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ePIC Computing & Software Review Report

ePIC Computing & Software Review, September 26–27, 2024

A committee of experts, the **EIC Computing and Software Advisory Committee**, has been formed to advise the host laboratories on the progress and status of computing and software for the ePIC collaboration. Reviews are expected to take place on a regular cadence, with a **charge reflective of** the **EIC schedule**, the **stage of the ePIC experiment**, and **impending deadlines**. This charge covers an **assessment of the ePIC computing model in preparation for the November 2024 RRB meeting**. The scope of this review also includes the organization of the newly formed ECSJI.

EIC Computing and Software Advisory Committee (ECSAC), present at the review

Mohammad Al-Turany (GSI)

Simone Campana (CERN)

Christoph Pauss (MIT)

Verena Martinez Outschoorn (UMass Amherst)

Frank Würthwein (chair, UCSD)

We are grateful to **Xiaofeng Guo (DOE SC NP)** for serving as an observer at the review.

Presentations at the Review

- **Welcome**
  - **Speaker:** David Dean, Deputy Director for Science at Jefferson Lab

- **The EIC and the ePIC Detector: Getting to the Heart of Matter**
  - **Speaker**: Holly Szumila-Vance (Florida International University)

- **ePIC Software & Computing Overview**
  - **Speaker**: Torre Wenaus (BNL)

- **ePIC Streaming Computing Model**
  - **Speaker**: Markus Diefenthaler (Jefferson Lab)

- **ePIC Software Components: Building with the Community**
  - **Speaker**: Dmitrii Kalinkin (University of Kentucky)

- **International Computing and ePIC**
  - **Speaker**: Wouter Deconinck (University of Manitoba)

- **ECSJI: Status Report**
  - **Speaker**: Alexei Klimentov (BNL)

ePIC Computing & Software Review Report

The **report** (direct link) has been finalized for the EIC RRB meeting and is available on Indico:

https://indico.bnl.gov/event/23813/

ECSAC: *"Overall, we think the ePIC computing & software preparations are in excellent shape for this early in the process."*

Charge Question 1.1

Is there a comprehensive and cost-effective short and long-term plan for the software and computing of the experiment?

- **The pre detector technical design report (TDR) is scheduled to be delivered in 2025. Are the resources for software and computing sufficient to deliver the TDR?**

Findings:
- Currently available computing resources sufficient for immediate needs of producing a TDR in 2025.
- Several software developments made in the last year, including build events from timeframes.
- No dedicated DOE effort for software and computing: Available effort based on synergistic contributions and best effort.

Comments:
- **ECSAC** congratulates ePIC for the achievements made in the last year in terms of software development:
  - Recommendation from last year's review were addressed.
- There has been significant progress towards the TDR, showing good readiness of the software and simulation.
- **ePIC together with host labs need to develop a long term staffing needs plan for software and computing**:
  - Timing for such long term dedicated funding must be commensurate with ePIC Software & Computing being in a position to successfully deliver towards the miniDAQ milestone in FY28.

Recommendation:
- Provide a detailed plan and timeline before the next ECSAC meeting for creating dedicated effort to the ePIC S&C team.

Charge Question 1.2

Is there a comprehensive and cost-effective short and long-term plan for the software and computing of the experiment?

- **Is the design of the ePIC computing model and resource needs assessment adequate for this stage of the project?**

Findings:
- Role of Echelon 2 w.r.t. to streaming needs to be clarified.
- ePIC Software & Computing developed detailed resource assessment leading to predict the storage and compute needs for EIC Phase I.

Comments:

Recommendations:

- None.

Charge Question 1.3

Is there a comprehensive and cost-effective short and long-term plan for the software and computing of the experiment?

- **Is the ePIC computing and model flexible? Can it evolve and integrate new technologies in software and computing?**

Findings:
- ePIC Computing model different from the current NHEP experiments to allow for more flexibility.
- Flexibility aims to:
  - Foster collaboration in software development,
  - Leveraging opportunities at facilities for contributing computing services.

Comments:
- Flexibility of the computing model is an important mechanism for engaging partners and leveraging synergies.
- At the same time it comes with the cost of complexity and that has to be properly balanced.

Recommendations:

- None.

Charge Question 2

Are the plans for software and computing consistent and integrated with standard practices across nuclear physics and particle physics communities, especially given technical evolution over the next decade?

Findings:
- ePIC Software & Computing plans well integrated with standard practices across NHEP.
- ePIC Software & Computing uses many common tools and are active contributors to several.
- Statement of Software Principles designed:
    - To take advantage of future developments, and
    - To be flexible to adapt to new technologies.

Comments:
- **ECSAC**: *"We congratulate the S&C team for a job well done."*

Recommendations:

- **None.**

Charge Question 3

Are the ECSJI plans to integrate into the software and computing plans of the experiment sufficient?

Findings:

- Presentation on the role of the ECSJI, the EIC Computing & Software Joint Institute between the host labs.

Comments:

- Upcoming long-term decision on ECSJI's role in funding for EIC Computing & Software.

Recommendations:

- None.

Charge Question 4

Are the plans for the integrating international partners' contributions flexible and adequate at this stage of the project?

Findings:
- **Globally distributed computing model** being developed that is similar to existing global computing efforts.
- **Increasing number of international partners** in the process of joining the computing and software infrastructure.

Comments:
- Streaming readout makes the computing model different from other such models in NHEP.
- International partners appear to be at a healthy and commensurate level with the size of the project at this stage.
- **ECSAC surprised that no potential Echelon 2 contributions from within the U.S. were presented**:
  - **ECSAC:** *"This is a gap where potential resources and effort could be tapped into."*

Recommendations:
- Investigate how U.S. universities can contribute to the software and computing needs of the experiment, and present a plan at the next ECSAC review.

Review Summary

ECSAC excited about ePIC Software & Computing status and plans:

- A lot of engagement. Intense, productive discussions.

- Many comments on how to present the compute-detector integration by ePIC, along with our computing plan, to the NHEP community and suggestions on ways to improve it.

Two Recommendations from ECSAC Review:

- Provide a detailed plan and timeline before the next ECSAC meeting for creating dedicated effort to the ePIC S&C team.

- Investigate how U.S. universities can contribute to the software and computing needs of the experiment, and present a plan at the next ECSAC review.