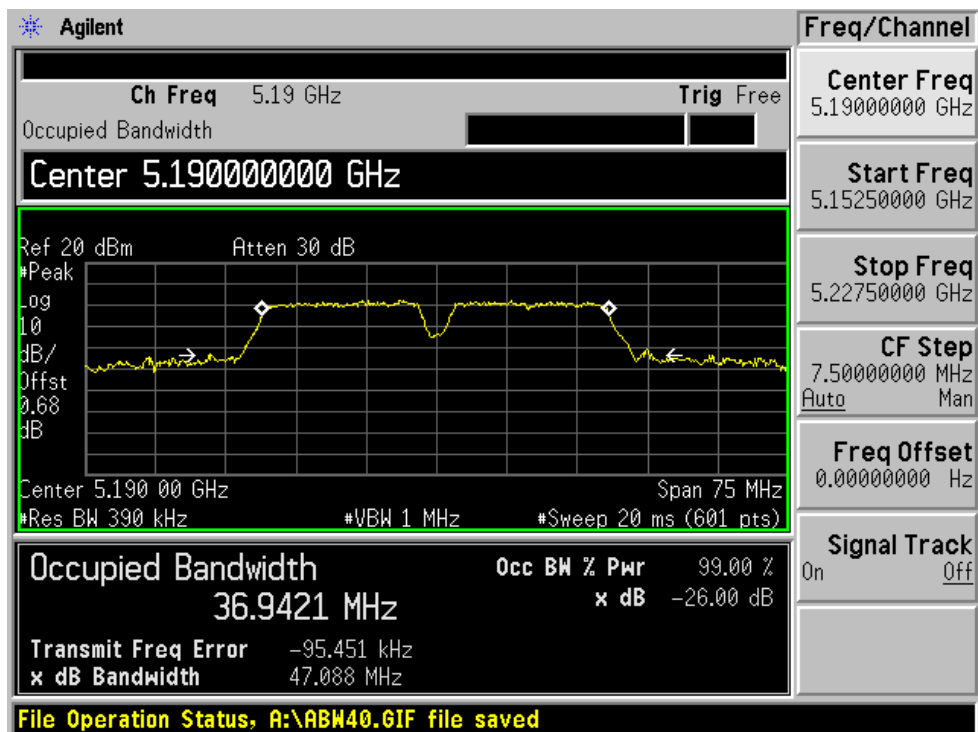


High Channel

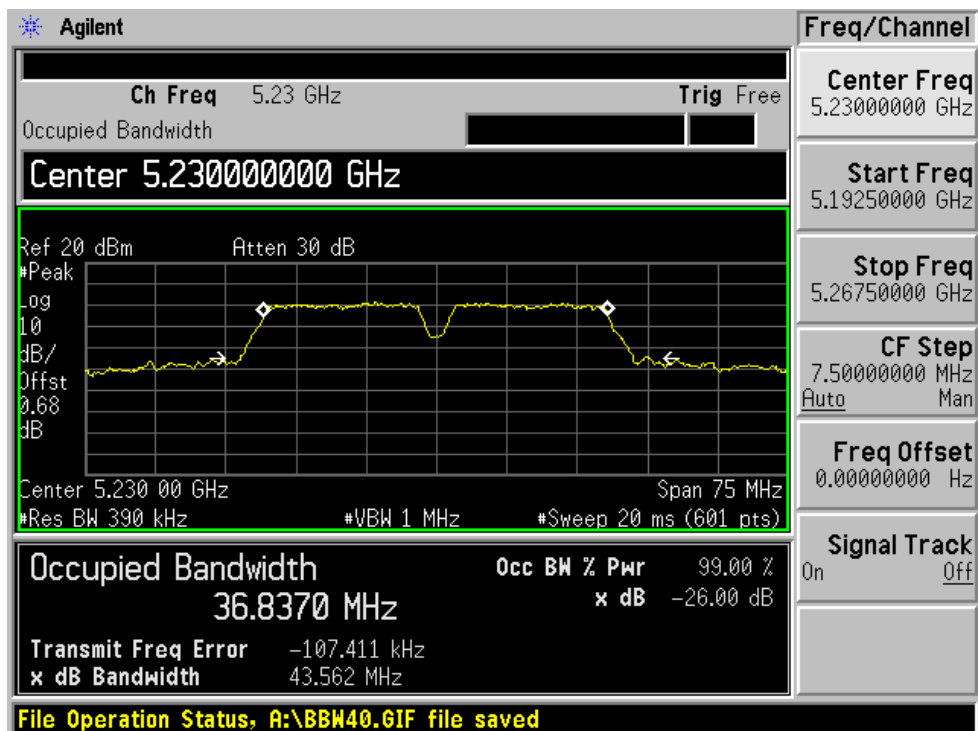


802.11a: 40MHz rate/channel, Chain B

Low Channel



High Channel



§15.407 (a) (1) & (a) (2) - MAXIMUM POWER

Applicable Standard

§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 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a)(2) For the band 5.25 – 5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.

Each chain is measured separately and the total power is calculated using the following formula:

$$\text{Total Power} = 10 \log (10^{(\text{Chain A Power} / 10)} + 10^{(\text{Chain B Power} / 10)})$$

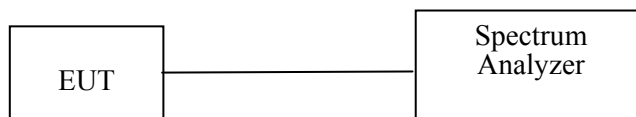
$$\text{Effective Antenna Gain} = \text{Antenna Gain} + 10 \log (\text{Number Tx Chains})$$

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	E4446A	US44300386	2006-03-06
Agilent	Power Meter	E4419B	MY4121511	2006-09-13
Agilent	Sensor	E9301A	MY41497252	2006-10-12

*** Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

* The testing was performed by Dan Corona from 2006-11-08 to 2006-11-28

Test Result**5150-5250 MHz Band (W52)****802.11n: 20MHz rate/channel**

Frequency (MHz)	Power Chain A (dBm)	Power Chain B (dBm)	Power Total (dBm)	4 + 10logB (dBm)	Limit (dBm)	Result
5180	13.77	13.71	16.75	18.73	16.99	Pass
5220	13.92	13.78	16.86	17.20	16.99	Pass
5240	13.77	13.81	16.80	17.57	16.99	Pass

802.11n: 40MHz rate/channel

Frequency (MHz)	Power Chain A (dBm)	Power Chain B (dBm)	Power Total (dBm)	4 + 10logB (dBm)	Limit (dBm)	Result
5190	13.92	13.59	16.77	19.60	16.99	Pass
5230	13.93	13.94	16.95	19.61	16.99	Pass

802.11a: 20MHz rate/channel

Frequency (MHz)	Power Chain A (dBm)	Power Chain B (dBm)	Power Total (dBm)	4 + 10logB (dBm)	Limit (dBm)	Result
5180	13.84	13.70	16.78	18.15	16.99	Pass
5220	13.91	13.57	16.75	17.73	16.99	Pass
5240	13.89	13.56	16.74	18.17	16.99	Pass

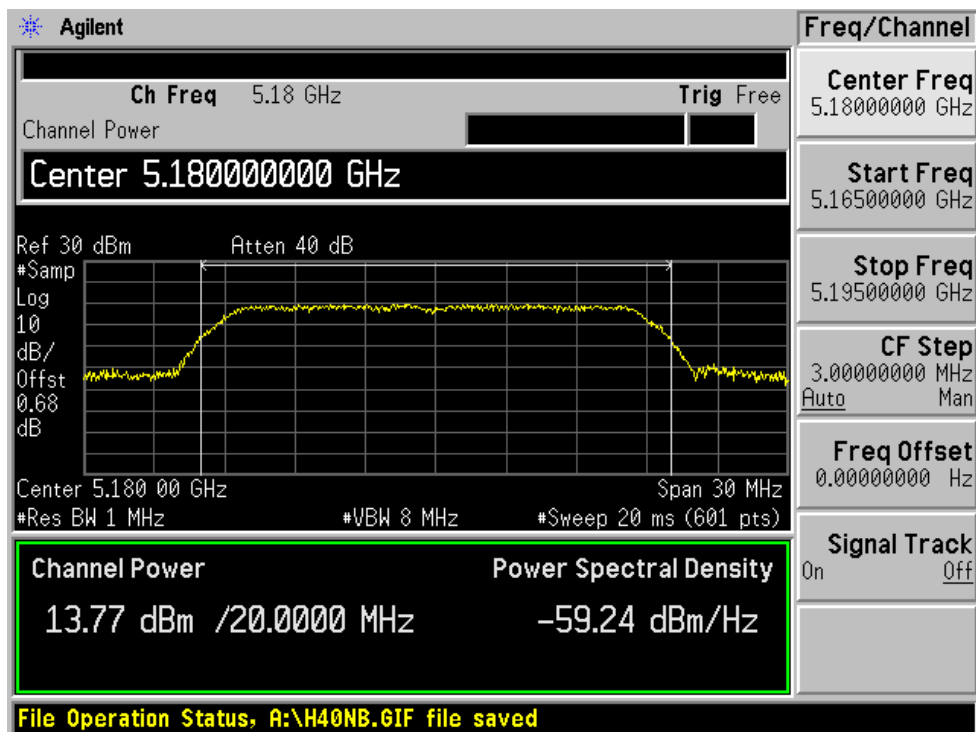
802.11a: 40MHz rate/channel

Frequency (MHz)	Power Chain A (dBm)	Power Chain B (dBm)	Power Total (dBm)	4 + 10logB (dBm)	Limit (dBm)	Result
5190	13.37	13.50	16.45	21.78	16.99	Pass
5230	13.89	13.84	16.88	20.42	16.99	Pass

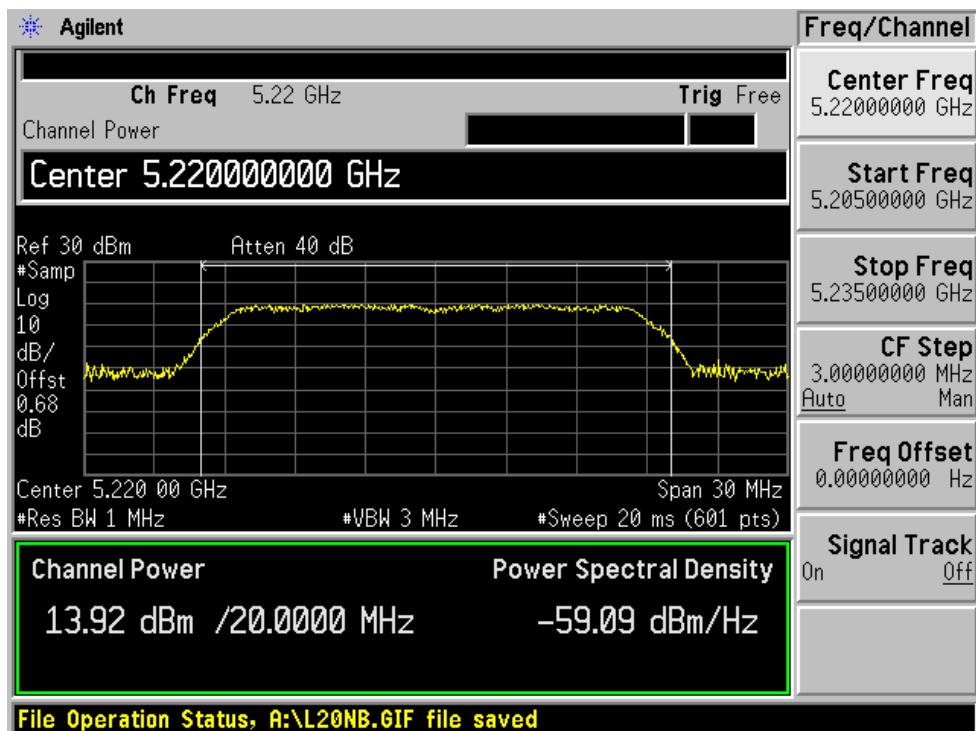
5150-5250 MHz Band (W52)

802.11n: 20MHz rate/channel, Chain A

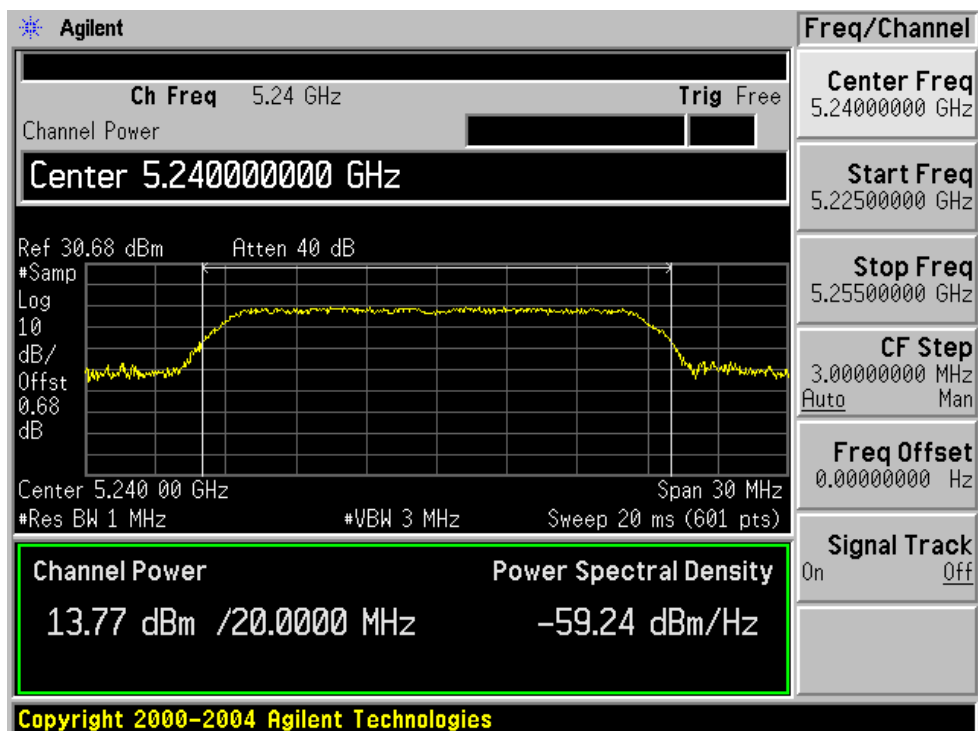
Low Channel



Middle Channel

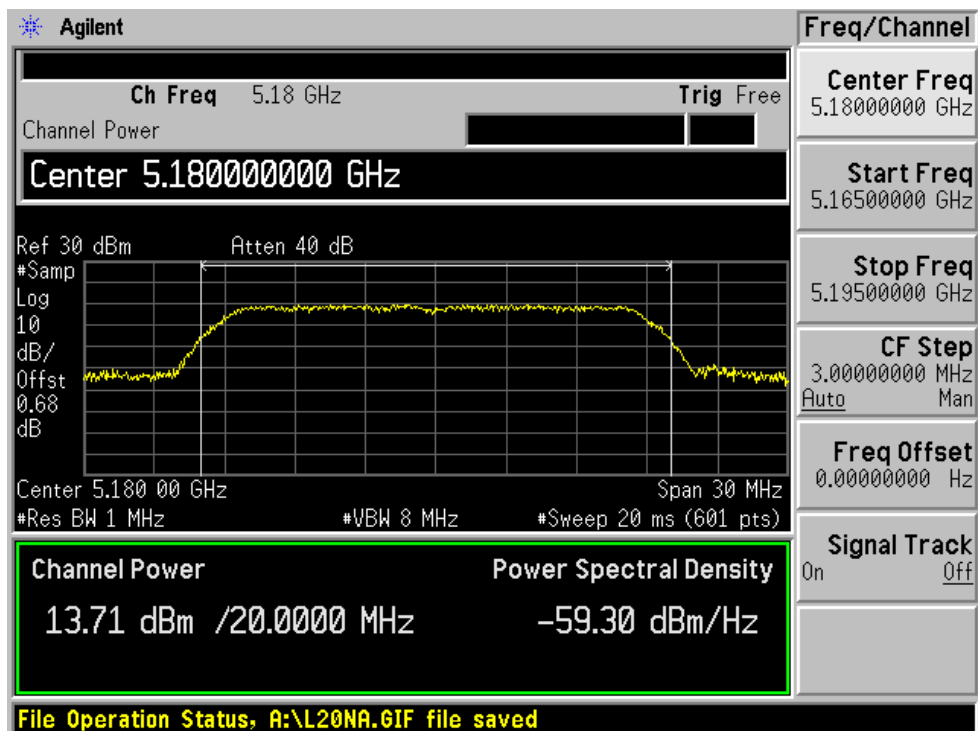


High Channel

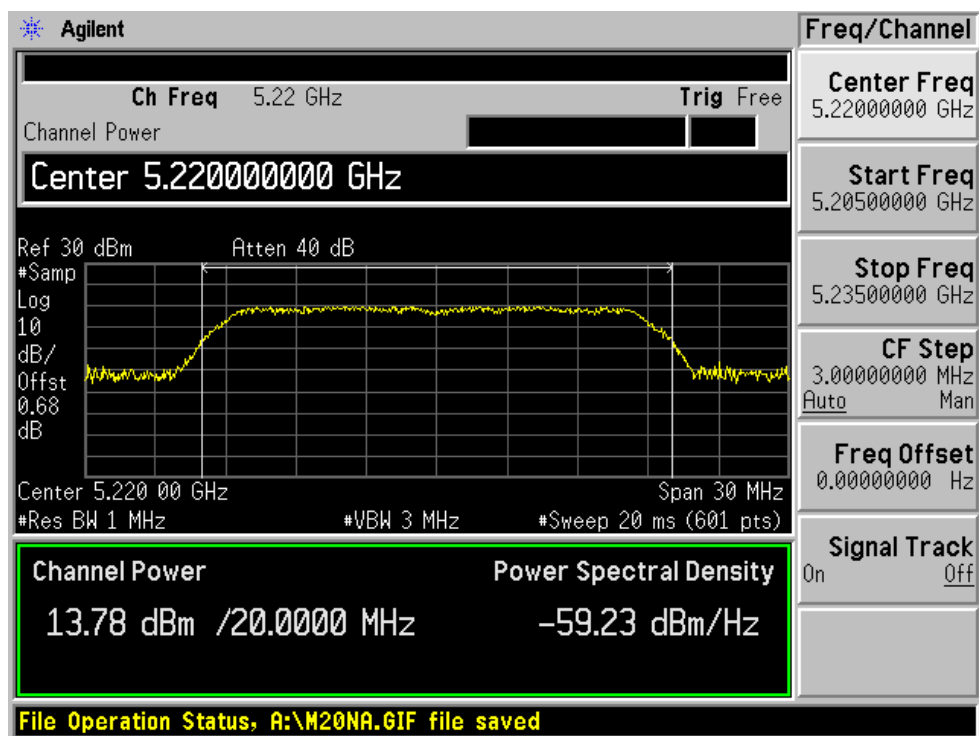


802.11n: 20MHz rate/channel, Chain B

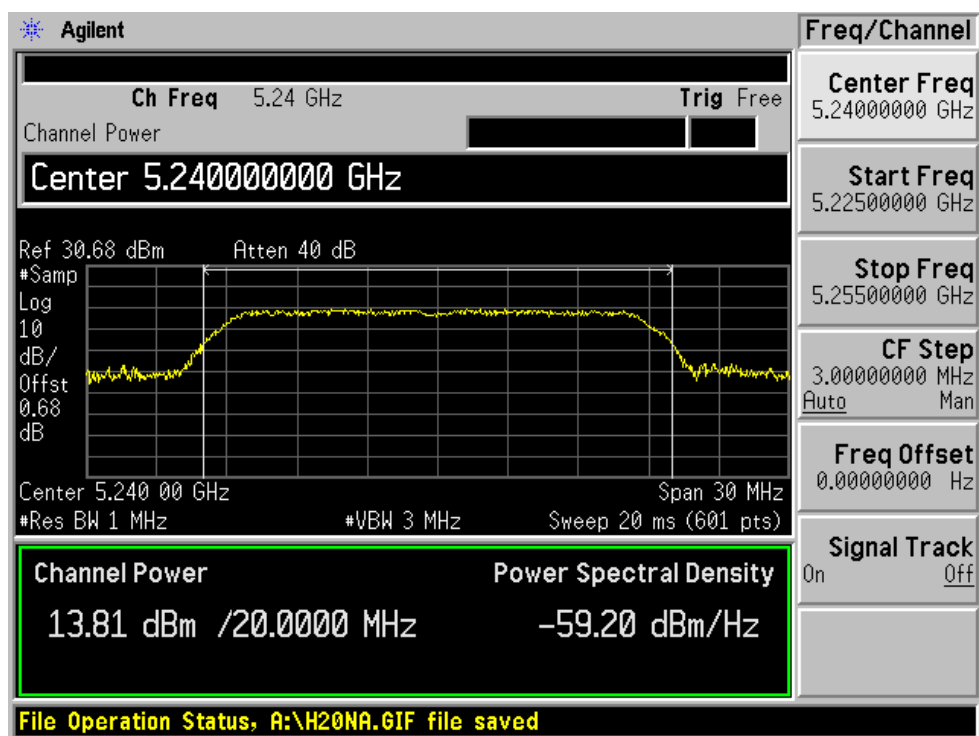
Low Channel



Middle Channel

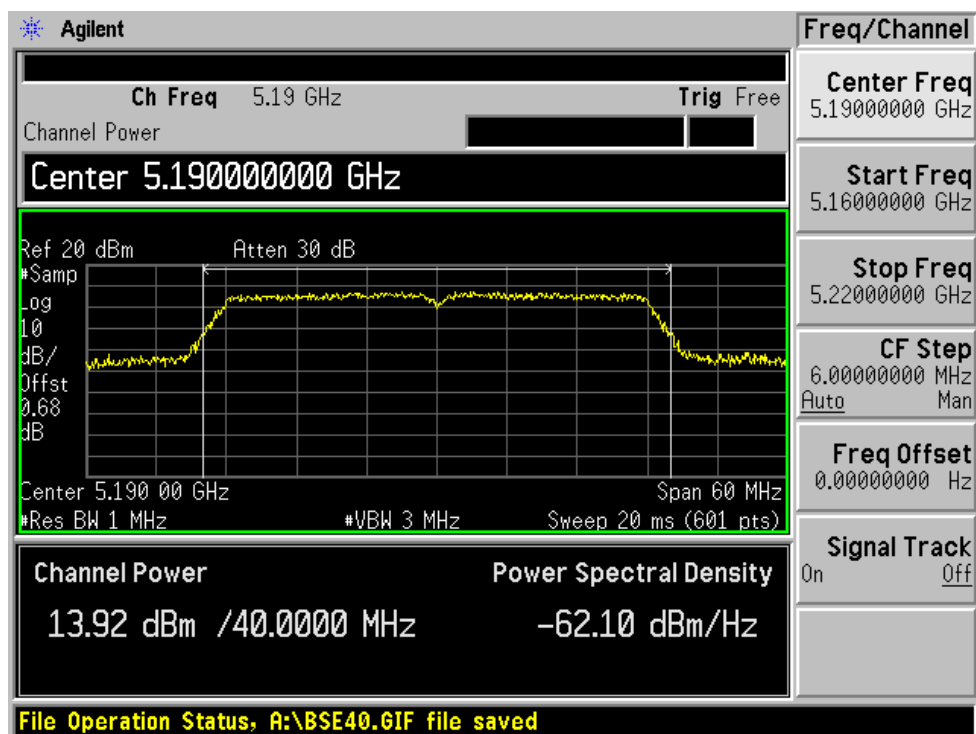


High Channel

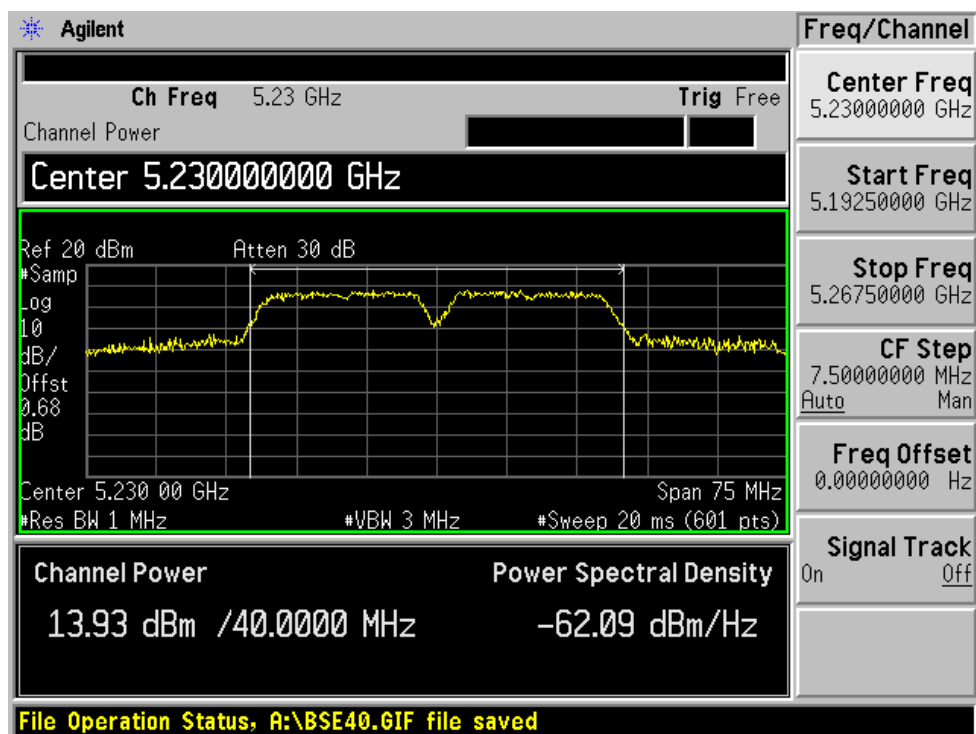


802.11n: 40MHz rate/channel, Chain A

Low Channel

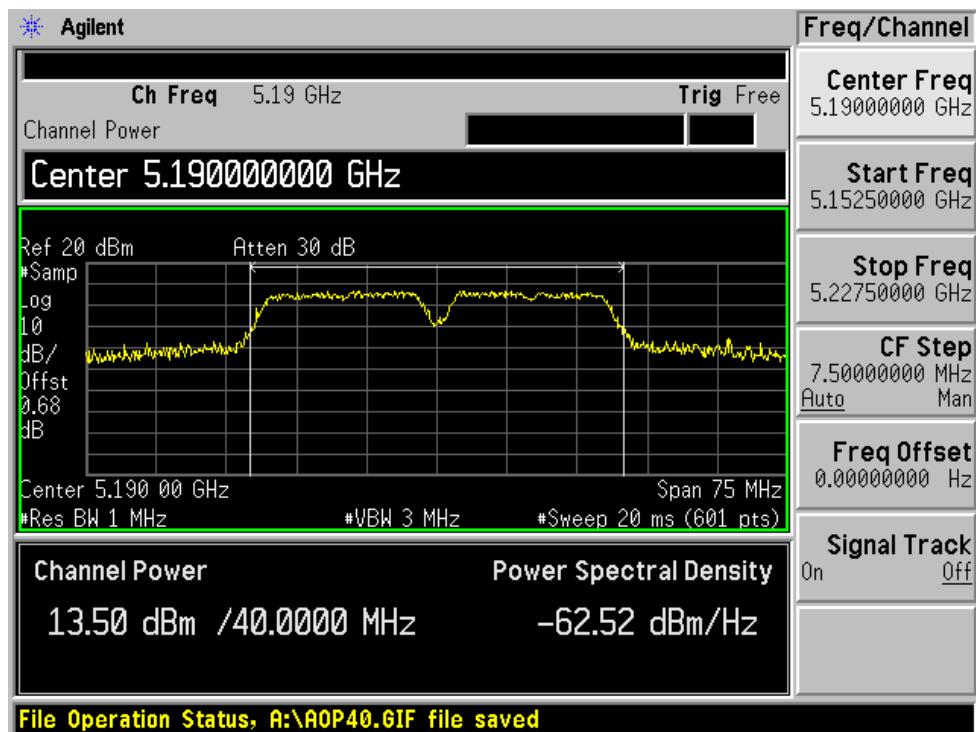


High Channel

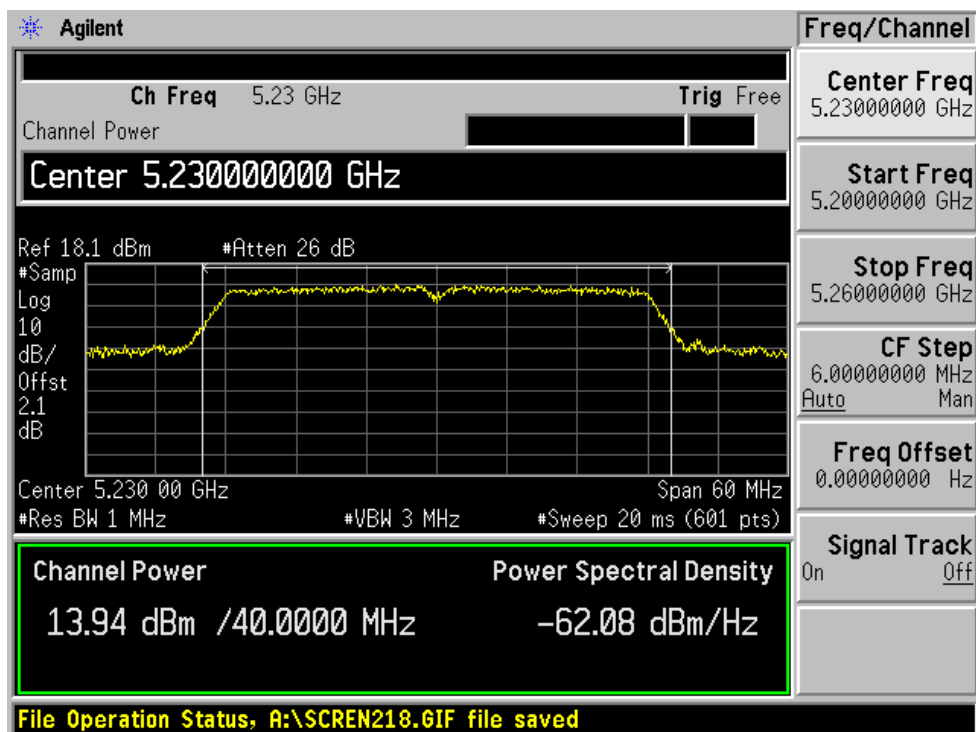


802.11n: 40MHz rate/channel, Chain B

Low Channel

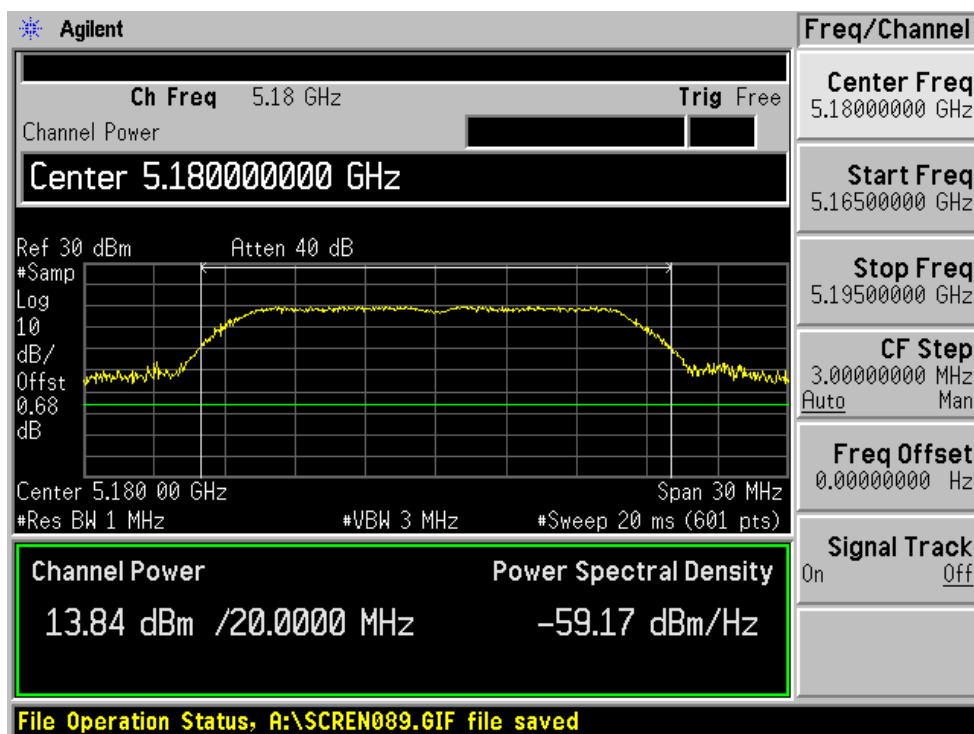


High Channel

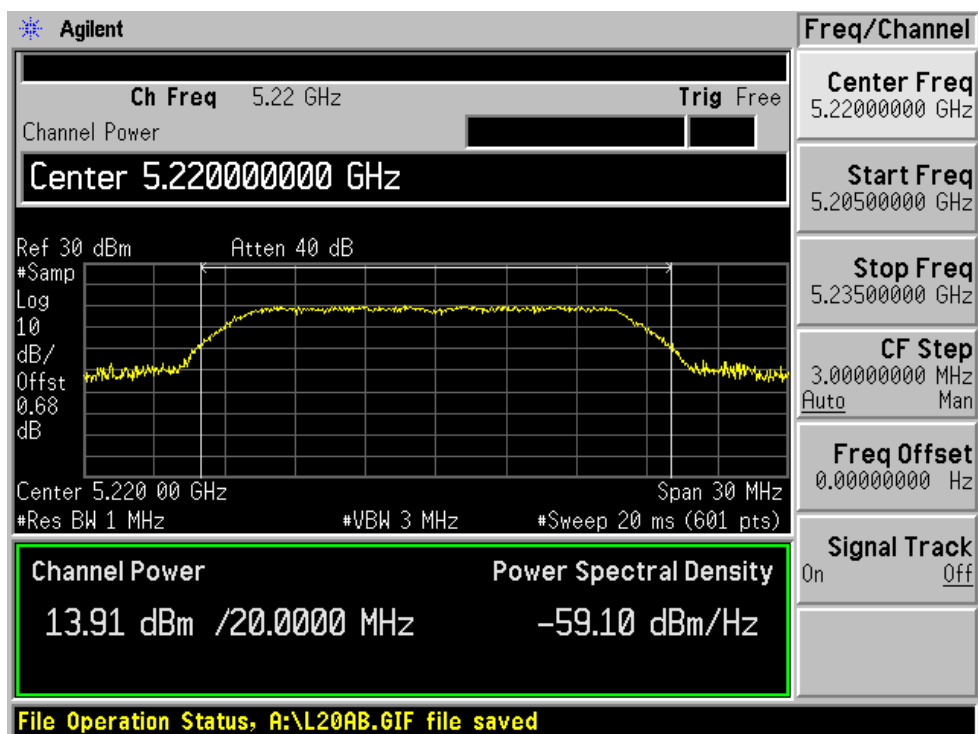


802.11a: 20MHz rate/channel, Chain A

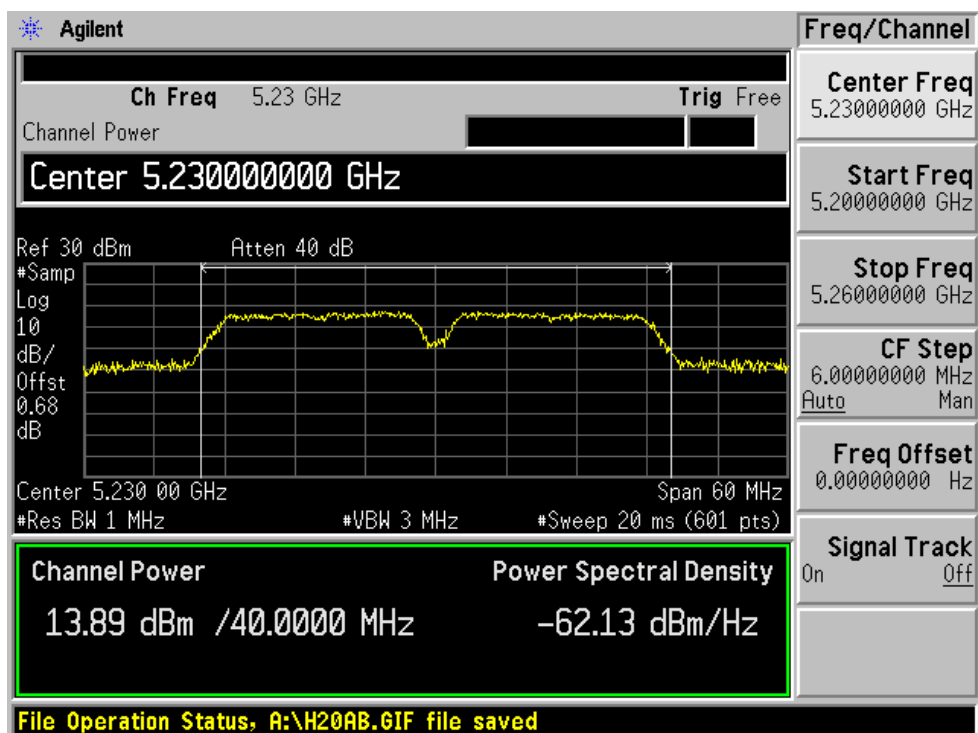
Low Channel



Middle Channel

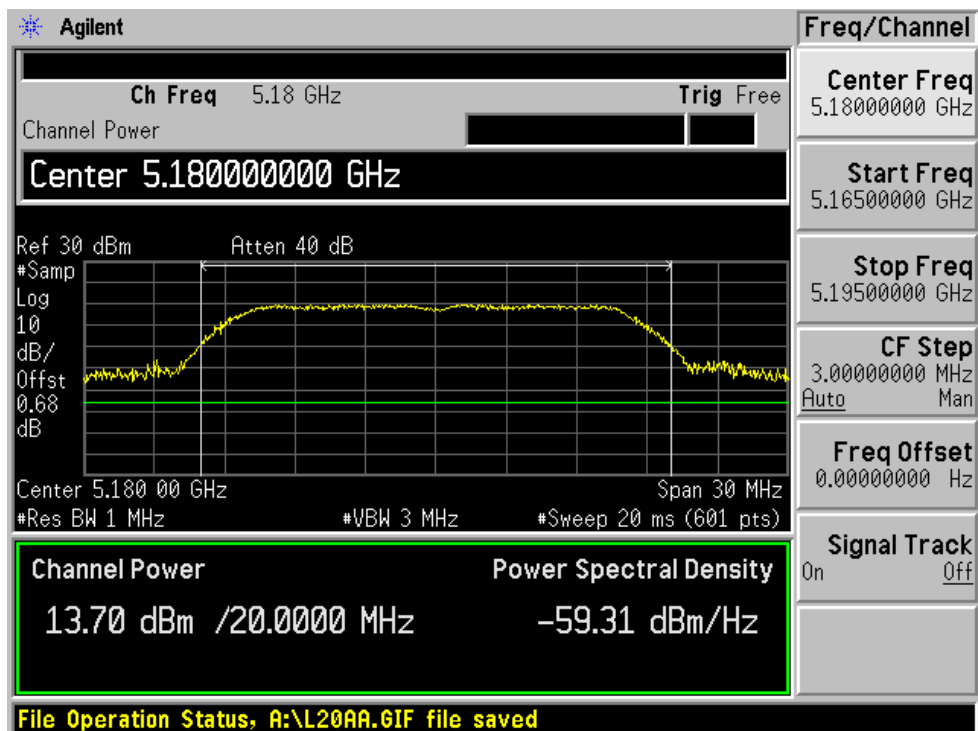


High Channel

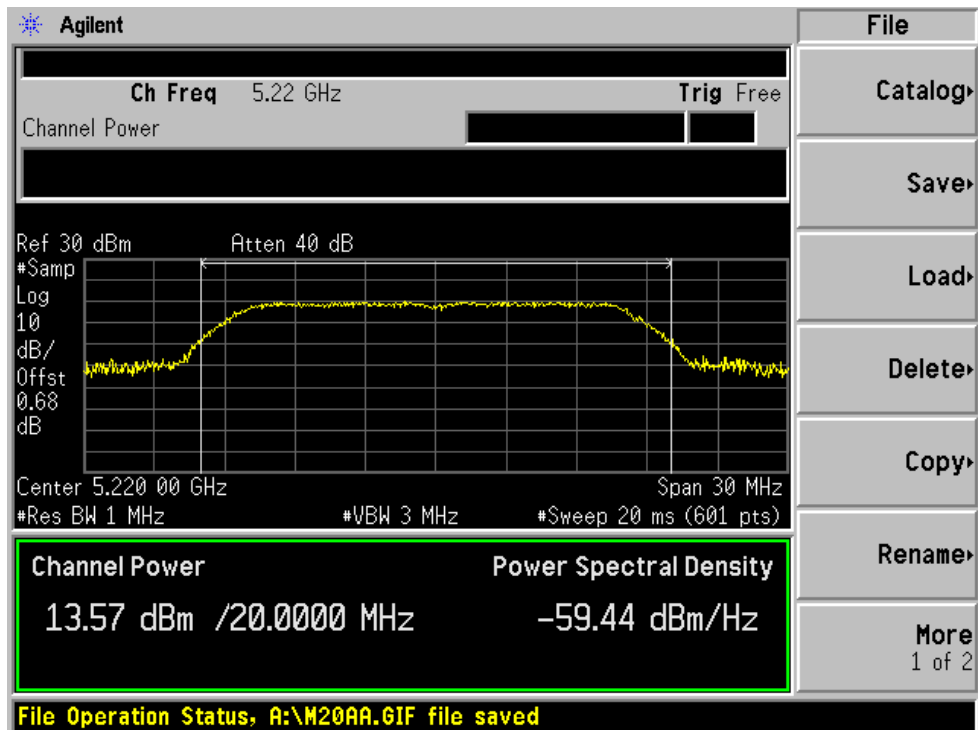


802.11a: 20MHz rate/channel, Chain B

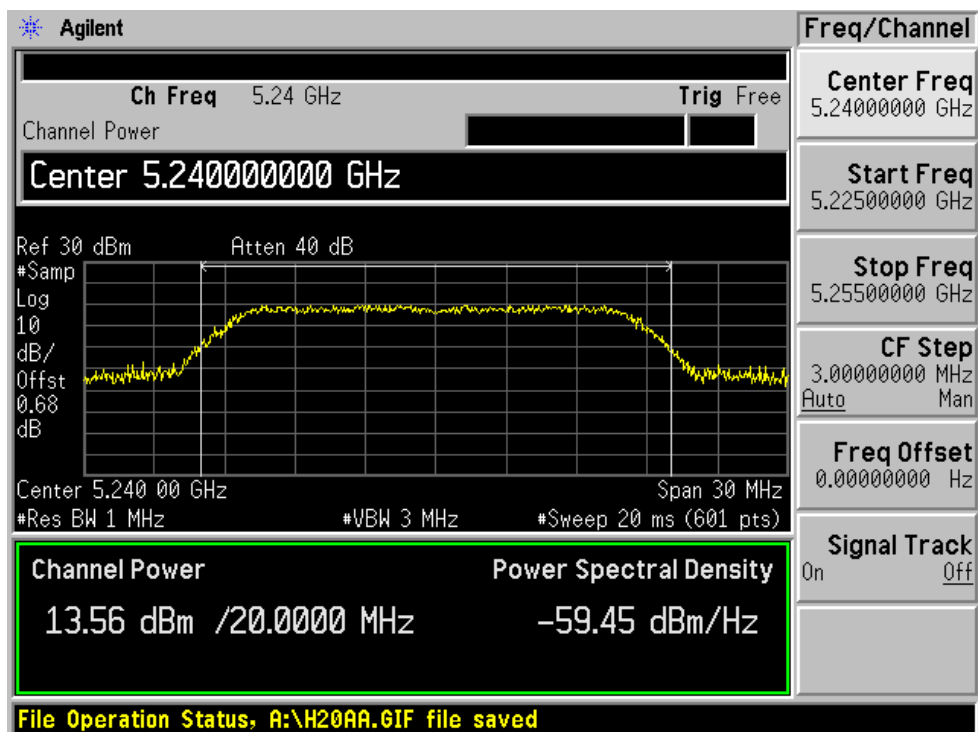
Low Channel



Middle Channel

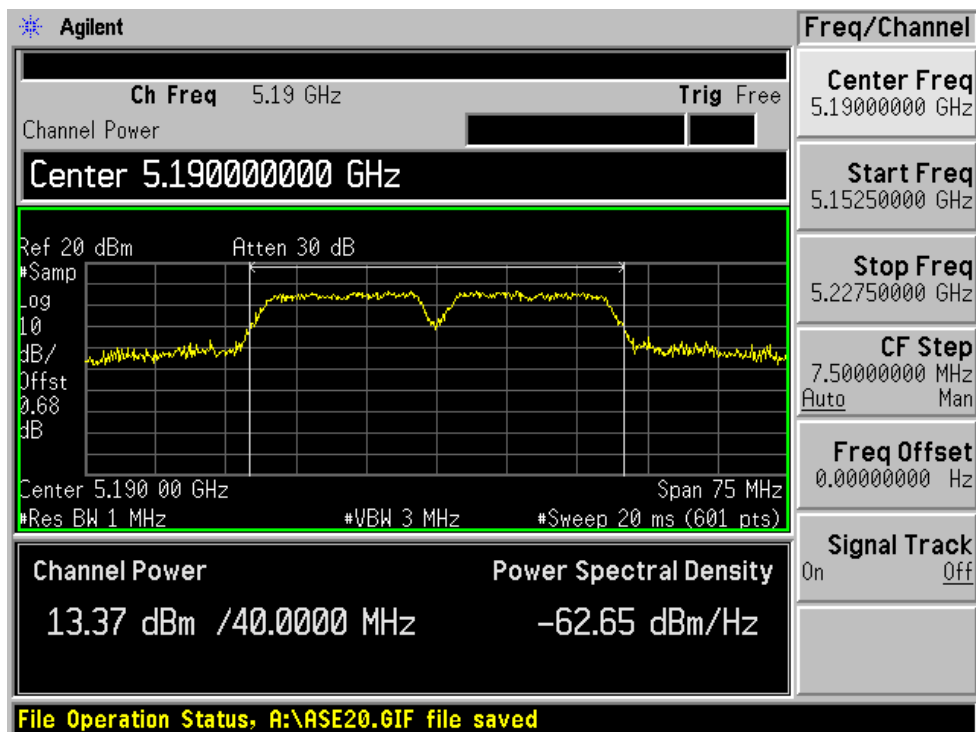


High Channel

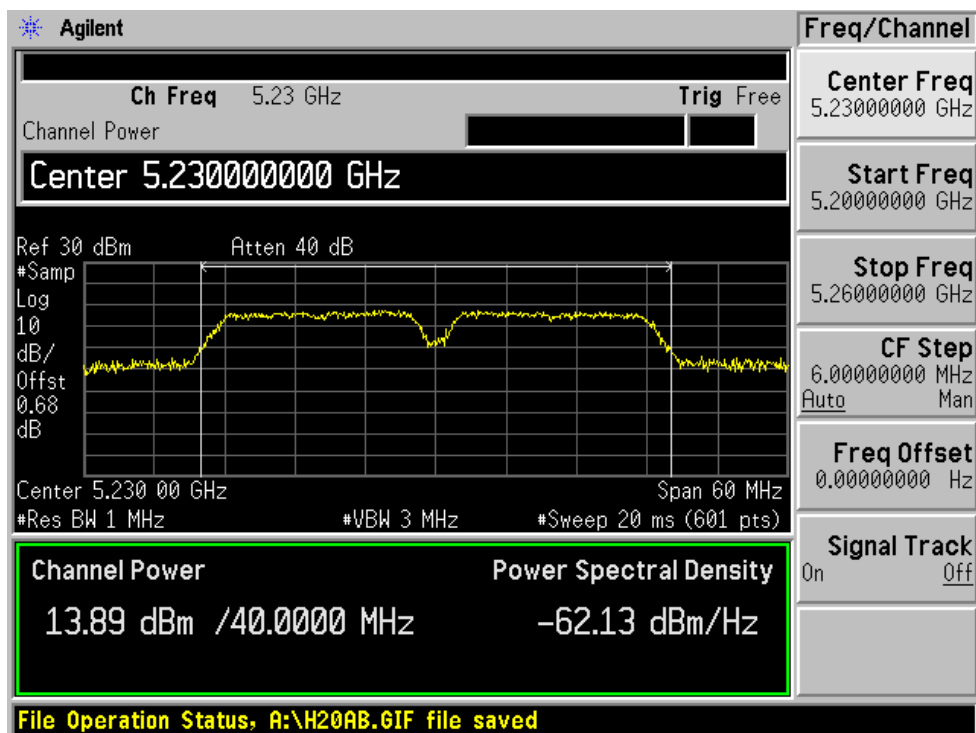


802.11a: 40MHz rate/channel, Chain A

Low Channel

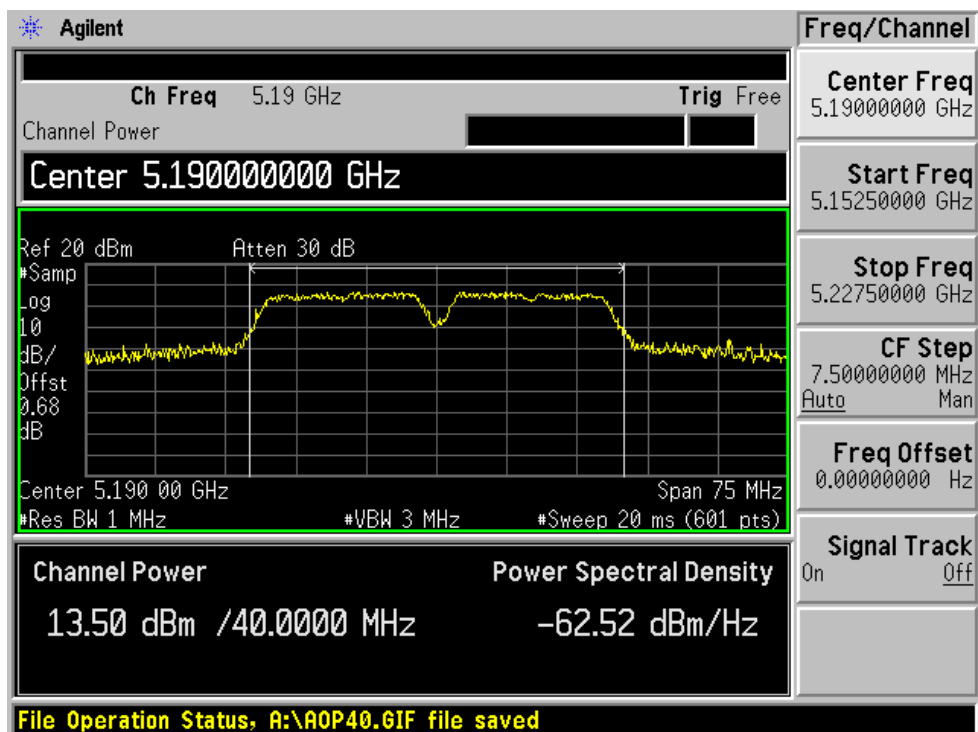


High Channel

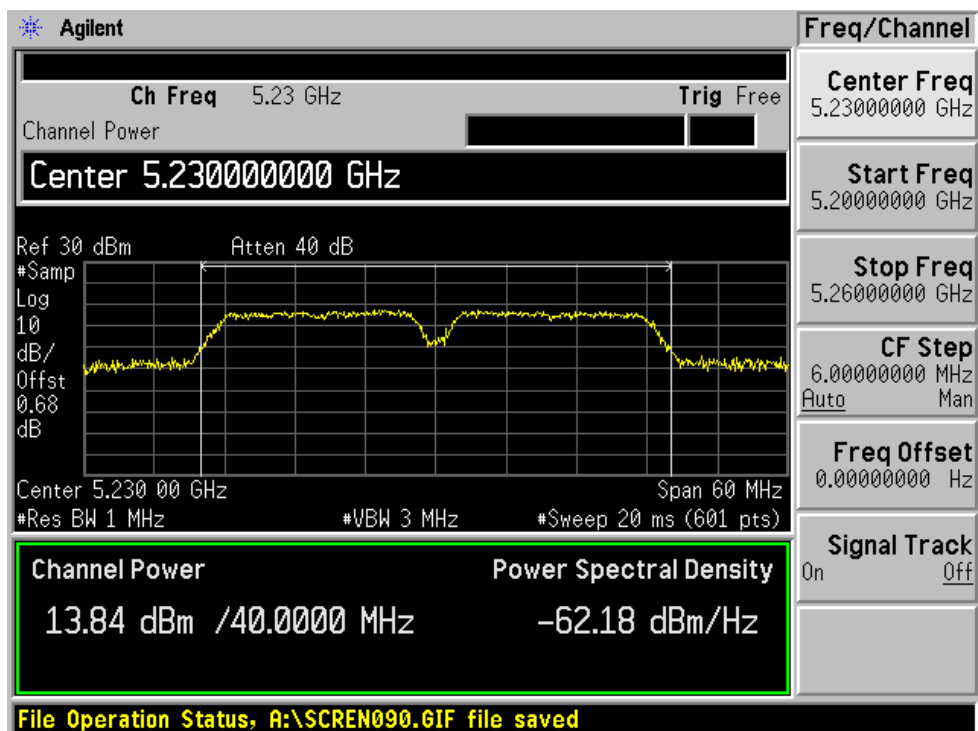


802.11a: 40MHz rate/channel, Chain B

Low Channel



High Channel



Average Output Power

No limit, for reporting purpose only.

Measurement Procedure

The transmitter output is connected to a power meter, each chain is measured separately and the total power is calculated using the following formula:

$$\text{Total Average Power} = 10 \log (10^{\text{(Chain A Power / 10)}} + 10^{\text{(Chain B Power / 10)}})$$

Test Results

5150-5250 MHz Band (W52)

802.11n: 20MHz rate/channel

Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
5180	13.48	13.53	16.52
5220	13.51	13.52	16.53
5240	13.34	13.40	16.38

802.11n: 40MHz rate/channel

Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
5190	13.61	13.50	16.57
5230	13.71	13.56	16.65

802.11a: 20MHz rate/channel

Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
5180	13.72	13.68	16.71
5220	13.66	13.74	16.71
5240	13.64	13.71	16.69

802.11a: 40MHz rate/channel

Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
5190	13.21	13.19	16.21
5230	13.45	13.51	16.49

§15.407 (a)(1) & (a)(2) – PEAK POWER SPECTRAL DENSITY

Applicable Standard

§15.407 (a)(1) For the band 5.15 – 5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a)(2) For the band 5.25 – 5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Procedure

1. Using sample detector and power averaging mode, set RBW=1 MHz and VBW > 1 MHz.
2. PSD is the highest level found across the emission in any 1-MHz band after 100 sweeps of averaging.
3. When the emission bandwidth is less than 1 MHz, a measurement bandwidth equal to the emission bandwidth is used in accordance with section 15.407(a)(5).

Each chain is measured separately and the total PPSD is calculated using the following formula:

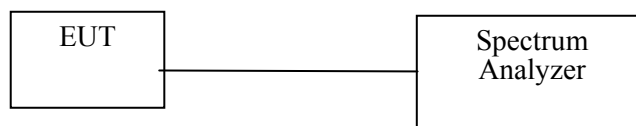
$$\text{Total PPSD} = 10 \log (10^{\text{(Chain A PPSD / 10)}} + 10^{\text{(Chain B PPSD / 10)}})$$

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	E4446A	US44300386	2006-03-06

* **Statement of Traceability:** **BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

* The testing was performed by Dan Corona from 2006-11-08 to 2006-11-28

5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel**

Frequency (MHz)	PPSD Chain A (dBm)	PPSD Chain B (dBm)	PPSD Total (dBm)	Limit (dBm)	Result
5180	0.839	0.533	3.70	4	Pass
5220	0.641	0.39	3.53	4	Pass
5240	1.548	0.328	3.99	4	Pass

802.11n: 40MHz rate/channel

Frequency (MHz)	PPSD Chain A (dBm)	PPSD Chain B (dBm)	PPSD Total (dBm)	Limit (dBm)	Result
5190	0.35	0.54	3.46	4	Pass
5230	0.461	0.235	3.36	4	Pass

802.11a: 20MHz rate/channel

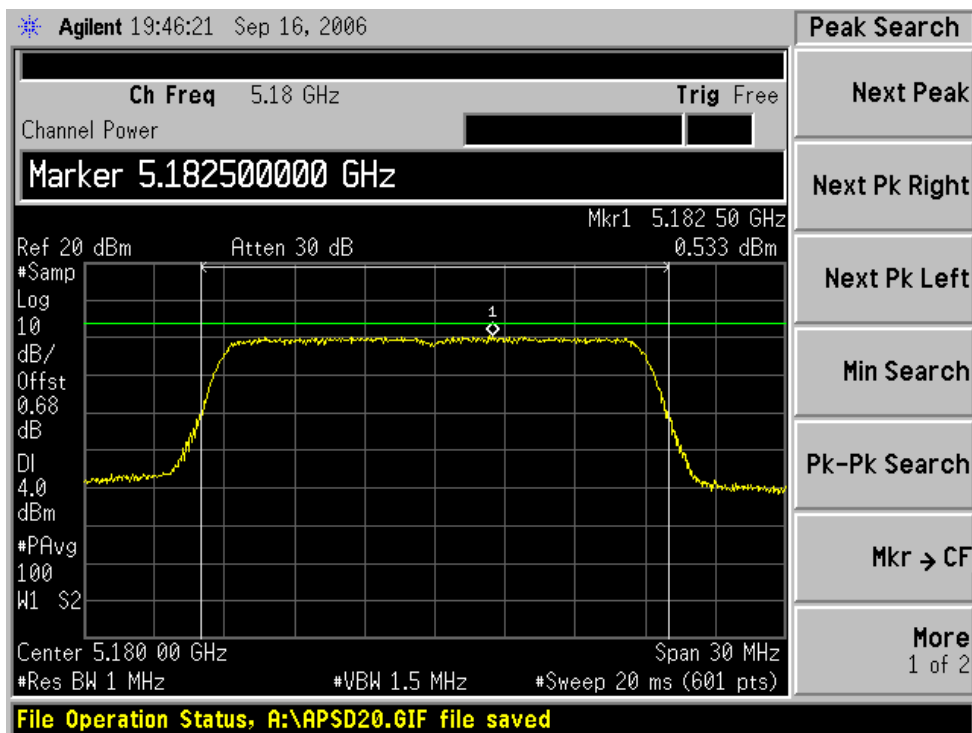
Frequency (MHz)	PPSD Chain A (dBm)	PPSD Chain B (dBm)	PPSD Total (dBm)	Limit (dBm)	Result
5180	1.543	0.100	3.89	4	Pass
5220	0.516	0.771	3.66	4	Pass
5240	1.226	0.245	3.77	4	Pass

802.11a: 40MHz rate/channel

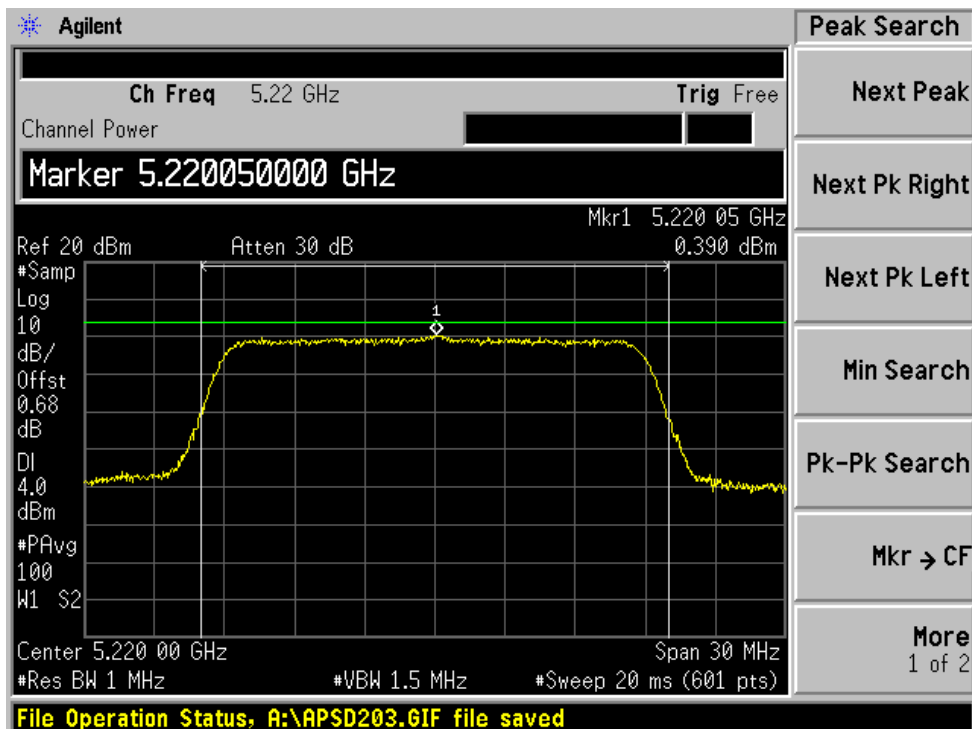
Frequency (MHz)	PPSD Chain A (dBm)	PPSD Chain B (dBm)	PPSD Total (dBm)	Limit (dBm)	Result
5190	1.192	0.481	3.86	4	Pass
5230	1.595	0.101	3.92	4	Pass

5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel, Chain A**

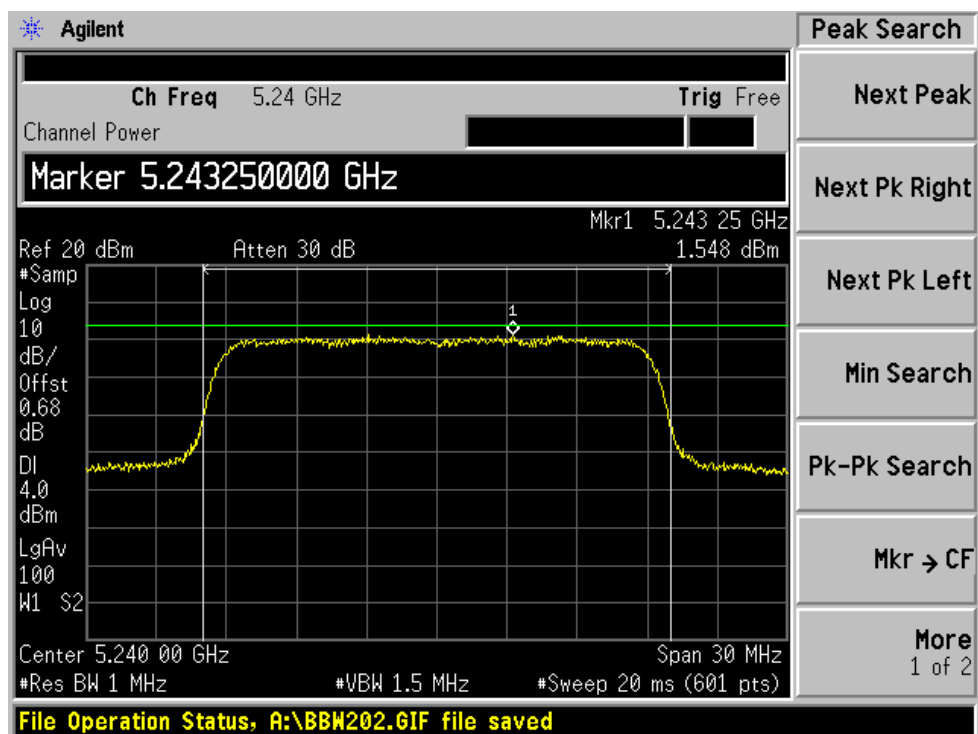
Low Channel



Middle Channel

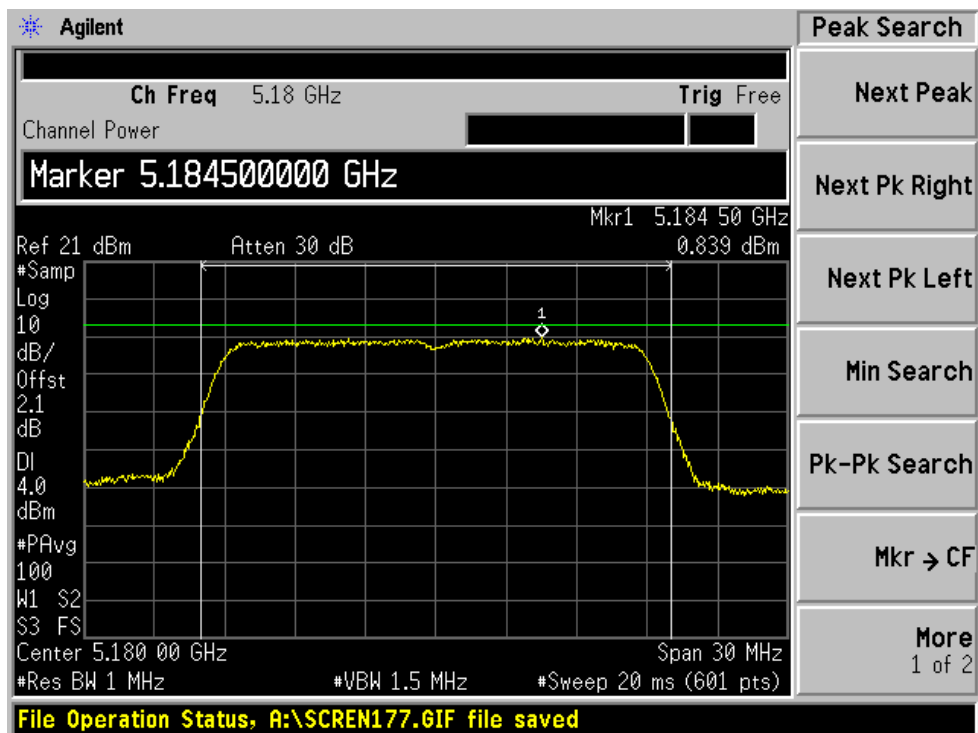


High Channel

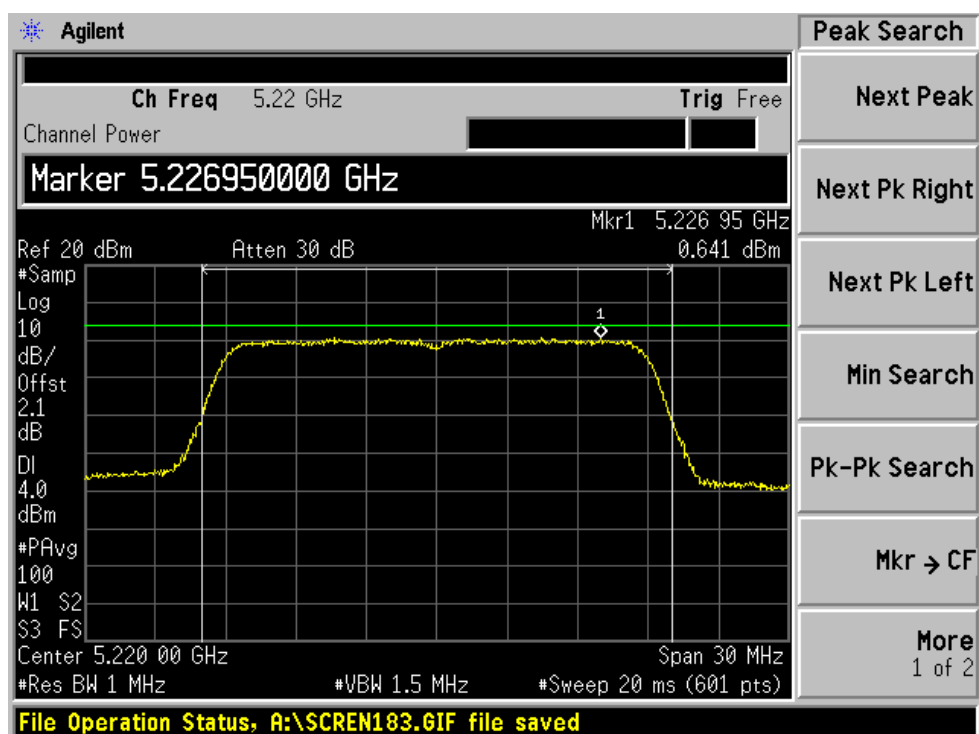


802.11n: 20MHz rate/channel, Chain B

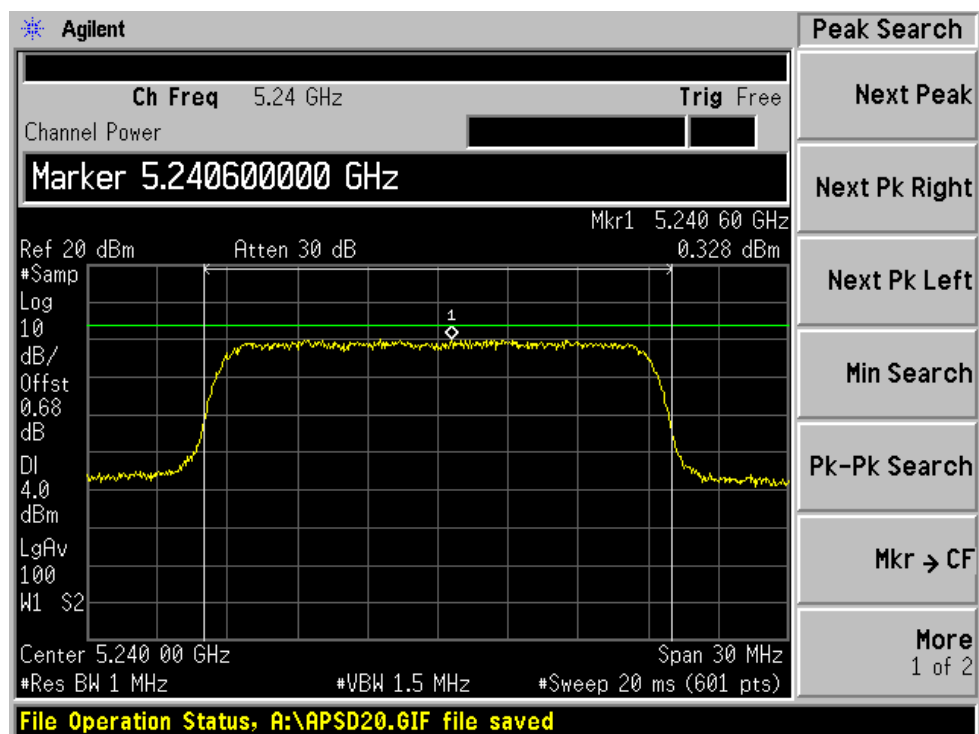
Low Channel



Middle Channel

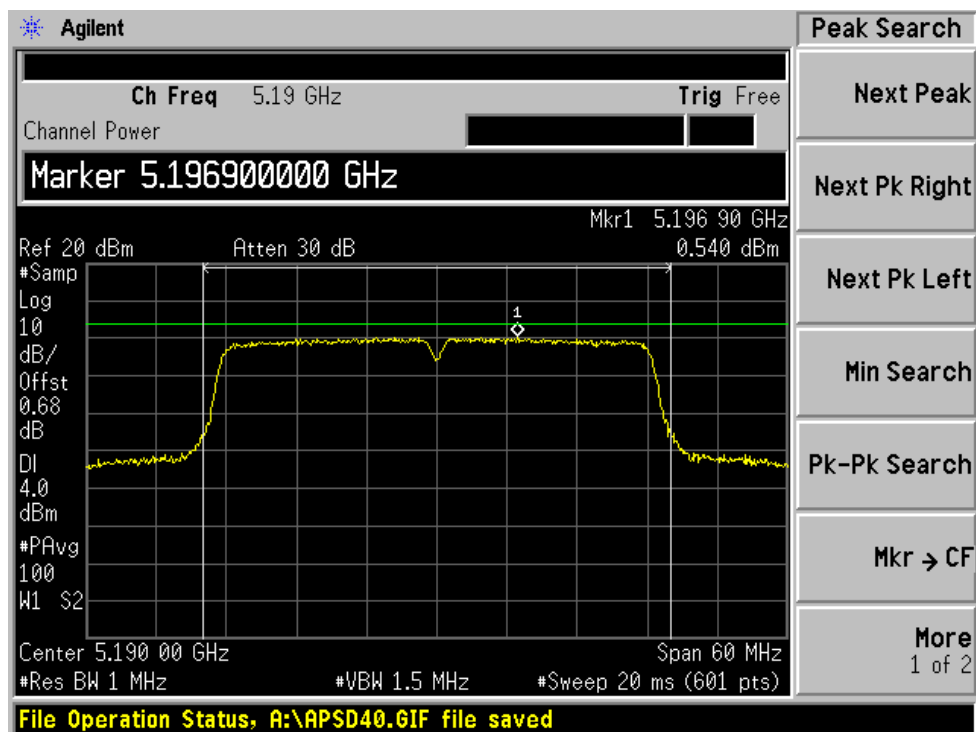


High Channel

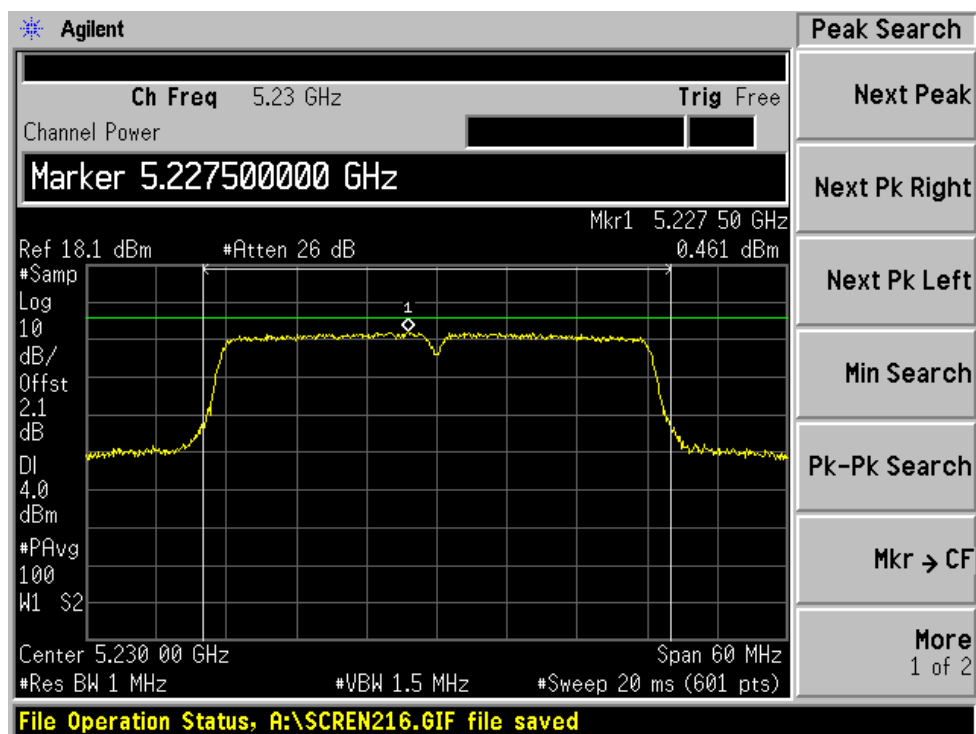


802.11n: 40MHz rate/channel, Chain A

Low Channel

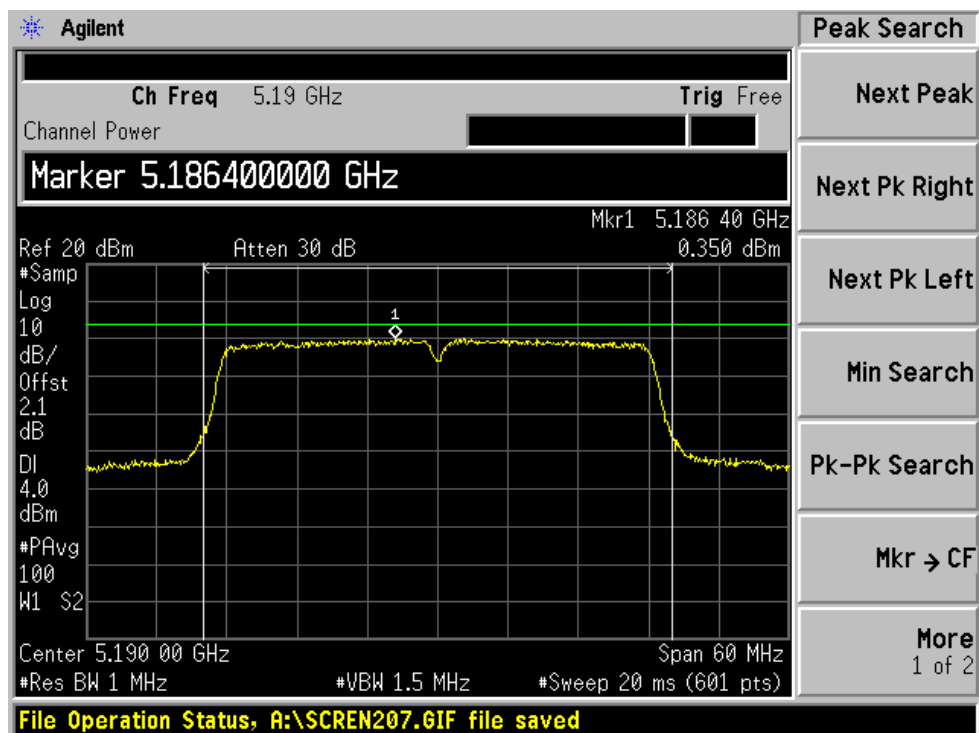


High Channel

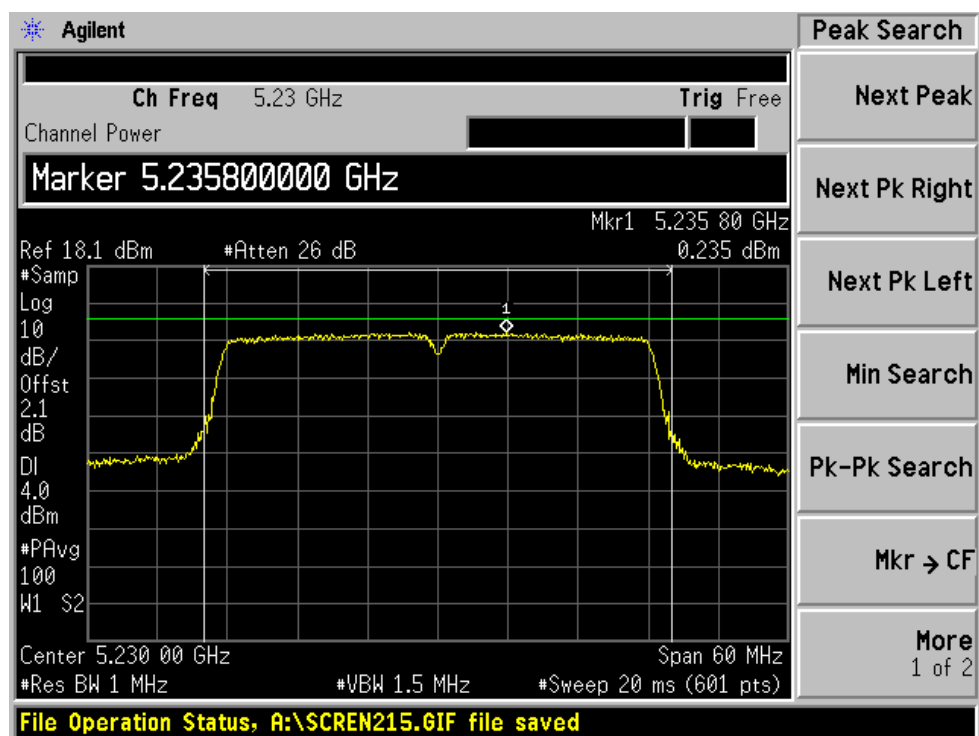


802.11n: 40MHz rate/channel, Chain B

Low Channel

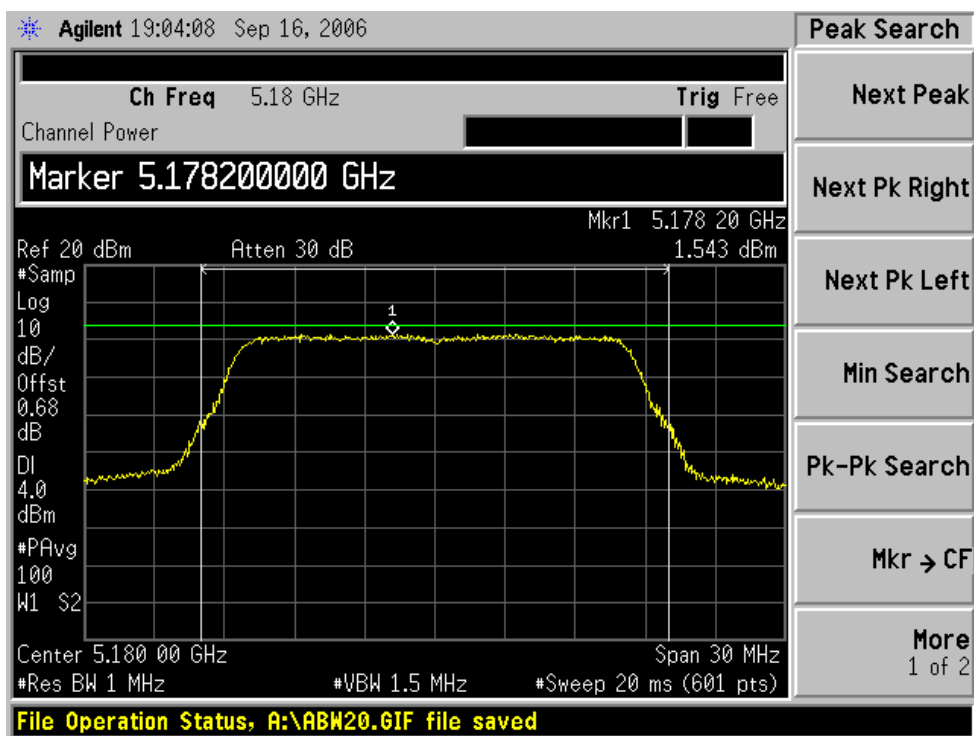


High Channel

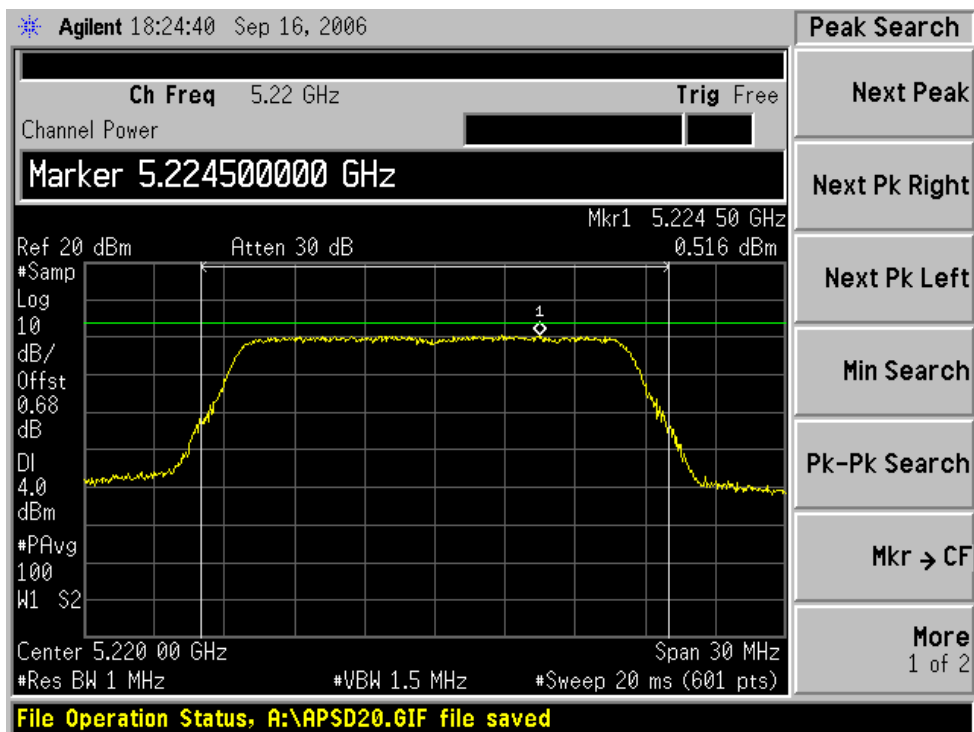


802.11a: 20MHz rate/channel, Chain A

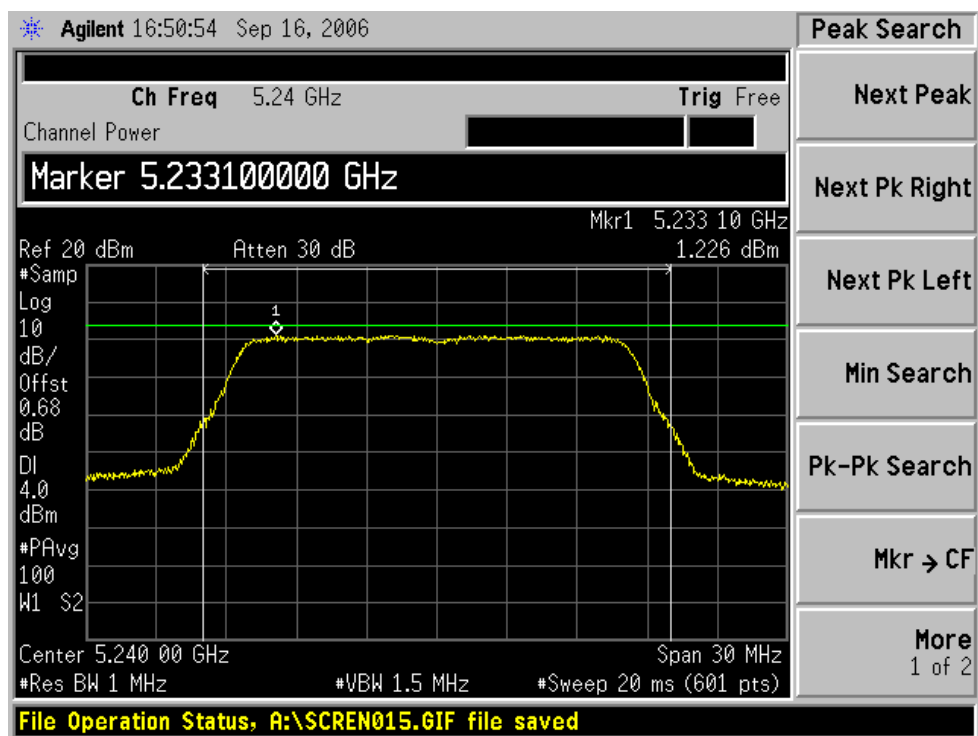
Low Channel



Middle Channel

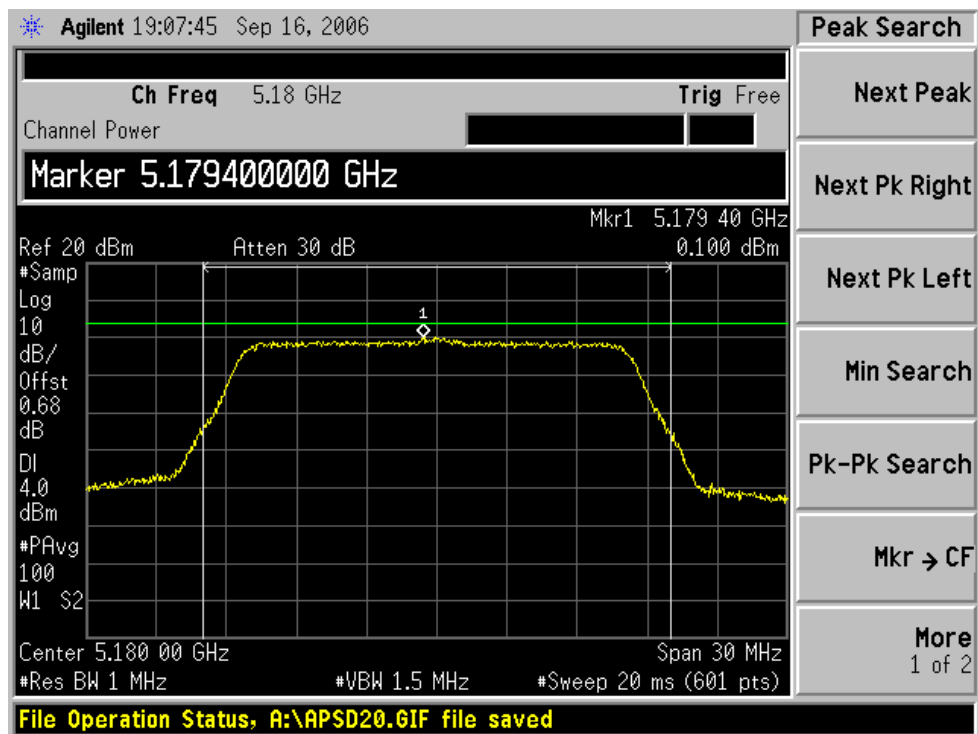


High Channel

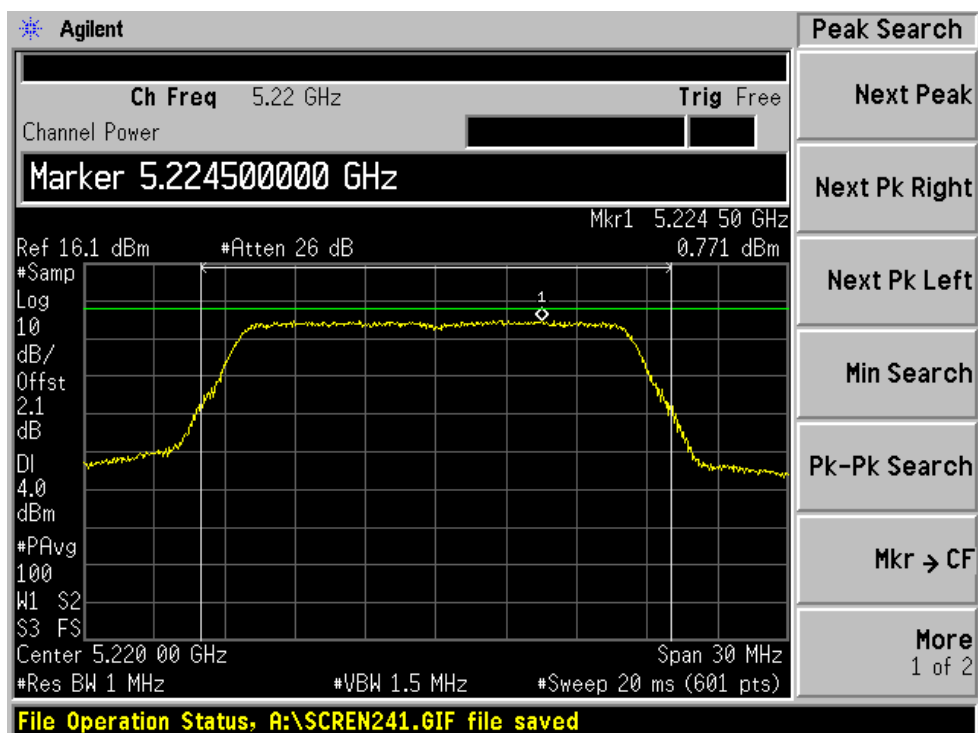


802.11a: 20MHz rate/channel, Chain B

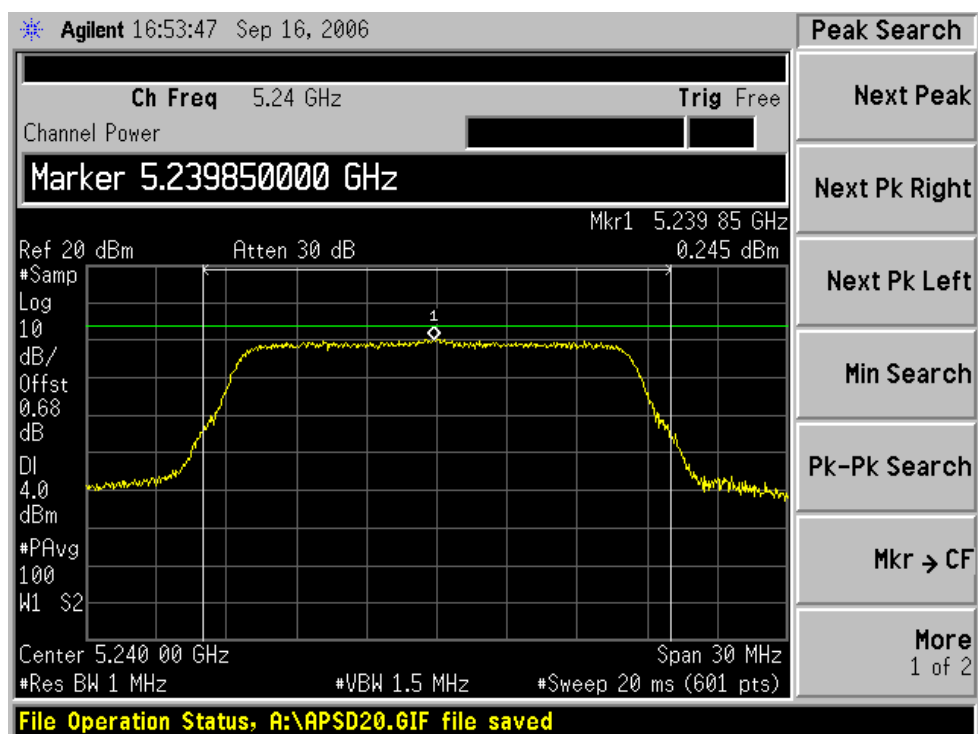
Low Channel



Middle Channel

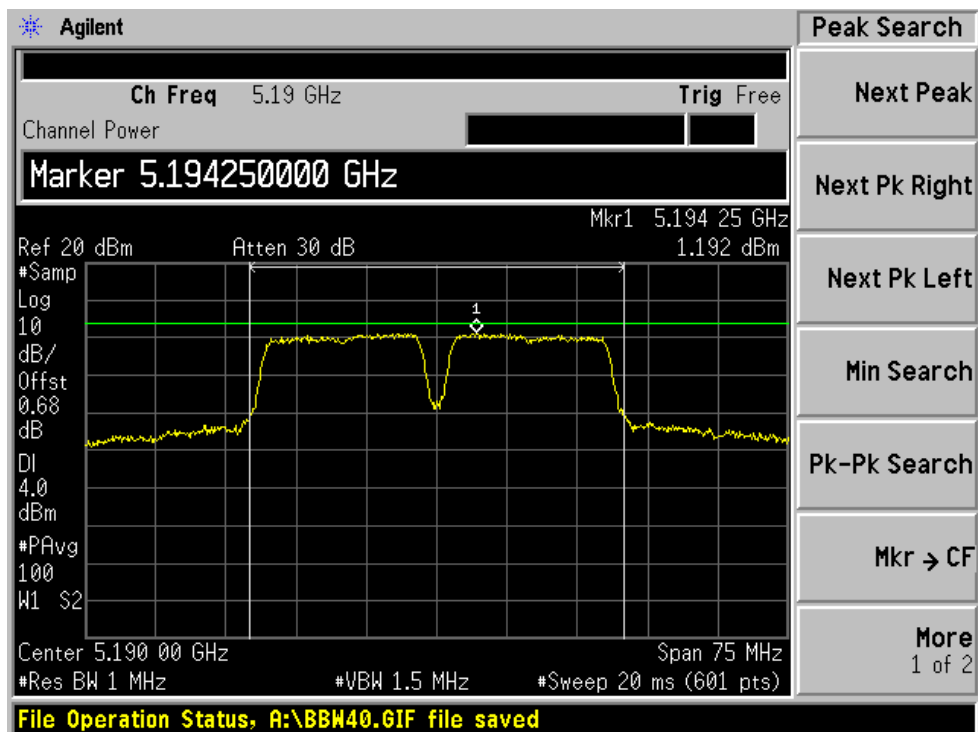


High Channel

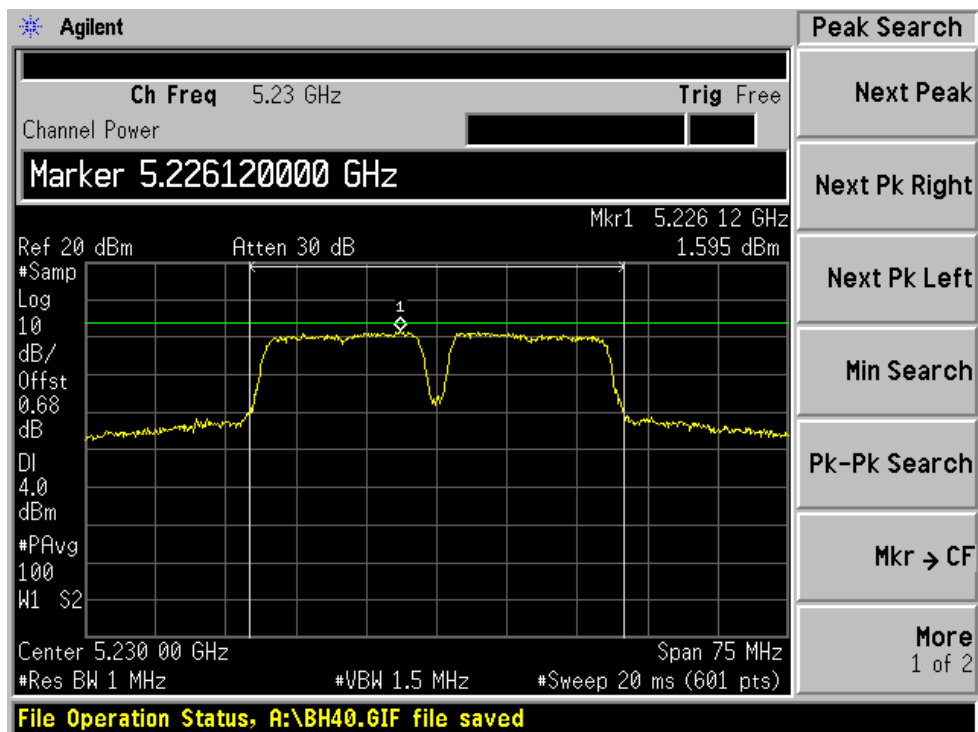


802.11a: 40MHz rate/channel, Chain A

Low Channel

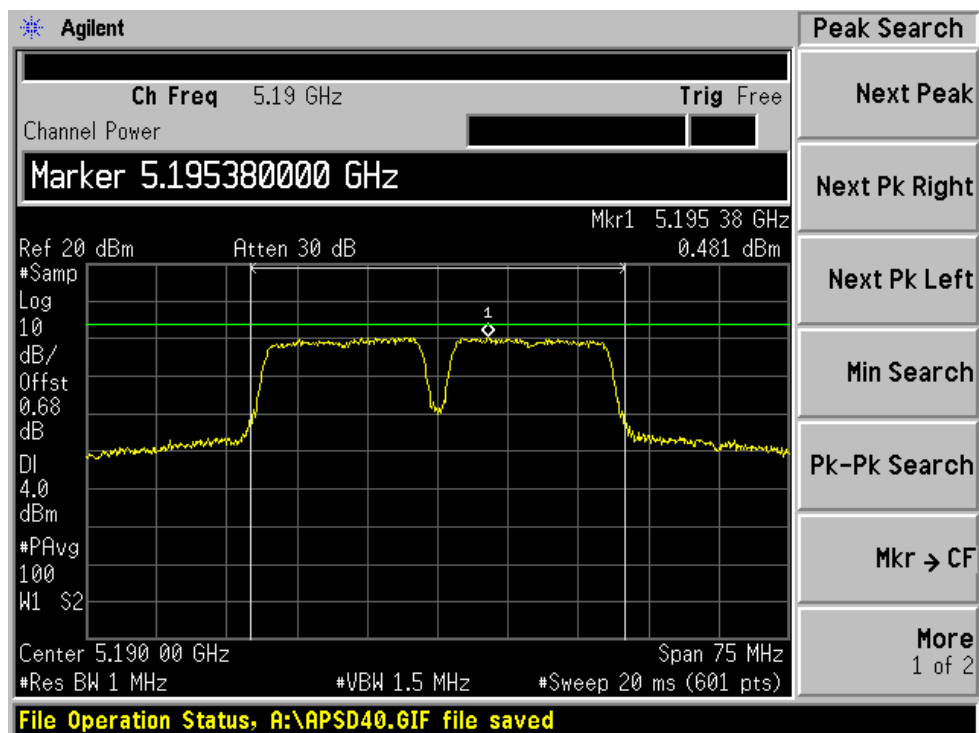


High Channel

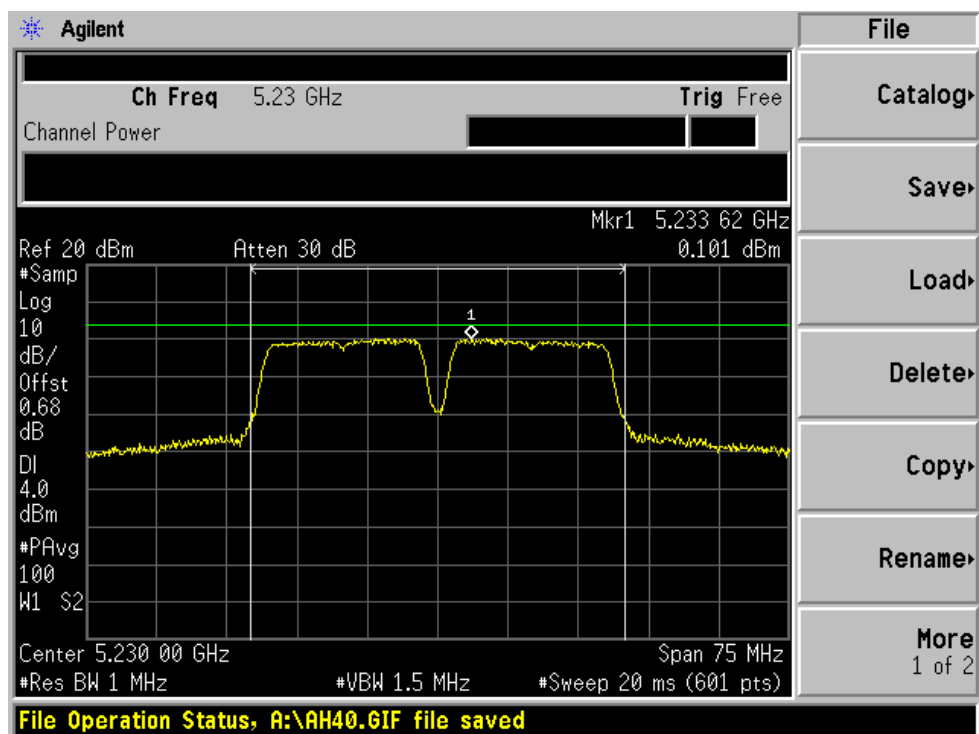


802.11a: 40MHz rate/channel, Chain B

Low Channel



High Channel



§15.407(a)(6) – Peak Excursion

Applicable Standard

According to §15.407 (a)(6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Measurement Procedure

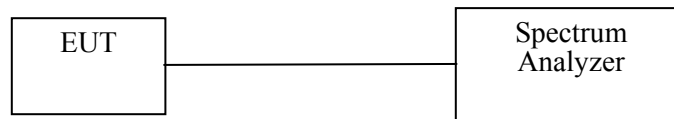
1. Set the SA span to view the entire emission bandwidth. The largest difference between the following two traces must be less than or equal to 13 dB for all frequencies across the emission bandwidth.
2. For the first trace, set RBW = 1MHz and VBW greater or equal to 3MHz utilizing the peak detector and max-hold function.
3. Second trace is created using the setting as described in method # 3 as used in measuring conducted peak output power under FCC Public Notice for U-NII devices August 30, 2002.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	E4446A	US44300386	2006-03-06

* **Statement of Traceability:** **BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

* The testing was performed by Dan Corona from 2006-11-08 to 2006-11-28

5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel**

Frequency (MHz)	Peak Excursion Chain A (dB)	Peak Excursion Chain B (dB)	Limit (dB)	Result
5180	7.51	7.05	13	Pass
5220	7.03	7.13	13	Pass
5240	6.91	6.06	13	Pass

802.11n: 40MHz rate/channel

Frequency (MHz)	Peak Excursion Chain A (dB)	Peak Excursion Chain B (dB)	Limit (dB)	Result
5190	7.26	7.15	13	Pass
5230	7.54	7.36	13	Pass

802.11a: 20MHz rate/channel

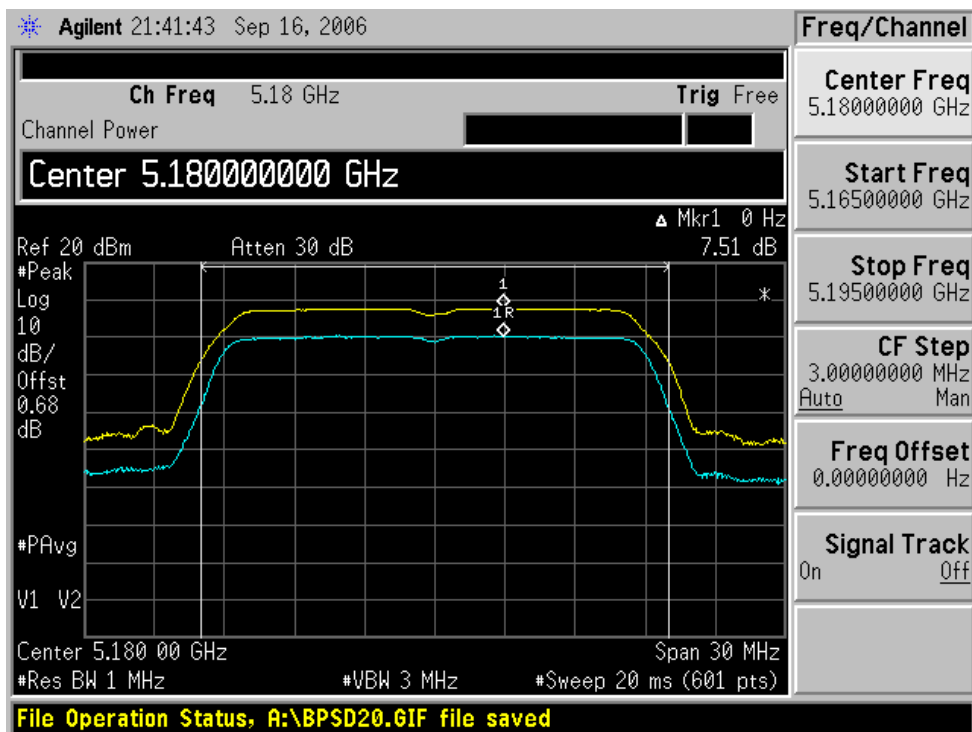
Frequency (MHz)	Peak Excursion Chain A (dB)	Peak Excursion Chain B (dB)	Limit (dB)	Result
5180	7.90	8.48	13	Pass
5220	6.56	5.55	13	Pass
5240	6.48	7.07	13	Pass

802.11a: 40MHz rate/channel

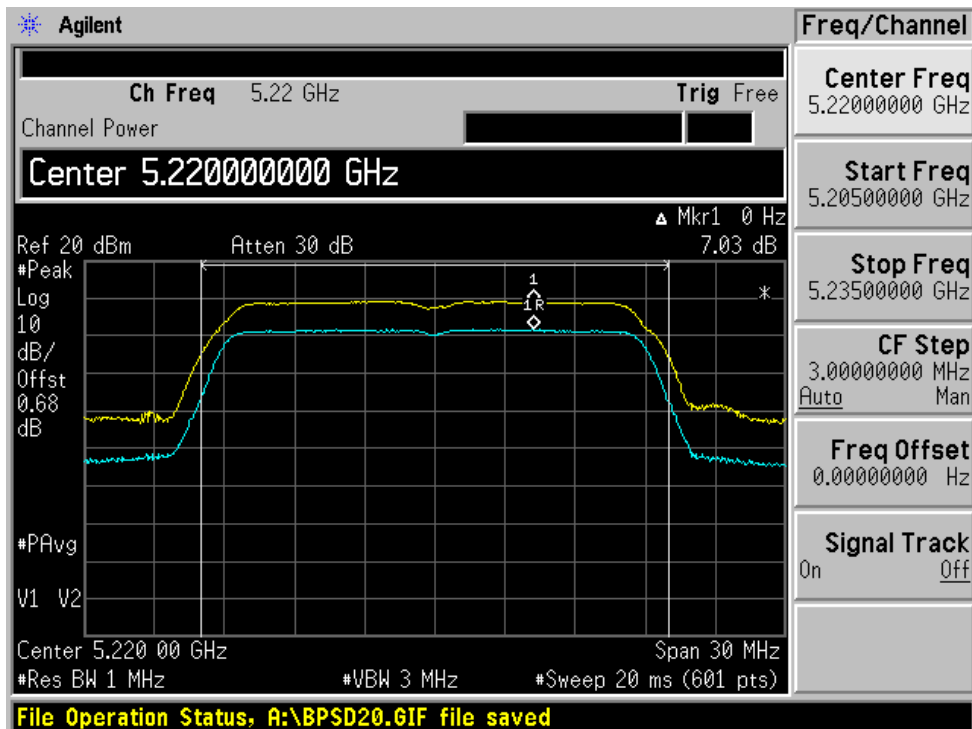
Frequency (MHz)	Peak Excursion Chain A (dB)	Peak Excursion Chain B (dB)	Limit (dB)	Result
5190	7.08	7.14	13	Pass
5230	6.93	7.02	13	Pass

5150-5250 MHz Band (W52)**802.11n: 20MHz rate/channel, Chain A**

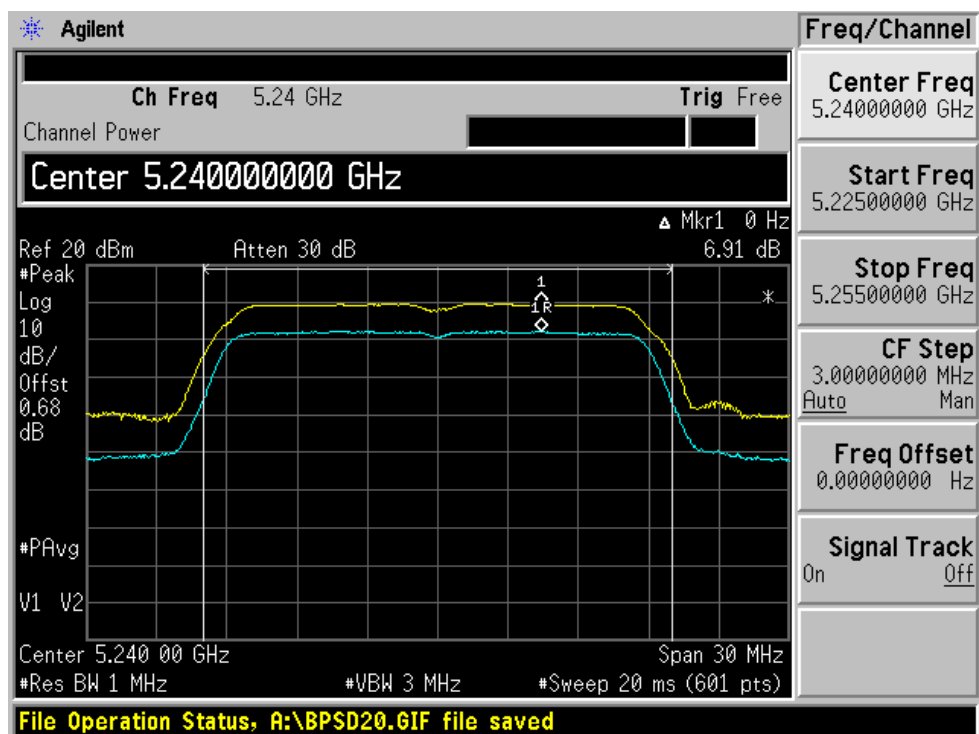
Low Channel



Middle Channel

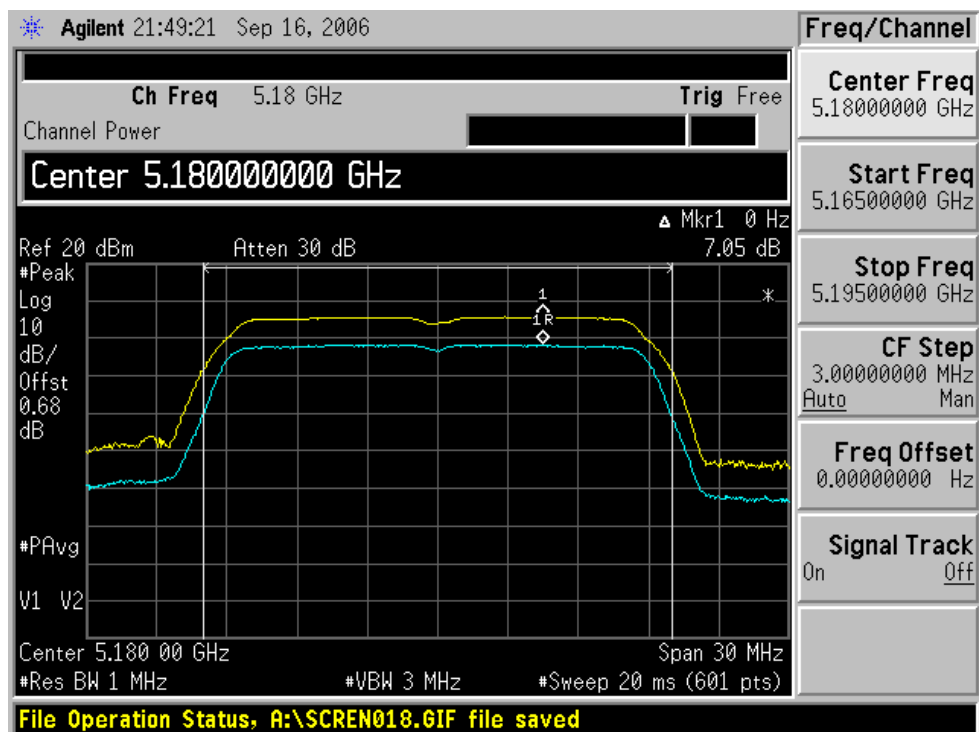


High Channel

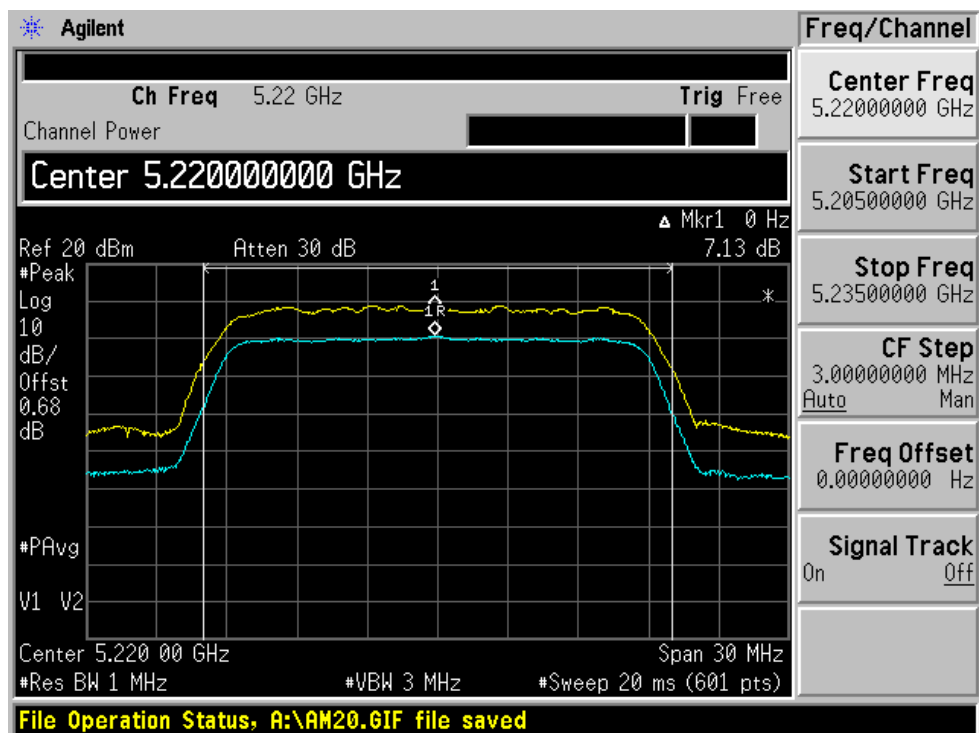


802.11n: 20MHz rate/channel, Chain B

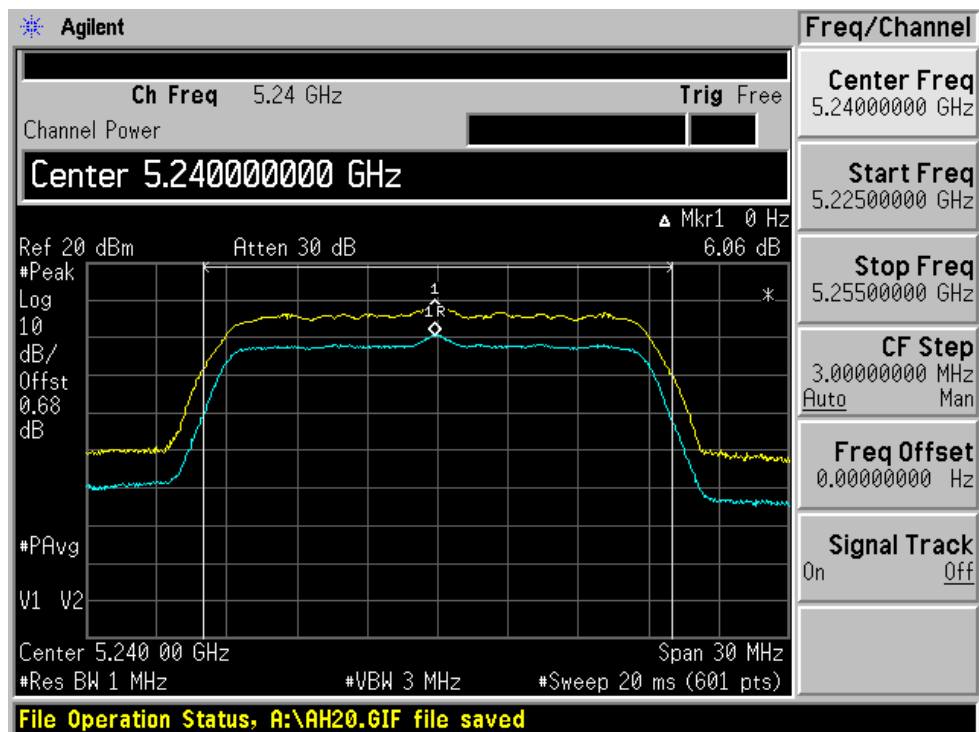
Low Channel



Middle Channel

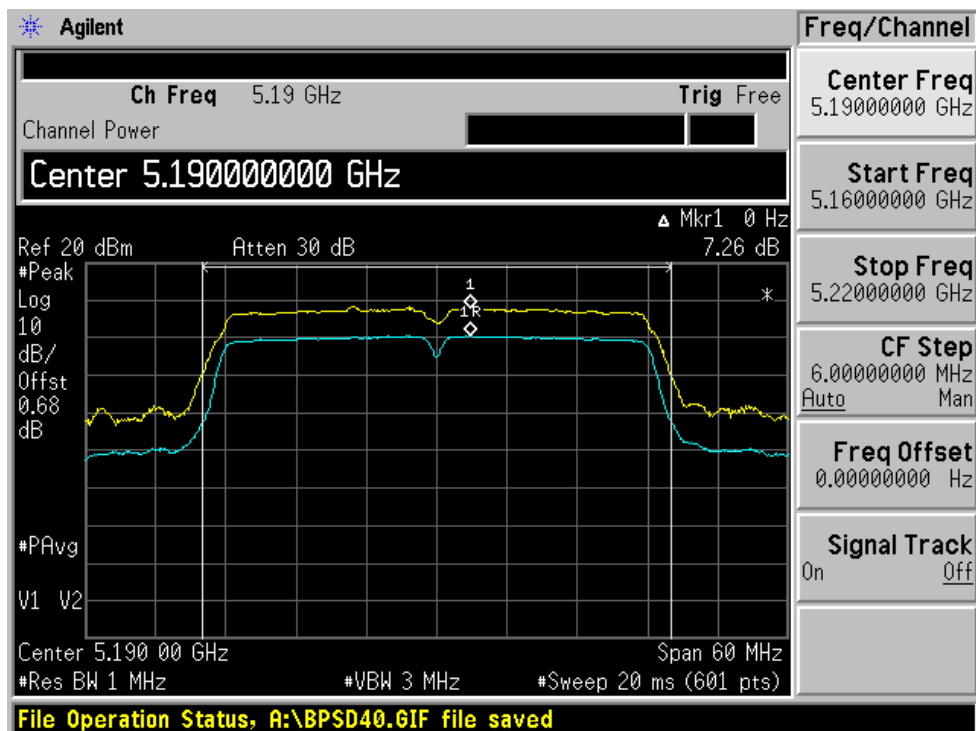


High Channel

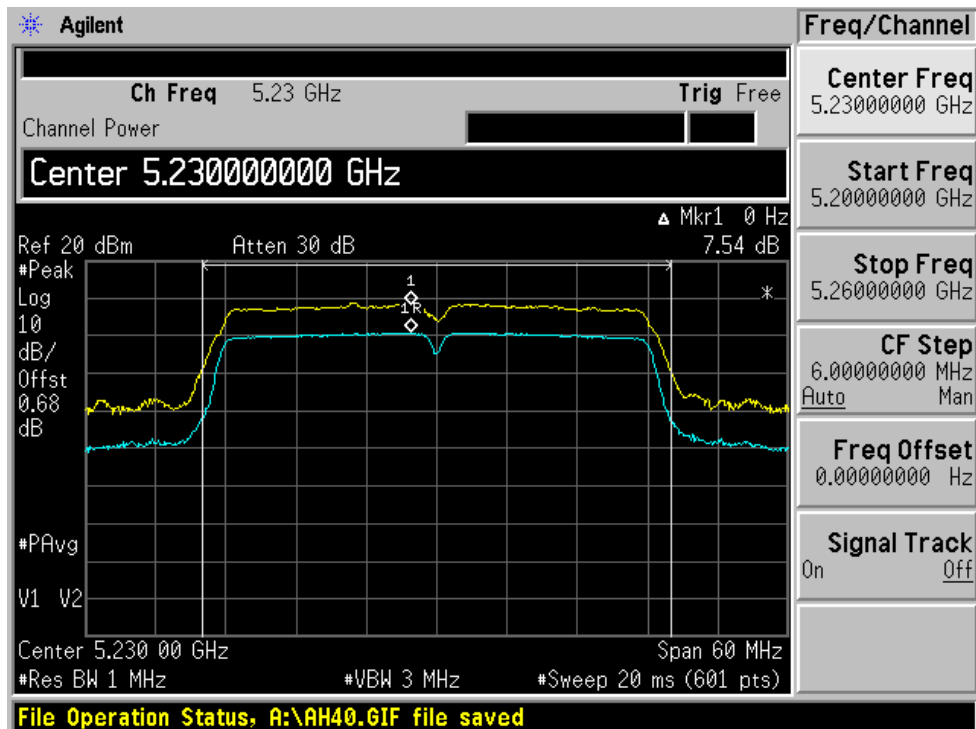


802.11n: 40MHz rate/channel, Chain A

Low Channel

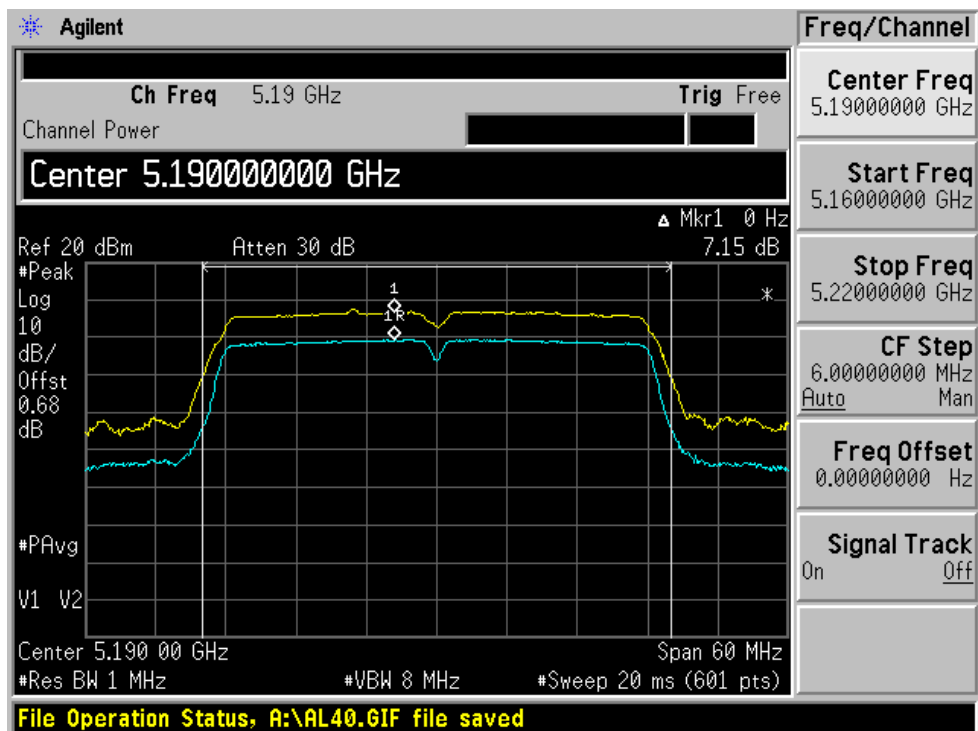


High Channel

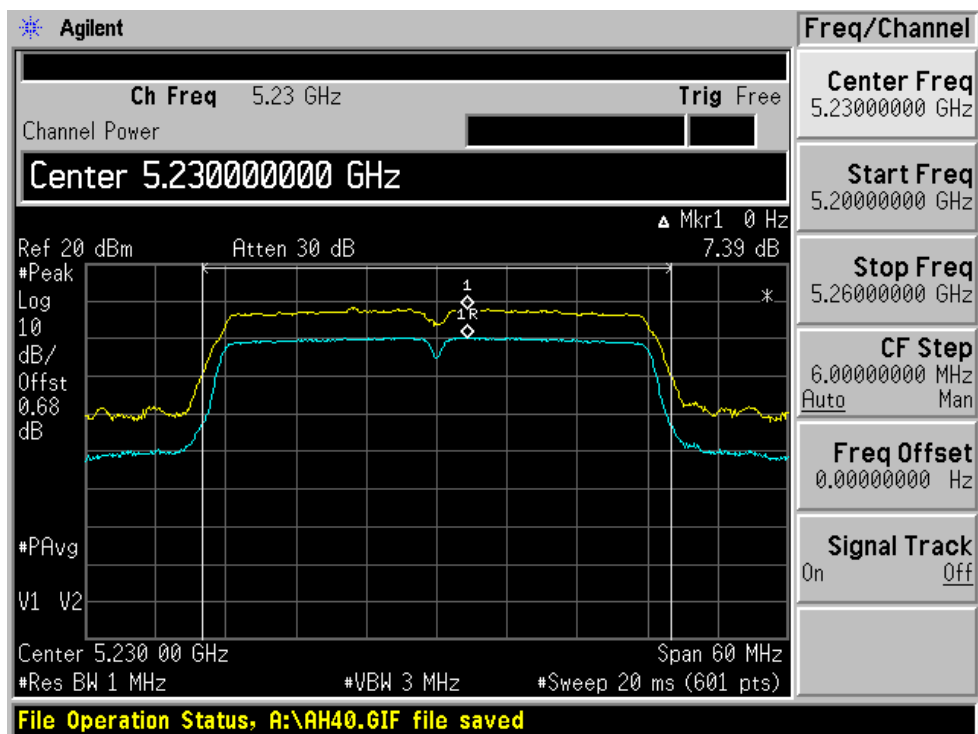


802.11n: 40MHz rate/channel, Chain B

Low Channel

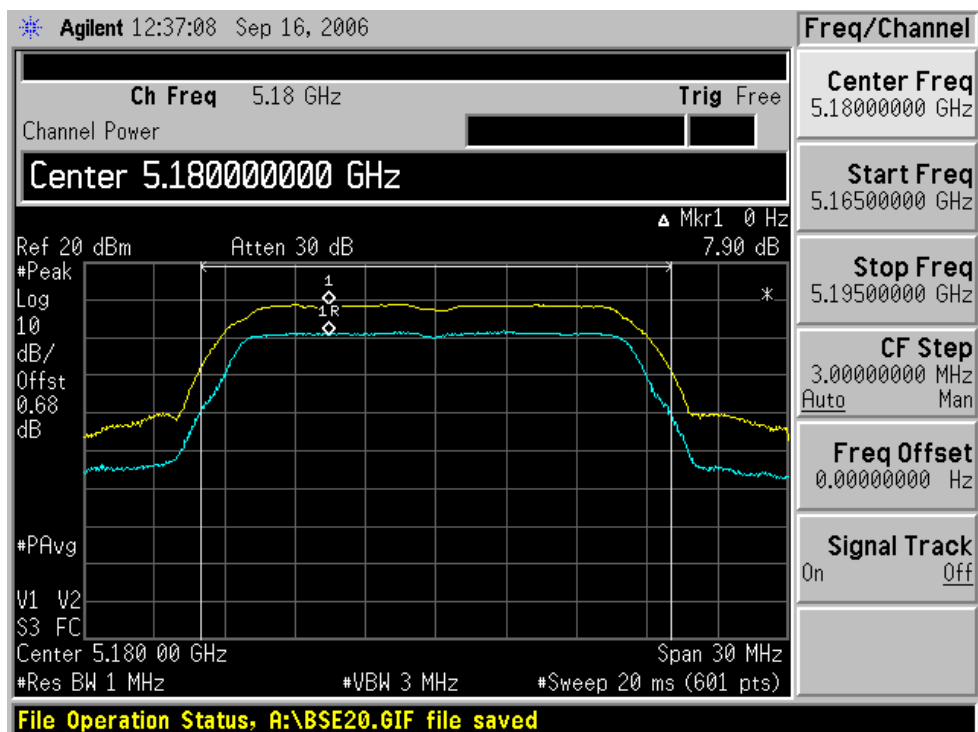


High Channel

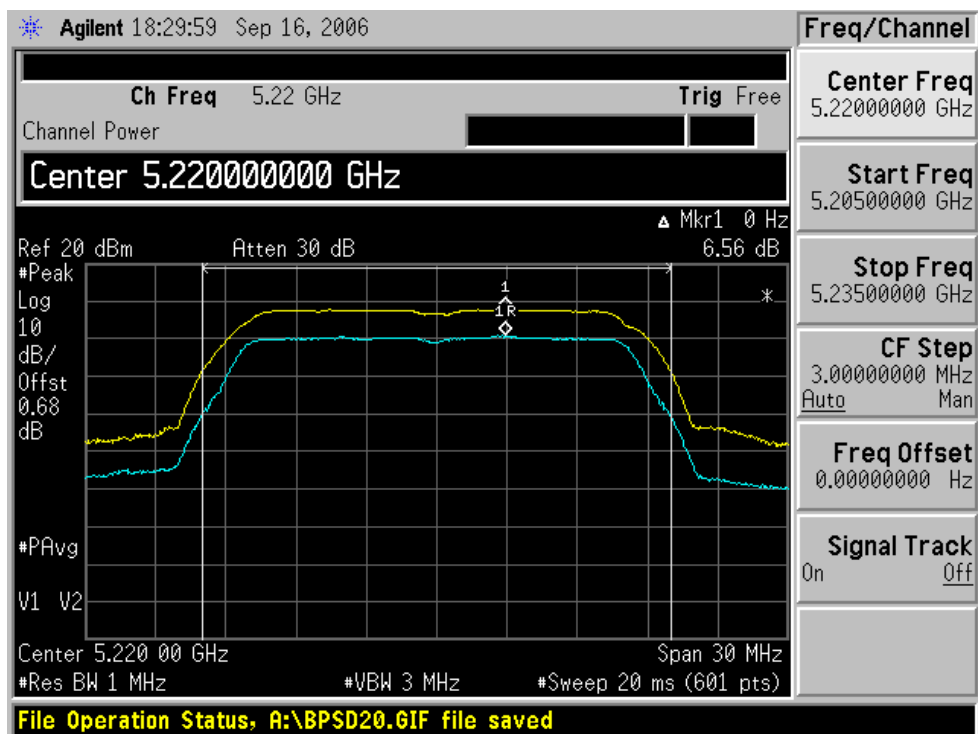


802.11a: 20MHz rate/channel, Chain A

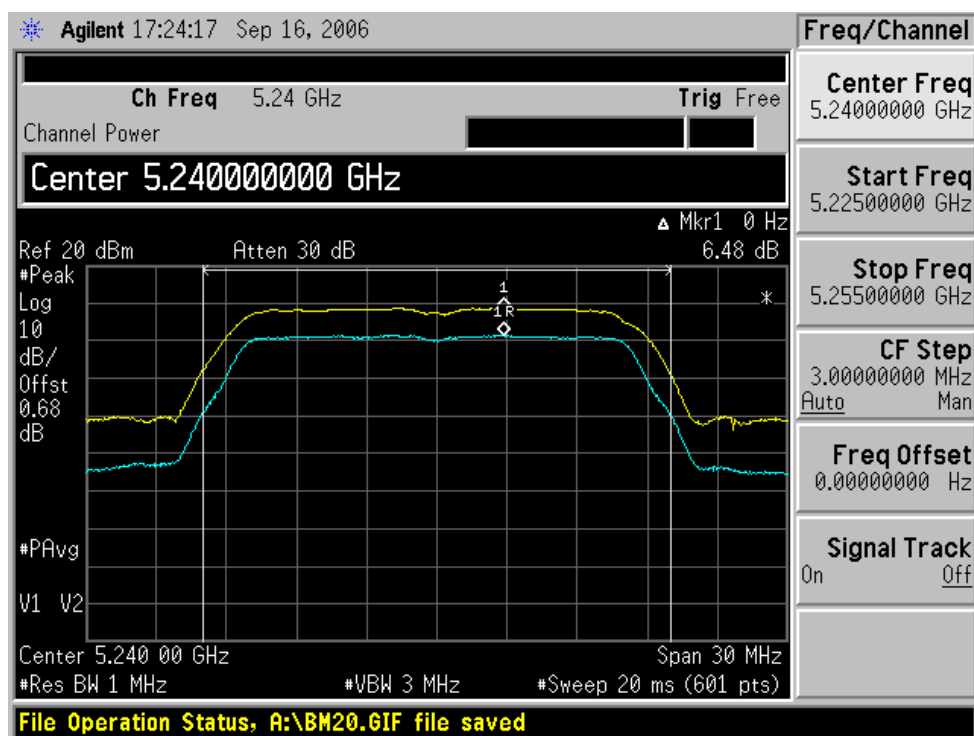
Low Channel



Middle Channel

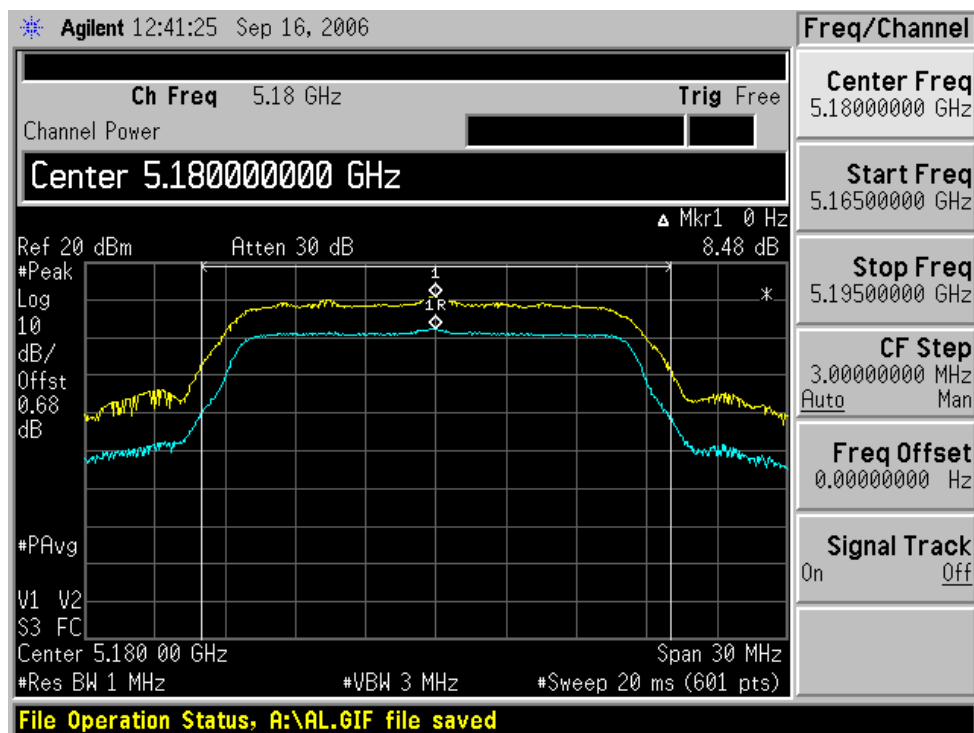


High Channel

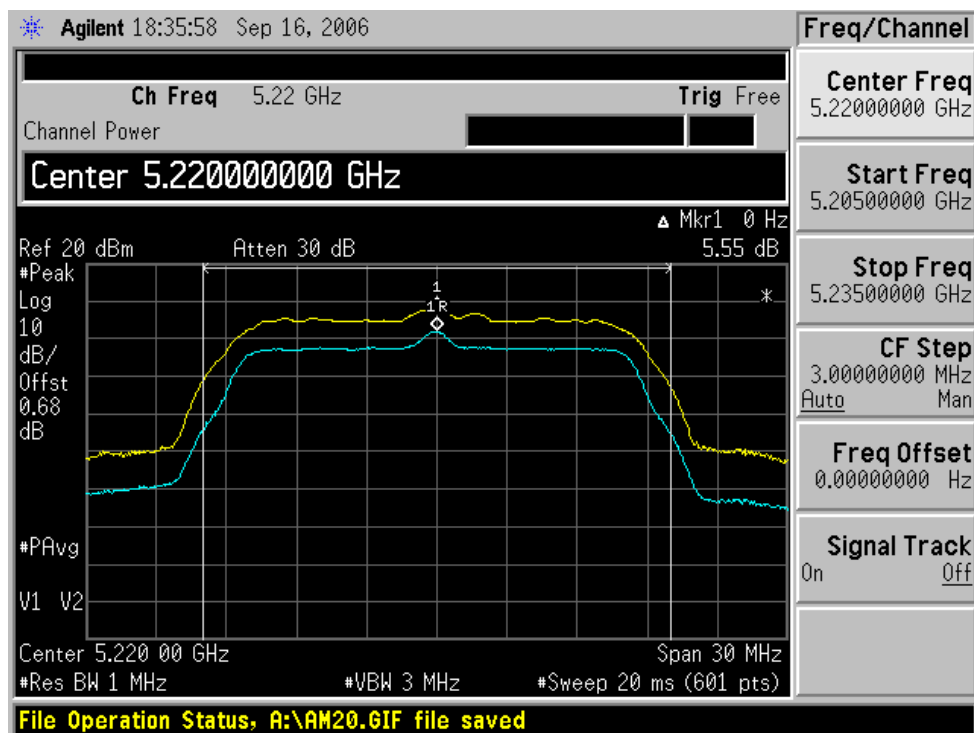


802.11a: 20MHz rate/channel, Chain B

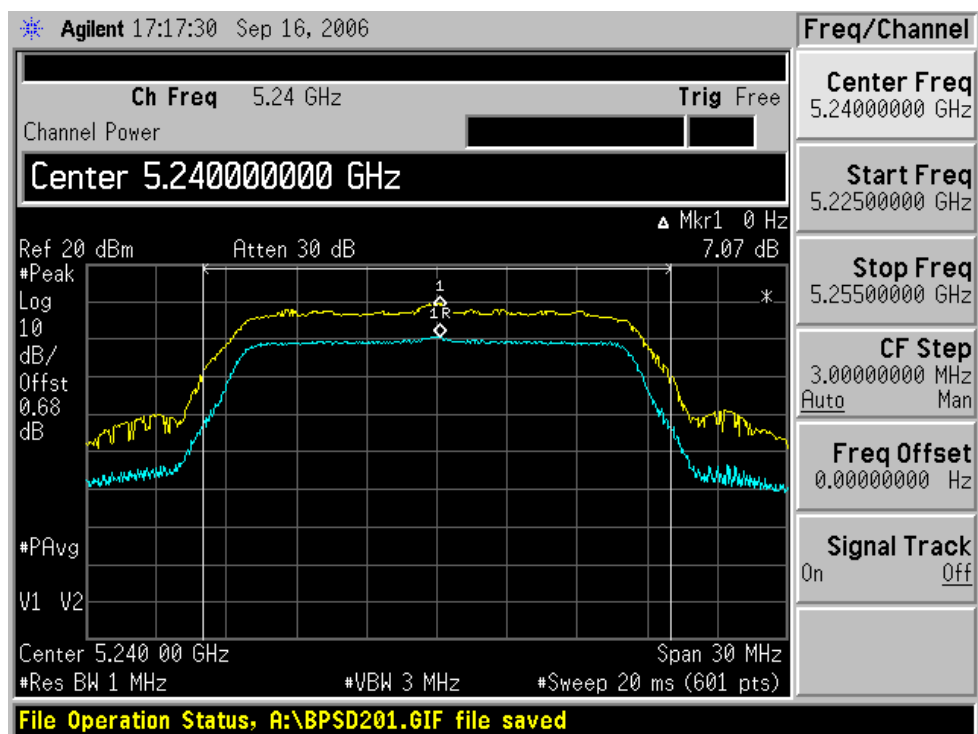
Low Channel



Middle Channel

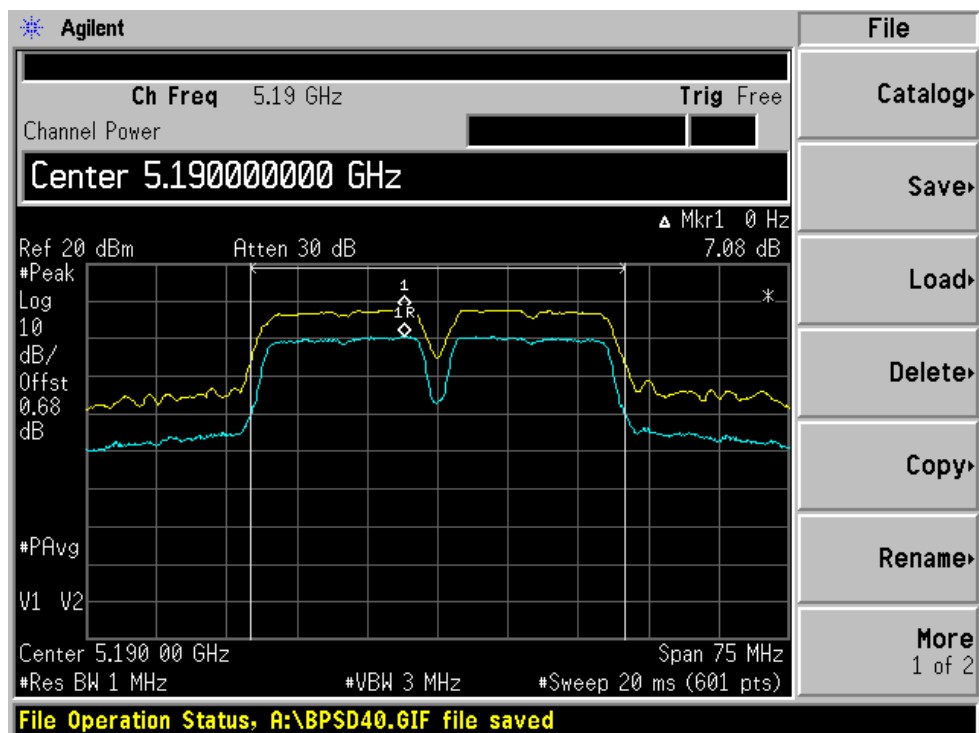


High Channel

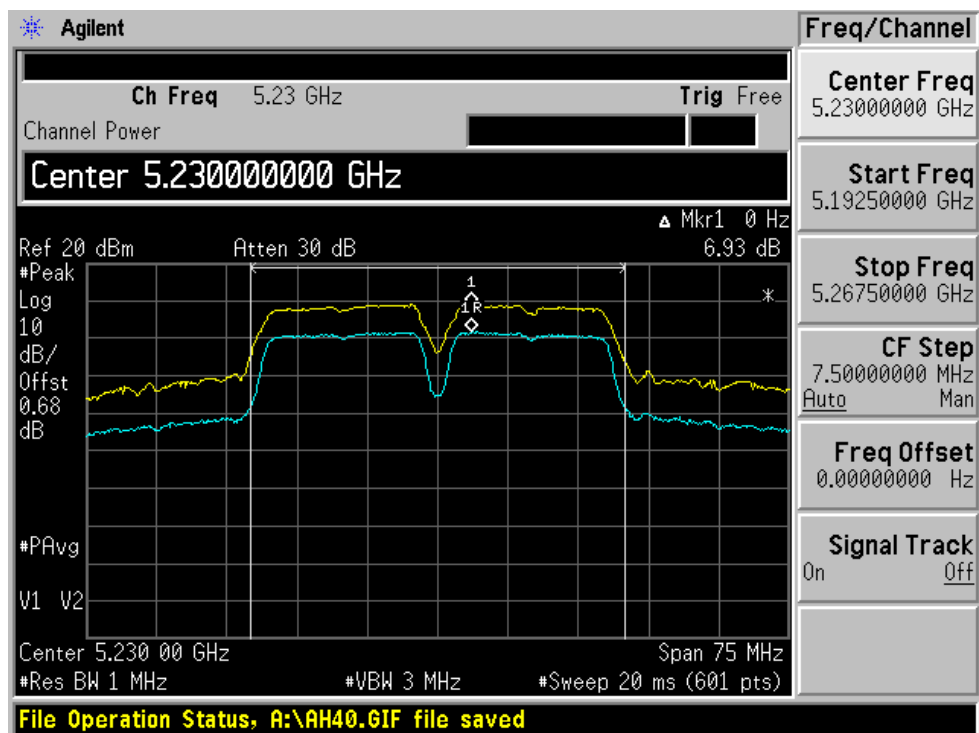


802.11a: 40MHz rate/channel, Chain A

Low Channel

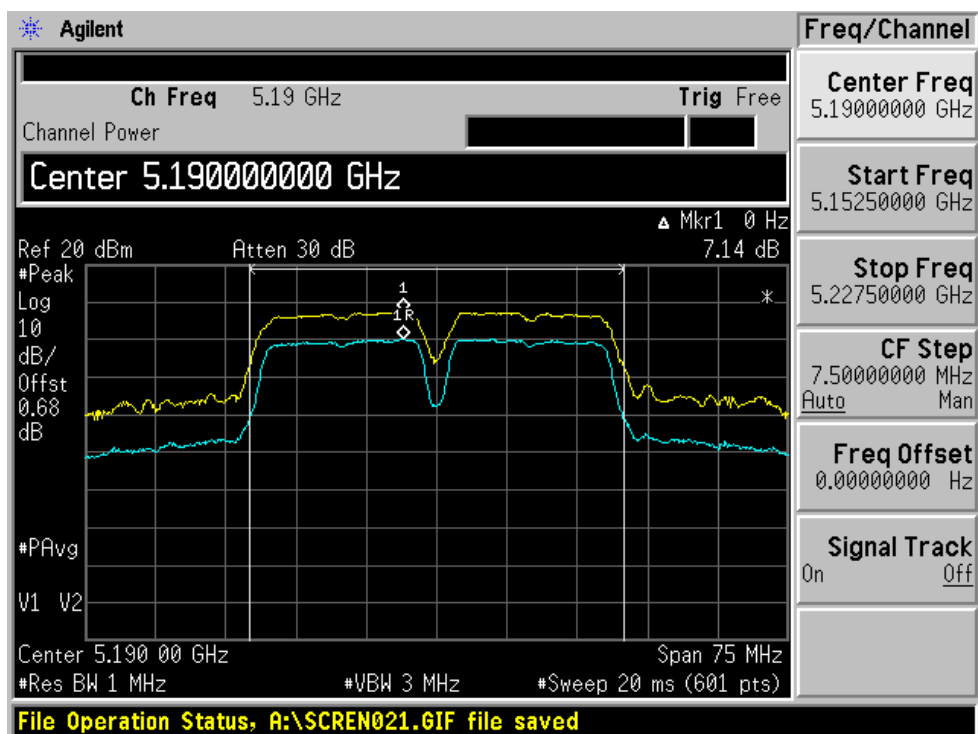


High Channel

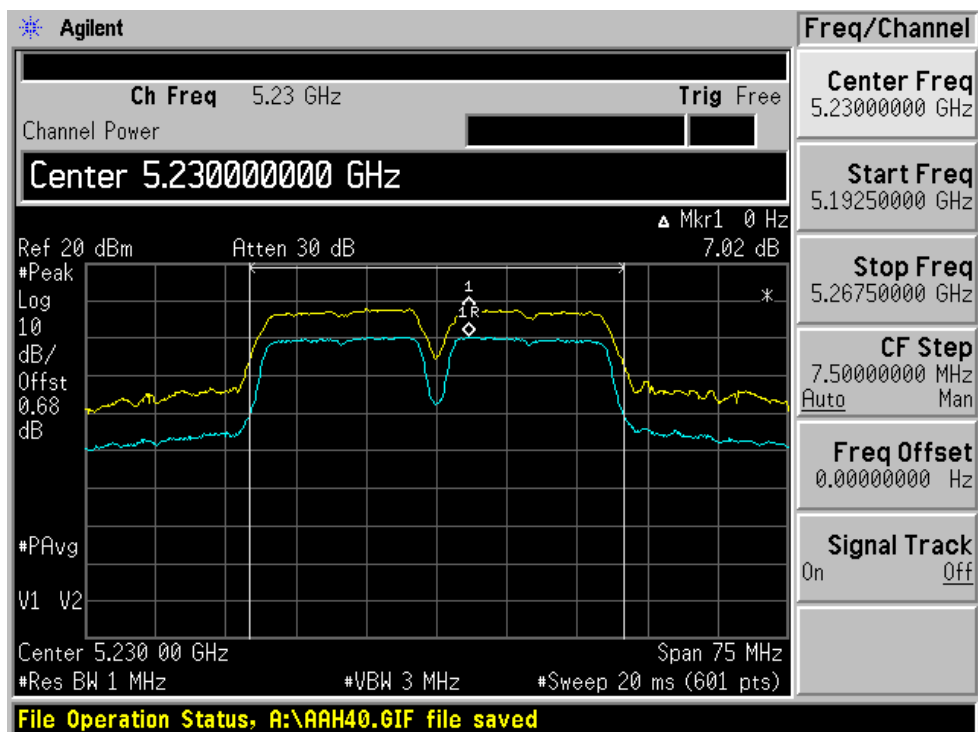


802.11a: 40MHz rate/channel, Chain B

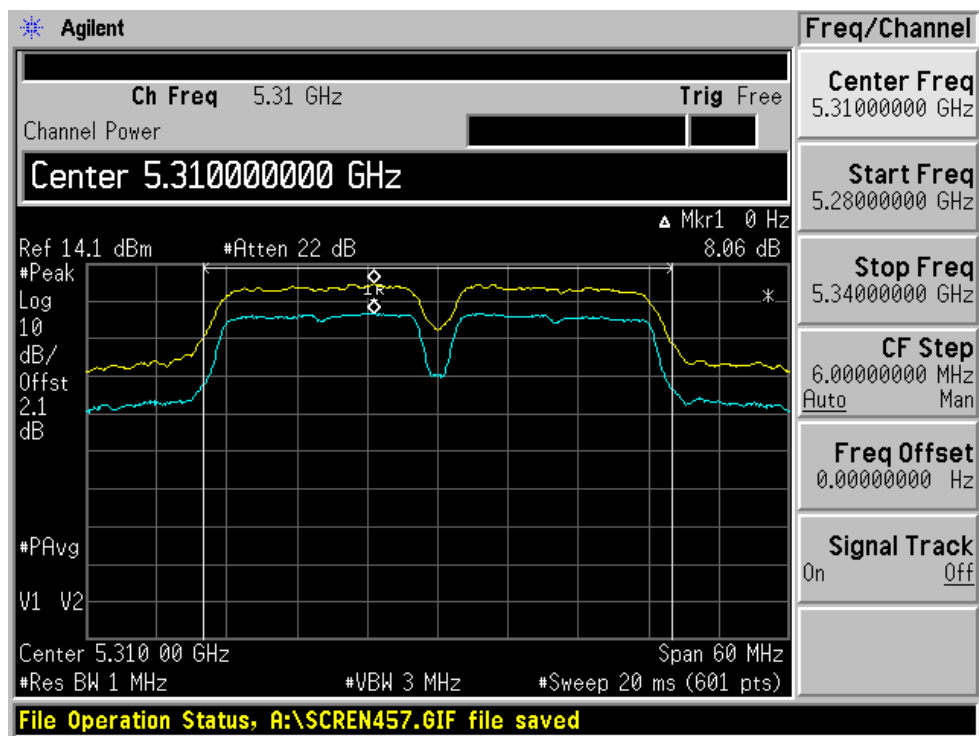
Low Channel



High Channel



High Channel



§15.407(h) – DYNAMIC FREQUENCY SELECTION

Applicable Standard

§15.407 (h) and FCC 06-96.

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (Without radar detection)	Client (With radar detection)
<i>Non-Occupancy Period</i>	Yes	Not Required	Yes
<i>DFS Detection Threshold</i>	Yes	Not Required	Yes
<i>Channel Availability Check Time</i>	Yes	Not Required	Not Required
<i>Uniform Spreading</i>	Yes	Not Required	Not Required
<i>U-NII Detection Bandwidth</i>	Yes	Not Required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	Client (Without DFS)	Client (With DFS)
<i>DFS Detection Threshold</i>	Yes	Not Required	Yes
<i>Channel Closing Transmission Time</i>	Yes	Yes	Yes
<i>Channel Move Time</i>	Yes	Yes	Yes

Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (See Notes 1 and 2)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Table 4: DFS Response requirement values

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
<i>U-NII Detection Bandwidth</i>	Minimum 80% of the UNII 99% transmission power bandwidth. See Note 3.

Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:

- For the Short Pulse Radar Test Signals this instant is the end of the *Burst*.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated.
- For the Long Pulse Radar Test Signal this instant is the end of the 12 second period defining the *Radar Waveform*.

Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Table 5: Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Table 6: Long Pulse Radar Test Signal

Radar Type	Bursts	Chirp Width (MHz)	PRI (usec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7: Frequency Hopping Radar Test Signal

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

Statement of Compliance

N/A ,this band is not required for DFS testing.