

ePIC Software and Simulation paper

The background of the slide is a dynamic, abstract digital composition. It features a central bright light source from which numerous colorful rays (red, orange, yellow, and blue) emanate, creating a sense of depth and speed. Overlaid on these rays are various elements of digital data, including binary code (0s and 1s) in different colors and sizes, and some blurred, glowing shapes that suggest motion or data flow.

Dmitry Kalinkin (BNL) on behalf of ePIC Software & Computing

Reminder from April 20th discussion

About the ePIC NIM- A Special Issue

- **Title:** "The ePIC Detector and Science Program at the Electron Ion Collider"
- Submissions will be managed by the **ePIC coordinators (acting as guest editors)**
- **All submissions** will be subject to **peer review**

Plan to publish a super-set of the material prepared for the pTDR; **high level perspectives:**

- ePIC Overview Paper

Also useful to skip EIC/ePIC introduction at the beginning of each paper in the special Issue

- Subsystem technical papers (derived from pTDR)

This is what we are going to discuss today

- Streaming Computing Model Paper

- Physics performance paper (derived from pTDR)

- Early Science Whitepaper

- Early Science Physics Appendices

- BSM/EW Physics Performance Paper

Also:

- Streaming Reconstruction Paper

TIC meeting

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- Need for **ePIC Software and Simulation paper**
 - A major effort in the collaboration that deserves documentation
 - A reference to provide for the simulation efforts by DSCs and PWGs
- The goal is to describe software stack and simulation/reconstruction procedures status as of NIM paper (July campaign)
- Define clear scope what goes in / what does not
- Is there a page limitation per manuscript?
 - No: the reviewers and the editors will check that the text length is adequate respect to the relevance of the messages.

Draft Outline: ePIC Software and Simulations

1	Introduction
2	Software Stack
2.1	User and Production Environment
2.2	Physics and Detector simulations
2.2.1	MCEGs
2.2.2	Event merging and Backgrounds
	Treatment of synchrotron radiation
2.2.3	Geometry and Engineering Design correspondence
2.2.4	Digitization
2.3	Event Processing
2.3.1	Framework
2.3.2	Reconstruction Algorithms
	Track and Vertex Reconstruction
2.4	Development and Validation
2.5	User Support
2.5.1	Event Display
3	Large Scale Simulation Campaigns
3.1	Distributed Computing Resources
3.2	Coordination with Physics WG and Detector Subsystem
3.3	Data management and Data delivery
4	Future development towards a Streaming and AI-enabled model
4.1	Timeframe reconstruction
4.2	Prompt and fast processing workflows
4.3	Heterogeneous computing and AI integration
5	Summary
	References

The paper is to document full process of campaign delivery and processing:

- how software is developed
- processing in the simulation and reconstruction
- how the simulation campaigns are realized
- how data analysis can be done from users perspective
- how overall framework is connected to future developments and other ongoing testbeds

Important input needed:

- any additional topics that need to be covered?