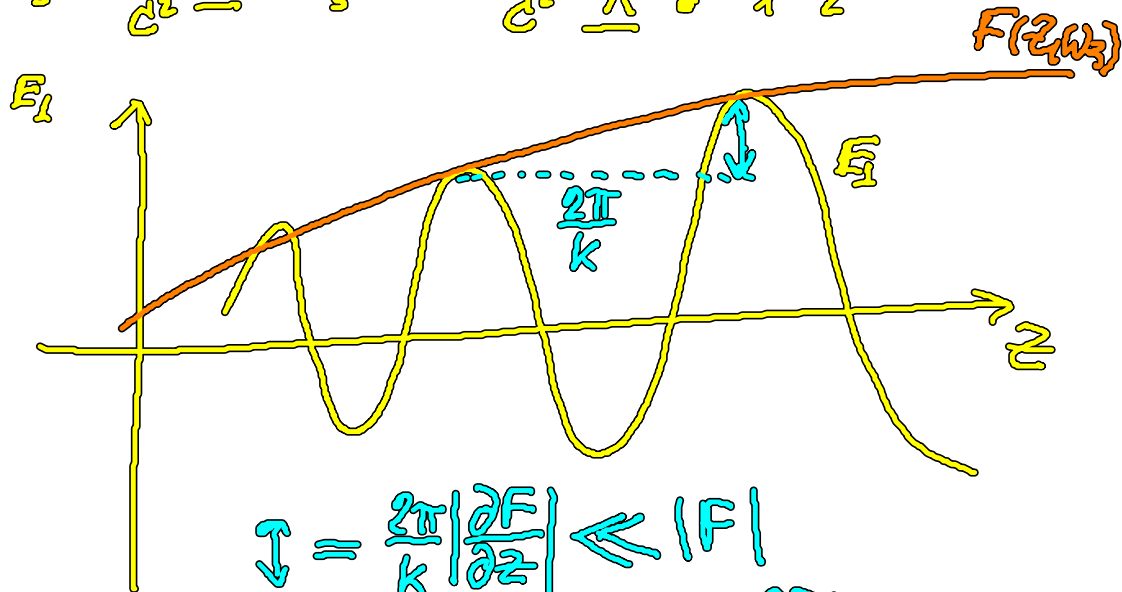


4.1 Nichtlineare elektrische Suszeptibilität

$$\Delta \vec{E}_3 - \nabla \nabla \cdot \vec{E}_3 + \frac{\omega_3^2}{c^2} \underline{\underline{\epsilon}} \cdot \vec{E}_3 = - \frac{\omega_3^2}{c^2} \underline{\underline{\chi}}^{(2)} : \vec{E}_1 \vec{E}_2$$



$$\begin{aligned} \downarrow &= \frac{2\pi}{k} \left| \frac{\partial F}{\partial z} \right| \ll |F| \\ \Rightarrow \left| \frac{\partial^2 F}{\partial z^2} \right| &\ll \frac{k}{2\pi} \left| \frac{\partial F}{\partial z} \right| \end{aligned}$$

$$E_{\perp} = F \exp\{i k z\}$$

$$\left(\frac{\partial^2}{\partial z^2} + k^2 \right) E_{\perp} = \frac{\partial^2 F}{\partial z^2} + 2 i k \frac{\partial F}{\partial z} - k^2 F \approx - \frac{\omega_3^2}{c^2} \underline{\underline{\chi}}_{\perp}^{(2)} E_{10} E_{20} \exp\{i(k_1 + k_2)z\}$$

$$2 i k \frac{\partial F}{\partial z} = - \frac{\omega_3^2}{c^2} \underline{\underline{\chi}}_{\perp}^{(2)} E_{10} E_{20} \exp\{i(k_1 + k_2)z\}$$

$$\int_0^z \frac{\partial F}{\partial z'} dz' = \dots \dots \text{ mit } F(z=0) = 0$$

$$\underbrace{-\frac{\omega^2}{2ikc^2} \chi_{\perp}^{(2)} E_{10} E_{20}}_A \int_0^z \exp\{iKz'\} dz' = A \frac{\exp\{iKz\} - 1}{iK}$$

$$= A \frac{\exp\{i\frac{Kz}{2}\} - \exp\{-i\frac{Kz}{2}\}}{iK} \exp\{i\frac{Kz}{2}\}$$

$$= A 2 \frac{\sin\{\frac{Kz}{2}\}}{K} \exp\{i\frac{Kz}{2}\}$$

$$I_{\perp} = v \epsilon \langle E_{\perp}^2 \rangle = v \frac{c^2}{v^2} \epsilon_0 \frac{1}{2} \left(\frac{\omega^2}{2kc^2} \right)^2 \left(\chi_{\perp}^{(2)} E_{10} E_{20} \right)^2$$

KH_2PO_4
 Kaliumdihydrogenphosphat (KDP)