
**COMPLIANCE WORLDWIDE INC.
TEST REPORT 154-16**

**In Accordance with the Requirements of
Federal Communications Commission CFR Title 47 Part 15.225, Subpart C
Industry Canada RSS 210, Issue 8, Annex 2**

**Low Power License-Exempt Radio Communication Devices
Intentional Radiators**

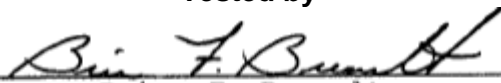
**Issued to
Velasa Sports, Inc.
30 Sudbury Road
Acton, MA 01720**

**for the
Sparx™ Skate Sharpener with
13.56 MHz RFID Reader
Model: ES100**

**FCC ID: 2AHFF-ES100
IC: 21355-ES100**

Report Issued on February 19, 2016

Tested by


Brian F. Breault

Reviewed by


Larry K. Stillings

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1. Scope

This test report certifies that the Velasa Sports ES100 Sparx™ Skate Sharpener with 13.56 MHz RFID Reader, as tested, meet the FCC Part 15.225 Subpart C, and Industry Canada RSS 210 requirements. The scope of this test report is limited to the test samples provided by the client, only in as much as those samples represent other production units. If any significant changes are made to the units, the changes shall be evaluated and a retest may be required.

2. Product Details

- 2.1. Manufacturer:** Velasa Sports, Inc.
- 2.2. Model Number:** ES100 Sparx™ Skate Sharpener with 13.56 MHz RFID Reader
- 2.3. Serial Number:** 1601 11 00001
- 2.4. Description of EUT:** The Sparx™ Skate Sharpener with 13.56 MHz RFID Reader is an ice skate sharpener that monitors the wheel grinders.
- 2.5. Power Sources:** 120 VAC, 60 Hz
- 2.6. Hardware Revision:** N/A
- 2.7. Software Revision:** N/A
- 2.8. EMC Modifications:** None

3. Product Configuration

3.1. Operational Characteristics & Software

The Sparx Skate Sharpener is powered up normally.

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Velasa Sports	ES100	1601 11 00001	120 VAC	60	13.56 MHz RFID Reader

3.3. EUT Connected Hardware

Manufacturer	Model	Serial Number	Description
N/A			

3.4. EUT Cables/Transducers

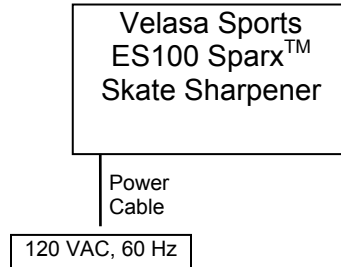
Cable Type	Length	Shield	From	To
Power Cable	2M	No	EUT	120 VAC, 60 Hz

3.5. Support Equipment

Manufacturer	Model	Serial Number	Input Voltage	Freq (Hz)	Description/Function
N/A					

3. Product Configuration (continued)

3.6. Block Diagram



4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Tests

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz - 7GHz ¹	Rohde & Schwarz	ESR7	101156	7/23/2017	2 Years
Spectrum Analyzer 20 Hz – 40 GHz ²	Rohde & Schwarz	FSV40	100899	7/23/2017	2 Years
Spectrum Analyzer, 9 kHz to 40 GHz ³	Rohde & Schwarz	FSVR40	100909	7/23/2017	2 Years
EMI Receiver	Hewlett Packard	8546A	3650A00360	6/4/2016	2 Years
Loop Antenna	EMCO	6512	9309-1139	9/23/2016	2 Years
Biconilog Antenna, 30 MHz to 2 GHz	Sunol Sciences Corp	JB1	25509	5/15/2016	3 Years
LISN 50 Ω 50 μH, 9 kHz to 30 MHz	EMCO	3825/2	9109-1860	7/23/2016	1 Year
Power Supply	Hewlett Packard	6296A	7M0599	8/26/2016	2 Years
Digital Barometer	Control Company	4195	ID236	10/8/2017	2 Years
Temperature Chamber	Associated Research	E-0029	N/A	N/A	---

¹ ESR7 Firmware revision: V2.26, Date installed: 8/15/2014 Previous V2.17, installed 6/11/2014.

² FSV40 Firmware revision: V2.30 SP1 Date installed: 10/22/2014 Previous V2.30, installed 7/23/2014.

³ FSVR40 Firmware revision: V2.23, Date installed: 10/20/2014 Previous V1.63 SP1, installed 8/28/2013.

4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Dates:	February 10 th to 16 th , 2016
Test Engineer:	Larry Stillings, Cody Merry
Normal Site Temperature (15 - 35°C):	22.0
Relative Humidity (20 -75%RH):	33%
Frequency Range:	10 kHz to 1 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz – 9 kHz to 150 kHz 9 kHz – 150 kHz to 30 MHz 120 kHz - 30 MHz to 1 GHz 1 MHz - Above 1 GHz
EMI Receiver Avg Bandwidth:	300 Hz – 9 kHz to 150 kHz 30 kHz – 150 kHz to 30 MHz 300 kHz - 30 MHz to 1 GHz 3 MHz - Above 1 GHz
Detector Function:	Peak, QP, Avg – 150 kHz to 30 MHz Peak, QP - 30 MHz to 1 GHz Peak, Avg - Above 1 GHz Unless otherwise specified.

4.3. Measurement Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 15, Subpart C - Intentional Radiators, notably Section 15.225, Operation within the band 13.110 – 14.010 MHz.

The test methods used to generate the data in this test report are in accordance with ANSI C63.10:2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

5. Choice of Equipment for Test Suits

5.1. Choice of Model

This test report is based on the test samples supplied by the manufacturer and are reported by the manufacturer to be equivalent to the production units.

5.2. Presentation

The test sample was tested complete with all required ancillary equipment. Refer to Section 3 of this report for the product equipment configuration.

5.3. Choice of Operating Frequencies

The transmitter in the unit under test utilizes a single operating frequency at approximately 13.56 MHz

6. Measurement Summary

Test Requirement	FCC Part 15 Reference	RSS Reference	Test Report Section	Result	Comment
Antenna Requirement	15.203	RSS-GEN Section 7.1.2	7.1	Compliant	
Operation within the Band 13.110 MHz – 14.010 MHz (Field Strength)	15.225 (a), (b), (c)	RSS-210 Section A2.6	7.2	Compliant	
Operation within the Band 13.110 MHz – 14.010 MHz (Frequency Tolerance)	15.225 (e)	RSS-210 Section A2.6	7.3	Compliant	
Spurious Radiated Emissions	15.209		7.4	Compliant	
Power Line Conducted Emissions	15.207	RSS-GEN Section 7.2.4	7.5	Compliant	
Occupied Bandwidth/ Lower and Upper Band Edges	15.215(c) C63.10	N/A	7.6	Compliant	
99% Power Bandwidth	N/A	RSS-GEN Section 4.6.1	6.7	Compliant	

7. Measurement Data

7.1. Antenna Requirement (Section 15.203, RSS-GEN 7.1.2)

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

Result: Compliant.

Status: The unit under test uses a u.fl connector and cable to run from the main PC board to the 13.56 MHz RFID Loop antenna.

7. Measurement Data (continued)

7.2. Operation within the Band 13.110 MHz – 14.010 MHz (15.225 (a), (b) and (c))

Requirement: The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

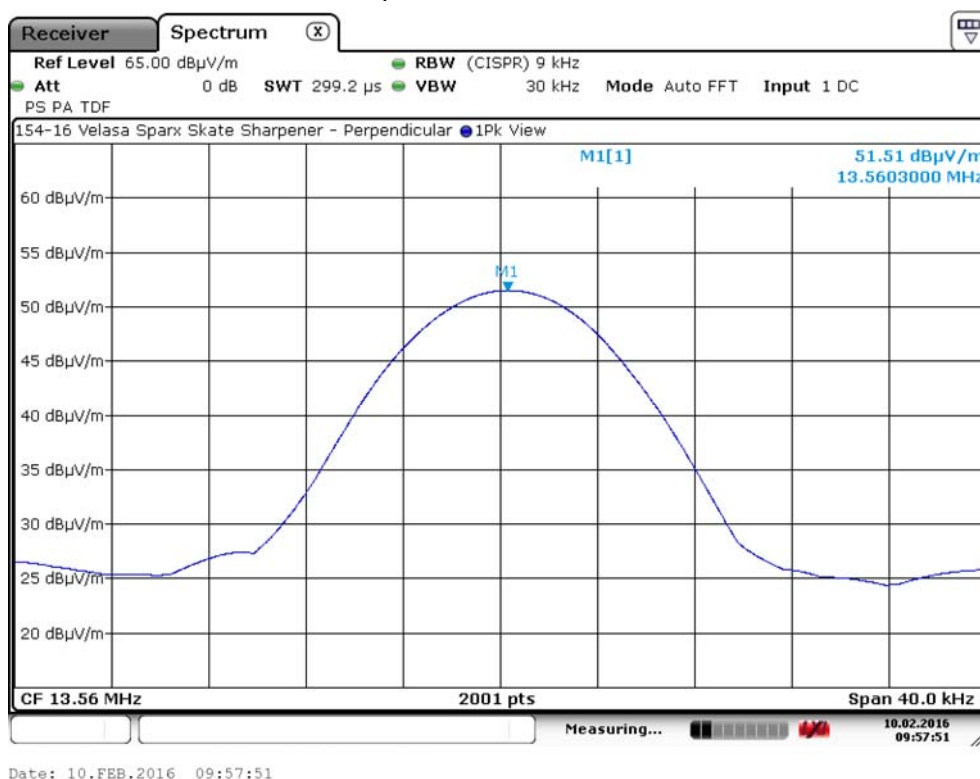
Result: The unit under test complies with the requirements detailed in FCC Part 15.225 (a), (b) and (c).

Freq. MHz	Distance Meters	Meas. Field Strength dBμV	Ant. Factor ¹ dB	Cable Loss ¹ dB	Corr. Field Strength dBμV/m	Limit ² dBμV/m	Margin (dB)
13.56	10	15.83	35.07	0.61	51.51	84.00	32.49

¹ Correction factors are included in the measurement analyzer.

² Limit at 30 meters.

7.2.1. Measurement Plot – Perpendicular was worse case



7. Measurement Data (continued)
7.3. Operation within the Band 13.110 MHz – 14.010 MHz (§ 15.225 (e))

Requirement: The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

Result: The unit under test complies with the requirements detailed in FCC Part 15.225 (e).

7.3.1. Temperature Variation

Temp °C	Meas Freq.	Limit			Offset	Result
	(MHz)	F _{MIN} (MHz)	F _{MAX} (MHz)	%	(%)	
Ambient	13.5604000	N/A			N/A	
-20	13.5603245	13.559044	13.561756	± 0.01	0.00055677	Compliant
-10	13.5603745	13.559044	13.561756	± 0.01	0.00018805	Compliant
0	13.5603745	13.559044	13.561756	± 0.01	0.00018805	Compliant
+10	13.5603745	13.559044	13.561756	± 0.01	0.00018805	Compliant
+20	13.5601870	13.559044	13.561756	± 0.01	0.00157075	Compliant
+30	13.5603245	13.559044	13.561756	± 0.01	0.00055677	Compliant
+40	13.5601750	13.559044	13.561756	± 0.01	0.00165924	Compliant
+50	13.5602350	13.559044	13.561756	± 0.01	0.00121678	Compliant

¹ Nominal frequency at ambient (~22°C)

7.3.2. Voltage Variation (Temperature - 22°C)

VAC	Meas Freq.	Limit			Offset	Result
	(MHz)	F _{MIN} (MHz)	F _{MAX} (MHz)	%	(%)	
120.00	13.5604000	N/A			N/A	
102.00	13.5602745	13.547356	13.573193	± 0.01	0.00092549	Compliant
138.00	13.5602745	13.547356	13.573193	± 0.01	0.00092549	Compliant

¹ Nominal voltage

² Nominal frequency at ambient (~22°C)

7. Measurement Data (continued)**7.4. Transmitter Spurious Radiated Emissions (15.225 (d), 15.209)**

Requirement: The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table (Reference FCC 15.209):

Frequency Range (MHz)	Distance (Meters)	Limit (dB μ V/m) ¹
0.009 to 0.490	3	128.5 to 93.8
0.490 to 1.705	3	73.8 to 63.0
1.705 to 30	3	69.5
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
>960	3	54.0

¹ Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector. Otherwise a quasi-peak detector is used.

² Extrapolation below 30 MHz is calculated at 40 dB/decade.

Procedure: Test measurements were made in accordance with ANSI C63.10:2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices..

Test Notes: First, the intentional radiators were disabled and a scan of the unit under test was performed. The intentional radiators were then enabled and a second scan was performed. The two scans were compared to determine the contribution of the intentional radiators to the overall emissions profile.

Results: The transmitter installed in the unit under test meet the FCC Part 15.209 emissions requirements.

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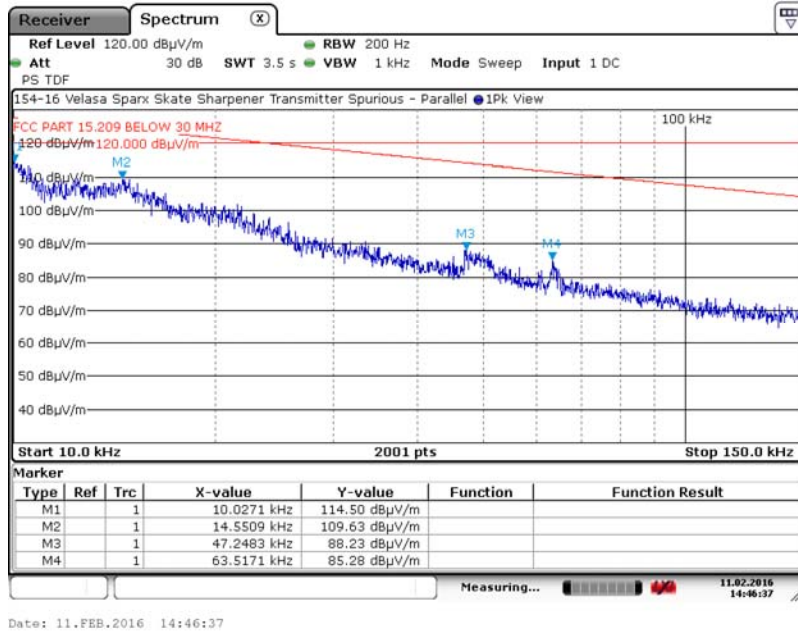
Issue Date: 2/19/2016

7. Measurement Data (continued)

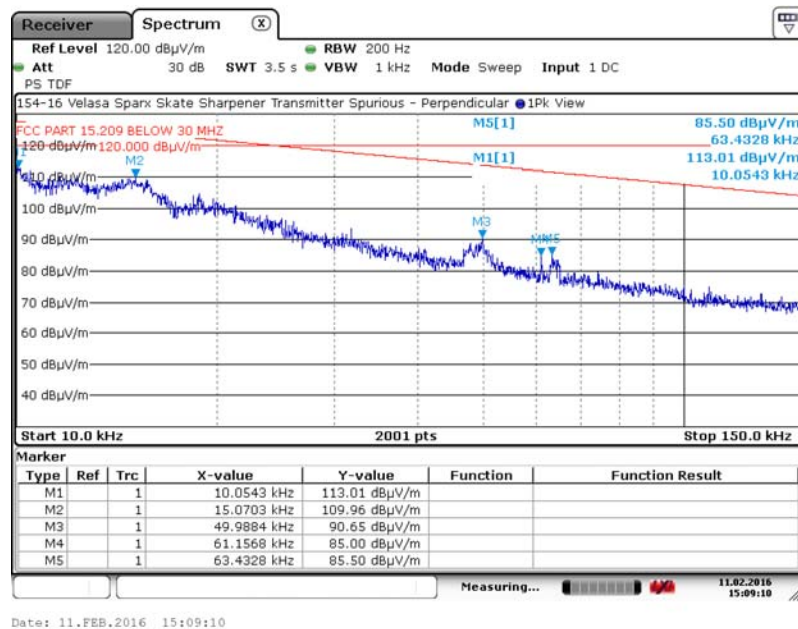
7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

7.4.1. Transmitter Spurious Radiated Emissions – 10 to 150 kHz

7.4.1.1. Antenna is Parallel to the UUT



7.4.1.2. Antenna is Perpendicular to the UUT



Test Number: 154-16

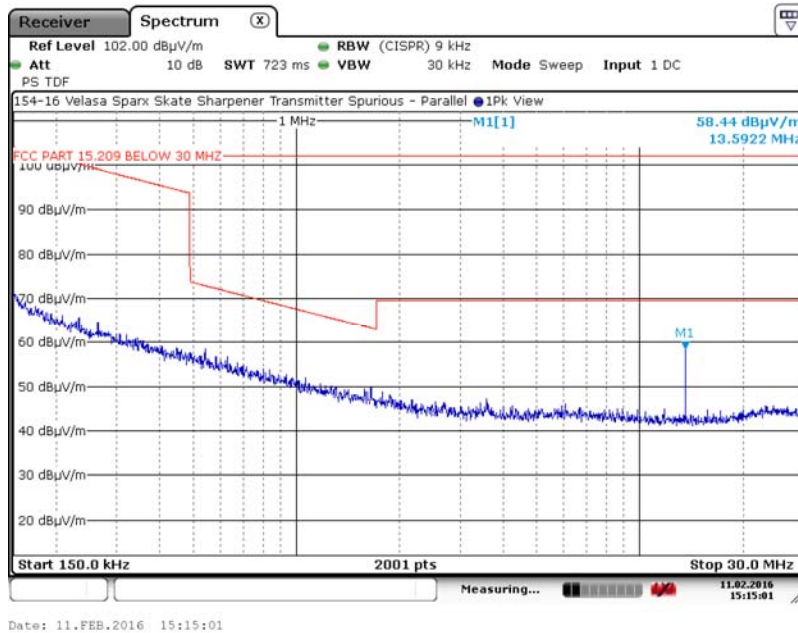
Issue Date: 2/19/2016

7. Measurement Data (continued)

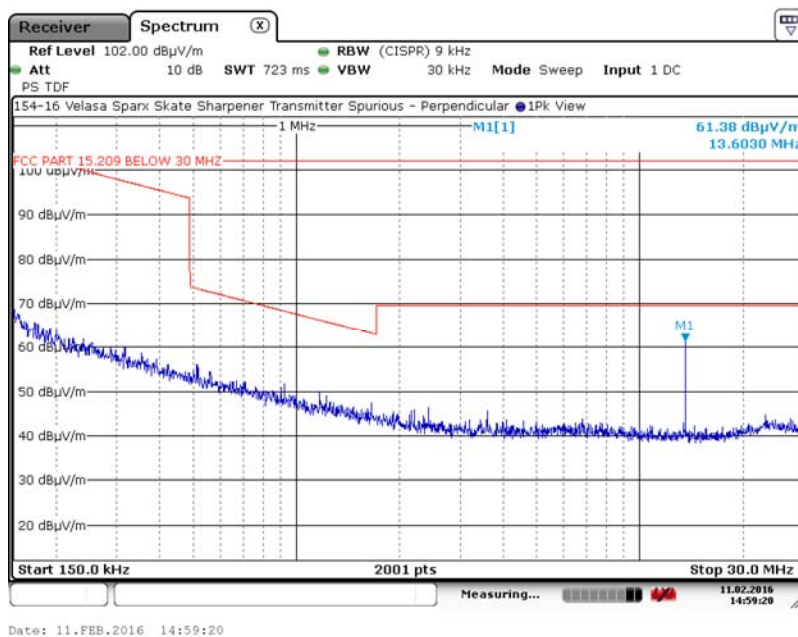
7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

7.4.2. Transmitter Spurious Radiated Emissions – 150 kHz to 30 MHz

7.4.2.1. Antenna is Parallel to the UUT



7.4.2.2. Antenna is Perpendicular to the UUT



Test Number: 154-16

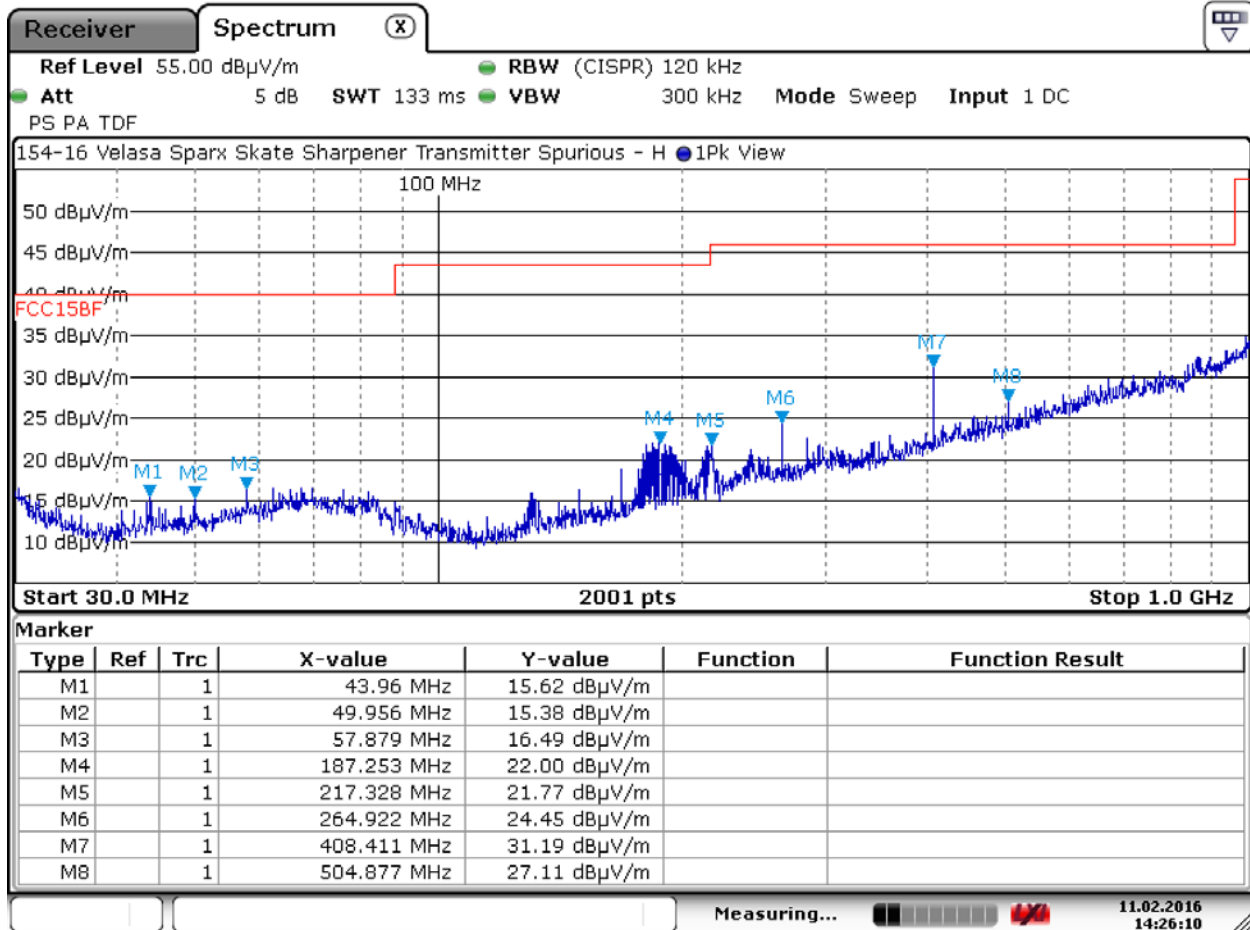
Issue Date: 2/19/2016

7. Measurement Data (continued)

7.4. Spurious Radiated Emissions (15.209) (continued)

7.4.3. Spurious Radiated Emissions – 30 MHz to 1 GHz

7.4.3.1. Antenna is Horizontal



Date: 11.FEB.2016 14:26:10

Test Number: 154-16

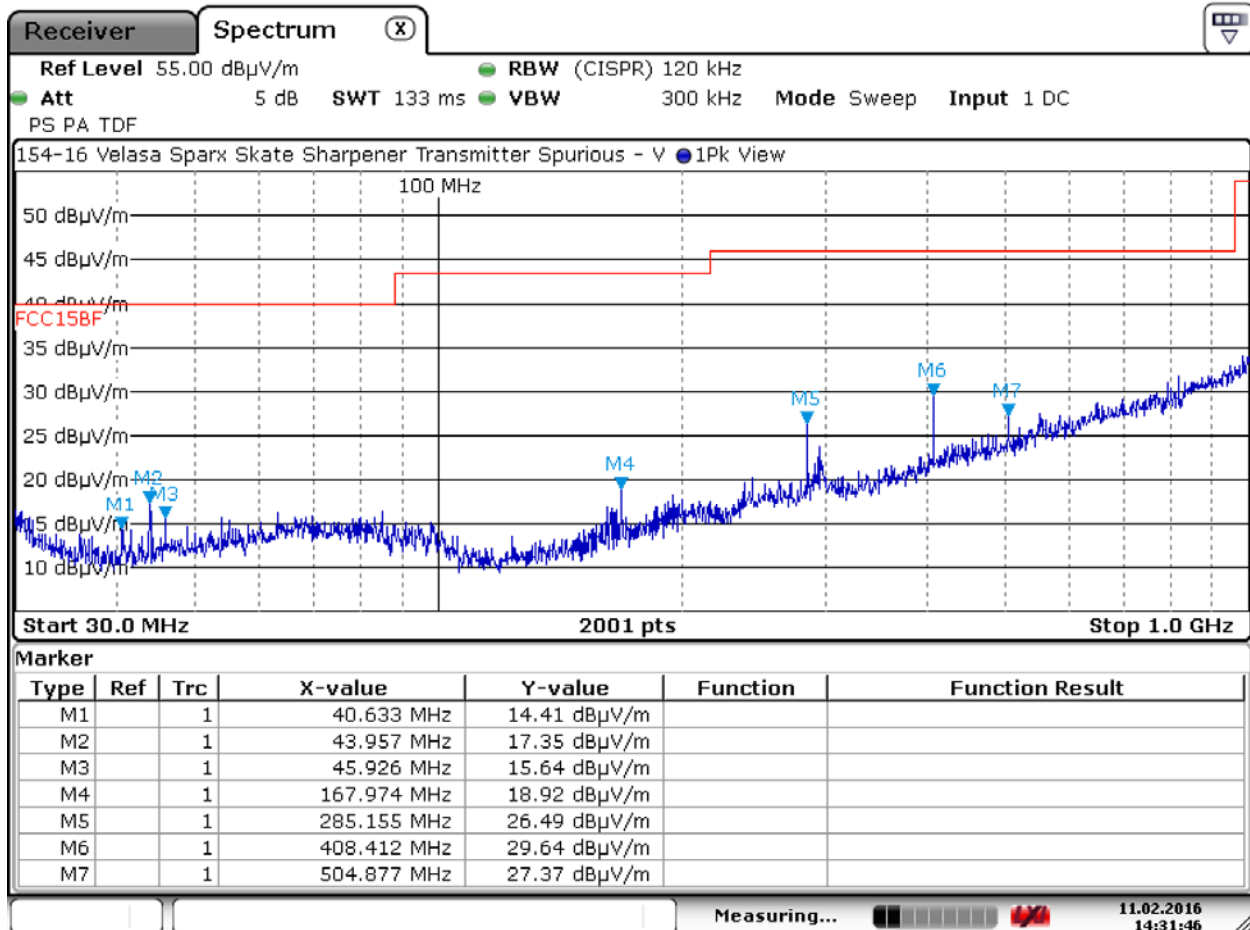
Issue Date: 2/19/2016

7. Measurement Data (continued)

7.4. Spurious Radiated Emissions (15.209) (continued)

7.4.3. Spurious Radiated Emissions – 30 MHz to 1 GHz

7.4.3.2. Antenna is Vertical



Date: 11.FEB.2016 14:31:46

7. Measurement Data (continued)**7.5. Power Line Conducted Emissions (15.207)**

Requirement: For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50
* Decreases with the logarithm of the frequency.		

Procedure: Test measurements were made in accordance with ANSI C63.10:2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. Specifically, FCC KDB 174176 D01 Line Conducted FAQ v01r01, dated 6-3-2015 regarding the use of a dummy load for a Part 15 transmitter operating below 30 MHz was used at the fundamental frequency.

Results: The unit under test meets the FCC Part 15.207 conducted emissions requirements.

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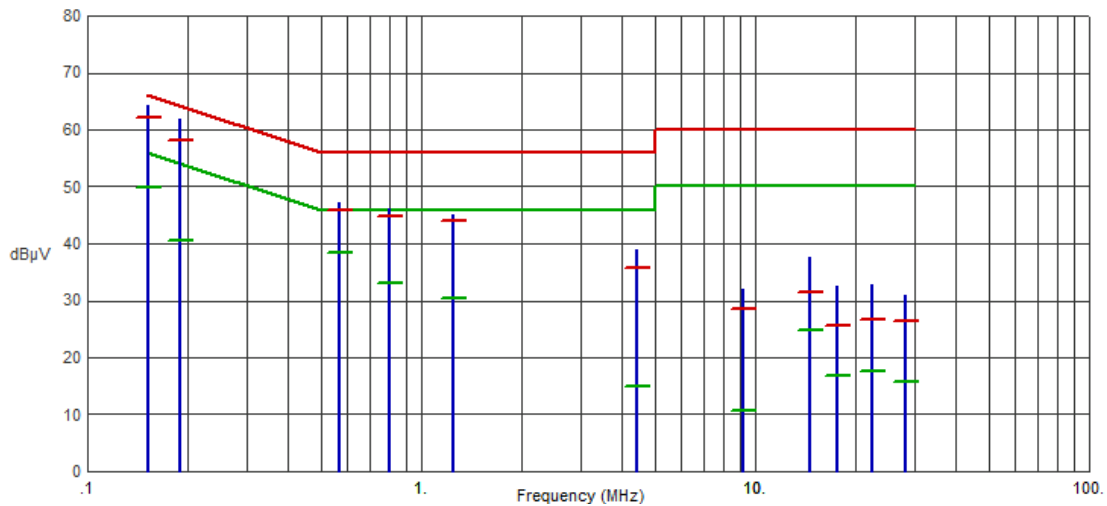
8. Conducted Emissions Test Results

7.5. Power Line Conducted Emissions (15.207)

7.5.1. 120 Volts, 60 Hz Phase

Test No.: 146-16, 120 Volts, 60 Hz Phase

FCC, Class B



Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1516	64.19	62.12	65.91	-3.79	49.95	55.91	-5.96	
.1886	61.74	58.02	64.10	-6.08	40.65	54.10	-13.45	
.5660	47.31	45.84	56.00	-10.16	38.32	46.00	-7.68	
.8000	46.07	44.67	56.00	-11.33	33.19	46.00	-12.81	
1.2489	45.16	43.87	56.00	-12.13	30.43	46.00	-15.57	
4.4333	38.81	35.86	56.00	-20.14	14.80	46.00	-31.20	
9.1561	32.10	28.43	60.00	-31.57	10.55	50.00	-39.45	
14.5704	37.67	31.39	60.00	-28.61	24.67	50.00	-25.33	
17.5566	32.50	25.51	60.00	-34.49	16.89	50.00	-33.11	
22.3071	32.91	26.80	60.00	-33.20	17.58	50.00	-32.42	
28.0883	30.84	26.31	60.00	-33.69	15.73	50.00	-34.27	

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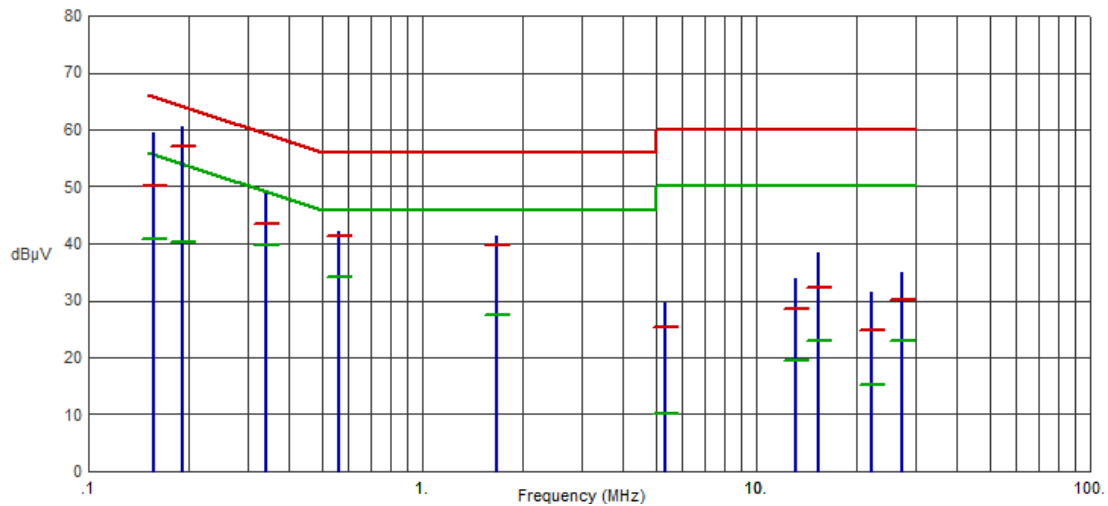
8. Conducted Emissions Test Results

7.5. Power Line Conducted Emissions (15.207)

7.5.2. 120 Volts, 60 Hz Neutral

Test No.: 146-16, 120 Volts, 60 Hz Neutral

FCC, Class B



Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1576	59.43	50.03	65.59	-15.56	40.74	55.59	-14.85	
.1904	60.44	57.16	64.02	-6.86	40.32	54.02	-13.70	
.3397	48.74	43.48	59.21	-15.73	39.61	49.21	-9.60	
.5649	42.19	41.35	56.00	-14.65	34.06	46.00	-11.94	
1.6727	41.23	39.86	56.00	-16.14	27.37	46.00	-18.63	
5.3230	29.66	25.37	60.00	-34.63	10.15	50.00	-39.85	
13.1811	33.99	28.58	60.00	-31.42	19.38	50.00	-30.62	
15.3612	38.31	32.31	60.00	-27.69	22.83	50.00	-27.17	
22.1950	31.45	24.70	60.00	-35.30	15.23	50.00	-34.77	
27.1951	34.97	30.24	60.00	-29.76	22.81	50.00	-27.19	

7. Measurement Data (continued)

7.6. Occupied Bandwidth (Section 15.215 (c) and ANSI C63.10, Section 6.9)

Requirement: Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sections 15.217 through 15.255 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule.

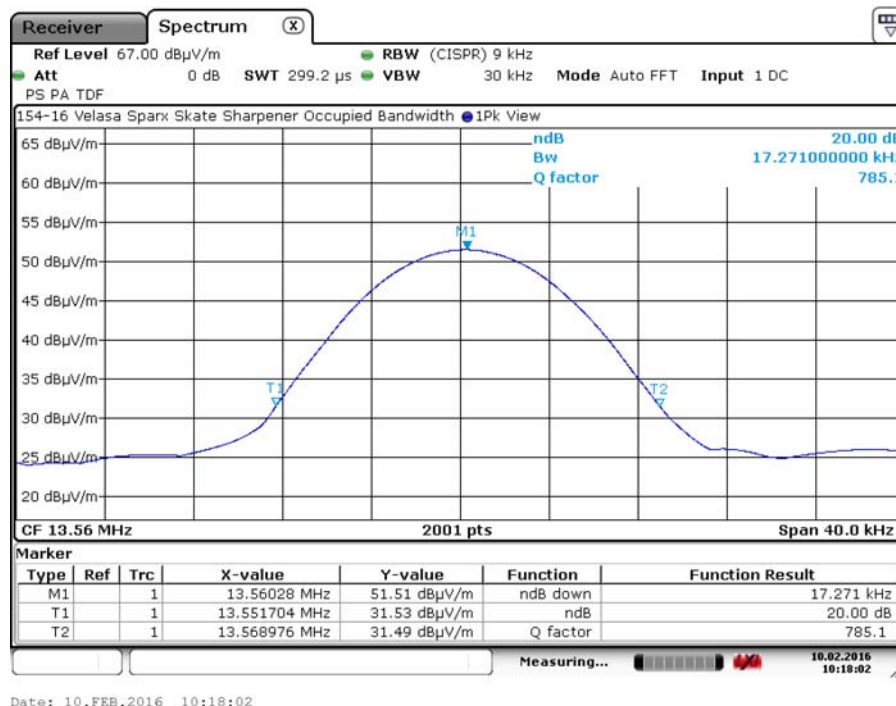
Frequency Band: $F_{MIN} = 13.110 \text{ MHz}$

$F_{MAX} = 14.010 \text{ MHz}$

Test Note: The reported bandwidth represents the worst case measured bandwidth of the combined three transmitters.

	-20 dB Frequency Measured	Lower & Upper Band Edge (F_{MIN} & F_{MAX})	Result
	MHz	MHz	
F_{LO}	13.551704	13.11	Compliant ($F_{LO} > F_{MIN}$)
F_{HI}	13.568976	14.01	Compliant ($F_{HI} < F_{MAX}$)

7.6.1. Plot of 20 dB Bandwidth vs. Frequency Band



7. Measurement Data (continued)

7.7. 99% Power Bandwidth (RSS-GEN Section 4.6.1)

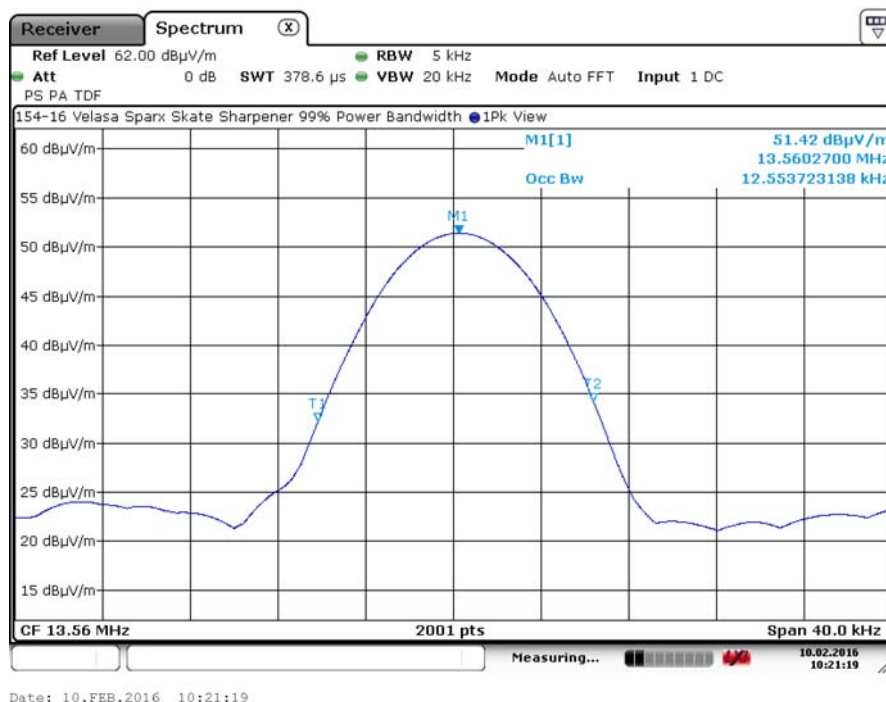
Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Procedure: This test was performed utilizing the automated 99% bandwidth function of the spectrum analyzer.

Frequency	99% Power Bandwidth
(MHz)	(kHz)
13.56	12.554

7.7.1. Plot of 99% Bandwidth



8. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC), Industry Canada, and Voluntary Control Council Interference (VCCI) standards. A description of the test sites is on file with the FCC (registration number 96392), Industry Canada (file number IC 3023A-1).

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meters W x 1.5 meters L x 2.0 meters H, floor standing or table top.

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9. Test Setup Images

9.1. Radiated Emissions – Front View



9. Test Setup Images

9.2. Radiated Emissions – Rear View Below 30 MHz



9. Test Setup Images

9.3. Radiated Emissions – Rear View 30 MHz to 1 GHz



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9. Test Setup Images

9.4. Conducted Emissions – Front View



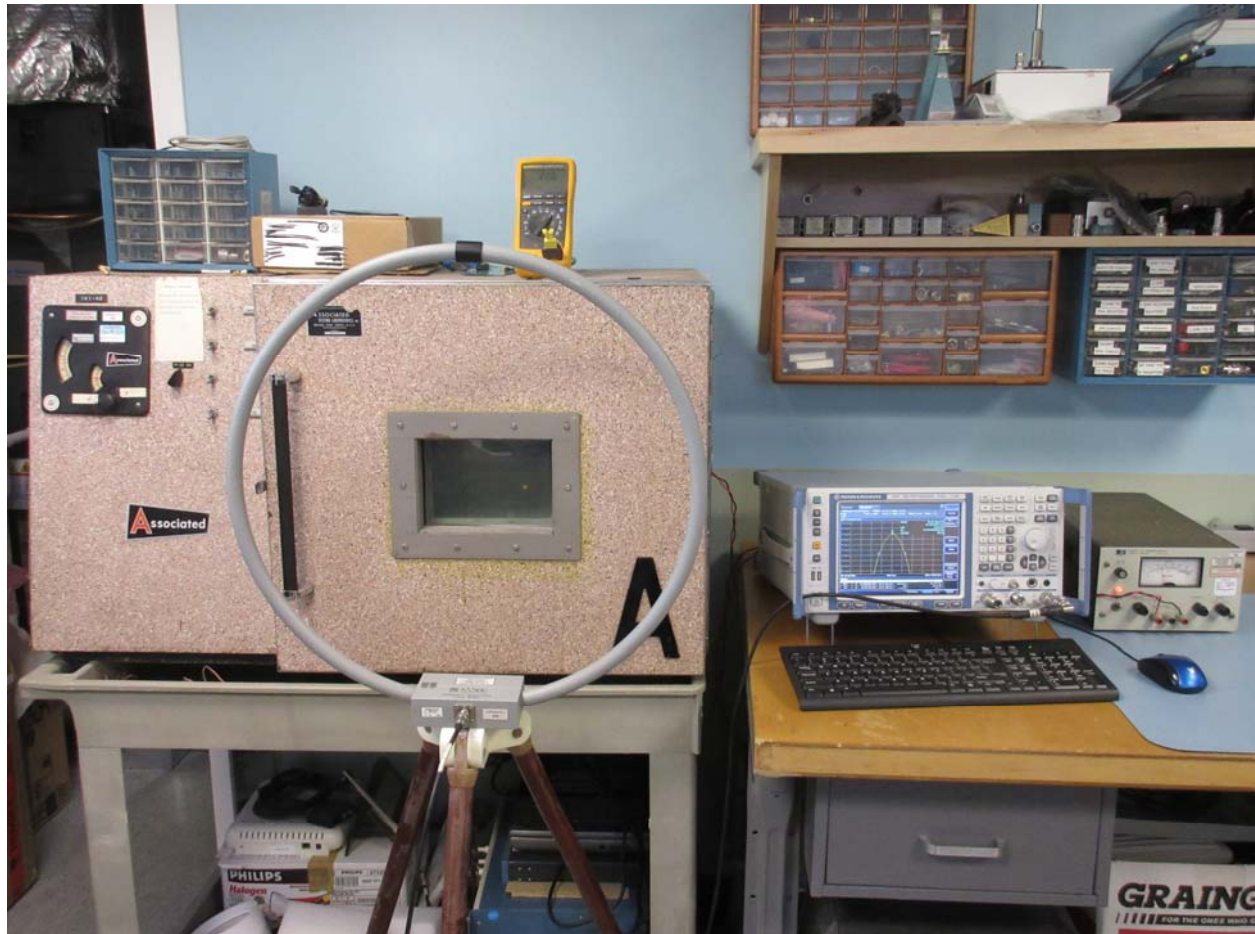
9. Test Setup Images

9.5. Conducted Emissions – Rear View



9. Test Setup Images

9.6. Environmental Emissions – Front View



9. Test Setup Images

9.7. Environmental Emissions – Inside Chamber View Board with RFID Antenna

