RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.231 & IC RSS-210 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	Safety Technology International, Inc. (STI) 2306 Airport Road Waterford, MI 48327 Contact: John Taylor

FCC ID **IC**	TXL34752 6335A-34752	**Test Report Date**	June 27, 2014
Platform	N/A	**RTL Work Order Number**	2014089
Model	STI-34752	**RTL Quote Number**	QRTL14-089B

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 (2013)
IC Standard	RSS-210 Issue 8: Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
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	516KP1D

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, IC RSS-210 and ANSI C63.4.

Signature: 

Date: June 27, 2014

Typed/Printed Name: Desmond A. Fraser

Position: President

This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and Safety Technology International, Inc. The test results reported relate only to the item tested.

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(b) limits).

IC RSS-210 Issue 8: Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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 Safety Technology International, Inc. Model STI-34752, FCC ID: TXL34752, IC: 6335A-34752.

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 and timing plots. Note that the EUT is a manually activated transmitter.

There were no deviations from the test standard(s) and/or methods.

2.3 Test Result Summary

Table 2-1: Test Result Summary

FCC	IC	Test	Pass/Fail or N/A
FCC 15.207	RSS-Gen 7.2.4	AC Conducted Emissions	N/A
FCC 15.231(a)	RSS-210 A1.1.1	Timing Requirements	Pass
FCC 15.231(b)	RSS-210 A1.1.2	Radiated Emissions	Pass
FCC 15.231(c)	N/A	20 dB Bandwidth	Pass
N/A	RSS-210 A1.1.3	99% Bandwidth	Pass

2.4 Test System Details

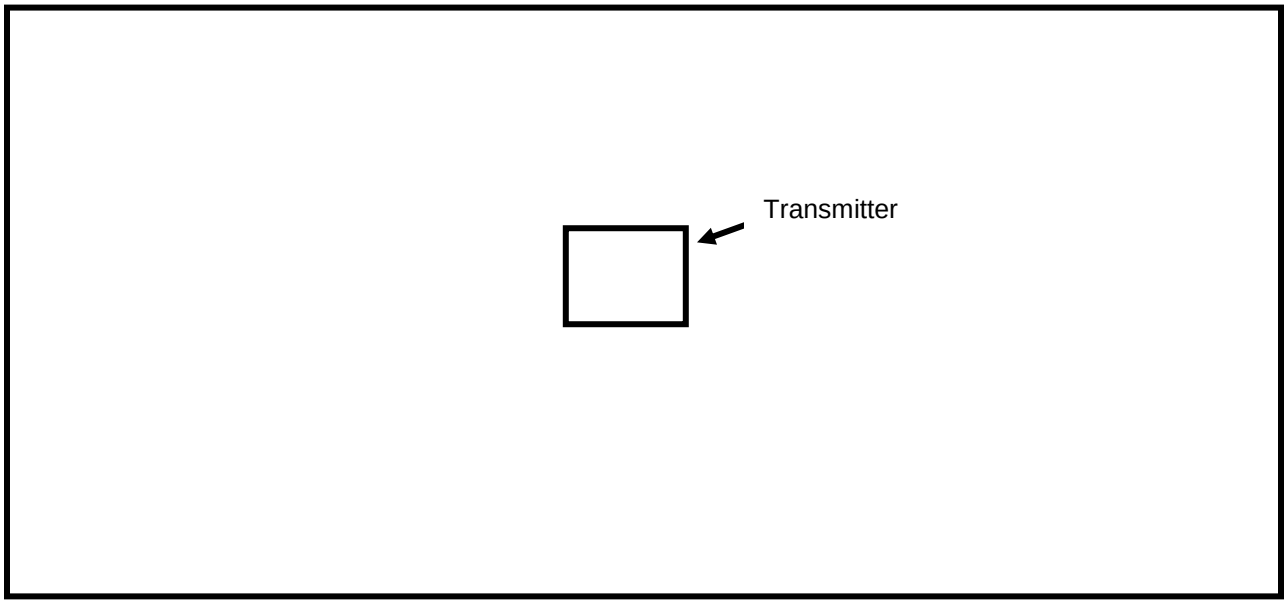
The test samples were received on June 4, 2014. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the following table.

Table 2-2: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
DFIR Sensor	Safety Technology International, Inc.	STI-34752	N/A	TXL34752	N/A	21129

2.5 Configuration of Tested System

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



3 Duty Cycle Calculation - FCC 15.35(c)

This transmitter uses ASK modulation with a max duty cycle of 50%. The transmitted packets are 16.54 ms in length, and are limited to one packet in any 100 ms period. The transmitter duty cycle in a 100ms period is therefore 16.54/2/100 = 8.27%.

Calculating the allowed duty cycle correction factor as given in §15.35(c):

20log(8.27/100) = -21.649 dB

Plot 3-1: Pulse Width

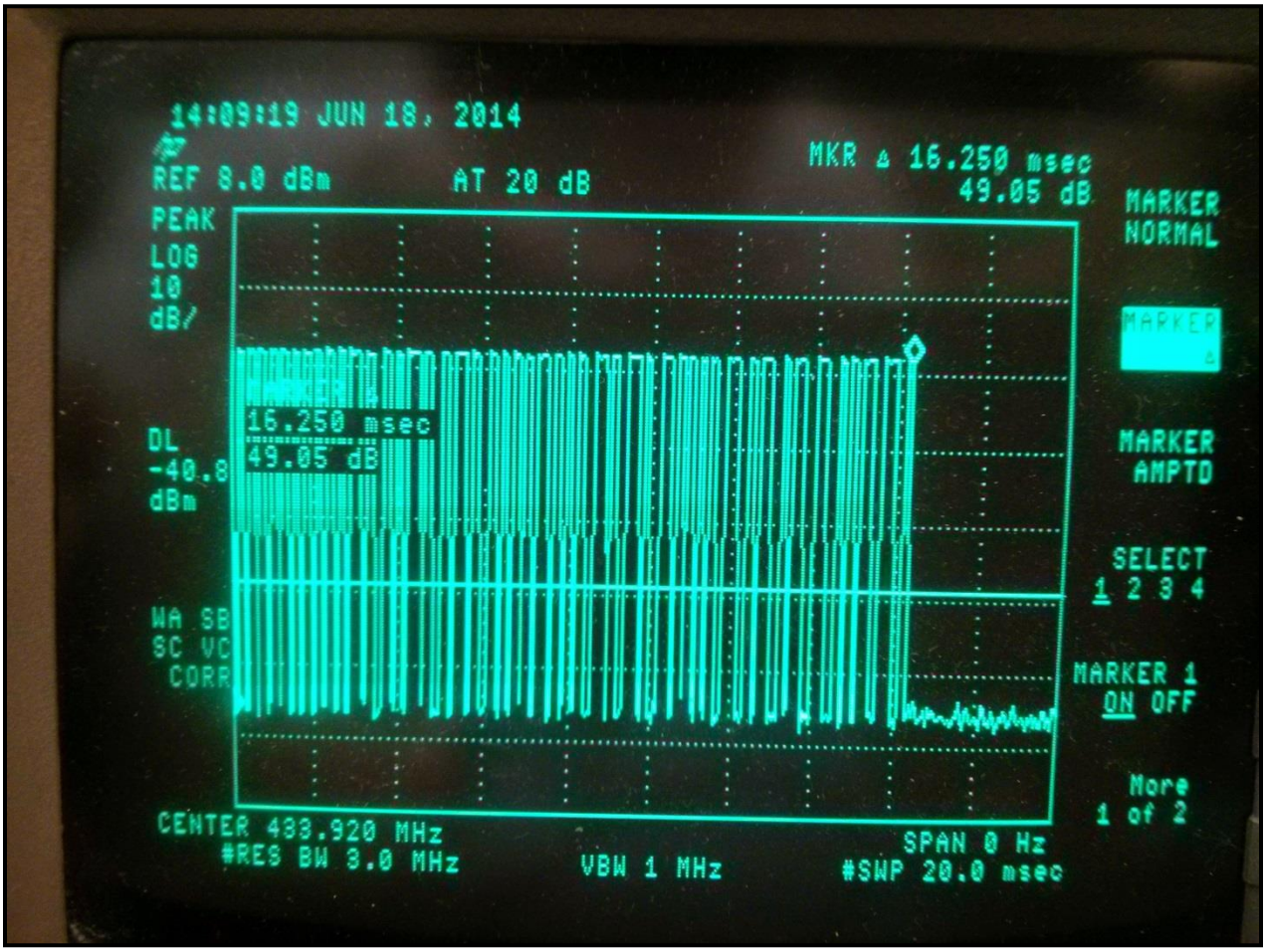


Table 3-1: Duty Cycle Test Equipment

Manufacturer	Model	Part Type	Calibration Due Date
Hewlett Packard	8595E	Spectrum Analyzer	2/26/15

4 Transmitter Deactivation – FCC 15.231(a)(1)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Plot 4-1: Transmitter Deactivation

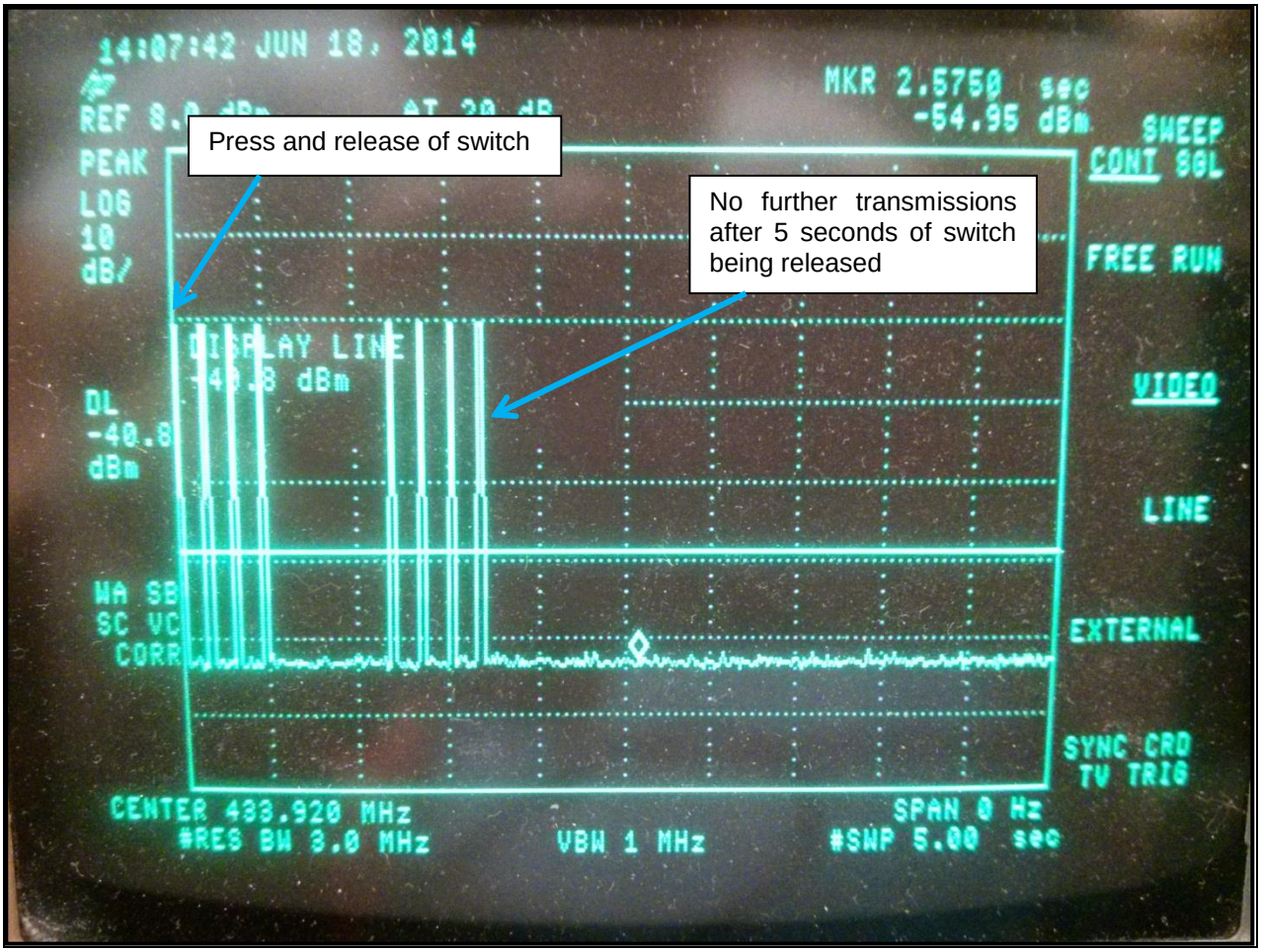


Table 4-1: Transmitter Deactivation Test Equipment

Manufacturer	Model	Part Type	Calibration Due Date
Hewlett Packard	8595E	Spectrum Analyzer	2/26/15

5 Modulated Bandwidth – FCC 15.231(c), RSS-210 A1.1.3

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

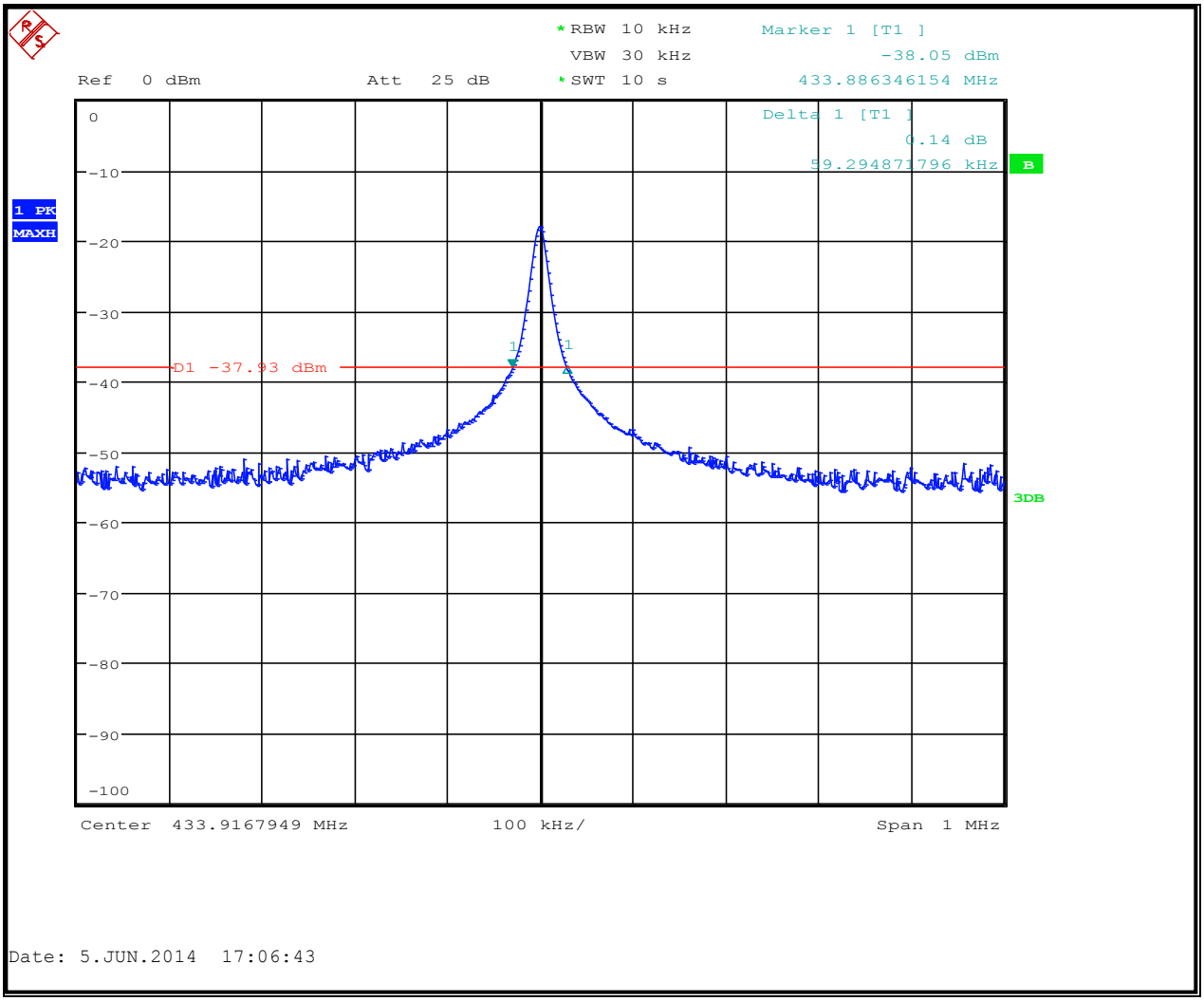
Table 5-1: 20 dB Modulated Bandwidths

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
433.92	59.3	0.25% of 433920 = 1085	-1025.7

Table 5-2: 99% Modulated Bandwidth (RSS-210 A1.1.3)

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
433.92	516	0.25% of 433920 = 1085	-569

Plot 5-1: Modulated Bandwidth (20 dB)



Plot 5-2: Modulated Bandwidth (99%)

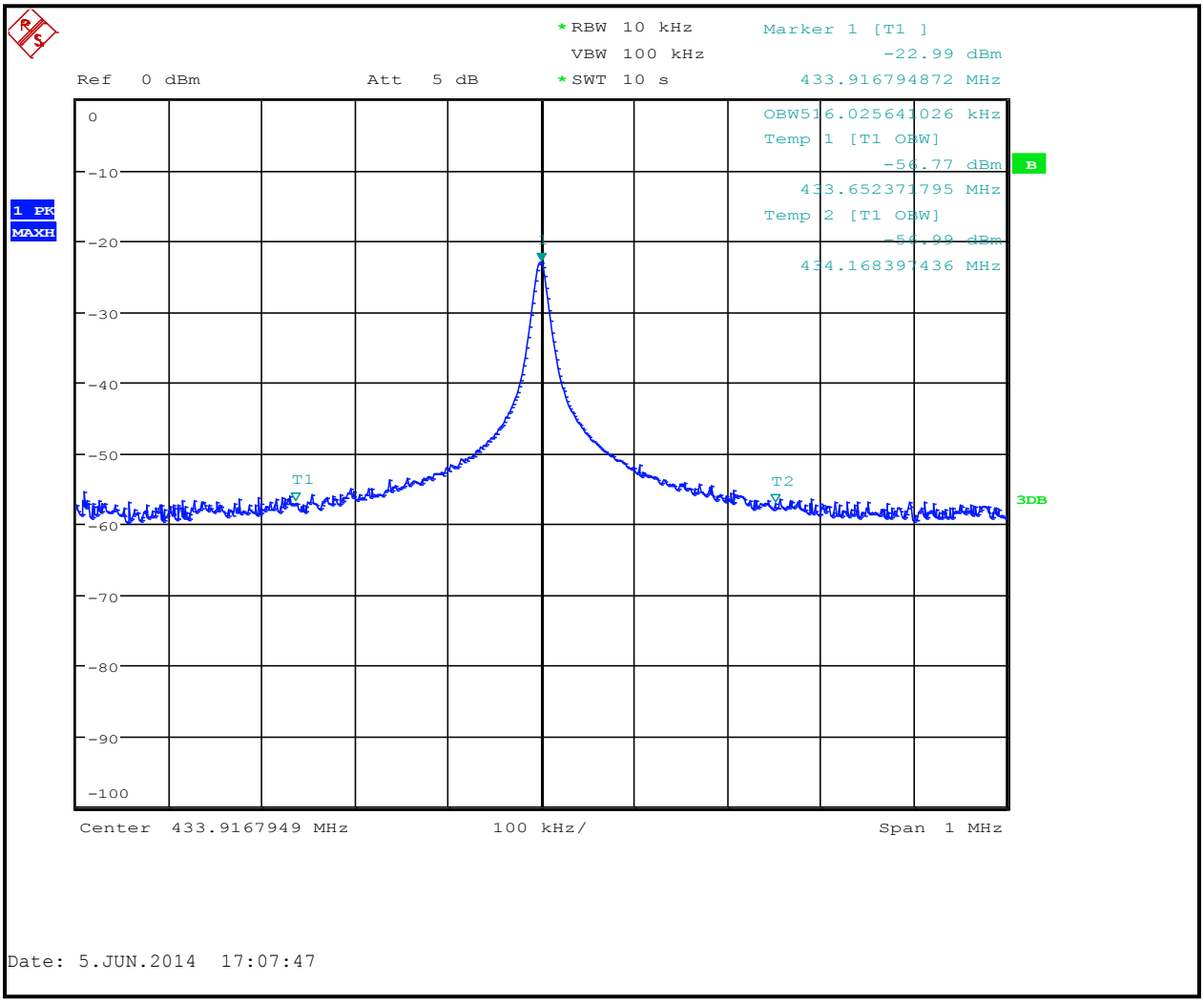


Table 5-3: Modulated Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14

Test Personnel:

Dan Baltzell		June 5, 2014
Test Engineer	Signature	Date of Test

6 Radiated Emissions – FCC 15.209, 15.231(b)

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 3,750 and 12,500 uV/m, and from 260-470 MHz, or 10,997 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(b) 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	111.7	-13.6	98.1	100.8	-2.7	-21.7	76.4	80.8	-4.4

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

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

Emission Frequency (MHz)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
867.834	74.1	-5.1	69.0	80.8	-11.8	Pass
1301.751	56.4	1.0	57.4	74.0	-16.6	Pass
1735.668	59.0	5.2	64.2	80.8	-16.7	Pass
2169.585	64.7	-8.8	55.9	80.8	-24.9	Pass
2603.502	68.8	-9.1	59.7	80.8	-21.1	Pass
3037.419	69.4	-9.0	60.4	80.8	-20.4	Pass
3471.336	61.1	-7.0	54.1	80.8	-26.7	Pass
3905.246	54.7	-2.6	52.1	74.0	-21.9	Pass
4339.163	52.6	-1.5	51.1	74.0	-22.9	Pass

Table 6-3: Radiated Digital Unintentional Emissions

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
216.957	Qp	H	60.6	-30.7	29.9	46.0	-16.1	Pass
325.440	Qp	H	47.8	-26.9	20.9	46.0	-25.1	Pass
379.677	Qp	H	43.6	-25.4	18.2	46.0	-27.8	Pass
420.358	Qp	H	55.0	-24.5	30.5	46.0	-15.5	Pass
447.475	Qp	H	51.5	-24.0	27.5	46.0	-18.5	Pass
496.417	Qp	H	23.7	-23.8	-0.1	46.0	-46.1	Pass
542.397	Qp	H	52.8	-21.5	31.3	46.0	-14.7	Pass

Table 6-4: Radiated Spurious Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/27/14
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/27/14
901629	Teledyne Cougar	A4C2123	Amplifier	003-003	9/4/14
900724	Antenna Research Associates, Inc.	LPB-2520	BiLog Antenna (25 - 1000 MHz)	1037	4/19/15
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/14
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	8/27/14
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/20/15
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/20/15

Test Personnel:

Dan Baltzell		June 4, 2014
Test Engineer	Signature	Date of Test

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 the Safety Technology International, Inc. Model STI-34752, FCC ID: TXL34752, IC: 6335A-34752, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and IC RSS-210.