



Engineering and Testing for EMC and Safety Compliance



Accredited under A2LA Certificate # 2653.01

### Certification Application Report FCC Part 15.249 & Industry Canada RSS-210

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<b>FCC ID</b>	PVT-R70MR11	<b>Test Report Date</b>	December 14, 2007
<b>IC</b>	4166A-R70MR11		
<b>Platform</b>	N/A	<b>RTL Work Order Number</b>	2007256
<b>Model #</b>	R70MR11	<b>RTL Quote Number</b>	QRTL07-293
<b>FCC Classification</b>	DXX – Part 15 Low Power Communication Device Transmitter		
<b>FCC Rule Part(s)</b>	Part 15.249 (10-01-06): Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz, and 24.0-24.25 GHz		
<b>Industry Canada Standard</b>	RSS-210 (Issue 7): Low Power License-Exempt Radio Communication Devices (All Frequency Bands)		
<b>Digital Interface Information</b>	Digital Interface was found to be compliant		
<b>Receiver Information</b>	Receiver was found to be compliant		
<b>Frequency Range (MHz)</b>	<b>Output Power (W)</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
902.5 - 927.45	N/A	N/A	9K25F1D

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: December 14, 2007

Typed/Printed Name: Desmond A. Fraser

Position: President

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## Table of Contents

<b>1</b>	<b>General Information .....</b>	<b>4</b>
1.1	Scope .....	4
1.2	Modifications.....	4
1.3	Test Facility .....	4
1.4	Related Submittal(s)/Grant(s) .....	4
<b>2</b>	<b>Test Information .....</b>	<b>5</b>
2.1	Test Justification .....	5
2.2	Exercising the EUT .....	5
2.3	Test Result Summary .....	5
2.4	Test System Details.....	6
2.5	Configuration of Tested System .....	6
<b>3</b>	<b>Conducted AC Emissions – FCC §15.207 &amp; IC RSS-Gen.....</b>	<b>7</b>
3.1	Site and Test Description.....	7
3.2	Test Limits .....	7
3.3	Conducted AC Emissions Test Data.....	8
<b>4</b>	<b>Radiated Emission Limits Fundamental Emissions – FCC §15.249 &amp; IC RSS-210 §A2.9 .....</b>	<b>10</b>
4.1	Radiated Emission Limits Test Procedure .....	10
4.2	Radiated Emission Limits Test Data .....	10
<b>5</b>	<b>Radiated Emission Limits Radiated Harmonics – FCC §15.249 &amp; IC RSS-210 §A2.9.....</b>	<b>10</b>
5.1	Radiated Emission Limits Test Procedure .....	10
<b>6</b>	<b>Conclusion.....</b>	<b>11</b>

## Table Index

Table 2-1:	Test Result Summary with FCC Rules and Regulations.....	5
Table 2-2:	Equipment under Test (EUT) .....	6
Table 3-1:	Conducted Emissions Test Equipment .....	7
Table 3-2:	Conducted AC Emissions; Neutral (Line 1); Receive Mode.....	8
Table 3-3:	Conducted AC Emissions; Hot (Line 2); Receive Mode .....	8
Table 3-4:	Conducted AC Emissions; Neutral (Line 1); Transmit Mode.....	9
Table 3-5:	Conducted AC Emissions; Hot (Line 2); Transmit Mode.....	9
Table 4-1:	Radiated Emissions Fundamental Emissions .....	10
Table 5-1:	Radiated Spurious Emissions Test Equipment .....	11
Table 6-1:	Industry Canada Modulated Bandwidth Test Equipment .....	32
Table 6-2:	Minimum 20 dB Modulated Bandwidths .....	32
Table 6-3:	Radiated Receiver/Digital Emissions Data.....	36
Table 6-4:	Radiated Receiver/Digital Emissions Test Equipment .....	36

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### Figure Index

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Figure 2-1:	Worst Case Configuration of System under Test.....	6
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### Plot Index

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Plot 6-1:	Modulated Bandwidth Low Channel.....	33
Plot 6-2:	Modulated Bandwidth Mid Channel.....	34
Plot 6-3:	Modulated Bandwidth High Channel.....	35

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### Appendix Index

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Appendix A:	FCC Part 1.1307, 1.1310, 2.1091, 2.1093; IC RSS-Gen: RF Exposure.....	12
Appendix B:	FCC/TCB Agency Authorization Letter.....	13
Appendix C:	FCC Confidentiality Request Letter.....	14
Appendix D:	IC Agency Authorization and Listing Requirements Letters.....	15
Appendix E:	IC Confidentiality Request Letter.....	16
Appendix F:	Label and Label Location.....	17
Appendix G:	Operational Description.....	18
Appendix H:	Schematics.....	19
Appendix I:	Block Diagram.....	20
Appendix J:	Manual.....	21
Appendix K:	Test Photographs.....	22
Appendix L:	External Photographs.....	26
Appendix M:	Internal Photographs.....	27
Appendix N:	Additional Information for Canadian Certification.....	32

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### Photograph Index

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Photograph 1:	ID Label Sample & Location on EUT Side.....	17
Photograph 2:	Radiated Emissions - Front View.....	22
Photograph 3:	Radiated Emissions - Rear View.....	23
Photograph 4:	Conducted AC Emissions - Front View.....	24
Photograph 5:	Conducted AC Emissions - Rear View.....	25
Photograph 6:	Front.....	26
Photograph 7:	Inside Front Cover.....	27
Photograph 8:	PCB Mounted in Case.....	28
Photograph 9:	PCB Top with Shield.....	29
Photograph 10:	PCB Top without Shield.....	30
Photograph 11:	PCB Bottom.....	31

## **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 A2.9: 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

### **1.2 Modifications**

R31 was changed to 470K ohm and C43 to 120 ohm to reduce the field strength.

### **1.3 Test Facility**

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

### **1.4 Related Submittal(s)/Grant(s)**

This is an original certification application for Model: R70MR11, FCC ID: PVT-R70MR11, IC: 4166A-R70MR11.

## 2 Test Information

### 2.1 Test Justification

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The low channel at 902.5 MHz, mid channel at 915.7 MHz, and high channel at 927.45 MHz, were tested and investigated from 9 kHz to 10 GHz. Data for all three channels is presented in this report. The test results relate only to the item that was tested. The PCB trace antenna transmits and receives.

### 2.2 Exercising the EUT

The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that the information was being transmitted. The IF, LO, and up to the 2<sup>nd</sup> LO, were investigated and tested, and found to be compliant. 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 15.249(a)	Radiated Emissions	Pass
FCC 15.207	AC Line Conducted Emissions	Pass
RSS-Gen	20 dB Bandwidth	N/A

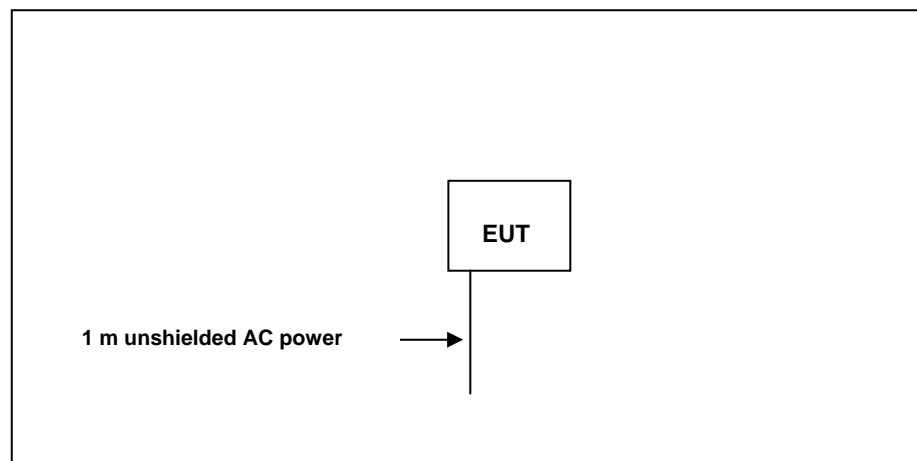
## 2.4 Test System Details

The test sample was received on September 24, 2007. 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
Transceiver	IKUSI	R70MR11	N/A	PVT-R70MR11	N/A	18128
Transceiver	IKUSI	R70MR11	N/A	PVT-R70MR11	N/A	18129

## 2.5 Configuration of Tested System



**Figure 2-1: Worst Case Configuration of System under Test**

### 3 Conducted AC Emissions – FCC §15.207 & IC RSS-Gen

#### 3.1 Site and Test Description

The power line conducted emissions 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 (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 AC line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 100 kHz 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. Video filter less than 10 times the resolution bandwidth is not 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 limits were measured and have been recorded.

#### 3.2 Test Limits

Line-Conducted Emissions		
Limit (dBµV)		
Frequency (MHz)	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.00	56	46
5.00 to 30.00	60	50

Table 3-1: Conducted Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 KHz – 6.5 GHz)	3325A00159	3/21/08
901084	AFJ International	LS16	16A LISN	16010020082	3/28/08

### 3.3 Conducted AC Emissions Test Data

**Table 3-2: Conducted AC Emissions; Neutral (Line 1); Receive Mode**

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
0.171	Pk	29.3	0.2	29.5	79.0	-49.5	66.0	-36.5	Pass
0.276	Pk	24.8	0.2	25.0	79.0	-54.0	66.0	-41.0	Pass
0.499	Pk	30.2	0.2	30.4	79.0	-48.6	66.0	-35.6	Pass
0.650	Pk	32.3	0.2	32.5	73.0	-40.5	60.0	-27.5	Pass
1.090	Pk	23.8	0.4	24.2	73.0	-48.8	60.0	-35.8	Pass
29.930	Pk	17.7	2.3	20.0	73.0	-53.0	60.0	-40.0	Pass

**Table 3-3: Conducted AC Emissions; Hot (Line 2); Receive Mode**

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
0.170	Pk	29.3	0.2	29.5	79.0	-49.5	66.0	-36.5	Pass
0.341	Pk	19.8	0.2	20.0	79.0	-59.0	66.0	-46.0	Pass
0.497	Pk	30.3	0.2	30.5	79.0	-48.5	66.0	-35.5	Pass
0.650	Pk	34.3	0.2	34.5	73.0	-38.5	60.0	-25.5	Pass
1.020	Pk	25.5	0.4	25.9	73.0	-47.1	60.0	-34.1	Pass
29.930	Pk	17.3	2.3	19.6	73.0	-53.4	60.0	-40.4	Pass



**Table 3-4: Conducted AC Emissions; Neutral (Line 1); Transmit Mode**

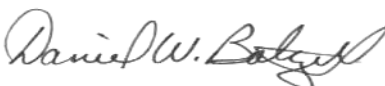
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/Fail
0.169	Pk	31.5	0.2	31.7	79.0	-47.3	66.0	-34.3	Pass
0.170	Pk	31.5	0.2	31.7	79.0	-47.3	66.0	-34.3	Pass
0.277	Pk	24.0	0.2	24.2	79.0	-54.8	66.0	-41.8	Pass
0.284	Pk	24.5	0.2	24.7	79.0	-54.3	66.0	-41.3	Pass
0.497	Pk	29.9	0.2	30.1	79.0	-48.9	66.0	-35.9	Pass
0.498	Pk	29.3	0.2	29.5	79.0	-49.5	66.0	-36.5	Pass

**Table 3-5: Conducted AC Emissions; Hot (Line 2); Transmit Mode**

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
0.170	Pk	29.5	0.2	29.7	79.0	-49.3	66.0	-36.3	Pass
0.288	Pk	21.0	0.3	21.3	79.0	-57.7	66.0	-44.7	Pass
0.497	Pk	30.1	0.2	30.3	79.0	-48.7	66.0	-35.7	Pass
0.650	Pk	34.6	0.2	34.8	73.0	-38.2	60.0	-25.2	Pass
1.160	Pk	25.1	0.4	25.5	73.0	-47.5	60.0	-34.5	Pass
29.710	Pk	19.3	2.3	21.6	73.0	-51.4	60.0	-38.4	Pass

**Test Personnel:**

Daniel Baltzell  
Test Engineer



Signature

September 25, 2007  
Date Of Test

#### 4 Radiated Emission Limits Fundamental Emissions – FCC §15.249 & IC RSS-210 §A2.9

##### 4.1 Radiated Emission Limits Test Procedure

Radiated Emissions of the Fundamentals were tested at three meters, and meet the quasi-peak limit of 50 mV/m. The EUT was tested in all three orthogonal planes for the low, mid, and high channels; the worst case emissions are shown. Peak measurements were taken and are compared to the quasi-peak limit.

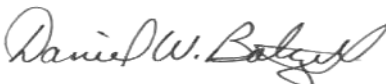
##### 4.2 Radiated Emission Limits Test Data

Table 4-1: Radiated Emissions Fundamental Emissions

Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dBm)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
902.500	Pk	60.5	29.2	89.7	94.0	-4.3
915.700	Pk	61.2	29.2	90.4	94.0	-3.6
927.450	Pk	62.2	29.3	91.5	94.0	-2.5

##### Test Personnel:

Daniel Baltzell  
Test Engineer



Signature

December 7, 2007  
Date Of Test

#### 5 Radiated Emission Limits Radiated Harmonics – FCC §15.249 & IC RSS-210 §A2.9

##### 5.1 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.

All spurious emissions were greater than 20 dB below the limit; no data is being reported per 15.31(o).

**Table 5-1: Radiated Spurious Emissions Test Equipment**

RTL Asset	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	9/21/08
900932	Miteq	JS4-01002600-36-5P	Preamplifier (30 MHz – 26 GHz)	849863	2/15/08
901132	Par Electronics	N/A	Notch Filter	N/A	2/1/09
900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	5/16/08
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/10
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	6/14/10
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	6/14/10
901413	Agilent	E4448A	Spectrum Analyzer	US44020346	6/13/08
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/08/08
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/08/08
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required

## 6 Conclusion

The data in this measurement report shows that IKUSI Model R70MR11, FCC ID: PVT-R70MR11, IC: 4166A-R70MR11, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules, and Industry Canada RSS-210.

## Appendix N: Additional Information for Canadian Certification

### Industry Canada - Modulated Bandwidth - RSS-210 §5.9.1

#### Modulated Bandwidth Test Procedure

The minimum 20 dB bandwidth was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 300 Hz, and the video bandwidth set at 3 kHz.

**Table 7-1: Industry Canada Modulated Bandwidth Test Equipment**


RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901215	Hewlett Packard	8696EM	Spectrum Analyzer	3826A00144	10/16/07

#### Modulated Bandwidth Test Data

**Table 7-2: Minimum 20 dB Modulated Bandwidths**

Frequency (MHz)	20 dB Bandwidth (kHz)
902.5	9.00
915.7	9.25
927.45	9.13

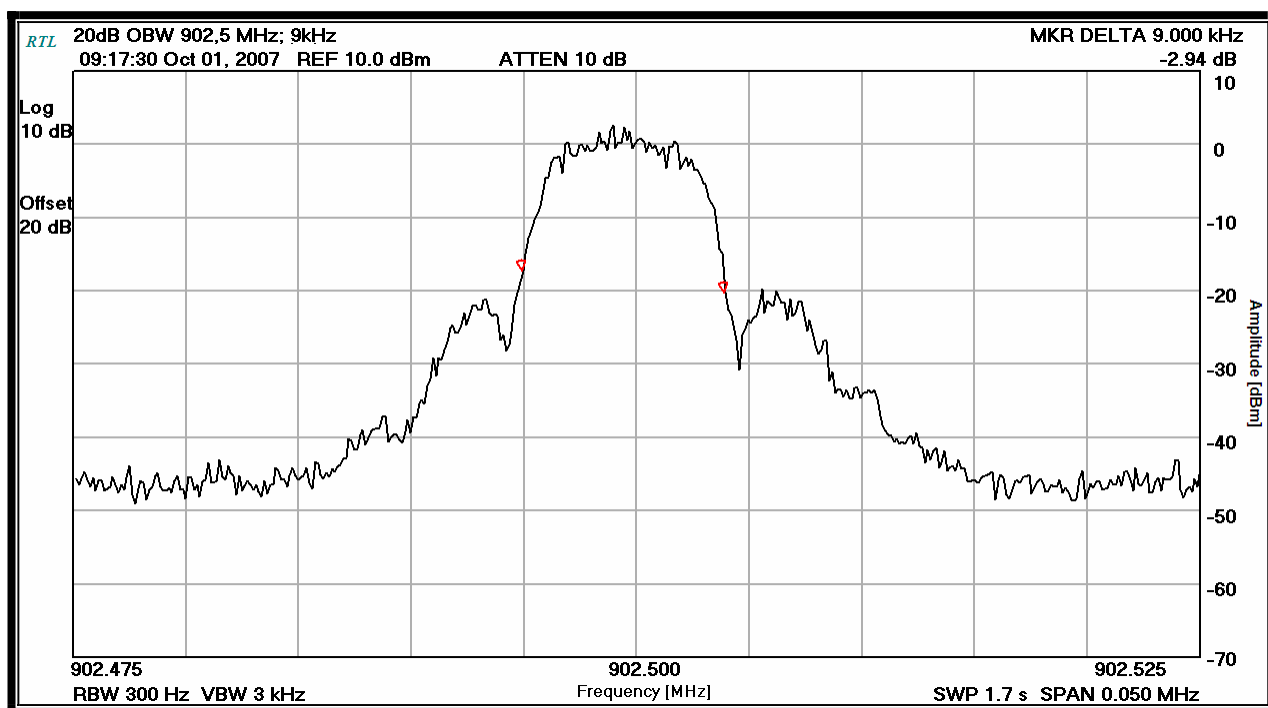
#### Test Personnel:

Daniel Baltzell		October 1, 2007
Test Engineer	Signature	Date Of Test

## Modulated Bandwidth Plots

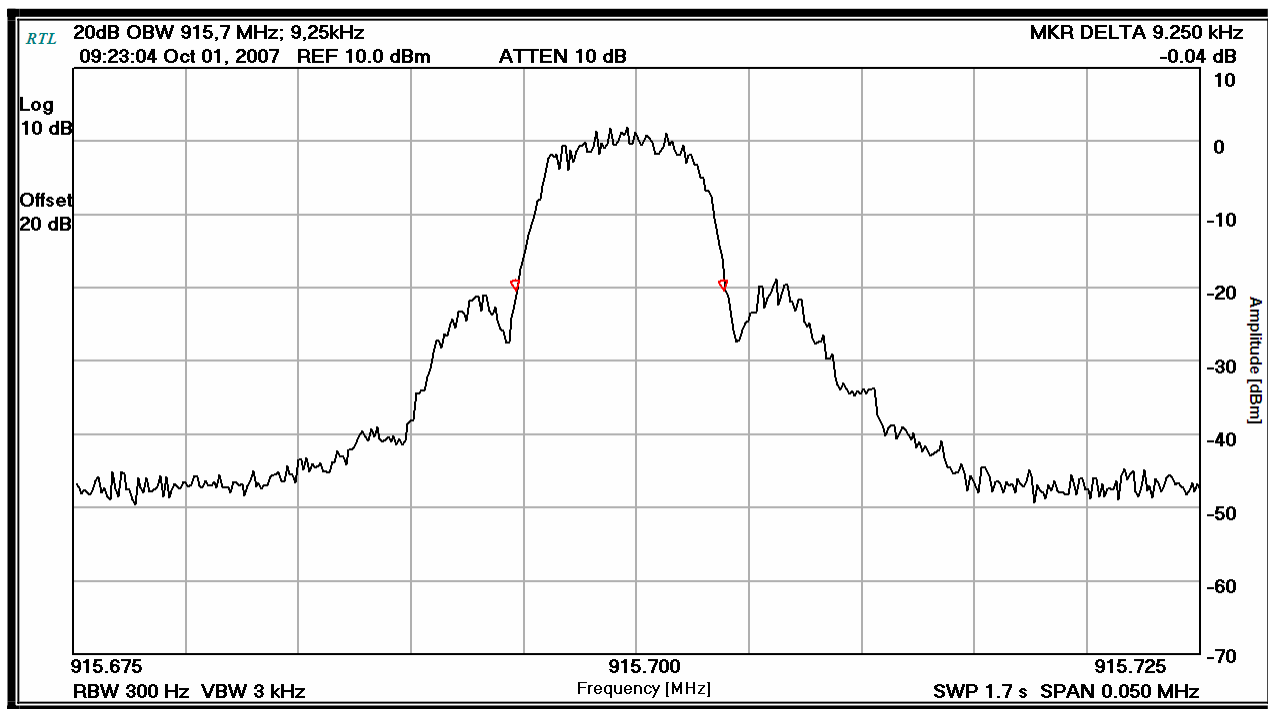
Frequency (MHz): 902.5  
 Resolution Bandwidth (Hz): 300  
 Video Bandwidth (kHz): 3  
 Sweep Time (s): 1.7

Plot 7-1: Modulated Bandwidth Low Channel



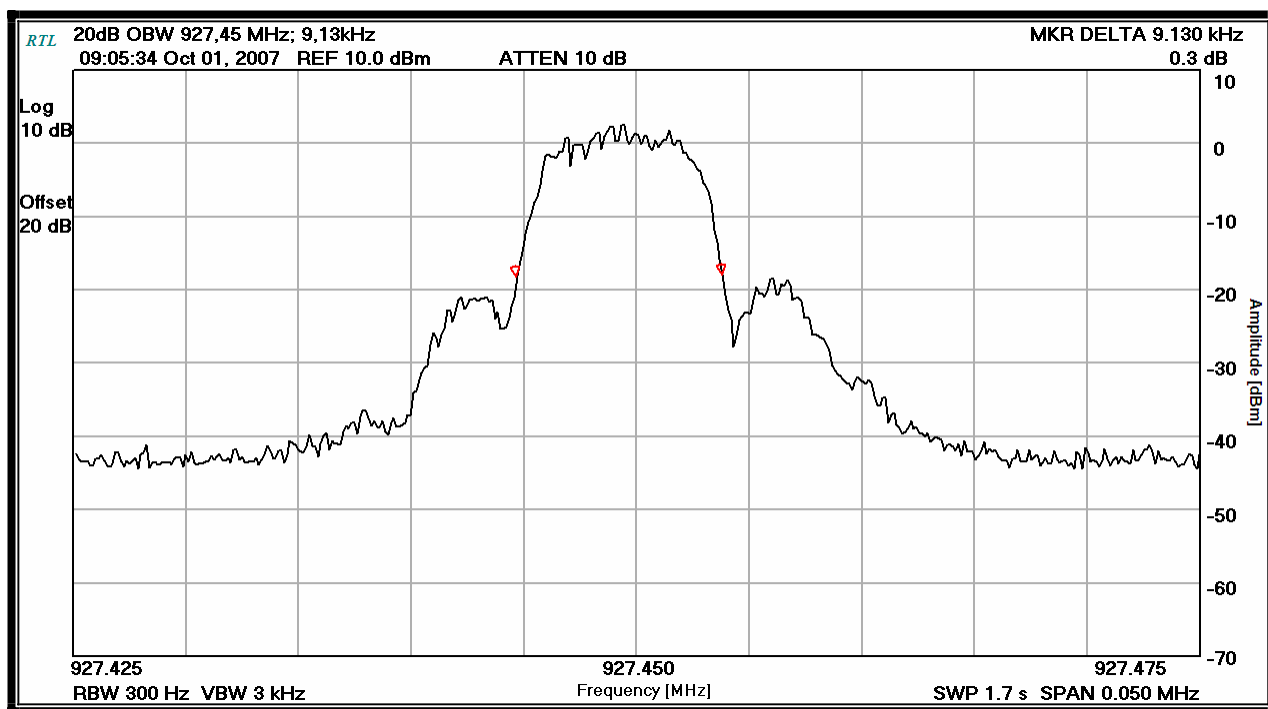
Frequency (MHz): 915.7  
Resolution Bandwidth (Hz): 300  
Video Bandwidth (kHz): 3  
Sweep Time (s): 1.7

Plot 7-2: Modulated Bandwidth Mid Channel



Frequency (MHz): 927.45  
Resolution Bandwidth (Hz): 300  
Video Bandwidth (kHz): 3  
Sweep Time (s): 1.7

Plot 7-3: Modulated Bandwidth High Channel



Test Personnel:

Daniel Baltzell  
Test Engineer

Signature


October 1, 2007  
Date Of Test

## Radiated Receiver/Digital Emissions Data – IC RSS-210 §5.17

**Table 7-3: Radiated Receiver/Digital Emissions Data**

Temperature: 62°F Humidity: 80%									
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)
95.205	Qp	V	90	1.0	61.8	-19.0	42.8	54.0	-11.2
104.372	Qp	H	90	2.0	52.5	-17.8	34.7	54.0	-19.3
115.335	Qp	V	90	1.0	60.3	-17.2	43.1	54.0	-10.9
125.512	Qp	H	90	2.0	57.8	-17.1	40.7	54.0	-13.3
128.585	Qp	H	90	2.0	53.7	-17.0	36.7	54.0	-17.3
146.085	Qp	V	90	1.0	54.1	-17.7	36.4	54.0	-17.6
171.476	Qp	H	180	2.0	47.4	-18.3	29.1	54.0	-24.9

### Test Personnel:

 Daniel Baltzell Test Engineer	Signature	September 25, 2007 Date Of Test
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**Table 7-4: Radiated Receiver/Digital Emissions Test Equipment**

RTL Asset	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900913	Hewlett Packard	8546A	Spectrum Analyzer (9 kHz – 6.5 GHz)	3325A00159	3/21/08
901053	Schaffner & Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	11/22/07
900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	5/16/08
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required