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Polarized Ion Beams Beyond Helium-3

Expanding science reach of EIC with polarized ion beams with A > 3

- Beyond the current scope of polarized H, D, ^{3}He beams
- Access to the **spin-dependent** structure of **nucleus**
- Benefit critical accelerator technologies
- Candidates: ^{6}Li (spin-1), ^{21}Ne (spin-3/2), and ^{129}Xe (spin-1/2)

Important physics programs enabled by polarized ^{6}Li at EIC

- Investigate a deuteron embedded in ^{6}Li (α core with two-nucleons)
  - b_1 structure function
  - gluon transversity distribution

- Polarized EMC effects
  - DIS on the valence p/n with tagging the recoiled $\alpha + n/p$

- Reference studies between nucleon and nucleus with polarized H, D beams
  - spin-1/2 nucleon or spin-1 deuteron embedded in ^{6}Li

Laser-driven Polarized Lithium-6 System

Laser-driven optical pumping system

- A proposed system to polarize ^{6}Li
- A well-developed technique

  Phys. Rev. Lett., 42:1520–1523 (1979).
  NIM-A, 329(1/2):37–45 (1993).

- Modification for spin-exchange optical pumping ^{21}Ne and ^{129}Xe

Breit-Rabbi polarimeter

- Precision measurement to study depolarization
- Simulation package developed from ANL LDRD