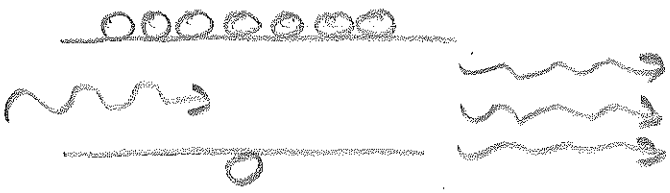
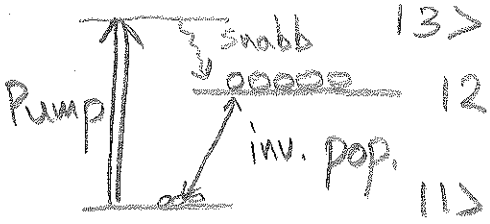
Föreläsning 8 15/04-15

Lasrar

(Inverterad population)



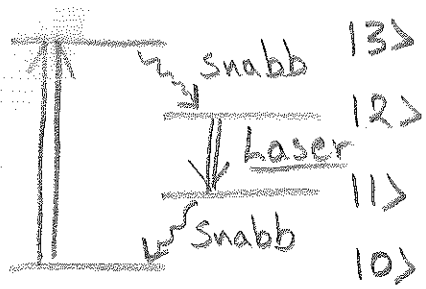
Trenivå system



|3> — Kallas (brac)ket, beskriver kvanttillstånd.

|2>
|1>
} Laser

Fyrnivå system



Interferens

$$I = I_1 + I_2 + \underbrace{2\sqrt{I_1 I_2}\cos\delta}_{\text{Interferens term}}$$

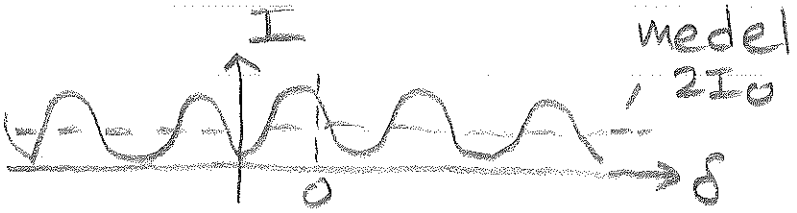

konstr.


destr.

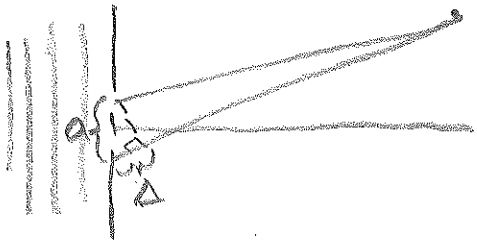
Om $I_1 = I_2 = I_0$

$\Rightarrow I_{max} = 4I_0$

$I_{min} = 0$



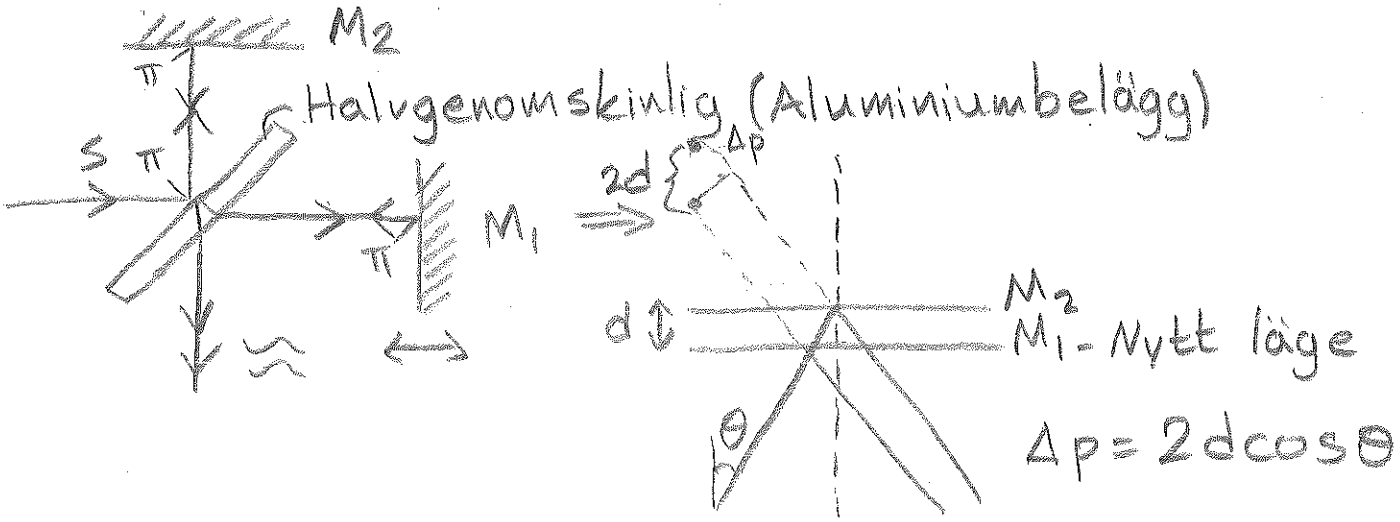
Dubbelspalt



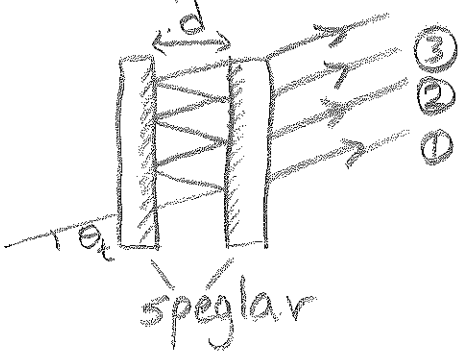
$L \gg a \Rightarrow s_2 - s_1 = \Delta \approx a\sin\theta = m\lambda$ om ljust

om mörkt $= m\lambda + \frac{\lambda}{2}$

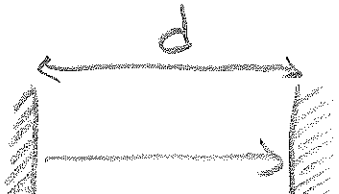
Michelson-interferometer



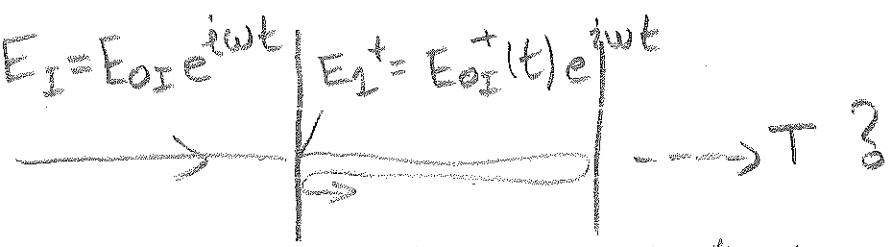
Fabry-Perot



$2d\cos\theta_t = m\lambda$ - ljust



$$\tau = \frac{2d}{v} = \frac{2nd}{c}$$



$$E_{01}^+(t+\tau)e^{i\omega(t+\tau)} = t E_{0I} e^{i\omega(t+\tau)} + r^2 E_{01}^+ e^{i\omega t} e^{i(\omega\tau - 2kd)}$$

Steady state

$$E_{01}^+(t+\tau) = E_{01}^+(t) \equiv E_{01}^+$$

$$\Rightarrow E_{01}^+ = \frac{t}{1 - r^2 e^{i\delta}} E_{01} \qquad \delta = 2kd$$

$$\Rightarrow E_T(t+\tau/2) = t E_{01}^+ e^{i\omega t} e^{i(\omega\tau/2 - \delta/2)}$$

$$E_{0T} = \frac{t^2 e^{-i\delta/2}}{1 - r^2 e^{-i\delta}} E_{0I}$$

$$T = \frac{I_I}{I_I} = \frac{E_{0T} E_{0I}^*}{E_{0I} E_{0I}^*} = \frac{t^4 e^{-i\delta/2} e^{i\delta/2}}{(1 - r^2 e^{-i\delta})(1 - r^2 e^{+i\delta})} =$$

$$= \frac{t^4}{1 + r^4 - 2r^2 \cos\delta} = \frac{(1 - r^2)^2}{1 + r^4 - 2r^2 \cos\delta}$$

$$1 - 2\sin^2\left(\frac{\delta}{2}\right) = \cos\delta$$

$$\Rightarrow T = \frac{1}{1 + \left[\frac{4r^2}{(1 - r^2)^2}\right] \sin^2\left(\frac{\delta}{2}\right)}$$ – Airy funktionen