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EMF Test Report: Ericsson Indoor AIR 1279 B260 (FCC)

Document number:	GFTL-21:000807 Uen Rev B	**Date of report:**	2021-08-20 (Rev B) Replaces GFTL-21:000807 Uen Rev A.
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Tests performed by:	Paramananda Joshi	**Dates of tests:**	2021-05-25 (Rev A) 2021-08-20 (Rev B)
Manufacturer and market name(s) of device:	Ericsson Indoor AIR 1279 B260		
Testing has been performed in accordance with:	FCC OET Bulletin 65 IEC 62232:2017		
Test results:	RF exposure compliance boundaries (exclusion zones) related to the limits in FCC 47 CFR 1.1310 to be included in the Customer Product Information (CPI) for Ericsson Indoor AIR 1279 B260.		
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Summary of EMF Test Report[1]

Equipment under test (EUT)

Product name	Indoor AIR 1279 B260		
Product number	KRD 901 230/4		
Supported bands, Tx frequency range (GHz) and standards	B260	37 – 40	NR
Duplexing technology and fraction of downlink transmission time to total time	TDD (75 %)		
Exposure environment	General public/uncontrolled, Occupational/controlled		

Results

RF exposure compliance boundaries, outside of which the exposure is below the general public (GP) and occupational (O) exposure limits, are listed below.

Dimensions of the box-shaped compliance boundary for general public (GP) and occupational (O) exposure for Indoor AIR 1279 applicable in markets employing the FCC RF exposure limits. The compliance boundaries are determined for total EIRP[2] with tolerance and TDD downlink duty cycle included.

Mode and EIRP for Indoor AIR 1279								**Dimensions of the box-shaped compliance boundary (m)**							
								Distance in front of EUT		**Width**		**Height**		**Distance behind EUT**	
Band	**Stan-dard**	**Config-uration Mode**	**EIRP**		**IEC 62232 installation class**	**TDD DL duty cycle**	**Sector shapes**	**GP**	**O**	**GP**	**O**	**GP**	**O**	**GP**	**O**
			Nominal total (dBm)	**Tolerance (dB)**											
B260	NR	1	37	2.4	E10	75 %	Hotspot1, Hotspot2	0.3	0.2	0.6	0.6	0.7	0.7	0.2	0.2
			40		E10			0.4	0.2	0.6	0.6	0.7	0.7	0.2	0.2
			43		E100			0.5	0.2	0.6	0.6	0.7	0.7	0.2	0.2

For the EIRP levels specified in the table with tolerances added, and the upward rounding of compliance boundary dimensions to the nearest decimeter, the specified results are conservative.

[1] This page contains a summary of the test results. The full report provides a complete description of all test details and results.
[2] Effective Isotropic Radiated Power.

1 General information

The test results presented in this report define compliance boundaries for Indoor AIR 1279 B260. Outside of these compliance boundaries, the radio frequency (RF) exposure levels are below the limits specified by the Federal Communications Commission (FCC) [1]. The tests were performed by calculations in accordance with the Ericsson RF exposure calculation procedure for base stations [2], which is in conformity with the FCC OET Bulletin 65 [3] and IEC 62232:2017 [4].

It should be noted that the test results presented in this test report are valid for the frequency range specified in Table 1, for the antenna properties specified in Table 2, and for the EIRP levels, the tolerance and TDD downlink duty cycle specified in Table 3. These data as well as the applied antenna pattern files were supplied by the client and may affect the validity of the results.

Proposed EMF health and safety information for inclusion in the Customer Product Information (CPI) is provided in Appendices A, B and C.

2 Equipment under test

Tables 1 and 2 below summarize the technical data for the equipment under test (EUT) and the antenna properties for the integrated antenna. Table 3 lists the nominal total EIRP levels of the radio unit and the total time-averaged EIRP including tolerance and the TDD downlink duty cycle for Configuration Mode 1, in which the phased array antenna module (PAAM) of the product is divided into two halves, each containing 2 x 8 subarrays. In this configuration, the product can generate four beams, one for each array half and polarization.

EMF compliance assessments were conducted at three nominal total EIRP levels, out of seven of those provided in Table 3, specifically at 37 dBm, 40 dBm, and 43 dBm.

The EUT related data in Tables 1-3 were supplied by the client.

Table 1 Technical data for the EUT.

Product name and product number	Indoor AIR 1279 B260		KRD 901 230/4
Supported bands, Tx frequency range (GHz), and standards	B260	37 – 40	NR
Dimensions[3], H x W x D (mm)	210 × 200 × 100		
Duplexing technology and fraction of downlink transmission time to total time	TDD (75 %)		
Exposure environment	General public/uncontrolled, Occupational/controlled		
IEC 62232 installation class [4][4]	E10 (for configurations with total EIRP ≤ 40 dBm) E100 (for configurations with total EIRP ≤ 50 dBm)		

[3] The dimensions of the EUT exclude protrusions and mounting brackets.
[4] The stated IEC 62232 installation class was determined based on the nominal total EIRP without tolerance included and considering the TDD downlink duty cycle.

Table 2 Properties of the integrated antenna.

Type	Phased Array Antenna Module (PAAM)
Number of antenna panels	2
Maximum nominal gain[5] (dBi)	20.2
Horizontal HPBW[6] (degrees)	12.2
Vertical HPBW[6] (degrees)	19.7
Antenna configuration (no. of subarray rows, subarray columns and polarizations) per antenna panel	2×8×2 ports
Subarray configuration	2×1
Element separation distance (Δ_H, Δ_V) (mm)	(3.9, 4.8)
Maximum scan range in horizontal plane (degrees)	±60
Maximum scan range in vertical plane (degrees)	±15

Table 3 EUT configuration with nominal EIRP levels and total EIRP levels including tolerance and TDD downlink duty cycle.

Band	Standard	Configuration Mode	EIRP		TDD downlink duty cycle	Total time-averaged EIRP (dBm)
			Nominal total (dBm)	Tolerance (dB)		
B260	NR	1	37.0	2.4	75 %	38.2
			38.0			39.2
			39.0			40.2
			40.0			41.2
			41.0			42.2
			42.0			43.2
			43.0			44.2

3 Exposure conditions

The EUT is intended to be installed on walls, poles, ceilings, and similar structures making it possible to ensure that the general public has no access to the EMF compliance boundary. Other installation related exposure conditions are not reasonably foreseeable for the EUT.

The maximum TDD downlink duty cycle was considered to obtain the maximum time-averaged EIRP. Other factors such as beam scanning in elevation and azimuth, RBS utilization, and scheduling time are reasonably foreseeable and will significantly reduce the time-averaged EIRP and the RF exposure. These factors were however not considered in this assessment, which adds to the conservativeness of the obtained compliance boundaries.

4 EMF compliance boundary calculations

The RF exposure was evaluated using calculations performed according to the Ericsson RF Exposure Calculation Procedure for Base Stations [2], which conforms to FCC OET Bulletin 65 [3] and IEC 62232 [4]. The calculations were made using the far-field spherical formula. The first step in calculating the compliance boundary was to use the spherical far-field formula to estimate power density:

$$S_{\mathrm{sph}}(\theta, \phi) = \frac{P_{\mathrm{a}} G(\theta, \phi)}{4\pi r^2},$$

[5] The stated gain values are provided by the client.
[6] The stated half-power beam widths are for broadside beam.

where S,P_{a}, G, r, θ, and ϕ denote the power density, the total time-averaged power accepted by antenna, the antenna gain, the distance from the antenna, and the angular variables in a spherical coordinate system, respectively. The EIRP, i.e., the product of P_a and $G(\theta,\phi)$, includes tolerances and the TDD downlink duty cycle. The envelopes of EIRP values for all possible traffic beams were obtained from far-field measurements provided by the client. Such envelope patterns were provided for three different frequencies, specifically 37 GHz, 38.5 GHz and 40 GHz within Band 260. Also, these patterns were provided for different sector shapes corresponding to different deployment scenarios, namely, Hotspot1 and Hotspot2. For each sector shape, power density values were estimated from the equation above using the maximum EIRP values of the envelope patterns provided for the three different frequencies. The maximum EIRP of the envelope traffic beams were found to be 36.8 dBm per beam.

The compliance distance for the spherical model, $\mathrm{CD}_{\mathrm{sph}}(\theta,\phi)$ was obtained for each sector shape by solving the following equation for r:

$$\frac{S_{\mathrm{sph}}(r,\theta,\phi)}{S_{\mathrm{gp,o}}^{\mathrm{lim}}} = 1,$$

where $S_{\mathrm{gp,o}}^{\mathrm{lim}}$ denotes the FCC power density reference levels [1] for general public/uncontrolled and occupational/controlled exposure in the frequency range used by the EUT. RF EMF exposure limits are given in Table 4.

Table 4 RF EMF exposure limits applicable for the frequency range used by the EUT.

Band	$S_{\mathrm{gp}}^{\mathrm{lim}}$ (W/m^2)	S_{o}^{lim} (W/m^2)
B260	10	50

Based on the calculated compliance distances, a box-shaped compliance boundary was determined. To comply with the FCC requirement of a minimum test separation distance for a non-portable device of 20 cm, the minimum distance from the EUT to the compliance boundary was set to 20 cm.

5 Results

A box-shaped compliance boundary is used, characterized by its width, height, and the compliance distances behind and in front of the equipment, see Figure 1. Outside of this box, the RF exposure is below the exposure limits.

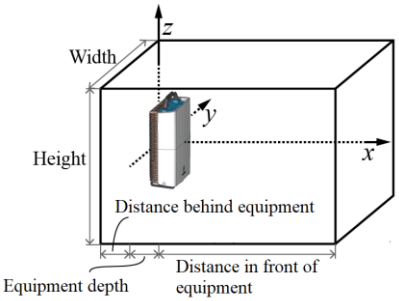

Figure 1 Box-shaped structure specifying the compliance boundary for the tested RBS product.

In Figure 2 and Figure 3 compliance distance results as obtained using the far-field spherical formula for general public (blue line) and occupational (red line) exposure are given for the tested configuration leading to the largest compliance boundary for sector shapes Hotspot1 and Hotspot2, respectively. Results are provided for the FCC exposure limits. Also shown are the resulting symmetric compliance boundaries (black lines, solid for general public, dashed for occupational exposure). The reported compliance boundary dimensions are given in Table 5 rounded upwards to the nearest decimeter.

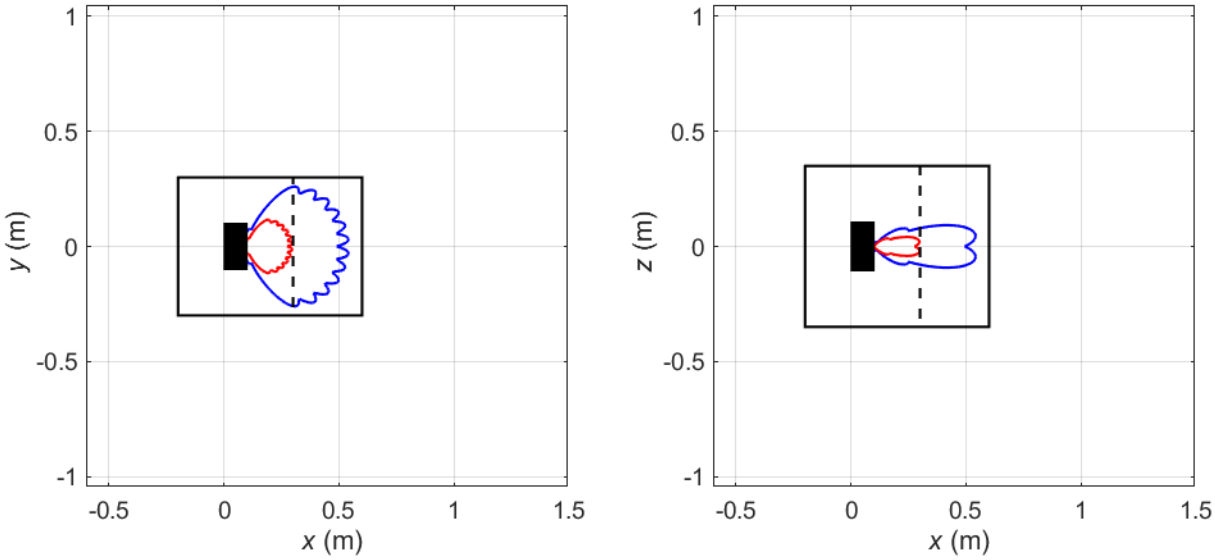

Figure 2 Compliance boundaries for general public (black solid line) and occupational (black dashed line) exposure for markets where the FCC exposure limits apply for Hotspot1 sector shape (Configuration Mode 1). The blue solid lines correspond to compliance distance results for general public exposure obtained using the spherical models. The solid red lines indicate the corresponding compliance distance results for occupational exposure. The EUT is shown from above (left) and from the side (right) with its backplane located at $x = 0$ m. Mode: B260 (39 GHz) (NR). Total EIRP of the radio: 44.2 dBm.

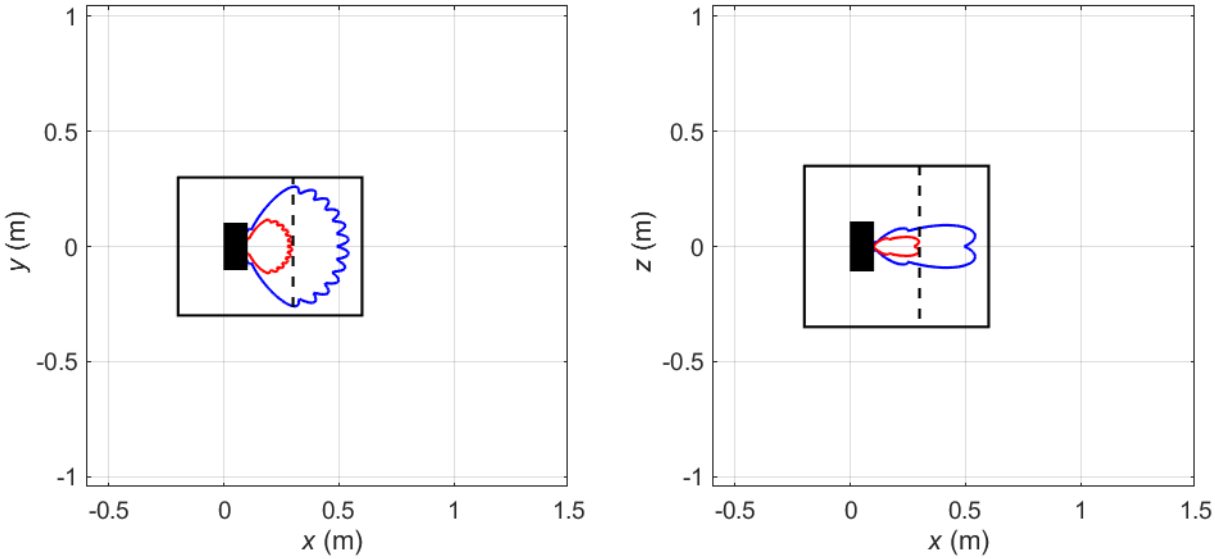

Figure 3 Compliance boundaries for general public (black solid line) and occupational (black dashed line) exposure for markets where the FCC exposure limits apply for Hotspot2 sector shape (Configuration Mode 1). The blue solid lines correspond to compliance distance results for general public exposure obtained using the spherical models. The solid red lines indicate the corresponding compliance distance results for occupational exposure. The EUT is shown from above (left) and from the side (right) with its backplane located at $x = 0$ m. Mode: B260 (39 GHz) (NR). Total EIRP of the radio: 44.2 dBm.

Table 5 Dimensions of the box-shaped compliance boundary for general public (GP) and occupational (O) exposure for Indoor AIR 1279 applicable in markets employing the FCC RF exposure limits. The compliance boundaries are determined for total EIRP with tolerance and TDD downlink duty cycle included.

Mode and EIRP for Indoor AIR 1279							Dimensions of the box-shaped compliance boundary (m)							
							Distance in front of EUT		Width		Height		Distance behind EUT	
Band	Stan-dard	Config-uration Mode	EIRP		TDD DL duty cycle	Sector shapes	GP	O	GP	O	GP	O	GP	O
			Nominal total (dBm)	Tolerance (dB)										
B260	NR	1	37	2.4	75 %	Hotspot1, Hotspot2	0.3	0.2	0.6	0.6	0.7	0.7	0.2	0.2
			40				0.4	0.2	0.6	0.6	0.7	0.7	0.2	0.2
			43				0.5	0.2	0.6	0.6	0.7	0.7	0.2	0.2

For the EIRP levels specified in the table with tolerances added, and the upward rounding of compliance boundary dimensions to the nearest decimeter, the specified results are conservative.

6 Uncertainty

For the input parameters defined in the test report, the calculated compliance boundary dimensions determined according the approach described in Section 4 results in an exposure assessment which is conservative. The compliance boundary dimensions were determined by comparing the evaluated RF exposure directly with the limits.

7 Conclusion

The Ericsson Indoor AIR 1279 B260 has been tested using methods and procedures specified in FCC OET Bulletin 65 [3] and IEC 62232:2017 [4]. The results in Section 5 show the compliance boundary dimensions for the considered configuration of the product. Outside of these compliance boundaries, the RF exposure is below the limits specified in [1].

8 References

[1] FCC, Code of Federal Regulations CFR title 47, part 1.1310 “Radiofrequency radiation exposure limits”, Federal Communications Commission (FCC), August 1997.

[2] GFTE-16:001718 Uen, “Ericsson RF exposure calculation procedure for base stations”.

[3] FCC, “Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields. OET Bulletin 65. Edition 97-01.” Federal Communications Commission (FCC), Office of Engineering and Technology, August 1997.

[4] IEC 62232:2017, Determination of RF field strength, power density and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure, June 2017.

[5] Ericsson, LME-12:001904 Uen, “Exposure to radio frequency electromagnetic fields”.

9 Revision history

Rev.	Date	Description
A	2021-05-31	First revision.
B	2021-08-20	Reconducted the test with updated product dimension. No change in the compliance boundary dimension was observed. Editorial correction done throughout the report by replacing ‘workers exposure’ by ‘occupational exposure’.

Appendix A. Information to be included in the CPI

Table A.1 lists the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Indoor AIR 1279 is below the limits applicable in:

- USA (47 CFR 1.1310)

Information is provided for the theoretical maximum exposure condition.

Table A.1: Dimensions of the box-shaped compliance boundary for general public (GP) and occupational (O) exposure applicable in USA and markets employing the FCC RF exposure limits.

Mode and EIRP for Indoor AIR 1279								Dimensions of the box-shaped compliance boundary[1] (m)							
								Distance in front of AIR		Width		Height		Distance behind AIR	
Band	Stan-dard	Config-uration Mode	EIRP		IEC 62232 installation class	TDD DL duty cycle	Sector shapes	GP	O	GP	O	GP	O	GP	O
			Nominal total (dBm)	Tolerance (dB)											
B260	NR	1	37	2.4	E10	75 %	Hotspot1, Hotspot2	0.3	0.2	0.6	0.6	0.7	0.7	0.2	0.2
			40		E10			0.4	0.2	0.6	0.6	0.7	0.7	0.2	0.2
			43		E100			0.5	0.2	0.6	0.6	0.7	0.7	0.2	0.2

(1) The compliance boundaries are determined for total EIRP with tolerance and TDD downlink duty cycle included.

Appendix B. Guidelines on how to install the product

The Ericsson Indoor AIR 1279 B260 product (KRD 901 230/4) shall be installed to make sure that the general public does not have access to the applicable RF EMF compliance boundary. The compliance boundary dimensions were determined for the product transmitting in free space.

Appendix C. Guidelines for workers during installation, maintenance, and repair of the product

For Ericsson Indoor AIR 1279 B260 product (KRD 901 230/4), if work needs to be performed within the compliance boundary applicable for workers, the radio equipment shall be powered off, or the power be reduced to a level ensuring that the RF EMF exposure is below the relevant exposure limit for workers.

If work is conducted on behalf of Ericsson, minimum EMF related requirements are provided in [5].