Optical Gain

In this tutorial we present how can be calculated the generated carriers upon optical irradiation. The irradiation parameters are the *poynting vector magnitude*, *Mid energy of the irradiation*, *Line width*.

Physics model

The transition rate per volume element can be expressed with the following sum: \[R = R_{ab} - R_{ba} = \frac{2}{V} \sum_{k_a} \sum_{k_b} \frac{2 \pi}{ \hbar} |H_{ba}| ^2 \delta(E_b - E_a - \hbar \omega)(f_a-f_b) \]

In order to make evaluate the sum much faster we calculate the H_{ba} matrix element at $k_a = 0; k_b = 0$(Remark: $k_a = k_b$), and we neglect the k dependence of it. Than we can simplify the sum in the following form:

\[R = \]