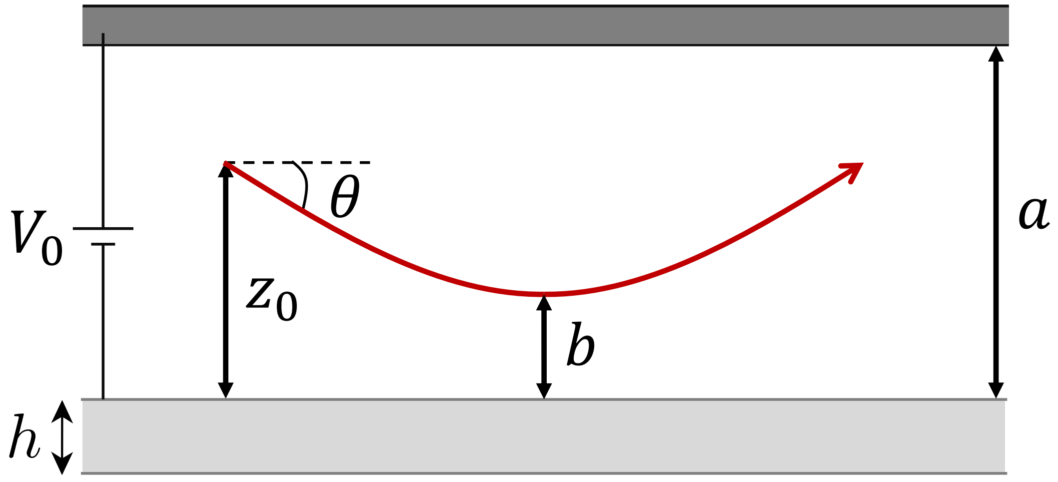
Total EELS as a function of the cutoff energy

$$\frac{d\Gamma}{dy}(\mathbf{r},\omega) = \frac{2e^2}{\pi\hbar v^2}\int_0^\infty \frac{\mathrm{d}k_x}{k_\parallel^2}\mathrm{Re}\left\{k_{z1}\mathrm{e}^{2\mathrm{i}k_{z1}z_\mathrm{e}(\mathbf{r})}\left[\left(\frac{k_x v}{k_{z1}c}\right)^2 r^\mathrm{s}_{123}(k_\parallel) - \frac{1}{\epsilon_1}r^\mathrm{p}_{123}(k_\parallel)\right]\right\},$$ #paper149 Eq. (25)

$$\Gamma(\omega) = \frac{2e^2}{\pi\hbar v^2}\int_0^\infty \frac{\mathrm{d}k_x}{k_\parallel^2}\mathrm{Re}\left\{\underbrace{\int_{-\infty}^{\infty}\mathrm{d}y\,\mathrm{e}^{2\mathrm{i}k_{z1}z_\mathrm{e}(y)}}_{L^\mathrm{eff}(k_\parallel)}\,k_{z1}\left[\left(\frac{k_x v}{k_{z1}c}\right)^2 r^\mathrm{s}_{123}(k_\parallel) - \frac{1}{\epsilon_1}r^\mathrm{p}_{123}(k_\parallel)\right]\right\},$$

$$L^\mathrm{eff}(k_\parallel) \approx L_0\mathrm{e}^{2\mathrm{i}k_{z1}b}\sqrt{\frac{\beta q_0}{k_\parallel}},$$

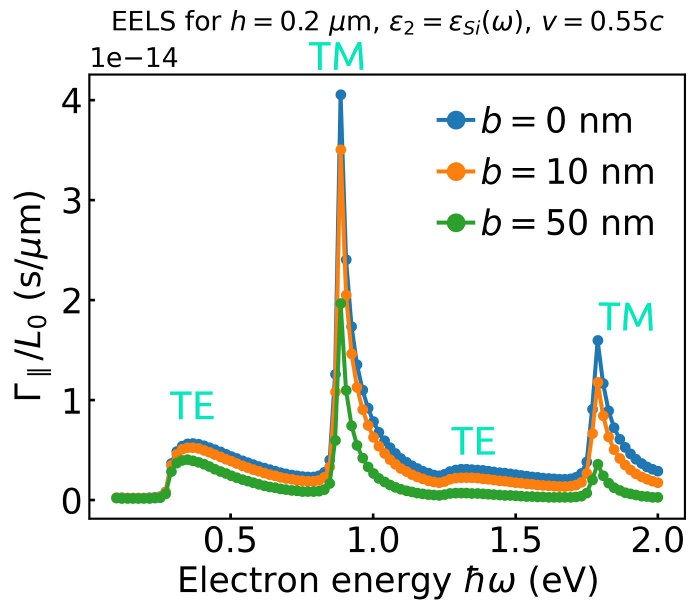


$\epsilon_2(\omega) + \mathrm{i}10^{-1}$ Si from Aspnes $\quad h = 0.2\ \mu\mathrm{m}$

$E_\mathrm{e} = 100$ keV $\quad L_0 = \sqrt{\hbar\pi ac/eV_0},$

$q_0 = m_\mathrm{e}v\gamma/\hbar,\ \beta = v/c.$

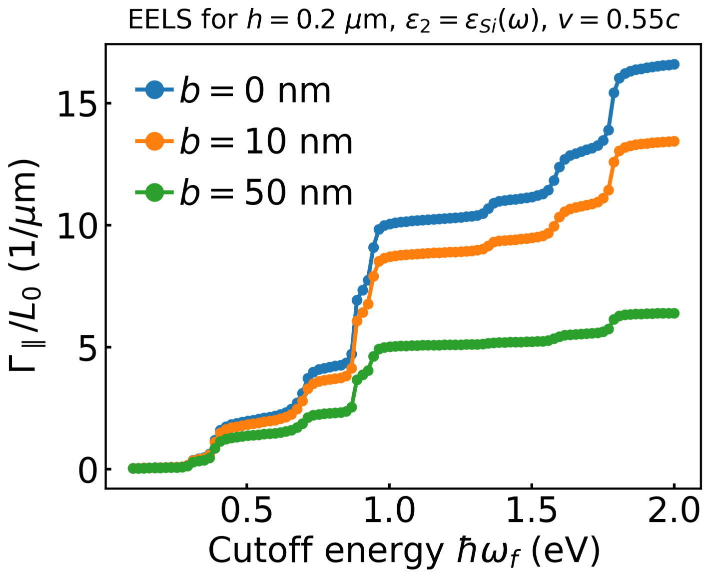
zoom in energy



$$\frac{\Gamma(\omega)}{L_0}$$

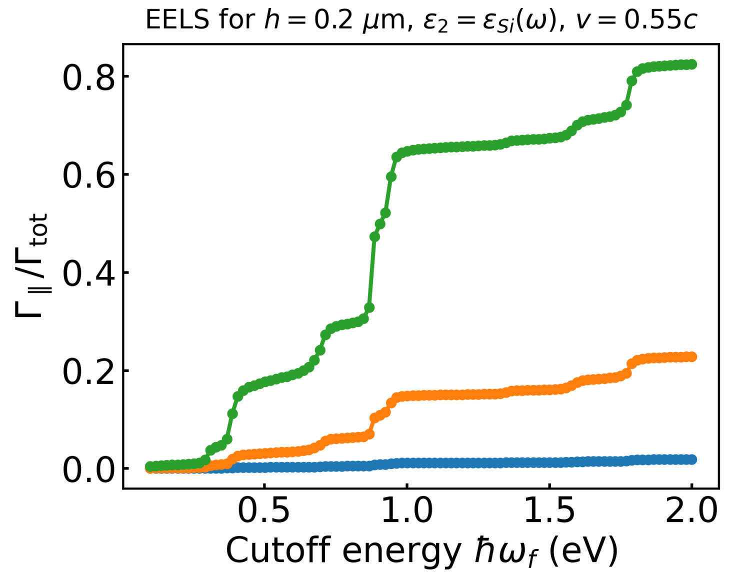
integration over frequency

$$\int_0^{\omega_\mathrm{f}}\mathrm{d}\omega\frac{\Gamma(\omega)}{L_0}$$

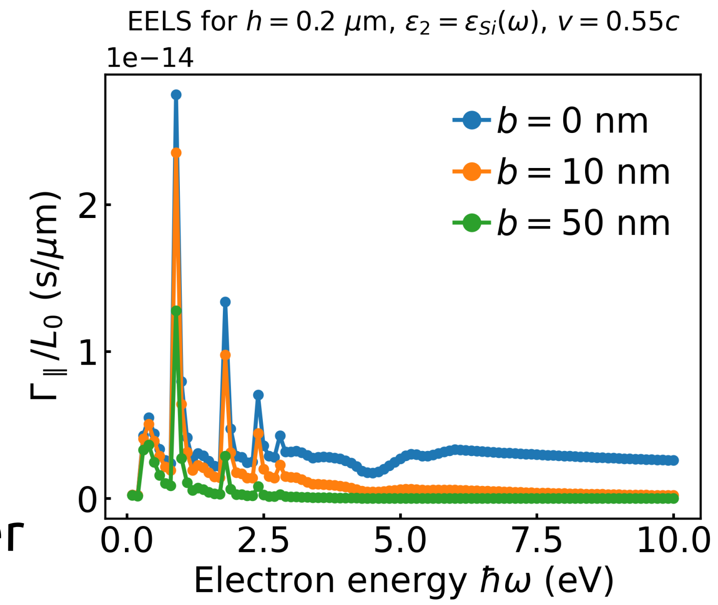


normalization over all frequencies

$$\frac{\int_0^{\omega_\mathrm{f}}\mathrm{d}\omega\Gamma(\omega)}{\int_0^{\infty}\mathrm{d}\omega\Gamma(\omega)}$$



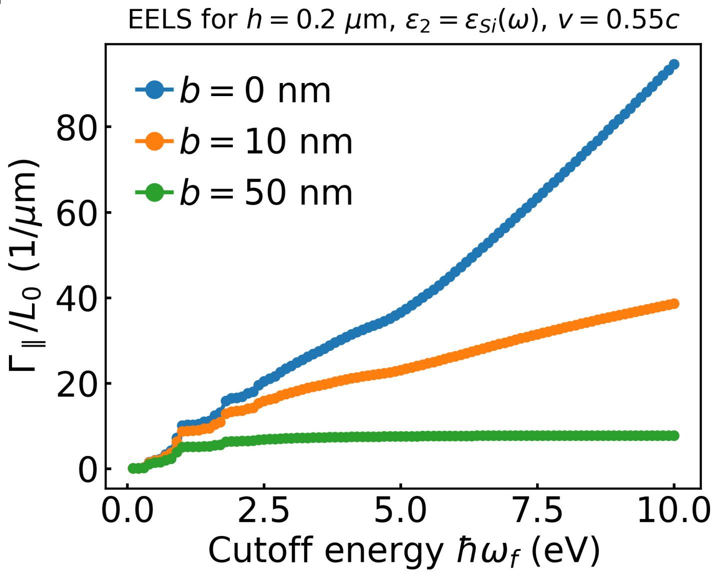
no zoom in energy



$$\frac{\Gamma(\omega)}{L_0}$$

integration over frequency

$$\int_0^{\omega_\mathrm{f}}\mathrm{d}\omega\frac{\Gamma(\omega)}{L_0}$$



normalization over all frequencies

$$\frac{\int_0^{\omega_\mathrm{f}}\mathrm{d}\omega\Gamma(\omega)}{\int_0^{\infty}\mathrm{d}\omega\Gamma(\omega)}$$