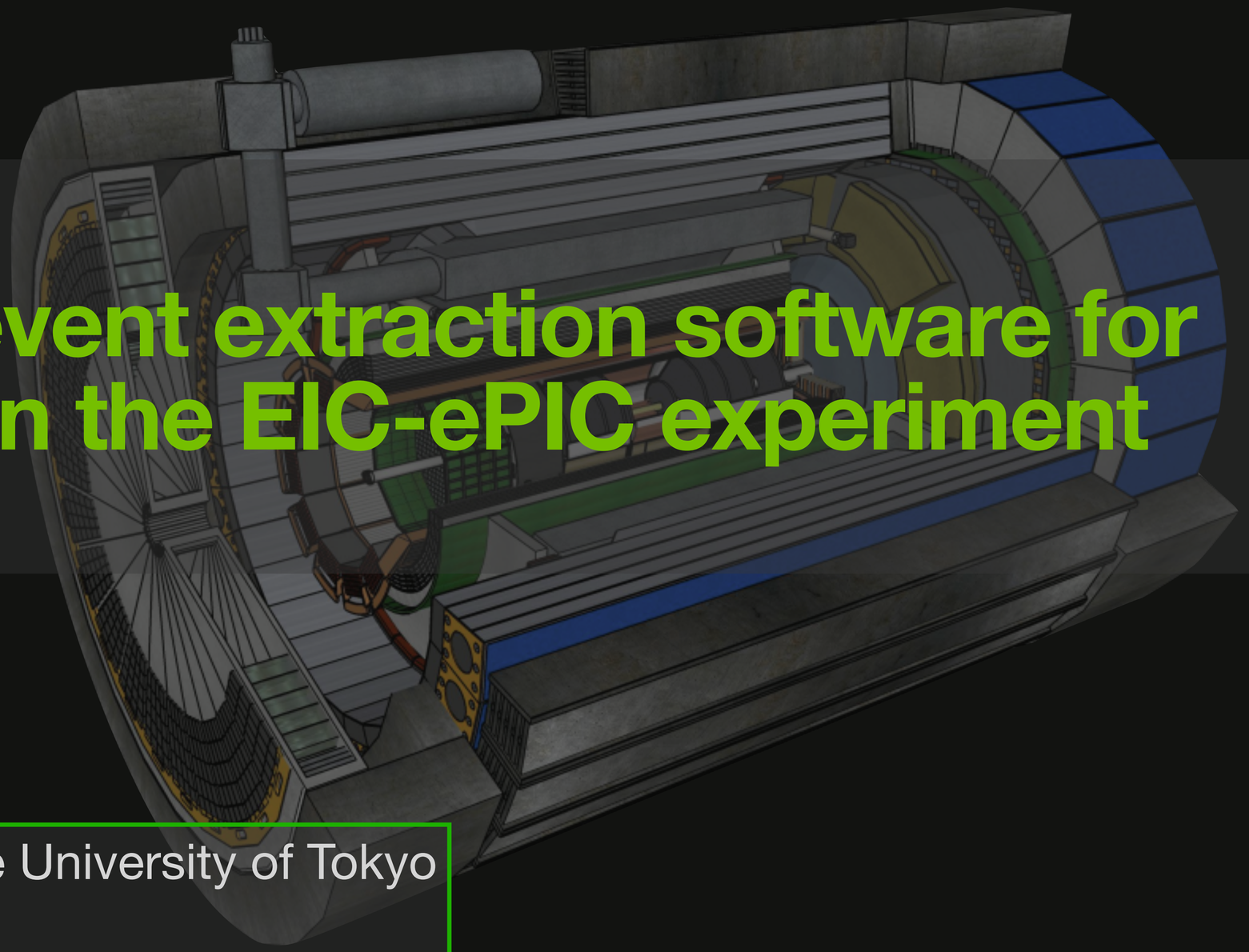
Development of event extraction software for streaming DAQ in the EIC-ePIC experiment



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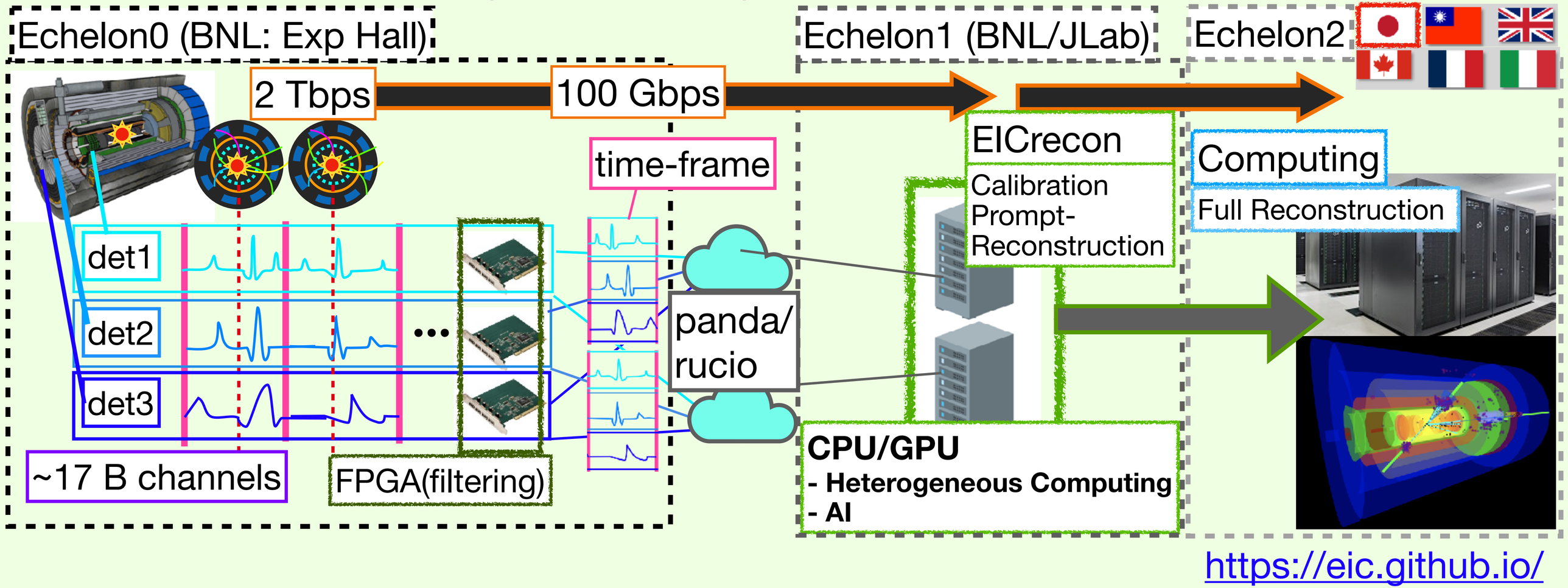
EIC-ePIC DAQ Software & Computing Model

The EIC-ePIC experiment adopted a **streaming DAQ** system to record all physics events, including those that are difficult to distinguish from background events.



https://eic.github.io/

Purpose of this study

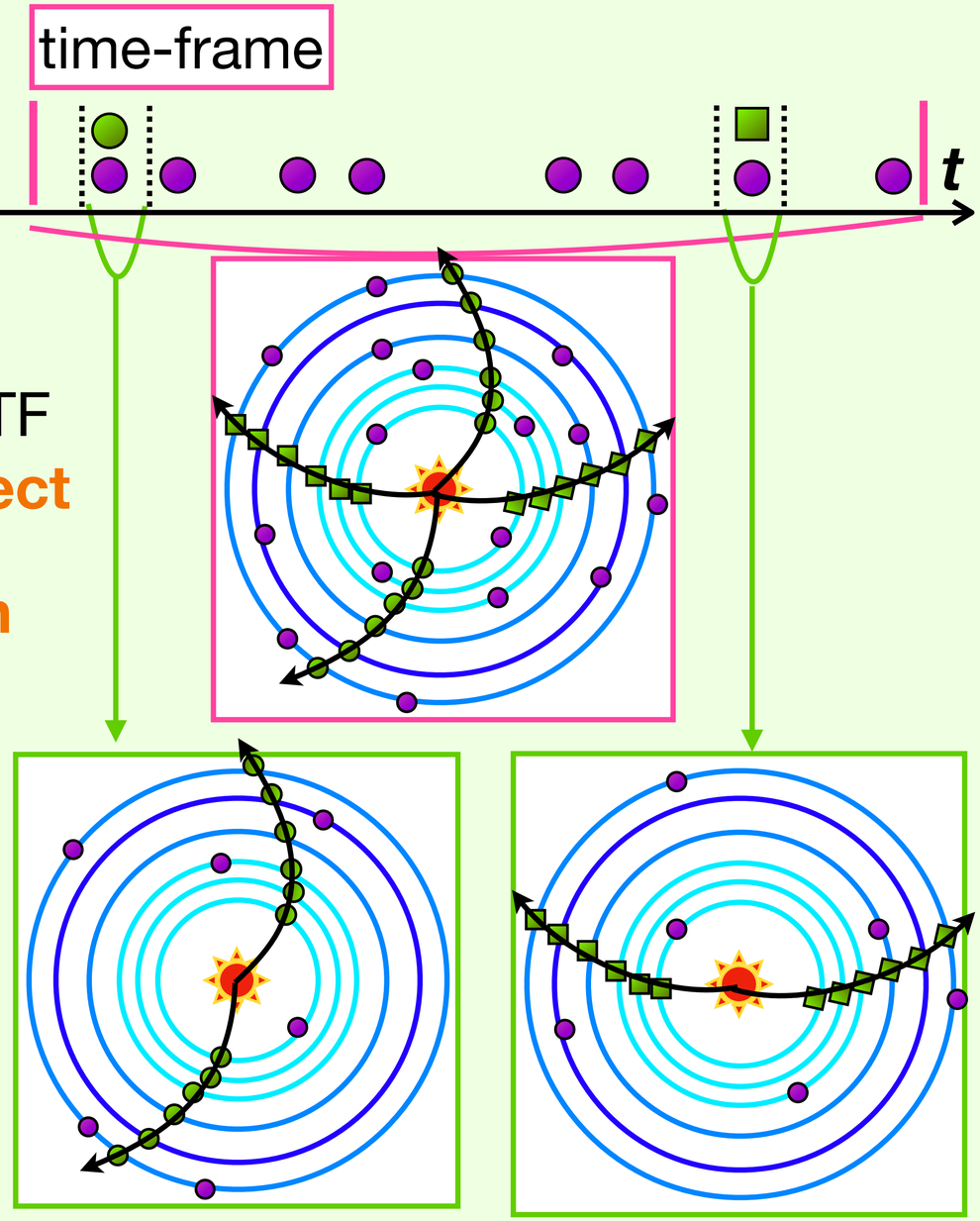
- Time-frame (TF) ~0.6 ms / super TF ~ x1000 TFs
- Acquire DIS events at 500 kHz (@ 18x275 GeV^2)
- Expected background rate (dominated by Synchrotron radiation) : 3.3 GHz(@ 18x275 GeV^2)

+ detector noises

→ 300 DIS events/TF and background ~2.0x10^6 events/TF

→ **Essential to deploy streaming reconstruction to select physics event and reject background**

+ With triggerless readout, events must be identified in software.

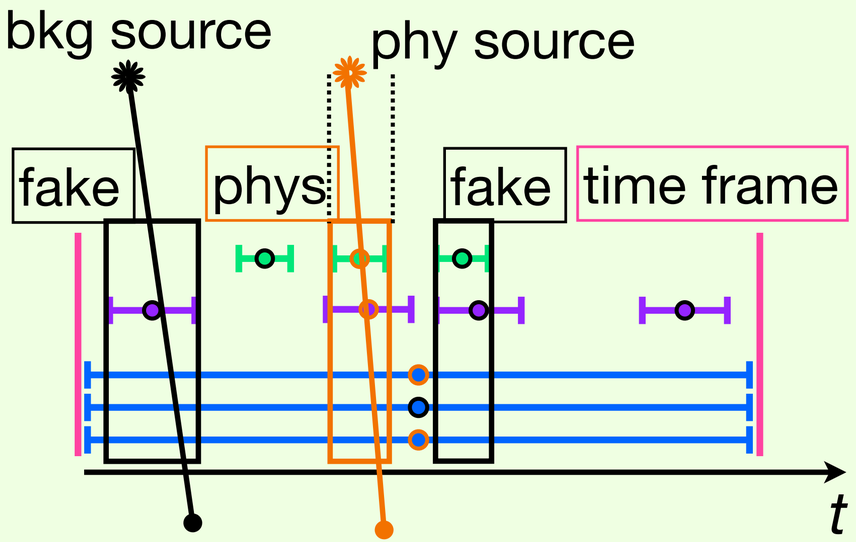


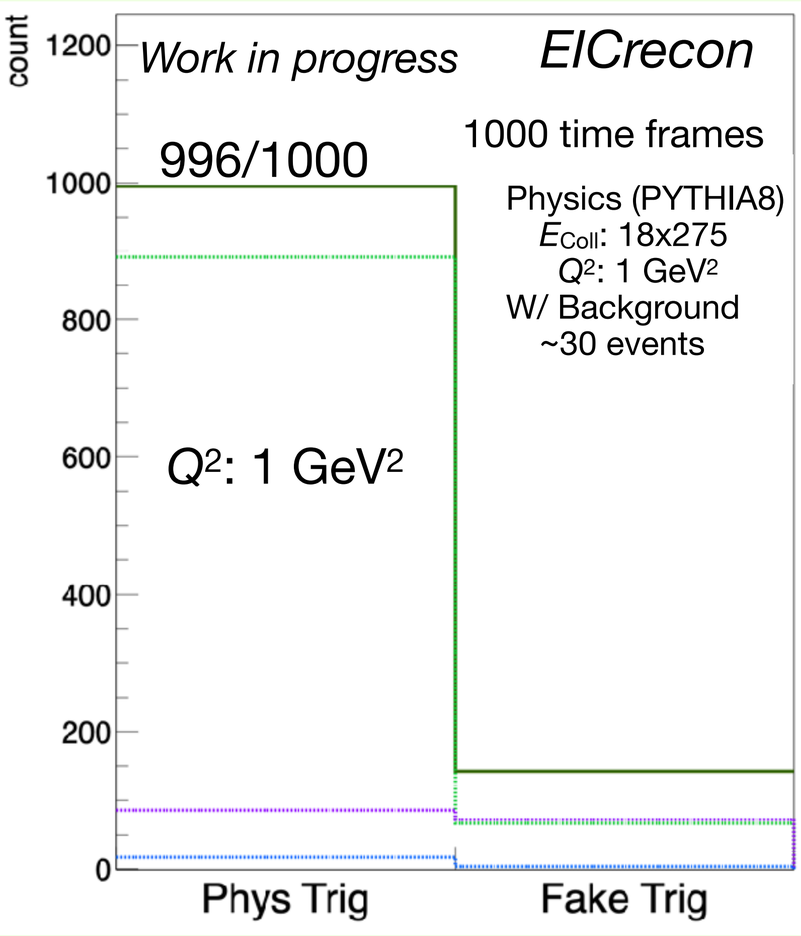
Purpose

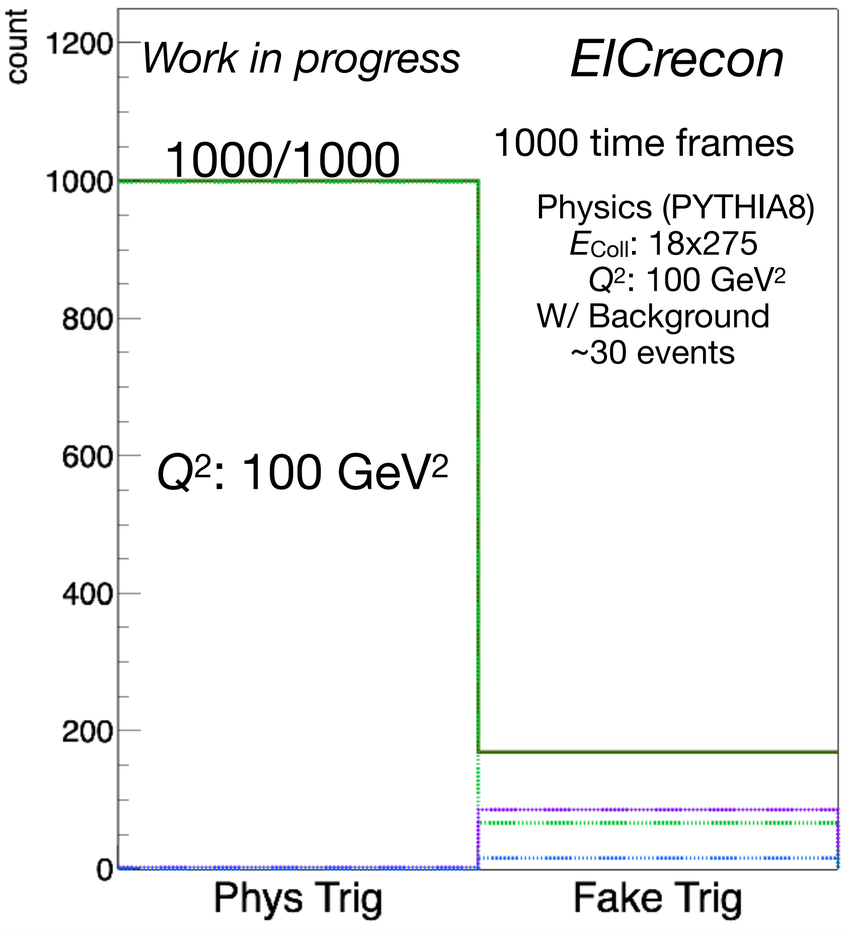
Development of streaming reconstruction and algorithms for event selection (EICrecon)

Pre-identification Efficiency

Time slice containing the production time of a physics
→ ✔ **physics trigger**
→ ✘ **fake triggers**







For DIS evens, the pre-identification efficiency achieved **over 99% for higher Q^2 > 1 GeV^2**

The background simulation is still old one, so it is not enough.
→ Need to test this with new background simulation.

Outlook

- Evaluate the pre-identification algorithm under **higher background occupancy**.
- Estimate the pre-identification efficiency for **various physics** processes.
- **Integrate all detectors**, including far-forward and far-backward systems.
- Apply **multi-threading**.
- Explore **GPU** acceleration.
- Develop a **machine learning** approach for event identification.
- Enhance **detector digitization** and **include detector noise**.

Contact: https://www.epic-eic.org/sc/sc_overview.html