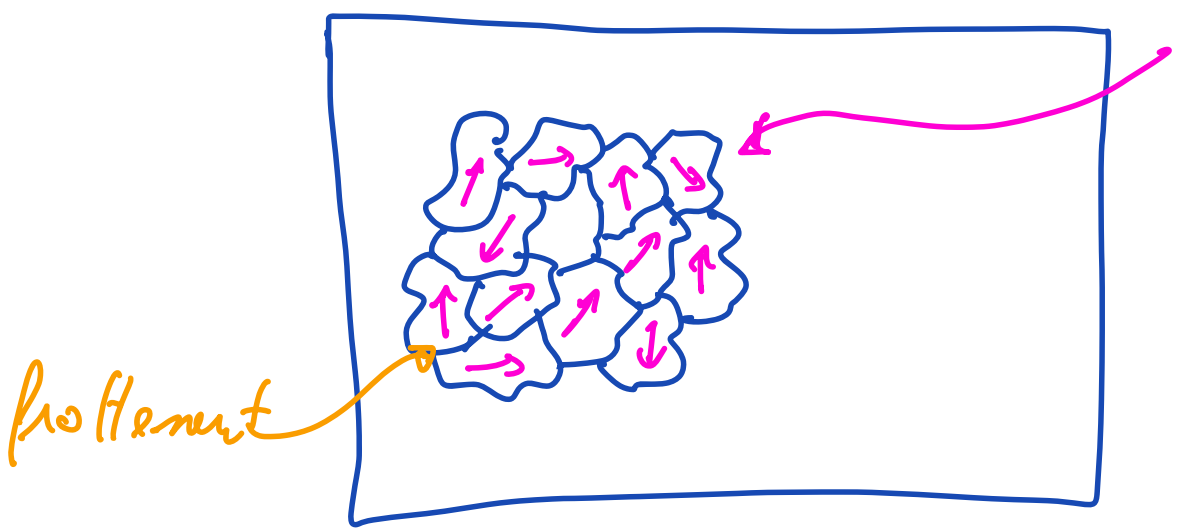
EPFL

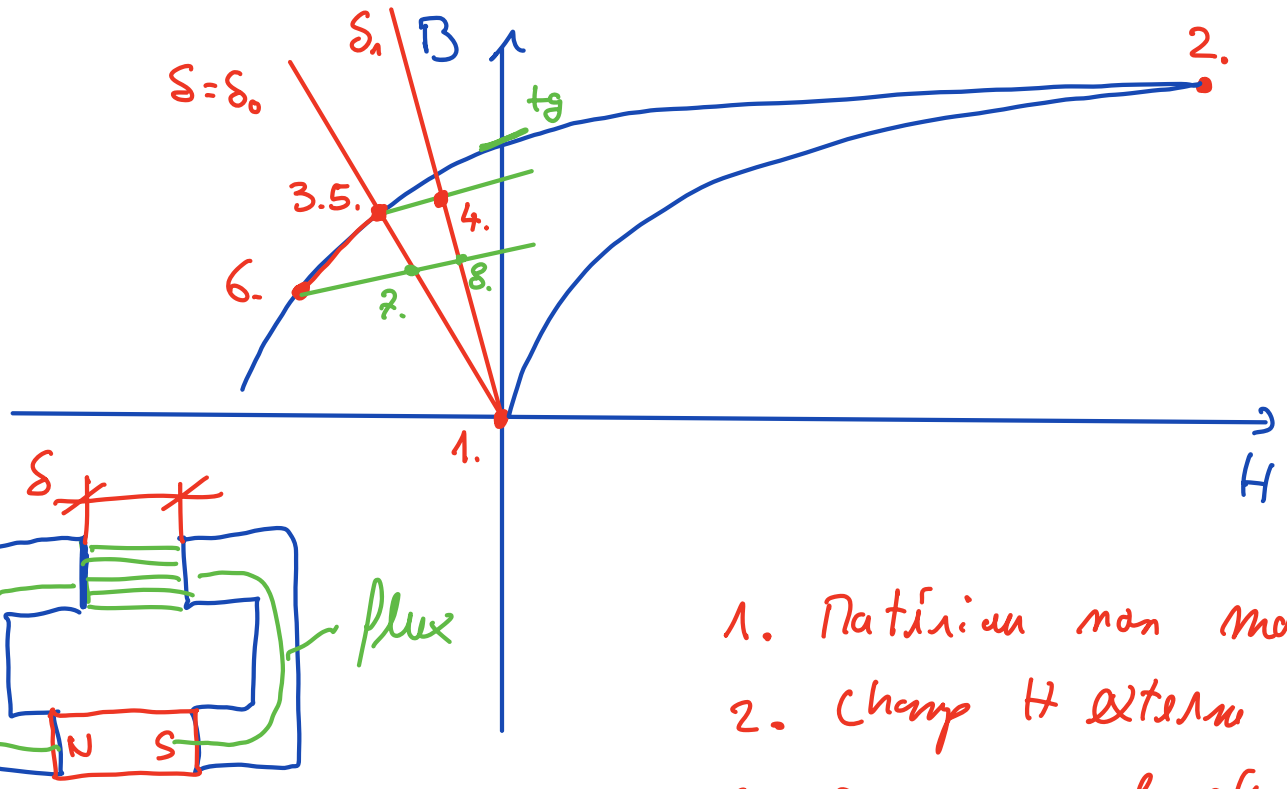
2.6 Aimant Permanent :



→ induction rémanente

→ Matériau à très fort hystérésis

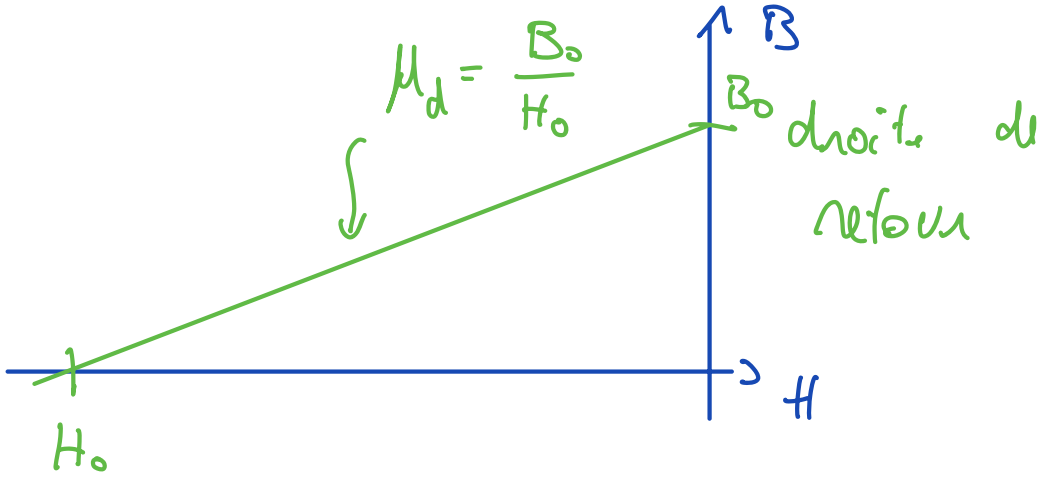
Vie d'un aimant :



1. Matériau non magnétisé
2. Champ H externe
3. On coupe le champ H externe. $\delta = \delta_0$
4. On change $\delta \rightarrow \delta_1 < \delta_0$
5. On revient à $\delta = \delta_0$
6. on change $\delta \rightarrow \delta_2 > \delta_0$

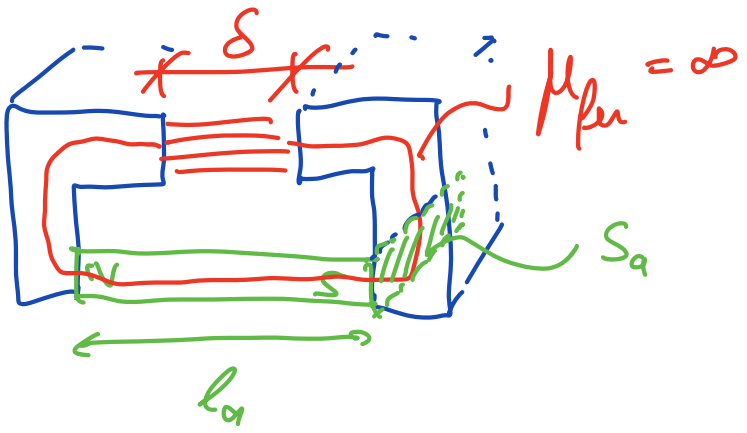
7. $\delta = \delta_0$
8. $\delta = \delta_1$

=> Modèle de l'aimant :



eqn : $B = B_0 + \mu_d \cdot H$

$\mu_d = 1{,}05 \dots 5\ \mu_0$



Maxwell : $\vec{Div}\ \vec{B} = 0$

$$\overline{\Phi}_a = \overline{\Phi}_e$$

$$B_a \cdot S_a = B_e \cdot S_e$$

$$B_a \cdot S_a = \mu_0 \cdot H_e \cdot S_e \qquad (1)$$

$$\vec{Rot}\ \vec{H} = \vec{j}$$

$$\vdots$$

$$\oint H\,dl = \Theta_b = N \cdot i = 0$$

pas de bobine

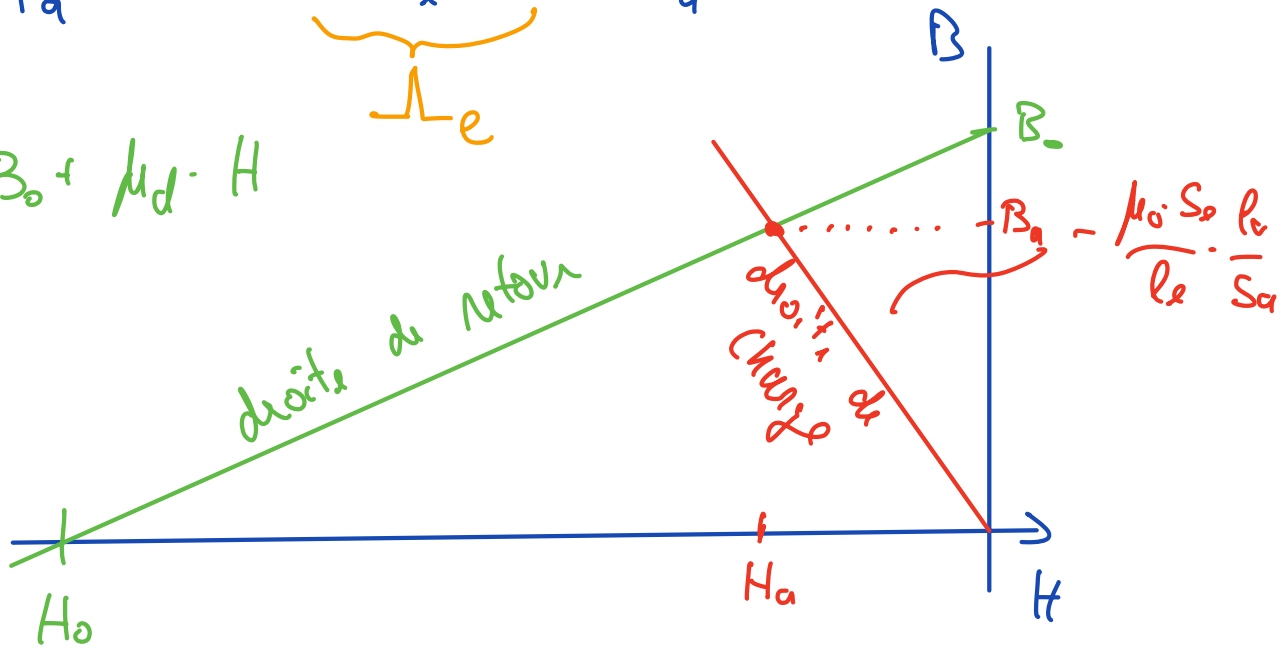
$$H_a \cdot l_a + H_e \cdot l_e = 0$$

de (1) $$H_e = \frac{B_a \cdot S_a}{\mu_0 \cdot S_e}$$

$$H_a \cdot l_a + \frac{B_a \cdot S_a}{\mu_0 \cdot S_e} \cdot l_e = 0$$

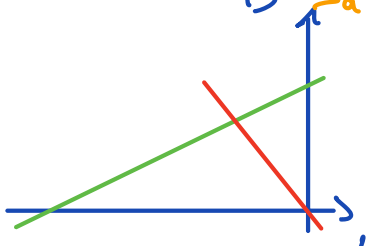
$$\frac{B_a}{H_a} = -\underbrace{\frac{\mu_0 \cdot S_e}{l_e}}_{\Lambda_e} \cdot \frac{l_a}{S_a} = -\Lambda_e \frac{l_a}{S_a}$$

$B = B_0 + \mu_d \cdot H$



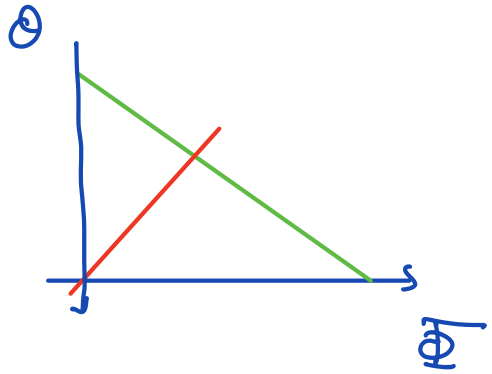
2.7 Modèle équivalent de l'aimant :

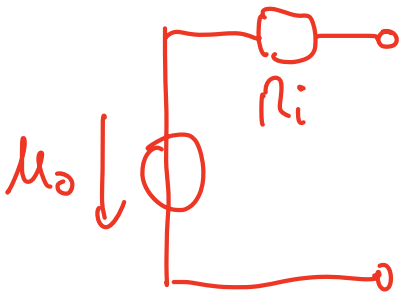
$B \cdot S_a = \Phi$



$H \cdot l_a = 0$

90°

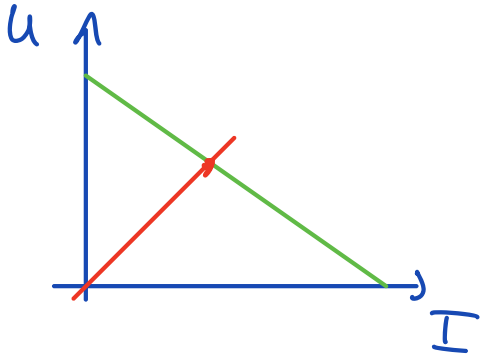




$u = u_0 - R_i I$

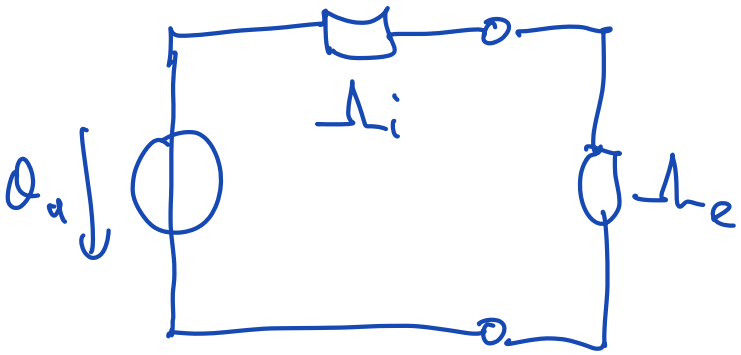
$u = R_L \cdot I$

$R_i = \frac{u_0}{I_{cc}}$



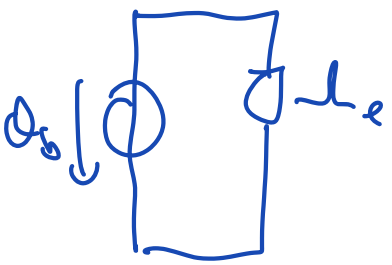
Analogie : $R_{im} = \frac{\theta_{a0}}{\Phi_{a0}} = \frac{H_0 \cdot l_a}{B_0 \cdot S_a}$

$$\Lambda_i = \frac{1}{R_{im}} = \frac{B_0 \cdot S_a}{H_0 \cdot l_a} = \frac{\mu_d \cdot S_a}{l_a}$$



$\theta_a = H_0 \cdot l_a$

[bobine



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Aimant carré de 3 mm de côté, 7 mm long

$|H_0| = 620 \text{ kA/m}$ (SmCo)

$\theta_a = H_0 \cdot l_a = 620000 \cdot 7 \cdot 10^{-3} = 4340 \text{ A}$

$\simeq$ 4340 spires d'une bobine parcourue par 1 A

θ_b (N·I)