

**EXHIBIT 12****RF EXPOSURE ASSESSMENT****Section 1.1307 (b) Environmental Assessment Requirement for Equipment Authorization**

Commission actions granting construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities, require the preparation of an Environmental Assessment (EA) if the particular facility, operation or transmitter would cause human exposure to levels of radiofrequency radiation in excess of the limits in §§ 1.1310 and 2.1093 of this chapter.

**Section 1.1310 Radio Frequency Radiation Exposure Limits**

The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Section 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of § 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation."

**Response**

The **AHCF AirScale RRH 4T4R B5 200W, (AHCF)** is typically installed on poles or walls in fixed locations. Therefore, the AHCF is neither a portable nor a mobile wireless device. The maximum antenna gain allowable is up to 14.95 dBi for 4 ports.

The limits specified in FCC Section 1.1310 Table 1(B) for occupational/controlled exposure and general population/uncontrolled exposure, which are tabulated below in Table 13.2, shall be met.

All of the transmitters installed in the AHCF operate in the frequency range of 869 MHz – 894 MHz. The maximum power density thus needs to be less than 0.58 mW/cm<sup>2</sup> for general population/uncontrolled environment and 2.90 mW/cm<sup>2</sup> for occupational/controlled environment.

**Table 13.2 - Power Density Limits for Occupational/Controlled Exposure and General Population/Uncontrolled for AHCF**

Environment	Frequency Range (MHz)	Min Power Density (S) (mW/cm <sup>2</sup> )
Occupational/Controlled	869 - 894	2.90
General Population/Uncontrolled	869 - 894	0.58

**SUMMARY OF THE TEST RESULTS**

Applied Standard(s): FCC Section 1.1310		
AHCF Configuration	Exposure Environment	Proposed RF Safety Distance (m)
AHCF equipped with Directional Antenna up to 14.95dBi	General Population/Uncontrolled*	9.5
AHCF equipped with Directional Antenna up to 14.95dBi	Occupational/Controlled	4.25

Per FCC's OST/OET Bulletin Number 65, the appropriate EIRP (equivalent or effective isotropically radiated power) limits can be calculated based on the relationship between power density and EIRP, i.e.,

$$S = \frac{EIRP}{4\pi R^2} \quad (1)$$

where S is the power density in mW/cm<sup>2</sup>, R is the distance to the center of radiation of the antenna in cm and EIRP is in mW.

**Table 13.3(a) AHCF Antenna**

Antenna	Model	Maximum Antenna Gain (dBi)
Directional	869 – 894 MHz	14.95

**Table 13.3(b) AHCF Maximum Output Power**

Signal Bandwidth (MHz)	Maxi Conducted Output Power Total (4x4)	Maximum Antenna Gain (dBi)	Maximum EIRP Total (dBm)
10	53.22 dBm	14.95	68.17 dBm*

\*: Per FCC Part 22.913, the Maximum ERP allowed is 400 watts/MHz (PSD) per sector for normal urban areas. Nokia does not provide antennas.

The Maximum EIRP Output 68.17 dBm for 10 MHz carriers was derived from Effective Radiated (ERP) Power limit 56 dBm/MHz + 10log 10MHz + 2.15 (to convert ERP to EIRP).

**Table 13.4 Limits for Occupational/Controlled Exposure and General Population/Uncontrolled Exposure (FCC Section 1.1310 Table 1(B))**

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Average Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
300 - 1500			F/300	6
1500 -			5.0	6
100,000				
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
300 - 1500			F/1500	30
1500 -			1.0	30
100,000				

Note: f = frequency in MHz; \*Plane-wave equivalent power density.

When all transmitters operate simultaneously, the EIRP and thus power density from all transmitters gives the worst-case scenario.

**Table 13.5 (a) Minimum RF Safety Distances for Uncontrolled Exposure**

LTE Band	Freq (MHz)	Maxi Total EIRP (dBm)	Maxi Total EIRP (mW)	Limit of Power Density S (mW/cm <sup>2</sup> )	RF Safety Distance (cm)
B5	869	68.17	6561452.66	0.58	949.05

**Table 13.5 (b) Power Density at the Proposed Minimum RF Safety Distance 949.1 cm**

LTE Band	Freq (MHz)	Maxi Total EIRP (dBm)	Maxi Total EIRP (mW)	RF Safety Distance (cm)	Power Density S (mW/cm <sup>2</sup> )
B5	869	68.17	6561452.66	949.1	0.5799

**Table 13.6 (a) Minimum RF Safety Distances for Controlled Exposure**

LTE Band	Freq (MHz)	Maxi Total EIRP (dBm)	Maxi Total EIRP (mW)	Limit of Power Density S (mW/cm <sup>2</sup> )	RF Safety Distance (cm)
B5	869	68.17	6561452.66	2.90	424.43

**Table 13.6 (b) Power Density at the Proposed Minimum RF Safety Distance 424.50**

LTE Band	Freq (MHz)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	RF Safety Distance (cm)	Power Density S (mW/cm <sup>2</sup> )
B5	869	68.17	6561452.66	424.50	2.899

## Results

The results are summarized below in Tables 13.7.

**Table 13.7 Minimum RF Safety Distances for AHCF for Urban Areas**

Exposure	RF Safety Distance (m)	Total Power Density S (mW/cm <sup>2</sup> )	Limit of Power Density S (mW/cm <sup>2</sup> )
Occupational/Controlled	4.25	2.899	2.90
General Population/Uncontrolled	9.5	0.5799	0.58

Therefore, the RF safety distance for the Nokia **AHCF AirScale RRH 4T4R B5 200W, (AHCF)** shall be larger than 4.25 m for occupational/controlled exposure and larger than 9.5m for general population/uncontrolled exposure.