**Reminders 04-09-08:**

- Lockdown Video
- Next POW Due Wednesday April 9
- Next Exam April 16, Chapters 33-36

**Outline:**

- Introduction to Diffraction
- Properties of Single Slit Diffraction
- Intensity of Diffraction Pattern

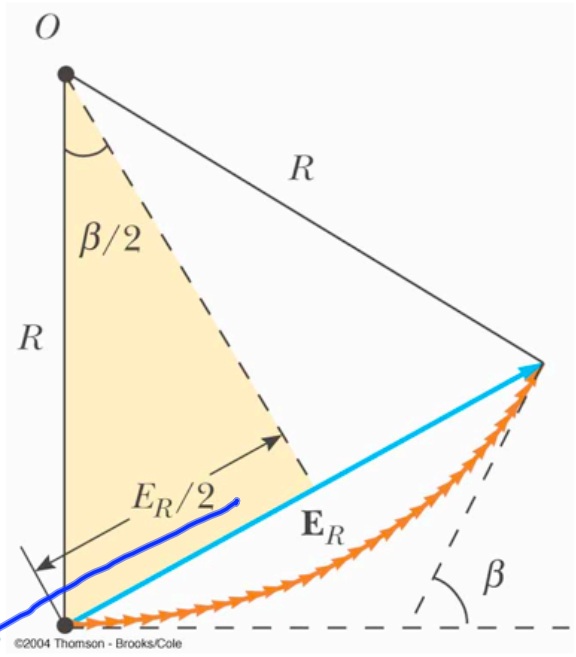
- **To find the intensity, go back to the phasors**
  - The phasors lie along a circle, subtending an angle β
  - Use trigonometry to find

$$\sin\frac{\beta}{2} = \frac{E_R/2}{R}, \quad R\beta = E_0$$

$$E_R = 2R\sin\frac{\beta}{2} = 2\left[\frac{E_0}{\beta}\right]\sin\frac{\beta}{2}$$

$$= E_0\left[\frac{\sin(\beta/2)}{\beta/2}\right]$$

$$I = I_0\left[\frac{\sin(\beta/2)}{\beta/2}\right]^2 = I_0\left[\frac{\sin(\pi a\sin\theta/\lambda)}{\pi a\sin\theta/\lambda}\right]^2$$




Phase angle $\phi = kx$

$$= \frac{2\pi}{\lambda} a\sin\theta$$

$$\frac{dI}{d\beta} = 0 = \frac{d}{d\beta} I_0\left[\frac{\sin(\beta/2)}{\beta/2}\right]^2 = 0$$

1st maxima $\beta = \pm 2.860\pi$; $I = .0472 I_0$

2nd maxima $\beta = 4.918\pi$; $I = .0165 I_0$

- **A screen is placed 50 cm from a single slit, which is illuminated with light of wavelength 690 nm. If the distance between the first and third minima in the diffraction pattern is 3.0 mm, what is the width of the slit?**

Solve for a

$$y = L\tan\theta \cong L\sin\theta = L\frac{m\lambda}{a}$$


$$\Delta y = \frac{L\,\Delta m\,\lambda}{a} = \frac{(.50m)(2)(690\times10^{-9})}{a}$$

$$a = \frac{(.50m)(2)(690\times10^{-9})}{.003m} = .23mm$$

$$2.3\times10^{-4}m$$