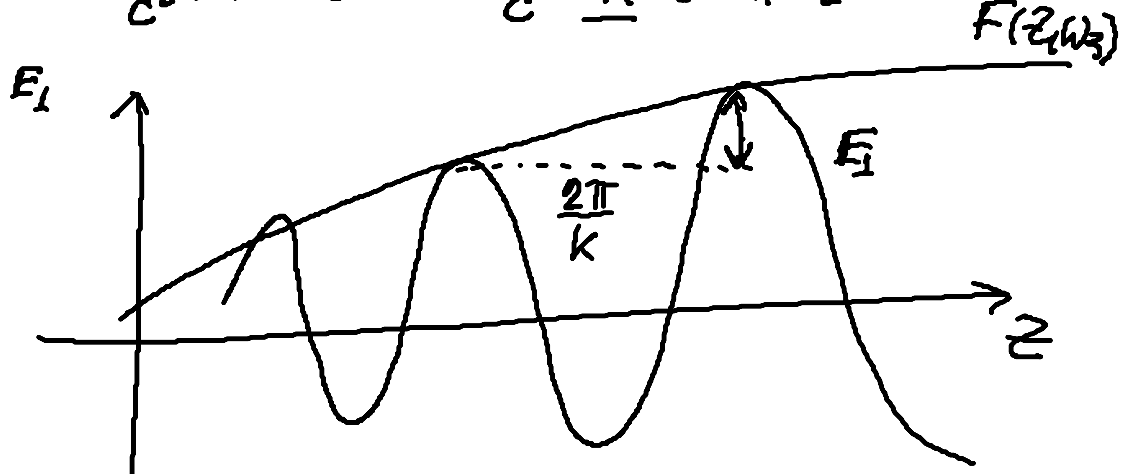
4.1 Nichtlineare elektrische Suszeptibilität

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



$$\updownarrow = \frac{2\pi}{k}\left|\frac{\partial F}{\partial z}\right| \ll |F|$$

$E_\perp = F\exp\{ikz\}$

$$\Rightarrow \left|\frac{\partial^2 F}{\partial z^2}\right| \ll \frac{k}{2\pi}\left|\frac{\partial F}{\partial z}\right|$$

$$\left(\frac{\partial^2}{\partial z^2}+k^2\right)E_\perp = \overset{\approx 0}{\frac{\partial^2 F}{\partial z^2}} + 2ik\frac{\partial F}{\partial z} - k^2F + k^2F)\exp\{ikz\}$$

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

z

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

$$\underbrace{-\frac{\omega_3^2}{2ikc^2}\chi_\perp^{(2)}E_{10}E_{20}}_{A}\int_0^z \exp\{iKz'\}\, dz' = A\,\frac{\exp\{iKz\}-1}{iK}$$

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

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

$$I_\perp = v\varepsilon\langle E_\perp^2\rangle = v\frac{c^2}{v^2}\varepsilon_0\frac{1}{2}\left(\frac{\omega_3^2}{2kc^2}\right)^2\left(\chi_\perp^{(2)}E_{10}E_{20}\right)^2$$

KH_2PO_4

Kaliumdihydrogenphosphat (KDP