Tracking WG meeting 19 May 2022
Introduction

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9 May 2022

Meetings organisation

- The tracking WG meetings will take place by-weekly on Thursday at 11am EDT.

- Indico category: https://indico.bnl.gov/category/404/

- Mailing list: https://lists.bnl.gov/mailman/listinfo/eic-projdet-tracking-l
  - Please subscribe if you have not done so yet.

Charge to detector WG

- The overall goal of the detector WGs is to optimize the ECCE reference design towards a technical design within the constraints of performance, cost, and risk.
  - In working toward this goal, the Detector WGs should collaborate with existing detector consortia, all detector R&D efforts relevant for Detector-1, and any additional efforts within the EIC community.

- All WGs will work closely with the Global Design & Integration WG and the EIC project toward a technical design that optimizes the global detector performance, taking into account global integration and physics performance.

- It is critical that WG members understand the scientific and technical reasoning behind different design choices before engaging in a discussion of optimization.

- WG conveners will lead discussions identifying any non-trivial differences and/or aspects in need of further optimization.
  - For each non-trivial difference, WGs will then prepare a pro/con list accounting for technical performance, risk, and cost. The resolution of non-trivial differences should be discussed in close consultation with the Global Design & Integration WG, Physics WGs, the EIC project, relevant detector consortia, and R&D efforts.

Timeline for charges to WGs

The goal emphasized by the EIC project is to confirm the reference **"advanced conceptual design"** by the July EICUG meeting (**End of July!**).

- There may be still open issues on important items, but the goal should be to converge by the end of July and raise early on if issues come up and/or more time is needed.

Work ahead

- There are a number of areas in which work is needed:
  - Detector technologies selection based on review of current R&D.
  - Detector geometry optimization and complementary options.
  - Simulations of detector performance.
  - CAD drawings.
  - Integration.

- Work on all aspects need to proceed apace and each aspect of the development need to feed into the others.
  - This meeting will try to facilitate exchanges between people working on different aspects of the detector concept development.

- In the next slides we present aspects in need of optimisation that emerged from the tracking WG kick-off meetings, “General/WG Conveners/Global Detector and Integration” meetings that have taken place so far.

Considerations on the Si vertex and tracker

- Vertex layers
  - The radii need to be adjusted as 5 mm clearance from the beam pipe because of beam pipe backout.
- Tracking layers
  - The material assumed in the ECCE proposal is 0.05%X/X0 per barrel layer. This needs to be updated to 0.55% X/X0 that is what is suggested by the EIC SC.
  - In addition, check the impact on performance by adjusting the position of the sagitta layers, i.e. move them to smaller radii as in the ATHENA design.
    - Smaller radii & shorter length, allow to use only two sensors along z, services come in from the sides, no services running in active area → less material.
- Disks
  - The last disk on both side in the ECCE design is currently floating and not supported. Service cone needs updating to make the required support connections.
- Hits per track as function of rapidity and p_T/momentum
  - The average number of hits per track in the electron going direction is 3 hits on average. Needs further verification in simulations.

Considerations on the MPGD tracker

- Detectors
  - Redundancy vs number of hits per track.
  - Forward: impact of a MPGD layer beyond the dRICH to be studied. → Clarify this once and for all with PID WG, we will follow up with PID WG.
  - Barrel: Technology selection (MM, μRWELL or both) → Internal discussion within eRD108 and choices presented at Tracking WG meeting.
- Detector thicknesses
  - Redefine the requirements in material thickness for each MPGD layer in the barrel region based on simulation studies and physic needs.
- FEE, concentrators, DC-DC…
  - Reference design: 280k channels.
  - The large number of channels will translate in a large number of FEE cards.
  - Space limitations to be considered.
  - Task to be discussed with DAQ liaison (see next slide).
- Services
  - Review number of detector modules.
  - Service routing.
- Support structures
  - To be studied.

Overall considerations

- Simulations
  - Detector geometry cross-checks and review of material budgets.
  - Background hits (SR and beam-gas) to be included.
  - Track finding algorithm to deal with backgrounds.
- Technology reviews
  - We will start a review of the choice of tracking technologies.
    - Two dedicated meetings for Si & MPGDs, emphasis on technology readiness.
  - Timelines to CD2/3A.
  - Discussion of fallback solutions.
- Requirements inputs from the physics WGs
  - List of key tracking requirements such as momentum resolution, vertex and projection spatial resolutions.
- Coordination with other WGs - Contact liaison are being identified for:
  - DAQ/Electronics/Readout: Kondo (MPGD), Jo (TBC, Si)
  - Computing & Software/Simulation Production & QA WG: Matt, Nicholas
  - PID: Laura (AC-LGAD), more TBC.

Simulation tasks organisation

- We have setup a spreadsheet for the tracking working group simulation workforce survey.
- Please click on the link below and add your availability as appropriate.

https://docs.google.com/spreadsheets/d/1Jp1-V7MavZFejn2SG185YarbMIpGCByGfF7yz4Y-Azc/edit?usp=sharing

- We will contact you for further task coordination and simulation contributions based on the survey feedback.