731 Enterprise Drive
Lexington, KY 40510

Telephone: 859-226-1000
Facsimile: 859-226-1040
www.intertek-etlsemko.com

TEST REPORT

Report Number: 3172127LEX-001
Project Number: 3172127

Evaluation of the Lexmark 802.11 Wireless Adapter
Model Number: LEX-M01-002

FCC ID: *IYLM01002*

Industry Canada ID: *2376A-M01002*

Tested to the Criteria in
FCC Part 15 Subpart C (15.247),
FCC Part 15 Subpart B (15.107 and 15.109),
ICES-003. RSS-210 Issue 7, and RSS-Gen Issue 2

For

Lexmark International, Inc.

Test Performed by:	Test Authorized by:
Intertek	Lexmark International, Inc.
731 Enterprise Drive	740 West New Circle Road
Lexington, KY 40510	Lexington, KY 40511

Prepared By:_____ **Date:** 4/28/2009

Bryan Taylor, Team Leader

Approved By:_____ **Date:** 4/28/2009

Jason Centers, Senior Project Engineer

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1 JOB DESCRIPTION

1.1 Test Sample Information

The LEX-M01-002 is an 802.11b/g wireless print server. It allows the printer, that it is installed in, to be shared on a wireless network without the use of CAT5, USB, or Serial connections. It is sold as an option on some printer models.

Company Information	
Manufacturer:	Lexmark International, Inc.
Address:	740 West New Circle Road Lexington KY 40511
Contact Name:	Mike Klave
Telephone Number:	(859) 232-3512
Fax Number:	(859) 232-7345
Email Address:	mklave@lexmark.com

Test sample		
Lexmark Model Number:	LEX-M01-002	
Serial Number:	Not Labled	
FCC ID:	IYLM01002	
Industry Canada ID:	2376A-M01002	
Device Category:	Mobile	
RF Exposure Category:	General Population/Uncontrolled Environment	
Transmission Modes:	**802.11b**	**802.11g**
Frequency Range, MHz:	2412MHz – 2462MHz	2412MHz – 2462MHz
Type of Transmission:	QPSK, BSK, CCK	BPSK, QPSK, 16QAM, 64QAM
Maximum Peak Conducted Output Power:	16.2dBm	15.68
Antenna Type:	PCB Antenna	
Antenna Location:	On PCB	
Antenna Gain:	2.75 dBi	
Sample Receive Date:	2/18/2009	

Test Signal Mode	
Test Commands:	X
Base Station Simulator:	

1.2 System Support Equipment

A Compaq laptop (Model EVO N410c) was used to configure the transmit mode of the 802.11 Wireless Adapter prior to each test. It also provided DC power to the test sample via the USB connection. No other support equipment was used.

1.3 Cables associated with EUT

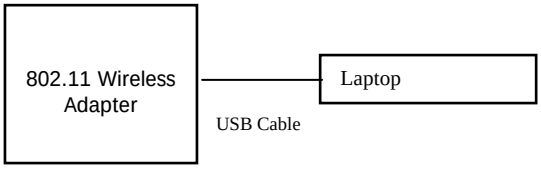
Table 1-1 contains the details of the cables associated with the EUT.

Table 1-1: Interconnecting cables between modules of EUT

Cables					
Description	**Length**	**Shielding**	**Ferrites**	**Connection**	
				From	**To**
DC Cable	6 ft.	None	None	Laptop	AC/DC Power Converter for Laptop
AC Power Cable	6 ft.	None	None	AC/DC Power Converter for Laptop	120VAC Power Source
USB Cable	3 ft.	Yes	None	EUT	Laptop

1.4 System Block Diagram

The diagram shown below details the interconnection of the EUT and its accessories during the testing.



1.5 Mode(s) of operation

The 802.11 Wireless Adapter was powered via a USB cable (5VDC) connected to a laptop computer. The laptop was powered by an 18VDC power brick which was connected to 120VAC / 60Hz. In order to force the 802.11 Wireless Adapter to transmit during the evaluation a control program was used to communicate with the module via the same USB cable. This software enabled the user to adjust the output power of the transmitter, change the transmission modulation scheme, and to select the transmit channel. During the evaluation the 802.11 Wireless Adapter was set to transmit at maximum output power as instructed by Lexmark International, Inc..

1.6 Modifications required for compliance

No modifications were required for compliance.

1.7 Related Submittal(s) Grants

None

2 EXECUTIVE SUMMARY

Testing performed for: Lexmark International, Inc.

Equipment Under Test: Model LEX-M01-002

Test Start Date: 2/18/2009

Test End Date: 2/28/2009

This device meets the requirements for modular approval.

Testing was performed using the methods outlined in KDB 558074.

IC Rule	FCC Rule	Description Of Test	Result	Page
RSS-210 (A8.2, A8.2, A8.4(4))	§15.247(a)(b)(d)	Conducted RF Power	**Compliant**	8
RSS-210 A8.4(4)	§15.247(b)	Effective Radiated Power	**Compliant**	8
RSS-210 (A8.2, A8.2, A8.4(4))	§15.247(a)(b)(d)	Measurement of 6dB Bandwidth	**Compliant**	10
RSS-210 (A8.2, A8.2, A8.4(4))	§15.247(a)(b)(d)	Power Density	**Compliant**	17
RSS-102	§15.247(b)(5)	Maximum Permissible Exposure (MPE) Calculations	**Compliant**	24
RSS-210 A8.5	§15.247(c)	Out of Band Emissions at Antenna Terminals	**Compliant**	26
RSS-210 2.2	§15.247(c) and §15.209(f)	Field Strength of Spurious Radiation (General Requirements and Restricted Band Requirements)	**Compliant**	28
ICES-003, RSS-Gen (7.2.3)	§15.109	Receiver Spurious Emissions	**Compliant**	39
ICES-003, RSS-Gen (7.2.2)	§15.107, §15.207	Power Line Conducted Emissions	**Compliant**	41

3 TEST FACILITY

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

3.1 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
RF Power Meter	Giga-tronics	8541C	1838539	7/29/2009
RF Power Sensor	Giga-tronics	80601A	1832667	7/29/2009
Signal Generator	Hewlett Packard	83620B	3614A00199	9/8/2009
Environmental Chamber	Thermotron	SM-8-C	32692	1/29/2010
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	8/28/2009
EMC Analyzer	Agilent Technologies	E7405	2142	9/5/2009
Horn Antenna	Antenna Research	DRG-118/A	1086	7/28/2009
Horn Antenna	EMCO	3115	6556	8/8/2009
Horn Antenna	EMCO	3116	9310-2222	4/29/2009
Bilog Antenna	ETS	3142C	00051864	12/24/2009
High Pass Filter	Microwave Circuits	H3G020G2	3986-01 DC0408	Verify at Time of Use
LISN	Fischer Custom Communication	FCC-LISN-50-50-2M	1026	5/6/2009
Pre-Amp	Miteq	AFS44-00102000-30-10P-44	987410	6/20/2009
Pre-Amp	Miteq	JS4-18004000-30-5P-S	965178	9/2/2009

4 CONDUCTED RF POWER AND EIRP

4.1 Test Procedure (FCC Rule: §15.247(b) Conducted RF Power and EIRP)

The antenna port of the 802.11 Wireless Adapter was connected to the input of a peak power meter. The power was read directly from the power meter and corrected for cable loss to obtain the power at the antenna terminals. Conducted power was measured on all channels and for all data rates and modulation modes.

The peak radiated RF output power for the 802.11 Wireless Adapter was calculated using the measured peak output power at the antenna terminals as follows:

$$EIRP = P_1 + G$$

where,

P_1 is the measured peak output power

G is the gain of the transmitting antenna in dBi.

The output power was measured in each modulation type and data rate, and the worst case was selected from 802.11b and 802.11g modes and used throughout the remainder of the evaluation.

4.2 Radiated and Conducted Output Power Criteria

The maximum allowable transmitter power (conducted or radiated) for antennas with gains of 6dBi or less is 1watt (30dBm).

4.3 Test Results

The 802.11 Wireless Adapter met the RF power output of FCC Part 15 Subpart C (15.247). The test results are located in Table 4-1. None of the conducted power or EIRP measurements exceeded the 30dBm limit.

Table 4-1 RF Output Power Measurements

Frequency MHz	Mode	Modulation	Data Rate (Mbps)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)
2437 Channel 6	802.11b	BPSK	1	15.68	2.75	18.43
		QPSK	2	15.77	2.75	18.52
		CCK	5.5	16.2	2.75	**18.95**
		CCK	11	15.7	2.75	18.45
	802.11g	OFDM	6	15.68	2.75	18.43
		OFDM	9	15.62	2.75	18.37
		OFDM	12	15.43	2.75	18.18
		OFDM	18	15.2	2.75	17.95
		OFDM	24	15.62	2.75	18.37
		OFDM	36	15.5	2.75	18.25
		OFDM	48	15.5	2.75	18.25
		OFDM	54	15.5	2.75	18.25
2412 Channel 1	802.11b	BPSK	1	15.6	2.75	18.35
		QPSK	2	15.42	2.75	18.17
		CCK	5.5	15.52	2.75	18.27
		CCK	11	15.5	2.75	18.25
	802.11g	OFDM	6	15.1	2.75	17.85
		OFDM	9	15	2.75	17.75
		OFDM	12	15	2.75	17.75
		OFDM	18	15	2.75	17.75
		OFDM	24	15.1	2.75	17.85
		OFDM	36	14.9	2.75	17.65
		OFDM	48	15	2.75	17.75
		OFDM	54	15.1	2.75	17.85
2462 Channel 11	802.11b	BPSK	1	16.1	2.75	18.85
		QPSK	2	15.9	2.75	18.65
		CCK	5.5	15.96	2.75	18.71
		CCK	11	16	2.75	18.75
	802.11g	OFDM	6	15.5	2.75	18.25
		OFDM	9	15.5	2.75	18.25
		OFDM	12	15.4	2.75	18.15
		OFDM	18	15.51	2.75	18.26
		OFDM	24	15.3	2.75	18.05
		OFDM	36	15.4	2.75	18.15
		OFDM	48	15.43	2.75	18.18
		OFDM	54	15.45	2.75	18.20

5 MEASUREMENT OF 6DB BANDWIDTH

5.1 Test Procedure (FCC Rule: §15.247(a), 6dB Bandwidth)

The antenna port of the 802.11 Wireless Adapter was connected to the input of a spectrum analyzer. The analyzer amplitude was offset for the associated cable loss. The analyzer resolution and video bandwidths were set to 100kHz and the max hold function was turned on. A marker peak search was performed on the resultant trace to find the peak amplitude. Markers were then positioned on either side of the peak amplitude such that they were 6dB lower than that amplitude. The 6dB bandwidth was the frequency difference between the marker on the lower side and the marker on the higher side of the peak amplitude. The 6dB bandwidth was measured for the highest data rate for each possible modulation mode on the high, middle, and low channels.

5.2 6dB Bandwidth Criteria

The minimum 6dB bandwidth shall be at least 500kHz

5.3 Test Results

The LEX-M01-002 802.11 Wireless Adapter met the 6dB bandwidth requirements of FCC Part 15 Subpart C (15.247). The test results are located in Table 5-1 and in Figure 5-1 through Figure 5-6.

Table 5-1: 6dB BandwidthMeasurements

Mode	Channel	Frequency (MHz)	6dB Bandwidth
802.11b	1	2411	10.625MHz
802.11b	6	2437	11.375MHz
802.11b	11	2462	10.375MHz
802.11g	1	2411	16.75MHz
802.11g	6	2437	16.5MHz
802.11g	11	2462	16.5MHz

Figure 5-1: 6dB Bandwidth, 802.11b, Channel 1

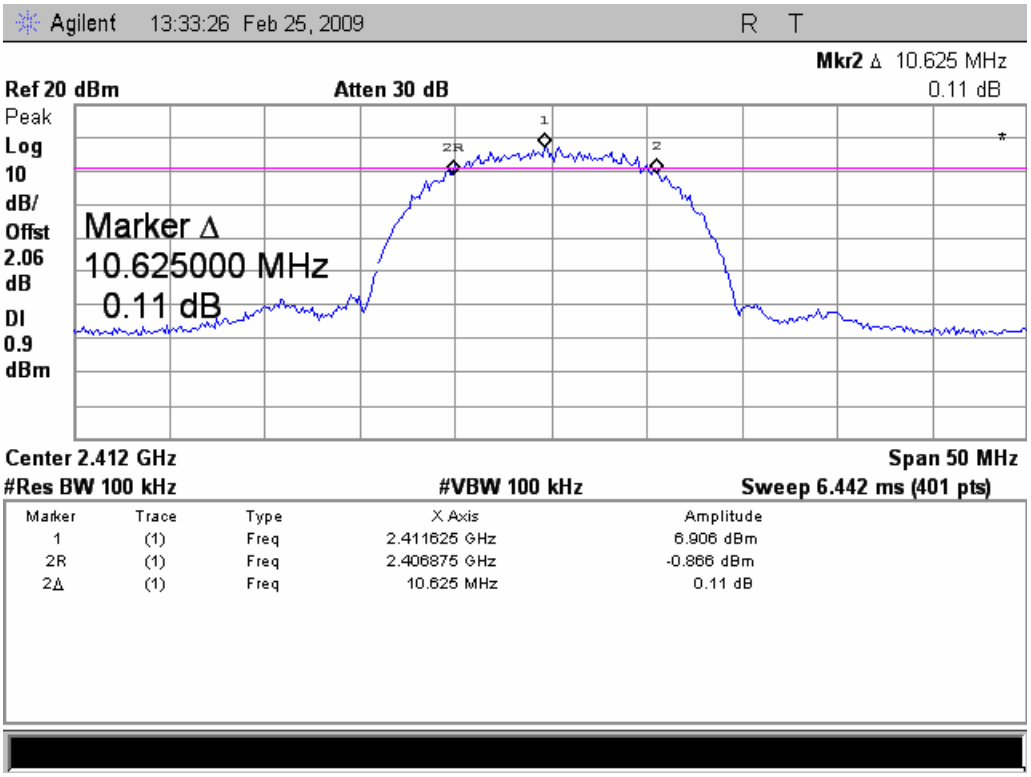


Figure 5-2: 6dB Bandwidth, 802.11b, Channel 6

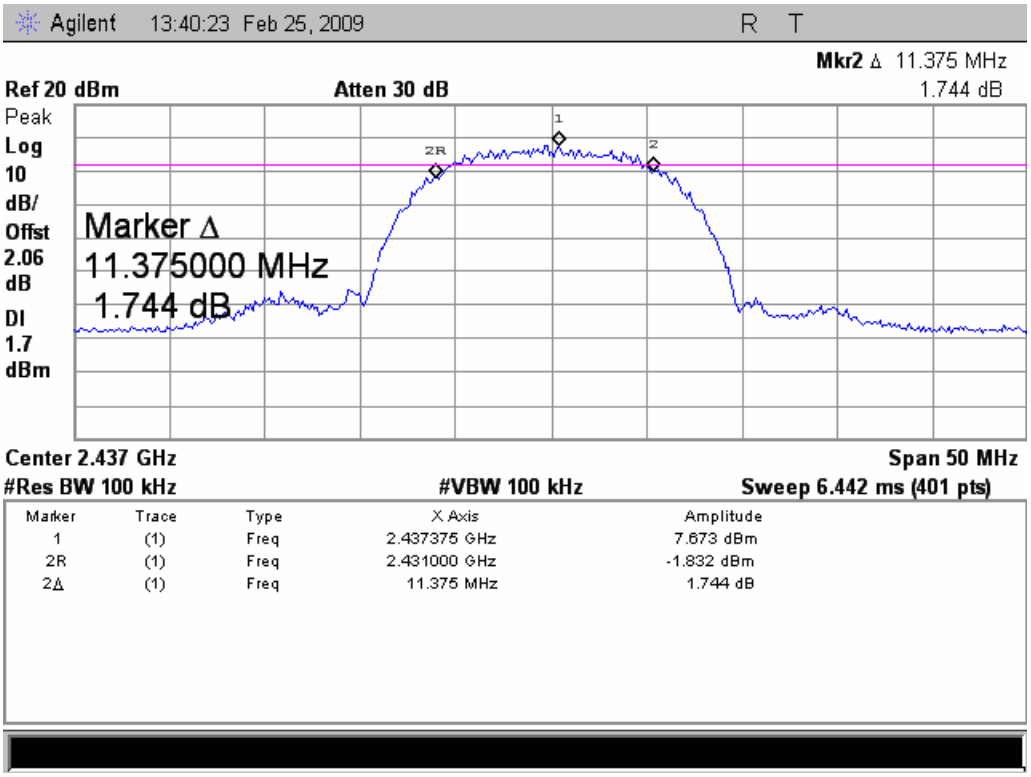


Figure 5-3: 6 dB Bandwidth, 802.11b, Channel 11

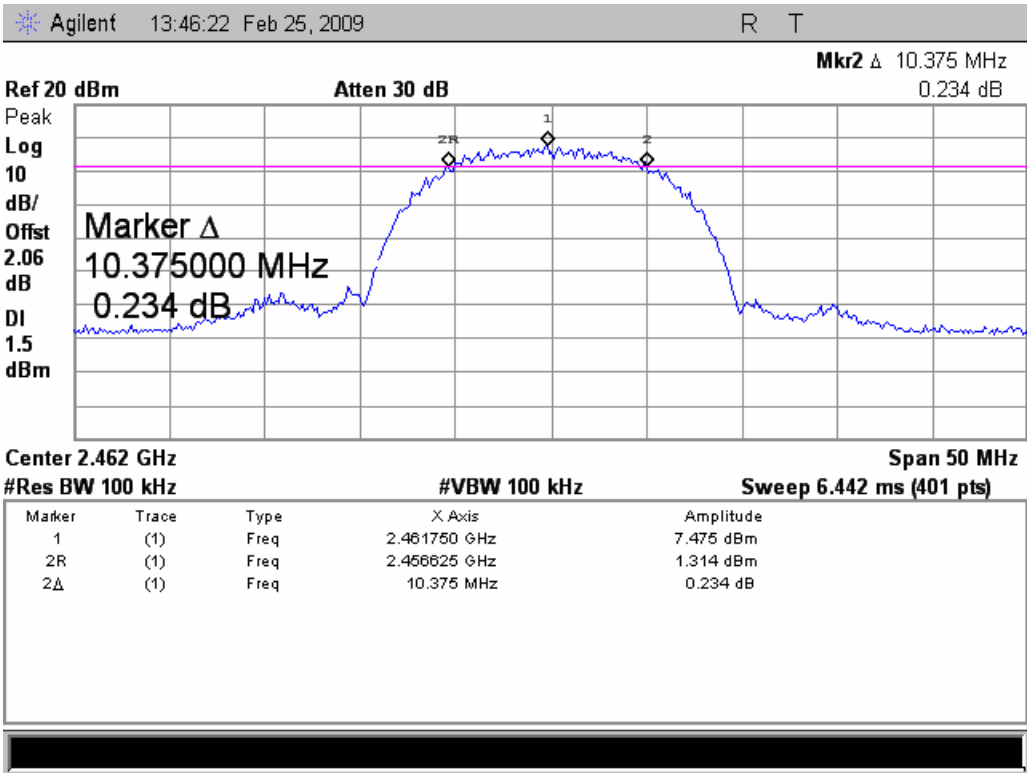


Figure 5-4: 6dB Bandwidth, 802.11g, Channel 1

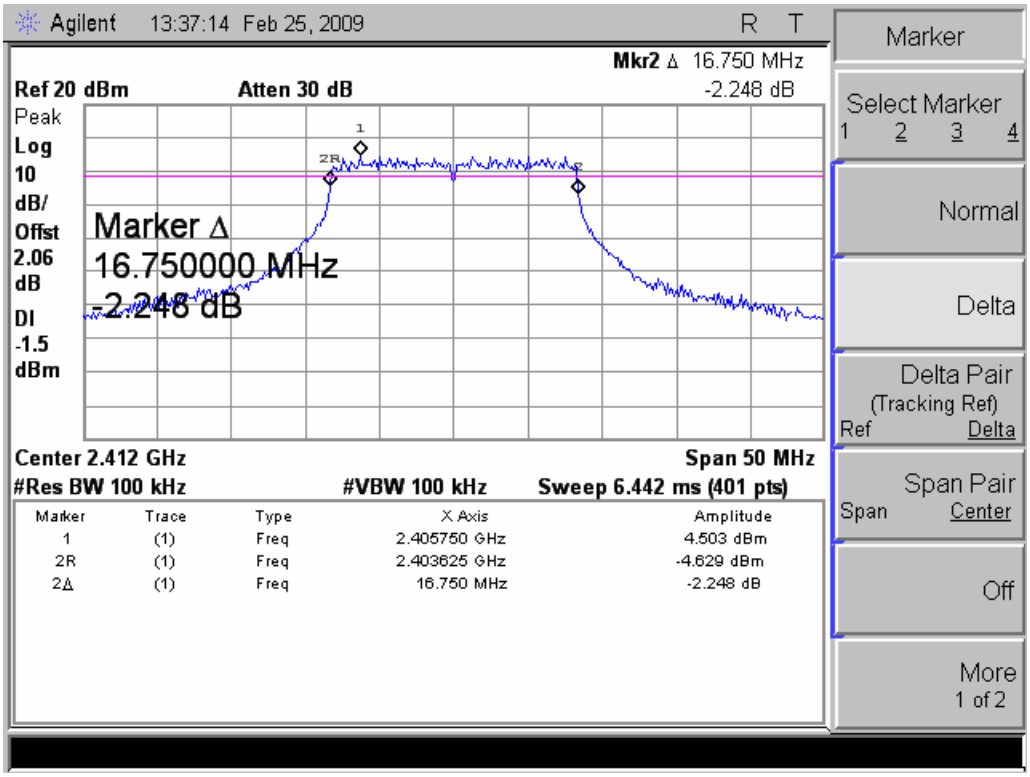


Figure 5-5: 6dB Bandwidth, 802.11g, Channel 6

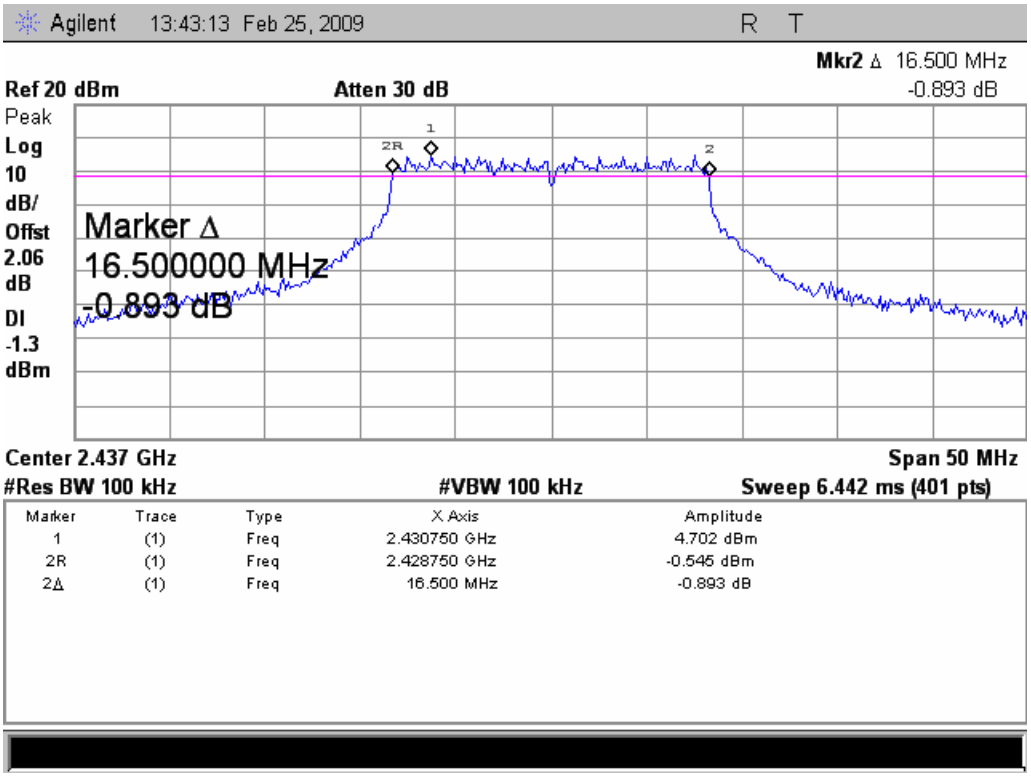
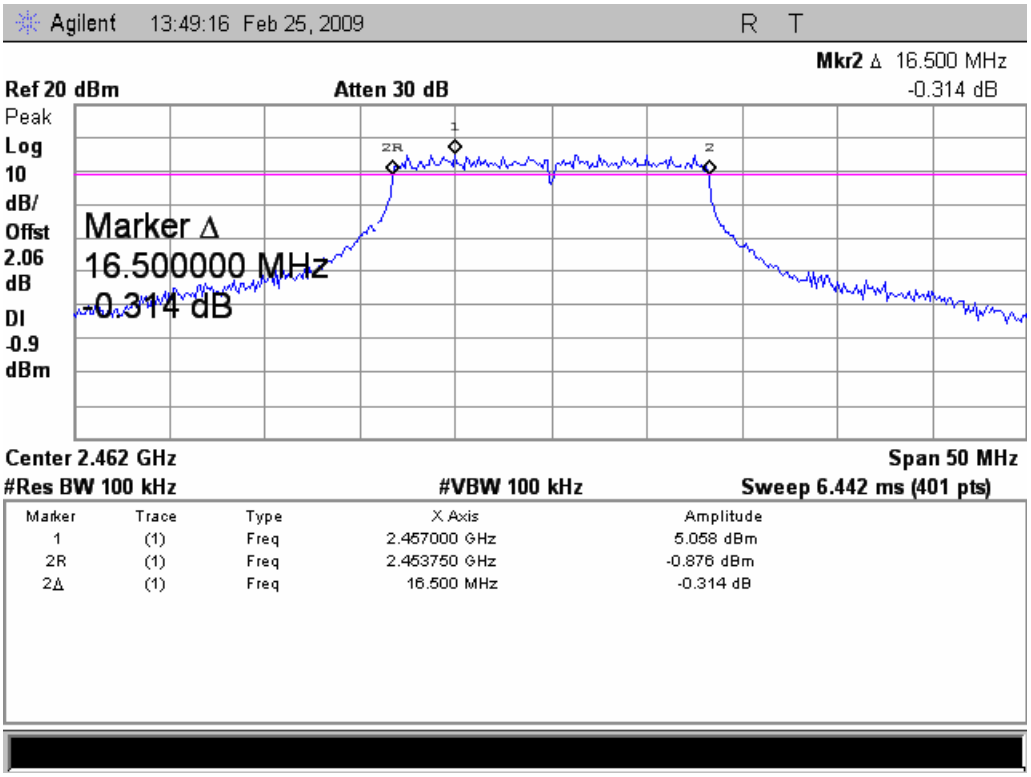


Figure 5-6: 6dB Bandwidth, 802.11g, Channel 11



6 POWER DENSITY

6.1 Test Procedure (FCC Rule: §15.247(d) (b) Power Density)

The antenna port of the 802.11 Wireless Adapter was connected to the input of a spectrum analyzer. The analyzer amplitude was offset for the associated cable loss. The analyzer resolution and video bandwidths were set to 3kHz and the max hold function was turned on. The frequency span was set to 600kHz around the highest amplitude occurring in the peak emission envelope. The total sweep time was calculated as follows:

Sweep time (Sec.) = (Fstop – Fstart)/Resolution Bandwidth

Sweep time (Sec) = 600kHz / 3kHz

Sweep time (Sec) = 200 Seconds

A peak search was then performed on the resultant trace. The amplitude of that peak was recorded as the maximum power density in dBm. Power density was measured for low, mid, and high channels in 802.11b and g modes.

6.2 Power Density Criteria

The peak power spectral density shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.3 Test Results

The LEX-M01-002 802.11 Wireless Adapter met the power density requirements of FCC Part 15 Subpart C (15.247). The test results are located in Table 6-1.

Table 6-1 Power Density Measurements

Mode	Channel	Frequency (MHz)	Power Density (dBm)
802.11b	1	2411	-13.06
802.11b	6	2437	-17.4
802.11b	11	2462	-12.79
802.11g	1	2411	-8.48
802.11g	6	2437	-8.59
802.11g	11	2462	**-7.56**

Figure 6-1: Power Density Measurement, 802.11b, Channel 1

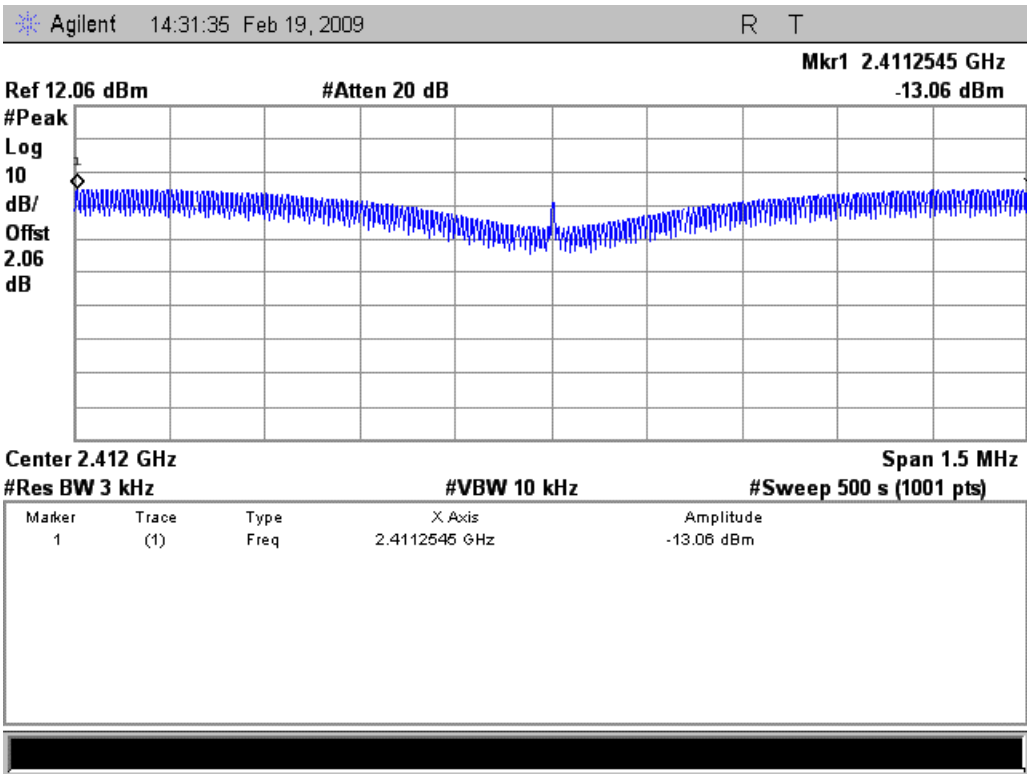


Figure 6-2: Power Density Measurement, 802.11b, Channel 6

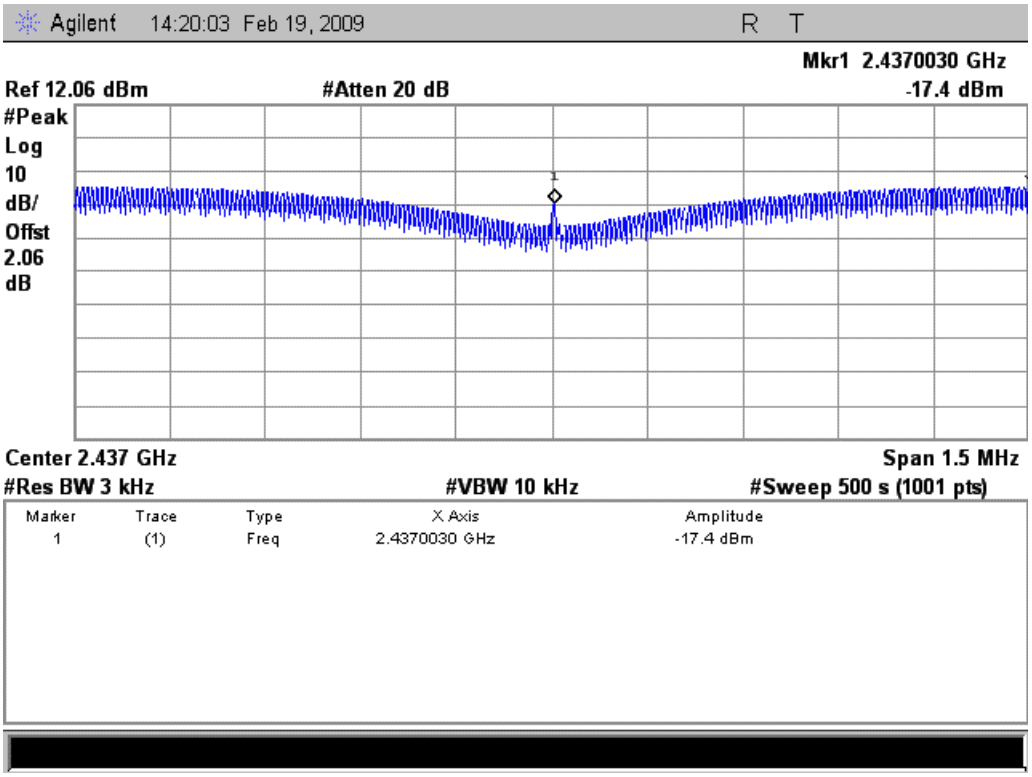


Figure 6-3: Power Density Measurement, 802.11b, Channel 11

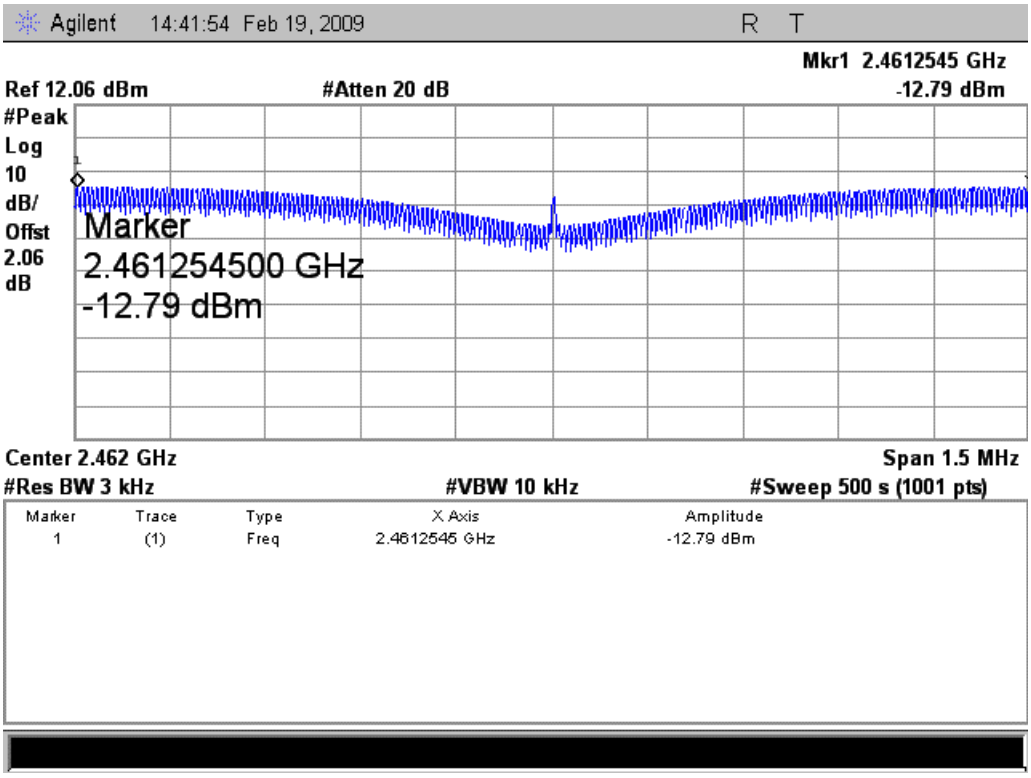


Figure 6-4: Power Density Measurement, 802.11g, Channel 1

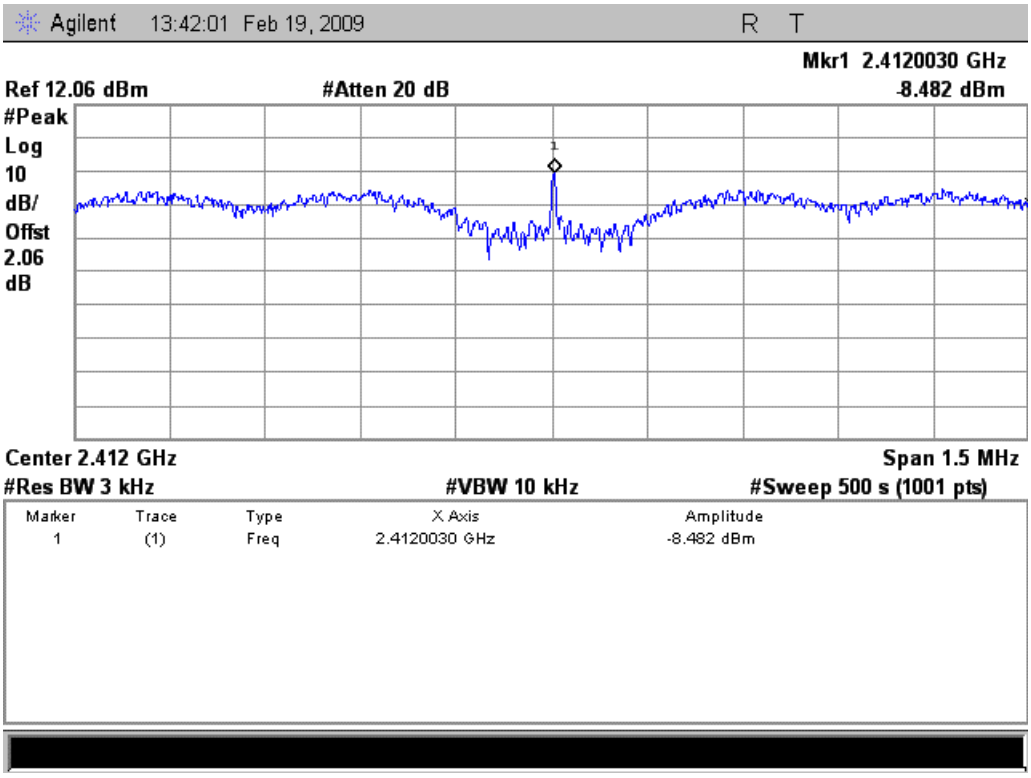


Figure 6-5: Power Density Measurement, 802.11g, Channel 6

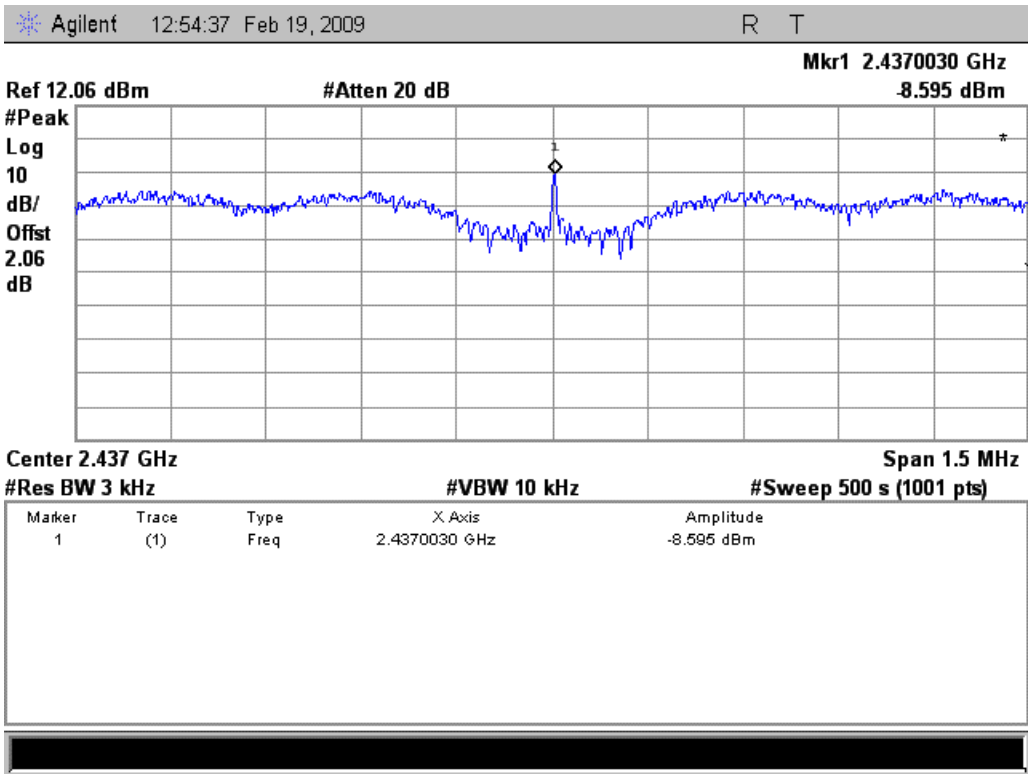
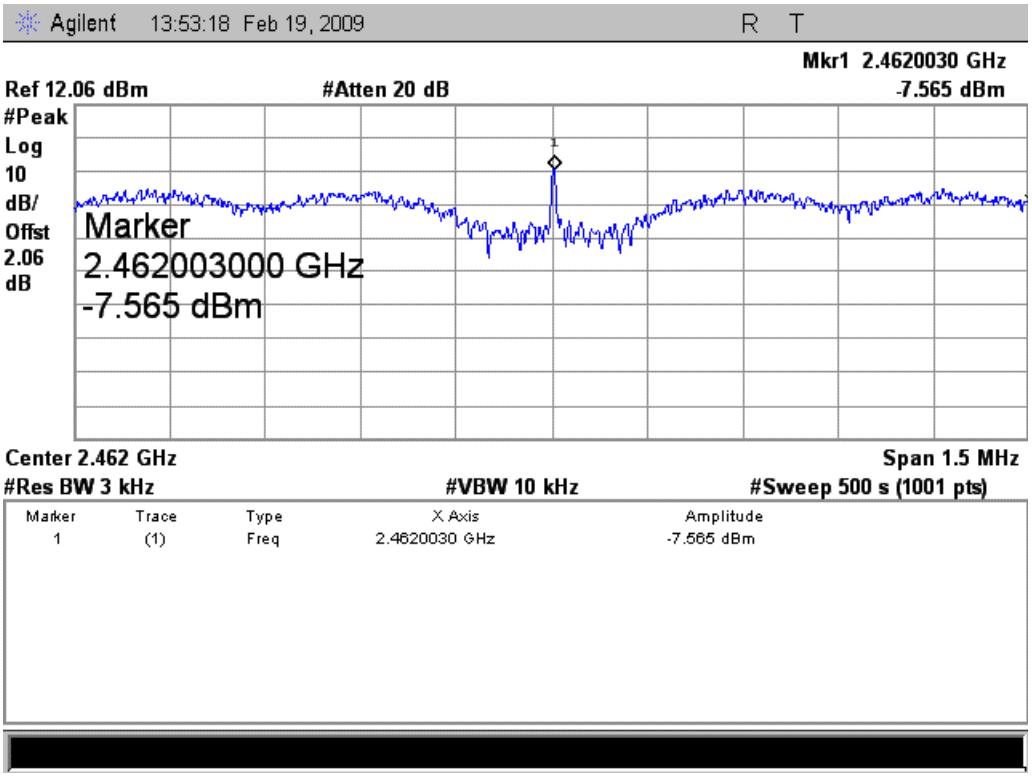


Figure 6-6: Power Density Measurement, 802.11g, Channel 11



7 MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS

The § 1.1310 Radiofrequency radiation exposure limits are listed in the table below.

	Frequency Range (MHz)	Power Density Limit (mW/cm^2)
Limits for Occupational/Controlled Exposures	0.3-3.0	100
	3.0-30	900/ Frequency2
	30-300	1.0
	300-1500	Frequency/300
	1500-100,000	5.0
Limits for General Population/Uncontrolled Exposure	0.3-1.34	100
	1.34-30	180/Frequency2
	30-300	0.2
	300-1500	Frequency/1500
	1500-100,000	1.0

7.1 Test Procedure (FCC Rule: §15.247(b)(5))

The EIRP was calculated in the previous report section. The radiated RF power was used to calculate the maximum RF exposure at a 20 cm distance using the formula:

$$\text{Maximum RF Exposure at 20cm} = (\text{EIRP in mW})/(4\text{Pi}(20\text{cm})^2)$$

Once the Maximum RF Exposure calculations were complete the results were compared to the MPE limits above.

7.2 Test Results

The following calculations show the Maximum RF Exposure from the 802.11 Wireless Adapter at 20cm for the worst case calculated EIRP. The MPE level is well below the limits for the general population described in the table above.

$$\text{Maximum Measured EIRP} = 18.95\ \text{dBm} = 78.52\ \text{mW}$$

$$\text{MPE} = 78.52\ \text{mW} / (4\text{Pi}(20\text{cm})^2) = 0.015\text{mW/cm}^2$$

8 OUT OF BAND EMISSIONS AT ANTENNA TERMINALS

8.1 Test Procedure (FCC Rule §15.247(c))

The antenna port of the 802.11 Wireless Adapter was connected to the input of a spectrum analyzer. The analyzer resolution and video bandwidths were set to 100kHz. The 802.11 Wireless Adapter was set to transmit at its highest output power level and with the modulation scheme that produced the highest conducted output power level. The spectrum analyzer was scanned from 30MHz to 26GHz using the max hold function to detect any out of band spurious emissions. The resulting trace was corrected for the cable loss between the test sample and the spectrum analyzer.

8.2 Out of Band Emissions at Antenna Terminals Criteria

In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, the RF power shall be at least 20dB below that of the carrier.

8.3 Test Results

The 802.11 Wireless Adapter met the out of band emission at antenna terminal requirements. The following plots illustrate the output power of channels 1, 6, and 11 and also show that there are no spurious emissions within 20dB of the peak carrier power.

Figure 8-1: Out of band emissions at antenna terminals – Channel 1, 6, and 11 (802.11b Mode)

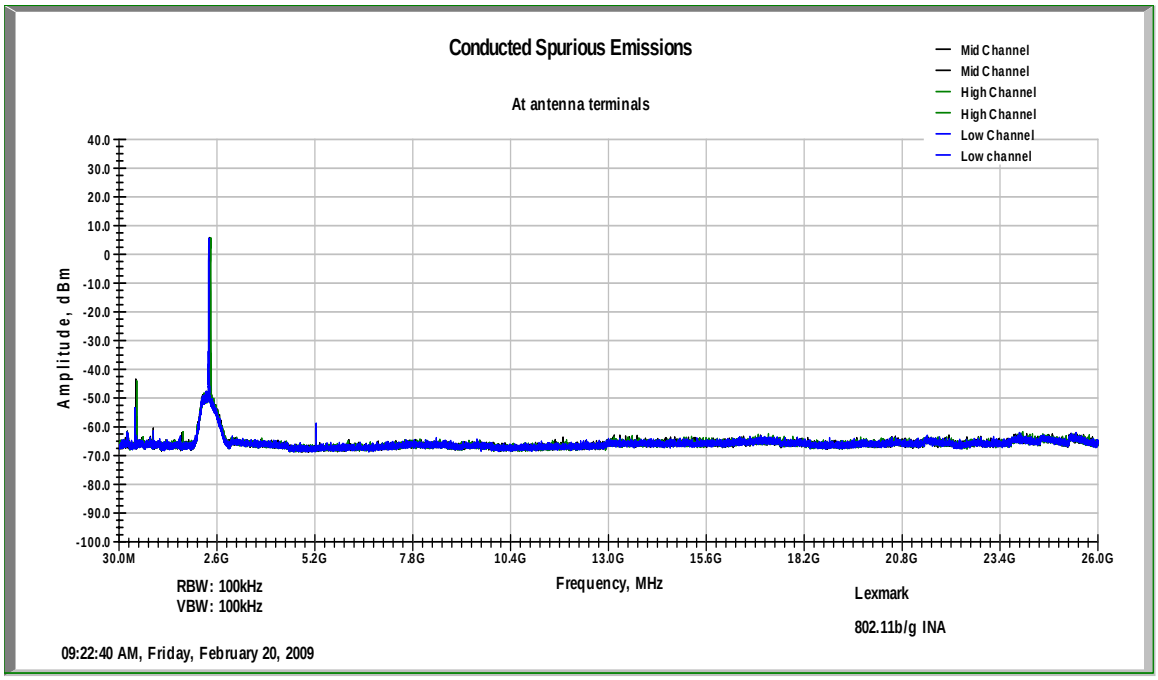
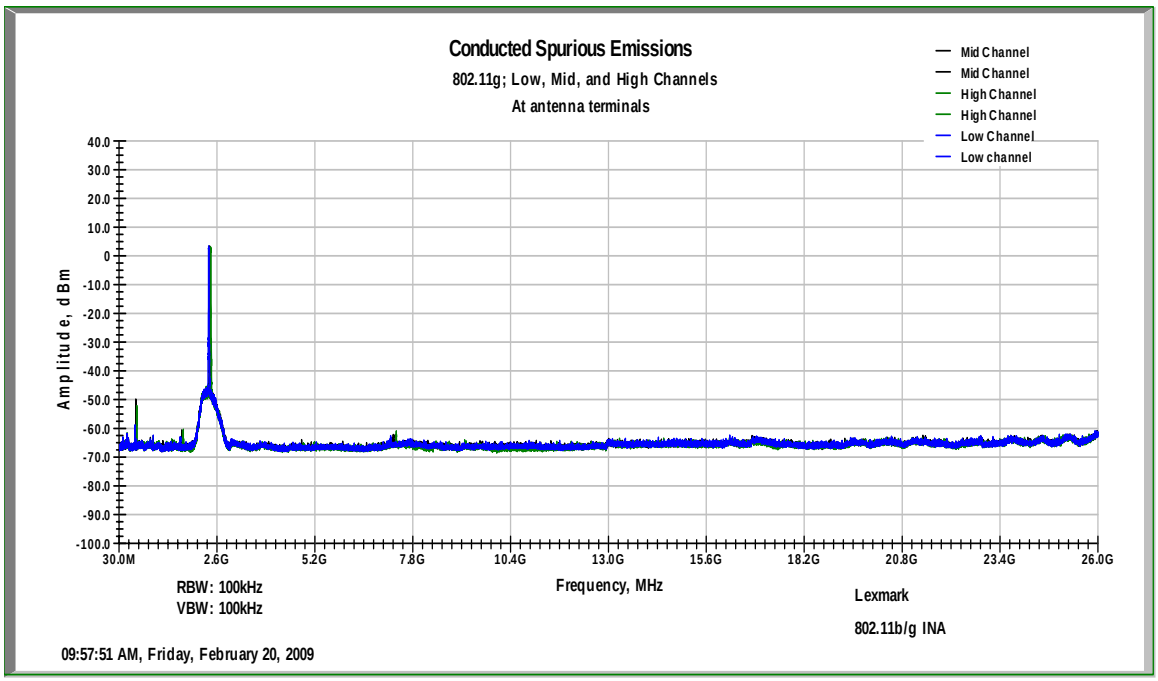


Figure 8-2: Out of band emissions at antenna terminals – Channel 1, 6, and 11 (802.11g mode)



9 FIELD STRENGTH OF SPURIOUS RADIATION (GENERAL REQUIREMENTS AND RESTRICTED BAND REQUIREMENTS)

9.1 Test Procedure (FCC Rule §15.247(c) for Radiated Measurements)

The 802.11 Wireless Adapter was placed on a non-conductive table. It was then set to transmit at its highest output power level and with the modulation scheme that produced the highest conducted output power level. The 30MHz – 3GHz range was measured with a bilog antenna, no external preamplifier, and no external filtering in the measurement path. The 3GHz-26GHz range was measured with an in line preamplifier and high pass filter with a pass band above 3GHz in order to keep the fundamental transmission from overloading the receiver. All measurements were performed with the receiving antenna 3 meters from the EUT with the exception of the 18-26GHz range which was performed at a distance of 1m. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels) in each operating band. The field strength of each spurious emission within 20dB of the limit was measured using the procedure outlined in ANSI C63.4. Radiated emissions which fell into restricted bands were investigated using a 1MHz resolution bandwidth on the spectrum analyzer.

Also, a scan was performed looking specifically at the band edge of channels 1 and 11 in order to show that the restricted bands ranging from 2310MHz to 2390MHz and 2483.5MHz to 2500 MHz were not intruded upon. To perform this measurement, the spectrum analyzer was manually set to show the band edge of channels 1 and 11 and the entire restricted band. The amplitude was offset to account for cable loss, antenna factor, and preamplifier gain. The turntable and tower were maximized with the analyzer set to max hold. These scans were performed in peak and average detection mode.

9.2 Field Strength of Spurious Radiation Criteria

In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, the RF power shall be at least 20dB below that of the carrier. In addition, emissions within the restricted bands as specified in §15.205(a), must also comply with the limits specified in §15.209(a). Those limits are in the table below.

Table 9-1 Radiated Emission Limit for FCC §15.209(a)

Radiated Emission Limits at 3 meters	
Frequency (MHz)	**Quasi-Peak limits, dB (μV/m)**
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 and up	54.0

9.3 Test Results

The LEX-M01-002 802.11 Wireless Adapter met the field strength of spurious radiation requirements of FCC §15.209 and §15.247(c). All harmonics and spurious emissions were at least 20dB below the carrier. There were no emissions within the restricted bands exceeding the limits specified in §15.209(a).

Table 9-2 Spurious Radiated Emissions (802.11b Mode)

TX Mode	Freqency	Pol.	Reading (dBuV)	Cable (Inc. Preamp)	Antenna (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Detector
802.11b Ch 1	4.8242 GHz	V	53.24	-31.41	32.92	54.75	74	-19.25	PK
802.11b Ch 1	7.2374 GHz	V	39.45	-27.92	36.06	47.59	74	-26.41	PK
802.11b Ch 1	4.8242 GHz	V	51.15	-31.41	32.92	52.66	54	**-1.34**	AVG
802.11b Ch 1	7.2374 GHz	V	28.87	-27.92	36.06	37.01	54	-16.99	AVG
802.11b Ch 1	4.824 GHz	H	52.59	-31.41	32.88	54.06	74	-19.94	PK
802.11b Ch 1	7.2354 GHz	H	39.33	-27.82	35.91	47.42	74	-26.58	PK
802.11b Ch 1	4.824 GHz	H	50.55	-31.41	32.88	52.02	54	-1.98	AVG
802.11b Ch 1	7.2354 GHz	H	28.95	-27.82	35.91	37.04	54	-16.96	AVG
802.11b Ch 6	4.8739 GHz	V	50.08	-30.67	33	52.41	74	-21.59	PK
802.11b Ch 6	7.3093 GHz	V	40.44	-27.26	36.27	49.45	74	-24.55	PK
802.11b Ch 6	4.8739 GHz	V	46.84	-30.67	33	49.17	54	-4.83	AVG
802.11b Ch 6	7.3093 GHz	V	32.01	-27.26	36.27	41.02	54	-12.98	AVG
802.11b Ch 6	4.874 GHz	H	51.26	-30.67	32.97	53.56	74	-20.44	PK
802.11b Ch 6	7.3104 GHz	H	38.43	-27.25	36.11	47.29	74	-26.71	PK
802.11b Ch 6	4.874 GHz	H	48.75	-30.67	32.97	51.05	54	-2.95	AVG
802.11b Ch 6	7.3104 GHz	H	26.56	-27.25	36.11	35.42	54	-18.58	AVG
802.11b Ch 11	4.924 GHz	V	51.79	-31.02	33.08	53.85	74	-20.15	PK
802.11b Ch 11	7.3865 GHz	V	42.43	-27.15	36.48	51.76	74	-22.24	PK
802.11b Ch 11	4.924 GHz	V	49.53	-31.02	33.08	51.59	54	-2.41	AVG
802.11b Ch 11	7.3865 GHz	V	33.73	-27.15	36.48	43.06	54	-10.94	AVG
802.11b Ch 11	4.9241 GHz	H	50.99	-31.02	33.06	53.03	74	-20.97	PK
802.11b Ch 11	7.3865 GHz	H	39.96	-27.15	36.3	49.11	74	-24.89	PK
802.11b Ch 11	4.9241 GHz	H	48.53	-31.02	33.06	50.57	54	-3.43	AVG
802.11b Ch 11	7.3865 GHz	H	29.95	-27.15	36.3	39.1	54	-14.9	AVG

Table 9-3 Spurious Radiated Emissions (802.11g Mode)

TX Mode	Freqency	Pol.	Reading (dBuV)	Cable (Inc. Preamp)	Antenna (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Detector
802.11b Ch 1	4.8237 GHz	V	46.76	-31.42	32.92	48.26	74	-25.74	PK
802.11b Ch 1	4.8237 GHz	V	34.66	-31.42	32.92	36.16	54	-17.84	AVG
802.11b Ch 1	4.8237 GHz	H	36.79	-31.42	32.88	38.25	74	-35.75	PK
802.11b Ch 1	4.8237 GHz	H	26.26	-31.42	32.88	27.72	54	-26.28	AVG
802.11b Ch 6	4.8706 GHz	V	45.2	-30.69	32.99	47.5	74	-26.5	PK
802.11b Ch 6	7.3089 GHz	V	42.83	-27.26	36.26	51.83	74	-22.17	PK
802.11b Ch 6	4.8706 GHz	V	30.4	-30.69	32.99	32.7	54	-21.3	AVG
802.11b Ch 6	7.3089 GHz	V	30.15	-27.26	36.26	39.15	54	**-14.85**	AVG
802.11b Ch 6	4.8706 GHz	H	37.92	-30.69	32.97	40.2	74	-33.8	PK
802.11b Ch 6	7.3089 GHz	H	33.44	-27.26	36.1	42.28	74	-31.72	PK
802.11b Ch 6	4.8706 GHz	H	31.37	-30.69	32.97	33.65	54	-20.35	AVG
802.11b Ch 6	7.3089 GHz	H	25.19	-27.26	36.1	34.03	54	-19.97	AVG
802.11b Ch 11	4.9249 GHz	V	50.06	-31.03	33.08	52.11	74	-21.89	PK
802.11b Ch 11	7.3865 GHz	V	44.96	-27.15	36.48	54.29	74	-19.71	PK
802.11b Ch 11	4.9249 GHz	V	37.19	-31.03	33.08	39.24	54	-14.76	AVG
802.11b Ch 11	7.3865 GHz	V	31.18	-27.15	36.48	40.51	54	-13.49	AVG
802.11b Ch 11	4.9249 GHz	H	36.26	-31.03	33.06	38.29	74	-35.71	PK
802.11b Ch 11	7.3865 GHz	H	33.05	-27.15	36.3	42.2	74	-31.8	PK
802.11b Ch 11	4.9249 GHz	H	35.32	-31.03	33.06	37.35	54	-16.65	AVG
802.11b Ch 11	7.3865 GHz	H	25.09	-27.15	36.3	34.24	54	-19.76	AVG

The final quasi peak or average amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the Antenna and cable loss as shown in the formula below.

FM = RA + CF + AF where,

FM = Final Measurement

RA = Receiver Amplitude

CF = Cable Factor

AF = LISN Factor

Figure 9-1: Channel 1 Band Edge Showing the Restricted Band from 2310 to 2390 MHz (802.11b) – Peak Detector

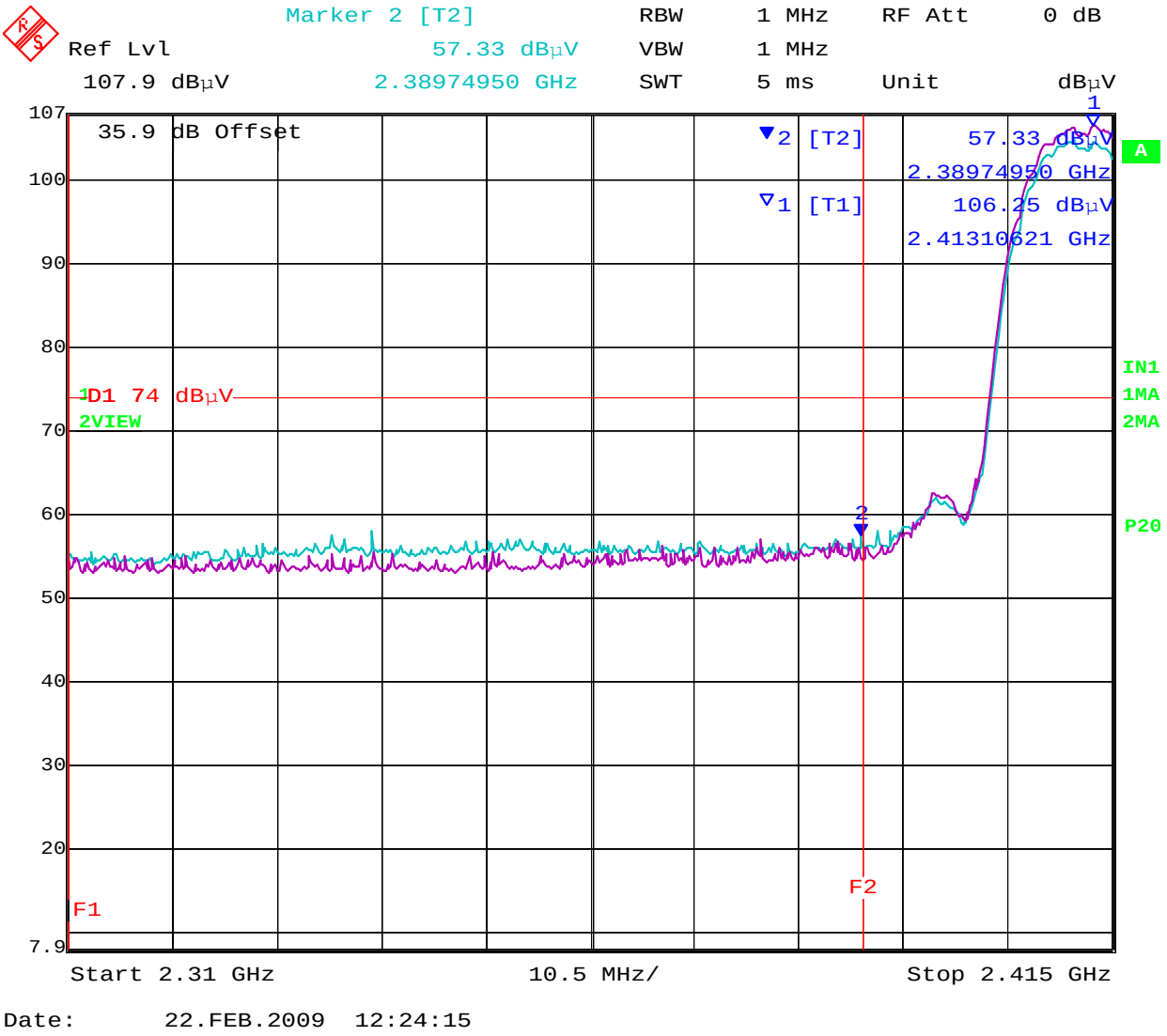


Figure 9-2: Channel 1 Band Edge Showing the Restricted Band from 2310 to 2390 MHz (802.11b) – Average Detector

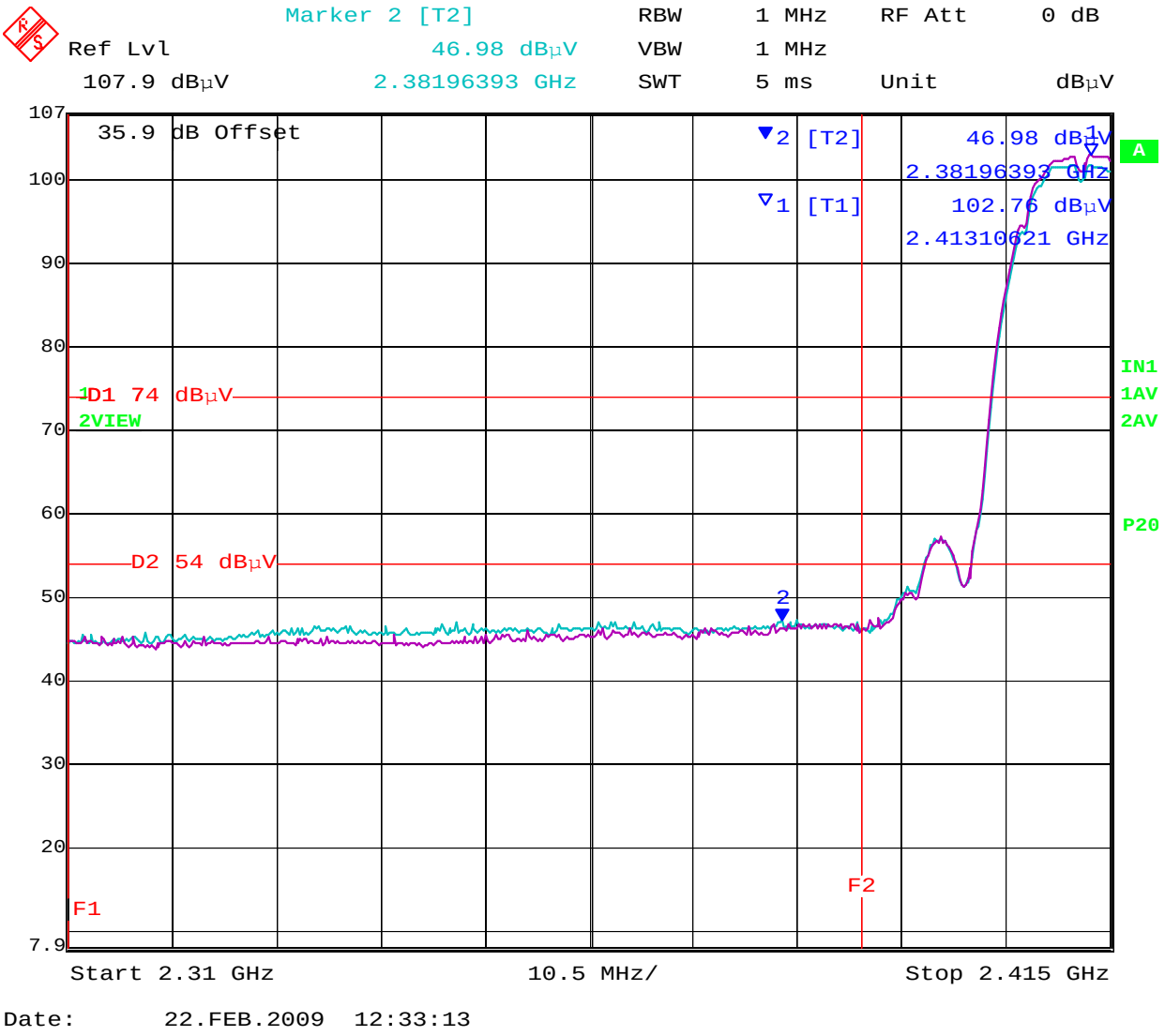


Figure 9-3: Channel 1 Band Edge Showing the Restricted Band from 2310 to 2390 MHz (802.11g) – Peak Detector

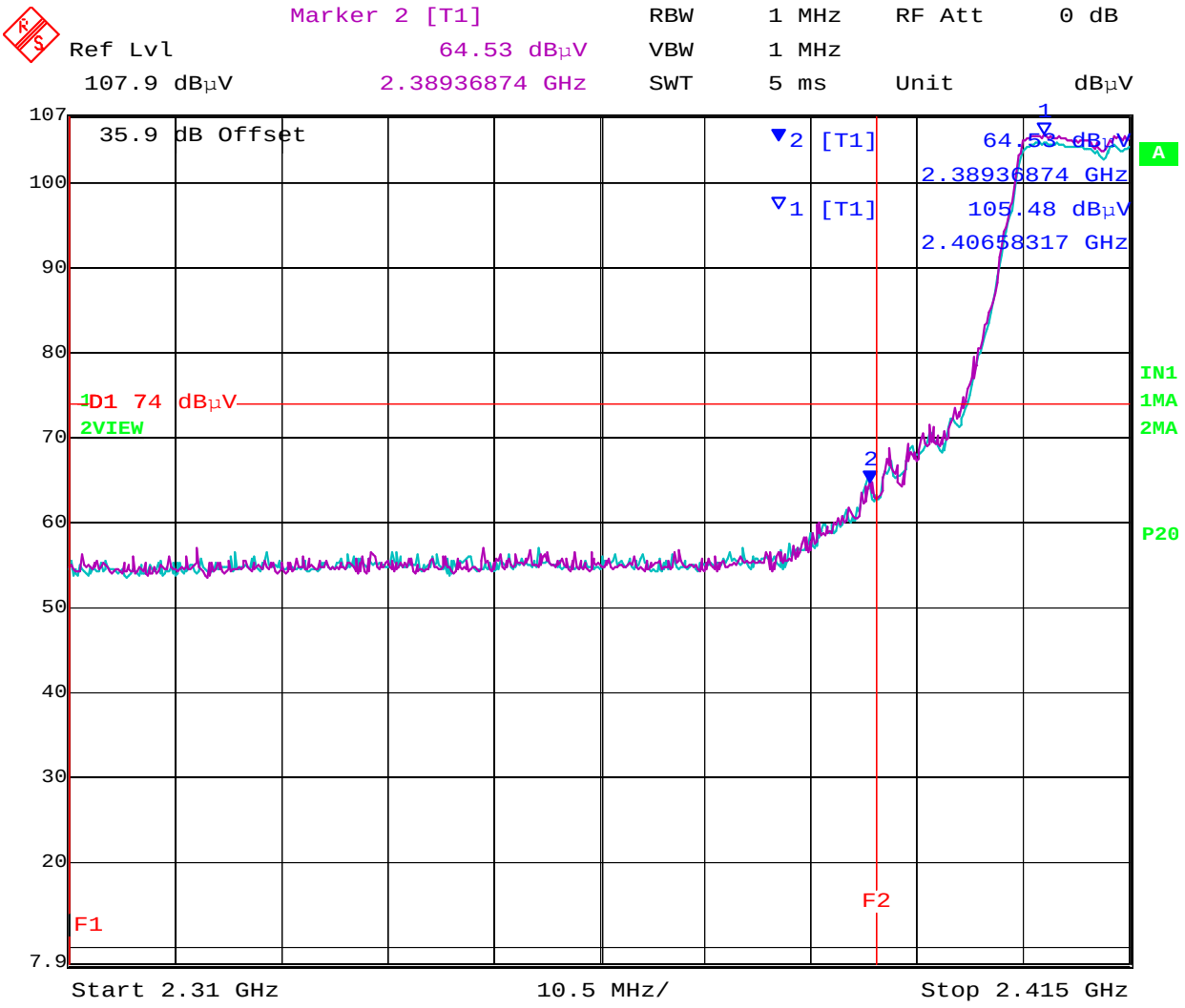


Figure 9-4: Channel 1 Band Edge Showing the Restricted Band from 2310 to 2390 MHz (802.11g) – Average Detector

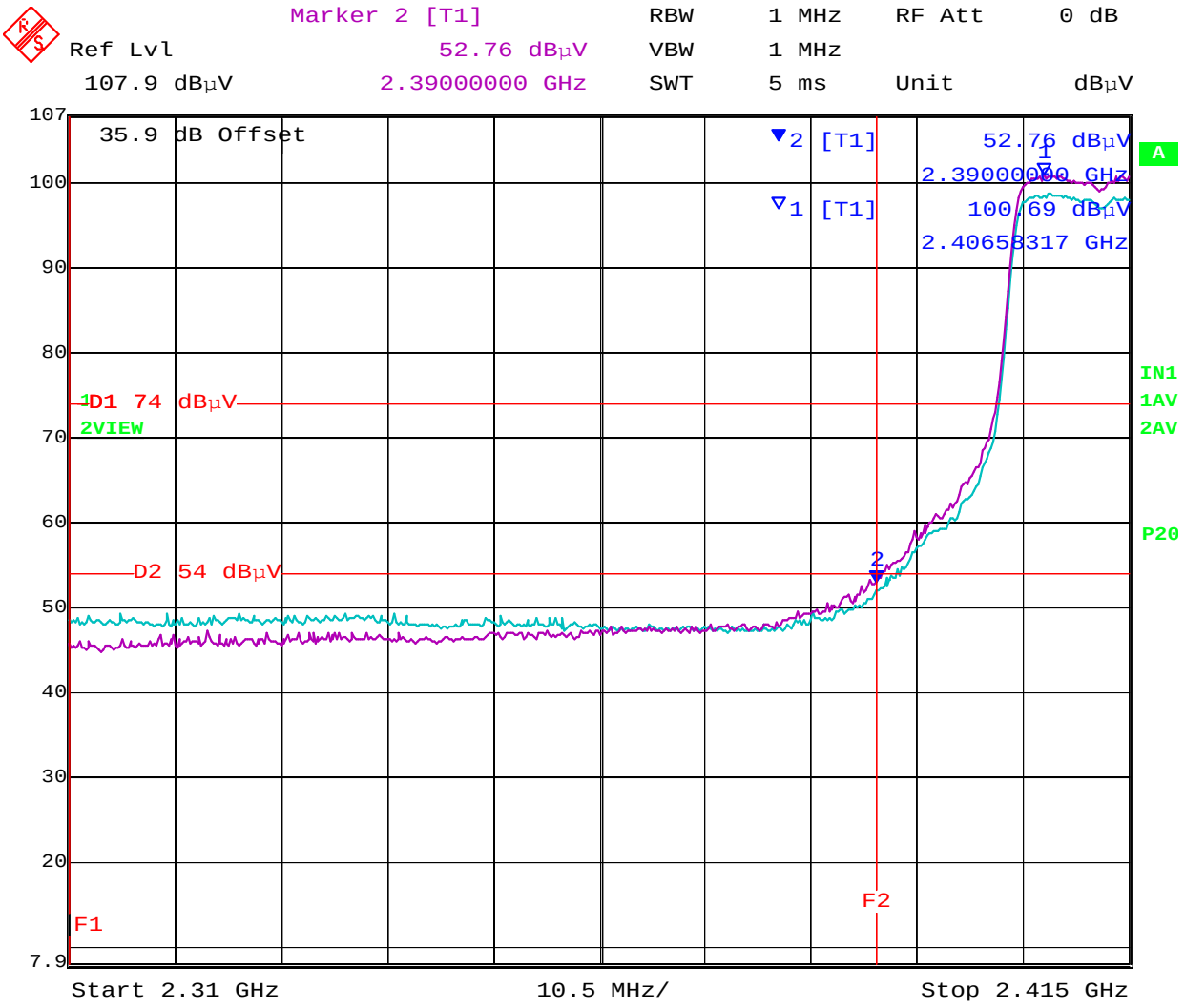


Figure 9-5: Channel 11 Band Edge Showing the Restricted Band from 2483.5 to 2500 MHz (802.11b) - Peak Detector

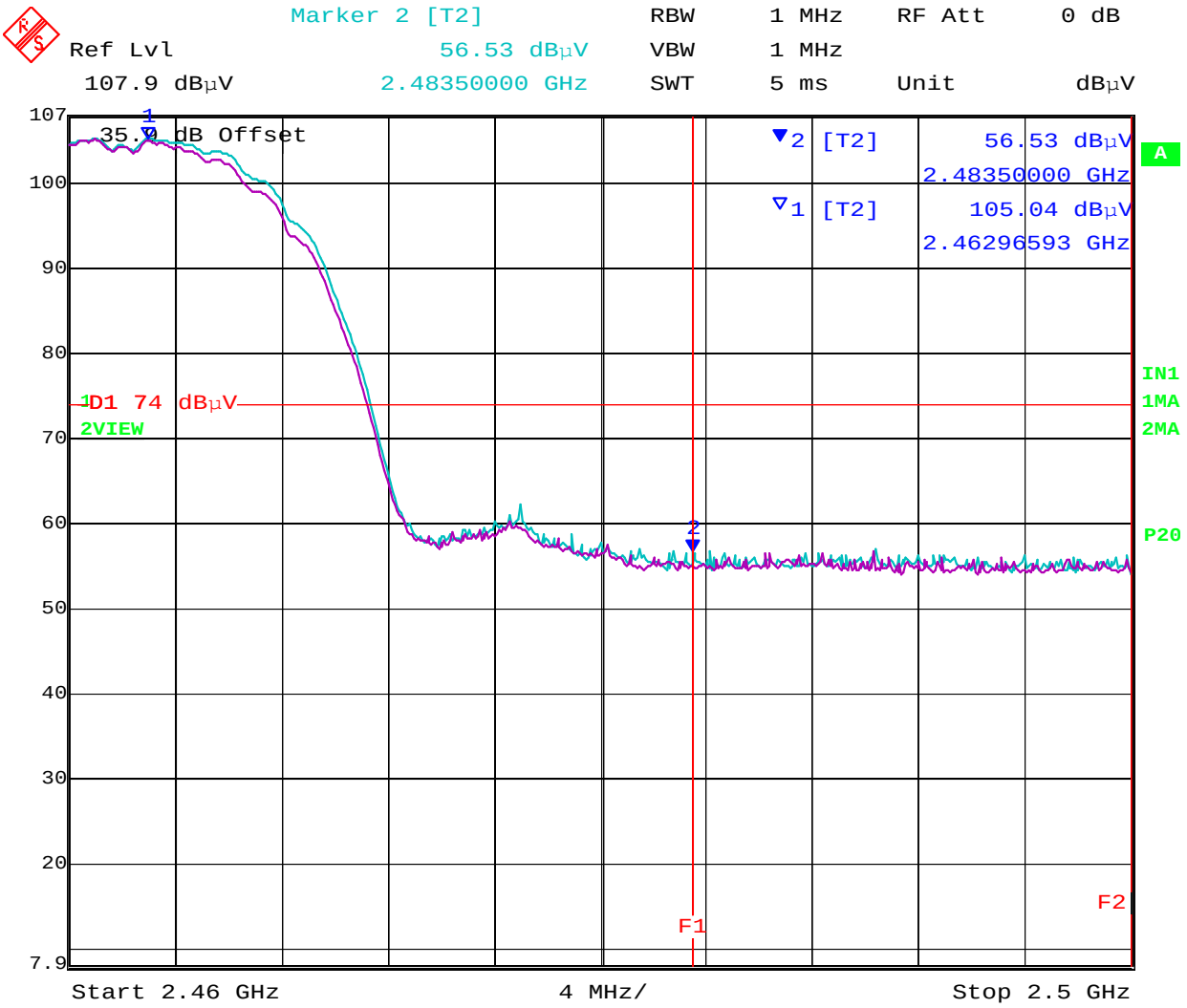


Figure 9-6: Channel 11 Band Edge Showing the Restricted Band from 2483.5 to 2500 MHz (802.11b) – Average Detector

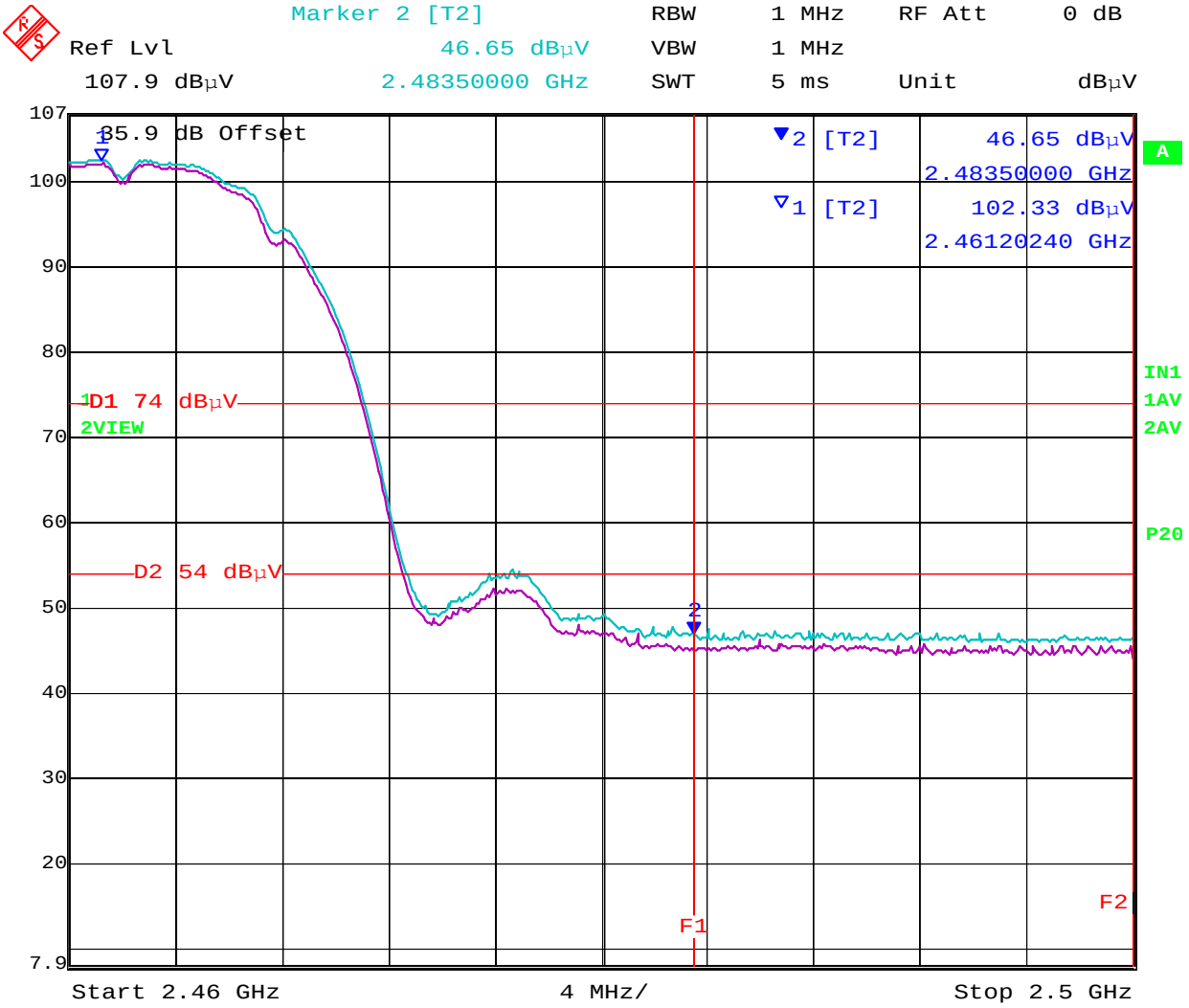
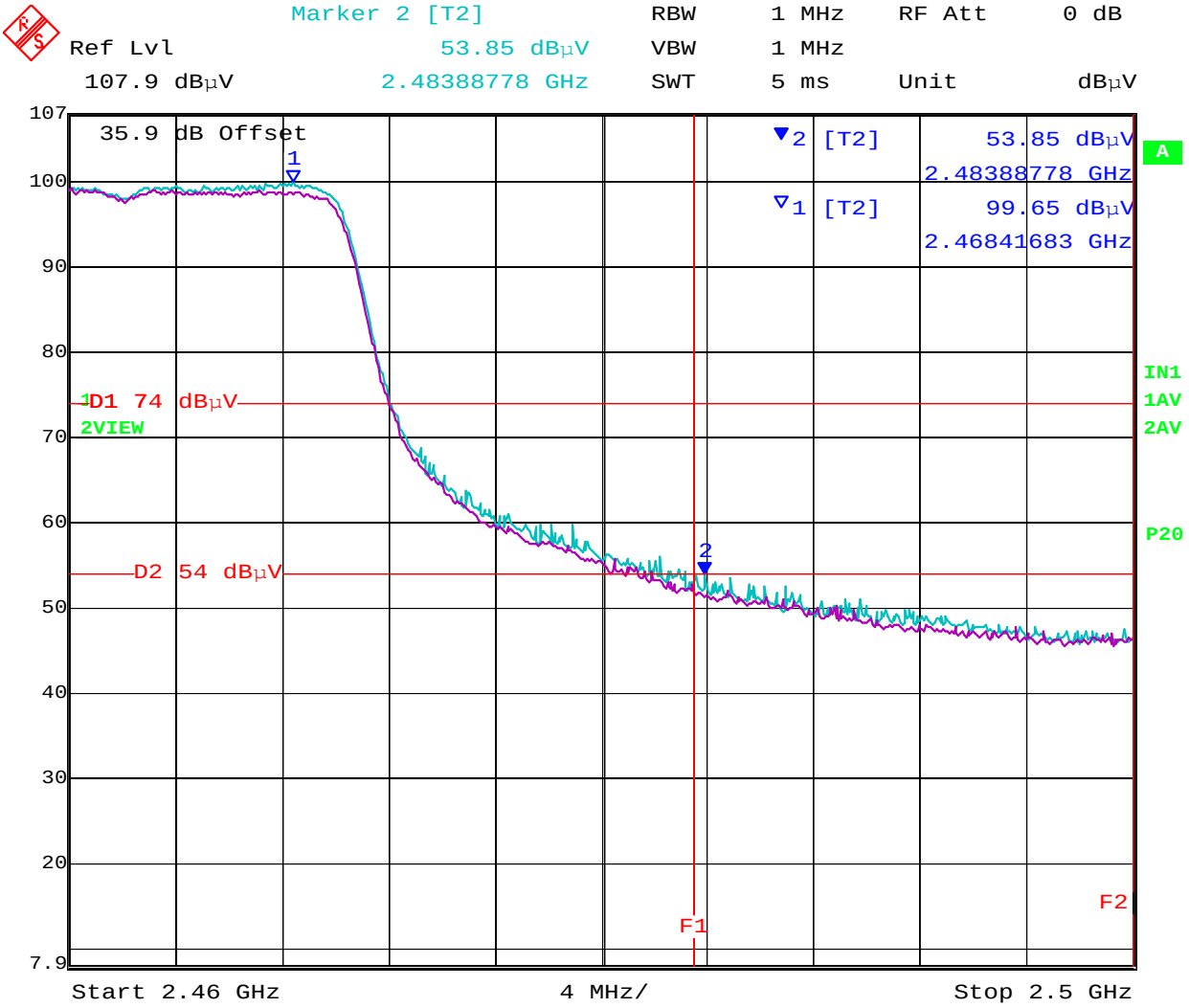


Figure 9-7: Channel 11 Band Edge Showing the Restricted Band from 2483.5 to 2500 MHz (802.11g) - Peak Detector

Figure 9-8: Channel 11 Band Edge Showing the Restricted Band from 2483.5 to 2500 MHz (802.11g) – Average Detector



10 RECEIVER SPURIOUS EMISSIONS

10.1 Test Procedure (FCC §15.109, ICES-003 §5.6)

Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole. From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.

Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 3m cannot be made because of high ambient noise level or for other reasons, measurements may be made at a closer distance, for example 1m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

10.2 Receiver Spurious Emissions Criteria

Table 10-1 Radiated Emission Limit for FCC §15.109

Radiated Emission Limits at 3 meters	
Frequency (MHz)	**Quasi-Peak limits, dB (µV/m)**
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 and up	54.0

10.3 Test Results

The LEX-M01-002 802.11 Wireless Adapter is **compliant** with the radiated disturbance requirements of FCC §15.109 for a class B device. The table in Figure 10-1 and the graph in Figure 10-2 show that there are no emissions above the limits specified in §15.109.

Figure 10-1 FCC §15.109 Receiver Spurious Emission (Quasi-Peak Readings)

Frequency	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
283.5 MHz	H	3.64	12.9	44.34	46.02	-1.68	273	100	**Compliant**
931.5 MHz	H	6.51	23.41	37.65	46.02	-8.37	311	158	**Compliant**
283.5 MHz	V	3.64	12.73	39.28	46.02	-6.74	251	143	**Compliant**
465.3 MHz	V	4.59	17.22	38.69	46.02	-7.33	36	133	**Compliant**
495.27 MHz	V	4.72	17.69	44.8	46.02	-1.22	-30	100	**Compliant**
597.16 MHz	V	5.24	19.46	43.92	46.02	-2.1	59	100	**Compliant**
663.46 MHz	V	5.48	19.67	37.95	46.02	-8.07	75	100	**Compliant**

The final quasi peak or average amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the Antenna and cable loss as shown in the formula below.

FM = RA + CF + AF where,

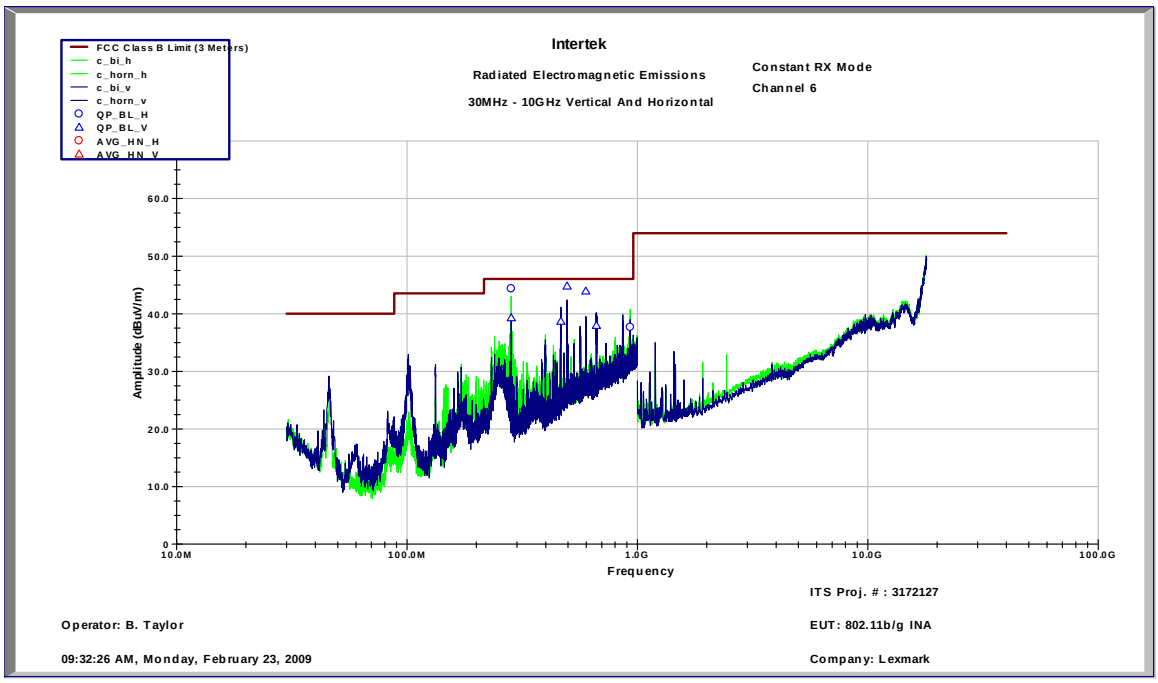
FM = Final Measurement

RA = Receiver Amplitude

CF = Cable Factor

AF = LISN Factor

Figure 10-2 FCC §15.109 Receiver Spurious Emission (Vertical and Horizontal)



11 POWER LINE CONDUCTED EMISSIONS

11.1 Test Procedure (FCC §15.207, ICES-003 §5.3)

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

11.2 Power Line Conducted Emissions Criteria

The RF energy radiated back onto the public utility (AC Power Lines) shall not exceed the values in the following table when measured with the corresponding detector function.

Table 11-1 Conducted Emission Limit for FCC §15.207(a)

Frequency Range (MHz)	FCC Part 15.207(a) Quasi Peak Limit (dBuV)	FCC Part 15.207(a) Average Limit (dBuV)
0.15 – 0.5 MHz	66 to 56	56 to 46
0.5 – 5.0 MHz	56	46
5.0 - 30 MHz	60	50

11.3 Test Results

The LEX-M01-002 802.11 Wireless Adapter met the power line conducted emission requirements of §15.207 and §15.207. See Figure 11-1 for tabular data with the device in transmit and receive modes. See Figure 11-2 through Figure 11-4 for graphical results of the device in transmit and receive modes. The test was performed on the AC input to the laptop computer providing the DC voltage to the LEX-M01-002 802.11 Wireless Adapter.

Figure 11-1: FCC §15.107 and §15.207 Power Line Conducted Emissions

Operating Mode	Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
802.11b	Line 1	150.0 KHz	42.88	66	-23.12	25.76	56	-30.24	**Compliant**
802.11b	Line 1	207.0 KHz	50.19	63.32	-13.13	37.92	53.32	-15.4	**Compliant**
802.11b	Line 1	414.4 KHz	44.1	57.56	-13.46	40.65	47.56	-6.91	**Compliant**
802.11b	Line 2	483.0 KHz	37.19	56.29	-19.09	33.07	46.29	-13.21	**Compliant**
802.11b	Line 2	1.1748 MHz	37.87	56	-18.13	34.21	46	-11.79	**Compliant**
802.11b	Line 2	1.383 MHz	44.1	56	-11.9	40.65	46	-5.35	**Compliant**
802.11g	Line 1	207.1 KHz	49.89	63.32	-13.43	38.32	53.32	-15	**Compliant**
802.11g	Line 1	413.1 KHz	43.36	57.59	-14.23	40.01	47.59	-7.58	**Compliant**
802.11g	Line 1	898.6 KHz	37.26	56	-18.74	33.81	46	-12.19	**Compliant**
802.11g	Line 2	206.0 KHz	47.67	63.37	-15.7	33.72	53.37	-19.65	**Compliant**
802.11g	Line 2	415.6 KHz	41.89	57.54	-15.65	38.08	47.54	-9.46	**Compliant**
802.11g	Line 2	2.9051 MHz	36.53	56	-19.47	31.26	46	-14.74	**Compliant**
Receive	Line 1	150.0 KHz	46.51	66	-19.49	26.01	56	-29.99	**Compliant**
Receive	Line 1	156.0 KHz	45.42	65.67	-20.26	23.29	55.67	-32.39	**Compliant**
Receive	Line 1	207.0 KHz	50.17	63.32	-13.15	36.84	53.32	-16.48	**Compliant**
Receive	Line 1	484.2 KHz	41.93	56.27	-14.33	38.9	46.27	-7.36	**Compliant**
Receive	Line 2	150.0 KHz	43.93	66	-22.07	24.68	56	-31.32	**Compliant**
Receive	Line 2	207.0 KHz	48.11	63.32	-15.21	33.41	53.32	-19.91	**Compliant**
Receive	Line 2	414.9 KHz	40.29	57.55	-17.26	36.9	47.55	-10.65	**Compliant**

The final quasi peak or average amplitude is computed from the measured receiver amplitude by adding a correction factor associated with the LISN and cable loss as shown in the formula below.

FM = RA + CF + LF where,

FM = Final Measurement

RA = Receiver Amplitude

CF = Cable Factor

LF = LISN Factor

Figure 11-2: FCC §15.207 Power Line Conducted Emissions 802.11b Mode (Lines 1 and 2)

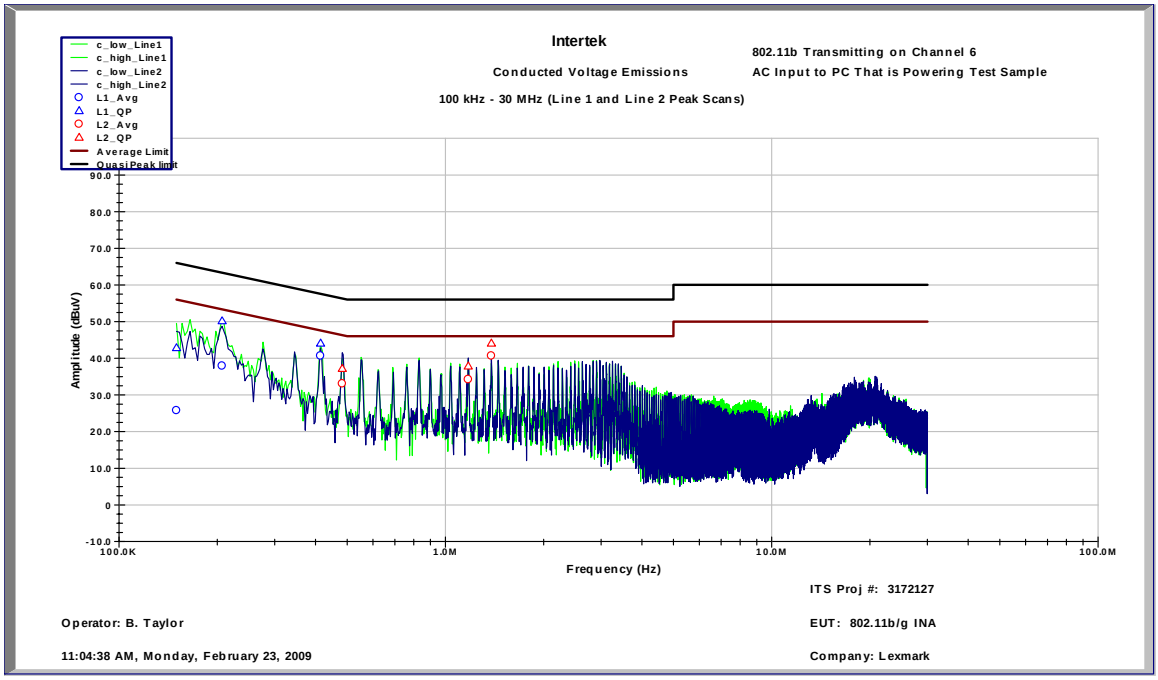


Figure 11-3: FCC §15.207 Power Line Conducted Emissions 802.11g Mode (Lines 1 and 2)

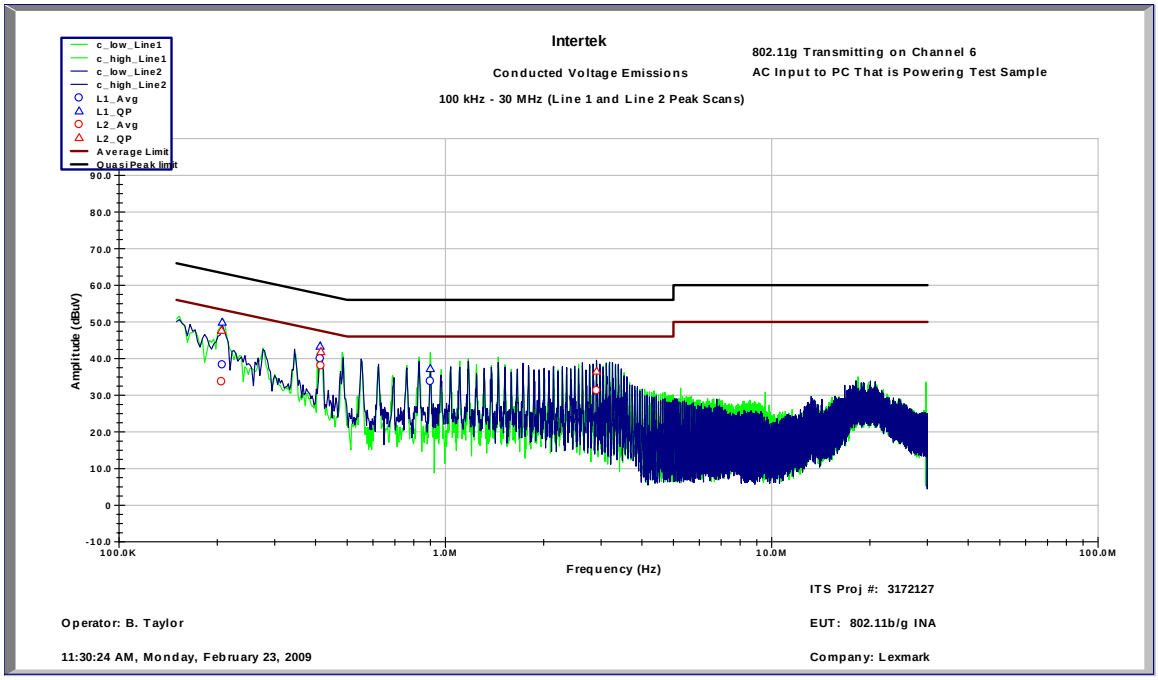


Figure 11-4: FCC §15.107 Power Line Conducted Emissions Receive Mode (Lines 1 and 2)