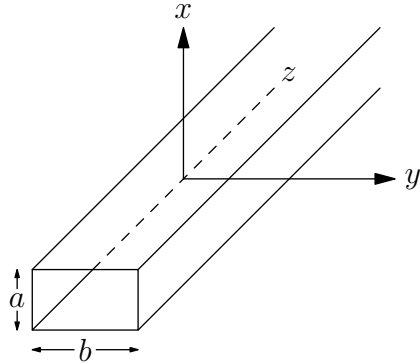


## J10E.3 - Rectangular Waveguide

### Problem



A transverse electric (T.E.) wave is propagating in an infinitely long rectangular waveguide with perfectly conducting walls. The waveguide is filled with a dielectric (dielectric constant  $\epsilon$  and relative magnetic permeability  $mu = 1$ ). The electric field inside it is

$$E_x = E_0 \sin\left(\frac{\pi y}{b}\right) e^{i(kz - \omega t)}, \quad E_y = 0.$$

- a) Find the corresponding  $\vec{B}$  field.

Suppose now that the dielectric is removed from the region  $z > 0$  inside the waveguide, so it is vacuum. The region  $z < 0$  remains filled with dielectric, as before, and the electric field of the incident wave in the region  $z < 0$  is that given above.

- b) Find the transmitted  $\vec{E}$  field in the vacuum region  $z > 0$ .
- c) For what range of  $\omega$  will there be no transmitted propagating wave in the vacuum region  $z > 0$ ?