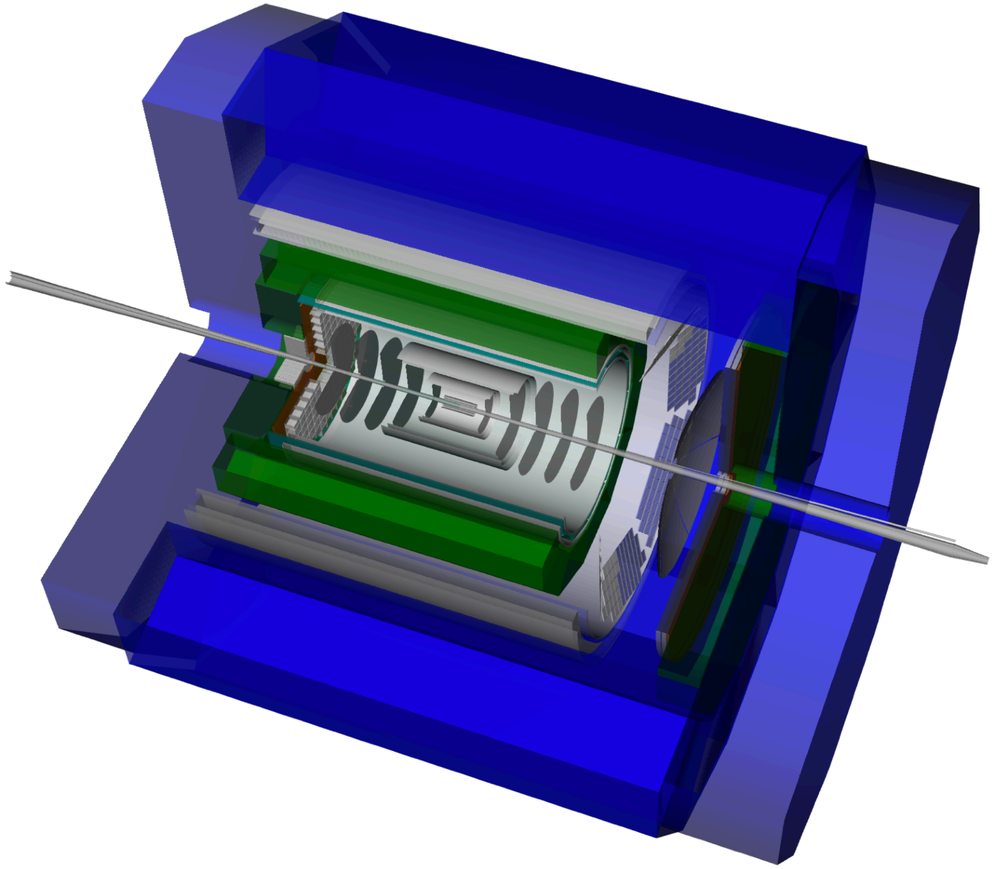
SIDIS Full Simulation

ATHENA Full Detector Simulation



- DD4Hep
- Athena software documentation: https://eic.phy.anl.gov/ip6/
- Configurations: https://wiki.bnl.gov/athena/index.php/Integration#Current_Configurations

Field [edit]

- Solenoidal

Barrel B-0.0 [edit]

- All-Silicon Tracker (no MPGD)
- HP-DIRC
- EMCAL
- HCAL (Fe/Sc)

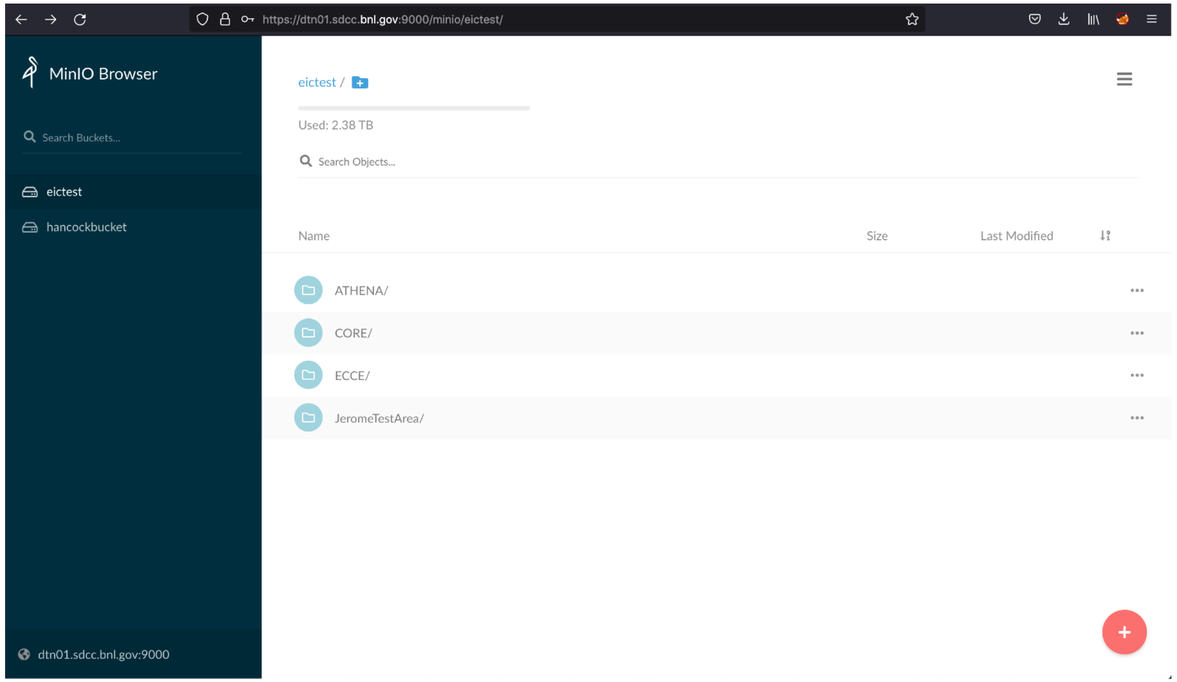
Forward P-0.0 [edit]

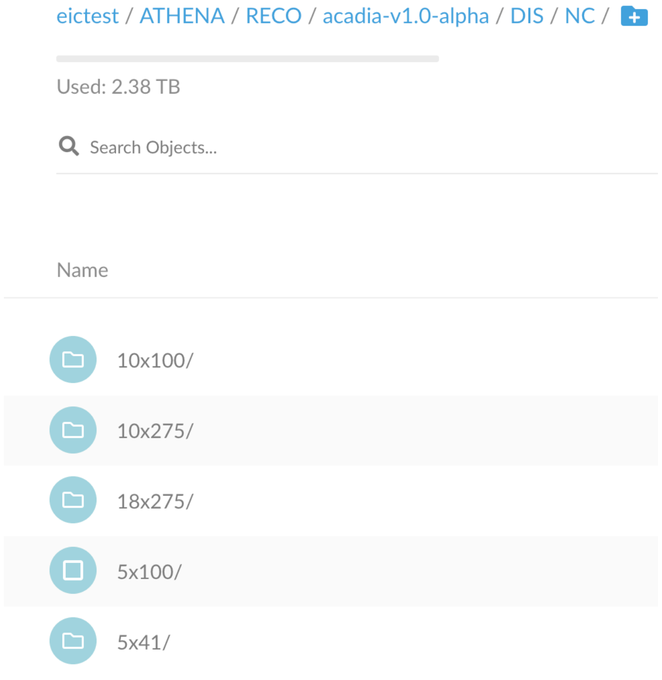
- Si-Disks
- GEM/MMG Layer
- dRICH
- EMCAL (W powder/ScFi)
- HCAL (Fe/Sc)
- B0
- Off-Momentum
- Roman Pots
- ZDC

Backward N-0.0 [edit]

- Si-Disks
- GEM/MMG Layer
- mRICH
- iEMCAL (PbWO4)
- oEMCAL (PbWO4*) – SciGlass possible if specs available?
- HCAL (Fe/Sc)
- Low-Q2 Tagger

Simulation output

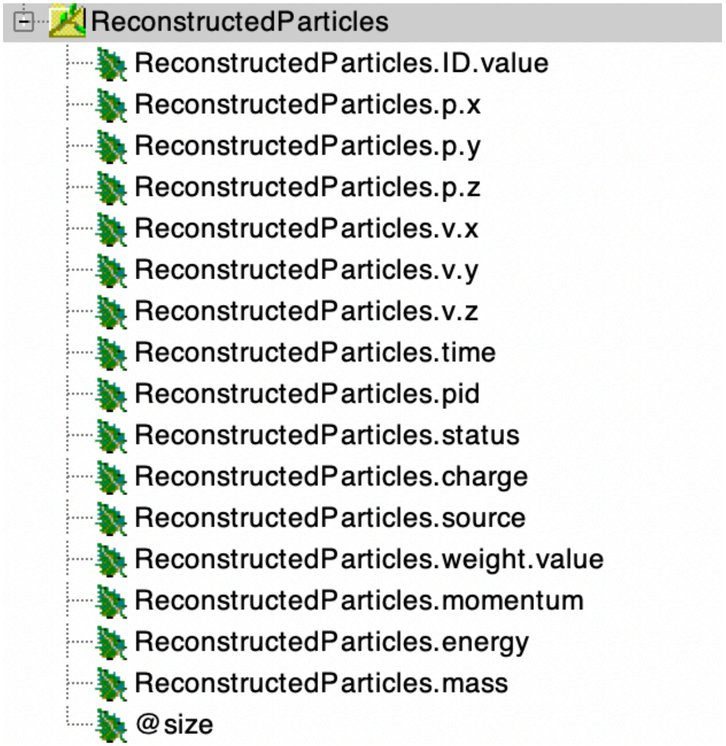




- S3 storage: https://eic.phy.anl.gov/ip6/howto/s3_file_storage.html
- (SI)DIS simulation: pythia8 + Detector simulation (DD4hep)
  - currently only tracking and calorimeter information available
  - For different energies and Q2 cuts (Q2 > 1, 10, 100, 1000)

AnalysisDD4hep

- Analysis class for the full simulation output, implemented within the common SIDIS software framework
- The idea is to use the existing framework and keep the output format the same (fast simulation, Delphes, DD4hep) for easy comparisons
- Similar to the existing Analysis class (developed for Delphes output), main difference is the event loop.
- Currently:
  - Truth information from mcparticles2 branches
  - Using calorimeter clusters to identify scattered electron (isolation cut, default R=1, energy threshold 10% of e beam energy)
  - Other final state hadrons: ReconstructedParticles (PID using truth information)



To be ready for general use:

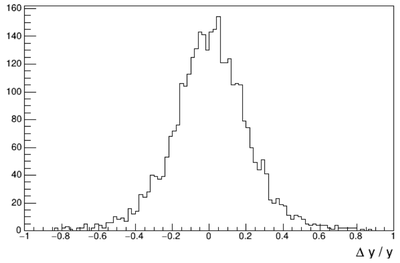
- Event loop works ok, but debugging the output process (filled the histogram ok if using the simple manual output, see test output in backup slide)
- *fullsim* branch being updated, to be merged into *main* after the output issue fixed
- To-dos:
  - Minor: PID smearing implementation, cleanup, ~~fix hard-coded parameter settings~~
  - Major: track-cluster matching (start with a simple projected position check?)
  - Major: low level distribution sanity checks

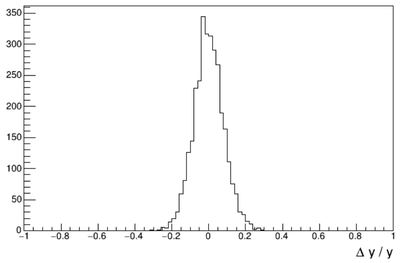
Backup

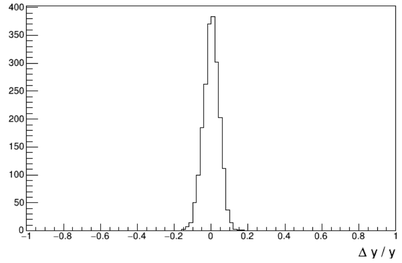
Electron method kinematic reconstruction

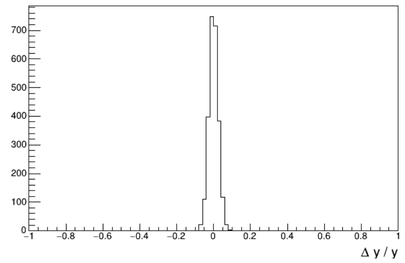
0.01 < y < 0.1 | 0.1 < y < 0.2 | 0.2 < y < 0.3 | 0.3 < y < 0.5 | 0.5 < y < 0.95

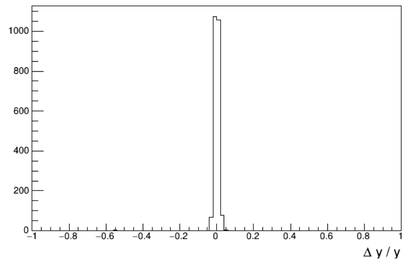
$\Delta y/y$











$\Delta x/x$