Stationary magnetic field

magnetic field acts by force on **moving** charged particles

$$\vec{F} = Q\vec{v} \times \vec{B}$$

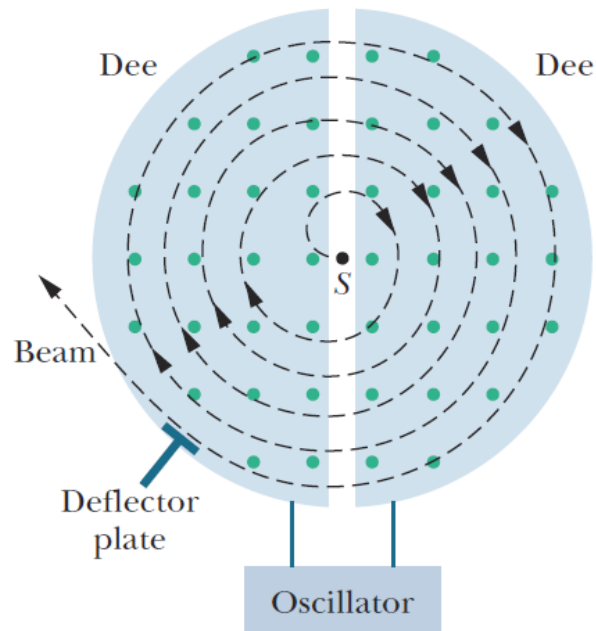$\vec{B}$ Magnetic field (flux density) $1\ T = N.A^{-1}.m^{-1}$

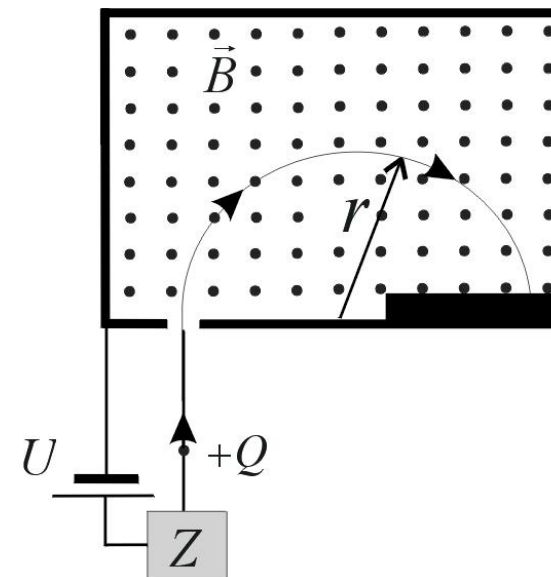|	
At surface of neutron star	10^8 T
Near big electromagnet	1,5 T
Near small bar magnet	10^{-2} T
At Earth surface	10^{-4} T
Lowest value in magnetically shielded room	10^{-14} T

$$\vec{F} = Q\left(\vec{E} + \vec{v} \times \vec{B}\right)$$ Lorentz force

$$\vec{v} \perp \vec{B} \Rightarrow r_L = \frac{mv}{QB}, \quad \omega_c = \frac{QB}{m}$$

cyclotron

Dee

Dee

Beam

S

Deflector plate

Oscillator

Mass spectrometer

$\vec{B}$

r

U

$+Q$

Z

Fermi National Accelerator Laboratory, FermiLab
Circumference of 6.3 km

Tevatron

closed in 2011

CERN

Large Hadron Collider

CMS - PA 5

ALICE - PA 2

SPS

ATLAS - LHC 1.8

PS

LHCb - PA 8

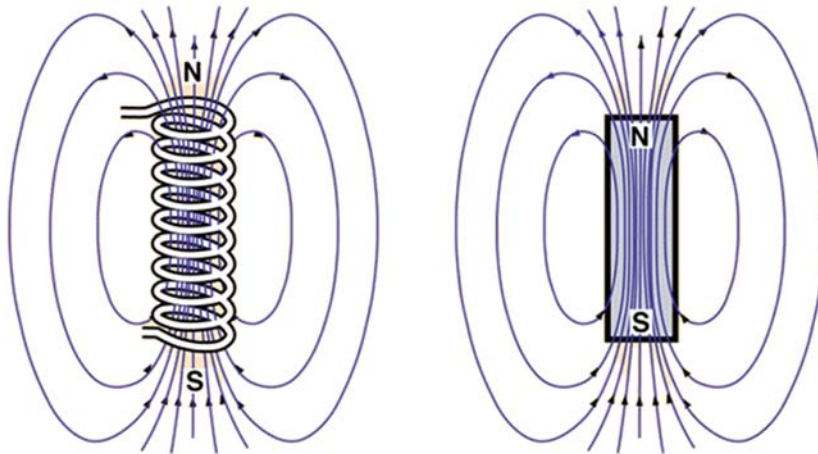http://forum.worldwindcentral.com/showthread.php?t=20452

$$A = \int \vec{F} \cdot d\vec{r} = 0$$

Stationary field

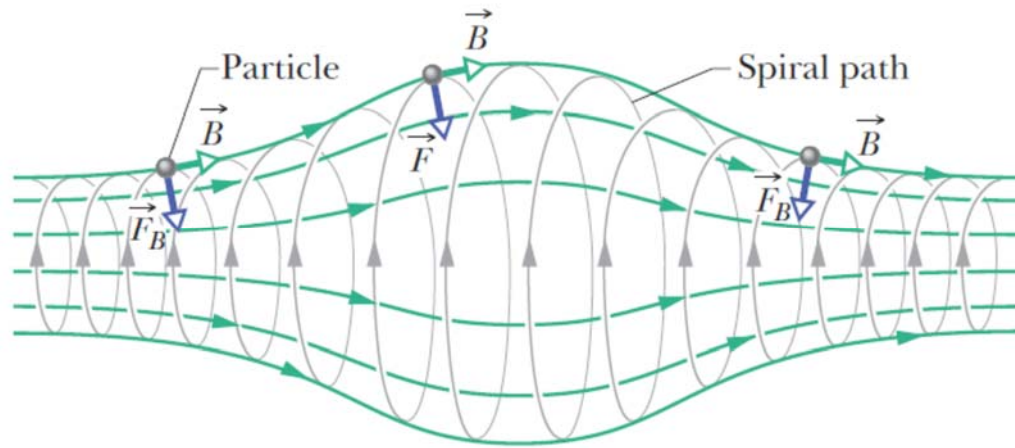no work done = no acceleration of particles

magnetic field lines

$\vec{B}$ is tangent to the lines

Field lines density = field strength

mg. field lines are closed loops !!

Magnetic particles mirror

spiral paths

trapped particles