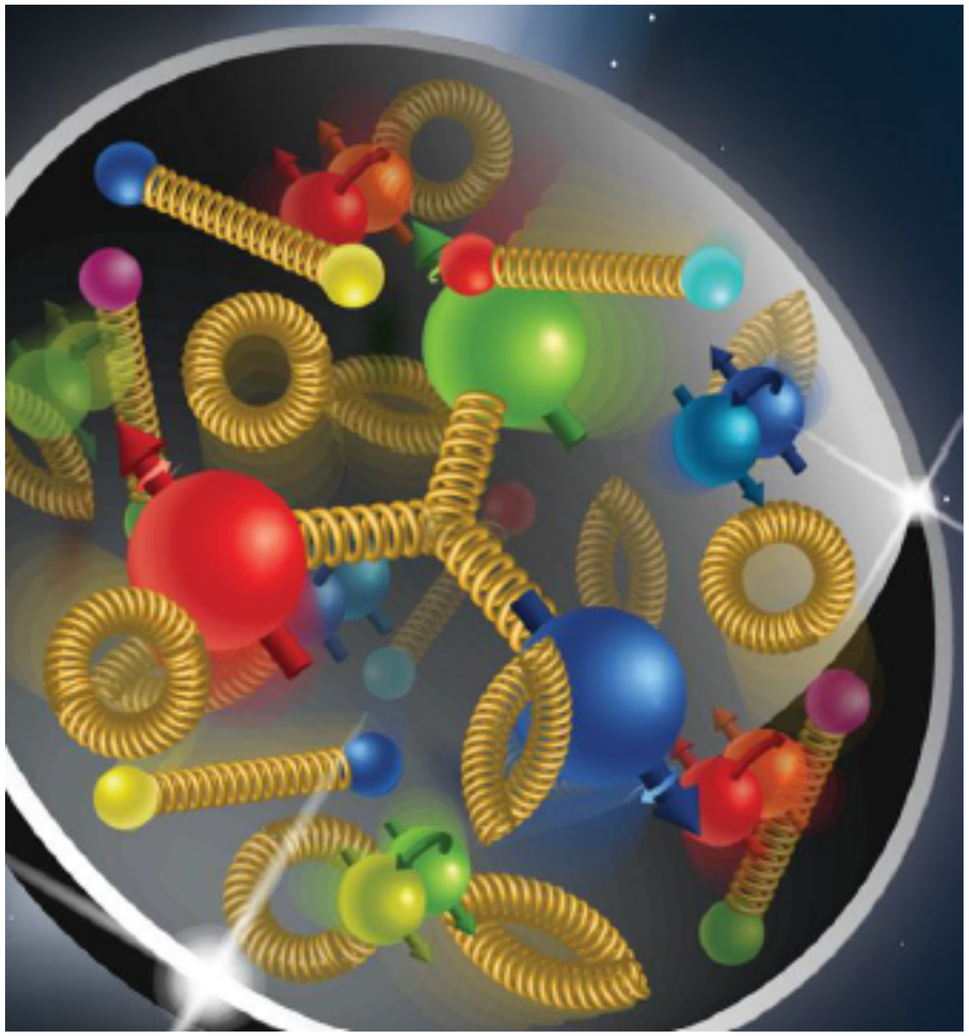
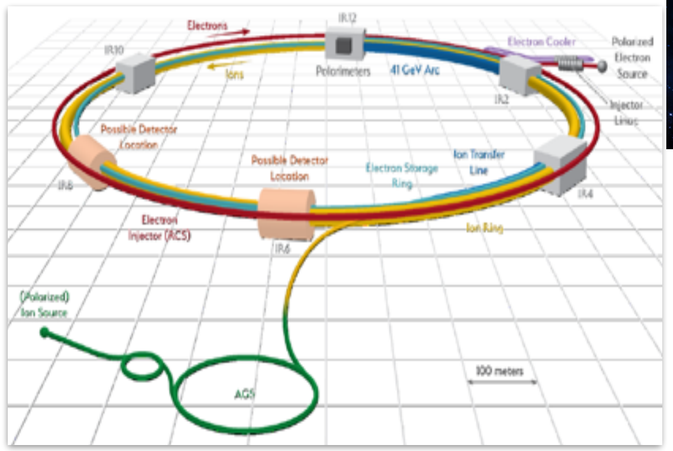
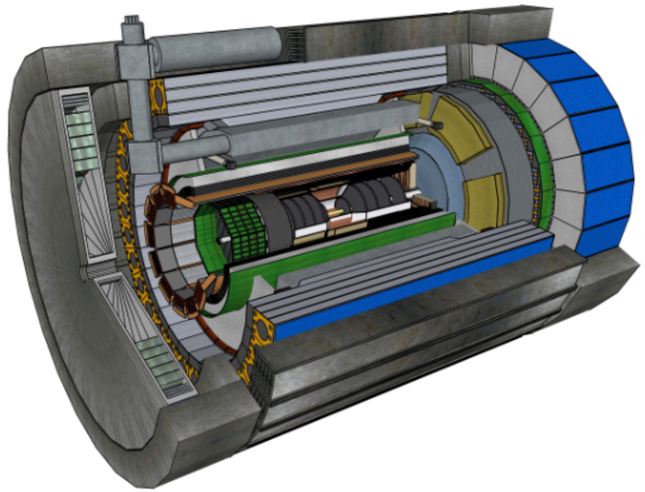




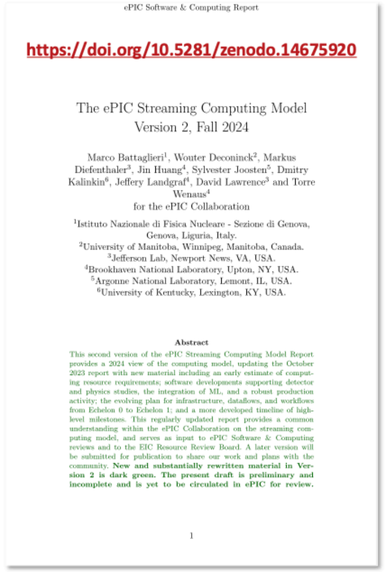


ePIC
Streaming Computing WG: Introduction

M.Battaglieri (INFN), M.Diefenthaler (JLab), T.Gunji (TokyoU), J.Landgraf (BNL), T.Wenaus (BNL)

ePIC SRO Computing WG work fest

The ePIC Streaming Computing Model


ePIC Software & Computing Report

https://doi.org/10.5281/zenodo.14675920

The ePIC Streaming Computing Model
Version 2, Fall 2024

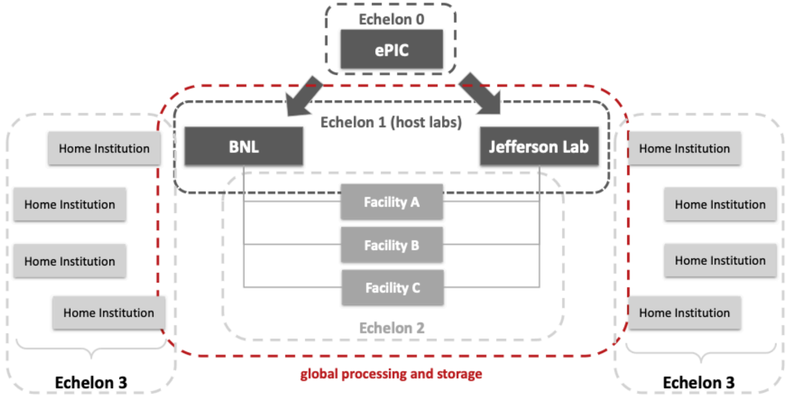
Marco Battaglieri[1], Wouter Deconinck[2], Markus Diefenthaler[3], Jin Huang[4], Sylvester Joosten[5], Dmitry Kalinkin[6], Jeffery Landgraf[4], David Lawrence[3] and Torre Wenaus[4]
for the ePIC Collaboration

[1]Istituto Nazionale di Fisica Nucleare - Sezione di Genova, Genova, Liguria, Italy.
[2]University of Manitoba, Winnipeg, Manitoba, Canada.
[3]Jefferson Lab, Newport News, VA, USA.
[4]Brookhaven National Laboratory, Upton, NY, USA.
[5]Argonne National Laboratory, Lemont, IL, USA.
[6]University of Kentucky, Lexington, KY, USA.

Abstract

This second version of the ePIC Streaming Computing Model Report provides a 2024 view of the computing model, updating the October 2023 report with new material including an early estimate of computing resource requirements; software developments supporting detector and physics studies, the integration of ML, and a robust production activity; the evolving plan for infrastructure, dataflows, and workflows from Echelon 0 to Echelon 1; and a more developed timeline of high-level milestones. This regularly updated report provides a common understanding within the ePIC Collaboration on the streaming computing model, and serves as input to ePIC Software & Computing reviews and to the EIC Resource Review Board. A later version will be submitted for publication to share our work and plans with the community. **New and substantially rewritten material in Version 2 is dark green. The present draft is preliminary and incomplete and is yet to be circulated in ePIC for review.**

1



We developed the ePIC Streaming Computing Model to accelerate the pace of discovery and enhance scientific precision through improved management of systematic uncertainties. The model is documented in a detailed report and was reviewed during the 2023 and 2024 ECSAC reviews.

From Markus' plenary talk on Jan 21, 2026 at ePIC Collaboration meeting

Prototyping Ideas and Tools in Testbeds

With active testbeds and functional prototypes now in place, the effort is moving from design to implementation. These developments aim to define and test the interface between DAQ and computing, and to mitigate risks in the integrated DAQ-computing system.

- **Streaming orchestration**, i.e., a workflow and workload management system for streaming data—is essential for system testing. A requirements document has been developed and is now guiding testbed and prototype development.
  - **Testbed plans** are taking concrete shape:
    - **Streaming reconstruction**: Raw data stream to event identification, reconstruction, and analysis.
    - **Streaming orchestration**: Developing E0-E2 streaming workflows in the testbed, utilizing Rucio and PanDA.
    - **Streaming processing**: Developing E0-E2 streaming workflows using EJFAT.
  - Not covered in this presentation but starting efforts:
    - **Streaming analysis**: Demonstrate simulation data production streaming to E2 site.
    - **Rapid data processing**: Autonomous calibration workflow for one detector system.

ePIC SRO Computing WG work fest

Two topics to discuss:
- Calibrations and alignement
- Echelon0-Echelon1 interface

- Status
- Plans for 2026

significant time for discussion and collaborator's feedback

Introduction *Marco Battaglieri*

Streaming Calibration Workflows
Taku Gunji

Streaming Calibration Su…
Marco Batta…

Coffee Break
Brookhaven National Labor…
09:45 - 10:00

Calibrations and alignment

- Taku's presentation at TIC meeting on Dec 1, 2025 (https://indico.bnl.gov/event/30589/)
- Real-time calibration challenging but essential for physics-quality full data recon in 2 weeks
- Toward (AI-Driven) Autonomous Calibration: ePIC autonomous calibration system, acts when calibrations are needed, executing and integrating results into the reconstruction
- LHC (but not only!) experiments C&A experience presented at EIC SRO-XIII workshop in Catania in December 2025
- DSCs involvement and feedback expected by gthe end of February 2026

Echelon 0 Status and Plan for 2026
Jeff Landgraf
Brookhaven National Laboratory
10:00 - 10:20

Orchestration of TF Proce…
Dr Maxim P…

Fast TF streaming with Pa…
Torre Wenaus

Streaming Reconstruction
Takuya Nakamura
Brookhaven National Laboratory
11:00 - 11:20

E0-E1 interfaces and testbed status

- Mini-ws organized in Oct at JLab (https://indico.jlab.org/event/988/timetable/?view=standard)
- E0 status and plans
- Data transfer E0-E1 for data processing
- Networking
- Progress in TF streaming
- Progress in streaming reconstruction