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RADIO TEST REPORT – PRJ0048354APFWL

Type of assessment:

SAR Exemption report

Manufacturer:

EXFO Inc.

Product:	Model number (HVIN):	HMNs
Communication Module	1YN	FIP-200 Series, AXS-1xx Series

FCC ID:	ISED certification number:
2AYQH-LB1DX	IC: 26882-LB1DX

Specifications:

- FCC 47 CFR Part 2 Subpart J, §2.1093
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- ISED Canada RSS-102 Issue 6 (December 15, 2023)
- Health Canada Safety Code 6

RSS-102 Annex C Attestation:

I attest that the radiocommunication apparatus meets the exemption from the routine evaluation limits in these standards; 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 the above standards.

Date of issue: December 5, 2024

Andrey Adelberg, Senior EMC/RF Specialist
Prepared by

Adelberg
Signature

Lab locations

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Test site identifier	**Organization**	**Ottawa**	**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.

Copyright notification

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Section 1 Evaluation summary

1.1 SAR exemption for standalone transmission

1.1.1 References, definitions and limits

FCC §2.1093

(2) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

FCC KDB 447498 D01

4.3.1 Standalone SAR test exclusion considerations

The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here, applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).
This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by formula

$$P_{th}(mW) = \begin{cases} ERP_{20\,cm}\left({}^{d}/_{20\,cm}\right)^{x} & d \le 20\ cm \\ ERP_{20\,cm} & 20\ cm < d \le 40\ cm \end{cases}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right)$$

and

$$ERP_{20\,cm}(mW) = \begin{cases} 2040f & 0.3\ GHz \le f < 1.5\ GHz \\ 3060 & 1.5\ GHz \le f < 6\ GHz \end{cases}$$

Table 1.1-1: Example Power Thresholds (mW)

Separation:	5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	50 mm
300 MHz	39	65	88	110	129	148	166	184	201	217
450 MHz	22	44	67	89	112	135	158	180	203	226
835 MHz	9	25	44	66	90	116	145	175	207	240
1900 MHz	3	12	26	44	66	92	122	157	195	236
2450 MHz	3	10	22	38	59	83	111	143	179	219
3600 MHz	2	8	18	32	49	71	96	125	158	195
5800 MHz	1	6	14	25	40	58	80	106	136	169

Notes: Values in the table are in mW

References, definitions and limits, continued

For mobile devices that are not exempt per Table 1 [of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP 20 cm in Formula below [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{th}(mW) = ERP_{20\,cm}(mW) = \begin{cases} 2040f & 0.3\ GHz \le f < 1.5\ GHz \\ 3060 & 1.5\ GHz \le f \le 6\ GHz \end{cases}$$

Table 1.1-2: Thresholds for single RF sources subject to routine environmental evaluation

Table 1

RF Source Frequency			Minimum Distance			Threshold ERP
f_L (MHz)		f_H (MHz)	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	(W)
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 R^2f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2 R^2

RSS-102, Section 6.3

Devices operating at or below the applicable output power levels (adjusted for tune-up tolerance) specified in table below, based on the separation distance, are exempt from SAR evaluation. The separation distance, defined as the distance between the user and/or bystander and the antenna and/or radiating element of the device or the outer surface of the device, shall be less than or equal to 20 cm for these exemption limits to apply.

Table 1.1-3: Exemption limits for routine evaluation based on frequency and separation distance

Separation:	≤5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	>50 mm
≤ 300 MHz	45	116	139	163	189	216	246	280	319	362
450 MHz	32	71	87	104	124	147	175	208	248	296
835 MHz	21	32	41	54	72	96	129	172	228	298
1900 MHz	6	10	18	33	57	92	138	194	257	323
2450 MHz	3	7	16	32	56	89	128	170	209	245
3500 MHz	2	6	15	29	50	72	94	114	134	158
5800 MHz	1	5	13	23	32	41	54	74	102	128

Notes: Values in the table are in mW

The exemption limits in table above are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 50 mm from a flat phantom, which provides a SAR value of approximately 0.4 W/kg for 1 g of tissue.

For limb-worn devices where the 10 gram of tissue applies, the exemption limits for routine evaluation in table above are multiplied by a factor of 2.5.

For controlled-use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in table above are multiplied by a factor of 5.

When the operating frequency of the device is between two frequencies located in table above, linear interpolation shall be applied for the applicable separation distance. If the separation distance of the device is between two distances located in table above, linear interpolation may be applied for the applicable frequency. Alternatively, the limit corresponding to the smaller distance may be employed. For example, in case of a 7 mm separation distance, either use the exception value for a 5 mm separation distance or interpolate between the limits corresponding to 5 mm and 10 mm separation distances.

For implanted medical devices, the exemption limit for routine SAR evaluation is set at an output power of 1 mW, regardless of frequency.

1.1.2 EUT technical information [BLE]

Type of EUT use	Body
Minimum separation distance	1.6 cm
Highest operating frequency	2.48 GHz
Antenna type	Chip antenna
Antenna gain	2.20 dBi
Maximum transmitter conducted power	10 dBm (10 mW)
Maximum system ERP	10.05 dBm (10.11 mW)
Duty cycle	100 %

1.1.3 Justification for Standalone SAR test exclusion [BLE]

SAR exemption verification for FCC:

Duty cycle (%):	100	INPUTS
Frequency (GHz):	2.48	
Distance (cm):	1	
Time averaged power (mW):	10.115	Calculated

Frequency (GHz)	λ (cm)	Power (mW)	Distance (cm)	Exemption ERP_{20cm} (mW)	x	$P_{threshold}$ (mW)	Result	Ratio
2.48	12.1	10	1	3060	1.90	10.17	EXEMPT	0.99

Table 1.1-4: SAR exemption verification for ISED Canada

Transmit frequency, MHz	Maximum EIRP, mW	Separation distance, mm	Limit, mW	Margin, dB
2480	16.59	16	18.00	0.35

Note: Margin was calculated as follows: $10 \times \text{Log}_{10}(\text{Limit} / \text{Maximum EIRP})$

1.1.4 EUT technical information [Wi-Fi]

Type of EUT use	Body
Minimum separation distance	3.6 cm
Highest operating frequency	2.48 GHz
Antenna type	Chip antenna
Antenna gain	2.20 dBi
Maximum transmitter conducted power	19 dBm (79.43 mW)
Maximum system ERP	19.05 dBm (80.35 mW)
Duty cycle	100 %

1.1.5 Justification for Standalone SAR test exclusion [Wi-Fi]

SAR exemption verification for FCC:

Duty cycle (%):	100	INPUTS
Frequency (GHz):	2.44	
Distance (cm):	3.6	
Time averaged power (mW):	80.35	Calculated

Frequency (GHz)	λ (cm)	Power (mW)	Distance (cm)	Exemption ERP_{20cm} (mW)	x	$P_{threshold}$ (mW)	Result	Ratio
2.44	12.3	80	3.6	3060	1.90	117.43	EXEMPT	0.68

Table 1.1-5: SAR exemption verification for ISED Canada

Transmit frequency, MHz	Maximum EIRP, mW	Separation distance, mm	Limit, mW	Margin, dB
2440	131.82	36	133	0.038

Note: Margin was calculated as follows: $10 \times \text{Log}_{10}$(Limit / Maximum EIRP)

1.1.6 Verdict

The calculation is below the threshold, therefore, the product exempt from the SAR test requirements.

End of the test report