

FCC PART 15.247
EMI MEASUREMENT AND TEST REPORT

For

Actiontec Electronics, Inc.

760 N. Mary Avenue, Sunnyvale, CA 94085

FCC ID: LNQGT704WGRV

This Report Concerns: ☒ Original Report	Equipment Type: Wireless DSL Voice Gateway
Test Engineer: Kevin Lee 	
Report No.: R0509061	
Report Date: 2005-09-20	
Reviewed By: Daniel Deng 	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Actiontec Electronics, Inc.* product, FCC ID: *LNQGT704WGRV* or the "EUT" as referred to in this report is a 802.11b/g Wireless Gateway which measures approximately 197mmL x 127mmW x 12mmH.

The emission designator is 12M5G1D for 802.11b and 16M9G1D for 802.11g.

** The test data gathered are from production sample, serial number: 0509704WGRV, provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *Actiontec Electronics, Inc.* 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, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emission, Conducted and Spurious Radiated Emission.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted 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 measurement was performed at Bay Area Compliance Laboratory, Corp.

Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA with registration number:90464.

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 and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. 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 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

Justification

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

Schematics and Block Diagram

Please refer to Appendix A.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Notebook	PP04S	W1708A00	E2K24CLNS
IBM	Notebook	2628	78-GPGCZ	None
Compaq	Notebook	2103 US	CNF43403FB	None
Philips	Telephone	None	None	None
CHP Elec	Telephone	None	20632837	None
Arescom	20 Port Simulator	CDS6015	None	None

Remote Support Equipment

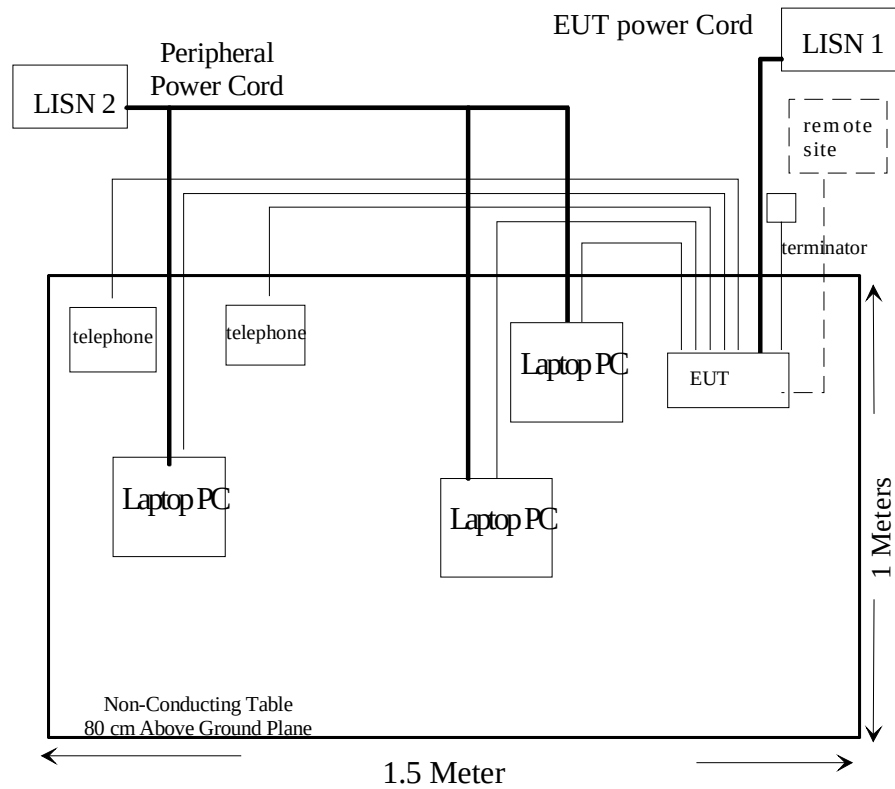
Manufacturer	Description	Model	Serial Number	FCC ID
Arescom	20 Port Simulator	CDS6015	None	None

External I/O Cabling List and Details

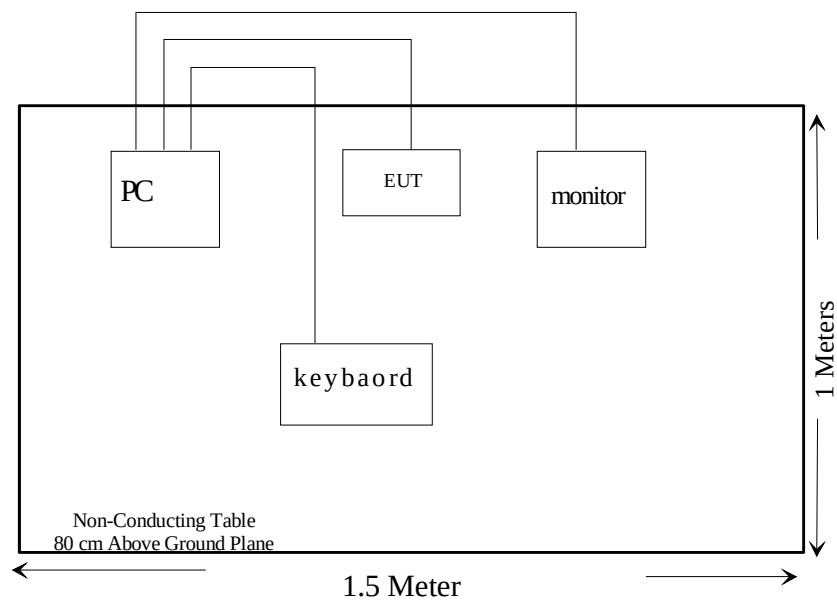
Cable Description	Length (M)	From	To
USB Extension Cable	1.0	USB Port/ Notebook	EUT
Unshielded RJ45 Cables	1.5	RJ45 Port/Notebook	EUT
Unshielded RJ 45 Cable	1.2	RJ45 Port/EUT	Terminator
Unshielded RJ11 Cable x2	1.5	RJ11 Port/EUT	Telephone
Unshielded RJ11 Cable	50	ADSL Port/EUT	Simulator

Test Setup Block Diagram For Line Conducted Emission

Line conducted Emission



Radiated Emission



SUMMARY OF TEST RESULTS FOR FCC PART 15.247

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§2.1091	RF Exposure	Pass
§15.203	Antenna Requirement	Pass
§15.205	Restricted Band	Pass
§ 15.207 (a)	Conducted Emissions	Pass
§2.1051	Spurious Emission at Antenna Port	Pass
§15.209 (a)	Radiated Emission	Pass*
§15.247 (a)(2)	6 dB Bandwidth	Pass
§15.247 (b)(3)	Maximum Peak Output Power	Pass
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Pass
§15.247 (e)	Peak Power Spectral Density	Pass

*: Test data are within the measurement uncertainty.

§1.1307(b)(1) & §2.1091 - RF EXPOSURE

According to §15.247(b)(5) 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 ²)	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 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

MPE Prediction

Predication 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: 22.3 (dBm)

Maximum peak output power at antenna input terminal: 169.82 (mW)

Predication frequency: 2450 (MHz)

Antenna Gain (typical): 5 (dBi)

antenna gain: 3.16 (numeric)

Prediction distance: 20 (cm)

Power density at predication frequency at 20 cm: 0.107 (mW/cm²)

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm²)

Test Result

The EUT is a mobile device. The Power density at predication frequency at 20 cm is 0.107 mW/cm² within the limit of 1.0 mW/cm².

ANTENNA REQUIREMENT

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 (1), 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 gain of antenna is 5 dBi by default. Please see EUT photo for details.

§15.207(a) - CONDUCTED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, 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 ± 2.4 dB.

Test Setup

The measurement was performed at shield room, using the same setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC Class B limits.

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

The host was connected with LISN-1.

Spectrum Analyzer Setup

The spectrum analyzer was set to investigate the spectrum from 150 kHz to 30 MHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
R&S	Receiver, EMI Test	ESCS30	100176	9/15/2005
R&S	LISN, Artificial Mains	ESH2-Z5	871884/039	8/16/2005

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

Test Procedure

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

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

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

Environmental Conditions

Temperature:	24.7° C
Relative Humidity:	49.3%
ATM Pressure:	1020 mbar

*The testing was performed by Jerry Wang on 2005-09-09.

Summary of Test Results

According to the recorded data in following table, the EUT complies with the FCC Conducted limit for a Class B device, with the *worst* margin reading of:

-12.7 dB at 0.15 MHz in the **Line** conductor

Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dB μ V	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dB μ V	Margin dB
0.15	53.3	QP	Line	66	-12.7
0.15	53.2	QP	Neutral	66	-12.8
0.15	24.0	Ave	Line	56	-32.0
0.15	23.6	Ave	Neutral	56	-32.4
27.60	15.0	Ave	Line	50	-35.0
27.60	15.0	Ave	Neutral	50	-35.0
2.53	10.5	Ave	Neutral	46	-35.5
26.50	11.8	Ave	Line	50	-38.2
2.53	14.2	QP	Neutral	56	-41.8
27.60	15.0	QP	Neutral	60	-45.0
27.60	14.8	QP	Line	60	-45.2
26.50	12.0	QP	Line	60	-48.0

Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.

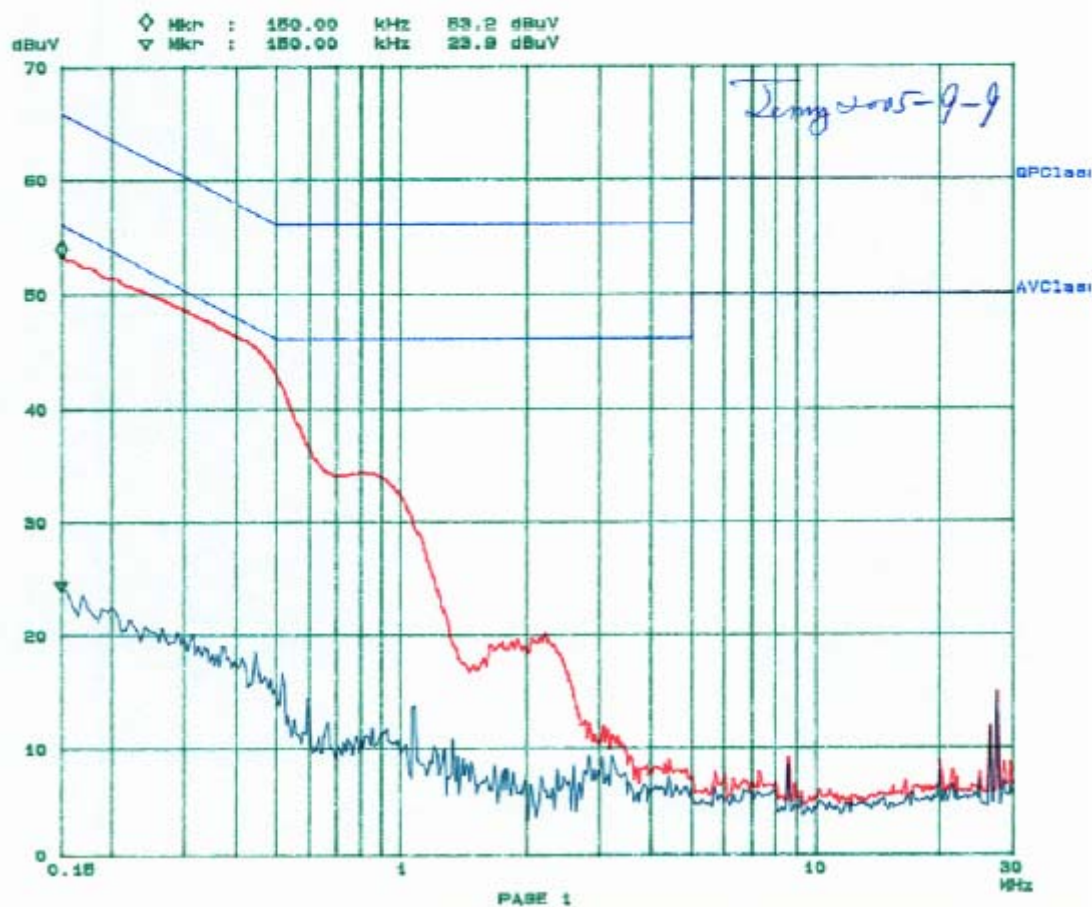
Bay Area Compliance Laboratory Corp
Class B

09. Sep 05 10:13

EUT: ST704WGRV
Manuf: Actiontec
Op Cond: Normal
Operator: Jerry
Comment: L
120VAC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	15dB LN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dB LN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dB LN	OFF



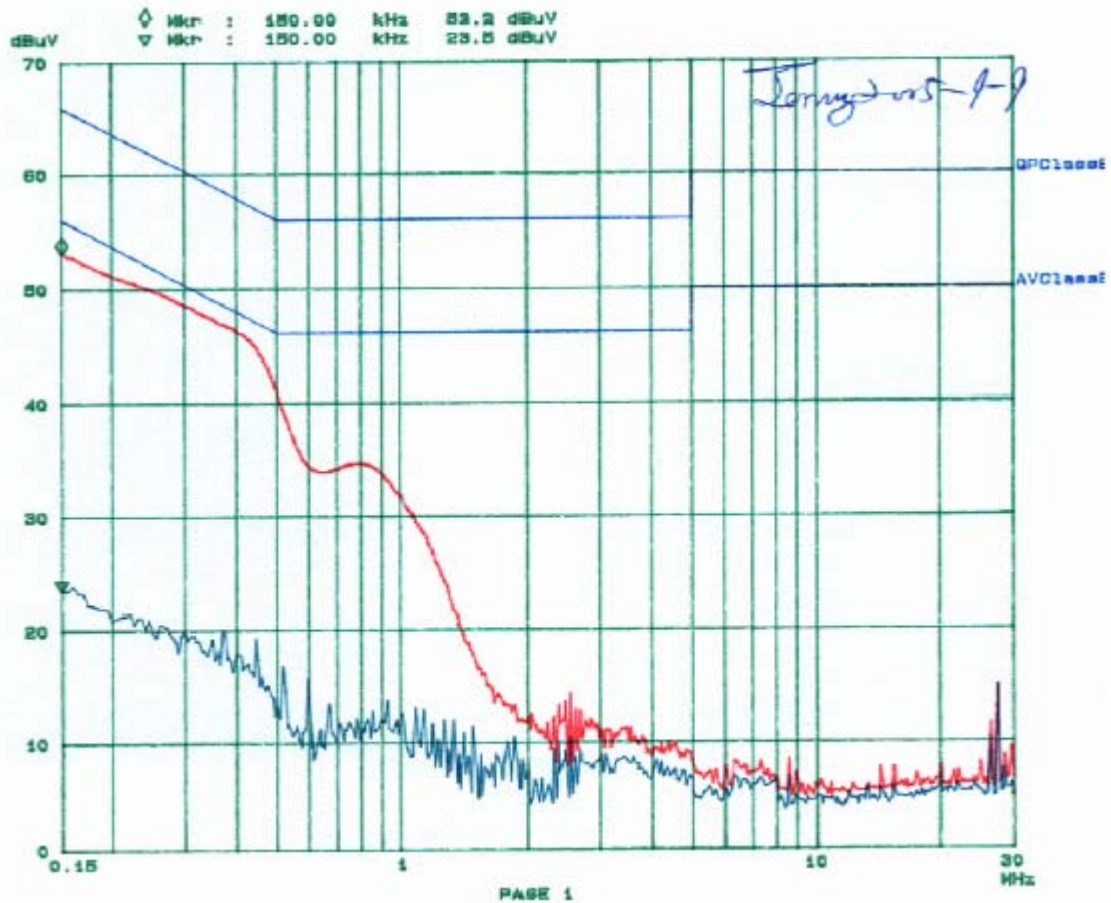
Bay Area Compliance Laboratory Corp
Class B

09. Sep 05 12:09

EUT: ST704WGRV
Manuf: Actiontec
Op Cond: Normal
Operator: Jerry
Comment: N
120VAC

Scan Settings (3 Ranges)

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	15dB LN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dB LN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dB LN	OFF



§2.1051 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Standard Applicable

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 10th harmonic.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Hewlett Packard	Spectrum Analyzer	8564E	3943A01781	10/04/2004

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

Measurement Result

Please refer to following pages for plots of spurious emission.

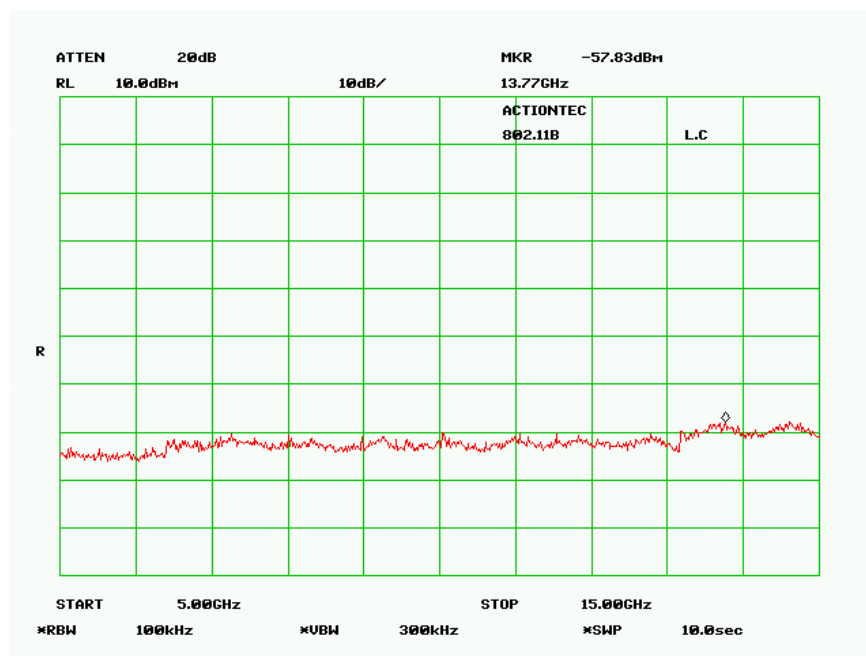
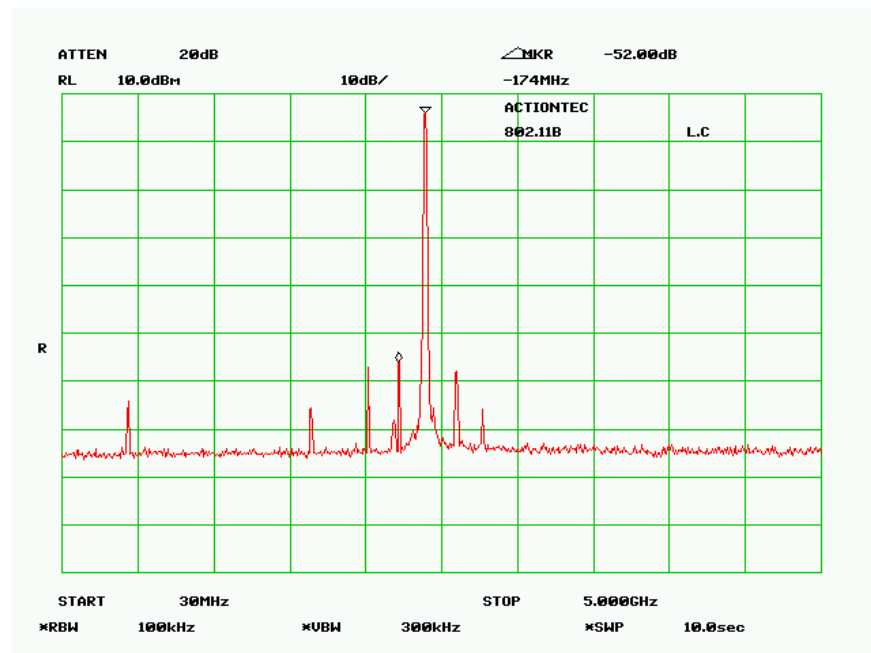
Environmental Conditions

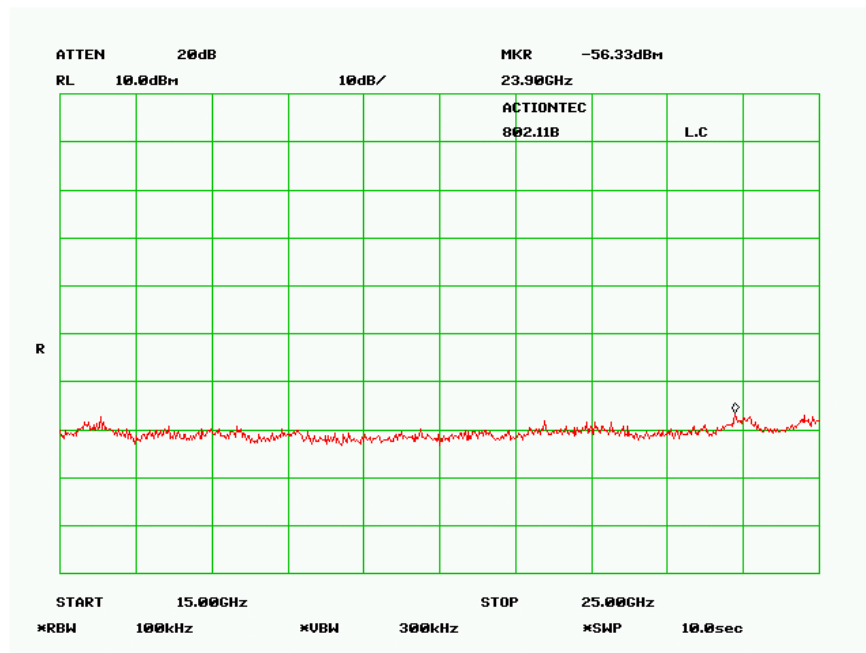
Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1018 mbar

**The testing was performed by Kevin Lee on 2005-09-16.*

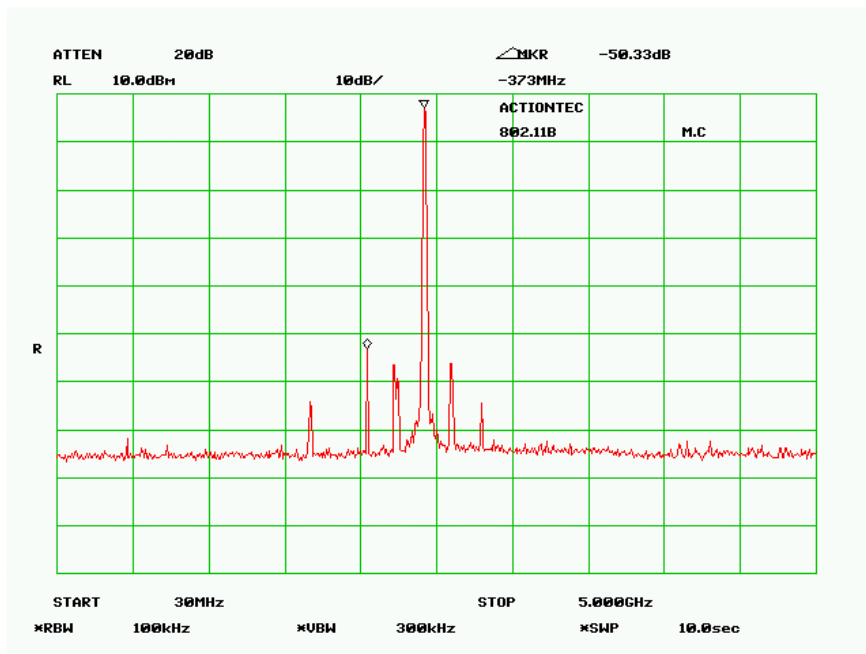
802.11b

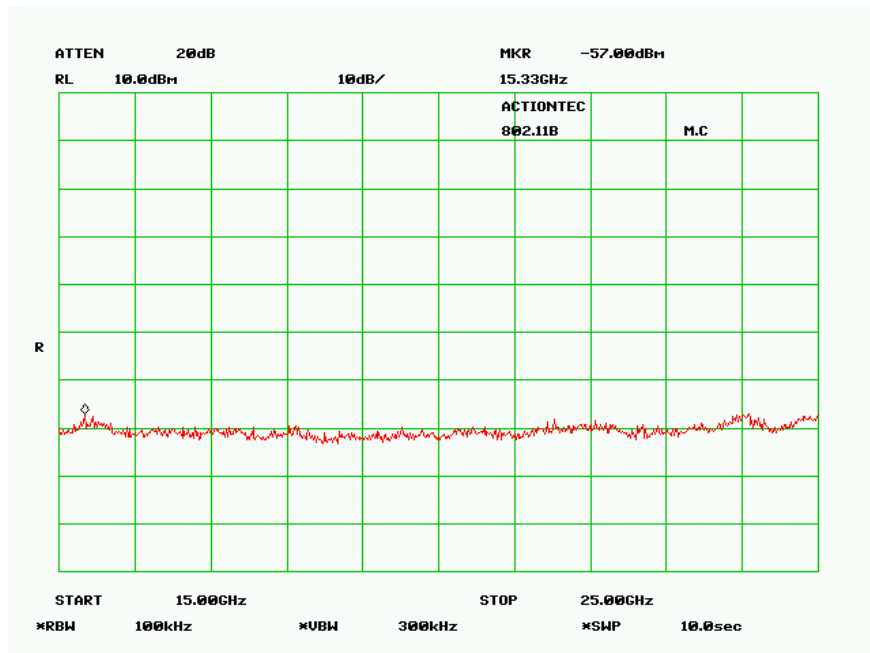
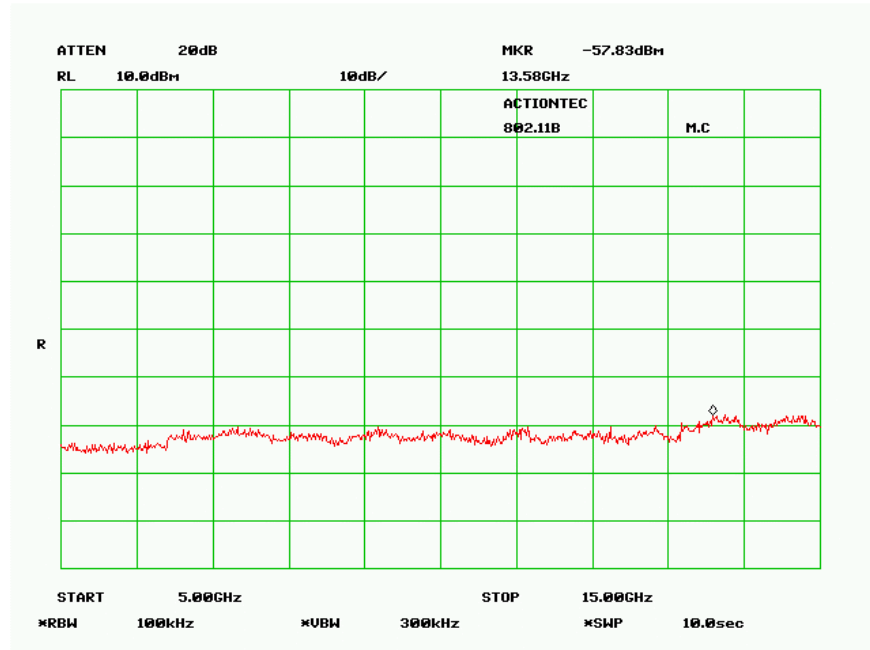
Low Channel

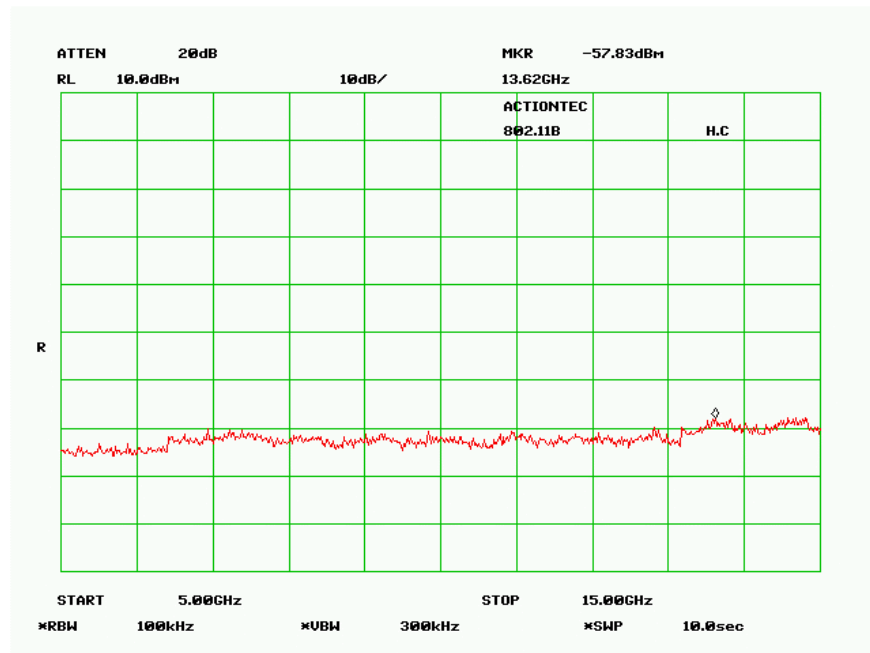
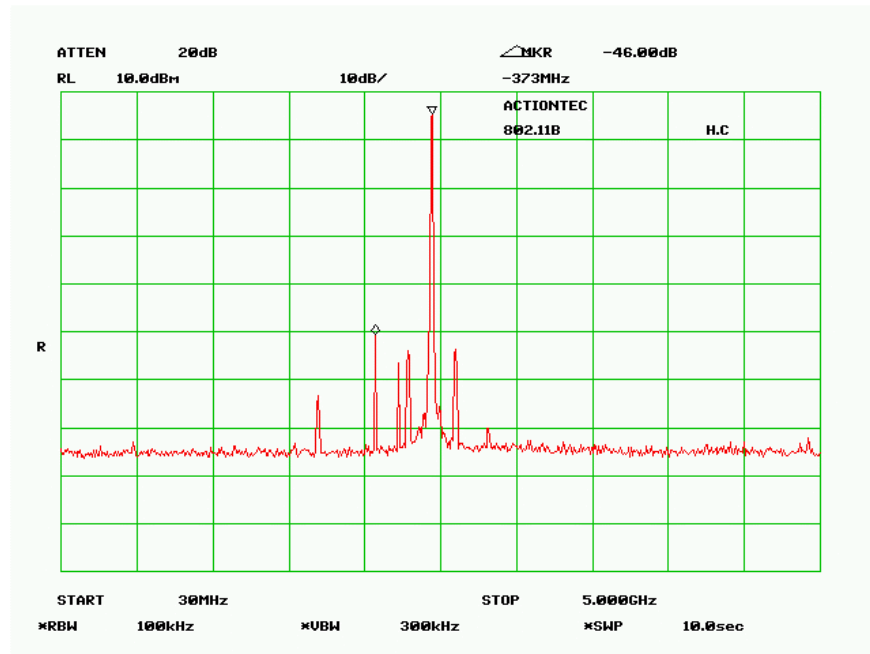


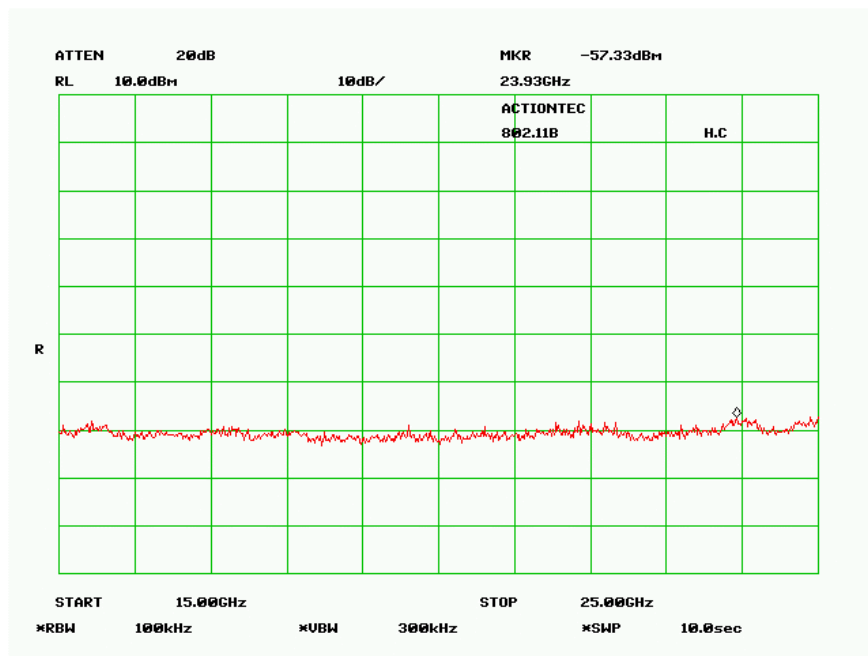


Mid Channel



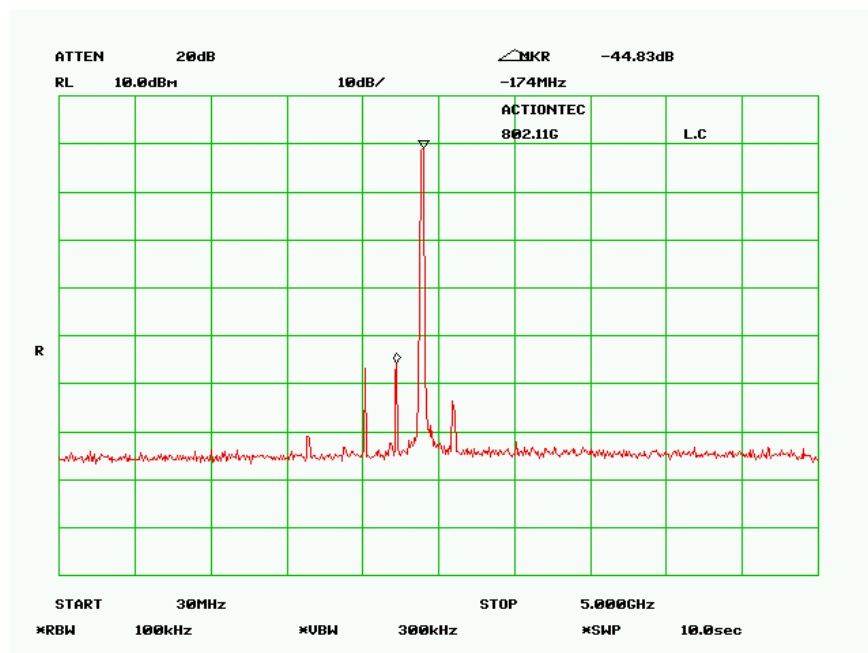


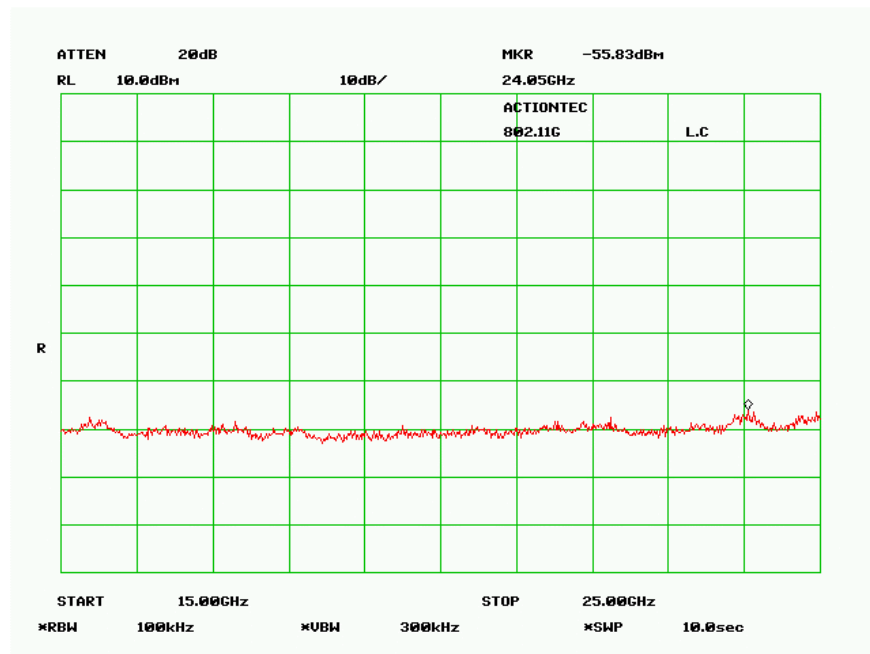
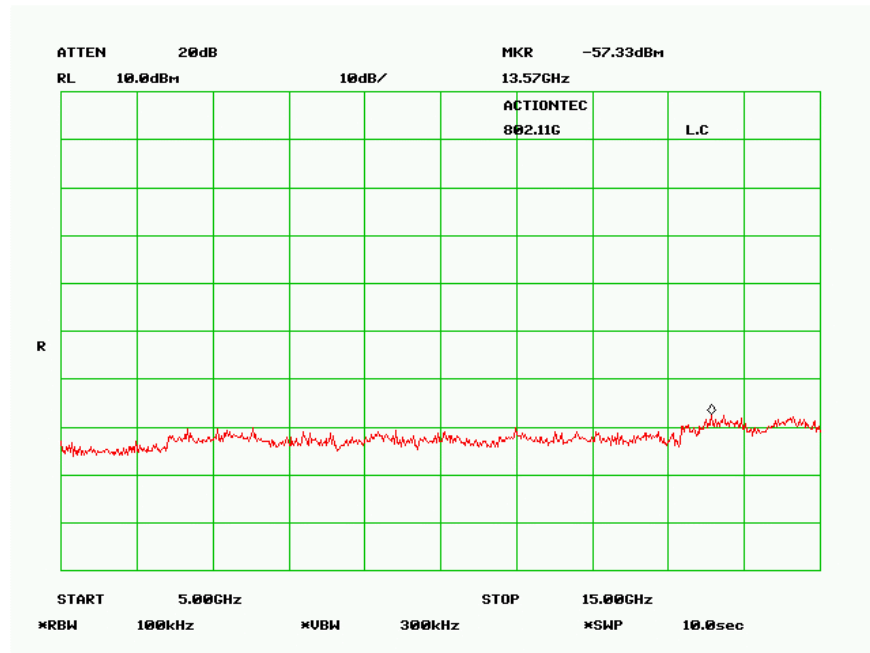
High Channel

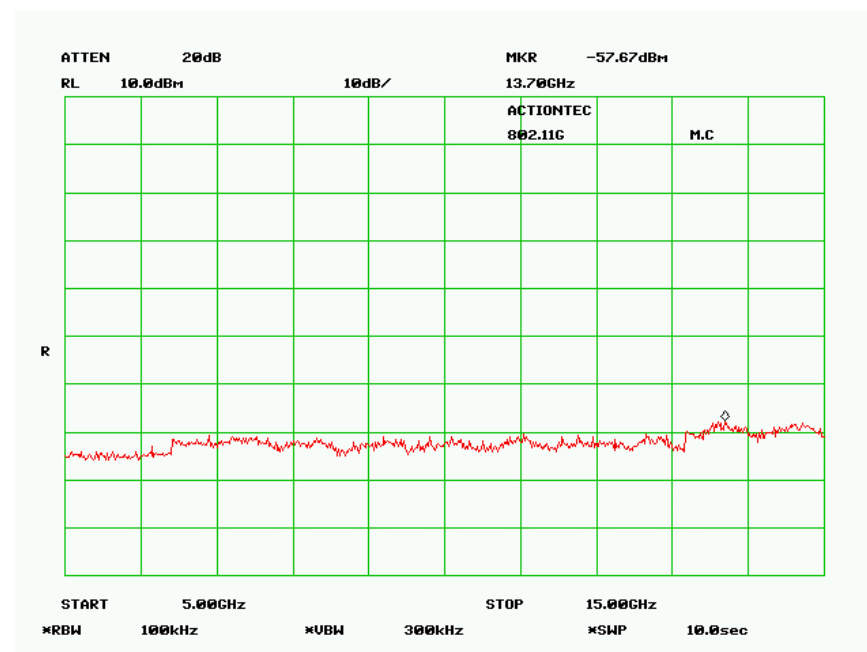
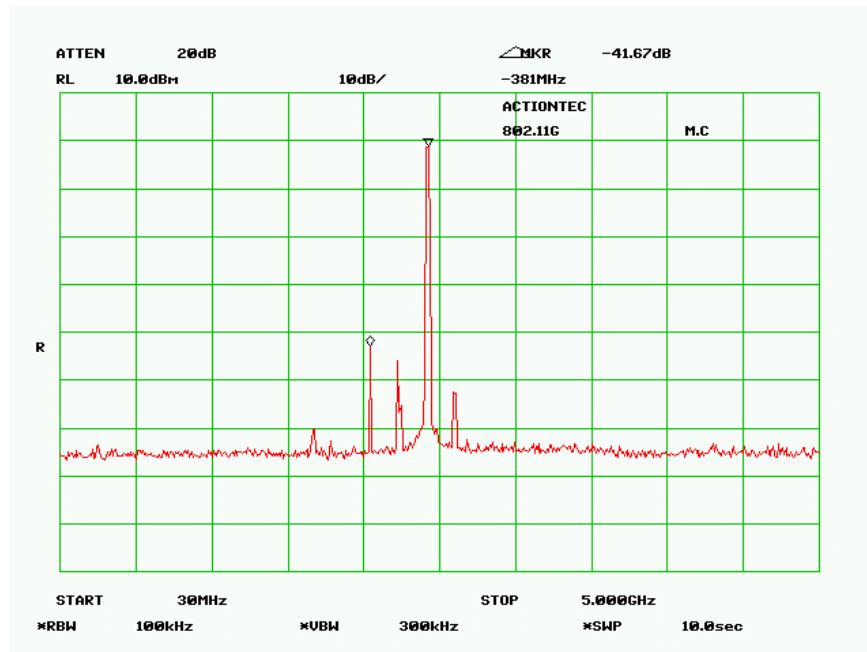


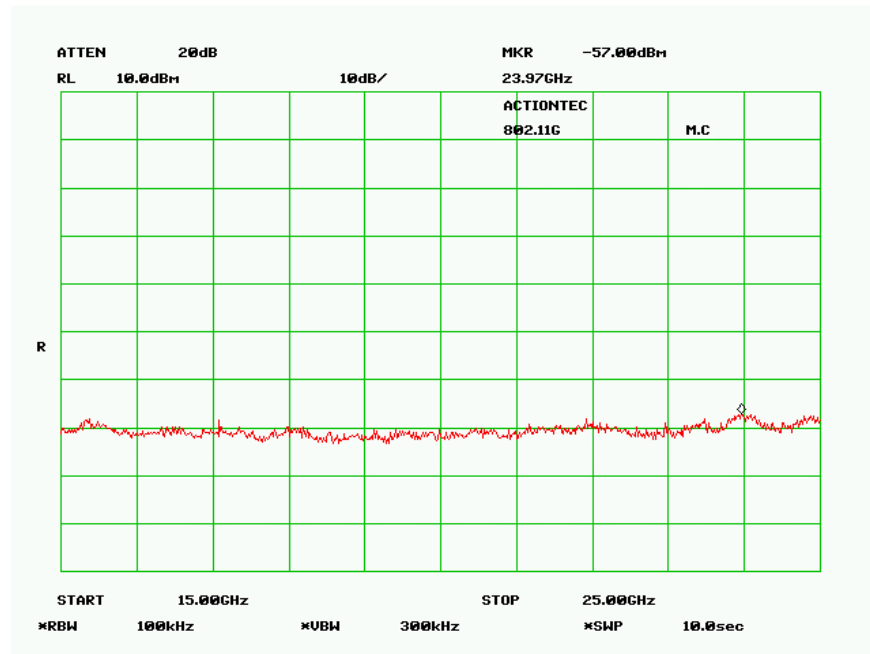
802.11g

Low Channel

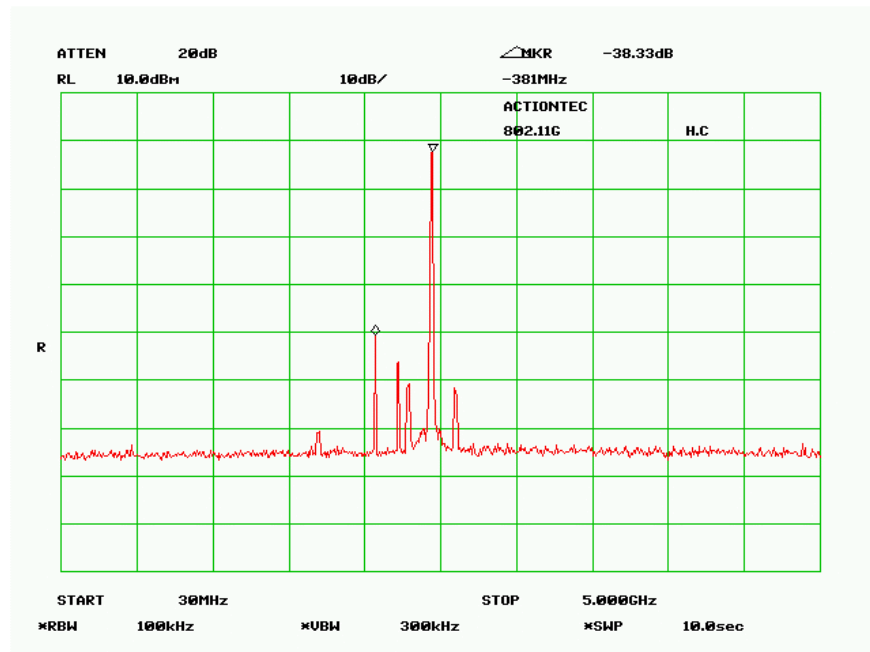


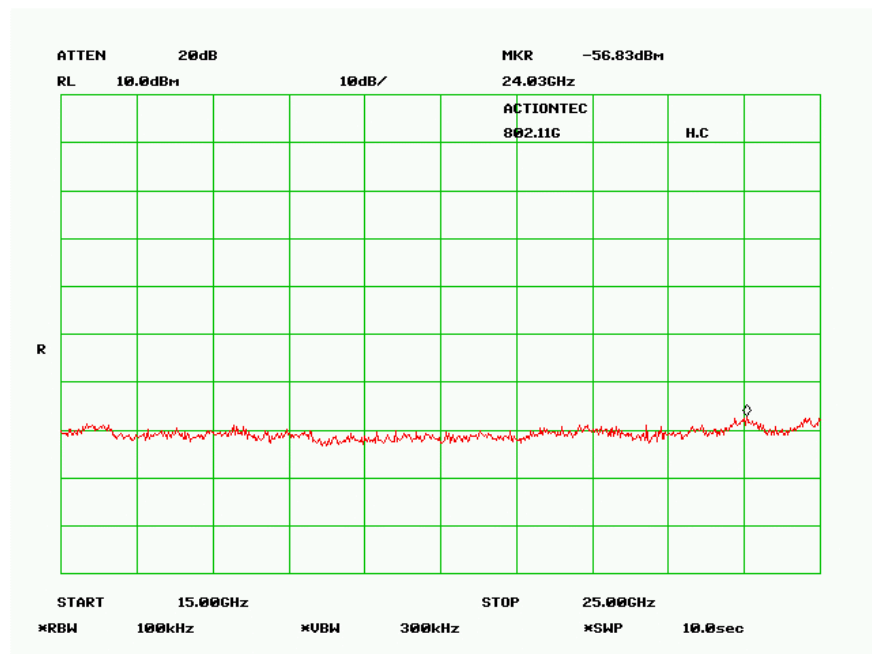
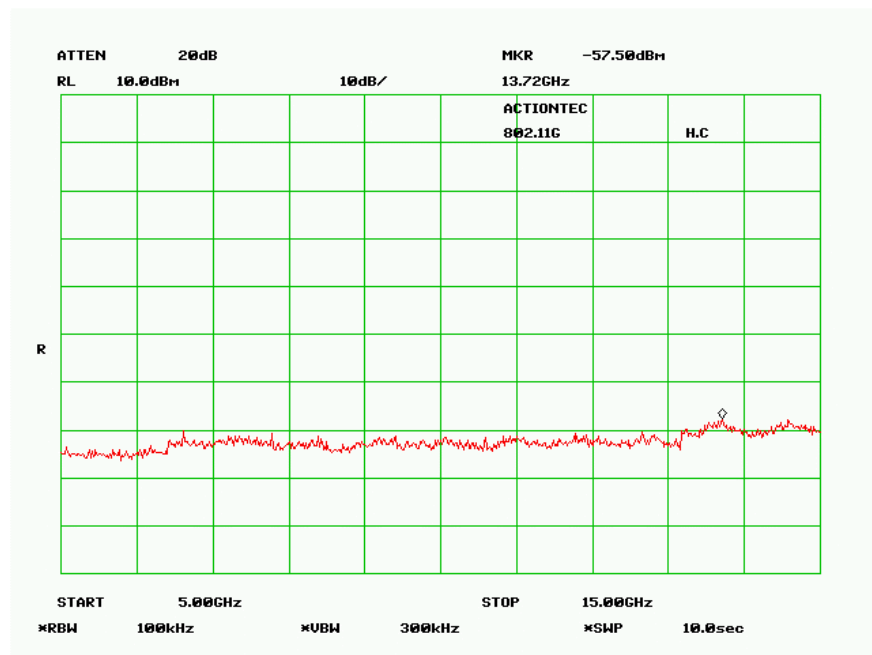


Mid Channel



High Channel





§15.205 & §15.209 - SPURIOUS RADIATED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties. 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 BACL is ± 4.0 dB.

According to §15.205, except as shown 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	399.9 – 410	4.5 – 5.15
¹ 0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.57725	240 – 285	3345.8 – 3358	36.43 – 36.5
13.36 – 13.41	322 – 335.4	3600 – 4400	(²)

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510MHz

² Above 38.6

Except as provided in paragraph (d) and (e), the filed strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

According to §15.209, the device shall meet radiated emission general requirements.

Except for Class A device, the filed strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength	
	(Microvolts/meter)	(dB μ V/meter)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 limits.

The spacing between the peripherals was 10 centimeters.

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

The EUT was connected to the power adapter which is connected with 120Vac/60Hz power source.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR, Section 15.33, the frequency was investigated from 30 to 25000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

For Average measurement: RBW = 1MHz, VBW = 10Hz (above 1000MHz)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Analyzer, Spectrum	8565EC	3946A00131	08/06/2005
ETS	Antenna, Log-Periodic	3148	4-1155	12/14/2004
ETS	Antenna, Biconical	3110B	9603-2315	12/14/2004
HP	Amplifier, Pre	8447D	2944A10198	08/20/2005
HP	Amplifier, Pre, Microwave	8449B	3147A00400	06/14/2005
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	04/20/2005
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	09/29/2004
Sunol Sciences	Antenna	JB1	A013105-3	02/11/2005

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

Test Procedure

For the radiated emissions test, the EUT, 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.

All data was recorded in the peak detection mode. Quasi-peak readings 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC 15.209 Limit}$$

Environmental Conditions

Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1018 mbar

**The testing was performed by Kevin Lee on 2005-09-16.*

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:

802.11b:

-13.6 dB at **7236.00 MHz** in the **Horizontal** polarization, Low Channel

-14.1 dB at **7311.00 MHz** in the **Horizontal** polarization, Middle Channel

-13.7 dB at **7386.00 MHz** in the **Vertical** polarization, High Channel

802.11g:

-13.9 dB at **7236.00 MHz** in the **Horizontal** polarization, Low Channel

-14.2 dB at **7311.00 MHz** in the **Vertical** polarization, Middle Channel

-13.5 dB at **7386.00 MHz** in the **Horizontal** polarization, High Channel

-0.9 dB at **164.48 MHz** in the **Horizontal** polarization, Unintentional Emission *

*: Test data are within the measurement uncertainty $\pm 4.0\text{dB}$.

Radiated Emission Test Result for 802.11b

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 SUBPART C	
Frequency MHz	Ampl. dBμV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dB	Cable dB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
Low Channel, 1-25GHz											
7236.0000	34.1	Ave	45	1.4	h	36.7	4.3	34.7	40.4	54	-13.6
7236.0000	33.2	Ave	90	1.5	h	36.7	4.3	34.7	39.5	54	-14.5
7236.0000	47.3	Peak	345	1.4	h	36.7	4.3	34.7	53.6	74	-20.4
7236.0000	47.0	Peak	90	1.4	v	36.7	4.3	34.7	53.3	74	-20.7
4824.0000	31.7	Ave	245	1.2	h	32.5	3.1	34.8	32.5	54	-21.5
4824.0000	31.5	Ave	270	1.3	v	32.5	3.1	34.7	32.5	54	-21.5
4824.0000	45.4	Peak	270	1.3	h	32.5	3.1	34.8	46.2	74	-27.8
4824.0000	44.9	Peak	270	1.2	v	32.5	3.1	34.7	45.9	74	-28.1
Middle Channel, 1-25GHz											
7311.0000	33.6	Ave	170	1.2	h	36.7	4.3	34.7	39.9	54	-14.1
7311.0000	33.4	Ave	255	1.6	v	36.7	4.3	34.7	39.8	54	-14.2
7311.0000	48.3	Peak	165	1.2	h	36.7	4.3	34.7	54.6	74	-19.4
7311.0000	46.6	Peak	190	1.8	v	36.7	4.3	34.7	52.9	74	-21.1
4874.0000	31.3	Ave	160	1.5	h	32.5	3.1	34.8	32.1	54	-21.9
4874.0000	30.6	Ave	300	1.8	v	32.5	3.1	34.8	31.4	54	-22.6
4874.0000	44.6	Peak	165	1.6	h	32.5	3.1	34.8	45.4	74	-28.6
4874.0000	44.2	Peak	180	1.6	v	32.5	3.1	34.8	45.0	74	-29.0
High Channel, 1-25GHz											
7386.0000	34.0	Ave	255	1.5	v	36.7	4.3	34.7	40.3	54	-13.7
7386.0000	34.0	Ave	90	1.4	h	36.7	4.3	34.7	40.3	54	-13.7
7386.0000	47.3	Peak	115	1.5	v	36.7	4.3	34.7	53.6	74	-20.4
7386.0000	47.1	Peak	345	1.4	h	36.7	4.3	34.7	53.4	74	-20.6
4924.0000	31.3	Ave	270	1.3	h	32.5	3.1	34.7	32.2	54	-21.8
4924.0000	31.3	Ave	200	1.4	v	32.5	3.1	34.8	32.1	54	-21.9
4924.0000	45.3	Peak	205	1.5	v	32.5	3.1	34.8	46.1	74	-28.0
4924.0000	44.8	Peak	270	1.4	h	32.5	3.1	34.7	45.8	74	-28.2

Radiated Emission Test Result for 802.11g

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 SUBPART C	
Frequency	Ampl.	Comments	Angle	Height	Polar	Anten na	Cable	Amp.	Corr. Ampl.	Limit	Margin
MHz	dBμV/ m		Degree	Meter	H/ V	dB	dB	dB	dBμV/m	dBμV/m	dB
Low Channel, 1-25GHz											
7236.0000	33.8	Ave	45	1.3	h	36.7	4.3	34.7	40.1	54	-13.9
7236.0000	33.4	Ave	95	1.5	h	36.7	4.3	34.7	39.7	54	-14.3
7236.0000	47.3	Peak	325	1.3	h	36.7	4.3	34.7	53.6	74	-20.4
7236.0000	47.2	Peak	90	1.3	v	36.7	4.3	34.7	53.5	74	-20.5
4824.0000	31.8	Ave	275	1.2	v	32.5	3.1	34.7	32.8	54	-21.2
4824.0000	31.9	Ave	215	1.2	h	32.5	3.1	34.8	32.7	54	-21.3
4824.0000	44.5	Peak	255	1.4	h	32.5	3.1	34.8	45.3	74	-28.7
4824.0000	44.2	Peak	275	1.2	v	32.5	3.1	34.7	45.2	74	-28.8
Middle Channel, 1-25GHz											
7311.0000	33.5	Ave	250	1.6	v	36.7	4.3	34.7	39.8	54	-14.2
7311.0000	33.5	Ave	175	1.2	h	36.7	4.3	34.7	39.8	54	-14.2
7311.0000	48.1	Peak	175	1.2	h	36.7	4.3	34.7	54.4	74	-19.6
4874.0000	31.6	Ave	315	1.8	v	32.5	3.1	34.8	32.4	54	-21.6
7311.0000	45.9	Peak	180	1.8	v	36.7	4.3	34.7	52.2	74	-21.8
4874.0000	31.3	Ave	160	1.5	h	32.5	3.1	34.8	32.1	54	-21.9
4874.0000	44.8	Peak	165	1.6	h	32.5	3.1	34.8	45.6	74	-28.4
4874.0000	43.2	Peak	180	1.6	v	32.5	3.1	34.8	44.0	74	-30.0
High Channel, 1-25GHz											
7386.0000	34.2	Ave	90	1.4	h	36.7	4.3	34.7	40.5	54	-13.5
7386.0000	33.2	Ave	215	1.5	v	36.7	4.3	34.7	39.5	54	-14.5
7386.0000	47.1	Peak	90	1.5	v	36.7	4.3	34.7	53.4	74	-20.6
7386.0000	46.4	Peak	325	1.4	h	36.7	4.3	34.7	52.7	74	-21.3
4924.0000	31.8	Ave	225	1.5	v	32.5	3.1	34.8	32.6	54	-21.4
4924.0000	31.2	Ave	275	1.4	h	32.5	3.1	34.7	32.2	54	-21.8
4924.0000	44.8	Peak	215	1.4	v	32.5	3.1	34.8	45.6	74	-28.4
4924.0000	44.2	Peak	270	1.5	h	32.5	3.1	34.7	45.2	74	-28.8

30MHz – 1GHz

Frequency MHz	Indicated		Table Height Meter	Antenna		Correction Factor			FCC 15 Subpart B	
	Ampl. dBμV/m	Direction Degree		Polar H/V	Antenna dB	Cable Loss dB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
164.48	55.89	155	1.7	h	12.2	2.5	28.0	42.6	43.5	-0.9
172.21	53.43	282	1.3	h	11.9	2.8	27.8	40.3	43.5	-3.2
172.21	52.23	215	1.5	v	11.9	2.8	27.8	39.1	43.5	-4.4
164.48	49.27	195	1.5	v	12.2	2.5	28.0	36.0	43.5	-7.5
184.35	49.3	180	1	h	11.6	2.8	27.8	35.9	43.5	-7.6
240.01	45.4	305	1.8	v	11.5	3.3	27.5	32.7	46	-13.3
184.35	43.18	150	1	v	11.6	2.8	27.8	29.8	43.5	-13.7
240.01	44.31	25	1.4	h	11.5	3.3	27.5	31.6	46	-14.4

§15.247(a)(2) – 6 dB BANDWIDTH

Standard Applicable

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 emission bandwidth. (6 dB bandwidth for DTS)
4. Repeat above procedures until all frequencies measured were complete.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Hewlett Packard	Spectrum Analyzer	8564E	3943A01781	10/04/2004

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

Measurement Result

Environmental Conditions

Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1018 mbar

**The testing was performed by Kevin Lee on 2005-09-16.*

Test Result

802.11b

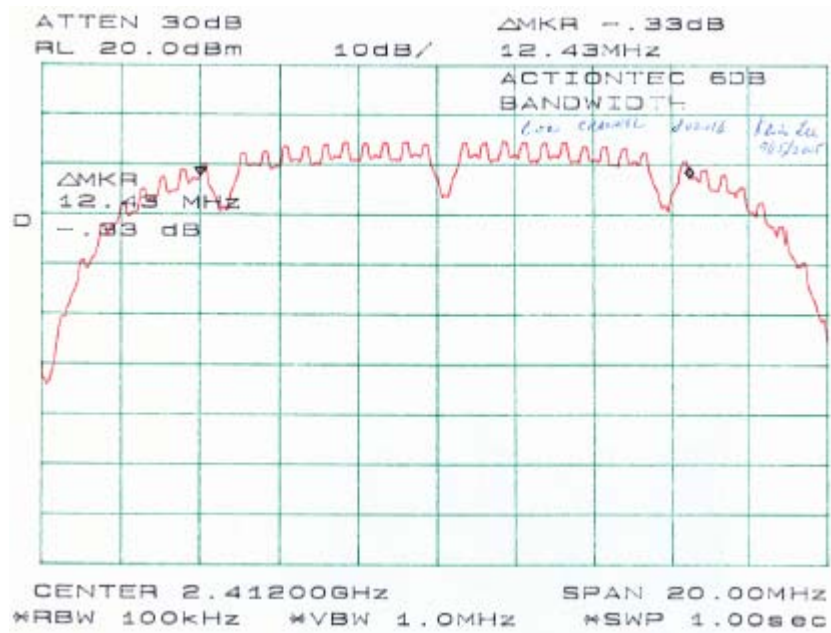
Channel	Frequency (MHz)	Measured (MHz)	Standard (kHz)	Result
Low	2412	12.43	≥ 500	Pass
Mid	2442	11.33	≥ 500	Pass
High	2462	12.47	≥ 500	Pass

802.11g

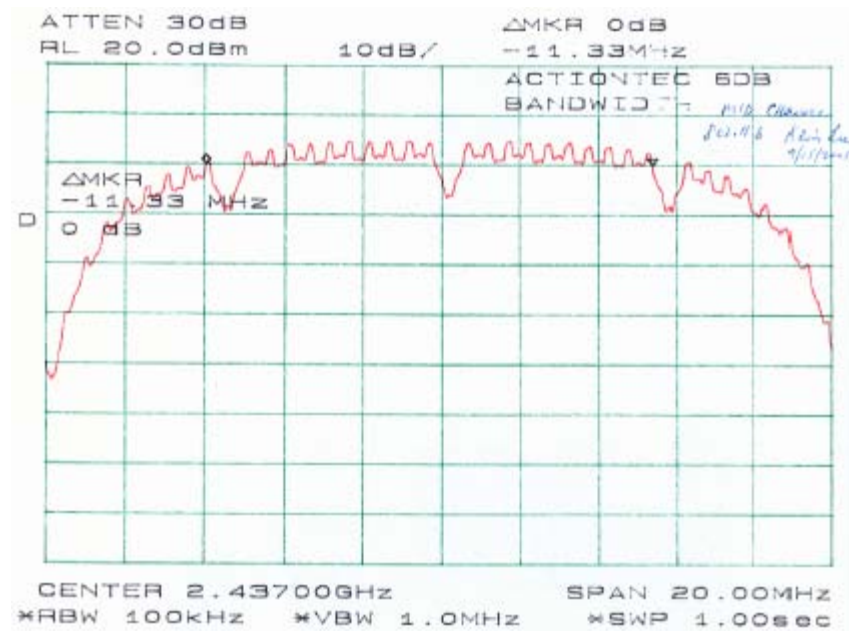
Channel	Frequency (MHz)	Measured (MHz)	Standard (kHz)	Result
Low	2412	16.90	≥ 500	Pass
Mid	2442	16.87	≥ 500	Pass
High	2462	16.83	≥ 500	Pass

802.11b

Low Channel



Middle Channel

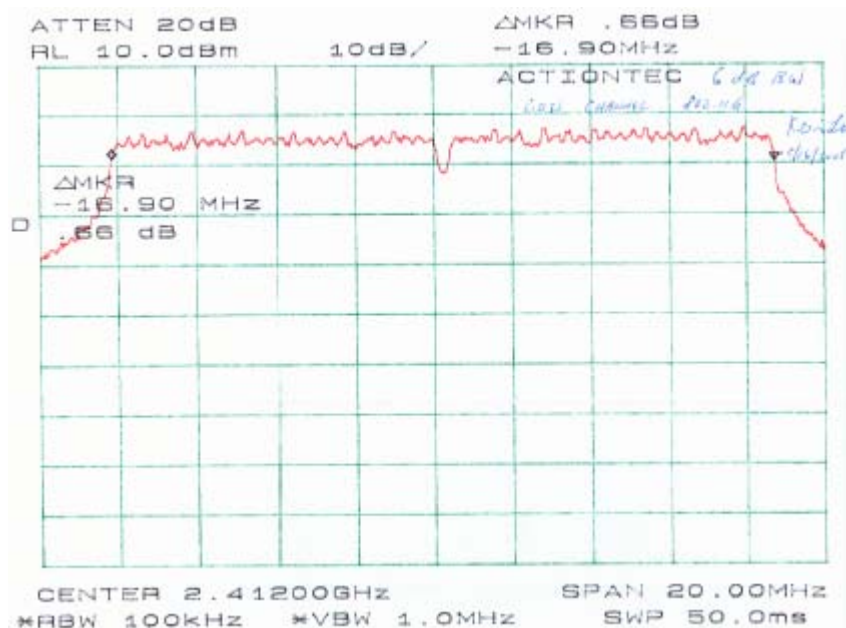


High Channel

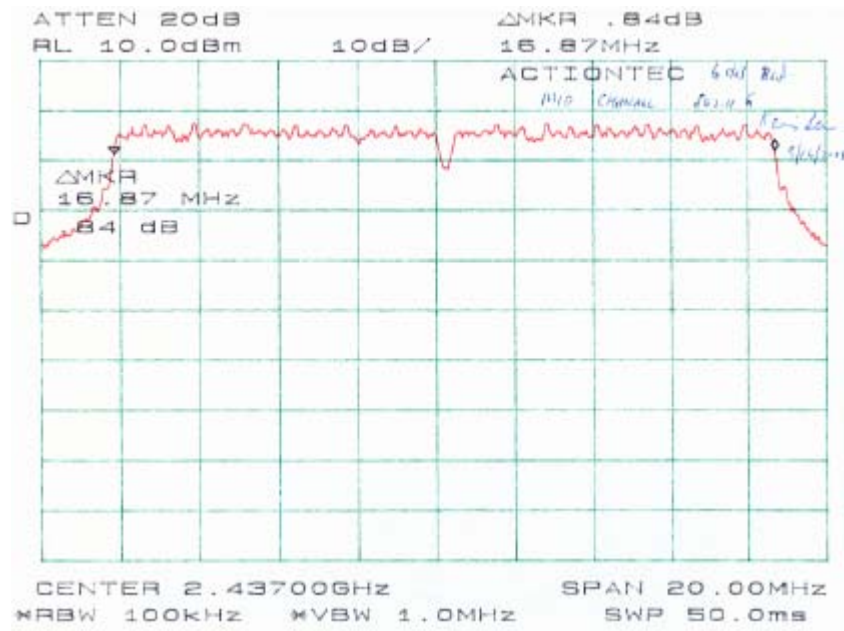


802.11g

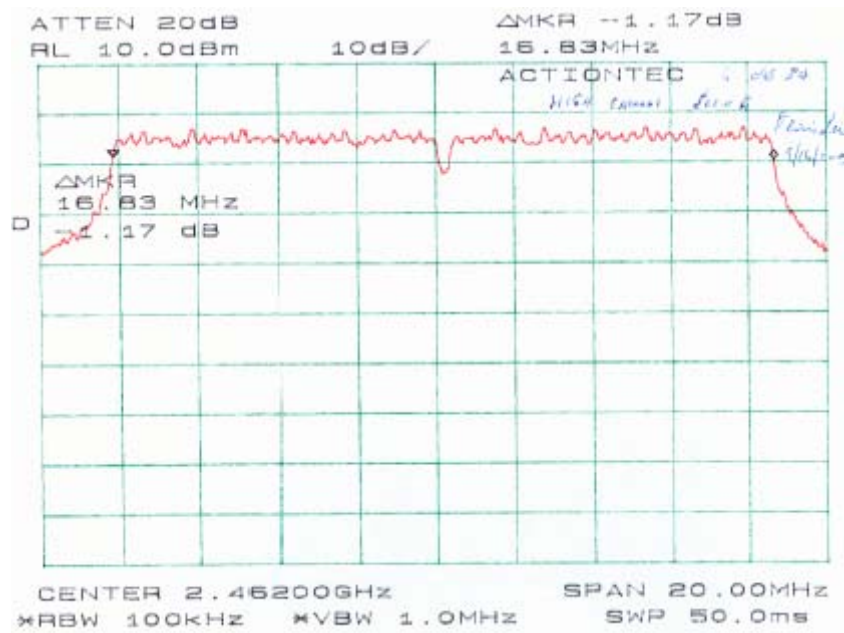
Low Channel



Middle Channel



High Channel



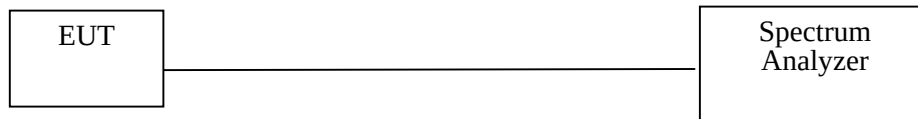
§15.247(b)(3) - PEAK OUTPUT POWER MEASUREMENT

Standard Applicable

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.



Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Hewlett Packard	Spectrum Analyzer	8564E	3943A01781	10/04/2004

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

Measurement Result

Environmental Conditions

Temperature:	21° C
Relative Humidity:	46%
ATM Pressure:	1018 mbar

**The testing was performed by Kevin Lee on 2005-10-05.*

Output Power

802.11b

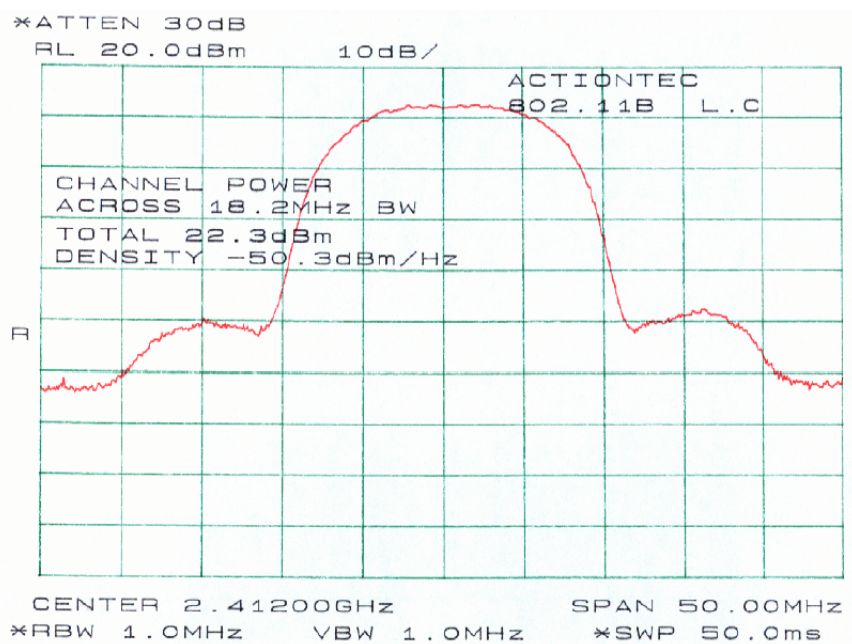
Channel	Frequency MHz	Max Peak Output Power		Limit (W)	Result
		(dBm)	(W)		
Low	2412	22.3	0.170	1	Pass
Mid	2442	22.1	0.162	1	Pass
High	2462	22.0	0.158	1	Pass

802.11g

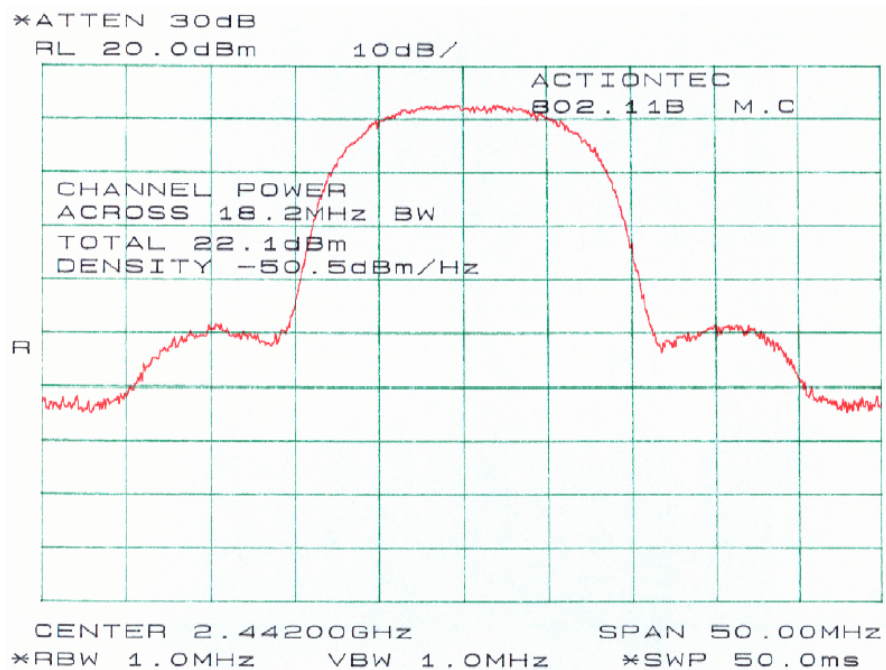
Channel	Frequency MHz	Max Peak Output Power		Limit (W)	Result
		(dBm)	(W)		
Low	2412	19.1	0.081	1	Pass
Mid	2442	19.1	0.081	1	Pass
High	2462	18.7	0.074	1	Pass

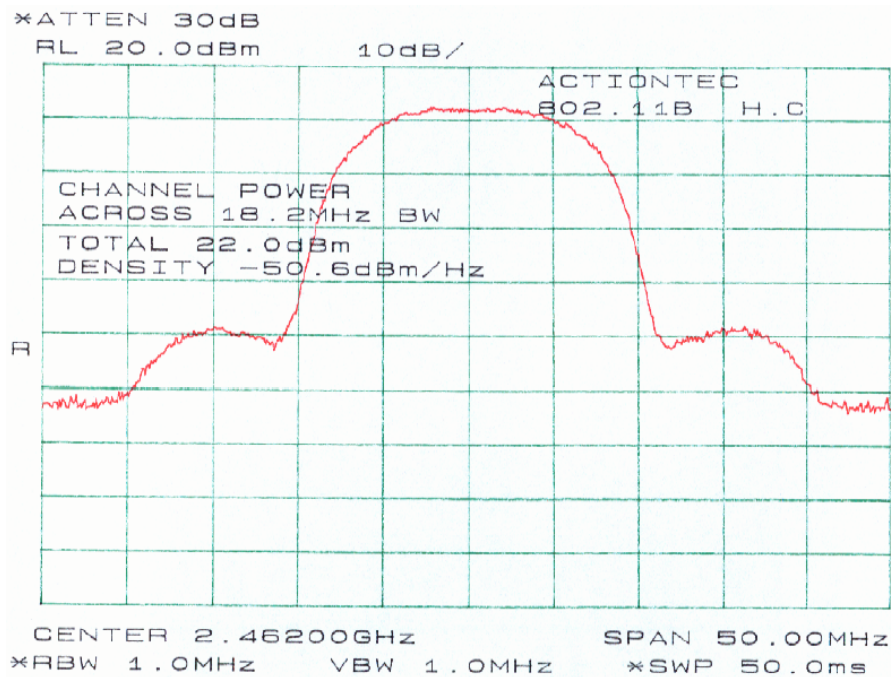
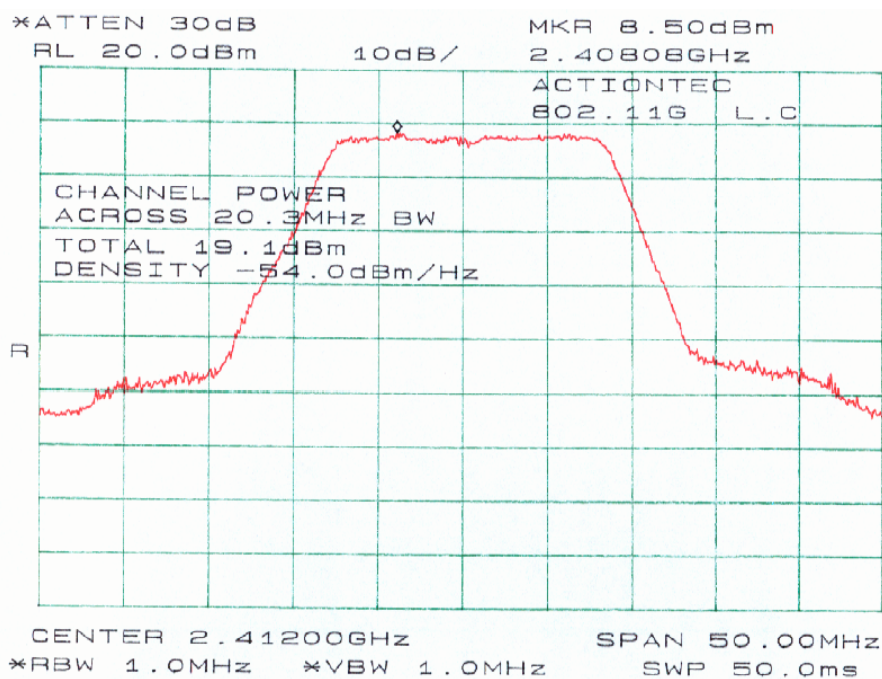
Plots of Output Power for 802.11b

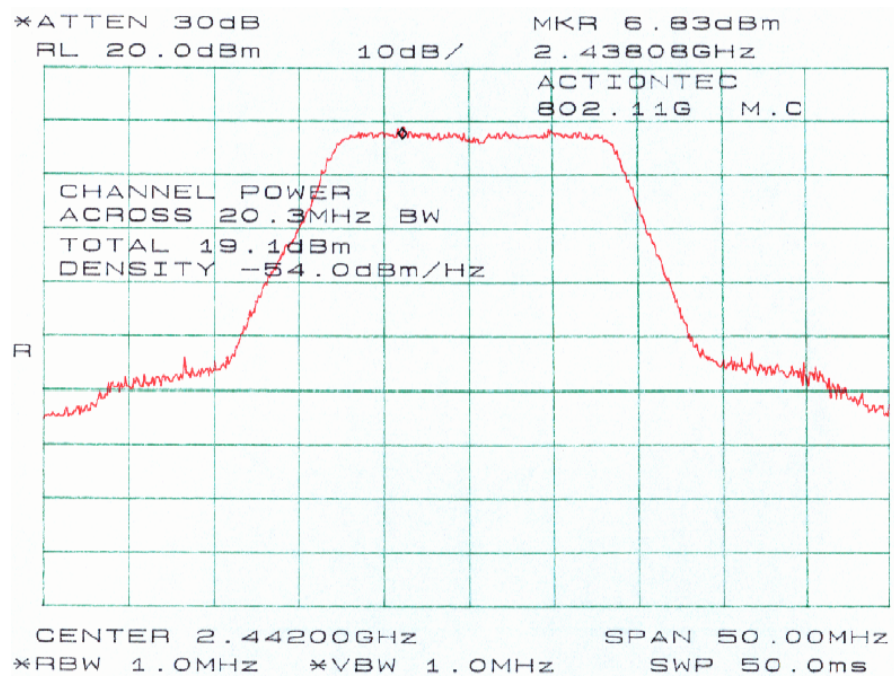
Low Channel



Middle Channel



High Channel*Plots of Output Power for 802.11g**Low Channel*

Middle Channel*High Channel*