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RADIO TEST REPORT

Report ID

REP026810

Project ID

PRJ0051009

Type of assessment:

MPE Calculation report

Manufacturer:

ORBCOMM LICENCE Corp. (ORBCOMM Inc.)

Product Marketing Name (PMN):

SC 1000

Product description:

Mobile Satellite Earth Station Terminal

Hardware Version Identification Number (HVIN):

SC1000

FCC identifier:

FCC ID: XGS-SC1000

ISED certification number:

IC: 11881A-SC1000

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: April 22, 2024

Alvin Liu, EMC/RF Specialist

Prepared by

Signature

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





Lab locations

Company name	Nemko Canada Inc.			
Facilities	<i>Ottawa site:</i>	<i>Montréal site:</i>	<i>Cambridge site:</i>	
	303 River Road Ottawa, Ontario Canada K1V 1H2 Tel: +1 613 737 9680 Fax: +1 613 737 9691	292 Labrosse Avenue Pointe-Claire, Québec Canada H9R 5L8 Tel: +1 514 694 2684 Fax: +1 514 694 3528	1-130 Saltsman Drive Cambridge, Ontario Canada N3E 0B2 Tel: +1 519 650 4811	
Test site identifier	Organization	Ottawa	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 (MES)	Transmitter 2 (Bluetooth)
Prediction frequency	1626.5 MHz	2480 MHz
Antenna type	Internal PCB antenna	Internal PCB antenna
Antenna gain	5.1 dBi	2.7 dBi
Maximum transmitter conducted power	31.4 dBm	9.7 dBm
Prediction distance (declared)	20 cm	20 cm

1.1.3 MPE calculation

	MES		Bluetooth	
Fundamental transmit (prediction) frequency:	1626.5	MHz	2480	MHz
Maximum measured conducted peak output power:	31.4	dBm	9.7	dBm
Cable and/or jumper loss:	0	dB	0	dB
Maximum peak power at antenna input terminal:	31.4	dBm	9.7	dBm
Duty cycle:	40	%	100	%
Maximum calculated average power at antenna input terminal:	552.15371	mW	9.332543	mW
Single Antenna gain (typical):	5.1	dBi	2.7	dBi
Number of antennae:	1		1	
Total system gain:	5.10	dBi	2.70	dBi
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	ISED limit	1.00000 mW/cm ²	ISED limit	1.00000 mW/cm ²
	4.099270	W/m ²	5.468948	W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	2.60329 mW/cm ²	5.00000 mW/cm ²	3.21456 mW/cm ²	5.00000 mW/cm ²
Minimum calculated prediction distance for compliance:	26.03294	W/m ²	32.14564	W/m ²
	20	cm	20	cm
Typical (declared) distance:	20	cm	20	cm
Average power density at prediction frequency:	0.355460 mW/cm ²	0.355460 mW/cm ²	0.003457 mW/cm ²	0.003457 mW/cm ²
	3.554595	W/m ²	0.034572	W/m ²
MPE compliance for simultaneous operation:				
Margin of Compliance for <u>controlled</u> environment:	8.65 dB	11.48 dB	29.68 dB	31.60 dB
with Maximum permitted antenna gain:	13.75	dB	32.38	dB
Margin of Compliance for <u>uncontrolled</u> environment:	0.62 dB	4.49 dB	21.99 dB	24.61 dB
with Maximum permitted antenna gain:	5.72	dB	24.69	dB
Average power density to MPE limit ratio (<u>uncontrolled</u>):	0.867	0.355	0.006	0.003
Average power density to MPE limit ratio (<u>controlled</u>):	0.137	0.071	0.001	0.001
Total sum of ratios for FCC (uncontrolled):	0.359	<1	0.072	<1
Total sum of ratios for ISED (uncontrolled):	0.873	<1	0.138	<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: 11881A-SC1000
Product marketing name (PMN)	SC 1000
Hardware version identification number (HVIN)	SC1000
Firmware version identification number (FVIN)	N/A
Host marketing name (HMN)	N/A
Applicant name	ORBCOMM LICENCE Corp. (ORBCOMM Inc.)
SAR/RF exposure test laboratory	24676 (3 m semi anechoic chamber - Cambridge)
Type of evaluation	<input type="checkbox"/> SAR Evaluation: Device Used in the Vicinity of the Human Head <input type="checkbox"/> SAR Evaluation: Body-Worn Device and Body-Supported Device <input type="checkbox"/> SAR Evaluation: Limb-Worn Device <input checked="" type="checkbox"/> RF Exposure Evaluation <input type="checkbox"/> Nerve Stimulation Exposure Evaluation (SPR-002)
SAR evaluation	Multiple transmitters: <input type="checkbox"/> Yes <input type="checkbox"/> No
	Evaluated against exposure limits: <input type="checkbox"/> General Public Use <input type="checkbox"/> 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 <input type="checkbox"/> Measured <input type="checkbox"/> Computed <input type="checkbox"/> Calculated
Nerve Stimulation Evaluation (SPR-002)	Evaluated against exposure limits: <input type="checkbox"/> General Public Use <input type="checkbox"/> Controlled Use
	Measurement distance: N/A m
	Field Strength: N/A <input type="checkbox"/> V/m (electric) <input type="checkbox"/> A/m (magnetic) <input type="checkbox"/> Measured <input type="checkbox"/> Computed <input type="checkbox"/> Calculated
	Exposure condition: <input type="checkbox"/> Whole body/Torso/Head <input type="checkbox"/> Leg <input type="checkbox"/> Arm <input type="checkbox"/> Hand/Foot
RF exposure evaluation	Evaluated against exposure limits: <input checked="" type="checkbox"/> General Public Use <input type="checkbox"/> Controlled Use
	Duty cycle used in evaluation*: 40 (Sat), 100 (BLE) %
	Operational frequency: 1626.5 (Sat), 2480 (BLE) MHz
	Standard used for evaluation: Safety Code 6
	Measurement distance: 0.2 m
	RF value: 3.589 <input checked="" type="checkbox"/> W/m ² <input type="checkbox"/> V/m <input type="checkbox"/> A/m <input type="checkbox"/> Measured <input type="checkbox"/> Computed <input checked="" type="checkbox"/> Calculated

*- The product is designed for machine-to-machine (M2M) applications, primarily focused on transmitting machine status information. Given the nature of this data—typically small-sized—and the compact design of the product the extended transmission periods are unnecessary. Furthermore, stringent control over power consumption dictates that the transmitting duty cycle be limited by both hardware and software, therefore this duty cycle is **hard-coded** and cannot be modified.

To provide more context, the device’s transmitting duty cycle adheres to the following parameters:

- Transmission occurs every 5 seconds.
- The maximum duration of transmitting activity within this 5-second window is capped at 2 seconds.
- Consequently, the absolute maximum duty cycle of Satellite transmitter does not exceed 40%.

End of the test report