FCC PART 15.407
TEST AND MEASUREMENT REPORT

For

Sensity Systems, Inc.

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FCC ID: SXNLSNM-0002-X

Report Type:	**Product Type:**
Original Report	Light Sensory Module

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Report Number:	R1404241-407
Report Date:	2014-07-11
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1404241-407	Original Report	2014-07-11

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Sensity Systems, Inc.*, and their product model: *LSNM-0002-X* with *FCC ID: SXNLSNM-0002-X* or the "EUT" as referred to in this report. The EUT is a light sensory module operating in the 2.4, 5.2, 5.3 and 5.6 GHz bands.

1.2 Mechanical Description of EUT

The EUT measures approximately 14cm (L) x 10 cm (W) x 3.8 cm (H) and weighs 230g.

The test data gathered are from typical production sample, serial number: LSNM-0002-X provided by the manufacturer.

1.3 Objective

This report is prepared on behalf of *Sensity Systems, Inc., in* accordance with FCC CFR47 §15.407.

The objective is to determine compliance with FCC Part 15.407 rules for Antenna Requirements, Conducted Emissions, Occupied Bandwidth, Output Power, Power Spectral Density, Radiated and Conducted Spurious Emissions, and Band Edge. Please refer to the detail antenna list in the antenna requirement section.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS grant with FCC ID: SXNLSNM-0002-X.

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, 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 and FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging 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 Corp.

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.

1.7 Test Facility

Bay Area Compliance Laboratories Corp. (BACL) is:

1- An independent Commercial Test Laboratory accredited to **ISO 17025:2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC (Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4 - A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:
1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

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

The test site at BACL Corp. 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 have 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 test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz, as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. 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 Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 EUT Test Configuration

2.1 Justification

The EUT was tested in a 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.

2.2 EUT Exercise Software

The test utility used was TeraTerm and was verified by Chen Ge to comply with the standard requirements being tested against.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

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

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Lenovo	Laptop	ThinkPad, X230	R9-VWWFK12/12

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Sensity Systems	Main Board	LF1B	ASI86386

2.7 Interface Ports and Cables

Cable Description	Length (m)	To	From
USB cable	<1.0	Laptop	Interface Board

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Result
FCC §15.407(f), §2.1091	RF Exposure	Compliant
FCC §15.203	Antenna Requirement	Compliant
FCC §15.207	AC Power Line Conducted Emissions	Compliant
FCC §15.209(a), 15.407(b)	Spurious Radiated Emissions	Compliant
FCC §15.407(a)	26 dB and 99% Emission Bandwidth	Compliant
FCC §407(a)	Peak Output Power Measurement	Compliant
FCC §2.1051, §15.407(b)	Band Edges	Compliant
FCC §15.407(a)	Power Spectral Density	Compliant
FCC §15.407(a)(6)	Peak Excursion Ratio	Compliant
FCC §2.1051, §15.407(b)	Spurious Emissions at Antenna Terminals	Compliant

4 FCC §15.407(f) & §2.1091 - RF Exposure

4.1 Applicable Standard

According to FCC §15.407(f) and §1.1307(b)(1), 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.

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

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from 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

4.3 MPE Results

W52 Band:

Maximum peak output power at antenna input terminal (dBm):	13.36
Maximum peak output power at antenna input terminal (mW):	21.67
Prediction distance (cm):	20
Prediction frequency (MHz):	5240
Maximum Antenna Gain, typical (dBi):	8.0
Maximum Antenna Gain (numeric):	6.309
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.027
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

W53 Band:

Maximum peak output power at antenna input terminal (dBm):	14.57
Maximum peak output power at antenna input terminal (mW):	28.64
Prediction distance (cm):	20
Prediction frequency (MHz):	5320
Maximum Antenna Gain, typical (dBi):	8.0
Maximum Antenna Gain (numeric):	6.309
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.035
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

W56 Band:

Maximum peak output power at antenna input terminal (dBm):	13.10
Maximum peak output power at antenna input terminal (mW):	20.41
Prediction distance (cm):	20
Prediction frequency (MHz):	5700
Maximum Antenna Gain, typical (dBi):	8.0
Maximum Antenna Gain (numeric):	6.309
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.025
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device meets FCC MPE requirement for uncontrolled exposure environment at 20 cm distance.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to FCC §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.

5.2 Antenna List

Manufacturers	Antenna Type/Pattern	Antenna Gain (dBi) @ 5 GHz
Laird Tech	OMNI	8

The product needs to be installed professionally; therefore, it complies with the antenna requirement. Please refer to the internal photos.

6 FCC §15.207 - AC Power Line Conducted Emissions

6.1 Applicable Standards

As per FCC §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 µH/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 frequencies 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.*

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2009 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §7.2.4 limits.

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

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

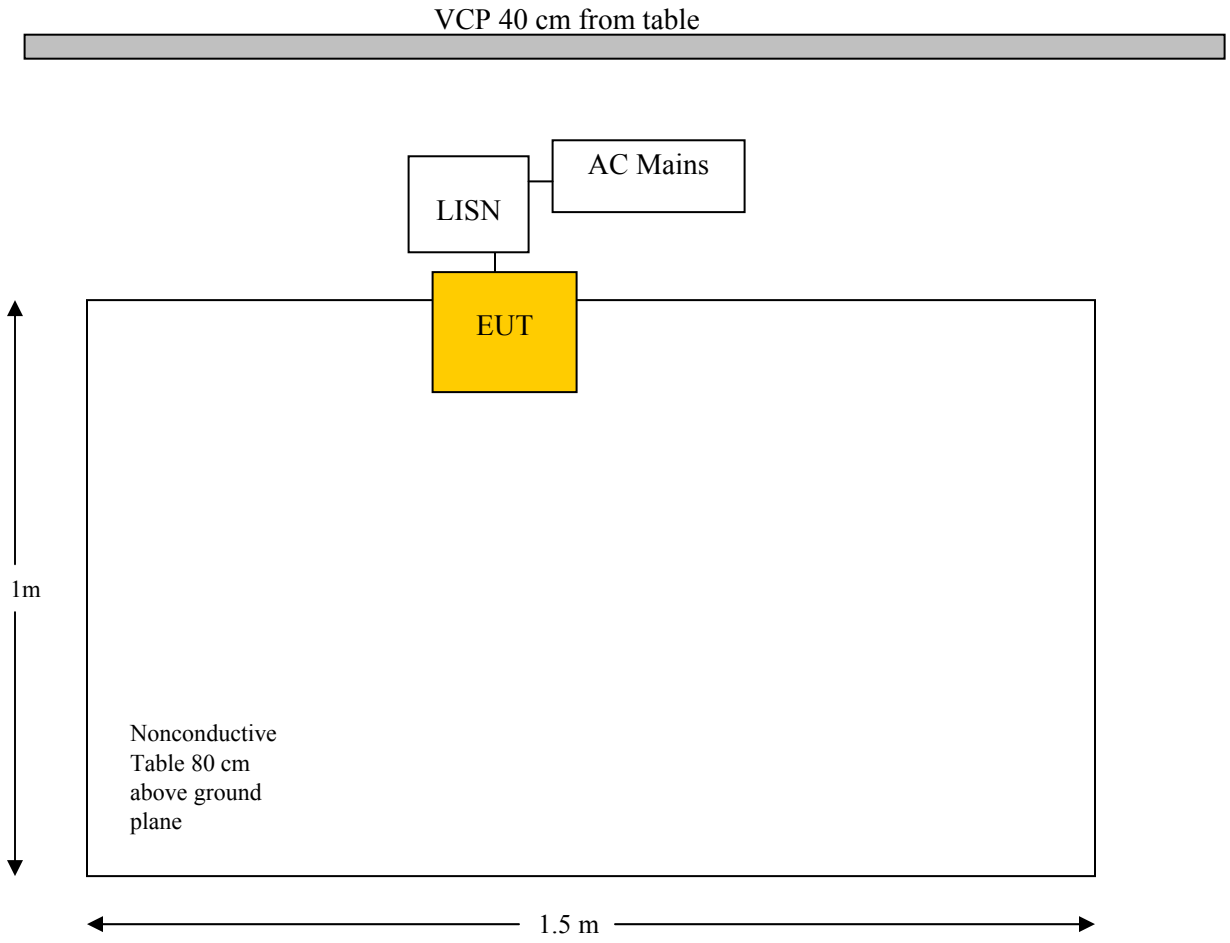
6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system 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”.

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2014-04-23	1 year
Solar Electronics	LISN	9252-R-24-BNC	511205	2013-06-25	1 year
TTE	Filter, High Pass	H9962-150K-50-21378	K7133	2014-05-30	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

6.7 Test Environmental Conditions

Temperature:	24 ºC
Relative Humidity:	46 %
ATM Pressure:	101.62 kPa

The testing was performed by Chen Ge on 2014-06-12 in 5 m chamber 3.

6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the margin reading of:

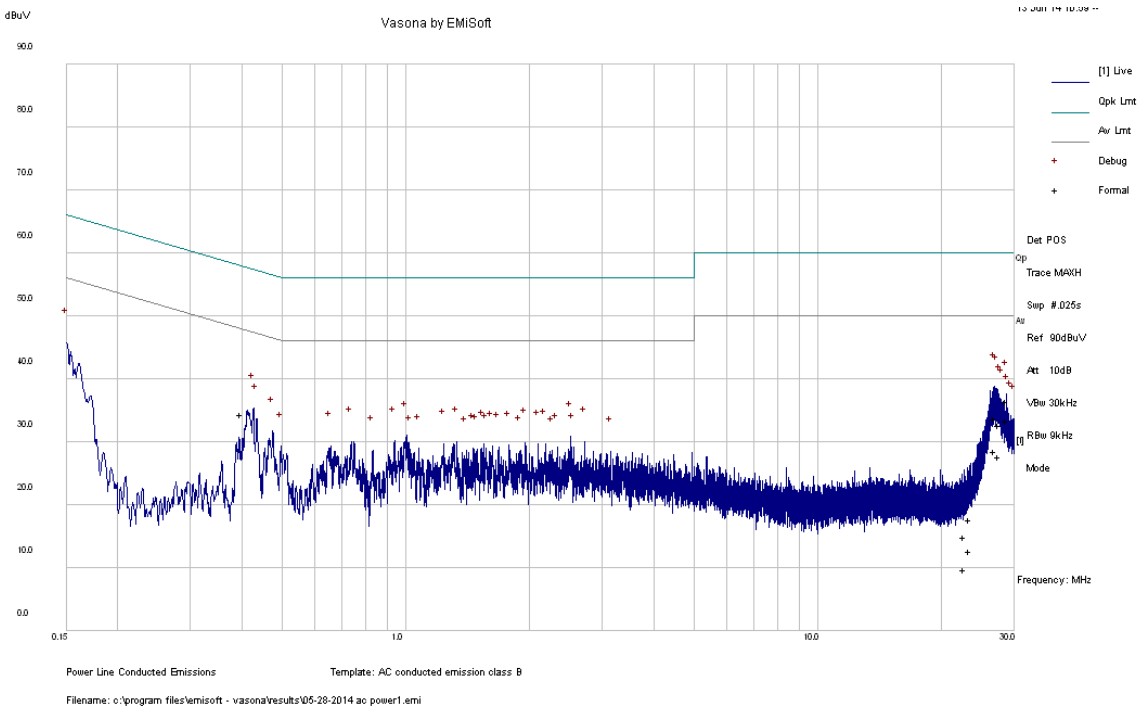
Transmitting Mode: Worst case with 5 GHz operating

Connection: 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor (Line/Neutral)**	**Range (MHz)**
-16.47	28.67244	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

Worst case in the 5 GHz Band:

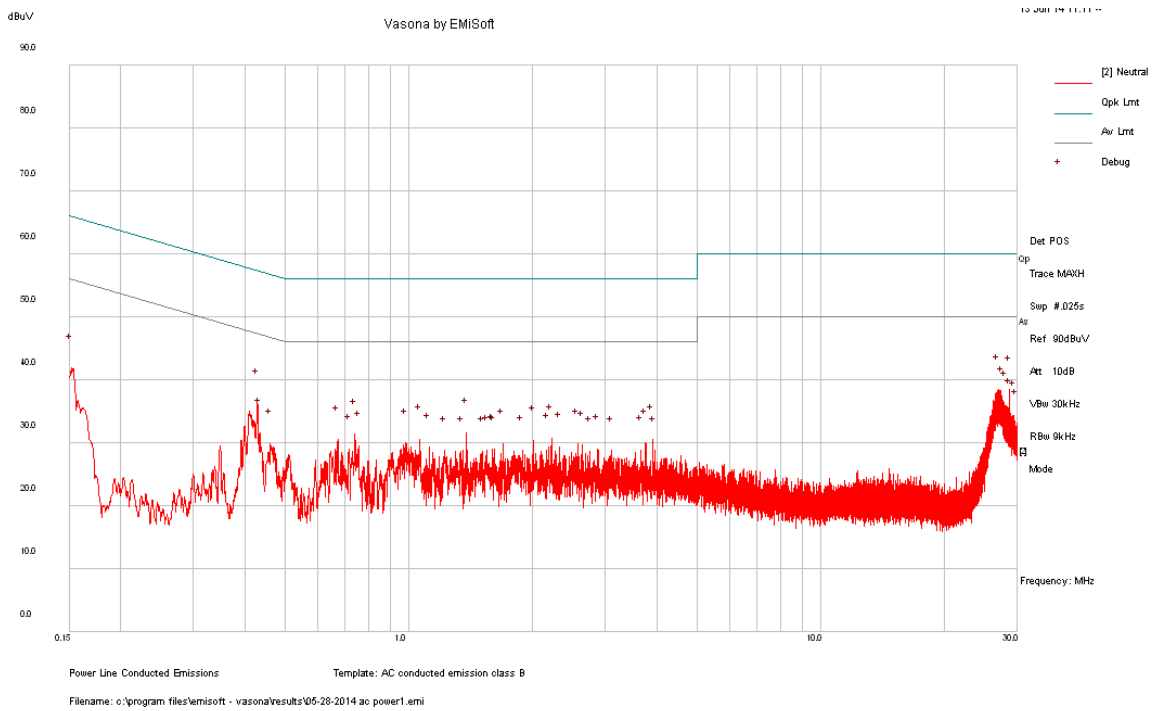
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.150278	42.61	Line	65.98	-23.37	QP
26.82034	33.94	Line	60	-26.06	QP
27.19178	34.05	Line	60	-25.95	QP
0.411587	32.38	Line	57.62	-25.24	QP
28.67244	36.58	Line	60	-23.42	QP
27.6336	32.84	Line	60	-27.16	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.150278	29.96	Line	55.98	-26.03	Ave.
26.82034	28.72	Line	50	-21.28	Ave.
27.19178	28.87	Line	50	-21.13	Ave.
0.411587	25.95	Line	47.62	-21.67	Ave.
28.67244	33.53	Line	50	-16.47	Ave.
27.6336	27.84	Line	50	-22.16	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.411201	31.96	Neutral	57.62	-25.66	QP
26.95259	33.83	Neutral	60	-26.17	QP
28.67319	35.11	Neutral	60	-24.89	QP
27.61602	32.68	Neutral	60	-27.32	QP
0.15005	38.18	Neutral	66	-27.81	QP
28.12201	30.98	Neutral	60	-29.02	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.411201	25.44	Neutral	47.62	-22.18	Ave.
26.95259	28.63	Neutral	50	-21.37	Ave.
28.67319	31.87	Neutral	50	-18.13	Ave.
27.61602	27.48	Neutral	50	-22.52	Ave.
0.15005	29.97	Neutral	56	-26.03	Ave.
28.12201	25.71	Neutral	50	-24.29	Ave.

7 FCC §15.209 & §15.407(b) - Spurious Radiated Emissions

7.1 Applicable Standard

As per FCC §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 FCC §15.209(a) and IC RSS-210: 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 (micro volts/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 Note 1	3
88 - 216	150 Note 1	3
216 - 960	200 Note 1	3
Above 960	500	3

Note 1: 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 FCC §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		

As per FCC §15.407(b), for transmitters operating in the 5.15-5.25 GHz, 5.25-5.35 GHz and 5.47-5.725 GHz band: all emissions outside of the operation bands shall not exceed an EIRP of -27 dBm/MHz.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2009. The specification used was the FCC 15C/15E and IC RSS-210/RSS-Gen 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.

7.3 Test Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E Section H: Unwanted emissions measurement as well as ANSI C63.4: 2009 as described below:

For the radiated emissions test, the EUT host, 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 meter, 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 1000 MHz:

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

Above 1000 MHz:

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

7.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Cycle
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2013-06-18	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2014-06-09	1 year
Agilent	Pre-amplifier	8449B	3008A01978	2014-02-04	1 year
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year
EMCO	Horn Antenna	3315	9511-4627	2013-10-17	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-03-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

7.6 Test Environmental Conditions

Temperature:	19-24 °C
Relative Humidity:	42-47 %
ATM Pressure:	101.3-101.6 kPa

The testing was performed by Chen Ge on 2014-06-11 to 2014-06-12 at 5m meter 3.

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.205, 15.209 and 15.407 radiated emissions limits, and had the worst margin of:

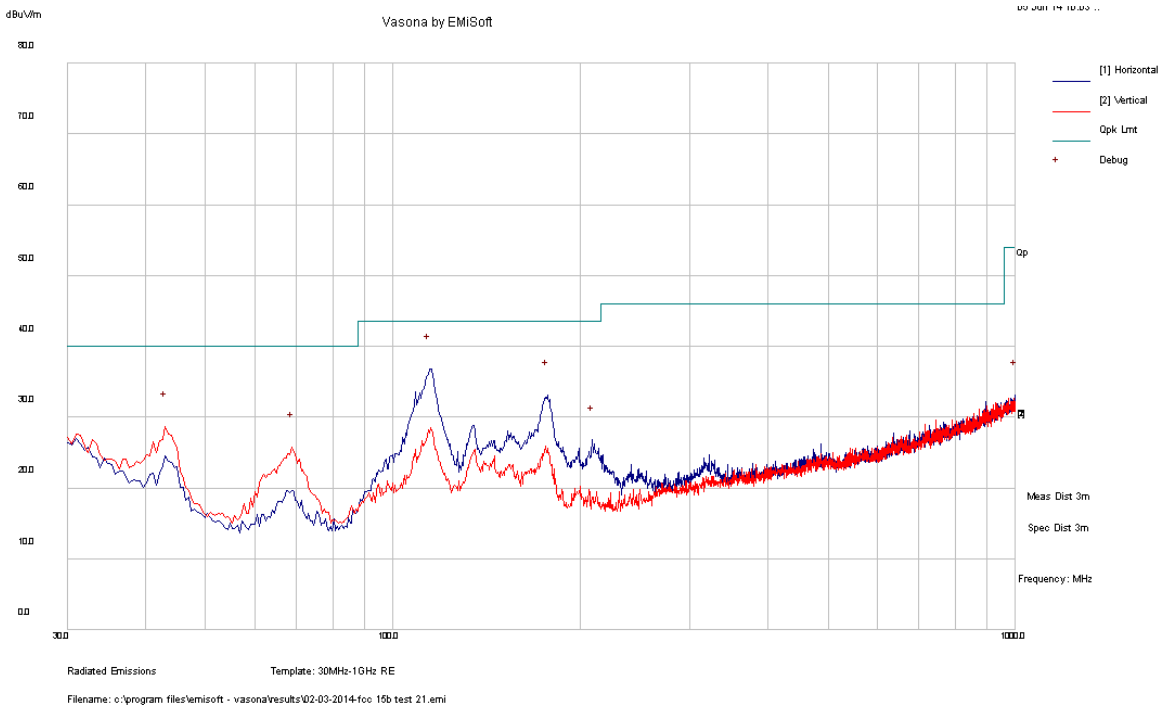
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-1.65	17010	Horizontal	1000 to 40000, 802.11a

Note: The higher power setting was used for all radiated emissions testing.

7.8 Radiated Emissions Test Result Data

Radiated Emission at 3 meters, all 5GHz Band, termination method was used.

1) 30 MHz–1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
114.626	32.46	251	H	134	43.5	-11.04	QP
176.841	28.2	149	H	282	43.5	-15.3	QP
43.31025	22.01	100	V	350	40	-17.99	QP
68.962	20.34	106	V	249	40	-19.66	QP
208.94	21.6	183	H	121	43.5	-21.9	QP
1000	17.64	116	H	325	54	-36.36	QP

2) 1 - 40 GHz:

5150-5250 MHz:

802.11a Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
10360	47.59	0	100	V	38.343	4.09	33.87	56.153	74	-17.847	Peak
10360	47.77	0	100	H	38.343	4.09	33.87	56.333	74	-17.667	Peak
10360	32.18	0	100	V	38.343	4.09	33.87	40.743	54	-13.257	Ave
10360	33.29	0	100	H	38.343	4.09	33.87	41.853	54	-12.147	Ave
15540	48.16	0	100	V	37.928	4.93	34.34	56.678	74	-17.322	Peak
15540	47.37	0	100	H	37.928	4.93	34.34	55.888	74	-18.112	Peak
15540	33.27	0	100	V	37.928	4.93	34.34	41.788	54	-12.212	Ave
15540	32.8	0	100	H	37.928	4.93	34.34	41.318	54	-12.682	Ave
20720	47.07	0	100	V	34.6	5.79	33.97	53.49	74	-20.51	Peak
20720	47.45	0	100	H	34.6	5.79	33.97	53.87	74	-20.13	Peak
20720	32.78	0	100	V	34.6	5.79	33.97	39.2	54	-14.8	Ave
20720	32.5	0	100	H	34.6	5.79	33.97	38.92	54	-15.08	Ave
Middle Channel 5200 MHz											
10400	48.08	0	100	V	38.418	4.09	33.87	56.718	74	-17.282	Peak
10400	49.17	0	100	H	38.418	4.09	33.87	57.808	74	-16.192	Peak
10400	32.48	0	100	V	38.418	4.09	33.87	41.118	54	-12.882	Ave
10400	33.51	0	100	H	38.418	4.09	33.87	42.148	54	-11.852	Ave
15600	48.82	0	100	V	37.914	4.93	34.34	57.324	74	-16.676	Peak
15600	48.26	0	100	H	37.914	4.93	34.34	56.764	74	-17.236	Peak
15600	33.3	0	100	V	37.914	4.93	34.34	41.804	54	-12.196	Ave
15600	33.36	0	100	H	37.914	4.93	34.34	41.864	54	-12.136	Ave
20800	47.79	0	100	V	34.6	5.79	33.97	54.21	74	-19.79	Peak
20800	48.3	0	100	H	34.6	5.79	33.97	54.72	74	-19.28	Peak
20800	33.21	0	100	V	34.6	5.79	33.97	39.63	54	-14.37	Ave
20800	33.4	0	100	H	34.6	5.79	33.97	39.82	54	-14.18	Ave
High Channel 5240 MHz											
10480	48.62	0	100	V	38.418	4.09	33.87	57.258	74	-16.742	Peak
10480	48.65	0	100	H	38.418	4.09	33.87	57.288	74	-16.712	Peak
10480	33.25	0	100	V	38.418	4.09	33.87	41.888	54	-12.112	Ave
10480	33.44	0	100	H	38.418	4.09	33.87	42.078	54	-11.922	Ave
15720	47.65	0	100	V	37.902	4.93	34.34	56.142	74	-17.858	Peak
15720	48.02	0	100	H	37.902	4.93	34.34	56.512	74	-17.488	Peak
15720	33.41	0	100	V	37.902	4.93	34.34	41.902	54	-12.098	Ave
15720	33.55	0	100	H	37.902	4.93	34.34	42.042	54	-11.958	Ave
20960	47.25	0	100	V	34.6	5.79	33.97	53.67	74	-20.33	Peak
20960	48.33	0	100	H	34.6	5.79	33.97	54.75	74	-19.25	Peak
20960	33.54	0	100	V	34.6	5.79	33.97	39.96	54	-14.04	Ave
20960	33.78	0	100	H	34.6	5.79	33.97	40.2	54	-13.8	Ave

802.11n-HT40 Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5190 MHz											
10380	48.16	0	100	V	38.343	4.09	33.87	56.723	74	-17.277	Peak
10380	49.02	0	100	H	38.343	4.09	33.87	57.583	74	-16.417	Peak
10380	32.94	0	100	V	38.343	4.09	33.87	41.503	54	-12.497	Ave
10380	33.73	0	100	H	38.343	4.09	33.87	42.293	54	-11.707	Ave
15570	49.03	0	100	V	37.928	4.93	34.34	57.548	74	-16.452	Peak
15570	48.24	0	100	H	37.928	4.93	34.34	56.758	74	-17.242	Peak
15570	33.42	0	100	V	37.928	4.93	34.34	41.938	54	-12.062	Ave
15570	33.75	0	100	H	37.928	4.93	34.34	42.268	54	-11.732	Ave
20760	47.66	0	100	V	34.6	5.79	33.97	54.08	74	-19.92	Peak
20760	48.7	0	100	H	34.6	5.79	33.97	55.12	74	-18.88	Peak
20760	33.16	0	100	V	34.6	5.79	33.97	39.58	54	-14.42	Ave
20760	33.3	0	100	H	34.6	5.79	33.97	39.72	54	-14.28	Ave
High Channel 5230 MHz											
10460	47.96	0	100	V	38.418	4.09	33.87	56.598	74	-17.402	Peak
10460	48.96	0	100	H	38.418	4.09	33.87	57.598	74	-16.402	Peak
10460	32.71	0	100	V	38.418	4.09	33.87	41.348	54	-12.652	Ave
10460	33.33	0	100	H	38.418	4.09	33.87	41.968	54	-12.032	Ave
15690	48.88	0	100	V	37.902	4.93	34.34	57.372	74	-16.628	Peak
15690	48.09	0	100	H	37.902	4.93	34.34	56.582	74	-17.418	Peak
15690	33.39	0	100	V	37.902	4.93	34.34	41.882	54	-12.118	Ave
15690	33.42	0	100	H	37.902	4.93	34.34	41.912	54	-12.088	Ave

Note: 802.11a/802.11n-HT20 is the same modulation, therefore only the worst case of the two was tested.

5250-5350 MHz Band:

802.11a Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5260 MHz											
10520	48.58	120	100	V	38.343	7	34.49	59.433	74	-14.567	Peak
10520	48	120	100	H	38.343	7	34.49	58.853	74	-15.147	Peak
10520	32.81	120	100	V	38.343	7	34.49	43.663	54	-10.337	Ave
10520	33.79	120	100	H	38.343	7	34.49	44.643	54	-9.357	Ave
15780	48.51	0	100	V	37.928	8.35	34.61	60.178	74	-13.822	Peak
15780	47.76	0	100	H	37.928	8.35	34.61	59.428	74	-14.572	Peak
15780	33.82	0	100	V	37.928	8.35	34.61	45.488	54	-8.512	Ave
15780	33.79	0	100	H	37.928	8.35	34.61	45.458	54	-8.542	Ave
21040	47.69	65	100	V	34.6	9.79	34	58.08	74	-15.92	Peak
21040	47.87	65	100	H	34.6	9.79	34	58.26	74	-15.74	Peak
21040	33.57	45	100	V	34.6	9.79	34	43.96	54	-10.04	Ave
21040	32.65	45	100	H	34.6	9.79	34	43.04	54	-10.96	Ave
Middle Channel 5280 MHz											
10560	48.23	120	100	V	38.418	7.07	34.49	59.228	74	-14.772	Peak
10560	49.7	120	100	H	38.418	7.07	34.49	60.698	74	-13.302	Peak
10560	33.04	120	100	V	38.418	7.07	34.49	44.038	54	-9.962	Ave
10560	33.72	120	100	H	38.418	7.07	34.49	44.718	54	-9.282	Ave
15840	49.45	0	100	V	37.914	8.38	34.61	61.134	74	-12.866	Peak
15840	48.8	0	100	H	37.914	8.38	34.61	60.484	74	-13.516	Peak
15840	33.65	0	100	V	37.914	8.38	34.61	45.334	54	-8.666	Ave
15840	33.47	0	100	H	37.914	8.38	34.61	45.154	54	-8.846	Ave
21120	48.37	65	100	V	34.6	9.8	34	58.77	74	-15.23	Peak
21120	48.94	65	100	H	34.6	9.8	34	59.34	74	-14.66	Peak
21120	33.5	45	100	V	34.6	9.8	34	43.9	54	-10.1	Ave
21120	33.61	45	100	H	34.6	9.8	34	44.01	54	-9.99	Ave
High Channel 5320 MHz											
10640	48.81	121	100	V	38.418	7.07	34.49	59.808	74	-14.192	Peak
10640	49.18	121	100	H	38.418	7.07	34.49	60.178	74	-13.822	Peak
10640	33.41	121	100	V	38.418	7.07	34.49	44.408	54	-9.592	Ave
10640	33.67	121	100	H	38.418	7.07	34.49	44.668	54	-9.332	Ave
15960	47.72	0	100	V	37.902	8.39	34.61	59.402	74	-14.598	Peak
15960	48.44	0	100	H	37.902	8.39	34.61	60.122	74	-13.878	Peak
15960	33.46	0	100	V	37.902	8.39	34.61	45.142	54	-8.858	Ave
15960	34.48	0	100	H	37.902	8.39	34.61	46.162	54	-7.838	Ave
21280	47.98	65	100	V	34.6	9.79	34	58.37	74	-15.63	Peak
21280	48.56	65	100	H	34.6	9.79	34	58.95	74	-15.05	Peak
21280	34.35	45	100	V	34.6	9.79	34	44.74	54	-9.26	Ave
21280	34.46	45	100	H	34.6	9.79	34	44.85	54	-9.15	Ave

802.11n-HT40 Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5270 MHz											
10540	47.55	0	100	V	38.343	7.05	34.49	58.453	74	-15.547	Peak
10540	48.74	0	100	H	38.343	7.05	34.49	59.643	74	-14.357	Peak
10540	32.65	0	100	V	38.343	7.05	34.49	43.553	54	-10.447	Ave
10540	33.62	0	100	H	38.343	7.05	34.49	44.523	54	-9.477	Ave
15810	48.4	0	100	V	37.928	8.35	34.61	60.068	74	-13.932	Peak
15810	47.8	0	100	H	37.928	8.35	34.61	59.468	74	-14.532	Peak
15810	33.21	0	100	V	37.928	8.35	34.61	44.878	54	-9.122	Ave
15810	32.87	0	100	H	37.928	8.35	34.61	44.538	54	-9.462	Ave
21080	47.35	0	100	V	34.6	9.84	34	57.79	74	-16.21	Peak
21080	48.19	0	100	H	34.6	9.84	34	58.63	74	-15.37	Peak
21080	32.49	0	100	V	34.6	9.84	34	42.93	54	-11.07	Ave
21080	32.55	0	100	H	34.6	9.84	34	42.99	54	-11.01	Ave
High Channel 5310 MHz											
10620	47.82	0	100	V	38.418	7.07	34.49	58.818	74	-15.182	Peak
10620	48.22	0	100	H	38.418	7.07	34.49	59.218	74	-14.782	Peak
10620	31.9	0	100	V	38.418	7.07	34.49	42.898	54	-11.102	Ave
10620	33.31	0	100	H	38.418	7.07	34.49	44.308	54	-9.692	Ave
15930	47.91	0	100	V	37.914	8.38	34.61	59.594	74	-14.406	Peak
15930	48.06	0	100	H	37.914	8.38	34.61	59.744	74	-14.256	Peak
15930	32.84	0	100	V	37.914	8.38	34.61	44.524	54	-9.476	Ave
15930	33.2	0	100	H	37.914	8.38	34.61	44.884	54	-9.116	Ave
21240	46.27	0	100	V	34.6	9.79	34	56.66	74	-17.34	Peak
21240	48.21	0	100	H	34.6	9.79	34	58.6	74	-15.4	Peak
21240	32.01	0	100	V	34.6	9.79	34	42.4	54	-11.6	Ave
21240	31.85	0	100	H	34.6	9.79	34	42.24	54	-11.76	Ave

Note: 802.11a/802.11n-HT20 is the same modulation, therefore only the worst case of the two was tested.

5470-5725 MHz Band:

802.11a Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5500 MHz											
11000	46.81	0	100	V	38.382	7.36	34.05	58.502	74	-15.498	Peak
11000	46.79	0	100	H	38.382	7.36	34.05	58.482	74	-15.518	Peak
11000	31.52	0	100	V	38.382	7.36	34.05	43.212	54	-10.788	Ave
11000	32.49	0	100	H	38.382	7.36	34.05	44.182	54	-9.818	Ave
16500	47.89	0	100	V	38.768	8.5	34.64	60.518	74	-13.482	Peak
16500	46.89	0	100	H	38.768	8.5	34.64	59.518	74	-14.482	Peak
16500	32.38	0	100	V	38.768	8.5	34.64	45.008	54	-8.992	Ave
16500	32.55	0	100	H	38.768	8.5	34.64	45.178	54	-8.822	Ave
22000	46.76	0	100	V	34.9	9.94	34.69	56.91	74	-17.09	Peak
22000	46.57	0	100	H	34.9	9.94	34.69	56.72	74	-17.28	Peak
22000	31.8	0	100	V	34.9	9.94	34.69	41.95	54	-12.05	Ave
22000	31.54	0	100	H	34.9	9.94	34.69	41.69	54	-12.31	Ave
Middle Channel 5580 MHz											
11160	47.2	0	100	V	38.511	7.52	34.05	59.181	74	-14.819	Peak
11160	48.55	0	100	H	38.511	7.52	34.05	60.531	74	-13.469	Peak
11160	32.23	0	100	V	38.511	7.52	34.05	44.211	54	-9.789	Ave
11160	33.19	0	100	H	38.511	7.52	34.05	45.171	54	-8.829	Ave
16740	48.62	0	100	V	39.94	8.63	34.64	62.55	74	-11.45	Peak
16740	48.24	0	100	H	39.94	8.63	34.64	62.17	74	-11.83	Peak
16740	32.33	0	100	V	39.94	8.63	34.64	46.26	54	-7.74	Ave
16740	32.51	0	100	H	39.94	8.63	34.64	46.44	54	-7.56	Ave
22320	46.83	0	100	V	34.9	9.92	34.69	56.96	74	-17.04	Peak
22320	48.21	0	100	H	34.9	9.92	34.69	58.34	74	-15.66	Peak
22320	33.04	0	100	V	34.9	9.92	34.69	43.17	54	-10.83	Ave
22320	33.37	0	100	H	34.9	9.92	34.69	43.5	54	-10.5	Ave
High Channel 5700 MHz											
11400	47.63	0	100	V	38.882	7.57	34.05	60.032	74	-13.968	Peak
11400	49.37	0	100	H	38.882	7.57	34.05	61.772	74	-12.228	Peak
11400	32.59	0	100	V	38.882	7.57	34.05	44.992	54	-9.008	Ave
11400	33.88	0	100	H	38.882	7.57	34.05	46.282	54	-7.718	Ave
17100	48.81	0	100	V	42.637	8.66	34.64	65.467	74	-8.533	Peak
17100	48.56	0	100	H	42.637	8.66	34.64	65.217	74	-8.783	Peak
17100	33.19	0	100	V	42.637	8.66	34.64	49.847	54	-4.153	Ave
17100	33.39	0	100	H	42.637	8.66	34.64	50.047	54	-3.953	Ave
22800	47.5	0	100	V	34.9	10.17	34.69	57.88	74	-16.12	Peak
22800	48.56	0	100	H	34.9	10.17	34.69	58.94	74	-15.06	Peak
22800	33.15	0	100	V	34.9	10.17	34.69	43.53	54	-10.47	Ave
22800	34.04	0	100	H	34.9	10.17	34.69	44.42	54	-9.58	Ave

802.11n-HT40 Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5510 MHz											
11100	48.13	0	100	V	38.511	7.39	34.05	59.981	74	-14.019	Peak
11100	49.71	0	100	H	38.511	7.39	34.05	61.561	74	-12.439	Peak
11100	32.89	0	100	V	38.511	7.39	34.05	44.741	54	-9.259	Ave
11100	33.96	0	100	H	38.511	7.39	34.05	45.811	54	-8.189	Ave
16650	49.69	0	100	V	39.256	8.55	34.64	62.856	74	-11.144	Peak
16650	48.94	0	100	H	39.256	8.55	34.64	62.106	74	-11.894	Peak
16650	34.35	0	100	V	39.256	8.55	34.64	47.516	54	-6.484	Ave
16650	34.02	0	100	H	39.256	8.55	34.64	47.186	54	-6.814	Ave
22200	47.8	0	100	V	35	9.91	34.69	58.02	74	-15.98	Peak
22200	49.44	0	100	H	35	9.91	34.69	59.66	74	-14.34	Peak
22200	33.73	0	100	V	35	9.91	34.69	43.95	54	-10.05	Ave
22200	33.23	0	100	H	35	9.91	34.69	43.45	54	-10.55	Ave
Low Channel 5550 MHz, measured at 3 meters											
11100	48.13	0	100	V	38.511	7.39	34.05	59.981	74	-14.019	Peak
11100	49.71	0	100	H	38.511	7.39	34.05	61.561	74	-12.439	Peak
11100	32.89	0	100	V	38.511	7.39	34.05	44.741	54	-9.259	Ave
11100	33.96	0	100	H	38.511	7.39	34.05	45.811	54	-8.189	Ave
16650	49.69	0	100	V	39.256	8.55	34.64	62.856	74	-11.144	Peak
16650	48.94	0	100	H	39.256	8.55	34.64	62.106	74	-11.894	Peak
16650	34.35	0	100	V	39.256	8.55	34.64	47.516	54	-6.484	Ave
16650	34.02	0	100	H	39.256	8.55	34.64	47.186	54	-6.814	Ave
22200	47.8	0	100	V	35	9.91	34.69	58.02	74	-15.98	Peak
22200	49.44	0	100	H	35	9.91	34.69	59.66	74	-14.34	Peak
22200	33.73	0	100	V	35	9.91	34.69	43.95	54	-10.05	Ave
22200	33.23	0	100	H	35	9.91	34.69	43.45	54	-10.55	Ave
High Channel 5670 MHz, measured at 3 meters											
11340	47.21	0	100	V	38.844	7.52	34.05	59.524	74	-14.476	Peak
11340	48.86	0	100	H	38.844	7.52	34.05	61.174	74	-12.826	Peak
11340	32.17	0	100	V	38.844	7.52	34.05	44.484	54	-9.516	Peak
11340	32.64	0	100	H	38.844	7.52	34.05	44.954	54	-9.046	Peak
17010	48.14	0	100	V	41.889	8.61	34.64	63.999	74	-10.001	Peak
17010	47.52	0	100	H	41.889	8.61	34.64	63.379	74	-10.621	Peak
17010	33.28	0	100	V	41.889	8.61	34.64	49.139	54	-4.861	Ave
17010	33.05	0	100	H	41.889	8.61	34.64	48.909	54	-5.091	Ave
22680	47.19	0	100	V	34.9	10.07	34.69	57.47	74	-16.53	Peak
22680	48.23	0	100	H	34.9	10.07	34.69	58.51	74	-15.49	Peak
22680	32.73	0	100	V	34.9	10.07	34.69	43.01	54	-10.99	Ave
22680	32.13	0	100	H	34.9	10.07	34.69	42.41	54	-11.59	Ave

Note: 802.11a/802.11n-HT20 is the same modulation, therefore only the worst case of the two was tested.

8 FCC §15.407(a) – 26 dB & 99% Emission Bandwidth

8.1 Applicable Standard

FCC §15.407(a).

8.2 Measurement Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section C: Emission bandwidth and section D: 99 Percent Occupied Bandwidth

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

8.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	46 %
ATM Pressure:	101.65 kPa

The testing was performed by Chen Ge on 2014-06-13 in the RF site.

8.5 Test Results

5150-5250 MHz Band

Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)
802.11a mode			
Low	5180	19.914	16.8632
Middle	5200	19.937	16.8691
High	5240	20.012	16.8860
802.11n-HT20 mode			
Low	5180	20.471	17.9109
Middle	5200	20.461	17.9548
High	5240	20.645	17.9469
802.11n-HT40 mode			
Low	5190	40.349	36.2571
High	5230	40.658	36.3428

5250-5350 MHz Band

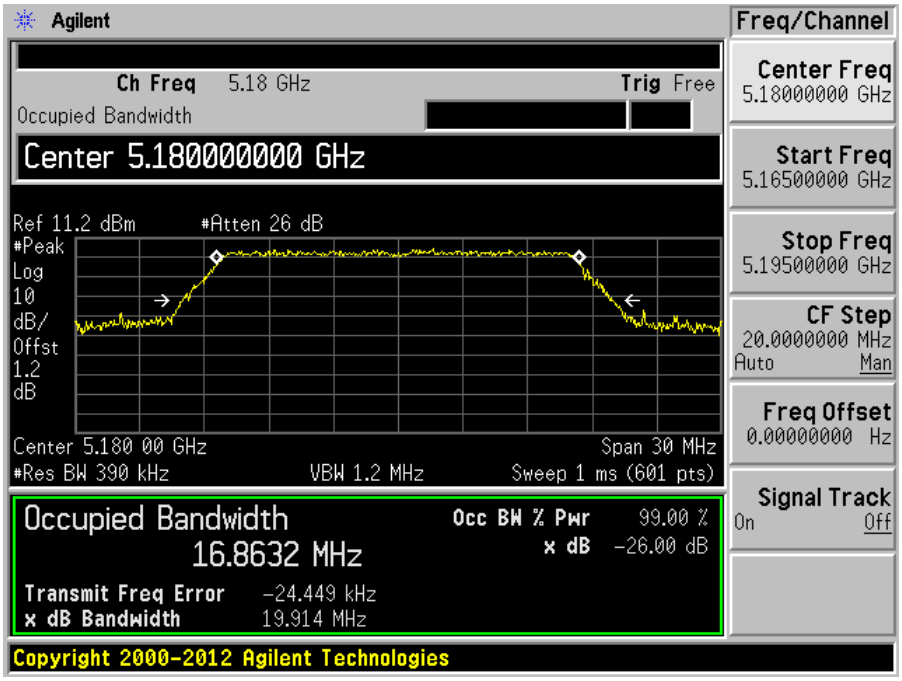
Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)
802.11a mode			
Low	5260	19.849	16.8791
Middle	5280	20.075	16.8329
High	5320	19.863	16.7709
802.11n-HT20 mode			
Low	5260	20.230	17.8655
Middle	5280	20.389	17.9112
High	5320	20.736	17.9608
802.11n-HT40 mode			
Low	5270	40.458	36.3254
High	5310	40.709	36.2645

5470-5725 MHz Band

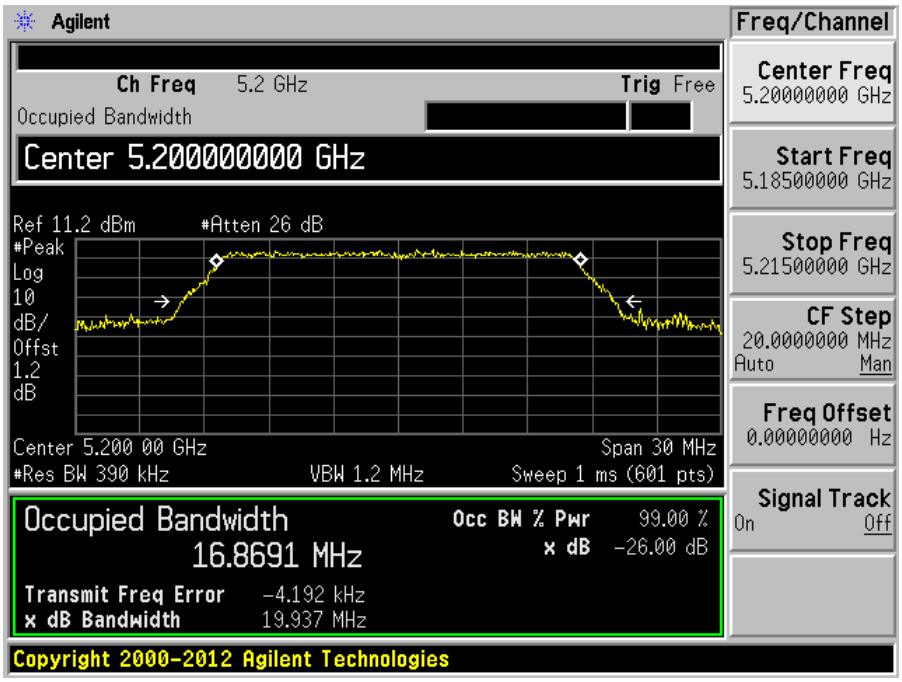
Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)
802.11a mode			
Low	5500	20.028	16.8540
Middle	5580	19.707	16.8736
High	5700	19.963	16.8924
802.11n-HT20 mode			
Low	5500	20.536	17.9997
Middle	5580	20.386	17.9260
High	5700	20.538	17.8818
802.11n-HT40 mode			
Low	5510	40.565	36.2861
Mid	5550	40.865	36.3214
High	5670	40.736	36.2996

5150-5250 MHz Band

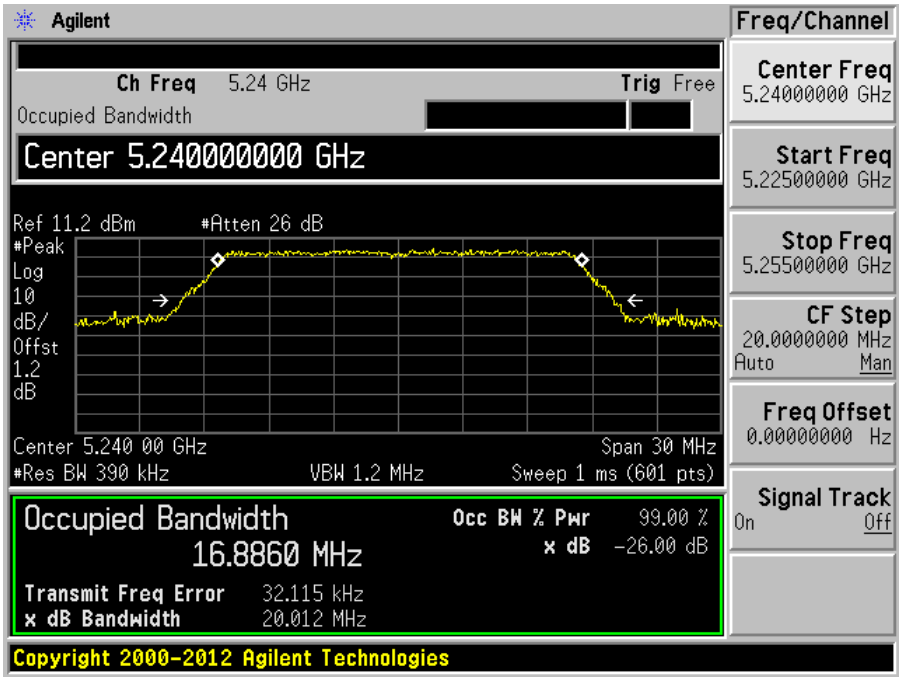
802.11a mode, 5180 MHz



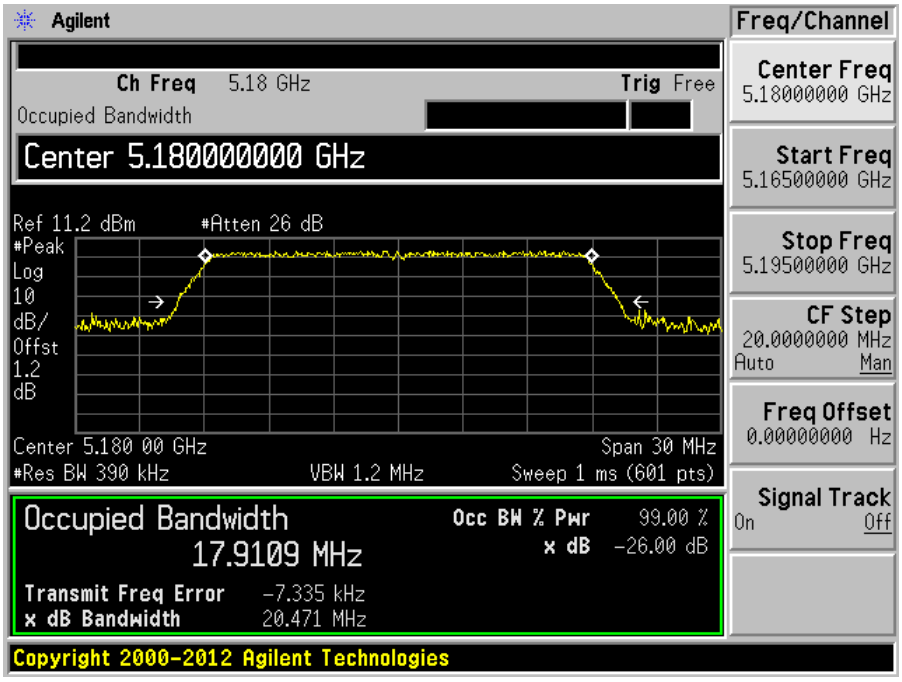
802.11a mode, 5200 MHz



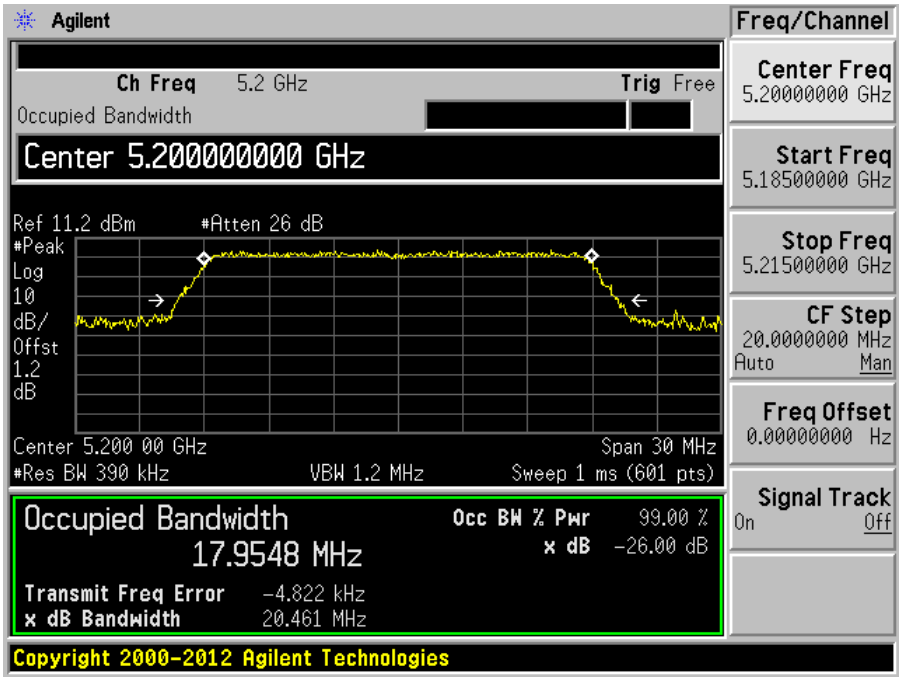
802.11a mode, 5240 MHz



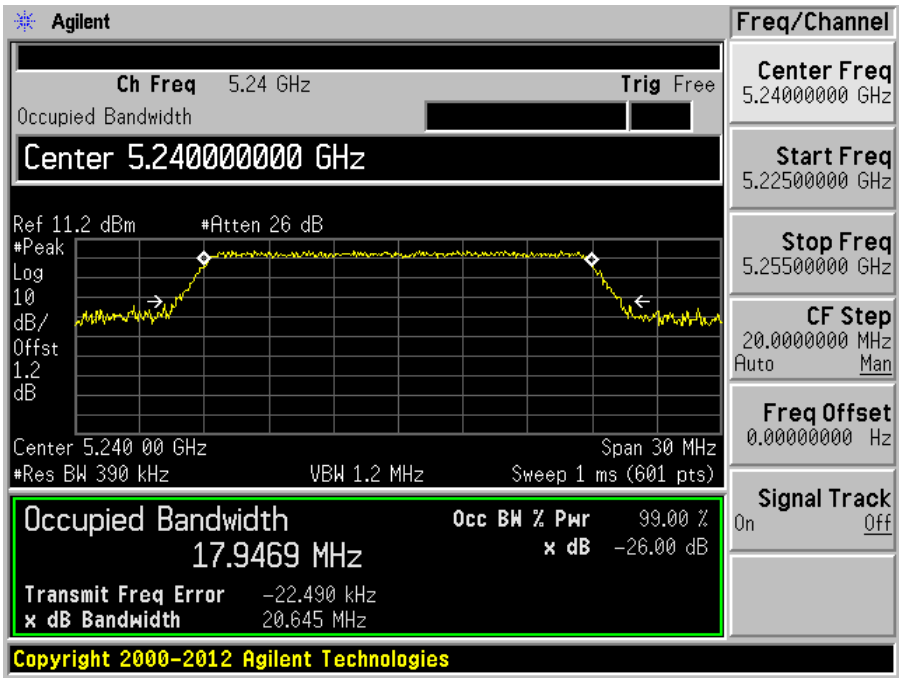
802.11n-HT20 mode, 5180 MHz



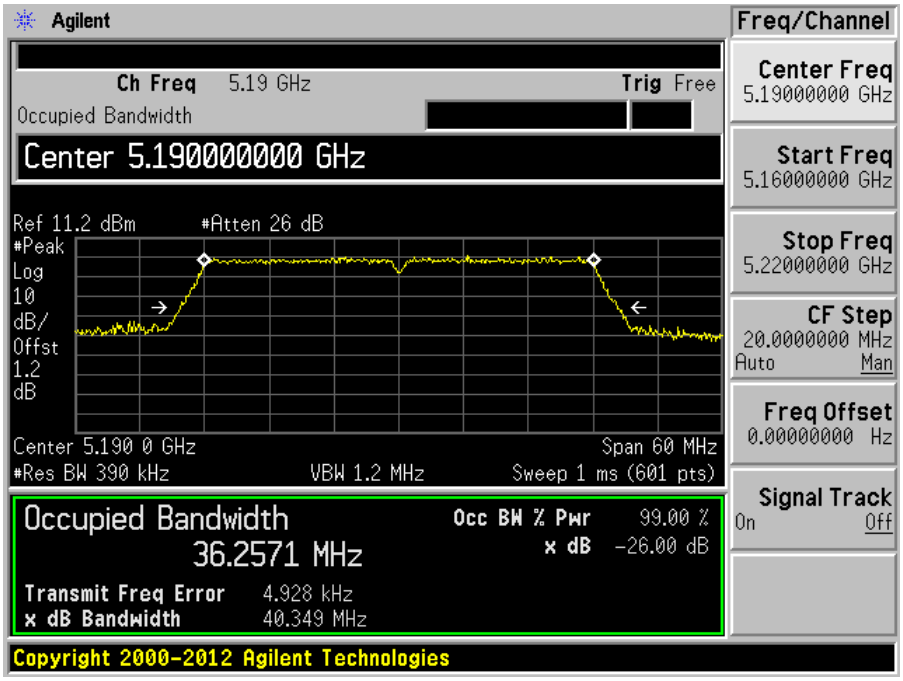
802.11n-HT20 mode, 5200 MHz



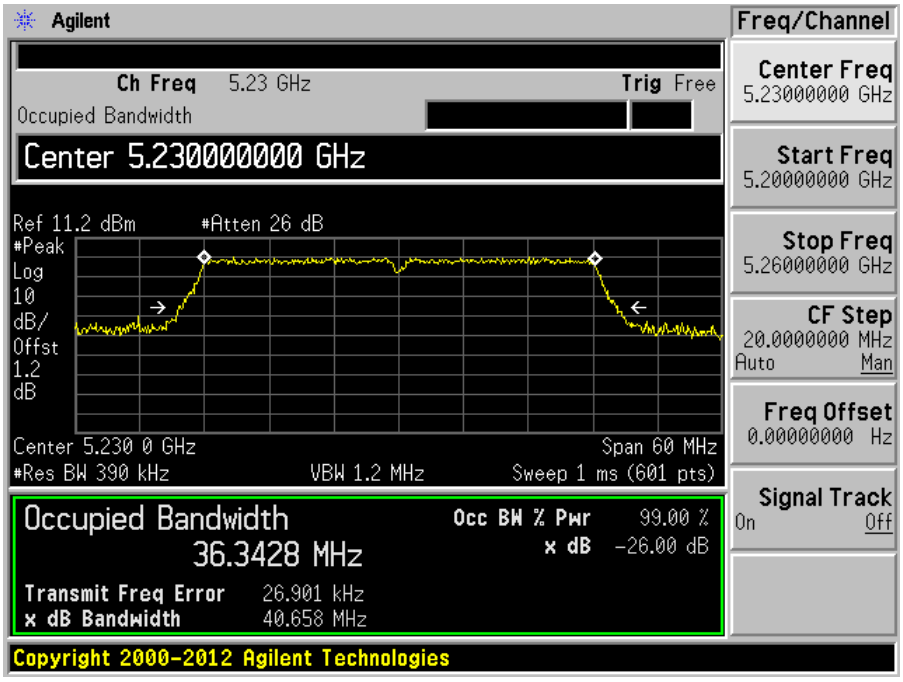
802.11n-HT20 mode, 5240 MHz



802.11n-HT40 mode, 5190 MHz

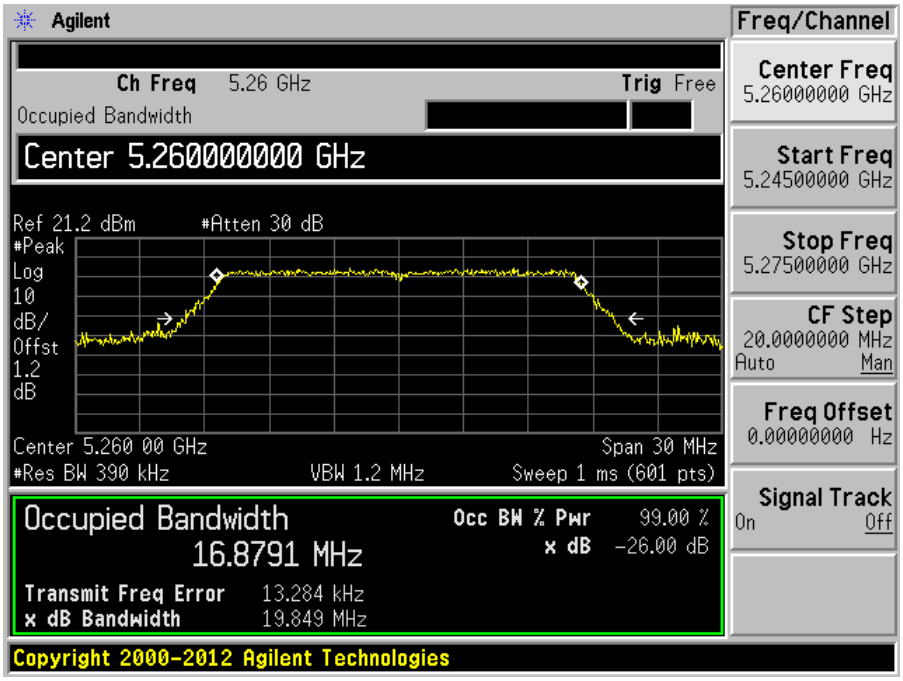


802.11n-HT40 mode, 5230 MHz

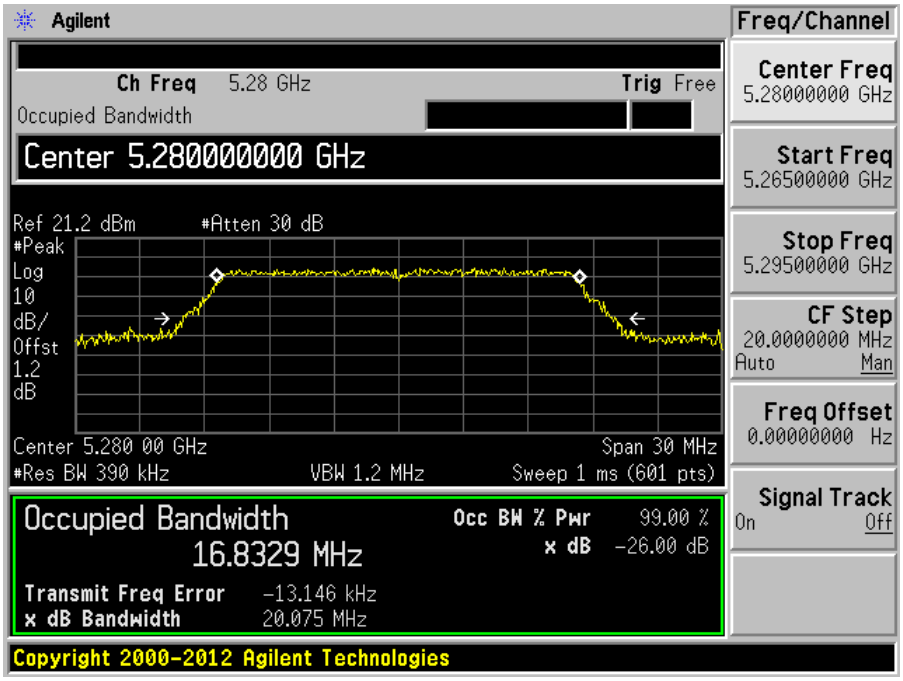


5250-5350 MHz Band

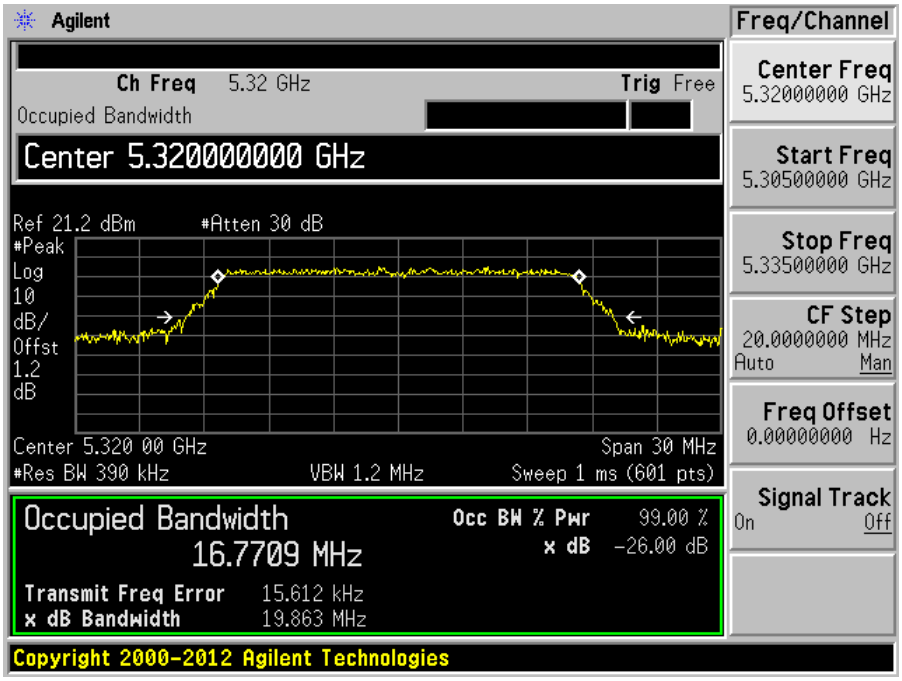
802.11a mode, 5260 MHz



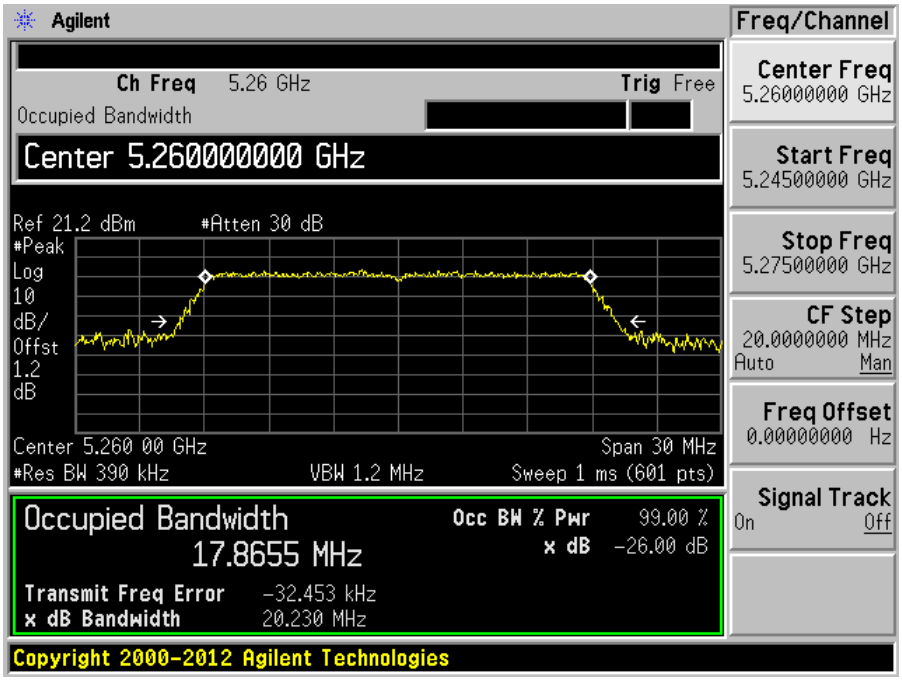
802.11a mode, 5280 MHz



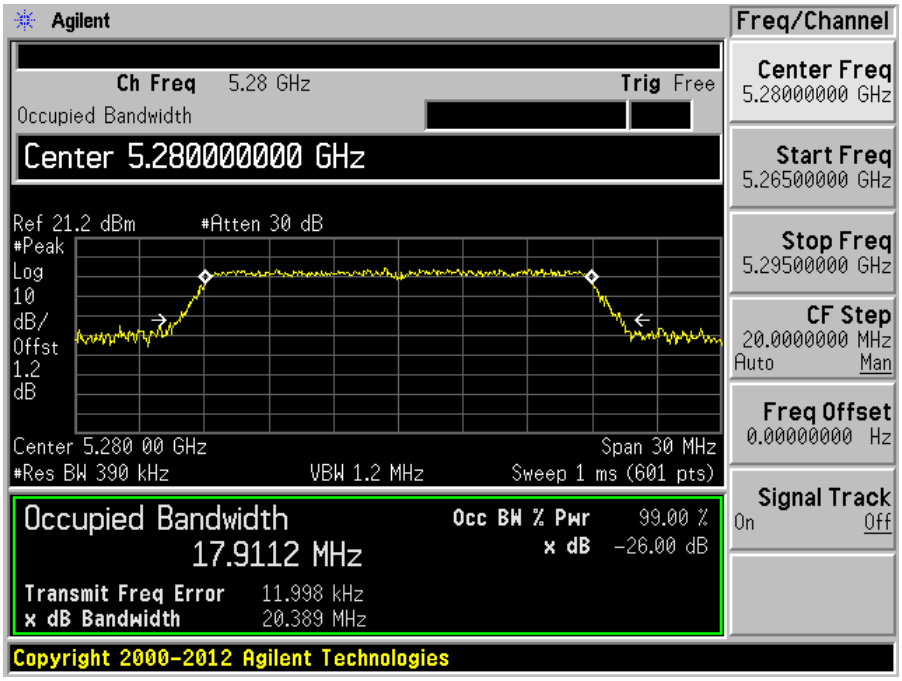
802.11a mode, 5320 MHz



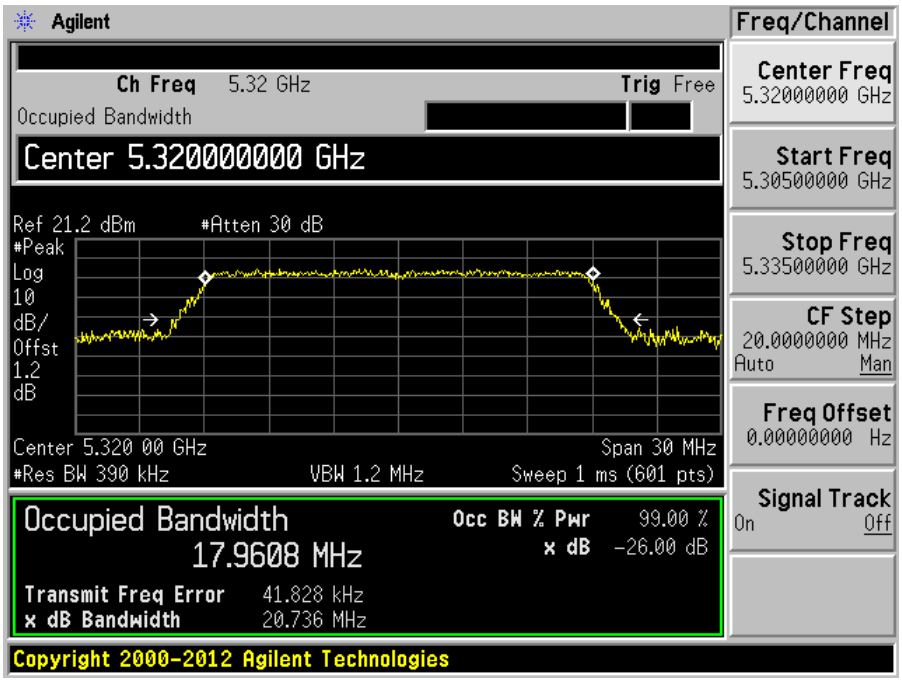
802.11n-HT20 mode, 5260 MHz



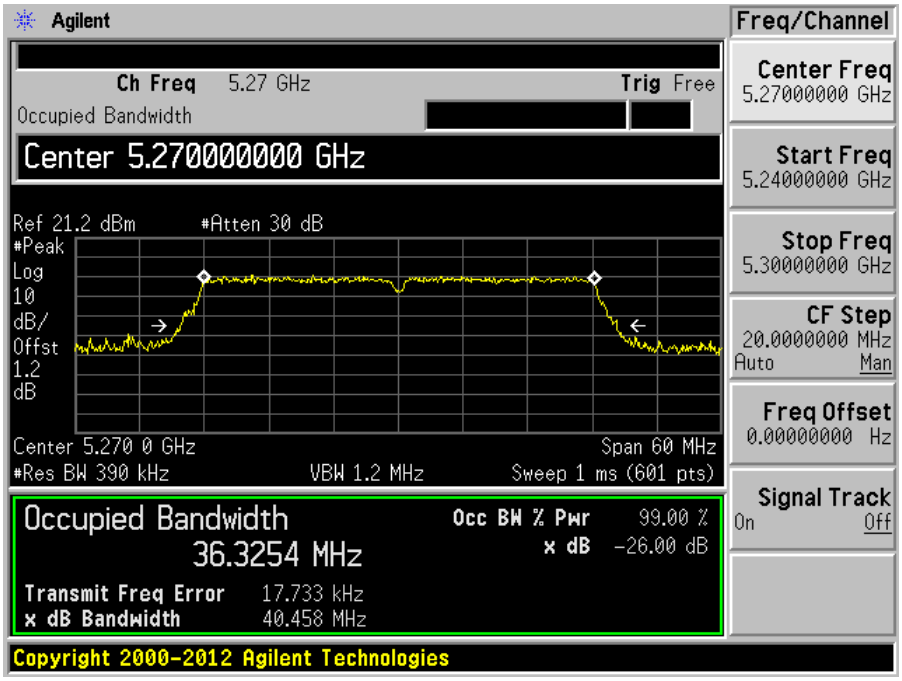
802.11n-HT20 mode, 5280 MHz



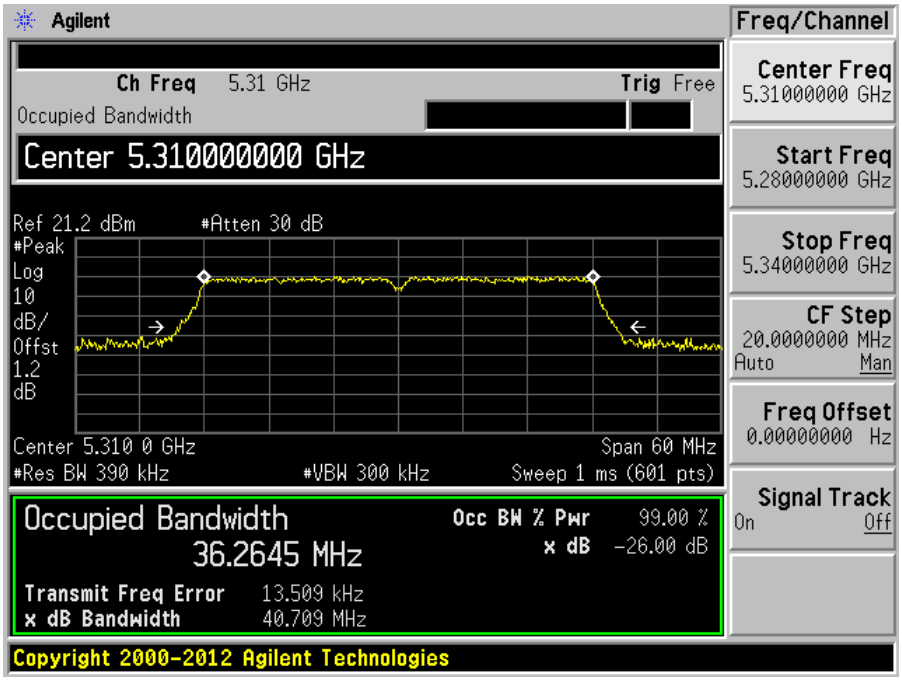
802.11n-HT20 mode, 5320 MHz



802.11n-HT40 mode, 5270 MHz

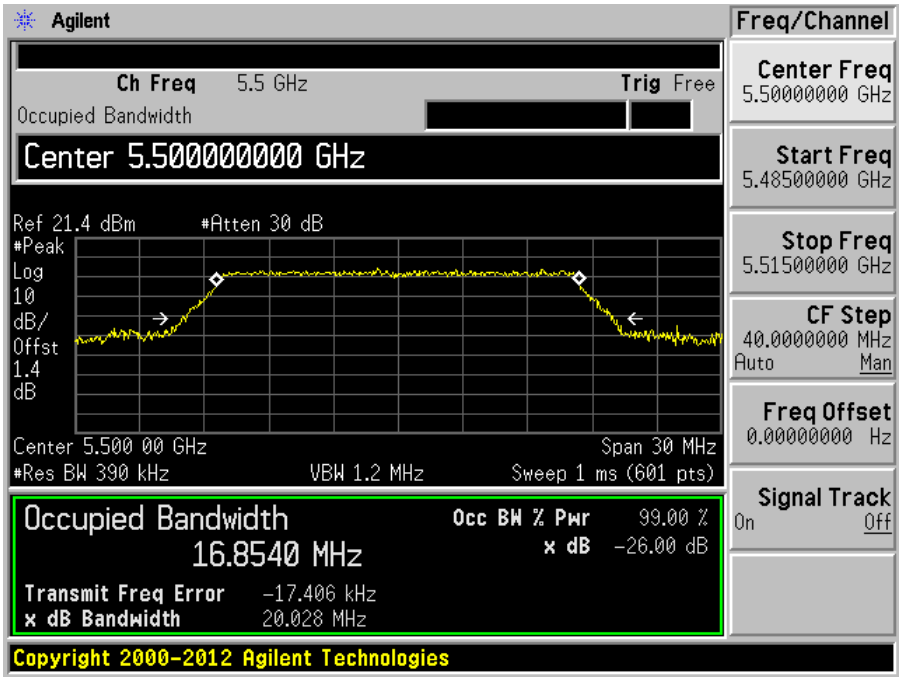


802.11n-HT40 mode, 5310 MHz

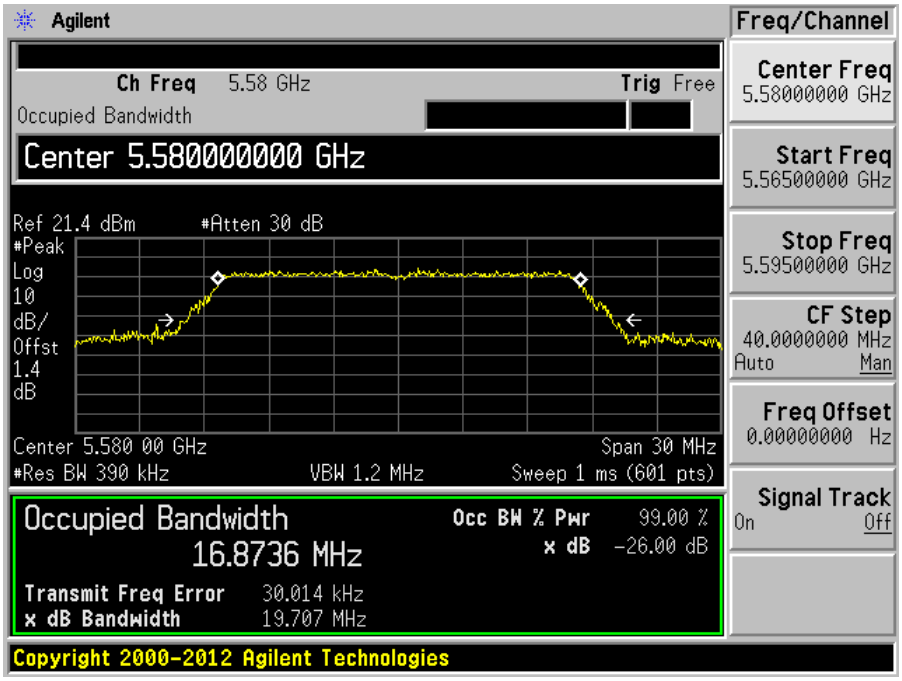


5470-5725 MHz Band

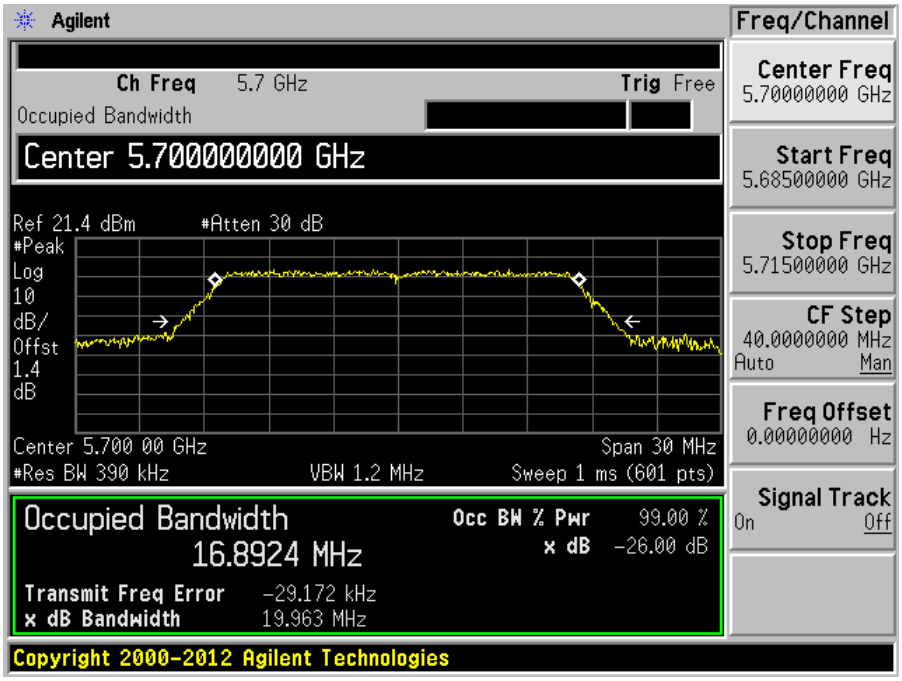
802.11a mode, 5500 MHz



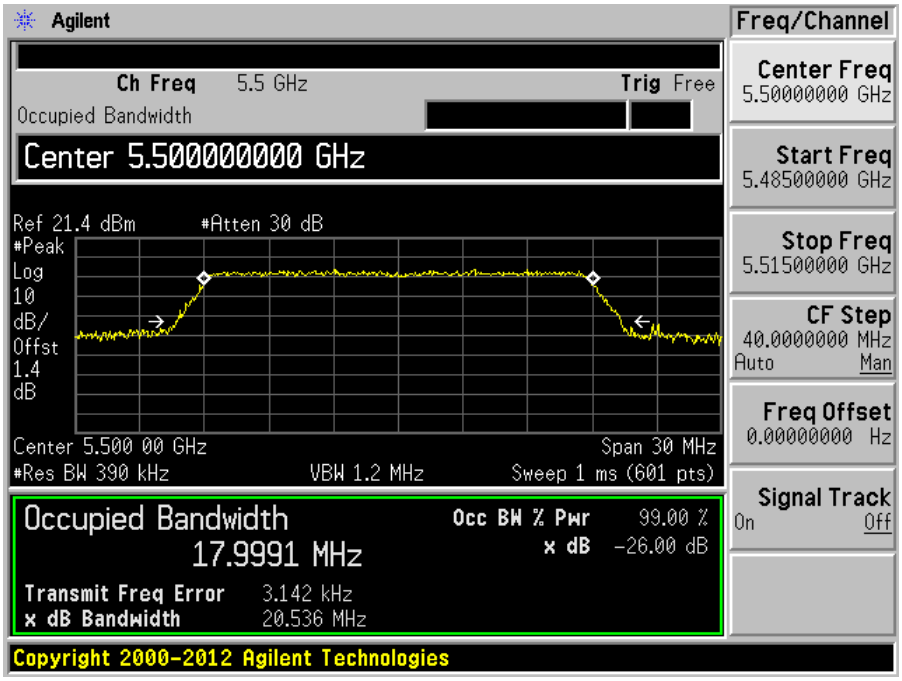
802.11a mode, 5580 MHz



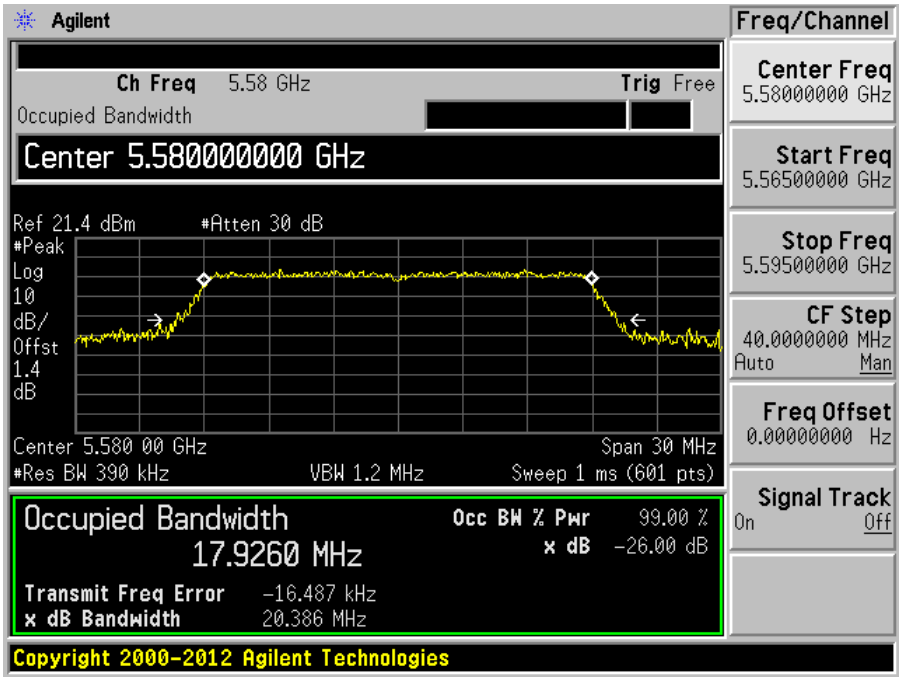
802.11a mode, 5700 MHz



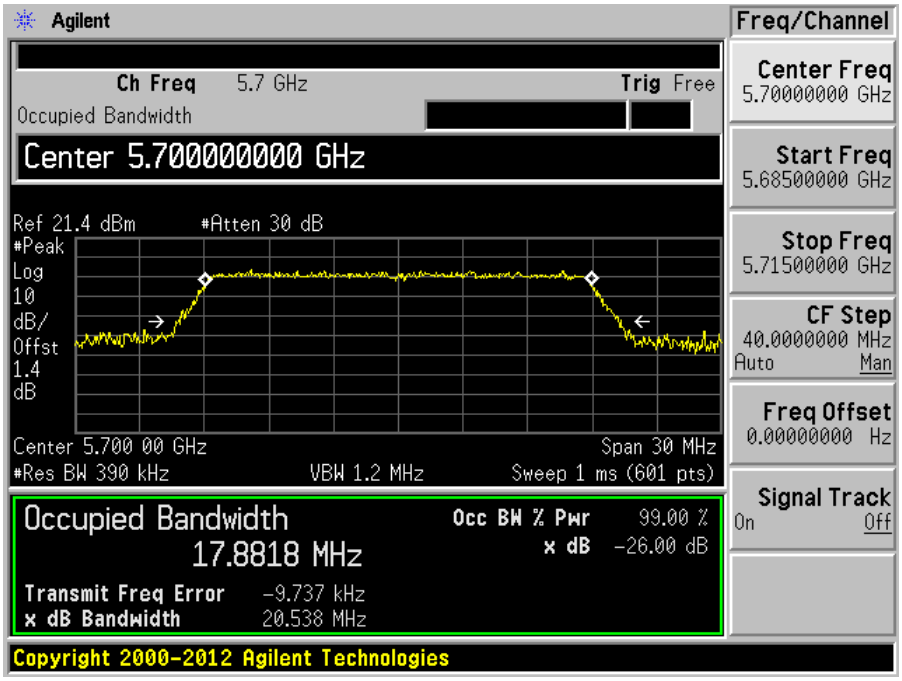
802.11n-HT20 mode, 5500 MHz



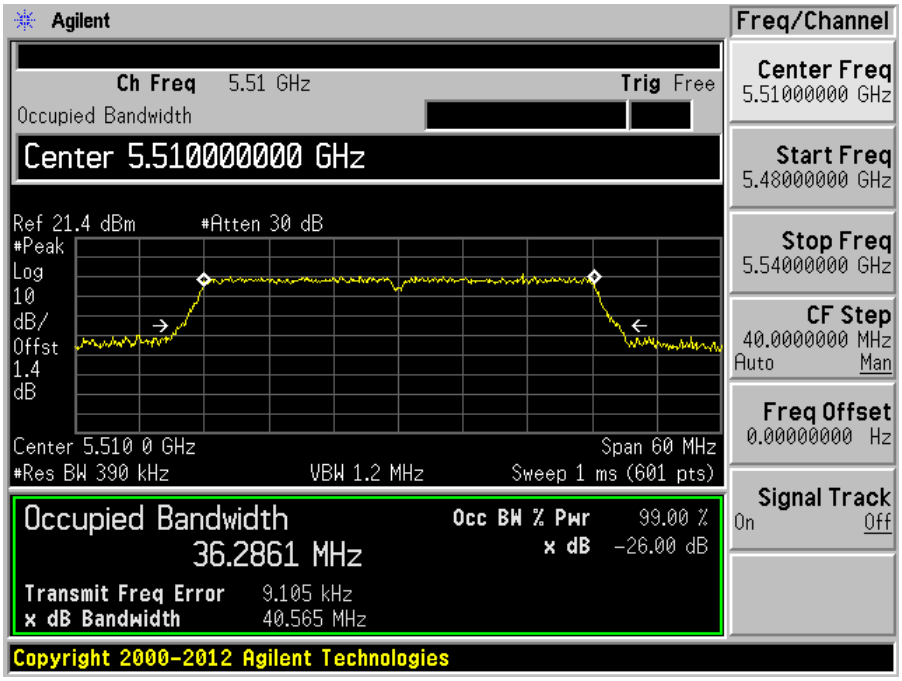
802.11n-HT20 mode, 5580 MHz



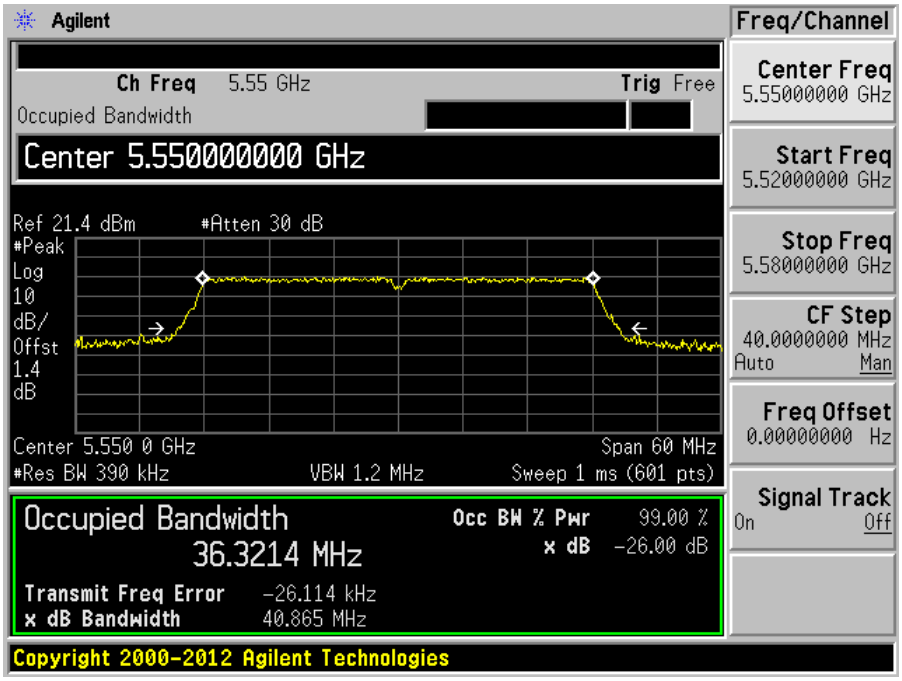
802.11n-HT20 mode, 5700 MHz



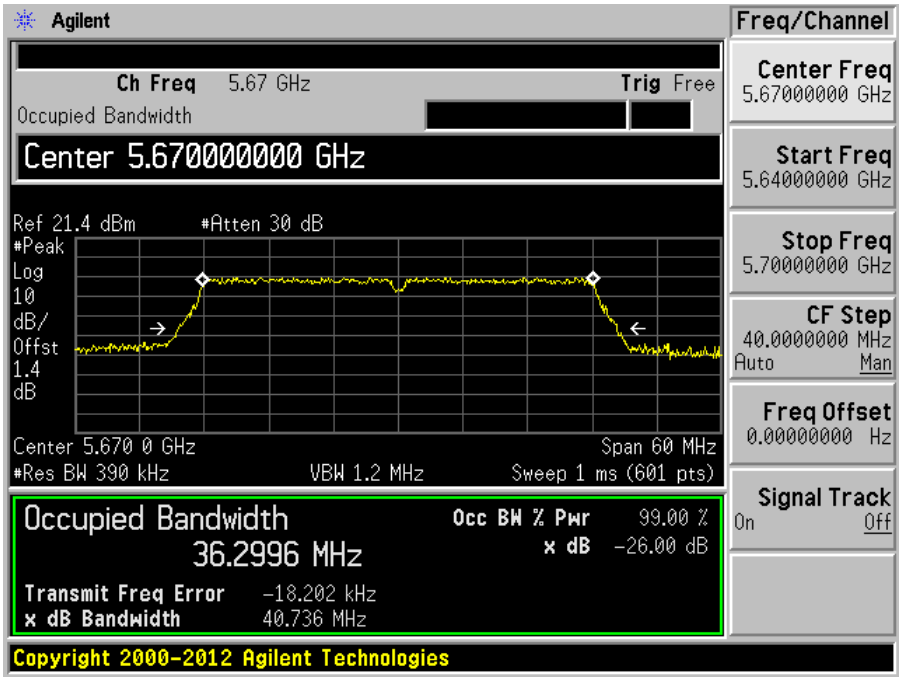
802.11n-HT40 mode, 5510 MHz



802.11n-HT40 mode, 5550 MHz



802.11n-HT40 mode, 5670 MHz



9 FCC §407(a) - Output Power Measurement

9.1 Applicable Standard

According to FCC §15.407(a)

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 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, 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, both the maximum 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.

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

9.2 Measurement Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section E: Maximum conducted output power

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Chen Ge on 2014-06-13 in the RF site.

9.5 Test Results

5150-5250 MHz Band

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
802.11a mode				
Low	5180	12.91	15	Pass
Middle	5200	13.3	15	Pass
High	5240	13.36	15	Pass
802.11n-HT20 mode				
Low	5180	13.16	15	Pass
Middle	5200	13.2	15	Pass
High	5240	13.3	15	Pass
802.11n-HT40 mode				
Low	5190	12.4	15	Pass
High	5230	12.54	15	Pass

5250-5350 MHz Band

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
802.11a mode				
Low	5260	13.61	22	Pass
Middle	5280	14.22	22	Pass
High	5320	14.48	22	Pass
802.11n-HT20 mode				
Low	5260	13.2	22	Pass
Middle	5280	14.41	22	Pass
High	5320	14.57	22	Pass
802.11n-HT40 mode				
Low	5270	13.09	22	Pass
High	5310	13.96	22	Pass

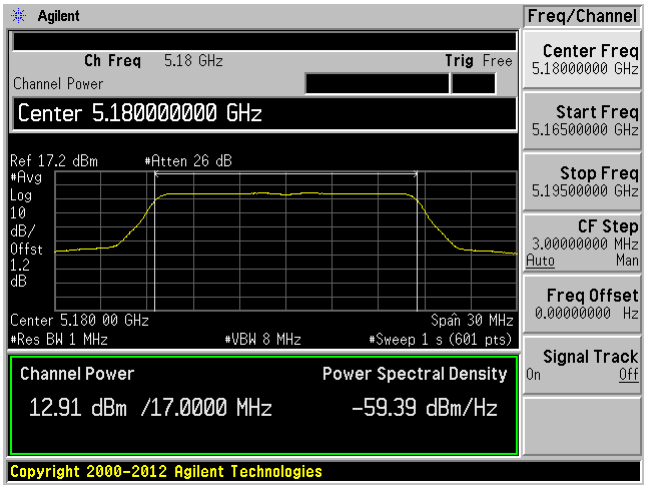
5470-5725 MHz Band

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
802.11a mode				
Low	5500	12.31	22	Pass
Middle	5580	12.91	22	Pass
High	5700	12.97	22	Pass
802.11n-HT20 mode				
Low	5500	13.04	22	Pass
Middle	5580	12.71	22	Pass
High	5700	13.1	22	Pass
802.11n-HT40 mode				
Low	5510	12.98	22	Pass
Mid	5550	12.74	22	
High	5670	12.74	22	Pass

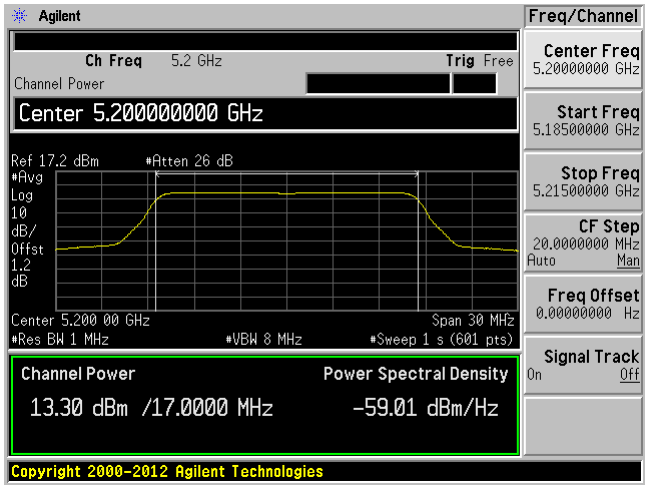
Note: the 8 dBi antenna was use to evaluate the maximum output power, for FCC, since the antenna gain is more than 6dBi, the power and PSD limit reduce by 8-6=2dB.

5150-5250 MHz Band

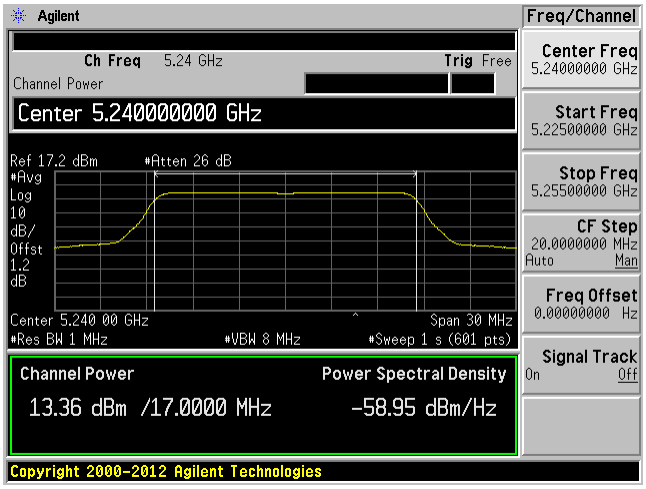
802.11a mode Low Channel



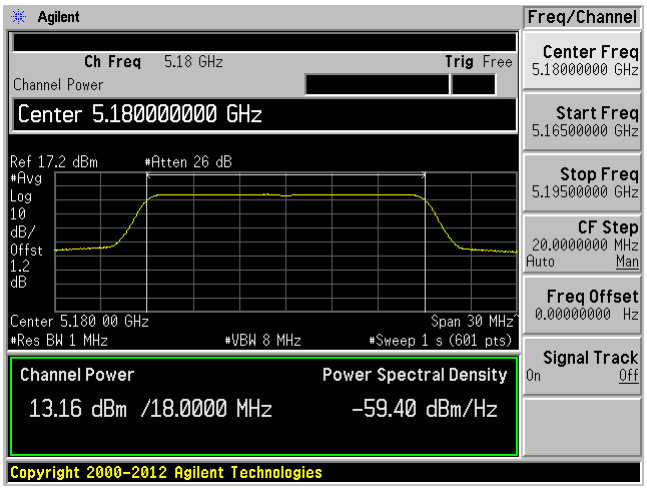
802.11a mode Middle Channel



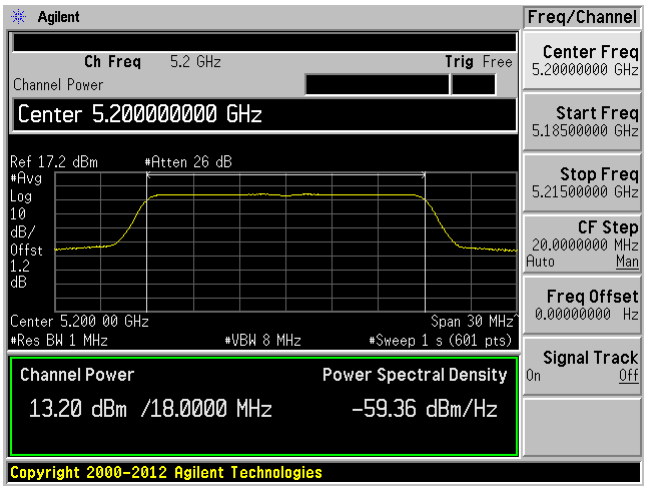
802.11a mode High Channel



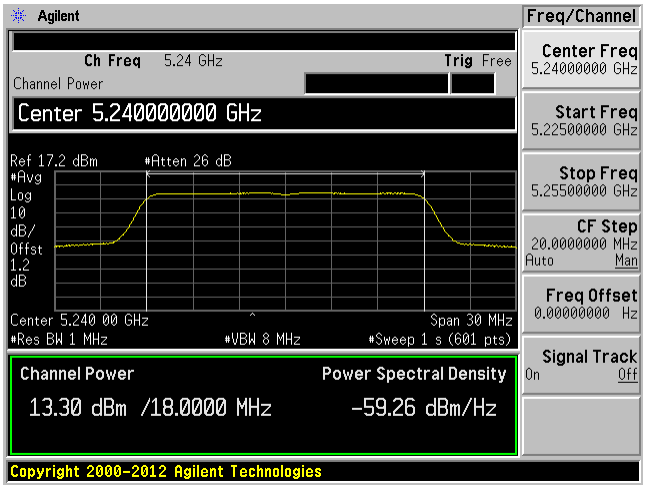
802.11n HT20 mode Low Channel



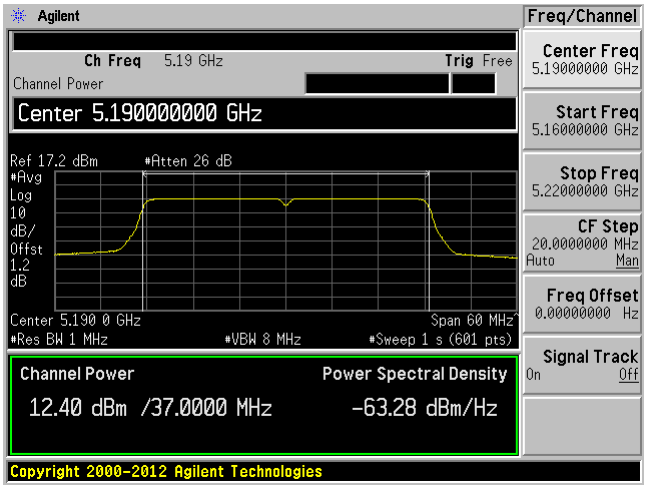
802.11n HT20 mode Middle Channel



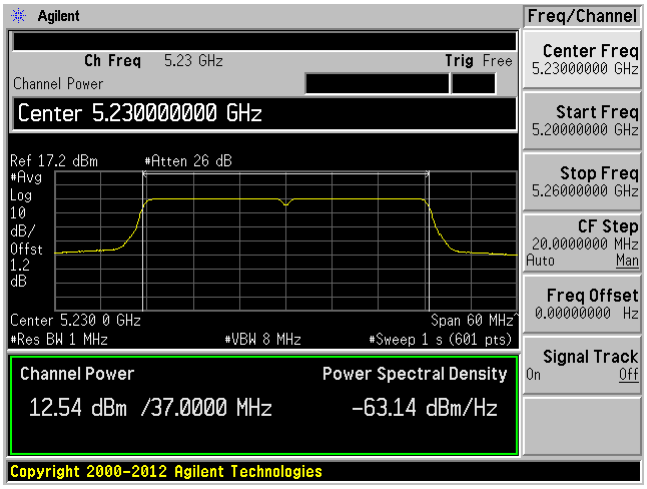
802.11n HT20 mode High Channel



802.11n HT40 mode Low Channel

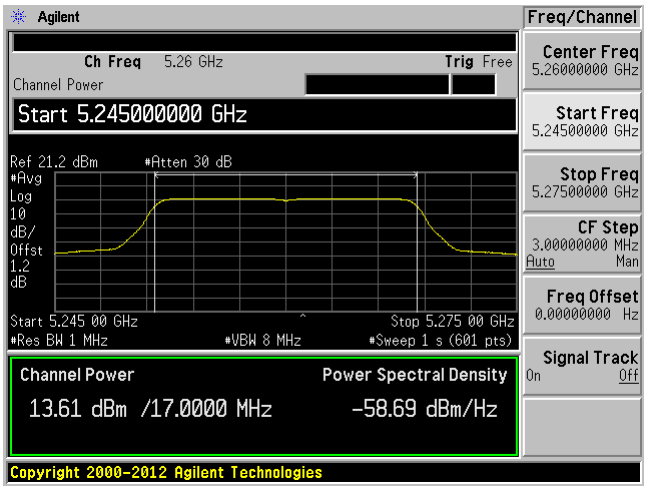


802.11n HT40 mode High Channel

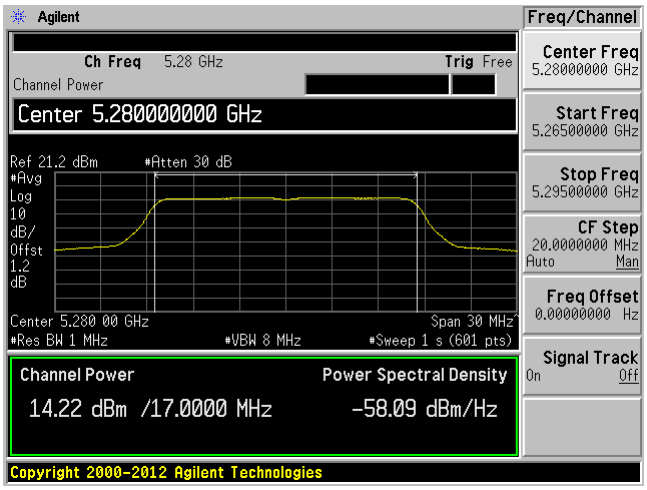


5250-5350 MHz Band

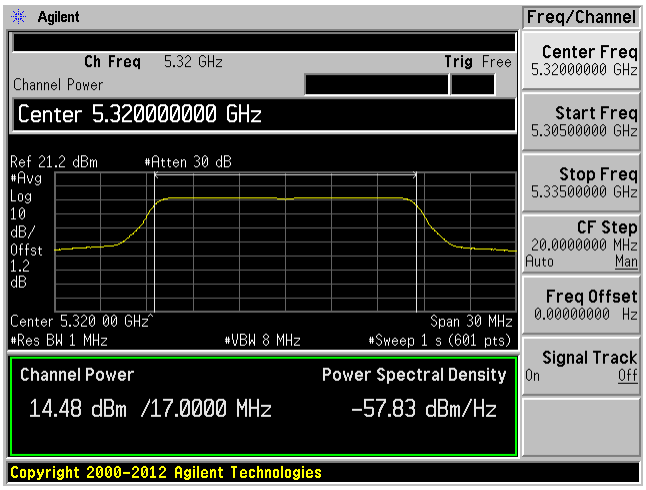
802.11a mode Low Channel



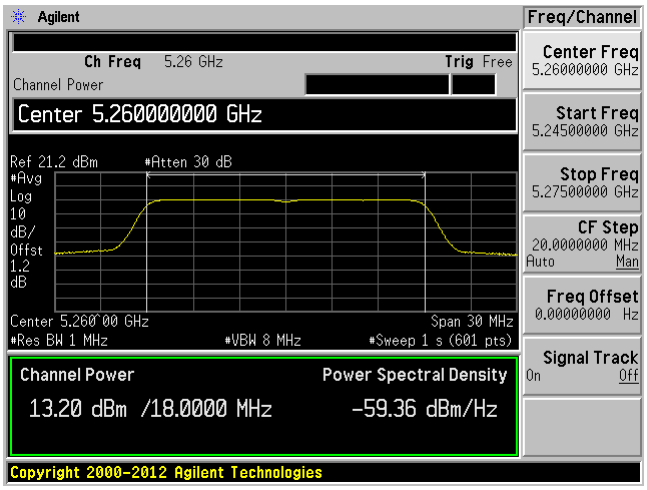
802.11a mode Middle Channel



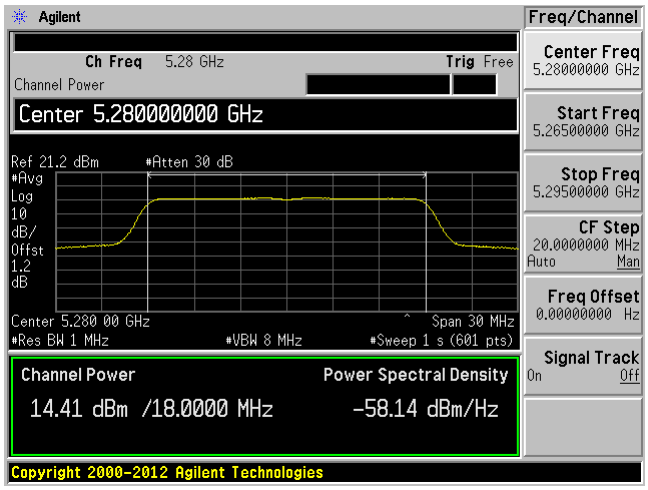
802.11a mode High Channel



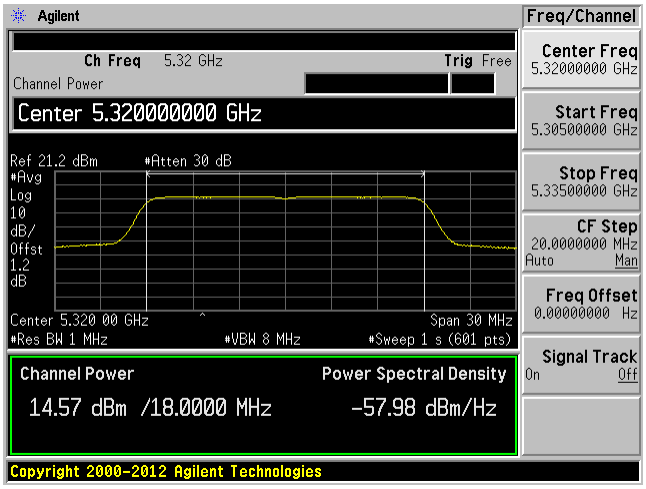
802.11n HT20 mode Low Channel



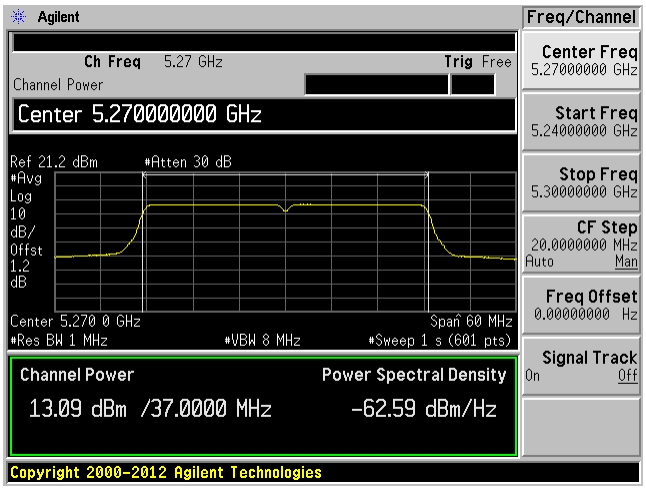
802.11n HT20 mode Middle Channel



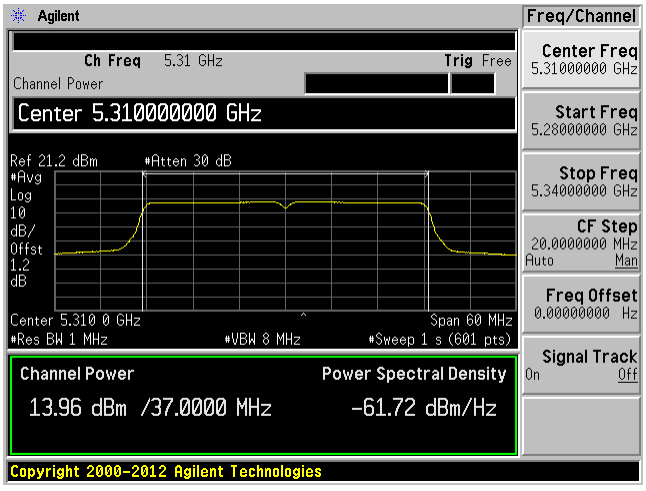
02.11n HT20 mode High Channel



802.11n HT40 mode Low Channel

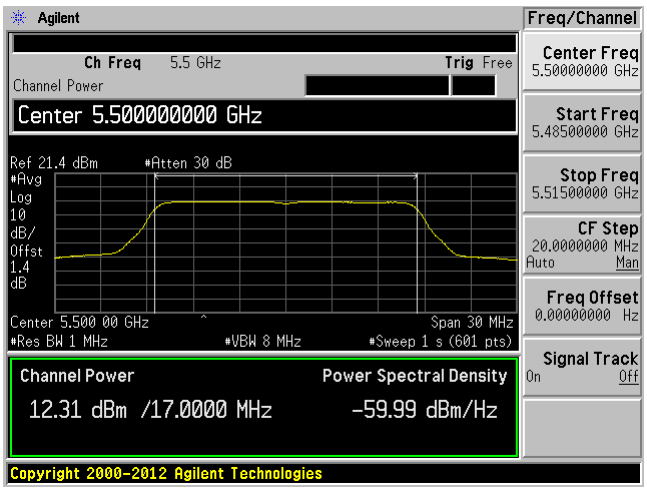


802.11n HT40 mode High Channel

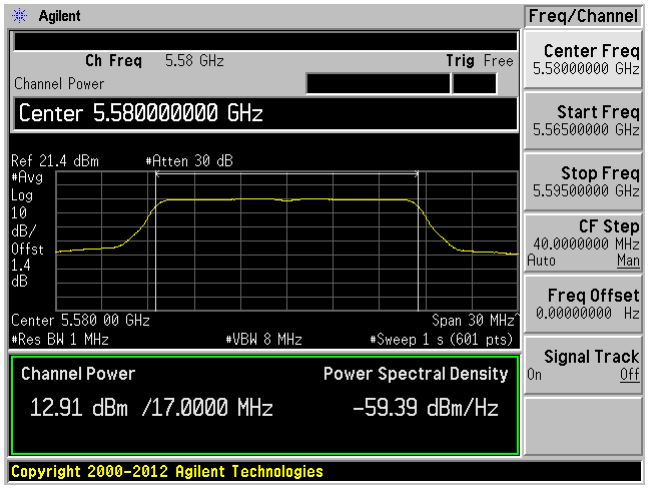


5470-5725 MHz Band

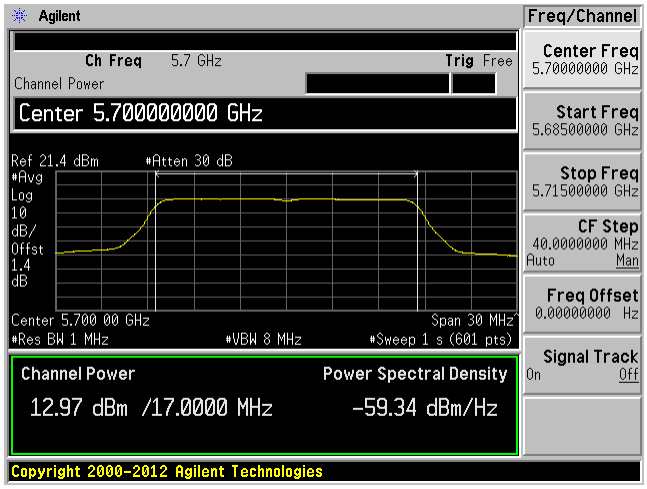
802.11a mode Low Channel



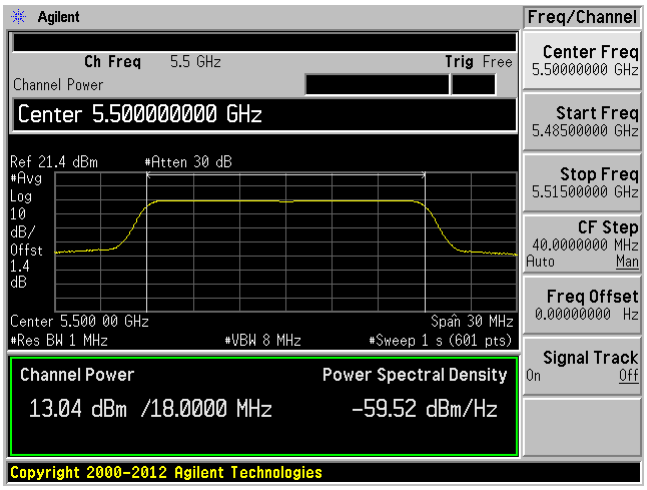
802.11a mode Middle Channel



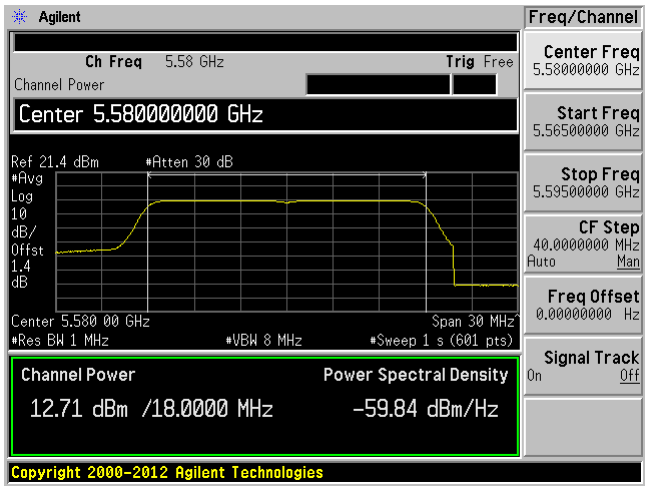
802.11a mode High Channel



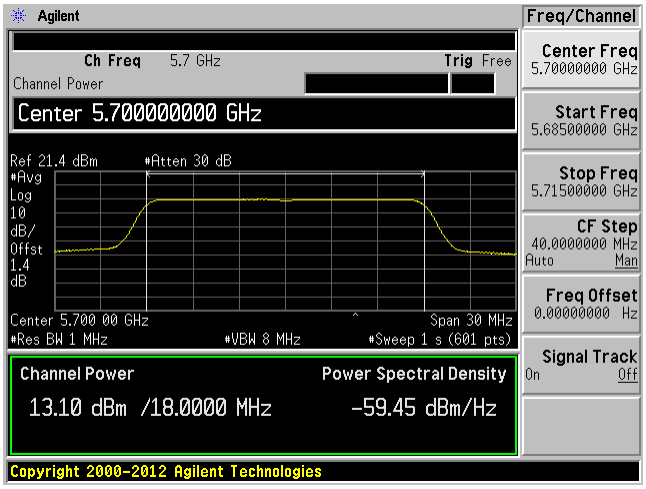
802.11n HT20 mode Low Channel



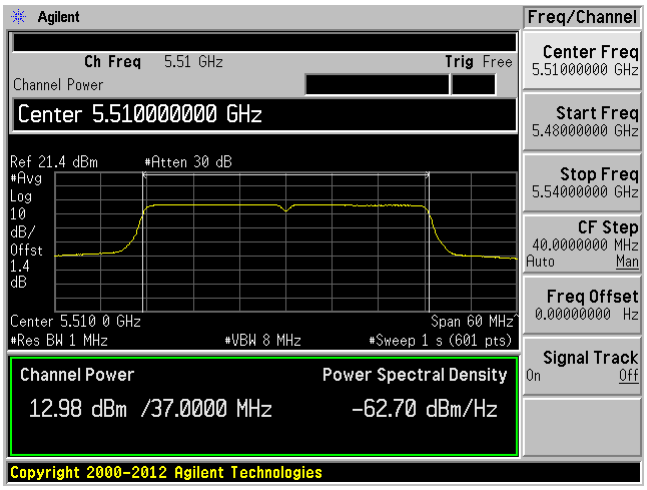
802.11n HT20 mode Middle Channel



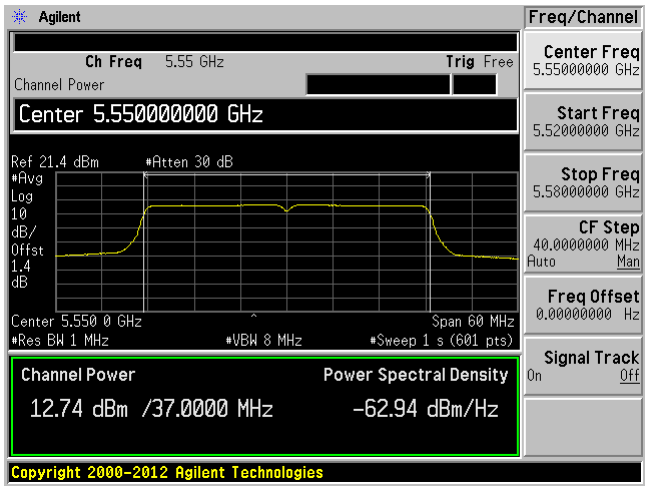
802.11n HT20 mode High Channel



802.11n HT40 mode Low Channel



802.11n HT40 mode High Channel



10 FCC §15.407(b) - Out of Band Emissions

10.1 Applicable Standard

According to FCC §15.407(b)

For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band. For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz

10.2 Measurement Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section H: Unwanted emissions measurement

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

10.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	45 %
ATM Pressure:	101.65 kPa

The testing was performed by Chen Ge on 2014-06-13 in the RF site.

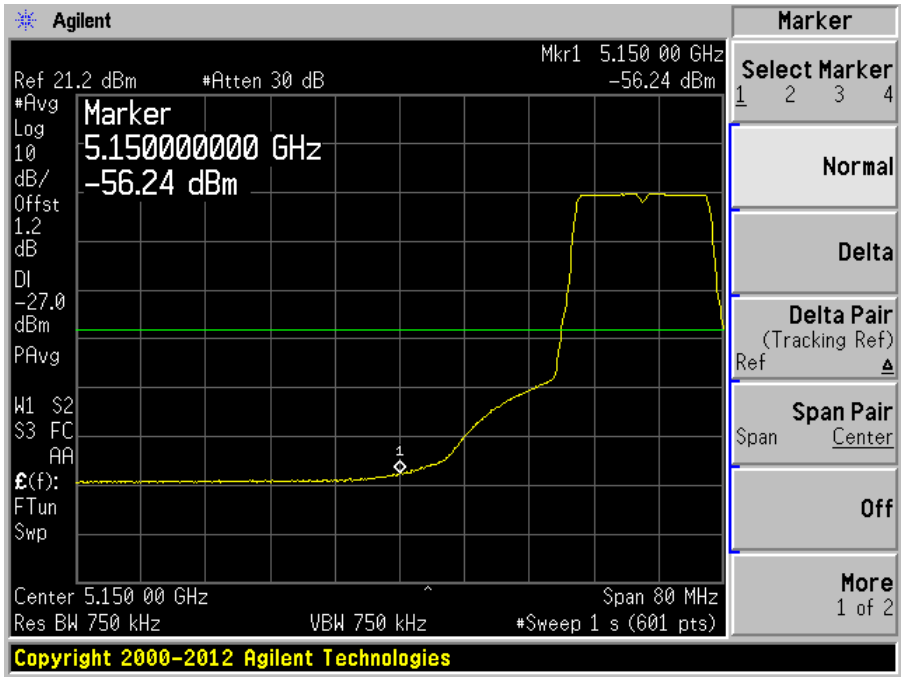
10.5 Test Results

Please refer to following pages for plots of band edge.

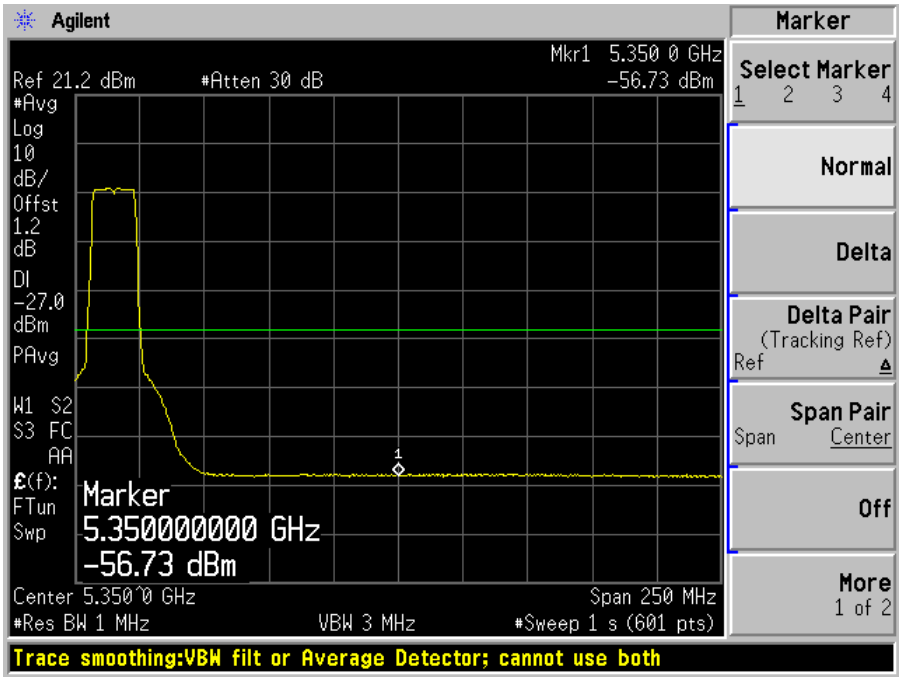
Note 2: We have at least 8dB margin for all the band edge testing result for the antenna gain.

5150-5250 MHz Band

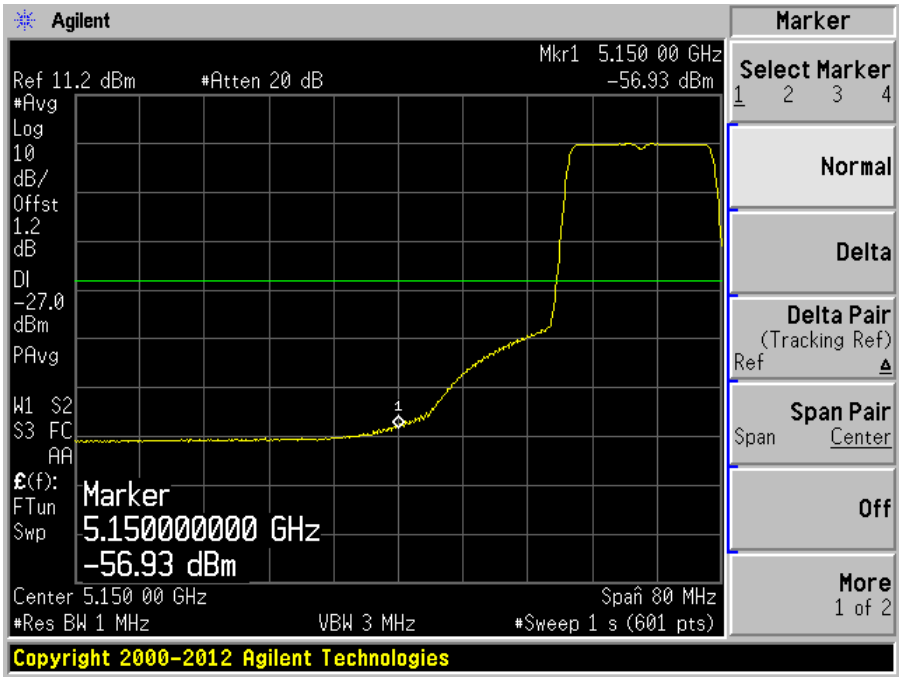
802.11a mode, Low Channel



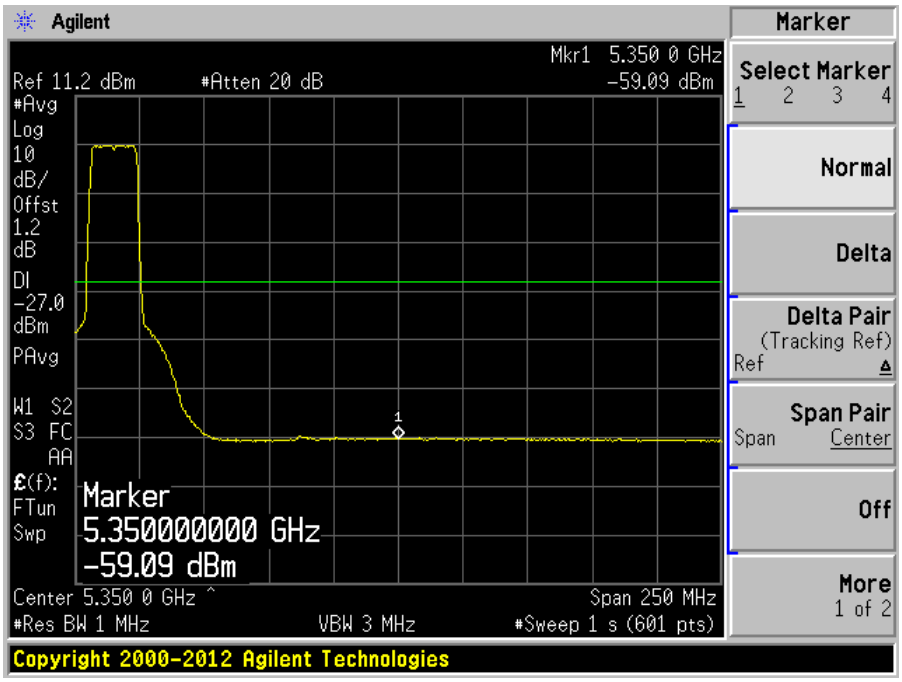
802.11a mode, High Channel



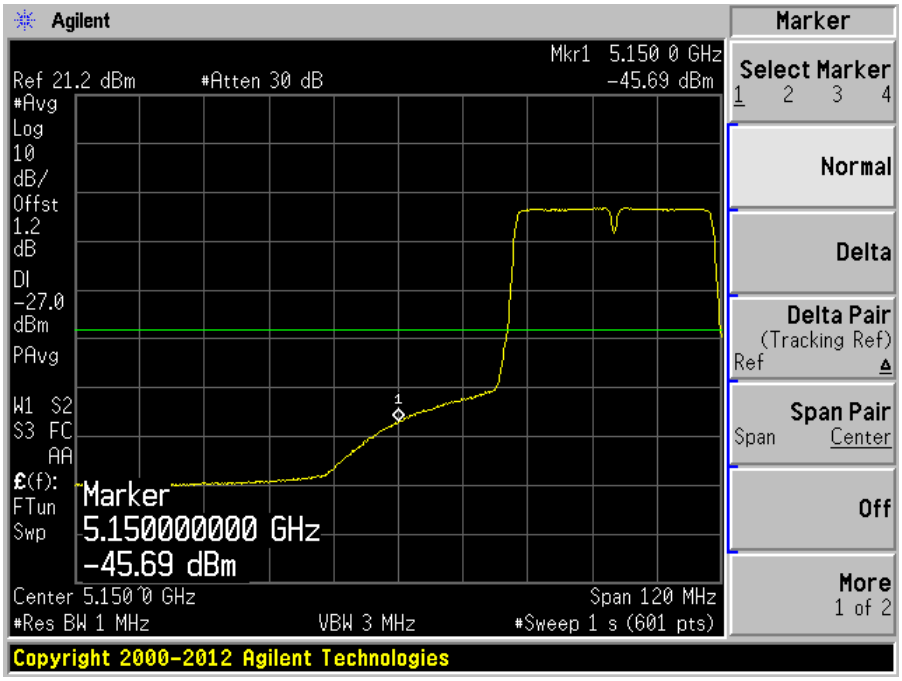
802.11n-HT20 mode, Low Channel



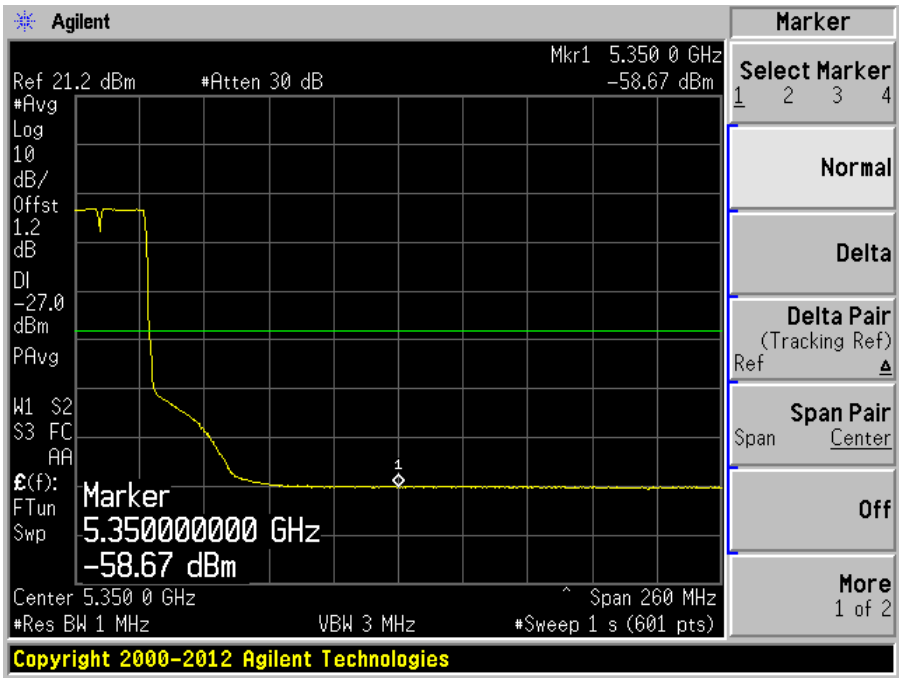
802.11n-HT20 mode, High Channel



802.11n-HT40 mode, Low Channel

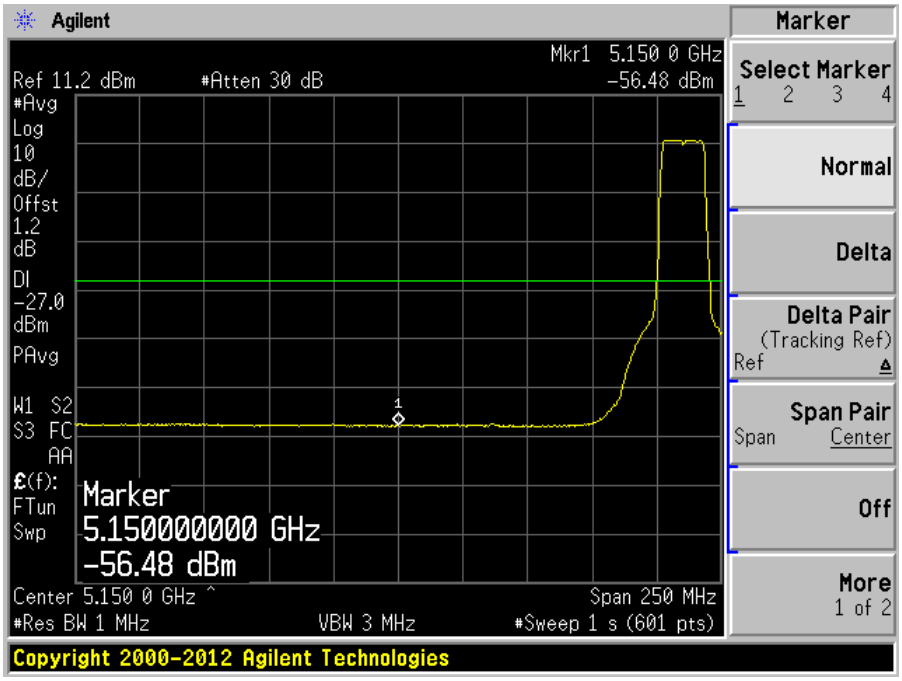


802.11n-HT40 mode, High Channel

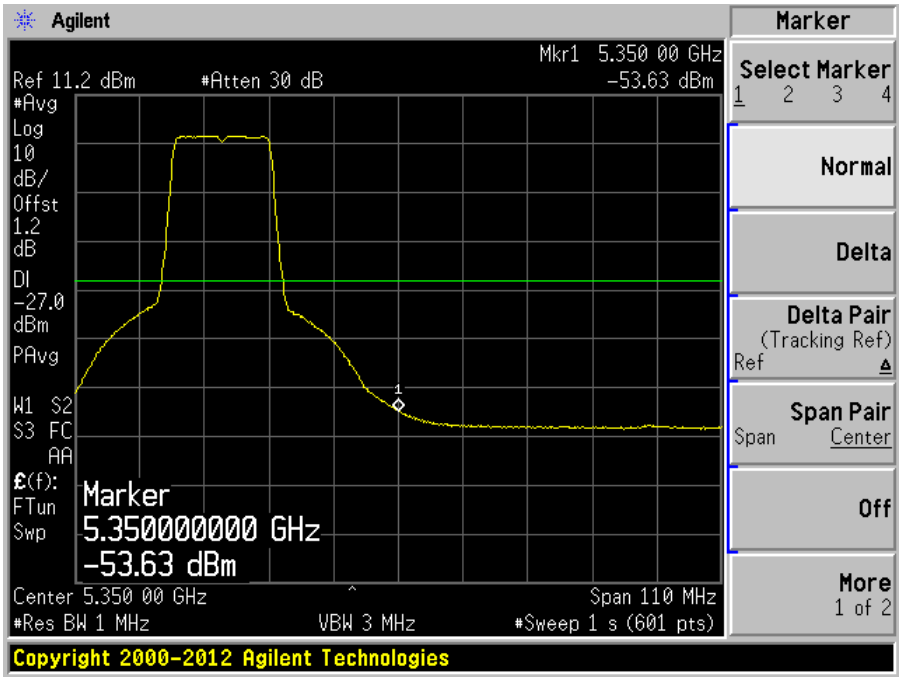


5250-5350 MHz Band

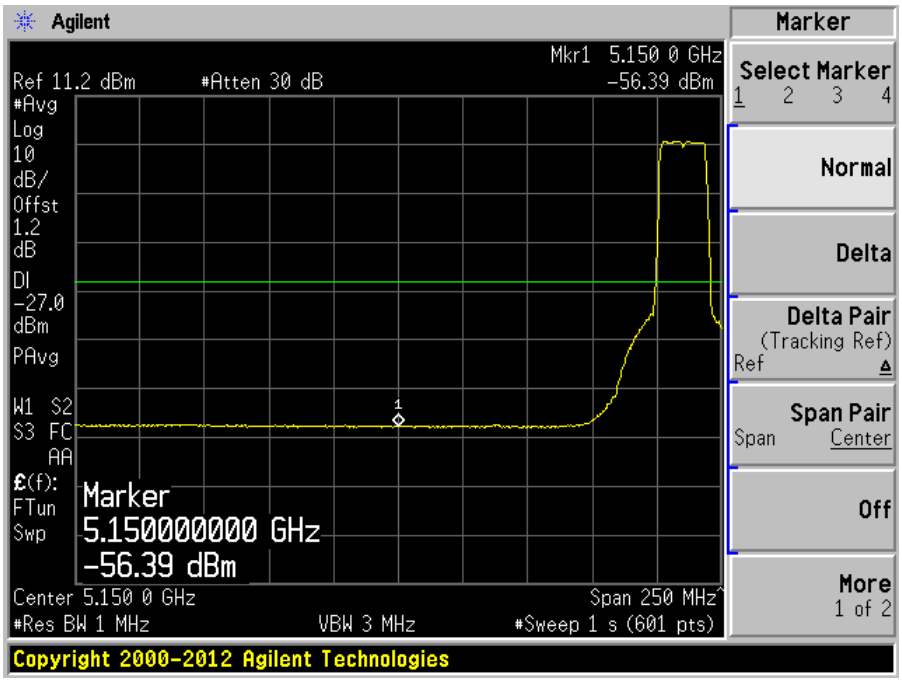
802.11a mode, Low Channel



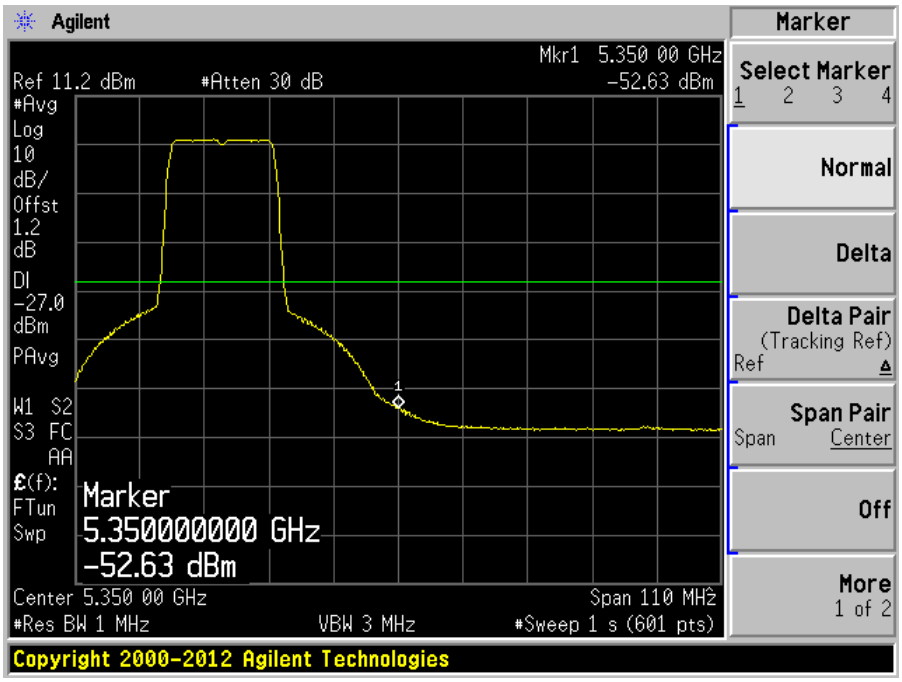
802.11a mode, High Channel



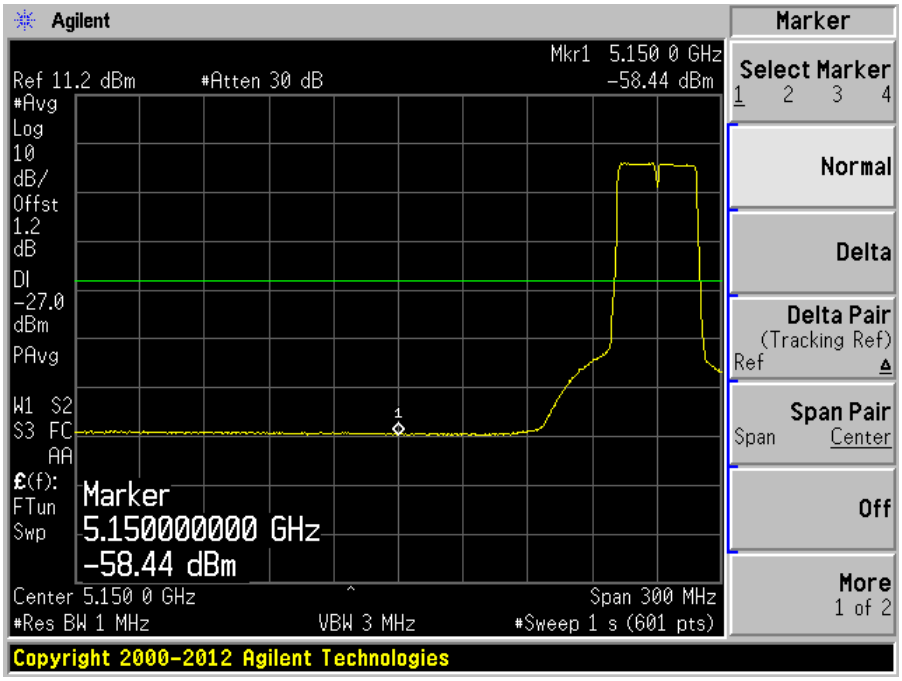
802.11n-HT20 mode, Low Channel



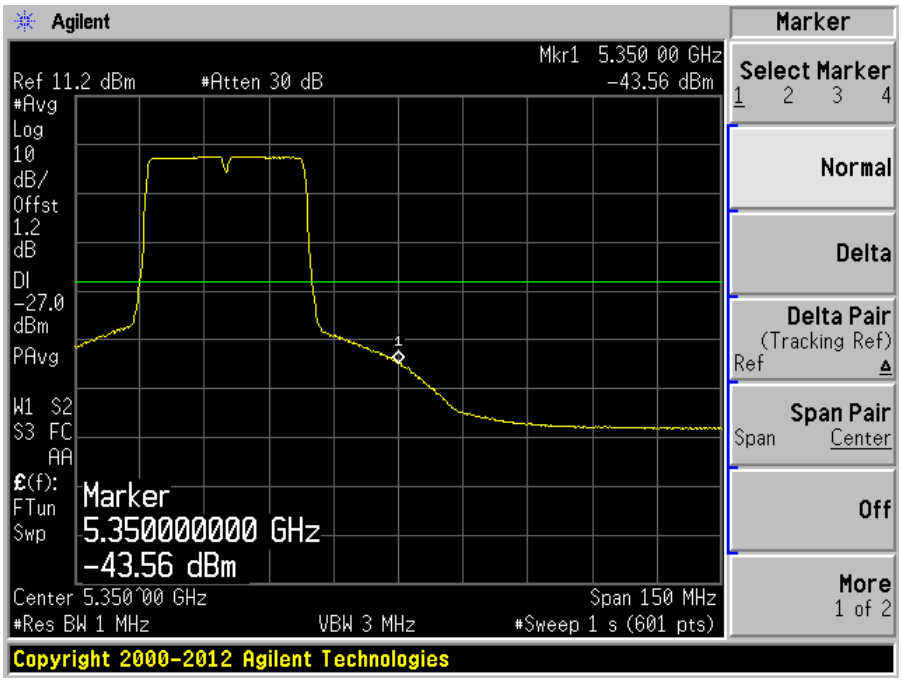
802.11n-HT20 mode, High Channel



802.11n-HT40 mode, Low Channel

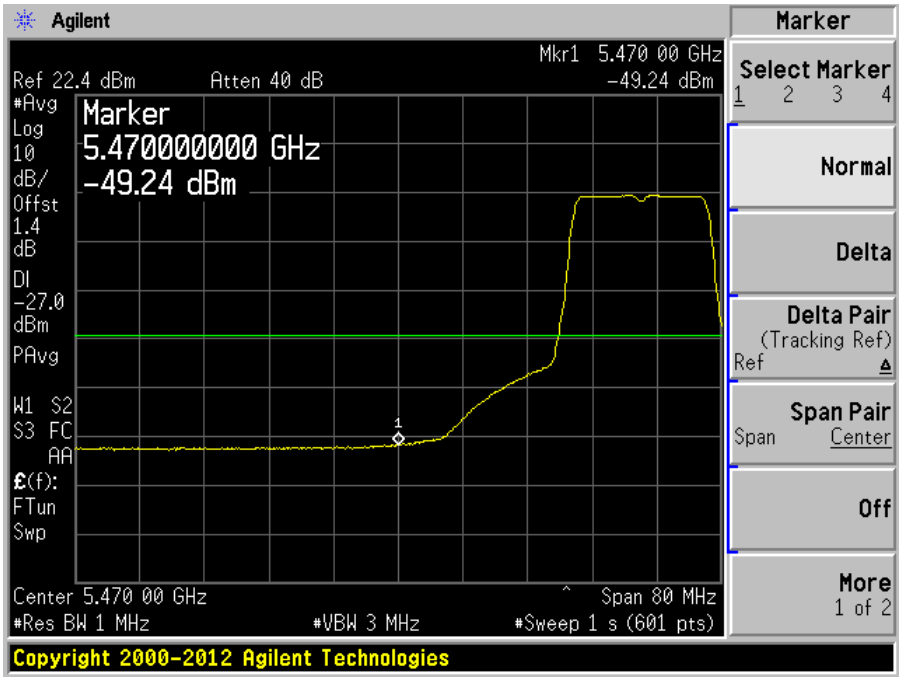


802.11n-HT40 mode, High Channel

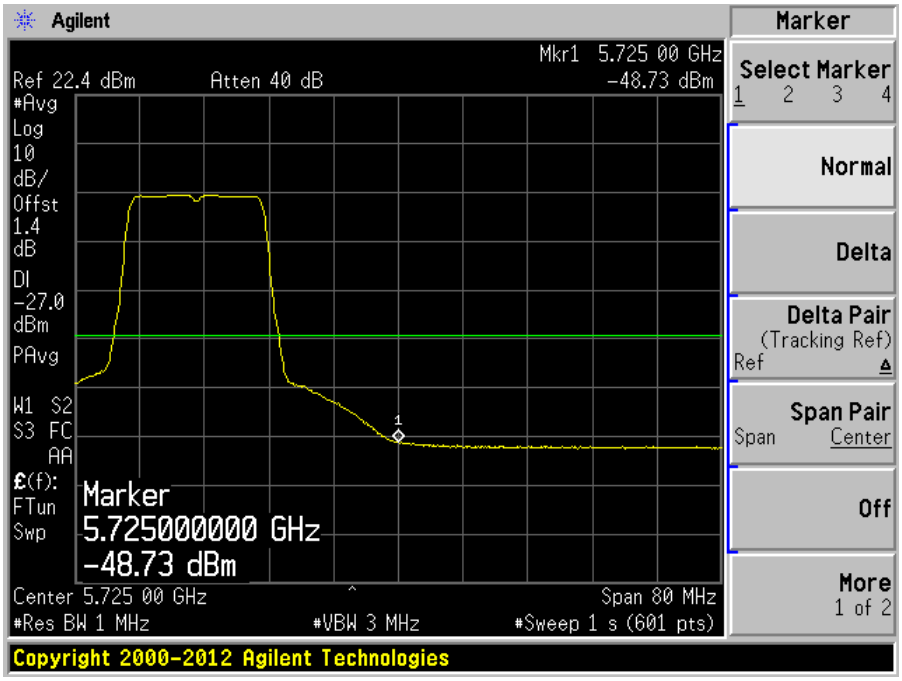


5470-5725 MHz Band

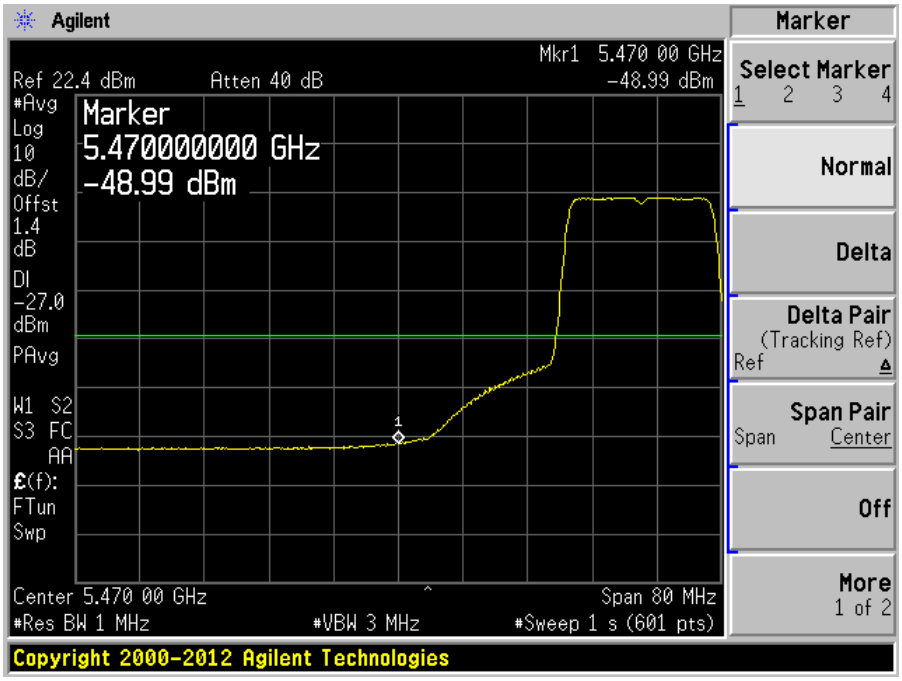
802.11a mode, Low Channel



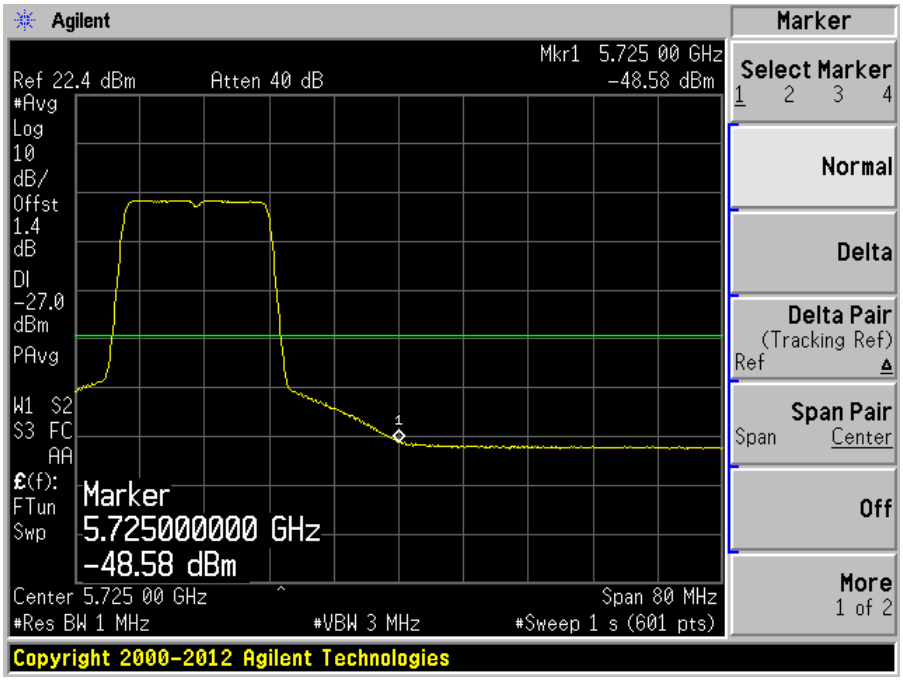
802.11a mode, High Channel



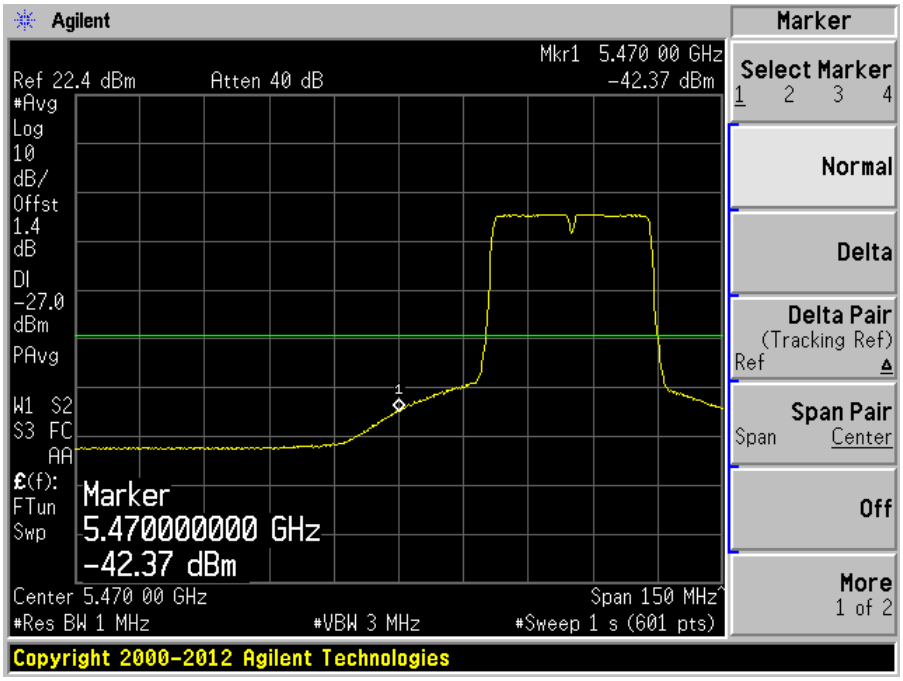
802.11n-HT20 mode, Low Channel



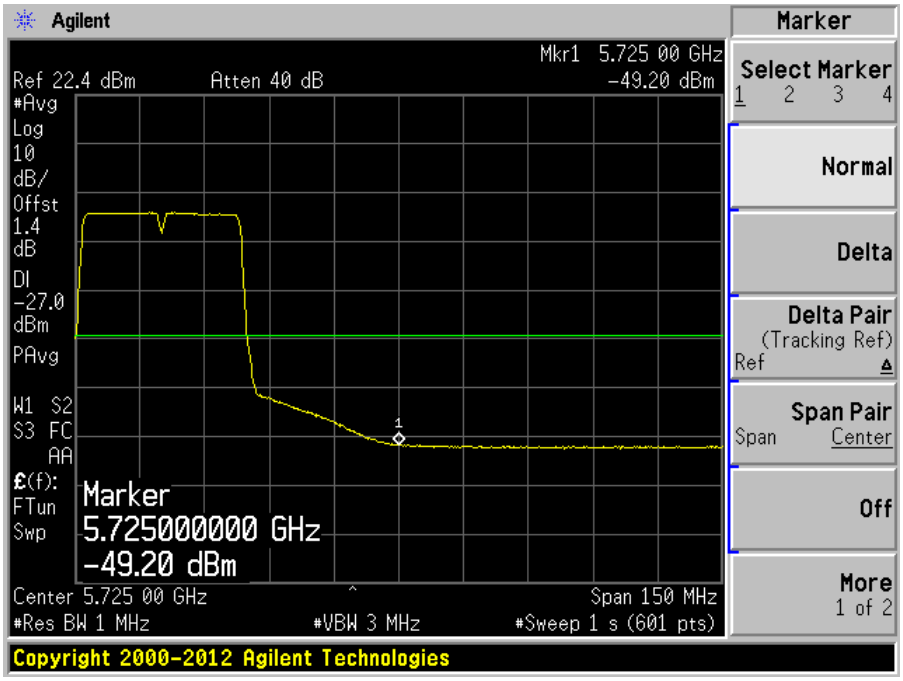
802.11n-HT20 mode, High Channel



802.11n-HT40 mode, Low Channel



802.11n-HT40 mode, High Channel



11 FCC §15.407(a)(1) - Power Spectral Density

11.1 Applicable Standard

According to FCC §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 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, 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, both the maximum 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.

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

11.2 Measurement Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section F:
Peak power spectral density (PPSD)

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

11.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	45 %
ATM Pressure:	101.65 kPa

The testing was performed by Chen Ge on 2014-06-13 in the RF site.

11.5 Test Results

5150-5250 MHz Band

Channel	Frequency (MHz)	Power spectral density (dBm)	Limit (dBm)	Result
802.11a mode				
Low	5180	1.672	2	Pass
Middle	5200	1.578	2	Pass
High	5240	1.812	2	Pass
802.11n-HT20 mode				
Low	5180	1.555	2	Pass
Middle	5200	1.569	2	Pass
High	5240	1.629	2	Pass
802.11n-HT40 mode				
Low	5190	-2.131	2	Pass
High	5230	-2.366	2	Pass

5250-5350 MHz Band

Channel	Frequency (MHz)	Power spectral density (dBm)	Limit (dBm)	Result
802.11a mode				
Low	5260	2.524	9	Pass
Middle	5280	2.888	9	Pass
High	5320	3.207	9	Pass
802.11n-HT20 mode				
Low	5260	2.205	9	Pass
Middle	5280	2.516	9	Pass
High	5320	2.628	9	Pass
802.11n-HT40 mode				
Low	5270	-2.453	9	Pass
High	5310	-0.952	9	Pass

5470-5725 MHz Band

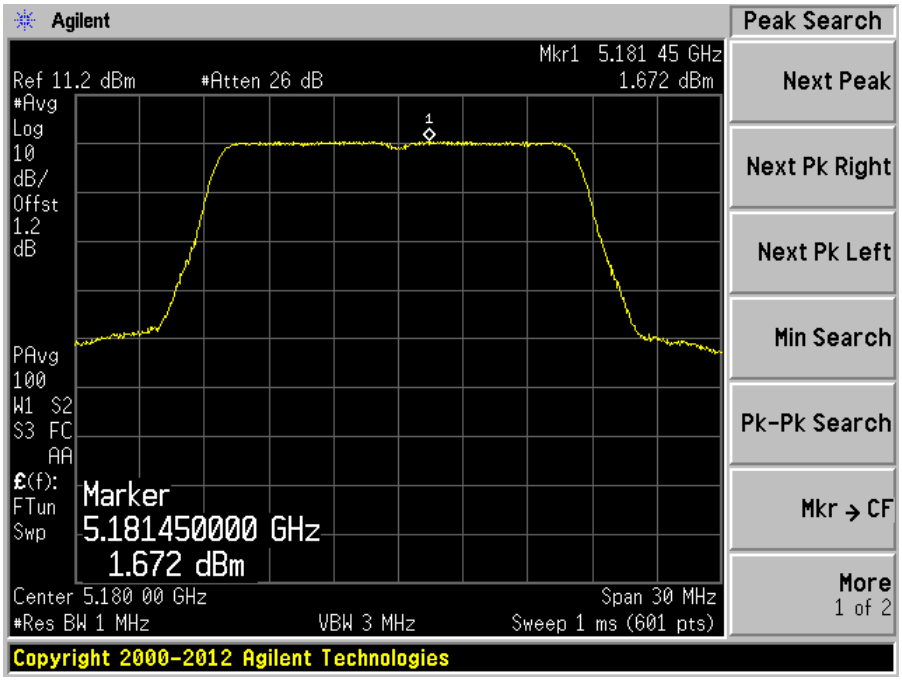
Channel	Frequency (MHz)	Power spectral density (dBm)	Limit (dBm)	Result
802.11a mode				
Low	5500	1.906	9	Pass
Middle	5580	1.63	9	Pass
High	5700	1.727	9	Pass
802.11n-HT20 mode				
Low	5500	1.761	9	Pass
Middle	5580	1.334	9	Pass
High	5700	1.444	9	Pass
802.11n-HT40 mode				
Low	5510	-2.05	9	Pass
Mid	5550	-2.261	9	
High	5670	-2.153	9	Pass

Note: the 8 dBi antenna was use to evaluate the maximum output power density, for FCC, since the antenna gain is more than 6dBi, the power and PSD limit reduce by 8-6=2 dB.

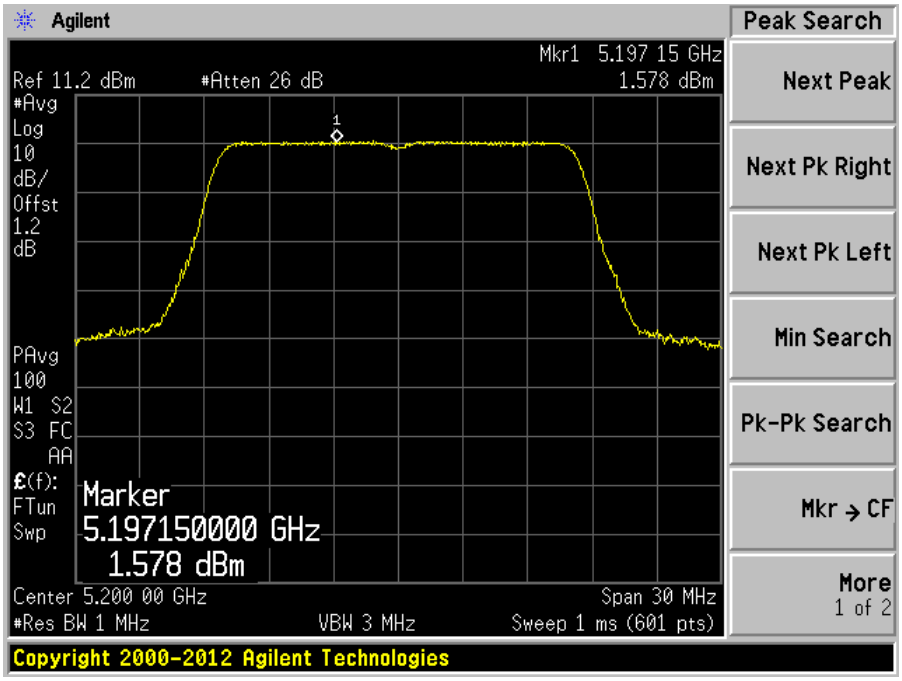
Please refer to the following plots.

5150-5250 MHz Band

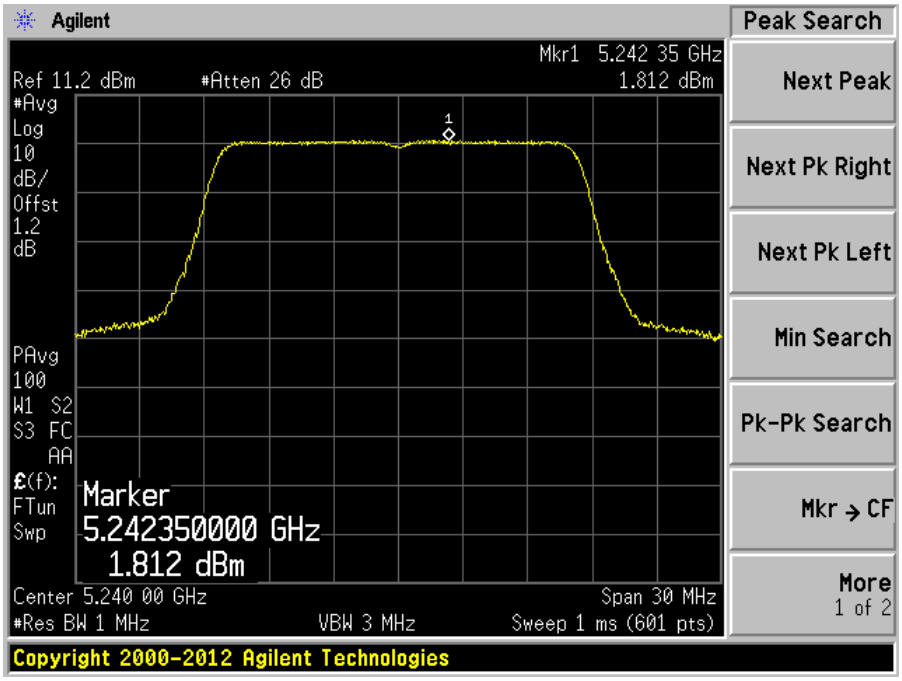
802.11a mode, 5180 MHz



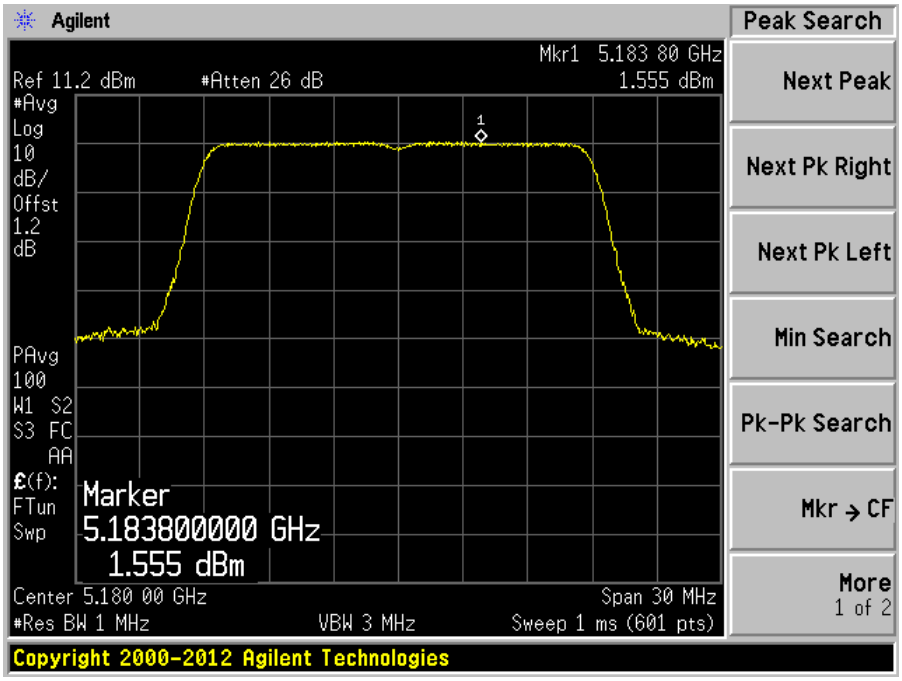
802.11a mode, 5200 MHz



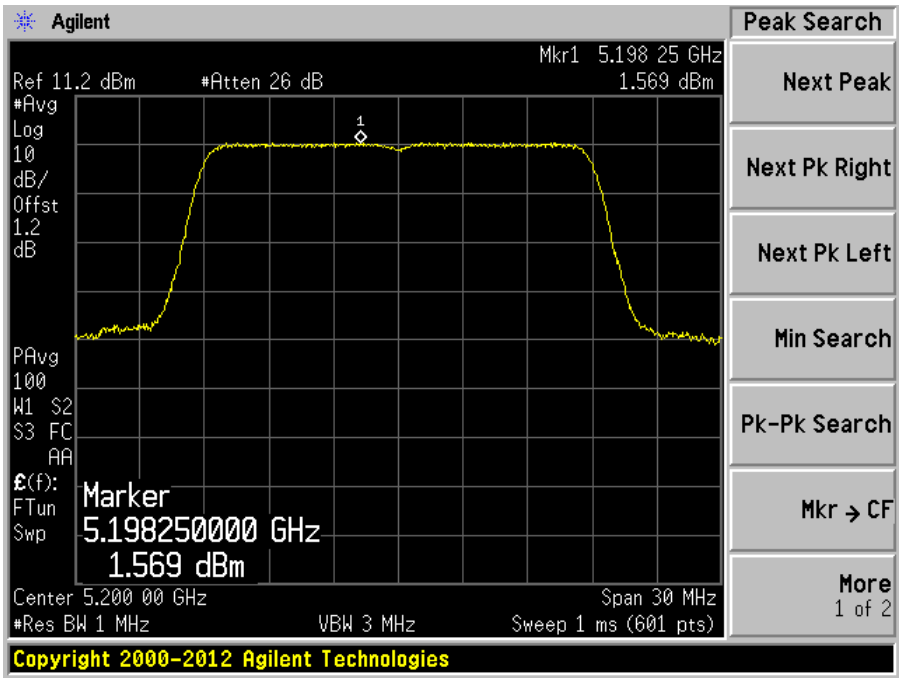
802.11a mode, 5240 MHz



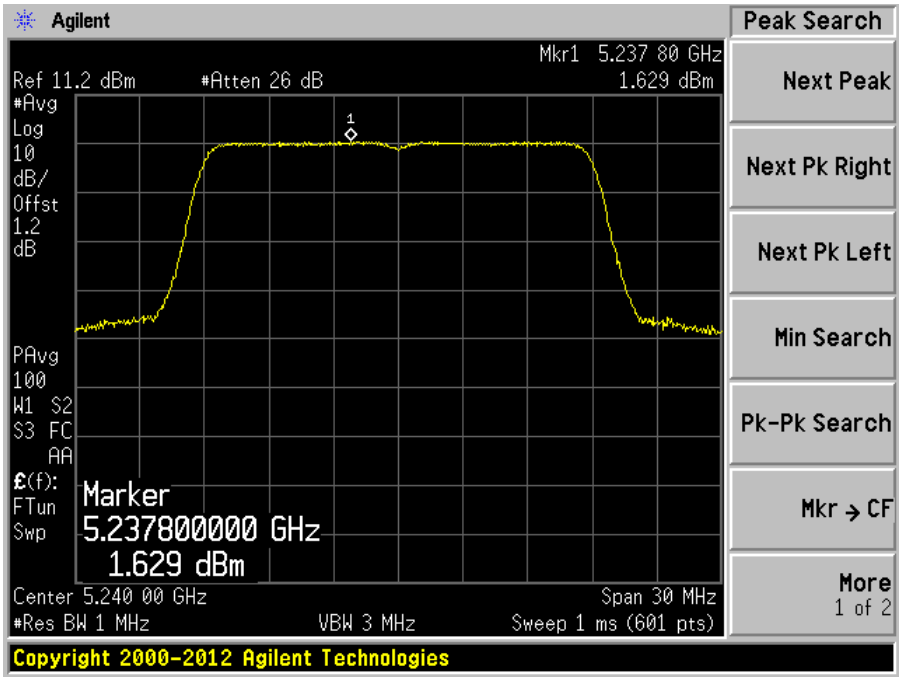
802.11n-HT20 mode, 5180 MHz



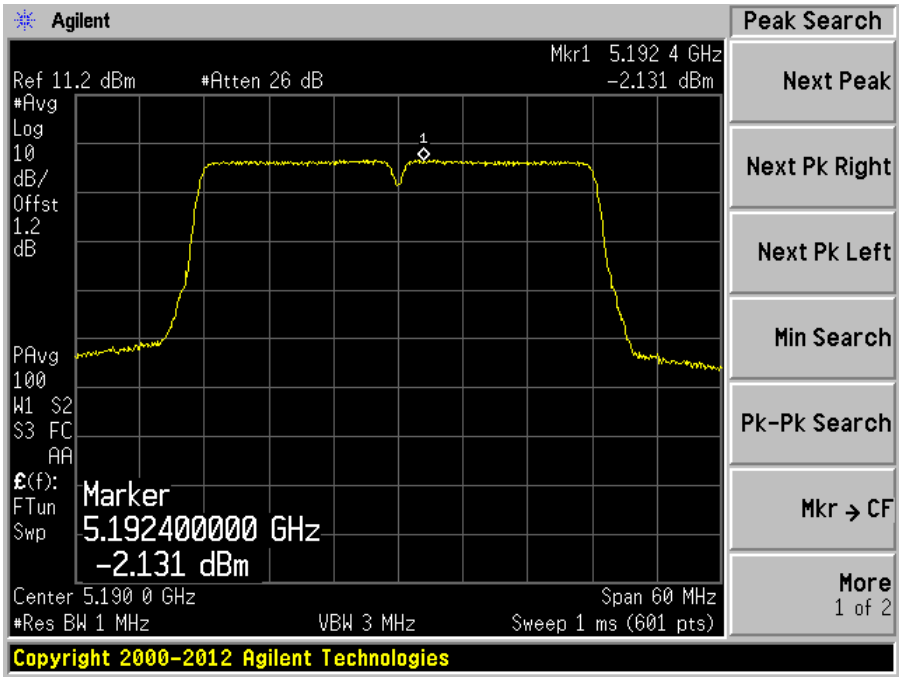
802.11n-HT20 mode, 5200 MHz



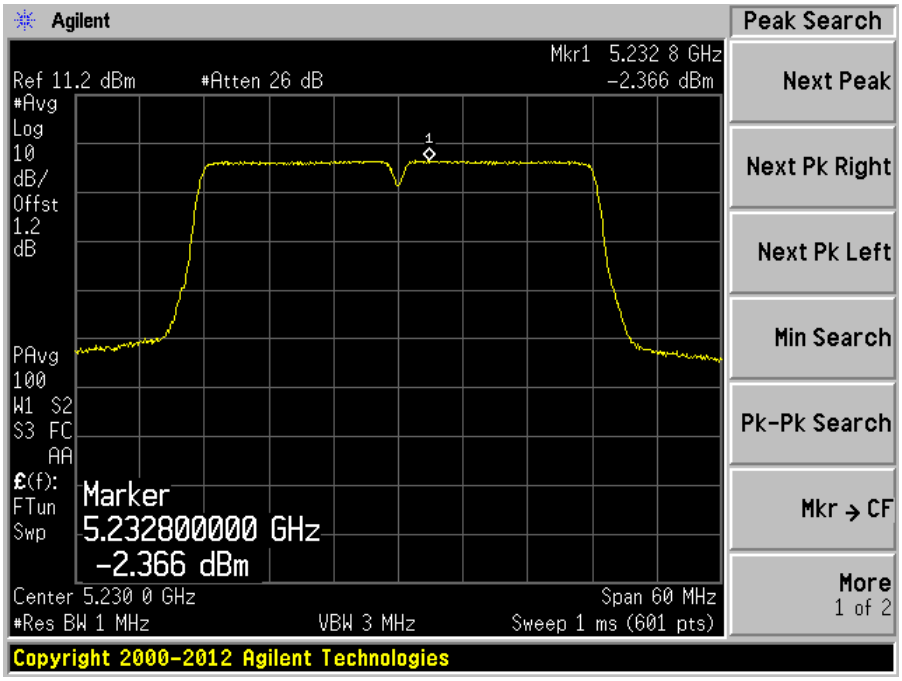
802.11n-HT20 mode, 5240 MHz



802.11n-HT40 mode, 5190 MHz

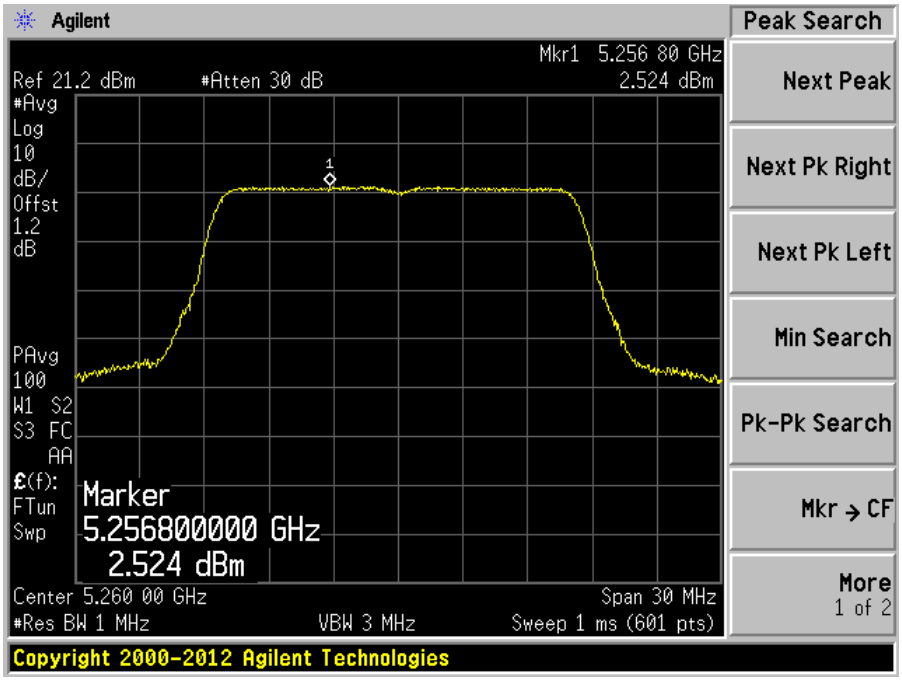


802.11n-HT40 mode, 5230 MHz

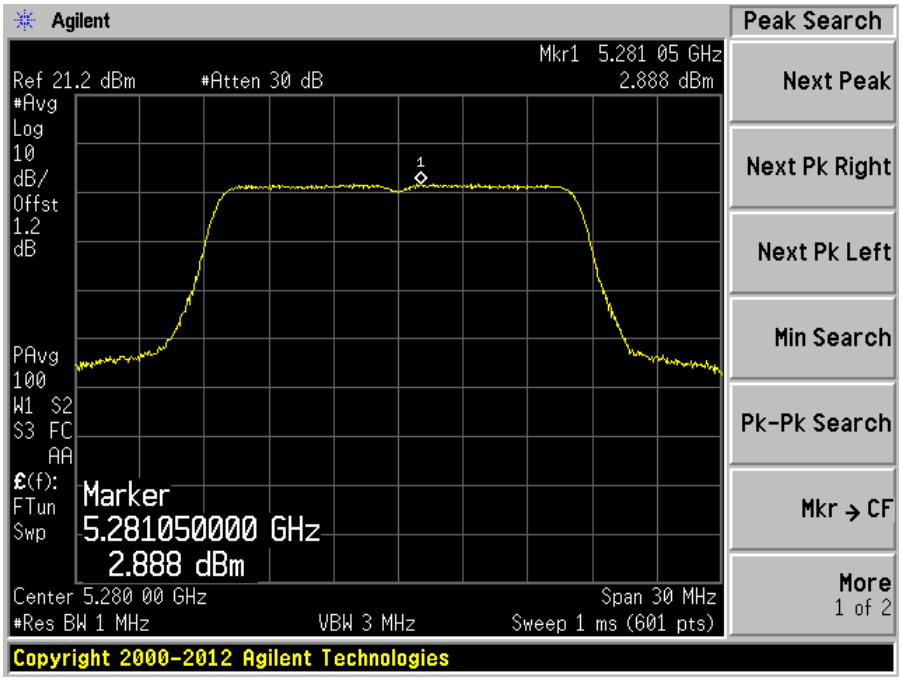


5250-5350 MHz Band

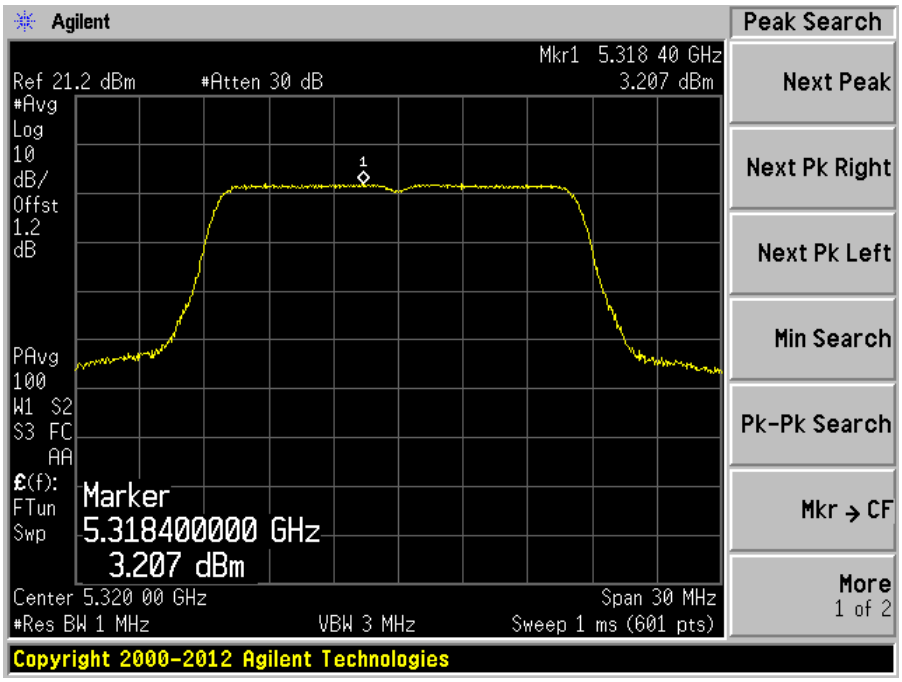
802.11a mode, 5260 MHz



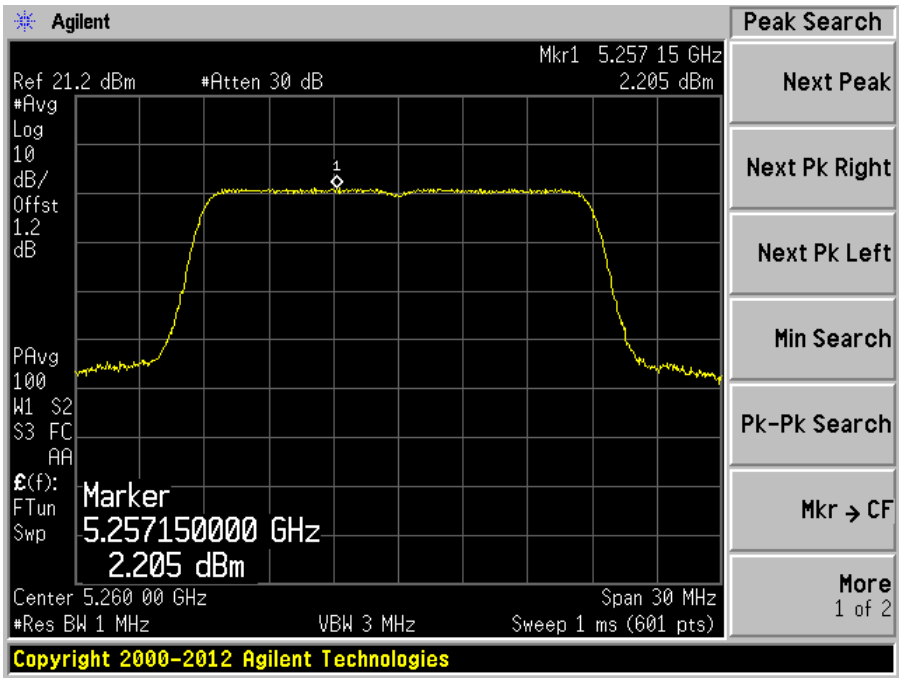
802.11a mode, 5280 MHz



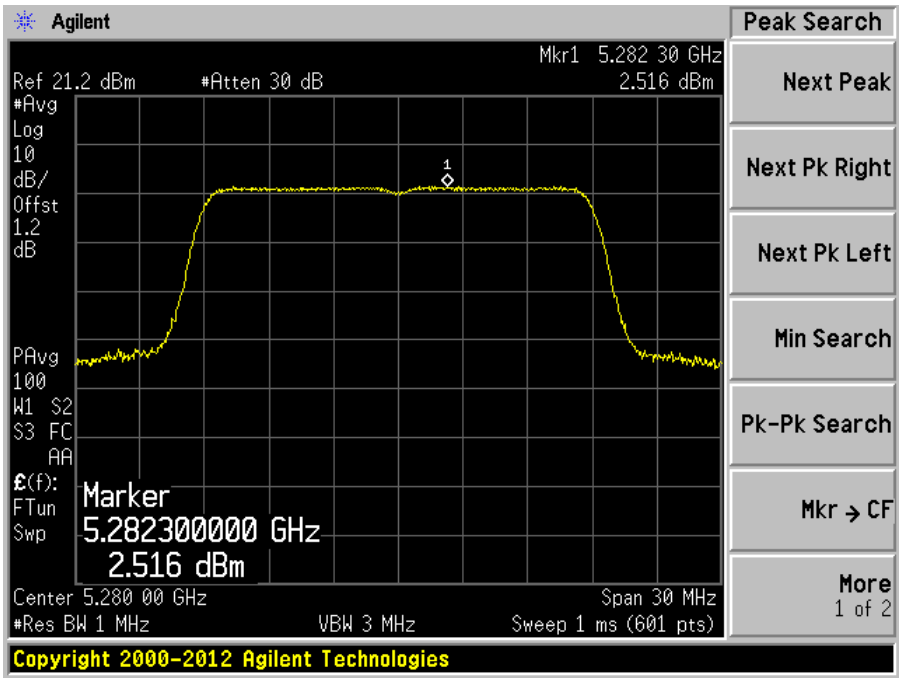
802.11a mode, 5320 MHz



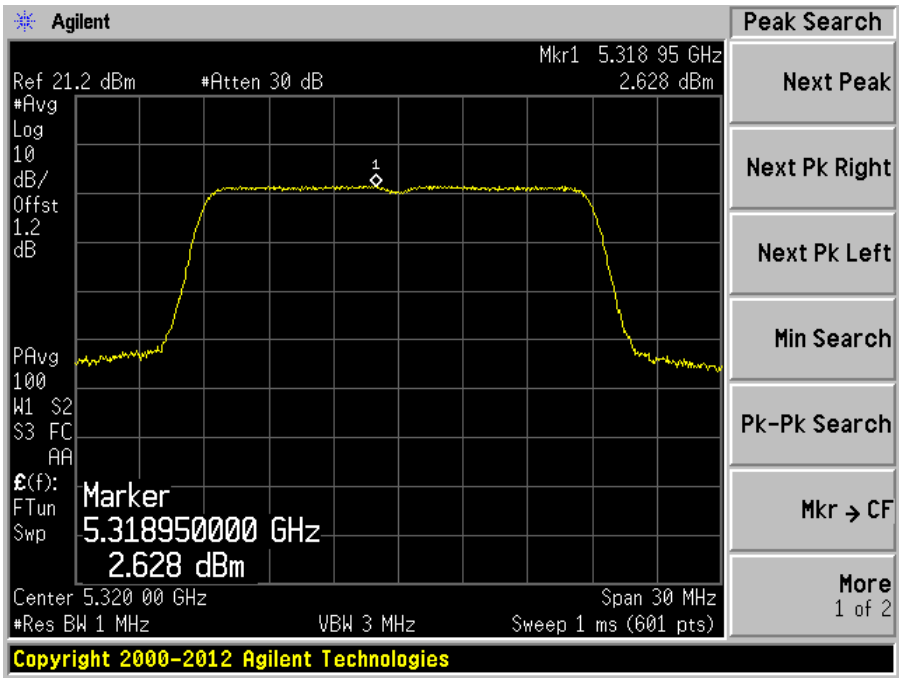
802.11n-HT20 mode, 5260 MHz



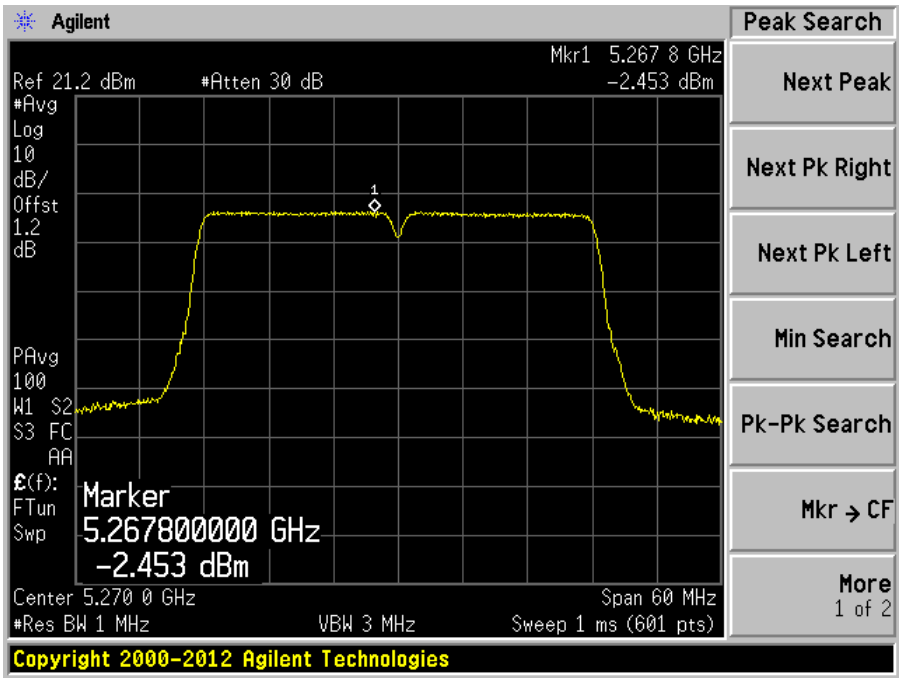
802.11n-HT20 mode, 5280 MHz



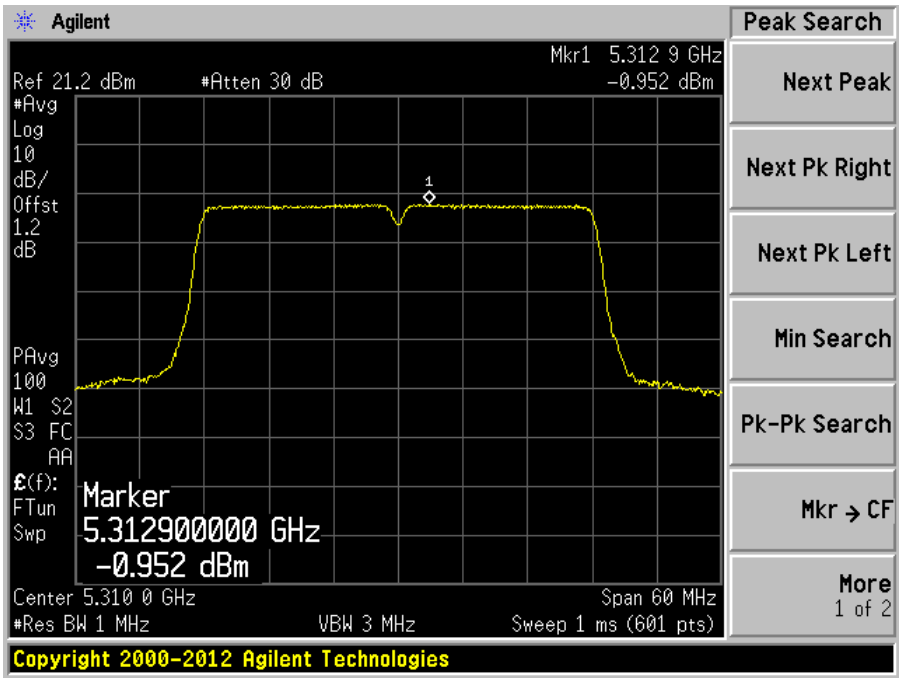
802.11n-HT20 mode, 5320 MHz



802.11n-HT40 mode, 5270 MHz

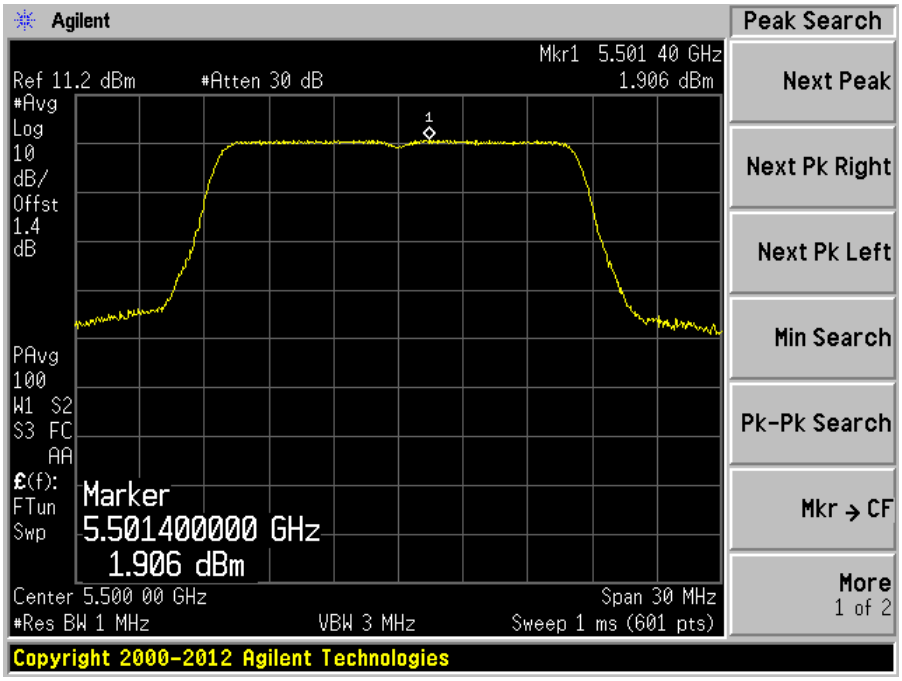


802.11n-HT40 mode, 5310 MHz

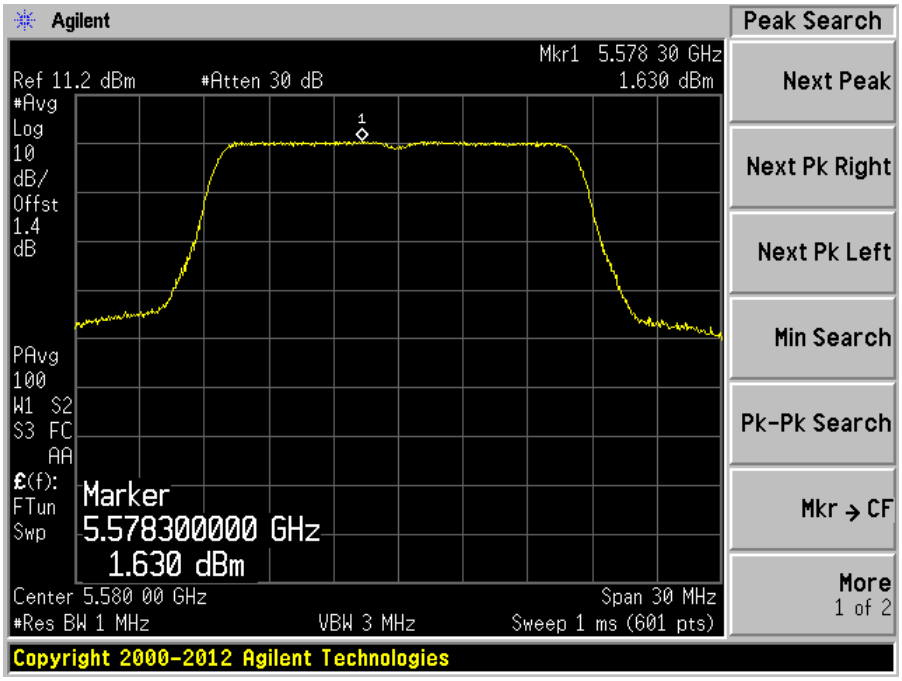


5470-5725 MHz Band

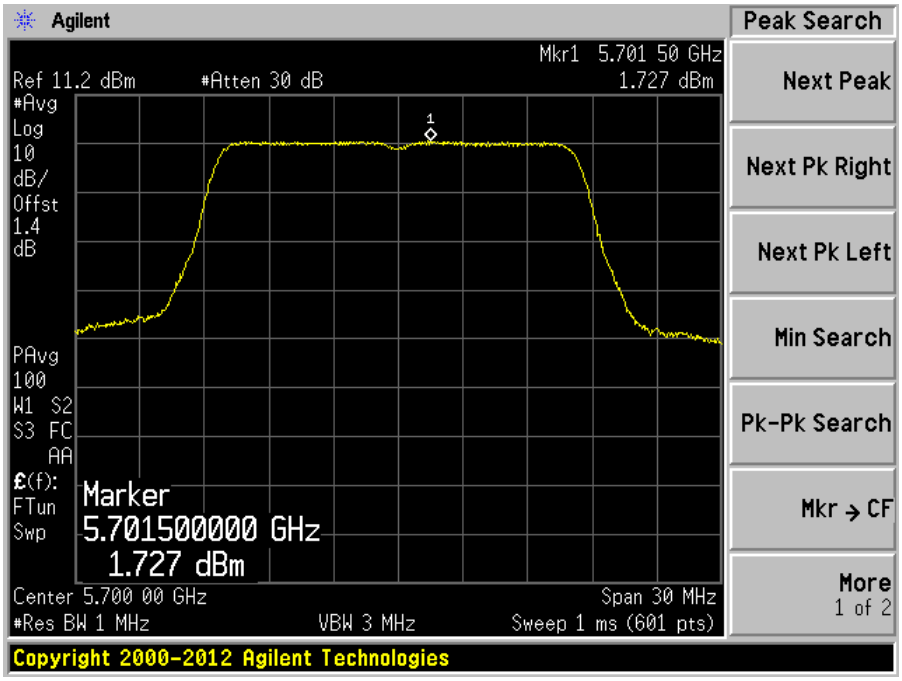
802.11a mode, 5500 MHz



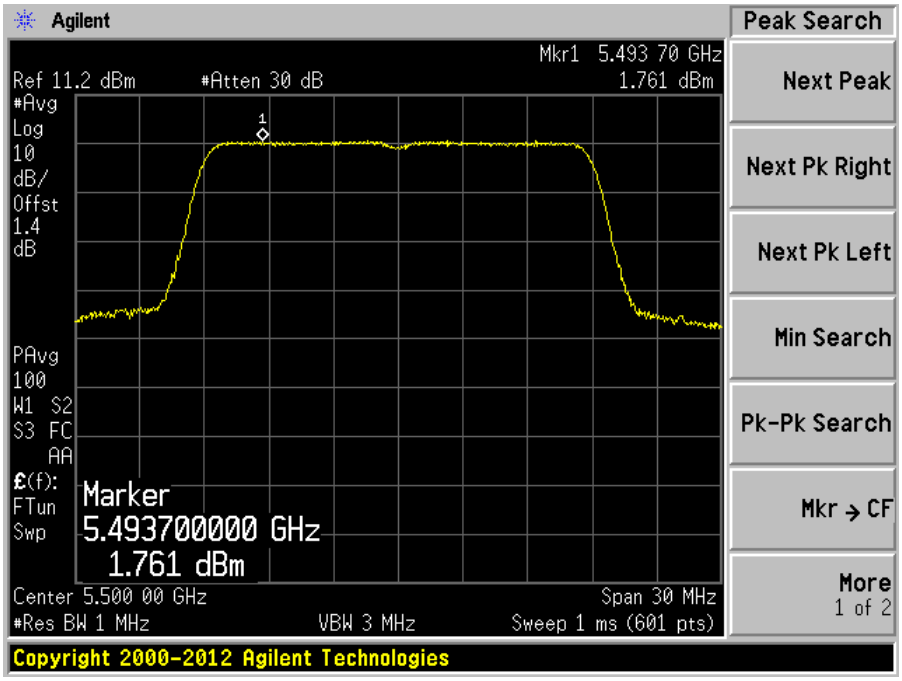
802.11a mode, 5580 MHz



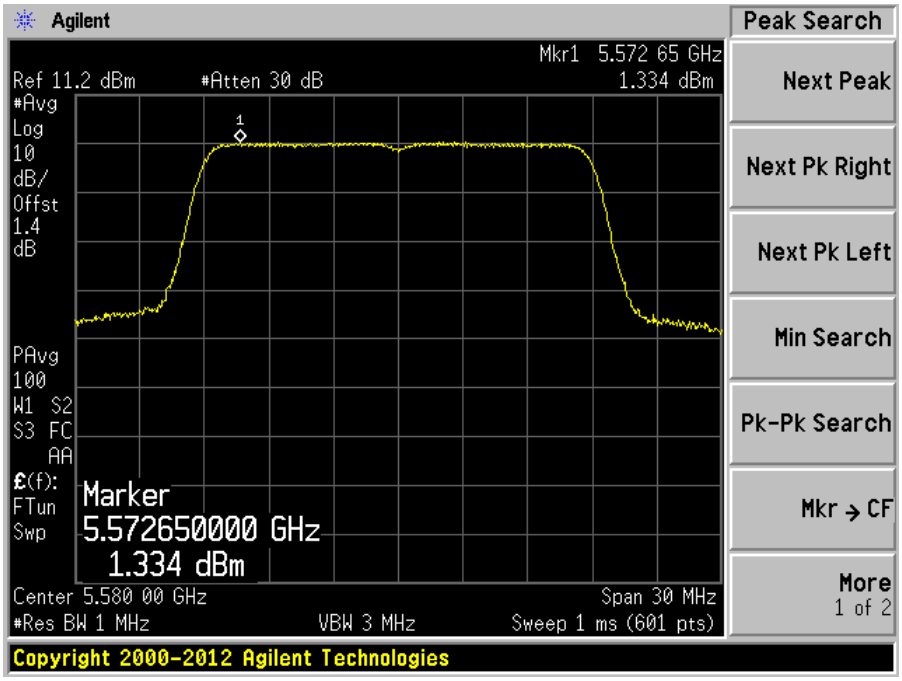
802.11a mode, 5700 MHz



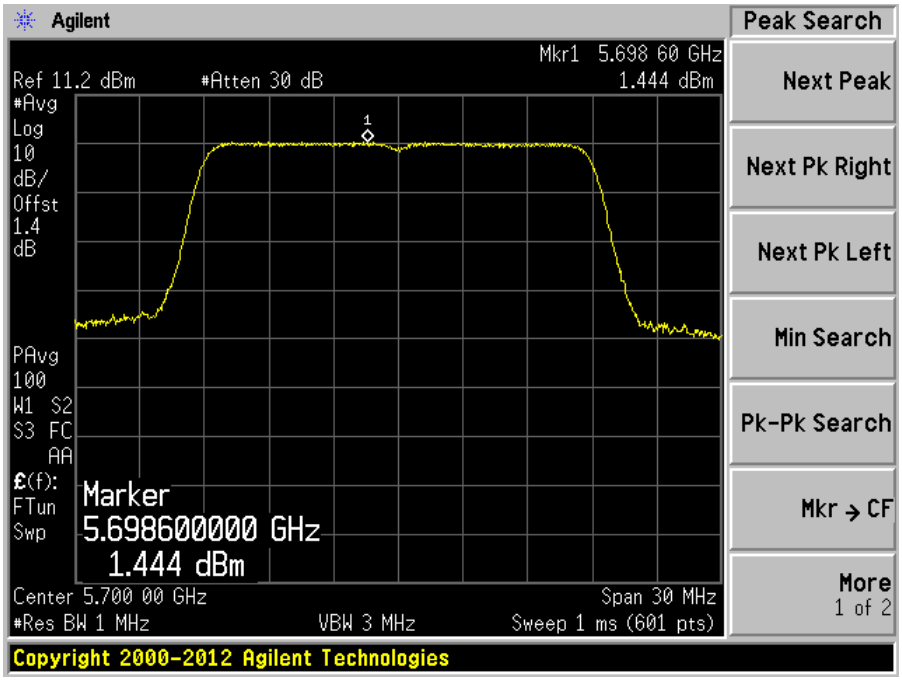
802.11n-HT20 mode, 5500 MHz



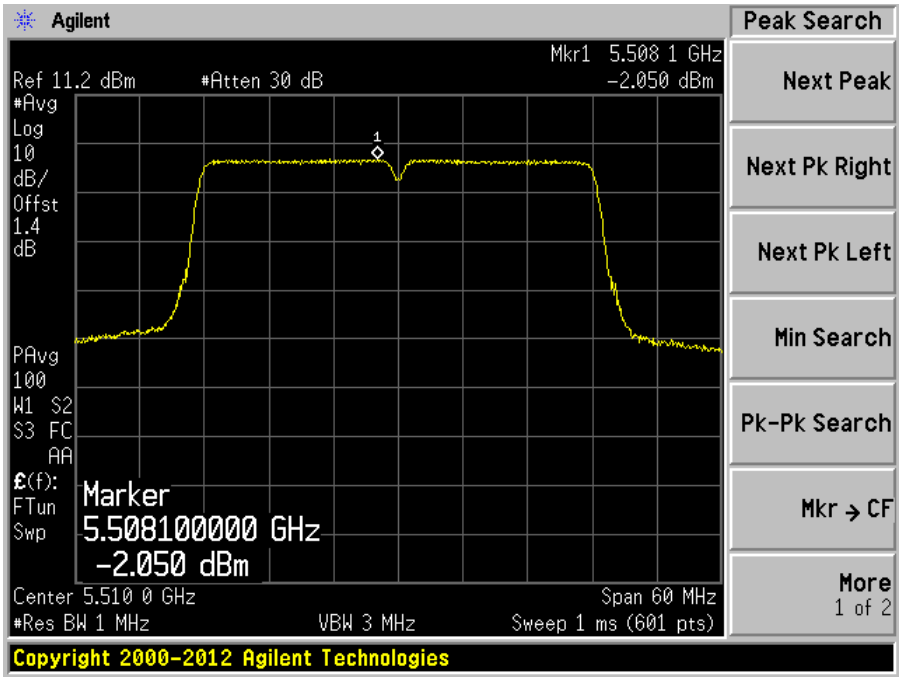
802.11n-HT20 mode, 5580 MHz



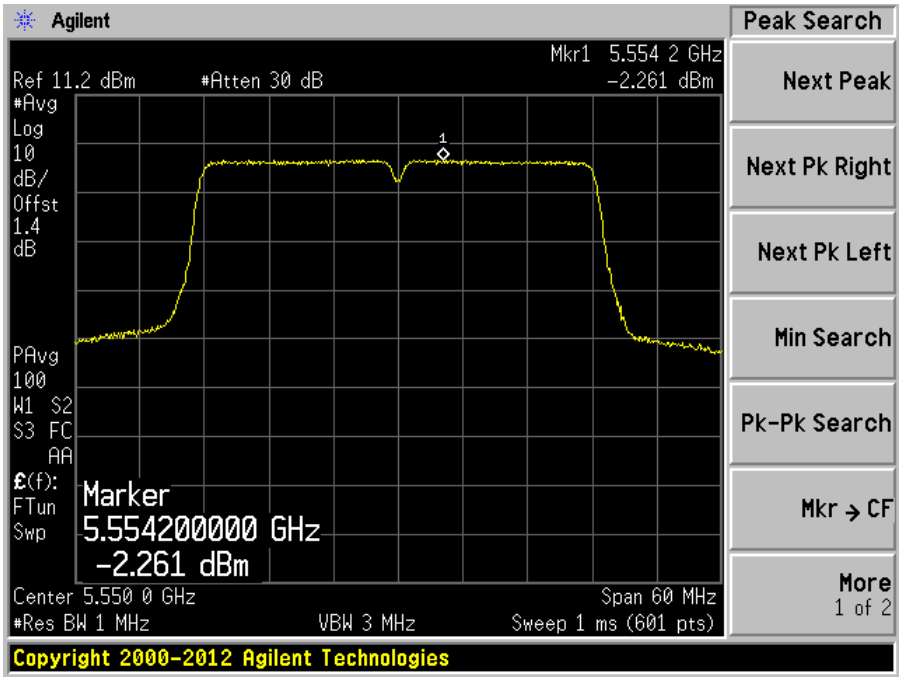
802.11n-HT20 mode, 5700 MHz



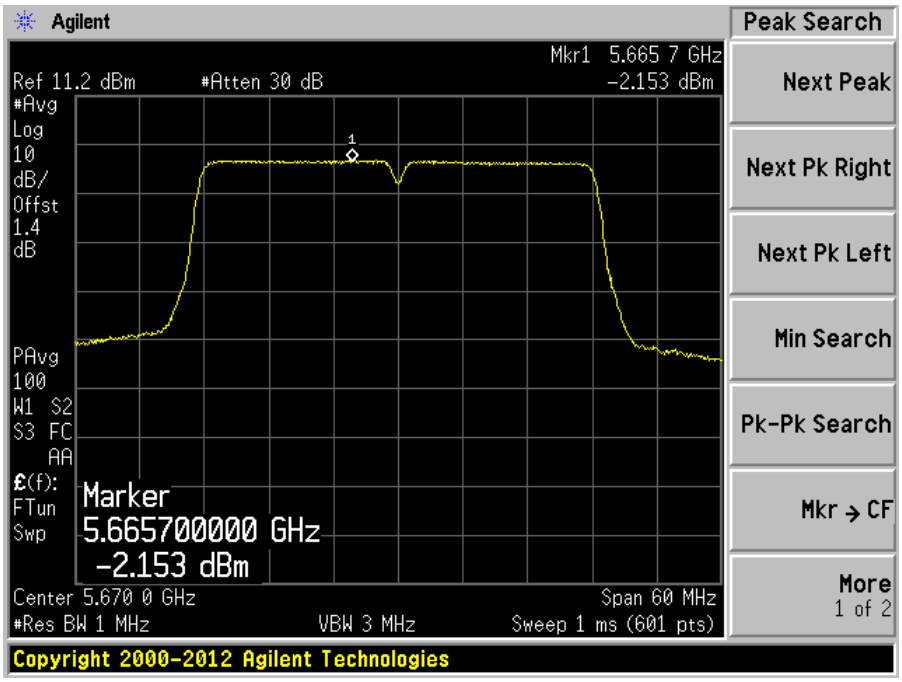
802.11n-HT40 mode, 5510 MHz



802.11n-HT40 mode, 5550 MHz



802.11n-HT40 mode, 5670 MHz



12 FCC §15.407(a)(6) – Peak Excursion Ratio

12.1 Applicable Standard

According to FCC §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.

12.2 Test Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section G: Peak excursion measurement

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.*

12.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	45 %
ATM Pressure:	101.65 kPa

The testing was performed by Chen Ge on 2014-06-13 in the RF site.

12.5 Test Results

5150-5250 MHz Band

802.11a mode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5200	7.549	13

802.11n-HT20 amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5200	7.736	13

802.11n-HT40 amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Low	5190	7.751	13

5250-5350 MHz Band

802.11a mode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5280	7.884	13

802.11n-HT20 amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5280	7.381	13

802.11n-HT40 amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Low	5270	8.590	13

5470-5725 MHz Band

802.11a amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5580	7.698	13

802.11n-HT20 amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5580	7.729	13

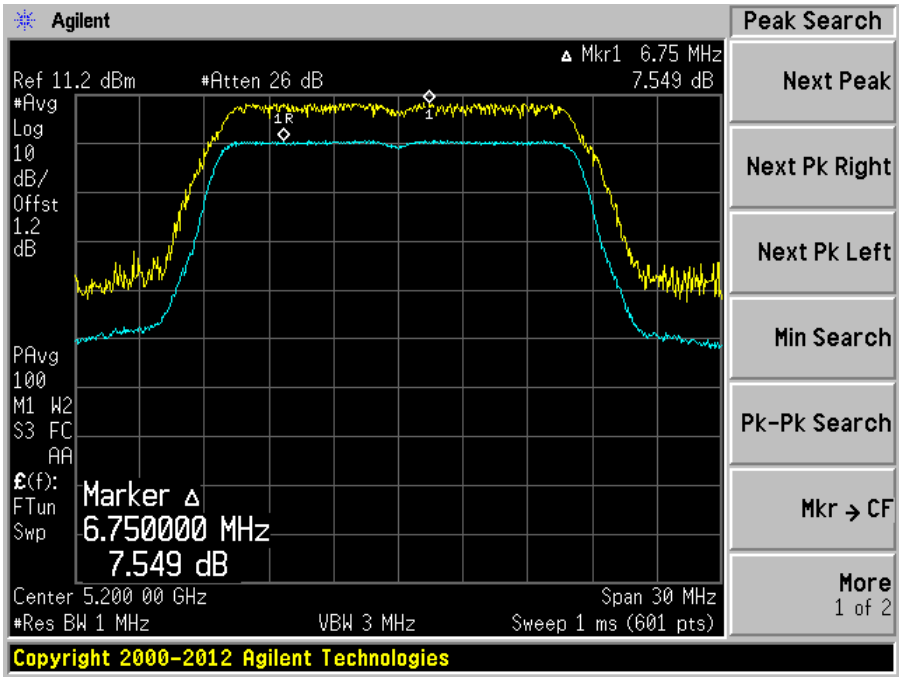
802.11n-HT40 amode

Channel	Frequency (MHz)	Results (dB)	Limit (dB)
Middle	5550	7.812	13

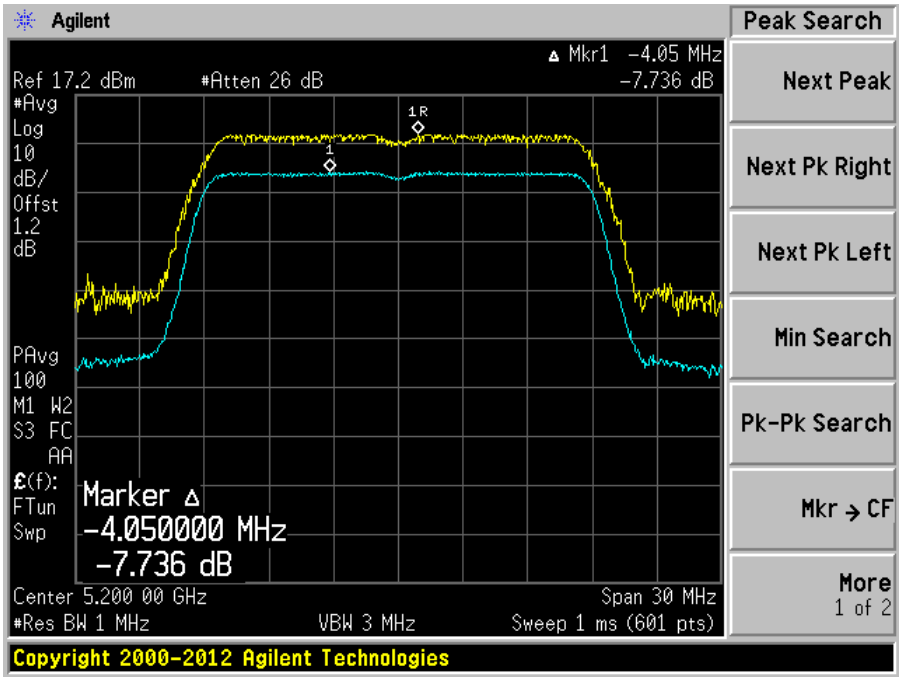
Please refer to the following plots for detailed test results:

5150-5250 MHz Band

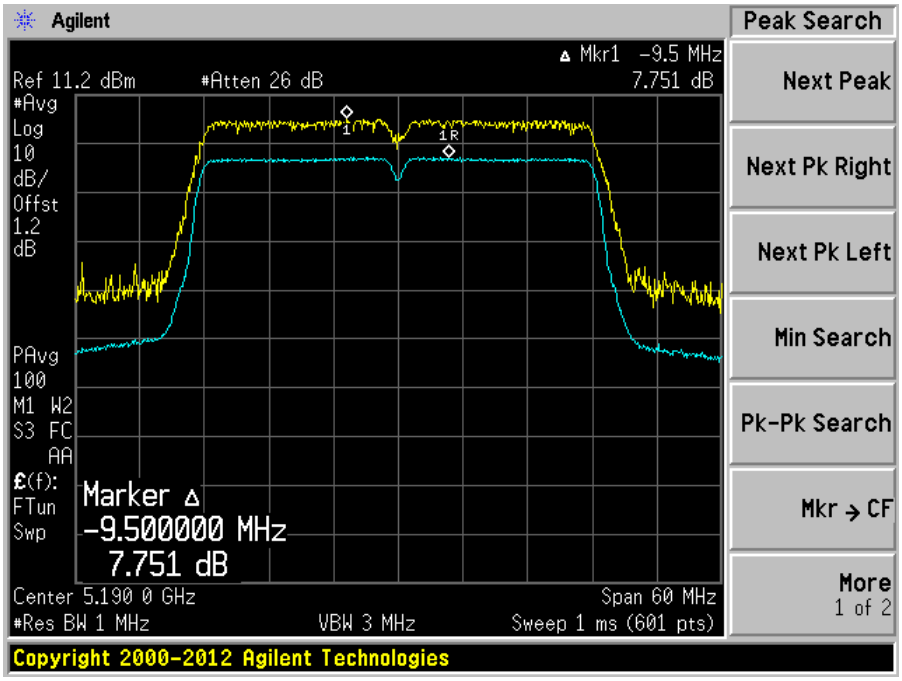
802.11a mode, 5200 MHz



802.11n-HT20 mode, 5200 MHz

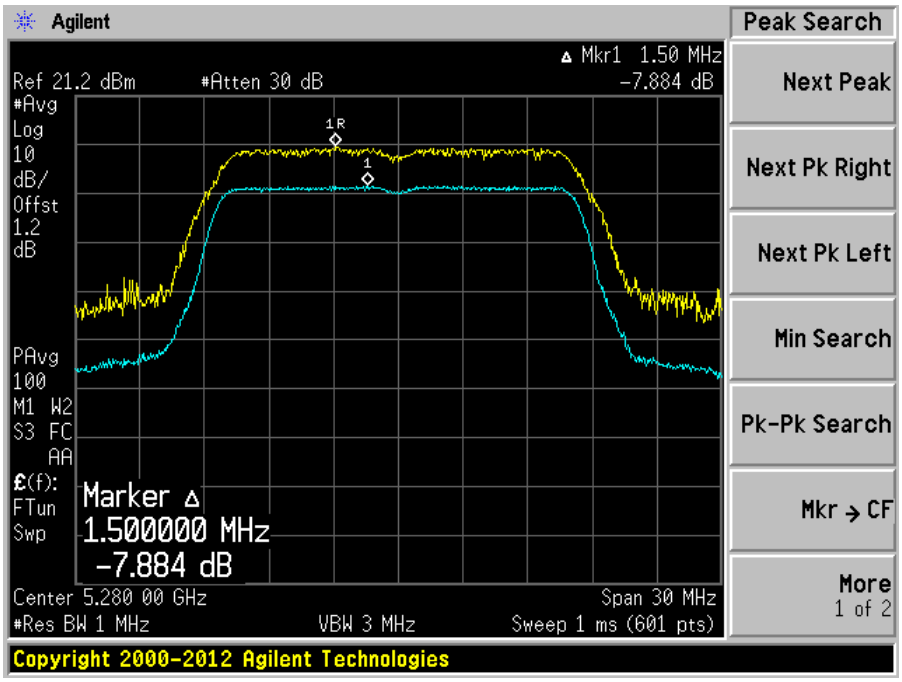


802.11n-HT40 mode, 5190 MHz

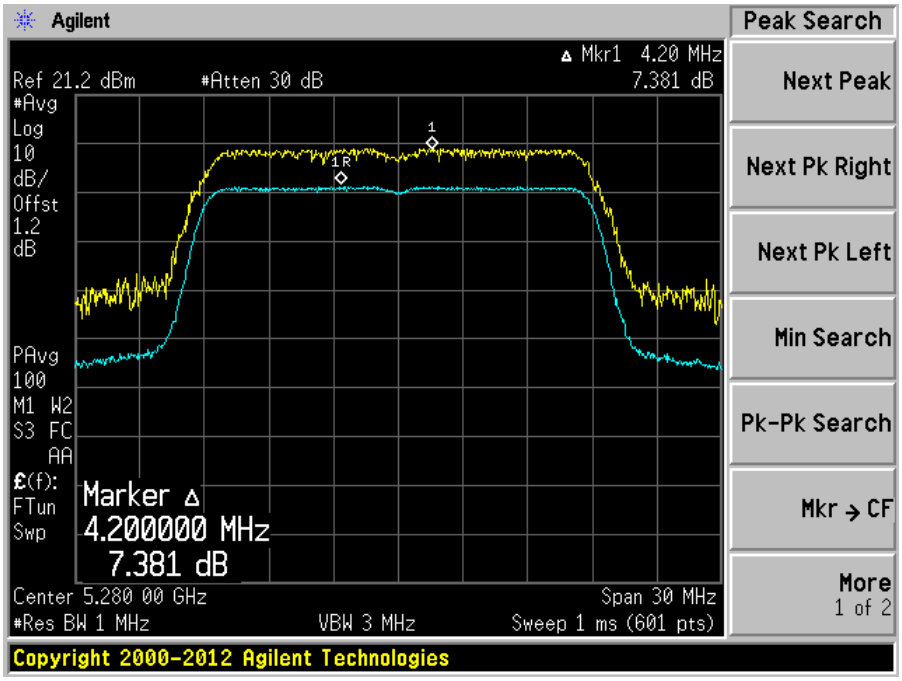


5250-5350 MHz Band

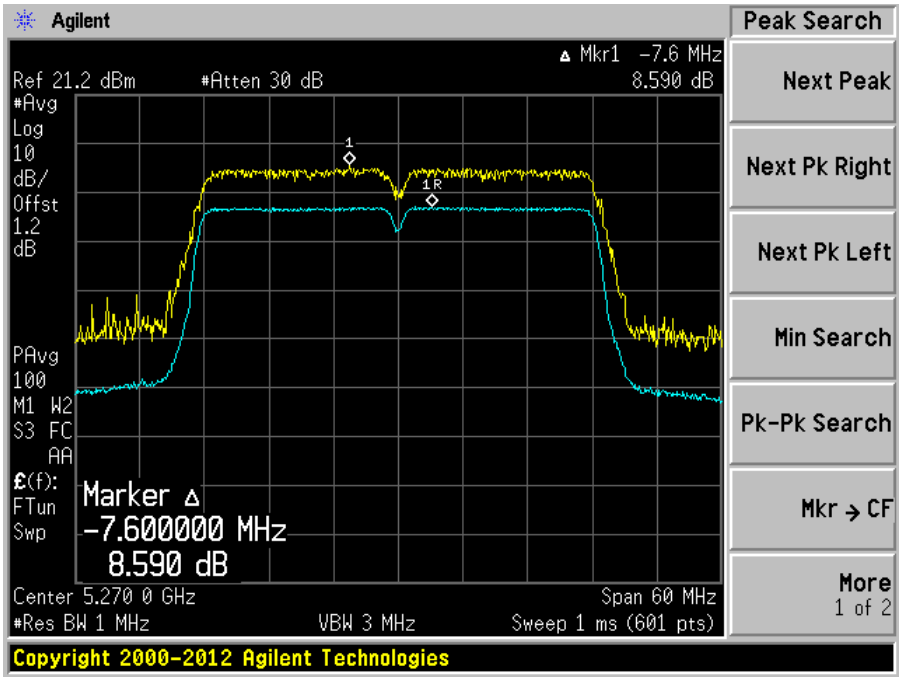
802.11a mode, 5280 MHz



802.11n-HT20 mode, 5280 MHz

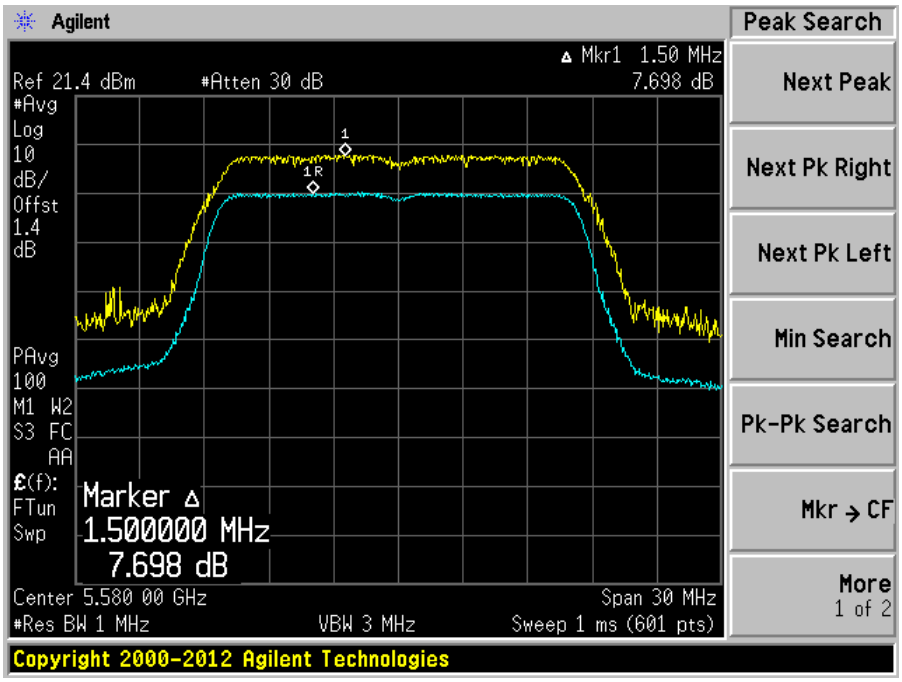


802.11n-HT40 mode, 5270 MHz

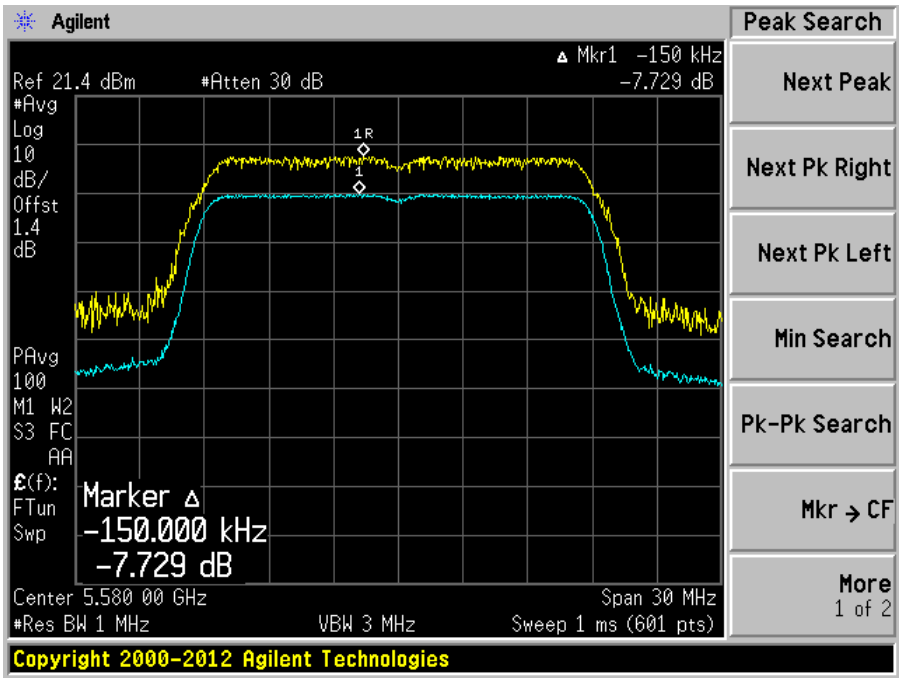


5470-5725 MHz Band

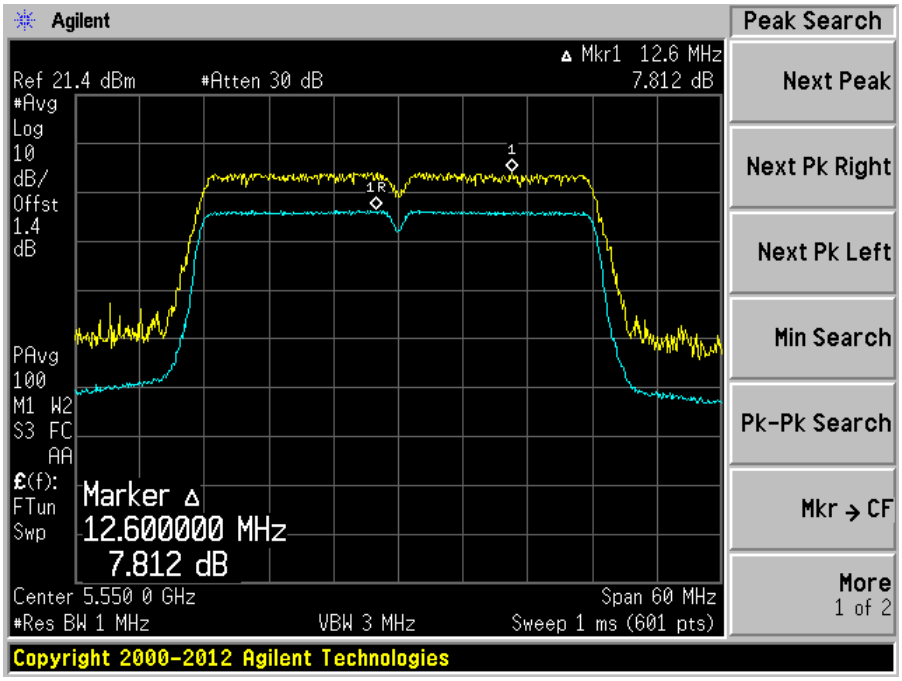
802.11a mode, 5580 MHz



802.11n-HT20 mode, 5580 MHz



802.11n-HT40 mode, 5550 MHz



13 FCC §15.407(b) - Spurious Emissions at Antenna Terminals

13.1 Applicable Standard

According to FCC §15.407(b)

For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band. For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz

13.2 Measurement Procedure

The measurements are base on FCC KDB 789033 D01 General UNII Test Procedures v01r03: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section H: Unwanted emissions measurement

13.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US44300386	2013-09-29	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

13.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	46 %
ATM Pressure:	101.45 kPa

The testing was performed by Chen Ge on 2014-06-12 in the RF site.

13.5 Test Results

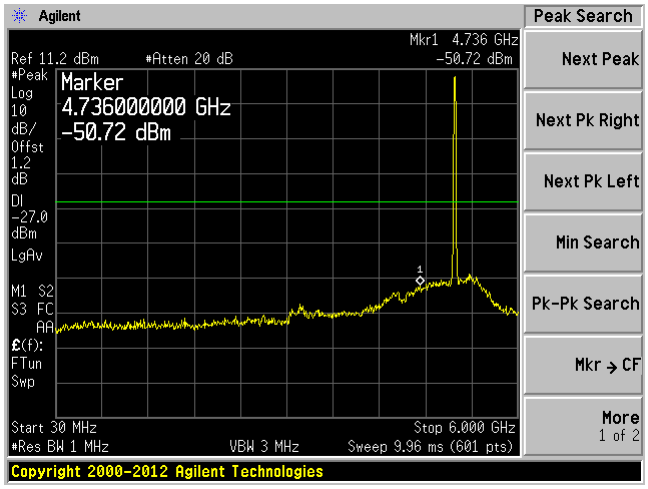
Please refer to following plots of spurious emissions.

Note: Only spurious emissions that fall into the restricted bands were remeasured with a smaller span.

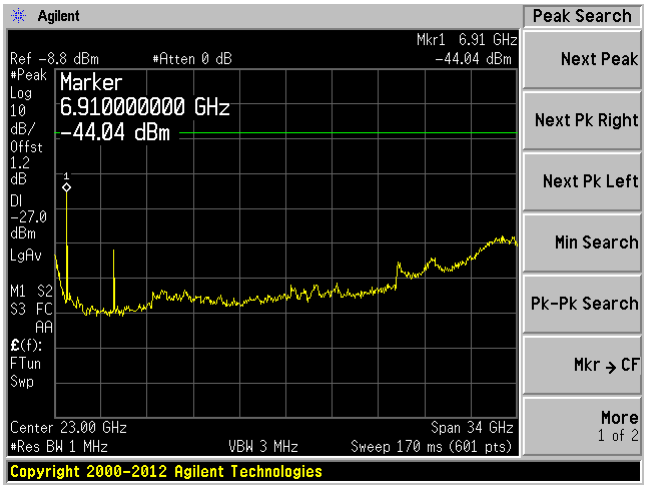
5150-5250 MHz Band

802.11a, Low Channel, 5180 MHz

30 MHz – 6 GHz

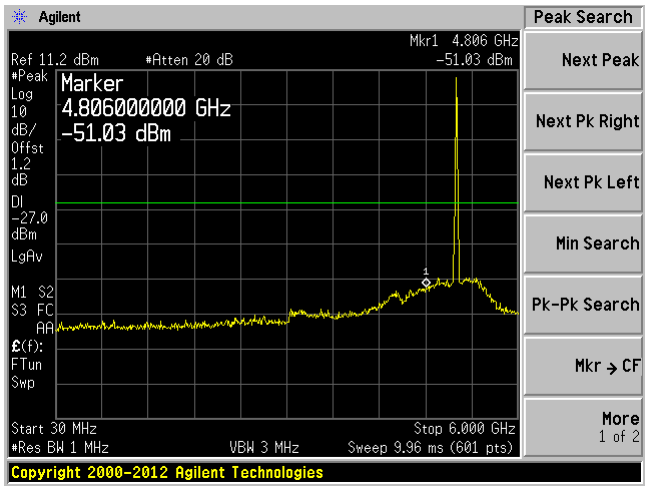


6 GHz – 40 GHz

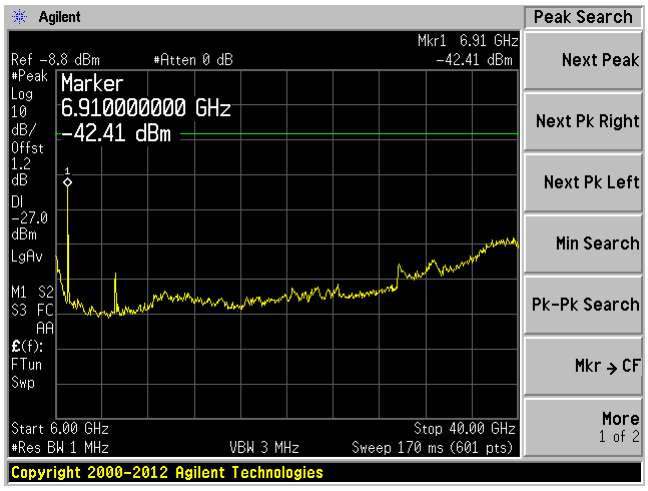


802.11a, Middle Channel, 5200 MHz

30 MHz – 6 GHz

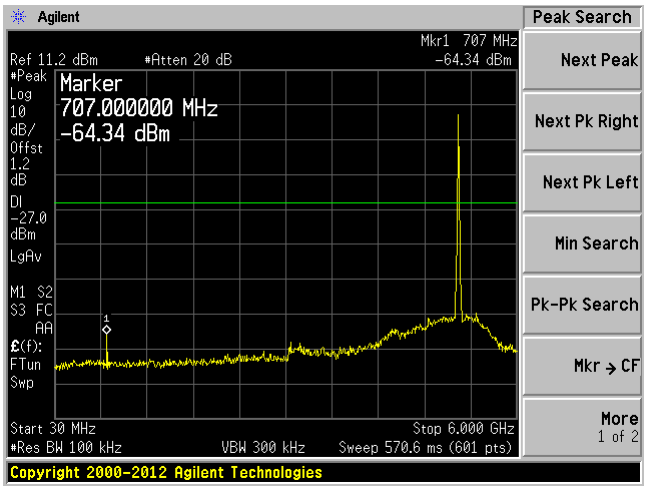


6 GHz – 40 GHz

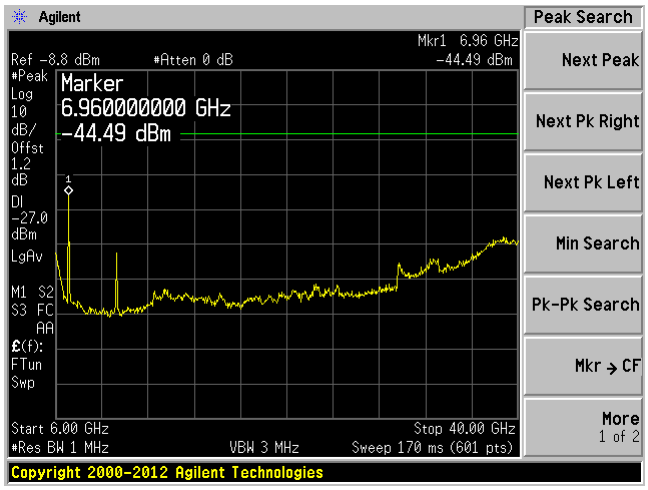


802.11a, High Channel, 5240 MHz

30 MHz – 6 GHz

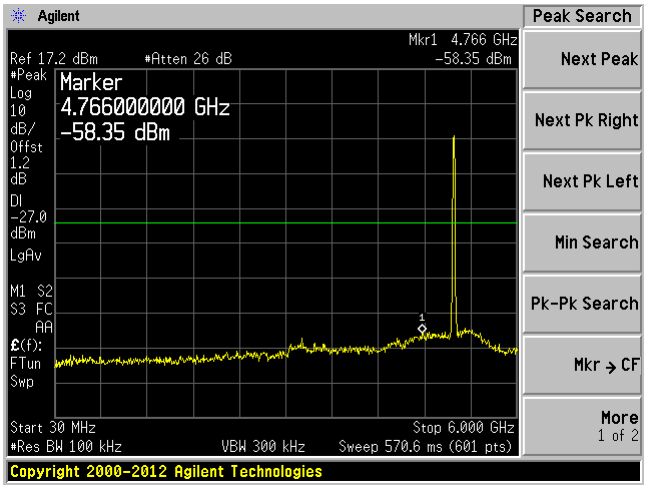


6 GHz – 40 GHz

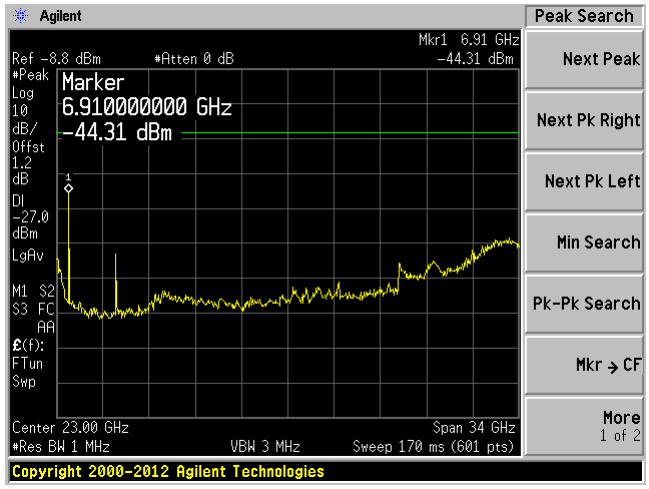


802.11n-HT20, Low Channel, 5180 MHz

30 MHz – 6 GHz

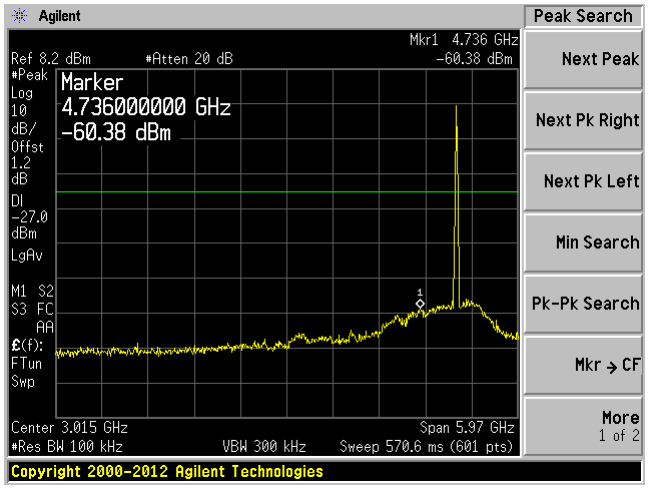


6 GHz – 40 GHz

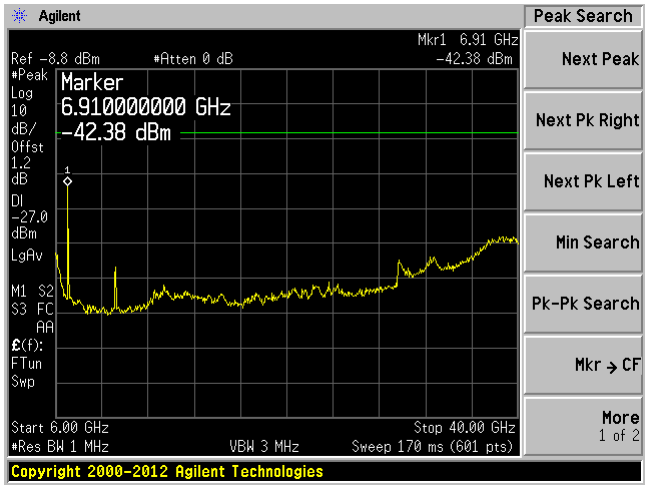


802.11n-HT20, Middle Channel, 5200 MHz

30 MHz – 6 GHz

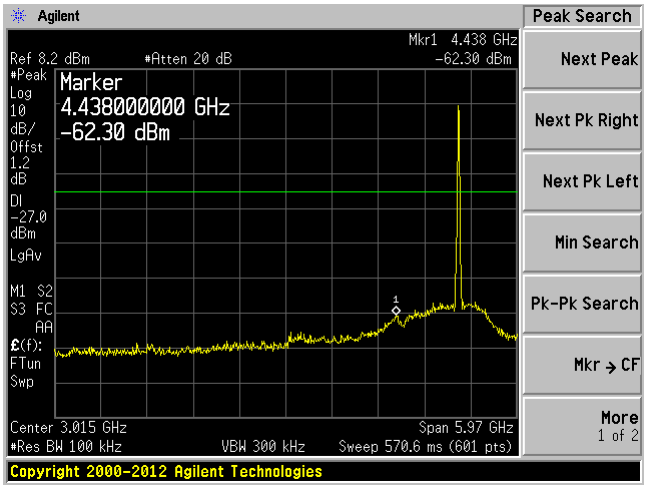


6 GHz – 40 GHz

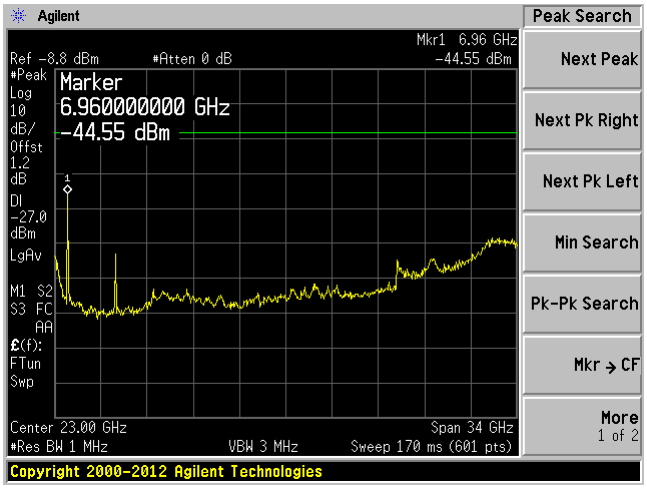


802.11n-HT20, High Channel, 5240 MHz

30 MHz – 6 GHz

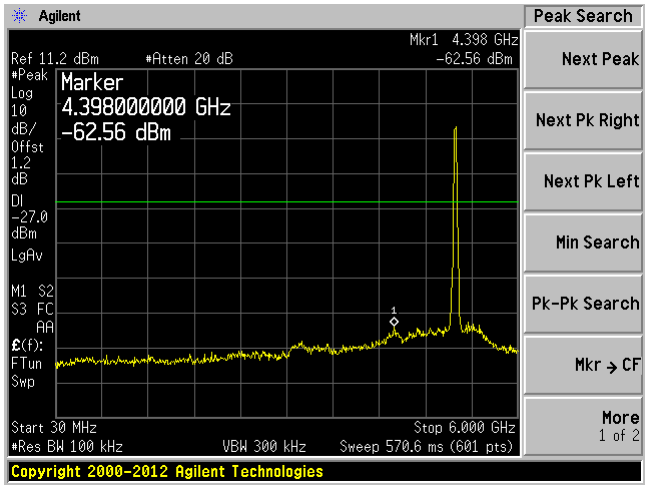


6 GHz – 40 GHz

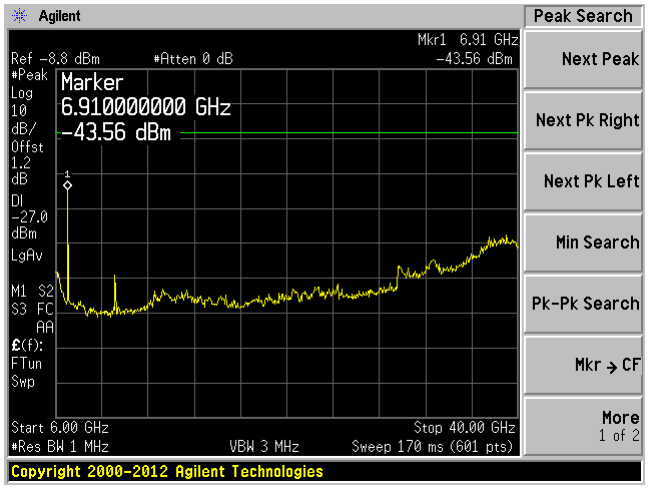


802.11n-HT40, Low Channel, 5190 MHz

30 MHz – 6 GHz

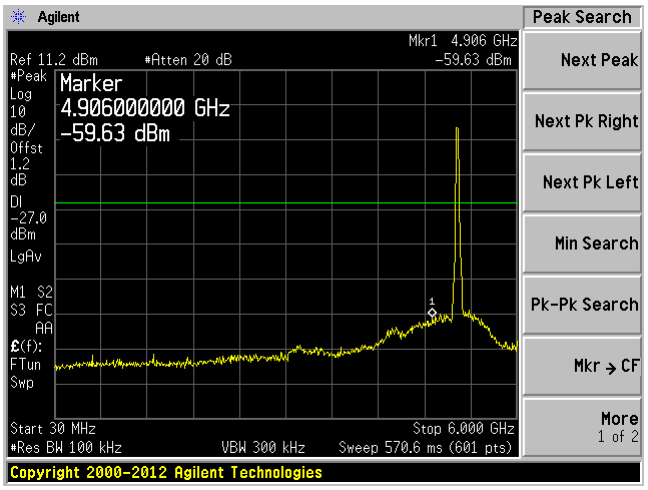


6 GHz – 40 GHz

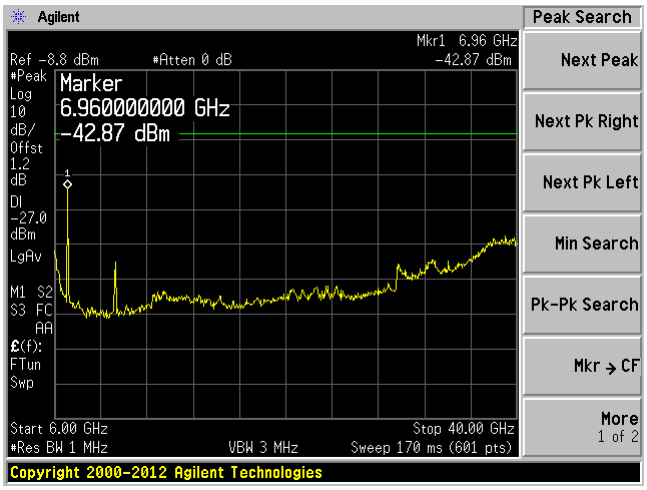


802.11n-HT40, High Channel, 5230 MHz

30 MHz – 6 GHz



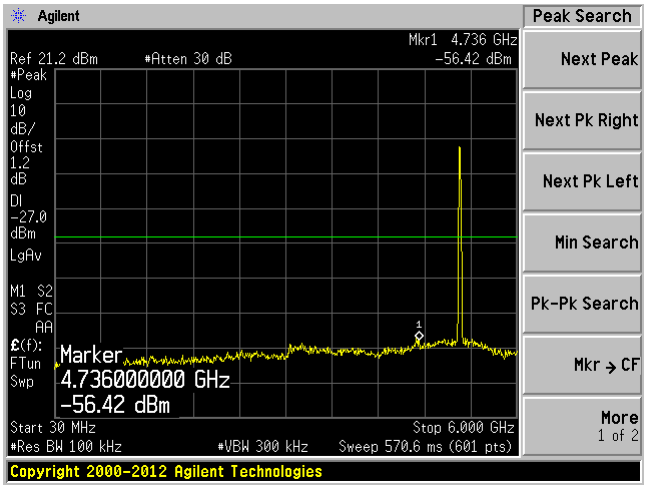
6 GHz – 40 GHz



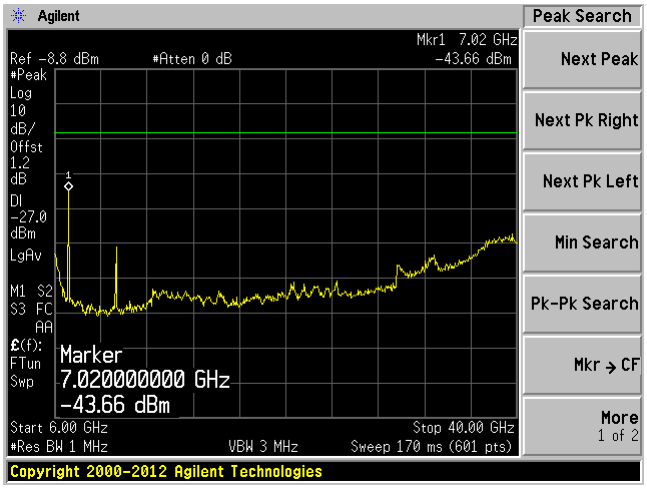
5250-5350 MHz Band

802.11a, Low Channel, 5260 MHz

30 MHz – 6 GHz

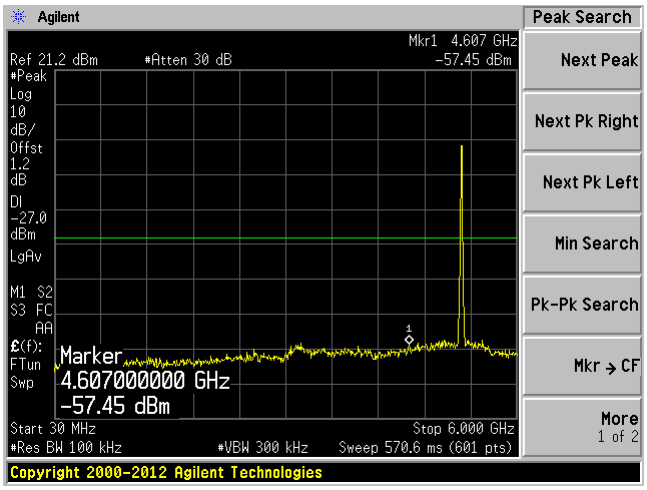


6 GHz – 40 GHz

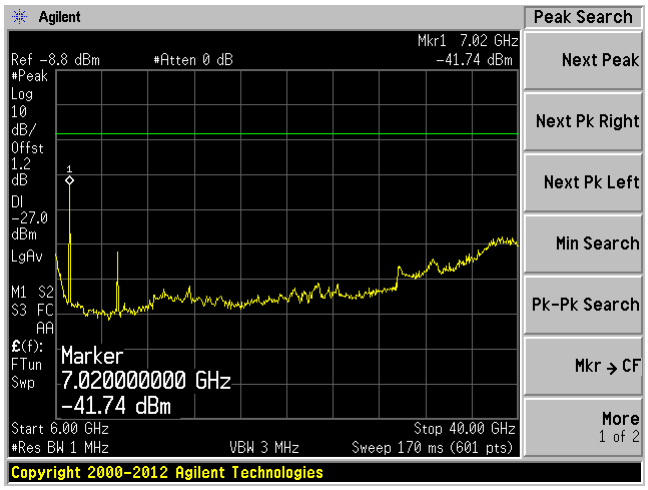


802.11a, Middle Channel, 5280 MHz

30 MHz – 6 GHz

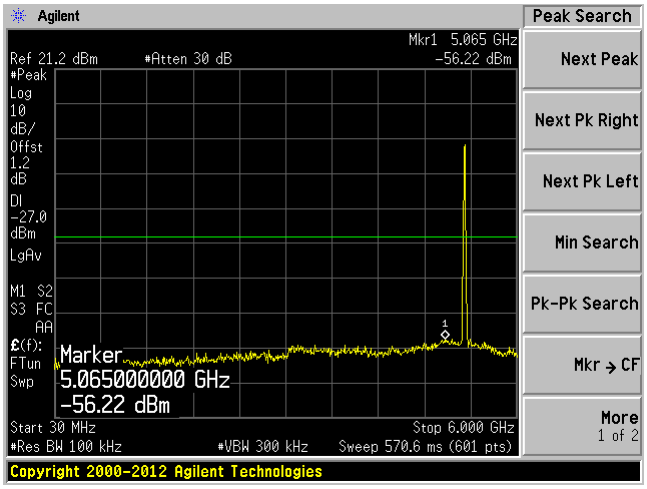


6 GHz – 25 GHz

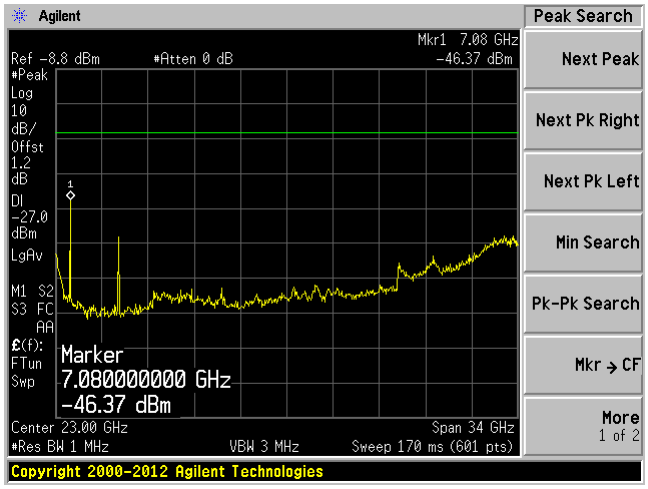


802.11a, High Channel, 5320 MHz

30 MHz – 6 GHz

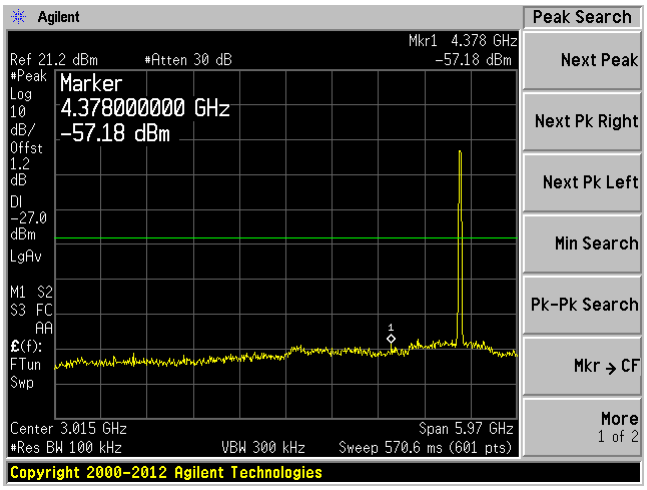


6 GHz – 40 GHz

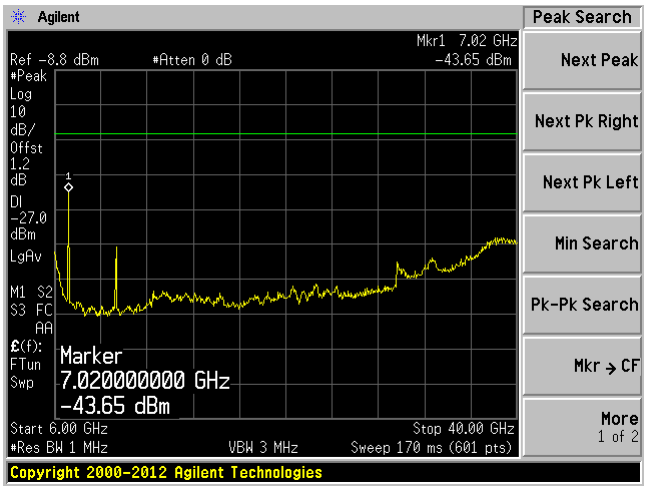


802.11n-HT20, Low Channel, 5260 MHz

30 MHz – 6 GHz

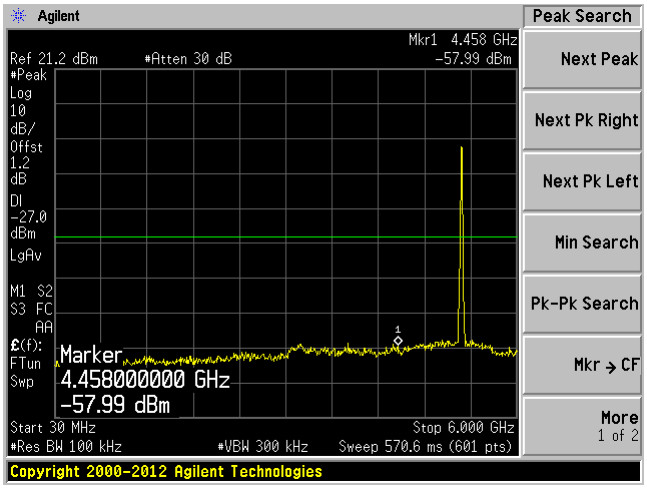


6 GHz – 40 GHz

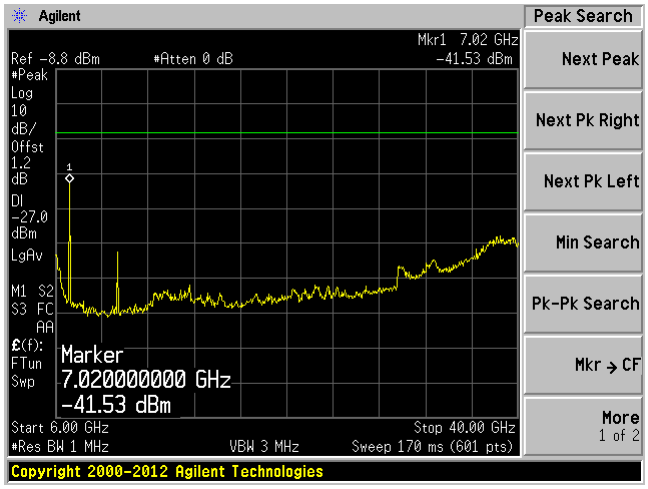


802.11n HT20, Middle Channel, 5280 MHz

30 MHz – 6 GHz

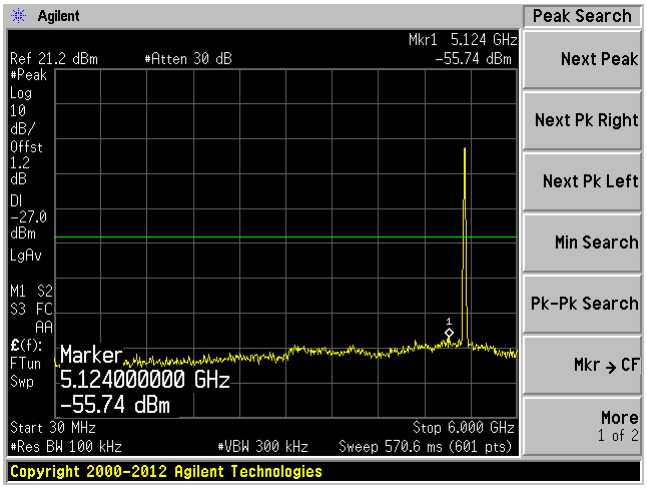


6 GHz – 40 GHz

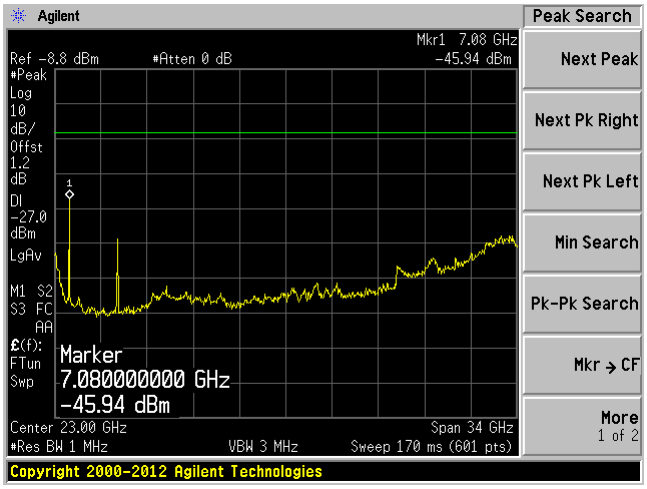


802.11n-HT20, High Channel, 5320 MHz

30 MHz – 6 GHz

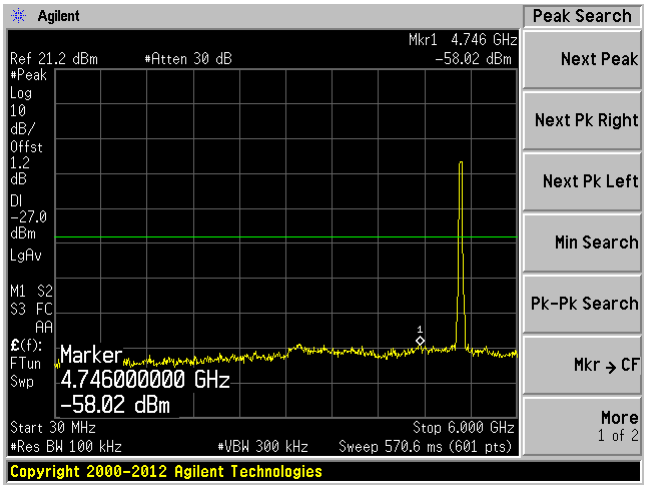


6 GHz – 40 GHz

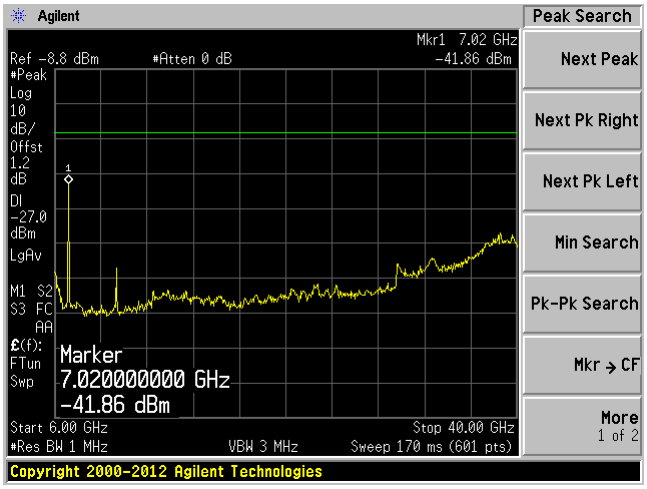


802.11n-HT40, Low Channel, 5270 MHz

30 MHz – 6 GHz

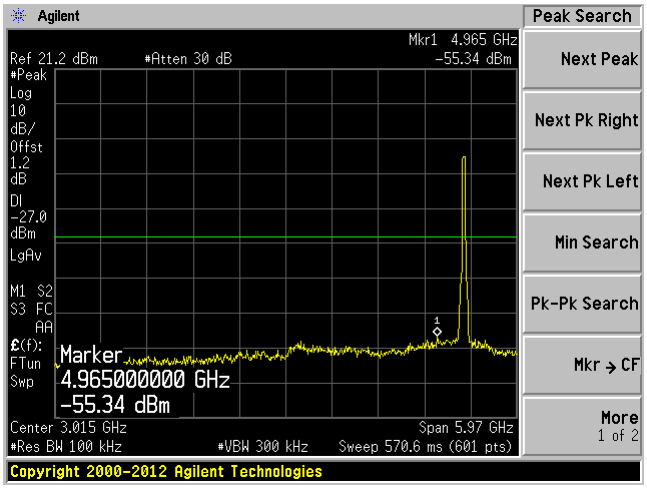


6 GHz – 40 GHz

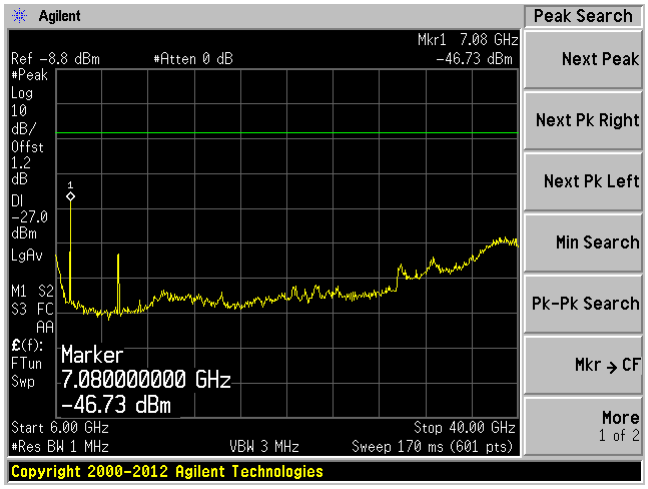


802.11n-HT40, High Channel, 5310 MHz

30 MHz – 6 GHz



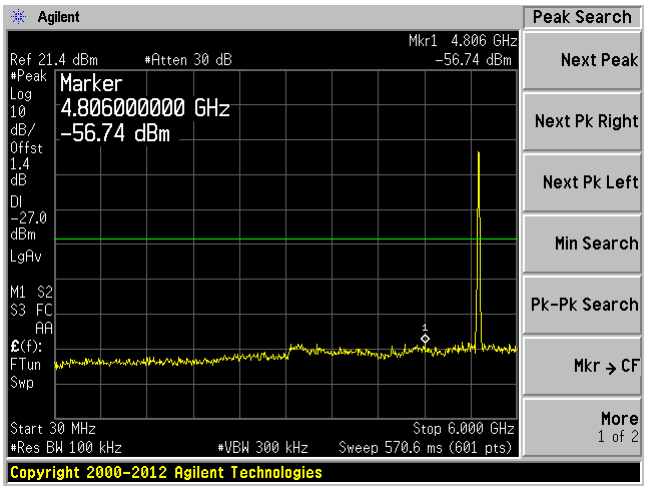
6 GHz – 40 GHz



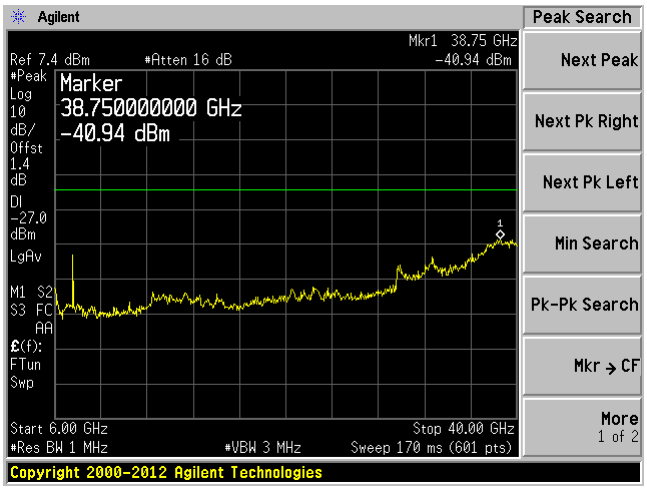
5470-5725 MHz Band

802.11a, Low Channel, 5500 MHz

30 MHz – 6 GHz

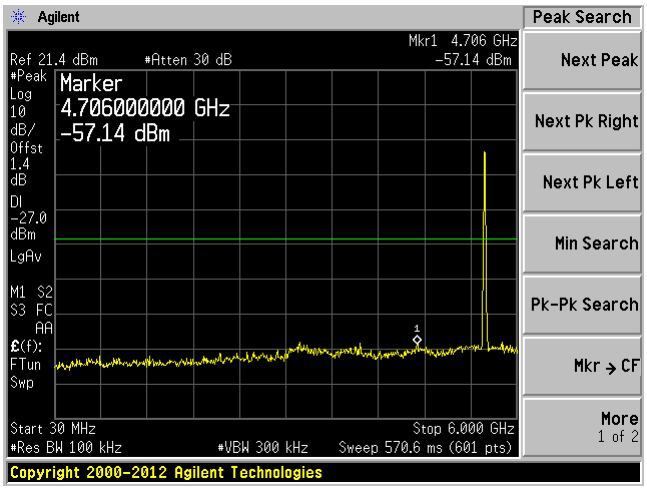


6 GHz – 40 GHz

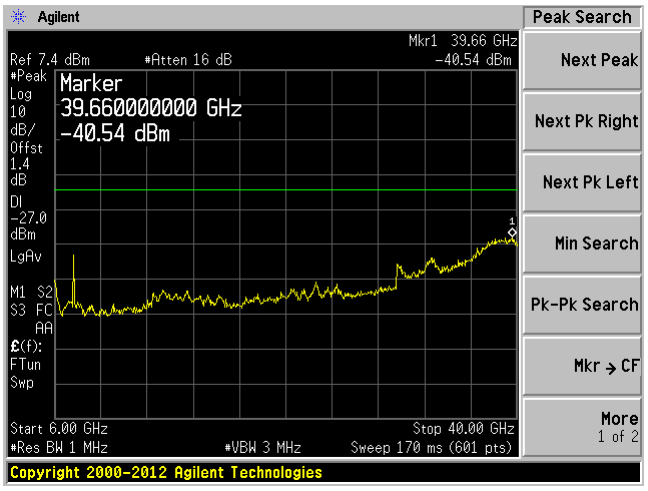


802.11a, Middle Channel, 5580 MHz

30 MHz – 6 GHz

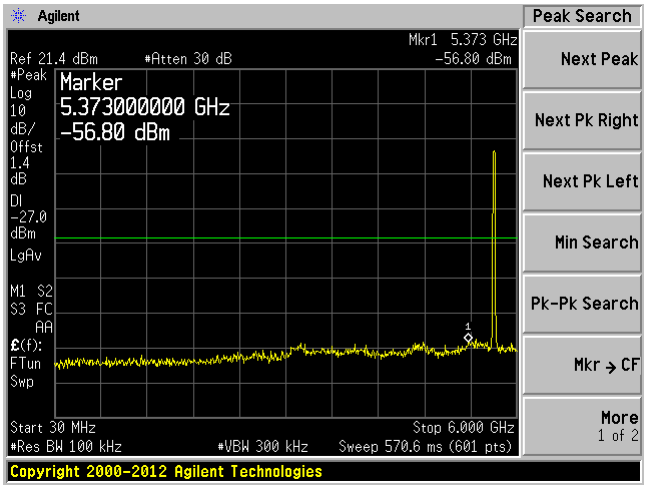


6 GHz –40 GHz

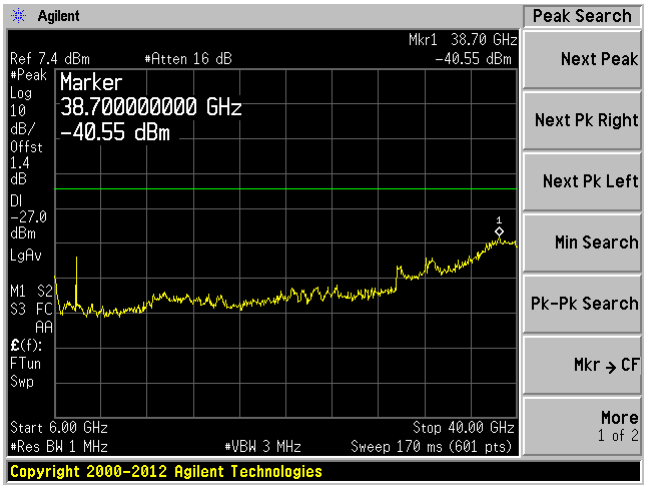


802.11a, High Channel, 5700 MHz

30 MHz – 6 GHz

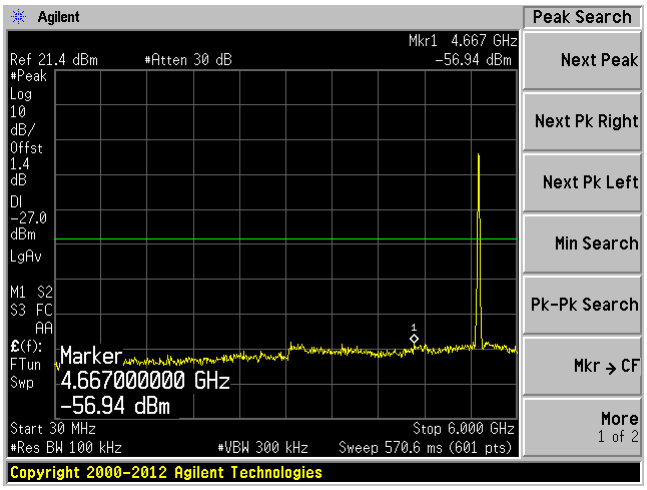


6 GHz – 40 GHz

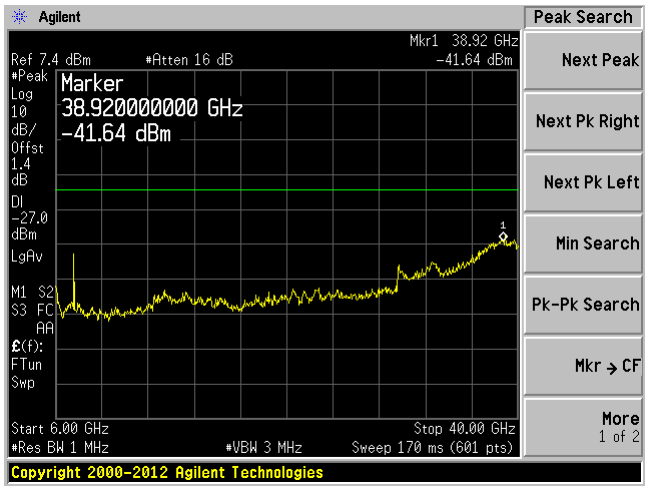


802.11n-HT20, Low Channel, 5500 MHz

30 MHz – 6 GHz

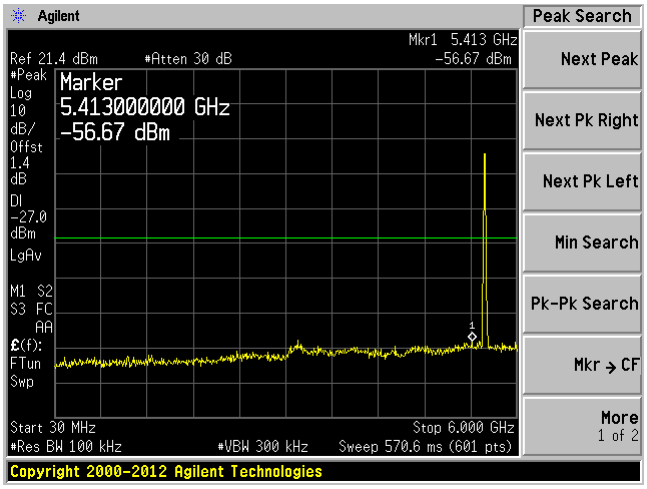


6 GHz – 40 GHz

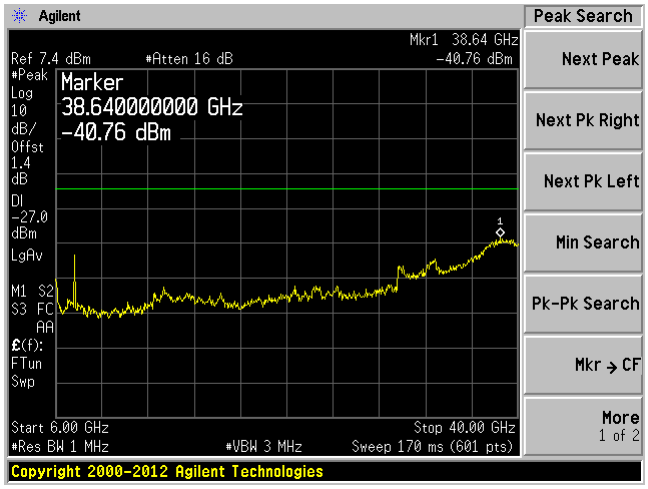


802.11n-HT20, Middle Channel, 5580 MHz

30 MHz – 6 GHz

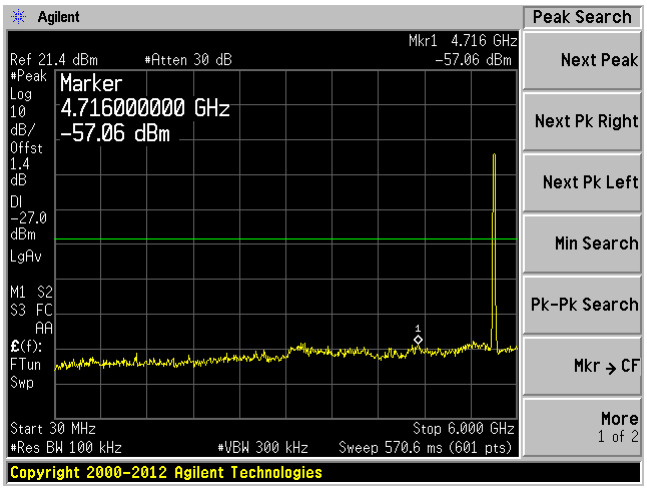


6 GHz – 40 GHz

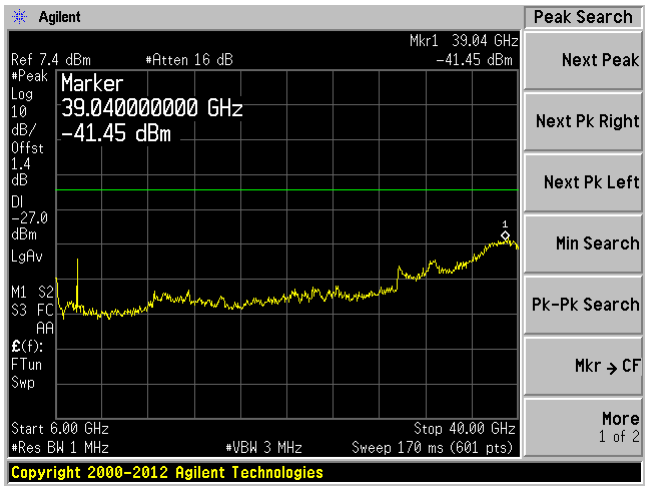


802.11n-HT20, High Channel, 5700 MHz

30 MHz – 6 GHz

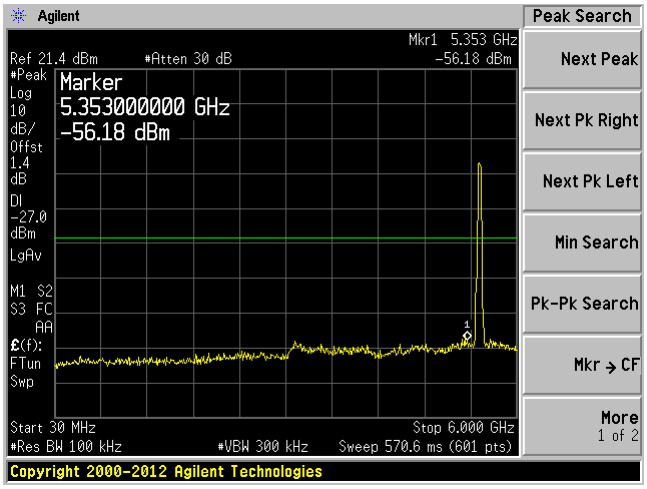


6 GHz – 40 GHz

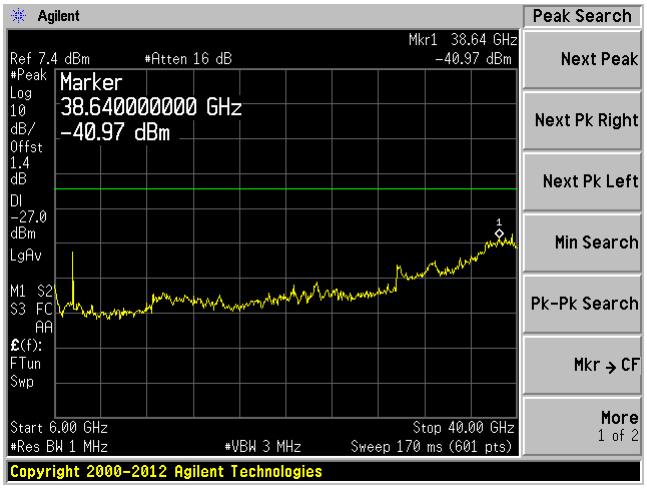


802.11n-HT40, Low Channel, 5510 MHz

30 MHz – 6 GHz

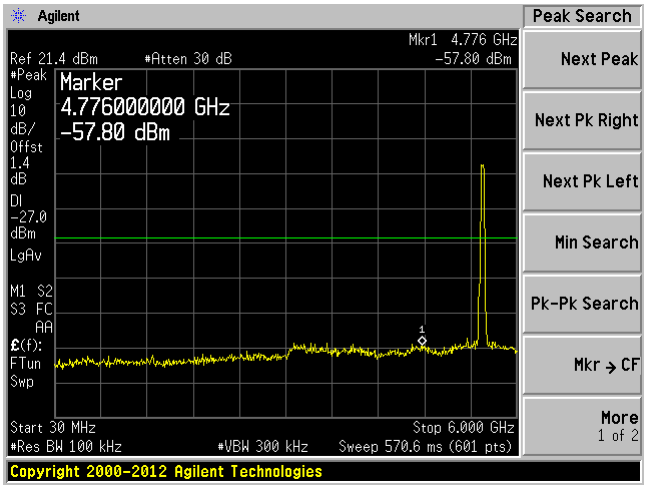


6 GHz – 40 GHz

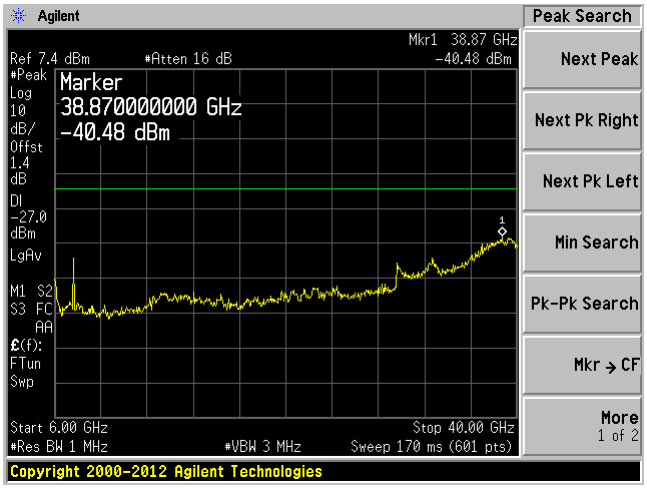


802.11n-HT40, Middle Channel, 5550 MHz

30 MHz – 6 GHz

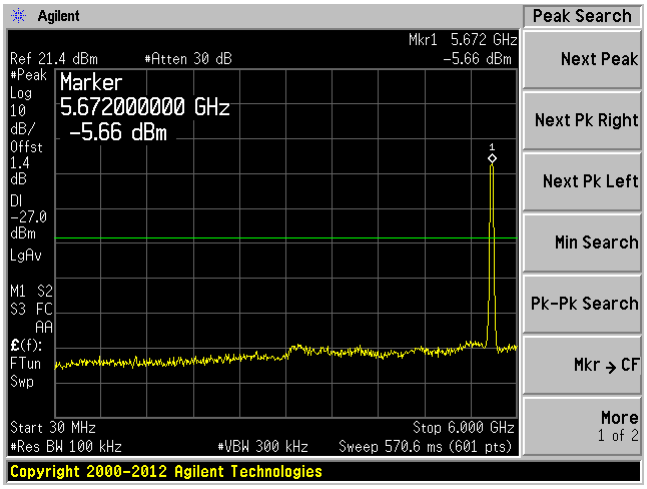
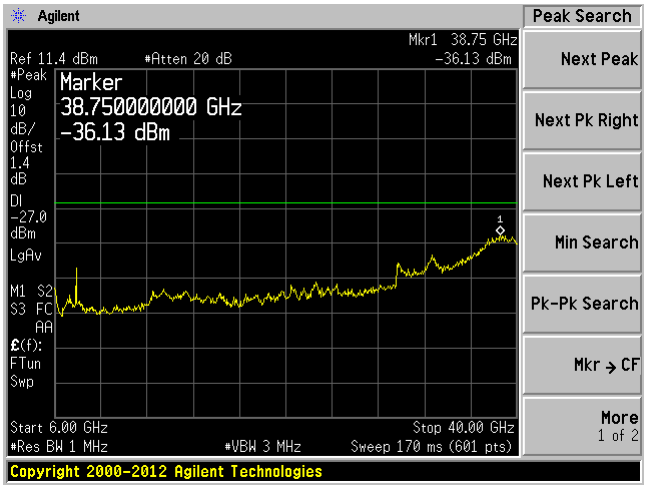


6 GHz – 40 GHz



802.11n-HT40, High Channel, 5670 MHz

30 MHz – 6 GHz



6 GHz – 40 GHz