



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 Email: atcbinfo@rheintech.com	Safety Technology International, Inc. 2306 Airport Road Waterford, MI 48327 Contact: John Taylor		
FCC ID/ IC	TXL34601 6335A-34601	Test Report Date	February 27, 2012
Platform	N/A	RTL Work Order Number	2012025
Model	34601	RTL Quote Number	QRTL12-005A
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 (10-01-11)		
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	98K7P1D

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: Desmond A. Fraser Date: February 27, 2012

Typed/Printed Name: Desmond A. Fraser Pos: 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/ACCLASS. Refer to certificate and scope of accreditation AT-1445.

Table of Contents

1	General Information	4
1.1	Scope	4
1.2	Modifications	4
1.3	Test Facility	4
1.4	Related Submittal(s)/Grant(s)	4
2	Test Information	5
2.1	Test Justification.....	5
2.2	Exercising the EUT	5
2.3	Test Result Summary	5
2.4	Test System Details	5
2.5	Configuration of Tested System.....	6
3	Duty Cycle Calculation - FCC 15.35(c)	7
4	Transmitter Deactivation – FCC 15.231(a)(1).....	9
5	Modulated Bandwidth – FCC 15.231(c), RSS-210 A1.1.3	11
5.1	Modulated Bandwidth Test Procedure	11
5.2	FCC 15.231(c) Limits	11
5.3	Modulated Bandwidth Test Data	12
6	Radiated Emissions – FCC 15.209, 15.231(b)	15
6.1	Radiated Fundamental Emissions Test Procedure	15
6.1.1	Radiated Fundamental Emissions Limits Test Data	15
6.2	Radiated Harmonics/Spurious Emissions – FCC 15.231(b)	15
6.2.1	Radiated Emissions Harmonics/Spurious Test Procedure	15
7	Conducted Emissions	18
7.1	Site and Test Description	18
7.2	Test Limits	18
7.3	Conducted Emissions Test Results	18
8	Conclusion	19

Table Index

Table 2-1:	Test Result Summary	5
Table 2-2:	Equipment Under Test (EUT).....	5
Table 3-1:	Duty Cycle Test Equipment.....	8
Table 4-1:	Transmitter Deactivation Test Equipment.....	10
Table 5-1:	20 dB Modulated Bandwidths	12
Table 5-2:	99% Modulated Bandwidth (RSS-210 A1.1.3)	13
Table 5-3:	Modulated Bandwidth Test Equipment	14
Table 6-1:	Radiated Fundamental Emissions	15
Table 6-2:	Radiated Spurious Harmonics	16
Table 6-3:	Radiated Digital Unintentional/RX Emissions	16
Table 6-4:	Radiated Emissions Test Equipment	17

Figure Index

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

Plot 3-1:	Transmit on in 100 ms Window	7
Plot 4-1:	Transmitter Deactivation	9
Plot 5-1:	Modulated Bandwidth – 20 dB	12
Plot 5-2:	Modulated Bandwidth – 99%	13

Appendix Index

Appendix A:	FCC/TCB Agency Authorization Letter	20
Appendix B:	FCC Confidentiality Request Letter.....	21
Appendix C:	IC Letters.....	22
Appendix D:	IC Confidentiality Request Letter	23
Appendix E:	Canadian Based Representative Attestation	24
Appendix F:	ID Label and Label Location	25
Appendix G:	Operational Description	26
Appendix H:	Schematics	27
Appendix I:	Block Diagram	28
Appendix J:	Manual	29
Appendix K:	Test Photographs	30
Appendix L:	External Photographs	33
Appendix M:	Internal Photographs	34

Photograph Index

Photograph 1:	Radiated Emissions X-Axis	30
Photograph 2:	Radiated Emissions Y-Axis	31
Photograph 3:	Radiated Emissions Z-Axis	32

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Client: STI, Inc.
Model: 34601
Standards: FCC 15.231/IC RSS-210
ID's: TXL34601/6335A-34601
Report #: 2012025

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 34601, FCC ID: TXL34601, IC: 6335A-34601.

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)	RSS-210 A1.1.3	20 dB Bandwidth/99% Bandwidth	Pass

2.4 Test System Details

The test samples were received on January 20, 2012. 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)

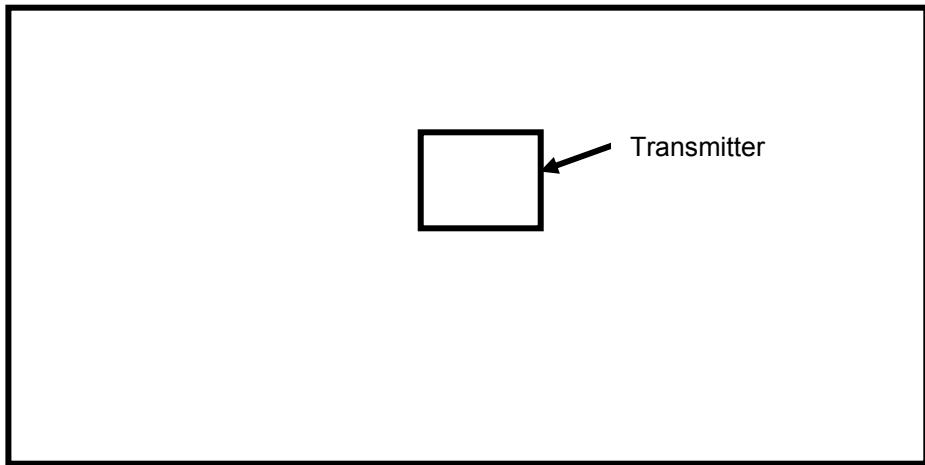
Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Door Button	Safety Technology International, Inc.	34601 N/A		TXL34601	N/A	20301

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2.5 Configuration of Tested System

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

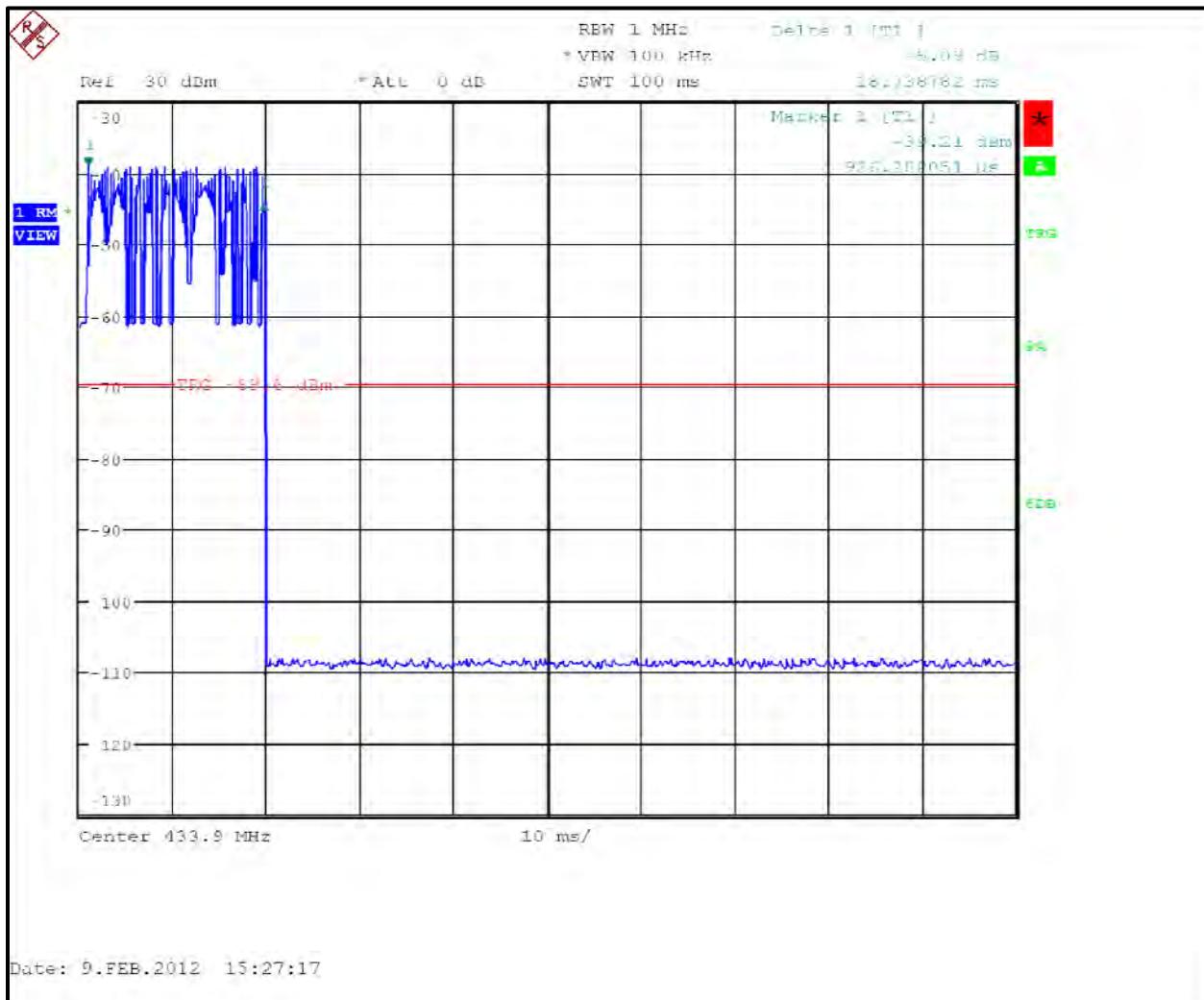


3 Duty Cycle Calculation - FCC 15.35(c)

A worst-case standard transmission in 100 ms consists of a "Transmit on-time" of 18 msec, when measured in a 100 msec window, consisting of one packet. Each packet is composed of 64 bits of 150us each or 9.6 ms/100ms window.

$$20 \log (9.6/100) = -20.4 \text{ dB}$$

Plot 3-1: Transmit on in 100 ms Window



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Table 3-1: Duty Cycle Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	1166.1660.50	FSU Spectrum Analyzer (20 Hz – 50 GHz)	200106 01/19/20	13

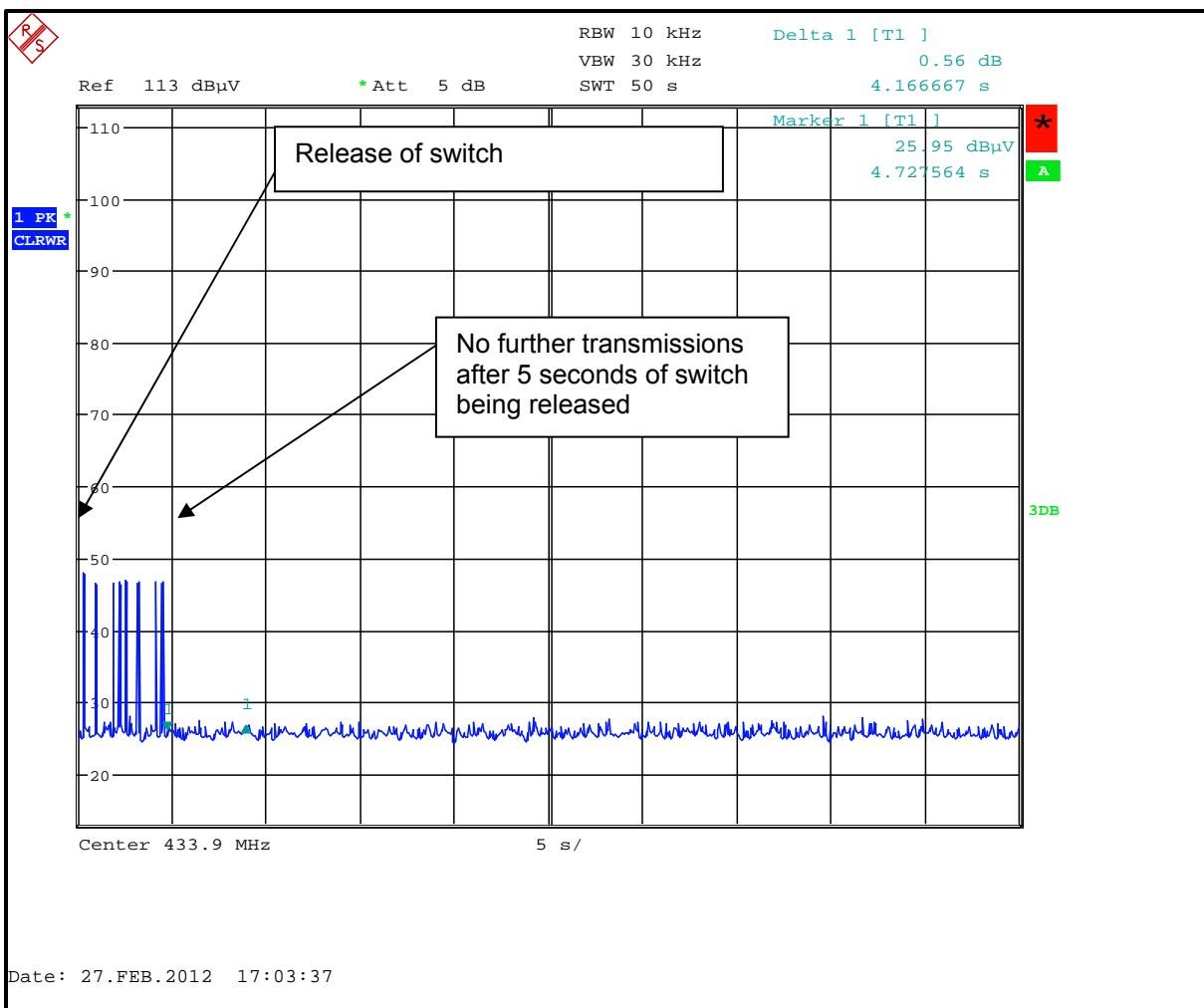
Test Personnel:

Rick McLay		February 9, 2012
Test Engineer	Signature	Date of Test

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



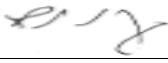
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Table 4-1: Transmitter Deactivation Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	1166.1660.50	FSU Spectrum Analyzer (20 Hz – 50 GHz)	200106 01/19/20	13

Test Personnel:

Rick McLay		February 27, 2012
Test Engineer	Signature	Date of Test

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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

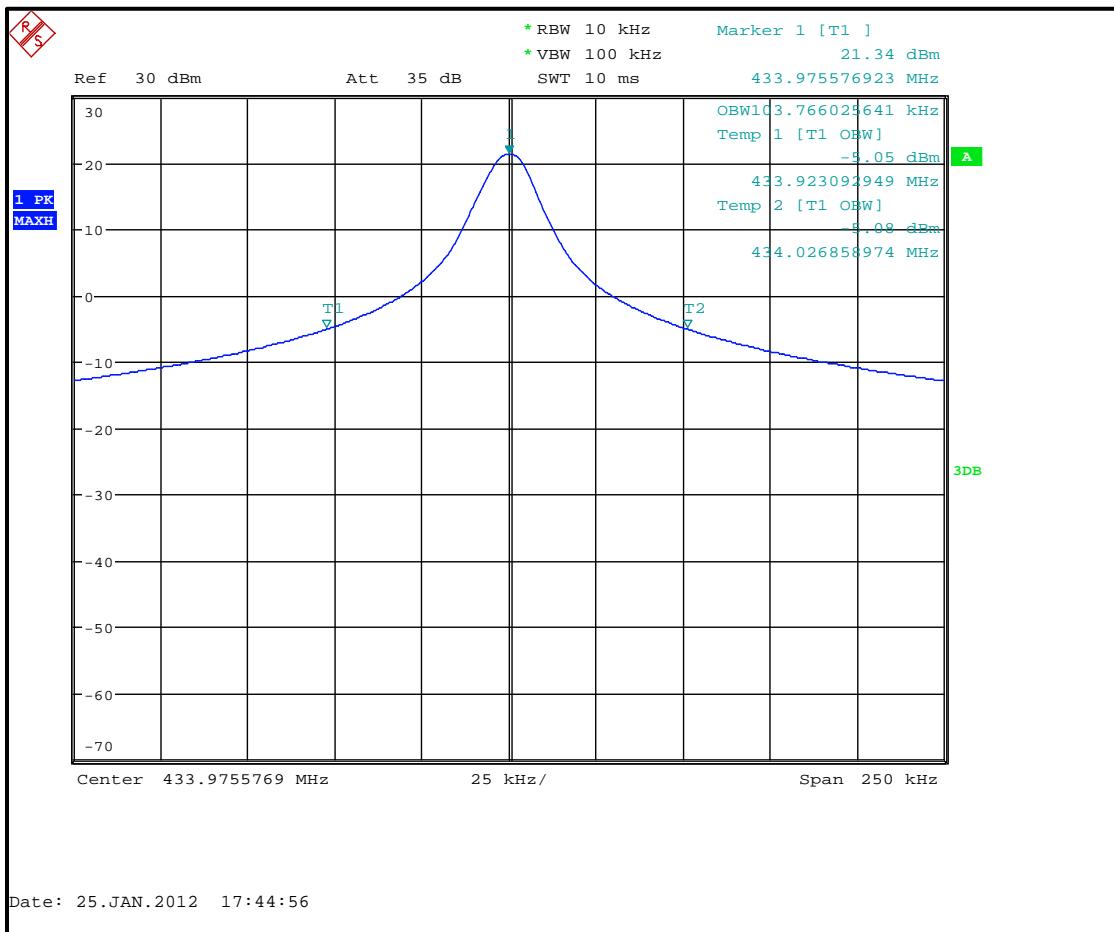
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated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

5.3 Modulated Bandwidth Test Data

Table 5-1: 20 dB Modulated Bandwidths

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
433.97	103.8	0.25% of 433920 = 1085	-981.2

Plot 5-1: Modulated Bandwidth – 20 dB



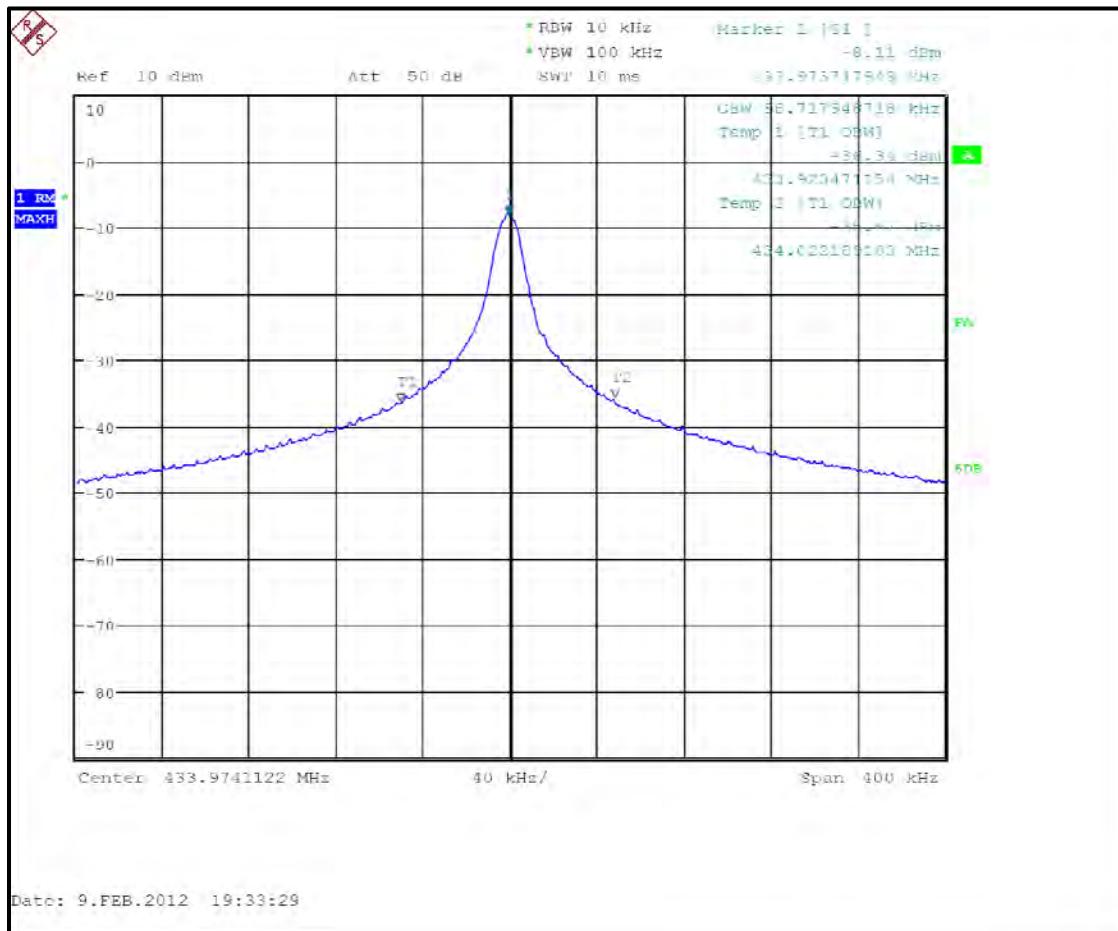
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Table 5-2: 99% Modulated Bandwidth (RSS-210 A1.1.3)

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
433.97	98.7	0.25% of 433920 = 1085	-98.3

Plot 5-2: Modulated Bandwidth – 99%



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Table 5-3: Modulated Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	1166.1660.50	FSU Spectrum Analyzer (20 Hz – 50 GHz)	200106 01/19/20	13

Test Personnel:

Rick McLay		February 9, 2012
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)
433.990	58.7	30.5	89.2	100.8	-11.6	-20.4	68.8	80.8	-12.0

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.

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 Report #: 2012025

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)
867.946	59.0	-1.9	57.1	80.8	-23.7	-20.4 36	7	60.8	-24.1
1301.936	44.5	7.9	52.4	74.0	-21.6	-20.4 32	0	54.0	-22.0
1735.926	44.3	8.1	52.4	80.8	-28.4	-20.4 32	0	60.8	-28.8
2169.935	47.9	-8.7	39.2	80.8	-41.6	-20.4 18	8	60.8	-42.0
2603.922	46.7	-5.8	40.9	80.8	-39.9	-20.4 20	5	60.8	-40.3
3037.909	43.0	-7.8	35.2	80.8	-45.6	-20.4 14	8	60.8	-46.0
3471.896	44.7	-6.7	38.0	80.8	-42.8	-20.4 17	6	60.8	-43.2
3905.883	44.7	-6.0	38.7	74.0	-35.3	-20.4 18	3	54.0	-35.7
4339.870	44.7	-1.1	43.0	74.0	-31.0	-20.4 22	6	54.0	-31.4

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
56.841 Qp		38.2	-22.8	15.4	40.0	-24.6	Pass
81.959 Qp		38.3	-21.3	17.0	40.0	-23.0	Pass
139.089 Qp		34.7	-17.9	16.8	43.5	-26.7	Pass
142.783 Qp		35.0	-18.1	16.9	43.5	-26.6	Pass
199.174 Qp		39.2	-18.8	20.4	43.5	-23.1	Pass
347.170 Qp		32.7	-12.6	20.1	46.0	-25.9	Pass

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Table 6-4: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901364	Rhein Tech Laboratories	PR-1042	40dB PreAmplifier, (1 - 18 GHz)	1003 07/14/20	12
900905	Rhein Tech Laboratories	PR-1040	Preamplifier 40dB (30 MHz – 2 GHz)	1006 07/14/20	12
900878	Rhein Tech Laboratories	AM3-1197-0005	4 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901399	Times Microwave	SFT-205	RF cable, 30'	NA	07/19/2012
901397	Times Microwave	SFT-205	RF cable, 1'	NA	07/19/2012
901242	Rhein Tech Laboratories	WRT-000-0003	Polystyrene rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159 08/02/20	12
900914	Hewlett Packard	85460A	RF Filter Section, (100 kHz - 6.5 GHz)	3330A00107 08/02/20	12
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	06/14/2012
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020 06/14/20	12
901581	Rohde & Schwarz	1166.1660.50	FSU Spectrum Analyzer (20 Hz – 50 GHz)	200106 01/19/20	13

Test Personnel:

Rick McLay

Test Engineer



January 25, 2012

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 (dB μ V)		
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 (dB μ V)		
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.

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8 Conclusion

The data in this measurement report shows that Safety Technology International, Inc. Model 34601, FCC ID: TXL34601, IC: 6335A-34601, complies with all the applicable requirements of Parts 2 and 15 of the FCC rules and IC RSS-210.