Los Alamos NATIONAL LABORATORY EST.1943

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EIC tracking detector thoughts

Xuan Li on behalf of the Los Alamos National Laboratory

LANL EIC project

- We start our EIC project supported by the Laboratory Directed funding by the Los Alamos National Laboratory LDRD office.
- PI: Ivan Vitev, Co-PI: Xuan Li
- 15+ staffs and postdocs working on this EIC project.
- Our team:

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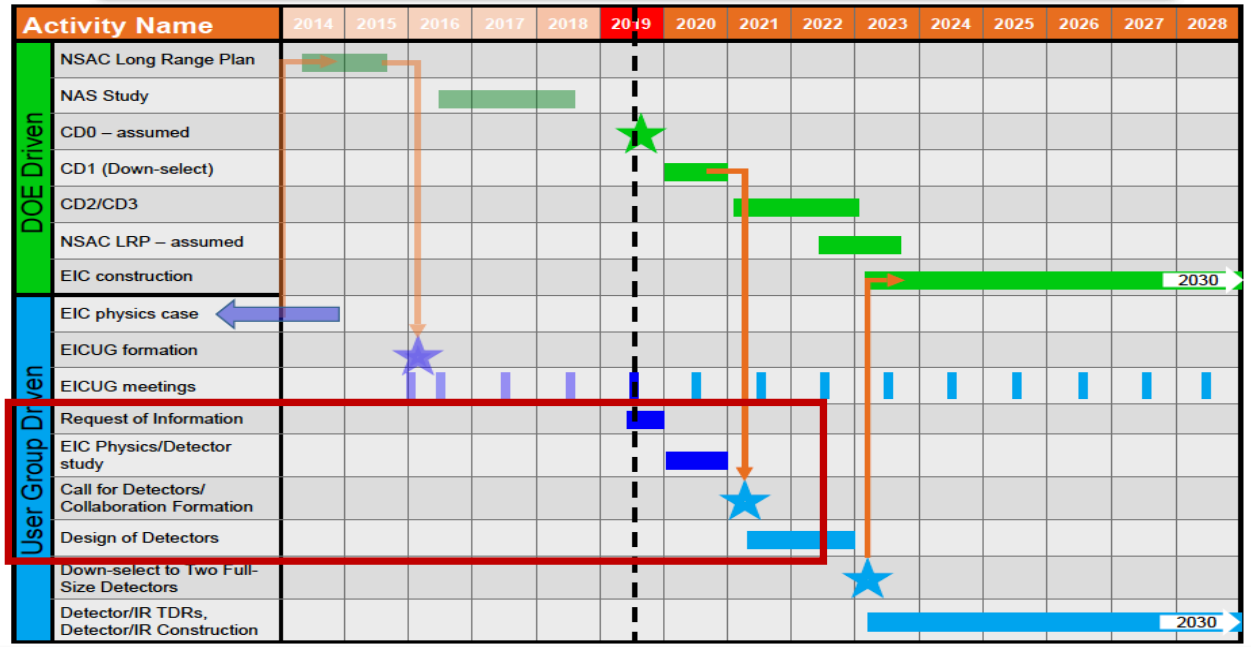
Several postdocs not added to the phonebook yet

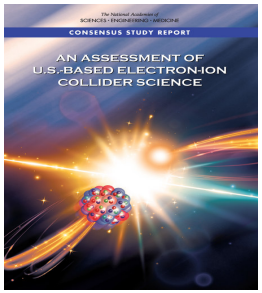
LANL EIC project

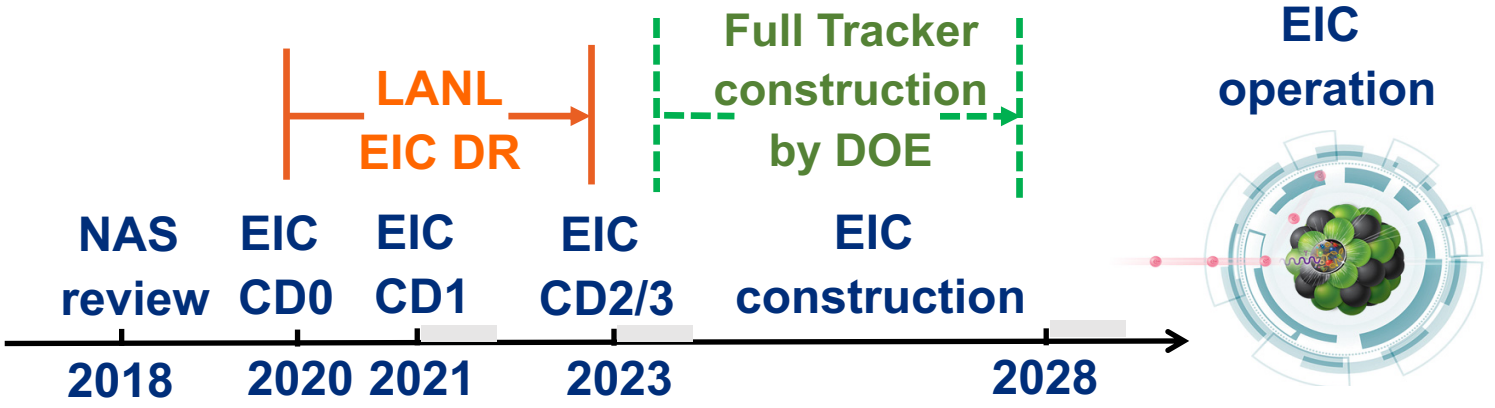
- LANL has a good record to lead the cutting-edge silicon detector developments, assembly, commissioning and operations in the past 15 years:
  - The PHENIX Forward Silicon Vertex Detector (FVTX) project have delivered 20+ high-impact physics papers in the past 5 years.
  - The ongoing sPHENIX MAPS Silicon Vertex Detector (MVTX) project.
- Goals:
  - To develop the heavy flavor and jet program for the future EIC.
  - Provide the full detector design for a forward silicon tracking detector at the EIC.
  - Characterize several advanced silicon techniques such as the Monolithic Active Pixel Sensor (MAPS) in lab.
  - Complete a prototype tracker based on advanced silicon techniques and carry out the relevant tests.

The LANL EIC DR aligns well with the EICUG timeline



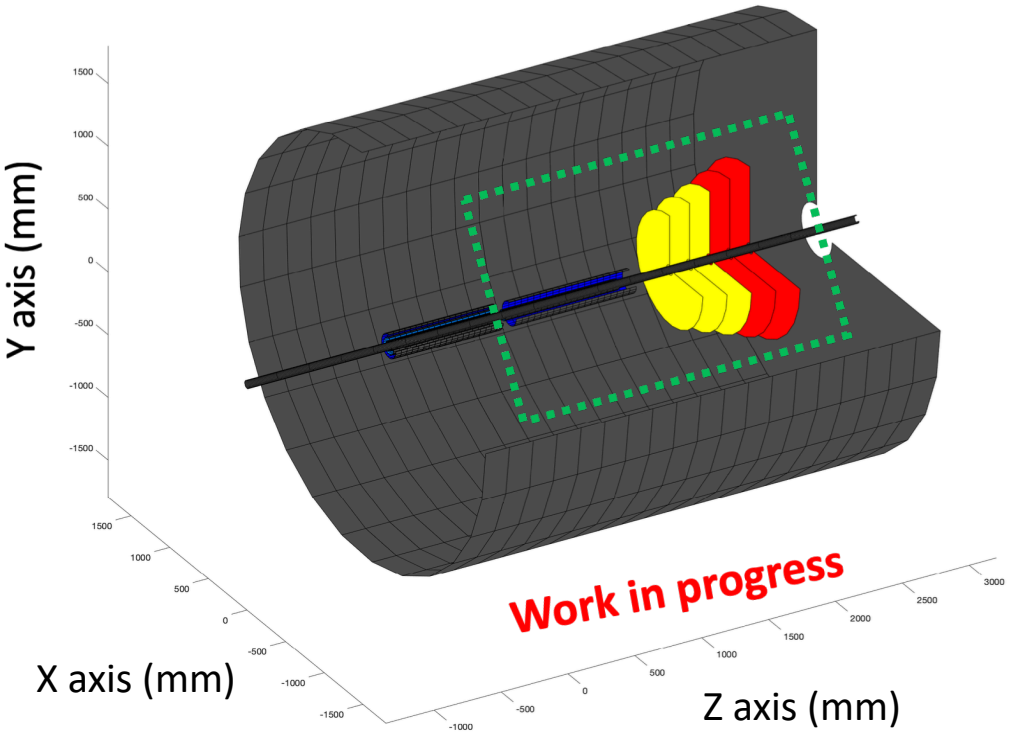
Updated timeline from the EICUG





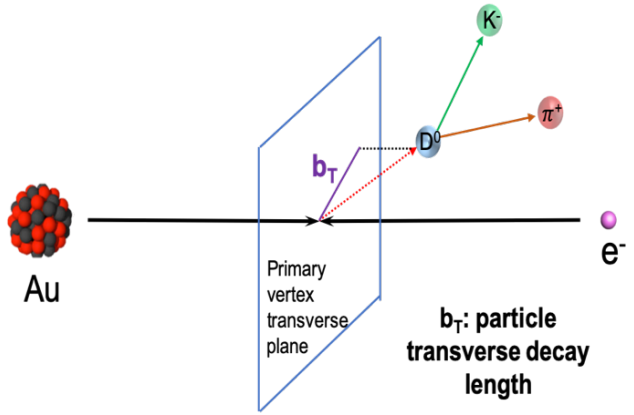
LANL EIC program progress (I)

- Initial detector design in fast simulation:
  - Mid-rapidity silicon vertex detector: 3 barrel layers of Monolithic Active Pixel Sensor (MAPS) type detector.
  - Forward-rapidity silicon tracking detector (FST): 2 barrel layers of MAPS + other silicon detector and 5 forward planes of MAPS + other silicon detector.



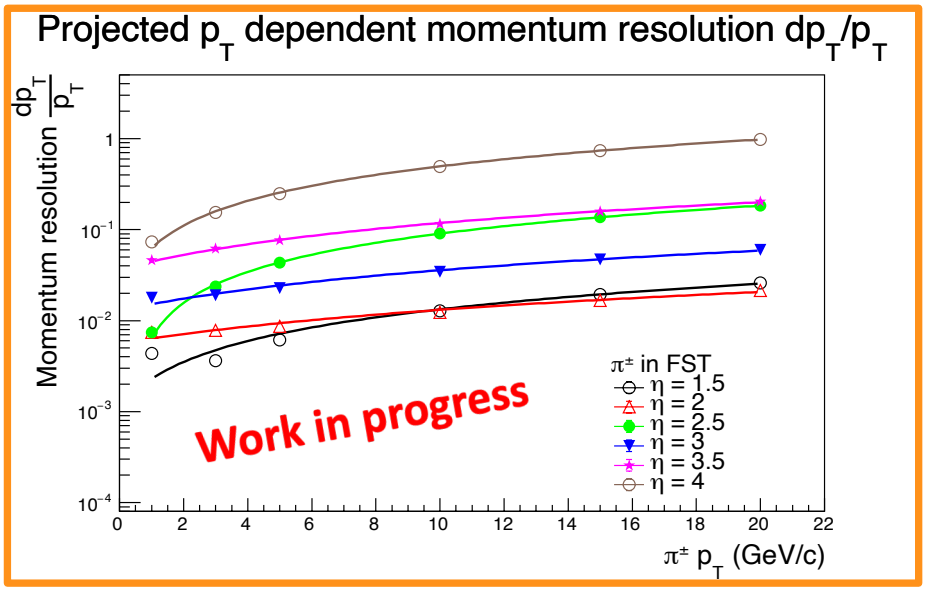
B = 3T

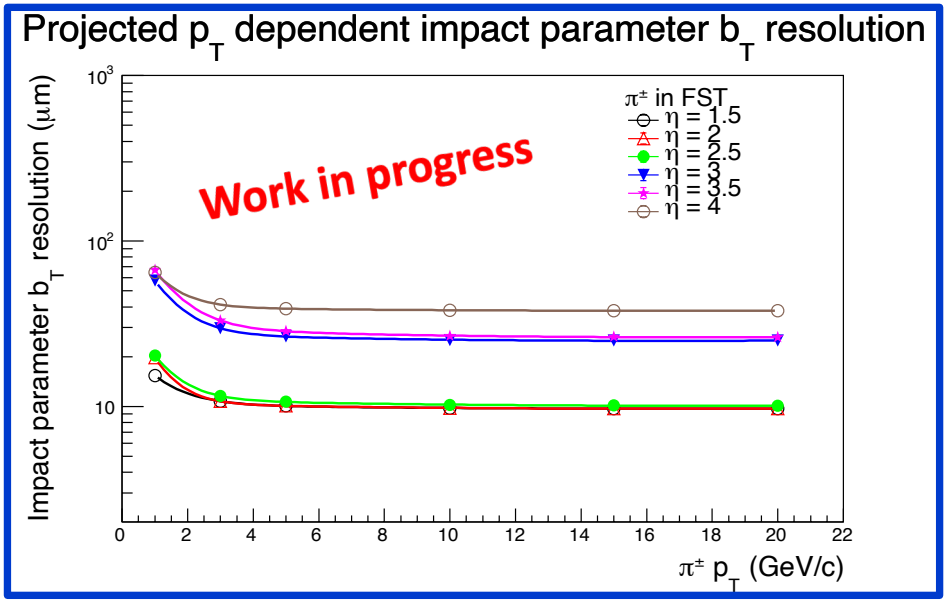
$1.0 < \eta < 4.5$



LANL EIC program progress (II)

- Initial track performance from the FST:





- Better than 70 μm resolution can be achieved by the initial FST design for the transverse decay length b_T measurements for tracks with p_T > 1 GeV/c over the 1.5<η<4.0 region.
- The momentum resolution dp_T/p_T are better than or consistent with the forward tracking requirements from the EIC detector handbook.

Questions

- What software to be used for the tracking detector simulation?
- Any R&D work to demonstrate the proposed tracking detector capability?
- How to integrate into other detectors such as the PID and calorimeter?
- Any EIC conceptual detector with the latest interaction point and the magnetic field available in GEANT4 available?
- Background evaluation status such as the synchrotron radiation?
- How to integrate or combine different approaches such as different technique and detector design?
- How to integrate the tracking detector work with relevant physics working subgroups?

Summary and Outlook

- A fast simulation version of the proposed forward silicon tracking detector is completed. Its performance is better or consistent with the EIC handbook requirements.
- A silicon detector R&D lab is under setting up at LANL to characterize several silicon techniques such as MAPS.
- We look forward to contribute to the EIC tracking detector design, relevant detector R&D and relevant simulation studies.