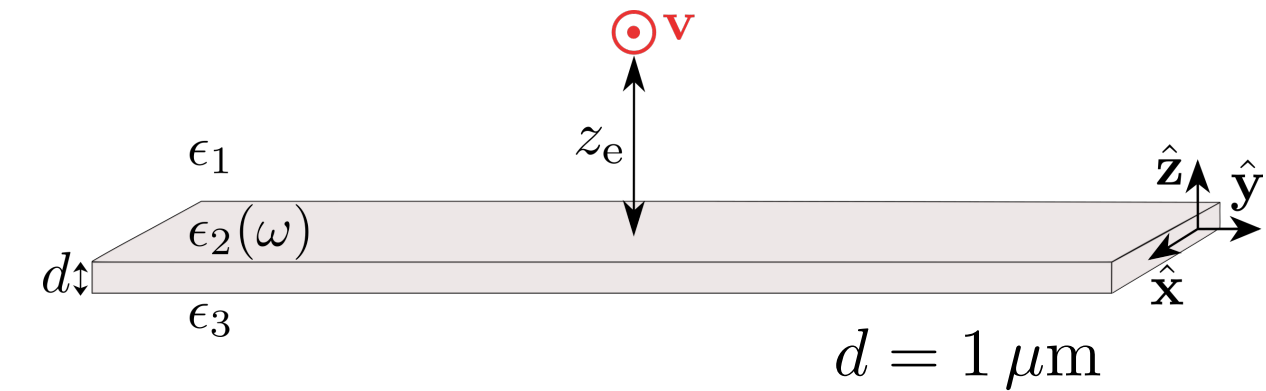
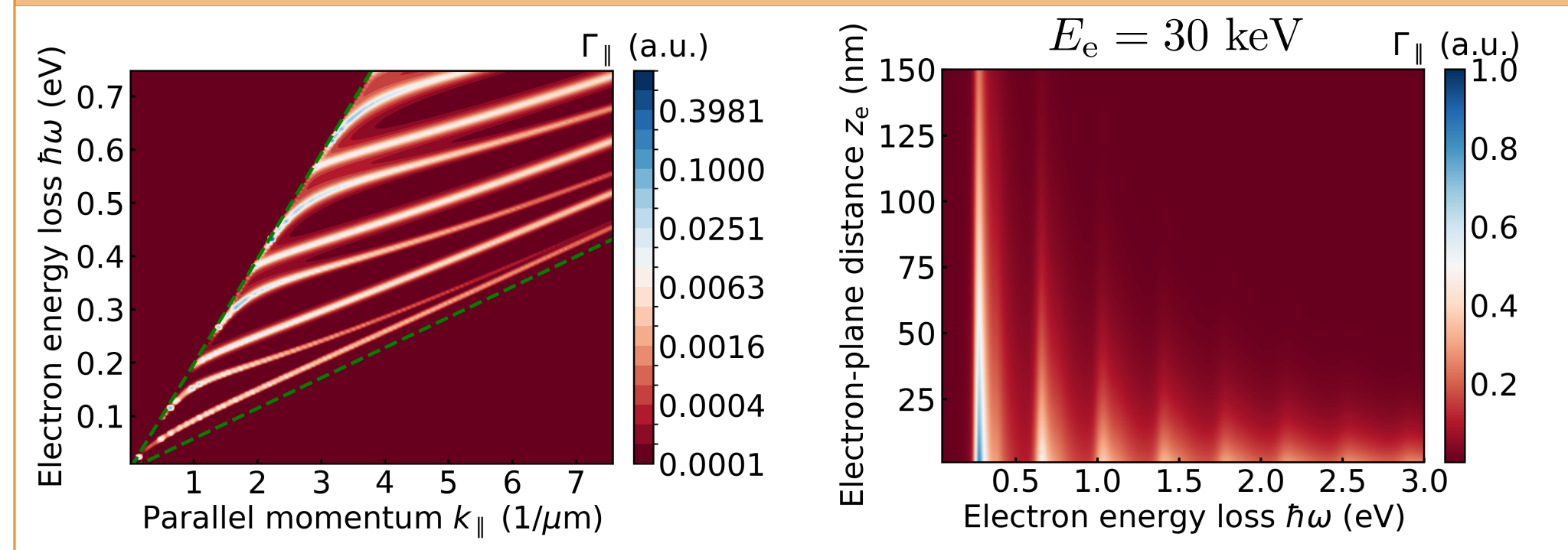


# Electron coupling to a waveguide mode

$$\frac{\Gamma_{\parallel}(\omega)}{L} = \frac{2e^2}{\pi\hbar v^2} \int_{\omega/v}^{\infty} \frac{dk_{\parallel}}{\sqrt{k_{\parallel}^2 - \omega^2/v^2}} e^{-2k_{\parallel} z_e} [\text{Im}\{r_{123}^s(k_{\parallel})\} + \text{Im}\{r_{123}^p(k_{\parallel})\}],$$

$$r_{123}^{\nu} = r_{12}^{\nu} + \frac{t_{12}^{\nu} t_{21}^{\nu} r_{23}^{\nu} e^{2ik_{z2}d}}{1 - r_{21}^{\nu} r_{23}^{\nu} e^{2ik_{z2}d}},$$

$$\epsilon_2 = 12 + i0.1$$



$$\epsilon_2(\omega) \text{ Si from Aspnes}$$

