Comments on Uklanov's idea

- The idea is OK: coherent polarization buildup by bending is possible.
- Why the theoretical evaluation is not that easy ?

Schwinger scattering & CNI

nA scattering:

- EM spin-orbit int. $V(r)\,\vec{L}\vec{S}$ (long-range) real
- Nuclear int.: short range absorptive

$$M = f + g\,\vec{L}\vec{S}$$

$$\vec{P}_n = \frac{2\,\mathrm{Im}\, f^* g}{|f|^2 + |g|^2}\,\vec{n}$$

- CNI at RHIC is of the same origin

- Misha Ukhanov:

  sequental scattering rightwards

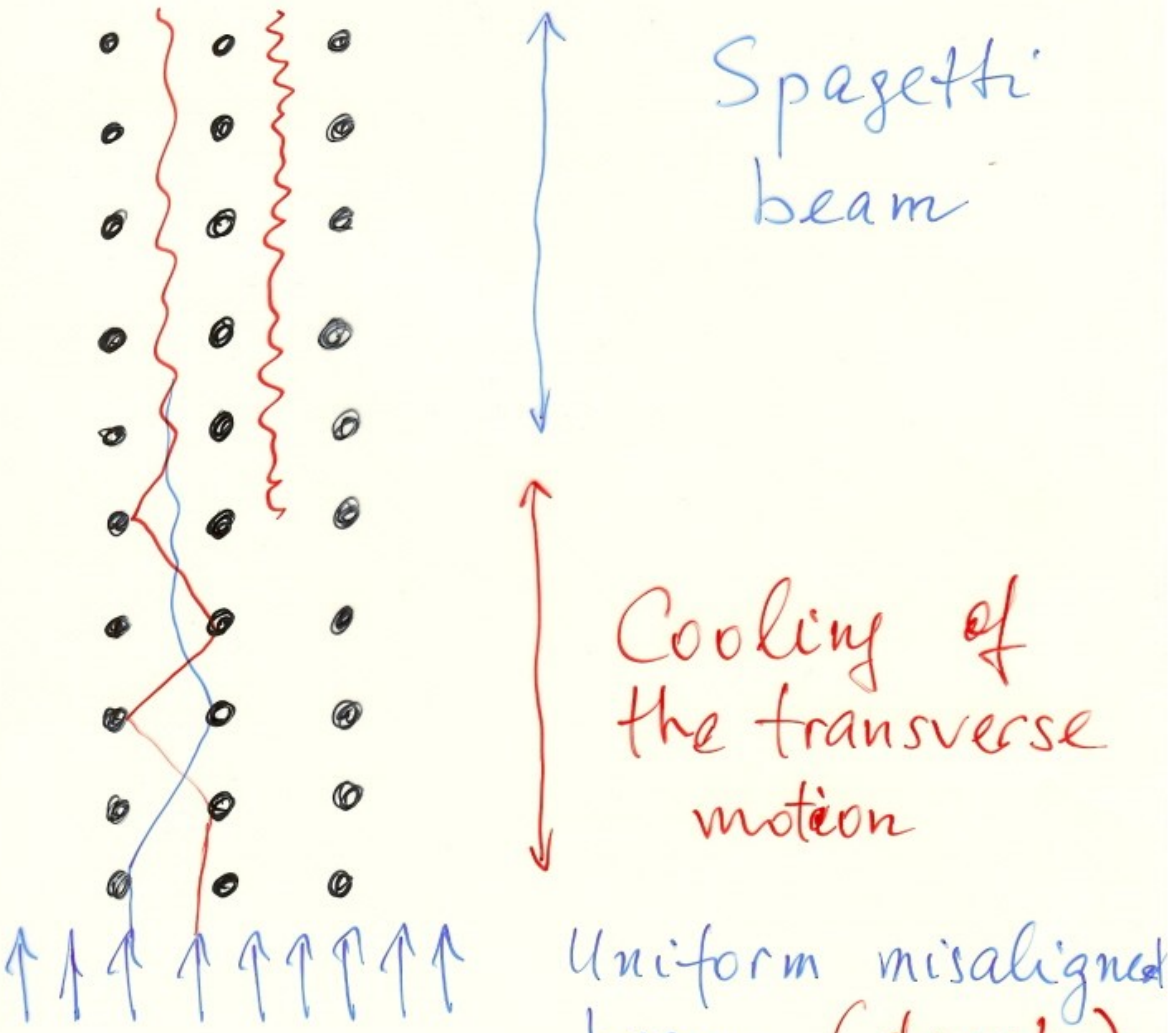
  → coherent polarization buildup

- Bending by channeling: sequental scattering

- Predominantly classical physics

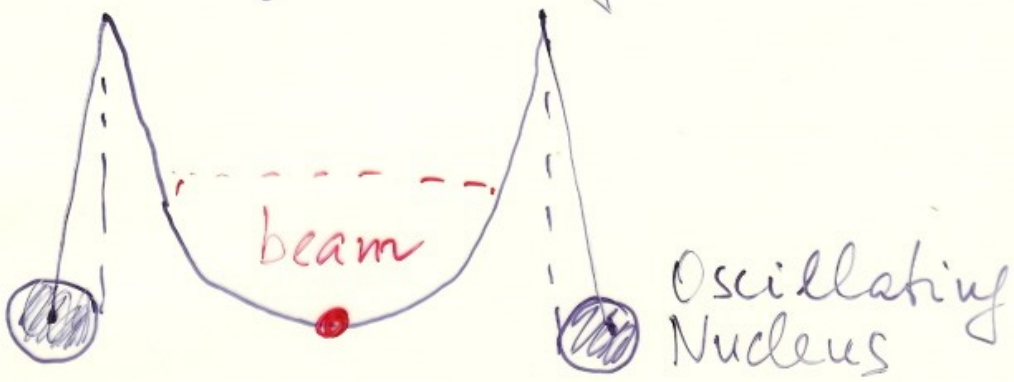
- How strong CNI is under the bending regime?

- $T_p \gtrsim 10-20$ MeV: Coulomb repulsion becomes irrelevant, but .....

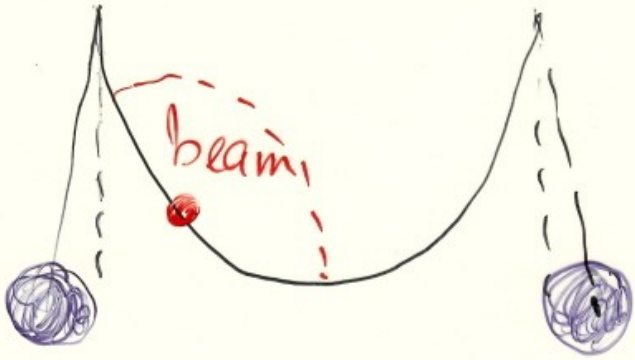


The potential profile for protons

- Straight crystal



- Bent crystal

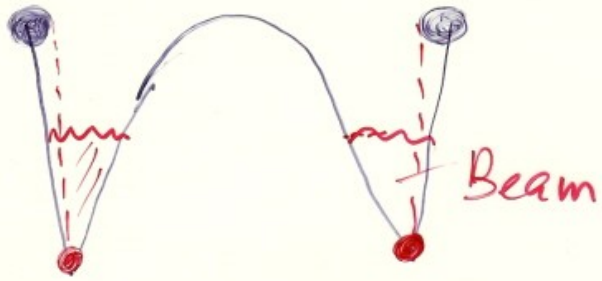


Electric field bends the beam

★ Nucleus is a classically inacsessible region

- Comoving frame: the electric field of a lattice generates the magnetic field!
- Spins are precessing but the unpolarized beam stays unpolarized as is the case in accelerators
- Need quantum tunneling of spagetti to scratch nuclei.
- ★ A good formalism for the transverse tunnelling in the spagetti regime is not yet available

- Antiprotons: the potential profile



Straight crystal

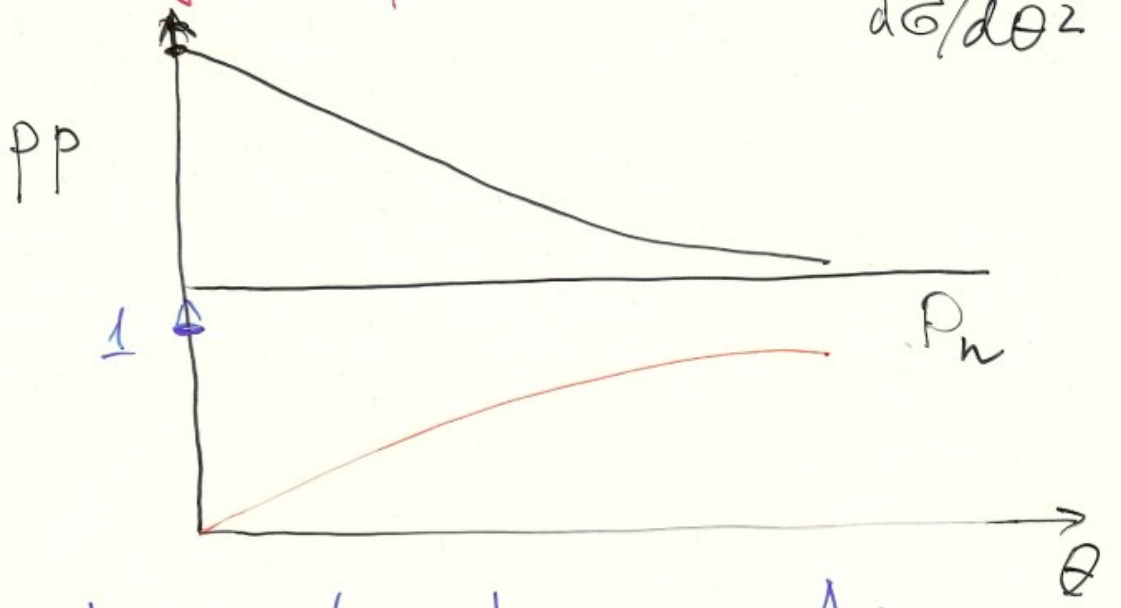
Bent crystal

- Stable classical trajectory too close too a nucleus?
- Enhanced CNI
- Free cheese in a mousetrap: strong nuclear absorption? (Hans-Otto: polarization in one package with absorption?)

Tasks for a good student:

- Understand quantum vs. classical transverse dynamics
- Impact of nuclear interaction in bending
- Evaluate CNI
- Very different CNI for protons and antiprotons ?

- Why not pure nuclear $\vec{L}\vec{S}$? L 9



strong absorption in pA: