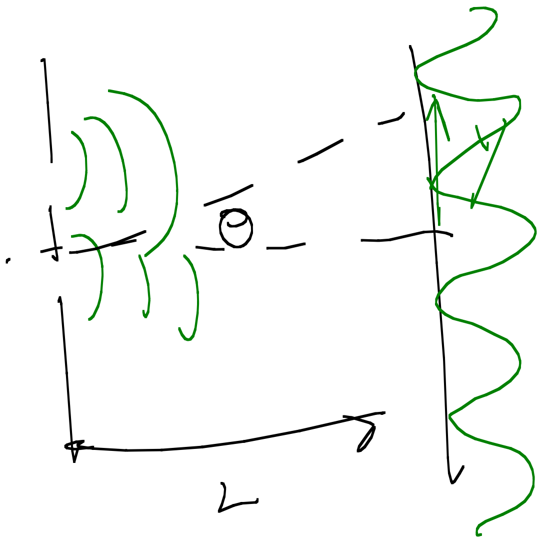
Phys 2120-4 12/7/12

Note Title 12/7/2012

Chap 32 Those damn slits

$\frac{y}{L} \simeq \sin\theta \approx \tan\theta$



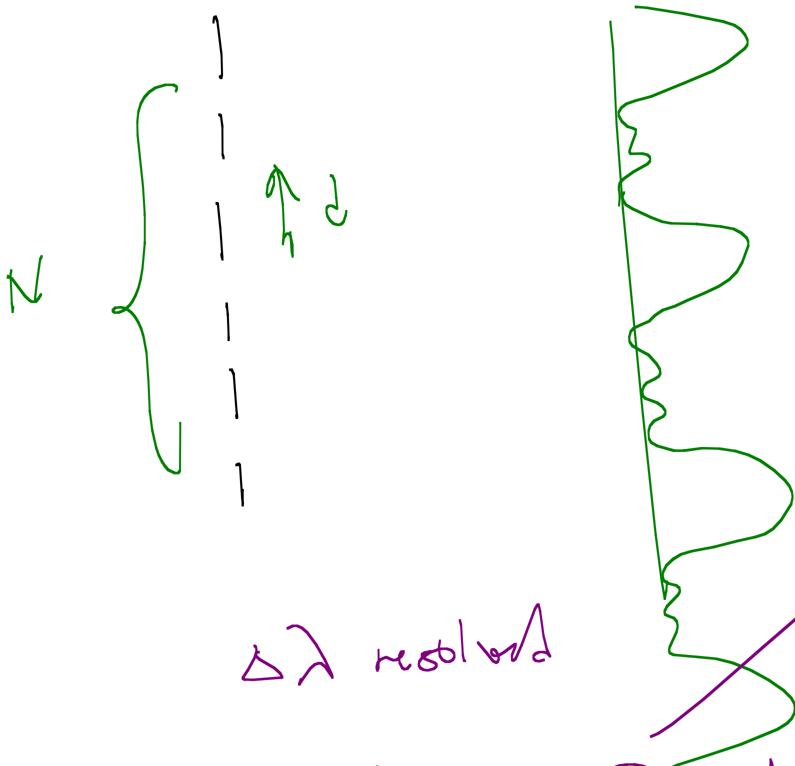
Interference

$m = 0, 1,$

$d \sin\theta = m\lambda$ bright

$d \sin\theta = (m + \frac{1}{2})$ dark

$$\bar{S} = 4\bar{S}_0 \cos^2\left(\frac{\pi d}{\lambda L} y\right)$$



N slits

$$d \sin\theta = m\lambda$$ same cond for maxima

$$d \sin\theta = \frac{m}{N}\lambda$$ dark

m not mult of N

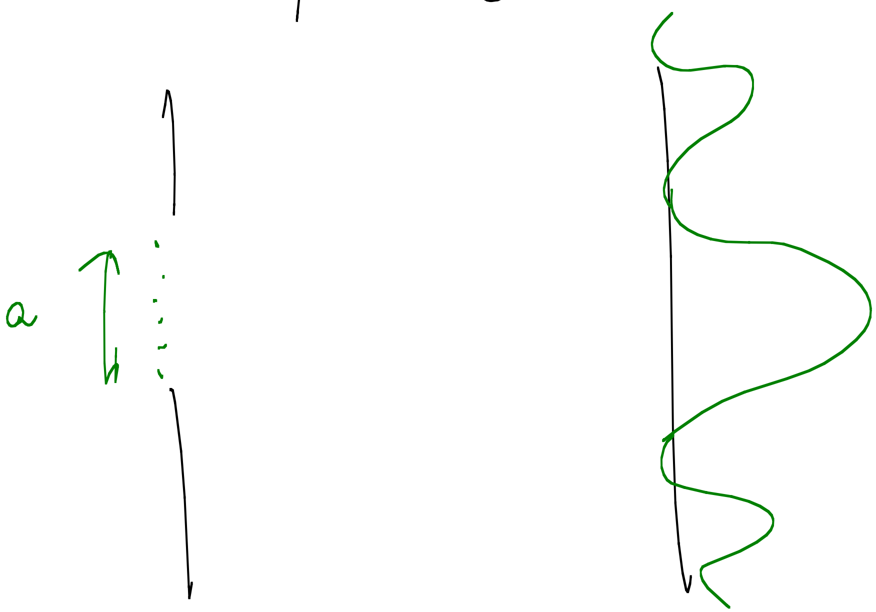
$\Delta\lambda$ resolved

$$\lambda/\Delta\lambda = mN$$

$m = 1, 2,$

Diffraction

Single slit

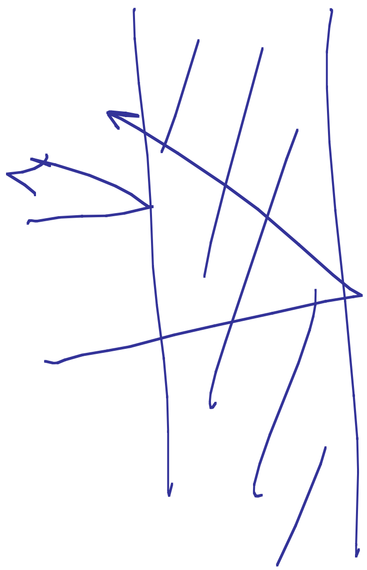


$$a \sin\theta = m\lambda$$

dark fringe

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

$$\bar{S} = \bar{S}_0 \left[\frac{\sin(\phi/2)}{\phi/2} \right]^2$$



Phase chang?

Extra length $2d$

$$\lambda_{material} = \lambda/_{c}$$

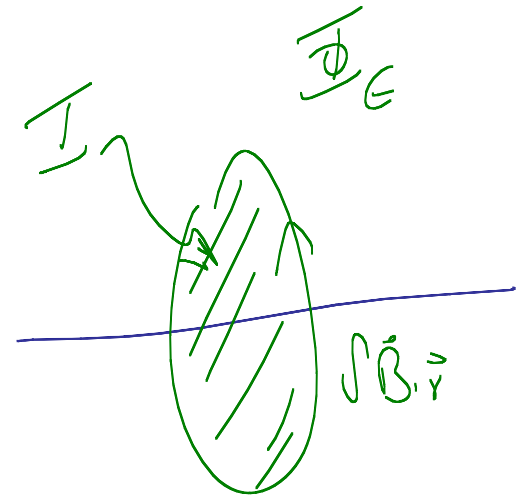
Essential of that Maxwell Eqn chapter

$$\oint \vec{B}\cdot d\vec{r} = \mu_0 I$$

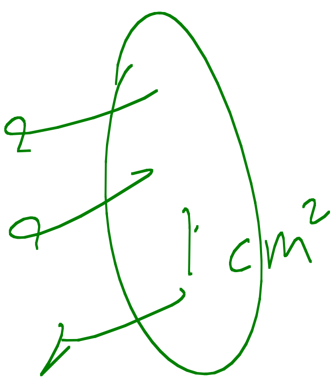
Correct version

$$\oint \vec{B}\cdot d\vec{r} = \mu_0 I + \overbrace{\mu_0 \epsilon_0 \frac{d\Phi_E}{dt}}^{I_{disp}}$$

$$\Phi_E = \int_S \vec{E}\cdot d\vec{A}$$



29.13 A uniform electric field is incr'ing at $1.5 \frac{(V/m)}{\mu s}$. Find disp current through $1\ cm^2$ area perp to field



$$I_{disp} = \frac{d}{dt}\left[\epsilon_0 \underbrace{\int \vec{E}\cdot d\vec{A}}_{EA}\right] \qquad 1.3\times10^{-9}\ A$$

$$= \epsilon_0 A \frac{dE_x}{dt} = (8.85\times10^{-12})(10^{-4}\ m^2)\left(\frac{1.5\ V}{10^{-6}\ s}\right) =$$

29.14 A parallel-plate capacitor has sq. plates 10 cm on side and 0.50 cm apart. Voltage is incr'ing at 220 $\frac{V}{ms}$. What's disp. current in capacitor.

∞ - plates

$E_{inside} = \frac{V}{d}$

d = 0.5 m

$10 \text{ m} = a$

$= 3.9 \times 10^{-16} A$

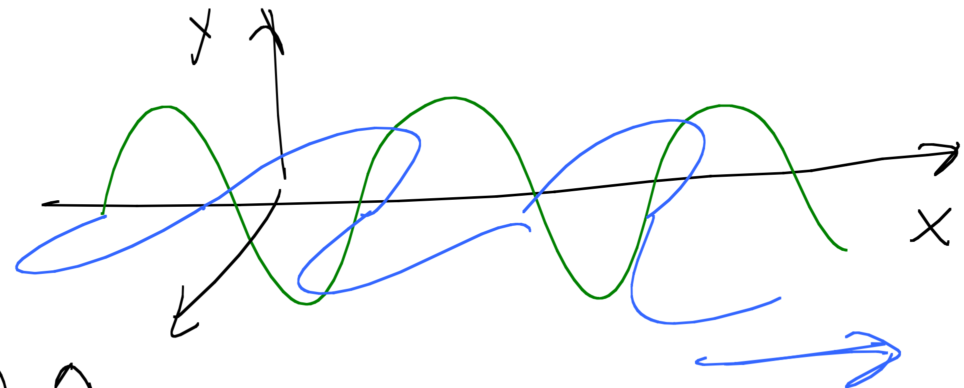
$I_{disp} = \epsilon_0 \frac{d\Phi_E}{dt}$

$= (8.85\times 10^{-12}) \frac{(0.10)^2\, 220V}{(0.005)\, 10^{-3} s}$

$= \epsilon_0 \frac{d}{dt}\left[E\,(a^2)\right] = \epsilon_0 a^2 \frac{1}{d} \frac{dV}{dt} = 3.9\ \mu A$

Prop along x

$E_y \quad B_z$



$$\vec{E}(x,t) = E_p \sin(kx-\omega t)\,\hat{j}$$

$$\vec{B}(x,y) = B_p \sin(kx-\omega t)\,\hat{k}$$

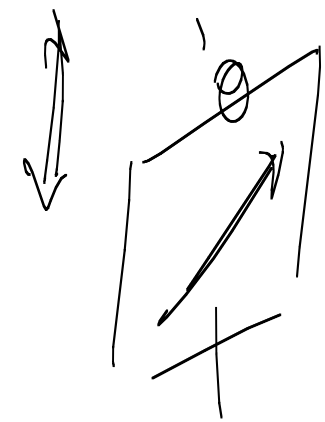
Speed $v = c = \frac{\omega}{k} = \lambda f$

Amplitudes

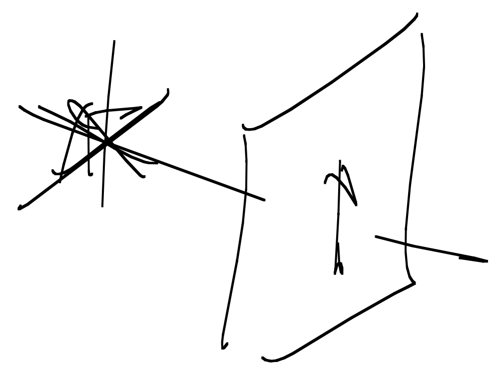
$E = cB$

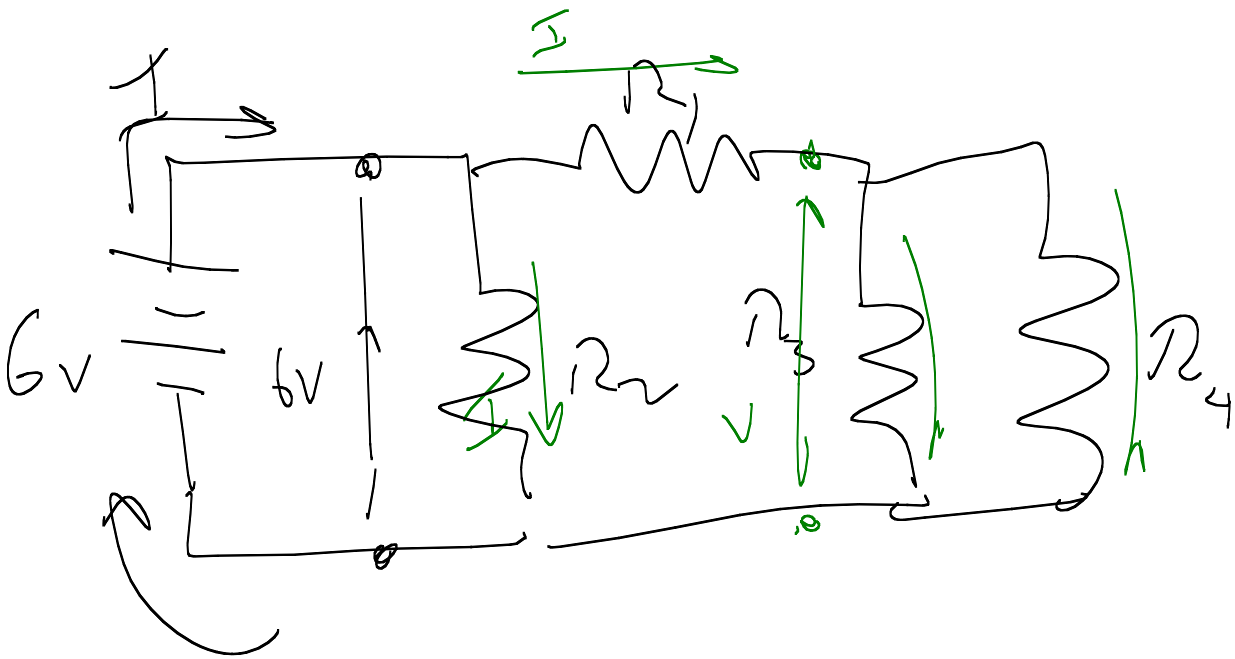
Polarization

$$S = S_0 \cos^2\theta$$



$$S = \frac{1}{2} S_0$$





$V = IR$