Polarized Ion Beams and Sources at the EIC

A Community Whitepaper

2025

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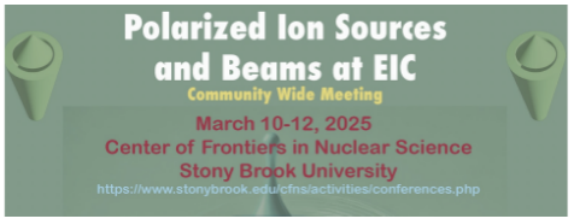

This Whitepaper is based on the presentations and discussions at a meeting of the community at Stony Brook University, New York on March 10-12, 2025.

THANK YOU!
to
Center for Frontiers in Nuclear Science
and BNL
Collider-Accelerator Department

Goals of the meeting

- to raise the visibility in the EIC and spin communities of the exciting scientific case for spin measurements;
- to assess, in the context of the considerable scientific motivation, the status of ion source development for EIC;
- to identify critical path R&D essential for a successful polarized EIC program that can be implemented on day-1;
- to motivate the education and training of a new generation of young physicists with expertise in spin polarization technology. This will be essential for realization of the EIC polarized program.

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Chapter Editors

All

Z.-E.M and RM

S. Nagaitsev and C. Montag

DR and FR

FR

JD

All

Perspective

- It must be realized that the adaption of a well-understood polarization technique into a reliable ion source operating at maximum performance injecting with high reliability into an accelerator requires a sustained R&D effort by a critical mass of suitably skilled personnel for about a decade.

- If we consider the major polarization experimental efforts in nuclear physics over the last half century, university-based research groups played an essential role in developing the technical capabilities and in attracting and training the generations of physicists who carried out the research.

- The EIC science demands the widest available range of polarized ions and innovative source technologies must be pursued.

- It is recommended that a specific amount of funding be set aside to target R&D associated with the realization of polarized ion beams at EIC. This would support education and training of young physicists with the necessary expertise.

- It is recommended that a focused multiweek program on the science case for polarized ion beams at EIC being organized at the Institute for Nuclear Theory in the next year

- It is recommended that an annual summer school for young physicists on the science and technical realization of polarized ion beams at EIC be organized

Scale of task before us

- OPPIS: multi-decade, 30 physicists, 10 engineers, 5 postdocs/students
- HERMES H/D target: 40 graduate student years, 50 postdoc/senior years
- HERMES He-3 target: 10 graduate student years, 12 postdoc senior years, two years of engineering
- SLAC He-3 target: 35 person years
- SLAC H/D target: 20 person years
- Ongoing He-3 source development at BNL: 12 physicists, 4 postdocs

Writing the Whitepaper

- The Chapter Editors will work with the speakers to draft text.
- Total length: about 70 pages
- Deadline: Friday April 18th
- All meeting attendees/participants are invited to be co-authors.
- Will publish in refereed journal.
- Also make available on arXiv.

The path forward

- Propose formation of

  EPIOS (**E**IC **P**olarized **IO** **S**ource) scientific consortium

  to continue to advance the realization of polarized ion beams at EIC.
- Meeting Organizing Committee would become EPIOS steering committee.
- Plan meetings about every six months: Stony Brook, ANL, MIT,……
- Immediate tasks:
  - Write and publish the whitepaper
  - Propose INT scientific workshop for 2026
  - Explore initiation of annual summer school, starting in 2026
- DNP Workshop ***Polarized Ion Beams at EIC***, proposed by Z.-E. Meziani and R. Milner approved. DNP meeting in Chicago Oct 17-20, 2025. Maybe EPIOS meeting at DNP meeting?