

Liten Formelsamling i Vågrörelselära

SHM:

$$f = \frac{1}{T} \quad \omega = 2\pi f \quad F_x = -kx \quad \omega = \sqrt{\frac{k}{m}} \quad x(t) = A \cos(\omega t + \phi)$$

$$E = \frac{1}{2}mv_x^2 + \frac{1}{2}kx^2 = \frac{1}{2}kA^2 = \textit{konst.}$$

strängar:

$$v = \sqrt{\frac{F}{\mu}} \quad y(x, t) = A \cos(kx \pm \omega t + \phi) \quad k = \frac{2\pi}{\lambda} \quad \omega = \frac{2\pi}{T}$$

$$v = f \cdot \lambda = \frac{\omega}{k} \quad f_n = \frac{nv}{2L} \quad \frac{\partial^2 y}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 y}{\partial t^2}$$

$$P_{av} = \frac{1}{2}\mu(\omega A)^2 v = \frac{1}{2}\sqrt{\mu F}(\omega A)^2 \quad I = \frac{\textit{Effekt}}{\textit{Area}}$$

i fluider:

$$v = \sqrt{\frac{B}{\rho}} \quad p_{max} = BkA = \rho\omega v A$$

intensiteter:

$$I = \frac{1}{2}\rho(\omega A)^2 v = \frac{1}{2}\sqrt{\rho B}(\omega A)^2 = \frac{p_{max}^2}{2\rho v} = \frac{p_{max}^2}{2\sqrt{\rho B}}$$

$$\beta = 10 \cdot \log \frac{I}{I_0} \quad I_0 = 10^{-12} \textit{ W/m}^2$$

pipor:

$$f_n = \frac{nv}{2L} \quad f_n = \frac{nv}{4L} \quad (n \textit{ udda})$$

Doppler:

$$f' = f \frac{v_W - v_L}{v_W - v_S}$$

chockvåg:

$$\sin \alpha = \frac{v_W}{v_S}$$

elektromagnetiska vågor:

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}} \quad \vec{E} = c \vec{B} \quad u_E = \frac{1}{2} \epsilon_0 E^2 \quad u_B = \frac{B^2}{2\mu_0}$$

$$\vec{S} = \frac{\vec{E} \times \vec{B}}{\mu_0} \quad S_{av} = \frac{E_{max} B_{max}}{2\mu_0} = \frac{E_{max}^2}{2\mu_0 c} = \frac{1}{2} \epsilon_0 c E_{max}^2$$

interferens:

$$\delta = m\lambda \quad \delta = \left(m + \frac{1}{2}\right) \lambda \quad \frac{\phi}{2\pi} = \frac{\delta}{\lambda}$$

dubbelspalt:

$$\delta = d \sin \theta \quad d \sin \theta = m\lambda \quad (\text{max}) \quad d \sin \theta = \left(m + \frac{1}{2}\right) \lambda \quad (\text{min})$$

$$I = I_0 \cos^2 \frac{\phi}{2}; \quad \phi = \frac{2\pi\delta}{\lambda}; \quad I_0 = \text{intensiteten rakt fram}$$

diffraktion:

$$a \sin \theta = m\lambda; \quad (m \neq 0) \quad I = I_0 \frac{\sin^2(\beta/2)}{(\beta/2)^2} \quad \text{där } \beta = \frac{2\pi a \sin \theta}{\lambda}$$

$I_0 =$ intensiteten rakt fram

$$I = I_0 \cos^2 \frac{\phi}{2} \left[\frac{\sin^2(\beta/2)}{(\beta/2)^2} \right]$$

Rayleigh's kriterium:

$$\theta_c = \frac{\lambda}{a} \quad (\text{spalt}) \quad \theta_c = \frac{1.22 \cdot \lambda}{d} \quad (\text{runt hål})$$

gitter:

$$d \sin \theta = m\lambda \quad R \equiv \frac{\lambda}{\Delta\lambda} = mN$$