EICUG Yellow report meeting – Silicon Tracking

Lawrence Berkeley National Laboratory

Silicon Tracking group for EICUG yellow report

The deliverables for this group are the completion of the yellow report detectors sections related to the internal high resolution tracking detectors, currently envisioned as vertexing and forward/backward discs. The intent is that the level of this yellow report is comparable to a conceptual design report for the tracking detectors.

From the yellow report Outline v6 draft

http://www.eicug.org/web/content/yellow-report-initiative

12. Introduction

Description of the effort and methodology used with the focus on detectors only. Define conventions (e.g. forward/backward). Maybe some sketches.

13. Detector Challenges and Performance Requirements

What was assumed in the report and what goes in the next sections. Sets important constraints on the machine requirement (lumi, energy, spin, etc) including the full integration detector and interaction region.

13.6. Physics Requirements

Summary of requirement as derived from "Volume II", but only the hard numbers w/o any physics motivation. Mainly tables.

14. Detector Aspects

14.1. Magnet

14.2. Tracking

17. Detector Technology

17.1. Areas of Targeted R&D

This is a bit a delicate part. We need to identify areas where targeted R&D is needed but we do not want to give the impression this is an open-ended R&D pit.

17.2. Generic Detector R&D

The generic detector R&D program to address the scientific requirements for measurements at a future Electron Ion Collider (EIC) has served to also consider more forward-looking detector concepts and technologies, and associated software and computing ideas. Here we can list opportunities for future computing and detector technologies that can enhance computing and detector technologies in general and possibly enhance the scope of EIC science in the outyears.

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We need to organize ourselves to work on (in cartoon outline form):

(Much of the information is already available but needs to be gathered and adapted to our needs)

Process Inputs and "tasks"

- Gather and generate physics based simulation based detector requirements and EIC machine parameters to assemble the detector requirements and environment
  - Required single point resolution required as a function of z, eta, r.
  - Radiation length requirements
  - Time structure of particle tracks
  - Hermeticity and layer count analysis
  - Backgrounds
  - Beam pipe sizes, shapes, thickness, etc.
  - Magnetic field maps

- Technology assessment for detectors and down select to appropriate technologies for the sensors
  - Includes areas for further research and development

- Existing EICRD and detector proposals
  - BeAST, JLEIC, etc. and assess detector configurations
  - eRD reports and past studies

Process and outputs

- Initiate balanced tracking detectors conceptual design:
  - Includes understanding of trade-offs in configuration and sensors
  - Assess infrastructure needs:
    - Reasonable support structures and conceptual designs
    - Cooling
    - Services loads and composition - likely the largest contribution to mass in the acceptance

- Feed into full GEANT simulations and ITERATE to reach a balanced and viable conceptual detector design that well matches the physics needs.

- *Lots to do, we need to start on understanding the capabilities, interests and available resources of interested groups and the best way to organize and distribute the work. Propose that we start this at the next meeting.*