COMPLIANCE WORLDWIDE INC.
TEST REPORT 232-23RF

In Accordance with the Requirements of

Federal Communications Commission CFR Title 47 Part 2.1091:2020
Radio Frequency Exposure Evaluation: Mobile Devices
Innovation, Science and Economic Development Canada
RSS-102, Issue 5 + Amendment 1:2021
Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus

Issued to

Velasa Sports, Inc.
30 Sudbury Road
Acton, MA 01720

for the

Sparx™ Skate Sharpener with
13.56 MHz RFID Reader
Models: ES300, PS300

FCC ID: 2AHFF-S300
IC: 21355-S300

Report Issued on June 30, 2023

Tested by

Sean P. Defelice

Sean P. Defelice

Reviewed by

Larry K. Stillings

Larry K. Stillings

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1. Scope

This test report certifies that the Velasa Sparx™ models ES300, PS300 Skate Sharpeners with 13.56 MHz RFID Reader, as tested, meets the FCC Part 2.1091 requirements and the ISED RSS-102, Issue 5 Section 2.5.2 requirements exempting the device from a SAR Evaluation.

The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

2. Product Details

2.1. Manufacturer:	Velasa Sports, Inc.
2.2. Model Numbers:	ES300, PS300
2.3. Serial Numbers:	12223112345
2.4. Description:	The Sparx™ Skate Sharpener with 13.56 MHz RFID Reader is an ice skate sharpener that monitors the wheel grinders.
2.5. Power Source:	100-240 VAC, 50/60 Hz
2.6. Hardware Revision:	Rev B
2.7. Software Revision:	N/A
2.8. Modulation Type:	Pulse Modulation
2.9. Operating Frequency:	13.56 MHz, 2.48 GHz (Only Bluetooth function is enabled in pre-certified module)
2.10. EMC Modifications:	None

3. Product Configuration

3.1. Operational Characteristics & Software

The device under test is powered up normally. No additional steps are necessary to activate the RFID reader.

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Volts	Freq (Hz)	Description/Function
Velasa Sports	ES300 PS300	12223112345	120	60	13.56 MHz RFID Reader
Espressif Systems	Bluetooth IoT Module				FCC ID: 2AC7Z-ESPC3MINI1 IC: 21098-ESPC3MINI1

3.3. EUT Connected Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
None					

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3. Product Configuration (continued)

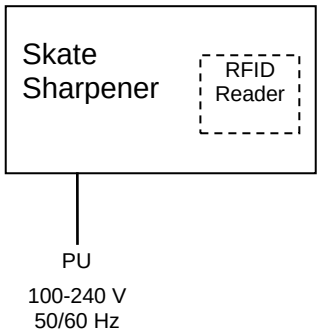
3.4. EUT Cables/Transducers

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

3.5. Support Equipment

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

3.6. Block Diagram



PU – Power Cable, Unshielded

4. Measurements Parameters

4.1. Measurement Equipment and Software Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz - 7GHz [1]	Rohde & Schwarz	ESR7	101156	10/26/2023	2 Years
EMI Test Receiver, 10 Hz - 7GHz [1]	Rohde & Schwarz	ESR7	101770	7/23/2024	3 Years
Loop Antenna 9 kHz - 30 MHz	EMCO	6512	9309-1139	4/14/2024	2 Years
Digital Barometer	Control Company	4195	ID236	1/27/2024	2 Years

[1] ESR7 Firmware revision: V3.48 SP3, Date installed: 09/30/2020 Previous V3.48 SP2, installed 07/23/2020.

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4. Measurements Parameters (continued)

4.2. Software Used to Perform Test

Manufacturer	Software Description	Title or Model #	Rev.	Report Sections
Compliance Worldwide	Test Report Generation Software	Test Report Generator	1.0	Used to process conducted emissions data

4.3 Measurement & Equipment Setup

Test Dates:	6/12/2023, 6/20/2023
Test Engineer:	Sean Defelice
Site Temperature (°C):	24
Relative Humidity (%RH):	33
Frequency Range:	30 kHz to 25 GHz
Measurement Distance:	3 Meters and 1 Meter
EMI Receiver IF Bandwidth:	200 Hz (30 kHz – 150 kHz) 9 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1 GHz) 1 MHz (>1 GHz)
EMI Receiver Avg Bandwidth:	≥ 3 * RBW or IF(BW)
Detector Functions:	Peak, Quasi-Peak and Average

4.4 Test 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 using ANSI C63.10: 2013, American National Standard for Methods for Unlicensed Wireless Devices.

In addition, FCC KDB 447498 D01 General RF Exposure Guidance v06, October 23, 2015 are referenced for the testing and requirements detailed in this report.

Testing was performed in accordance with the requirements detailed in ISED RSS-210, Issue 10 Annex B.6 using ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and ISED RSS-GEN, Issue 5 Amendment 1 (March 2019) and Amendment 2 (February 2021).

In addition, ISED RSS-102, Issue 5, Amendment 1 (February 2, 2021) are referenced for the testing and requirements detailed in this report.

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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

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6. Measurement Data (continued)

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

Radiated Field Strength of Fundamental (15.225 (a), (b) and (c))

Requirement: (a) The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBµV/m) at 30 meters.

(b) 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 (50.5 dBµV/m) at 30 meters.

(c) 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 (40.5 dBµV/m) at 30 meters.

Test Note: Reference ANSI C63.10-2013 sections 5.3.2 and 6.4.4.2. The following formula was used to extrapolate the measurement distance to the limit distance:

$$FS_{limit} = FS_{max} - 40\log\left(\frac{d_{near\ field}}{d_{measure}}\right) - 20\log\left(\frac{d_{limit}}{d_{near\ field}}\right)$$ Equation 1

FS_{limit} is the calculation of field strength at the limit distance (dBµV/m)	**49.76**
FS_{max} is the measured field strength, expressed in (dBµV/m QP @ 3M)	71.15
$d_{near\ field}$ is the λ / 2π distance (Meters)	3.52
$d_{measure}$ is the distance of the measurement point from the EUT (Meters)	3.00
d_{limit} is the reference limit distance (Meters)	30.00

The screen captures on the following pages display the value measured at a distance of 3 meters. This distance value was adjusted to the limit distance using the formula detailed in Equation 1.

Result: Compliant - The fundamental frequency radiated field strength of the device under test complies with the requirements detailed in FCC Part 15.225, Section (a).

The peak field strength of the device under test met the average requirement. For this reason, the quasi-peak field strength was not factored using a duty cycle correction factor.

Freq. (MHz)	Ampl.[1] (dBµV/m) Peak	Corr. Ampl.[2] (dBµV/m) (3M) QP	Corr. Ampl.[2] (dBµV/m) (30M) QP	FCC 15.225 Limit (dBµV/m) QP 30M	Margin (dB)	Ant Pos. Par/Per Gnd Par	Ant Height (cm)	Turntable Azimuth (Deg)	Result
13.56	71.29	71.15	49.76	84.00	-12.85	Par	100	8	Compliant

[1] Measurement has been extrapolated from 3 meters to 30 meters using Equation 1 on this page.

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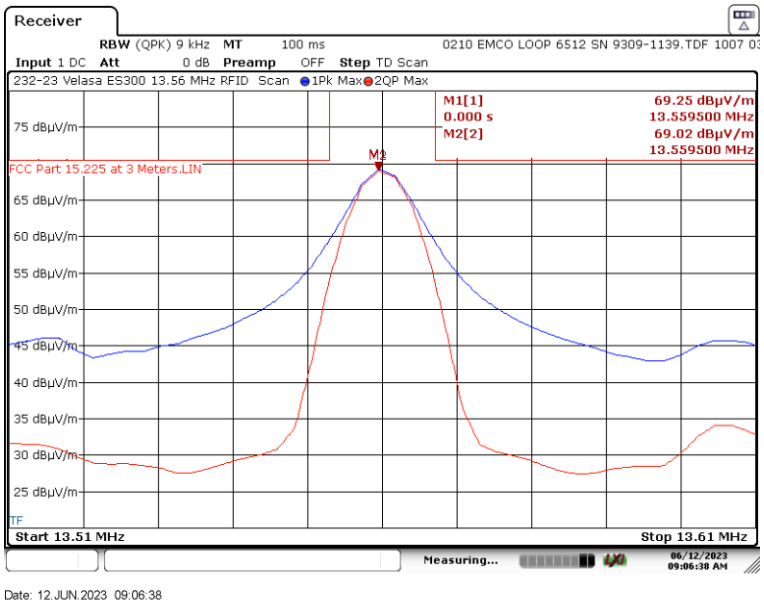
6. Measurement Data (continued)

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

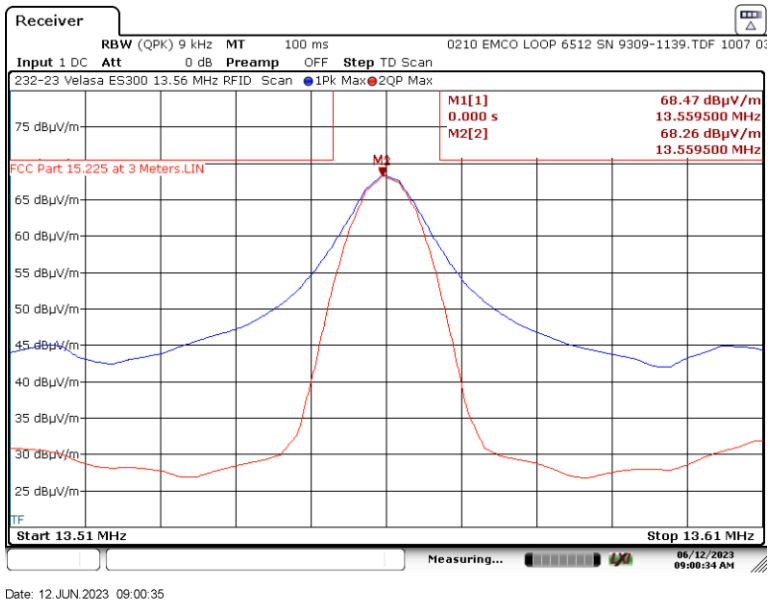
Radiated Field Strength of Fundamental (15.225 (a), (b) and (c)) (continued)

6.1.1. Worst Case Field Strength of the Fundamental – Parallel Antenna



Date: 12.JUN.2023 09:06:38

6.1.2. Worst Case Field Strength of the Fundamental – Perpendicular Antenna



Date: 12.JUN.2023 09:00:35

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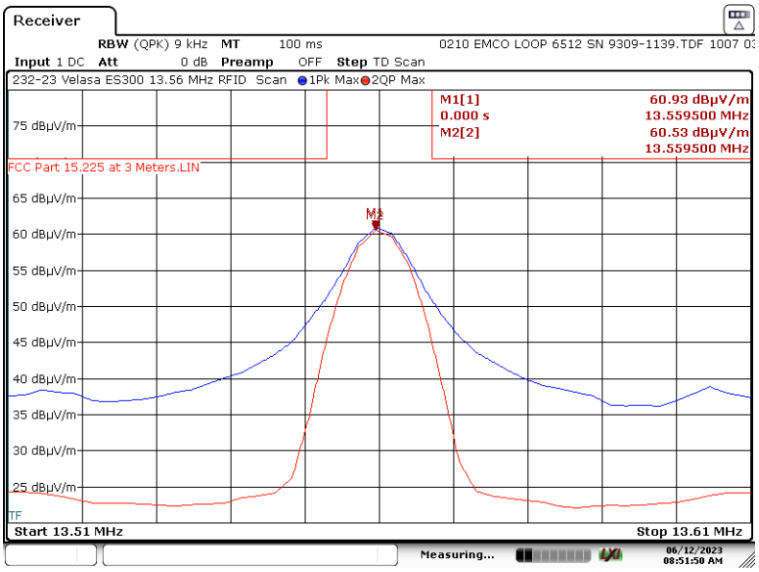
6. Measurement Data (continued)

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

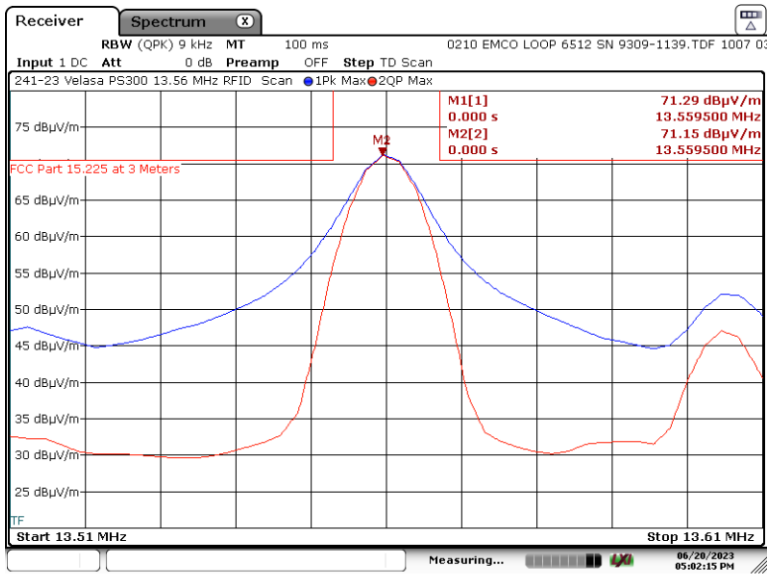
Radiated Field Strength of Fundamental (15.225 (a), (b) and (c)) (continued)

6.1.3. Worst Case Field Strength of the Fundamental – Ground Parallel Antenna



Date: 12.JUN.2023 08:51:50

6.1.4. Worst Case Field Strength of the Fundamental – Parallel Antenna



Date: 20.JUN.2023 17:02:15

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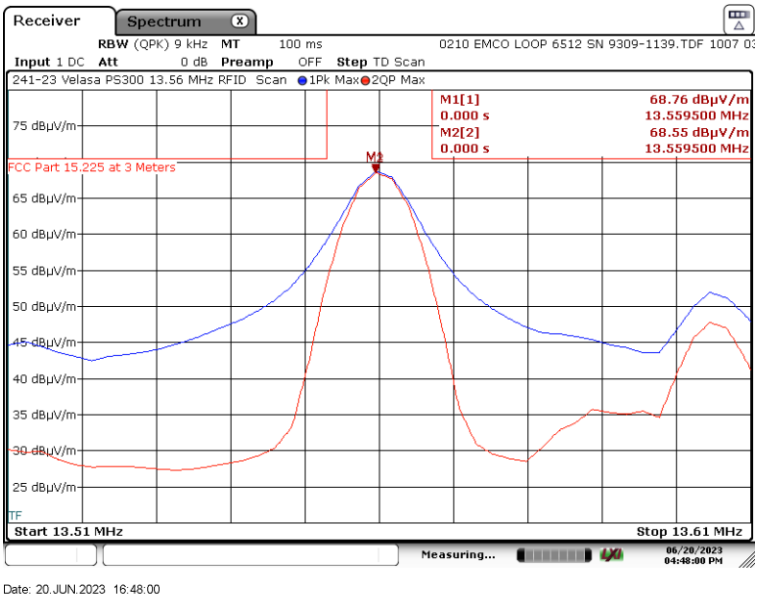
6. Measurement Data (continued)

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

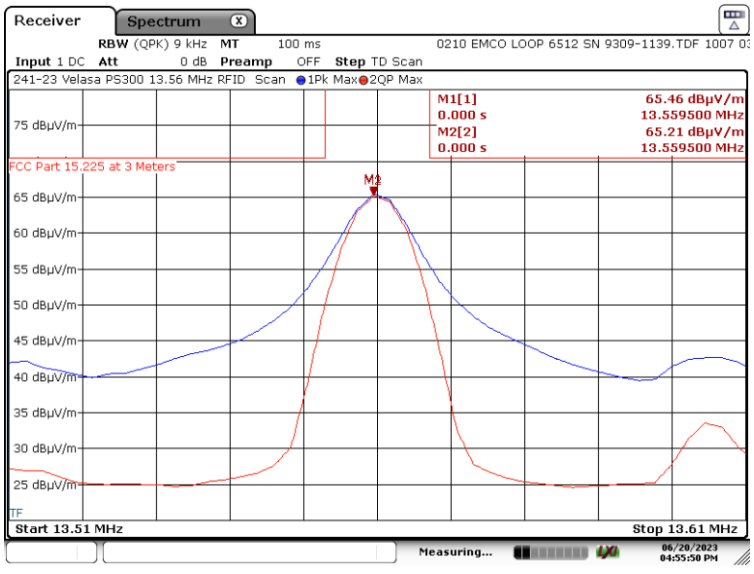
Radiated Field Strength of Fundamental (15.225 (a), (b) and (c)) (continued)

6.1.5. Worst Case Field Strength of the Fundamental – Perpendicular Antenna



Date: 20.JUN.2023 16:48:00

6.1.6. Worst Case Field Strength of the Fundamental – Ground Parallel Antenna



Date: 20.JUN.2023 16:55:51

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6. Measurement Data (continued)

6.2. Public Exposure to Radio Frequency Energy Levels (FCC Part 2.1091:2020)

6.2.1. 2.1091 Requirements

Requirement: Reference CFR 2.1091: For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

RF Exposure of simultaneously operated radios within the host which is considered a Mobile Device.
Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0, according to calculated/estimated, numerically modeled, or measured field strengths or power density. The MPE ratio of each antenna is determined at the minimum *test separation distance* required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to the MPE limit at the test frequency

FCC Part 1.1310:2020 Table 1 Limits for General Population / Uncontrolled Exposure
Power Density Limit from 1.34 to 30 MHz is $180 / f^2$, where f is in MHz
Power Density Limit from 1500 to 100,000 MHz is 1.0

In addition to the EUT, the device contains and Espressif ESP32-S3-MINI1 BLE Radio. The highest power from each of these radios including tune up tolerances were used in the table below.

Power Density (S) = (P*G) / $4\pi R^2$, where S = mW/cm^2, P is power to antenna (mW), G = Gain of the Antenna (numeric), π = 3.1416 and R is the distance in cm to the antenna

	Frequency (MHz)	MPE Distance (cm)	DUT Field Strength at 3M (dBµV/m)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	DUT Output Power (mW)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
		(1)		(2)	(3)		(4)	(5)	
EUT	13.56	20	71.29	-23.91	0	0.00406	0.00000081	0.98	Compliant
BLE	2440	20		6.00	3.96	3.98	0.00197120	1.00	Compliant
						SUM	**0.0020**	1.00	Compliant

Result: Compliant - The device under test meets the exclusion requirement detailed in FCC OET 447498, dated October 23, 2015 Clause 7.2 for simultaneous operation.

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6. Measurement Data (continued)

6.3. Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (RSS-102, Issue 5 + A1:2021)

6.3.1. RSS-102 Issue 5 Requirements

Requirement: RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10^{-2} $f^{0.6834W}$ (adjusted for tune-up tolerance), where f is in MHz

All transmitters are exempt from routine SAR and RF exposure evaluations provided that they comply with the requirements of sections 2.5.2. If the equipment under test (EUT) meets the requirements of sections 2.5.2, applicants are only required to submit a properly signed declaration of compliance (see Annex C).

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power.

In addition to the EUT, the device contains and Espressif ESP32-S3-MINI1 BLE Radio. The highest powers from each of these radios including tune up tolerances were used in the table below.

	Frequency	Separation Distance	Maximum Power	Maximum Power	RSS-102 Exemption Limit	Result
	(MHz)	(cm)	(mW)	(W)	(W)	
EUT	13.56	≥ 20	0.00406	0.00000406	1.00	Compliant
BLE	2440	≥ 20	3.98	0.00398107	2.71	Compliant
			SUM	**0.00398514**		

Result: Compliant, the sum of the three radios is less than the lowest exemption level in RSS-102.

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