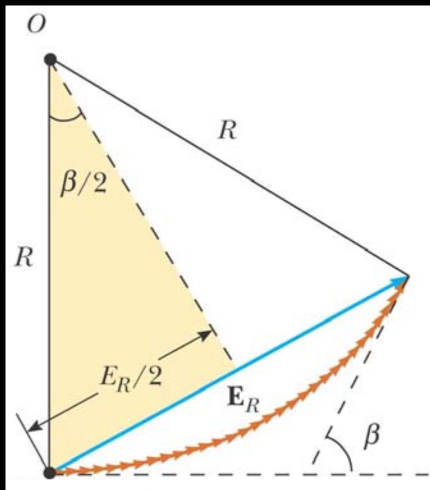
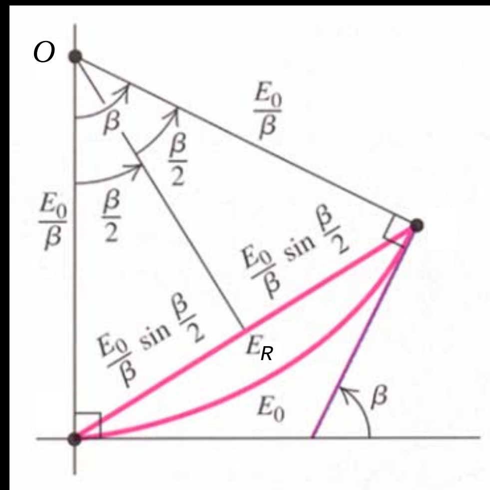
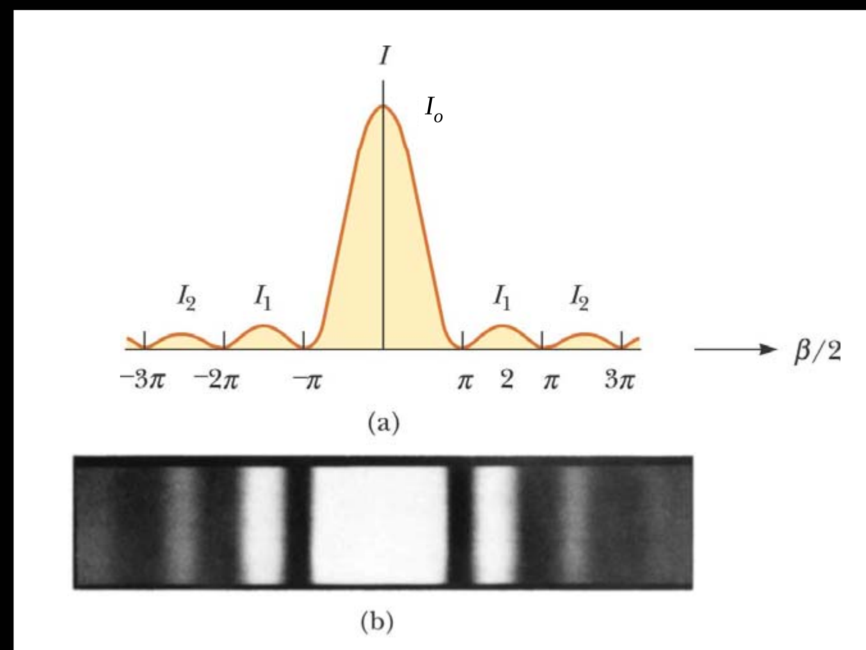
38.2.3. Intensity of single-slit diffraction patterns



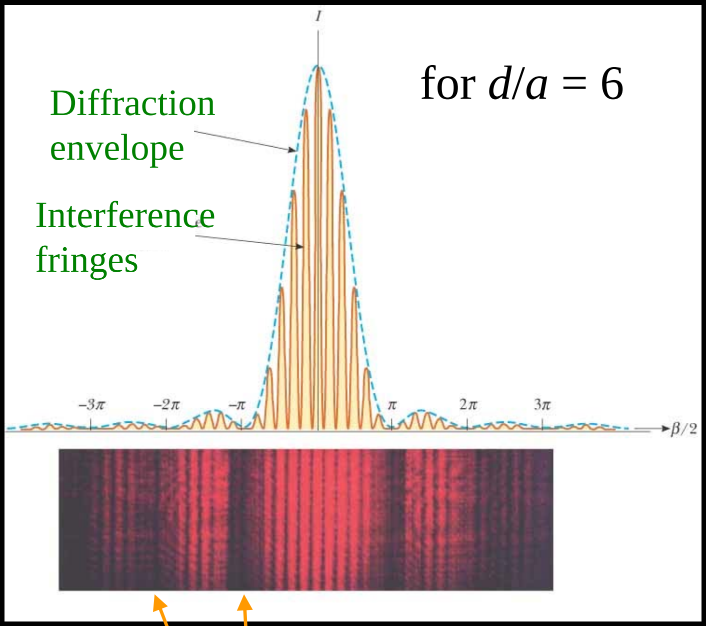


Phasor diagram for a large number of coherent sources. All the ends of the phasors lie on the circular arc of radius R. The resultant electric field magnitude E_R equals the length of the chord.

$$I = I_o \left[\frac{\sin(\pi a \sin\theta / \lambda)}{(\pi a \sin\theta / \lambda)} \right]^2$$



38.2.4. Intensity of two-slit diffraction patterns



Missing orders

$$I = I_o \left[\frac{\sin(\pi a \sin\theta / \lambda)}{(\pi a \sin\theta / \lambda)} \right]^2$$

$$I = I_o \cos^2\left(\frac{\pi}{\lambda} d \sin\theta \right)$$

$$\boxed{\begin{gathered} I = I_o \cos^2(\phi/2) \left[\frac{\sin(\beta/2)}{\beta/2} \right]^2 \\ \begin{cases} \phi = (2\pi d \sin\theta) / \lambda \\ \beta = (2\pi a \sin\theta) / \lambda \end{cases} \end{gathered}}$$

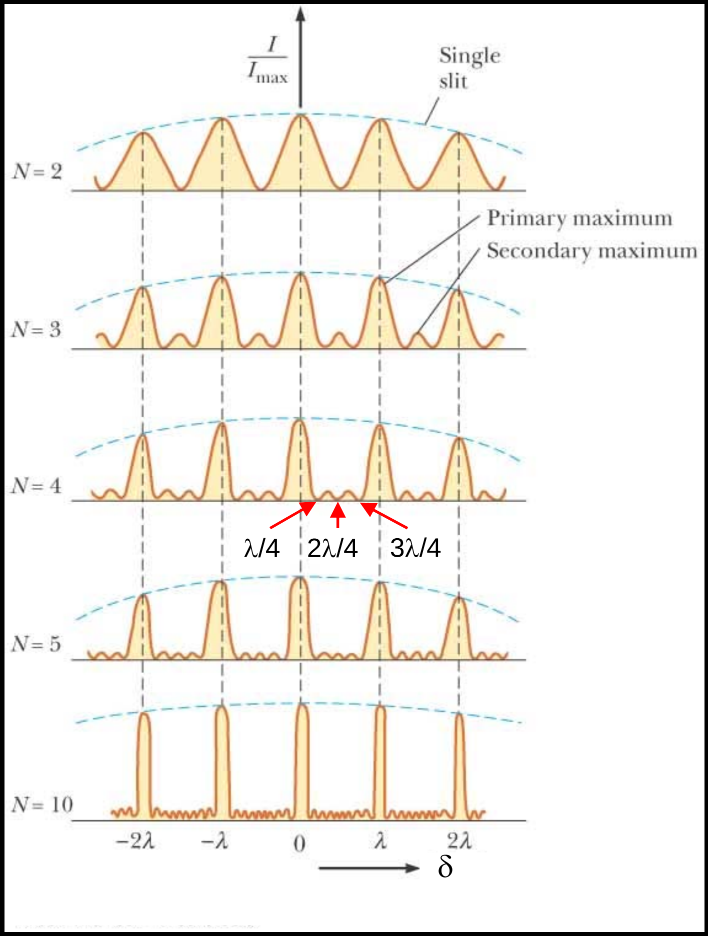
38.4 The diffracting grating

A device, consisting of a large number of equally spaced parallel slits.

(a) Transmission grating.

(b) Reflection grating.

(1) Multiple-slit diffraction :



Increasing the number of slits while keeping the spacing of adjacent slits constant gives interference patterns in which the maxima are in the same positions, but progressively sharper and narrower, than with two slits.