Estimate of RF Field Maximum Exposure

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Calculations can be made to predict RF power density levels around typical RF sources. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the equation below. This equation is generally accurate in the far-field of an antenna but will **over-predict** power density in the near field, where it could be used for making a "**worst case**" or conservative prediction.:

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

where:

S = power density (in appropriate units, e.g. mW/cm^2)
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)
EIRP = equivalent (or effective) isotropically radiated power (in appropriate units, e.g., mW)

Power Density Calculations Using EIRP Value From 7-Layers Test Report 4_SMART_IRV_0304_ERF_FCCa

The Bluetooth Wireless USB/Printer Adapter, model bt300 can classified as a Portable Device. As per 47 CFR §2.1091 Portable Devices have their radiating elements operating 20 cm or less from the body of the user or of a nearby person. FCC power density limit for MPE for General Population/Uncontrolled Exposure is $\mathbf{S_{max} = 1.0\ mW/cm^2}$ (OET Bulletin 65 Supplement C, Edition 97-01).

The maximum EIRP of a Bluetooth transmitter Class 2 is 2.5 mW. The power density at the distance of r = 2.5 cm from the antenna is:

$$W = \frac{EIRP}{4\pi r^2} = \frac{2.5 \times 10^{-3}}{4\pi \times 0.025^2} = 0.32[W/m^2]$$

The power density of the Bluetooth bt300 transmitter at 2.5 cm distance is still more than an order of magnitude below the FCC exposure limit for General Population.

The maximum power density of 10 W/m^2 would theoretically be exceeded at a distance of less than 4.5 mm:

$$r = \sqrt{\frac{EIRP}{4\pi W}} = \sqrt{\frac{2.5 \times 10^{-3}}{4\pi \times 10}} = 4.5\times10^{-3}[m]$$