

FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

**LG-Nortel Co. Ltd.**

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Kyongki-do, Korea 431-749

**FCC ID: TUILVP2890**

**Model: LVP-2890**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Product name:</b> Video Phone with 802.11b/g WLAN
<b>Test Engineer:</b> Tom Chen <i>Tom Chen</i>	
<b>Report No.:</b> R06060134	
<b>Report Date:</b> 2006-07-14	
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## **GENERAL INFORMATION**

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### **Product Description for Equipment Under Test (EUT)**

The *LG-Nortel Co. Ltd.*'s product, Model: *LVP-2890* or the "EUT" as referred to in this report is a hybrid PSTN and IP base phone with 802.11b/g Wireless LAN that permits audio and video calls and access to special services available from your communications provider.

### **Mechanical Description**

The *LG-Nortel Co. Ltd.*'s product, *FCC ID: TUILVP2890*, or the "EUT" as referred to this report is a *Video Phone* which measures approximately *50.0mmL x 190.0 mmW x 206.0 mmH*.

The antenna for this device is an integral antenna with gain of 0.99 dBi

*\* The test data gathered are from production sample, serial number: N/A provided by the manufacturer.*

### **EUT Photo**



*Additional photos in Exhibit C*

### **Objective**

This type approval report is prepared on behalf of LG-Nortel Co. Ltd. in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

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

### **Related Submittal(s)/Grant(s)**

No Related Submittals.

## **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.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## **Test Facility**

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

Test site at BACL 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 has 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 facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference have the reports on file and are listed under FCC file 31040/SIT 1300F2, IC registration number: 3062A, and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL 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/ts/htdocs/210/214/scopes/2001670.htm>

## **SYSTEM TEST CONFIGURATION**

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### **Justification**

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

### **EUT Exercise Software**

The EUT exercise program used for testing, and the following Channel setting was used during the testing:

802.11b	2412 MHZ	2437 MHz	2462 MHz
802.11g	2412 MHZ	2437 MHz	2462 MHz

### **Special Accessories**

N/A

### **Equipment Modifications**

No modifications were made to the EUT.

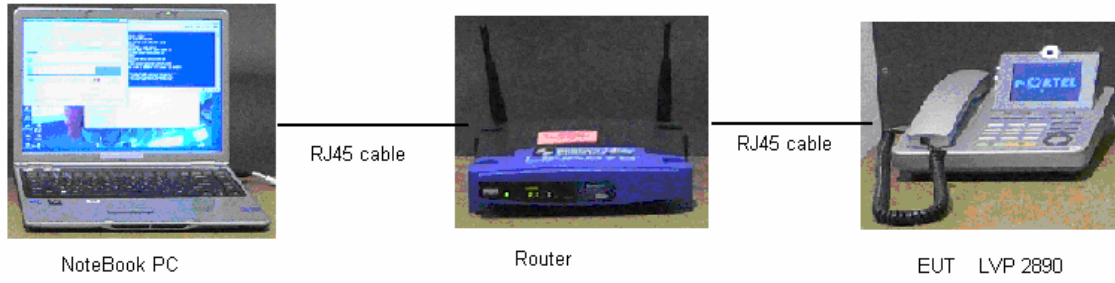
### **Power Supply and Line Filters**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>
Dream Electronic CO., LTD	AC-DC Adaptor	DEP-05150Y	DRU0605000001

### **Interface Ports and Cabling**

<b>Cable Description</b>	<b>Length (M)</b>	<b>From</b>	<b>To</b>
Power cable	1.8	Power supply	EUT
RJ-45 Cable	1.5	Router	EUT

## Test Setup Block Diagram



## **SUMMARY OF TEST RESULTS**

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Results reported relate only to the product tested.

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.247(e)(i) §2.1091	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207	Conducted emission	Compliant
§2.1051 & §15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205	Restricted Band	Compliant
§15.209 (a) & §15.247(c)	Radiated Emissions	Compliant
§15.247 (a)(2)	6 dB Bandwidth	Compliant
§15.247 (b)(3)	Maximum Peak Output Power	Compliant
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247 (d)	Power Spectral Density	Compliant



## **§15.247(e)(i), §2.1091 - RF EXPOSURE**

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According to §15.247(e)(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.

According to §1.1310 and §2.1091 RF exposure is calculated.

### Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
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 <sup>2</sup> )	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

### **MPE Prediction**

Prediction of MPE limit at a given distance

Equation from page 18 of 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

Maximum peak output power at antenna input terminal: 14.10(dBm)

Maximum peak output power at antenna input terminal: 25.70 (mW)

Prediction distance: 20 (cm)

Prediction frequency: 2400 (MHz)

Antenna Gain (typical): 0.99 (dBi)

antenna gain: 1.256 (numeric)

Power density at prediction frequency at 20 cm: 0.0064(mW/cm<sup>2</sup>)

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm<sup>2</sup>)

### **Test Result**

The EUT is a Home Plug wireless Adapter. The power density level at 20 cm is 0.0064 mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 1.0mW/cm<sup>2</sup> at 2400 MHz.

## **§15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to § 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.

And according to § 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.

The antenna for this device is an integral antenna with gain of 0.99 dBi.

## §15.207 - CONDUCTED EMISSIONS

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### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are receiver, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is  $\pm 2.4$  dB.

### EUT Setup

The measurement was performed in the shielded room, using the setup per ANSI C63.4 - 2003 measurement procedure. The specification used was FCC 15.207 limits.

The external I/O cables were draped along the test table and flushed as required.

The EUT was connected to 120VAC/60Hz power source.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2005-11-14
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2006-03-13
Agilent	AC Power source generator	6812B	US38390366	N/R

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

### Test Procedure

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

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

All data were 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".

## Test Data

According to following recorded data, the EUT complied with the FCC15.207 with the *worst* margin reading of:

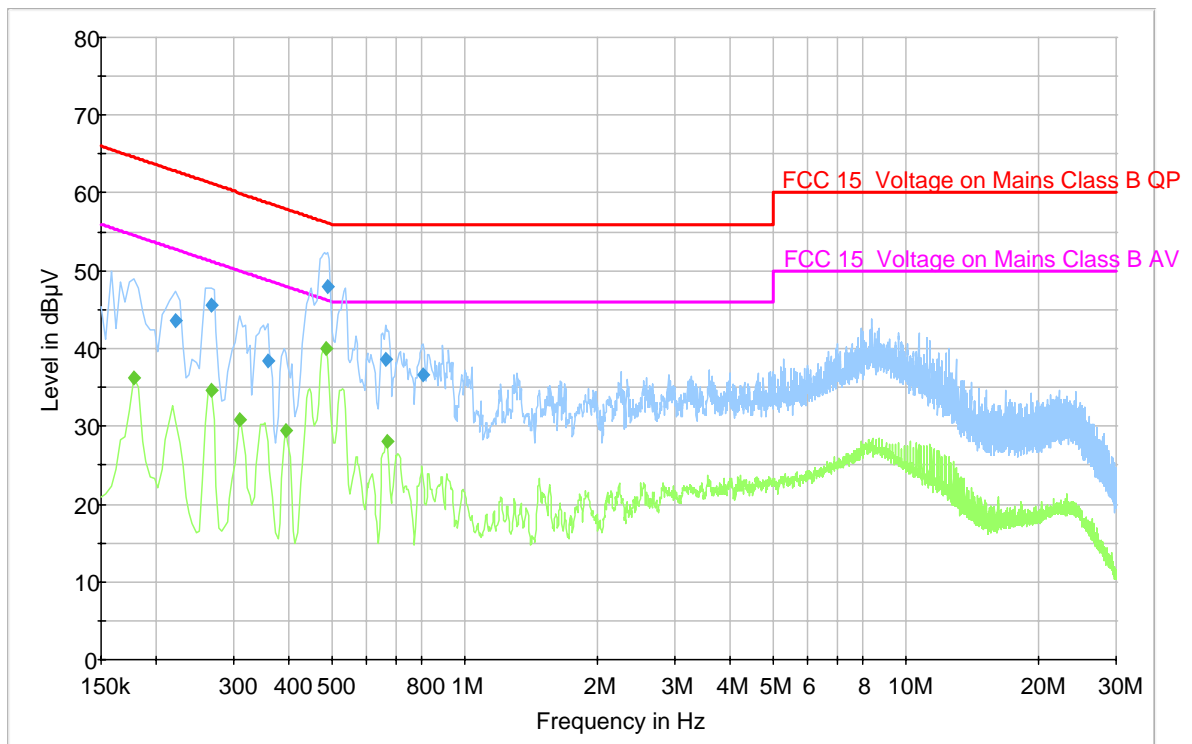
**-6.3 dB at 0.486000 MHz at Line mode**

## Environmental Conditions

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

*\*Testing was performed by Tom Chen on 2006-06-05.*

## 120V/60Hz, Line



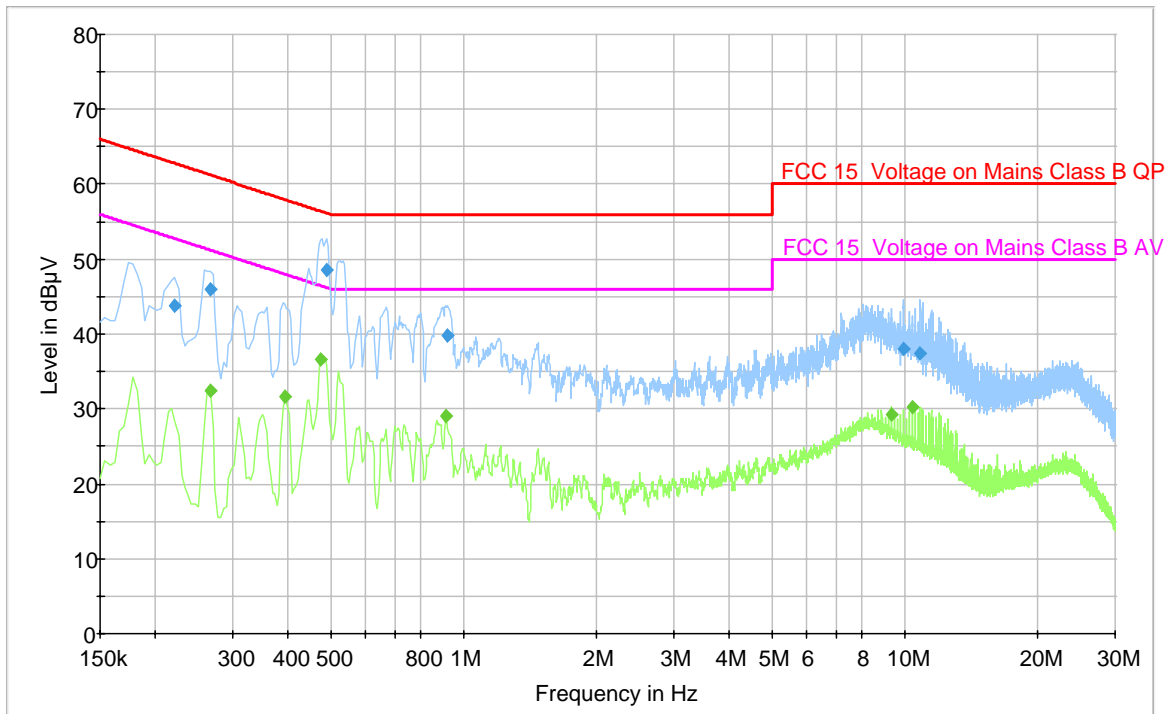
### QP Measurement

Frequency (MHz)	Quasi Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Margin (dB)	Limit (dBuV)
0.490000	47.9	1000.000	9.000	L1	8.3	56.2
0.266000	45.5	1000.000	9.000	L1	15.7	61.2
0.662000	38.7	1000.000	9.000	L1	17.3	56.0
0.222000	43.5	1000.000	9.000	L1	19.2	62.7
0.806000	36.6	1000.000	9.000	L1	19.4	56.0
0.358000	38.4	1000.000	9.000	L1	20.3	58.8

### Average Measurement

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Margin (dB)	Limit (dBuV)
0.486000	40.0	1000.000	9.000	L1	6.3	46.2
0.266000	34.6	1000.000	9.000	L1	16.7	51.2
0.670000	28.0	1000.000	9.000	L1	18.0	46.0
0.178000	36.3	1000.000	9.000	L1	18.3	54.6
0.394000	29.5	1000.000	9.000	L1	18.5	48.0
0.310000	30.8	1000.000	9.000	L1	19.2	50.0

### 120V/60Hz, Neutral



### QP Measurement

Frequency (MHz)	Quasi Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Margin (dB)	Limit (dBuV)
0.490000	48.5	1000.000	9.000	N	7.7	56.2
0.266000	45.9	1000.000	9.000	N	15.3	61.2
0.922000	39.9	1000.000	9.000	N	16.1	56.0
0.222000	43.8	1000.000	9.000	N	19.0	62.7
9.950000	38.1	1000.000	9.000	N	22.0	60.0
10.866000	37.5	1000.000	9.000	N	22.5	60.0

### Average Measurement

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Margin (dB)	Limit (dBuV)
0.474000	36.7	1000.000	9.000	N	9.8	46.4
0.394000	31.7	1000.000	9.000	N	16.2	48.0
0.910000	29.0	1000.000	9.000	N	17.0	46.0
0.266000	32.5	1000.000	9.000	N	18.7	51.2
10.410000	30.2	1000.000	9.000	N	19.8	50.0
9.334000	29.2	1000.000	9.000	N	20.8	50.0

## §2.1051 & §15.247(d) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

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### Applicable Standard

Requirements: CFR 47, § 2.1051.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

### 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 10<sup>th</sup> harmonic.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

### Environmental Conditions

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

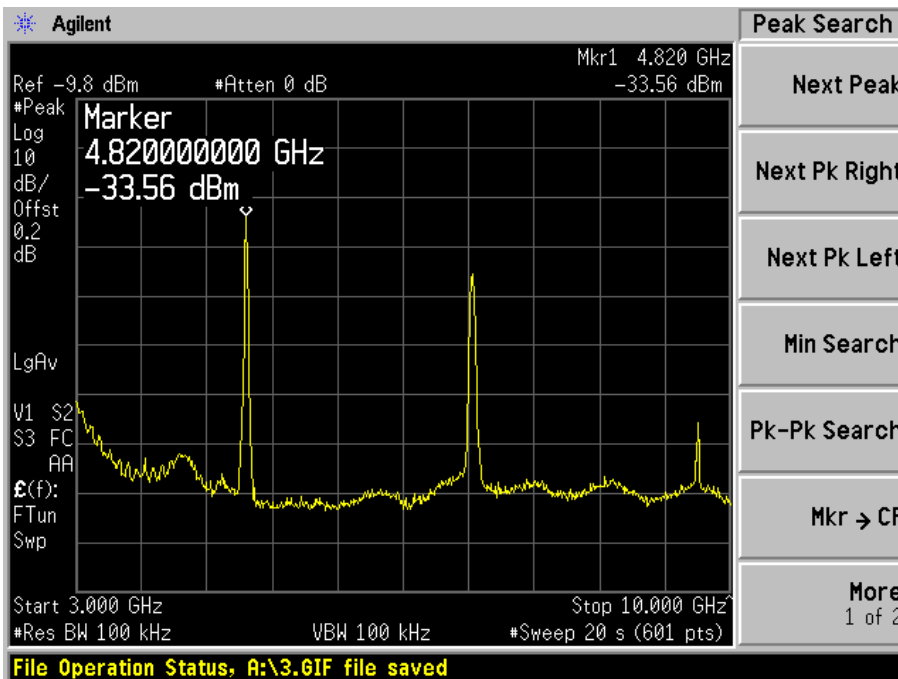
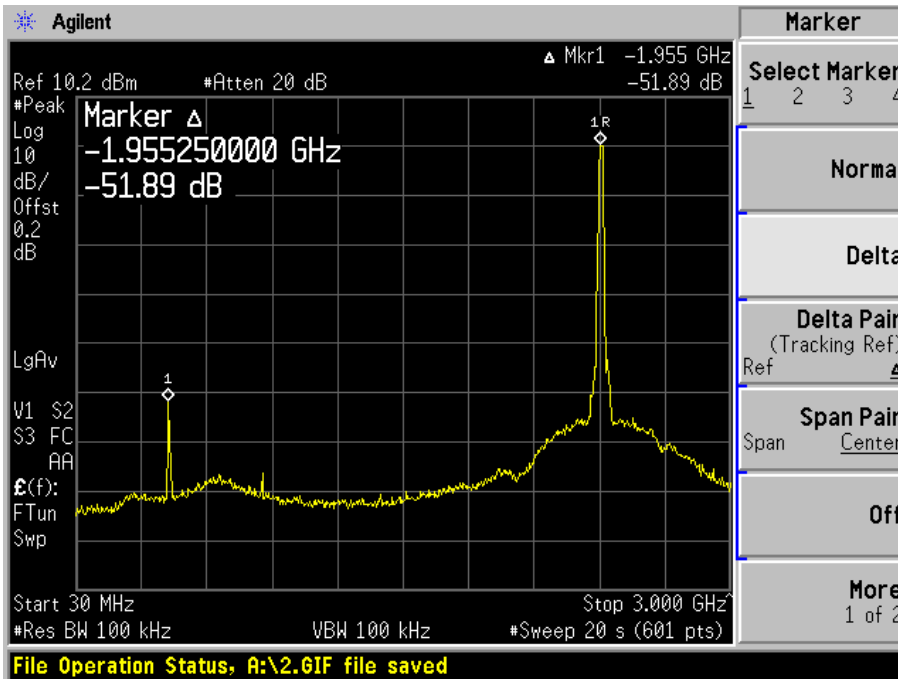
*\*The testing was performed by Tom Chen on 2006-06-05.*

### Measurement Result

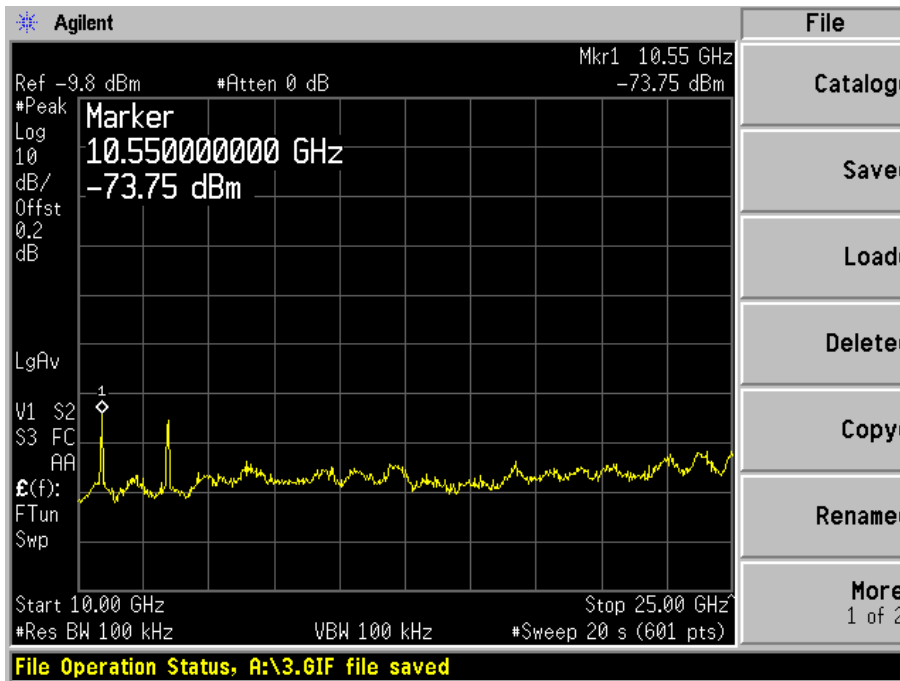
Please refer to following pages for plots of spurious emissions.

802.11b mode:

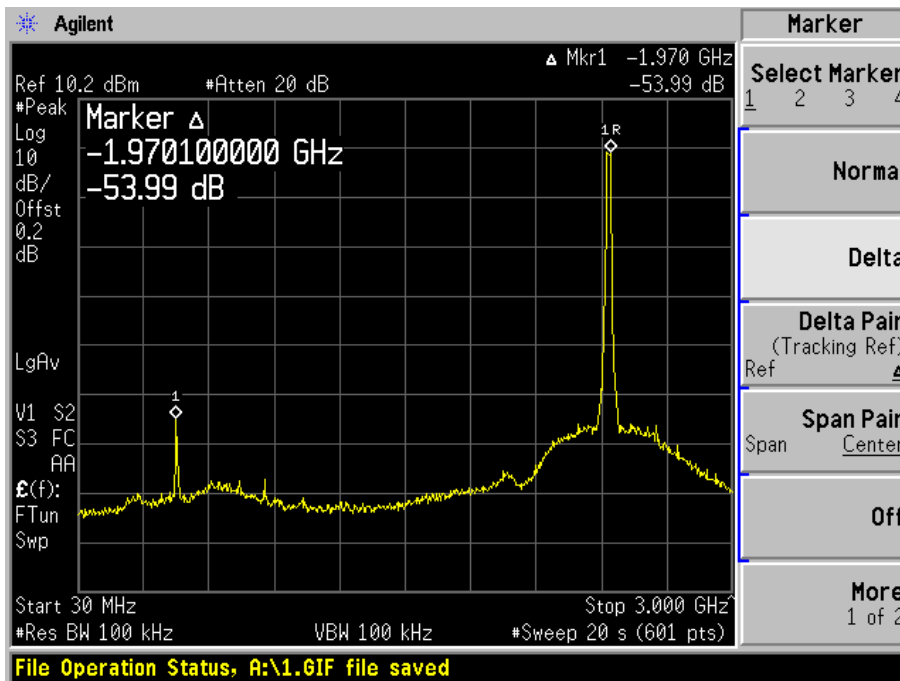
Low Channel

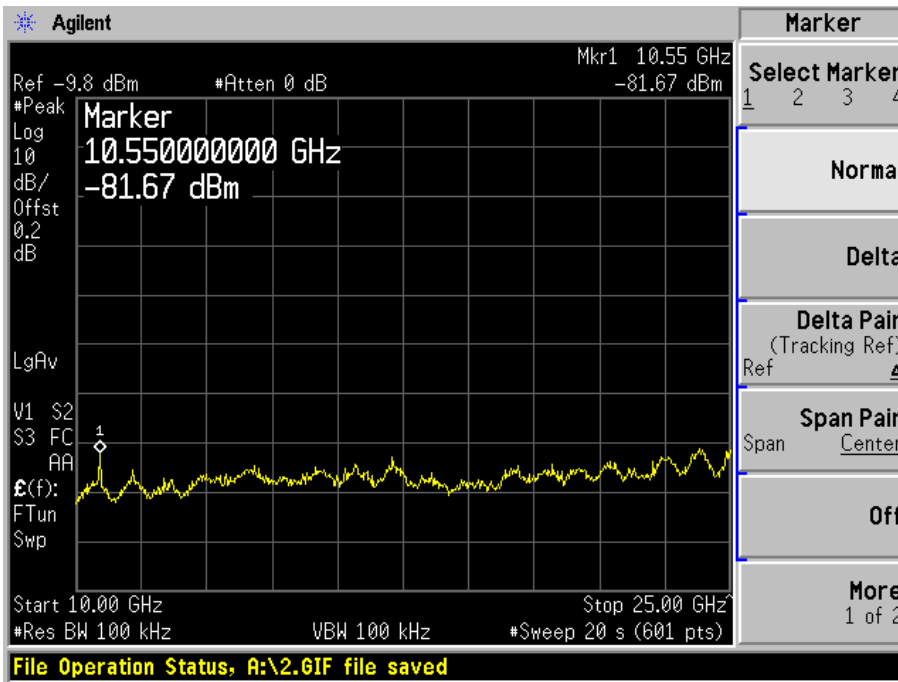
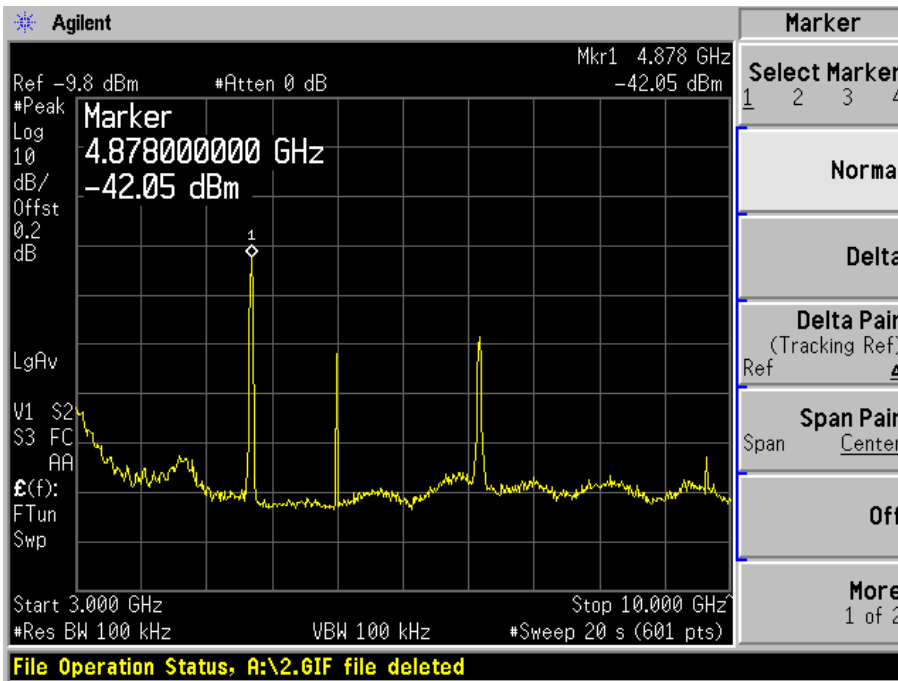




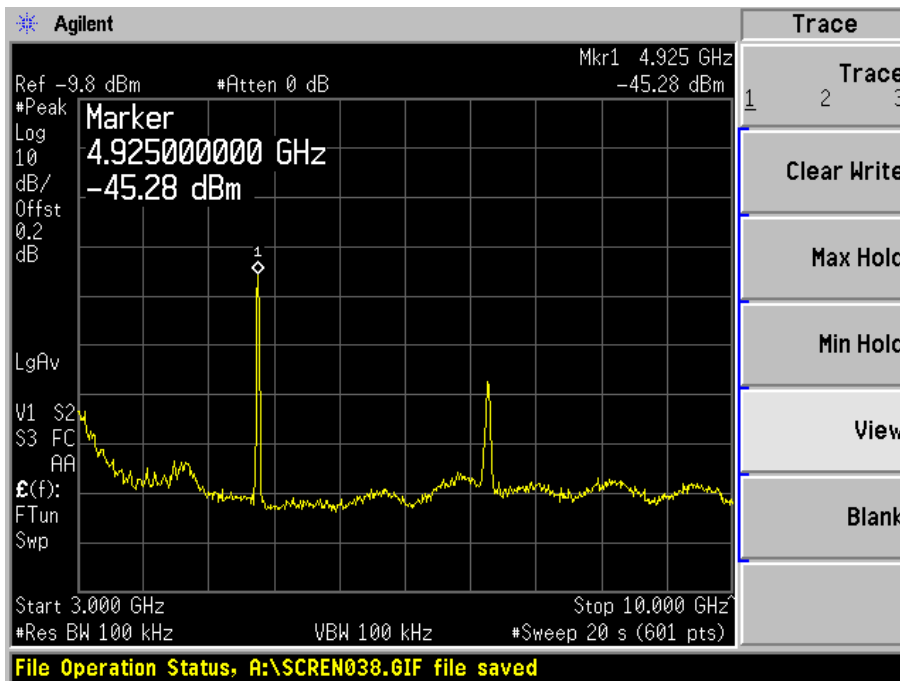
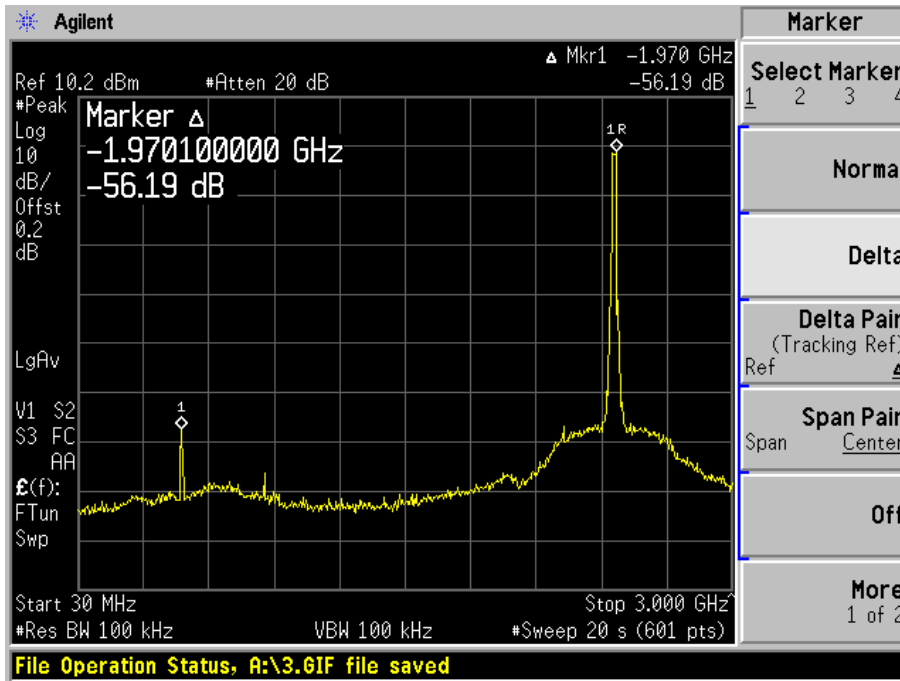


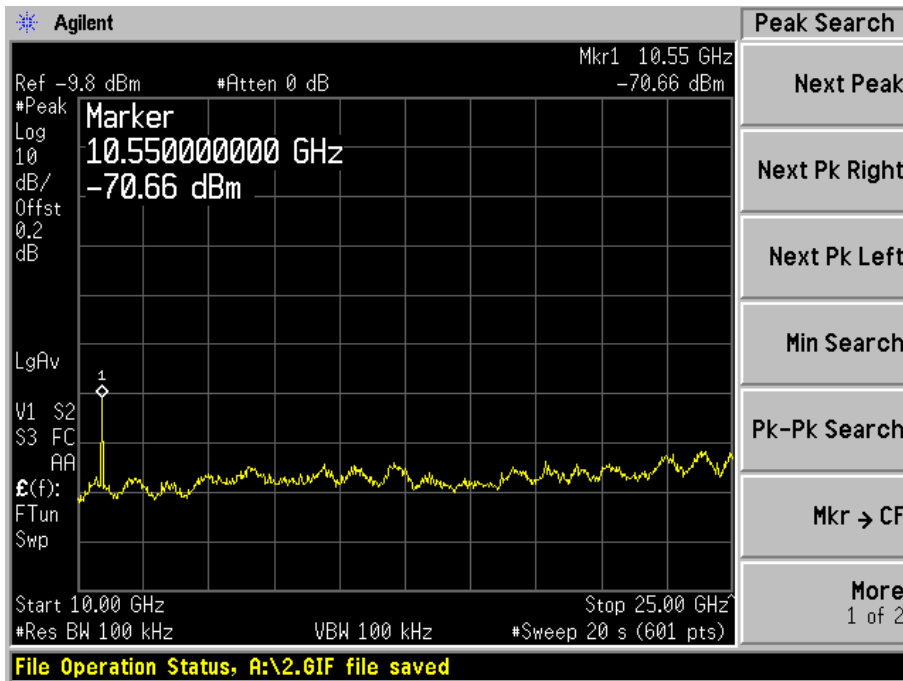
Mid Channel





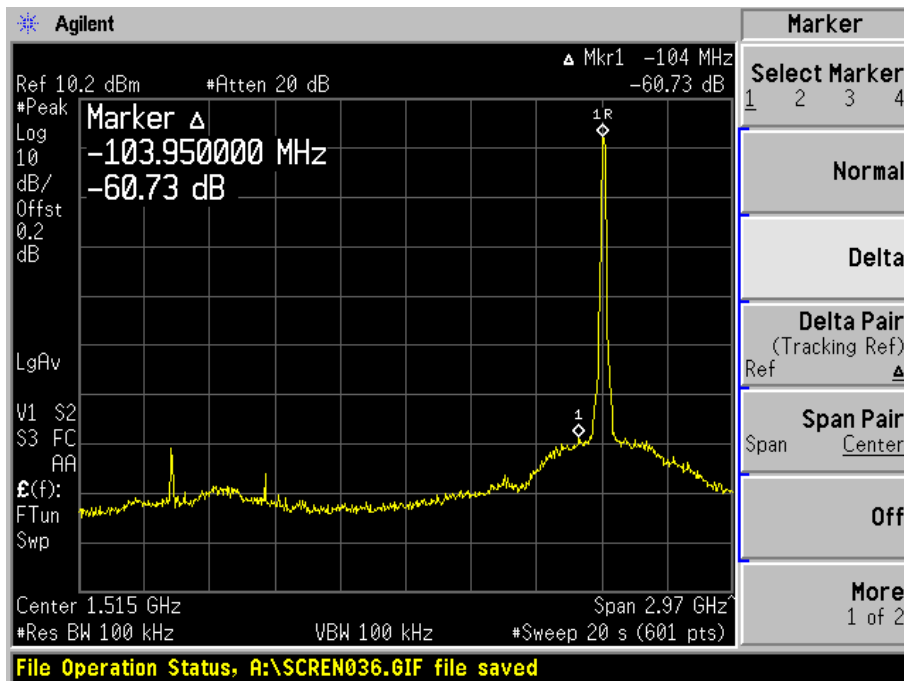
# High Channel

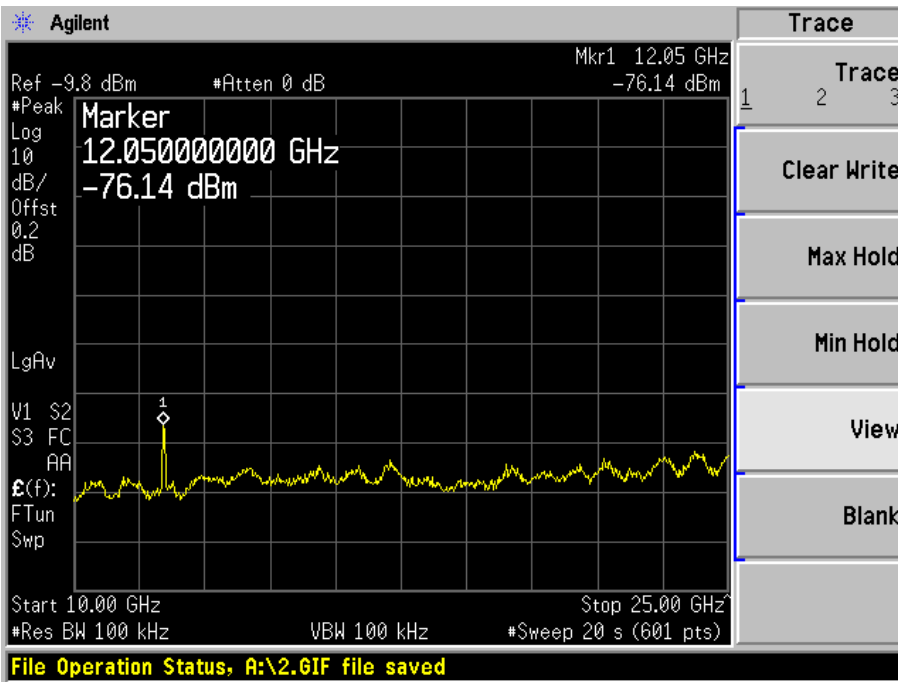
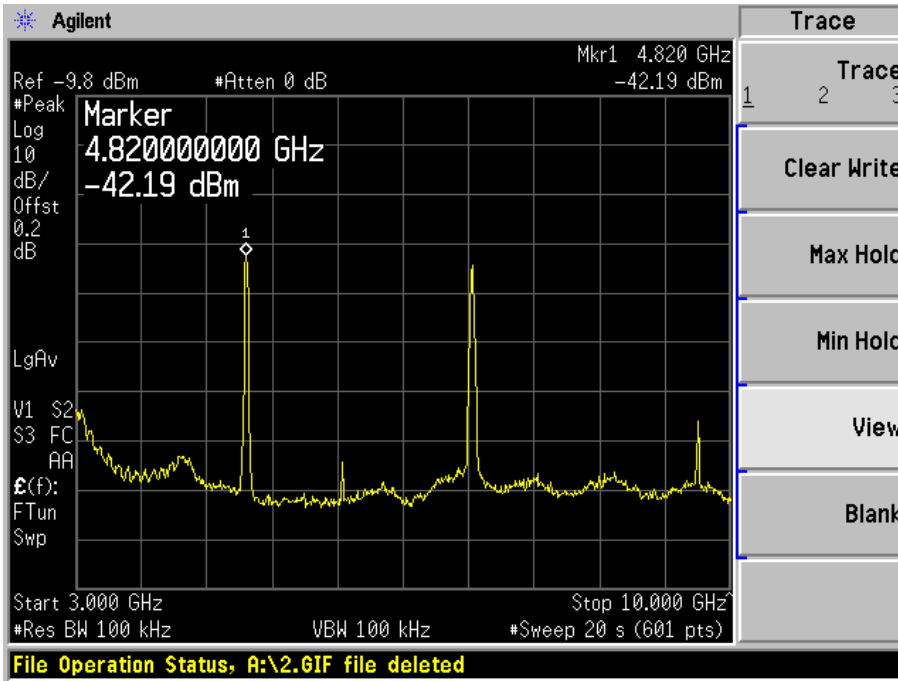




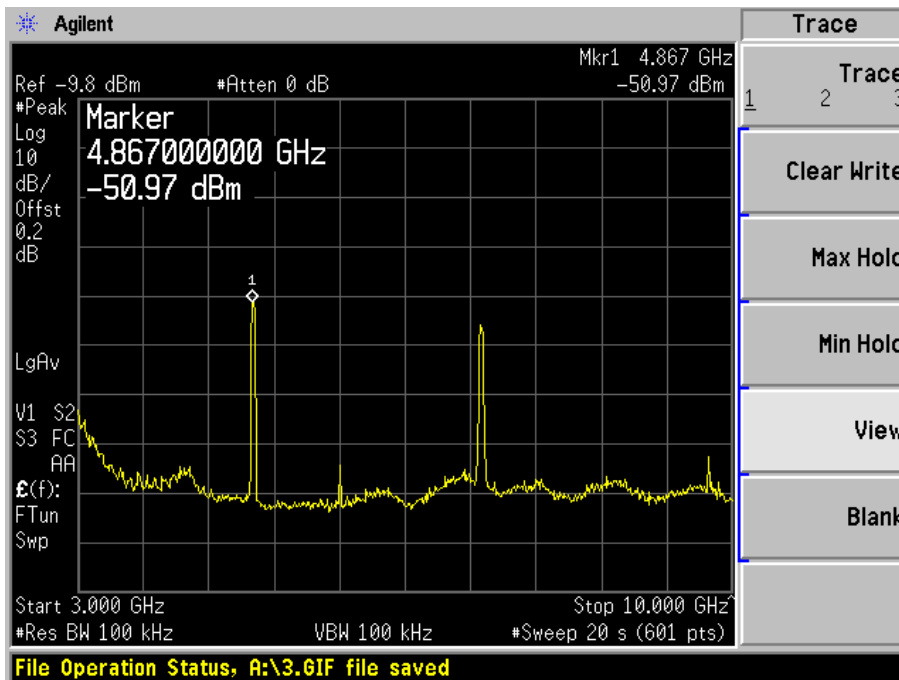
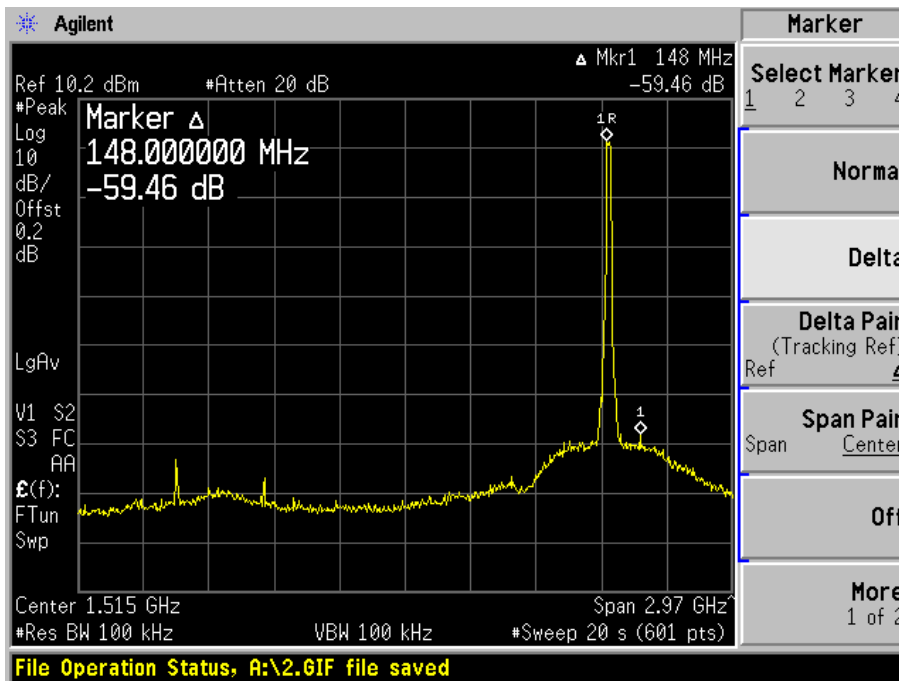
802.11g mode:

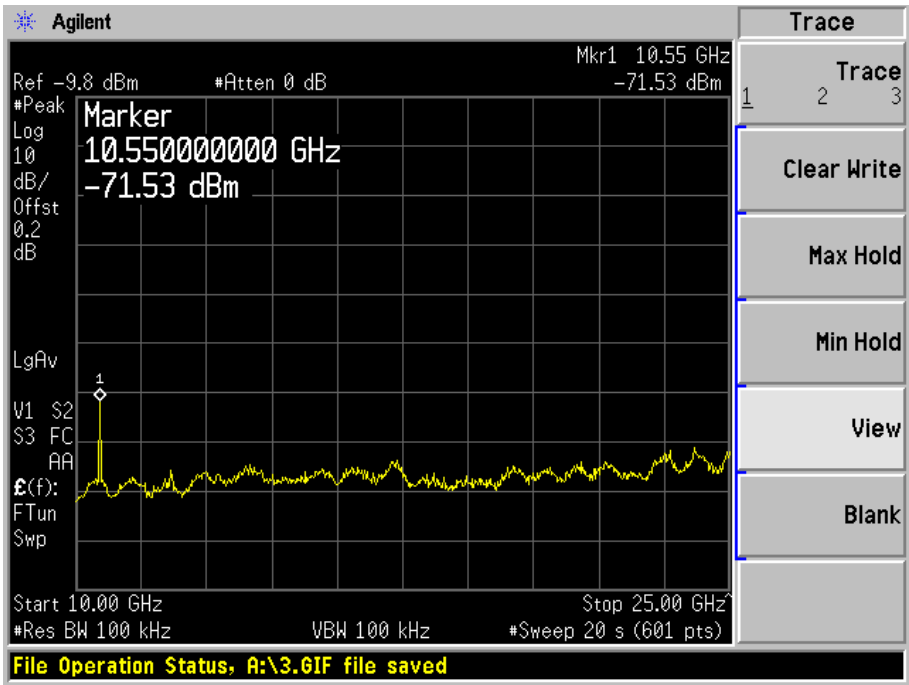
Low Channel



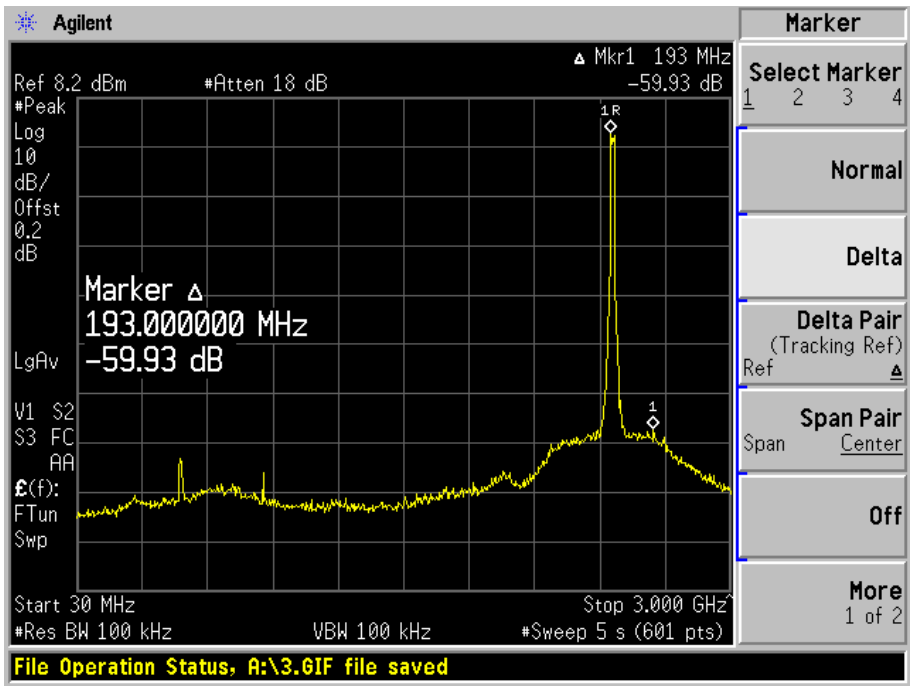


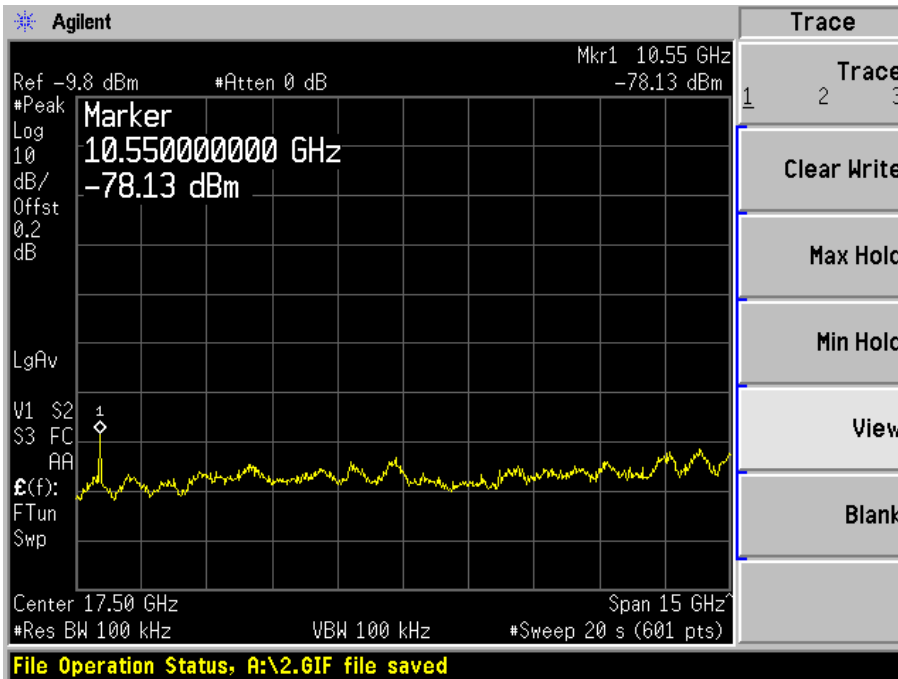
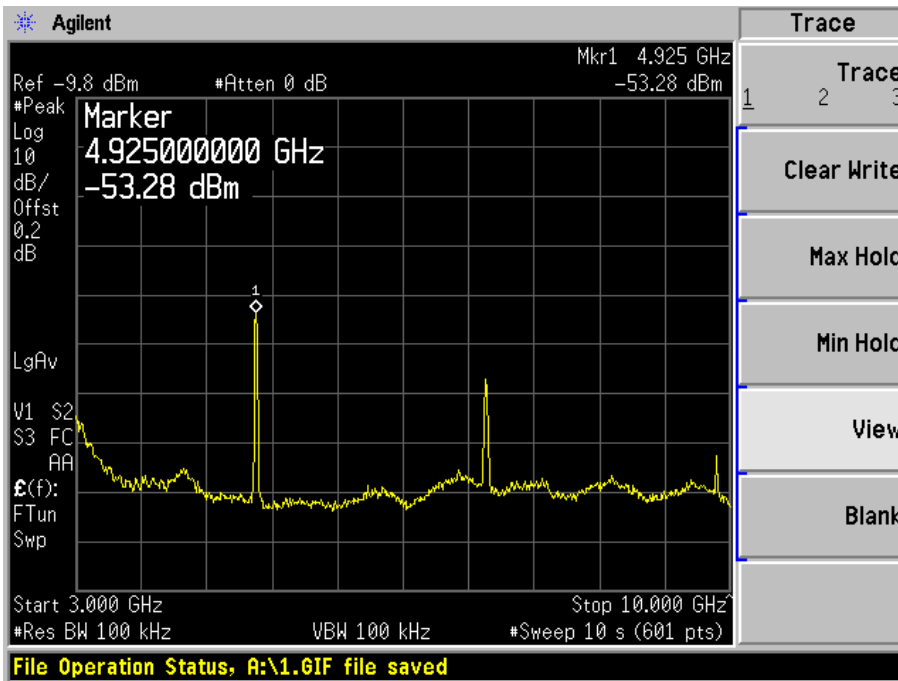
## Middle Channel





High Channel







## **§15.205, §15.209 & §15.247(c) - RADIATED EMISSIONS**

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### **Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in 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 NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BAACL is  $\pm 4.0$  dB.

### **Test Setup**

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal. Date</b>
Agilent	Analyzer, Spectrum	8565EC	3946A00131	2006-01-11
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2006-05-02
Sonoma Instrument	Amplifier, Broadband	317	260408	2006-02-03
HP	Amplifier, Pre, Microwave	8449B	3147A00400	2005-08-10
HP	Generator, Signal	83650B	3614A00276	2006-05-10
A.R.A.	Antenna, Horn	DRG-118/A	1132	2006-08-17
ETS-Lindgren	Antenna	JB3	A020106-3 / S006628	2006-03-14

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

### **Environmental Conditions**

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

\*The testing was performed by Tom Chen on 2006-06-05.

## 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 emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "QP" in the data table.

## 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:

$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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 emissions is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Part15.247 Limit}$$

## Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

**-11.2 dB at 9648.0000 MHz** in the **Vertical** polarization, 802.11b Low Channel, 3 meters

**-8.3 dB at 9747.9000 MHz** in the **Vertical** polarization, 802.11b Middle Channel, 3 meters

**-9.3 dB at 9848.0000 MHz** in the **Vertical** polarization, 802.11b High Channel, 3 meters

**-11.0 dB at 9647.9000 MHz** in the **Horizontal** polarization, 802.11g Low Channel, 3 meters

**-8.8 dB at 9747.8000 MHz** in the **Vertical** polarization, 802.11g Middle Channel, 3 meters

**-9.6 dB at 9847.9000 MHz** in the **Vertical** polarization, 802.11g High Channel, 3 meters

**-18.7 dB at 48.44 MHz** in the **Vertical** polarization, 30MHz -1GHz, 3 meter

### Run#1 Radiated Harmonics and Spur Emissions

802.11b Low Channel:

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
9648.0000	35.2	213	1.3	V	38.1	3.7	34.2	42.8	54	-11.2	Ave
9648.0000	35.0	170	1.1	H	38.1	3.7	34.2	42.6	54	-11.4	Ave
4823.9500	42.8	123	1.3	V	32.5	1.9	34.8	42.4	54	-11.6	Ave
4823.9500	34.3	139	1.3	H	32.5	1.9	34.8	33.9	54	-20.1	Ave
9648.0000	45.8	213	1.3	V	38.1	3.7	34.2	53.5	74	-20.6	Peak
9648.0000	44.8	170	1.1	H	38.1	3.7	34.2	52.4	74	-21.6	Peak
4823.9500	49.2	123	1.3	V	32.5	1.9	34.8	48.8	74	-25.3	Peak
1000.0000	39.1	118	1.1	V	23.3	1.3	36.8	26.8	54	-27.2	Ave
4823.9500	46.7	139	1.3	H	32.5	1.9	34.8	46.3	74	-27.7	Peak
1000.0000	34.3	55	1.0	H	23.3	1.3	36.8	22.0	54	-32.0	Ave
1000.0000	46.8	118	1.1	V	23.3	1.3	36.8	34.5	74	-39.5	Peak
1000.0000	43.4	55	1.0	H	23.3	1.3	36.8	31.1	74	-42.9	Peak

802.11b Middle Channel:

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
9747.9000	38.1	281	1.4	V	38.1	3.7	34.2	45.7	54	-8.3	Ave
9747.9000	34.1	180	1.4	H	38.1	3.7	34.2	41.7	54	-12.3	Ave
4874.0000	40.1	341	1.4	V	32.5	1.9	34.8	39.7	54	-14.3	Ave
4874.0000	38.0	248	1.0	H	32.5	1.9	34.8	37.6	54	-16.4	Ave
9747.9000	44.9	180	1.4	H	38.1	3.7	34.2	52.5	74	-21.5	Peak
9747.9000	44.3	281	1.4	V	38.1	3.7	34.2	52.0	74	-22.1	Peak
1000.0000	43.3	176	1.4	V	23.3	1.3	36.8	31.0	54	-23.0	Ave
4874.0000	46.7	341	1.4	V	32.5	1.9	34.8	46.3	74	-27.7	Peak
1000.0000	37.3	170	1.2	H	23.3	1.3	36.8	25.0	54	-29.0	Ave
4874.0000	44.7	248	1.0	H	32.5	1.9	34.8	44.3	74	-29.7	Peak
1000.0000	50.2	176	1.4	V	23.3	1.3	36.8	37.9	74	-36.2	Peak
1000.0000	45.5	170	1.2	H	23.3	1.3	36.8	33.2	74	-40.8	Peak

*802.11b High Channel:*

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
9848.0000	37.1	281	1.2	V	38.1	3.7	34.2	44.7	54	-9.3	Ave
9848.0000	32.8	245	1.2	H	38.1	3.7	34.2	40.4	54	-13.6	Ave
4924.0000	39.9	158	1.3	V	32.5	1.9	34.8	39.5	54	-14.5	Ave
9848.0000	45.2	281	1.2	V	38.1	3.7	34.2	52.9	74	-21.1	Peak
4924.0000	32.8	180	1.4	H	32.5	1.9	34.8	32.4	54	-21.6	Ave
9848.0000	43.7	245	1.2	H	38.1	3.7	34.2	51.3	74	-22.7	Peak
1000.0000	40.1	217	1.1	V	23.3	1.3	36.8	27.8	54	-26.2	Ave
4924.0000	46.9	158	1.3	V	32.5	1.9	34.8	46.5	74	-27.5	Peak
4924.0000	43.9	180	1.4	H	32.5	1.9	34.8	43.5	74	-30.5	Peak
1000.0000	30.4	173	1.2	H	23.3	1.3	36.8	18.1	54	-35.9	Ave
1000.0000	46.9	217	1.1	V	23.3	1.3	36.8	34.6	74	-39.4	Peak
1000.0000	43.7	173	1.2	H	23.3	1.3	36.8	31.4	74	-42.7	Peak

*802.11g Low Channel:*

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
9647.9000	35.4	280	1.5	V	38.1	3.7	34.2	43.0	54	-11.0	Ave
9647.9000	35.3	247	1.2	H	38.1	3.7	34.2	42.9	54	-11.1	Ave
4823.9500	35.7	152	1.4	V	32.5	1.9	34.8	35.3	54	-18.7	Ave
9647.9000	44.7	280	1.5	V	38.1	3.7	34.2	52.3	74	-21.7	Peak
9647.9000	43.3	247	1.2	H	38.1	3.7	34.2	51.0	74	-23.1	Peak
4823.9500	26.5	197	1.4	H	32.5	1.9	34.8	26.1	54	-27.9	Ave
1000.0000	37.0	170	1.3	H	23.3	1.3	36.8	24.7	54	-29.3	Ave
4823.9500	44.8	152	1.4	V	32.5	1.9	34.8	44.4	74	-29.6	Peak
1000.0000	36.0	171	1.5	V	23.3	1.3	36.8	23.7	54	-30.3	Ave
4823.9500	39.9	197	1.4	H	32.5	1.9	34.8	39.5	74	-34.5	Peak
1000.0000	47.3	171	1.5	V	23.3	1.3	36.8	35.0	74	-39.0	Peak
1000.0000	44.1	170	1.3	H	23.3	1.3	36.8	31.8	74	-42.2	Peak

802.11g Middle Channel:

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Readingr dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
9747.8000	37.6	216	1.3	V	38.1	3.7	34.2	45.2	54	-8.8	Ave
9747.8000	37.3	167	1.2	H	38.1	3.7	34.2	44.9	54	-9.1	Ave
9747.8000	45.8	216	1.3	V	38.1	3.7	34.2	53.4	74	-20.6	Peak
1000.0000	43.7	162	1.4	V	23.3	1.3	36.8	31.4	54	-22.6	Ave
9747.8000	43.8	167	1.2	H	38.1	3.7	34.2	51.4	74	-22.6	Peak
4874.0000	28.4	209	1.2	H	32.5	1.9	34.8	28.0	54	-26.0	Ave
4874.0000	28.1	246	1.6	V	32.5	1.9	34.8	27.7	54	-26.3	Ave
1000.0000	38.8	149	1.1	H	23.3	1.3	36.8	26.5	54	-27.5	Ave
4874.0000	42.2	246	1.6	V	32.5	1.9	34.8	41.8	74	-32.2	Peak
4874.0000	42.0	209	1.2	H	32.5	1.9	34.8	41.6	74	-32.4	Peak
1000.0000	50.8	162	1.4	V	23.3	1.3	36.8	38.5	74	-35.5	Peak
1000.0000	46.1	149	1.1	H	23.3	1.3	36.8	33.8	74	-40.2	Peak

802.11g High Channel:

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15.247 Limit (dBuV/m)	15.247 Margin	Comments
9847.9000	36.8	266	1.5	V	38.1	3.7	34.2	44.4	54	-9.6	Ave
9847.9000	28.9	252	1.2	H	38.1	3.7	34.2	36.5	54	-17.5	Ave
9847.9000	45.3	266	1.5	V	38.1	3.7	34.2	53.0	74	-21.1	Peak
1000.0000	43.9	163	1.6	V	23.3	1.3	36.8	31.6	54	-22.4	Ave
9847.9000	42.8	252	1.2	H	38.1	3.7	34.2	50.4	74	-23.6	Peak
4924.0000	28.8	279	1.3	V	32.5	1.9	34.8	28.4	54	-25.6	Ave
4924.0000	27.9	177	1.3	H	32.5	1.9	34.8	27.5	54	-26.5	Ave
1000.0000	38.8	278	1.0	H	23.3	1.3	36.8	26.5	54	-27.5	Ave
4924.0000	42.2	279	1.3	V	32.5	1.9	34.8	41.8	74	-32.2	Peak
4924.0000	41.7	177	1.3	H	32.5	1.9	34.8	41.3	74	-32.8	Peak
1000.0000	51.2	163	1.6	V	23.3	1.3	36.8	38.9	74	-35.2	Peak
1000.0000	46.3	278	1.0	H	23.3	1.3	36.8	34.0	74	-40.0	Peak

Run # 1- 4: Primary scan 30MHz -1GHz

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Factor dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	15B Limit (dBuV/m)	15B Margin	Comments
48.44	37.8	128	1.0	V	10.6	1.5	28.6	21.3	40	-18.7	Peak
48.43	37.2	129	1.2	V	10.6	1.5	28.6	20.7	40	-19.3	Peak
50.44	37.4	40	1.2	V	8.3	1.6	28.5	18.8	40	-21.2	Peak
45.76	34.9	301	1.0	V	10.6	1.5	28.6	18.4	40	-21.6	Peak
58.74	34.9	29	1.3	V	7.3	1.6	28.5	15.3	40	-24.7	Peak
60.19	32.0	7	1.5	V	7.4	1.7	28.5	12.6	40	-27.4	Peak

## **§15.247(a)(2) – 6 dB BANDWIDTH**

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### **Applicable Standard**

According to §15.247(a)(2), for digital modulation techniques, the minimum 6dB bandwidth shall be at least 500 kHz.

### **Measurement Procedure**

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

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal. Date</b>
Agilent	Analyzer, Spectrum	E4446A	3946A00131	2006-03-06

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

### **Environmental Conditions**

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

*\*The testing was performed by Tom Chen on 2006-06-05*

## Measurement Result

*802.11b mode:*

Channel	Frequency (MHz)	Channel Bandwidth (MHz)	Limit (KHz)
Low	2412	13.142	>500
Mid	2437	13.133	>500
High	2462	13.140	>500

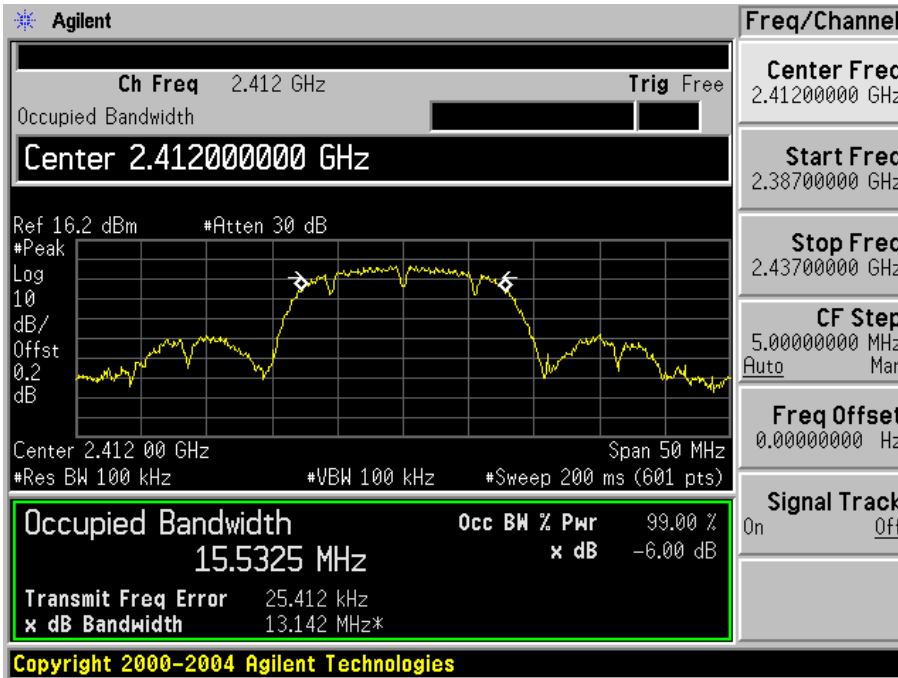
*802.11g mode:*

Channel	Frequency (MHz)	Channel Bandwidth (MHz)	Limit (KHz)
Low	2412	16.389	>500
Mid	2437	16.392	>500
High	2462	16.387	>500

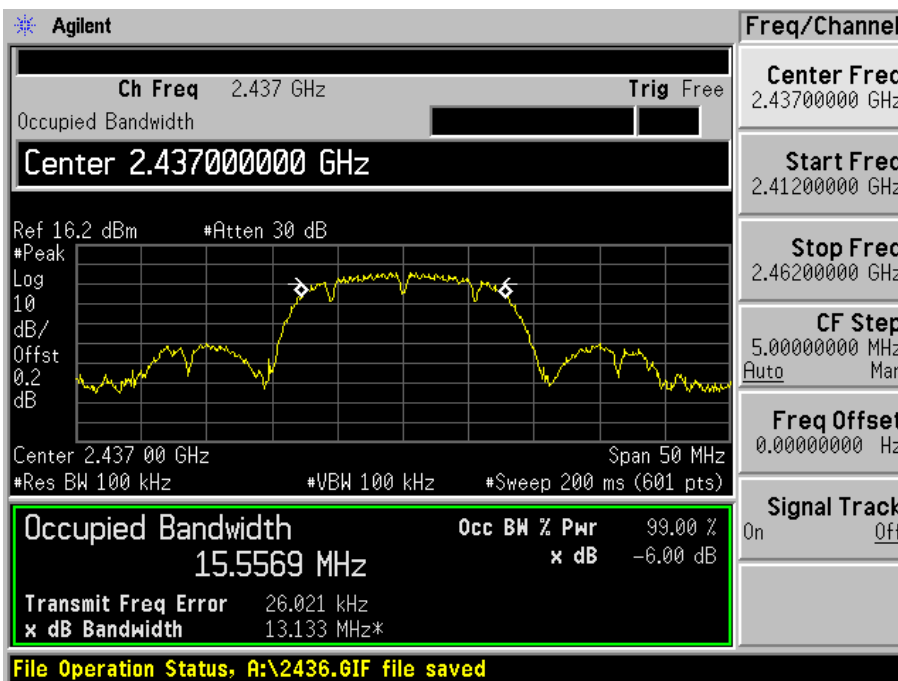


802.11b mode:

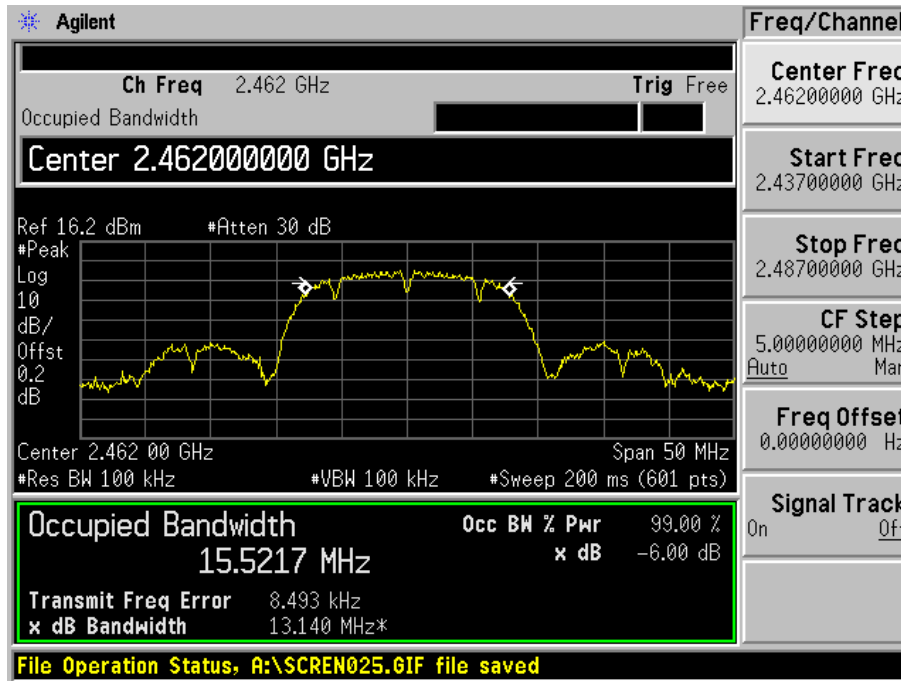
Low Channel



Middle Channel

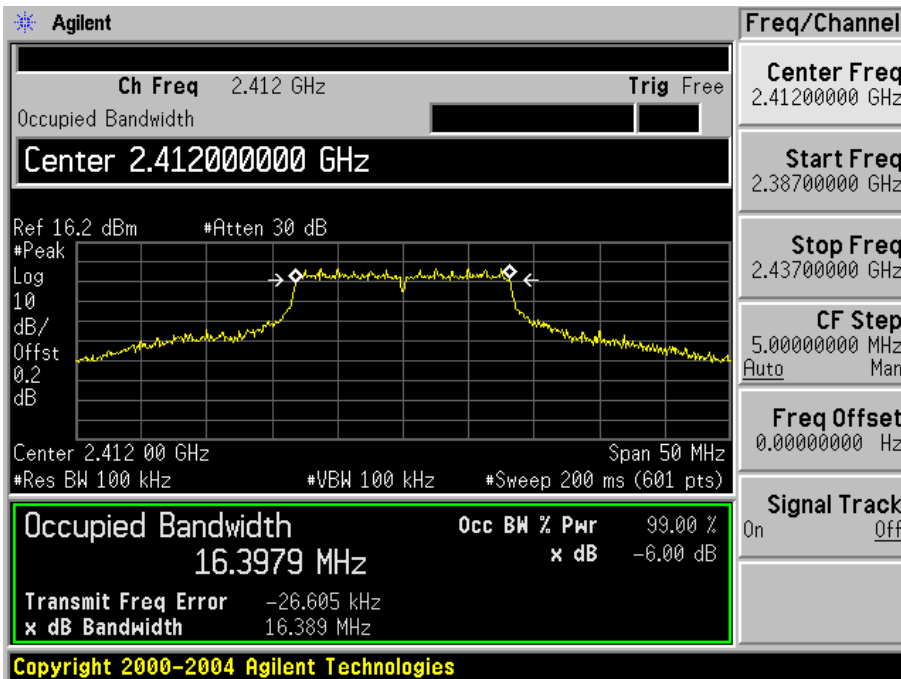


## High Channel

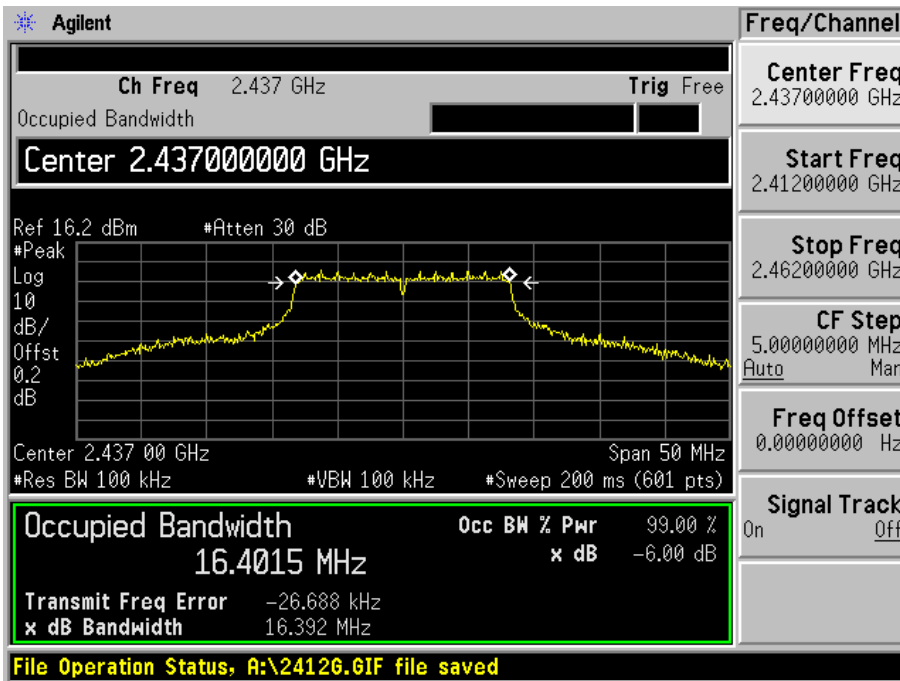


802.11g mode:

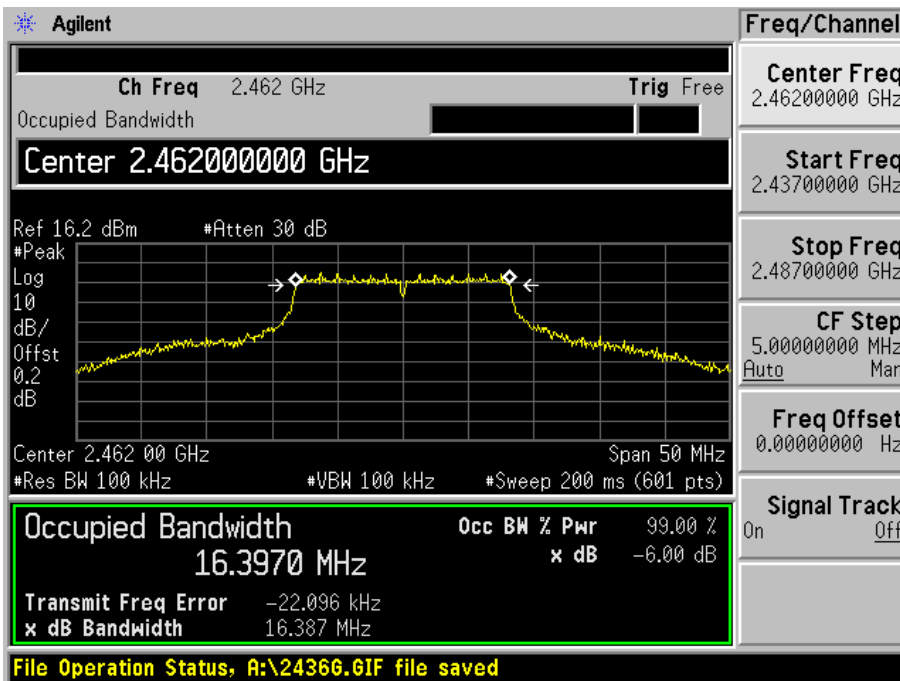
## Low Channel



Mid. Channel



High Channel



## §15.247(b)(3) - PEAK OUTPUT POWER MEASUREMENT

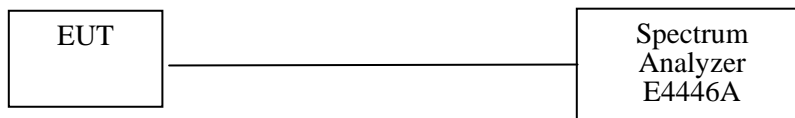
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### Applicable Standard

According to §15.247(b) (3), for systems using digital modulation in 2400-2483.5 MHz: 1 Watt

### 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.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Sensor, Power	E4412A	US38488542	2006-09-08
Agilent	Meter, Power	E4419B	MY4121511	2006-08-31
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

### Environmental Conditions

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

\*The testing was performed by Tom Chen on 2006-06-05.

## Measurement Result

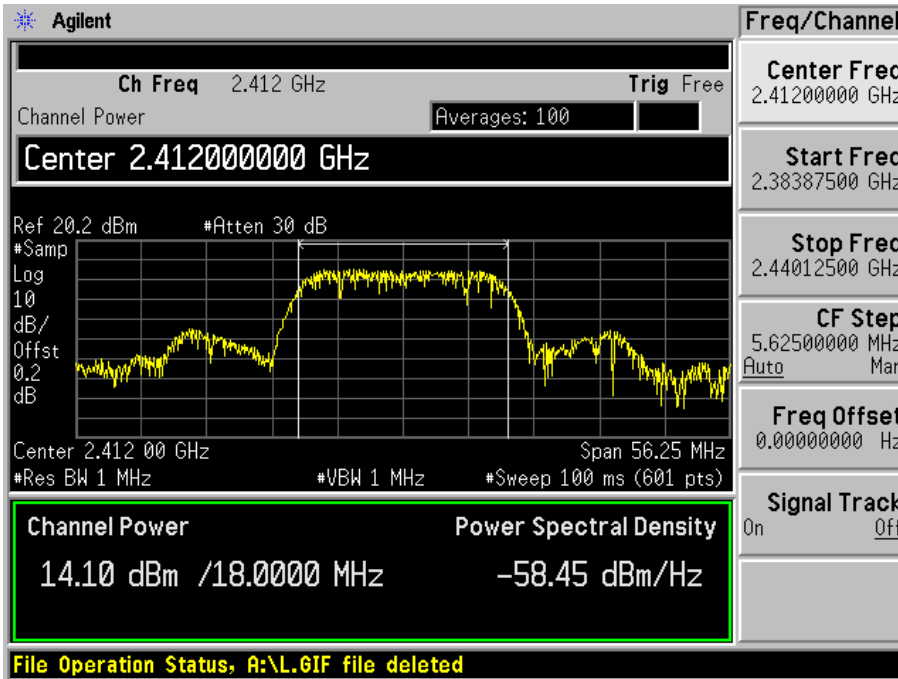
*802.11b mode:*

Channel	Frequency MHz	Max Peak Output Power		Limit (mw)	Result
		(dBm)	(mw)		
Low	2412	14.1	25.70	1000	Pass
Mid	2437	13.17	20.75	1000	Pass
High	2462	12.49	17.74	1000	Pass

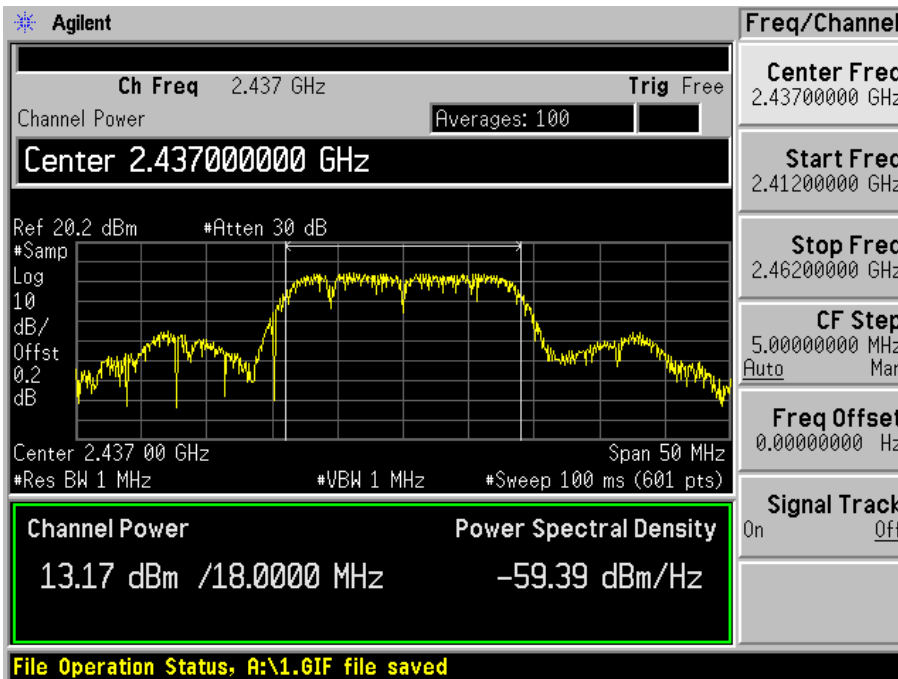
*802.11g mode:*

Channel	Frequency MHz	Max Peak Output Power		Limit (mw)	Result
		(dBm)	(mw)		
Low	2412	13.7	23.44	1000	Pass
Mid	2437	12.8	19.05	1000	Pass
High	2462	12.13	16.33	1000	Pass

802.11b, Low Channel

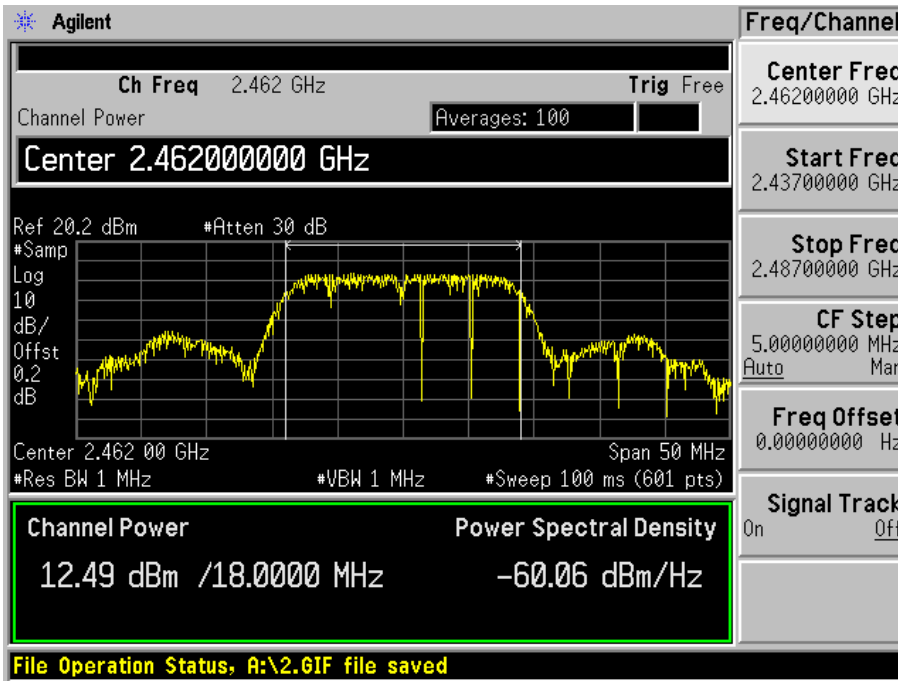


802.11b, Middle Channel

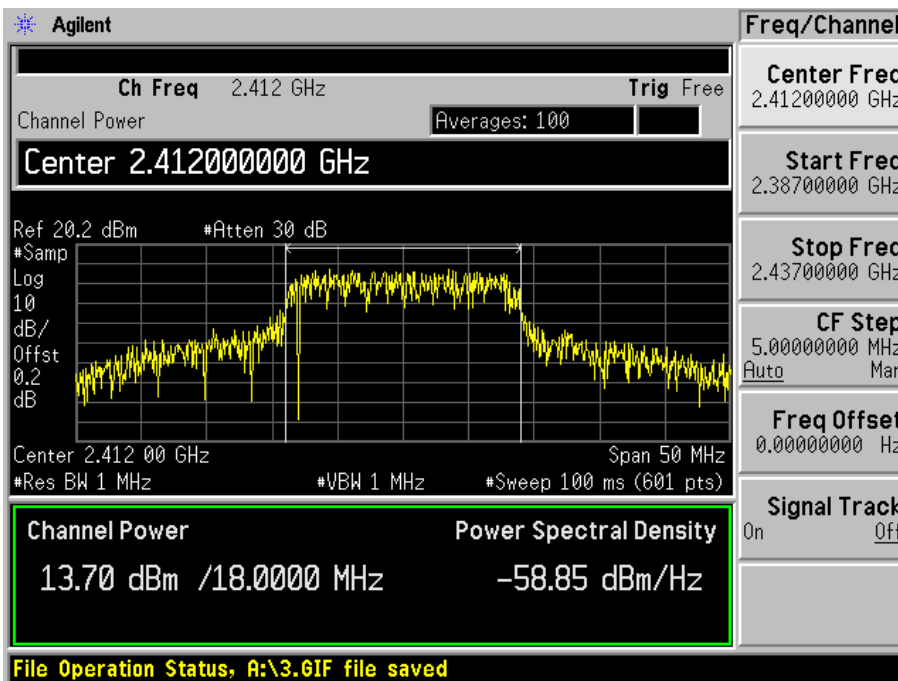




802.11b, High Channel

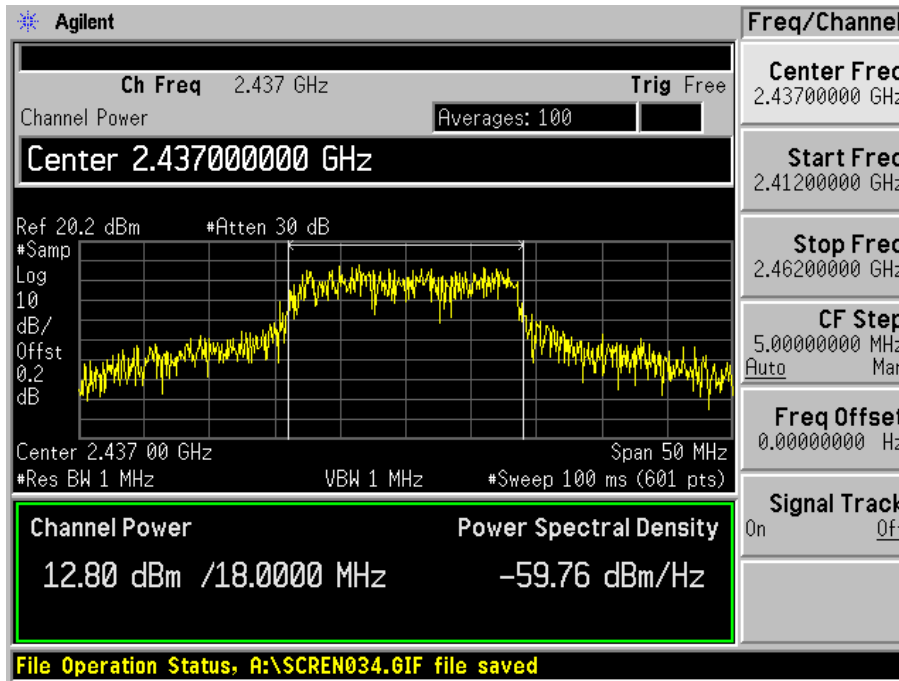


802.11g, Low Channel

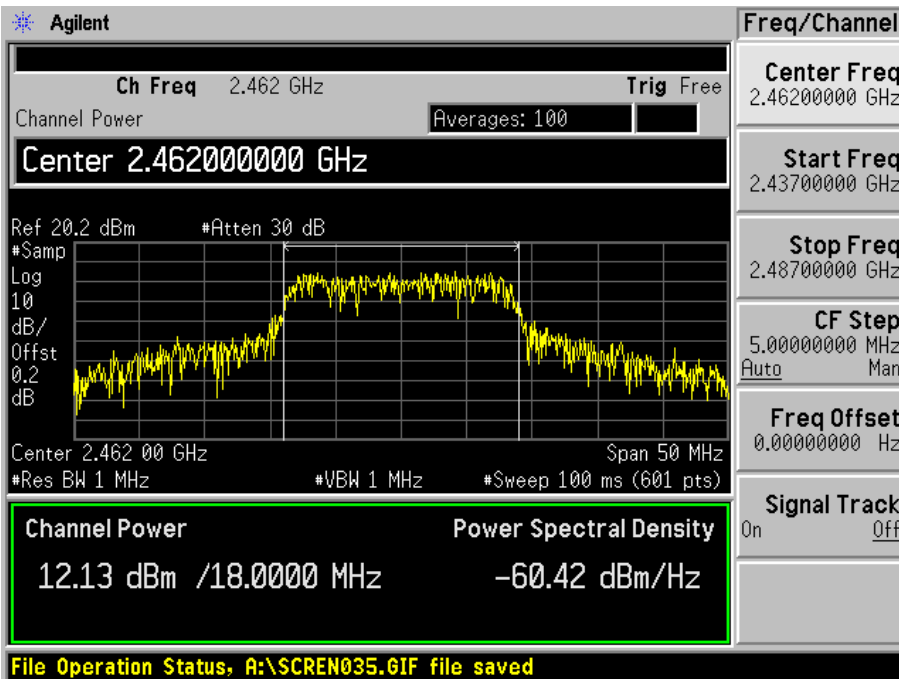




802.11g, Middle Channel



802.11g, High Channel



## **§15.247(c) - 100 KHZ BANDWIDTH OF BAND EDGES**

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### **Applicable Standard**

According to §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)).

### **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.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal. Date</b>
Agilent	Analyzer, Spectrum	E4446A	3946A00131	2006-03-06

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

### **Environmental Conditions**

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

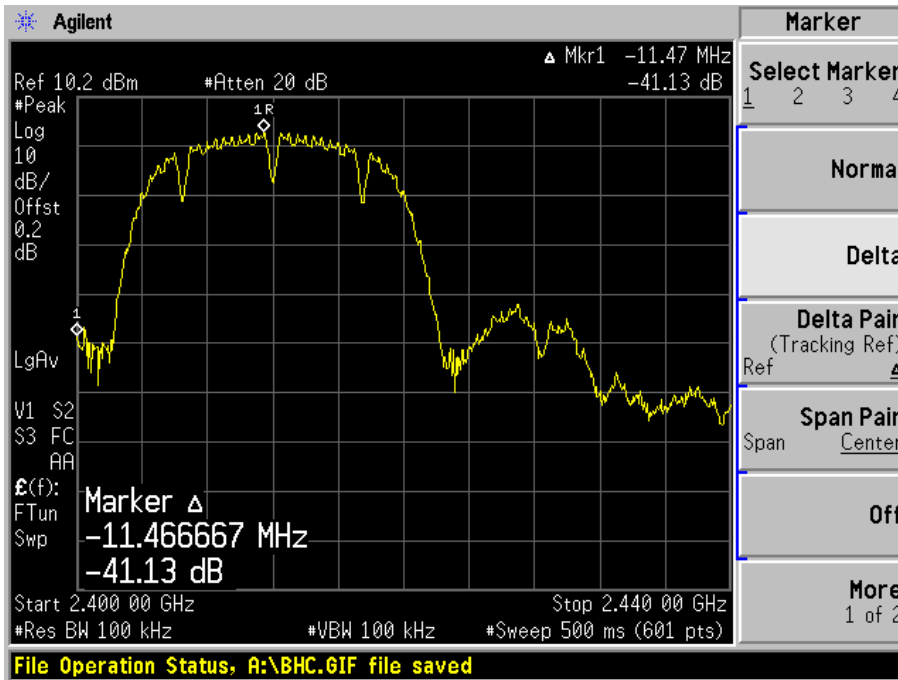
\*The testing was performed by Tom Chen on 2006-06-05.

## Measurement Result

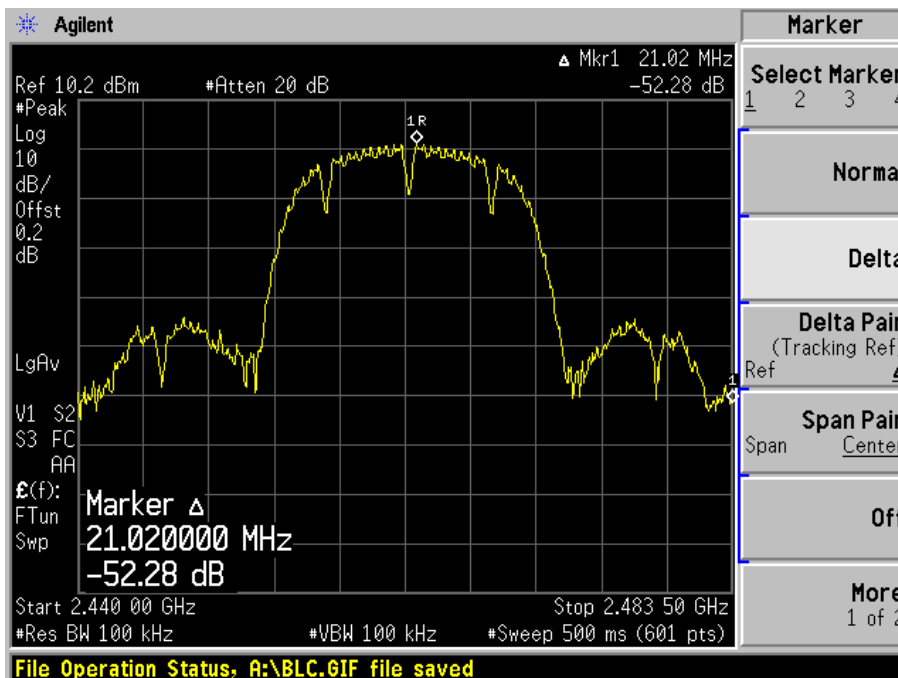
Please refer to following pages for plots of band edge.

802.11b mode:

Low Channel

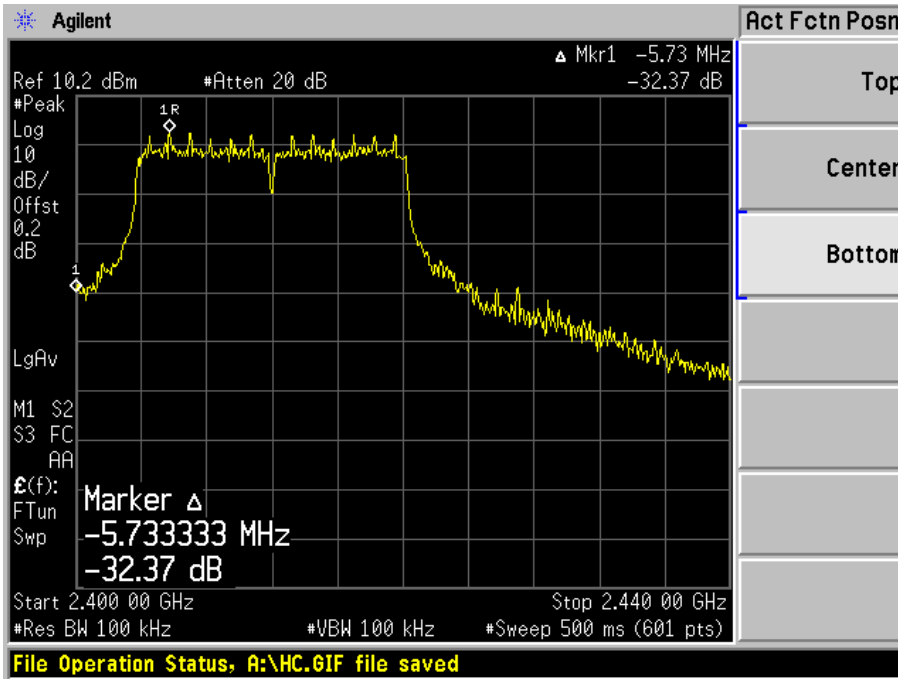


High Channel

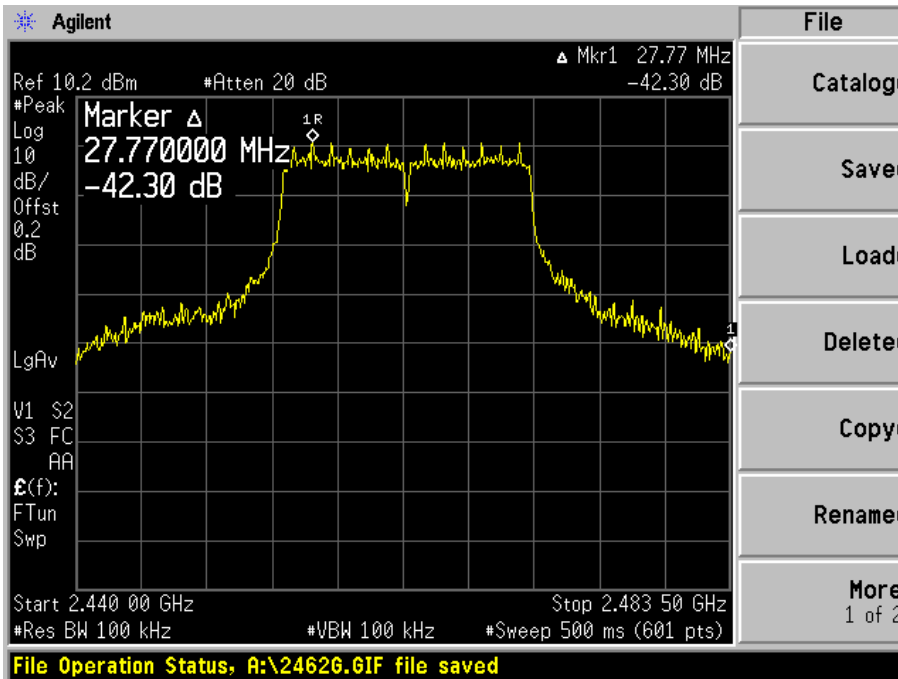


802.11g mode:

Low Channel



High Channel



## §15.247(d) - POWER SPECTRAL DENSITY

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### Applicable Standard

According to §15.247 (d), for direct sequence systems, the peak 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.

### 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 was set 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. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Repeat above procedures until all frequencies measured were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

### Environmental Conditions

Temperature:	24 °C
Relative Humidity:	45%
ATM Pressure:	1020mbar

*\*The testing was performed by Tom Chen on 2006-06-05*

## Measurement Result

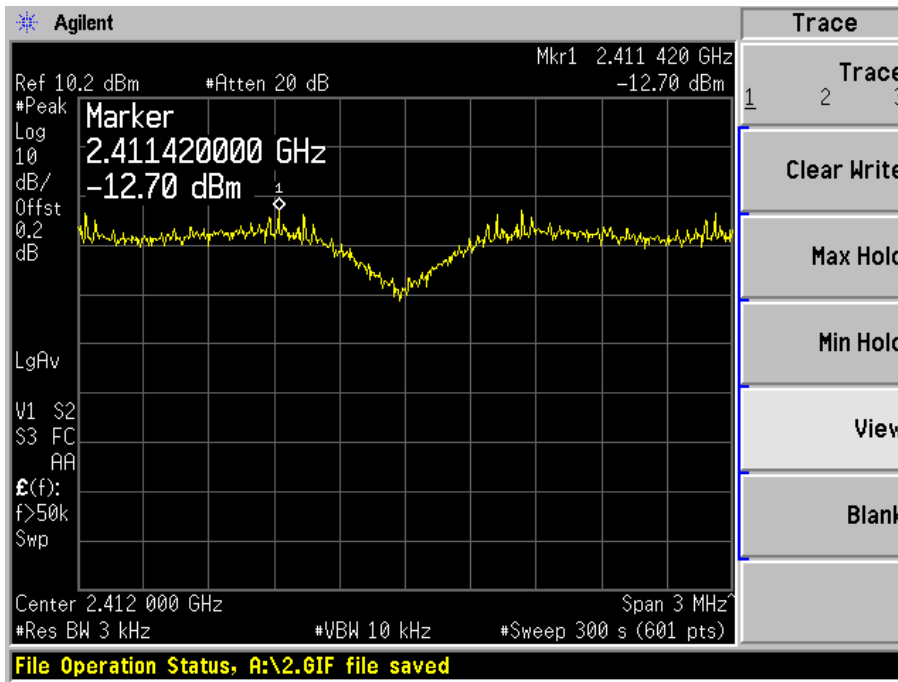
*802.11b mode:*

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)
Low	2412	-12.7	8
Mid	2437	-13.79	8
High	2462	-14.26	8

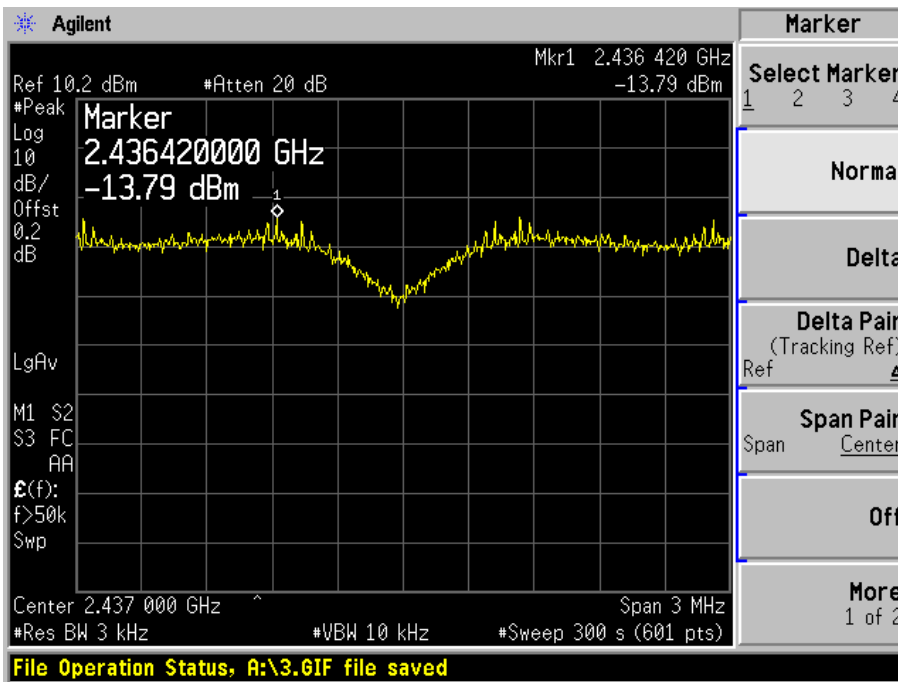
*802.11g mode:*

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)
Low	2412	-13.32	8
Mid	2437	-14.23	8
High	2462	-14.92	8

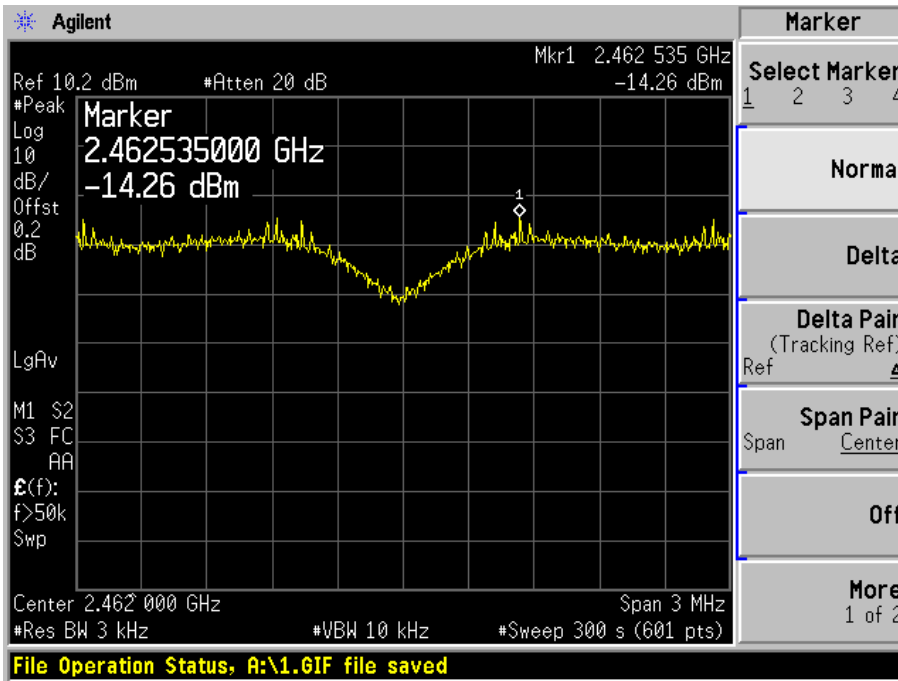
802.11b, Low Channel



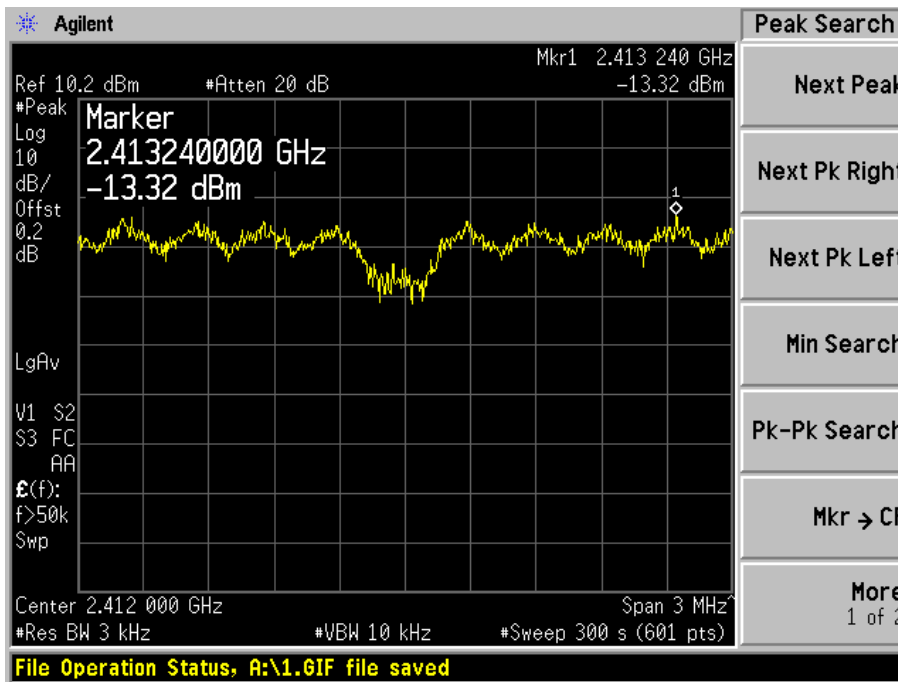
802.11b, Mid. Channel



802.11b, High Channel

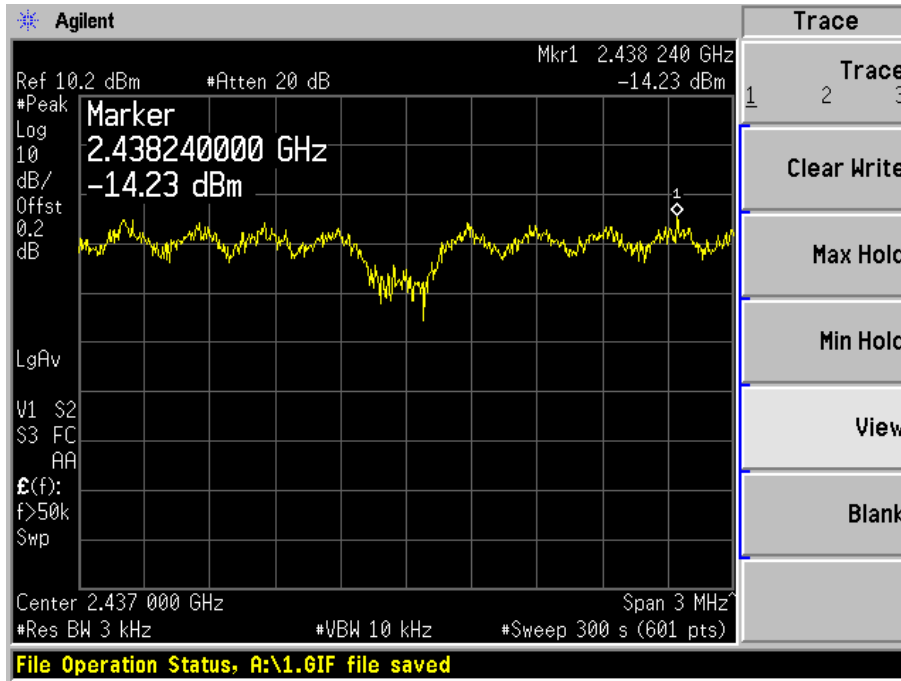


802.11g, Low Channel





### 802.11g, Mid Channel



### 802.11g, High Channel

