

Física Experimental 3

Prática 6

Determinação Experimental campo Magnético Da Terra

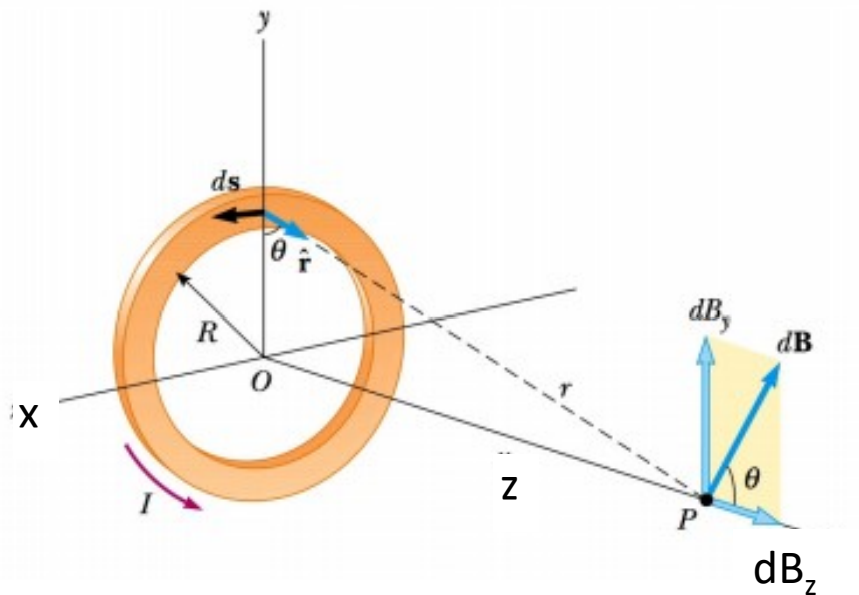
Prof. Carlos Renato Menegatti

Objetivos

- Bobinas configuração Helmholtz;
- Determinação do campo Magnético da Terra;

Conceitos teóricos: Bobinas config. Helmholtz

Campo mag. no eixo de uma espira



Lei de Biot-Savart

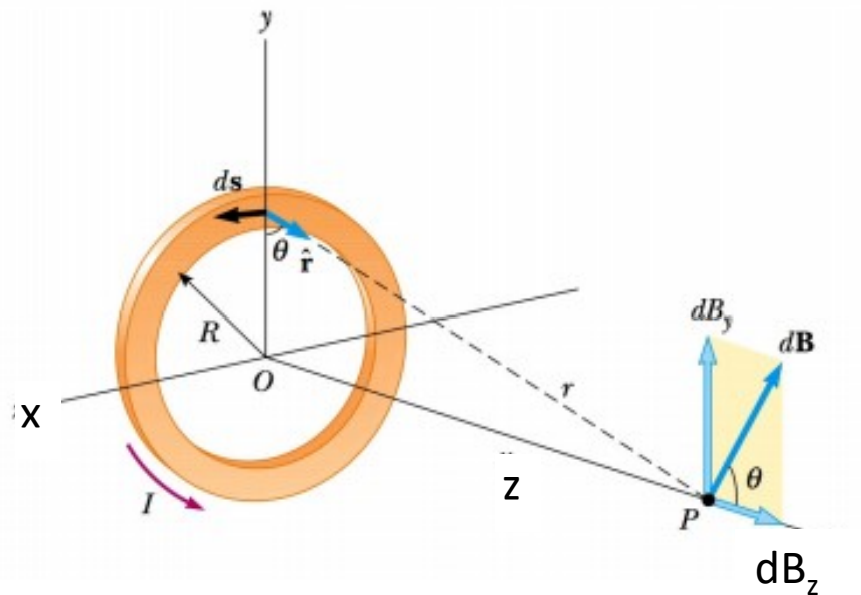
$$d\vec{B} = \frac{\mu_0}{4\pi} \cdot \frac{i \cdot d\vec{l} \times \hat{r}}{r^2}$$

$$d\vec{B} = \frac{\mu_0}{4\pi} \cdot \frac{i \cdot dl}{(z^2 + R^2)}$$

$$dB_z = dB \cdot \cos\theta = \frac{\mu_0 \cdot i}{4\pi} \cdot \frac{dl}{(z^2 + R^2)} \cdot \frac{R}{(z^2 + R^2)^{1/2}}$$

Conceitos teóricos: Bobinas config. Helmholtz

Campo mag. no eixo de uma espira



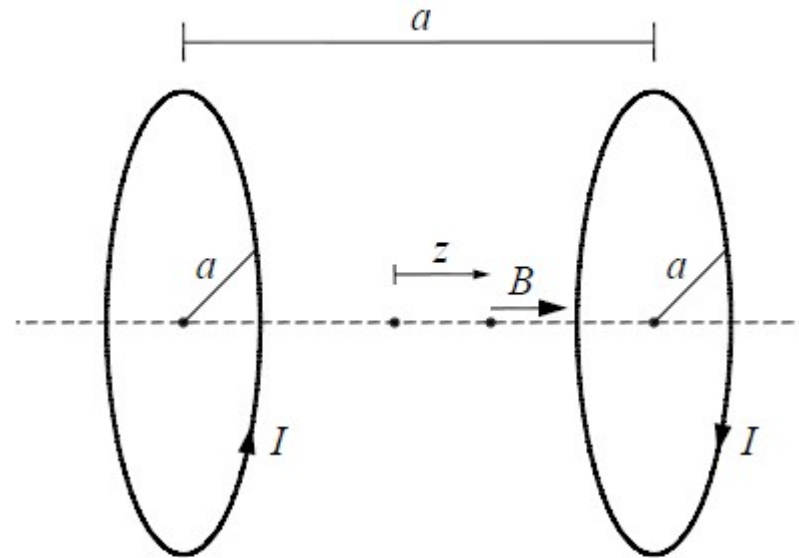
$$B_z = \int \frac{\mu_0 \cdot i}{4\pi} \cdot \frac{R}{(z^2 + R^2)^{3/2}} \cdot dl$$

$$B_z = \frac{\mu_0 \cdot i}{4\pi} \cdot \frac{R}{(z^2 + R^2)^{3/2}} \cdot 2\pi \cdot R$$

$$B_z = \frac{\mu_0 \cdot i}{2} \cdot \frac{N \cdot R^2}{(z^2 + R^2)^{3/2}}$$

Campo mag. no eixo de N espiras

Bobinas config. Helmholtz



$$\vec{B}(z) = \frac{\mu_0 I a^2}{2} \left(\frac{1}{((z - a/2)^2 + a^2)^{3/2}} + \frac{1}{((z + a/2)^2 + a^2)^{3/2}} \right) \hat{z}$$

$$B = \frac{8}{5^{3/2}} \cdot \frac{N\mu_0 I}{a} \hat{z} \approx 0,715 \cdot \frac{N\mu_0 I}{a} \hat{z}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ N} \cdot \text{A}^{-2}$$

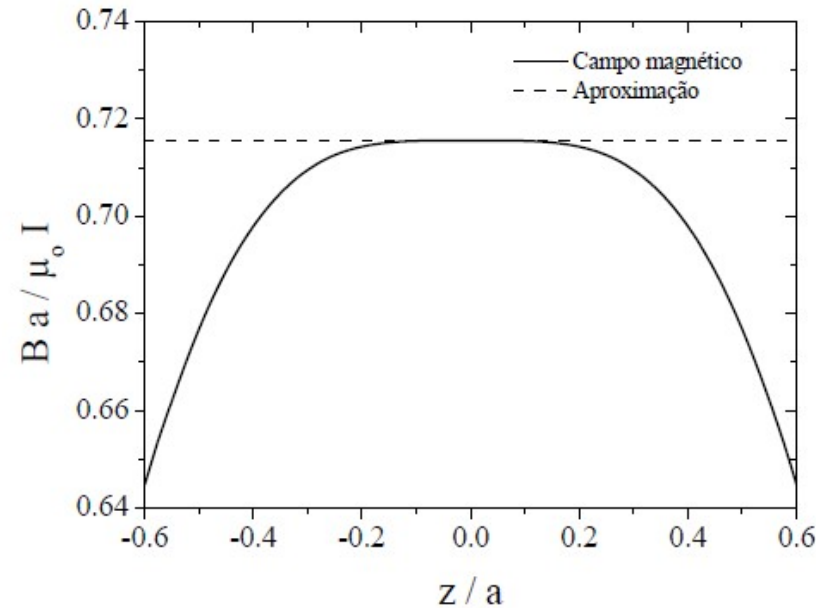
Permeabilidade mag.

No **SI** unidade de **B** - **Tesla**

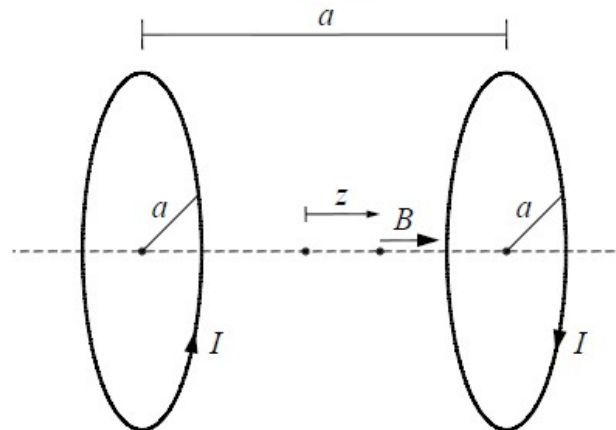
Campo mag. no centro geométrico das bobinas

Bobinas config. Helmholtz

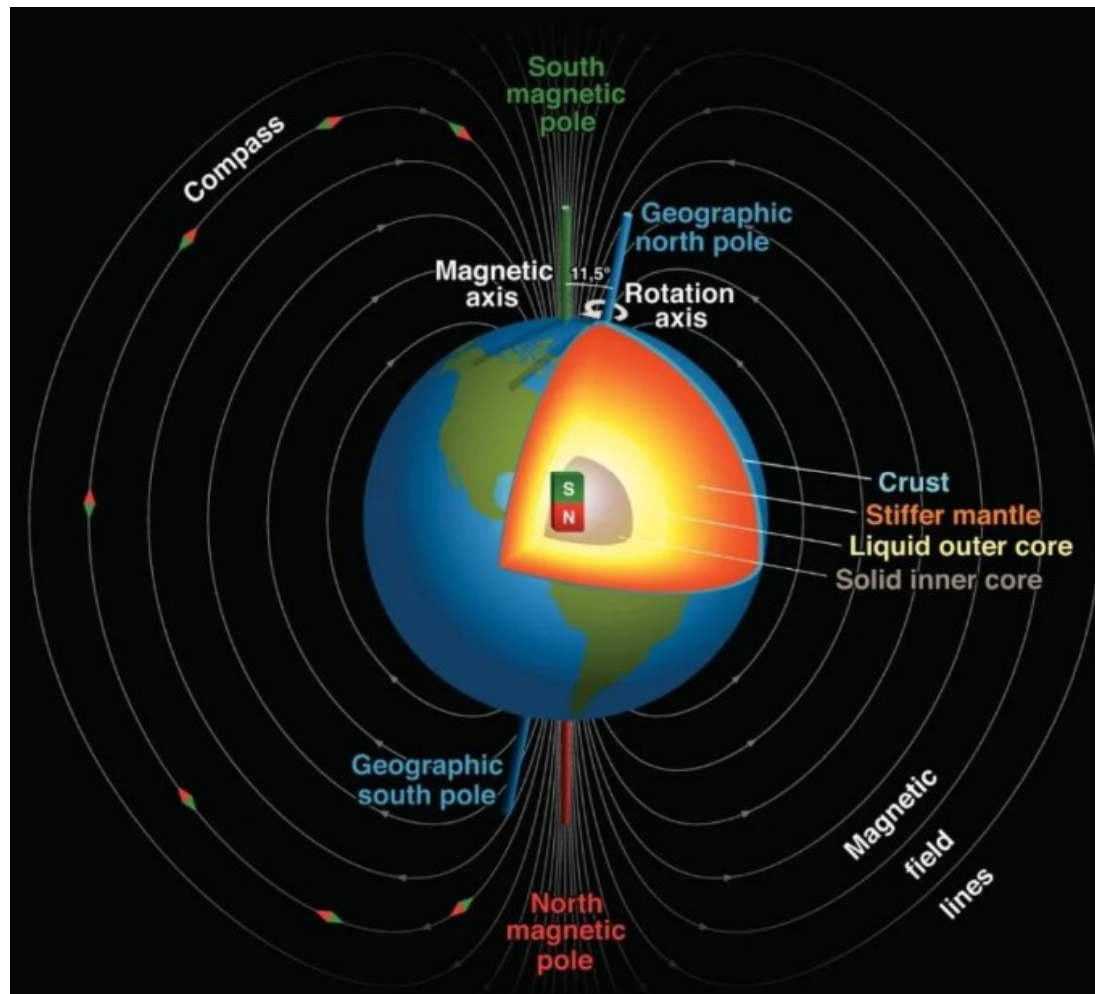
Figura 10.4 - Campo magnético (normalizado) gerado por uma bobina de Helmholtz. As bobinas estão localizadas em $z/a = \pm 0,5$



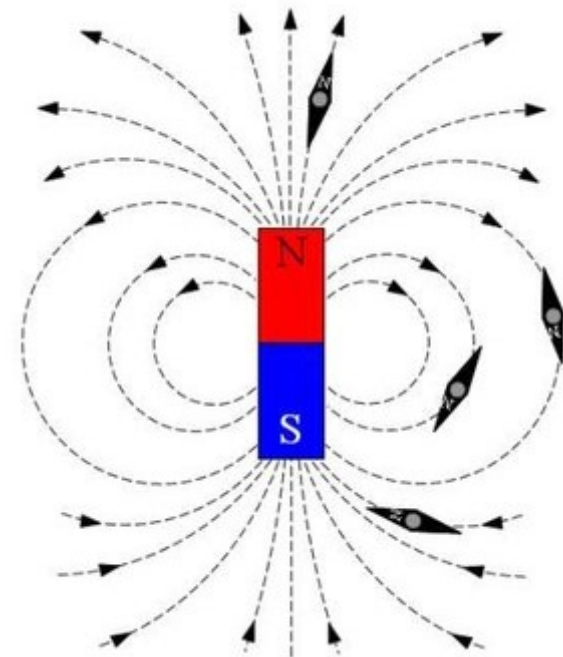
$$\vec{B}_{ap} = \frac{8}{5^{3/2}} \cdot \frac{\mu_0 I}{a} \hat{z} \approx 0,715 \cdot \frac{\mu_0 I}{a} \hat{z}$$



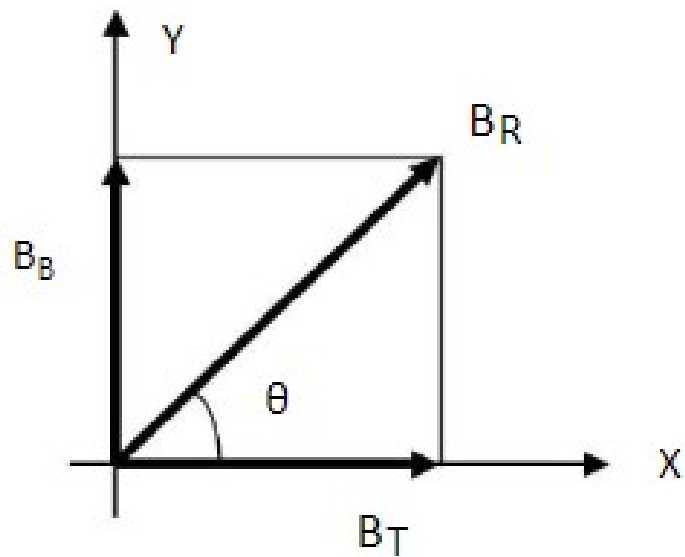
Campo magnético da Terra



Bússula

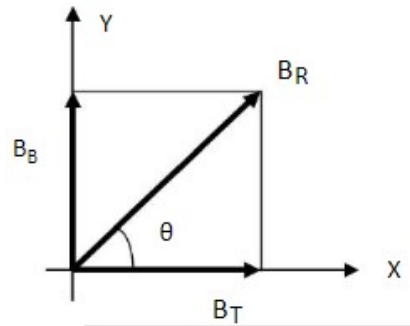


Deter. Campo magnético da Terra

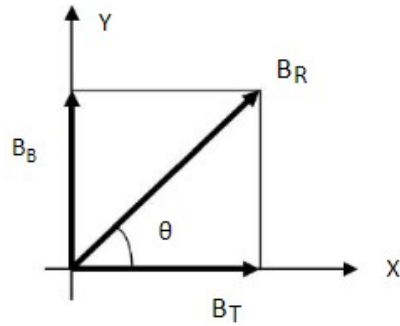


$$B_T = \frac{B_B}{\operatorname{tg} \theta}$$

A photograph of a laboratory setup for measuring the Hall effect. The setup includes a red base with two large silver circular coils, a central white disc, a blue digital multimeter, and a white DC power supply. The multimeter is connected to the coils and the disc, and the power supply is connected to the coils. The multimeter display shows a reading of 0.00.



Resultados



θ (graus)	I (A)
20	0,26
25	0,30
30	0,40
35	0,45
40	0,55
45	0,65
50	0,78

Trabalho

- Dados $N = 12$ Voltas / $a = 20$ cm;
 - Linearizar dados da tabela;
 - Fazer gráfico $\text{Tang}(\theta)$ (eixo y) x I (eixo x);
 - Determinar campo mag. da terra (B_T) através do gráfico.
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- Entrega: 30/ 06