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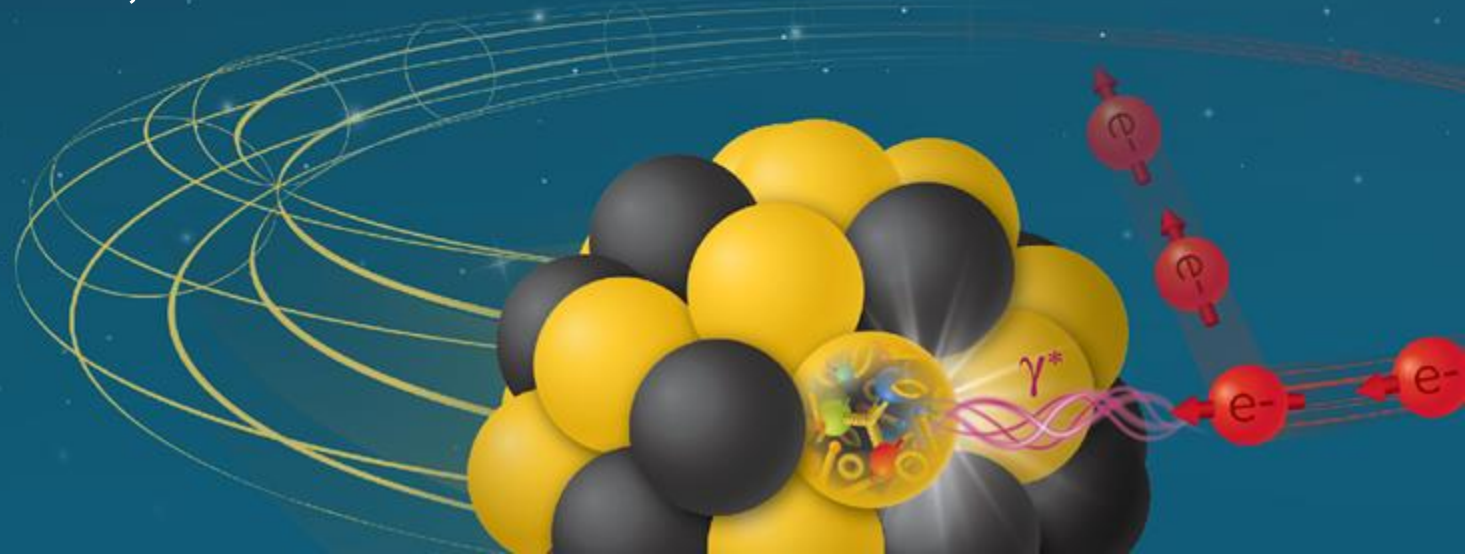
Peer Review of the EIC Particle Identification Detectors based on AC-LGAD

Review Committee: Koji Nakamura, Stefania Bufalino and Giovanni Pinaroli



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Electron-Ion Collider

Outline

- Review Committee
- Charge Questions
- Committee Report
  - Findings
  - Comments
  - Recommendations
- Conclusion

Review Committee

- Koji Nakamura
- Stefania Bufalino
- Giovanni Pinaroli

Charge Questions

1. Are the technical performance requirements appropriately defined and complete for this stage of the project?
2. Are the plans for achieving detector performance and construction sufficiently developed and documented for the present phase of the project?
3. Are the current designs and plans for detector and electronics readout likely to achieve the performance requirements with a low risk of cost increases, schedule delays, and technical problems?
4. Are the fabrication and assembly plans for the AC-LGAD based detector systems sufficiently developed for the present phase of the project?

Response to Charge Questions

Charge Question #1

Are the technical performance requirements appropriately defined and complete for this stage of the project?

Response:

The majority of the technical requirements are well defined at this stage of the project.

Nevertheless, the minimum requirement on timing resolution is not appropriately defined, and some simulation work would be beneficial to show the impact of the PID performance on the physics program

Response to Charge Questions

Charge Question #2

Are the plans for achieving detector performance and construction sufficiently developed and documented for the present phase of the project?

Response:

At this stage of the project, it would be beneficial to include in the plan the following aspects:

- present manpower available and (if possible) some projection of the manpower for the future
- A brief discussion of the actions to be taken/planned to mitigate the risks

Response to Charge Questions

Charge Question #3

Are the current designs and plans for detector and electronics readout likely to achieve the performance requirements with a low risk of cost increases, schedule delays, and technical problems?

Response:

Some aspects (like risk of cost increase and technical problems) of the plan for electronics readout and their consequence on the cooling design should be clarified.

Moreover, the production schedule would benefit from the inclusion of a more comprehensive risk analysis, including mitigation strategies and potential delays (e.g., holidays, staff availability, and technical setbacks), to yield a more realistic completion estimate. In addition, a representative list of personnel and manpower allocation should be provided to clearly document the committed effort.

Response to Charge Questions

Charge Question #4

Are the fabrication and assembly plans for the AC-LGAD based detector systems sufficiently developed for the present phase of the project?

Response:

Yes

Comments

- The “single vendor” strategy seems risky. One possible mitigation strategy could be to include a second vendor in the plan
- The minimum requirements are not clear at present and this is important to define the impact of the PID performance on the physics program. The timing requirement as needed for particle identification is a combination of the required sensor timing resolution and many other factors.
- A more detailed risk analysis, including mitigation strategies and potential delays would be beneficial for the project

Recommendations

- Inclusion of additional simulation work on PCB design for transmission lines, to define the technical performance and in particular for the resistivity on the Barrel TOF
- A clearer power budget estimation and cooling design strategy
- An estimation of the manpower needed and the one available with a trend for the future phases of the project
- The preparation of a document including the details about the interfaces of the single parts of the project (for instance the geometry envelope) would be beneficial

Conclusion

- The status of the different activities presented shows a sufficient level of maturity for the current phase of the project. The project planning would greatly benefit from the implementation of the suggested recommendations