FCC PART 15, SUBPART C

TEST AND MEASUREMENT REPORT

For

Sensity Systems, Inc.

480 Oakmead Parkway,

Sunnyvale, CA 94085, USA

FCC ID: SXNLSNM-0001-A

Report Type:	Product Type:
Original Report	Light Sensory Module

Prepared By: Lionel Lara

Report Number: R1304307-247

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*"

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1304307-247	Original Report	2013-09-24

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-0001-A* with *FCC ID: SXNLSNM-0001-A* 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 15 cm (L) x 15 cm (W) x 12 cm (H) and weighs 620 g.

The test data gathered are from typical production sample, serial number: 0102713A0000C250 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 Commission's rules.

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

1.4 Related Submittal(s)/Grant(s)

N/A

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 Lionel Lara 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
DELL	Laptop	Latitude E5420	-

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Sensity Systems	Main Board	U-Node V2	40313260134
Sensity Systems	Power Board	PMAC V2	40313260176
Sensity Systems	Sensor Board	D055	6MT064462-0089

2.7 Interface Ports and Cables

Cable Description	Length (m)	To	From
RF Cable	<1.0	PSA	EUT
USB cable	<1.0	Laptop	Interface Board
RJ45 Cable	<1.0	Power Supply	EUT

2.8 Power Supply List and Details

Manufacturer	Description	Model	Part Number
BK Precision	DC Power Supply	1621A	D185052265

Note: The EUT is AC powered only. A DC power supply was used for testing purposes only.

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 §2.1091 & §15.247 (i) – 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):	17.48
Maximum peak output power at antenna input terminal (mW):	55.98
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	-1.7
Maximum Antenna Gain (numeric):	0.676
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0075
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 0.0075 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	Models/Name	Antenna Gain (dBi) @ 2.4 GHz
Taiyo Yuden	AH104N2450D1	-1.7

The chip antenna has less than 6 dBi gain; 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.

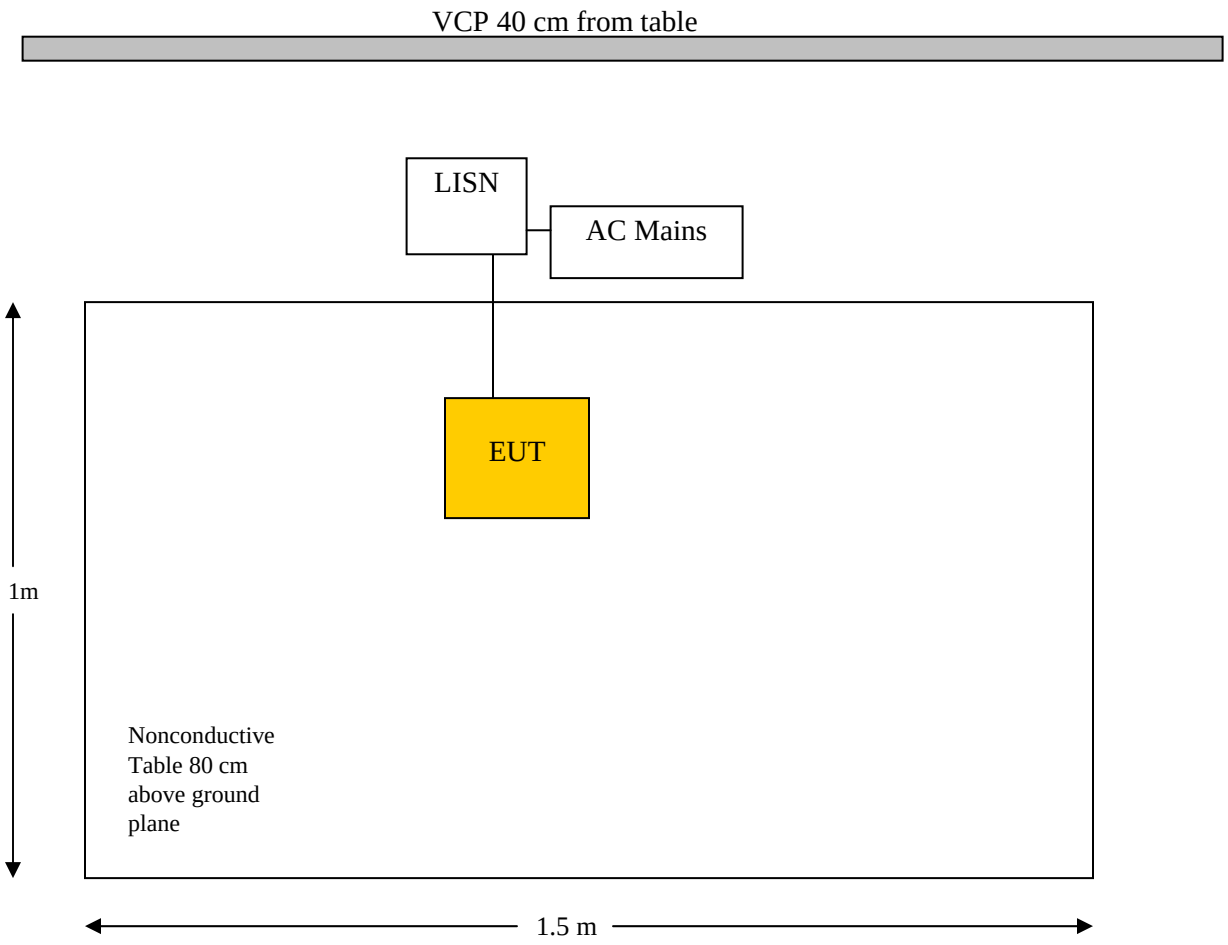
6.3 Test Procedure

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	2013-04-23	1 year
Solar Electronics	LISN	9252-50-R-24-N	511205	2013-06-25	1 year
TTE	Filter, High Pass	H962-150k-50-21378	K7133	2013-05-30	1 year

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

6.7 Test Environmental Conditions

Temperature:	20 ºC
Relative Humidity:	58 %
ATM Pressure:	101.3 kPa

The testing was performed by Lionel Lara on 2013-08-05 in 5 m chamber 3.

6.8 Summary of Test Results

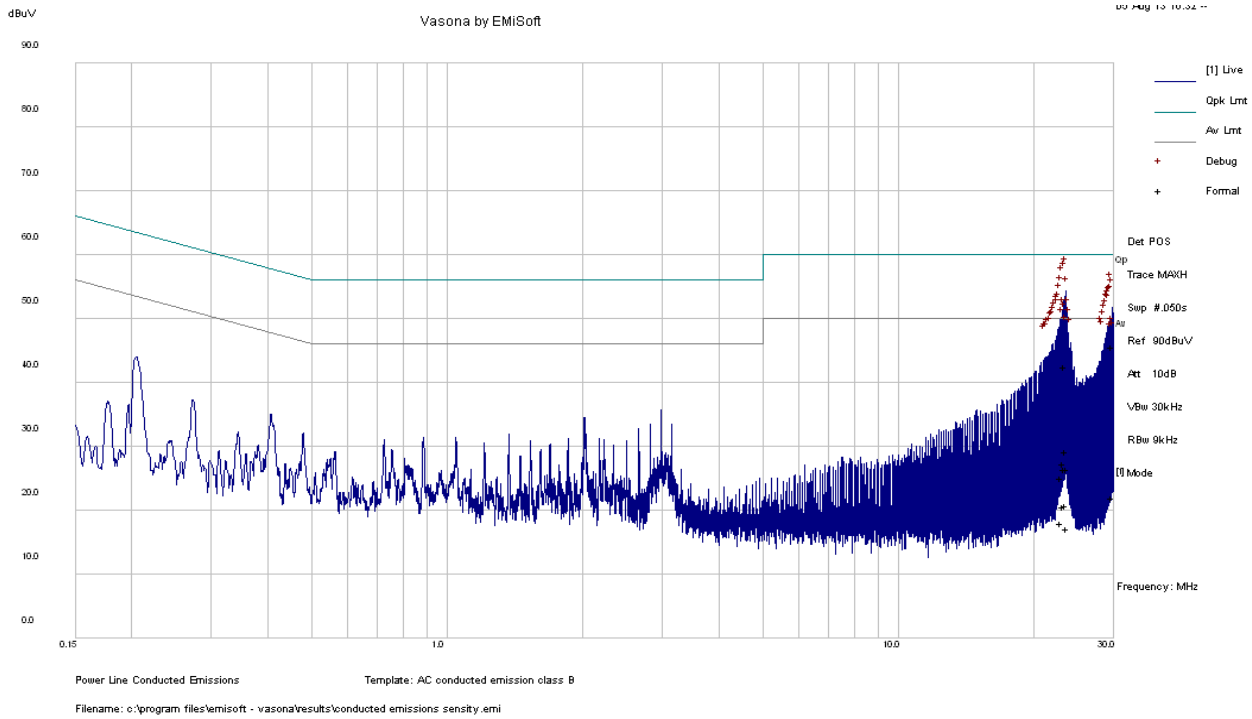
According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the margin reading of:

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)**
-2.63	23.60831	Neutral	0.15 - 30

6.9 Conducted Emissions Test Plots and Data

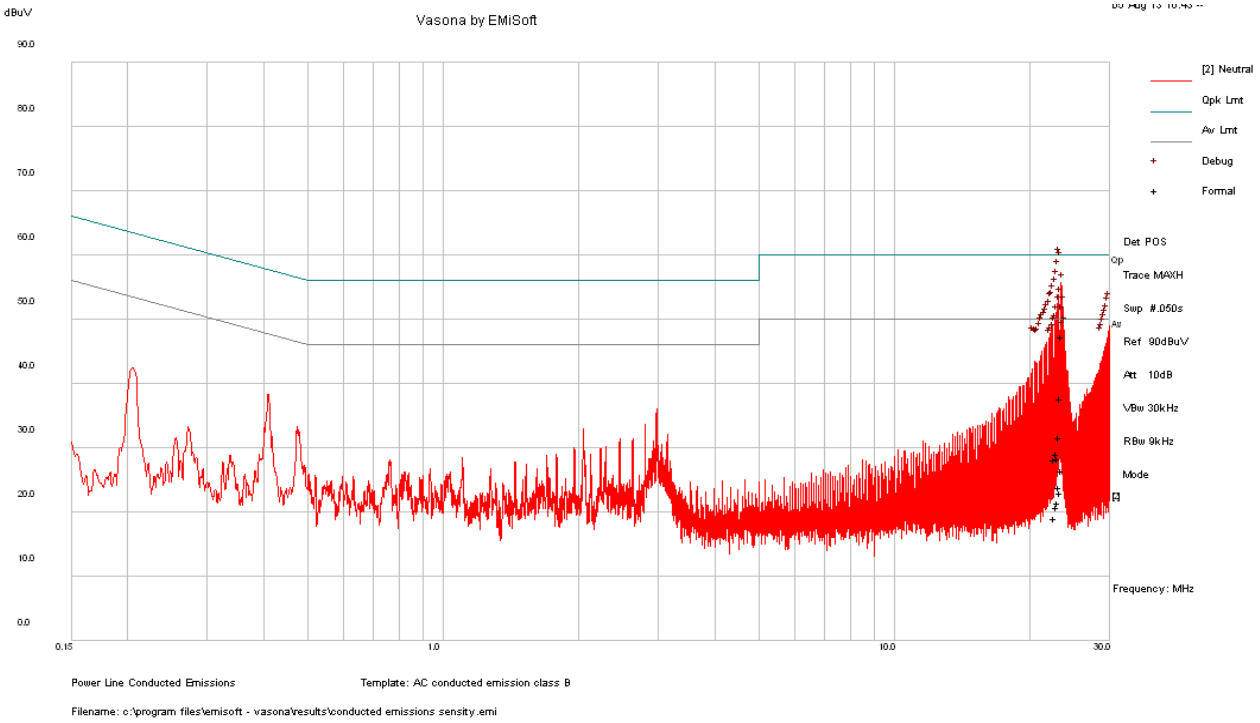
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
23.52293	29.27	Line	60	-30.73	QP
23.18768	27.28	Line	60	-32.72	QP
23.34985	26.49	Line	60	-33.51	QP
23.68153	26.42	Line	60	-33.58	QP
23.00374	25.12	Line	60	-34.88	QP
29.73946	22.06	Line	60	-37.94	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
29.73946	45.61	Line	50	-4.39	Ave.
23.34985	42.49	Line	50	-7.51	Ave.
23.52293	20.75	Line	50	-29.25	Ave.
23.18768	20.63	Line	50	-29.37	Ave.
23.00374	18.02	Line	50	-31.98	Ave.
23.68153	17.15	Line	50	-32.85	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
23.43484	37.65	Neutral	60	-22.35	QP
23.28564	31.60	Neutral	60	-28.40	QP
22.93077	28.98	Neutral	60	-31.02	QP
23.12713	28.43	Neutral	60	-31.57	QP
22.75745	28.18	Neutral	60	-31.82	QP
23.60831	26.42	Neutral	60	-33.58	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
23.60831	47.37	Neutral	50	-2.63	Ave.
23.28564	23.96	Neutral	50	-26.04	Ave.
23.43484	23.09	Neutral	50	-26.91	Ave.
23.12713	21.51	Neutral	50	-28.49	Ave.
22.93077	20.84	Neutral	50	-29.16	Ave.
22.75745	19.14	Neutral	50	-30.86	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 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 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	E4440A	US42221851	2013-03-05	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:	21 °C
Relative Humidity:	42 %
ATM Pressure:	101.1 kPa

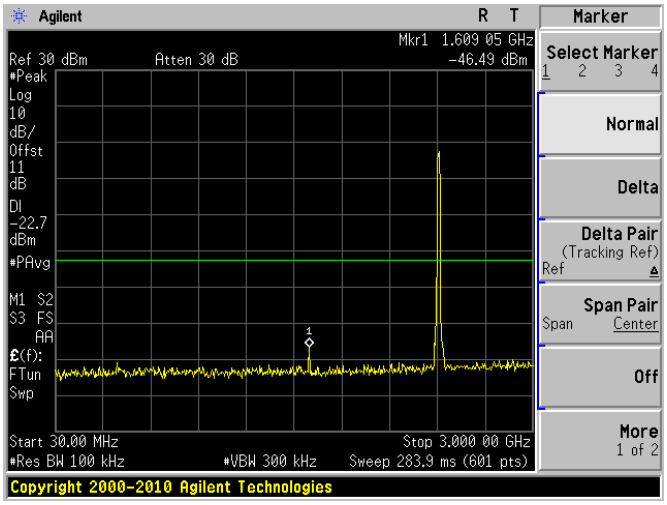
The testing was performed by Lionel Lara on 2013-05-01 at the RF site.

7.5 Test Results

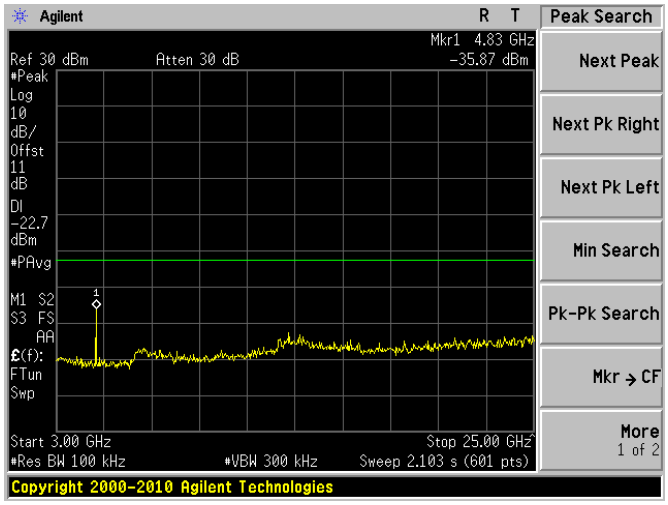
Please refer to following plots of spurious emissions.

802.11b, Low Channel, 2412 MHz

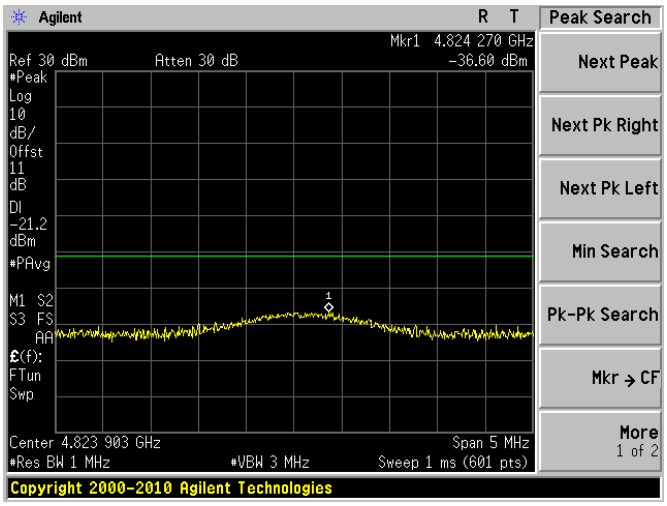
30 MHz – 3 GHz



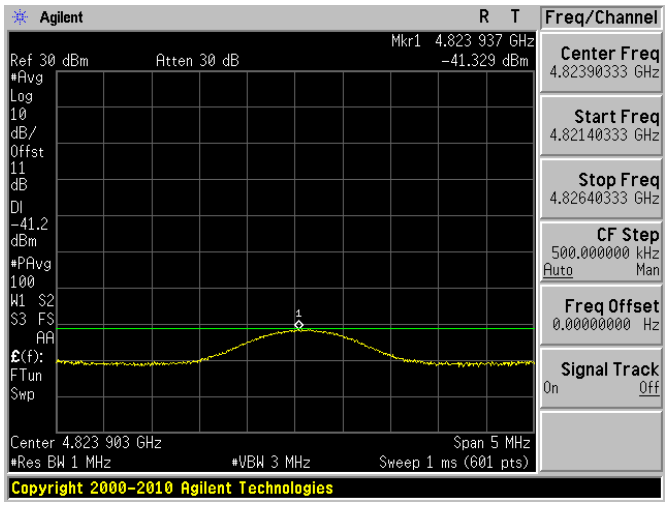
3 GHz – 25 GHz



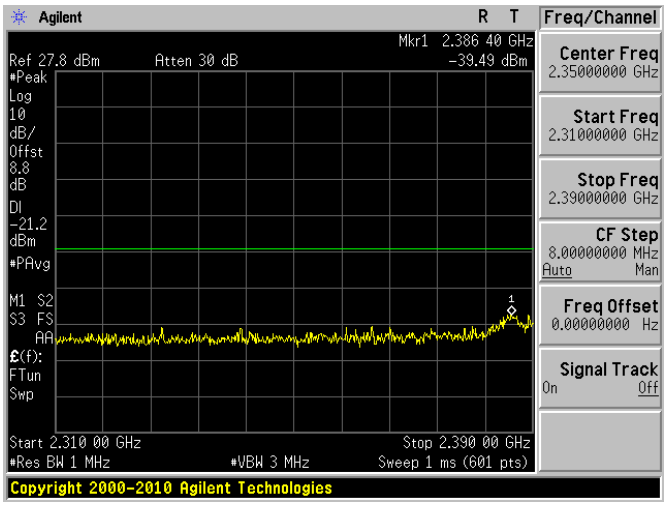
4824 MHz 2nd Harmonic Peak



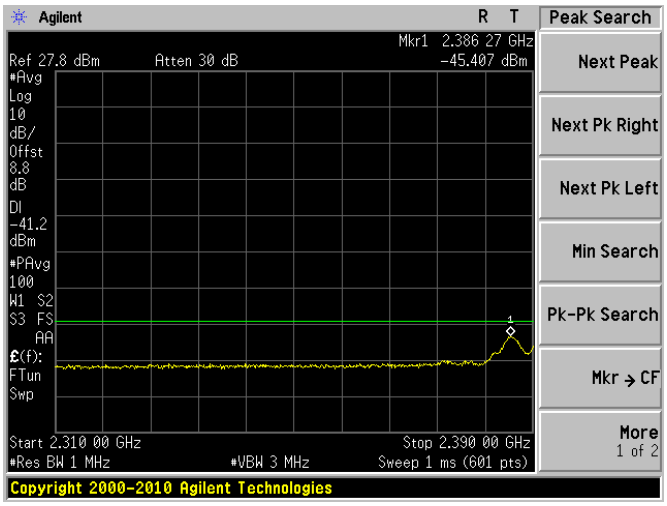
4824 2nd Harmonic Average



Restricted Band Edge Peak

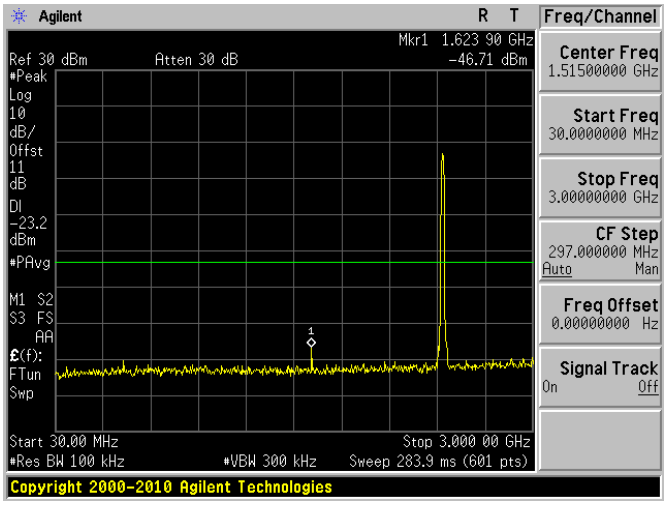


Restricted Band Edge Average

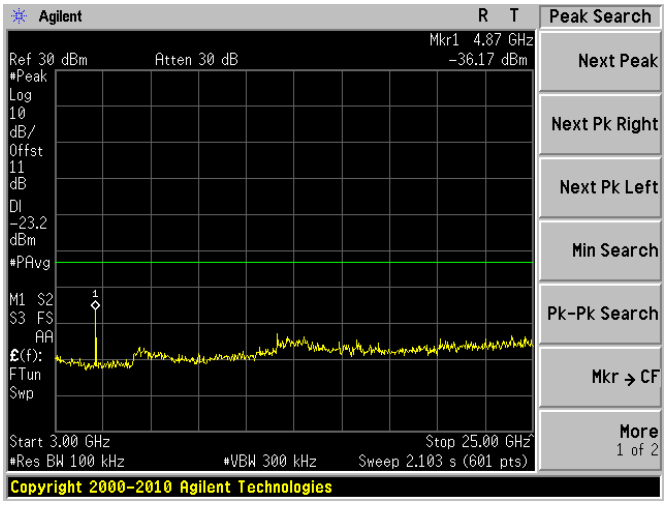


802.11b, Middle Channel, 2437 MHz

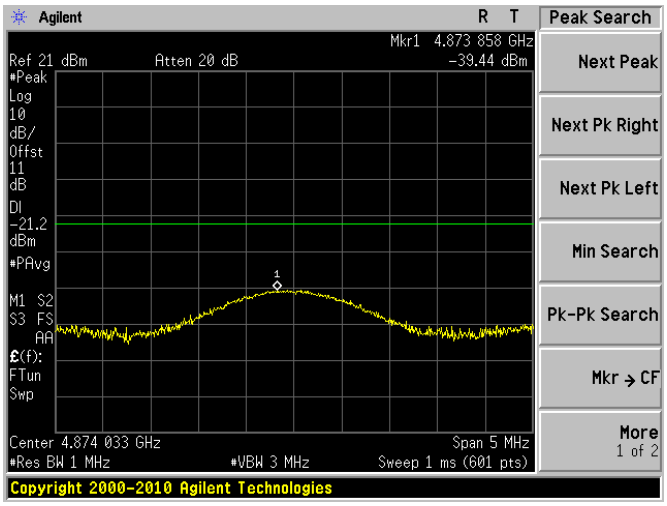
30 MHz – 3 GHz



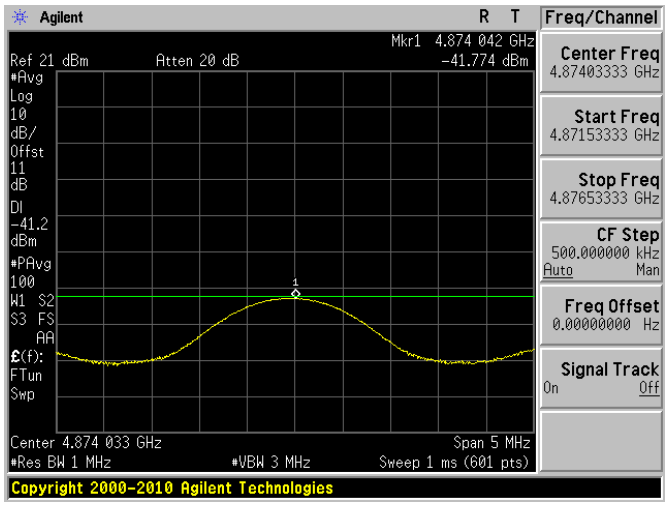
3 GHz – 25 GHz



4874 MHz 2nd Harmonic Peak

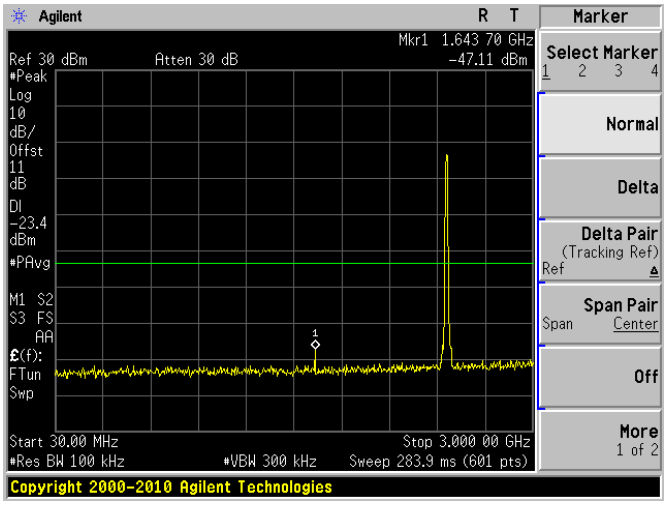


4874 2nd Harmonic Average

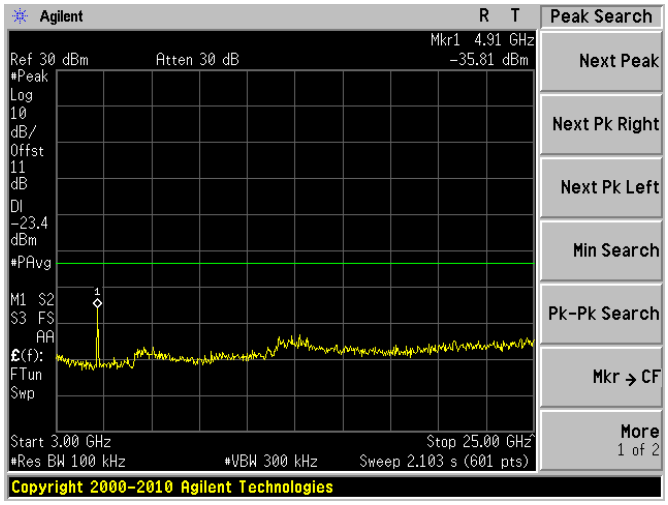


802.11b, High Channel, 2462 MHz

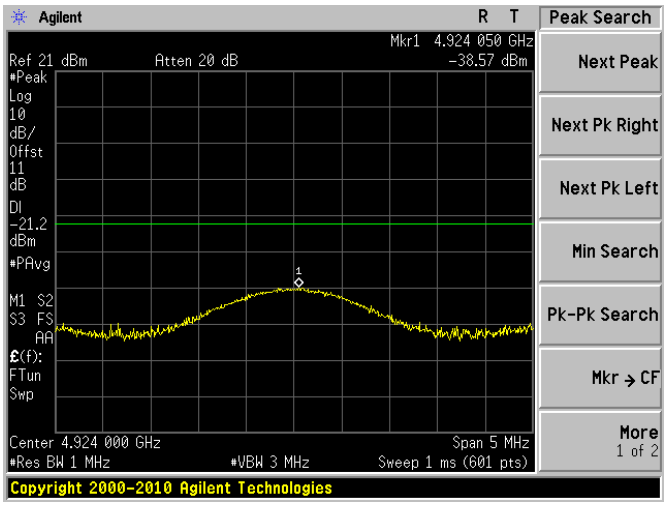
30 MHz – 3 GHz



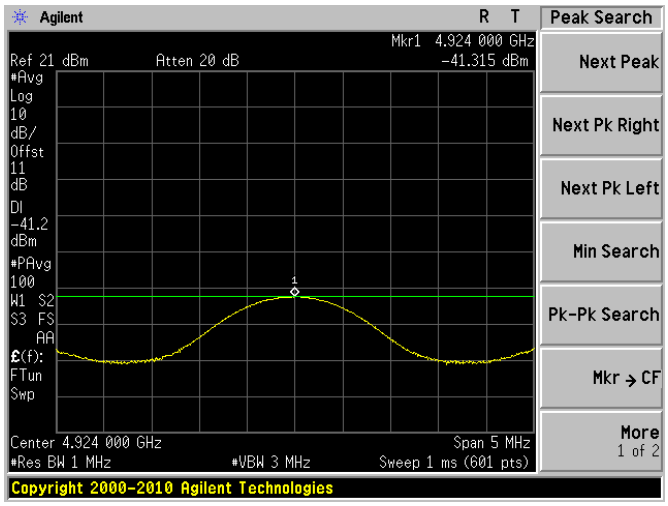
3 GHz – 25 GHz



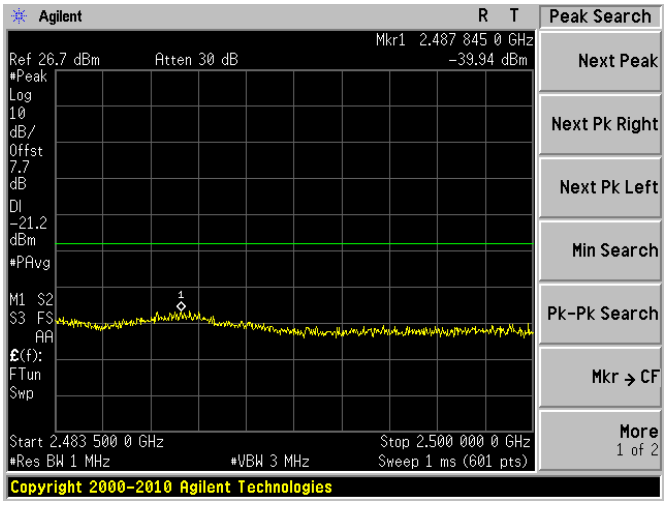
4924 MHz 2nd Harmonic Peak



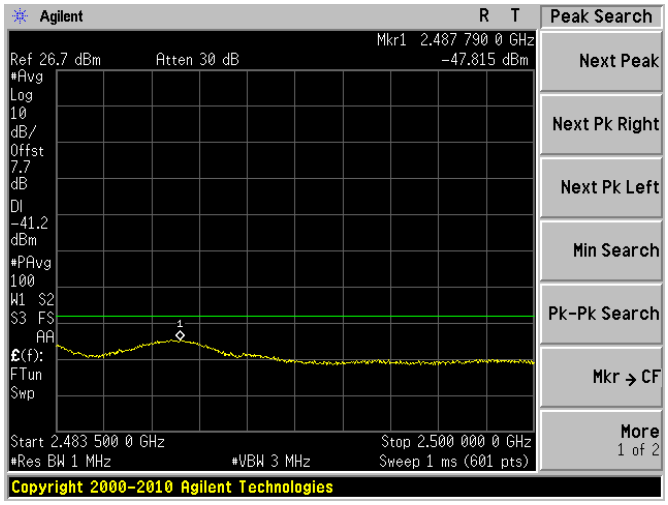
4924 2nd Harmonic Average



Restricted Band Edge Peak

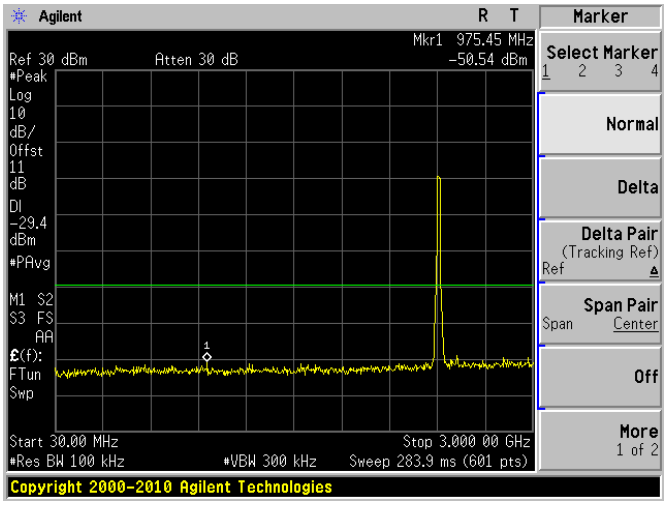


Restricted Band Edge Average

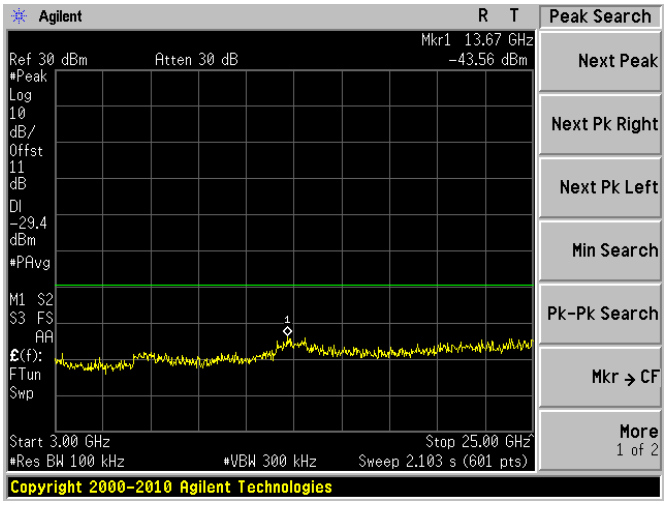


802.11g, Low Channel, 2412 MHz

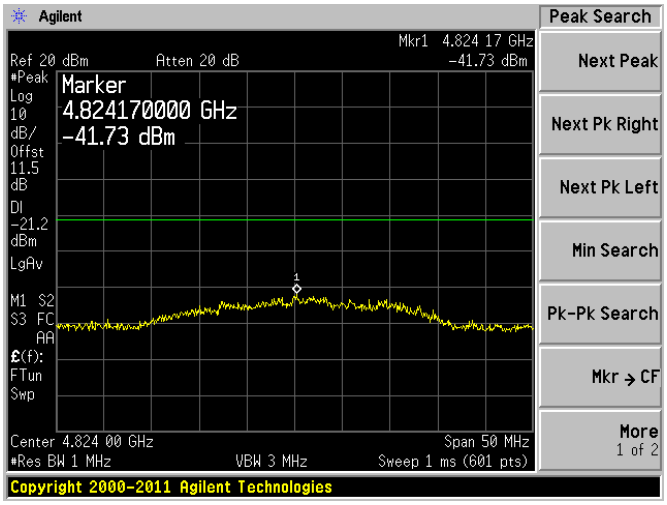
30 MHz – 3 GHz



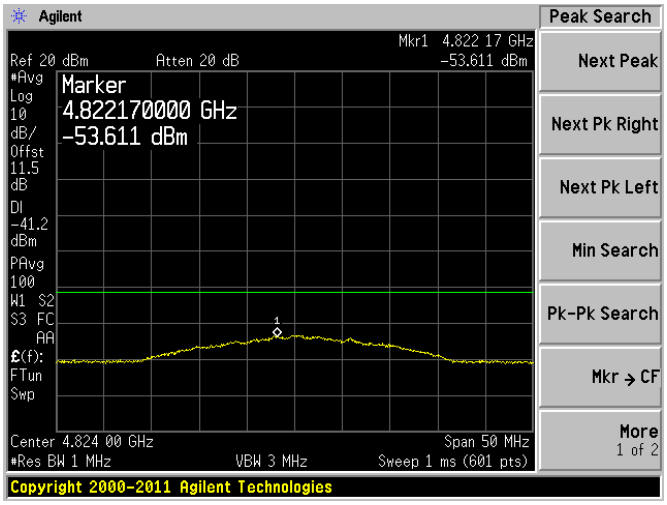
3 GHz – 25 GHz



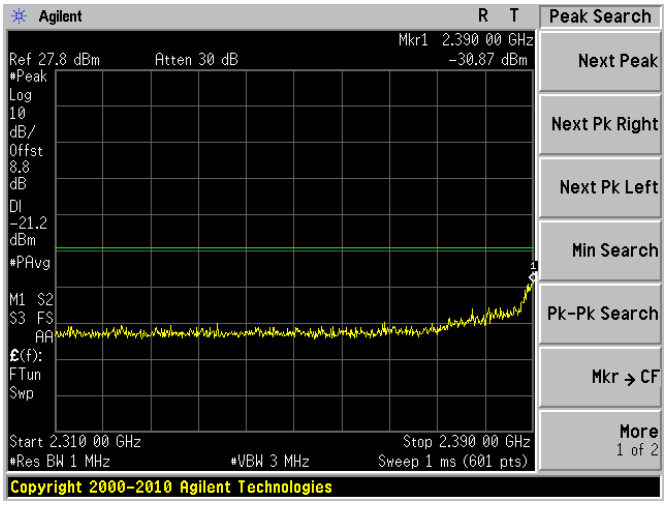
4824 MHz 2nd Harmonic Peak



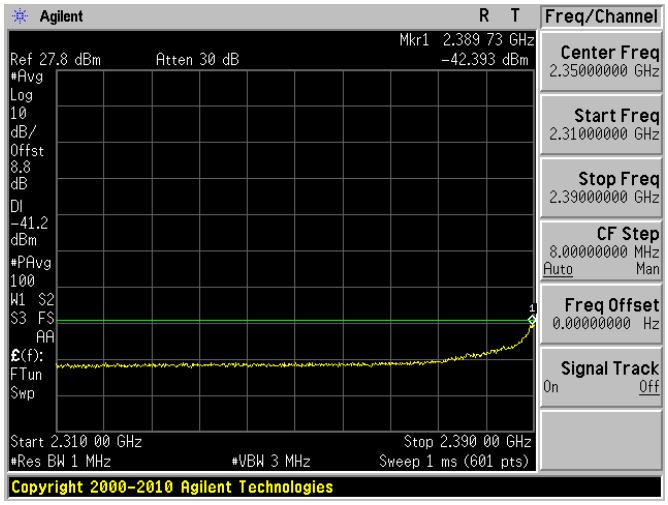
4824 2nd Harmonic Average



Restricted Band Edge Peak

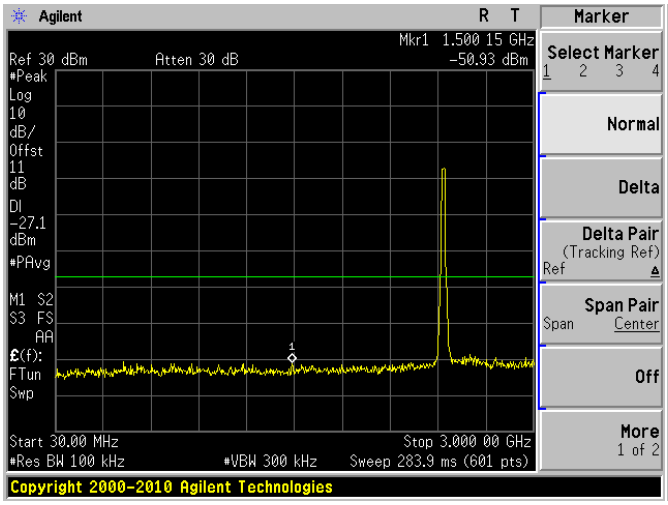


Restricted Band Edge Average

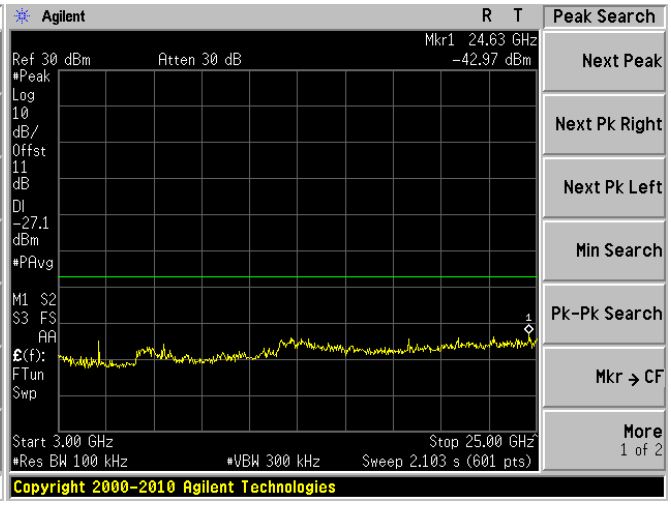


802.11g, Middle Channel, 2437 MHz

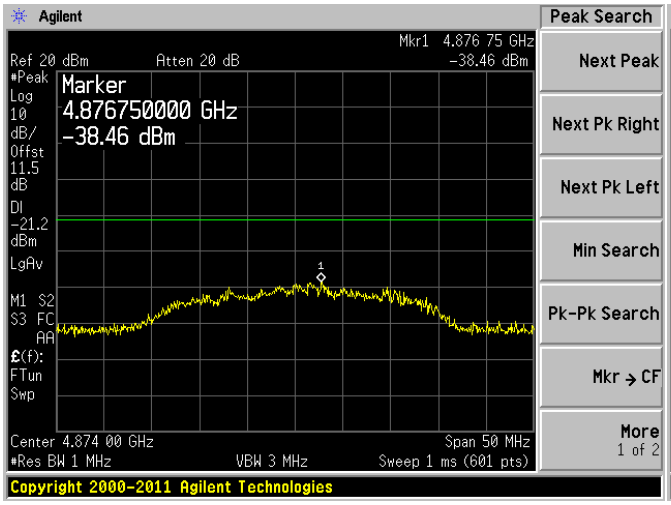
30 MHz – 3 GHz



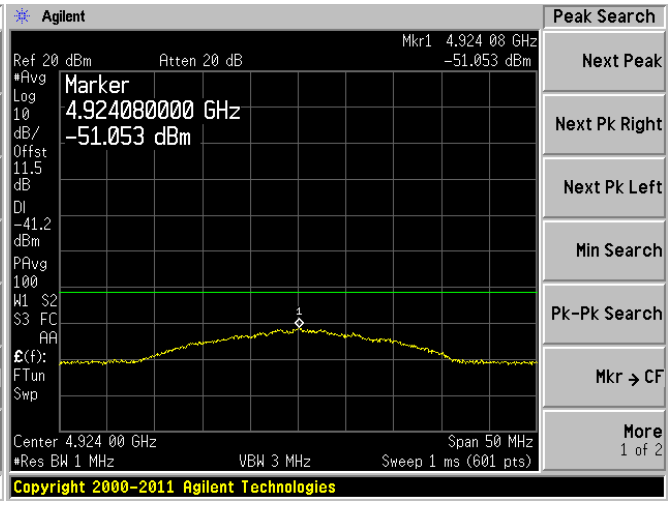
3 GHz – 25 GHz



4874 MHz 2nd Harmonic Peak

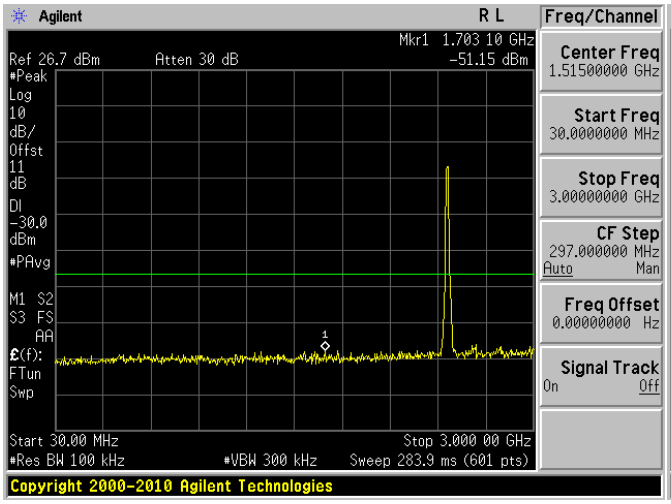


4874 2nd Harmonic Average

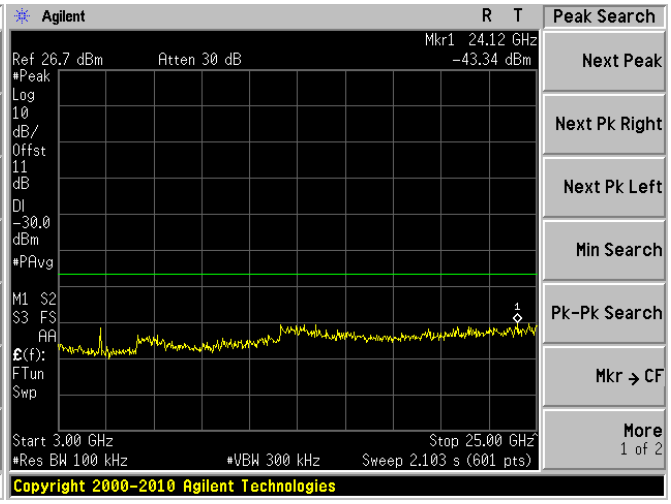


802.11g, High Channel, 2462 MHz

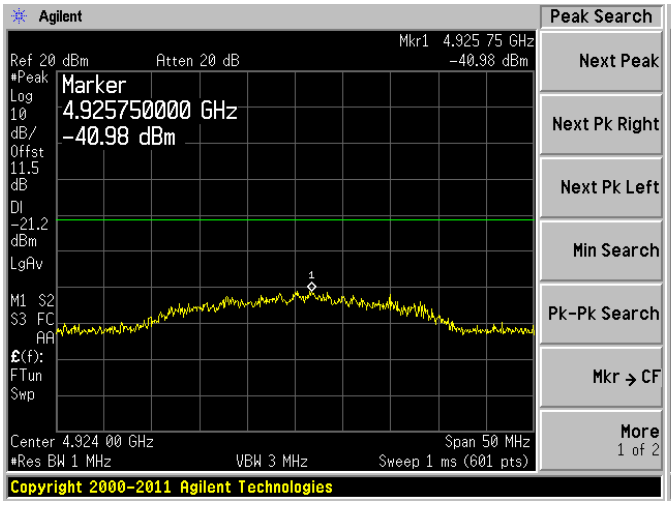
30 MHz – 3 GHz



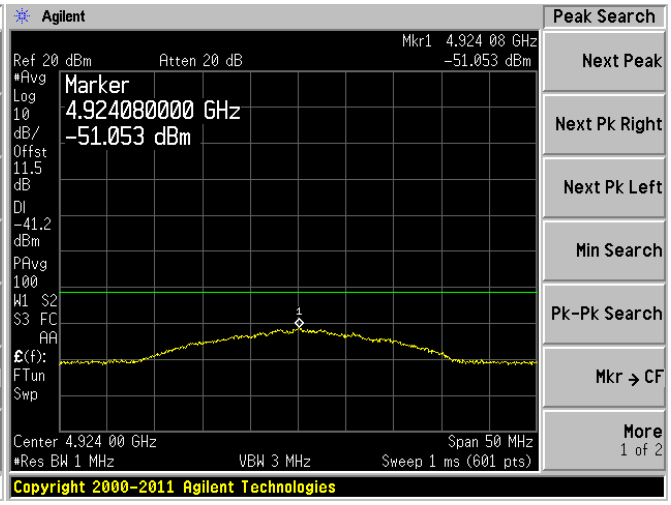
3 GHz – 25 GHz



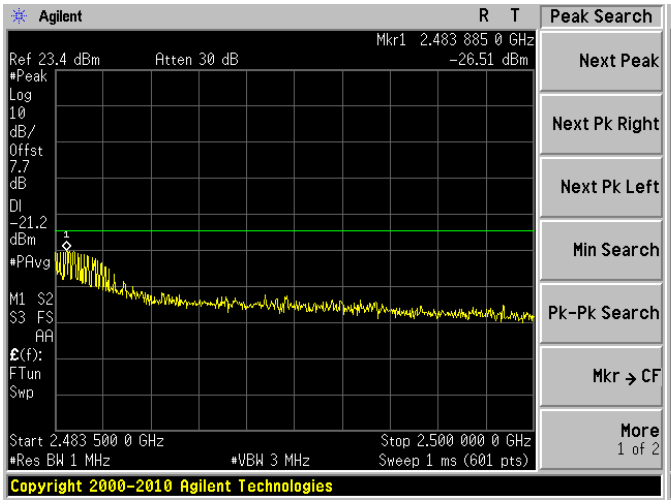
4924 MHz 2nd Harmonic Peak



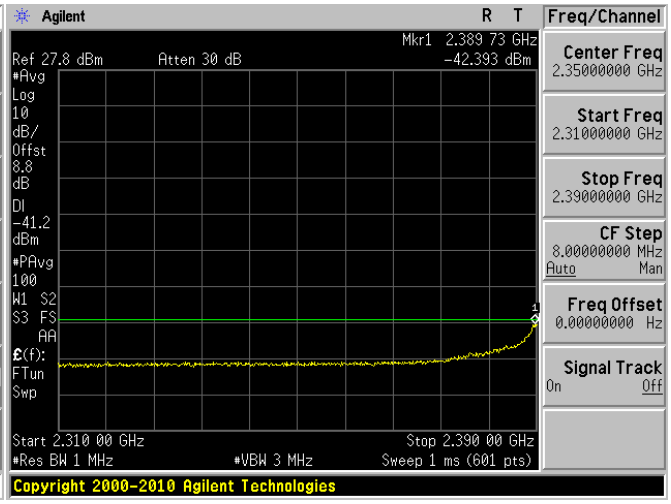
4924 2nd Harmonic Average



Restricted Band Edge Peak

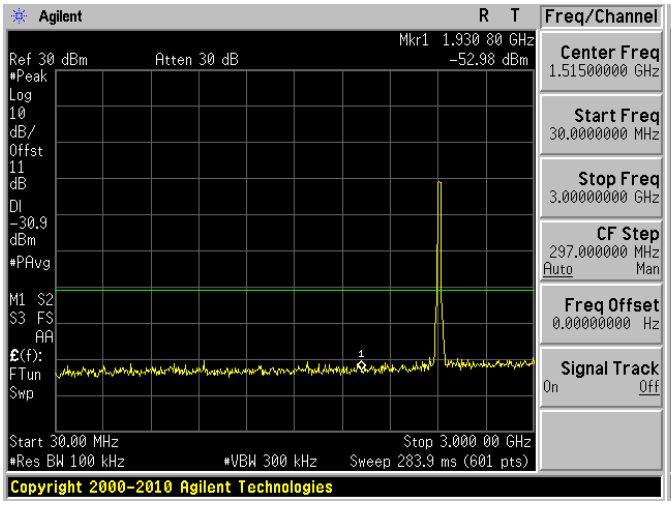


Restricted Band Edge Average

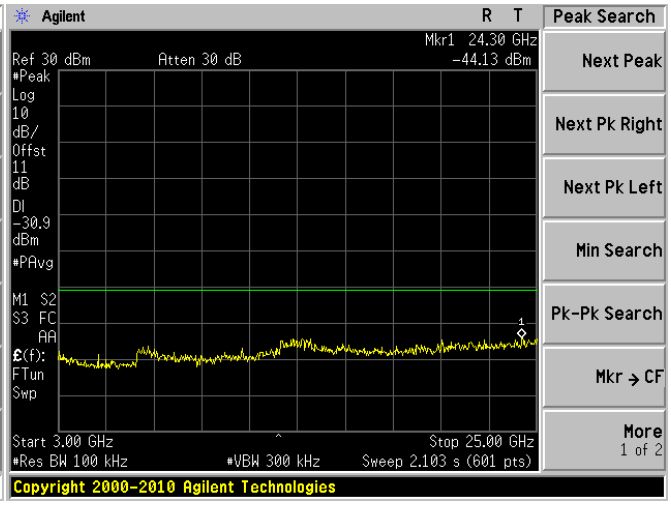


802.11n-HT20, Low Channel, 2412 MHz

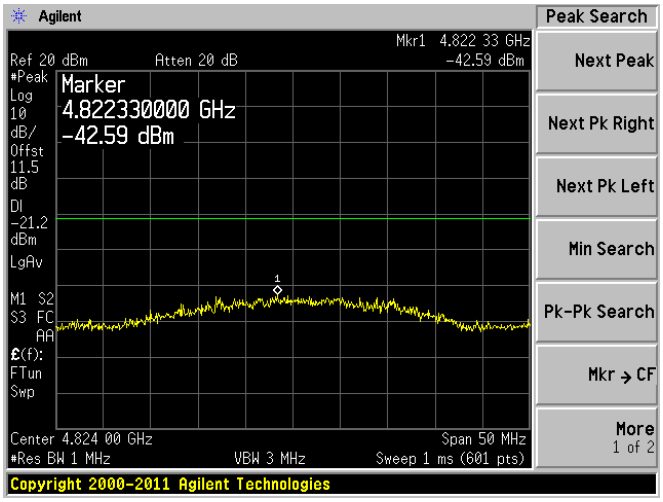
30 MHz – 3 GHz



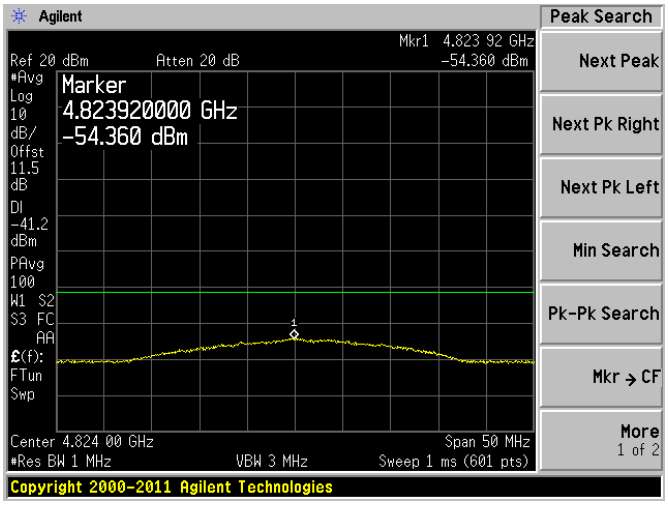
3 GHz – 25 GHz



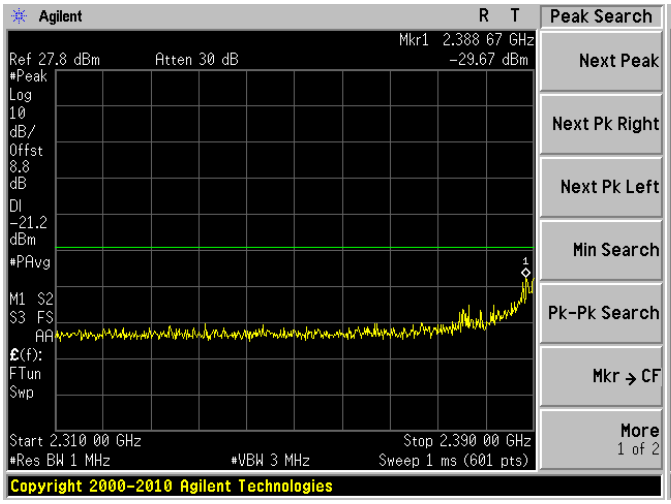
4824 MHz 2nd Harmonic Peak



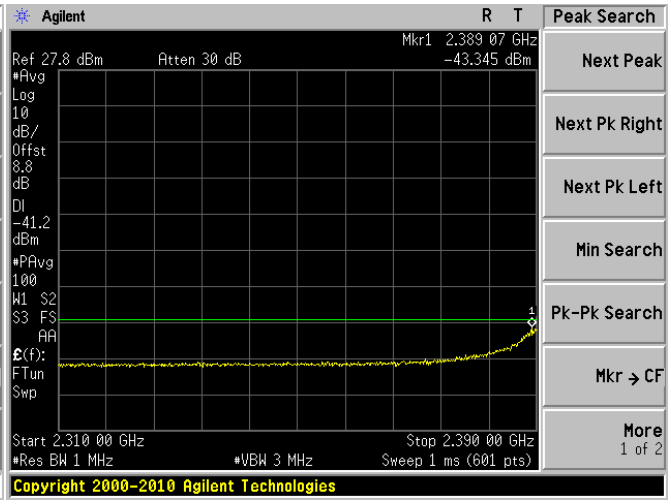
4824 2nd Harmonic Average



Restricted Band Edge Peak

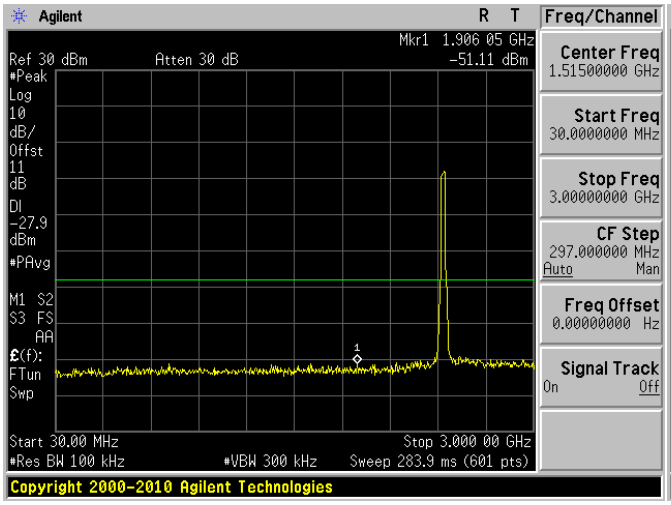


Restricted Band Edge Average

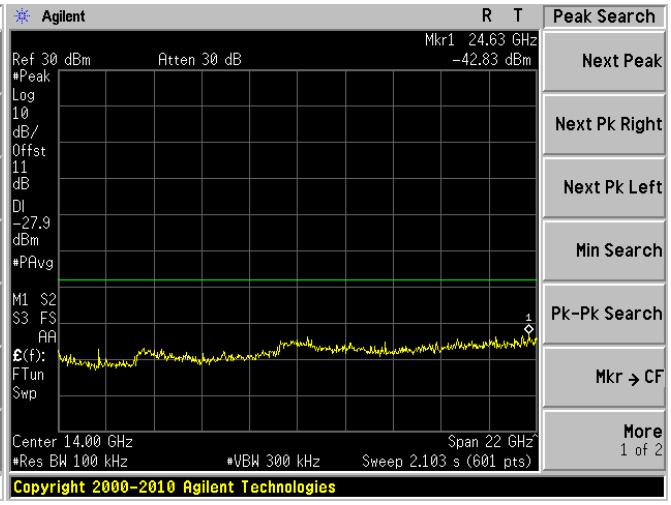


802.11n-HT20, Middle Channel, 2437 MHz

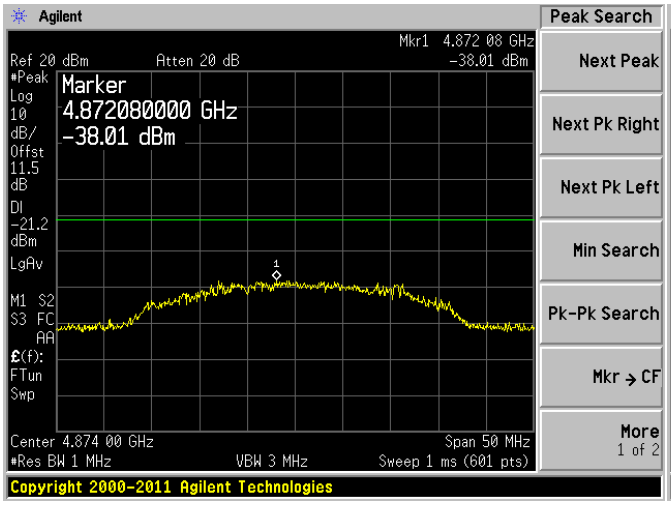
30 MHz – 3 GHz



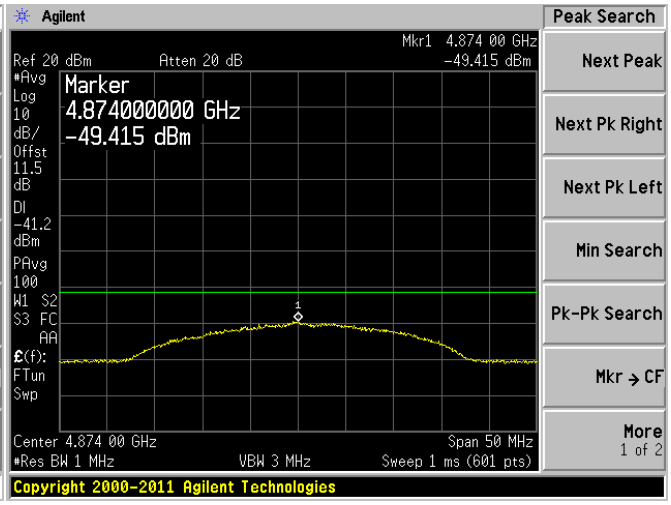
3 GHz – 25 GHz



4874 MHz 2nd Harmonic Peak

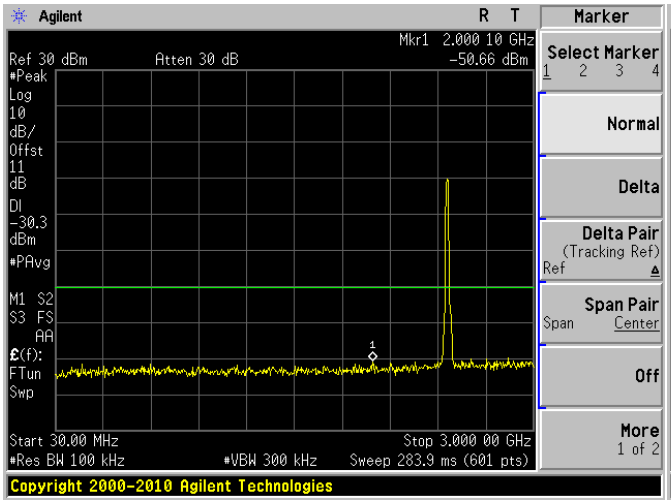


4874 2nd Harmonic Average

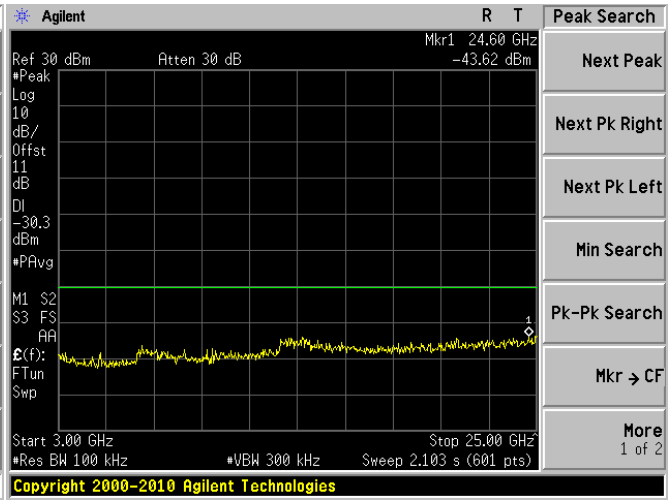


802.11n-HT20, High Channel, 2462 MHz

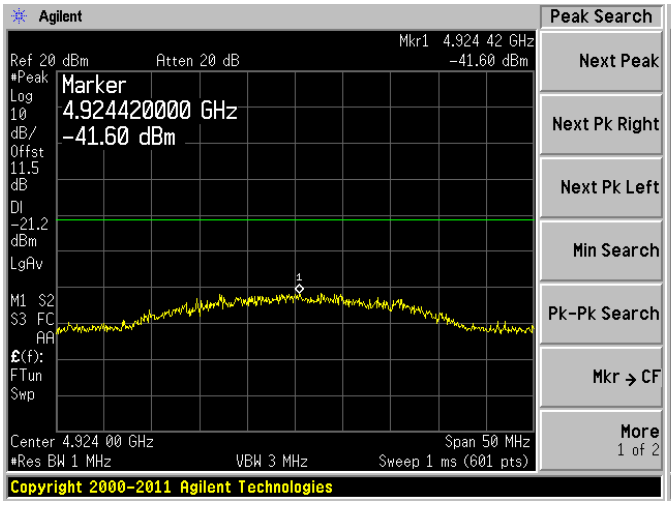
30 MHz – 3 GHz



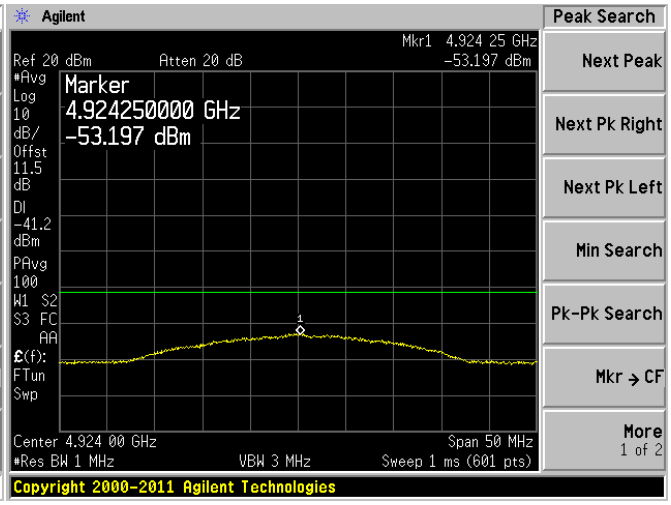
3 GHz – 25 GHz



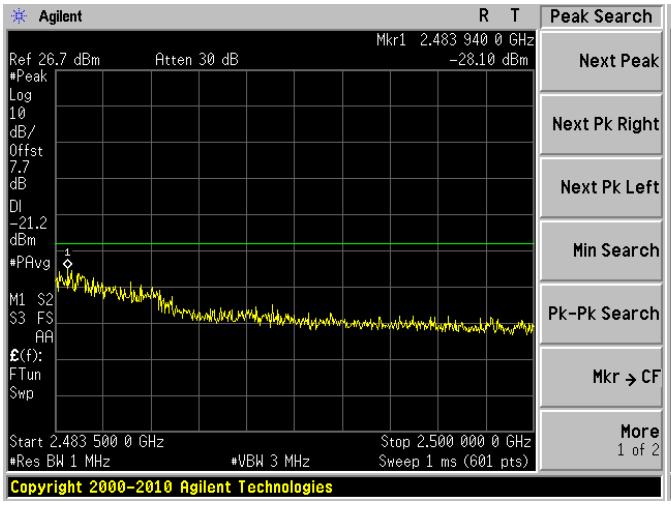
4924 MHz 2nd Harmonic Peak



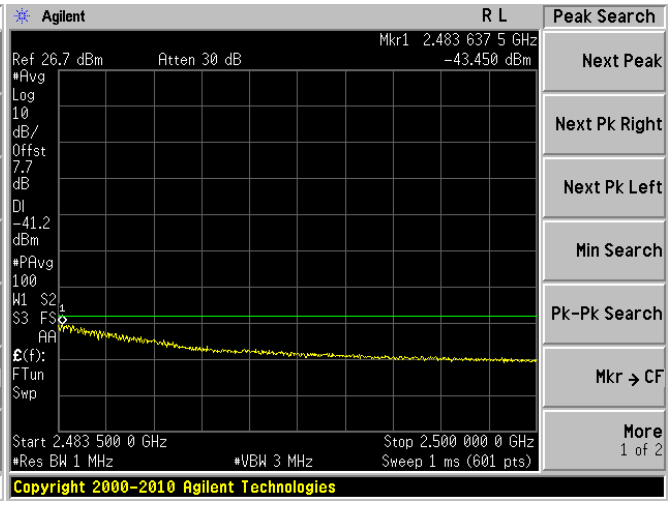
4924 2nd Harmonic Average



Restricted Band Edge Peak

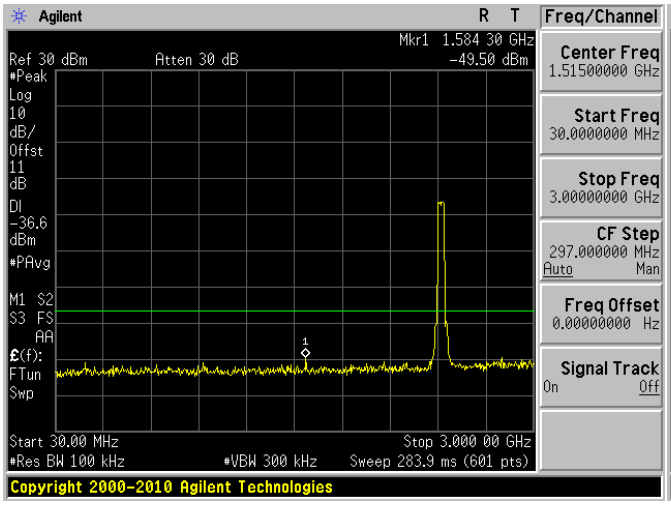


Restricted Band Edge Average

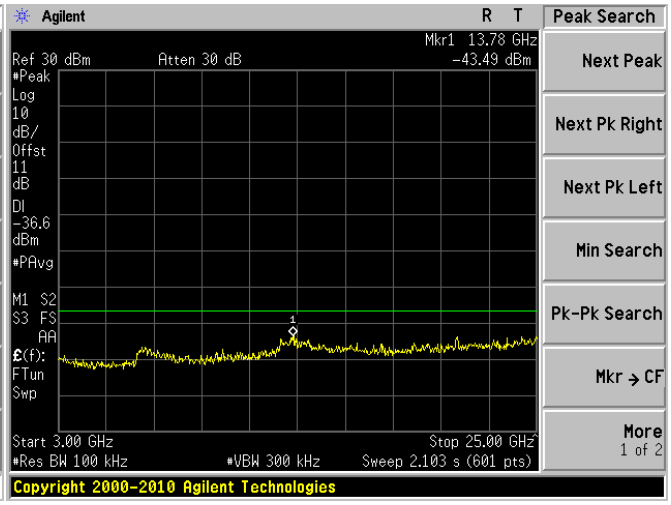


802.11n-HT40, Low Channel, 2422 MHz

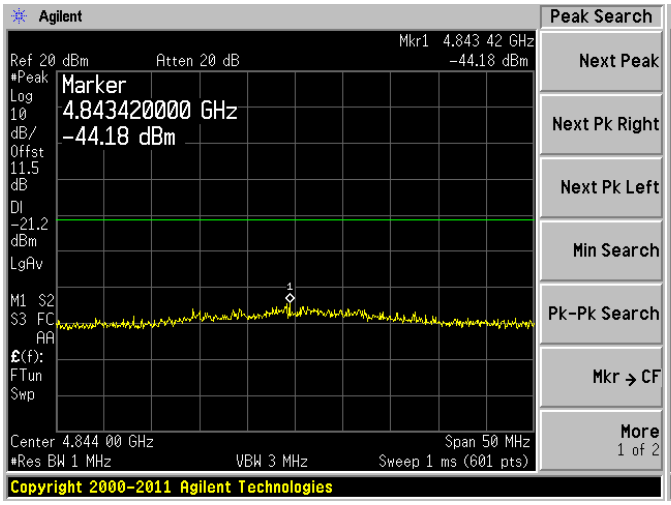
30 MHz – 3 GHz



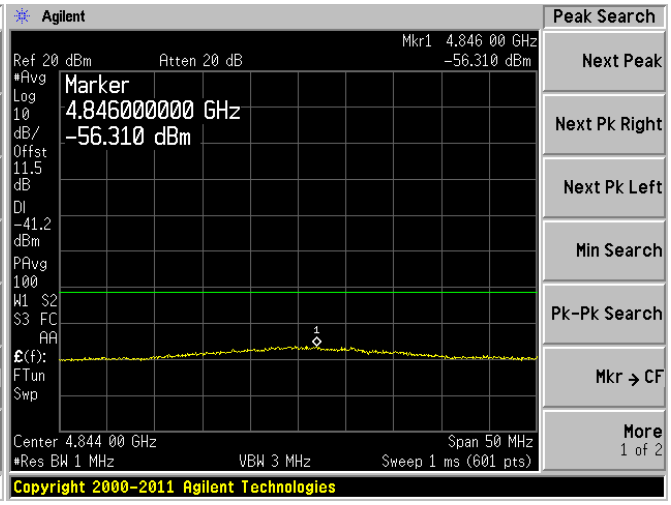
3 GHz – 25 GHz



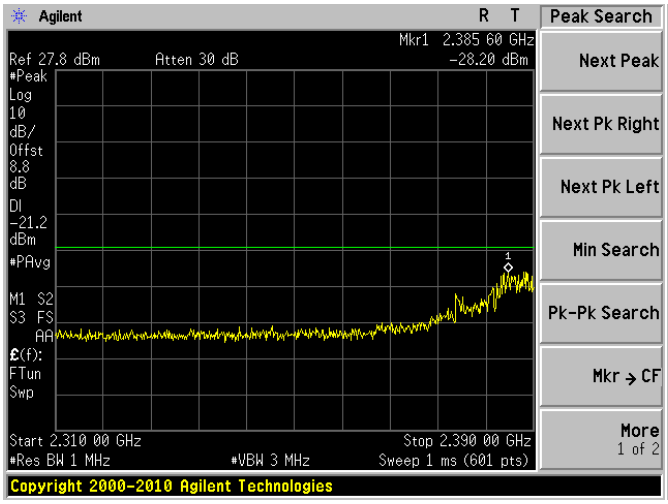
4844 MHz 2nd Harmonic Peak



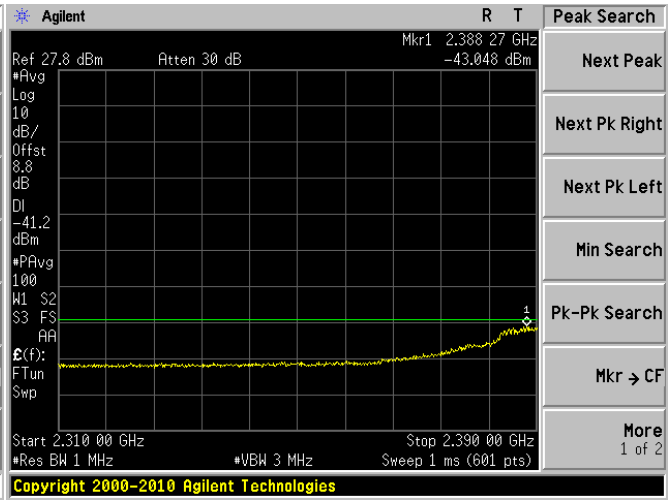
4844 2nd Harmonic Average



Restricted Band Edge Peak

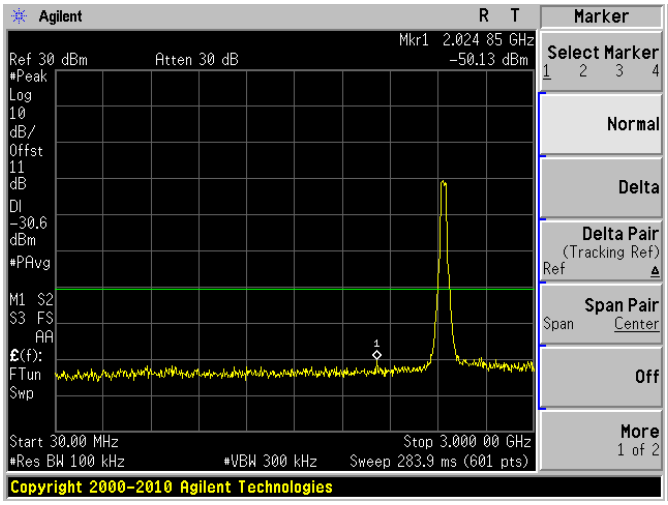


Restricted Band Edge Average

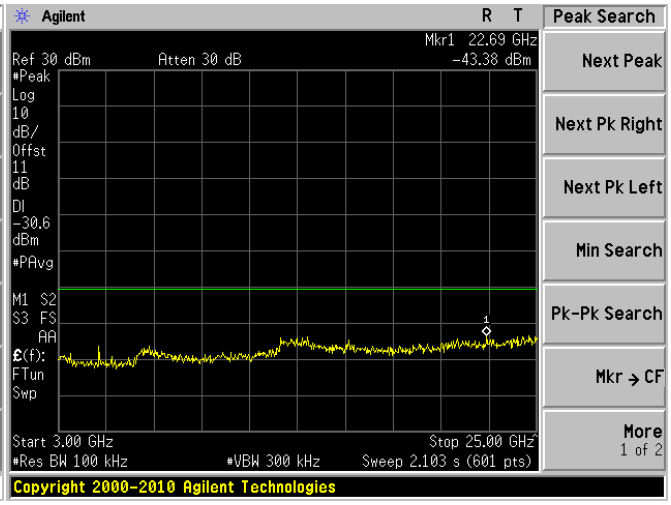


802.11n-HT40, Middle Channel, 2437 MHz

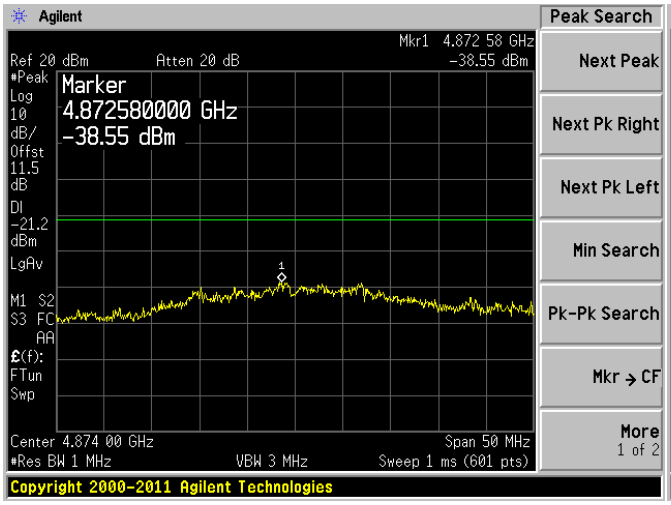
30 MHz – 3 GHz



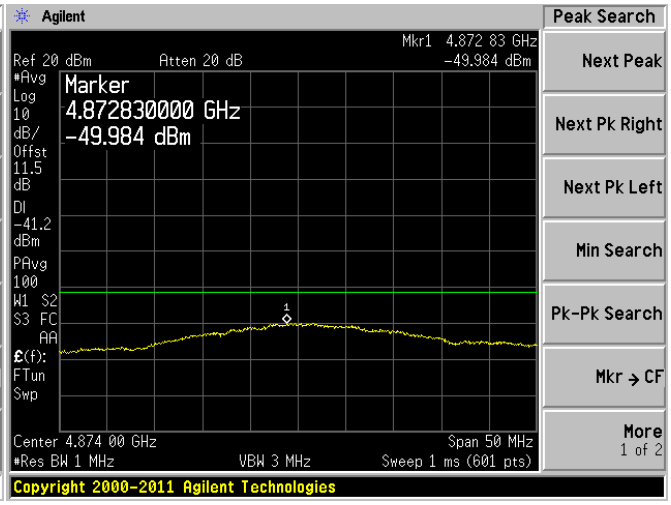
3 GHz – 25 GHz



4874 MHz 2nd Harmonic Peak

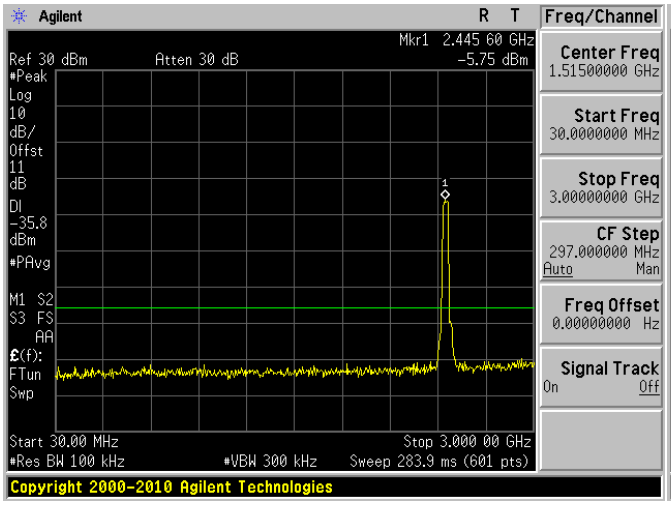


4874 2nd Harmonic Average

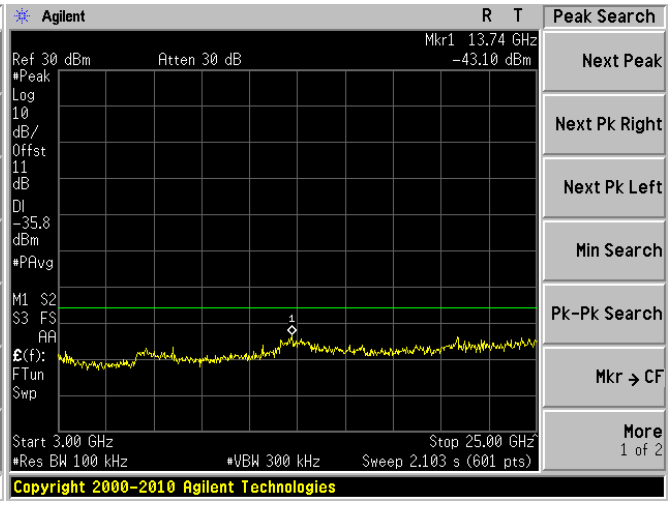


802.11n-HT40, High Channel, 2452 MHz

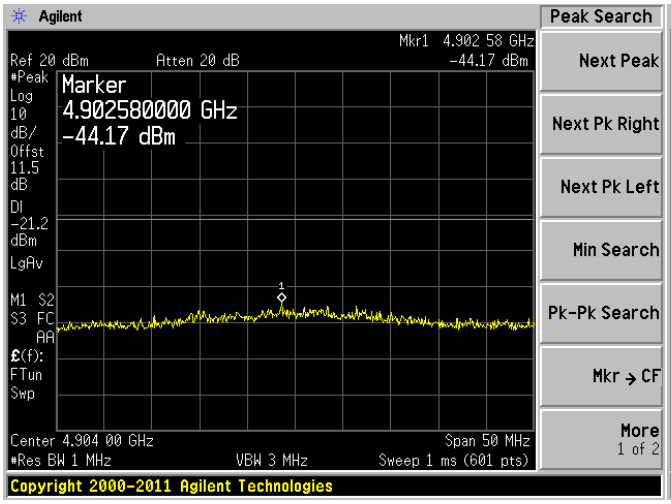
30 MHz – 3 GHz



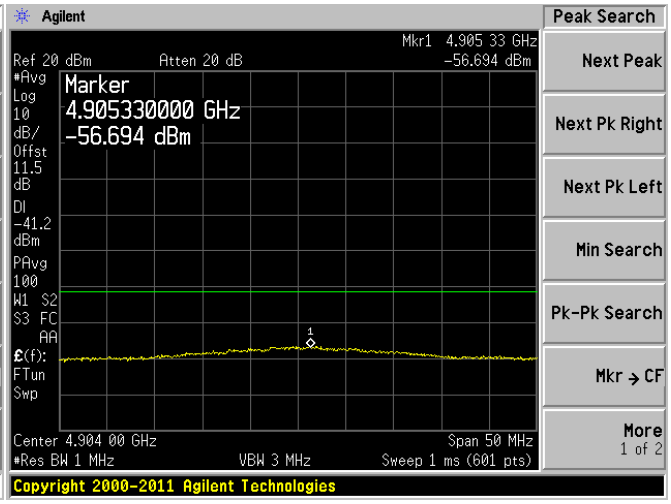
3 GHz – 25 GHz



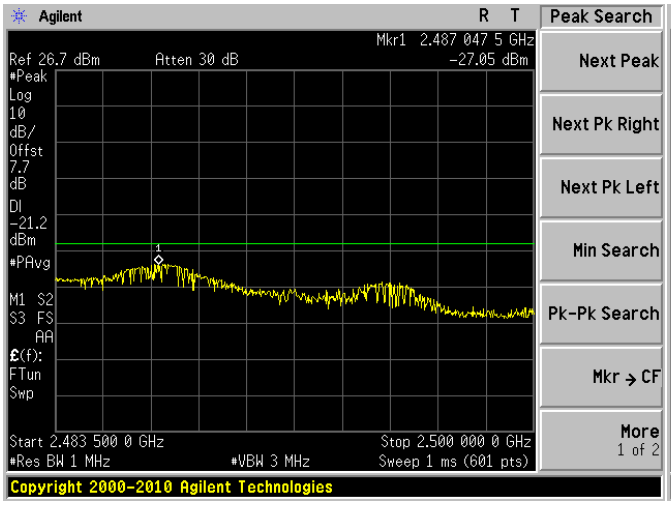
4904 MHz 2nd Harmonic Peak



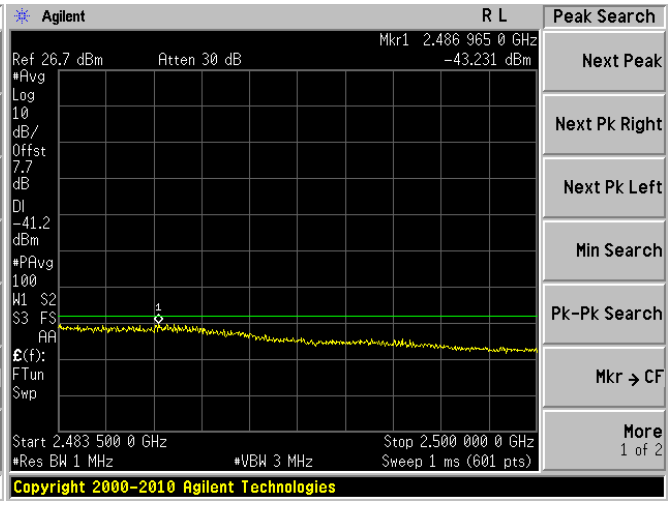
4904 2nd Harmonic Average



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): 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 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
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2013-05-09	1 year
Agilent	Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
EMCO	Horn Antenna	3115	9511-4627	2012-10-17	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:	22-24 °C
Relative Humidity:	41-45 %
ATM Pressure:	101.2-101.6 kPa

The testing was performed by Lionel Lara from 2013-05-13 to 2013-05-14 at 5 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:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-3.74	349.689	Horizontal	802.11b, High

1–25 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-6.02	4924	Horizontal	802.11b, High

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

Note 1: EUT antenna port was terminated.
Note 2: Worst modulation was chosen between 802.11g and 802.11n HT20 since they have similar modulation.

8.8 Radiated Emissions Test Data

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

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

Quasi-Peak Measurements

802.11b mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
350.1638	41.31	99	H	204	46	-4.69
550.5235	37.54	106	V	327	46	-8.46
400.2965	30.86	99	H	56	46	-15.14
137.6393	25.61	284	H	87	43.5	-17.89

802.11b mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
349.709	42.12	100	H	203	46	-3.88
549.546	36.66	106	V	361	46	-9.34
135.522	26.17	286	H	88	43.5	-17.33
399.622	31.85	99	H	58	46	-14.15

802.11b mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
349.689	42.26	100	H	204	46	-3.74
549.812	36.84	106	V	360	46	-9.16
399.681	31.97	99	H	60	46	-14.03
135.525	26.12	285	H	88	43.5	-17.38

802.11g mode, Low Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
549.708	40.26	109	V	328	46	-5.74
349.686	37.03	107	H	23	46	-8.97
144.34	27.26	197	V	62	43.5	-16.24
399.6045	28.65	258	H	211	46	-17.35

802.11g mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
550.2068	40.76	106	V	328	46	-5.24
350.0953	40.04	109	H	22	46	-5.96
143.6503	29.92	198	H	61	43.5	-13.58
400.0015	31.37	259	H	211	46	-14.63

802.11g mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
350.0378	41.32	108	H	21	46	-4.68
550.181	40.34	110	V	328	46	-5.66
144.5908	32.59	198	H	60	43.5	-10.91
400.0258	29.31	257	H	211	46	-16.69

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)
549.954	40.5	99	V	285	46	-5.50
349.9668	36.89	339	H	349	46	-9.11
145.278	30.04	174	H	306	43.5	-13.46
399.9538	29.95	100	H	199	46	-16.05

802.11n-HT40 mode, Middle Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
349.6668	40.46	107	H	348	46	-5.54
549.4578	39.02	99	V	284	46	-6.98
144.6633	30.46	175	H	306	43.5	-13.04
399.695	30.47	99	H	198	46	-15.53

802.11n-HT40 mode, High Channel

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
549.6458	41.18	100	V	283	46	-4.82
349.8385	39.45	109	H	348	46	-6.55
399.7938	29.38	99	H	197	46	-16.62
146.0005	26.85	176	H	306	43.5	-16.65

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

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

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											
4824	39.06	37	100	V	32.55	4.56	27.7	48.47	74	-25.53	Peak
4824	41.16	68	136	H	32.55	4.56	27.7	50.57	74	-23.43	Peak
4824	34.51	37	100	V	32.55	4.56	27.7	43.92	54	-10.08	Ave
4824	37.96	68	136	H	32.55	4.56	27.7	47.37	54	-6.63	Ave
7236[1]	34.65	0	100	V	35.93	4.93	27.58	47.93	74	-26.07	Peak
7236[1]	34.65	0	100	H	35.93	4.93	27.58	47.93	74	-26.07	Peak
7236[1]	20	0	100	V	35.93	4.93	27.58	33.28	54	-20.72	Ave
7236[1]	20	0	100	H	35.93	4.93	27.58	33.28	54	-20.72	Ave
9648[1]	34.04	0	100	V	37.95	5.82	27.06	50.75	74	-23.25	Peak
9648[1]	34.04	0	100	H	37.95	5.82	27.06	50.75	74	-23.25	Peak
9648[1]	19.44	0	100	V	37.95	5.82	27.06	36.15	54	-17.85	Ave
9648[1]	19.44	0	100	H	37.95	5.82	27.06	36.15	54	-17.85	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	38.27	228	100	V	33.33	4.1	27.75	47.95	74	-26.05	Peak
4874	40.75	55	131	H	33.33	4.1	27.75	50.43	74	-23.57	Peak
4874	33.53	228	100	V	33.33	4.1	27.75	43.21	54	-10.79	Ave
4874	37.39	55	131	H	33.33	4.1	27.75	47.07	54	-6.93	Ave
7311[1]	33.97	0	100	V	36.51	4.89	27.51	47.86	74	-26.14	Peak
7311[1]	33.97	0	100	H	36.51	4.89	27.51	47.86	74	-26.14	Peak
7311[1]	19.35	0	100	V	36.51	4.89	27.51	33.24	54	-20.76	Ave
7311[1]	19.35	0	100	H	36.51	4.89	27.51	33.24	54	-20.76	Ave
9748[1]	33.64	0	100	V	38.29	5.77	26.98	50.72	74	-23.28	Peak
9748[1]	33.64	0	100	H	38.29	5.77	26.98	50.72	74	-23.28	Peak
9748[1]	19.21	0	100	V	38.29	5.77	26.98	36.29	54	-17.71	Ave
9748[1]	19.21	0	100	H	38.29	5.77	26.98	36.29	54	-17.71	Ave

Note 1: Noise floor level. All other emissions at noise floor level.

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											
4924	37.83	223	100	V	33.33	4.1	27.76	47.5	74	-26.5	Peak
4924	41.16	53	120	H	33.33	4.1	27.76	50.83	74	-23.17	Peak
4924	32.16	223	100	V	33.33	4.1	27.76	41.83	54	-12.17	Ave
4924	38.31	53	120	H	33.33	4.1	27.76	47.98	54	-6.02	Ave
7386[1]	34.4	0	100	V	36.36	4.88	27.51	48.13	74	-25.87	Peak
7386[1]	34.4	0	100	H	36.36	4.88	27.51	48.13	74	-25.87	Peak
7386[1]	19.19	0	100	V	36.36	4.88	27.51	32.92	54	-21.08	Ave
7386[1]	19.19	0	100	H	36.36	4.88	27.51	32.92	54	-21.08	Ave
9848[1]	33.02	0	100	V	38.06	5.74	26.98	49.84	74	-24.16	Peak
9848[1]	33.02	0	100	H	38.06	5.74	26.98	49.84	74	-24.16	Peak
9848[1]	18.49	0	100	V	38.06	5.74	26.98	35.31	54	-18.69	Ave
9848[1]	18.49	0	100	H	38.06	5.74	26.98	35.31	54	-18.69	Ave

Note 1: Noise floor level. All other emissions at noise floor level.

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											
4824	38.43	37	101	V	32.55	4.56	27.7	47.84	74	-26.16	Peak
4824	41.45	57	135	H	32.55	4.56	27.7	50.86	74	-23.14	Peak
4824	24.32	37	101	V	32.55	4.56	27.7	33.73	54	-20.27	Ave
4824	28.07	57	135	H	32.55	4.56	27.7	37.48	54	-16.52	Ave
7236[1]	35.02	0	100	V	35.93	4.93	27.58	48.3	74	-25.7	Peak
7236[1]	35.02	0	100	H	35.93	4.93	27.58	48.3	74	-25.7	Peak
7236[1]	20.08	0	100	V	35.93	4.93	27.58	33.36	54	-20.64	Ave
7236[1]	20.08	0	100	H	35.93	4.93	27.58	33.36	54	-20.64	Ave
9648[1]	34.65	0	100	V	37.95	5.82	27.06	51.36	74	-22.64	Peak
9648[1]	34.65	0	100	H	37.95	5.82	27.06	51.36	74	-22.64	Peak
9648[1]	19.53	0	100	V	37.95	5.82	27.06	36.24	54	-17.76	Ave
9648[1]	19.53	0	100	H	37.95	5.82	27.06	36.24	54	-17.76	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	38.65	227	100	V	32.77	4.54	27.76	48.2	74	-25.8	Peak
4874	42.48	59	131	H	32.77	4.54	27.76	52.03	74	-21.97	Peak
4874	24.59	227	100	V	32.77	4.54	27.76	34.14	54	-19.86	Ave
4874	28.92	59	131	H	32.77	4.54	27.76	38.47	54	-15.53	Ave
7311	39.5	202	177	V	36.6	5.57	27.51	54.16	74	-19.84	Peak
7311	37.26	216	133	H	36.6	5.57	27.51	51.92	74	-22.08	Peak
7311	24.41	202	177	V	36.6	5.57	27.51	39.07	54	-14.93	Ave
7311	22.57	216	133	H	36.6	5.57	27.51	37.23	54	-16.77	Ave
9748[1]	33.82	0	100	V	38.29	5.77	26.98	50.9	74	-23.1	Peak
9748[1]	33.82	0	100	H	38.29	5.77	26.98	50.9	74	-23.1	Peak
9748[1]	18.87	0	100	V	38.29	5.77	26.98	35.95	54	-18.05	Ave
9748[1]	18.87	0	100	H	38.29	5.77	26.98	35.95	54	-18.05	Ave

Note 1: Noise floor level. All other emissions at noise floor level.

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											
4924	37.13	228	100	V	33.33	4.1	27.76	46.8	74	-27.2	Peak
4924	39.37	60	130	H	33.33	4.1	27.76	49.04	74	-24.96	Peak
4924	22.67	228	100	V	33.33	4.1	27.76	32.34	54	-21.66	Ave
4924	25.81	60	130	H	33.33	4.1	27.76	35.48	54	-18.52	Ave
7386	35.22[1]	0	100	V	36.36	4.88	27.51	48.95	74	-25.05	Peak
7386	35.22[1]	0	100	H	36.36	4.88	27.51	48.95	74	-25.05	Peak
7386	19.39[1]	0	100	V	36.36	4.88	27.51	33.12	54	-20.88	Ave
7386	19.39[1]	0	100	H	36.36	4.88	27.51	33.12	54	-20.88	Ave
9848	32.71[1]	0	100	V	38.06	5.74	26.98	49.53	74	-24.47	Peak
9848	32.71[1]	0	100	H	38.06	5.74	26.98	49.53	74	-24.47	Peak
9848	18.3[1]	0	100	V	38.06	5.74	26.98	35.12	54	-18.88	Ave
9848	18.3[1]	0	100	H	38.06	5.74	26.98	35.12	54	-18.88	Ave

Note 1: Noise floor level. All other emissions at noise floor level.

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											
4844[1]	34.29	0	100	V	32.55	4.56	27.7	43.7	74	-30.3	Peak
4844	38.46	58	136	H	32.55	4.56	27.7	47.87	74	-26.13	Peak
4844[1]	19.3	0	100	V	32.55	4.56	27.7	28.71	54	-25.29	Ave
4844	25.55	58	136	H	32.55	4.56	27.7	34.96	54	-19.04	Ave
7266[1]	34.82	0	100	V	35.93	4.93	27.58	48.1	74	-25.9	Peak
7266[1]	34.82	0	100	H	35.93	4.93	27.58	48.1	74	-25.9	Peak
7266[1]	20.08	0	100	V	35.93	4.93	27.58	33.36	54	-20.64	Ave
7266[1]	20.08	0	100	H	35.93	4.93	27.58	33.36	54	-20.64	Ave
9688[1]	34.15	0	100	V	37.95	5.82	27.06	50.86	74	-23.14	Peak
9688[1]	34.15	0	100	H	37.95	5.82	27.06	50.86	74	-23.14	Peak
9688[1]	19.32	0	100	V	37.95	5.82	27.06	36.03	54	-17.97	Ave
9688[1]	19.32	0	100	H	37.95	5.82	27.06	36.03	54	-17.97	Ave
Middle Channel 2437 MHz, measured at 3 meters											
4874	36.05	223	101	V	32.77	4.54	27.76	45.6	74	-28.4	Peak
4874	39.73	59	132	H	32.77	4.54	27.76	49.28	74	-24.72	Peak
4874	22.26	223	101	V	32.77	4.54	27.76	31.81	54	-22.19	Ave
4874	27.03	59	132	H	32.77	4.54	27.76	36.58	54	-17.42	Ave
7311[1]	34.7	0	100	V	36.6	5.57	27.51	49.36	74	-24.64	Peak
7311[1]	34.7	0	100	H	36.6	5.57	27.51	49.36	74	-24.64	Peak
7311[1]	20.04	0	100	V	36.6	5.57	27.51	34.7	54	-19.3	Ave
7311[1]	20.04	0	100	H	36.6	5.57	27.51	34.7	54	-19.3	Ave
9748[1]	33.54	0	100	V	38.29	5.77	26.98	50.62	74	-23.38	Peak
9748[1]	33.54	0	100	H	38.29	5.77	26.98	50.62	74	-23.38	Peak
9748[1]	18.85	0	100	V	38.29	5.77	26.98	35.93	54	-18.07	Ave
9748[1]	18.85	0	100	H	38.29	5.77	26.98	35.93	54	-18.07	Ave

Note 1: Noise floor level. All other emissions at noise floor level.

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											
4904[1]	33.85	0	100	V	33.33	4.1	27.76	43.52	74	-30.48	Peak
4904	34.59	59	100	H	33.33	4.1	27.76	44.26	74	-29.74	Peak
4904[1]	18.78	0	100	V	33.33	4.1	27.76	28.45	54	-25.55	Ave
4904	21.04	59	100	H	33.33	4.1	27.76	30.71	54	-23.29	Ave
7356[1]	33.69	0	100	V	36.36	4.88	27.51	47.42	74	-26.58	Peak
7356[1]	33.69	0	100	H	36.36	4.88	27.51	47.42	74	-26.58	Peak
7356[1]	19.25	0	100	V	36.36	4.88	27.51	32.98	54	-21.02	Ave
7356[1]	19.25	0	100	H	36.36	4.88	27.51	32.98	54	-21.02	Ave
9808[1]	33.12	0	100	V	38.06	5.74	26.98	49.94	74	-24.06	Peak
9808[1]	33.12	0	100	H	38.06	5.74	26.98	49.94	74	-24.06	Peak
9808[1]	18.76	0	100	V	38.06	5.74	26.98	35.58	54	-18.42	Ave
9808[1]	18.76	0	100	H	38.06	5.74	26.98	35.58	54	-18.42	Ave

Note 1: Noise floor level. All other emissions at noise floor level.

9 FCC§15.247(a)(2) – 6 dB & 99% 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	E4440A	US42221851	2013-03-05	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:	42 %
ATM Pressure:	101.1 kPa

The testing was performed by Lionel Lara on 2013-05-01 at the RF site.

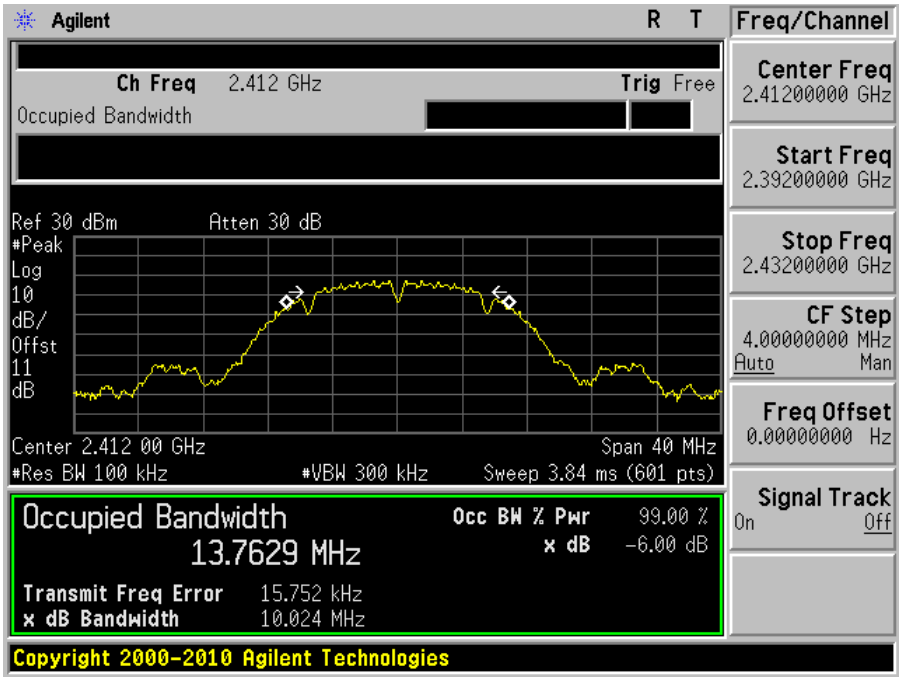
9.5 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
802.11 b mode					
Low	2412	10.024	13.7629	> 0.5	Compliant
Middle	2437	9.985	13.7604	> 0.5	Compliant
High	2462	10.028	13.8124	> 0.5	Compliant
802.11 g mode					
Low	2412	16.612	16.4663	> 0.5	Compliant
Middle	2437	16.588	16.5318	> 0.5	Compliant
High	2462	16.615	16.4591	> 0.5	Compliant
802.11n-HT20 mode					
Low	2412	17.6720	17.856	> 0.5	Compliant
Middle	2437	17.7376	17.867	> 0.5	Compliant
High	2462	17.880	17.6735	> 0.5	Compliant
802.11n-HT40 mode					
Low	2422	36.641	36.2235	> 0.5	Compliant
Middle	2437	36.586	36.3895	> 0.5	Compliant
High	2452	36.650	36.2216	> 0.5	Compliant

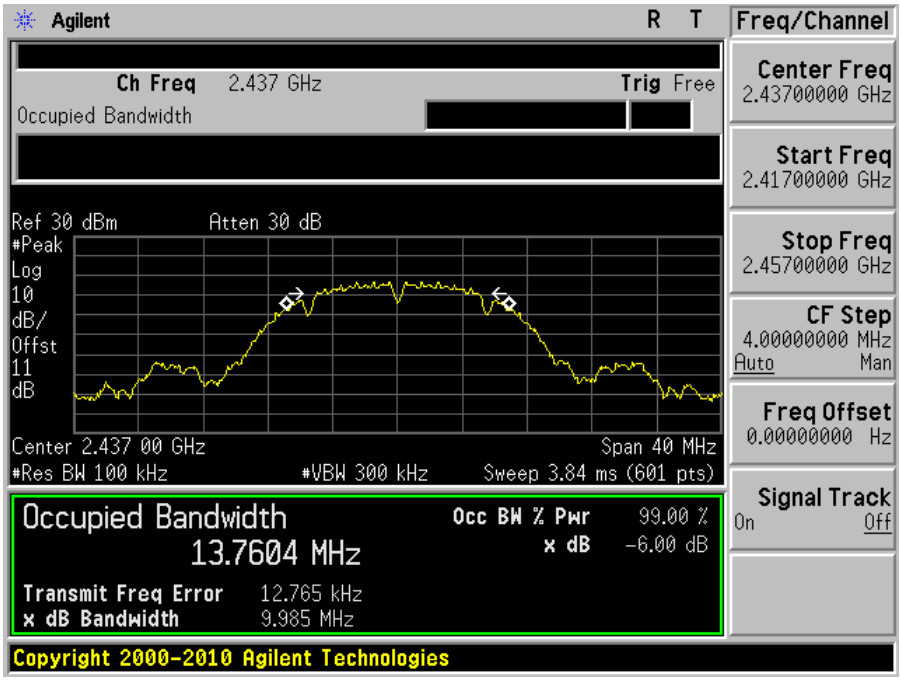
Please refer to the following plots for detailed test results.

802.11b mode

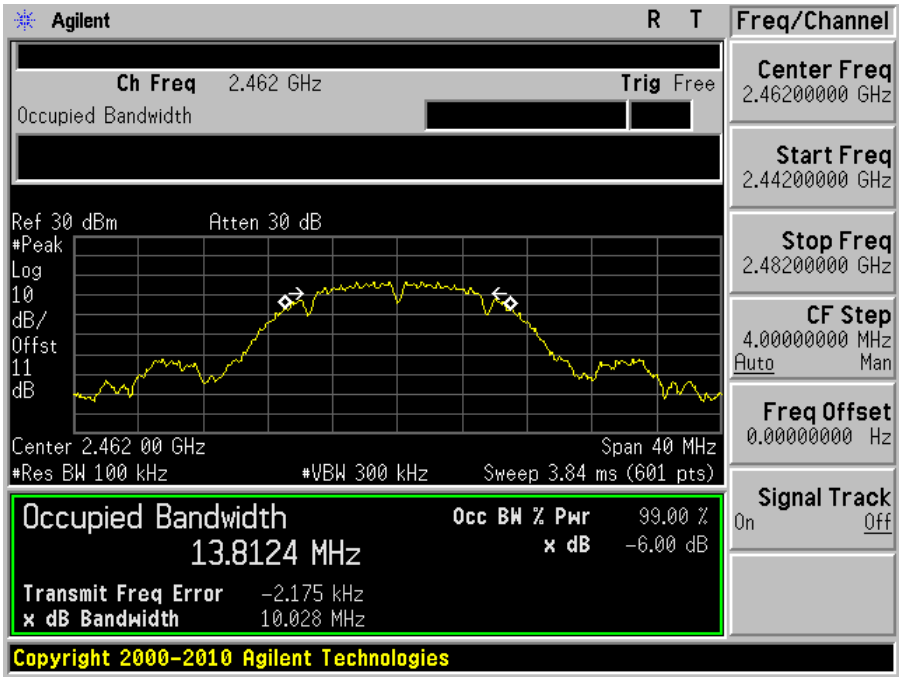
Low channel: 2412 MHz



Middle channel: 2437 MHz

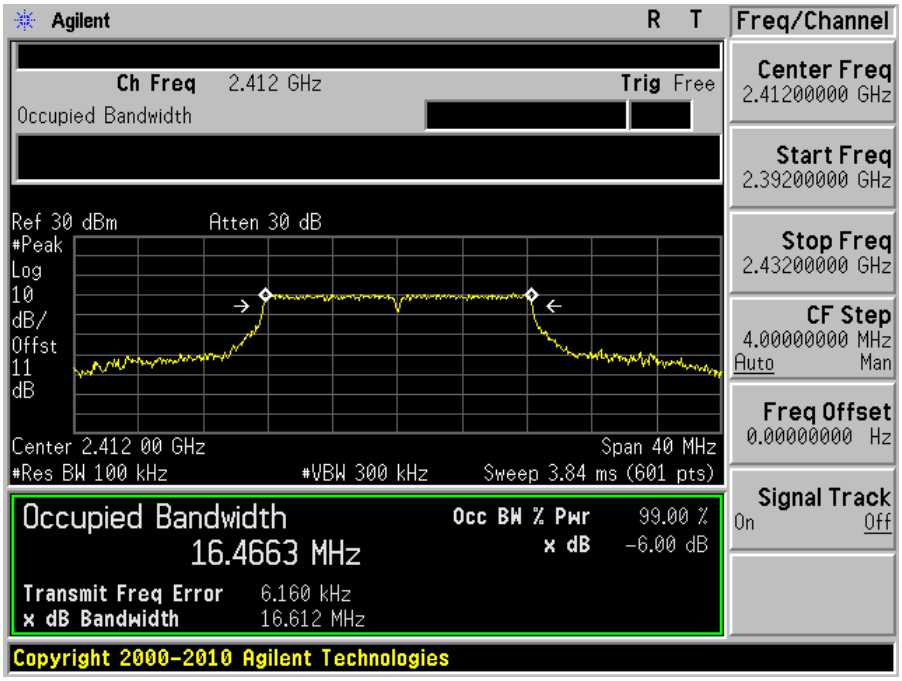


High channel: 2462 MHz

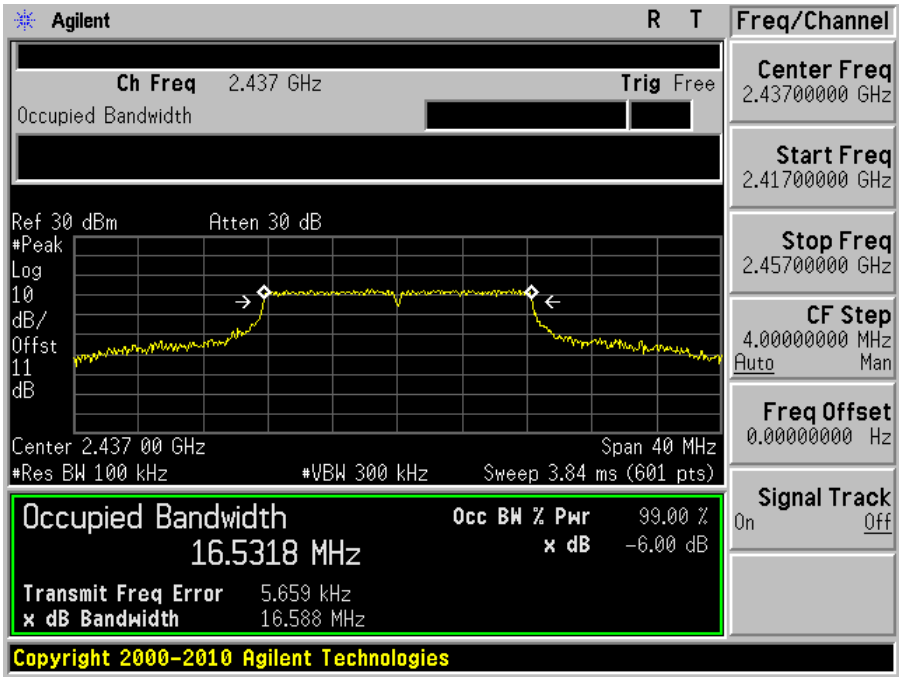


802.11g mode

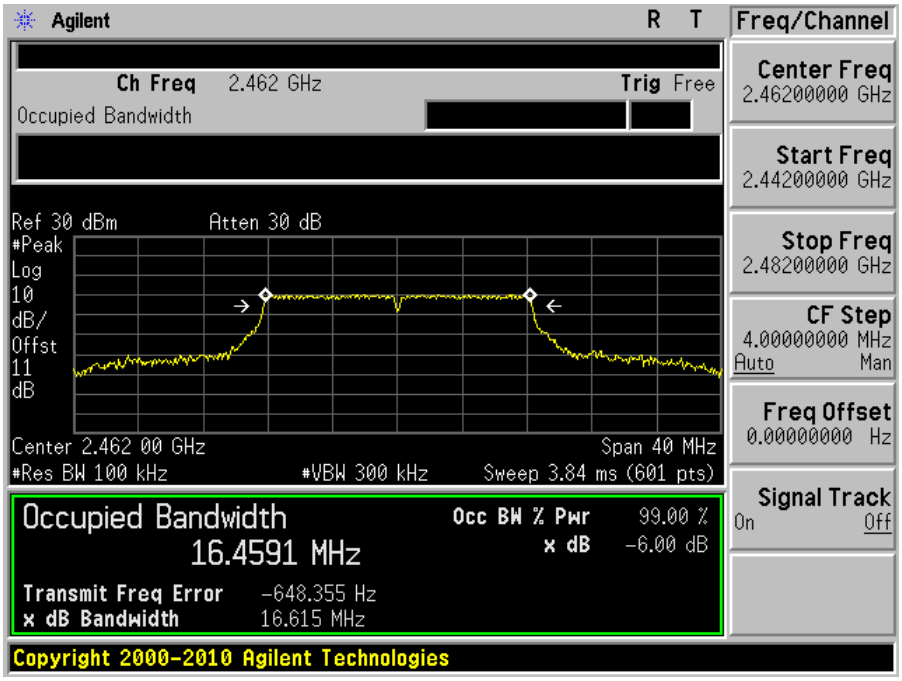
Low channel: 2412 MHz



Middle channel: 2437 MHz

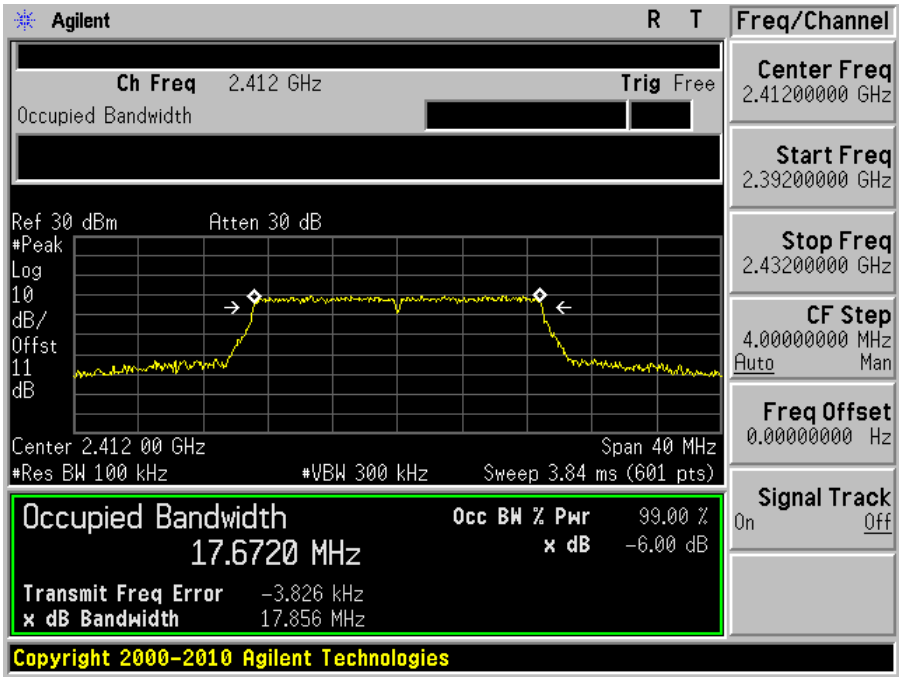


High channel: 2462 MHz

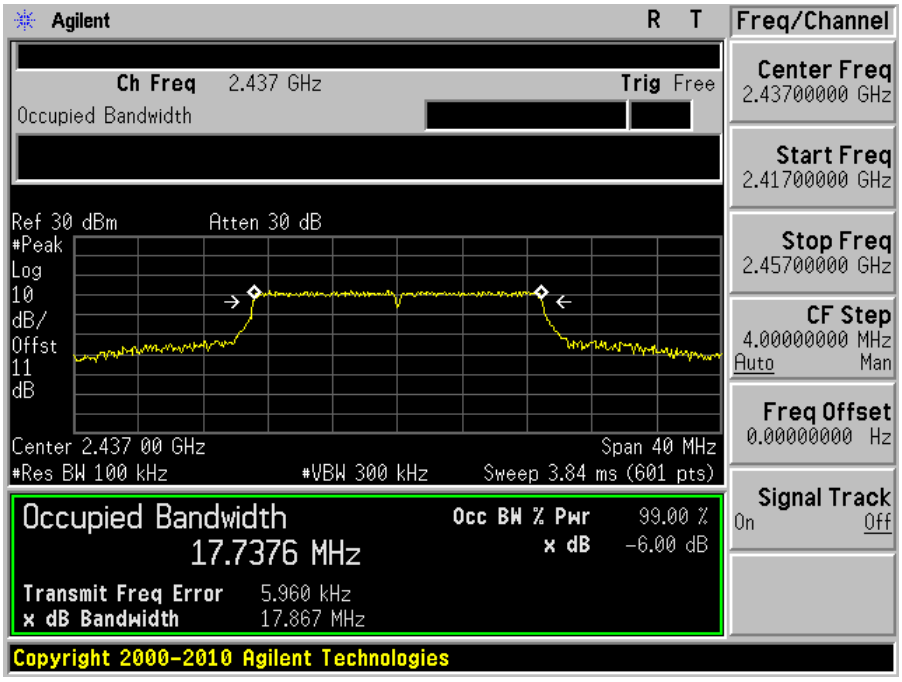


802.11n-HT20 mode

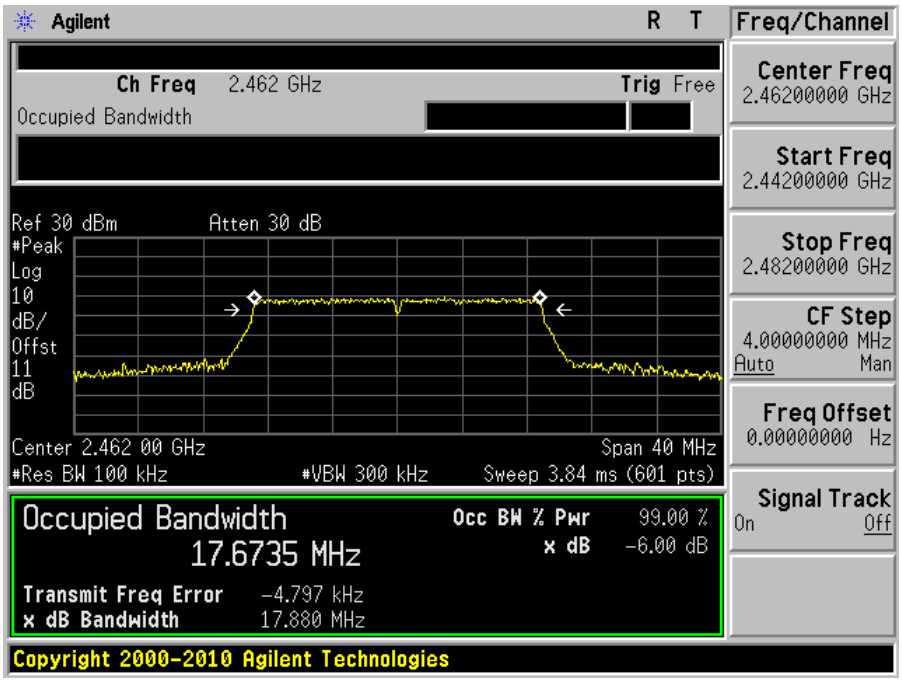
Low channel: 2412 MHz



Middle channel: 2437 MHz

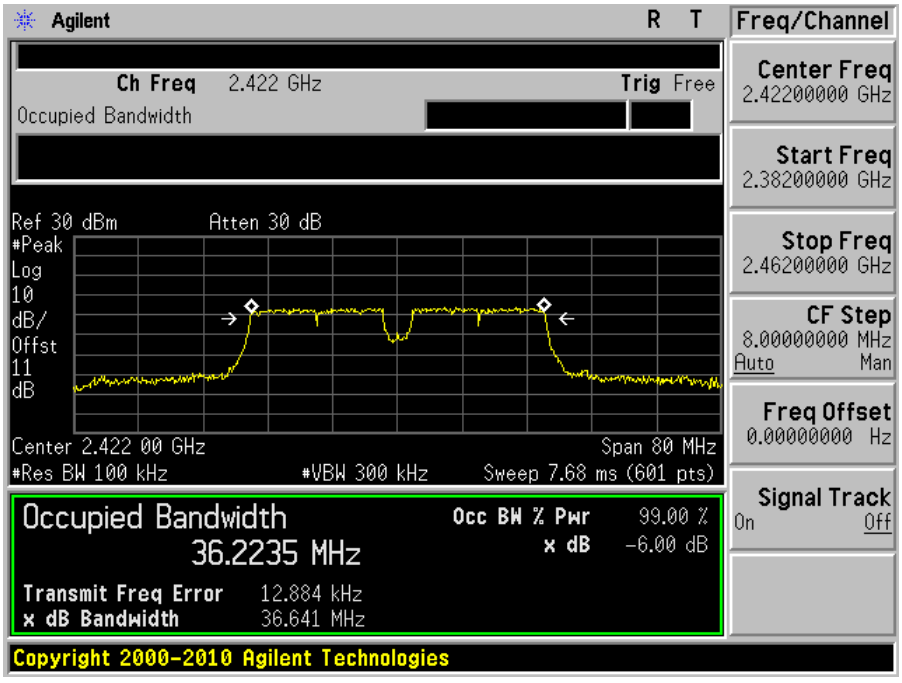


High channel: 2462 MHz

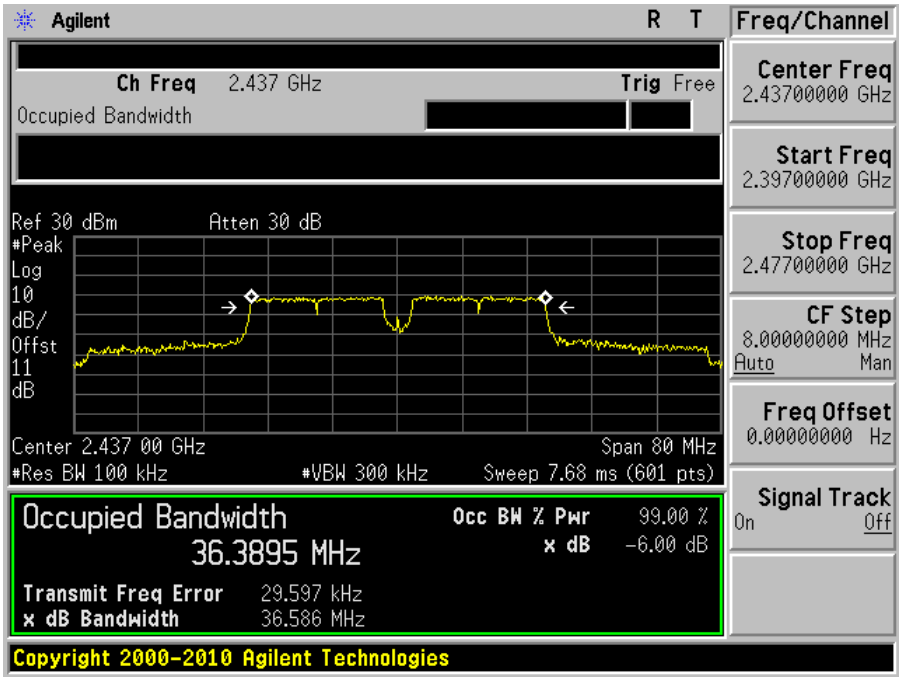


802.11n-HT40 mode

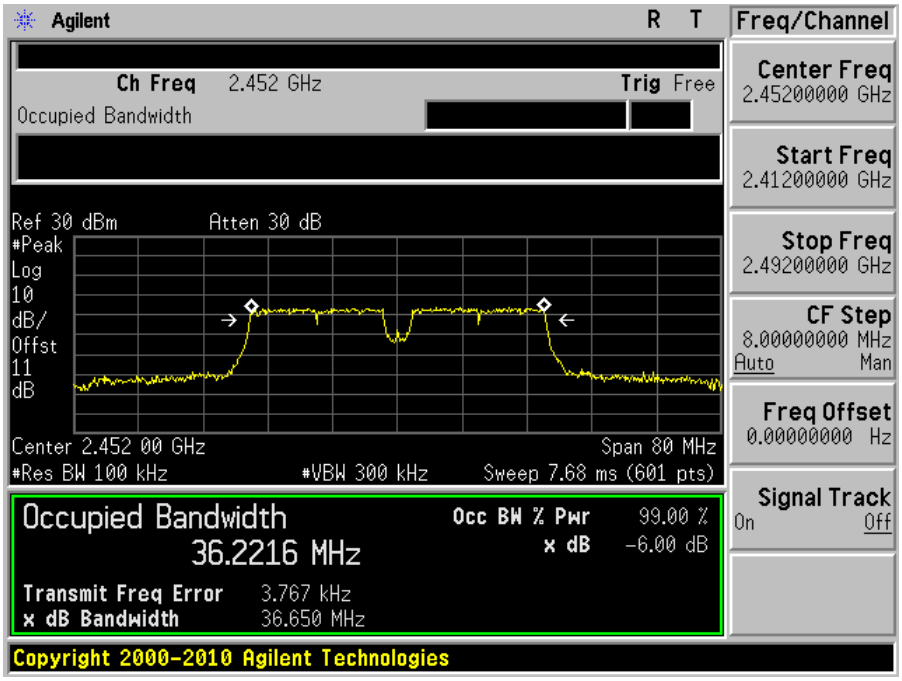
Low channel: 2422 MHz



Middle channel: 2437 MHz



High channel: 2452 MHz



10 FCC §15.247(b) – Peak Output Power Measurement

10.1 Applicable Standard

According to FCC §15.247(b): The maximum peak conducted output power of the intentional radiator, for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands, shall not exceed 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	E4440A	US42221851	2013-03-05	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:	42 %
ATM Pressure:	101.1kPa

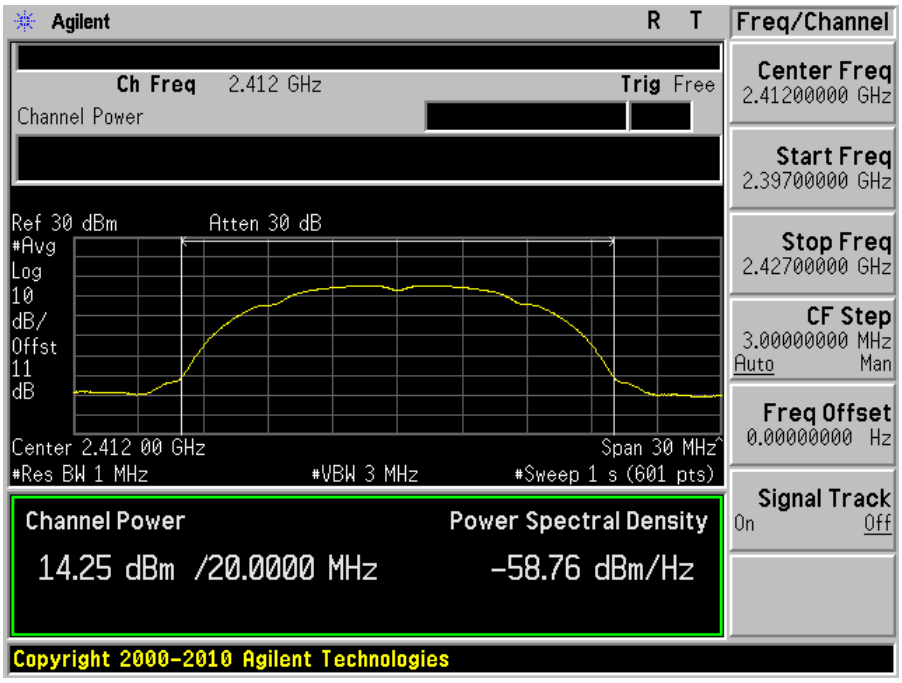
The testing was performed by Lionel Lara on 2013-05-01 at the RF site.

10.5 Test Results

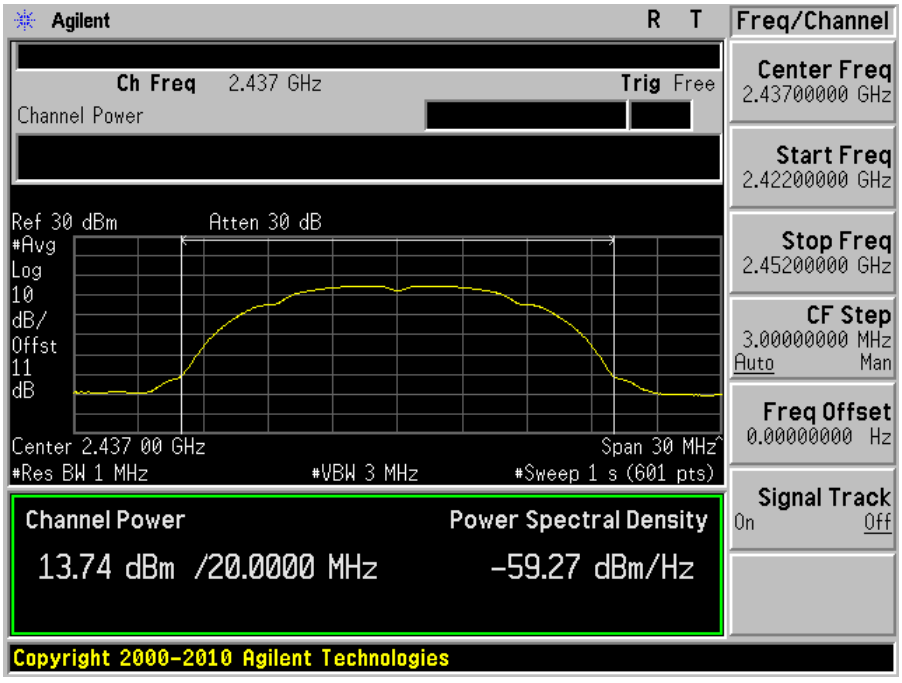
Mode	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)	Software Power Setting
802.11b	2412	14.25	30	-15.75	16
	2437	13.74	30	-16.26	16
	2462	13.45	30	-16.55	16
802.11g	2412	15.28	30	-14.72	17
	2437	17.48	30	-12.52	20
	2462	14.85	30	-15.15	17
802.11n-HT20	2412	14.30	30	-15.7	16
	2437	17.05	30	-12.95	20
	2462	13.97	30	-16.03	16
802.11n-HT40	2422	11.03	30	-18.97	14
	2437	16.67	30	-13.33	20
	2452	10.98	30	-19.02	13

802.11b mode

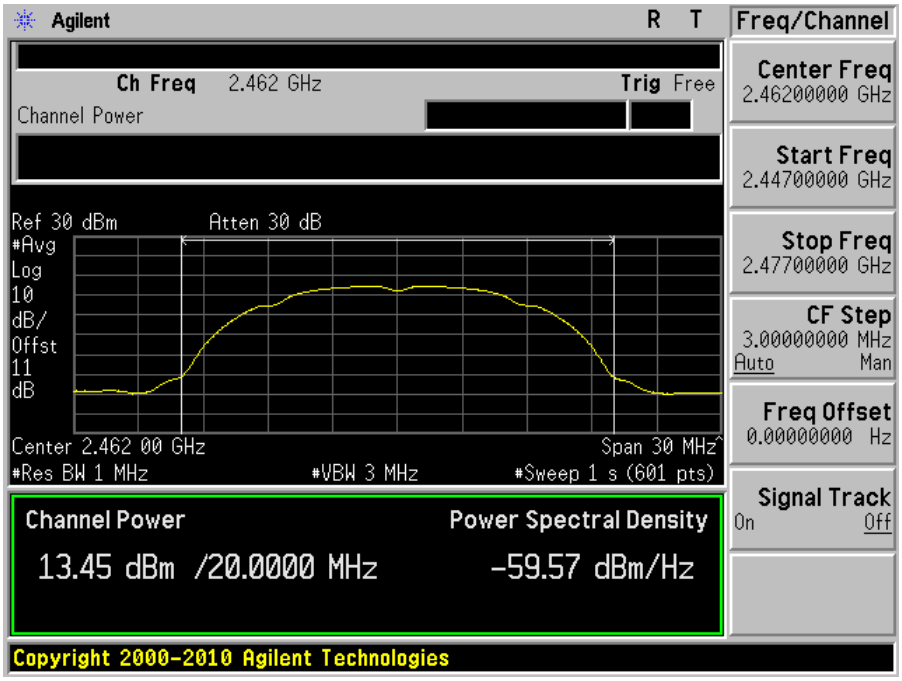
Low channel: 2412 MHz



Middle channel: 2437 MHz

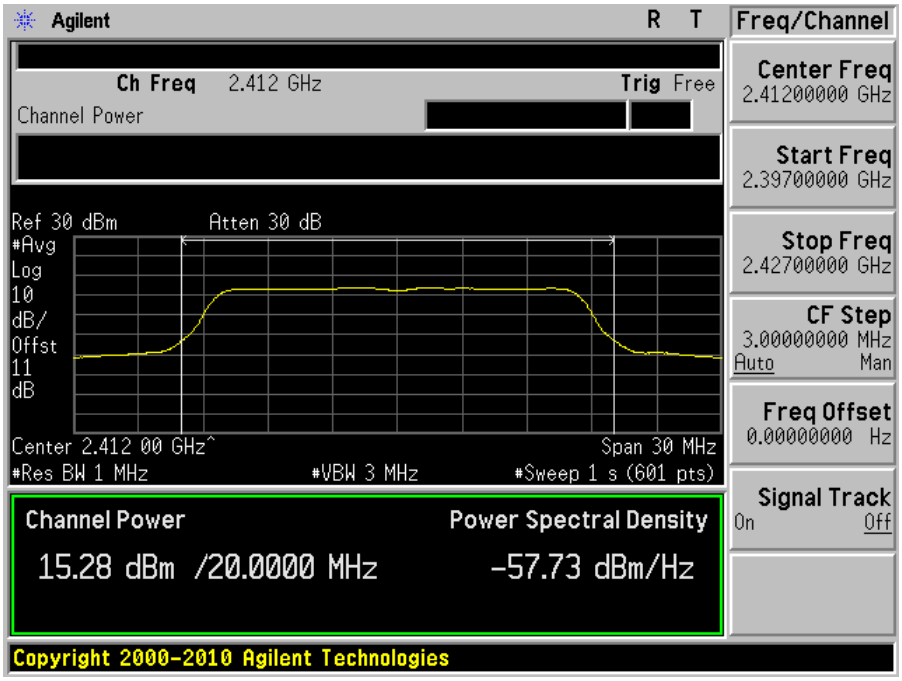


High channel: 2462 MHz

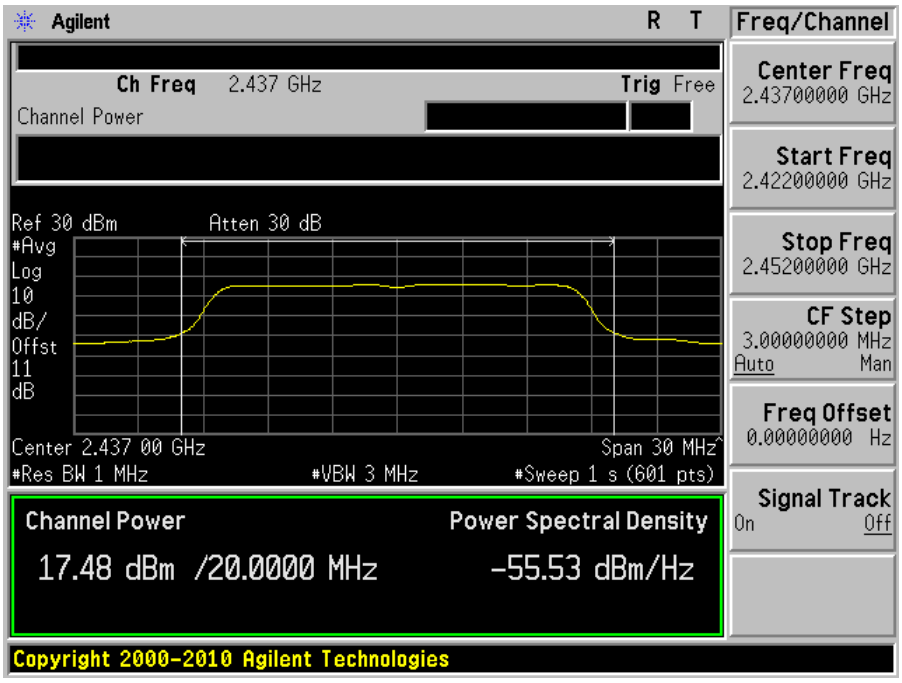


802.11g mode

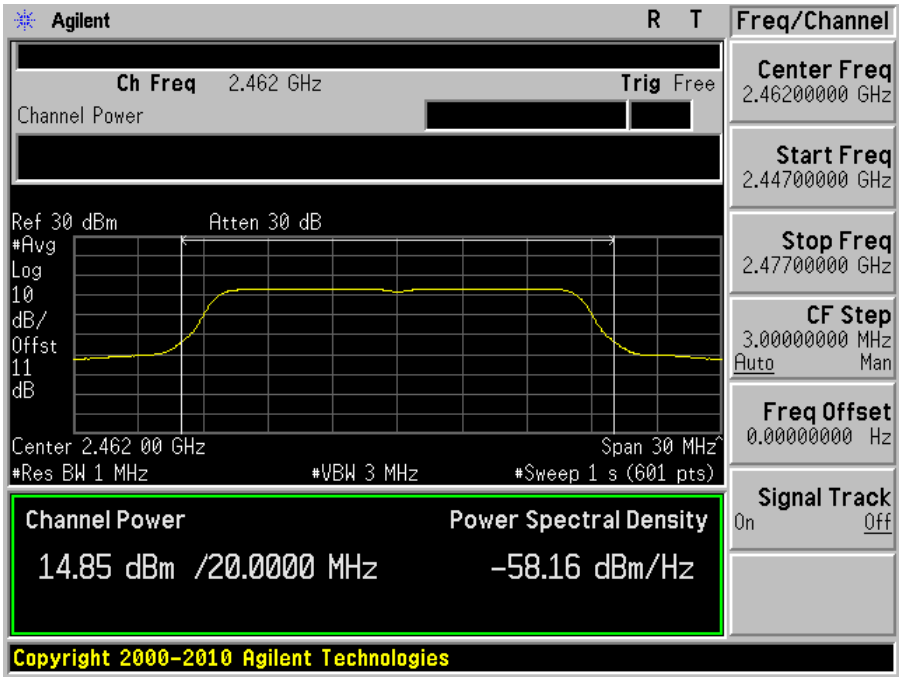
Low channel: 2412 MHz



Middle channel: 2437 MHz

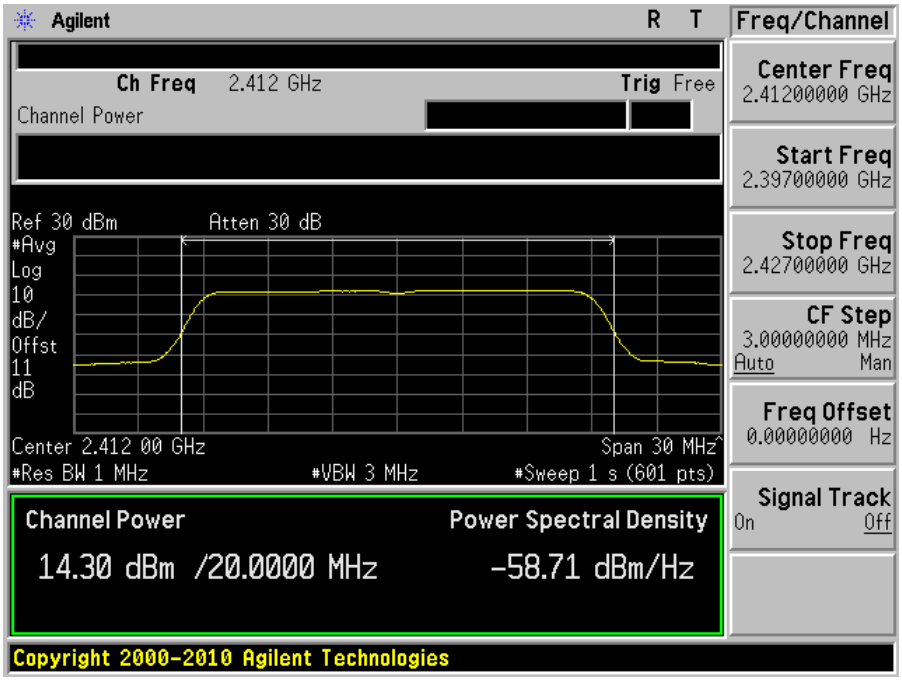


High channel: 2462 MHz

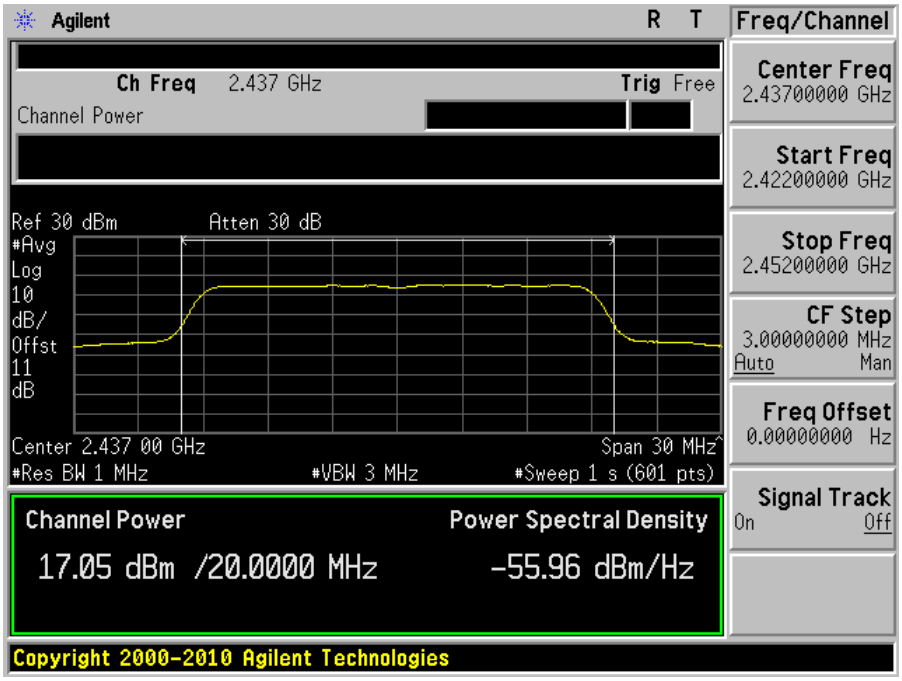


802.11n-HT20 mode

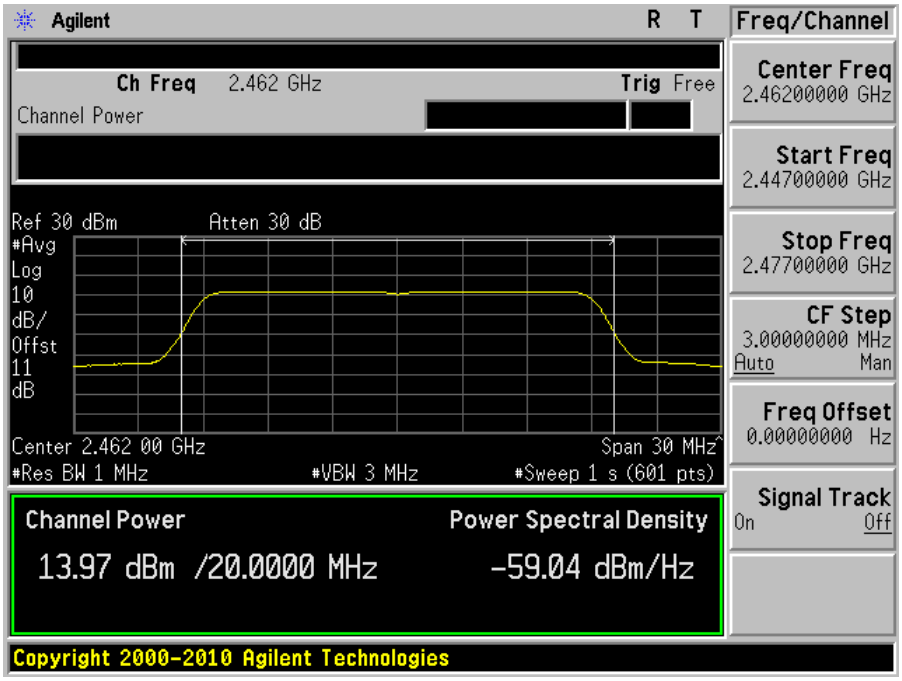
Low channel: 2412 MHz



Middle channel: 2437 MHz

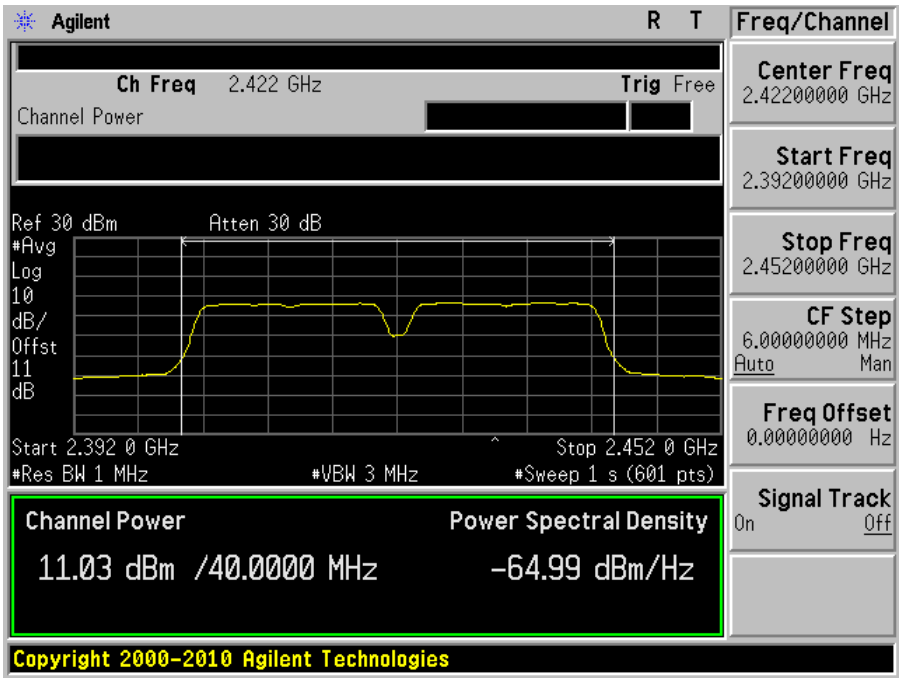


High channel: 2462 MHz

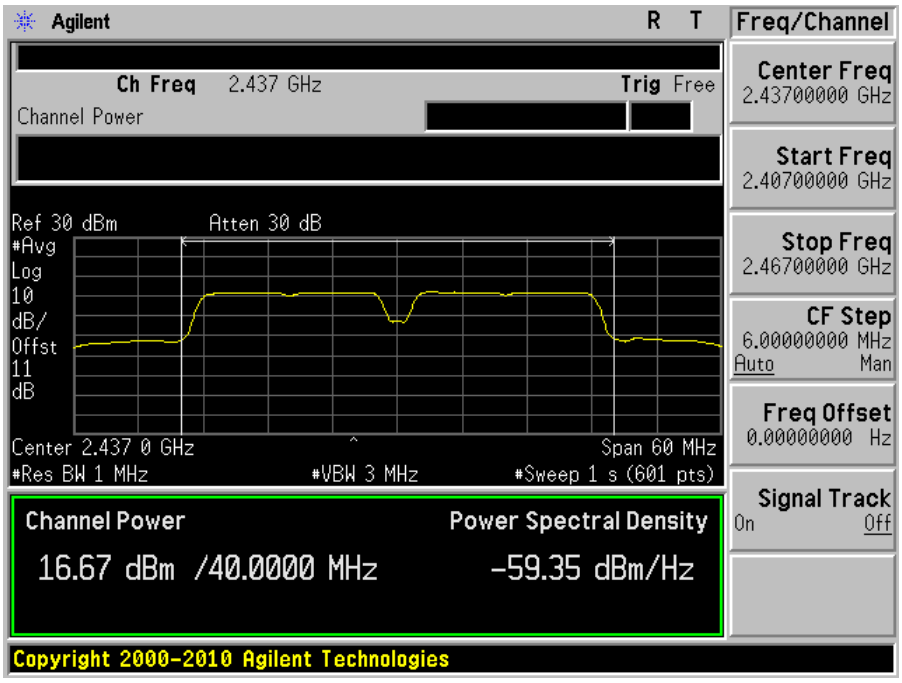


802.11n-HT40 mode

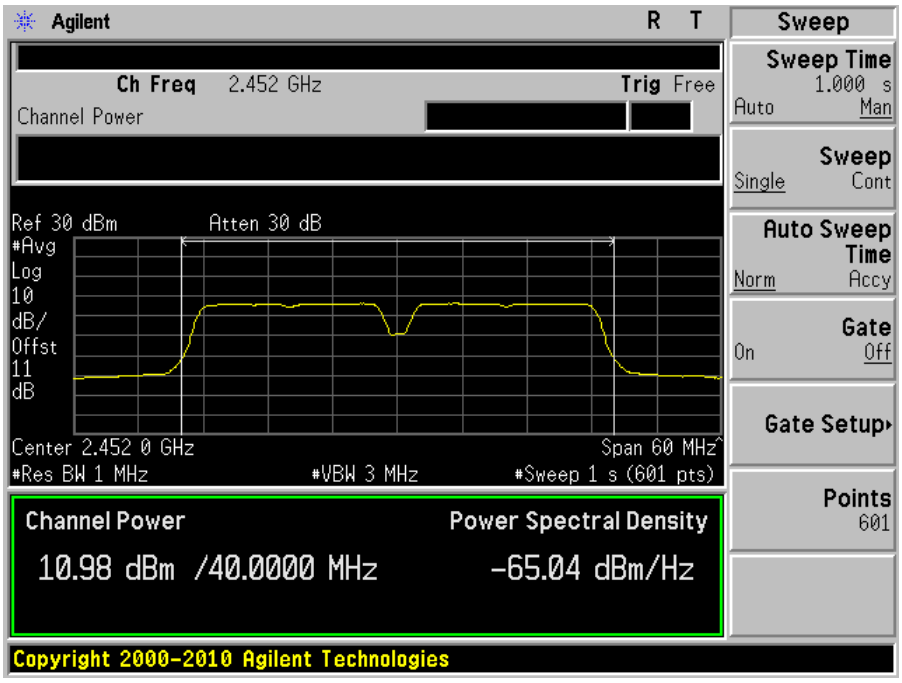
Low channel: 2422 MHz



Middle channel: 2437 MHz



High channel: 2452 MHz



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	E4440A	US42221851	2013-03-05	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:	21 °C
Relative Humidity:	42 %
ATM Pressure:	101.1 kPa

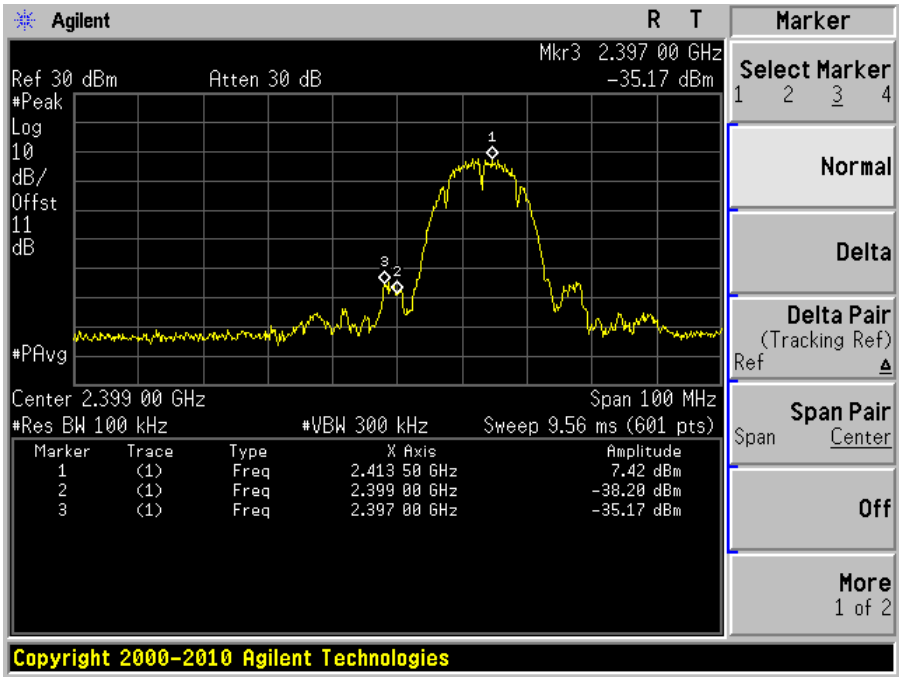
The testing was performed by Lionel Lara on 2013-05-01 at the RF site.

11.5 Test Results

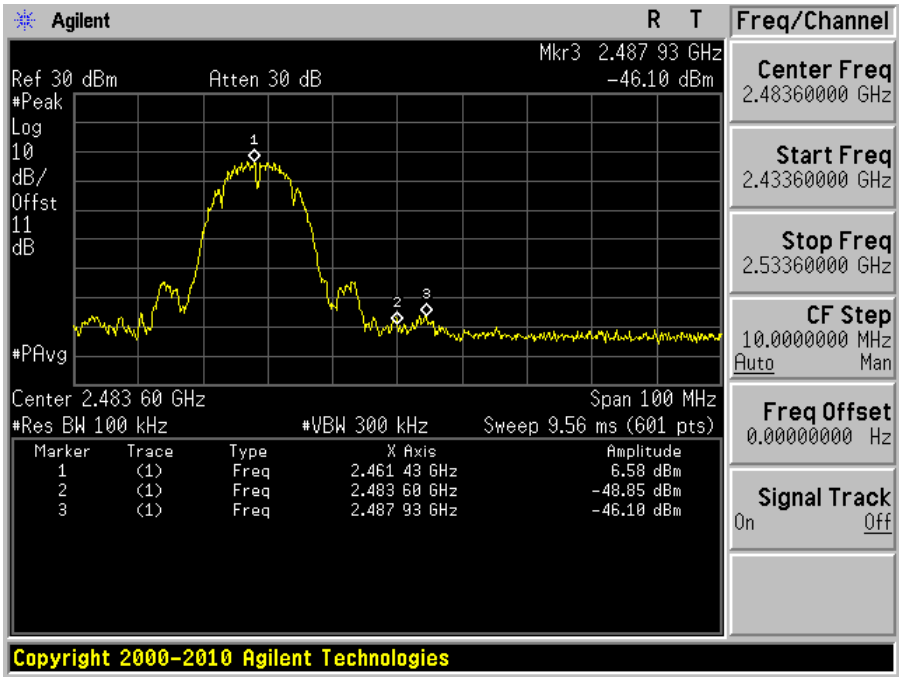
Please refer to following pages for plots of band edge.

802.11b mode

Low channel: 2412 MHz

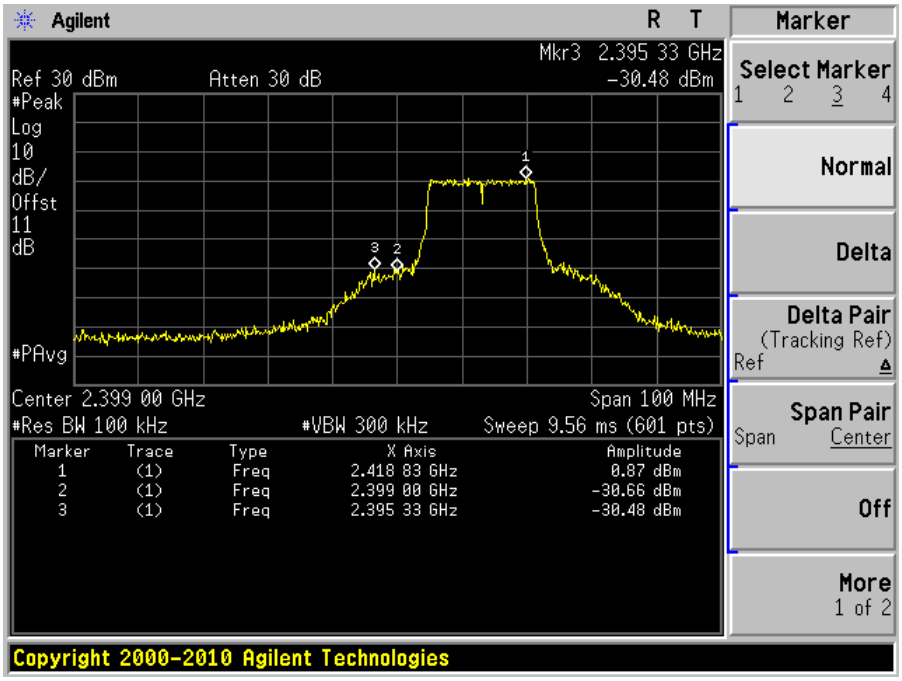


High channel: 2462 MHz

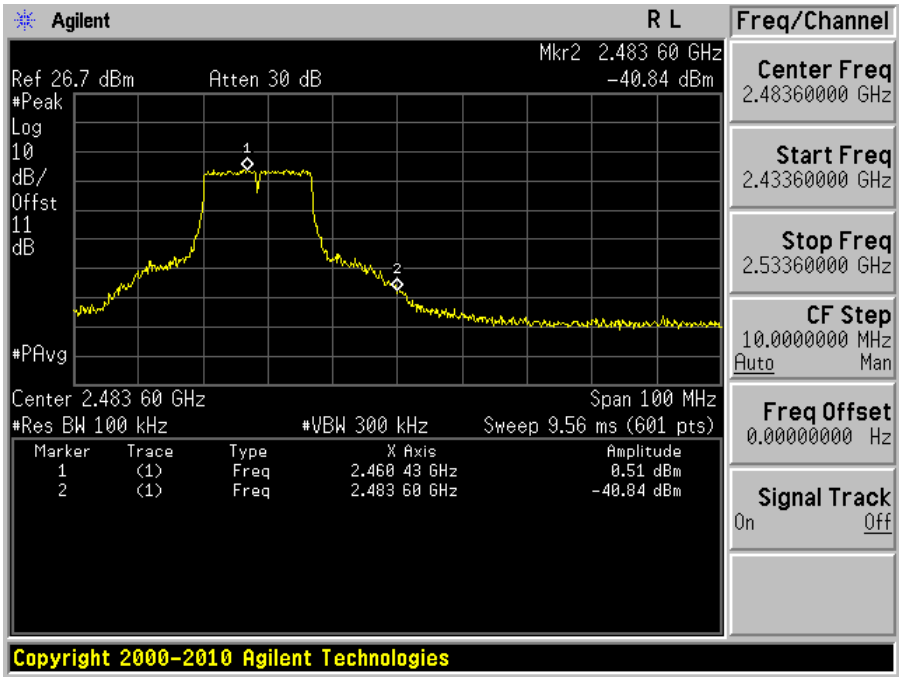


802.11g mode

Low channel: 2412 MHz

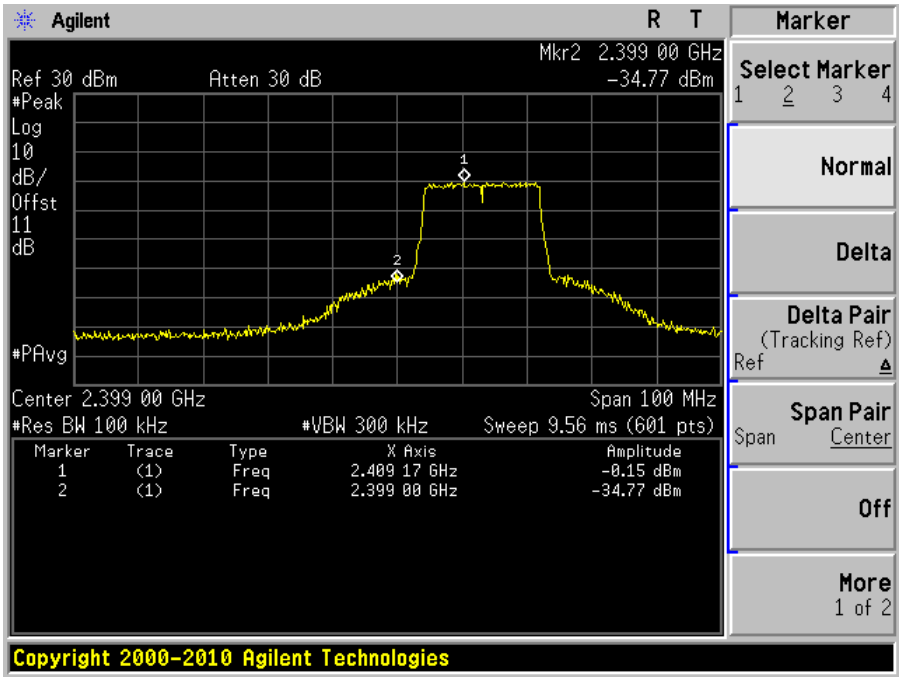


High channel: 2462 MHz

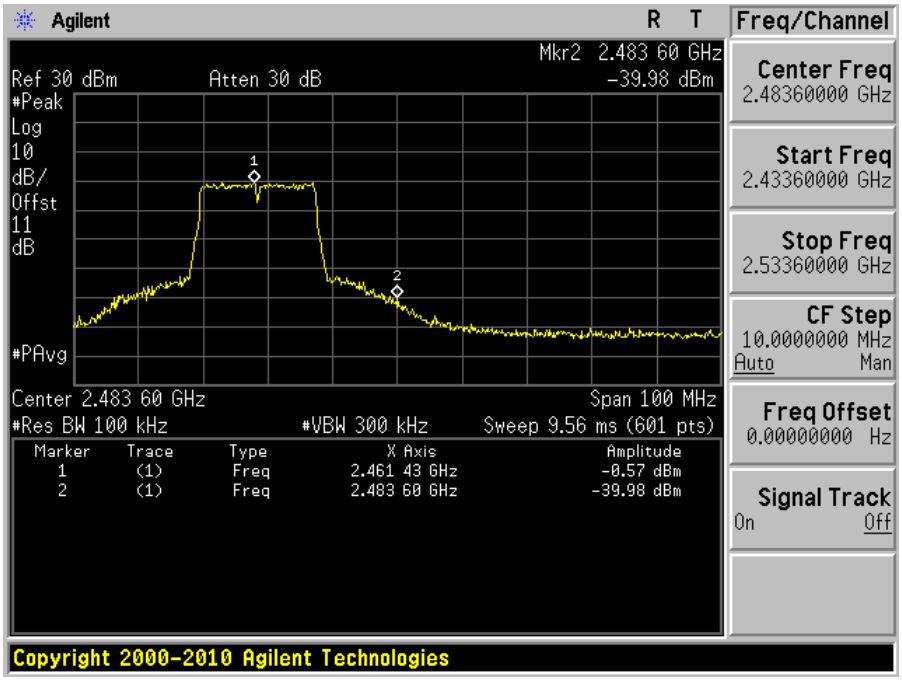


802.11n-HT20 mode

Low channel: 2412 MHz

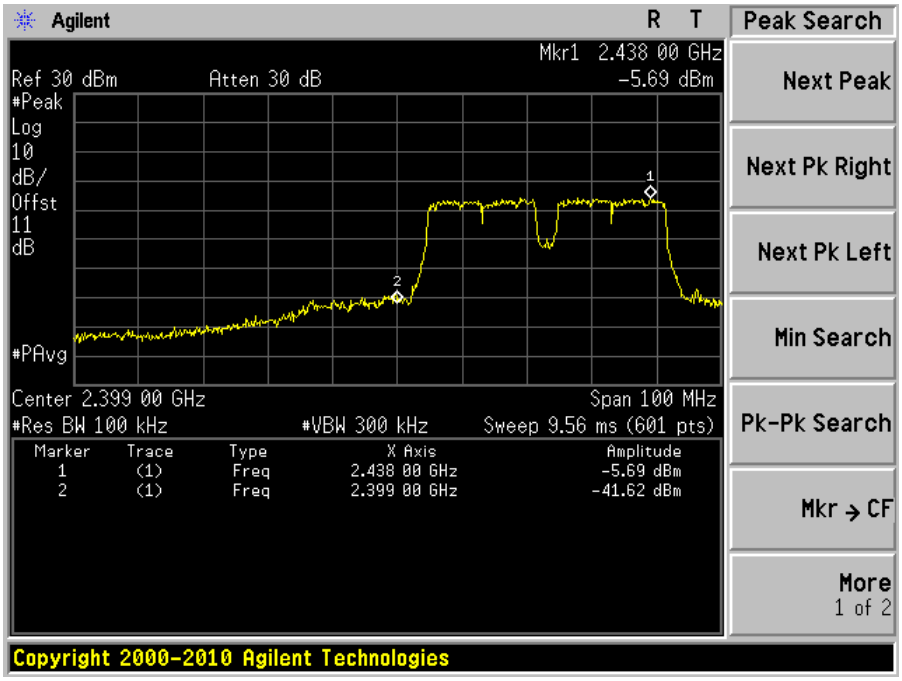


High channel: 2462 MHz

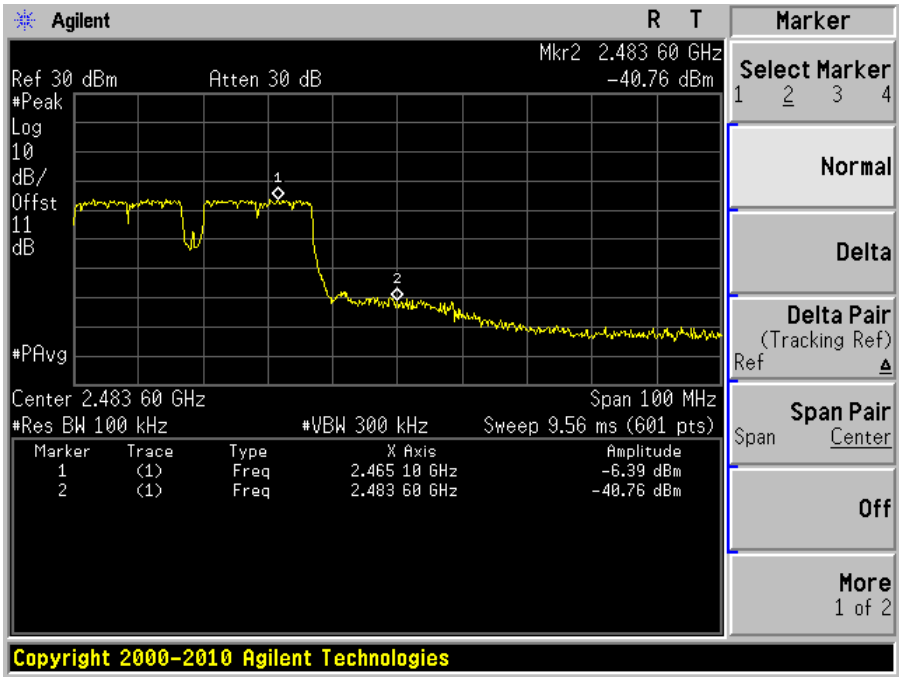


802.11n-HT40 mode

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	E4440A	US42221851	2013-03-05	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:	42 %
ATM Pressure:	101.1 kPa

The testing was performed by Lionel Lara on 2013-05-01 at the RF site.

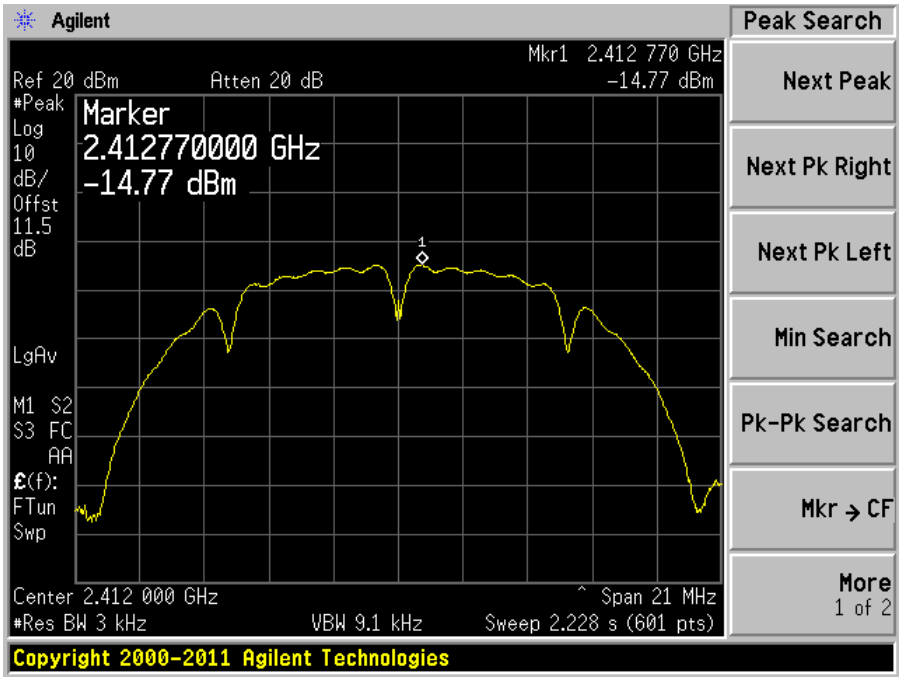
12.5 Test Results

Mode	Frequency (MHz)	PSD (dBm)	Limit (dBm)
802.11b	2412	-14.77	8
	2437	-15.32	8
	2462	-15.17	8
802.11g	2412	-13.27	8
	2437	-11.18	8
	2462	-13.70	8
802.11n-HT20	2412	-13.13	8
	2437	-10.55	8
	2462	-13.86	8
802.11n-HT40	2422	-20.08	8
	2437	-14.33	8
	2452	-20.24	8

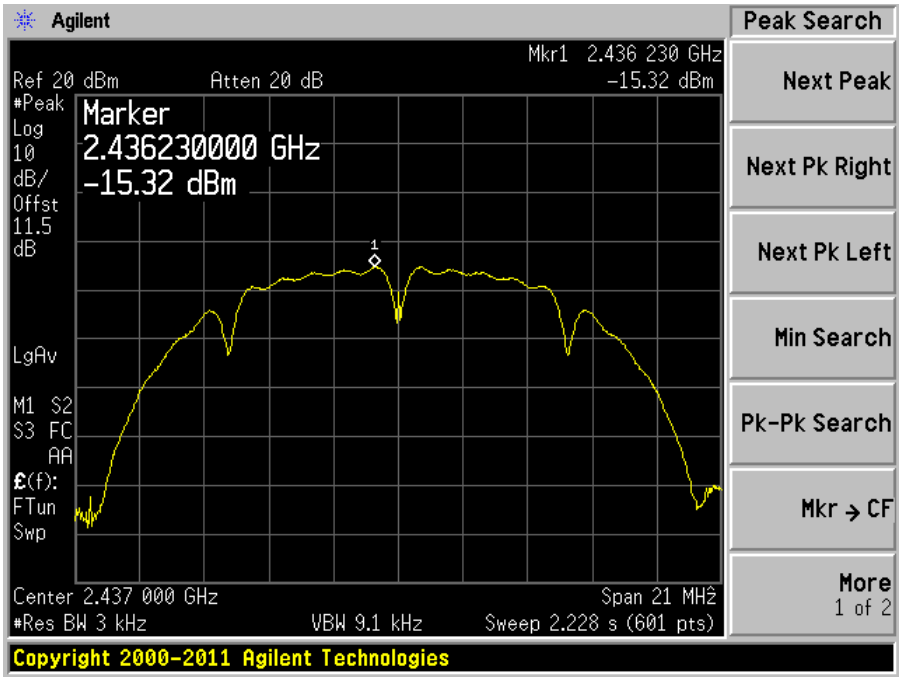
Please refer to the following plots for detailed test results:

802.11b mode

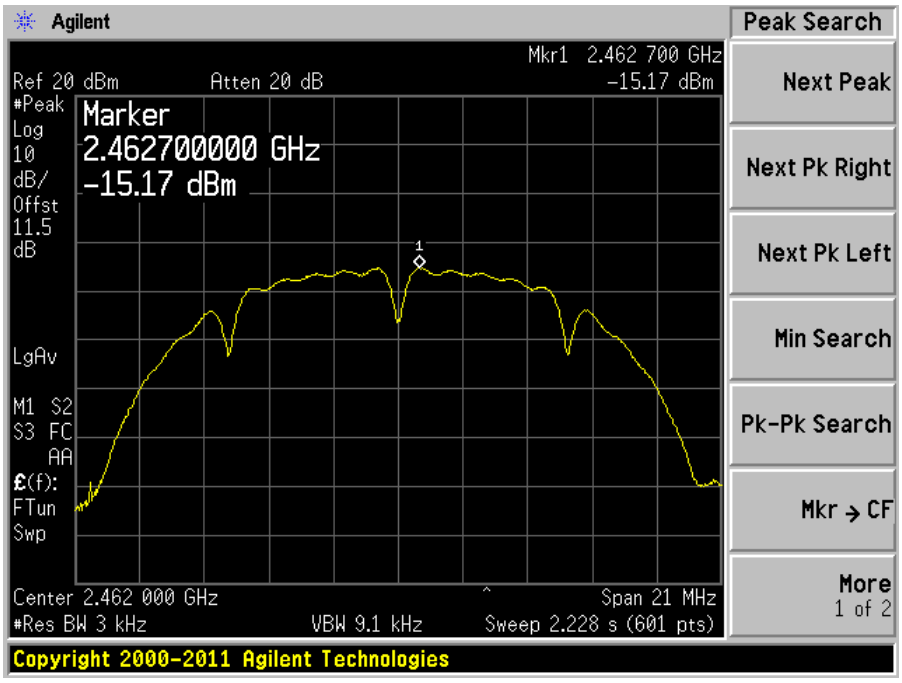
Low channel: 2412 MHz



Middle channel: 2437 MHz

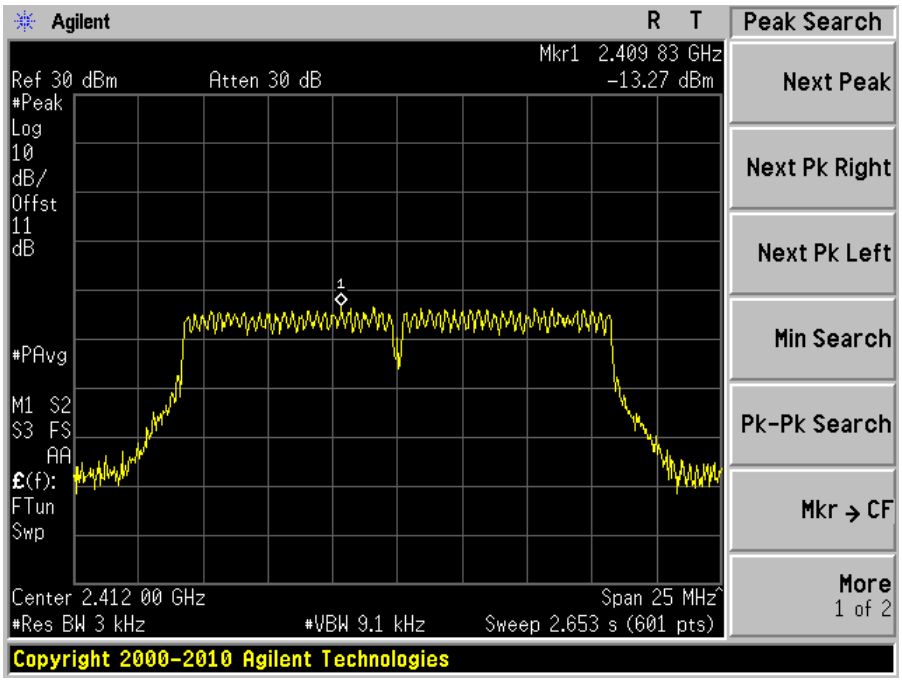


High channel: 2462 MHz

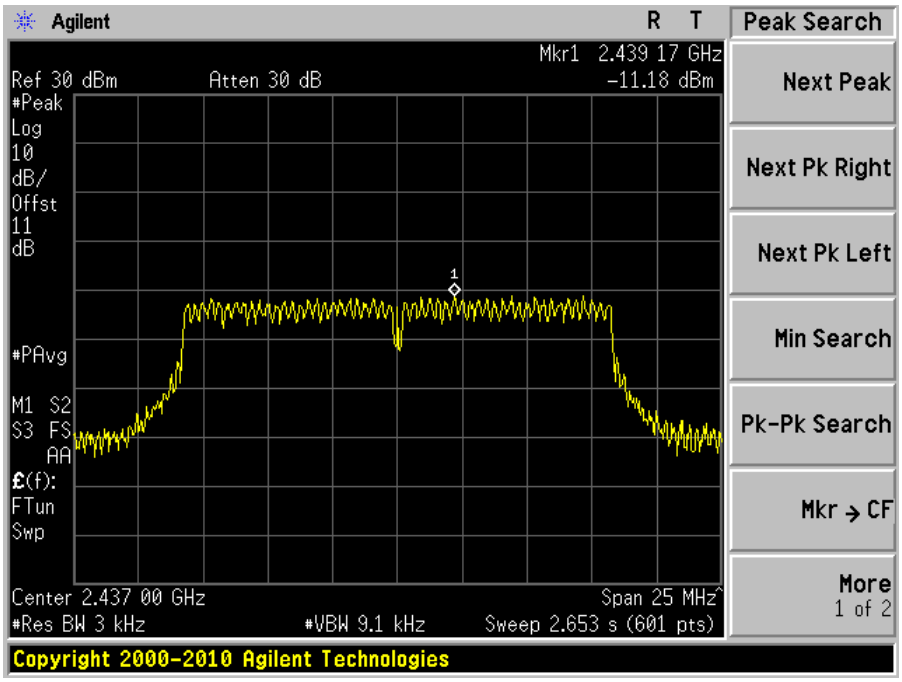


802.11g mode

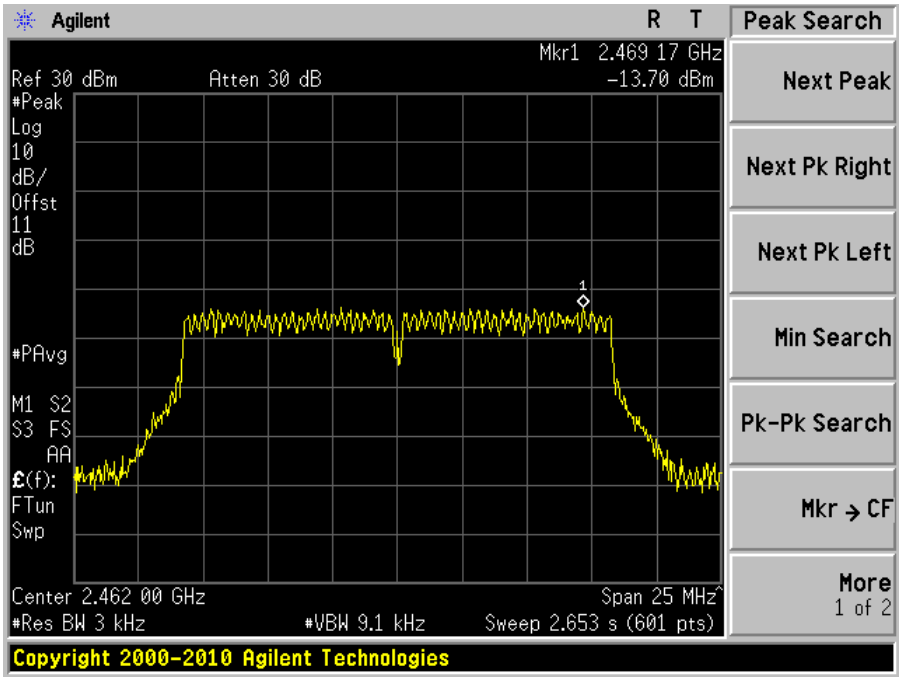
Low channel: 2412 MHz



Middle channel: 2437 MHz

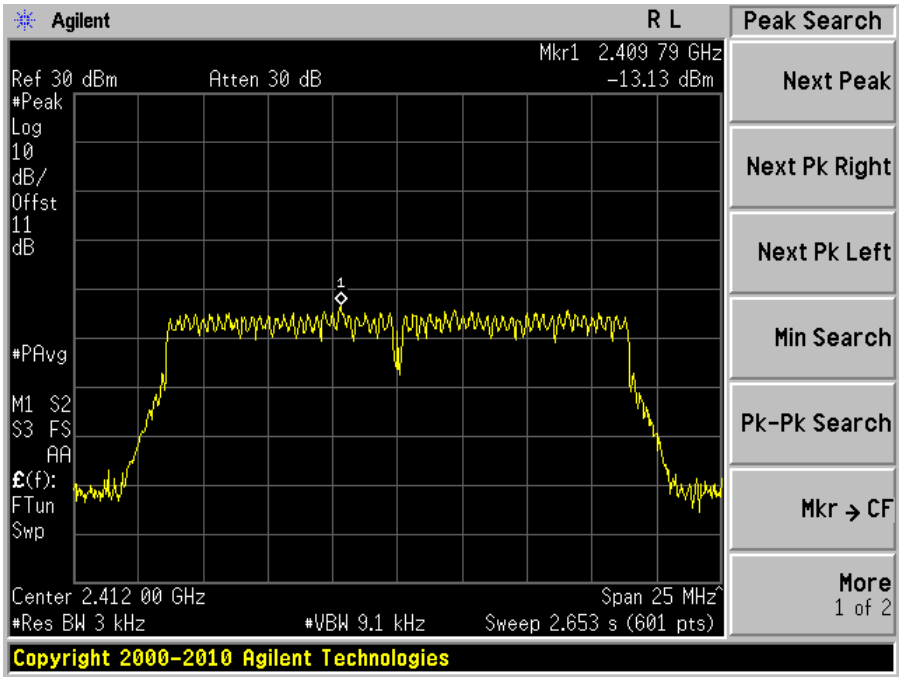


High channel: 2462 MHz

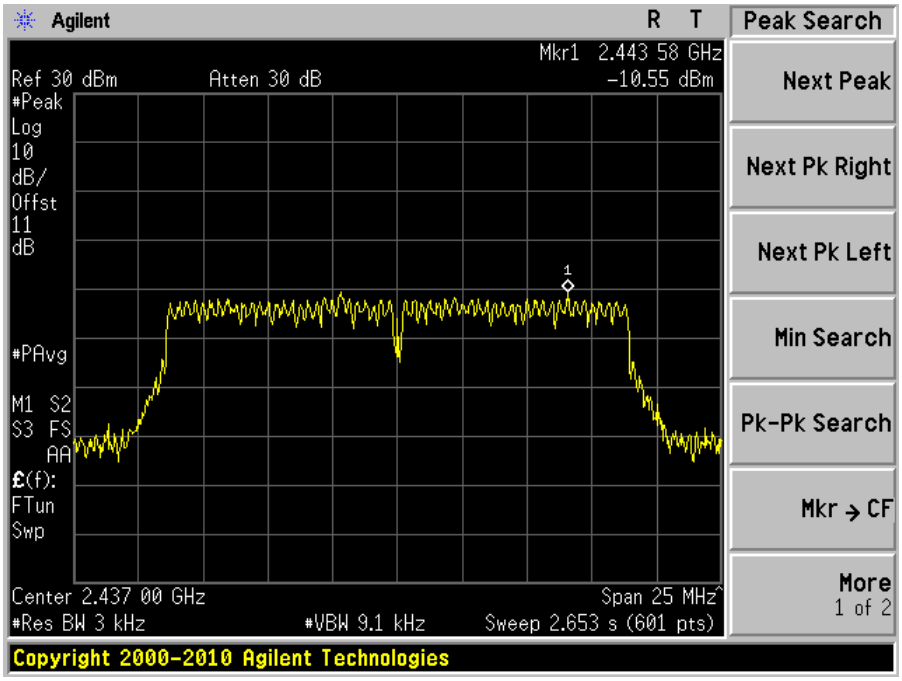


802.11n-HT20 mode

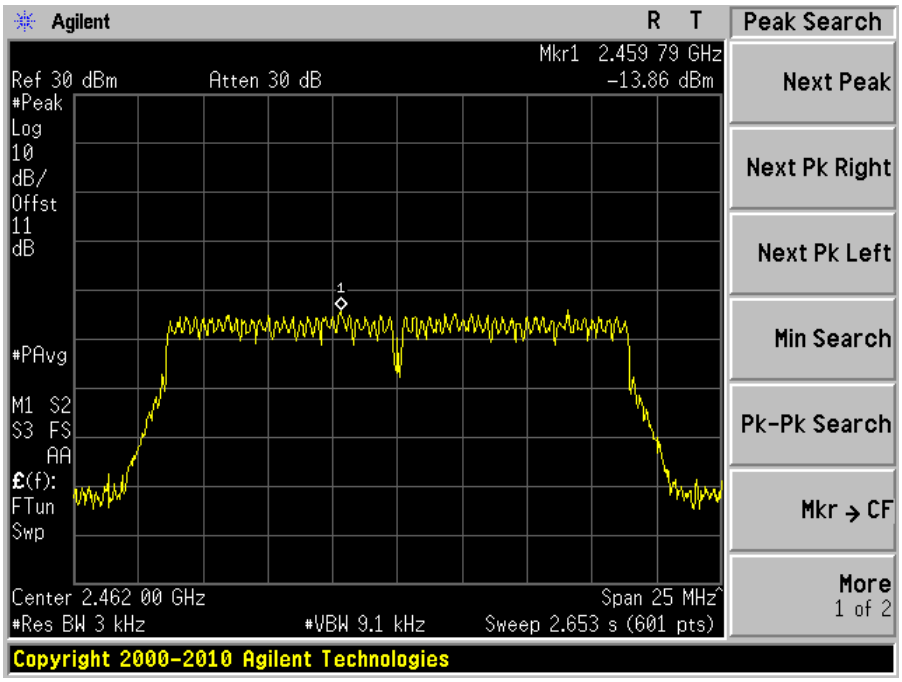
Low channel: 2412 MHz



Middle channel: 2437 MHz

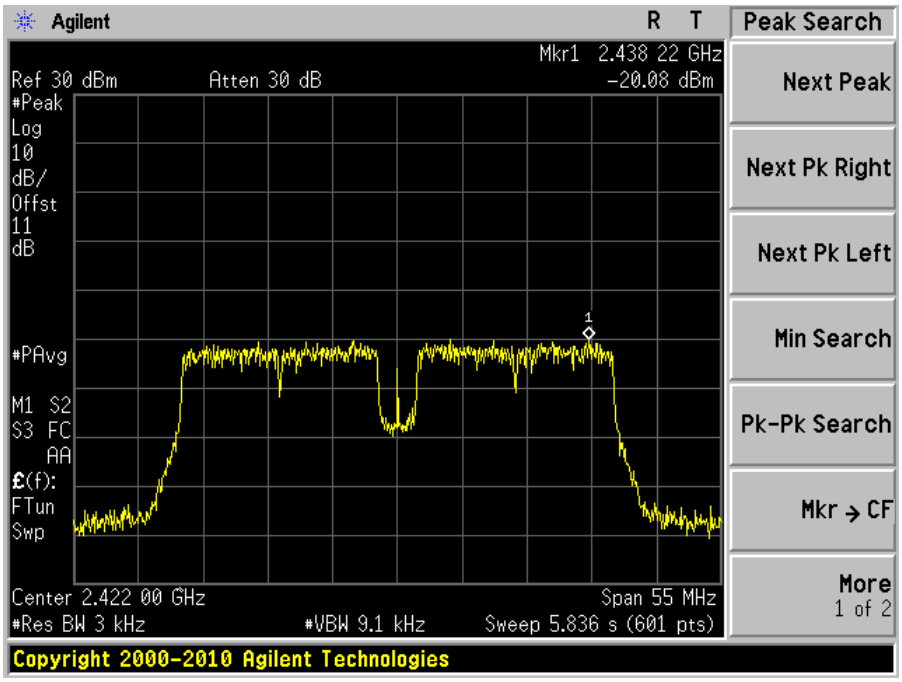


High channel: 2462 MHz

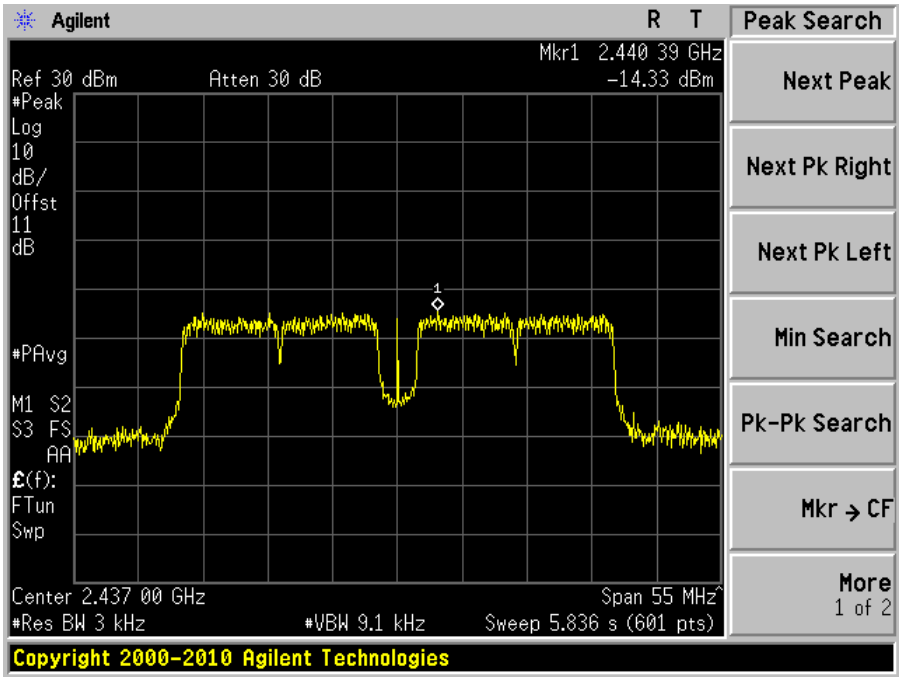


802.11n-HT40 mode

Low channel: 2422 MHz



Middle channel: 2437 MHz



High channel: 2452 MHz