

# Thermal Radiation of Hot Electrons

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01.04.2025

# Laser Power

The laser has a power of:

$$P(t) \propto e^{-(t-t_0)/2\sigma^2}$$

with a total energy:

$$E = \int S(t)dt = P_{\text{Average}}/f \approx 1.2 \text{ W}/100 \text{ MHz} = 12 \text{ uJ}$$

# Absorption

only a fraction  $A = 1$  is absorbed into a volume given by the laser radius  $r \approx 200 \text{ }\mu\text{m}$  and the optical depth  $d \approx 250 \text{ nm}$ :

$$V = \pi r^2 \cdot d$$

$$S = \frac{P}{V} A$$

with  $[S] = W/m^3$

## $e^-$ Gas

The temperature change due to absorption can be calculated with the molar Volume  $V_m = M/\rho$  and the specific heat capacity  $c_e = 1/M dQ/dT$ .

The lattice relaxation time  $g \approx 300$  fs.

Diffusion is neglected. Radiative cooling is also ignored.

$$\frac{dT_e}{dt} = \frac{V_m}{c_e(T)} S - \frac{T_e - T_l}{\tau_e}$$

# Lattice Temperature

For now the lattice temperature is assumed to be constant.  
For the lattice it is similar with the diffusion  $\tau_l \approx$ :

$$\frac{dT_l}{dt} = \frac{T_e - T_l}{\tau_l} - \frac{g}{T_e - T_{\text{Room}}}$$





