

## 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

AirScale Base Transceiver Station Remote Radio Head 4T4R n41 160W 2.5 GHz is typically installed on poles or walls in fixed locations. Therefore, the AWHHJ is neither a portable nor a mobile wireless device. The maximum antenna gain is 12.0 dBi for 4 ports

The information on Nokia supplied antennas is provided in Table 13.1.

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 AWHHJ operate in the frequency range of 2.496 GHz – 2.69 GHz. The maximum power density thus needs to be less than 1.0 mW/cm<sup>2</sup> for general population/uncontrolled environment and 5.0 mW/cm<sup>2</sup> for occupational/controlled environment.

**SUMMARY OF THE TEST RESULTS**

<b>Applied Standard(s): FCC Section 1.1310</b>		
<b>AWHHJ Configuration</b>	<b>Exposure Environment</b>	<b>Proposed RF Safety Distance (cm)</b>
AWHHJ equipped with Directional Antenna	General Population/Uncontrolled*	449.3
AWHHJ equipped with Directional Antenna	Occupational/Controlled	201.0

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 13.1(a) AWHHJ Antenna**

<b>Antenna</b>	<b>Model</b>	<b>Maximum Antenna Gain (dBi)</b>
Directional	AAHM & 2496 – 2690 MHz	12.0

**Table 13.1(b) AWHHJ Maximum Output Power**

<b>Signal Bandwidth (MHz)</b>	<b>Maxi Conducted Output Power Per Port</b>	<b>Maxi Conducted Output Power Total (4x4)</b>	<b>Antenna Gain</b>	<b>Maximum EIRP Total</b>
100	46.02 dBm	52.04 dBm	12.0 dBi	64.04 dBm

The maximum EIRP Output 64.04 dBm was derived from Maximum Conducted Output Power Total + Maximum Antenna Gain Used.

**Table 13.2 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)
(A) Limits for Occupational/Controlled Exposure				
300 - 1500			F/300	6
1500 – 100,000			5.0	6
(B) Limits for General Population/Uncontrolled Exposure				
300 - 1500			F/1500	30
1500 – 100,000			1.0	30

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 13.3 (a) Minimum RF Safety Distances for Uncontrolled Exposure**

LTE Band	Freq (GHz)	Maxi Total EIRP (dBm)	Maxi Total EIRP (mW)	Limit of Power Density S (mW/cm <sup>2</sup> )	RF Safety Distance (cm)
B41	2.496	64.04	2535128.6305	1	449.15

**Table 13.3 (b) Power Density at the Proposed Minimum RF Safety Distance 449.3 cm**

LTE Band	Freq (GHz)	Maxi Total EIRP (dBm)	Maxi Total EIRP (mW)	RF Safety Distance (cm)	Power Density S (mW/cm <sup>2</sup> )
B41	2.496	64.04	2535128.6305	449.3	0.9999

**Table 13.4 (a) Minimum RF Safety Distances for Controlled Exposure**

LTE Band	Freq (GHz)	Maxi Total EIRP (dBm)	Maxi Total EIRP (mW)	Limit of Power Density S (mW/cm <sup>2</sup> )	RF Safety Distance (cm)
B41	2.496	64.04	2535128.6305	5	200.87

**Table 13.4 (b) Power Density at the Proposed Minimum RF Safety Distance 201.0 cm**

LTE Band	Freq (GHz)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	RF Safety Distance (cm)	Power Density S (mW/cm <sup>2</sup> )
B41	2.496	64.04	2535128.6305	201.0	4.996

**Results**

The results are summarized below in Tables 13.5.

**Table 13.5 Minimum RF Safety Distances for AWHHJ**

Exposure	RF Safety Distance (cm)	Total Power Density S (mW/cm <sup>2</sup> )	Limit of Power Density S (mW/cm <sup>2</sup> )
Occupational/Controlled	201.0	4.996	5
General Population/Uncontrolled	449.3	0.9999	1

Therefore, the RF safety distance for the Nokia **AirScale Base Transceiver Station Remote Radio Head 4T4R n41 160W 2.5 GHz** shall be larger than 201.0 cm for occupational/controlled exposure and larger than 449.3 cm for general population/uncontrolled exposure.