RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.231 Certification Application Report

Test Lab:	Applicant:
Rhein Tech Laboratories, Inc. Tel: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 Web: www.rheintech.com Herndon, VA 20170 Email: atcbinfo@rheintech.com	Reconyx, Inc. Phone: 866-493-6064 3828 Creekside Lane Suite 2 Holmen WI 54636 Contact: Darrel VanderZee

FCC ID	ZON-HF-TRX	**Test Report Date**	October 12, 2011
Platform	N/A	**RTL Work Order Number**	2011095
Model	SC950	**RTL Quote Number**	QRTL11-135

FCC Classification	DSC – Part 15 Security/Remote Control Transmitter
FCC Rule Part(s)	Part 15.231: Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz (10-01-10)
Procedure or Other Guidance	ANSI C63.4-2003 Standard for Methods of Measurement of Radio-Noise Emissions
Digital Interface Information	N/A

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
433.92	N/A	N/A	N/A

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 and ANSI C63.4.

Signature: _____ Date: October 12, 2011

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

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

FCC Rules Part 15.231: Periodic operation in the band 40.66–40.70 MHz and above 70 MHz (Part 15.231(e) limits).

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 Reconyx, Inc. Model SC950, FCC ID: ZON-HF-TRX.

2 Test Information

2.1 Test Justification

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT's frequencies were tested and investigated from 9 kHz to the 10th harmonic. The test results relate only to the item that was tested.

The antenna transmits, receives, and is internal. The IF, LO, and up to the 2nd LO, were investigated and tested, and found to be compliant for unintentional emissions compliance.

2.2 Exercising the EUT

The EUT was adapted to continuously transmit for testing purposes. The carrier was also checked to verify that the information was being transmitted. The unit was reprogrammed for normal operation for the duty cycle plots.

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 Conducted Emissions	N/A
FCC 15.231(b)/(e)	Radiated Emissions	Pass
FCC 15.231(c)	20 dB Bandwidth	Pass

2.4 Test System Details

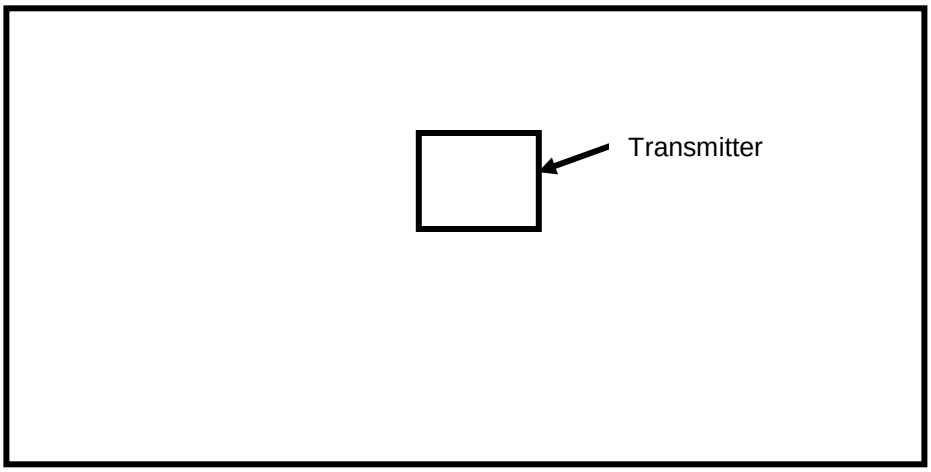
The test samples were received on July 22, 2011. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the following table.

Table 2-2: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Camera Transmitter	Reconyx, Inc.	SC950	S950EE 03121547	ZON-HF-TRX	N/A	20104

2.5 Configuration of Tested System

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

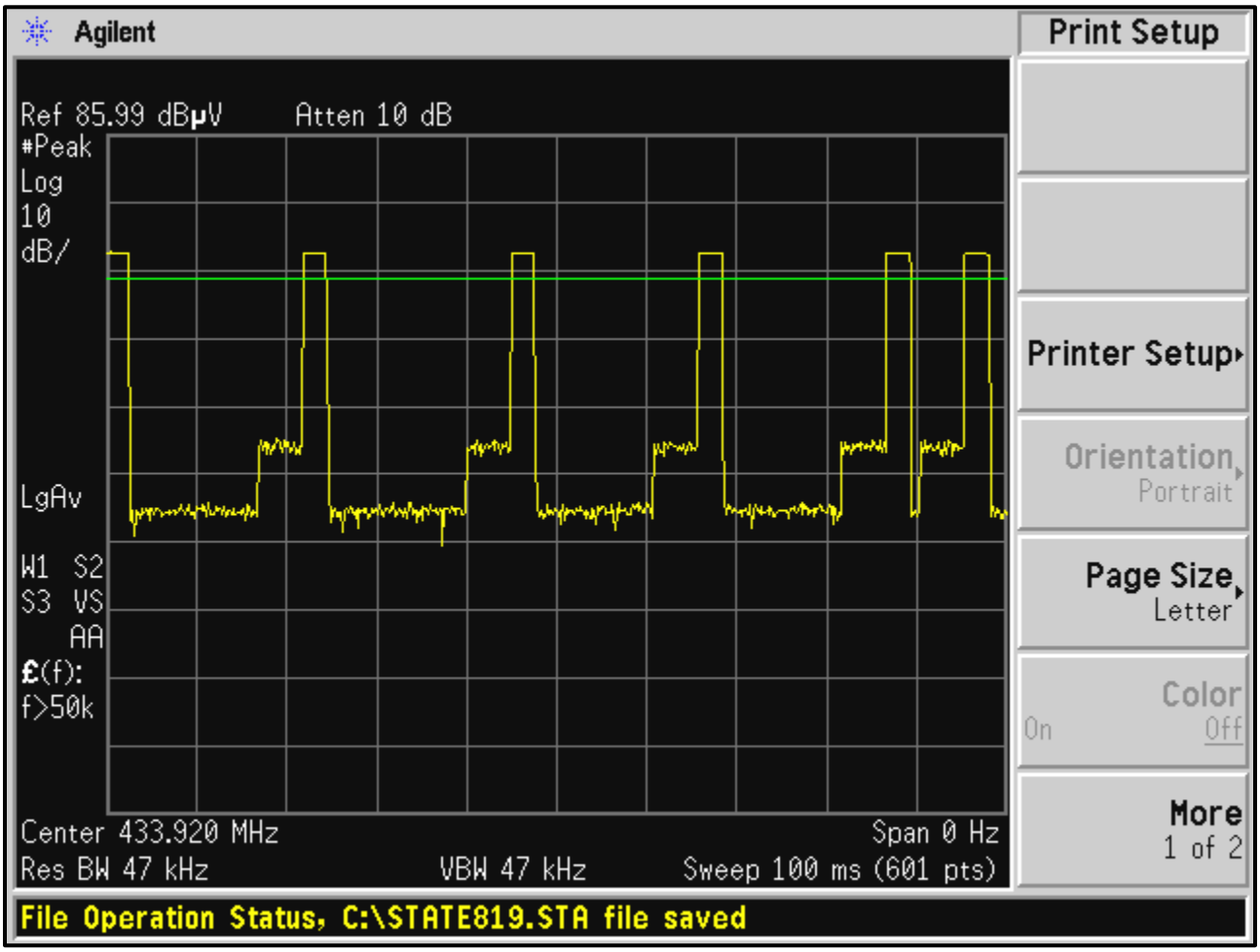


3 Duty Cycle Calculation - FCC 15.35(c)

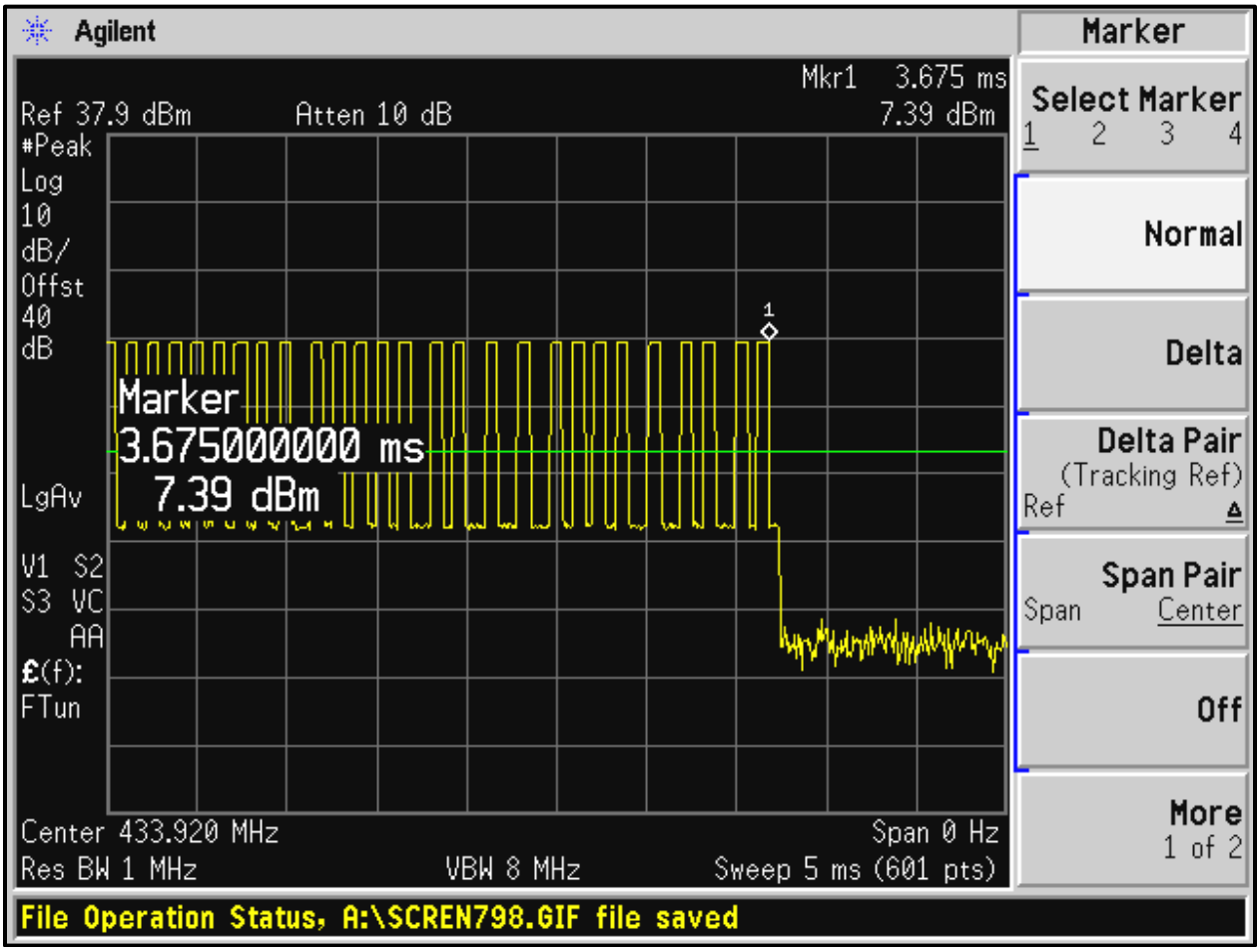
A worst-case standard transmission in 100 ms consists of 6 packets with 27 0.06 ms “on” bits. Therefore, the maximum “on” time in a 100 ms window is 6 * 27 * 0.06 ms = 9.72 ms.

20 log (9.72/100) = -20.2 dB

Plot 3-1: Six Packets in 100 ms



Plot 3-2: Total Number of "on" Bits in a Packet = 27



Plot 3-3: "On" Time of a Bit = 60 us

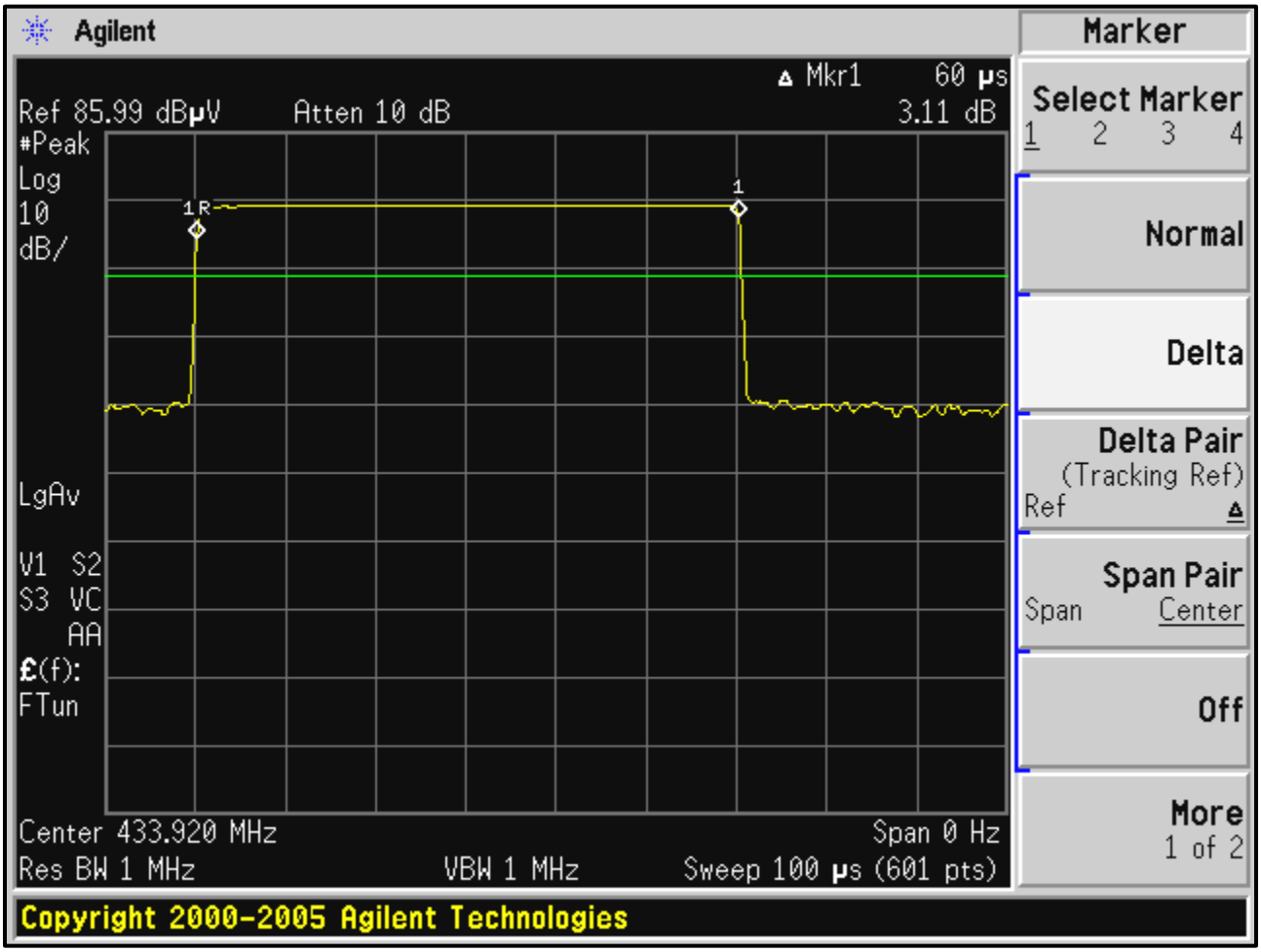


Table 3-1: Duty Cycle Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	4/8/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	October 6, 2011
Test Engineer	Signature	Date of Test

4 Transmitter Deactivation – FCC 15.231(a)(2)

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Plot 4-1: Transmitter Deactivation

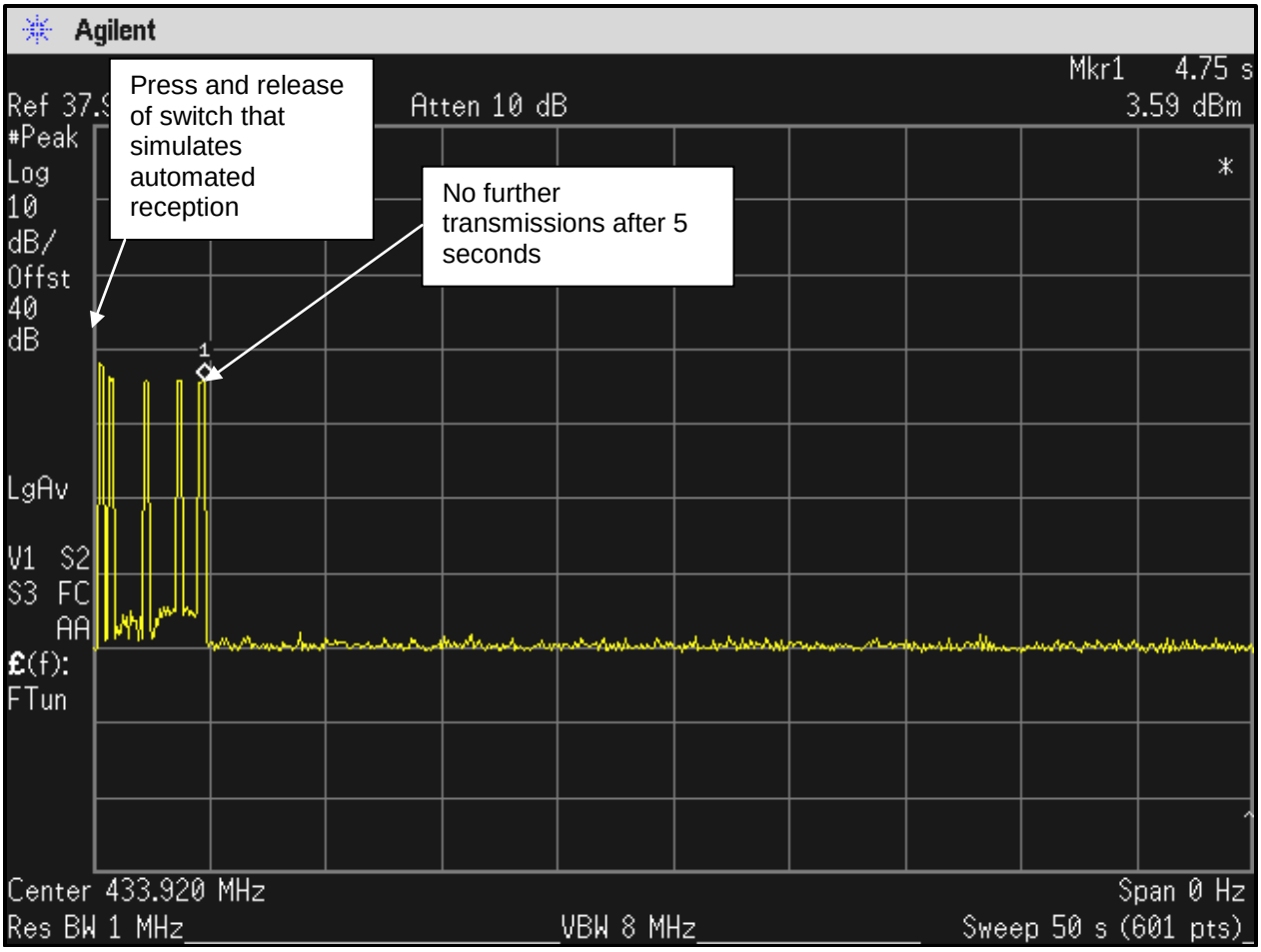


Table 4-1: Transmitter Deactivation Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	4/8/12

Test Personnel:

Daniel Baltzell		October 6, 2011
Test Engineer	Signature	Date of Test

5 Modulated Bandwidth – FCC 15.231(c)

5.1 Modulated Bandwidth Test Procedure

The minimum 20 dB bandwidth was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 10 kHz and the video bandwidth set at 100 kHz. The spectrum analyzer's display markers were set to -20 dB using max hold until the spectrum was filled and a plot taken.

5.2 FCC 15.231(c) Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.3 Modulated Bandwidth Test Data

Table 5-1: 20 dB Modulated Bandwidths

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
433.92	52	0.25% of 433920 = 1085	-1033

Plot 5-1: Modulated Bandwidth

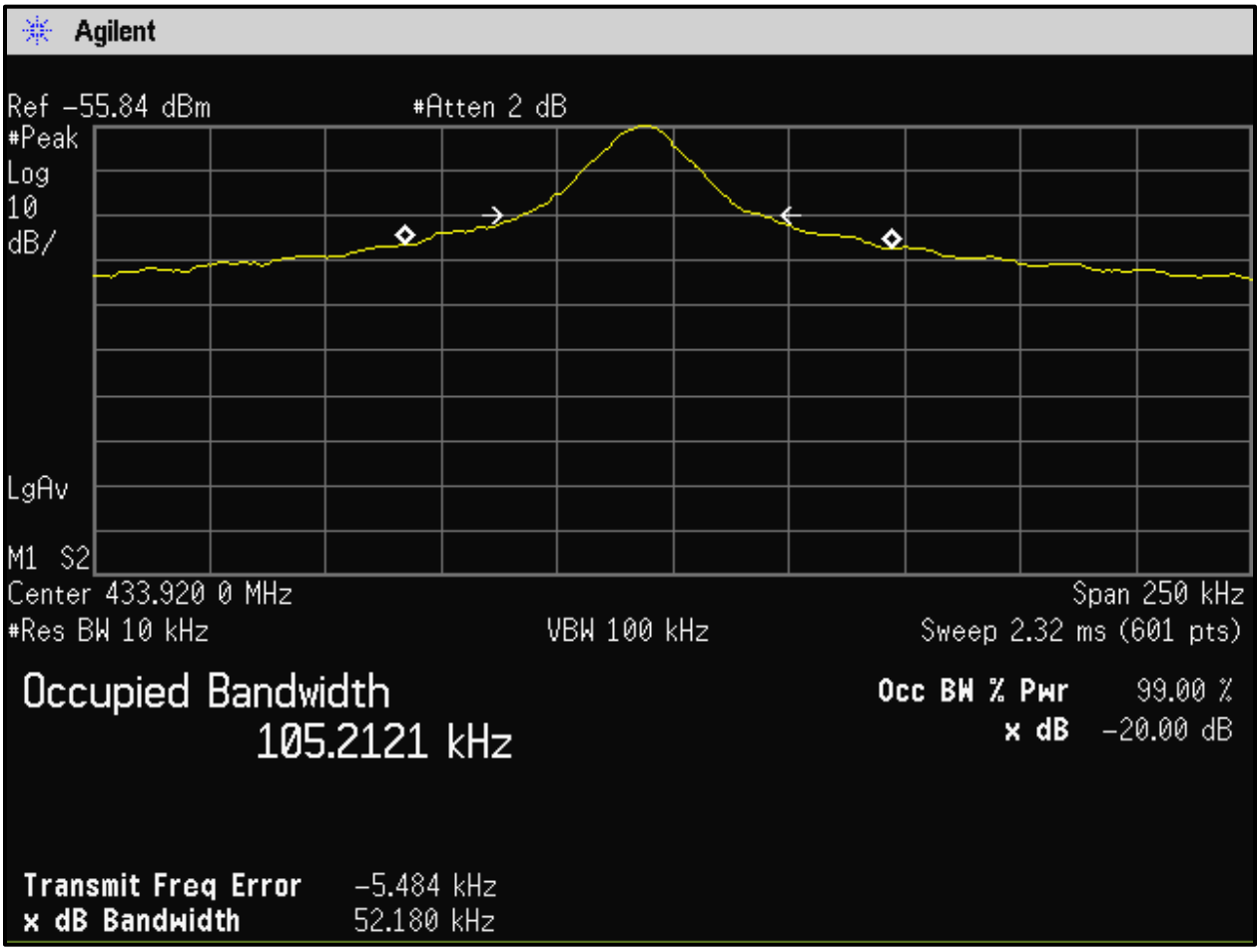


Table 5-2: Modulated Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	4/08/12

Test Personnel:

Richard B. McMurray, P.E.	Richard B. McMurray	August 3, 2011
Test Engineer	Signature	Date of Test

6 Radiated Emissions – FCC 15.209, 15.231(e)

6.1 Radiated Fundamental Emissions Test Procedure

Radiated emissions of the fundamentals were tested at three meters, and meet the requirements of average mode, and 20 dB higher in peak mode. The limit is calculated from a linear interpolation between 1,500 and 5,000 uV/m, and from 260-470 MHz, or 4,399 uV/m at 433.92 MHz. The EUT was tested in all three orthogonal planes. Measurement was based on a peak detector and an average level was calculated. The average level was compared to the average limit as per 15.231(e) and the peak level was compared to the average limit +20 dB per 15.35(b).

6.1.1 Radiated Fundamental Emissions Limits Test Data

Table 6-1: Radiated Fundamental Emissions

Frequency (MHz)	Peak Analyzer Reading (dBuV)	Site Correction Factor (dBm)	Peak Level Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Duty Cycle Correction (dB)	Calculated Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
433.92	61.3	30.5	91.8	92.9	-1.1	-20.2	71.6	72.9	-1.3

6.2 Radiated Harmonics/Spurious Emissions – FCC 15.231(e)

6.2.1 Radiated Emissions Harmonics/Spurious Test Procedure

Radiated emissions of the harmonics were tested at three meters. The EUT was tested in the three orthogonal planes with the receive antenna in both polarities. The emissions were maximized per ANSI C63.4:2003 8.3.1.2; that is, the measurement antenna height was varied between 1 and 4 m, and the EUT was rotated through 360° on a rotating turntable until the maximum emissions were found. Both horizontal and vertical measurement antenna polarizations were used. A resolution bandwidth of 100 kHz was used for frequencies less than 1000 MHz, and a resolution bandwidth of 1 MHz was used for frequencies greater than or equal to 1000 MHz.

Table 6-2: Radiated Spurious Harmonics

Frequency (MHz)	Peak Analyzer Reading (dBuV)	Site Correction Factor (dBm)	Peak Level Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Duty Cycle Correction (dB)	Calculated Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
867.823	62.9	-3.2	59.7	72.9	-13.2	-20.2	39.5	52.9	-13.4
1301.742	51.3	3.4	54.7	72.9	-18.2	-20.2	34.5	52.9	-18.4
1735.652	50.8	7.8	58.6	72.9	-14.3	-20.2	38.4	52.9	-14.5
2,169.572	47.5	7.8	55.3	72.9	-17.6	-20.2	35.1	52.9	-17.8
2,603.492	43.4	9.0	52.4	72.9	-20.5	-20.2	32.2	52.9	-20.7
3,037.412	46.9	7.3	54.2	72.9	-18.7	-20.2	34.0	52.9	-18.9
3,471.332	39.1	8.0	47.1	72.9	-25.8	-20.2	26.9	52.9	-26.0
3,905.252	41.1	8.8	49.9	72.9	-23.0	-20.2	29.7	52.9	-23.2
4,339.172	39.6	13.0	52.6	72.9	-20.3	-20.2	32.4	52.9	-20.5

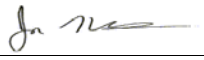
Table 6-3: Radiated Digital Unintentional/RX Emissions

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
80.000	Qp	42.0	-21.7	20.3	40.0	-19.7	Pass
131.400	Qp	43.7	-17.4	26.3	43.5	-17.2	Pass
132.500	Qp	51.0	-17.5	33.5	43.5	-10.0	Pass
139.950	Qp	44.0	-18.0	26.0	43.5	-17.5	Pass
259.940	Qp	46.9	-13.8	33.1	46.0	-12.9	Pass
294.315	Qp	48.6	-14.3	34.3	46.0	-11.7	Pass
451.275	Qp	50.3	-9.3	41.0	46.0	-5.0	Pass
499.924	Qp	48.2	-8.9	39.3	46.0	-6.7	Pass
700.000	Qp	42.3	-5.2	37.1	46.0	-8.9	Pass
1020.000	Av	39.2	-0.9	38.3	54.0	-15.7	Pass

Table 6-4: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900905	Rhein Tech Laboratories, Inc.	PR-1040	Amplifier (20 MHz - 2 GHz)	900905	4/10/12
900791	Schaffner Chase	CBL6112	Bilog Periodic Antenna (25 MHz - 2 GHz)	2099	12/12/12
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz - 6.5 GHz)	3325A00159	8/2/11
900914	Hewlett Packard	85460A	RF Filter Section (100 kHz - 6.5 GHz)	3330A00107	8/2/11
901215	Hewlett Packard	8596EM	Spectrum Analyzer	3826A00144	11/23/11
900932	Hewlett Packard	8449B OPT H02	Amplifier (1 GHz – 26.4 GHz)	3008A00505	7/14/12
900772	EMCO	3161-02	Horn Antenna, (2.0 - 4.0 GHz)	9804-1044	6/13/12
900321	EMCO	3161-03	Horn Antenna, (4.0 - 8.2 GHz)	9508-1020	6/13/12
N/A	Rhein Tech Laboratories, Inc.	Automated Emission Tester	Emissions Testing Software	Rev. 14.0.2	N/A

Test Personnel:

Jon Wilson		July 25, 2011
Test Engineer	Signature	Date of Tests

7 Conducted Emissions

7.1 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 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 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, 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. The limits for Class A and Class B are contained therein.

7.2 Test Limits

Class A Line-Conducted Emissions		
	Limit (dBµV)	
Frequency (MHz)	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30.0	73	60

Class B 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

7.3 Conducted Emissions Test Results

Testing is N/A – the EUT is battery powered.

8 Conclusion

The data in this measurement report shows that Reconyx, Inc. Model SC950, FCC ID: ZON-HF-TRX, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules.