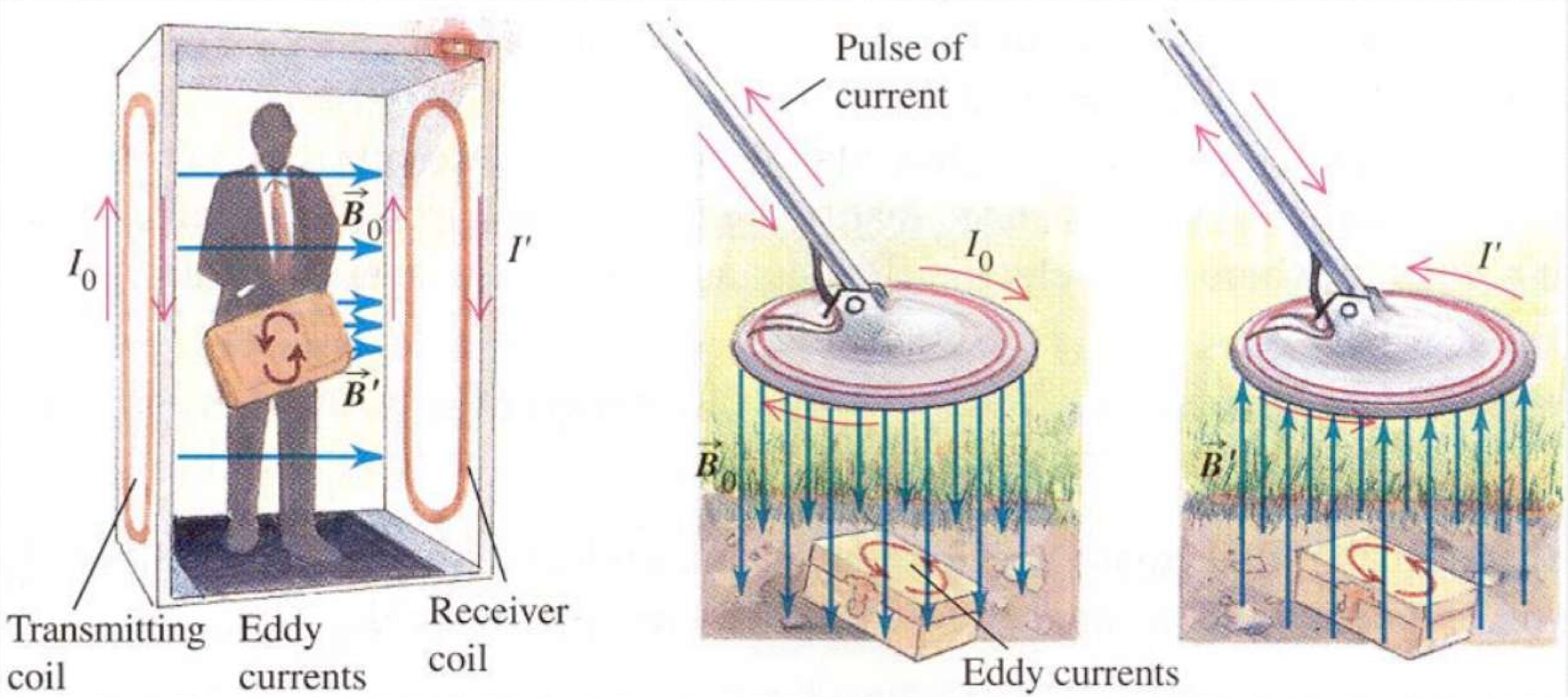
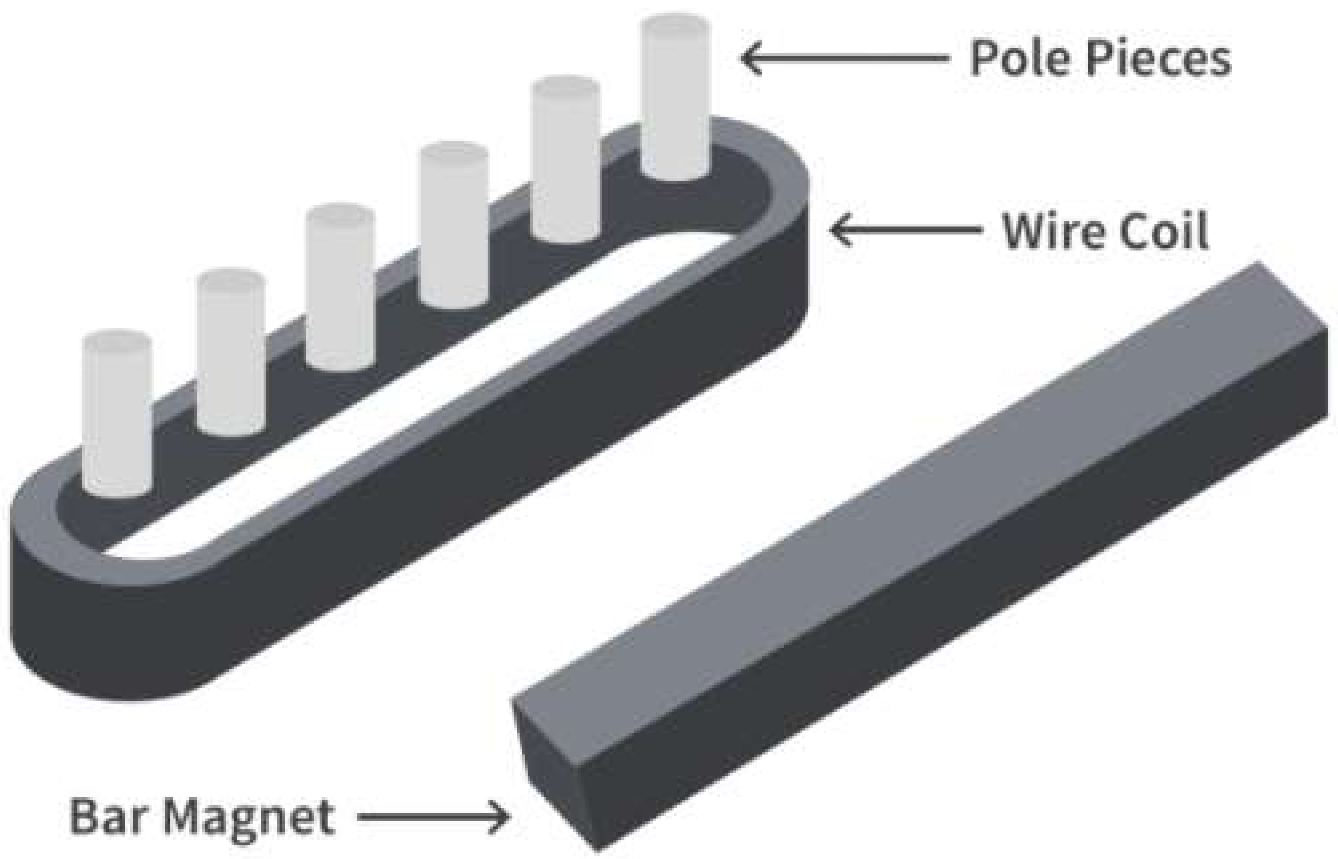
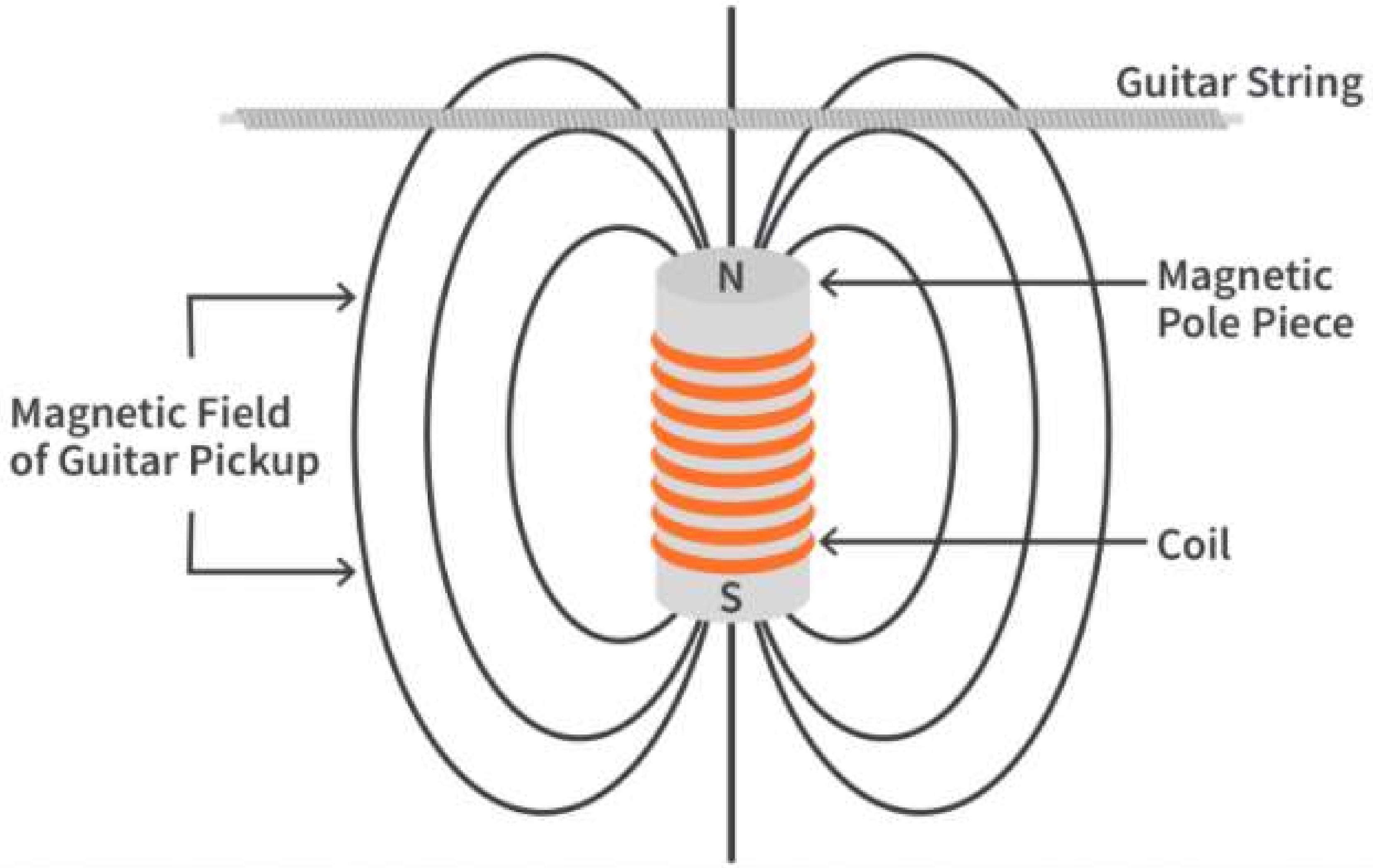
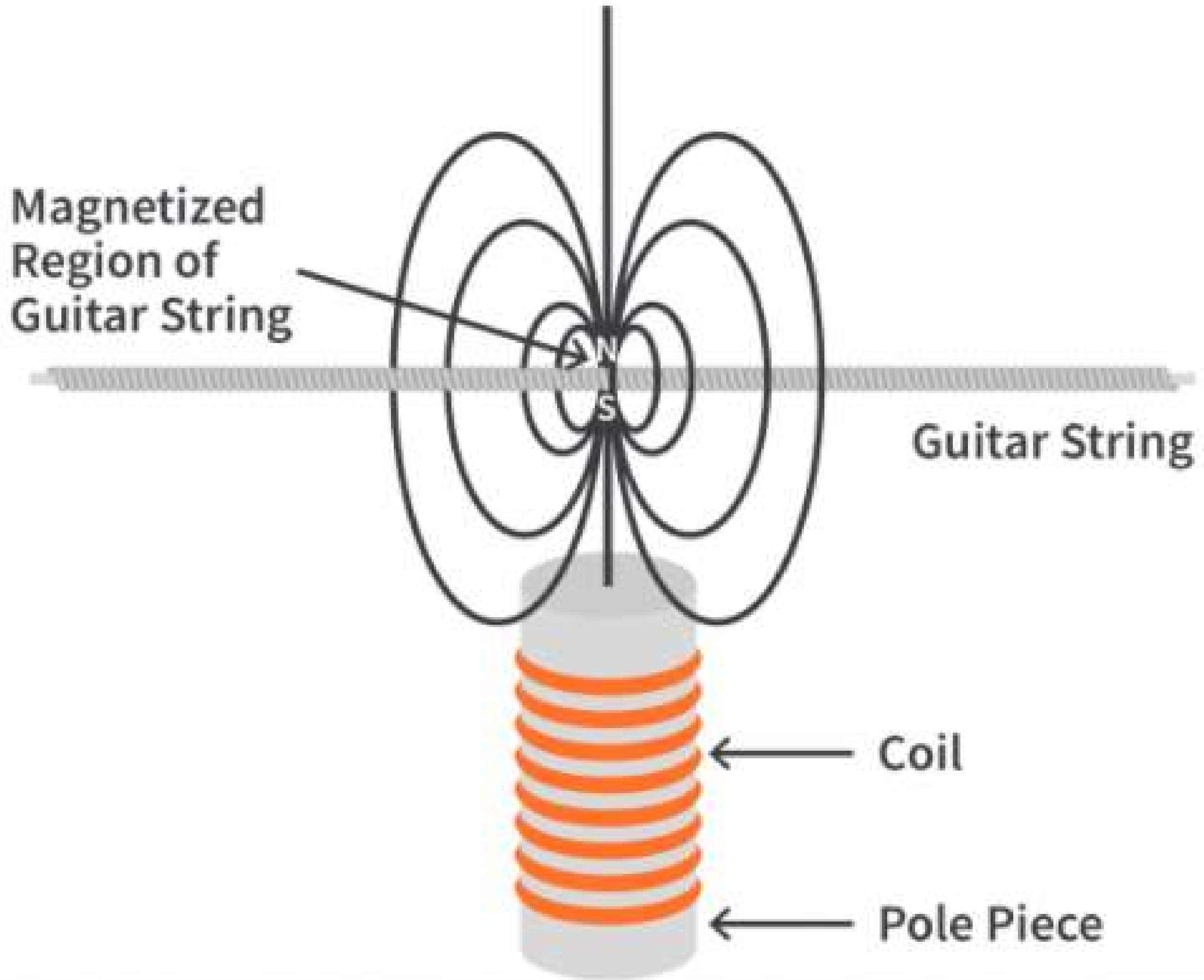
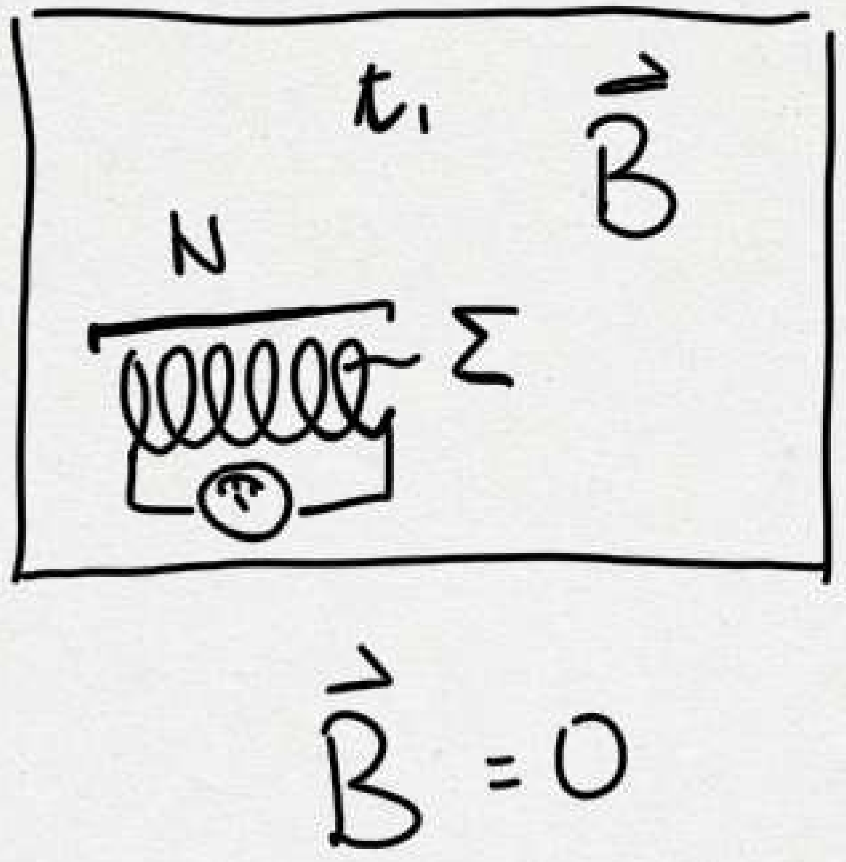
CORRENTI DI FOUCAULT / PARASSITE
(EDDY CURRENTS)

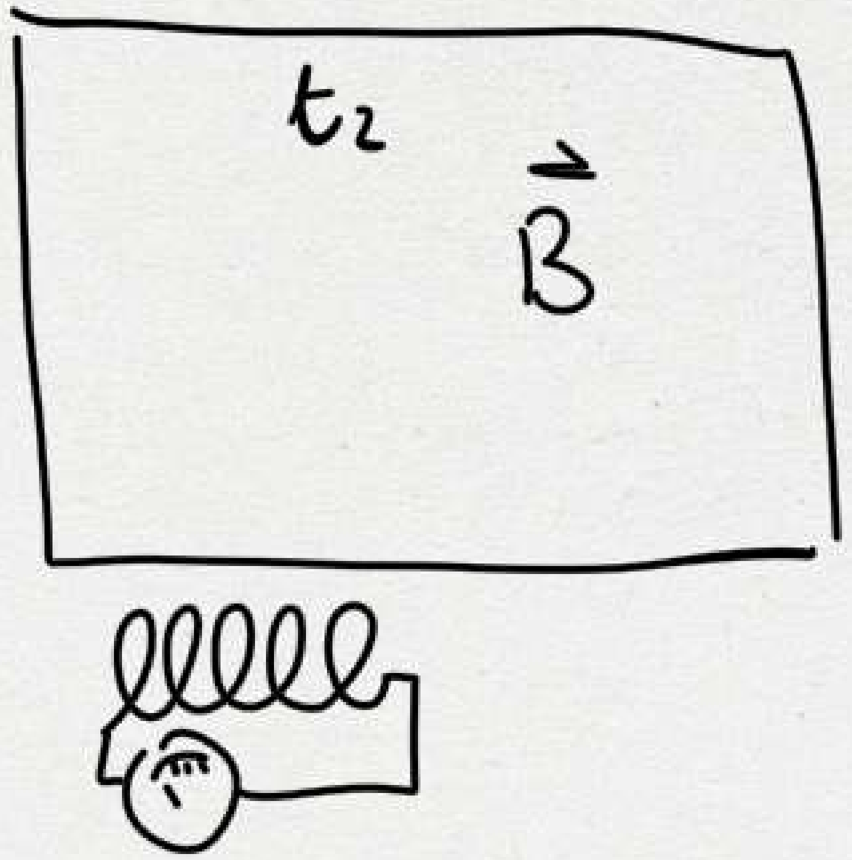



Pole Pieces
Wire Coil
Bar Magnet


Guitar String
N
Magnetic
Pole Piece
Magnetic Field
of Guitar Pickup
Coil
S


Magnetized
Region of
Guitar String
N
S
Guitar String
Coil
Pole Piece





$$q = \int_{t_1}^{t_2} i\,dt = \int_{t_1}^{t_2} \frac{\mathcal{E}_i}{R}\,dt = \frac{1}{R}\int_{t_1}^{t_2}\left(-\frac{d\Phi}{\cancel{dt}}\right)\cancel{dt} = -\frac{1}{R}\int_{\Phi_1}^{\Phi_2} d\Phi =$$

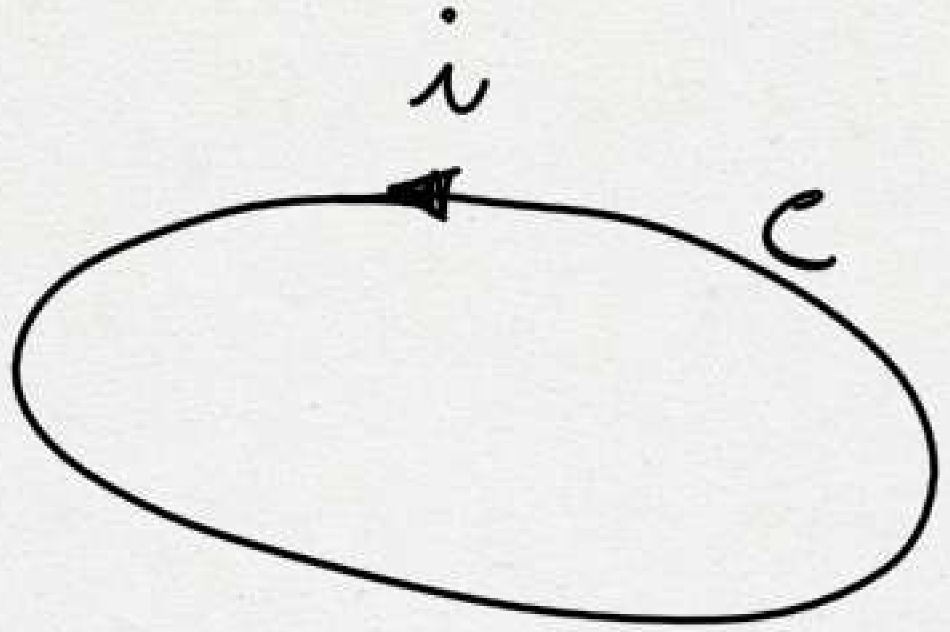
$$= \frac{\Phi_1 - \Phi_2}{R} \xrightarrow[\Phi_2 = 0]{} = \frac{\Phi_1}{R}$$

LEGGE DI FELICI

$$\Phi_1 = \Sigma B N$$

$$q = \frac{\Sigma B N}{R} \Rightarrow \boxed{B = \frac{qR}{N\Sigma}}$$

AUTOINDUZIONE

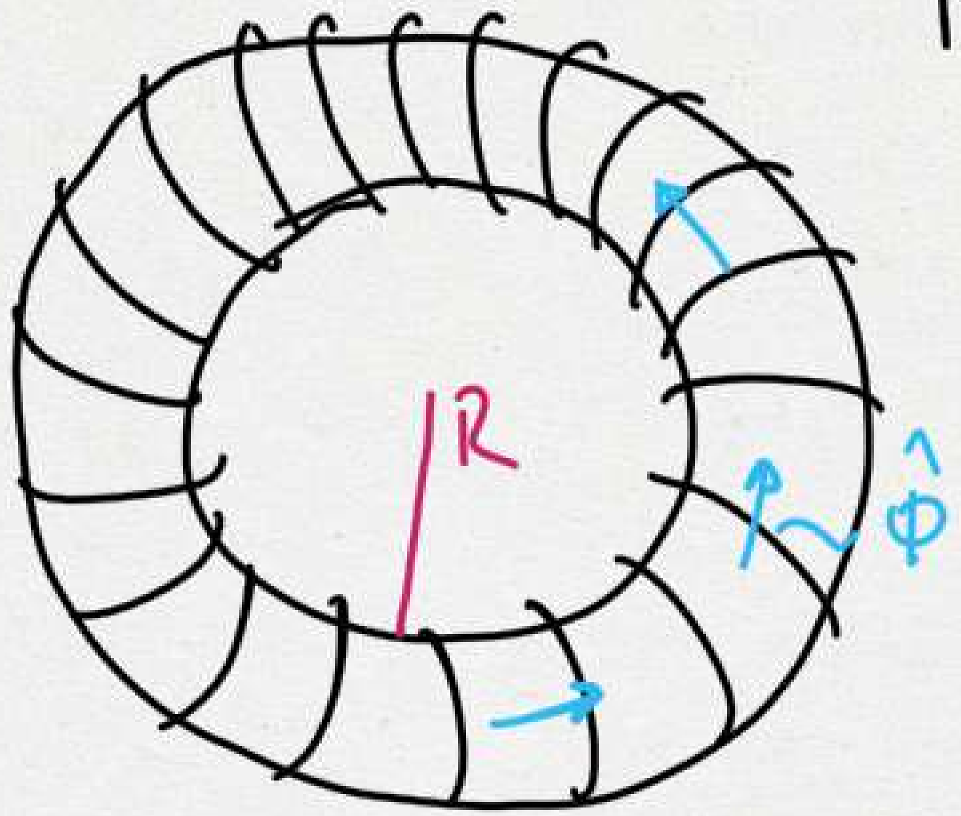


$$\vec{B} = \frac{\mu_0 i}{4\pi} \oint_C \frac{d\vec{s} \times \hat{r}}{r^2}$$ LEGGE DI AMPERE-LAPLACE

$$\Phi_c(\vec{B}) = \int_{\Sigma(c)} \vec{B} \cdot \hat{n}\, d\Sigma = \int_{\Sigma(c)} \left(\frac{\mu_0 i}{4\pi} \oint \frac{d\vec{s} \times \hat{r}}{r^2} \right) \cdot \hat{n}\, d\Sigma$$ AUTOFLUSSO

$$\Phi_c(\vec{B}) = L i$$, L É L'INDUTTANZA DEL CIRCUITO

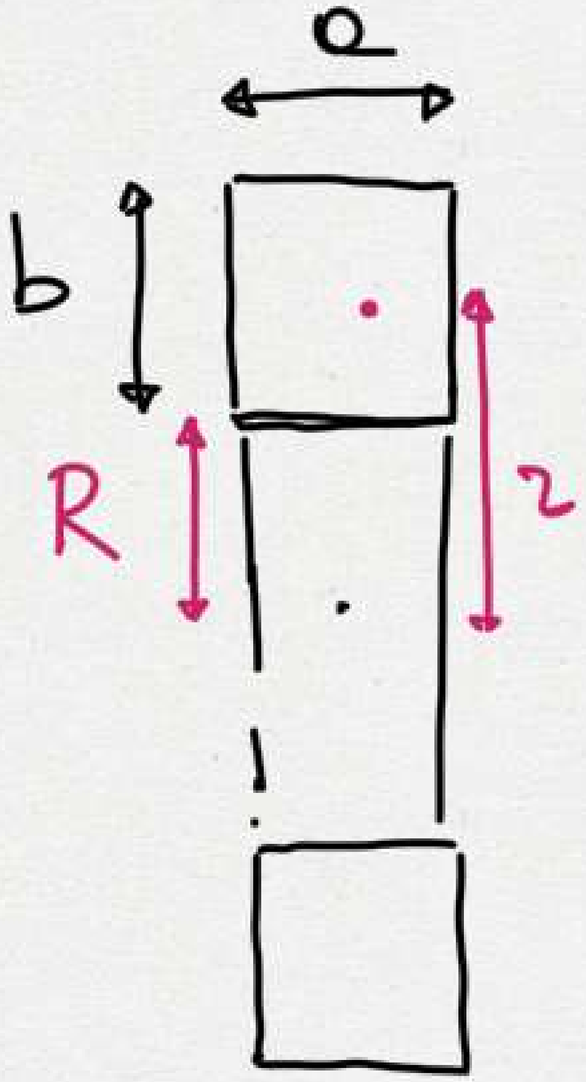
COEFFICIENTE DI AUTOINDUZIONE



N SPIRE

$$\vec{B} = \frac{\mu_0 N i}{2\pi r}\hat{\phi}$$

$$\Phi_s(\vec{B}) = \int_\Sigma \vec{B}\cdot\hat{n}\, d\Sigma = \int_0^a da' \int_0^b db' \frac{\mu_0 N i}{2\pi (R+b')} = \frac{\mu_0 N i a}{2\pi}\int_0^b \frac{db'}{R+b'} =$$



$$= \frac{\mu_0 N i a}{2\pi}\log(R+b')\Big|_0^b = \frac{\mu_0 N i a}{2\pi}\log\left(\frac{R+b}{R}\right) \Rightarrow$$

$$\Phi(\vec{B}) = N\,\Phi_s(\vec{B}) = \frac{\mu_0 N^2 i a}{2\pi}\log\left(\frac{R+b}{R}\right) = L i \Rightarrow$$

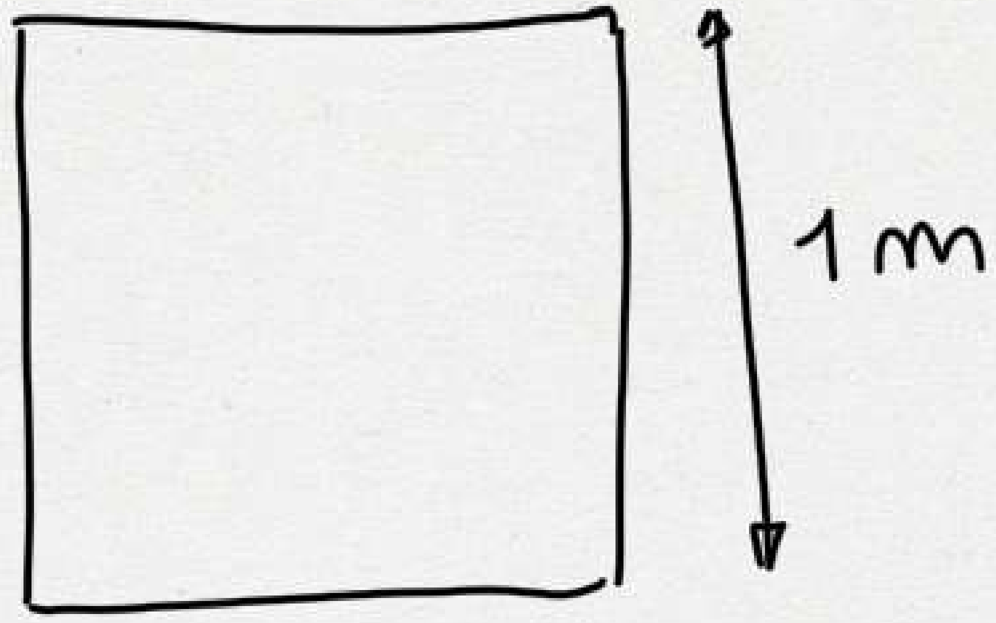
$$L = \frac{a\mu_0 N^2}{2\pi}\log\left(\frac{R+b}{R}\right)$$

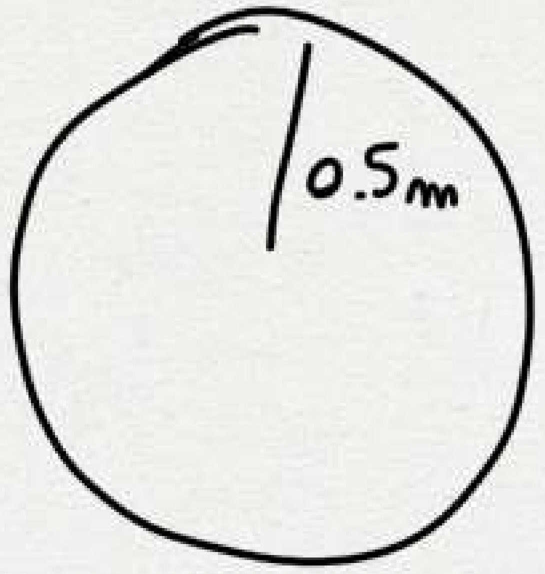
$$\mathcal{E}_i = -\frac{d\Phi}{dt} = -\frac{d}{dt}Li = -L\frac{di}{dt} \Rightarrow$$

$$i_i = -\frac{L}{R}\frac{di}{dt}$$

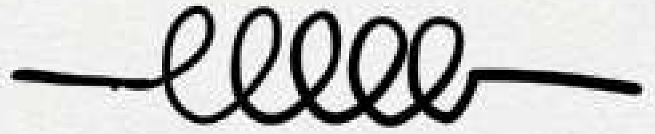
$$[\Phi] = [L][i] \Rightarrow \quad Tm^2 = Wb = [L]A \Rightarrow$$

$$[L] = \frac{Wb}{A} = H$$ Henry



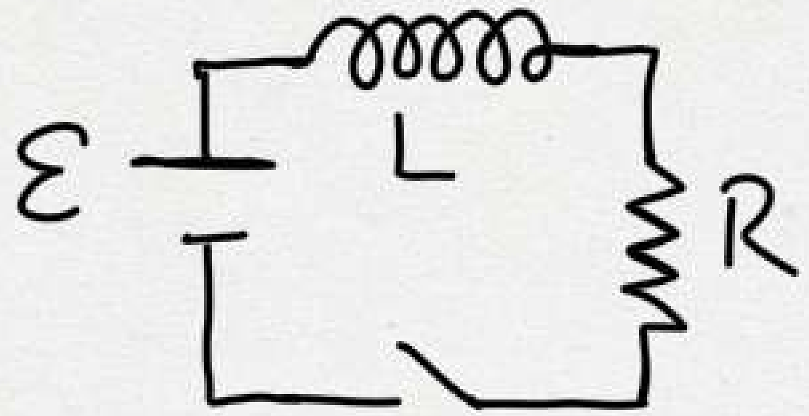


$$L \approx 4\cdot 10^{-6}\ H$$

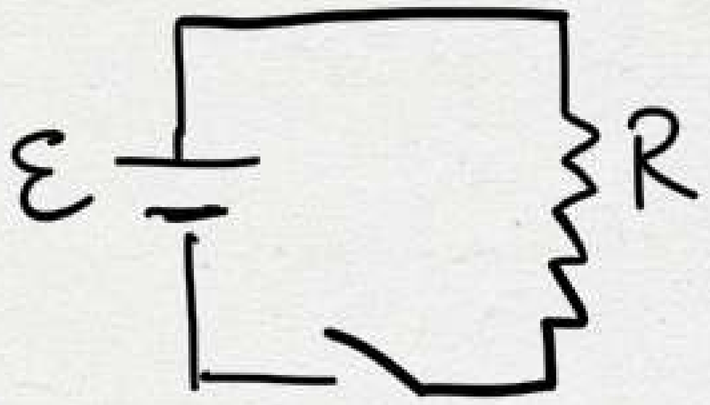


mH

CIRCUITO RL



$\xrightarrow{t\to\infty}$



$i(0) = 0$

$$Ri = \mathcal{E} + \mathcal{E}_i = \mathcal{E} - L\frac{di}{dt} \Rightarrow Ri - \mathcal{E} = -L\frac{di}{dt} \Rightarrow$$

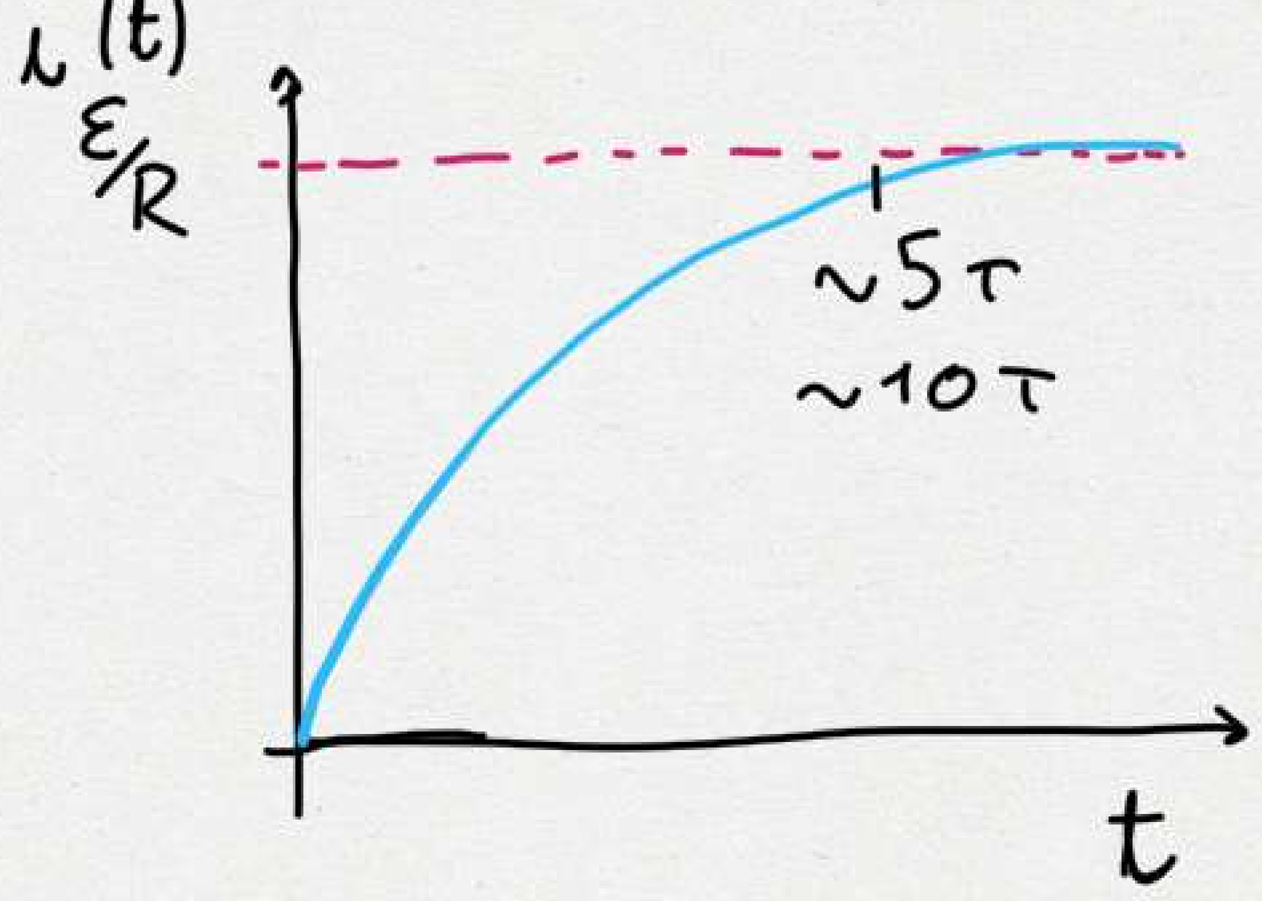
$$\frac{di}{i - \mathcal{E}/R} = -\frac{R}{L}dt \Rightarrow \log\left(i - \mathcal{E}/R\right)\Big|_0^{i(t)} = -\frac{R}{L}t \Rightarrow$$

$$\log\left(\frac{i - \mathcal{E}/R}{-\mathcal{E}/R}\right) = -\frac{R}{L}t \Rightarrow \frac{i - \mathcal{E}/R}{-\mathcal{E}/R} = e^{-\frac{R}{L}t} \Rightarrow$$

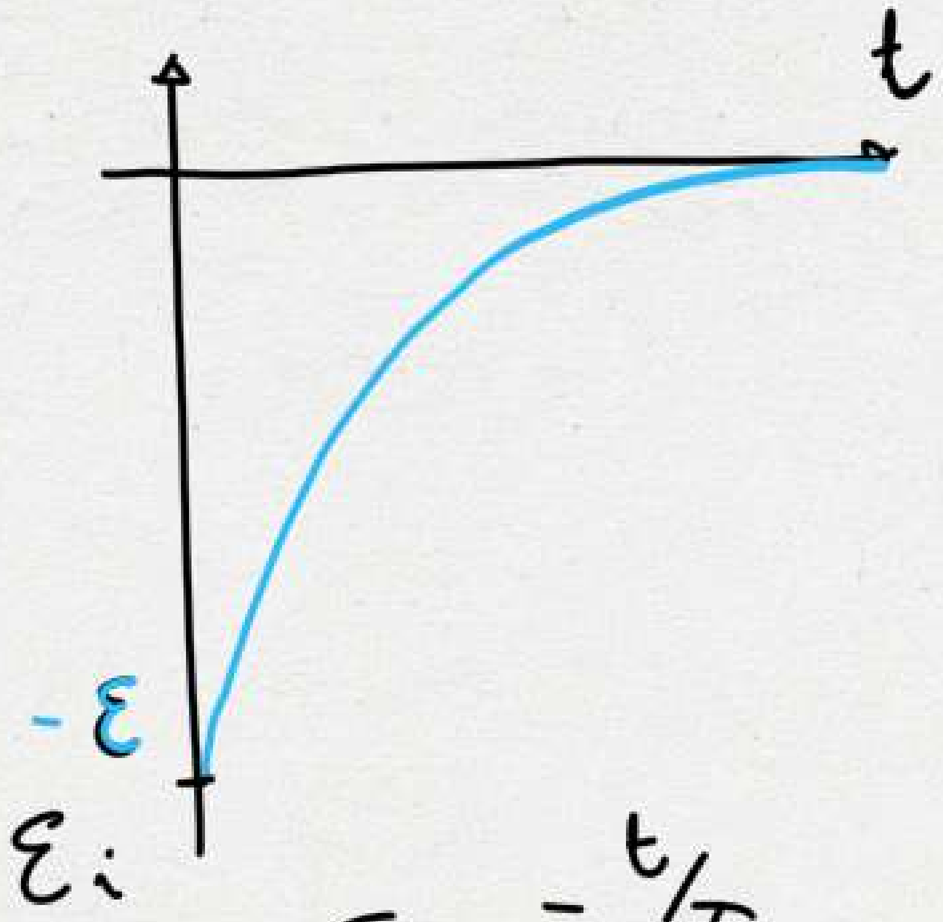
$$i(t) = \frac{\mathcal{E}}{R}\left(1 - e^{-\frac{R}{L}t}\right), \quad \mathcal{E}_i(t) = -L\frac{di}{dt} = -\cancel{L}\frac{\mathcal{E}}{\cancel{R}}\frac{\cancel{R}}{\cancel{L}}e^{-\frac{R}{L}t} = -\mathcal{E}e^{-\frac{R}{L}t}$$

$$i_i(t) = -\frac{\mathcal{E}}{R}e^{-\frac{R}{L}t}$$

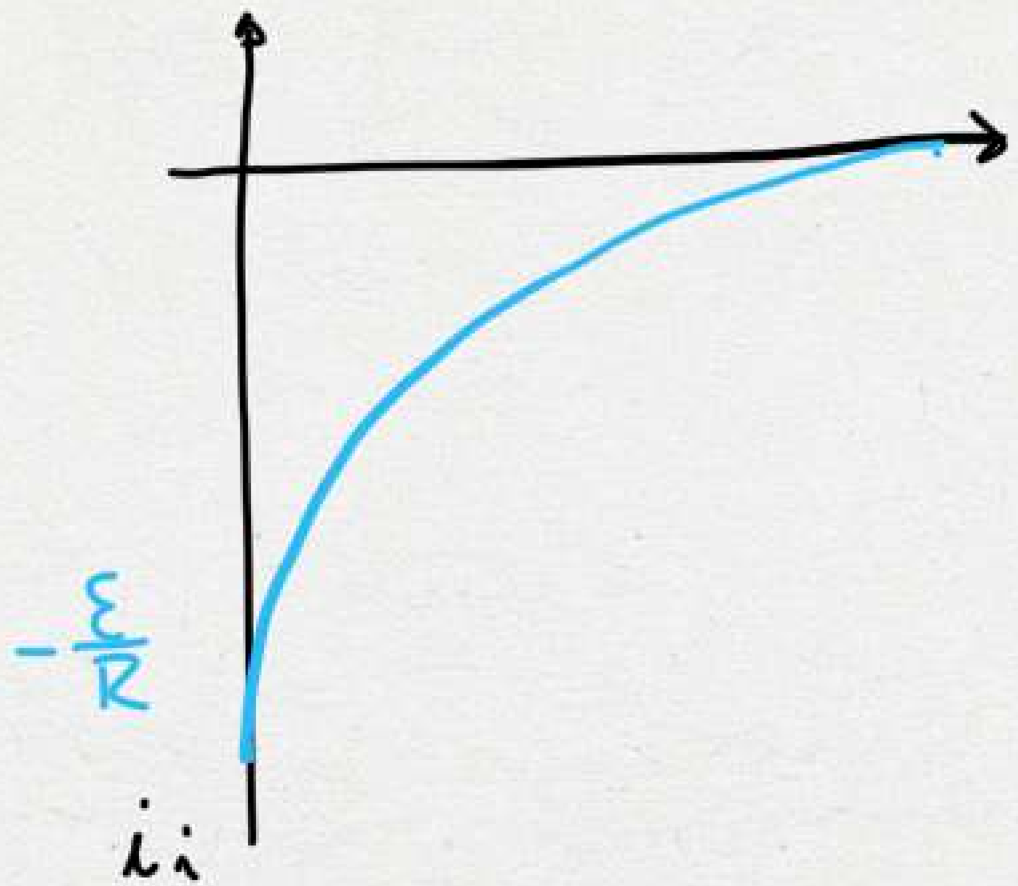
$$i(t) = \frac{\varepsilon}{R}\left(1-e^{-t/\tau}\right), \tau = \frac{L}{R}$$



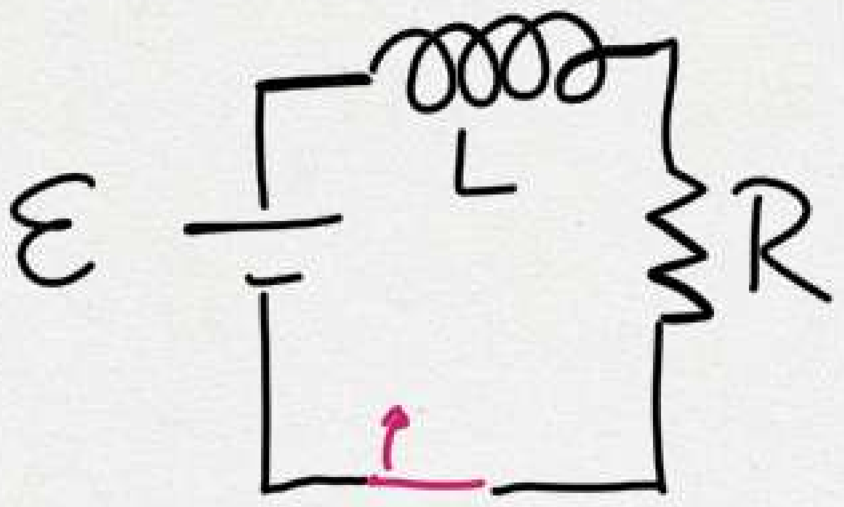
$$\varepsilon_i = -\varepsilon e^{-t/\tau}$$



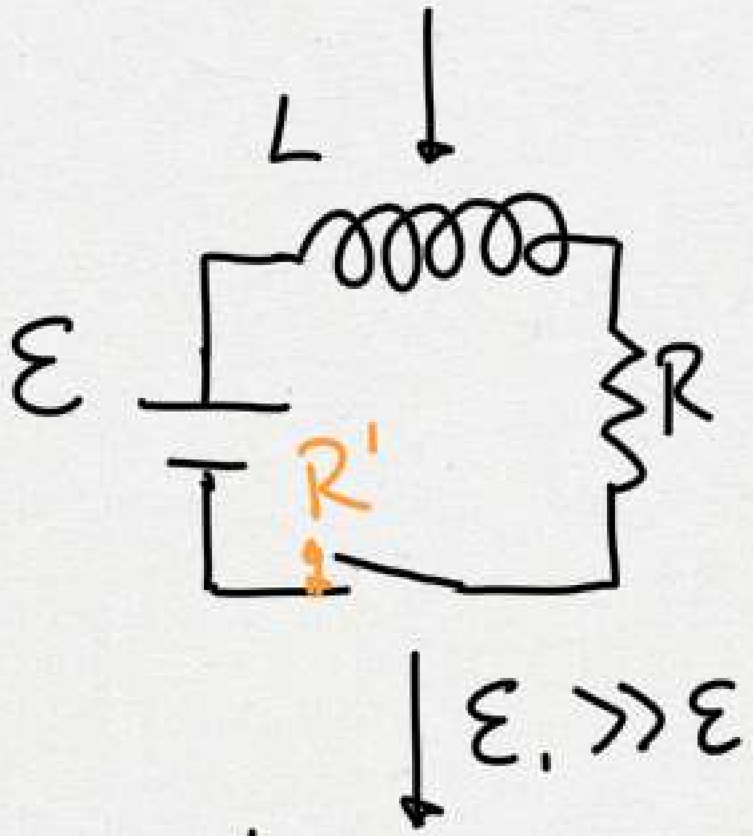
$$i_i = -\frac{\varepsilon}{R} e^{-t/\tau}$$



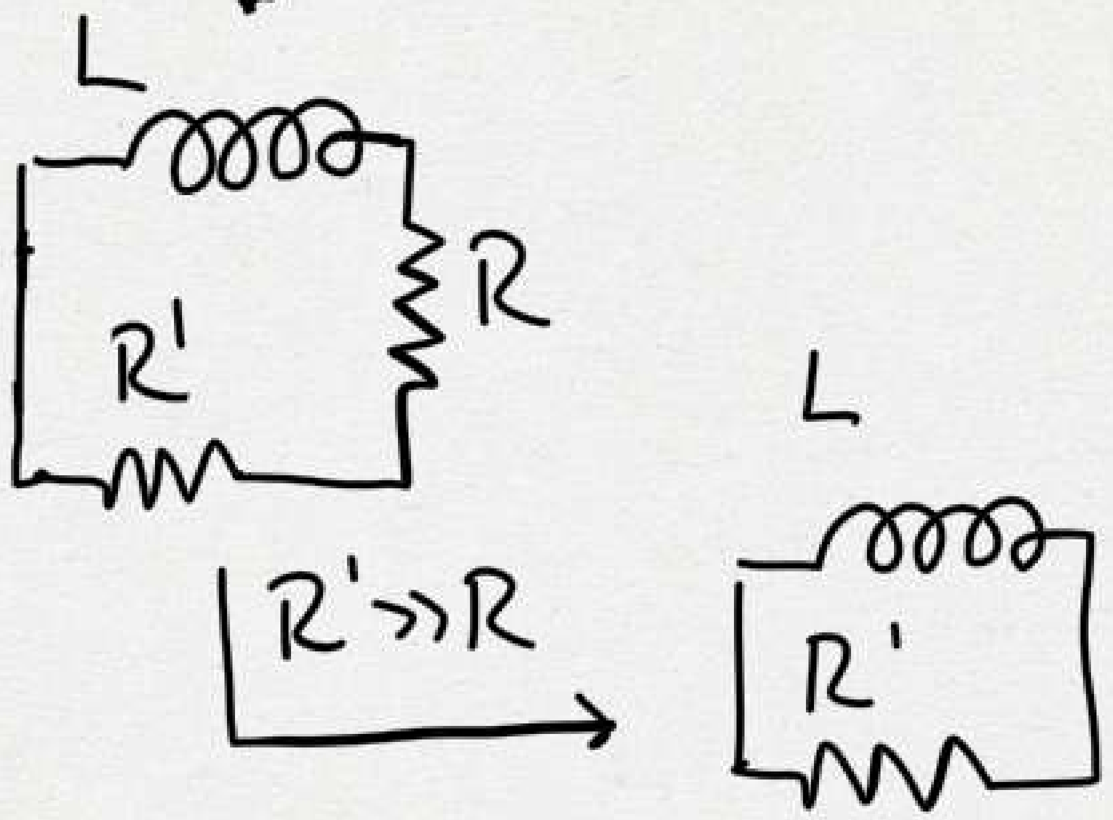
APERTURA DEL CIRCUITO RL



$$i(0) = \frac{\varepsilon}{R}$$



$$R' \gg R \,, \quad \varepsilon_i \gg \varepsilon$$



$$\varepsilon_i = -L\frac{di}{dt} = R' i \Rightarrow$$

$$\frac{di}{i} = -\frac{R'}{L}dt \Rightarrow$$

$$\left(\log i\right)_{\varepsilon/R}^{i(t)} = -\frac{R'}{L}t \Rightarrow \log\frac{i(t)}{\varepsilon/R} = -\frac{R'}{L}t \Rightarrow$$

$$i(t) = \frac{\varepsilon}{R}e^{-\frac{R'}{L}t} = \frac{\varepsilon}{R}e^{-t/\tau'} \,, \quad \tau' = \frac{L}{R'} \ll \tau$$

$$\varepsilon_i = -L\frac{di}{dt} = \frac{\varepsilon}{R}\frac{R'}{\cancel{L}}\cancel{L}\,e^{-t/\tau'} = \varepsilon\frac{R'}{R}e^{-t/\tau}$$