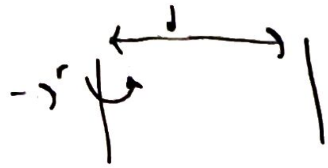
Week 7

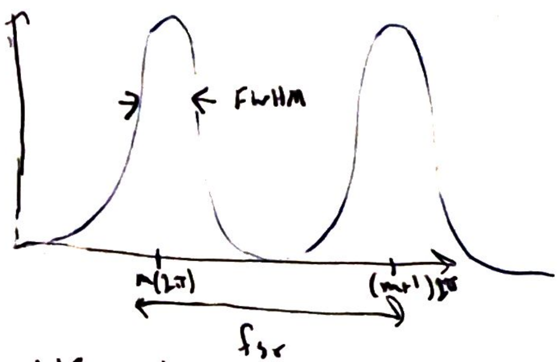
$\Delta f_{fsr} = \frac{c}{2d}$



$T = \frac{1}{1+F\sin^2(\delta/2)}$ $\delta = 2kd$

$F = \frac{4r^2}{(1-r^2)^2}$ coefficient of finesse

$\mathcal{F} = \frac{\pi\sqrt{F}}{2} = \frac{\pi r}{1-r^2}$ finesse $= \frac{\text{sep. of peaks}}{\text{FWHM}}$



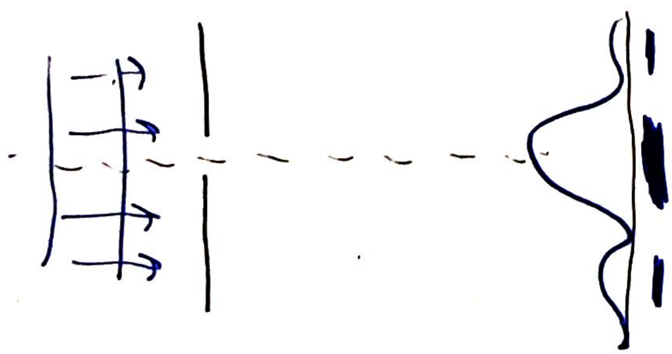
$\text{FWHM} = \frac{\Delta f_{fsr}}{\mathcal{F}}$

$\left|\frac{df}{d\lambda}\right| = \frac{-c}{\lambda^2}$ $\Delta\lambda = \frac{\lambda^2 \Delta f}{c}$

$R = \frac{\lambda}{\Delta\lambda}$ ← minimum difference resolvable

FSR?

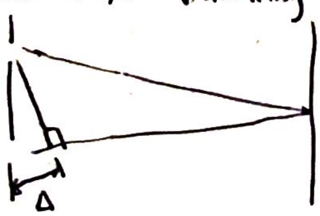
Fraunhofer diffraction



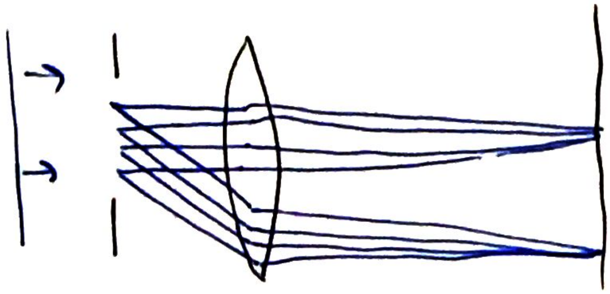
Fraunhofer:
- screen far away
- aperture small (comparable to light wavelength)

our analysis of young's 2-slits was Fraunhofer diffraction

we had rays travelling (almost parallel to each other).



Fraunhofer is exact at the back focal plane of a lens



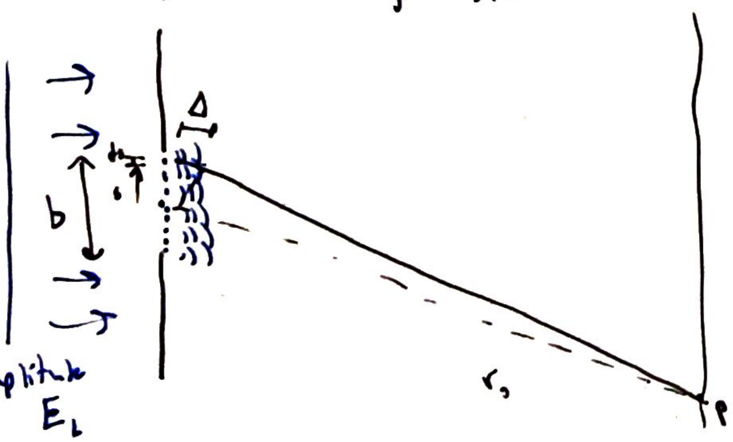
Single slit

$\theta \approx \frac{\lambda}{b}$

$\Delta = \frac{b}{2}\sin\theta$

if $\Delta = \frac{\lambda}{2} \Rightarrow$ destruction so $\frac{\lambda}{2} = \frac{b}{2}\sin\theta$ so $\theta = \frac{\lambda}{b}$

Analysis of single slit



amplitude E_L

due to an Huygenian emitter

disturbance at p is $\frac{E_L\, ds}{r_0+\Delta}\exp\left(ik(r_0+\Delta)-\omega t)\right)$

amplitude of E

this is because the spherical wave will decay like 1/r