

RADIO TEST REPORT – PRJ0039147APF1

Type of assessment:

MPE Calculation report

Manufacturer:

Tektelic Communications

Hardware Version Identification Number (HVIN):

T0007752

Product Marketing Name (PMN):

IotaComm Dual-Band Gateway

HVIN/Model variant(s):

T0007754

FCC ID:

2ALEPT0008765

ISED certification number:

IC: 22504-T0008765

Contains FCC ID:

N7NEM7455

Contains ISED certification number:

IC: 2417C-EM7455

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: August 15, 2023

Andrey Adelberg, Senior EMC/RF Specialist

Prepared by



Signature

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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>	<i>Montréal site:</i>	<i>Cambridge site:</i>	<i>Almonte 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	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			

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 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 [Ant 0]

Prediction frequency	925.1 MHz
Antenna type	Omnidirectional
Antenna gain	6 dBi
Number of antennas	1
Maximum transmitter power	27.33 dBm (conducted)
Prediction distance (declared)	96 cm (FCC); 140 cm (ISED)

1.1.3 MPE calculation [Ant 0]

Fundamental transmit (prediction) frequency:	925.1 MHz	
Maximum measured conducted peak output power:	27.33 dBm	
Cable and/or jumper loss:	0 dB	
Maximum peak power at antenna input terminal:	27.33 dBm	
Duty cycle:	98.5 %	
Maximum calculated average power at antenna input terminal:	532.6430081 mW	
Single Antenna gain (typical):	6 dBi	
Number of antennae:	1	
Total system gain:	6.00 dBi	
	FCC limit:	ISED limit:
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	0.616733 mW/cm ²	0.278759 mW/cm ²
	6.167333 W/m ²	2.787590 W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	3.083667 mW/cm ²	1.963318 mW/cm ²
	30.836667 W/m ²	19.633177 W/m ²
Minimum calculated prediction distance for compliance:	20 cm	25 cm
Typical (declared) distance:	96 cm	140 cm
Average power density at prediction frequency:	0.018310 mW/cm ²	0.008609 mW/cm ²
	0.183098 W/m ²	0.086093 W/m ²
Margin of Compliance for uncontrolled environment:	15.27 dB	15.10 dB
with Maximum permitted antenna gain:	21.27 dBi	21.10 dBi
Margin of Compliance for controlled environment:	22.26 dB	23.58 dB
with Maximum permitted antenna gain:	55.53 dBi	56.84 dBi

1.1.4 EUT technical information [Ant 1]

Prediction frequency	858.1125 MHz
Antenna type	Omnidirectional
Antenna gain	6 dBi
Number of antennas	1
Maximum transmitter power	35.92 dBm (conducted)
Prediction distance (declared)	96 cm (FCC); 140 cm (ISED)

1.1.5 MPE calculation [Ant 1]

Fundamental transmit (prediction) frequency:	<u>858.1125</u> MHz	
Maximum measured conducted peak output power:	<u>36.24</u> dBm	
Cable and/or jumper loss:	<u>0</u> dB	
Maximum peak power at antenna input terminal:	<u>36.24</u> dBm	
Duty cycle:	<u>98.5</u> %	
Maximum calculated average power at antenna input terminal:	<u>4144.15729</u> mW	
Single Antenna gain (typical):	<u>6</u> dBi	
Number of antennae:	<u>1</u>	
Total system gain:	<u>6.00</u> dBi	
	FCC limit:	ISED limit:
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	<u>0.572075</u> mW/cm ²	<u>0.264801</u> mW/cm ²
	<u>5.720750</u> W/m ²	<u>2.648010</u> W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	<u>2.860375</u> mW/cm ²	<u>1.890899</u> mW/cm ²
	<u>28.603750</u> W/m ²	<u>18.908991</u> W/m ²
Minimum calculated prediction distance for compliance:	<u>48</u> cm	<u>70</u> cm
Typical (declared) distance:	<u>96</u> cm	<u>140</u> cm
Average power density at prediction frequency:	<u>0.142457</u> mW/cm ²	<u>0.066984</u> mW/cm ²
	<u>1.424570</u> W/m ²	<u>0.669839</u> W/m ²
Margin of Compliance for uncontrolled environment:	<u>6.04</u> dB	<u>5.97</u> dB
with Maximum permitted antenna gain:	<u>12.04</u> dBi	<u>11.97</u> dBi
Margin of Compliance for controlled environment:	<u>13.03</u> dB	<u>14.51</u> dB
with Maximum permitted antenna gain:	<u>55.20</u> dBi	<u>56.68</u> dBi

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

	Transmitter 1 (Ant 0)	Transmitter 2 (Ant 1)	Transmitter 3 (Cellular)
Prediction frequency	925.1 MHz	858.1125 MHz	782 MHz
Antenna type	Omnidirectional	Omnidirectional	Omnidirectional
Antenna gain	6 dBi	6 dBi	2 dBi
Maximum transmitter conducted power	27.33 dBm	36.24 dBm	24 dBm
Prediction distance (declared)	96 cm (FCC); 140 cm (ISED)	96 cm (FCC); 140 cm (ISED)	96 cm (FCC); 140 cm (ISED)

1.2.3 MPE calculation

	Transmitter 1		Transmitter 2		Transmitter 3	
Fundamental transmit (prediction) frequency:	925.1 MHz		858.1125 MHz		782 MHz	
Maximum measured conducted peak output power:	27.33 dBm		36.24 dBm		24 dBm	
Cable and/or jumper loss:	0 dB		0 dB		0 dB	
Maximum peak power at antenna input terminal:	27.33 dBm		36.24 dBm		24 dBm	
Duty cycle:	98.5 %		98.5 %		100 %	
Maximum calculated average power at antenna input terminal:	532.64301 mW		4144.1573 mW		251.18864 mW	
Single Antenna gain (typical):	6 dBi		6 dBi		2 dBi	
Number of antennae:	1		1		1	
Total system gain:	6.00 dBi		6.00 dBi		2.00 dBi	
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	ISED limit 0.27876 mW/cm ² 2.787590 W/m ²	FCC limit 0.61673 mW/cm ² 6.16733 W/m ²	ISED limit 0.26480 mW/cm ² 2.648010 W/m ²	FCC limit 0.57208 mW/cm ² 5.72075 W/m ²	ISED limit 0.24852 mW/cm ² 2.485152 W/m ²	FCC limit 0.52133 mW/cm ² 5.21333 W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	1.96332 mW/cm ² 19.63318 W/m ²	3.08367 mW/cm ² 30.83667 W/m ²	1.89090 mW/cm ² 18.90899 W/m ²	2.86038 mW/cm ² 28.60375 W/m ²	1.80509 mW/cm ² 18.05093 W/m ²	2.60667 mW/cm ² 26.06667 W/m ²
Minimum calculated prediction distance for compliance:	25 cm	20 cm	70 cm	48 cm	20 cm	20 cm
Typical (declared) distance:	140 cm	96 cm	140 cm	96 cm	140 cm	96 cm
Average power density at prediction frequency:	0.008609 mW/cm ² 0.086093 W/m ²	0.018310 mW/cm ² 0.183098 W/m ²	0.066984 mW/cm ² 0.669839 W/m ²	0.142457 mW/cm ² 1.424570 W/m ²	0.001616 mW/cm ² 0.016163 W/m ²	0.003438 mW/cm ² 0.034375 W/m ²
MPE compliance for simultaneous operation:						
Margin of Compliance for <u>controlled</u> environment:	23.58 dB with Maximum permitted antenna gain: 29.58 dBi	22.26 dB with Maximum permitted antenna gain: 28.26 dBi	14.51 dB with Maximum permitted antenna gain: 20.51 dBi	13.03 dB with Maximum permitted antenna gain: 19.03 dBi	30.48 dB with Maximum permitted antenna gain: 32.48 dBi	28.80 dB with Maximum permitted antenna gain: 30.80 dBi
Margin of Compliance for <u>uncontrolled</u> environment:	15.10 dB with Maximum permitted antenna gain: 21.10 dBi	15.27 dB with Maximum permitted antenna gain: 15.27 dBi	5.97 dB with Maximum permitted antenna gain: 11.97 dBi	6.04 dB with Maximum permitted antenna gain: 6.04 dBi	21.87 dB with Maximum permitted antenna gain: 23.87 dBi	21.81 dB with Maximum permitted antenna gain: 21.81 dBi
Average power density to MPE limit ratio (<u>uncontrolled</u>):	0.031	0.030	0.253	0.249	0.007	0.007
Average power density to MPE limit ratio (<u>controlled</u>):	0.004	0.006	0.035	0.050	0.001	0.001
Total sum of ratios for FCC (uncontrolled):	0.285 <1			0.057 <1		
Total sum of ratios for ISCED (uncontrolled):	0.290 <1			0.041 <1		
Maximum allowed sum of ratios:	1					
Total RF value for ISCED:						0.7721 W/m ²

1.2.4 Verdict

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

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

ISED certification number	IC: 22504-T0008765
Contains ISED certification number	IC: 2417C-EM7455
Product marketing name (PMN)	IotaComm Dual-Band Gateway
Hardware version identification number (HVIN)	T0007752, T0007754
Firmware version identification number (FVIN)	N/A
Host marketing name (HMN)	N/A
Applicant name	Tektelic Communications
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 checked="" type="checkbox"/> Controlled Use
	Duty cycle used in evaluation: 98.5 for Ant 0 and Ant 1 100 for Cellular %
	Operational frequency: 925.1 for Ant0 858.1125 for Ant1 782 MHz for Cellular MHz
	Standard used for evaluation: Safety Code 6
	Measurement distance: 1.40 m
	RF value: 0.7721 <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