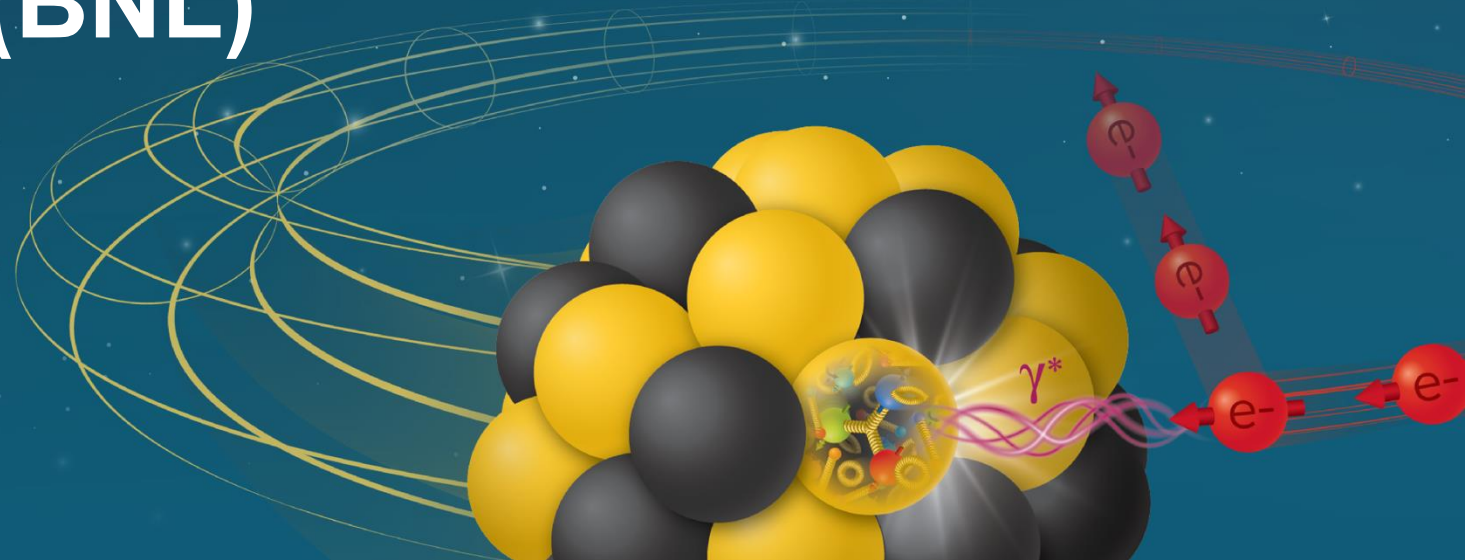


EIC Incremental Preliminary Design and Safety Review of the ePIC Time-of-Flight Systems

Closeout Report

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Outline

- Review Panel
- Charge Questions
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- Conclusion

Review Panel

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Charge Questions

1. Are the technical performance requirements appropriately defined and complete for this stage of the project?
2. Are the plans for the various sub-systems appropriately documented and complete for this stage of the project?
3. Are the current plans for the detector likely to achieve the technical performance requirements, with a low risk for cost increases, schedule delays, and technical problems?
4. Are the schedule assumptions for the fabrication of the various sub-systems and assembly plans reasonable and consistent with the overall detector schedule?
5. Have ESH&Q and QA considerations been adequately incorporated into the plans at their present stage?
6. Have the recommendations from previous reviews been adequately addressed?

Responses to Charge Questions

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

Yes. The technical requirements are generally appropriate for this stage of the project; however, some technical requirements and acceptance criteria should be better documented and stated more clearly (in particular for external participants).

Responses to Charge Questions

2. Are the plans for the various sub-systems appropriately documented and complete for this stage of the project?

Yes, The reviewers agree on the general improvement made by the several groups. The clarity of the plan and related documentation has been improved quite a lot and is considered appropriate for this stage of the project.

Responses to Charge Questions

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

Yes. The reviewers agree on the effort made by presenters to include technical requirements, risk assessment, schedules and delays. At this stage, this is considered appropriate and mature with the project timeline.

Responses to Charge Questions

4. Are the schedule assumptions for the fabrication of the various sub-systems and assembly plans reasonable and consistent with the overall detector schedule?

Yes. The reviewers consider the assumption on schedules and work estimation sufficient at this stage of the project. The overall detectors schedule appear to be appropriate.

Responses to Charge Questions

5. Have ESH&Q and QA considerations been adequately incorporated into the plans at their present stage?

Yes, the reviewers consider that ESH&Q and QA have been adequately incorporated in the presented plans. However, a more precise statement on acceptance criteria for QA should be provided. See comments and recommendations.

Responses to Charge Questions

6. Have the recommendations from previous reviews been adequately addressed?

Partially yes. The reviewers agree on the overall improvement on the presentation following the recommendations from previous reviews. However, still some points need to be addressed more precisely. In particular:

- Simulation of acceptable glue fill factor for the wire bonding;
- Material budget estimation for both bTOF and fTOF;
- Improve and complete a realistic thermal model for both fTOF and bTOF

Comments

- For ease of external reviewers, the requirements can be stated more clearly, and presenters should coordinate and keep consistency through all presentations. We suggest this to include:
 - The physics requirement for the timing performance needed to achieve the science goals.
 - The engineering target for the timing performance that is realistically acceptable for the instrument.
- A full simulation, including all material budgets, to ensure the detectors achieve the requirements needs to be performed and documented. This should also address the number of dead channels and staves that can be tolerated without impacting the science.
- Generally, from the presentation, a lack of work force still needs to be addressed particularly, in view of the future stages of the project, when an increment of personnel will be needed (production, assembly,..). We suggest to include this consideration for the next critical review.
- The yield assumed was only based on those of the sensors during production. The reviewers suggest to envision a more conservative estimation for the overall yield related to sensors, module and mechanical assembly/installation.
- The reviewers suggest to incorporate a precise statement on acceptance criteria for QA (alignment, glue fill factor, dead channels).
- The acceptable glue fill factor for the wire bonding was not presented and needs to be simulated.
- A more comprehensive allowable material budget estimation for both bTOF and fTOF should be performed folding in impact on the detector performance itself and the other ePIC detectors.
- ~~A realistic thermal model for both fTOF and bTOF should be completed to ensure a workable engineering design and to get a realistic estimate for the material budget coming from the cooling system.~~

Recommendations

- Improve the estimation of the work force needed for future construction and acceptance stages.
- Perform a more conservative estimation for the overall detector yield (sensors, module and mechanical assembly/installation).
- Include precise statements on the acceptance criteria for component quality assurance (e.g., on alignment, glue fill factor, dead channels).
- Complete a simulation of the minimum acceptable glue fill factor for the wire bonding.
- Document the allowable material budget estimation for both bTOF and fTOF.
- Improve and complete a more realistic thermal model for both bTOF and fTOF.
- Include a detailed analysis of the detector powering scheme for the bTOF.

Conclusion

- The status of the different activities presented show an appropriate level of maturity for the current phase of the project.
- The project made a considerable amount of work to implement the suggestion given during the last review
- The project planning would benefit from the implementation of the recommendations envisioning next stages of the review