

$$\dot{\vec{P}} = \vec{j}$$

vlindex.html

$$\dot{\vec{D}} = \epsilon_0 \dot{\vec{E}} + \dot{\vec{P}} = \epsilon_0 \dot{\vec{E}} + \vec{j}$$

$$\nabla \times \vec{H} = \dot{\vec{D}} + \vec{j}$$

Lindhard Dielektrizitätsfunktion

$$\epsilon(\vec{q}) = 1 + \frac{2k_F}{q^2} S\left(\frac{q}{2k_F}\right)$$

$$S(z) = 1 + \frac{1-z^2}{2z} \ln \left| \frac{1+z}{1-z} \right|$$

$$S(0) = 2$$

$$S(1) = 0$$

$$S(\infty) = 0$$

$$\Rightarrow \epsilon(0) = \infty$$

$$\epsilon(2k_F) = 1 + \frac{1}{2\pi k_F}$$

$$\epsilon(\infty) = 1$$

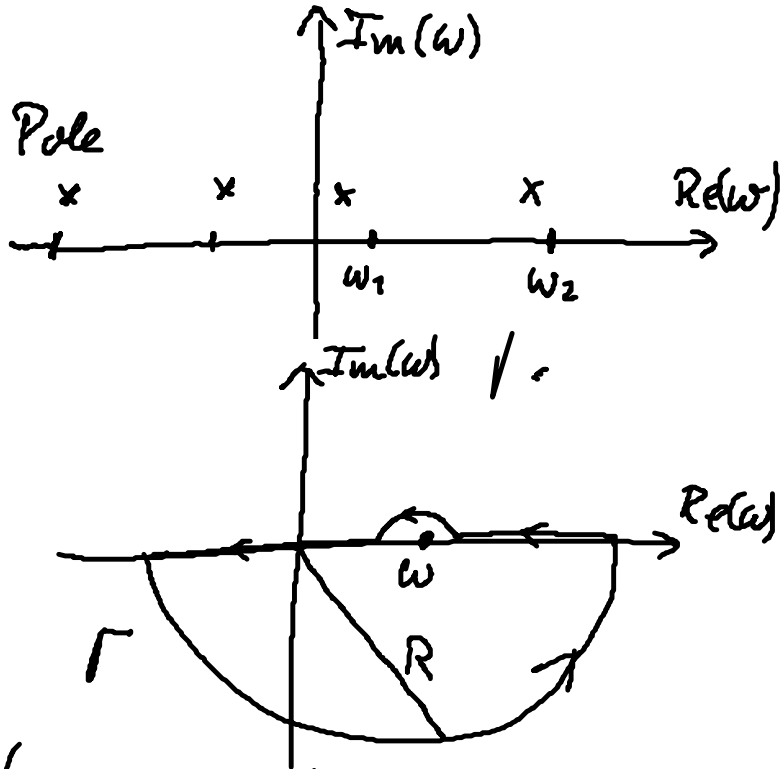
Dispersionsrelationen

$$\tilde{\epsilon}(\omega) = 1 + \frac{Ne^2}{\epsilon_0 m} \sum_j \frac{f_j}{\omega_j^2 - \omega^2 + i\omega\gamma_j} \quad ; \gamma_j > 0$$

einfache Polstellen bei

$$\omega = \pm \omega_j \sqrt{1 - \left(\frac{\gamma_j}{2\omega_j}\right)^2} + \frac{i}{2}\gamma_j$$

$f(w)$  holomorph  
 auf der reellen Achse  
 und der unteren Halbebene



$$dz = iR d\varphi \exp\{iz\}$$

$$|f(w)R| \rightarrow 0$$

$$R \rightarrow \infty$$

$$f(w) = \int_{-\infty}^{\infty} \dots = \int_{-\infty}^{\infty} \dots + \frac{1}{2} \int_{-\infty}^{\infty} \dots = -P \int_{-\infty}^{\infty} \dots + \frac{1}{2} f(w)$$

The diagram shows the transition from a single integral over the real axis to a sum of integrals over a contour in the lower half-plane and a principal value integral.

$$\lim_{\epsilon \rightarrow 0} \left[ \int_{-\infty}^{a-\epsilon} f(x) dx + \int_{a+\epsilon}^{+\infty} f(x) dx \right] = P \int_{-\infty}^{+\infty} f(x) dx$$

Pol an der Stelle  $a$

$$f(-w) = f^*(w)$$