



Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247 CERTIFICATION & INDUSTRY CANADA CERTIFICATION

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FCC ID:	I28QL320352	GRANTEE FRN NUMBER:	0006-3040-75
PLAT FORM:	N/A	RTL WORK ORDER NUMBER:	2002112
MODEL(S):	QL320	RTL QUOTE NUMBER:	QRTL02-466
DATE OF TEST REPORT:	June 6, 2002		
Standards and Procedures:	ANSI 63.4, DA00-705 (FHSS) and FCC 97-114 (DSSS)		
FCC Classification:	DSSS Direct Sequence Spread Spectrum		
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		
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)	Freq. Tolerance	Emission Designator
2412-2462	0.1549	N/A	N/A

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 63.4, DA00-705 (FHSS) and FCC 97-114 (DSSS).

Signature: _____

Date: June 6, 2002

Typed/Printed Name: Desmond A. Fraser

Position: President

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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 M/N: QL320, FCC ID: I28QL320352. 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 patch antenna;. The patch antenna transmits, receives, and is connected to the antenna port available.

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.

2.2 EXERCISING THE EUT

The EUT was provided with the software to continuously transmit during testing. The carrier was also checked to verify that the information was being transmitted.

2.3 TEST RESULT SUMMARY

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

STANADARD	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 FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system are:

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RIL BAR CODE
WIRELESS PRINTER	ZEBRA TECHNOLOGIES	QL320	N/A	I28QL320352	N/A	014241
WIRELESS LAN ADAPTER	CISCO SYSTEMS	AIR-LMC352	VEM060800GL	LDK102040		

2.5 CONFIGURATION OF TESTED SYSTEM

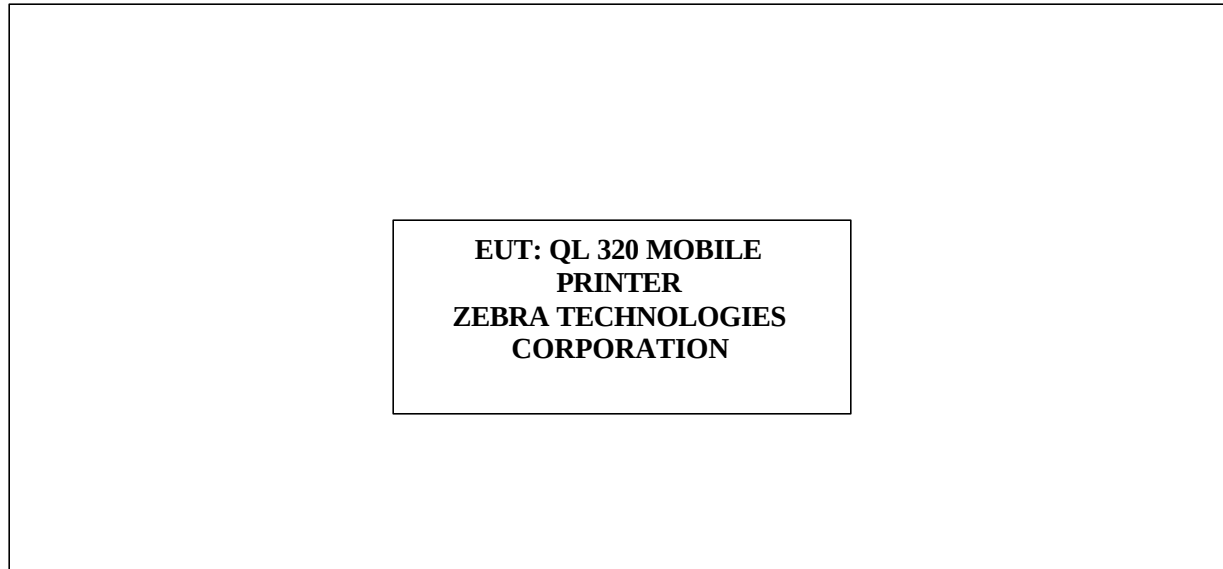


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205

3.1 TEST PROCEDURE

Compliance with the band edges was performed using the FCC's "Radiated Measurement at a Band Edge" guidance document. The final data derived below were from radiated measurements only. The data taken in this report represents the worst case at 11 MBPS. Data rates of 5.5MBPS, 2 MBPS and 1 MBPS were investigated and found to be in compliance.

3.2 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

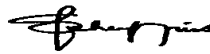
Operating Frequency (MHz): 2412-2462
Channel: 1 & 11
Distance: 3 meter
Limit: 54 dBuV/m

TABLE 3-1: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBm V/m)	Level Corrected (dBm V/m)	FCC Limit (dBm V/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	31	42	54.0	-12
11	2483.5	Absolute measurement	28.6	39.6	54.0	-14.4

TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer

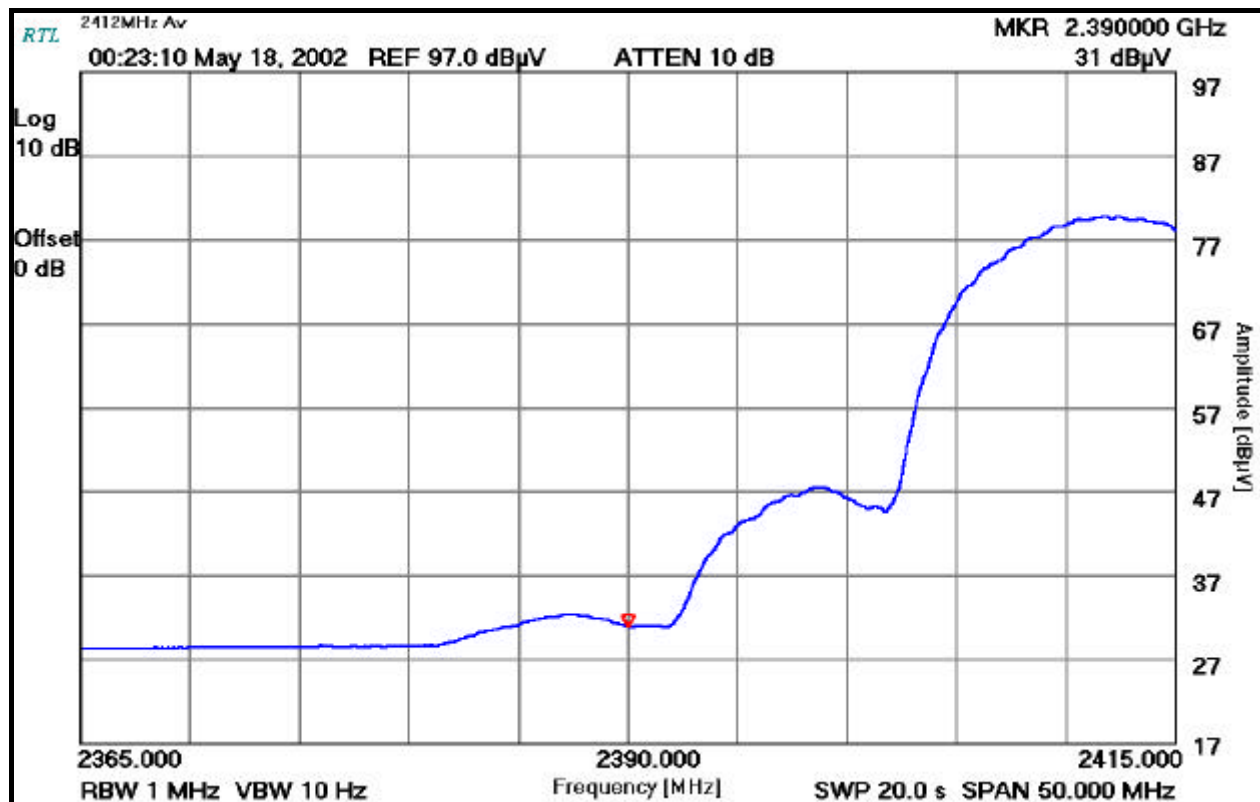

Signature

5/15/2002
Date Of Test

3.3 RESTRICTED BAND EDGE PLOTS

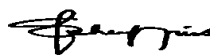
Channel Number: 1
Frequency: 2412MHz
Resolution Bandwidth: 1MHz
Video Bandwidth: 10Hz
Sweep Time: 20.0s

PLOT 3-1: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1



TEST PERSONNEL:

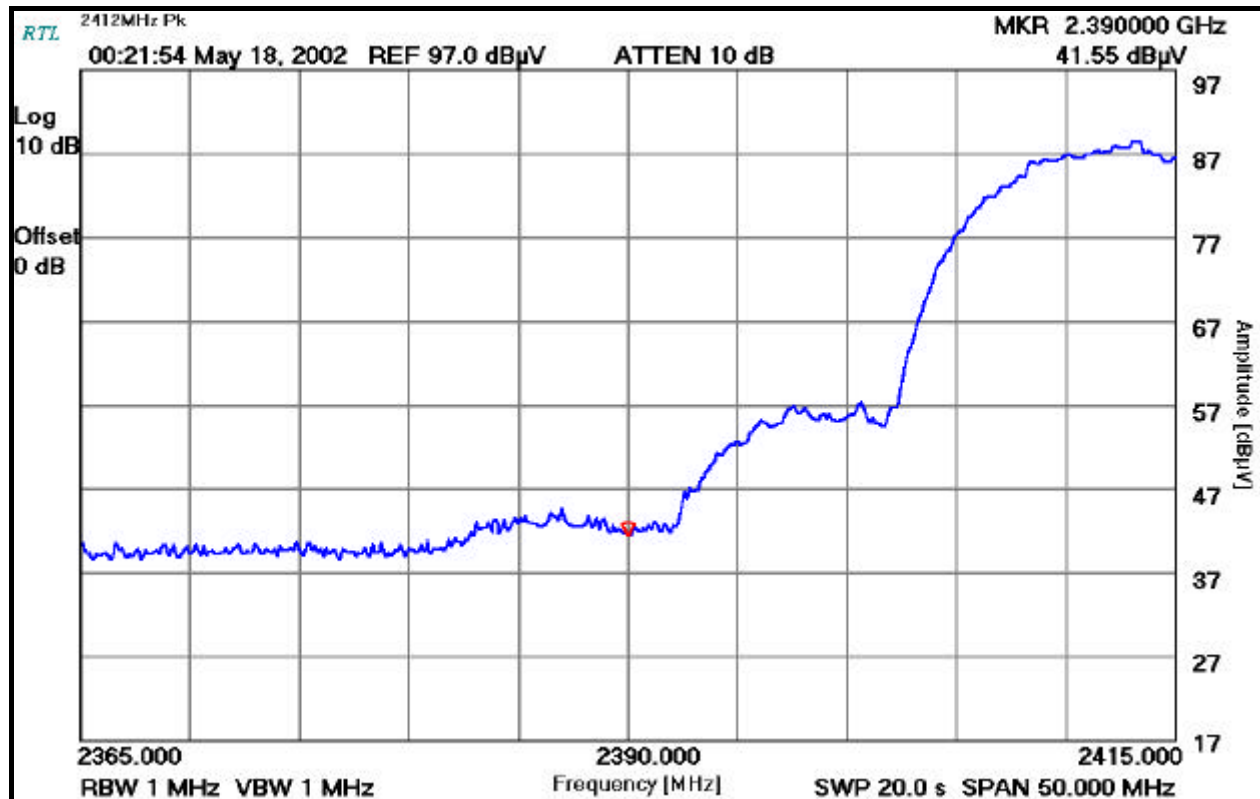
Franck Schuppius
Test Technician/Engineer


Signature

05/18//2002
Date Of Test

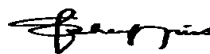
Channel Number: 1
Frequency: 2412MHz
Bandwidth Resolution: 1MHz
Video Bandwidth: 1MHz
Sweep Time: 20.0s

PLOT 3-2: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1



TEST PERSONNEL:

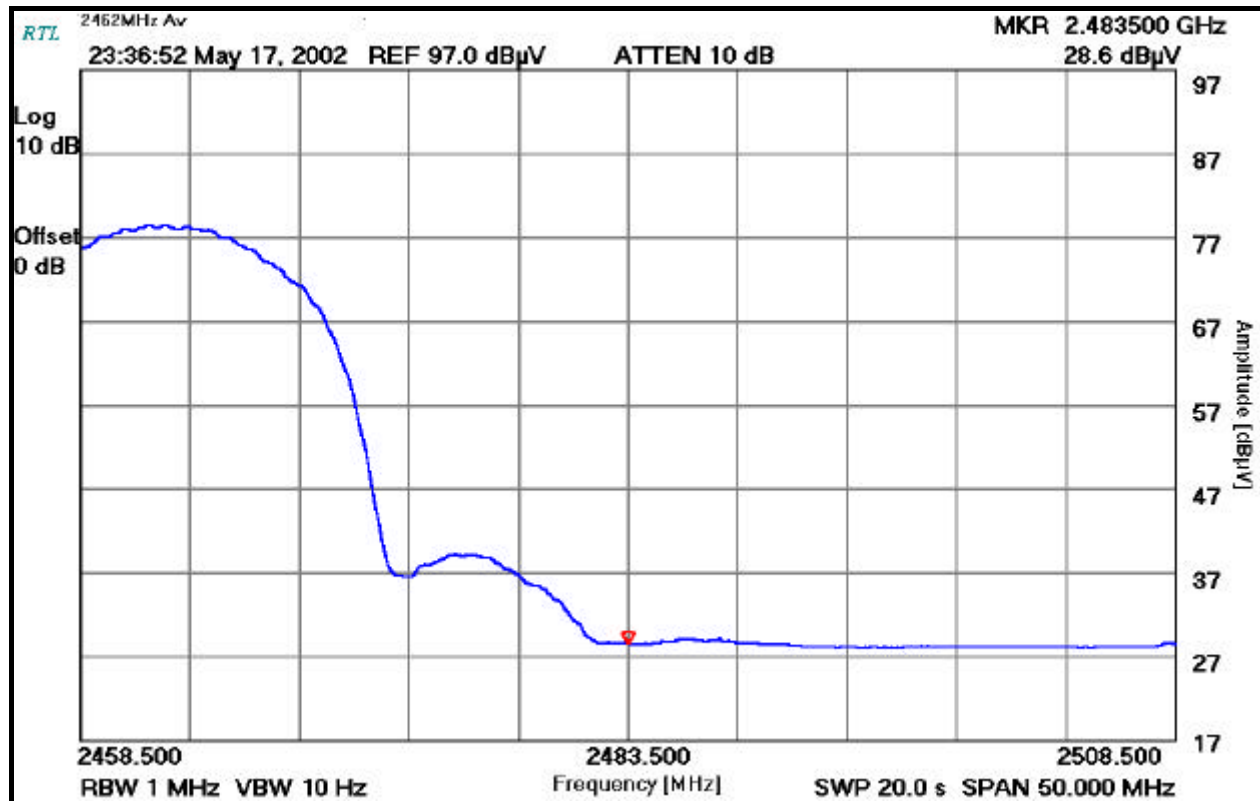
Franck Schuppius
Test Technician/Engineer


Signature

05/18/2002
Date Of Test

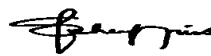
Channel Number: 11
Frequency: 2462MHz
Resolution Bandwidth: 1MHz
Video Bandwidth: 10Hz
Sweep Time: 20.0s

PLOT 3-3: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11



TEST PERSONNEL:

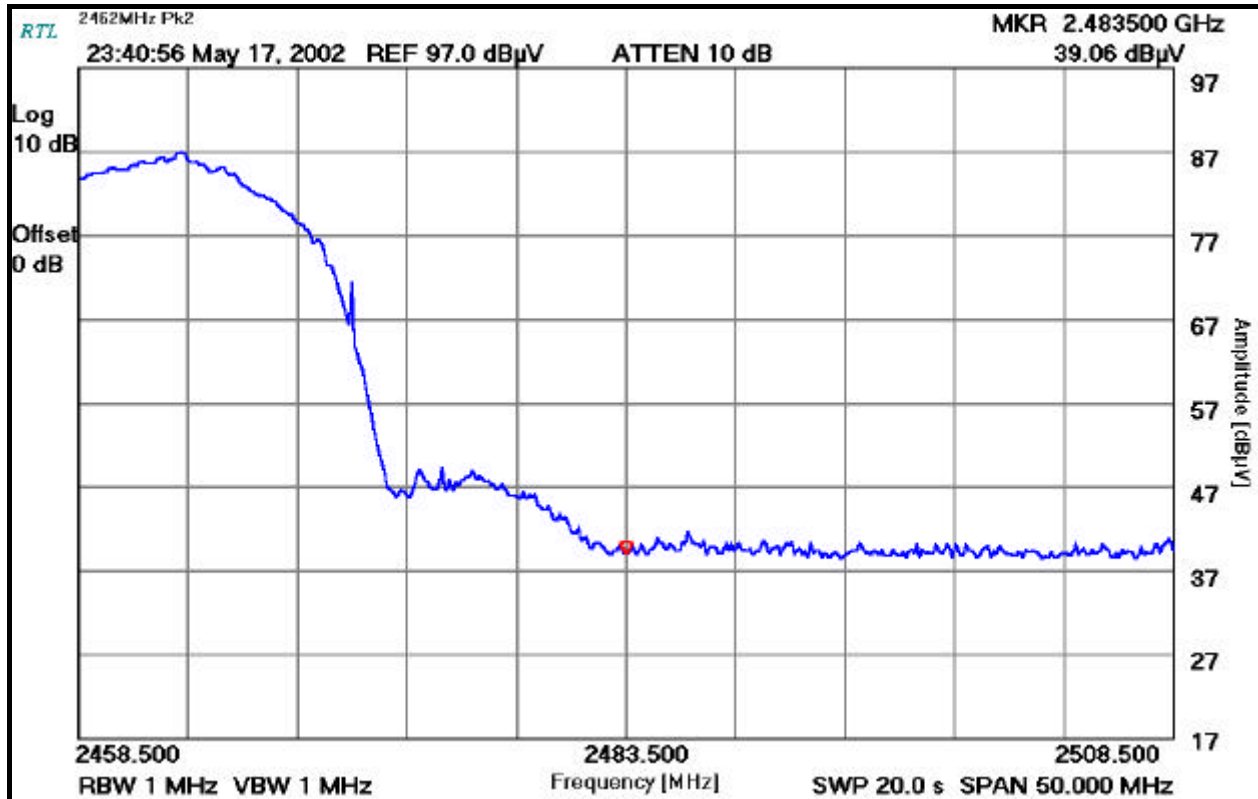
Franck Schuppiss
Test Technician/Engineer


Signature

05/17/2002
Date Of Test

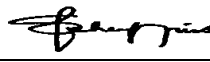
Channel Number: 11
Frequency: 2462MHz
Resolution Bandwidth: 1MHz
Video Bandwidth: 1MHz
Sweep Time: 20.0s

PLOT 3-4: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11



TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

05/17/2002
Date Of Test

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

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

4.2 CONDUCTED EMISSION TEST

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

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

TABLE 4-1: CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771
900070	Solar		LISN	

4.3 CONDUCTED EMISSION TEST DATA

TABLE 4-2: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 1

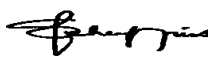
Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	43.4	0.8	44.2	48.0	-3.8
0.768	Pk	42.0	0.7	42.7	48.0	-5.3
0.826	Pk	43.0	0.7	43.7	48.0	-4.3
1.112	Pk	43.1	0.8	43.9	48.0	-4.1
8.155	Pk	38.4	2.0	40.4	48.0	-7.6
25.560	Pk	36.8	3.4	40.2	48.0	-7.8

TABLE 4-3: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 1

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	44.1	0.8	44.9	48.0	-3.1
0.768	Pk	42.7	0.7	43.4	48.0	-4.6
0.827	Pk	42.4	0.6	43.0	48.0	-5.0
3.244	Pk	44.0	1.3	45.3	48.0	-2.7
7.860	Pk	41.6	2.0	43.6	48.0	-4.4
10.120	Pk	35.7	1.4	37.1	48.0	-10.9

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

05/15/2002
Date Of Test

TABLE 4-4: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 6

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	42.2	0.8	43.0	48.0	-5.0
0.828	Pk	42.3	0.7	43.0	48.0	-5.0
1.112	Pk	41.8	0.8	42.6	48.0	-5.4
7.395	Pk	38.8	1.9	40.7	48.0	-7.3
25.600	Pk	37.4	3.4	40.8	48.0	-7.2
26.740	Pk	37.1	3.4	40.5	48.0	-7.5

TABLE 4-5: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 6

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	43.0	0.8	43.8	48.0	-4.2
0.707	Pk	40.9	0.7	41.6	48.0	-6.4
0.768	Pk	41.0	0.7	41.7	48.0	-6.3
3.480	Pk	43.6	1.4	45.0	48.0	-3.0
7.450	Pk	40.6	1.9	42.5	48.0	-5.5
11.120	Pk	34.6	2.3	36.9	48.0	-11.1

TEST PERSONNEL:

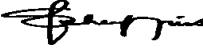
Franck Schuppius		05/15/2002
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-6: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 11

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.473	Pk	42.5	0.8	43.3	48.0	-4.7
0.829	Pk	42.7	0.7	43.4	48.0	-4.6
0.889	Pk	41.2	0.7	41.9	48.0	-6.1
1.056	Pk	41.9	0.7	42.6	48.0	-5.4
7.815	Pk	39.4	2.0	41.4	48.0	-6.6
26.160	Pk	37.5	3.4	40.9	48.0	-7.1

TABLE 4-7: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 11

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.473	Pk	43.0	0.8	43.8	48.0	-4.2
0.711	Pk	41.7	0.7	42.4	48.0	-5.6
0.770	Pk	41.6	0.7	42.3	48.0	-5.7
3.668	Pk	43.4	1.4	44.8	48.0	-3.2
7.590	Pk	41.0	2.0	43.0	48.0	-5.0
10.850	Pk	36.0	2.2	38.2	48.0	-9.8
24.660	Pk	33.8	3.4	37.2	48.0	-10.8

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

05/15/2002
Date Of Test

TABLE 4-8: CONDUCTED EMISSIONS (NEUTRAL SIDE) RECEIVING CH 1

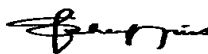
Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	43.4	0.8	44.2	48.0	-3.8
0.768	Pk	42.0	0.7	42.7	48.0	-5.3
0.826	Pk	43.0	0.7	43.7	48.0	-4.3
1.112	Pk	43.1	0.8	43.9	48.0	-4.1
8.155	Pk	38.4	2.0	40.4	48.0	-7.6
25.560	Pk	36.8	3.4	40.2	48.0	-7.8

TABLE 4-9: CONDUCTED EMISSIONS (PHASE SIDE) RECEIVING CH 1

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	44.1	0.8	44.9	48.0	-3.1
0.768	Pk	42.7	0.7	43.4	48.0	-4.6
0.827	Pk	42.4	0.6	43.0	48.0	-5.0
3.244	Pk	44.0	1.3	45.3	48.0	-2.7
7.860	Pk	41.6	2.0	43.6	48.0	-4.4
10.120	Pk	35.7	1.4	37.1	48.0	-10.9

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

5/15/2002
Date Of Test

TABLE 4-10: CONDUCTED EMISSIONS (NEUTRAL SIDE) RECEIVING CH 6

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	42.2	0.8	43.0	48.0	-5.0
0.828	Pk	42.3	0.7	43.0	48.0	-5.0
1.112	Pk	41.8	0.8	42.6	48.0	-5.4
7.395	Pk	38.8	1.9	40.7	48.0	-7.3
25.600	Pk	37.4	3.4	40.8	48.0	-7.2
26.740	Pk	37.1	3.4	40.5	48.0	-7.5

TABLE 4-11: CONDUCTED EMISSIONS (PHASE SIDE) RECEIVING CH 6

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.472	Pk	43.0	0.8	43.8	48.0	-4.2
0.707	Pk	40.9	0.7	41.6	48.0	-6.4
0.768	Pk	41.0	0.7	41.7	48.0	-6.3
3.480	Pk	43.6	1.4	45.0	48.0	-3.0
7.450	Pk	40.6	1.9	42.5	48.0	-5.5
11.120	Pk	34.6	2.3	36.9	48.0	-11.1

TEST PERSONNEL:

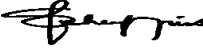
Franck Schuppis		5/15/2002
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-12: CONDUCTED EMISSIONS (NEUTRAL SIDE) RECEIVING CH 11

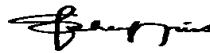
Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.473	Pk	42.5	0.8	43.3	48.0	-4.7
0.829	Pk	42.7	0.7	43.4	48.0	-4.6
0.889	Pk	41.2	0.7	41.9	48.0	-6.1
1.056	Pk	41.9	0.7	42.6	48.0	-5.4
7.815	Pk	39.4	2.0	41.4	48.0	-6.6
26.160	Pk	37.5	3.4	40.9	48.0	-7.1

TABLE 4-13: CONDUCTED EMISSIONS (PHASE SIDE) RECEIVING CH 11

Temperature: 74°F				Humidity: 45%		
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.473	Pk	43.0	0.8	43.8	48.0	-4.2
0.711	Pk	41.7	0.7	42.4	48.0	-5.6
0.770	Pk	41.6	0.7	42.3	48.0	-5.7
3.668	Pk	43.4	1.4	44.8	48.0	-3.2
7.590	Pk	41.0	2.0	43.0	48.0	-5.0
10.850	Pk	36.0	2.2	38.2	48.0	-9.8
24.660	Pk	33.8	3.4	37.2	48.0	-10.8

TEST PERSONNEL:

Franck Schuppius
 Test Technician/Engineer


 Signature

5/15/2002
 Date Of Test

5 RADIATED EMISSION FOR RECEIVER/DIGITAL INTERFACE - §15.209

5.1 RADIATED EMISSION TEST PROCEDURE FOR RECEIVER/DIGITAL INTERFACE

Radiated spurious emissions for receiver/digital interface fall in the restricted and non-restricted bands between 30 MHz and up to the 2nd LO when the EUT is in the receiver/digital interface mode. The IF, LO and up to the 2nd LO of the receiver were investigated and tested. Channels 1, 6, and 11 were tested and investigated. The restricted bands are listed in FCC Part 15.205 and the maximum permitted average field strength for the restricted band is listed in Part 15.209. The data in this report represents the worst case modes.

5.2 RADIATED EMISSION TEST DATA RECEIVER/DIGITAL INTERFACE

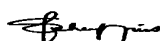
TABLE 5-1: RADIATED EMISSIONS RECEIVING CH 1

Temperature: 73°F Humidity: 42%									
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)
110.599	Qp	H	90	1.0	57.7	-16.7	41.0	43.5	-2.5
165.890	Qp	H	90	2.0	54.5	-17.8	36.7	43.5	-6.8
184.326	Qp	H	145	2.0	53.2	-18.5	34.7	43.5	-8.8
202.744	Qp	H	75	1.8	55.9	-17.8	38.1	43.5	-5.4
221.180	Qp	H	0	2.0	55.1	-17.3	37.8	46.0	-8.2
239.597	Qp	V	270	1.0	53.1	-15.6	37.5	46.0	-8.5
258.033	Qp	V	90	1.0	50.9	-14.6	36.3	46.0	-9.7
368.649	Qp	V	90	1.0	44.1	-11.0	33.1	46.0	-12.9
405.521	Qp	V	145	1.0	37.2	-10.1	27.1	46.0	-18.9
552.938	Qp	H	0	1.8	47.0	-6.9	40.1	46.0	-5.9

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

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

05/16/2002
Date Of Test

TABLE 5-2: RADIATED EMISSIONS RECEIVING CHANNEL 6

Temperature: 73°F					Humidity: 42%				
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)
110.579	Qp	H	90	1.8	56.7	-16.7	40.0	43.5	-3.5
165.887	Qp	H	90	1.6	55.2	-17.8	37.4	43.5	-6.1
184.323	Qp	H	180	1.8	53.5	-18.5	35.0	43.5	-8.5
202.759	Qp	H	90	1.4	53.6	-17.8	35.8	43.5	-7.7
221.158	Qp	H	270	1.6	55.9	-17.3	38.6	46.0	-7.4
239.594	Qp	H	90	1.3	54.8	-15.6	39.2	46.0	-6.8
294.890	Qp	H	145	1.5	53.3	-13.6	39.7	46.0	-6.3
331.762	Qp	H	145	1.0	52.6	-12.4	40.2	46.0	-5.8
516.079	Qp	H	225	1.0	45.4	-7.5	37.9	46.0	-8.1

Qp: RES. =100 kHz, VID= 100 kHz

TEST PERSONNEL:

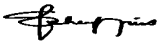
Franck Schuppious		05/16/2002
Test Technician/Engineer	Signature	Date Of Test

TABLE 5-3 RADIATED EMISSIONS RECEIVING CH 11

Temperature: 73°F					Humidity: 42%				
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)
110.584	Qp	H	90	1.3	55.6	-16.7	38.9	43.5	-4.6
165.876	Qp	H	270	1.0	53.3	-17.8	35.5	43.5	-8.0
202.748	Qp	H	0	1.0	55.5	-17.8	37.7	43.5	-5.8
258.042	Qp	H	145	1.0	54.1	-14.1	40.0	46.0	-6.0
276.478	Qp	H	180	1.0	53.8	-13.9	39.9	46.0	-6.1
294.906	Qp	H	145	1.0	54.9	-13.6	41.3	46.0	-4.7
331.755	Qp	H	270	1.0	53.4	-12.4	41.0	46.0	-5.0
368.615	Qp	H	275	1.0	52.0	-11.1	40.9	46.0	-5.1
405.479	Qp	H	270	1.0	50.6	-9.7	40.9	46.0	-5.1
442.351	Qp	H	90	1.0	47.4	-8.9	38.5	46.0	-7.5
479.208	Qp	H	180	1.0	48.0	-8.2	39.8	46.0	-6.2
516.079	Qp	H	145	1.0	47.6	-7.5	40.1	46.0	-5.9

Qp: RES. =100 kHz, VID= 100 kHz

TEST PERSONNEL:

Franck Schuppious		05/17/2002
Test Technician/Engineer	Signature	Date Of Test

6 RADIATED EMISSION RADIATED HARMONICS/SPURIOUS NOISE - §15.247

6.1 RADIATED EMISSION TEST PROCEDURE FOR HARMONICS/SPURIOUS NOISE

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands when the EUT is configured in the transmit mode. 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 plane from 10 kHz to the 10th harmonic of the fundamental. The data in this report represents the worst case modes.

Operating Frequency (MHz): 2412
Channel: 1
Measured Cond. Pwr. (dBm): 21.9

Measured EIRP (dBm): 26.1
Antenna: Patch antenna

6.2 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA

TABLE 6-1: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1)

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)
2412.000	Av	V	45	1.5	79.6	26	105.6	Fundamental
2412.000	Pk	V	45	1.5	87.7	26	113.7	Fundamental
4824.000	Av	V	45	1.5	<20 dB			54.0
7236.000	Av	V	45	1.5	<20 dB			54.0
9648.000	Av	V	45	1.5	<20 dB			54.0
12060.000	Av	V	45	1.5	<20 dB			54.0
14472.000	Av	V	45	1.5	<20 dB			54.0
16884.000	Av	V	45	1.5	<20 dB			54.0
19296.000	Av	V	45	1.5	<20 dB			54.0
21708.000	Av	V	45	1.5	<20 dB			54.0
24120.000	Av	V	45	1.5	<20 dB			54.0

PEAK: RES. =1 MHz, VID= 1MHz; AVERAGE: RES. =1 MHz, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

5/20/2002
Date Of Test

Operating Frequency (MHz): 2437
Channel: 6
Measured Cond. Pwr. (dBm): 21.4

Measured EIRP (dBm): 25.9
Antenna: Patch antenna

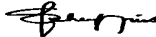
TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6)

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)
2437.000	Av	V	45	1.5	78.4	26	104.4	Fundamental
2437.000	Pk	V	45	1.5	86.7	26	112.7	Fundamental
4874.000	Av	V	45	1.5	<20 dB			54.0
7311.000	Av	V	45	1.5	<20 dB			54.0
9748.000	Av	V	45	1.5	<20 dB			54.0
12185.000	Av	V	45	1.5	<20 dB			54.0
14622.000	Av	V	45	1.5	<20 dB			54.0
17059.000	Av	V	45	1.5	<20 dB			54.0
19496.000	Av	V	45	1.5	<20 dB			54.0
21933.000	Av	V	45	1.5	<20 dB			54.0
24370.000	Av	V	45	1.5	<20 dB			54.0

AVERAGE: RES. =1 MHz, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

5/20/2002
Date Of Test

Operating Frequency (MHz): 2462
Channel: 11
Measured Cond. Pwr. (dBm): 21.4

Measured EIRP (dBm): 25.4
Antenna: Patch antenna

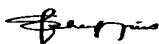
TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11)

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)
2462.000	Av	V	45	1.5	78.1	26	104.1	Fundamental
2462.000	Pk	V	45	1.5	86.2	26	112.2	Fundamental
4924.000	Av	V	45	1.5	<20 dB			54.0
7386.000	Av	V	45	1.5	<20 dB			54.0
9848.000	Av	V	45	1.5	<20 dB			54.0
12310.000	Av	V	45	1.5	<20 dB			54.0
14772.000	Av	V	45	1.5	<20 dB			54.0
17234.000	Av	V	45	1.5	<20 dB			54.0
19696.000	Av	V	45	1.5	<20 dB			54.0
22158.000	Av	V	45	1.5	<20 dB			54.0
24620.000	Av	V	45	1.5	<20 dB			54.0

AVERAGE: RES. = 1 MHz, VID= 10Hz; NF = NOISE FLOOR; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

5/20/2002
Date Of Test

6.3 TEST EQUIPMENT USED FOR TESTING

TABLE 6-4: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900321	EMCO	3161-03	Horn Antennas (4-8,2GHz)	9508-1020
900323	EMCO	3160-7	Horn Antennas (8,2-12,4 GHz)	9605-1054
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051
900723	Miteq	NA	AMP 100MHz-26GHz	NA
900791	Schaffner - Chase	CBL6112	Antenna (25 MHz - 2 GHz)	2099

7 MODULATED BANDWIDTH - §15.247(A)(2)

7.1 MODULATED BANDWIDTH TEST PROCEDURE

The minimum 6 dB bandwidth per FCC 15.247 (a)(2) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The minimum 6 dB modulated bandwidths are the following:

7.2 TEST EQUIPMENT USED FOR TESTING

TABLE 7-1: TEST EQUIPMENT USED FOR TESTING (MODULATED BANDWIDTH)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

7.3 MODULATED BANDWIDTH TEST DATA

TABLE 7-2: MINIMUM 6 DB MODULATED BANDWIDTHS

CHANNEL	6 dB BANDWIDTH (MHz)
1	9.95
6	9.75
11	9.55

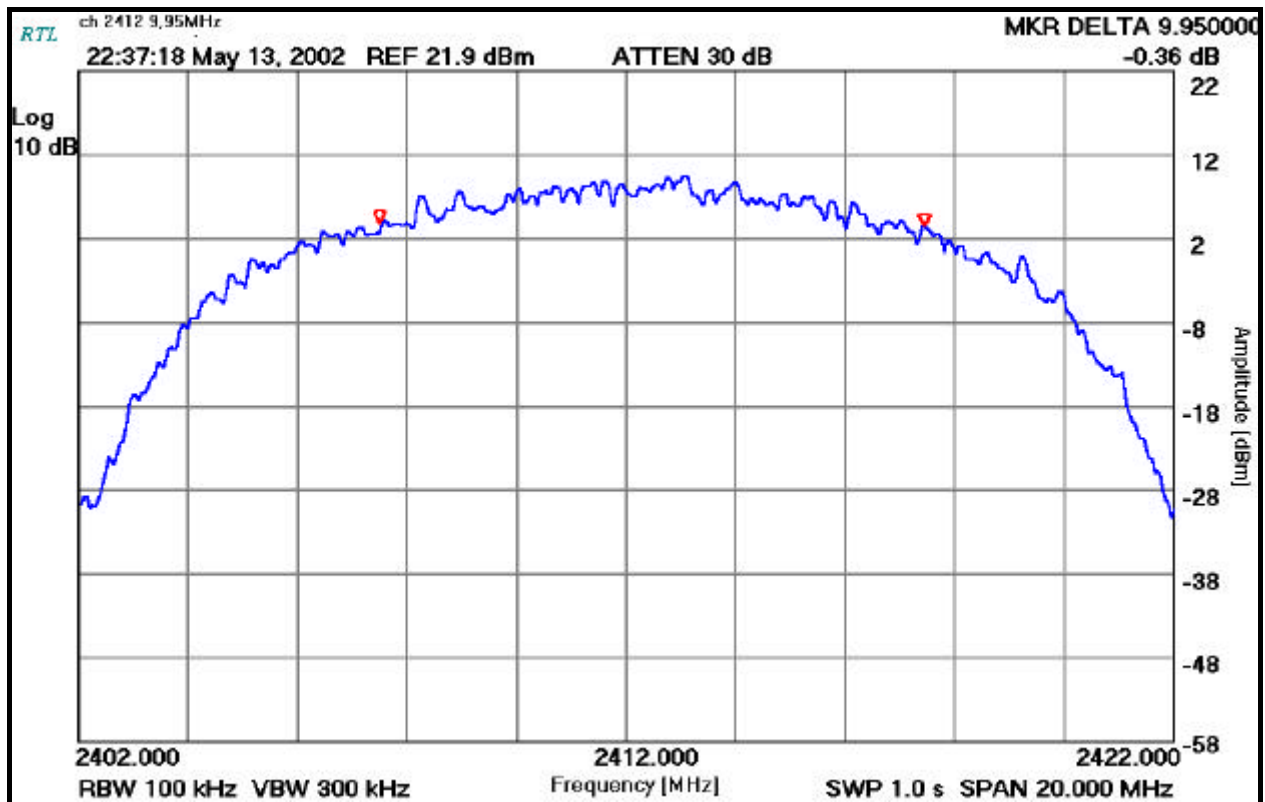
TEST PERSONNEL:

Franck Schuppis		5/13/2002
Test Technician/Engineer	Signature	Date Of Test

7.4 MODULATED BANDWIDTH PLOTS

Channel Number: 1
Frequency (MHz): 2412
Resolution Bandwidth: 100kHz
Video Bandwidth: 300kHz
Sweep Time: 1.0s

PLOT 7-1: MODULATED BANDWIDTH CHANNEL 1



TEST PERSONNEL:

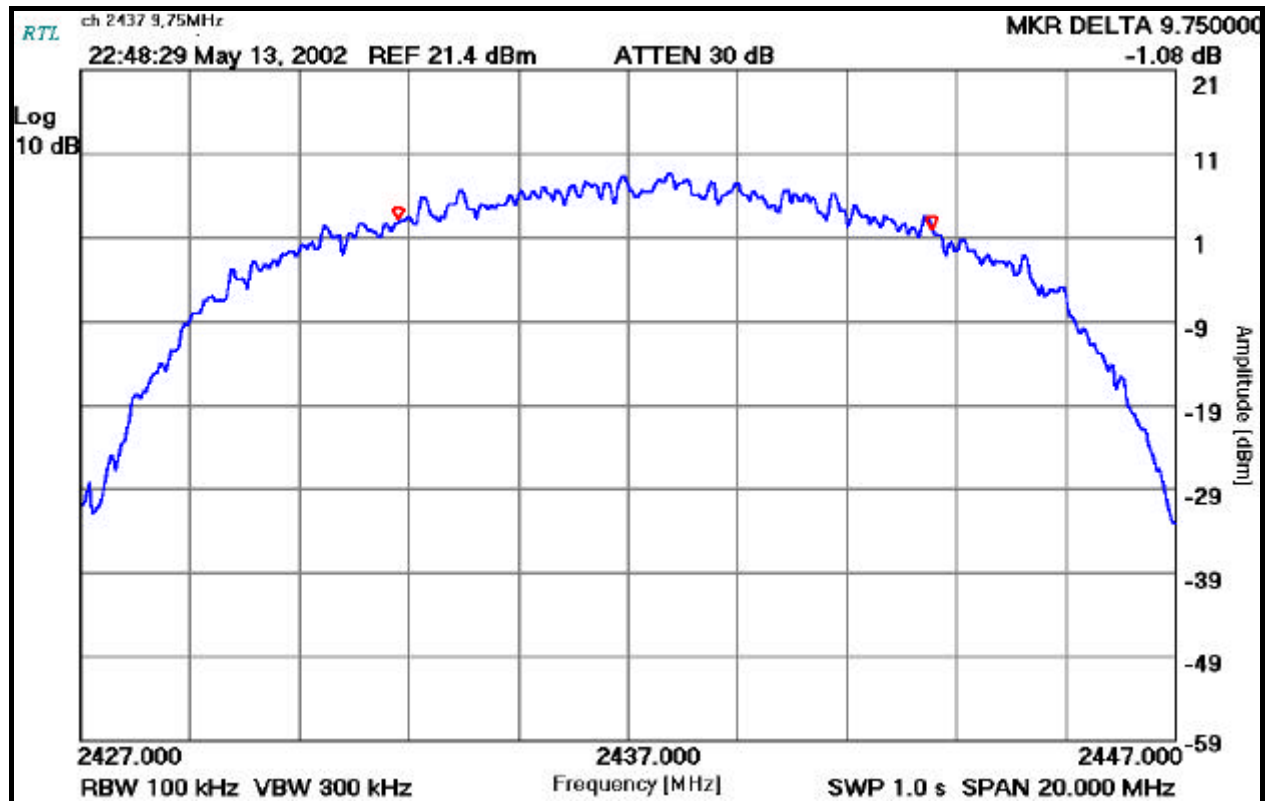
Franck Schuppis
Test Technician/Engineer

Franck Schuppis
Signature

05/13/2002
Date Of Test

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

PLOT 7-2: MODULATED BANDWIDTH CHANNEL 6



TEST PERSONNEL:

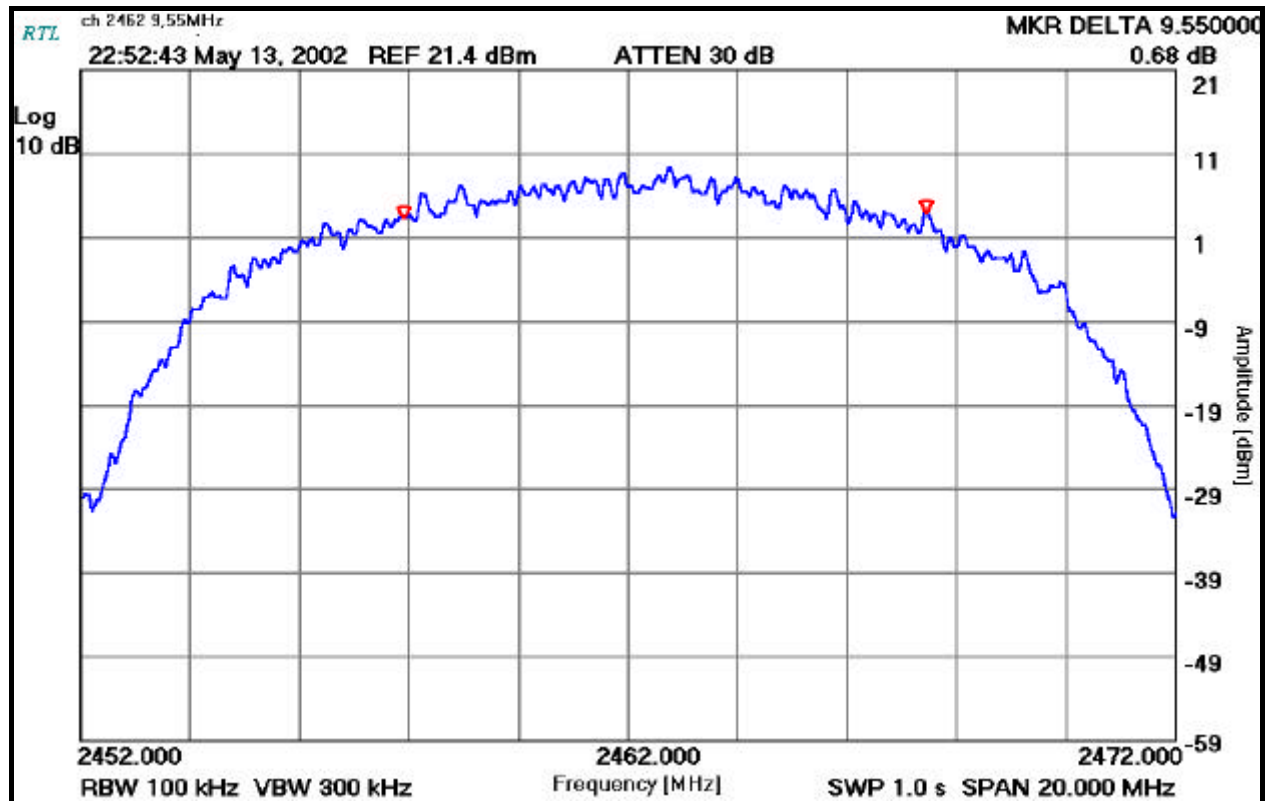
Franck Schuppius
 Test Technician/Engineer

[Signature]
 Signature

05/13/2002
 Date Of Test

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

PLOT 7-3: MODULATED BANDWIDTH CHANNEL 11



TEST PERSONNEL:

Franck Schuppis
 Test Technician/Engineer

[Signature]
 Signature

05/13/2002
 Date Of Test

8 POWER OUTPUT - §15.247(B)

8.1 POWER OUTPUT TEST PROCEDURE

The peak conducted output power of the EUT was measured using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor. The EIRP measurement was performed as a radiated test using the substitution method

8.2 TEST EQUIPMENT USED FOR TESTING

TABLE 8-1: TEST EQUIPMENT USED FOR TESTING (RADIATED RF OUTPUT – EIRP)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
901186	Agilent Technologies	E9323A (50MHz-6GHz)	Peak & Avg. Power Sensor	US40410380
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900723	Miteq	NA	AMP 100MHz-26GHz	NA
900814	Electro-Metrics	RGA-60	Double Ridges Guide Antenna (1-18 GHz)	2310

8.3 POWER OUTPUT TEST DATA

TABLE 8-2: POWER OUTPUT TEST DATA

Operating Frequency (MHz): 2412MHz, 2437MHz, 2462MHz
Channel: 1, 6 & 11
Measured Cond. Pwr. (dBm): 21.9, 21.4, 21.4
Measured EIRP (dBm): 26.1, 25.9, 25.4
Modulation bandwidth: 9.95MHz
Antenna: Patch Antenna

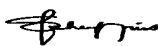
TABLE 8-3: POWER OUTPUT TEST DATA

CHANNEL	EIRP (dBm)*	POWER CONDUCTED OUTPUT (dBm)
1	26.1	21.9
6	25.9	21.4
11	25.4	21.4

*Measurement accuracy is +/- 1.5 dB

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

5/13/2002
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 2.412GHz for Channel 1, 2.437GHz for Channel 6 and 2.462GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9kHz to the carriers 10th harmonic. See antenna conducted spurious noise table.

Channels 1, 6, and 11 were investigated and tested.

9.2 ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1

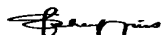
Operating Frequency (MHz): 2412
Channel: 1
Measured Cond. Pwr. (dBm): 21.9
Measured EIRP (dBm): 26.1
Conducted Spurious Limit: -38.93

TABLE 9-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBm)	Corrected Measured Level (dBc)	Margin (dB)
4824	-68.2	2.3	-65.9	47.0	-27.0
7236	-65.6	2.4	-63.2	44.3	-24.3
9648	-66.9	9.3	-57.63	38.7	-18.7
12060	-66.6	6.7	-59.9	41.0	-21.0
14472	-63.4	6.5	-56.9	38.0	-18.0
16884	-65.6	8.8	-56.8	37.9	-17.9
19296	-63.1	8.8	-54.3	35.4	-15.4
21708	-65.1	8.4	-56.7	37.8	-17.8
24120	-60.9	8.4	-52.5	33.6	-13.6

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer


Signature

5/13/2002
Date Of Test

9.3 ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6

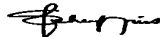
Operating Frequency (MHz): 2437
 Channel: 6
 Measured Cond. Pwr. (dBm): 21.4
 Measured EIRP (dBm): 25.9
 Conducted Spurious Limit: -38.6

TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBm)	Corrected Measured Level (dBc)	Margin (dB)
4824	-68.4	2.3	-66.1	47.5	-27.5
7236	-66.5	2.4	-64.1	45.5	-25.5
9648	-66.3	9.3	-57.0	38.4	-18.4
12060	-66.2	6.7	-59.5	40.9	-20.9
14472	-63.5	6.5	-57.0	38.4	-18.4
16884	-64.5	8.8	-55.7	37.1	-17.1
19296	-63.0	8.8	-54.2	35.6	-15.6
21708	-65.2	8.4	-56.8	38.2	-18.2
24120	-60.1	8.4	-51.7	33.1	-13.1

TEST PERSONNEL:

Franck Schuppius
 Test Technician/Engineer


 Signature

5/13/2002
 Date Of Test

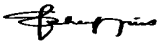
9.4 ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11

Operating Frequency (MHz): 2462
Channel: 11
Measured Cond. Pwr. (dBm): 21.4
Measured EIRP (dBm): 25.4
Conducted Spurious Limit: -38.3

TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBm)	Corrected Measured Level (dBc)	Margin (dB)
4824	-68.0	2.3	-65.7	47.4	-27.4
7236	-67.1	2.4	-64.7	46.4	-26.4
9648	-65.9	9.3	-56.6	38.3	-18.3
12060	-66.2	6.7	-59.5	41.2	-21.2
14472	-65.6	6.5	-59.1	40.8	-20.8
16884	-64.9	8.8	-56.1	37.8	-17.8
19296	-62.3	8.8	-53.5	35.2	-15.2
21708	-65.4	8.4	-57.0	38.7	-18.7
24120	-60.3	8.4	-51.9	33.6	-13.6

TEST PERSONNEL:

Franck Schuppious		5/13/2002
Test Technician/Engineer	Signature	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 3kHz, the video bandwidth set at 30kHz, and the sweep time set at 1000 second. Since the EUT has an integral antenna, the test was performed as a radiated testing. The 6 dB value on the bandwidth plots were corrected using the site correction factor (i.e. cable loss, amplifier gain, and antenna factor) and the path loss at 3 meter distance; and referenced to the EIRP value measured in section 7 of this report. The spectral lines were resolved for the modulated carriers at 2.412GHz, 2.437GHz, and 2.462GHz respectively. These levels are well below the +8 dBm limit. See power spectral density table and plots.

10.2 TEST EQUIPMENT USED FOR TESTING

TABLE 10-1: TEST EQUIPMENT USED FOR TESTING (POWER SPECTRAL DENSITY)

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

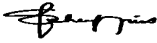
10.3 POWER SPECTRAL DENSITY TEST DATA

Operating Frequency (MHz): 2412MHz, 2437MHz & 2462MHz
Channel: 1, 6 & 11
Measured Cond. Pwr. (dBm): 21.9, 21.4, 21.4
Modulation Bandwidth: 10.3 MHz
Power Spectral Density Limit: +8dBm

TABLE 10-2: POWER SPECTRAL DENSITY

CHANNEL	POWER SPECTRAL DENSITY LIMIT = +8dBm
1	-31.6
6	-30.1
11	-30.3

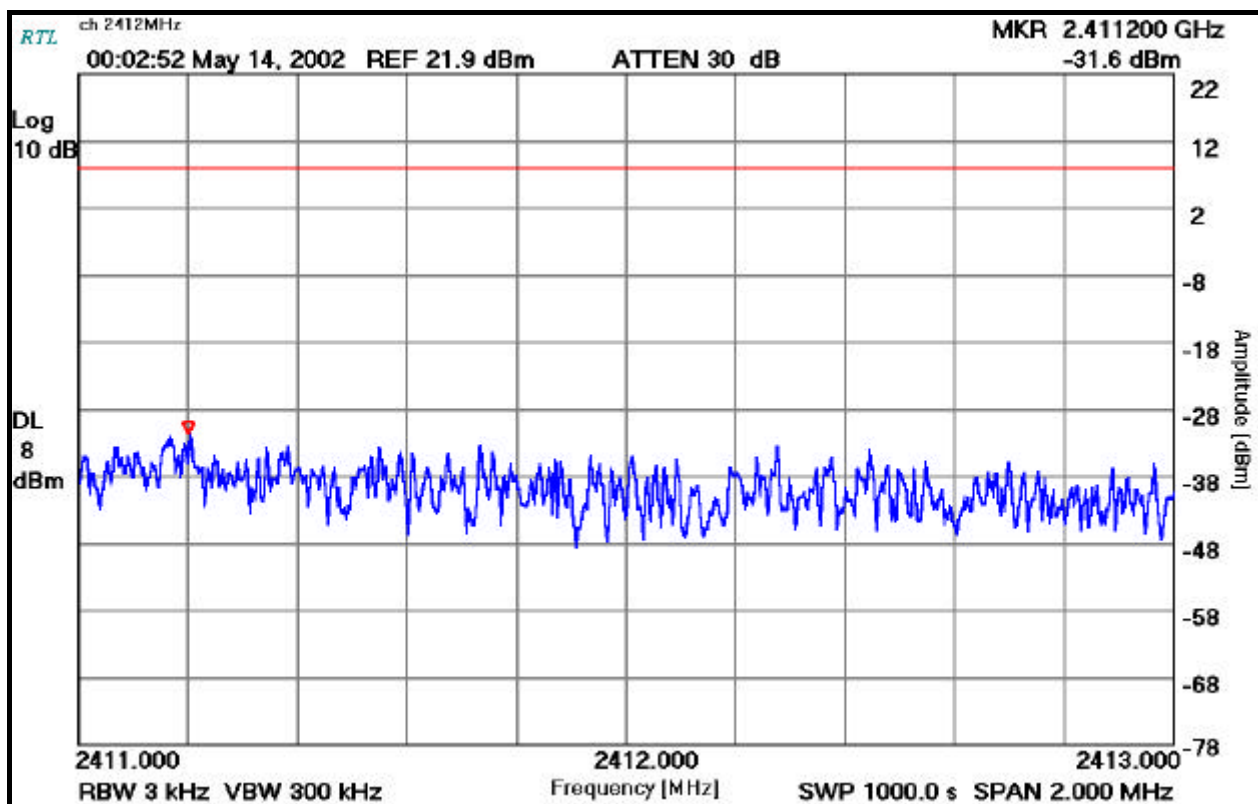
TEST PERSONNEL:

Franck Schuppius		5/14/2002
Test Technician/Engineer	Signature	Date Of Test

10.4 POWER SPECTRAL DENSITY PLOTS

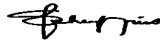
Operating Frequency (MHz): 2412
 Channel: 1
 Measured Cond. Pwr. (dBm): 21.9
 Measured EIRP (dBm): 26.1
 Bandwidth Resolution: 3kHz
 Bandwidth Video: 300kHz
 Sweep Time: 1000.0s

PLOT 10-1: POWER SPECTRAL DENSITY: CHANNEL 1



TEST PERSONNEL:

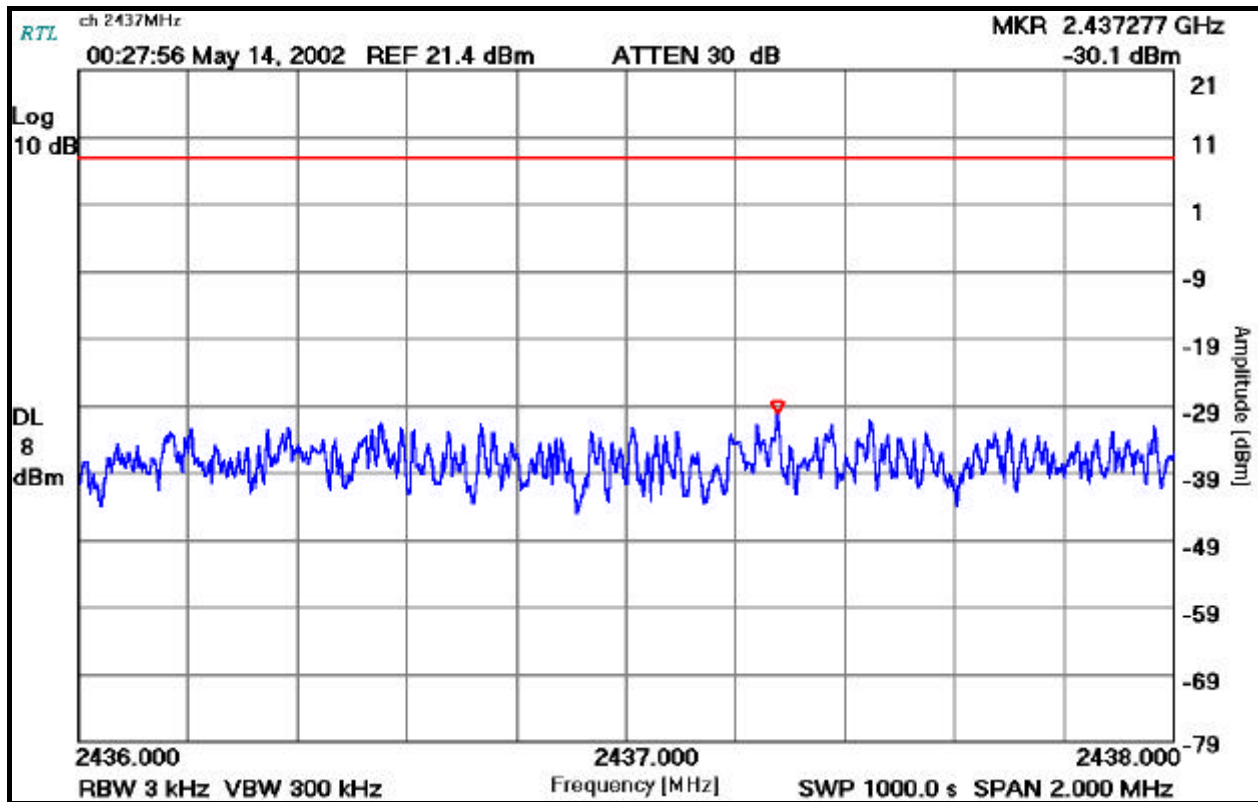
Franck Schuppiss
 Test Technician/Engineer


 Signature

05/14/2002
 Date Of Test

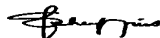
Operating Frequency (MHz): 2437
 Channel: 6
 Measured Cond. Pwr. (dBm): 21.4
 Measured EIRP (dBm): 25.9
 Bandwidth Resolution: 3kHz
 Bandwidth Video: 300kHz
 Sweep Time: 1000.0s

PLOT 10-2: POWER SPECTRAL DENSITY: CHANNEL 6



TEST PERSONNEL:

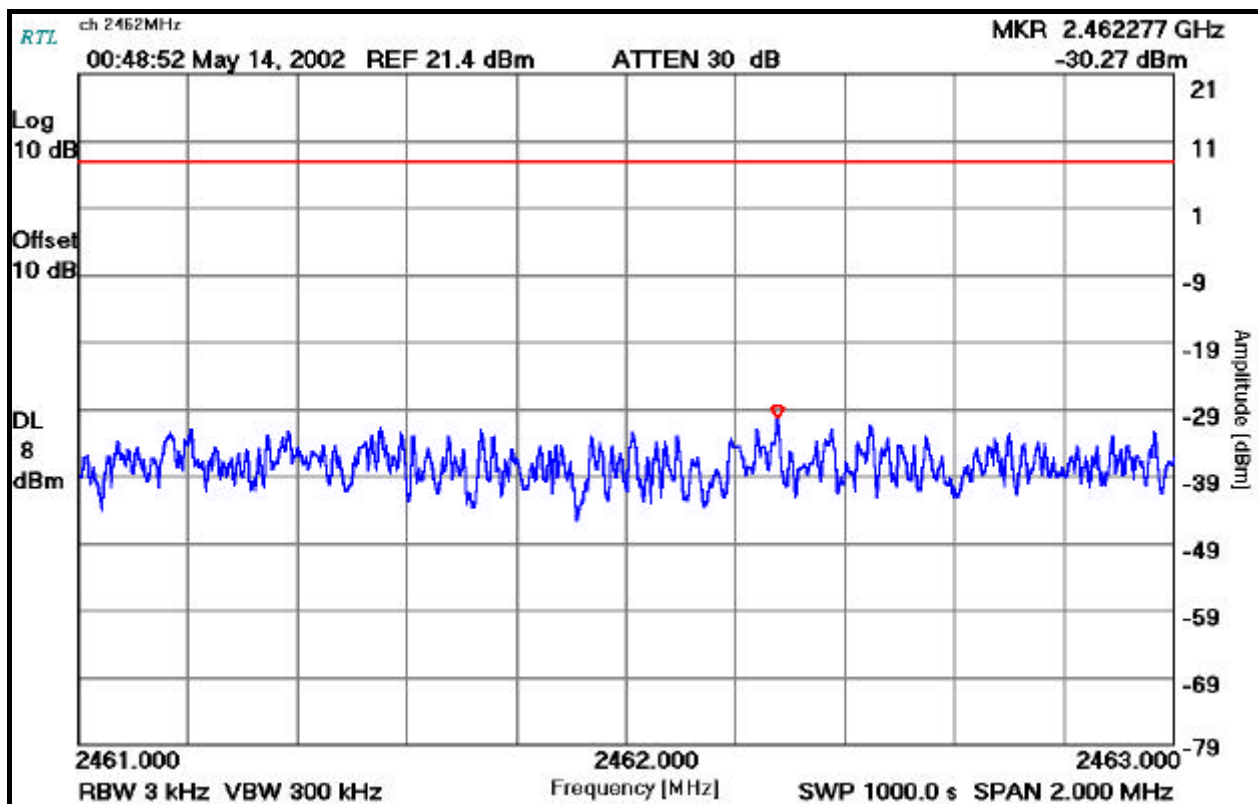
Franck Schuppious
 Test Technician/Engineer


 Signature

05/14/2002
 Date Of Test

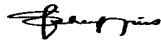
Operating Frequency (MHz): 2462
Channel: 11
Measured Cond. Pwr. (dBm): 21.4
Measured EIRP (dBm): 25.4
Bandwidth Resolution: 3kHz
Bandwidth Video: 300kHz
Sweep Time: 1000.0s

PLOT 10-3: POWER SPECTRAL DENSITY: CHANNEL 11



TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

05/14/2002
Date Of Test

11 CONCLUSION

The data in this measurement report shows that Zebra Model: QL320, FCC ID: I28-QL320352 complies with all the requirements of Parts 2 and 15 of the FCC Rules, Industry Canada RSS-210, ANSI 63.4, DA00-705 (FHSS) and FCC 97-114 (DSSS).