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:	UFE-R3MOD24/ 6652A-R3MOD24	**Test Report Date:**	July 26, 2006
Platform:	N/A	**RTL Work Order Number:**	2006085
Model Name/ Model Number:	2.4 GHz Module/4123659	**RTL Quote Number:**	QRTL06-223
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		
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, October 1, 2005		
Industry Canada:	RSS-210, Issue 6 September 2005: 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
2405-2480	0.0003	N/A	1M67G7D

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 26, 2006

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 (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 (Issue 6 September 2005): Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	2.4 GHz Module
Model Name/Number	2.4 GHz Module/4123659
Power Supply	Battery operated
Modulation Type	DSSS
Frequency Range	2405-2480 MHz
Antenna Connector Type	N/A PCB Trace Antenna
Antenna Types	F Type PCB Trace

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 certification application for FCC and Industry Canada modular approval for Model # 4123659, 2.4 GHz Module, FCC ID: UFE-R3MOD24 and IC: 6652A-R3MOD24, based on the guidelines in FCC Publication DA 00-1407 and IC RSS-GEN.

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

Channel	Frequency
0	2405
7	2440
15	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 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. Although normally battery operated, for AC conducted testing, an off-the-shelf AC adapter was provided for AC conducted emissions testing.

2.3 Test Result Summary

Table 2-2: 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

2.4 Test System Details

The test sample was received on July 18, 2006. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
R3 Lighthouse Dev Board	iRobot Corporation	N/A	#	N/A	N/A	17458
R3 Lighthouse Dev Board	iRobot Corporation	N/A	005	N/A	N/A	17461
Radio PCB	iRobot Corporation	RF13202	SPINPCB6 42131	UFE-R3MOD24	N/A	17391
Radio PCB	iRobot Corporation	RF13202	SPINPCB6 42145	UFE-R3MOD24	N/A	17390
Radio PCB no antenna for conducted port testing	iRobot Corporation	RF13202	N/A	UFE-R3MOD24	N/A	17392
3-12V AC Adapter	Radio Shack	273-1667	N/A	N/A	1.8 m unshielded	N/A

2.5 Configuration of Tested System

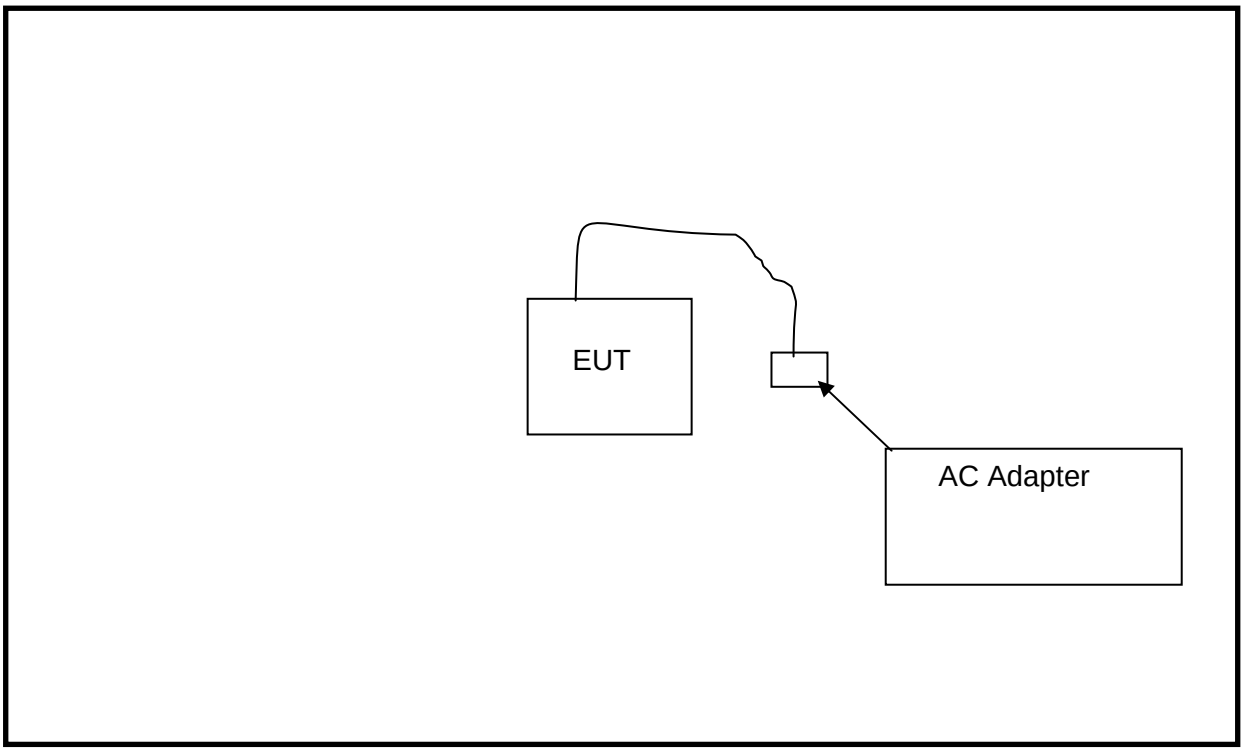


Figure 2-1: Configuration of System Under Test

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

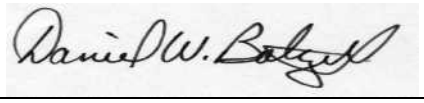
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	9/21/06
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	9/21/06

3.2 Power Output Test Data

Table 3-2: Power Output Test Data

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
0	2405	-6.6
7	2440	-6.4
15	2480	-6.0

Test Personnel:



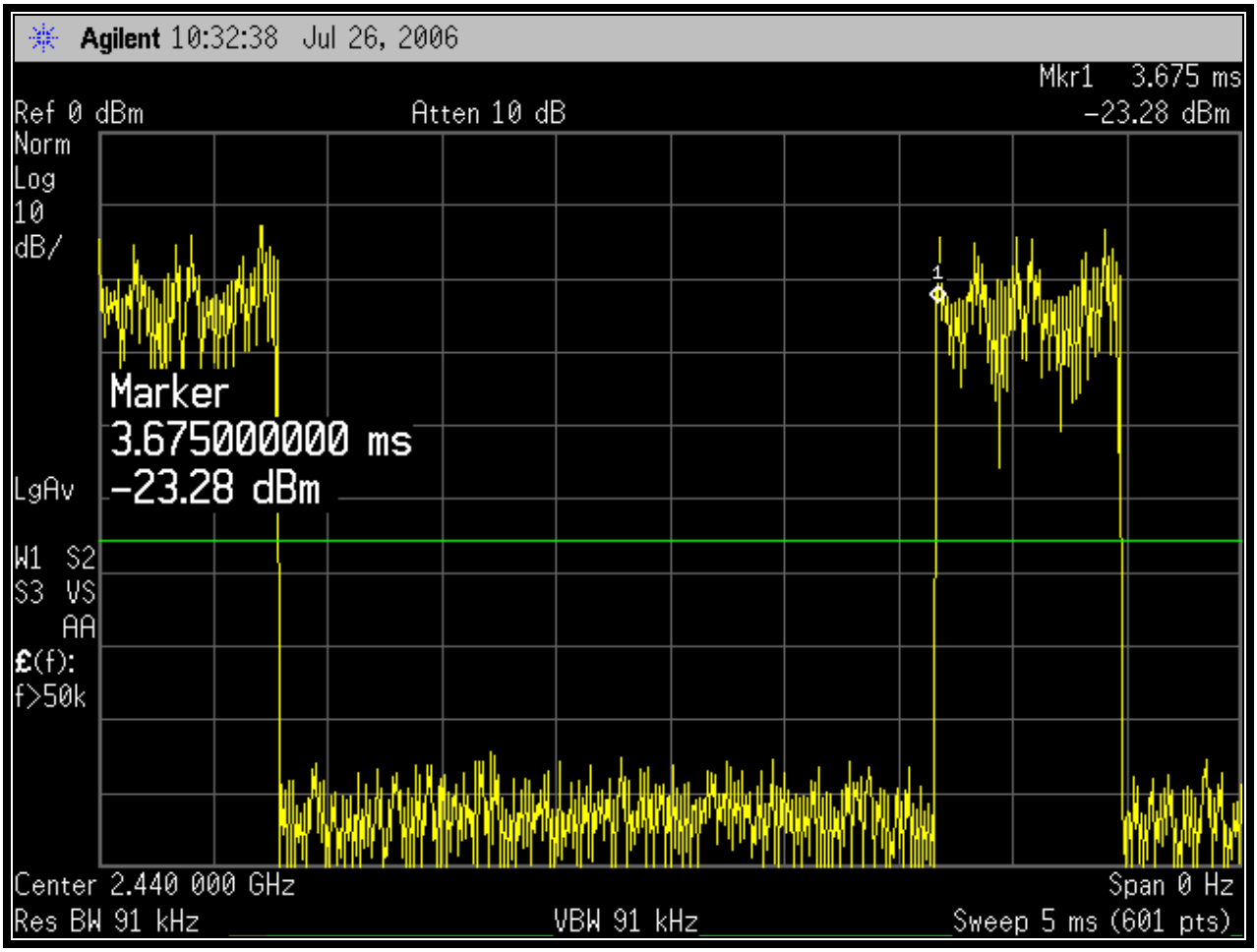
Daniel W. Baltzell		July 26, 2006
Test Engineer	Signature	Dates Of Test

4 Duty Cycle Measurement

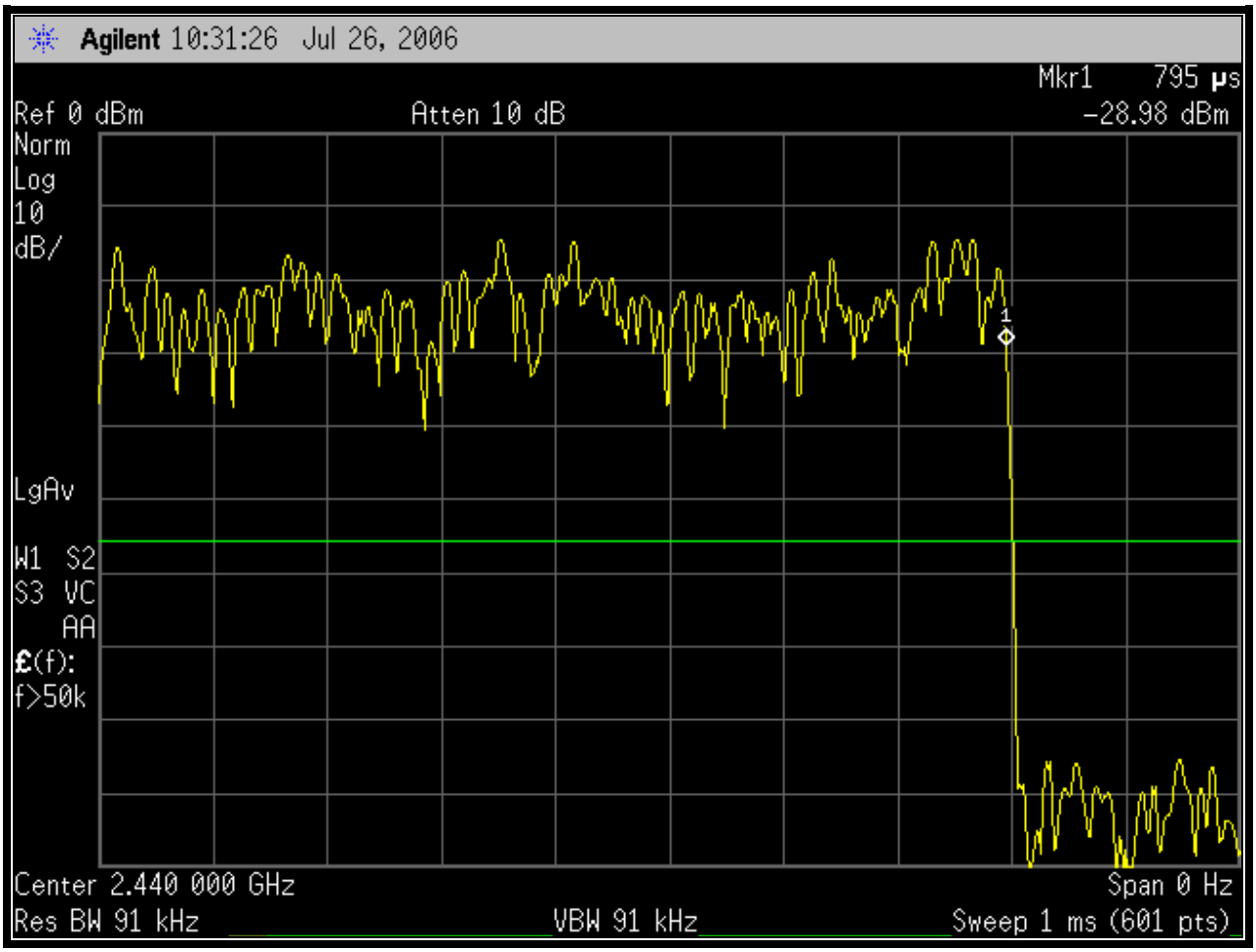
Table 4-1: Duty Cycle Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer	US44020346	11/2/06

Plot 4-1: Duty Cycle Timing



Plot 4-2: Duty Cycle Pulse Width



Duty cycle calculation from above plots:

0.795/3.675=21.6% duty cycle

10log(.216)=-6.6 dB

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

5.1 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 5-1: 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
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
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
901413	Agilent	E4448A	Spectrum Analyzer	US44020346	11/2/06

5.2 Restricted Band Edge Test Results

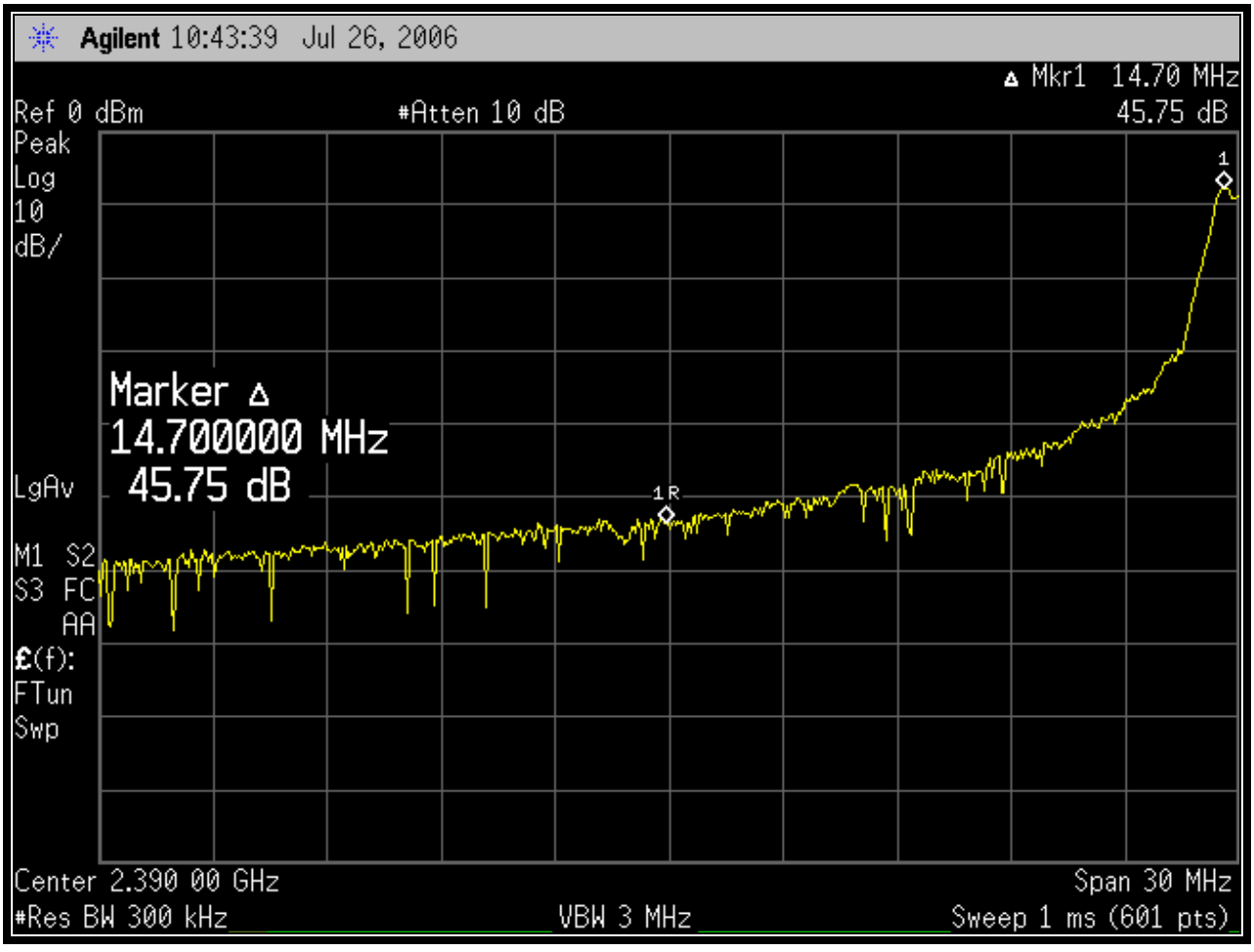
5.2.1 Calculation of Lower Band Edge

83.2 dBuV/m is the field strength measurement, from which the delta measurement of 45.8 dB is subtracted (reference plots), resulting in a level of 40.4 dB. This level has a margin of 16.6 dB below the limit of 54 dBuV/m.

Calculation: 83.2 dBuV/m – 45.8 dB – 54 dBuV/m = -16.6 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 (Pk less duty cycle -6.6 dB) = 83.2 dBuV/m
Delta measurement = 45.8 dB

Plot 5-1: Lower Band Edge: Average Measurement Channel 1 (TX Frequency: 2405 MHz)



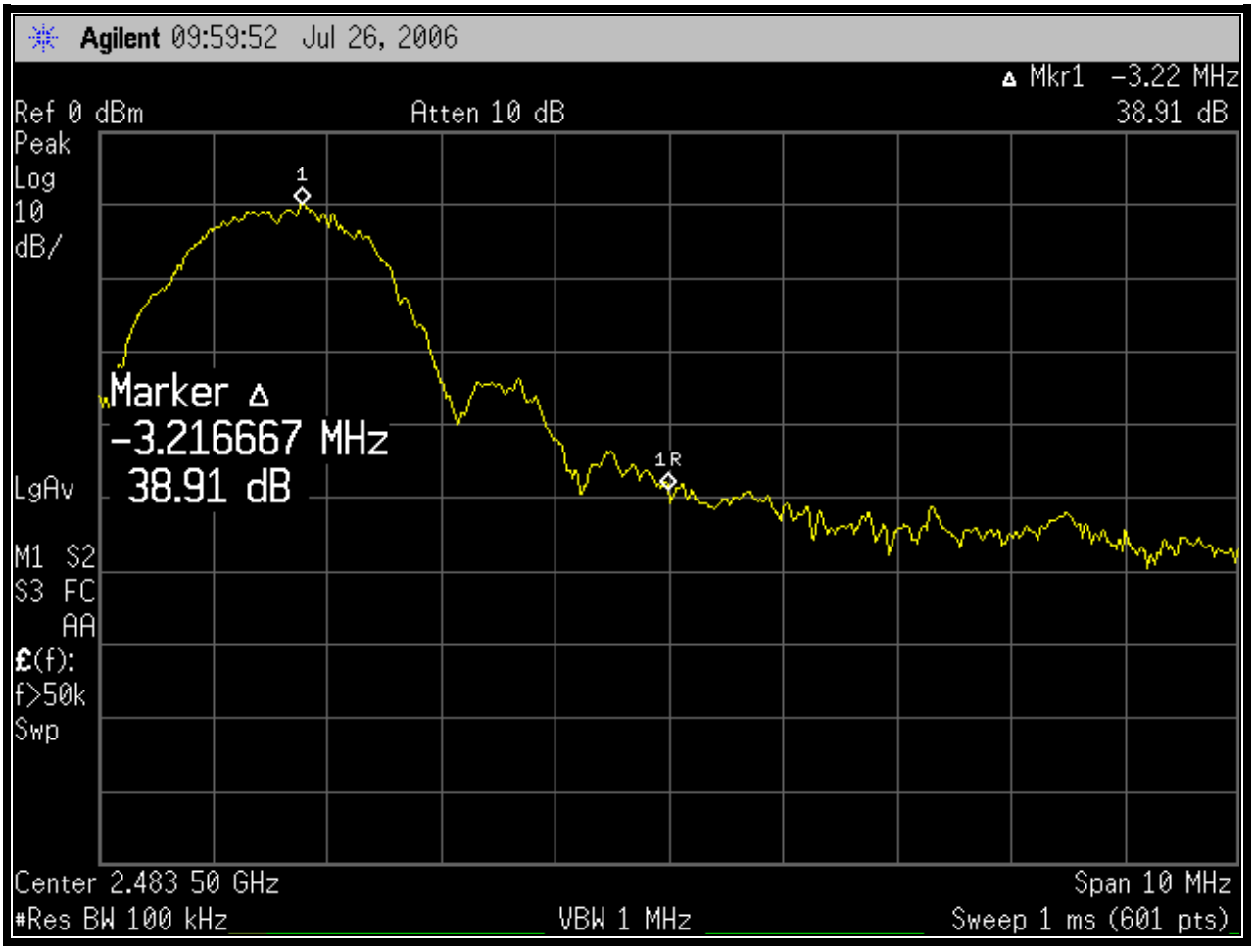
5.2.2 Calculation of Upper Band Edge

84.4 dBuV/m is the field strength measurement, from which the delta measurement of 38.9 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: 84.4 dBuV/m – 38.9 dB – 54 dBuV/m = -8.5 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 91.4 dBuV/m
Average Field Strength of Lower Band Edge (Pk less duty cycle -6.6 dB) = 84.4 dBuV/m
Delta measurement = 38.9 dB

Plot 5-2: Upper Band Edge: Average Measurement Channel 11 (TX Frequency: 2480 MHz)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	July 26, 2006
EMC Test Engineer	Signature	Date Of Test

6 Antenna Conducted Spurious Emissions - §15.247(d); RSS-210 RSS-Gen

6.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) were 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: 2405 MHz, 2440 MHz and 2480 MHz.

Table 6-1: Antenna Conducted Spurious 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

6.2 Antenna Conducted Spurious Emissions Test Results

Table 6-2: Antenna Conducted Spurious Emissions (2405 MHz)

Frequency (MHz)	Amplitude Measured (dBm)	Limit (20 dBc)	Margin (dB)
2405.0	-10.8		Fundamental
4810.0	-48.5	-30.8	-17.7
7215.0	-65.6	-30.8	-34.8
9620.0	-66.6	-30.8	-35.8
12025.0	-73.3	-30.8	-42.5
14430.0	-76.5	-30.8	-45.7
16835.0	-87.7	-30.8	-56.9

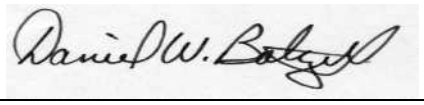
Table 6-3: Antenna Conducted Spurious Emissions (2440 MHz)

Frequency (MHz)	Amplitude Measured (dBm)	Limit (20 dBc)	Margin (dB)
2440.0	-10.4		Fundamental
4880.0	-47.4	-30.4	-17.0
7320.0	-66.6	-30.4	-36.2
9760.0	-67.6	-30.4	-37.2
12200.0	-79.1	-30.4	-48.7
14640.0	-82.8	-30.4	-52.4
17080.0	-83.4	-30.4	-53.0

Table 6-4: Antenna Conducted Spurious Emissions (2480 MHz)

Frequency (MHz)	Amplitude Measured (dBm)	Limit (20 dBc)	Margin (dB)
2480.0	-10.1		Fundamental
4960.0	-48.5	-30.1	-18.4
7440.0	-64.7	-30.1	-34.6
9920.0	-64.5	-30.1	-34.4
12400.0	-76.7	-30.1	-46.6
14880.0	-79.5	-30.1	-49.4
17360.0	-84.4	-30.1	-54.3

Test Personnel:



Daniel W. Baltzell		July 26, 2006
EMC Test Engineer	Signature	Date Of Test

7 6 dB Bandwidth - §15.247(a)(2); RSS-210 §A8.2

7.1 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 300 Hz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 7-1: 6 dB Bandwidth Test Equipment

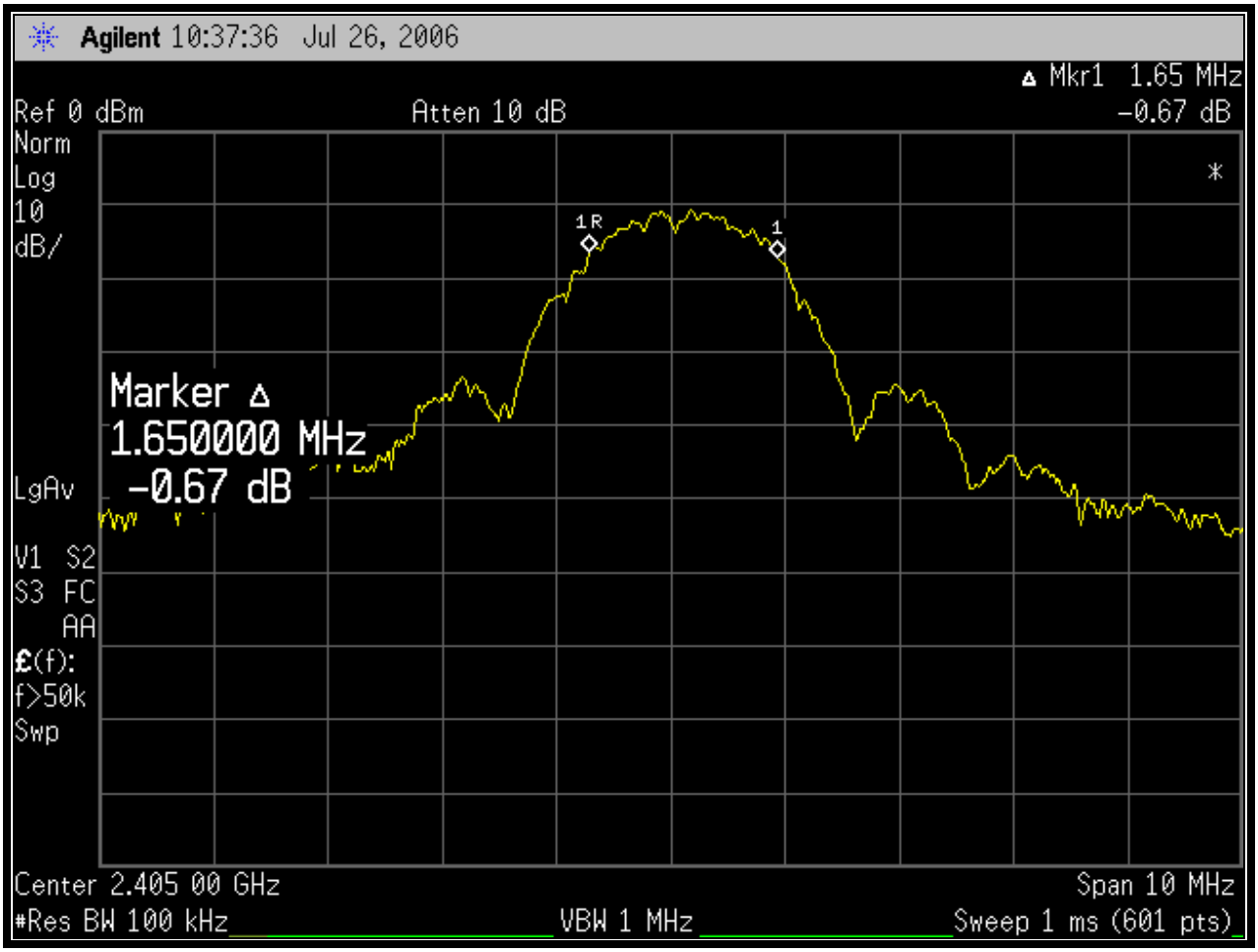
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

7.2 6 db Bandwidth Test Results

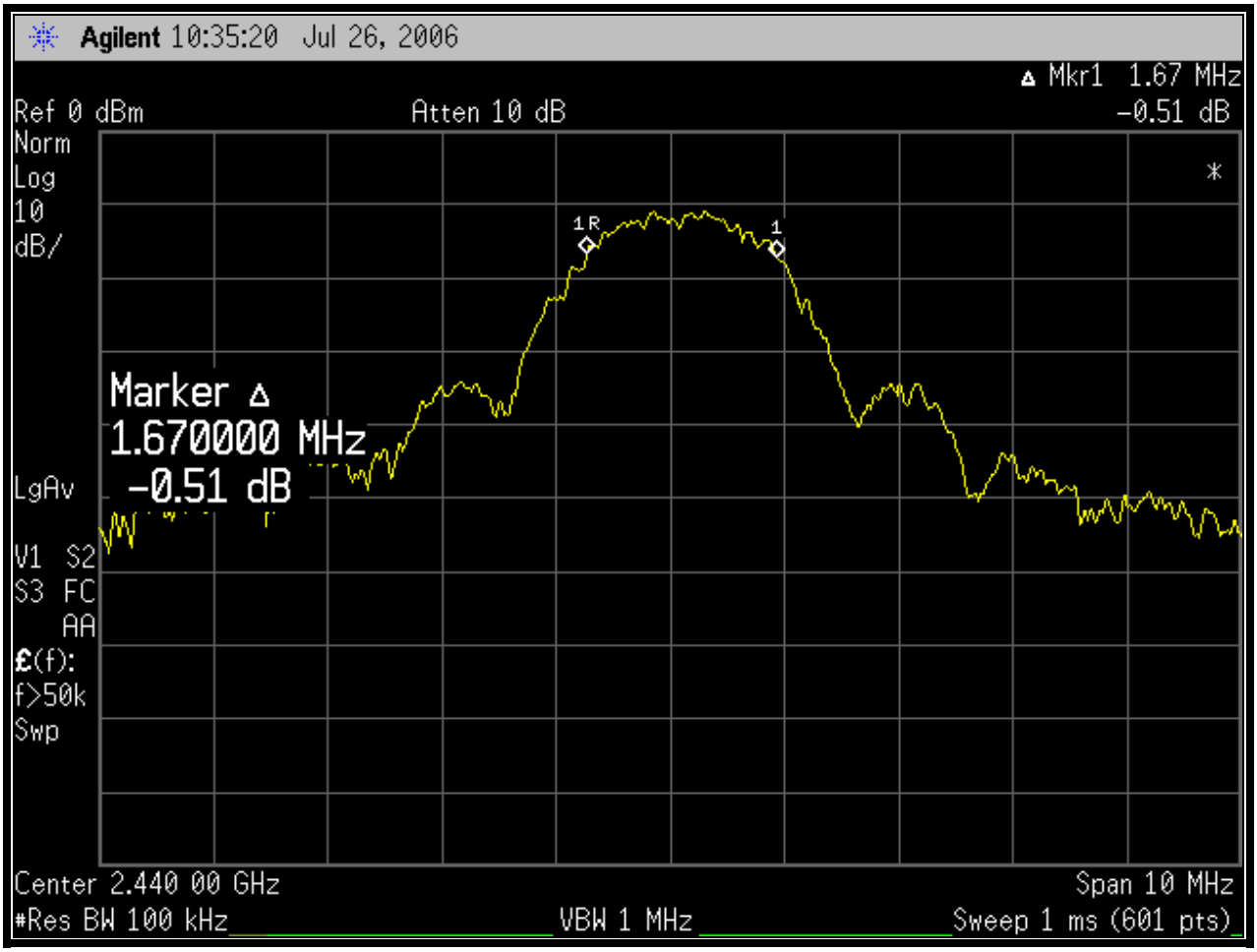
Table 7-2: 6 db Bandwidth Test Data

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
0	2405	1.65	0.5	Pass
7	2440	1.67	0.5	Pass
15	2480	1.62	0.5	Pass

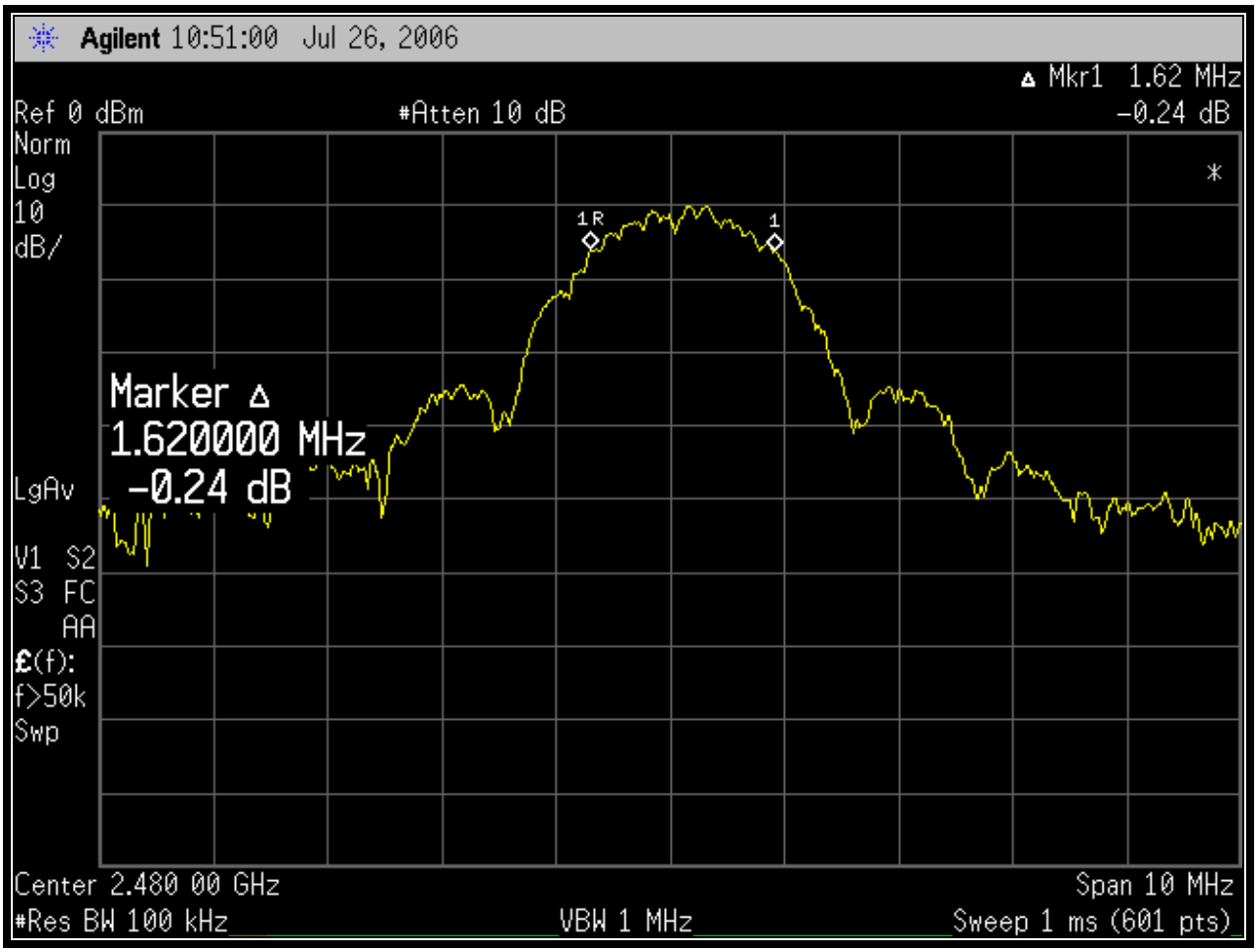
Plot 7-1: 6 dB Bandwidth Channel 0 (TX Frequency: 2405 MHz)



Plot 7-2: 6 dB Bandwidth Channel 7 (TX Frequency: 2440 MHz)



Plot 7-3: 6 dB Bandwidth Channel 15 (TX Frequency: 2480 MHz)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	July 26, 2006
EMC Test Engineer	Signature	Date Of Test

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

8.1 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 2.405 GHz, 2.440 GHz, and 2.480 GHz respectively. These levels are below the +8 dBm limit. See the power spectral density table and plots.

Table 8-1: Power Spectral Density Test Equipment

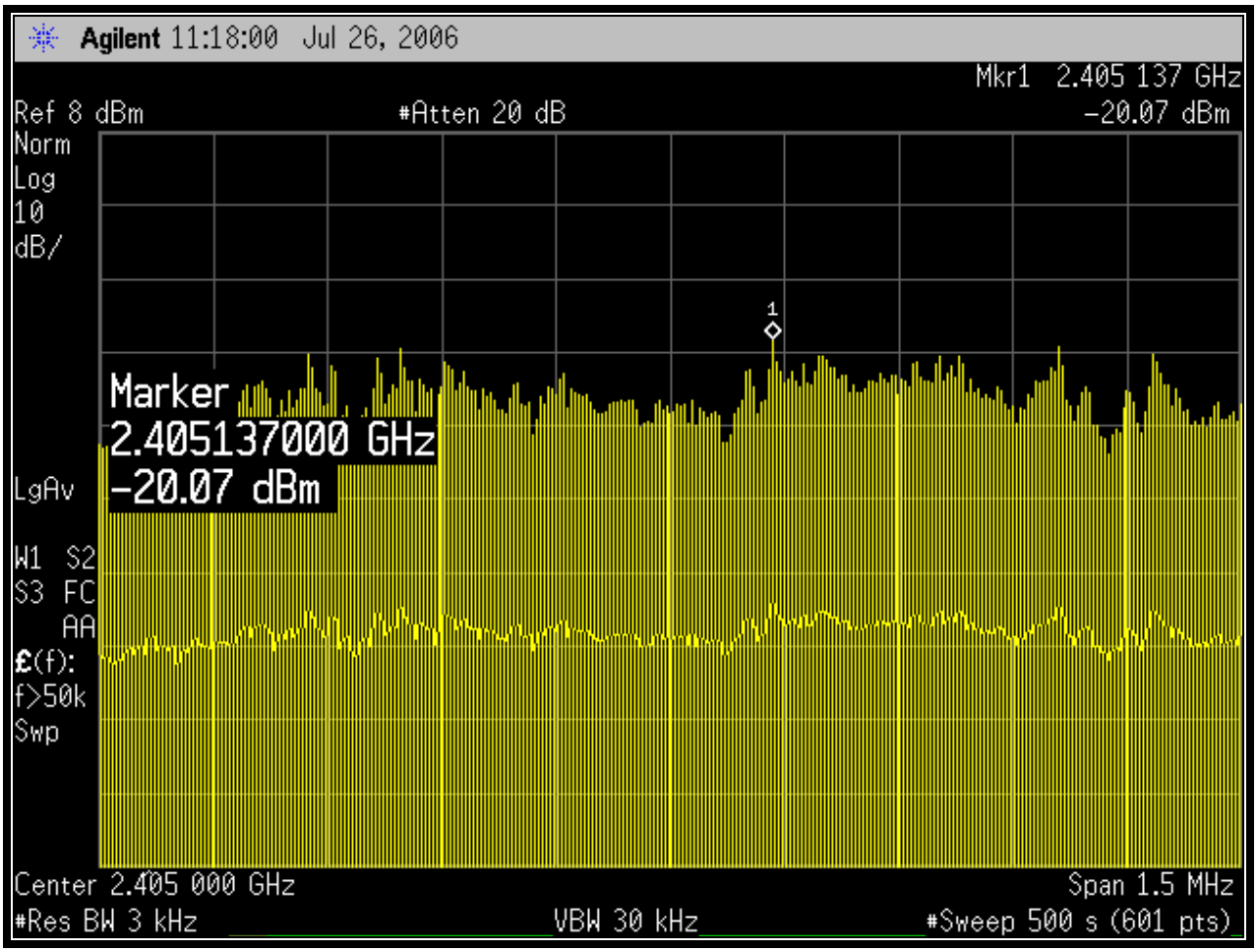
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

8.2 Power Spectral Density Test Data

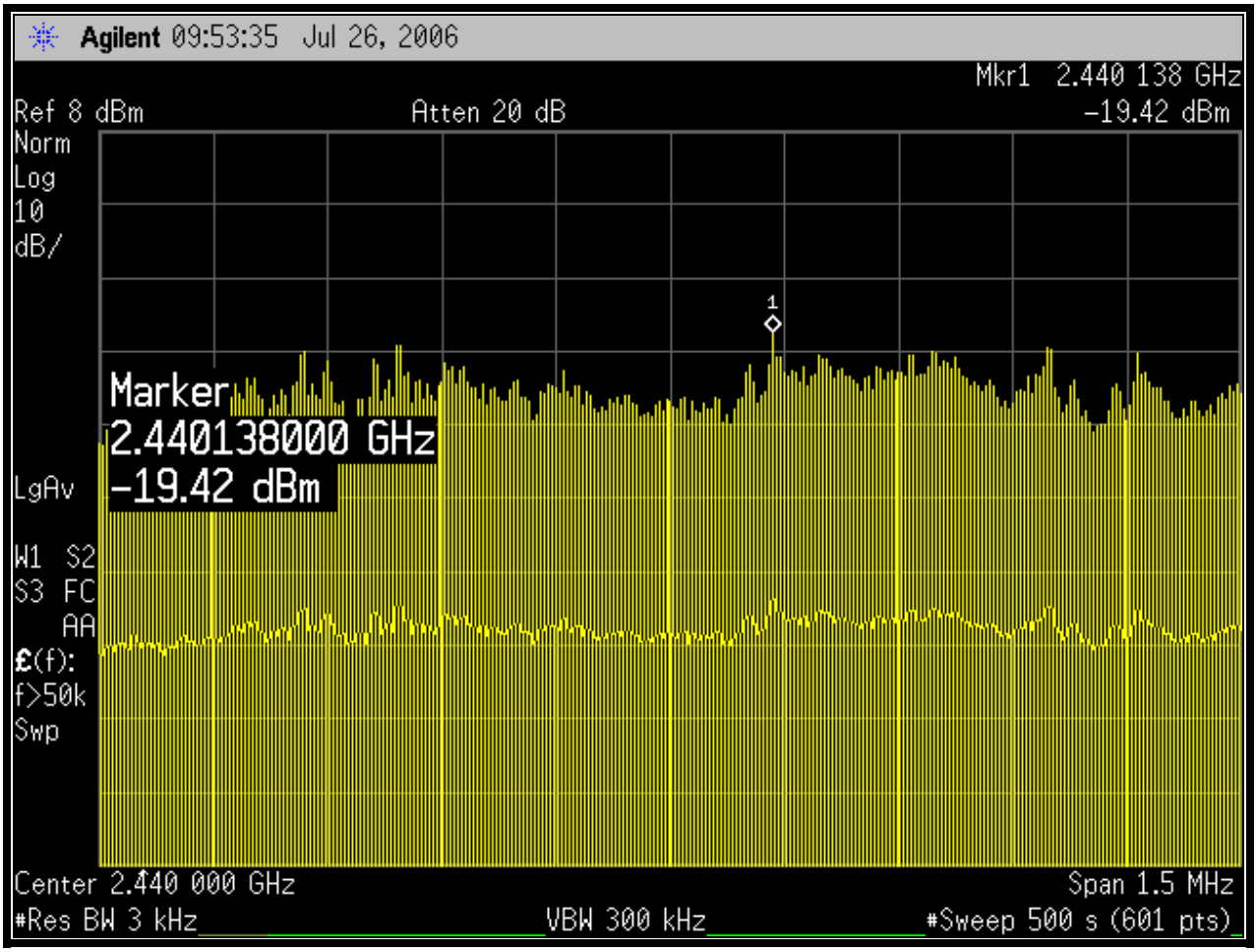
Table 8-2: Power Spectral Density Test Data

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
0	2405	-20.1	8	Pass
7	2440	-19.4	8	Pass
15	2480	-19.0	8	Pass

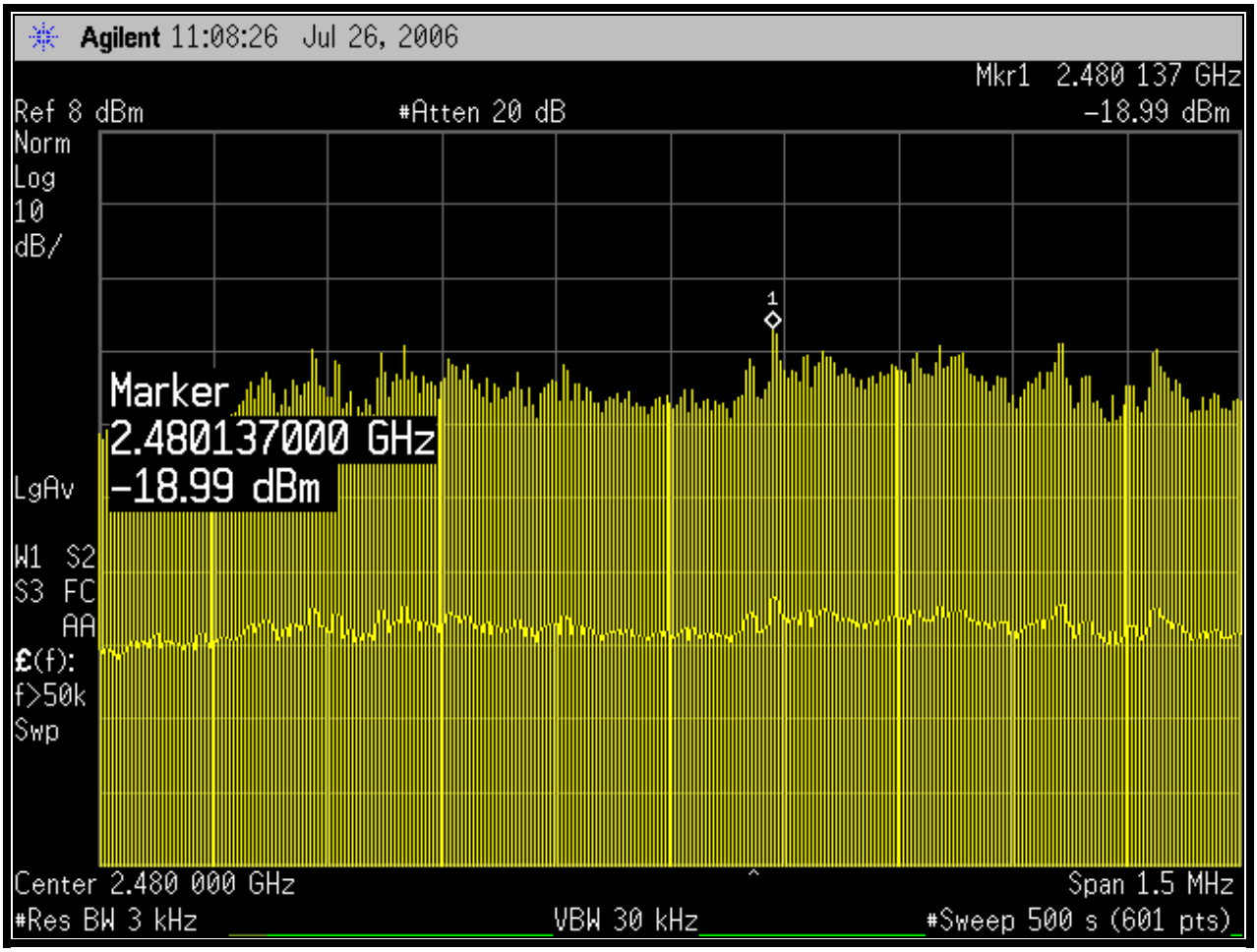
Plot 8-1: Power Spectral Density: Channel 0 (2405 MHz)



Plot 8-2: Power Spectral Density: Channel 7 (2440 MHz)



Plot 8-3: Power Spectral Density: Channel 15 (2480 MHz)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	July 26, 2006
EMC Test Engineer	Signature	Date Of Test

9 Conducted Limits - §15.207; RSS-Gen

The conducted test was performed with the EUT exercised in center channel transmit and receive modes, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

9.1 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

9.2 Conducted Emissions Measurement Test Procedure

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 microhenry 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 high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 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 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.

Table 9-1: Conducted Line 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
901083	AFJ International	LS16	16A LISN (110 V)	16010020080	3/28/08

9.3 Conducted Line Emission Test Data

Table 9-2: Conducted Emissions (Neutral Side); Transmit Mode

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)
0.158	Pk	40.8	0.2	41.0	65.6	-24.6	55.6	-14.6
0.229	Pk	34.2	0.1	34.3	62.5	-28.2	52.5	-18.2
0.304	Pk	28.3	0.3	28.6	60.1	-31.5	50.1	-21.5
0.408	Pk	24.7	0.3	25.0	57.7	-32.7	47.7	-22.7
0.465	Pk	22.1	0.2	22.3	56.6	-34.3	46.6	-24.3
0.596	Pk	16.5	0.3	16.8	56.0	-39.2	46.0	-29.2
27.870	Pk	12.9	2.3	15.2	60.0	-44.8	50.0	-34.8

Table 9-3: Conducted Emissions (Phase Side); Transmit Mode

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)
0.150	Pk	42.3	0.2	42.5	66.0	-23.5	56.0	-13.5
0.218	Pk	36.1	0.2	36.3	62.9	-26.6	52.9	-16.6
0.318	Pk	27.0	0.3	27.3	59.8	-32.5	49.8	-22.5
0.397	Pk	25.3	0.3	25.6	57.9	-32.3	47.9	-22.3
0.711	Pk	15.1	0.4	15.5	56.0	-40.5	46.0	-30.5
27.840	Pk	12.8	2.3	15.1	60.0	-44.9	50.0	-34.9

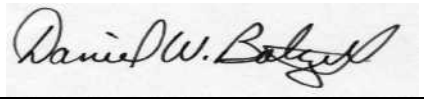
Table 9-4: Conducted Emissions (Neutral Side); Receive Mode

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)
0.151	Pk	32.3	0.2	32.5	65.9	-33.4	55.9	-23.4
0.214	Pk	26.3	0.2	26.5	63.0	-36.5	53.0	-26.5
0.311	Pk	19.6	0.3	19.9	59.9	-40.0	49.9	-30.0
0.400	Pk	17.8	0.3	18.1	57.9	-39.8	47.9	-29.8
0.500	Pk	14.8	0.2	15.0	56.0	-41.0	46.0	-31.0
0.618	Pk	15.4	0.3	15.7	56.0	-40.3	46.0	-30.3
27.870	Pk	13.0	2.3	15.3	60.0	-44.7	50.0	-34.7

Table 9-5: Conducted Emissions (Phase Side); Receive Mode

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)
0.150	Pk	42.6	0.2	42.8	66.0	-23.2	56.0	-13.2
0.218	Pk	36.1	0.2	36.3	62.9	-26.6	52.9	-16.6
0.312	Pk	29.6	0.3	29.9	59.9	-30.0	49.9	-20.0
0.411	Pk	25.7	0.3	26.0	57.6	-31.6	47.6	-21.6
0.486	Pk	21.0	0.2	21.2	56.2	-35.0	46.2	-25.0
0.545	Pk	16.8	0.2	17.0	56.0	-39.0	46.0	-29.0
27.820	Pk	13.4	2.3	15.7	60.0	-44.3	50.0	-34.3

Test Personnel:



Daniel W. Baltzell		July 25, 2006
EMC Test Engineer	Signature	Date Of Test

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

10.1 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.

10.2 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 10^{th} 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 10-1: 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 40dB (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 - 8,2 GHz)	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

10.3 Radiated Emissions Test Results

10.3.1 Radiated Emissions – Digital Test Data

Table 10-2: Digital Radiated Emissions

Temperature: 70°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**
112.003	Qp	H	0	1.0	33.1	-16.5	16.6	43.5	-26.9	Pass
112.003	Pk	H	0	1.0	36.0	-16.5	19.5	43.5	-24.0	Pass
186.735	Qp	H	0	1.0	36.6	-18.5	18.1	43.5	-25.4	Pass
186.735	Pk	H	0	1.0	44.7	-18.5	26.2	43.5	-17.3	Pass
202.780	Pk	V	0	1.0	42.4	-17.6	24.8	43.5	-18.7	Pass
202.780	Qp	V	0	1.0	33.9	-17.6	16.3	43.5	-27.2	Pass
416.014	Qp	H	90	1.0	34.0	-9.1	24.9	46.0	-21.1	Pass
416.014	Pk	H	90	1.0	36.2	-9.1	27.1	46.0	-18.9	Pass
832.026	Qp	H	0	1.0	35.1	-2.6	32.5	46.0	-13.5	Pass
832.026	Pk	H	0	1.0	35.6	-2.6	33.0	46.0	-13.0	Pass
1040.033	Pk	H	90	1.2	36.4	0.8	37.2	54.0	-16.8	Pass
1040.033	Av	H	90	1.2	26.6	0.8	27.4	54.0	-26.6	Pass

10.3.2 Radiated Emissions Harmonics/Spurious Test Data

Table 10-3: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2405 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (less duty cycle -6.6dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4810.0	45.3	38.7	0.4	39.1	54.0	-14.9
7215.0	45.5	38.9	3.4	42.3	63.2	-20.9
9620.0	38.3	31.7	8.8	40.5	63.2	-22.7
12025.0	38.0	31.4	11.1	42.5	54.0	-11.5
14430.0	39.5	32.9	15.6	48.5	63.2	-14.7
16835.0	39.3	32.7	16.1	48.8	63.2	-14.4

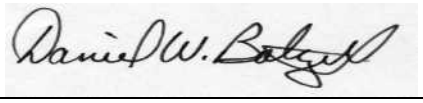
Table 10-4: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2440 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (less duty cycle -6.6dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4880.0	45.2	38.6	0.2	38.8	54.0	-15.2
7320.0	38.8	32.2	3.3	35.5	54.0	-18.5
9760.0	37.5	30.9	8.5	39.4	63.6	-24.2
12200.0	37.3	30.7	10.1	40.8	54.0	-13.2
14640.0	40.0	33.4	15.6	49.0	63.6	-14.6
17080.0	38.8	32.2	16.2	48.4	63.6	-15.2

Table 10-5: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2480 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (less duty cycle -6.6dB)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4960.0	47.5	40.9	0.7	41.6	54.0	-12.4
7440.0	38.5	31.9	3.9	35.8	54.0	-18.2
9920.0	40.7	34.1	9.4	43.5	64.8	-21.3
12400.0	38.2	31.6	14.1	45.7	54.0	-8.3
14880.0	39.5	32.9	15.7	48.6	64.8	-16.2
17360.0	37.8	31.2	16.2	47.4	64.8	-17.4

Test Personnel:

Daniel W. Baltzell		July 25 and 26, 2006
EMC Test Engineer	Signature	Dates Of Tests

11 Conclusion

The data in this measurement report shows that the EUT as tested, Model # 4123659, 2.4 GHz Module, FCC ID: UFE-R3MOD24, IC: 6652A-R3MOD24, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210.