Engineering and Testing for EMC and Safety Compliance

Certification Application Report
FCC Part 15.247 & Industry Canada RSS-210

Test Lab:	Applicant:
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FCC ID/ IC ID:	QL9-IPAD100-20/ 4432A-IPAD20	**Test Report Date:**	July 9, 2006
Platform:	N/A	**RTL Work Order #:**	2006048
Model Name/Model #:	iPAD/iPAD100-20	**RTL Quote #:**	QRTL06-209C

American National Standard Institute:	ANSI C63.4-2003: 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:	DTS – Part 15 Digital Transmission System (WLAN portion) DSS – Part 15 Spread Spectrum Transmitter (Bluetooth portion)
FCC Rule Part(s):	FCC Rules Part 15.247 (10-01-05): Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System
Approved Test Methods:	DA000705 Bluetooth Devices KDB558074 DTS for WLAN Devices
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)	Emission Designator
2412-2462	0.089	15M5G7D
2412-2462	0.074	19M9G7D
2402-2480	0.002	1M12FXD

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 applicable parts of FCC Part 2, FCC Part 15, FCC 97-114, ANSI C63.4, and Industry Canada RSS-210.

Signature: _____ Date: July 9, 2006

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

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The test results relate only to the item(s) tested.

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1 General Information

1.1 Scope

Applicable Standards:

- FCC Rules Part 15.247 (10-01-05): 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.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	
Model Name/#	iPAD/iPAD100-20
Power Supply	Battery operated
Modulation Type	DSSS 802.11b/g; FHSS
Transfer Rate	1, 2, 5.5, 6, 9, 11, 12, 18, 22, 24, 54, 72 Mbps
Frequency Range	2412 – 2462 MHz; 2402-2480 MHz
Antenna Connector Type	Internal W.FL for DSSS and U.FL for FHSS
Antenna Types	Separate internal patch for FHSS and DSSS

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 Fujitsu Transaction Solutions Inc. Model #: iPAD100-20, FCC ID: QL9-IPAD100-20, IC: 4432A-IPAD20.

1.5 Modifications

No modifications were required for compliance.

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:

Table 2-1: Channels Tested - DSSS

Channel	Frequency
1	2412
6	2437
11	2462

Table 2-2: Channels Tested - FHSS

Channel	Frequency
2	2402
41	2441
80	2480

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to transmit continuously, or hopping for FHSS, 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 2-3: Test Result Summary – FCC Part 15, Subpart C (Section 15.247)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	6 dB Bandwidth	Pass
FCC 15.247(b)	Maximum Peak Power Output	Pass
FCC 15.247(d)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(e)	Power Spectral Density	Pass
FCC 15.247(d)	Band Edge Measurement	Pass
FCC 15.247(a)(1)	Carrier Frequency Separation	Pass
FCC 15.247(a)(1)(ii)	20 dB Bandwidth	Pass
FCC 15.247(a)(1)(iii)	Hopping Characteristics	Pass
FCC 15.247(a)(1)(iii)	Average Time of Occupancy	Pass

2.4 Test System Details

The test sample was received on May 16, 2006. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-4: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Hand Scanner/ PIM	Fujitsu, Ltd.	iPAD100-20	N/A	QL9-IPAD100-20	N/A	17234
Charger Cradle	Fujitsu, Ltd.	iPAD100-20 Cradle	70	N/A	Unshielded	17238
Charger Cradle	Fujitsu, Ltd.	iPAD100-20 Cradle	199	N/A	Unshielded	17236
AC Adapter	Fujitsu, Ltd.	CQ01007-0730	031 02409C	N/A	1.9 m Unshielded AC power; 1.8m Unshielded DC power	17237
AC Adapter	Fujitsu, Ltd.	CQ01007-0750	9921 1964E	N/A	1.9 m Unshielded AC power; 1.8m Unshielded DC power	17239

2.5 Configuration of Tested System

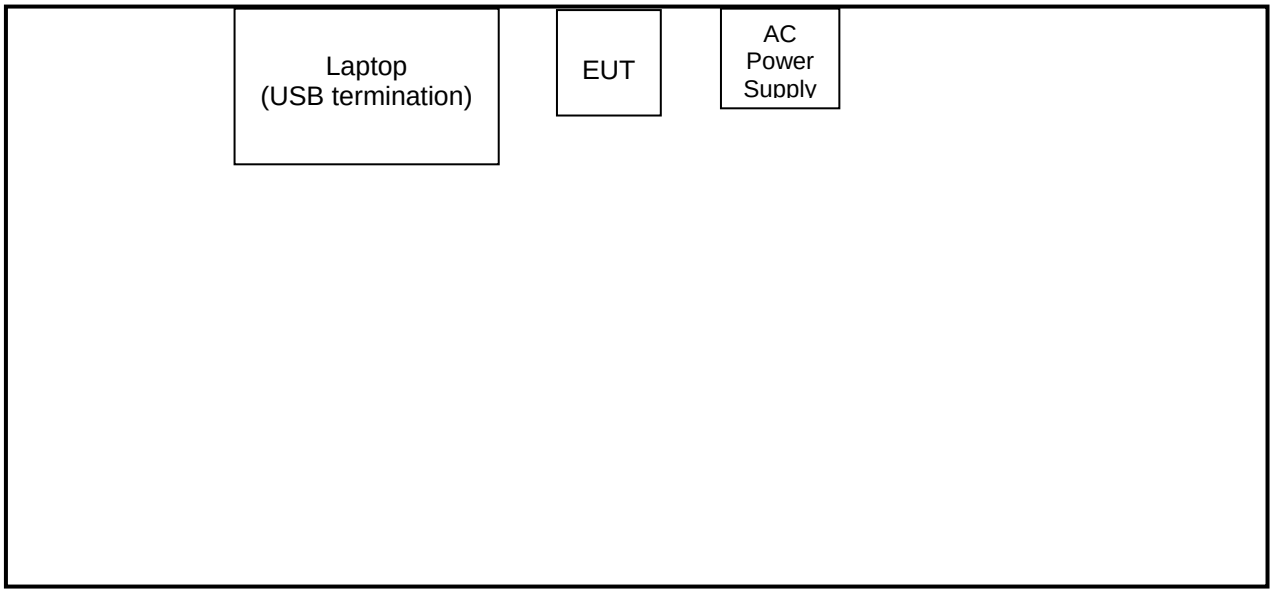


Figure 2-1: Configuration of System Under Test

3 Peak Output Power - §15.247(b)(1); RSS-210 §A8.4(4)

3.1 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 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	9/21/06
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	9/21/06

3.2 Power Output Test Data

Table 3-2: Power Output Test Data 802.11b/WLAN

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	19.4
6	2437	19.5
11	2462	19.5

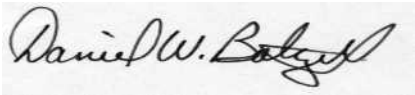
Table 3-3: Power Output Test Data 802.11g/WLAN

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	18.0
6	2437	18.3
11	2462	18.7

Table 3-4: Power Output Test Data FHSS/Bluetooth

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
2	2402	2.5
41	2441	2.8
80	2480	2.8

Test Personnel:



Daniel W. Baltzell		July 7, 2006
EMC Test Engineer	Signature	Date Of Test

4 Compliance with the Band Edge – FCC §15.247(d); RSS-210 §2.2

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

Table 4-1: Band Edge 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	9/14/06
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	9/22/06
900878	Rhein Tech Labs	AM3-1197-0005	3 meter Antenna Mast, polarizing	Outdoor Range 1	Not Required
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901232	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901235	IW Microwave Products	KPS-1503-360-KPS	High frequency RF cables	36"	9/1/06
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06

4.2 Restricted Band Edge Test Results

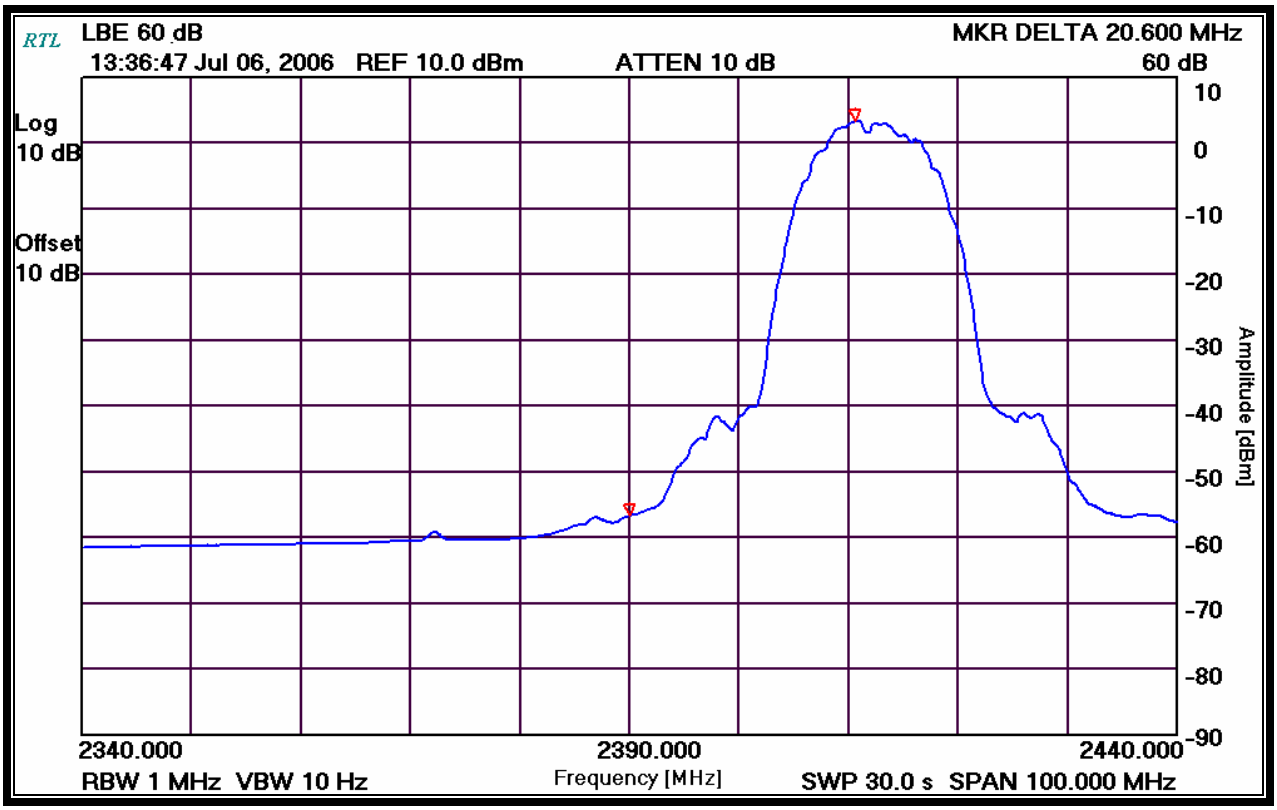
Calculation of Lower Band Edge 802.11b

100.4 dBuV/m is the field strength measurement, from which the delta measurement of 60.0 dB is subtracted (reference plots), resulting in a level of 40.4 dB. This level has a margin of 13.6 dB below the limit of 54 dBuV/m.

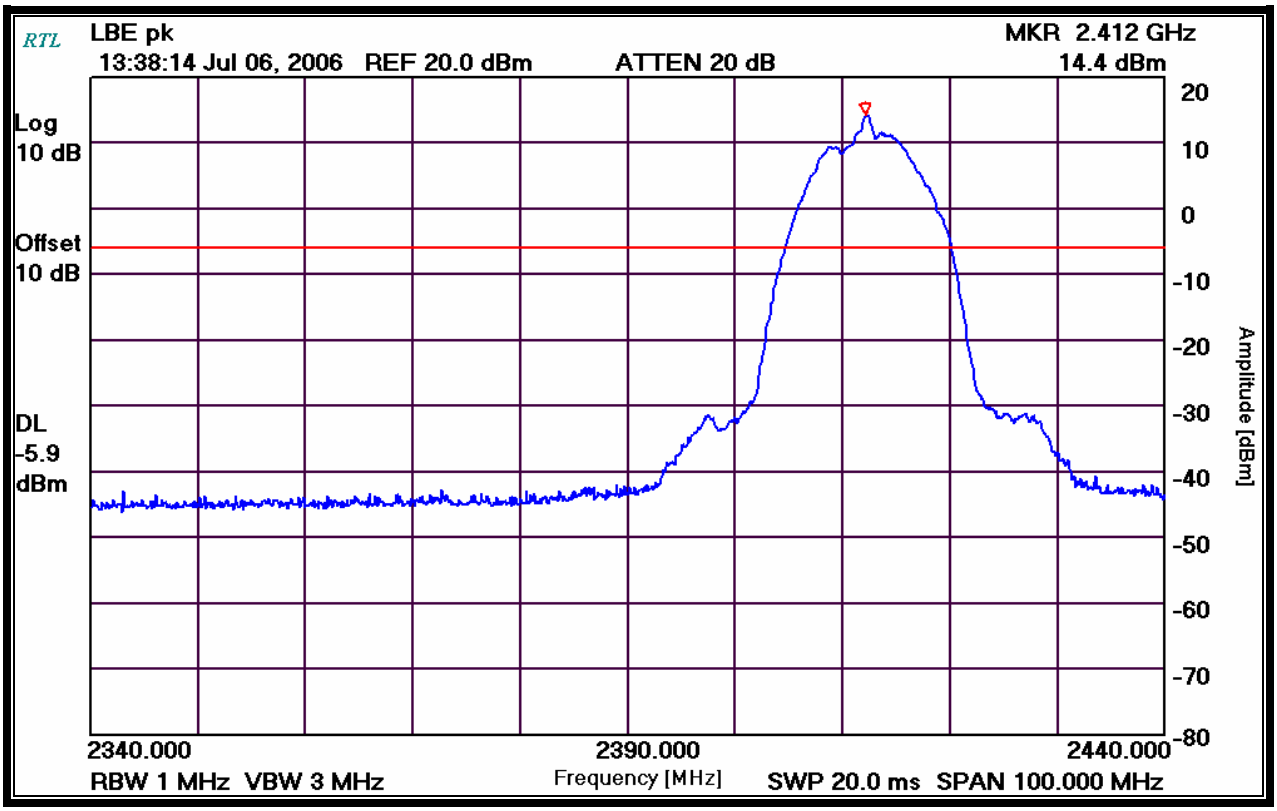
Calculation: 100.4 dBuV/m – 60.0 dB – 54 dBuV/m = -13.6 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 105.4 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 100.4 dBuV/m
Delta measurement = 60.0 dB

Plot 4-1: Lower Band Edge: Average Delta Measurement Channel 1 (TX Frequency: 2412 MHz) 802.11b



Plot 4-2: Lower Band Edge: Peak Measurement Channel 1 (TX Frequency: 2412 MHz) 802.11b



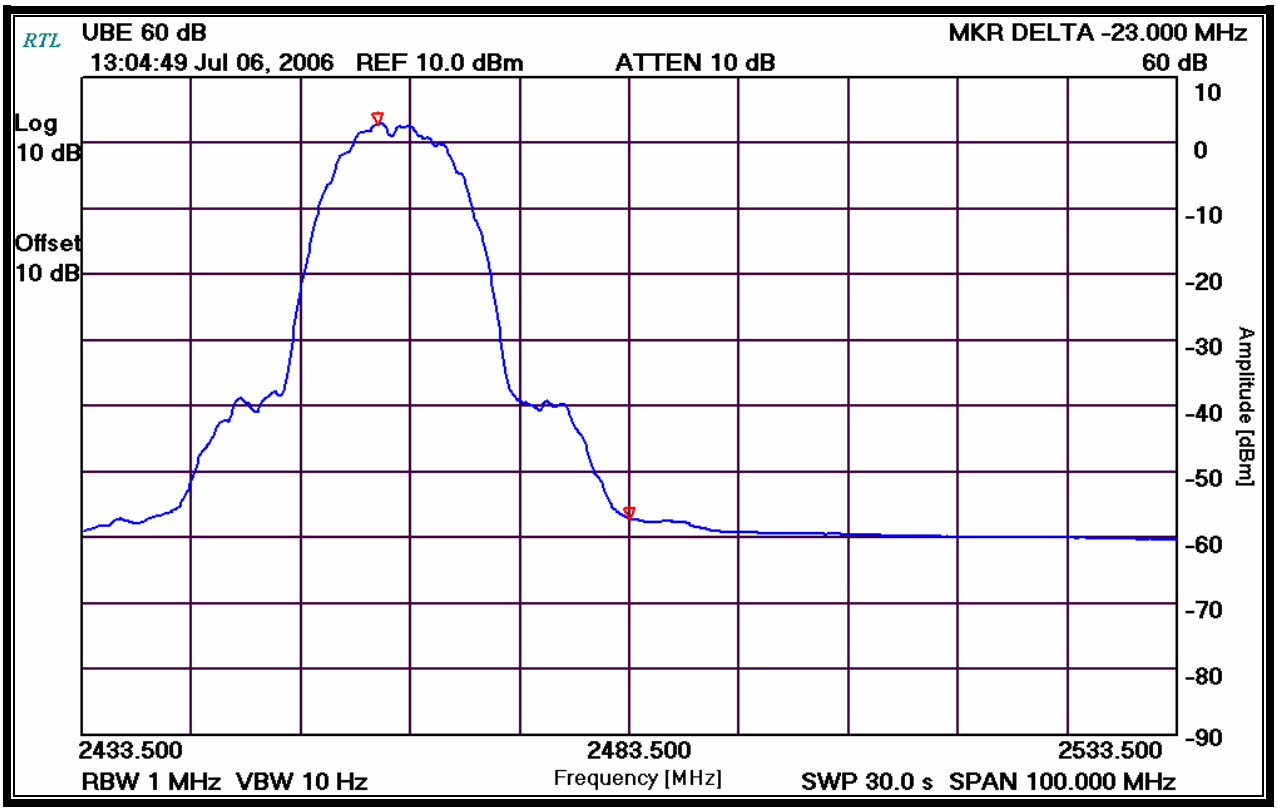
Calculation of Upper Band Edge 802.11b

102.1 dBuV/m is the field strength measurement, from which the delta measurement of 60.0 dB is subtracted (reference plots), resulting in a level of 42.1dB. This level has a margin of 11.9 dB below the limit of 54 dBuV/m.

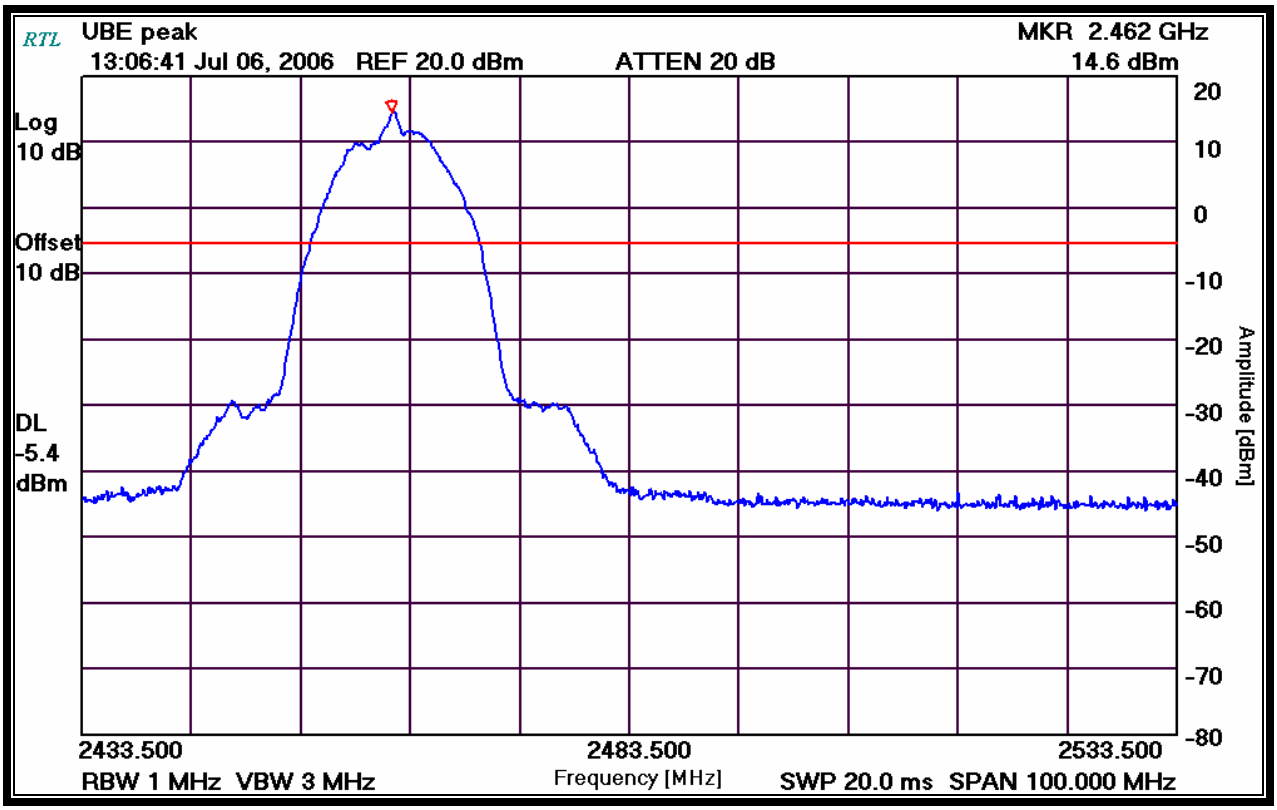
Calculation: 102.1 dBuV/m – 60.0 dB – 54 dBuV/m = -11.9 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 107.1 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 102.1 dBuV/m
Delta measurement = 60.0 dB

Plot 4-3: Upper Band Edge: Average Delta Measurement Channel 11 (TX Frequency: 2462 MHz) 802.11b



Plot 4-4: Upper Band Edge: Peak Measurement Channel 11 (TX Frequency: 2462 MHz) 802.11b



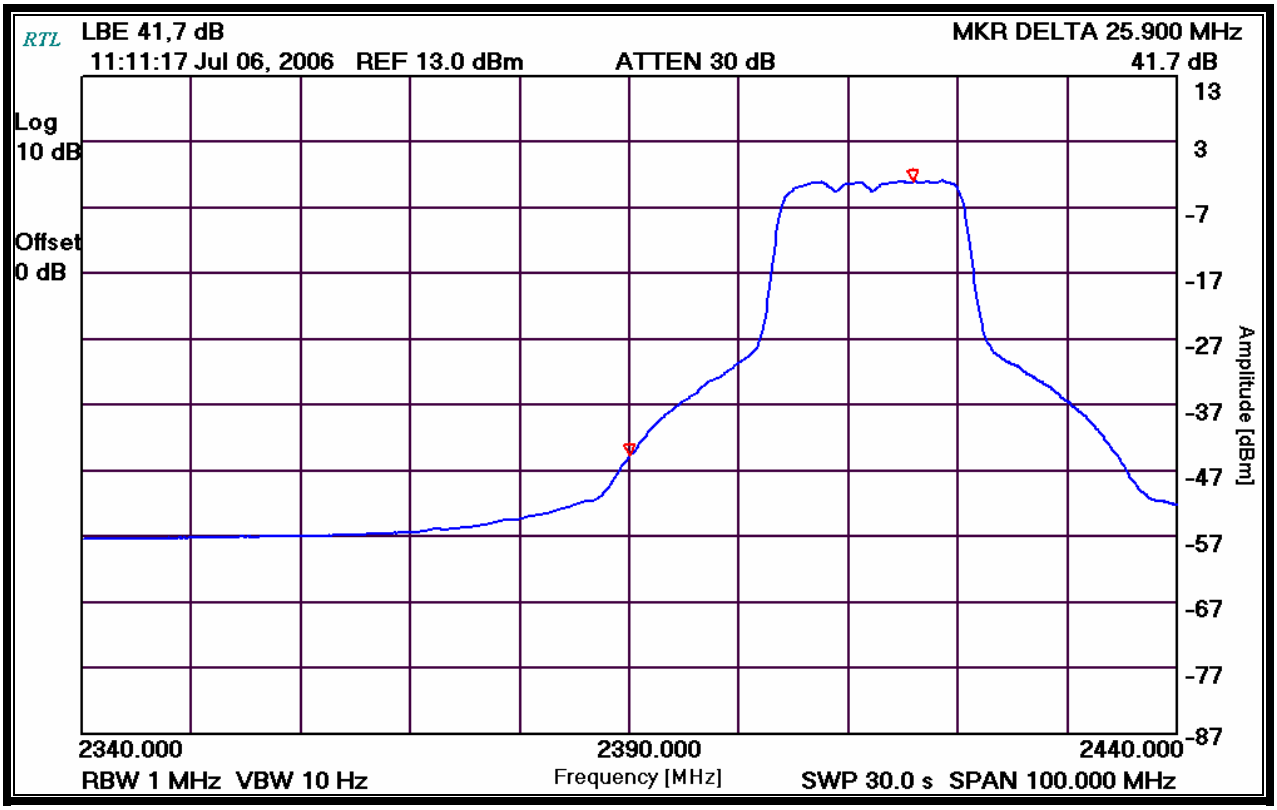
Calculation of Lower Band Edge 802.11g

95.1 dBuV/m is the field strength measurement, from which the delta measurement of 41.7 dB is subtracted (reference plots), resulting in a level of 53.4 dB. This level has a margin of 0.6 dB below the limit of 54 dBuV/m.

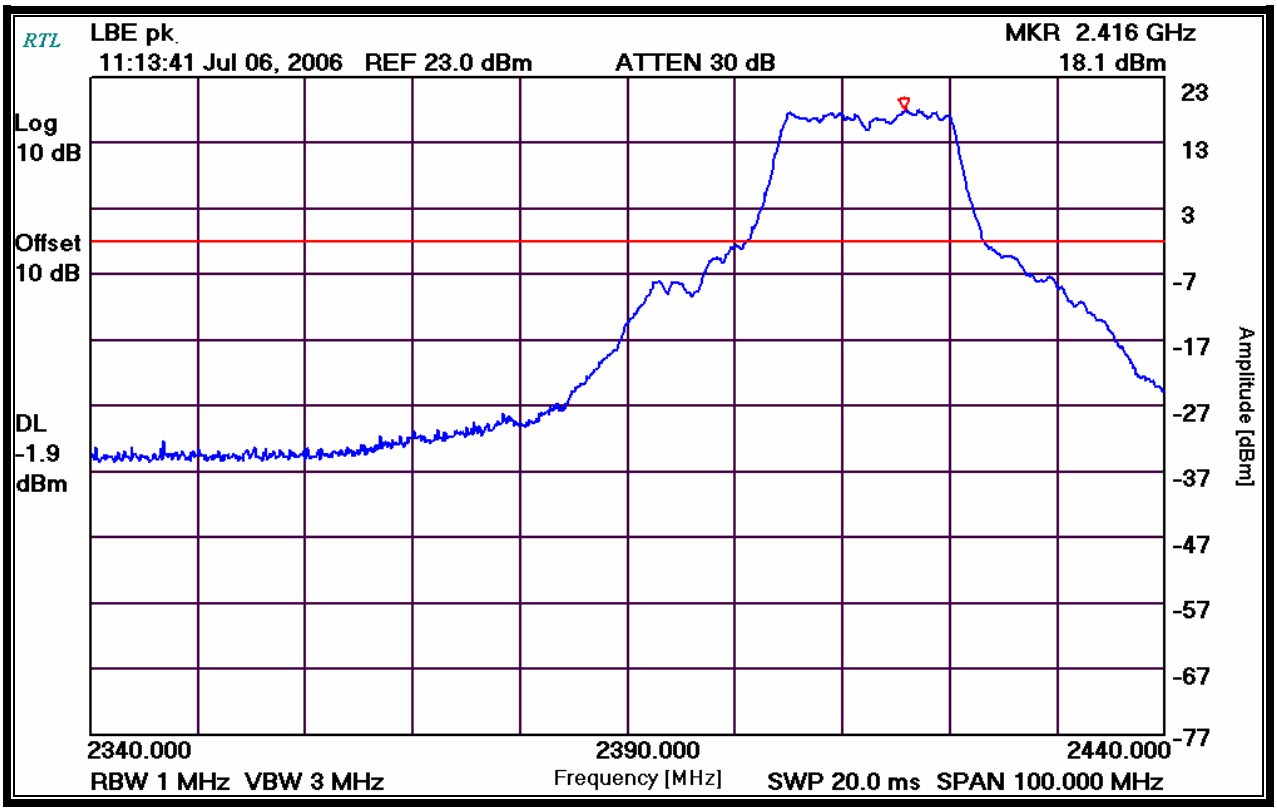
Calculation: 95.1 dBuV/m – 41.7 dB – 54 dBuV/m = -0.6 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 105.9 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 95.1 dBuV/m
Delta measurement = 41.7 dB

Plot 4-5: Lower Band Edge: Average Delta Measurement Channel 1 (TX Frequency: 2412 MHz) 802.11g



Plot 4-6: Lower Band Edge: Peak Measurement Channel 1 (TX Frequency: 2412 MHz) 802.11g



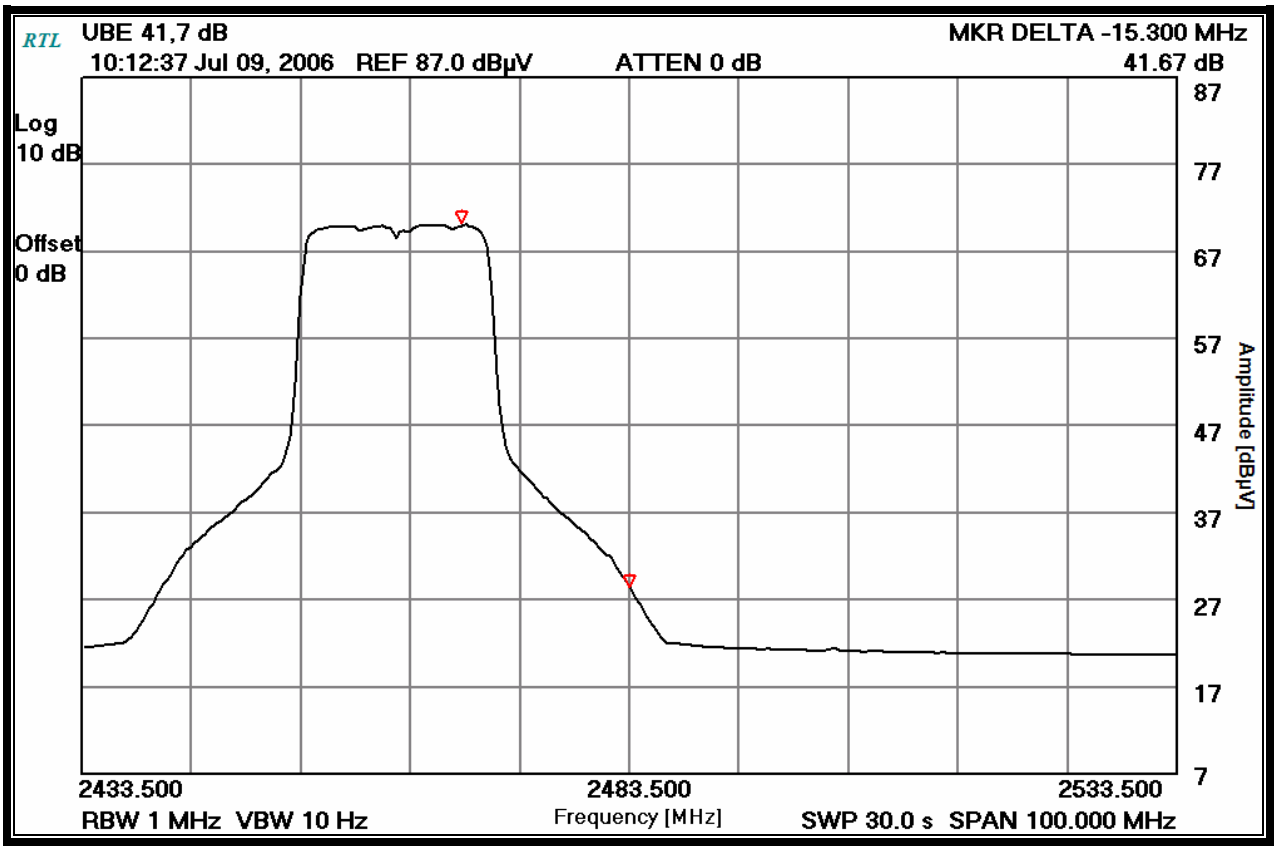
Calculation of Upper Band Edge 802.11g

94.3 dBuV/m is the field strength measurement, from which the delta measurement of 41.7 dB is subtracted (reference plots), resulting in a level of 52.6 dB. This level has a margin of 1.4 dB below the limit of 54 dBuV/m.

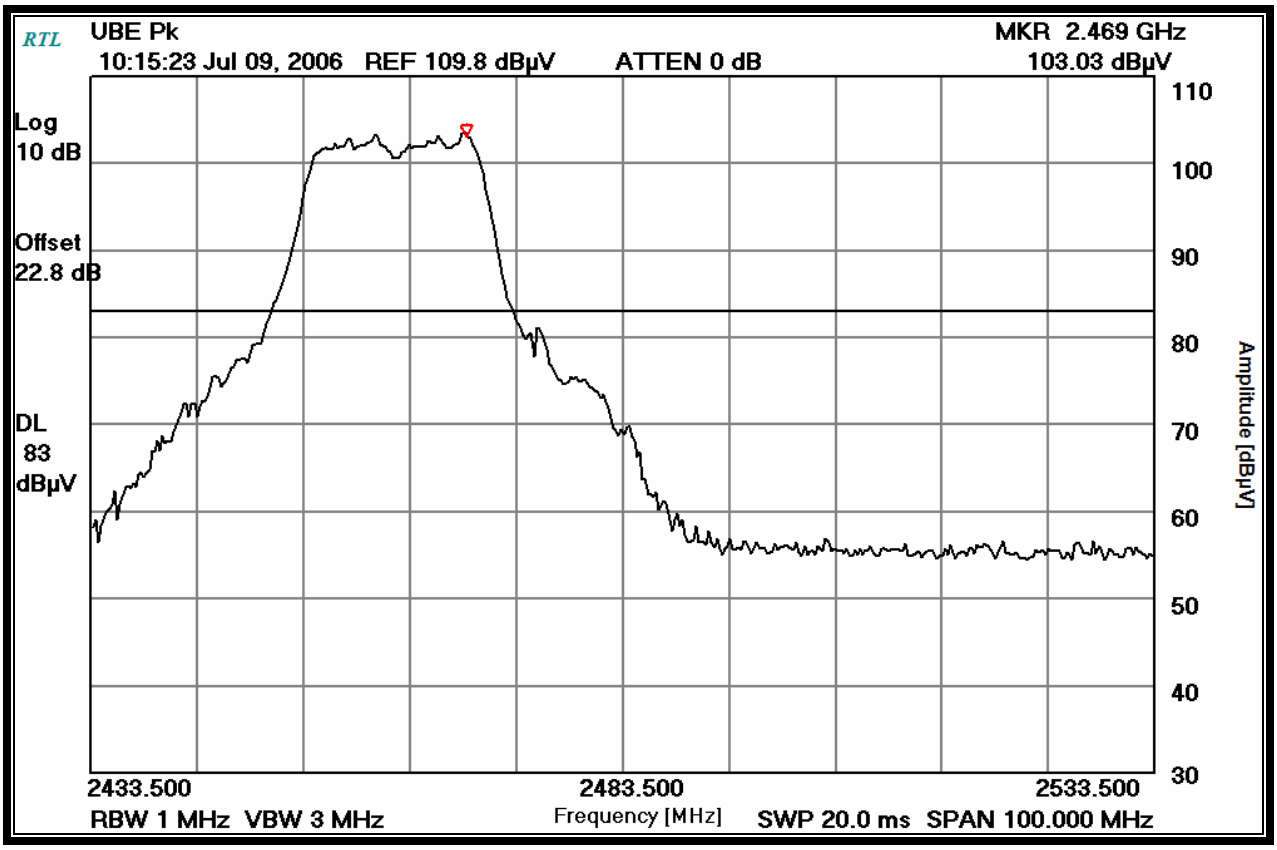
Calculation: 94.3 dBuV/m – 41.7 dB – 54 dBuV/m = -1.4 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 103.0 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 94.3 dBuV/m
Delta measurement = 41.7 dB

Plot 4-7: Upper Band Edge: Average Delta Measurement Channel 11 (TX Frequency: 2462 MHz) 802.11g



Plot 4-8: Upper Band Edge: Peak Measurement Channel 11 (TX Frequency: 2462 MHz) 802.11g



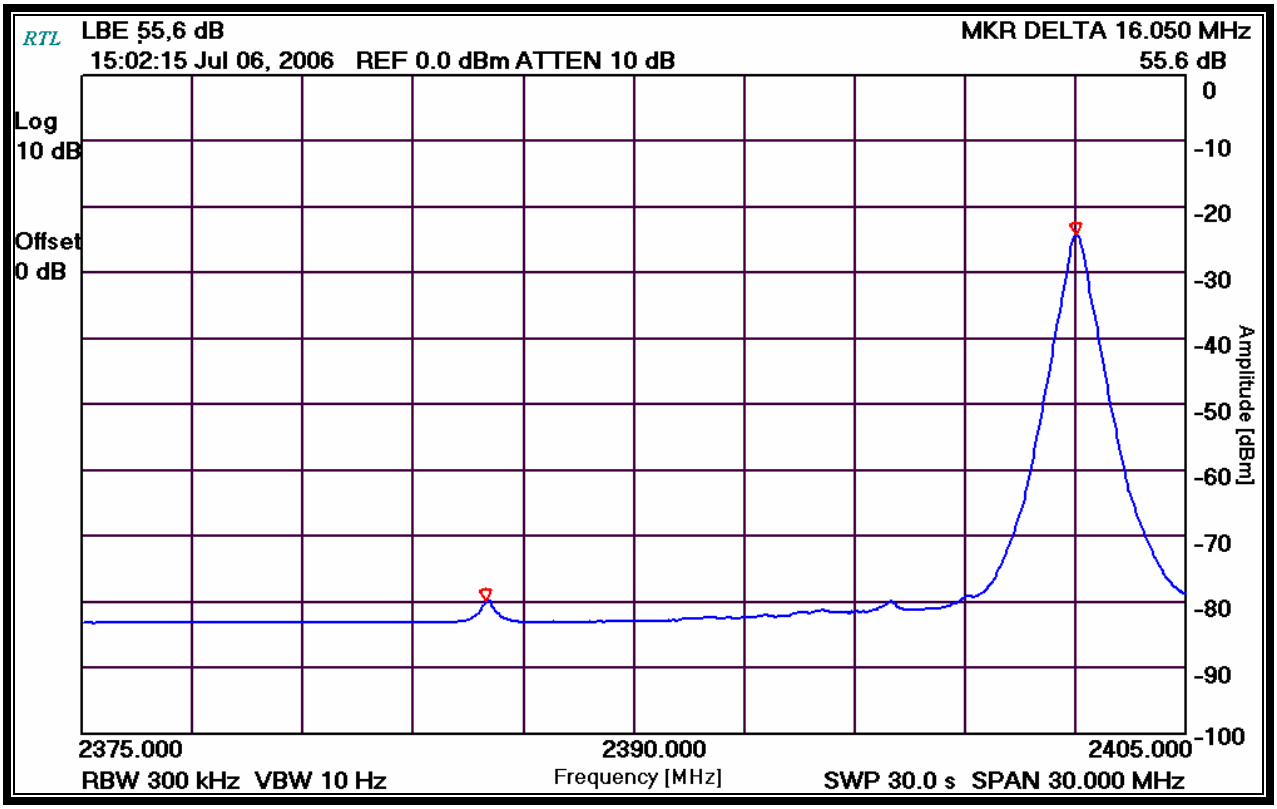
Calculation of Lower Band Edge FHSS

77.7 dBuV/m is the field strength measurement, from which the peak delta measurement of 55.6 dB is subtracted (reference plots), resulting in a level of 22.1 dB. This level has a margin of 31.9 dB below the limit of 54 dBuV/m.

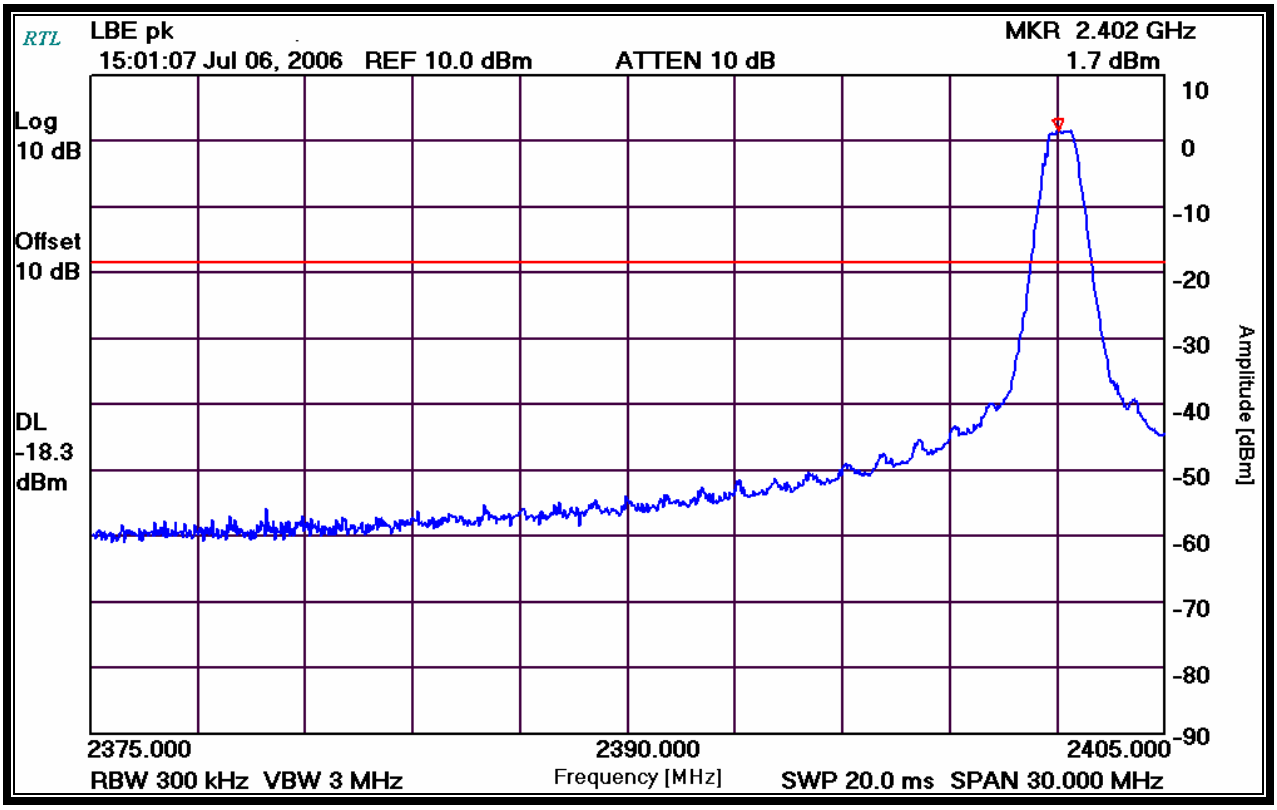
Calculation: 77.7 dBuV/m – 55.6 dB – 54 dBuV/m = -31.9 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 91.2 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 77.7 dBuV/m
Delta measurement = 55.6 dB

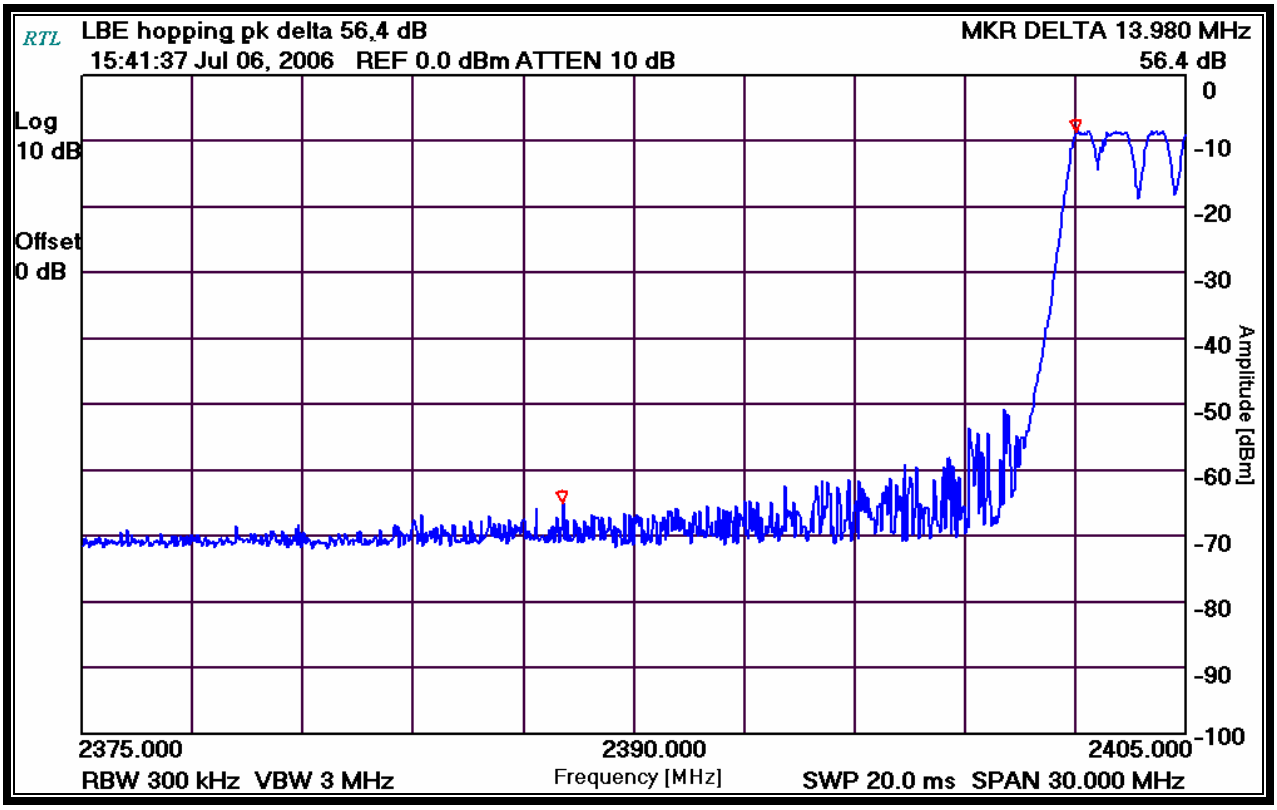
Plot 4-9: Lower Band Edge: Average Delta Measurement Channel 1 (TX Frequency: 2402 MHz) FHSS



Plot 4-10: Lower Band Edge: Peak Measurement Channel 1 (TX Frequency: 2402 MHz) FHSS



Plot 4-11: Lower Band Edge: Average Delta Measurement (Hopping) FHSS



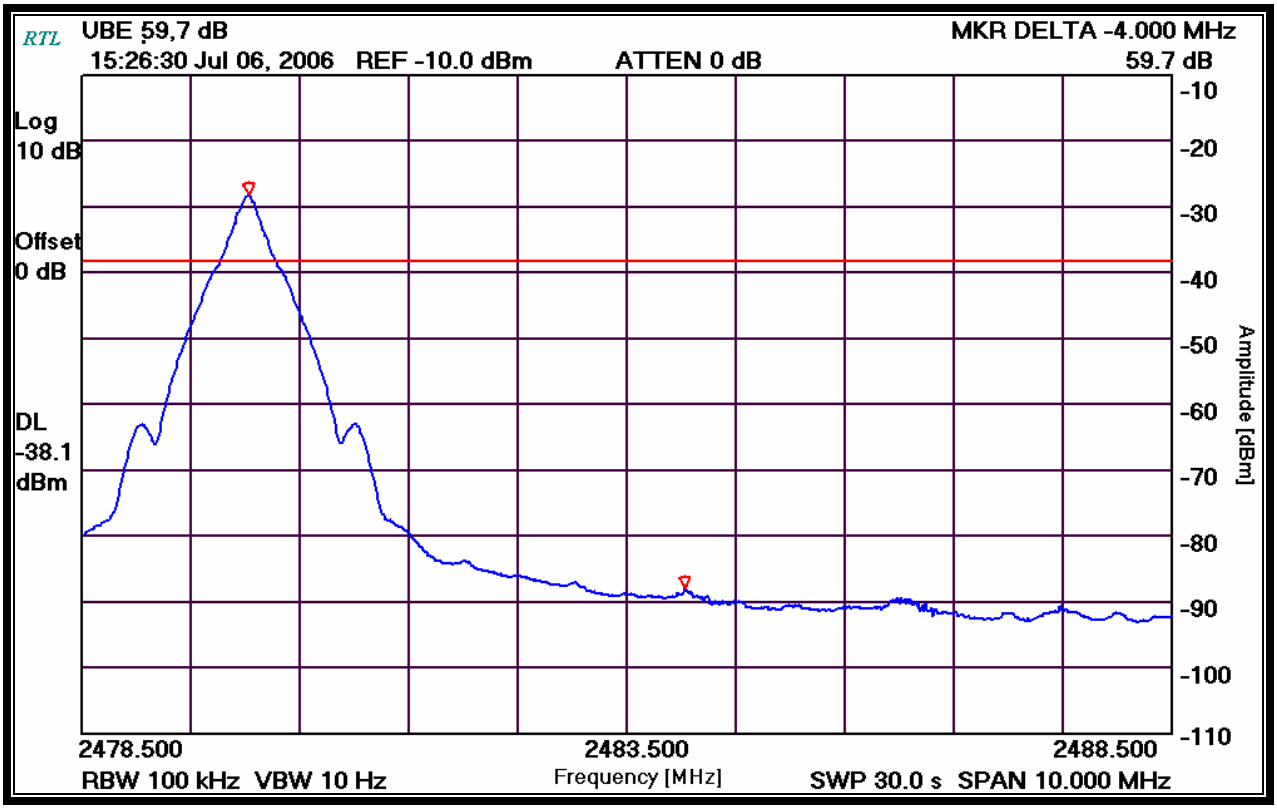
Calculation of Upper Band Edge FHSS

76.8 dBuV/m is the field strength measurement, from which the delta measurement of 59.7 dB is subtracted (reference plots), resulting in a level of 17.1 dB. This level has a margin of 36.9 dB below the limit of 54 dBuV/m.

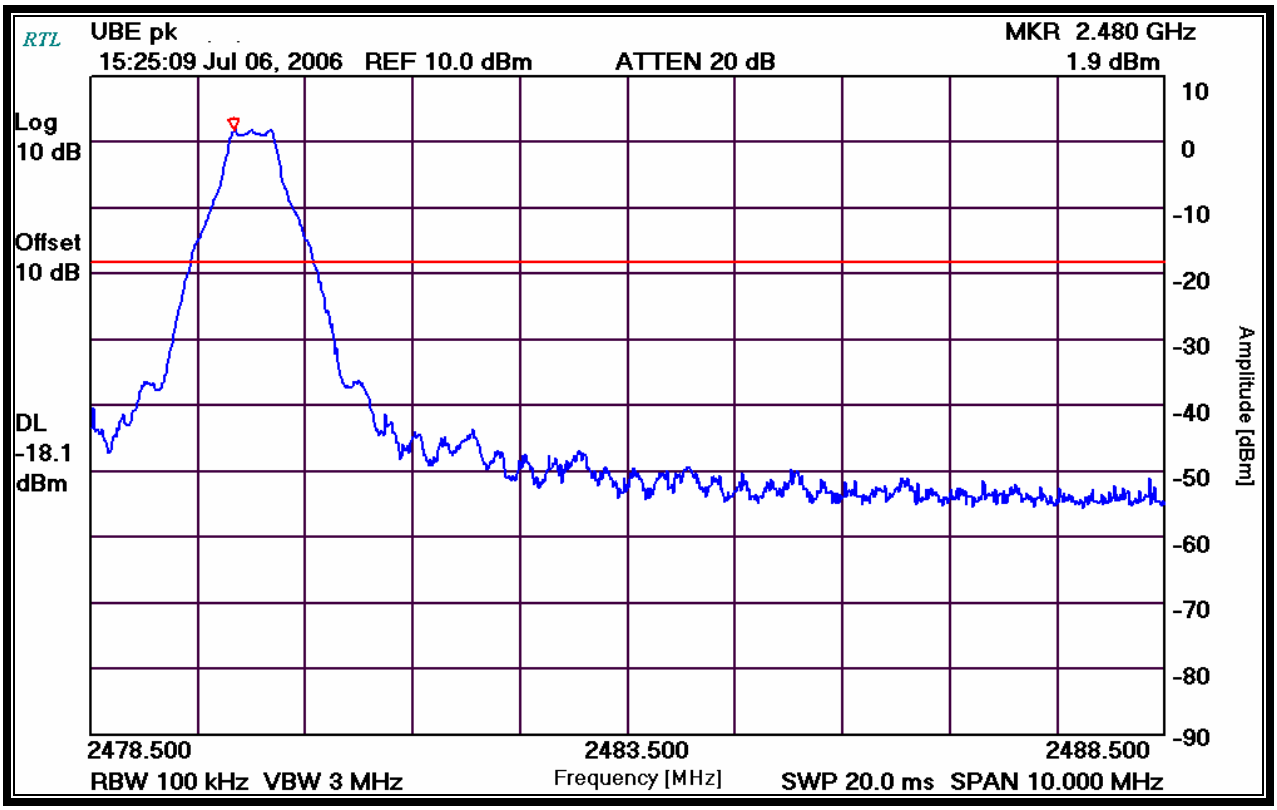
Calculation: 76.8 dBuV/m – 59.7 dB – 54 dBuV/m = -36.9 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 89.8 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 76.8 dBuV/m
Delta measurement = 59.7 dB

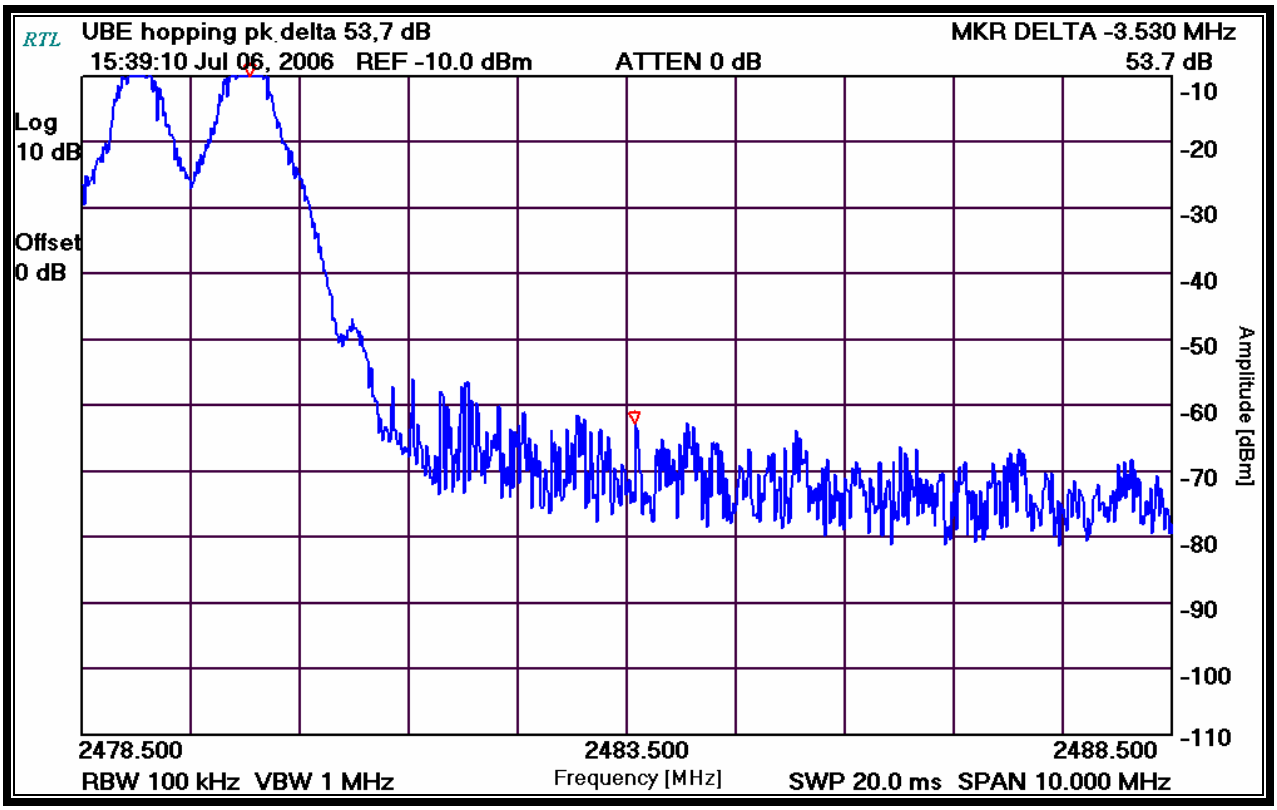
Plot 4-12: Upper Band Edge: Average Delta Measurement Channel 11 (TX Frequency: 2480 MHz) FHSS



Plot 4-13: Upper Band Edge: Peak Measurement Channel 11 (TX Frequency: 2480 MHz) FHSS



Plot 4-14: Upper Band Edge: Peak Measurement (Hopping) FHSS



Test Personnel:

Daniel W. Baltzell		July 6 and 9, 2006
Test Engineer	Signature	Dates Of Test

5 Antenna Conducted Spurious Emissions - §15.247(d); RSS-Gen

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions 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 for DSSS, and 2402, 2441, and 2480 for FHSS.

Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

5.2 Antenna Conducted Spurious Emissions Test Results

Table 5-2: Antenna Conducted Spurious Emissions 2412 MHz; 802.11b (5.8 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4824.0	-63.7	-14.2	-49.5	Pass
7236.0	-69.8	-14.2	-55.6	Pass
9648.0	-69.7	-14.2	-55.5	Pass
12060.0	-70.3	-14.2	-56.1	Pass
14472.0	-66.6	-14.2	-52.4	Pass
16884.0	-66.8	-14.2	-52.6	Pass

Table 5-3: Antenna Conducted Spurious Emissions 2437 MHz; 802.11b (8 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4874.0	-61.3	-12.0	-49.3	Pass
7311.0	-79.7	-12.0	-67.7	Pass
9748.0	-75.8	-12.0	-63.8	Pass
12185.0	-70.7	-12.0	-58.7	Pass
14622.0	-66.4	-12.0	-54.4	Pass
17059.0	-66.9	-12.0	-54.9	Pass

Table 5-4: Antenna Conducted Spurious Emissions 2462 MHz; 802.11b (5.8 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4924.0	-74.4	-14.2	-60.2	Pass
7386.0	-79.9	-14.2	-65.7	Pass
9848.0	-75.8	-14.2	-61.6	Pass
12310.0	-83.4	-14.2	-69.2	Pass
14772.0	-79.7	-14.2	-65.5	Pass
17234.0	-77.4	-14.2	-63.2	Pass

Table 5-5: Antenna Conducted Spurious Emissions 2412 MHz; 802.11g (0.7 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4824.0	-66.2	-19.3	-46.9	Pass
7236.0	-70.0	-19.3	-50.7	Pass
9648.0	-70.2	-19.3	-50.9	Pass
12060.0	-70.3	-19.3	-51.0	Pass
14472.0	-66.3	-19.3	-47.0	Pass
16884.0	-66.8	-19.3	-47.5	Pass

Table 5-6: Antenna Conducted Spurious Emissions 2437 MHz; 802.11g (1.5 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4874.0	-48.5	-18.5	-30.0	Pass
7311.0	-76.6	-18.5	-58.1	Pass
9748.0	-69.8	-18.5	-51.3	Pass
12185.0	-70.8	-18.5	-52.3	Pass
14622.0	-66.1	-18.5	-47.6	Pass
17059.0	-67.5	-18.5	-49.0	Pass

Table 5-7: Antenna Conducted Spurious Emissions 2462 MHz; 802.11g (1.6 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4924.0	-64.6	-18.4	-46.2	Pass
7386.0	-74.5	-18.4	-56.1	Pass
9848.0	-70.5	-18.4	-52.1	Pass
12310.0	-77.2	-18.4	-58.8	Pass
14772.0	-73.4	-18.4	-55.0	Pass
17234.0	-73.7	-18.4	-55.3	Pass

Table 5-8: Antenna Conducted Spurious Emissions 2402 MHz; FHSS (0.7 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4804.0	-47.4	-19.3	-28.1	Pass
7206.0	-55.6	-19.3	-36.3	Pass
9608.0	-51.6	-19.3	-32.3	Pass
12010.0	-68.0	-19.3	-48.7	Pass
14412.0	-57.4	-19.3	-38.1	Pass
16814.0	-66.4	-19.3	-47.1	Pass

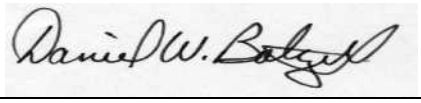
Table 5-9: Antenna Conducted Spurious Emissions 2441 MHz; FHSS (0.8 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4882.0	-56.9	-19.2	-37.7	Pass
7323.0	-58.5	-19.2	-39.3	Pass
9764.0	-53.9	-19.2	-34.7	Pass
12205.0	-77.2	-19.2	-58.0	Pass
14646.0	-67.0	-19.2	-47.8	Pass
17087.0	-77.0	-19.2	-57.8	Pass

Table 5-10: Antenna Conducted Spurious Emissions 2480 MHz; FHSS (0.9 dBm peak at 100k RBW)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4960.0	-62.3	-19.1	-43.2	Pass
7440.0	-63.4	-19.1	-44.3	Pass
9920.0	-61.7	-19.1	-42.6	Pass
12400.0	-75.3	-19.1	-56.2	Pass
14880.0	-70.1	-19.1	-51.0	Pass
17360.0	-76.7	-19.1	-57.6	Pass

Test Personnel:



Daniel W. Baltzell		May 12, 2006
EMC Test Engineer	Signature	Date Of Test

6 6 dB Bandwidth - §15.247(a)(2); RSS-210 §A8.2

6.1 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 1 MHz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 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	8/3/06
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	9/22/06

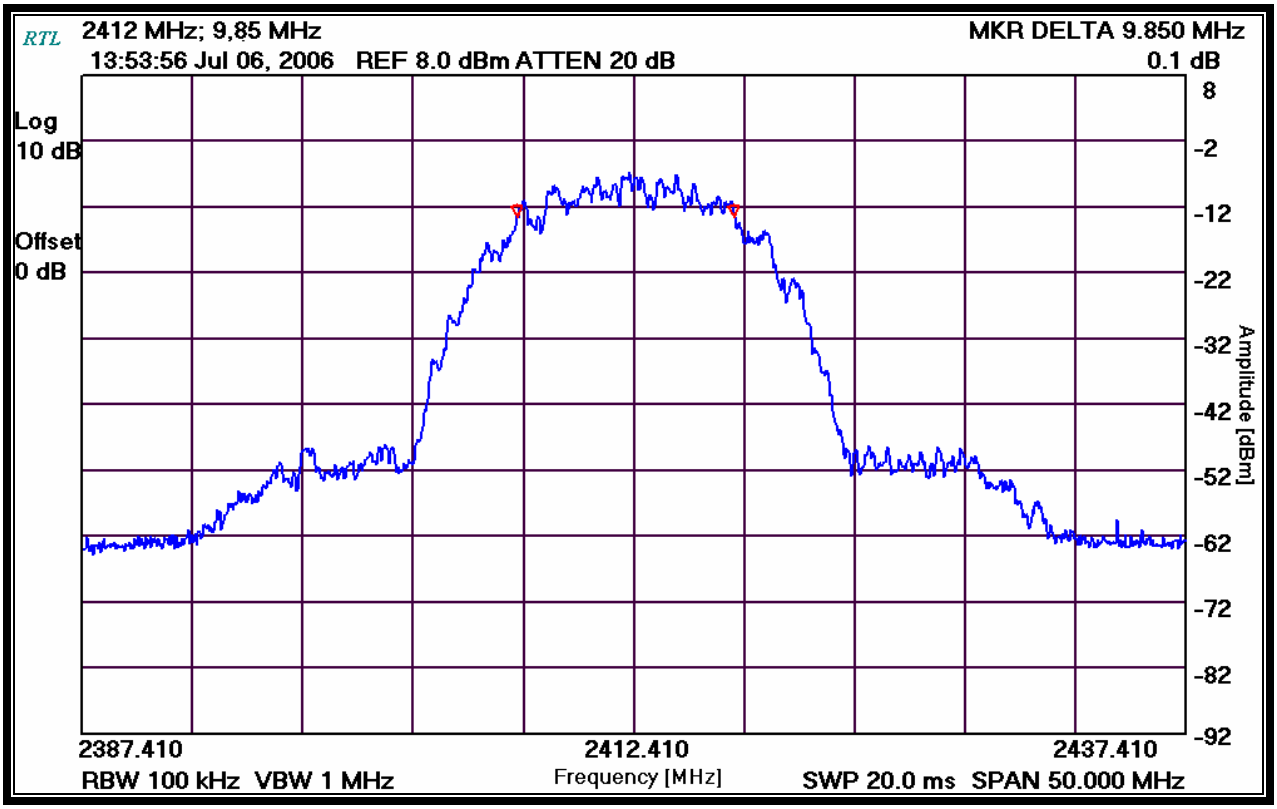
6.2 6 db Bandwidth Test Results

Table 6-2: 6 db Bandwidth Test Data 802.11b

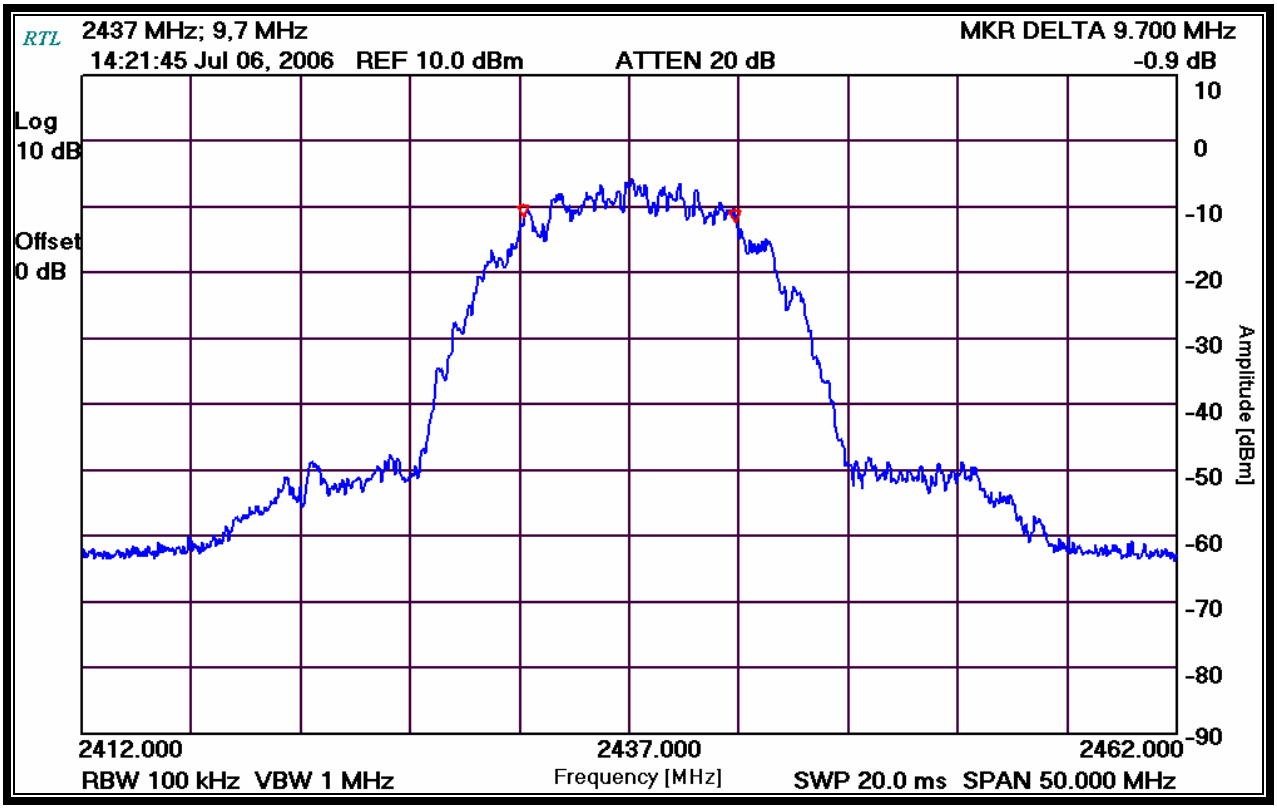
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
1	2412	9.85	0.5	Pass
6	2437	9.70	0.5	Pass
11	2462	9.75	0.5	Pass

Table 6-3: 6 db Bandwidth Test Data 802.11g

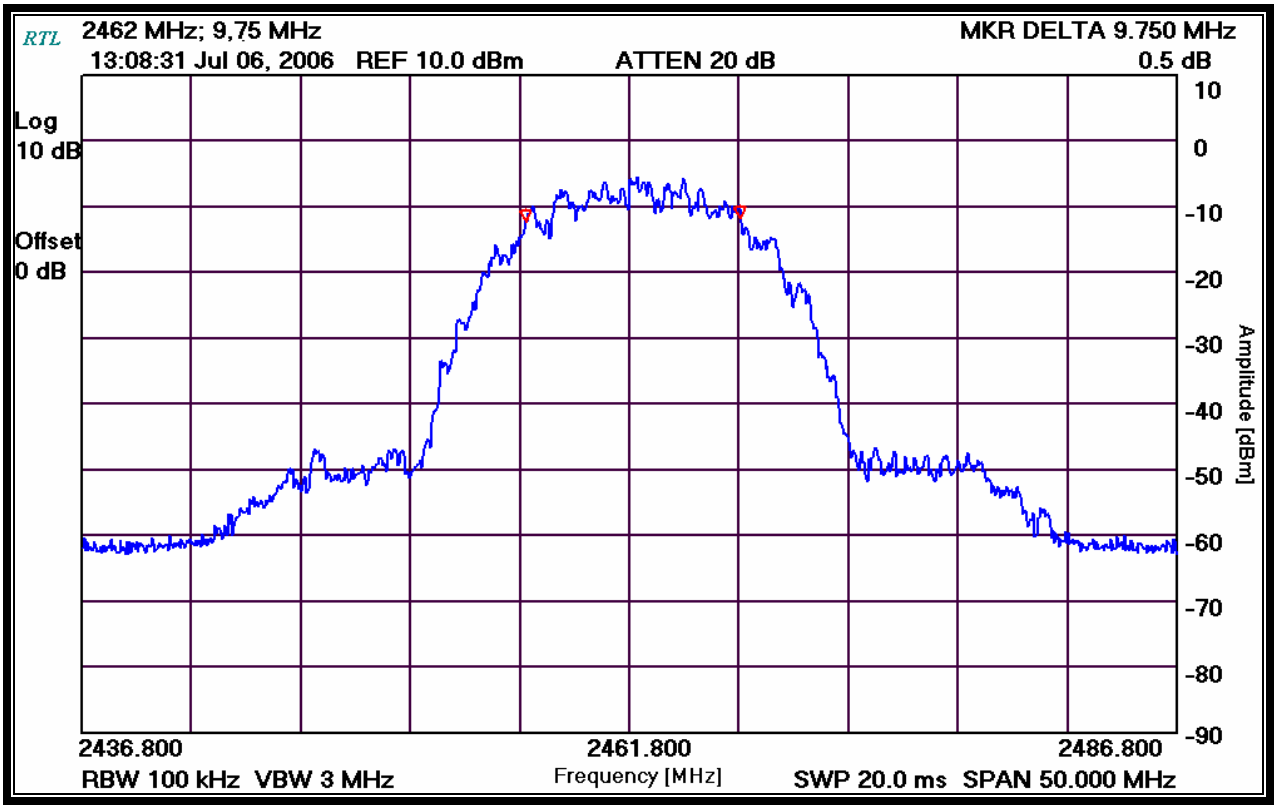
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
1	2412	16.65	0.5	Pass
6	2437	16.65	0.5	Pass
11	2462	16.50	0.5	Pass



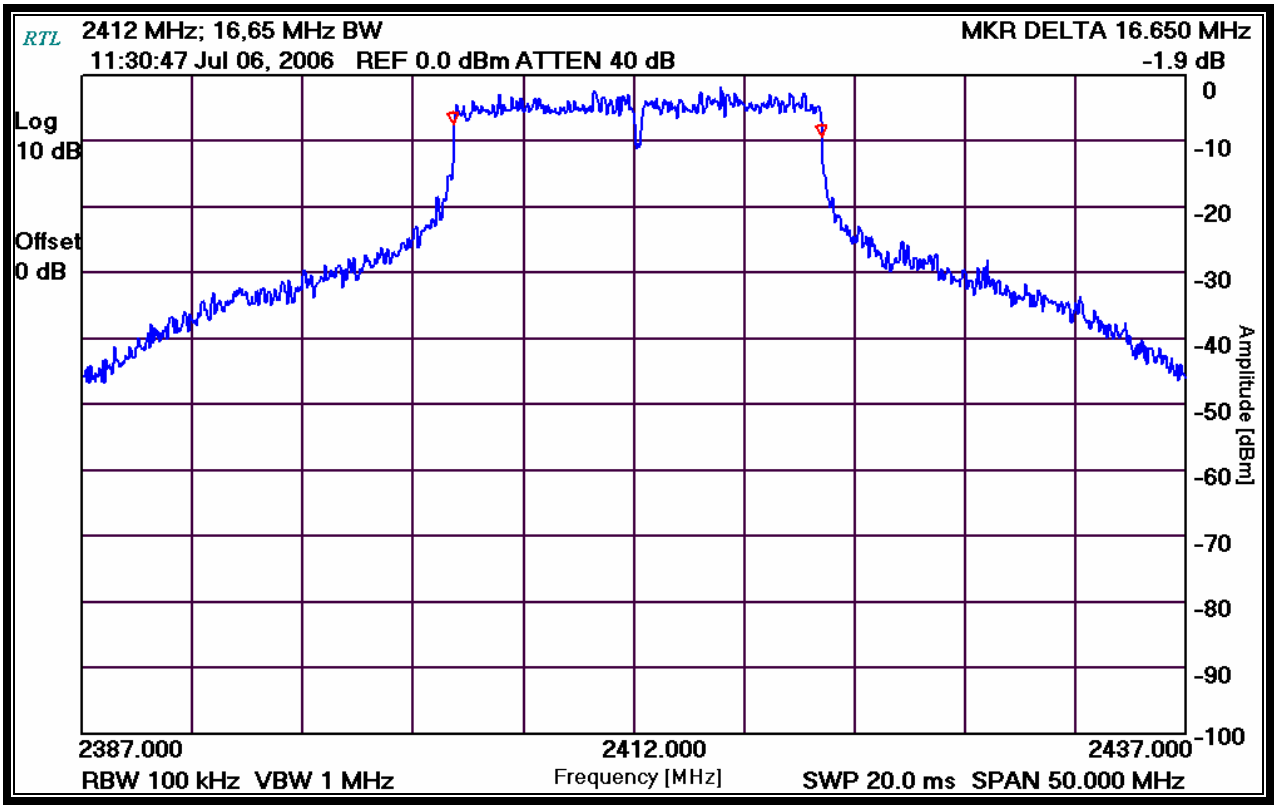
Plot 6-1: 6 dB Bandwidth Channel 1 (TX Frequency: 2412 MHz); 802.11b



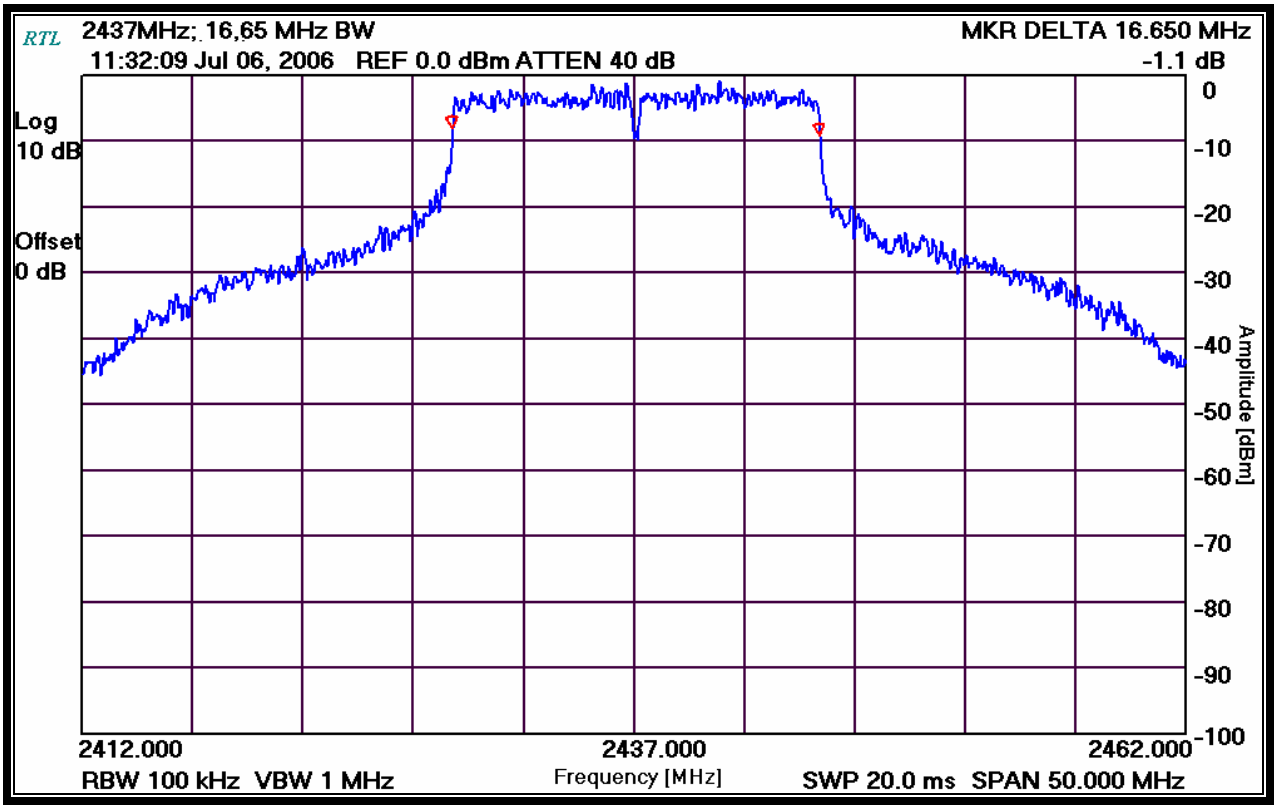
Plot 6-2: 6 dB Bandwidth Channel 6 (TX Frequency: 2437 MHz); 802.11b



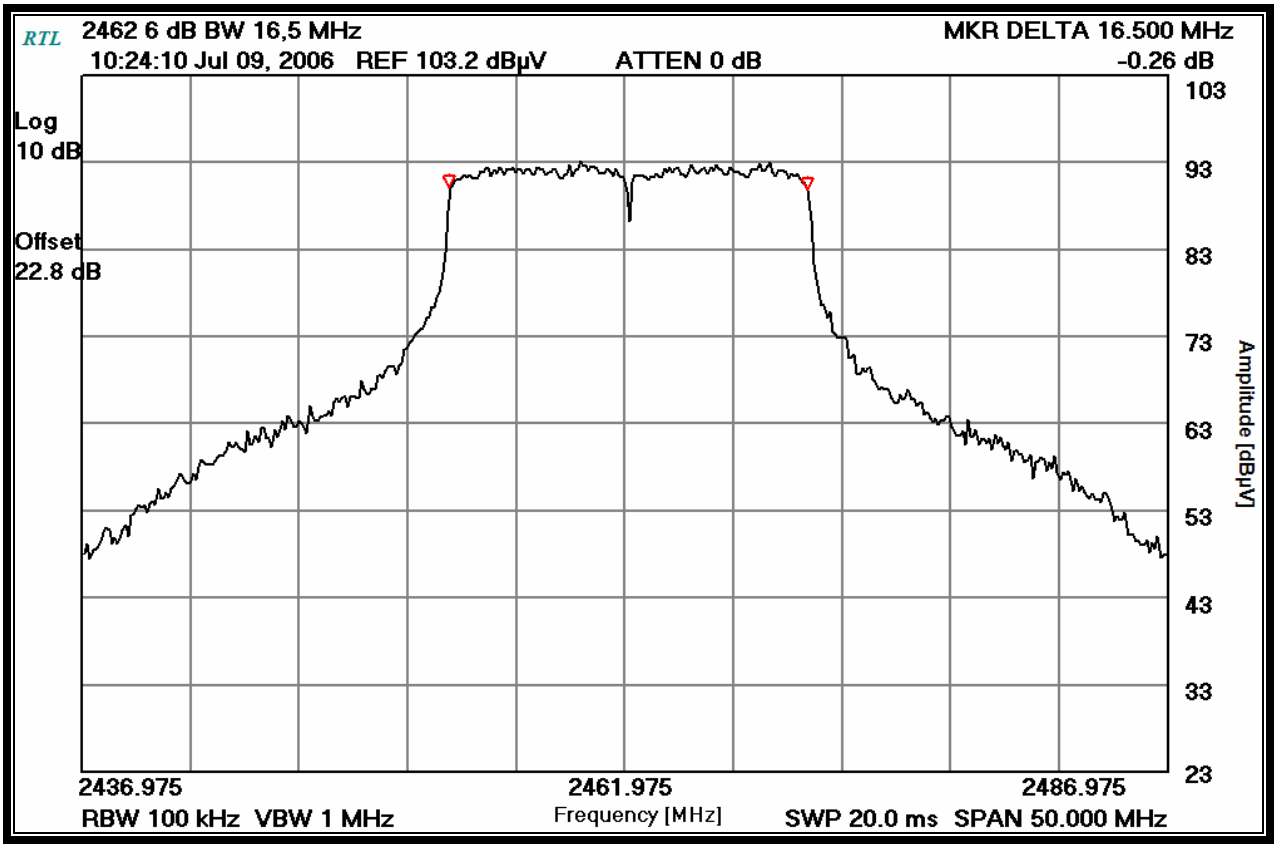
Plot 6-3: 6 dB Bandwidth Channel 11 (TX Frequency: 2462 MHz); 802.11b



Plot 6-4: 6 dB Bandwidth Channel 1 (TX Frequency: 2412 MHz); 802.11g



Plot 6-5: 6 dB Bandwidth Channel 6 (TX Frequency: 2437 MHz); 802.11g



Plot 6-6: 6 dB Bandwidth Channel 11 (TX Frequency: 2462 MHz); 802.11g

Test Personnel:

Daniel W. Baltzell		July 6 and 9, 2006
EMC Test Engineer	Signature	Dates Of Test

7 Power Spectral Density - §15.247(e); RSS-210 §A8.2

7.1 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 7-1: 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	8/3/06

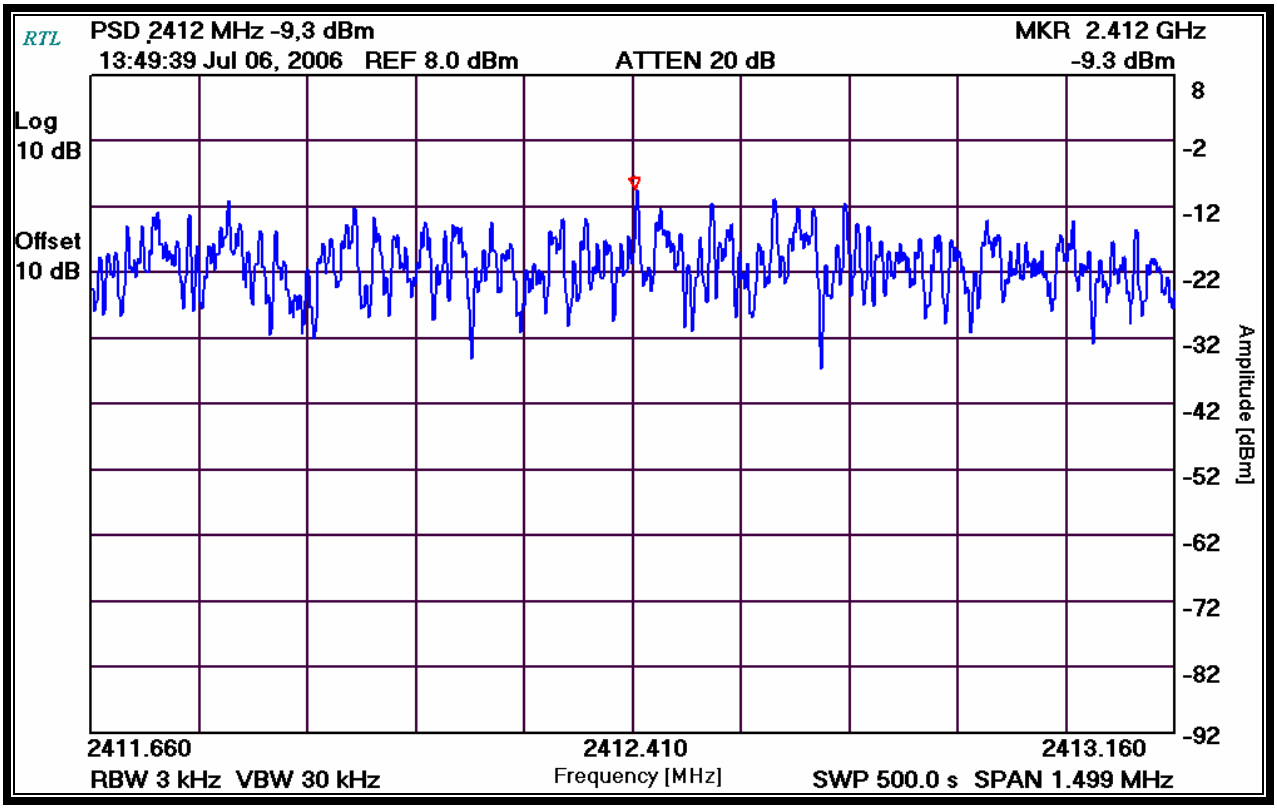
7.2 Power Spectral Density Test Data

Table 7-2: Power Spectral Density Test Data; 802.11b

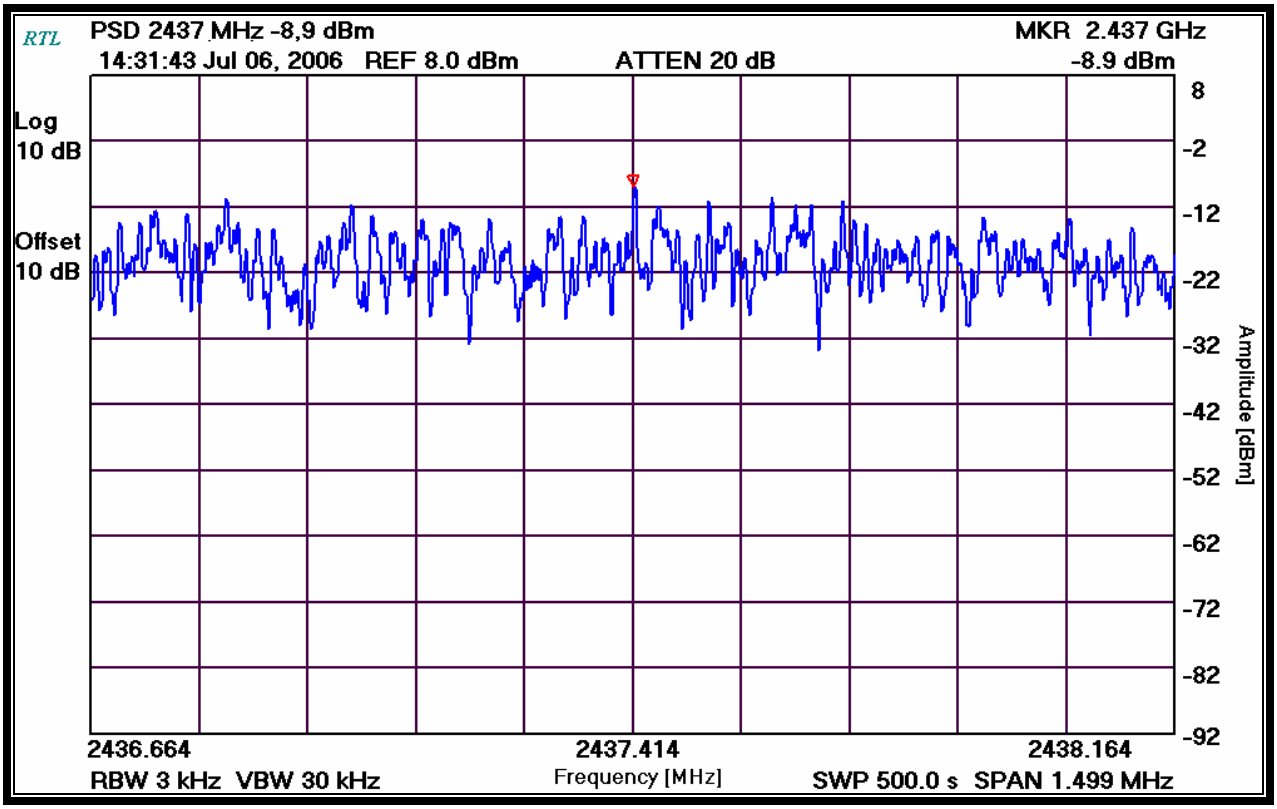
Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-9.3	8	Pass
6	2437	-8.9	8	Pass
11	2462	-8.0	8	Pass

Table 7-3: Power Spectral Density Test Data; 802.11g

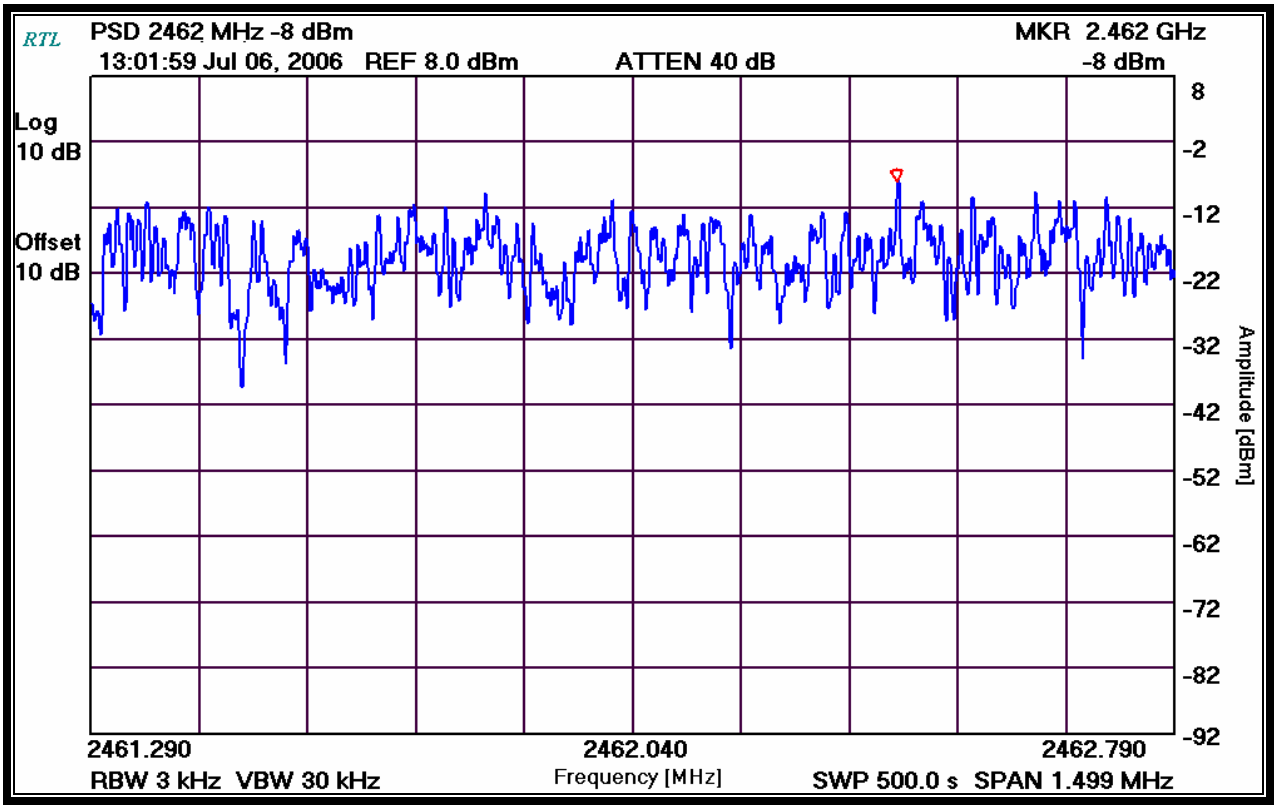
Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-14.5	8	Pass
6	2437	-14.3	8	Pass
11	2462	-12.2	8	Pass



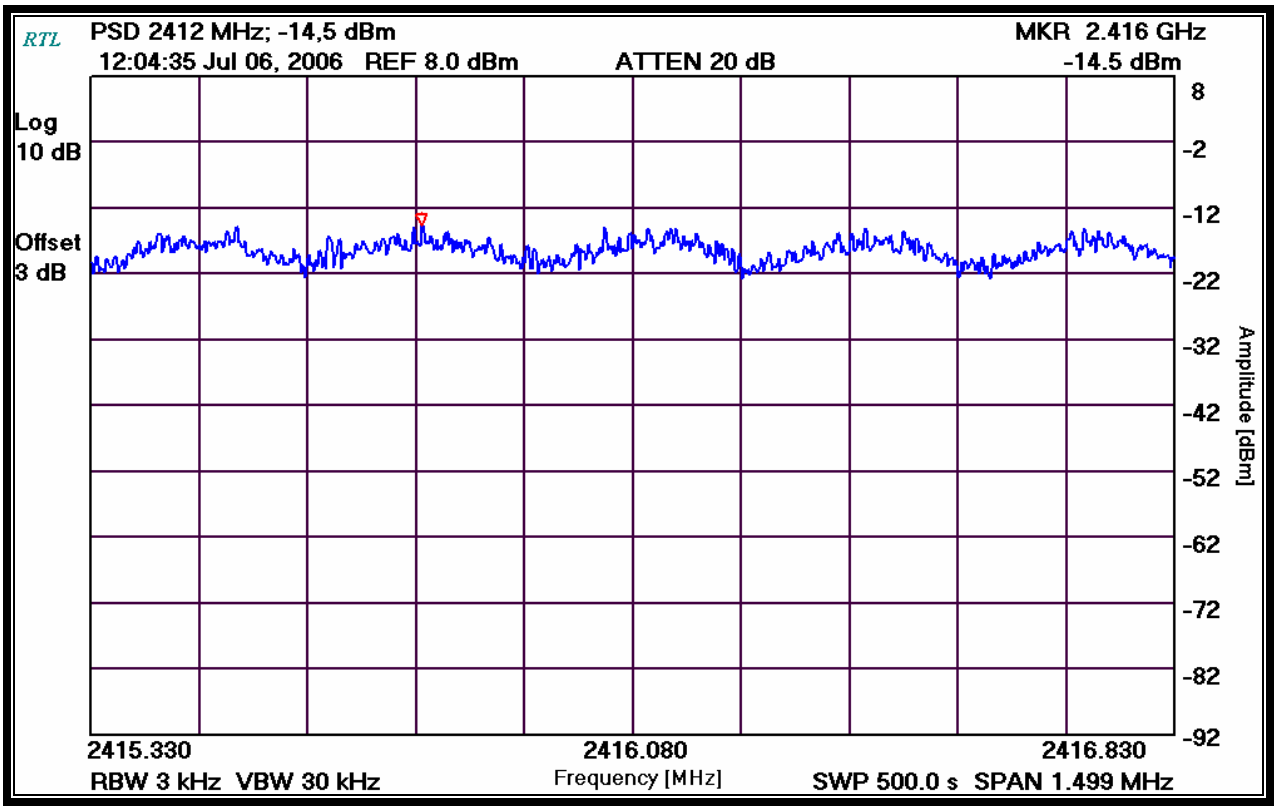
Plot 7-1: Power Spectral Density: Channel 1 (2412 MHz); 802.11b



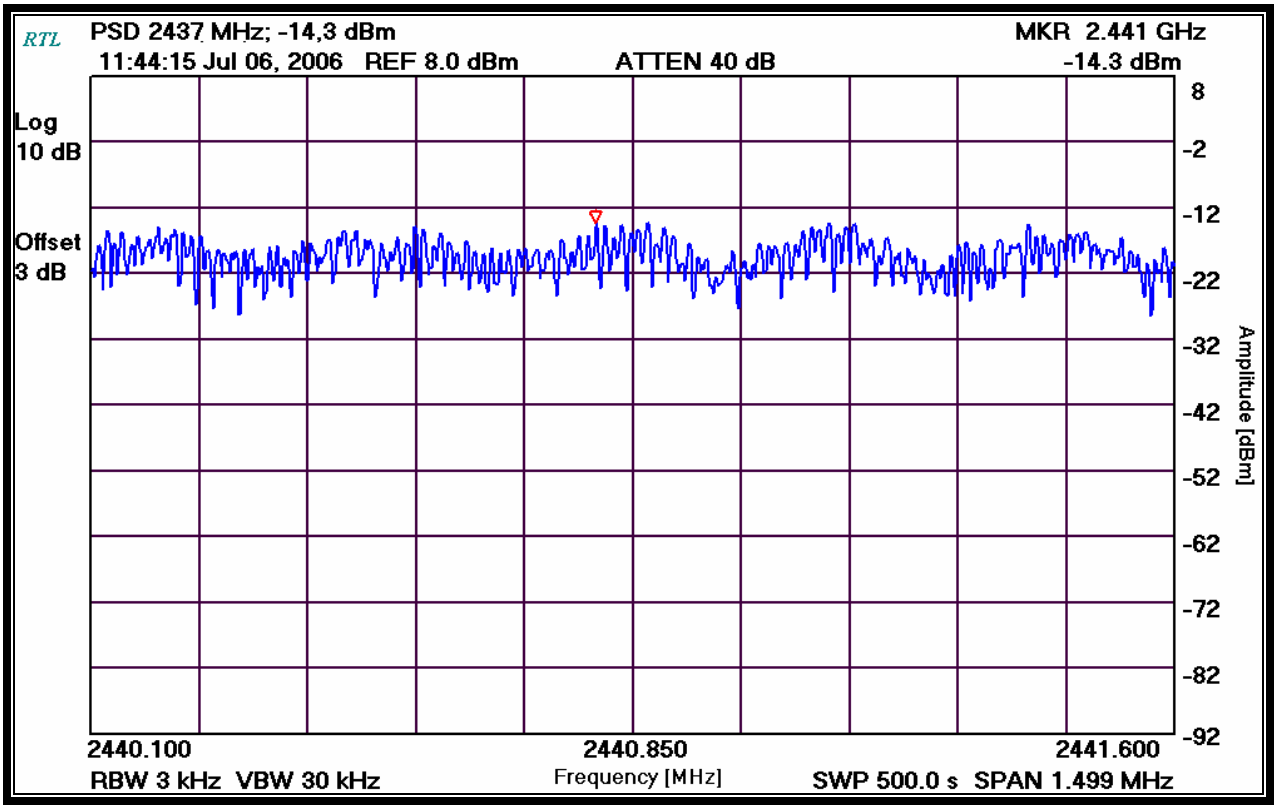
Plot 7-2: Power Spectral Density: Channel 6 (2437 MHz); 802.11b



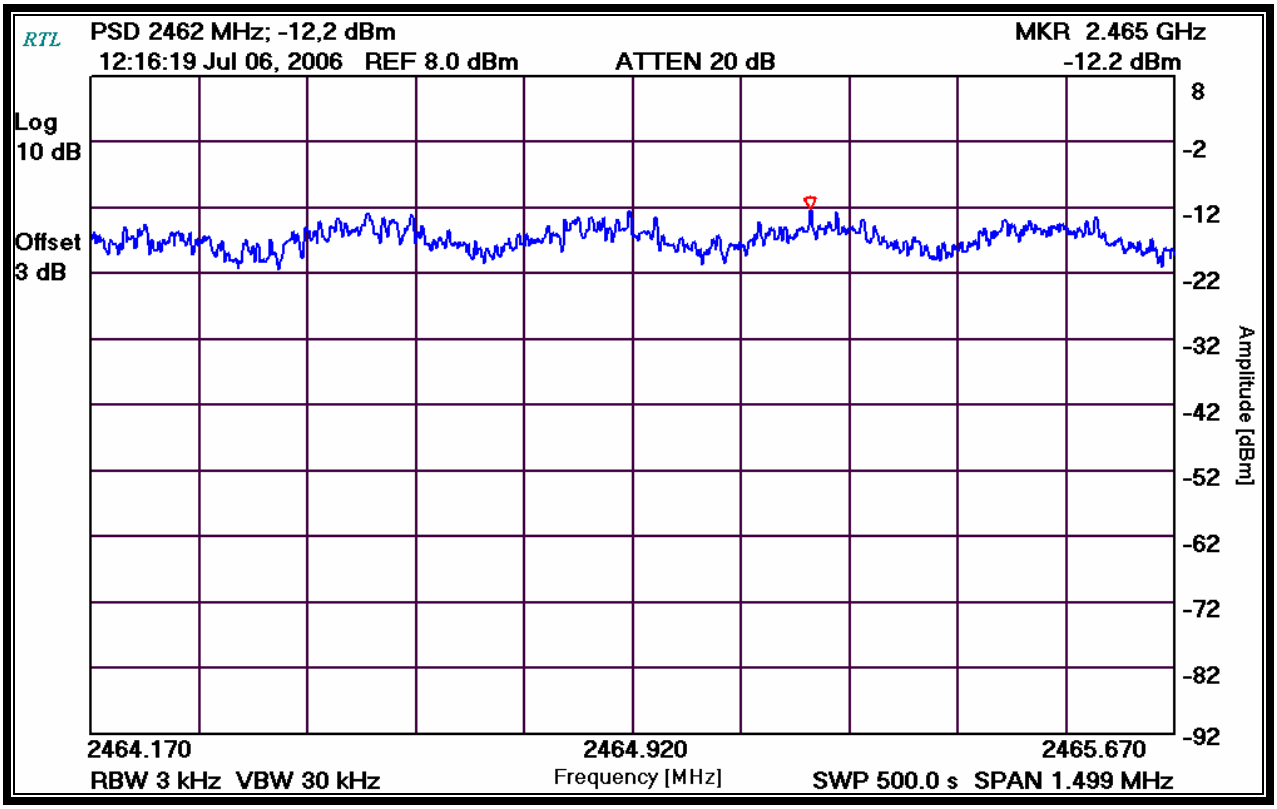
Plot 7-3: Power Spectral Density: Channel 11 (2462 MHz); 802.11b



Plot 7-4: Power Spectral Density: Channel 1 (2412 MHz); 802.11g



Plot 7-5: Power Spectral Density: Channel 6 (2437 MHz); 802.11g



Plot 7-6: Power Spectral Density: Channel 11 (2462 MHz); 802.11g

Test Personnel:

Daniel W. Baltzell		July 6, 2006
EMC Test Engineer	Signature	Date Of Test

8 20 dB Bandwidth – FCC §15.247(a)(1)(ii); IC RSS-210 A8.1(1)

8.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths were measured using a 50-ohm spectrum analyzer. The carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was set to auto with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set at 1 MHz. The minimum 20 dB bandwidths were measured using the spectrum analyzer delta marker set 20 dB down from the peak of the carrier and modulated. The table below contains the bandwidth measurement results.

Table 8-1: 20 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	8/3/06
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	9/22/06

8.2 20 dB Modulated Bandwidth Test Data

Table 8-2: 20 db Bandwidth Test Data 802.11b

Frequency (MHz)	Channel	20 dB Bandwidth (MHz)
2412	1	15.3
2437	6	15.5
2462	11	15.5

Table 8-3: 20 db Bandwidth Test Data 802.11g

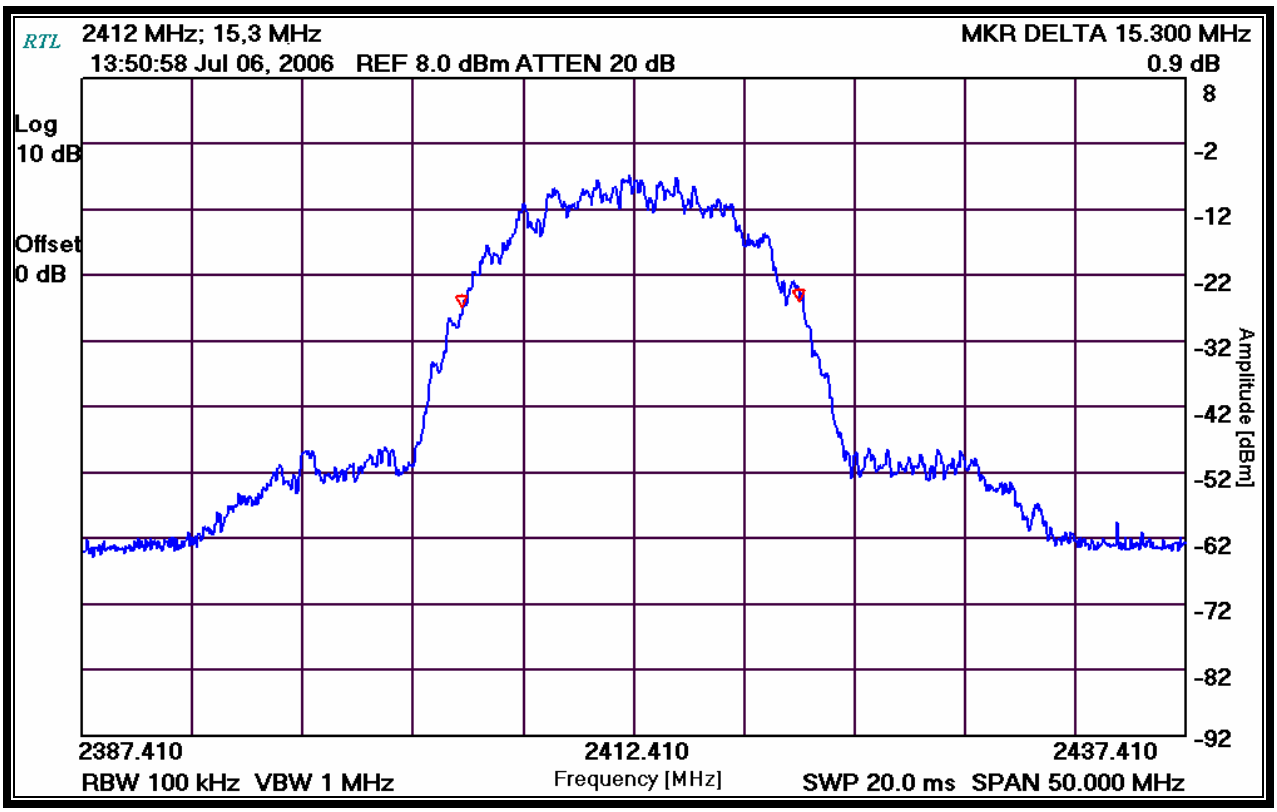
Frequency (MHz)	Channel	20 dB Bandwidth (MHz)
2412	1	18.25
2437	6	19.85
2462	11	19.38

Table 8-4: 20 dB Modulated Bandwidth Test Data FHSS

Frequency (MHz)	Channel	20 dB Bandwidth (MHz)
2402	1	1.105
2441	41	1.103
2480	80	1.115

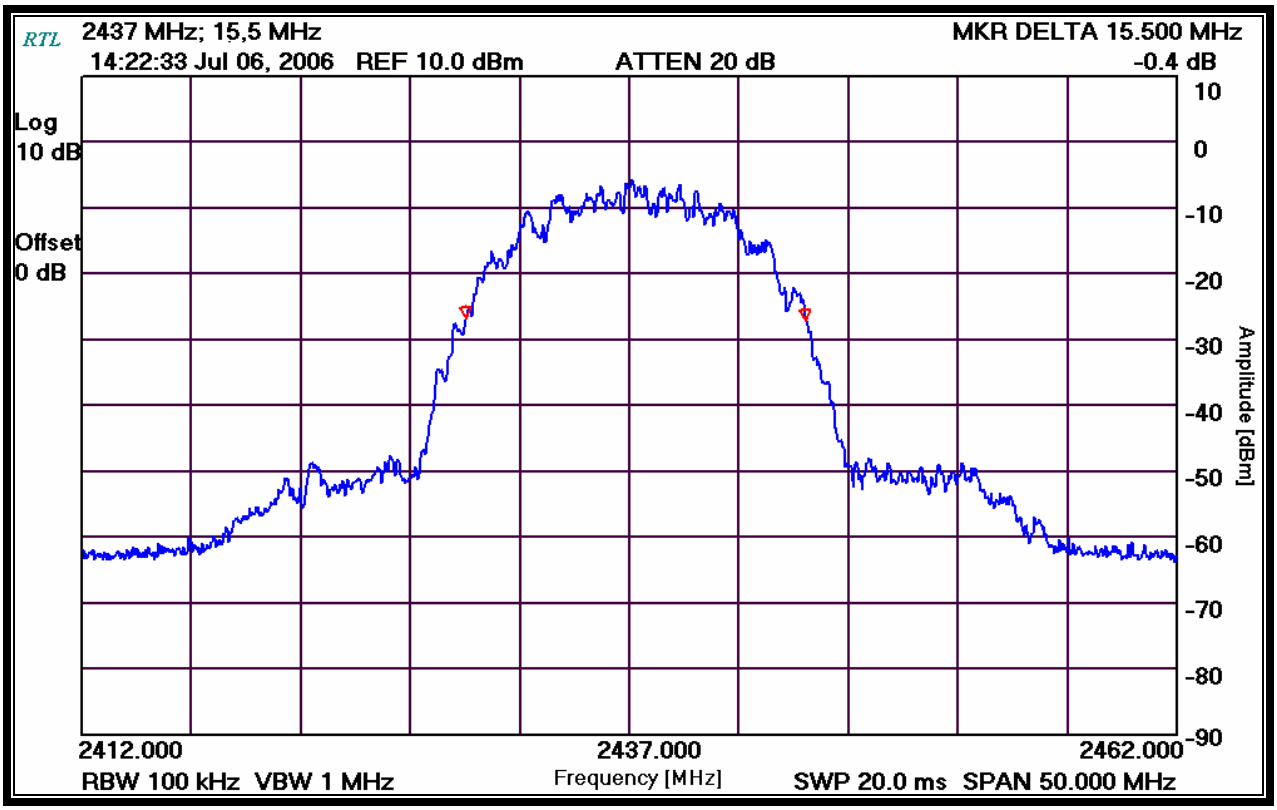
8.3 20 dB Bandwidth Plots - 802.11b

Channel: 1
Channel Frequency (MHz): 2412
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1



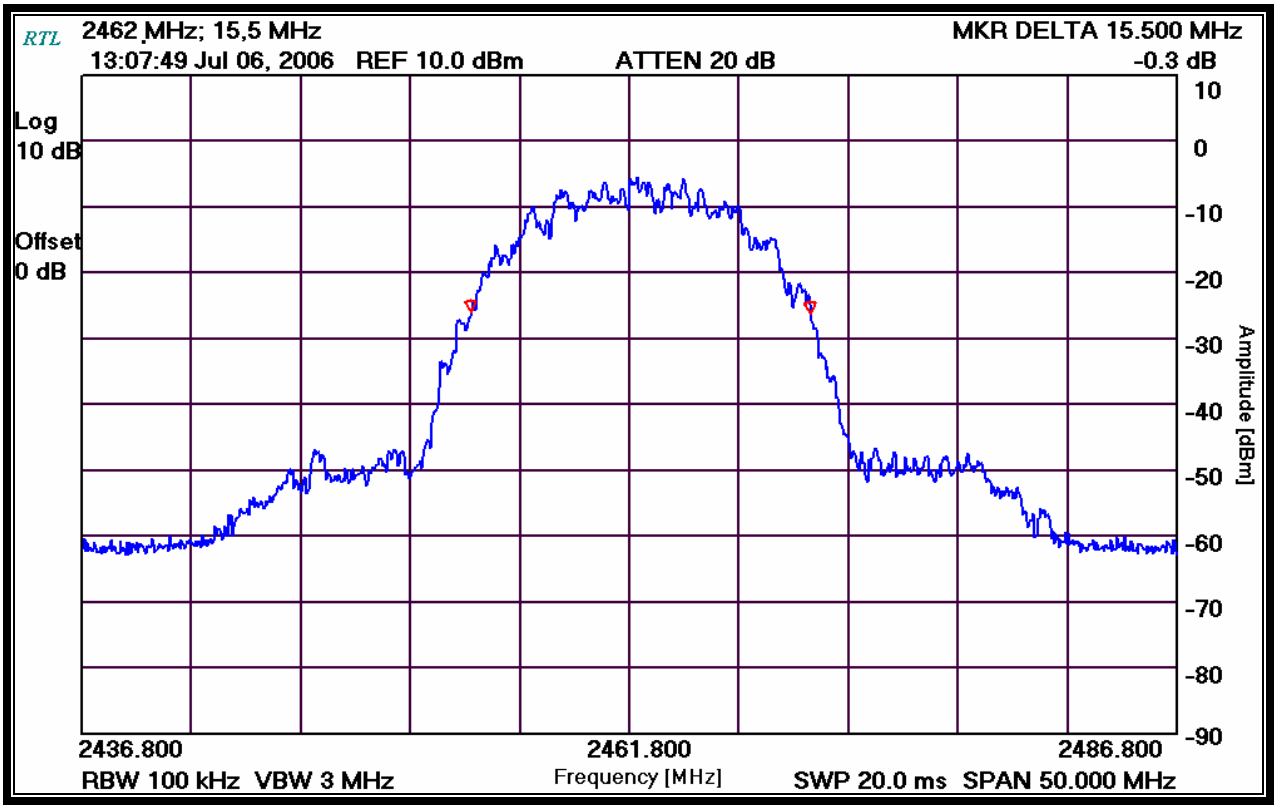
Plot 8-1: **20 dB Bandwidth Channel 1; 802.11b**

Channel: 6
Channel Frequency (MHz): 2437
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1



Plot 8-2: 20 dB Bandwidth Channel 6; 802.11b

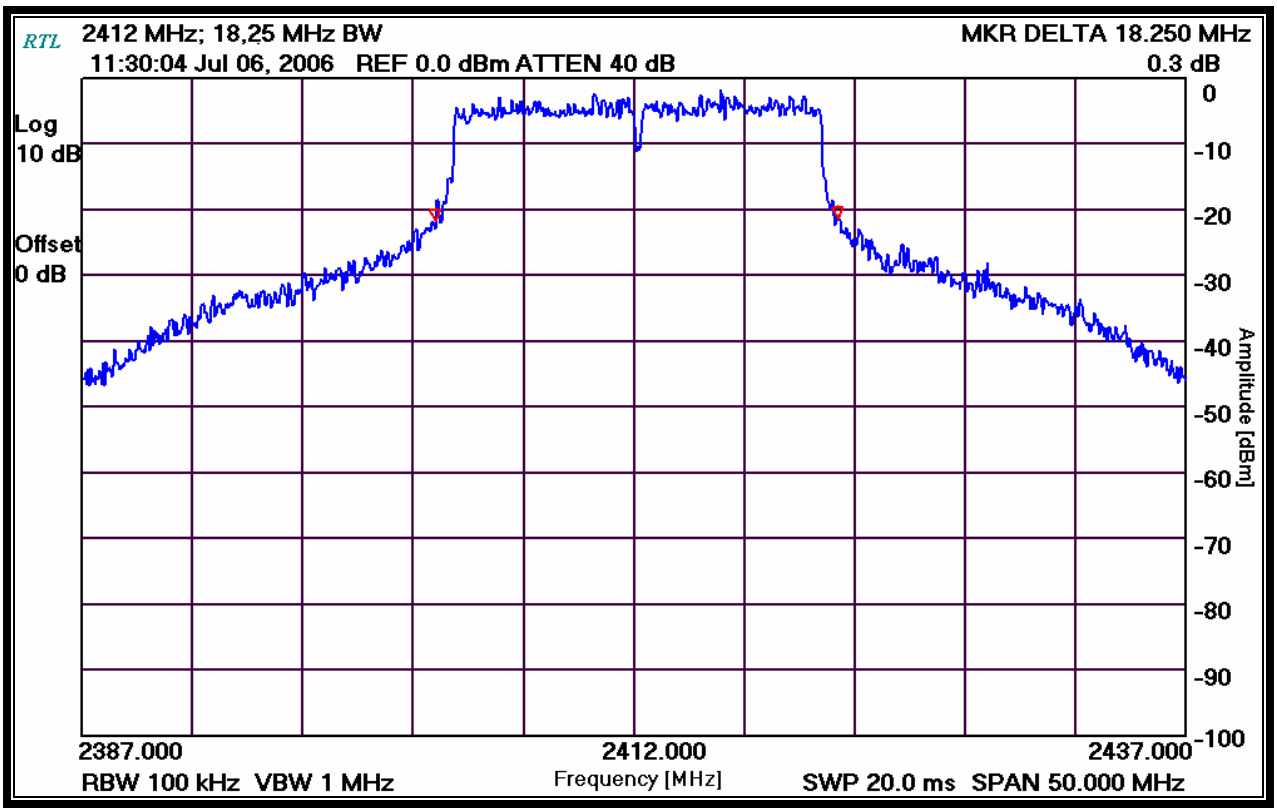
Channel: 11
Channel Frequency (MHz): 2462
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 3



Plot 8-3: **20 dB Bandwidth Channel 11; 802.11b**

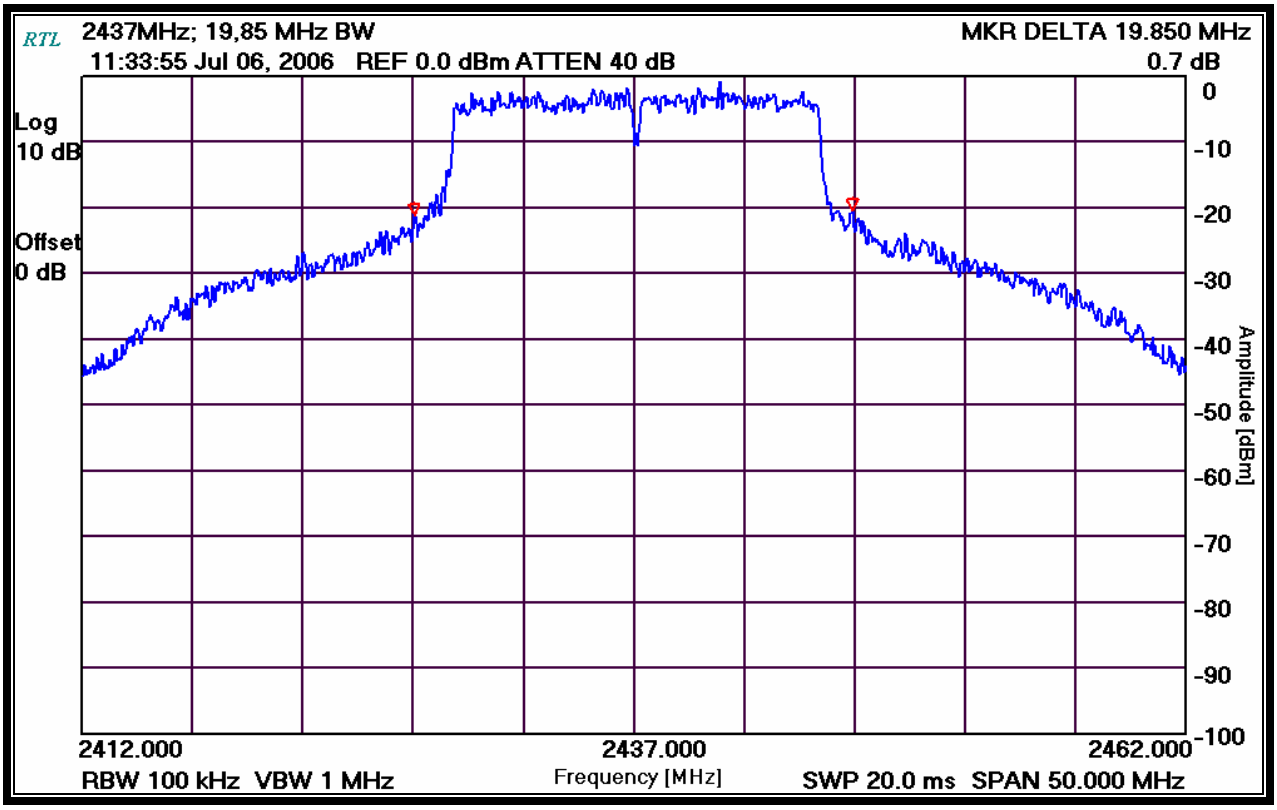
8.4 20 dB Bandwidth Plots - 802.11g

Channel:	1
Channel Frequency (MHz):	2412
Resolution Bandwidth (kHz):	100
Video Bandwidth (MHz):	1



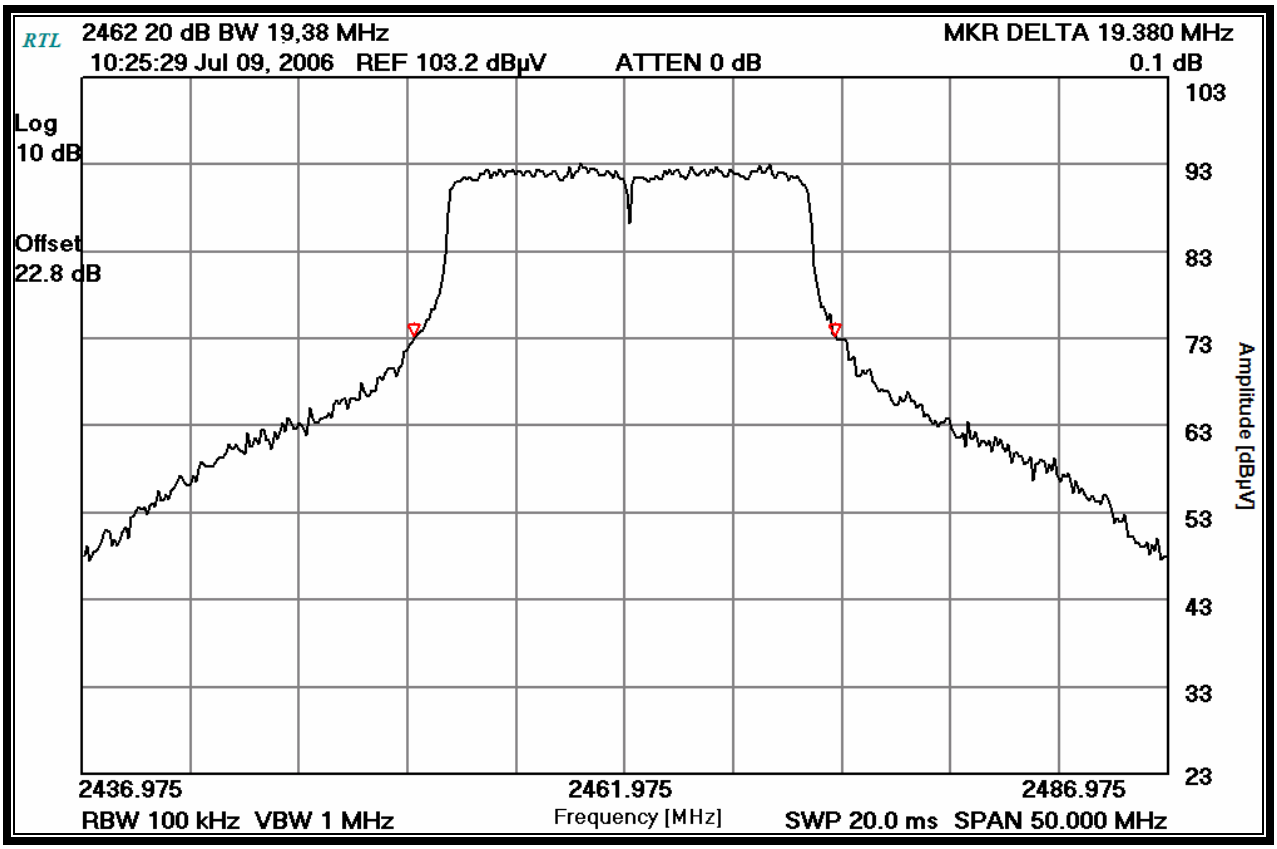
Plot 8-4: 20 dB Bandwidth Channel 1; 802.11g

Channel: 6
Channel Frequency (MHz): 2437
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1



Plot 8-5: **20 dB Bandwidth Channel 6; 802.11g**

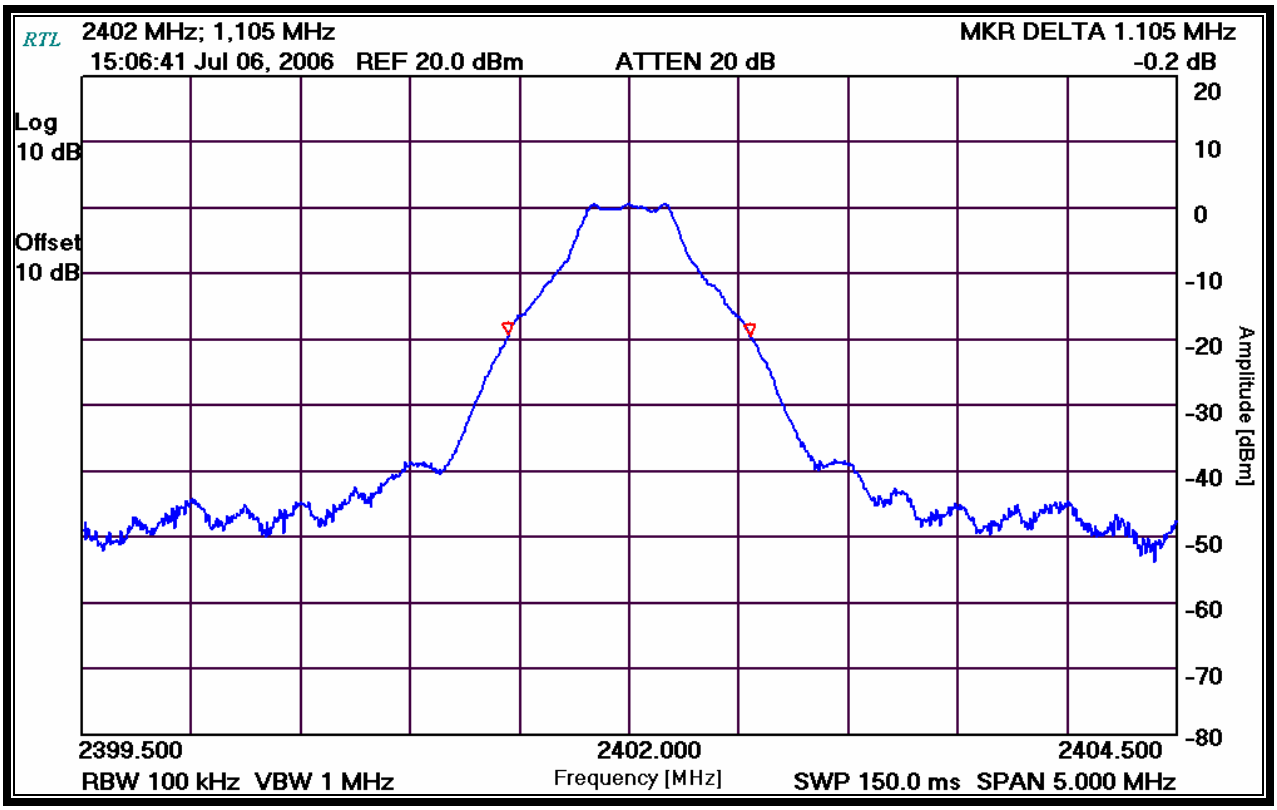
Channel: 11
Channel Frequency (MHz): 2462
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1



Plot 8-6: 20 dB Bandwidth Channel 11; 802.11g

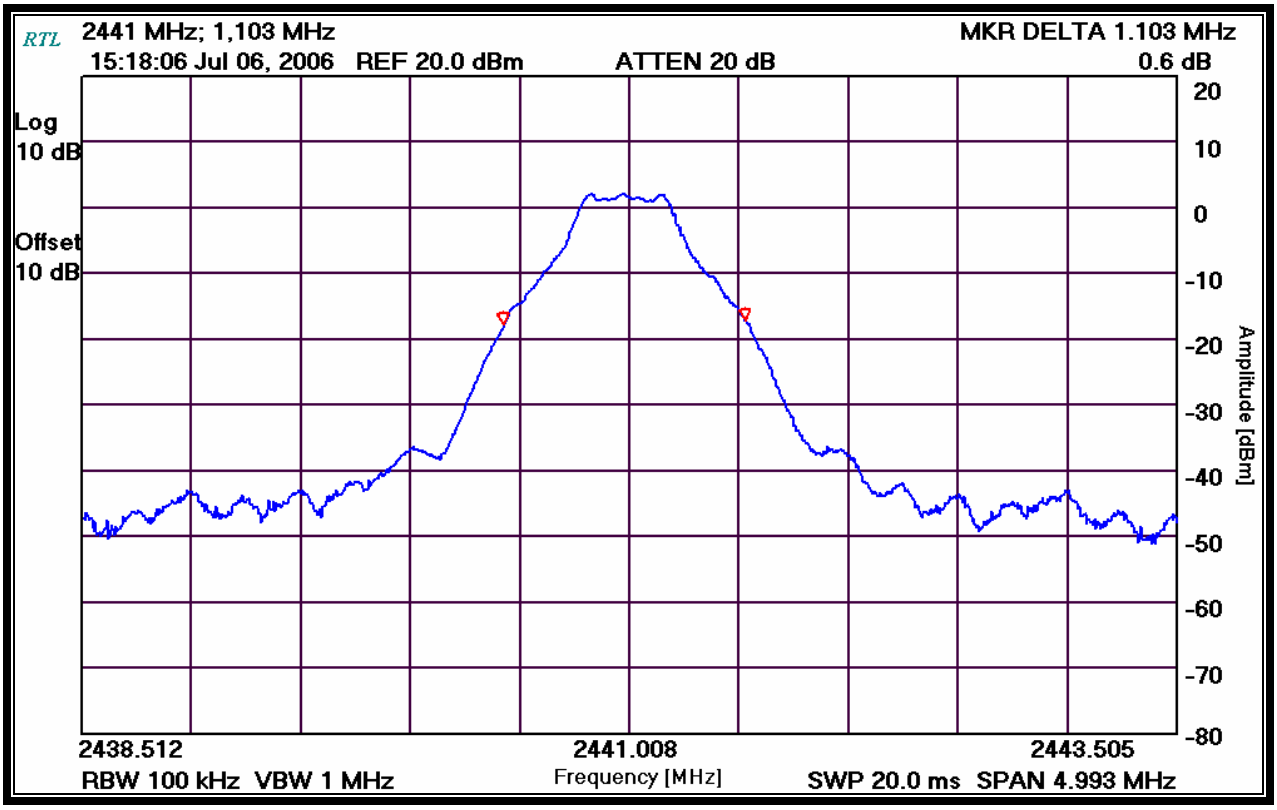
8.5 20 dB Bandwidth Plots - FHSS

Channel:	2
Channel Frequency (MHz):	2402
Resolution Bandwidth (kHz):	100
Video Bandwidth (MHz):	1



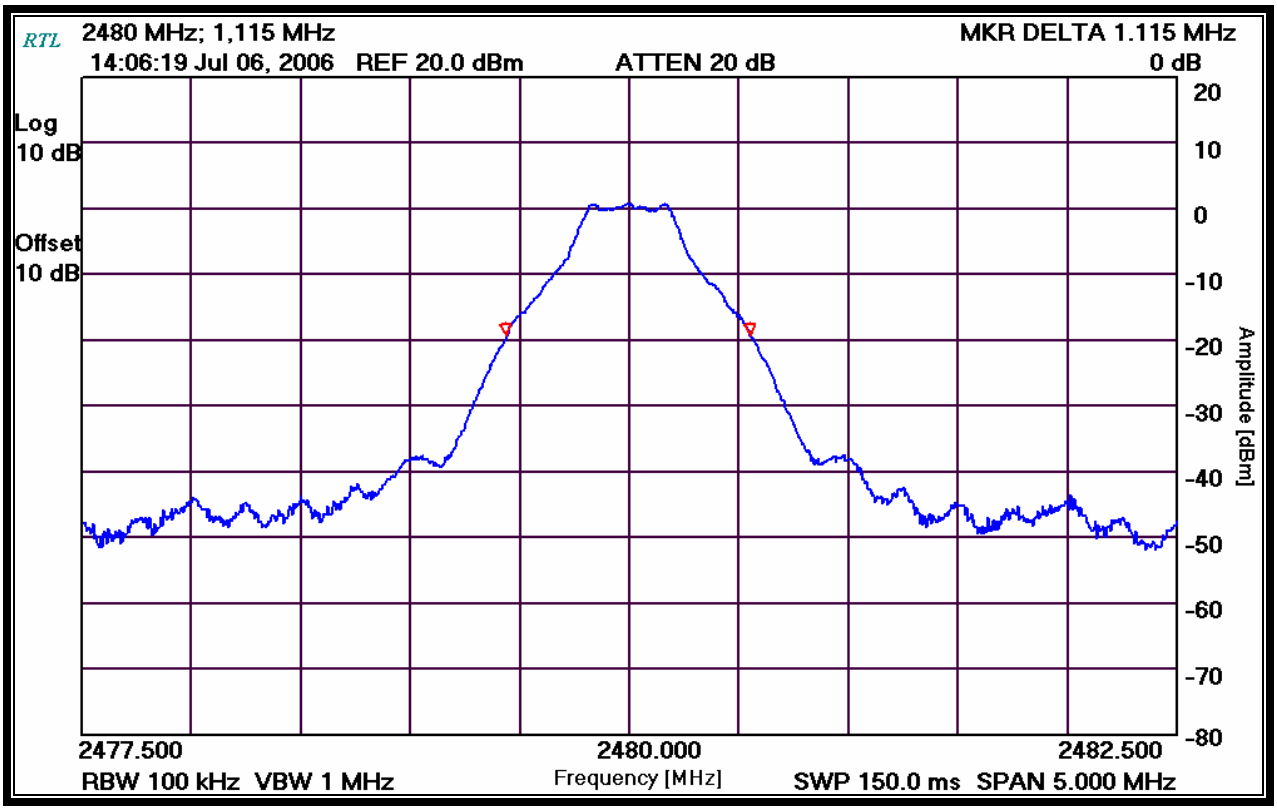
Plot 8-7: 20 dB Bandwidth Channel 2

Channel: 41
Channel Frequency (MHz): 2441
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1



Plot 8-8: **20 dB Bandwidth Channel 41**

Channel: 80
Channel Frequency (MHz): 2480
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1



Plot 8-9: **20 dB Bandwidth Channel 80**

Test Personnel:

Daniel W. Baltzell		May 18, July 6 and 9, 2006
EMC Test Engineer	Signature	Dates Of Test

9 Carrier Frequency Separation - §15.247(a)(1); IC RSS-210 A8.1(2)

9.1 Carrier Frequency Separation Test Procedure

Frequency Hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

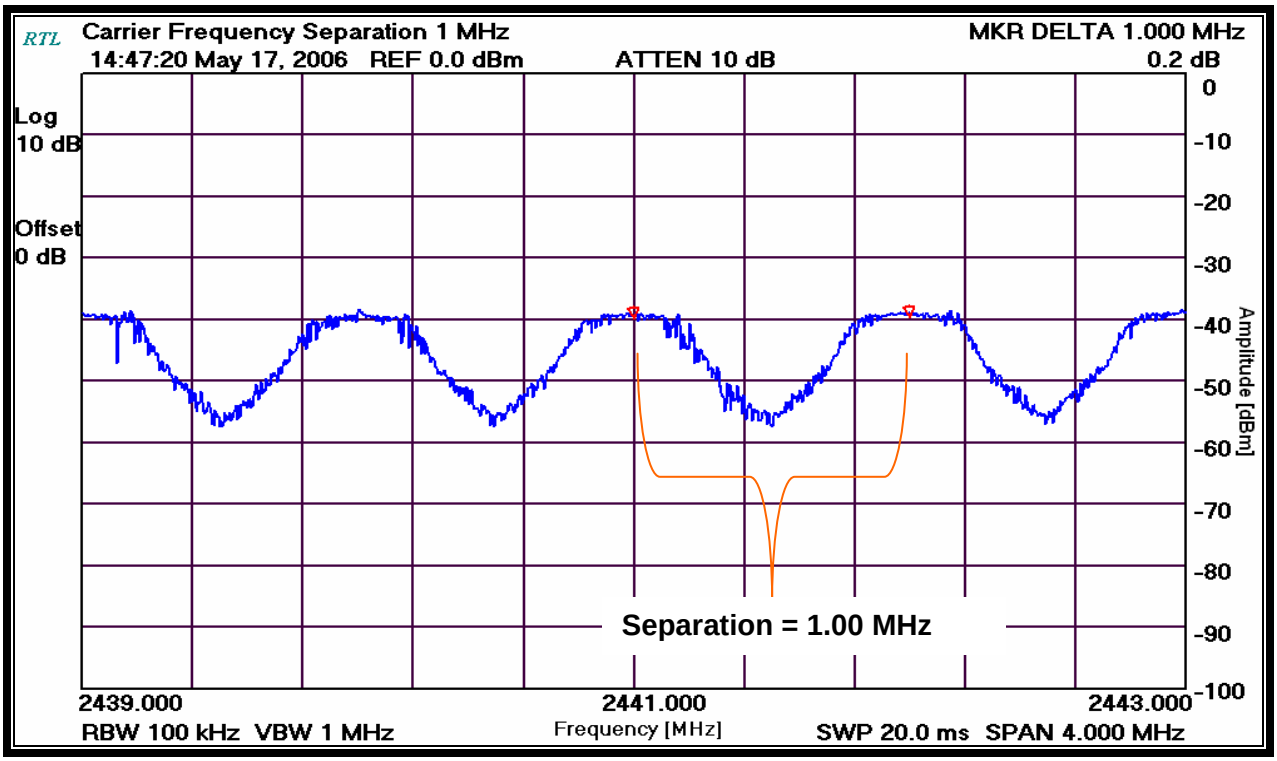
Measured frequency separation = 1.00 MHz

Table 9-1: Carrier Frequency Separation Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06

9.2 Carrier Frequency Separation Test Data

Plot 9-1: Carrier Frequency Separation - Bluetooth



Test Personnel:

Daniel W. Baltzell		May 17, 2006
EMC Test Engineer	Signature	Date Of Test

10 Hopping Characteristics – FCC §15.247(a)(1)(iii); IC RSS-210 §A8.1(4)

10.1 Hopping Characteristics Test Procedure

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

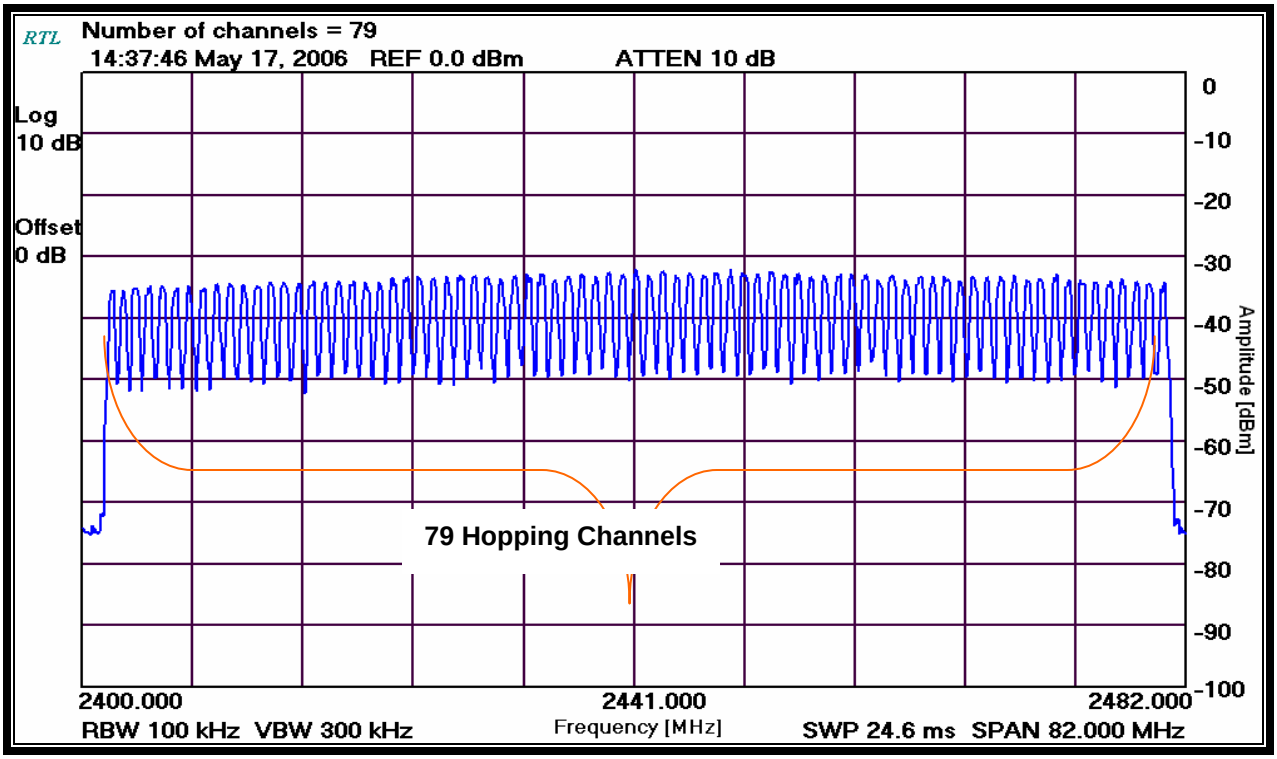
Table 10-1: Hopping Characteristics Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06

10.2 Number of Hopping Frequencies - Bluetooth

Measured number of hopping frequencies = 79

Plot 10-1: Number of Hopping Frequencies



Test Personnel:

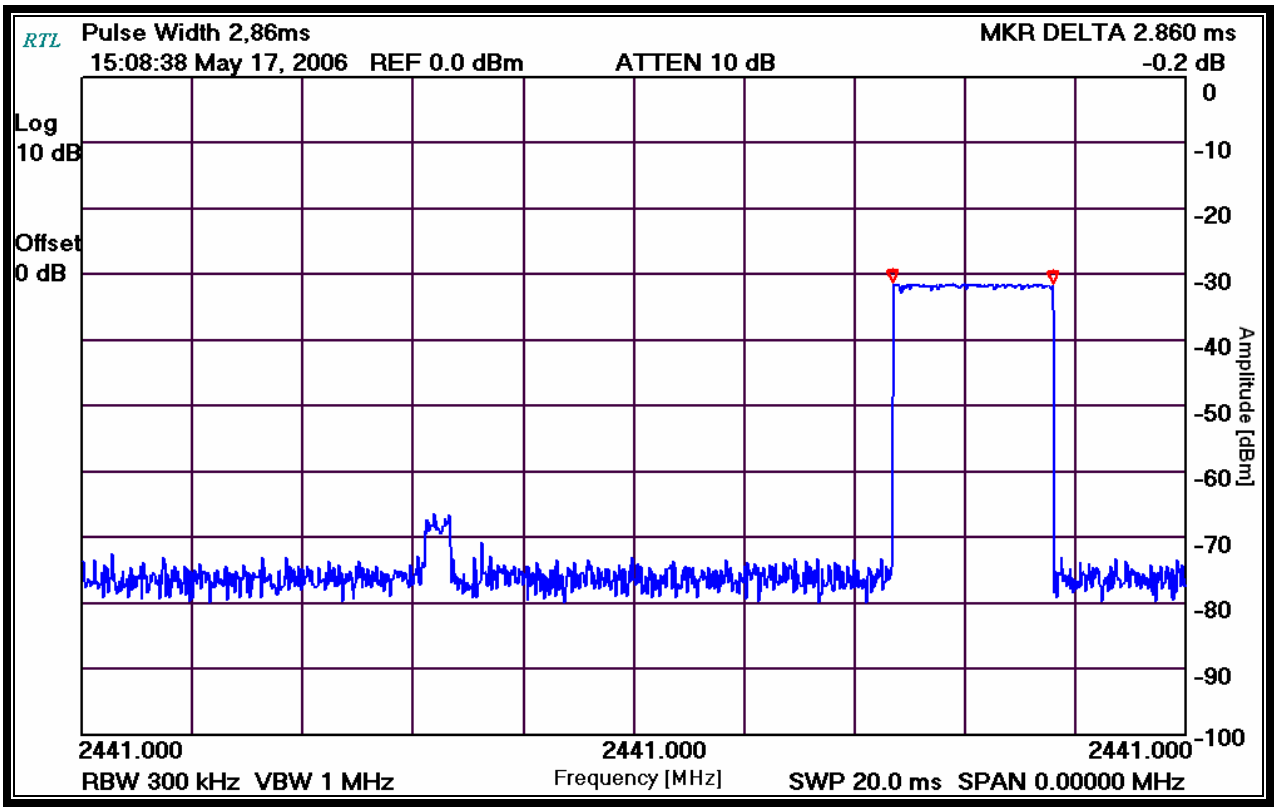
Daniel W. Baltzell		May 17, 2006
EMC Test Engineer	Signature	Date Of Test

10.3 Average Time of Occupancy - Bluetooth

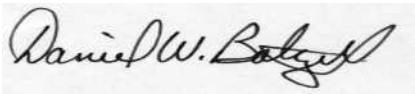
The spectrum analyzer sweep was set to 20 ms, with a zero span and max hold until a pulse from the device under test was captured. A marker delta was used to measure the dwell time for this pulse. The sweep was then set to single sweep for 31.6 s.

The number of pulses in 31.6 s was 93. The average time of occupancy in the above period (31.6 s) is equal to 93 pulses x 2.86 ms = 266 ms, which meets the limit as defined by 15.247(a)(1)(iii) of 0.4 seconds.

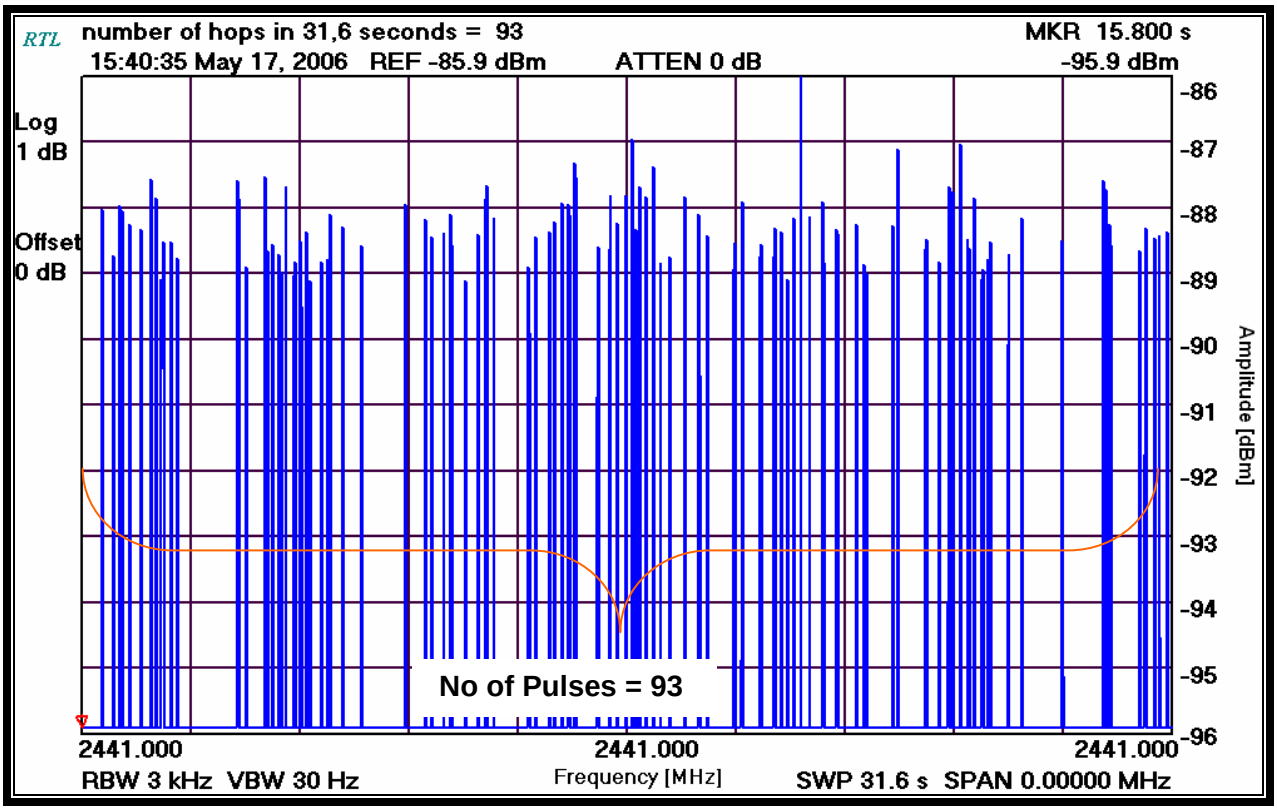
Plot 10-2: Time of Occupancy (Dwell Time)



Test Personnel:

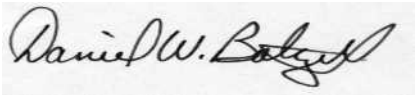
Daniel W. Baltzell		May 17, 2006
EMC Test Engineer	Signature	Date Of Test

Plot 10-3: Time of Occupancy (Dwell Time 31.6 Second Sweep)



Number of pulses in 31.6 seconds: 93

Test Personnel:

Daniel W. Baltzell		May 17, 2006
EMC Test Engineer	Signature	Date Of Test

11 Conducted Limits - §15.207; RSS-GEN

11.1 Test Methodology for Conducted Line Emissions Measurements

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm / 50 micro Henry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 400 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 400 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from (150/450) kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, Section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

11.2 Conducted Line Emissions Test

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. If the quasi-peak measurement is at least 6 dB higher than the amplitude in the average mode, the level measured in the quasi-peak mode may be reduced by 13 dB before comparing it to the limit.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 450 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

Table 11-1: Conducted Line 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	8/3/06
901084	AFJ international	LS16	16A LISN	16010020082	1/23/07

11.3 Conducted Line Emission Test Data

Table 11-2: Conducted Emissions (Neutral Side) Transmitting

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.171	Pk	46.6	0.2	46.8			54.9	-8.1	Pass
0.243	Pk	43.4	0.1	43.5			52.0	-8.5	Pass
0.342	Pk	40.5	0.2	40.7			49.2	-8.5	Pass
0.428	Qp	45.5	0.2	45.7	57.3	-11.6			Pass
0.428	Av	36.4	0.3	36.7			47.7	-11.0	Pass
0.486	Pk	39.9	0.2	40.1			46.2	-6.1	Pass
0.505	Pk	39.5	0.2	39.7			46.0	-6.3	Pass
0.679	Pk	34.8	0.3	35.1			46.0	-10.9	Pass
22.660	Pk	26.9	2.4	29.3			50.0	-20.7	Pass

Pk = Peak; Qp = quasi-peak; Av = Average

Table 11-3: Conducted Emissions (Phase Side) Transmitting

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.161	Pk	47.9	0.2	48.1			55.4	-7.3	Pass
0.259	Pk	43.9	0.1	44.0			51.5	-7.5	Pass
0.325	Pk	36.0	0.3	36.3			49.6	-13.3	Pass
0.418	Qp	46.0	0.3	46.3	57.5	-11.2			Pass
0.418	Av	36.3	0.3	36.6			47.7	-11.1	Pass
0.487	Pk	40.2	0.2	40.4			46.2	-5.8	Pass
0.502	Pk	38.8	0.2	39.0			46.0	-7.0	Pass
0.668	Pk	35.2	0.3	35.5			46.0	-10.5	Pass
20.650	Pk	27.3	2.4	29.7			50.0	-20.3	Pass

Pk = Peak; Qp = quasi-peak; Av = Average

Table 11-4: Conducted Emissions (Neutral Side) Receive/Digital

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.150	Pk	47.2	0.2	47.4			56.0	-8.6	Pass
0.246	Pk	43.4	0.1	43.5			51.9	-8.4	Pass
0.345	Pk	37.3	0.2	37.5			49.1	-11.6	Pass
0.429	Qp	42.0	0.2	42.2	57.3	-15.1			Pass
0.429	Av	34.9	0.3	35.2			47.4	-12.2	Pass
0.487	Pk	39.2	0.2	39.4			46.2	-6.8	Pass
0.509	Pk	39.1	0.2	39.3			46.0	-6.7	Pass
0.680	Pk	33.0	0.3	33.3			46.0	-12.7	Pass
22.610	Pk	25.2	2.4	27.6			50.0	-22.4	Pass

Pk = Peak; Qp = quasi-peak; Av = Average

Table 11-5: Conducted Emissions (Phase Side) Receive/Digital

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.162	Pk	45.3	0.2	45.5			55.4	-9.9	Pass
0.252	Pk	42.7	0.1	42.8			51.7	-8.9	Pass
0.343	Pk	37.5	0.2	37.7			49.1	-11.4	Pass
0.422	Pk	47.0	0.3	47.3			47.4	-0.1	Pass
0.429	Qp	41.8	0.2	42.0	57.3	-15.3			Pass
0.429	Av	34.8	0.3	35.1			47.4	-12.3	Pass
0.486	Pk	40.0	0.2	40.2			46.2	-6.0	Pass
0.515	Pk	39.4	0.2	39.6			46.0	-6.4	Pass
0.686	Pk	30.7	0.3	31.0			46.0	-15.0	Pass
20.700	Pk	27.2	2.4	29.6			50.0	-20.4	

Pk = Peak; Qp = quasi-peak; Av = Average

12 Radiated Emissions - §15.209; RSS-210 §A8.5 and RSS-Gen

12.1 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.

12.2 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 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency (24.8 GHz).

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 12-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Antenna (Loop antenna, (9 kHz - 30 MHz)	827525/019	8/25/06
901365	Miteq	JS4-00102600-41-5P	Amplifier, 15 V, 0.1-26 GHz, 28 dB gain, power 5 dB	1094152	3/24/07
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06
900905	Rhein Tech Labs	PR-1040	OATS 1 Preamplifier 40 dB (30 MHz – 2 GHz)	1006	3/15/07
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901232	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901235	IW Microwave Products	KPS-1503-360-KPS	High frequency RF cables	36"	9/1/06
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07
900321	EMCO	3161-03	Horn Antennas (4 - 8,2GHz)	9508-1020	5/20/07
900323	EMCO	3160-7	Horn Antennas (8,2 - 12,4 GHz)	9605-1054	5/20/07
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	5/20/07
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	5/20/07
901218	EMCO	3301B	Horn Antenna (18 - 26.5 GHz)	960281-003	5/20/07
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 – 26.5 GH)z	3525A00159	11/27/07
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	8/3/06
900889	Hewlett Packard	85685A	RF Preselector (20 Hz - 2 GHz)	3146A01309	4/12/07

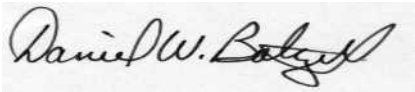
12.3 Radiated Emissions Test Results

12.3.1 Radiated Emissions - Digital

Table 12-2: Digital Radiated Emissions

Temperature: 69°F Humidity: 56%										
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**
146.819	Qp	H	120	1.0	39.0	-17.0	22.0	43.5	-21.5	Pass
146.820	Qp	V	180	1.0	42.1	-16.9	25.2	43.5	-18.3	Pass
159.054	Qp	H	120	1.0	38.6	-17.6	21.0	43.5	-22.5	Pass
165.172	Qp	H	120	1.0	48.3	-17.9	30.4	43.5	-13.1	Pass
165.172	Qp	V	180	1.0	48.2	-17.6	30.6	43.5	-12.9	Pass
171.289	Qp	H	120	1.0	46.8	-18.1	28.7	43.5	-14.8	Pass
189.642	Qp	H	120	1.0	39.2	-18.4	20.8	43.5	-22.7	Pass
201.877	Qp	H	120	1.0	39.2	-17.4	21.8	43.5	-21.7	Pass
214.112	Qp	H	120	1.0	41.9	-17.2	24.7	43.5	-18.8	Pass
226.347	Qp	H	120	1.0	42.6	-16.9	25.7	46.0	-20.3	Pass
238.582	Qp	H	120	1.0	42.9	-15.8	27.1	46.0	-18.9	Pass
250.817	Qp	H	120	1.0	40.9	-14.6	26.3	46.0	-19.7	Pass
250.817	Qp	H	120	1.0	42.1	-14.6	27.5	46.0	-18.5	Pass
263.052	Qp	H	120	1.0	37.8	-13.6	24.2	46.0	-21.8	Pass
269.169	Qp	H	120	1.0	31.1	-13.8	17.3	46.0	-28.7	Pass
275.287	Qp	H	290	1.0	28.4	-13.9	14.5	46.0	-31.5	Pass
287.522	Qp	H	180	1.0	32.1	-13.6	18.5	46.0	-27.5	Pass
336.465	Qp	H	180	1.0	26.2	-12.2	14.0	46.0	-32.0	Pass
599.515	Qp	H	120	1.2	32.8	-5.7	27.1	46.0	-18.9	Pass
648.455	Qp	H	180	1.0	30.5	-5.2	25.3	46.0	-20.7	Pass

Test Personnel:



Daniel W. Baltzell		May 18, 2006
EMC Test Engineer	Signature	Date Of Test

12.3.2 Radiated Emissions Harmonics/Spurious

Table 12-3: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz); 802.11b

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4813.2	39.2	28.2	0.4	28.6	54.0	-25.4
4816.2	40.0	29.8	0.5	30.3	54.0	-23.7
4820.8	40.3	31.0	0.5	31.5	54.0	-22.5
4824.0	51.2	50.8	0.5	51.3	54.0	-2.7
4827.5	41.2	31.5	0.6	32.1	54.0	-21.9
4823.3	41.0	30.5	0.5	31.0	54.0	-23.0
4835.4	40.8	28.8	0.6	29.4	54.0	-24.6
7236.0	39.0	27.0	3.3	30.3	80.4	-50.1
9648.0	35.8	26.5	8.4	34.9	80.4	-45.5
12060.0	37.0	24.2	11.3	35.5	54.0	-18.5
14472.0	38.3	26.5	15.3	41.8	54.0	-12.2
16884.0	39.7	26.8	16.3	43.1	80.4	-37.3
19296.0	36.2	25.3	21.2	46.5	54.0	-7.5
21708.0	39.3	26.3	9.1	35.4	80.4	-45.0
24120.0	40.3	27.2	9.1	36.3	80.4	-44.1

Table 12-4: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz); 802.11b

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4863.4	40.8	28.7	0.2	28.9	54.0	-25.1
4866.3	41.0	30.5	0.1	30.6	54.0	-23.4
4871.3	41.3	32.0	0.1	32.1	54.0	-21.9
4874.0	49.2	46.2	0.1	46.3	54.0	-7.7
4877.3	42.0	32.2	0.2	32.4	54.0	-21.6
4882.3	41.5	31.5	0.2	31.7	54.0	-22.3
4885.3	41.3	29.8	0.2	30.0	54.0	-24.0
7311.0	36.8	26.0	2.8	28.8	54.0	-25.2
9748.0	36.3	26.2	8.6	34.8	81.9	-47.1
12185.0	34.7	25.2	10.6	35.8	54.0	-18.2
14622.0	38.0	26.8	15.7	42.5	81.9	-39.4
17059.0	37.3	27.2	15.9	43.1	81.9	-38.8
19496.0	41.3	27.2	20.4	47.6	54.0	-6.4
21933.0	35.5	24.5	9.1	33.6	81.9	-48.3
24370.0	37.7	24.7	9.1	33.8	81.9	-48.1

Table 12-5: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz); 802.11b

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4913.3	41.0	29.5	0.4	29.9	54.0	-24.1
4916.1	41.2	30.7	0.4	31.1	54.0	-22.9
4921.2	41.5	32.0	0.4	32.4	54.0	-21.6
4924.0	49.8	46.5	0.4	46.9	54.0	-7.1
4927.3	42.2	31.8	0.4	32.2	54.0	-21.8
4932.2	40.7	30.8	0.5	31.3	54.0	-22.7
4935.3	40.3	29.7	0.5	30.2	54.0	-23.8
7386.0	38.0	26.8	4.0	30.8	54.0	-23.2
9848.0	36.7	26.2	9.3	35.5	82.1	-46.6
12310.0	35.7	25.5	10.2	35.7	54.0	-18.3
14772.0	37.5	26.0	14.7	40.7	82.1	-41.4
17234.0	37.0	26.8	16.2	43.0	82.1	-39.1
19696.0	37.8	26.3	20.8	47.1	54.0	-6.9
22158.0	35.2	24.7	9.1	33.8	54.0	-20.2
24620.0	37.8	26.7	9.1	35.8	82.1	-46.3

Table 12-6: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz); 802.11g

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4824.0	46.0	32.0	0.5	32.5	54.0	-21.5
7236.0	38.0	26.3	3.3	29.6	75.1	-45.5
9648.0	36.2	25.8	8.4	34.2	75.1	-40.9
12060.0	36.0	24.8	11.3	36.1	54.0	-17.9
14472.0	37.5	26.7	15.3	42.0	54.0	-12.0
16884.0	38.3	26.5	16.3	42.8	75.1	-32.3
19296.0	35.5	25.2	21.2	46.4	54.0	-7.6
21708.0	37.8	26.2	9.1	35.3	75.1	-39.8
24120.0	39.7	27.5	9.1	36.6	75.1	-38.5

Table 12-7: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz); 802.11g

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4874.0	46.5	32.2	0.1	32.3	54.0	-21.7
7311.0	49.8	35.2	2.8	38.0	54.0	-16.0
9748.0	38.8	27.3	8.6	35.9	75.7	-39.8
12185.0	41.3	26.7	10.6	37.3	54.0	-16.7
14622.0	42.3	28.0	15.7	43.7	75.7	-32.0
17059.0	42.0	28.5	15.9	44.4	75.7	-31.3
19496.0	41.2	26.3	20.4	46.7	54.0	-7.3
21933.0	41.0	26.2	9.1	35.3	75.7	-40.4
24370.0	40.0	26.3	9.1	35.4	75.7	-40.3

Table 12-8: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz); 802.11g

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4924.0	49.8	36.8	0.4	37.2	54.0	-16.8
7386.0	42.5	28.0	4.0	32.0	54.0	-22.0
9848.0	42.0	27.2	9.3	36.5	77.4	-40.9
12310.0	40.8	27.0	10.2	37.2	54.0	-16.8
14772.0	41.2	27.2	14.7	41.9	77.4	-35.5
17234.0	41.5	27.7	16.2	43.9	77.4	-33.5
19696.0	41.0	27.2	20.8	48.0	54.0	-6.0
22158.0	41.7	26.3	9.1	35.4	54.0	-18.6
24620.0	40.0	27.3	9.1	36.4	77.4	-41.0

Table 12-9: Radiated Emissions Harmonics/Spurious Channel 2 (TX Frequency: 2402MHz); FHSS

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4804.0	48.0	38.7	0.3	39.0	54.0	-15.0
7206.0	46.5	33.7	3.4	37.1	57.7	-20.6
9608.0	45.2	33.2	9.0	42.2	57.7	-15.5
12010.0	37.8	26.7	10.9	37.6	54.0	-16.4
14412.0	40.7	27.8	15.7	43.5	57.7	-14.2
16814.0	40.2	27.2	16.1	43.3	57.7	-14.4

Table 12-10: Radiated Emissions Harmonics/Spurious Channel 41 (TX Frequency: 2441 MHz); FHSS

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4882.0	47.5	37.8	0.2	38.0	54.0	-16.0
7323.0	46.8	34.2	3.3	37.5	54.0	-16.5
9764.0	41.7	31.0	8.5	39.5	59.2	-19.7
12205.0	39.5	26.7	10.1	36.8	54.0	-17.2
14646.0	41.3	28.0	15.6	43.6	59.2	-15.6
17087.0	42.5	28.2	16.2	44.4	59.2	-14.8

Table 12-11: Radiated Emissions Harmonics/Spurious Channel 80 (TX Frequency: 2480 MHz); FHSS

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4960.0	49.3	34.2	0.7	34.9	54.0	-19.1
7440.0	44.2	34.3	3.9	38.2	54.0	-15.8
9920.0	40.7	28.8	9.4	38.2	56.8	-18.6
12400.0	39.7	27.0	14.1	41.1	54.0	-12.9
14880.0	37.5	27.8	15.7	43.5	56.8	-13.3
17360.0	42.3	28.2	16.2	44.4	56.8	-12.4

Table 12-12: Radiated Emissions Harmonics/Spurious Hopping Mode; FHSS

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2389.900	44.8	27.2	-5.0	22.2	54.0	-31.8
2483.870	55.2	28.8	-4.9	23.9	54.0	-30.1
4803.700	46.8	27.7	0.3	28.0	54.0	-26.0
4898.000	45.3	27.2	0.3	27.5	54.0	-26.5
7267.000	43.2	28.2	3.6	31.8	54.0	-22.2
7347.300	43.3	28.3	3.9	32.2	54.0	-21.8

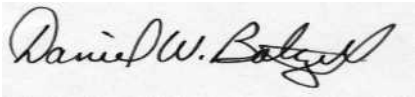
Table 12-13: Radiated Emissions Harmonics/Spurious Collocated Mode; FHSS and 802.11b (2437 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2387.680	50.8	33.7	-5.0	28.7	54.0	-25.3
2484.180	55.3	35.2	-4.9	30.3	54.0	-23.7
4874.700	44.0	32.7	0.2	32.9	54.0	-21.1
4890.700	44.0	26.0	0.2	26.2	54.0	-27.8
7309.170	41.5	32.2	2.9	35.1	54.0	-18.9
7323.250	38.8	28.0	3.5	31.5	54.0	-22.5

Table 12-14: Radiated Emissions Harmonics/Spurious Collocated Mode; FHSS and 802.11g (2437 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2389.970	52.5	35.8	-5.0	30.8	54.0	-23.2
2483.530	55.5	38.0	-4.9	33.1	54.0	-20.9
4874.500	44.2	32.5	0.1	32.6	54.0	-21.4
4897.800	42.7	27.0	0.3	27.3	54.0	-26.7
7310.920	40.2	27.7	2.9	30.6	54.0	-23.4
7316.670	41.2	27.7	3.2	30.9	54.0	-23.1

Test Personnel:



Daniel W. Baltzell		July 7, 2006
EMC Test Engineer	Signature	Date Of Test

13 Conclusion

The data in this measurement report shows that the EUT as tested, Fujitsu Transaction Solutions Inc. Model # iPAD100-20, FCC ID: QL9-IPAD100-20, IC: 4432A-IPAD20, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210 & RSS-Gen.