



Engineering Solutions & Electromagnetic Compatibility Services

**FCC Part 15.249 & IC RSS-210 Certification Application Report**

<b>Test Lab:</b>  Rhein Tech Laboratories, Inc. Tel: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 Web: <a href="http://www.rheintech.com">www.rheintech.com</a> Herndon, VA 20170 Email: <a href="mailto:atcbinfo@rheintech.com">atcbinfo@rheintech.com</a>		<b>Applicant:</b>  Safety Technology International, Inc. 2306 Airport Road Waterford, MI 48327 Contact: John Taylor	
<b>FCC ID</b>	TXL-STI-ED55	<b>Test Report Date</b>	August 30, 2012
<b>IC</b>	6335A-STIED55		
<b>Platform</b>	N/A	<b>RTL Work Order Number</b>	2012241
<b>Model</b>	ED-55	<b>RTL Quote Number</b>	QRTL12-241A
<b>FCC Classification</b>	DXX – Part 15 Low Power Communication Device Transmitter		
<b>FCC Rule Part(s)</b>	Part 15.249: Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz. (10-01-11)		
<b>IC Standard</b>	RSS-210 Issue 8: Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment		
<b>Procedure or Other Guidance</b>	ANSI C63.4-2003 Standard for Methods of Measurement of Radio-Noise Emissions		
<b>Digital Interface Information</b>	N/A		
<b>Frequency Range (MHz)</b>	<b>Output Power (W)</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
2400-2483.5	N/A	N/A	2M88F0N

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: August 30, 2012

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.*

## 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	Radiated Emissions – FCC 15.209, 15.249(a), RSS-210 A2.9 .....	8
4.1	Radiated Emission Limits Test Procedure .....	8
4.2	Radiated Emission Limits Test Data .....	8
4.2.1	Radiated Fundamental Emissions Limits Test Data .....	8
5	Radiated Emission Limits Radiated Harmonics – FCC 15.249 .....	9
5.1	Radiated Emission Limits Test Procedure .....	9
6	In-Band Emissions Requirement – FCC 15.215(c).....	11
6.1	Test Procedure.....	11
6.2	FCC 15.215(c) Requirement .....	11
6.3	Test Data.....	12
7	Occupied Bandwidth – RSS-Gen 4.6.1 .....	14
7.1	Modulated Bandwidth Test Procedure .....	14
8	Conducted Emissions .....	16
8.1	Site and Test Description .....	16
8.2	Test Limits .....	16
8.3	Conducted AC Emissions Test Data.....	17
9	Conclusion .....	18

---

### 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:	Radiated Fundamental Emissions .....	8
Table 5-1:	Radiated Spurious Emissions – Peak.....	9
Table 5-2:	Radiated Spurious Emissions – Calculated Average.....	9
Table 5-3:	Radiated Emissions Test Equipment .....	10
Table 6-1:	In-band Test Equipment.....	13
Table 7-1:	99% Modulated Bandwidth (RSS-210 A1.1.3).....	14
Table 7-2:	Modulated Bandwidth Test Equipment .....	15
Table 8-1:	Conducted Emissions Test Equipment.....	18

---

### Figure Index

---

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

---

### Plot Index

---

Plot 3-1:	Transmit on in 100 $\mu$ sec Window .....	7
Plot 6-1:	20 dB Bandwidth .....	12
Plot 7-1:	Occupied Bandwidth – 99% .....	14
Plot 8-1:	Conducted AC Emissions; Phase .....	17
Plot 8-2:	Conducted AC Emissions; Neutral.....	17

---

### Appendix Index

---

Appendix A:	FCC/TCB Agency Authorization Letter .....	19
Appendix B:	FCC Confidentiality Request Letter.....	20
Appendix C:	IC Letters.....	21
Appendix D:	IC Confidentiality Request Letter .....	22
Appendix E:	Canadian Based Representative Attestation .....	23
Appendix F:	ID Label and Label Location .....	24
Appendix G:	Operational Description .....	25
Appendix H:	Schematics.....	26
Appendix I:	Block Diagram .....	27
Appendix J:	Manual.....	28
Appendix K:	Test Photographs .....	29
Appendix L:	External Photographs.....	33
Appendix M:	Internal Photographs .....	34

---

### Photograph Index

---

Photograph 1:	Radiated Emissions – Front View .....	29
Photograph 2:	Radiated Emissions – Side View .....	30
Photograph 3:	Conducted Emissions – Front View .....	31
Photograph 4:	Conducted Emissions – Rear View.....	32

## **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

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: ED-55, FCC ID: TXL-STI-ED55, IC: 6335A-STIED55.

## 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 10<sup>th</sup> 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 2<sup>nd</sup> 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 15.249(a)	RSS-210 A2.9	Radiated Emissions	Pass
N/A	RSS-Gen 4.6.1	99% Bandwidth	Pass

### 2.4 Test System Details

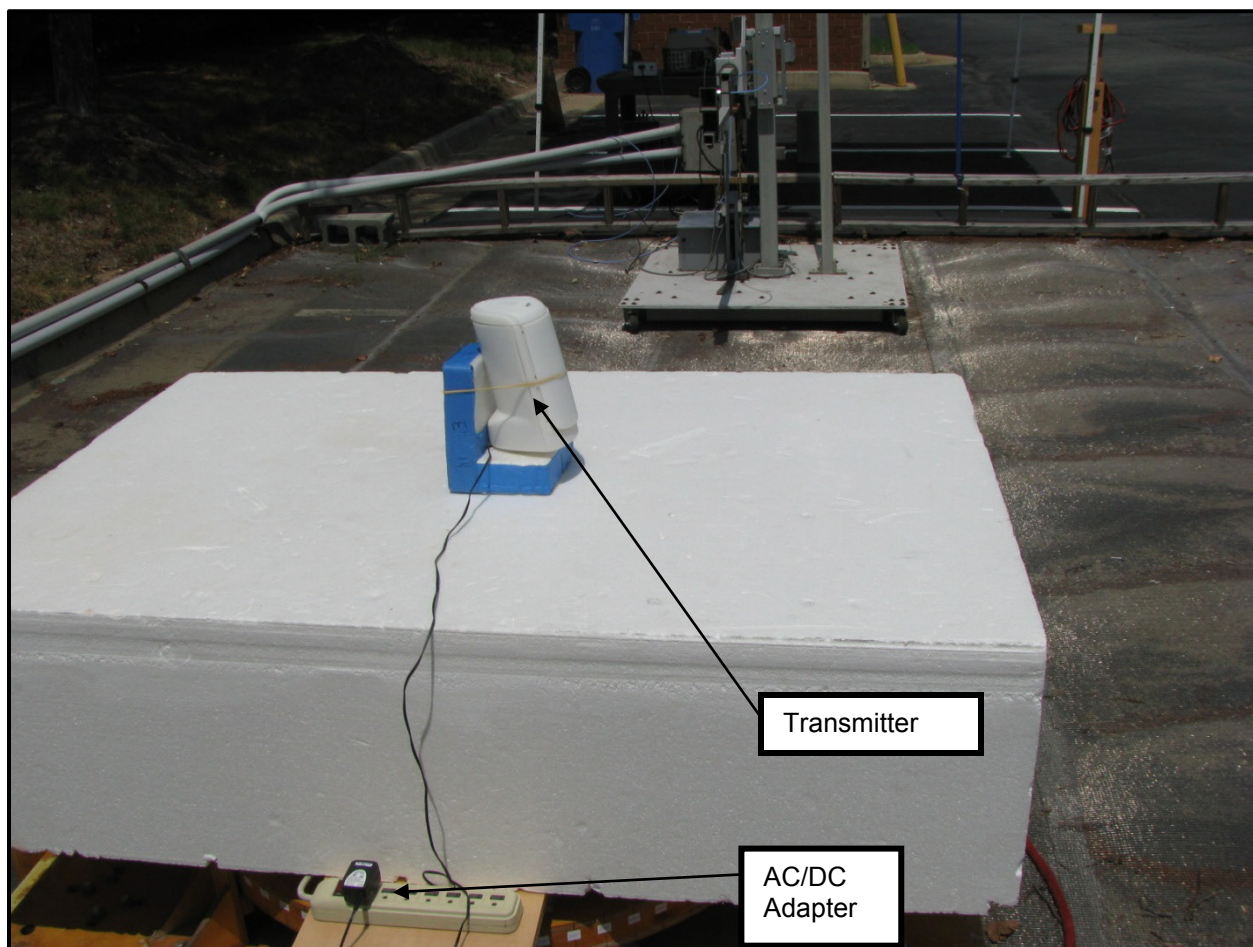
The test samples were received on July 29, 2012. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the following table.

**Table 2-2: Equipment Under Test (EUT)**

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Electronic Watchdog	Safety Technology International, Inc.	ED-55	N/A	TXL-STI-ED55	N/A	20363
AC/DC Adapter	Voltamax	YMC06-3U	LPS	DoC	Unshielded	20365

## 2.5 Configuration of Tested System

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

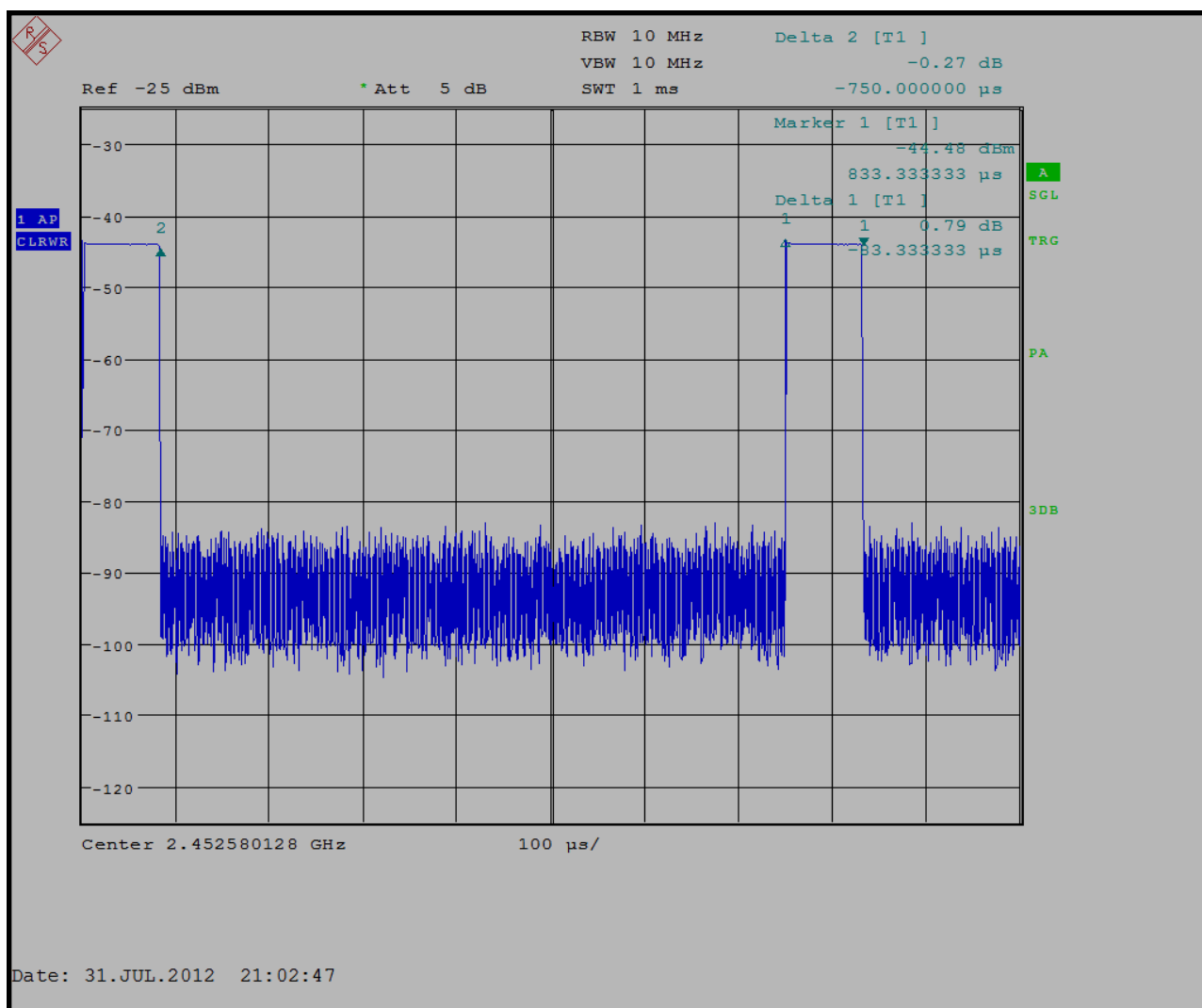


### 3 Duty Cycle Calculation - FCC 15.35(c)

A worst-case standard transmission in 100 ms consists of a "Transmit on-time" of 83.3  $\mu$ sec, when measured in a 100  $\mu$ sec window, consisting of one packet. On time plus off time is 750  $\mu$ sec.

$$20 \log (83.3/750) = -19.1 \text{ dB}$$

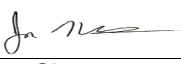
Plot 3-1: Transmit on in 100  $\mu$ sec Window



**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	01/19/13

**Test Personnel:**

Jon Wilson		July 31, 2012
Test Engineer	Signature	Date of Test

**4 Radiated Emissions – FCC 15.209, 15.249(a), 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 channel in power control setting of -1.0 dBm; the worst case emissions are shown. Peak measurements were taken and are compared to the quasi-peak limit.

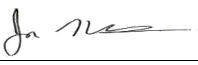
**4.2 Radiated Emission Limits Test Data**

**4.2.1 Radiated Fundamental Emissions Limits Test Data**

**Table 4-1: Radiated Fundamental Emissions**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Peak Corrected Level (dBuV/m)	Limit (dBuV/m)	Peak Margin (dB)	Duty Cycle Correction (dB)	Calculated Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2,452.580	63.9	25.1	89.0	94.0	-5.0	-19.1	69.9	74.0	-4.1

**Test Personnel:**

Jon Wilson		July 31, 2012
Test Engineer	Signature	Date of Test



## 5 Radiated Emission Limits Radiated Harmonics – FCC 15.249

### 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 by rotating through three orthogonal planes, each at 360° rotation with the receive antenna in both vertical and horizontal polarity.

**Table 5-1: Radiated Spurious Emissions – Peak**

Emission Frequency (MHz)	Antenna Polarity (H/V)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
4,857.000	V	68.0	-10.3	57.7	74.0	-16.3	Pass
7,323.000	V	55.6	-8.0	47.6	74.0	-26.4	Pass
9,772.000	H	38.9	-1.2	37.7	74.0	-36.3	Pass
12,222.000	H	33.8	0.7	34.5	74.0	-39.5	Pass
14,665.700	H	19.4	14.6	34.0	74.0	-40.0	Pass
17,109.400	H	18.0	13.5	41.5	74.0	-32.5	Pass
19,553.100	V	17.5	32.0	49.5	74.0	-24.5	Pass
21,996.800	V	18.2	33.0	51.2	74.0	-22.8	Pass
24,440.500	V	18.3	33.9	52.2	74.0	-21.8	Pass


**Table 5-2: Radiated Spurious Emissions – Calculated Average**

Emission Frequency (MHz)	Antenna Polarity (H/V)	Peak Emission Level (dBuV/m)	Duty Cycle Correction (dB)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Pass/Fail
4,857.000	V	57.7	-19.1	38.6	54.0	-15.4	Pass
7,323.000	V	47.6	-19.1	28.5	54.0	-25.5	Pass
9,772.000	H	37.7	-19.1	18.6	54.0	-35.4	Pass
12,222.000	H	34.5	-19.1	15.4	54.0	-38.6	Pass
14,665.700	H	34.0	-19.1	14.9	54.0	-39.1	Pass
17,109.400	H	41.5	-19.1	22.4	54.0	-31.6	Pass
19,553.100	V	49.5	-19.1	30.4	54.0	-23.6	Pass
21,996.800	V	51.2	-19.1	32.1	54.0	-21.9	Pass
24,440.500	V	52.2	-19.1	33.1	54.0	-20.9	Pass

**Table 5-3: 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	07/14/13
900905	Rhein Tech Laboratories	PR-1040	Preamplifier 40dB (30 MHz–2 GHz)	1006	07/14/13
900878	Rhein Tech Laboratories	AM3-1197-0005	4 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901334	RF Depot	N/A	RF cable, 30'	NA	05/24/13
901336	RF Depot	N/A	RF cable, 3'	NA	05/24/13
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	08/02/12
900914	Hewlett Packard	85460A	RF Filter Section, (100 kHz–6.5 GHz)	3330A00107	08/02/12
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	04/20/17
900321	EMCO	3161-03	Horn Antenna (4.0-8.2 GHz)	9508-1020	04/20/17
900323	EMCO	3160-07	Horn Antennas (8.2–12 GHz)	9605-1054	04/20/17
900356	EMCO	3160-08	Horn Antennas (12.4–18 GHz)	9607-1044	04/20/17
901218	EMCO	3160-09	Horn Antenna (18-26 GHz)	960281-003	04/20/17
900392	Hewlett Packard	1197OK	Harmonic Mixer (18-26 GHz)	3525A00159	11/27/13
901581	Rohde & Schwarz	1166.1660.50	FSU Spectrum Analyzer (20 Hz–50 GHz)	200106	01/19/13

**Test Personnel:**

Jon Wilson		July 31, 2012
Test Engineer	Signature	Date of Test

## **6 In-Band Emissions Requirement – FCC 15.215(c)**

### **6.1 Test Procedure**

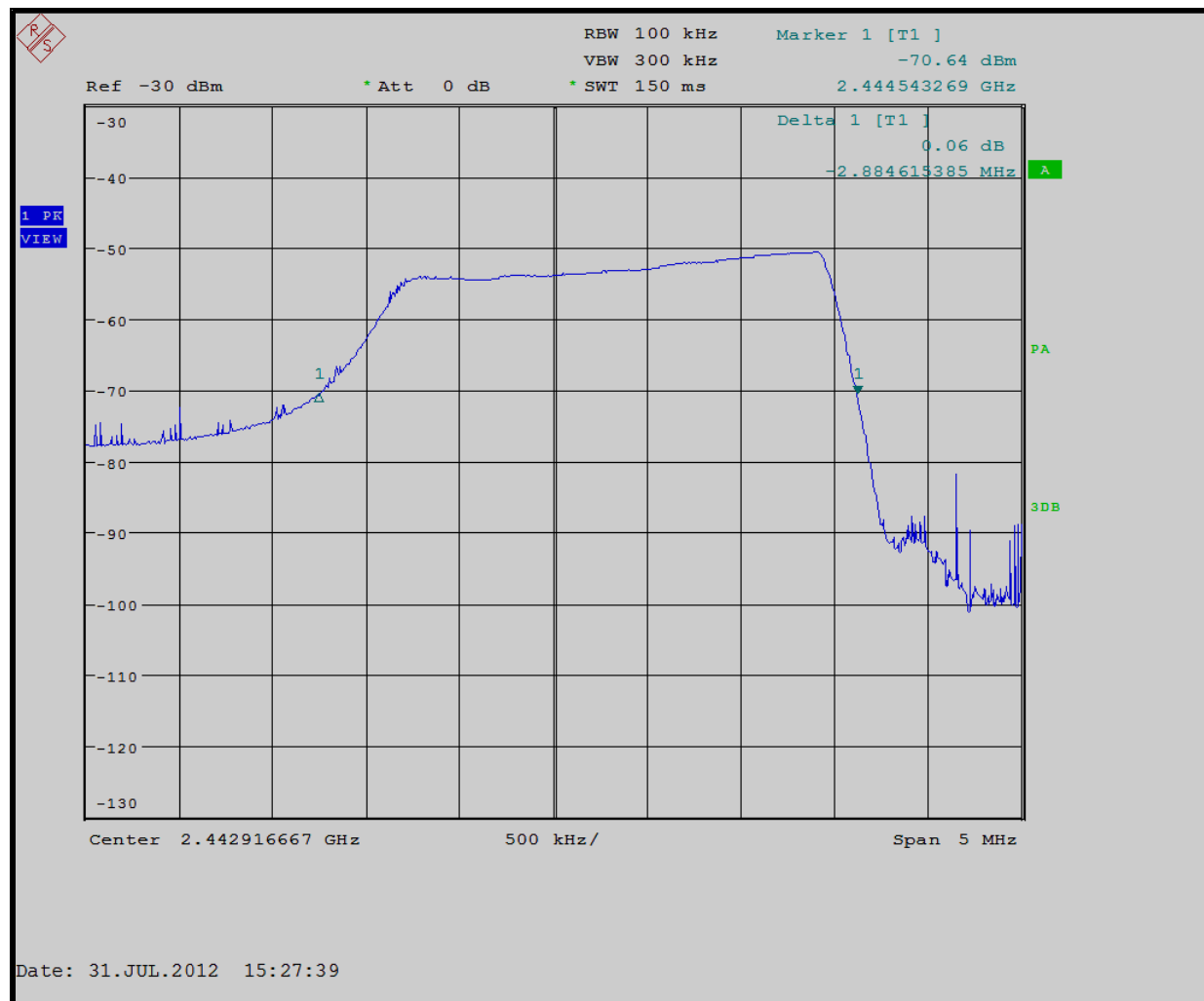
The 20 dB bandwidth was measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz (1% of span), and the video bandwidth set at 1 MHz. The spectrum analyzer's automated display markers adjusted to -20 dBc using max hold until the spectrum was filled and a plot taken.

### **6.2 FCC 15.215(c) Requirement**

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 6.3 Test Data

Plot 6-1: 20 dB Bandwidth



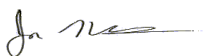
Rhein Tech Laboratories, Inc.  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: STI, Inc.  
Model: ED-55  
Standards: FCC 15.249/IC RSS-210  
ID's: TXL-STI-ED55/6335A-STIED55  
Report #: 2012241

**Table 6-1: In-band 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	01/19/13

**Test Personnel:**

Jon Wilson		July 31, 2012
Test Engineer	Signature	Date of Test

## 7 Occupied Bandwidth – RSS-Gen 4.6.1

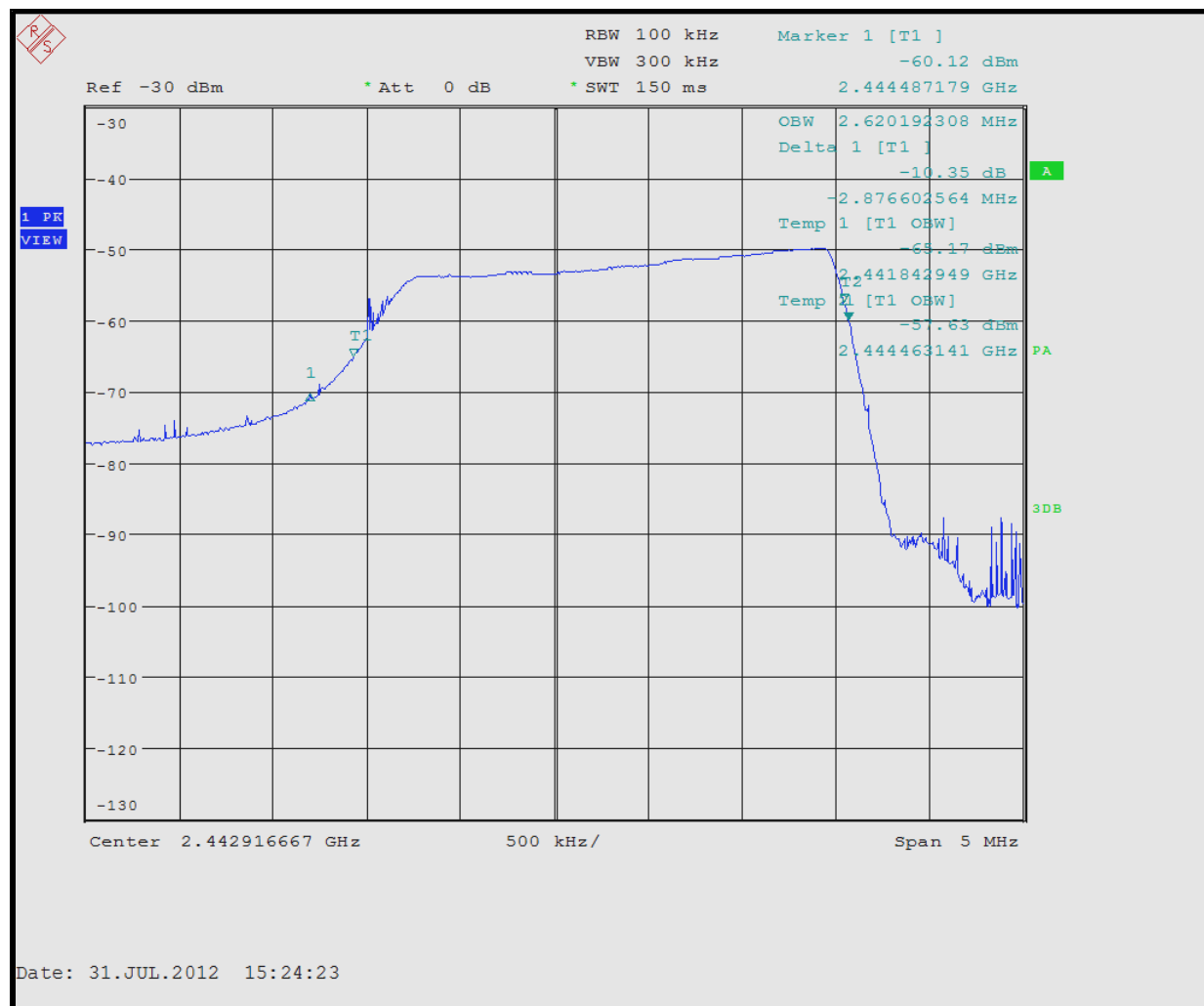
### 7.1 Modulated Bandwidth Test Procedure

The 99% bandwidth was measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz and the video bandwidth set at 300 kHz. The spectrum analyzer's display markers were set to -99% using max hold until the spectrum was filled and a plot taken.

**Table 7-1: 99% Modulated Bandwidth (RSS-210 A1.1.3)**

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
2,442.916	2,876.6	0.25% of 2442916 = 6107.3	-3,230.7

**Plot 7-1: Occupied Bandwidth – 99%**



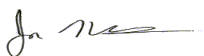
Rhein Tech Laboratories, Inc.  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: STI, Inc.  
Model: ED-55  
Standards: FCC 15.249/IC RSS-210  
ID's: TXL-STI-ED55/6335A-STIED55  
Report #: 2012241

**Table 7-2: 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	01/19/13

**Test Personnel:**

Jon Wilson		July 31, 2012
Test Engineer	Signature	Date of Test

## 8 Conducted Emissions

### 8.1 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.

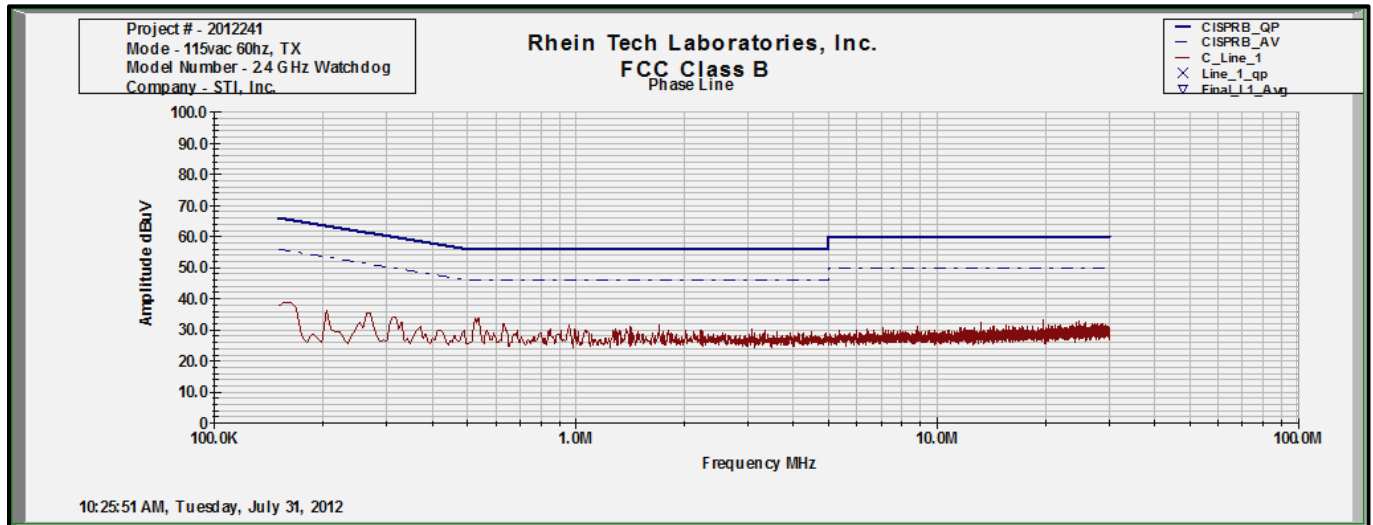
### 8.2 Test Limits

Line-Conducted Emissions		
Limit (dB $\mu$ 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

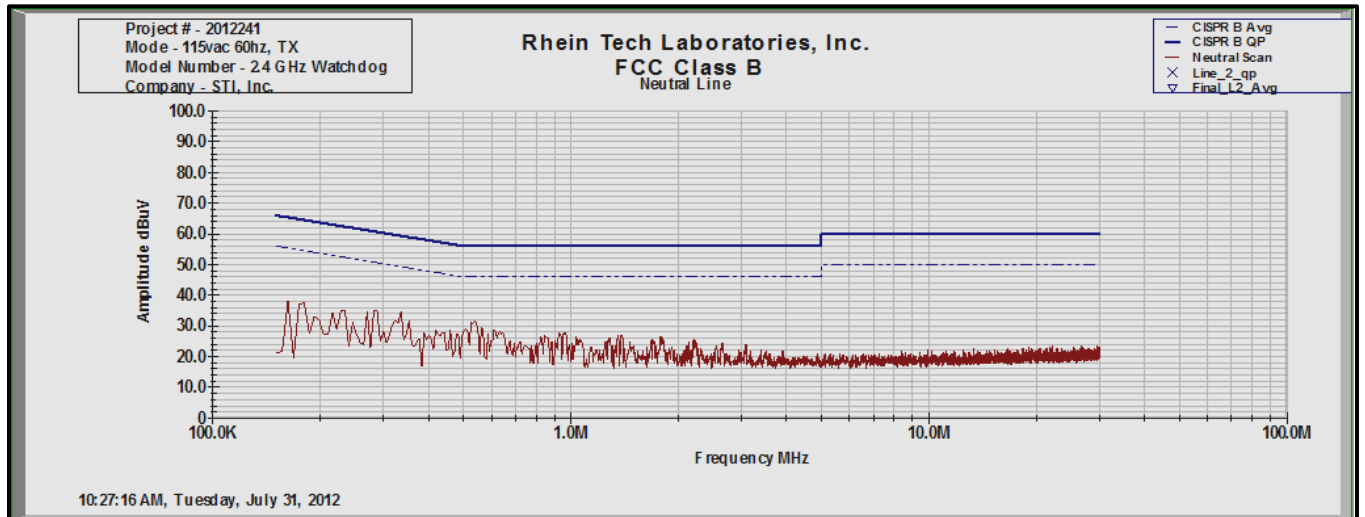


### 8.3 Conducted AC Emissions Test Data

Plot 8-1: Conducted AC Emissions; Phase



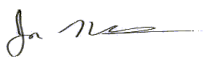
Plot 8-2: Conducted AC Emissions; Neutral



**Table 8-1: Conducted Emissions Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900968	Hewlett Packard	8567A	Spectrum Analyzer (100 Hz-15 GHz)	2602A00160	11/17/12
900970	Hewlett Packard	85662A	Spectrum Analyzer Display Section	2542A11239	11/17/12
900339	Hewlett Packard	85650A	Quasi-Peak Adapter	2521A00743	11/17/12
901083	AFJ International	LS16/110VAC	16A LISN	16010020080	12/1/12
N/A	Shaffner	ISN T400	ISN	16019	9/10/12
N/A	Quantum Change	Tile!	Test Software	4.0.A.8	N/A

**Test Personnel:**

Jon Wilson		July 31, 2012
Test Engineer	Signature	Date of Test

## 9 Conclusion

The data in this measurement report shows that Safety Technology International, Inc. Model ED-55 FCC ID: TXL-STI-ED55, IC: 6335A-STIED55, complies with all the applicable requirements of Parts 2 and 15 of the FCC rules and IC RSS-210.