

ATHENA

Collaboration Meeting

Thursday 2021-07-15

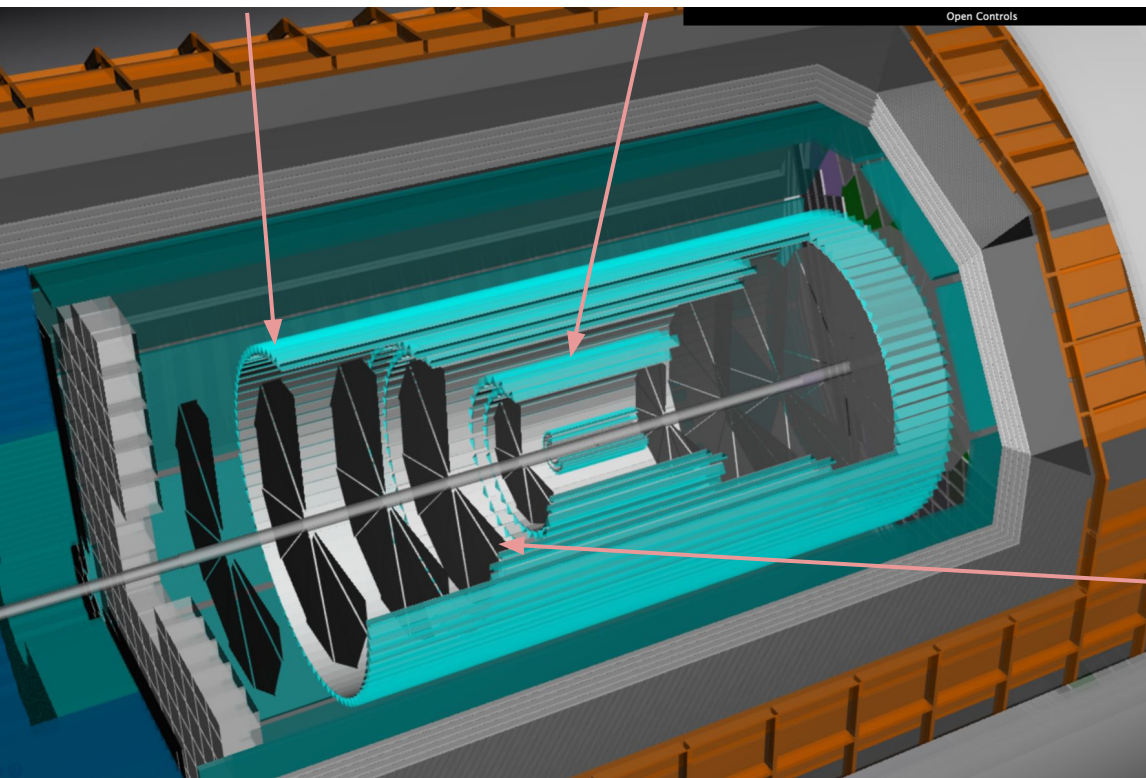
The Software and Computing WG Conveners:
Andrea Bressan (University of Trieste and INFN) ,
Dmitry Romanov (Jefferson lab) ,
Sylvester Joosten (Argonne National Laboratory) ,
Whitney Armstrong (Argonne National Laboratory) ,
Wouter Deconinck (The University of Manitoba)

Simulation status (and “baseline” geometry implementation)

Tracking WG

Outer LGAD layer not part of the “0-0-0” setup

Barrel staves as in ITS2 TDR



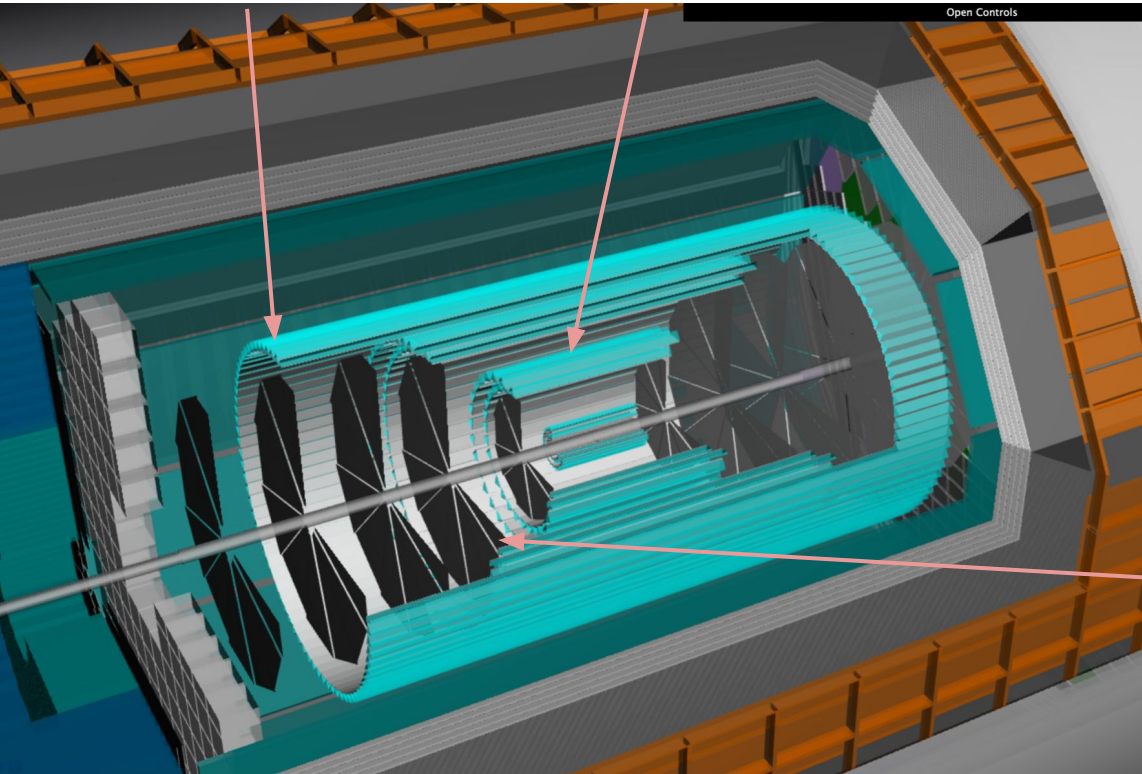
- 🚧 silicon tracker
 - 🚧 Material validation (Shujie Li)
 - 🚧 NEW Vertex layers to be changed to cylindrical geometry
 - ❌ Support cones
- ✅ barrel MPGD
 - 🚧 NEW convert to mMGAS (Francesco Bossu)
- ✅ GEM
- Reconstruction:
 - ✅ geometries fully functional with ACTS
 - 🚧 updating algorithms for ACTS v8.3 (tracking benchmarks ongoing)

Disks are wedges with sensitive layer and average material backing. Needs better constraints from WG

Tracking WG

Outer LGAD layer not part of the “0-0-0” setup

Barrel staves as in ITS2 TDR












Track reconstruction high-intensity sprint:

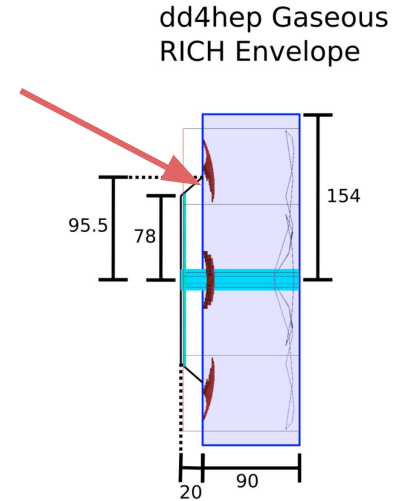
- **✗** Smearing as temporary work-around: not a solution for tracking, but see computing
- **✗** Revert to older ACTS version: not a solution and would break more than it fixes
- **✗** Implement genfit tracking from scratch: entirely new effort with unpredictability
- **✓ NEW** Local coordinate transformation verification (Chao)
- **✓ NEW** Cylinder layer overstep limit geometry issue (Chao)
- **⚠ NEW** Simplified tracking geometry with only cylinder barrels and equivalent material thickness, no staves (Wouter)

Disks are wedges with sensitive layer and average material backing. Needs better constraints from WG

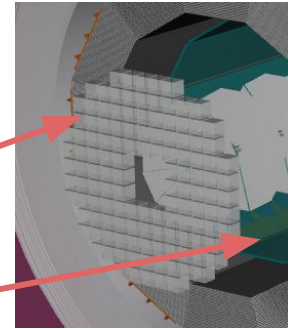
PID WG

- dRICH (Christopher Dilks, Chao Peng)
 -  functioning fuzzy-K ring-clustering
 -  geometry being adjusted by Christopher
 -  have field maps for both magnet setups
- mRICH (Murad Sarsour, Whitney Armstrong)
 -  received baseline realistic geometry (implemented in fun4All) from Murad
 -  implement realistic detector in DD4hep (90% complete)
- DIRC (Grzegorz Kalicy, Dmitry Romanov)
 -  Converted geometry (some polishing needed)
 -  Refactor the code for DD4hep
 -  Make initial validation benchmark
- TOF (Zhenyu Ye)
 -  LGAD implementation with realistic services


dRICH geometry
implementation
in DD4Hep



mRICH geometry
(changing quickly)



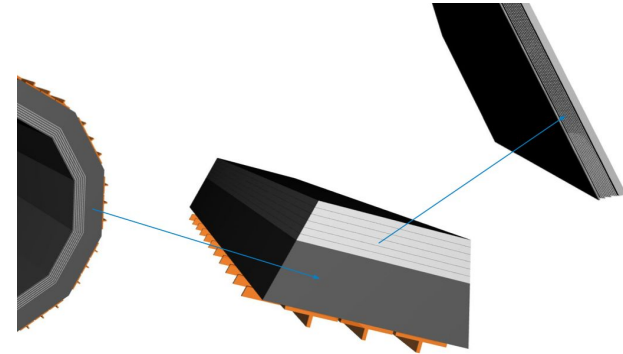
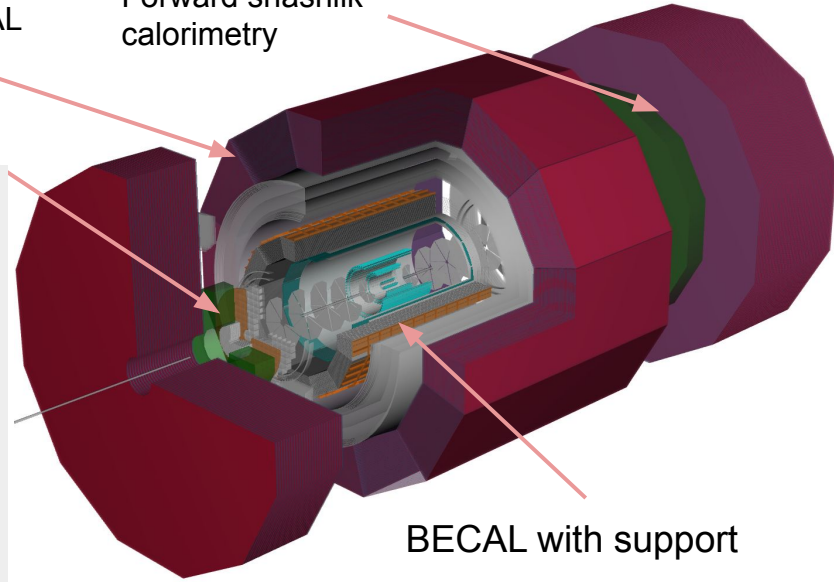
Calorimetry WG

- Ready to study impact of magnet on HCAL:
 - Realistic HCAL geometry
 - Solenoid and Helmholtz
 - HCAL clustering and energy calibration
- ECAL system well-developed:
 - Barrel ECAL:
 - Barrel SiW imaging calorimeter
 - Barrel hybrid SiW + WSciFi calorimeter
 - Electron-endcap ECAL:
 - Crystal calorimeter
 - Glass calorimeter
 - Hybrid electron endcap for baseline
 - **NEW** WSciFi calorimeter now ready
 - Reconstruction (2D, 2+1D and 3D clustering)
- Geometry:
 -  Finalize geometry for “baseline” setup with longer barrel/smaller negative endcap ECAL

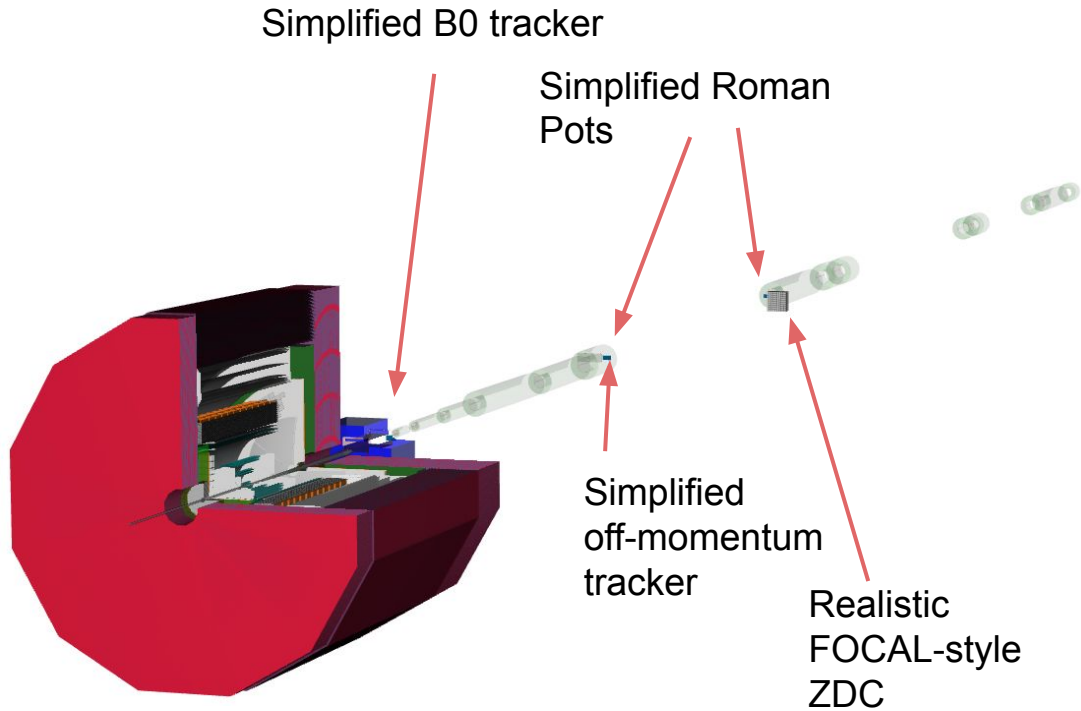
Hybrid electron
endcap calorimeter
with crystal







Realistic HCAL

Forward shashlik
calorimetry










Far-forward & Far-backward WGs



- FF being worked on by Alex Jentsch
 -   Magnets and detectors updated to latest design
 -  Flip IR orientation to right-handed coordinate system (“big flip” in 2 weeks)
 -  Will add realistic beam-pipe model
- FB
 -   IR implementation

FF delegate: Alex Jentsch
FB delegate: Jaroslav Adam
S&C WG contact: Whitney Armstrong

Physics WGs

-  Generic (unvalidated) afterburner
 -  Update afterburner based on the presentation by Brian Page
-  Collect physics analysis portfolio
-   First physics-ready production next week
 - gaps in baseline detector reconstruction filled-in with fastMC-style algorithms.
-   Tutorial example on data analysis

*Exclusive & Tagging delegate: TBD
S&C WG contact: Sylvester Joosten*

*Inclusive delegate: Barak Schmookler
S&C WG contact: N/A*

*Jets, HF & EW-BSM delegate: Brian Page
S&C WG contact: Wouter Deconinck*

*SIDIS delegate: Christopher Dilks
S&C WG contact: N/A*

DAQ WG

*DAQ delegates: Alexandre Camsonne &
Jeffery Landgraf
S&C WG contact: Andrea Bressan*

Computing Update

Sample full simulation data files for PWGs

- NC DIS 5x41 GeV at 25 mrad crossing angle, divergence ($Q^2 > 10 \text{ GeV}^2$, v2)
- Full simulation with current detector model, all bells and whistles:
- Full reconstruction
 - Tracking: smearing of truth particles by 1% (just to fill the structures)
 - Calorimetry: ECAL and HCAL clustering
 - PID: Initial RICH clustering
- Download sample file at
 - <https://dtn01.sdcc.bnl.gov:9000/minio/eictest/ATHENA/RECO/DIS/crossDivNrgCrab/>
- Or use directly from S3 with
 - TFile* file =
TFile::Open("s3https://dtn01.sdcc.bnl.gov:9000/eictest/ATHENA/RECO/DIS/crossDivNrgCrab/DIS_NC_Q2gt10_crossDivNrgCrab_25mRad_5x41_v2.0001.root", "AUTH=eicS3read:eicS3read")

More info: https://doc.athena-eic.org/en/latest/howto/s3_file_storage.html

Sample full simulation data files for PWGs

```
ReconstructedParticles      "ReconstructedParticles_"      8115
  ReconstructedParticles.pid      "pid[ReconstructedParticles_]"      114308
  ReconstructedParticles.energy    "energy[ReconstructedParticles_]"    114320
  ReconstructedParticles.p.x      "x[ReconstructedParticles_]"      114308
  ReconstructedParticles.p.y      "y[ReconstructedParticles_]"      114308
  ReconstructedParticles.p.z      "z[ReconstructedParticles_]"      114308
  ReconstructedParticles.charge    "charge[ReconstructedParticles_]"    114320
  ReconstructedParticles.mass      "mass[ReconstructedParticles_]"      114312
  ReconstructedParticles.clusters_begin  "clusters_begin[ReconstructedParticles_]"  59180
  ReconstructedParticles.clusters_end    "clusters_end[ReconstructedParticles_]"  59176
  ReconstructedParticles.tracks_begin    "tracks_begin[ReconstructedParticles_]"  59176
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  ReconstructedParticles.particles_begin  "particles_begin[ReconstructedParticles_]"  59182
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```

MCConv library (Beta)

CLI supported types (out of the box):

- LUND (vanilla pythia6)
- LUND GEMC (various generators especially from Clas12)
- Pythia6 RadCor (aka Pythia-EIC, Pythia6-BNL, Pythia6-HERMES)
- Beagle
- Eic-smear (aka Eic-tree)

Python API supported types

- Any type of text event+particles formats
- Eic-smear (aka Eic-tree)

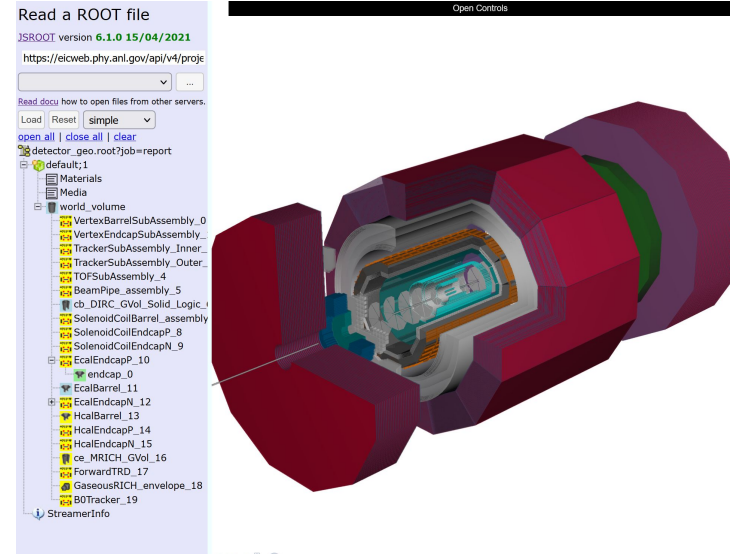
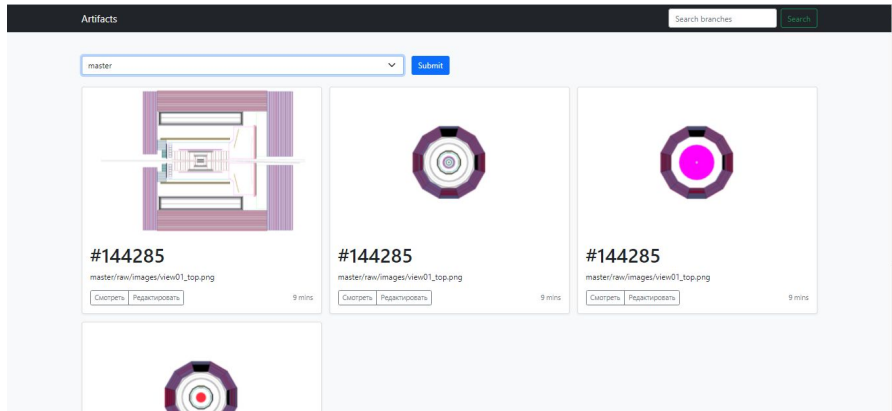
Flat vs topologic convert

There are two conversion methods: **flat**(implemented) and **topologic (on request)** convert.

```
pip install mcconv  
mcconv my_file.txt
```

Geometry and artifacts viewer

Arina Shulyak - a new student working on implementation of the viewer



Tutorial plans



Documentation portal:

doc.athena-eic.org

[Full simulation tutorials](#)

eic-ip6-software-l@lists.bnl.gov

#software-helpdesk on Slack

1. Full reconstruction tutorial will be posted as online-only tutorial, with **#software-helpdesk** for support. We can organize an in-person Q&A session later as needed
2. Analysis tutorial/example on data analysis (aimed and Physics WGs). Will be as website.

Software & Computing WG

Bi-weekly software meeting: Thursday 12:00pm EDT

Software & Computing Conveners:

Whitney Armstrong, Andrea Bressan(*), Wouter Deconinck, Sylvester Joosten, Dmitry Romanov
(*)- liaison to EICUG software group

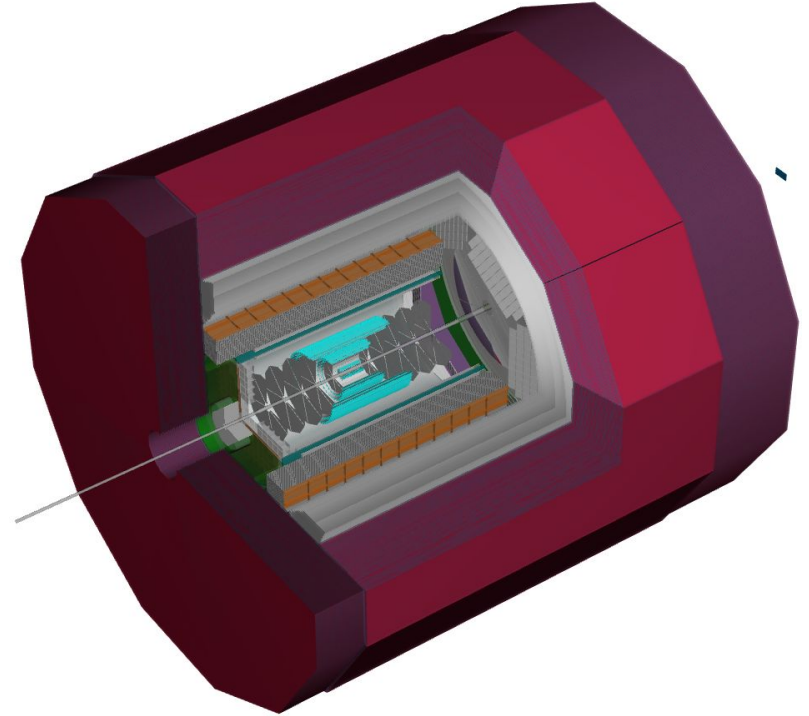
Day 0 WG support:

Kolja Kauder, Miguel Arratia, Stephen Sekula, Dmitry Romanov, Yulia Furletova, Andrea Bressan

Full simulation/reconstruction team

Whitney Armstrong, Miguel Arratia, Wouter Deconinck, Sylvester Joosten, Jihee Kim, Chao Peng, Tomas Polakovic, Dmitry Romanov, Marshall Scott, Zhenyu Ye, Ziyue Zhang, Maria Žurek

...and a rapidly growing amount ATHENA collaborators!



ATHENA central detector

Documentation portal:

doc.athena-eic.org

[Full simulation tutorials](#)

eic-ip6-software-l@lists.bnl.gov

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