Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247 & INDUSTRY CANADA RSS-210

Test Lab:	Applicant:
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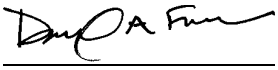
FCC ID	RIM-ICFR	**GRANTEE FRN NUMBER**	0009610718
PLAT FORM	PDAs with a mini-PCI slot	**RTL WORK ORDER NUMBER**	2003153
MODEL NUMBER / NAME	*i*CFR	**RTL QUOTE NUMBER**	QRTL03-970
DATE OF TEST REPORT	October 30, 2003		

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 Frequency Hopping
FCC Rule Part(s)	Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Frequency Hopping 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)	Power output (W)	Frequency Tolerance	Emission Designator
902 – 928	0.007	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.

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

Signature:  Date: October 30, 2003

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. FCC DA 00-705 Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems was also used for guidance.

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.

The EUT utilizes a frequency hopping system operating in the 902 – 928 MHz band.

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 FCC ID: RIM-ICFR.

1.4 MODIFICATIONS

Initially, transmit spurious emissions were failing. The modifications described below were performed to achieve compliance. The manufacturer understands that these exact modifications must be performed on all production units.

A pi low pass filter comprising two capacitors to ground and a series inductor was implemented before the PCB antenna. The filter roll-off nominally starts at about 1 GHz, thus providing some attenuation at the second harmonic and more at the third harmonic where it was most needed. Higher harmonics were present and these were found to be exacerbated by overdriving the PA stage beyond its recommended level. The correct drive level was programmed into the driver chip to rectify this problem.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. 902.4914 MHz, 914.6038 MHz and 927.7695 MHz were tested and investigated from 9 kHz to 9.3 GHz. Data for all three frequencies is presented in this report.

The EUT is a mini-PCI card for use in PDA's. A SAR evaluation was not required because of the low power levels. The digital and receiver portions of the *i*CFR are subject to verification under FCC Part 15; a verification test report is held by the manufacturer and test lab.

2.2 EXERCISING THE EUT

The EUT was provided with software to continuously transmit on one channel or in the hopping mode during testing. The carrier was also checked to verify that information was being transmitted.

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)	Modulated Bandwidth	Pass
FCC 15.247(b)	Power Output	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions	N/A

2.4 TEST SYSTEM DETAILS

The FCC identifiers for all applicable 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 IDENTIFIER	CABLE DESCRIPTION	RTL BARCODE
Mini PCI card	Luna iMonitoring	*i*CFR	1180017	RIM-ICFR	N/A	15425

TABLE 2-3: SUPPORT EQUIPMENT

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC IDENTIFIER	CABLE DESCRIPTION	RTL BARCODE
Pocket PC	Dell	AXIM X5 - HC01U	TW-0W0772-70161-32N-C0CV	DoC	N/A	15413
Pocket PC	Toshiba	MAESTRO	091137738A	DoC	N/A	15403
Pocket PC	Compaq	PAQ	4G26DW33C107	DoC	N/A	15402

2.5 CONFIGURATION OF TESTED SYSTEM

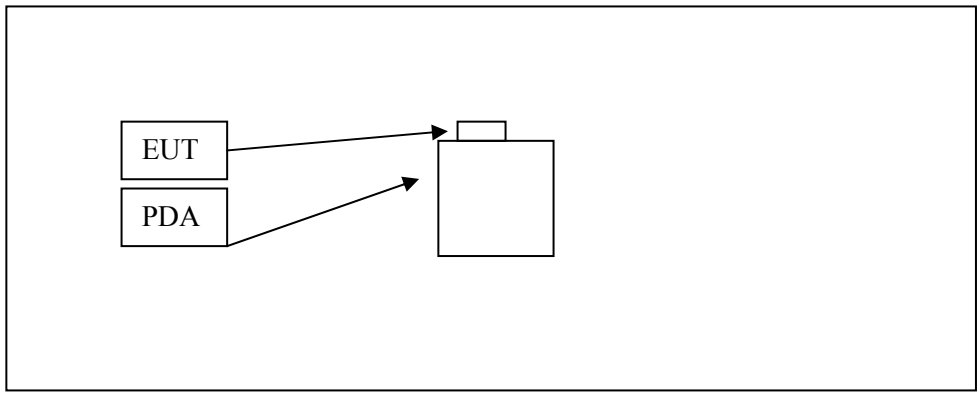


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH FCC §15.31(m)

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, three frequencies were investigated for those tests that required the hopping function to be disabled. The following frequencies were tested: 902.4914 MHz, 914.6038 MHz and 927.7695 MHz.

4 COMPLIANCE WITH FCC §15.203

The antenna is implemented on the PCB, and is therefore permanently attached and meets the requirement of this section.

5 COMPLIANCE WITH FCC §15.204

Because the antenna is implemented on the PCB and there is no provision for the use of an external antenna, the EUT inherently meets the requirements of 15.204(c).

6 COMPLIANCE WITH THE BAND EDGE – FCC §15.247(c), §15.205; IC RSS-210 §6.3

6.1 TEST PROCEDURE

Compliance with the band edges was performed using the FCC's "Radiated Measurement at a Band Edge" guidance document. The data taken in this report represents the worst case operation.

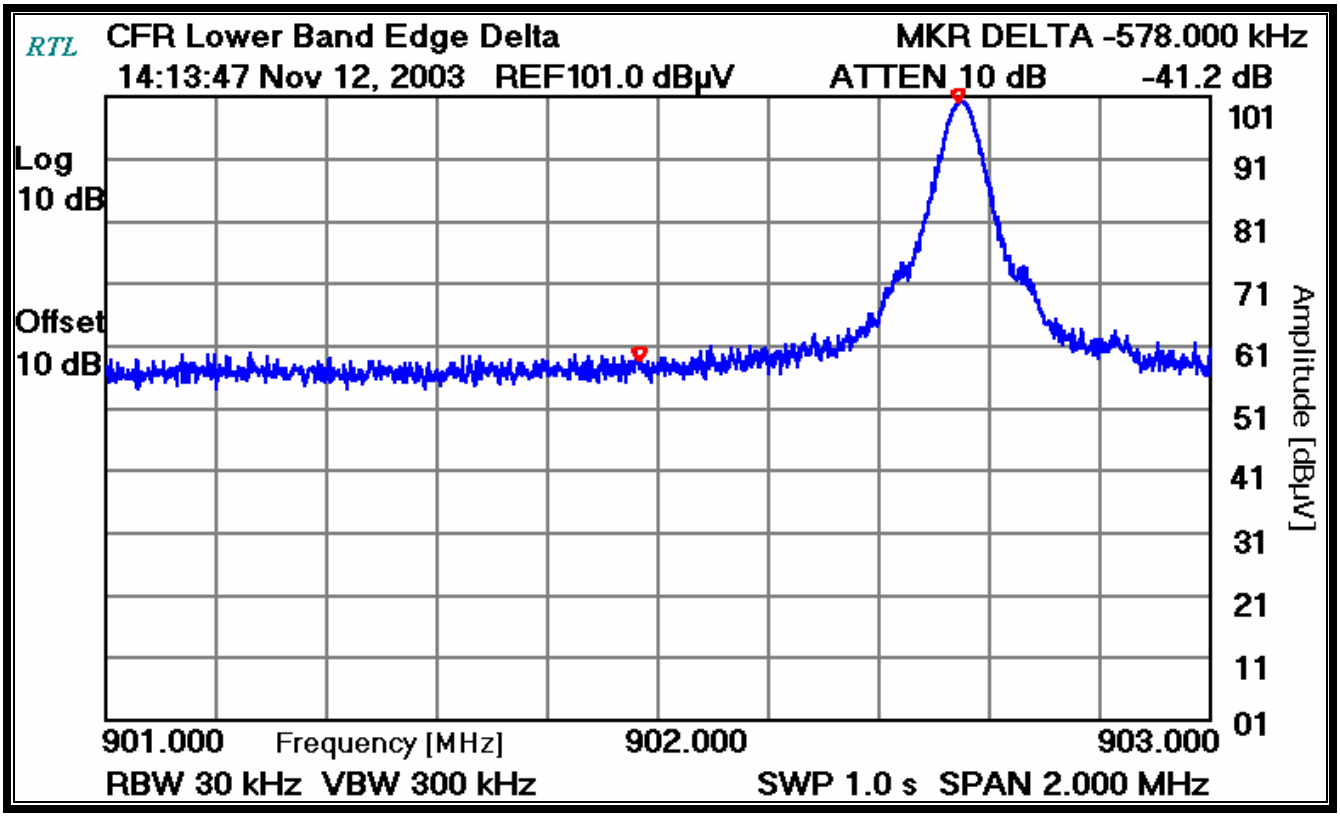
6.2 BAND EDGE TEST EQUIPMENT

TABLE 6-1: BAND EDGE TEST EQUIPMENT

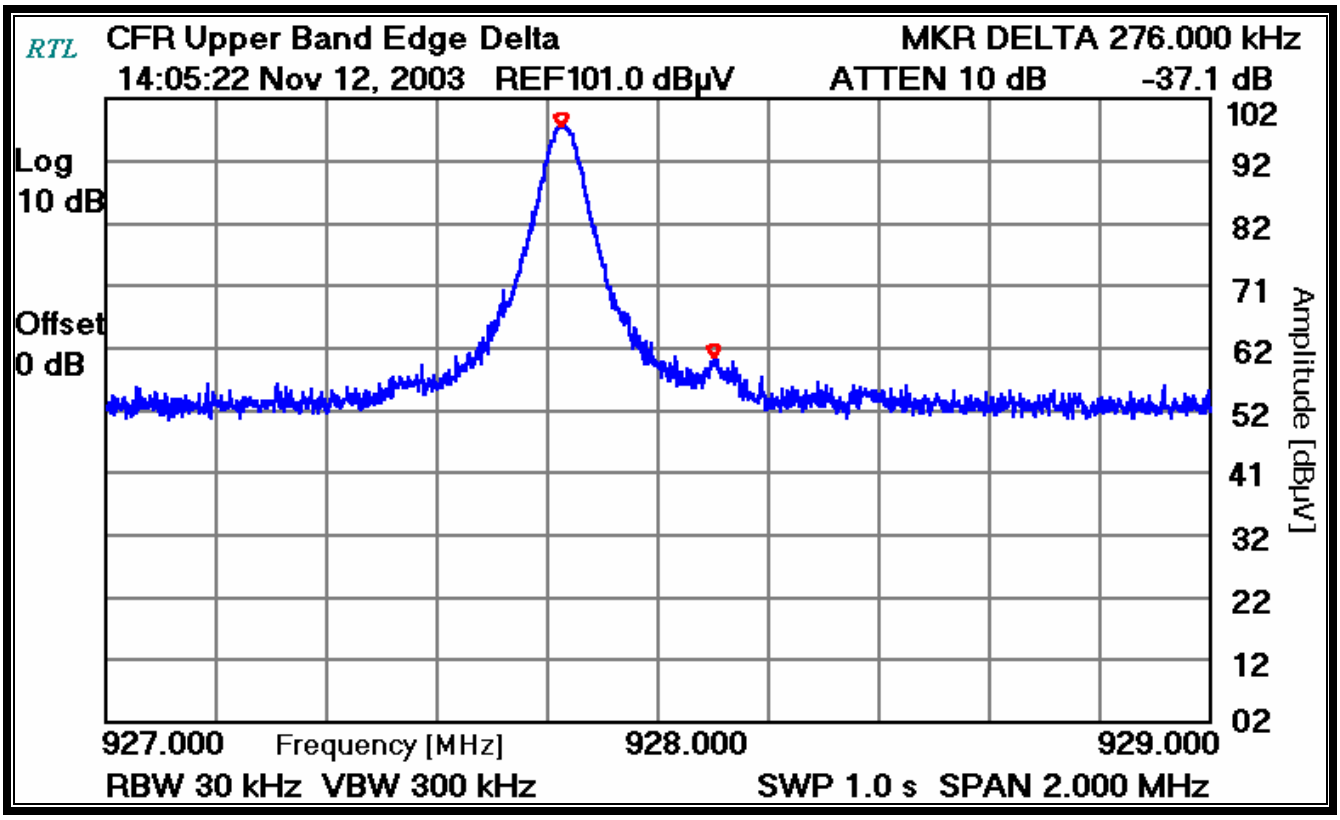
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	7/03/04
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	5/12/04
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/12/04

6.3 RESTRICTED BAND EDGE PLOTS

PLOT 6-1: LOWER BAND EDGE: MARKER-DELTA METHOD (TX FREQUENCY: 902.4914 MHZ)



PLOT 6-2: UPPER BAND EDGE: MARKER-DELTA METHOD (TX FREQUENCY: 927.7695 MHZ)



TEST PERSONNEL:

Rachid Sehb		November 12, 2003
Test Engineer	Signature	Dates Of Test

7 CONDUCTED LIMITS - §15.207

7.1 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 microhenry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

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

7.2 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.

7.3 CONDUCTED LINE TEST EQUIPMENT

TABLE 7-1: 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	5/12/04
901084	AFJ international	LS16	16A LISN	16010020082	11/4/03

7.4 CONDUCTED LINE EMISSION TEST DATA

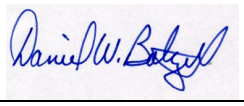
TABLE 7-2: CONDUCTED EMISSIONS (NEUTRAL SIDE)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	Limit (dBuV)	Margin (dBuV)
0.179	Pk	52.5	1.8	54.3	64.5	-10.2
0.183	Av	34.6	1.7	36.3	64.3	-28.0
0.185	Qp	46.8	1.7	48.5	64.3	-15.8
0.245	Pk	46.6	1.3	47.9	61.9	-14.0
0.430	Pk	35.7	0.8	36.5	57.3	-20.8
6.390	Pk	29.6	1.8	31.4	60.0	-28.6

TABLE 7-3: CONDUCTED EMISSIONS (PHASE SIDE)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	Limit (dBuV)	Margin (dBuV)
0.154	Pk	54.5	2.0	56.5	65.8	-9.3
0.184	Av	27.9	1.7	29.6	64.3	-34.7
0.184	Qp	43.4	1.7	45.1	64.3	-19.2
0.243	Pk	45.4	1.3	46.7	62.0	-15.3
0.372	Pk	36.8	0.8	37.6	58.5	-20.9
6.450	Pk	33.2	1.8	35.0	60.0	-25.0

TEST PERSONNEL:



Daniel W. Baltzell		September 22, 2003
EMC Test Engineer	Signature	Date Of Test

8 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE – FCC §15.209; IC RSS-210 §7.3

8.1 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE

Emissions from the digital portion of the transceiver circuitry and the receiver of the EUT were tested and found to comply with the requirements of FCC Part 15.209. Digital emissions from the non-transceiver circuitry are subject to verification and are provided in a separate verification report held by the manufacturer and test laboratory.

8.2 RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT

TABLE 8-1: 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	3/5/04
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	9/15/04
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/12/04
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	7/03/04
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	5/12/04
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/12/04

8.3 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA

TABLE 8-2: DIGITAL INTERFACE RADIATED EMISSION (*I*CFR)

Temperature: 74°F Humidity: 43%									
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)**
368.660	Qp	H	0	1.0	31.3	-12.7	18.6	46.0	-27.4
427.647	Qp	H	90	1.0	31.4	-11.0	20.4	46.0	-25.6
575.101	Qp	H	0	1.0	28.5	-8.2	20.3	46.0	-25.7
796.301	Qp	H	180	1.5	34.3	-5.3	29.0	46.0	-17.0
825.795	Qp	H	180	1.0	33.6	-4.9	28.7	46.0	-17.3
870.032	Qp	H	0	1.0	31.5	-4.0	27.5	46.0	-18.5

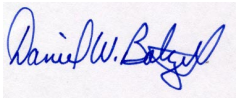
QP: RES. =100 KHZ, VID= 100 KHZ

TABLE 8-3: RECEIVER RADIATED EMISSION (*I*CFR)

Temperature: 77°F Humidity: 43%									
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)**
902.662	Qp	H	180	1.1	41.3	-3.8	37.5	46.0	-8.5
914.769	Qp	H	180	1.4	46.3	-3.7	42.6	46.0	-3.4
927.934	Qp	H	180	1.4	42.9	-3.4	39.5	46.0	-6.5
1805.324	Av	H	180	1.0	23.2	5.7	28.9	54.0	-25.1
1829.537	Av	H	90	1.4	26.8	6.5	33.3	54.0	-20.7
1855.868	Av	H	180	1.0	26.6	7.4	34.0	54.0	-20.0

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

TEST PERSONNEL:



Daniel W. Baltzell		September 23, 2003
EMC Test Engineer	Signature	Date Of Test

9 RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS – FCC §15.247; IC RSS-210 §6.3

9.1 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 3 orthogonal planes.

9.2 RADIATED SPURIOUS TEST EQUIPMENT

TABLE 9-1: 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
900356	EMCO	3160-08	Horn Antennas (12.4 – 18 GHz)	9607-1044	6/10/04
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/10/04
901053	Schaffner &Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	7/3/04
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/12/04
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	5/12/04
900932	Hewlett Packard	8449B	Microwave Preamplifier, (1 - 26.5 GHz)	3008A00505	4/22/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/15/04
901232	IW Microwave Products	KPW-1503-2400-KPS	High Frequency RF Cables	240"	1/30/04
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	1/30/04

9.3 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA

TABLE 9-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (TX FREQUENCY: 902.4914 MHZ)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1805.332	34.6	28.8	29.5	58.3	81.3	-23.0
2707.615	42.6	33.7	10.1	43.8	54.0	-10.2
3610.095	41.1	29.4	11.1	40.5	54.0	-13.5
4512.707	37.7	28.9	14.8	43.7	54.0	-10.3
5415.984	33.1	28.2	13.5	41.7	54.0	-12.3
6318.647	29.8	19.7	13.0	32.7	81.3	-48.6
7220.351	31.3	24.2	12.1	36.3	81.3	-45.0
8122.899	31.8	29.0	11.5	40.5	54.0	-13.5
9025.447	30.2	20.5	16.8	37.3	54.0	-16.7

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TABLE 9-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (TX FREQUENCY: 914.6663 MHZ)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1829.544	36.8	25.1	30.1	55.2	84.4	-29.2
2743.968	43.5	35.5	10.1	45.6	54.0	-8.4
3659.088	40.2	29.3	10.3	39.6	54.0	-14.4
4573.267	37.4	28.6	15.0	43.6	54.0	-10.4
5487.933	35.6	28.5	13.6	42.1	84.4	-42.3
6402.599	32.8	25.5	13.1	38.6	84.4	-45.8
7318.176	34.7	28.7	11.6	40.3	54.0	-13.7
8231.932	34.7	27.0	16.7	43.7	54.0	-10.3
9146.598	31.3	21.2	16.5	37.7	54.0	-16.3

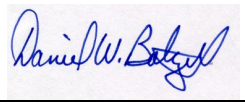
PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TABLE 9-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (TX FREQUENCY: 927.7695 MHZ)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1855.883	37.5	24.6	30.2	54.8	82.0	-27.2
2783.466	44.1	35.3	9.3	44.6	54.0	-9.4
3711.294	40.9	28.8	10.0	38.8	54.0	-15.2
4639.122	33.5	28.5	15.0	43.5	54.0	-10.5
5566.949	34.7	28.1	14.0	42.1	82.0	-39.9
6495.573	30.2	19.5	12.8	32.3	82.0	-49.7
7423.511	29.2	20.3	12.0	32.3	54.0	-21.7
8350.433	32.8	19.8	16.8	36.6	54.0	-17.4
9278.261	31.2	20.7	16.8	37.5	82.0	-44.5

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TEST PERSONNEL:

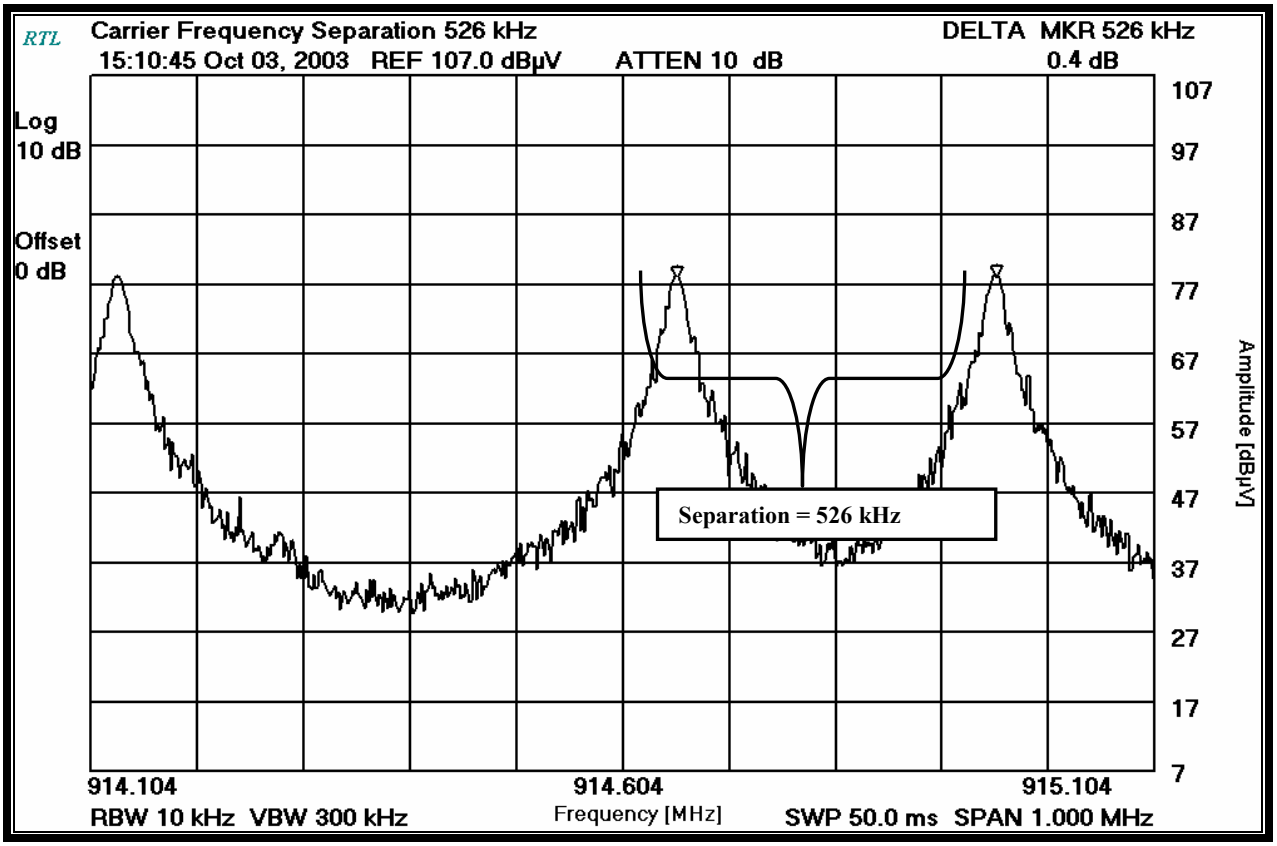


Daniel W. Baltzell		September 26, 2003
EMC Test Engineer	Signature	Date Of Test

10 CARRIER FREQUENCY SEPARATION - §15.247(a)(1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The greatest measured 20 dB bandwidth was 163 kHz; since this is greater than 25 kHz, 163 kHz should be used as the minimum separation. As shown by the plot below, the EUT met this requirement.

PLOT 10-1: CARRIER FREQUENCY SEPARATION



TEST PERSONNEL:

Daniel W. Baltzell		October 3, 2003
EMC Test Engineer	Signature	Date Of Test

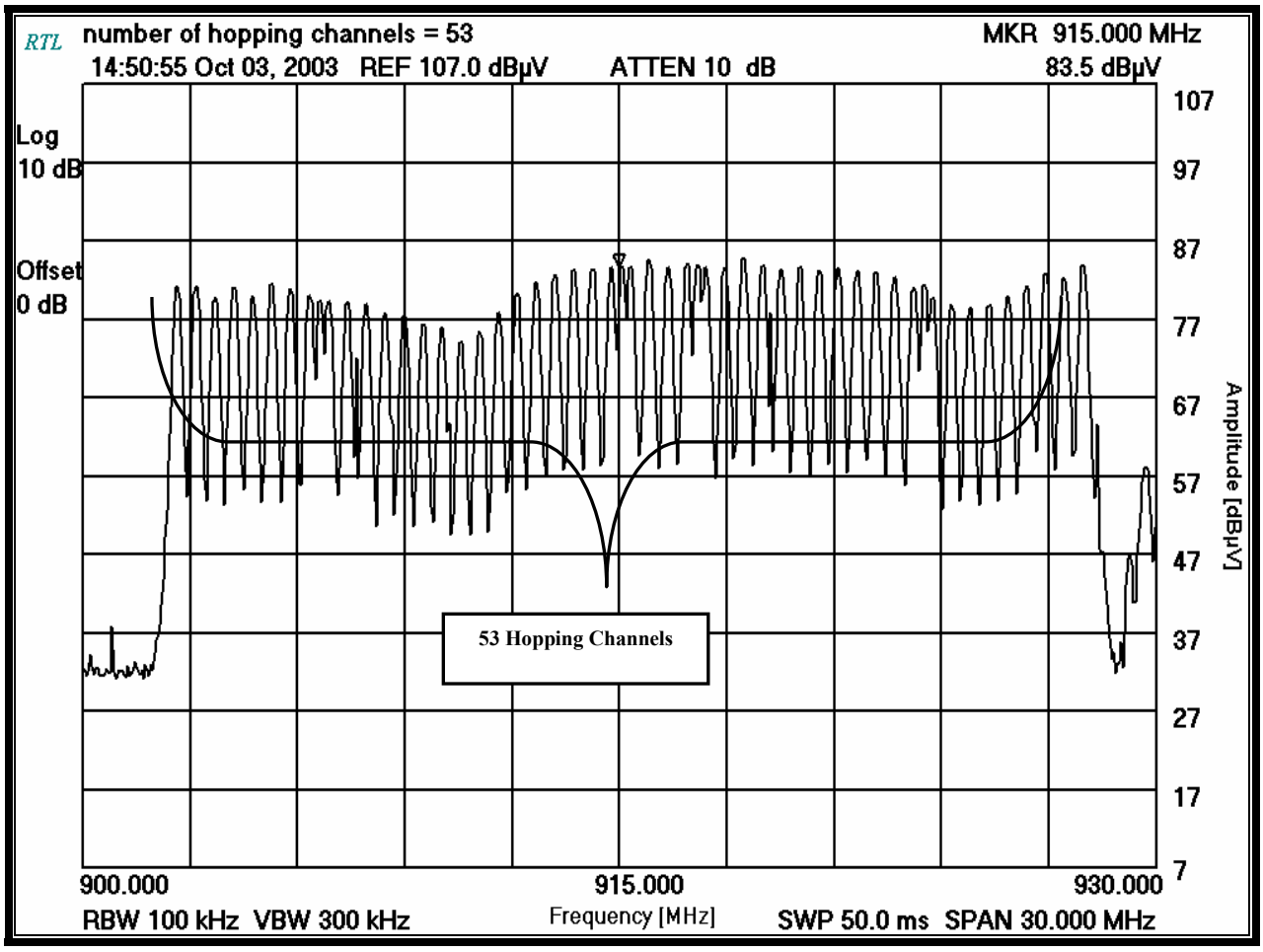
11 HOPPING CHARACTERISTICS – FCC §15.247 (a)(1)(i); IC RSS-210 §6.2.2(O)

For frequency hopping systems operating in the 902 - 928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Since the 20 dB bandwidth of the EUT is less than 250 kHz, 50 hopping frequencies must be used. As shown by the plot below, the EUT met this requirement (53 hopping frequencies).

11.1 NUMBER OF HOPPING FREQUENCIES

PLOT 11-1: NUMBER OF HOPPING FREQUENCIES



TEST PERSONNEL:

Daniel W. Baltzell		October 3, 2003
EMC Test Engineer	Signature	Date Of Test

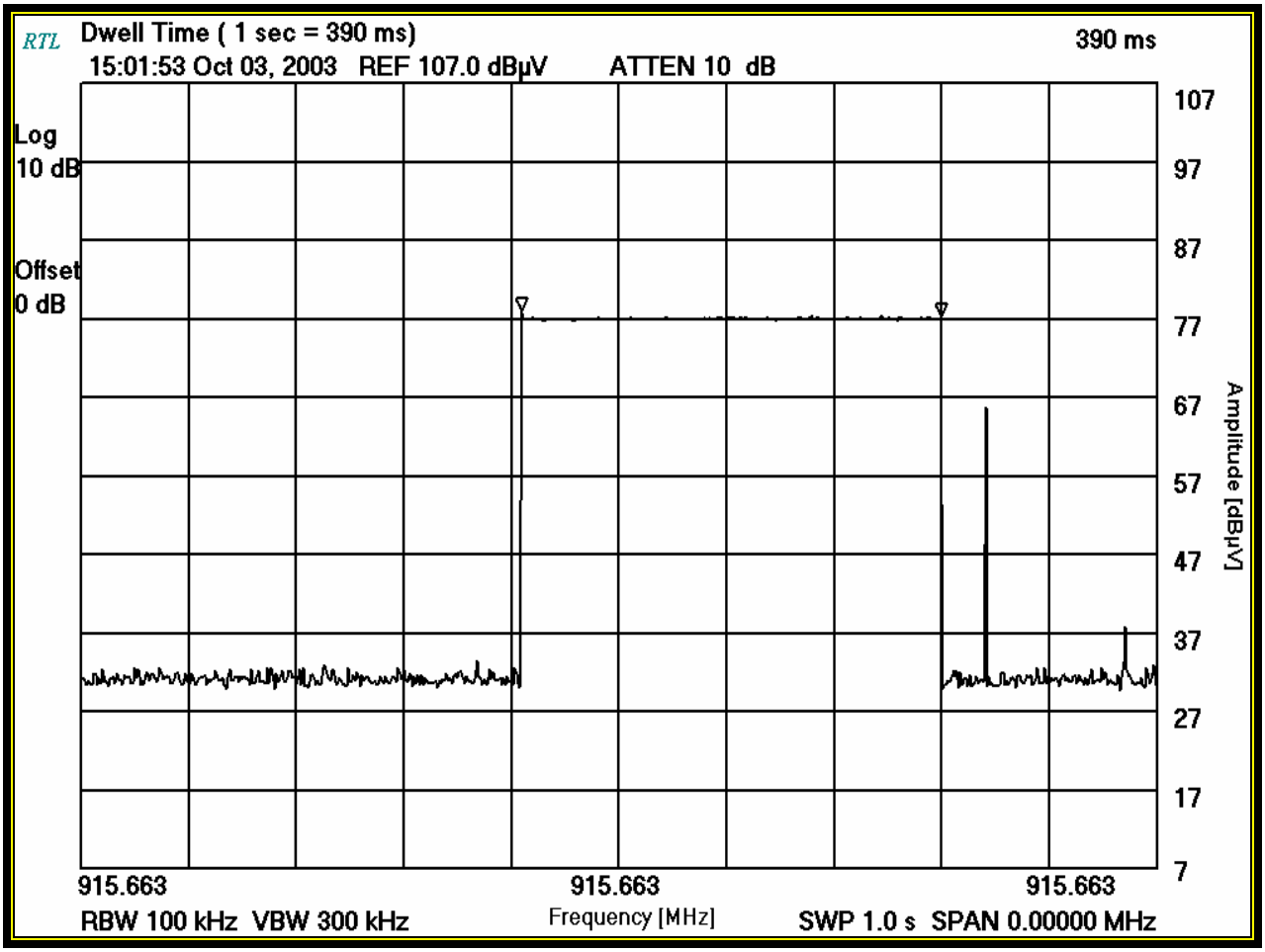
11.2 AVERAGE TIME OF OCCUPANCY

Since the 20 dB bandwidth of the EUT is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period. As shown and described by the plot and description below, the EUT met this requirement (390 ms).

In discovery mode, a transmitting device alternates between hopping with 1ms dwell time and hopping with 15ms dwell time. Transmission occurs on all 53 channels with 1ms dwell time followed by a single 15ms dwell at the next frequency. The device then stops transmission to listen for a response for approximately 8ms on the same channel and then restarts hopping with 1ms dwell time on all 53 channels followed by a 15ms dwell at the next frequency, etc. In this way the channel with 15ms dwell time advances one position in the hop sequence for each 15ms dwell occurrence (which occurs every 76ms). Thus one 15ms dwell occurs for all 53 channels in the space of 4.028 seconds, and the whole sequence then repeats, typically until discovery of any potential target receiver(s) is complete. The net result is that each channel is occupied for 69 milliseconds in any 4.028 seconds interval, and in any case not more than 400ms in any 20 second period.

In normal transmission, a transmitting device channel hops in a pre-defined pseudo random sequence of 53 steps. Hopping is in synchronism with its target receiver with a hop rate of 3 hops per second. Any one channel is occupied for 333ms in this hop sequence which repeats after 53/3 seconds (17.667 seconds). In any case, each channel in the hop sequence occupies no more than 400ms in any 20 second period.

PLOT 11-2: TIME OF OCCUPANCY (DWELL TIME)



TEST PERSONNEL:

Daniel W. Baltzell		October 3, 2003
EMC Test Engineer	Signature	Date Of Test

11.3 20 dB BANDWIDTH – FCC §15.247 (a)(1)(i); IC RSS-210 §5.9.1

The minimum 20 dB bandwidths were measured using a 50 ohm spectrum analyzer. The carrier was adjusted on the analyzer so that it was displayed entirely on the Spectrum Analyzer. The sweep time was set to 10 seconds and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set at 300 kHz. The minimum 20 dB bandwidths were measured using the spectrum analyzer delta marker set 20 dB down from the peak of the carrier.

The maximum allowed 20 dB bandwidth is 500 kHz. As shown in the following table and plots, the EUT met this requirement.

TABLE 11-1 20 DB BANDWIDTH TEST EQUIPMENT

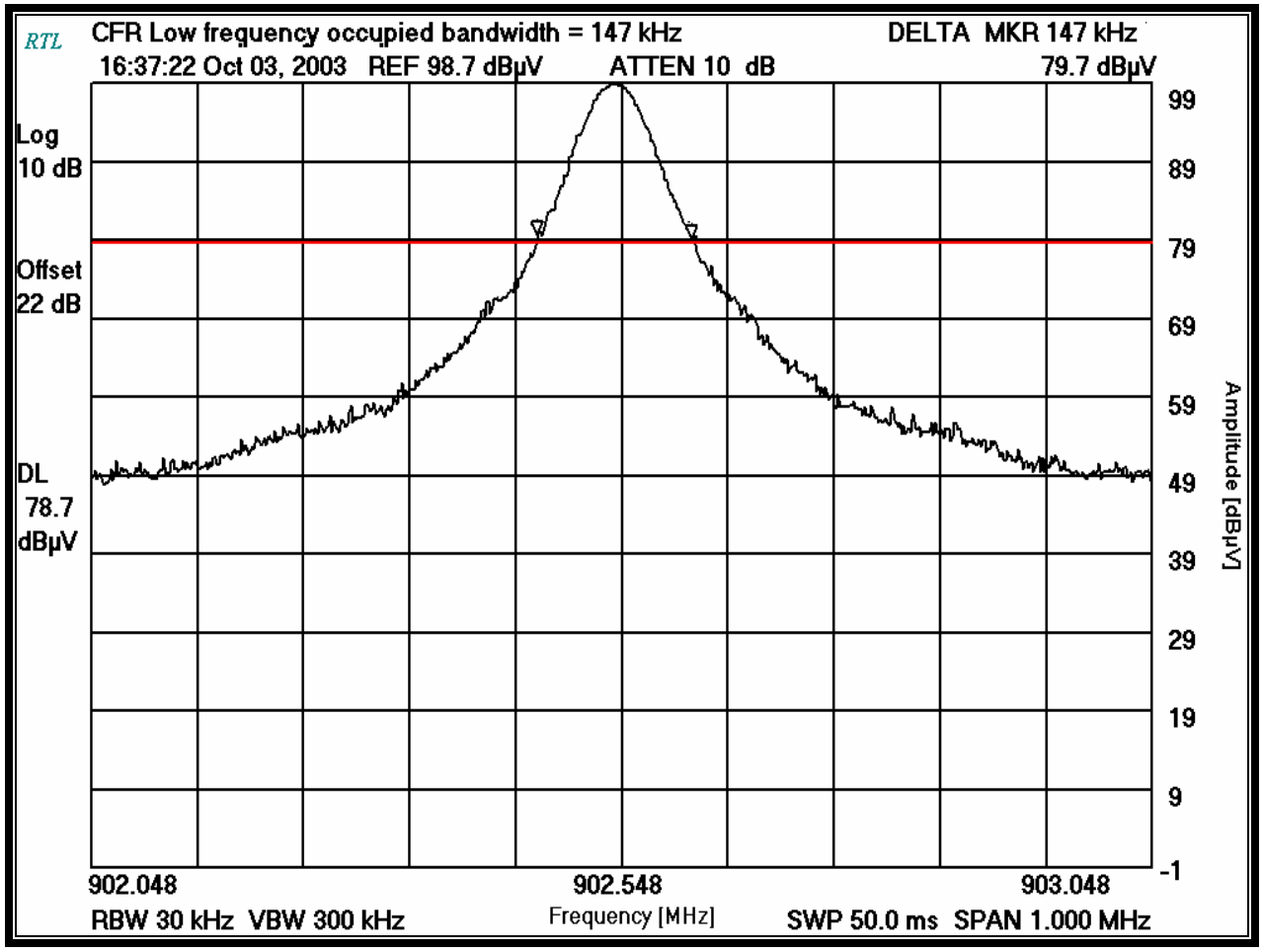
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771	5/12/04

TABLE 11-2 MODULATED BANDWIDTH TEST DATA

Minimum 20 dB bandwidths

FREQUENCY (MHz)	20 dB BANDWIDTH (kHz)
902.4914	147.0
914.6038	163.0
927.7695	157.0

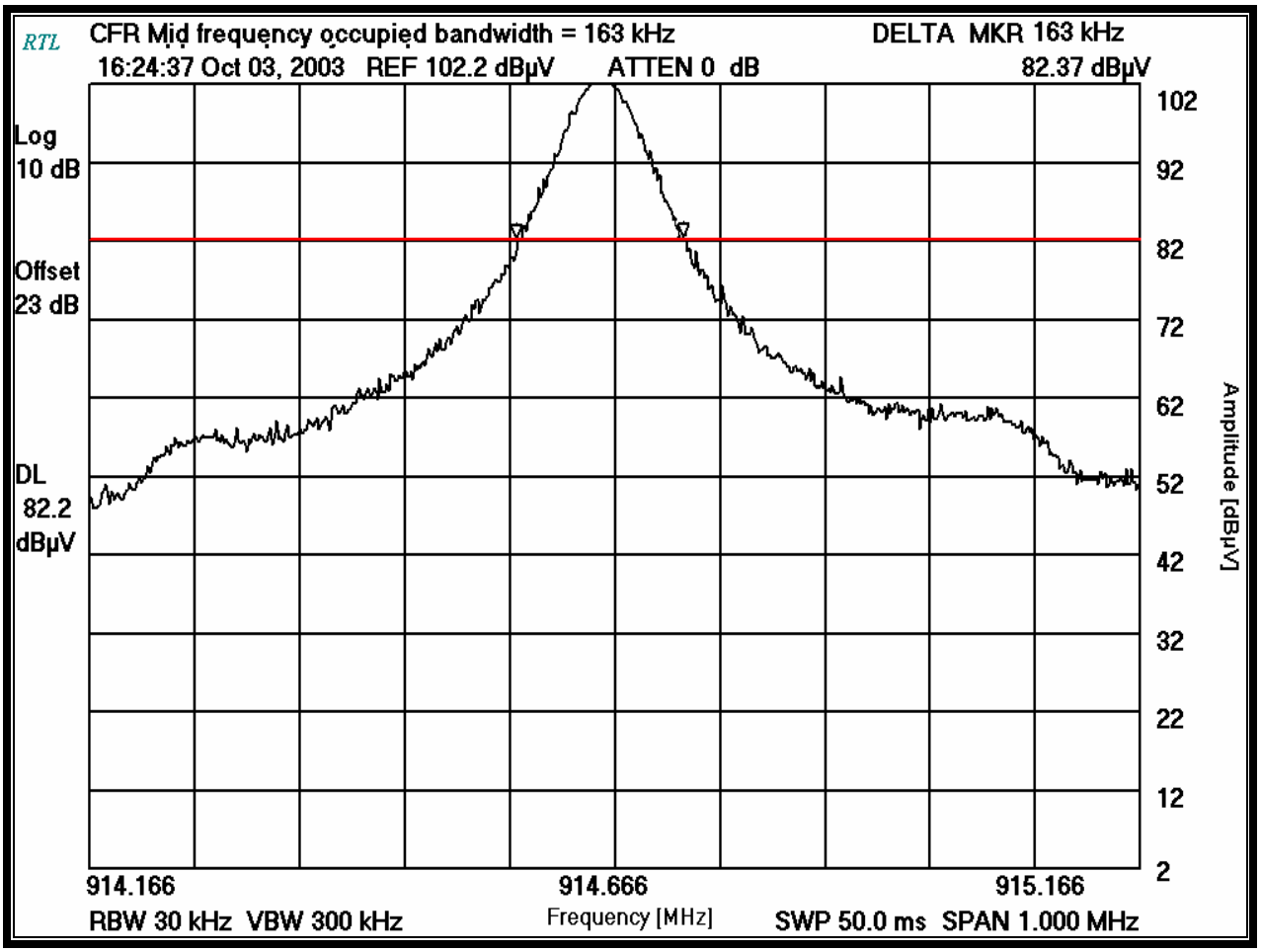
PLOT 11-3: 20 DB BANDWIDTH (TX FREQUENCY: 902.4914 MHZ)



TEST PERSONNEL:

Daniel W. Baltzell		October 3, 2003
EMC Test Engineer	Signature	Date Of Test

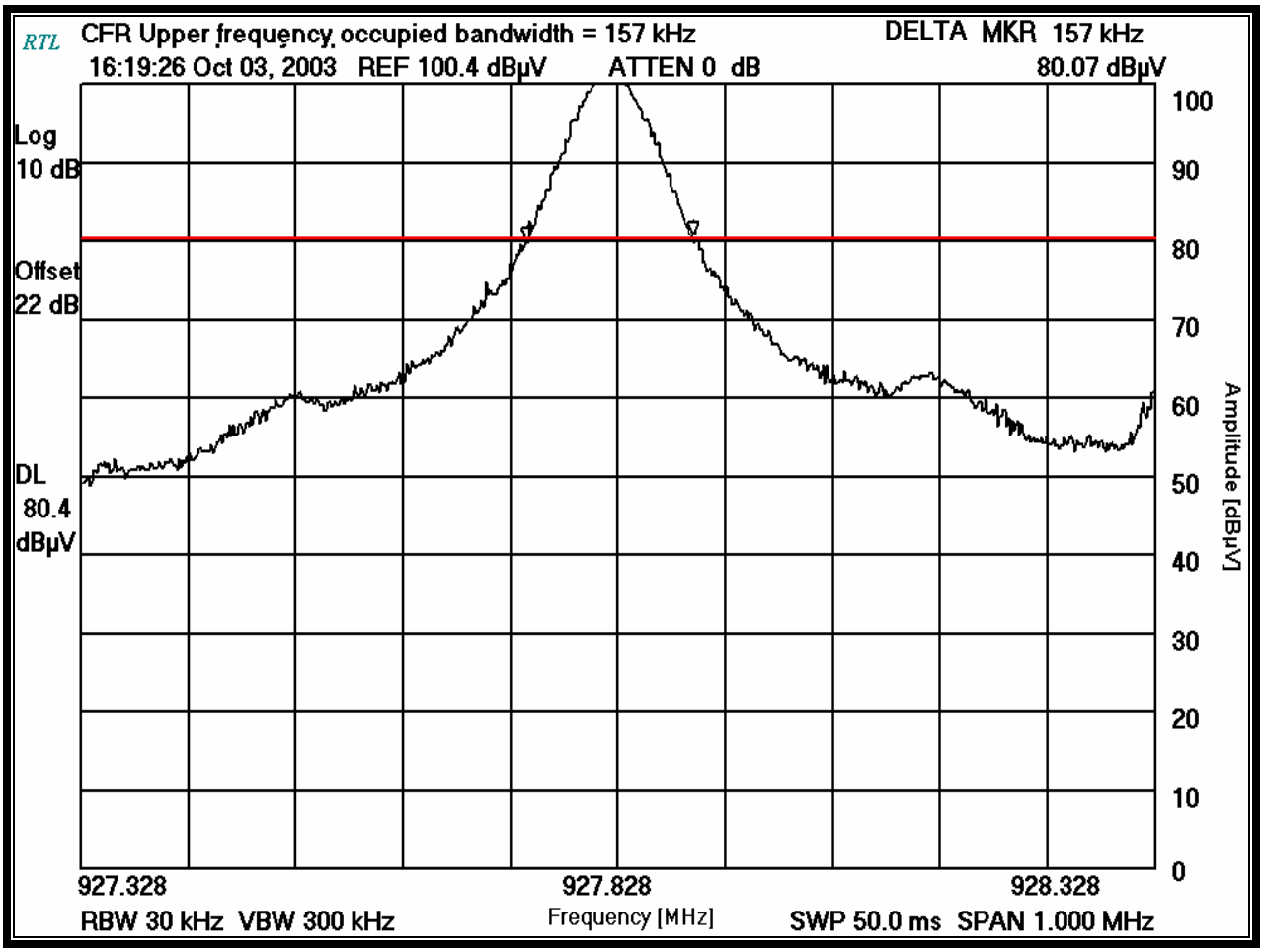
PLOT 11-4: 20 DB BANDWIDTH (TX FREQUENCY: 914.6038 MHZ)



TEST PERSONNEL:

Daniel W. Baltzell	Signature	October 3, 2003
EMC Test Engineer		Date Of Test

PLOT 11-5: 20 DB BANDWIDTH (TX FREQUENCY: 927.7695 MHZ)



TEST PERSONNEL:

Daniel W. Baltzell		October 3, 2003
EMC Test Engineer	Signature	Date Of Test

12 PEAK OUTPUT POWER- FCC §15.247(b)(2); IC RSS-210 §6.2.2(o)(b)

Conducted power output was measured because the EUT has an antenna implemented on the PCB. For frequency hopping systems operating in the 902-928 MHz band and employing at least 50 hopping channels, the maximum peak output power must not exceed 1 W. As shown by the table below, the EUT met this requirement.

12.1 CONDUCTED POWER OUTPUT TEST PROCEDURE

The conducted power was determined by using the calculation based on the E field value, as described in DA000705.

$$P \equiv \frac{(E \times d)^2}{30 \times G}$$

P=Conducted power output in W
E=Field Strength V/m
G=Antenna numeric gain
D=Distance in meter

12.2 CONDUCTED POWER OUTPUT TEST EQUIPMENT

TABLE 12-1: CONDUCTED POWER OUTPUT TEST EQUIPMENT

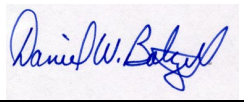
RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
901184/901186	Agilent	E4416A/E9323A	Power Meter / Sensor	GB41050573/US15410380	7/30/04
901158	Compliance Design, Inc.	Roberts Dipole Antenna	Adjustable Elements Dipole	00401	10/6/04
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz - 3200 MHz)	3537A01741	5/2/04
901053	Schaffner-Chase	CBL6112	Antenna (25 MHz – 2 GHz)	2648	9/3/04

12.3 CONDUCTED POWER OUTPUT TEST DATA

TABLE 12-2: TEST DATA

FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)
902.4914	5.6	3.6
914.6038	8.9	7.6
927.7695	6.4	4.3

TEST PERSONNEL:



Daniel W. Baltzell		October 13, 2003
EMC Test Engineer	Signature	Date Of Test

13 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(c); IC RSS-210 §6.2.2(o)(e1)

13.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Not applicable, as the EUT has an antenna implemented on the PCB.

14 CONCLUSION

The data in this measurement report shows that the EUT as tested, Model: *i*CFR, FCC ID: RIM-ICFR, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and Industry Canada RSS-210.