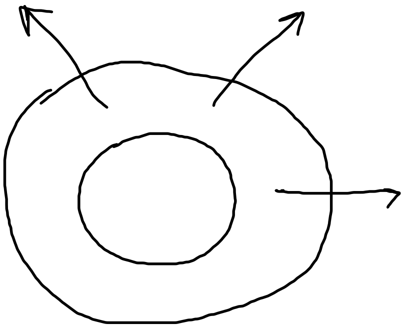
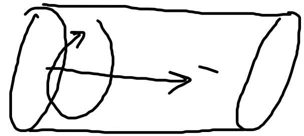
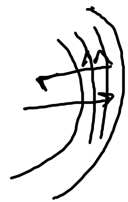
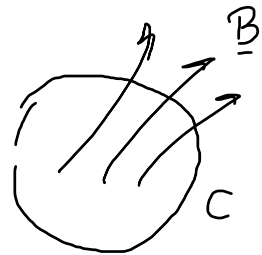






Parete metallica perfetta



resistività

$$\frac{d\Phi}{dt} = \int_S \frac{\partial \underline{B}}{\partial t} \cdot d\underline{S} + \int_C \underline{B}(t) \cdot (\underline{u}_\perp \times d\underline{l})$$

$$\underline{E} + \underline{u}_\perp \times \underline{B} = \eta \underline{j}$$

$$\frac{\partial \underline{B}}{\partial t} = -\underline{\nabla} \times \underline{E} = \quad \longrightarrow \quad \underline{E} + \underline{u}_\perp \times \underline{B} = 0 \text{ (caso ideale)}$$

$$\underline{E} = -\underline{u}_\perp \times \underline{B} + \eta \underline{j}$$

$$\frac{\partial \underline{B}}{\partial t} = -\underline{\nabla} \times \underline{E} = -\underline{\nabla} \times (\eta \underline{j} - \underline{u}_{\perp} \times \underline{B}) \quad (1)$$

$$\frac{d\Phi}{dt} = \int_S \underline{\nabla} \times (-\eta \underline{j} + \underline{u}_{\perp} \times \underline{B}) \cdot d\underline{S} + \int_C \underline{B}(t) \cdot (\underline{u}_{\perp} \times d\underline{l})$$

$$= -\int_S \underline{\nabla} \times (\eta \underline{j}) \cdot d\underline{S}_{\neq 0} + \cancel{\int_S \underline{\nabla} \times (\underline{u}_{\perp} \times \underline{B}) \cdot d\underline{S}} + \cancel{\int_C \underline{B}(t) \cdot (\underline{u}_{\perp} \times d\underline{l})}.$$

(2): Th Ampere $\quad \underline{\nabla} \times \underline{B} = \mu_0 \underline{j}\ ; \quad \underline{j} = \frac{1}{\mu_0}(\underline{\nabla} \times \underline{B}) \quad \underline{\nabla} \times (\underline{\nabla} \times \underline{B}) = \cancel{\underline{\nabla}(\underline{\nabla} \cdot \underline{B})} - \nabla^2 \underline{B}$

(2), (1): $\quad \frac{\partial \underline{B}}{\partial t} = -\frac{\eta}{\mu_0} \underline{\nabla} \times (\underline{\nabla} \times \underline{B}) + \underline{\nabla} \times (\underline{u}_{\perp} \times \underline{B})$

$$= \frac{\eta}{\mu_0} \nabla^2 \underline{B} + \underline{\nabla} \times (\underline{u}_{\perp} \times \underline{B})$$

Suppongo $\underline{u}_\perp = 0$

$$\frac{\partial \underline{B}}{\partial t} = \frac{\eta}{\mu_0} \nabla^2 \underline{B} \quad \text{(eq. di diffusione)}$$

$$\frac{\cancel{B}}{\tau} \simeq \frac{\eta \cancel{B}}{\mu_0 L^2} \; ; \quad \tau \simeq \frac{\mu_0 L^2}{\eta}$$

Se $\eta \to 0$ $\quad \tau \to +\infty$

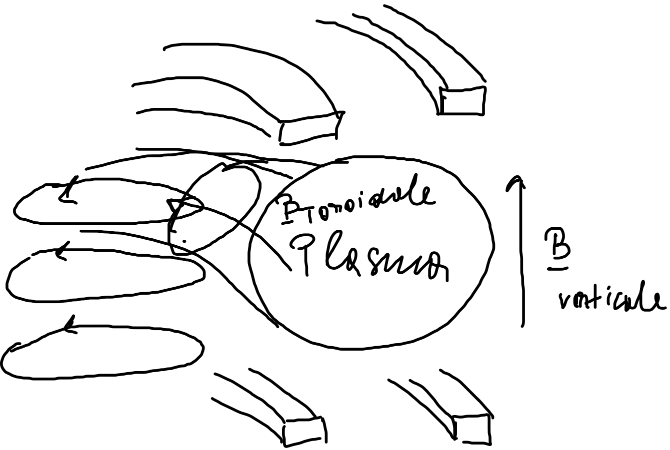
$\sigma_{Copper} \simeq 6 \cdot 10^{7} \, \Omega^{-1} m^{-1}$

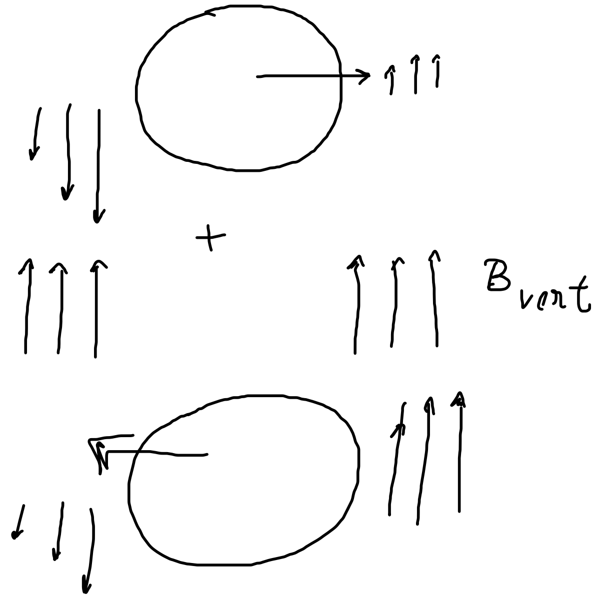
$L \simeq 1 \, m$

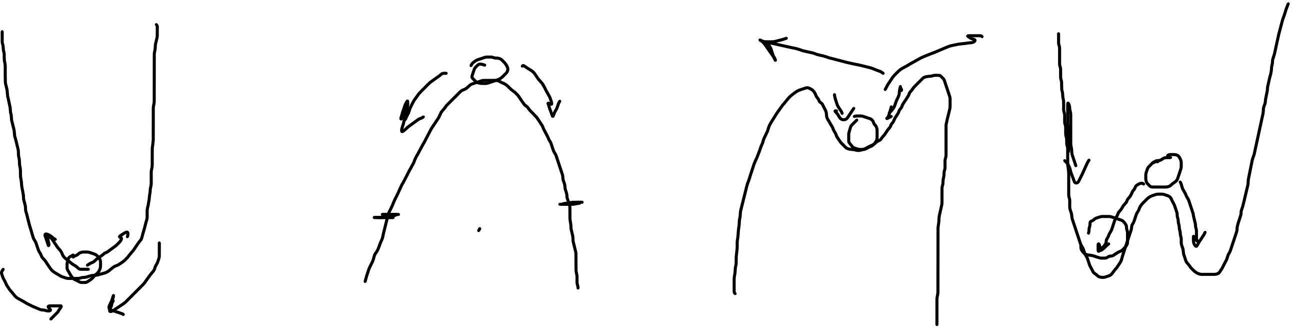
$\eta = \frac{1}{\sigma_{Copper}} = 1.7 \cdot 10^{-8} \, \Omega \cdot m$

$$\tau \simeq \frac{4\pi \cdot 10^{-7}}{1.7 \cdot 10^{-8}} \simeq 74 \, s \simeq \text{minuti}$$

$\tau_{MHD} \sim \frac{L}{v_{th,i}} \sim \mu s \quad T \sim keV$


B toroidale
Plasma
B verticale


+
B vert



Inst. ideali rispettano la legge di gelo

1) $W^{fin} < W^{iniz.}$

W^{fin} é accessibile

$\tau \sim \mu s$

rispett. la legge di gelo

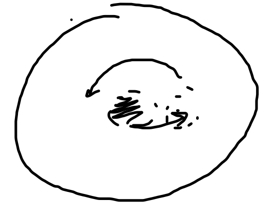
2) $W^{fin} < W^{iniz.}$

non ideali

violano la legge di gelo

$\tau \sim s$

Inst. { interne : redistribuzione locale (dente es. di sega)
esterne : moto compl. del plasma

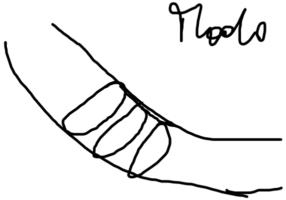


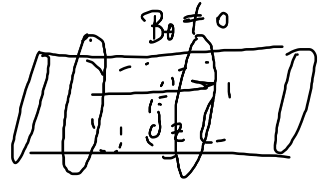
Inst. dovute alla corrente — limitano la corrente // che può scorrere

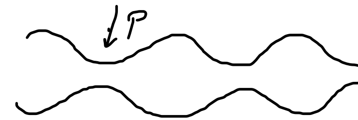
" " pressione

$$\underline{\nabla} p = \underline{j}_\perp \times \underline{B}$$

Modo kink





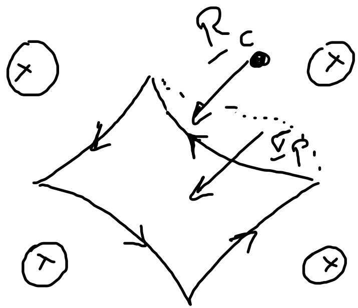


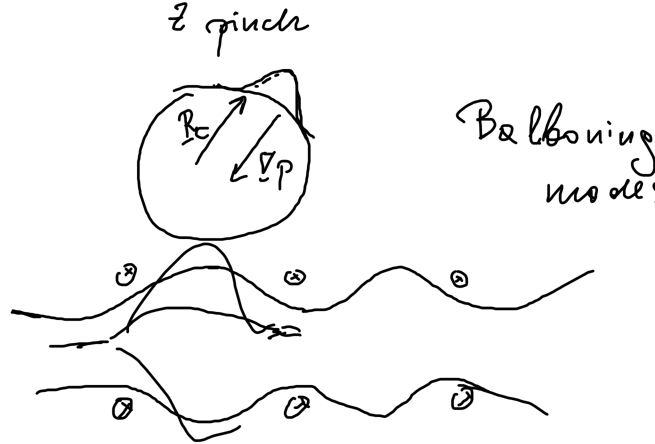
$+ \; B_z \Rightarrow$ screw pinch

Regioni a curvatura favorevole e sfavorevole

Se $\underline{R}_c \parallel \underline{\nabla} p$: curvatura è favorevole

Se $\underline{R}_c$ anti $\parallel$ $\underline{\nabla} p$: " " sfavorevole





$$f(x) \in L_2\left(-\frac{a}{2}, \frac{a}{2}\right) \qquad \left[-\frac{a}{2}, \frac{a}{2}\right]$$

$$f(x) = \frac{a_0}{2} + \sum_{m=1}^{+\infty}\left[a_m \cos\left(\frac{2\pi m x}{a}\right) + b_m \sin\left(\frac{2\pi m x}{a}\right)\right] \qquad m = 1, 2, 3\ldots$$

$$a_m = \frac{2}{a}\int_{-\frac{a}{2}}^{\frac{a}{2}} f(x)\cos\left(\frac{2\pi m x}{a}\right)dx$$

$$b_m = \frac{2}{a}\int_{-\frac{a}{2}}^{\frac{a}{2}} f(x)\,\text{sen}\left(\frac{2\pi m x}{a}\right)dx$$

$$K_m = \frac{2\pi}{a}m$$

$$\lambda = \frac{2\pi}{k_m} = \frac{a}{m}$$

$$K_m - K_{m-1} = \frac{2\pi}{a}$$