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Dormakaba USA Inc.
MPE REPORT

SCOPE OF WORK
MPE CALCULATION
ON THE TRINITY DEVICE

REPORT NUMBER
105079698LEX-004

ISSUE DATE
2/22/2023

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DOCUMENT CONTROL NUMBER
Non-Specific EMC Report Shell Rev. December 2017

MPE TEST REPORT

Report Number: 105079698LEX-004
Project Number: G105079698

Report Issue Date: 2/22/2023

Product Name: Trinity

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

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510
USA

Client:
Dormakaba USA Inc.
1525 Bull Lea Rd. #100
Lexington, KY 40511
USA

Report prepared by

Seth Parker, Associate Engineer

Report reviewed by

Brian Lackey, Team Leader

Table of Contents

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

3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Dormakaba USA Inc.
Address:	1525 Bull Lea Rd. #100 Lexington, KY 40511 USA
Contact:	James Adams
Email:	james.adams@dormakaba.com
Manufacturer Information	
Manufacturer Name:	Dormakaba USA Inc.
Manufacturer Address:	1525 Bull Lea Rd. #100 Lexington, KY 40511 USA

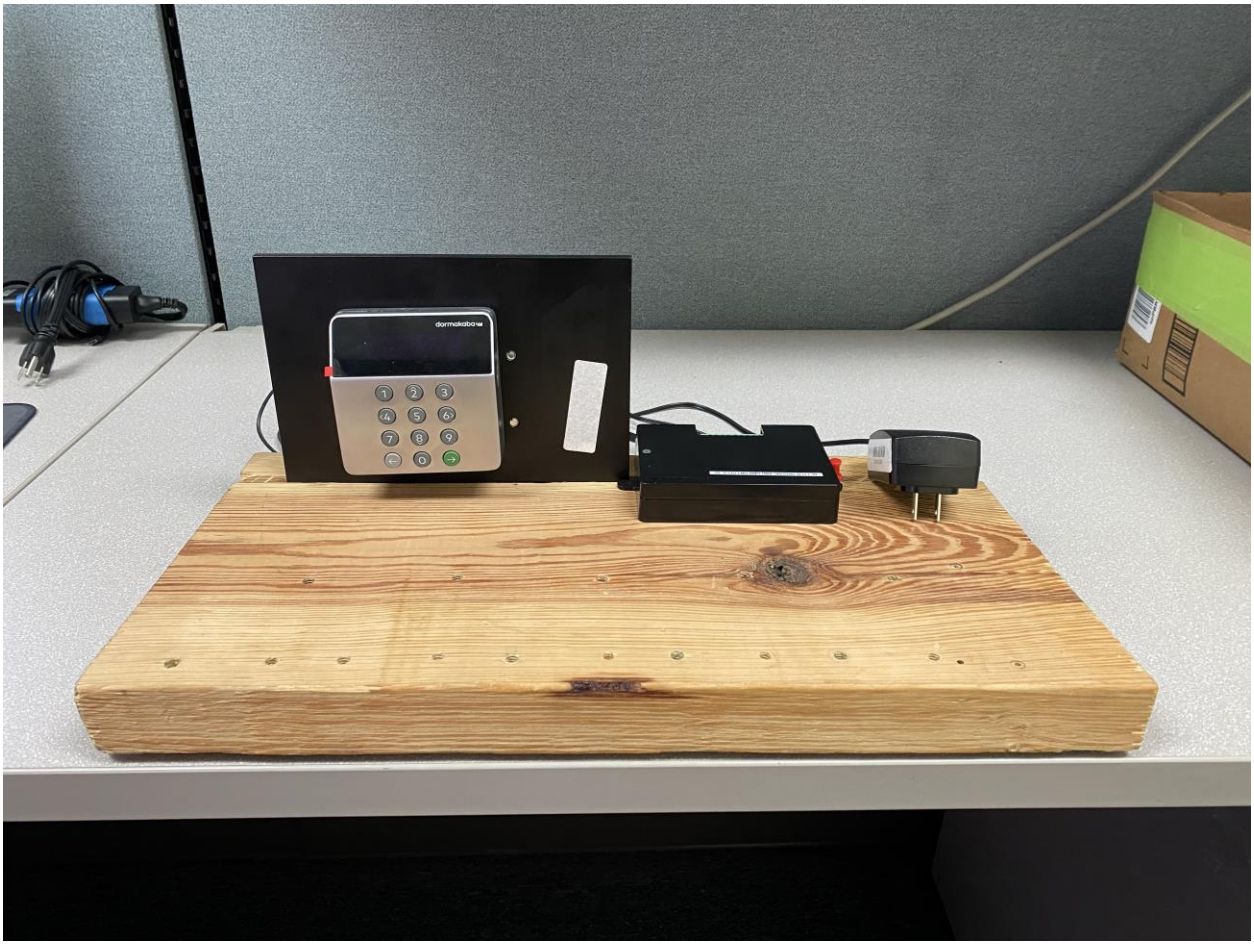
4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	Trinity
Model Number	E-Box: DKAPXEB Lock: DKAPXMLK Entry: DKAPX81X
Supported Transmit Bands	2402 – 2480MHz
Embedded Module	LEGIC SM-3610 RFID
Test Start Date	8/15/2022
Test End Date	9/19/2022
Device Received Condition	Good
Test Sample Type	Production
Power Ratings	100-240VAC, 50/60Hz, 0.7A
Description of Equipment Under Test (provided by client)	
Electronic lock and keypad system with Bluetooth and NFC transceivers.	

4.1 Variant Models:

There were no variant models covered by this evaluation.

4.2 EUT Photo:



5 EIRP Measurements

Wireless Technology	Frequency (MHz)	EIRP (dBm)
BLE	2402	-4.90
BLE	2440	-4.79
BLE	2480	-4.64
RFID	13.56	-64.02

Note: The EIRP Measurements can be found the 105079680LEX.EIRP report.

6 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.

7 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	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

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

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 measured EIRP of the Bluetooth and RFID transmitter was used to determine the plane wave power density at 20cm.

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 and RSS-102 Issue 5 and the device was found to be **compliant**.

Additionally, to demonstrate compliance for simultaneous transmission between the BLE and RFID 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.

FCC MPE Data

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	**Frequency (MHz)**	**Measured EIRP (dBm)**	**Duty Cycle Adjusted Cond. Output Power (dBm)**	**MPE Value (mW/cm2)**	**MPE Limit (mW/cm2)**	**Margin to Limit (mW/cm2)**	**MPE / Limit Ratio (for Co-Locaiton)**
BLE	2480	-4.64	-4.64	0.0001	1.0000	**0.9999**	0.0001
RFID	13.56	-64.02	-64.02	0.0000	0.9789	**0.9789**	0.0000

Limit to MPE Ratio Sum = 0.0001 + 0.0000 = 0.0001

RSS-102 Issue 5 MPE Data

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	**Frequency (MHz)**	**Measured EIRP (dBm)**	**Duty Cycle Adjusted Cond. Output Power (dBm)**	**MPE Value (W/m2)**	**MPE Limit (W/m2)**	**Margin to Limit (W/m2)**	**MPE / Limit Ratio (for Co-Locaiton)**
BLE	2480	-4.64	-4.64	0.0007	5.4689	**5.4683**	0.0001
RFID	13.56	-64.02	-64.02	0.0000	2.0000	**2.0000**	0.0000

Limit to MPE Ratio Sum = 0.0001 + 0.0000 = 0.0001

10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	2/22/2023	105079698LEX-004			Original Issue