fact
Muon Collaboration

BEAM DYNAMICS OF IONIZATION COOLING CHANNELS

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TOPICS

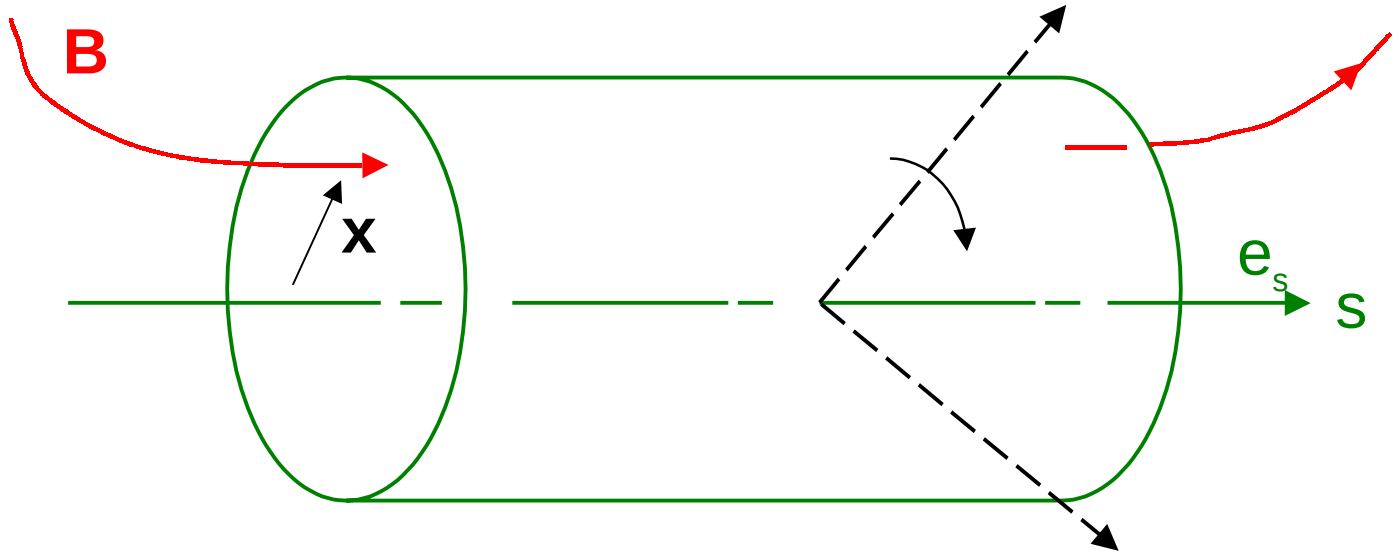
- Linear Transverse Cooling Dynamics

  Penn & Wurtele (PRL), Kim & Wang (PRL), Kim & Wang (MUCool)

- Orbit Stability and Energy Acceptance

  Wang & Kim (MUCool)

SOLENOIDAL FOCUSING



B(s): solenoidal field on s-axis

Simplest 3-D field satisfying $\nabla \times B = 0, \nabla \cdot B = 0$

$$B(s, x_\perp) = B(s)\hat{e}_s - \frac{1}{2}\left(\frac{dB}{ds}\right) x_\perp + \text{non-linear terms}$$

EQUATION OF MOTION

- Lab frame:

$$\frac{d}{ds}P_s\frac{dx}{ds} = -qBH_s'\frac{dx}{ds} - \frac{q}{2}B\phi H_s' x - hP_s\frac{d[}{ds} + P_s X$$

$$h = \frac{1}{P_s}\frac{dP_s}{ds}\bigg|_{loss}; \quad X: \text{ stochastic excitation (M.S.)}$$

- Larmor frame:

$$\frac{d}{ds}P_s\frac{d[_R}{ds} = -P_s k^2 [_R - P_s h\left(\frac{d[_R}{ds}\right) - k e_s' [_R \frac{\ddot{o}}{\div\phi} - P_s X_R$$

$$\frac{df}{ds} = k = \frac{qB}{2P_s}$$