RF exposure compliance assessment

Product: AirScale Indoor pRRH 8T8R – AWHFIQA/AWHFIQB

Standard: IEC 62232:2025, IEC 62232:2022, , US FCC OET Bulletin 65, IEEE Std C95.3-2021, Canada RSS-102

Signatures:

Prepared by	Approved by	Dated
		12-09-2025
Kamil Bechta Owner, RF Exposure assessment	Jarkko Kenttälä Squad Group Lead, Type Approval	

Author	Piotr Szlosarczyk, Marcin Rybakowski
Owner	Kamil Bechta
Organization	MN RAN R&D A&S
Document Type	Final
Document ID	PSIMP5QI2URB-1868097887-2069
Document location	https://nokia.sharepoint.com/:f:/r/sites/EMF-ProductsRFexposureassessment/Shared%20Documents/Original/Products-RF-exposure-assessment/AWHFIQA%20AWHFIQB?csf=1&web=1&e=1wOgJN

Change History

Version	Status	Date	Author	Owner	Reviewed by	Reviewed date	Approver	Approval date	Description of changes
1.0	Final	12-09-2025	P. Szlosarczyk, M. K. Bechta Rybakowski		J. Kenttälä	12-09-2025	J. Kenttälä	12-09-2025	

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1 General content

This assessment report is prepared under FINAS testing laboratory accreditation number:

- T297

It is addressing human exposure to radiofrequency electromagnetic fields (RF EMF) transmitted by the following AirScale Indoor pRRH 8T8R Products (see §2.2):

- Nokia AWHFIQA AirScale Indoor pRRH 8T8R B25/n25+B66/n66+n77 2.4W (internal antenna)
- Nokia AWHFIQB AirScale Indoor pRRH 8T8R B25/n25+B66/n66+n77 2.4W + external antenna

It provides the RF exposure compliance boundaries for this product with an internal antenna (AWHFIQA) and when it is connected with a typical external antenna (AWHFIQB). The assessment is performed regarding both general population and occupational exposure. Outside of these compliance boundaries, human exposure to RF EMF is below the limits defined by the US Federal Communications Commission (FCC) and Canada Safety Code 6 (see §2.1 and 3).

2 References

2.1 Applicable RF exposure standards and regulations

[1] ICNIRP-2020, International Commission on Non-Ionizing Radiation Protection (ICNIRP), "Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz)", Health Physics, 118(5):483-524; 2020

[2] Canada Safety Code 6, “Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz”, June 2015

[3] US FCC 47CFR 1.1310 “Radiofrequency radiation exposure limits”, August 1997

2.2 Product and assessment method

[4] IEC TR62669:2019, “Case studies supporting the implementation of IEC 62232”, 2019

[5] IEC 62232:2025 ED4, “Determination of RF field strength, power density and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure”, 2025

[6] IEC 62232:2022 ED3, “Determination of RF field strength, power density and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure”, 2022

[7] Canada RSS-102, “Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”, Issue 6, December 15, 2023

[8] US FCC OET Bulletin 65, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields and its supplements”, edition 97-01, August 1997

[9] IEEE Std C95.3-2021, IEEE Recommended Practice for Measurements and Computations of Electric, Magnetic, and Electromagnetic Fields with Respect to Human Exposure to Such Fields, 0 Hz to 300 GHz, 2021

3 RF exposure limits

The applicable RF exposure limits are defined, by [2] in Canada and by [3] in the US and related countries. The applicable power density limits are recalled in Table 1, 2 and 3 for the frequency range applicable to the equipment under test.

Table 1 – Applicable RF exposure levels in B25/n25 band expressed in power density

Region of application	General Population/Uncontrolled Exposures	Occupational/Controlled Exposures
US	10.0 W/m²	50.0 W/m²
Canada	4.6 W/m²	28.4 W/m²

Table 2 - Applicable RF exposure levels in B66/n66 band expressed in power density

Region of application	General Population/Uncontrolled Exposures	Occupational/Controlled Exposures
US	10.0 W/m²	50.0 W/m²
Canada	4.9 W/m²	29.7 W/m²

Table 3 - Applicable RF exposure levels in n77 band expressed in power density

Region of application	General Population/Uncontrolled Exposures	Occupational/Controlled Exposures
US/related	10.0 W/m²	50.0 W/m²
Canada	6.9 W/m²	37.9 W/m²

4 Description of the equipment under test (EUT)

The main technical characteristics of Nokia AWHFIQA product is reproduced in Table 4.

Table 4 – Nokia AWHFIQA/AWHFIQB product general technical characteristics

Product name	Nokia AWHFIQA/AWHFIQB AirScale Indoor pRRH 8T8R B25/n25+B66/n66+n77 2.4W
Model number	476651A (AWHFIQA), 476652A (AWHFIQB)
Rated max Tx power	2.4 W
Tx power per frequency band	Band 25/66: 0.8 W Band 77: 1.6 W
Number of TXRX	8T8R
Beamforming	NO
Standard	3GPP/ISED/FCC/NEBS, FDD/TDD
Frequency range	Band 25: RX 1850 MHz – 1915 MHz, TX 1930 MHz – 1995 MHz Band 66: RX 1710 MHz – 1780 MHz, TX 2110 MHz – 2200 MHz Band 77: RX 3450 MHz – 3980 MHz, TX 3450 MHz – 3980 MHz
Antenna Gain (internal) - AWHFIQA	Band 25: 4 dBi Band 66: 4 dBi Band 77: 5 dBi
Antenna Gain (external) - AWHFIQB	Band 25: 3.5 dBi Band 66: 3.5 dBi Band 77: 5 dBi
Antenna Characteristic	omnidirectional
Dimensions	Height: 222 mm Width: 222 mm Depth: 67 mm 
Technology duty cycle factor	Band 25: 100 % Band 66: 100 % Band 77: 75 %
Transmitted power tolerance	1.5 dB

5 RF exposure assessment method

RF exposure assessment is performed using the estimation based on free space propagation loss formulas and considering Total Exposure Ratio (TER) according to IEC62232 [5].

The TER from all relevant frequency bands was calculated using equation 9 from IEC62232 [5]:

$$TER = \sum_{i=1}^{N} ER_i$$

where:

ER_i – the exposure ratio for the source i

$$ER_i = \frac{S_i}{S_L}$$

S_i – the power density at frequency i

S_L – the power density basic restriction (from Table 1, Table 2 and Table 3)

The level of power density was calculated using equation B.1 from IEC62232 [5]:

$$S = \frac{P \times F_{TDC} \times G}{4 \times \pi \times r^2}$$

where:

S – power density [W/m^2]

P – transmit power level [W]

G – antenna gain

F_{TDC} - technology duty cycle factor

r – distance from antenna front [m]

TER has been calculated only for frequency bands 25 and 77 to obtain the most conservative compliance distance with the following transmit power levels (+1.5dB power tolerance was included in calculation) and antenna gains:

AWHFIQA:

- Band 25: 0.8 W, 4 dBi
- Band 77: 1.6 W, 5 dBi

AWHFIQB:

- Band 25: 0.8 W, 3.5 dBi
- Band 77: 1.6 W, 5 dB

6 RF exposure computation results

Figures 1-8 shows the Exposure Ratio (ER) for bands 25 and 77 and Total Exposure Ratio (TER) versus distance from the front of the antenna.

The exposure to multiple sources is deemed to comply with the applicable exposure limits if the TER is less than or equal to 1.

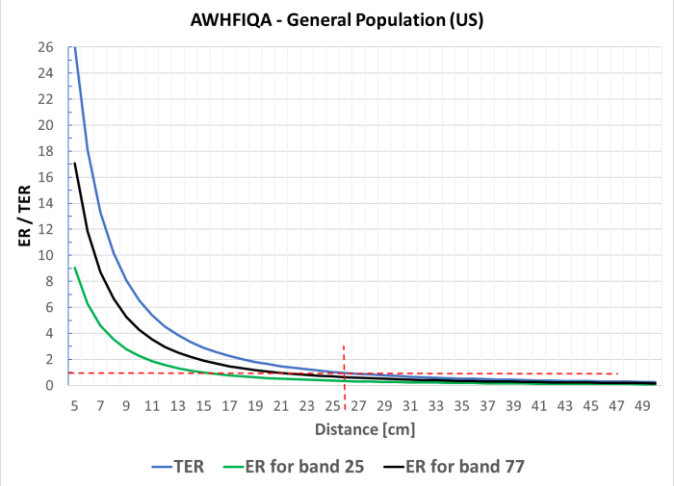

Figure 1. ER and TER for AWHFIQA versus distance from antenna (General Population in US)

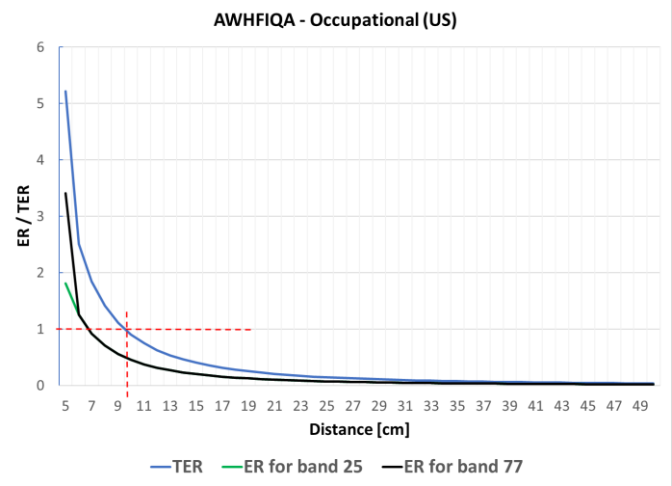

Figure 2. ER and TER for AWHFIQA versus distance from antenna (Occupational in US)

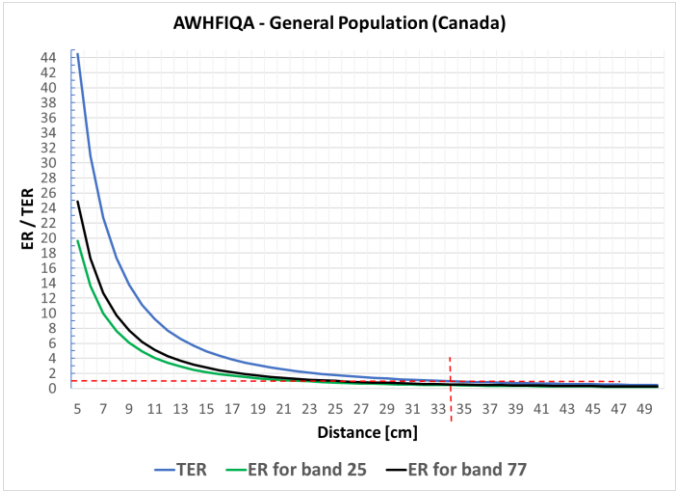

Figure 3. ER and TER for AWHFIQA versus distance from antenna (General Population in Canada)

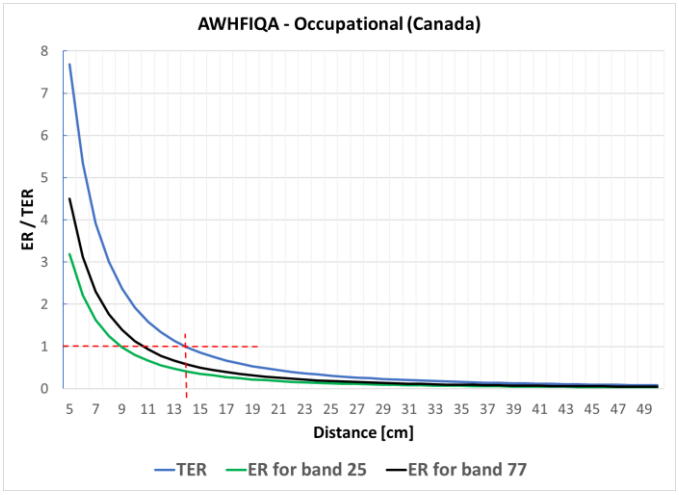

Figure 4. ER and TER for AWHFIQA versus distance from antenna (Occupational in Canada)

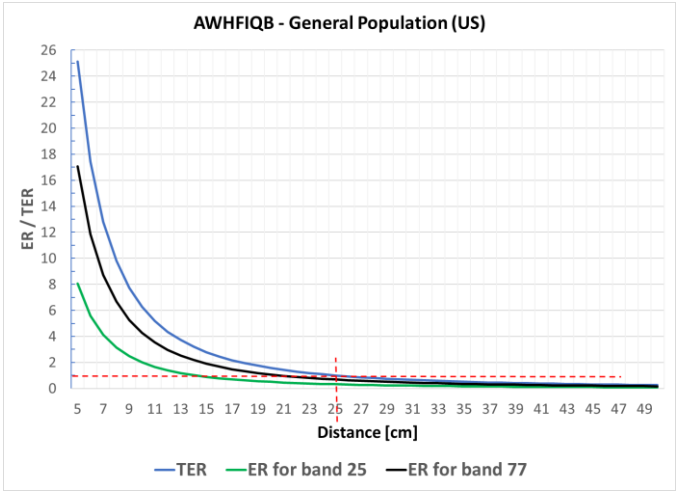

Figure 5. ER and TER for AWHFIQB versus distance from antenna (General Population in US)

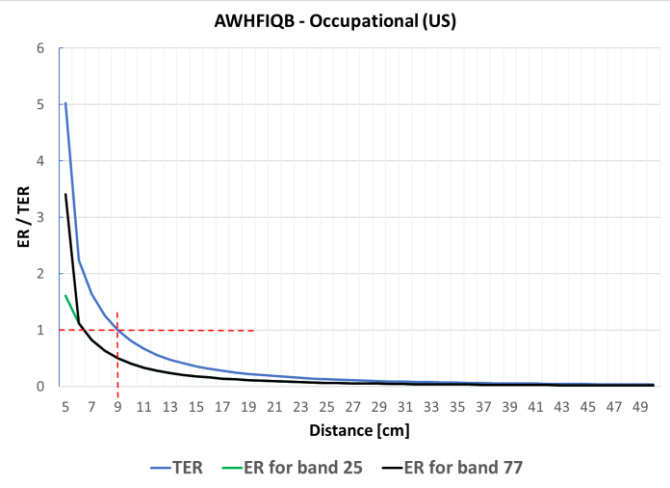

Figure 6. ER and TER for AWHFIQB versus distance from antenna (Occupational in US)

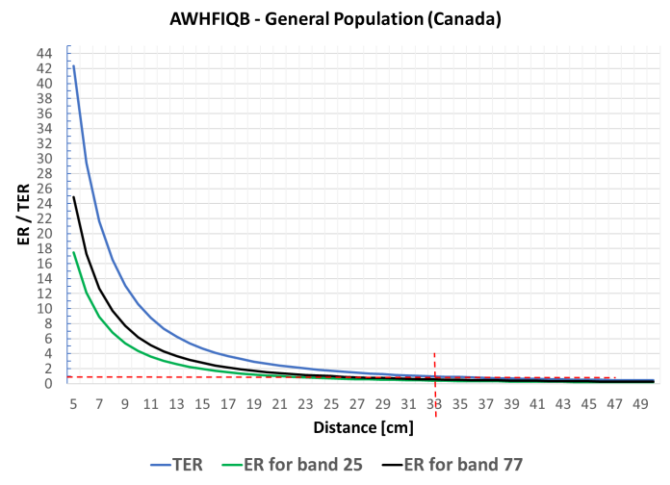

Figure 7. ER and TER for AWHFIQB versus distance from antenna (General Population in Canada)

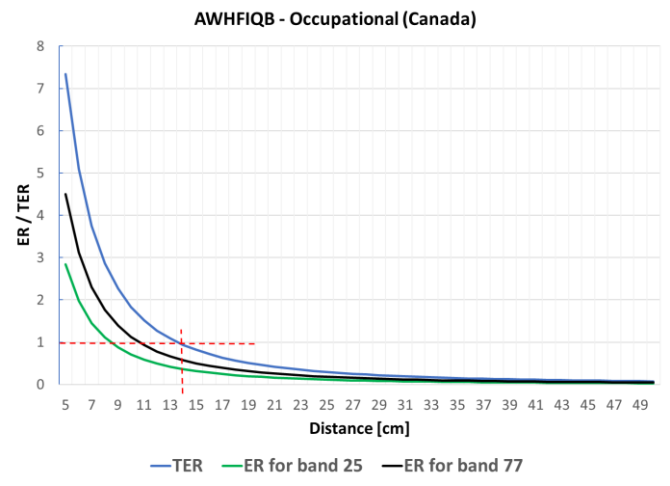

Figure 8. ER and TER for AWHFIQB versus distance from antenna (Occupational in Canada)

7 Conclusion and installation recommendations

The RF exposure compliance distances for the Nokia AWHFIQA/ AWHFIQB AirScale Indoor pRRH 8T8R product are summarized in Table 5 for US/related [3] requirements and in Table 6**Error! Reference source not found.** for Canada [2] requirements.

Table 5 - AWHFIQA/AWHFIQB RF exposure compliance distances based on the time-averaged maximum transmitted power of 2.4 W for US

Region of application: US/related	General Population/Uncontrolled Exposures	Occupational/Controlled Exposures
AWHFIQA: Compliance distance in front (CDf)	26 cm	10 cm
AWHFIQB: Compliance distance in front (CDf)	25 cm	9 cm

Table 6 - AWHFIQA RF exposure compliance distances based on the time-averaged maximum transmitted power of 2.4 W for Canada

Region of application: Canada	General Population/Uncontrolled Exposures	Occupational/Controlled Exposures
AWHFIQA: Compliance distance in front (CDf)	34 cm	14 cm
AWHFIQB: Compliance distance in front (CDf)	33 cm	14 cm

Installation of the Nokia AWHFIQA/ AWHFIQB AirScale Indoor pRRH 8T8R B25/n25+B66/n66+n77 2.4 W product shall be performed in accordance with all applicable manufacturer's recommendations and national laws and regulations related to human exposure to radiofrequency fields.

In particular:

- The operator or entity putting the equipment into operation shall take the necessary measures to ensure that the general population cannot access the area within the general population/uncontrolled compliance boundary in the vicinity of the transmitting antennas (see Table 5 and Table 6).

- Depending on the site installation configuration, the operator or the entity putting the equipment into operation determines the most suitable place to display the appropriate warning signs and any other necessary information or precautionary measures.
- Workers that are required to operate in the close proximity of the transmitting antennas connected to the equipment, for example installation and maintenance personnel, need to be informed about the potential risks of human exposure to RF fields and how to protect against them. They should strictly follow instructions provided by their employer. They should stand-off the occupational/controlled exposure compliance boundary defined in the vicinity of transmitting antennas (see Table 5 and Table 6). If it is necessary to operate within this compliance boundary, workers shall make sure that the transmitters contributing to exposure in this area are all switched off, or they must contact the relevant operator(s) to switch off emissions during operation period.

----- end of the assessment report ---------