Engineering and Testing for EMC and Safety Compliance

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Certification Application Report
FCC Part 15.245 & Industry Canada RSS-210

Test Lab:	Applicant:
Rhein Tech Laboratories, Inc. Phone:703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 www.rheintech.com Herndon, VA 20170 Email: atcbinfo@rheintech.com	Hach Company Phone: (800) 227-4224 5600 Lindberg Drive Loveland, CO 80539 Contact: Michael Taylor Email: mtaylor@hach.com

FCC ID	VIC-FLODAR24	**Test Report Date**	May 28, 2009
IC	6149A-FLODAR24		
Platform	N/A	**RTL Work Order Number**	2009165
Model #s	FLO-DAR Sensor, 24GHz	**RTL Quote Number**	QRTL09-134

FCC Classification	FDS - Part 15 Field Disturbance Sensor
FCC Rule Part(s)	Part 15.245: Operation within the bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz, and 24075-24175 MHz (10-01-08)
Industry Canada Standard	RSS-210 Issue 7 June 2007: Low Power License-Exempt Radio Communication Devices (All Frequency Bands)
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	N/A

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
24125	N/A	N/A	12M1F1D

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 applicable parts of FCC Part 2, FCC Part 15, Industry Canada RSS-210, RSS-Gen, and ANSI C63.4.

Signature: _____ Date: May 28, 2009

Typed/Printed Name: Desmond A. Fraser Position: President

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1 General Information

1.1 Scope

FCC Rules Part 15.245: Operation within the bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz, and 24075-24175 MHz (10-01-08)

IC RSS-210 Annex 7: Field Disturbance Sensors Operating in the Bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10.5-10.55 GHz and 24.075-24.175 GHz

1.2 Modifications

N/A.

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, Inc. (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 Hach Company Model FLO-DAR Sensor, 24GHz, FCC ID: VIC-FLODAR24, IC: 6149A-FLODAR24.

2 Test Information

2.1 Test Justification

The EUT was tested in order to determine worst-case emissions. 24.125 GHz was tested and investigated from 9 kHz to 100 GHz. The test results relate only to the item that was tested.

2.2 Exercising the EUT

The EUT was adapted to continuously transmit for testing purposes. 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	AC Line Conducted Emissions	N/A
FCC 15.245(b), 15.205, 15.209	Radiated Emissions	Pass
RSS-Gen 4.6.1	99% Bandwidth	N/A

2.4 Test System Details

The test sample was received by RTL on April 28, 2009. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the following table.

Table 2-2: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
FLO-DAR Sensor, 24GHz	Hach Company	170 0117 01	BA-2217	NIV-450-01	10.5m Unshielded I/o	18936
Flo-Station Monitor	Hach Company	1204-100	080800DA1067	N/A	2.5 m unshielded	18939
12VDC/6AH Gel Battery	American Sigma	1414	N/A	N/A	0.2m unshielded	18937
914 Battery Charger 14.5 VDC 400mA	Engineering Design and Sales	6216	2003	N/A	1.8m unshielded	18938

2.5 Configuration of Tested System

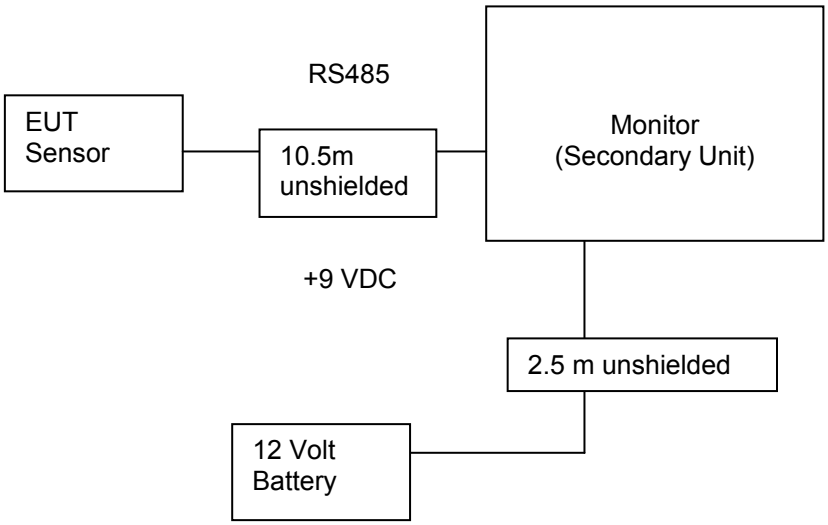


Figure 2-1: Worst Case Configuration of System under Test

3 Radiated Emissions – FCC 15.205/15.209, 15.245 & IC RSS-210 Annex

3.1 Radiated Emissions Test Procedure

Radiated emission of the fundamental was tested at three meters, and meets the requirements of 15.245.

3.1.1 Radiated Fundamental Emission Test Data

Plot 3-1: Fundamental Emission

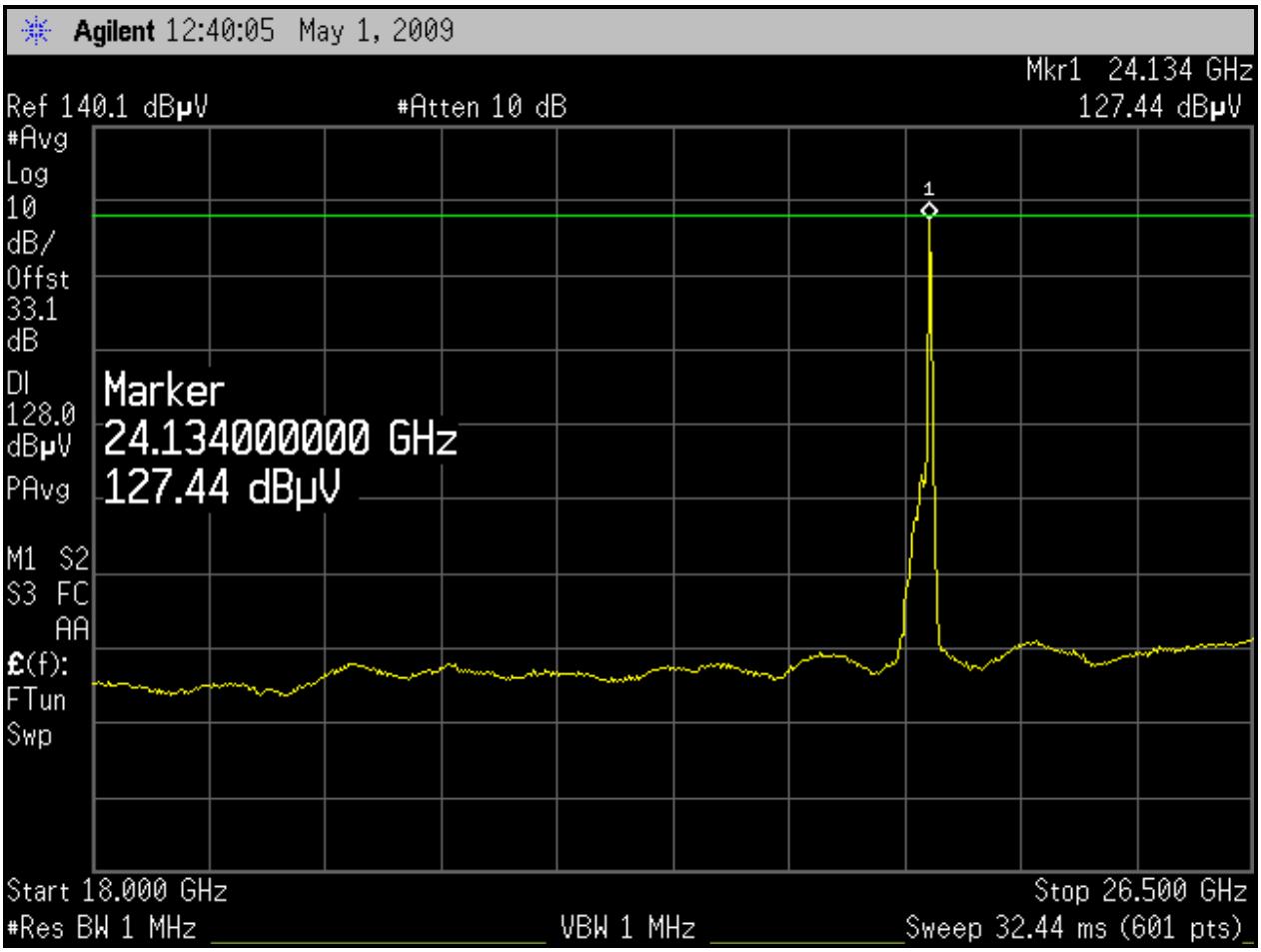


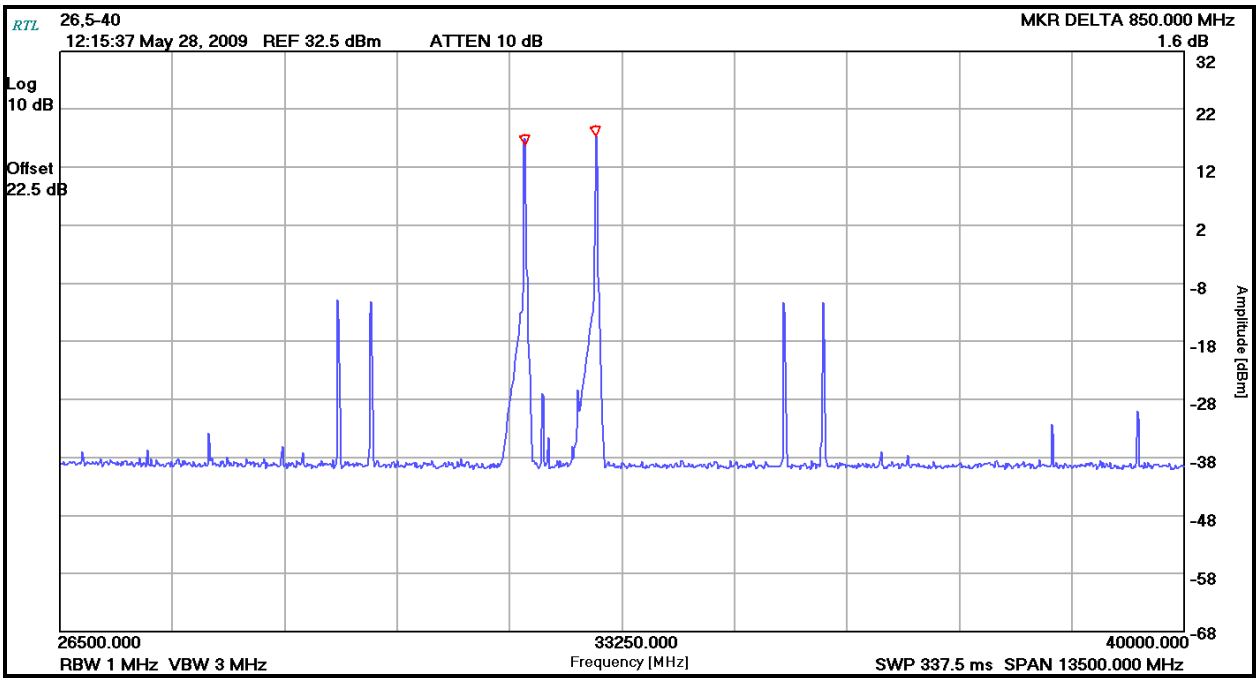
Table 3-1: Radiated Fundamental Emission

Emission Frequency (GHz)	Analyzer Reading (dBuV)	Detector	Pol	Site Correction Factor (dB)	Corrected Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
24.125	94.3	Avg	H	33.1	127.4	128	-0.6

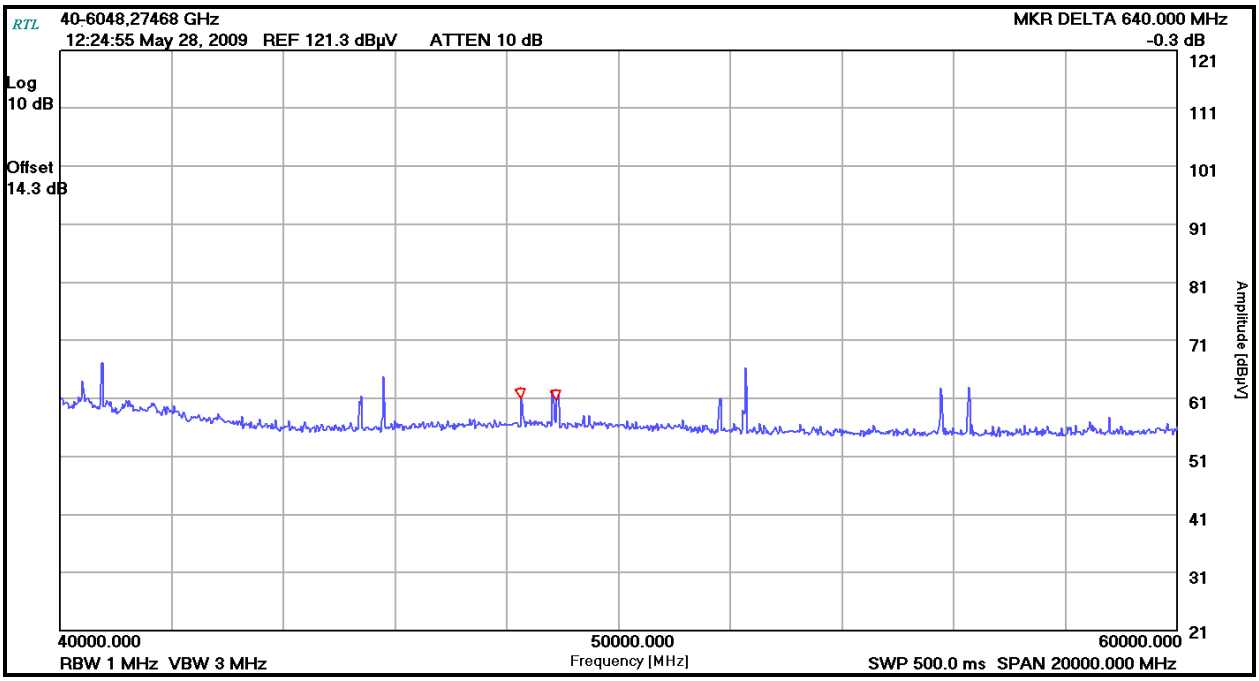
3.1.2 Radiated Harmonics Emissions Test Data

The following plots show mostly ghost images of harmonics of the LO, only images with a separation of 642.8 MHz (twice the IF) are valid. All the plots except 3-1 were taken with no separation between the antenna and EUT and are therefore considered noise floor measurements, since 20log(3/0.01)= 49.5 dB higher than what would result at 3 meters. Plot 3-1 was taken with approximately 20 cm separation to prevent overloading from the fundamental, and contains no valid frequencies. The plots have an offset which is equivalent to a site correction factor, which includes the mixer conversion loss, antenna factor, cable loss, and amplifier gain.

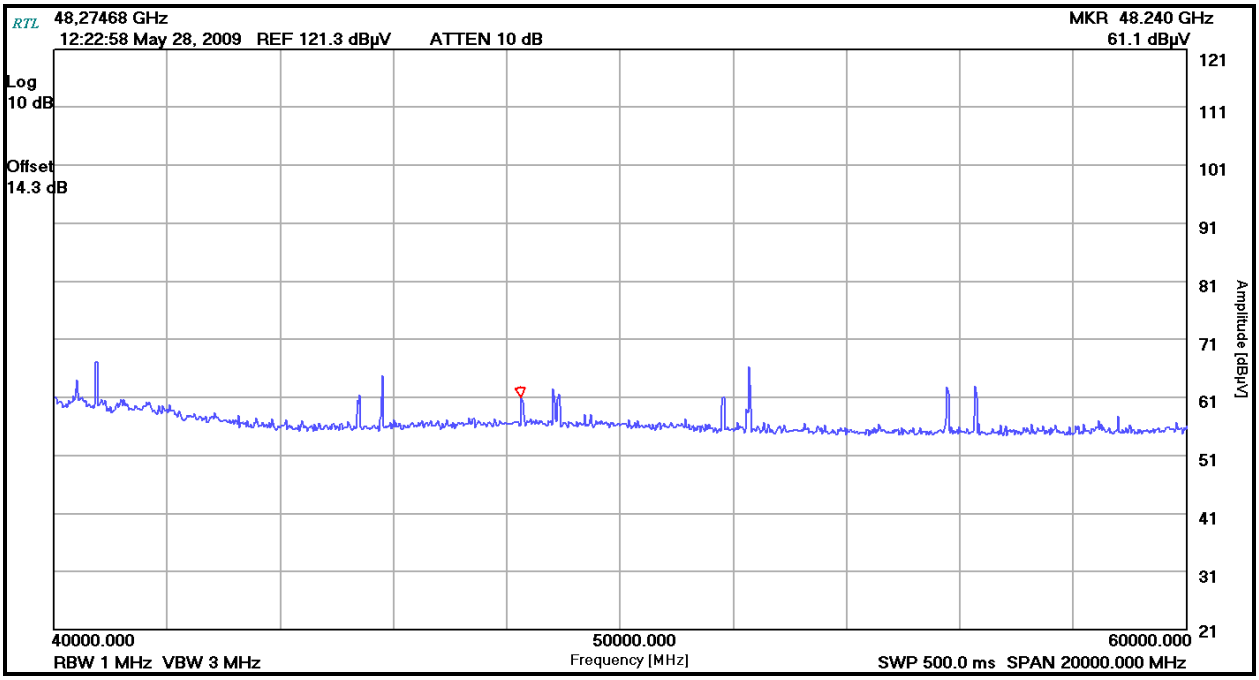
Plot 3-2: 26.5–40 GHz (Band 8)



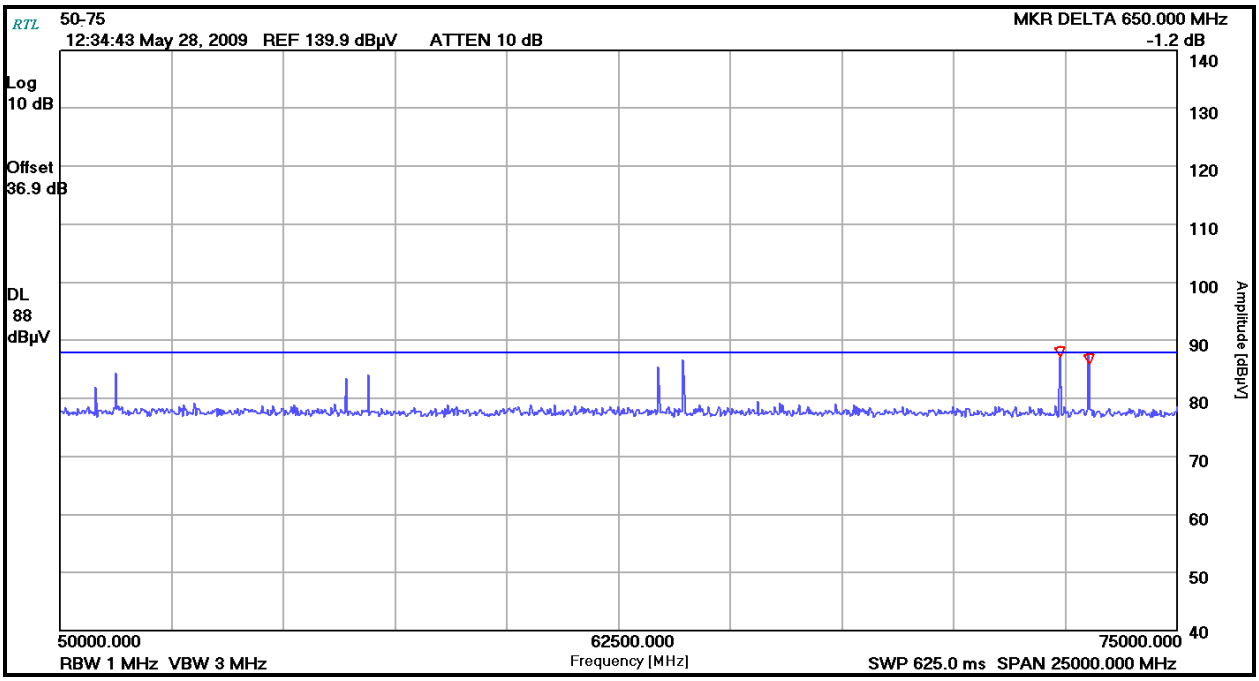
Plot 3-3: 40-60 GHz (Band 10) Showing Harmonic at 48.27468 GHz and Paired Ghost Image



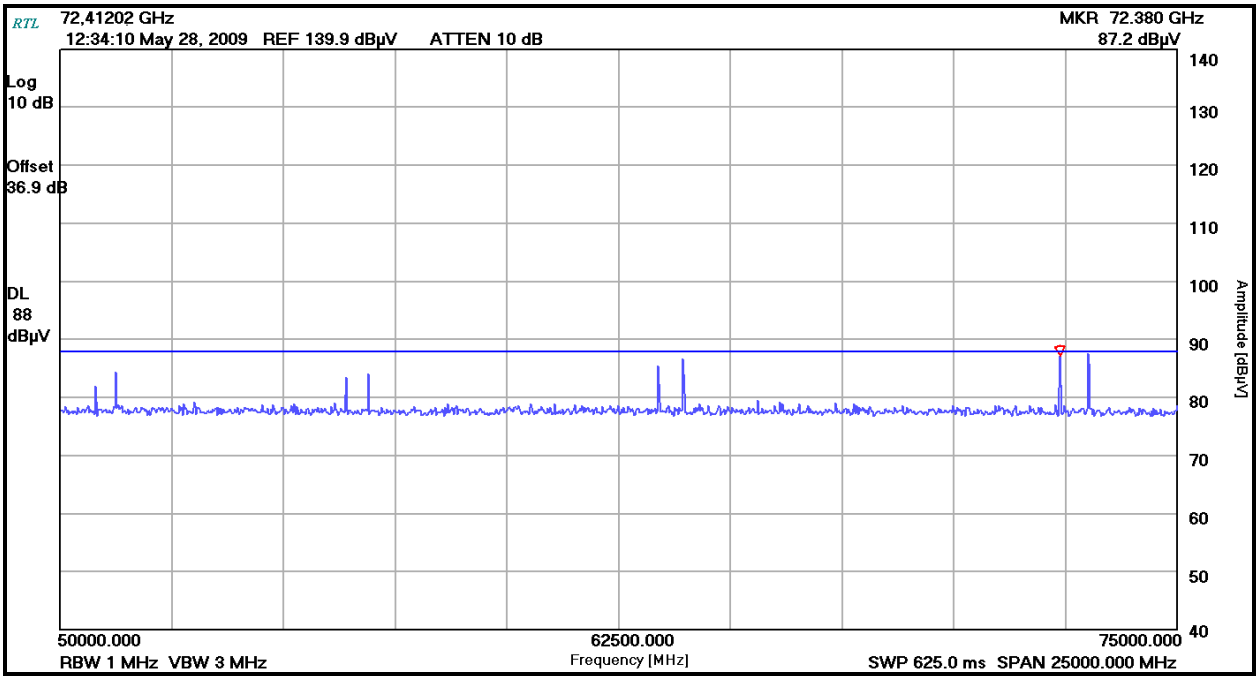
Plot 3-4: 48.27468 GHz



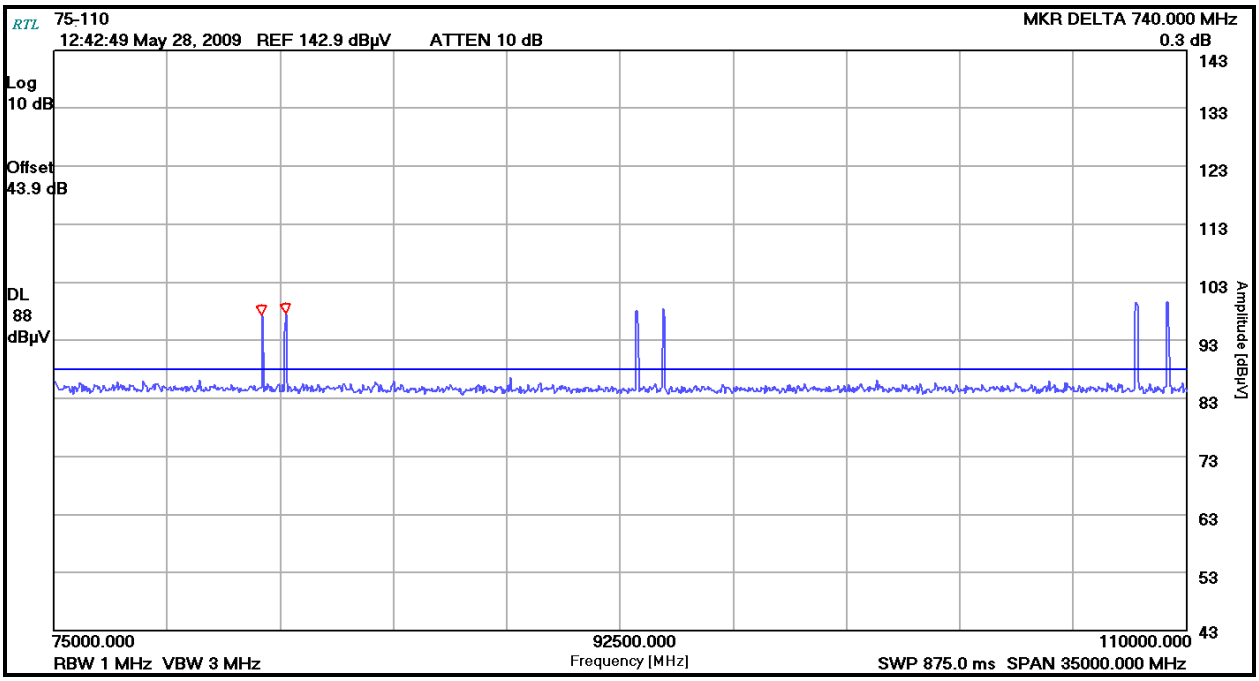
Plot 3-5: 50-75 GHz (Band 14) Showing Harmonic at 72.41202 GHz and Paired Ghost Image



Plot 3-6: 72.41202 GHz



Plot 3-7: 75–110 GHz (Band 18) Showing No Valid Frequencies



Plot 3-8: 96.54936 GHz Showing No Valid Harmonic

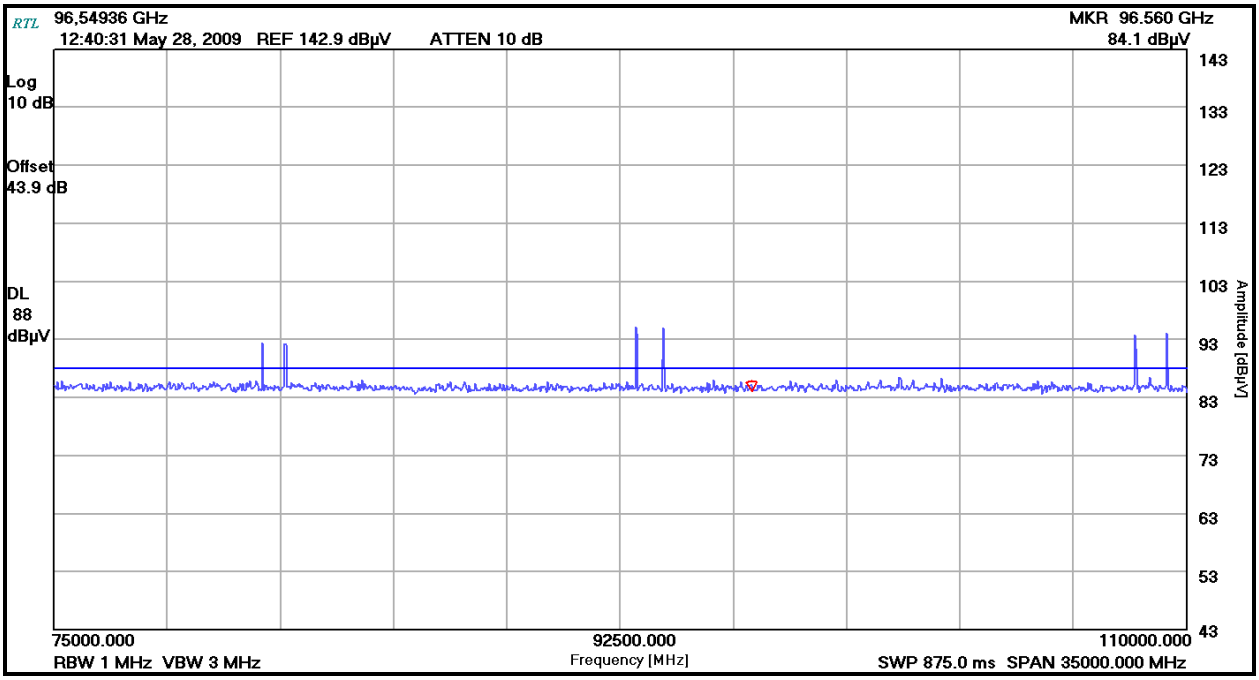


Table 3-2: Radiated Unintentional Emissions

Emission Frequency (GHz)	Analyzer Reading (dBuV)	Detector	Pol	Site Correction Factor (dB)	Corrected Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
70.003	39.2	Qp	H	-26.3	12.9	39.0	-26.1
90.002	45.2	Qp	V	-23.0	22.2	43.5	-21.3
90.003	48.8	Qp	H	-23.0	25.8	43.5	-17.7
110.002	42.9	Qp	V	-19.7	23.2	43.5	-20.3
110.003	51.5	Qp	H	-19.7	31.8	43.5	-11.7
130.003	46.2	Qp	H	-20.3	25.9	43.5	-17.6
154.990	30.0	Qp	V	-20.4	9.6	43.5	-33.9
230.002	30.0	Qp	V	-20.6	9.4	46.4	-37.0
270.002	37.7	Qp	H	-17.3	20.4	46.4	-26.0
270.002	31.3	Qp	V	-17.3	14.0	46.4	-32.4
370.003	27.8	Qp	H	-14.7	13.1	46.4	-33.3

RBW =120 kHz; VBW = 1.2 MHz

Table 3-3: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900905	Rhein Tech Laboratories	PR-1040	Amplifier	900905	4/10/10
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	12/12/10
900913	Hewlett Packard	85462A	EMI Receiver RF Section, (9 KHz - 6.5 GHz)	3325A00159	6/15/09
900914	Hewlett Packard	85460A	RF Filter Section, (100 KHz - 6.5 GHz)	3330A00107	6/15/09
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	6/14/10
901365	MITEQ	JS4-00102600-41-5P	Amplifier, 0.1-26 GHz, 30dB gain	N/A	3/4/10
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/17/09
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	3/11/10
901413	Agilent Technologies	E4448	Spectrum Analyzer	US44020346	7/31/09
900126	Hewlett Packard	11970A	Harmonic Mixer (26.5 - 40 GHz)	2332A01199	10/29/09
901303	EMCO	3160-10	Horn Antenna (26.5-40.0 GHz)	960452-007	6/19/10
901256	ATM	19-443-6R	Horn antenna (40-60 GHz), waveguide size WR-19	8041704-01	12/5/10
900711	ATM	10-443-6R	Horn Antenna (75 - 110 GHz)	8051905-1	12/2/10
900712	ATM	15-443-6R	Horn Antenna (50 - 75 GHz)	8051805-1	12/7/10
900715	Hewlett Packard	11970V	Harmonic Mixer (50 - 75 GHz)	2521A00512	11/19/09
900716	Hewlett Packard	11970W	Harmonic Mixer (75 - 110 GHz)	2521A00710	10/29/09
900717	Hewlett Packard	11970U	Harmonic Mixer (40 - 60 GHz)	2332A01110	10/28/09

Test Personnel:

Daniel Baltzell		May 13-28, 2009
Test Engineer	Signature	Dates Of Test

4 Occupied Bandwidth – IC RSS-Gen

Plot 4-1: Occupied Bandwidth

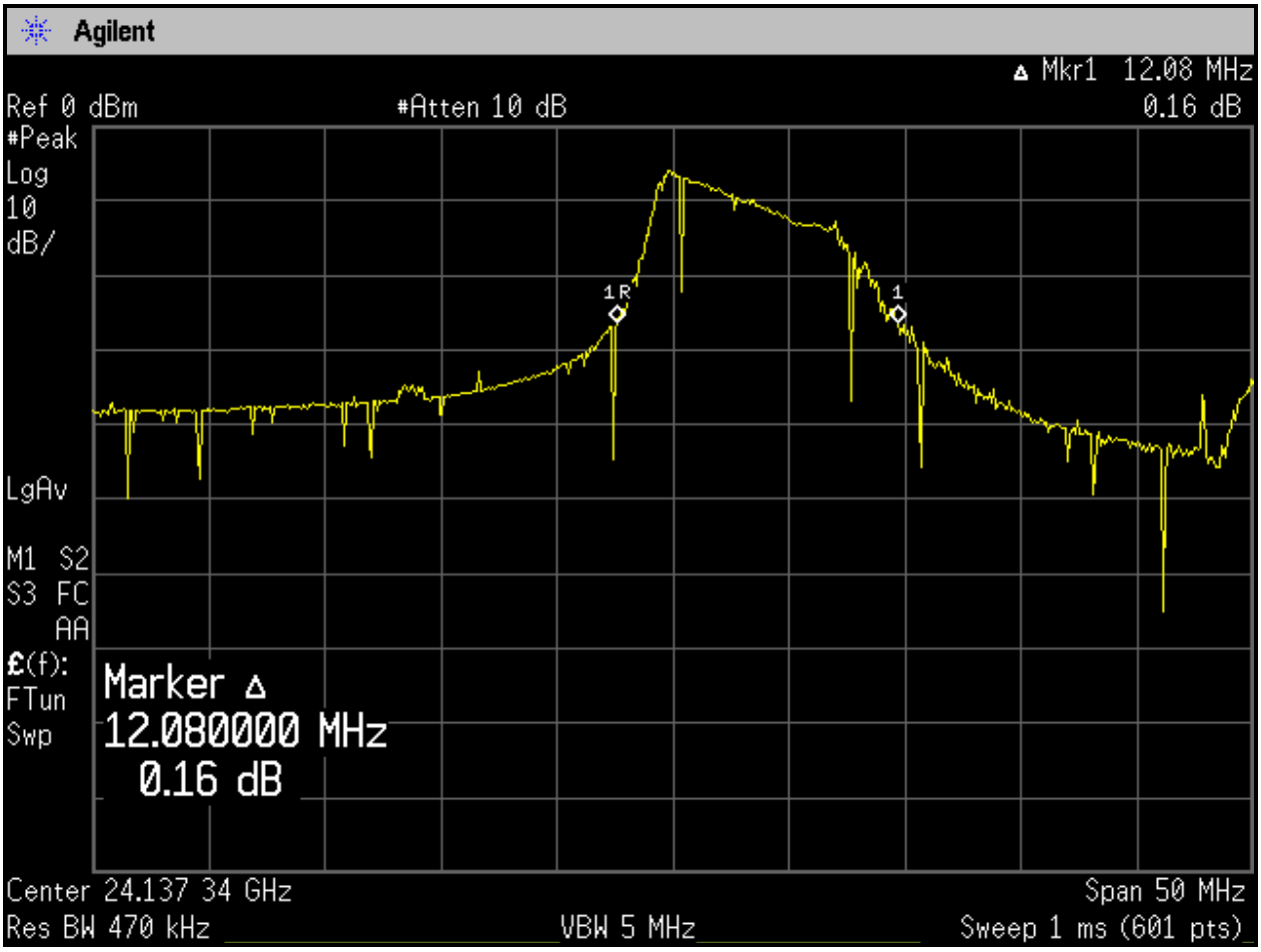


Table 4-1: Occupied Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901413	Agilent Technologies	E4448	Spectrum Analyzer	US44020346	7/31/09

Test Personnel:

Daniel Baltzell		May 28, 2009
Test Engineer	Signature	Date Of Test

5 Conclusion

The data in this measurement report shows that Hach Company Model FLO-DAR Sensor, 24GHz; FCC ID: VIC-FLODAR24, IC: 6149A-FLODAR24, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules, and Industry Canada RSS-210 and RSS-Gen.