UNIVERSITY OF BIRMINGHAM | SCHOOL OF PHYSICS AND ASTRONOMY

University of Birmingham simulations update

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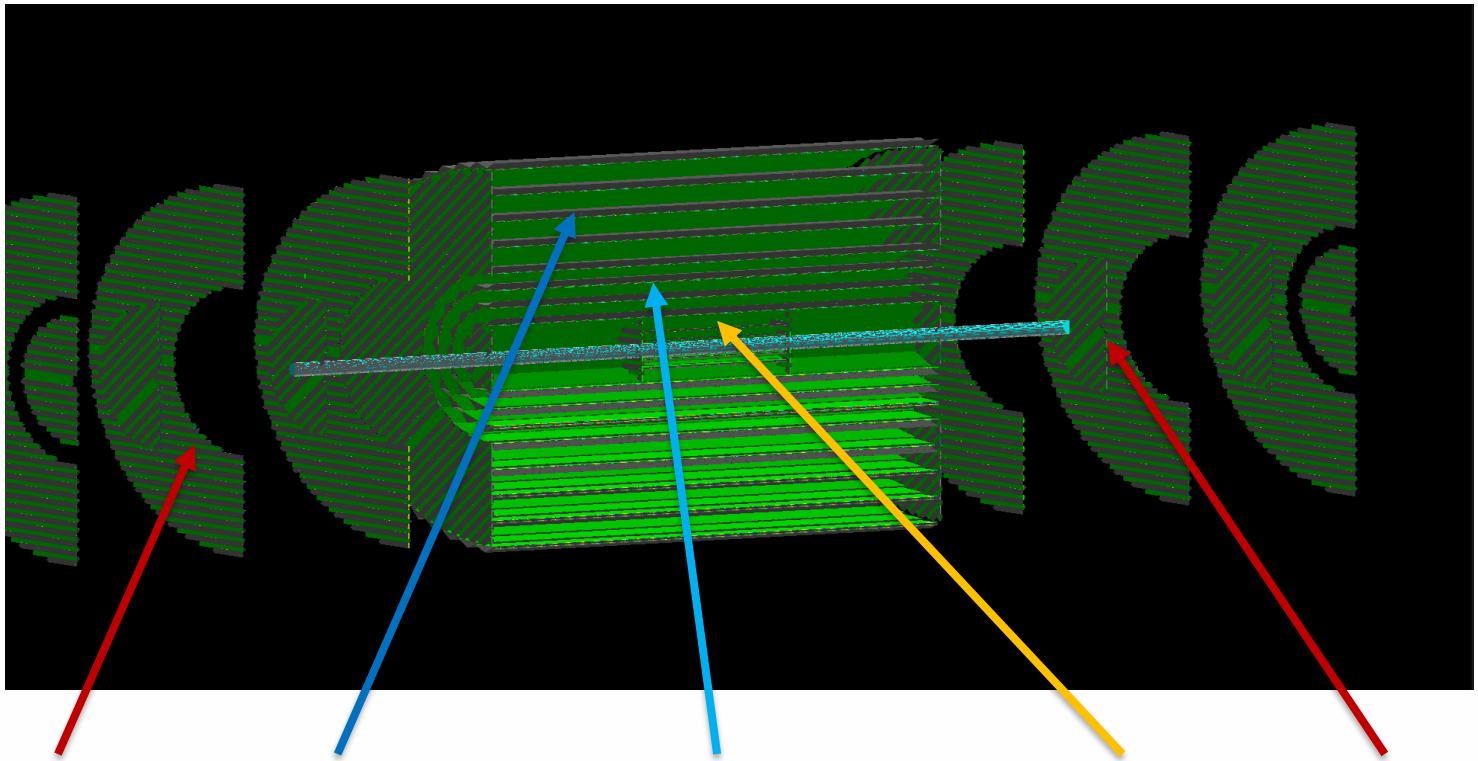
Fun4All – GDML import

- Thanks to Jin, Alexander, and Rey for helping with this
- EICROOT set up to export geometry pieces as GDML files
  - One file for each subdetector part, see next slide
- Possible to import the exact EICROOT geometries used into new framework, thus using EICROOT as a “scripting tool” for easily generating layouts

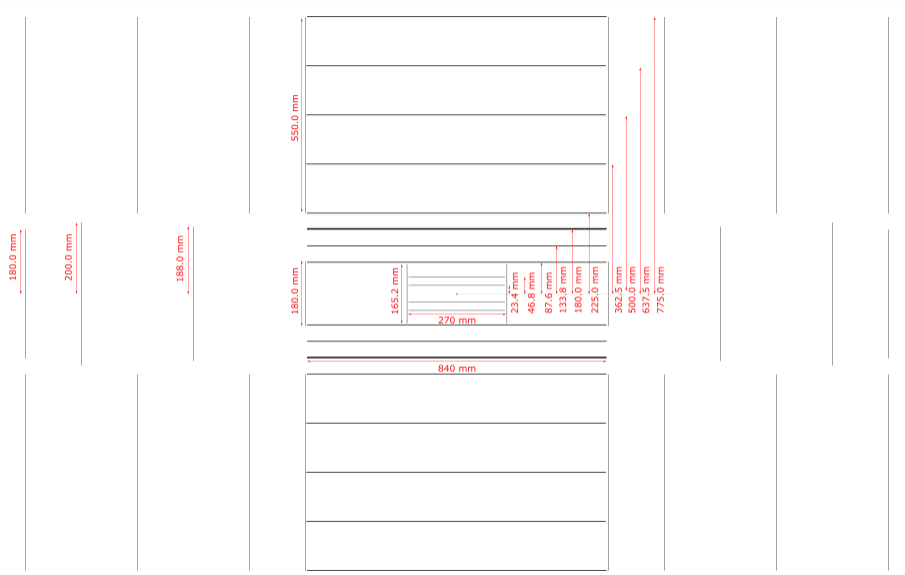
Fun4All – GDML import



- Bst.gdml Sitpc.gdml TimeStamping.gdml Vst.gdml Fst.gdml
- Beampipe 18 mm radius 0.8 mm thick beryllium, as in EICROOT. Study done in central region.
- Set up in a modular way, easy to turn on/off detectors

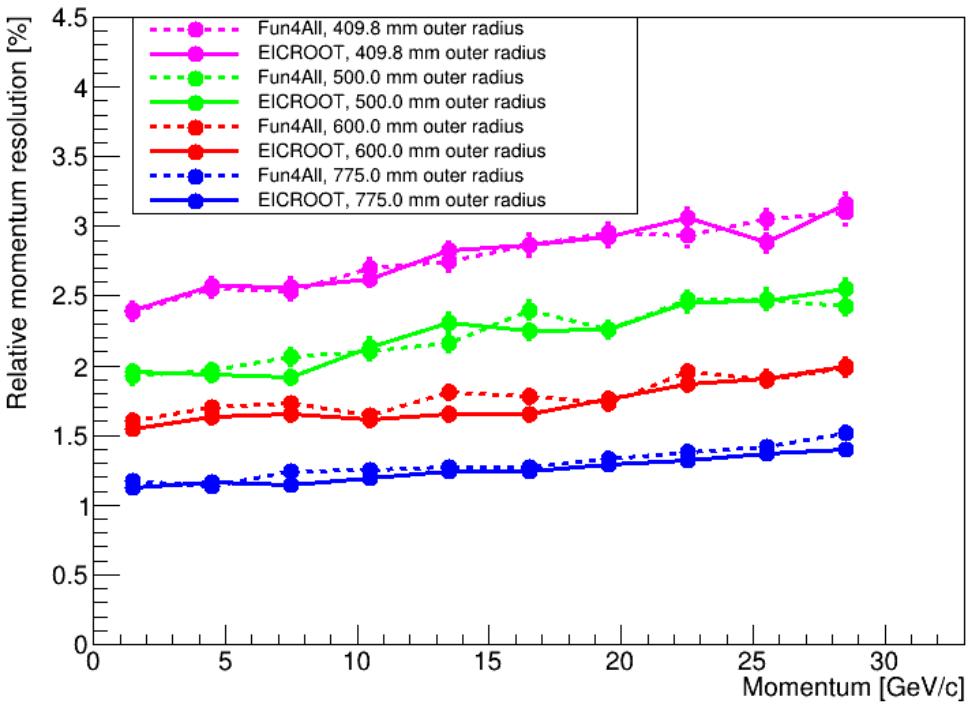
EICROOT benchmarking

- Using a previous study in EICROOT:
  - Export GDML geometry, and import into Fun4All
  - Generate particles in same parameter space
  - Run same analysis code on output
  - Compare results
- All-silicon, varying outer radius study used
  - Details: http://cern.ch/go/xKk6



EICROOT benchmarking – initial results

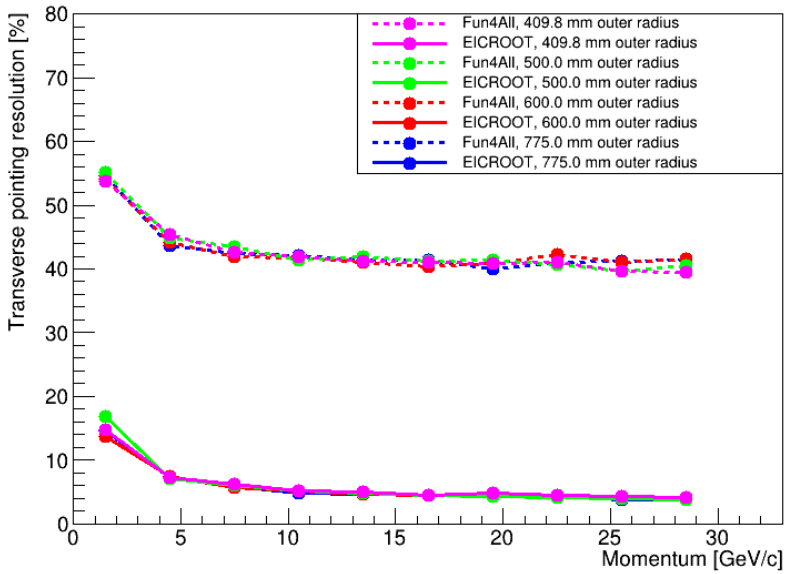
- Relative momentum resolution studied already
- Different outer radii used;
  - 409.8 mm
  - 500.0 mm
  - 600.0 mm
  - 775.0 mm
- Dashed lines: Fun4All. Filled lines: EICROOT
- **No significant difference** between results from the different frameworks



EICROOT benchmarking – pointing resolutions

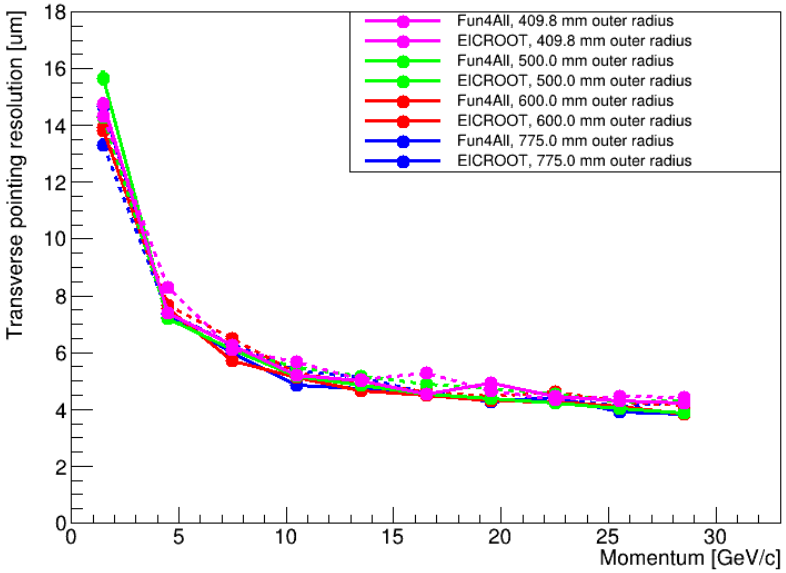
- Originally: big difference between frameworks.
- Constant offset.
- Jin helped straighten it out; difference in how distance of closest approach was extracted.
- New results: see next slide

Transverse pointing resolution

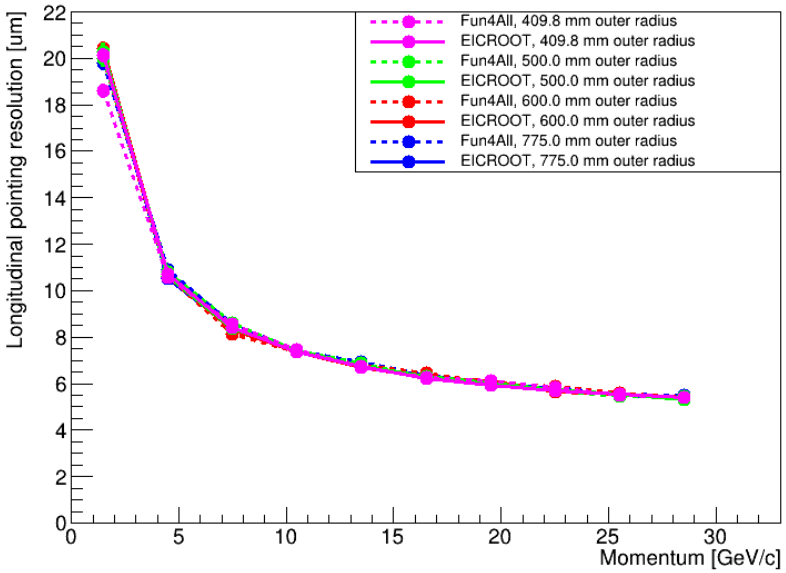


EICROOT benchmarking – pointing resolutions

Transverse pointing resolution



Longitudinal pointing resolution

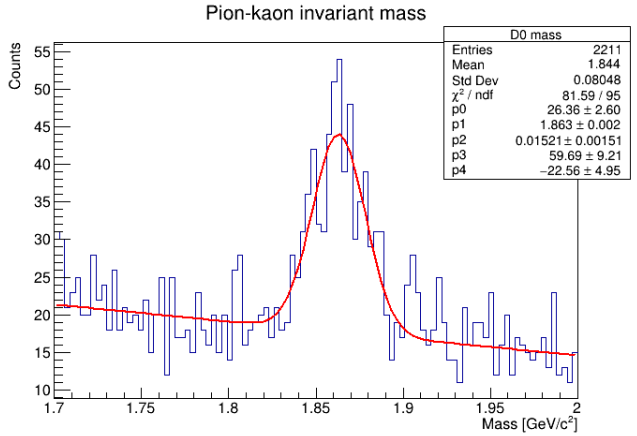


- Generally very good agreement between the frameworks.
- Gives confidence that both old and new studies are relevant.

Current/future plans

- Simulations of physics events using different detector configurations.
- Pythia events have been generated for e-p collisions and photon-gluon fusion to $c\bar{c}$ at energies suggested by Physics WG at Pavia meeting:
  - 5x41 GeV
  - 5x100 GeV
  - 10x100 GeV
  - 18x275 GeV
- A theoretical study of the impact of pixel size on D^0 vertex separation has been done using Pythia data.

- Events currently being propagated and reconstructed through different detector layouts using Fun4All.
- First study: D^0 invariant mass reconstruction, with different parameters.



- Near future: mass difference D* and D0.