Vorlesung 17

Physik II

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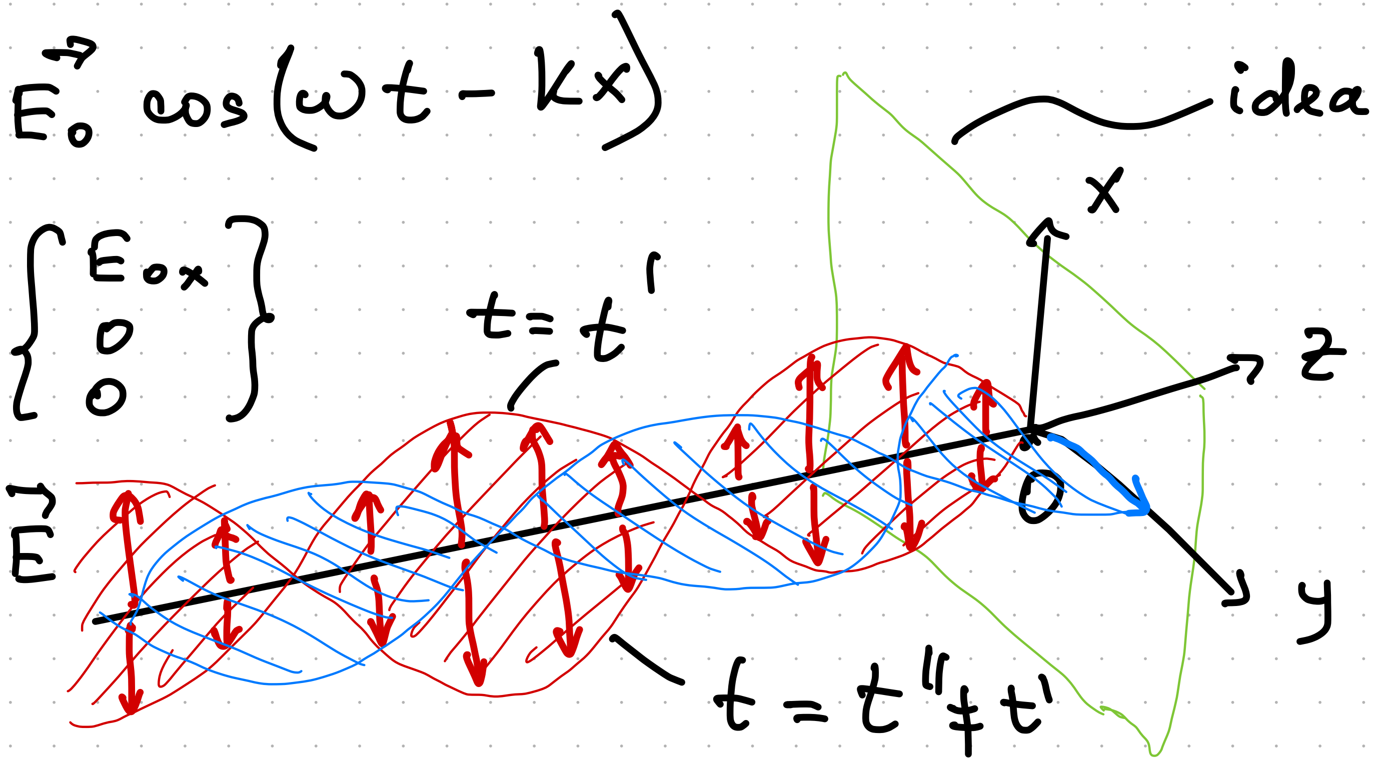
SS 2020

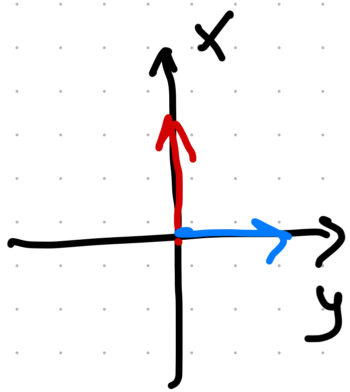
Stehende EM Wellen

Überlagerung mehrerer, in verschiedenen Richtungen laufender Wellen gleicher Frequenz ω. 1D.

$$\vec{E}_e = \vec{E}_0 \cos(\omega t - kx)$$

$$\vec{E}_0 = \begin{Bmatrix} E_{0x} \\ 0 \\ 0 \end{Bmatrix}$$





$\Rightarrow$

keine Tangentialkomponente $\vec{E}$ bei $z=0$

$$\vec{E}\Big|_{z=0} = \vec{E}_{0e} + \vec{E}_{0r} = 0 \; ; \quad \vec{E}_{0e} = -\vec{E}_{0r}$$

einfallender ($\vec{E}_{0e}$), reflektierter ($\vec{E}_{0r}$)

$$\vec{E} = \vec{E}_{0e} \cos(\omega t - kx) + \vec{E}_{0r} \cos(\omega t + kx) \; ;$$

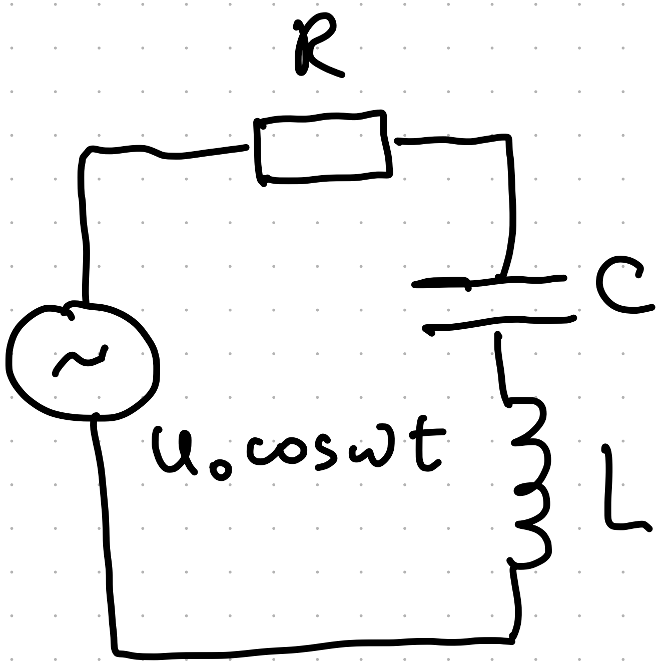
$$\vec{E} = 2 E_0 \sin(kz) \cdot \sin(\omega t) \; ;$$

$$\frac{\partial E_x}{\partial z} = -\frac{\partial B_y}{\partial t} \; ; \quad \text{rot}\, \vec{E} = -\frac{\partial \vec{B}}{\partial t} \; ;$$

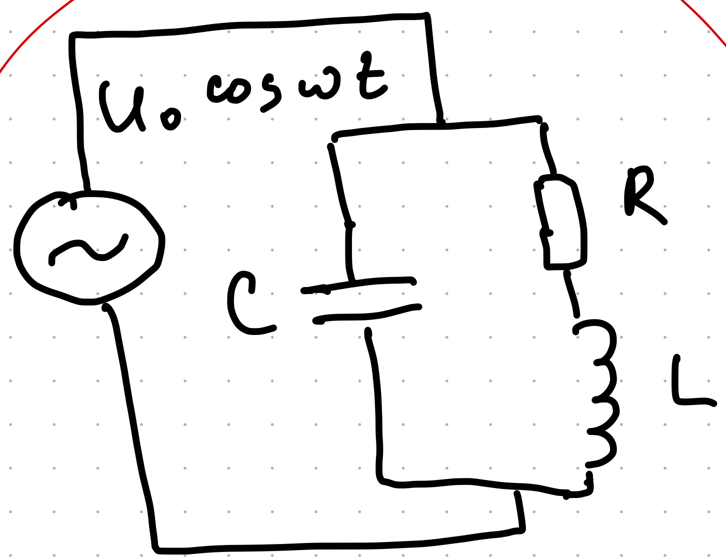
$$\vec{B} = 2 \vec{B}_0 \cos(kz) \cdot \cos(\omega t) \; ; \quad B_0 = \begin{pmatrix} 0 \\ \frac{k E_0}{\omega} \\ 0 \end{pmatrix} ;$$

Phasenverschiebung zw E&B: $\frac{\pi}{2}$

5.3. Hertzscher Dipol



Serienschwingkreis
(Vorl. 13)

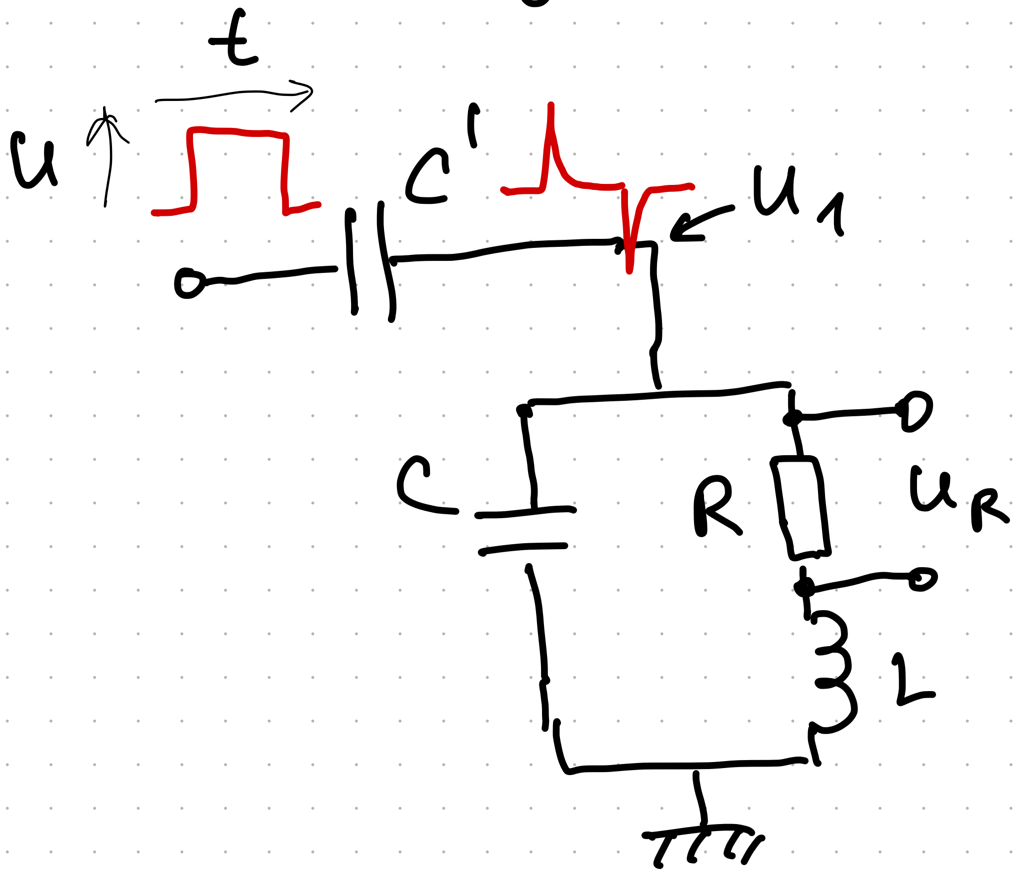


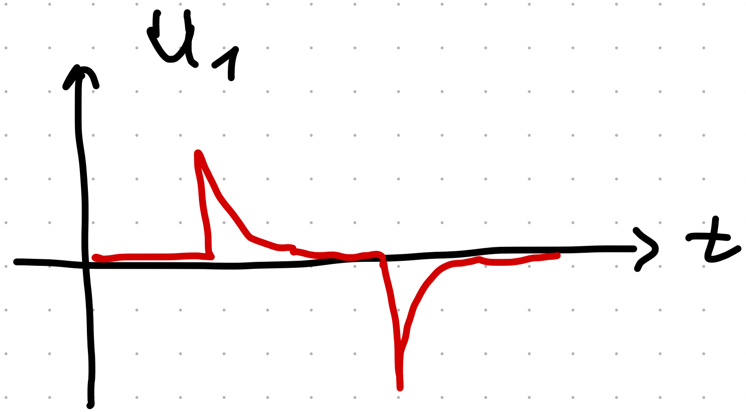
Parallelschwingkreis

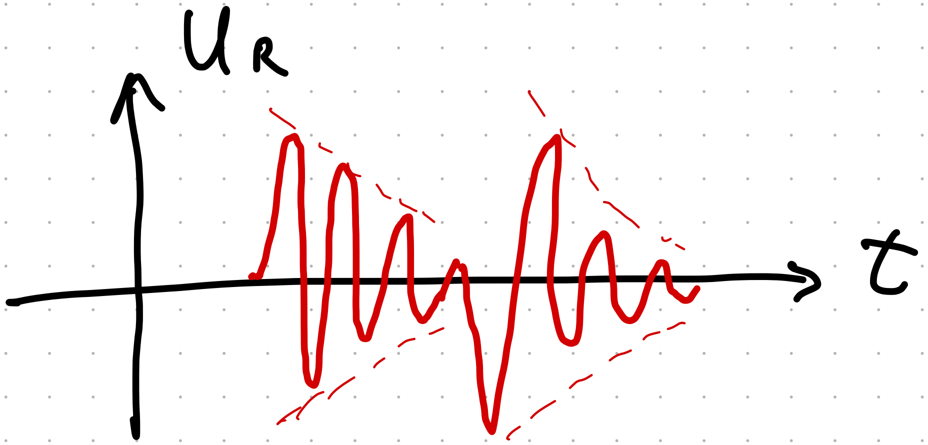
$$\omega_0 = \frac{1}{\sqrt{LC}};$$

Bei $\omega = \omega_0$ ist $|Z|$ maximal

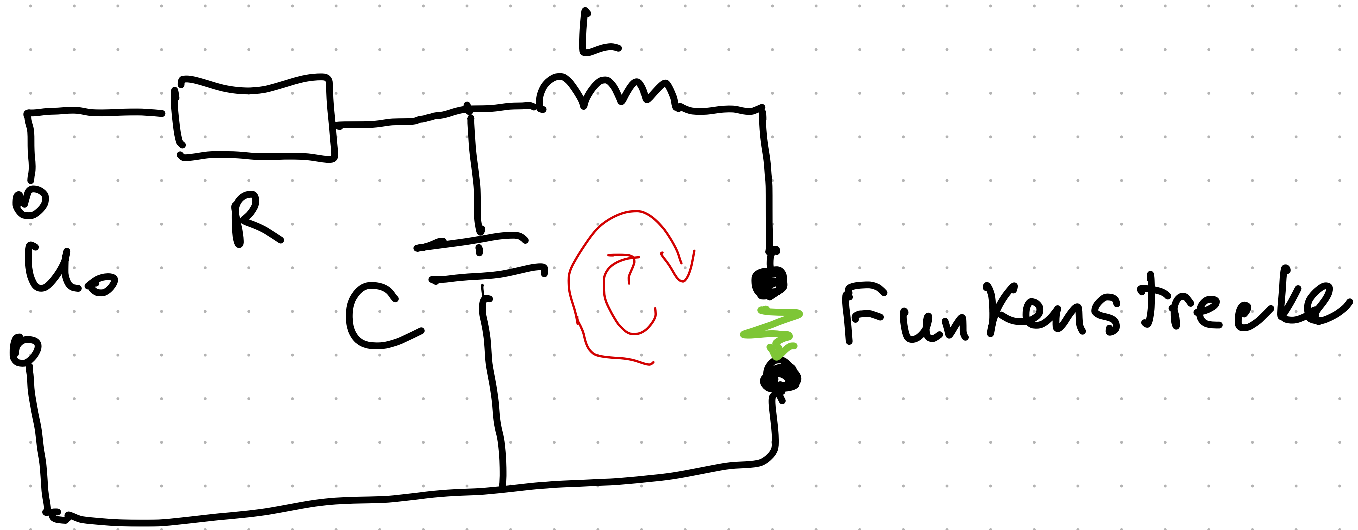
Anregung gedämpfter EM Schwingungen



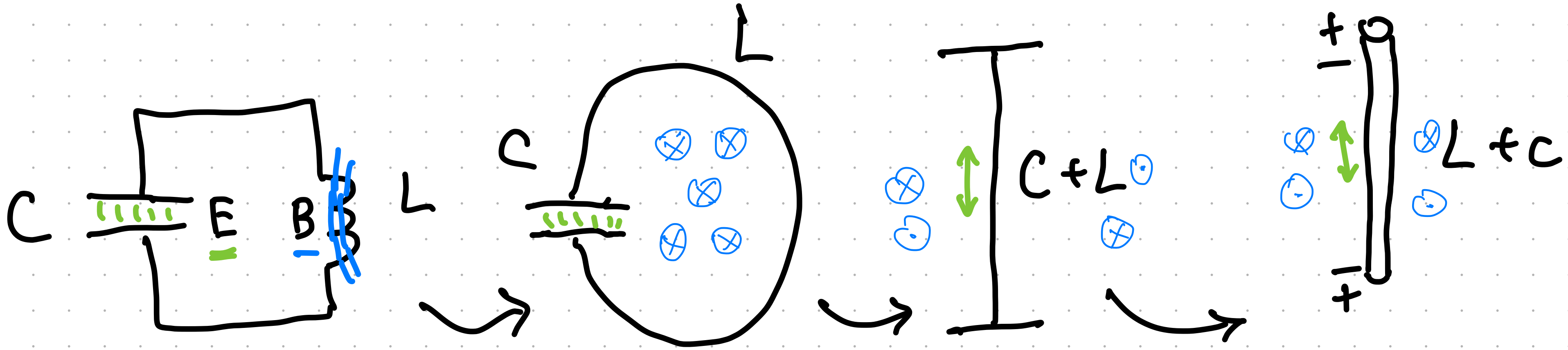


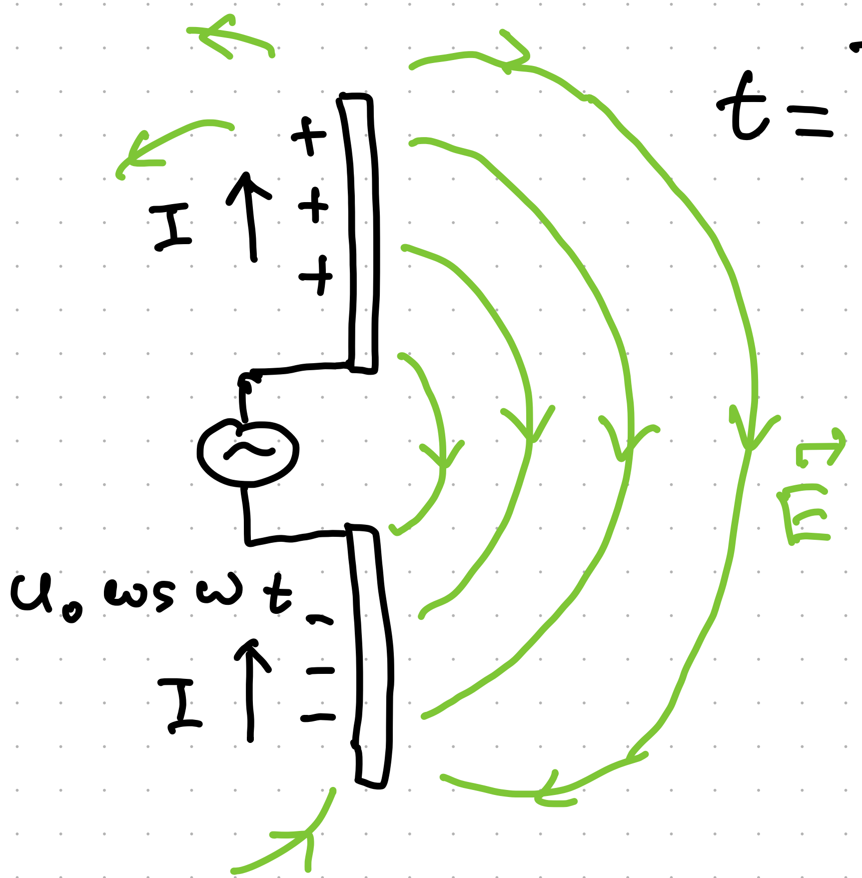


Funkenschwingkreis:

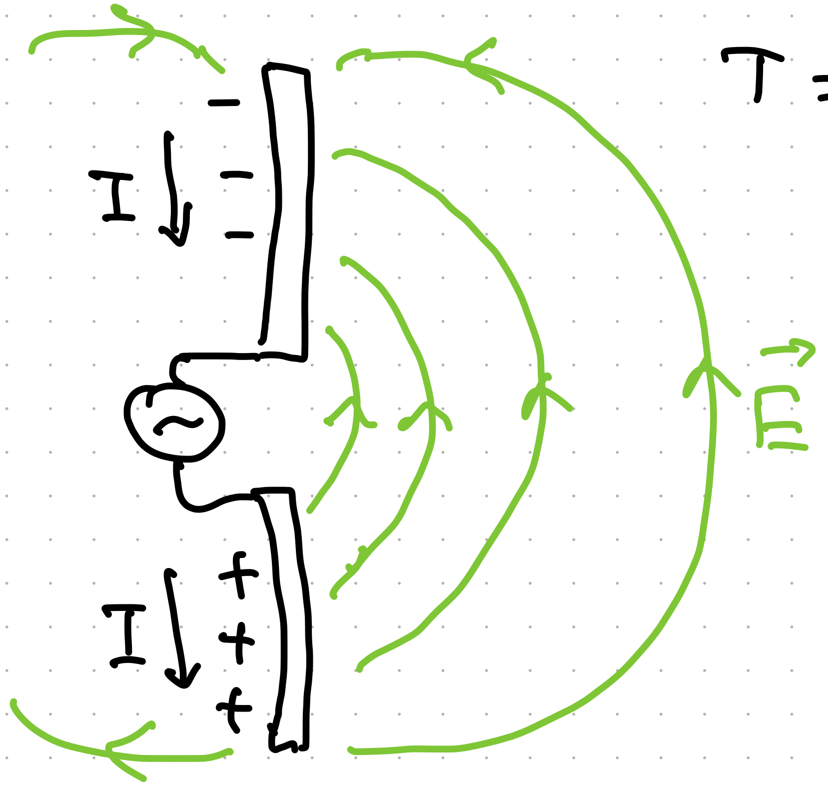


Übergang vom Schwingkreis zur Antenne



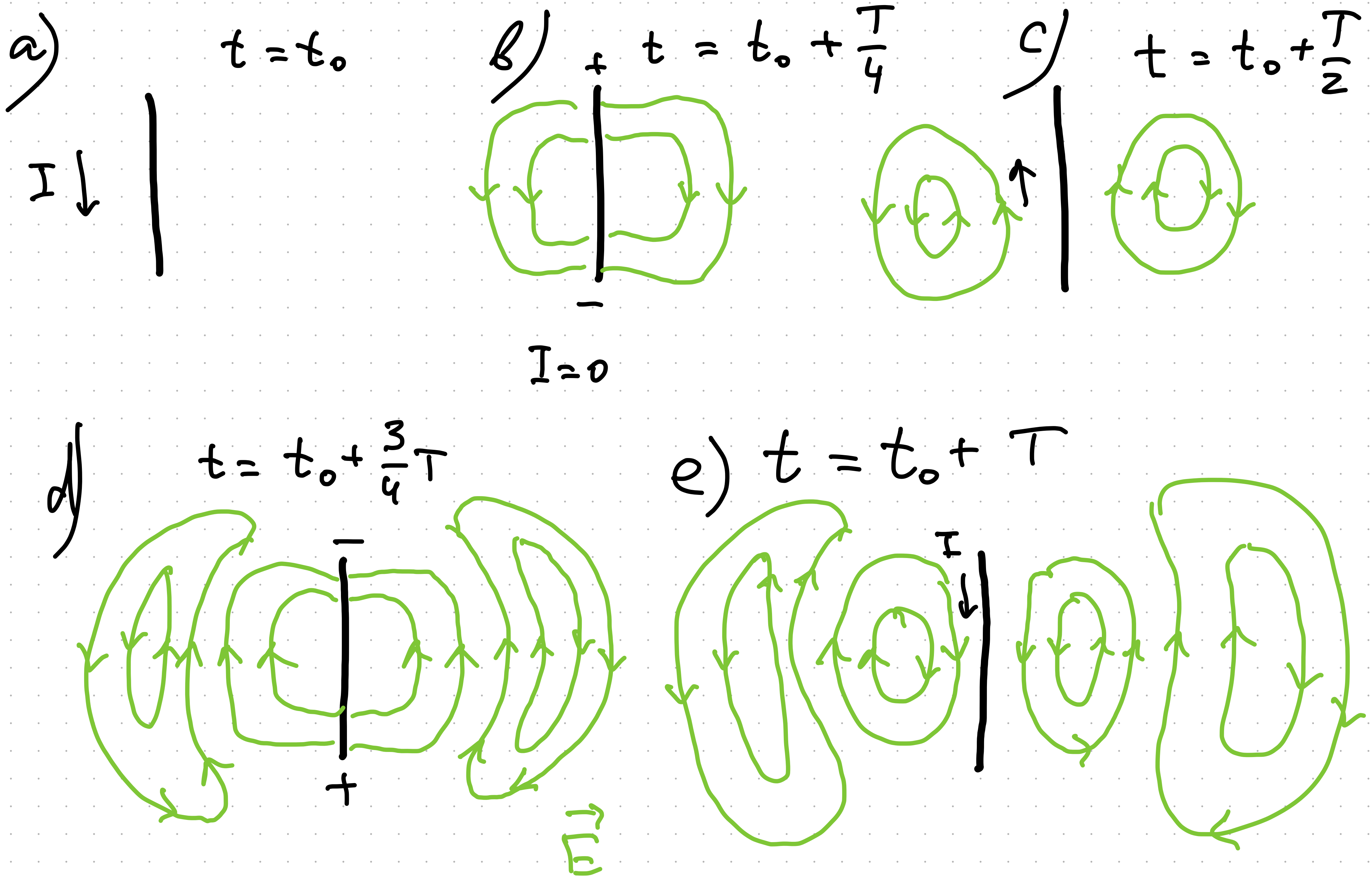


$t = \frac{T}{4}$

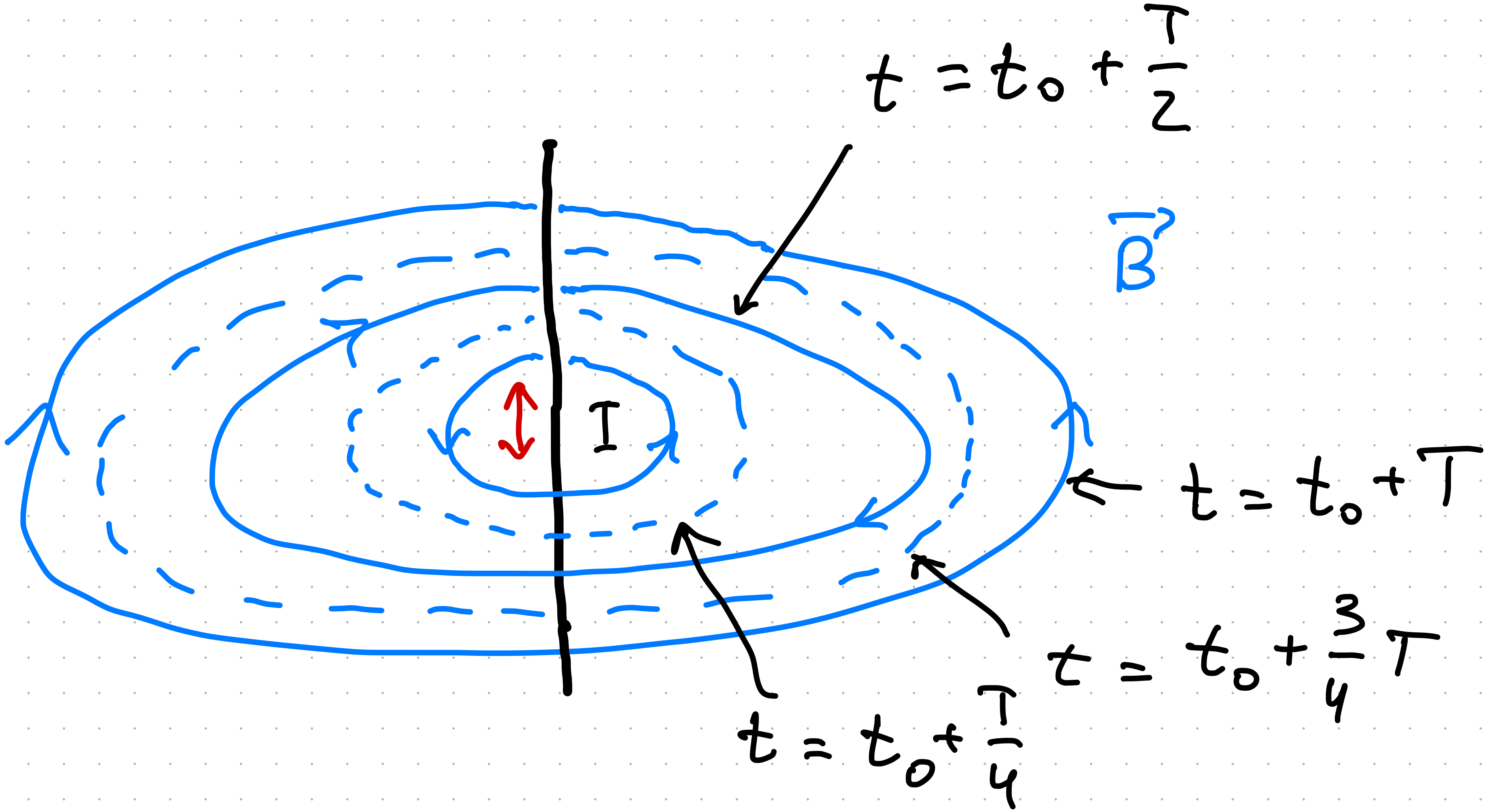


$T = \frac{3T}{4}$

$T = \frac{2\pi}{\omega}$;



a) t = t₀
I
b) t = t₀ + T/4
+
−
I = 0
c) t = t₀ + T/2
d) t = t₀ + 3/4 T
−
+
E
e) t = t₀ + T
I



$t = t_0 + \frac{T}{2}$
$\vec{B}$
I
$t = t_0 + T$
$t = t_0 + \frac{3}{4}T$
$t = t_0 + \frac{T}{4}$