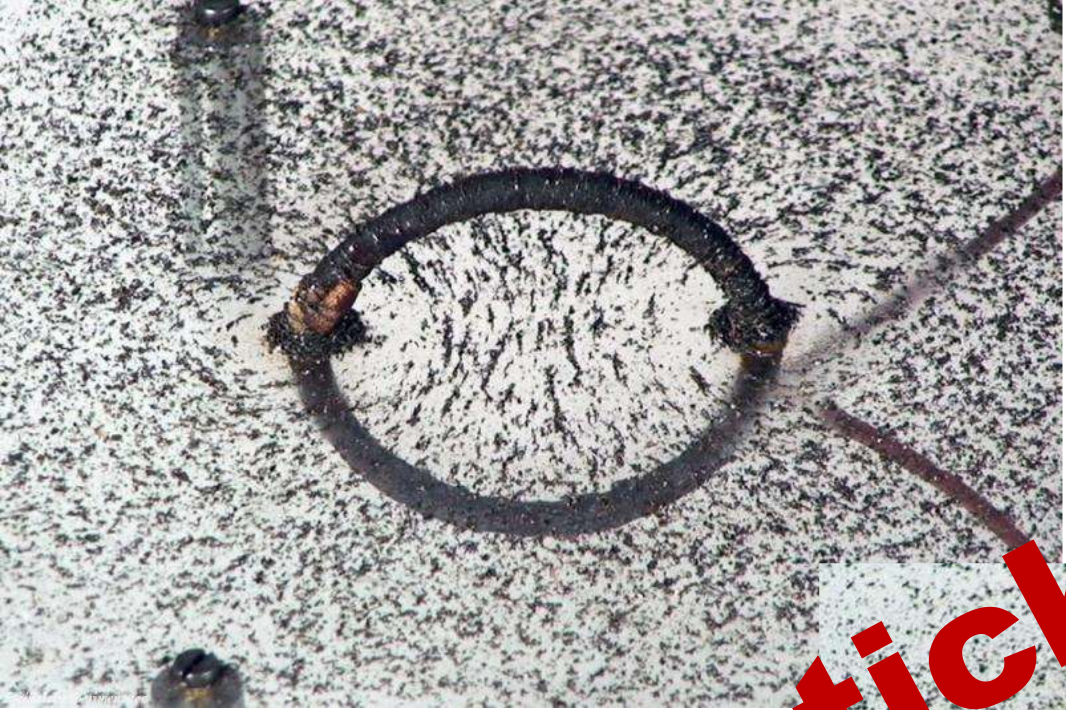
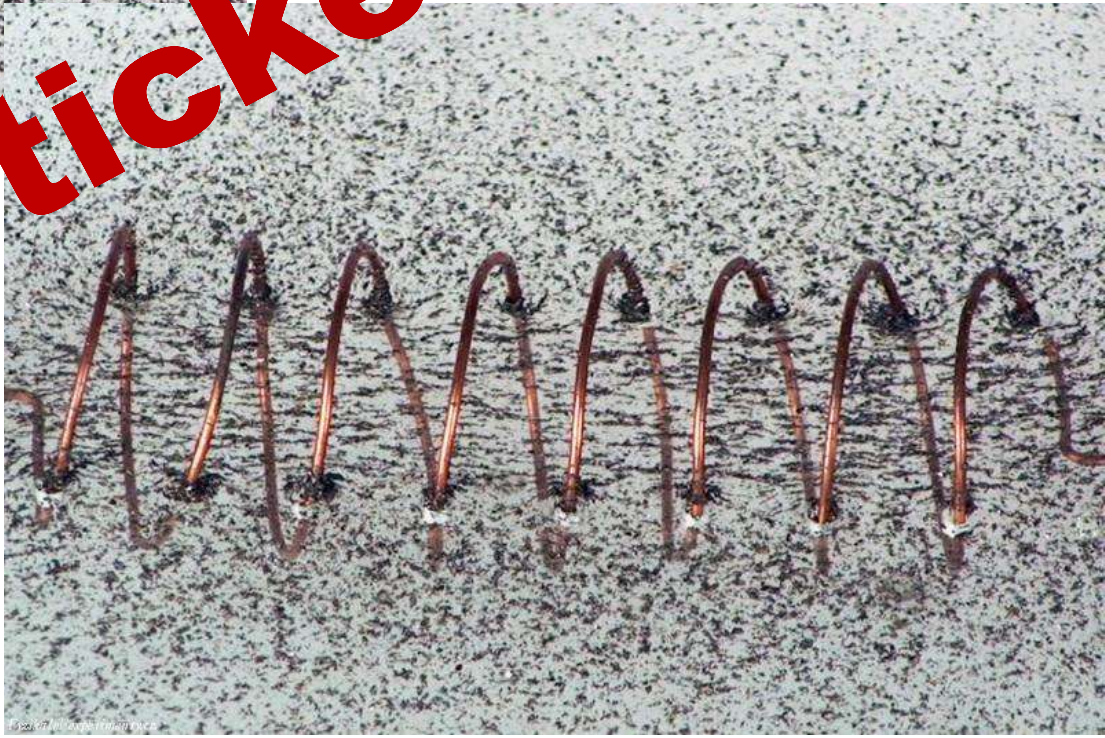
Magnetické pole

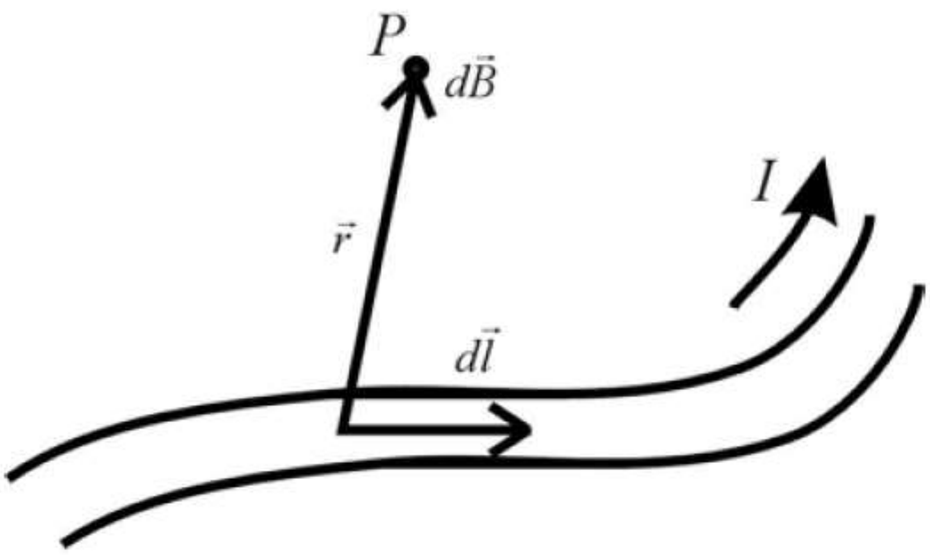




http://www.fyzikalni-experimenty.cz/cz/elektromagnetismus/

Biotův – Savartův zákon

$$d\vec{B} = \frac{\mu_0}{4\pi} \frac{I\left(d\vec{l} \times \vec{r}\right)}{r^3}$$

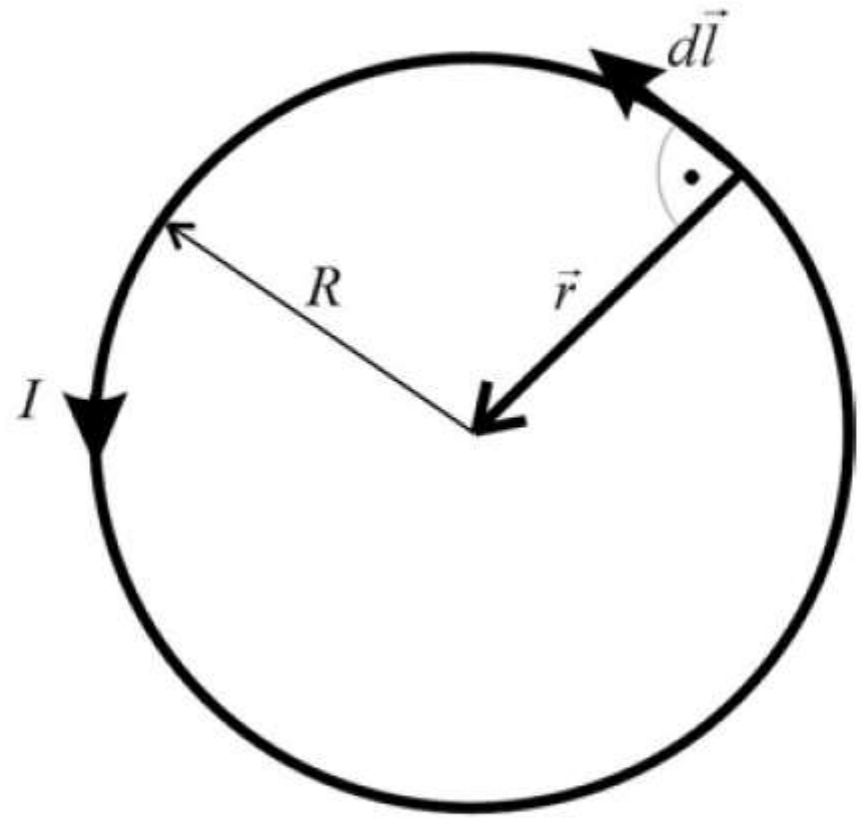


magnetická konstanta

$$\mu_0 = 4\pi \cdot 10^{-7}\ \mathrm{T} \cdot \mathrm{m} \cdot \mathrm{A}^{-1}$$

Magnetické pole ve středu kruhové smyčky

$$d\vec{B} = \frac{\mu_0}{4\pi}\frac{I\left(d\vec{l} \times \vec{r}\right)}{r^3}$$



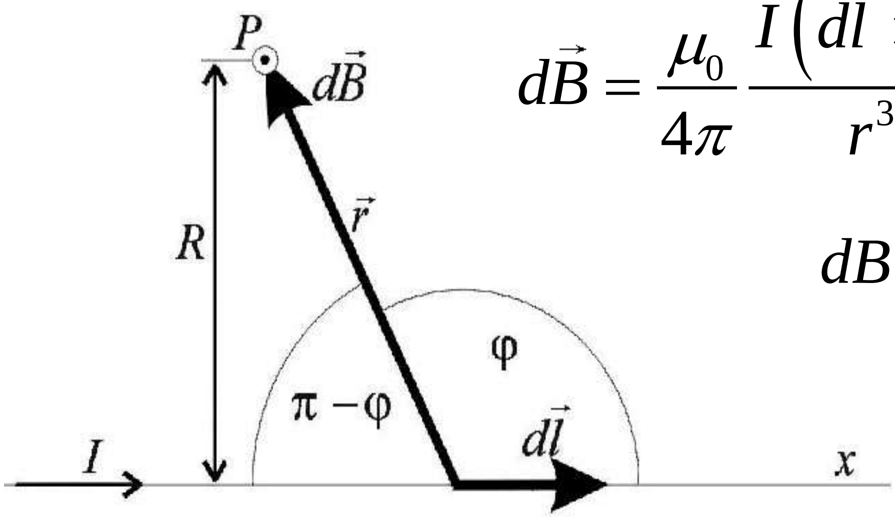
$$dB = \frac{\mu_0 I}{4\pi}\frac{dl\,r}{r^3} = \frac{\mu_0 I}{4\pi}\frac{dl}{r^2} = \frac{\mu_0 I}{4\pi}\frac{dl}{R^2}$$

$$B = \int_0^{2\pi R} \frac{\mu_0 I}{4\pi}\frac{dl}{R^2} = \frac{\mu_0 I}{4\pi}\frac{1}{R^2}\int_0^{2\pi R} dl$$

$$B = \frac{\mu_0 I}{4\pi}\frac{1}{R^2}2\pi R = \frac{\mu_0 I}{2R}$$

$$B = \frac{\mu_0 I}{2R}$$

Magnetické pole nekonečně dlouhého přímého vodiče



Obr. 1.9

$$d\vec{B} = \frac{\mu_0}{4\pi}\frac{I\left(d\vec{l}\times\vec{r}\right)}{r^3} \qquad \vec{B} = \int d\vec{B} \qquad B = \int dB$$

$$dB = \frac{\mu_0}{4\pi}\frac{I\,dl\,r\sin\varphi}{r^3} = \frac{\mu_0}{4\pi}\frac{I\,dl\sin\varphi}{r^2}$$

$$dl = dx$$

$$r^2 = x^2 + R^2$$

$$dB = \frac{\mu_0}{4\pi}\frac{I\,dx\sin\varphi}{x^2+R^2}$$

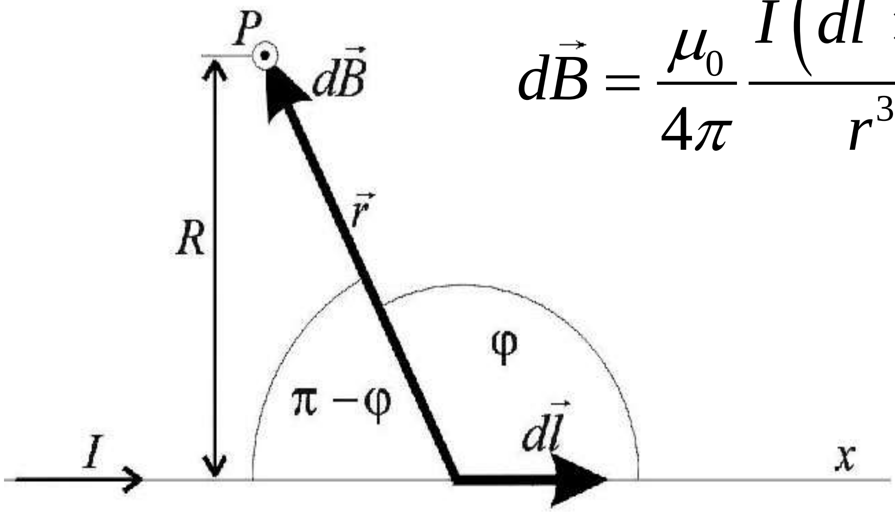
$$\sin\varphi = \sin\left(\pi-\varphi\right) = \frac{R}{\left(x^2+R^2\right)^{\frac{1}{2}}}$$

$$dB = \frac{\mu_0}{4\pi}\frac{I\,R\,d\varphi\sin\varphi}{\sin^2\varphi\left(x^2+R^2\right)}$$

$$\operatorname{cotg}\left(\varphi\right) = -\operatorname{cotg}\left(\pi-\varphi\right) = -\frac{x}{R}$$

$$dB = \frac{\mu_0}{4\pi}\frac{I\,d\varphi\sin\varphi}{R}$$

$$-\frac{d\varphi}{\sin^2\varphi} = -\frac{dx}{R}$$



Obr. 1.9

$$d\vec{B} = \frac{\mu_0}{4\pi} \frac{I\left(d\vec{l} \times \vec{r}\right)}{r^3}$$

$$B = \int_0^\pi \frac{\mu_0}{4\pi} \frac{I \sin\varphi}{R} d\varphi \;= \frac{\mu_0 I}{4\pi R} \left[-\cos\varphi\right]_0^\pi = \frac{\mu_0 I}{2\pi R}$$

$$B = \frac{\mu_0 I}{2\pi R}$$

http://fyzweb.cz/materialy/videopokusy/POKUSY/DVADRATY/INDEX.HTM

Velikost síly působící mezi 2 dlouhými přímými tenkými vodiči

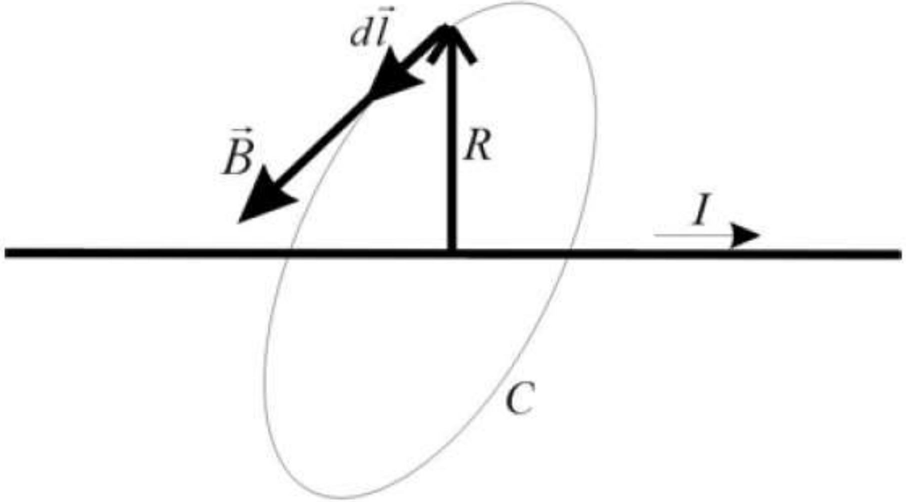
$$\vec{F} = I\vec{l} \times \vec{B}$$

$$\vec{F} = I_2\vec{l} \times \vec{B}_1$$

$$F = B_1 I_2 l = \frac{\mu_0 I_1 I_2}{2\pi R} l$$

$$B_1 = \frac{\mu_0 I_1}{2\pi R}$$

Ampèrův zákon



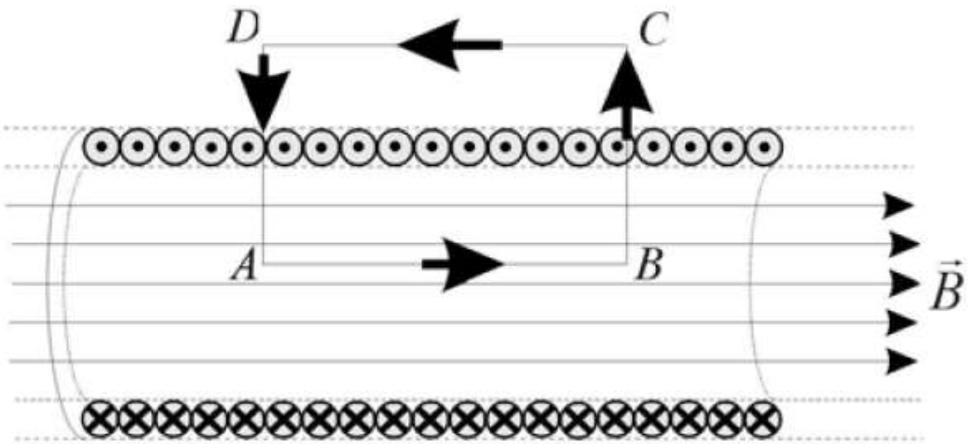
$$\oint \vec{E}\cdot d\vec{l} = 0$$

$$\oint \vec{B}\cdot d\vec{l} \neq 0$$

$$\oint \vec{B}\cdot d\vec{l} = \oint B\,dl = B\oint dl = B2\pi R = \frac{\mu_0 I}{2\pi R}2\pi R = \mu_0 I$$

$$\oint_C \vec{B}\cdot d\vec{l} = \mu_0 \sum_i I_i$$

Velikost magnetické indukce uvnitř dlouhého štíhlého solenoidu



$$\oint_{ABCD} \vec{B}\cdot d\vec{l} = \int_{AB} \vec{B}\cdot d\vec{l} = \mu_0 \sum_i I_i$$

$$\int_{AB} \vec{B}\cdot d\vec{l} = \int_{AB} B\,dl = B\int_{AB} dl = Bl_1$$

$$Bl_1 = \mu_0 N_1 I$$

$$\oint_{ABCD} \vec{B}\cdot d\vec{l} = \int_{AB} \vec{B}\cdot d\vec{l} + \int_{BC} \vec{B}\cdot d\vec{l} + \int_{CD} \vec{B}\cdot d\vec{l} + \int_{DA} \vec{B}\cdot d\vec{l}$$

$$B = \frac{\mu_0 N_1 I}{l_1} = \frac{\mu_0 N I}{l}$$

$$\vec{B} \perp d\vec{l} \Rightarrow \int_{BC} \vec{B}\cdot d\vec{l} = \int_{DA} \vec{B}\cdot d\vec{l} = 0$$

$$\int_{CD} \vec{B}\cdot d\vec{l} = 0$$

$$B = \frac{\mu_0 N I}{l}$$