Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247/15.407 & INDUSTRY CANADA RSS-210

Test Lab:	Applicant:
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FCC ID/ IC ID:	SNR-830-00000-00 / 5473A-83000000	**GRANTEE FRN NUMBER:**	0011914082
PLATFORM:	802.11 Application Platform	**RTL WORK ORDER NUMBER:**	2004142
MODEL NAME/NUMBER:	Pronghorn / DEVKIT01	**RTL QUOTE NUMBER:**	QRTL04-279B
DATE OF TEST REPORT:	November 19, 2004		
American National Standard Institute:	ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification:	DSS – Part 15 Spread Spectrum Transmitter		
FCC Rule Part(s):	FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System FCC Rules Part 15.407 (Subpart E): Unlicensed National Information Infrastructure Devices 97-114: Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters; ET Docket No. 96-8		
Industry Canada:	RSS-210: Low Power License-Exempt Communications Devices		
Digital Interface Information	Digital Interface was found to be compliant		

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
2412-2462	0.054	+/-0.01%	N/A
5150-5350	0.026	+/-0.01%	N/A
5725-5850	0.021	+/-0.01%	N/A

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, FCC 97-114, ANSI C63.4, and Industry Canada RSS-210.

Signature: _____ Date: November 19, 2004

Typed/Printed Name: Desmond A. Fraser Position: President

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1 GENERAL INFORMATION

1.1 SCOPE

Applicable Standards:

- FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
- FCC Rules Part 15.407 (Subpart E): Unlicensed National Information Infrastructure Devices
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

A direct sequence (DS) system is a spread spectrum (SS) system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high-speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted signal.

1.2 DESCRIPTION OF EUT

Equipment Under Test	802.11 Application Platform
Model	Pronghorn
Modulation Type	DBPSK, DQPSK, CCK, OFDM
Modulation Technology	DSSS, CCK
Transfer Rate	54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, and 1 Mbps
Frequency Range	802.11b & g: 2412 – 2462 MHz 802.11a: 5150 - 5850 MHz
Output Power	17 dBm typical
Power Supply	5 Vdc from host equipment
Antenna Connector Type	Dual Hirose UF-L
Antenna Type	Dipole antennas – one main and one auxiliary, 5dBi gain

1.3 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

1.4 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for certification for ADI Engineering, Model: Pronghorn 802.11 Application Platform, FCC ID: SNR-830-00000-00.

1.5 MODIFICATIONS

No modifications were made to the EUT.

2 TEST INFORMATION

2.1 DESCRIPTION OF TEST MODES

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested for 802.11B, 802.11G and 802.11A operation:

TABLE 2-1: CHANNELS TESTED FOR 802.11B – 11 MBPS

Channel	Frequency
1	2412
6	2437
11	2462

TABLE 2-2: CHANNELS TESTED FOR 802.11G – 6 MBPS

Channel	Frequency
1	2412
6	2437
6 (Turbo)	2437
11	2462

TABLE 2-3: CHANNELS TESTED FOR 802.11A – 6 MBPS

Channel	Frequency
1	5180
4	5240
5	5260
8	5320
1 (Turbo)	5210
9	5745
11	5785
13	5825

2.2 EXERCISING THE EUT

The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 TEST RESULT SUMMARY

TABLE 2-4: TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS – FCC PART 15, SUBPART C (SECTION 15.247)

STANDARD	TEST	PASS/FAIL OR N/A
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.247(a)(2)	Spectrum Bandwidth of DSSS System – Limit: 500 kHz minimum	Pass
FCC 15.247(b)	Maximum Peak Power Output - Limit: 30 dBm max.	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions – Limit: 15.209	Pass
FCC 15.247(d)	Power Spectral Density – Limit: 8 dBm max.	Pass
FCC 15.247(c)	Band Edge Measurement – Limit: 20 dB less than peak level of fundamental	Pass

TABLE 2-5: TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS – FCC PART 15, SUBPART E (SECTION 15.407)

5.15 – 5.35 GHZ BAND		
STANDARD	**TEST**	**PASS/FAIL OR N/A**
FCC 15.407(b)(5)	AC Power Conducted Emissions	Pass
FCC 15.407(b/1/2/3) (b)(5)	Electric Field Strength Spurious Emissions, 30 MHz – 4000 MHz	Pass
FCC 15.407(a)(6)	Peak Power Excursion	Pass
FCC 15.407(a/1/2/3)	Peak Transmit Power	Pass
FCC 15.407(a/1/2/3)	Peak Power Spectral Density	Pass
FCC 15.407(g)	Frequency Stability	Pass

TABLE 2-6: TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS – FCC PART 15, SUBPART C (SECTION 15.247)

5.725 – 5.850 GHZ BAND		
STANDARD	**TEST**	**PASS/FAIL OR N/A**
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.247(a)(2)	Spectrum Bandwidth of DSSS System - Limit: 500 kHz minimum	Pass
FCC 15.247(b)	Maximum Peak Power Output - Limit: 30 dBm max.	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions – Limit: 15.209	Pass
FCC 15.247(d)	Power Spectral Density – Limit: 8 dBm max.	Pass
FCC 15.247(c)	Band Edge Measurement – Limit: 20 dB less than peak level of fundamental	Pass

2.4 TEST SYSTEM DETAILS

The test sample was received on September 27, 2004. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

TABLE 2-7: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
802.11 Platform	ADI Engineering	Pronghorn	0433 0006	SNR-830-00000-00	2 m unshielded power	N/A
Antenna	ADI Engineering	Nearson T614	N/A	N/A	N/A	N/A
Antenna	ADI Engineering	Nearson T614	N/A	N/A	N/A	N/A
Power Adapter	CUI Inc.	3A-161WP05	N/A	N/A	Non-shielded	N/A

TABLE 2-8: SUPPORT EQUIPMENT

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Notebook Computer	Panasonic	CF28 Toughbook	N/A	N/A	2m unshielded power	N/A
Data cable	ADI Engineering	N/A	N/A	N/A	Serial	N/A

2.5 CONFIGURATION OF TESTED SYSTEM

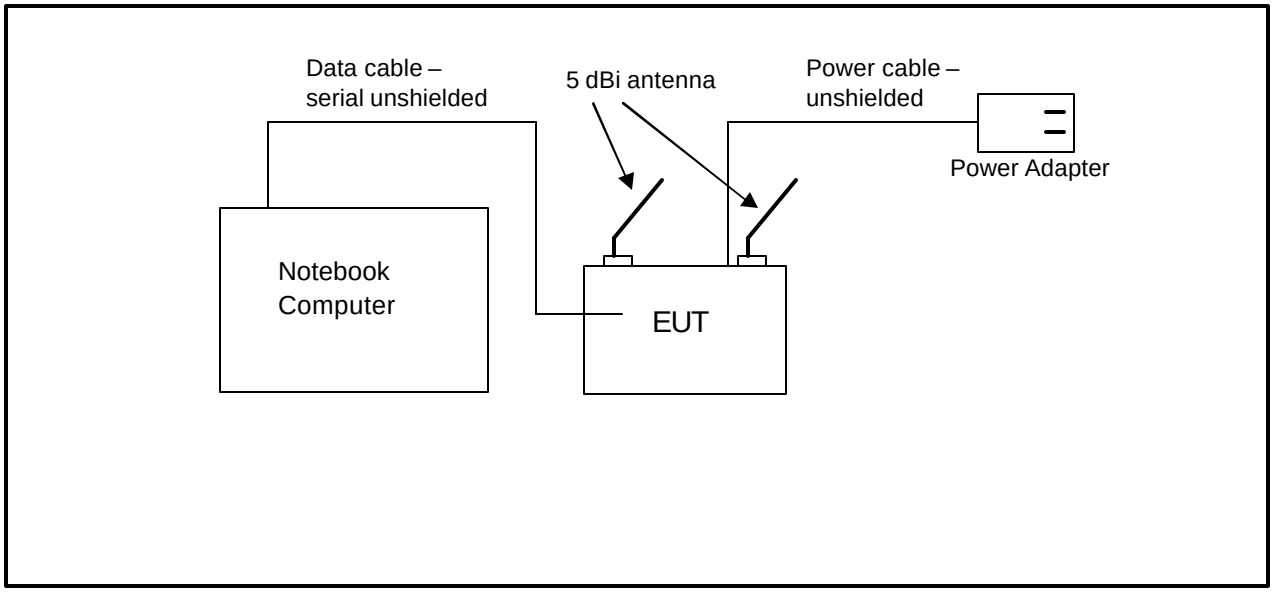


FIGURE 1: CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH FCC §15.204

Please see Appendix B for antenna specifications.

4 TEST RESULTS FOR 802.11B AND 802.11G

4.1 CONDUCTED EMISSIONS MEASUREMENT LIMITS – FCC §15.207; RSS-210 §9

4.1.1 LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

4.1.2 CONDUCTED EMISSIONS MEASUREMENT TEST PROCEDURE

The EUT was placed 0.4 meters from the conducting bulkhead of the shielded room. The EUT was connected to mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/50 uH coupling impedance to the measuring receiver.

The test frequency range was from 150 kHz to 30 MHz.

TABLE 4-1: CONDUCTED EMISSIONS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	6/23/05
900896	Hewlett Packard	85662A	Display Section	2816A16471	2/27/05
900897	Hewlett Packard	8567A	HP Spectrum Analyzer (10 kHz - 1.5 GHz)	2727A00535	2/27/05
900729	Solar	8130	Filter	947306	N/A
901084	AFJ International	LS16/110VAC	16A LISN	16010020082	12/4/04
901083	AFJ International	LS16	LISN	16010020080	3/24/06
900889	Hewlett Packard	85685A	RF Preselector for HP 8566B or 8568B (20 Hz – 2 GHz)	3146A01309	3/10/05
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	6/23/05

4.1.3 CONDUCTED TEST DATA

TABLE 4-2: CONDUCTED TEST DATA; MODE RX, CHANNEL 1 NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.179	Pk	44.1	1.8	45.9	64.5	-18.6	54.5	-8.6	Pass
0.237	Pk	37.8	1.4	39.2	62.2	-23.0	52.2	-13.0	Pass
0.298	Pk	32.4	0.9	33.3	60.3	-27.0	50.3	-17.0	Pass
2.390	Pk	29.1	1.2	30.3	56.0	-25.7	46.0	-15.7	Pass
15.190	Pk	32.8	2.7	35.5	60.0	-24.5	50.0	-14.5	Pass
19.200	Pk	33.7	3.1	36.8	60.0	-23.2	50.0	-13.2	Pass
22.270	Pk	27.7	3.2	30.9	60.0	-29.1	50.0	-19.1	Pass

TABLE 4-3: CONDUCTED TEST DATA; MODE RX, CHANNEL 1, HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.174	Pk	35.5	1.8	37.3	64.8	-27.5	54.8	-17.5	Pass
0.304	Pk	29.8	0.9	30.7	60.1	-29.4	50.1	-19.4	Pass
0.423	Pk	31.8	0.8	32.6	57.4	-24.8	47.4	-14.8	Pass
2.510	Pk	32.4	1.3	33.7	56.0	-22.3	46.0	-12.3	Pass
15.190	Pk	30.2	2.8	33.0	60.0	-27.0	50.0	-17.0	Pass
18.200	Pk	32.8	2.9	35.7	60.0	-24.3	50.0	-14.3	Pass
19.200	Pk	34.5	3.1	37.6	60.0	-22.4	50.0	-12.4	Pass

TABLE 4-4: CONDUCTED TEST DATA; MODE TX, CHANNEL 1, NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.197	Pk	40.8	1.6	42.4	63.7	-21.3	53.7	-11.3	Pass
0.265	Pk	36.2	1.2	37.4	61.3	-23.9	51.3	-13.9	Pass
0.398	Pk	31.6	0.8	32.4	57.9	-25.5	47.9	-15.5	Pass
2.480	Pk	33.2	1.3	34.5	56.0	-21.5	46.0	-11.5	Pass
15.190	Pk	33.9	2.8	36.7	60.0	-23.3	50.0	-13.3	Pass
18.230	Pk	32.6	3.0	35.6	60.0	-24.4	50.0	-14.4	Pass
18.970	Pk	33.4	3.1	36.5	60.0	-23.5	50.0	-13.5	Pass
22.330	Pk	27.5	3.2	30.7	60.0	-29.3	50.0	-19.3	Pass

TABLE 4-5: CONDUCTED TEST DATA; MODE TX, CHANNEL 1, HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.151	Pk	37.3	2.0	39.3	65.9	-26.6	55.9	-16.6	Pass
0.191	Pk	36.9	1.7	38.6	64.0	-25.4	54.0	-15.4	Pass
0.265	Pk	36.1	1.2	37.3	61.3	-24.0	51.3	-14.0	Pass
0.461	Pk	29.8	0.8	30.6	56.7	-26.1	46.7	-16.1	Pass
2.510	Pk	31.6	1.3	32.9	56.0	-23.1	46.0	-13.1	Pass
18.260	Pk	33.3	3.0	36.3	60.0	-23.7	50.0	-13.7	Pass
19.260	Pk	32.1	3.1	35.2	60.0	-24.8	50.0	-14.8	Pass
22.330	Pk	27.0	3.2	30.2	60.0	-29.8	50.0	-19.8	Pass

TABLE 4-6: CONDUCTED TEST DATA; MODE TX, CHANNEL 6, NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.193	Pk	41.1	1.7	42.8	63.9	-21.1	53.9	-11.1	Pass
0.266	Pk	36.6	1.2	37.8	61.2	-23.4	51.2	-13.4	Pass
0.398	Pk	31.5	0.8	32.3	57.9	-25.6	47.9	-15.6	Pass
2.450	Pk	33.7	1.3	35.0	56.0	-21.0	46.0	-11.0	Pass
16.190	Pk	31.0	2.8	33.8	60.0	-26.2	50.0	-16.2	Pass
18.230	Pk	35.0	3.0	38.0	60.0	-22.0	50.0	-12.0	Pass
18.910	Pk	32.8	3.1	35.9	60.0	-24.1	50.0	-14.1	Pass
22.270	Pk	26.7	3.2	29.9	60.0	-30.1	50.0	-20.1	Pass

TABLE 4-7: CONDUCTED TEST DATA; MODE TX, CHANNEL 6, HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.151	Pk	39.7	2.0	41.7	65.9	-24.2	55.9	-14.2	Pass
0.264	Pk	35.9	1.2	37.1	61.3	-24.2	51.3	-14.2	Pass
0.461	Pk	28.9	0.8	29.7	56.7	-27.0	46.7	-17.0	Pass
2.510	Pk	32.3	1.3	33.6	56.0	-22.4	46.0	-12.4	Pass
15.190	Pk	33.0	2.7	35.7	60.0	-24.3	50.0	-14.3	Pass
18.260	Pk	33.5	3.0	36.5	60.0	-23.5	50.0	-13.5	Pass
19.260	Pk	31.0	3.1	34.1	60.0	-25.9	50.0	-15.9	Pass

TABLE 4-8: CONDUCTED TEST DATA; MODE TX, CHANNEL 11, NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.200	Pk	42.4	1.6	44.0	63.6	-19.6	53.6	-9.6	Pass
0.260	Pk	37.2	1.2	38.4	61.4	-23.0	51.4	-13.0	Pass
0.395	Pk	32.0	0.8	32.8	58.0	-25.2	48.0	-15.2	Pass
2.480	Pk	33.6	1.3	34.9	56.0	-21.1	46.0	-11.1	Pass
18.230	Pk	34.5	3.0	37.5	60.0	-22.5	50.0	-12.5	Pass
19.200	Pk	32.2	3.1	35.3	60.0	-24.7	50.0	-14.7	Pass
22.270	Pk	28.1	3.2	31.3	60.0	-28.7	50.0	-18.7	Pass

TABLE 4-9: CONDUCTED TEST DATA; MODE TX, CHANNEL 11 HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.197	Pk	43.4	1.6	45.0	63.7	-18.7	53.7	-8.7	Pass
0.257	Pk	32.0	1.2	33.2	61.5	-28.3	51.5	-18.3	Pass
0.392	Pk	30.2	0.8	31.0	58.0	-27.0	48.0	-17.0	Pass
2.570	Pk	31.2	1.3	32.5	56.0	-23.5	46.0	-13.5	Pass
15.160	Pk	32.9	2.7	35.6	60.0	-24.4	50.0	-14.4	Pass
15.900	Pk	31.8	2.8	34.6	60.0	-25.4	50.0	-15.4	Pass
18.200	Pk	33.4	2.9	36.3	60.0	-23.7	50.0	-13.7	Pass
19.260	Pk	33.6	3.1	36.7	60.0	-23.3	50.0	-13.3	Pass

TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	September 27, 2004
EMC Test Engineer	Signature	Date Of Test

4.2 RADIATED EMISSIONS - §15.209; RSS-210 §6.2.1

4.2.1 LIMITS OF RADIATED EMISSIONS MEASUREMENT

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	2400/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

4.2.2 RADIATED EMISSIONS MEASUREMENT TEST PROCEDURE

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 30 MHz to 2,000 MHz.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

TABLE 4-10: RADIATED EMISSIONS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07
900323	EMCO	3160-7	Horn Antennas (8.2 - 12.4 GHz)	9605-1054	5/20/07
900356	EMCO	3160-08	Horn Antennas (12.4 – 18 GHz)	9607-1044	5/20/07
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	5/20/07
901053	Schaffner & Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	9/20/05
900932	Hewlett Packard	8449B	Microwave Preamplifier (1 - 26.5 GHz)	3008A00505	5/5/05
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	8/11/05

4.2.3 RADIATED EMISSIONS TEST RESULTS

4.2.3.1 FREQUENCY RANGE – BELOW 1000 MHZ

TABLE 4-11: RADIATED EMISSIONS TEST RESULTS – BELOW 1000 MHZ

Temperature: 68°F Humidity: 73%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
133.330	Qp	H	30	1.0	32.4	-7.0	25.4	43.5	-18.1	Pass
133.330	Qp	V	0	1.0	34.8	-8.9	25.9	43.5	-17.6	Pass
200.010	Qp	H	100	1.0	47.2	-5.9	41.3	43.5	-2.2	Pass
200.010	Qp	V	30	1.0	40.0	-7.8	32.2	43.5	-11.3	Pass
204.660	Qp	H	120	1.0	42.8	-5.8	37.0	43.5	-6.5	Pass
205.800	Qp	V	90	2.0	41.2	-7.7	33.5	43.5	-10.0	Pass
231.860	Qp	H	0	1.0	40.0	-5.4	34.6	46.0	-11.4	Pass
266.665	Qp	V	0	1.0	31.6	-6.7	24.9	46.0	-21.1	Pass
395.641	Qp	H	0	1.0	40.9	-2.8	38.1	46.0	-7.9	Pass
399.998	Qp	V	0	1.0	43.3	-4.4	38.9	46.0	-7.1	Pass
466.663	Qp	V	0	1.0	40.4	-3.3	37.1	46.0	-8.9	Pass
499.981	Qp	H	90	1.0	44.4	-1.1	43.3	46.0	-2.7	Pass
666.648	Qp	V	0	1.0	39.8	0.0	39.8	46.0	-6.2	Pass
799.978	Qp	H	0	1.0	38.7	3.6	42.3	46.0	-3.7	Pass

TEST PERSONNEL:

Daniel W. Biggs		September 30, 2004
EMC Test Engineer	Signature	Date Of Test

4.2.3.2 FREQUENCY RANGE – 1000 MHZ – 25000 MHZ

4.2.3.2.1 802.11B

TABLE 4-12: RADIATED EMISSIONS HARMONICS/SPURIOUS CHANNEL 1 (TX FREQUENCY: 2412 MHZ/11 MB/S)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2688	44.46	-	10.5	54.96	74.0	-19.04
2688	-	35.38	10.5	45.88	54.0	-8.12
2390	47.84	-	9.9	57.74	74.0	-16.26
2390	-	37.57	9.9	47.47	54.0	-6.53
4824	50.73	-	13.9	64.63	74.0	-9.37
4824	-	37.54	13.9	51.44	54.0	-2.56
7236	46.05	-	12.8	58.58	74.0	-15.42
7236	-	35.91	12.8	48.71	54.0	-5.29
2412	100.03	--	10.2	110.23	-	-
2412	-	93.07	10.2	103.27	-	-

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TABLE 4-13: RADIATED EMISSIONS HARMONICS/SPURIOUS CHANNEL 6 (TX FREQUENCY: 2437 MHZ/11 MB/S)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2688	47.65	-	10.5	58.15	74.0	-15.85
2688	-	35.77	10.5	46.27	54.0	-7.73
4874	46.37	-	14.6	60.97	74.0	-23.03
4874	-	33.65	14.6	48.25	54.0	-5.75
7311	49.45	-	12.2	61.65	74.0	-12.35
7311	-	38.12	12.2	50.32	54.0	-3.68
2437	101.5	-	10.3	111.8	-	-
2437	-	93.17	10.3	103.47	-	-

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TABLE 4-14: RADIATED EMISSIONS HARMONICS/SPURIOUS CHANNEL 11 (TX FREQUENCY: 2462 MHZ/11 MB/S)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2688	49.37	-	10.5	59.87	74.0	-14.13
2688	-	40.27	10.5	50.77	54.0	-3.23
4924	51.68	-	13.7	65.38	74.0	-8.62
4924	-	37.45	13.7	51.15	54.0	-2.85
7386	47.5	-	12.8	60.3	74.0	-13.7
7386	-	36.8	12.8	49.6	54.0	-4.4
2462	100.89	-	10.3	111.19	-	-
2462	-	92.86	10.3	103.16	-	-

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

4.2.3.2.2 802.11G

TABLE 4-15: RADIATED EMISSIONS HARMONICS/SPURIOUS CHANNEL 1 (TX FREQUENCY: 2412 MHZ/6 MB/S)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390	49.61	-	9.9	59.51	74.0	-14.49
2390	-	38.34	9.9	48.24	54.0	-5.76
2688	43.94	-	10.5	54.44	74.0	-19.56
2688	-	35.35	10.5	45.85	54.0	-8.15
4824	47.26	-	13.9	61.16	74.0	-12.84
4824	-	34.18	13.9	48.08	54.0	-5.92
7236	44.92	-	12.8	57.72	74.0	-16.28
7236	-	33.16	12.8	45.96	54.0	-8.04
2412	96.0	-	10.2	106.20	-	-
2412	-	84.1	10.2	94.30	-	-

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TABLE 4-16: RADIATED EMISSIONS HARMONICS/SPURIOUS CHANNEL 6 (TX FREQUENCY: 2437 MHZ/6 MB/S)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2688	48.2	-	10.5	58.7	74.0	-15.3
2688	-	37.23	10.5	47.73	54.0	-6.27
4874	52.2	-	14.6	66.8	74.0	-7.2
4874	-	38.49	14.6	53.09	54.0	-0.91
7311	48.36	-	12.2	60.56	74.0	-13.44
7311	-	38.1	12.2	50.3	54.0	-3.7
2437	100.41	-	10.3	110.71	-	-
2437	-	90.11	10.3	100.41	-	-

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TABLE 4-17: RADIATED EMISSIONS HARMONICS/SPURIOUS CHANNEL 11 (TX FREQUENCY: 2462 MHZ/6 MB/S)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2688	48.02		10.5	58.52	74.0	-15.48
2688		36.84	10.5	47.34	54.0	-6.66
4924	43.61		13.7	57.31	74.0	-16.69
4924		30.25	13.7	43.95	54.0	-10.05
7386	48.47		12.8	61.27	74.0	-12.73
7386		38.37	12.8	51.17	54.0	-2.83
2462	96.25	-	10.3	106.55	-	-
2462	-	86.57	10.3	96.87	-	-

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TEST PERSONNEL:

Daniel W. Biggs		October 14, 2004
EMC Test Engineer	Signature	Date Of Test

4.3 6 DB BANDWIDTH - §15.247(A)(2); RSS-210 §6.6.2(O)

4.3.1 6 DB BANDWIDTH TEST PROCEDURE – MINIMUM 6 DB BANDWIDTH

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The device was modulated using the maximum 11 Mbps data rate for 802.11B and 6 Mbps for 802.11G. The minimum 6 dB bandwidths are presented in Tables 4-19 and 4-20 below.

TABLE 4-18: 6 DB BANDWIDTH TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	6/23/05

4.3.2 6 DB BANDWIDTH TEST RESULTS

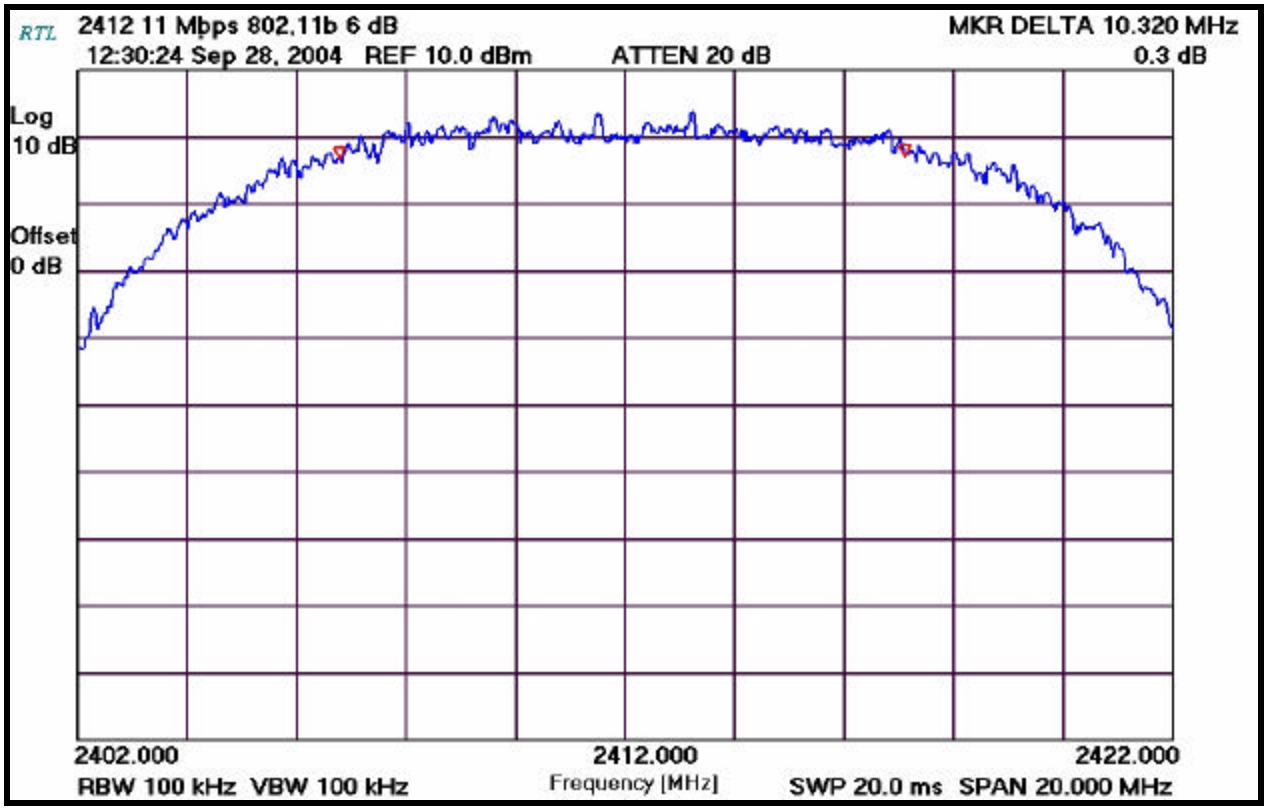
TABLE 4-19: 6DB BANDWIDTH TEST DATA 802.11B

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)	Pass/ Fail
1	2412	10.32	0.5	Pass
6	2437	10.78	0.5	Pass
11	2462	11.66	0.5	Pass

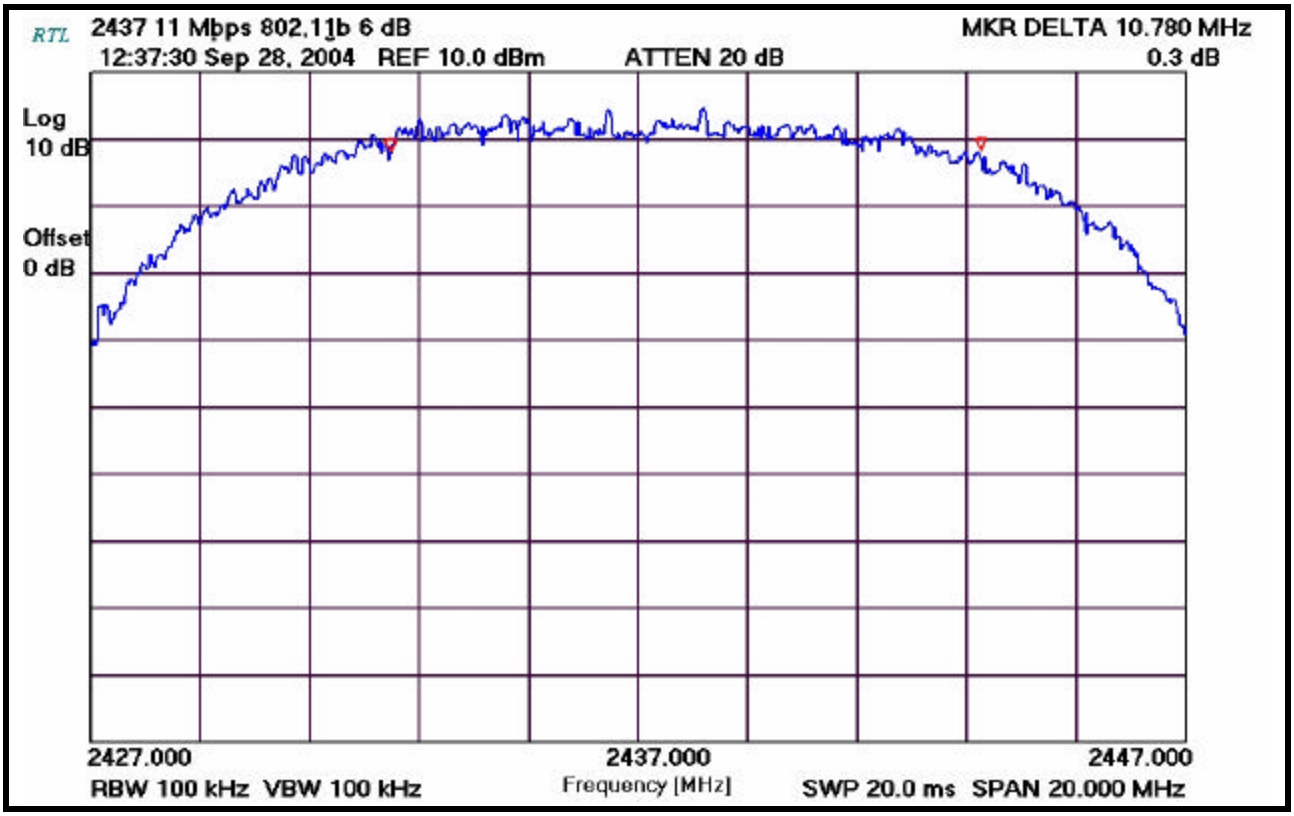
TABLE 4-20: 6DB BANDWIDTH TEST DATA 802.11G

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)	Pass/ Fail
1	2412	16.72	0.5	Pass
6	2437	16.66	0.5	Pass
6 (Turbo)	2437 (Turbo)	16.64	0.5	Pass
11	2462	16.62	0.5	Pass

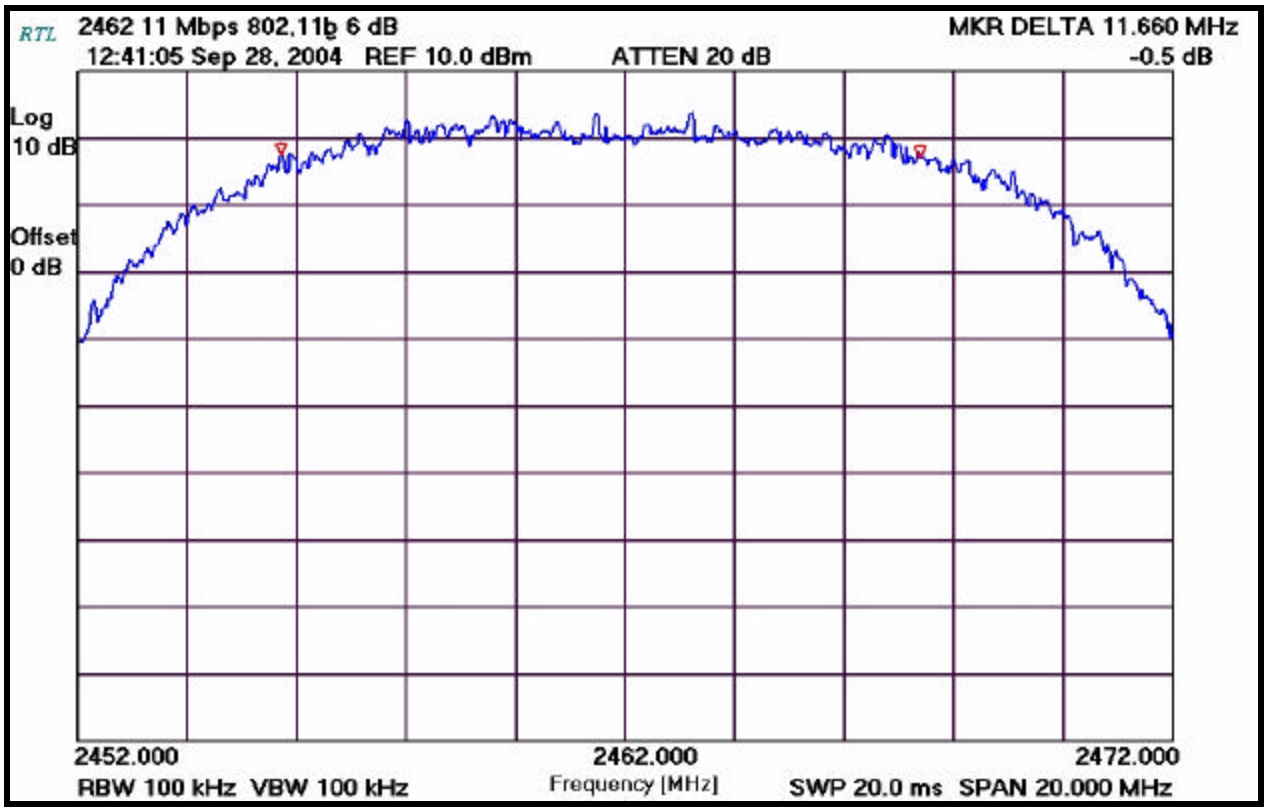
PLOT 4-1: 6 DB BANDWIDTH CHANNEL 1 (TX FREQUENCY: 2412 MHZ – 11 MB/S)



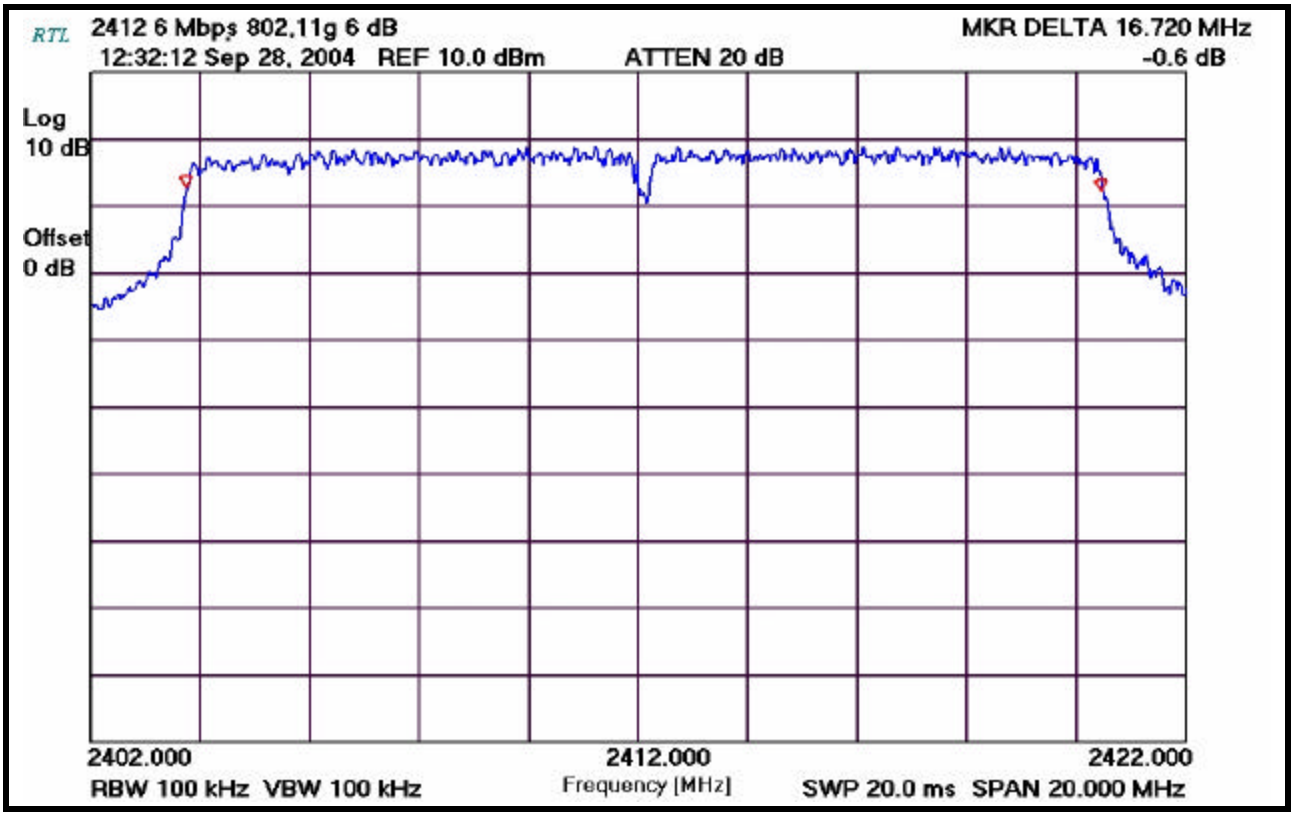
PLOT 4-2: 6 DB BANDWIDTH CHANNEL 6; (TX FREQUENCY: 2437 MHZ – 11 MB/S)



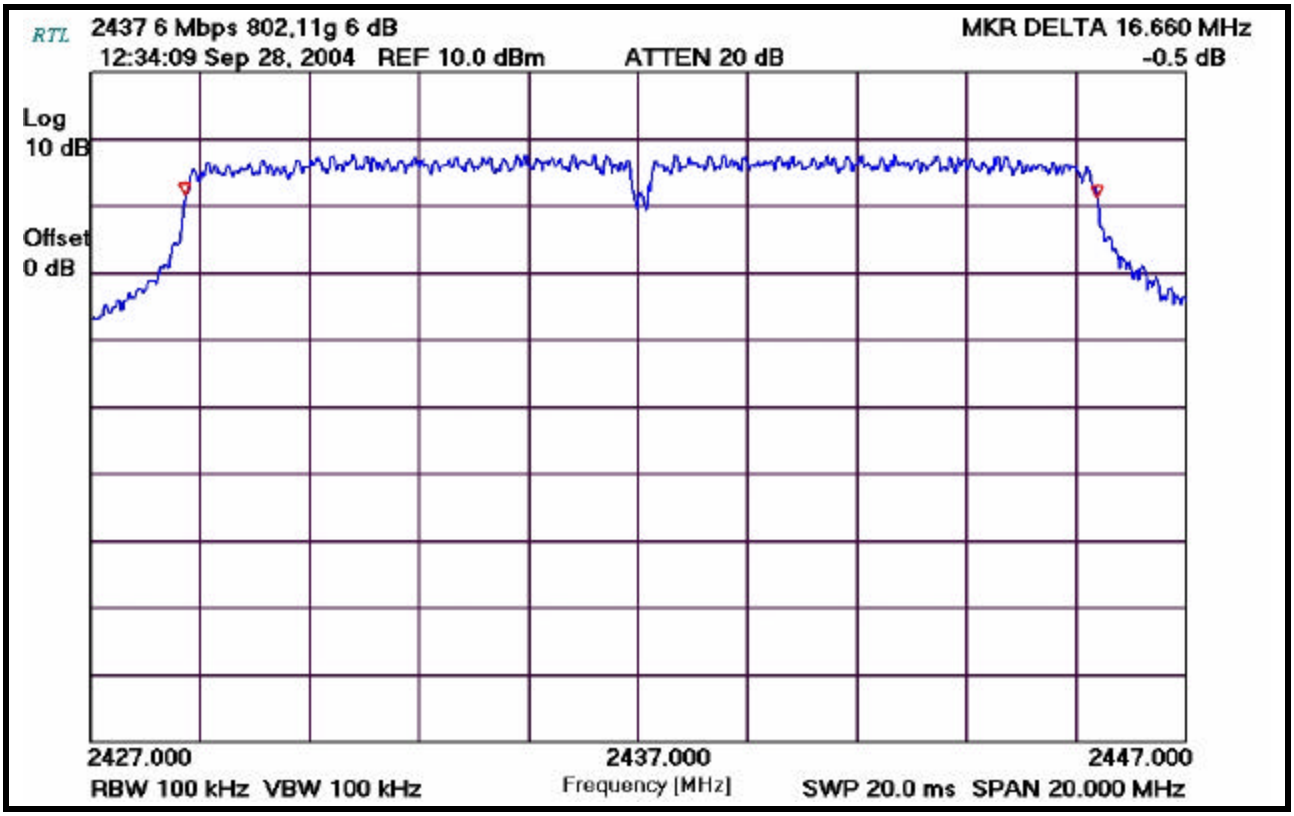
PLOT 4-3: 6 DB BANDWIDTH CHANNEL 11 (TX FREQUENCY: 2462 MHZ – 11 MB/S)



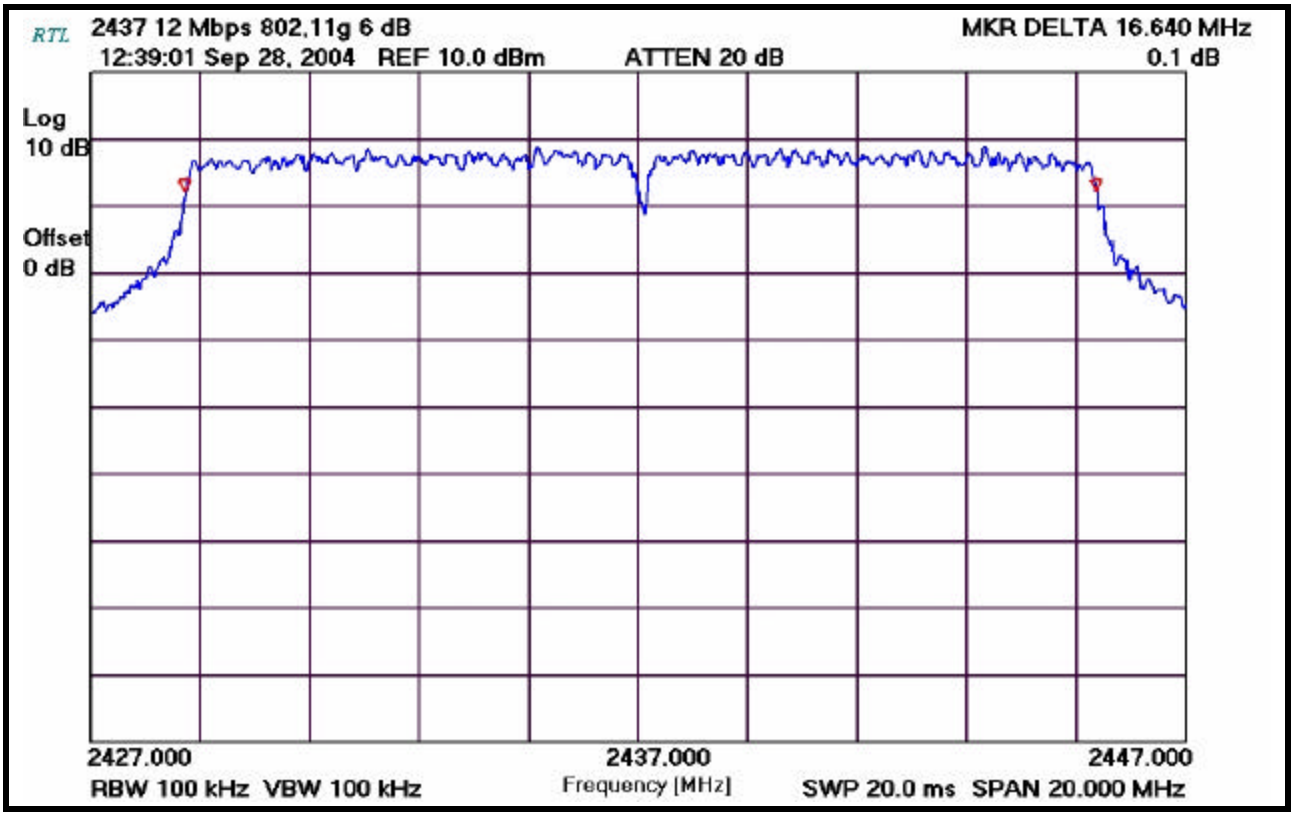
PLOT 4-4: 6 DB BANDWIDTH CHANNEL 1 (TX FREQUENCY: 2412 MHZ – 6 MB/S)



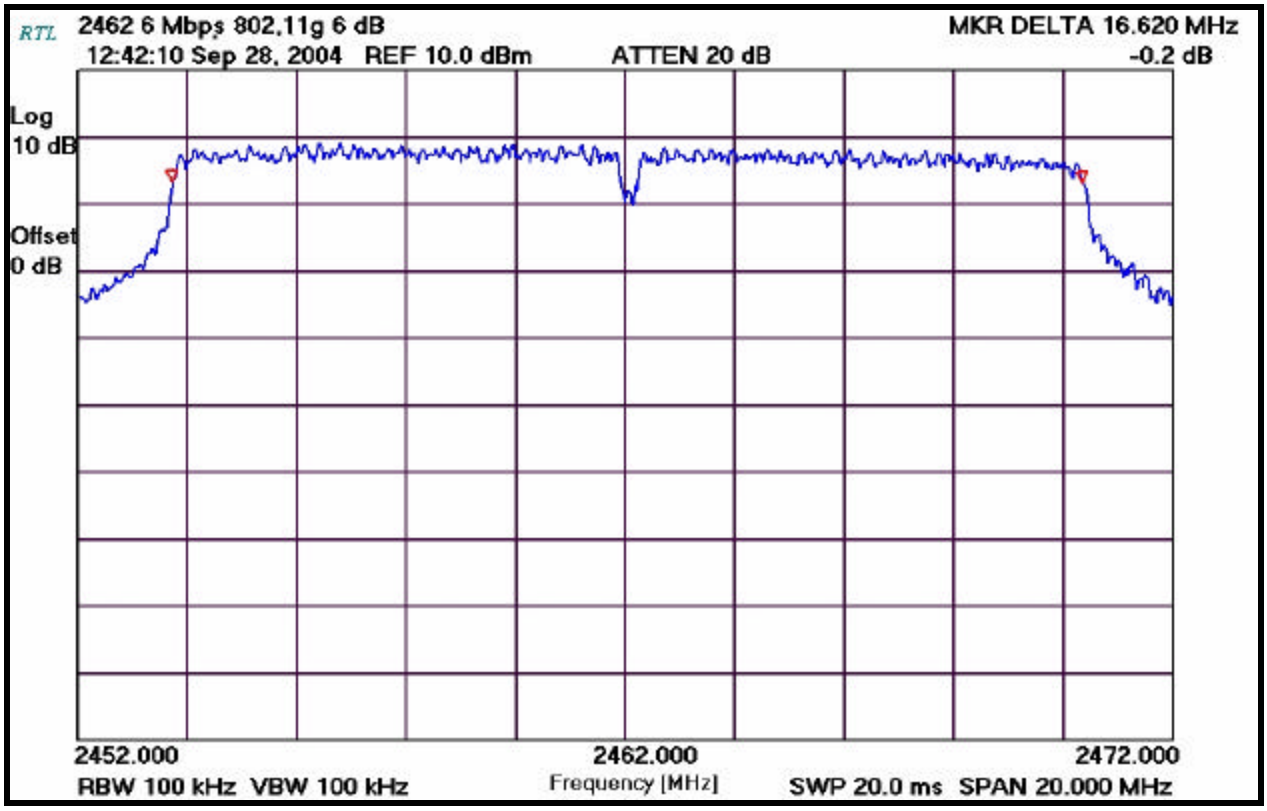
PLOT 4-5: 6 DB BANDWIDTH CHANNEL 6 (TX FREQUENCY: 2437 MHZ – 6 MB/S)



PLOT 4-6: 6 DB BANDWIDTH CHANNEL 6 (TX FREQUENCY: 2437 MHZ – 12 MB/S)



PLOT 4-7: 6 DB BANDWIDTH CHANNEL 11 (TX FREQUENCY: 2462 MHZ - 6 MB/S)



TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	September 28, 2004
EMC Test Engineer	Signature	Date Of Test

4.4 PEAK OUTPUT POWER - §15.247(B)(1); RSS-210 §6.6.2(O)

4.4.1 POWER OUTPUT TEST PROCEDURE

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

TABLE 4-21: POWER OUTPUT TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
901184/ 901186	Agilent	E4416A/E9323A	Power Meter / Sensor	GB41050573/ US420.52510380	07/30/05

4.4.2 POWER OUTPUT TEST DATA

TABLE 4-22: POWER OUTPUT TEST DATA – 802.11B

CHANNEL	FREQUENCY (MHZ)	PEAK POWER CONDUCTED OUTPUT (dBm)
1	2412	16.5
6	2437	16.6
11	2462	17.3

TABLE 4-23: POWER OUTPUT TEST DATA - 802.11G

CHANNEL	FREQUENCY (MHZ)	PEAK POWER CONDUCTED OUTPUT (dBm)
1	2412	12.1
6	2437	15.2
11	2462	13.0
6 (Turbo)	2437	14.8

TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	September 28, 2004
EMC Test Engineer	Signature	Date Of Test

4.5 POWER SPECTRAL DENSITY - §15.247(D); RSS-210 §6.6.2(O)

4.5.1 POWER SPECTRAL DENSITY TEST PROCEDURE

The power spectral density per FCC 15.247(d) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 30 kHz, and the sweep time set at 500 seconds. The spectral lines were resolved for the modulated carriers at 2.412 GHz, 2.437 GHz, and 2.462 GHz respectively. These levels are below the +8 dBm limit. See the power spectral density table and plots.

TABLE 4-24: POWER SPECTRAL DENSITY TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	6/23/05

4.5.2 POWER SPECTRAL DENSITY TEST DATA

TABLE 4-25: POWER SPECTRAL DENSITY TEST DATA 802.11B

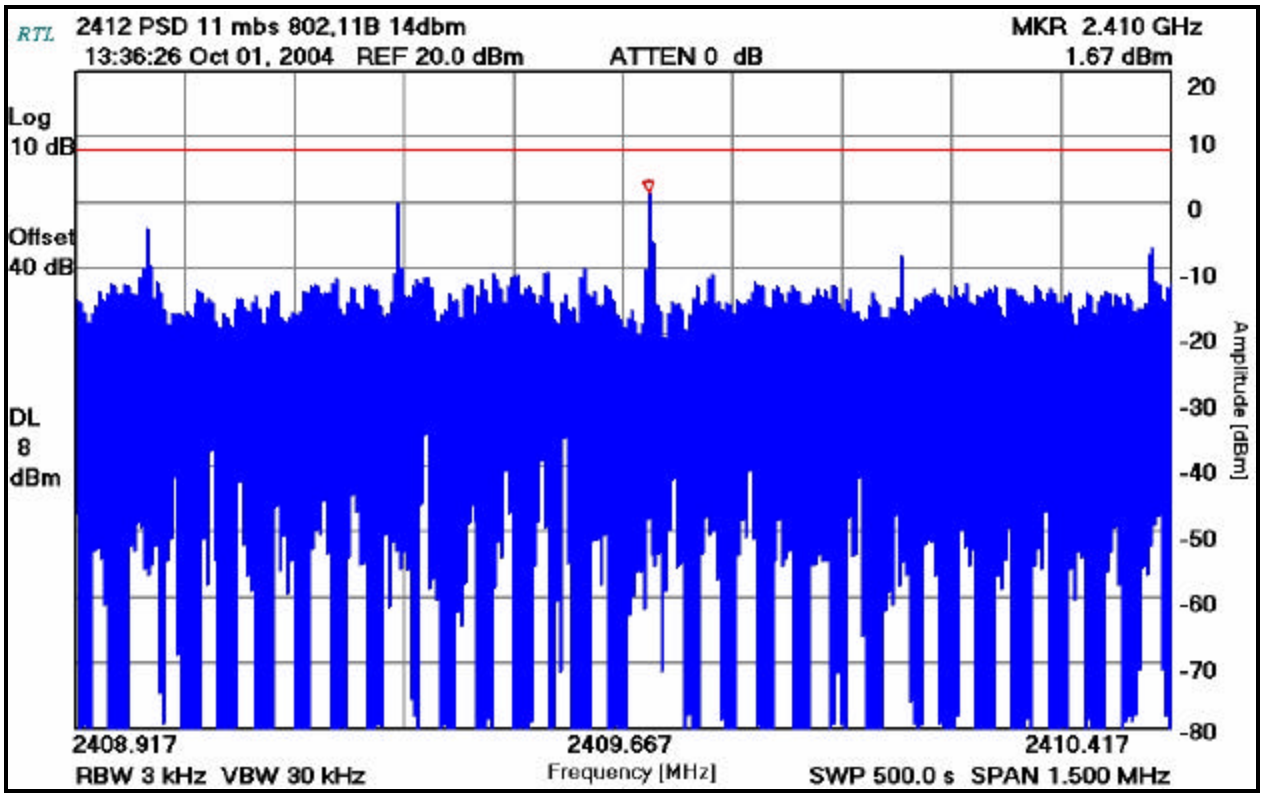
Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	1.67	8	**Pass**
6	2437	4.33	8	**Pass**
11	2462	-2.33	8	**Pass**

TABLE 4-26: POWER SPECTRAL DENSITY TEST DATA 802.11G

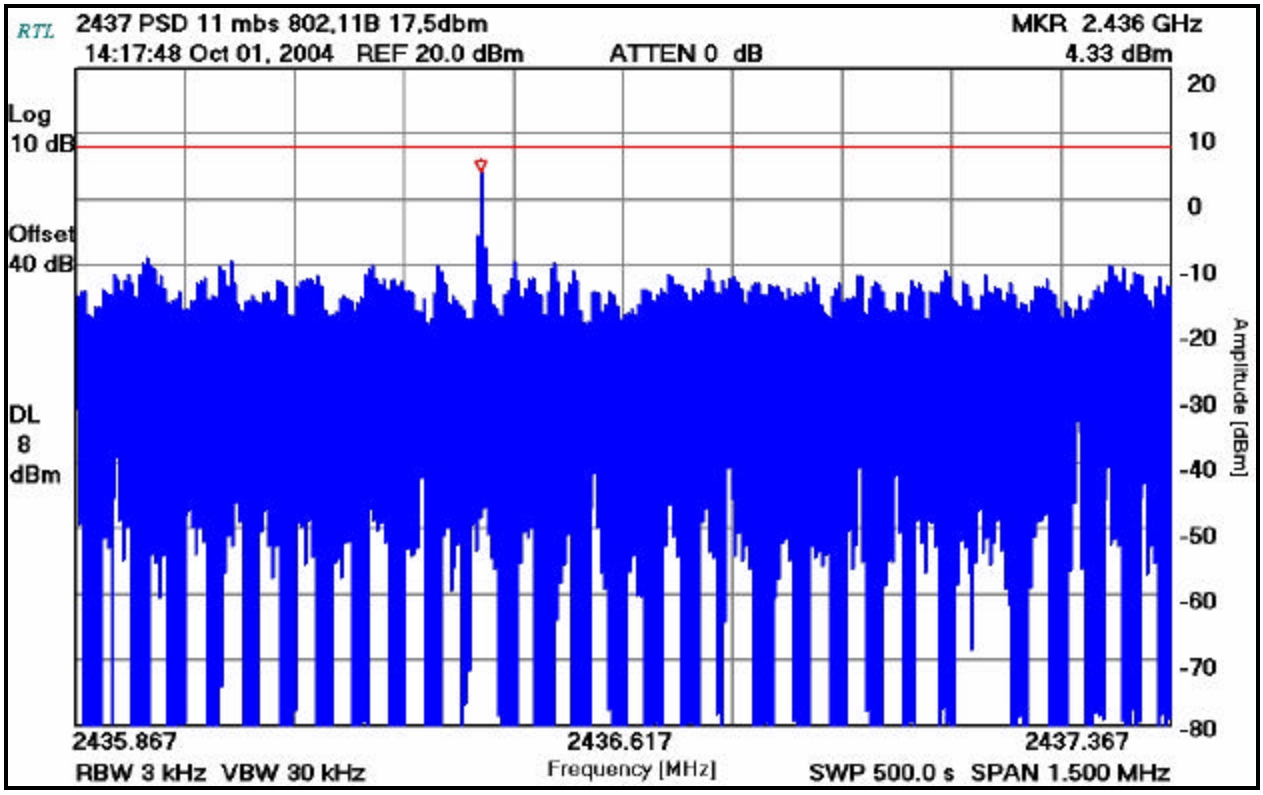
Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-16.17	8	**Pass**
6	2437	-13.33	8	**Pass**
11	2462	-15.83	8	**Pass**
6 (Turbo)	2437 (Turbo)	-13.67	8	**Pass**

4.5.3 POWER SPECTRAL DENSITY PLOTS - 802.11B

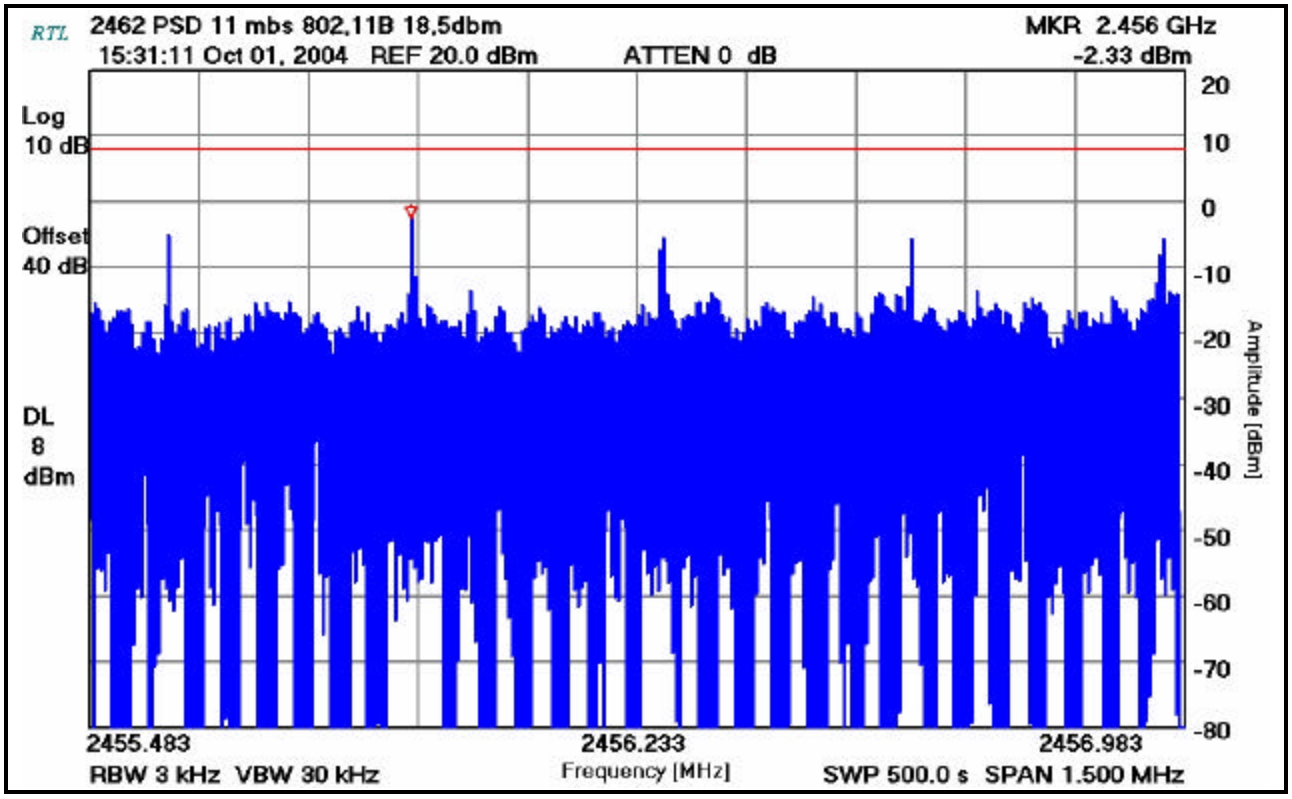
PLOT 4-8: POWER SPECTRAL DENSITY: CHANNEL 1 (2412 MHZ – 11 MB/S)



PLOT 4-9: POWER SPECTRAL DENSITY: CHANNEL 6 (2437 MHZ – 11 MB/S)

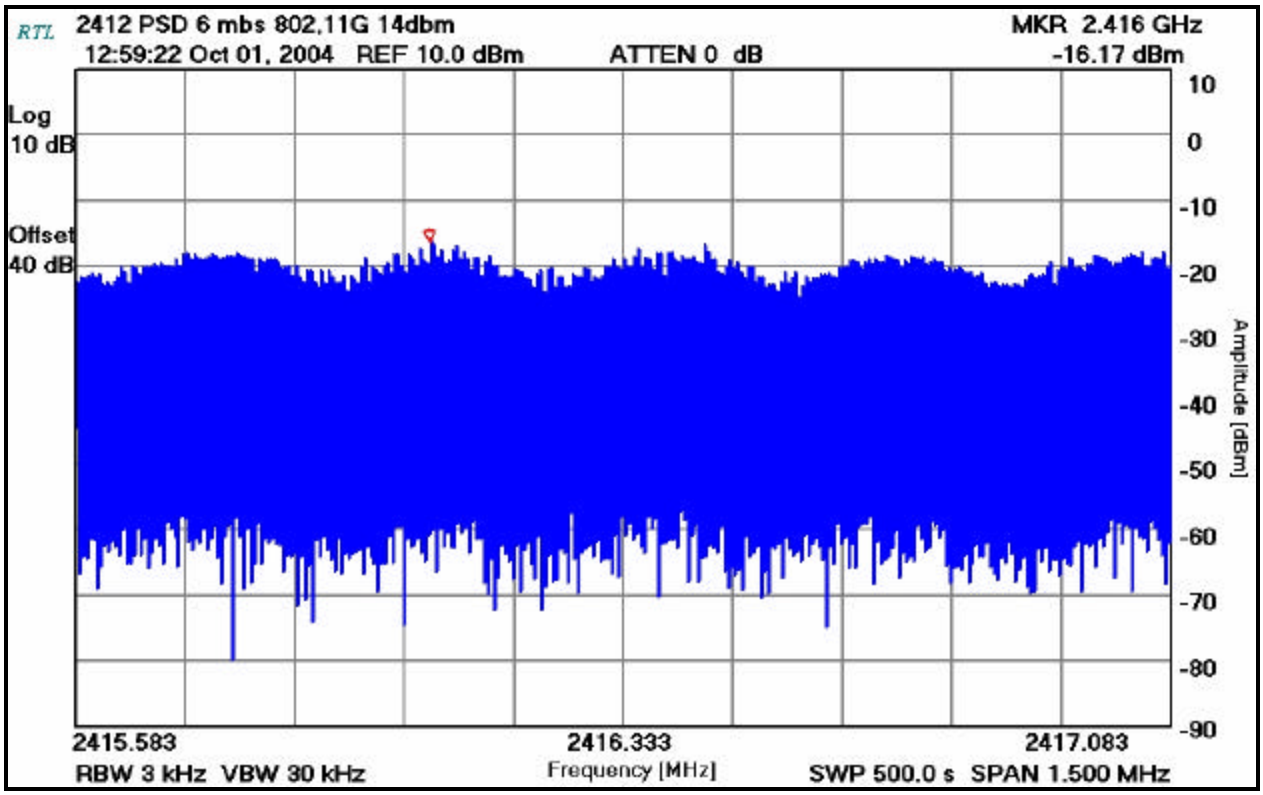


PLOT 4-10: POWER SPECTRAL DENSITY: CHANNEL 11 (2462 MHZ – 11 MB/S)

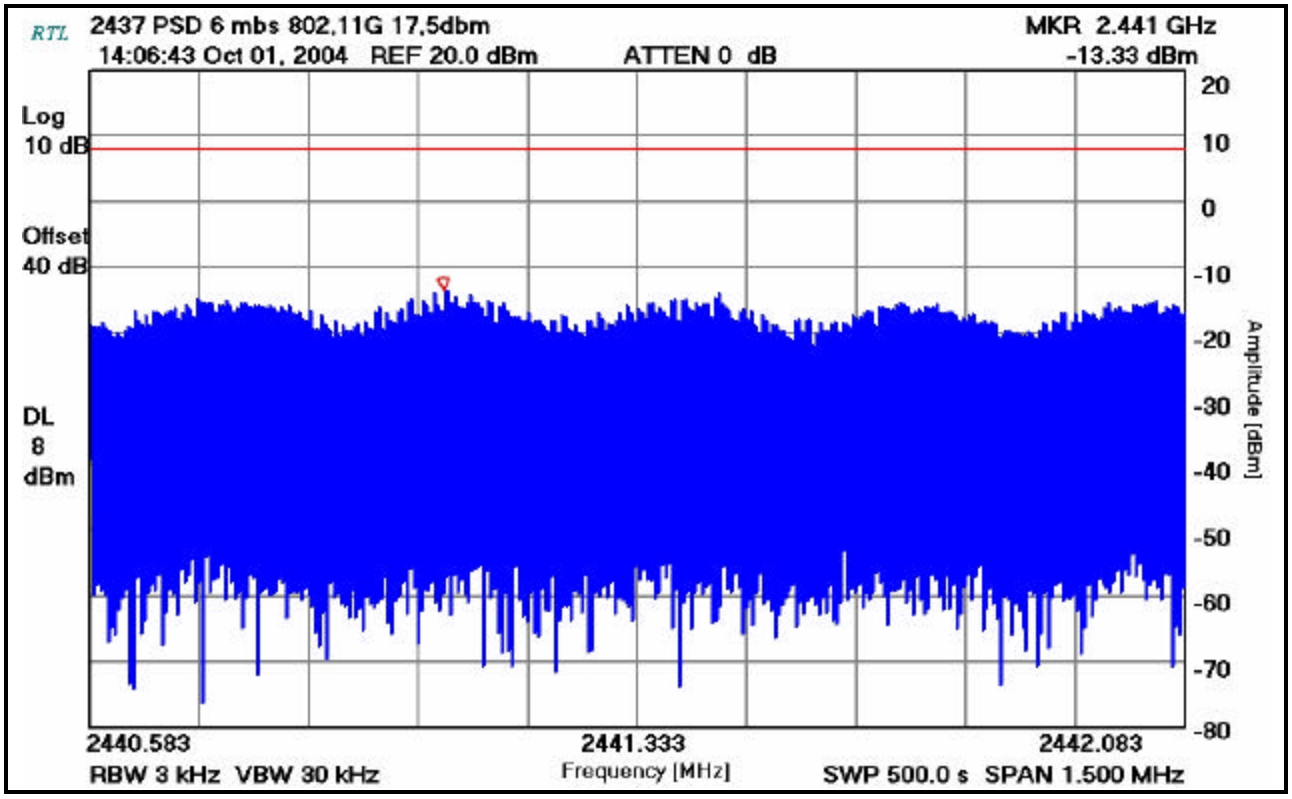


4.5.4 POWER SPECTRAL DENSITY PLOTS - 802.11G

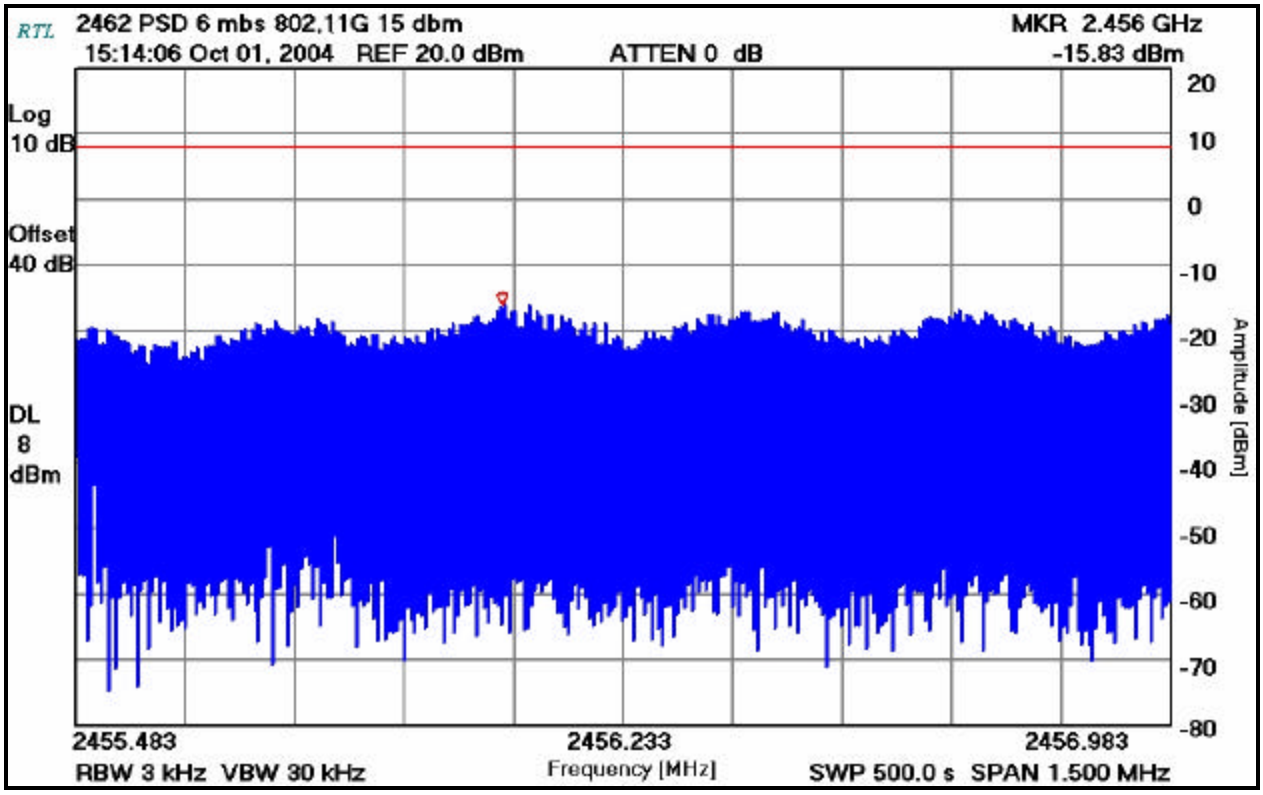
PLOT 4-11: POWER SPECTRAL DENSITY: CHANNEL 1 (2412 MHZ – 6 MB/S)



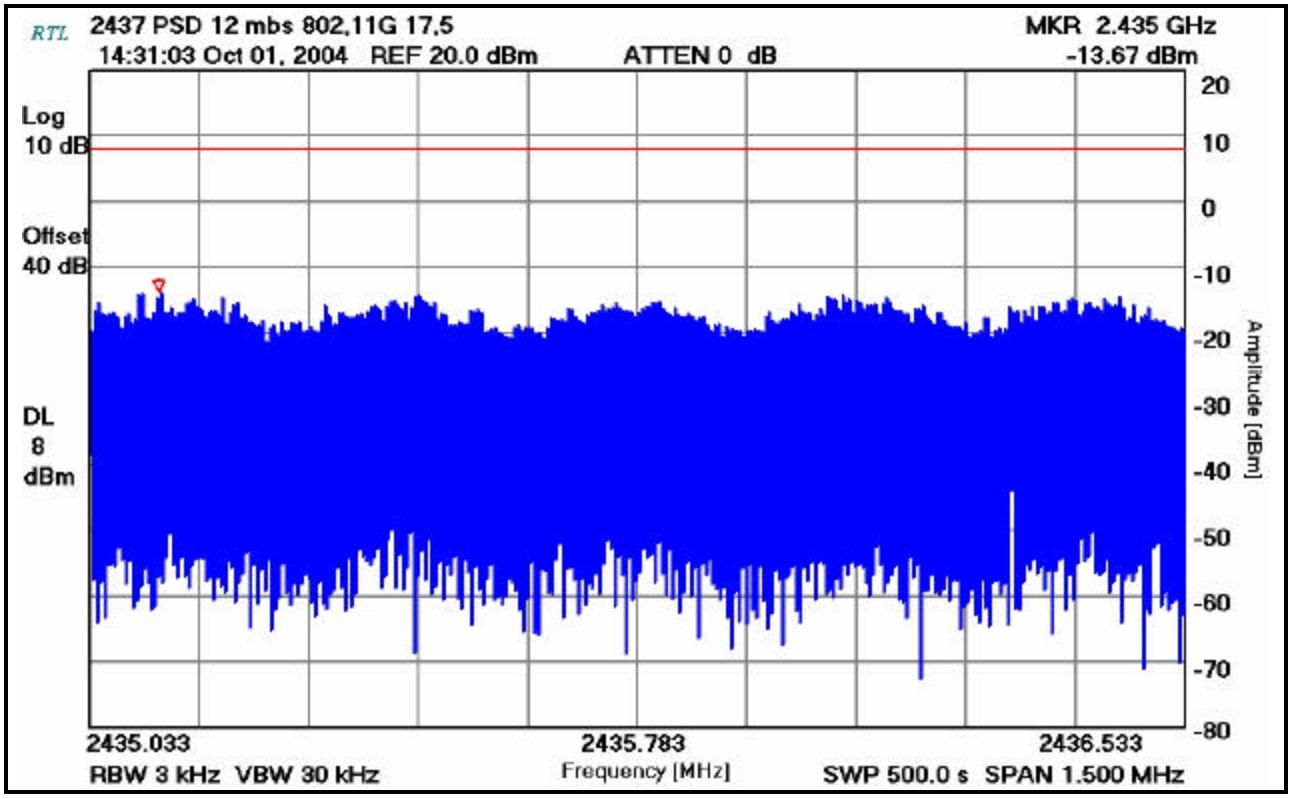
PLOT 4-12: POWER SPECTRAL DENSITY: CHANNEL 6 (2437 MHZ – 6 MB/S)



PLOT 4-13: POWER SPECTRAL DENSITY: CHANNEL 11 (2462 MHZ – 6 MB/S)



PLOT 4-14: POWER SPECTRAL DENSITY: CHANNEL 6 TURBO (2437 MHZ – 12 MB/S)



TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	October 1, 2004
EMC Test Engineer	Signature	Date Of Test

4.6 COMPLIANCE WITH THE BAND EDGE – FCC §15.247(C), §15.205; RSS-210 §6.6.2(O)

4.6.1 LIMITS OF BAND EDGE MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100 kHz resolution bandwidth)

4.6.2 BAND EDGE TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer through a low loss cable. The RBW was set to 1 MHz and the VBW was set to 10 Hz with a suitable span including 100 MHz bandwidth from band edge.

For signals in the restricted band above and below 5150 and 5350 MHz, a measurement of the amplitude of the spurious emissions was made with respect to the intentional signal. The relative amplitude, in dBc, was applied to the average measurement using the peak field strength which was measured on the OATS site to calculate the field strength of the unintentional signals.

TABLE 4-27: BAND EDGE TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	6/23/05

4.6.3 RESTRICTED BAND EDGE TEST RESULTS

4.6.3.1 802.11B

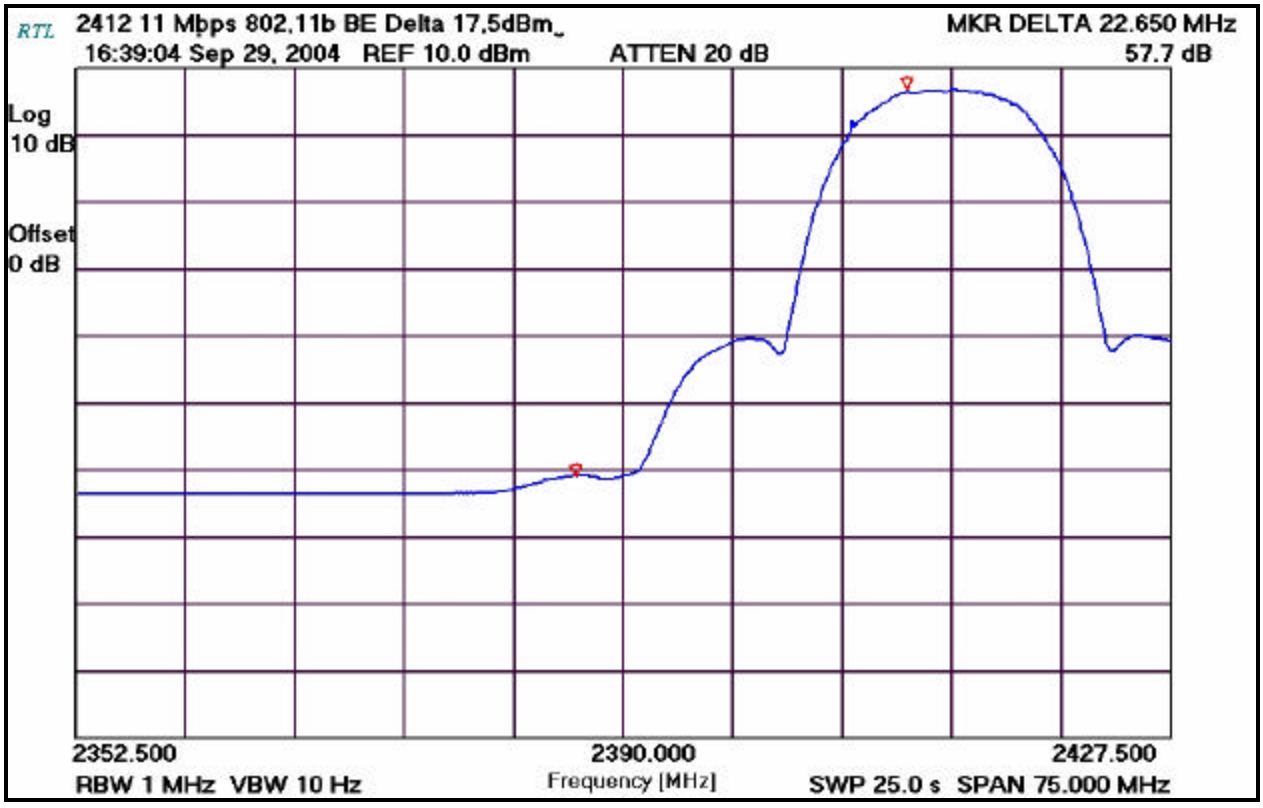
4.6.3.1.1 Calculation of Lower Band Edge

103.27 dBuV/m is the field strength measurement, from which the delta measurement of 57.7 dB is subtracted (reference plots), resulting in a level of 45.57 dB. This level has a margin of 8.43 dB below the limit of 54 dBuV/m.

Calculation: 103.27 dBuV/m – 57.7 dB – 54 dBuV/m = -8.43 dB

Field strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 103.27 dBuV/m
Delta measurement = 57.7 dB

PLOT 4-15: LOWER BAND EDGE: AVERAGE MEASUREMENT CHANNEL 1 (TX FREQUENCY: 2412 MHZ – 11 MB/S)



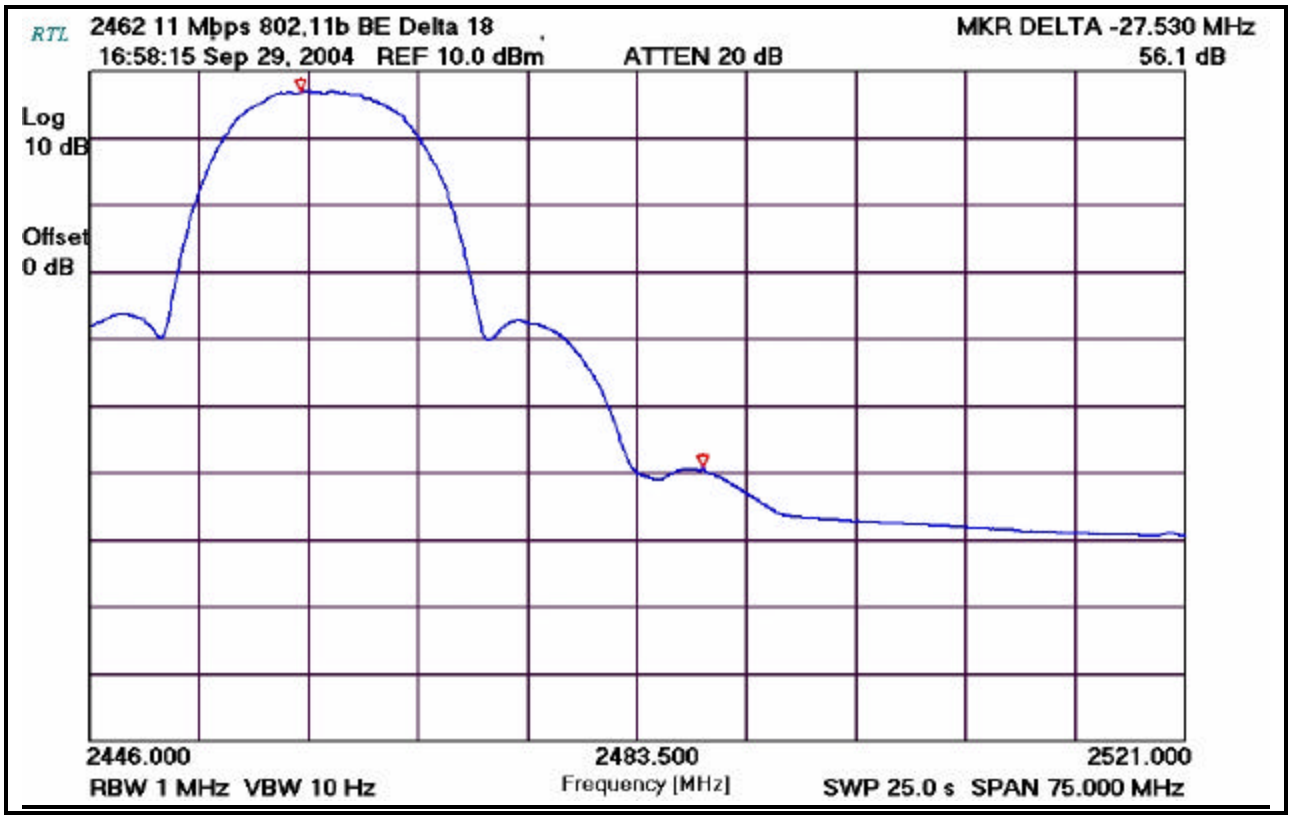
4.6.3.1.2 Calculation of Upper Band Edge

103.16 dBuV/m is the field strength measurement, from which the delta measurement of 56.1 dB is subtracted (reference plots), resulting in a level of 47.06 dB. This level has a margin of 7.3 dB below the limit of 54 dBuV/m.

Calculation: 103.16 dBuV/m – 56.1 dB – 54 dBuV/m = -6.94 dB

Field strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 103.16 dBuV/m
Delta measurement = 56.1 dB

PLOT 4-16: UPPER BAND EDGE: AVERAGE MEASUREMENT CHANNEL 11 (TX FREQUENCY: 2462 MHZ – 11 MB/S)



TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	September 29, 2004
Test Engineer	Signature	Dates Of Test

4.6.3.2 802.11G

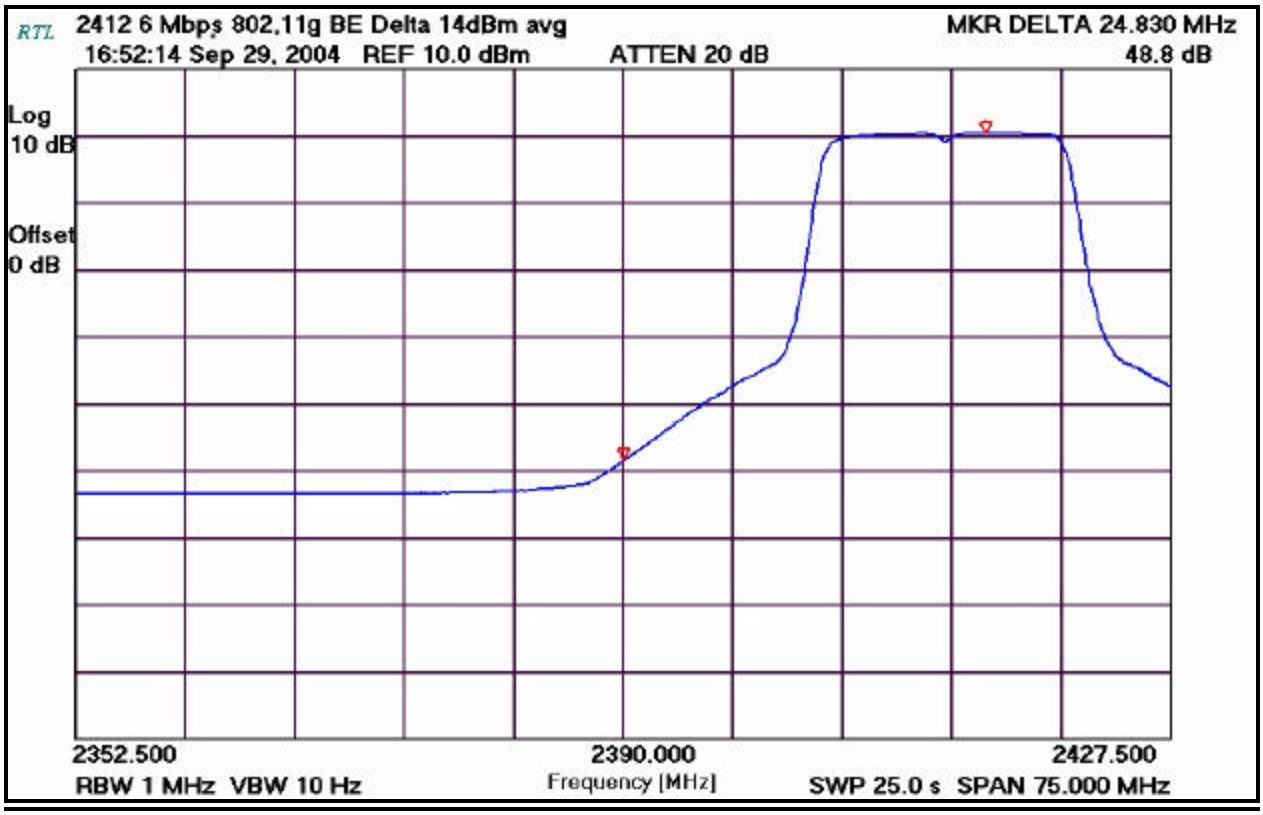
4.6.3.2.1 Calculation of Lower Band Edge

94.3 dBuV/m is the field strength measurement, from which the delta measurement of 48.8 dB is subtracted (reference plots), resulting in a level of 45.5 dB. This level has a margin of 8.5 dB below the limit of 54 dBuV/m.

Calculation: 94.3 dBuV/m – 48.8 dB – 54 dBuV/m = -8.5 dB

Field strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 94.3 dBuV/m
Delta measurement = 48.8 dB

PLOT 4-17: LOWER BAND EDGE: PEAK MEASUREMENT CHANNEL 1 (TX FREQUENCY: 2412 MHZ – 6 MB/S)



TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	September 29, 2004
Test Engineer	Signature	Dates Of Test

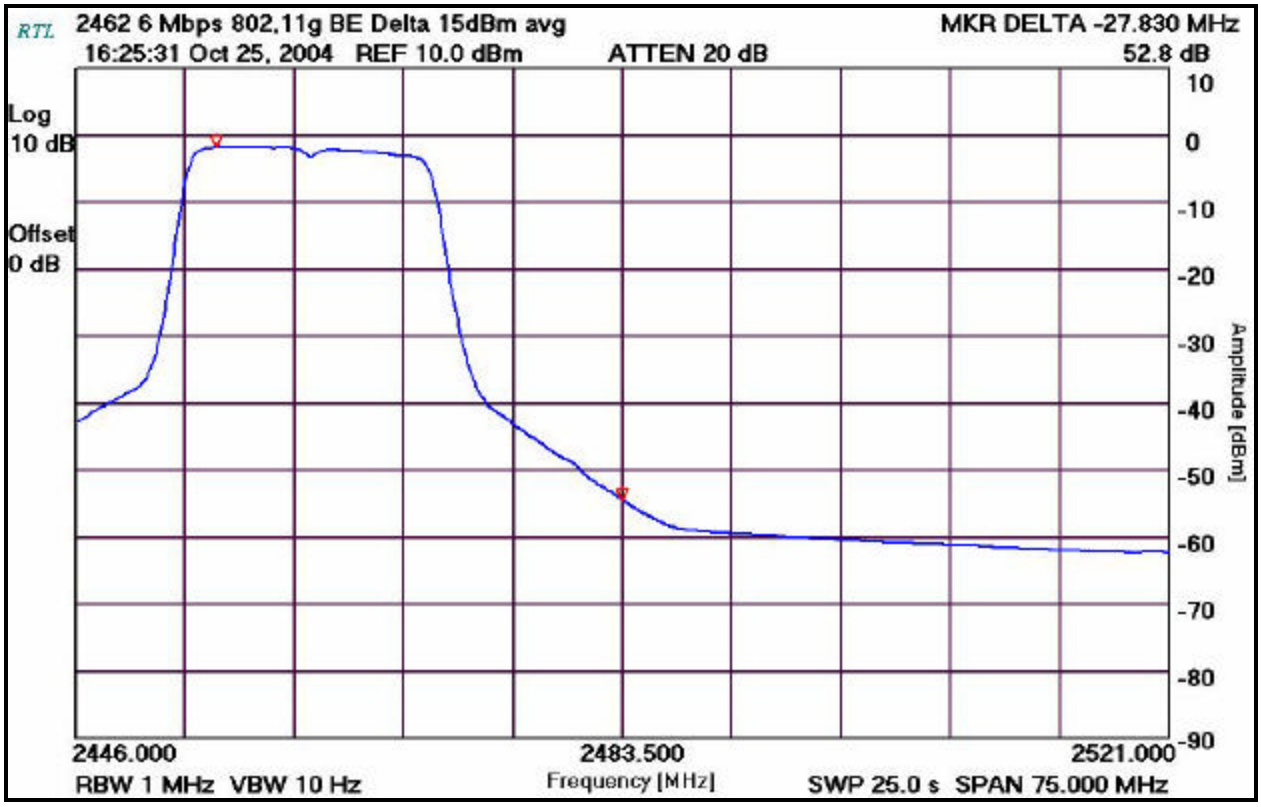
4.6.3.2.2 Calculation of Upper Band Edge

The level 96.87 dBuV/m is the field strength measurement, from which the delta measurement of 52.8 dB is subtracted (reference plots), which is equivalent to a level of 44.07 dB. This level has a margin of 14.0 dB below the limit of 54 dBuV/m.

Calculation: 96.87 dBuV/m – 52.8 dB – 54 dBuV/m = -9.93 dB

Field strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 96.87 dBuV/m
Delta measurement = 52.8 dB

PLOT 4-18: UPPER BAND EDGE: MARKER-DELTA METHOD CHANNEL 11 (TX FREQUENCY: 2462 MHZ – 6 MB/S)



TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	October 25, 2004
Test Engineer	Signature	Dates Of Test

4.7 ANTENNA REQUIREMENT – FCC §15.203

4.7.1 APPLICABLE STANDARD

According to Part 25.203, an intentional radiating device shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with this device. According to Part 15.247(b), 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.

4.7.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is a dipole antenna with a connector. The maximum gain is stated as 5 dBi.

4.8 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C); RSS-210 §6.6.2(O)

4.8.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna spurious emission per FCC 15.247(c) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2437 MHz and 2462 MHz. No other harmonics or spurs were found within 20 dB of the carrier level from 2.5 GHz to 24GHz. See the Antenna Conducted Spurious Noise Table below. The low, middle, and high frequencies were investigated and tested.

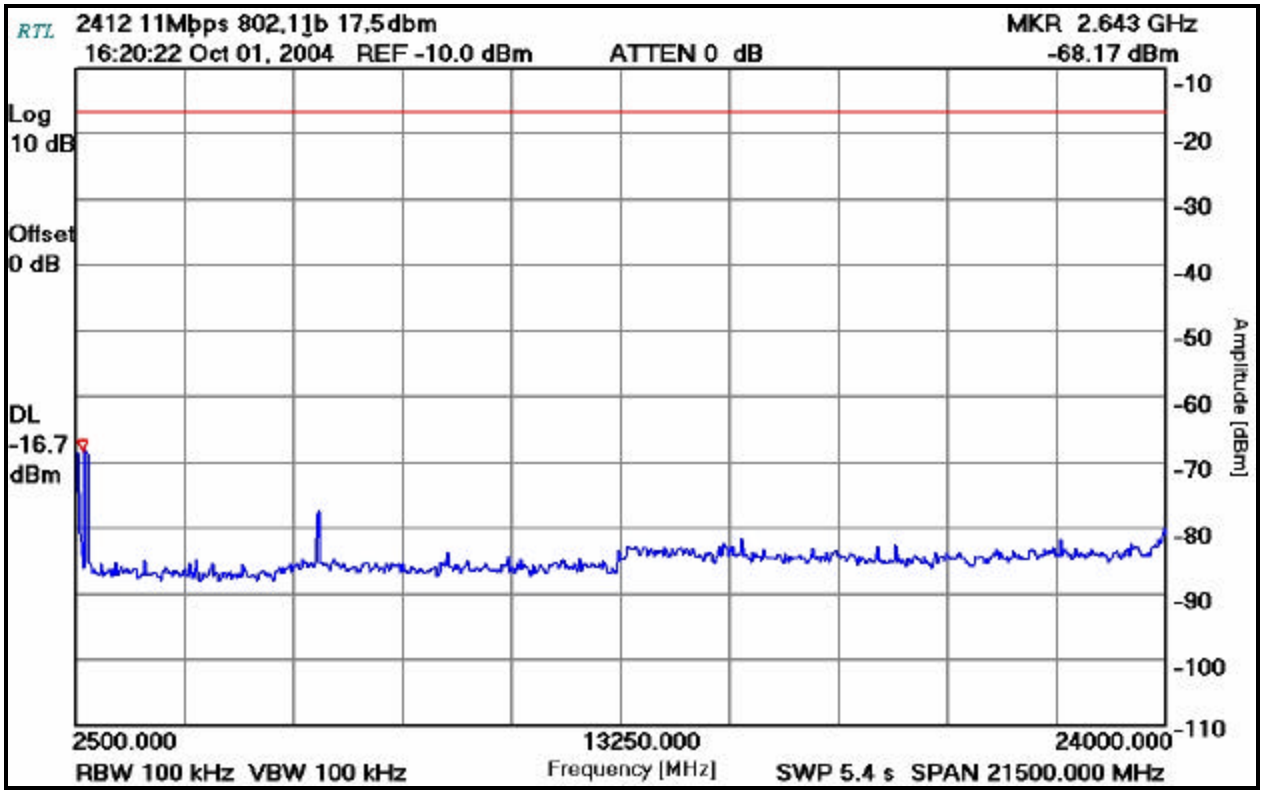
TABLE 4-28: ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	8/11/05

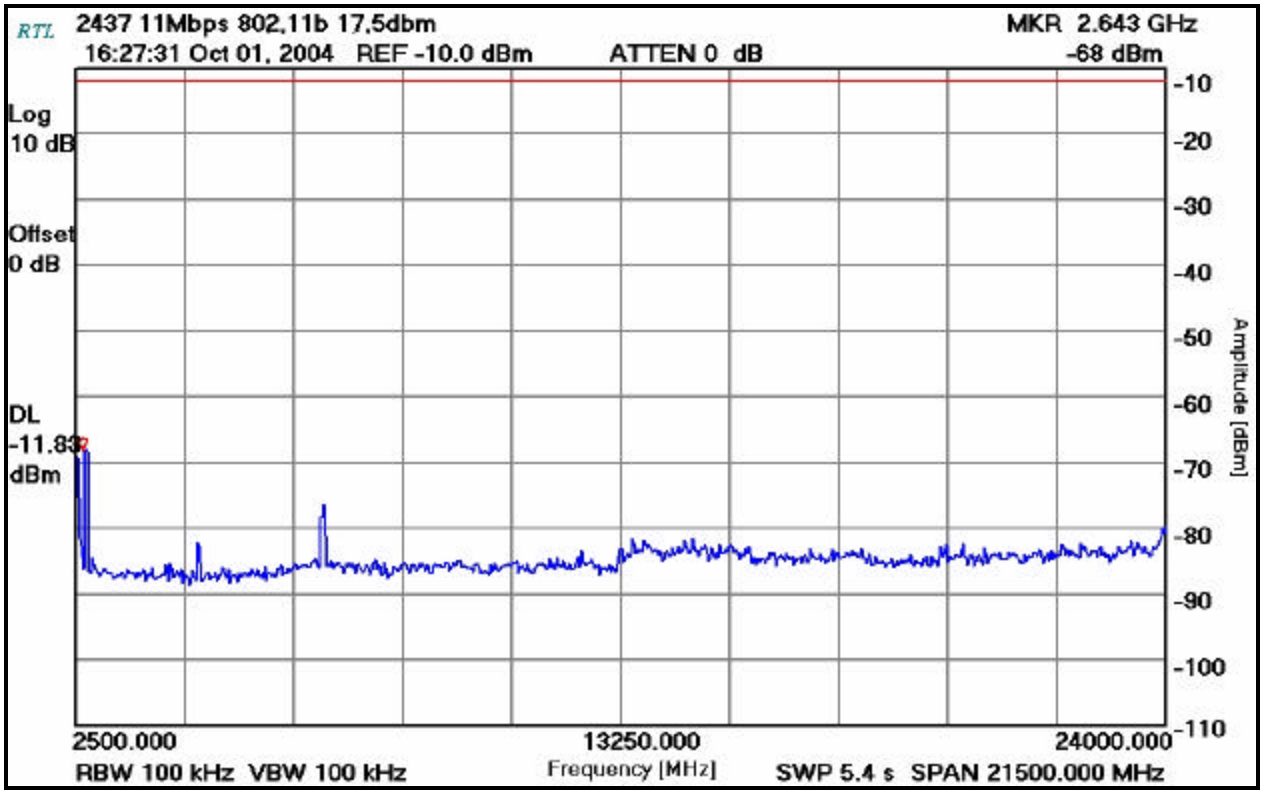
4.8.2 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST RESULTS

4.8.2.1 802.11B

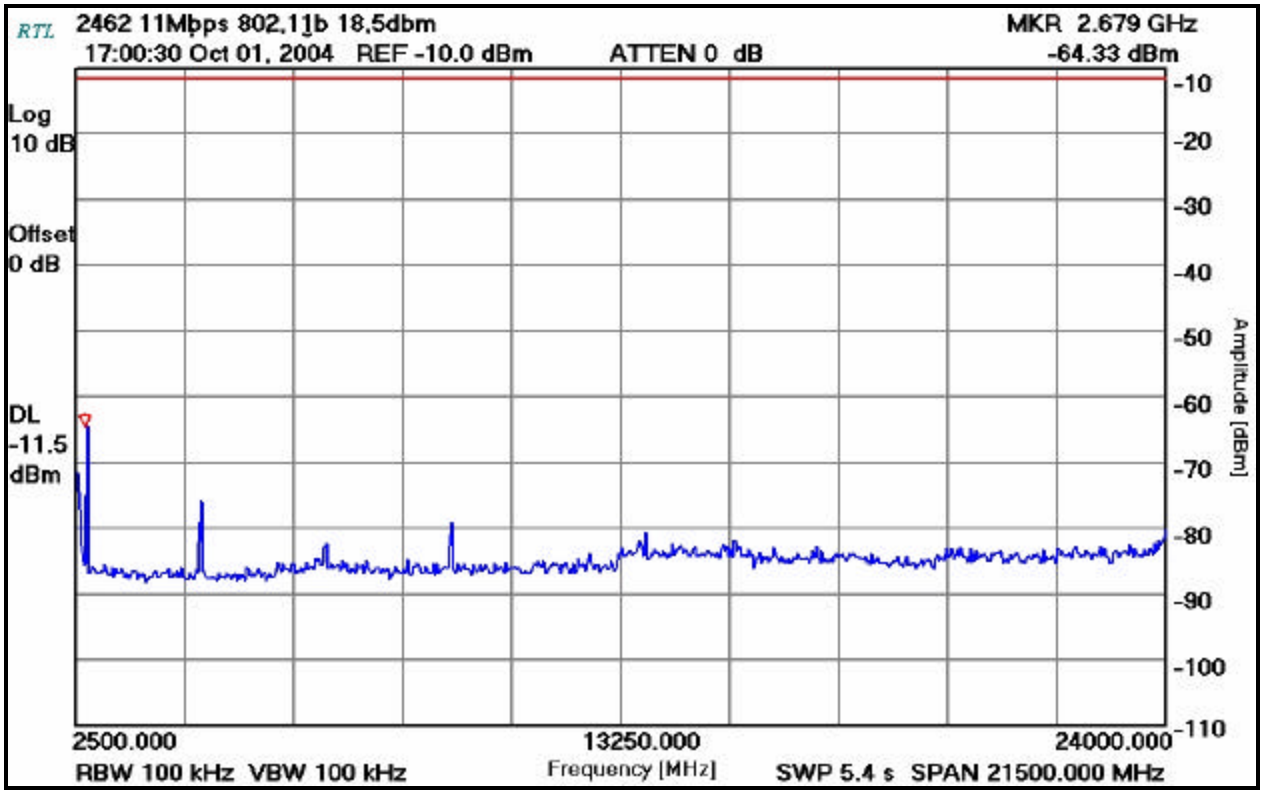
PLOT 4-19: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 (TX FREQUENCY: 2412 MHZ – 11 MB/S)



PLOT 4-20: CONDUCTED SPURIOUS EMISSIONS CHANNEL 6 (TX FREQUENCY: 2437 MHZ – 11 MB/S)

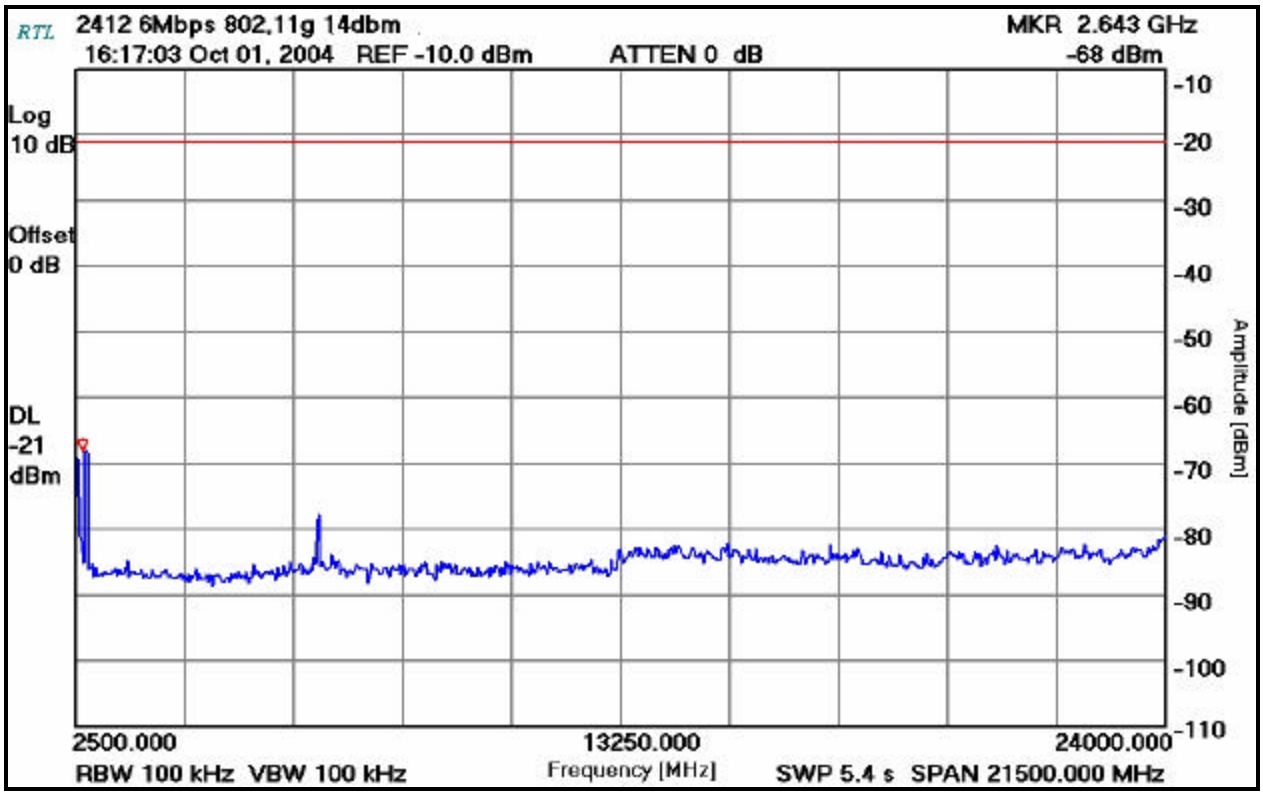


PLOT 4-21: CONDUCTED SPURIOUS EMISSIONS CHANNEL 11 (TX FREQUENCY: 2462 MHZ – 11 MB/S)

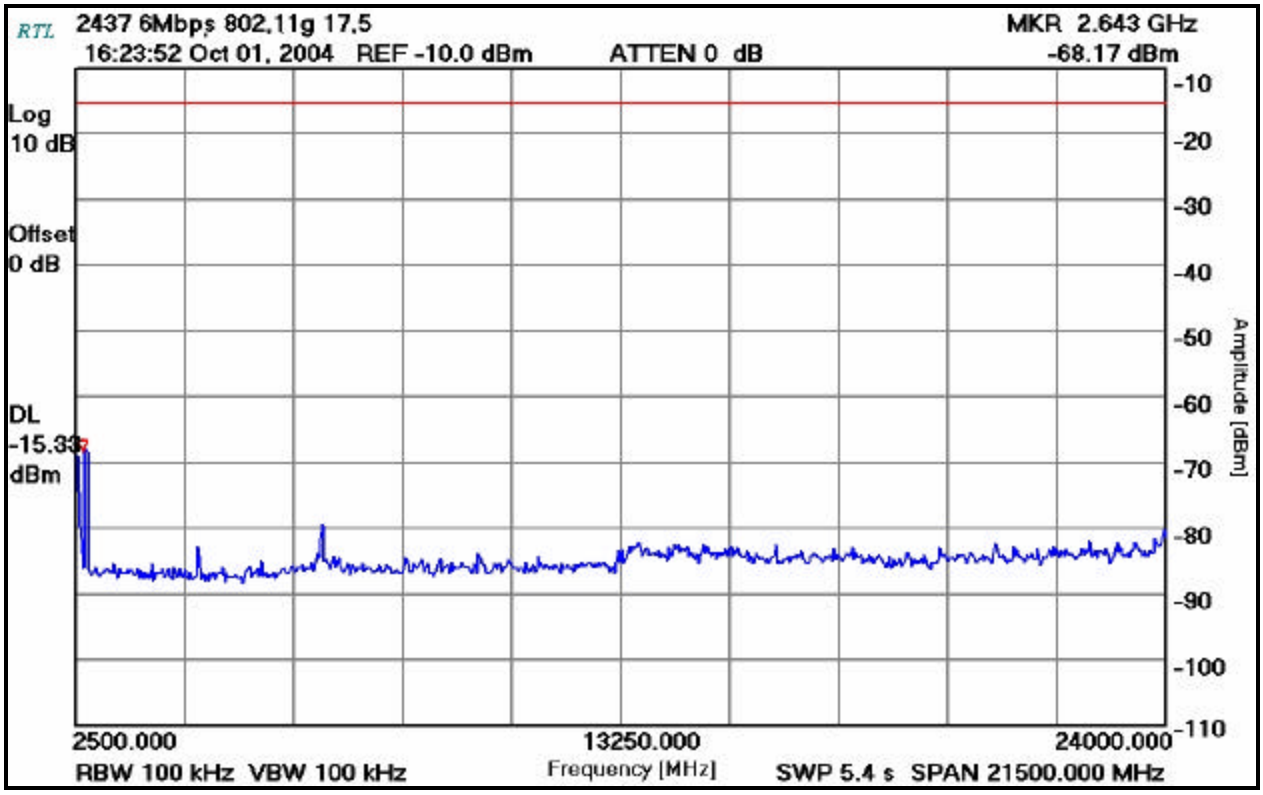


4.8.2.2 802.11G

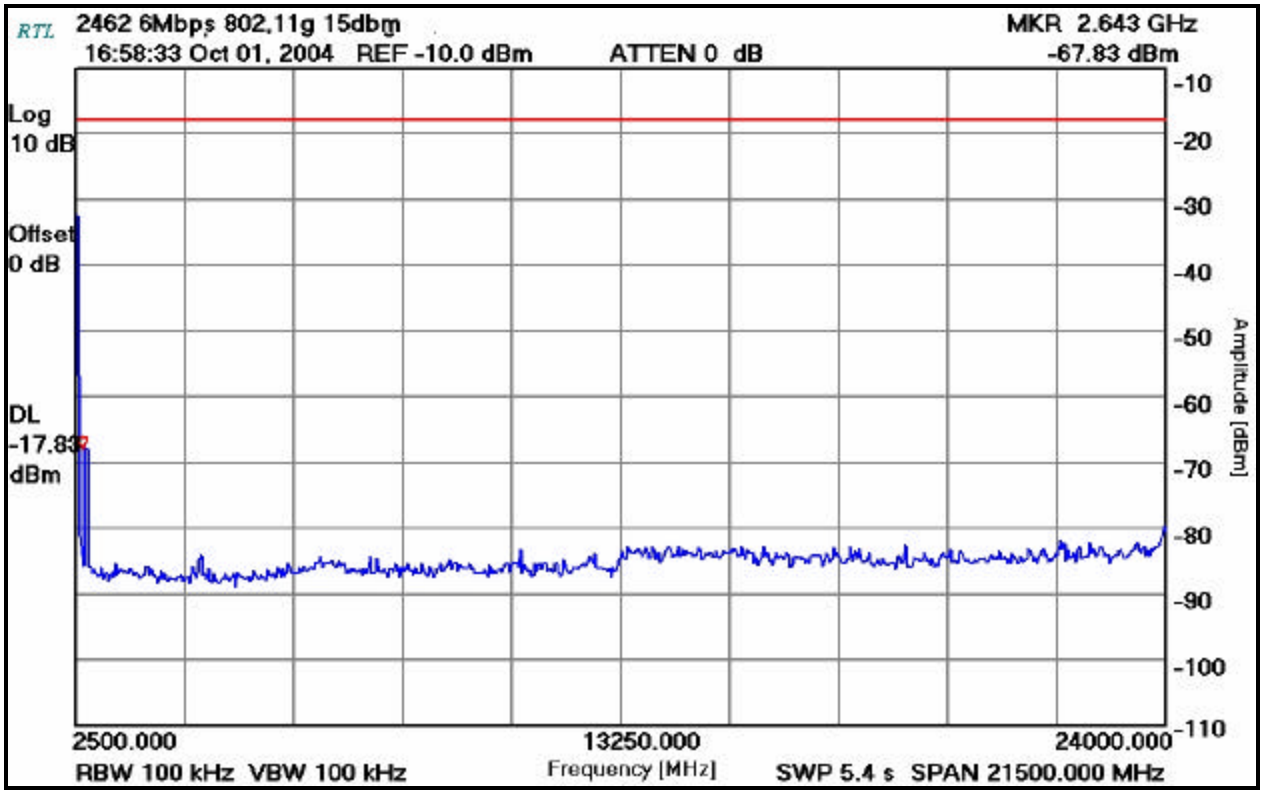
PLOT 4-22: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 (TX FREQUENCY: 2412 MHZ – 6 MB/S)



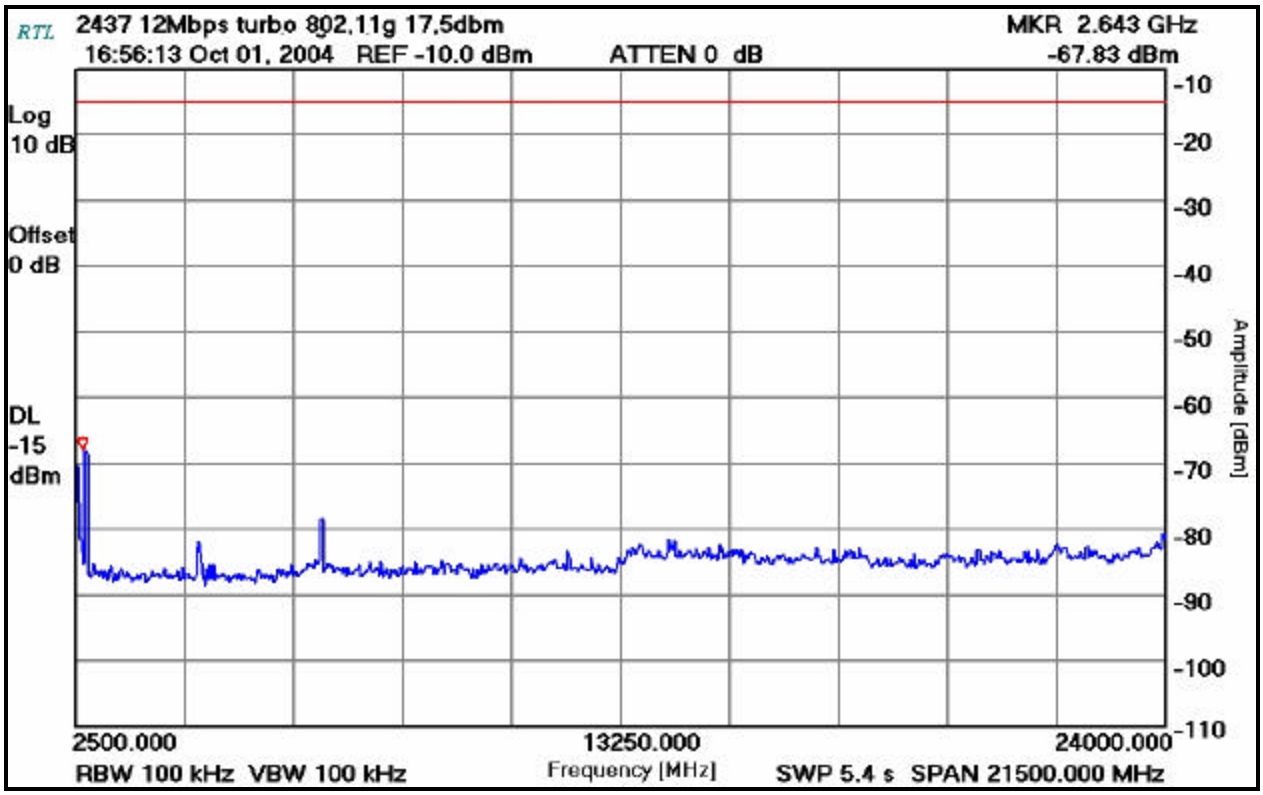
PLOT 4-23: CONDUCTED SPURIOUS EMISSIONS CHANNEL 6 (TX FREQUENCY: 2437 MHZ – 6 MB/S)



PLOT 4-24: CONDUCTED SPURIOUS EMISSIONS CHANNEL 11 (TX FREQUENCY: 2462 MHZ – 6 MB/S)



PLOT 4-25: CONDUCTED SPURIOUS EMISSIONS CHANNEL 6 TURBO (TX FREQUENCY: 2437 MHZ – 12 MB/S)



TEST PERSONNEL:

Daniel W. Biggs	Daniel Biggs	October 1, 2004
EMC Test Engineer	Signature	Date Of Test