

RADIO TEST REPORT

Type of assessment:

MPE Calculation report

Manufacturer:

Dormakaba Canada Inc.

Hardware Version Identification Number (HVIN):

MT6 Quantum IV

Product Marketing Name (PMN):

Quantum IV Electromechanical lock series

FVIN variant(s):

QIV6, QIV6-AD, QIV6-M, QIV6-ADM

FCC ID:

SAPQUANTUMIV

ISED certification number:

4652A-QUANTUMIV

Specification:

- ◆ FCC 47 CFR Part 1 Subpart I, §§1.1307, 1.1310
- ◆ FCC 47 CFR Part 2 Subpart J, §2.1091
- ◆ FCC KDB 447498 D01 General RF Exposure Guidance v06
- ◆ ISED Canada RSS-102 Issue 5 Amendment 1, (February 2021)

RSS-102 Annex B - Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in Annex A is correct; that the Technical Brief was prepared and the information contained therein is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed; and that the device meets the SAR and/or RF field strength limits of RSS-102.

Date of issue: December 21, 2023

Andrey Adelberg, Senior EMC/RF Specialist

Prepared by



Signature

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ANAB File Number: AT-3195 (Ottawa/Almonte); AT-3193 (Pointe-Claire); AT-3194 (Cambridge)



Lab locations

Company name	Nemko Canada Inc.			
Facilities	<i>Ottawa site:</i> 303 River Road Ottawa, Ontario Canada K1V 1H2 Tel: +1 613 737 9680 Fax: +1 613 737 9691	<i>Montréal site:</i> 292 Labrosse Avenue Pointe-Claire, Québec Canada H9R 5L8 Tel: +1 514 694 2684 Fax: +1 514 694 3528	<i>Cambridge site:</i> 1-130 Saltsman Drive Cambridge, Ontario Canada N3E 0B2 Tel: +1 519 650 4811	<i>Almonte site:</i> 1500 Peter Robinson Road West Carleton, Ontario Canada K0A 1L0 Tel: +1 613 256-9117
Test site identifier	Organization	Ottawa/Almonte	Montreal	Cambridge
	FCC:	CA2040	CA2041	CA0101
	ISED:	2040A-4	2040G-5	24676
Website	www.nemko.com			

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1 Evaluation summary

1.1 MPE calculation for simultaneous transmission

1.1.1 References, definitions and limits

FCC §2.1091(d)

- (2) (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.

Table 1.1-1: Table 1 to §1.1310(e)(1)—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)
(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
300–1500			f / 300	<6
1500–100000			5	<6
(ii) 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
1500–100000			1.0	<30

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

RSS-102, Section 4

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6:

Table 1.1-2: Table 4 to RSS-102— RF Field Strength Limits

Frequency range (MHz)	Electric field strength (V/m rms)	Magnetic field strength (A/m rms)	Power density (W/m ²)	Reference Period (minutes)
Limits for Controlled Environment				
10–20	61.4	0.163	10	6
20–48	129.8 / f ^{0.25}	0.3444 / f ^{0.25}	44.72 / f ^{0.5}	6
48–100	49.33	0.1309	6.455	6
100–6000	15.60 f ^{0.25}	0.04138 f ^{0.25}	0.6455 f ^{0.5}	6
6000–15000	137	0.364	50	6
Limits for Uncontrolled Environment				
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

Notes: f = frequency in MHz.

References, definitions and limits, continued

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (mW/cm² or W/m²)
P = power input to the antenna (mW or W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (cm or m)

1.1.2 EUT technical information

	Transmitter 1 (BLE)	Transmitter 2 (RFID)	Transmitter 3 (ZigBee)
Prediction frequency	2480 MHz	13.56 MHz	2405 MHz
Antenna type	Integral	Integral	Integral
Antenna gain	0.5 dBi	0 dBi	0.5 dBi
Maximum transmitter conducted power	3.60 dBm	-42.73 dBm (52.5 dBμV/m @ 3 m)	21 dBm
Prediction distance (declared)	20 cm	20 cm	20 cm

1.1.3 MPE calculation

	Transmitter 1	Transmitter 2	Transmitter 3			
Fundamental transmit (prediction) frequency:	2480 MHz	13.56 MHz	2405 MHz			
Maximum measured conducted peak output power:	3.6 dBm	-42.73 dBm	21 dBm			
Cable and/or jumper loss:	0 dB	0 dB	0 dB			
Maximum peak power at antenna input terminal:	3.6 dBm	-42.73 dBm	21 dBm			
Duty cycle:	100 %	100 %	100 %			
Maximum calculated average power at antenna input terminal:	2.2908677 mW	5.333E-05 mW	125.89254 mW			
Single Antenna gain (typical):	0.5 dBi	0 dBi	0.5 dBi			
Number of antennae:	1	1	1			
Total system gain:	0.50 dBi	0.00 dBi	0.50 dBi			
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	ISSED limit 0.54689 mW/cm ² 5.468948 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²	ISSED limit 0.20000 mW/cm ² 2.000000 W/m ²	FCC limit 0.97893 mW/cm ² 9.78933 W/m ²	ISSED limit 0.53554 mW/cm ² 5.355371 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	3.21456 mW/cm ² 32.14564 W/m ²	5.00000 mW/cm ² 50.00000 W/m ²	1.00000 mW/cm ² 10.00000 W/m ²	4.89467 mW/cm ² 48.94667 W/m ²	3.16558 mW/cm ² 31.65584 W/m ²	5.00000 mW/cm ² 50.00000 W/m ²
Minimum calculated prediction distance for compliance:	20 cm	20 cm	20 cm	20 cm	20 cm	20 cm
Typical (declared) distance:	20 cm	20 cm	20 cm	20 cm	20 cm	20 cm
Average power density at prediction frequency:	0.000511 mW/cm ² 0.005114 W/m ²	0.000511 mW/cm ² 0.005114 W/m ²	0.000000 mW/cm ² 0.000000 W/m ²	0.000000 mW/cm ² 0.000000 W/m ²	0.028102 mW/cm ² 0.281015 W/m ²	0.028102 mW/cm ² 0.281015 W/m ²
MPE compliance for simultaneous operation:						
Margin of Compliance for <u>controlled</u> environment:	37.98 dB	39.90 dB	79.74 dB	86.64 dB	20.52 dB	22.50 dB
with Maximum permitted antenna gain:	38.48 dBi	40.40 dBi	79.74 dBi	86.64 dBi	21.02 dBi	23.00 dBi
Margin of Compliance for <u>uncontrolled</u> environment:	30.29 dB	32.91 dB	72.75 dB	79.65 dB	12.80 dB	15.51 dB
with Maximum permitted antenna gain:	30.79 dBi	32.91 dBi	72.75 dBi	79.65 dBi	13.30 dBi	15.51 dBi
Average power density to MPE limit ratio (<u>uncontrolled</u>):	0.001	0.001	0.000	0.000	0.052	0.028
Average power density to MPE limit ratio (<u>controlled</u>):	0.000	0.000	0.000	0.000	0.009	0.006
Total sum of ratios for FCC (uncontrolled):	0.029 <1		Total sum of ratios for FCC (controlled):	0.006 <1	Total RF value for ISSED:	0.2861 W/m ²
Total sum of ratios for ISSED (uncontrolled):	0.053 <1		Total sum of ratios for ISSED (controlled):	0.009 <1		
Maximum allowed sum of ratios:	1					

1.1.4 Verdict

The calculation is below the limit; therefore, the product is passing the RF Exposure requirements for the declared distance.

1.1.5 RSS-102, Annex A - RF technical brief cover sheet

ISED certification number	IC: 4652A-QUANTUMIV		
Product marketing name (PMN)	Quantum IV Electromechanical lock series		
Hardware version identification number (HVIN)	MT6 Quantum IV		
Firmware version identification number (FVIN)	QIV6, QIV6-AD, QIV6-M, QIV6-ADM		
Host marketing name (HMN)	N/A		
Applicant name	Dormakaba Canada Inc.		
SAR/RF exposure test laboratory	2040G-5 (3 m semi anechoic chamber - Montréal)		
Type of evaluation	☐ SAR Evaluation: Device Used in the Vicinity of the Human Head ☐ SAR Evaluation: Body-Worn Device and Body-Supported Device ☐ SAR Evaluation: Limb-Worn Device ☒ RF Exposure Evaluation ☐ Nerve Stimulation Exposure Evaluation (SPR-002)		
SAR evaluation	Multiple transmitters: ☐ Yes ☐ No		
	Evaluated against exposure limits: ☐ General Public Use ☐ Controlled Use		
	Duty cycle used in evaluation: N/A %		
	Separation distance: N/A mm		
	Standard used for evaluation: N/A		
	SAR value: N/A W/kg		
☐ Measured ☐ Computed ☐ Calculated			
Nerve Stimulation Evaluation (SPR-002)	Evaluated against exposure limits: ☐ General Public Use ☐ Controlled Use		
	Measurement distance: N/A m		
	Field Strength: N/A ☐ V/m (electric) ☐ A/m (magnetic) ☐ Measured ☐ Computed ☐ Calculated		
	Exposure condition: ☐ Whole body/Torso/Head ☐ Leg ☐ Arm ☐ Hand/Foot		
RF exposure evaluation	Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use		
	Duty cycle used in evaluation: 100 %		
	Operational frequency: 2480 MHz, 13.56 MHz, 2405 MHz		
	Standard used for evaluation: Safety Code 6		
	Measurement distance: 0.2 m		
	RF value: 0.2861 ☒ W/m ² ☐ V/m ☐ A/m ☐ Measured ☐ Computed ☒ Calculated		

End of the test report