

In the frequency range 33 GHz to 325 GHz, spurious frequencies are measured as power densities. For further remarks see section 1.). In order to simplify spurious measurements, the FMCW-modulation is disabled, and the EUT is operating as a CW transmitter. The RBW and VBW are set to such a value that spurious power levels clearly are readable above fundamental noise level.

4. Measurements of maximum safe level for radiated power density

According to FCC § 1.1307, 1.1310, 2.1091, and 2.1093 and also according to ETSI/EN 301 091 measurements are carried out in order to evaluate the impact of human exposure to RF radiation. For this test the EUT is in normal operation mode: FMCW and normal pulse mode. The measurement is performed at 5 different distances: 4 m, 2 m, 1 m, 0.5 m, and 0.25 m. See ETSI test report 2-3314-01-02/03 page 15.

The measurements are applicable only for far field conditions. The near field area extends to a distance of R (meters) and can be calculated from the following equation:

$$R < 2 * L^2 / \lambda$$

with R = distance in meters, L = largest dimension of either receiving or transmitting horn antenna (L = 0.02 m), and λ = wavelength in meters. In case of 76 GHz ($\lambda = 0.0039$ m), the far field starts at $R > 0.205$ m.

The peak power density is measured in 3 m distance as $7.5 \mu\text{W}/\text{cm}^2$ ($-21.25 \text{ dBmW}/\text{cm}^2$).

$$\begin{aligned}\text{Peak Power (EIRP)} \quad \text{EIRP} &= \text{PD} * 4\pi * R^2 \\ \text{EIRP} &= 8.482 \text{ W (Peak)}\end{aligned}$$

This is a PEP value which must be multiplied with the duty cycle correction factor (dcc) in order to get the average value. With $t_{\text{on}} = 9.412 \text{ ms}$, and $t_{\text{off}} = 90 \text{ ms}$.

$$\begin{aligned}\text{Average power (EIRP)} \quad \text{dcc} &= 20 * \log(t_{\text{on}} / t_{\text{off}}) \\ \text{dcc} &= -19.61 \text{ dB} \\ \text{eirp} &= 10 \log(\text{EIRP Peak}) - \text{dcc} \\ \text{eirp} &= -10.32 \text{ dBW} \\ \text{EIRP} &= 92.789 \text{ mW}\end{aligned}$$

Limit of maximum ERP for frequencies above 1.5 GHz is 3 W. See FCC § 2.1091

RF Exposure for mobile conditions at $R = 20 \text{ cm}$ distance from EUT

$$\begin{aligned}\text{PD} &= \text{EIRP average} / (4\pi * R^2) \\ \text{PD} &= 0.0184 \text{ mW}/\text{cm}^2\end{aligned}$$

Limit of maximum permissible exposure (MPE) for uncontrolled environment: $1.0 \text{ mW}/\text{cm}^2$. See FCC § 1.1310.