Calculation of exposure to non-ionizing radiation

Basically, every RFbeam module conforms in terms of safety and health to the applicable requirements of the **Radio Equipment Directive 2014/53/EU (RED), Article 3.1(a)**, as demonstrated by assessment of human exposure to electromagnetic fields according to the following harmonised standard (referenced in the respective EU Declaration of Conformity):

EN IEC 62311:2020

The exposure limits for the electromagnetic field generated by the radar front end are based on the general public exposure limits for electromagnetic fields in the frequency range from 6 to 300 GHz, i.e.:

- The health effects exposure limit value is 50 W/m²
- The power density shall be averaged over 20 cm²

Exposure calculation

Power density (S) can be calculated from the EIRP Power (P_{EIRP}) and the distance (R):

$$S = \frac{P_{EIRP}}{4 \cdot \pi \cdot R^2}$$

This equation can be rearranged to provide the distance for a given power density:

$$R = \sqrt{\frac{P_{EIRP}}{4 \cdot \pi \cdot S}}$$

By using the exposure limit value of 50 W/m² and different max. P_{EIRP} the following minimum distances can be calculated:

Table 1: Minimum distances for different EIRP values

Max. P_{EIRP} [dBm]	Max. P_{EIRP} [Watt]	Min. distance [m]
10	0.01	0.004
20	0.1	0.013
30	1	0.040
40	10	0.126
50	100	0.400
60	1000	1.262

This is the worst case, with the antenna radiating out into free space (not in an enclosure). At closer ranges the maximum power density averaged over 20 cm² will not exceed the maximum exposure limit of 50 W/m² as long as the EIRP is equal or below 20dBm.

$$P_{EIRP,max} = 50\frac{W}{m^2} \cdot 0.002m^2 = 0.1W = 20dBm$$

This means that all modules with a maximum EIRP of ≤ 20 dBm do not exceed the applicable exposure limits. At higher EIRP levels, a minimum distance to the module must be maintained.