



Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.249 & INDUSTRY CANADA RSS-210

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FCC ID	PVTRAD-RF	TEST REPORT DATE	April 18, 2005
PLATFORM	N/A	RTL WORK ORDER NUMBER	2005059
MODEL #	RAD-RF	RTL QUOTE NUMBER	QRTL05-075
FCC Classification	DSR – Part 15 Remote Control		
FCC Rule Part(s)	Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz, and 24.0-24.25 GHz		
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
914.15 - 915.875	0.0005	N/A	14K40DSR

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. Modifications made to the equipment during testing, in order to achieve compliance with these standards, are listed in the 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: April 18, 2005

Typed/Printed Name: Desmond A. Fraser

Position: President

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1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz, and 24.0-24.25 GHz.

IC RSS-210 Section 6.2.2(m2): 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

1.2 MODIFICATIONS

R16 was changed from 8.2ohms to 18 ohms to reduce the amplitude of the carrier below the 94 dBuV/m limit.

1.3 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

1.4 RELATED SUBMITTAL(S)/GRANT(S)

This is an original certification application for Model Number: RAD-RF, FCC ID: PVTRAD-RF. The IF, LO, and up to the 2nd LO, were investigated and tested, and found to be compliant. Verification Reports have been completed, and are on file.

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 914.15 MHz, Channel 35 at 915 MHz, and Channel 70 at 915.875 MHz, were tested and investigated from 9 kHz to 10 GHz. Data for all three channels are presented in this report. The test results relate only to the item(s) that was tested. The antenna transmits, receives, and is connected to, the only antenna port available.

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. 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 15.207	Conducted Emissions	Pass
FCC 15.249(a)	Radiated Emissions	Pass

2.4 TEST SYSTEM DETAILS

The test sample was received by Rhein Tech Labs on April 13, 2005. 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	RTL Bar Code
Receive Unit (Transceiver) EUT	IKUSI	RAD-RF	03050425	PVTRAD-RF	2.7m unshielded power	16607
Hand Transmitter (Transceiver)	IKUSI	RAD-TF	0305425	PVTRAD-TF	NA	16606
Battery	IKUSI	BT06K	NA	NA	NA	16603
Battery	IKUSI	BT06K	NA	NA	NA	16604

TABLE 2-3: EXTERNAL COMPONENTS IN TEST CONFIGURATION

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Charger For Handheld Batteries	IKUSI	BC60K	NA	NA	NA	16602
AC Adapter	Ontop	A42004	1103C	NA	1.8m unshielded power	16605

2.5 CONFIGURATION OF TESTED SYSTEM

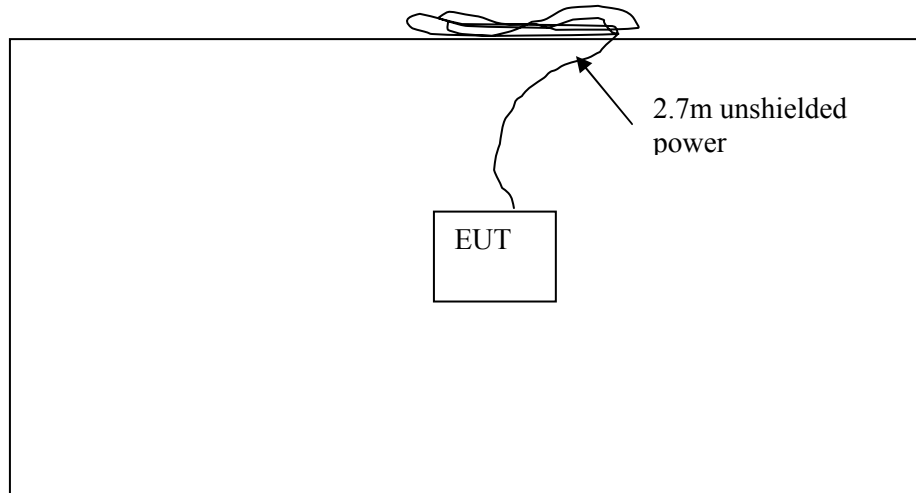


FIGURE 2-1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 CONDUCTED LIMITS – FCC §15.207 AND IC RSS-210 §9.0

3.1 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 high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 150 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by decreasing 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.

3.2 CONDUCTED EMISSIONS TEST

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. 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.

TABLE 3-1: CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05
901083	AFJ International	LS16	16A LISN	16010020080	3/24/06

3.3 CONDUCTED EMISSIONS TEST DATA

TABLE 3-2: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMIT

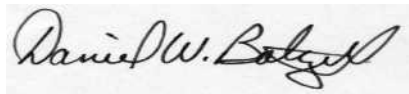
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/Fail
0.156	Pk	30.9	0.4	31.3	65.7	-34.4	55.7	-24.4	Pass
0.176	Pk	28.0	0.4	28.4	64.7	-36.3	54.7	-26.3	Pass
0.289	Pk	23.6	0.4	24.0	60.6	-36.6	50.6	-26.6	Pass
11.120	Pk	21.2	1.4	22.6	60.0	-37.4	50.0	-27.4	Pass
17.140	Pk	19.7	1.6	21.3	60.0	-38.7	50.0	-28.7	Pass
25.690	Pk	20.8	1.7	22.5	60.0	-37.5	50.0	-27.5	Pass

TABLE 3-3: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMIT

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/Fail
0.159	Pk	29.8	0.4	30.2	65.5	-35.3	55.5	-25.3	Pass
0.296	Pk	25.9	0.4	26.3	60.4	-34.1	50.4	-24.1	Pass
0.440	Pk	24.1	0.5	24.6	57.1	-32.5	47.1	-22.5	Pass
8.700	Pk	20.0	1.3	21.3	60.0	-38.7	50.0	-28.7	Pass
11.060	Pk	20.5	1.4	21.9	60.0	-38.1	50.0	-28.1	Pass
26.670	Pk	19.9	1.7	21.6	60.0	-38.4	50.0	-28.4	Pass

TEST PERSONNEL:

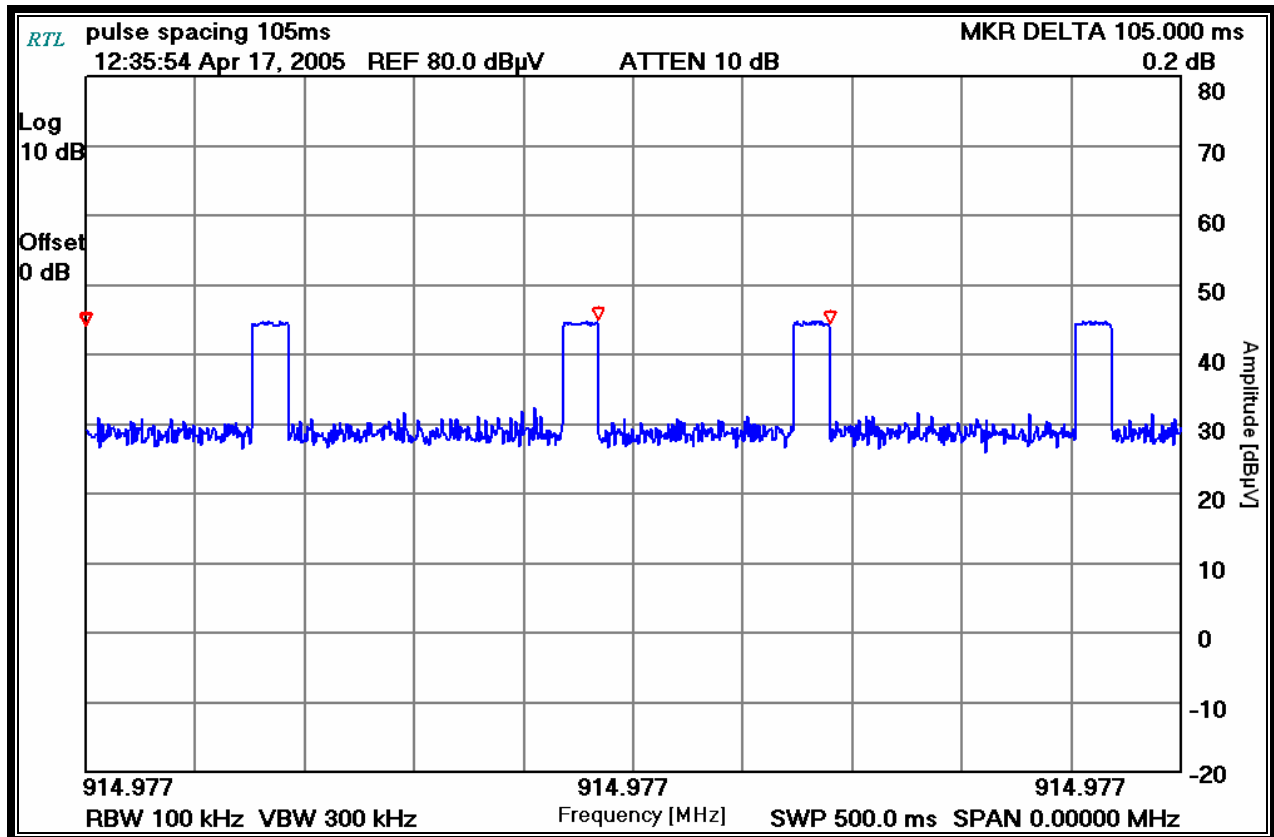
Daniel Baltzell
Test Engineer



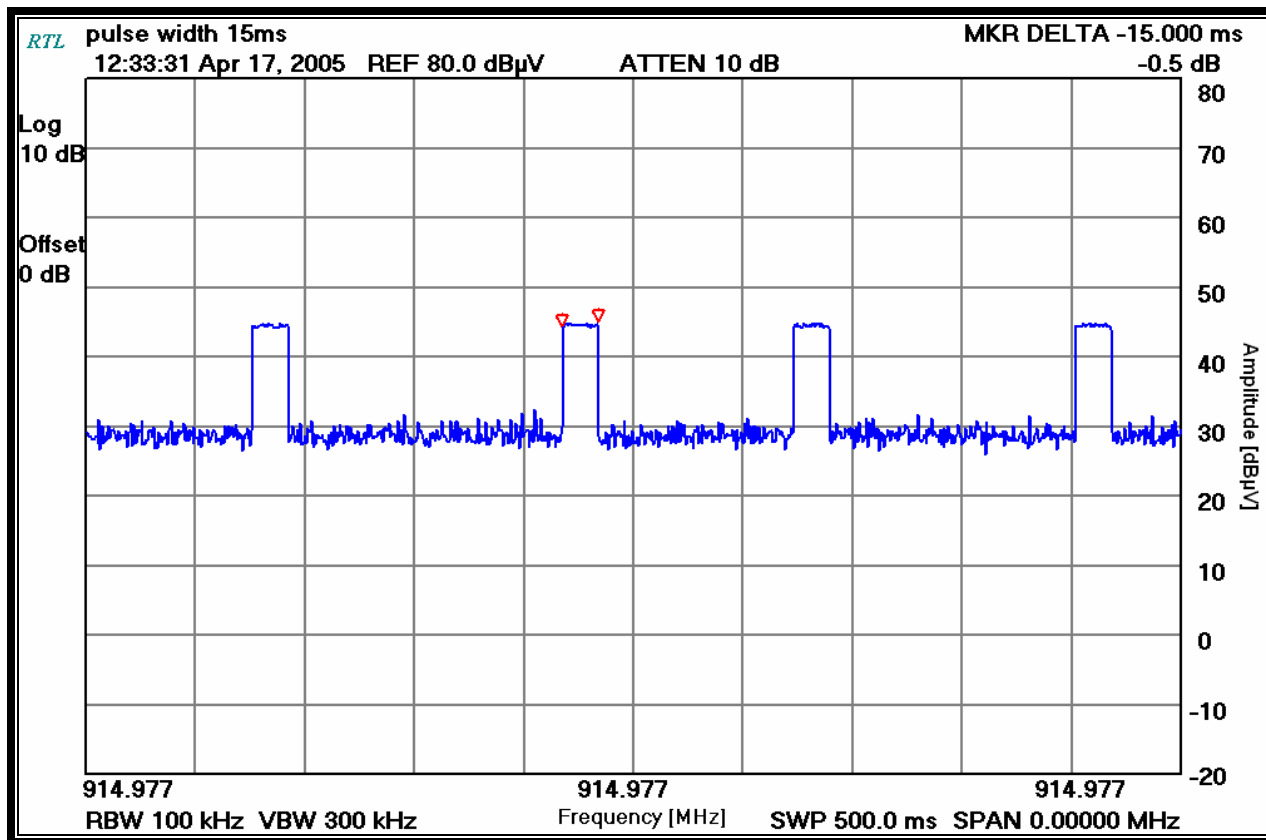
Signature

April 18, 2005
Date Of Test

4 DUTY CYCLE CALCULATION



PLOT 4-1: PULSE SPACING



PLOT 4-2: PULSE WIDTH

Duty Cycle Calculation: $20 \log (15\text{ms}/105\text{ms}) = -16.9 \text{ dB}$
14.3% duty cycle used.

TEST PERSONNEL:

Daniel Baltzell
Test Engineer

Signature

April 17, 2005
Date Of Test

5 RADIATED EMISSION LIMITS FUNDAMENTAL EMISSIONS – FCC §15.249 AND IC RSS-210 §6.2.2 (M2)

5.1 RADIATED EMISSION LIMITS TEST PROCEDURE

Radiated Emissions of the Fundamentals were tested at three meters, and meet the requirements of 50 millivolts/meter in average mode, and 20 dB higher in peak mode, per 15.249(e). The EUT was tested in all three orthogonal planes for channels 1, 35, and 70; the worst case emissions are shown.

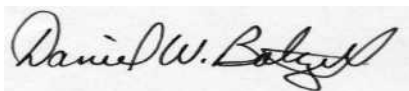
5.2 RADIATED EMISSION LIMITS TEST DATA

TABLE 5-1: RADIATED EMISSIONS FUNDAMENTAL EMISSIONS

Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dBm)	Corrected Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
914.150	Pk	H	0	1.4	94.9	-3.2	91.7	94.0	-2.3
915.700	Pk	H	0	1.4	95.0	-3.2	91.8	94.0	-2.2
915.875	Pk	H	0	1.4	95.3	-3.2	92.1	94.0	-1.9

TEST PERSONNEL:

Daniel Baltzell
Test Engineer



Signature

April 17, 2005
Date Of Test

6 RADIATED EMISSION LIMITS RADIATED HARMONICS – FCC §15.249 – IC RSS-210 §6.2.2 (M2)

6.1 RADIATED EMISSION LIMITS TEST PROCEDURE

Radiated Emissions of the harmonics were tested at three meters, and meet the requirements of 500 microvolts/meter in average mode, and 20 dB higher in peak mode, per 15.249(e). The EUT was tested in the X-Y, X-Z, and Y-Z orthogonal planes.

6.2 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA – ANTENNA S/N 2303722

TABLE 6-1: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1, 914.15 MHZ)

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) (Average less 16.9 dB duty cycle correction factor)	Limit (dBuV/m)	Margin (dB)
1828.297	Pk	H	20	1.5	55.2	-15.2	40.0	74.0	-34.0
1828.297	Av	H	20	1.5	55.2	-15.2	23.1	54.0	-30.9
2742.447	Pk	V	80	1.3	46.2	10.8	57.0	74.0	-17.0
2742.447	Av	V	80	1.3	46.2	10.8	40.1	54.0	-13.9
3656.597	Pk	V	30	1.0	41.3	9.3	50.6	74.0	-23.4
3656.597	Av	V	30	1.0	41.3	9.3	33.7	54.0	-20.3
4570.747	Pk	V	10	1.4	43.0	14.2	57.2	74.0	-16.8
4570.747	Av	V	10	1.4	43.0	14.2	40.3	54.0	-13.7
5484.897	Pk	V	50	1.0	42.5	13.9	56.4	74.0	-17.6
5484.897	Av	V	50	1.0	42.5	13.9	39.5	54.0	-14.5
6399.047	Pk	V	120	1.0	43.5	13.6	57.1	74.0	-16.9
6399.047	Av	V	120	1.0	43.5	13.6	40.2	54.0	-13.8
7313.197	Pk	H	0	1.0	44.8	13.1	57.9	74.0	-16.1
7313.197	Av	H	0	1.0	44.8	13.1	41.0	54.0	-13.0
8227.347	Pk	V	0	1.5	44.3	18.7	63.0	74.0	-11.0
8227.347	Av	V	0	1.5	44.3	18.7	46.1	54.0	-7.9
9141.497	Pk	V	0	1.0	45.5	18.3	63.8	74.0	-10.2
9141.497	Av	V	0	1.0	45.5	18.3	46.9	54.0	-7.1

PEAK RESOLUTION/VIDEO BANDWIDTH IS 1 MHZ

TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 35, 915 MHZ)

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) (Average less 16.9 dB duty cycle correction factor)	Limit (dBuV/m)	Margin (dB)
1830.000	Pk	H	20	1.4	13.3	24.3	37.6	74.0	-36.4
1830.000	Av	H	20	1.4	13.3	24.3	20.7	54.0	-33.3
2745.000	Pk	H	355	1.0	46.7	15.6	62.3	74.0	-11.7
2745.000	Av	H	355	1.0	46.7	15.6	45.4	54.0	-8.6
3660.000	Pk	H	350	1.2	42.7	9.3	52.0	74.0	-22.0
3660.000	Av	H	350	1.2	42.7	9.3	35.1	54.0	-18.9
4575.000	Pk	H	0	1.2	41.8	14.2	56.0	74.0	-18.0
4575.000	Av	H	0	1.2	41.8	14.2	39.1	54.0	-14.9
5490.000	Pk	H	0	1.2	42.0	13.9	55.9	74.0	-18.1
5490.000	Av	H	0	1.2	42.0	13.9	39.0	54.0	-15.0
6405.000	Pk	H	0	1.2	43.2	13.6	56.8	74.0	-17.2
6405.000	Av	H	0	1.2	43.2	13.6	39.9	54.0	-14.1
7320.000	Pk	H	0	1.2	44.2	13.1	57.3	74.0	-16.7
7320.000	Av	H	0	1.2	44.2	13.1	40.4	54.0	-13.6
8235.000	Pk	H	0	1.2	44.8	18.7	63.5	74.0	-10.5
8235.000	Av	H	0	1.2	44.8	18.7	46.6	54.0	-7.4
9150.000	Pk	H	0	1.2	45.0	18.2	63.2	74.0	-10.8
9150.000	Av	H	0	1.2	45.0	18.2	46.3	54.0	-7.7

PEAK RESOLUTION/VIDEO BANDWIDTH IS 1 MHz

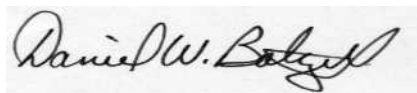
TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 70, 915.875 MHZ)

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) (Average less 16.9 dB duty cycle correction factor)	Limit (dBuV/m)	Margin (dB)
1831.750	Pk	H	20	1.4	12.3	24.3	36.6	74.0	-37.4
1831.750	Av	H	20	1.4	12.3	24.3	19.7	54.0	-34.3
2747.625	Pk	H	0	1.0	45.5	9.9	55.4	74.0	-18.6
2747.625	Av	H	0	1.0	45.5	0.0	38.5	54.0	-15.5
3663.500	Pk	V	345	1.2	41.0	9.4	50.4	74.0	-23.6
3663.500	Av	V	345	1.2	41.0	9.4	33.5	54.0	-20.5
4579.375	Pk	H	350	1.0	41.3	14.2	55.5	74.0	-18.5
4579.375	Av	H	350	1.0	41.3	14.2	38.6	54.0	-15.4
5495.250	Pk	V	40	1.3	42.2	13.9	56.1	74.0	-17.9
5495.250	Av	V	40	1.3	42.2	13.9	39.2	54.0	-14.8
6411.125	Pk	V	20	1.0	42.7	13.6	56.3	74.0	-17.7
6411.125	Av	V	20	1.0	42.7	13.6	39.4	54.0	-14.6
7327.000	Pk	V	90	1.0	43.8	13.1	56.9	74.0	-17.1
7327.000	Av	V	90	1.0	43.8	13.1	40.0	54.0	-14.0
8242.875	Pk	V	350	1.1	44.5	18.7	63.2	74.0	-10.8
8242.875	Av	V	350	1.1	44.5	18.7	46.3	54.0	-7.7
9158.750	Pk	V	0	1.0	44.7	18.3	63.0	74.0	-11.0
9158.750	Av	V	0	1.0	44.7	18.3	46.1	54.0	-7.9

PEAK RESOLUTION/VIDEO BANDWIDTH IS 1 MHz

TEST PERSONNEL:

Daniel Baltzell
Test Engineer



Signature

April 18, 2005
Date Of Test

TABLE 6-4: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL Asset	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	6/23/05
901053	Schaffner & Chase	CBL6112B	Bilog antenna (20 MHz - 2 GHz)	2648	9/20/05
900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	9/1/05
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/12/05
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	5/05/05
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	5/20/07
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	5/20/07
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	8/11/05
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/05
901232	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/05
901235	IW Microwave Products	KPS-1503-360-KPS	High frequency RF cables	36"	9/1/05
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required

* Note: The preamplifier's gain is included in the site correction factor.

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Client: IKUSI
FCC ID: PVTRAD-RF
Standards: FCC 15.249/IC RSS-210
Model #: RAD-RF
Report #: 2005059

7 CONCLUSION

The data in this measurement report shows that the Ikusi Model #: RAD-RF; FCC ID: PVTRAD-RF, complies with all the requirements of Parts 2 and 15 of the FCC Rules, and Industry Canada RSS-210.