Lab Code: 200167-0

FCC PART 15 SUBPART C
IC RSS-210, ISSUE 8, DEC 2010

TEST AND MEASUREMENT REPORT

For

Trimble Navigation Ltd.

935 Stewart Drive,

Sunnyvale, CA 94085, USA

FCC ID: JUP-76577WFBT
IC: 1756A-76577WFBT

Report Type:	**Product Type:**
Original Report	802.11b/g and Bluetooth Combo Module

Test Engineer:	Ning Ma
Report Number:	R1201318-247
Report Date:	2012-04-09
Reviewed By:	Victor Zhang RF/EMC Lead
Prepared By: (84)	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1201318-247	Original Report	2012-04-09

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1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Trimble Navigation Ltd.* and their product, *model: LBEE19NJZC, FCC ID: JUP-76577WFBT, IC: 1756A-76577WFBT* or the "EUT" as referred to this report. The EUT is Bluetooth and 802.11a/b/g/n Wi-Fi combo module.

1.2 Mechanical Description of EUT

The EUT measures approximately 9.5mm **(L)** x 8.05mm **(W)** x 1.4mm **(H)** and weighs approximately 0.29 g.

The data gathered are from a typical production sample provided by the manufacturer with serial 112566 provide by the manufacture.

1.3 Objective

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

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 C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2003, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

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

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, 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.: R-3729, C-4176, G-469, and T-1206. 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 a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2001670.htm

2 System Test Configuration

2.1 Justification

The system was configured for testing in accordance with ANSI C63.4-2003.

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

2.2 EUT Exercise Software

The software was used to Ping flood with large packets between a Linux-based PC and the EUT. Signal mask was verified using a spectrum analyzer and all sub-carriers were enabled. Beacon interval was set to minimum.

2.3 Special Accessories

N/A.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
DELL	Laptop	PP18L	-
Trimble Navigation Ltd	Connected Site	SPS985	-
Trimble Navigation Ltd	Connected Site	R10	-

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Delta Electronics Inc.	AC/DC Adapter	ADP-65JH AB	67JW1CG007P

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF Cable	< 1	EUT	Spectrum Analyzer

3 Summary of Test Results

FCC & IC Rules	Description of Test	Results
FCC §15.247(i), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §7.1.2	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §7.2.4	Conducted Emissions	Compliant
FCC §15.209 IC RSS-210 §A8.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-210 §2.2	Restricted Bands	Compliant
FCC §15.209, §15.247 IC RSS-210 §2.2, §A8.5	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-210 §A8.2	6 dB Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-210 §A8.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-210 §A8.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) IC RSS-210 §A8.2(b)	Power Spectral Density	Compliant
FCC Part 15.109 IC RSS-Gen §6	Receiver Spurious Emission	Compliant

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

4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

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

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

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

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

4.2 MPE Prediction

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

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

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

4.3 MPE Results

Maximum peak output power at antenna input terminal (dBm):	18.71
Maximum peak output power at antenna input terminal (mW):	74.3
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	4
Maximum Antenna Gain (numeric):	2.51
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0371
Power density of prediction frequency at 20.0 cm (W/m^2):	0.371
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	10

4.4 Test Result

This device complies with the MPE limit at 20cm for uncontrolled exposure.

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

5.1 Applicable Standard

For intentional device, according to FCC Part §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Per IC RSS-Gen §7.1.2, A transmitter can only be sold or operated with antennas with which it was certified. A transmitter maybe certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in IC RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to IC RSS-210 Annex 8 or RSS-210 Annex 9, the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to IC RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

5.2 Antennas List

Model Number	Manufacturer	Antenna Type	Antenna Gain (dBi)
SWLP.12	Taoglas	Patch (Internal Antenna)	2.0
MAF94432	Laird	Dipole (Reversed TNC)	2.5
1513151-1	Tyco/Rangestar Wireless	IFA (Internal Antenna)	4.0

All antennas meet the requirements of FCC §15.203 and IC RSS-Gen §7.1.2. Please refer to the EUT photos.

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

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.4 Conducted limits:

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

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	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 in a shielded room. The test setup and measurement procedure was per ANSI C63.4-2003. The specification limits were in accordance with FCC §15.207 and IC RSS-Gen §7.2.2.

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

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

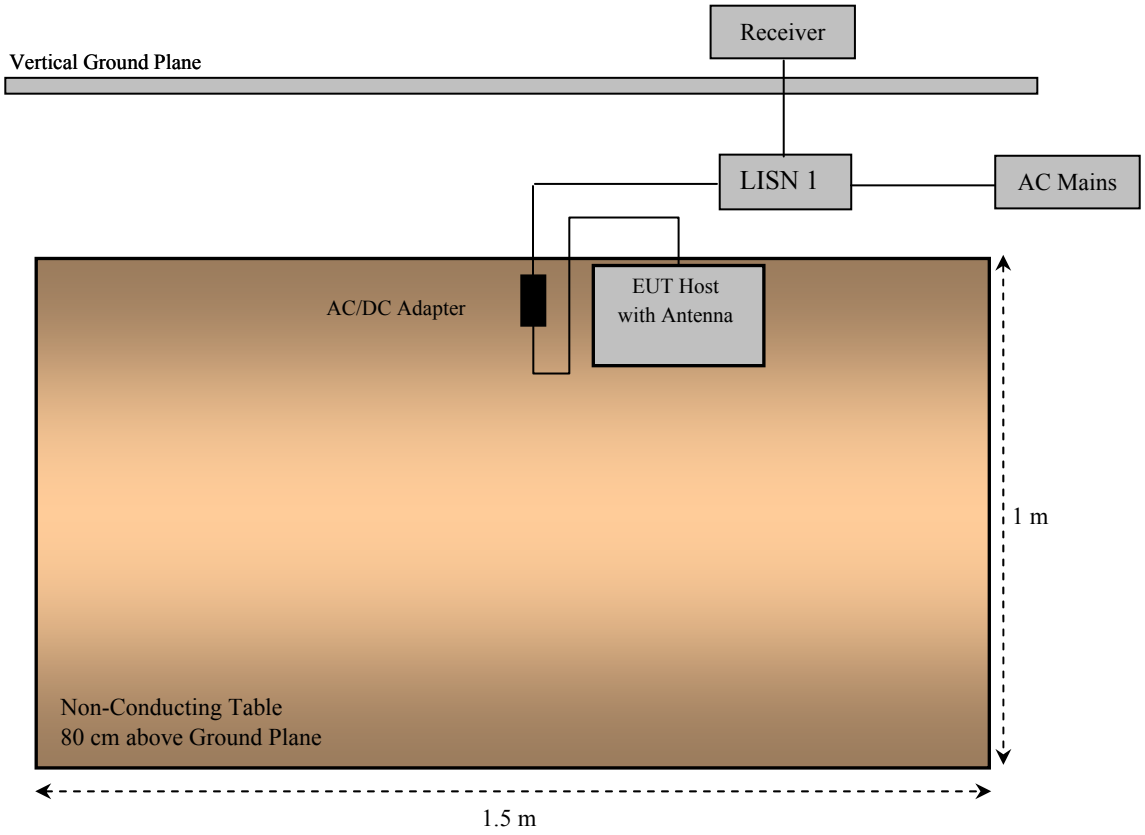
6.3 Test Procedure

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) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + Atten – Ga

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
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2011-04-14
Solar Electronics	LISN	9252-R-24-BNC	511205	2011-06-25
TTE	Filter, High Pass	H9962-150K-50-21378	K7133	2011-06-10

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

6.7 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

The testing was performed by Ning Ma on 2012-03-14 in 5meters chamber3.

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 a worst case margin of:

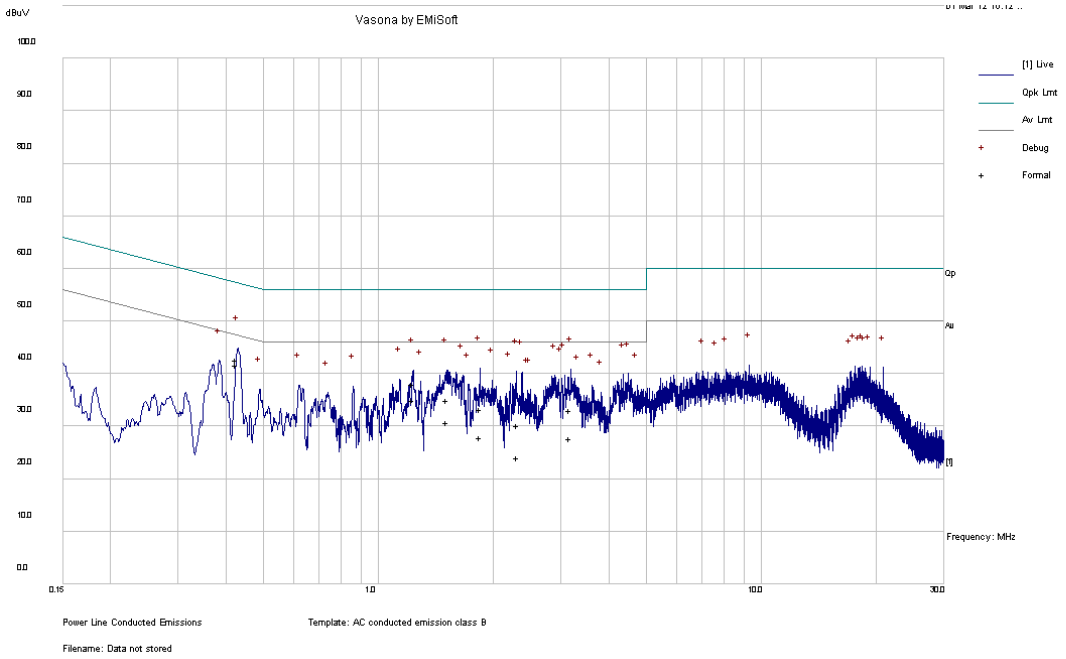
Transceiver Mode

Worst Case: 2.4 GHz, 802.11 b Mode, Low Channel (2412 MHz)

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-2.73	0.431358	Neutral	0.15 to 30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz 802.11 b Mode, Low Channel (2412 MHz): 120 V, 60 Hz – Line



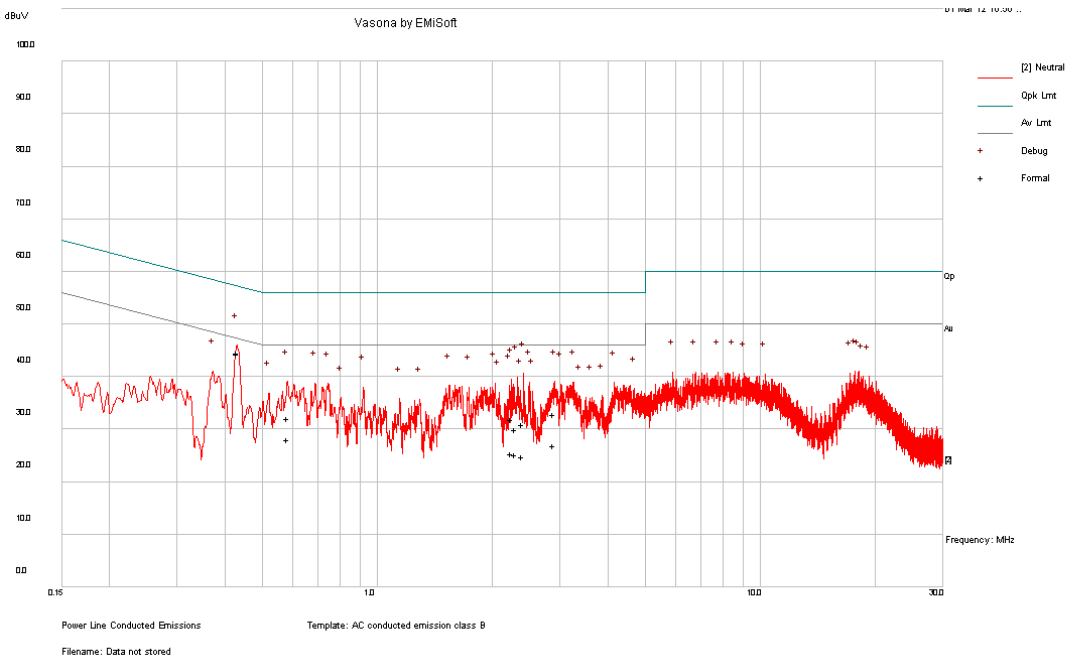
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.427434	42.54	Line	57.3	-14.76
1.845816	33.32	Line	56	-22.68
3.16608	33.09	Line	56	-22.91
1.512111	34.97	Line	56	-21.03
1.22913	38.02	Line	56	-17.98
2.305592	30.26	Line	56	-25.74

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.427434	41.65	Line	47.3	-5.66
1.845816	27.91	Line	46	-18.09
3.16608	27.77	Line	46	-18.23
1.512111	30.73	Line	46	-15.27
1.22913	34.93	Line	46	-11.07
2.305592	24.06	Line	46	-21.94

2.4 GHz 802.11 b Mode, Low Channel (2412 MHz): 120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.431358	44.41	Neutral	57.23	-12.82
2.400558	30.9	Neutral	56	-25.1
2.298913	30.05	Neutral	56	-25.95
2.24106	31.95	Neutral	56	-24.05
2.899917	32.82	Neutral	56	-23.18
0.58434	32.05	Neutral	56	-23.95

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.431358	44.5	Neutral	47.23	-2.73
2.400558	24.76	Neutral	46	-21.24
2.298913	25.21	Neutral	46	-20.79
2.24106	25.34	Neutral	46	-20.66
2.899917	26.97	Neutral	46	-19.03
0.58434	28.04	Neutral	46	-17.96

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

7.1 Applicable Standard

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

7.2 Measurement Procedure

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

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

7.4 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

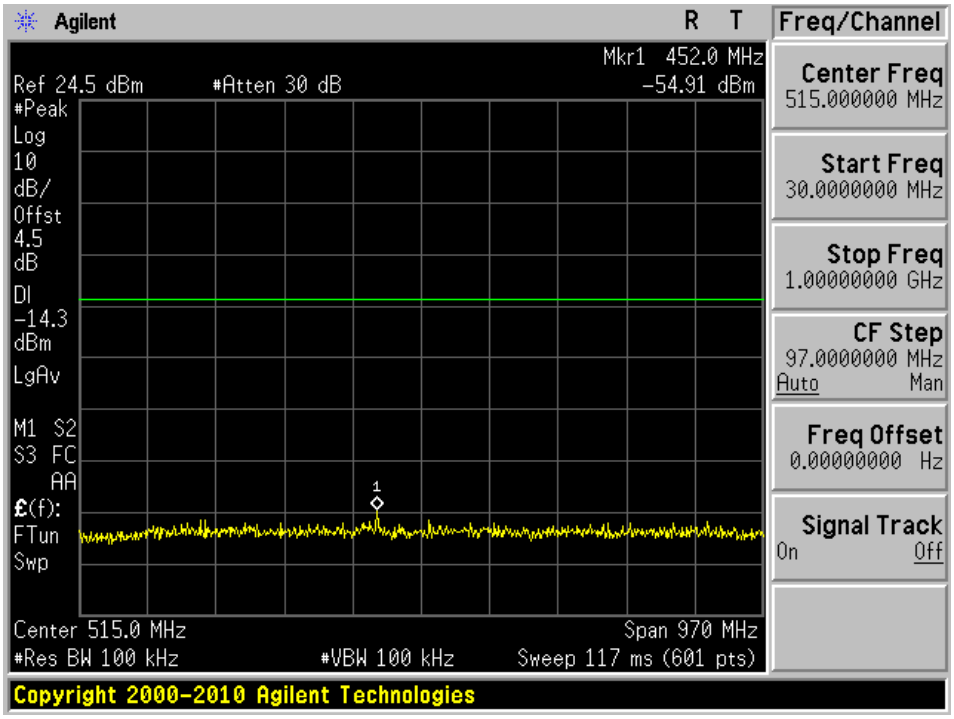
The testing was performed Nimg Ma on2012-03-18 at RF Test Site.

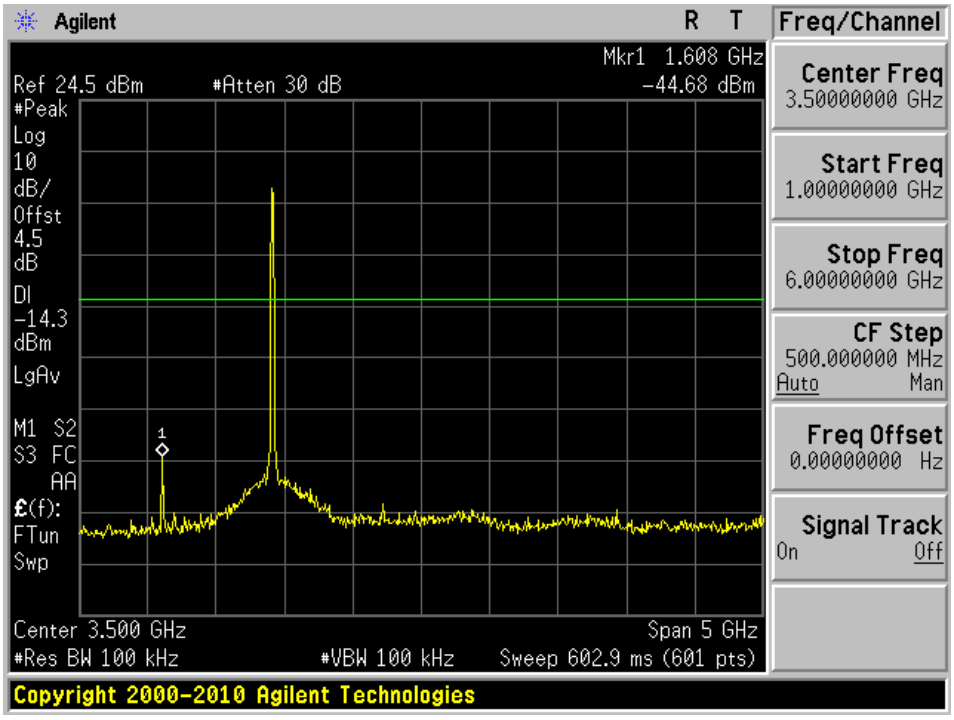
7.5 Test Results

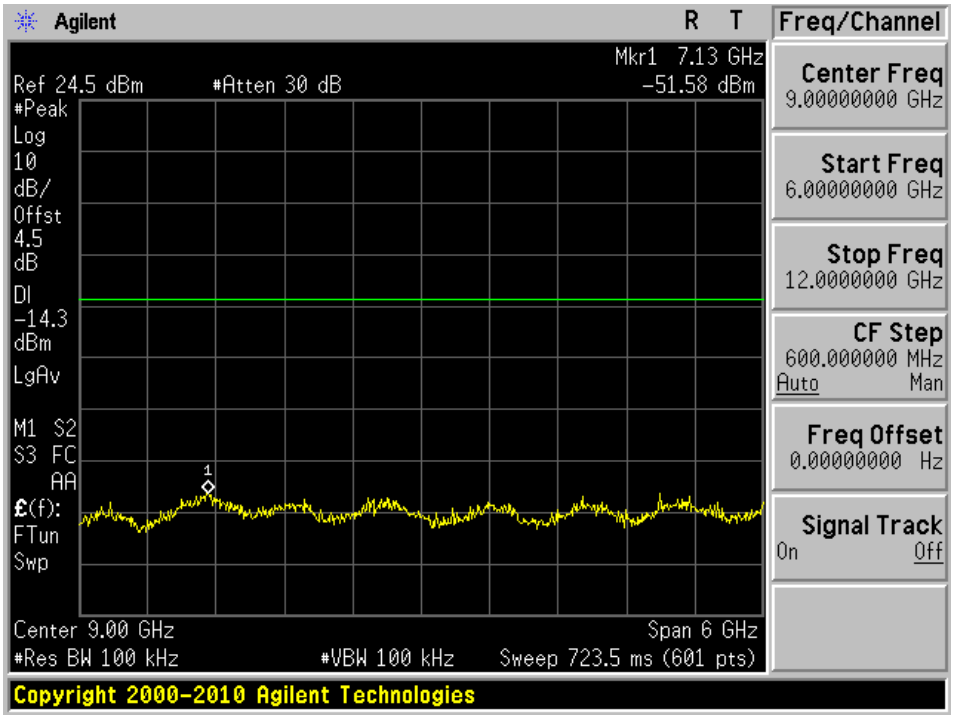
Please refer to following plots of spurious emissions.

2.4 GHz: 802.11b

Low Channel 2412 MHz






Agilent
R T
Freq/Channel
Mkr1 7.13 GHz
Ref 24.5 dBm
#Atten 30 dB
-51.58 dBm
#Peak
Log
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4.5
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LgAv
M1 S2
S3 FC
AA
£(f):
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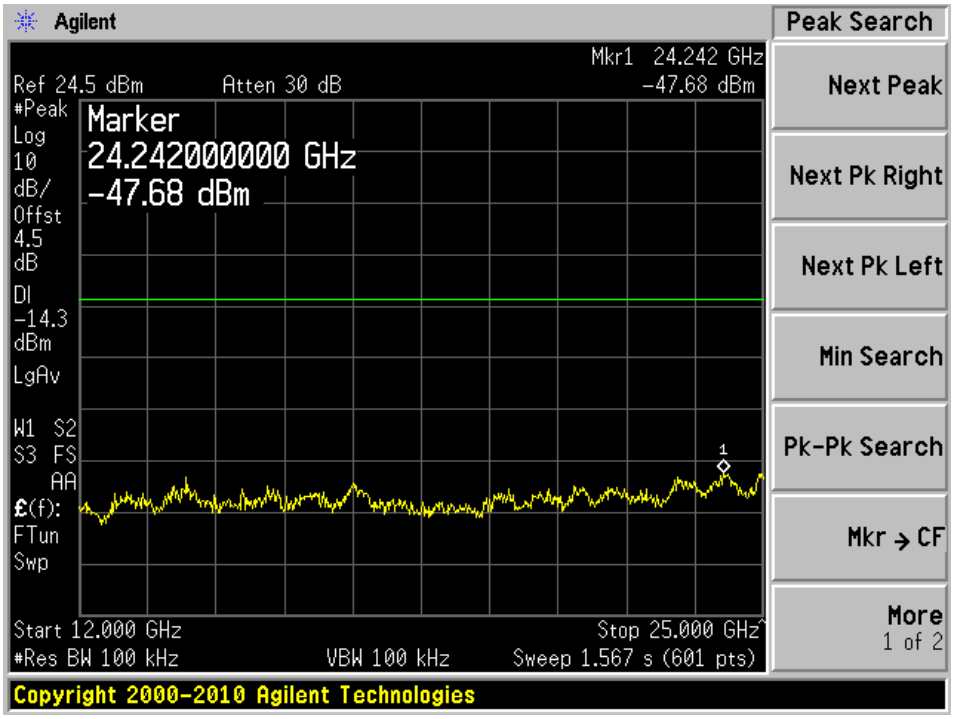
Swp
Center Freq
9.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
12.0000000 GHz
CF Step
600.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 9.00 GHz
Span 6 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 723.5 ms (601 pts)
Copyright 2000-2010 Agilent Technologies


Agilent
Peak Search
Mkr1 24.242 GHz
Ref 24.5 dBm
Atten 30 dB
-47.68 dBm
#Peak
Log
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Offst
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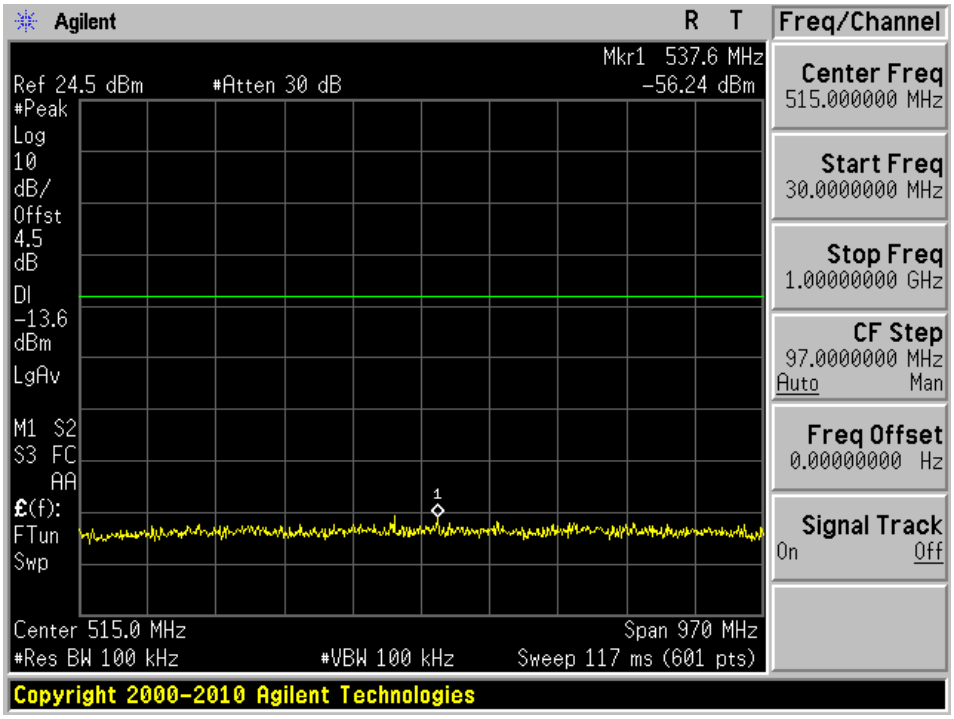
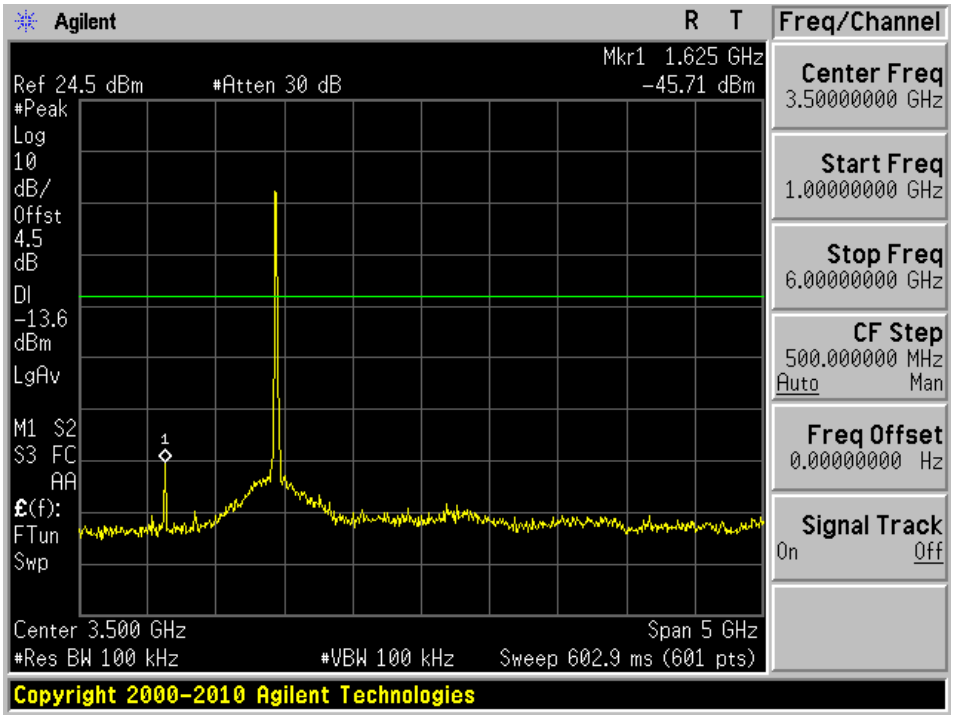
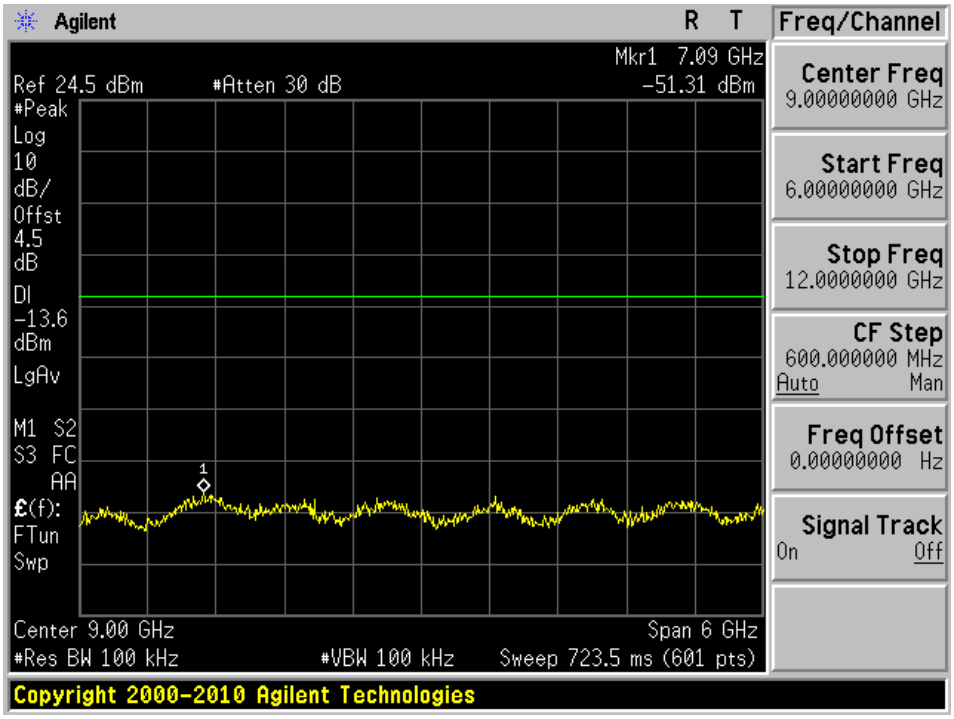
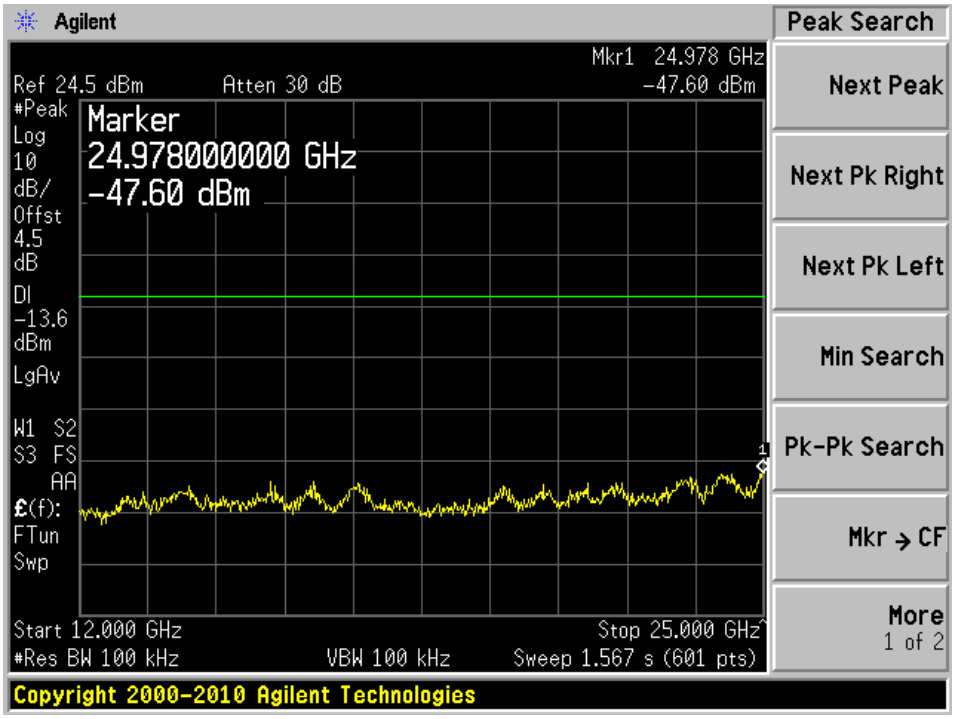
FTun
Swp
Marker
24.242000000 GHz
-47.68 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 12.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 1.567 s (601 pts)
Copyright 2000-2010 Agilent Technologies

Middle Channel 2437 MHz

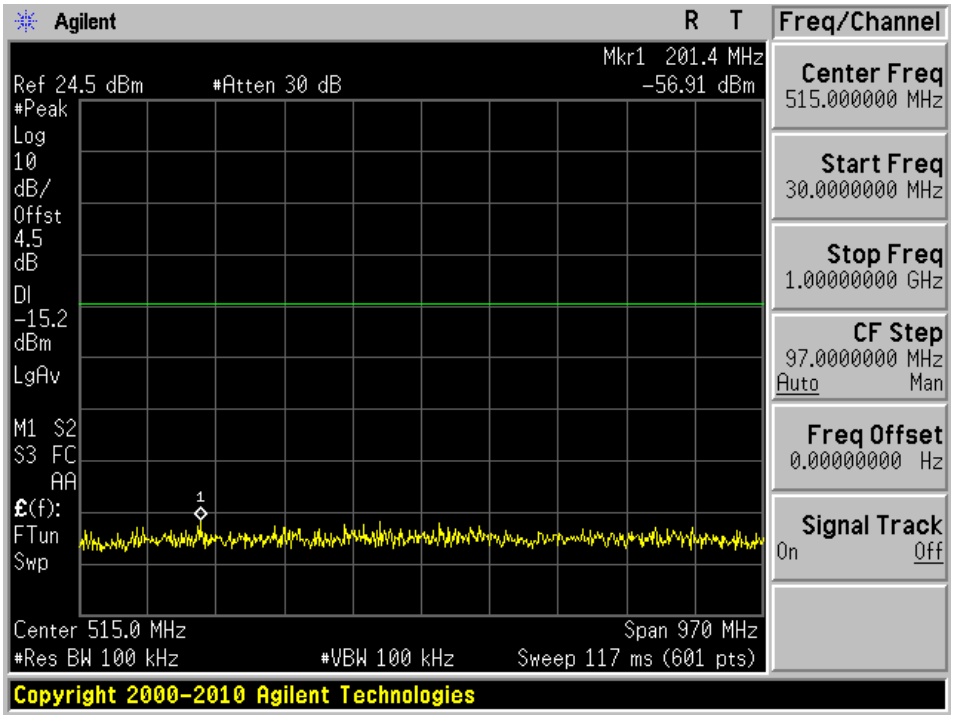


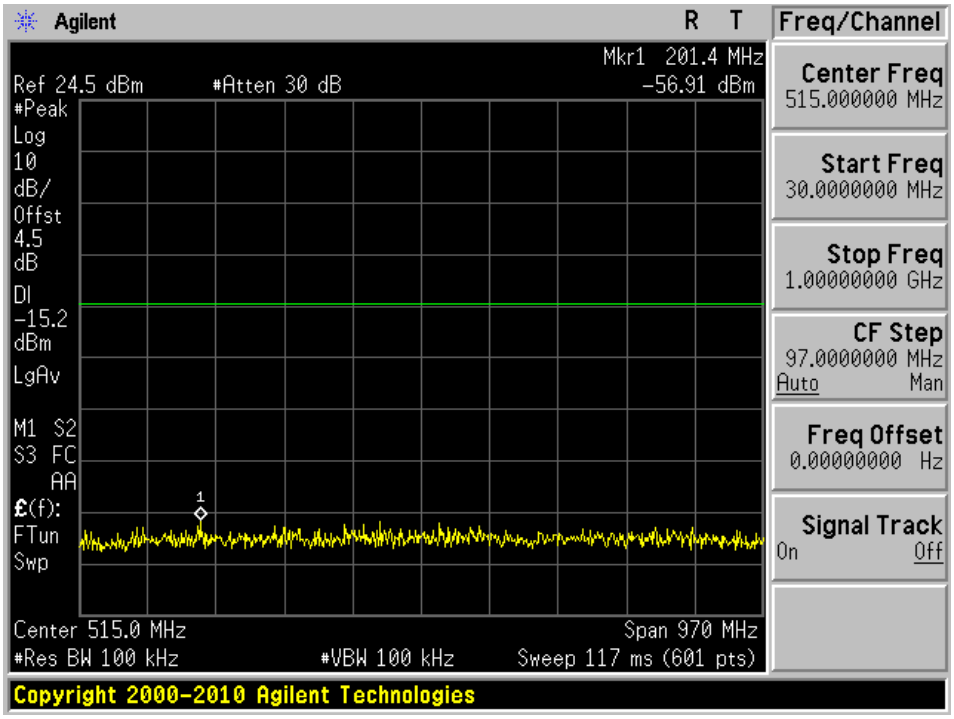


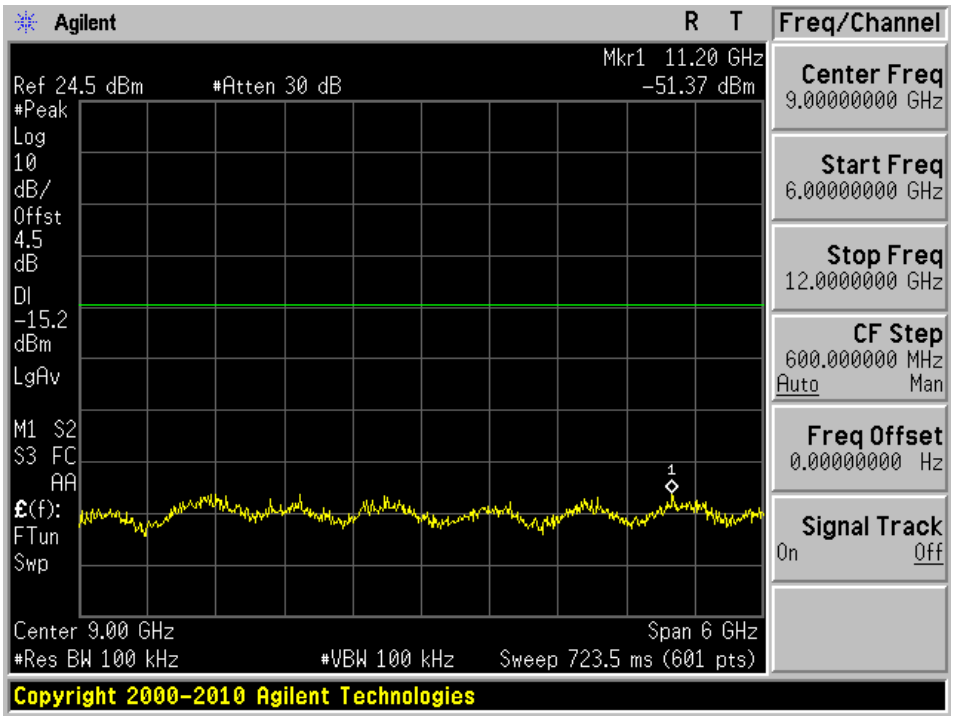

Agilent
R T
Freq/Channel
Mkr1 7.09 GHz
Ref 24.5 dBm
#Atten 30 dB
-51.31 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-13.6
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center Freq
9.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
12.0000000 GHz
CF Step
600.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 9.00 GHz
Span 6 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 723.5 ms (601 pts)
Copyright 2000-2010 Agilent Technologies

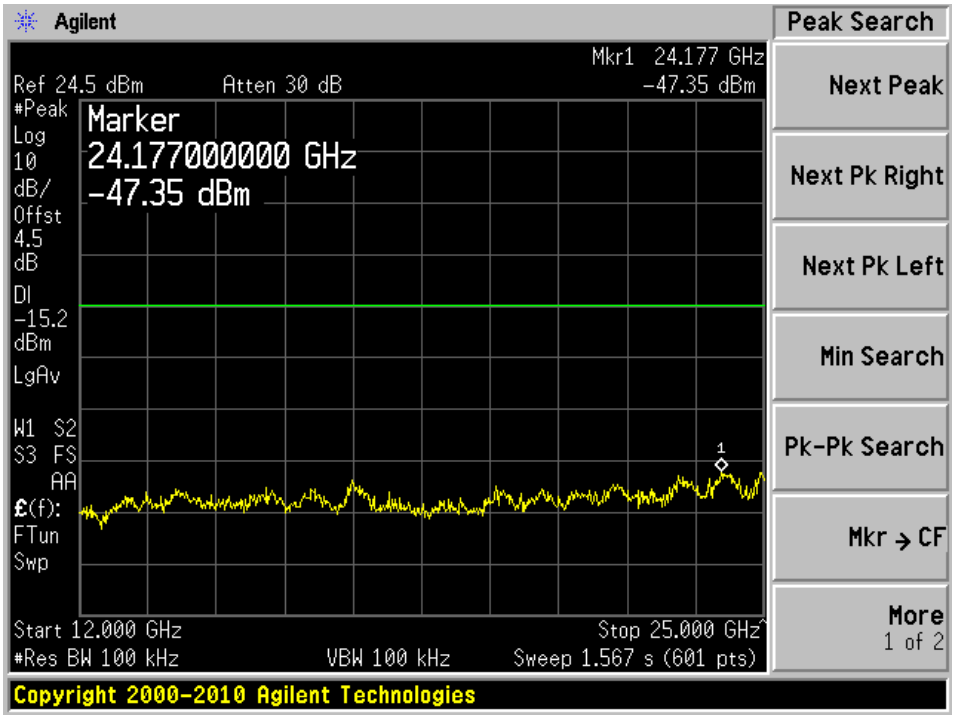

Agilent
Peak Search
Mkr1 24.978 GHz
Ref 24.5 dBm
Atten 30 dB
-47.60 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-13.6
dBm
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Swp
Marker
24.978000000 GHz
-47.60 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 12.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 1.567 s (601 pts)
Copyright 2000-2010 Agilent Technologies

High Channel 2462 MHz






Agilent
R T
Freq/Channel
Mkr1 11.20 GHz
Ref 24.5 dBm
#Atten 30 dB
-51.37 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-15.2
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 9.00 GHz
Span 6 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 723.5 ms (601 pts)
Center Freq
9.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
12.0000000 GHz
CF Step
600.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2010 Agilent Technologies


Agilent
Peak Search
Mkr1 24.177 GHz
Ref 24.5 dBm
Atten 30 dB
-47.35 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-15.2
dBm
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Swp
Marker
24.177000000 GHz
-47.35 dBm
Start 12.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 1.567 s (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
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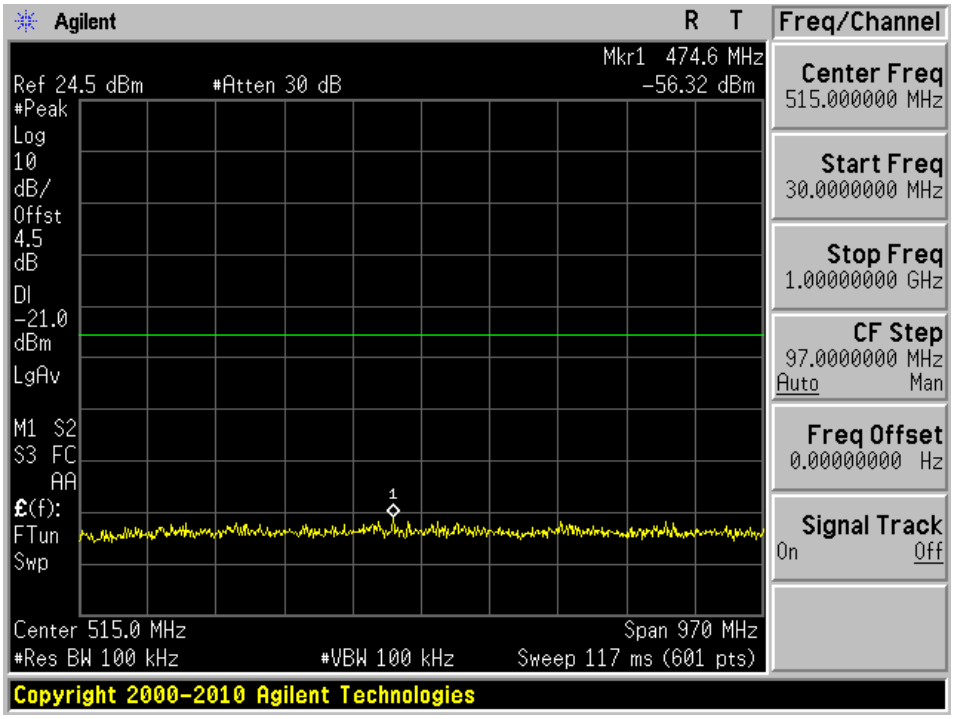
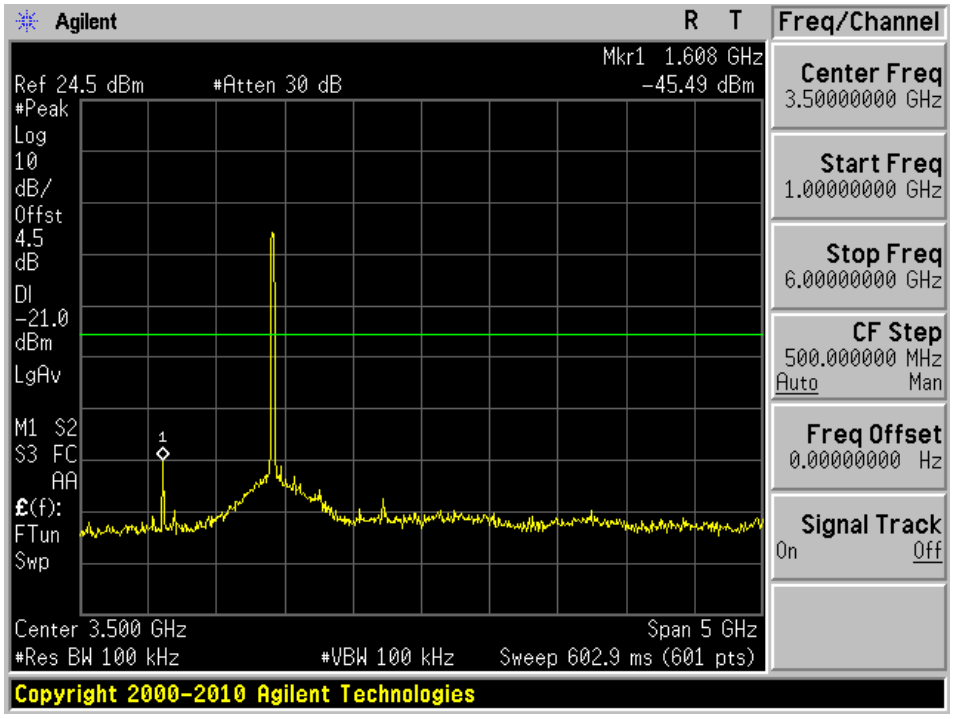
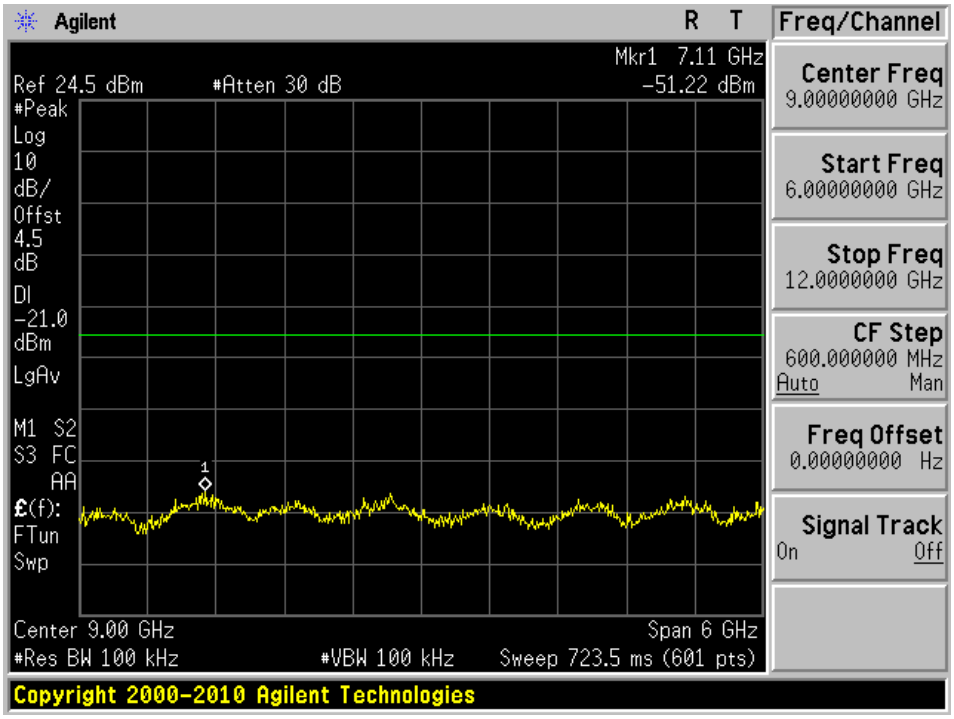
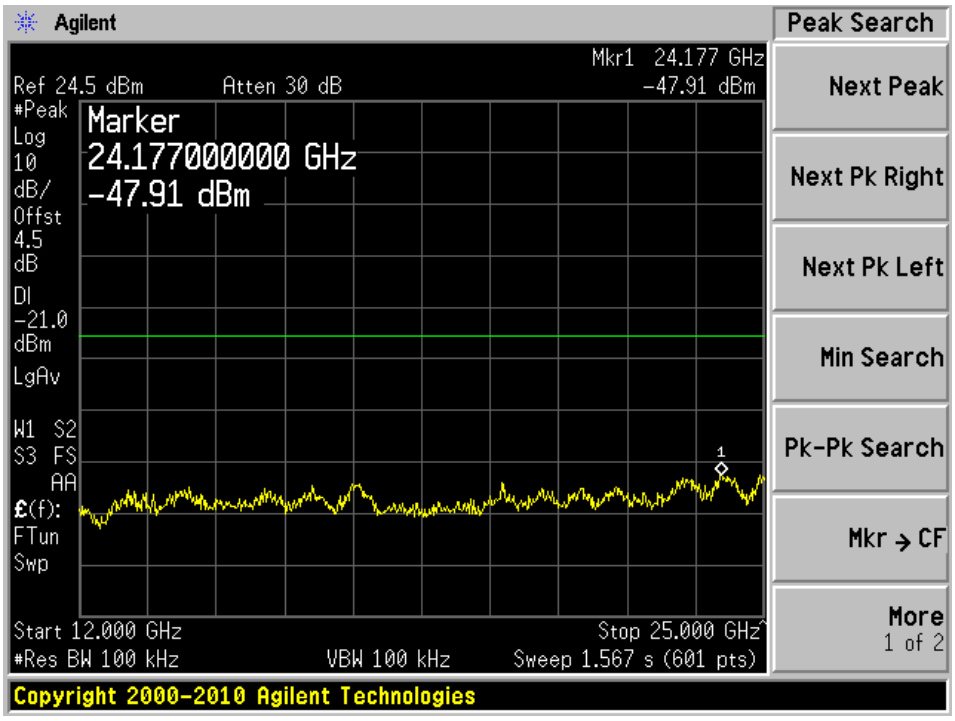
2.4 GHz: 802.11g

Low Channel 2412 MHz

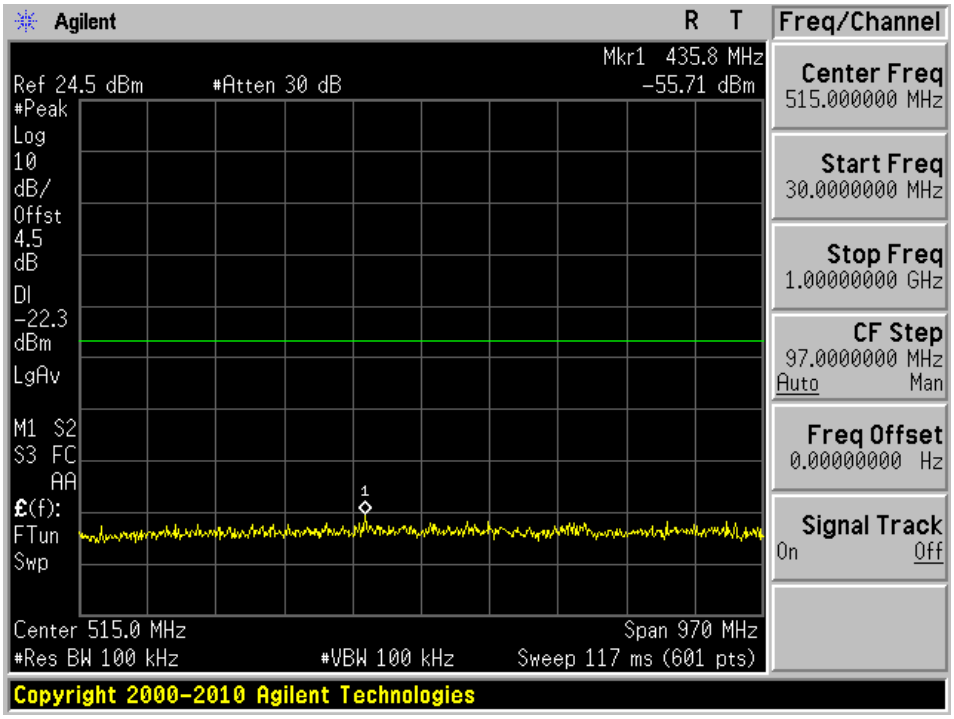


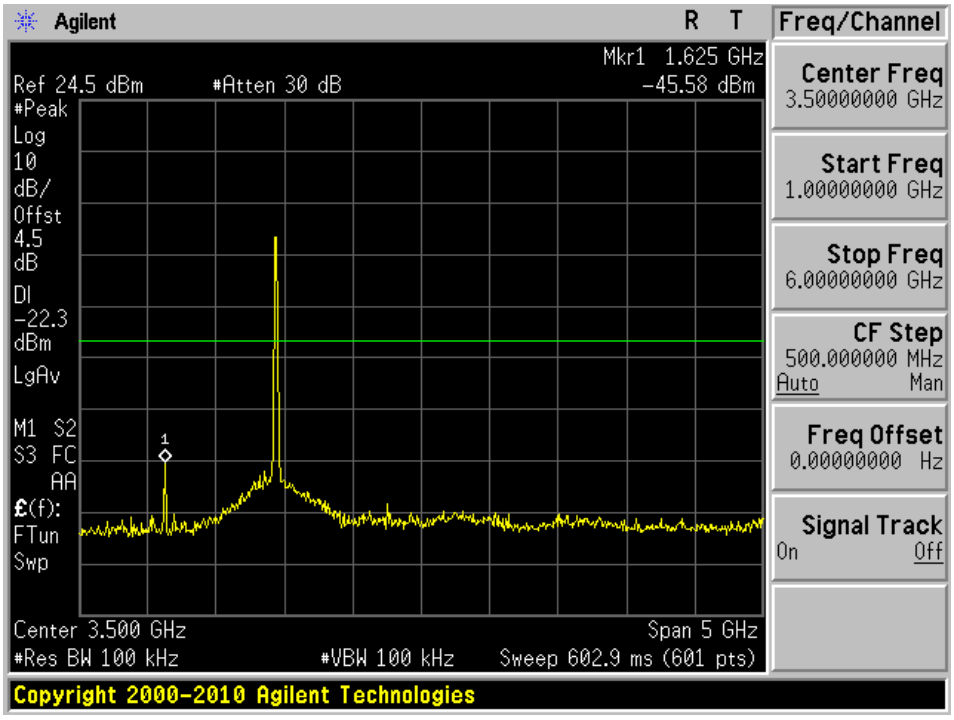


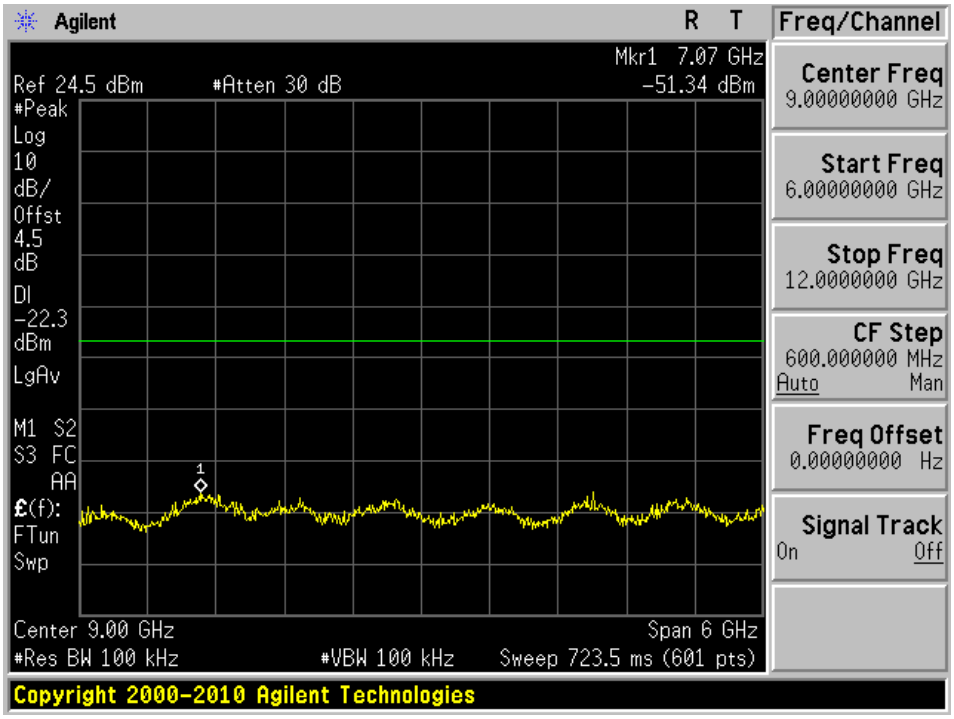

Agilent
R T
Freq/Channel
Mkr1 7.11 GHz
Ref 24.5 dBm
#Atten 30 dB
-51.22 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-21.0
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center Freq
9.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
12.0000000 GHz
CF Step
600.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 9.00 GHz
Span 6 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 723.5 ms (601 pts)
Copyright 2000-2010 Agilent Technologies

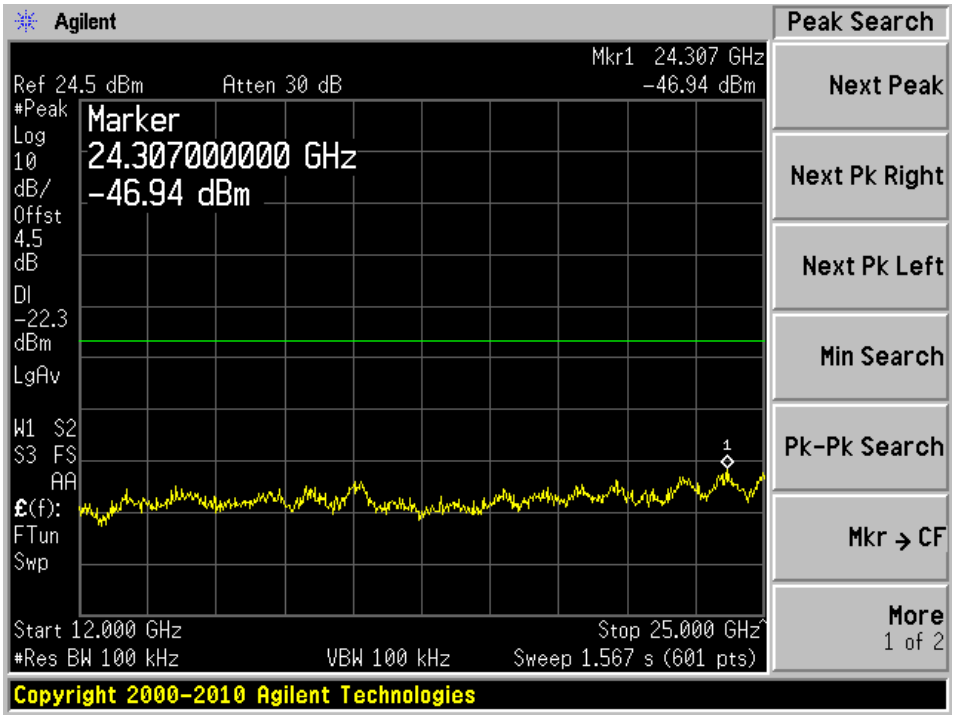

Agilent
Peak Search
Mkr1 24.177 GHz
Ref 24.5 dBm
Atten 30 dB
-47.91 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-21.0
dBm
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Swp
Marker
24.177000000 GHz
-47.91 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 12.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 1.567 s (601 pts)
Copyright 2000-2010 Agilent Technologies

Middle Channel 2437 MHz

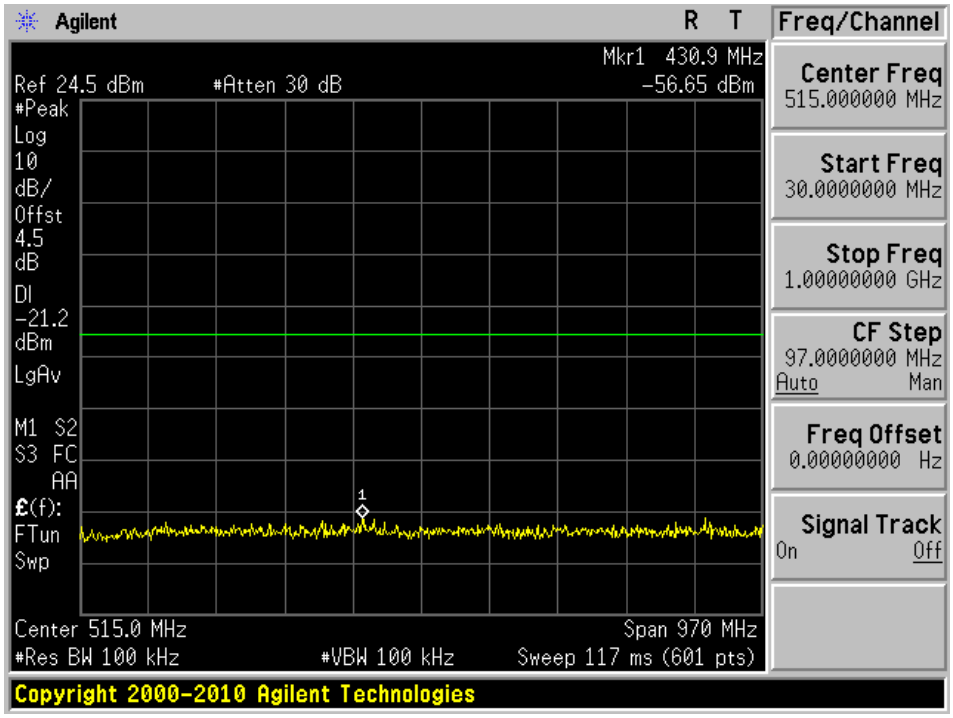


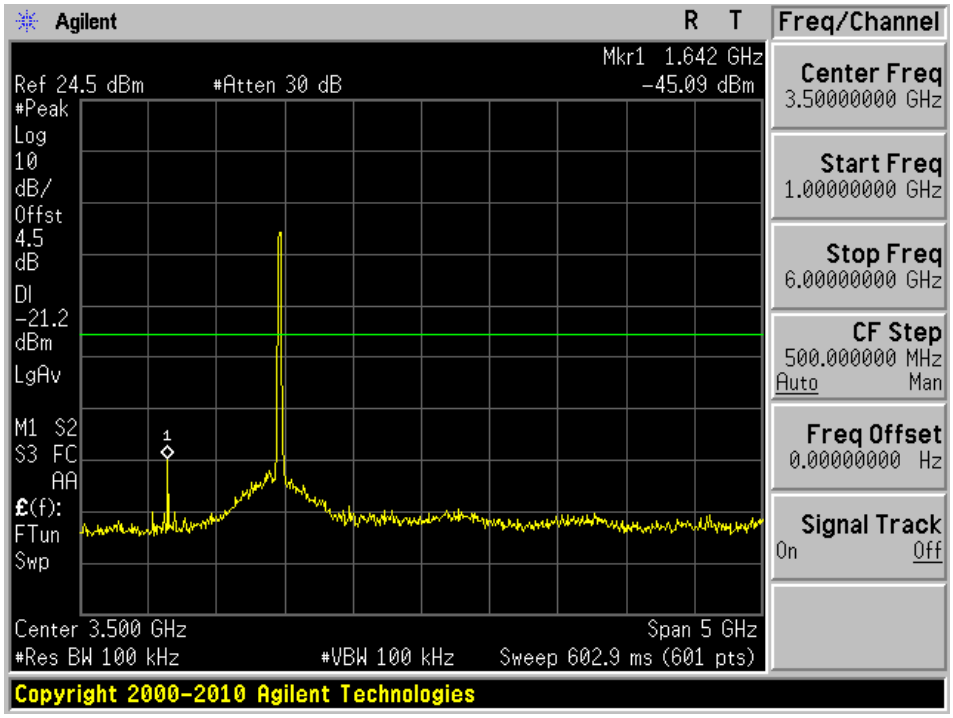


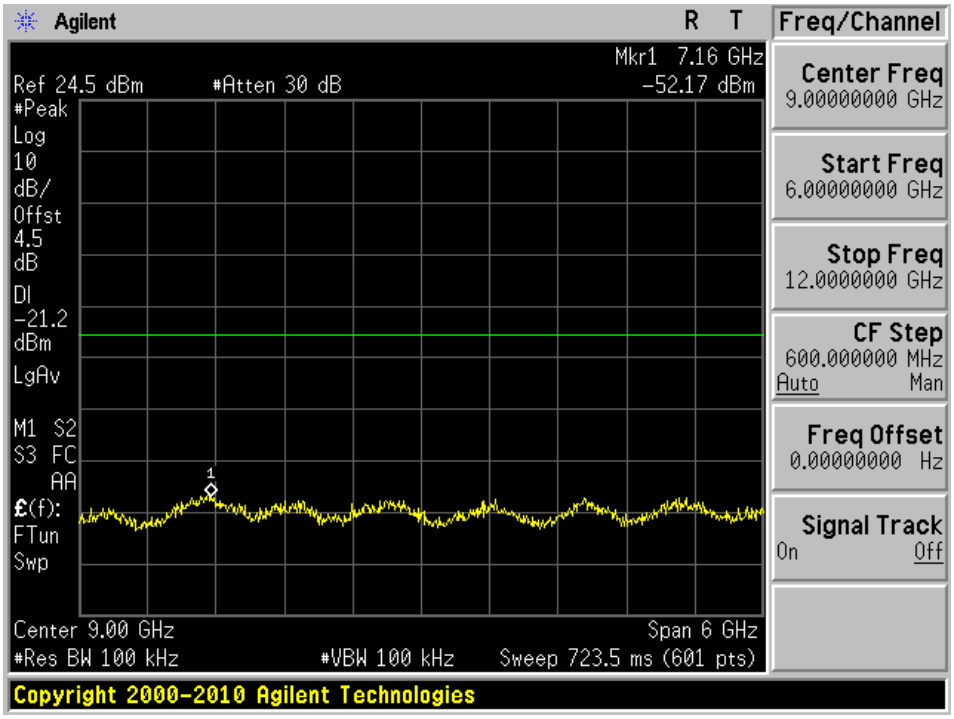

Agilent
R T
Freq/Channel
Mkr1 7.07 GHz
Ref 24.5 dBm
#Atten 30 dB
-51.34 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-22.3
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 9.00 GHz
Span 6 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 723.5 ms (601 pts)
Center Freq
9.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
12.0000000 GHz
CF Step
600.000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Copyright 2000-2010 Agilent Technologies

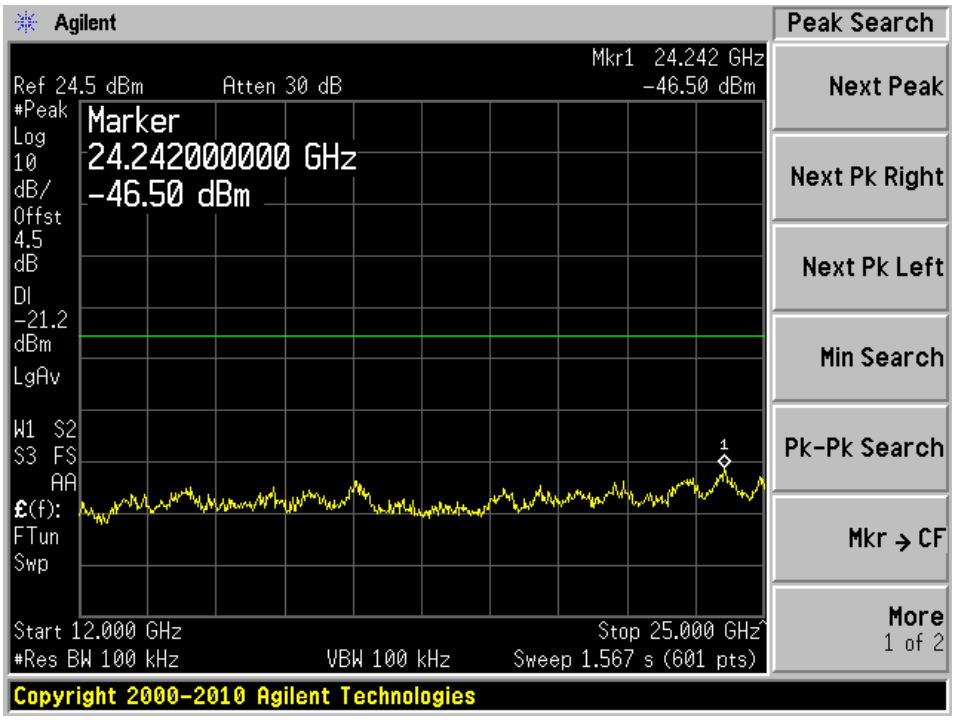

Agilent
Peak Search
Mkr1 24.307 GHz
Ref 24.5 dBm
Atten 30 dB
-46.94 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-22.3
dBm
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Swp
Marker
24.307000000 GHz
-46.94 dBm
Start 12.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 1.567 s (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2010 Agilent Technologies

High Channel 2462 MHz






Agilent
R T
Freq/Channel
Mkr1 7.16 GHz
Ref 24.5 dBm
#Atten 30 dB
-52.17 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-21.2
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 9.00 GHz
Span 6 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 723.5 ms (601 pts)
Center Freq
9.00000000 GHz
Start Freq
6.00000000 GHz
Stop Freq
12.0000000 GHz
CF Step
600.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2010 Agilent Technologies


Agilent
Peak Search
Mkr1 24.242 GHz
Ref 24.5 dBm
Atten 30 dB
-46.50 dBm
#Peak
Log
10
dB/
Offst
4.5
dB
Dl
-21.2
dBm
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Swp
Marker
24.242000000 GHz
-46.50 dBm
Start 12.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 1.567 s (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
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8 FCC §15.205, §15.209 & §15.247(d) & IC RSS-210 §A8.5 - Spurious Radiated Emissions

8.1 Applicable Standard

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

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

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

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

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

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

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

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

8.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2003. The specification limits were in accordance with FCC 15 Subpart C and IC RSS-210.

8.3 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C 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.

8.4 Test Procedure

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

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT placed on a turntable, 0.8 meter above ground plane. The turntable shall be rotated 360 degrees to determine the highest emission with the antenna in both horizontal and vertical polarizations.

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

8.5 Corrected Amplitude & Margin Calculation

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

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

Margin = Corrected Amplitude - Limit

8.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2011-09-14
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
EMCO	Horn antenna	3115	9511-4627	2011-10-03
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-09
Mini-Circuits	Pre-amplifier	ZVA-183-S	667400960	2011-05-08

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

8.7 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

The testing was performed by Ning Ma on 2012-03-18 in 5 meters chamber 3.

8.8 Summary of Test Results

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

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-13.03	66.62475	Horizontal	802.11b Low, 30-1000 MHz

Above 1 GHz:

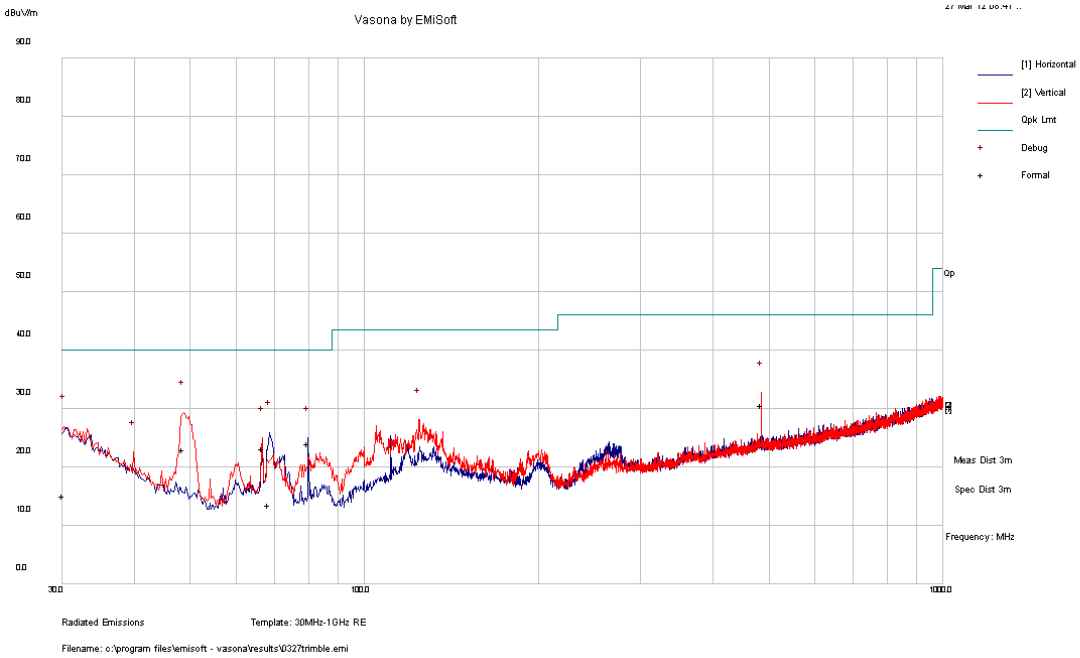
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-9.02	4874	Vertical	802.11b Middle, 1GHz – 25GHz

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

8.9 Radiated Emissions Test Data and Plots

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

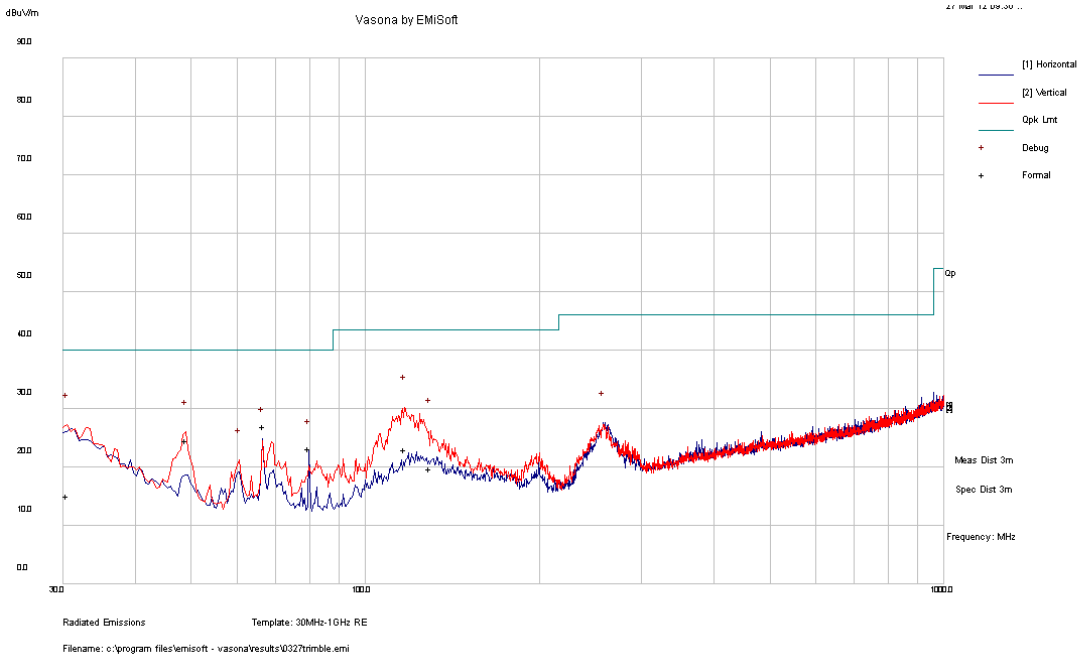
Worst Case: 2.4 GHz, 802.11b Mode, Low channel, Host: R10, Antenna Model: SWLP.12



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
48.70625	23	123	V	184	40	-17.00
30.17025	15.12	234	V	143	40	-24.88
485.0008	30.53	103	V	338	46	-15.47
68.47675	13.46	269	H	170	40	-26.54
66.61875	23.16	197	V	254	40	-16.84
80.0055	24.02	121	H	335	40	-15.98

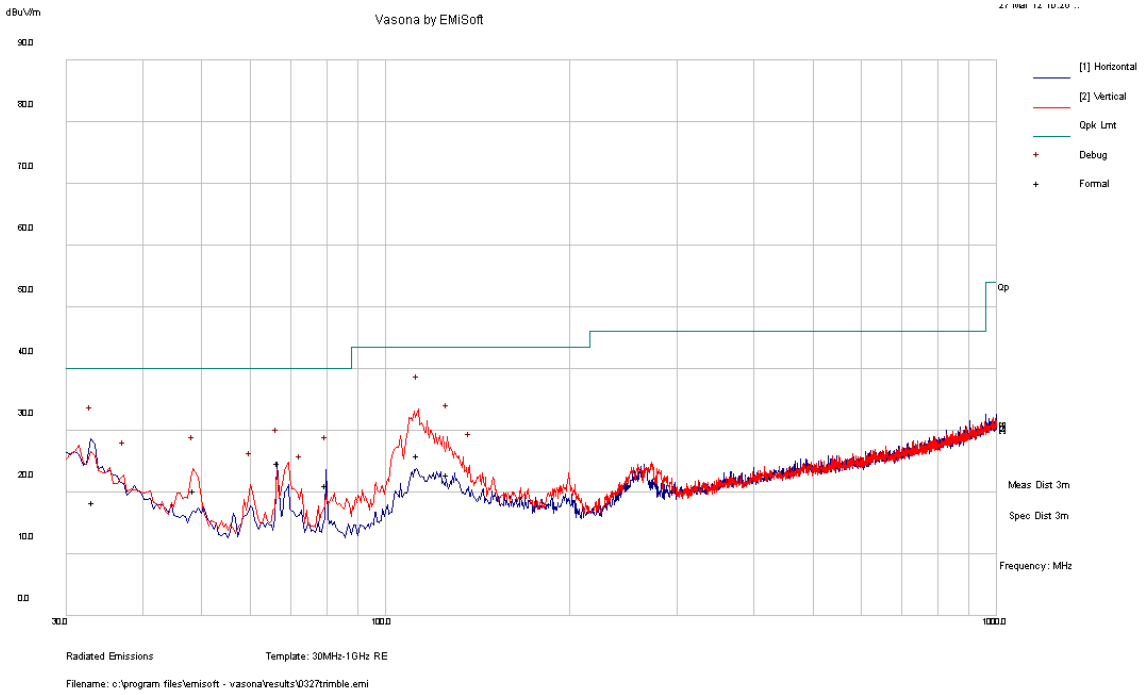
Worst Case: 2.4 GHz, 802.11b Mode, Low channel, Host: SPS985, Antenna Model: MAF94432



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
30.4955	15.02	131	V	229	40	-24.98
116.792	22.99	183	V	114	43.5	-20.51
49.0165	24.52	100	V	116	40	-15.48
66.62475	26.97	100	H	295	40	-13.03
79.997	23.21	100	H	186	40	-16.79
129.5098	19.82	117	V	45	43.5	-23.68

Worst Case: 2.4 GHz, 802.11b Mode, Low channel, Host: SPS985, Antenna Model: 1513151-1



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
112.8903	25.99	212	V	94	43.5	-17.51
33.14875	18.42	216	H	270	40	-21.58
126.272	22.93	138	V	88	43.5	-20.57
66.60625	24.72	137	H	274	40	-15.28
48.6435	20.24	193	V	107	40	-19.76
80.0015	21.21	184	H	114	40	-18.79

2) Above 1 GHz Spurious Emissions, Measured at 3 meters

2.4 GHz 802.11b mode, Low Channel

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: R10, Antenna Model: SWLP.12											
4824	38.02	264	114	V	32.6	4.56	27.7	47.48	74	-26.52	Peak
4824	37.91	227	114	H	32.6	4.56	27.7	47.37	74	-26.63	Peak
4824	33.14	264	114	V	32.6	4.56	27.7	42.6	54	-11.4	Ave
4824	32.42	227	114	H	32.6	4.56	27.7	41.88	54	-12.12	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: MAF94432											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: 1513151-1											
4824	39.23	360	115	V	32.6	4.56	27.7	48.69	74	-25.31	Peak
4824	36.25	250	100	H	32.6	4.56	27.7	45.71	74	-28.29	Peak
4824	35.38	360	115	V	32.6	4.56	27.7	44.84	54	-9.16	Ave
4824	28.42	250	100	H	32.6	4.56	27.7	37.88	54	-16.12	Ave

2.4 GHz 802.11b mode, Middle Channel

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: R10, Antenna Model: SWLP.12											
4874	39.35	148	124	V	32.7	4.54	27.8	48.79	74	-25.21	Peak
4874	37.29	127	122	H	32.7	4.54	27.8	46.73	74	-27.27	Peak
4874	35.54	148	124	V	32.7	4.54	27.8	44.98	54	-9.02	Ave
4874	30.89	127	122	H	32.7	4.54	27.8	40.33	54	-13.67	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: MAF94432											
4874	41.59	150	108	V	32.7	4.54	27.8	51.03	74	-22.97	Peak
4874	39.05	159	116	H	32.7	4.54	27.8	48.49	74	-25.51	Peak
4874	39.01	150	108	V	32.7	4.54	27.8	48.45	54	-5.55	Ave
4874	34.84	159	116	H	32.7	4.54	27.8	44.28	54	-9.72	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: 1513151-1											
4874	38.91	0	100	V	32.7	4.54	27.8	48.35	74	-25.65	Peak
4874	35.08	237	100	H	32.7	4.54	27.8	44.52	74	-29.48	Peak
4874	34.36	0	100	V	32.7	4.54	27.8	43.8	54	-10.2	Ave
4874	26.52	237	100	H	32.7	4.54	27.8	35.96	54	-18.04	Ave

2.4 GHz 802.11b mode. High Channel

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: R10, Antenna Model: SWLP.12											
4924	39.42	9	126	V	32.7	4.52	27.7	48.94	74	-25.06	Peak
4924	34.81	217	100	H	32.7	4.52	27.7	44.33	74	-29.67	Peak
4924	34.88	9	126	V	32.7	4.52	27.7	44.4	54	-9.6	Ave
4924	26.96	217	100	H	32.7	4.52	27.7	36.48	54	-17.52	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: MAF94432											
4924	40.6	354	113	V	32.7	4.52	27.7	50.12	74	-23.88	Peak
4924	39.38	158	101	H	32.7	4.52	27.7	48.9	74	-25.1	Peak
4924	37.53	354	113	V	32.7	4.52	27.7	47.05	54	-6.95	Ave
4924	36.11	158	101	H	32.7	4.52	27.7	45.63	54	-8.37	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: 1513151-1											
4924	38.17	0	111	V	32.7	4.52	27.7	47.69	74	-26.31	Peak
4924	35.15	228	100	H	32.7	4.52	27.7	44.67	74	-29.33	Peak
4924	33.75	0	111	V	32.7	4.52	27.7	43.27	54	-10.73	Ave
4924	27.09	228	100	H	32.7	4.52	27.7	36.61	54	-17.39	Ave

2.4 GHz 802.11g mode Low Channel

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: R10, Antenna Model: SWLP.12											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: MAF94432											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: 1513151-1											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

2.4 GHz 802.11g mode Middle Channel

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: R10, Antenna Model: SWLP.12											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: MAF94432											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: 1513151-1											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

2.4 GHz 802.11g mode High Channel

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: R10, Antenna Model: SWLP.12											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: MAF94432											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Host: SPS985, Antenna Model: 1513151-1											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

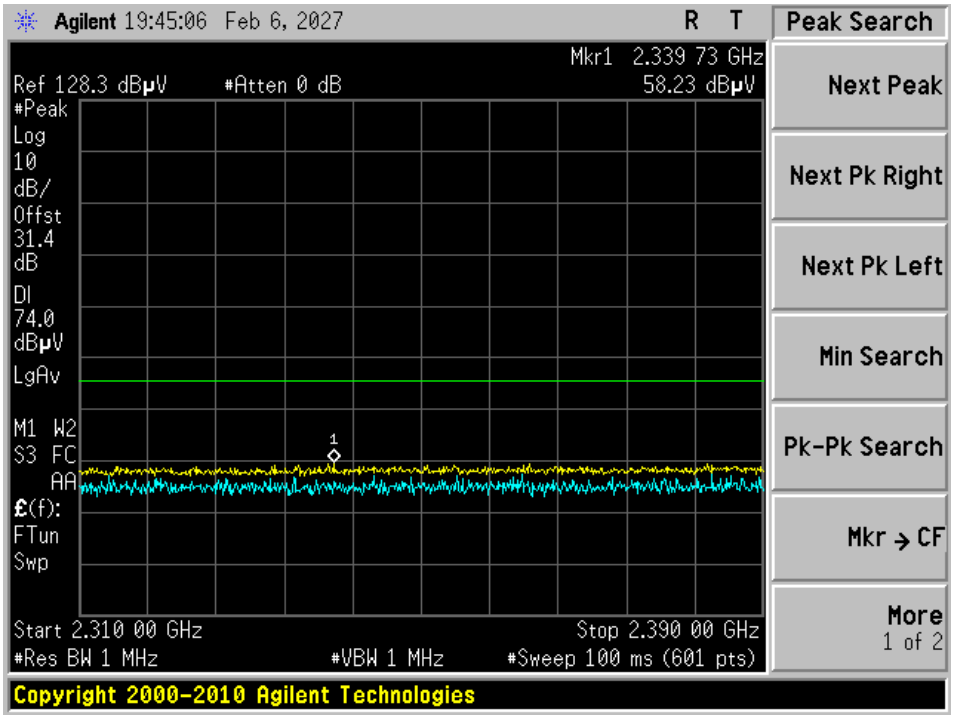
Note: All emissions are 20 dB below the limit and/or under the noise floor level

3) Restricted Band Emissions

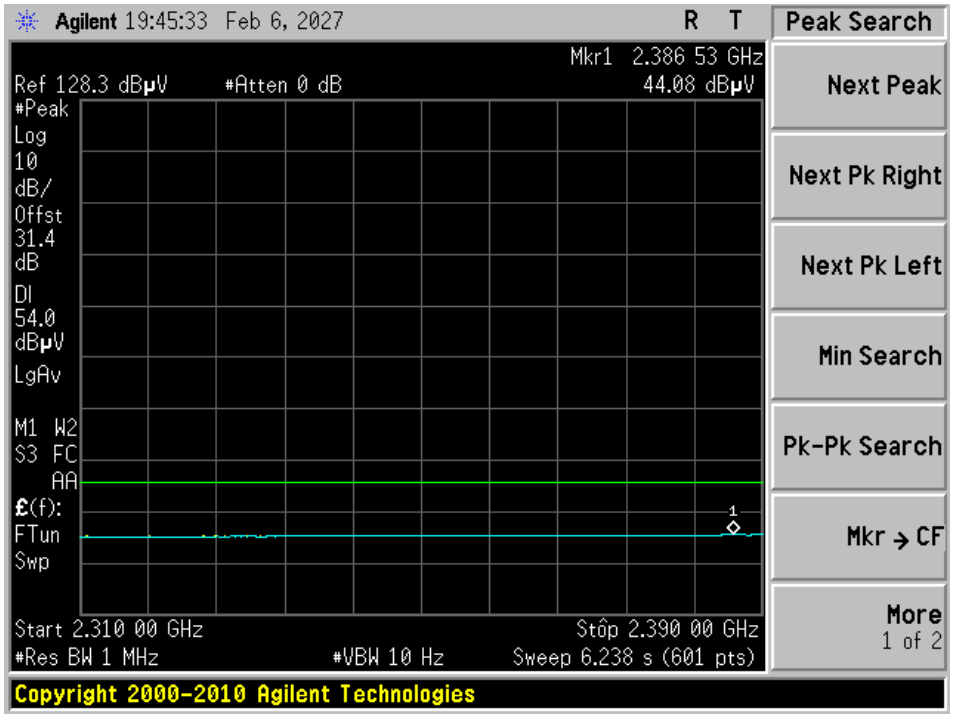
2.4 GHz 802.11b mode:

Host: R10, Antenna Model: SWLP.12

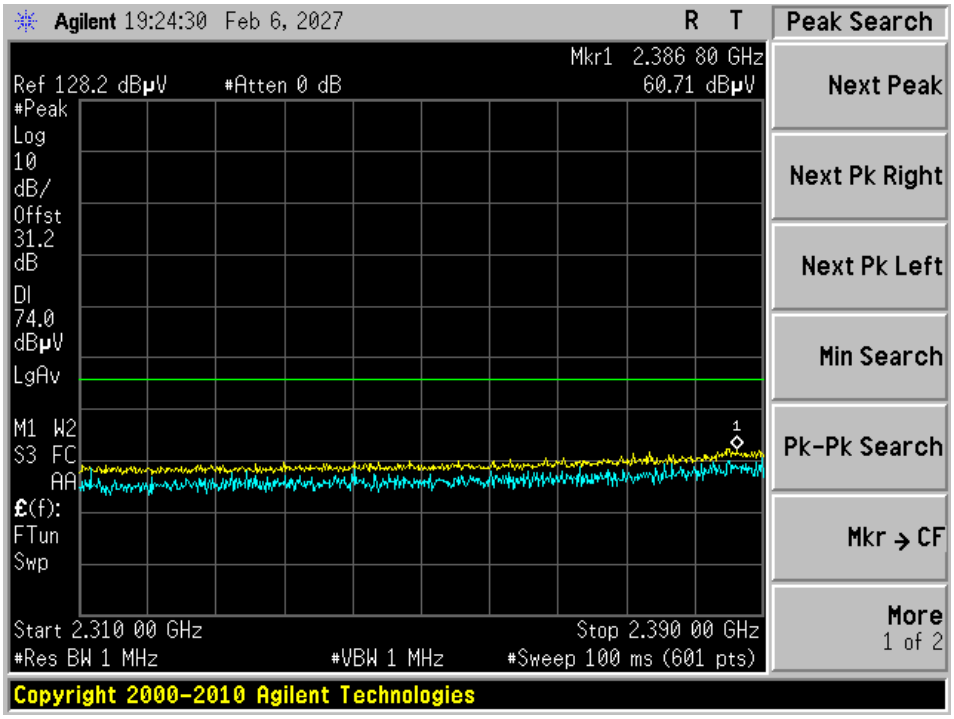
Low Channel-Peak (Horizontal)



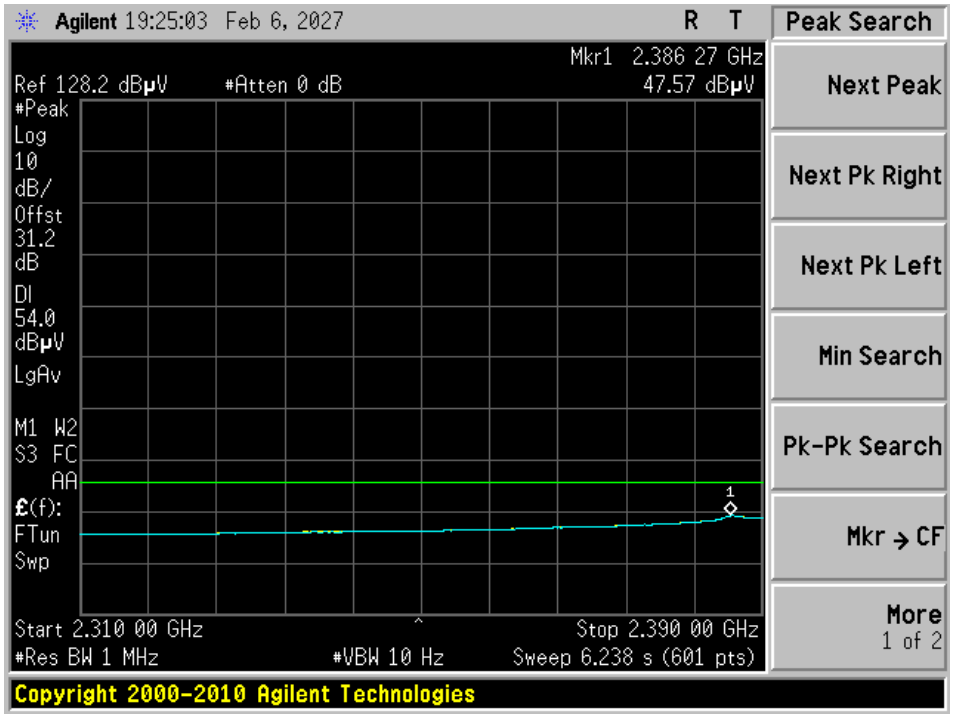
Low Channel-Average (Horizontal)



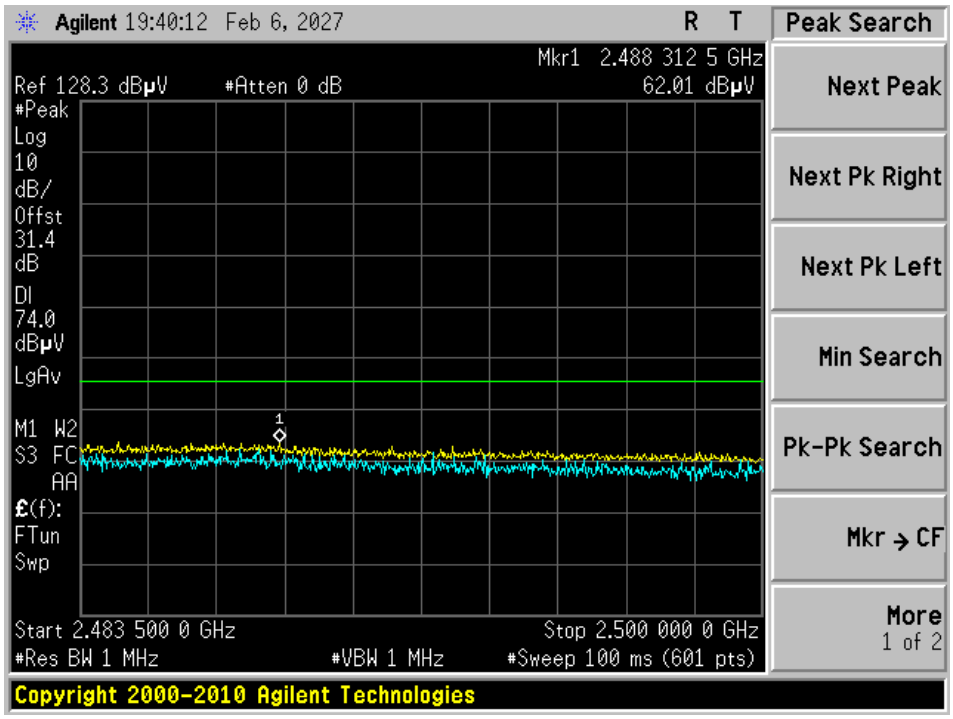
Low Channel-Peak (Vertical)



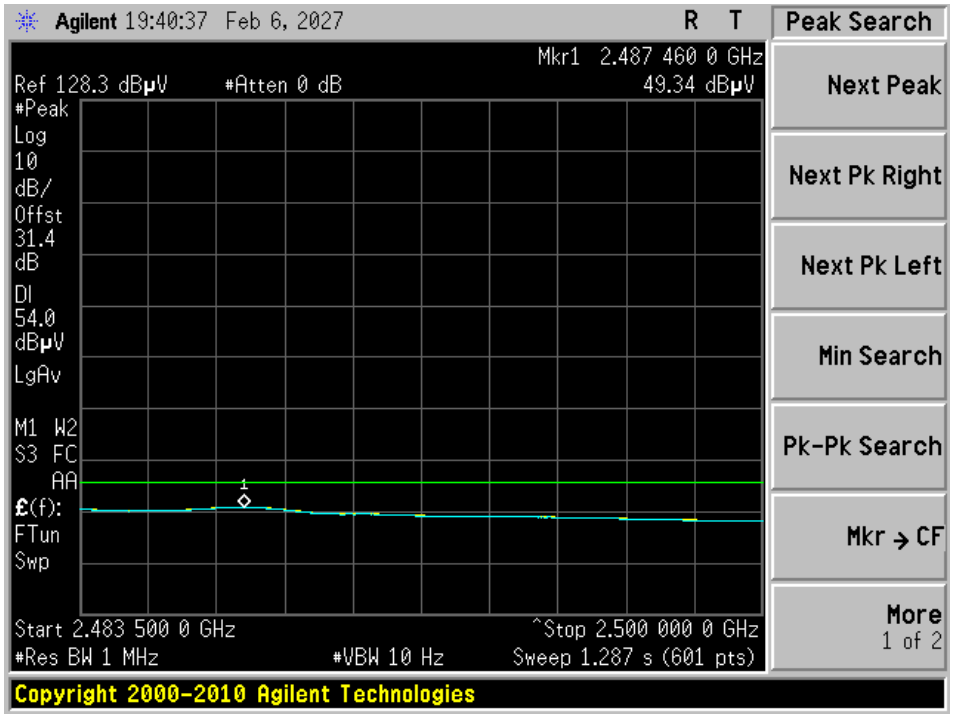
Low Channel-Average (Vertical)



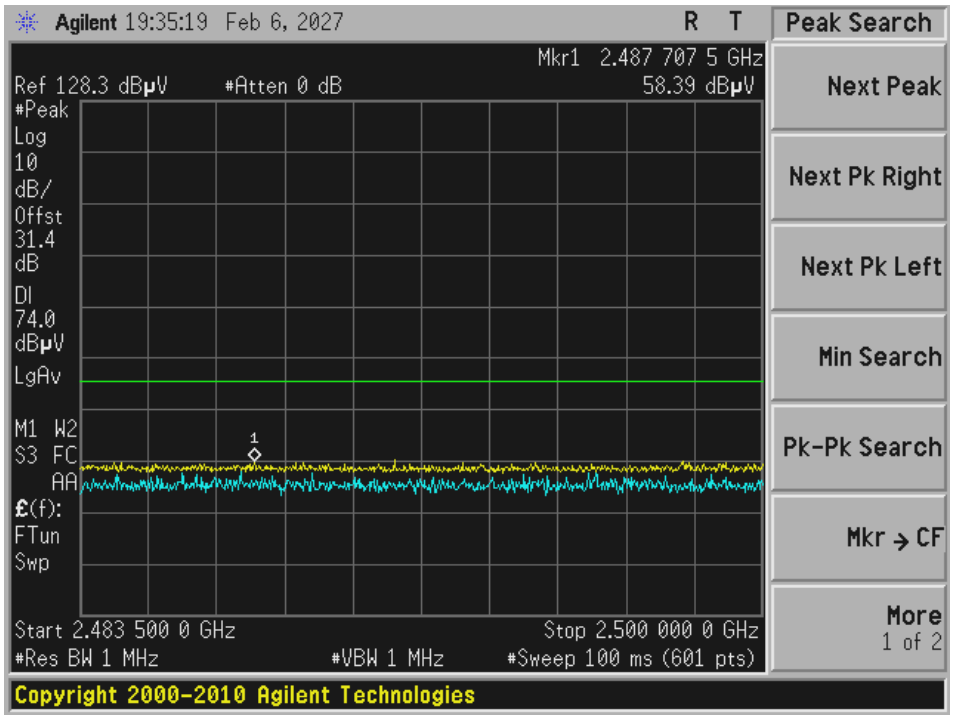
High Channel-Peak (Horizontal)



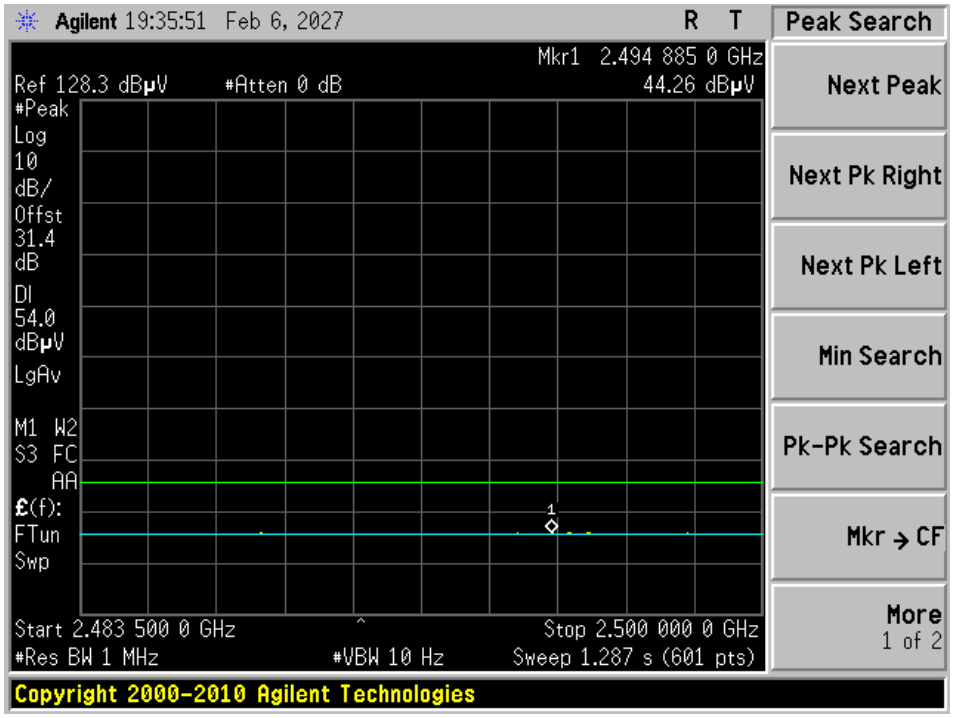
High Channel-Average (Horizontal)



High Channel-Peak (Vertical)

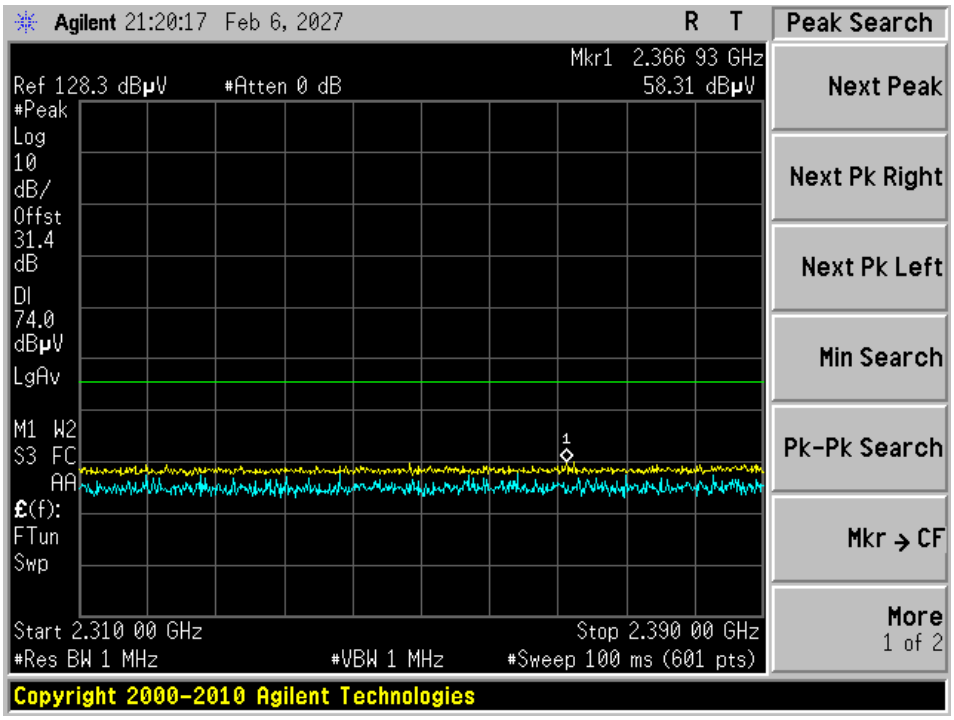


High Channel-Average (Vertical)

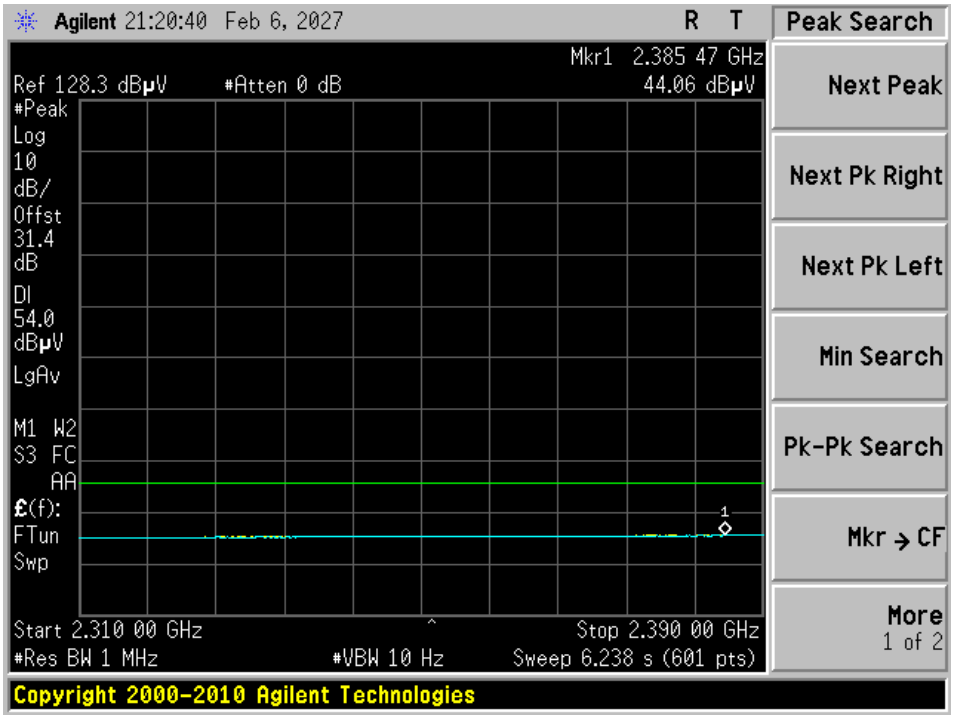


Host: SPS985, Antenna Model: MAF94432

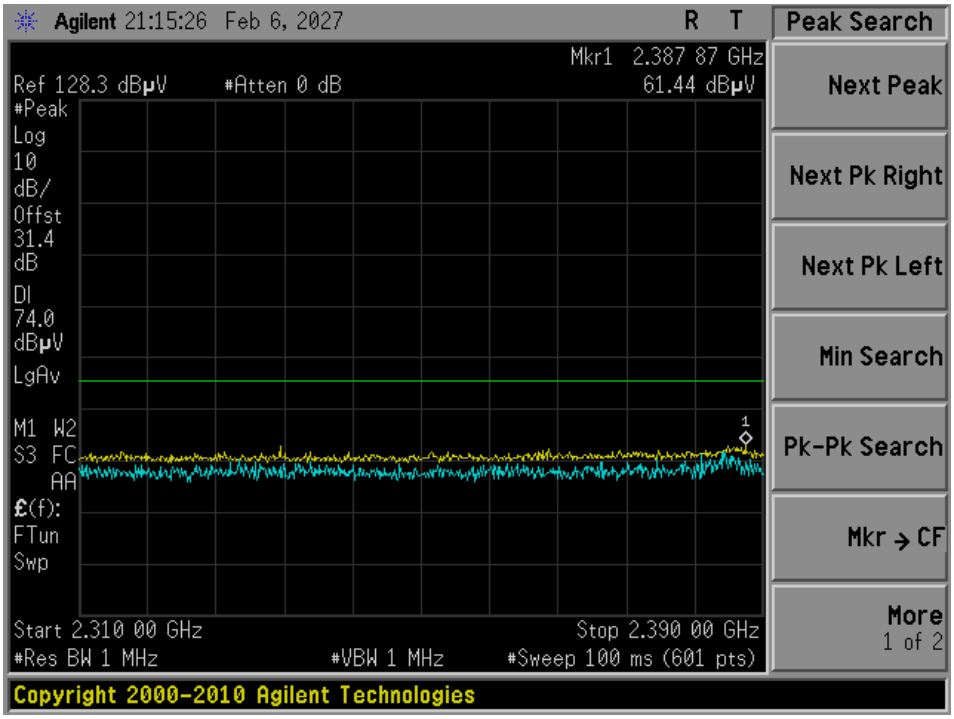
Low Channel-Peak (Horizontal)



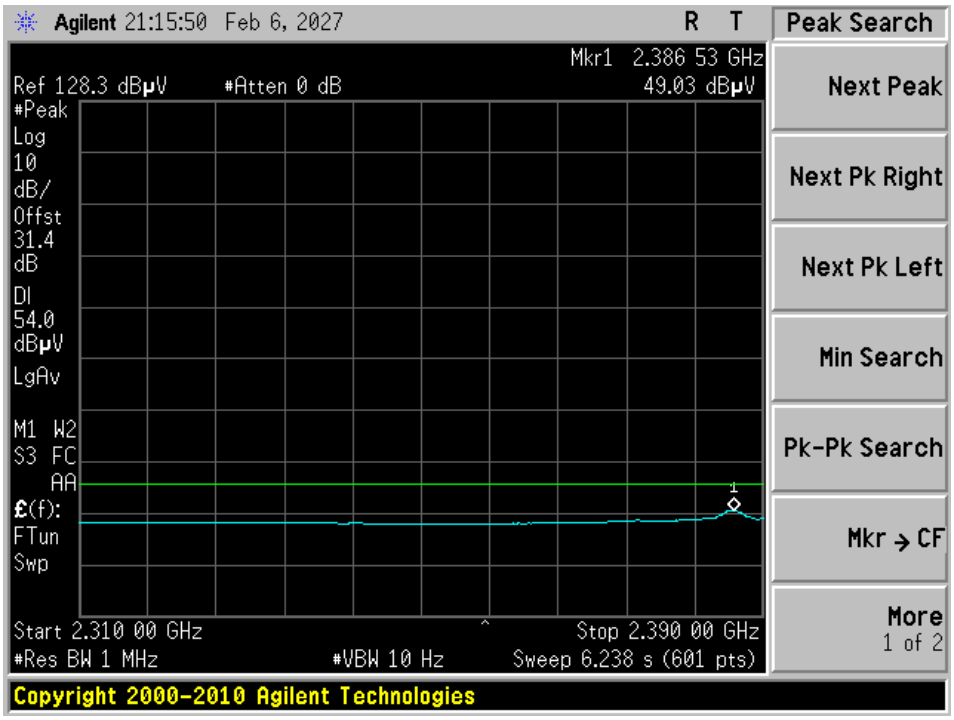
Low Channel-Average (Horizontal)



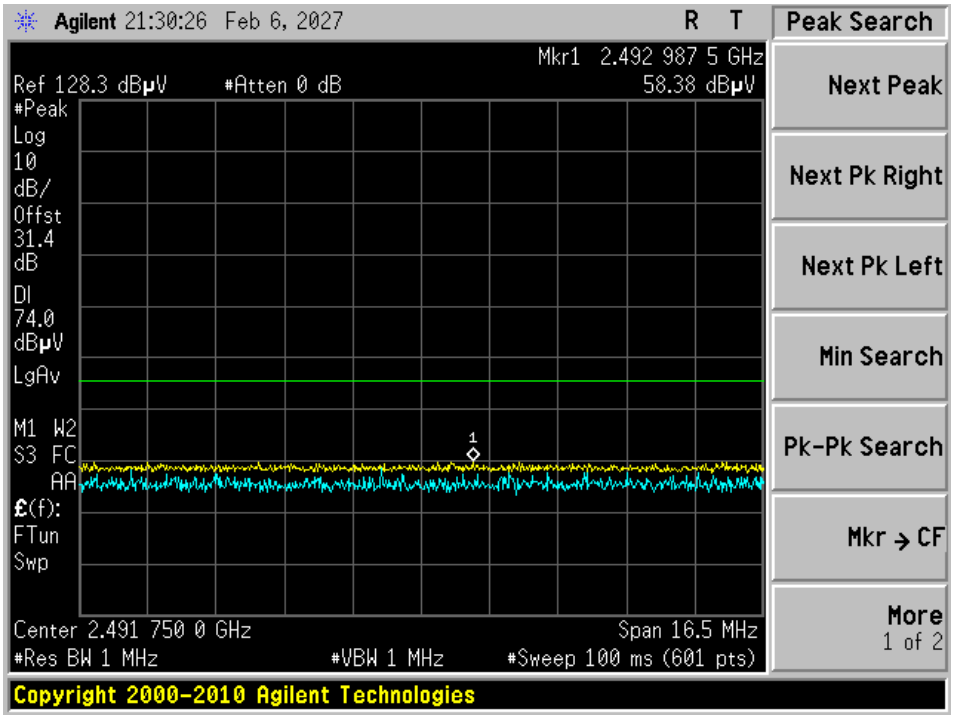
Low Channel-Peak (Vertical)



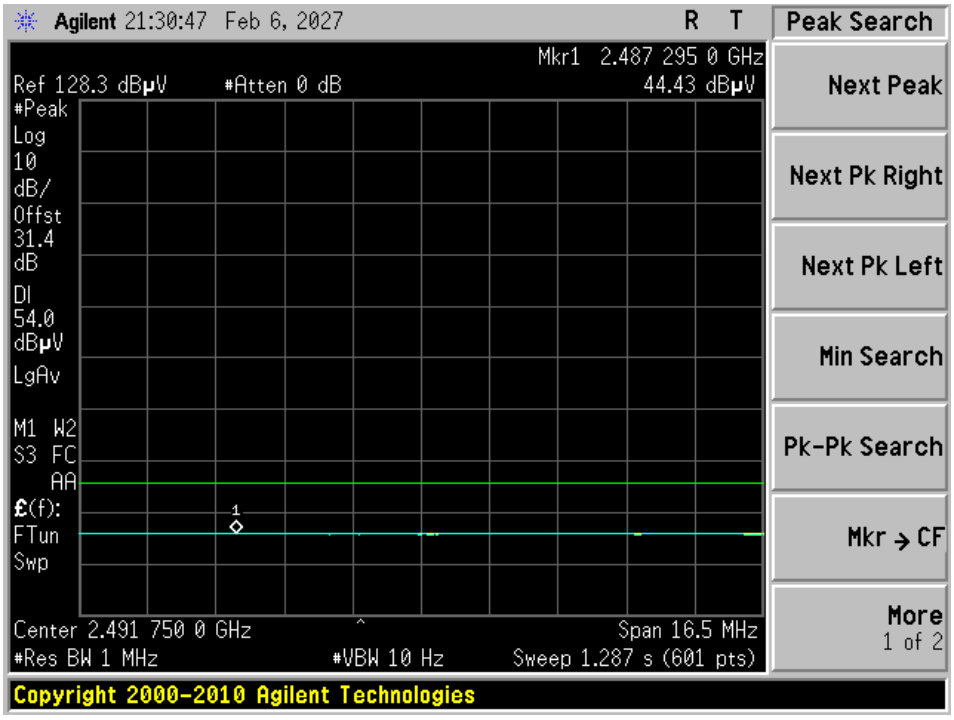
Low Channel-Average (Vertical)



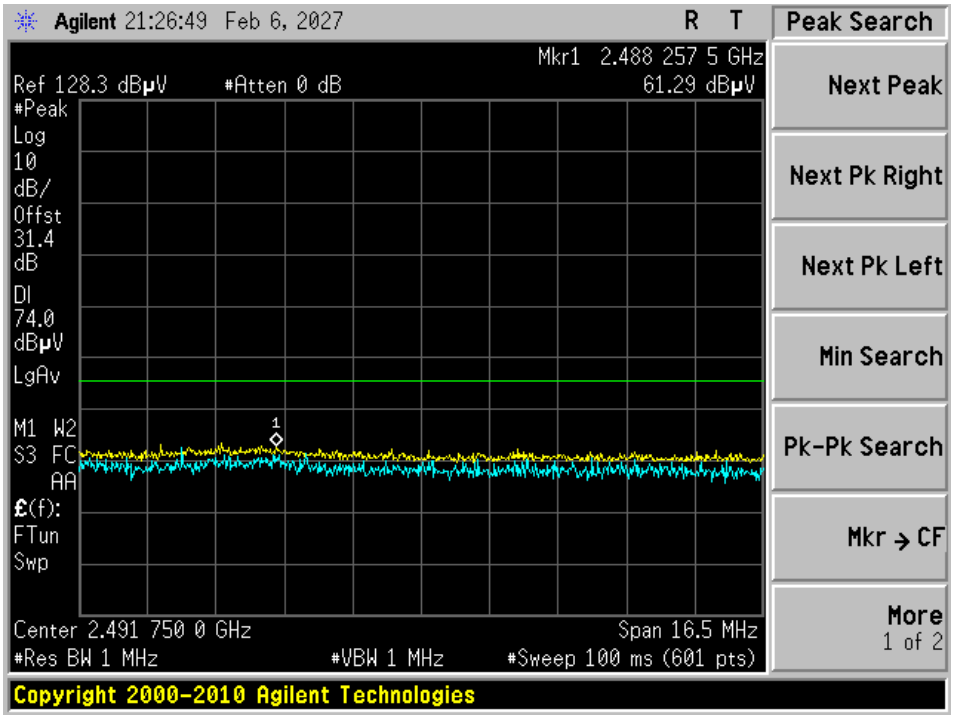
High Channel-Peak (Horizontal)



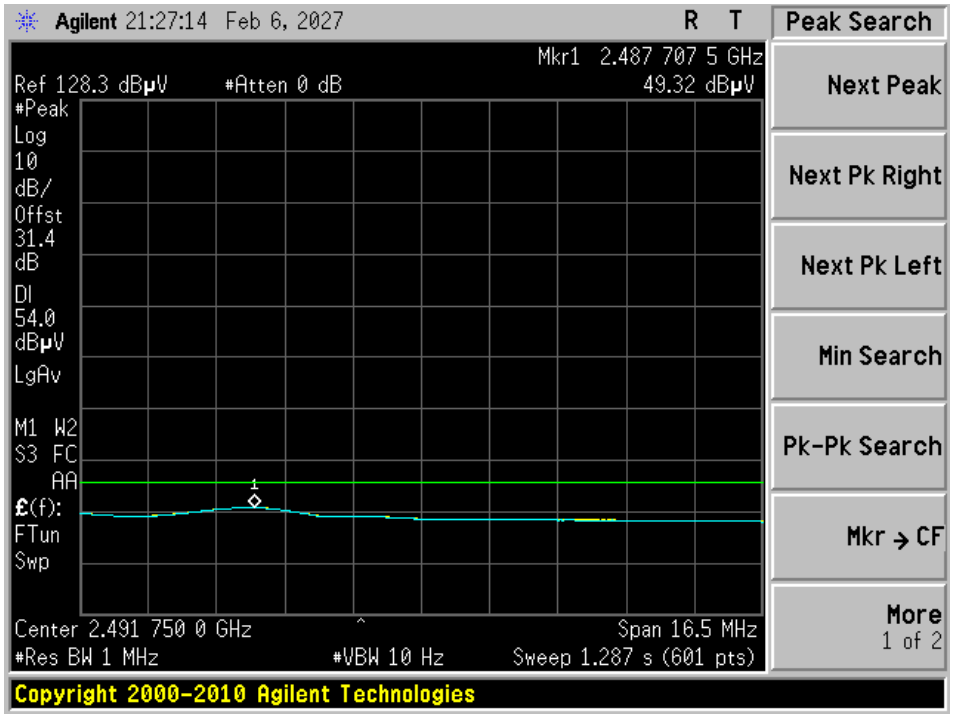
High Channel-Average (Horizontal)



High Channel-Peak (Vertical)

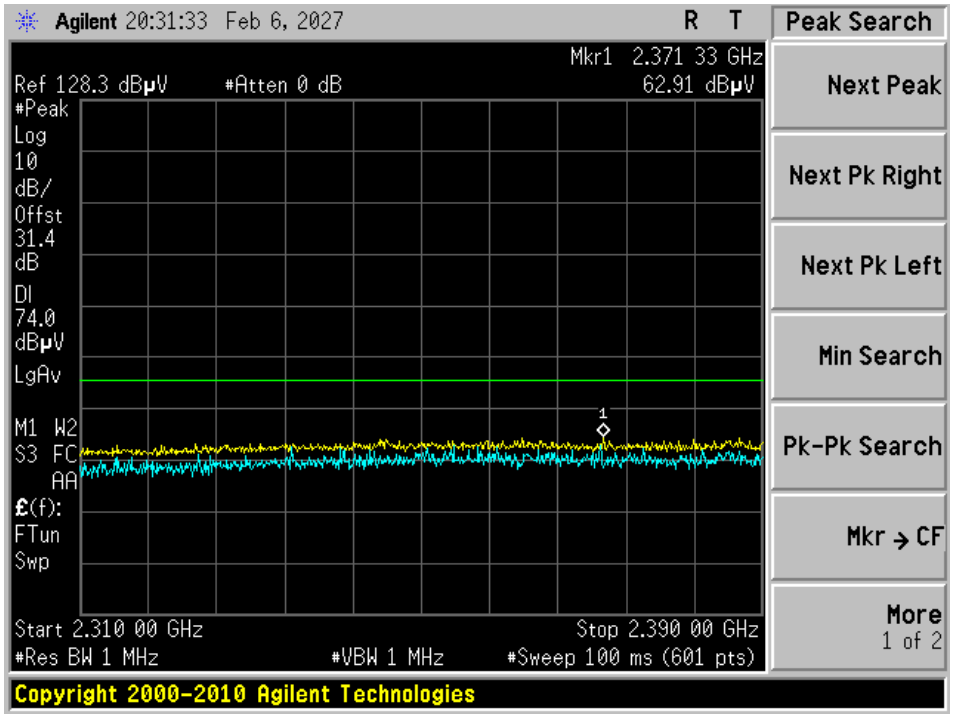


High Channel-Average (Vertical)

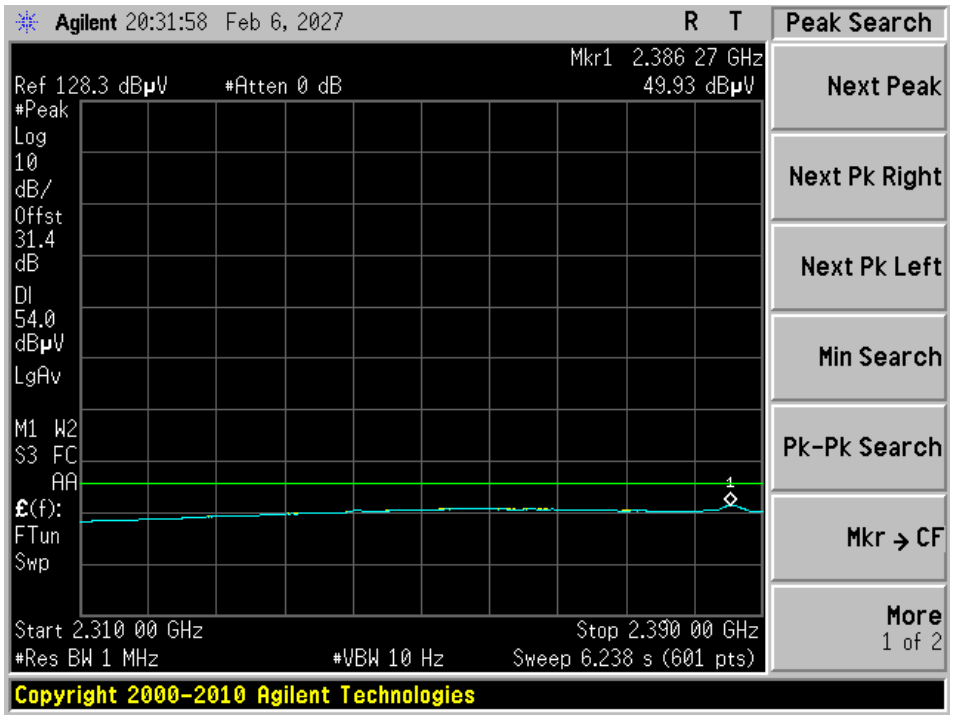


Host: SPS985, Antenna Model: 1513151-1

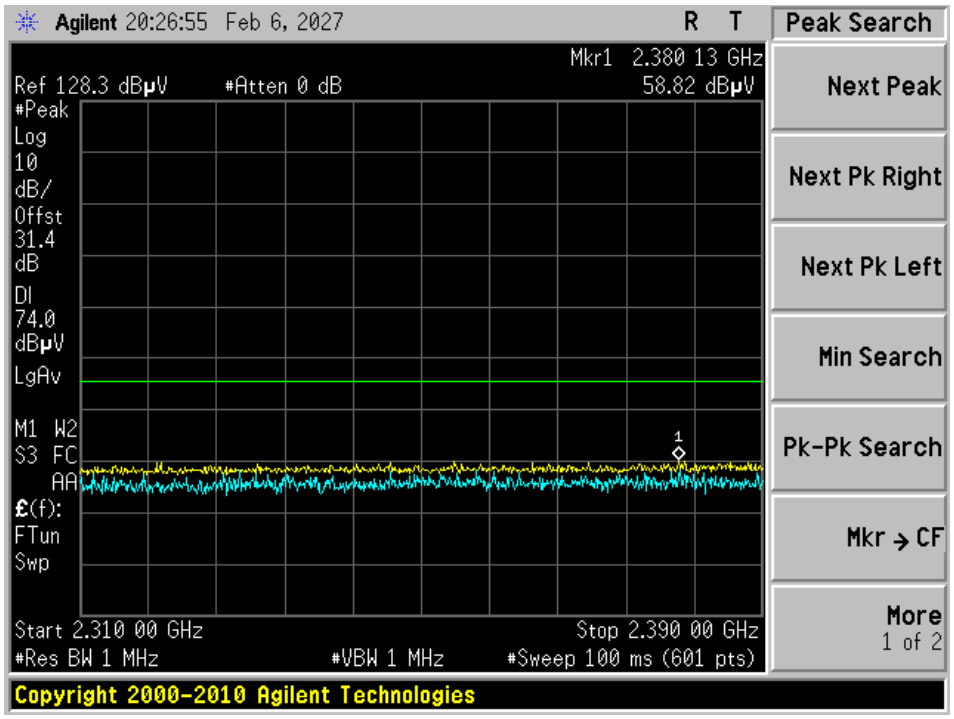
Low Channel-Peak (Horizontal)



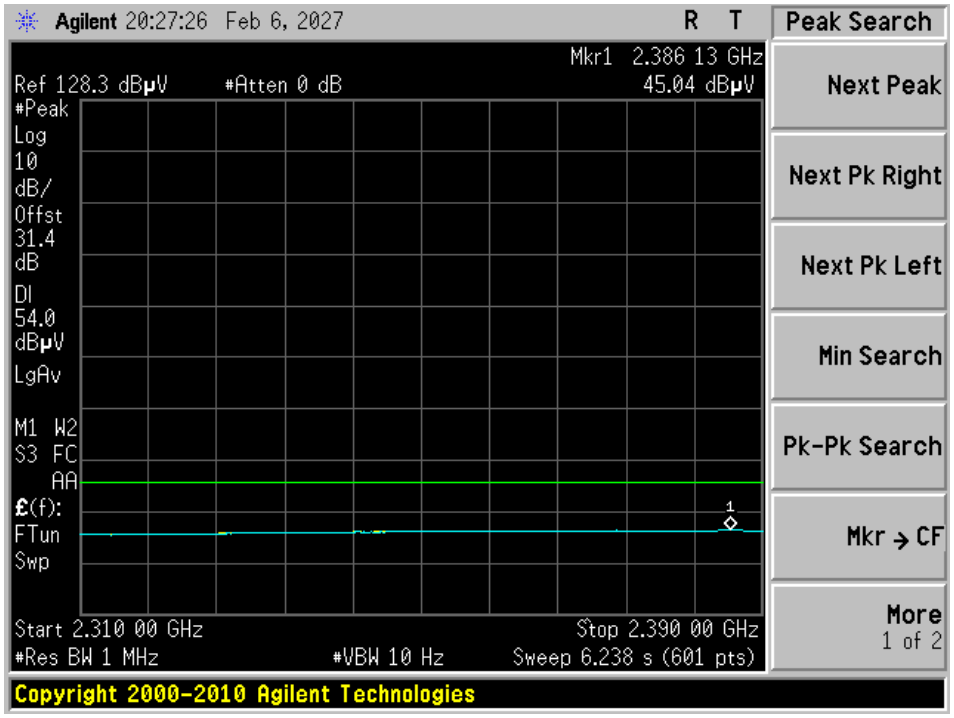
Low Channel-Average (Horizontal)



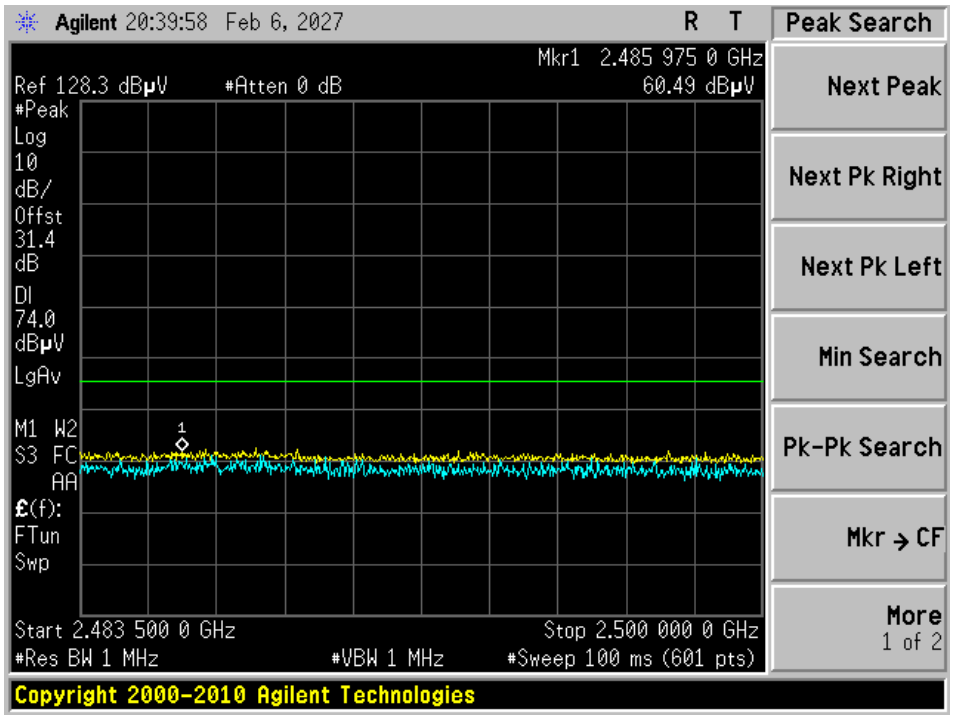
Low Channel-Peak (Vertical)



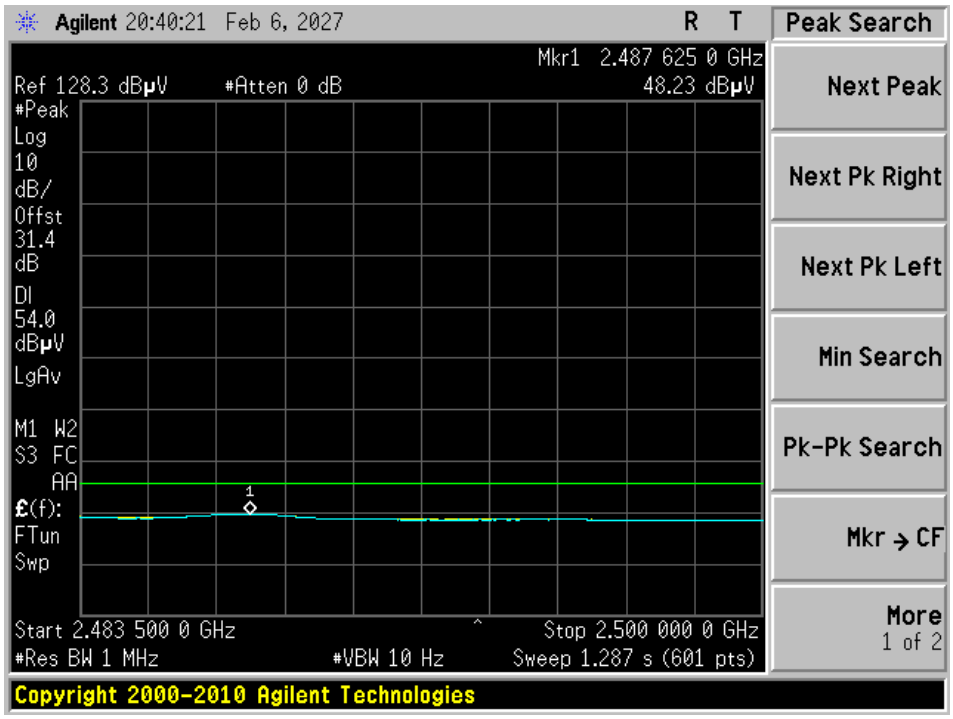
Low Channel-Average (Vertical)



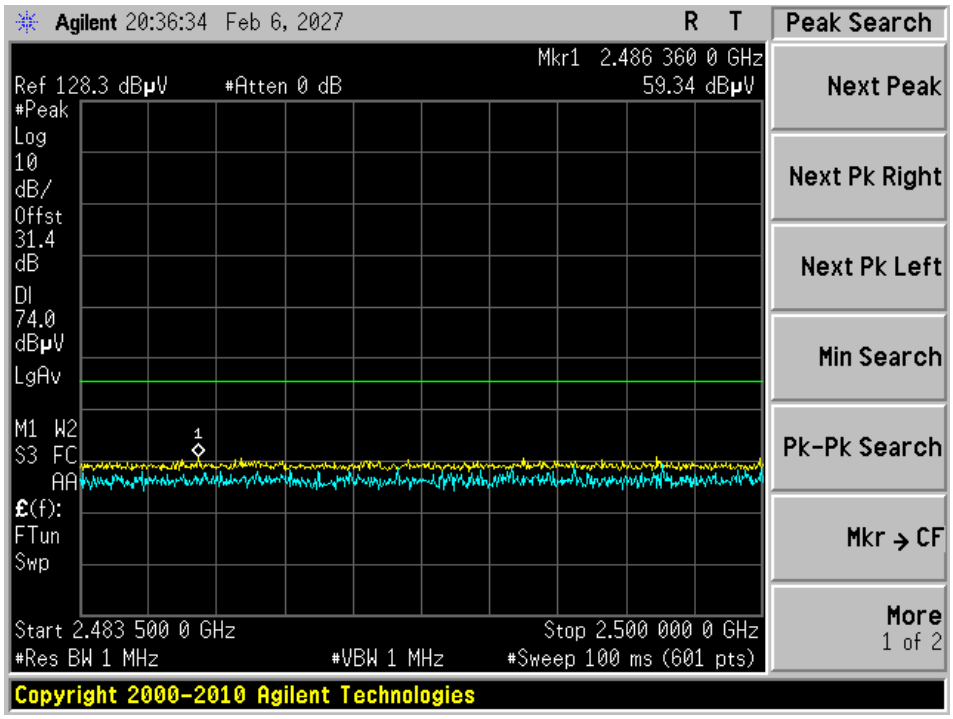
High Channel-Peak (Horizontal)



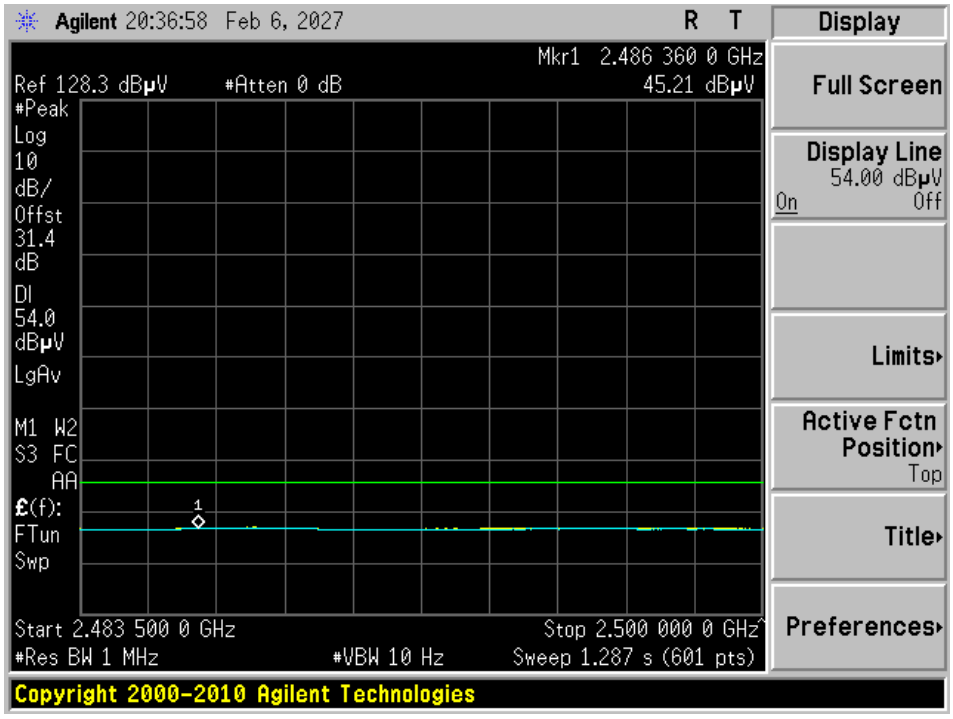
High Channel-Average (Horizontal)



High Channel-Peak (Vertical)



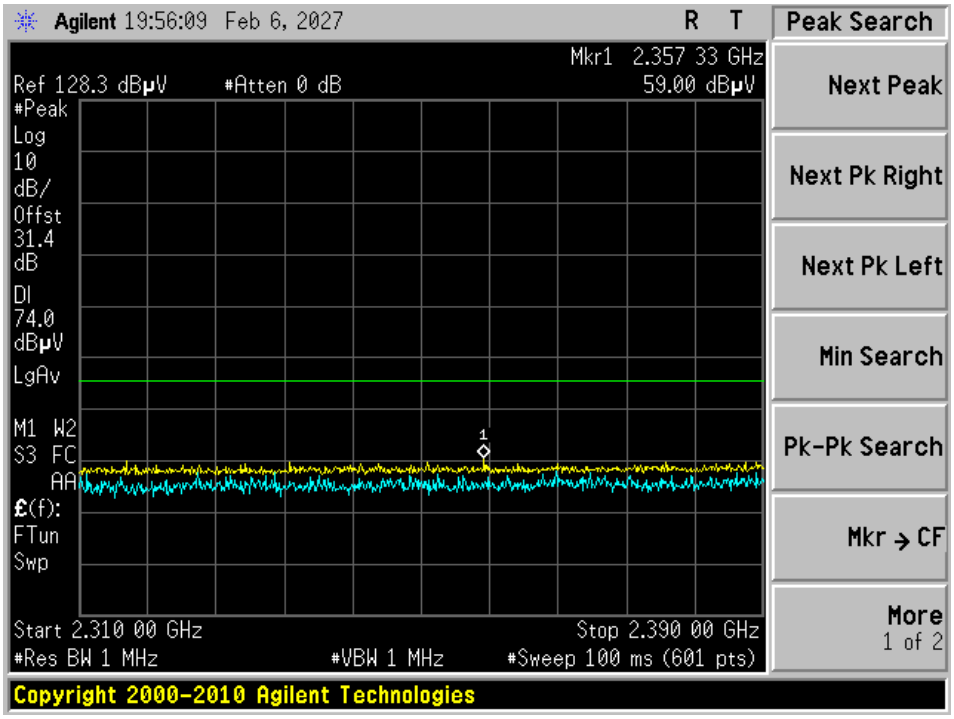
High Channel-Average (Vertical)



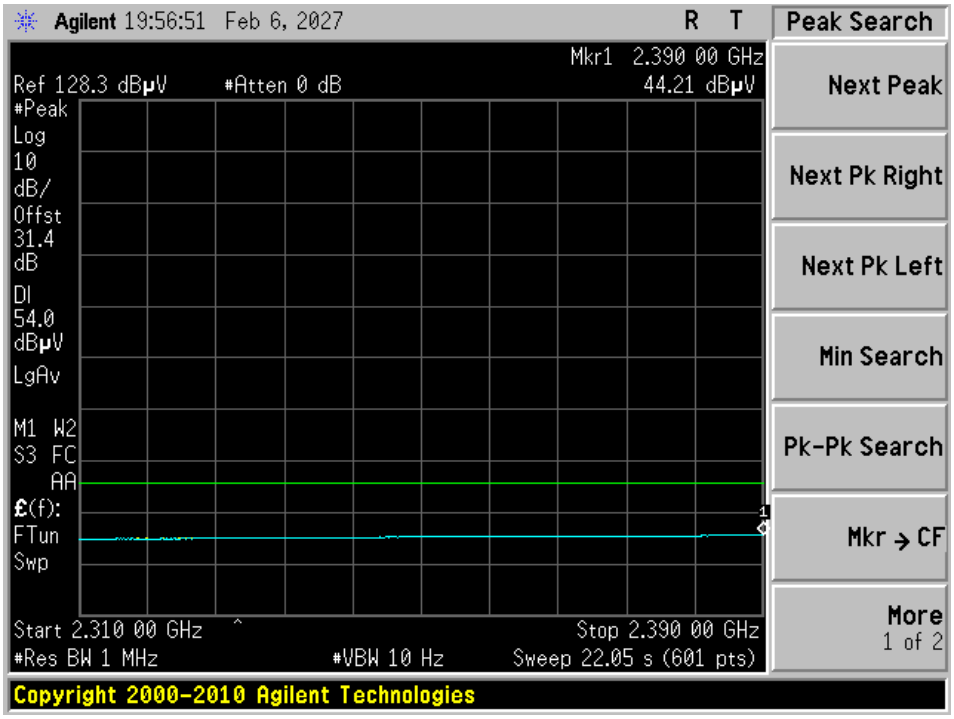
2.4 GHz 802.11g mode:

Host: R10, Antenna Model: SWLP.12

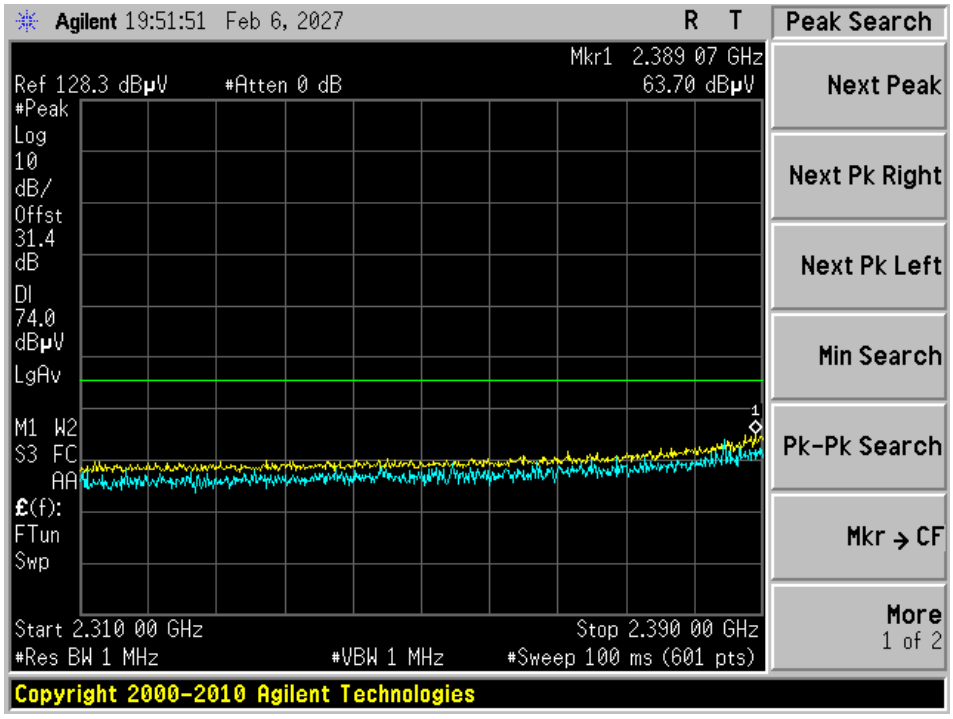
Low Channel-Peak (Horizontal)



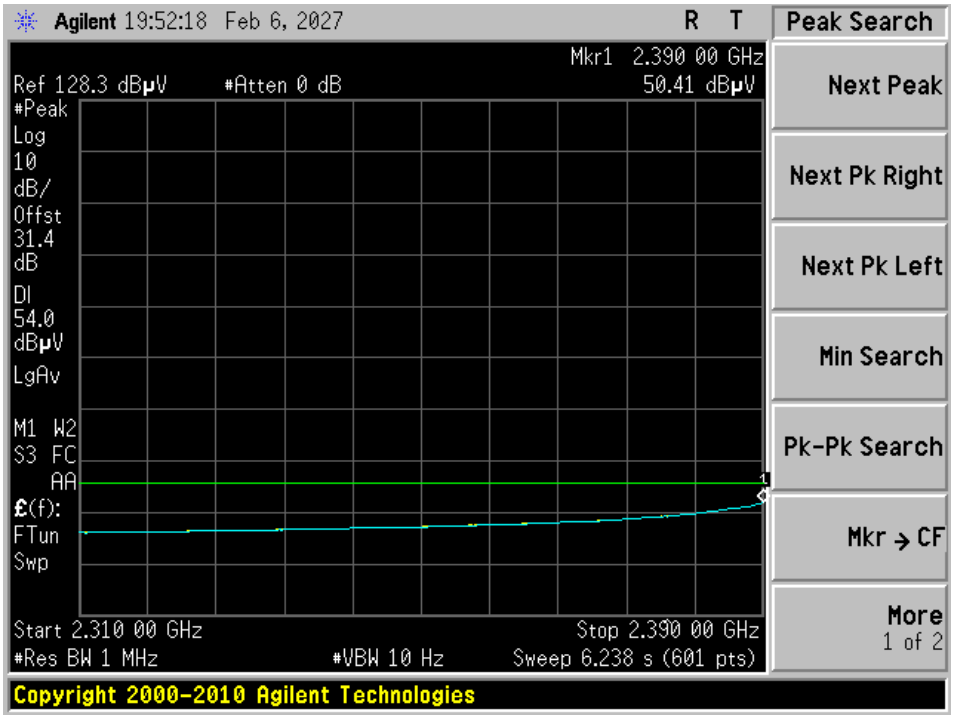
Low Channel-Average (Horizontal)



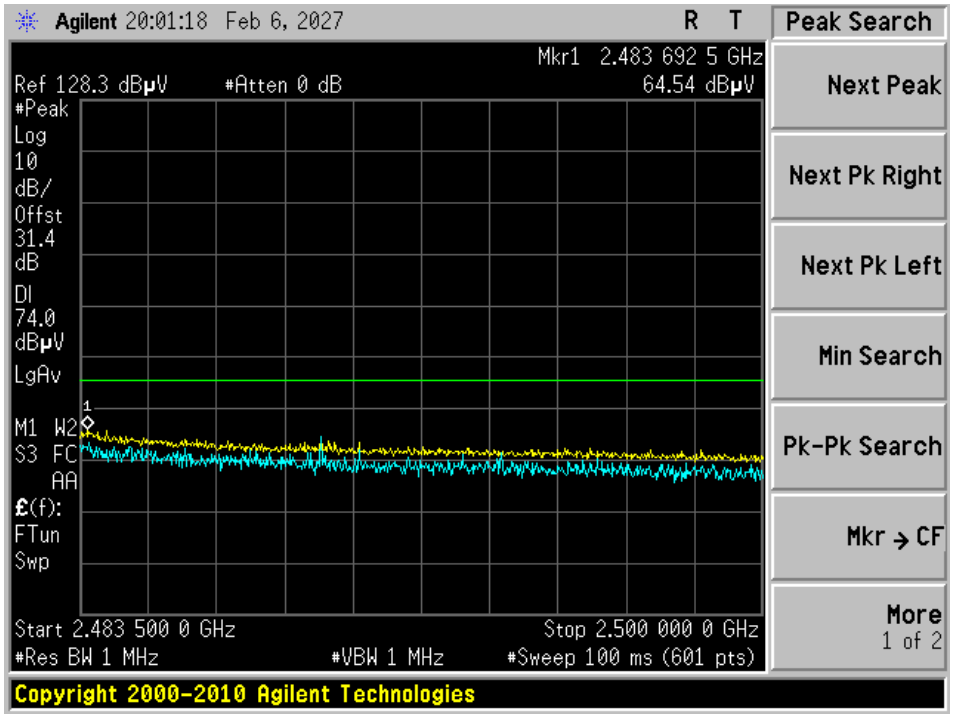
Low Channel-Peak (Vertical)



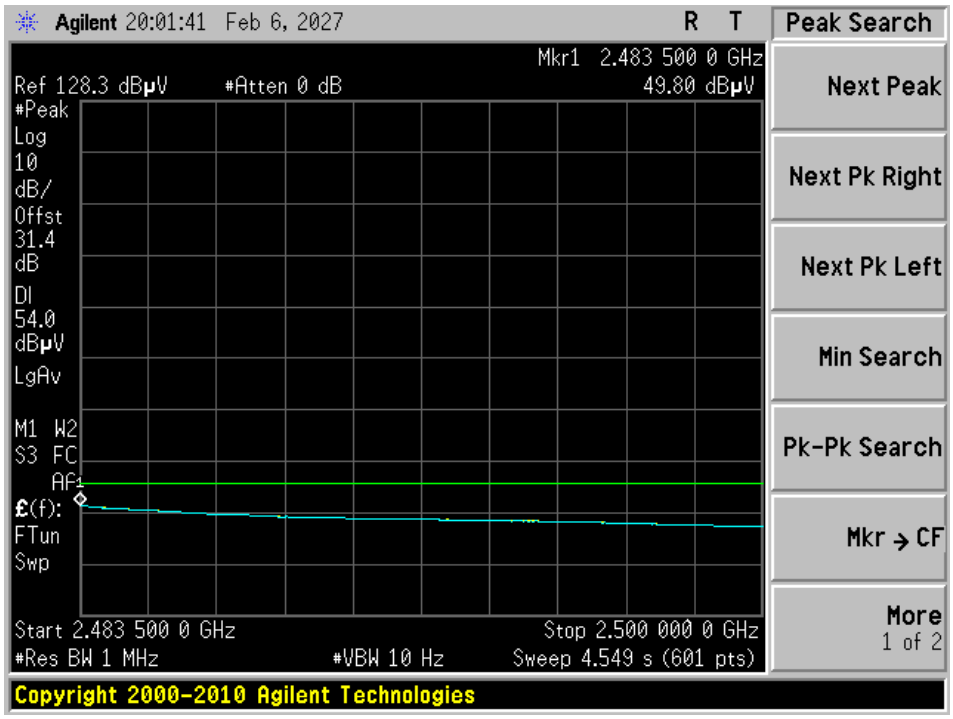
Low Channel-Average (Vertical)



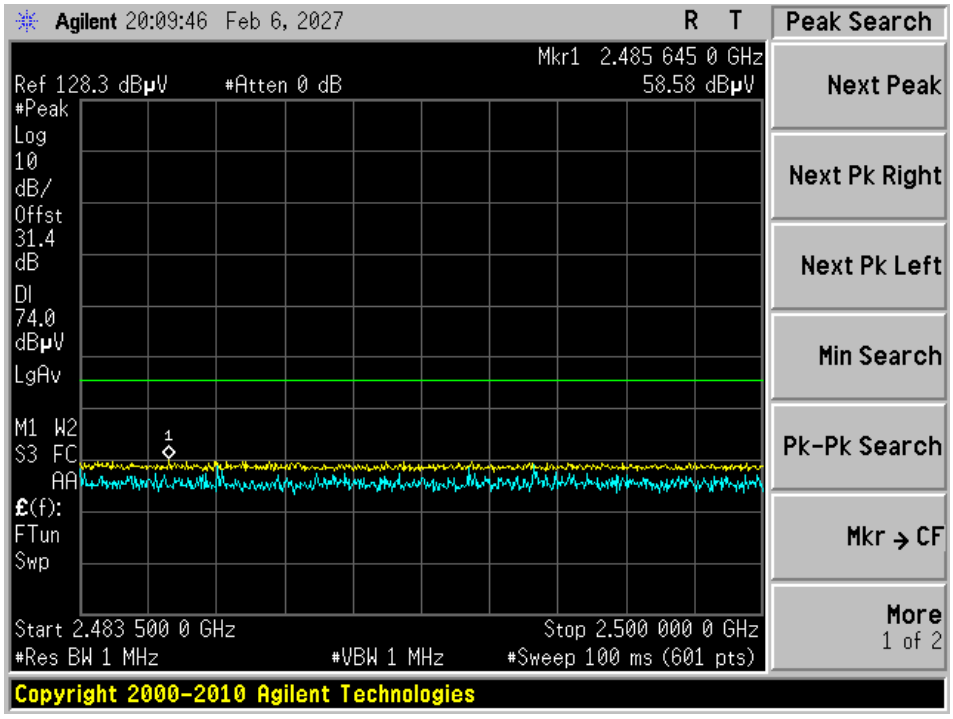
High Channel-Peak (Horizontal)



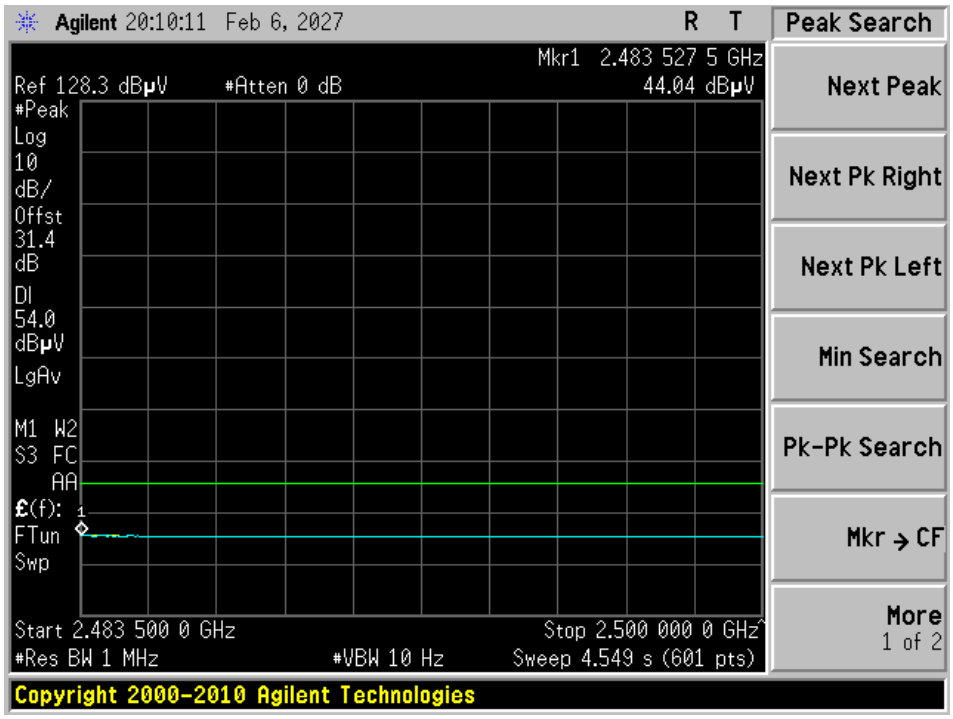
High Channel-Average (Horizontal)



High Channel-Peak (Vertical)

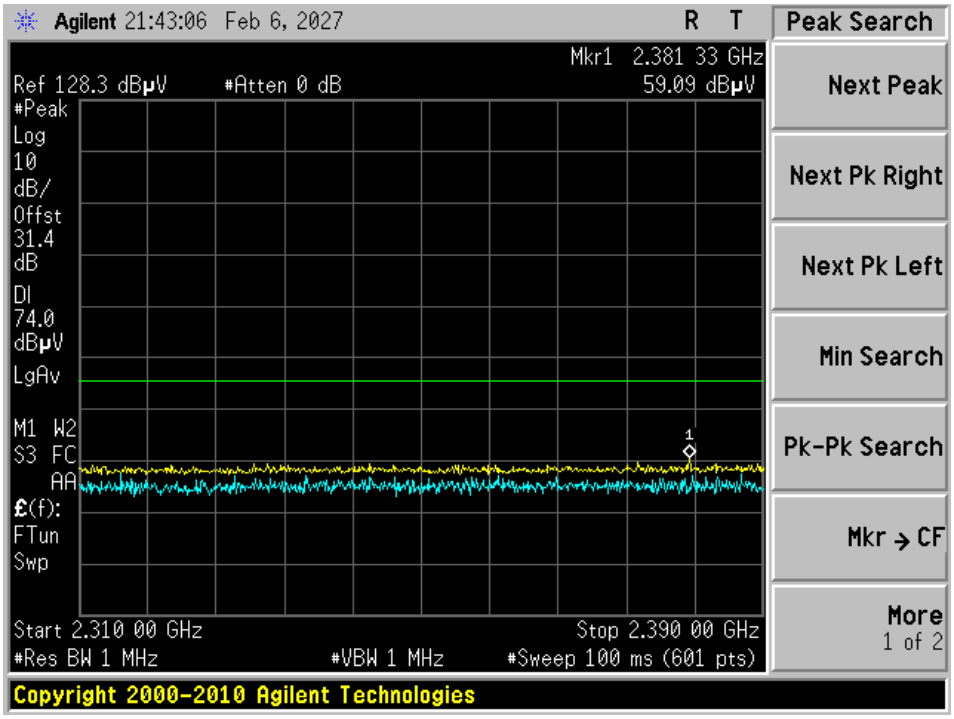


High Channel-Average (Vertical)

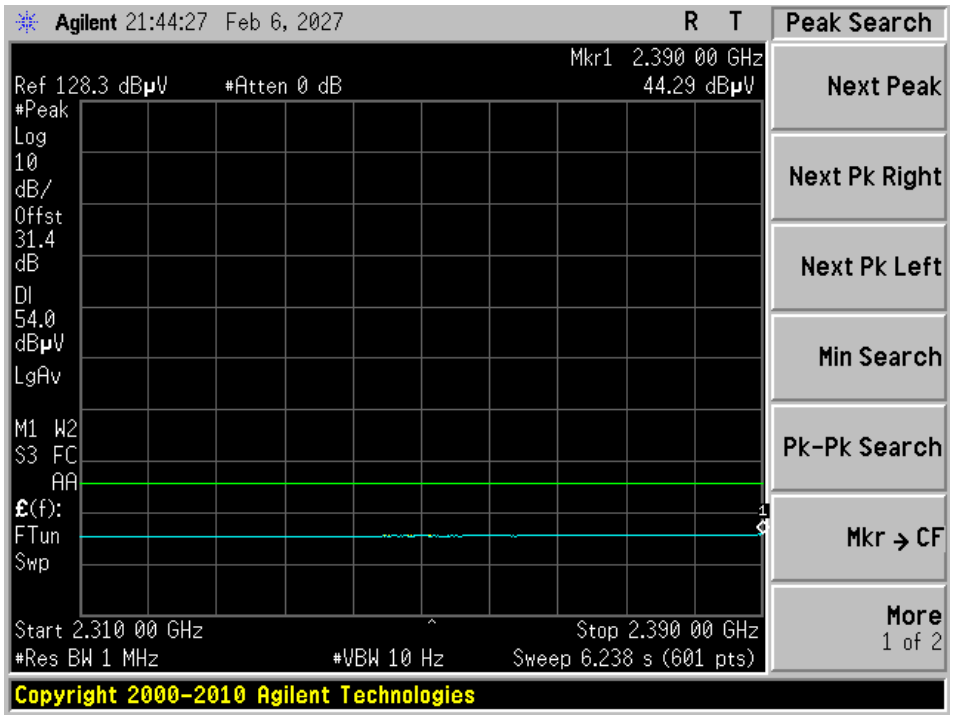


Host: SPS985, Antenna Model: MAF94432

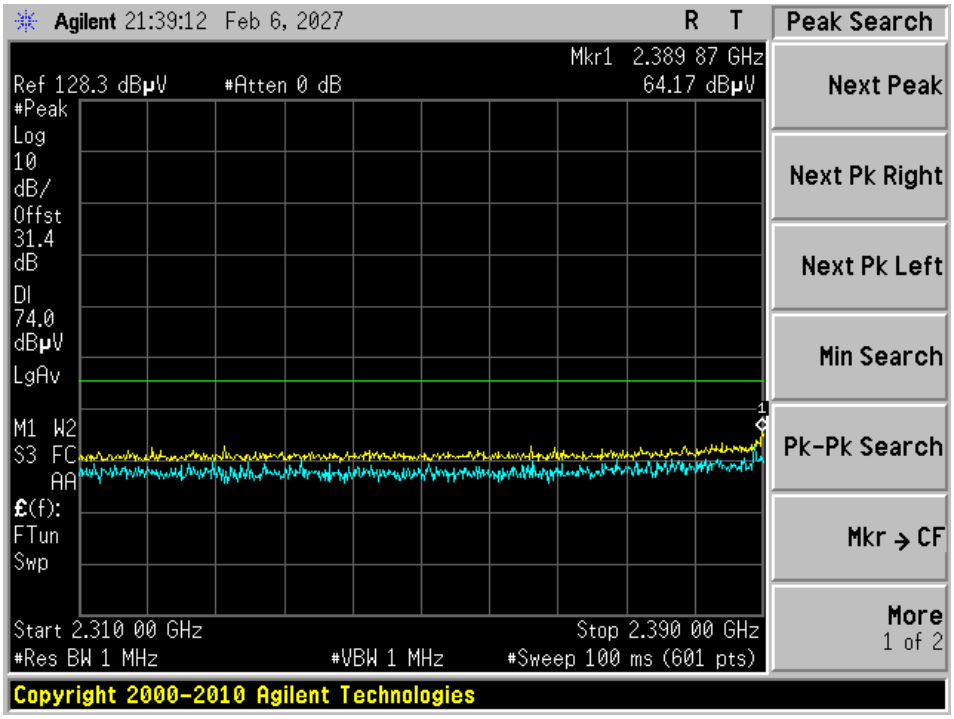
Low Channel-Peak (Horizontal)



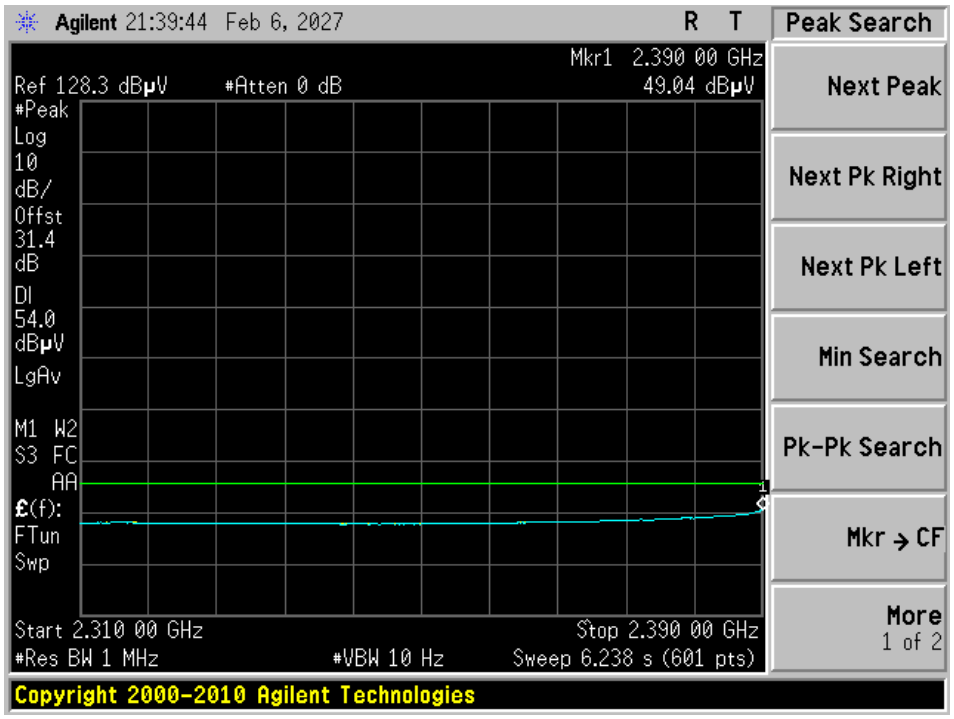
Low Channel-Average (Horizontal)



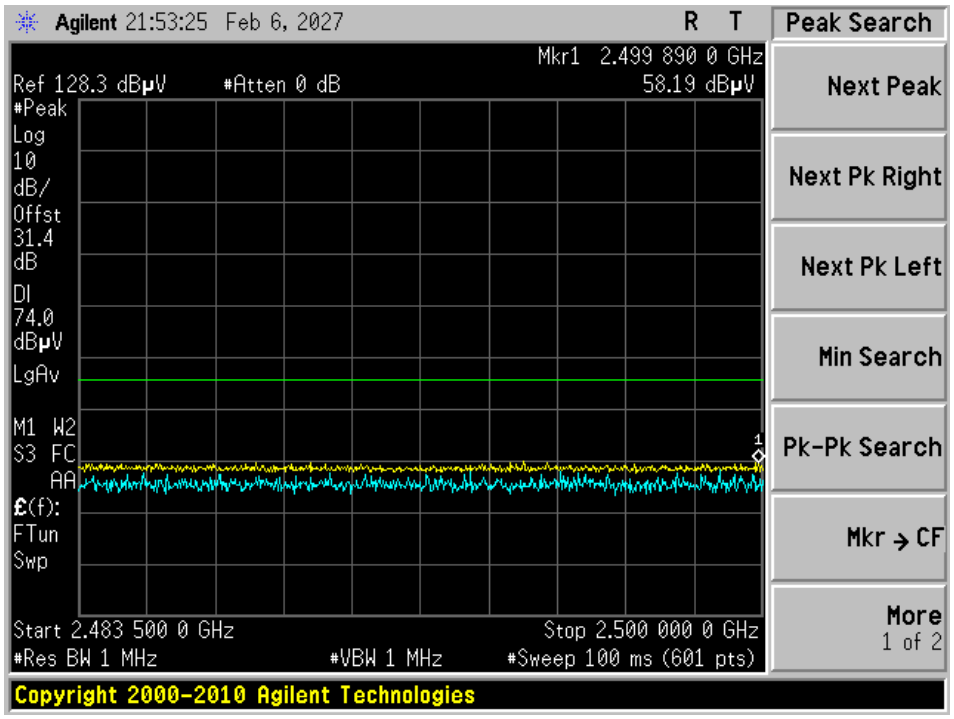
Low Channel-Peak (Vertical)



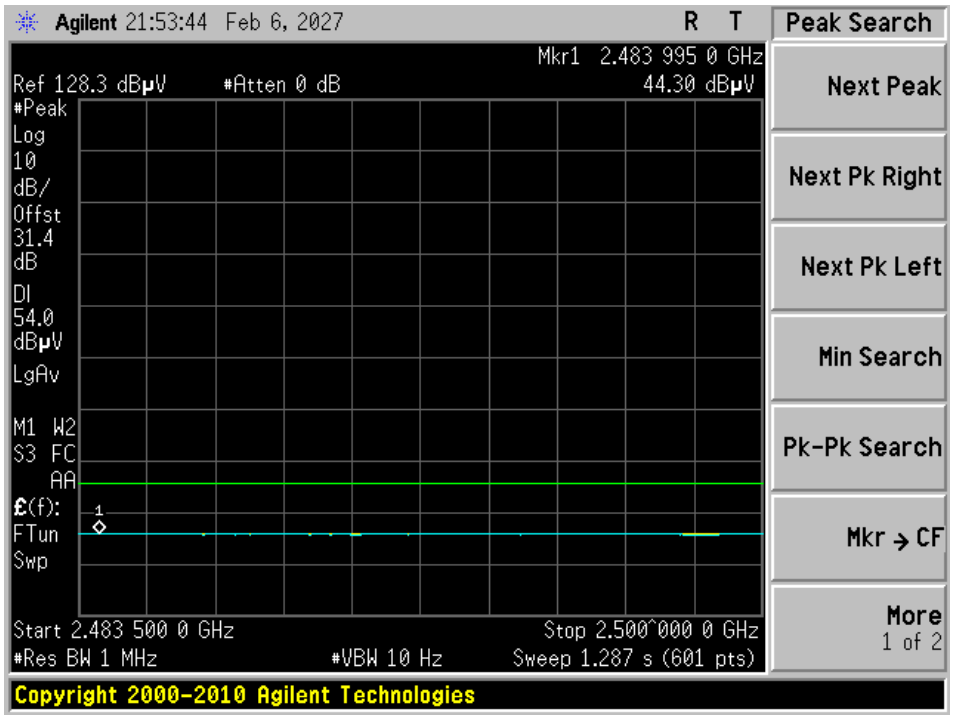
Low Channel-Average(Vertical)



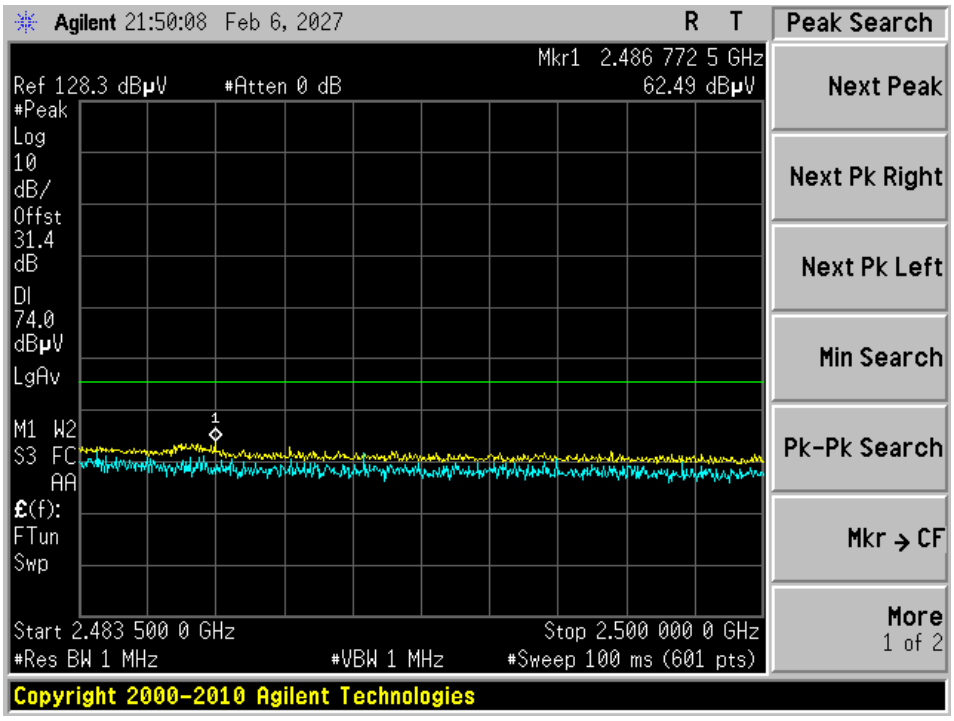
High Channel-Peak (Horizontal)



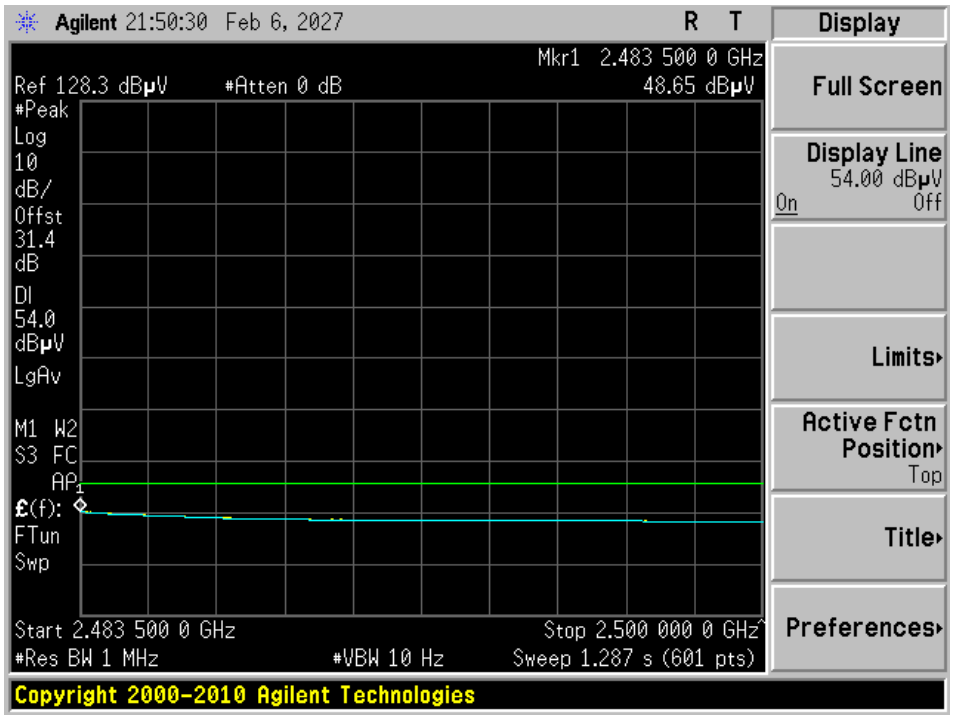
High Channel-Average (Horizontal)



High Channel-Peak (Vertical)

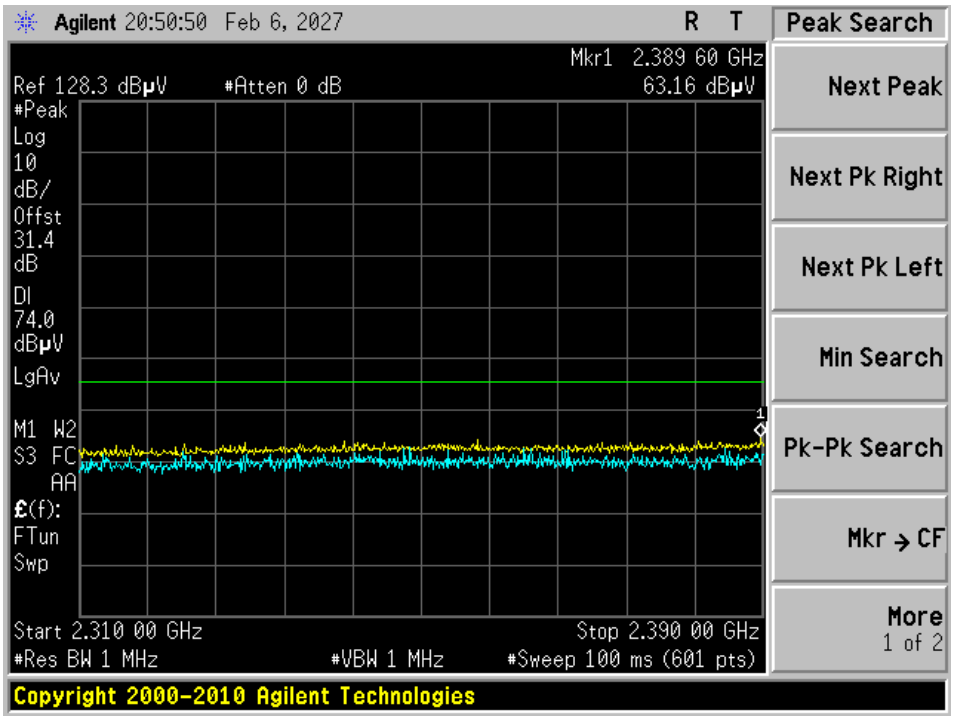


High Channel-Average (Vertical)

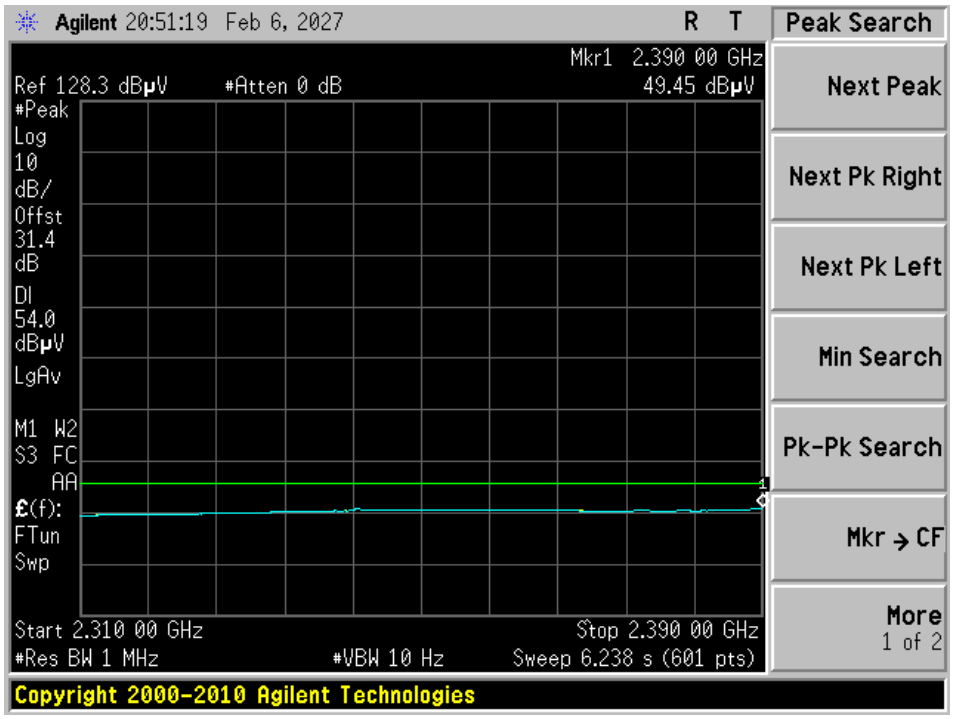


Host: SPS985, Antenna Model: 1513151-1

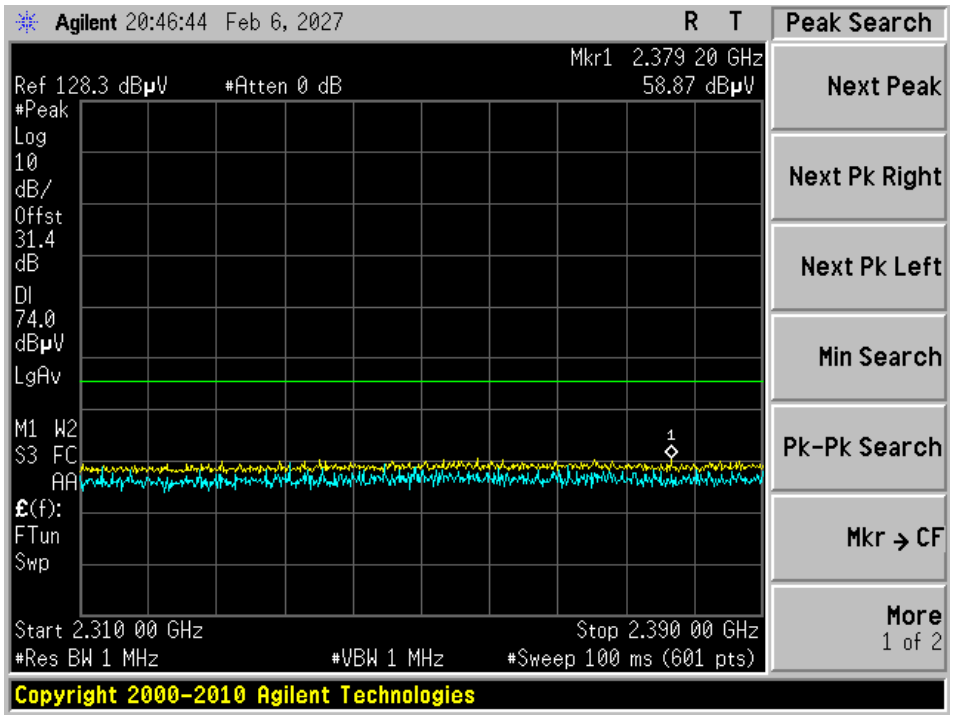
Low Channel-Peak (Horizontal)



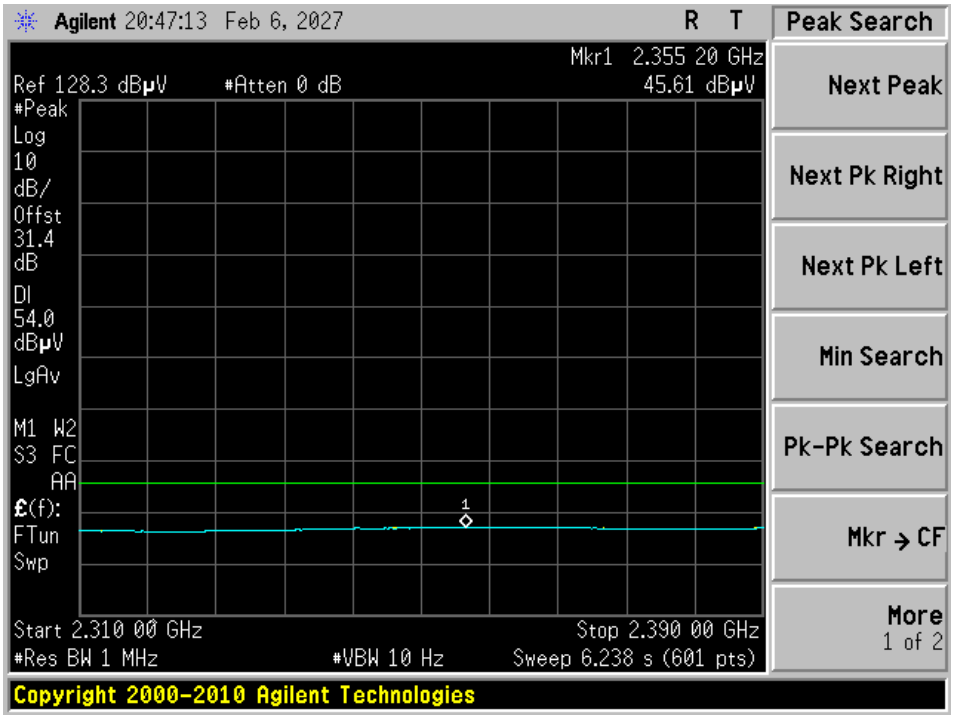
Low Channel-Average (Horizontal)



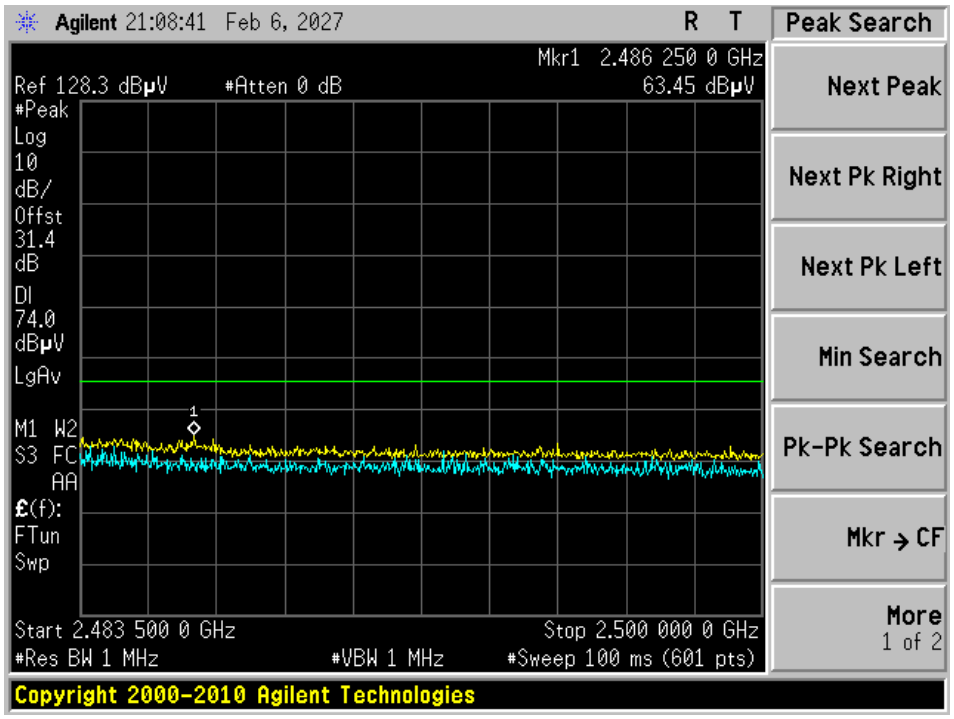
Low Channel-Peak (Vertical)



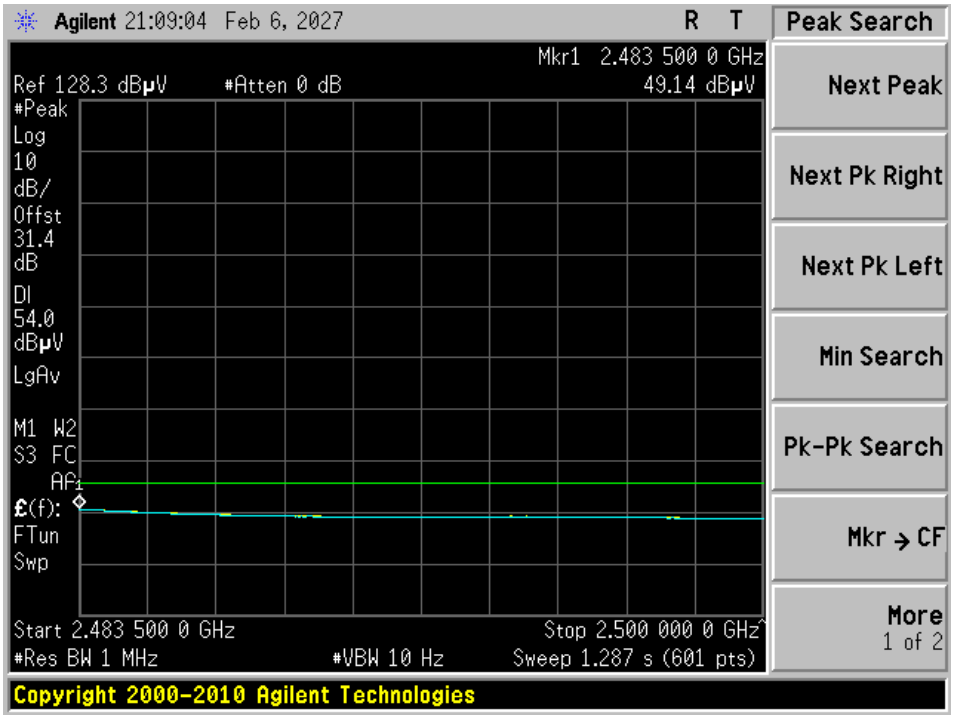
Low Channel-Average (Vertical)



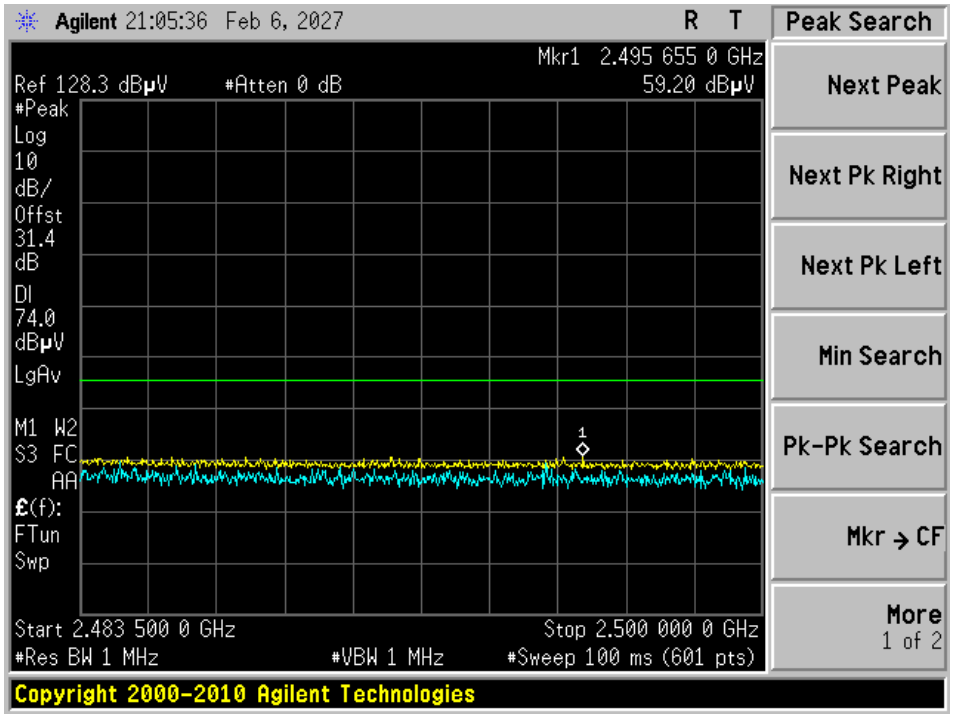
High Channel-Peak (Horizontal)



High Channel-Average (Horizontal)



High Channel-Peak (Vertical)



High Channel-Average (Vertical)

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

9.1 Applicable Standard

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

9.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

9.4 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

The testing was performed by Ning Ma on 2012-03-15 at RF Test Site.

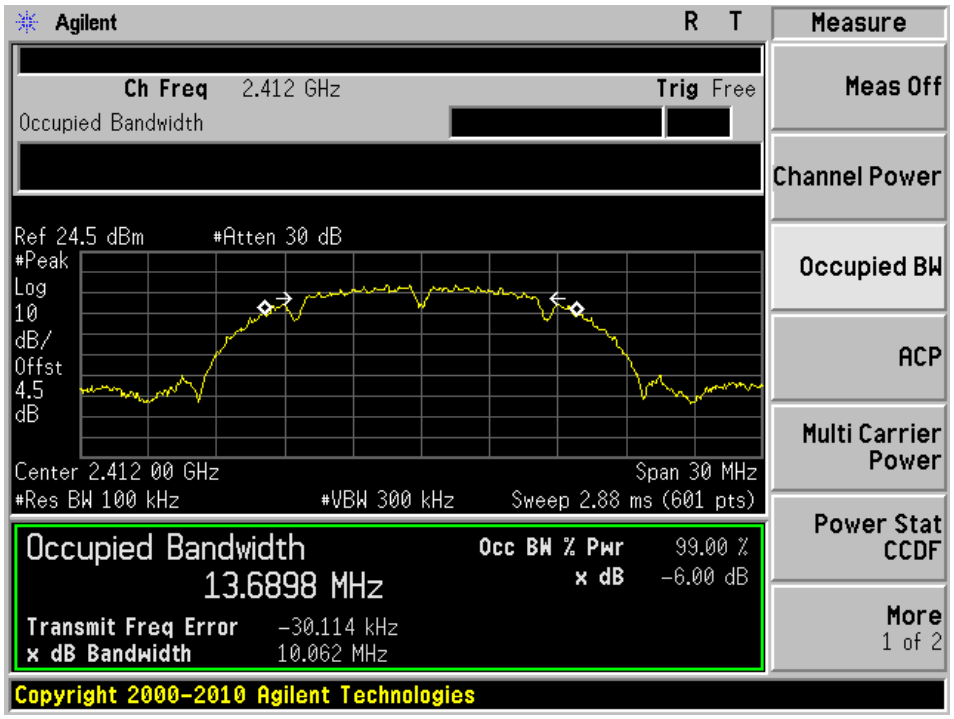
9.5 Test Results

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
802.11b mode					
Low	2412	13.6898	10.062	> 500	Compliant
Middle	2437	13.6776	10.04	> 500	Compliant
High	2462	13.7275	9.979	> 500	Compliant
802.11g mode					
Low	2412	16.4753	16.578	> 500	Compliant
Middle	2437	16.4553	16.565	> 500	Compliant
High	2462	16.4614	16.590	> 500	Compliant

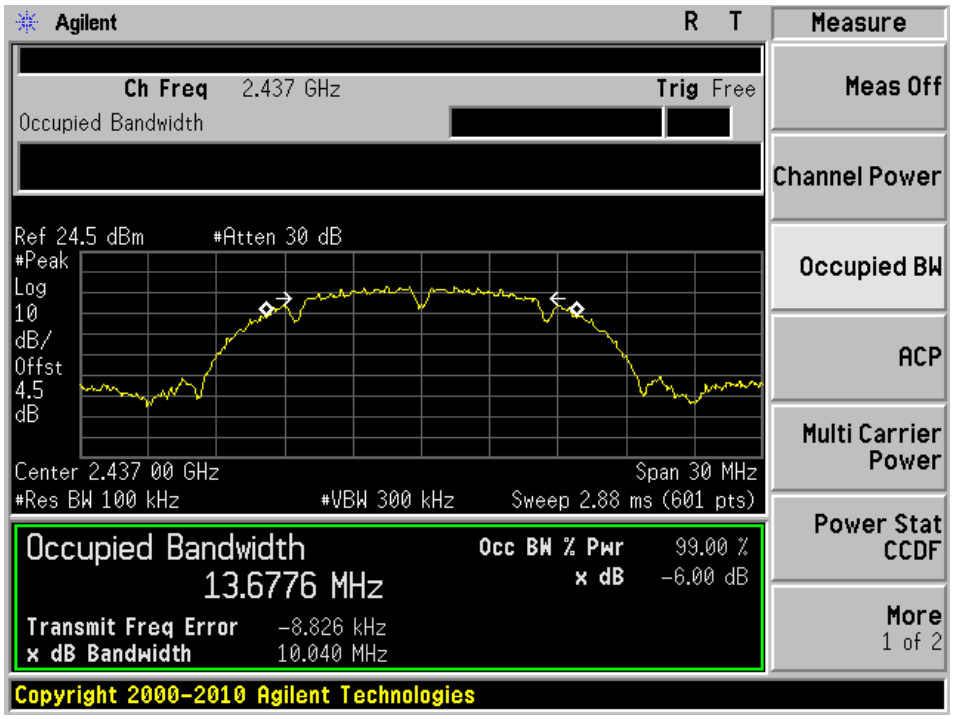
Please refer to the following plots for detailed test results

2.4 GHz 802.11b Mode

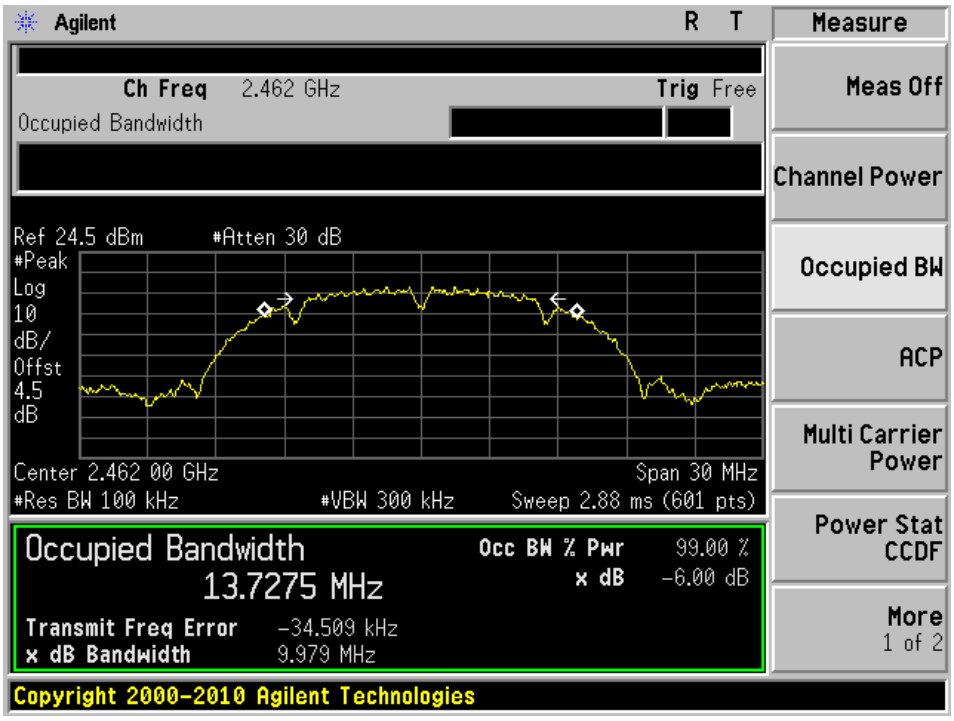
Low channel



Middle channel

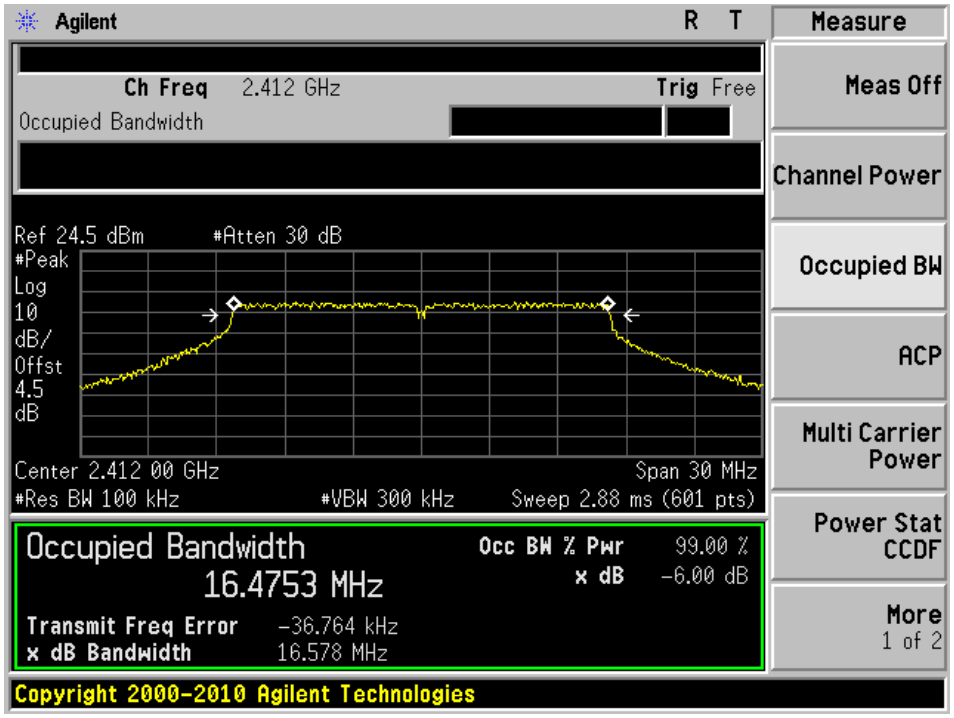


High channel

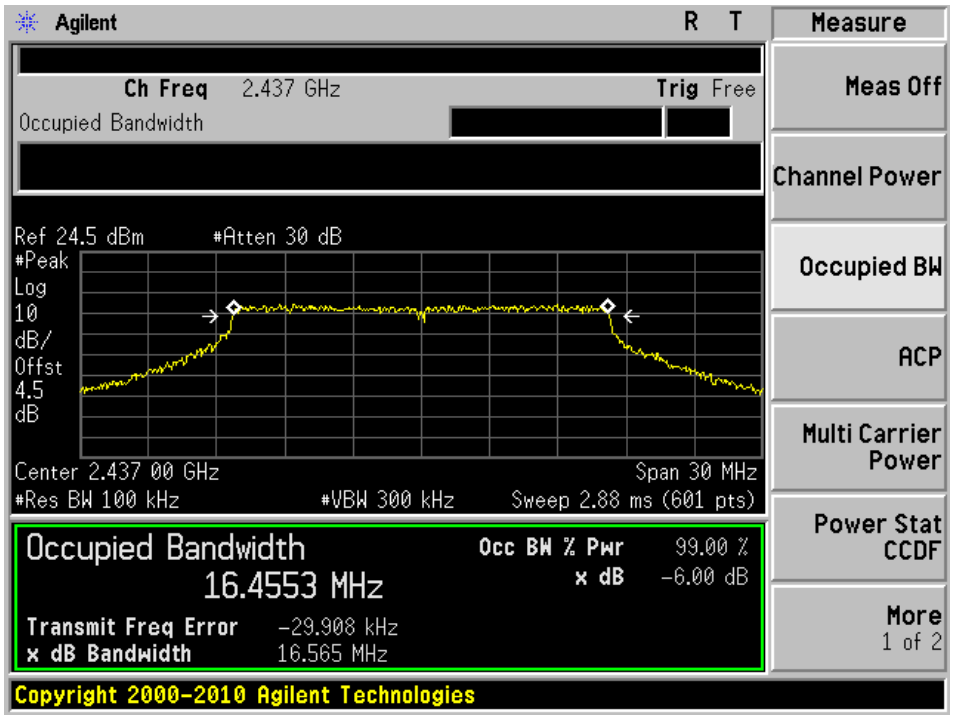


2.4 GHz 802.11g Mode

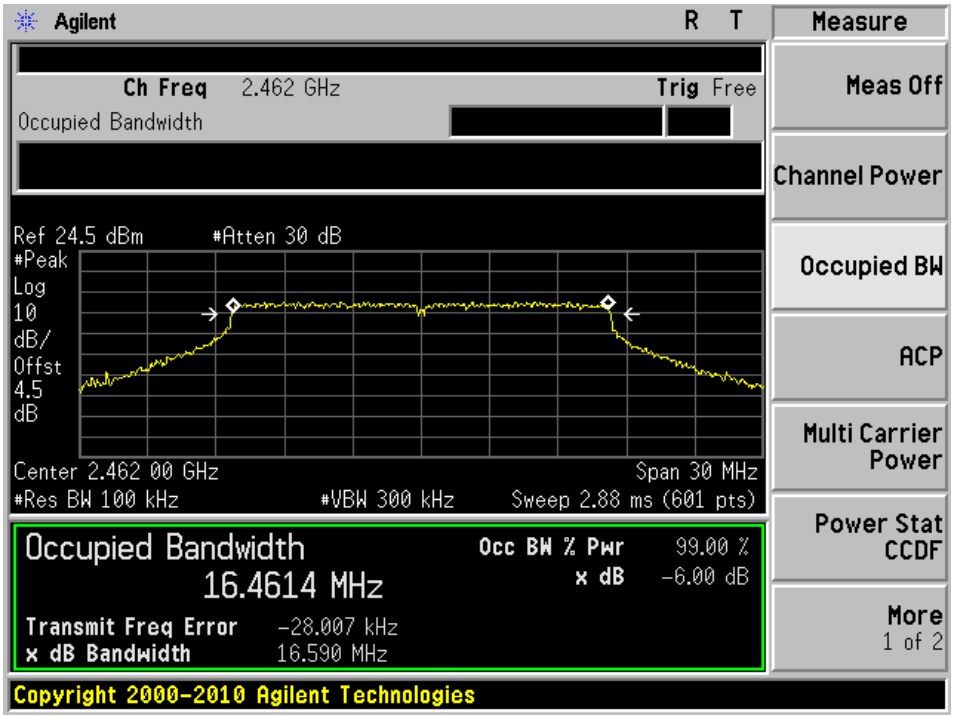
Low channel



Middle channel



High channel



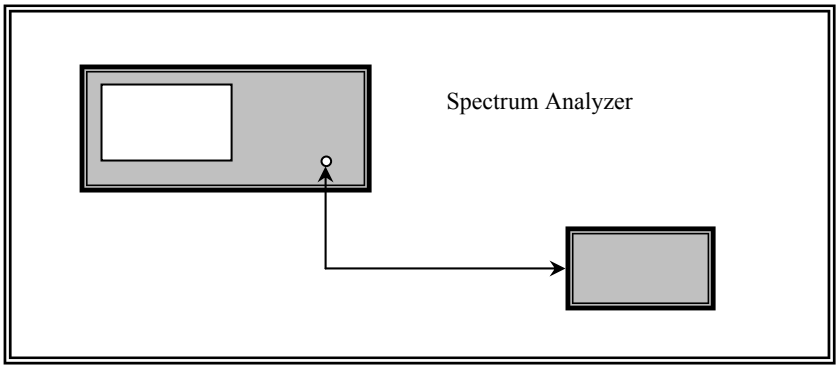
10 FCC §15.247(b) & IC RSS-210 §A8.4 - Peak Output Power Measurement

10.1 Applicable Standard

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

10.2 Measurement Procedure

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



10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

10.4 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

The testing was performed by Ning Ma on 2012-03-18 at RF Test Site.

10.5 Test Results

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dBm)
802.11 b	Low	2412	18.71	30	-11.29
	Middle	2437	18.00	30	-12
	High	2462	17.96	30	-12.04
802.11 g	Low	2412	13.89	30	-16.11
	Middle	2437	13.29	30	-16.71
	High	2462	14.10	30	-15.90

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

11.1 Applicable Standard

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

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

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

11.4 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

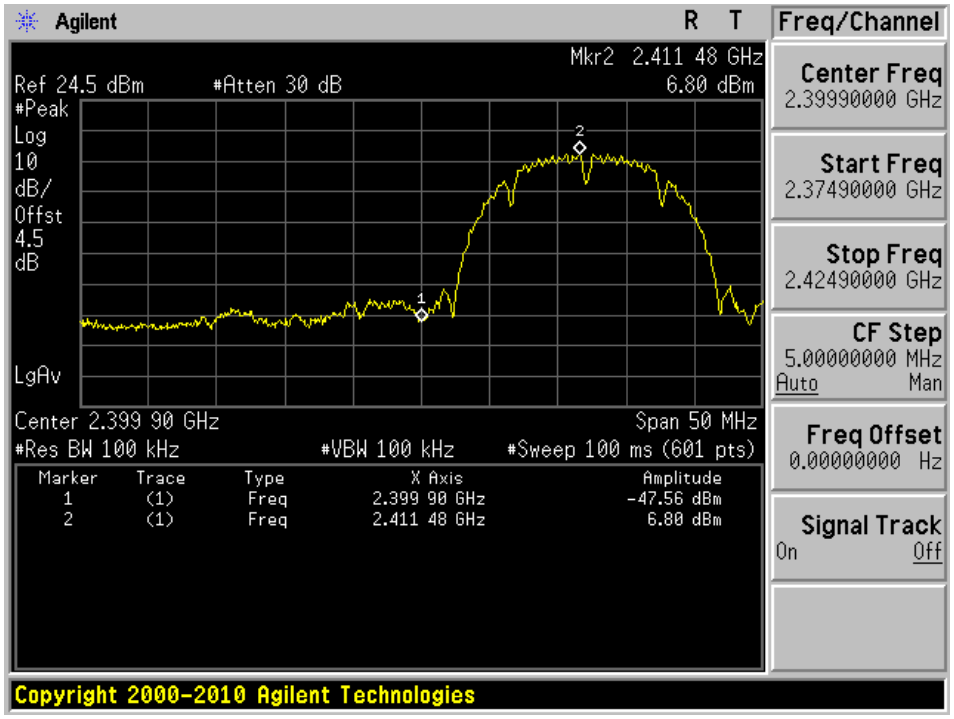
The testing was performed by Ning Ma on 2012-03-18 at RF Test Site.

11.5 Test Results

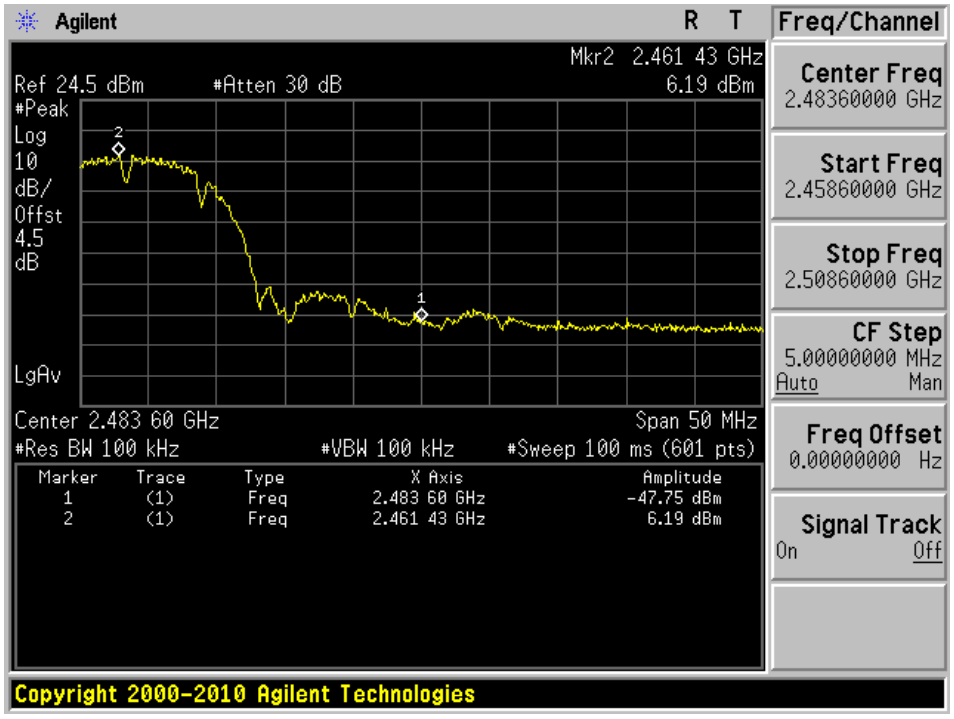
Please refer to following pages for plots of band edge.

2.4 GHz 802.11b mode

Low Band Edge

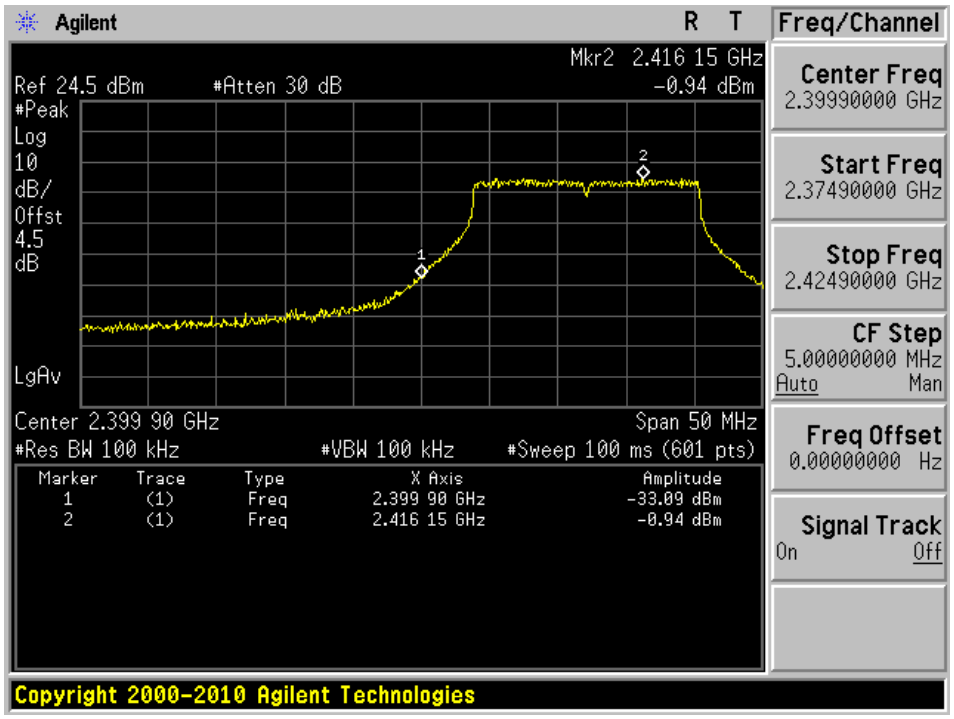


High Band Edge

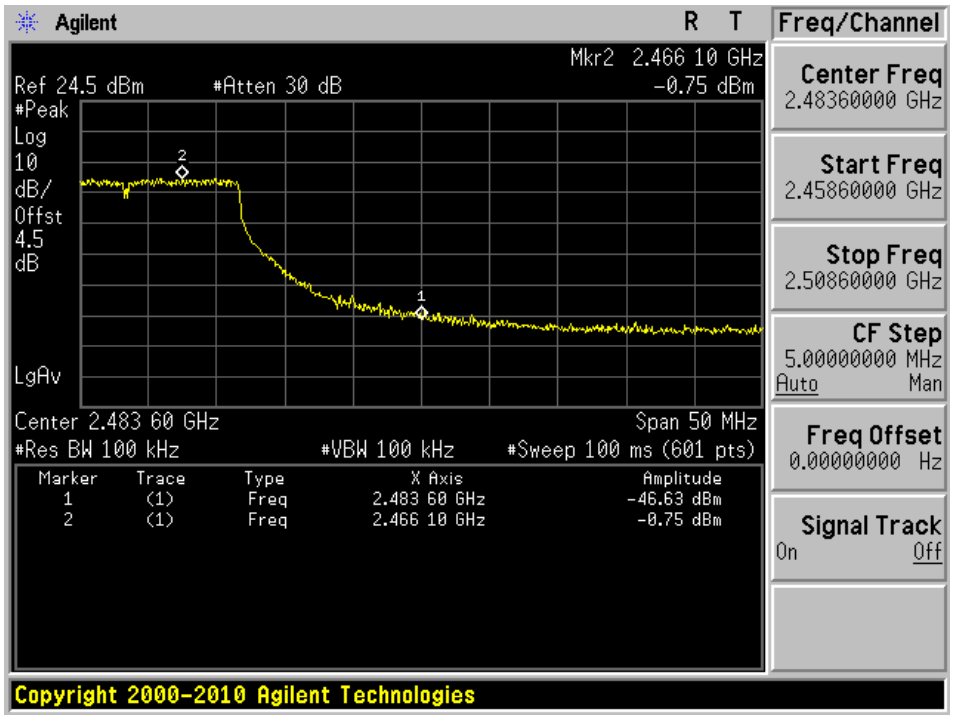


2.4 GHz 802.11g Mode

Low Band Edge



High Band Edge



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

12.1 Applicable Standard

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

12.2 Measurement Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

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

12.4 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

The testing was performed Ning Ma on 2012-03-18 at RF Test Site.

12.5 Test Results

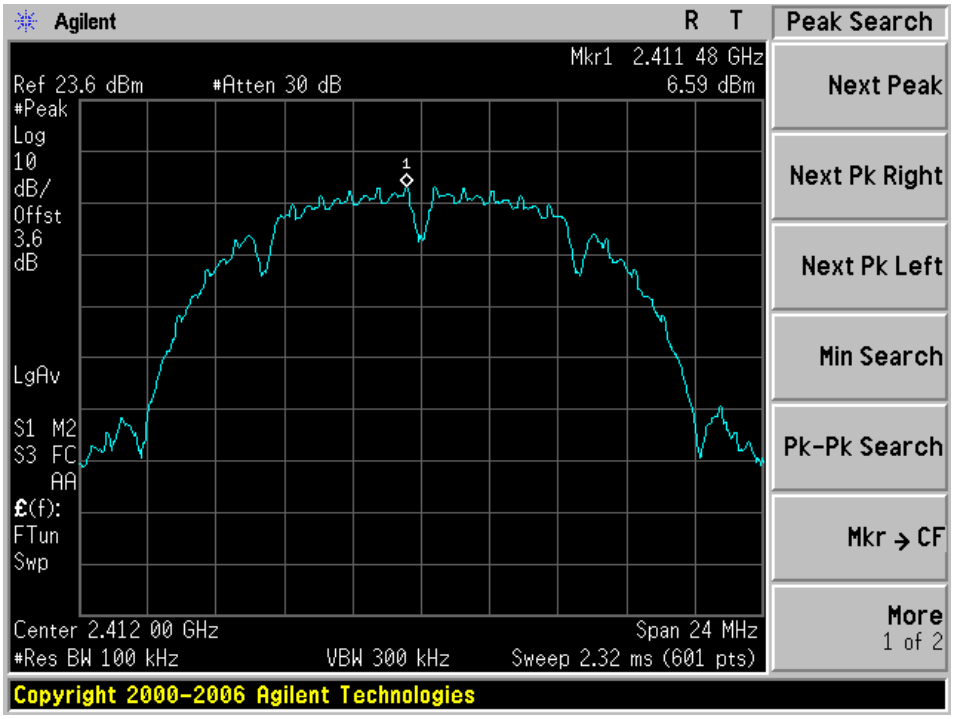
Mode	Channel	Frequency (MHz)	Measured Power Spectral Density (dBm)	Corrected PSD (dBm)	Limit (dBm)	Results
802.11 b	Low	2412	6.59	-8.61	8	Compliant
	Middle	2437	1.99	-13.21	8	Compliant
	High	2462	2.54	-12.66	8	Compliant
802.11 g	Low	2412	-2.76	-17.96	8	Compliant
	Middle	2437	-3.81	-19.01	8	Compliant
	High	2462	-4.03	-19.23	8	Compliant

*BWCF (Bandwidth Correction Factor) =10*log (3 kHz/100kHz) =-15.2 dB*

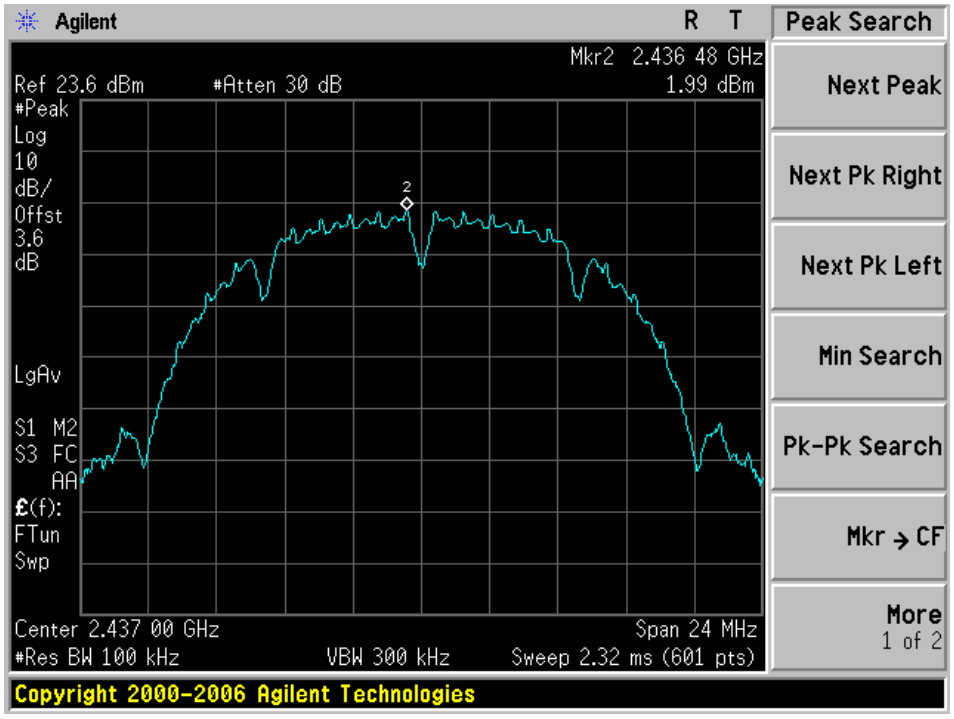
Please refer to the following plots for detailed test results:

2.4 GHz 802.11b Mode

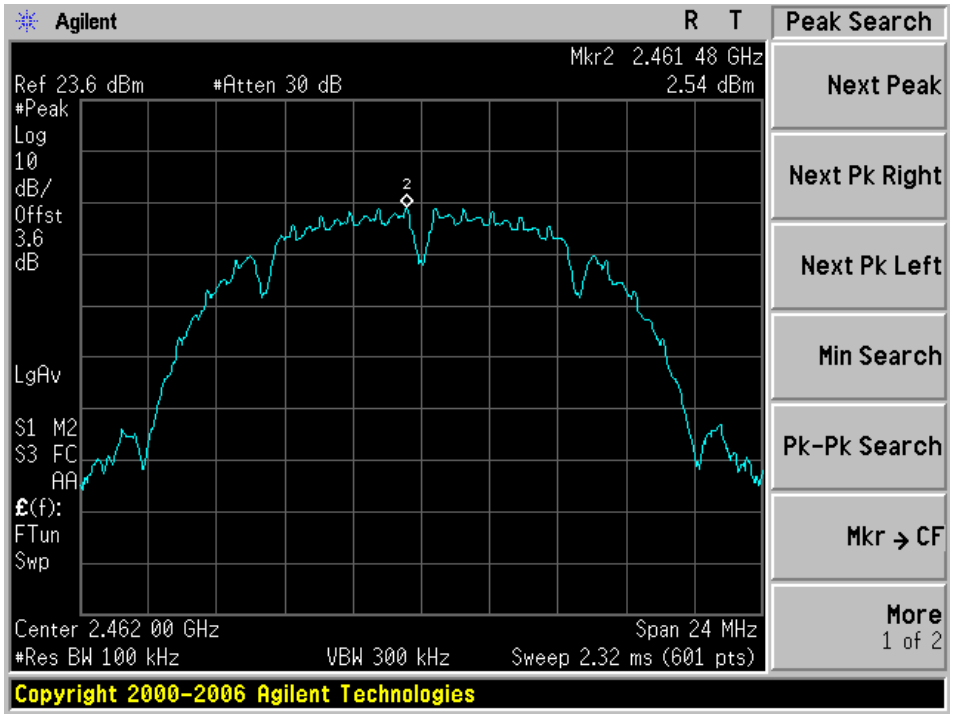
Low channel



Middle channel

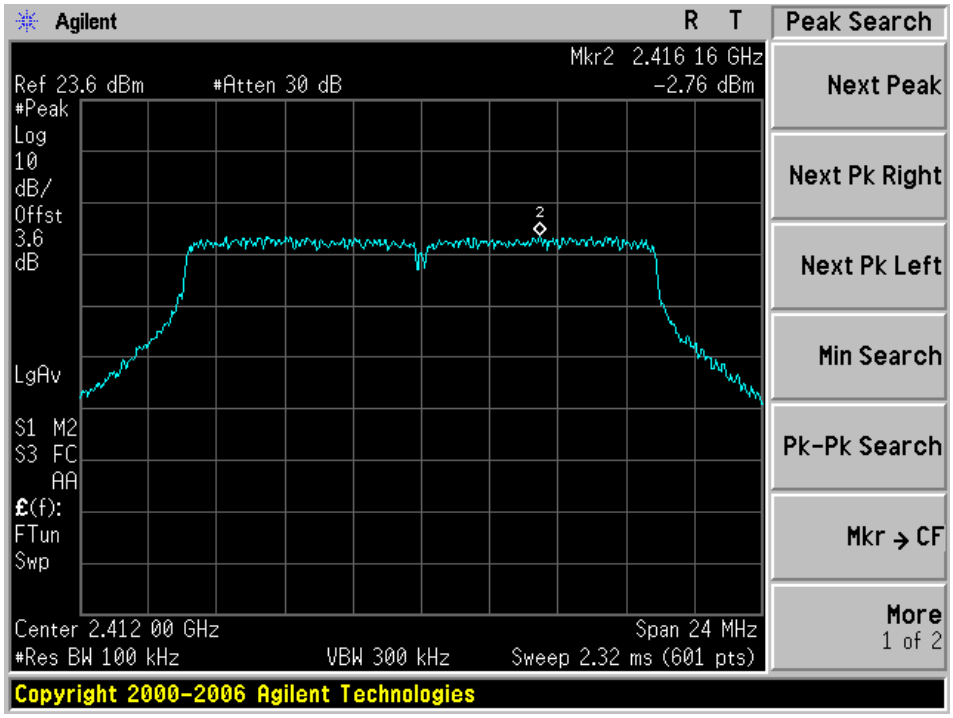


High channel

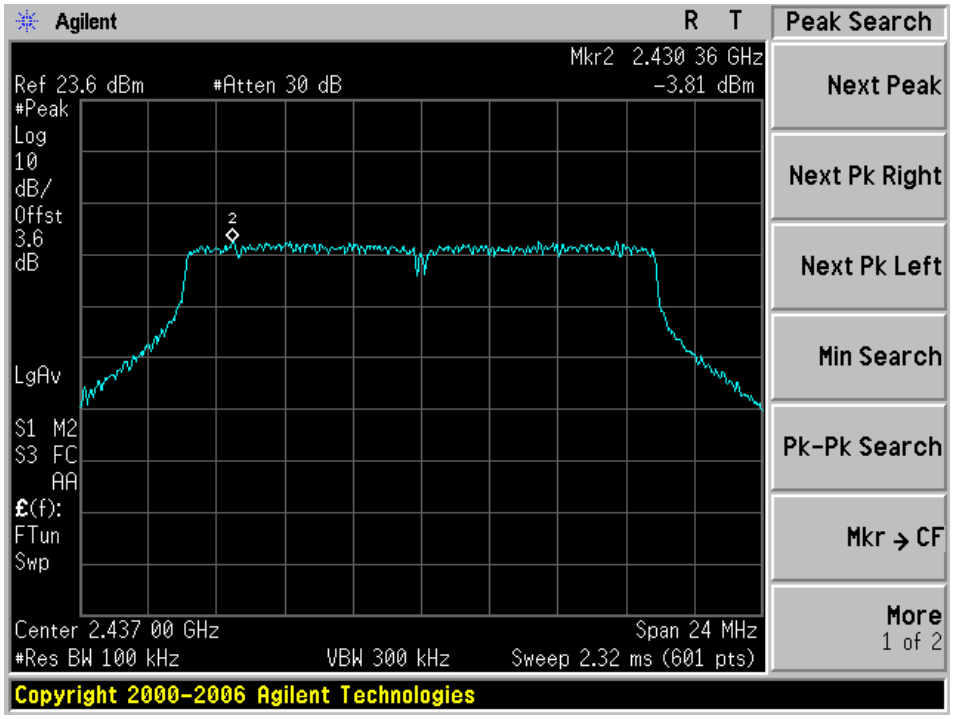


2.4 GHz 802.11g Mode

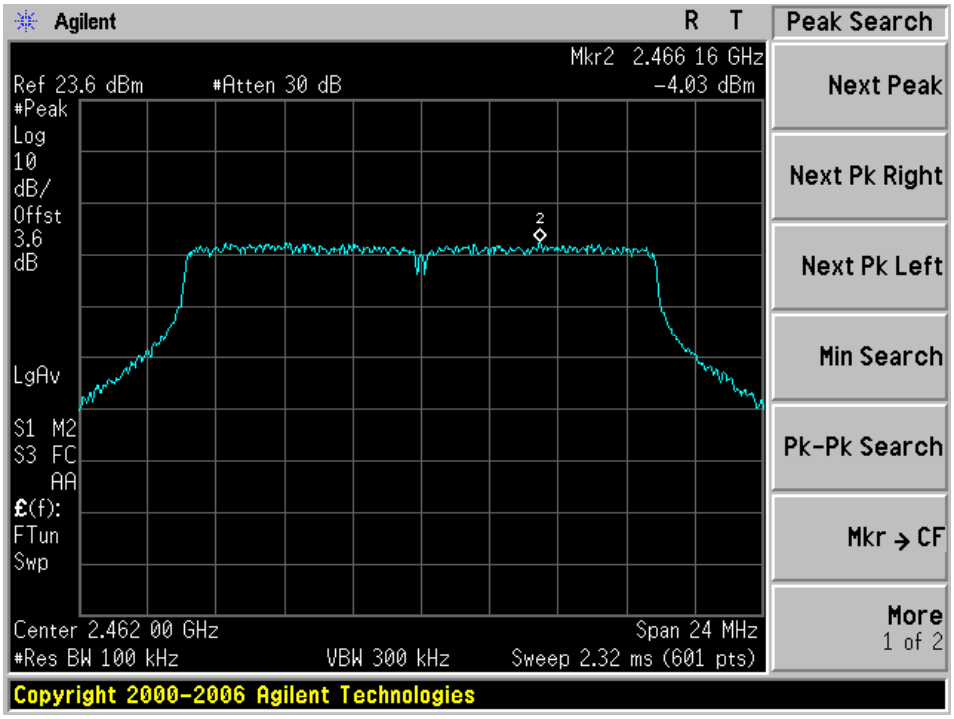
Low channel



Middle channel



High channel



13 IC RSS-210 §2.6 & RSS-Gen §4.10 - Receiver Spurious Radiated Emissions

13.1 Applicable Standard

According to IC RSS-Gen §6, receiver spurious emission shall not exceed the radiated limits shown in the table below:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

13.2 EUT Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2003.

13.3 Test Procedure

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

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

13.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

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

Margin = Corrected Amplitude - Limit

13.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2011-09-14
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
EMCO	Horn antenna	3115	9511-4627	2011-10-03
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-09
Mini-Circuits	Pre-amplifier	ZVA-183-S	667400960	2011-05-08

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

13.6 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	35-45%
ATM Pressure:	101-102kPa

The testing was performed by Wei Sun on 2012-03-27 at 5 meters chamber 3.

13.7 Summary of Test Results

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

Worst Case: Host: R10, Antenna Model: SWLP.12

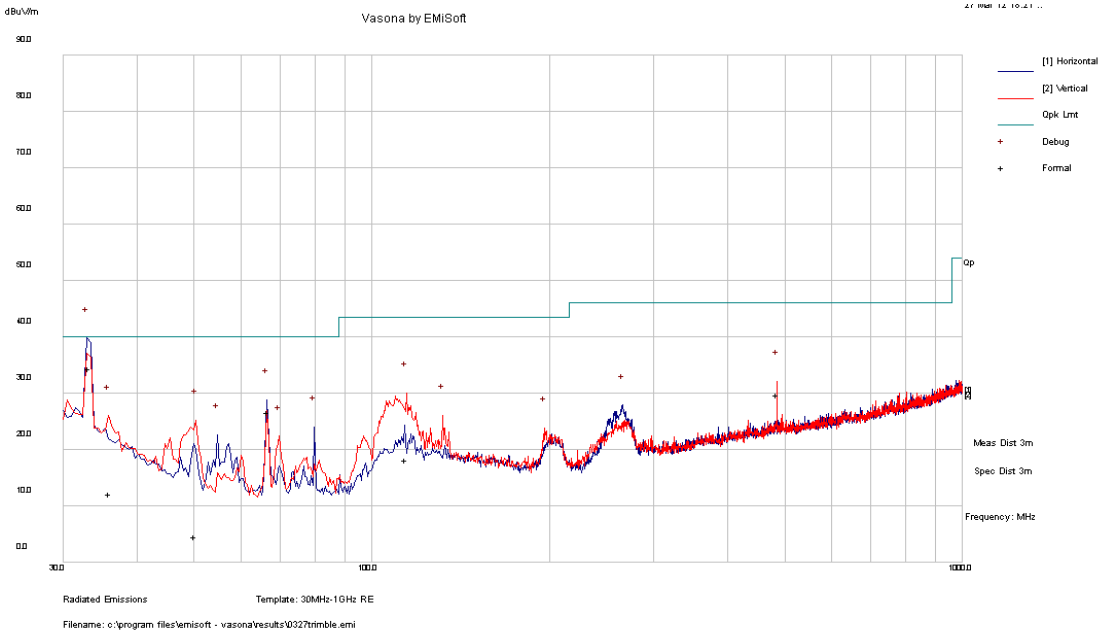
Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-8.32	375.0303	Horizontal	30 to 1000

Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-8.14	4173	Vertical	1000 to 8000

13.8 Test Results

Host: R10, Antenna Model: SWLP.12

1) 30 MHz -1 GHz, measured at 3 meters



Quasi-Peak Measurements

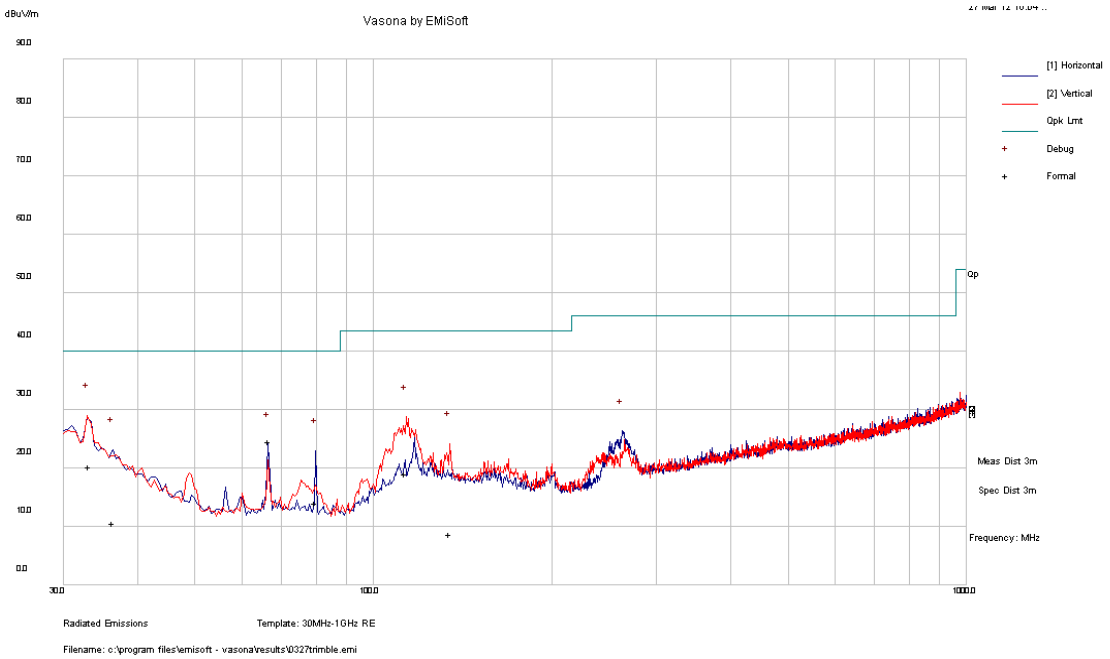
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
33.156	34.34	249	H	140	40	-5.66
66.622	26.62	186	H	192	40	-13.38
114.3308	18.22	246	V	190	43.5	-25.28
485.0008	29.67	112	V	23	46	-16.33
35.97075	12.22	205	V	132	40	-27.78
50.25175	4.55	228	V	287	40	-35.45

2) Above 1 GHz, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC & IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
4173	40.26	150	114	V	31.67	4.19	27.89	48.23	74	-25.77	Peak
4169	39.33	219	100	H	31.67	4.19	27.89	47.3	74	-26.7	Peak
4173	37.89	150	114	V	31.67	4.19	27.89	45.86	54	-8.14	Avg
4169	36.27	219	100	H	31.67	4.19	27.89	44.24	54	-9.76	Avg
4173	40.26	150	114	V	31.67	4.19	27.89	48.23	74	-25.77	Peak
4169	39.33	219	100	H	31.67	4.19	27.89	47.3	74	-26.7	Peak

Host: SPS985, Antenna Model: MAF94432

1) 30 MHz – 1 GHz, measured at 3 meters



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
33.159	20.24	242	V	110	40	-19.76
113.2143	19.08	217	V	127	43.5	-24.42
66.6145	24.59	110	H	83	40	-15.41
36.37125	10.65	170	H	185	40	-29.35
79.98975	13.99	98	H	357	40	-26.01
134.516	8.71	143	V	341	43.5	-34.79

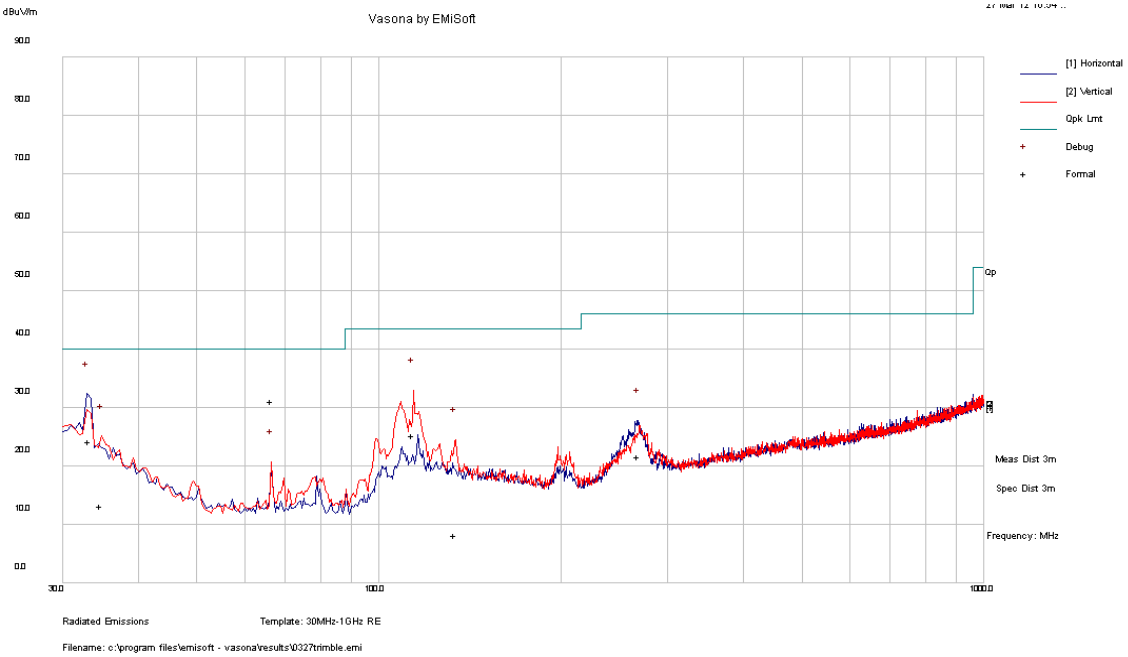
2) Above 1 GHz, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC & IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level

Host: SPS985, Antenna Model: 1513151-1

1) 30 MHz – 1 GHz, measured at 3 meters



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
33.15875	24.18	205	H	168	40	-15.82
113.79	25.34	108	V	191	43.5	-18.16
34.745	13.17	222	V	321	40	-26.83
268.233	21.7	108	H	296	46	-24.3
133.6623	8.19	272	V	229	43.5	-35.31
66.38475	31.04	98	V	182	40	-8.96

2) Above 1 GH, measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC & IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions are 20 dB below the limit and/or under the noise floor level