FCC PART 15, SUBPART C

TEST AND MEASUREMENT REPORT

For

Sensity Systems, Inc.

480 Oakmead Parkway, Sunnyvale, CA 94085, USA

FCC ID: SXNLSNM-0002-X

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

Prepared By:	Chen Ge Test Engineer
Report Number:	R1404241-247
Report Date:	2014-07-11
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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" (Rev.2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1404241-247	Original Report	2014-07-11

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

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

1.2 Mechanical Description of EUT

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

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

1.3 Objective

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

The objective is to determine compliance with FCC Part 15.247 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 15.407 NII grant with FCC ID: SXNLSNM-0002-X.

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz and FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

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: 2007, 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

Bay Area Compliance Laboratories Corp. (BACL) is:

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

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

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

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

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

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz, as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

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

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2009 and FCC KDB 558074 D01 DTS Meas Guidance v03r01.

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

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

2.2 EUT Exercise Software

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

2.3 Special Equipment

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

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

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

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Sensity Systems	Main Board	LF1B	ASI86386

2.7 Interface Ports and Cables

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

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
FCC §15.247(i), §2.1091	RF Exposure	Compliant
FCC §15.203	Antenna Requirement	Compliant
FCC §15.207(a)	AC Line Conducted Emissions	Compliant
FCC §15.247 (d)	Spurious Emissions at Antenna Port	Compliant
FCC §15.205	Restricted Bands	Compliant
FCC §15.209, §15.247 (d)	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2)	6 dB Emission Bandwidth	Compliant
FCC §15.247(b)(3)	Maximum Peak Output Power	Compliant
FCC §15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e)	Power Spectral Density	Compliant

4 FCC §15.247 (i) & §2.1091 – 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

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):	14.66
Maximum peak output power at antenna input terminal (mW):	29.24
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	2.2
Maximum Antenna Gain (numeric):	1.659
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.009655
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.009655 mW/cm^2.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

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

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.

5.2 Antenna List

Manufacturers	Antenna Type/Pattern	Antenna Gain (dBi) @ 2.4 GHz
Laird Tech	OMNI	2.2

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

6 FCC §15.207 – AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

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

**Decreases with the logarithm of the frequency.*

6.2 Test Setup

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

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

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

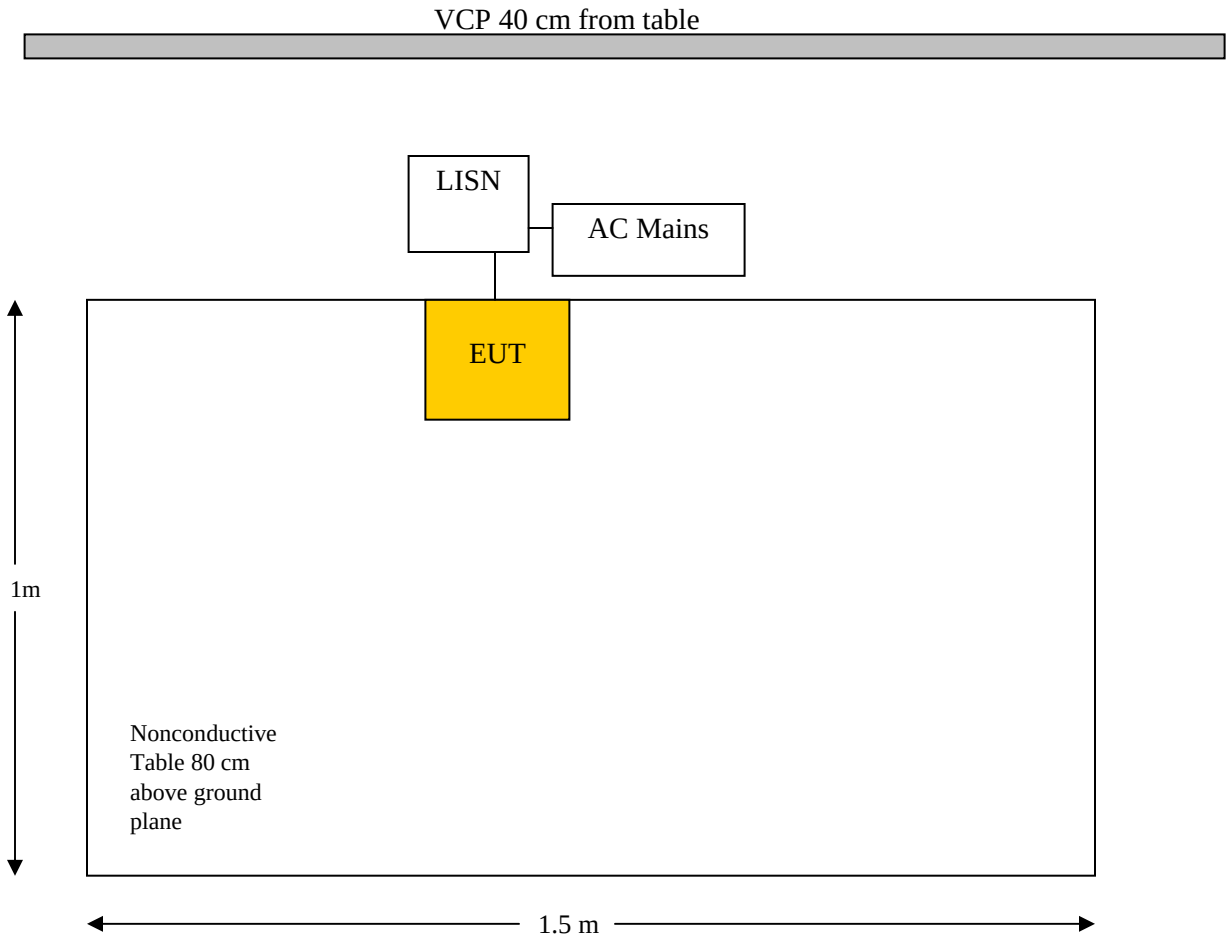
6.3 Test Procedure

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

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

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

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude & Margin Calculation

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

CA = Ai + CL + Atten

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

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

Margin = Corrected Amplitude - Limit

6.6 Test Equipment List and Details

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

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

6.7 Test Environmental Conditions

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

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

6.8 Summary of Test Results

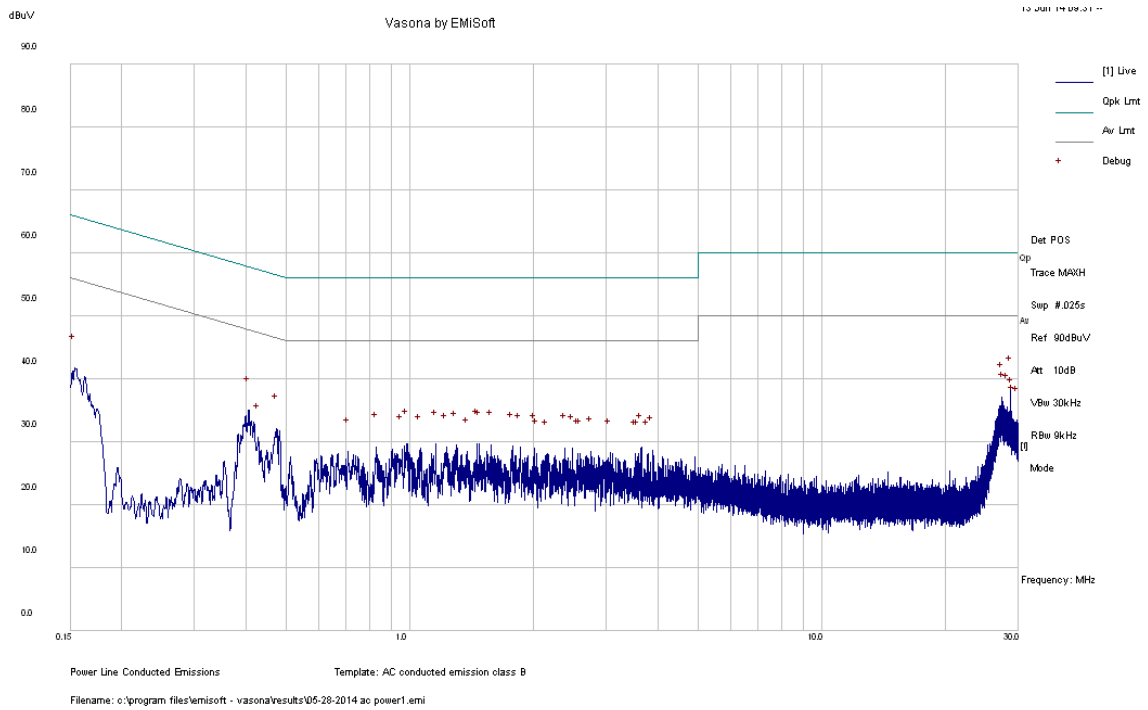
According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the margin reading of:

Transmitting Mode: Worst case with 2.4 GHz operating:

Connection: Connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-16.33	28.67162	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

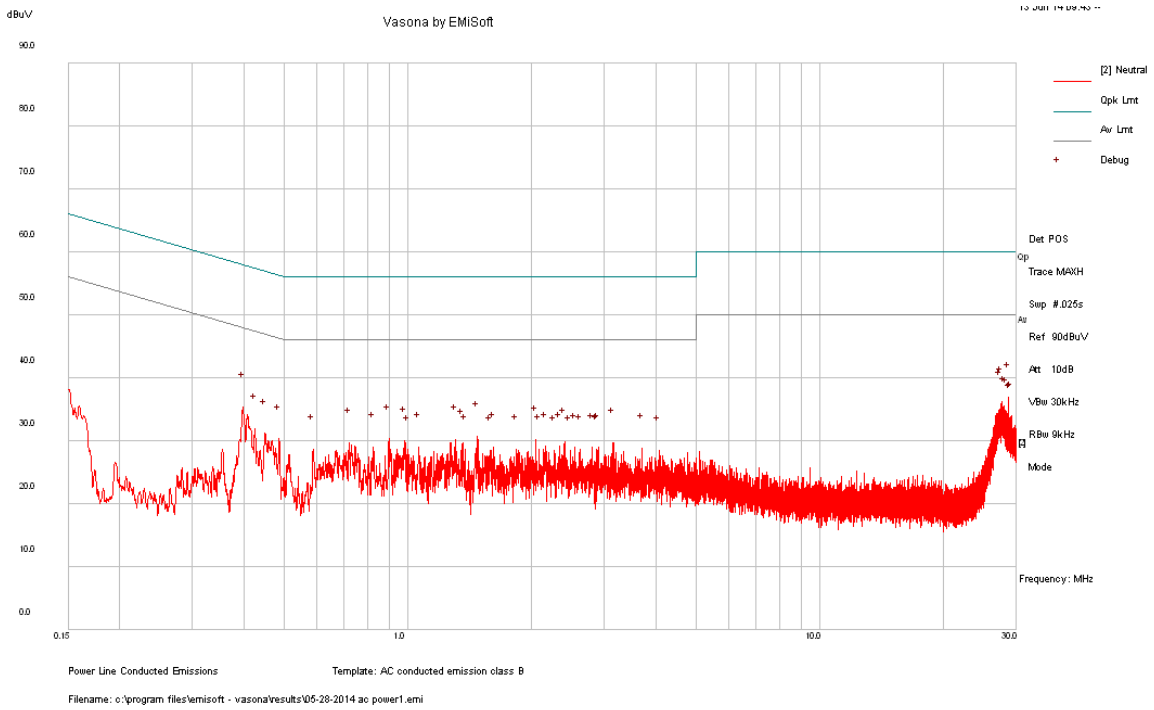
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
28.67162	36.22	Line	60	-23.78	QP
0.401393	30.9	Line	57.82	-26.93	QP
27.39482	31.06	Line	60	-28.94	QP
0.150998	40.76	Line	65.94	-25.18	QP
0.457851	27.98	Line	56.73	-28.76	QP
27.63041	31.17	Line	60	-28.83	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
28.67162	33.67	Line	50	-16.33	Ave.
0.401393	24.88	Line	47.82	-22.94	Ave.
27.39482	26	Line	50	-24	Ave.
0.150998	26.78	Line	55.94	-29.17	Ave.
0.457851	20.19	Line	46.73	-26.54	Ave.
27.63041	26.22	Line	50	-23.78	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.396398	30.4	Neutral	57.93	-27.53	QP
28.67333	35.06	Neutral	60	-24.94	QP
27.60456	30.88	Neutral	60	-29.12	QP
27.40902	30.66	Neutral	60	-29.34	QP
28.11488	29.97	Neutral	60	-30.03	QP
1.48002	23.66	Neutral	56	-32.34	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.396398	25.32	Neutral	47.93	-22.61	Ave.
28.67333	32.15	Neutral	50	-17.85	Ave.
27.60456	25.93	Neutral	50	-24.07	Ave.
27.40902	25.55	Neutral	50	-24.45	Ave.
28.11488	25.05	Neutral	50	-24.95	Ave.
1.48002	15.61	Neutral	46	-30.39	Ave.

7 FCC §2.1051 & §15.247(d) – Spurious Emissions at Antenna Terminals

7.1 Applicable Standard

For 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 30 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 measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 11: Emissions in non-restricted frequency bands and section 12: Emissions in restricted frequency bands.

7.3 Test Equipment List and Details

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

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

7.4 Test Environmental Conditions

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

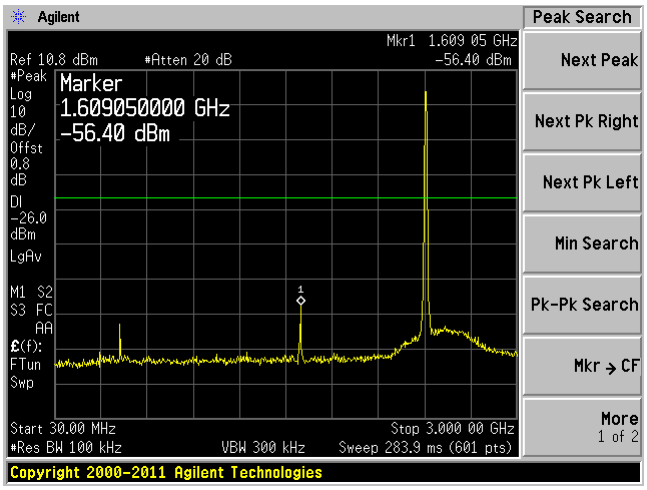
The testing was performed by Chen Ge on 2014-06-12 in the RF site.

7.5 Test Results

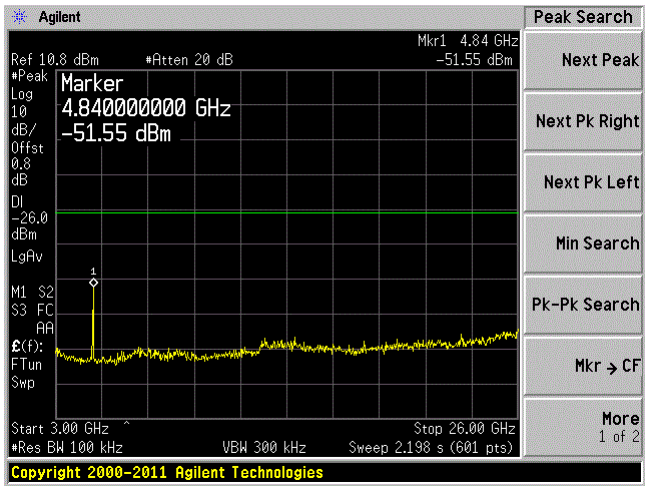
Please refer to following plots of spurious emissions.

802.11b, Low Channel, 2412 MHz

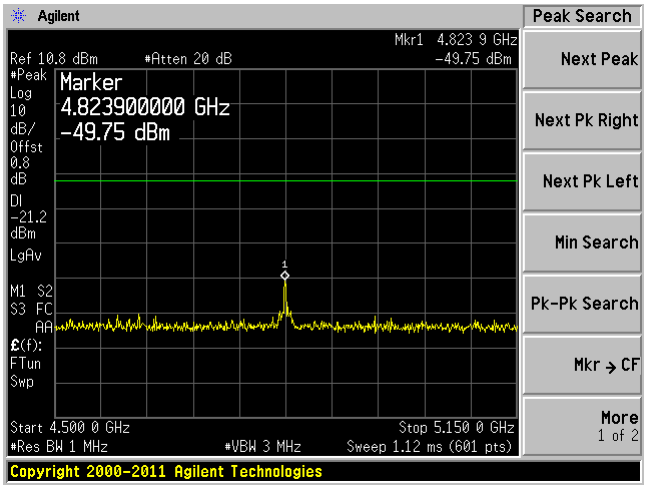
30 MHz – 3 GHz



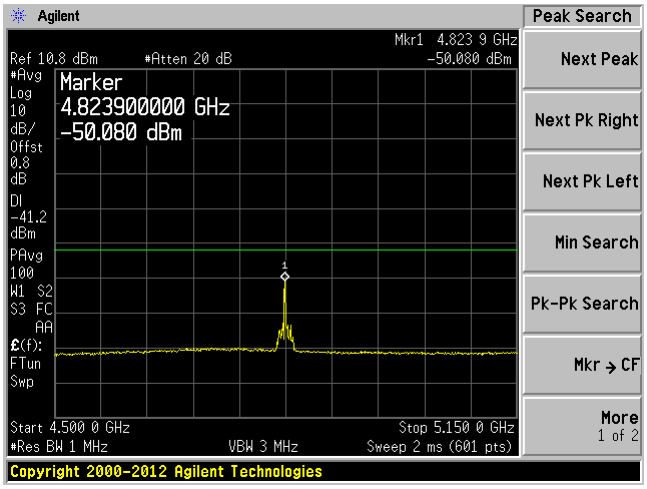
3 GHz – 26 GHz



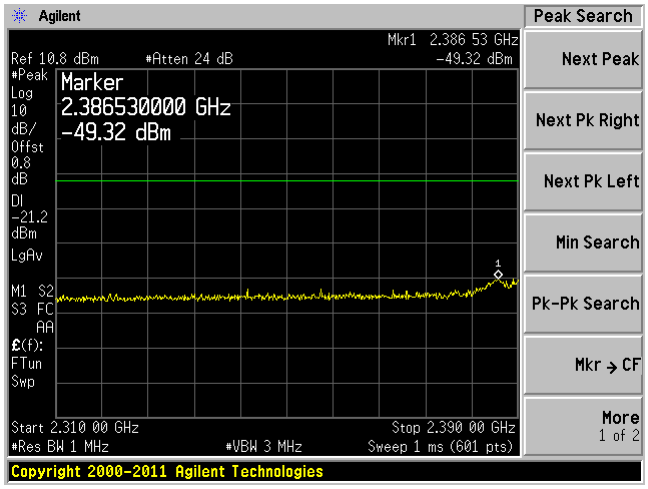
4824 MHz 2nd Harmonic Peak



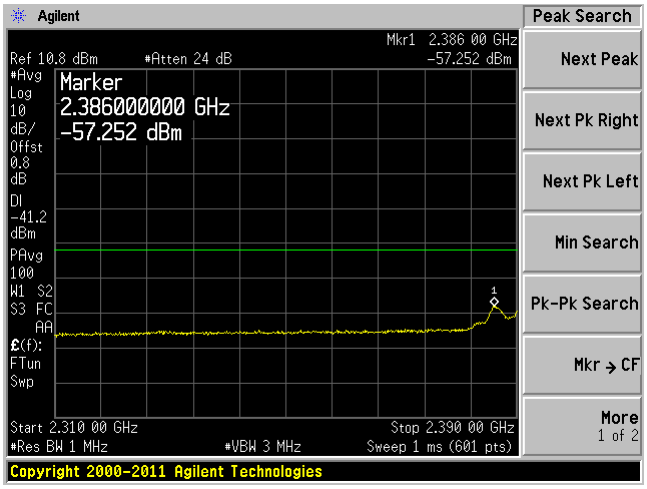
4824 2nd Harmonic Average



Restricted Band Edge Peak

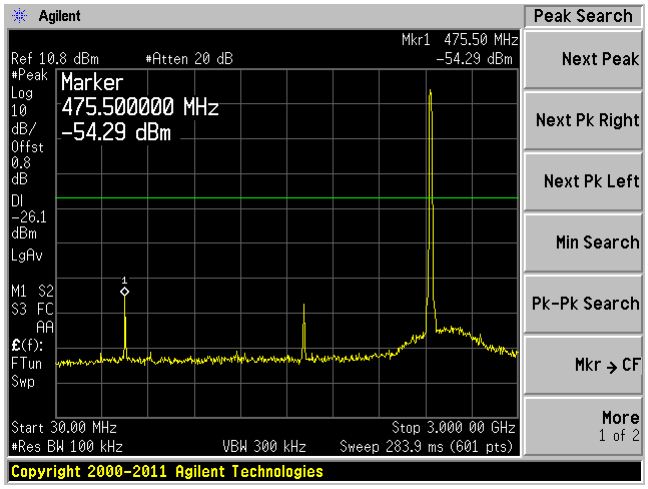


Restricted Band Edge Average

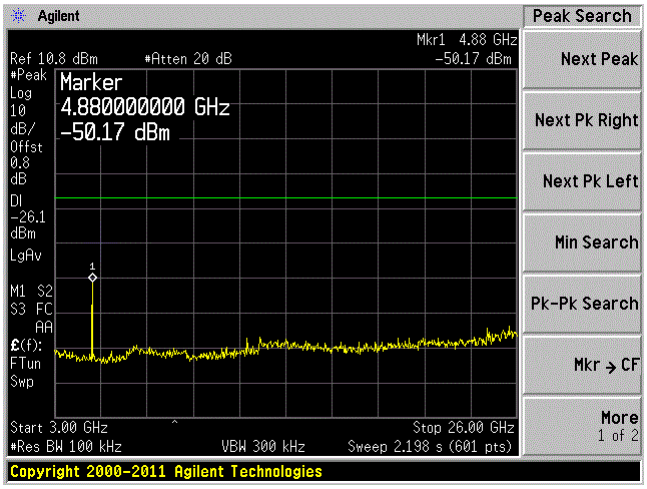


802.11b, Middle Channel, 2437 MHz

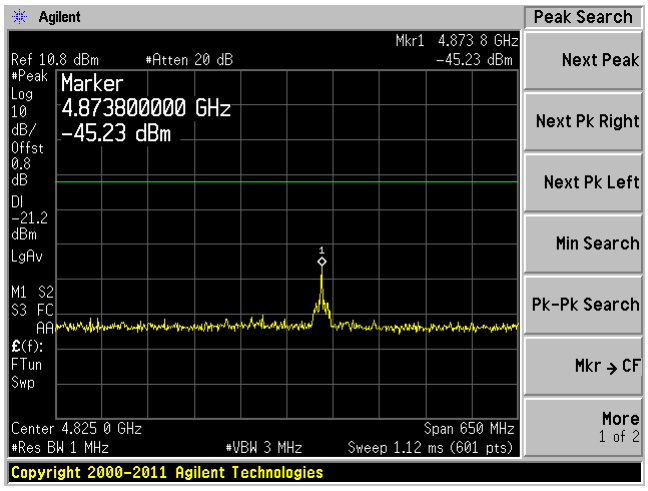
30 MHz – 3 GHz



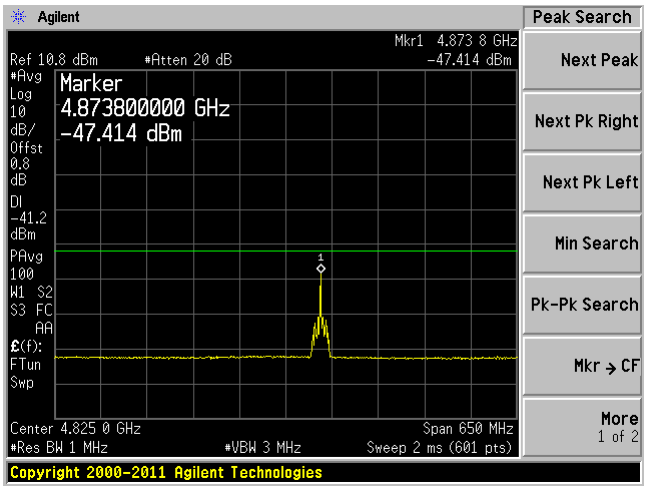
3 GHz – 26 GHz



4874 MHz 2nd Harmonic Peak

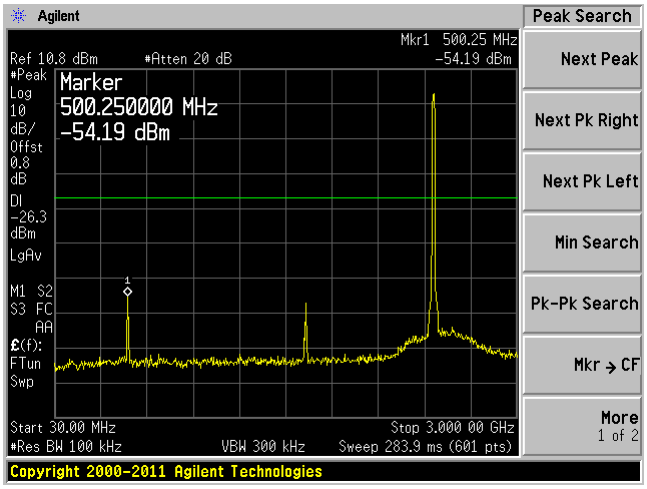


4874 2nd Harmonic Average

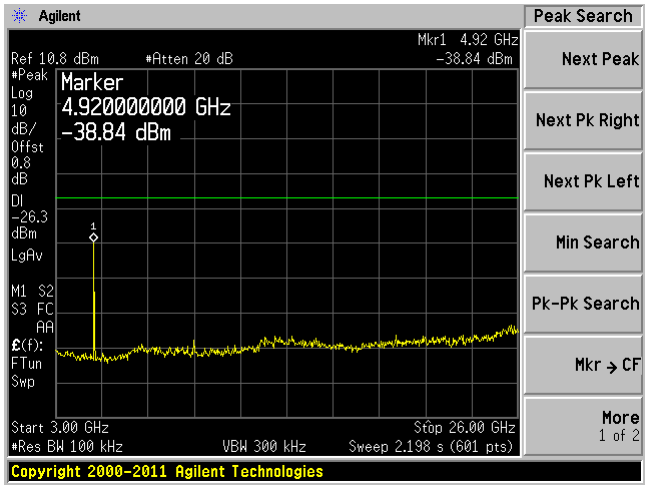


802.11b, High Channel, 2462 MHz

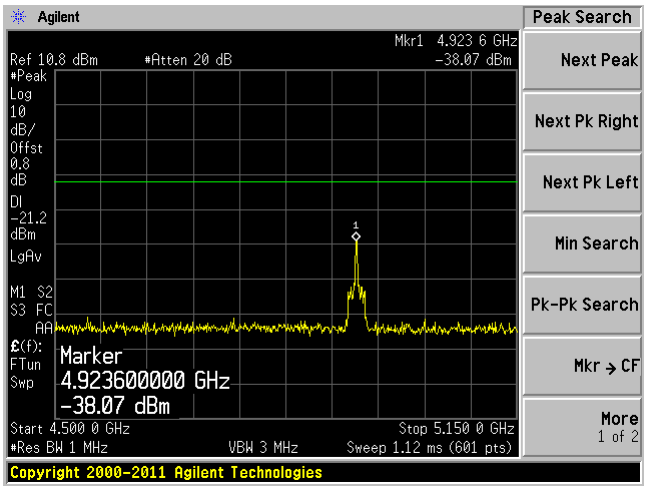
30 MHz – 3 GHz



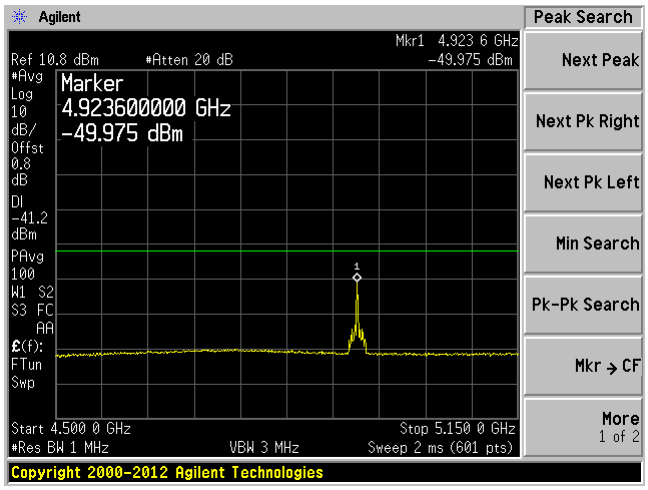
3 GHz – 26 GHz



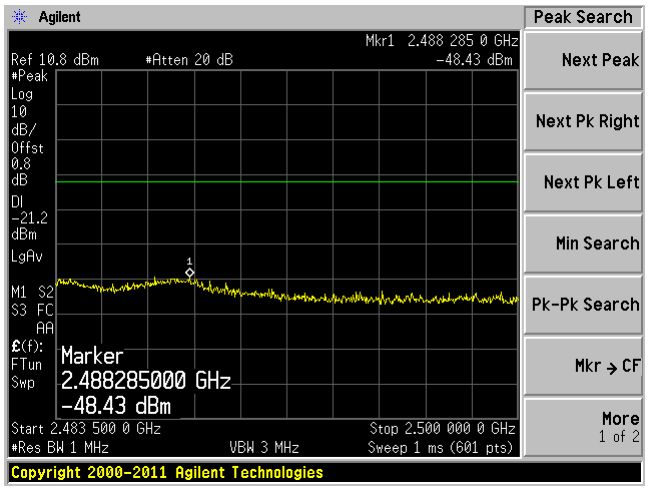
4924 MHz 2nd Harmonic Peak



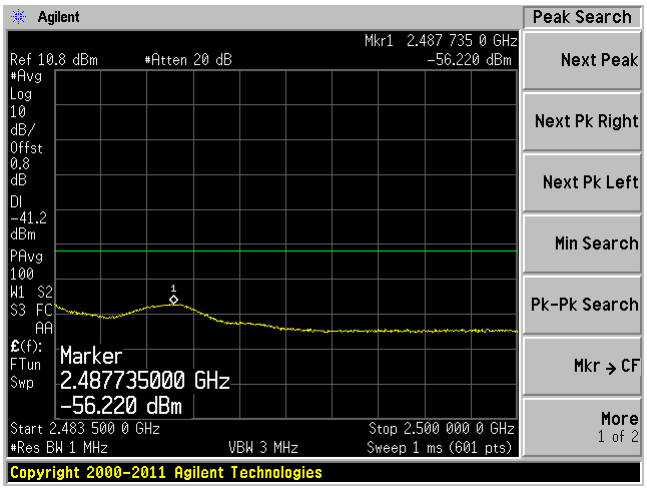
4924 2nd Harmonic Average



Restricted Band Edge Peak

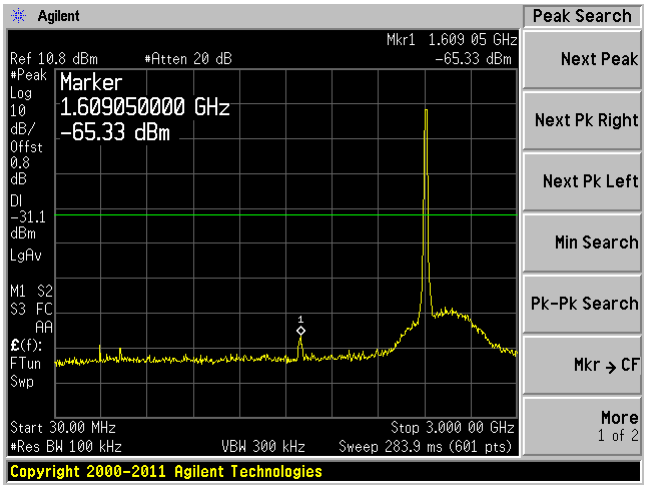


Restricted Band Edge Average

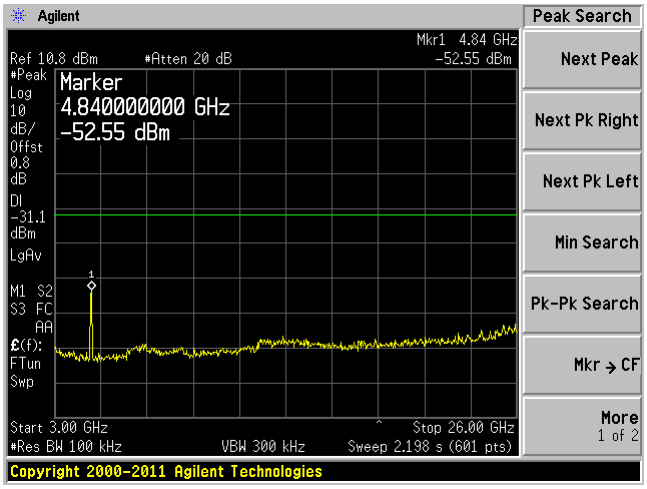


802.11g, Low Channel, 2412 MHz

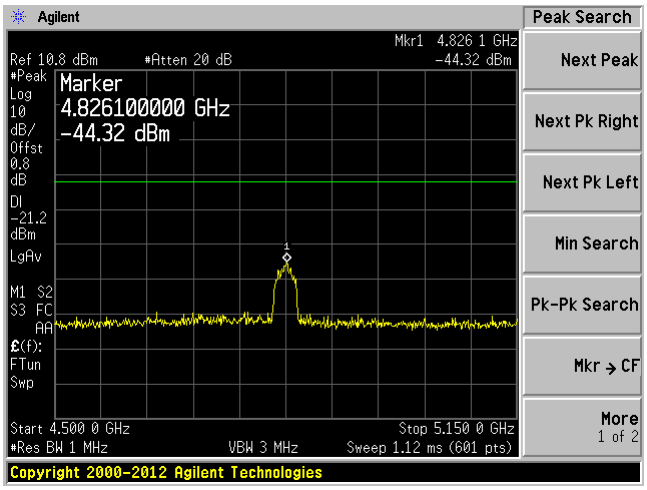
30 MHz – 3 GHz



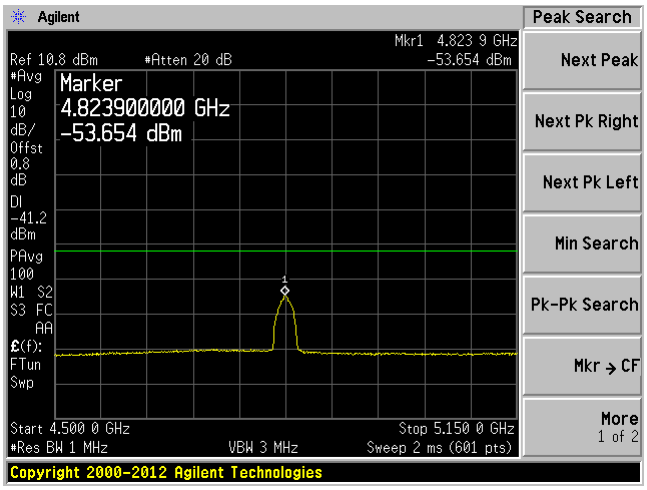
3 GHz – 26 GHz



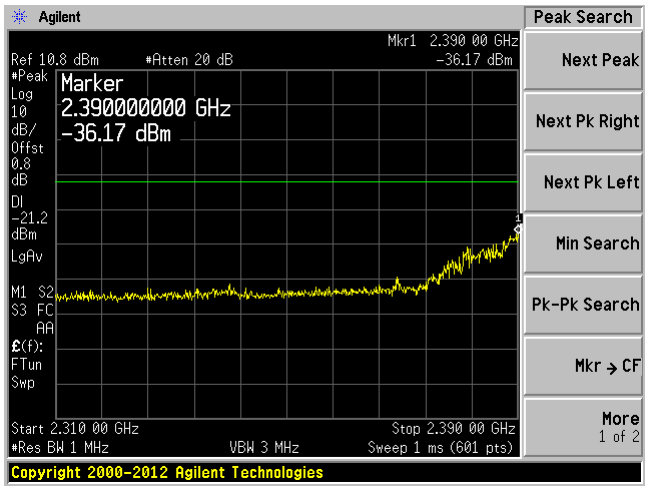
4824 MHz 2nd Harmonic Peak



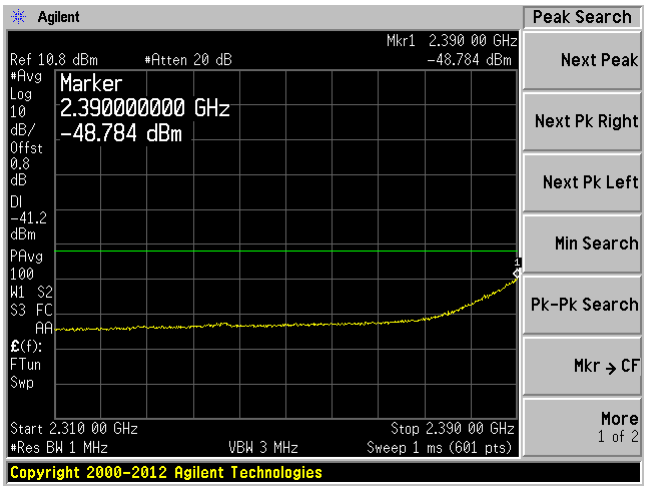
4824 2nd Harmonic Average



Restricted Band Edge Peak

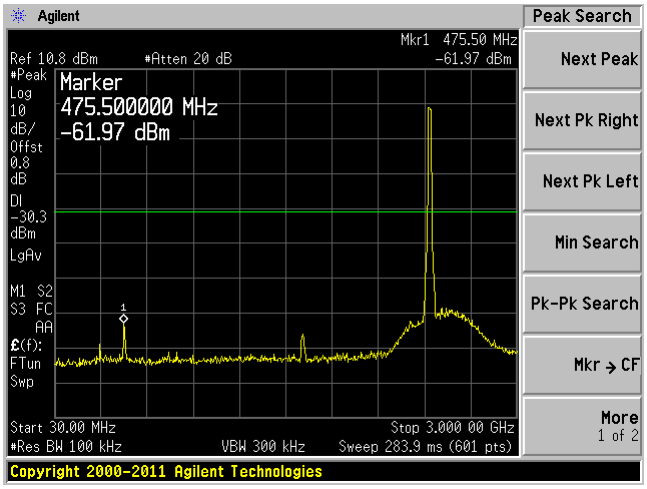


Restricted Band Edge Average

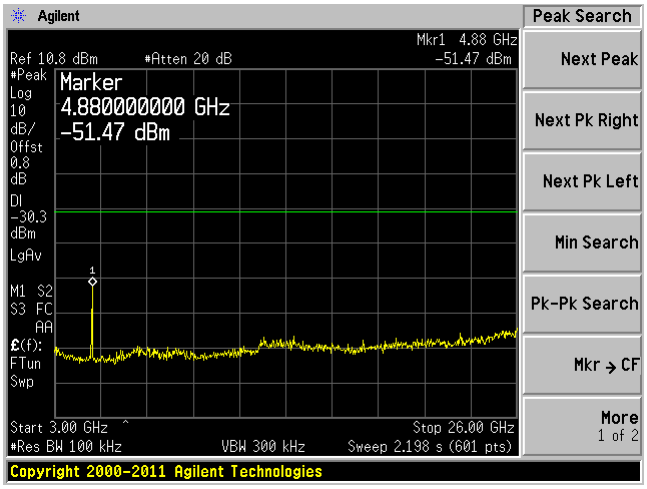


802.11g, Middle Channel, 2437 MHz

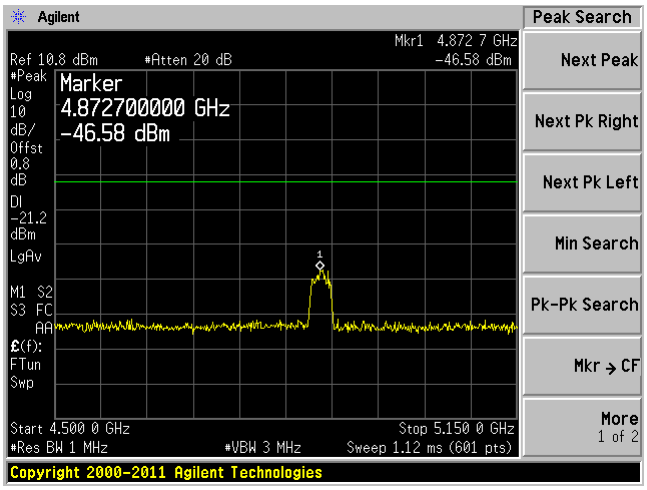
30 MHz – 3 GHz



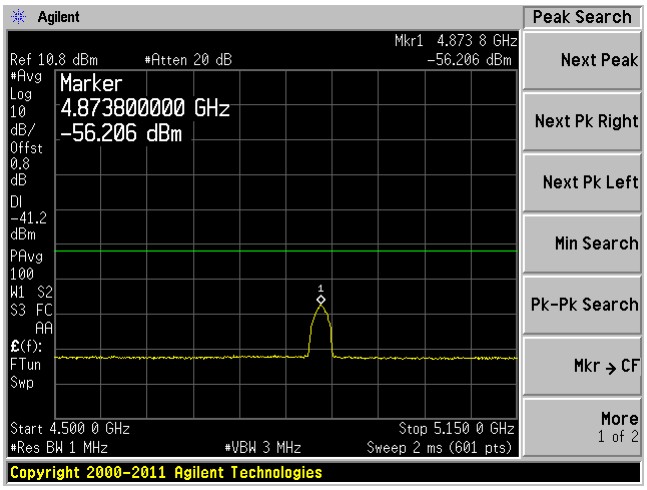
3 GHz – 26 GHz



4874 MHz 2nd Harmonic Peak

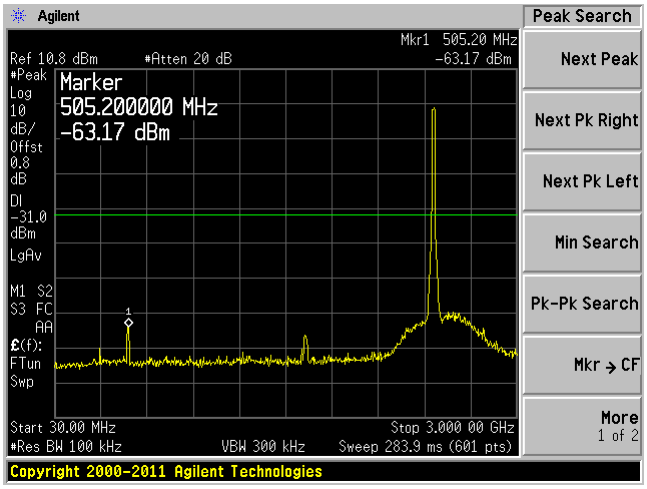


4874 2nd Harmonic Average

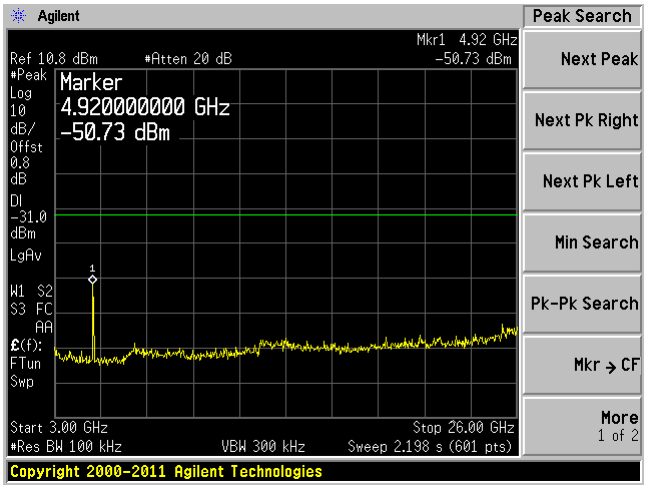


802.11g, High Channel, 2462 MHz

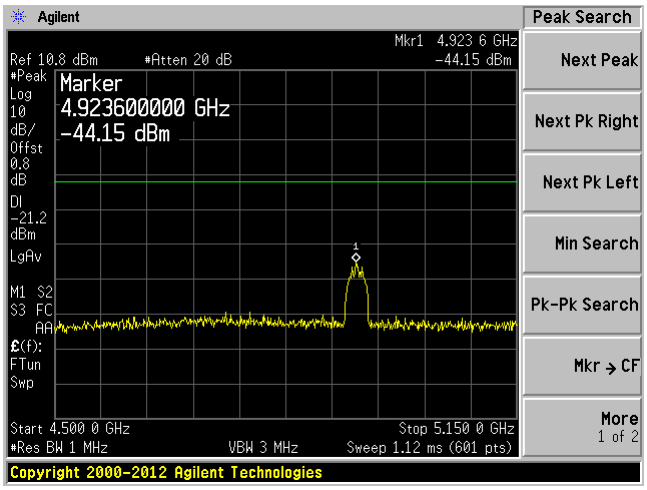
30 MHz – 3 GHz



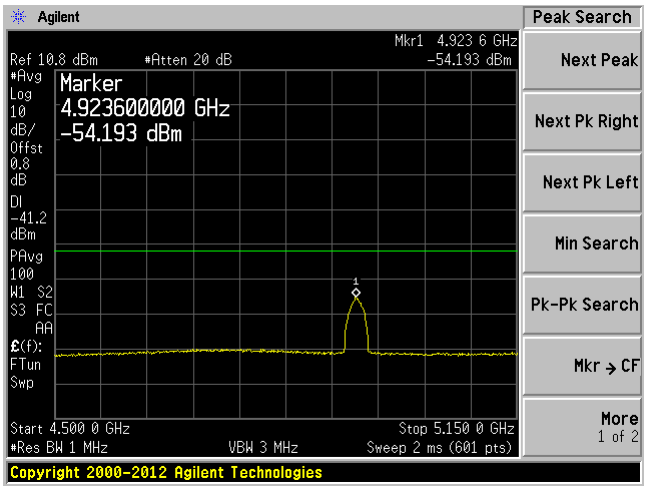
3 GHz – 26 GHz



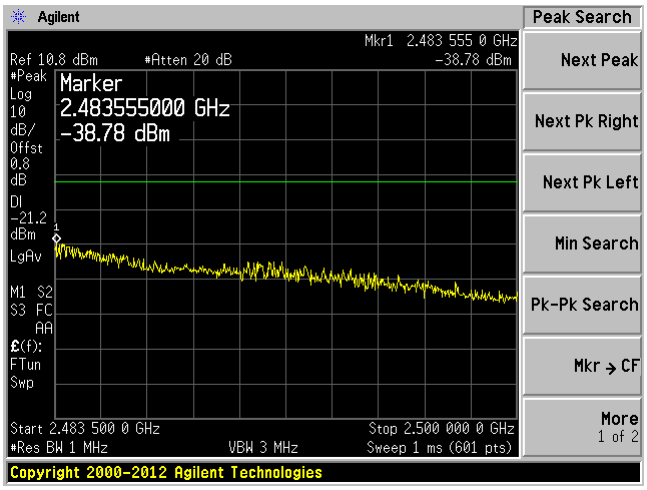
4924 MHz 2nd Harmonic Peak



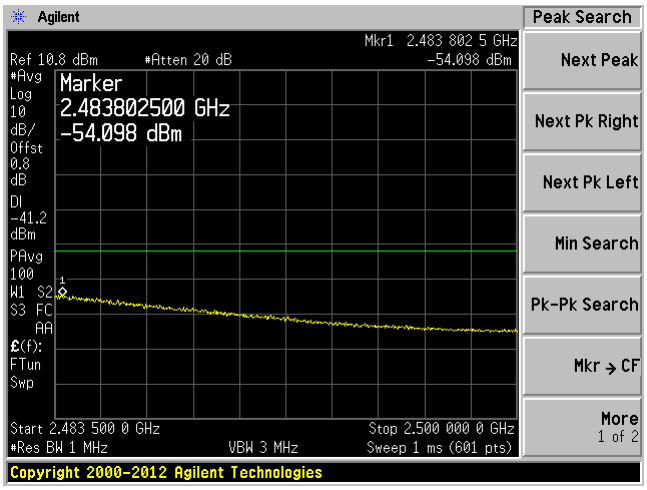
4924 2nd Harmonic Average



Restricted Band Edge Peak

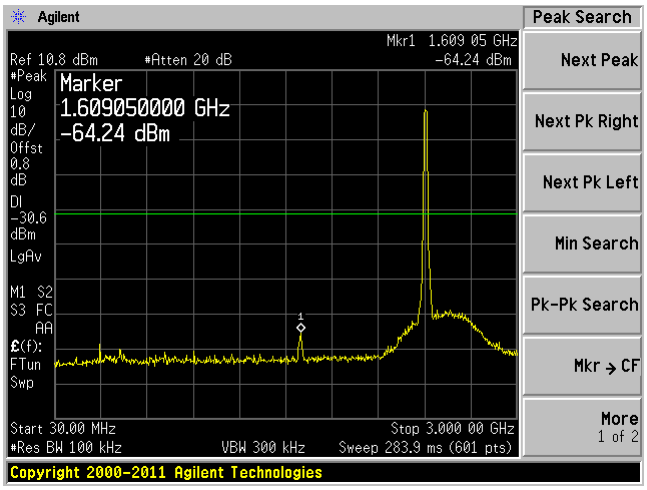


Restricted Band Edge Average

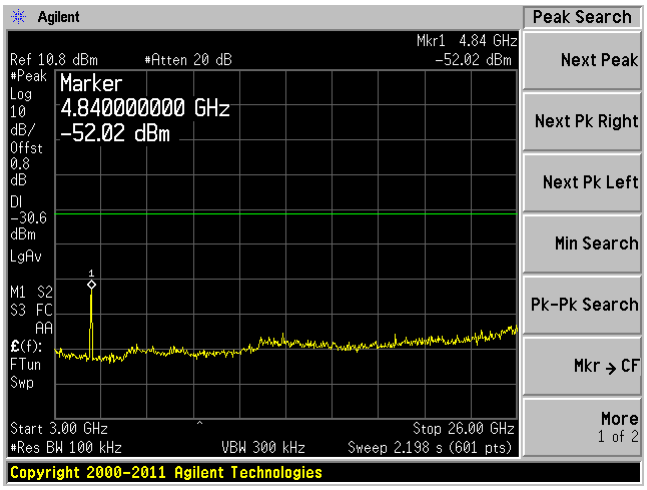


802.11n-HT20, Low Channel, 2412 MHz

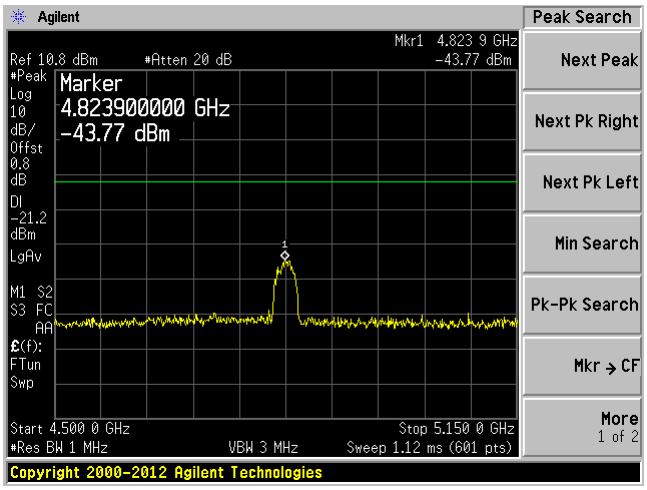
30 MHz – 3 GHz



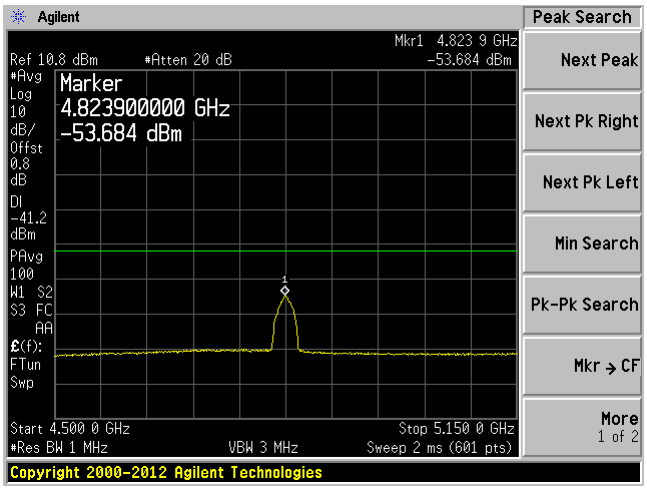
3 GHz – 26 GHz



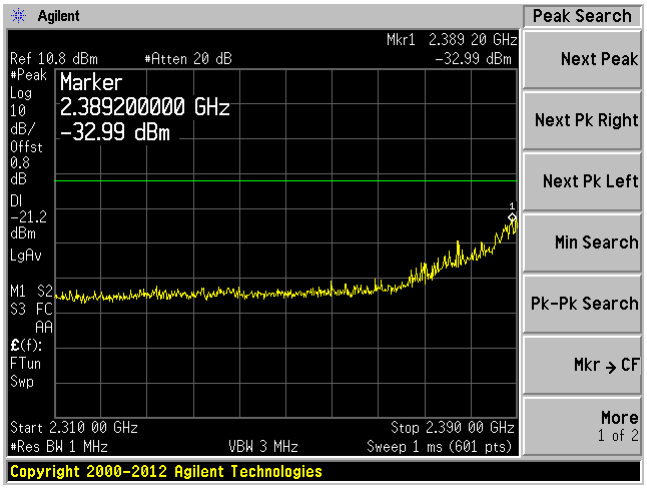
4824 MHz 2nd Harmonic Peak



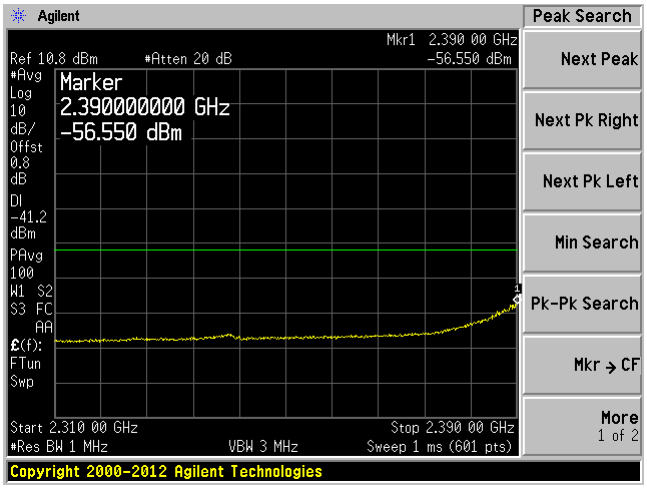
4824 2nd Harmonic Average



Restricted Band Edge Peak

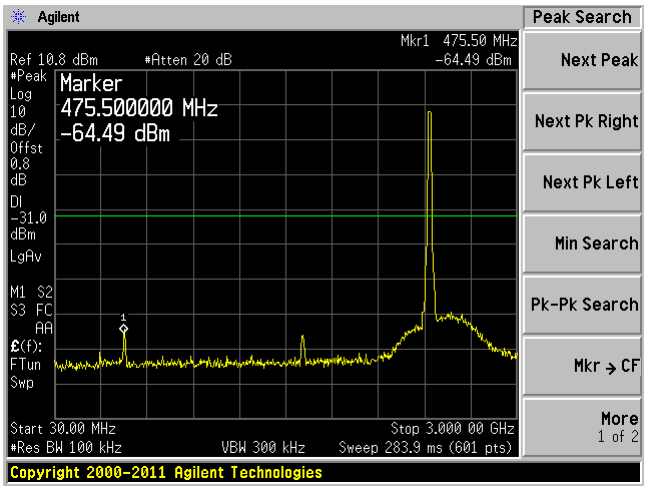


Restricted Band Edge Average

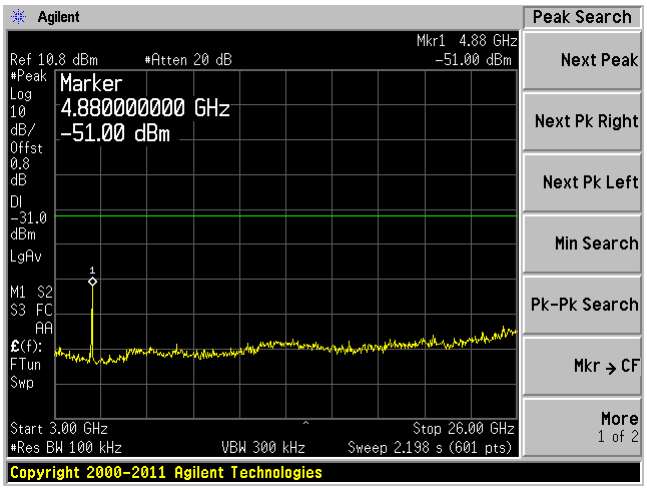


802.11n-HT20, Middle Channel, 2437 MHz

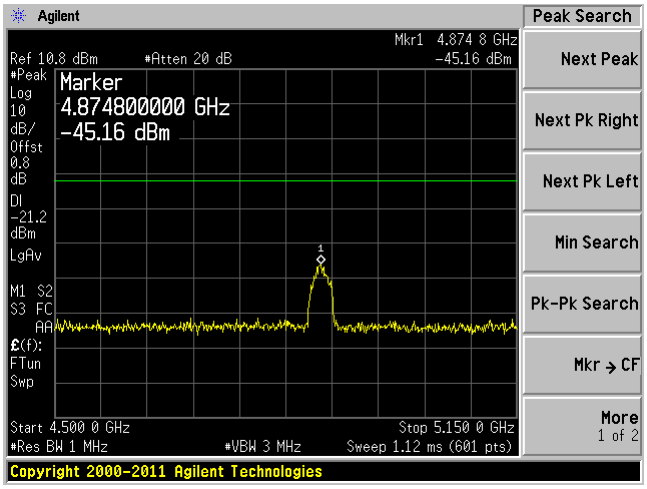
30 MHz – 3 GHz



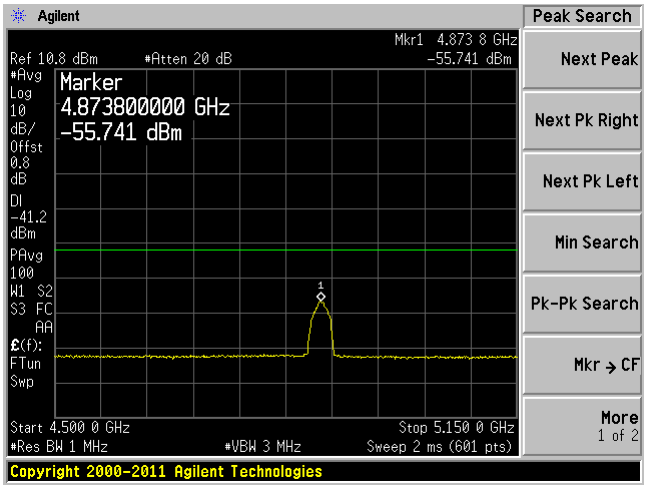
3 GHz – 26 GHz



4874 MHz 2nd Harmonic Peak

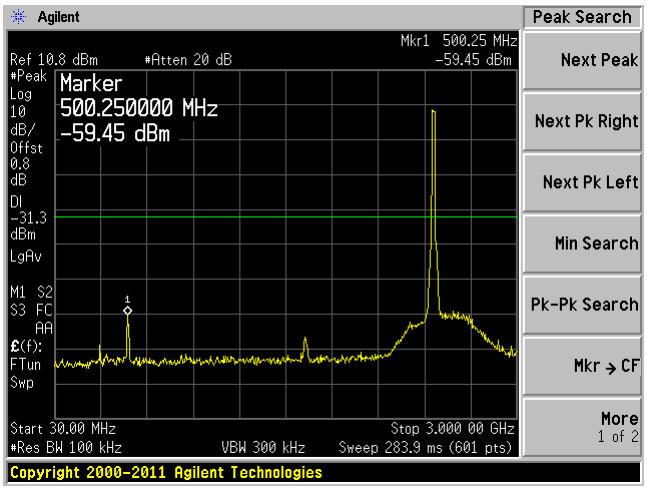


4874 2nd Harmonic Average

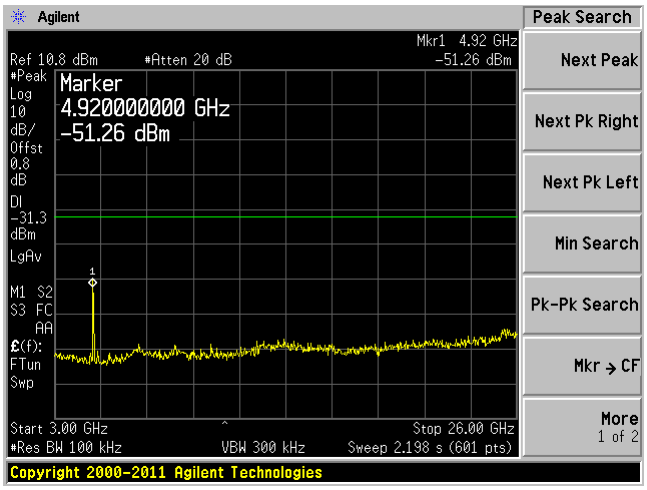


802.11n-HT20, High Channel, 2462 MHz

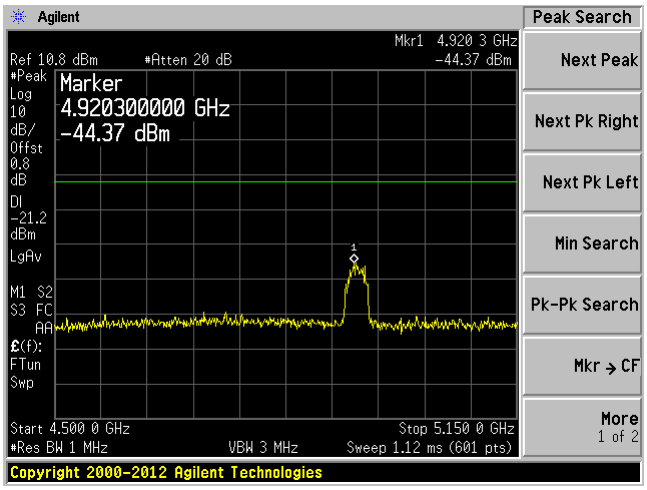
30 MHz – 3 GHz



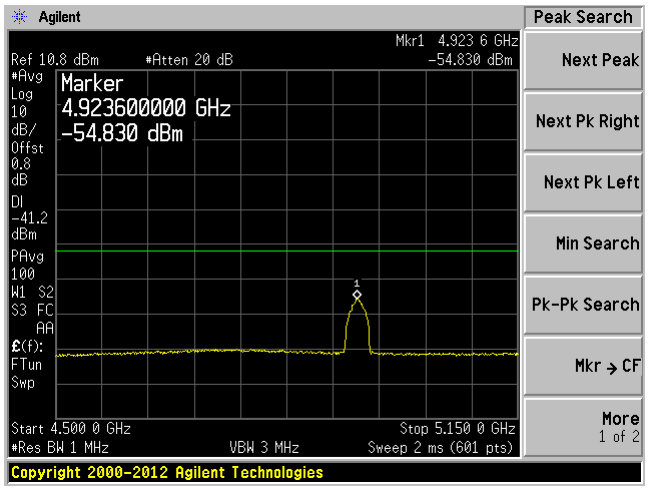
3 GHz – 26 GHz



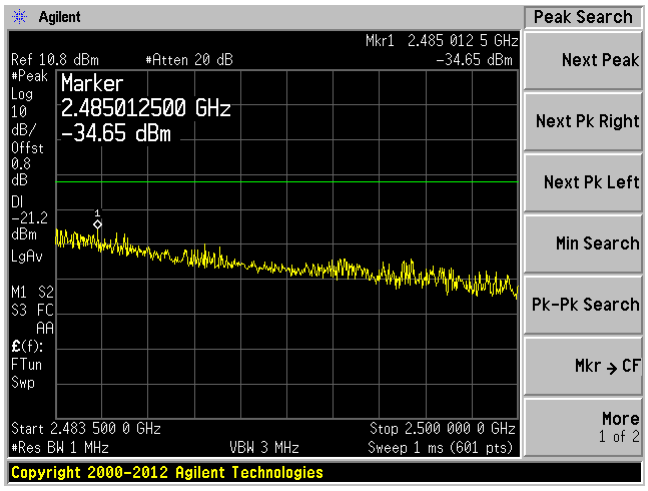
4924 MHz 2nd Harmonic Peak



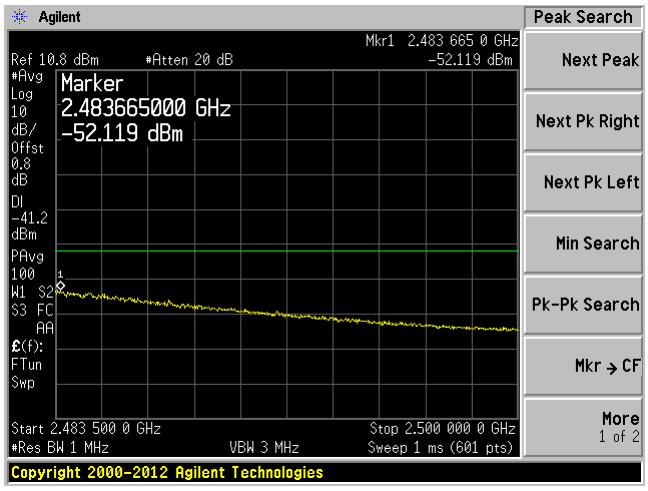
4924 2nd Harmonic Average



Restricted Band Edge Peak

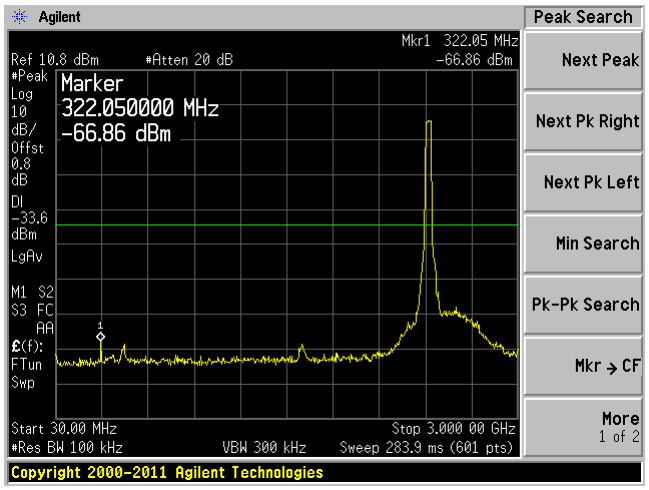


Restricted Band Edge Average

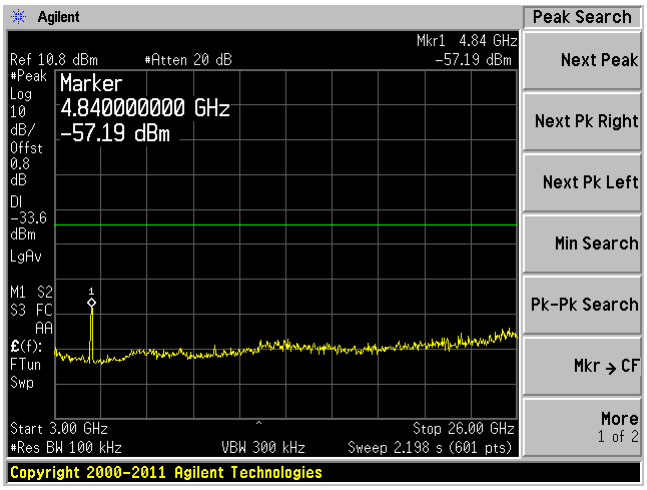


802.11n-HT40, Low Channel, 2422 MHz

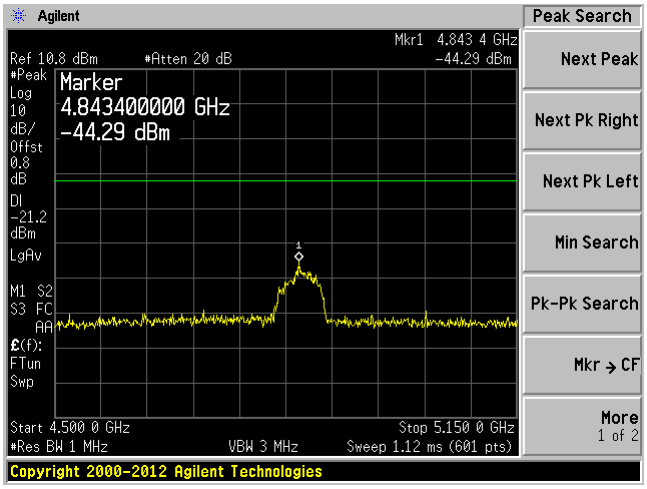
30 MHz – 3 GHz



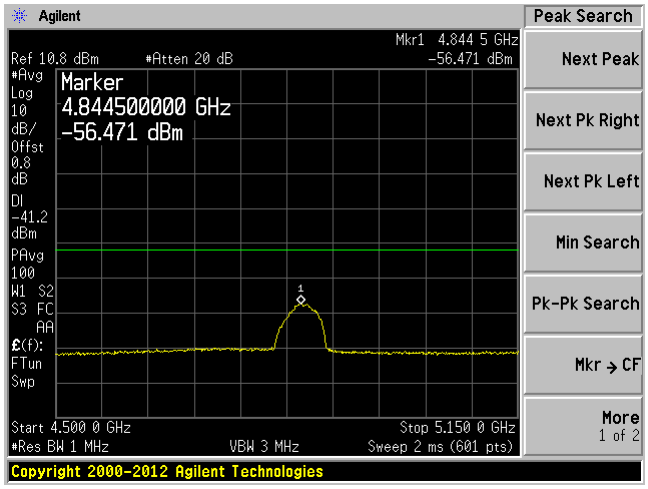
3 GHz – 26 GHz



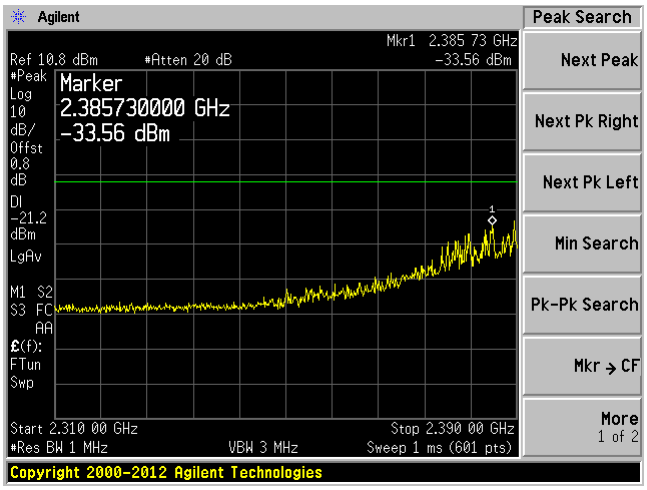
4844 MHz 2nd Harmonic Peak



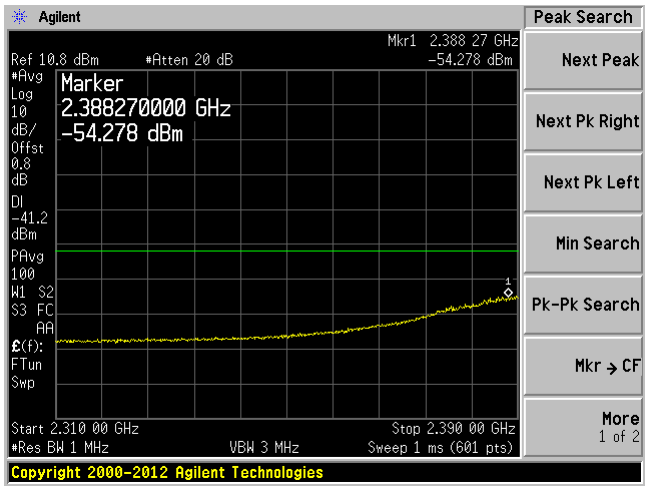
4844 2nd Harmonic Average



Restricted Band Edge Peak

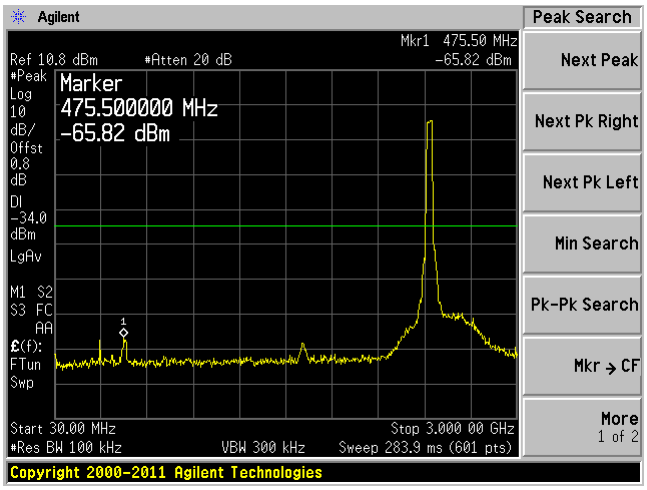


Restricted Band Edge Average

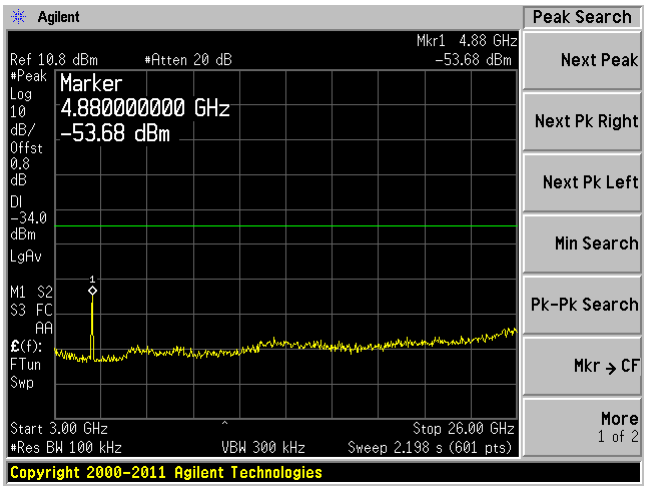


802.11n-HT40, Middle Channel, 2437 MHz

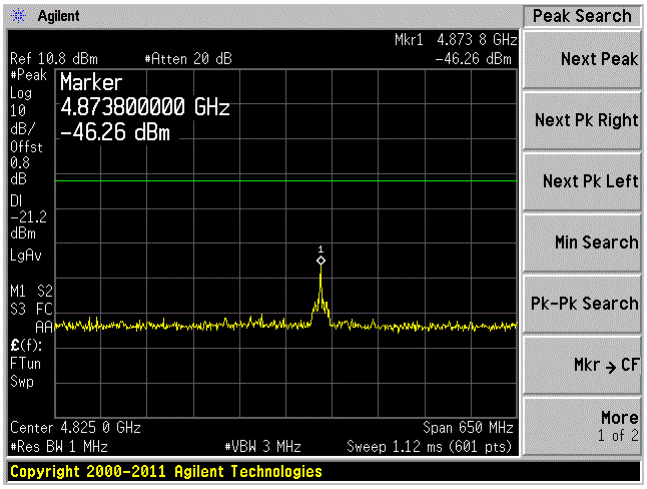
30 MHz – 3 GHz



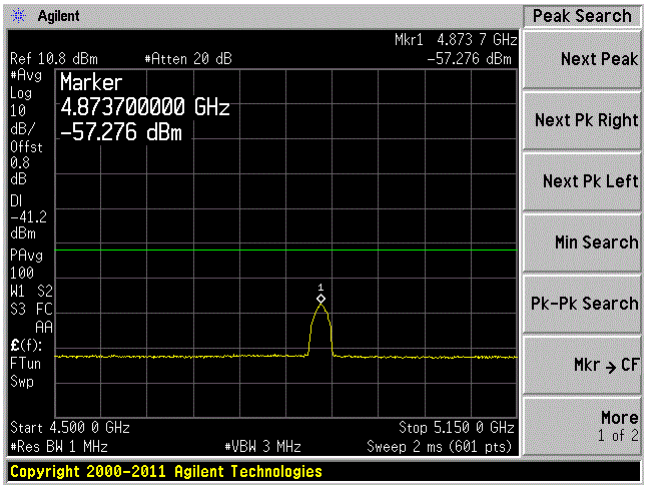
3 GHz – 26 GHz



4874 MHz 2nd Harmonic Peak

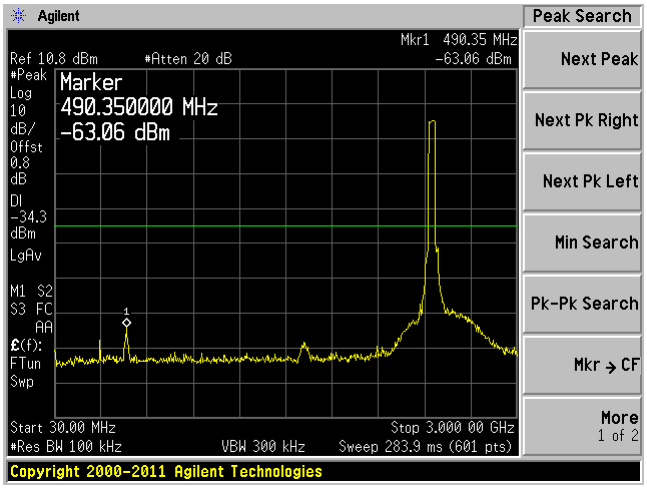


4874 2nd Harmonic Average

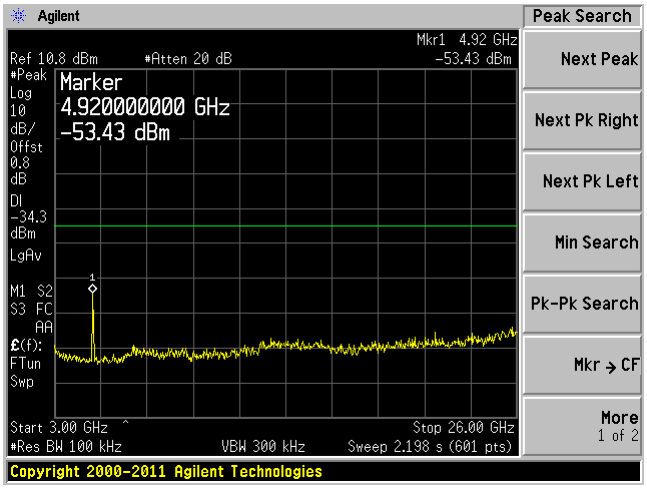


802.11n-HT40, High Channel, 2452 MHz

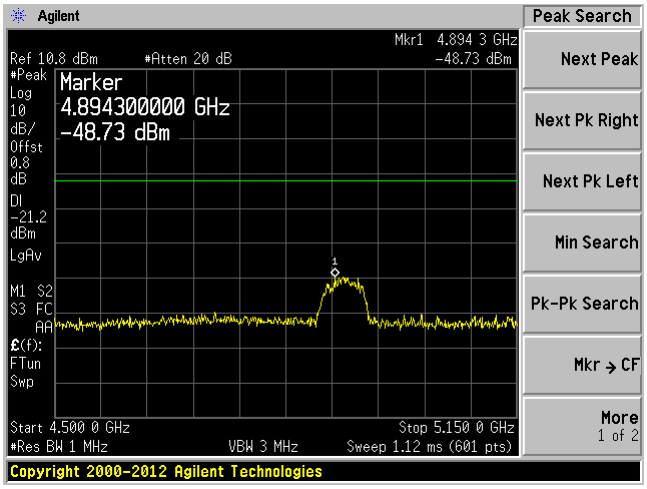
30 MHz – 3 GHz



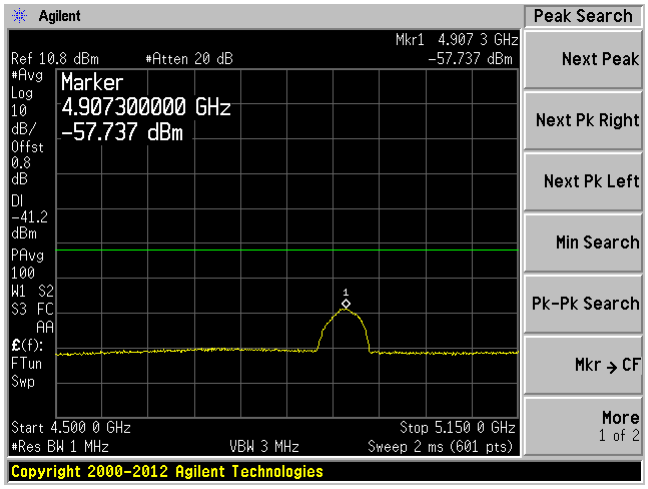
3 GHz – 26 GHz



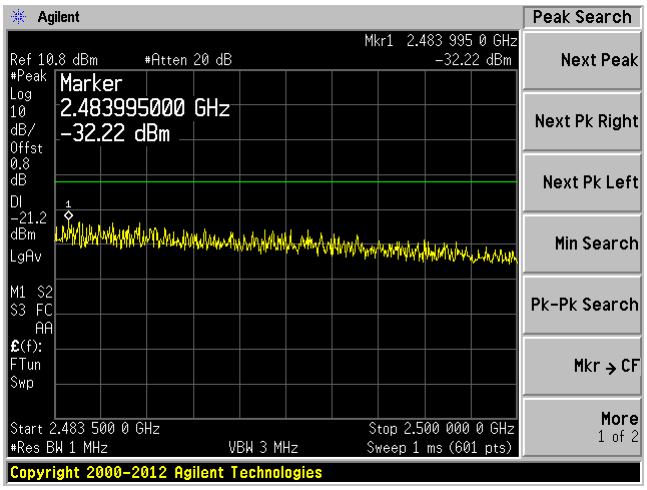
4904 MHz 2nd Harmonic Peak



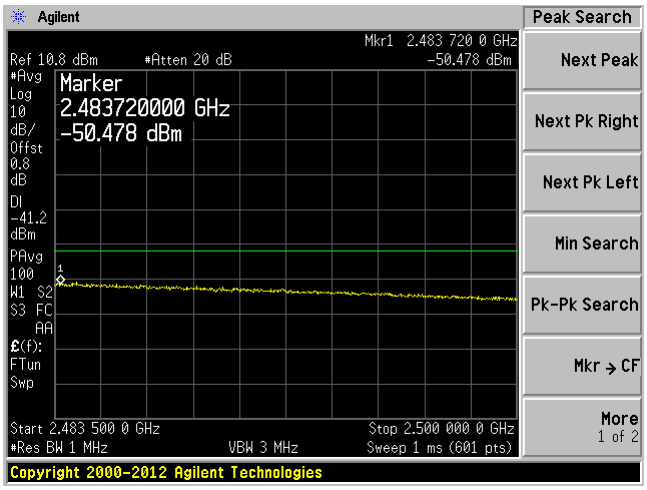
4904 2nd Harmonic Average



Restricted Band Edge Peak



Restricted Band Edge Average



8 FCC §15.205, §15.209 & §15.247(d) – 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).

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 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

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 11: Emissions in non-restricted frequency bands and section 12: Emissions in restricted frequency bands. As well as ANSI C63.4: 2009 as described below:

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

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

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 (+23.5dB) + 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

8.5 Test Equipment List and Details

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

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

8.6 Test Environmental Conditions

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

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

8.7 Summary of Test Results

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

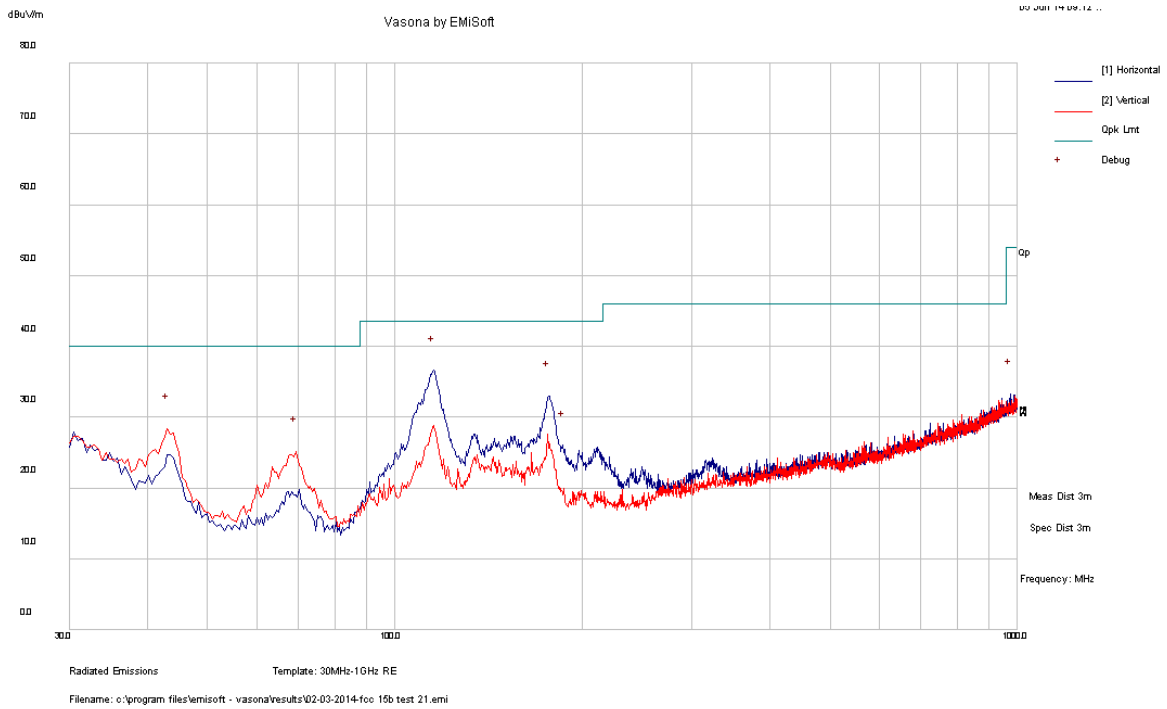
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-11.00	115.2198	Horizontal	802.11b, High

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

Note: EUT antenna port was terminated.

8.8 Radiated Emissions Test Data

1) 30 MHz-1 GHz, Measured at 3 meters, EUT antenna port was terminated



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
115.2198	32.5	281	H	340	43.5	-11.00
176.6048	28.32	220	H	248	43.5	-15.18
43.3165	21.98	100	V	360	40	-18.02
69.1625	19.84	125	V	282	40	-20.16
186.1205	20.61	199	H	264	43.5	-22.89
972.9595	17.31	251	H	110	54	-36.69

2) 1–25 GHz, Measured at 3 meters, EUT antenna port was terminated

802.11b mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2390	50.58	0	100	V	28.956	2.65	34.29	47.896	74	-26.104	Peak
2390	50.29	0	100	H	28.956	2.65	34.29	47.606	74	-26.394	Peak
2390	36.16	0	100	V	28.956	2.65	34.29	33.476	54	-20.524	Ave
2390	36.22	0	100	H	28.956	2.65	34.29	33.536	54	-20.464	Ave
4824	47.24	32	100	V	33.097	3.78	34.29	49.827	74	-24.173	Peak
4824	46.56	0	100	H	33.097	3.78	34.29	49.147	74	-24.853	Peak
4824	34.14	32	100	V	33.097	3.78	34.29	36.727	54	-17.273	Ave
4824	32.38	0	100	H	33.097	3.78	34.29	34.967	54	-19.033	Ave
7236	46.65	0	100	V	35.928	4.63	34.39	52.818	74	-21.182	Peak
7236	46.79	0	100	H	35.928	4.63	34.39	52.958	74	-21.042	Peak
7236	33.52	0	100	V	35.928	4.63	34.39	39.688	54	-14.312	Ave
7236	33.21	0	100	H	35.928	4.63	34.39	39.378	54	-14.622	Ave
9648	46.65	0	100	V	37.954	5.26	34.9	54.964	74	-19.036	Peak
9648	47.31	0	100	H	37.954	5.26	34.9	55.624	74	-18.376	Peak
9648	32.72	0	100	V	37.954	5.26	34.9	41.034	54	-12.966	Ave
9648	33.05	0	100	H	37.954	5.26	34.9	41.364	54	-12.636	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	47.38	0	100	V	33.327	3.78	34.29	50.197	74	-23.803	Peak
4874	46.79	0	100	H	33.327	3.78	34.29	49.607	74	-24.393	Peak
4874	32.23	0	100	V	33.327	3.78	34.29	35.047	54	-18.953	Ave
4874	31.85	0	100	H	33.327	3.78	34.29	34.667	54	-19.333	Ave
7311	46.99	0	100	V	36.369	4.63	34.42	53.569	74	-20.431	Peak
7311	46.95	0	100	H	36.369	4.63	34.42	53.529	74	-20.471	Peak
7311	31.65	0	100	V	36.369	4.63	34.42	38.229	54	-15.771	Ave
7311	31.34	0	100	H	36.369	4.63	34.42	37.919	54	-16.081	Ave
9748	47.64	0	100	V	38.087	5.26	34.85	56.137	74	-17.863	Peak
9748	47.48	0	100	H	38.087	5.26	34.85	55.977	74	-18.023	Peak
9748	32.57	0	100	V	38.087	5.26	34.85	41.067	54	-12.933	Ave
9748	33.12	0	100	H	38.087	5.26	34.85	41.617	54	-12.383	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2483.5	50.63	0	100	V	29.155	2.71	34.29	48.205	74	-25.795	Peak
2483.5	50.06	0	100	H	29.155	2.71	34.29	47.635	74	-26.365	Peak
2483.5	35.31	0	100	V	29.155	2.71	34.29	32.885	54	-21.115	Ave
2483.5	35.38	0	100	H	29.155	2.71	34.29	32.955	54	-21.045	Ave
4924	46.62	0	110	V	33.327	3.79	34.42	49.317	74	-24.683	Peak
4924	46.66	0	100	H	33.327	3.79	34.42	49.357	74	-24.643	Peak
4924	32.14	0	110	V	33.327	3.79	34.42	34.837	54	-19.163	Ave
4924	32.33	0	100	H	33.327	3.79	34.42	35.027	54	-18.973	Ave
7386	46.57	0	100	V	36.565	4.75	34.44	53.445	74	-20.555	Peak
7386	46.41	0	100	H	36.565	4.75	34.44	53.285	74	-20.715	Peak
7386	31.52	0	100	V	36.565	4.75	34.44	38.395	54	-15.605	Ave
7386	31.49	0	100	H	36.565	4.75	34.44	38.365	54	-15.635	Ave
9848	47.25	0	100	V	38.287	5.35	34.84	56.047	74	-17.953	Peak
9848	48.23	0	100	H	38.287	5.35	34.84	57.027	74	-16.973	Peak
9848	32.17	0	100	V	38.287	5.35	34.84	40.967	54	-13.033	Ave
9848	32.15	0	100	H	38.287	5.35	34.84	40.947	54	-13.053	Ave

Note: Worst modulation was chosen between 802.11g and 802.11n HT20 since they have similar modulation.

802.11g mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz, measured at 3 meters											
2390	50.05	0	100	V	28.956	2.65	34.29	47.366	74	-26.634	Peak
2390	50.69	0	100	H	28.956	2.65	34.29	48.006	74	-25.994	Peak
2390	35.59	0	100	V	28.956	2.65	34.29	32.906	54	-21.094	Ave
2390	35.67	0	100	H	28.956	2.65	34.29	32.986	54	-21.014	Ave
4824	45.95	60	100	V	33.097	3.78	34.29	48.537	74	-25.463	Peak
4824	46.45	0	100	H	33.097	3.78	34.29	49.037	74	-24.963	Peak
4824	31.31	60	100	V	33.097	3.78	34.29	33.897	54	-20.103	Ave
4824	31.46	0	100	H	33.097	3.78	34.29	34.047	54	-19.953	Ave
7236	46.33	0	100	V	35.928	4.63	34.39	52.498	74	-21.502	Peak
7236	46.14	0	100	H	35.928	4.63	34.39	52.308	74	-21.692	Peak
7236	31.24	0	100	V	35.928	4.63	34.39	37.408	54	-16.592	Ave
7236	31.25	0	100	H	35.928	4.63	34.39	37.418	54	-16.582	Ave
9648	47.13	0	100	V	37.954	5.26	34.9	55.444	74	-18.556	Peak
9648	47.87	0	100	H	37.954	5.26	34.9	56.184	74	-17.816	Peak
9648	32.15	0	100	V	37.954	5.26	34.9	40.464	54	-13.536	Ave
9648	32.15	0	100	H	37.954	5.26	34.9	40.464	54	-13.536	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	46.42	0	100	V	33.327	3.78	34.29	49.237	74	-24.763	Peak
4874	46.07	0	100	H	33.327	3.78	34.29	48.887	74	-25.113	Peak
4874	31.04	0	100	V	33.327	3.78	34.29	33.857	54	-20.143	Ave
4874	30.97	0	100	H	33.327	3.78	34.29	33.787	54	-20.213	Ave
7311	46.26	0	100	V	36.369	4.63	34.42	52.839	74	-21.161	Peak
7311	45.86	0	100	H	36.369	4.63	34.42	52.439	74	-21.561	Peak
7311	31.25	0	100	V	36.369	4.63	34.42	37.829	54	-16.171	Ave
7311	31.35	0	100	H	36.369	4.63	34.42	37.929	54	-16.071	Ave
9748	47.29	0	100	V	38.087	5.26	34.85	55.787	74	-18.213	Peak
9748	48.57	0	100	H	38.087	5.26	34.85	57.067	74	-16.933	Peak
9748	32.02	0	100	V	38.087	5.26	34.85	40.517	54	-13.483	Ave
9748	33.62	0	100	H	38.087	5.26	34.85	42.117	54	-11.883	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz, measured at 3 meters											
2483.5	50.38	0	100	V	29.155	2.71	34.29	47.955	74	-26.045	Peak
2483.5	50.57	0	100	H	29.155	2.71	34.29	48.145	74	-25.855	Peak
2483.5	35.41	0	100	V	29.155	2.71	34.29	32.985	54	-21.015	Ave
2483.5	35.3	0	100	H	29.155	2.71	34.29	32.875	54	-21.125	Ave
4924	46.56	0	100	V	33.327	3.79	34.42	49.257	74	-24.743	Peak
4924	46.59	0	100	H	33.327	3.79	34.42	49.287	74	-24.713	Peak
4924	31.24	0	100	V	33.327	3.79	34.42	33.937	54	-20.063	Ave
4924	31.36	0	100	H	33.327	3.79	34.42	34.057	54	-19.943	Ave
7386	46.17	0	100	V	36.565	4.75	34.44	53.045	74	-20.955	Peak
7386	46.26	0	100	H	36.565	4.75	34.44	53.135	74	-20.865	Peak
7386	31.44	0	100	V	36.565	4.75	34.44	38.315	54	-15.685	Ave
7386	31.52	0	100	H	36.565	4.75	34.44	38.395	54	-15.605	Ave
9848	47.46	0	100	V	38.287	5.35	34.84	56.257	74	-17.743	Peak
9848	47.34	0	100	H	38.287	5.35	34.84	56.137	74	-17.863	Peak
9848	32.65	0	100	V	38.287	5.35	34.84	41.447	54	-12.553	Ave
9848	32.54	0	100	H	38.287	5.35	34.84	41.337	54	-12.663	Ave

802.11n-HT40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2422 MHz, measured at 3 meters											
2390	51.13	0	100	V	28.956	2.65	34.29	48.446	74	-25.554	Peak
2390	50.83	0	100	H	28.956	2.65	34.29	48.146	74	-25.854	Peak
2390	36.93	0	100	V	28.956	2.65	34.29	34.246	54	-19.754	Ave
2390	36.94	0	100	H	28.956	2.65	34.29	34.256	54	-19.744	Ave
4844	48.17	0	100	V	33.097	3.78	34.33	50.717	74	-23.283	Peak
4844	47.89	0	100	H	33.097	3.78	34.33	50.437	74	-23.563	Peak
4844	35.03	0	100	V	33.097	3.78	34.33	37.577	54	-16.423	Ave
4844	32.94	0	100	H	33.097	3.78	34.33	35.487	54	-18.513	Ave
7266	47.69	0	100	V	35.928	4.63	34.39	53.858	74	-20.142	Peak
7266	47.09	0	100	H	35.928	4.63	34.39	53.258	74	-20.742	Peak
7266	33.57	0	100	V	35.928	4.63	34.39	39.738	54	-14.262	Ave
7266	33.3	0	100	H	35.928	4.63	34.39	39.468	54	-14.532	Ave
9688	47.66	0	103	V	37.954	5.26	34.87	56.004	74	-17.996	Peak
9688	47.66	0	100	H	37.954	5.26	34.87	56.004	74	-17.996	Peak
9688	33.56	0	103	V	37.954	5.26	34.87	41.904	54	-12.096	Ave
9688	33.41	0	100	H	37.954	5.26	34.87	41.754	54	-12.246	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	46.54	0	100	V	33.327	3.78	34.33	49.317	74	-24.683	Peak
4874	47.63	0	100	H	33.327	3.78	34.33	50.407	74	-23.593	Peak
4874	32.58	0	100	V	33.327	3.78	34.33	35.357	54	-18.643	Ave
4874	32.53	0	100	H	33.327	3.78	34.33	35.307	54	-18.693	Ave
7311	47.02	0	100	V	36.369	4.63	34.42	53.599	74	-20.401	Peak
7311	47.89	0	100	H	36.369	4.63	34.42	54.469	74	-19.531	Peak
7311	32.73	0	100	V	36.369	4.63	34.42	39.309	54	-14.691	Ave
7311	32.86	0	100	H	36.369	4.63	34.42	39.439	54	-14.561	Ave
9748	48.22	0	101	V	38.087	5.26	34.85	56.717	74	-17.283	Peak
9748	48.77	0	100	H	38.087	5.26	34.85	57.267	74	-16.733	Peak
9748	33.48	0	101	V	38.087	5.26	34.85	41.977	54	-12.023	Ave
9748	33.99	0	100	H	38.087	5.26	34.85	42.487	54	-11.513	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2452 MHz, measured at 3 meters											
2483.5	51.37	0	100	V	29.155	2.71	34.29	48.945	74	-25.055	Peak
2483.5	51.21	0	100	H	29.155	2.71	34.29	48.785	74	-25.215	Peak
2483.5	35.77	0	100	V	29.155	2.71	34.29	33.345	54	-20.655	Ave
2483.5	37.14	0	100	H	29.155	2.71	34.29	34.715	54	-19.285	Ave
4904	48.58	0	113	V	33.327	3.79	34.42	51.277	74	-22.723	Peak
4904	47.71	0	100	H	33.327	3.79	34.42	50.407	74	-23.593	Peak
4904	33.21	0	113	V	33.327	3.79	34.42	35.907	54	-18.093	Ave
4904	33.46	0	100	H	33.327	3.79	34.42	36.157	54	-17.843	Ave
7356	48.08	0	100	V	36.565	4.75	34.43	54.965	74	-19.035	Peak
7356	47.65	0	100	H	36.565	4.75	34.43	54.535	74	-19.465	Peak
7356	32.99	0	100	V	36.565	4.75	34.43	39.875	54	-14.125	Ave
7356	32.59	0	100	H	36.565	4.75	34.43	39.475	54	-14.525	Ave
9808	48.4	0	102	V	38.287	5.35	34.85	57.187	74	-16.813	Peak
9808	49.18	0	100	H	38.287	5.35	34.85	57.967	74	-16.033	Peak
9808	33.53	0	102	V	38.287	5.35	34.85	42.317	54	-11.683	Ave
9808	32.27	0	100	H	38.287	5.35	34.85	41.057	54	-12.943	Ave

9 FCC§15.247(a)(2) – 6 dB Emission Bandwidth

9.1 Applicable Standard

According to FCC §15.247(a)(2), 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

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

9.3 Test Equipment List and Details

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

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

9.4 Test Environmental Conditions

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

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

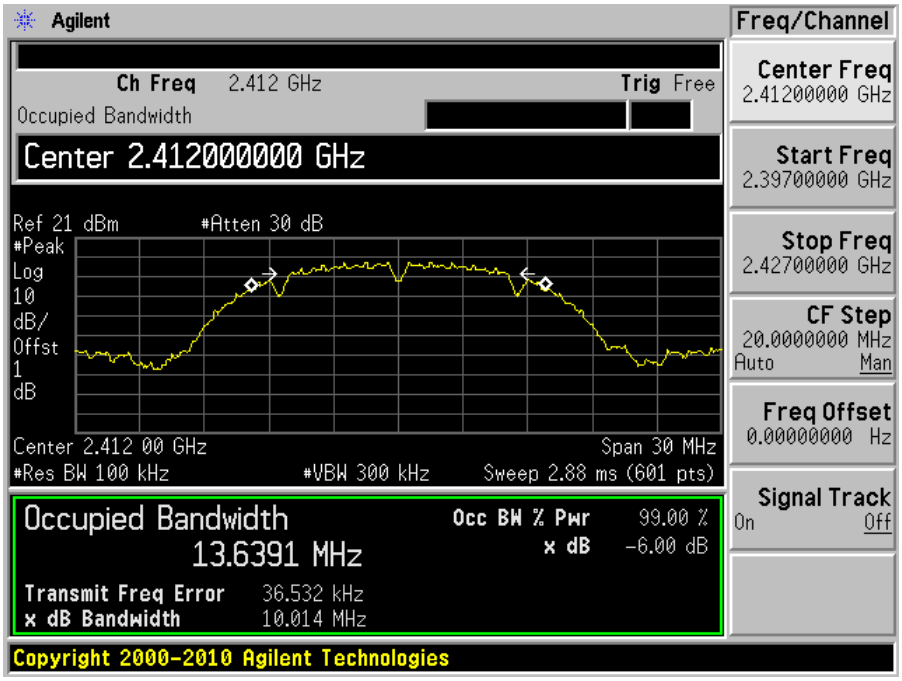
9.5 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
802.11 b mode					
Low	2412	10.014	13.6391	> 0.5	Compliant
Middle	2437	9.995	13.6573	> 0.5	Compliant
High	2462	9.958	13.5986	> 0.5	Compliant
802.11 g mode					
Low	2412	16.544	16.4669	> 0.5	Compliant
Middle	2437	16.602	16.4671	> 0.5	Compliant
High	2462	16.617	16.4765	> 0.5	Compliant
802.11n-HT20 mode					
Low	2412	16.589	16.4614	> 0.5	Compliant
Middle	2437	16.595	16.4720	> 0.5	Compliant
High	2462	16.621	16.4783	> 0.5	Compliant
802.11n-HT40 mode					
Low	2422	36.2382	36.615	> 0.5	Compliant
Middle	2437	36.2501	36.625	> 0.5	Compliant
High	2452	36.601	36.2215	> 0.5	Compliant

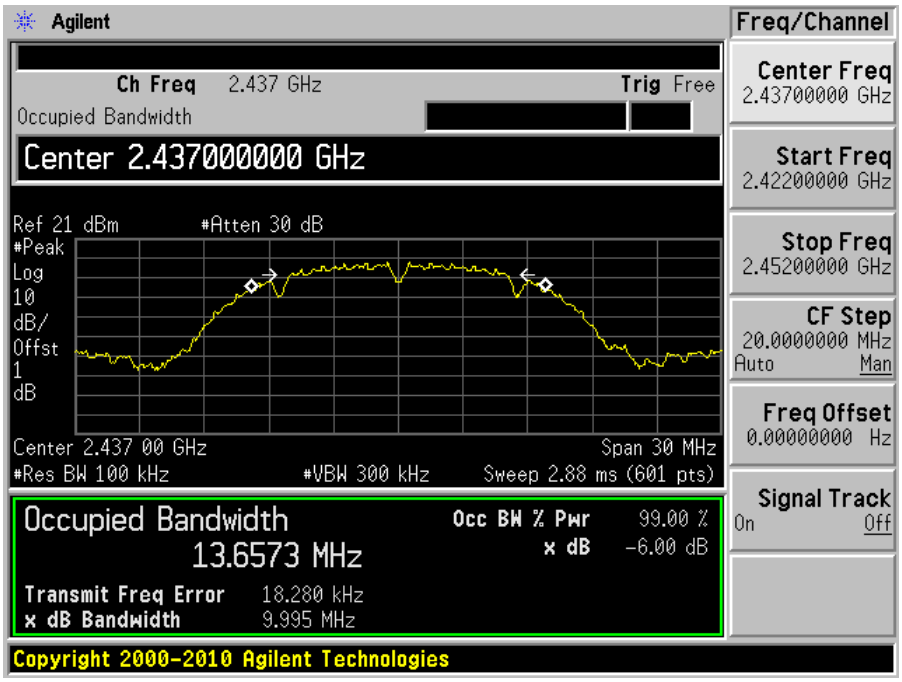
Please refer to the following plots for detailed test results.

802.11b mode

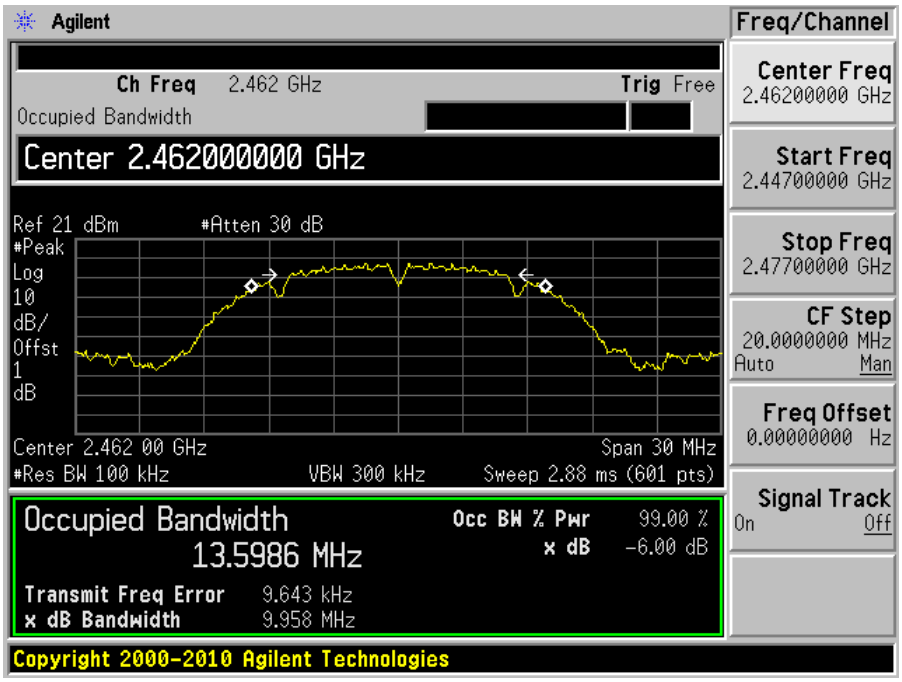
Low channel: 2412 MHz



Middle channel: 2437 MHz

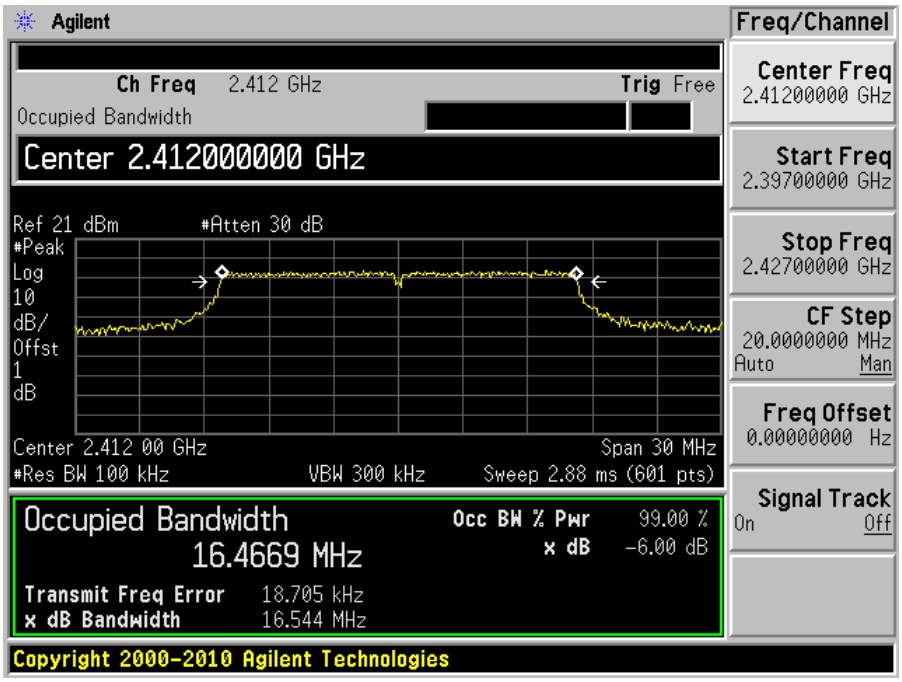


High channel: 2462 MHz

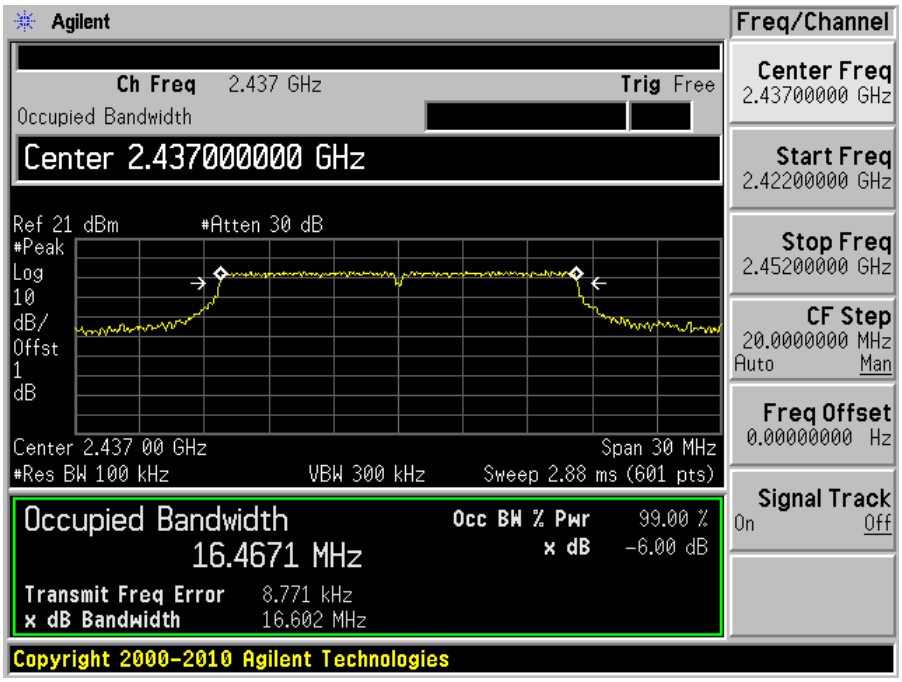


802.11g mode

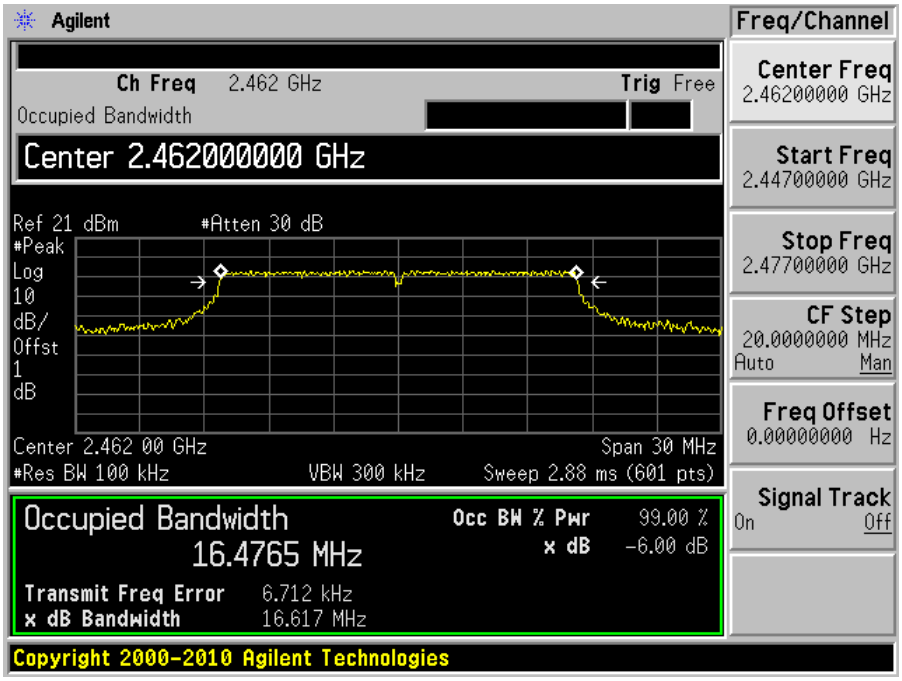
Low channel: 2412 MHz



Middle channel: 2437 MHz

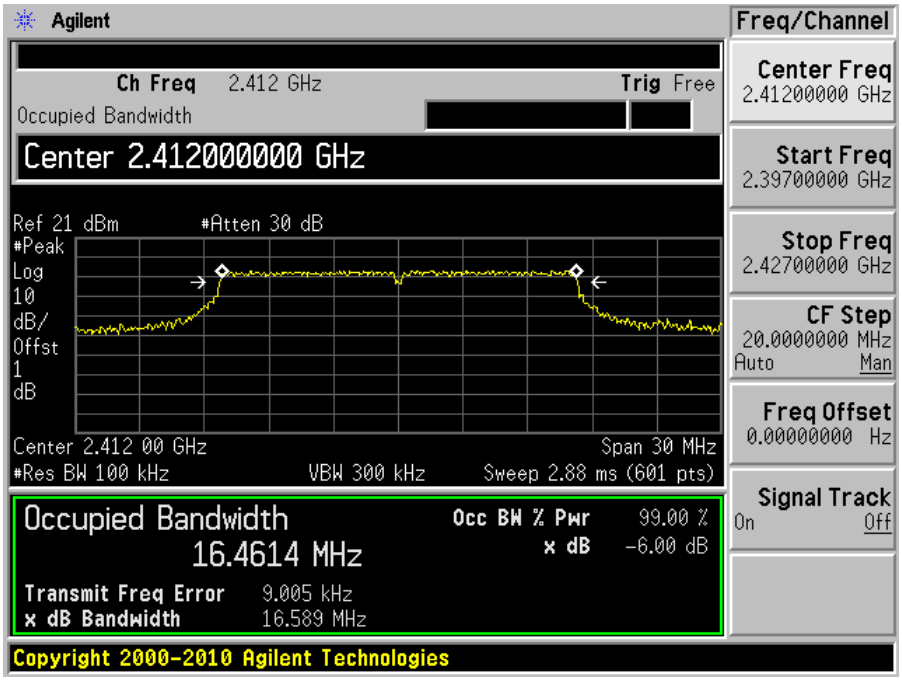


High channel: 2462 MHz

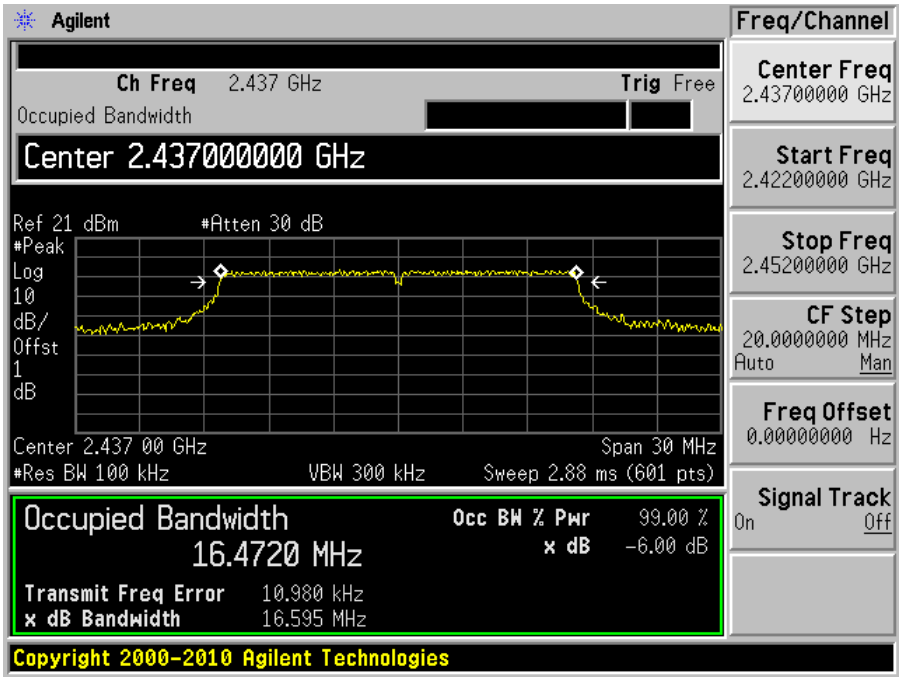


802.11n-HT20 mode

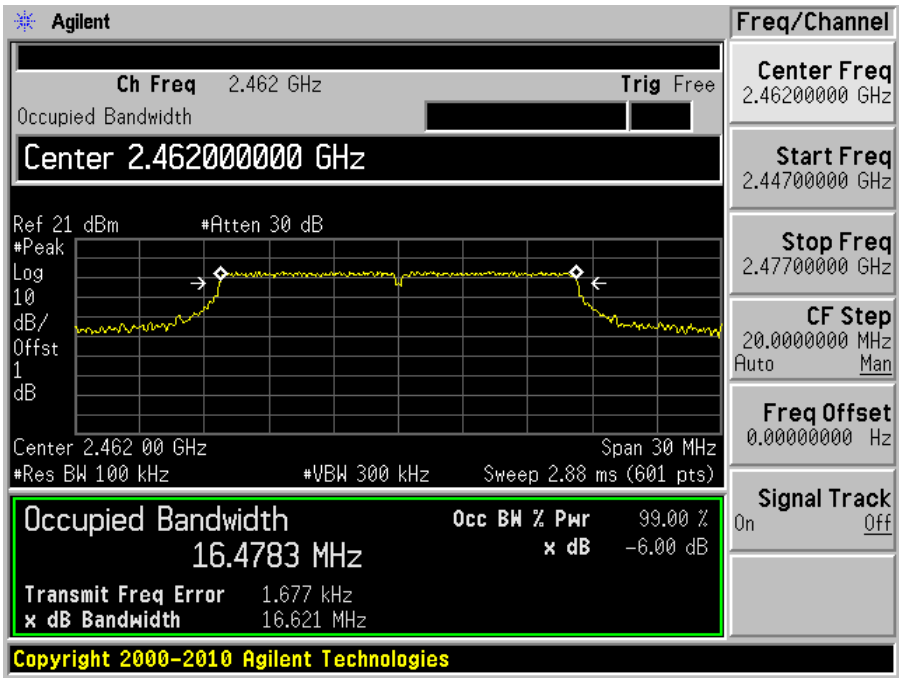
Low channel: 2412 MHz



Middle channel: 2437 MHz

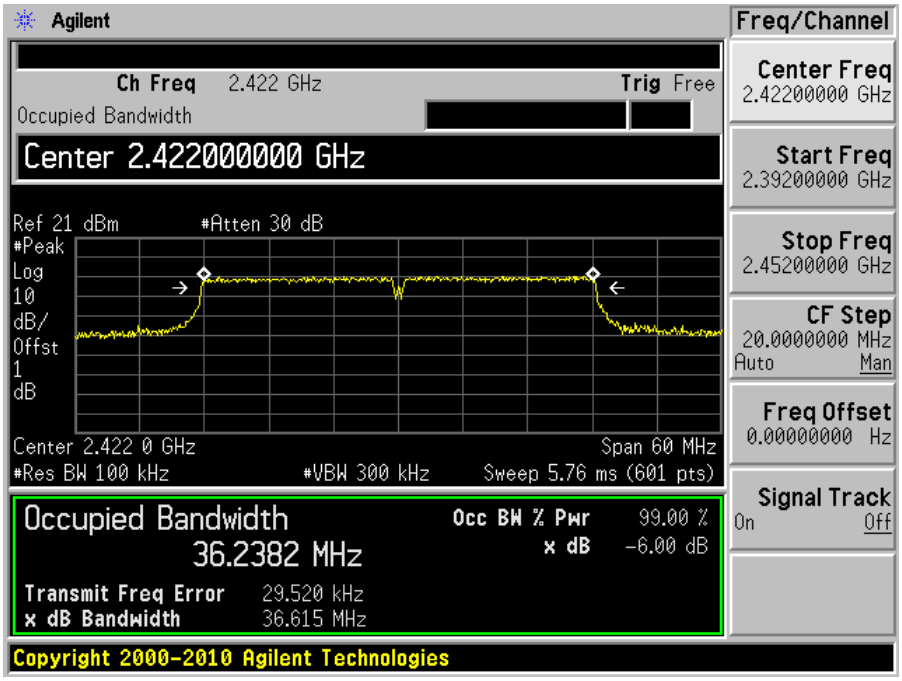


High channel: 2462 MHz

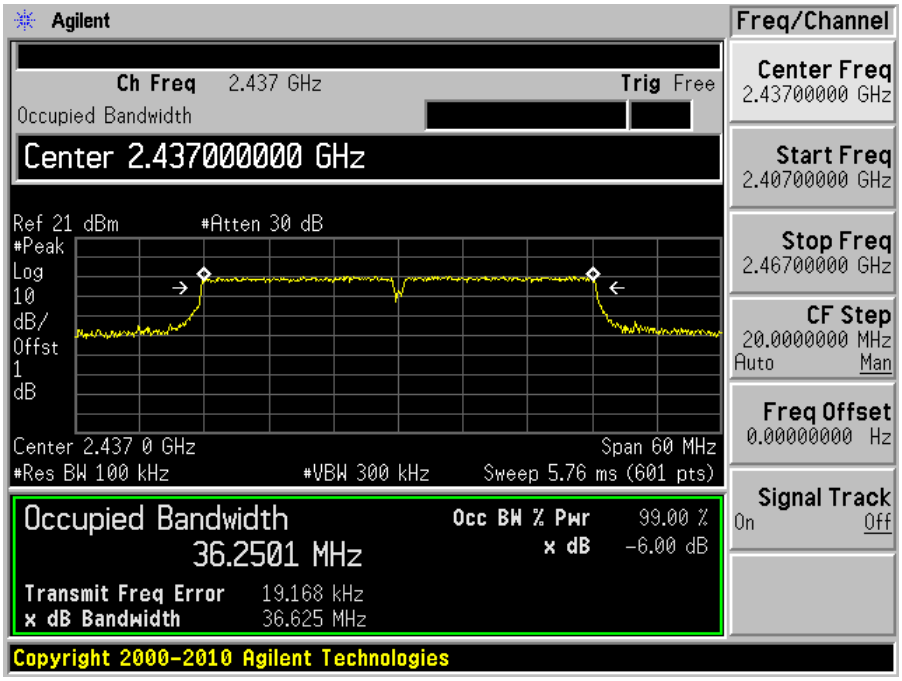


802.11n-HT40 mode

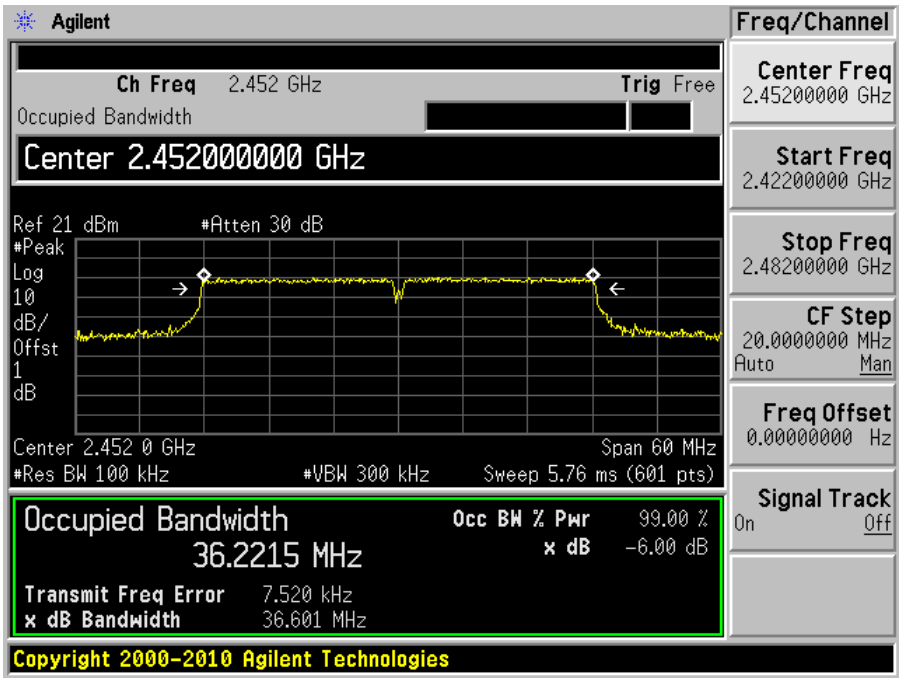
Low channel: 2422 MHz



Middle channel: 2437 MHz



High channel: 2452 MHz



10 FCC §15.247(b) – Output Power

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

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power

10.3 Test Equipment List and Details

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

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

10.4 Test Environmental Conditions

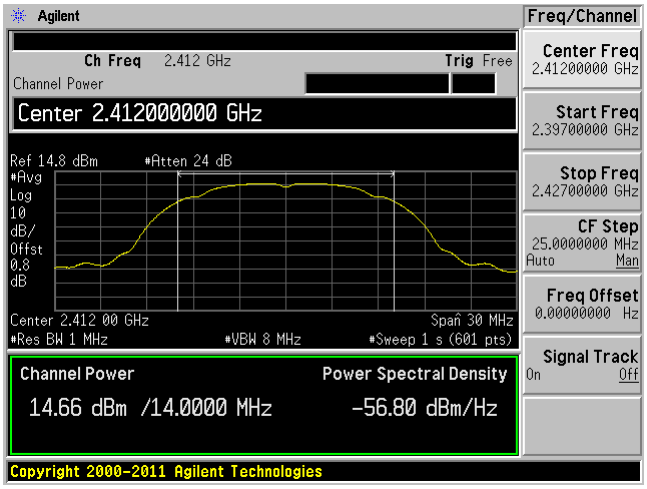
Temperature:	23 °C
Relative Humidity:	46 %
ATM Pressure:	101.65 kPa

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

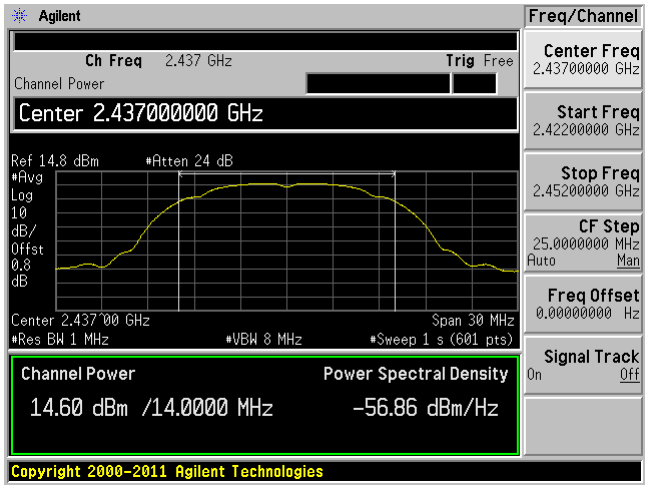
10.5 Test Results

Mode	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
802.11b	2412	14.66	30	-15.34	14
	2437	14.6	30	-15.4	14
	2462	14.52	30	-15.48	14
802.11g	2412	13.91	30	-16.09	14
	2437	14.00	30	-16.00	14
	2462	13.53	30	-16.47	14
802.11n-HT20	2412	13.52	30	-16.48	14
	2437	14.08	30	-15.92	14
	2462	13.55	30	-16.45	14
802.11n-HT40	2422	13.69	30	-16.31	14
	2437	14.51	30	-15.49	14
	2452	13.79	30	-16.21	14

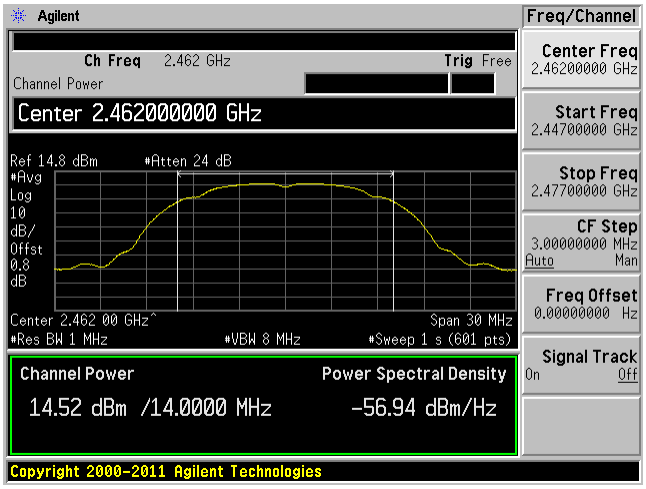
802.11b Low Channel



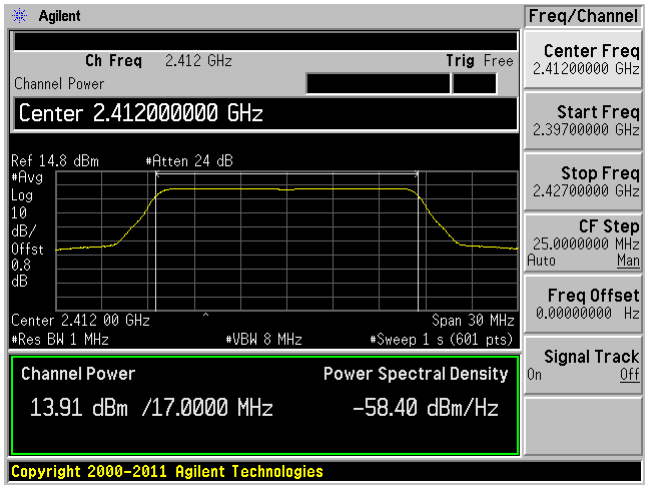
802.11b Middle Channel



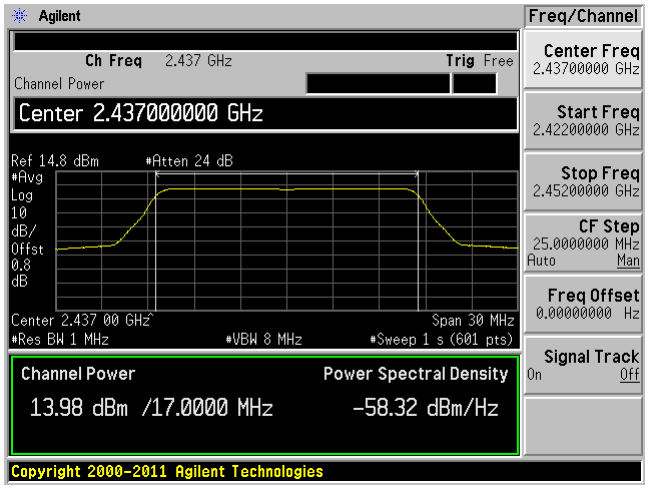
802.11b High Channel



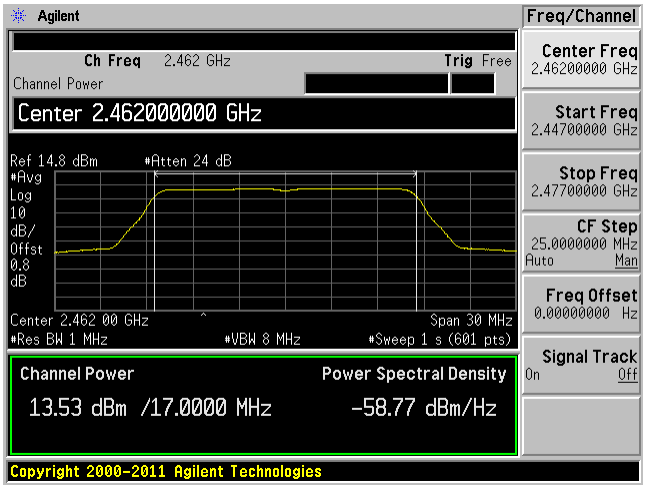
802.11g Low Channel



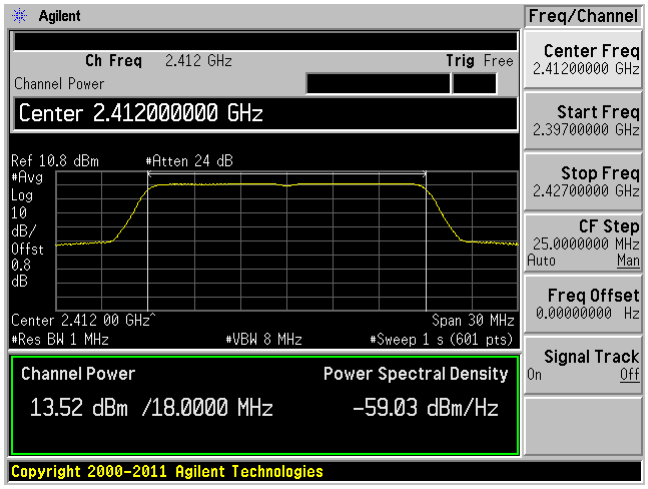
802.11g Middle Channel



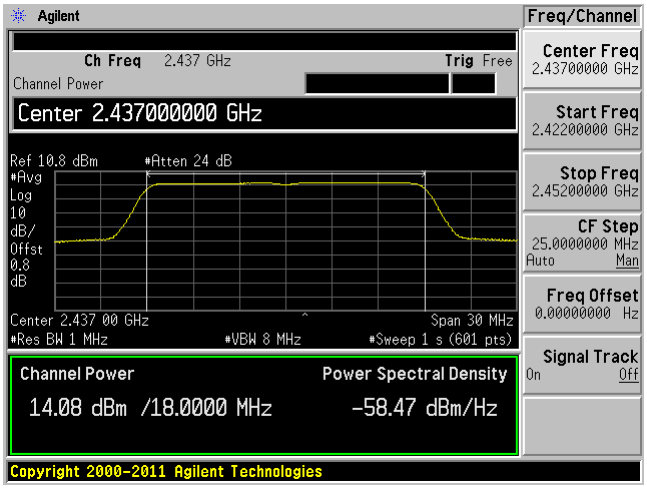
802.11g High Channel



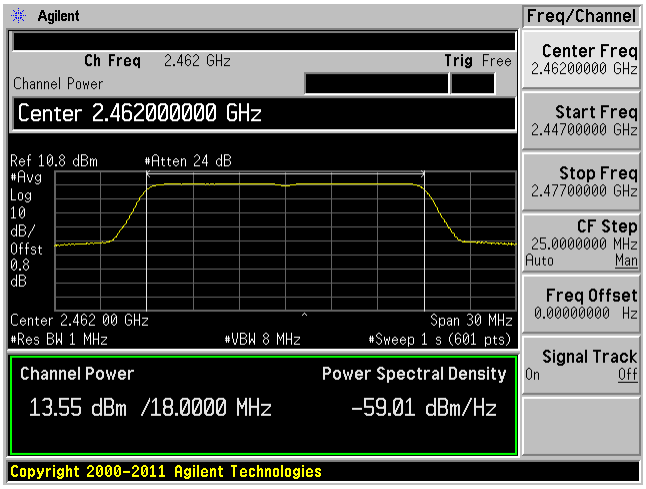
802.11n HT20 Low Channel



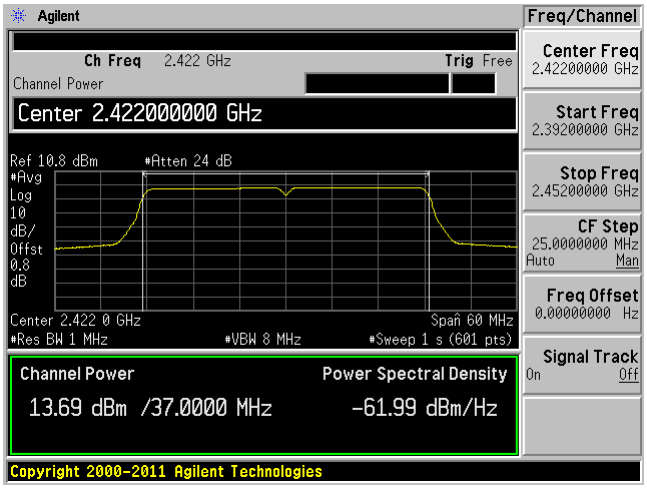
802.11n HT20 Middle Channel



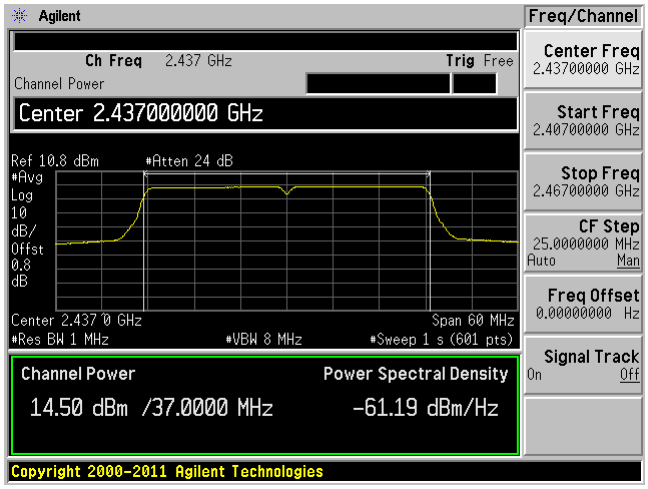
802.11n HT20 High Channel



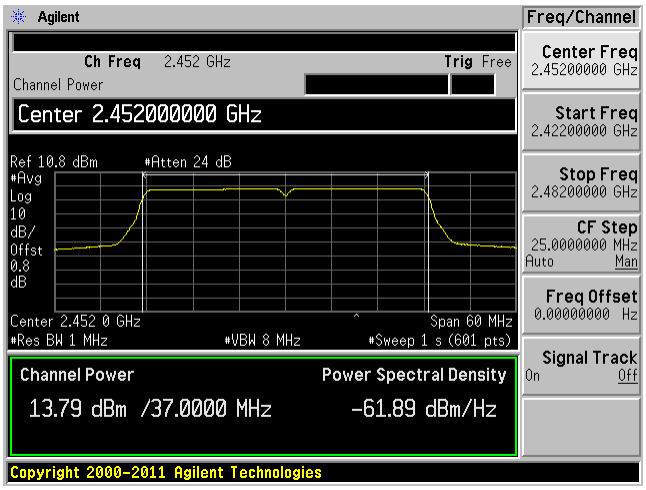
802.11n HT40 Low Channel



802.11n HT40 Middle Channel



802.11n HT40 High Channel



11 FCC §15.247(d) – 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).

11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

11.3 Test Equipment List and Details

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

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

11.4 Test Environmental Conditions

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

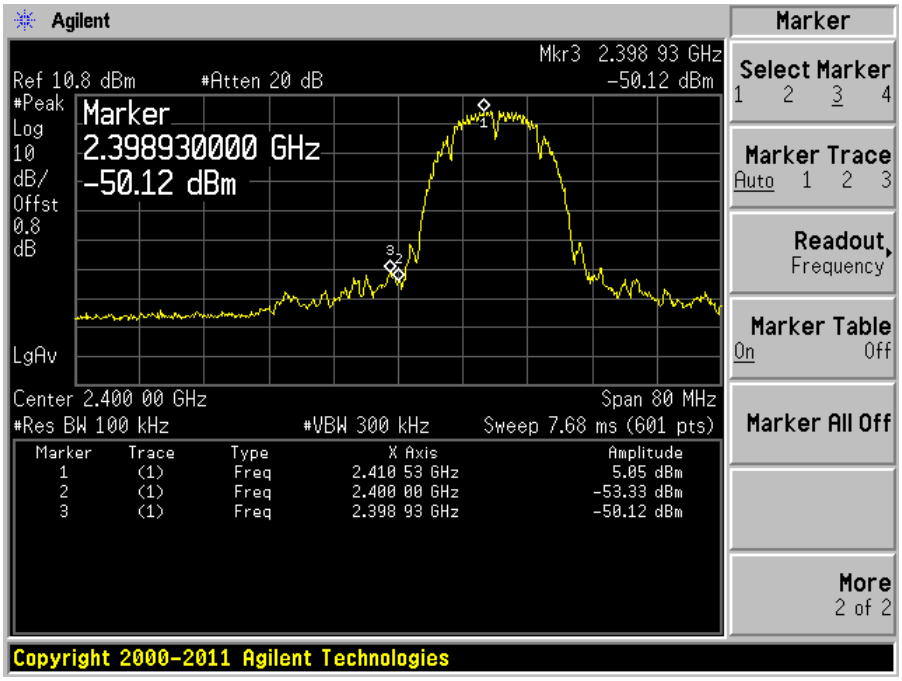
The testing was performed by Chen Ge on 2014-06-13 in the RF site.

11.5 Test Results

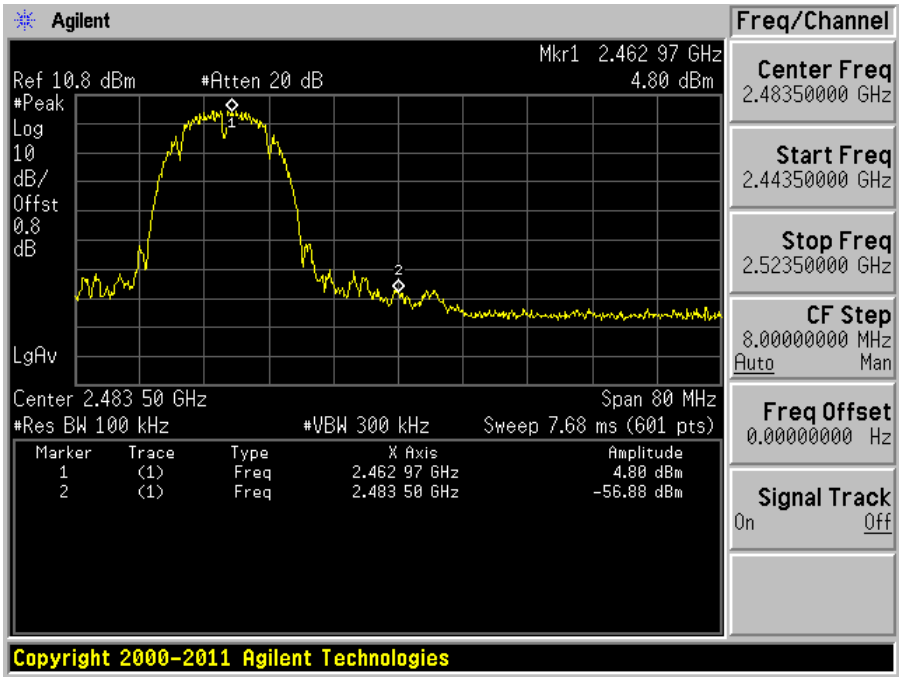
Please refer to following pages for plots of band edge.

802.11b mode

Low channel: 2412 MHz

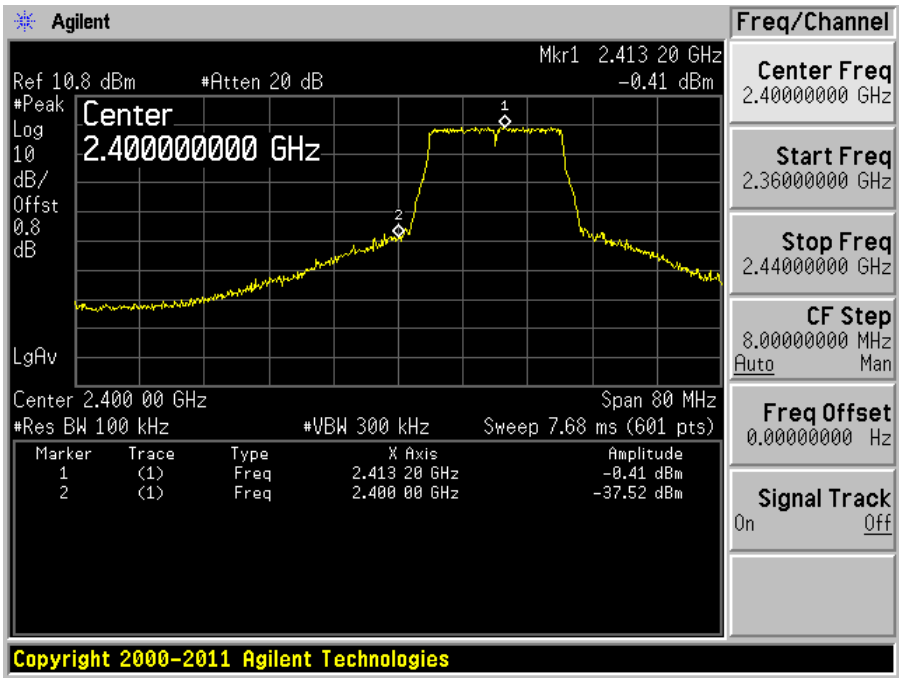


High channel: 2462 MHz

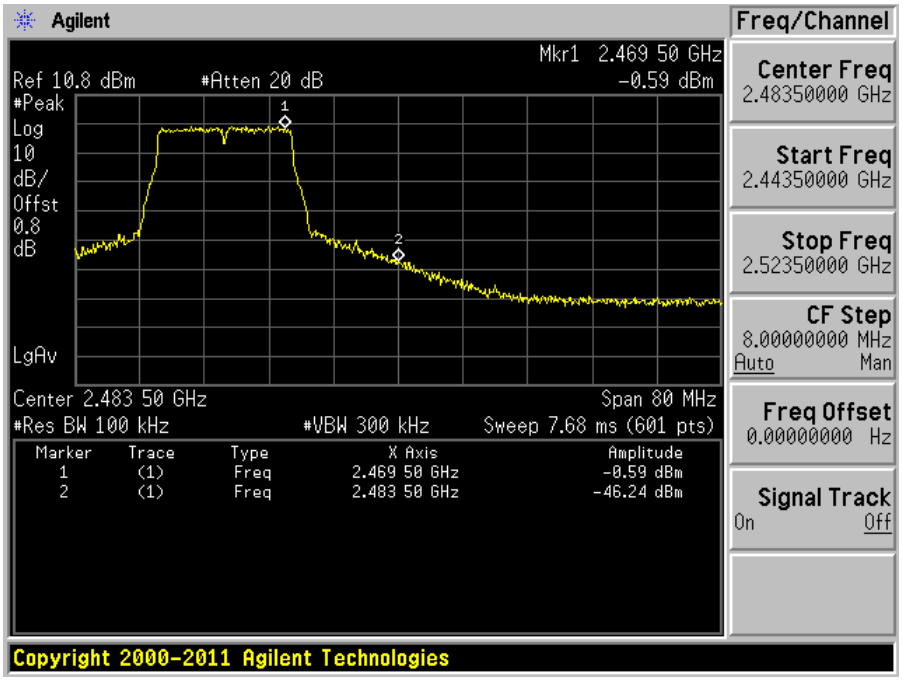


802.11g mode

Low channel: 2412 MHz

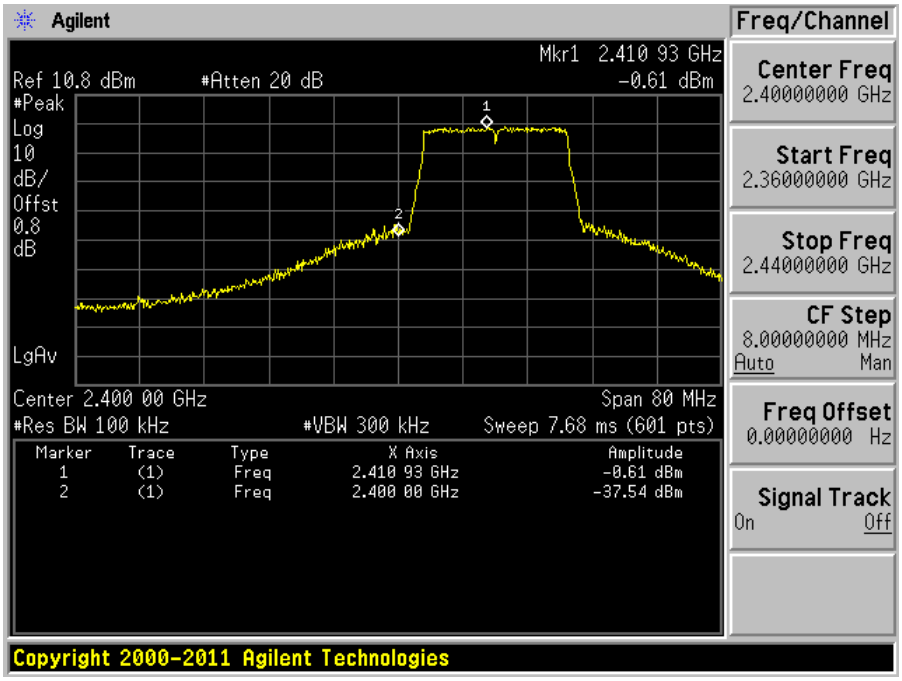


High channel: 2462 MHz

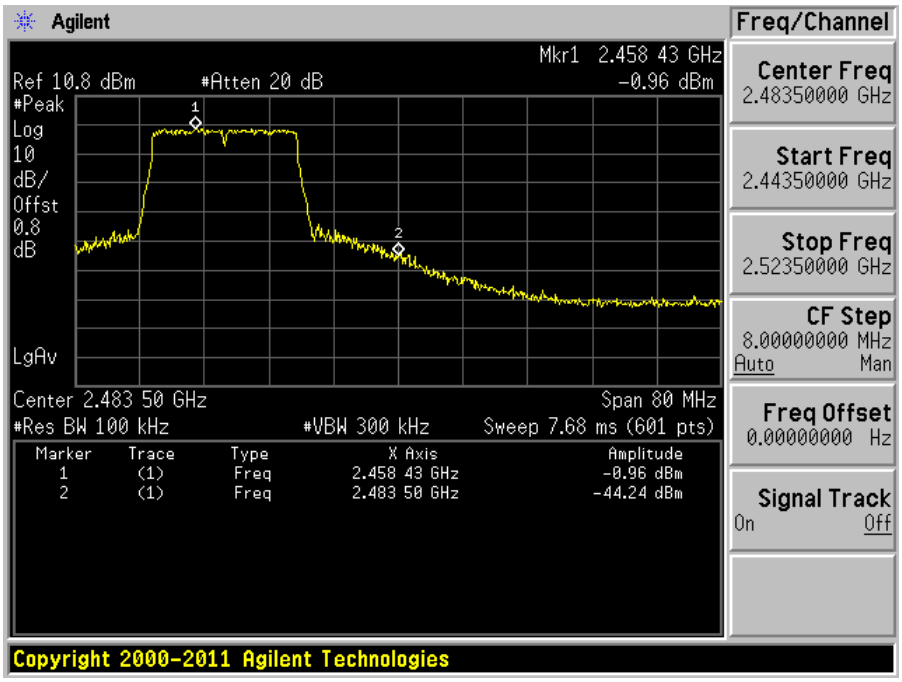


802.11n-HT20 mode

Low channel: 2412 MHz

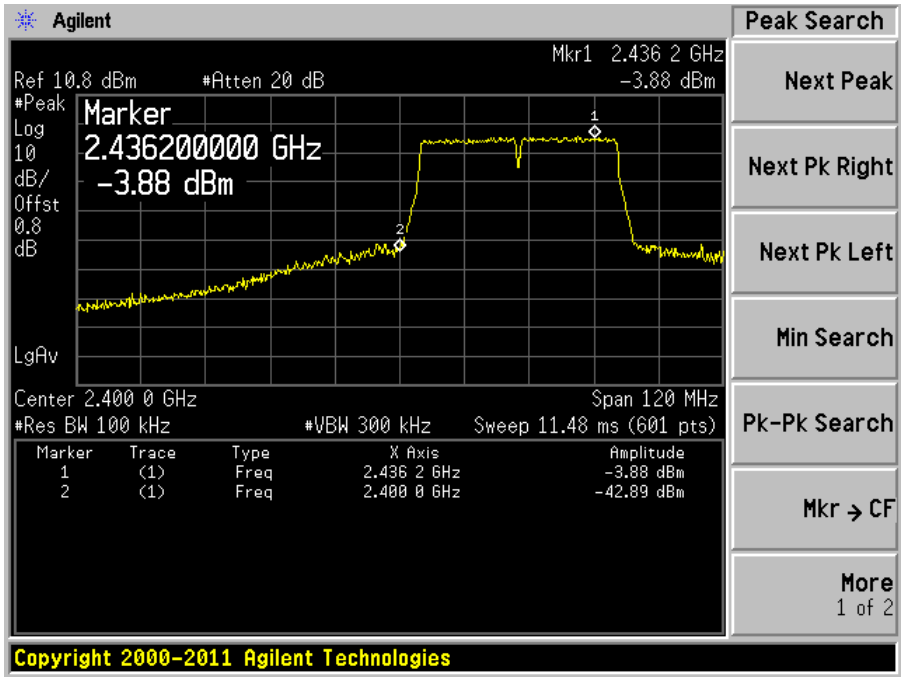


High channel: 2462 MHz

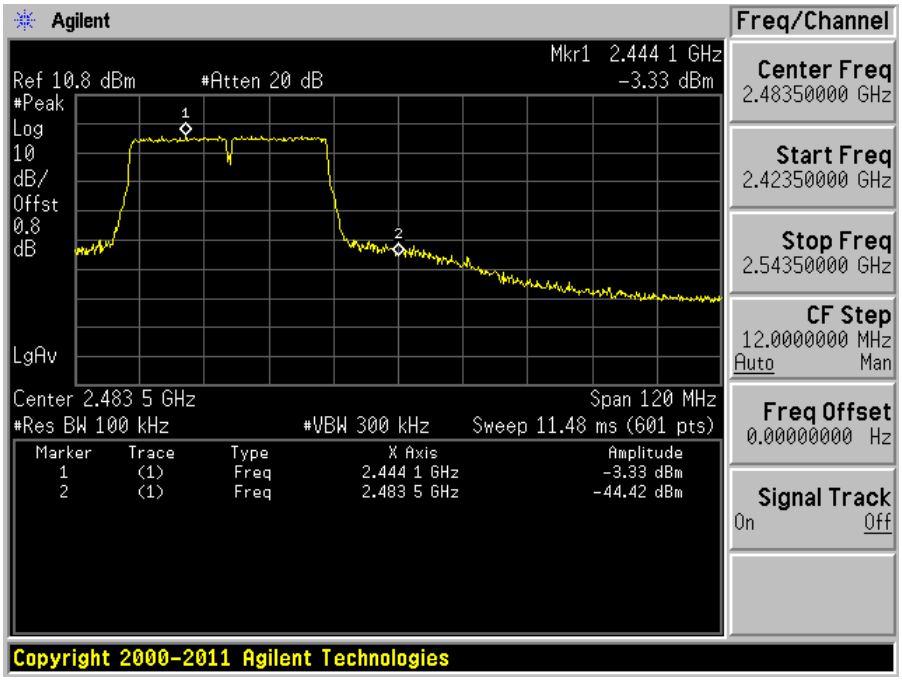


802.11n-HT40 mode

Low channel: 2422 MHz



High channel: 2452 MHz



12 FCC §15.247(e) – Power Spectral Density

12.1 Applicable Standard

According to FCC §15.247(e), 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

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission

12.3 Test Equipment List and Details

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

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

12.4 Test Environmental Conditions

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

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

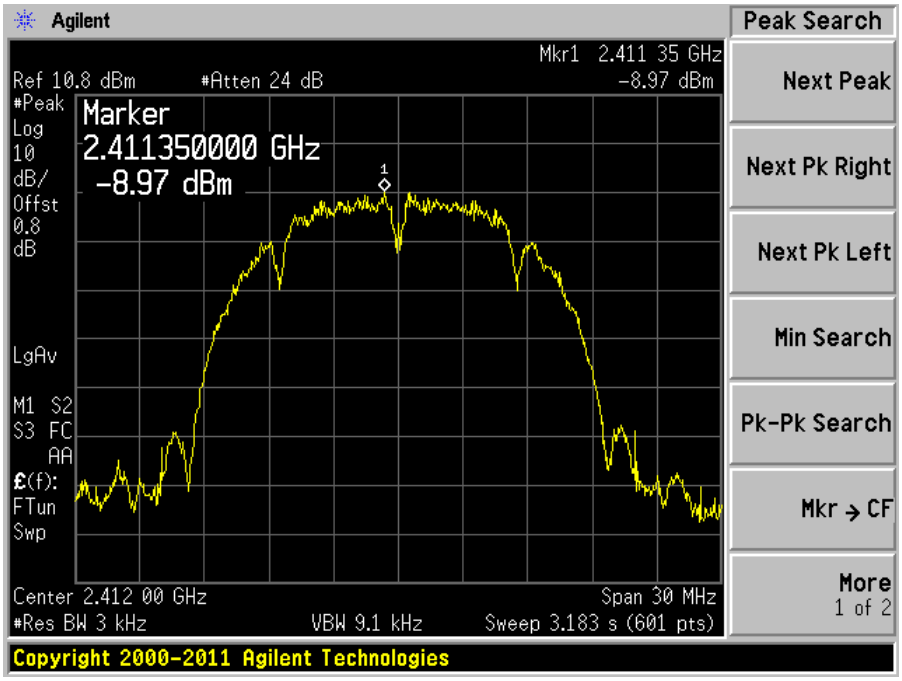
12.5 Test Results

Mode	Frequency (MHz)	PSD (dBm)	Limit (dBm)
802.11b	2412	-8.97	8
	2437	-9.01	8
	2462	-9.11	8
802.11g	2412	-12.44	8
	2437	-12.73	8
	2462	-13.41	8
802.11n-HT20	2412	-11.26	8
	2437	-11.79	8
	2462	-12.07	8
802.11n-HT40	2422	-15.52	8
	2437	-14.54	8
	2452	-15.28	8

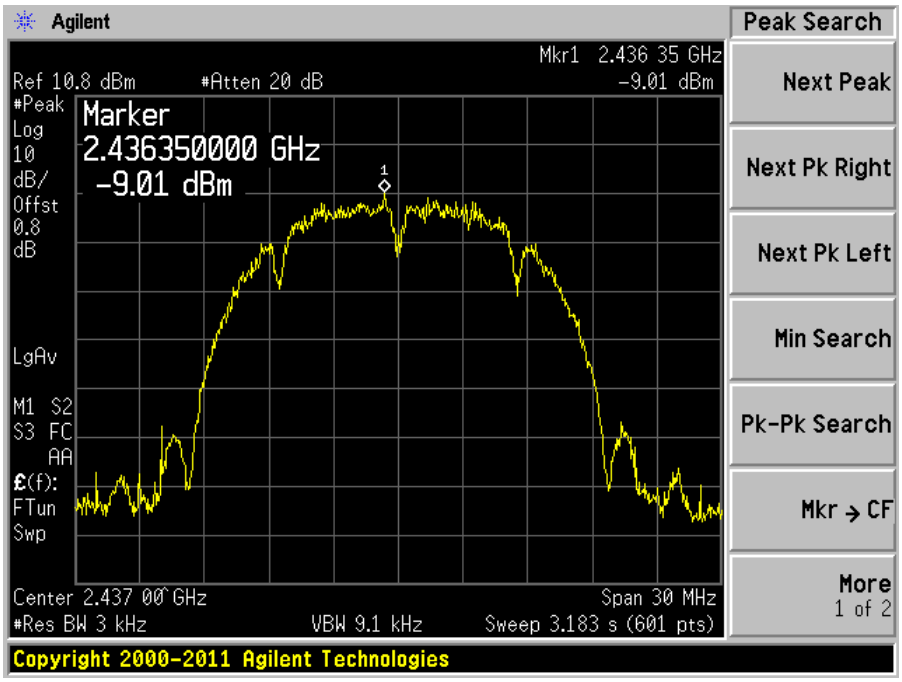
Please refer to the following plots for detailed test results:

802.11b mode

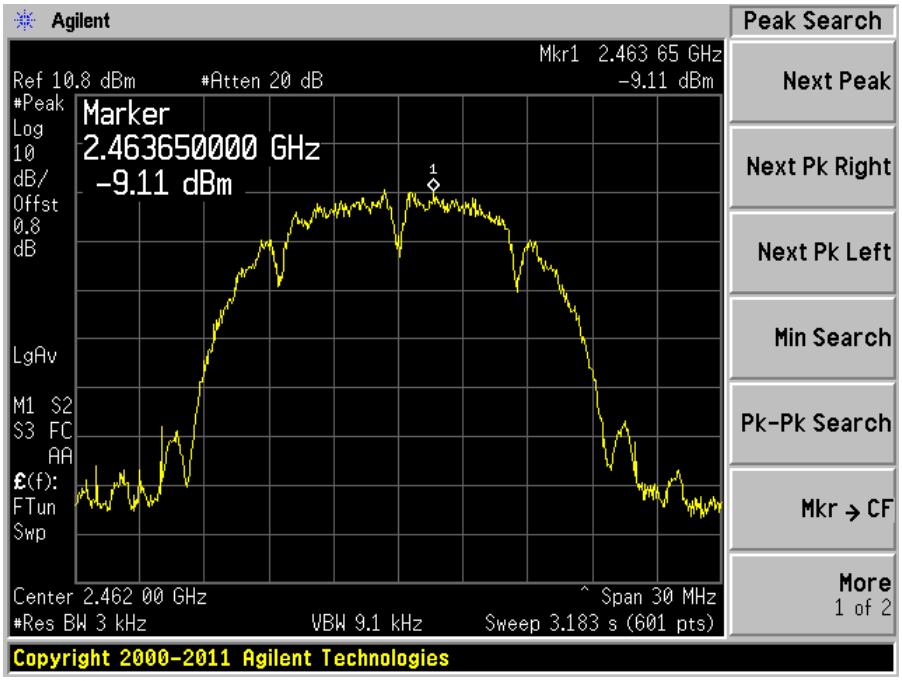
Low channel: 2412 MHz



Middle channel: 2437 MHz

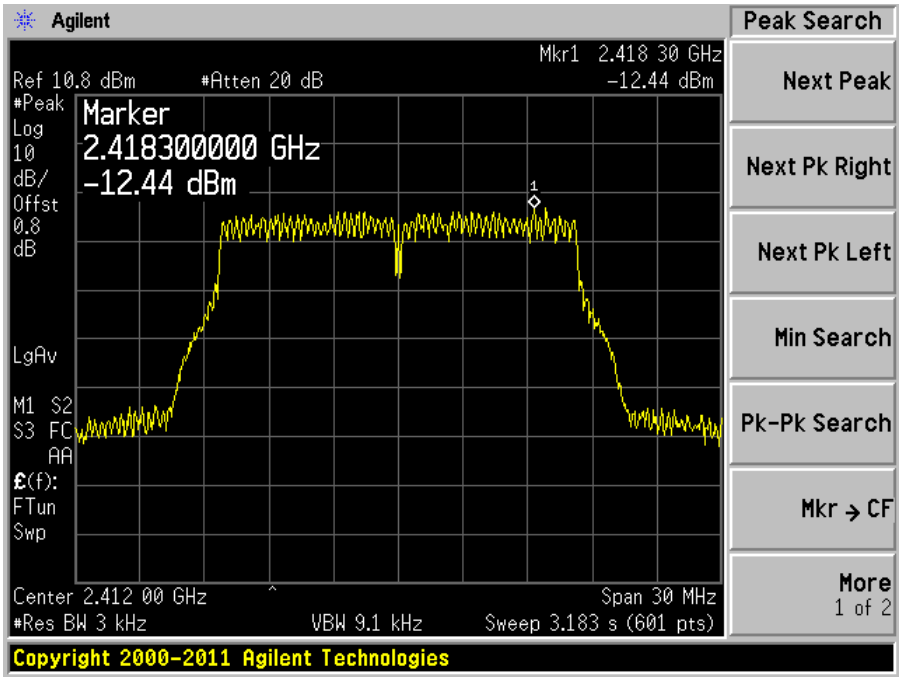


High channel: 2462 MHz

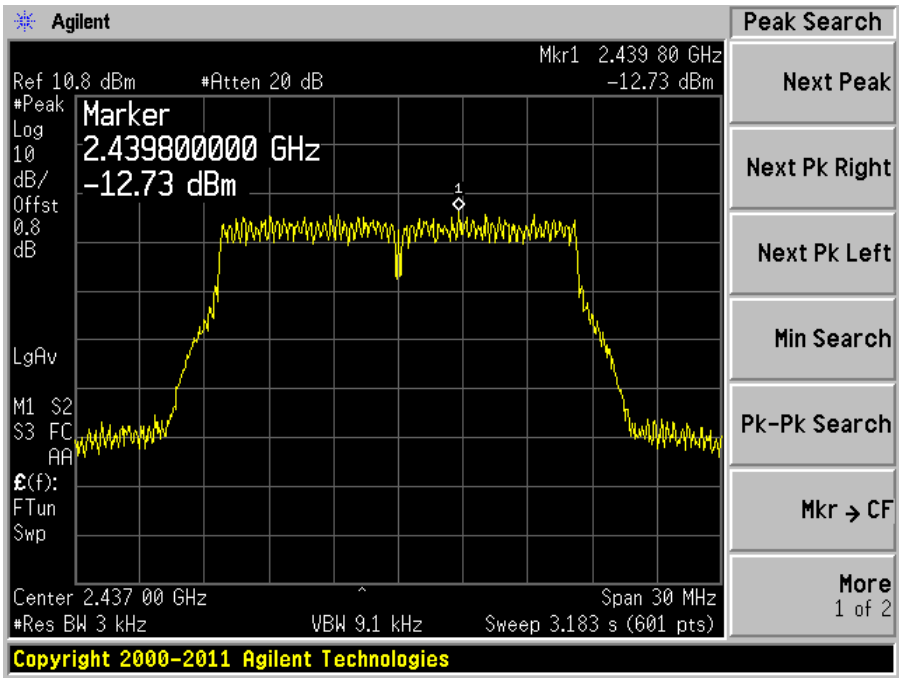


802.11g mode

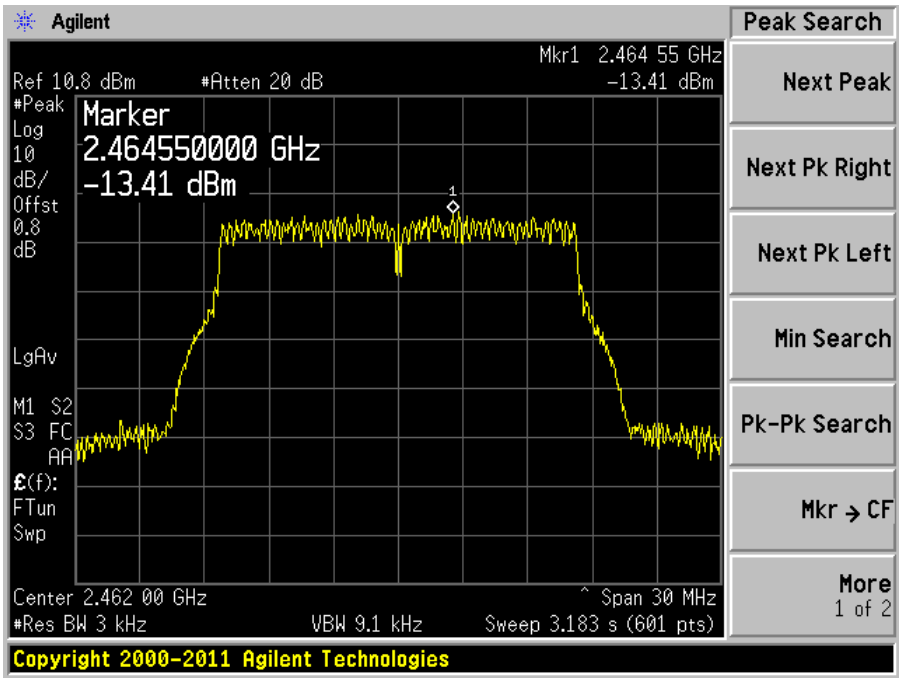
Low channel: 2412 MHz



Middle channel: 2437 MHz

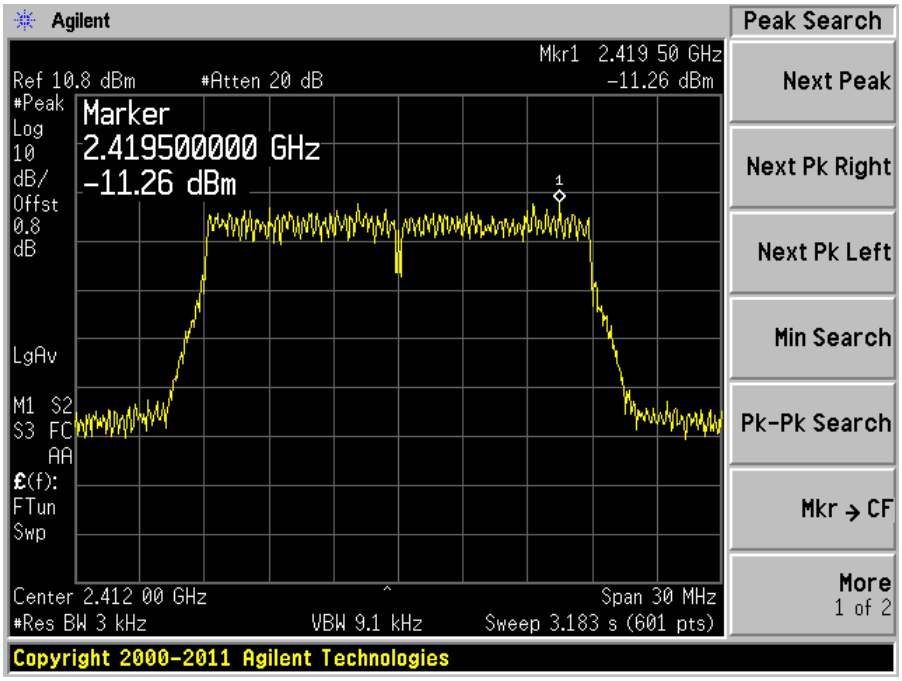


High channel: 2462 MHz

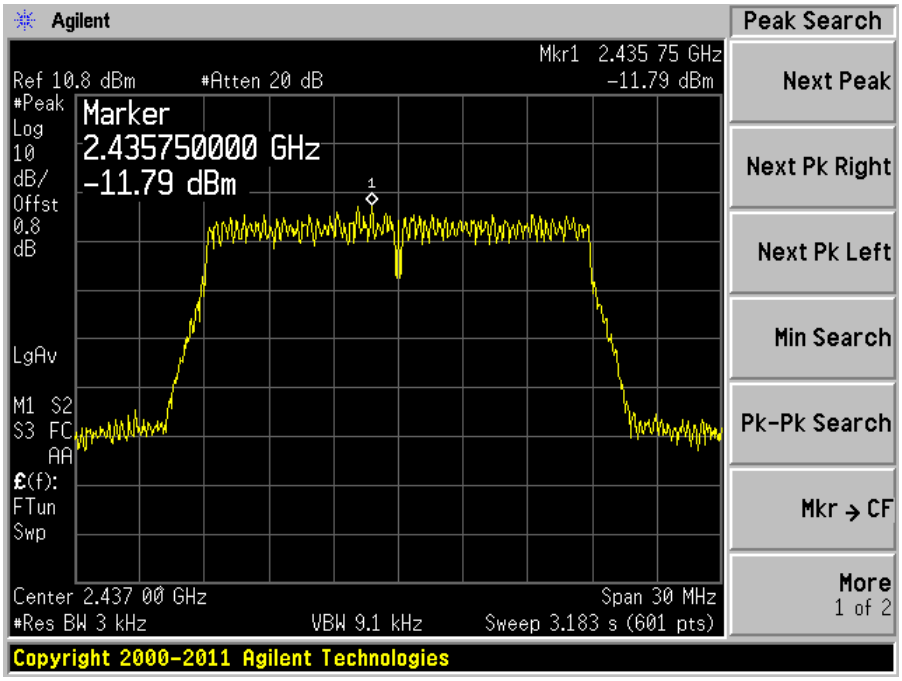


802.11n-HT20 mode

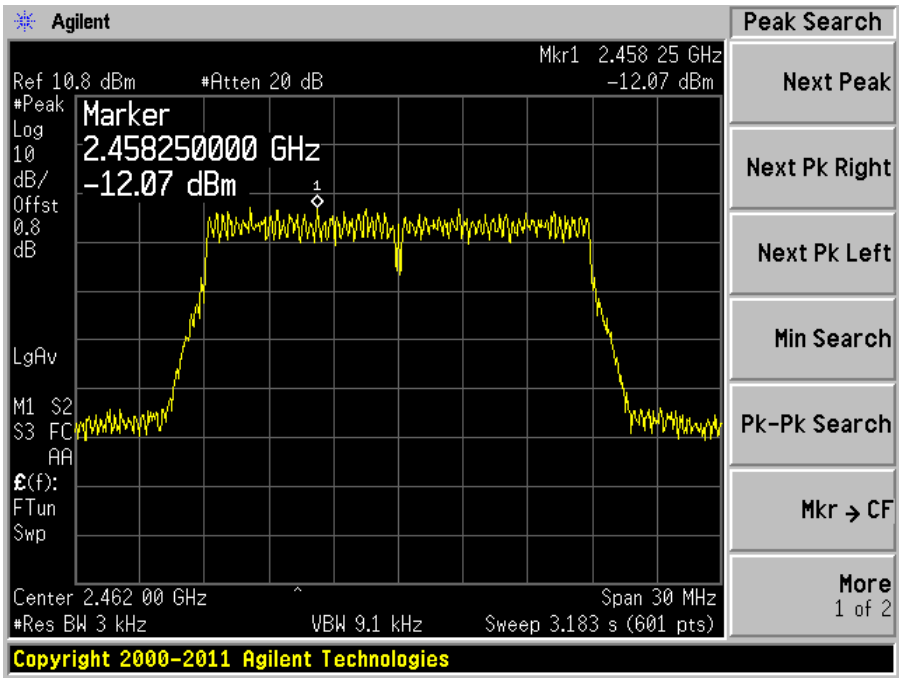
Low channel: 2412 MHz



Middle channel: 2437 MHz

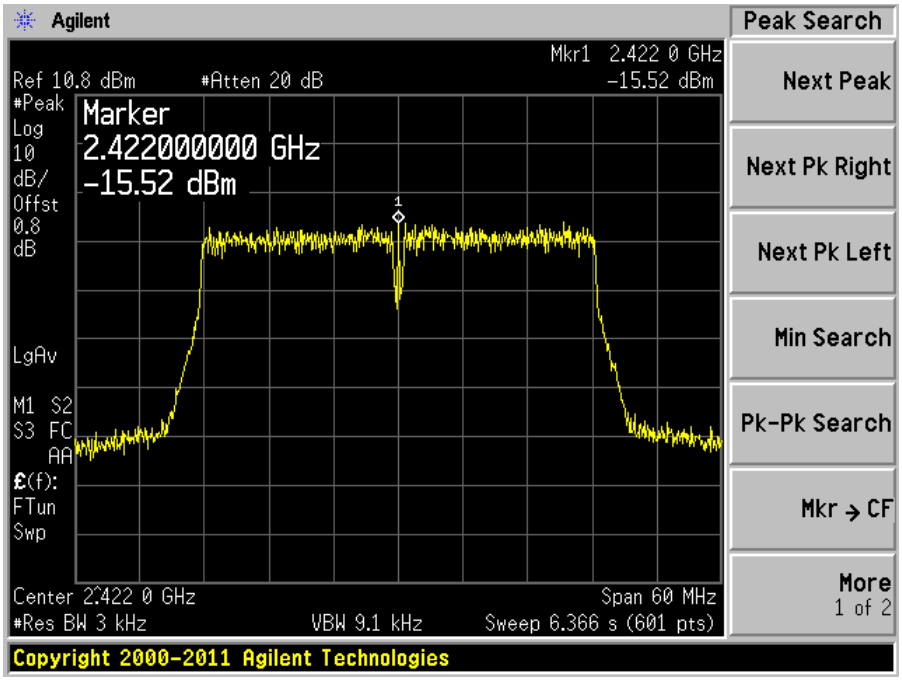


High channel: 2462 MHz

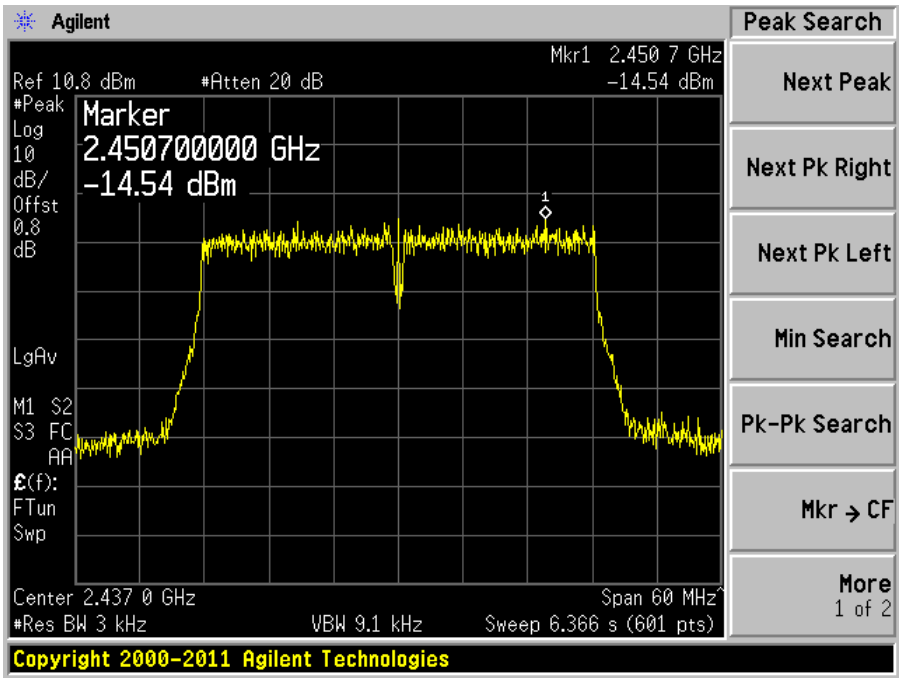
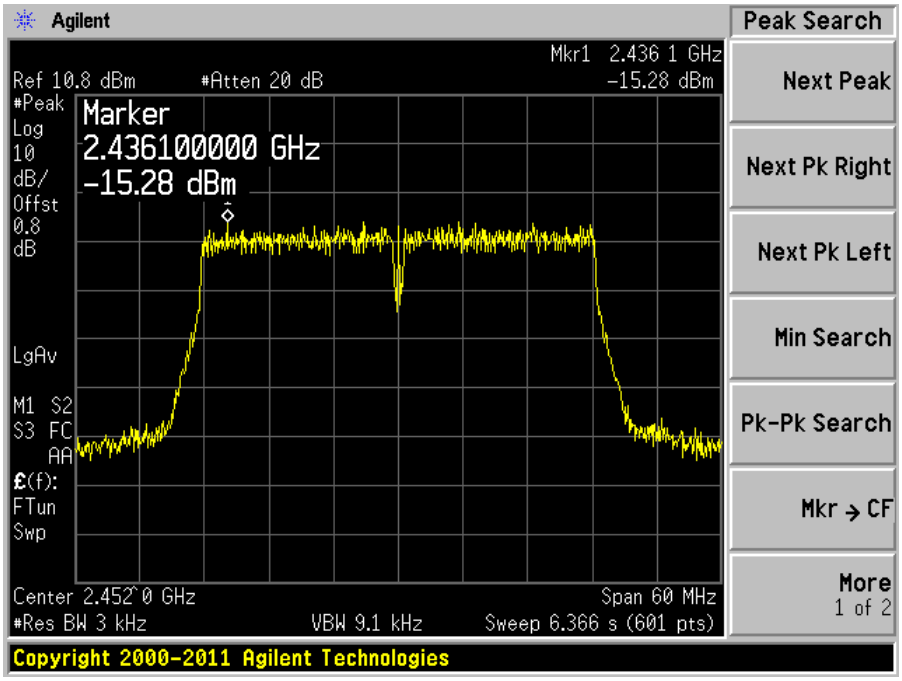


802.11n-HT40 mode

Low channel: 2422 MHz



Middle channel: 2437 MHz



High channel: 2452 MHz