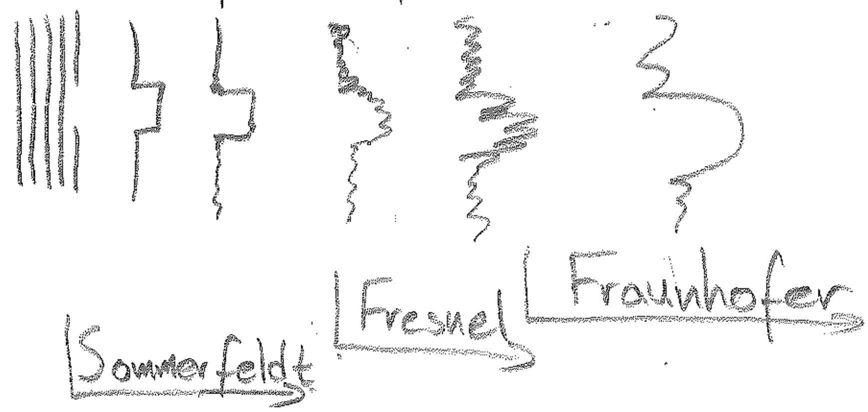
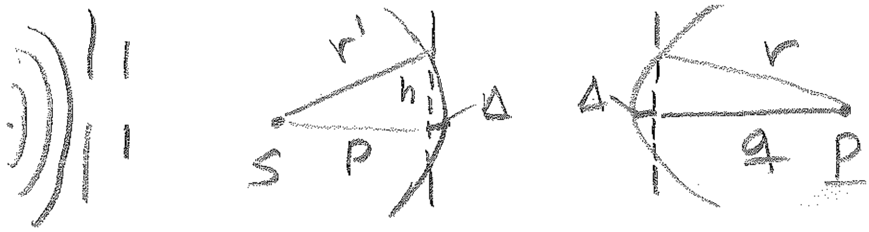
Föreläsning 11 27/04-15

Fresneldiffraktion

Diffraktion långt borta från spalten kallas Fraunhoferdiffraktion.



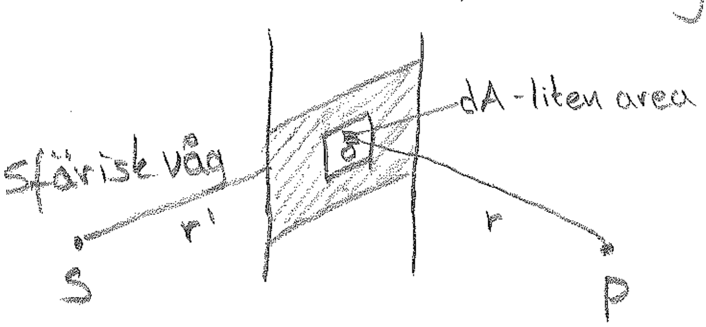


$$\Delta = r' - \sqrt{r'^2 - h^2} = r' - r'\left(1 - \frac{h^2}{r'^2}\right)^{1/2} \approx r' - r'\left(1 - \frac{h^2}{2r'^2}\right)$$

$$\Delta \approx \frac{h^2}{2r'} \approx \frac{h^2}{2p} > \lambda \qquad \Delta \approx \frac{h^2}{2q} > \lambda$$

$$\Rightarrow \frac{1}{2}\left(\frac{1}{p} + \frac{1}{q}\right) h^2 > \lambda$$ – Använd Fresnel

Fresnel-Kirchoffs integral



$$E_0 = \frac{E_S}{r'} e^{i(kr' - \omega t)}$$

$$dE_P = \frac{dE_0}{r} e^{i(kr - \omega t)}$$

$$\frac{dE_0}{r} = \frac{E_A}{r} dA$$ Fält/Area

Hur starkt vid hindret?

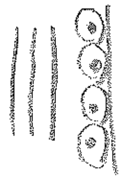
$$E_A = \underset{\text{konst}}{\alpha}\left(\frac{E_s}{r'}\right)e^{ikr'} \Rightarrow dE_p = \alpha\left(\frac{E_s}{rr'}\right)e^{ik(r+r')}e^{-i\omega t}dA$$

$$\Rightarrow E_p = \alpha E_s e^{-i\omega t}\iint_{\text{öppningen}} \frac{1}{rr'}e^{ik(r+r')}dA \quad \text{- Fresnel}$$

Kirchoff

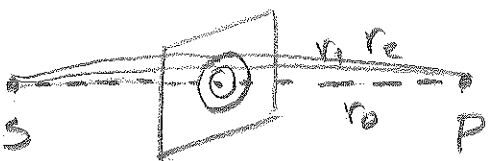
$$E_p = -\frac{ikE_s}{2\pi}e^{-i\omega t}\iint F(\theta)\frac{e^{ik(r+r')}}{rr'}dA$$

$F(\theta)$ - skevhetsfaktorn



Huygens ⇒ Huygen + Fresnel

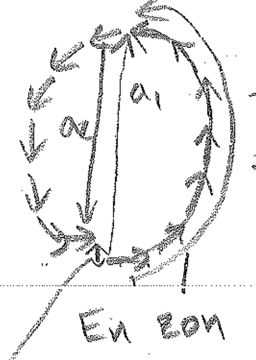
$$F(\theta) = \frac{1+\cos\theta}{2}$$



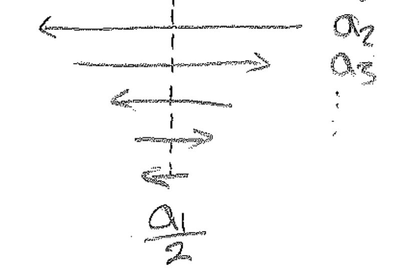
Fresnel-zoner!

så att $r_1 = r_0 + \frac{\lambda}{2}$

$r_2 = r_1 + \frac{\lambda}{2}$



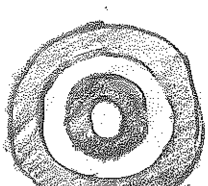
$$\Rightarrow A_n = a_1 + a_2e^{i\pi} + a_3e^{i2\pi} + \dots$$
$$= a_1 - a_2 + a_3 - a_4 \dots$$



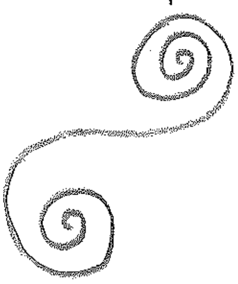
En zon

Pga $F(\theta)$

Fresnels zonplatta



Cornu spiral



$$E_p = C_1 e^{-i\omega t}\iint e^{ik(r+r')}dA$$