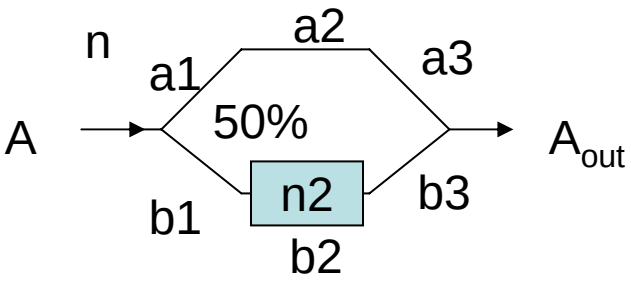
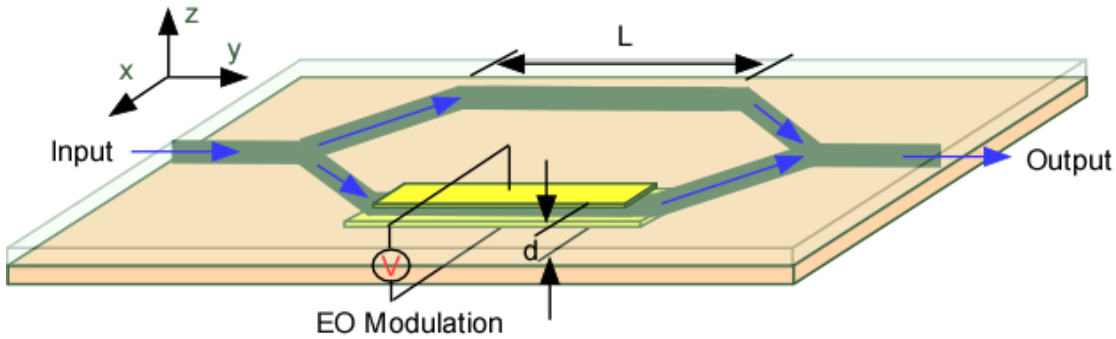
1. Electro-optic modulator based on Mach-Zehnder interferometer



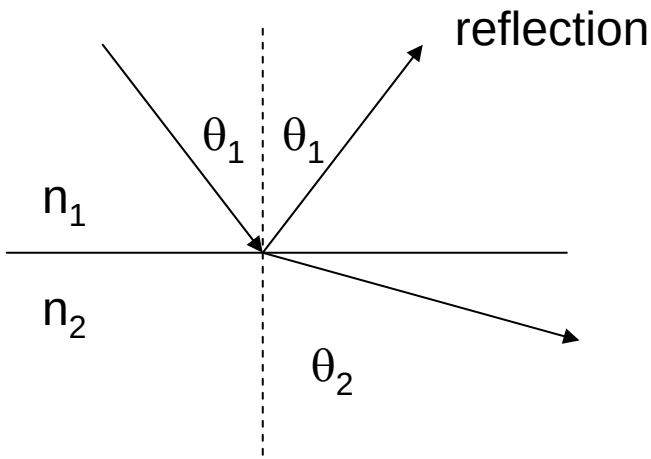


Electro-optic effect, n_2 changes with E –field, $n_2 = n - 1.5\times10^{-4}V$, and the length L = 2cm. Assume the wavelength of the input light is 1.5μm.

a). What's the required voltage to change the output from bright to dark?

b). What's the required voltage to change the output from bright to dark if the input wavelength is 0.5μm (green light)?

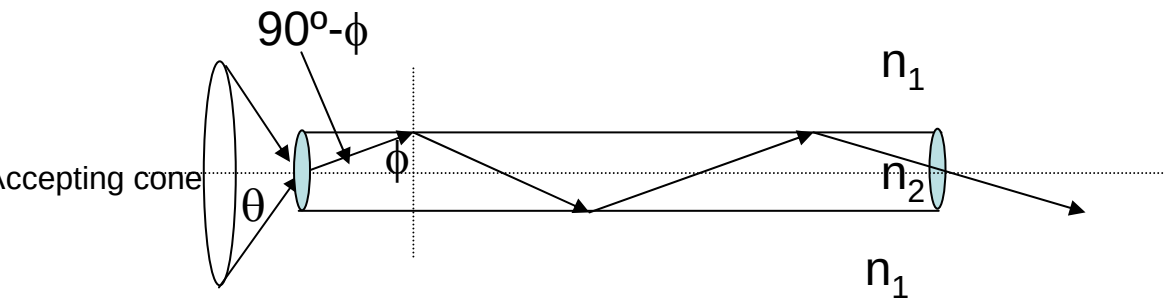
2: reflection and refraction



a). If n_2 = 1.5 (glass) and n_1 = 1.0 (air). Calculate the refractive angle if the incident angle is 30º.

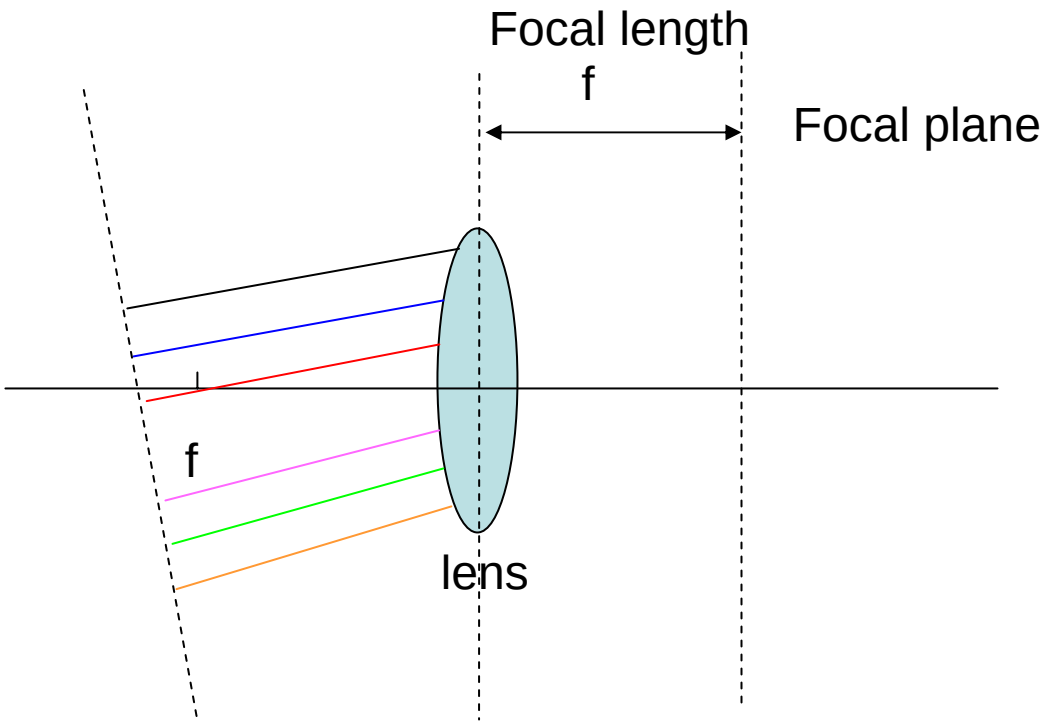
b). If n_2 = 1.5 (glass) and n_1 = 1.0 (air). Calculate the critical angle for total internal reflection.

3. Incident angle for an optical fiber, numerical aperture (NA)



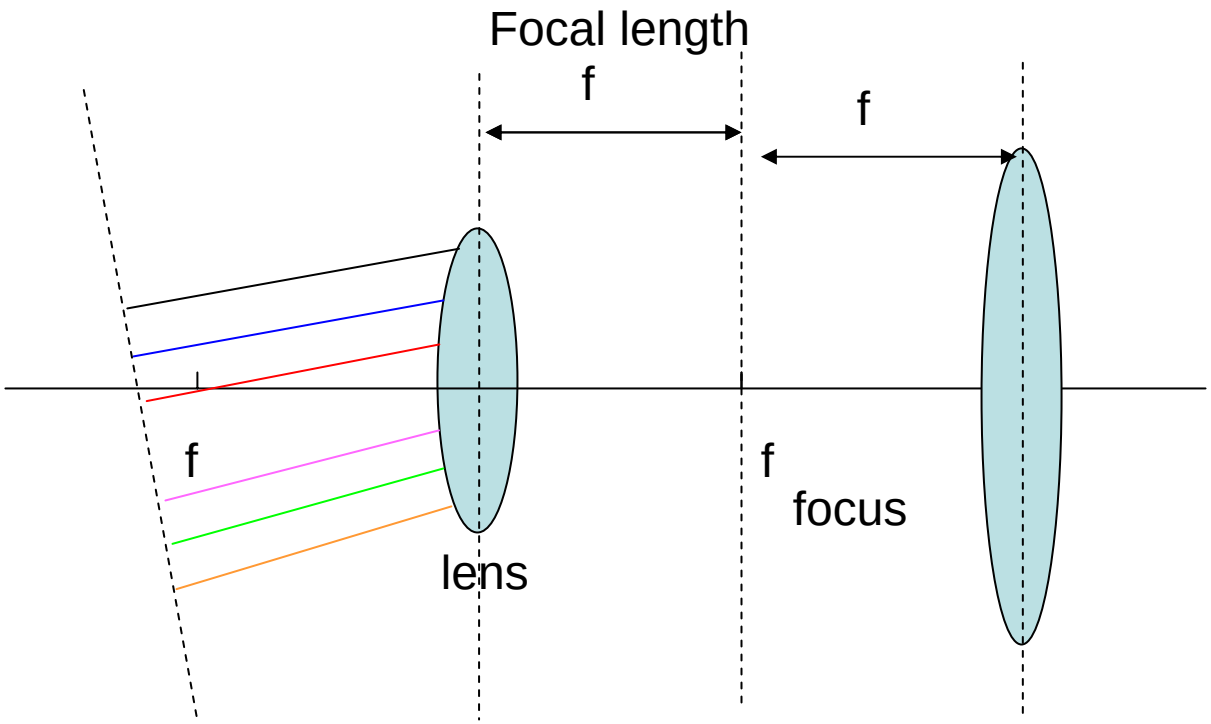
If the index of an optical fiber is n_2 = 1.5 (glass) and n_1 = 1.0 (air). Calculate the maximum allowed angle θ for low loss transmission in an optical fiber. Sin(θ) is called numerical aperture.

4. Lens optics



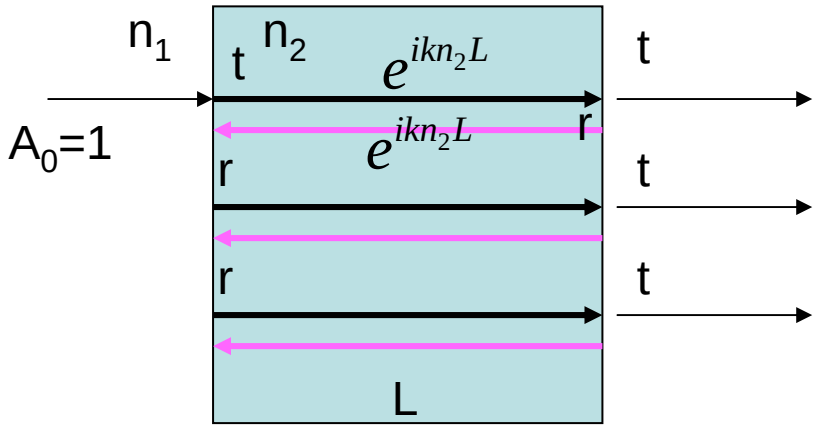
Using graphics, find out the focus point

5. Lens optics



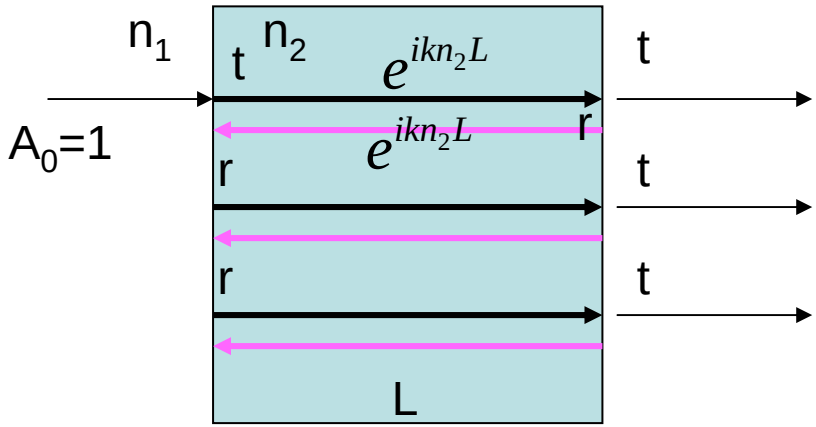
Using graphics, find out the direction of the output light for this lens pair.

6. Resonators



For a resonant filter, n2 = 1.5, n1 =1, L = 20μm. a). Calculate three of the passing wavelengths around 1.5μm. b). What's the orders (m) of these passing wavelengths? c). What's the wavelength separation?

7. Resonators



For a resonant filter, n2 = 1.5, n1 =1, If we want the filter to pass the wavelength of around 1.5μm? what are the possible lengths for the resonator? What's the free spectral range for each of these lengths?