Calculation of exposure to non-ionizing radiation

Basically, every RFbeam module conforms in terms of safety/health to the following standards (can be found in the respective Certificate of Conformity):

EN 62311 2008
EN 62368-1 2014+AC:2015

Exposure limits for the electromagnetic field generated by the radar front end are covered by "DIRECTIVE 2013/35/EU OF THE EUROPEAN PARLIAMENT":

- The health effects exposure limit value for exposure to electromagnetic fields from 6 to 300 GHz is 50 Watts/m²
- The power density shall be averaged over 20 cm²

Exposure can be calculated using the following formulas:

Power density (S) can be calculated from the EIRP Power (P) 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. EIRP's the following minimum distances can be calculated:

Table 1: Minimum distances for different EIRP's

Max. EIRP [dBm]	Max. 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 Watts/m^2 as long as the EIRP is equal or below 20dBm.

$$EIRP_{Max} = 50\frac{W}{m^2} \cdot 0.002m^2 = 0.1W = 20dBm$$

This means that all modules up to a max. EIRP of 20dBm pose no security risk. At higher powers, a minimum distance to the module must be maintained.