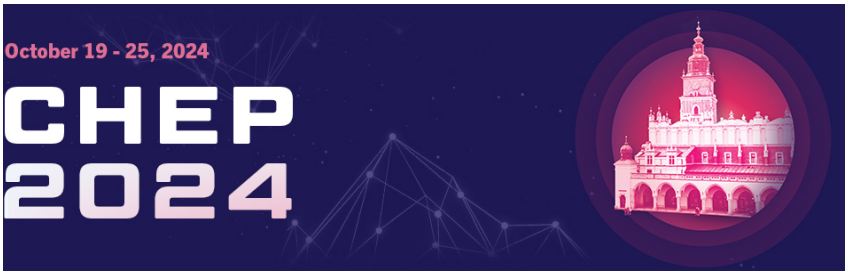

Contribution ID: **76** Type: **Talk**

Advancements in the ATLAS Fast Chain for HL-LHC: Towards Efficient MC Production

Monday 21 October 2024 16:15 (18 minutes)

The ATLAS Fast Chain represents a significant advancement in streamlining Monte Carlo (MC) production efficiency, specifically for the High-Luminosity Large Hadron Collider (HL-LHC). This project aims to simplify the production of Analysis Object Data (AODs) and potentially Derived Analysis Object Data (DAODs) from generated events with a single transform, facilitating rapid reproduction of the entire MC dataset multiple times per year. By eliminating intermediate formats and optimizing CPU utilization, the Fast Chain offers substantial savings in disk space while staying within the CPU budget by employing fast simulation methodologies instead of full MC campaigns. Central to the success of the Fast Chain is the seamless integration of fast simulation and reconstruction techniques. Leveraging AtlFast3 methodologies for efficient calorimeter shower simulation and employing Fast Track Simulation (FATRAS) for charged particles in the Inner Detector, the project aims at accelerated processing without compromising accuracy. Notably, muon simulations rely on Geant4 due to minimal CPU overhead. Pileup effects are incorporated through MC overlay, with potential future integration of data overlay. Reconstruction speed optimization focuses on Inner Detector track reconstruction. Strategies such as dedicated reconstruction configurations and track overlay from pre-mixed pileup datasets are being explored. In summary, the ATLAS Fast Chain project demonstrates a paradigm shift in MC production methodologies, offering a scalable and efficient solution tailored to the demands of the HL-LHC era. This abstract provides an overview of the project's objectives, methodologies, and ongoing developments, showcasing its potential to revolutionize MC production within the ATLAS experiment.

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Session Classification: Parallel (Track 5)

Track Classification: Track 5 - Simulation and analysis tools