

RADIO TEST REPORT

Type of assessment:

MPE Calculation report

Manufacturer:

SolidRun Ltd.

Product Marketing Name (PMN):

SolidSense Compact

FVIN:

FWYL, FWNL

Hardware Version Identification Number (HVIN):

SRG0400

FCC ID:

2BA24-SRG0400

ISED certification number:

IC: 12107A-SRG0400

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: **September 1, 2023**

Andrey Adelberg, Senior EMC/RF Specialist

Prepared by



Signature

Nemko Canada Inc., a testing laboratory, is accredited by ANSI National Accreditation Board (ANAB).
The tests included in this report are within the scope of this accreditation.
The ANAB symbol is an official symbol of the ANSI National Accreditation Board, used under licence.

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			

Tested/reported at Ottawa site.

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 standalone 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 for BLE stand alone

Prediction frequency	2.480 GHz
Antenna type	Flexible printed
Antenna gain	3 dBi
Number of antennas	1
Maximum transmitter power	7.81 dBm (conducted)
Prediction distance (declared)	20 cm

1.1.3 MPE calculation for BLE stand alone

Fundamental transmit (prediction) frequency:	2480 MHz	
Maximum measured conducted peak output power:	7.81 dBm	
Cable and/or jumper loss:	0 dB	
Maximum peak power at antenna input terminal:	7.81 dBm	
Duty cycle:	100 %	
Maximum calculated average power at antenna input terminal:	6.039486294 mW	
Single Antenna gain (typical):	3 dBi	
Number of antennae:	1	
Total system gain:	3.00 dBi	
FCC limit:		
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	1.000000 mW/cm ²	0.546895 mW/cm ²
	10.000000 W/m ²	5.468948 W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	5.000000 mW/cm ²	3.214564 mW/cm ²
	50.000000 W/m ²	32.145641 W/m ²
Minimum calculated prediction distance for compliance:	20 cm	20 cm
Typical (declared) distance:	20 cm	20 cm
Average power density at prediction frequency:		
	0.002397 mW/cm ²	0.002397 mW/cm ²
	0.023973 W/m ²	0.023973 W/m ²
Margin of Compliance for <u>uncontrolled</u> environment:		
with Maximum permitted antenna gain:	26.20 dB	23.58 dB
	29.20 dBi	26.58 dBi
Margin of Compliance for <u>controlled</u> environment:		
with Maximum permitted antenna gain:	33.19 dB	31.27 dB
	44.00 dBi	42.08 dBi

1.1.4 Verdict

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

1.2 MPE calculation for simultaneous transmission

1.2.1 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 1.2-1: 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 1.2-2: 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)

1.2.2 EUT technical information (Wi-Fi 5 GHz + Cellular + BLE) – FVIN: FWYN (worst case)

	Wi-Fi 5 GHz	Cellular	BLE
Prediction frequency	5250 MHz	779.5 MHz	2480
Antenna gain	4 dBi	4.45 dBi	3 dBi
Maximum transmitter conducted power	14.8 dBm	25 dBm	7.81 dBm
Prediction distance (declared)	20 cm	20 cm	20

1.2.3 MPE calculation (Wi-Fi 5 GHz + Cellular + BLE) – FVIN: FWYN (worst case)

	Transmitter 1	Transmitter 2	Transmitter 3
Fundamental transmit (prediction) frequency:	5250 MHz	779.5 MHz	2480 MHz
Maximum measured conducted peak output power:	14.8 dBm	25 dBm	7.81 dBm
Cable and/or jumper loss:	0 dB	0 dB	0 dB
Maximum peak power at antenna input terminal:	14.8 dBm	25 dBm	7.81 dBm
Duty cycle:	100 %	100 %	100 %
Maximum calculated average power at antenna input terminal:	30.199517 mW	316.22777 mW	6.0394863 mW
Single Antenna gain (typical):	4 dBi	4.45 dBi	3 dBi
Number of antennae:	1	1	1
Total system gain:	4.00 dBi	4.45 dBi	3.00 dBi
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	ISED limit 0.91305 mW/cm ² 9.130454 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²	ISED limit 0.24797 mW/cm ² 2.479720 W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	FCC limit 0.51967 mW/cm ² 5.19667 W/m ²	ISED limit 0.54689 mW/cm ² 5.468948 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²
Minimum calculated prediction distance for compliance:	46.77092 W/m ² 20 cm	50.00000 W/m ² 20 cm	18.02205 W/m ² 20 cm
Typical (declared) distance:	20 cm	20 cm	20 cm
Average power density at prediction frequency:	0.015091 mW/cm ² 0.150914 W/m ²	0.015091 mW/cm ² 0.150914 W/m ²	0.175279 mW/cm ² 1.752791 W/m ²
MPE compliance for simultaneous operation:	0.175279 mW/cm ² 1.752791 W/m ²	0.175279 mW/cm ² 1.752791 W/m ²	0.002397 mW/cm ² 0.023973 W/m ²
Margin of Compliance for controlled environment:	0.002397 mW/cm ² 0.023973 W/m ²	0.002397 mW/cm ² 0.023973 W/m ²	0.002397 mW/cm ² 0.023973 W/m ²
with Maximum permitted antenna gain:	24.91 dB 28.91 dBi	25.20 dB 29.20 dBi	10.12 dB 14.57 dBi
Margin of Compliance for <u>uncontrolled</u> environment:	11.71 dB 16.16 dBi	11.71 dB 16.16 dBi	31.27 dB 34.27 dBi
with Maximum permitted antenna gain:	17.82 dB 21.82 dBi	18.21 dB 21.82 dBi	4.72 dB 5.96 dBi
Average power density to MPE limit ratio (<u>uncontrolled</u>):	0.017 0.004	0.015 0.004	0.707 0.337
Average power density to MPE limit ratio (<u>controlled</u>):	0.003 0.001	0.003 0.001	0.067 0.001
Total sum of ratios for FCC (uncontrolled):	0.355 <1	0.071 <1	0.071 <1
Total sum of ratios for ISSED (uncontrolled):	0.728 <1	0.101 <1	0.101 <1
Maximum allowed sum of ratios:	1	1	1
Total RF value for ISSED:	1.9277 W/m ²		

1.2.4 EUT technical information (Wi-Fi 2.4 GHz + Cellular + BLE) – FVIN: FWYN (worst case)

	Wi-Fi 2.4 GHz	Cellular	BLE
Prediction frequency	2412 MHz	779.5 MHz	2480
Antenna gain	3 dBi	4.45 dBi	3 dBi
Maximum transmitter conducted power	23.82 dBm	25 dBm	7.81 dBm
Prediction distance (declared)	20 cm	20 cm	20

1.2.5 MPE calculation (Wi-Fi 2.4 GHz + Cellular + BLE) – FVIN: FWYN (worst case)

	Transmitter 1	Transmitter 2	Transmitter 3
Fundamental transmit (prediction) frequency:	2412 MHz	779.5 MHz	2480 MHz
Maximum measured conducted peak output power:	23.82 dBm	25 dBm	7.81 dBm
Cable and/or jumper loss:	0 dB	0 dB	0 dB
Maximum peak power at antenna input terminal:	23.82 dBm	25 dBm	7.81 dBm
Duty cycle:	100 %	100 %	100 %
Maximum calculated average power at antenna input terminal:	240.99054 mW	316.22777 mW	6.0394863 mW
Single Antenna gain (typical):	3 dBi	4.45 dBi	3 dBi
Number of antennae:	1	1	1
Total system gain:	3.00 dBi	4.45 dBi	3.00 dBi
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	0.53660 mW/cm ²	1.00000 mW/cm ²	0.24797 mW/cm ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	5.366018 W/m ²	5.00000 mW/cm ²	5.19667 W/m ²
Minimum calculated prediction distance for compliance:	20 cm	20 cm	20 cm
Typical (declared) distance:	20 cm	20 cm	20 cm
Average power density at prediction frequency:	0.095660 mW/cm ²	0.175279 mW/cm ²	0.002397 mW/cm ²
MPE compliance for simultaneous operation:	0.956599 W/m ²	1.752791 W/m ²	0.023973 W/m ²
Margin of Compliance for <u>controlled</u> environment:	15.20 dB	10.12 dB	31.27 dB
with Maximum permitted antenna gain:	18.20 dBi	14.57 dBi	34.27 dBi
Margin of Compliance for <u>uncontrolled</u> environment:	7.49 dB	10.19 dB	23.58 dB
with Maximum permitted antenna gain:	10.49 dBi	10.19 dBi	26.58 dBi
Average power density to MPE limit ratio (uncontrolled):	0.178	0.096	0.004
Average power density to MPE limit ratio (controlled):	0.030	0.019	0.001
Total sum of ratios for FCC (uncontrolled):	0.435 <1	0.087 <1	0.087 <1
Total sum of ratios for FCC (controlled):	0.890 <1	0.128 <1	0.128 <1
Maximum allowed sum of ratios:	1	1	1
Total RF value for ISSED:			2.7334 W/m ²

1.2.6 Verdict

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

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

ISED certification number	IC: 12107A-SRG0400		
Product marketing name (PMN)	SolidSense Compact		
Hardware version identification number (HVIN)	SRG0400		
Firmware version identification number (FVIN)	FWYL, FWNL		
Host marketing name (HMN)	N/A		
Applicant name	SolidRun Ltd.		
SAR/RF exposure test laboratory	2040A-4 (3 m semi anechoic chamber - Ottawa)		
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: 2412 + 779.5 + 2480 MHz		
	Standard used for evaluation: Safety Code 6		
	Measurement distance: 0.2 m		
	RF value: 2.73 ☒ W/m ² ☐ V/m ☐ A/m ☐ Measured ☐ Computed ☒ Calculated		

End of the test report