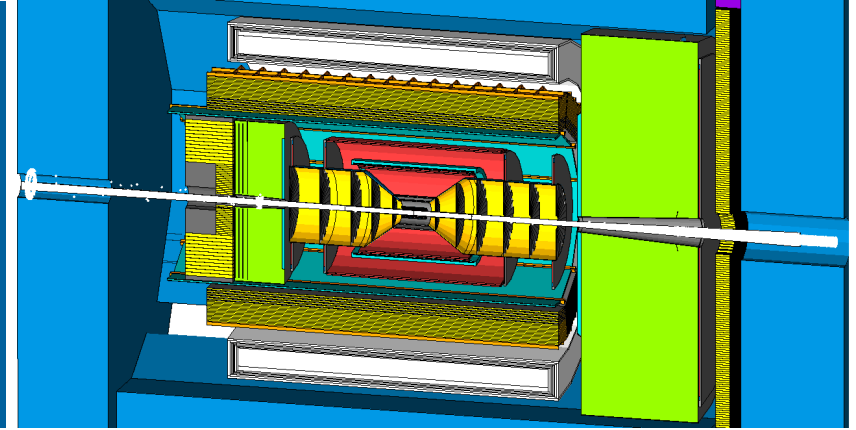


This work is supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics, under contract DE-AC02-06CH11357, and Argonne's LDRD program.

SoLID Simulation with ATHENA Software



CHAO PENG

For Argonne EIC LDRD software team

SoLID Collaboration Meeting

Automated Workflow

- Development initiated by Argonne EIC LDRD (S. Joosten, W. Armstrong, C. Peng, M. Zurek, K. Jihee, ...)

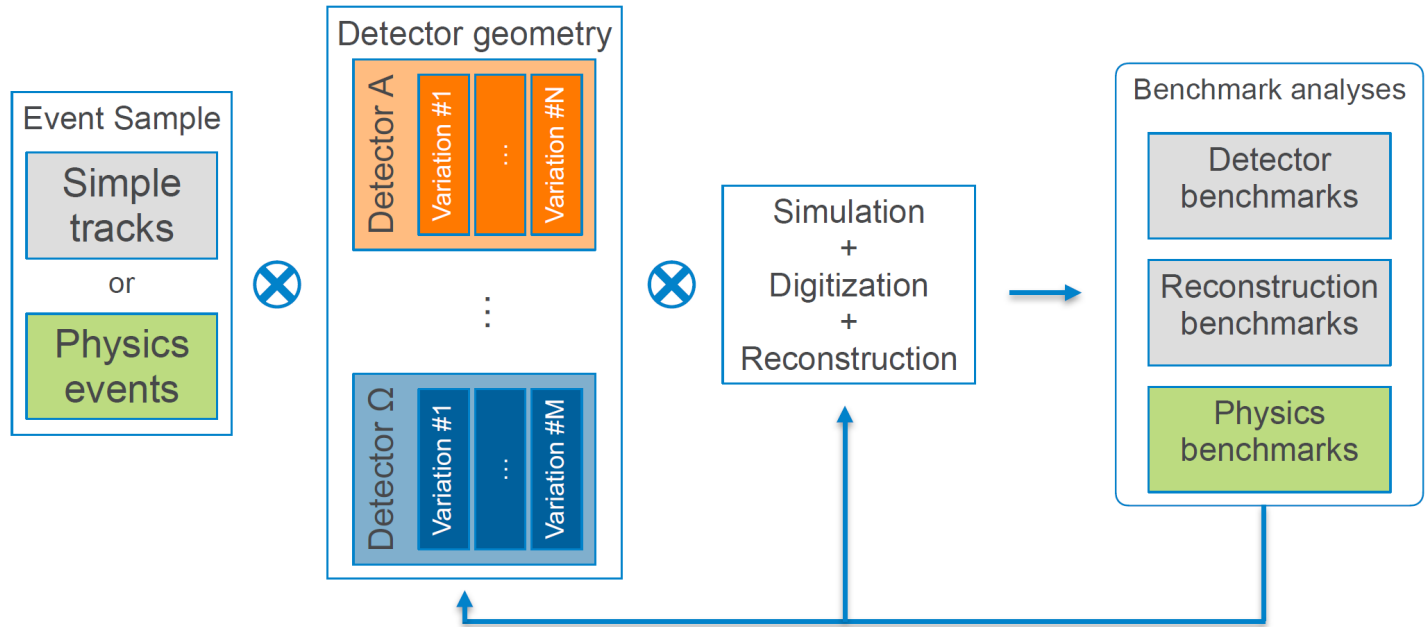


Figure courtesy: S. Joosten

Major Toolchain

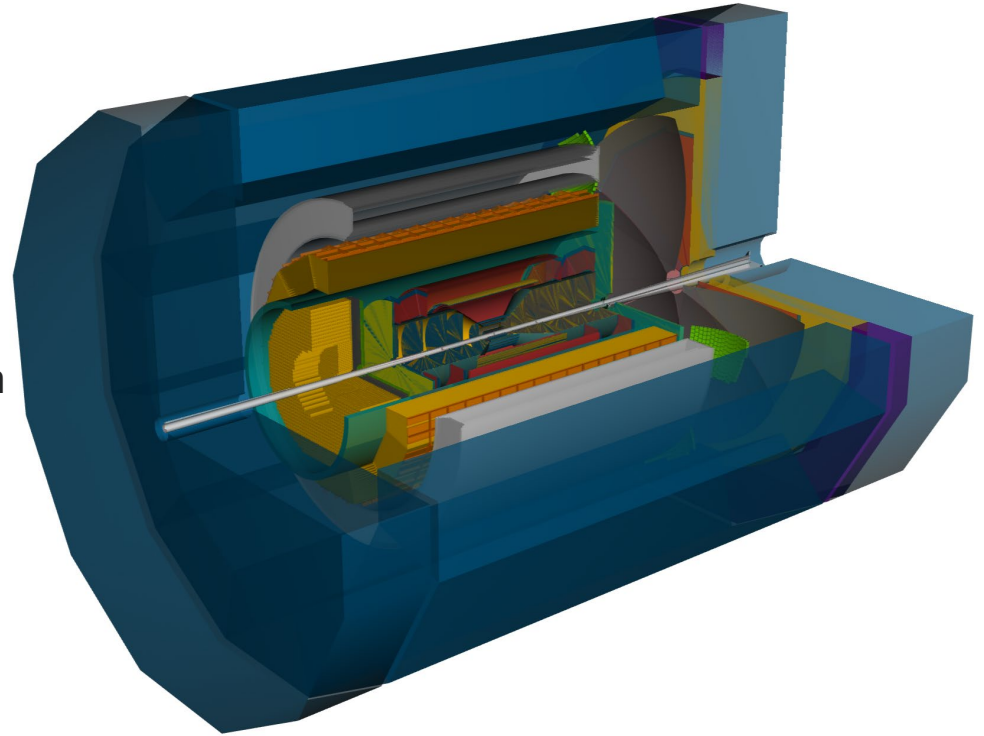
simulation/digitization/reconstruction

- **DD4hep**: a consistent detector description for simulation, reconstruction, and analysis
 - Geant4 geometry from plugin library
 - Configurable with xml file
- **ACTS**: Experiment-independent tracking toolkit for HEP in modern C++
 - Built-in support for DD4hep geometry description (via plugin)
- **GAUDI**: Generic event processing framework for concurrent execution
- **Podio**: Robust data model definition

- **Project Juggler**: Event processing framework for EIC, built upon GAUDI, ACTS, DD4hep and Podio. Used for digitization and reconstruction step.

ATHENA Software Framework

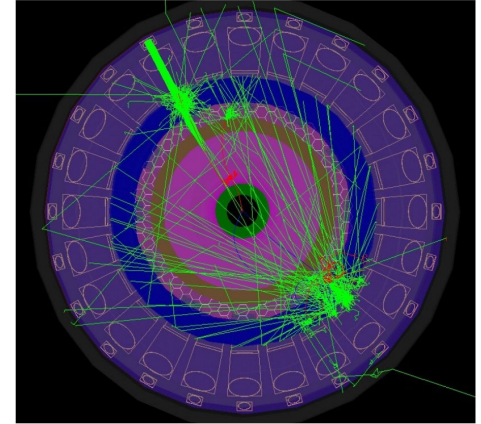
- Development initiated by Argonne EIC LDRD project (S. Joosten, W. Armstrong, C. Peng, M. Zurek, K. Jihee, ...)
- Further development and application in ATHENA collaboration
- Candidate software framework for EIC project detector I



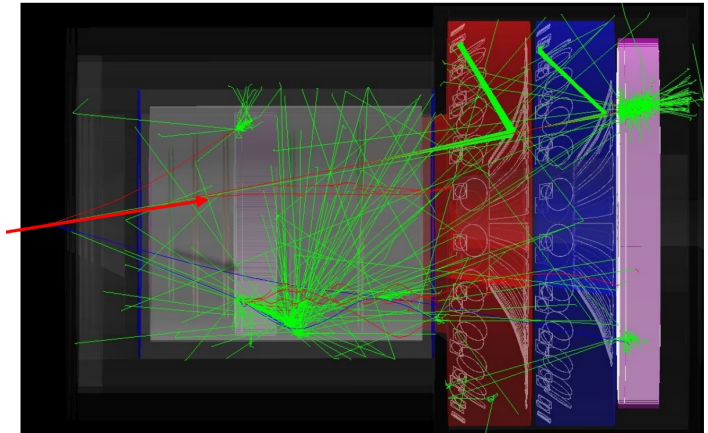
SoLID in DD4hep

- Major components
 - Developed previously by W. Armstrong and C. Peng
 - ECals, GEMs, Cherenkov detectors, magnets, ...
 - Parameters taken from pre-CDR, not fully detailed
- Reuse of ATHENA data model definition
- Reuse of the digitization/reconstruction algorithms
 - Calorimeter clustering
 - ACTS tracking
 - Optical photon detection and clustering

Front view



Side view



Possible Path to Move Forward

- EIC software choice expected to be in **early summer**
 - Fully transition by **October**
- Small amount of effort before EIC choice
 - Get familiar with candidate EIC software frameworks
 - Subdetector benchmarking with the current SoLID in DD4hep
- Start transition after the choice
 - Transition to new data model
 - Geometry implementation
 - Subdetector benchmarking and comparison with original simulations
 - Physics simulation