

EXHIBIT 13

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 Nokia **AHDB AirScale 2T4R B8 Sub-Band 160W** is typically installed on poles or walls in fixed locations. Therefore, the AHDB is neither a portable nor a mobile wireless device. The Nokia AHDB is a 2 port radio head that transmits 40 Watts per port over the B8 spectrum (936.5 – 939.5 MHz). This product supports up to 2x1.4 MHz, and 1x3 MHz LTE carriers, and 3x.2 MHz NBloT carriers utilizing QPSK, 16 QAM, 64QAM and 256QAM modulation formats. The 2 individual transmit ports are identical in design, rated power and performance. The RF exposure assessment for the overall AHDB will be evaluated separately to ensure the compliance.

Table 13.1 Product Specifications on AHDB LTE RRH Band 8 (URBAN)

Product	Technologies	Transmitting Frequency (MHz)	Max Total Output Conducted Power (dBm rms)	Max Total Output EIRP Power (dBm rms)
AHDB	LTE-FDD .2/1.4/3 MHz, Q16/64/256QAM	Band 8 936.5 – 939.5	49.0	62.94

Table 13.2 Product Specifications on AHDB LTE RRH Band 8 (RURAL)

Product	Technologies	Transmitting Frequency (MHz)	Max Total Output Conducted Power (dBm rms)	Max Total Output EIRP Power (dBm rms)
AHDB	LTE-FDD .2/1.4/3 MHz, Q16/64/256QAM	Band 8 936.5 – 939.5	49.0	69.93

The information on Nokia supplied antennas is provided in Table 13.2

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 13.3, shall be met.

All of the transmitters installed in AHDB operate in the frequency range of 936.5 – 939.5 MHz. The maximum power density thus needs to be less than 0.62 mW/cm² for general population/uncontrolled environment and 3.11 mW/cm² for occupational/controlled environment.

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.,

$$S = \frac{EIRP}{4\pi R^2}, \tag{1}$$

where S is the power density in mW/cm², R is the distance to the center of radiation of the antenna in cm and EIRP is in mW.

Table 13.3 AHDB Antenna

Antenna	Deployment Area	Model	Antenna Gain (dBi)
Directional	URBAN	AHDB	13.94

Table 13.4 AHDB Antenna

Antenna	Deployment Area	Model	Antenna Gain (dBi)
Directional	RURAL	AHDB	20.93

Table 13.5 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 ²)	Average Time E ² , H ² 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 om 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 13.6 (a) Minimum RF Safety Distances for controlled Exposure (URBAN)

Module	Freq Band (GHz)	Maxi Total P _{out} (2x4) (dBm)	Antenna Gain (dBi)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	Limit of Power Density S (mW/cm ²)	RF Safety Distance (cm)
AHDB	936.5	49.0	13.94	62.94	1967886.29	3.11	224.34

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

Module	Freq Band (GHz)	Maxi Total P _{out} (2x4) (dBm)	Maxi Antenna Gain (dBi)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	RF Safety Distance (cm)	Limit of Power Density S (mW/cm ²)
AHDB	936.5	49.0	13.94	62.94	1967886.29	225	3.09

Table 13.7 (a) Minimum RF Safety Distances for UnControlled Exposure (URBAN)

Module	Freq Band (GHz)	Maxi Total P _{out} (2x4) (dBm)	Antenna Gain	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	Limit of Power Density S (mW/cm ²)	RF Safety Distance (cm)
AHDB	936.5	49.0	13.94	62.94	1967886.29	0.62	502.61

Table 13.7 (b) Power Density at the Proposed Minimum RF Safety Distance (URBAN)

Module	Freq Band (GHz)	Maxi Total P _{out} (64x64) (dBm)	Antenna Gain (dBi)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	RF Safety Distance (cm)	Limit of Power Density S (mW/cm ²)
AHDB	936.5	49.0	13.94	62.94	1967886.29	503.0	0.619

Table 13.8 (a) Minimum RF Safety Distances for controlled Exposure (RURAL)

Module	Freq Band (GHz)	Maxi Total P _{out} (2x4) (dBm)	Antenna Gain (dBi)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	Limit of Power Density S (mW/cm ²)	RF Safety Distance (cm)
AHDB	936.5	49.0	20.93	69.93	9840111.06	3.11	501.66

Table 13.8 (b) Power Density at the Proposed Minimum RF Safety Distance (RURAL)

Module	Freq Band (GHz)	Maxi Total P _{out} (2x4) (dBm)	Maxi Antenna Gain (dBi)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	RF Safety Distance (cm)	Limit of Power Density S (mW/cm ²)
AHDB	936.5	49.0	20.93	69.93	9840111.06	502	3.109

Table 13.9 (a) Minimum RF Safety Distances for UnControlled Exposure (RURAL)

Module	Freq Band (GHz)	Maxi Total P _{out}	Antenna Gain	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	Limit of Power Density S (mW/cm ²)	RF Safety Distance (cm)

		(2x4) (dBm)					
AHDB	936.5	49.0	20.93	69.93	9840111.06	0.62	1123.91

Table 13.9 (b) Power Density at the Proposed Minimum RF Safety Distance (RURAL)

Module	Freq Band (GHz)	Maxi Total P _{out} (64x64) (dBm)	Antenna Gain (dBi)	Maximum Total EIRP (dBm)	Maximum Total EIRP (mW)	RF Safety Distance (cm)	Limit of Power Density S (mW/cm ²)
AHDB	936.5	49.0	20.93	69.93	9840111.06	1124	0.62

Results

The results are summarized below in Tables 13.10.

Table 13.10 (a) Minimum RF Safety Distances for AHDB RF Module (URBAN)

Exposure	RF Safety Distance (cm)	Total Power Density S (mW/cm ²)	Limit of Power Density S (mW/cm ²)
Occupational/Controlled	225	3.09	3.11
General Population/Uncontrolled	503	0.619	0.62

Table 13.10 (b) Minimum RF Safety Distances for AHDB RF Module (RURAL)

Exposure	RF Safety Distance (cm)	Total Power Density S (mW/cm ²)	Limit of Power Density S (mW/cm ²)
Occupational/Controlled	502	3.109	3.11
General Population/Uncontrolled	1124	0.62	0.62

Therefore, the RF safety distance for the AHDB RF module shall be larger than 225cm or 2.25 m for occupational/controlled exposure and larger than 503 cm or 5.03 m for general population/uncontrolled exposure in URBAN areas.

The RF safety distance for the AHDB RF module shall be larger than 502cm or 5.02 m for occupational/controlled exposure and larger than 1124 cm or 11.24 m for general population/uncontrolled exposure in RURAL areas.