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 WI-Q PORTAL GATEWAY

REPORT NUMBER
104024249LEX-001c

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MPE TEST REPORT

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Product Name:	Wi-Q Portal Gateway
FCC Standards:	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE)
Industry Canada Standards:	RSS-102 Issue 5

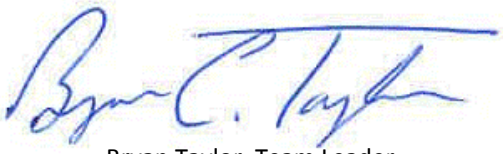
Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510

Client:
Dormakaba USA Inc.
6161 E. 75th Street
Indianapolis, IN 46250
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):

1.2.1 Zigbee Radio

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	Frequecy (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Antenna Gain (dBi)	MPE Value (mW/cm^2)	Limit (mW/cm^2)	Margin to Limit (mW/cm^2)	MPE / Limit Ratio (for Co-Location)
Pulse W1030W	2405	20.38	2.00	0.0344	1.00	0.9656	0.0344
PCTEL (Maxrad) MC2400PTMSMA Ceiling Mount	2405	20.38	2.50	0.0386	1.00	0.9614	0.0386
Mobile Mark (Comtelco) CMTB36247V Wall Mount	2405	20.38	7.50	0.1221	1.00	0.8779	0.1221
Mobile Mark (Comtelco) CMTBS2400XL3 Omnidirectional	2405	20.38	5.00	0.0687	1.00	0.9313	0.0687

The device features two identical Zigbee radios, each with four possible antenna configurations. The worst case antenna configuration was found to be the Mobile Mark (Comtelco) CMTB36247V Wall Mount antenna. The calculated maximum power density at 20cm distance is less that the limit for general population / uncontrolled exposure.

1.2.2 Wi-Fi Radio

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	Frequecy (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Antenna Gain (dBi)	MPE Value (mW/cm^2)	Limit (mW/cm^2)	Margin to Limit (mW/cm^2)	MPE / Limit Ratio (for Co-Location)
Wi-Fi	2437	19.9	0.00	0.0194	1.00	0.9806	0.0194

Note: values were taken from RF exposure report for Models ISM43362-M3G-L44-E and ISM43362-M3G-L44-U, FCCID O7P-362. The calculated maximum power density at 20cm distance is less that the limit for general population / uncontrolled exposure.

1.2.3 Simultaneous Transmission

The worst case simultaneous transmission for the device is both Zigbee radios transmitting using Mobile Mark (Comtelco) CMTB36247V Wall Mount antennas, and Wi-Fi transmitting:

2 x (0.1221) + 0.0194 = 0.2636

Since the result is less than 1, the device is deemed to comply with simultaneous transmission requirements.

1.3 Results (IC):

1.3.1 Zigbee Radio

Duty Cycle	100 (%)						
Separation Dist.	0.2 (m)						
Operating Mode	Frequecy (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Antenna Gain (dBi)	MPE Value (W/m^2)	Limit (W/m^2)	Margin to Limit (W/m^2)	MPE / Limit Ratio (for Co-Location)
Pulse W1030W	2405	20.38	2.00	0.344136	5.36	5.011235	0.064260
PCTEL (Maxrad) MC2400PTMSMA Ceiling Mount	2405	20.38	2.50	0.386127	5.36	4.969244	0.072101
Mobile Mark (Comtelco) CMTB36247V Wall Mount	2405	20.38	7.50	1.221041	5.36	4.134330	0.228003
Mobile Mark (Comtelco) CMTBS2400XL3 Omnidirectional	2405	20.38	5.00	0.686642	5.36	4.668729	0.128216

The device features two identical Zigbee radios, each with four possible antenna configurations. The worst case antenna configuration was found to be the Mobile Mark (Comtelco) CMTB36247V Wall Mount antenna. The calculated maximum power density at 20cm distance is less that the limit for general population / uncontrolled exposure.

1.3.2 Wi-Fi Radio

Duty Cycle	100 (%)						
Separation Dist.	0.2 (m)						
Operating Mode	Frequecy (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Antenna Gain (dBi)	MPE Value (W/m^2)	Limit (W/m^2)	Margin to Limit (W/m^2)	MPE / Limit Ratio (for Co-Location)
Wi-Fi	2437	19.9	0.00	0.194415	5.40	5.209550	0.035976

Note: values were taken from RF exposure report for Models ISM43362-M3G-L44-E and ISM43362-M3G-L44-U, ICID 10147A-362. The calculated maximum power density at 20cm distance is less that the limit for general population / uncontrolled exposure.

1.3.3 Simultaneous Transmission

The worst case simultaneous transmission for the device is both Zigbee radios transmitting using Mobile Mark (Comtelco) CMTB36247V Wall Mount antennas, and Wi-Fi transmitting:

2 x (0.2280) + 0.0360 = 0.4920

Since the result is less than 1, the device is deemed to comply with simultaneous transmission requirements.

2 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	9/10/2019	104024249LEX-001c	BL	BCT	Original Issue