



Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247 CERTIFICATION

Test Lab: Rhein Tech Laboratories, Inc. Phone: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 Web: www.rheintech.com Herndon, VA 20170 E-mail: ATCBINFO@rheintech.com		Applicant: Innovative Wireless Technologies, Inc. (IWT) 1047 Vista Park Dr., Suite A Phone: 434-316-5230 x14 Forest, VA 24551 Fax: 434-316-5232 Email: graulerson@iwtwireless.com Contact: Gary Raulerson, Jr.	
FCC ID:	SP8-IWTBB1142	DATE OF TEST REPORT:	March 2, 2005
PLAT FORM:	N/A	RTL WORK ORDER:	2005012
MODEL:	AXON™ Module	RTL QUOTE NUMBER:	QRTL04-423
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):	Part 15.247: Operation within the bands 920-2480 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System		
Digital Interface Information	Digital Interface was found to be compliant		
Frequency Range (MHz)	Output Power* (W)	Frequency Tolerance	Emission Designator
2405-2480	0.0011	N/A	N/A

* output power is maximum peak conducted

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.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, and ANSI C63.4-2003.

Signature: 

Date: March 2, 2005

Typed/Printed Name: Desmond A. Fraser

Position: President

TABLE OF CONTENTS

1	GENERAL INFORMATION	5
1.1	SCOPE	5
1.2	TEST FACILITY	5
1.3	RELATED SUBMITTAL(S)/GRANT(S)	5
1.4	MODIFICATIONS	5
2	TEST INFORMATION.....	6
2.1	TEST JUSTIFICATION.....	6
2.2	EXERCISING THE EUT	6
2.3	TEST RESULT SUMMARY	6
2.4	TEST SYSTEM DETAILS.....	7
2.5	CONFIGURATION OF TESTED SYSTEM.....	8
3	COMPLIANCE WITH THE RESTRICTED BAND EDGE – FCC §15.205	9
3.1	TEST PROCEDURE.....	9
3.2	BAND EDGE TEST EQUIPMENT	9
3.3	COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA	9
4	CONDUCTED LIMITS – FCC §15.207	12
4.1	TEST METHODOLOGY FOR CONDUCTED EMISSIONS MEASUREMENTS	12
4.2	CONDUCTED EMISSIONS TEST	12
4.3	CONDUCTED EMISSIONS TEST DATA	13
5	RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE – FCC §15.209	17
5.1	RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE	17
5.2	RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT	17
5.3	RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA	17
6	RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS – FCC §15.247.....	18
6.1	RADIATED SPURIOUS EMISSION LIMITS TEST PROCEDURE	18
6.2	RADIATED SPURIOUS TEST EQUIPMENT	18
6.3	RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA	19
7	MODULATED BANDWIDTH - §15.247(A)(2).....	20
7.1	MODULATED BANDWIDTH TEST PROCEDURE – MINIMUM 6 DB BANDWIDTH	20
7.2	BANDWIDTH TEST EQUIPMENT.....	20
7.3	BANDWIDTH TEST DATA	20
7.4	MODULATED BANDWIDTH PLOTS.....	21
8	PEAK OUTPUT POWER - FCC §15.247(B)(3).....	24
8.1	POWER OUTPUT TEST PROCEDURE	24
8.2	POWER OUTPUT TEST EQUIPMENT	24
8.3	POWER OUTPUT TEST DATA.....	24
9	ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C).....	25
9.1	ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES.....	25
9.2	ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT.....	25
9.3	ANTENNA CONDUCTED SPURIOUS EMISSIONS LOW CHANNEL	25
9.4	ANTENNA CONDUCTED SPURIOUS EMISSIONS MID CHANNEL.....	26
9.5	ANTENNA CONDUCTED SPURIOUS EMISSIONS HIGH CHANNEL	26
10	POWER SPECTRAL DENSITY - §15.247(D).....	27
10.1	POWER SPECTRAL DENSITY TEST PROCEDURE.....	27
10.2	POWER SPECTRAL DENSITY TEST EQUIPMENT	27
10.3	POWER SPECTRAL DENSITY TEST DATA	27
10.4	POWER SPECTRAL DENSITY PLOTS	28
11	CONCLUSION	31

FIGURE INDEX

FIGURE 2-1:	WORST CASE CONFIGURATION OF SYSTEM UNDER TEST	8
-------------	---	---

TABLE INDEX

TABLE 2-1:	TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS	6
TABLE 2-2:	EQUIPMENT UNDER TEST (EUT)	7
TABLE 3-1:	BAND EDGE TEST EQUIPMENT	9
TABLE 4-1:	CONDUCTED EMISSIONS TEST EQUIPMENT	12
TABLE 4-2:	CONDUCTED TEST DATA; MODE RX, NEUTRAL SIDE (LINE 1)	13
TABLE 4-3:	CONDUCTED TEST DATA; MODE RX, HOT SIDE (LINE 2)	13
TABLE 4-4:	CONDUCTED TEST DATA; MODE TX, 2405 MHZ, NEUTRAL SIDE (LINE 1)	14
TABLE 4-5:	CONDUCTED TEST DATA; MODE TX, 2405 MHZ, HOT SIDE (LINE 2)	14
TABLE 4-6:	CONDUCTED TEST DATA; MODE TX, 2440 MHZ, NEUTRAL SIDE (LINE 1)	15
TABLE 4-7:	CONDUCTED TEST DATA; MODE TX, 2440 MHZ, HOT SIDE (LINE 2)	15
TABLE 4-8:	CONDUCTED TEST DATA; MODE TX, 2480 MHZ, NEUTRAL SIDE (LINE 1)	16
TABLE 4-9:	CONDUCTED TEST DATA; MODE TX, 2480 MHZ, HOT SIDE (LINE 2)	16
TABLE 5-1:	RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT	17
TABLE 5-2:	RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS	17
TABLE 6-1:	RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT	18
TABLE 6-2:	RADIATED EMISSIONS HARMONICS/SPURIOUS (LOW CHANNEL; 2405 MHZ)	19
TABLE 6-3:	RADIATED EMISSIONS HARMONICS/SPURIOUS (MID CHANNEL; 2440 MHZ)	19
TABLE 6-4:	RADIATED EMISSIONS HARMONICS/SPURIOUS (HIGH CHANNEL; 2480 MHZ)	19
TABLE 7-1:	BANDWIDTH TEST EQUIPMENT	20
TABLE 7-2:	MINIMUM 6 DB BANDWIDTH TEST DATA	20
TABLE 8-1:	POWER OUTPUT TEST EQUIPMENT	24
TABLE 8-2:	POWER OUTPUT TEST DATA	24
TABLE 9-1:	ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT	25
TABLE 9-2:	ANTENNA CONDUCTED SPURIOUS EMISSIONS LOW CHANNEL	25
TABLE 9-3:	ANTENNA CONDUCTED SPURIOUS EMISSIONS MID CHANNEL	26
TABLE 9-4:	ANTENNA CONDUCTED SPURIOUS EMISSIONS HIGH CHANNEL	26
TABLE 10-1:	POWER SPECTRAL DENSITY TEST EQUIPMENT	27
TABLE 10-2:	POWER SPECTRAL DENSITY TEST DATA	27

PLOT INDEX

PLOT 3-1:	LOWER BAND EDGE: DELTA MEASUREMENT (2405 MHZ)	10
PLOT 3-2:	UPPER BAND EDGE: DELTA MEASUREMENT (2480 MHZ)	11
PLOT 7-1:	MODULATED BANDWIDTH LOW CHANNEL	21
PLOT 7-2:	MODULATED BANDWIDTH MID CHANNEL	22
PLOT 7-3:	MODULATED BANDWIDTH HIGH CHANNEL	23
PLOT 10-1:	POWER SPECTRAL DENSITY: LOW CHANNEL	28
PLOT 10-2:	POWER SPECTRAL DENSITY: MID CHANNEL	29
PLOT 10-3:	POWER SPECTRAL DENSITY: HIGH CHANNEL	30

APPENDIX INDEX

APPENDIX A:	RF EXPOSURE COMPLIANCE	32
APPENDIX B:	ATTESTATION – DA 00-1407 MODULAR APPROVAL	33
APPENDIX C:	AGENCY AUTHORIZATION LETTER	34
APPENDIX D:	CONFIDENTIALITY REQUEST LETTER	35
APPENDIX E:	LABEL AND LABEL LOCATION	36
APPENDIX F:	PRODUCT DESCRIPTION	37
APPENDIX G:	SCHEMATICS	38
APPENDIX H:	BLOCK DIAGRAM	39
APPENDIX I:	MANUAL	40
APPENDIX J:	TEST PHOTOGRAPHS	41
APPENDIX K:	EXTERNAL PHOTOGRAPHS	45

PHOTOGRAPH INDEX

PHOTOGRAPH 1:	RADIATED EMISSIONS FRONT VIEW (3 M)	41
PHOTOGRAPH 2:	RADIATED EMISSIONS REAR VIEW (3 M)	42
PHOTOGRAPH 3:	CONDUCTED EMISSIONS FRONT VIEW	43
PHOTOGRAPH 4:	CONDUCTED EMISSIONS REAR VIEW	44
PHOTOGRAPH 5:	MODULE TOP VIEW	45
PHOTOGRAPH 6:	MODULE BOTTOM VIEW WITH SHIELD	46
PHOTOGRAPH 7:	MODULE BOTTOM VIEW WITHOUT SHIELD	47

1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.247: Operation within the bands 902 – 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz.

1.2 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).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for **MODULAR APPROVAL** certification for Innovative Wireless Technologies, Inc. (IWT), Model: AXON™ Module, FCC ID: SP8-IWTBB1142.

1.4 MODIFICATIONS

The power for the upper channel (2480 MHz) was lowered from an initial value of -1.21 dBm to -11.76 dBm to pass the Upper Band Edge Measurement.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. Channels 2405 MHz, 2440 MHz, and 2480 MHz were tested and investigated from 9 kHz to 24 GHz. Data for all three channels is presented in this report.

The EUT contains a ceramic antenna mounted on the PCB. The antenna both transmits and receives transmissions.

2.2 EXERCISING THE EUT

The EUT was programmed to transmit at one frequency per device 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.

2.3 TEST RESULT SUMMARY

TABLE 2-1: TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS

STANDARD	TEST	PASS/FAIL OR N/A
FCC 15.205	Compliance with the Restricted Band Edge	Pass
FCC 15.207	Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	Occupied Bandwidth	Pass
FCC 15.247(b)(3)	Power Output	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions	Pass

2.4 TEST SYSTEM DETAILS

The test sample was received on January 18, 2005. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are identified in Table 2-2.

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Module	Innovative Wireless Technologies	AXON™	1	SP8-IWTBB1142	N/A	16447
Module	Innovative Wireless Technologies	AXON™	2	SP8-IWTBB1142	N/A	16448
Module	Innovative Wireless Technologies	AXON™	3	SP8-IWTBB1142	N/A	16449
Module	Innovative Wireless Technologies	AXON™	4	SP8-IWTBB1142	N/A	16450
Module	Innovative Wireless Technologies	AXON™	5	SP8-IWTBB1142	N/A	16451
Battery	Innovative Wireless Technologies	EEMB 2CR1/3N6V	N/A	N/A	3.5cm unshielded	16443
Battery	Innovative Wireless Technologies	EEMB 2CR1/3N6V	N/A	N/A	3.5cm unshielded	16444
Battery	Innovative Wireless Technologies	EEMB 2CR1/3N6V	N/A	N/A	3.5cm unshielded	16445
Battery	Innovative Wireless Technologies	EEMB 2CR1/3N6V	N/A	N/A	3.5cm unshielded	16446
AC Adapter	Radio Shack	273-1667	N/A	N/A	0.8m unshielded	N/A

2.5 CONFIGURATION OF TESTED SYSTEM

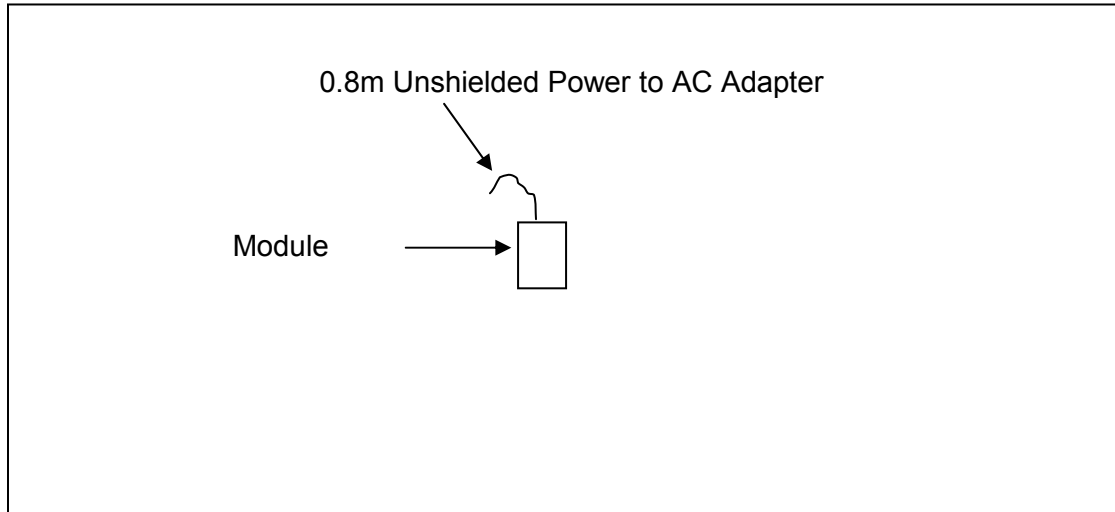


FIGURE 2-1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH THE RESTRICTED BAND EDGE – FCC §15.205

3.1 TEST PROCEDURE

Compliance with the band edges was performed using the FCC's "Radiated Measurement at a Band Edge" guidance document.

3.2 BAND EDGE TEST EQUIPMENT

TABLE 3-1: BAND EDGE TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	9/20/05
900811	Rhein Tech Labs	PR-1040	Amplifier	1003	2/13/05
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	9/8/05
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05

3.3 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

Calculation of Lower Band Edge

The level 93.9 dBuV/m is the field strength measurement, from which the delta measurement of 52.7 dB is subtracted (reference plots), which is equivalent to a level of 41.2 dBuV/m. This level has a margin of 12.8 dB below the limit of 54 dBuV/m.

Calculation: $93.9 \text{ dBuV/m} - 52.7 \text{ dB} - 54.0 \text{ dBuV/m} = -12.8 \text{ dB}$

Calculation of Upper Band Edge

The level 84.8 dBuV/m is the field strength measurement, from which the delta measurement of 32.3 dB is subtracted (reference plots), which is equivalent to a level of 52.5 dBuV/m. This level has a margin of 1.5 dB below the limit of 54.0 dBuV/m.

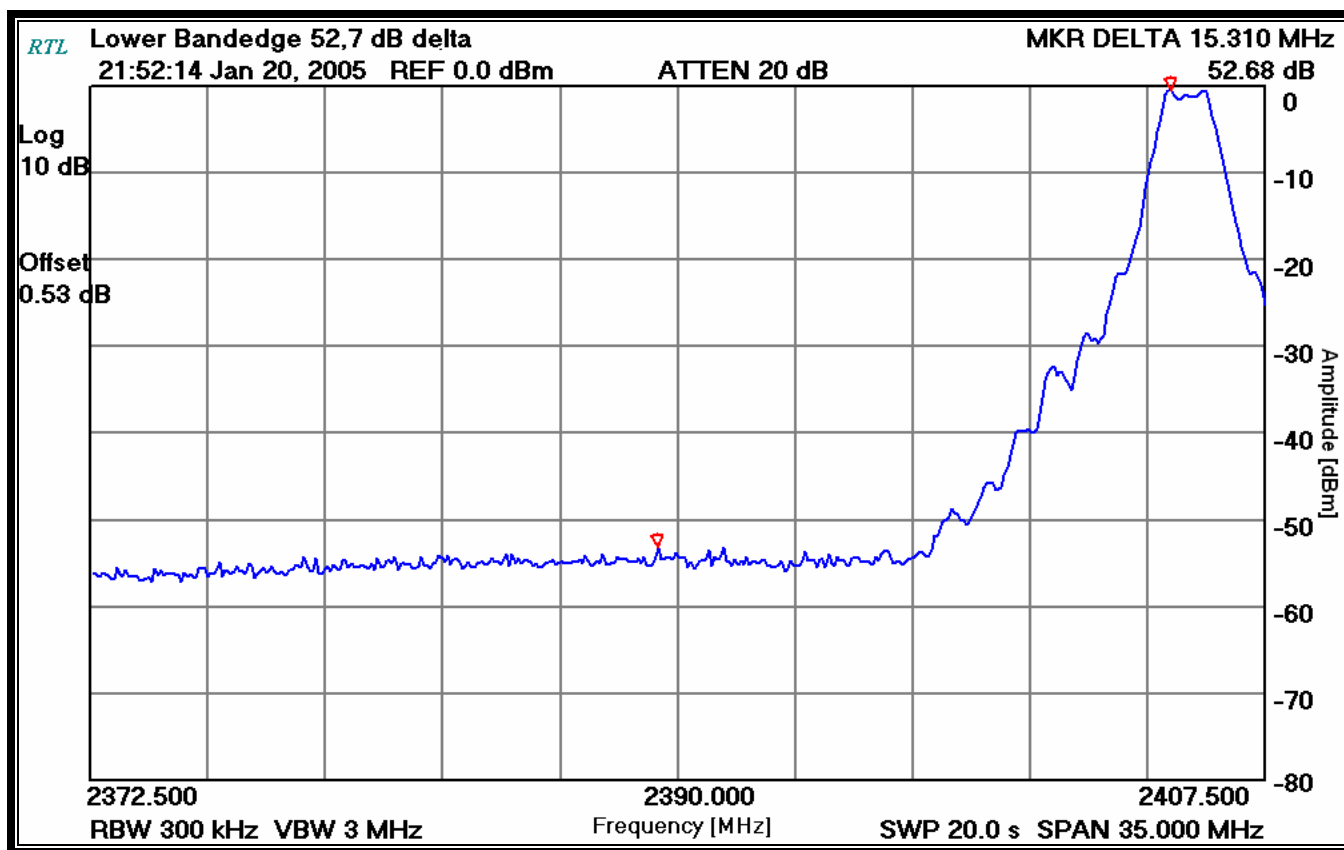
Calculation: $84.8 \text{ dBuV/m} - 32.3 \text{ dB} - 54.0 \text{ dBuV/m} = -1.5 \text{ dB}$

Frequency (MHz): 2405
Resolution Bandwidth (kHz): 300
Video Bandwidth (MHz): 3
Sweep Time (s): 20

PLOT 3-1: LOWER BAND EDGE: DELTA MEASUREMENT (2405 MHz)

Field strength (1M RBW/1 MHz VBW) = 93.9dBuV/m

Delta measurement: 52.7 dB



TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer


Signature

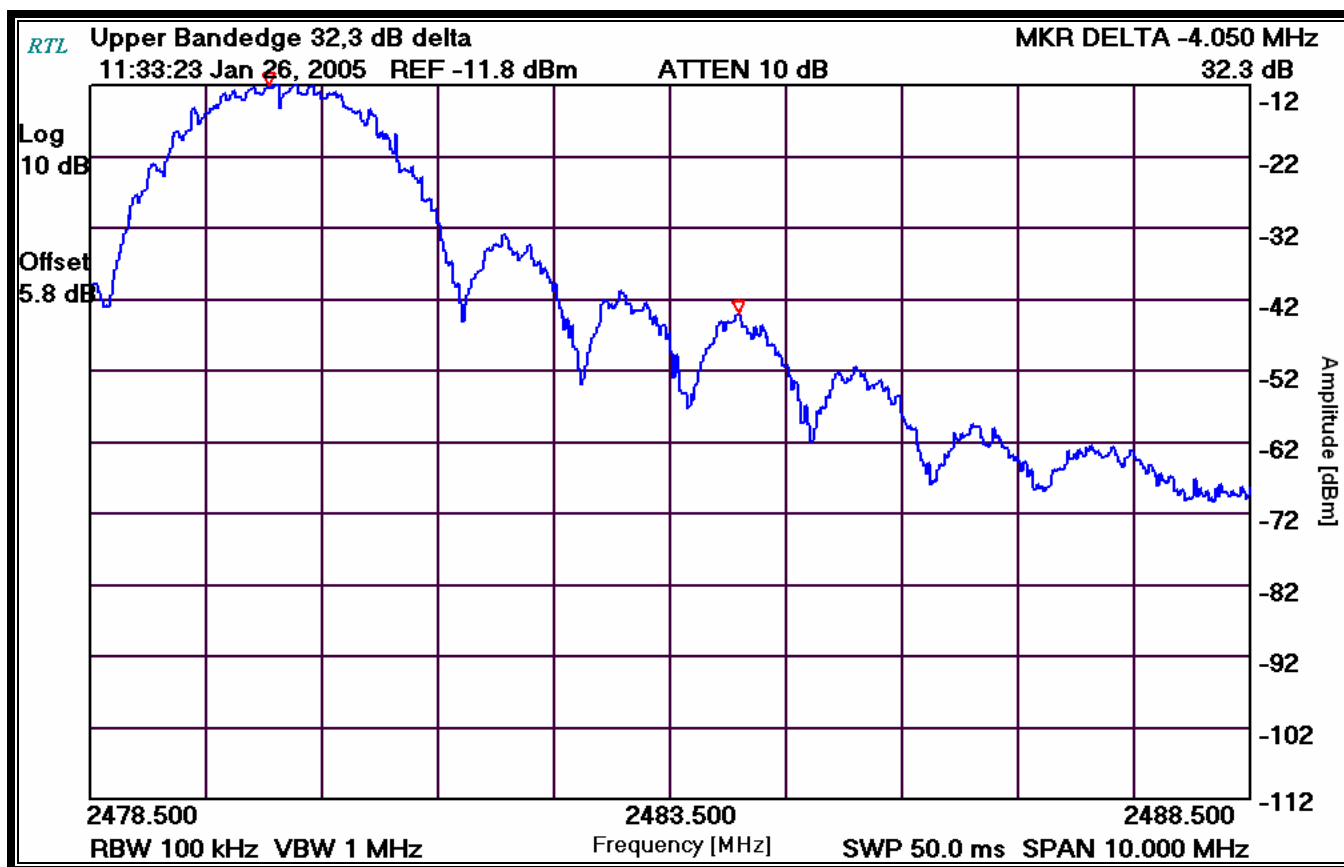
January 20, 2005
Date Of Test

Frequency (MHz): 2480
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1
Sweep Time (ms): 50

PLOT 3-2: UPPER BAND EDGE: DELTA MEASUREMENT (2480 MHZ)

Field strength (1 MHz RBW/1 MHz VBW) = 84.8dBuV/m

Delta measurement = 32.3 dB



TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer

Signature

January 26, 2005
Date Of Test

4 CONDUCTED LIMITS – FCC §15.207

4.1 TEST METHODOLOGY FOR CONDUCTED 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 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 high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 150 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.

4.2 CONDUCTED 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, then the instrument is set to the quasi-peak mode and compared to the quasi-peak limit, then measurements are made in the average mode and compared to the average limit. The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and HOT SIDE.

TABLE 4-1: CONDUCTED EMISSIONS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900339	Hewlett Packard	85650A	Quasi-Peak Adapter (30 Hz-1 GHz)	2521A00743	4/28/05
901084	AFJ international	LS16	16A LISN	16010020082	12/4/05
900968	Hewlett Packard	8567A	Spectrum Analyzer (10 kHz-1.5 GHz)	2602A00160	4/28/05
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	4/28/05

4.3 CONDUCTED EMISSIONS TEST DATA

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

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.154	Pk	39.1	2.0	41.1	65.8	-24.7	55.8	-14.7	Pass
0.224	Pk	33.7	1.5	35.2	62.7	-27.5	52.7	-17.5	Pass
0.412	Pk	22.2	1.0	23.2	57.6	-34.4	47.6	-24.4	Pass
5.400	Pk	7.8	2.0	9.8	60.0	-50.2	50.0	-40.2	Pass
16.220	Pk	7.4	3.5	10.9	60.0	-49.1	50.0	-39.1	Pass
26.190	Pk	5.5	4.3	9.8	60.0	-50.2	50.0	-40.2	Pass

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

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.155	Pk	37.0	2.0	39.0	65.7	-26.7	55.7	-16.7	Pass
0.239	Pk	32.6	1.5	34.1	62.1	-28.0	52.1	-18.0	Pass
0.318	Pk	27.1	1.0	28.1	59.8	-31.7	49.8	-21.7	Pass
0.710	Pk	11.5	0.9	12.4	56.0	-43.6	46.0	-33.6	Pass
5.570	Pk	11.5	2.0	13.5	60.0	-46.5	50.0	-36.5	Pass
16.160	Pk	8.0	3.5	11.5	60.0	-48.5	50.0	-38.5	Pass

TABLE 4-4: CONDUCTED TEST DATA; MODE TX, 2405 MHZ, NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.184	Pk	45.8	1.8	47.6	64.3	-16.7	54.3	-6.7	Pass
0.239	Pk	30.4	1.5	31.9	62.1	-30.2	52.1	-20.2	Pass
0.317	Pk	26.6	1.0	27.6	59.8	-32.2	49.8	-22.2	Pass
0.560	Pk	12.0	0.8	12.8	56.0	-43.2	46.0	-33.2	Pass
11.150	Pk	8.4	2.9	11.3	60.0	-48.7	50.0	-38.7	Pass
17.790	Pk	9.8	3.7	13.5	60.0	-46.5	50.0	-36.5	Pass

TABLE 4-5: CONDUCTED TEST DATA; MODE TX, 2405 MHZ, HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.170	Pk	45.2	1.9	47.1	65.0	-17.9	55.0	-7.9	Pass
0.219	Pk	31.0	1.5	32.5	62.9	-30.4	52.9	-20.4	Pass
0.292	Pk	24.0	1.1	25.1	60.5	-35.4	50.5	-25.4	Pass
0.560	Pk	10.2	0.8	11.0	56.0	-45.0	46.0	-35.0	Pass
14.540	Pk	7.6	3.4	11.0	60.0	-49.0	50.0	-39.0	Pass
27.910	Pk	8.1	4.4	12.5	60.0	-47.5	50.0	-37.5	Pass

TABLE 4-6: CONDUCTED TEST DATA; MODE TX, 2440 MHZ, NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.150	Pk	48.4	2.0	50.4	66.0	-15.6	56.0	-5.6	Pass
0.234	Pk	29.6	1.5	31.1	62.3	-31.2	52.3	-21.2	Pass
0.332	Pk	23.5	1.0	24.5	59.4	-34.9	49.4	-24.9	Pass
0.620	Pk	10.3	0.8	11.1	56.0	-44.9	46.0	-34.9	Pass
16.310	Pk	9.3	3.5	12.8	60.0	-47.2	50.0	-37.2	Pass
27.960	Pk	7.5	4.4	11.9	60.0	-48.1	50.0	-38.1	Pass

TABLE 4-7: CONDUCTED TEST DATA; MODE TX, 2440 MHZ, HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.151	Pk	47.1	2.0	49.1	65.9	-16.8	55.9	-6.8	Pass
0.250	Pk	25.6	1.4	27.0	61.8	-34.8	51.8	-24.8	Pass
0.310	Pk	24.6	1.0	25.6	60.0	-34.4	50.0	-24.4	Pass
0.530	Pk	11.6	0.8	12.4	56.0	-43.6	46.0	-33.6	Pass
12.950	Pk	8.0	3.2	11.2	60.0	-48.8	50.0	-38.8	Pass
23.010	Pk	9.0	4.2	13.2	60.0	-46.8	50.0	-36.8	Pass

TABLE 4-8: CONDUCTED TEST DATA; MODE TX, 2480 MHZ, NEUTRAL SIDE (LINE 1)

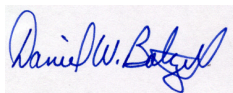
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.165	Pk	48.9	1.9	50.8	65.2	-14.4	55.2	-4.4	Pass
0.224	Pk	33.8	1.5	35.3	62.7	-27.4	52.7	-17.4	Pass
0.307	Pk	26.6	1.0	27.6	60.1	-32.5	50.1	-22.5	Pass
0.500	Pk	15.5	0.9	16.4	56.0	-39.6	46.0	-29.6	Pass
6.050	Pk	11.1	2.1	13.2	60.0	-46.8	50.0	-36.8	Pass
10.650	Pk	9.4	2.8	12.2	60.0	-47.8	50.0	-37.8	Pass

TABLE 4-9: CONDUCTED TEST DATA; MODE TX, 2480 MHZ, HOT SIDE (LINE 2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC QP Limit (dBuV)	FCC QP Margin (dBuV)	FCC AV Limit (dBuV)	FCC AV Margin (dBuV)	Pass/Fail
0.197	Pk	49.1	1.7	50.8	63.7	-12.9	53.7	-2.9	Pass
0.225	Pk	33.4	1.5	34.9	62.6	-27.7	52.6	-17.7	Pass
0.309	Pk	27.0	1.0	28.0	60.0	-32.0	50.0	-22.0	Pass
0.800	Pk	11.5	0.9	12.4	56.0	-43.6	46.0	-33.6	Pass
5.990	Pk	10.3	2.1	12.4	60.0	-47.6	50.0	-37.6	Pass
17.200	Pk	7.7	3.6	11.3	60.0	-48.7	50.0	-38.7	Pass

TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer



Signature

January 20, 2005
Date Of Test

5 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE – FCC §15.209

5.1 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE

Emissions from the digital portion of the EUT were tested and found to comply with the requirements of FCC Part 15.209.

5.2 RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT

TABLE 5-1: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900889	Hewlett Packard	85685A	RF Preselector for HP 8566B or 8568B (20 Hz - 2 GHz)	3146A01309	3/10/05
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	9/10/05
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	6/23/05
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	9/20/05

5.3 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA

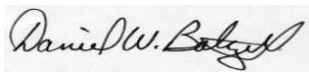
TABLE 5-2: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS

Temperature: 20°F Humidity: 38%									
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)
48.003	Qp	V	90	1.0	43.4	-24.7	18.7	40.0	-21.3
120.000	Qp	V	0	1.0	49.2	-18.5	30.7	43.5	-12.8
144.000	Qp	V	0	1.0	47.3	-18.6	28.7	43.5	-14.8
152.000	Qp	V	0	1.0	45.6	-19.3	26.3	43.5	-17.2
176.000	Qp	V	0	1.0	43.7	-20.1	23.6	43.5	-19.9
288.000	Qp	V	0	1.0	42.1	-16.4	25.7	46.0	-20.3
360.000	Qp	H	0	1.0	33.9	-13.2	20.7	46.0	-25.3
360.000	Qp	V	0	1.0	26.5	-13.6	12.9	46.0	-33.1
400.000	Qp	H	0	1.0	34.6	-12.2	22.4	46.0	-23.6

QP: RES. =120 KHZ, VID= 120 KHZ; PK: RES. = 1MHZ, VID = 1 MHZ; AV: RES. = 1MHZ, VID= 10 HZ

TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer



Signature

January 20, 2005
Date Of Test

6 RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS – FCC §15.247

6.1 RADIATED SPURIOUS EMISSION LIMITS TEST PROCEDURE

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The EUT was tested in the X-Y, X-Z, and Y-Z orthogonal planes.

6.2 RADIATED SPURIOUS TEST EQUIPMENT

TABLE 6-1: RADIATED SPURIOUS 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	Bi-Log Antenna (20 MHz - 2 GHz)	2648	9/20/05
900905	Rhein Tech Labs	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	9/1/05
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	5/20/07
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	2/17/06
900889	Hewlett Packard	85685A	RF Preselector for HP 8566B or 8568B (20 Hz - 2 GHz)	3146A01309	3/10/05
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	3/5/05
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	6/23/05
900932	Hewlett Packard	8449B	Microwave Preamplifier, (1 - 26.5 GHz)	3008A00505	5/5/05
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	6/23/05

6.3 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA

TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (LOW CHANNEL; 2405 MHZ)

Emission Frequency (MHz)	Analyzer Reading (Pk) (dBuV)	Analyzer Reading (Av) (dBuV)	Antenna Polarity (H/V)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0)
4810	46.3	33.2	H	14.3	47.5	54.0	-6.5

PEAK: RES. = 1 MHz, VID = 1MHz; AVERAGE: RES. = 1 MHz, VID = 10 Hz

TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (MID CHANNEL; 2440 MHZ)

Emission Frequency (MHz)	Analyzer Reading (Pk) (dBuV)	Analyzer Reading (Av) (dBuV)	Antenna Polarity (H/V)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0)
4880	47.5	34.0	H	14.5	48.5	54.0	-5.5

PEAK: RES. = 1 MHz, VID = 1MHz; AVERAGE: RES. = 1 MHz, VID = 10 Hz

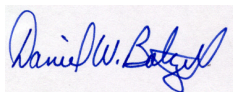
TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (HIGH CHANNEL; 2480 MHZ)

Emission Frequency (MHz)	Analyzer Reading (Pk) (dBuV)	Analyzer Reading (Av) (dBuV)	Antenna Polarity (H/V)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0)
4960	48.8	38.2	H	14.6	52.8	54.0	-1.2

PEAK: RES. = 1 MHz, VID = 1MHz; AVERAGE: RES. = 1 MHz, VID = 10 Hz

TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer



Signature

March 1, 2005
Date Of Test

7 MODULATED BANDWIDTH - §15.247(A)(2)

7.1 MODULATED 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 minimum 6 dB bandwidths are presented in Table 7-2.

7.2 BANDWIDTH TEST EQUIPMENT

TABLE 7-1: 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

7.3 BANDWIDTH TEST DATA

TABLE 7-2: MINIMUM 6 DB BANDWIDTH TEST DATA

Channel	6 dB Bandwidth (MHz)
Low; 2405 MHz	1.74
Mid; 2440 MHz	1.56
High; 2480 MHz	1.62

TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer



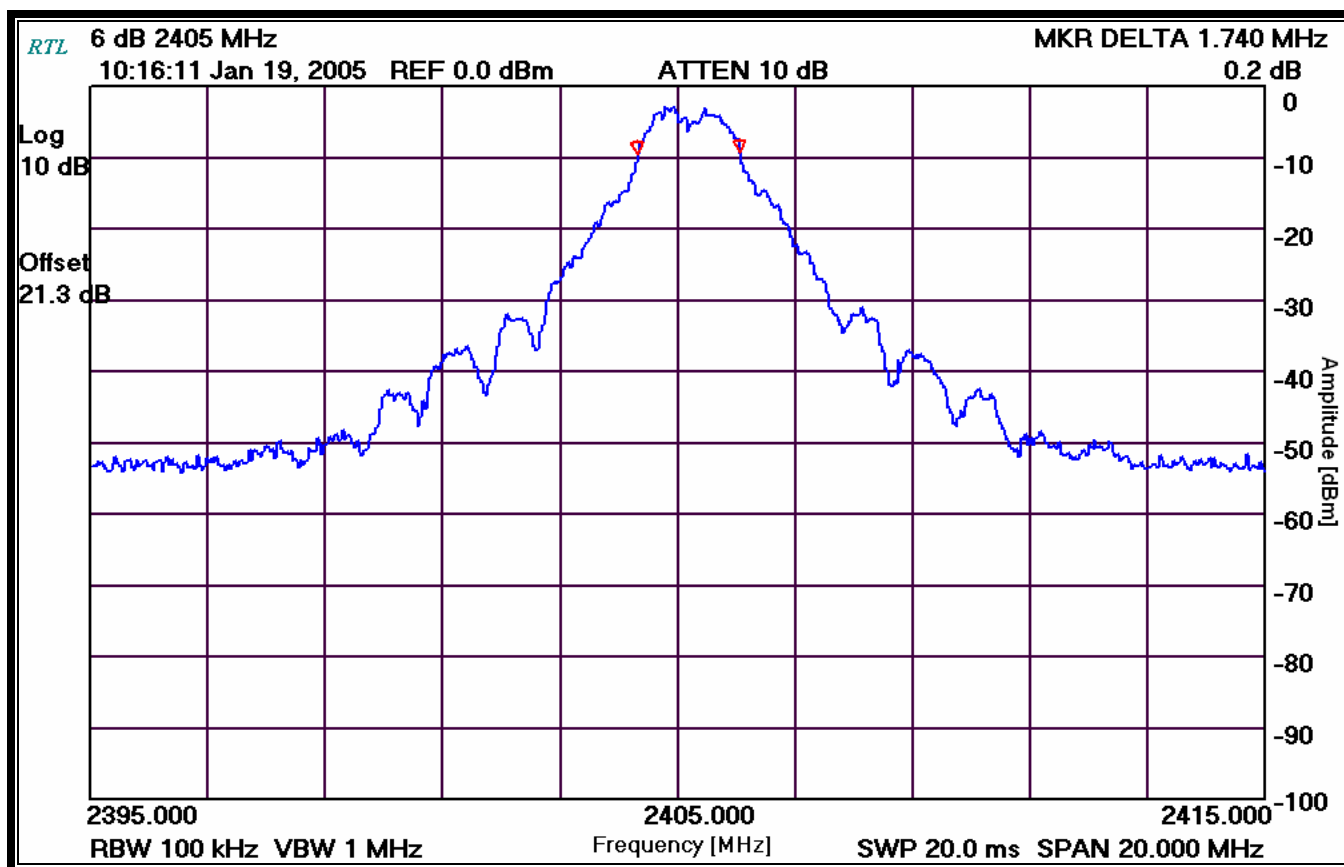
Signature

January 19, 2005
Date Of Test

7.4 MODULATED BANDWIDTH PLOTS

Channel Number: Low
Frequency (MHz): 2405
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1
Sweep Time (ms): 20

PLOT 7-1: MODULATED BANDWIDTH LOW CHANNEL



TEST PERSONNEL:

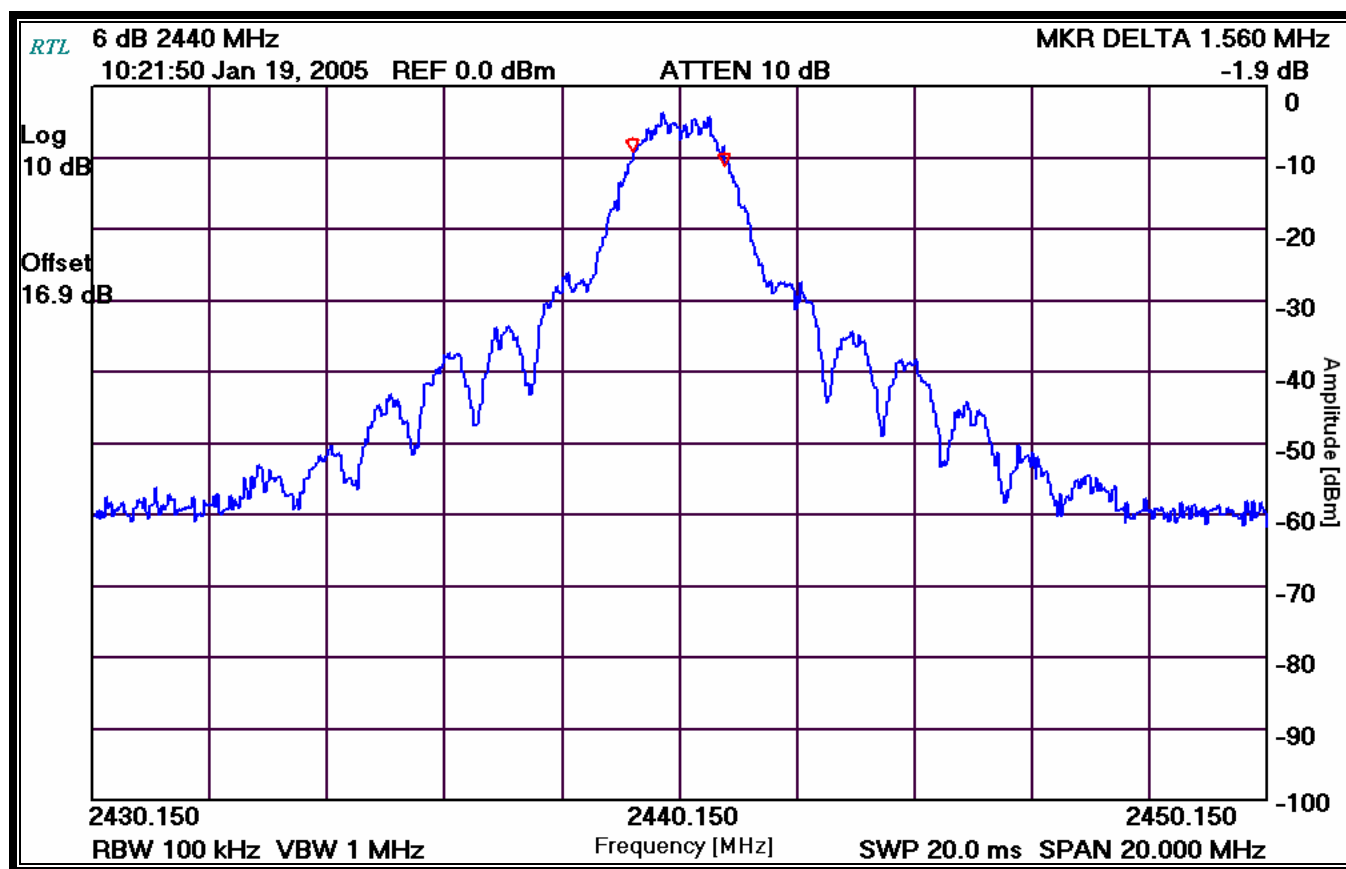
Daniel W. Baltzell
EMC Test Engineer

Signature

January 19, 2005
Date Of Test

Channel Number: Mid
Frequency (MHz): 2440
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1
Sweep Time (ms): 20

PLOT 7-2: MODULATED BANDWIDTH MID CHANNEL



TEST PERSONNEL:

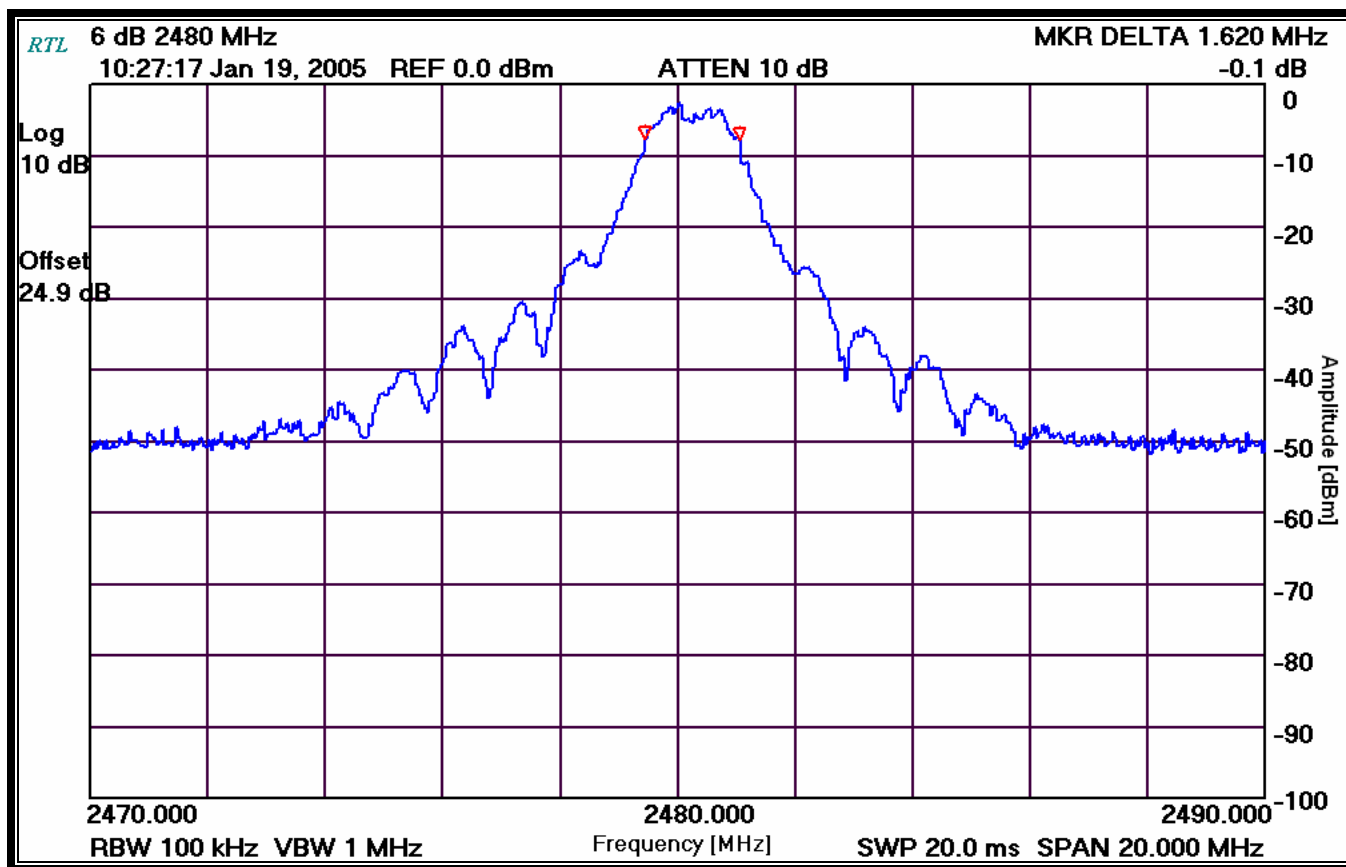
Daniel W. Baltzell
EMC Test Engineer

Signature

January 19, 2005
Date Of Test

Channel Number: High
Frequency (MHz): 2480
Resolution Bandwidth (kHz): 100
Video Bandwidth (MHz): 1
Sweep Time (ms): 20

PLOT 7-3: MODULATED BANDWIDTH HIGH CHANNEL



TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer

Signature

January 19, 2005
Date Of Test

8 PEAK OUTPUT POWER - FCC §15.247(B)(3)

8.1 POWER OUTPUT TEST PROCEDURE

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 2725-5850 MHz bands:
1 Watt.

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.

8.2 POWER OUTPUT TEST EQUIPMENT

TABLE 8-1: POWER OUTPUT TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901186	Agilent Technologies	E9323A	Peak & Avg. Power Sensor (50 MHz – 6 GHz)	US40410380	8/2/05
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	8/2/05

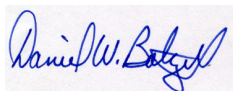
8.3 POWER OUTPUT TEST DATA

TABLE 8-2: POWER OUTPUT TEST DATA

Frequency (MHZ)	Channel	Peak Power Conducted Output (dBm)	Peak Power Conducted Output (mW)
Low; 2405 MHz	Low	0.2	1.1
Mid; 2440 MHz	Mid	-0.1	1.0
High; 2480 MHz	High	-11.8	.07

TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer



Signature

January 21, 2005
Date Of Test

9 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C)

9.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50 Ω spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier was identified at 2405 MHz for the low channel, 2440 MHz for the mid channel and 2480 MHz for the high channel. No other harmonics or spurs were found within 20 dB of the carrier level from 9 kHz to the carrier 10th harmonic. The low, middle, and high channels were investigated and tested. See the Antenna Conducted Spurious Noise Table for the test results.

9.2 ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT

TABLE 9-1: ANTENNA CONDUCTED SPURIOUS 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

9.3 ANTENNA CONDUCTED SPURIOUS EMISSIONS LOW CHANNEL

Operating Frequency (MHz): 2405
Channel: Low
Measured Power Level (dBm/100kHz): -3.2
Limit (dBm): -23.2

TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS LOW CHANNEL

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
4810.0	-44.0	40.8	20.0	-20.8
7215.0	-46.4	43.2	20.0	-23.2
9620.0	-61.7	58.5	20.0	-38.5
12025.0	-70.6	67.4	20.0	-47.4

9.4 ANTENNA CONDUCTED SPURIOUS EMISSIONS MID CHANNEL

Operating Frequency (MHz): 2440
Channel: Mid
Measured Level (dBm/100kHz): -4.1
Limit (dBm): -24.1

TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS MID CHANNEL

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
4880.0	-40.0	35.9	20.0	-15.9
7320.0	-41.7	37.6	20.0	-17.6
9760.0	-51.2	47.1	20.0	-27.1
12200.0	-69.9	65.8	20.0	-45.8

9.5 ANTENNA CONDUCTED SPURIOUS EMISSIONS HIGH CHANNEL

Operating Frequency (MHz): 2480
Channel: High
Measured Level (dBm/100kHz): -3.2
Limit (dBm): -23.2

TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS HIGH CHANNEL

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
4960.0	-39.8	36.6	20.0	-16.6
7440.0	-48.3	45.1	20.0	-25.1
9920.0	-62.5	59.3	20.0	-39.3
12400.0	-75.4	72.2	20.0	-52.2
14880.0	-76.7	73.5	20.0	-53.5
17360.0	-76.7	73.5	20.0	-53.5
19840.0	-78.7	75.5	20.0	-55.5

TEST PERSONNEL:

Daniel W. Baltzell
EMC Test Engineer



Signature

January 21, 2005
Date Of Test

10 POWER SPECTRAL DENSITY - §15.247(D)

10.1 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 span/3k seconds. The test was performed as a conducted test. The spectral lines were resolved for the modulated carriers at 2.405 GHz, 2.440 GHz, and 2.480 GHz respectively. These levels are well below the +8 dBm limit. See the power spectral density table and plots that follow.

10.2 POWER SPECTRAL DENSITY TEST EQUIPMENT

TABLE 10-1: 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	6/23/05
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9kHz-12.8GHz)	3826A00144	9/8/05

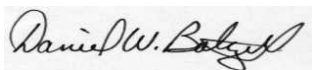
10.3 POWER SPECTRAL DENSITY TEST DATA

TABLE 10-2: POWER SPECTRAL DENSITY TEST DATA

CHANNEL	POWER SPECTRAL DENSITY (dBm) (LIMIT = +8dBm)
low	-14.6
middle	-14.2
high	-13.8

TEST PERSONNEL:

Daniel Baltzell
Test Engineer



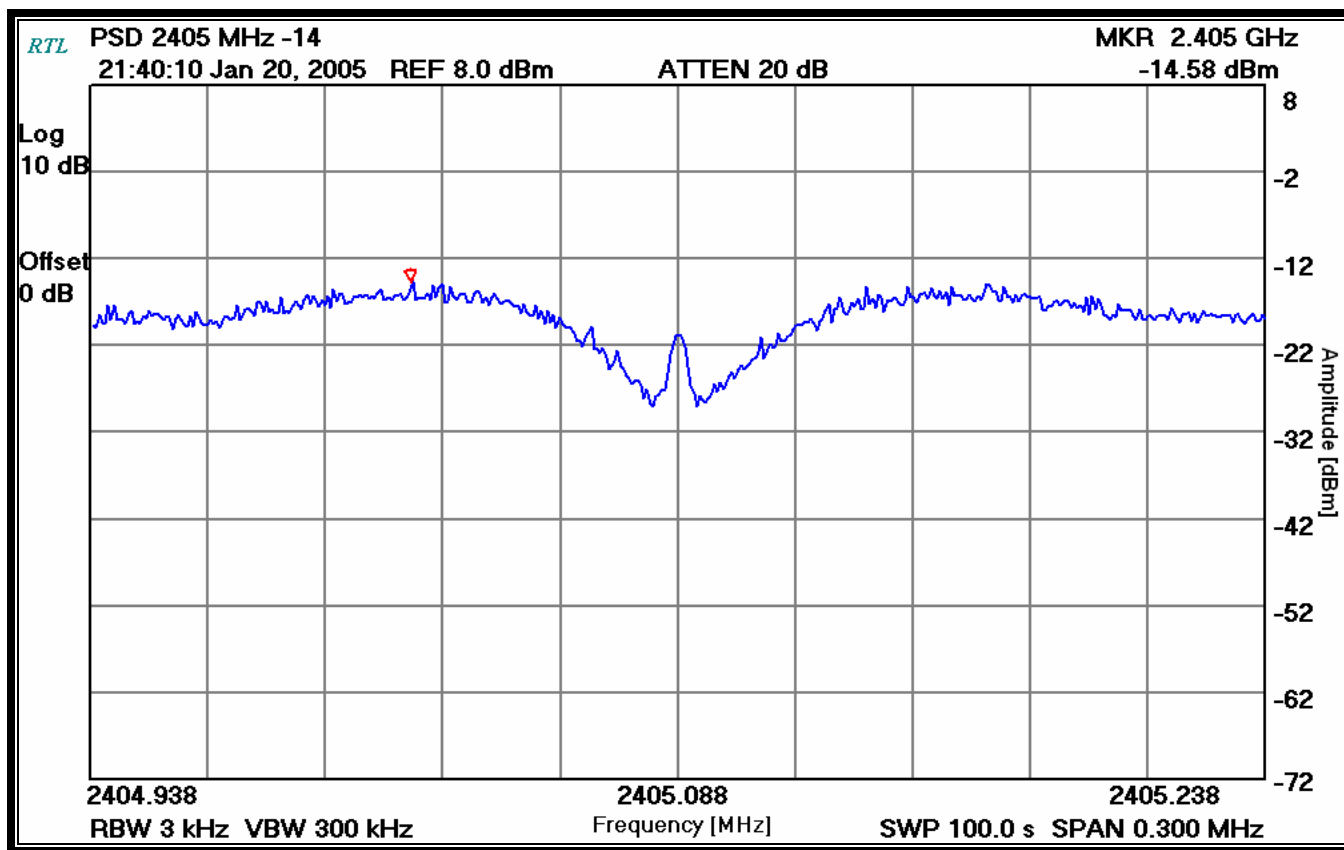
Signature

January 18, 2005
Date Of Test

10.4 POWER SPECTRAL DENSITY PLOTS

Operating Frequency (MHz): 2405
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 100

PLOT 10-1: POWER SPECTRAL DENSITY: LOW CHANNEL



TEST PERSONNEL:

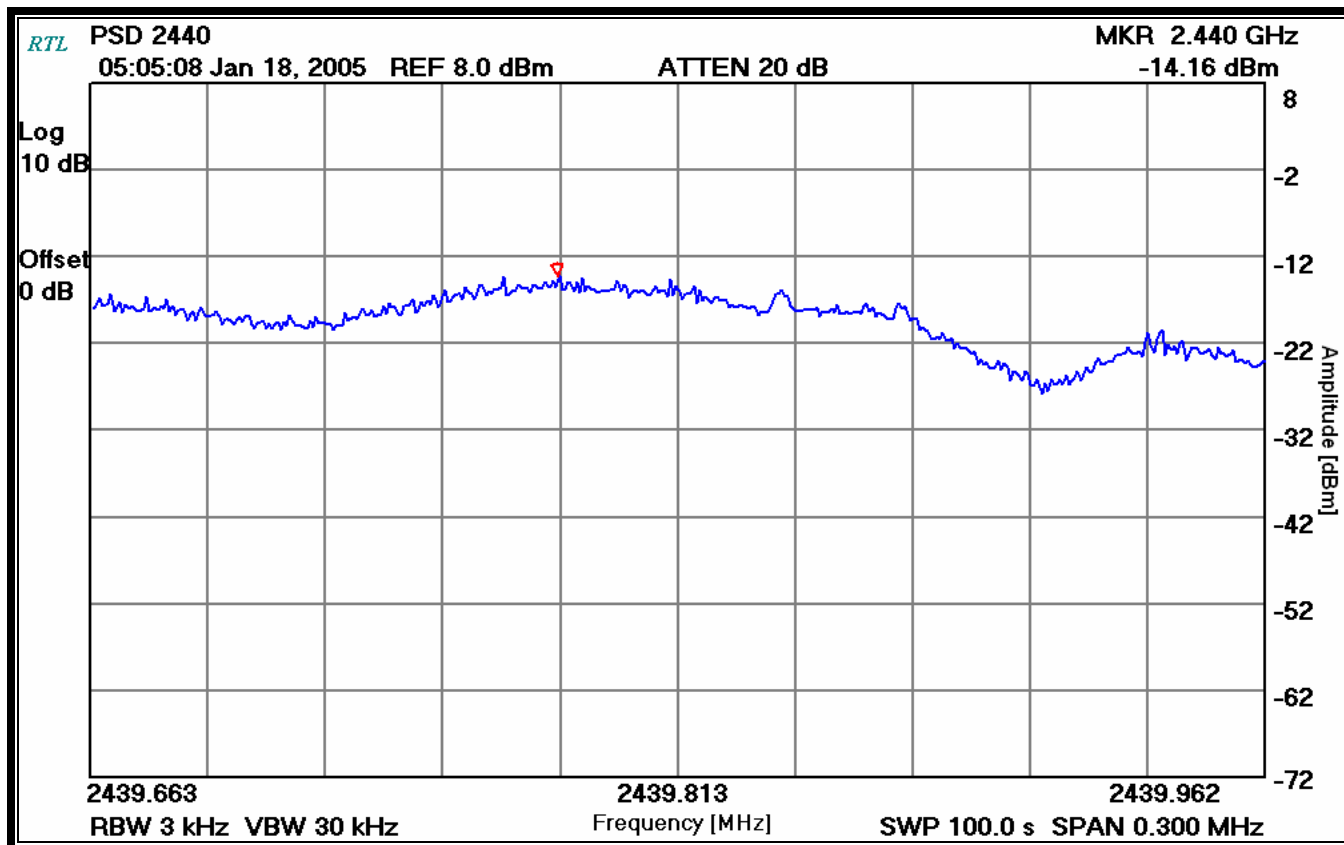
Daniel Baltzell
Test Engineer

Signature

January 20, 2005
Date Of Test

Operating Frequency (MHz): 2440
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 30
Sweep Time (s): 100

PLOT 10-2: POWER SPECTRAL DENSITY: MID CHANNEL



TEST PERSONNEL:

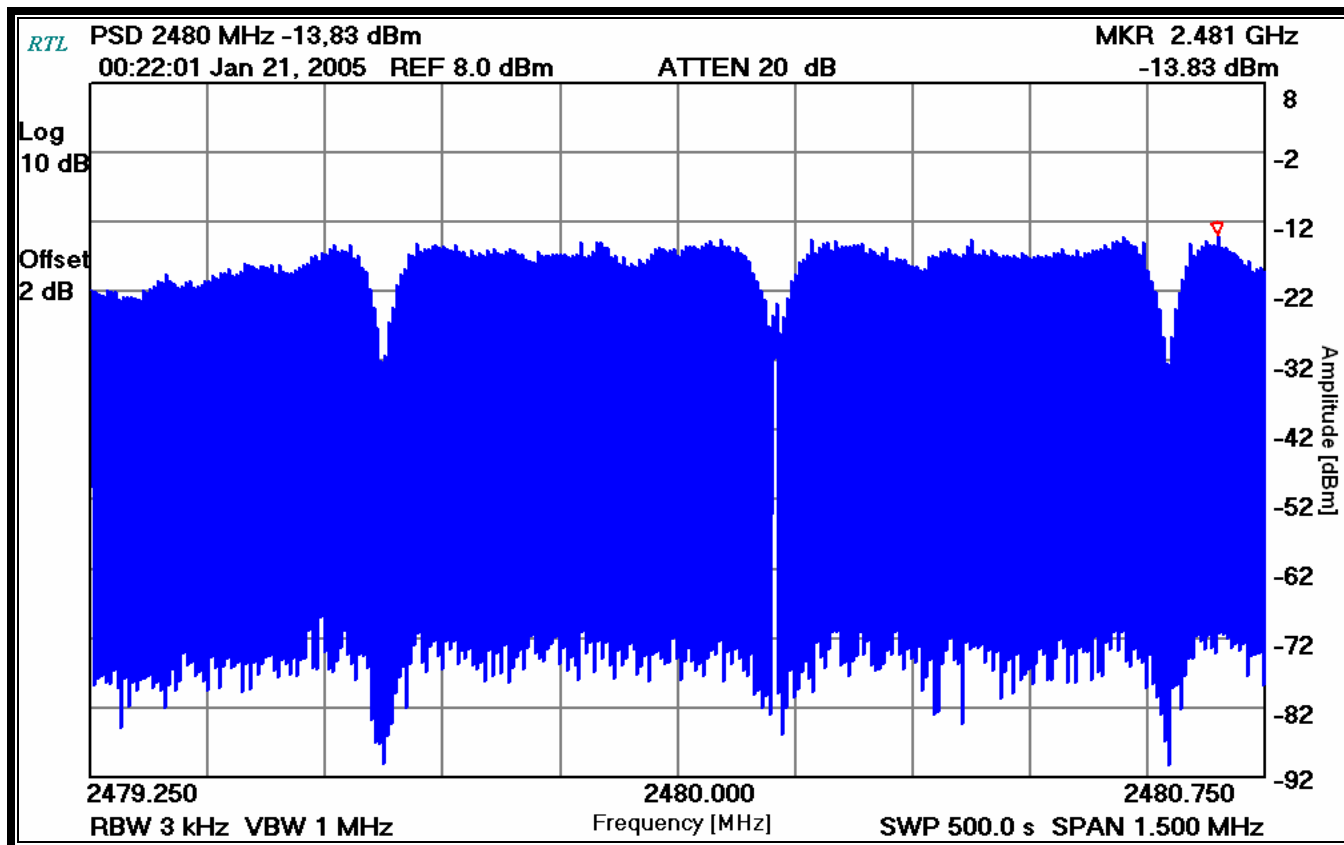
Daniel Baltzell
Test Engineer

Signature

January 18, 2005
Date Of Test

Operating Frequency (MHz): 2480
Bandwidth Resolution (kHz): 3
Bandwidth Video (MHz): 1
Sweep Time (s): 500

PLOT 10-3: POWER SPECTRAL DENSITY: HIGH CHANNEL



TEST PERSONNEL:

Daniel Baltzell
Test Engineer

Signature

January 21, 2005
Date Of Test

11 CONCLUSION

The data in this measurement report shows that the Innovative Wireless Technologies, Inc., Model: AXON™ Module, FCC ID: SP8-IWTBB1142, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules.