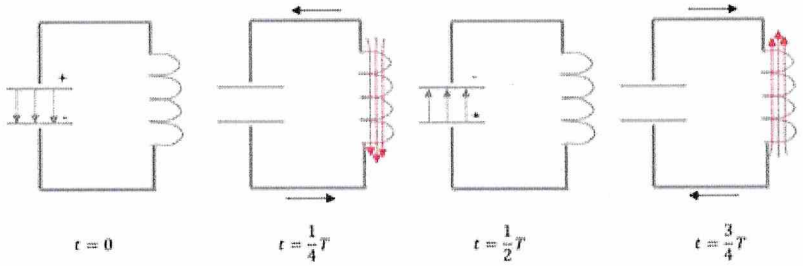
Formelsammlung:
Elektromagnetischer Schwingkreis und Hertzscher Dipol



Quelle: elektromagn_schwing (abiweb.de)

Thomsonsche Schwingungsgleichung:

Energieerhaltung:

$$E_C + E_L = konst.$$

$$\frac{1}{2}CU^2 + \frac{1}{2}LI^2 = konst. \qquad \boxed{U = \frac{Q}{C}}$$

$$\frac{1}{2}\frac{Q^2}{C} + \frac{1}{2}LI^2 = konst. \ /(^0) \quad Q_{(t)}; I_{(t)}$$

$$\frac{1}{2}\frac{2Q_{(t)}\dot{Q}_{(t)}}{C} + \frac{1}{2}L\,2I_{(t)}\dot{I}_{(t)} = 0 \quad /\dot{Q}_{(t)}$$

$$\frac{Q_{(t)}}{C} + L\dot{I}_{(t)} = 0 \qquad \boxed{I = \dot{Q}; \dot{I} = \ddot{Q}}$$

$$\boxed{Q_{(t)} + LC\ddot{Q}_{(t)} = 0}$$

Ansatz:

$$Q_{(t)} = \hat{Q}\cos(\omega t)$$

Einsetzen:

$$\hat{Q}\cos(\omega t) - LC\omega^2\hat{Q}\cos(\omega t) = 0 \ /: \hat{Q}\cos(\omega t)$$

$$1 - LC\omega^2 = 0$$

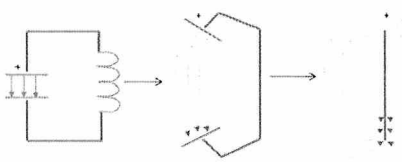
$$\boxed{\omega^2 = \frac{1}{LC}}$$

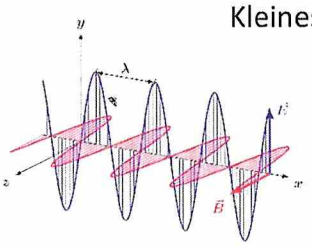
$$\omega = \sqrt{\frac{1}{LC}} = \frac{2\pi}{T}$$

$$\boxed{T = 2\pi\sqrt{LC}}; \ f = \frac{1}{T} = \frac{1}{2\pi\sqrt{LC}}$$

Hertzscher Dipol:

$f = \frac{1}{T} = \frac{1}{2\pi\sqrt{LC}}$ -> Hochfrequente Schwingung für: kleines C (kleine Fläche)
Kleines L (geringe Windungszahl)





$$C_0 = \sqrt{\frac{1}{\mu_0\mu_r\varepsilon_r\varepsilon_0}}$$

$$U_{max} \ I = 0 \ W_{max} = \frac{1}{2}CU^2$$

$$I_{max} \ U = 0 \ W_{max} = \frac{1}{2}LI^2$$

$$U_{max} = I_{max}\sqrt{\frac{L}{C}}$$

Quelle: Hertzscher Dipol - Elektromagnetismus (abiweb.de)