Intertek
731 Enterprise Drive
Lexington, KY 40510

Tel 859 226 1000
Fax 859 226 1040

www.intertek.com

Dormakaba USA, Inc.
MPE REPORT

SCOPE OF WORK
MPE CALCULATION
ON THE FOB MODEL DKLG70X

REPORT NUMBER
104364418LEX-010.1

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MPE TEST REPORT

Report Number:	104364418LEX-010.1
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Product Name:	Fob Model DKLG70X
FCC Standards:	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE)
Industry Canada Standards:	RSS-102 Issue 5

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

Client:
Dormakaba USA, Inc.
749 West Short Street
Lexington, KY 40508-1200
USA

Report prepared by

Brian Lackey, Staff Engineer

Report reviewed by

Bryan Taylor, Team Leader

MPE Calculation

§ 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.

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	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

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

1.1 Test Procedure

An MPE evaluation for was performed in order to show that the device was compliant with §2.1091 and RSS-102. The maximum power density was calculated at a separation distance of 20cm. The calculation was performed using the maximum gain from the internal antenna declared by the manufacturer.

The maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{ConductedPower(dBm)/10}$$

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

1.2 Results (FCC):

Duty Cycle	100 (%)							
Separation Dist.	0.5 (cm)							
Operating Mode	Frequecy (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	-1.66	-1.66	2.2	0.3605	1.00	0.6395	0.3605

The calculated maximum power density at 20cm distance is less that the limit for general population / uncontrolled exposure.

Additionally, the device is exempt from SAR testing by KDB 447498 D01v06:

100 MHz to 6 GHz and separation distance ≤ 50 mm KDB 447498 D01 v06 4.3.1.a			
Description	**Value**	**Unit**	**Comments**
Max Power of Channel	1.132	mW	
Minimum Separation Distance	5	mm	
Frequency	2.48	GHz	
Max Power of Channel (Rounded)	**1**	**mW**	Rounded to nearest mW
Minimum Separation Distance (Rounded)	**5**	**mm**	Rounded to nearest mm, limited to 5 mm
SAR Exclusion Threshold	**0.315**		Max power, mW / min. separation distance, mm x √(frequency, GHz)
Excluded from 1-g SAR?	**Yes**		Threshold ≤ 3.0
Excluded from 10-g extremity SAR?	**Yes**		Threshold ≤ 7.5

1.3 Results (ISED):

Duty Cycle	100 (%)							
Separation Dist.	0.5 (cm)							
Operating Mode	Frequecy (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	-1.66	-1.66	2.2	3.6045	5.35	1.7463	0.673645

The calculated maximum power density at 20cm distance is less that the limit for general population / uncontrolled exposure.

Additionally, the device is exempt from SAR testing since its maximum output power is less than the exemption limits from RSS 102 Issue 5 Table 1:

Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance[1,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

The maximum EIRP was calculated to be 0.54 dBm, or 1.13 mW.

2 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	7/31/2020	104364418LEX-010	BL	BCT	Original Issue
1	2/15/2021	104364418LEX-010.1	BL	BCT	Added ISED SAR exemption