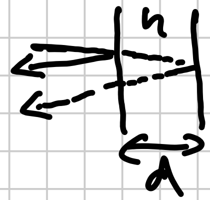
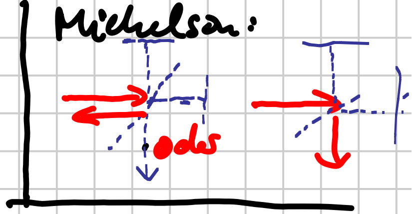
Interferenzen: Dünne Schichten, Newton-Ringe, ...

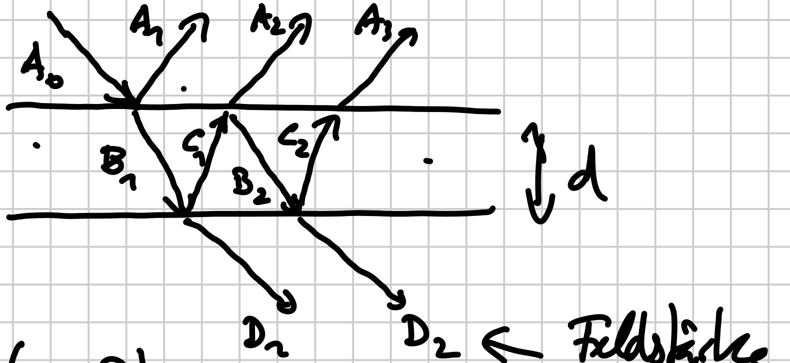




Optische Wegdifferenz $\Delta s = 2n\cdot d \overset{!}{=} m\cdot\lambda$

⇒ konstruktive Interferenz, wenn kein Phasensprung. Sonst $+\lambda/2$

Fabry-Perot (nach Demtröder II): Vielstrahlinterferenz



einfallende Welle: $E = A_0 \cdot e^{i(\omega t - kr)}$

reflektierte Welle $E_r \sim A_i \cdot \overset{=r}{\sqrt{R}}$

transmittierte Welle $E_t \sim A_i \cdot \overset{=t}{\sqrt{1-R}}$ weil $I_t \sim I_i\,(1-R)$

z.B. $|C_1| \sim \sqrt{R(1-R)}\,|A_0|$; $|D_1| \sim (1-R)A_0$; $|D_2| \sim D_1\cdot R$

allgemein: $|A_{i+1}| = R\cdot|A_i|$; Bei senkrechter Inzidenz: $\varphi = 2\pi d/\lambda$ Phasendifferenz

$$D_{ges} = \sum_{m=1}^{\infty} D_m\, e^{i(m-1)\varphi} = D_1\left(1 + Re^{i\varphi} + R^2 e^{2i\varphi} + \dots\right) = \frac{D_1}{1-Re^{i\varphi}} = \frac{(1-R)\cdot A_0}{1-R\cdot e^{i\varphi}}$$

$$I_{trans} = D_{ges}\cdot D_{ges}^{*} = \frac{(1-R)^2 A_0^2}{1+R^2-2R\cos\varphi} = \frac{(1-R)^2\cdot I_0}{(1-R)^2 + 4R\sin^2(\varphi/2)}$$

$(1-\cos x = 2\sin^2(x/2))$ hier: $+2R - 2R\cos\varphi = 4R\sin^2\varphi/2$

$$I_{trans} = \frac{I_0}{1+F\sin^2\varphi/2}\ ; \quad F = \frac{4R}{(1-R)^2} = 3{,}96\times 10^4$$

$R = 0{,}99$

$I_{max} = I_0$; $I_{min} \approx I_0/4\cdot 10^4$