

RADIO TEST REPORT – 454155-3APFWL

Type of assessment:

MPE Calculation report

Manufacturer:

Redline Communications Inc.

Hardware Version Identification Number (HVIN):

RDL-3211 XC

Product Marketing Name (PMN):

RDL-3211 XC

FCC ID:

QC8-RDL3211XC

IC certification number:

4310A-RDL3211XC

Specification:

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

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: March 29, 2022

Fahar Abdul Sukkoor, EMC/RF Specialist

Prepared by



Signature



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SCC File Number: 15064 (Ottawa/Almonte); 151100 (Montreal); 151097 (Cambridge)

FCC and RSS-102 Annex C – MPE Calculation; Date: May 2021



Lab locations

Company name	Nemko Canada Inc.			
Facilities	<i>Ottawa site:</i> 303 River Road Ottawa, Ontario Canada K1V 1H2	<i>Montréal site:</i> 292 Labrosse Avenue Pointe-Claire, Québec Canada H9R 5L8	<i>Cambridge site:</i> 1-130 Saltsman Drive Cambridge, Ontario Canada N3E 0B2	<i>Almonte site:</i> 1500 Peter Robinson Road West Carleton, Ontario Canada K0A 1L0
	Tel: +1 613 737 9680 Fax: +1 613 737 9691	Tel: +1 514 694 2684 Fax: +1 514 694 3528	Tel: +1 519 650 4811	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.

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Table of Contents

Table of Contents	3
Section 1 Evaluation summary	4
1.1 MPE calculation for simultaneous transmission	4

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 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $0.0131 f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

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 (UNII-3)	Transmitter 2 (2.4 GHz BLE)
Prediction frequency	5.790 GHz	2.444 GHz
Antenna type	Dual Polarization Antenna	Dipole Antenna
Antenna gain	25 dBi	2.14 dBi
Maximum transmitter conducted power	24.46 dBm (279.25 mW)	19.56 dBm (90.37 mW)
Prediction distance	100 cm	100 cm

1.1.3 MPE calculation

	Transmitter 1		Transmitter 2	
Fundamental transmit (prediction) frequency:	5790 MHz		2444 MHz	
Maximum measured conducted peak output power:	24.46 dBm		19.56 dBm	
Cable and/or jumper loss:	0.7 dB		0 dB	
Maximum peak power at antenna input terminal:	23.76 dBm		19.56 dBm	
Tx On time:	0.950 ms		1.000 ms	
Tx period time:	1.000 ms		1.000 ms	
Average factor:	95 %		100 %	
Maximum calculated average power at antenna input terminal:	225.8 mW		90.3649 mW	
Single Antenna gain (typical):	25 dBi		2.14 dBi	
Number of antennae:	1		1	
Total system gain:	25.00 dBi		2.14 dBi	
MPE limit for uncontrolled exposure at prediction frequency:	0.976225 mW/cm²	1.000000 mW/cm²	0.541457 mW/cm²	1.000000 mW/cm²
Minimum calculated prediction distance for compliance:	9.762252 W/m ²	10.00 W/m ²	5.414569 W/m ²	10.00 W/m ²
Typical (declared) distance:	76 cm	75 cm	20 cm	20 cm
Average power density at prediction frequency:	0.568216 mW/cm²	0.568216 mW/cm²	0.001177 mW/cm²	0.001177 mW/cm²
Combined MPE compliance:	5.682164 W/m ²	5.682164 W/m ²	0.011770 W/m ²	0.011770 W/m ²
Margin of Compliance:	2.35 dB	2.45 dB	26.63 dB	29.29 dB
Maximum allowable antenna gain:	27.35 dBi	24.45 dBi	28.77 dBi	29.29 dBi
Average power density to MPE limit ratio:	0.582	0.568	0.002	0.001
Total sum of ratios for FCC:	0.569			
Total sum of ratios for ISED:	0.584			
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

IC Certification Number	4310A-RDL3211XC		
Product marketing name (PMN)	RDL-3211 XC		
Hardware version identification number (HVIN)	RDL-3211 XC		
Firmware version identification number (FVIN)	N/A		
Host marketing name (HMN)	N/A		
Applicant company number	4310A		
Applicant name	Redline Communications Inc.		
SAR/RF exposure test laboratory	2040A-4 (3 m semi anechoic chamber)		
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: 95 % Operational frequency: 5790 MHz Standard used for evaluation: Safety Code 6 Measurement distance: 1.0 m RF value: N/A <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