FCC PART 15.407
TEST AND MEASUREMENT REPORT

For

Ruckus Wireless, Inc.

350 West Java Drive, Sunnyvale, CA 94089, USA

Model: R500
FCC ID: S9GR500

Report Type:	**Product Type:**
Original Report	802.11 a/b/g/n/ac Wireless Access Point

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1403241-407	Original Report	2014-08-08
1	R1403241-407 Rev A	Revised report to show similarity to product xClaim Xi-3	2014-08-18
2	R1403241-407 Rev B	Revised MPE	2014-09-02

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Ruckus Wireless, Inc*., and their product model: *R500, FCC ID: S9GR500* or the "EUT" as referred to in this report. The EUT is a dual band 2x2 MIMO 802.11 a/b/g/n/ac RLAN Access Point.

1.2 Mechanical Description of EUT

The EUT measures approximately 160 mm (L) x 160 mm (W) x 35 mm (H) and weighs approximately 400 g.

The data gathered are from a typical production sample provided by the manufacturer with serial number assigned by BACL: R1403241

1.3 Objective

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

The objective is to determine compliance with FCC Part 15.407 for Output Power, Antenna Requirements, AC Line Conducted Emissions, Bandwidth, power spectral density, Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submissions with FCC ID: S9GR500

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.

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 $\pm$2.0 dB for Conducted Emissions tests and $\pm$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:
.
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 configured for testing according to ANSI C63.4-2009.

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 *R500 ART* was provided by Ruckus Wireless Inc., 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 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Ruckus	DC Adaptor/POE	NPE-5818	740-64157-001
Ruckus	AC Adaptor	PA10244HUB	740-64125-010
Lenovo	Laptop	Ideapad U310	QB04927703

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Ruckus	Main Board	ASM 120-11267-001 rev. 3.1	RUK03752

2.6 Interface Ports and Cables

Cable Description	Length (m)	From	To
RJ45	1m	DC Adaptor/POE	EUT
RJ45	1m	Laptop	DC Adaptor/POE

2.7 Power Supply List and Details

Manufacturer	Description	Model	Part Number
Ruckus	Power Supply cord	PA1024-4HU	-
Ruckus	POE Power Adapter	NPE-5818	740-64157-001

3 Summary of Test Results

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)	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 §2.1051, §15.407(b)	Spurious Emissions at Antenna Terminals	Compliant

4 FCC §15.203 – Antenna Requirements

4.1 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.

4.2 Antenna Description

Manufacturers	Antenna Type/Pattern	Antenna Gain (dBi) @ 5 GHz
Ruckus	Omni	3.0

The antenna is an internal antenna with less 6 dBi gain; therefore, it complies with the antenna requirement. Please refer to the internal photos.

5 FCC §15.407 (f), §2.1091– RF Exposure

5.1 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

5.2 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

5.3 MPE Results

5.2 GHz band:

Maximum peak output power at antenna input terminal (dBm):	23.66
Maximum peak output power at antenna input terminal (mW):	232.2737
Prediction distance (cm):	20
Prediction frequency (MHz):	5240
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0922
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

5.8 GHz band:

Maximum peak output power at antenna input terminal (dBm):	25.14
Maximum peak output power at antenna input terminal (mW):	326.5878
Prediction distance (cm):	20
Prediction frequency (MHz):	5785
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	1.995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.1296
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

2.4 GHz band:

Maximum peak output power at antenna input terminal (dBm):	23.12
Maximum peak output power at antenna input terminal (mW):	205.1162
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	1.0
Maximum Antenna Gain (numeric):	1.258
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0513
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The total exposure level of 2.4 GHz and 5.8 GHz band co-location at 20 cm distance is 0.1296+0.0513= 0.1809 mW/cm^2 which is less than limit of 1.0 mW/ cm^2.

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 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1 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 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

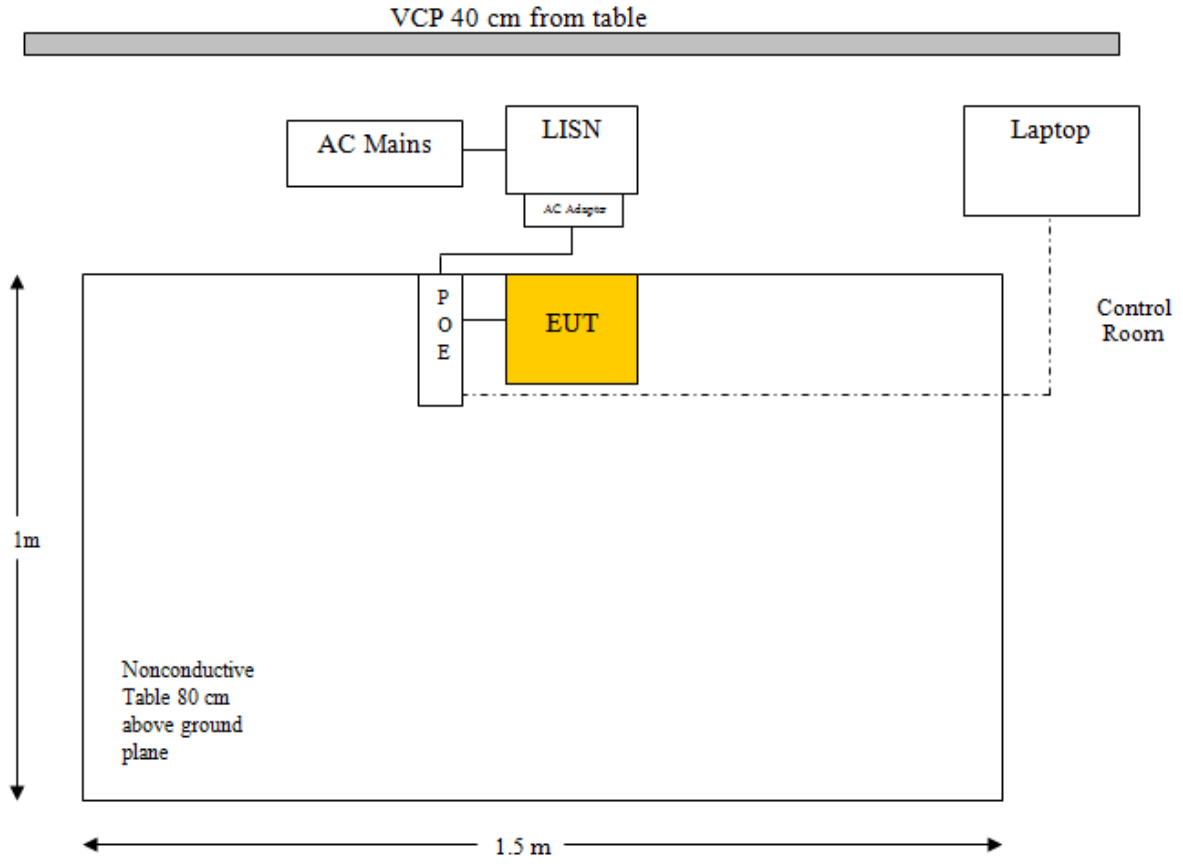
During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cord of the support equipment was connected to LISN-2.

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

POE:



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	100337	2014-03-28	1 year
Solar Electronics	LISN	9252-50-R-24-N	511205	2014-06-25	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 per the A2LA requirements, traceable to the NIST.*

6.7 Test Environmental Conditions

Temperature:	25º C
Relative Humidity:	41 %
ATM Pressure:	101.1-101.2 kPa

The testing was performed by Chen Ge on 2014-07-07 in 5m chamber3.

6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC Part 15 standard's conducted emissions limits, with the margin reading of:

2.4GHz and 5GHz co-location:

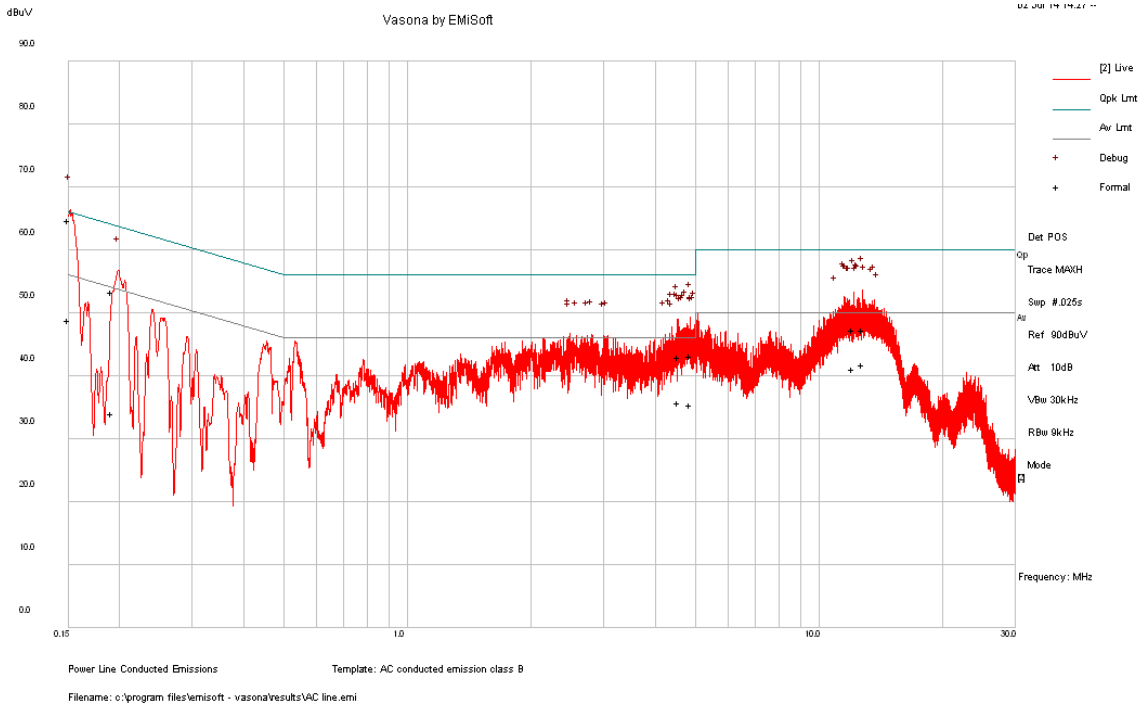
Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-0.49	0.1505	Neutral	0.15-30

6.9 Conducted Emissions Test Plots and Data

Worst case: 2.4 GHz and 5 GHz transmitting at same time.

POE:

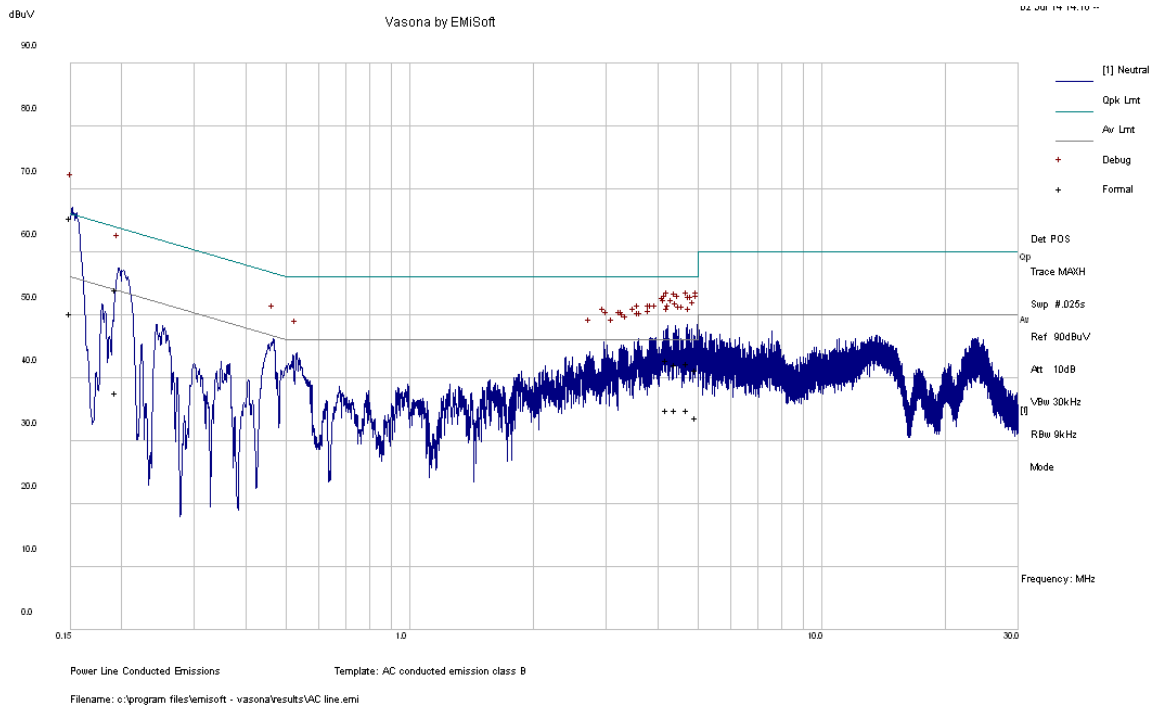
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.150032	64.8	Line	66	-1.2	QP
12.76115	47.33	Line	60	-12.67	QP
4.877971	43.28	Line	56	-12.72	QP
12.12168	47.27	Line	60	-12.73	QP
0.191963	53.3	Line	63.95	-10.65	QP
4.544114	43	Line	56	-13	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.150032	48.96	Line	56	-7.04	Ave.
12.76115	41.74	Line	50	-8.26	Ave.
4.877971	35.47	Line	46	-10.53	Ave.
12.12168	41.07	Line	50	-8.93	Ave.
0.191963	34.05	Line	53.95	-19.9	Ave.
4.544114	35.71	Line	46	-10.29	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.1505	65.48	Neutral	65.97	**-0.49**	QP
0.194094	54.01	Neutral	63.86	-9.85	QP
4.963619	41.26	Neutral	56	-14.74	QP
4.733461	42.4	Neutral	56	-13.6	QP
4.222255	42.89	Neutral	56	-13.11	QP
4.413713	42.11	Neutral	56	-13.89	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.1505	50.19	Neutral	55.97	-5.78	Ave.
0.194094	37.6	Neutral	53.86	-16.26	Ave.
4.963619	33.68	Neutral	46	-12.32	Ave.
4.733461	34.88	Neutral	46	-11.12	Ave.
4.222255	35	Neutral	46	-11	Ave.
4.413713	34.86	Neutral	46	-11.14	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.

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 Part 15.407 (b)

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) 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 e.i.r.p. of −27 dBm/MHz.

(3) 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 e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

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 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

For the radiated emissions test, the EUT host, and all support equipment power cords were 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 Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 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 for Class A. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2014-06-18	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2014-06-09	1 year
Agilent	Pre-amplifier	8449B	3008A01978	2014-02-04	1 year
WiseWave	Horn Antenna	ARH-4223-02	10555-01	2012-08-09	3 Years
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 *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

7.6 Test Environmental Conditions

Temperature:	21-24º C
Relative Humidity:	40-46 %
ATM Pressure:	102.1-104.3 kPa

The testing was performed by Chen Ge on 2014-07-07 to 2014-07-10 at 5 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 standard's radiated emissions limits, and had the worst margin of:

30 MHz-1 GHz

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-2.32	37.68	Vertical	30 MHz – 1 GHz

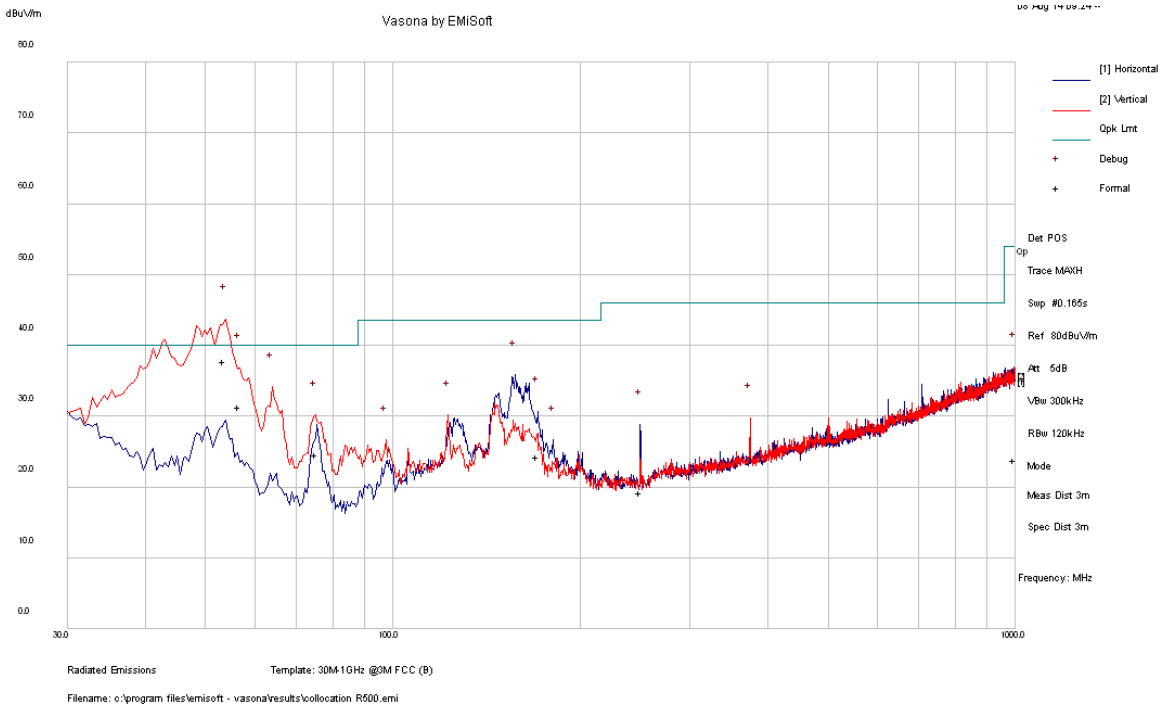
1 GHz-40 GHz

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-2.438	17475	Horizontal	1 - 40 GHz

7.8 Radiated Emissions Test Result Data

1) 30 MHz – 1 GHz

2.4 GHz and 5 GHz Co-Location



Frequency (MHz)	Cord. Reading (dBµV/m)	Measurement Type	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
53.5995	37.78	QP	V	110	263	40	-2.22
56.67525	31.29	QP	V	111	246	40	-8.71
75.209	24.67	QP	V	179	333	40	-15.33
170.4068	24.37	QP	H	170	234	43.5	-19.13
994.134	23.76	QP	V	197	333	54	-30.24

2) 1–40 GHz

5.2 GHz 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 5180 MHz											
10360	44	0	100	V	38.329	7.02	35.12	54.229	74	-19.771	Peak
10360	43.36	0	100	H	38.329	7.02	35.12	53.589	74	-20.411	Peak
10360	30.03	0	100	V	38.329	7.02	35.12	40.259	54	-13.741	Ave
10360	30.13	0	100	H	38.329	7.02	35.12	40.359	54	-13.641	Ave
15540	43.75	0	100	V	38.432	8.38	34.05	56.512	74	-17.488	Peak
15540	43.41	0	100	H	38.432	8.38	34.05	56.172	74	-17.828	Peak
15540	29.79	0	100	V	38.432	8.38	34.05	42.552	54	-11.448	Ave
15540	29.56	0	100	H	38.432	8.38	34.05	42.322	54	-11.678	Ave
20720	41.9	0	100	V	34.557	9.68	34.01	52.127	74	-21.873	Peak
20720	42.75	0	100	H	34.557	9.68	34.01	52.977	74	-21.023	Peak
20720	28.01	0	100	V	34.557	9.68	34.01	38.237	54	-15.763	Ave
20720	28.11	0	100	H	34.557	9.68	34.01	38.337	54	-15.663	Ave
Middle Channel 5200 MHz											
10400	43.65	0	100	V	38.329	6.99	35.12	53.849	74	-20.151	Peak
10400	44.37	0	100	H	38.329	6.99	35.12	54.569	74	-19.431	Peak
10400	29.98	0	100	V	38.329	6.99	35.12	40.179	54	-13.821	Ave
10400	29.93	0	100	H	38.329	6.99	35.12	40.129	54	-13.871	Ave
15600	45.5	0	100	V	38.325	8.4	34.15	58.075	74	-15.925	Peak
15600	44.76	0	100	H	38.325	8.4	34.15	57.335	74	-16.665	Peak
15600	30.66	0	100	V	38.325	8.4	34.15	43.235	54	-10.765	Ave
15600	30.73	0	100	H	38.325	8.4	34.15	43.305	54	-10.695	Ave
20800	42.49	0	100	V	34.557	9.8	34.11	52.737	74	-21.263	Peak
20800	43.04	0	100	H	34.557	9.8	34.11	53.287	74	-20.713	Peak
20800	28.67	0	100	V	34.557	9.8	34.11	38.917	54	-15.083	Ave
20800	28.59	0	100	H	34.557	9.8	34.11	38.837	54	-15.163	Ave
High Channel 5240 MHz											
10480	43.38	0	100	V	38.343	7	34.97	53.753	74	-20.247	Peak
10480	43.1	0	100	H	38.343	7	34.97	53.473	74	-20.527	Peak
10480	29.4	0	100	V	38.343	7	34.97	39.773	54	-14.227	Ave
10480	29.48	0	100	H	38.343	7	34.97	39.853	54	-14.147	Ave
15720	43.76	0	100	V	38.188	8.38	34.25	56.078	74	-17.922	Peak
15720	43.62	0	100	H	38.188	8.38	34.25	55.938	74	-18.062	Peak
15720	29.87	0	100	V	38.188	8.38	34.25	42.188	54	-11.812	Ave
15720	29.71	0	100	H	38.188	8.38	34.25	42.028	54	-11.972	Ave
20960	41.64	0	100	V	34.68	9.81	34.19	51.94	74	-22.06	Peak
20960	41.63	0	100	H	34.68	9.81	34.19	51.93	74	-22.07	Peak
20960	27.56	0	100	V	34.68	9.81	34.19	37.86	54	-16.14	Ave
20960	27.34	0	100	H	34.68	9.81	34.19	37.64	54	-16.36	Ave

802.11n-HT20 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	44.11	0	100	V	38.329	7.02	35.12	54.339	74	-19.661	Peak
10360	43.59	0	100	H	38.329	7.02	35.12	53.819	74	-20.181	Peak
10360	30.06	0	100	V	38.329	7.02	35.12	40.289	54	-13.711	Ave
10360	30.11	0	100	H	38.329	7.02	35.12	40.339	54	-13.661	Ave
15540	43.72	0	100	V	38.432	8.38	34.05	56.482	74	-17.518	Peak
15540	43.43	0	100	H	38.432	8.38	34.05	56.192	74	-17.808	Peak
15540	29.61	0	100	V	38.432	8.38	34.05	42.372	54	-11.628	Ave
15540	29.66	0	100	H	38.432	8.38	34.05	42.422	54	-11.578	Ave
20720	41.92	0	100	V	34.557	9.68	34.01	52.147	74	-21.853	Peak
20720	42.62	0	100	H	34.557	9.68	34.01	52.847	74	-21.153	Peak
20720	28.12	0	100	V	34.557	9.68	34.01	38.347	54	-15.653	Ave
20720	28.11	0	100	H	34.557	9.68	34.01	38.337	54	-15.663	Ave
Middle Channel 5200 MHz											
10400	43.61	0	100	V	38.329	6.99	35.12	53.809	74	-20.191	Peak
10400	44.04	0	100	H	38.329	6.99	35.12	54.239	74	-19.761	Peak
10400	29.97	0	100	V	38.329	6.99	35.12	40.169	54	-13.831	Ave
10400	29.95	0	100	H	38.329	6.99	35.12	40.149	54	-13.851	Ave
15600	45.69	0	100	V	38.325	8.4	34.15	58.265	74	-15.735	Peak
15600	44.45	0	100	H	38.325	8.4	34.15	57.025	74	-16.975	Peak
15600	30.63	0	100	V	38.325	8.4	34.15	43.205	54	-10.795	Ave
15600	30.64	0	100	H	38.325	8.4	34.15	43.215	54	-10.785	Ave
20800	42.51	0	100	V	34.557	9.8	34.11	52.757	74	-21.243	Peak
20800	43.13	0	100	H	34.557	9.8	34.11	53.377	74	-20.623	Peak
20800	28.61	0	100	V	34.557	9.8	34.11	38.857	54	-15.143	Ave
20800	28.68	0	100	H	34.557	9.8	34.11	38.927	54	-15.073	Ave
High Channel 5240 MHz											
10480	43.48	0	100	V	38.343	7	34.97	53.853	74	-20.147	Peak
10480	43.38	0	100	H	38.343	7	34.97	53.753	74	-20.247	Peak
10480	29.5	0	100	V	38.343	7	34.97	39.873	54	-14.127	Ave
10480	29.59	0	100	H	38.343	7	34.97	39.963	54	-14.037	Ave
15720	43.25	0	100	V	38.188	8.38	34.25	55.568	74	-18.432	Peak
15720	43.03	0	100	H	38.188	8.38	34.25	55.348	74	-18.652	Peak
15720	29.42	0	100	V	38.188	8.38	34.25	41.738	54	-12.262	Ave
15720	29.4	0	100	H	38.188	8.38	34.25	41.718	54	-12.282	Ave
20960	41.34	0	100	V	34.68	9.81	34.19	51.64	74	-22.36	Peak
20960	41.08	0	100	H	34.68	9.81	34.19	51.38	74	-22.62	Peak
20960	27.45	0	100	V	34.68	9.81	34.19	37.75	54	-16.25	Ave
20960	27.62	0	100	H	34.68	9.81	34.19	37.92	54	-16.08	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	45	0	100	V	38.329	7.02	35.12	55.229	74	-18.771	Peak
10380	44.45	0	100	H	38.329	7.02	35.12	54.679	74	-19.321	Peak
10380	30.86	0	100	V	38.329	7.02	35.12	41.089	54	-12.911	Ave
10380	30.84	0	100	H	38.329	7.02	35.12	41.069	54	-12.931	Ave
15570	44.5	0	100	V	38.325	8.4	34.15	57.075	74	-16.925	Peak
15570	44.21	0	100	H	38.325	8.4	34.15	56.785	74	-17.215	Peak
15570	30.53	0	100	V	38.325	8.4	34.15	43.105	54	-10.895	Ave
15570	30.51	0	100	H	38.325	8.4	34.15	43.085	54	-10.915	Ave
20760	42.56	0	100	V	34.557	9.75	34.11	52.757	74	-21.243	Peak
20760	42.21	0	100	H	34.557	9.75	34.11	52.407	74	-21.593	Peak
20760	28.7	0	100	V	34.557	9.75	34.11	38.897	54	-15.103	Ave
20760	28.69	0	100	H	34.557	9.75	34.11	38.887	54	-15.113	Ave
High Channel 5230 MHz											
10460	44.54	0	100	V	38.343	6.99	34.97	54.903	74	-19.097	Peak
10460	44.61	0	100	H	38.343	6.99	34.97	54.973	74	-19.027	Peak
10460	30.33	0	100	V	38.343	6.99	34.97	40.693	54	-13.307	Ave
10460	30.29	0	100	H	38.343	6.99	34.97	40.653	54	-13.347	Ave
15690	44.69	0	100	V	38.188	8.44	34.25	57.068	74	-16.932	Peak
15690	44.19	0	100	H	38.188	8.44	34.25	56.568	74	-17.432	Peak
15690	30.71	0	100	V	38.188	8.44	34.25	43.088	54	-10.912	Ave
15690	30.75	0	100	H	38.188	8.44	34.25	43.128	54	-10.872	Ave
20920	42.95	0	100	V	34.68	9.76	34.14	53.25	74	-20.75	Peak
20920	42.86	0	100	H	34.68	9.76	34.14	53.16	74	-20.84	Peak
20920	29.16	0	100	V	34.68	9.76	34.14	39.46	54	-14.54	Ave
20920	29.03	0	100	H	34.68	9.76	34.14	39.33	54	-14.67	Ave

802.11ac VHT80 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)	
Channel 5210 MHz											
10420	43.08	0	100	V	38.329	7.02	35.12	53.309	74	-20.691	Peak
10420	44.19	0	100	H	38.329	7.02	35.12	54.419	74	-19.581	Peak
10420	29.62	0	100	V	38.329	7.02	35.12	39.849	54	-14.151	Ave
10420	29.79	0	100	H	38.329	7.02	35.12	40.019	54	-13.981	Ave
15630	43.58	0	100	V	38.325	8.4	34.15	56.155	74	-17.845	Peak
15630	43.39	0	100	H	38.325	8.4	34.15	55.965	74	-18.035	Peak
15630	29.68	0	100	V	38.325	8.4	34.15	42.255	54	-11.745	Ave
15630	29.74	0	100	H	38.325	8.4	34.15	42.315	54	-11.685	Ave
20840	41.38	0	100	V	34.557	9.75	34.11	51.577	74	-22.423	Peak
20840	40.95	0	100	H	34.557	9.75	34.11	51.147	74	-22.853	Peak
20840	27.22	0	100	V	34.557	9.75	34.11	37.417	54	-16.583	Ave
20840	27.44	0	100	H	34.557	9.75	34.11	37.637	54	-16.363	Ave

5.8 GHz 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 5745 MHz											
11490	41.58	0	100	V	39.047	7.6	34.51	53.717	74	-20.283	Peak
11490	41.71	0	100	H	39.047	7.6	34.51	53.847	74	-20.153	Peak
11490	28.26	0	100	V	39.047	7.6	34.51	40.397	54	-13.603	Ave
11490	27.92	0	100	H	39.047	7.6	34.51	40.057	54	-13.943	Ave
17235	43.16	0	100	V	43.239	8.63	33.36	61.669	74	-12.331	Peak
17235	42.4	0	100	H	43.239	8.63	33.36	60.909	74	-13.091	Peak
17235	28.68	0	100	V	43.239	8.63	33.36	47.189	54	-6.811	Ave
17235	28.82	0	100	H	43.239	8.63	33.36	47.329	54	-6.671	Ave
22980	40.23	0	100	V	35.2	10.07	34.07	51.43	74	-22.57	Peak
22980	39.9	0	100	H	35.2	10.07	34.07	51.1	74	-22.9	Peak
22980	26.39	0	100	V	35.2	10.07	34.07	37.59	54	-16.41	Ave
22980	26.27	0	100	H	35.2	10.07	34.07	37.47	54	-16.53	Ave
Middle Channel 5785 MHz											
11570	41.99	0	100	V	39.203	7.69	34.53	54.353	74	-19.647	Peak
11570	42.26	0	100	H	39.203	7.69	34.53	54.623	74	-19.377	Peak
11570	28.43	0	100	V	39.203	7.69	34.53	40.793	54	-13.207	Ave
11570	28.59	0	100	H	39.203	7.69	34.53	40.953	54	-13.047	Ave
17355	43.98	0	100	V	45.311	8.64	33.51	64.421	74	-9.579	Peak
17355	42.99	0	100	H	45.311	8.64	33.51	63.431	74	-10.569	Peak
17355	29.46	0	100	V	45.311	8.64	33.51	49.901	54	-4.099	Ave
17355	29.28	0	100	H	45.311	8.64	33.51	49.721	54	-4.279	Ave
23140	40.7	0	100	V	35.2	10.23	34.07	52.06	74	-21.94	Peak
23140	41.8	0	100	H	35.2	10.23	34.07	53.16	74	-20.84	Peak
23140	27.33	0	100	V	35.2	10.23	34.07	38.69	54	-15.31	Ave
23140	27.28	0	100	H	35.2	10.23	34.07	38.64	54	-15.36	Ave
High Channel 5825 MHz											
11650	42.98	0	100	V	39.203	7.78	34.53	55.433	74	-18.567	Peak
11650	43.47	0	100	H	39.203	7.78	34.53	55.923	74	-18.077	Peak
11650	29.21	0	100	V	39.203	7.78	34.53	41.663	54	-12.337	Ave
11650	29	0	100	H	39.203	7.78	34.53	41.453	54	-12.547	Ave
17475	43.23	0	100	V	46.782	8.74	33.53	65.222	74	-8.778	Peak
17475	43.23	0	100	H	46.782	8.74	33.53	65.222	74	-8.778	Peak
17475	29.54	0	100	V	46.782	8.74	33.53	51.532	54	-2.468	Ave
17475	29.57	0	100	H	46.782	8.74	33.53	51.562	54	**-2.438**	Ave
23300	41.79	0	100	V	35.2	10.13	33.99	53.13	74	-20.87	Peak
23300	41.43	0	100	H	35.2	10.13	33.99	52.77	74	-21.23	Peak
23300	27.94	0	100	V	35.2	10.13	33.99	39.28	54	-14.72	Ave
23300	28	0	100	H	35.2	10.13	33.99	39.34	54	-14.66	Ave

802.11n-HT20 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 5745 MHz											
11490	41.65	0	100	V	39.047	7.6	34.51	53.787	74	-20.213	Peak
11490	41.67	0	100	H	39.047	7.6	34.51	53.807	74	-20.193	Peak
11490	28.31	0	100	V	39.047	7.6	34.51	40.447	54	-13.553	Ave
11490	28.23	0	100	H	39.047	7.6	34.51	40.367	54	-13.633	Ave
17235	43.24	0	100	V	43.239	8.63	33.36	61.749	74	-12.251	Peak
17235	42.37	0	100	H	43.239	8.63	33.36	60.879	74	-13.121	Peak
17235	28.66	0	100	V	43.239	8.63	33.36	47.169	54	-6.831	Ave
17235	28.74	0	100	H	43.239	8.63	33.36	47.249	54	-6.751	Ave
22980	40.21	0	100	V	35.2	10.07	34.07	51.41	74	-22.59	Peak
22980	39.98	0	100	H	35.2	10.07	34.07	51.18	74	-22.82	Peak
22980	26.31	0	100	V	35.2	10.07	34.07	37.51	54	-16.49	Ave
22980	26.24	0	100	H	35.2	10.07	34.07	37.44	54	-16.56	Ave
Middle Channel 5785 MHz											
11570	41.91	0	100	V	39.203	7.69	34.53	54.273	74	-19.727	Peak
11570	42.28	0	100	H	39.203	7.69	34.53	54.643	74	-19.357	Peak
11570	28.49	0	100	V	39.203	7.69	34.53	40.853	54	-13.147	Ave
11570	28.41	0	100	H	39.203	7.69	34.53	40.773	54	-13.227	Ave
17355	43.89	0	100	V	45.311	8.64	33.51	64.331	74	-9.669	Peak
17355	43.14	0	100	H	45.311	8.64	33.51	63.581	74	-10.419	Peak
17355	29.44	0	100	V	45.311	8.64	33.51	49.881	54	-4.119	Ave
17355	29.29	0	100	H	45.311	8.64	33.51	49.731	54	-4.269	Ave
23140	40.79	0	100	V	35.2	10.23	34.07	52.15	74	-21.85	Peak
23140	41.81	0	100	H	35.2	10.23	34.07	53.17	74	-20.83	Peak
23140	27.34	0	100	V	35.2	10.23	34.07	38.7	54	-15.3	Ave
23140	27.27	0	100	H	35.2	10.23	34.07	38.63	54	-15.37	Ave
High Channel 5825 MHz											
11650	43.05	0	100	V	39.203	7.78	34.53	55.503	74	-18.497	Peak
11650	43.41	0	100	H	39.203	7.78	34.53	55.863	74	-18.137	Peak
11650	29.2	0	100	V	39.203	7.78	34.53	41.653	54	-12.347	Ave
11650	29.1	0	100	H	39.203	7.78	34.53	41.553	54	-12.447	Ave
17475	43.26	0	100	V	46.782	8.74	33.53	65.252	74	-8.748	Peak
17475	43.33	0	100	H	46.782	8.74	33.53	65.322	74	-8.678	Peak
17475	29.55	0	100	V	46.782	8.74	33.53	51.542	54	-2.458	Ave
17475	29.57	0	100	H	46.782	8.74	33.53	51.562	54	-2.438	Ave
23300	41.84	0	100	V	35.2	10.13	33.99	53.18	74	-20.82	Peak
23300	41.56	0	100	H	35.2	10.13	33.99	52.9	74	-21.1	Peak
23300	27.97	0	100	V	35.2	10.13	33.99	39.31	54	-14.69	Ave
23300	27.99	0	100	H	35.2	10.13	33.99	39.33	54	-14.67	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 5755 MHz											
11510	42.06	0	100	V	39.047	7.6	34.51	54.197	74	-19.803	Peak
11510	42.68	0	100	H	39.047	7.6	34.51	54.817	74	-19.183	Peak
11510	28.34	0	100	V	39.047	7.6	34.51	40.477	54	-13.523	Ave
11510	28.43	0	100	H	39.047	7.6	34.51	40.567	54	-13.433	Ave
17265	44.32	0	100	V	43.239	8.63	33.41	62.779	74	-11.221	Peak
17265	44.25	0	100	H	43.239	8.63	33.41	62.709	74	-11.291	Peak
17265	30.46	0	100	V	43.239	8.63	33.41	48.919	54	-5.081	Ave
17265	30.35	0	100	H	43.239	8.63	33.41	48.809	54	-5.191	Ave
23020	40.88	0	100	V	35.2	10.07	34.07	52.08	74	-21.92	Peak
23020	41.23	0	100	H	35.2	10.07	34.07	52.43	74	-21.57	Peak
23020	27.39	0	100	V	35.2	10.07	34.07	38.59	54	-15.41	Ave
23020	27.46	0	100	H	35.2	10.07	34.07	38.66	54	-15.34	Ave
High Channel 5795 MHz											
11590	42.8	0	100	V	39.203	7.69	34.53	55.163	74	-18.837	Peak
11590	42.72	0	100	H	39.203	7.69	34.53	55.083	74	-18.917	Peak
11590	29.08	0	100	V	39.203	7.69	34.53	41.443	54	-12.557	Ave
11590	28.96	0	100	H	39.203	7.69	34.53	41.323	54	-12.677	Ave
17385	44.43	0	100	V	45.311	8.64	33.51	64.871	74	-9.129	Peak
17385	44.28	0	100	H	45.311	8.64	33.51	64.721	74	-9.279	Peak
17385	30.23	0	100	V	45.311	8.64	33.51	50.671	54	-3.329	Ave
17385	30.32	0	100	H	45.311	8.64	33.51	50.761	54	-3.239	Ave
23180	41.73	0	100	V	35.2	10.23	34.07	53.09	74	-20.91	Peak
23180	42.36	0	100	H	35.2	10.23	34.07	53.72	74	-20.28	Peak
23180	28.15	0	100	V	35.2	10.23	34.07	39.51	54	-14.49	Ave
23180	28.03	0	100	H	35.2	10.23	34.07	39.39	54	-14.61	Ave

802.11ac VHT80 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)	
Channel 5775 MHz											
11550	41.86	0	100	V	39.047	7.6	34.51	53.997	74	-20.003	Peak
11550	42.41	0	100	H	39.047	7.6	34.51	54.547	74	-19.453	Peak
11550	28.1	0	100	V	39.047	7.6	34.51	40.237	54	-13.763	Ave
11550	28.71	0	100	H	39.047	7.6	34.51	40.847	54	-13.153	Ave
17325	43.24	0	100	V	43.239	8.63	33.41	61.699	74	-12.301	Peak
17325	42.84	0	100	H	43.239	8.63	33.41	61.299	74	-12.701	Peak
17325	29.16	0	100	V	43.239	8.63	33.41	47.619	54	-6.381	Ave
17325	28.89	0	100	H	43.239	8.63	33.41	47.349	54	-6.651	Ave
23100	40.48	0	100	V	35.2	10.07	34.07	51.68	74	-22.32	Peak
23100	40.3	0	100	H	35.2	10.07	34.07	51.5	74	-22.5	Peak
23100	27.06	0	100	V	35.2	10.07	34.07	38.26	54	-15.74	Ave
23100	26.77	0	100	H	35.2	10.07	34.07	37.97	54	-16.03	Ave

8 FCC §15.407(a) – Emission Bandwidth

8.1 Applicable Standards

FCC §15.407(a)

8.2 Measurement Procedure

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

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:	21-24º C
Relative Humidity:	40-43 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Chen Ge on 2014-06-26 to 2014-06-27 at RF site.

8.5 Test Results

5.2 GHz Band:

802.11a mode

Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz) Tx0	26 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1
Low	5180	28.758	27.348	16.8212	16.6506
Middle	5200	28.202	24.811	16.8407	16.6306
High	5240	24.472	23.580	16.6733	16.5518

802.11n-HT20 mode

Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz) Tx0	26 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1
Low	5180	28.878	27.362	17.8665	17.8151
Middle	5200	28.324	25.576	17.8012	17.7780
High	5240	26.914	23.456	17.7782	17.7714

802.11n-HT40 mode

Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz) Tx0	26 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1
Low	5190	53.691	47.118	36.3334	36.3192
High	5230	49.010	43.833	36.2735	36.2013

802.11ac 80 mode

Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz) Tx0	26 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1
-	5210	102.786	86.180	75.8776	75.5708

5.8 GHz Band:

802.11a mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) Tx0	6 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1	Limit (MHz)	Results
Low	5745	16.498	16.483	16.5832	16.5711	> 0.5	Compliant
Middle	5785	16.432	16.453	16.5393	16.5404	> 0.5	Compliant
High	5825	16.498	16.489	16.5177	16.5035	> 0.5	Compliant

802.11n-HT20 mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) Tx0	6 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1	Limit (MHz)	Results
Low	5745	17.712	17.747	17.6841	17.7198	> 0.5	Compliant
Middle	5785	17.743	17.721	17.7376	17.7379	> 0.5	Compliant
High	5825	17.700	17.737	17.7350	17.7387	> 0.5	Compliant

802.11n-HT40 mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) Tx0	6 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1	Limit (MHz)	Results
Low	5755	36.289	36.354	36.1842	36.1909	> 0.5	Compliant
High	5795	35.854	36.226	36.1816	36.1768	> 0.5	Compliant

802.11n HT40 mode

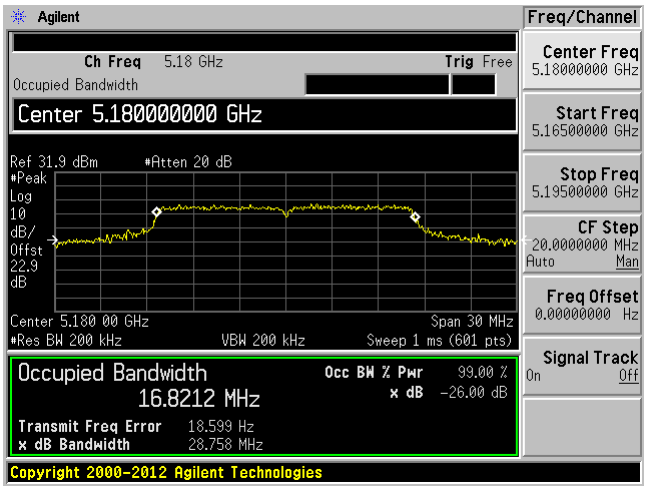
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz) Tx0	6 dB Emission Bandwidth (MHz) Tx1	99% Emission Bandwidth (MHz) Tx0	99% Emission Bandwidth (MHz) Tx1	Limit (MHz)	Results
-	5775	75.338	75.145	75.6974	75.6290	> 0.5	Compliant

Please refer to the following plots.

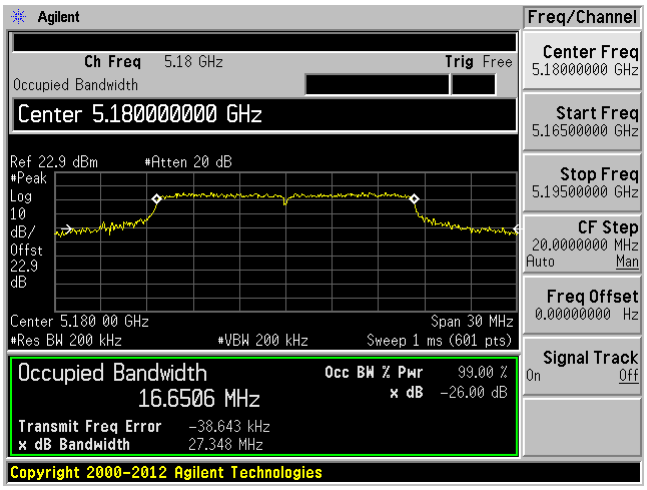
5.2 GHz Band

802.11a mode

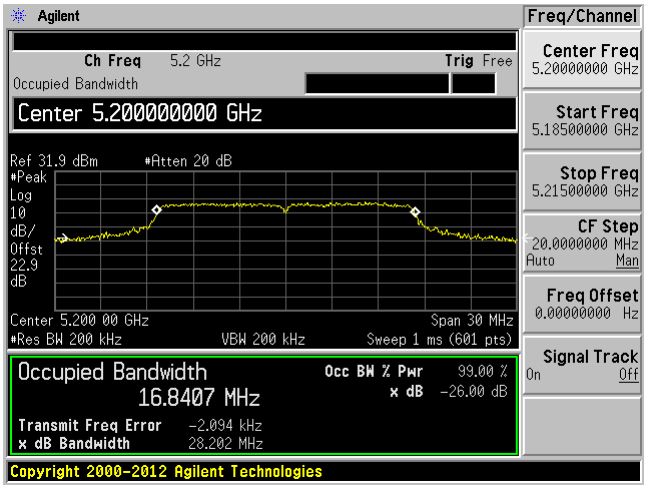
Low channel: 5180 MHz Chain 0



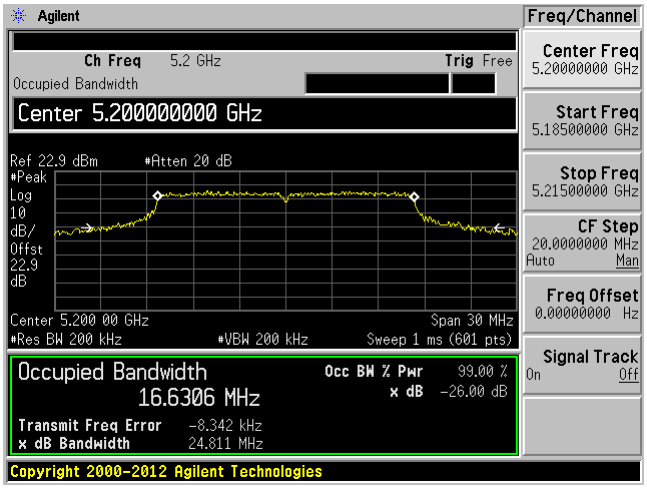
Low channel: 5180 MHz Chain 1



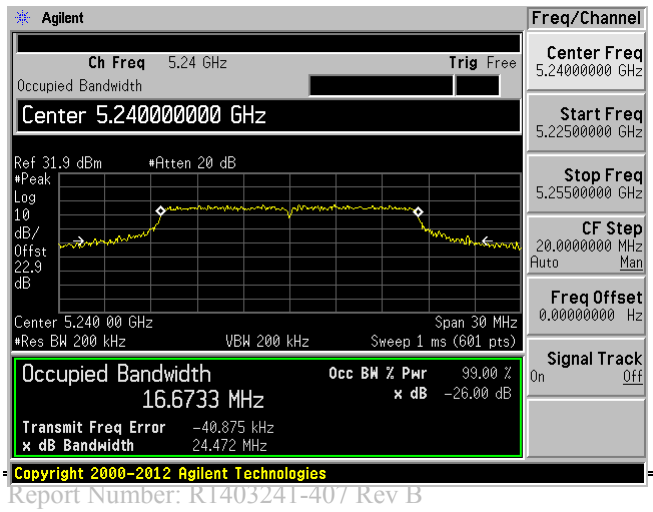
Middle channel: 5200 MHz Chain 0



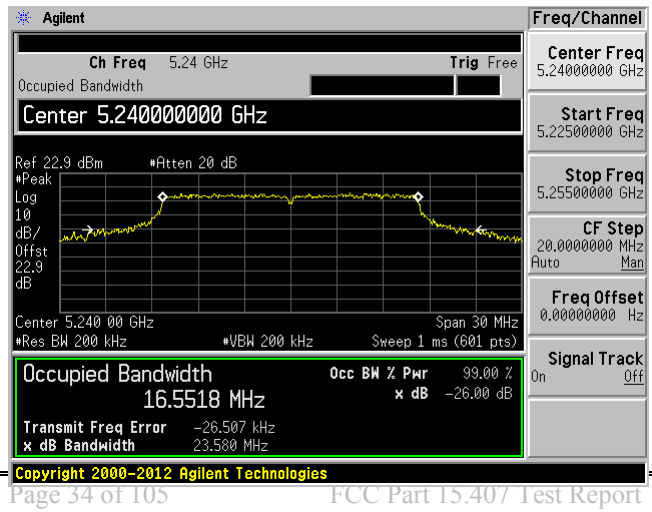
Middle channel: 5200 MHz Chain 1



High channel: 5240 MHz Chain 0

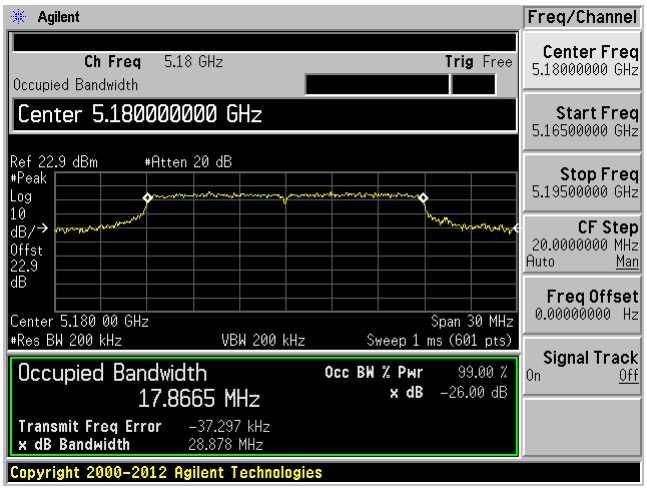


High channel: 5240 MHz Chain 1

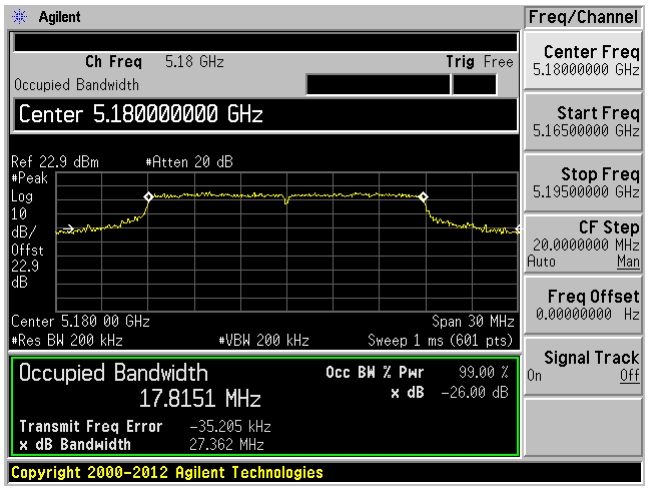


802.11n-HT20 mode

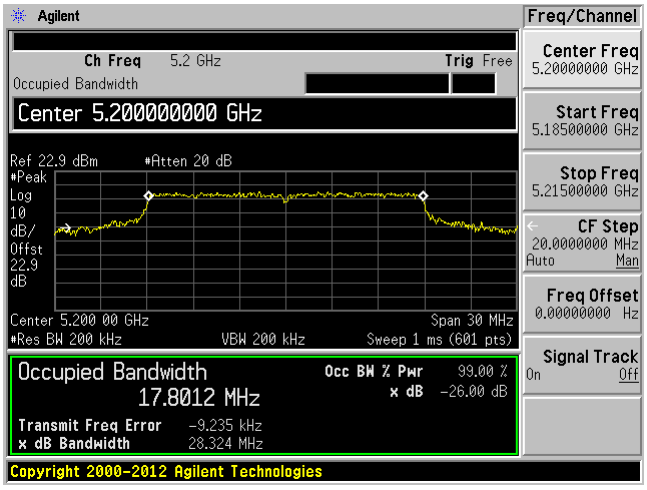
Low channel: 5180 MHz Chain 0



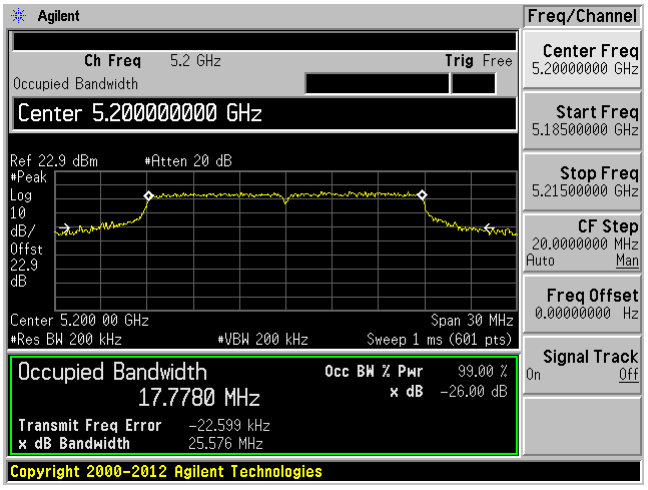
Low channel: 5180 MHz Chain 1



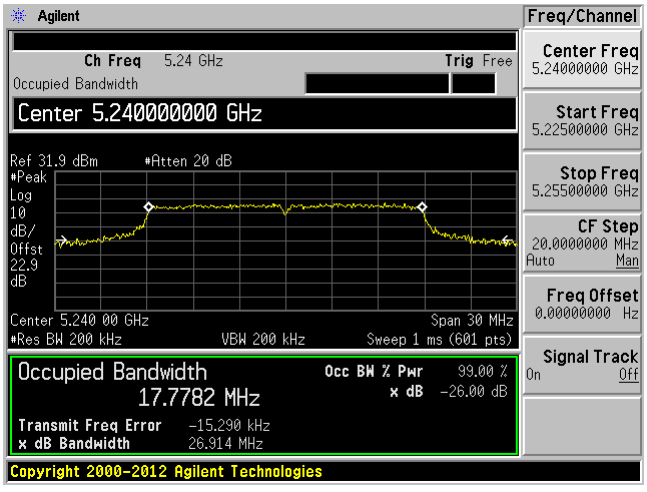
Middle channel: 5200 MHz Chain 0



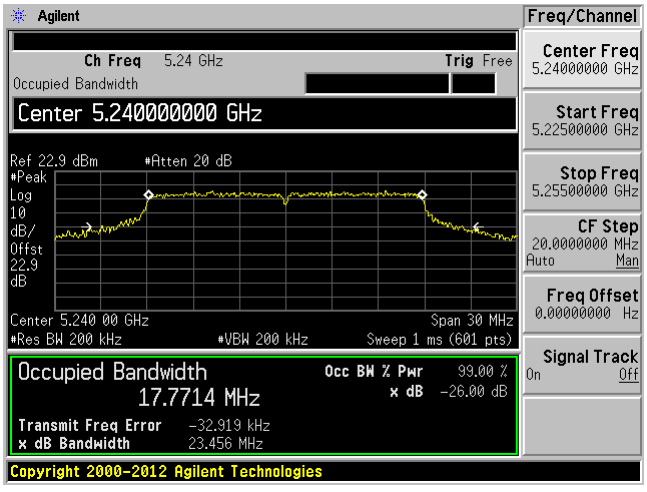
Middle channel: 5200 MHz Chain 1



High channel: 5240 MHz Chain 0

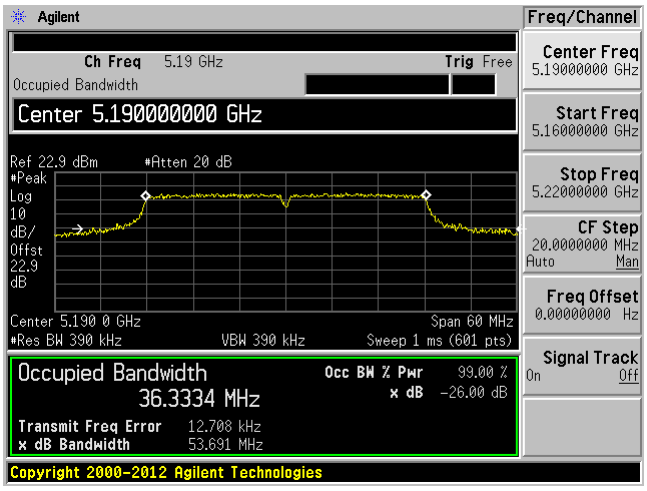


High channel: 5240 MHz Chain 1

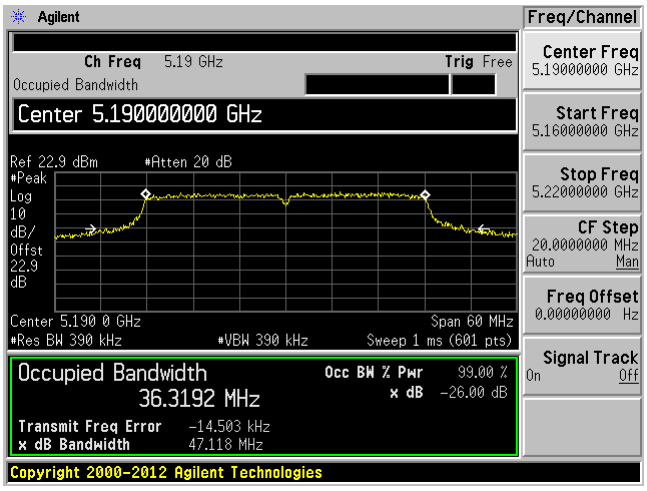


802.11n-HT40 mode

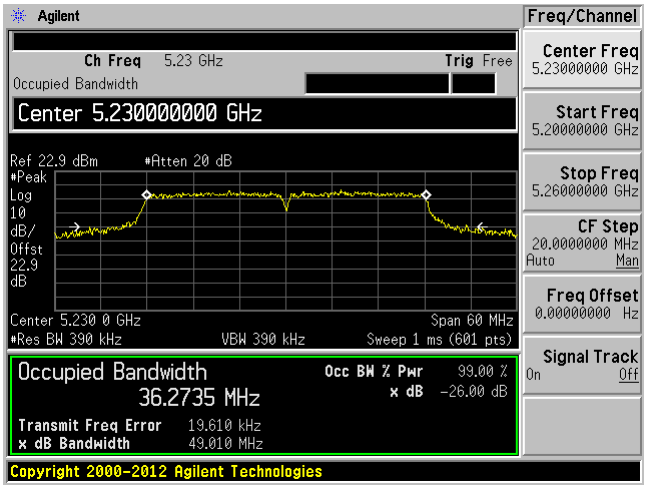
Low channel: 5190 MHz Chain 0



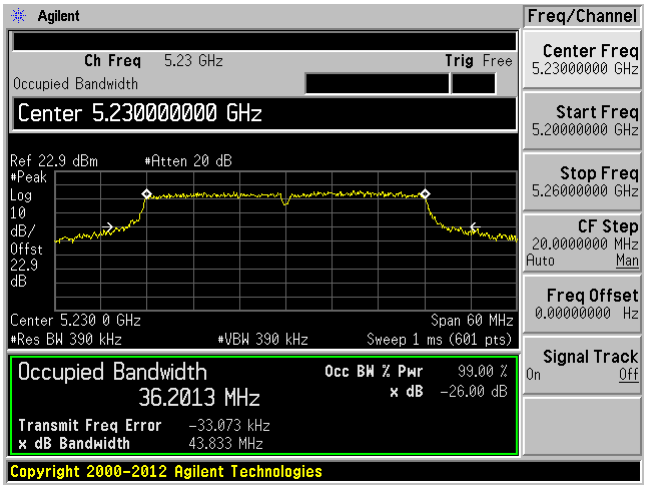
Low channel: 5190 MHz Chain 1



High channel: 5230 MHz Chain 0

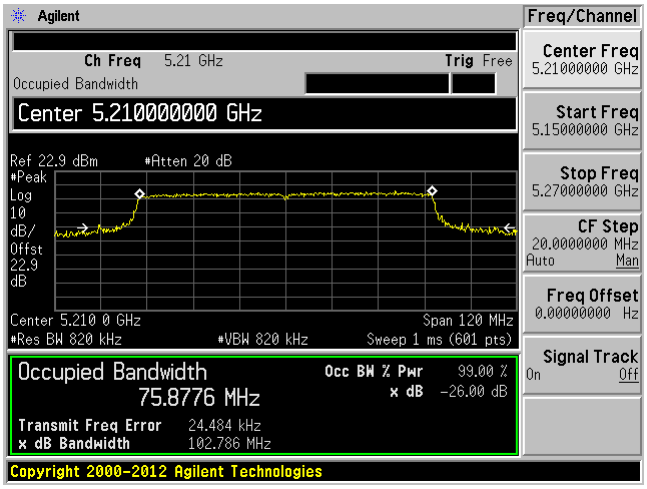


High channel: 5230 MHz Chain 1

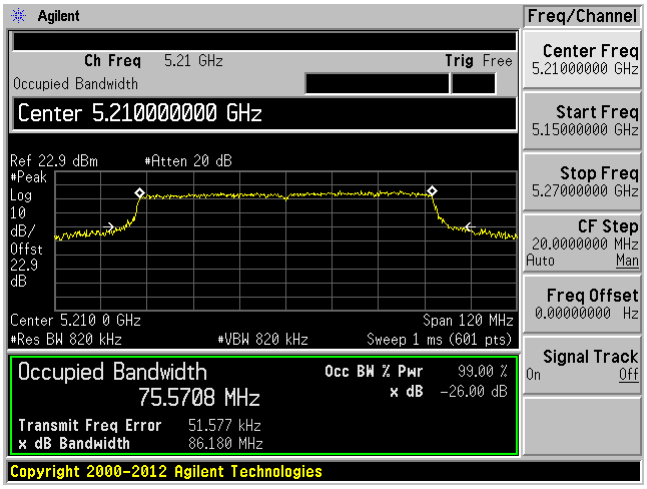


802.11ac 80 mode

Channel: 5210 MHz Chain 0



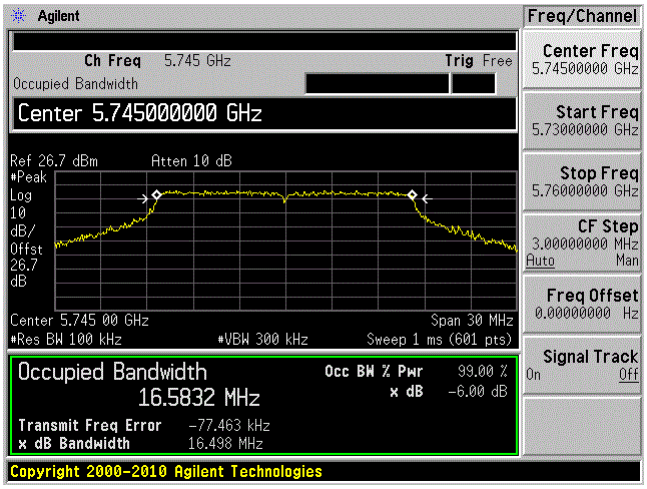
Channel: 5210 MHz Chain 1



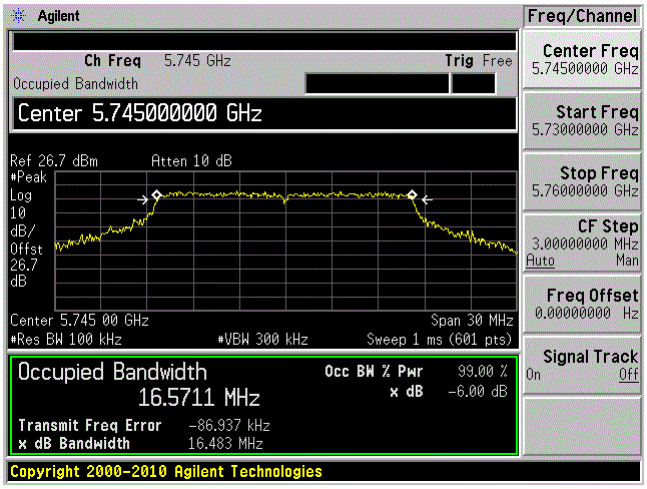
5.8 GHz Band

802.11a mode

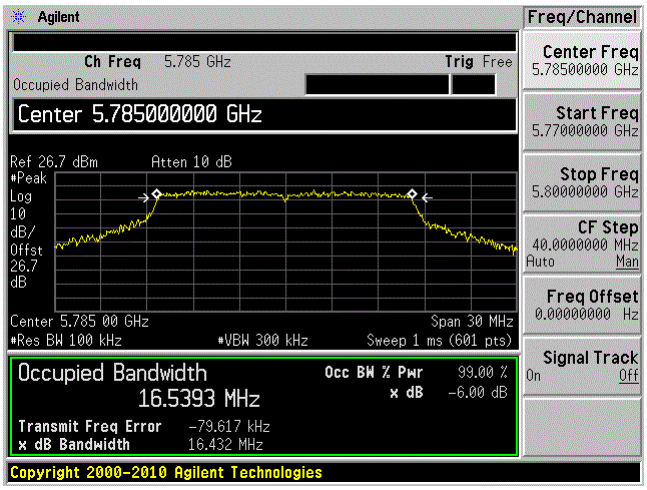
Low channel: 5745 MHz Chain 0



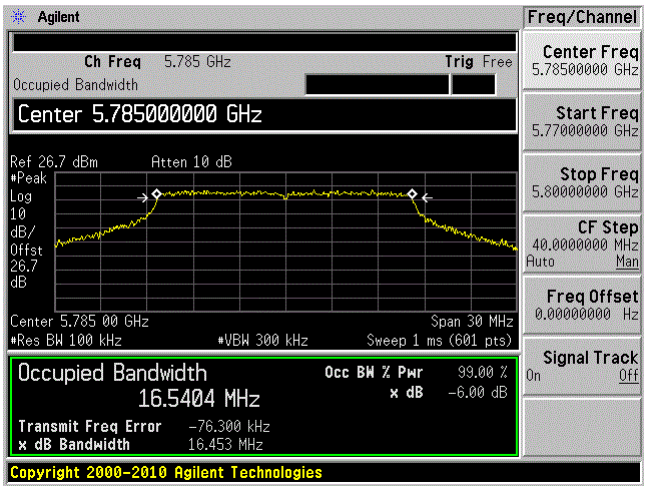
Low channel: 5745 MHz Chain 1



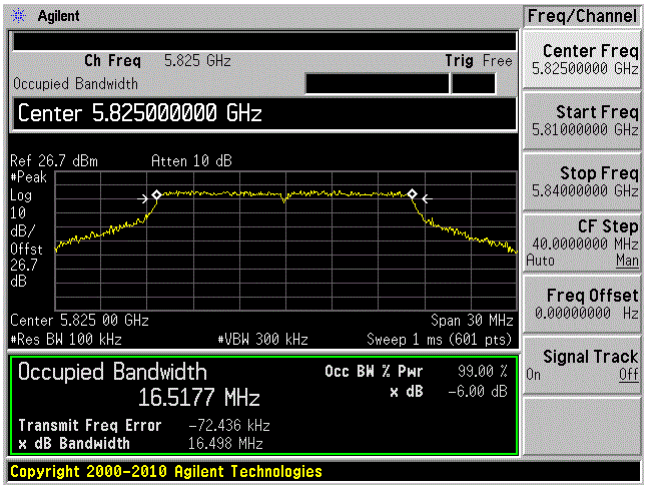
Middle channel: 5785 MHz Chain 0



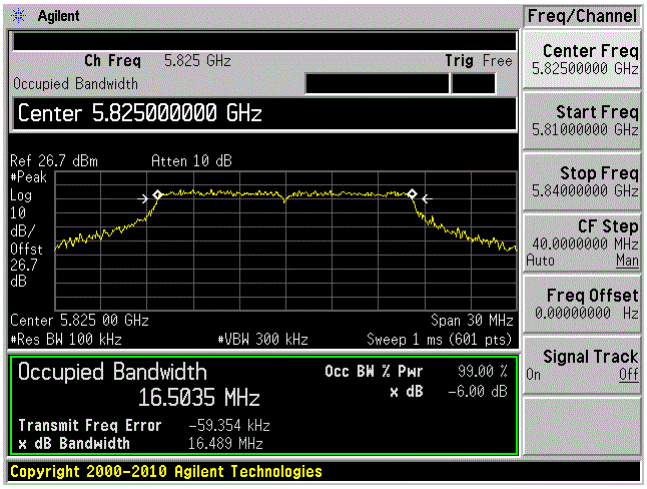
Middle channel: 5785 MHz Chain 1



High channel: 5825 MHz Chain 0

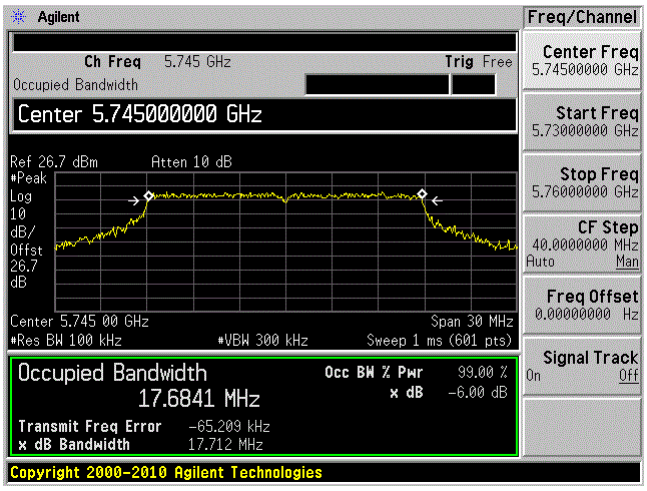


High channel: 5825 MHz Chain 1

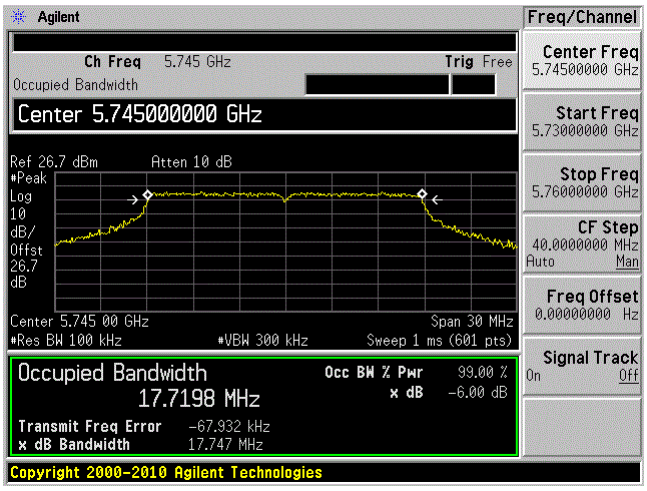


802.11n-HT20 mode

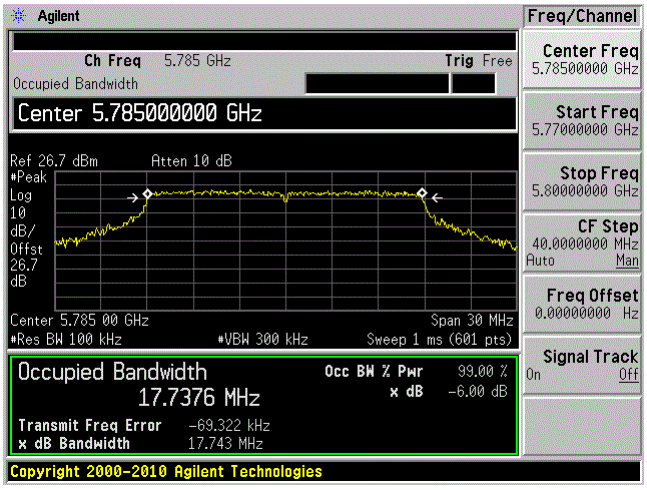
Low channel: 5745 MHz Chain 0



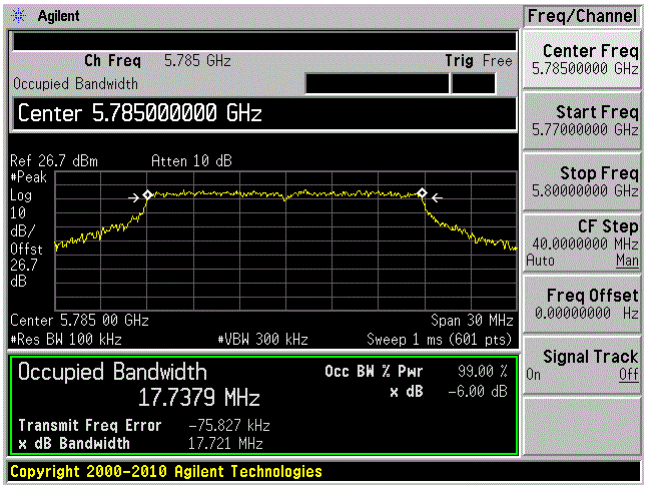
Low channel: 5745 MHz Chain 1



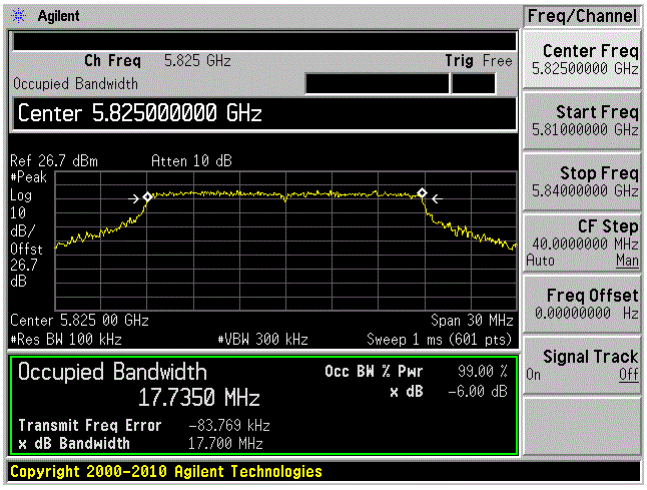
Middle channel: 5785 MHz Chain 0



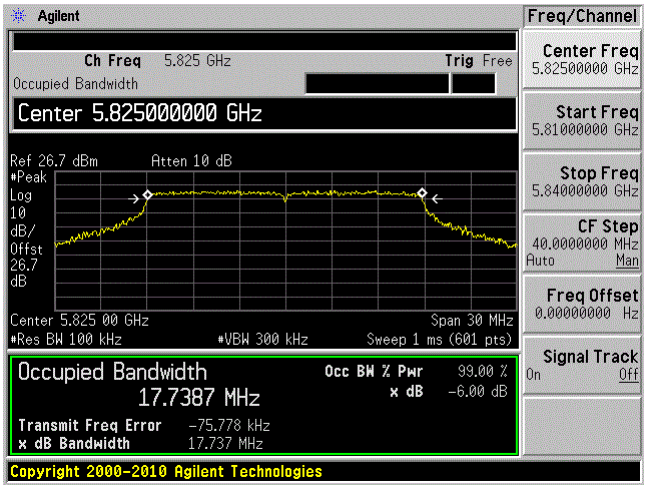
Middle channel: 5785 MHz Chain 1



High channel: 5825 MHz Chain 0

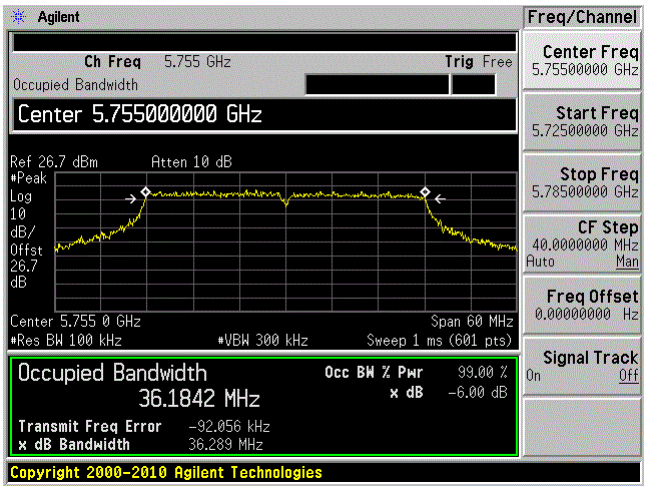


High channel: 5825 MHz Chain 1

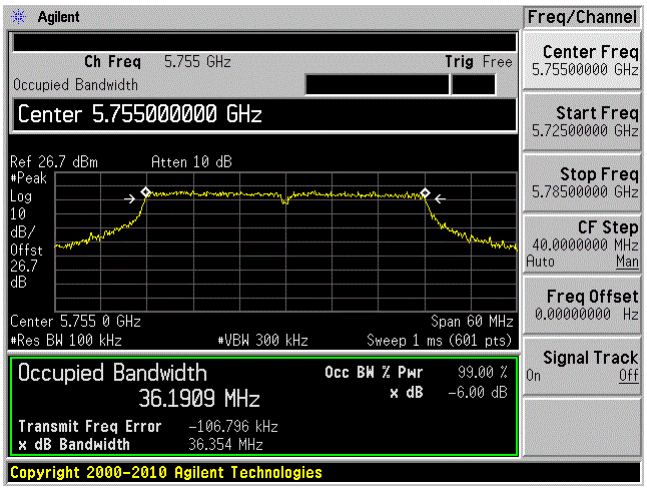


802.11n-HT40 mode

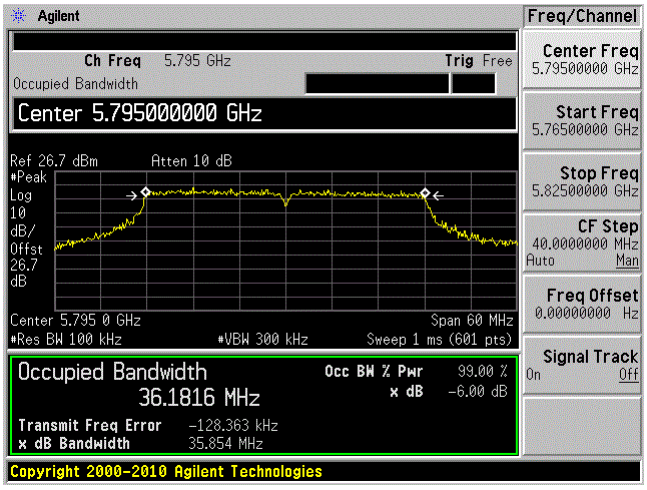
Low channel: 5755 MHz Chain 0



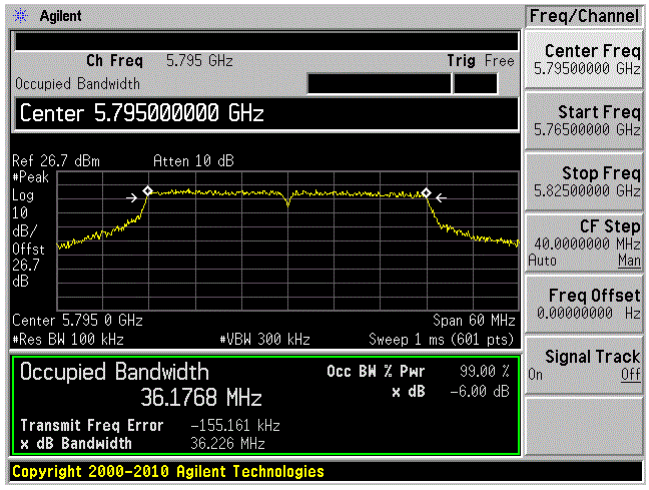
Low channel: 5755 MHz Chain 1



High channel: 5795 MHz Chain 0

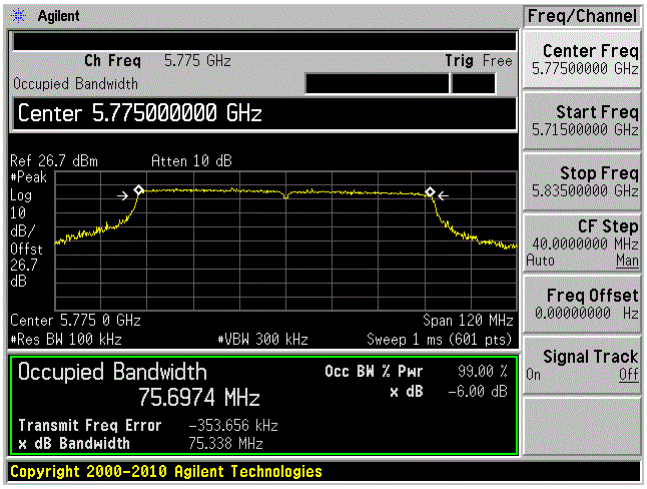


High channel: 5795 MHz Chain 1

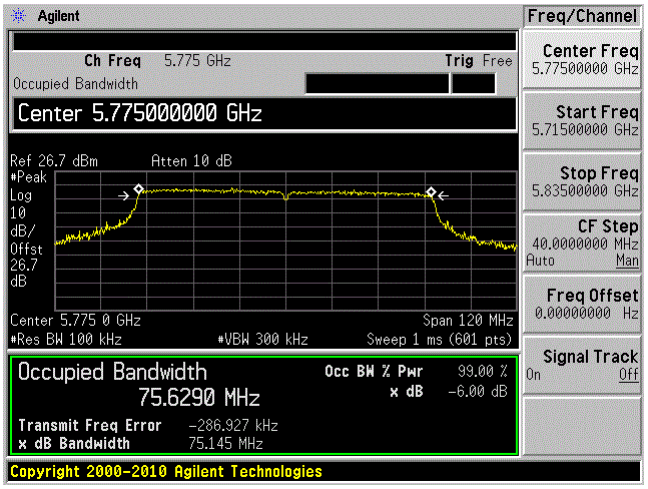


802.11ac 80 mode

Channel: 5775 MHz Chain 0



Channel: 5775 MHz Chain 1



9 FCC §407(a) - Peak Output Power Measurement

9.1 Applicable Standards

According to FCC §15.407(a)

(1) For the band 5.15-5.25 GHz

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

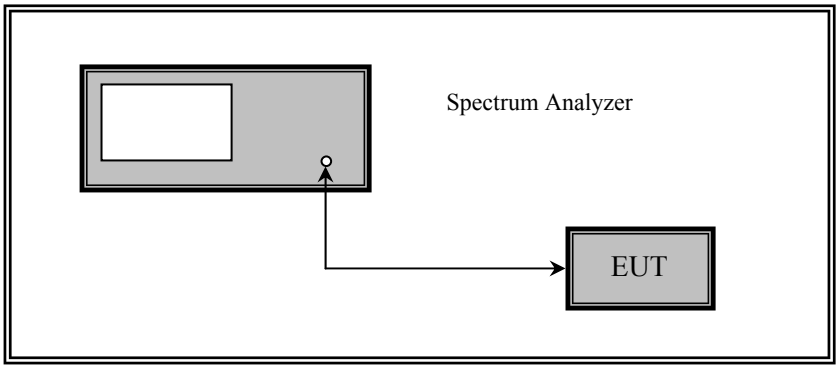
(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz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

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

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

9.2 Measurement Procedure

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



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:	21-24º C
Relative Humidity:	40-43 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Chen Ge on 2014-06-26 to 2014-06-27 at RF site.

9.5 Test Results

5.2 GHz Band:

802.11a mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
Low	5180	20.17	20.07	23.13	30	20
Middle	5200	20.26	20.22	23.25	30	target
High	5240	20.72	20.58	23.66	30	target

802.11n-HT20 mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
Low	5180	20.16	20.03	23.12	30	20
Middle	5200	20.3	20.15	23.24	30	target
High	5240	20.69	20.51	23.61	30	target

802.11n-HT40 mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
Low	5190	19.34	19.51	22.44	30	20
High	5230	19.92	20.01	22.98	30	20

802.11ac 80 mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
-	5210	19.4	19.53	22.47	30	20

5.8 GHz Band:

802.11a mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
Low	5745	22.35	21.29	24.86	30	target
Middle	5785	22.27	21.98	25.14	30	target
High	5825	22.19	21.51	24.87	30	target

802.11n HT20 mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
Low	5745	22.08	21.17	24.66	30	target
Middle	5785	22.24	21.95	25.11	30	target
High	5825	22.1	21.54	24.84	30	target

802.11n HT40 mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
Low	5755	19.84	19.79	22.82	30	20
High	5795	22.02	21.67	24.86	30	target

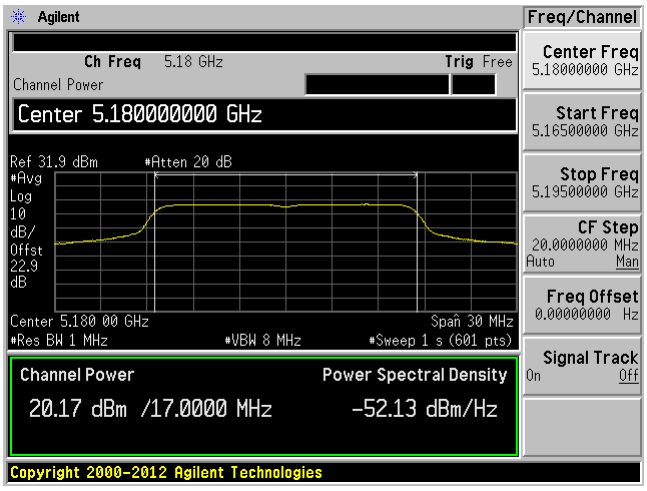
802.11ac 80 mode

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)	Limit (dBm)	Power Setting
-	5775	17.6	17.57	20.60	30	18

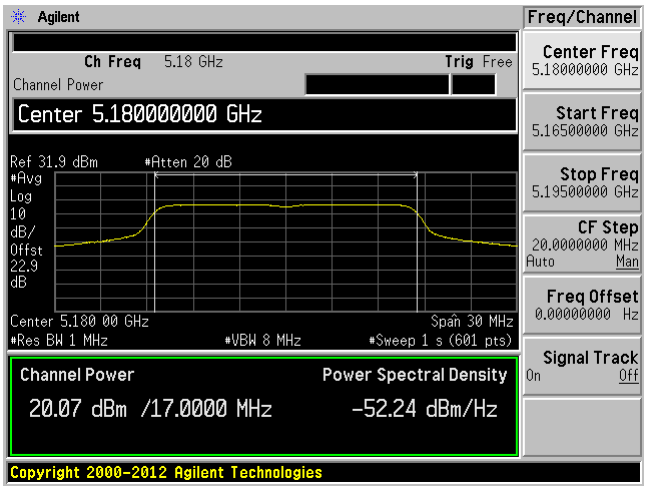
W52 band:

802.11a, Low Channel, 5180 MHz

Chain 0

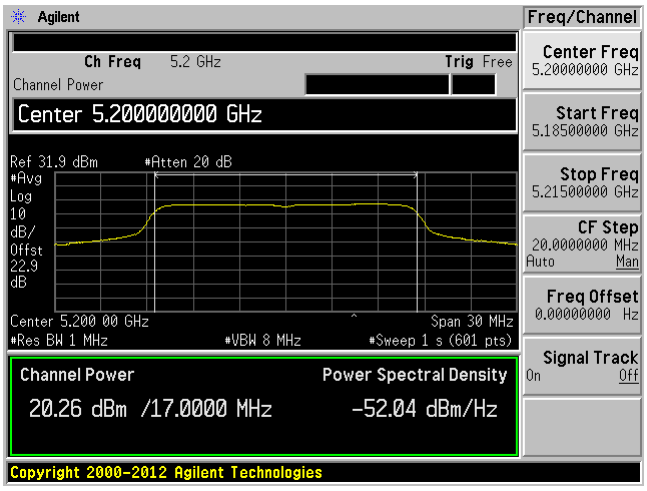


Chain 1

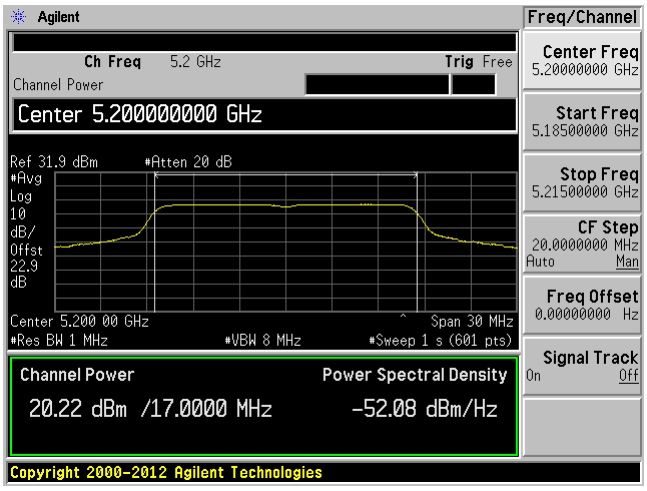


802.11a, Middle Channel, 5200 MHz

Chain 0

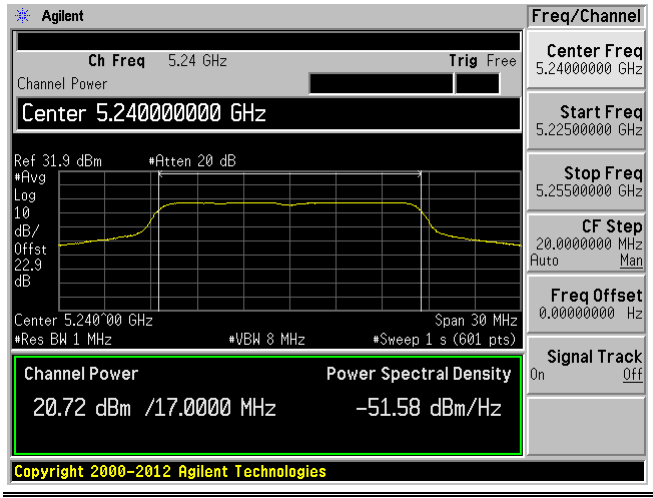


Chain 1

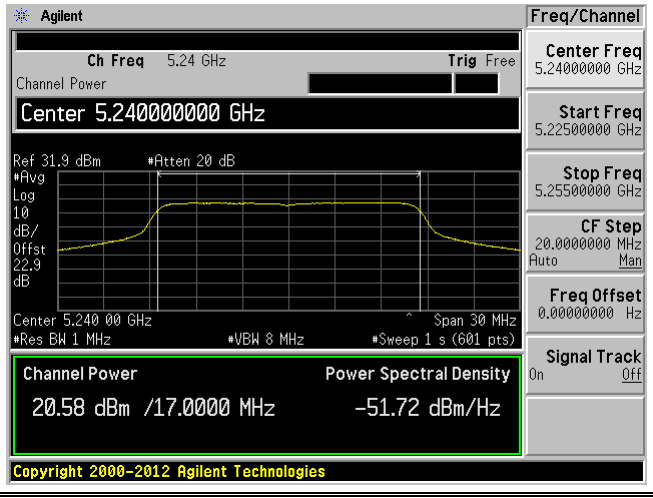


802.11a, High Channel, 5240 MHz

Chain 0

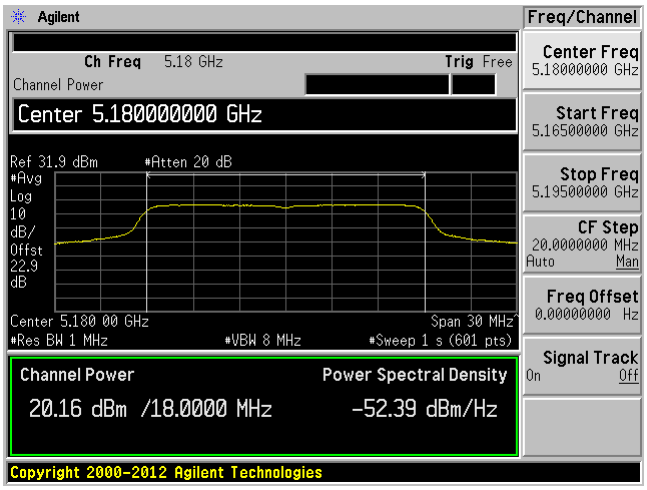


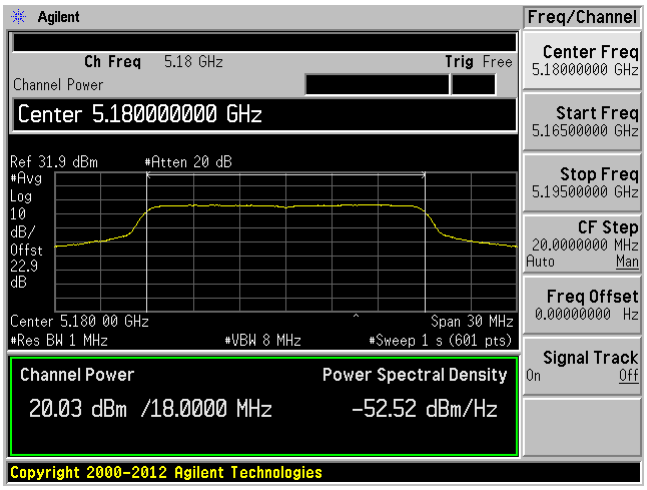
Chain 1



802.11n-HT 20, Low Channel 5180 MHz

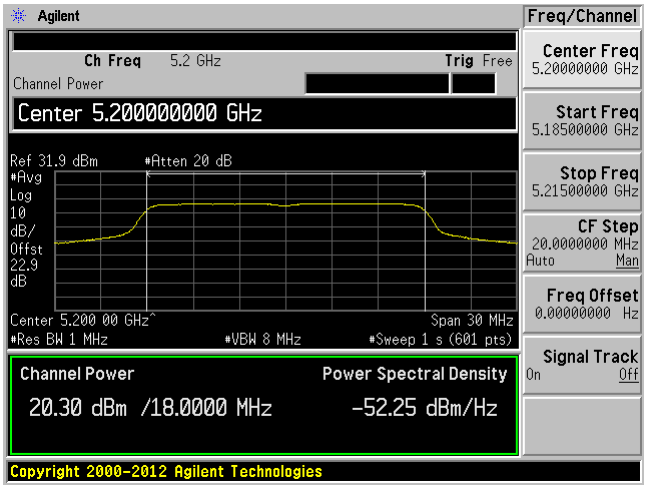
Chain 0 Chain 1

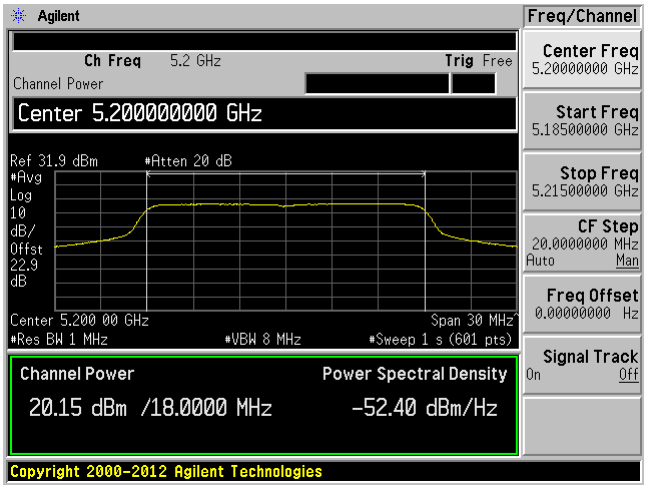




802.11n-HT20, Middle Channel 5200 MHz

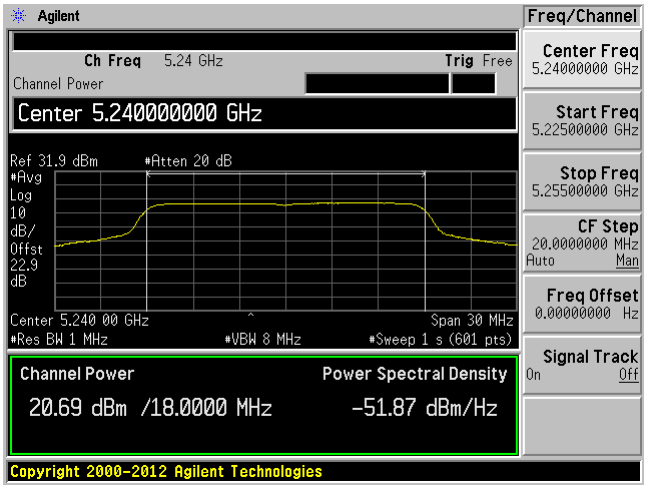
Chain 0 Chain 1

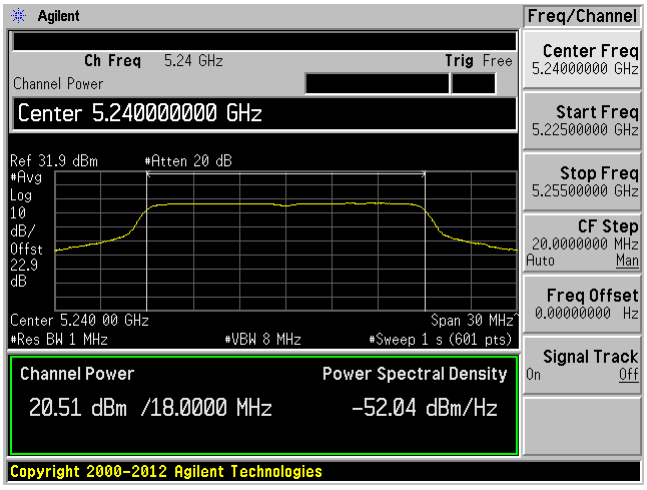




802.11n-HT20, High Channel, 5240 MHz

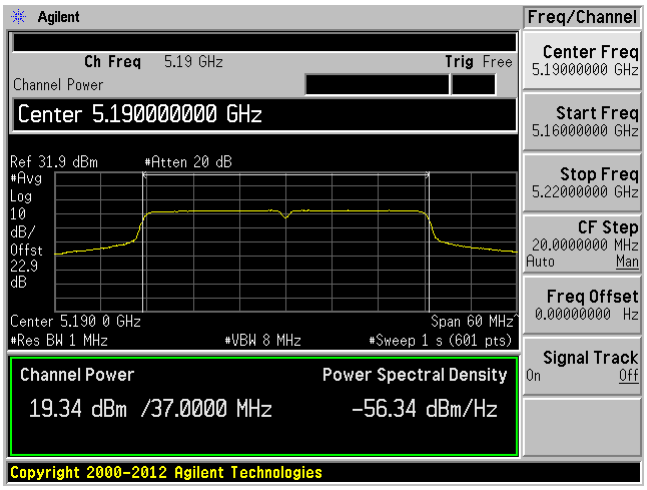
Chain 0 Chain 1



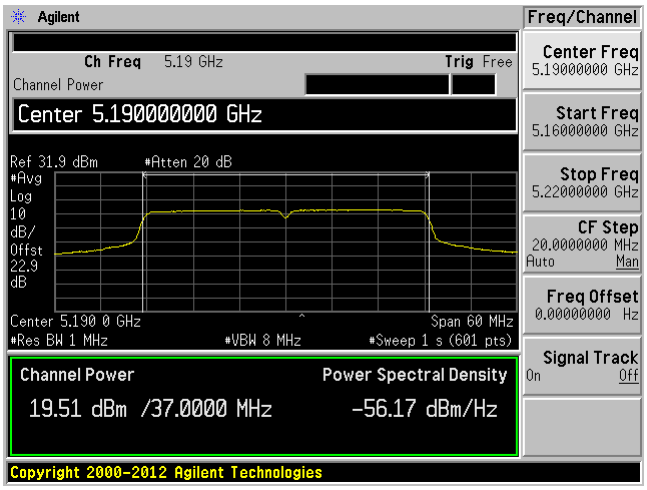


802.11n-HT40, Low Channel 5190 MHz

Chain 0

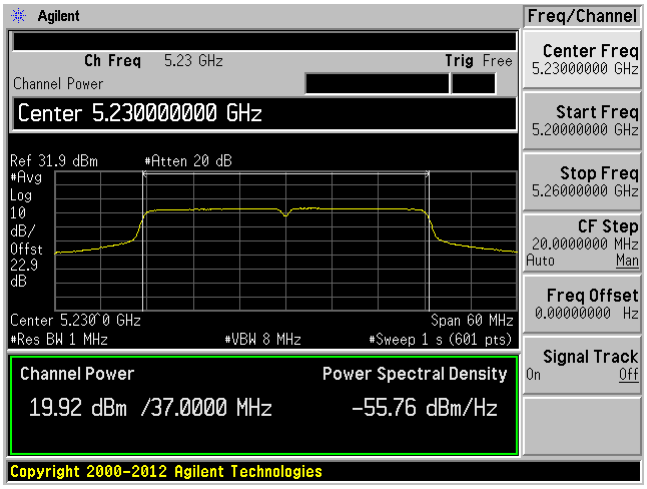


Chain 1

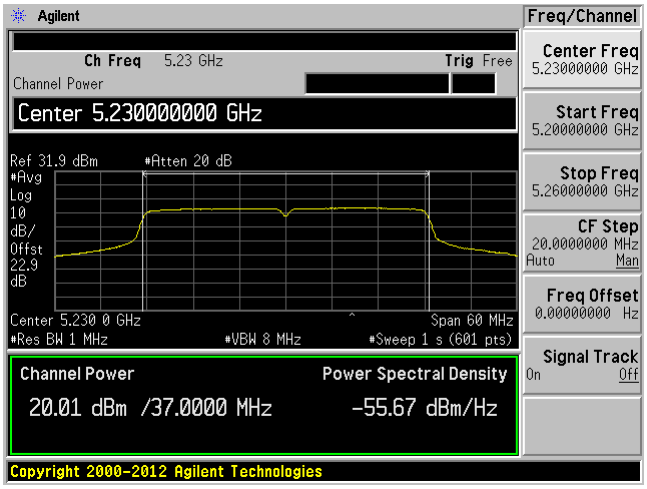


802.11n-HT40, High Channel 5230 MHz

Chain 0

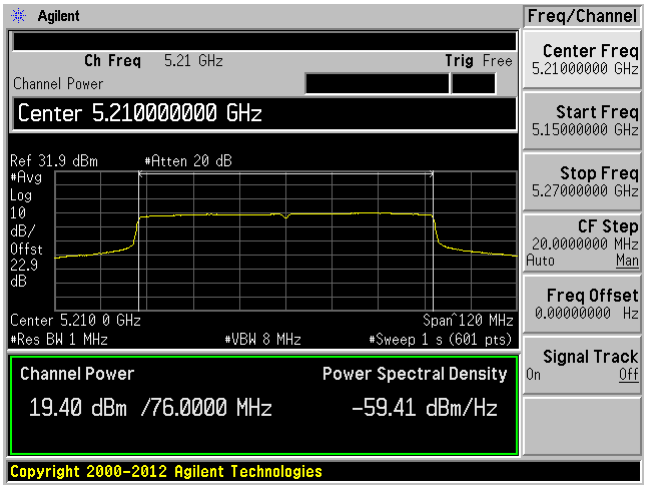


Chain 1

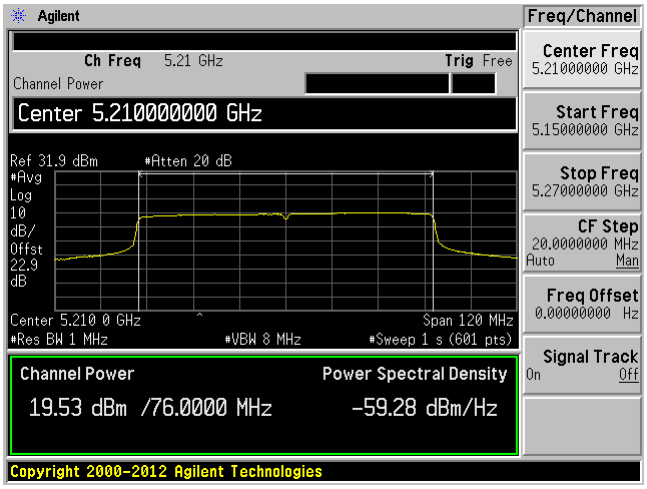


802.11ac-VHT80, High Channel 5210 MHz

Chain 0



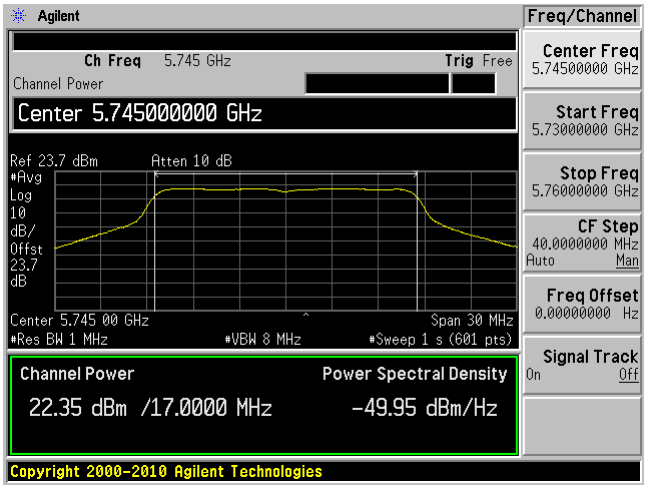
Chain 1



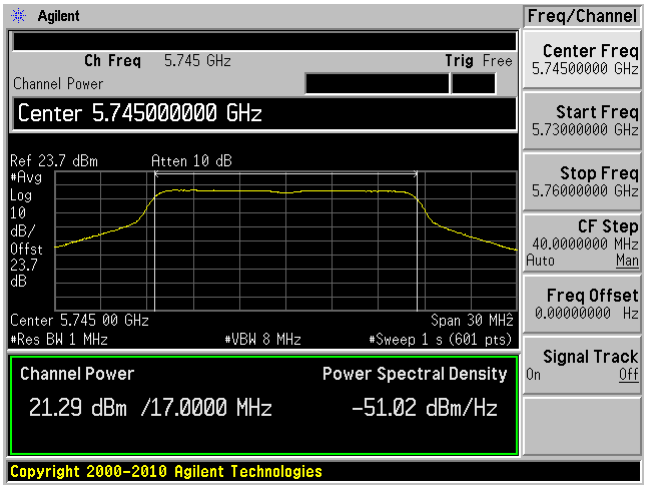
W58 band:

802.11a, Low Channel, 5745 MHz

Chain 0

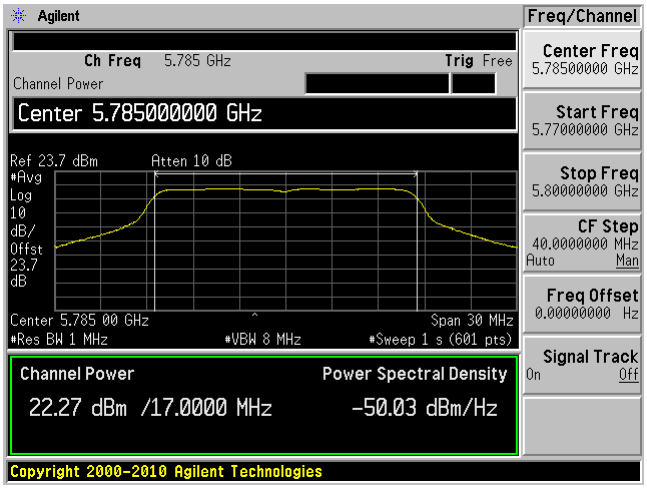


Chain 1

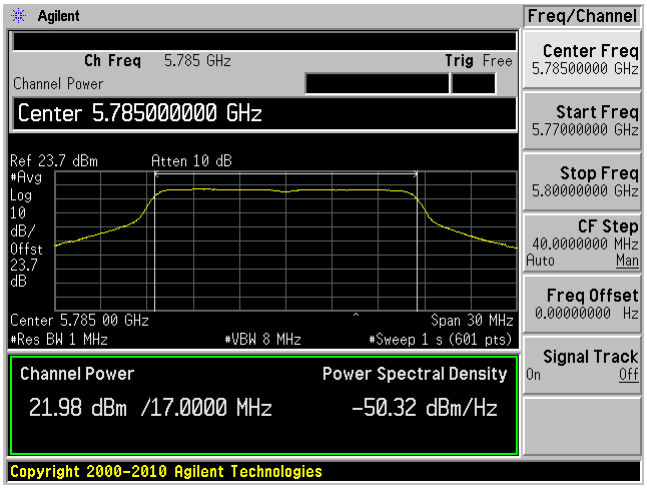


802.11a, Middle Channel, 5785 MHz

Chain 0

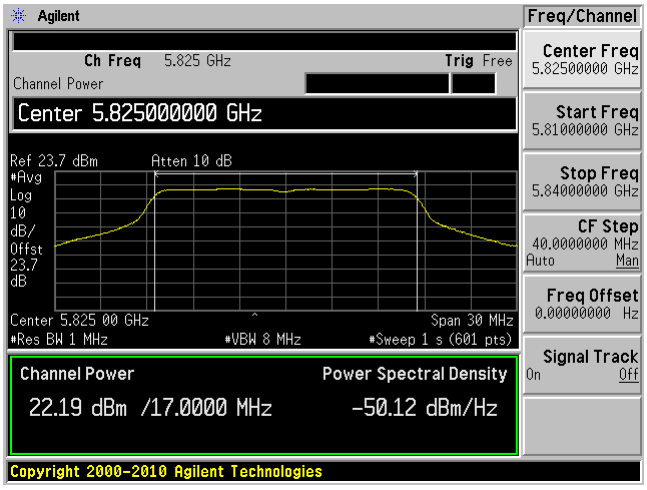


Chain 1

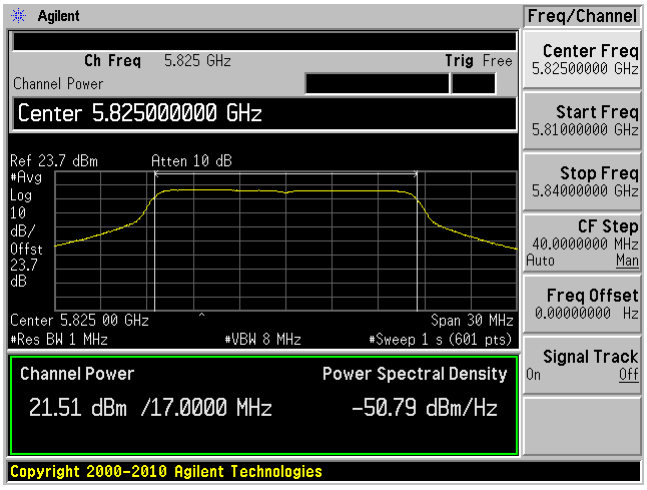


802.11a, High Channel, 5825 MHz

Chain 0

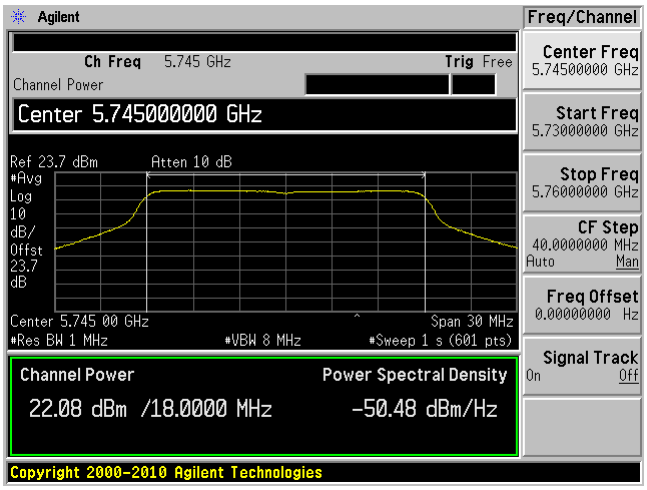


Chain 1

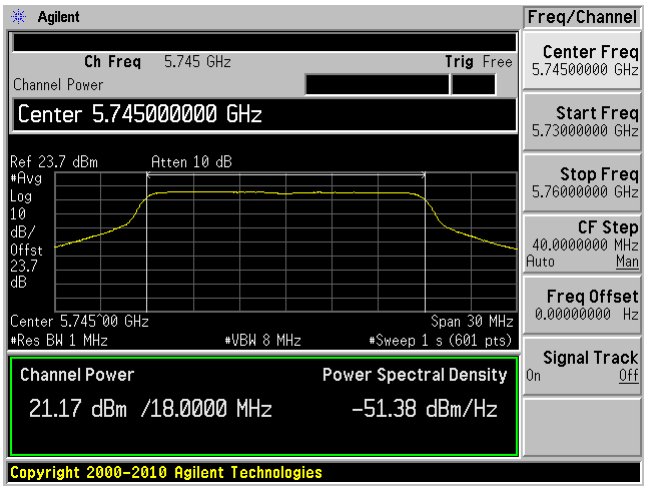


802.11n-HT 20, Low Channel 5745 MHz

Chain 0

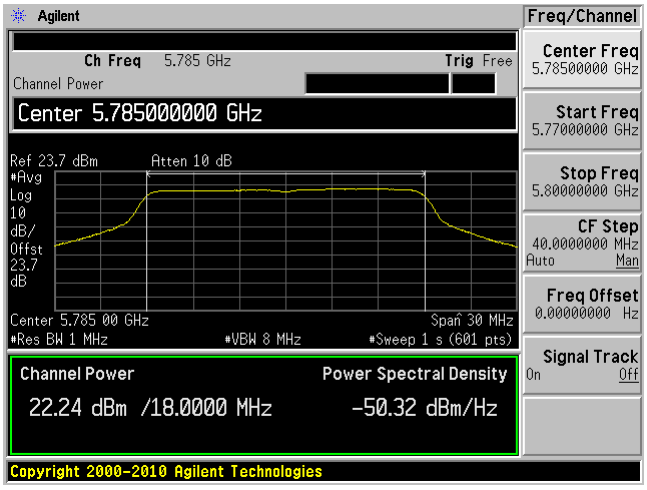


Chain 1

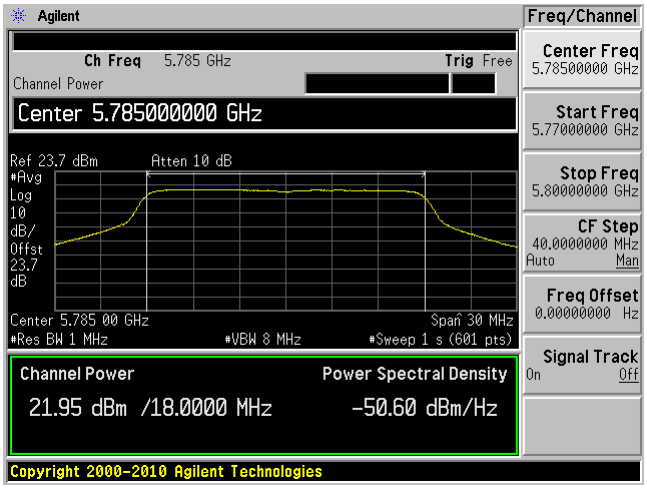


802.11n-HT20, Middle Channel 5785 MHz

Chain 0

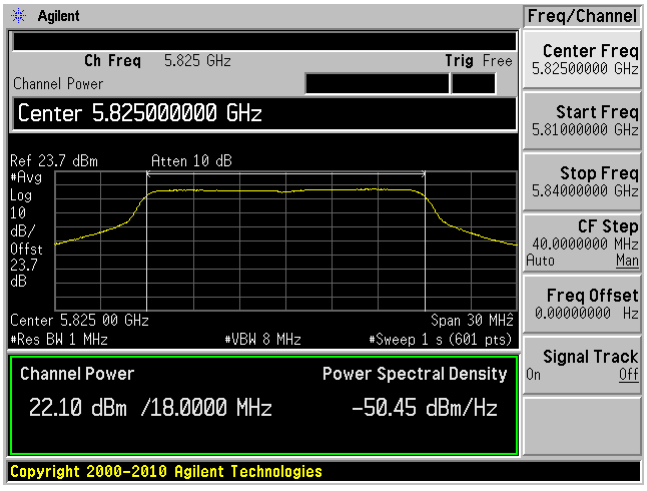


Chain 1

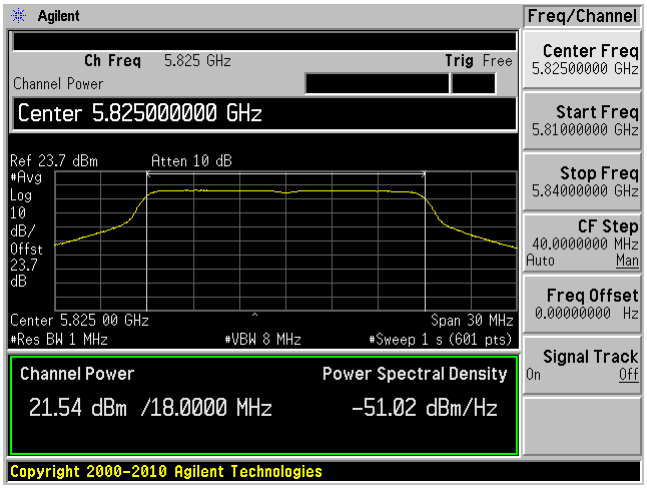


802.11n-HT20, High Channel, 5825 MHz

Chain 0

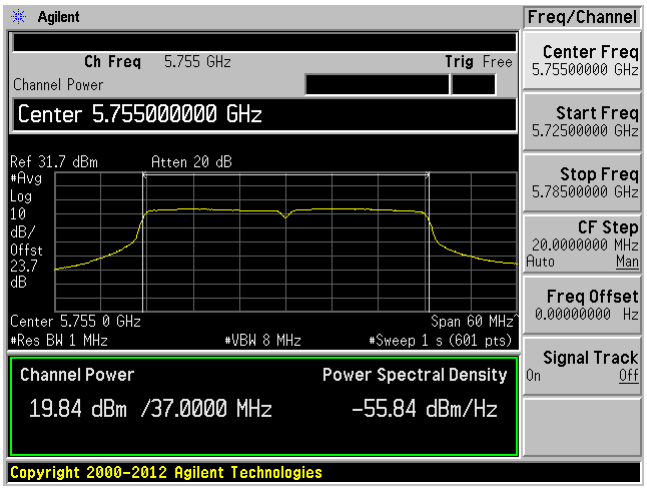


Chain 1

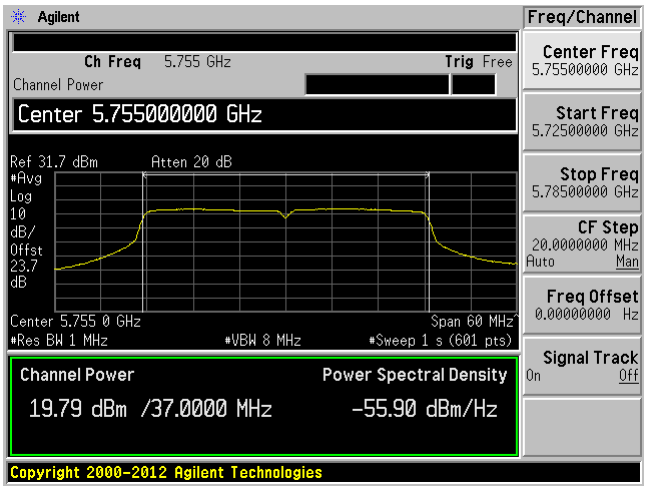


802.11n-HT40, Low Channel 5755 MHz

Chain 0

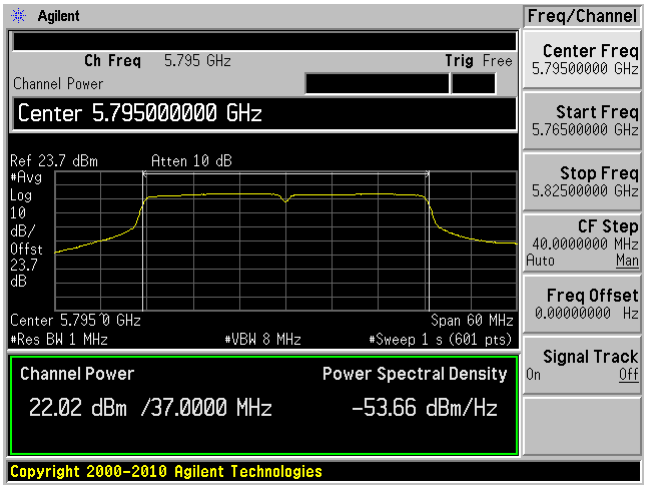


Chain 1

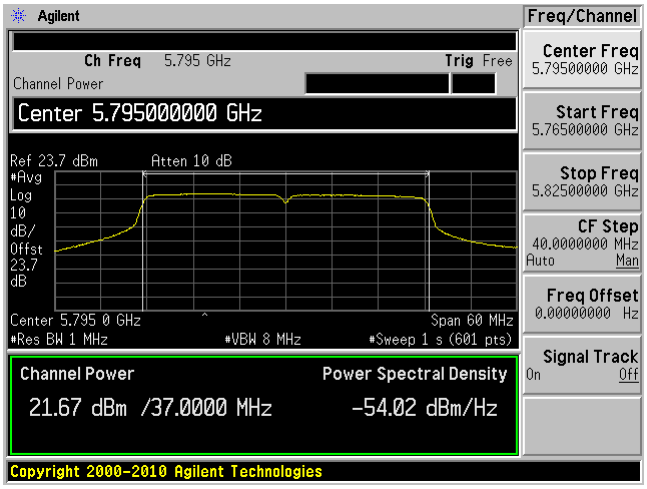


802.11n-HT40, High Channel 5795 MHz

Chain 0

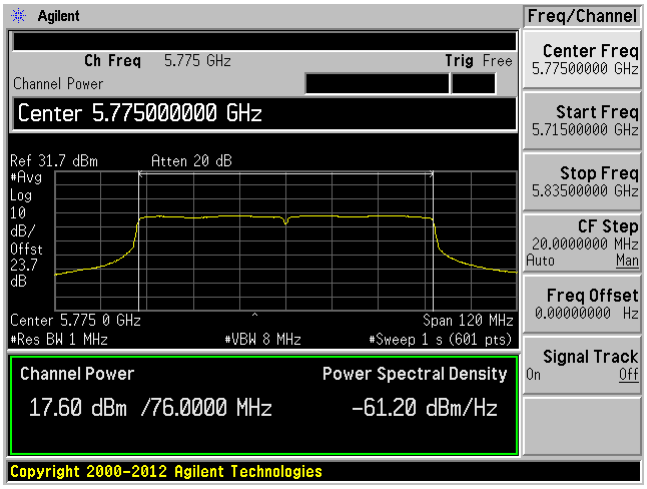


Chain 1

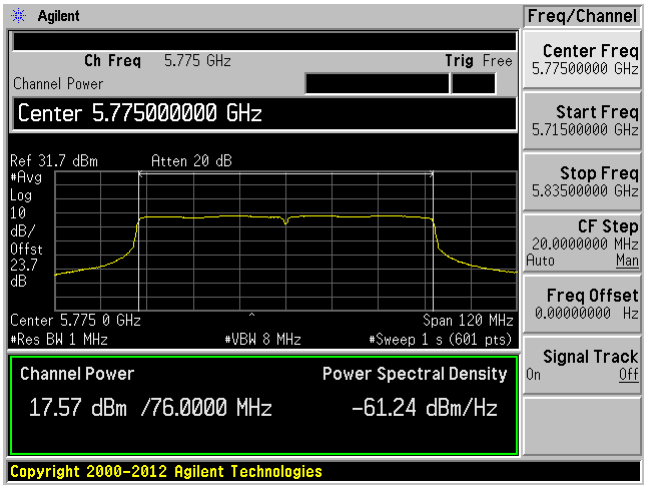


802.11ac-VHT80, High Channel 5775 MHz

Chain 0



Chain 1



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

10.1 Applicable Standards

According to FCC §15.407(b)
Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. 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 e.i.r.p. 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 e.i.r.p. of −27 dBm/MHz. For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

10.2 Measurement Procedure

Add a correction factor (antenna gain+ Attenuator loss+cable loss) to the display.

Integration Method

1. For peak emissions measurements, follow the procedures described in section H)5), "Procedures for Peak Unwanted Emissions Measurements above 1000 MHz", except for the following changes:

- Set RBW = 100 kHz
- Set VBW = 3 · RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured. CAUTION: You must ensure that the spectrum analyzer or EMI receiver is set for peak-detection and max-hold for this measurement.

2. For average emissions measurements, follow the procedures described in section H)6), "Procedures for Average Unwanted Emissions Measurements above 1000 MHz", except for the following changes:

- Set RBW = 100 kHz
- Set VBW = 3xRBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

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:	21-24º C
Relative Humidity:	40-43 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Chen Ge on 2014-06-26 to 2014-06-27 at RF site.

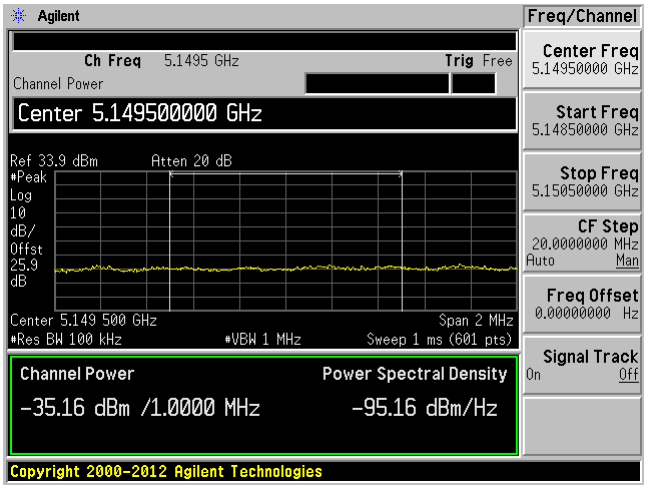
10.5 Test Results

Please refer to following pages for plots of band edge

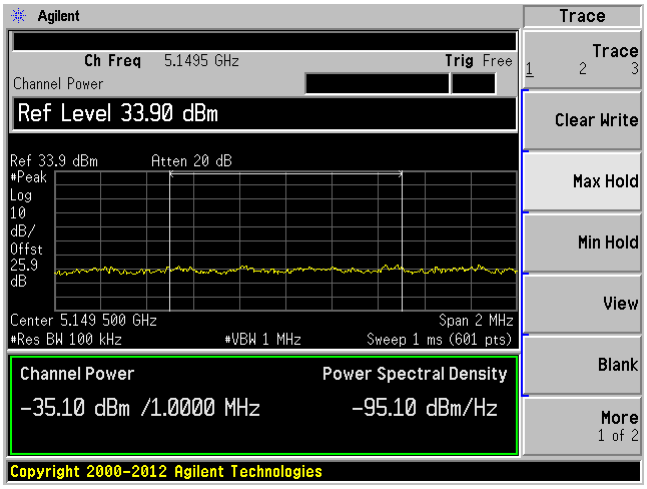
5.2 GHz Band

802.11a mode

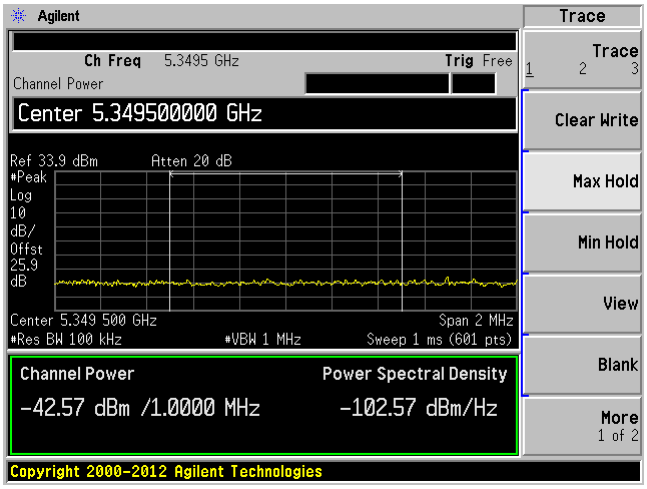
Low channel: 5180 MHz Chain 0



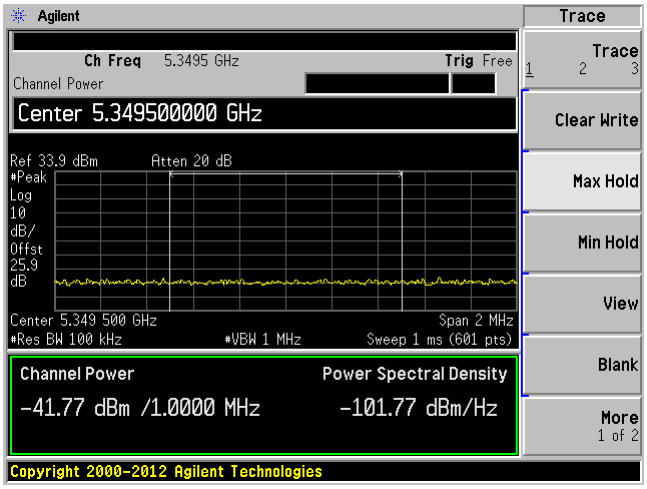
Low channel: 5180 MHz Chain 1



High channel: 5240 MHz Chain 0

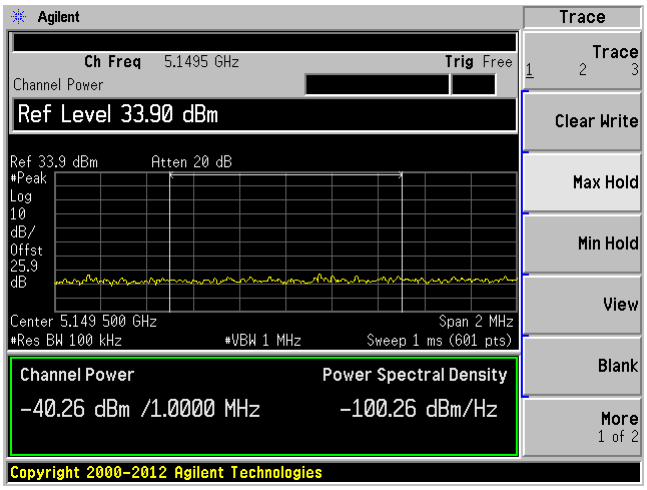


High channel: 5240 MHz Chain 1

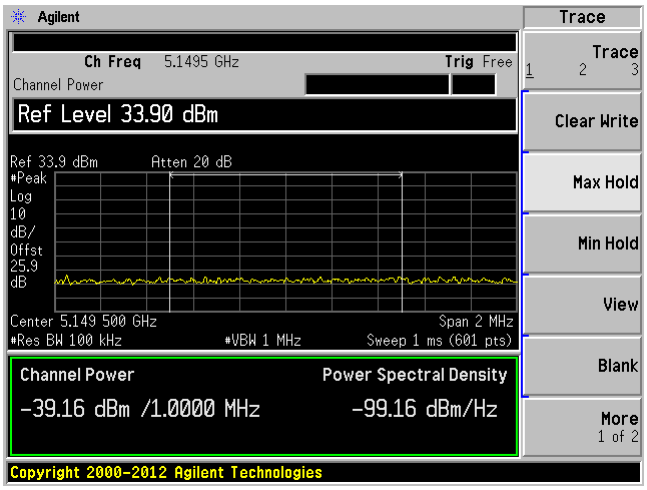


802.11n-HT20 mode

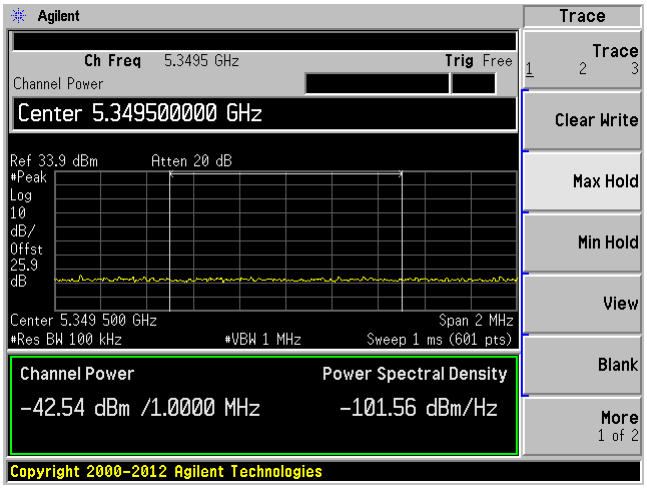
Low channel: 5180 MHz Chain 0



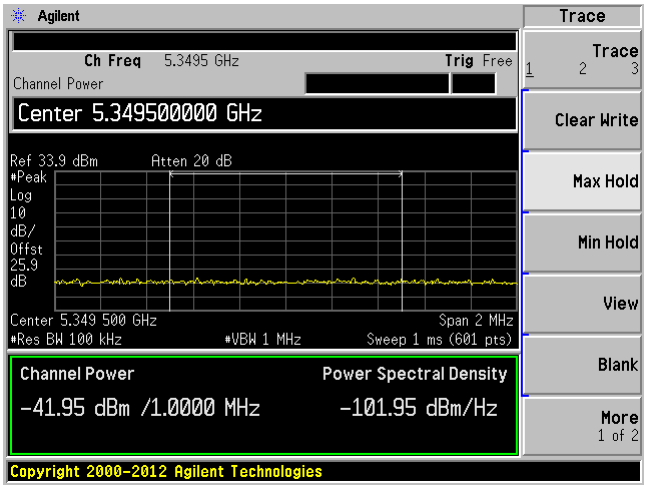
Low channel: 5180 MHz Chain 1



High channel: 5240 MHz Chain 0

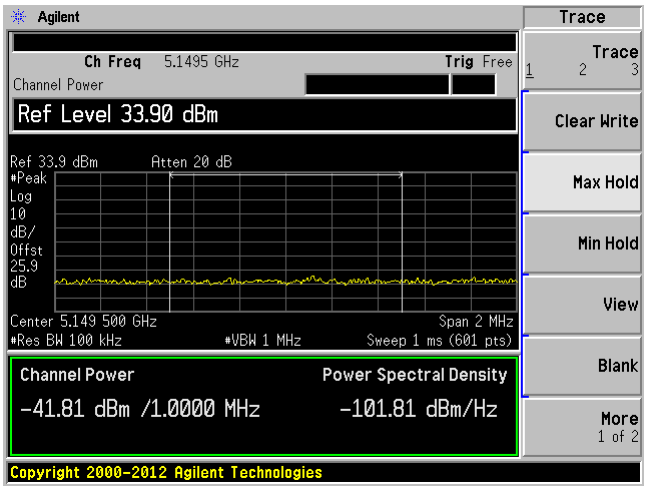


High channel: 5240 MHz Chain 1

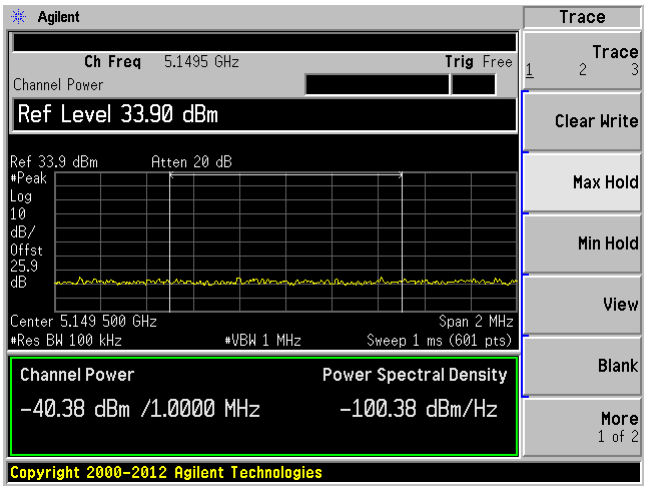


802.11n-HT40 mode

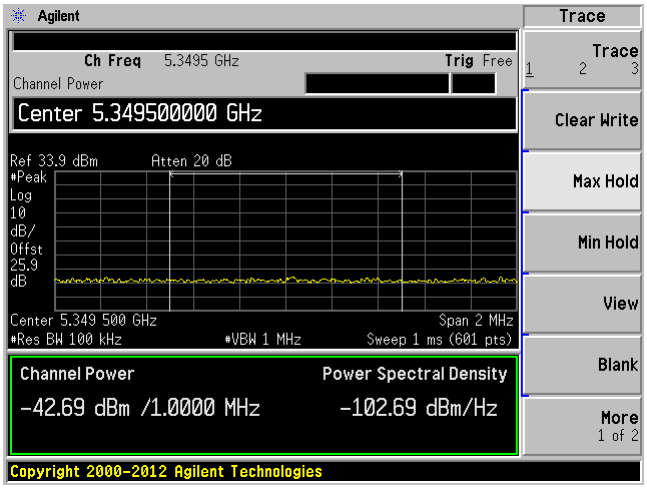
Low channel: 5190 MHz Chain 0



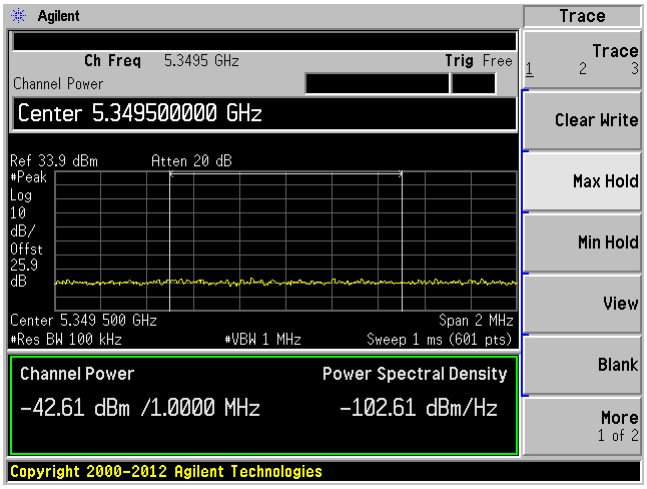
Low channel: 5190 MHz Chain 1



High channel: 5230 MHz Chain 0

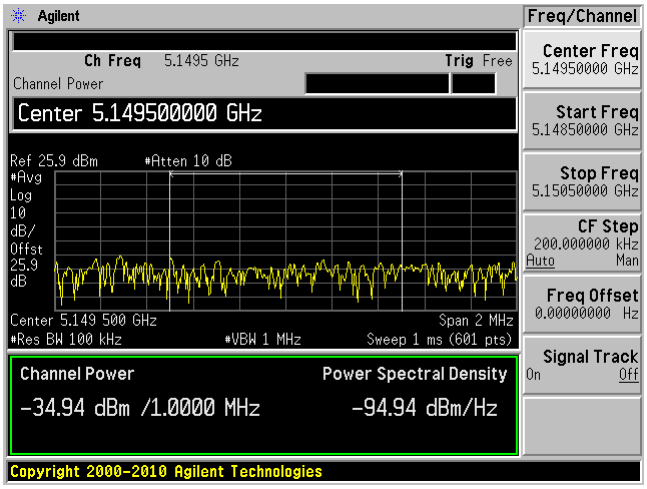


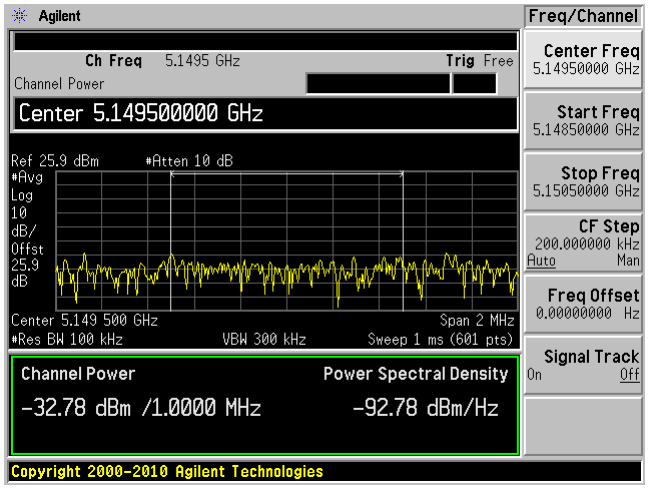
High channel: 5230 MHz Chain 1



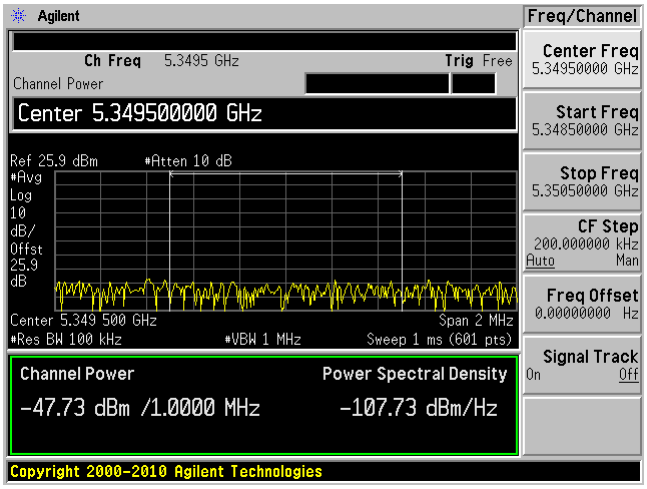
802.11ac 80 mode

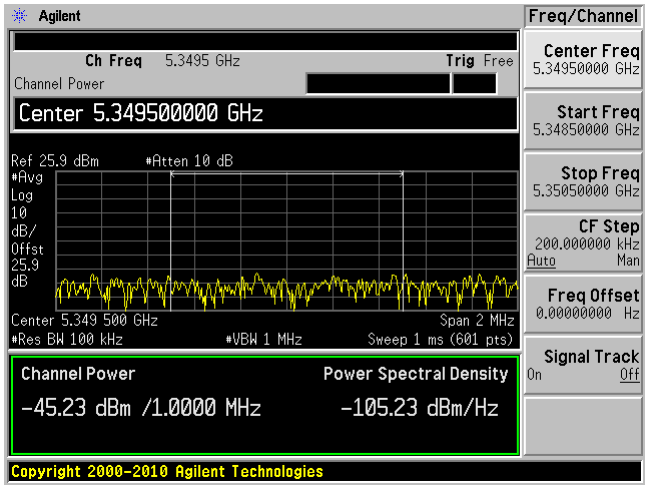
Channel: 5210 MHz Chain 0 Left Channel: 5210 MHz Chain 1





Channel: 5210 MHz Chain 0 Right Channel: 5210 MHz Chain 1

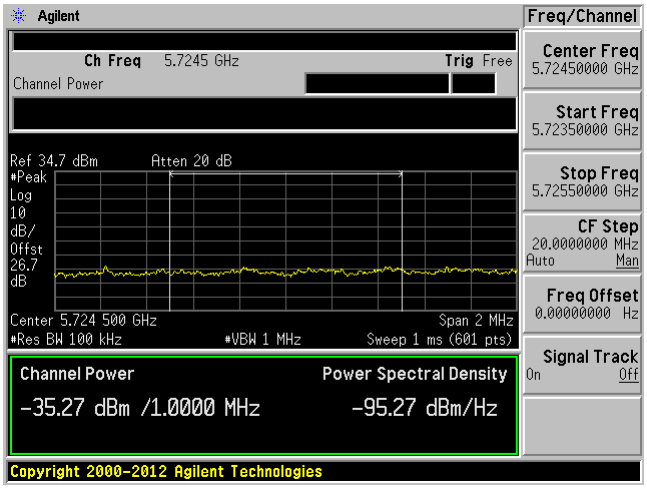




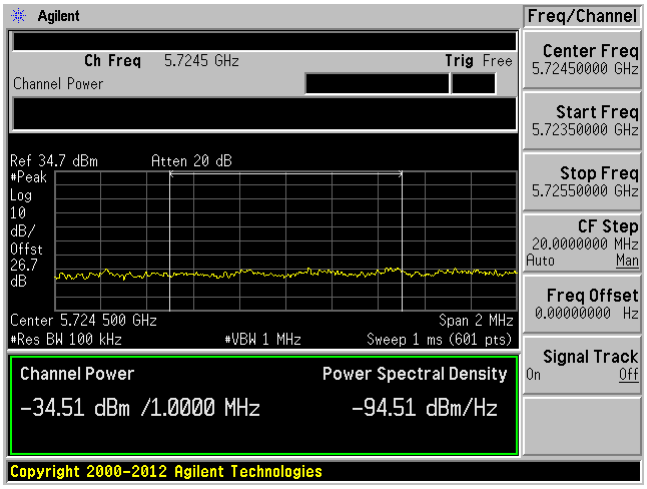
5.8 GHz Band

802.11a mode

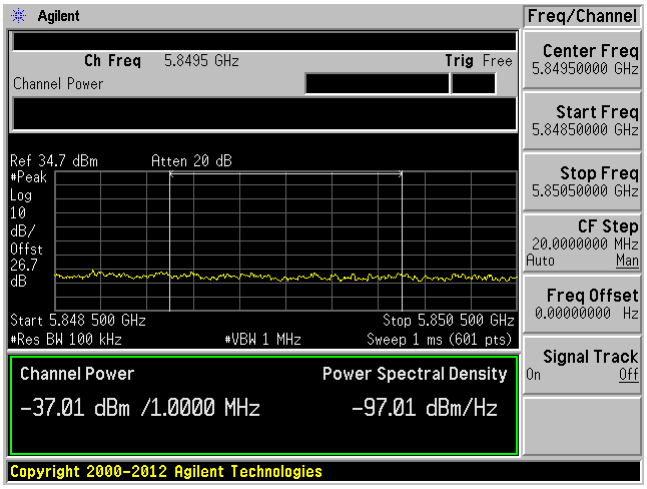
Low channel: 5745 MHz Chain 0



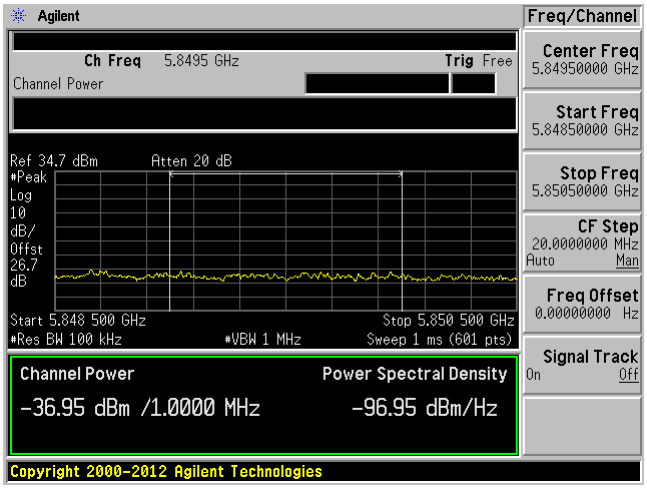
Low channel: 5745 MHz Chain 1



High channel: 5825 MHz Chain 0

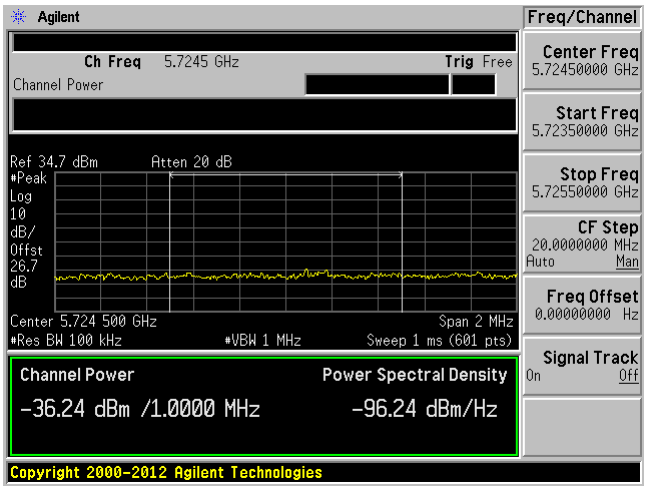


High channel: 5825 MHz Chain 1

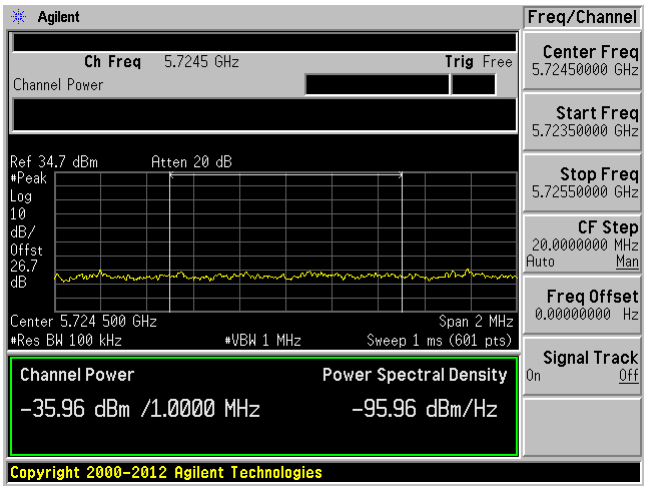


802.11n-HT20 mode

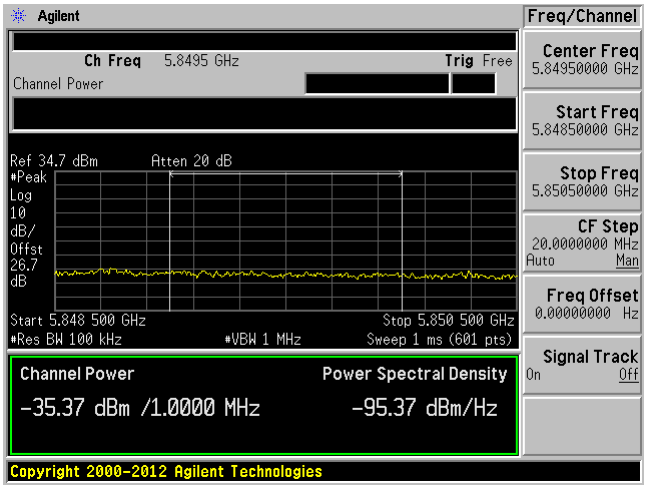
Low channel: 5745 MHz Chain 0



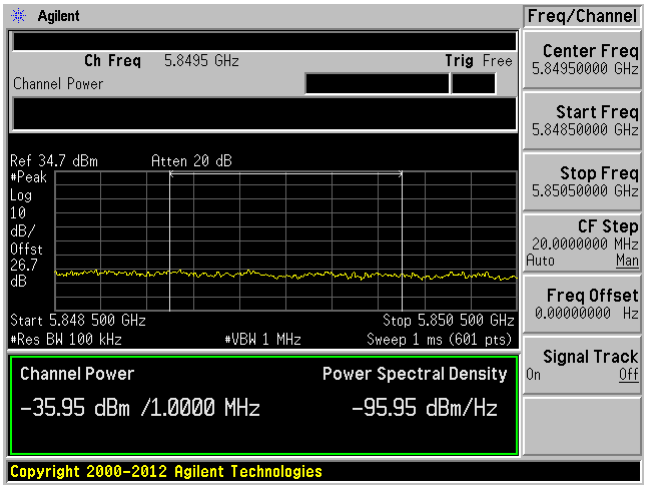
Low channel: 5745 MHz Chain 1



High channel: 5825 MHz Chain 0

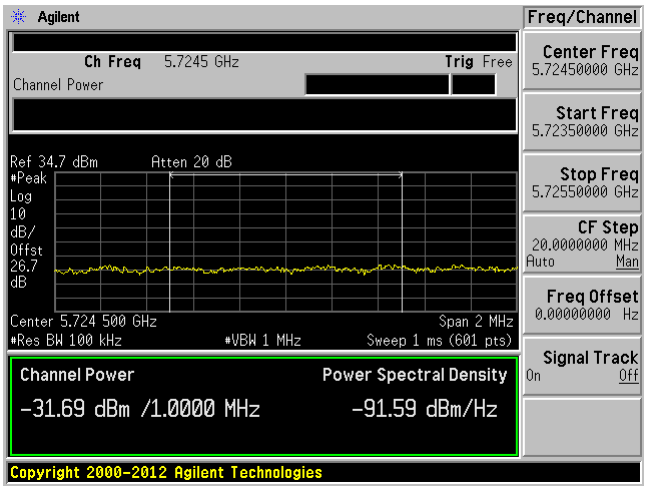


High channel: 5825 MHz Chain 1

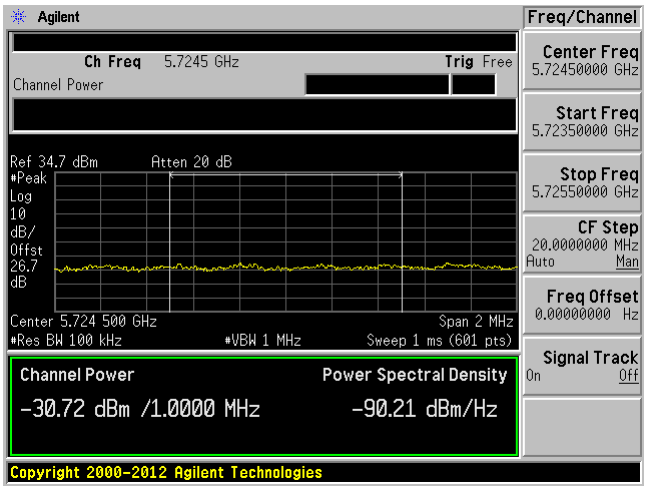


802.11n-HT40 mode

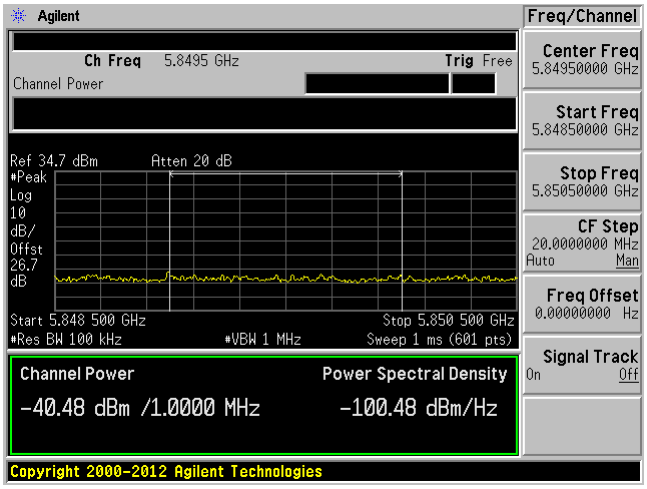
Low channel: 5755 MHz Chain 0



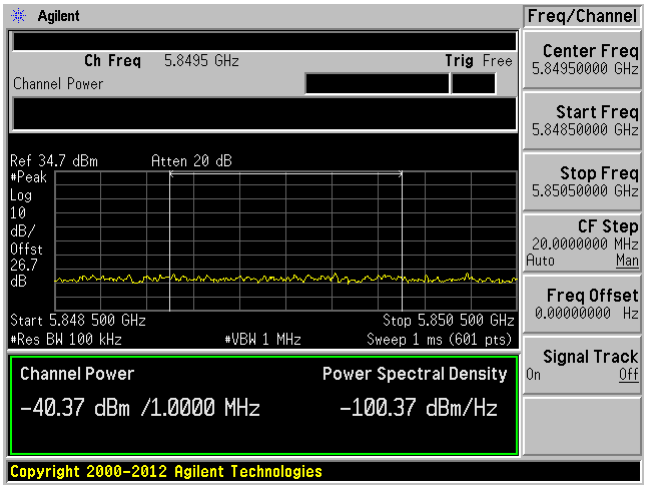
Low channel: 5755 MHz Chain 1



High channel: 5795 MHz Chain 0

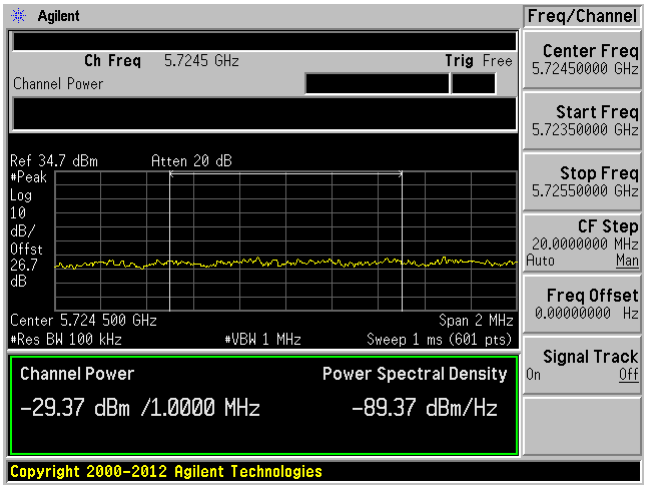


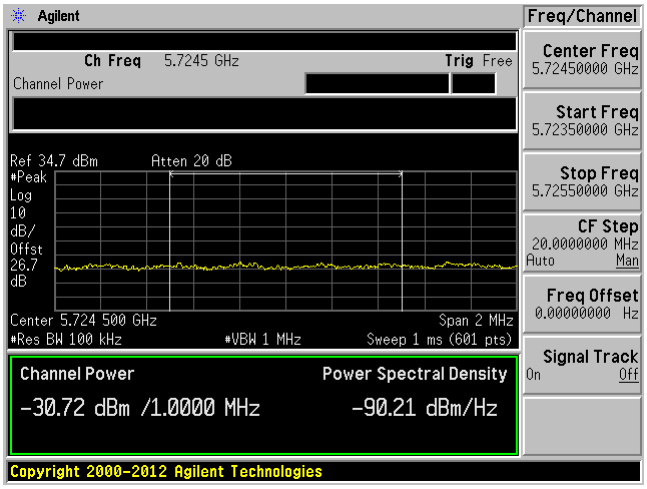
High channel: 5795 MHz Chain 1



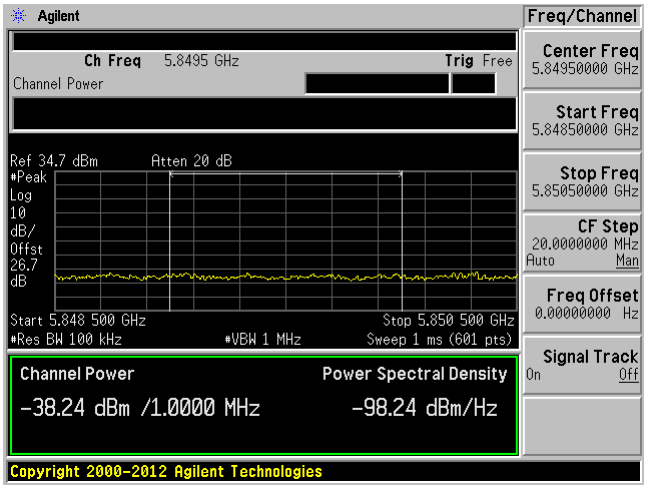
802.11ac 80 mode

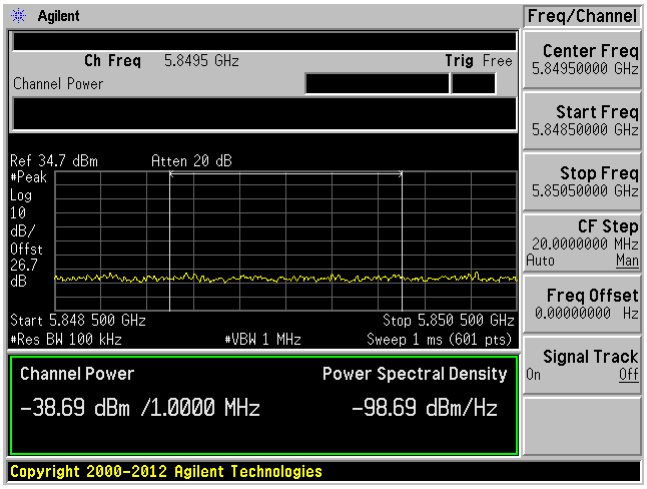
Channel: 5775 MHz Chain 0 Left Channel: 5775 MHz Chain 1





Channel: 5775 MHz Chain 0 Right Channel: 5775 MHz Chain 1





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

11.1 Applicable Standards

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. 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 e.i.r.p. 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 e.i.r.p. of −27 dBm/MHz. For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

11.2 Measurement Procedure

Procedure for Unwanted Emissions Measurements below 1000 MHz.
a) Follow the requirements in section G)3), “General Requirements for Unwanted Emissions Measurements”.
b) Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

Procedures for Average Unwanted Emissions Measurements above 1000 MHz.
a) Follow the requirements in section G)3), “General Requirements for Unwanted Emissions Measurements”.
b) Average emission levels shall be measured using one of the following two methods.
c) Method AD (Average Detection): Primary method
(i) RBW = 1 MHz.
(ii) VBW ≥ 3 MHz.
(iii) Detector = RMS, if span/(# of points in sweep) ≤ RBW/2. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
(iv) Averaging type = power (i.e., RMS)

• As an alternative, the detector and averaging type may be set for linear voltage averaging. Some analyzers require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
(v) Sweep time = auto.
(vi) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces should be averaged.
(vii) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
• If power averaging (RMS) mode was used in step (iv) above, the correction factor is10 log(1/x), where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.
• If linear voltage averaging mode was used in step (iv) above, the correction factor is 20 log(1/x), where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.

Add a correction factor (antenna gain+ Attenuator loss+cable loss) to the display.

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:	21-24º C
Relative Humidity:	40-43 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Chen Ge on 2014-06-26 to 2014-06-27 at RF site.

11.5 Test Results

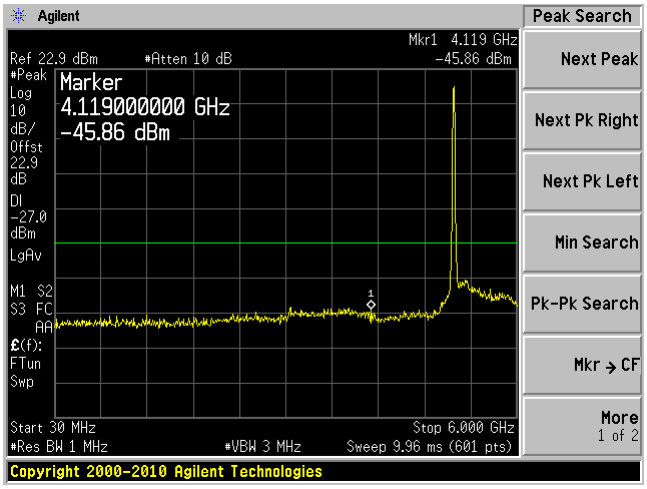
Please refer to following plots of spurious emissions.

Note: the offset include the attenuation, cable loss and the maximum antenna gain. And the magin between limit line and the emission covers other requirements in the KDB 789033.

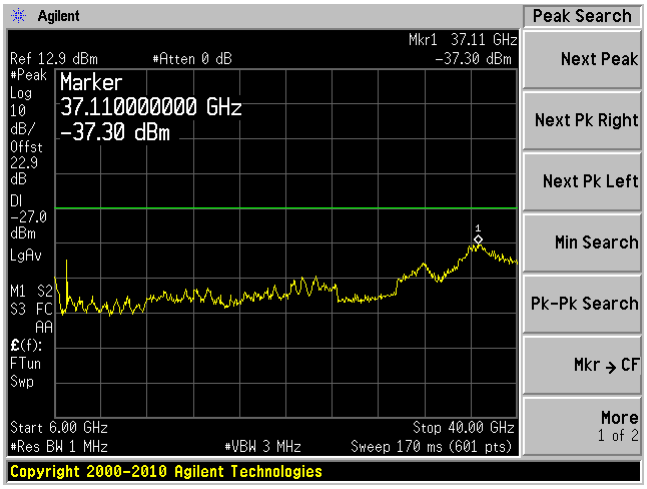
5.2 GHz Band

802.11a, Low Channel, 5180 MHz

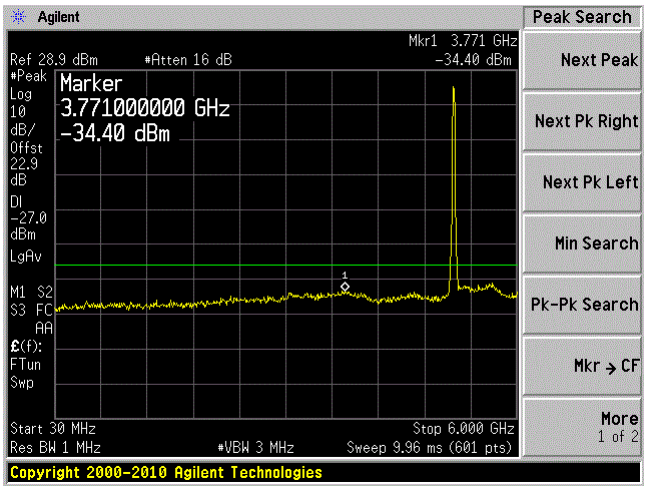
Chain 0, Plot: 30 MHz – 6 GHz



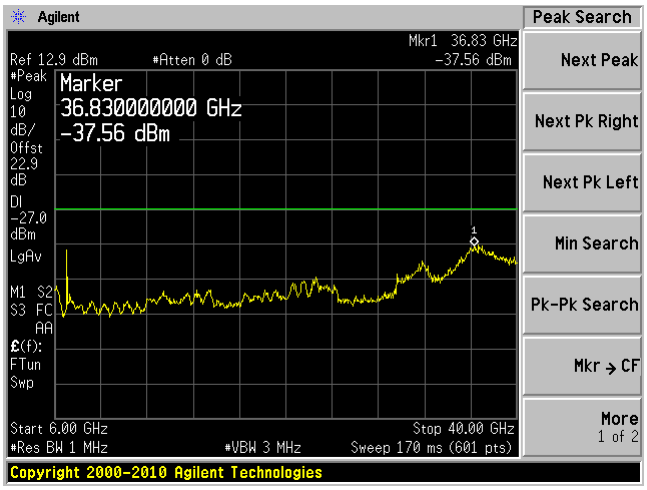
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

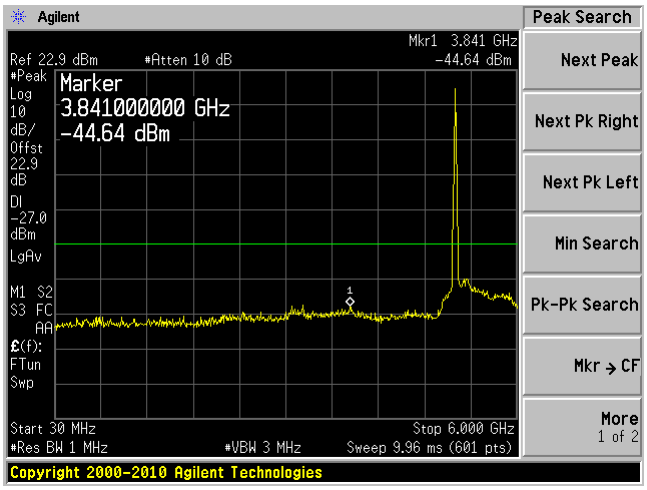


Chain 1, Plot: 6 GHz – 40 GHz

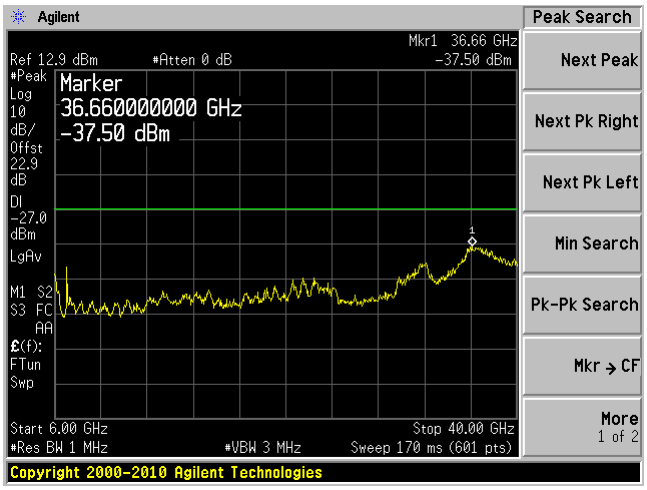


802.11a, Middle Channel, 5200 MHz

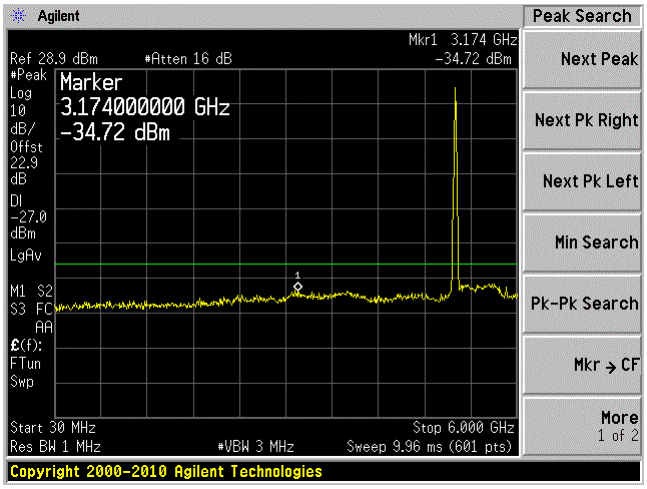
Chain 0, Plot: 30 MHz – 6 GHz



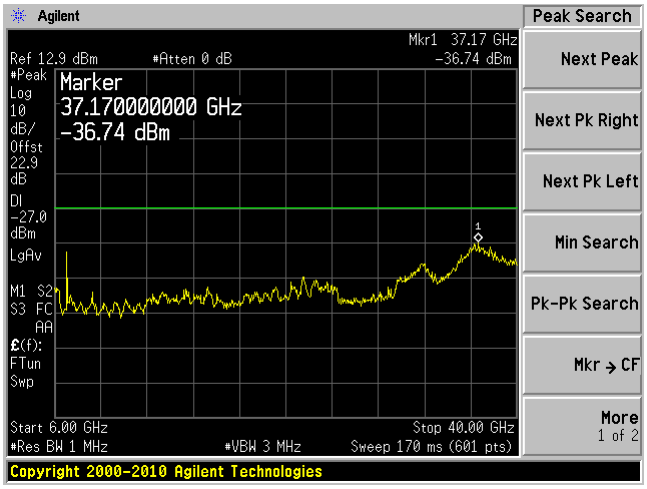
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

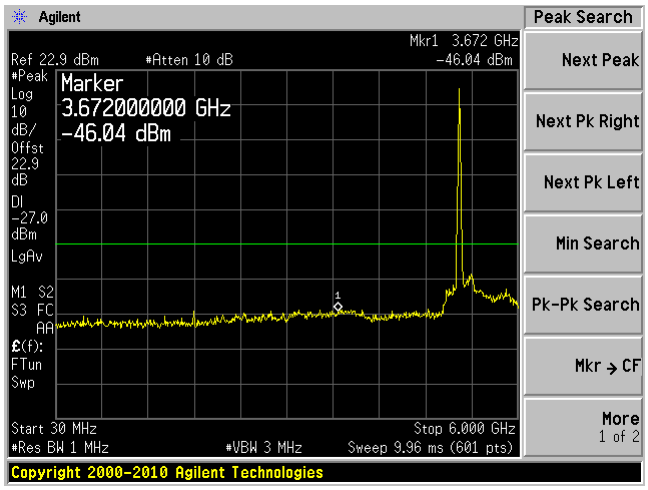


Chain 1, Plot: 6 GHz – 40 GHz

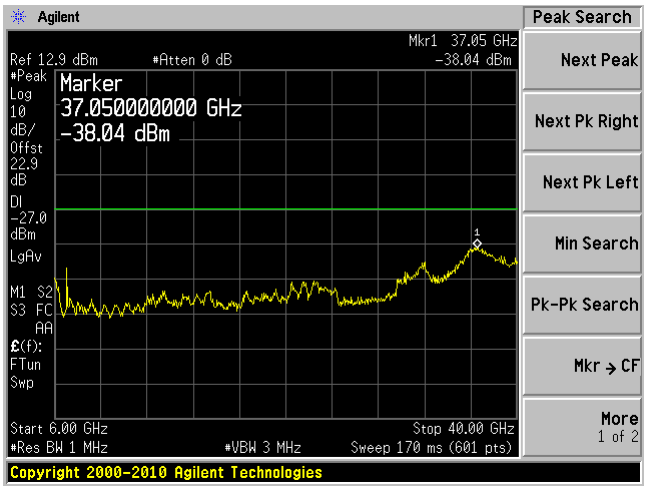


802.11a, High Channel, 5240 MHz

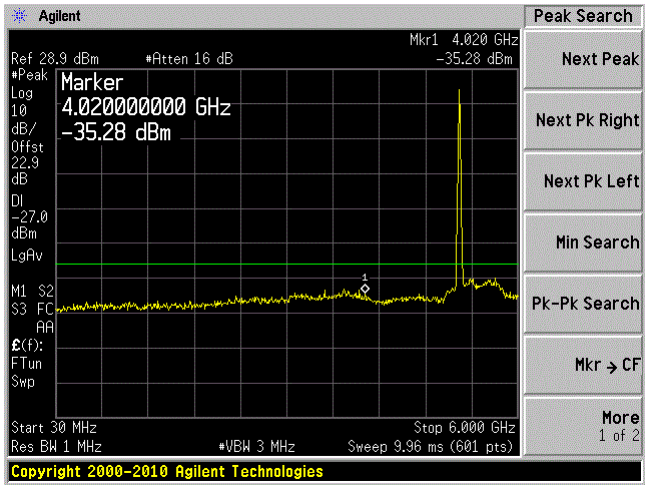
Chain 0, Plot: 30 MHz – 6 GHz



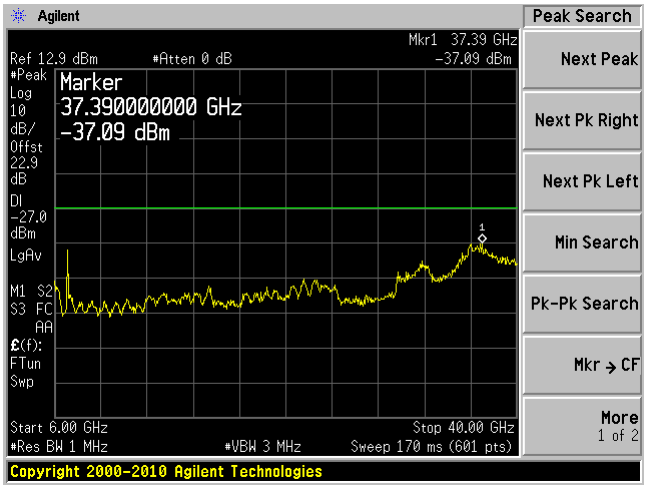
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

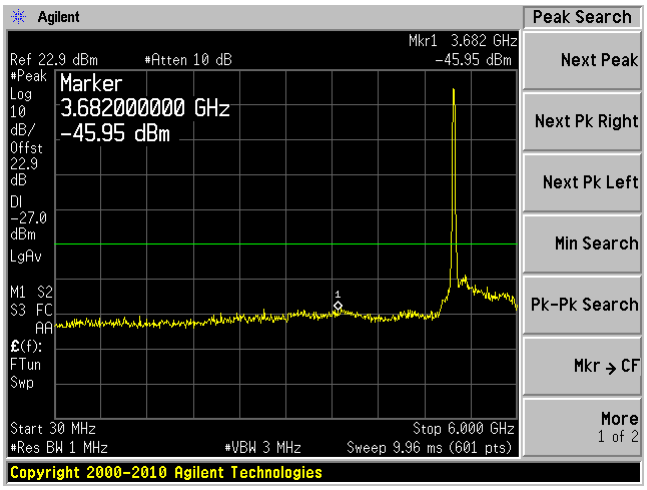


Chain 1, Plot: 6 GHz – 40 GHz

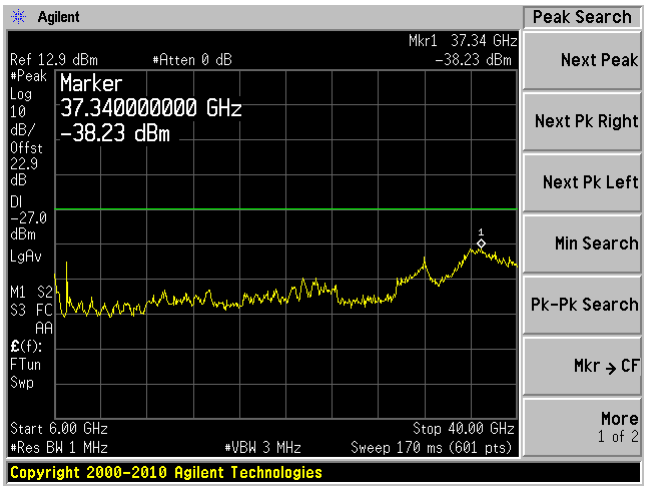


802.11n-HT 20, Low Channel 5180 MHz

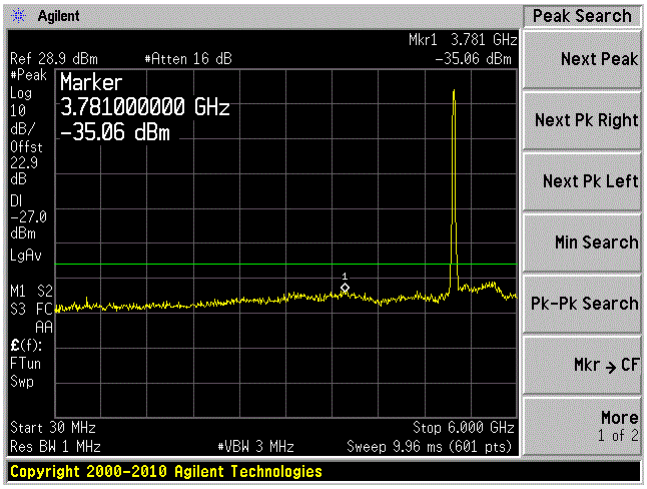
Chain 0, Plot: 30 MHz – 6 GHz



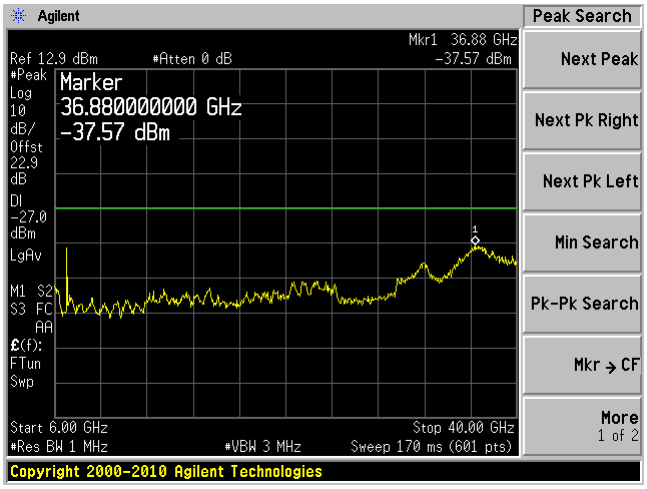
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

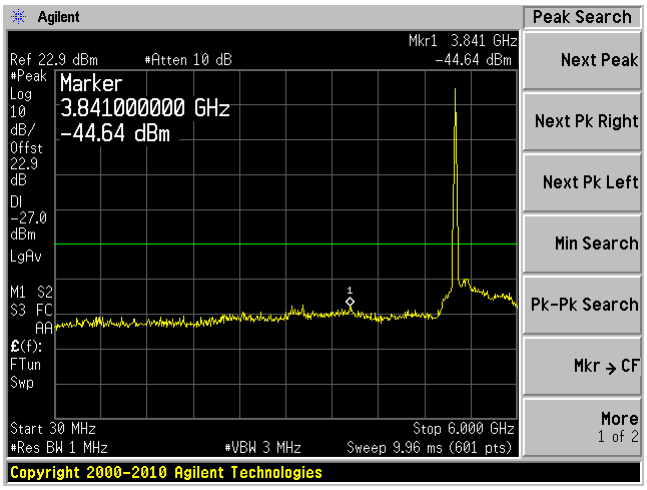


Chain 1, Plot: 6 GHz – 40 GHz

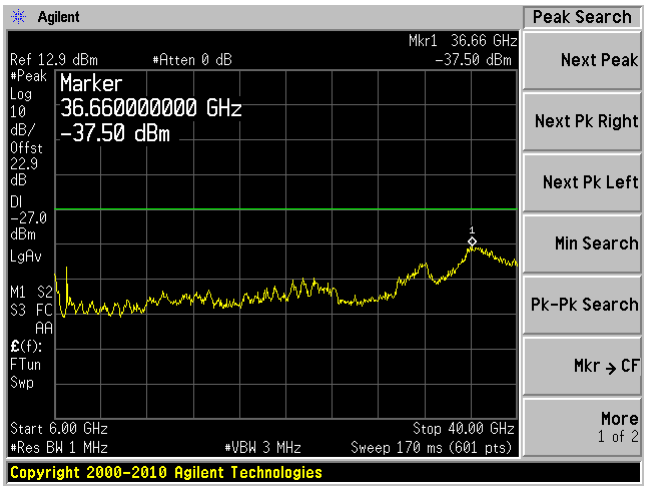


802.11n-HT20, Middle Channel 5200 MHz

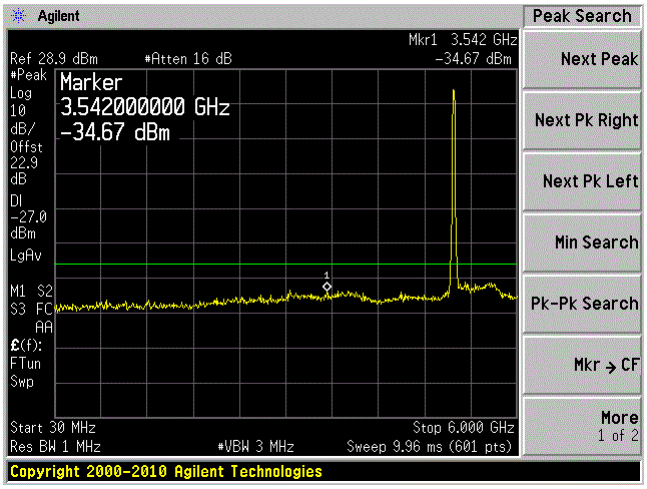
Chain 0, Plot: 30 MHz – 6 GHz



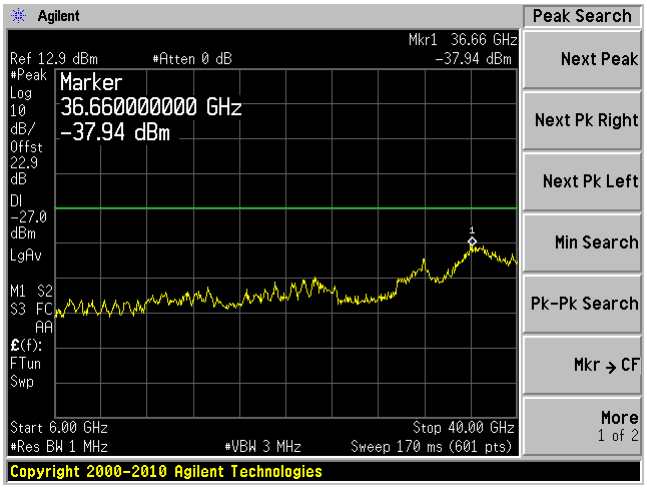
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

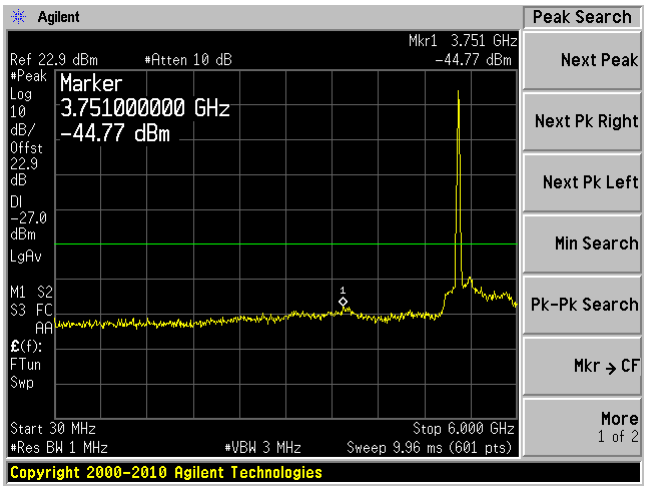


Chain 1, Plot: 6 GHz – 40 GHz

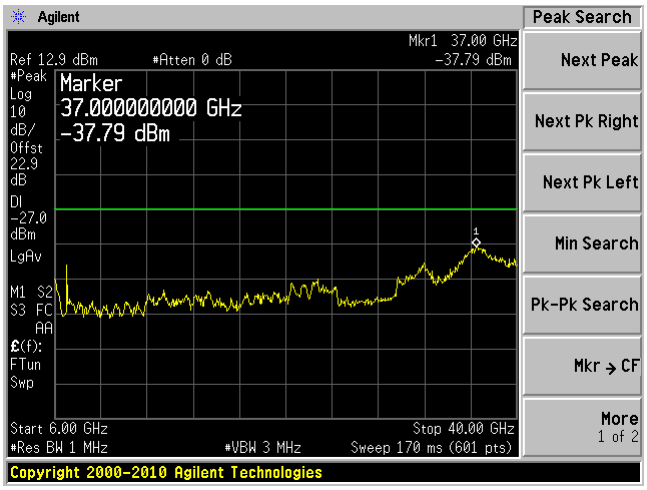


802.11n-HT 20, High Channel 5240 MHz

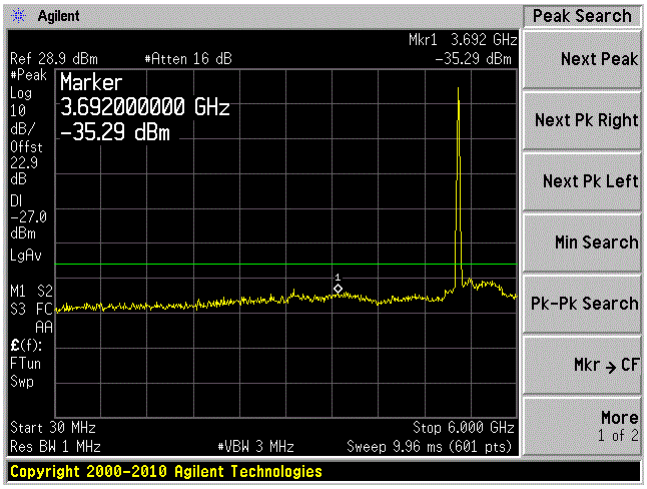
Chain 0, Plot: 30 MHz – 6 GHz



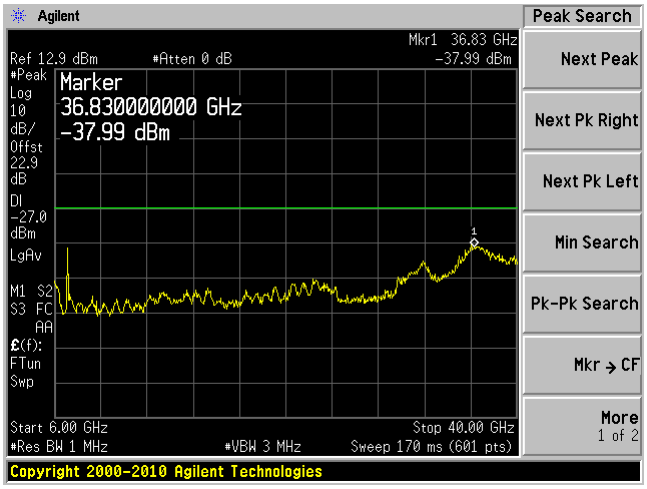
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

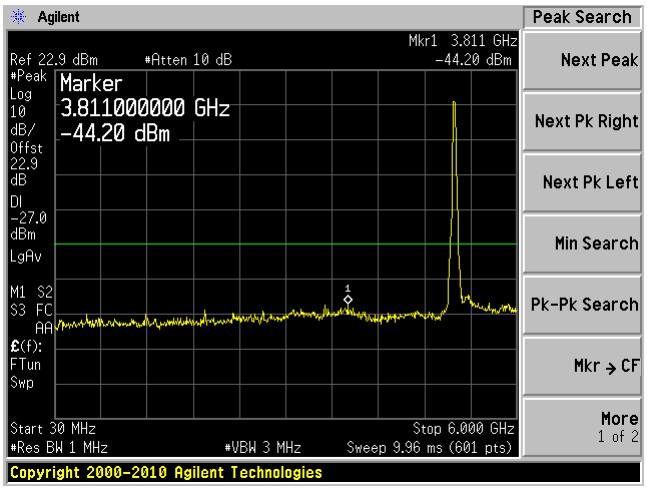


Chain 1, Plot: 6 GHz – 40 GHz

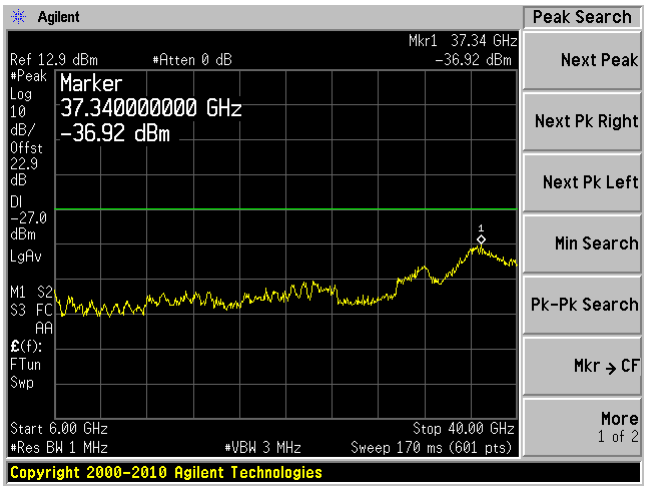


802.11n-HT40, Low Channel 5190 MHz

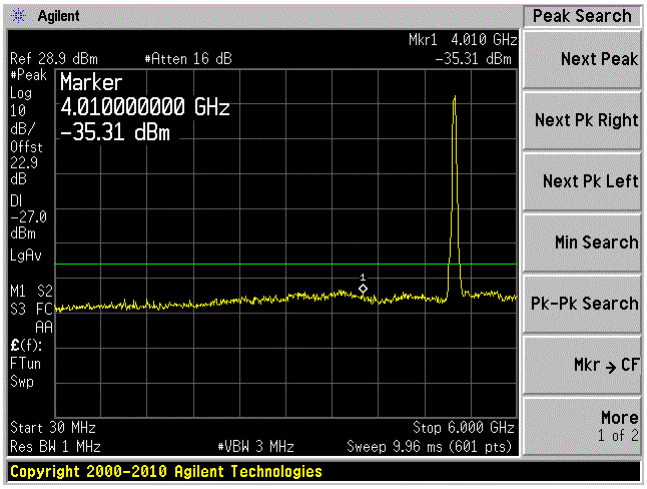
Chain 0, Plot: 30 MHz – 6 GHz



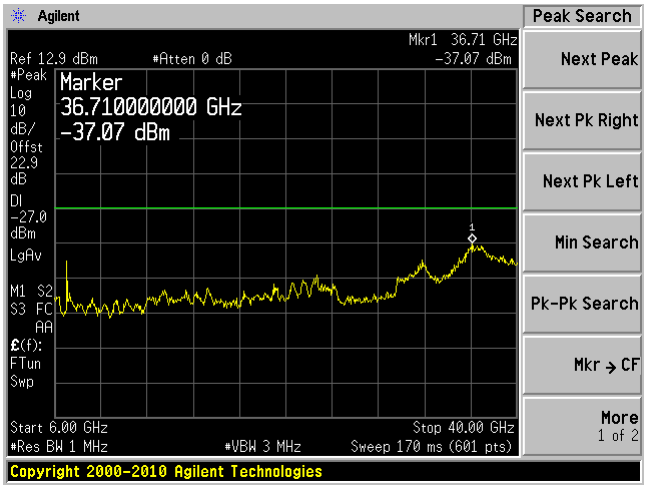
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

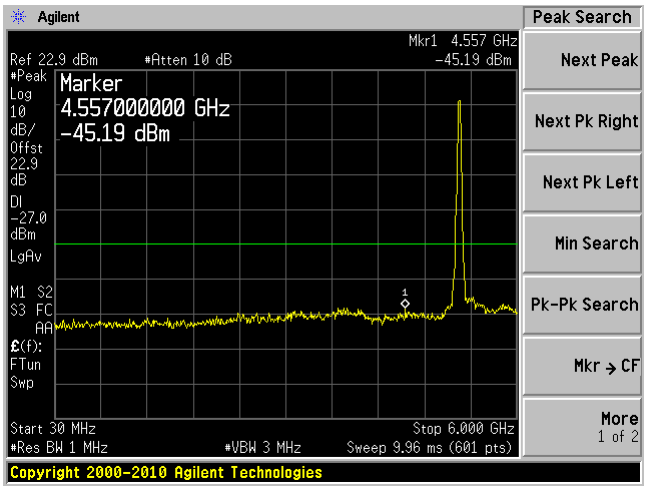


Chain 1, Plot: 6 GHz – 40 GHz

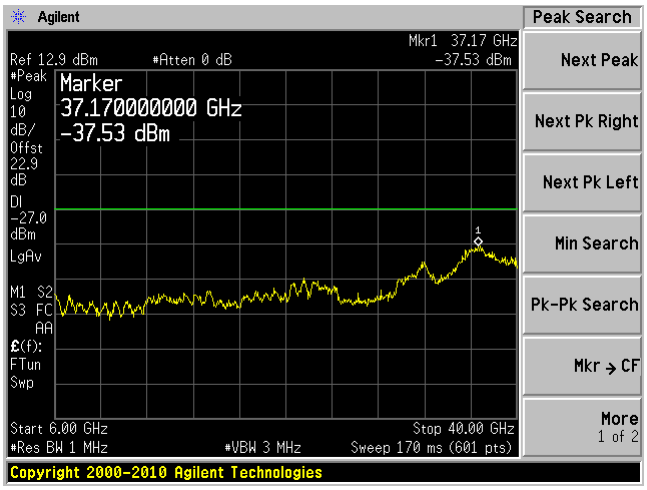


802.11n-HT40, High Channel 5230 MHz

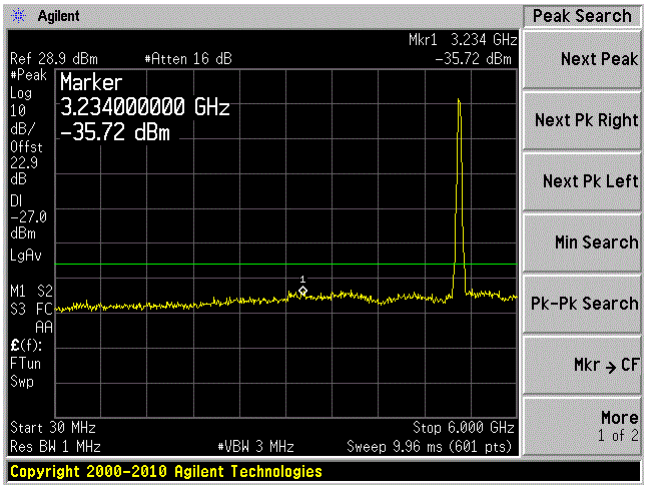
Chain 0, Plot: 30 MHz – 6 GHz



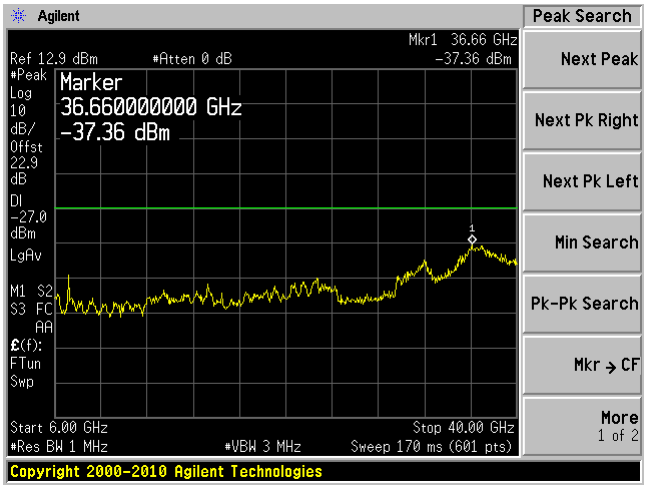
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

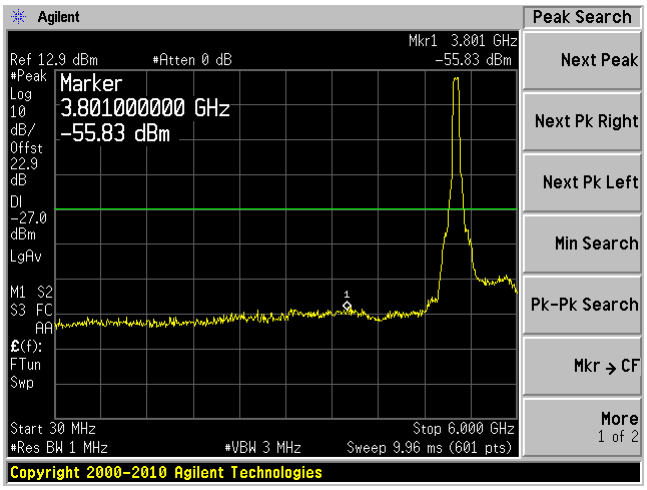


Chain 1, Plot: 6 GHz – 40 GHz

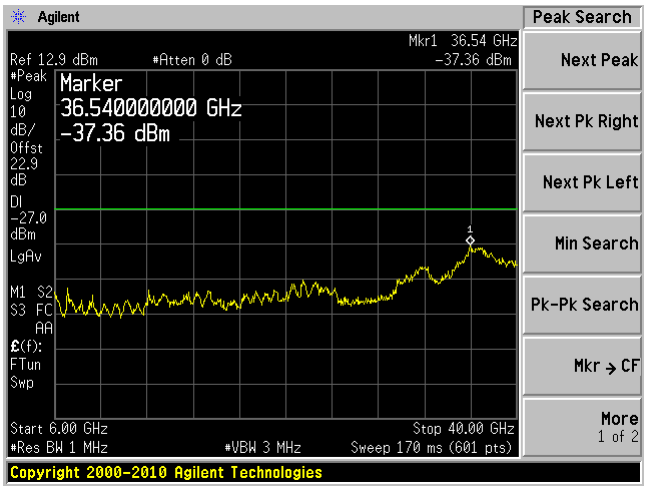


802.11ac 80, Channel 5210 MHz

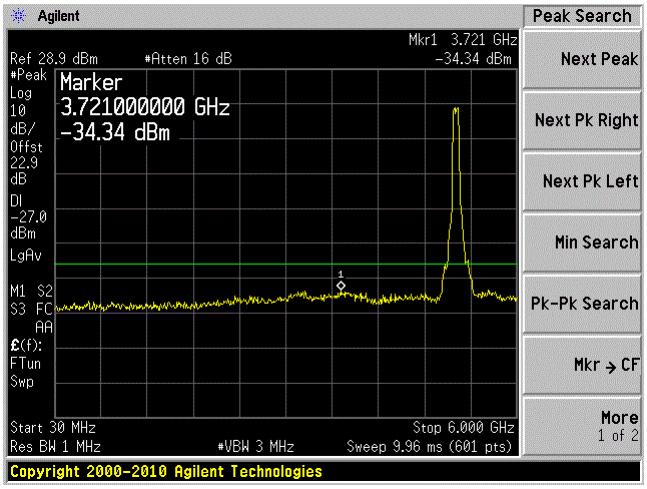
Chain 0, Plot: 30 MHz – 6 GHz



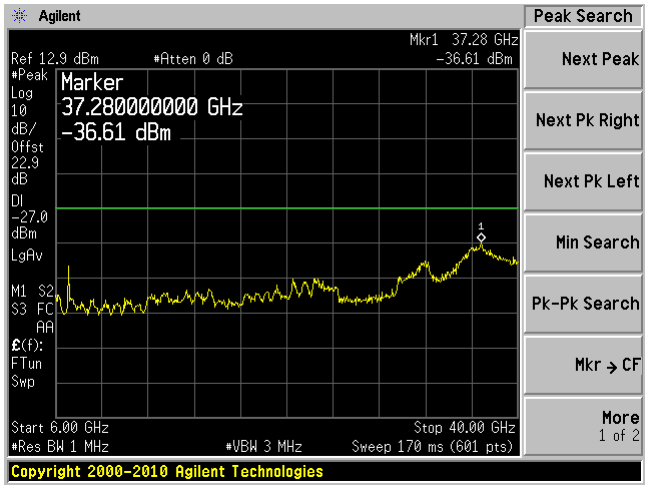
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz



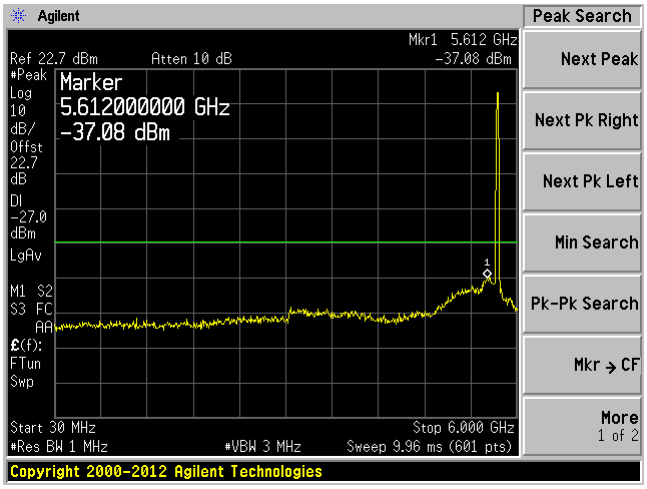
Chain 1, Plot: 6 GHz – 40 GHz



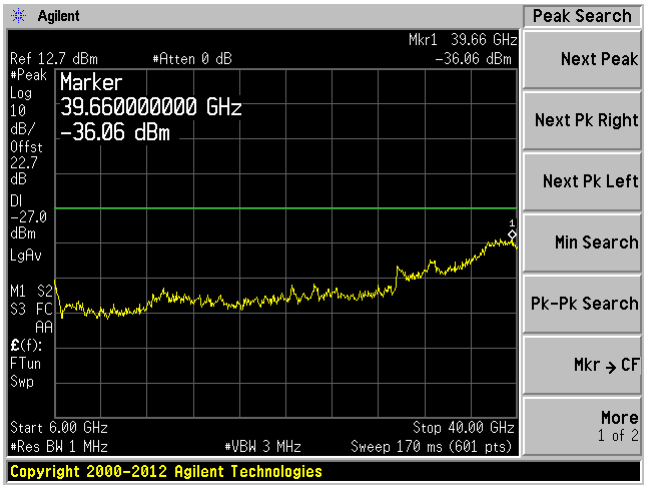
5.8 GHz Band

802.11a, Low Channel, 5745 MHz

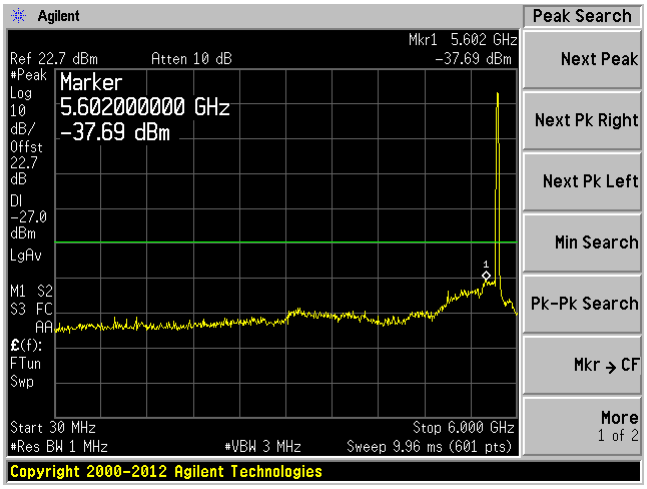
Chain 0, Plot: 30 MHz – 6 GHz



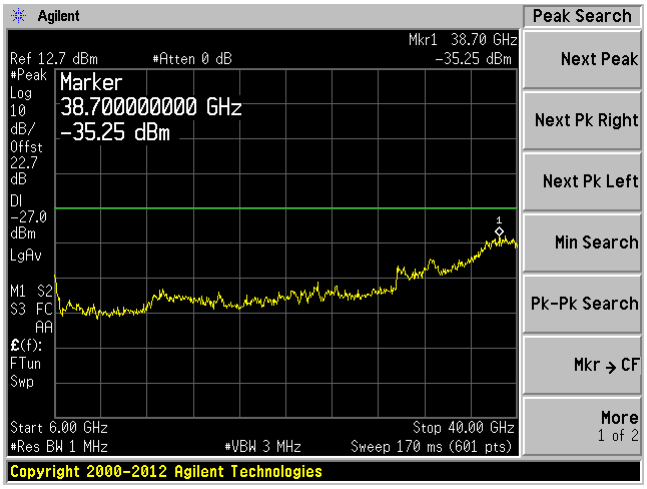
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

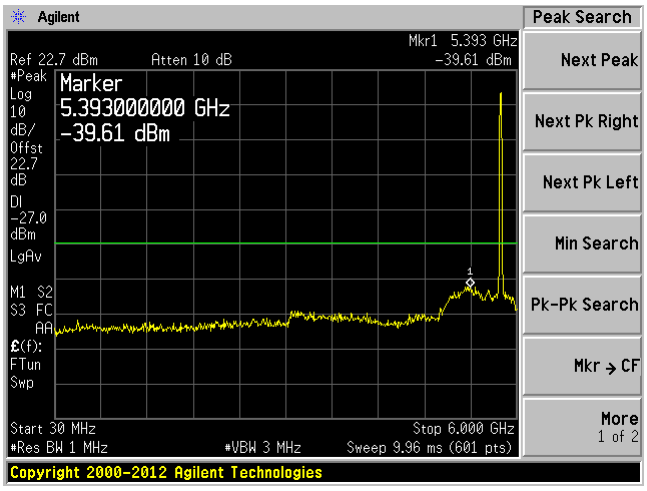


Chain 1, Plot: 6 GHz – 40 GHz

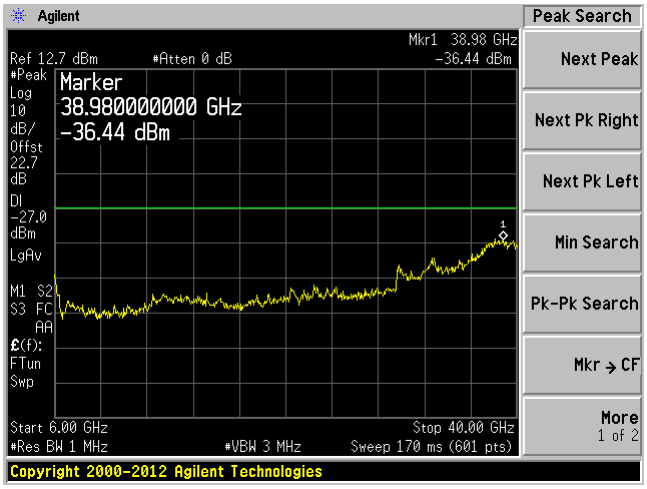


802.11a, Middle Channel, 5785 MHz

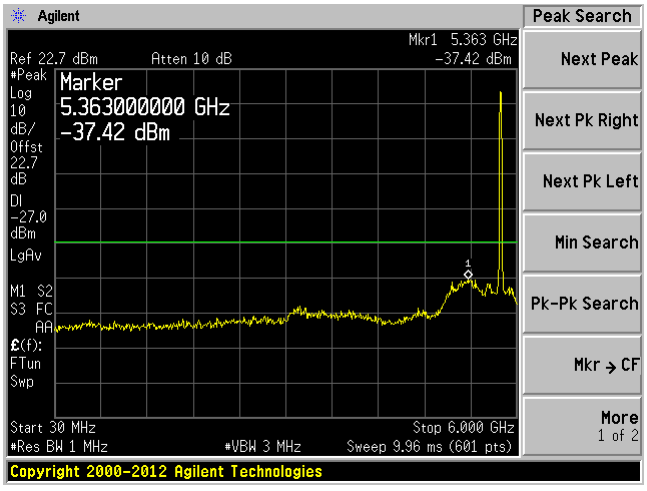
Chain 0, Plot: 30 MHz – 6 GHz



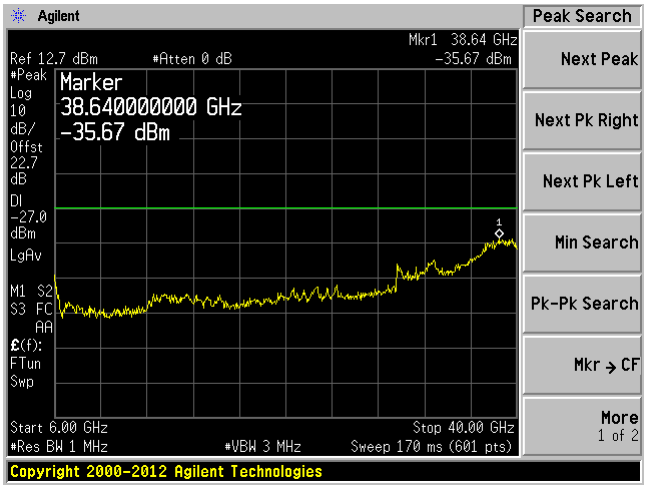
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

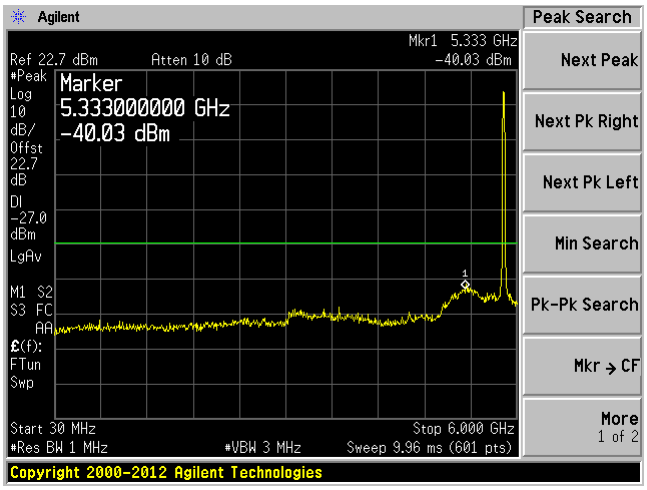


Chain 1, Plot: 6 GHz – 40 GHz

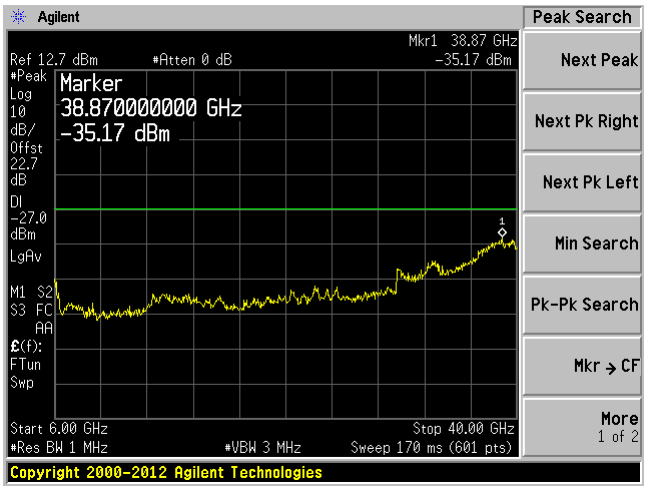


802.11a, High Channel, 5825 MHz

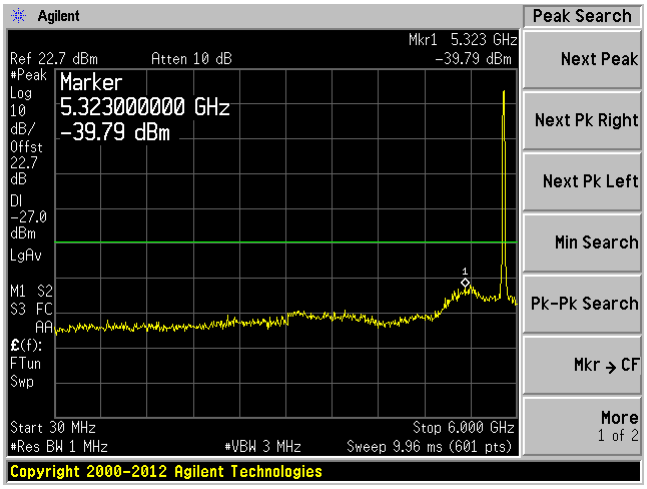
Chain 0, Plot: 30 MHz – 6 GHz



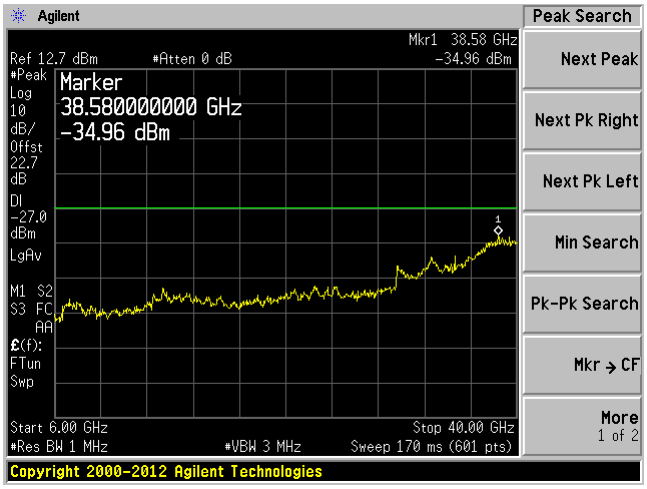
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

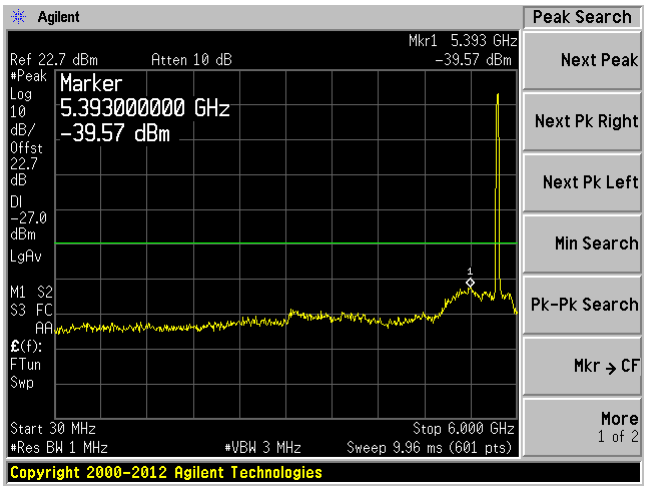


Chain 1, Plot: 6 GHz – 40 GHz

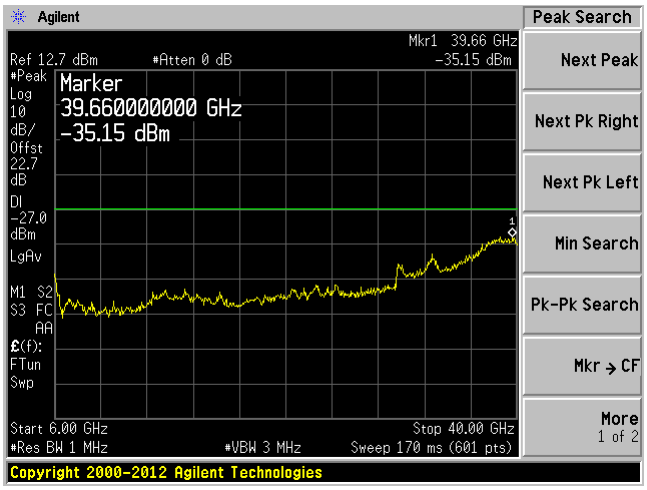


802.11n-HT 20, Low Channel 5745 MHz

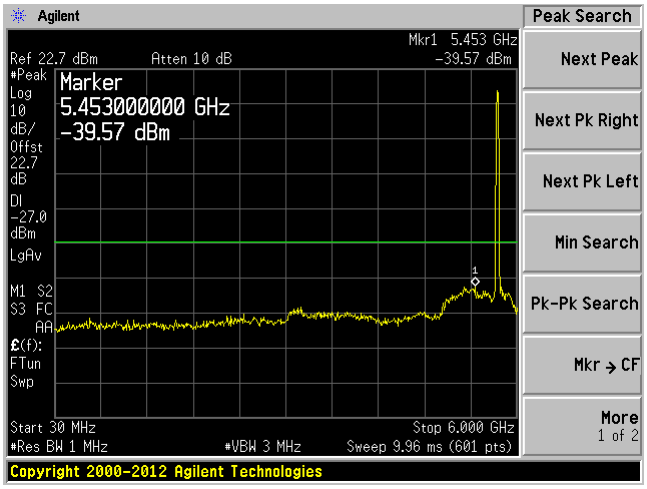
Chain 0, Plot: 30 MHz – 6 GHz



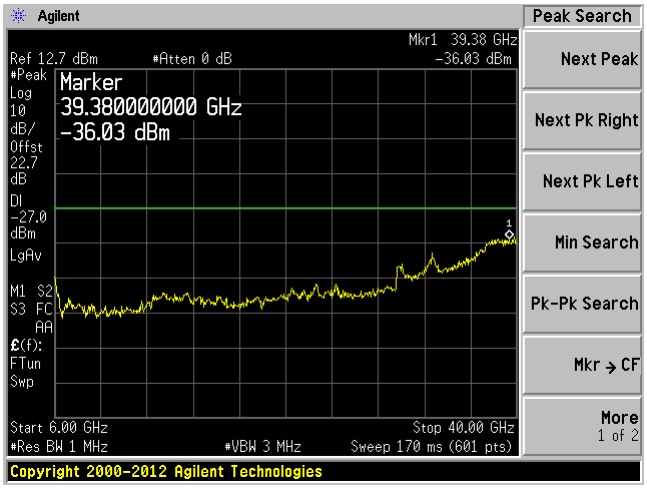
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

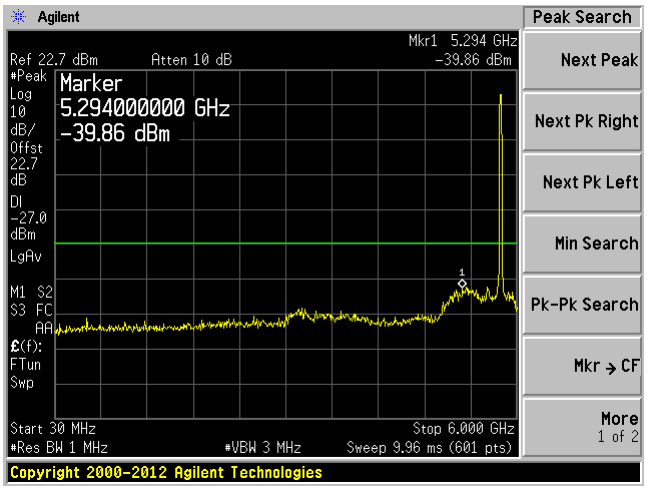


Chain 1, Plot: 6 GHz – 40 GHz

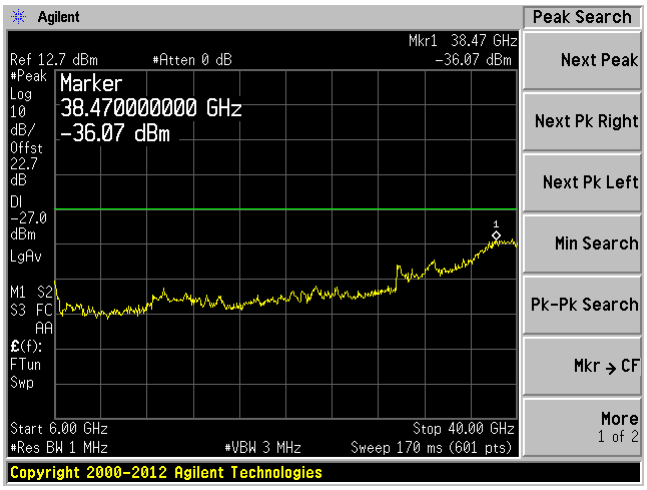


802.11n-HT20, Middle Channel 5785 MHz

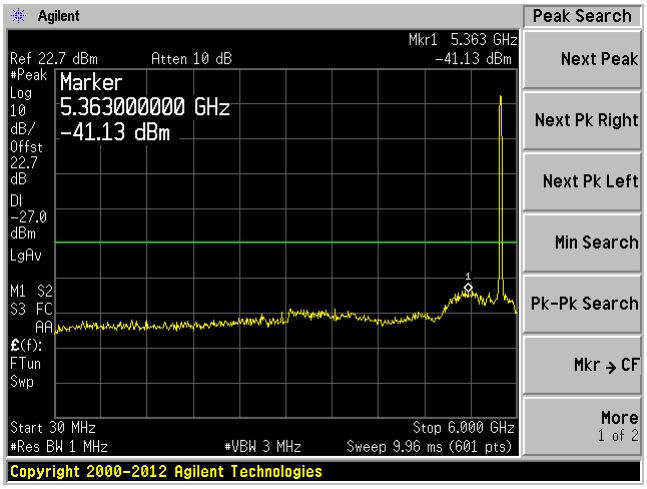
Chain 0, Plot: 30 MHz – 6 GHz



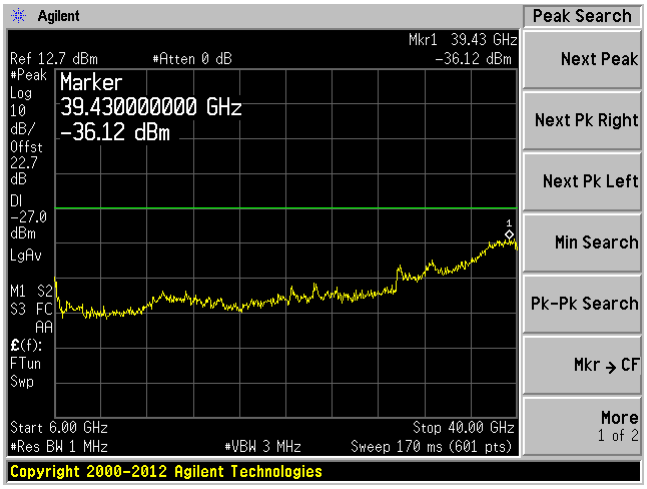
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

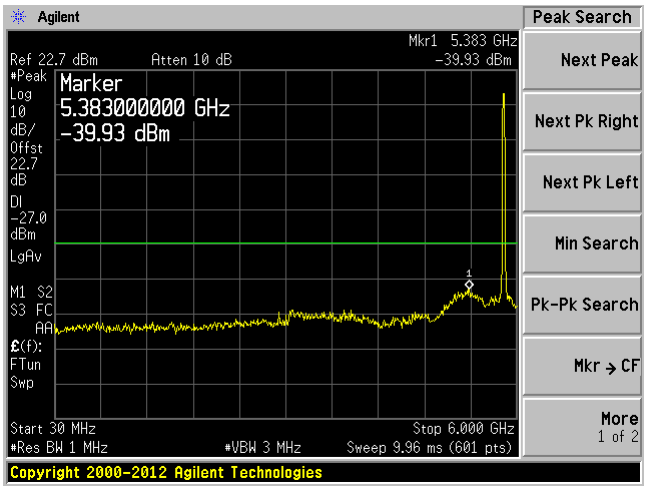


Chain 1, Plot: 6 GHz – 40 GHz

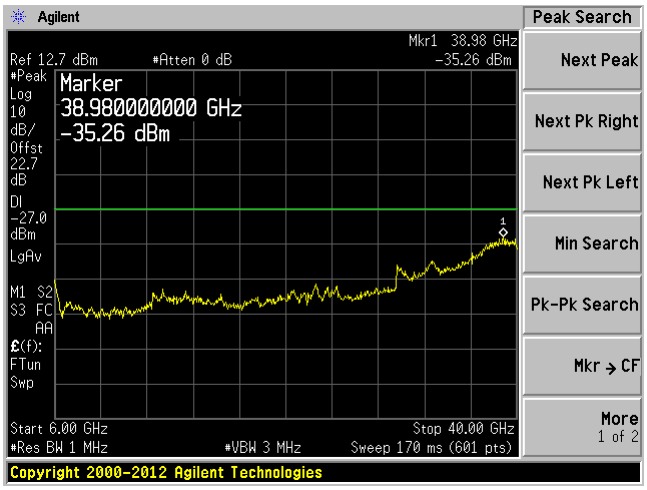


802.11n-HT20, High Channel 5825 MHz

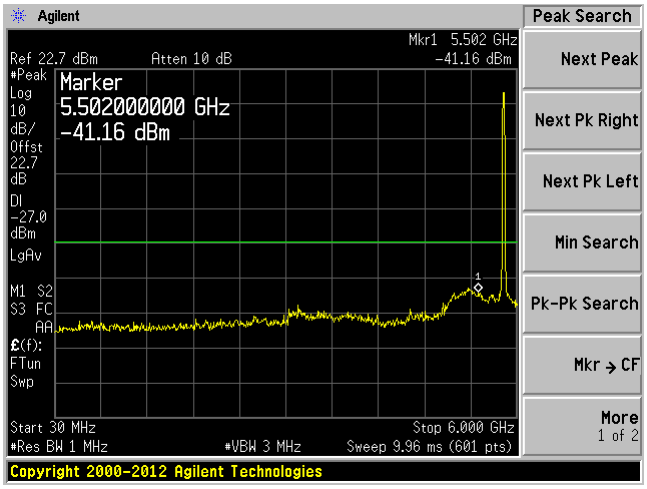
Chain 0, Plot: 30 MHz – 6 GHz



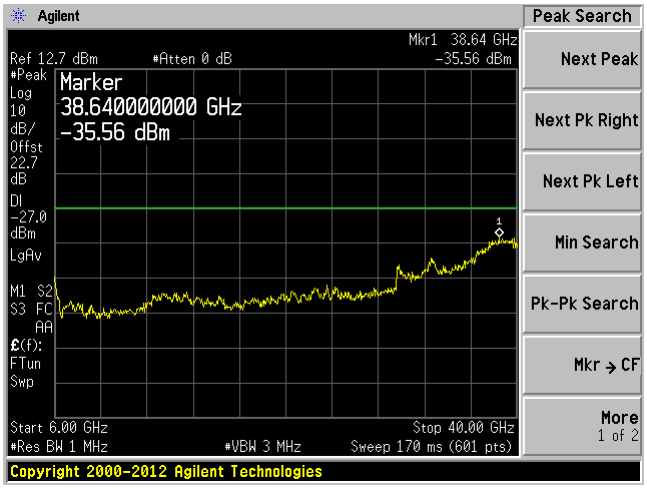
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

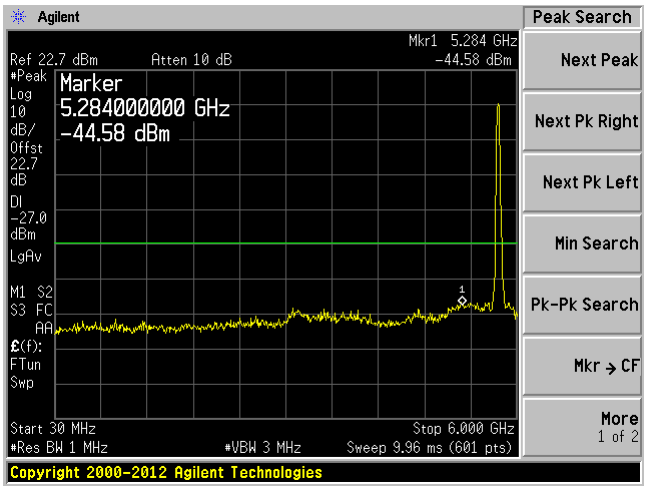


Chain 1, Plot: 6 GHz – 40 GHz

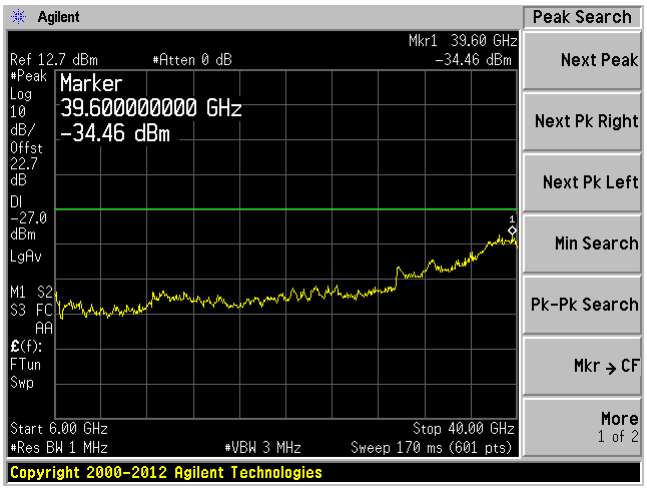


802.11n-HT40, Low Channel 5755 MHz

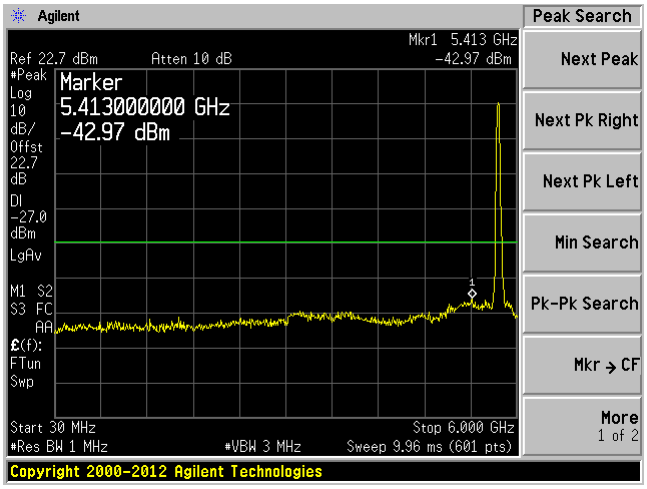
Chain 0, Plot: 30 MHz – 6 GHz



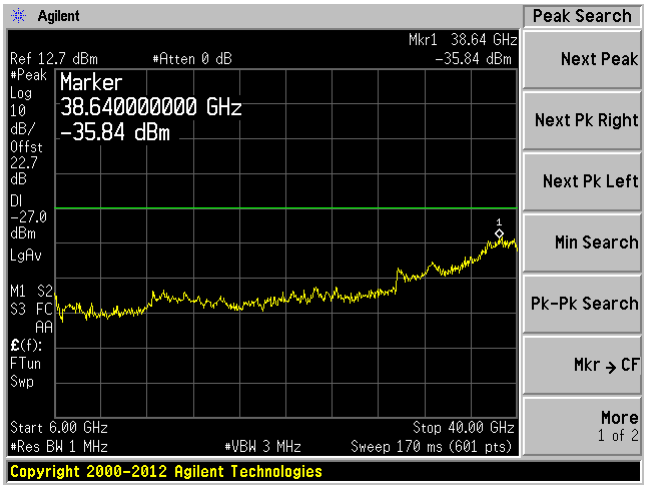
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

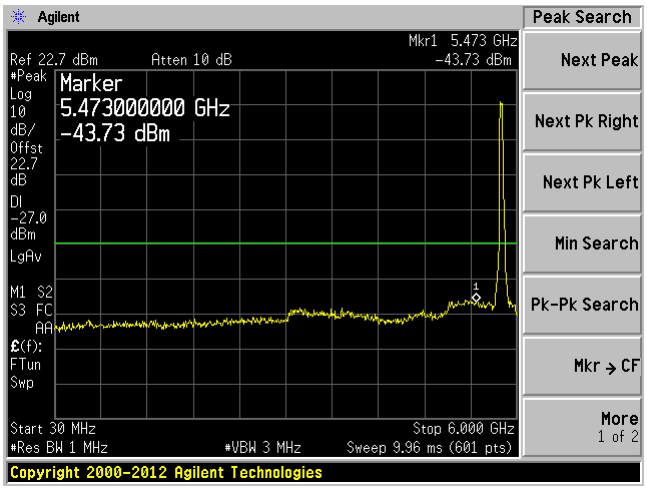


Chain 1, Plot: 6 GHz – 40 GHz

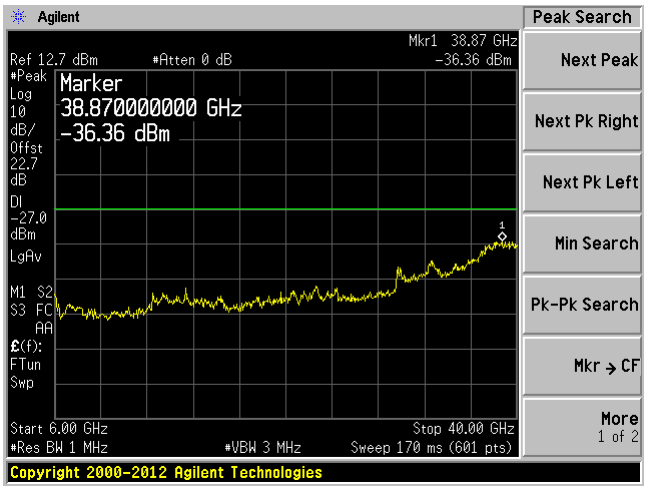


802.11n-HT40, High Channel 5795 MHz

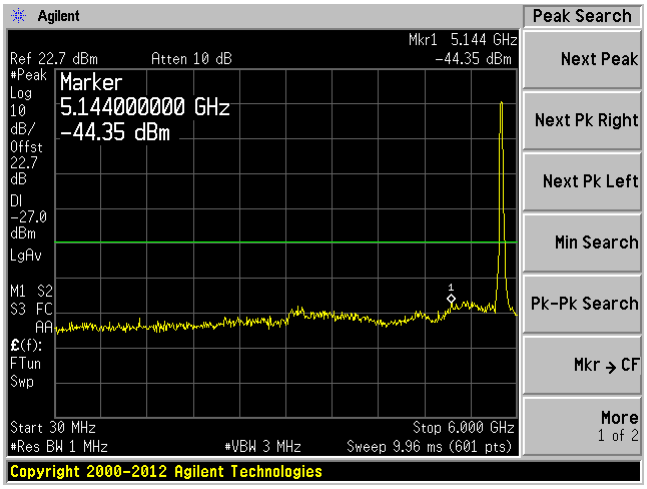
Chain 0, Plot: 30 MHz – 6 GHz



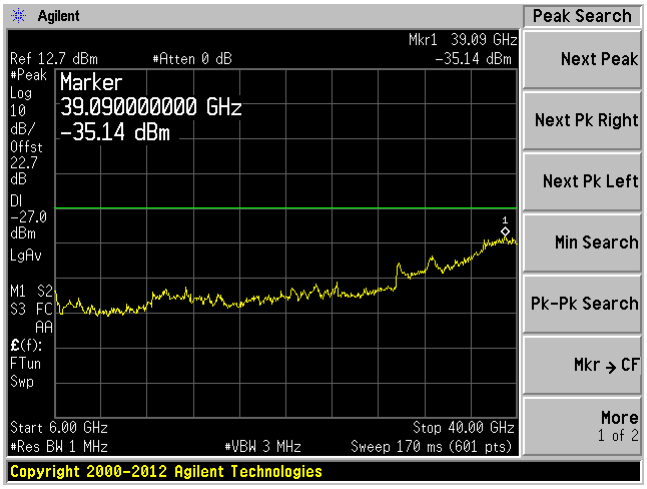
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz

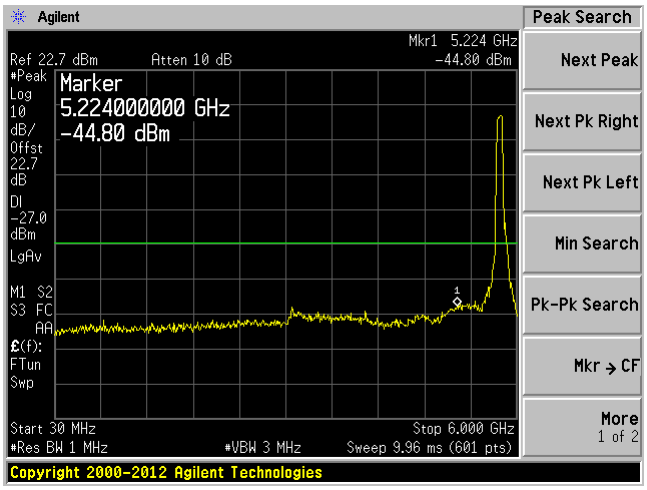


Chain 1, Plot: 6 GHz – 40 GHz

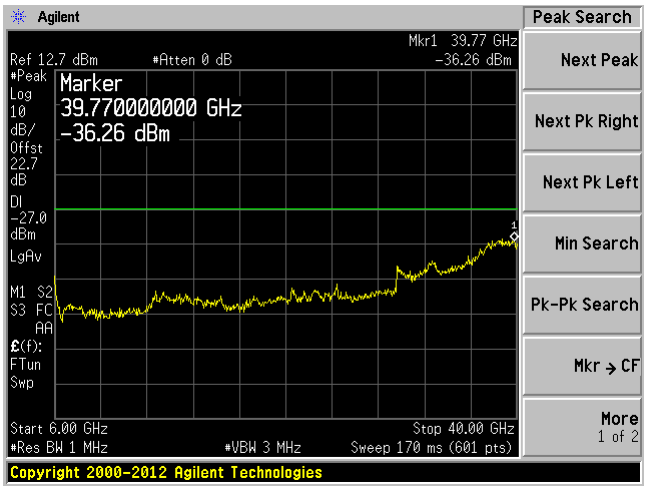


802.11ac 80, High Channel 5775 MHz

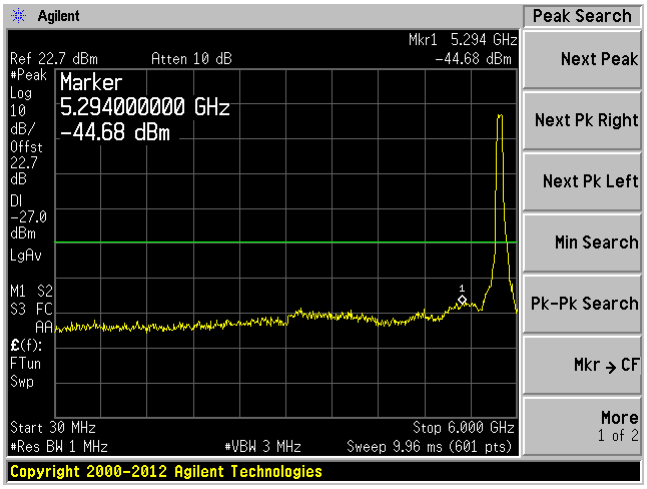
Chain 0, Plot: 30 MHz – 6 GHz



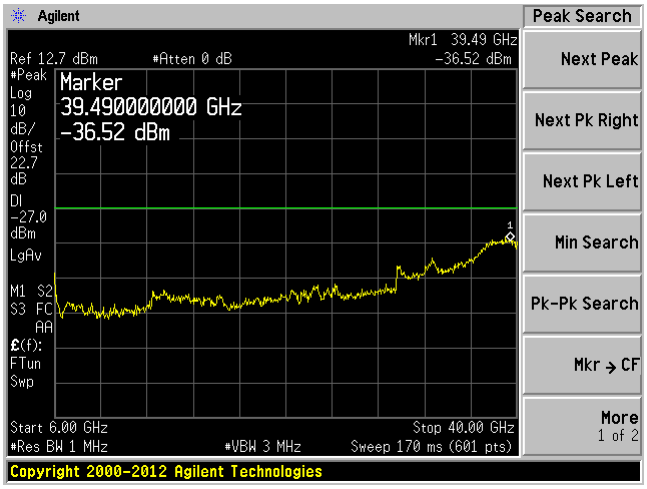
Chain 0, Plot: 6 GHz – 40 GHz



Chain 1, Plot: 30 MHz – 6 GHz



Chain 1, Plot: 6 GHz – 40 GHz



12 FCC §15.407(a) - Power Spectral Density

12.1 Applicable Standards

According to FCC §15.407(a)(1)

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

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

According to FCC §15.407(a)(2)

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

According to FCC §15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

12.2 Measurement Procedure

(i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
(ii) Set RBW = 1 MHz.
(iii) Set VBW ≥ 3 MHz.
(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(v) Sweep time = auto.
(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
(ix) Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

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:	21-24º C
Relative Humidity:	40-43 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Chen Ge on 2014-06-26 to 2014-06-27 at RF site.

12.5 Test Results

5.2 GHz Band

802.11a mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/MHz)	TX Chain 1 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)
Low	5180	7.712	7.653	10.693	17
Middle	5200	9.535	9.661	12.609	17
High	5240	9.027	8.986	12.017	17

802.11n-HT20 mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/MHz)	TX Chain 1 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)
Low	5180	7.164	7.497	10.344	17
Middle	5200	9.23	9.152	12.201	17
High	5240	8.739	8.848	11.804	17

802.11n-HT40 mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/MHz)	TX Chain 1 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)
Low	5190	3.394	3.922	6.676	17
High	5230	5.453	5.618	8.547	17

802.11ac 80 mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/MHz)	TX Chain 1 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)
-	5210	2.157	1.838	5.011	17

5.8 GHz Band

802.11a mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/100kHz)	TX Chain 1 PSD (dBm/100kHz)	Total PSD (dBm/100 kHz)	Corrected PSD (dBm/500 kHz)	Limit (dBm/500 kHz)
Low	5745	1.065	0.87	3.979	10.959	30
Middle	5785	1.735	1.095	4.437	11.417	30
High	5825	1.337	0.533	3.964	10.944	30

802.11n-HT20 mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/100kHz)	TX Chain 1 PSD (dBm/100kHz)	Total PSD (dBm/100 kHz)	Corrected PSD (dBm/500 kHz)	Limit (dBm/500 kHz)
Low	5745	0.899	0.433	3.683	10.663	30
Middle	5785	1.27	1.092	4.192	11.172	30
High	5825	0.904	0.997	3.961	10.941	30

802.11n-HT40 mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/100kHz)	TX Chain 1 PSD (dBm/100kHz)	Total PSD (dBm/100 kHz)	Corrected PSD (dBm/500 kHz)	Limit (dBm/500 kHz)
Low	5755	-1.632	-1.711	1.339	8.319	30
High	5795	-2.351	-1.989	0.844	7.824	30

802.11ac 80 mode

Channel	Frequency (MHz)	TX Chain 0 PSD (dBm/100kHz)	TX Chain 1 PSD (dBm/100kHz)	Total PSD (dBm/100 kHz)	Corrected PSD (dBm/500 kHz)	Limit (dBm/500 kHz)
-	5775	-6.768	-6.735	-3.741	3.239	30

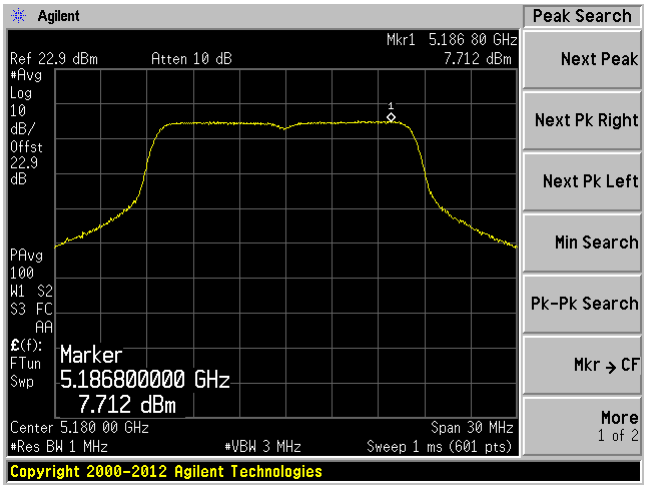
Note : RBW=100 kHz is used for the testing of W58 band, and the corrected level=PSD/100 kHz+10Log(500/100).

Please refer to the following plots.

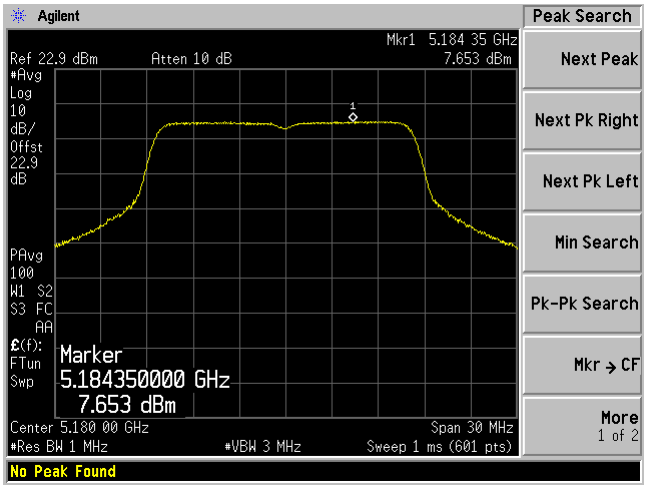
5.2 GHz Band

802.11a mode

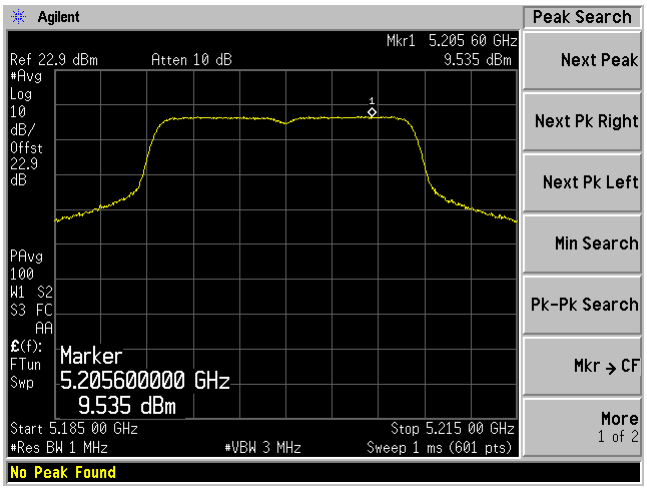
Low channel: 5180 MHz Chain 0



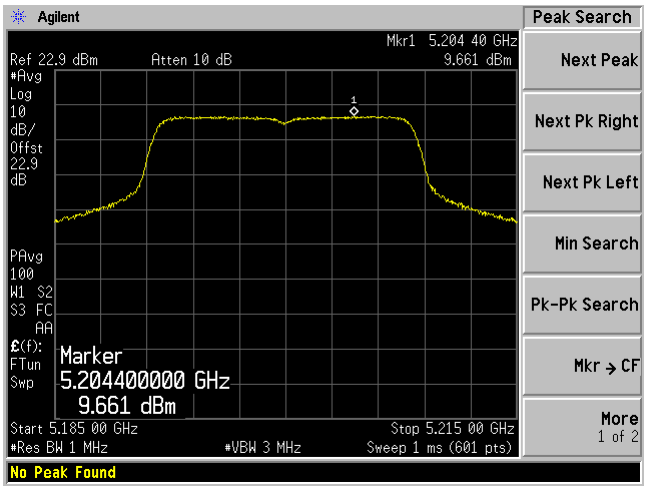
Low channel: 5180 MHz Chain 1



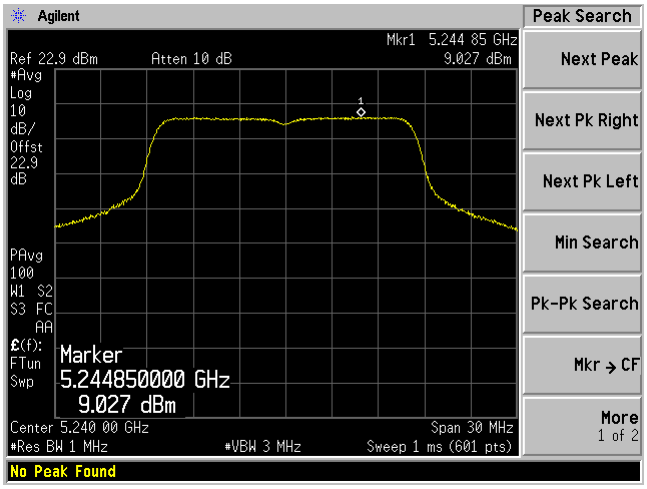
Middle channel: 5200 MHz Chain 0



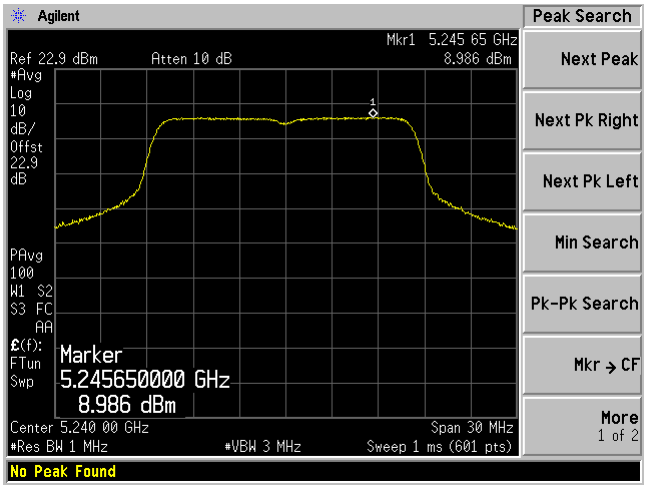
Middle channel: 5200 MHz Chain 1



High channel: 5240 MHz Chain 0

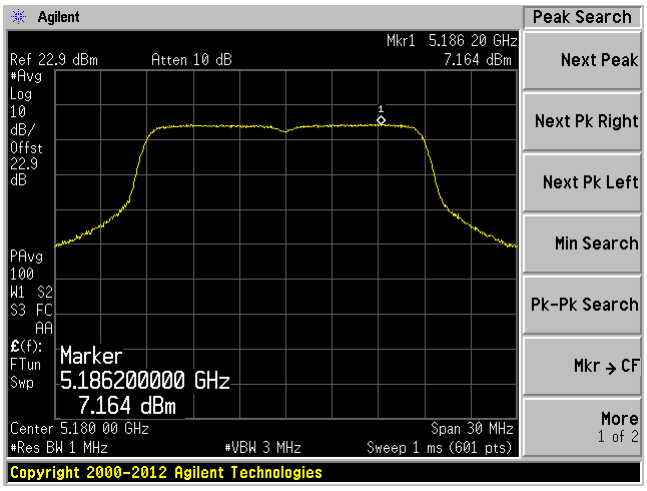


High channel: 5240 MHz Chain 1

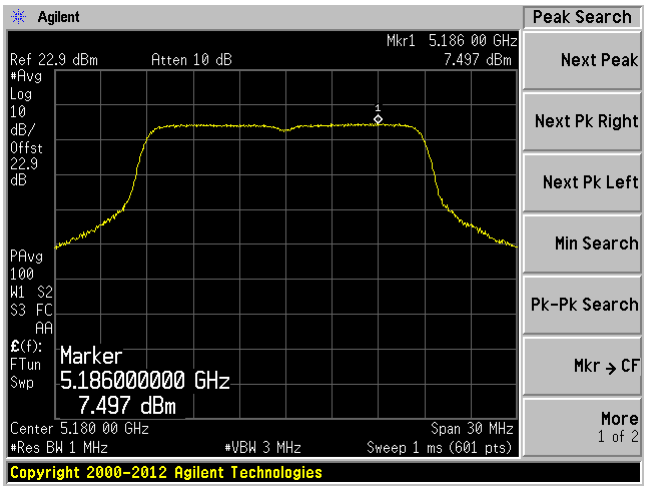


802.11n-HT20 mode

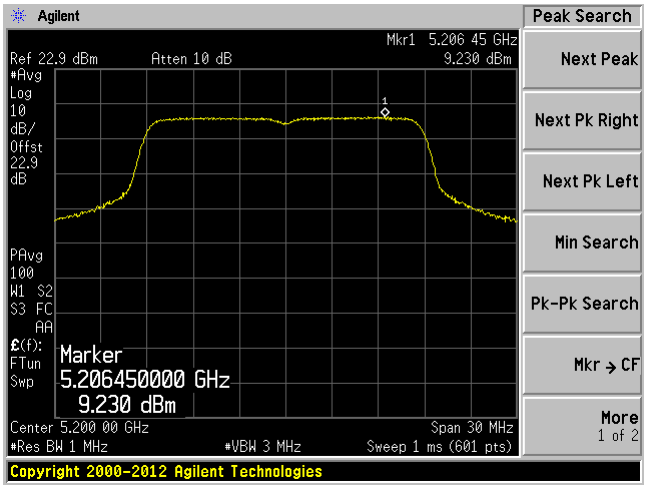
Low channel: 5180 MHz Chain 0



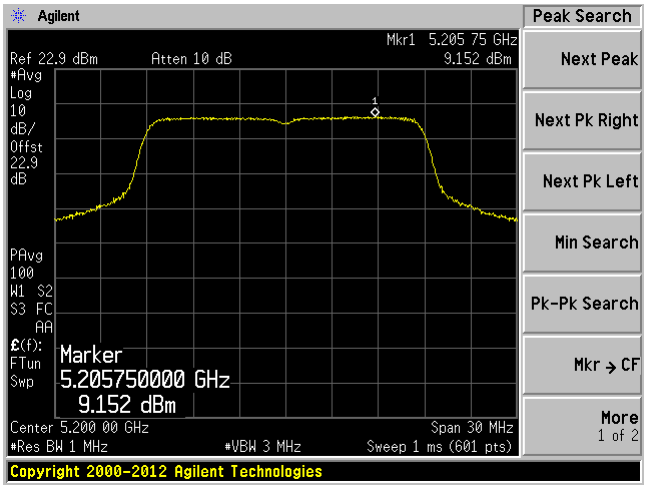
Low channel: 5180 MHz Chain 1



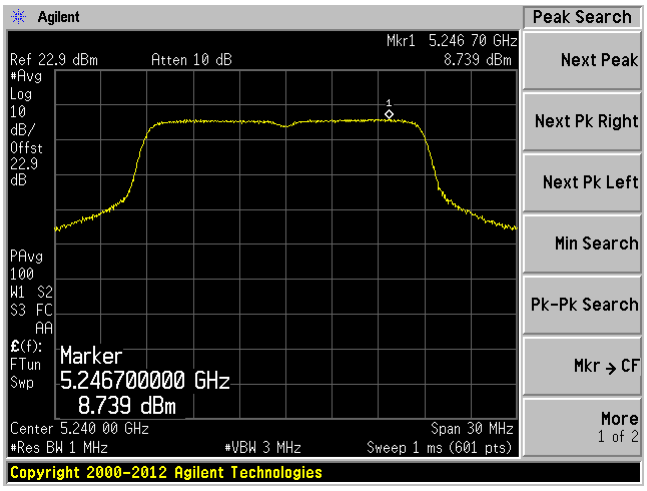
Middle channel: 5200 MHz Chain 0



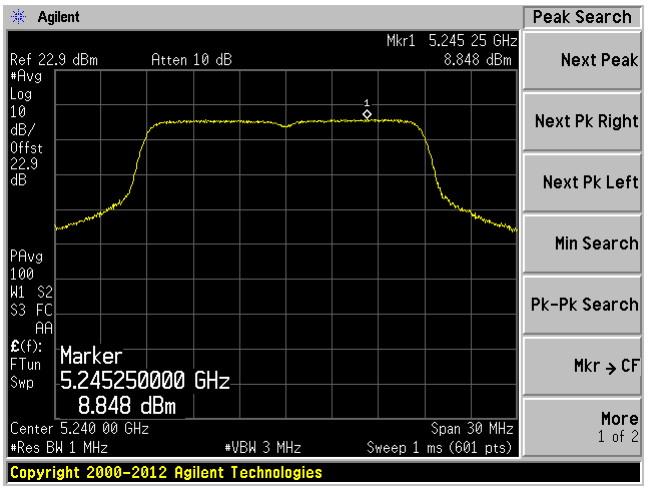
Middle channel: 5200 MHz Chain 1



High channel: 5240 MHz Chain 0

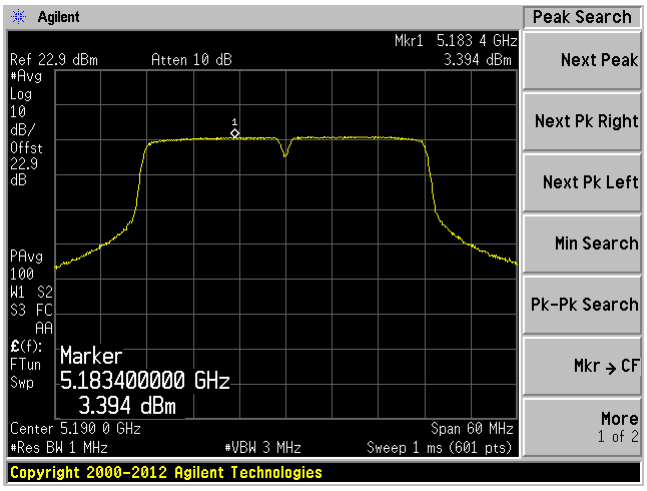


High channel: 5240 MHz Chain 1

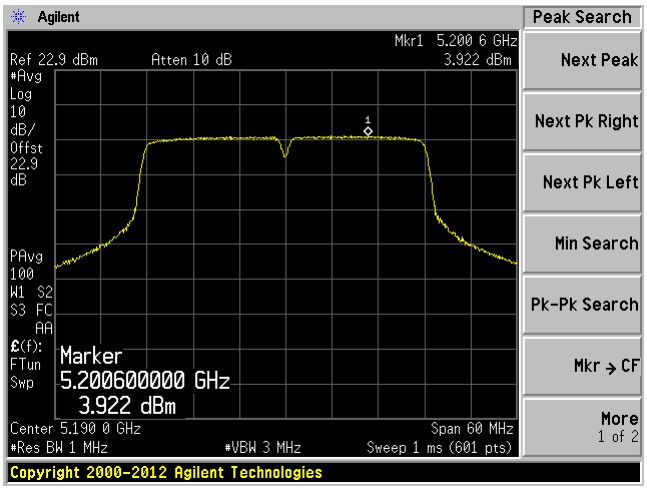


802.11n-HT40 mode

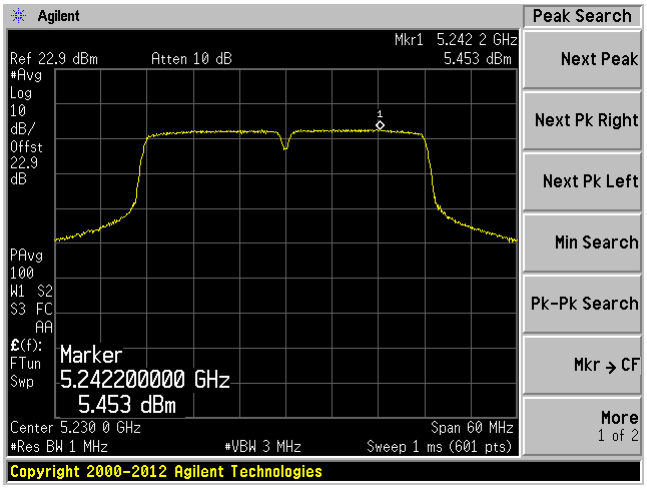
Low channel: 5190 MHz Chain 0



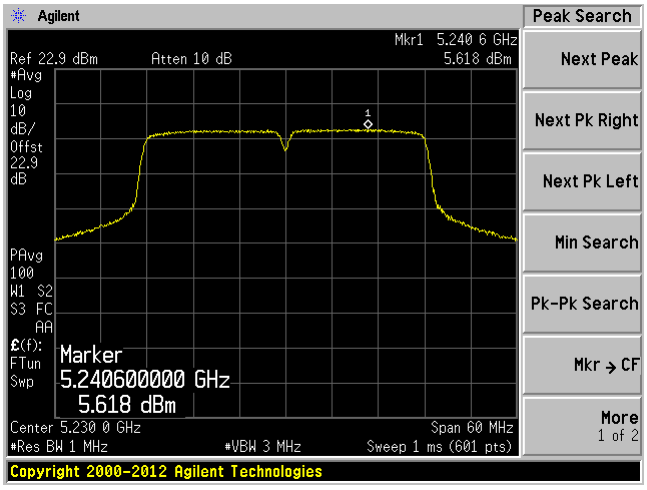
Low channel: 5190 MHz Chain 1



High channel: 5230 MHz Chain 0

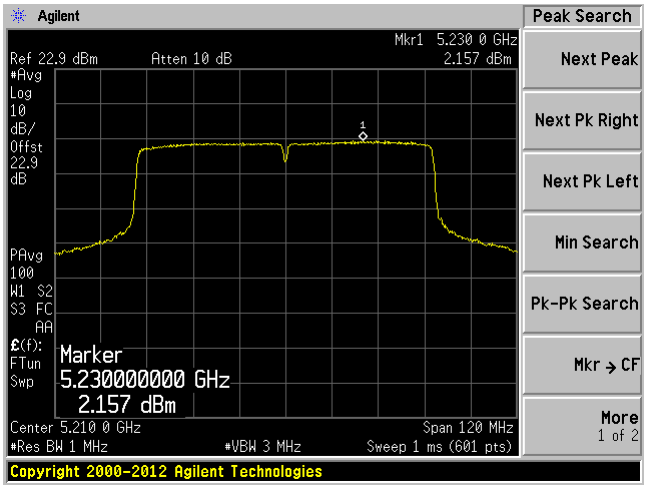


High channel: 5230 MHz Chain 1

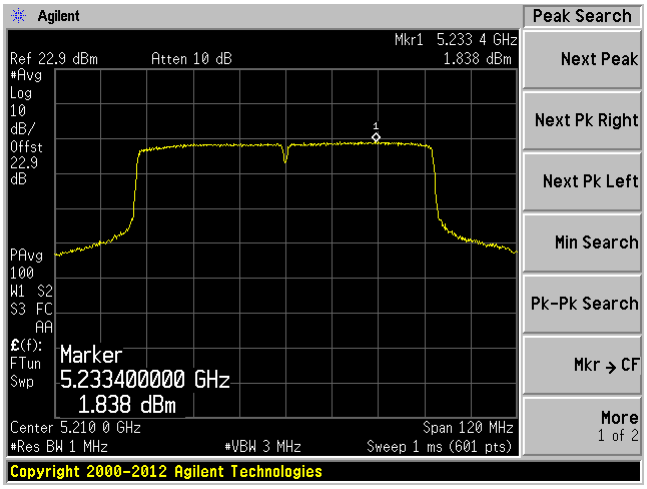


802.11ac 80 mode

Low channel: 5210 MHz Chain 0



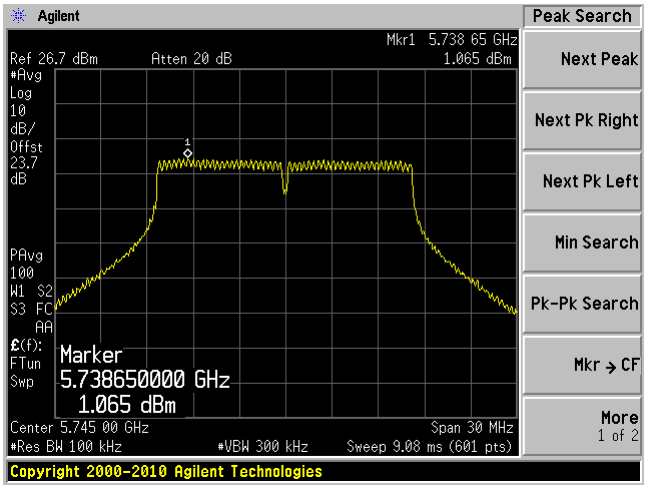
Low channel: 5210 MHz Chain 1



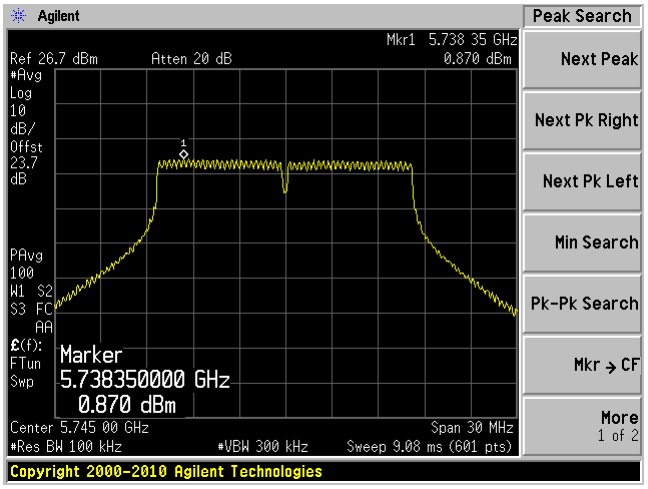
5.8 GHz Band

802.11a mode

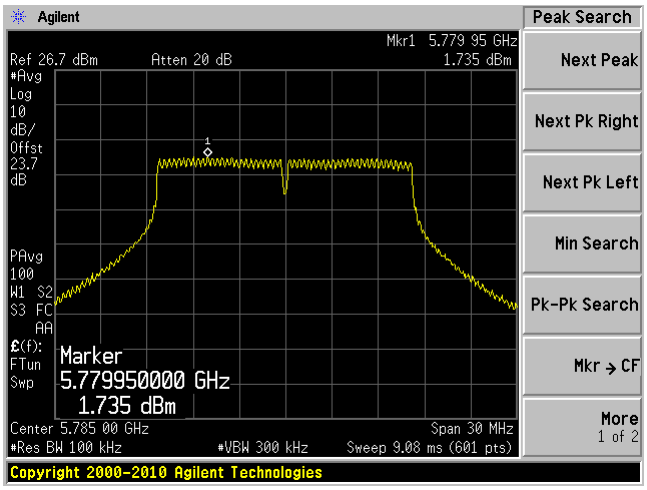
Low channel: 5745 MHz Chain 0



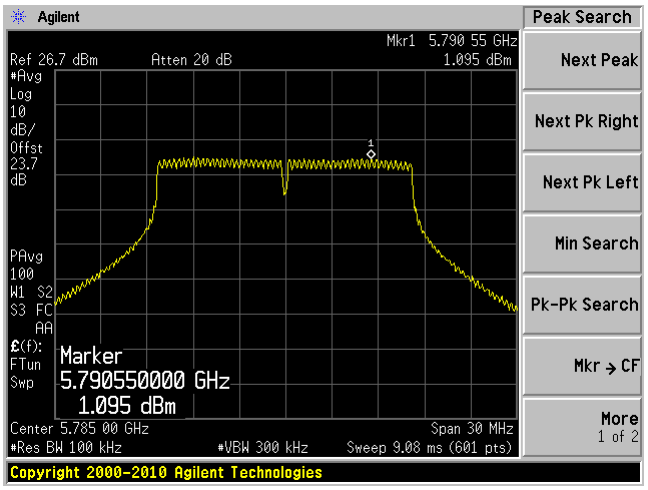
Low channel: 5745 MHz Chain 1



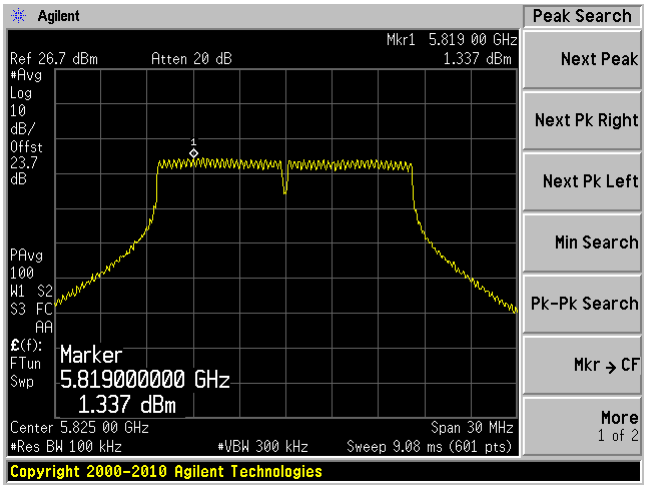
Middle channel: 5785 MHz Chain 0



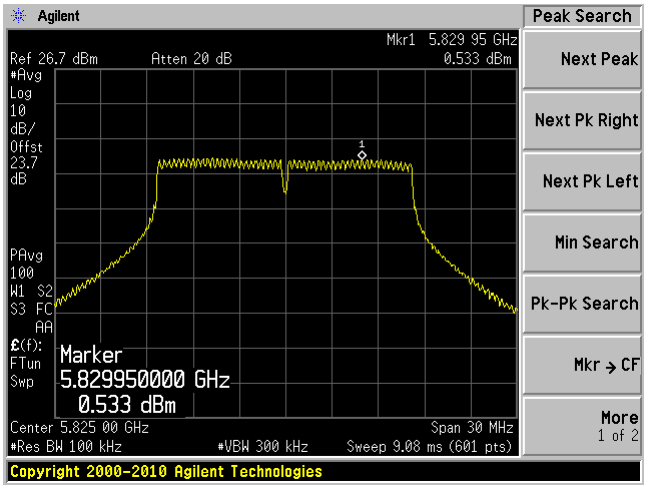
Middle channel: 5785 MHz Chain 1



High channel: 5825 MHz Chain 0

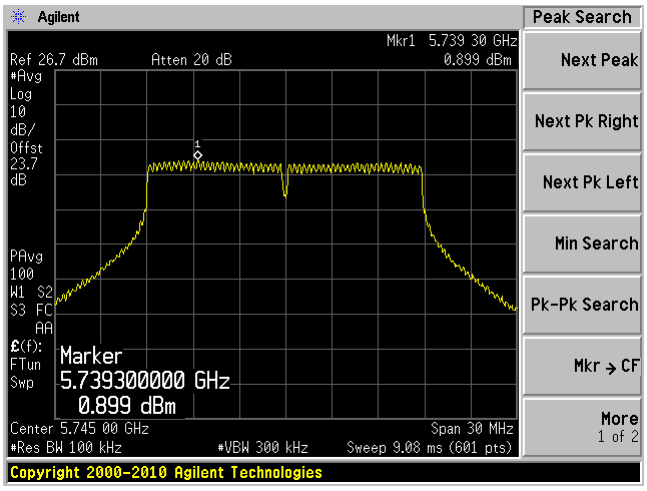


High channel: 5825 MHz Chain 1

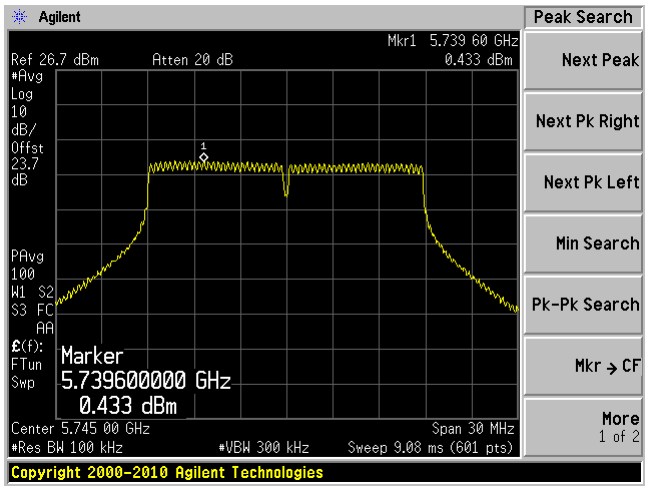


802.11n-HT20 mode

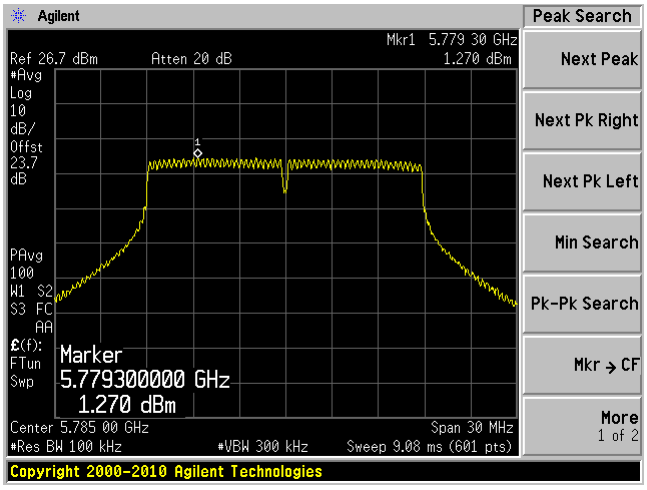
Low channel: 5745 MHz Chain 0



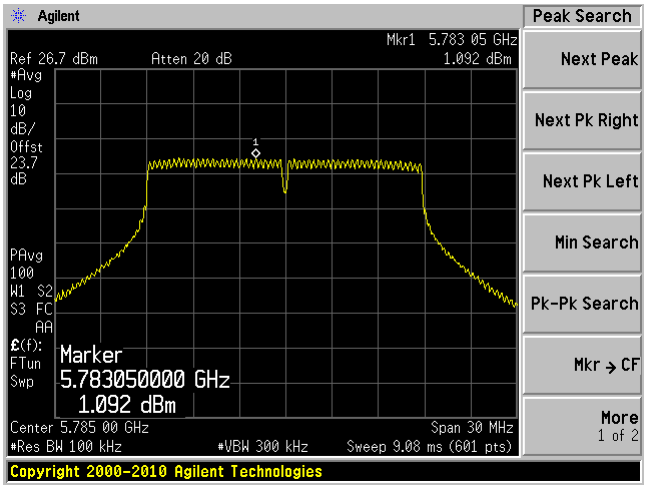
Low channel: 5745 MHz Chain 1



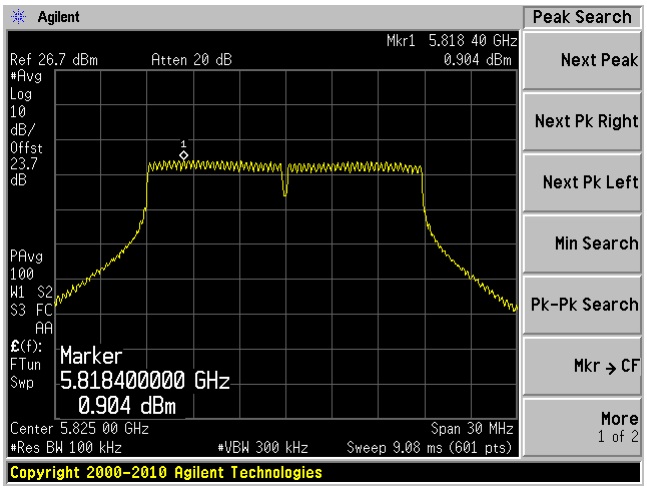
Middle channel: 5785 MHz Chain 0



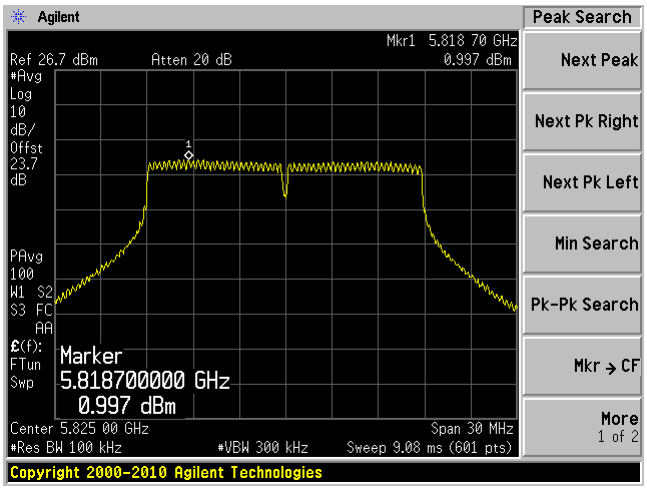
Middle channel: 5785 MHz Chain 1



High channel: 5825 MHz Chain 0

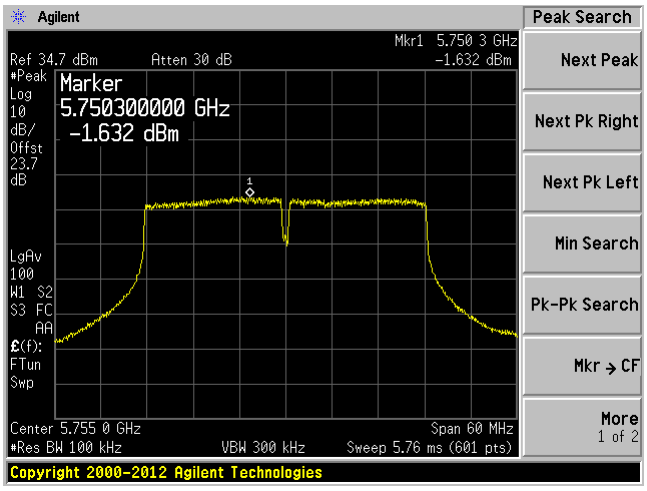


High channel: 5825 MHz Chain 1

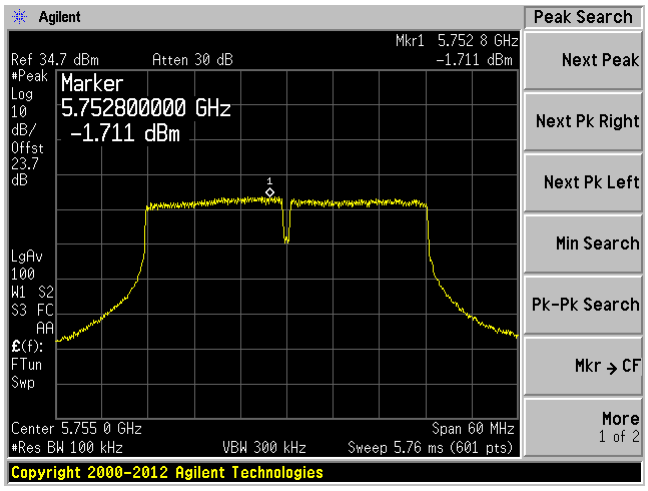


802.11n-HT40 mode

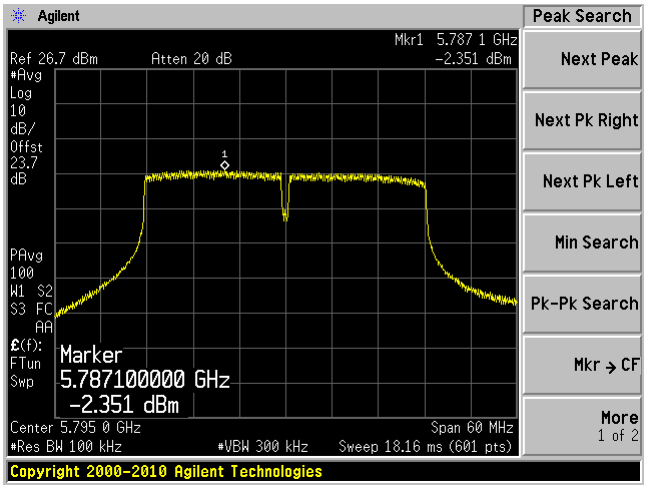
Low channel: 5755 MHz Chain 0



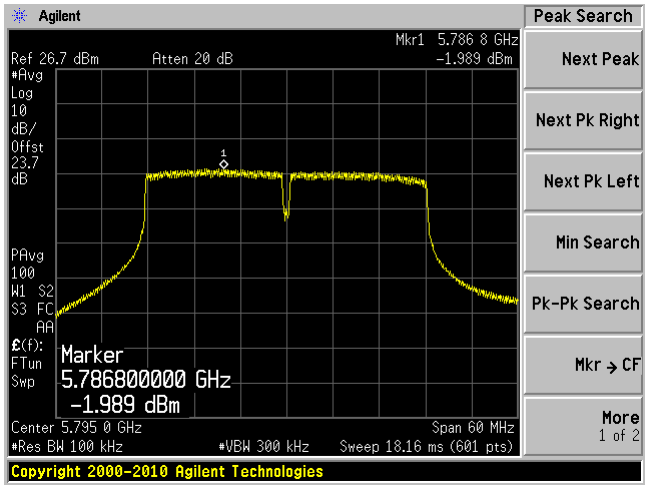
Low channel: 5755 MHz Chain 1



High channel: 5795 MHz Chain 0

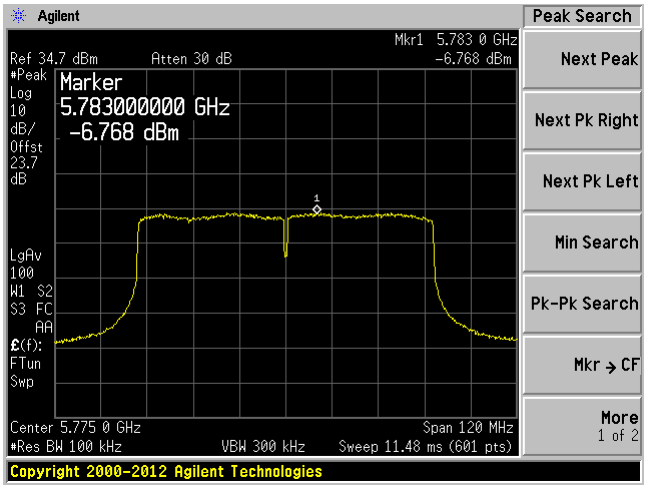


High channel: 5795 MHz Chain 1



802.11ac 80 mode

Channel: 5775 MHz Chain 0



Channel: 5775 MHz Chain 1