

ePIC Tracking

Incremental Preliminary Design and Safety Review Summary

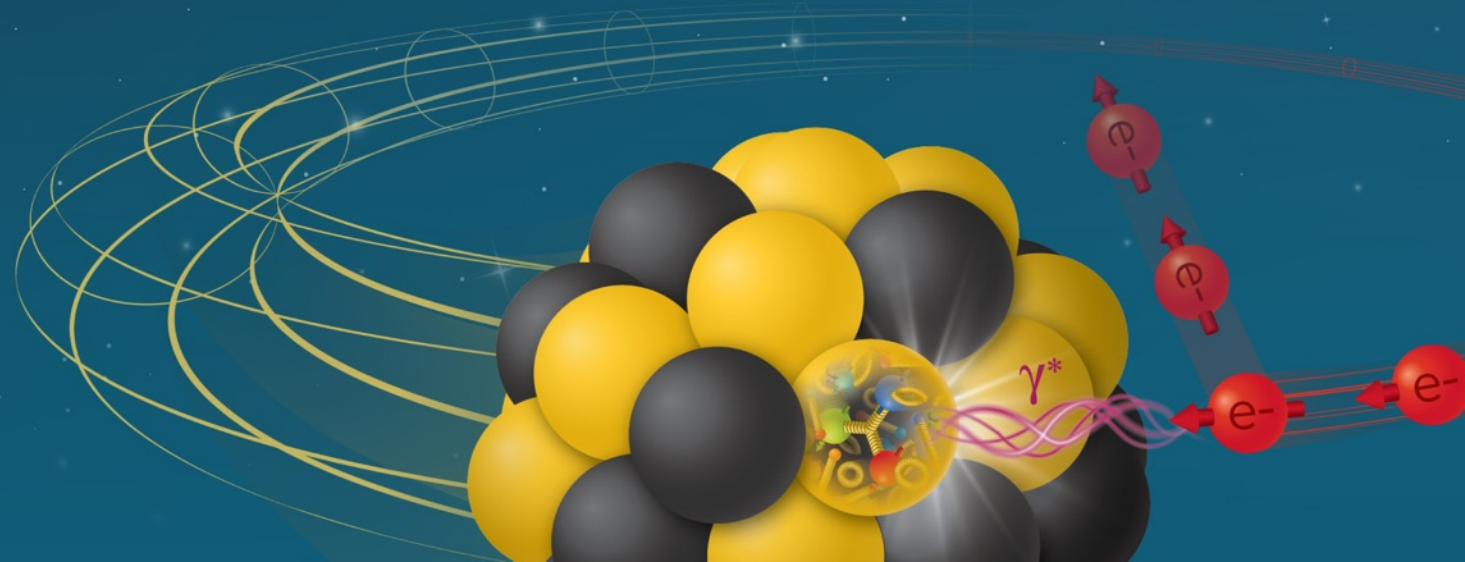
Brian Eng

L3 CAM

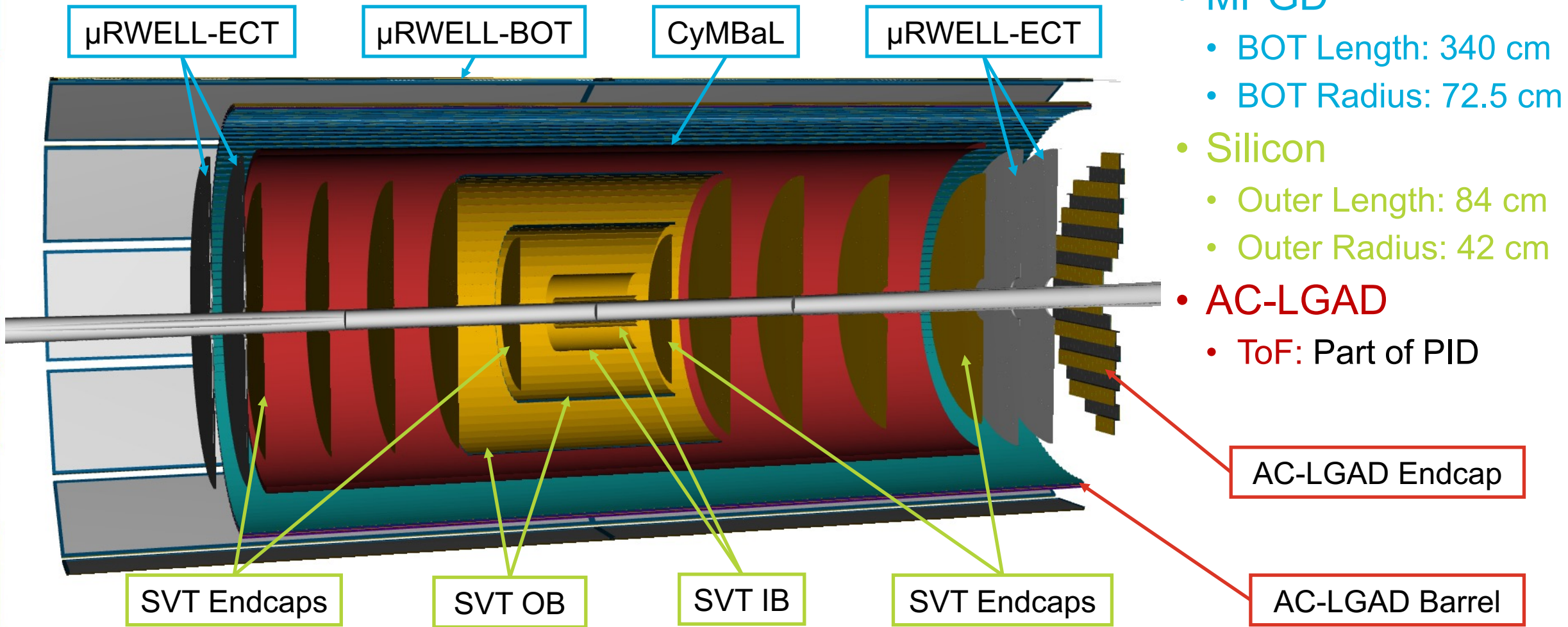
Jefferson Lab

TIC Meeting
April 8, 2024

Electron-Ion Collider



Overall Tracking Layout



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, electronics readout, and services sufficiently developed to achieve the performance requirements?
4. Are plans in place to mitigate risk of cost increases, schedule delays, and technical problems?
5. Are the fabrication and assembly plans for the various tracking detector systems consistent with the overall project and detector schedule?
6. Are the plans for detector integration in the EIC detector appropriately developed for the present phase of the project?
7. Have ES&H and QA considerations been adequately incorporated into the designs at their present stage?

Review Panel

- **Andy White (Chair) – University of Texas at Arlington**
 - General issues: schedule, integration, installation, risks
- **Michael Begel – Brookhaven National Laboratory**
 - Silicon tracking, electronics, interface to DAQ
- **Maxim Titov – CEA Saclay**
 - MPGDs – Micromegas
- **David Lynn – Brookhaven National Laboratory**
 - Silicon tracking
- **Piotr Gasik – GSI Helmholtz Centre for Heavy Ion Research**
 - MPGDs – GEM & uRWELLS

Responses – Yes

- The charges below were answered in the affirmative with no* recommendations
 - All charges have comments that will need to be taken into account in future reviews
 - 3. Are the current designs and plans for detector, electronics readout, and services sufficiently developed to achieve the performance requirements?
 - 4. Are plans in place to mitigate risk of cost increases, schedule delays, and technical problems?
 - 5. *Are the fabrication and assembly plans for the various tracking detector systems consistent with the overall project and detector schedule?*
 - 6. Are the plans for detector integration in the EIC detector appropriately developed for the present phase of the project?
- 5 is in italics because they were only Yes for MPGD, silicon needs to develop fabrication and assembly plans as well as institutional commitments

Responses – Partial (1/2)

- The charges below were only partially answered in the affirmative and received recommendations
 1. Are the technical performance requirements appropriately defined and complete for this stage of the project?
 - Panel noted that not all the technical requirements are fully defined as well as being difficult to trace back to the general/functional requirements
 - JLab Systems Engineering already working on improvements to Vizure which was also the recommendation
 2. Are the plans for achieving detector performance and construction sufficiently developed and documented for the present phase of the project?
 - Panel made similar comments to 5 earlier, namely MPGD was in better shape and that silicon needed more construction plans
 - Several recommendations for this charge: more simulation, more details on tracking alternatives (cost/schedule) and additional physical mockups for silicon to better understand constraints

Responses – Partial (2/2)

7. Have ES&H and QA considerations been adequately incorporated into the designs at their present stage?
- Panel noted that all groups incorporated ES&H well but that QA was only addressed for MPGD
 - Two recommendations: Document QA procedures for each component, document requirements for production sites and have each produce at least one module

Panel's Conclusion

The review committee congratulates the ePIC tracking system team on its significant progress since the definition of the system in 2023. The technologies for each component of the tracker have been settled and development paths are being defined from final prototypes to pre-production and final production. The schedule is aggressive and critically dependent on the success of the ITS3 project.

Summary

- Overall it was a timely and good review
- MPGD groups did well by showing off previous work as well as facilities available
- Several of recommendations are already being worked on so it shows we're on the right track
 - Simulation
 - Improve documentation
 - More planning and details on institutional commitments
- Most of the issues were from the silicon side, which was mostly expected as they're naturally later in the schedule (e.g. R&D still on-going while other detectors are finished), but that doesn't offer any safety net due to the aggressive schedule

Backup

Panel's Full Recommendations

- Charge 1
 - Document the flow down of performance requirements to technical requirements on detector components and incorporate them into the Vizure system.
- Charge 2
 - Include the calorimeters in the simulation to verify full detector performance meets requirements.
 - Alternate tracker solutions, including potentially time-phasing installation of the silicon tracker, should be developed to maintain physics performance within schedule constraints.
 - Build thermomechanical models and mockups for each silicon detector subsystem that can be utilized to understand construction and installation constraints as well as the thermal and mechanical performance.
- Charge 5
 - Develop a fabrication and assembly plan for the silicon tracker with emphasis on institutional commitments.
- Charge 7
 - Document quality assurance procedures for each component.
 - Document requirements for qualifying each production site for deliverables distributed across multiple sites. Each site should produce at least one pre-production module.