



Declaration of Conformity to EN 62311:2008 Human Exposure Restrictions for Electromagnetic Fields

We Triorail Bahnfunk GmbH
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Germany

declare under our sole responsibility that the products

| | | | |
|-----------------------------------|-----------------------|--------------------------------------|---------|
| Triorail® | Modules: | TRC-5RMe ext and TTS-TRC-5RMe | |
| suitable for the frequency bands: | GSM-R / EGSM-R / EGSM | | 900MHz |
| | GSM | | 1800MHz |
| with the RF power classes: | 2 (39 dBm / 8 W) | GSM-R / EGSM-R / EGSM | 900MHz |
| | 1 (30 dBm / 1 W) | GSM | 1800MHz |

are conform with the requirements of the standard EN 62311:2008 "Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)" if the safety distance to an isotropic radiator is more than 37.6 cm.

Maximum Permissible Exposure (MPE)

According to EN 62311 the following maximum power densities (S_{eq}) are defined:

$$900 \text{ MHz} \quad f/200 \quad \rightarrow \quad S_{eq} \leq 4.5 \text{ W/m}^2$$

$$1800 \text{ MHz} \quad f/200 \quad \rightarrow \quad S_{eq} \leq 9.0 \text{ W/m}^2$$

Higher antenna gain requires increased safety distance. For more details, see table and calculations below.

Table: Safety distance of antenna depending on antenna gain

| D [dB_i] (antenna gain) | r [cm] (safety distance) |
|---|------------------------------------|
| 0 | 37.6 |
| 3 | 53.2 |
| 6 | 75.0 |
| 9 | 106.0 |
| 12 | 149.6 |

The manufacturer of applications based on the above mentioned Triorail products is responsible to define safety distances in accordance to the applied antenna gain of his products and to the table and calculations provided in this document.

Calculation

- S_{eq} : Power density
- P : Transmitted power
- D : Antenna gain
- r : Distance to antenna
- i : Isotropic ($D=1$ or $D=0$ dB_i)

$$S_{eq} = \frac{P * D}{\int_{\varphi=-\frac{\pi}{2}}^{\varphi=+\frac{\pi}{2}} 2\pi * r * r * \sin\varphi d\varphi} = \frac{P * D}{4\pi * r^2 * \int_{\varphi=0}^{\varphi=+\frac{\pi}{2}} \sin\varphi d\varphi} = \frac{P * D}{4\pi * r^2 * (-\cos\varphi) \Big|_{\varphi=0}^{\varphi=+\frac{\pi}{2}}} = \frac{P * D}{4\pi * r^2}$$

$$r = \sqrt{\frac{P * D}{4\pi * S_{eq}}}$$

$$D [\text{dB}_i] = 10 \log D$$

$$D = 10^{\frac{D [\text{dB}_i]}{10}}$$

$$r = r_i * \sqrt{10^{\frac{D [\text{dB}_i]}{10}}}$$

$$r = r_i * 10^{\frac{D [\text{dB}_i]}{20}}$$

The technical documentation (TCF) relevant to the above named products are kept at:

Triorail Bahnfunk GmbH, Luitpoldstrasse 2a, 85276 Pfaffenhofen, Germany.

Signed for and on behalf of Triorail Bahnfunk GmbH

Pfaffenhofen, 13-02-2019



Juergen Hofmann
Chief Executive Officer