FCC PART 15, SUBPART C
IC RSS-210, ISSUE 8, DEC 2010
TEST AND MEASUREMENT REPORT

For

Ruckus Wireless, Inc.

350 West Java Drive,

Sunnyvale, CA 94089, USA

FCC ID: S9G-MPE5AC33A
IC: 5912A-MPE5AC33A

Report Type:	**Product Type:**
Original Report	802.11ac mini-PCI Express Radio Module

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1302145-247	Original Report	2013-07-03

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 FCC ID: S9G-MPE5AC33A, IC: 5912A-MPE5AC33A, model: *MPE5AC33A* or the "EUT" as referred on this report. The EUT is an 802.11ac mini-PCI Express Radio Module.

1.2 Mechanical Description of EUT

The "EUT" measures approximately *6.7cm (L) x 3.8cm (W) x 1.1cm (H)*, and weighs approximately *16*g.

The test data gathered are from typical production sample, serial number: CTS0413RK0085 *provided by the manufacture.*

1.3 Objective

This report is prepared on behalf of *Ruckus Wireless, Inc*. in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules and IC RSS-210 Issue 8, Dec 2010.

The objective is to determine compliance with FCC Part 15.247, and IC RSS-210 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS with FCC ID: S9G-MPE5AC33A, IC: 5912A-MPE5AC33A

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.

1.7 Test Facility

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 System 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 CART Version: 4.4, CartBuildDate: 4494324 was provided by Ruckus Wireless Inc, and was verified Ning Ma to comply with the standard requirements being tested against.

2.3 Local Support Equipment

Manufacturer	Description	Model	Serial Number
DELL	Laptop	P15F	-

2.4 EUT Internal Configuration Details

N/A: The EUT is a module and the serial number is shown on section 1.2.

2.5 Power Supply List and Details

Manufacturer	Description	Model	Serial Number
Ruckus Wireless	Switching adapter	MPBS-12020000	-

2.6 Interface Ports and Cables

Cable Description	Length (m)	To	From
RF Cable	<1.0	PSA	EUT
RJ 45 Cable	<1.0	Laptop	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.247(i), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §7.1.2	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §7.2.4	AC Line Conducted Emissions	Compliant
FCC §15.247 (d) IC RSS-210 §A8.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-210 §2.2, §A8.5	Restricted Bands	Compliant
FCC §15.209, §15.247 (d), IC RSS-210 §A8.5	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2), IC RSS-210 §A8.2	6 dB Emission Bandwidth 26 dB and 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3), IC RSS-210 §A8.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-210 §A8.5	100 kHz Bandwidth of Frequency Band Edge Out of Band Emissions	Compliant
FCC §15.247(e), IC RSS-210 §A8.2(b)	Power Spectral Density	Compliant
IC RSS-210 §2.3 & RSS-Gen §6.1	Receiver Spurious Emission	Compliant

4 FCC §15.247 (i), §2.1091 & IC RSS-102 – RF Exposure

4.1 Applicable Standard

According to FCC §15.247(i) 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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 4 section 4.2, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Time Averaging (min)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f / 150	6
1 500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000- 300 000	$0.158\ f^{0.5}$	$4.21 \times 10\ -4\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: *f* is frequency in MHz
* = Power density limit is applicable at frequencies greater than 100 MHz

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 MPE Results

Maximum peak output power at antenna input terminal (dBm):	25.72
Maximum peak output power at antenna input terminal (mW):	372.39
Prediction distance (cm):	20
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	3
Maximum Antenna Gain (numeric):	1.99
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.148
Power density of prediction frequency at 20.0 cm (W/m^2):	1.48
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	10

The device is compliant with the MPE requirement for uncontrolled exposure.

5 FCC §15.203 & IC RSS-Gen §7.1.2 – Antenna Requirements

5.1 Applicable Standard

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

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to IC RSS-Gen §7.1.2: Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 mW or less. For devices of output powers greater than 10 mW, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

5.2 Result

The EUT will antennas that consist of UFL connectors and gain of 3 dBi; therefore, it complies with the antenna requirement. Please refer to the internal photos.

6 FCC §15.207 & IC RSS-Gen §7.2.4 – AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.4 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 [1]	56 to 46 [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 and IC RSS-Gen §7.2.4 limits.

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

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

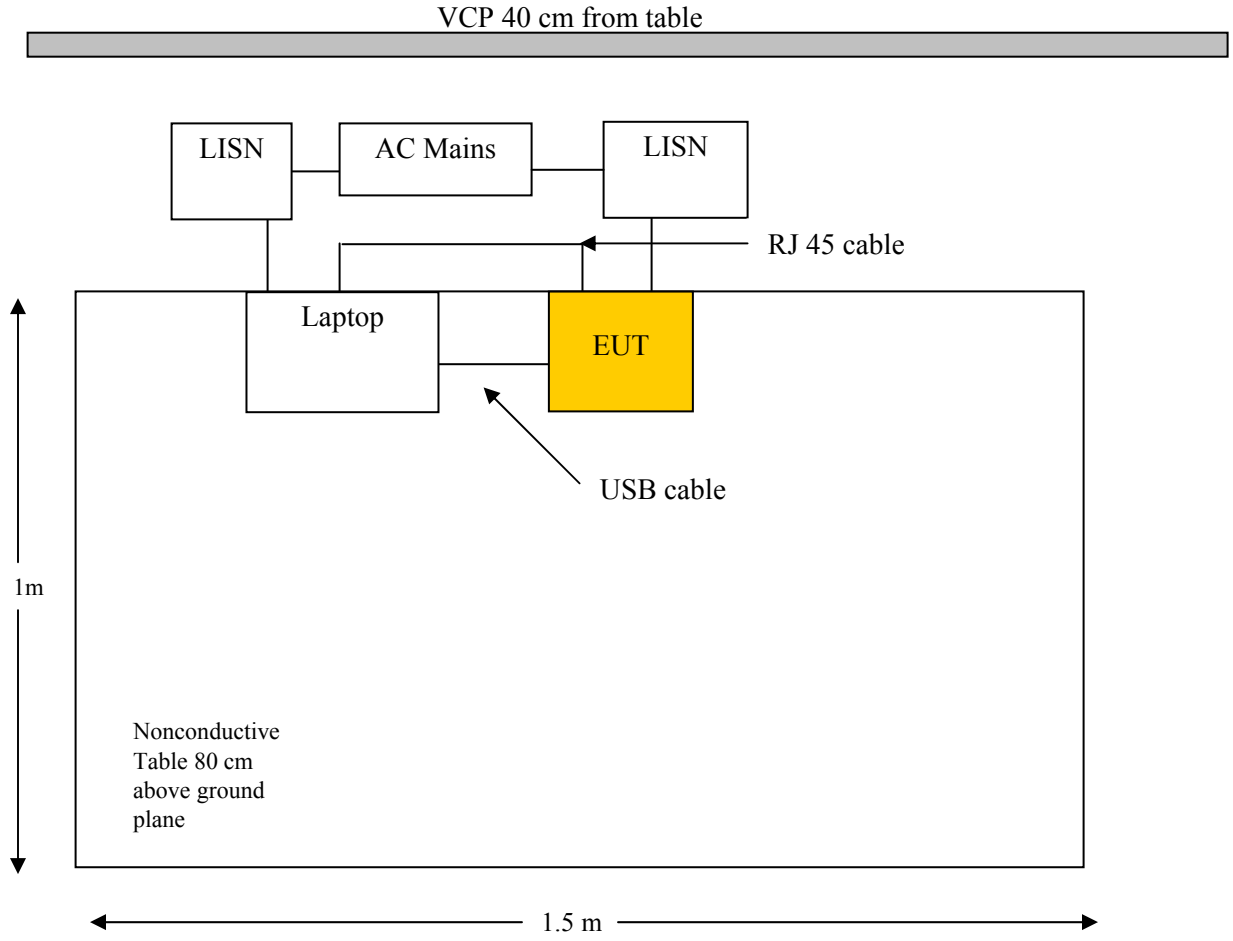
6.3 Test Procedure

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



6.5 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. 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	Receiver, EMI Test	ESCI 1166.5950K03	100337	2013-03-28	1 year
TTE	Filter, High Pass	H962-150k-50-21378	K7133	2012-05-30	1 year
Solar Electronics	LISN, EMC	9252-50-R-24-N	511205	2012-06-25	1 year
Solar Electronics	LISN, EMC	9252-50-R-24-N	511213	2012-06-25	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:	21°C
Relative Humidity:	41%
ATM Pressure:	102.1kPa

The testing was performed by Ning ma on 2013-05-07 at 5m-3.

6.8 Summary of Test Results

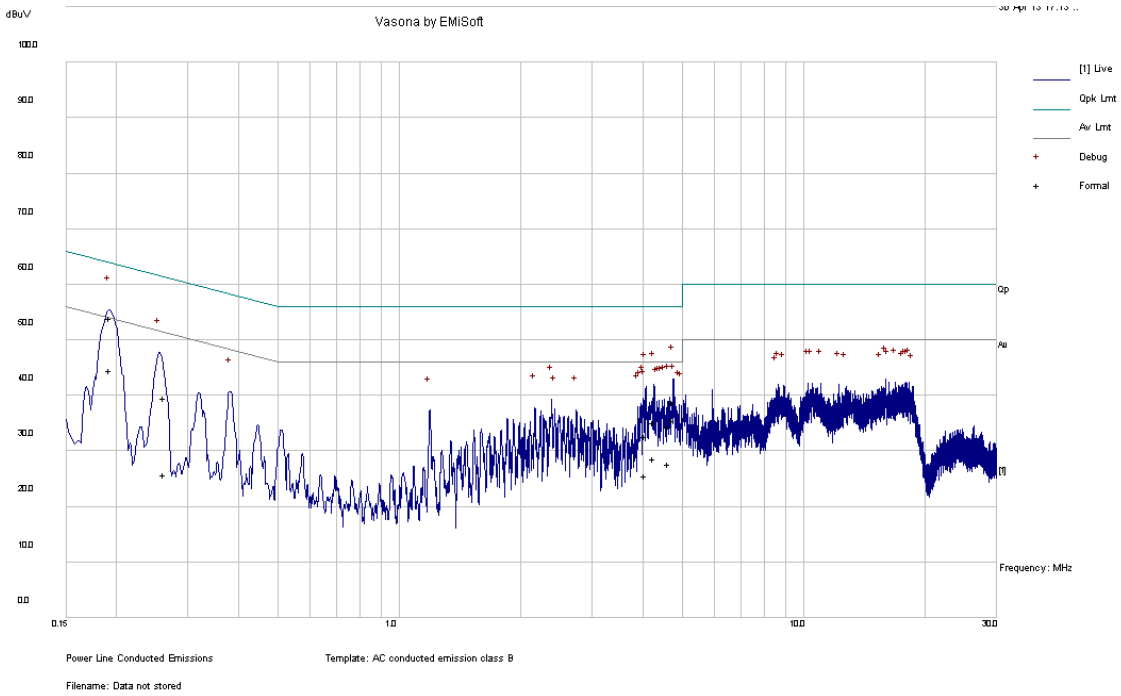
According to the recorded data in following table, the EUT complied with the FCC Part 15.207 & RSS-Gen §7.2.4 standard's conducted emissions limits, with the margin reading of:

Transmitting Mode the Worst Case: 802.11 a Middle channel

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-9.31	0.192859	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

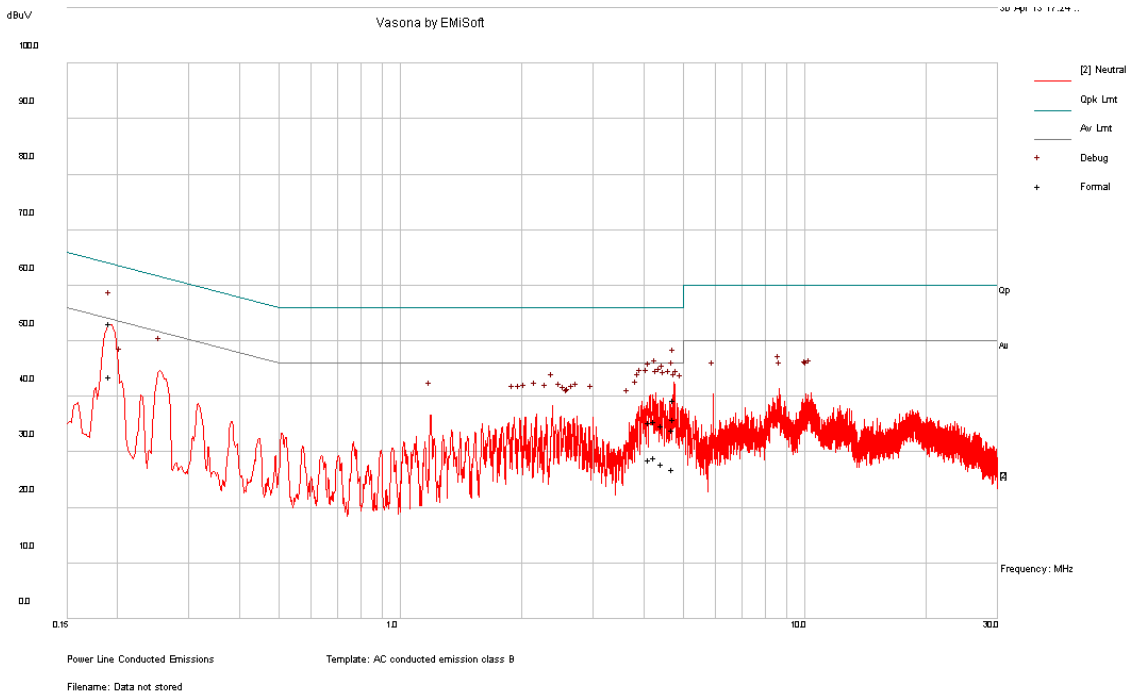
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.192859	53.85	Line	63.91	-10.06	QP
4.754078	38.89	Line	56	-17.11	QP
0.262226	39.58	Line	61.36	-21.78	QP
4.272782	35.1	Line	56	-20.90	QP
4.062134	32.6	Line	56	-23.40	QP
4.650686	34.44	Line	56	-21.56	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.192859	44.61	Line	53.91	-9.31	Ave.
4.754078	35.51	Line	46	-10.49	Ave.
0.262226	25.71	Line	51.36	-25.65	Ave.
4.272782	28.64	Line	46	-17.36	Ave.
4.062134	25.56	Line	46	-20.44	Ave.
4.650686	27.7	Line	46	-18.30	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.191203	53.25	Neutral	63.98	-10.73	QP
4.749872	39.35	Neutral	56	-16.65	QP
4.268024	35.63	Neutral	56	-20.37	QP
4.718156	34.08	Neutral	56	-21.92	QP
4.146176	35.27	Neutral	56	-20.73	QP
4.453094	34.78	Neutral	56	-21.22	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.191203	43.61	Neutral	53.98	-10.37	Ave.
4.749872	35.86	Neutral	46	-10.14	Ave.
4.268024	29.01	Neutral	46	-16.99	Ave.
4.718156	26.85	Neutral	46	-19.15	Ave.
4.146176	28.73	Neutral	46	-17.27	Ave.
4.453094	27.79	Neutral	46	-18.21	Ave.

7 FCC §2.1051, §15.247(d) & IC RSS-210 §A8.5, §A9.2 – Spurious Emissions at Antenna Terminals

7.1 Applicable Standards

For FCC §15.247(d) and IC RSS-210 §A8.5 in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

7.2 Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446A	US42221851	2013-03-05	1 year

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

7.4 Test Environmental Conditions

Temperature:	24 °C
Relative Humidity:	40%
ATM Pressure:	101.8kPa

The testing was performed by Ning Ma on 2013-04-16 at RF site.

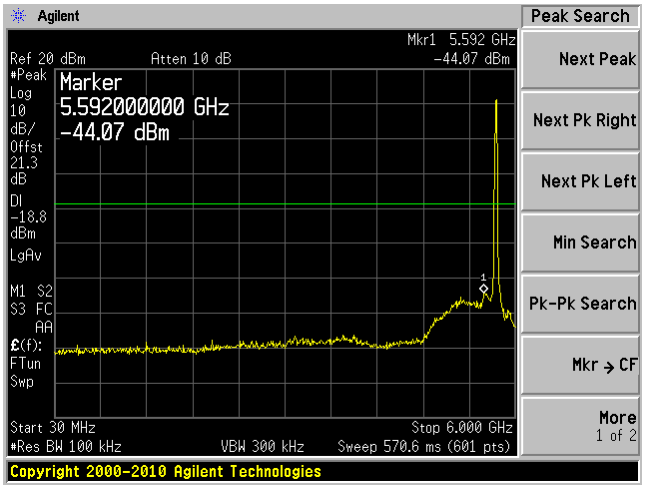
7.5 Test Results

Please refer to following plots of spurious emissions.

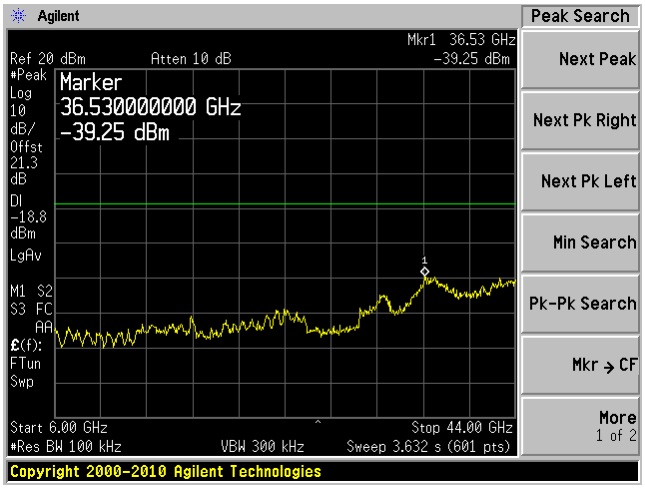
5725-5850 MHz

802.11a, Low Channel,

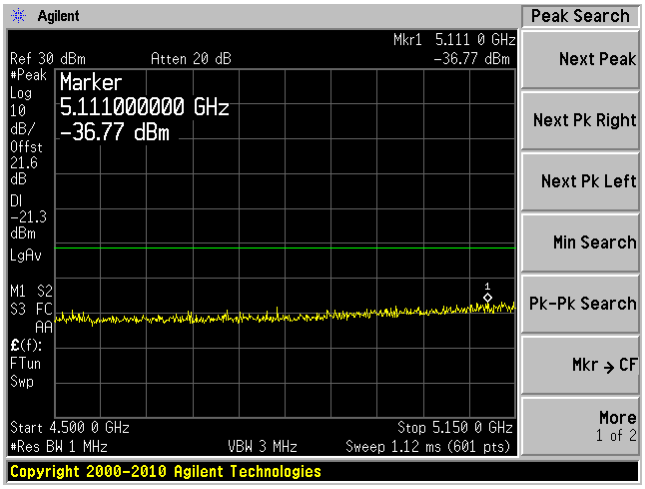
Chain 0, Plot: 30 MHz – 6 GHz



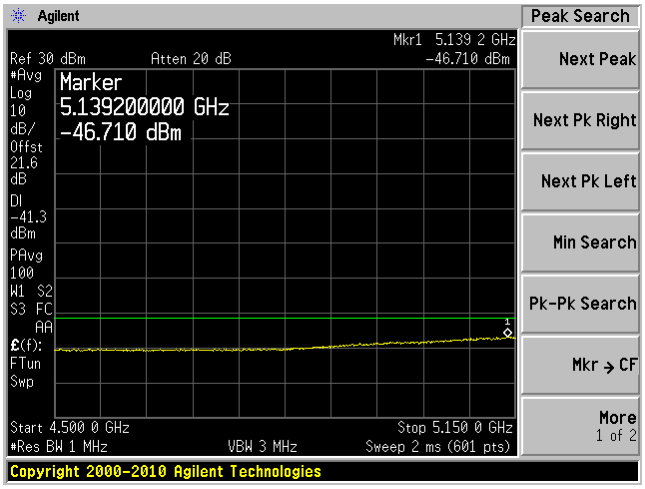
Chain 0, Plot: 6 GHz – 44 GHz



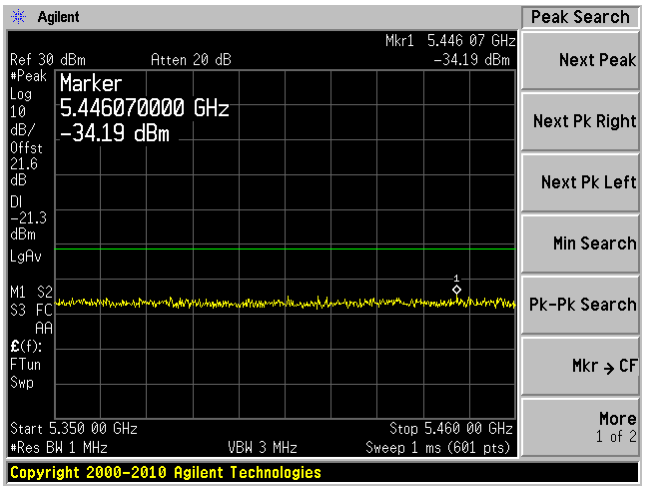
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



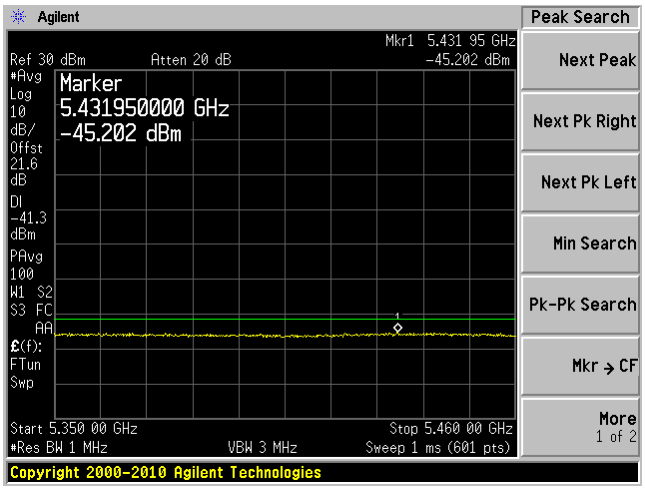
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



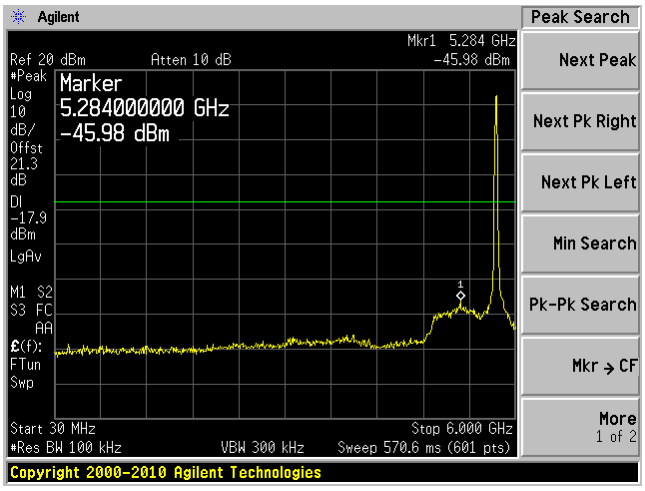
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



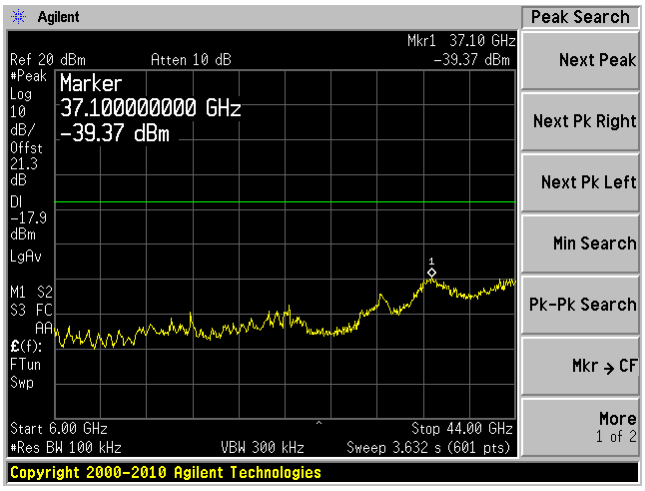
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



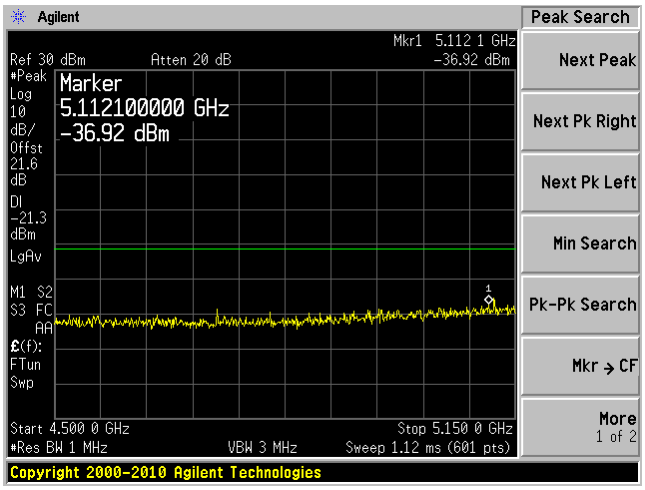
Chain 1, Plot: 30 MHz – 6 GHz



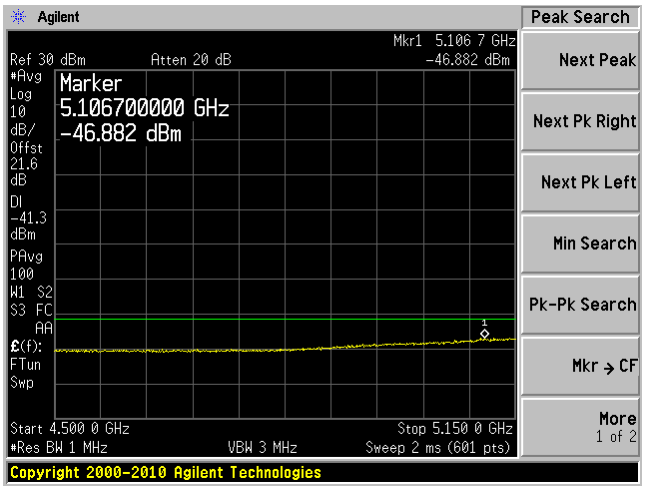
Chain 1, Plot: 6 GHz – 44 GHz



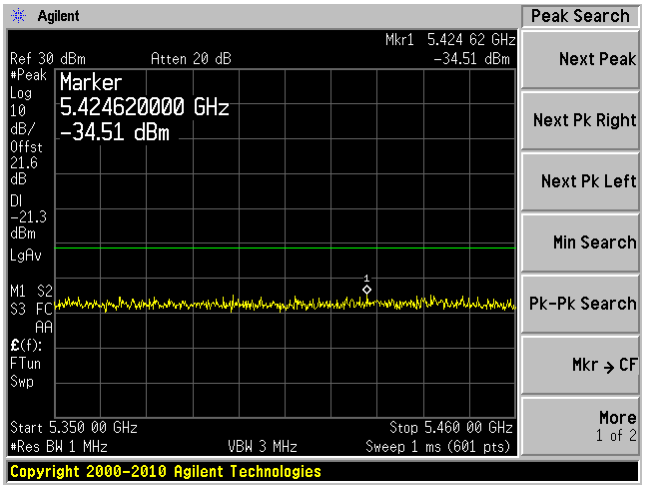
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



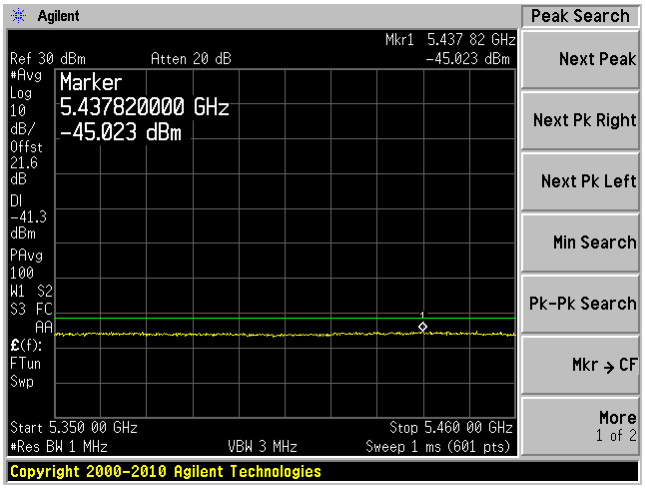
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



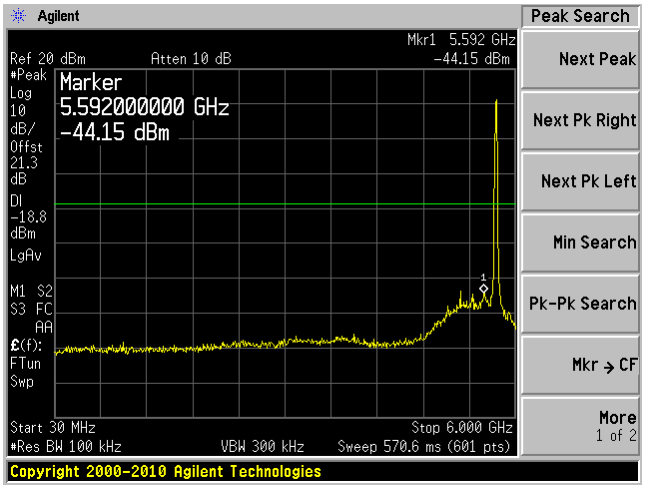
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



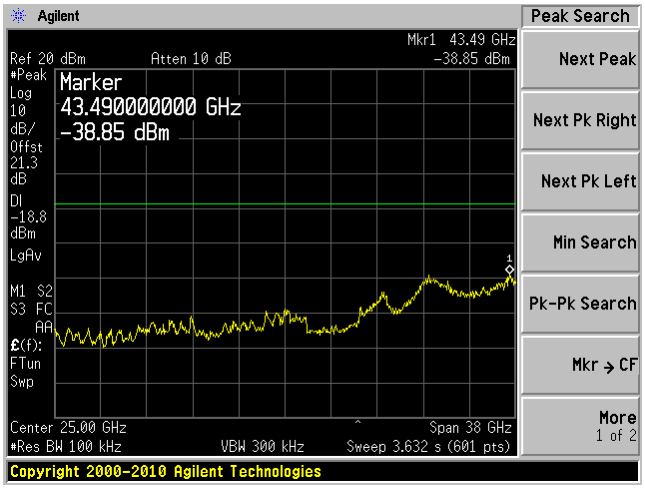
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



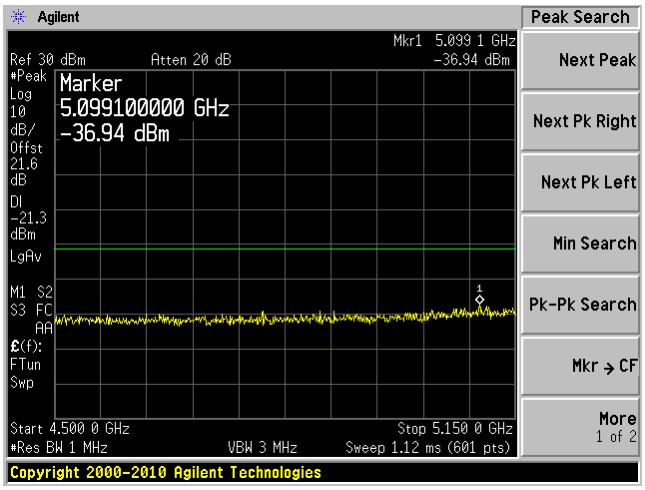
Chain 2, Plot: 30 MHz – 6 GHz



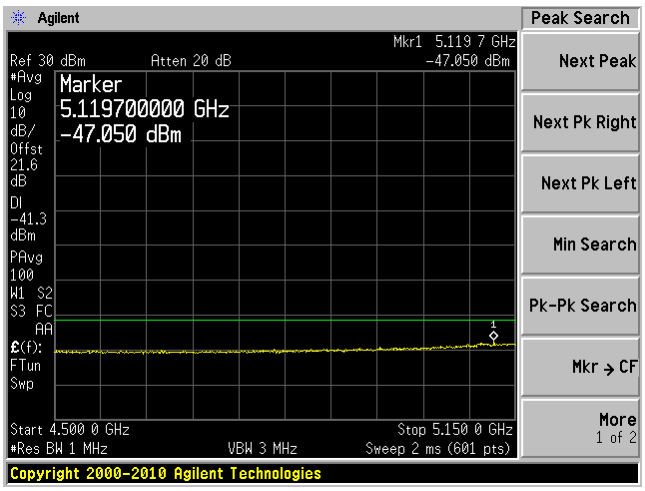
Chain 2, Plot: 6 GHz – 44 GHz



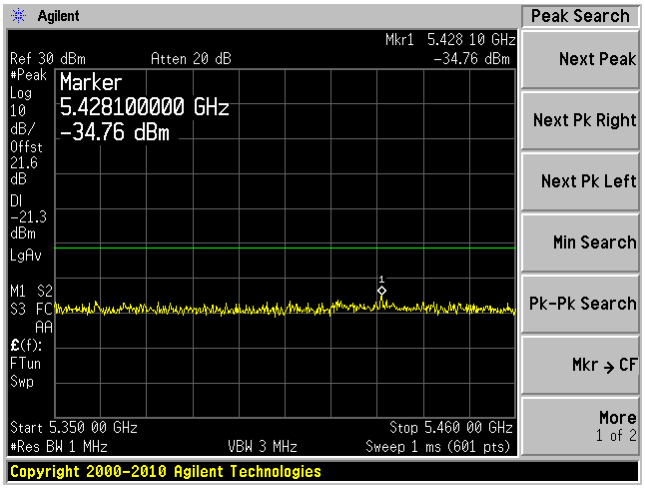
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



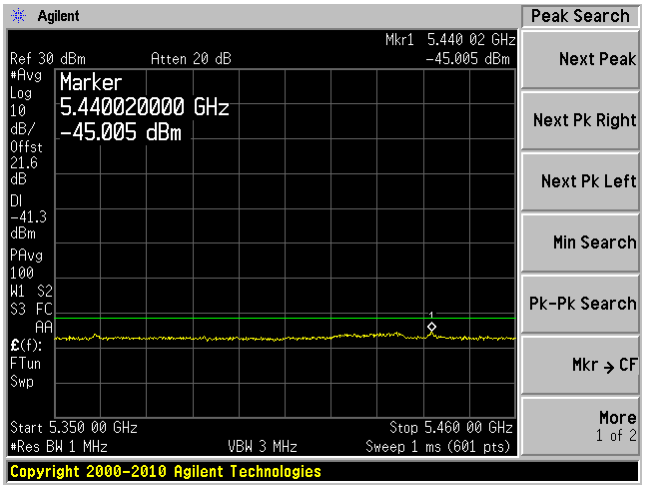
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak

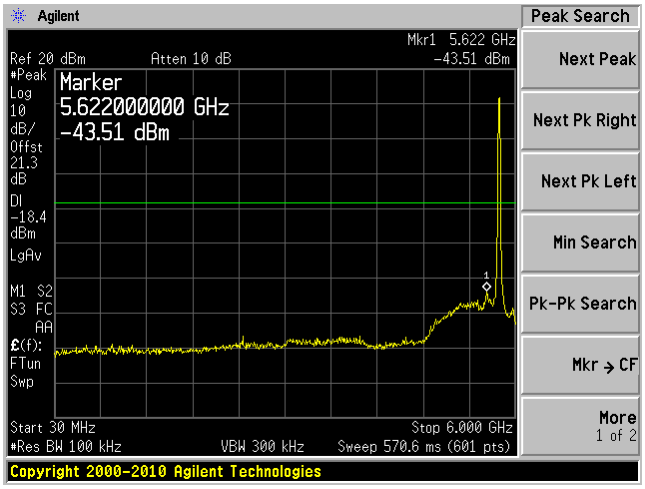


Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave

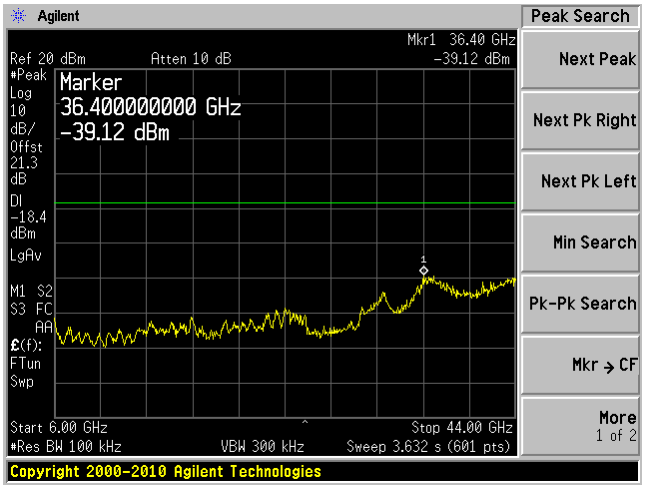


802.11a, Middle Channel,

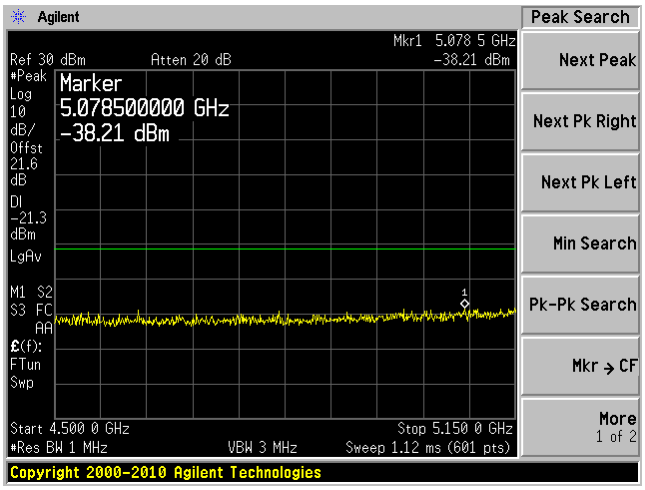
Chain 0, Plot: 30 MHz – 6 GHz



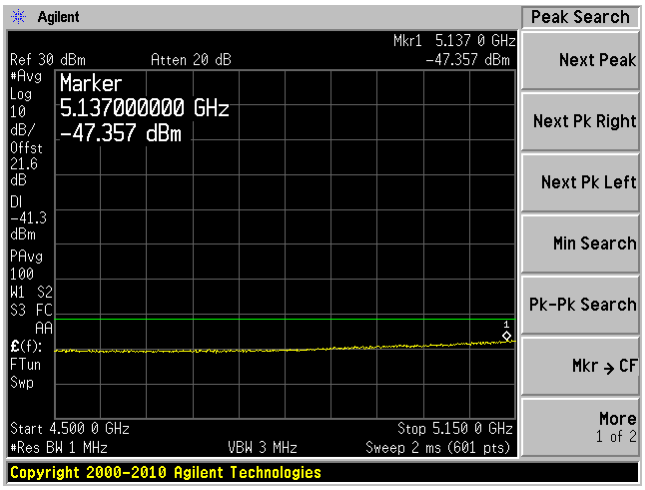
Chain 0, Plot: 6 GHz – 44 GHz



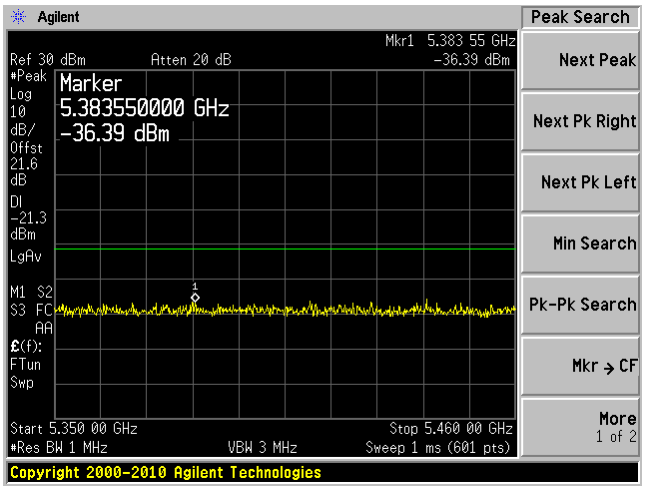
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



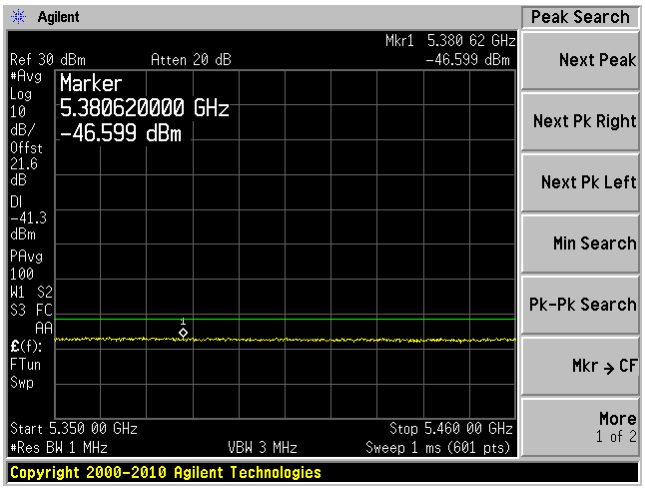
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



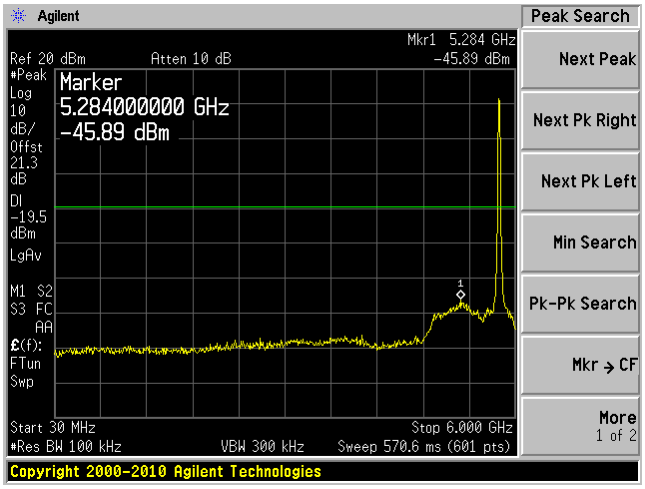
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



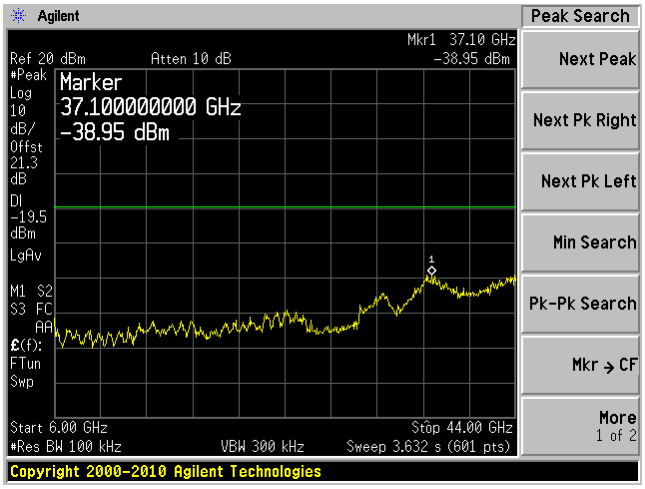
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



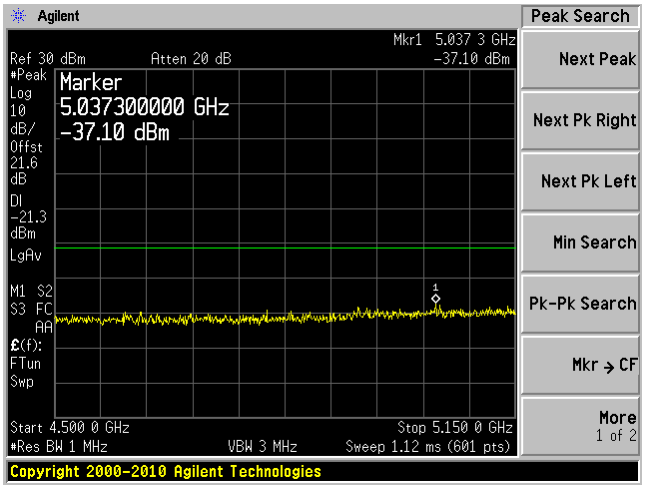
Chain 1, Plot: 30 MHz – 6 GHz



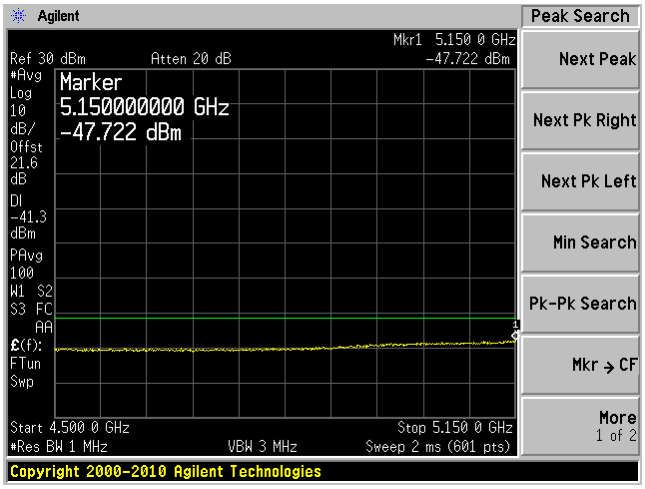
Chain 1, Plot: 6 GHz – 44 GHz



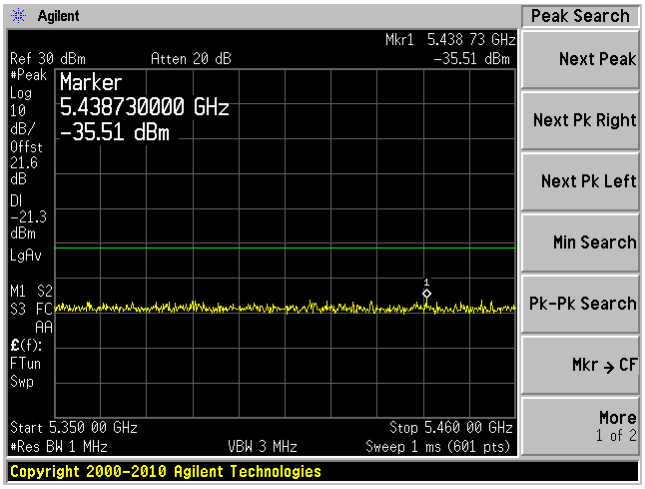
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



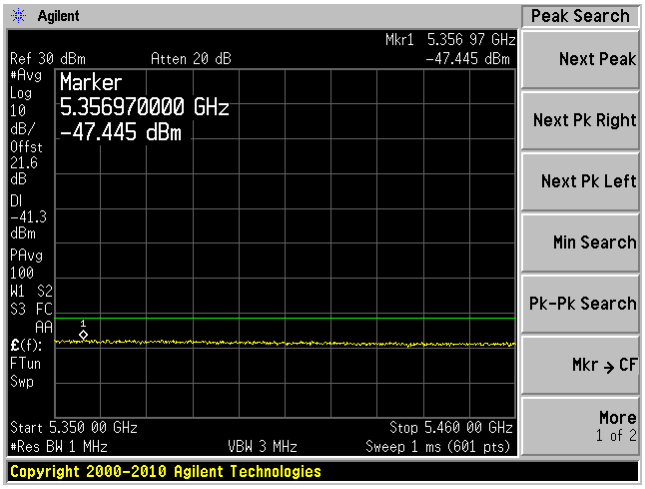
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



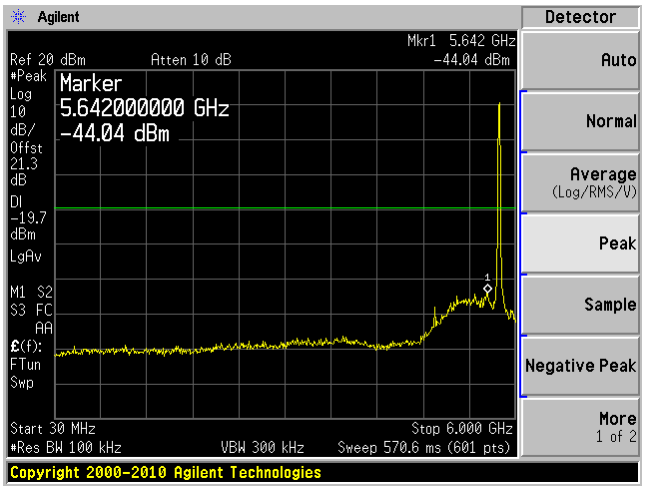
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



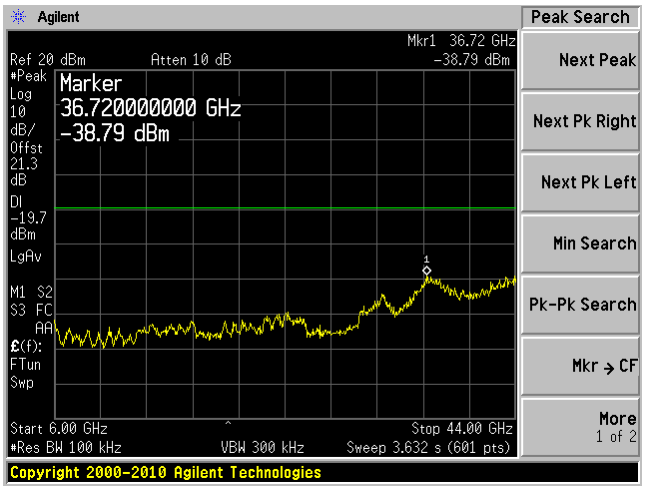
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



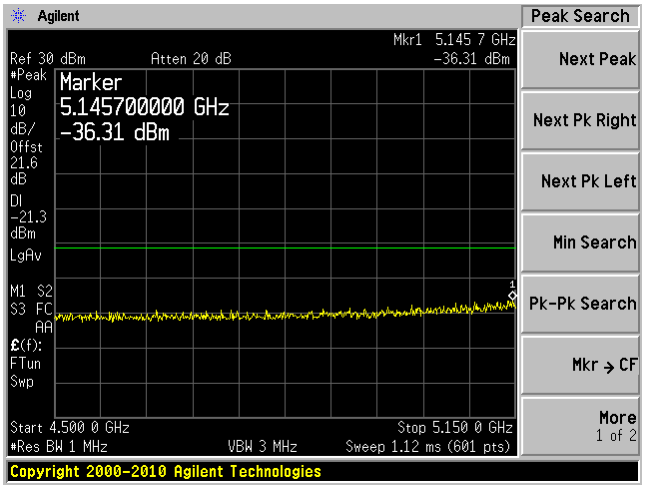
Chain 2, Plot: 30 MHz – 6 GHz



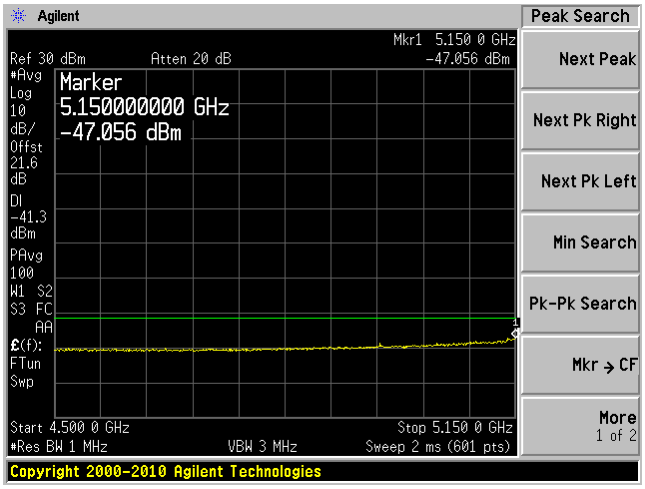
Chain 2, Plot: 6 GHz – 44 GHz



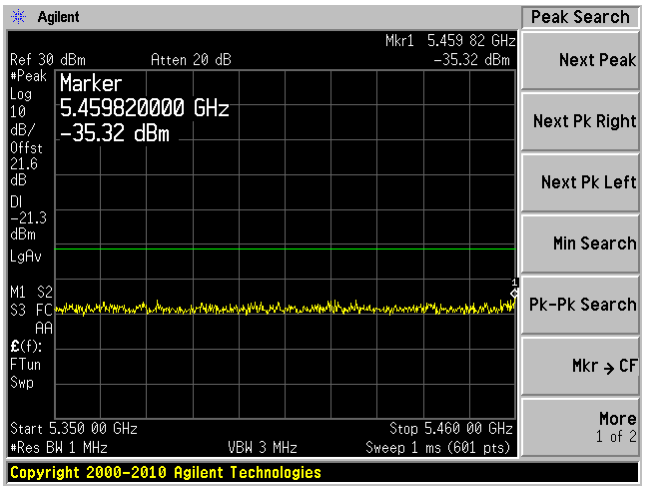
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



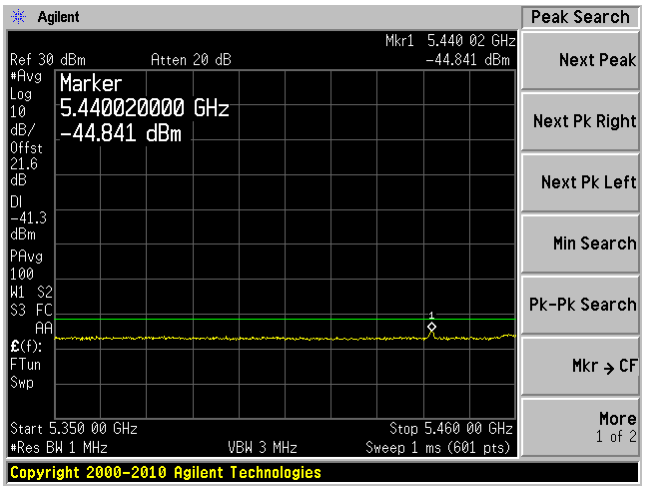
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak

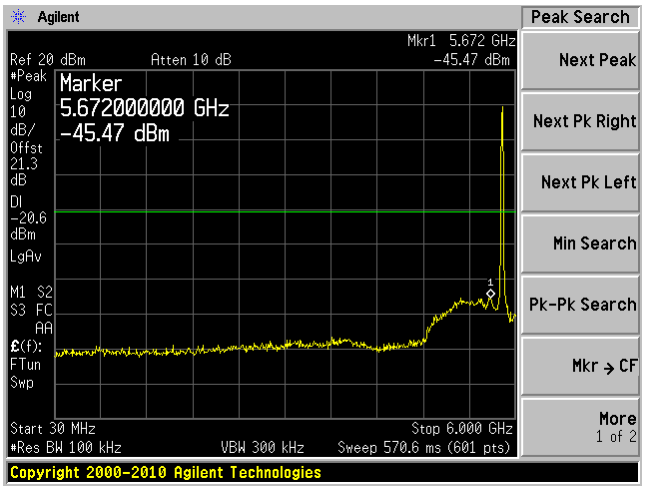


Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave

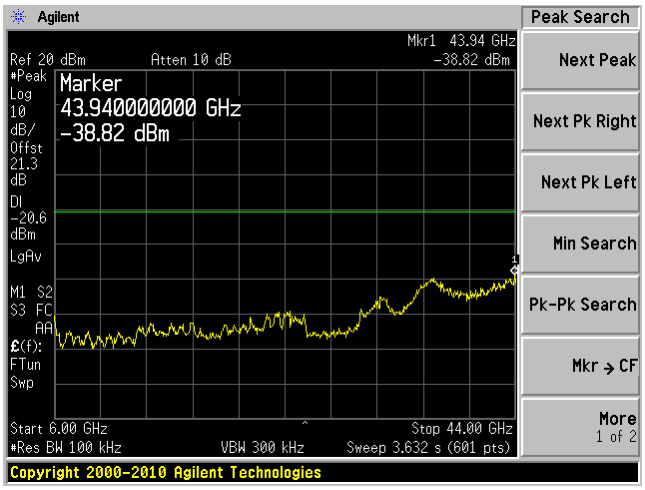


802.11a, High Channel,

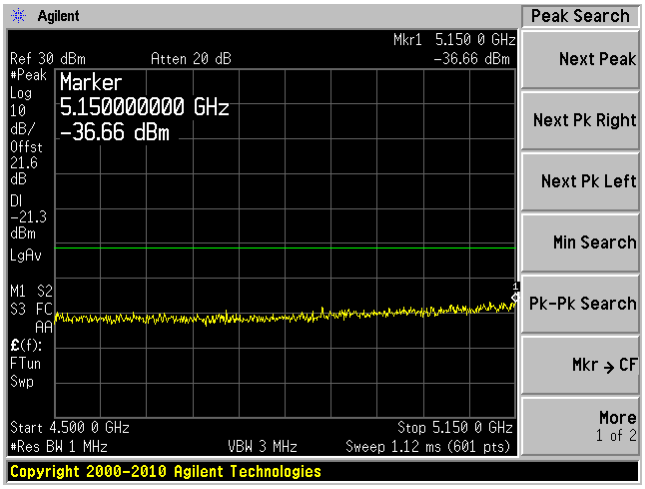
Chain 0, Plot: 30 MHz – 6 GHz



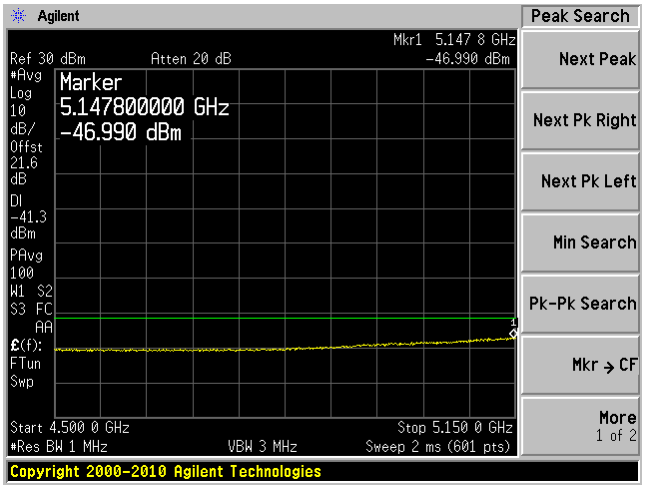
Chain 0, Plot: 6 GHz – 44 GHz



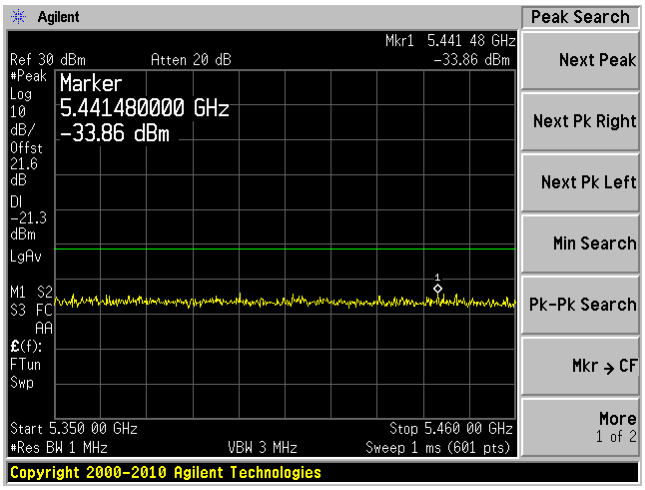
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



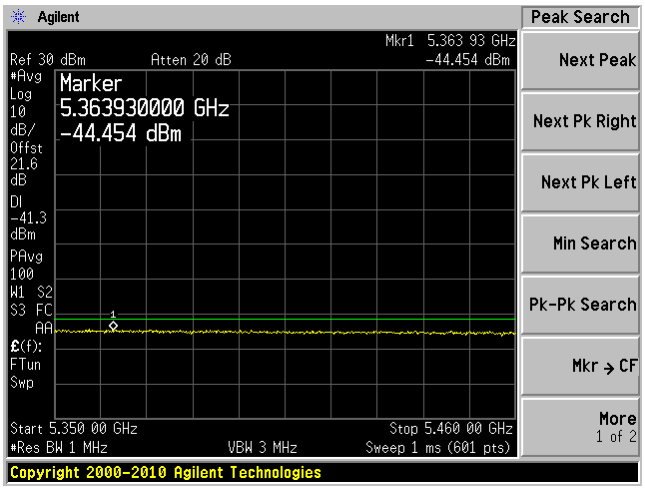
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



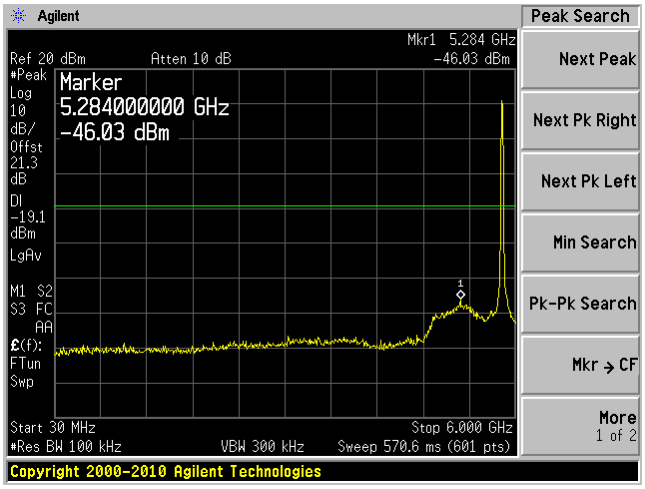
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



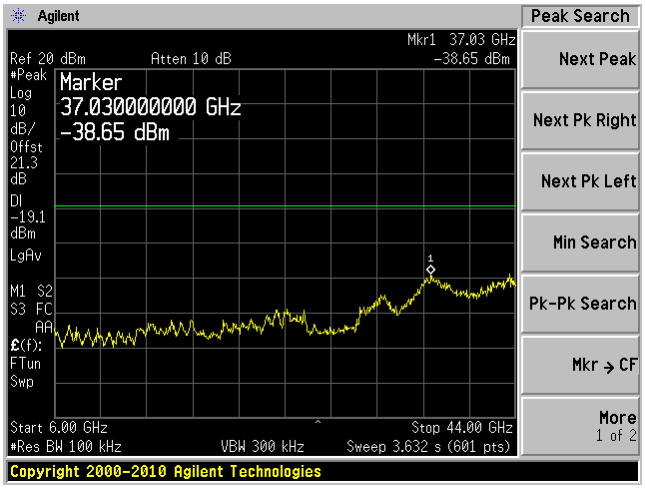
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



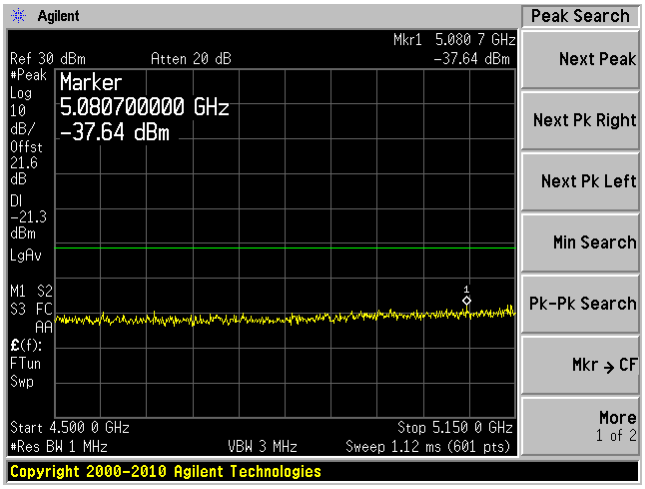
Chain 1, Plot: 30 MHz – 6 GHz



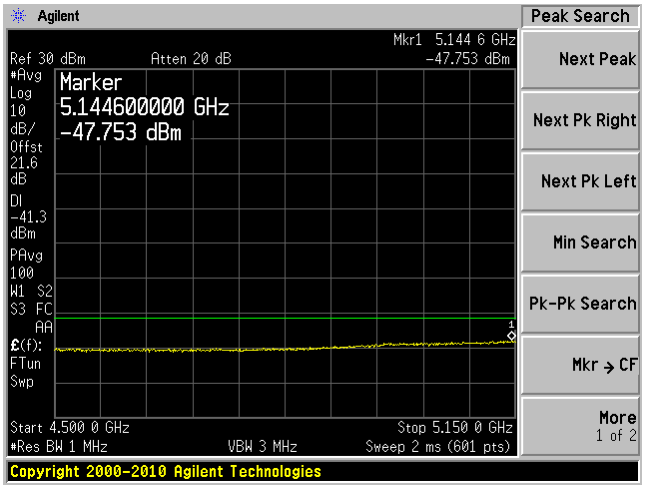
Chain 1, Plot: 6 GHz – 44 GHz



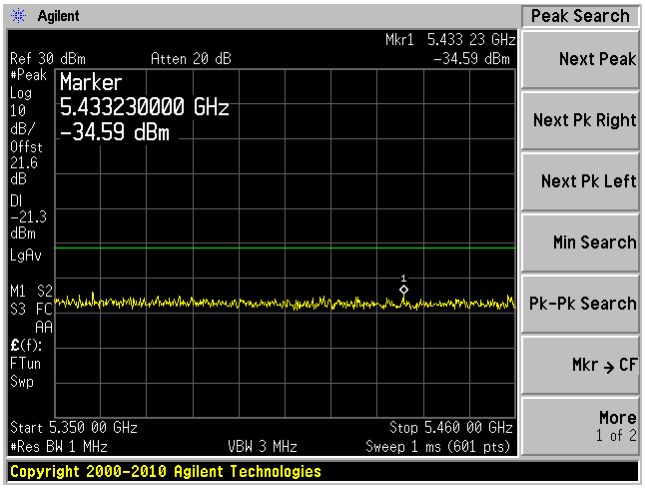
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



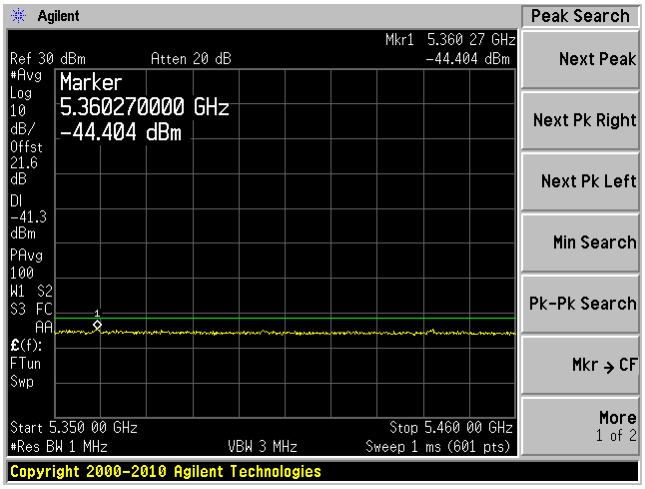
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



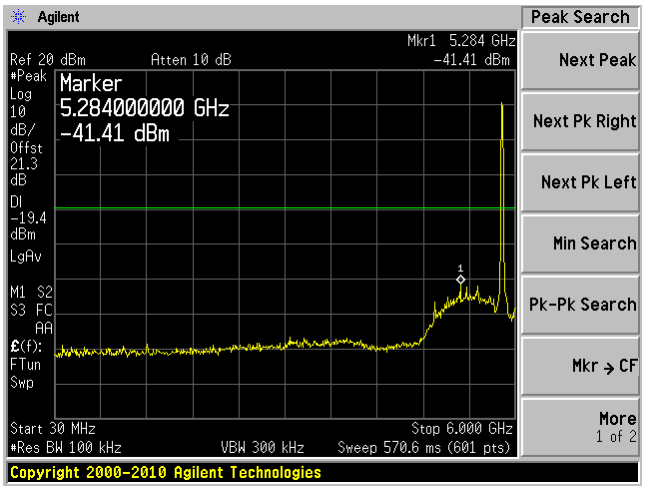
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



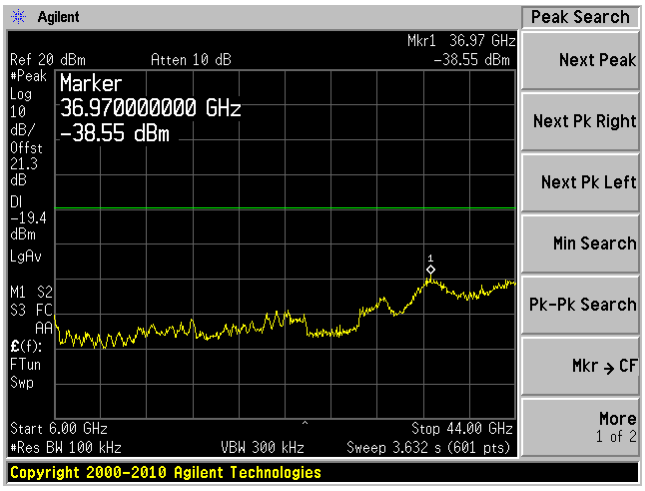
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



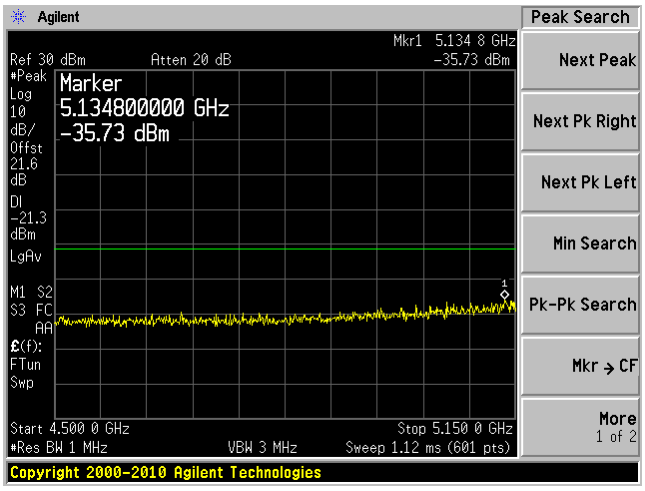
Chain 2, Plot: 30 MHz – 6 GHz



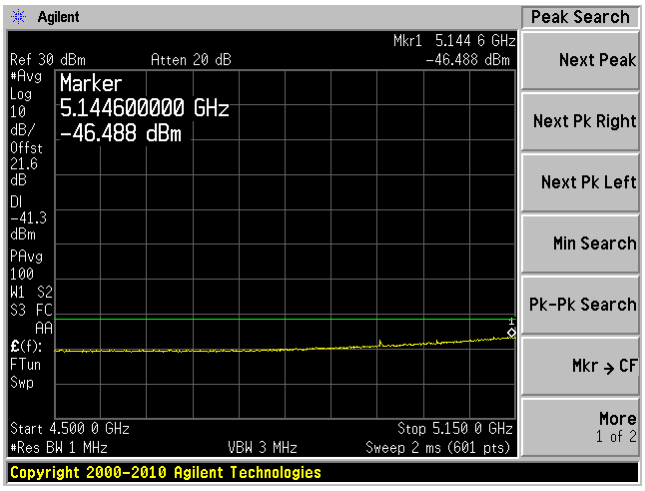
Chain 2, Plot: 6 GHz – 44 GHz



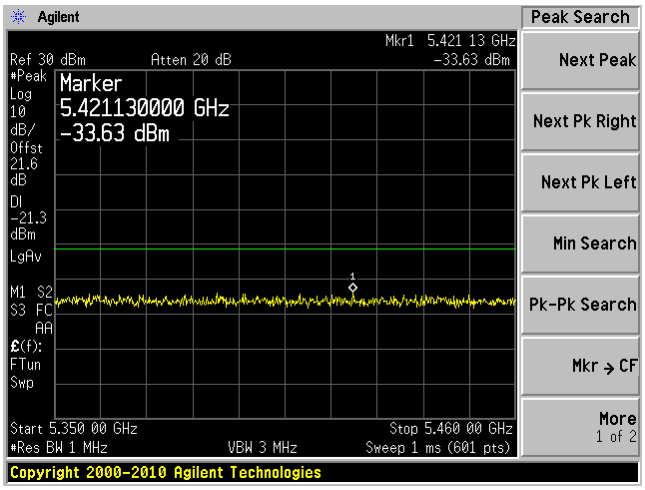
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



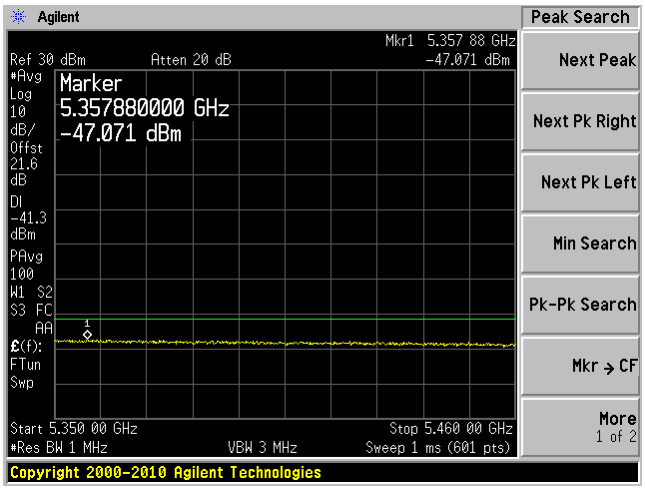
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak

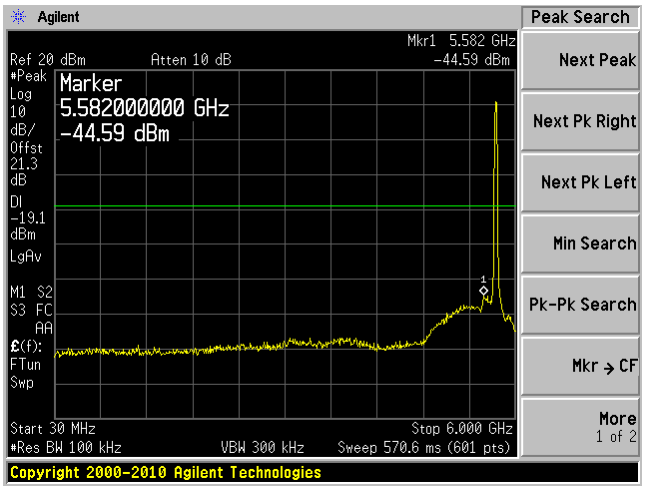


Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave

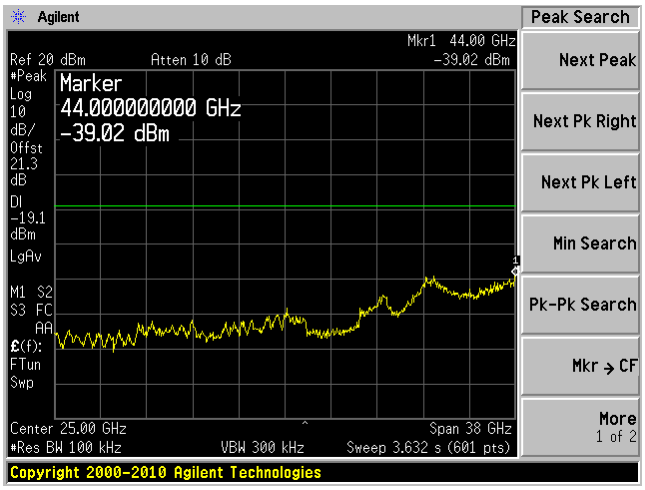


802.11n HT20, Low Channel,

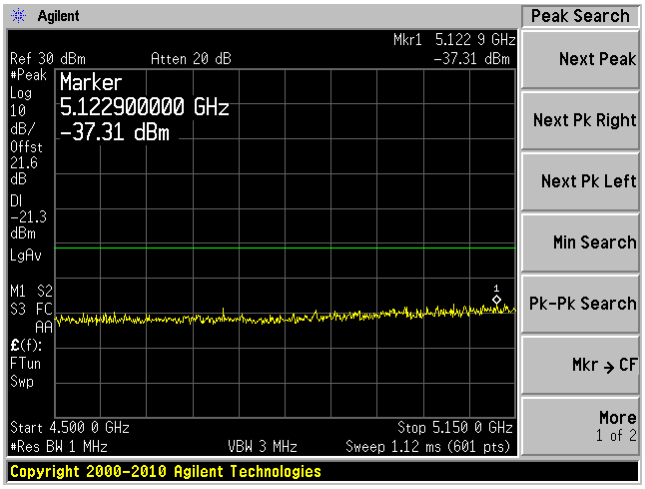
Chain 0, Plot: 30 MHz – 6 GHz



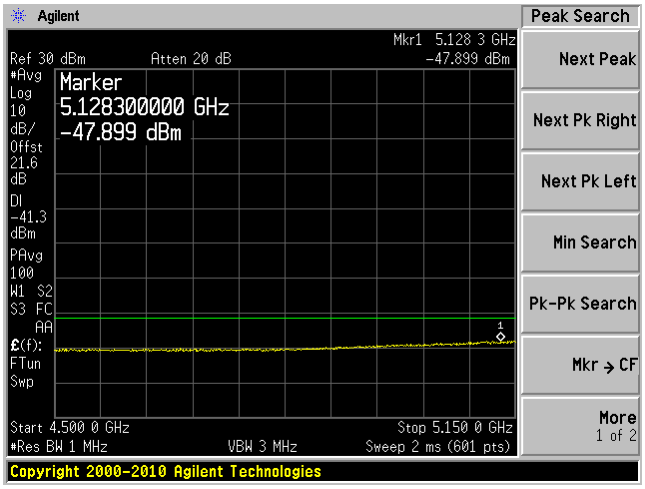
Chain 0, Plot: 6 GHz – 44 GHz



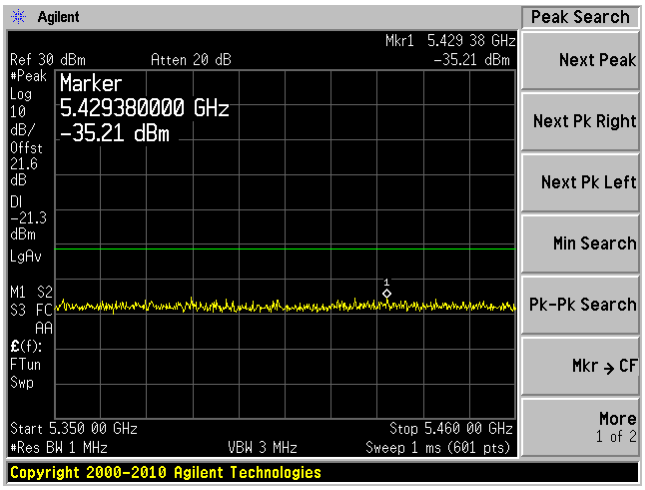
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



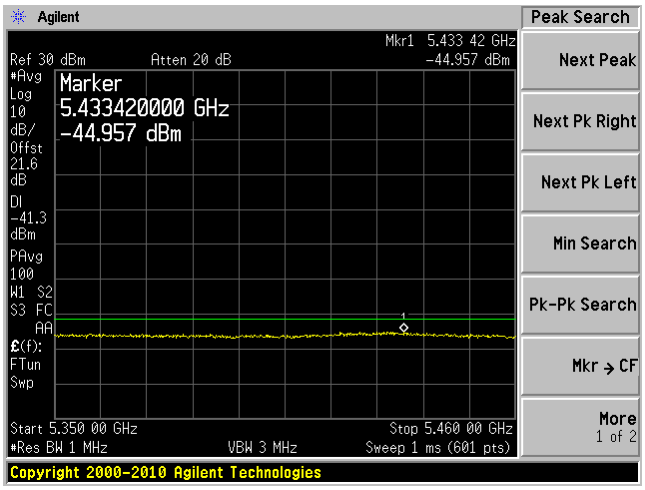
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



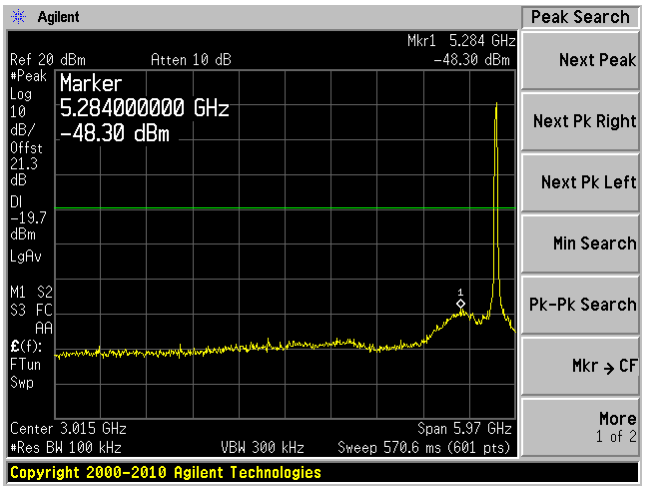
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



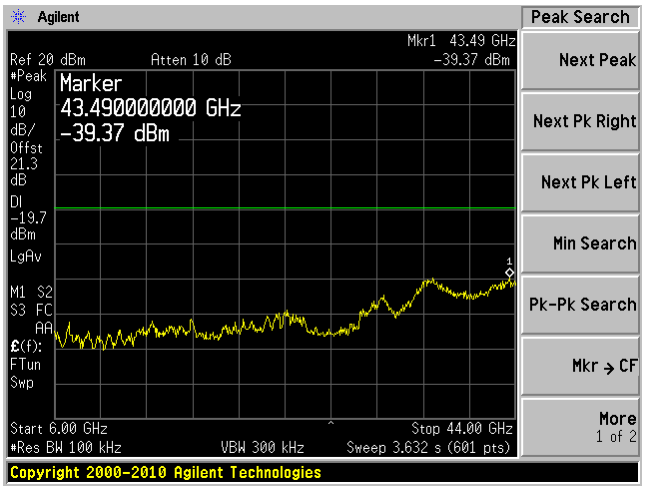
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



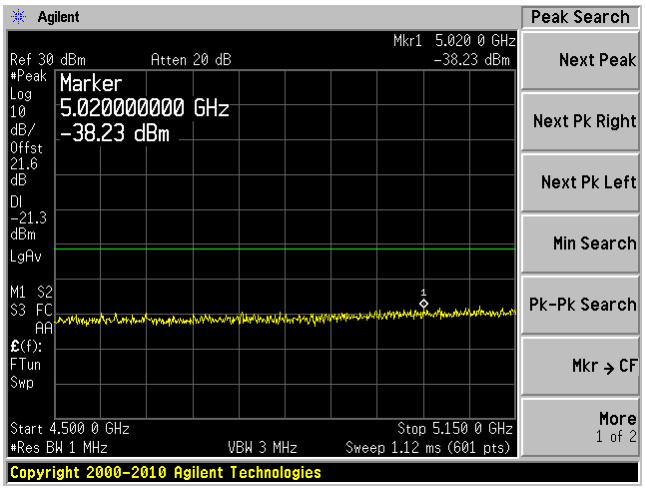
Chain 1, Plot: 30 MHz – 6 GHz



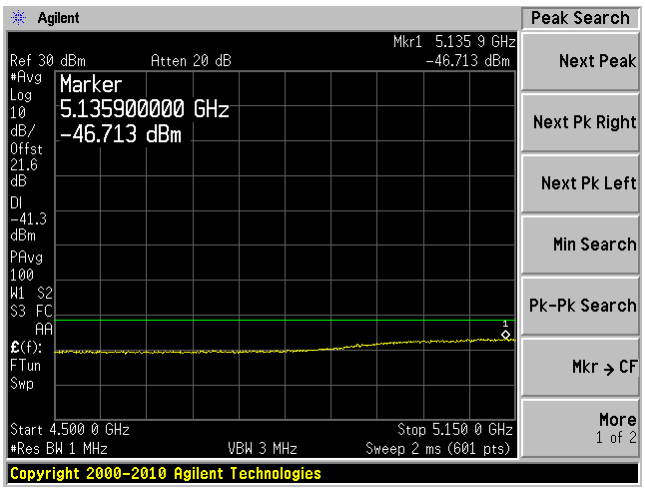
Chain 1, Plot: 6 GHz – 44 GHz



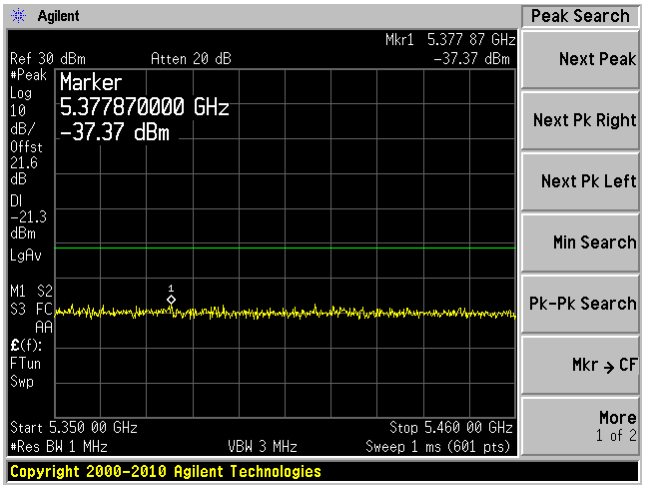
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



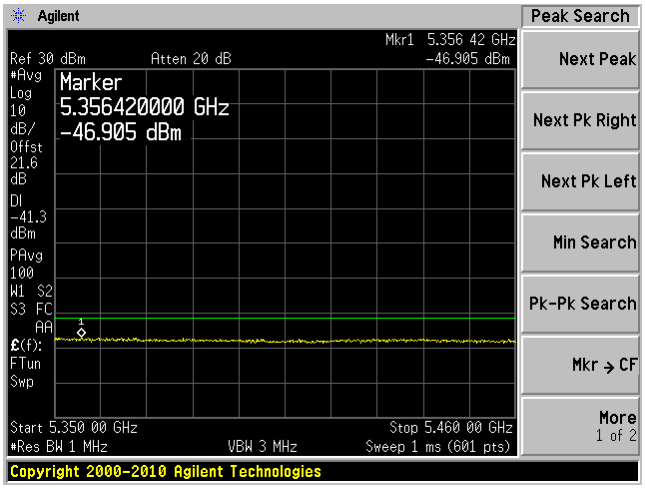
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



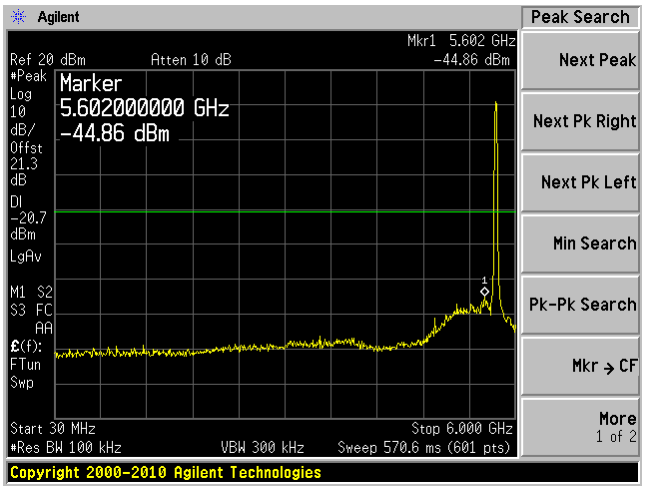
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



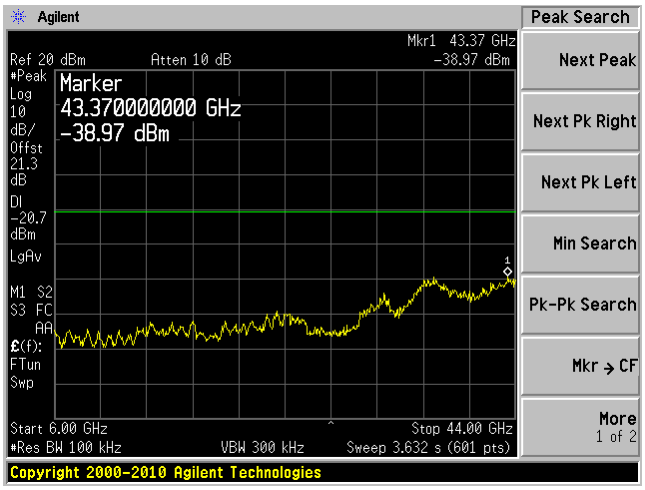
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



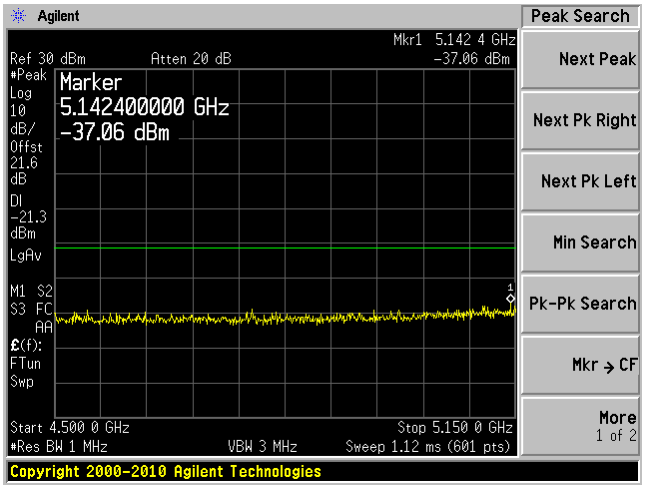
Chain 2, Plot: 30 MHz – 6 GHz



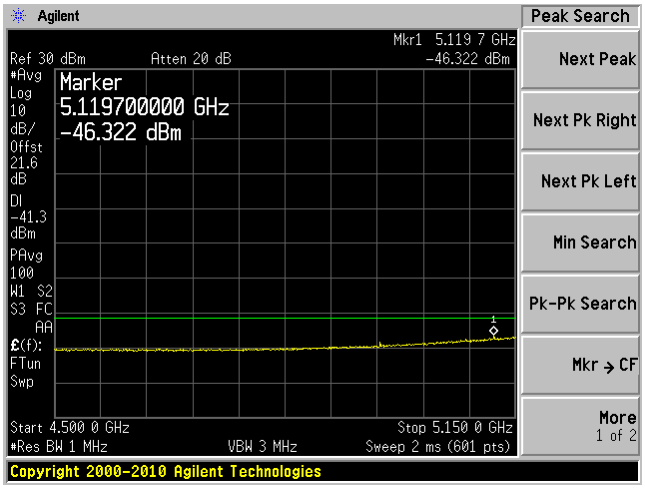
Chain 2, Plot: 6 GHz – 44 GHz



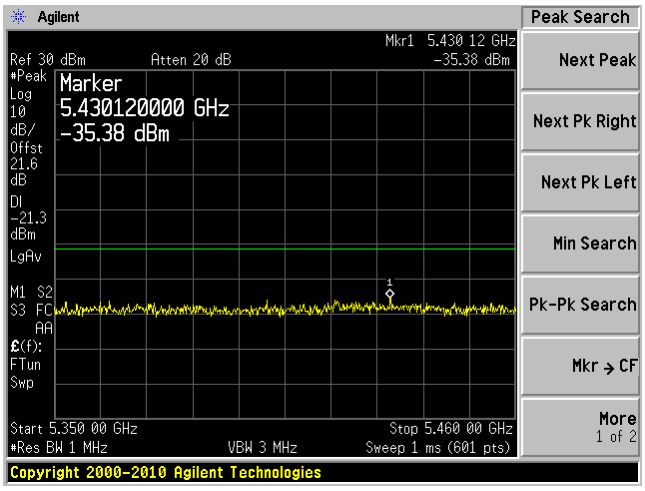
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



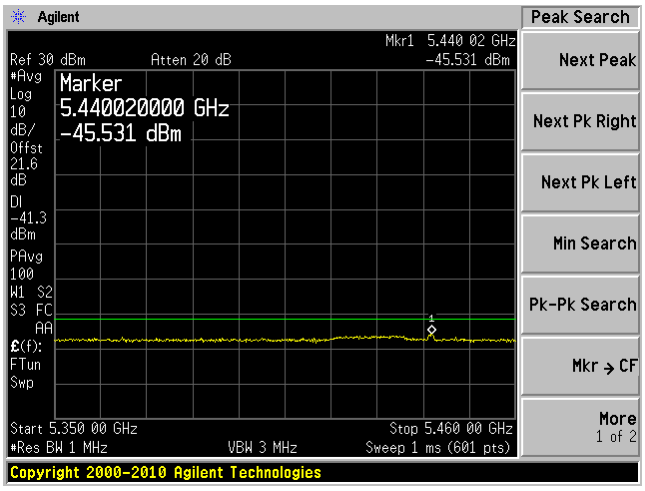
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak

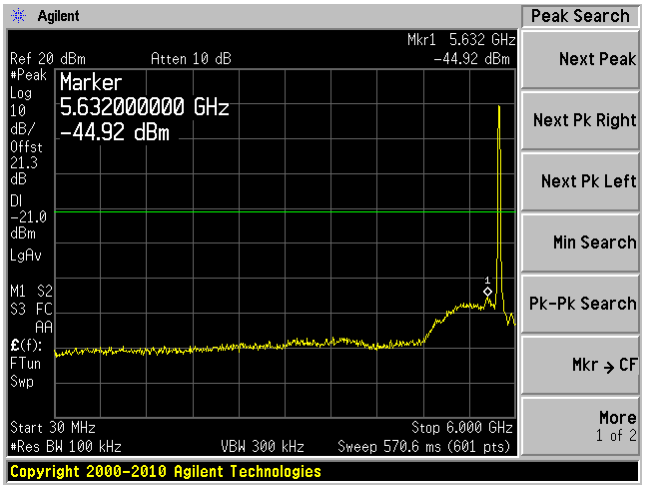


Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave

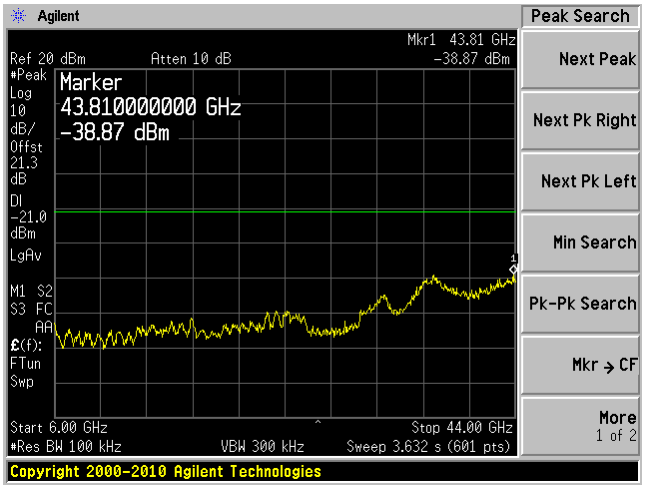


802.11n HT20, Middle Channel,

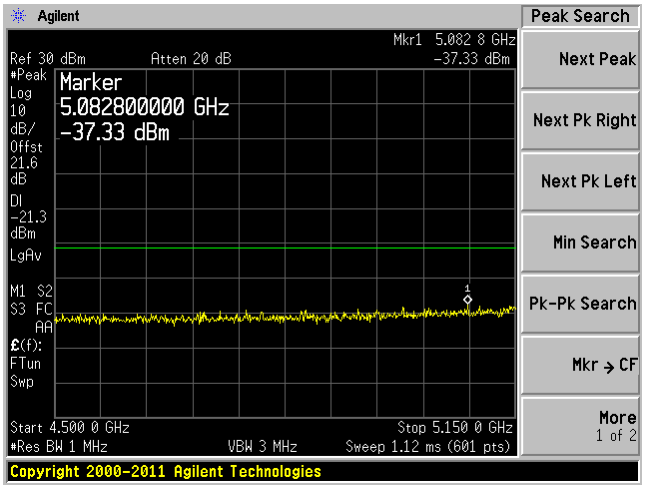
Chain 0, Plot: 30 MHz – 6 GHz



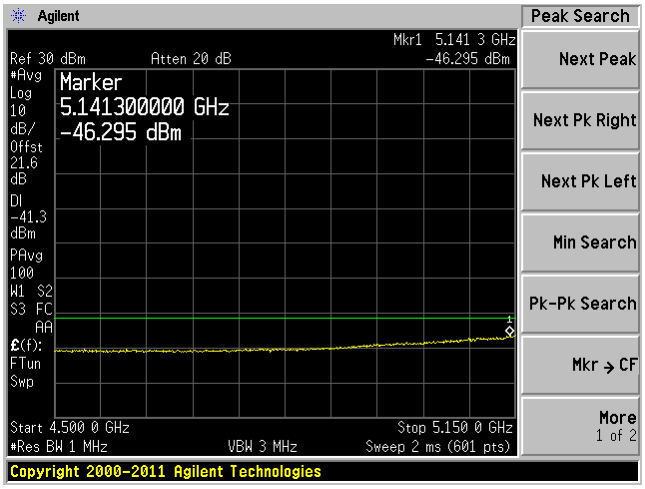
Chain 0, Plot: 6 GHz – 44 GHz



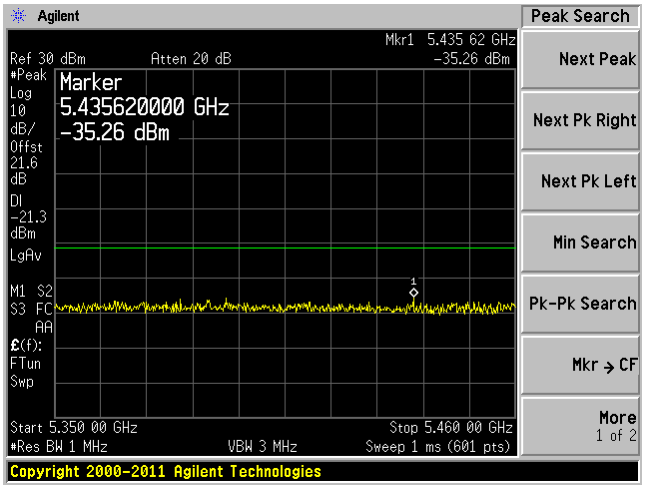
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



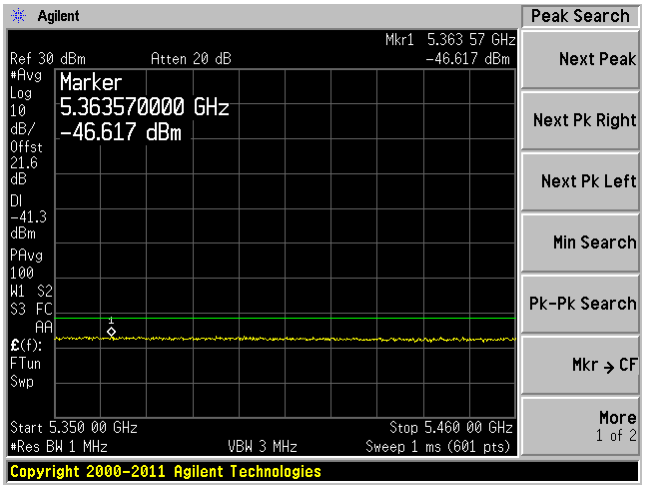
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



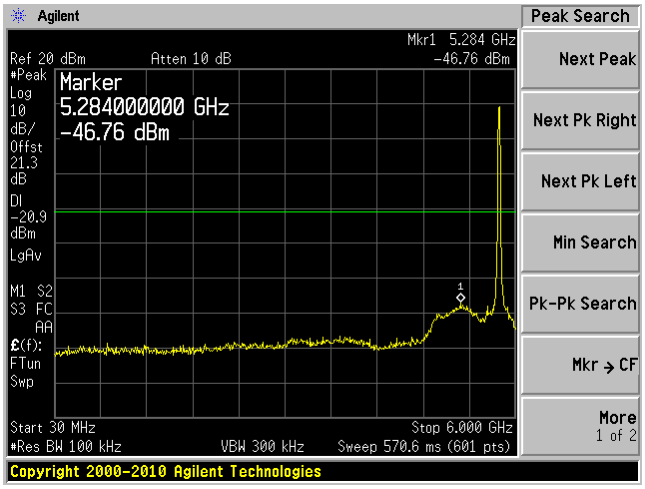
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



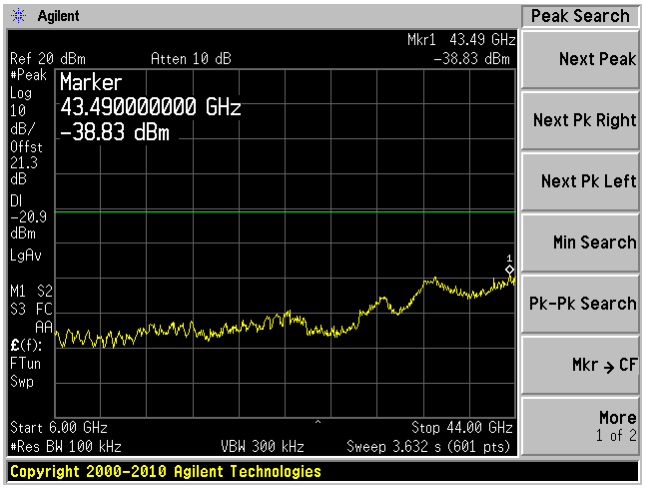
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



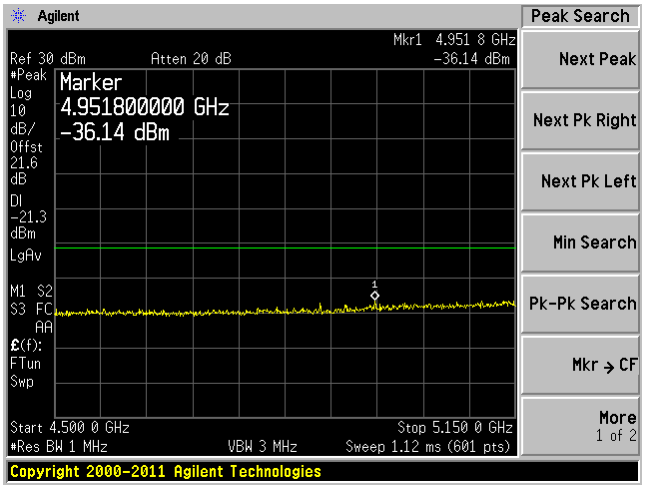
Chain 1, Plot: 30 MHz – 6 GHz



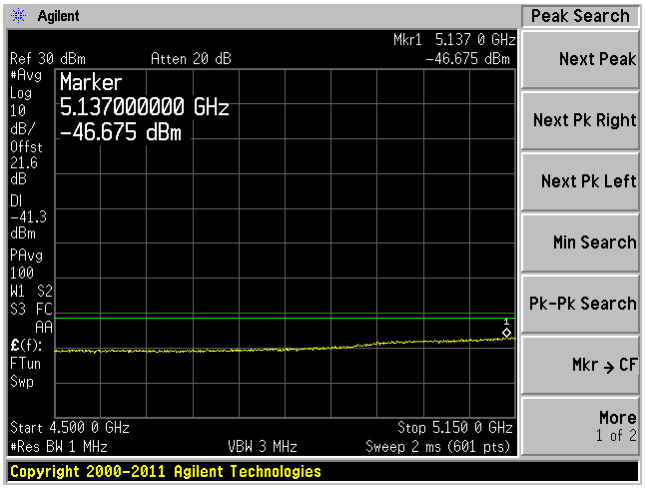
Chain 1, Plot: 6 GHz – 44 GHz



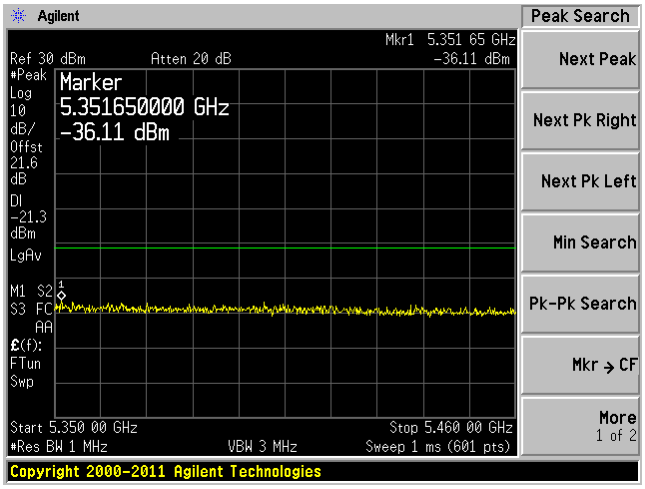
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



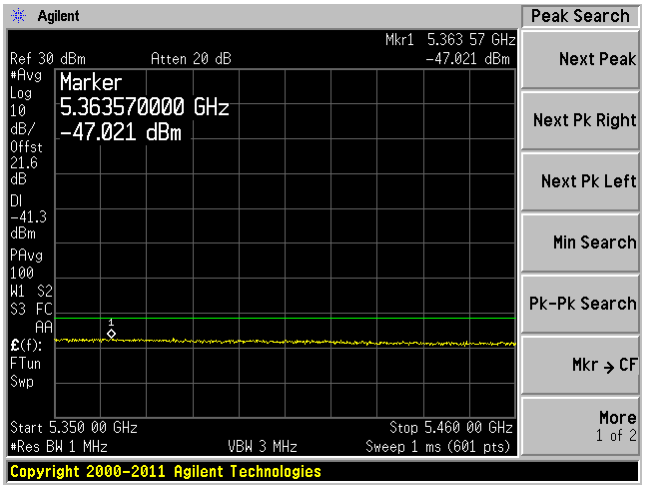
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



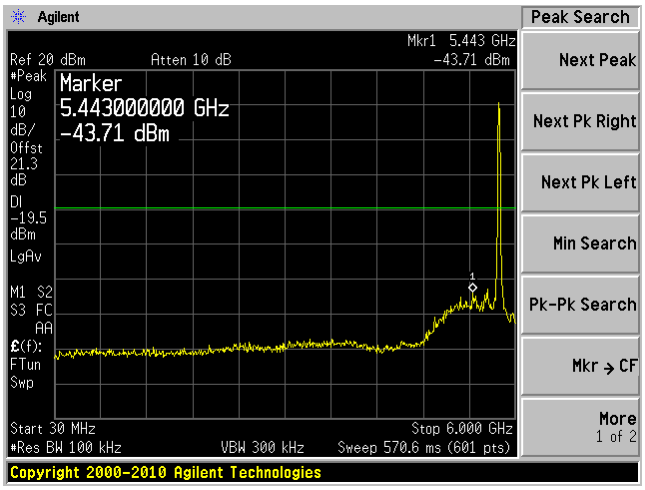
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



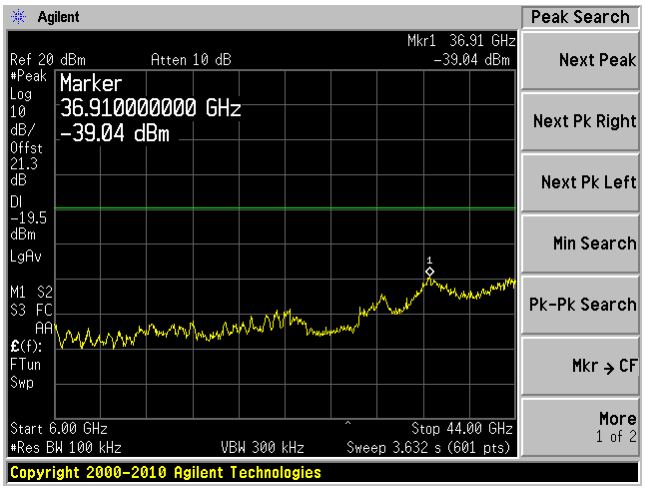
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



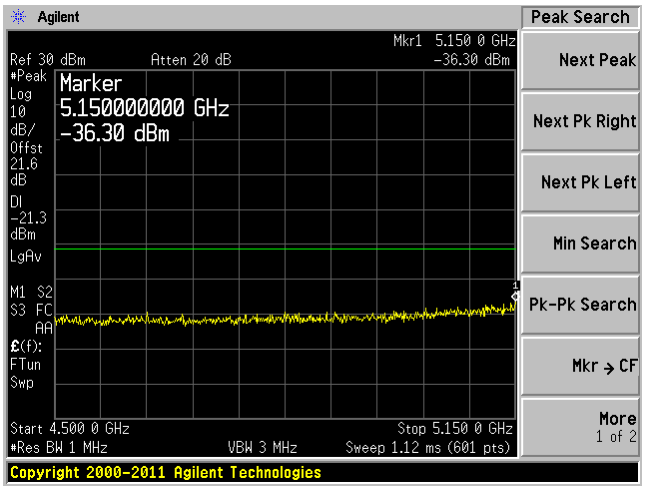
Chain 2, Plot: 30 MHz – 6 GHz



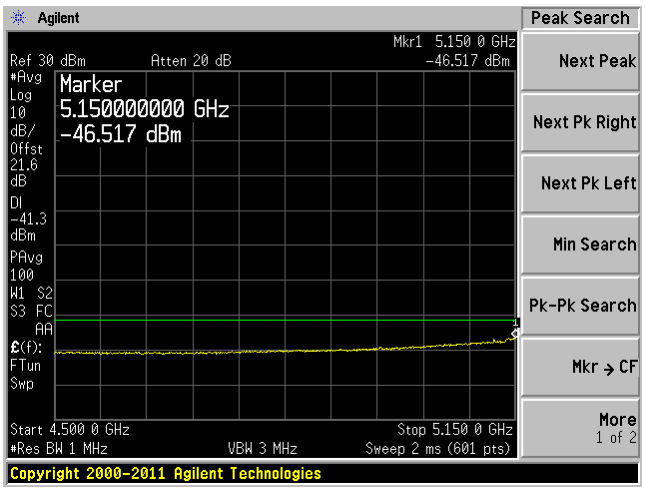
Chain 2, Plot: 6 GHz – 44 GHz



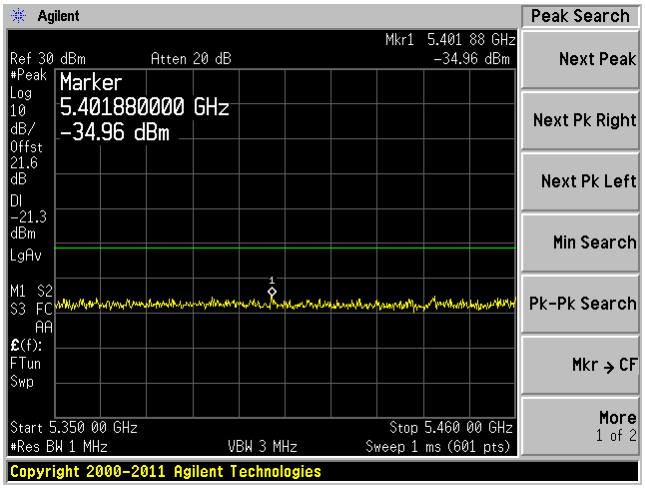
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



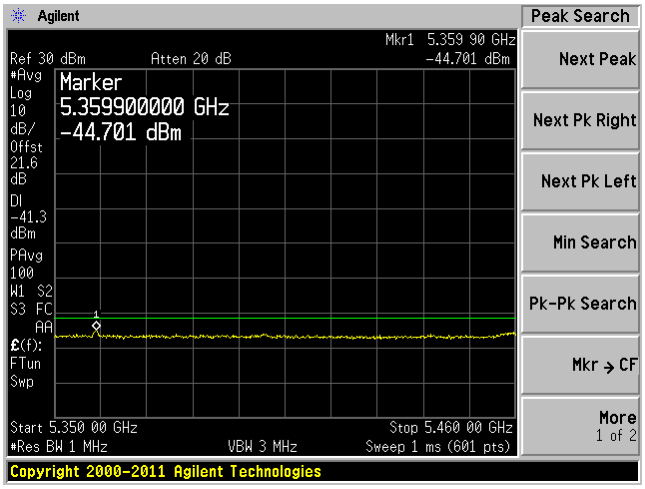
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak

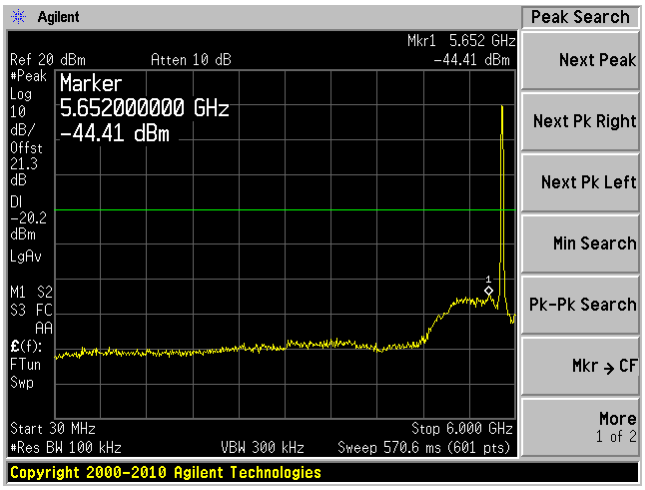


Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave

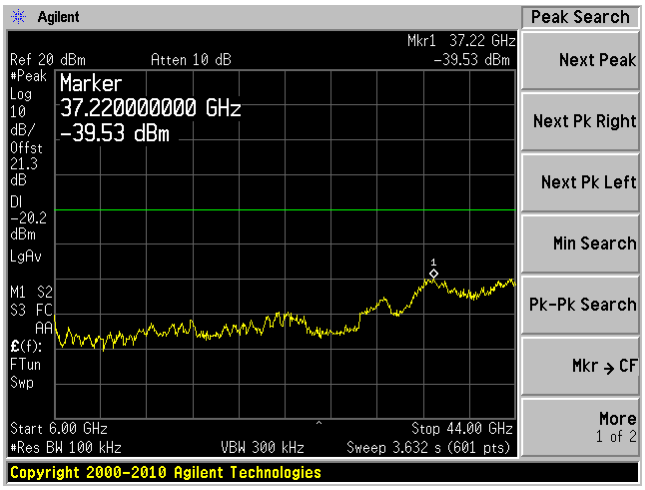


802.11n HT20, High Channel,

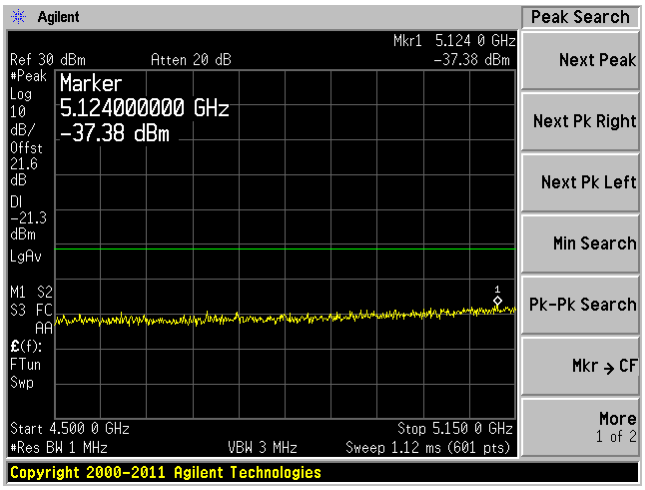
Chain 0, Plot: 30 MHz – 6 GHz



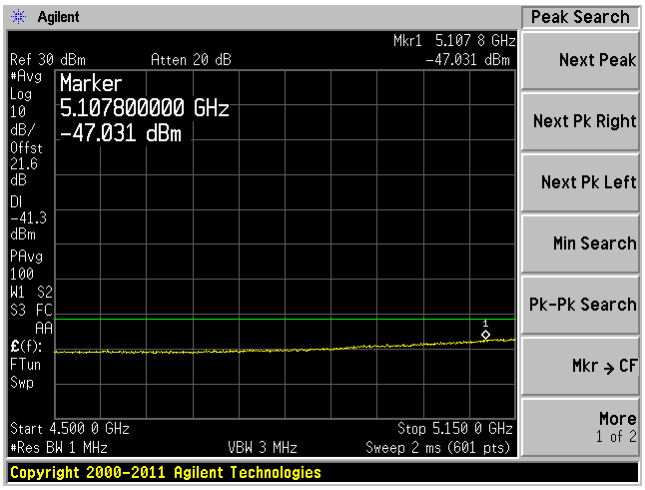
Chain 0, Plot: 6 GHz – 44 GHz



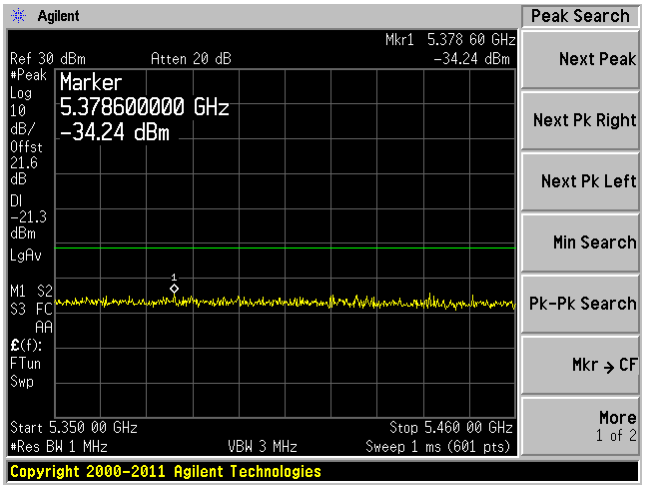
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



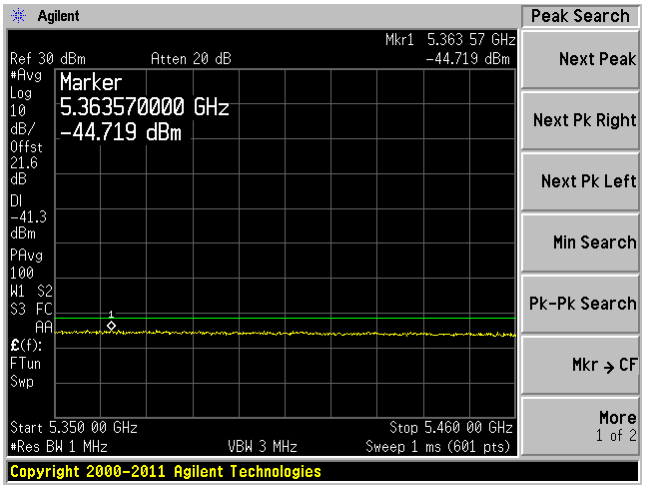
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



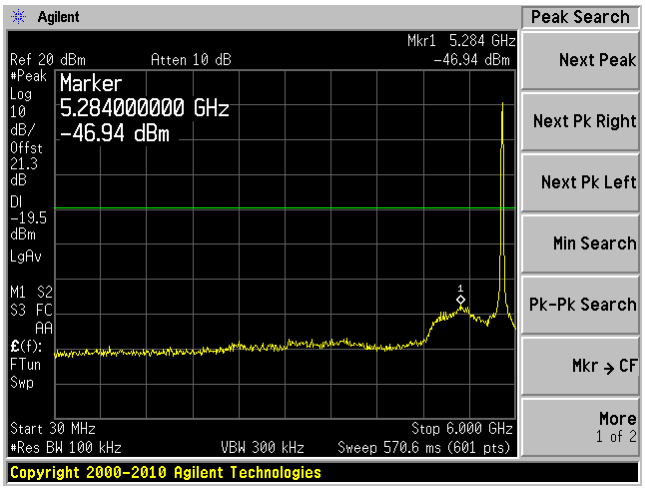
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



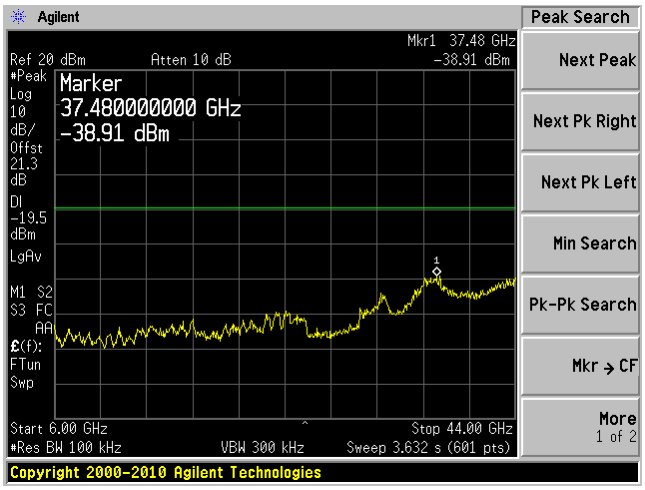
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



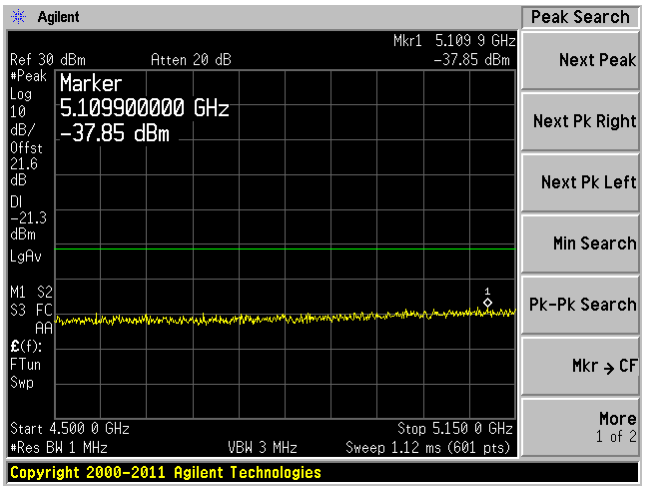
Chain 1, Plot: 30 MHz – 6 GHz



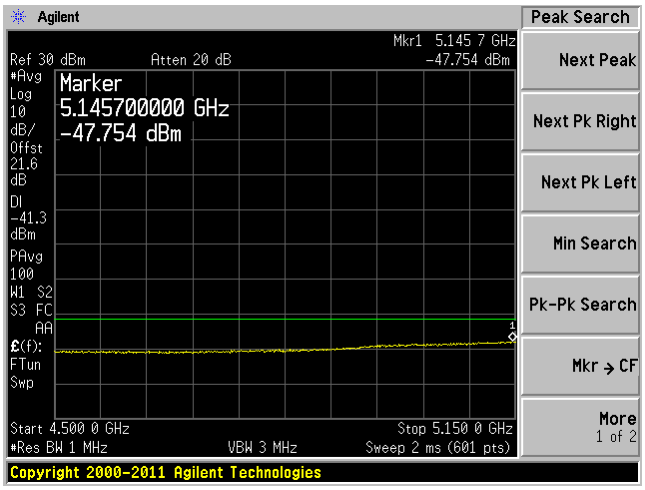
Chain 1, Plot: 6 GHz – 44 GHz



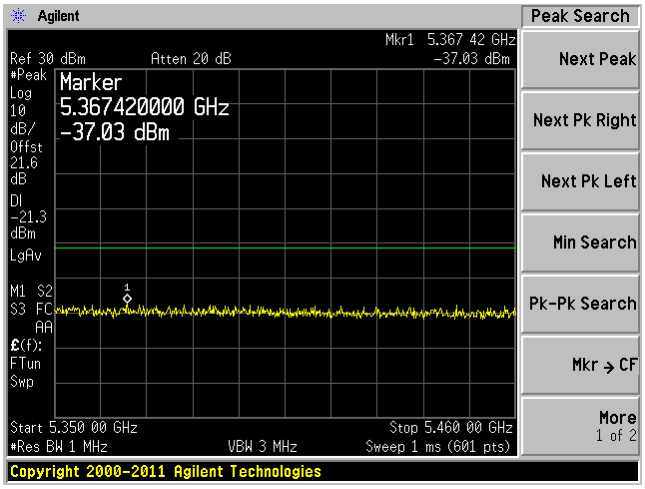
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



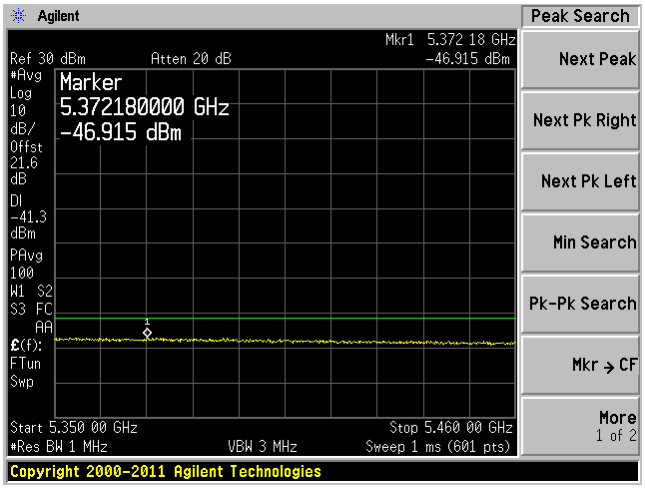
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



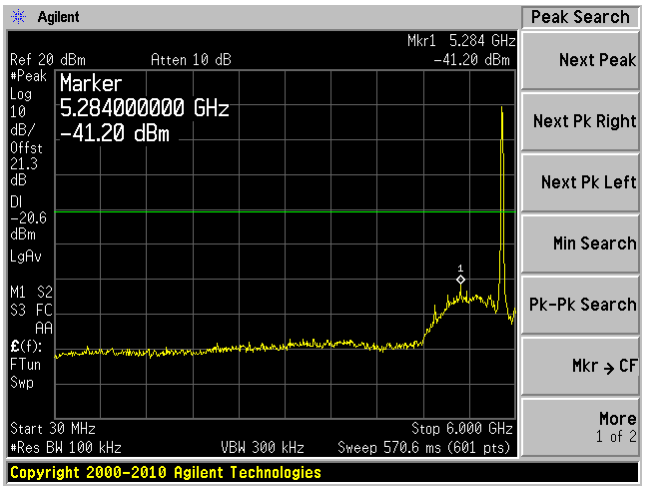
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



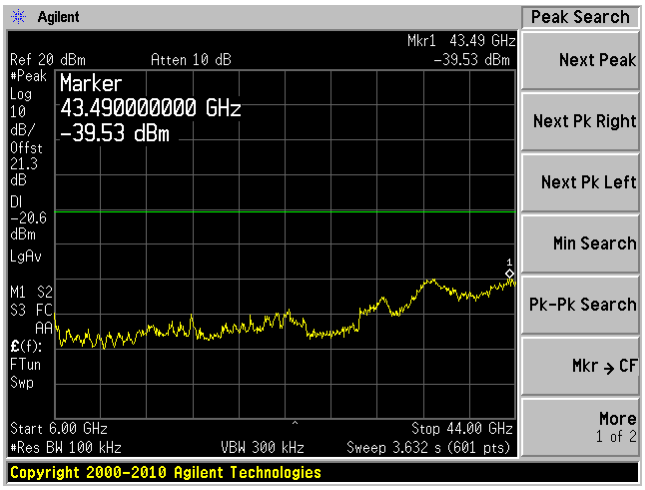
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



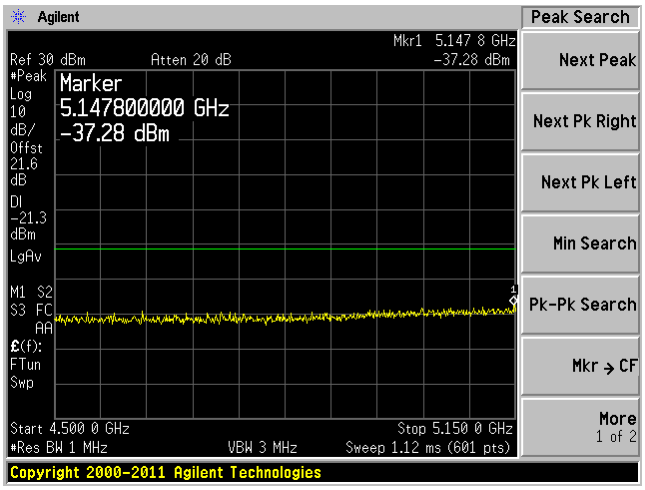
Chain 2, Plot: 30 MHz – 6 GHz



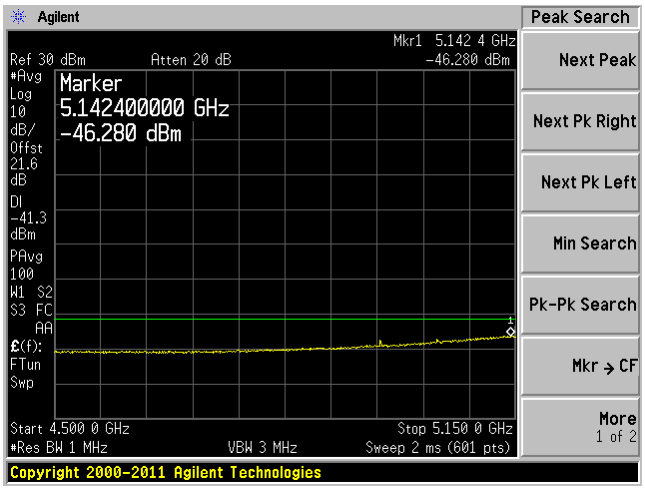
Chain 2, Plot: 6 GHz – 44 GHz



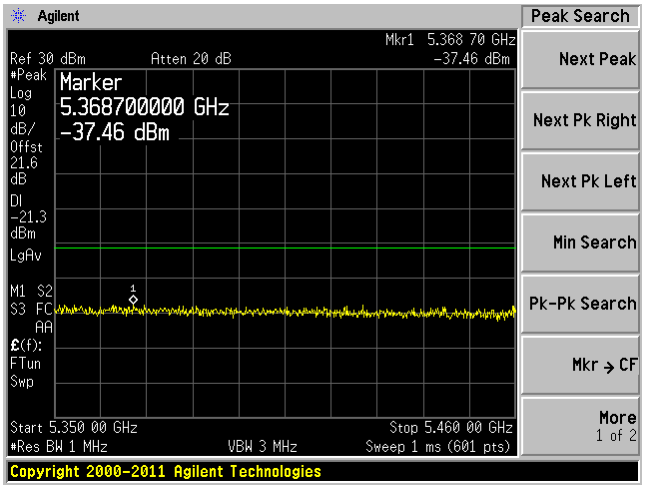
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



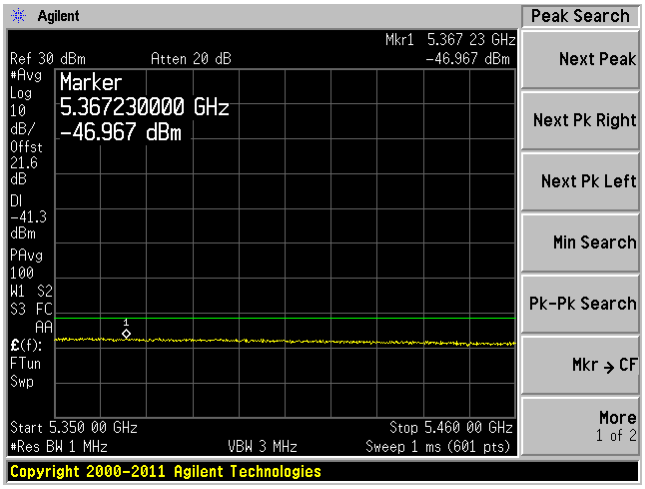
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak

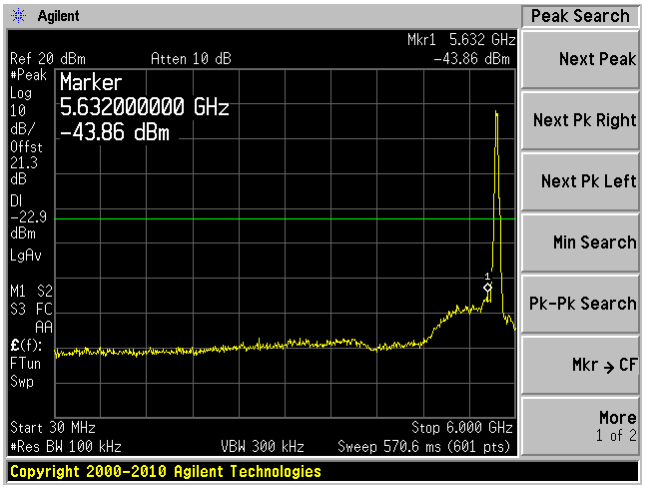


Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave

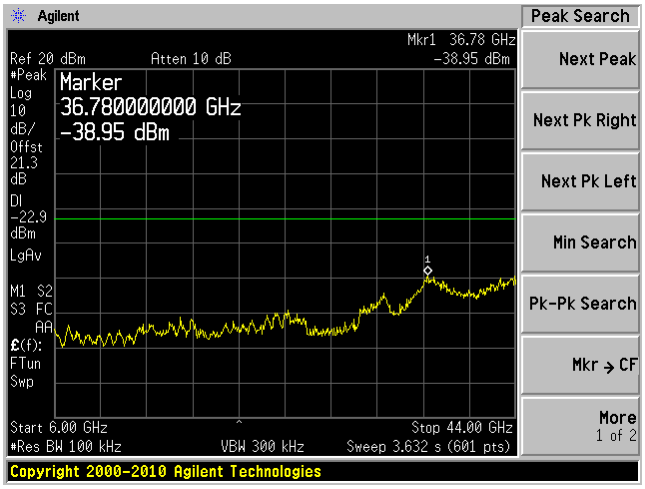


802.11n HT40, Low Channel,

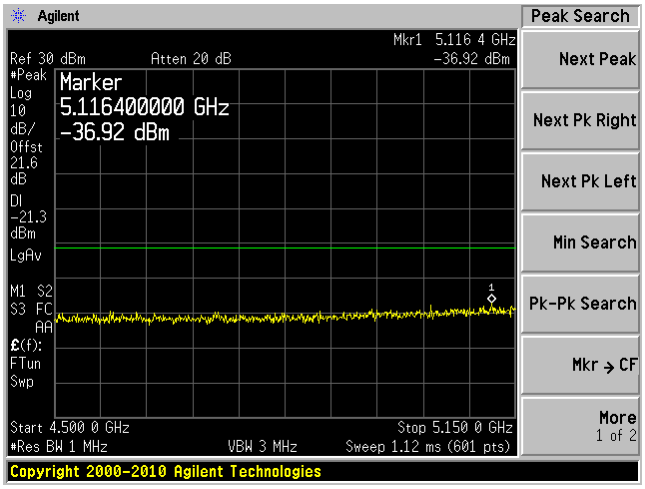
Chain 0, Plot: 30 MHz – 6 GHz



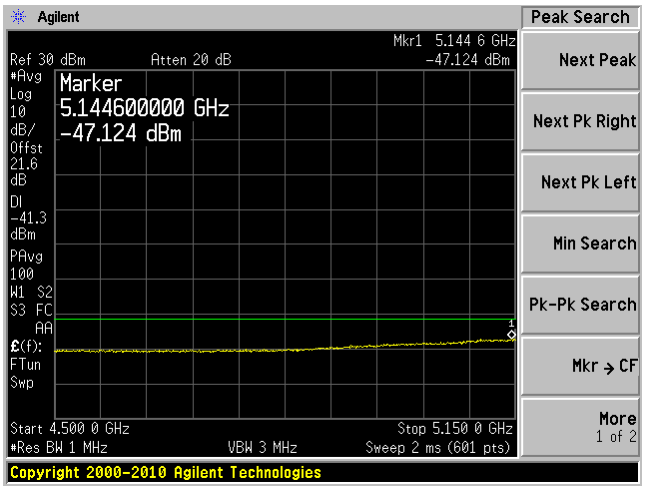
Chain 0, Plot: 6 GHz – 44 GHz



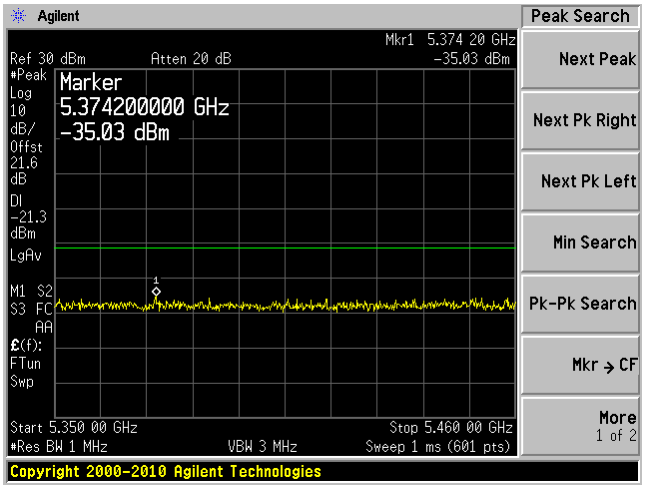
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



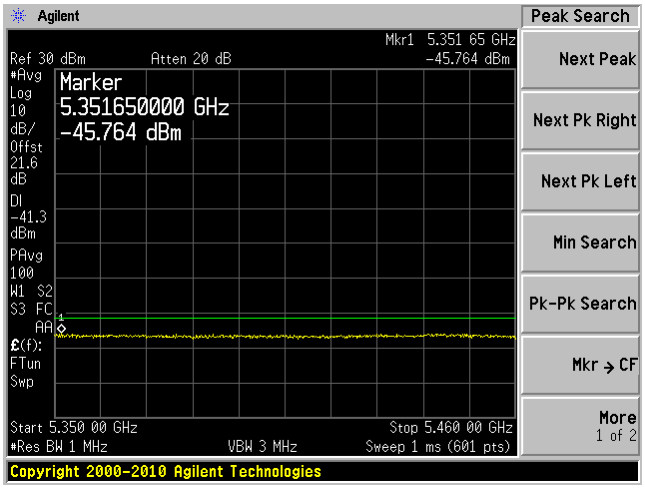
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



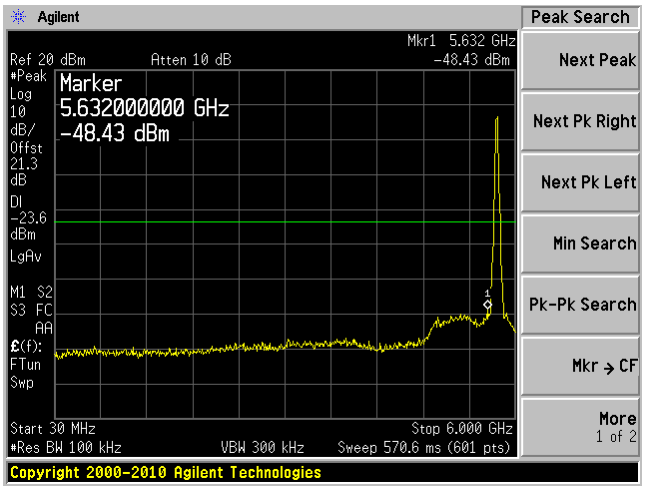
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



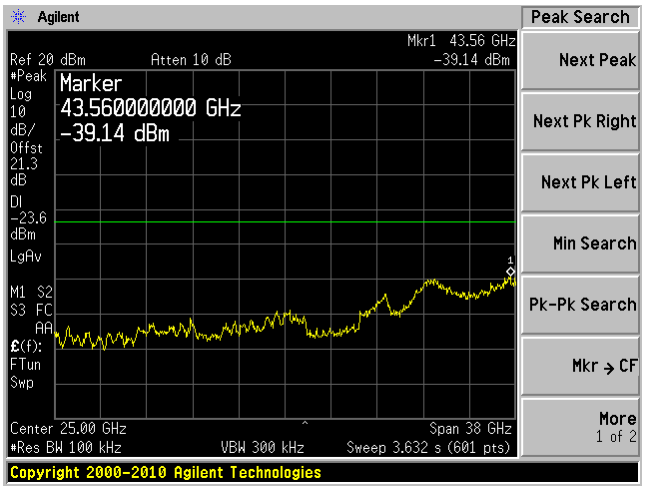
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



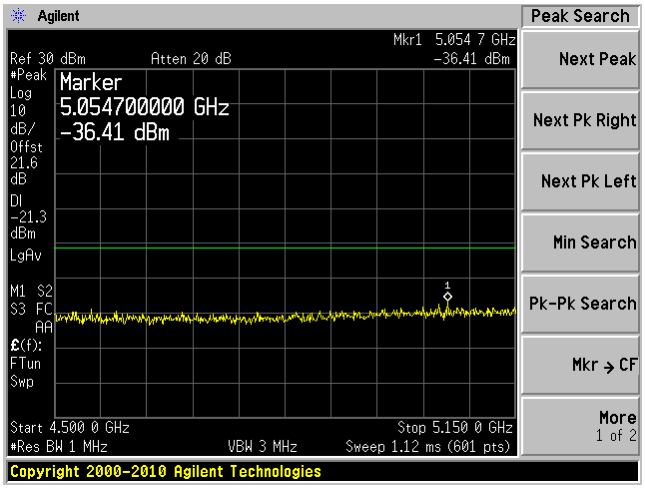
Chain 1, Plot: 30 MHz – 6 GHz



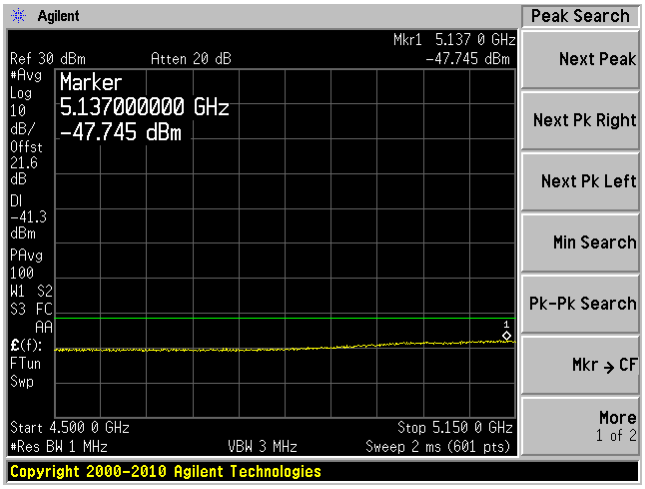
Chain 1, Plot: 6 GHz – 44 GHz



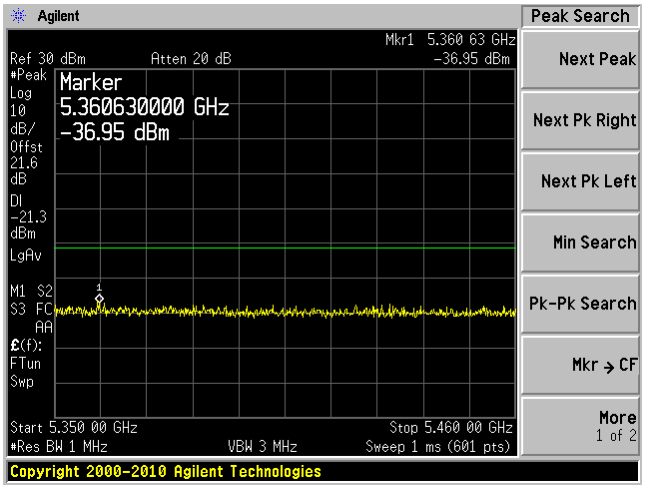
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



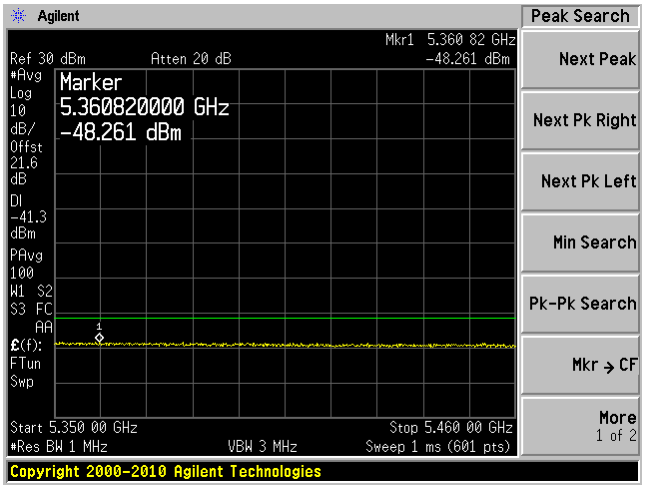
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



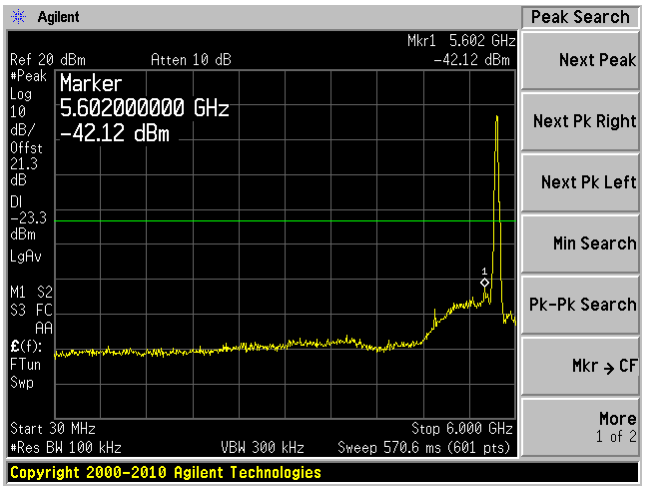
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



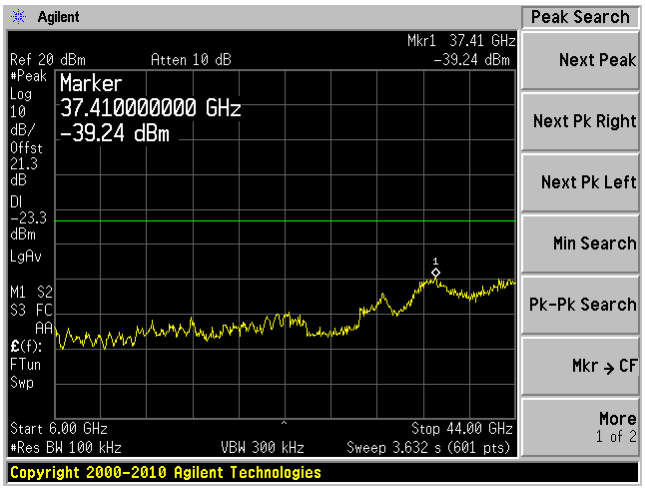
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



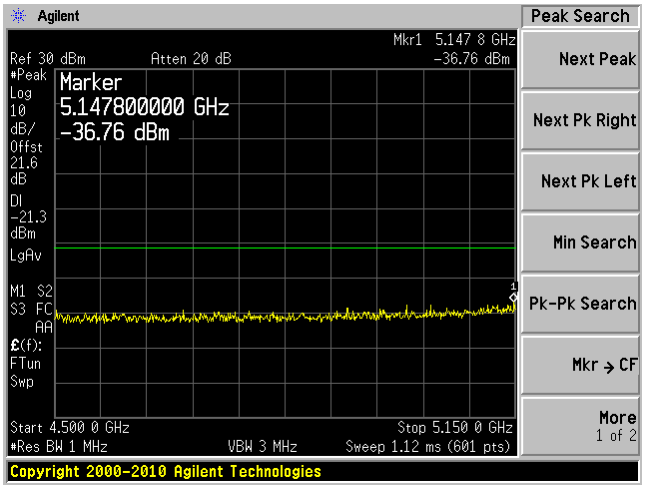
Chain 2, Plot: 30 MHz – 6 GHz



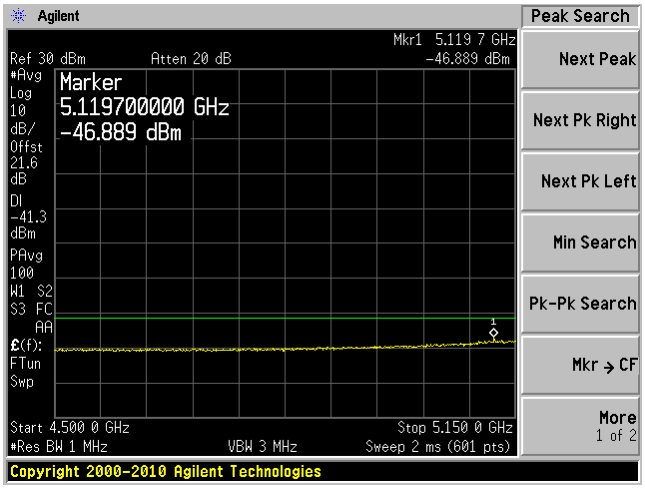
Chain 2, Plot: 6 GHz – 44 GHz



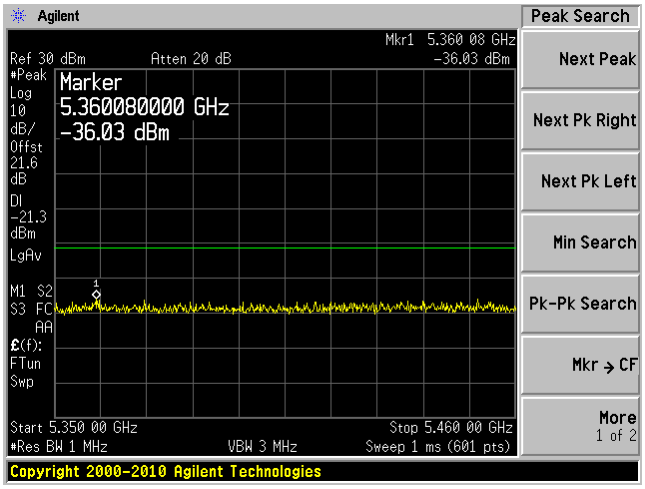
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



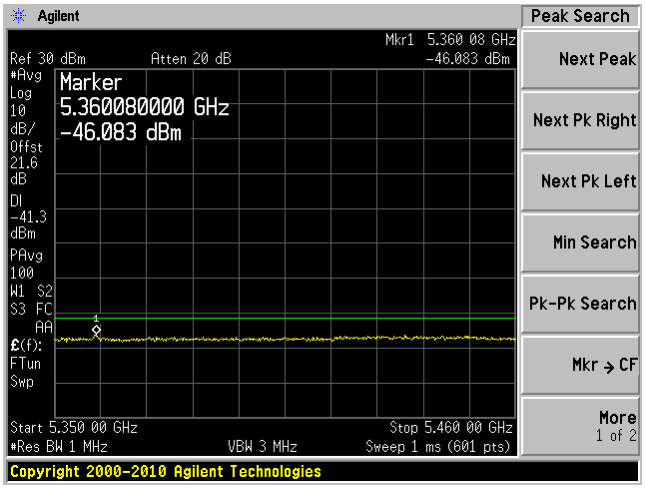
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



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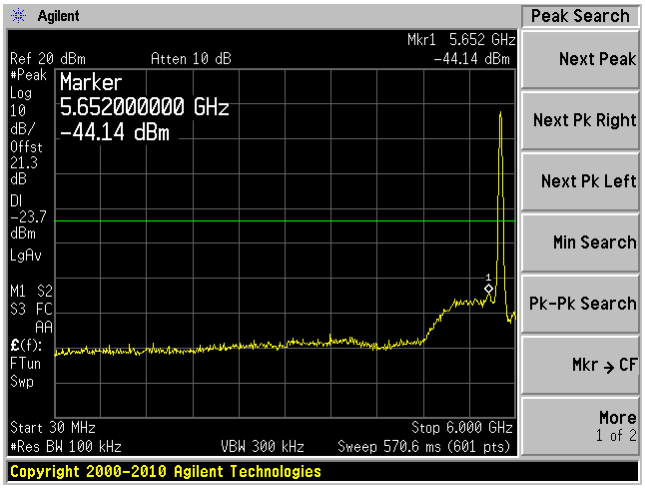
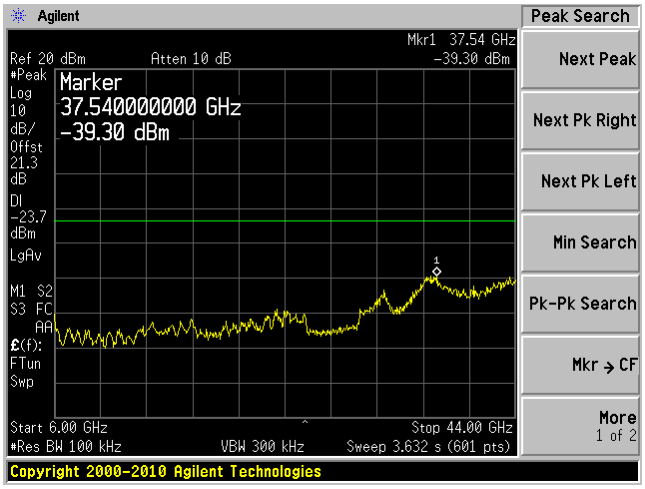
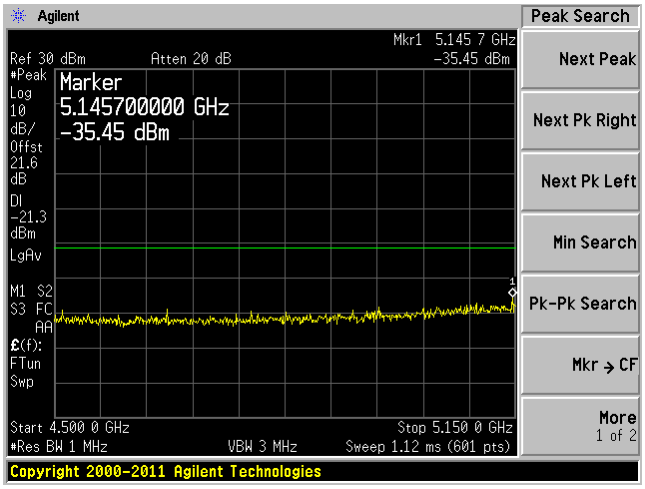
Chain 0, Plot: 30 MHz – 6 GHz



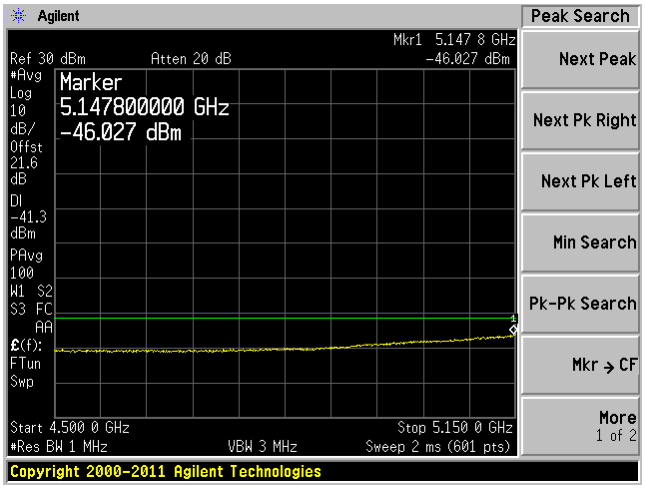
Chain 0, Plot: 6 GHz – 44 GHz



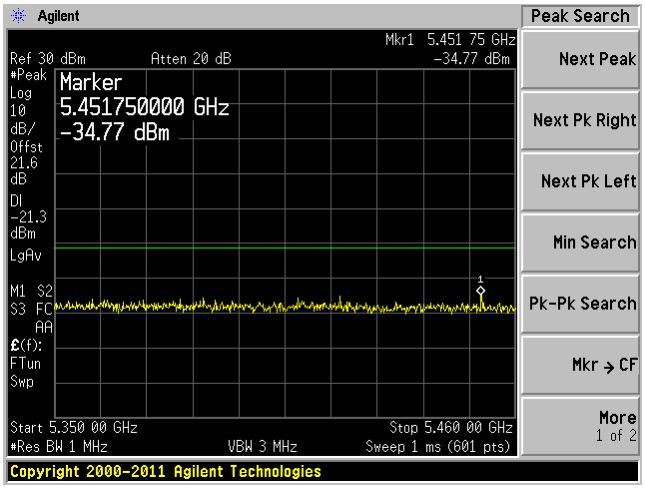
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



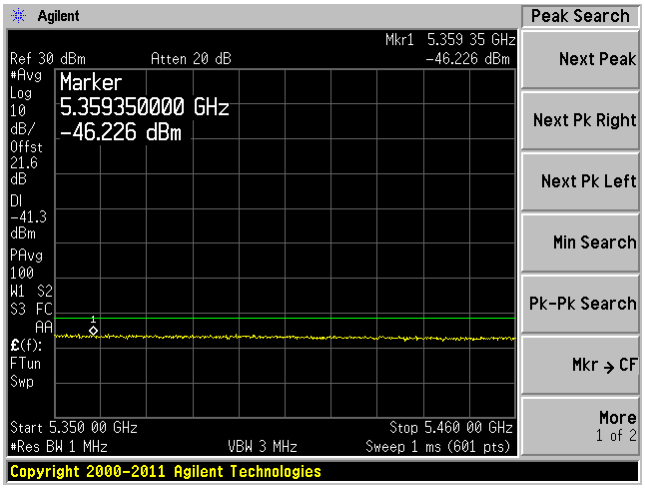
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



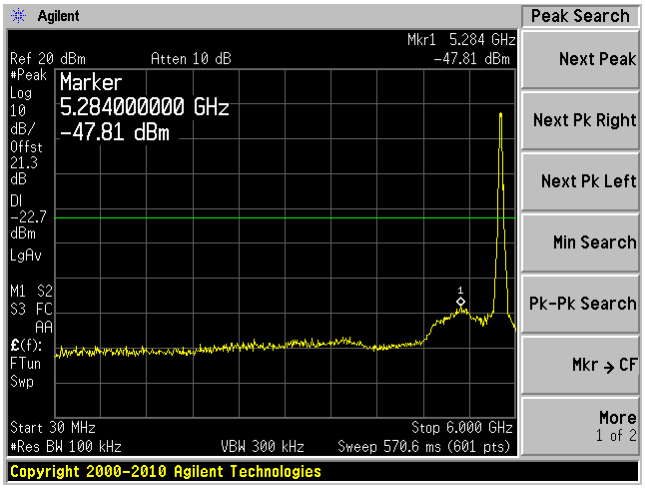
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



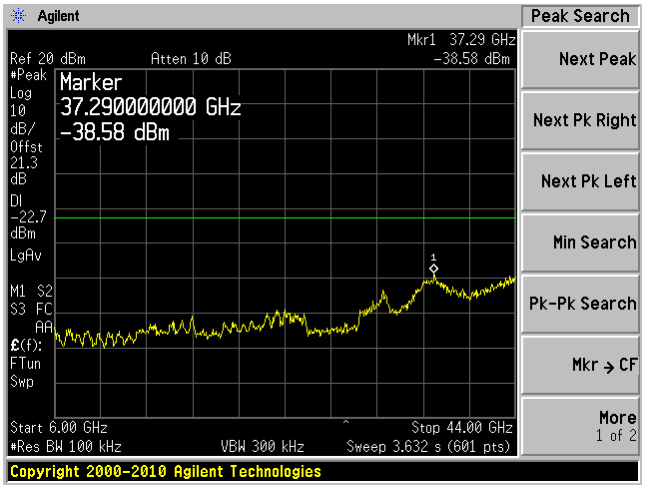
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



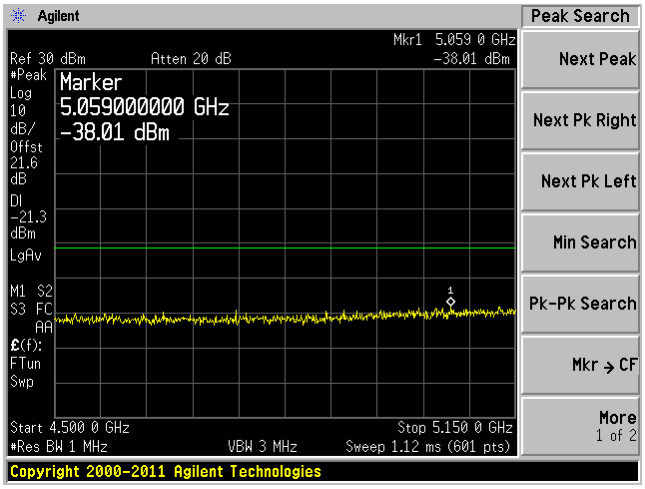
Chain 1, Plot: 30 MHz – 6 GHz



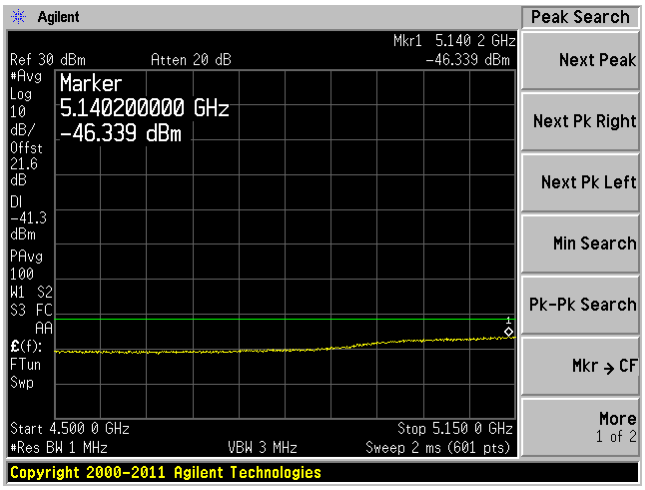
Chain 1, Plot: 6 GHz – 44 GHz



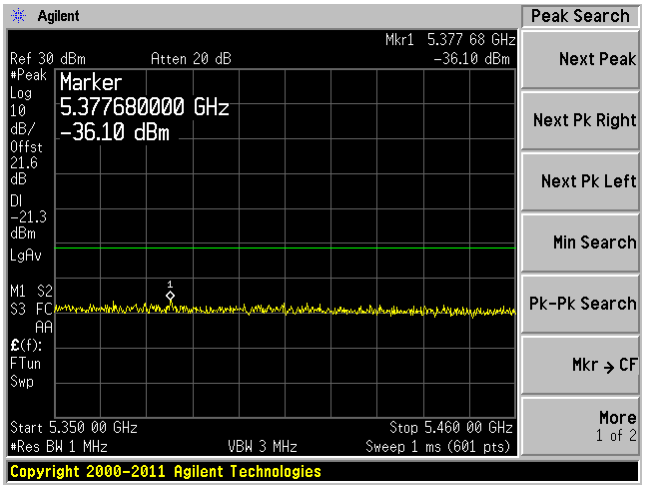
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



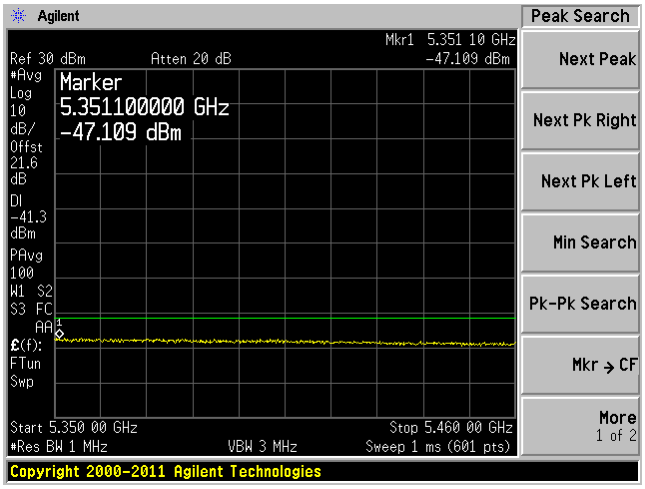
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



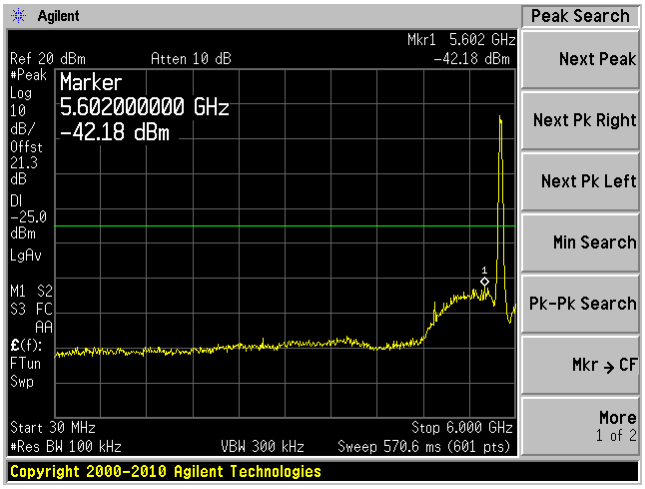
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



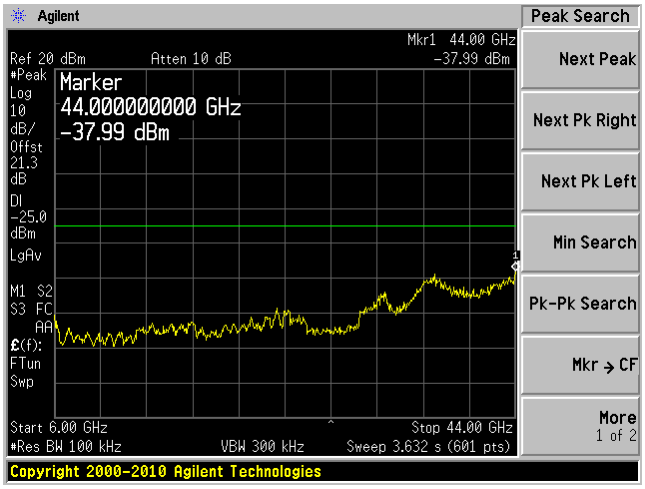
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



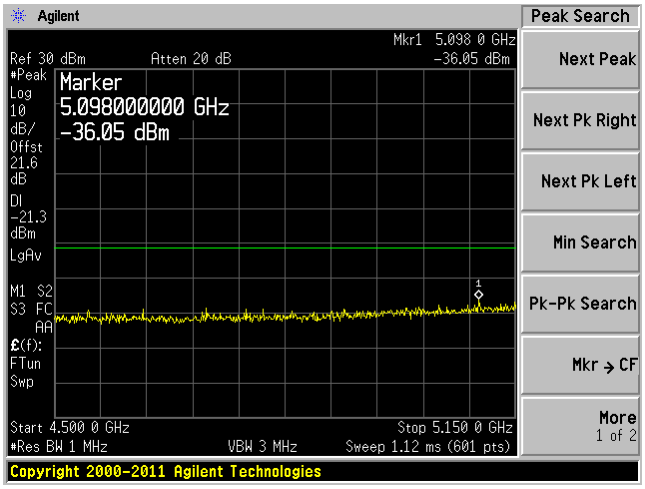
Chain 2, Plot: 30 MHz – 6 GHz



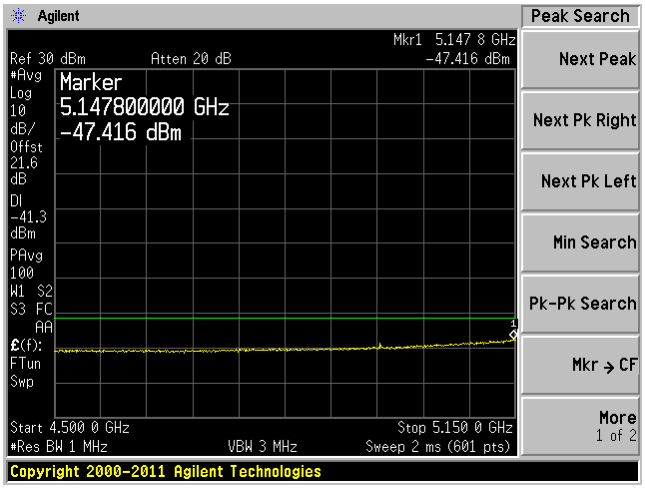
Chain 2, Plot: 6 GHz – 44 GHz



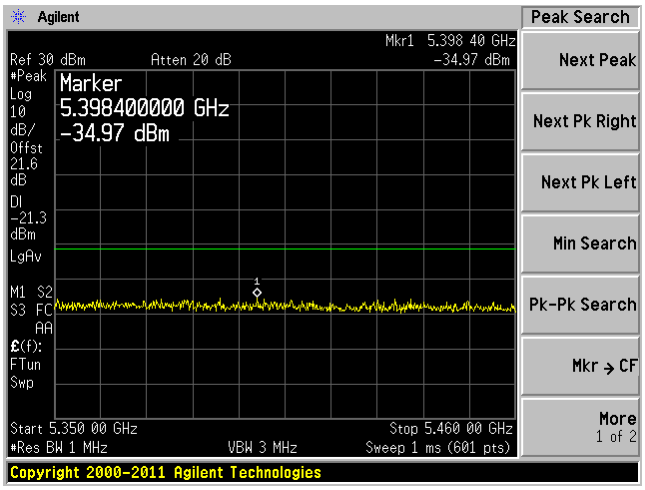
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



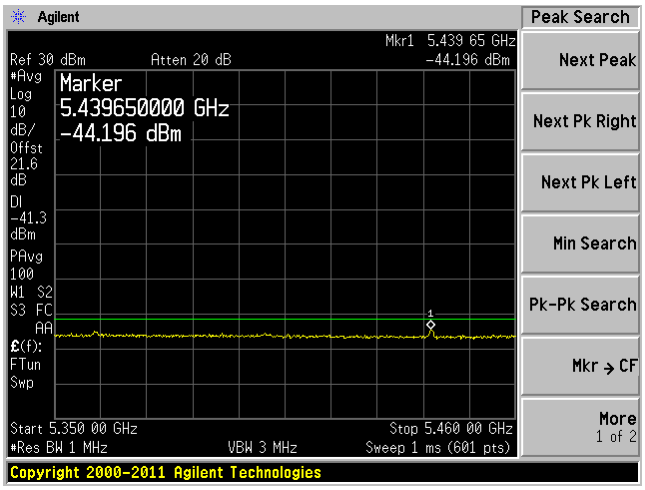
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



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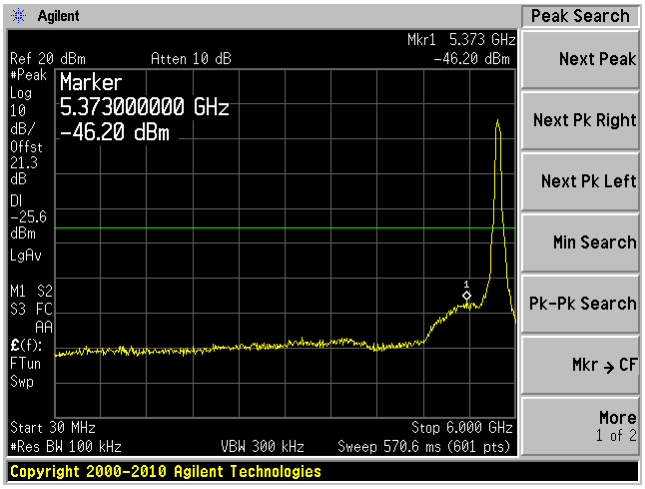
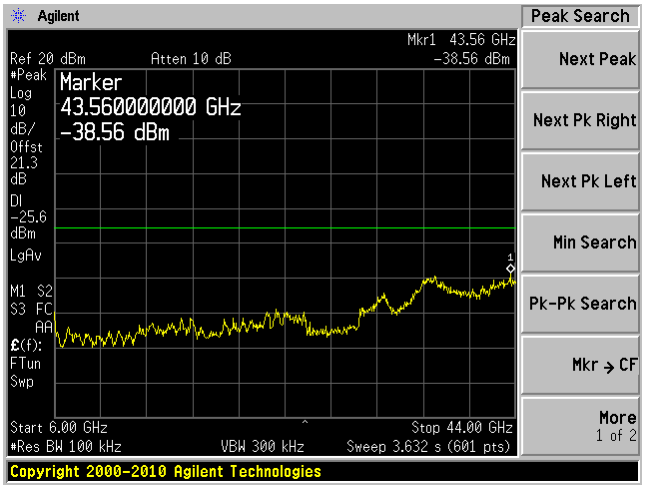
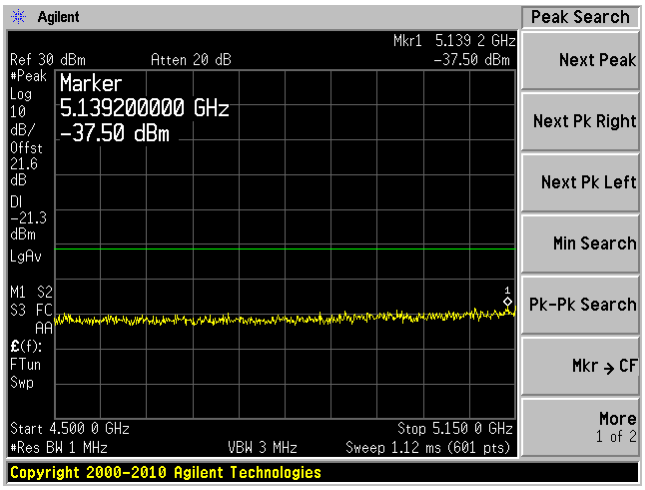
Chain 0, Plot: 30 MHz – 6 GHz



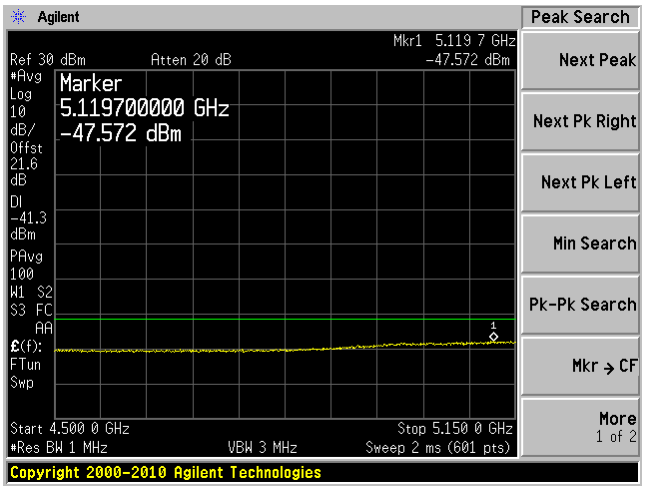
Chain 0, Plot: 6 GHz – 44 GHz



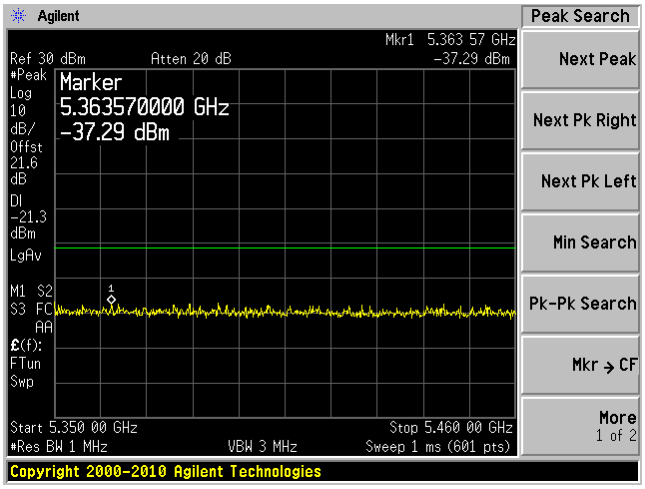
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



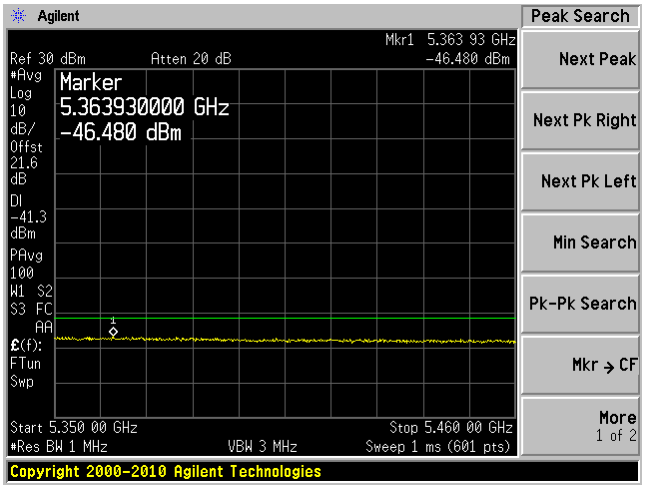
Chain 0, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



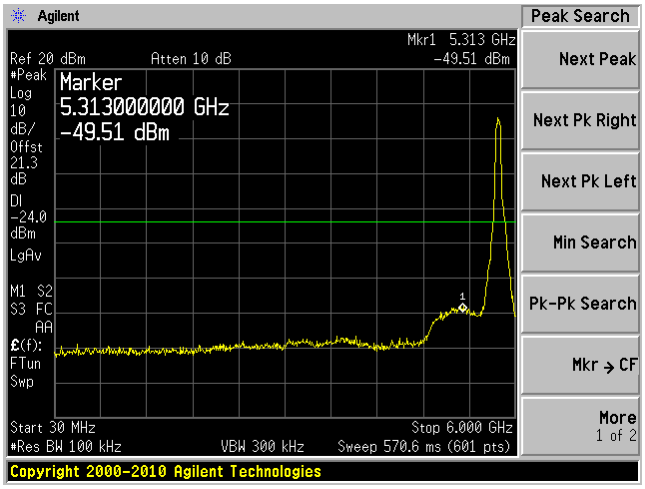
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict Band) Peak



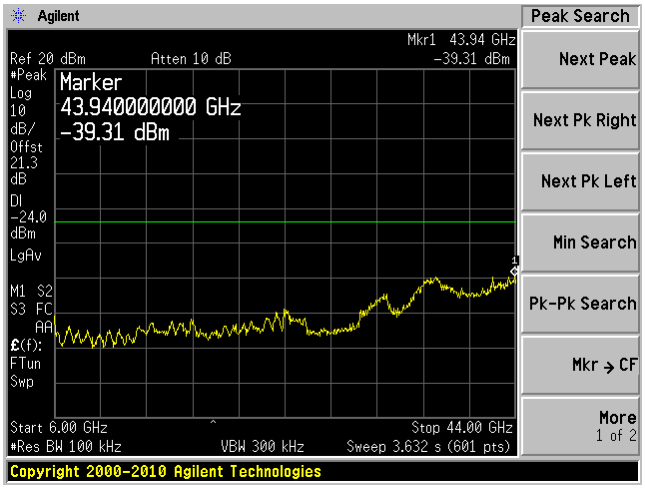
Chain 0, Plot: 5.35 GHz – 5.46 GHz (restrict band) Ave



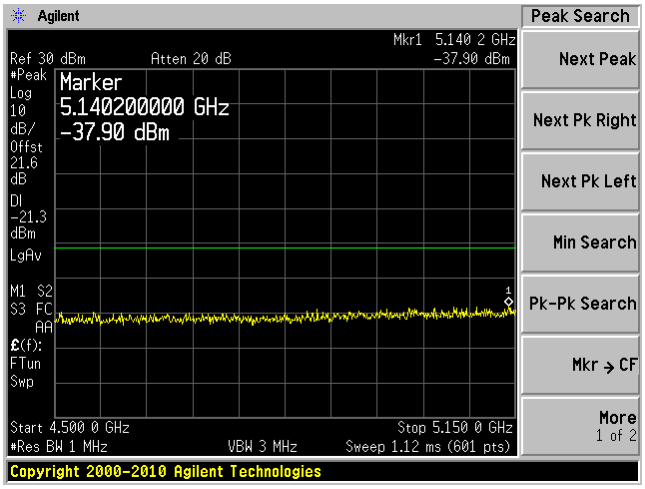
Chain 1, Plot: 30 MHz – 6 GHz



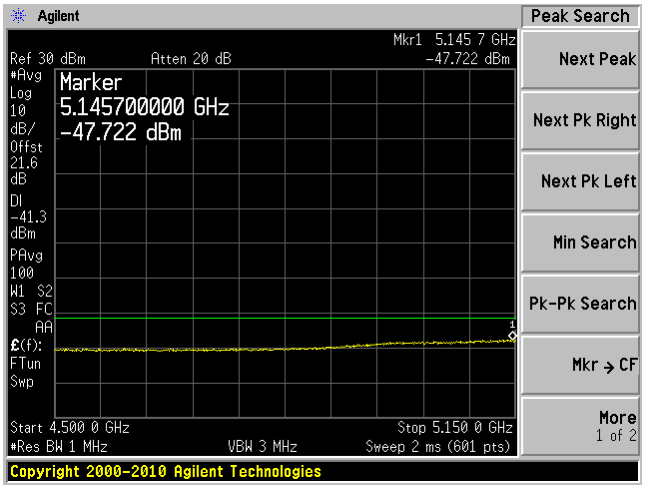
Chain 1, Plot: 6 GHz – 44 GHz



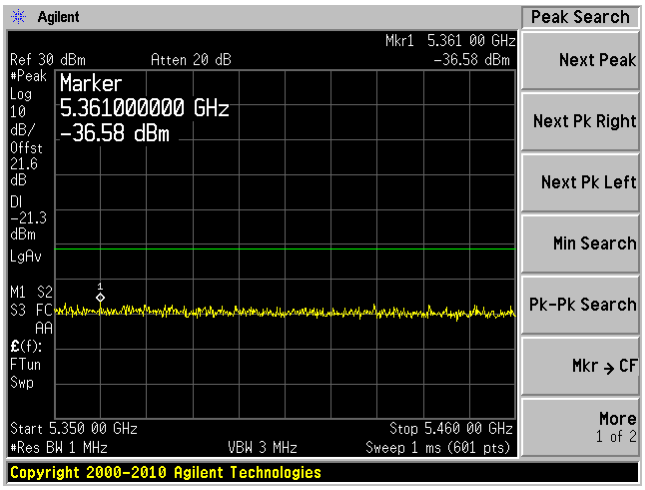
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict Band)
Peak



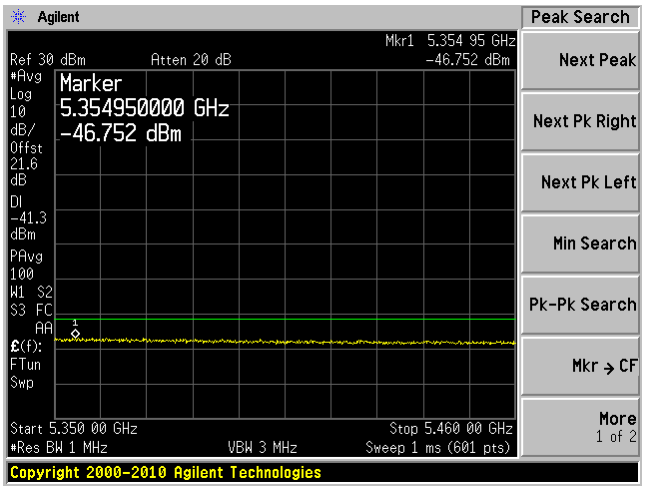
Chain 1, Plot: 4.5 GHz – 5.15 GHz (restrict band)
Ave



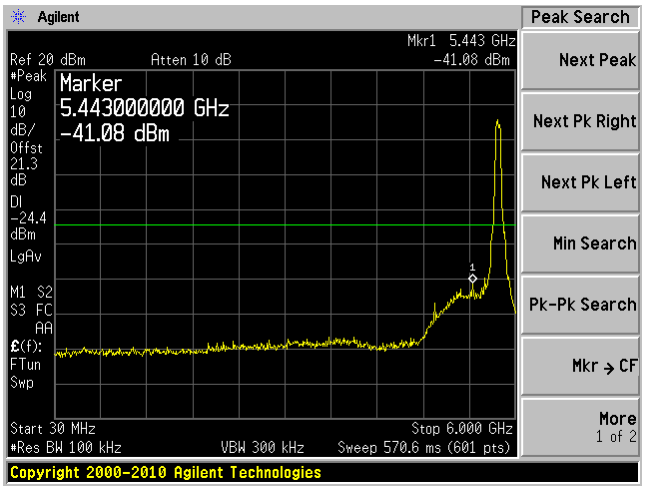
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



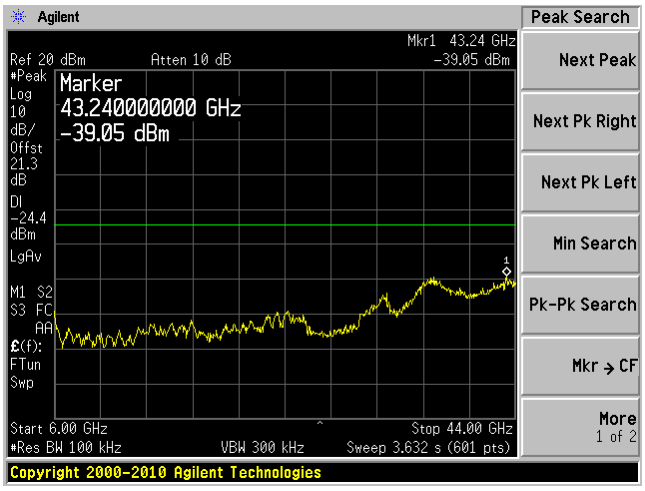
Chain 1, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



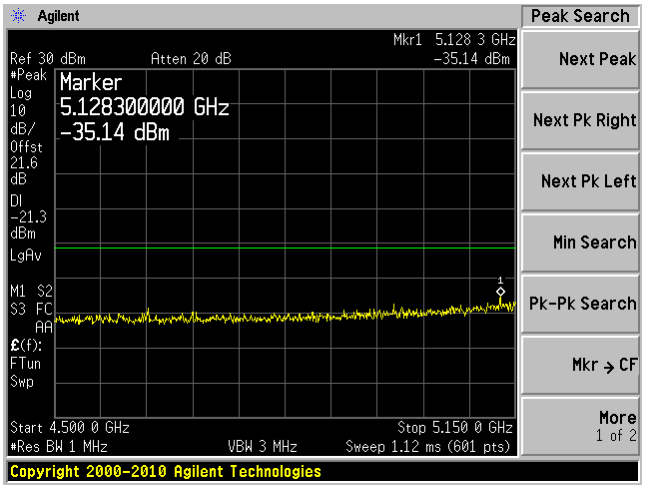
Chain 2, Plot: 30 MHz – 6 GHz



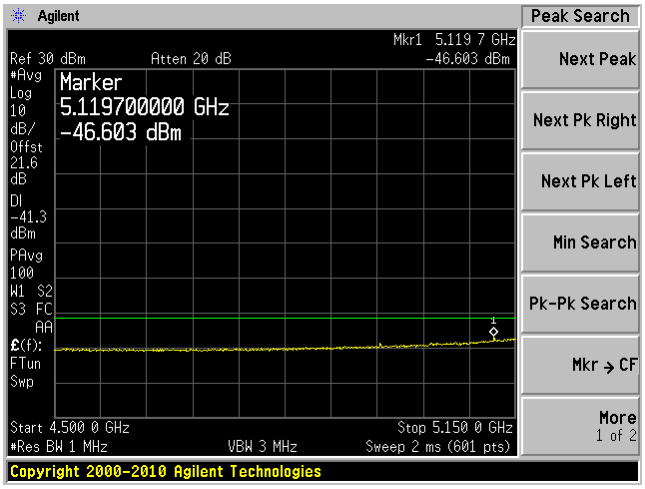
Chain 2, Plot: 6 GHz – 44 GHz



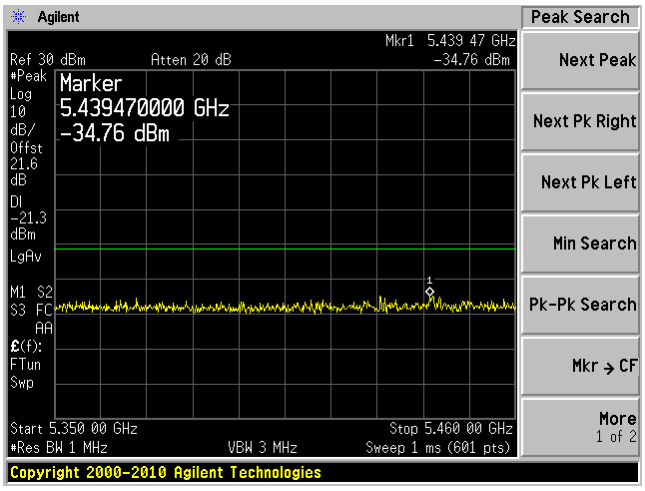
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict Band) Peak



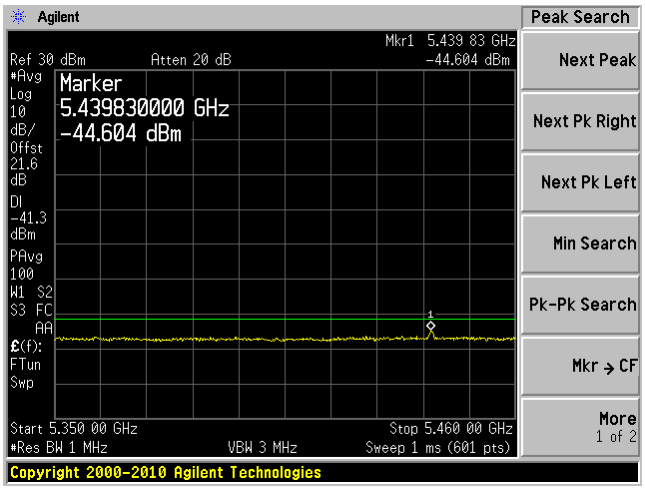
Chain 2, Plot: 4.5 GHz – 5.15 GHz (restrict band) Ave



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict Band)
Peak



Chain 2, Plot: 5.35 GHz – 5.46 GHz (restrict band)
Ave



8 FCC §15.205, §15.209, §15.247(d) & IC RSS-210 §A8.5 – Spurious Radiated Emissions

8.1 Applicable Standard

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

As per FCC §15.209(a) and RSS-210: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

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

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

As per IC RSS-210 A8.5 Out-of-band Emissions, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.2 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 15 Subpart C and IC RSS-210 limits.

The spacing between the peripherals was 3 centimeters.

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

8.3 Test Procedure

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

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

8.4 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 (+23.5 dB) + 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. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

8.5 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	A020106-2	2012-08-15	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2012-06-09	1 year
HP	Pre-amplifier	8449B	3147A00400	2013-02-04	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
A.R.A	Horn Antenna	DRG-118/A	1132	2013-01-29	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2012-09-19	1 year

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

8.6 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	41%
ATM Pressure:	102.1kPa

The testing was performed by Ning Ma on 2013-05-08 at 5 meter 3 chamber.

8.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C and IC RSS-210 standard's radiated emissions limits, and had the worst margin of:

30 MHz – 40 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-0.48	125.0015	V	30 MHz – 40 GHz

Note: termination method was used

Please refer to the following table and plots for specific test result details

8.8 Radiated Emissions Test Data and Plots

1). 30 MHz – 1 GHz, Measured at 3 meters

Quasi-Peak Measurements

802.11a mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
874.9955	36.4	159	V	139	46	-9.6
125.0015	43.02	107	V	52	43.5	-0.48
625.015	43.46	124	H	154	46	-2.54
249.999	39.09	112	H	136	46	-6.91

802.11n HT20 mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
874.9955	36.79	159	V	139	46	-9.21
125.0015	42.08	107	V	52	43.5	-1.42
625.015	43.91	124	H	154	46	-2.09
249.999	40.02	112	H	136	46	-5.98

802.11n HT40 mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
874.9955	37.051	159	V	139	46	-8.949
125.0015	42.82	107	V	52	43.5	-0.68
625.015	44.03	124	H	154	46	-1.97
249.999	39.88	112	H	136	46	-6.12

802.11ac 80 mode

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
874.9955	36.11	159	V	139	46	-9.89
125.0015	41.57	107	V	52	43.5	-1.93
625.015	45.07	124	H	154	46	-0.93
249.999	39.51	112	H	136	46	-6.49

Note: Only digital emissions present from 30MHz to 1GHz, therefore only one channel was tested per modulation.

2) 1–40 GHz, Measured at 3 meters,

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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz, measured at 3 meters											
11490	36.04	16	120	V	43.625	7.6	27.54	59.725	74	-14.275	Peak
11490	32.81	245	162	H	41.992	7.6	27.54	54.862	74	-19.138	Peak
11490	21.52	16	120	V	43.625	7.6	27.54	45.205	54	-8.795	Ave
11490	19.21	245	162	H	41.993	7.6	27.54	41.263	54	-12.737	Ave
17235	32.22	0	100	V	44.363	8.63	25.18	60.033	74	-13.967	Peak
17235	32.38	0	100	H	43.875	8.63	25.18	59.705	74	-14.295	Peak
17235	17.16	0	100	V	44.363	8.63	25.18	44.973	54	-9.027	Ave
17235	16.84	0	100	H	43.875	8.63	25.18	44.165	54	-9.835	Ave
5460	29.27	70	128	V	34.343	4.76	0	68.373	74	-5.627	Peak
5460	29.56	114	110	H	34.303	4.76	0	68.623	74	-5.377	Peak
5460	12.92	70	128	V	34.343	4.76	0	52.023	54	-1.977	Ave
5460	12.67	114	110	H	34.303	4.76	0	51.733	54	-2.267	Ave
7250	33.02	0	100	V	37.519	5.49	27.6	48.429	74	-25.571	Peak
7250	33.53	0	100	H	37.633	5.49	27.6	49.053	74	-24.947	Peak
7250	20.33	0	100	V	37.519	5.49	27.6	35.739	54	-18.261	Ave
7250	20.39	0	100	H	37.633	5.49	27.6	35.913	54	-18.087	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel 5785 MHz, measured at 3 meters											
11570	37.45	297	179	V	40.195	7.69	27.38	57.955	74	-16.045	Peak
11570	32.14	80	100	H	40.195	7.69	27.38	52.645	74	-21.355	Peak
11570	22.76	297	179	V	40.195	7.69	27.38	43.265	54	-10.735	Ave
11570	18.57	80	100	H	40.195	7.69	27.38	39.075	54	-14.925	Ave
17355	32.23	0	100	V	46.815	8.66	25.08	62.625	74	-11.375	Peak
17355	32.15	0	100	H	44.908	8.66	25.08	60.638	74	-13.362	Peak
17355	16.71	0	100	V	46.815	8.66	25.08	47.105	54	-6.895	Ave
17355	16.43	0	100	H	44.908	8.66	25.08	44.918	54	-9.082	Ave
5460	27.29	86	100	V	34.343	4.76	0	66.393	74	-7.607	Peak
5460	29.73	114	122	H	34.303	4.76	0	68.793	74	-5.207	Peak
5460	12.5	86	100	V	34.343	4.76	0	51.603	54	-2.397	Ave
5460	13.1	114	122	H	34.303	4.76	0	52.163	54	-1.837	Ave
7250	33.46	0	100	V	37.519	5.49	27.6	48.869	74	-25.131	Peak
7250	32.87	0	100	H	37.633	5.49	27.6	48.393	74	-25.607	Peak
7250	17.68	0	100	V	37.519	5.49	27.6	33.089	54	-20.911	Ave
7250	17.69	0	100	H	37.633	5.49	27.6	33.213	54	-20.787	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5825 MHz, measured at 3 meters											
11650	36.32	186	170	V	40.106	7.78	27.02	57.186	74	-16.814	Peak
11650	31.93	0	100	H	40.106	7.78	27.02	52.796	74	-21.204	Peak
11650	21.72	186	170	V	40.106	7.78	27.02	42.586	54	-11.414	Ave
11650	16.63	0	100	H	40.106	7.78	27.02	37.496	54	-16.504	Ave
17475	35.6	106	100	V	47.044	8.74	25.8	65.584	74	-8.416	Peak
17475	37.24	85	145	H	47.044	8.74	25.8	67.224	74	-6.776	Peak
17475	19.64	106	100	V	47.044	8.74	25.8	49.624	54	-4.376	Ave
17475	22.49	85	145	H	47.044	8.74	25.8	52.474	54	-1.526	Ave
5460	27.35	74	112	V	34.343	4.76	0	66.453	74	-7.547	Peak
5460	28.69	112	108	H	34.303	4.76	0	67.753	74	-6.247	Peak
5460	12.16	74	112	V	34.343	4.76	0	51.263	54	-2.737	Ave
5460	13	112	108	H	34.303	4.76	0	52.063	54	-1.937	Ave
7250	32.8	0	100	V	37.519	5.49	27.6	48.209	74	-25.791	Peak
7250	31.42	0	100	H	37.633	5.49	27.6	46.943	74	-27.057	Peak
7250	17.29	0	100	V	37.519	5.49	27.6	32.699	54	-21.301	Ave
7250	17.2	0	100	H	37.633	5.49	27.6	32.723	54	-21.277	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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz, measured at 3 meters											
11490	35.99	297	166	V	43.625	7.6	27.54	59.675	74	-14.325	Peak
11490	31.6	0	100	H	41.992	7.6	27.54	53.652	74	-20.348	Peak
11490	21.43	297	100	V	43.625	7.6	27.54	45.115	54	-8.885	Ave
11490	17.98	0	100	H	41.993	7.6	27.54	40.033	54	-13.967	Ave
17235	32.67	0	100	V	44.363	8.63	25.18	60.483	74	-13.517	Peak
17235	31.98	0	100	H	43.875	8.63	25.18	59.305	74	-14.695	Peak
17235	17.04	0	100	V	44.363	8.63	25.18	44.853	54	-9.147	Ave
17235	17.12	0	100	H	43.875	8.63	25.18	44.445	54	-9.555	Ave
5460	27.68	0	100	V	34.343	4.76	0	66.783	74	-7.217	Peak
5460	26.91	0	100	H	34.303	4.76	0	65.973	74	-8.027	Peak
5460	12.36	0	100	V	34.343	4.76	0	51.463	54	-2.537	Ave
5460	12.96	0	100	H	34.303	4.76	0	52.023	54	-1.977	Ave
7250	32.59	0	100	V	37.519	5.49	27.6	47.999	74	-26.001	Peak
7250	33.49	0	100	H	37.633	5.49	27.6	49.013	74	-24.987	Peak
7250	19.88	0	100	V	37.519	5.49	27.6	35.289	54	-18.711	Ave
7250	20.67	0	100	H	37.633	5.49	27.6	36.193	54	-17.807	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel 5785 MHz, measured at 3 meters											
11570	37.07	292	177	V	40.195	7.69	27.38	57.575	74	-16.425	Peak
11570	31.87	0	100	H	40.195	7.69	27.38	52.375	74	-21.625	Peak
11570	21.14	292	177	V	40.195	7.69	27.38	41.645	54	-12.355	Ave
11570	17.01	0	100	H	40.195	7.69	27.38	37.515	54	-16.485	Ave
17355	32.07	0	100	V	46.815	8.66	25.08	62.465	74	-11.535	Peak
17355	31.79	0	100	H	44.908	8.66	25.08	60.278	74	-13.722	Peak
17355	17.03	0	100	V	46.815	8.66	25.08	47.425	54	-6.575	Ave
17355	16.75	0	100	H	44.908	8.66	25.08	45.238	54	-8.762	Ave
5460	28.01	0	100	V	34.343	4.76	0	67.113	74	-6.887	Peak
5460	27.95	0	100	H	34.303	4.76	0	67.013	74	-6.987	Peak
5460	12.96	0	100	V	34.343	4.76	0	52.063	54	-1.937	Ave
5460	12.76	0	100	H	34.303	4.76	0	51.823	54	-2.177	Ave
7250	32.19	0	100	V	37.519	5.49	27.6	47.599	74	-26.401	Peak
7250	32.91	0	100	H	37.633	5.49	27.6	48.433	74	-25.567	Peak
7250	17.06	0	100	V	37.519	5.49	27.6	32.469	54	-21.531	Ave
7250	17.52	0	100	H	37.633	5.49	27.6	33.043	54	-20.957	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5825 MHz, measured at 3 meters											
11650	35.85	20	182	V	40.106	7.78	27.02	56.716	74	-17.284	Peak
11650	31.61	0	100	H	40.106	7.78	27.02	52.476	74	-21.524	Peak
11650	21.3	20	182	V	40.106	7.78	27.02	42.166	54	-11.834	Ave
11650	16.76	0	100	H	40.106	7.78	27.02	37.626	54	-16.374	Ave
17475	33.13	182	100	V	47.044	8.74	25.8	63.114	74	-10.886	Peak
17475	36.96	85	144	H	47.044	8.74	25.8	66.944	74	-7.056	Peak
17475	16.85	182	100	V	47.044	8.74	25.8	46.834	54	-7.166	Ave
17475	22.21	85	144	H	47.044	8.74	25.8	52.194	54	-1.806	Ave
5460	25.19	0	100	V	34.343	4.76	0	64.293	74	-9.707	Peak
5460	26.22	0	100	H	34.303	4.76	0	65.283	74	-8.717	Peak
5460	12.85	0	100	V	34.343	4.76	0	51.953	54	-2.047	Ave
5460	12.31	0	100	H	34.303	4.76	0	51.373	54	-2.627	Ave
7250	33.19	0	100	V	37.519	5.49	27.6	48.599	74	-25.401	Peak
7250	32.06	0	100	H	37.633	5.49	27.6	47.583	74	-26.417	Peak
7250	17.69	0	100	V	37.519	5.49	27.6	33.099	54	-20.901	Ave
7250	17.11	0	100	H	37.633	5.49	27.6	32.633	54	-21.367	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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5755 MHz, measured at 3 meters											
11510	32.38	10	100	V	40.192	7.6	26.95	53.222	74	-20.778	Peak
11510	31.42	0	100	H	40.192	7.6	26.95	52.262	74	-21.738	Peak
11510	17.54	10	100	V	40.192	7.6	26.95	38.382	54	-15.618	Ave
11510	17.63	0	100	H	40.192	7.6	26.95	38.472	54	-15.528	Ave
17265	31.32	0	100	V	44.363	8.63	25.94	58.373	74	-15.627	Peak
17265	32.19	0	100	H	44.363	8.63	25.94	59.243	74	-14.757	Peak
17265	16.87	0	100	V	44.363	8.63	25.94	43.923	54	-10.077	Ave
17265	17.03	0	100	H	44.363	8.63	25.94	44.083	54	-9.917	Ave
5460	21.63	0	100	V	34.343	4.76	0	60.733	74	-13.267	Peak
5460	21.89	0	100	H	34.303	4.76	0	60.953	74	-13.047	Peak
5460	12.76	0	100	V	34.343	4.76	0	51.863	54	-2.137	Ave
5460	12.26	0	100	H	34.303	4.76	0	51.323	54	-2.677	Ave
7250	33.19	0	100	V	37.519	5.49	27.6	48.599	74	-25.401	Peak
7250	34.52	0	100	H	37.633	5.49	27.6	50.043	74	-23.957	Peak
7250	18.26	0	100	V	37.519	5.49	27.6	33.669	54	-20.331	Ave
7250	17.03	0	100	H	37.633	5.49	27.6	32.553	54	-21.447	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 5795 MHz, measured at 3 meters											
11590	32.33	0	100	V	40.106	7.69	26.99	53.136	74	-20.864	Peak
11590	31.55	0	100	H	40.106	7.69	26.99	52.356	74	-21.644	Peak
11590	17.21	0	100	V	40.106	7.69	26.99	38.016	54	-15.984	Ave
11590	17.09	0	100	H	40.106	7.69	26.99	37.896	54	-16.104	Ave
17385	31.44	0	100	V	46.815	8.66	25.86	61.055	74	-12.945	Peak
17385	32.09	0	100	H	46.815	8.66	25.86	61.705	74	-12.295	Peak
17385	16.82	0	100	V	46.815	8.66	25.86	46.435	54	-7.565	Ave
17385	16.93	0	100	H	46.815	8.66	25.86	46.545	54	-7.455	Ave
5460	21.39	0	100	V	34.343	4.76	0	60.493	74	-13.507	Peak
5460	22.06	0	100	H	34.303	4.76	0	61.123	74	-12.877	Peak
5460	12.55	0	100	V	34.343	4.76	0	51.653	54	-2.347	Ave
5460	12.63	0	100	H	34.303	4.76	0	51.693	54	-2.307	Ave
7250	31.08	0	100	V	37.519	5.49	27.6	46.489	74	-27.511	Peak
7250	32.57	0	100	H	37.633	5.49	27.6	48.093	74	-25.907	Peak
7250	19.08	0	100	V	37.519	5.49	27.6	34.489	54	-19.511	Ave
7250	18	0	100	H	37.633	5.49	27.6	33.523	54	-20.477	Ave

802.11 ac 80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Channel 5775 MHz, measured at 3 meters											
11550	31.81	0	100	V	40.195	7.69	27.38	52.315	74	-21.685	Peak
11550	32.4	0	100	H	40.195	7.69	27.38	52.905	74	-21.095	Peak
11550	16.35	0	100	V	40.195	7.69	27.38	36.855	54	-17.145	Ave
11550	16.89	0	100	H	40.195	7.69	27.38	37.395	54	-16.605	Ave
17325	32.02	0	100	V	46.815	8.66	25.08	62.415	74	-11.585	Peak
17325	31.26	0	100	H	44.908	8.66	25.08	59.748	74	-14.252	Peak
17325	16.92	0	100	V	46.815	8.66	25.08	47.315	54	-6.685	Ave
17325	17.06	0	100	H	44.908	8.66	25.08	45.548	54	-8.452	Ave
5460	22.65	0	100	V	34.343	4.76	0	61.753	74	-12.247	Peak
5460	22.06	0	100	H	34.303	4.76	0	61.123	74	-12.877	Peak
5460	12.66	0	100	V	34.343	4.76	0	51.763	54	-2.237	Ave
5460	12.02	0	100	H	34.303	4.76	0	51.083	54	-2.917	Ave
7250	33.06	0	100	V	37.519	5.49	27.6	48.469	74	-25.531	Peak
7250	31.79	0	100	H	37.633	5.49	27.6	47.313	74	-26.687	Peak
7250	18.62	0	100	V	37.519	5.49	27.6	34.029	54	-19.971	Ave
7250	17.93	0	100	H	37.633	5.49	27.6	33.453	54	-20.547	Ave

9 FCC§15.247(a) (2) & IC RSS-210 §A8.2 – 6 dB & 99% Emission Bandwidth

9.1 Applicable Standards

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

9.2 Measurement Procedure

FCC 15.247

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 6 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

FCC 15.407

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.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2012-09-29	1 year

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

9.4 Test Environmental Conditions

Temperature:	21°C
Relative Humidity:	43%
ATM Pressure:	102.1kPa

The testing was performed by Ning Ma on 2013-04-15 at RF site.

9.5 Test Results

802.11a mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)			99% Emission Bandwidth (MHz)			Limit (MHz)	Results
		Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2		
Low	5745	15.726	15.719	15.993	16.9706	18.1149	17.1230	> 0.5	Compliant
Middle	5785	15.935	16.125	16.345	17.1272	18.0784	16.7798	> 0.5	Compliant
High	5825	16.034	15.993	16.360	16.8063	17.2893	16.6938	> 0.5	Compliant

802.11n HT20 mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)			99% Emission Bandwidth (MHz)			Limit (MHz)	Results
		Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2		
Low	5745	15.966	16.347	17.033	17.8626	18.6694	17.8620	> 0.5	Compliant
Middle	5785	16.304	16.929	17.582	18.0906	18.1530	17.9103	> 0.5	Compliant
High	5825	16.334	16.321	17.337	17.8418	18.4053	17.7373	> 0.5	Compliant

802.11n HT40 mode:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)			99% Emission Bandwidth (MHz)			Limit (MHz)	Results
		Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2		
Low	5755	35.795	35.447	35.809	36.3130	36.5369	36.3095	> 0.5	Compliant
High	5795	34.246	35.780	35.723	36.2932	36.4804	36.3005	> 0.5	Compliant

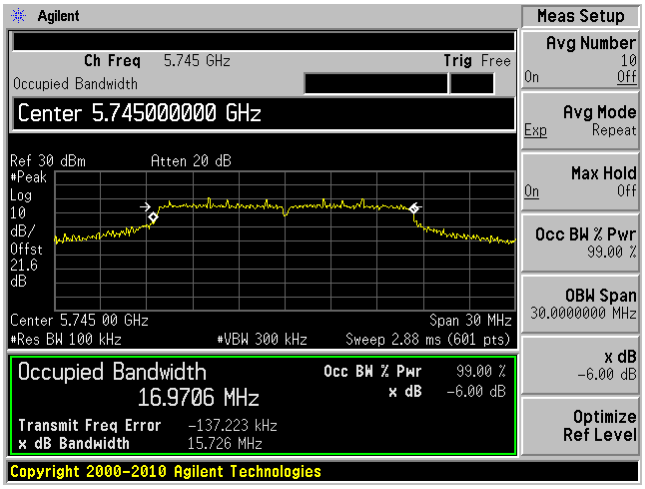
802.11ac 80 mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)			99% Emission Bandwidth (MHz)			Limit (MHz)	Results
		Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2		
/	5775	69.384	75.118	72.520	75.8077	75.8570	75.8622	> 0.5	Compliant

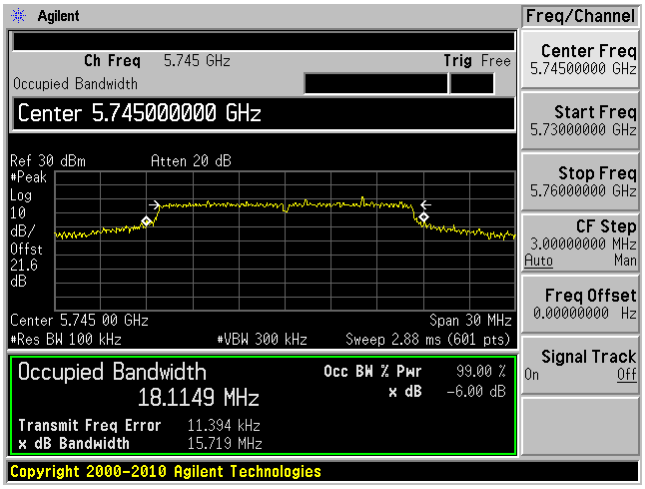
Please refer to the following plots for detailed test results

802.11a mode

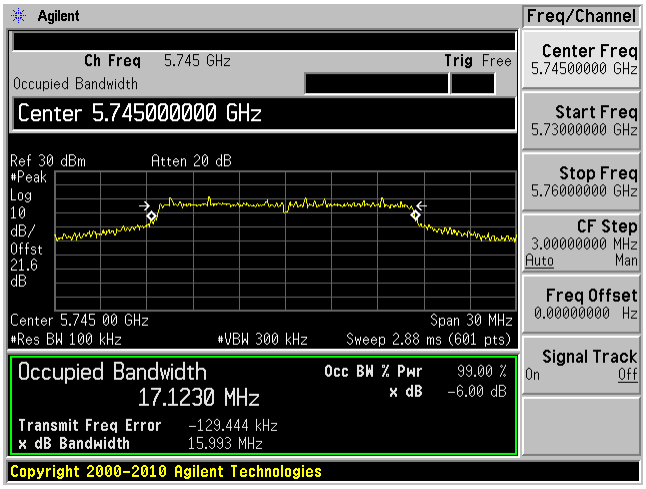
Low channel: Chain 0



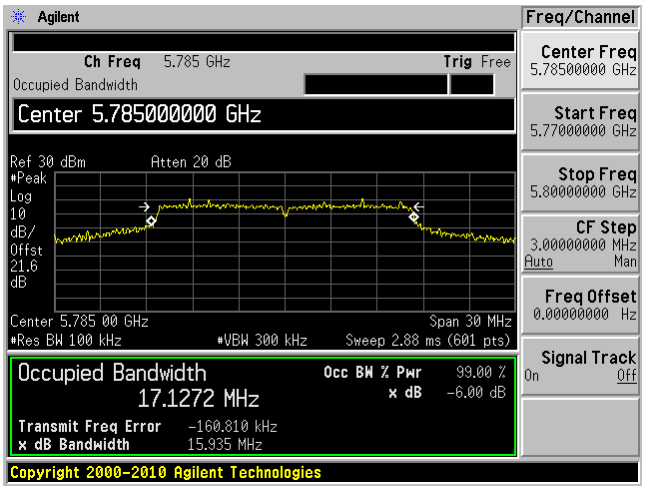
Low channel: Chain 1



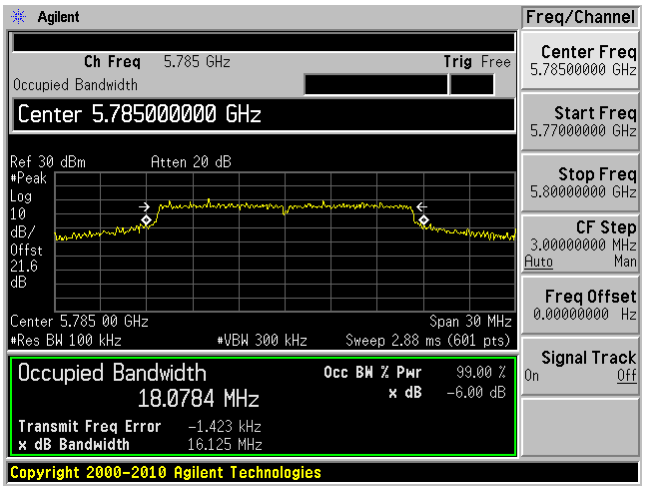
Low Channel: Chain 2



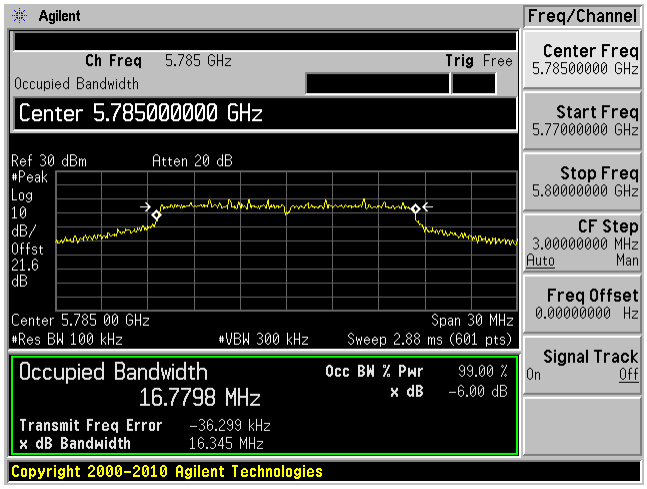
Middle channel: Chain 0



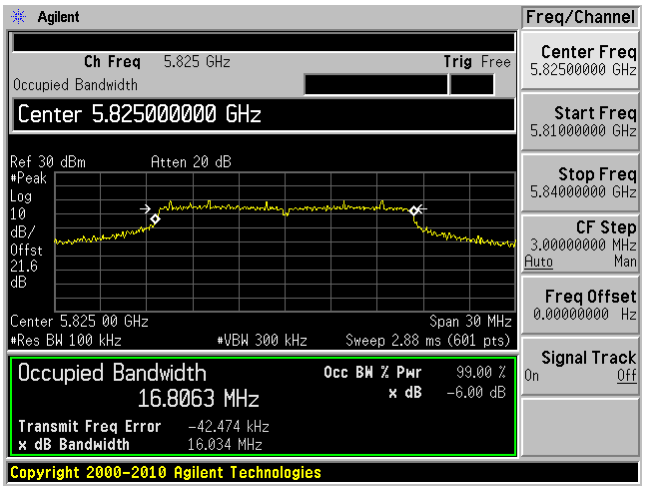
Middle channel: Chain 1



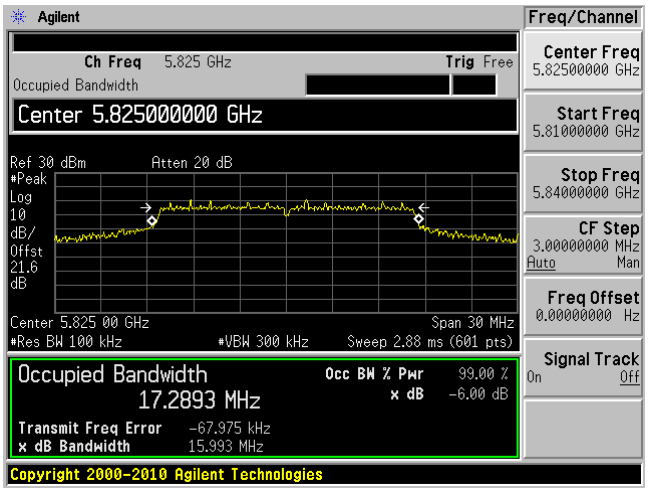
Middle Channel: Chain 2



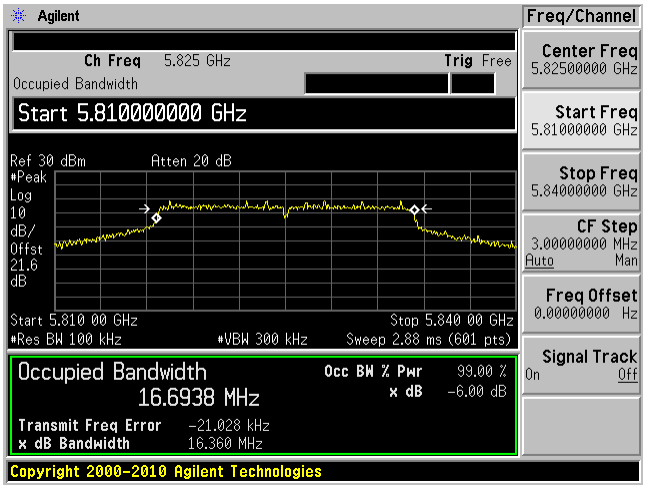
High channel: Chain 0



High channel: Chain 1

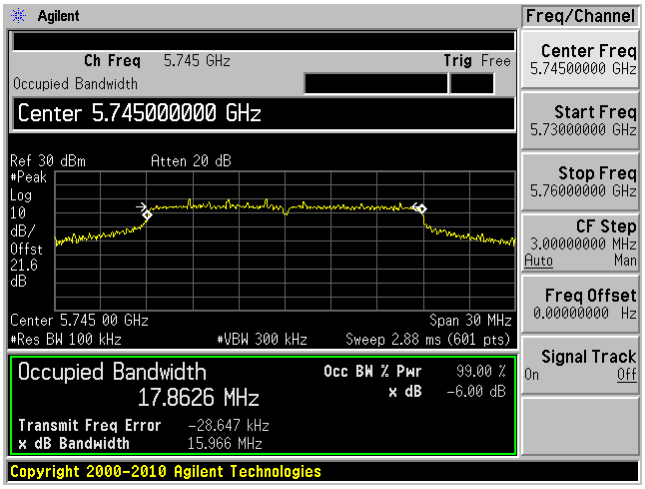


High Channel: Chain 2

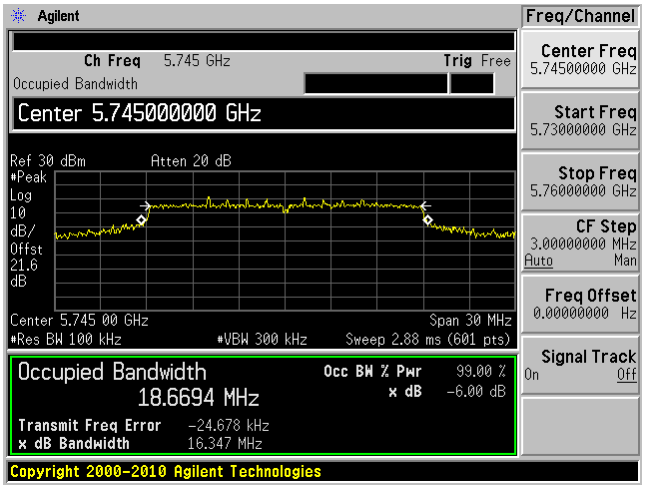


802.11n HT20 mode

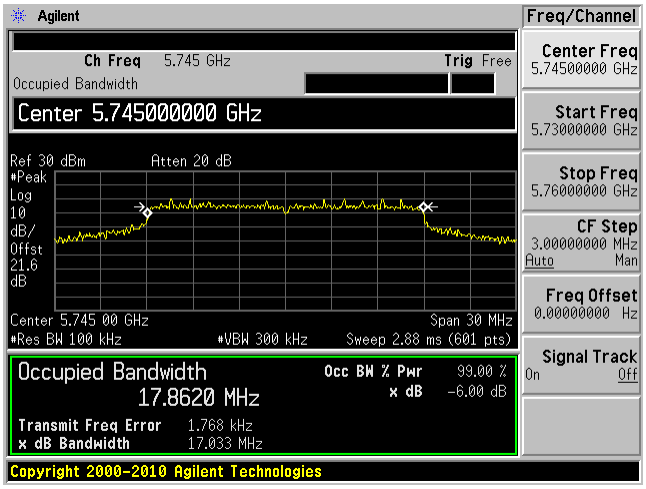
Low channel: Chain 0



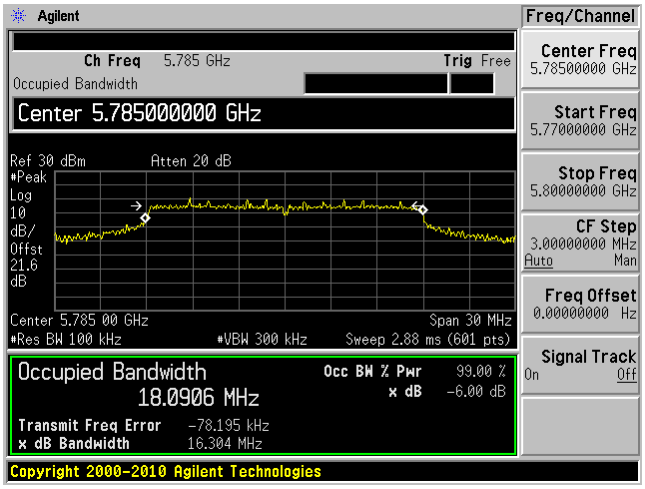
Low channel: Chain 1



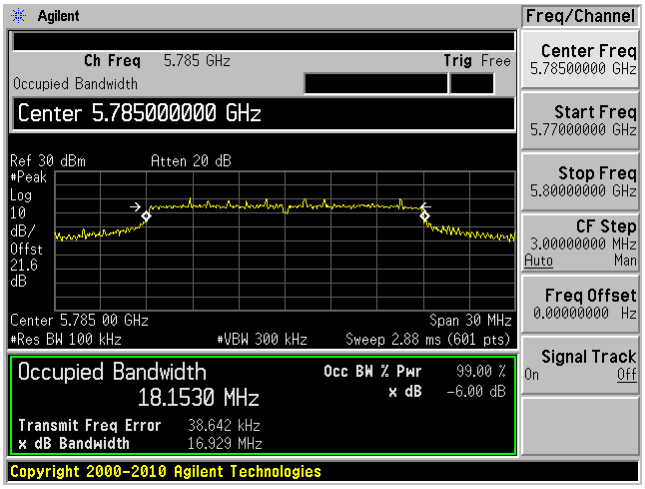
Low Channel: Chain 2



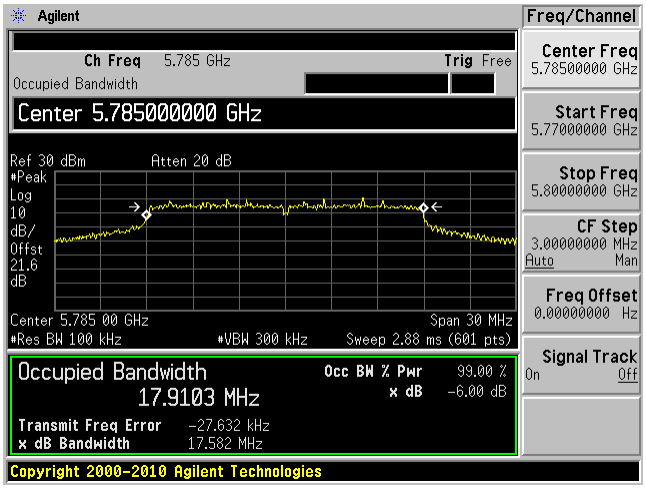
Middle channel: Chain 0



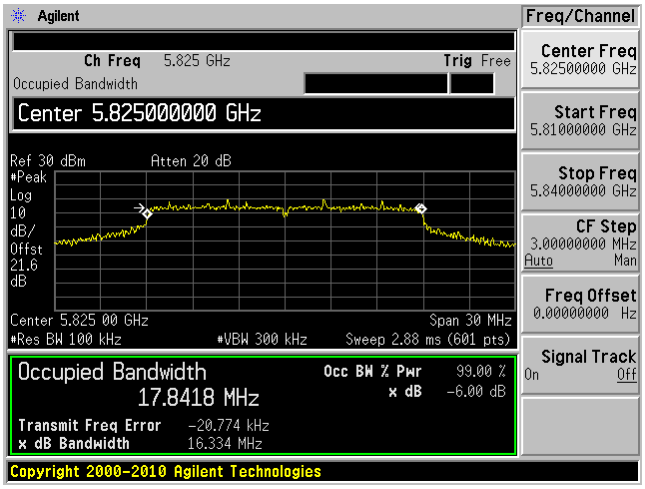
Middle channel: Chain 1



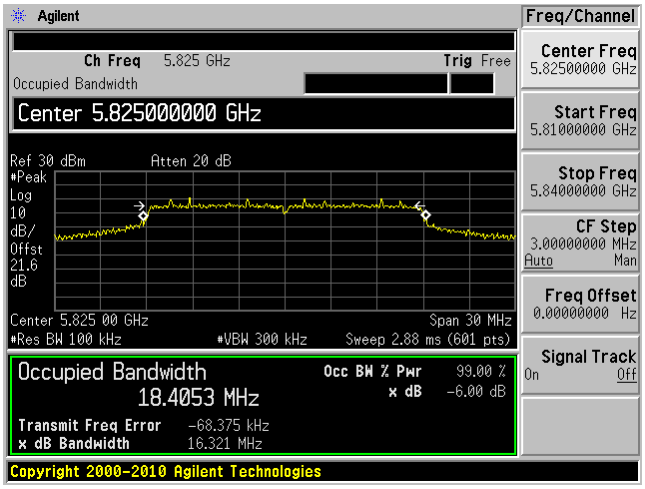
Middle Channel: Chain 2



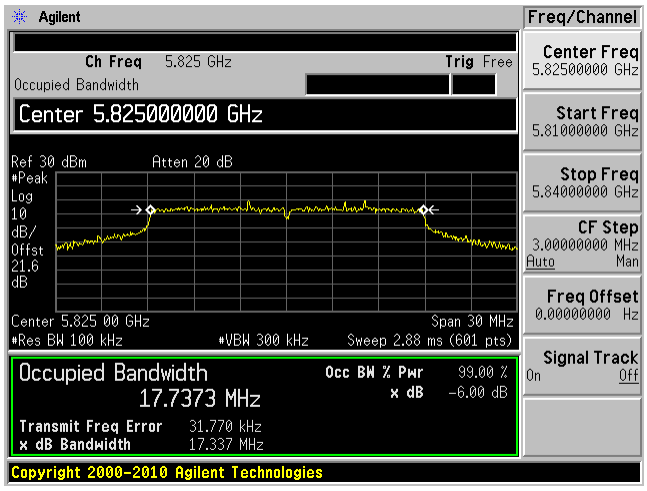
High channel: Chain 0



High channel: Chain 1

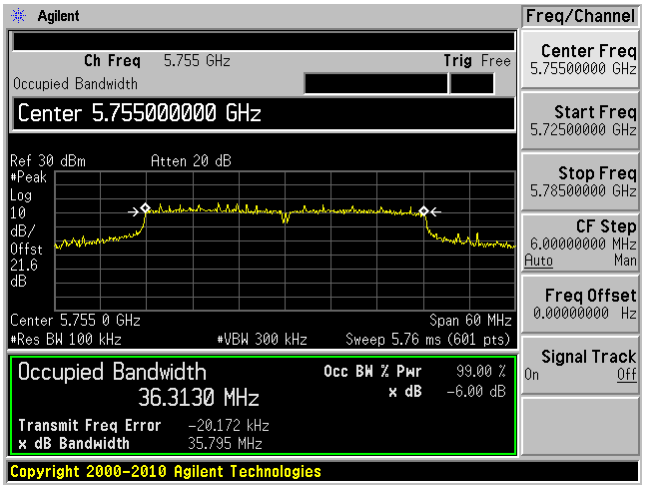


High Channel: Chain 2

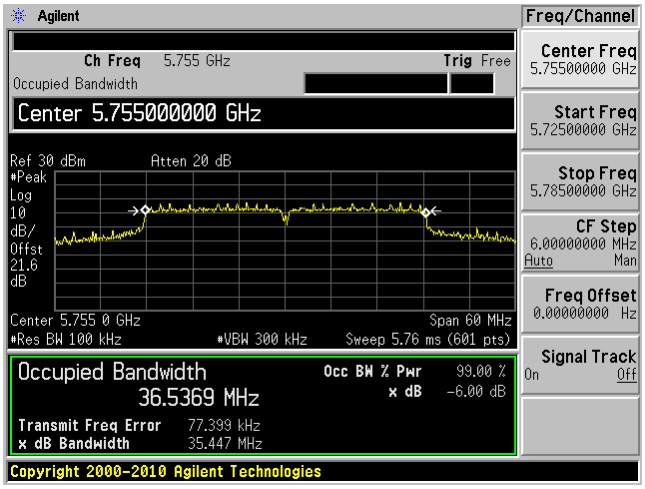


802.11n HT40 mode

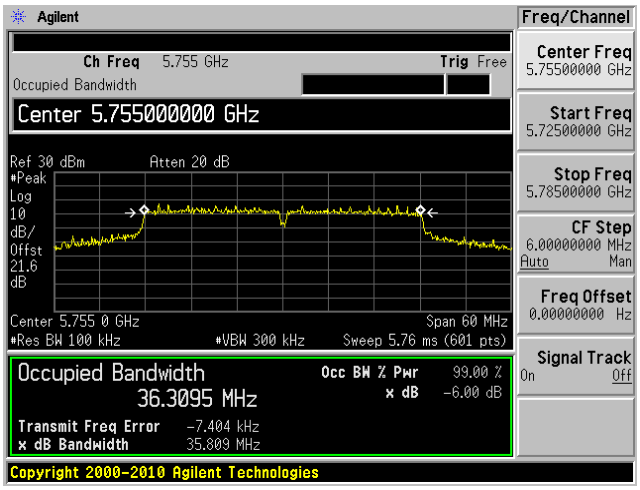
Low channel: Chain 0



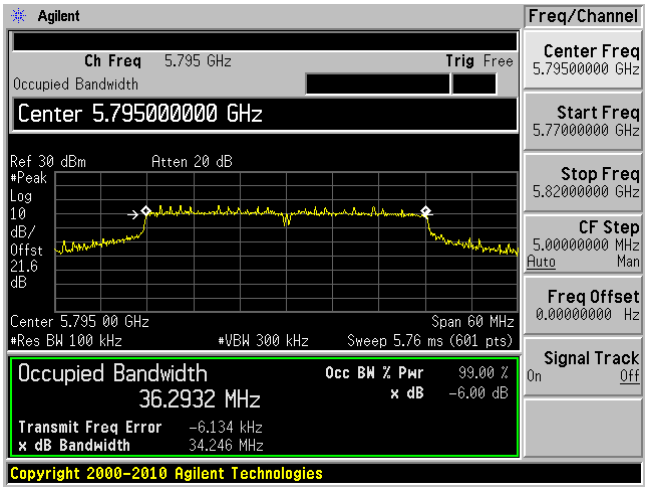
Low channel: Chain 1



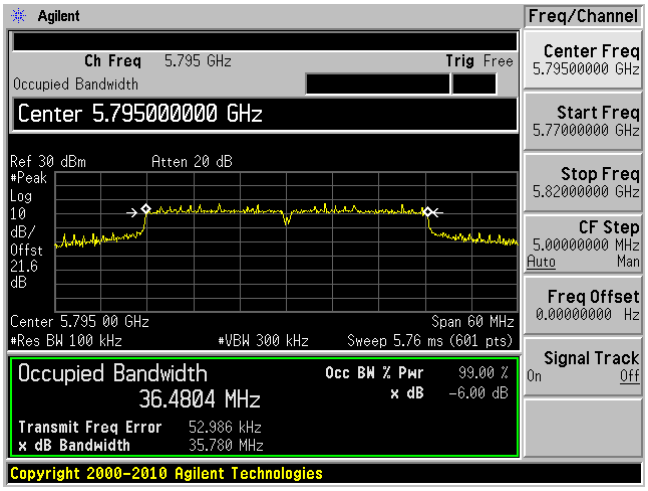
Low Channel: Chain 2



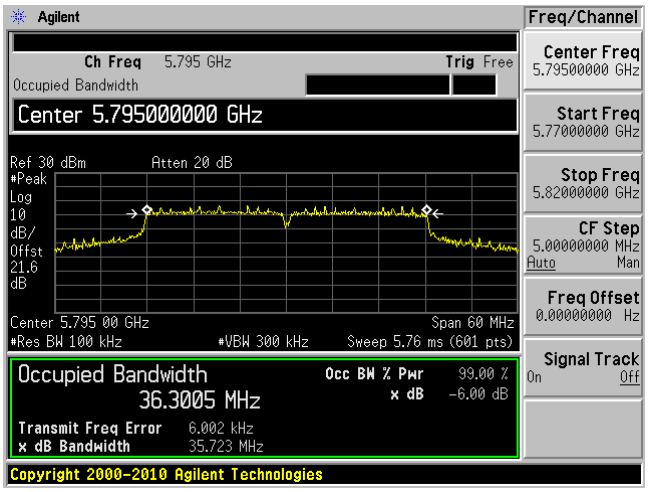
High channel: Chain 0



High channel: Chain 1

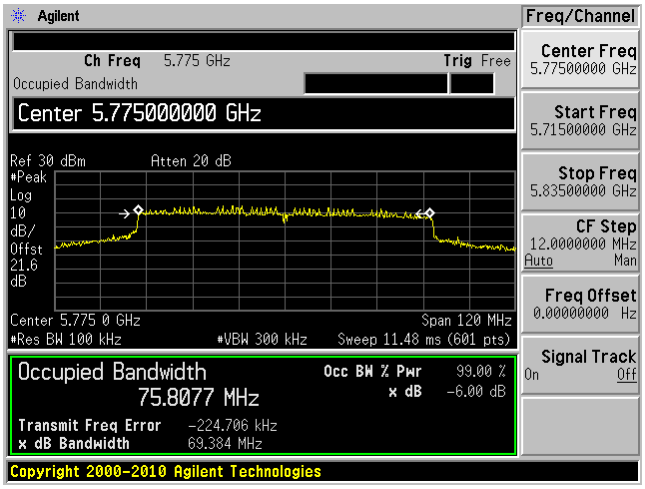


High Channel: Chain 2

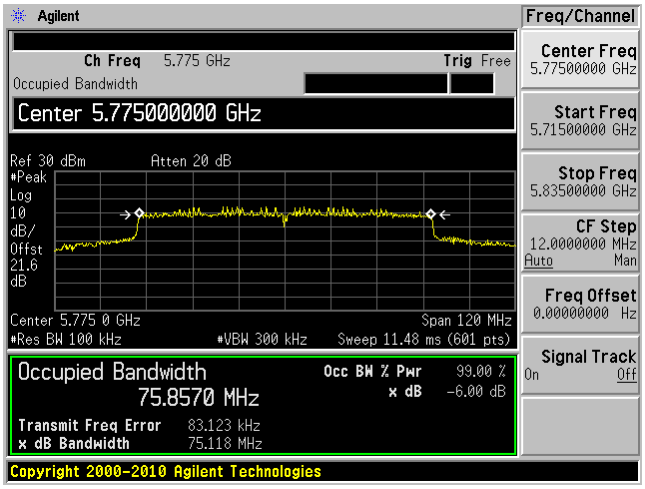


802.11ac 80 mode

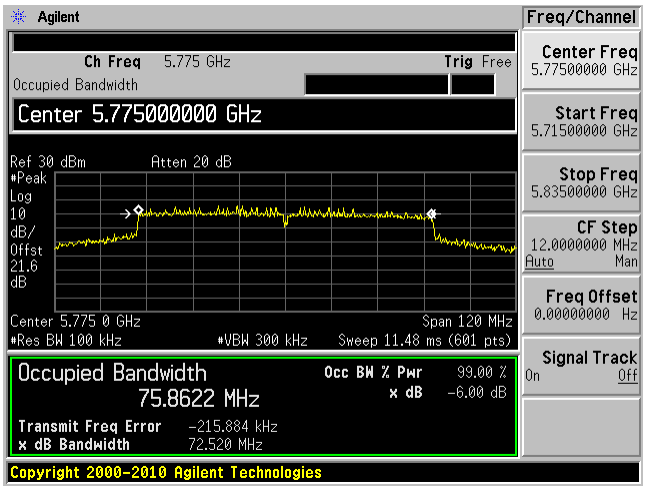
Chain 0



Chain 1



Chain 2



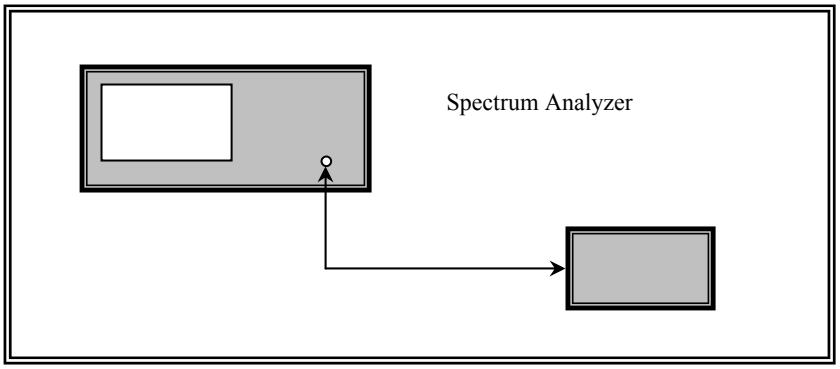
10 FCC §15.247(b) & IC RSS-210 §A8.4 – Peak Output Power Measurement

10.1 Applicable Standard

According to FCC §15.247(b) and IC RSS-210 §A8.4 (4) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

10.2 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.



10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2012-09-29	1 year

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

10.4 Test Environmental Conditions

Temperature:	21°C
Relative Humidity:	43%
ATM Pressure:	102.1kPa

The testing was performed by Ning Ma on 2013-04-15 at RF site.

10.5 Test Results

802.11a:

Frequency (MHz)	Conducted Output Power (dBm)			Total Power (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5745	20.33	20.21	20.71	25.19	30	-4.81	24
5785	20.48	21.46	20.66	25.66	30	-4.34	24
5825	20.17	20.73	19.84	25.03	30	-4.97	24

802.11n HT20:

Frequency (MHz)	Conducted Output Power (dBm)			Total Power (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5745	20.13	21.45	21.15	25.72	30	-4.28	24
5785	21.2	20.87	20.08	25.51	30	-4.49	24
5825	19.69	20.45	20.74	25.09	30	-4.91	24

802.11n HT40:

Frequency (MHz)	Conducted Output Power (dBm)			Total Power (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5755	20.1	21.11	20.33	25.31	30	-4.69	24
5795	19.04	20.06	19.58	24.35	30	-5.65	24

802.11ac 80:

Frequency (MHz)	Conducted Output Power (dBm)			Total Power (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5775	19.25	20.35	20.01	24.67	30	-5.33	25

11 FCC §15.247(d) & IC RSS-210 §A8.5 – 100 kHz Bandwidth of Band Edges

11.1 Applicable Standard

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

According to IC Rss-210 §A8.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

11.2 Measurement Procedure

1. Set RBW = 100 KHz.
2. Set VBW ≥ 3 x RBW
3. Perform a band-power intergration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.
4. Detector = RMS.
5. Averaging type = power
6. Sweep time = auto.
7. Perform a trace average of at least 100 traces if the transmission is continuous.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2012-09-29	1 year

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

11.4 Test Environmental Conditions

Temperature:	24°C
Relative Humidity:	40%
ATM Pressure:	101.8kPa

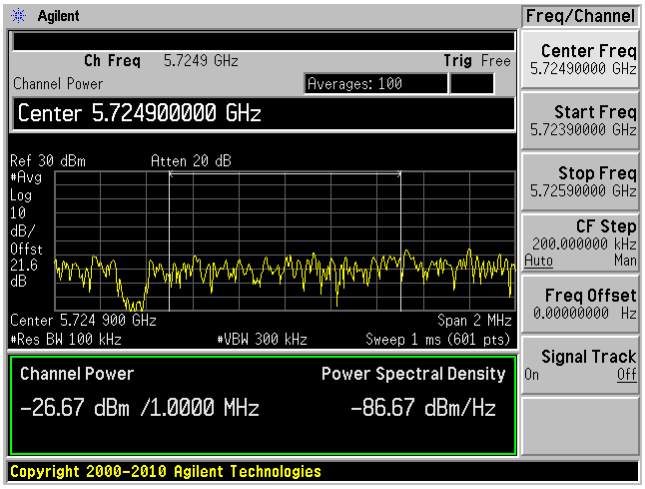
The testing was performed by Ning Ma on 2013-04-16 at RF site.

11.5 Test Results

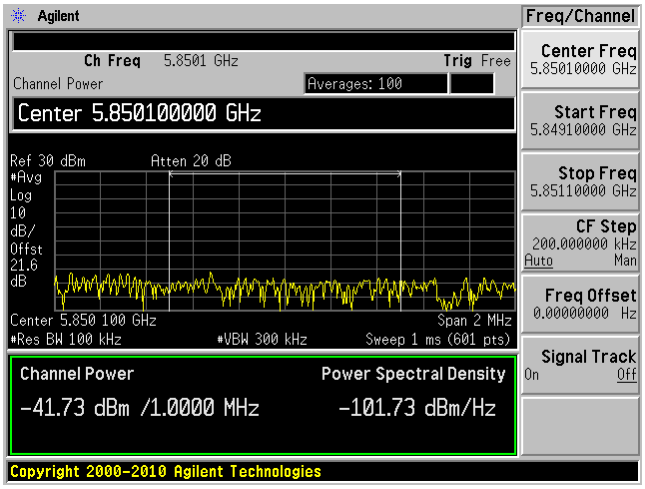
Please refer to following pages for plots of band edge.

802.11a mode

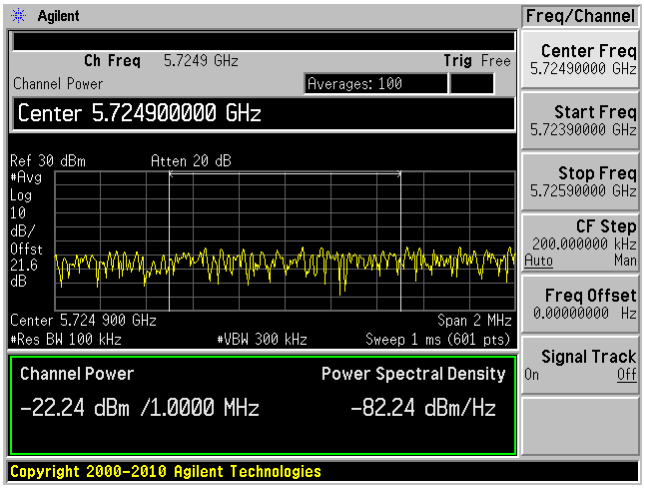
802.11a, Chain 0 Low Band Edge



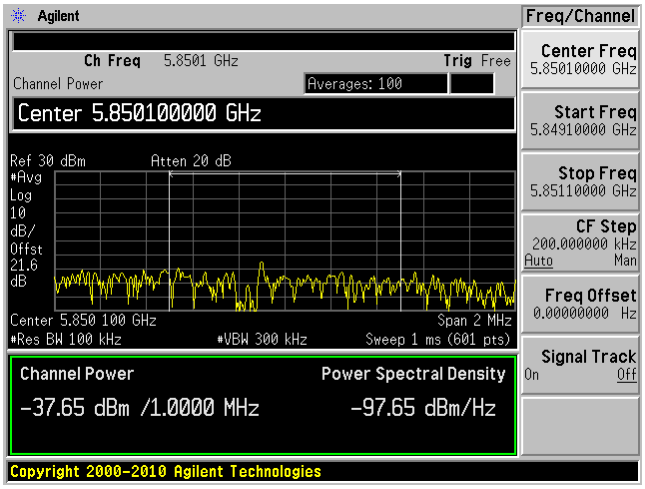
802.11a, Chain 0 High Band Edge



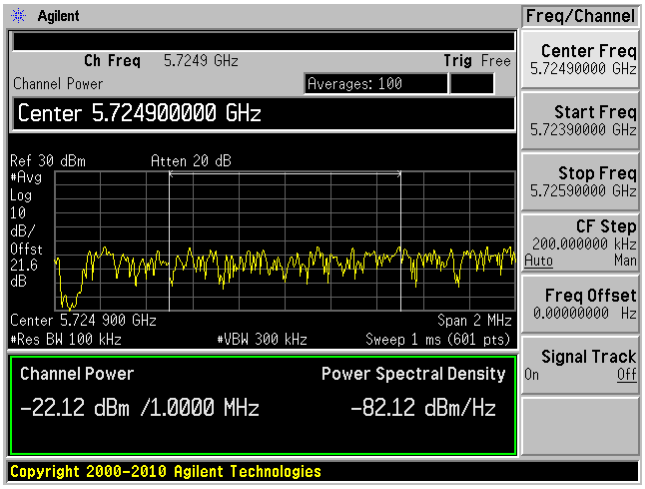
802.11a, Chain 1 Low Band Edge



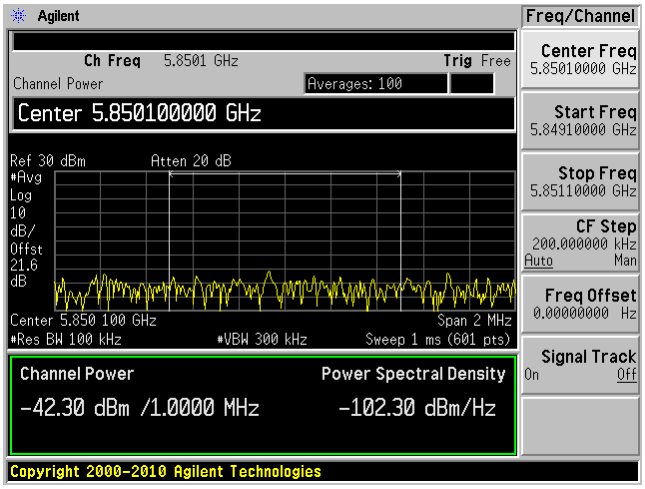
802.11a, Chain 1 High Band Edge



802.11a, Chain 2 Low Band Edge

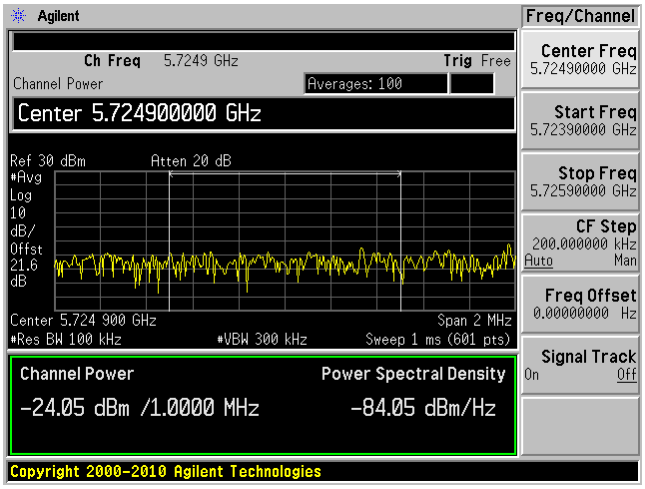


802.11a, Chain 2 High Band Edge

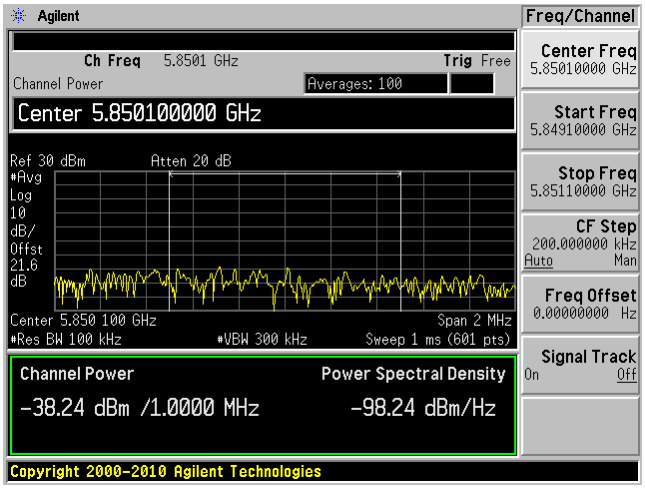


802.11n HT20 mode

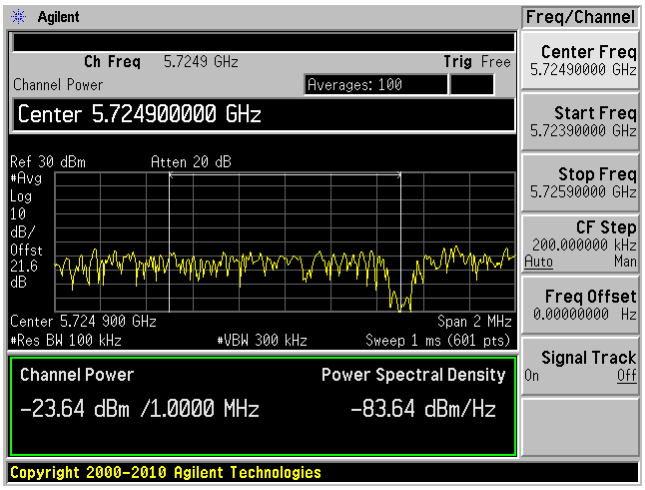
802.11n HT20, Chain 0 Low Band Edge



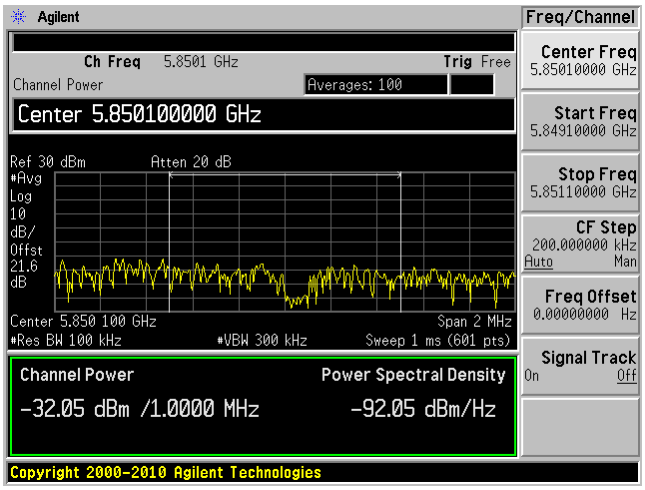
802.11 n HT20, Chain 0 High Band Edge



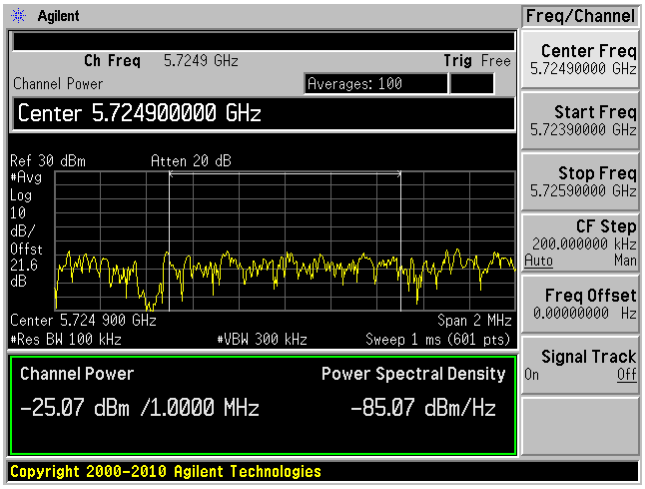
802.11n HT20, Chain 1 Low Band Edge



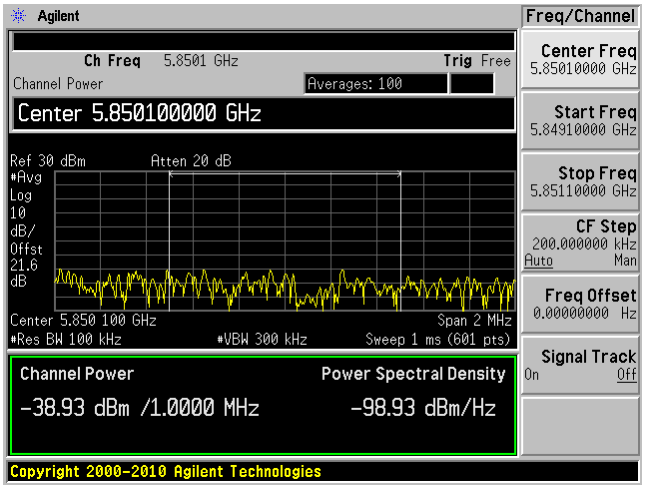
802.11n HT20, Chain 1 High Band Edge



802.11n HT20, Chain 2 Low Band Edge

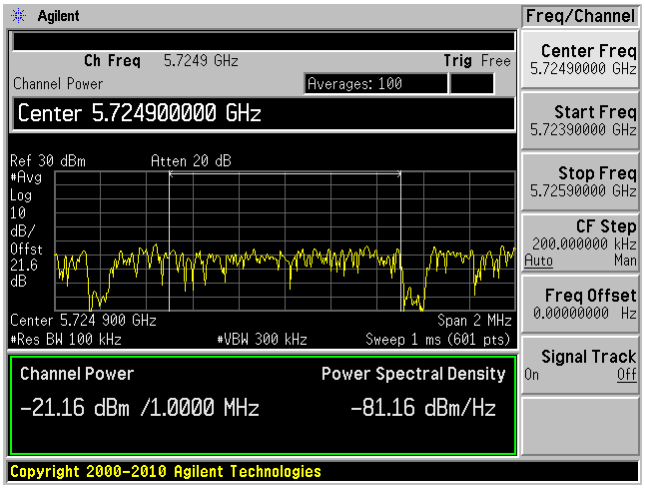


802.11n HT20, Chain 2 High Band Edge

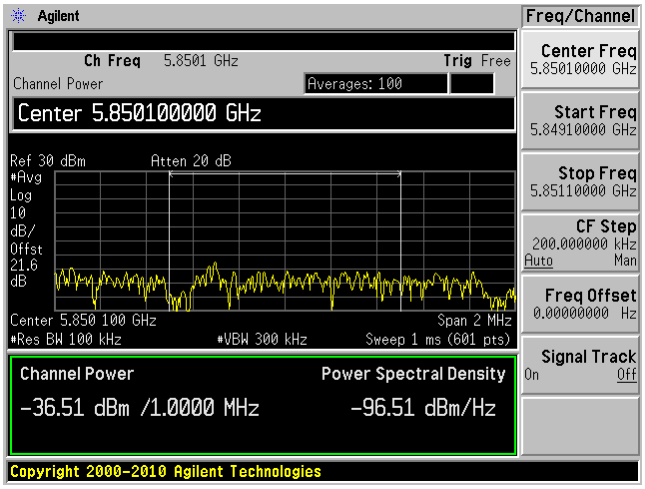


802.11n HT40 mode

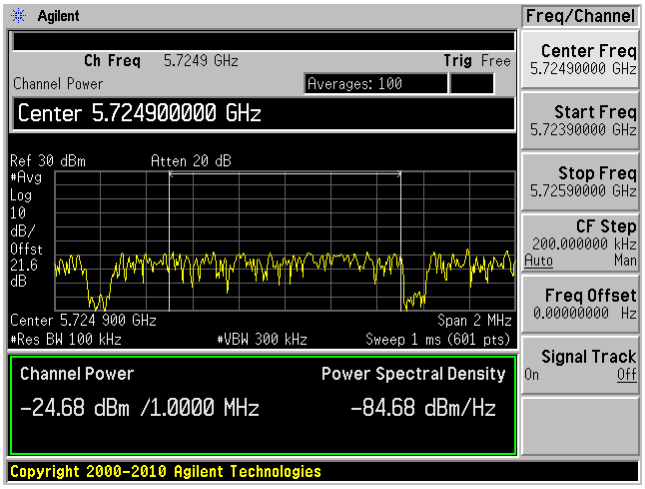
802.1 n HT40, Chain 0 Low Band Edge



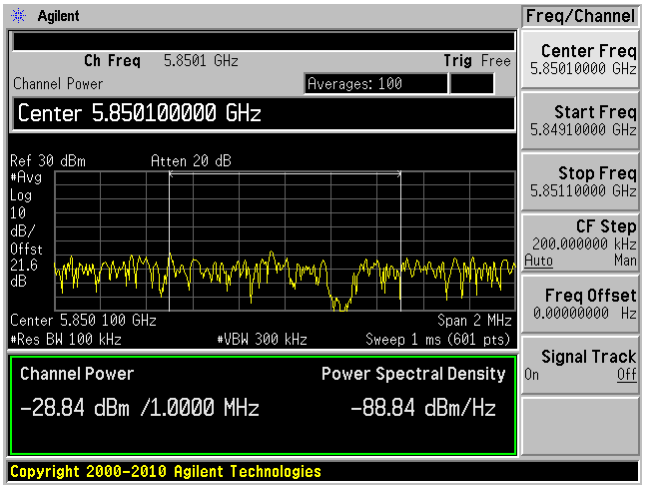
802.11n HT40, Chain 0 High Band Edge



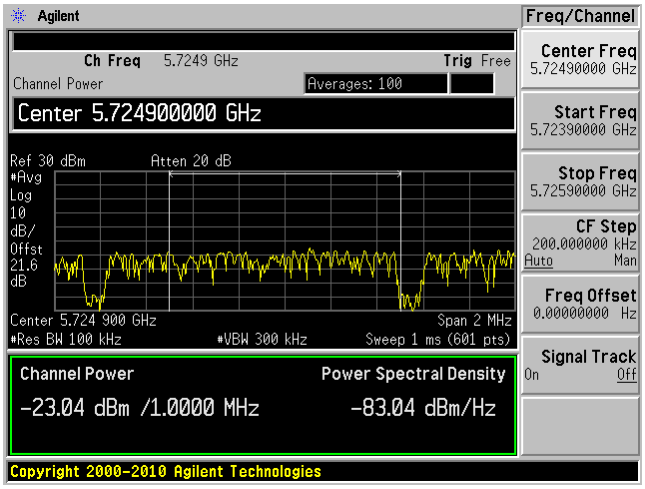
802.11n HT40, Chain 1 Low Band Edge



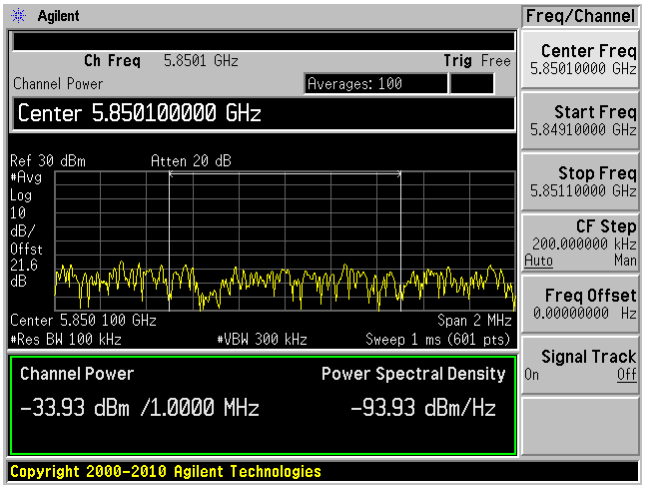
802.11n HT40, Chain 1 High Band Edge



802.11n HT40, Chain 2 Low Band Edge

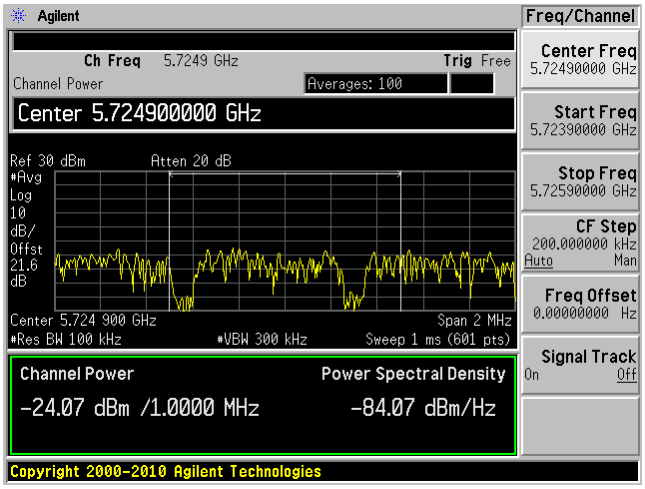


802.11n HT40, Chain 2 High Band Edge

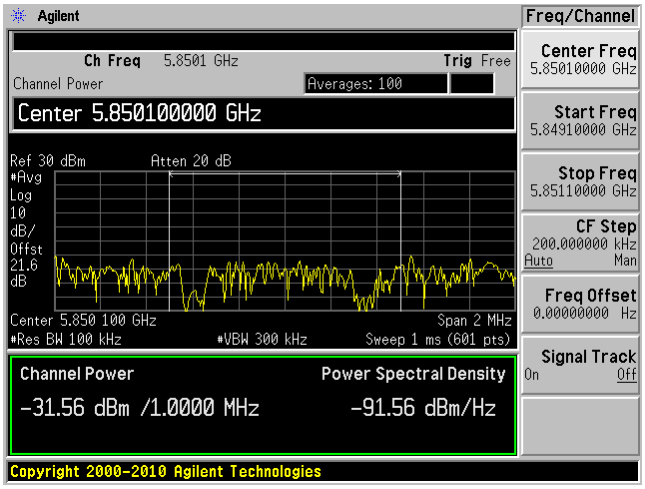


802.11ac 80 MHz mode

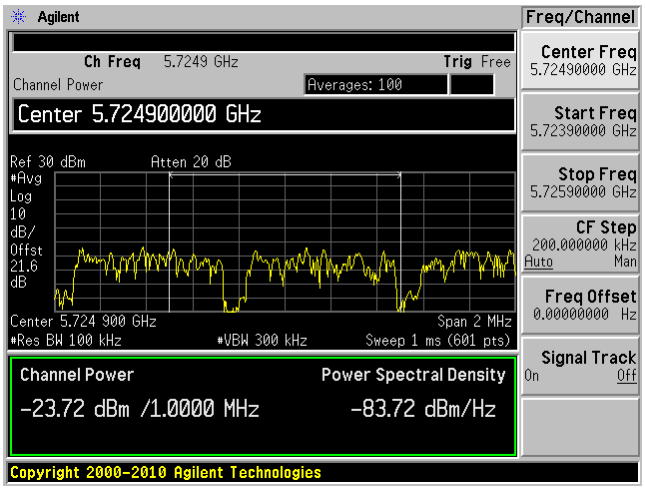
802.11ac 80, Chain 0 Low Band Edge



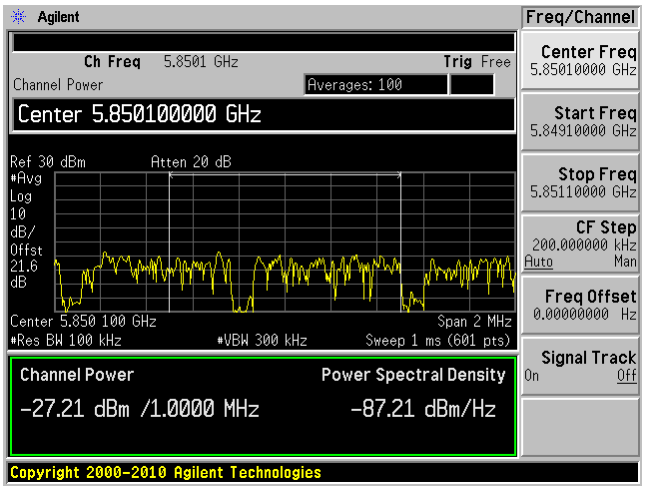
802.11ac 80, Chain 0 High Band Edge



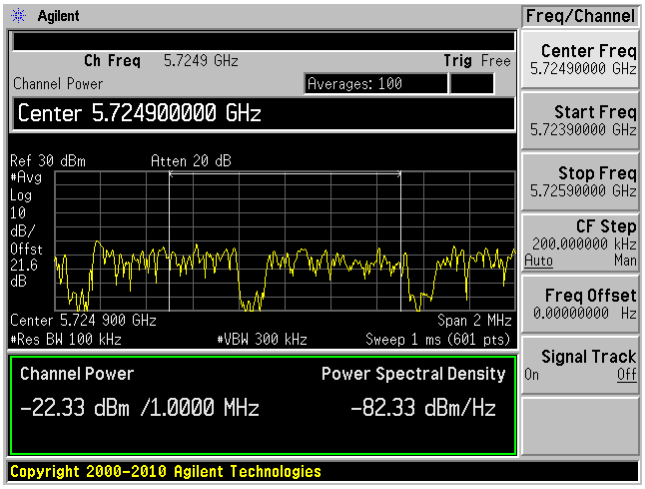
802.11ac 80, Chain 1 Low Band Edge



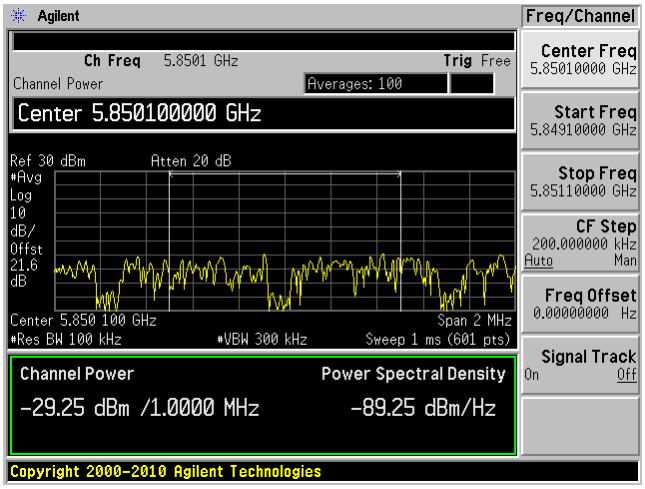
802.11ac 80, Chain 1 High Band Edge



802.11ac 80, Chain 2 Low Band Edge



802.11ac 80, Chain 2 High Band Edge



12 FCC §15.247(e) & IC RSS-210 §A8.2 (b) – Power Spectral Density

12.1 Applicable Standard

According to FCC §15.247(e) and RSS-210 §A8.2 (b) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

12.2 Measurement Procedure

FCC 15.247
1. Set instrument center frequency to DTS channel center frequency.
2. Set span to at least 1.5 times the OBW.
3. Set RBW to: 3 KHz ≤ RBW ≤ 100 KHz.
4. Set VBW ≥ 3 x RBW.
5. Detector = power averaging (RMS) or sample detector (when RMS not available).
6. Ensure that the number of measurement points in the sweep ≥ 2x span/RBW.
7. Sweep time = auto couple.
8. Employ trace averaging (RMS) mode over a minimum of 100 traces.
9. Use the peak marker function to determine the maximum amplitude level.

FCC 15.407
1). Set RBW = 1MHz.
2). Set VBW = 3 MHz.
3). Number of points in sweep ≥ 2 Span / RBW.
4). Sweep time = auto.
5). Detector = RMS.
6). Trace average at least 100 trace in power averaging mode.

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2012-09-29	1 year

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

12.4 Test Environmental Conditions

Temperature:	21°C
Relative Humidity:	43%
ATM Pressure:	102.1kPa

The testing was performed by Ning Ma on 2013-04-15 at RF site.

12.5 Test Results

802.11a Mode:

Frequency (MHz)	Power Spectral Density (dBm)			Total PSD (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5745	1.193	1.986	1.084	6.21	8	-1.79	24
5785	0.106	1.209	0.569	5.42	8	-2.58	24
5825	0.132	0.617	0.071	5.05	8	-2.95	24

802.11n HT20 Mode:

Frequency (MHz)	Power Spectral Density (dBm)			Total PSD (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5745	5745	0.353	1.43	0.21	5.47	8	24
5785	5785	0.392	0.242	0.384	5.11	8	24
5825	5825	-0.339	0.385	0.041	4.81	8	24

802.11n HT40 Mode:

Frequency (MHz)	Power Spectral Density (dBm)			Total PSD (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5755	-0.921	-2.152	-2.671	2.92	8	-5.08	24
5795	-3.703	-2.92	-2.763	1.66	8	-6.34	24

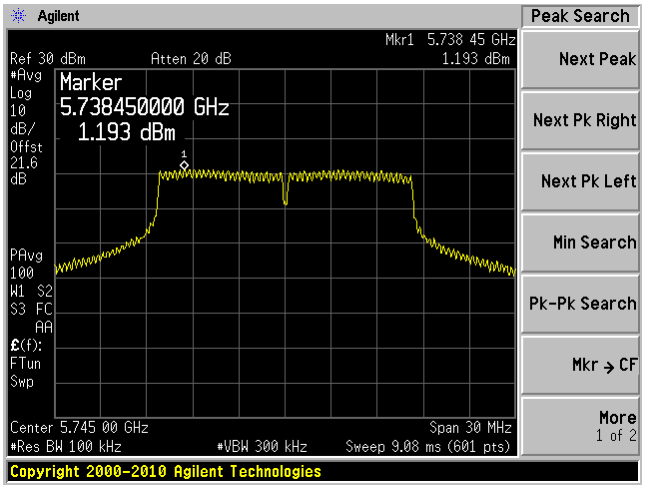
802.11ac 80 MHz Mode

Frequency (MHz)	Power Spectral Density (dBm)			Total PSD (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
	Chain 0	Chain 1	Chain 2				
5775	-6.378	-5.949	-5.332	-1.09	8	-9.09	25

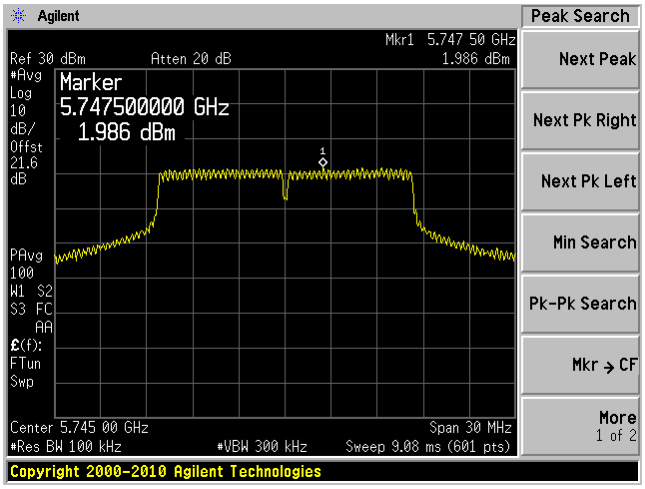
Please refer to the following plots for detailed test results:

802.11a mode

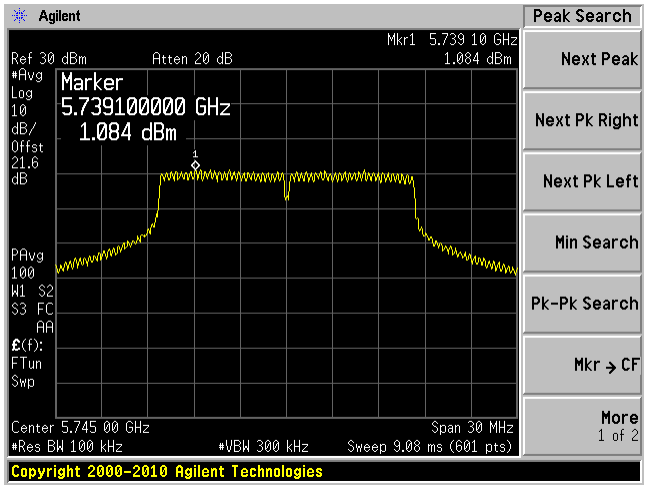
Low channel: Chain 0



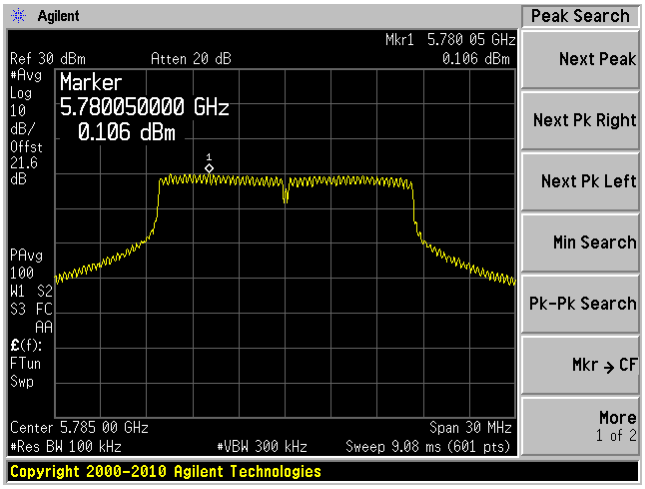
Low channel: Chain 1



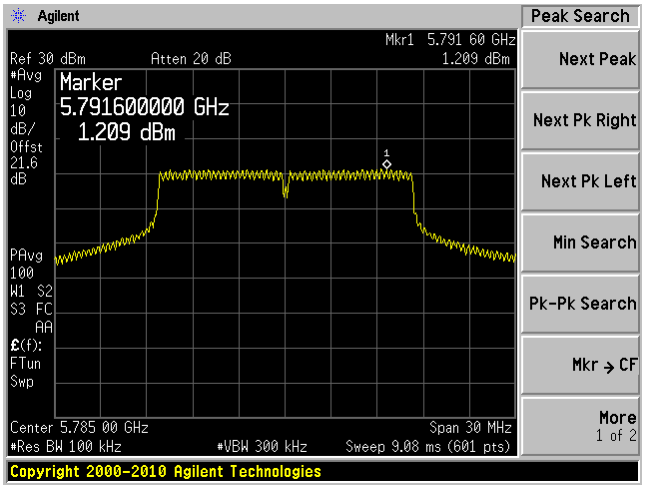
Low Channel: Chain 2



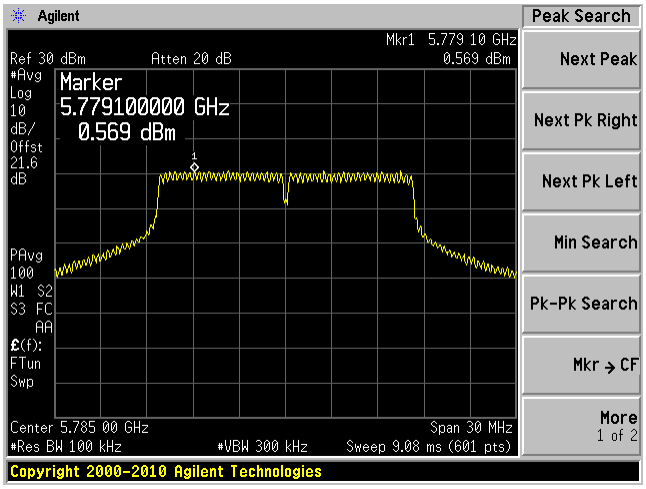
Middle channel: Chain 0



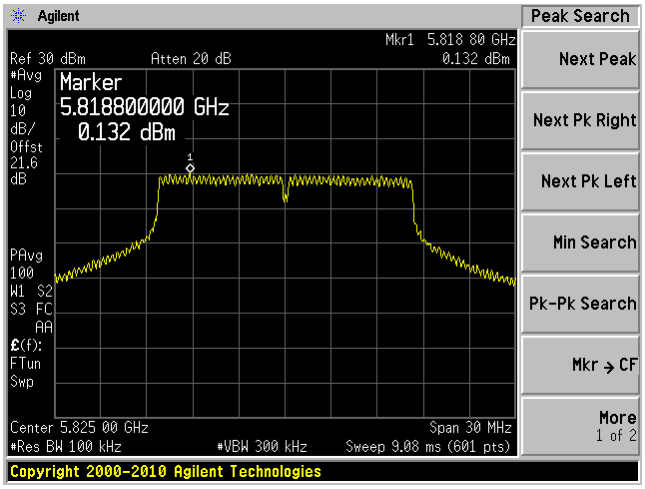
Middle channel: Chain 1



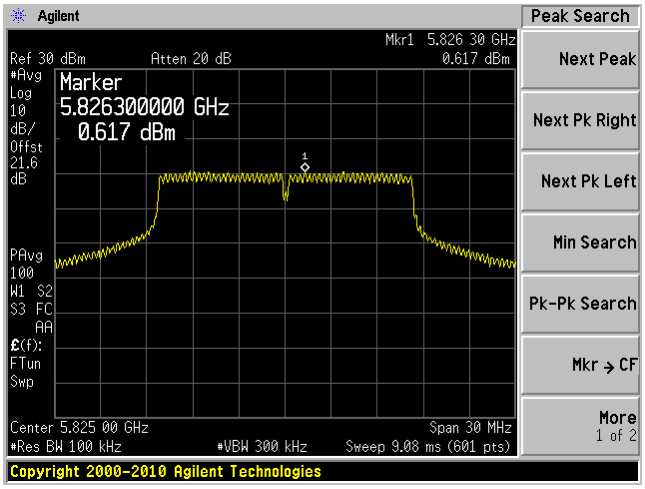
Middle Channel: Chain 2



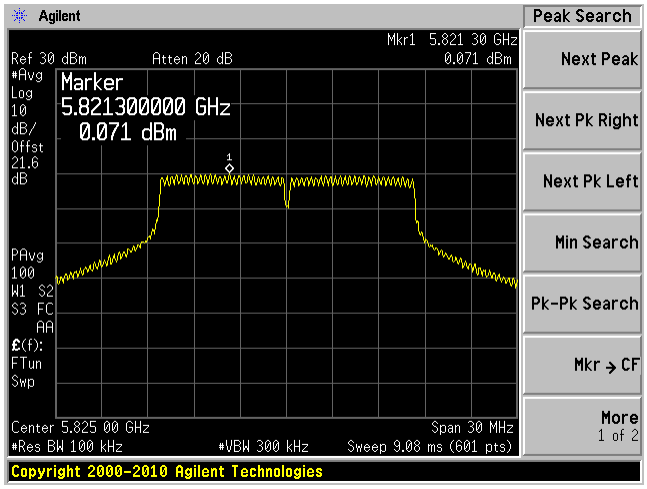
High channel: Chain 0



High channel: Chain 1

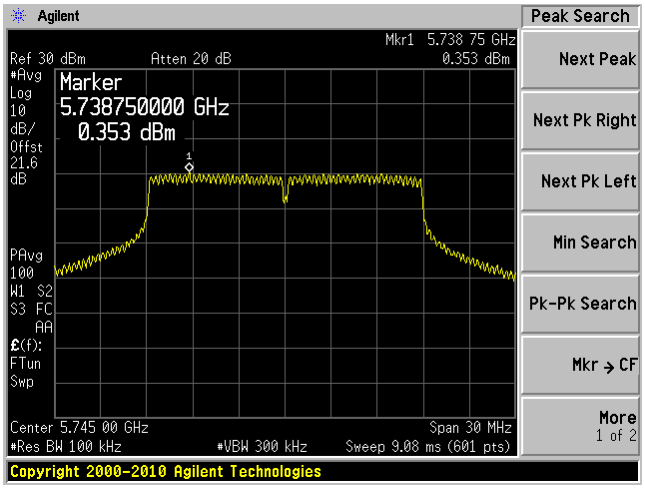


High Channel: Chain 2

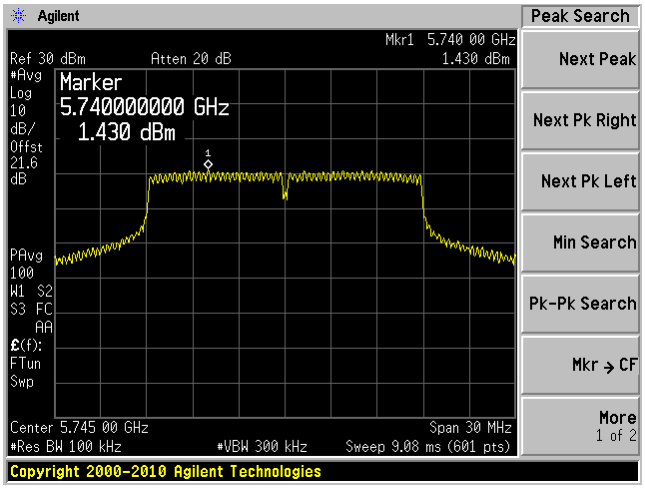


802.11n HT20 mode

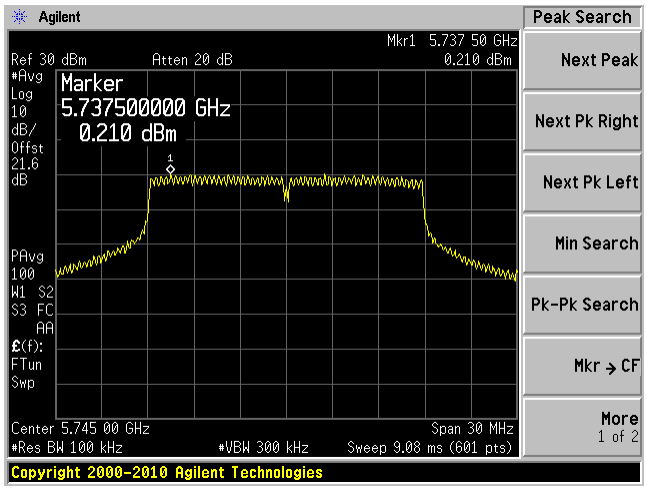
Low channel: Chain 0



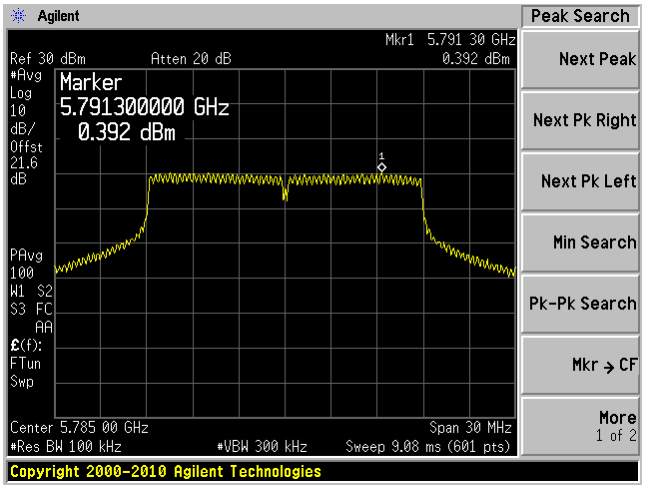
Low channel: Chain 1



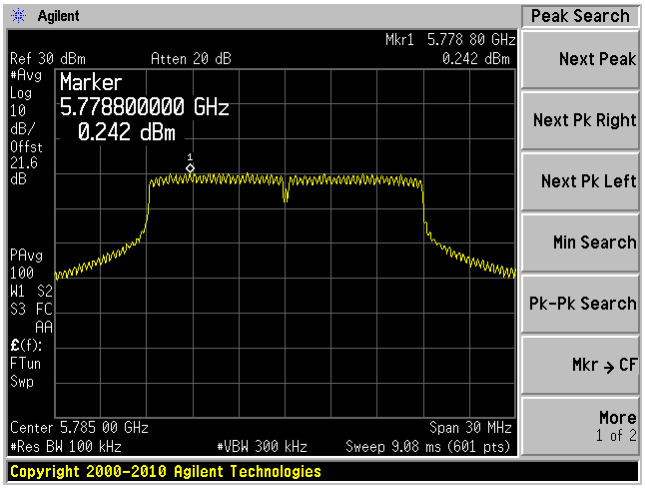
Low Channel: Chain 2



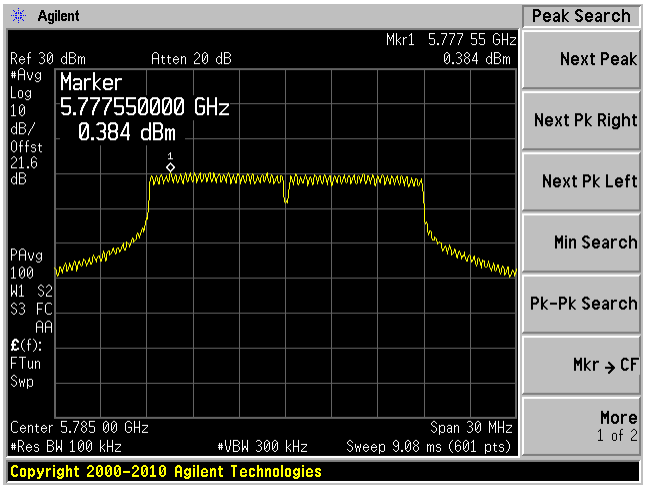
Middle channel: Chain 0



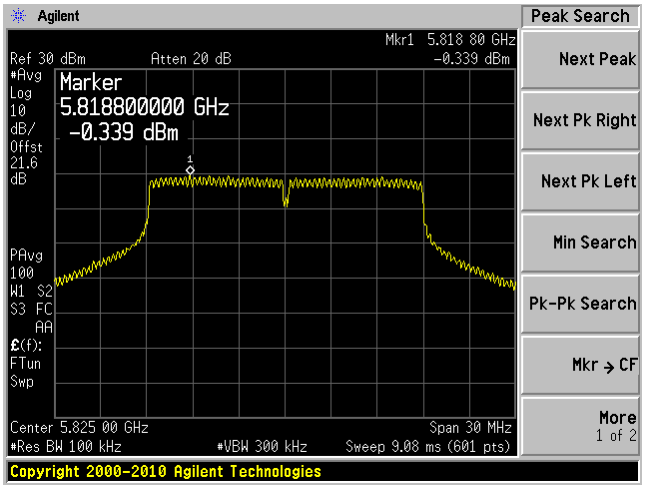
Middle channel: Chain 1



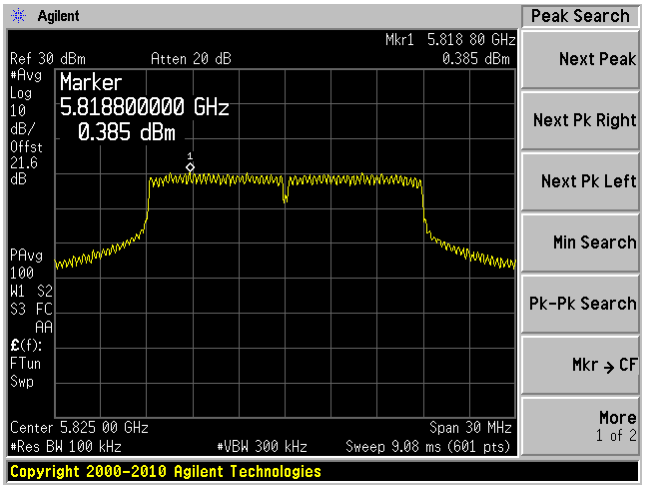
Middle Channel: Chain 2



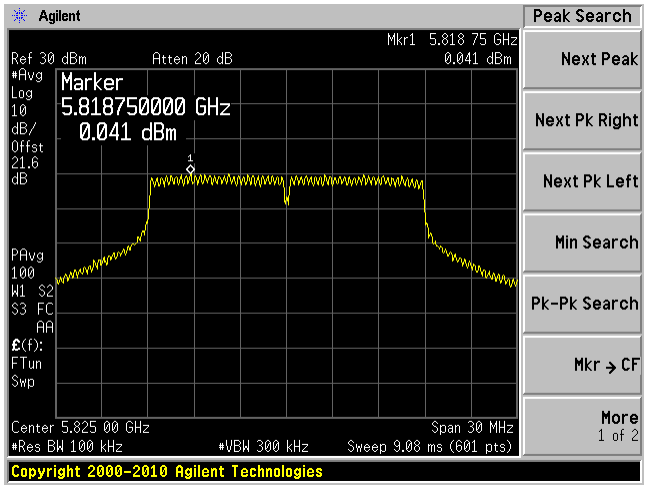
High channel: Chain 0



High channel: Chain 1

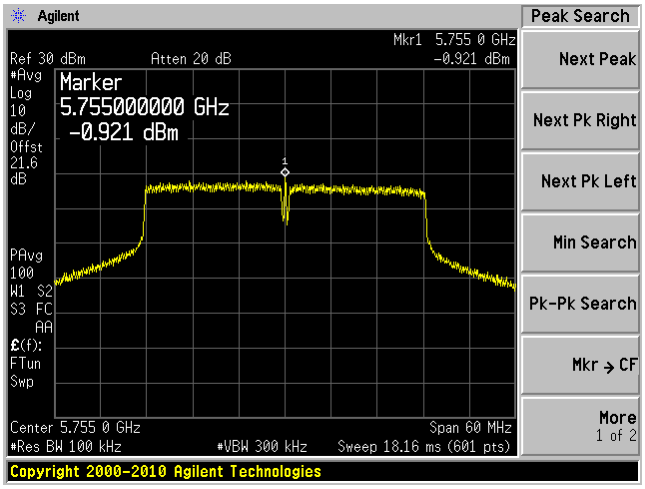


High Channel: Chain 2

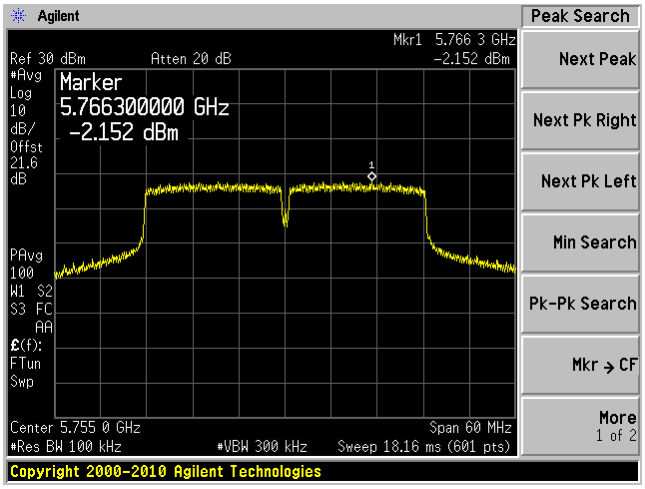


802.11n HT40 mode

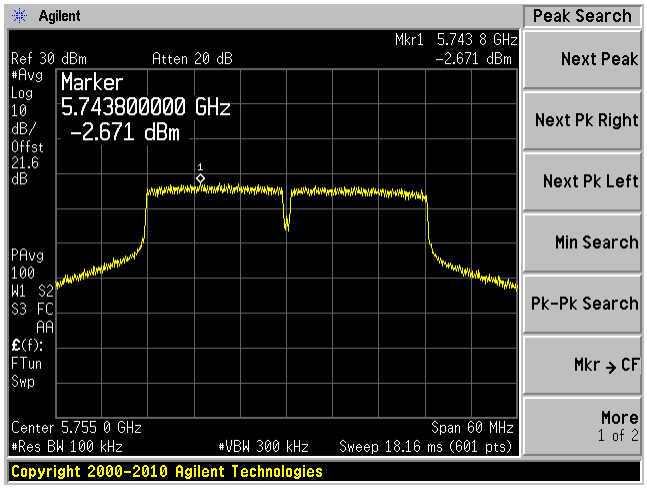
Low channel: Chain 0



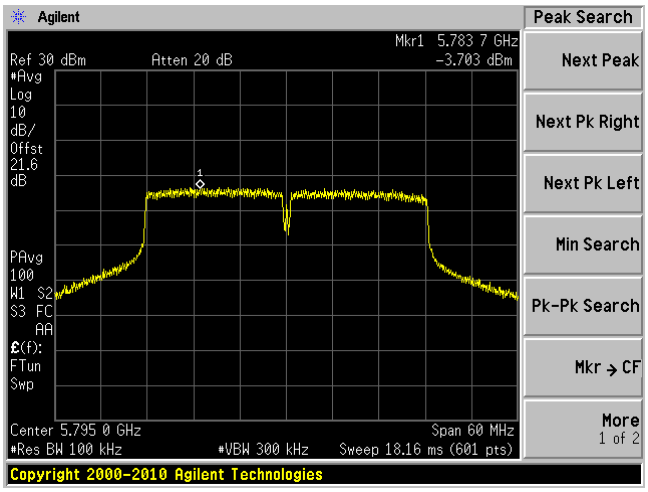
Low channel: Chain 1



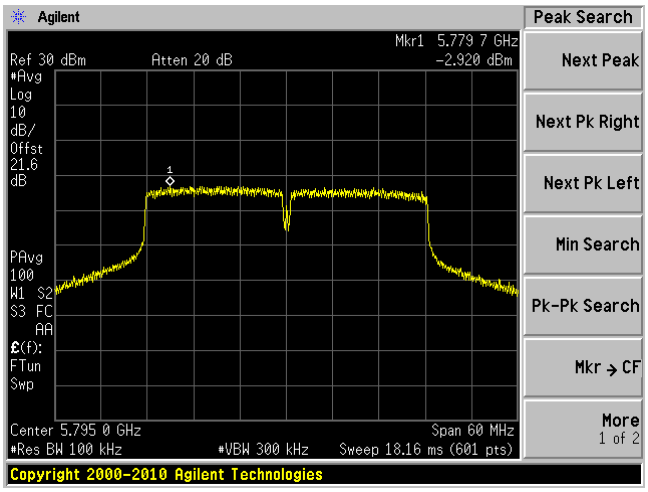
Low Channel: Chain 2



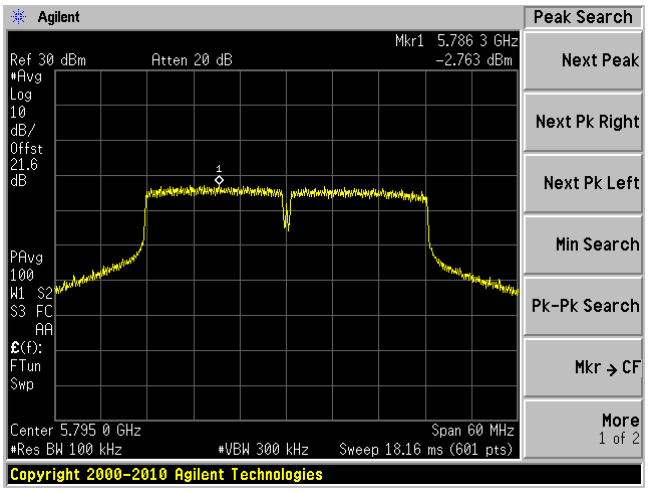
High channel: Chain 0



High channel: Chain 1

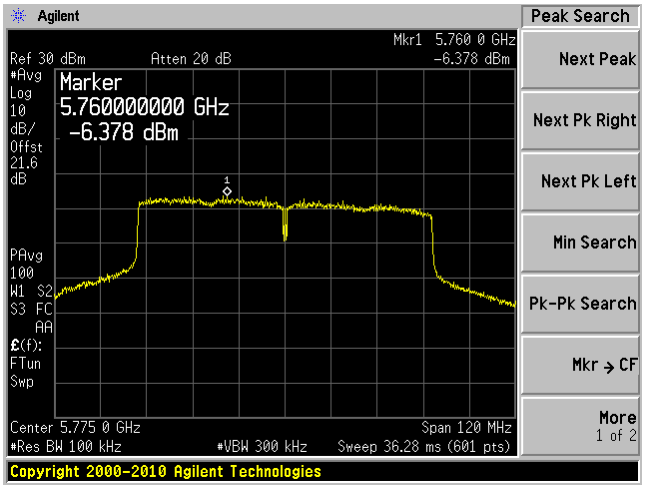


High Channel: Chain 2

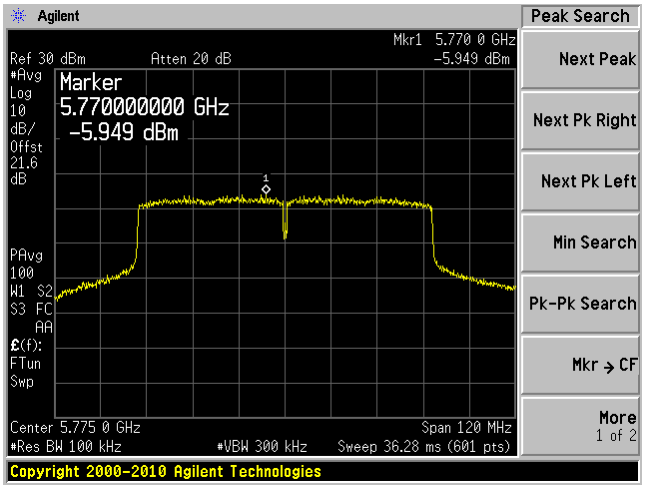


802.11ac 80 MHz mode

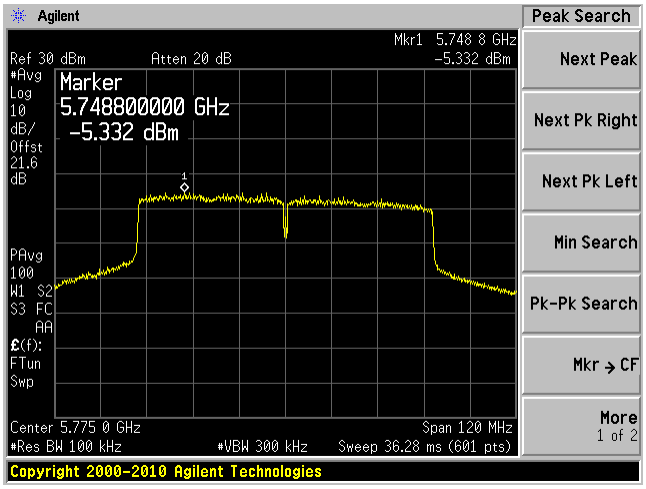
Chain 0



Chain 1



Chain 2



13 IC RSS-210 §2.3 & RSS-Gen §6.1 – Receiver Spurious Radiated Emissions

13.1 Applicable Standard

According to IC RSS-Gen §6.1, spurious emissions from receivers shall not exceed the radiated limits shown in the table below.

Table 2: General Field Strength Limits for Transmitters and Receivers at Frequencies above 30 MHz

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

13.2 EUT Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2009.

13.3 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

13.4 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. The equation for margin calculation is as follows:

$$Margin = Corrected\ Amplitude - Limit$$

13.5 Test Equipment Lists 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	A020106-2	2012-08-15	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2012-06-09	1 year
HP	Pre-amplifier	8449B	3147A00400	2013-02-04	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-10-16	1 year
A.R.A	Horn Antenna	DRG-118/A	1132	2013-01-29	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2012-09-19	1 year

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

13.6 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	41 %
ATM Pressure:	102.1 kPa

The testing was performed by Ning Ma from 2013-05-08 at 5 meter 3.

13.7 Summary of Test Results

According to the test data, the EUT complied with the RSS-210/RSS-Gen, with the closest margins from the limit listed below:

Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-0.88	56.0212	Vertical	30 MHz – 40 GHz

13.8 Test Results

30 MHz - 40 GHz, Measured at 3 meters

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
874.9955	37.16	161	V	140	46	-8.84
125.0015	42.79	100	V	55	43.5	-0.71
625.015	43.28	126	H	154	46	-2.72
249.999	40.03	110	H	132	46	-5.97

Note: Emissions above 1 GHz are 20 dB below the margin/under the noise floor.