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Foundation Fitness LLC MPE REPORT

SCOPE OF WORK

MPE CALCULATION
ON THE DASH L200 AND M200 BIKE COMPUTER

REPORT NUMBER

104771489LEX-027.4

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MPE TEST REPORT

Report Number: 104771489LEX-027.4

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Report Issue Date: 12/7/2021

Report Revised Date: 8/23/2022

Product Name: Dash L200 and M200 Bike Computer

Standards: FCC Part 1.1310 Limits for Maximum
Permissible Exposure (MPE)

RSS-102 Issue 5 RF Field Strength Limits for
Devices Used by the General Public

IEC62311: 2019

Tested by:
Intertek Testing Services NA, Inc.
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Client:
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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
9	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure)	Pass
	RSS-102 Issue 5 RF Field Strength Limits (For Devices Used by the General Public)	Pass
	IEC62311: 2019 MPE Limits (For General Public Exposure)	Pass



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Foundation Fitness LLC
Address:	1220 Main Street Suite 400 Vancouver, WA 98660 USA
Contact:	Jim Stemper
Telephone:	+1 (303) 536-1837
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Manufacturer Information	
Manufacturer Name:	Digital Concepts, Inc.
Manufacturer Address:	3108 Riverport Tech Center Drive Maryland Heights, MO 63043 United States of America
Factory Address:	Digital Concepts de Mexico. S de RL de CV Ponciano Arriaga No. 716 Col. Parque Industrial Los Aztecas Cd. Juarez Chihuahua, Mexico, CP: 32679



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	Dash L200 and M200 Bike Computer
Model Numbers	L200 and M200
Serial Number	Test Sample 1 and 2
Receive Date	9/1/2021
Test Start Date	9/1/2021
Test End Date	9/28/2021
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	3.8VDC
Frequency Band(s)	2400-2483.5MHz
Antenna Gain	BLE: 1.6dBi WiFi: 4.7dBi Antenna gain info was provided by the manufacturer and could affect compliance.
Radio Transmitters Onboard	BLE, WiFi (Silicom Labs, Model: WFM200S, FCCID: QOQWFM200)
Description of Equipment Under Test (provided by client)	
<p>The Dash L200 and M200 Bike Computer is a 2.7" color display rechargeable bike computer with GPS, Bluetooth (Low Energy), WiFi (approved module), Barometric pressure sensor, piezoelectric buzzer, 16GB of memory, 5 buttons and a plastic mounting interface to connect to handlebars. This computer is built on Linux and is based on the existing M50 bike computer, utilizing all of its existing features.</p>	

4.1 Variant Models:

The Dash L200 and M200 Bike Computer used the same radio combinations and only differed in screen size. This RF Exposure analysis covers both variants.



5 FCC Limits

§ 1.1310: The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Part 1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**6 RSS-102 Issue 5 Exposure Limits:**

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

Note: *f* is frequency in MHz.
* Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).



7 IEC62311 (ICNIRP) Exposure Limits:

Table 7. Reference levels for general public exposure to time-varying electric and magnetic fields (unperturbed rms values).^a

Frequency range	E-field strength (V m ⁻¹)	H-field strength (A m ⁻¹)	B-field (μT)	Equivalent plane wave power density S_{eq} (W m ⁻²)
up to 1 Hz	—	3.2×10^4	4×10^4	—
1–8 Hz	10,000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8–25 Hz	10,000	$4,000/f$	$5,000/f$	—
0.025–0.8 kHz	$250/f$	$4/f$	$5/f$	—
0.8–3 kHz	$250/f$	5	6.25	—
3–150 kHz	87	5	6.25	—
0.15–1 MHz	87	$0.73/f$	$0.92/f$	—
1–10 MHz	$87/f^{1/2}$	$0.73/f$	$0.92/f$	—
10–400 MHz	28	0.073	0.092	2
400–2,000 MHz	$1.375f^{1/2}$	$0.0037f^{1/2}$	$0.0046f^{1/2}$	$f/200$
2–300 GHz	61	0.16	0.20	10

^a Note:

1. f as indicated in the frequency range column.
2. Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded.
3. For frequencies between 100 kHz and 10 GHz, S_{eq} , E^2 , H^2 , and B^2 are to be averaged over any 6-min period.
4. For peak values at frequencies up to 100 kHz see Table 4, note 3.
5. For peak values at frequencies exceeding 100 kHz see Figs. 1 and 2. Between 100 kHz and 10 MHz, peak values for the field strengths are obtained by interpolation from the 1.5-fold peak at 100 kHz to the 32-fold peak at 10 MHz. For frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width does not exceed 1,000 times the S_{eq} restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.
6. For frequencies exceeding 10 GHz, S_{eq} , E^2 , H^2 , and B^2 are to be averaged over any $68/f^{1.05}$ -min period (f in GHz).
7. No E-field value is provided for frequencies <1 Hz, which are effectively static electric fields, perception of surface electric charges will not occur at field strengths less than 25 kV m^{-1} . Spark discharges causing stress or annoyance should be avoided.



8 Test Procedure

An MPE evaluation for was performed in order to show that the device was compliant with the general population exposure limits from FCC §2.1091 and RSS-102 Issue 5. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$\text{ConductedPower}_{mW} = 10^{\text{ConductedBwer}(dBm)/10}$$

$$\text{PowerDensity} = \frac{\text{ConductedPower}_{mW} \times \text{Ant. Gain}}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.



9 Results:

The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 1.1310, RSS-102 Issue 5, and IEC62311: 2019.

Additionally, to demonstrate compliance for simultaneous transmission between the BLE and WiFi transmitters the worst-case limit to MPE ratios for each radio were summed. Since that sum was less than 1 that combination of radios is deemed to comply with the simultaneous transmission RF exposure criteria.

9.1 Results (L200)

FCC MPE Data

Duty Cycle		100 (%)						
Separation Dist.		20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm ²)	MPE Limit (mW/cm ²)	Margin to Limit (mW/cm ²)	MPE / Limit Ratio (for Co-Location)
BLE	2402	3.7	3.70	1.6	0.0007	1.0000	0.9993	0.0007
WiFi	2412	16.4	16.40	4.7	0.0256	1.0000	0.9744	0.0256
ANT+	2402	-2.2	-2.20	1.6	0.0002	1.0000	0.9998	0.0002

Limit to MPE Ratio Sum = 0.0007 + 0.0256 + 0.0002 = 0.0265

RSS-102 Issue 5 MPE Data

Duty Cycle		100 (%)						
Separation Dist.		20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m ²)	MPE Limit (W/m ²)	Margin to Limit (W/m ²)	MPE / Limit Ratio (for Co-Location)
BLE	2402	3.7	3.70	1.6	0.0067	5.3508	5.3441	0.0013
WiFi	2412	16.4	16.40	4.7	0.2563	5.3660	5.1097	0.0478
ANT+	2402	-2.2	-2.20	1.6	0.0017	5.3508	5.3491	0.0003

Limit to MPE Ratio Sum = 0.0013 + 0.0478 + 0.0003 = 0.0494

IEC62311 MPE Data

Duty Cycle		100 (%)						
Separation Dist.		20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m ²)	MPE Limit (W/m ²)	Margin to Limit (W/m ²)	MPE / Limit Ratio (for Co-Location)
BLE	2402	3.7	3.70	1.6	0.0067	10.0000	9.9933	0.0007
WiFi	2412	16.4	16.40	4.7	0.2563	10.0000	9.7437	0.0256
ANT+	2402	-2.2	-2.20	1.6	0.0017	10.0000	9.9983	0.0002

Limit to MPE Ratio Sum = 0.0007 + 0.0256 + 0.0002 = 0.0265



9.2 Results (M200)

FCC MPE Data

Duty Cycle		100 (%)						
Separation Dist.		20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm ²)	MPE Limit (mW/cm ²)	Margin to Limit (mW/cm ²)	MPE / Limit Ratio (for Co-Location)
BLE	2402	3.2	3.20	1.6	0.0006	1.0000	0.9994	0.0006
WiFi	2412	16.4	16.40	4.7	0.0256	1.0000	0.9744	0.0256
ANT+	2402	1.16	1.16	1.6	0.0004	1.0000	0.9996	0.0004

Limit to MPE Ratio Sum = 0.0006 + 0.0256 + 0.0004 = 0.0266

RSS-102 Issue 5 MPE Data

Duty Cycle		100 (%)						
Separation Dist.		20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m ²)	MPE Limit (W/m ²)	Margin to Limit (W/m ²)	MPE / Limit Ratio (for Co-Location)
BLE	2402	3.2	3.20	1.6	0.0060	5.3508	5.3448	0.0011
WiFi	2412	16.4	16.40	4.7	0.2563	5.3660	5.1097	0.0478
ANT+	2402	1.16	1.16	1.6	0.0038	5.3508	5.3470	0.0007

Limit to MPE Ratio Sum = 0.0011 + 0.0478 + 0.0008 = 0.0497

IEC62311 MPE Data

Duty Cycle		100 (%)						
Separation Dist.		20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m ²)	MPE Limit (W/m ²)	Margin to Limit (W/m ²)	MPE / Limit Ratio (for Co-Location)
BLE	2402	3.2	3.20	1.6	0.0060	10.0000	9.9940	0.0006
WiFi	2412	16.4	16.40	4.7	0.2563	10.0000	9.7437	0.0256
ANT+	2402	1.16	1.16	1.6	0.0038	10.0000	9.9962	0.0004

Limit to MPE Ratio Sum = 0.0006 + 0.0256 + 0.0004 = 0.0266



10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	12/7/2021	104771489LEX-027	BCT	BZ	Original Issue
1	4/22/2022	104771489LEX-027.1	BZ	JTS	Updated output power values
2	8/4/2022	104771478LEX-027.2	BZ	JTS	Updated contact information.
3	8/15/2022	104771478LEX-027.3	BZ	JTS	Added ANT+ Radio
4	8/23/2022	104771489LEX-027.4	BZ	JTS	Updated antenna gain