



Engineering and Testing for EMC and Safety Compliance

**CERTIFICATION APPLICATION REPORT
FCC PART 15.247 CERTIFICATION & INDUSTRY CANADA CERTIFICATION**

Test Lab: Rhein Tech Laboratories, Inc. Phone: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 Web Site: www.rheintech.com Herndon, VA 20170 E-Mail: FCCINFO@rheintech.com		Applicant: Vocollect Phone: 412-829-8145 Contact: Paul Reynolds Fax: 412-829-0972 703 Rodi Road E-Mail: preynolds@vocollect.com Pittsburgh, PA 15235	
FCC ID:	MQOTT600-50300	GRANTEE FRN NUMBER:	0007-0735-47
PLAT FORM:	N/A	RTL WORK ORDER NUMBER:	2003191
MODEL(S):	TT-600	RTL QUOTE NUMBER:	QRTL03-129
DATE OF TEST REPORT:	February 5, 2004		
American National Standard Institute:	ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification:	DSS – Part 15 Spread Spectrum Transmitter		
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System 97-114: Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters; ET Docket No. 96-8		
Industry Canada Standard:	RSS-210: Low Power License-Exempt Radio Communication Devices (All Frequency Bands)		
Digital Interface Information	Digital Interface was found to be compliant		
Receiver Information	Receiver was found to be compliant		
Frequency Range (MHz)	Output Power* (W)	Frequency Tolerance	Emission Designator
2412-2462	0.10	N/A	N/A

* output power is maximum peak conducted

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, Industry Canada RSS-210, ANSI C63.4, and FCC 97-114.

Signature: 

Date: February 5, 2004

Typed/Printed Name: Desmond A. Fraser

Position: President

360 Herndon Parkway, Suite 1400
Herndon, VA 20170
Telephone: 703-689-0368 Fax: 703-689-2056 Metro: 703-471-6441

TABLE OF CONTENTS

1	GENERAL INFORMATION	5
1.1	SCOPE	5
1.2	TEST FACILITY	5
1.3	RELATED SUBMITTAL(S)/GRANT(S).....	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.....	7
3	COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205	8
3.1	TEST PROCEDURE.....	8
3.2	BAND EDGE TEST EQUIPMENT	8
3.3	COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA	9
4	CONDUCTED LIMITS - §15.207	13
4.1	TEST METHODOLOGY FOR CONDUCTED LINE EMISSIONS MEASUREMENTS	13
4.2	CONDUCTED LINE EMISSION TEST	13
4.3	CONDUCTED LINE TEST EQUIPMENT	13
4.4	CONDUCTED LINE EMISSION TEST DATA	14
5	RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE - §15.209.....	15
5.1	RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE.....	15
5.2	RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT	15
5.3	RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA	16
6	RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS - §15.247	17
6.1	RADIATED SPURIOUS EMISSION LIMITS TEST PROCEDURE.....	17
6.2	RADIATED SPURIOUS TEST EQUIPMENT	17
6.3	RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA	18
7	MODULATED BANDWIDTH - §15.247(A)(2).....	19
7.1	MODULATED BANDWIDTH TEST PROCEDURE – MINIMUM 6 DB BANDWIDTH.....	19
7.2	BANDWIDTH TEST EQUIPMENT	19
7.3	BANDWIDTH TEST DATA	19
7.4	MODULATED BANDWIDTH PLOTS	20
8	PEAK OUTPUT POWER - §15.247(B)(1).....	23
8.1	POWER OUTPUT TEST PROCEDURE	23
8.2	POWER OUTPUT TEST EQUIPMENT	23
8.3	POWER OUTPUT TEST DATA	23
9	ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C).....	24
9.1	ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES	24
9.2	ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT	24
9.3	ANTENNA CONDUCTED SPURIOUS DATA	25
10	POWER SPECTRAL DENSITY - §15.247(D)	28
10.1	POWER SPECTRAL DENSITY TEST PROCEDURE	28
10.2	POWER SPECTRAL DENSITY TEST EQUIPMENT	28
10.3	POWER SPECTRAL DENSITY TEST DATA.....	28
10.4	POWER SPECTRAL DENSITY PLOTS	29
11	CONCLUSION	32

FIGURE INDEX

FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST	7
---	---

TABLE INDEX

TABLE 2-1: TEST RESULT SUMMARY WITH FCC RULES AND REGULATIONS	6
TABLE 2-2: EQUIPMENT UNDER TEST (EUT)	7
TABLE 3-1: BAND EDGE TEST EQUIPMENT	8
TABLE 4-1: CONDUCTED LINE TEST EQUIPMENT	13
TABLE 4-2: CONDUCTED EMISSIONS (NEUTRAL SIDE)	14
TABLE 4-3: CONDUCTED EMISSIONS (PHASE SIDE)	14
TABLE 5-1: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT	15
TABLE 5-2: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS	16
TABLE 6-1: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT	17
TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1; 2412 MHZ)	18
TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6; 2437 MHZ)	18
TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11; 2462 MHZ)	18
TABLE 7-1: BANDWIDTH TEST EQUIPMENT	19
TABLE 7-2: MINIMUM 6 DB BANDWIDTH TEST DATA	19
TABLE 8-1: POWER OUTPUT TEST EQUIPMENT	23
TABLE 8-2: POWER OUTPUT TEST DATA	23
TABLE 9-1: ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT	24
TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1	25
TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6	26
TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11	27
TABLE 10-1: POWER SPECTRAL DENSITY TEST EQUIPMENT	28
TABLE 10-2: POWER SPECTRAL DENSITY TEST DATA	28
TABLE 11-1: 20 DB BANDWIDTH TEST EQUIPMENT	65
TABLE 11-2: MODULATED BANDWIDTH TEST DATA	65

PLOT INDEX

PLOT 3-1: BAND EDGE: RADIATED AVERAGE MEASUREMENT (CHANNEL 1)	9
PLOT 3-2: BAND EDGE: RADIATED PEAK MEASUREMENT (CHANNEL 1)	10
PLOT 3-3: BAND EDGE: RADIATED AVERAGE MEASUREMENT (CHANNEL 11)	11
PLOT 3-4: BAND EDGE: RADIATED PEAK MEASUREMENT (CHANNEL 11)	12
PLOT 7-1: MODULATED BANDWIDTH CHANNEL 1	20
PLOT 7-2: MODULATED BANDWIDTH CHANNEL 6	21
PLOT 7-3: MODULATED BANDWIDTH CHANNEL 11	22
PLOT 10-1: POWER SPECTRAL DENSITY: CHANNEL 1	29
PLOT 10-2: POWER SPECTRAL DENSITY: CHANNEL 6	30
PLOT 10-3: POWER SPECTRAL DENSITY: CHANNEL 11	31
PLOT 11-1: 20 DB BANDWIDTH CHANNEL 1	66
PLOT 11-2: 20 DB BANDWIDTH CHANNEL 6	67
PLOT 11-3: 20 DB BANDWIDTH CHANNEL 11	68

APPENDIX INDEX

APPENDIX A:	RF EXPOSURE	33
APPENDIX B:	ANTENNA SPECIFICATIONS	34
APPENDIX C:	AGENCY AUTHORIZATION LETTER	35
APPENDIX D:	CONFIDENTIALITY REQUEST LETTER	36
APPENDIX E:	PRODUCT DESCRIPTION	37
APPENDIX F:	LABEL AND LABEL LOCATION	38
APPENDIX G:	SCHEMATICS	39
APPENDIX H:	BLOCK DIAGRAM	40
APPENDIX I:	MANUAL	41
APPENDIX J:	TEST PHOTOGRAPHS	42
APPENDIX K:	EXTERNAL PHOTOGRAPHS	46
APPENDIX L:	INTERNAL PHOTOGRAPHS	49
APPENDIX M:	ADDITIONAL INFORMATION FOR CANADIAN CERTIFICATION	65

PHOTOGRAPH INDEX

PHOTOGRAPH 1:	LABEL LOCATION	38
PHOTOGRAPH 2:	RADIATED EMISSION FRONT VIEW; WORST CASE CONFIGURATION	42
PHOTOGRAPH 3:	RADIATED EMISSION REAR VIEW; WORST CASE CONFIGURATION	43
PHOTOGRAPH 4:	CONDUCTED EMISSION FRONT VIEW	44
PHOTOGRAPH 5:	CONDUCTED EMISSION REAR VIEW	45
PHOTOGRAPH 6:	FRONT VIEW WITH BATTERY	46
PHOTOGRAPH 7:	FRONT VIEW WITHOUT BATTERY	47
PHOTOGRAPH 8:	REAR VIEW SHOWING BELT CLIP AND SIDE CONNECTORS	48
PHOTOGRAPH 9:	OVERALL INTERNAL VIEW	49
PHOTOGRAPH 10:	INTERNAL VIEW WITH WLAN CARD	50
PHOTOGRAPH 11:	INSIDE FRONT COVER	51
PHOTOGRAPH 12:	INSIDE REAR COVER	52
PHOTOGRAPH 13:	PCB TOP	53
PHOTOGRAPH 14:	PCB REAR WITH SHIELD	54
PHOTOGRAPH 15:	PCB REAR WITHOUT SHIELD	55
PHOTOGRAPH 16:	WLAN CARD FRONT WITH ANTENNA	56
PHOTOGRAPH 17:	WLAN CARD REAR WITH ANTENNA	57
PHOTOGRAPH 18:	ANTENNA FRONT	58
PHOTOGRAPH 19:	FRONT WLAN PCMCIA CARD	59
PHOTOGRAPH 20:	BACK WLAN PCMCIA CARD	60
PHOTOGRAPH 21:	PCB CONNECTIONS	61
PHOTOGRAPH 22:	TOP VIEW WLAN WITH SHIELD	62
PHOTOGRAPH 23:	TOP VIEW WLAN WITHOUT SHIELD	63
PHOTOGRAPH 24:	BOTTOM VIEW WLAN	64

1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

IC RSS-210 Section 6.2.2(o): 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.

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

1.2 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 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for certification for Vocollect Inc. Model Talkman T2, M/N: TT-600, FCC ID: MQOTT600-50300. The IF, LO and up to the 2nd LO were investigated and tested.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. Channel 1 at 2412 MHz, Channel 6 at 2437 MHz and Channel 11 at 2462 MHz were tested and investigated from 9 kHz to 24 GHz. Data for all three channels are presented in this report.

The EUT contains an internal dipole antenna. The dipole antenna transmits, receives, and is connected to the internal antenna port.

The worst-case data taken in this report represents the highest data rate at 11 Mbps. Data rates of 5.5 Mbps, 2 Mbps and 1 Mbps were investigated and found to be in compliance. The change in envelope did not cause the EUT to be non-compliant in any of the aforementioned modes.

Deviations from the test standard(s) and/or methods: none

2.2 EXERCISING THE EUT

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

2.3 TEST RESULT SUMMARY

TABLE 2-1: TEST RESULT SUMMARY WITH 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)	Modulated Bandwidth	Pass
FCC 15.247(b)	Power Output	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	Power Spectral Density	Pass

2.4 TEST SYSTEM DETAILS

The test sample was received on October 30, 2003. 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
Talkman	Vocollect, Inc.	T2	63417515	MQOTT600-50300	N/A	15516
Battery	Vocollect, Inc.	1500mAh	0038	N/A	N/A	15507
Wall Mount Charger	Vocollect, Inc.	CM-601-1	42172872	N/A	Unshielded	15530

2.5 CONFIGURATION OF TESTED SYSTEM

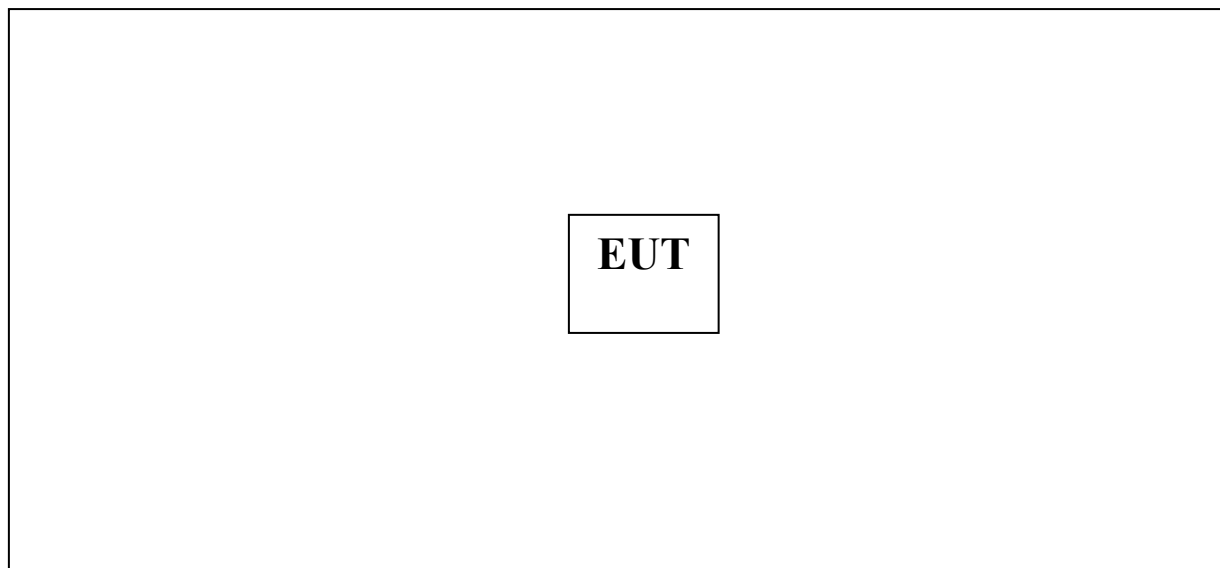


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205

3.1 TEST PROCEDURE

Compliance with the band edges was performed using the guidance in FCC 97-114. The final data derived below was from radiated measurements only. All measurements were found to be compliant with the maximum permitted average field strength listed in FCC 15.209.

The data taken in this report represents the worst case at 11 Mbps. Data rates of 5.5 Mbps, 2 Mbps and 1 Mbps were investigated and found to be in compliance.

3.2 BAND EDGE TEST EQUIPMENT

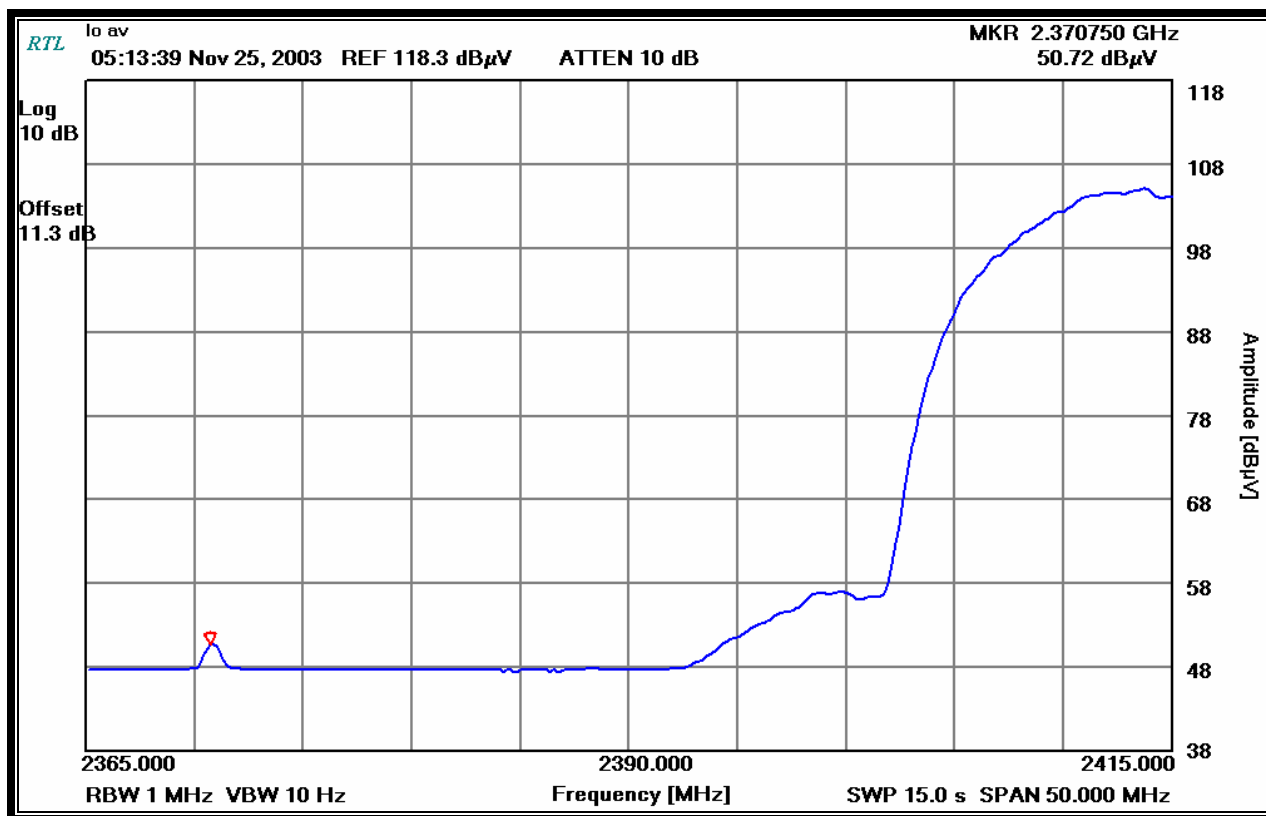
TABLE 3-1: BAND EDGE TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	3/15/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/15/04
900890	Rhein Tech Labs	Outdoor Range 1	OATS 1	N/A	3/26/2004
900878	Rhein Tech Labs	AM3- 1197-0005	3 meter antenna mast, polarizing	N/A	N/A
901242	Rhein Tech Labs	WRT-000- 0003	Wood rotating table	N/A	N/A
901231	IW Microwave Products	KPS-1503- 2400-KPS	High frequency RF cables	240"	9/5/2004
901235	IW Microwave Products	KPS-1503- 360-KPS	High frequency RF cables	36"	9/5/2004

3.3 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

Channel Number: 1
Frequency (MHz): 2412
Resolution Bandwidth (MHz): 1
Video Bandwidth (Hz): 10
Sweep Time (s): 15

PLOT 3-1: BAND EDGE: RADIATED AVERAGE MEASUREMENT (CHANNEL 1)



TEST PERSONNEL:

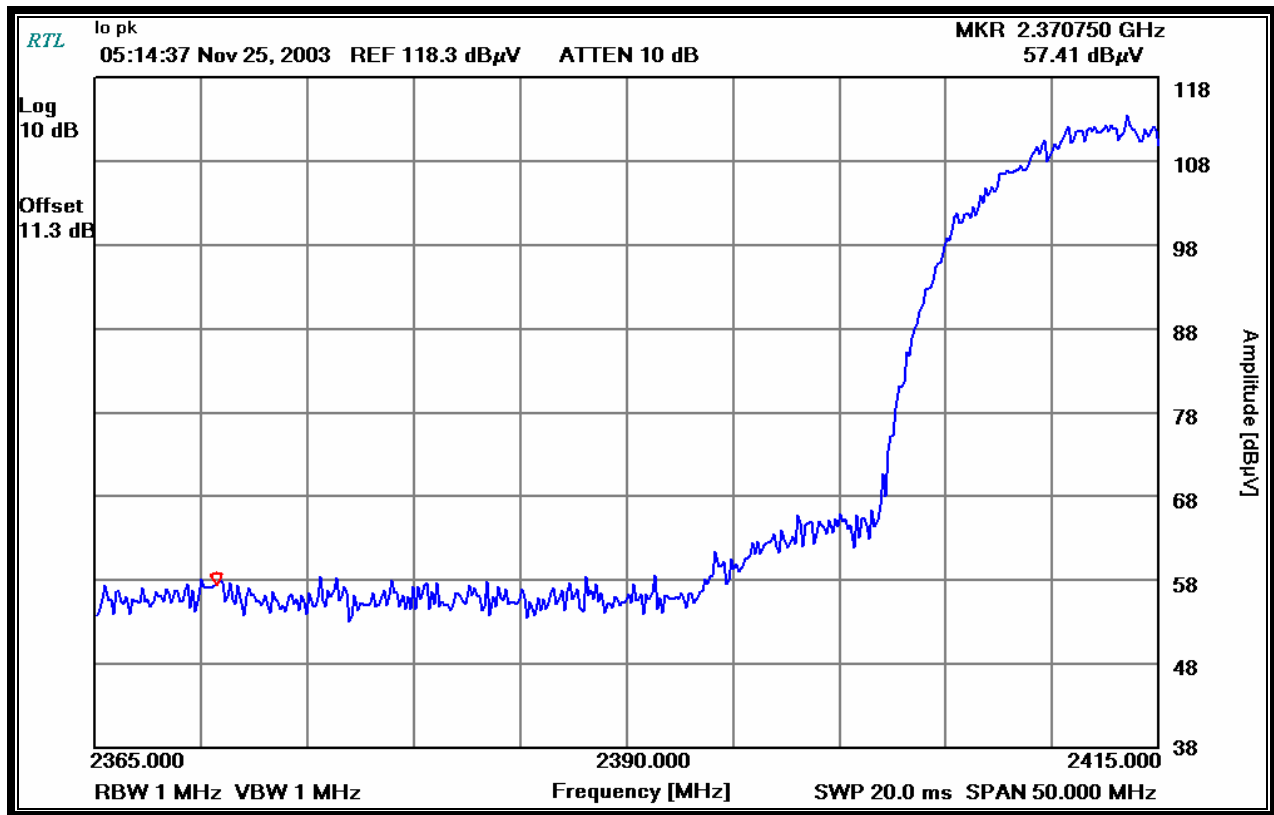
Rachid Sehb
EMC Test Engineer


Signature

November 25, 2003
Date of Test

Channel Number: 1
 Frequency (MHz): 2412
 Resolution Bandwidth (MHz): 1
 Video Bandwidth (MHz): 1
 Sweep Time (ms): 20

PLOT 3-2: BAND EDGE: RADIATED PEAK MEASUREMENT (CHANNEL 1)



TEST PERSONNEL:

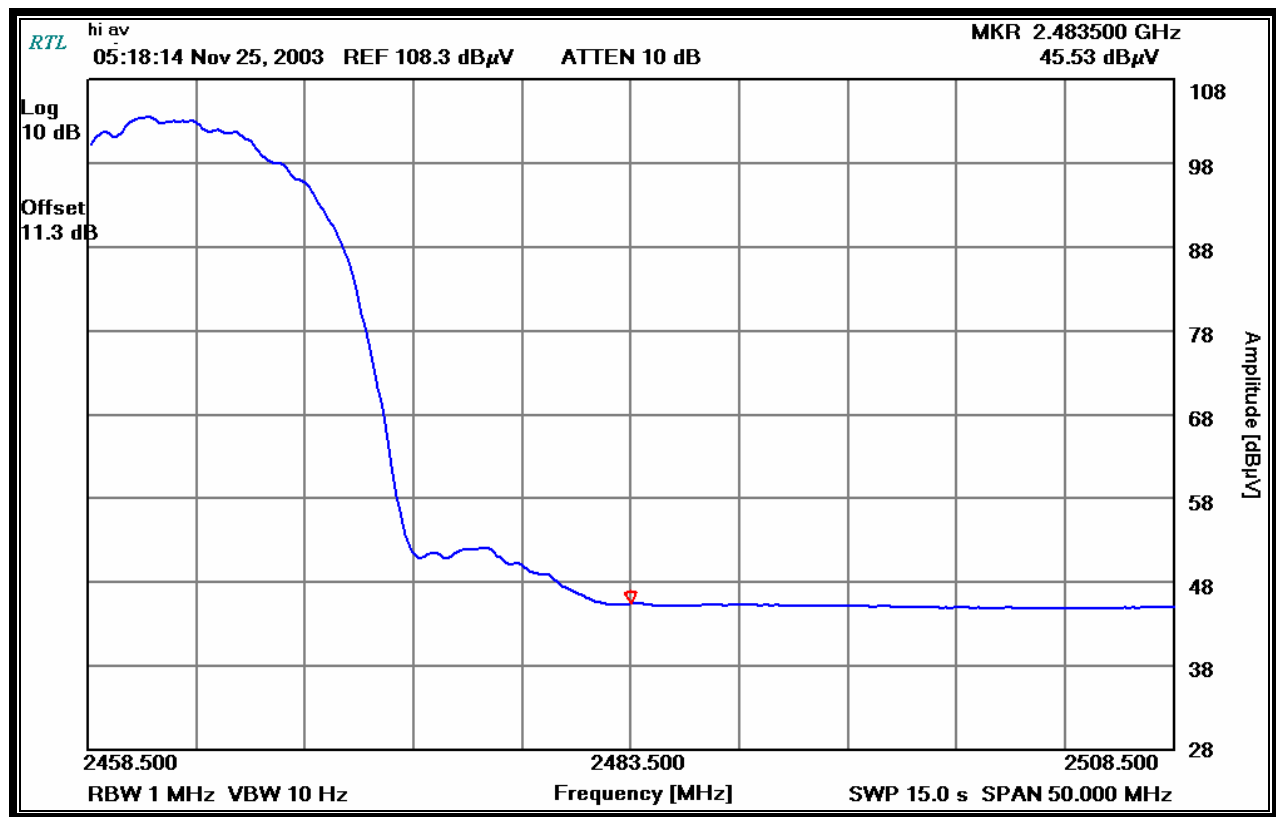
Rachid Sehb
 EMC Test Engineer

See
 Signature

November 25, 2003
 Date of Test

Channel Number: 11
Frequency (MHz): 2462
Resolution Bandwidth (MHz): 1
Video Bandwidth (Hz): 10
Sweep Time (s): 15.0

PLOT 3-3: BAND EDGE: RADIATED AVERAGE MEASUREMENT (CHANNEL 11)



TEST PERSONNEL:

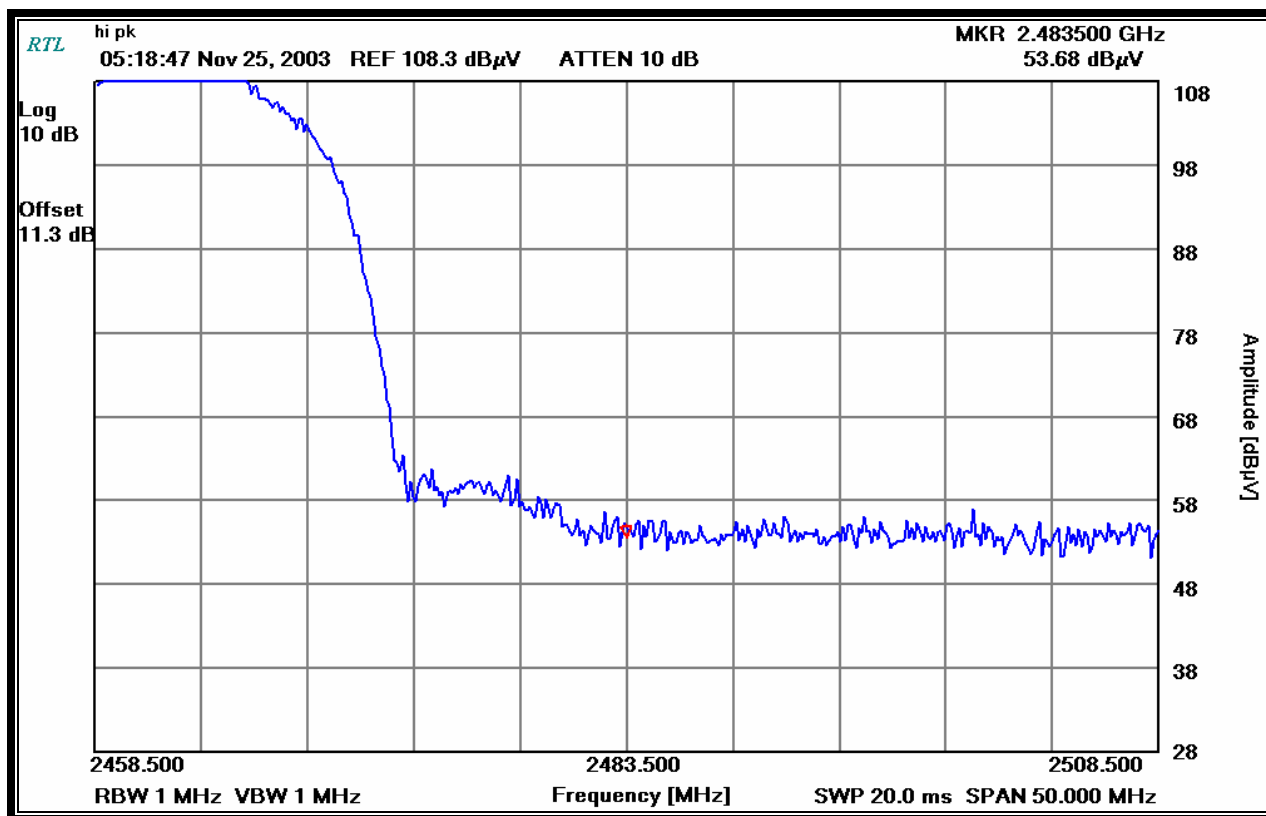
Rachid Sehb
EMC Test Engineer

See
Signature

November 25, 2003
Date of Test

Channel Number: 11
Frequency (MHz): 2462
Resolution Bandwidth (MHz): 1
Video Bandwidth (MHz): 1
Sweep Time (ms): 20.0

PLOT 3-4: BAND EDGE: RADIATED PEAK MEASUREMENT (CHANNEL 11)



TEST PERSONNEL:

Rachid Sehb
EMC Test Engineer


Signature

November 25, 2003
Date of Test

4 CONDUCTED LIMITS - §15.207

4.1 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. 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 LINE EMISSION TEST

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 PHASE SIDE.

4.3 CONDUCTED LINE TEST EQUIPMENT

TABLE 4-1: 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	05/12/2004
901082	AFJ International	LS16	16A LISN	16010020081	11/5/2004

4.4 CONDUCTED LINE EMISSION TEST DATA

TABLE 4-2: CONDUCTED EMISSIONS (NEUTRAL SIDE)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	CISPR B QP Limit (dBuV)	CISPR B QP Margin (dBuV)	CISPR B AV Limit (dBuV)	CISPR B AV Margin (dBuV)
0.372	Av	41.9	1.0	42.9	58.5	-15.6	48.5	-5.6
0.372	Qp	36.7	1.0	37.7	58.5	-20.8	48.5	-10.8
2.698	Qp	33.1	1.5	34.6	56.0	-21.4	46.0	-11.4
2.698	Av	35.5	1.5	37.0	56.0	-19.0	46.0	-9.0
7.403	Av	24.8	2.3	27.1	60.0	-32.9	50.0	-22.9
7.406	Qp	21.7	2.3	24.0	60.0	-36.0	50.0	-26.0
10.100	Qp	27.5	2.7	30.2	60.0	-29.8	50.0	-19.8
10.103	Av	31.9	2.7	34.6	60.0	-25.4	50.0	-15.4
17.057	Pk	25.4	3.6	29.0	60.0	-31.0	50.0	-21.0
24.333	Pk	20.9	4.2	25.1	60.0	-34.9	50.0	-24.9

TABLE 4-3: CONDUCTED EMISSIONS (PHASE SIDE)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	CISPR B QP Limit (dBuV)	CISPR B QP Margin (dBuV)	CISPR B AV Limit (dBuV)	CISPR B AV Margin (dBuV)
0.157	Qp	35.2	2.0	37.2	65.6	-28.4	55.6	-18.4
0.158	Av	33.1	1.9	35.0	65.6	-30.6	55.6	-20.6
0.370	Qp	37.3	1.0	38.3	58.5	-20.2	48.5	-10.2
0.370	Av	38.8	1.0	39.8	58.5	-18.7	48.5	-8.7
1.269	Av	33.7	1.1	34.8	56.0	-21.2	46.0	-11.2
1.270	Qp	33.7	1.1	34.8	56.0	-21.2	46.0	-11.2
10.312	Pk	30.9	2.7	33.6	60.0	-26.4	50.0	-16.4
11.058	Pk	28.4	2.8	31.2	60.0	-28.8	50.0	-18.8
17.403	Pk	29.9	3.6	33.5	60.0	-26.5	50.0	-16.5
18.889	Pk	29.6	3.7	33.3	60.0	-26.7	50.0	-16.7

TEST PERSONNEL:

Rachid Sehb
EMC Test Engineer


Signature

November 20, 2003
Date of Test

5 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE - §15.209

5.1 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE

Emissions apply to 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 IF, LO and up to the 2nd LO were investigated and tested. Channels 1, 6, and 11 were tested and investigated in the transmitting and receiving mode between 10 kHz and 1 GHz.

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
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	3/15/04
900323	EMCO	3160-7	Horn Antennas (8.2 - 12.4 GHz)	9605-1054	6/10/04
900356	EMCO	3160-08	Horn Antennas (12.4 – 18 GHz)	9607-1044	6/10/04
900890	Rhein Tech Labs	Outdoor Range 1	OATS 1	N/A	3/26/2004
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	N/A	N/A
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	N/A
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/5/2004
900321	EMCO	3161-03	Horn Antenna (4 - 8.2 GHz)	9508-1020	4/10/04
901053	Schaffner & Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	7/3/04
900905	Rhein Tech Labs	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	7/10/03
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	7/30/04

5.3 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA

TABLE 5-2: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS

Temperature: 88°F					Humidity: 46%				
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)
154.954	Qp	H	45	1.8	45.0	-18.4	26.6	43.5	-16.9
159.329	Qp	H	0	1.0	45.9	-18.8	27.1	43.5	-16.4
206.462	Qp	H	270	1.8	54.1	-18.3	35.8	43.5	-7.7
309.694	Qp	H	45	1.0	47.6	-14.3	33.3	46.0	-12.7
319.000	Qp	H	145	1.0	42.1	-14.1	28.0	46.0	-18.0
412.932	Qp	H	180	1.0	53.5	-10.9	42.6	46.0	-3.4
464.548	Qp	H	45	1.0	45.4	-9.9	35.5	46.0	-10.5
516.164	Qp	H	180	1.0	49.4	-8.9	40.5	46.0	-5.5
774.244	Qp	H	45	1.0	37.6	-5.6	32.0	46.0	-14.0
825.860	Qp	H	90	1.0	38.7	-4.9	33.8	46.0	-12.2

QP: RES. =100 KHZ, VID= 100 KHZ

TEST PERSONNEL:

Rachid Sehb
EMC Test Engineer


Signature

November 20, 2003
Date of Test

6 RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS - §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	3/15/04
900323	EMCO	3160-7	Horn Antennas (8.2 - 12.4 GHz)	9605-1054	6/10/04
900890	Rhein Tech Labs	Outdoor Range 1	OATS 1	N/A	3/26/2004
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	N/A	N/A
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	N/A
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/5/2004
900356	EMCO	3160-08	Horn Antennas (12.4 – 18 GHz)	9607-1044	6/10/04
900321	EMCO	3161-03	Horn Antenna (4 - 8.2 GHz)	9508-1020	4/10/04
901053	Schaffner & Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	7/3/04
900905	Rhein Tech Labs	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	9/10/04
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	7/30/04
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	7/10/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/15/04

6.3 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA

TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1; 2412 MHZ)

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2037.8	48.3	42.7	10.0	52.7	54.0	-1.3
2087.9	48.1	42.3	10.6	52.9	54.0	-1.1
4822.8	41.0	30.8	14.0	44.8	54.0	-9.2
7235.9	44.1	33.6	12.5	46.1	54.0	-7.9

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

TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6; 2437 MHZ)

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2788.3	44.5	33.5	11.4	44.9	54.0	-9.1
4874.0	40.4	30.6	15.3	45.9	54.0	-8.1
7311.0	43.4	33.6	12.1	45.7	54.0	-8.3

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

TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11; 2462 MHZ)

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2062.8	48.9	43.1	10.6	53.7	54.0	-0.3
4924.0	40.4	30.8	13.9	44.7	54.0	-9.3
7386.0	45.3	34.1	13.3	47.4	54.0	-6.6

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

TEST PERSONNEL:

Rachid Sehb
EMC Test Engineer


Signature

November 15, 2003
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 300 kHz. The device was modulated using the maximum 11Mbps data rate. 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	5/12/04

7.3 BANDWIDTH TEST DATA

TABLE 7-2: MINIMUM 6 DB BANDWIDTH TEST DATA

CHANNEL	6 dB BANDWIDTH (MHz)
1	11.2
6	11.0
11	11.0

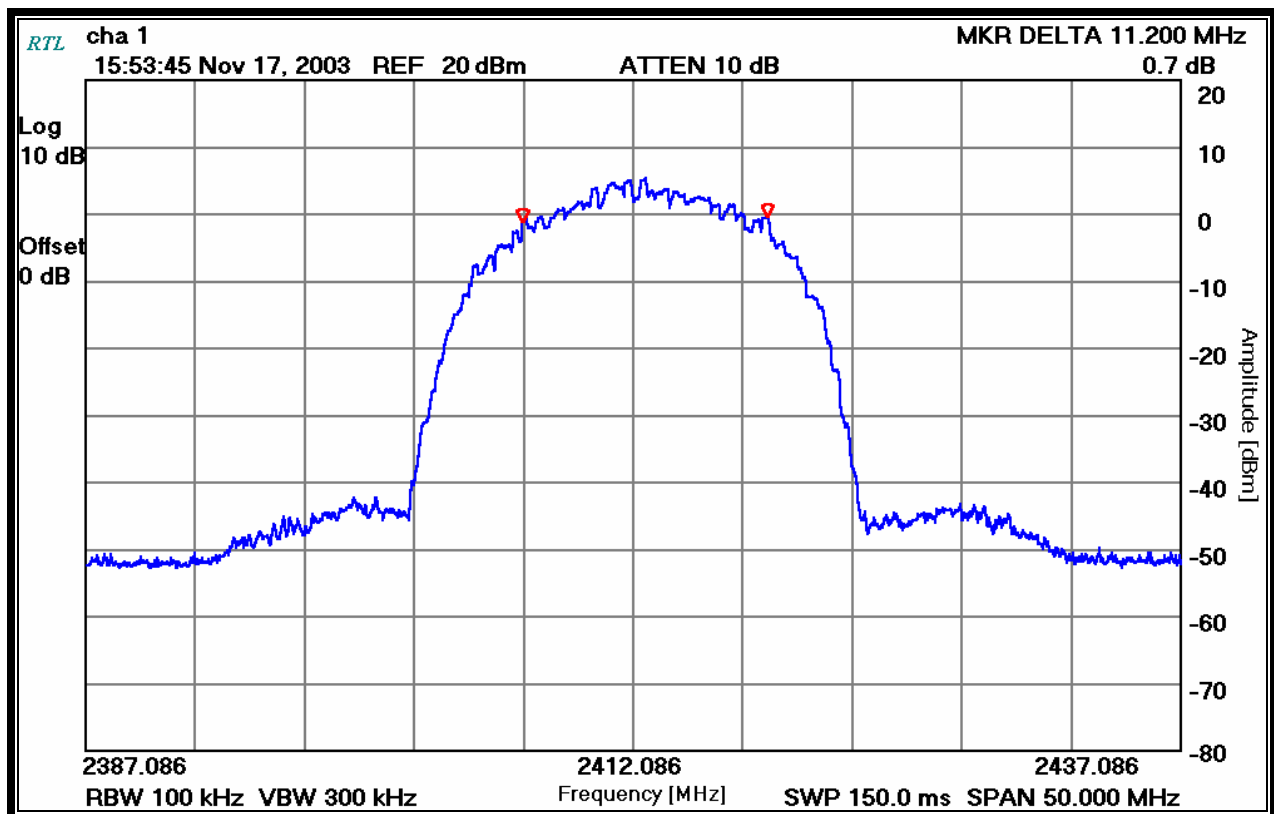
TEST PERSONNEL:

Rachid Sehb		November 17, 2003
EMC Test Engineer	Signature	Date of Test

7.4 MODULATED BANDWIDTH PLOTS

Channel Number: 1
 Frequency (MHz): 2412
 Resolution Bandwidth (kHz): 100
 Video Bandwidth (kHz): 300
 Sweep Time (ms): 150

PLOT 7-1: MODULATED BANDWIDTH CHANNEL 1



TEST PERSONNEL:

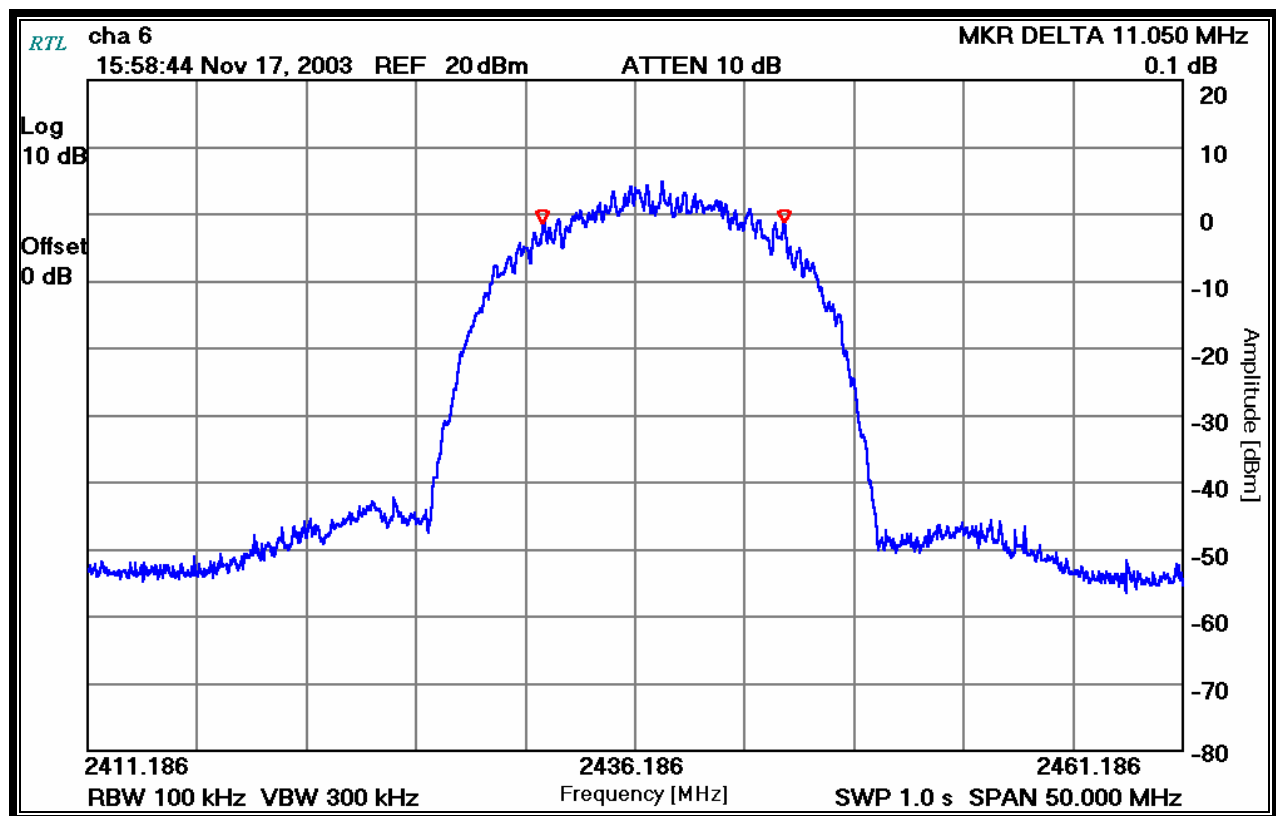
Rachid Sehb
 EMC Test Engineer

See
 Signature

November 17, 2003
 Date of Test

Channel Number: 6
 Frequency (MHz): 2437
 Resolution Bandwidth (kHz): 100
 Video Bandwidth (kHz): 300
 Sweep Time (s): 1.0

PLOT 7-2: MODULATED BANDWIDTH CHANNEL 6



TEST PERSONNEL:

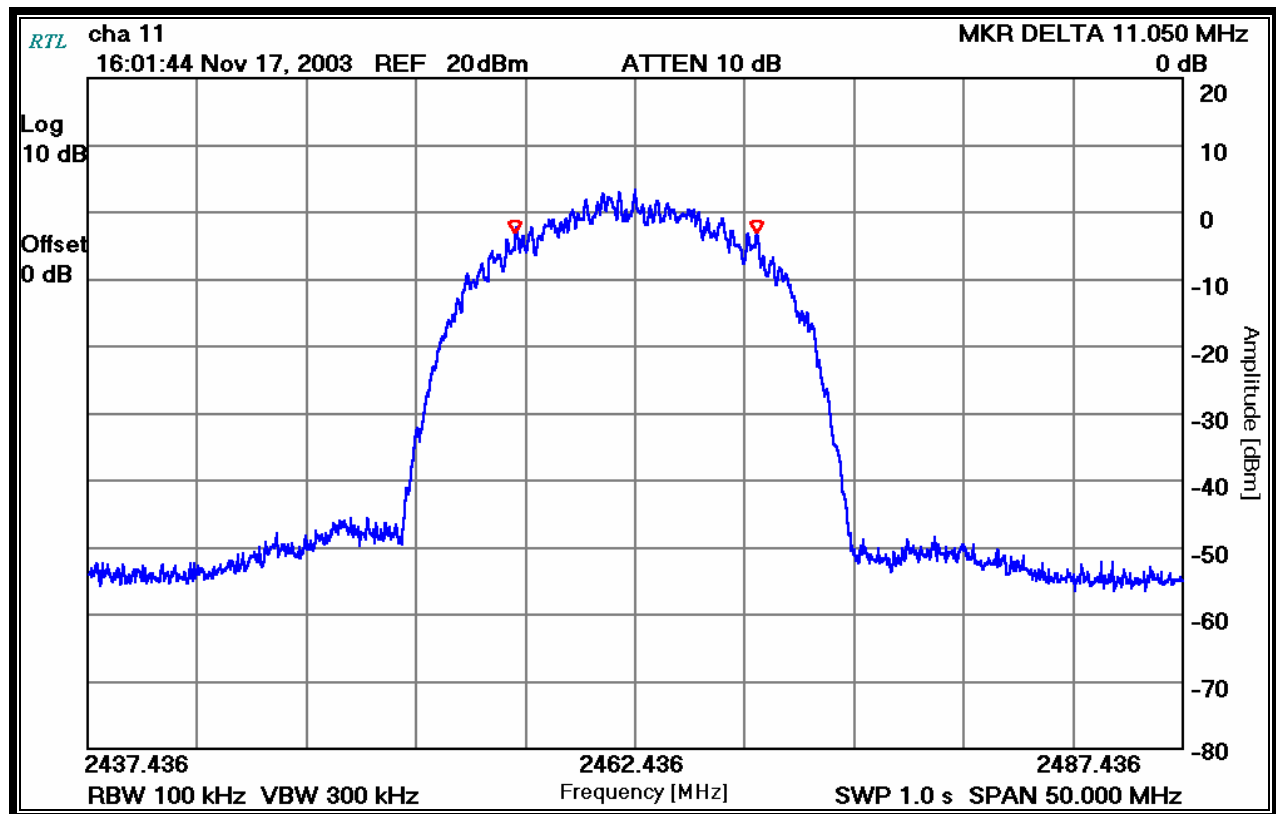
Rachid Sehb
 EMC Test Engineer

See
 Signature

November 17, 2003
 Date of Test

Channel Number: 11
 Frequency (MHz): 2462
 Resolution Bandwidth (kHz): 100
 Video Bandwidth (kHz): 300
 Sweep Time (s): 1.0

PLOT 7-3: MODULATED BANDWIDTH CHANNEL 11



TEST PERSONNEL:

Rachid Sehb
 EMC Test Engineer


 Signature

November 17, 2003
 Date of Test

8 PEAK OUTPUT POWER - §15.247(B)(1)

8.1 POWER OUTPUT TEST PROCEDURE

A conducted power measurement of the EUT was measured 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

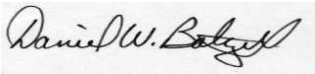
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901186	Agilent Technologies	E9323A (50 MHz-6 GHz)	Peak & Average Power Sensor	US40410380	7/30/04
901184	Agilent Technologies	E4416A	EPM-P Power Meter	GB41050573	7/30/04

8.3 POWER OUTPUT TEST DATA

TABLE 8-2: POWER OUTPUT TEST DATA

FREQUENCY (MHZ)	CHANNEL	PEAK POWER CONDUCTED OUTPUT (dBm)
2412	1	20.0
2437	6	19.7
2462	11	20.0

TEST PERSONNEL:

Dan Baltzell		January 14, 2004
EMC Test Engineer	Signature	Date of Test

9 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C)

9.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna spurious emission per FCC 15.247(c) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier was identified at 2.412 GHz for Channel 1, 2.437 GHz for Channel 6 and 2.462 GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level from 9 kHz to the carrier 10th harmonic. See the antenna conducted spurious noise tables. Channels 1, 6, and 11 were investigated and tested. The notch filter used was found to have no effect on emission levels so it was not used in data presented.

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
901020	Hewlett Packard	8564E	Spectrum Analyzer (30 Hz – 40 GHz)	3943A01719	7/15/04

9.3 ANTENNA CONDUCTED SPURIOUS DATA

Operating Frequency (MHz): 2412
 Channel: 1
 Measured Level at 100 kHz (dBm): 5.2
 Limit (dBm): -14.8

TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
1493.66	-62.1	-67.3	-20.0	-47.3
1523.64	-62.8	-68.0	-20.0	-48.0
2037.59	-48.0	-53.2	-20.0	-33.2
2453.30	-39.9	-45.1	-20.0	-25.1
2789.29	-55.4	-60.6	-20.0	-40.6
4826.10	-54.3	-59.5	-20.0	-39.5
7239.20	-51.0	-56.2	-20.0	-36.2
9653.90	-50.8	-56.0	-20.0	-36.0
12063.20	-50.8	-56.0	-20.0	-36.0
14480.00	-47.5	-52.7	-20.0	-32.7

Operating Frequency (MHz): 2437
Channel: 6
Measured Level at 100 kHz (dBm): 5.2
Limit (dBm): -14.8

TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
1366.78	-62.1	-67.3	-20.0	-47.3
1731.26	-62.8	-68.0	-20.0	-48.0
2063.44	-48.0	-53.2	-20.0	-33.2
2809.69	-39.9	-45.1	-20.0	-25.1
4868.70	-55.4	-60.6	-20.0	-40.6
4872.80	-54.3	-59.5	-20.0	-39.5
7315.60	-51.0	-56.2	-20.0	-36.2
9757.90	-50.8	-56.0	-20.0	-36.0
12178.60	-50.8	-56.0	-20.0	-36.0
14608.00	-47.5	-52.7	-20.0	-32.7

Operating Frequency (MHz): 2462
Channel: 11
Measured Level at 100kHz (dBm): 4.8
Limit (dBc): -15.2

TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
483.00	-54.5	-59.3	-20.0	-39.3
1359.86	-53.8	-58.6	-20.0	-38.6
2087.66	-51.2	-56.0	-20.0	-36.0
2402.54	-35.9	-40.7	-20.0	-20.7
4920.70	-54.8	-59.6	-20.0	-39.6
7380.50	-50.6	-55.4	-20.0	-35.4
9849.70	-50.3	-55.1	-20.0	-35.1
12286.70	-50.8	-55.6	-20.0	-35.6
14768.40	-46.7	-51.5	-20.0	-31.5
17231.70	-47.7	-52.5	-20.0	-32.5

TEST PERSONNEL:

Rachid Sehb
EMC Test Engineer



Signature

November 13, 2003

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 300 kHz, and the sweep time set at 1000 seconds. The spectral lines were resolved for the modulated carriers at 2.412GHz, 2.437GHz, and 2.462GHz respectively. These levels are below the +8 dBm limit. See the power spectral density table and plots.

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
901020	Hewlett Packard	8564E	Spectrum Analyzer (30 Hz – 40 GHz)	3943A01719	7/15/04

10.3 POWER SPECTRAL DENSITY TEST DATA

Operating Frequency (MHz): 2412, 2437 & 2462
Channels: 1, 6 & 11
Limit (dBm): 8

TABLE 10-2: POWER SPECTRAL DENSITY TEST DATA

CHANNEL	POWER SPECTRAL DENSITY LIMIT = +8dBm
1	-12.1
6	-8.5
11	-8.7

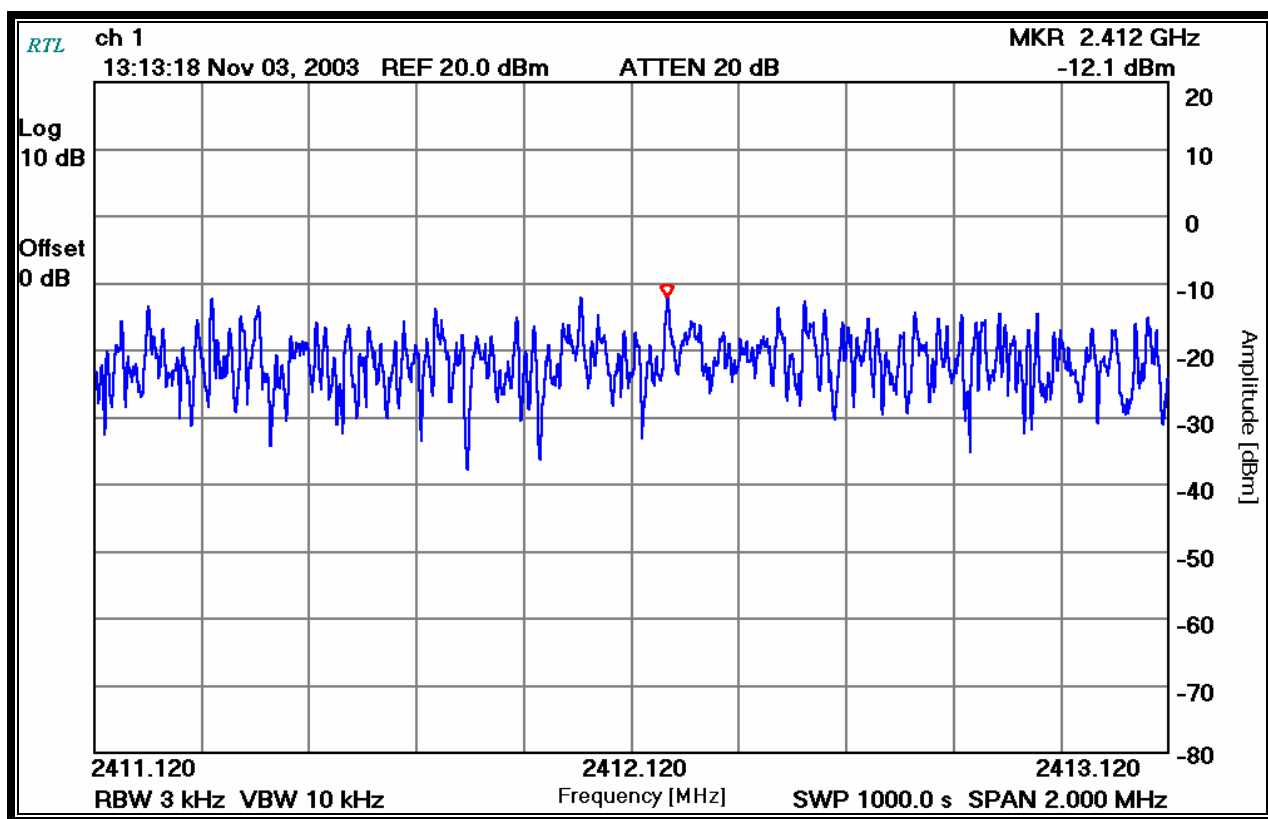
TEST PERSONNEL:

Rachid Sehb EMC Test Engineer	 Signature	November 03, 2003 Date Of Test
----------------------------------	--	-----------------------------------

10.4 POWER SPECTRAL DENSITY PLOTS

Operating Frequency (MHz): 2412
 Channel: 1
 Measured Conducted Power. (dBm): 17.2
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 10
 Sweep Time (s): 1000.0

PLOT 10-1: POWER SPECTRAL DENSITY: CHANNEL 1



TEST PERSONNEL:

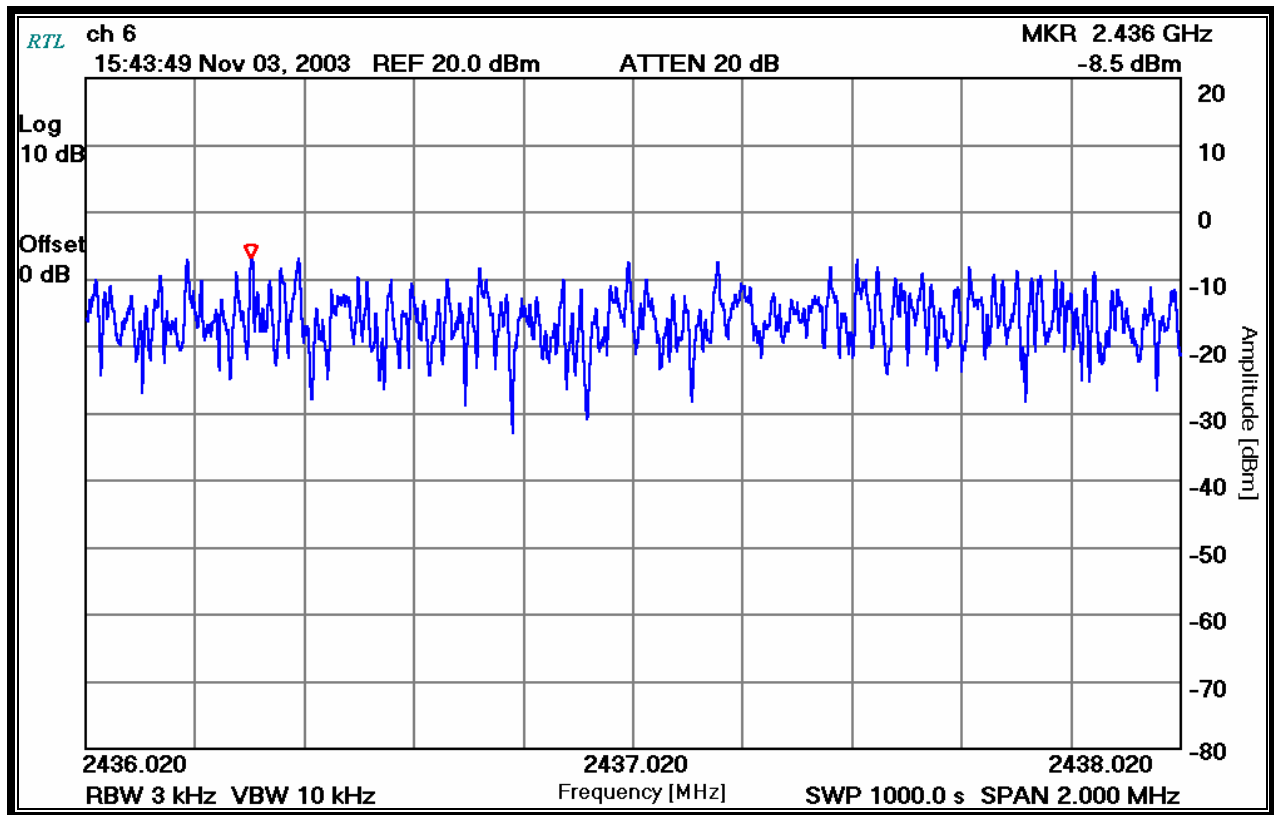
Rachid Sehb
 EMC Test Engineer

See
 Signature

November 03, 2003
 Date of Test

Operating Frequency (MHz): 2437
 Channel: 6
 Measured Conducted Power (dBm): 17.4
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 10
 Sweep Time (s): 1000.0

PLOT 10-2: POWER SPECTRAL DENSITY: CHANNEL 6



TEST PERSONNEL:

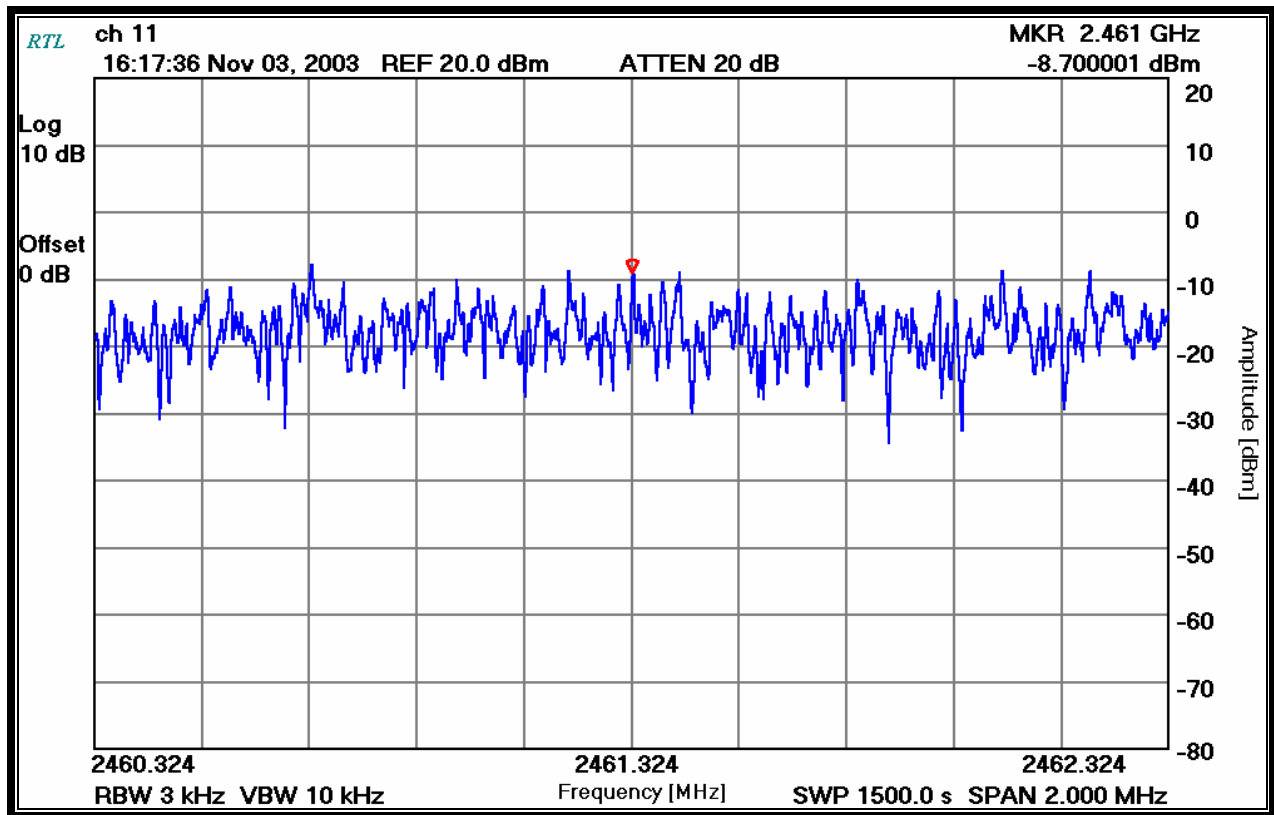
Rachid Sehb
 EMC Test Engineer


 Signature

November 03, 2003
 Date of Test

Operating Frequency (MHz): 2462
 Channel: 11
 Measured Conducted Power. (dBm): 18.1
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 10
 Sweep Time (s): 1500.0

PLOT 10-3: POWER SPECTRAL DENSITY: CHANNEL 11



TEST PERSONNEL:

Rachid Sehb
 EMC Test Engineer


 Signature

November 03, 2003
 Date of Test

11 CONCLUSION

The data in this measurement report shows that the Vocollect, Inc. Talkman T2, Model: TT-600, FCC ID: MQOTT600-35300, complies with all the requirements of Parts 2 and 15 of the FCC Rules and Industry Canada RSS-210.