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Dormakaba USA Inc. RF EXPOSURE REPORT

SCOPE OF WORK RF EXPOSURE CALCULATION ON THE CENCON X

REPORT NUMBER 105956124LEX-003

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RF EXPOSURE TEST REPORT

Report Number: 105956124LEX-003 **Project Number:** G105956124

Report Issue Date: 10/30/2024

Product Name: Cencon X Product Model: CNXLLLLLLLDZZ000

Standards: FCC Title 47 CFR Part 1.1310(e)(1) Limits for Maximum Permissible Exposure (MPE)

> RSS-102 Issue 6 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

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1 Introduction and Conclusion

The tests indicated in section 2 were performed on the product constructed as described in section 4. 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
10	FCC Title 47 CFR Part 1.1310(e)(1) Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure)	Pass
10	RSS-102 Issue 6 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:	Tejaswi Desari			
Email: Tejaswi.dasari@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 Cencon X					
Model Number	CNXLLLLLLDZZ000				
Hardware Version	1				
Software Version	00.01.11				
Wireless Technology Bluetooth Low Energy					
Supported Transmit Bands 2402-2480MHz					
Supported Transmit Modes BLE, 1MHz bandwidth, GFSK					
Antenna Gain ¹	1.5dB				
Maximum Output Power	-4.72dBm				
Ratings 2x 9VDC Batteries					
Description of Equipment Under Test (provided by client)					
The Dormakaba USA Inc. Cencon X is a door lock with BLE capabilities.					

4.1 Variant Models:

There were no variant models covered by this evaluation.

¹ Values were provided by the client and may affect compliance. Intertek does not make any claims of compliance for values other than those shown.



5 Output Power

The output power table below was taken from Intertek report # 105956124LEX-002 §8.7.

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Output Power Limit (W)	EIRP Limit (W)
2402	-4.97	3.18E-04	1.5	-3.47	4.50E-04	1	4
2426	-4.91	3.23E-04	1.5	-3.41	4.56E-04	1	4
2480	-4.72	3.37E-04	1.5	-3.22	4.76E-04	1	4



6 Antenna Gain

Taken from Johanson Technology data sheet for P/N 2450AT18D0100001E. Intertek makes no claims of compliance for other values.

General Specifications^{1 2}

Passband Frequency (MHz)	2400 - 2500
Impedance (Ω)	50
Return Loss (dB)	6 Min.
Peak Gain (dBi)	1.5 Тур.
Average Gain (dBi)	-1.0 Тур.
Average Radiated Efficiency (%)	72



7 FCC RF Exposure Limits

Title 47 CFR Part 1.1310(d)(2):

For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)					
(i) Limits for Occupational/Controlled Exposure									
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					
300-1,500			f/300	<6					
1,500- 100,000			5	<6					
	(ii) Limits for Genera	Population/Uncontrolled	d 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					
300-1,500			f/1500	<30					
1,500– 100,000			1.0	<30					

Table 1 to § 1.1310(e)(1)-Limits for Maximum Permissible Exposure (MPE)

f = frequency in MHz. * = Plane-wave equivalent power density.



8 RSS-102 Issue 6 RF Exposure Limits

RSS-102 Issue 6 § 6.6:

Field reference level (FRL) 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 (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 1 W (adjusted for tune-up tolerance)
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 4.49/f^{0.5}W (adjusted for tune-up tolerance), where f is in MHz
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance)
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz
- at or above 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 5 W (adjusted for tune-up tolerance)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

RSS-102 Issue 6 § 5.3.2:

The electric and magnetic field strength reference levels, power density reference levels, and associated reference period for devices employed by the general public (uncontrolled environment) and controlleduse devices (controlled environment) are specified in table 7 and table 8. Note that the power density limits specified in these tables apply to whole body exposure conditions.

Frequency range (MHz)	Electric field (V _{RMS} / m)	Magnetic field (A _{RMS} / m)	Power density (W/ m ²)	Reference period (minutes)
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 <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}	4.21×10 ⁻⁴ f ^{0.5}	6.67×10 ⁻⁵ f	616000/ <i>f</i> ^{1.2}

Table 7: RF field strength and power density limits for devices used by the general public (uncontrolled environment)

Note: *f* is frequency in MHz.

9 Test Procedure

An RF exposure calculation was performed to show that the device was compliant with the general population exposure limits from FCC Title 47 CFR Part 1.1310(e)(1), RSS-102 Issue 6, and ICNIRP Guidelines (2020). The maximum power density was calculated for each transmitter at a separation distance of 20cm using the maximum conducted output power (including tune up tolerance) plus antenna gain, or measured EIRP.

For each transmitter the maximum power density at a 20cm distance using the formula:

$$EIRP(dBm) = Conducted Power(dBm) + Antenna Gain(dBi)$$
$$EIRP(mW) = 10^{EIRP(dBm)/10}$$
$$Power Density \left(\frac{mW}{cm^2}\right) = \frac{EIRP(mW)}{4\pi \cdot (20cm)^2}$$
$$Power Density \left(\frac{W}{m^2}\right) = \left(\frac{100cm}{1m}\right)^2 \left(\frac{1W}{1000mW}\right) Power Density \left(\frac{mW}{cm^2}\right)$$

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



10 Results:

The calculated maximum power density at 20cm was less than or equal to the limits for general population exposure in FCC Title 47 CFR Part 1.1310(e)(1), and RSS-102 Issue 6.



10.1 FCC RF Exposure Data

Transmitter	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Power Density (W/m²)	Limit (W/m²)
Bluetooth BLE Low Channel	2402	-4.97	1.5	-3.47	.450	0.0001	1.0000
Bluetooth BLE Mid Channel	2426	-4.91	1.5	-3.41	.456	0.0001	1.0000
Bluetooth BLE High Channel	2480	-4.72	1.5	-3.22	.476	0.0001	1.0000



10.2 RSS-102 Issue 6 RF Exposure Data

Transmitter	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Power Density (W/m²)	Limit (W/m²)
Bluetooth BLE Low Channel	2402	-4.97	1.5	-3.47	.450	0.0009	5.3508
Bluetooth BLE Mid Channel	2426	-4.91	1.5	-3.41	.456	0.0009	5.4085
Bluetooth BLE High Channel	2480	-4.72	1.5	-3.22	.476	0.0009	5.4689



11 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	10/30/2024	105956124LEX-003	MC	DP	Original Issue