



Charting a course to the 2nd Detector and Interaction Region at the EIC

Dec 6, 2022

Clear support from EIC community for the 2nd Detector and IR



The Electron-Ion Collider (EIC) is a transformational and unique accelerator that will enable studies of nuclear matter with unprecedented precision. The EIC is required to address fundamental open questions in physics, such as the origin of mass and spin of protons and neutrons, the details of the "glue" that binds them, and the nature of very dense gluon systems in nuclei. This ambitious collider could

not deliver physics results without powerful "cameras" capable of taking the most detailed snapshots of the collisions produced at the EIC. Novel particle detectors must be designed and constructed to capitalize on the investment made on the accelerator side, so that the deepest secrets of the building blocks of matter in our visible universe may be unlocked.

At the 2021 Annual Users Meeting Richard Milner and Rolf Ent lead a discussion about the role of a 2nd IR and Detector at the EIC.

Discussion with Users Group and Steering Committee resulted in a short document [Maximizing the Scientific Output of the EIC](#)

- "Due to constrained resources the EIC project only supports one interaction region and detector"
- "... but a deliverable of the EIC project is the possibility of a second IR and detector
- "It is recognized by all stakeholders that a second EIC experiment is essential to fully exploit the science potential of the EIC."

EICUG-SC expanded and codified the arguments, producing a glossy brochure : [THE ELECTRON-ION COLLIDER, The Benefits of Two Detectors](#)

EIC Detector Proposal Advisory Panel Report on a 2nd Detector/IR

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- “...requires a *well-chosen balance between optimization as general-purpose detector versus partial specialization* and the ability to cross check the other detector for a broad range of measurements. The design of a second detector should be chosen with these criteria in mind.”
- “The time required for its design and construction may offer *opportunities for benefiting from technological progress.*”
- “As laid out in the section 2.1 on physics performance, *an IR with a secondary focus can significantly broaden the physics scope and output of the EIC.*”

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In late spring 2022 the EICUG Steering Committee formed the 2nd Detector/IR working group. This group was put in motion at the 2022 EIC Annual Users Meeting.

Charge for Detector II/IP8 Working Group

1. Engage the broader community, *including theorists, accelerator physicists and ePIC experimentalists*, to fully develop projections for the portfolio of measurements that are complementary to the ePIC physics program, including those that capitalize on the implementation of the secondary focus.
2. Work with the EICUG Steering Committee and Project to *recruit new institutions* and establish a diverse and vibrant 2nd Detector working group.
3. Utilize the extended design period for Detector 2 to identify groups that will focus on *R&D for emerging technologies* that could provide another aspect of complementarity to ePIC.
4. Facilitate the development of a *unified concept* for a general-purpose detector at IR8. In particular, the 2nd detector should be complementary to the project detector at IR6 and may capitalize on the possibility of a secondary focus at IR8.

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2iEIC : 2nd Detector Incubator @ the EIC

Which cross-checks are highest priority? Which are most interesting for a 2nd Detector?



What new science or technology focus can a 2nd Detector/IR bring to an EIC?

As the ePIC design solidifies, **NOW** is the time to build a unified concept.

2iEIC : 2nd Detector Incubator @ the EIC

- You were invited because you are an expert in your chosen specialty
- Your job is two-fold
 1. Bring new ideas to the table
 2. Highlight existing measurements that should be high profile for a 2nd detector.
- This is another opportunity to help shape the future physics scope at the EIC.

Thank you!