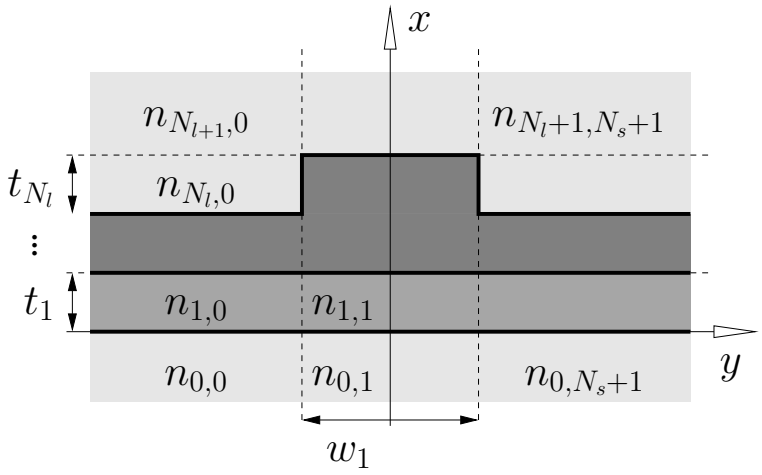
10 WMMS

Wave-matching mode solver for rectangular dielectric optical waveguides



$\sim \exp(\mathrm{i}\omega t),\ \partial_z n = 0,$
$(\boldsymbol{E}, \boldsymbol{H})(x, y, z) = \boldsymbol{\phi}(x, y)\ \exp(-\mathrm{i}\beta z),\ \beta = kN_{\text{eff}}$

fully vectorial or quasi-TE/TM mode equations,
semi-analytical wave-matching procedure

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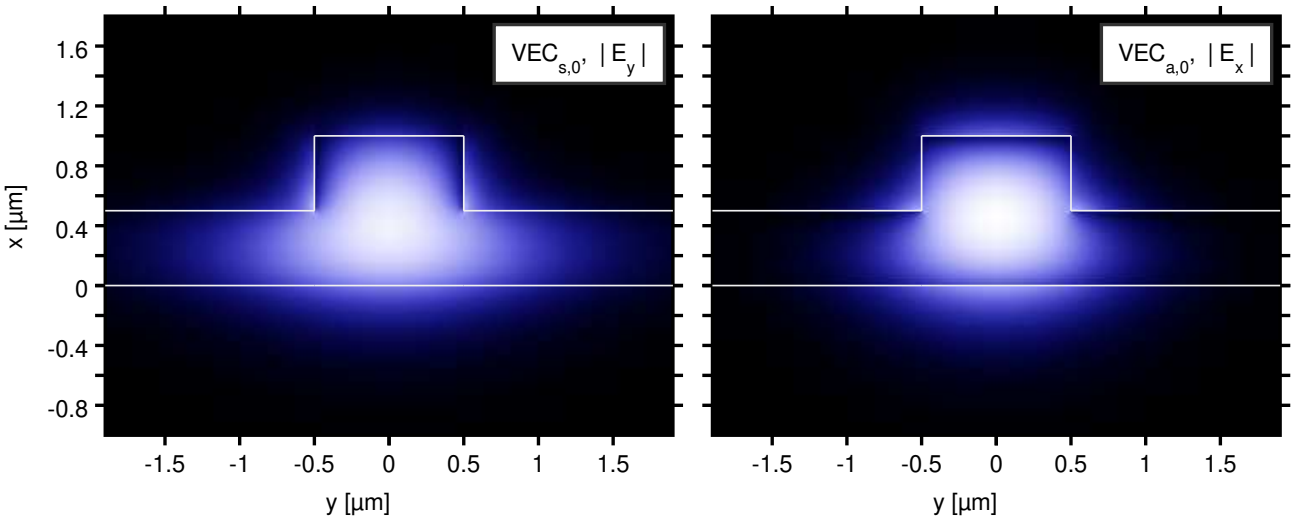
eigenvalue problem ⇝ β, $\boldsymbol{\phi}$.

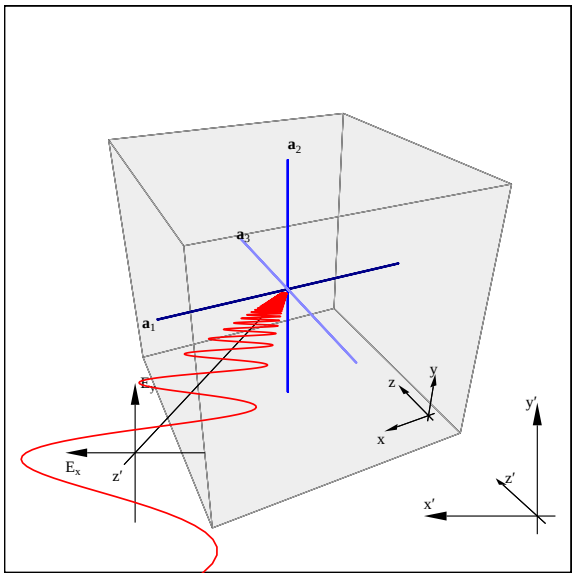
Rib waveguide,

a rib with thicknesses $t_1 = 0.5\,\mu$m, $t_2 = 0.5\,\mu$m, of width $w_1 = 1\,\mu$m, refractive index contrast $1.45 : 1.99 : 1.0$. At wavelength $\lambda = 1.55\,\mu$m, the WMMS solver identifies fundamental vectorial TE-like and TM-like modes of different symmetry with effective indices $N_{\text{eff}} = 1.8242$ ($\text{VEC}_{\text{s,0}}$) and $N_{\text{eff}} = 1.7976$ ($\text{VEC}_{\text{a,0}}$).



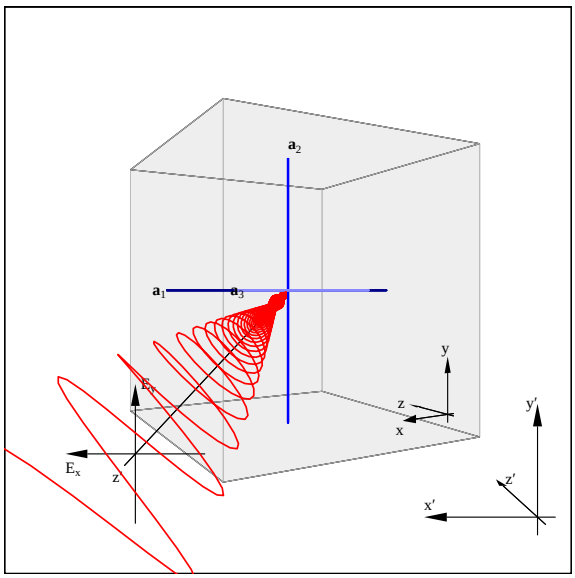
11 ϵ (epsilon)

Optics of anisotropic media in non-crystal-aligned coordinates



Air

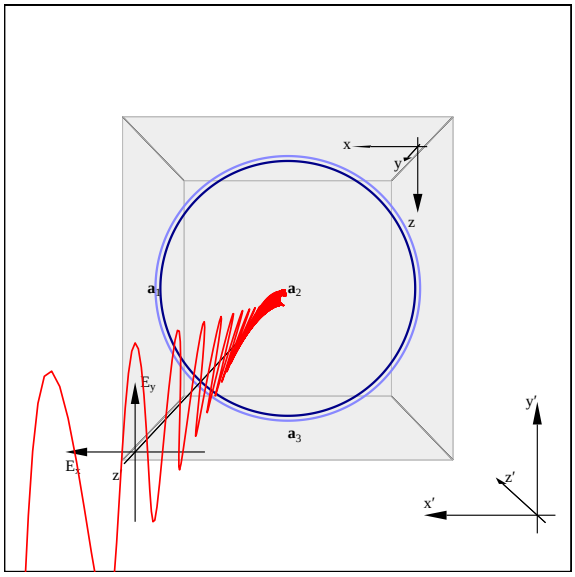
$$\hat{\epsilon} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$



$LiNbO_3$

$$\hat{\epsilon} = \begin{pmatrix} n_\mathrm{e}^2 & 0 & 0 \\ 0 & n_\mathrm{o}^2 & 0 \\ 0 & 0 & n_\mathrm{o}^2 \end{pmatrix},$$

$n_\mathrm{e} = 2.1565,\ n_\mathrm{o} = 2.2242,\ \lambda = 1.55\,\mu\mathrm{m}$



Magnetooptic garnet

$$\hat{\epsilon} = \begin{pmatrix} n^2 & 0 & -\mathrm{i}\xi \\ 0 & n^2 & 0 \\ \mathrm{i}\xi & 0 & n^2 \end{pmatrix}$$

$n = 2.302,\ \lambda = 1.3\,\mu\mathrm{m},$
$\xi = 0.1$ (exaggerated)