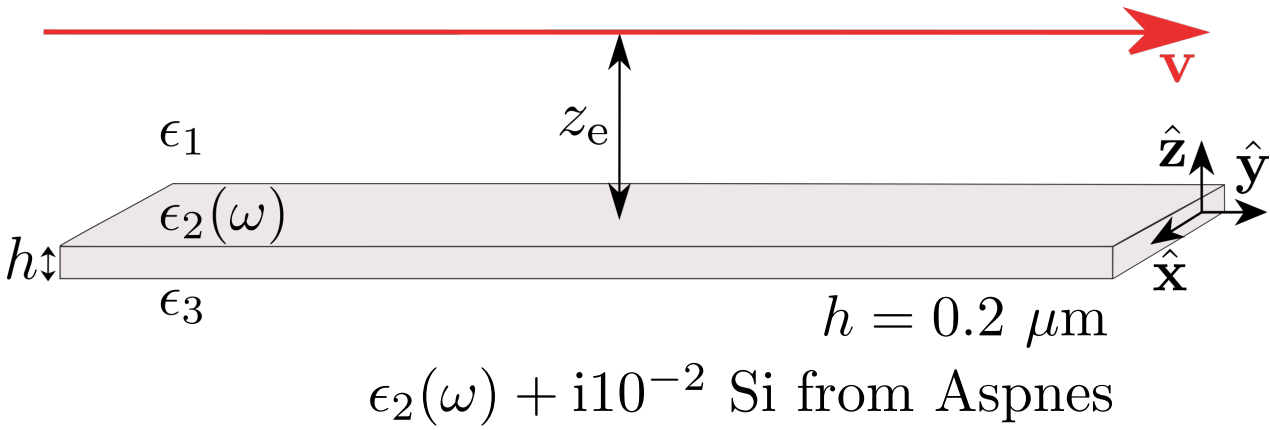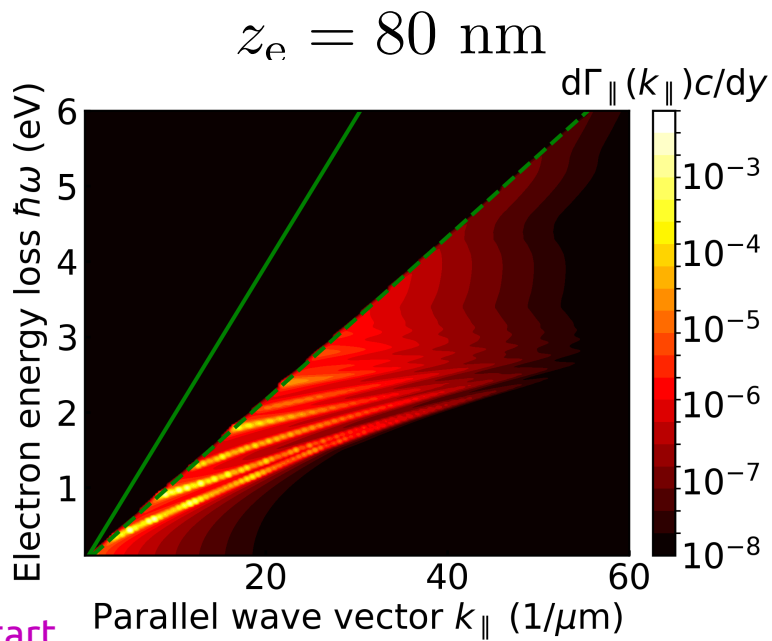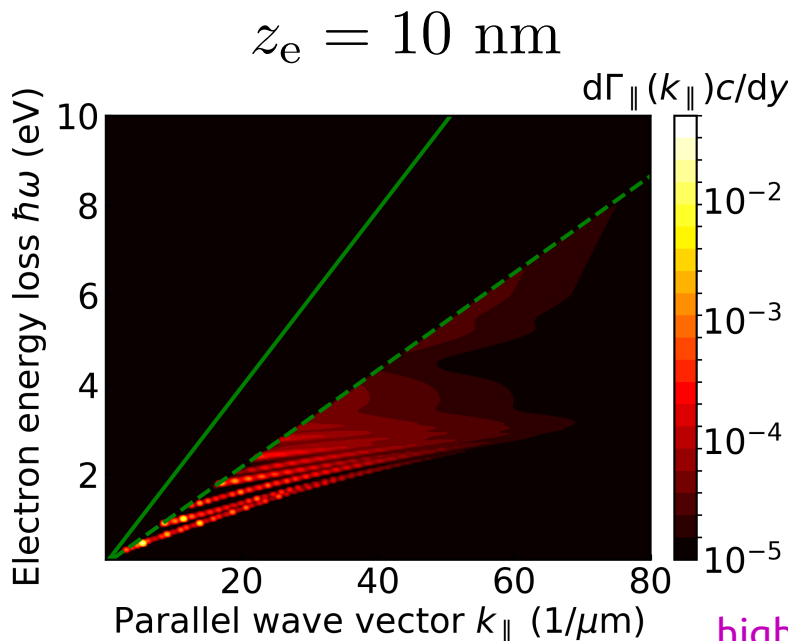# Waveguide modes

$$\frac{d\Gamma}{dy}(k_\parallel, \omega) = \frac{2e^2}{\pi\hbar v^2} \frac{k}{k_\parallel^2} \text{Re}\left\{ k_{z1}e^{2ik_{z1}z_e}\left[\left(\frac{k_x v}{k_{z1}c}\right)^2 r_{123}^s(k_\parallel) - \frac{1}{\epsilon_1}r_{123}^p(k_\parallel) \right] \right\}$$ #paper149 Eq. (25)
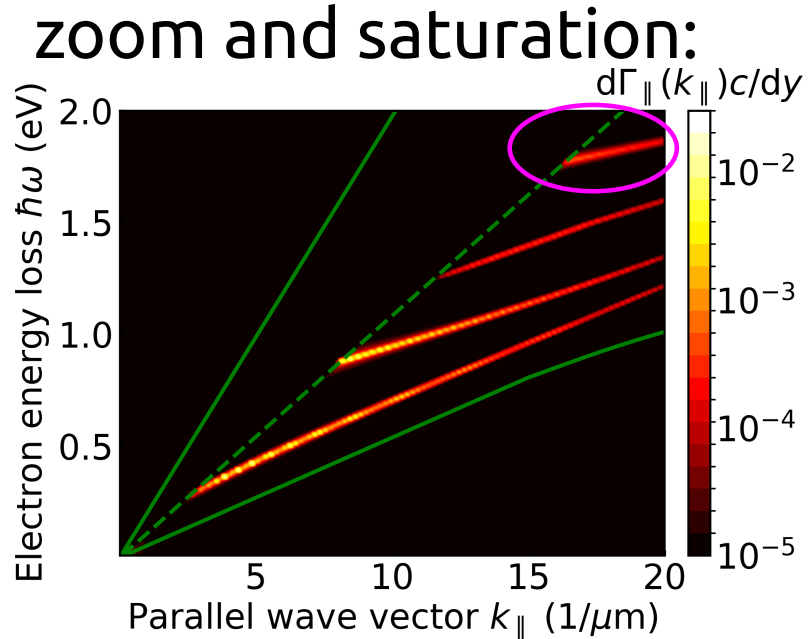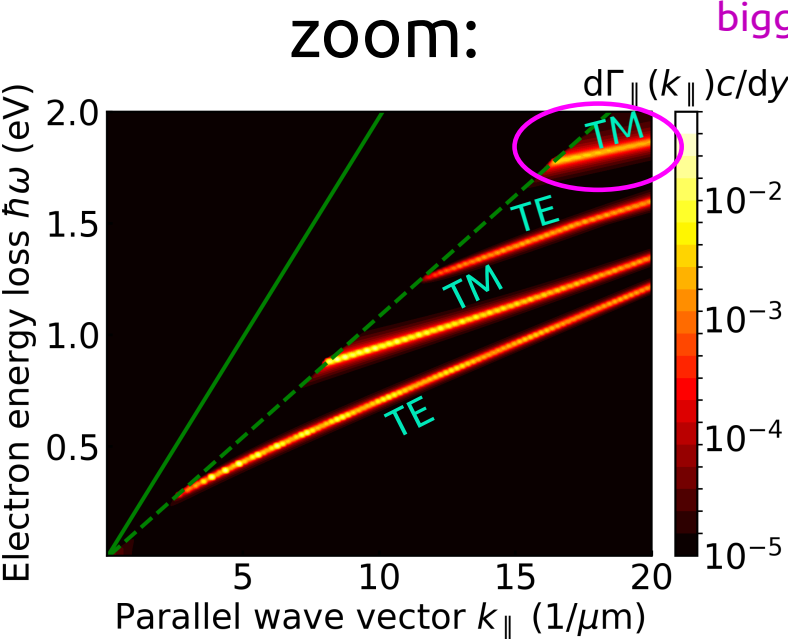
$$r_{123}^\nu = r_{12}^\nu + \frac{t_{12}^\nu t_{21}^\nu r_{23}^\nu e^{2ik_{z2}h}}{1 - r_{21}^\nu r_{23}^\nu e^{2ik_{z2}h}},$$

ϵ_1

z_e

$\epsilon_2(\omega)$

$h \updownarrow$

ϵ_3

$h = 0.2 \ \mu m$

$\epsilon_2(\omega) + i10^{-2}$ Si from Aspnes

$E_e = 100$ keV

$z_e = 10$ nm

$z_e = 80$ nm

higher modes start dissapearing with bigger ze

zoom:

zoom and saturation:

TE: rp = 0
TM: rs = 0

$E_e = 200$ keV

$z_e = 10$ nm

$z_e = 80$ nm

zoom:

zoom and saturation: