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RF Exposure Compliance – MPE Calculation Report

Applicant information:		SmartWave Technologies
Product information:	*Model number (HVIN):*	B01-010A
	Model name (PMN):	Bell iQ LoRa
	Product type:	Mobile Device
	Device category	Consumer Device for General Population/Uncontrolled Exposure
	FCC Identification:	FCC ID: 2ASYW-B01010A
	ISED certification number:	IC: 24934-B01010A
Date of issue:		July 31, 2025
Compliance Specifications:		FCC 47 CFR Part 1 Subpart I, §§1.1307, 1.1310 FCC 47 CFR Part 2 Subpart J, §§2.1091, 2.1093 FCC KDB 447498 D01 General RF Exposure Guidance v06 FCC KDB 865664 D01 RF Exposure Procedures and Equipment Authorization Policies ISED Canada RSS-102 Issue 6 December 15, 2023

Test locations of Nemko Canada Inc.			
	Ottawa site	**Montréal site**	**GTA Cambridge site**
Facility address	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 - FCC	CA2040	CA2041	CA0101
Test site identifier – ISED Canada	2040A-4	2040G-5	24676
ANAB File Number	AT-3195	AT-3193	AT-3194

Andrey Adelberg
Senior EMC/Wireless Specialist
Prepared by


Signature

Limits of responsibility

The results presented in this report apply solely to the specific device model tested and are valid only for the operating conditions and installation requirements specified herein. Testing was conducted in accordance with ISO/IEC 17025:2017 requirements, and all results fall within the scope of Nemko Canada's accreditation.

This MPE evaluation is based on the maximum power levels and operating conditions specified. Any modifications to the device hardware, software, or installation that could affect RF output power or antenna characteristics may invalidate this compliance demonstration.

Copyright notification

1. Executive Summary

This report presents the Maximum Permissible Exposure (MPE) analysis for [Product Name] to demonstrate compliance with FCC and ISED RF exposure requirements. The evaluation considers both single transmitter operation and simultaneous multi-transmitter scenarios where applicable.

2. Key Findings

Compliance status	Complies
Critical separation distances	20 cm
Special conditions or limitations	N/A

MPE calculations for **stand-alone** transmission

Device Classification Requirements	
Portable Device Definition (§2.1093)	Devices designed for use by a person where the radiating structure is within 20 cm of the user's body require SAR evaluation rather than MPE calculation.
Mobile Device Definition	Devices installed in vehicles or with permanently installed antennas may use MPE calculations if minimum separation distances can be established.
Fixed/Base Station Definition	Stationary transmitters with controlled access to antenna locations may use MPE calculations for both occupational and general population exposure scenarios.

3. References, definitions and limits for FCC

FCC §2.1091(d)	
(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: *§1.1310(e)(1)—Power Density Limits for Maximum Permissible Exposure (MPE)*

Frequency range (MHz)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure		
0.3–3.0	*(100)	≤6
3.0–30	*(900 / f^2)	<6
30–300	1.0	<6
300–1500	f / 300	<6
1500–100000	5	<6
(ii) Limits for General Population/Uncontrolled Exposure		
0.3–1.34	*(100)	<30
1.34–30	*(180 / f^2)	<30
30–300	0.2	<30
300–1500	f / 1500	<30
1500–100000	1.0	<30

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

4. References, definitions and limits for ISED

RSS-102	
Section 5.3.2	The power density reference levels, and associated reference period for devices employed by the general public (uncontrolled environment) and controlled-use devices (controlled environment) are specified in table below. Note that the power density limits specified in this table apply to whole body exposure conditions.

Table 2: *RSS-102— Power density limits*

Frequency range (MHz)	Power density (W/m^2)	Power density (mW/cm^2)	Reference Period (minutes)
Limits for controlled-use devices (controlled environment)			
10–20	10	1	6
20–48	$44.72 / f^{0.5}$	$4.472 / f^{0.5}$	6
48–100	6.455	0.6455	6
100–6000	$0.6455 f^{0.5}$	$0.06455 f^{0.5}$	6
6000–15000	50	5	$616000 / f^{1.2}$
15000–30000	$3.33\times10^{-4} f$	$0.333\times10^{-4} f$	$616000 / f^{1.2}$
Limits for devices used by the general public (uncontrolled environment)			
10–20	2	0.2	6
20–48	$8.944 / f^{0.5}$	$0.8944 / f^{0.5}$	6
48–300	1.291	0.1291	6
300–6000	$0.02619 f^{0.6834}$	$0.002619 f^{0.6834}$	6
6000–15000	10	1	$616000 / f^{1.2}$
15000–30000	$6.67\times10^{-5} / f$	$0.667\times10^{-5} / f$	$616000 / f^{1.2}$

Notes: f = frequency in MHz.

The above table refers to Health Canada's Safety Code 6 for relevant notes and additional information.

Additional ISED Considerations	
Routine Evaluation Thresholds	ISED requires routine evaluation when predicted or measured field strength exceeds certain thresholds, even for equipment that would otherwise be categorically excluded.
Environmental Classification	Clear distinction must be made between controlled and uncontrolled environments based on RF awareness and access control measures.

5. Power density calculation formula

The fundamental equation (from page 18 of OET Bulletin 65, Edition 97-01) for calculating power density at a specified distance from an RF source is derived from the far-field assumption:

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

where:

- S = Power density (mW/cm² or W/m²)
- P = Power input to antenna (mW or W)
- G = Antenna gain (linear ratio, not dB)
- R = Distance from radiation center (cm or m)

This equation assumes:

- Far-field conditions ($R > 2D^2/\lambda$, where D is largest antenna dimension) are assumed at the evaluation distance of 20 cm
- Isotropic power distribution (conservative approach)
- Free-space propagation conditions
- Worst-case antenna orientation

Multiple Transmitter Analysis (if applicable)

Total Exposure Ratio (TER) Calculation: TER = Σ(Si/Li) ≤ 1.0

Where:

- Si = Power density from transmitter i
- Li = Applicable limit for transmitter i

6. EUT technical information for a single transmitter operation

	Transmitter (LoRa)
Prediction frequency	914.9
Antenna gain	2.15 dBi
Number of antennas	1
Maximum transmitter power	19.94 dBm
Declared separation distance	20 cm
Duty cycle	100%

7. Test report references

Transmitter maximum output power measurement result was taken from the following RF test reports:

	Report 1
Report ID	REP099071
Issue date	July 30, 2025
Test standard	FCC Part 15 Subpart C and RSS-247, Issue 3

8. Verdict

The calculated power density at the declared separation distance is below the applicable regulatory limits. Therefore, the product **COMPLIES** with FCC and ISED RF exposure requirements for single transmitter operation.

9. MPE calculation for stand-alone (single) transmitter (conducted method)

Fundamental transmit (prediction) frequency:	914.9	MHz
Maximum measured conducted peak output power:	19.94	dBm
Cable and/or jumper loss:	0	dB
Maximum peak power at antenna input terminal:	19.94	dBm
Duty cycle:	100	%
Maximum calculated average power at antenna input terminal:	98.63	mW
Single Antenna gain (typical):	2.15	dBi
Number of antennae:	1	
Total system gain:	2.15	dBi

	FCC calculations		ISED calculations	
Uncontrolled environment				
Declared distance:	20	cm	20	cm
Average power density at declared distance:	**0.032191**	**mW/cm²**	**0.032191**	**mW/cm²**
	0.321907	W/m²	0.321907	W/m²
MPE limit at prediction frequency:	**0.609933**	**mW/cm²**	**0.276655**	**mW/cm²**
	6.099333	W/m²	2.766548	W/m²
Minimum calculated prediction **distance** for compliance:	20	cm	20	cm
Margin of Compliance:	**12.78**	**dB**	**9.34**	**dB**
with Maximum premitted antenna gain:	14.93	dBi	11.49	dBi

Controlled environment				
Declared distance:	20	cm	20	cm
Average power density at declared distance:	**0.032191**	**mW/cm²**	**0.032191**	**mW/cm²**
	0.321907	W/m²	0.321907	W/m²
MPE limit at prediction frequency:	**3.049667**	**mW/cm²**	**1.952464**	**mW/cm²**
	30.496667	W/m²	19.524641	W/m²
Minimum calculated prediction **distance** for compliance:	20	cm	20	cm
Margin of Compliance:	**19.77**	**dB**	**17.83**	**dB**
with Maximum permitted antenna gain:	21.92	dBi	19.98	dBi

End of the test report