

RADIO TEST REPORT – APFWL

Type of assessment:

MPE Calculation report

Manufacturer:

ORBCOMM License Corp.

Hardware Version Identification Number (HVIN):

CT1000

Product Marketing Name (PMN):

CT1000

FCC ID:

XGS-BTCT1

ISED certification number:

IC: 11881A-BTCT1

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: **November 16, 2022**

Moustapha Salah Toubeh, EMC/RF Specialist

Prepared by



Signature

Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada.
The tests included in this report are within the scope of this accreditation.
The SCC Accreditation Symbol is an official symbol of the Standards Council of Canada, used under licence.

SCC File Number: 15064 (Ottawa/Almonte); 151100 (Montreal); 151097 (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 KOA 1L0 Tel: +1 613 256-9117
Test site identifier	Organization FCC: ISED:	Ottawa/Almonte CA2040 2040A-4	Montreal CA2041 2040G-5	Cambridge CA0101 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.

Copyright notification

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.
 © Nemko Canada Inc.

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 (Cellular)
Prediction frequency	2440 MHz	700 MHz
Antenna gain	3 dBi	3 dBi
Maximum transmitter conducted power	4.88 dBm	24.5 dBm
Prediction distance (declared)	20 cm	20 cm

1.1.3 MPE calculation

	Transmitter BLE		Transmitter Cellular	
Fundamental transmit (prediction) frequency:	2440 MHz		699.7 MHz	
Maximum measured conducted peak output power:	4.88 dBm		24.5 dBm	
Cable and/or jumper loss:	0 dB		0 dB	
Maximum peak power at antenna input terminal:	4.88 dBm		24.5 dBm	
Duty cycle:	100 %		100 %	
Maximum calculated average power at antenna input terminal:	3.0760968 mW		281.83829 mW	
Single Antenna gain (typical):	3 dBi		3 dBi	
Number of antennae:	1		1	
Total system gain:	3.00 dBi		3.00 dBi	
MPE limit for uncontrolled exposure at prediction frequency:	ISED limit 0.54085 mW/cm ² 5.408511 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²	ISED limit 0.23033 mW/cm ² 2.303288 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²
MPE limit for controlled exposure at prediction frequency:	3.18853 mW/cm² 31.88535 W/m ²	5.00000 mW/cm² 50.00000 W/m ²	1.70747 mW/cm² 17.07466 W/m ²	2.33233 mW/cm² 23.32333 W/m ²
Minimum calculated prediction distance for compliance:	20 cm	20 cm	20 cm	20 cm
Typical (declared) distance:	20 cm	20 cm	20 cm	20 cm
Average power density at prediction frequency:	0.001221 mW/cm² 0.012210 W/m ²	0.001221 mW/cm² 0.012210 W/m ²	0.111874 mW/cm² 1.118743 W/m ²	0.111874 mW/cm² 1.118743 W/m ²
MPE compliance for simultaneous operation:				
Margin of Compliance for controlled environment:	34.17 dB	36.12 dB	11.84 dB	13.19 dB
with Maximum permitted antenna gain:	37.17 dBi	39.12 dBi	14.84 dBi	16.19 dBi
Margin of Compliance for uncontrolled environment:	26.46 dB	29.13 dB	3.14 dB	9.51 dB
with Maximum permitted antenna gain:	29.46 dBi	29.13 dBi	6.14 dBi	9.51 dBi
Average power density to MPE limit ratio (uncontrolled):	0.002	0.001	0.486	0.112
Average power density to MPE limit ratio (controlled):	0.000	0.000	0.066	0.048
Total sum of ratios for FCC (uncontrolled):	0.113 <1		Total sum of ratios for FCC (controlled):	0.048 <1
Total sum of ratios for ISED (uncontrolled):	0.488 <1		Total sum of ratios for ISED (controlled):	0.066 <1
Maximum allowed sum of ratios:	1			
			Total RF value for ISED:	1.1310 W/m ²

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-BTCT1
Product marketing name (PMN)	CT1000
Hardware version identification number (HVIN)	CT1000
Firmware version identification number (FVIN)	V1.10
Host marketing name (HMN)	N/A
Applicant name	ORBCOMM License Corp.
SAR/RF exposure test laboratory	2040A-4 (3 m semi anechoic chamber - Ottawa)
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: 100 %
	Operational frequency: 2400 and 700 MHz
	Standard used for evaluation: Safety Code 6
	Measurement distance: 0.2 m
	RF value: 1.131 <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

End of the test report