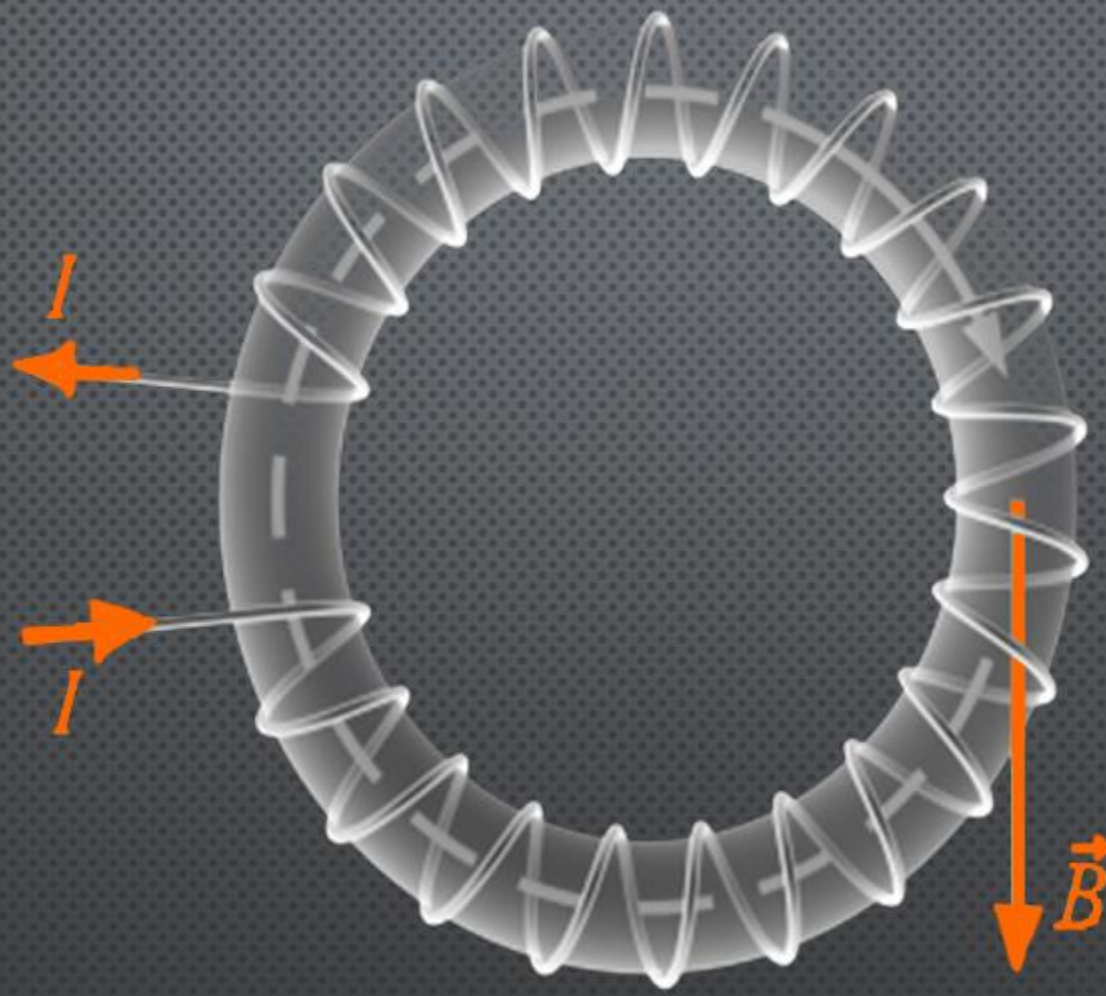
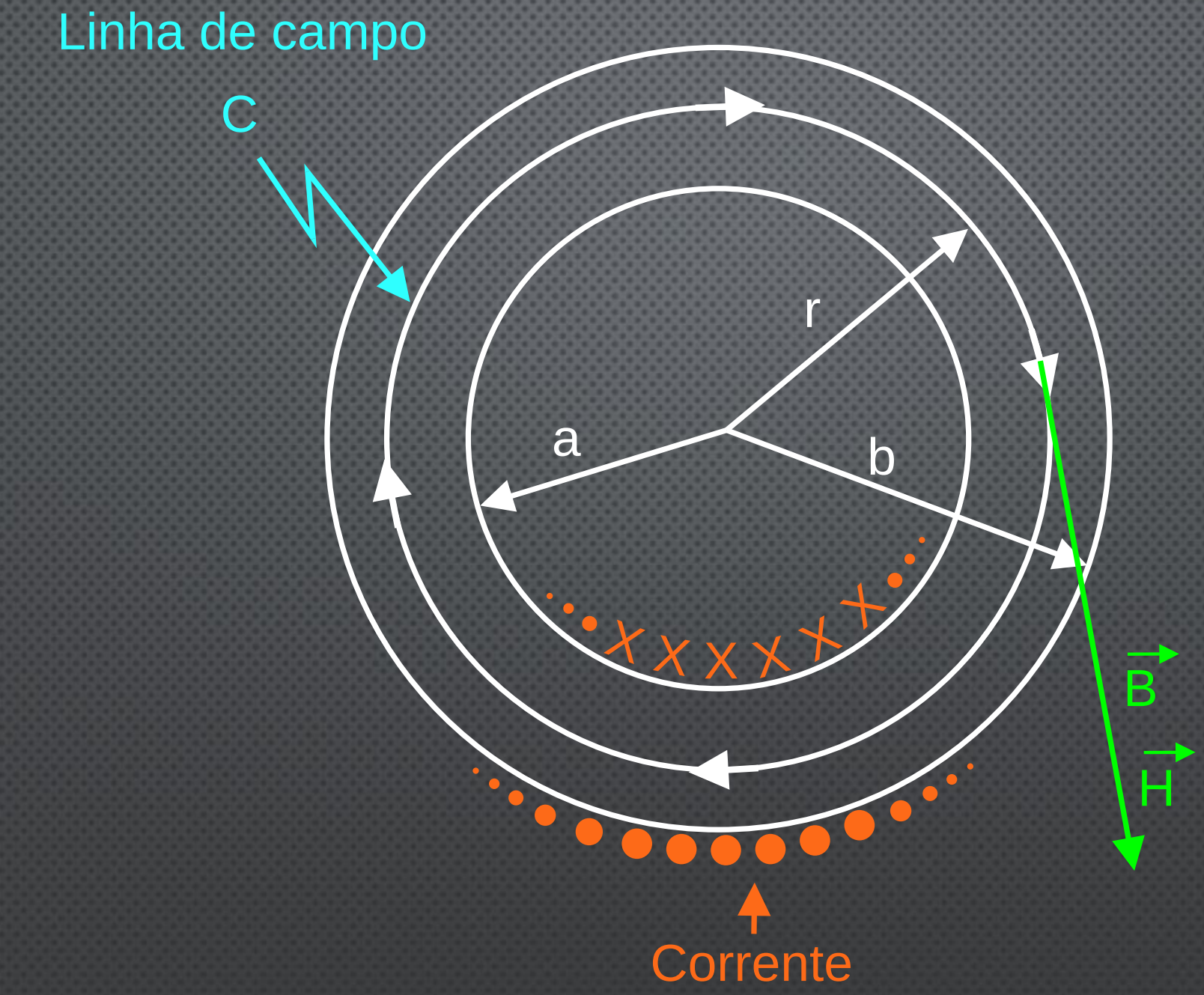
ESCOLA POLITÉCNICA DA USP

DISCIPLINA: CONVERSÃO ELETROMECÂNICA DE ENERGIA

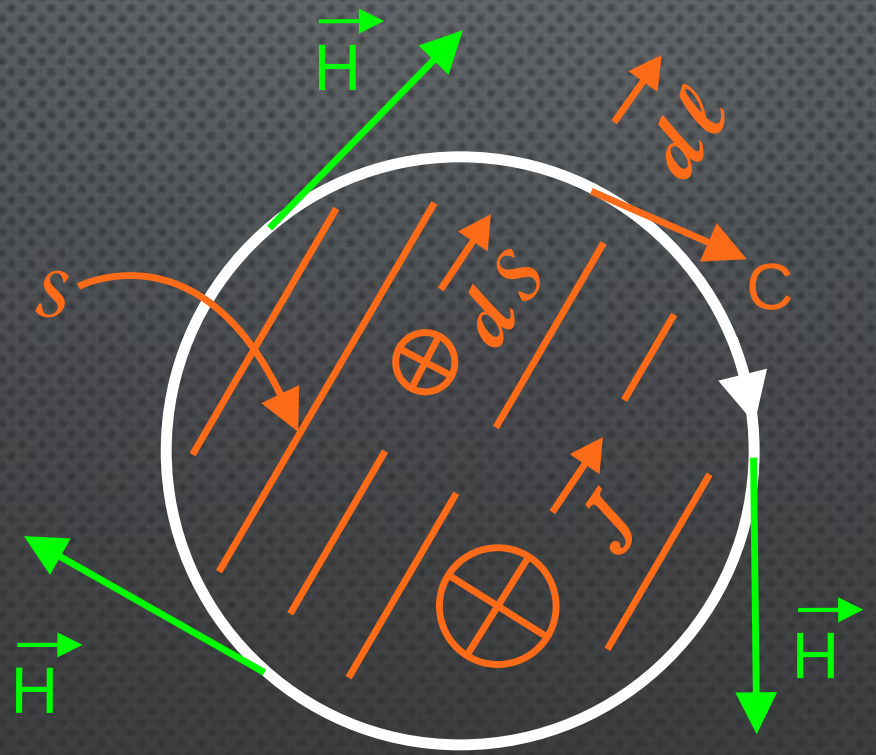
AULA: CIRCUITOS MAGNÉTICOS EM CORRENTE CONTÍNUA

Prof. José Roberto Cardoso


I
I
$\vec{B}$


Linha de campo
C
r
a
b
$\vec{B}$
$\vec{H}$
Corrente

$$\oint_C \vec{H} \cdot \vec{dl} = \int_S \vec{J} \cdot \vec{dS}$$



$$H2\pi r = NI$$

Lei Circuital de Ampère

Campo Intensidade Magnética

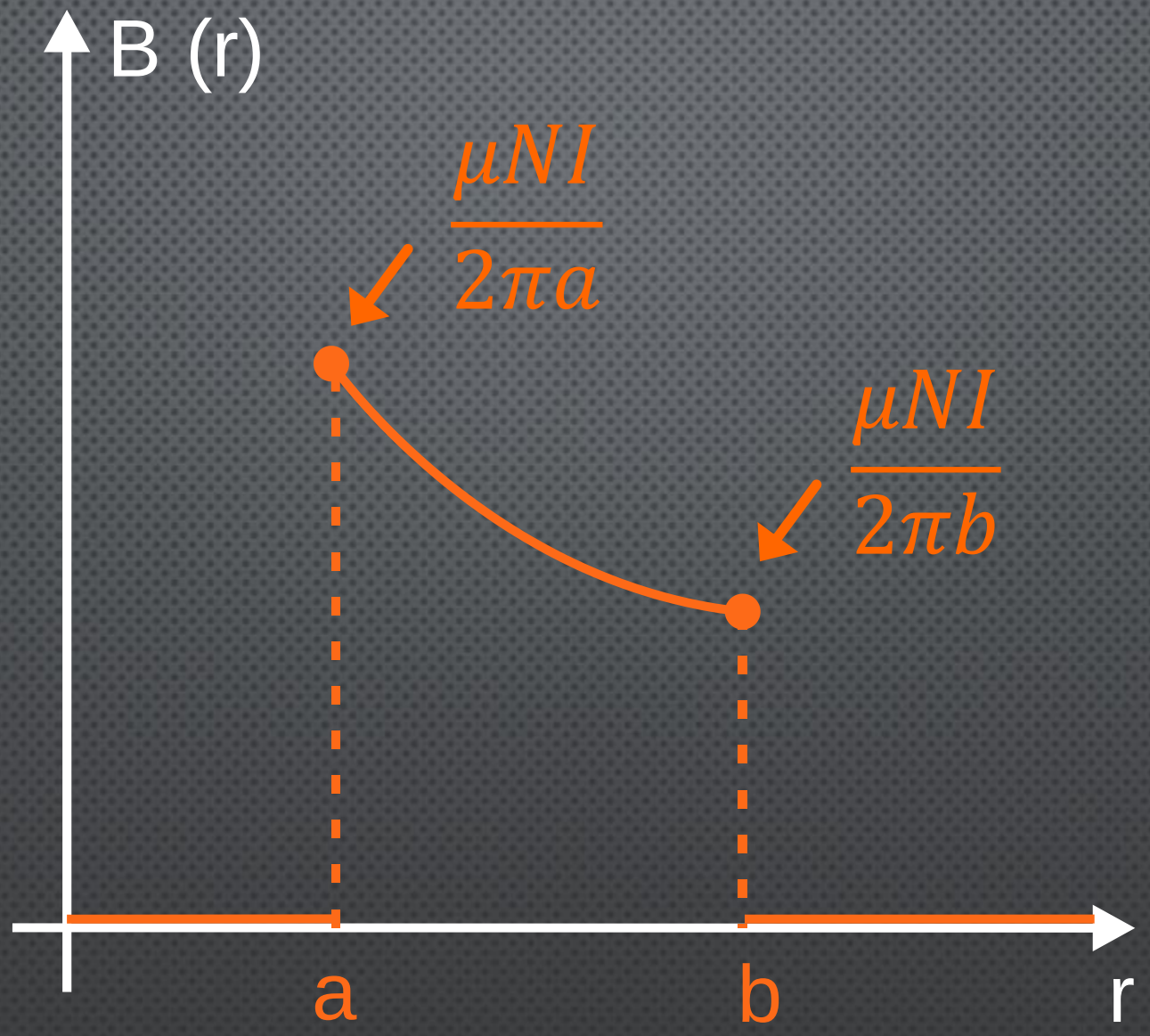
$$H = \frac{NI}{2\pi r}$$

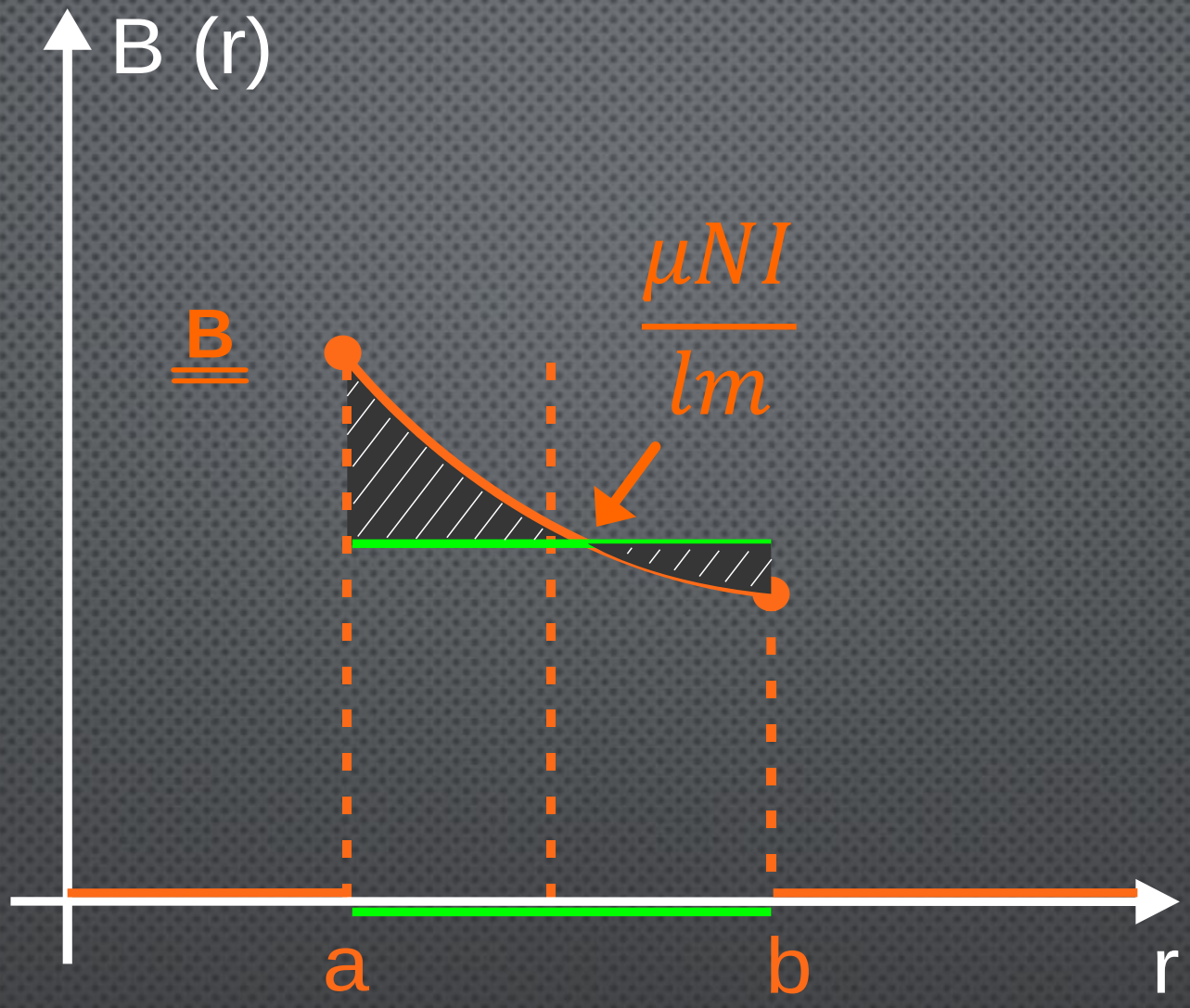
Relação Constitutiva

$$B = \mu H$$

$$B \equiv \frac{\mu N I}{2\pi r}$$

Campo Magnético


B (r)
$\frac{\mu NI}{2\pi a}$
$\frac{\mu NI}{2\pi b}$
a
b
r



$$Rm = \frac{a+b}{2}$$

$$lm = 2\pi Rm$$

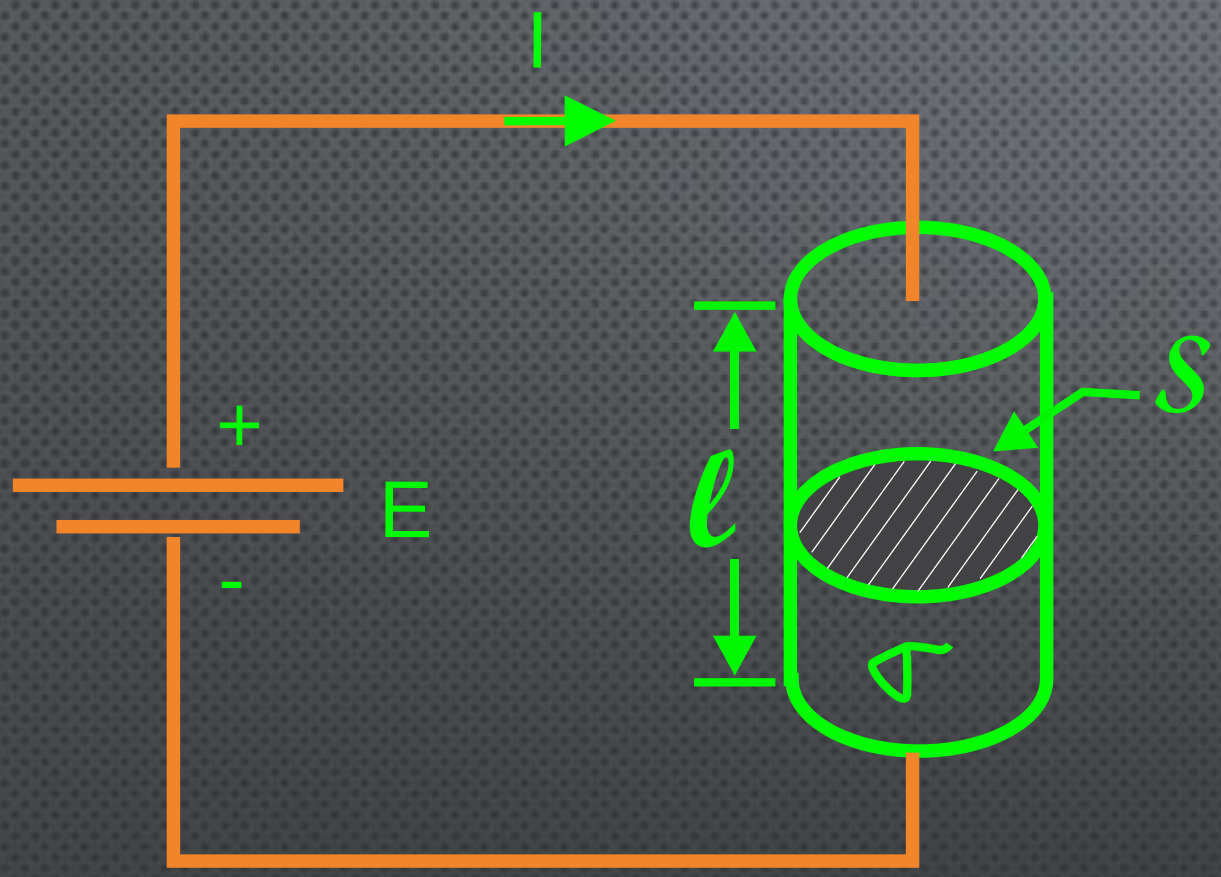
$$\emptyset = \int_S \vec{B}.\overrightarrow{dS}$$

$$\emptyset = B.S$$

Fluxo Magnético

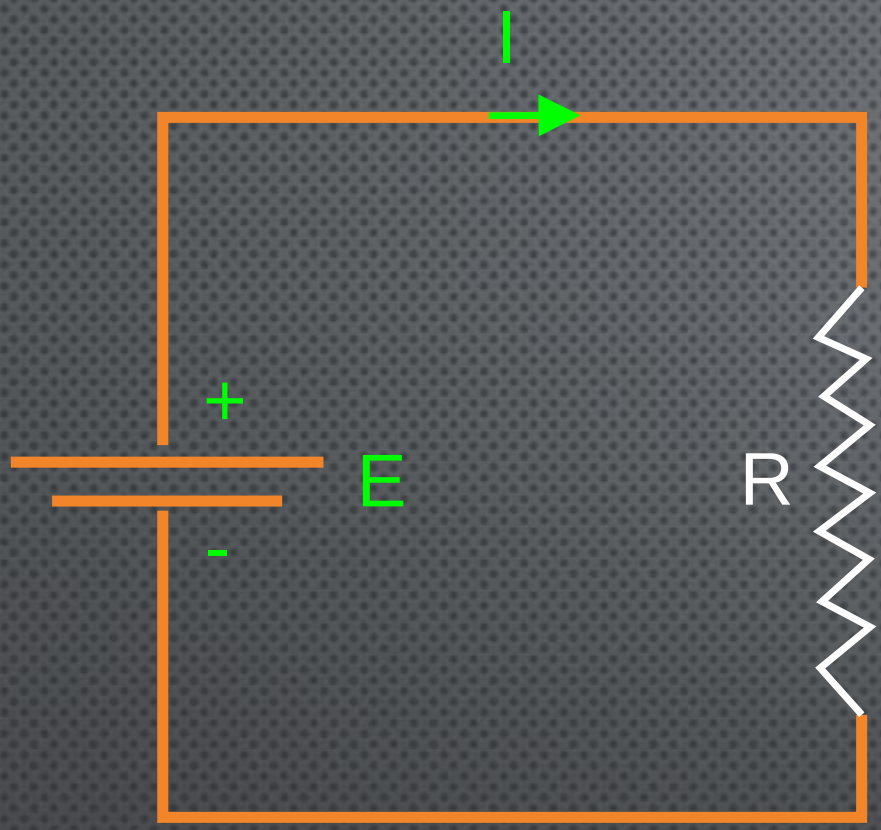
$$\emptyset = \frac{\mu NI}{l_m}.S$$

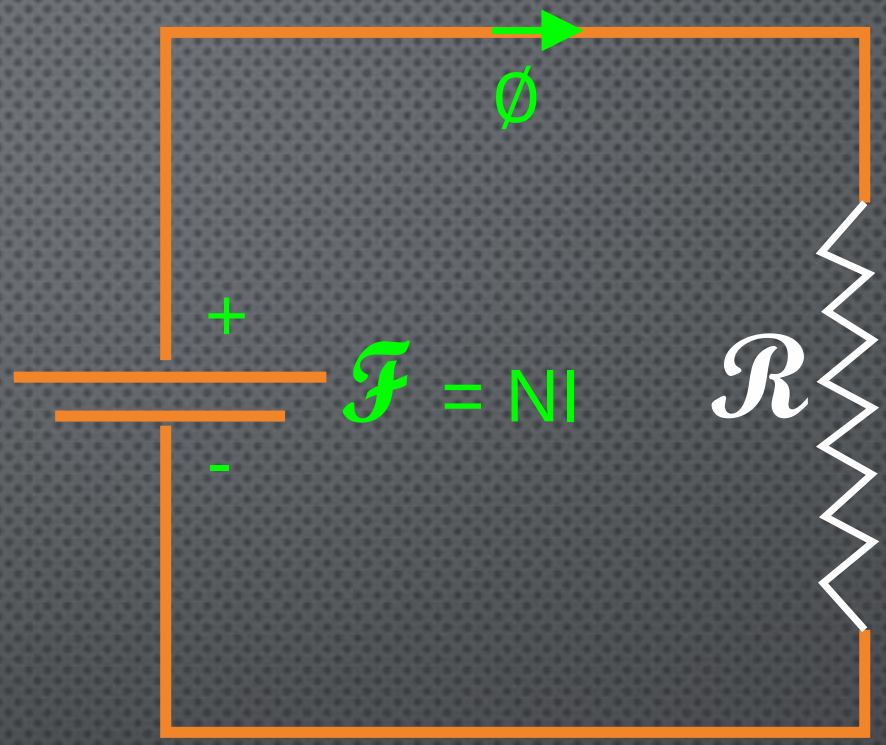
$$\emptyset = \frac{NI}{\frac{1}{\mu}\times\frac{l_m}{S}}$$



$$I = \frac{E}{\frac{1}{\sigma} \times \frac{\ell}{S}} = \frac{E}{R}$$

$$\emptyset = \frac{NI}{\frac{1}{\mu} \times \frac{lm}{S}} = \frac{\mathcal{F}}{R}$$

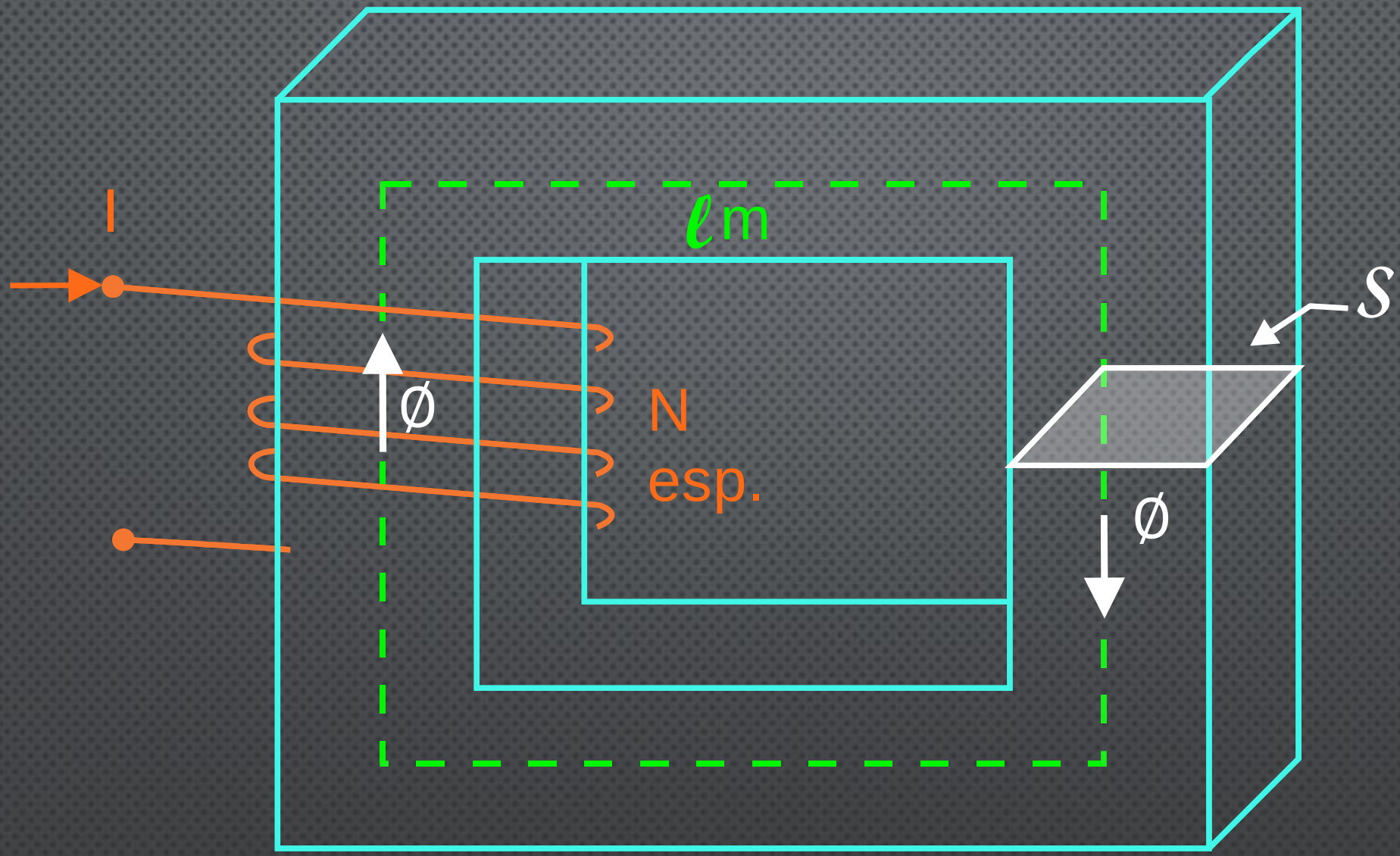


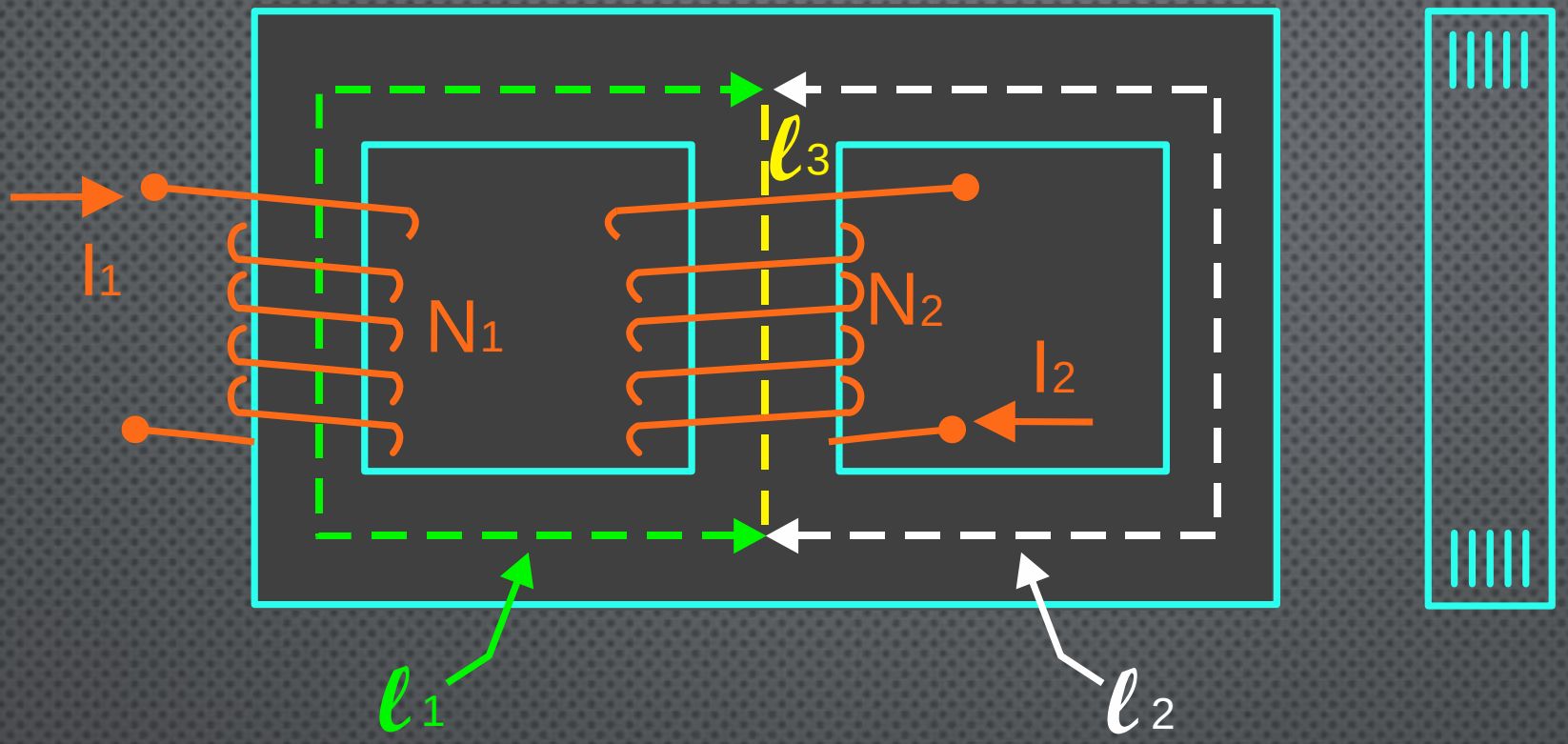


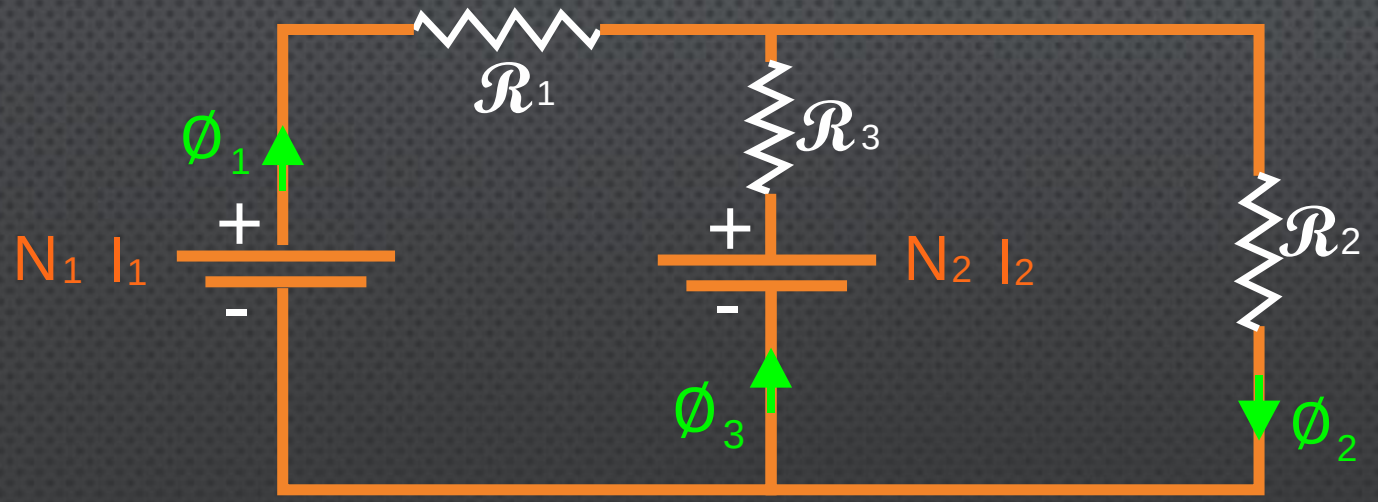
$$R = \frac{1}{\sigma}\frac{l}{S}\ (\Omega)$$

$$\mathcal{R} = \frac{1}{\mu}\frac{l_m}{S}\ \left(\frac{\text{Aesp}}{\text{Wb}}\right)$$

Circuito Elétrico	Circuito Magnético
I – Corrente (A)	Φ – Fluxo Magnético (Wb)
E – F.E.M. (V)	$\mathcal{F}$ =NI - F.M.M. (Aesp)
s – Condutividade (S/m)	μ – Permeabilidade (H/m)
R – Resistência (Ohm)	$\mathcal{R}$ – Relutância (Aesp/Wb)
G=1/R Condutância (S)	$\mathcal{P}=1/\mathcal{R}$– Permeância (Wb/Aesp)
J–Dens. de Corrente (A/m^2)	B – Campo Magnético (Wb/m^2)


I
ℓm
ø
N
esp.
S
ø


ℓ_3
I_1
N_1
N_2
I_2
ℓ_1
ℓ_2


$\mathcal{R}_1$
$\mathcal{R}_3$
$\mathcal{R}_2$
ϕ_1
N_1 I_1
N_2 I_2
ϕ_3
ϕ_2