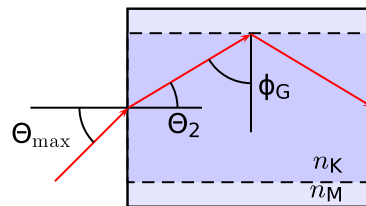


Problem 1: Step-index optical fiber

Determine the maximal angle of incidence Θ_{\max} , for which light can be coupled from air ($n = 1$) into an optical fiber (cladding $n_M = 1.45$, core $n_K = 1.46$). Estimate the coupling losses at this maximal angle of incidence.



Problem 2: Fourier transforms of sine and comb

Compute the Fourier transform of the following functions:

a. $u(t) = \sin(\omega_0 t)$

b. $v(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT)$

Hint: $\delta(x + a) = \frac{1}{2\pi} \int_{-\infty}^{\infty} dq e^{iq(x+a)}$.

Problem 3: Phase velocity

Require $f(x + \Delta x, t + \Delta t) = f(x, t)$ and determine the phase velocity $v = \Delta x / \Delta t$ of the following functions:

a. $f(x, t) = f(x + t)$

b. $f(x, t) = f(bx + ct + d)$

c. $f(x, t) = f(x + d)$