Update on Global Reconstruction with GenFit

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X FOOT Collaboration Meeting

26/05/2021

Outline

Track Reconstruction with GenFit:

- Strategy
- Workflow
- Preliminary results
  - MC truth
  - Data-like approach

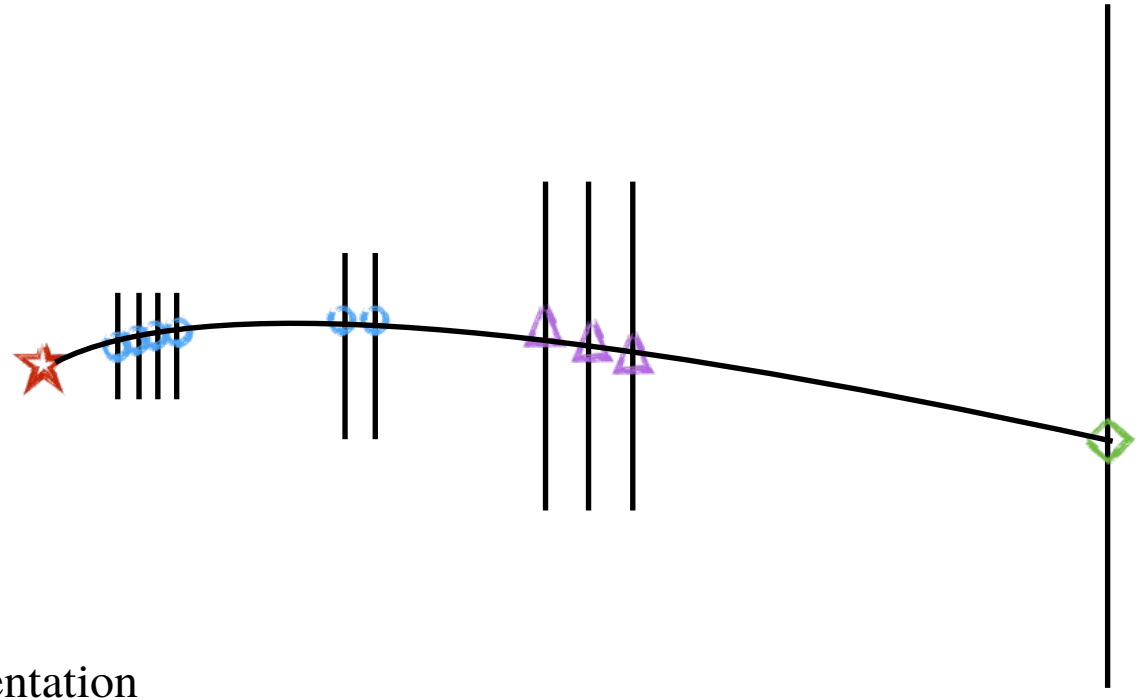
Track reconstruction strategy

- Use info from trackers (VT, IT, MSD) + TW
- Reconstructed hits → **clusters**
- Track finding → **categorize**

  1) MC truth

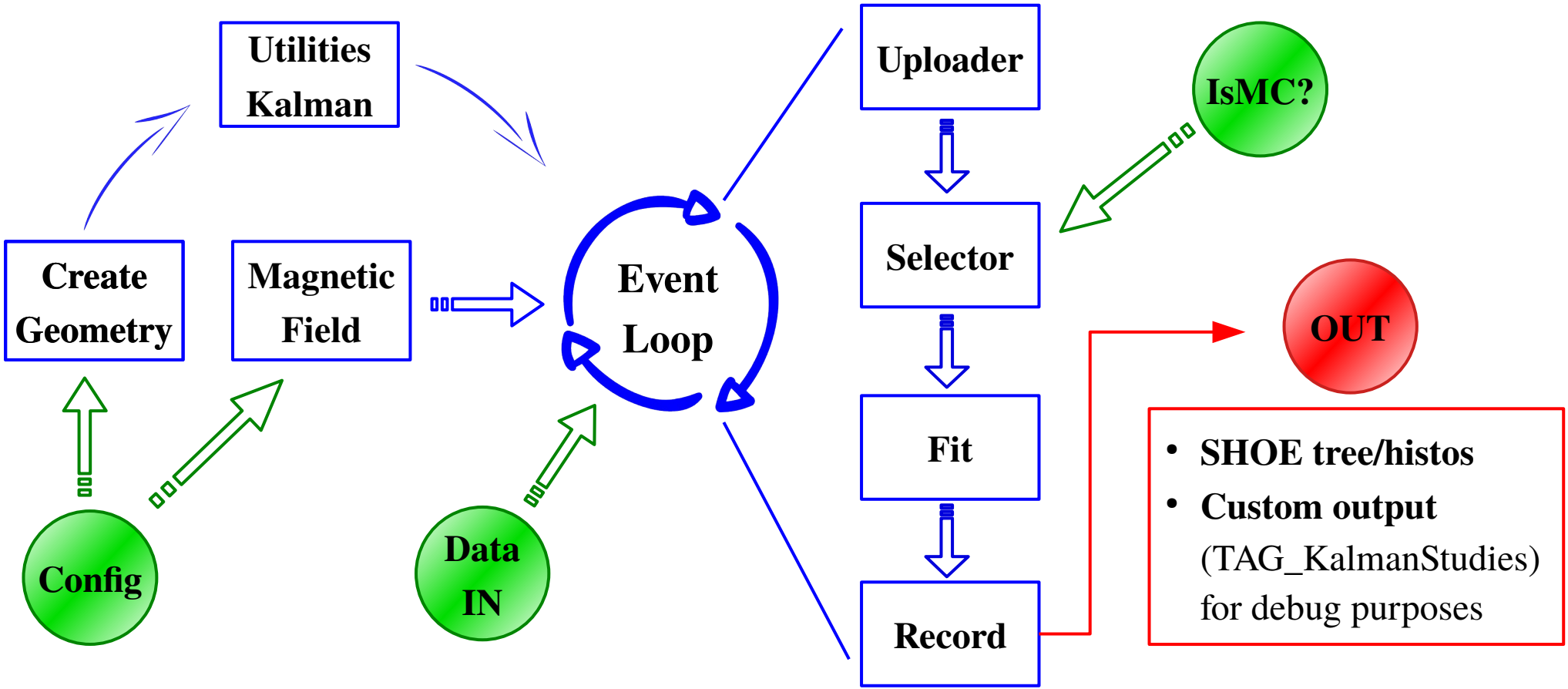
  2) "Data-like":

  - Start from VT tracklets
  - Projection to possible planes of IT
  - KF extrapolation to MSD
  - KF extrapolation to TW
  - Possible Z from TW → track representation



- Fit the track candidates and extract particle momentum

Workflow


Utilities
Kalman
Create
Geometry
Magnetic
Field
Config
Data
IN
Event
Loop
Uploader
IsMC?
Selector
Fit
Record
OUT
• SHOE tree/histos
• Custom output
(TAG_KalmanStudies)
for debug purposes

Preliminary tests

Both algorithms tested on MC simulations:

- 16O_C2H4_200_1.root (-exp 16O_200 -run 1)
- ~ 3×10^5 events processed
- On one thread:
  - ~ 20 evts/s w/ MC truth
  - ~ 14 evts/s w/ Data-like
- Efficiency and purity
- Momentum resolution

$$efficiency(Z) = \frac{N_{Z,conv}}{N_{Z,tot}}$$

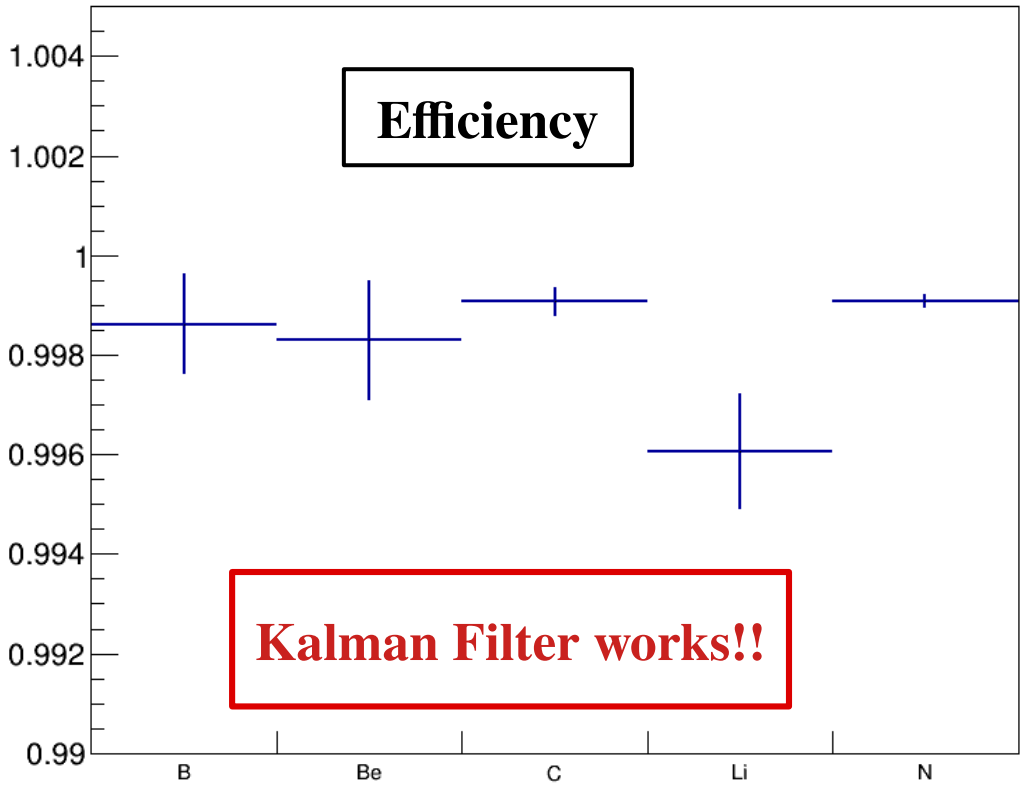
$$purity(Z) = \frac{N_{Z,good}}{N_{Z,conv}}$$

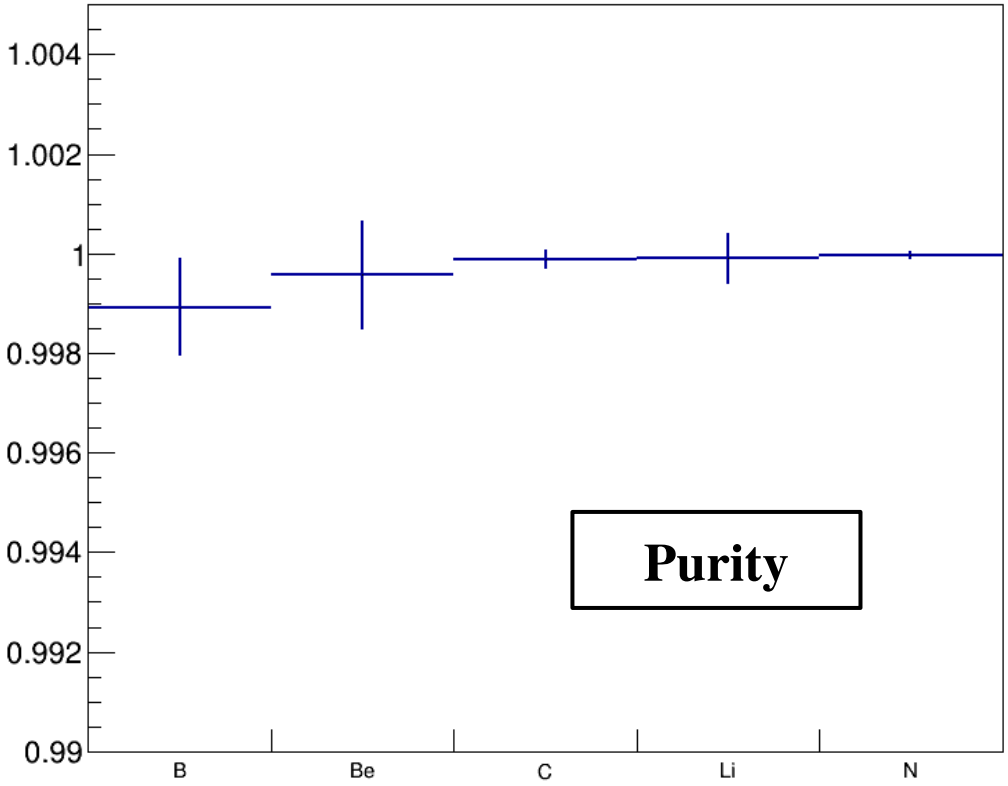
$N_{Z,tot}$ = number of total tracks with certain Z hypo

$N_{Z,conv}$ = converged tracks with some Z hypo

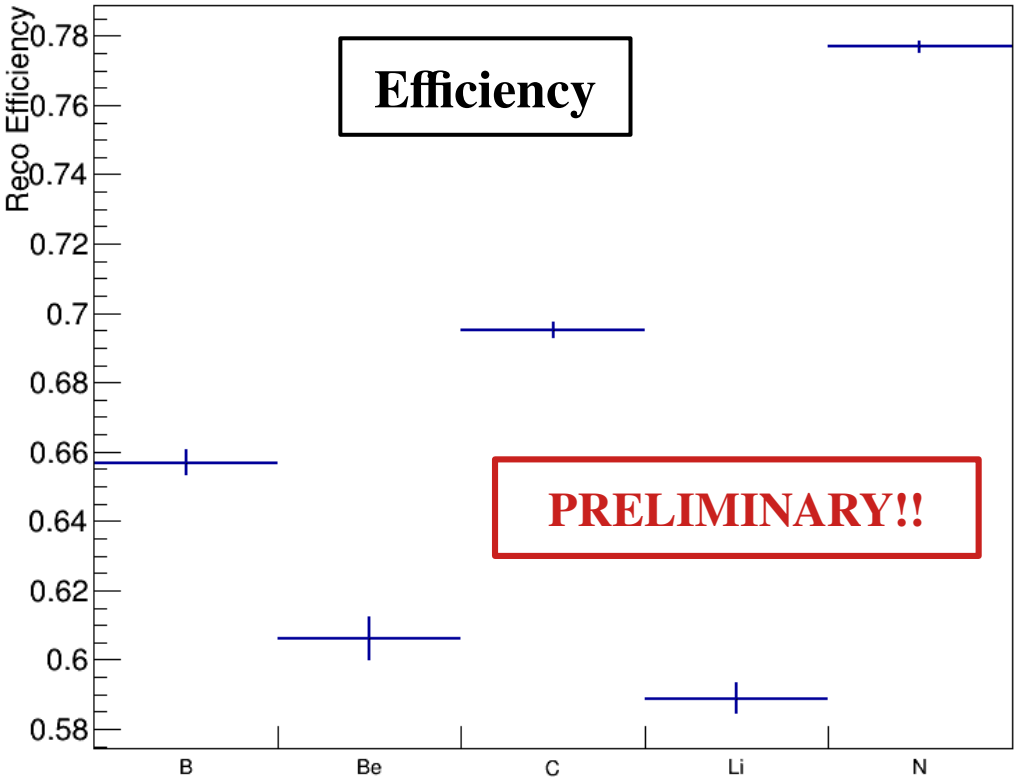
$N_{Z,good}$ = converged tracks with correct Z hypo (checked with MC truth)

Results: MC truth





First test preview: Data-like

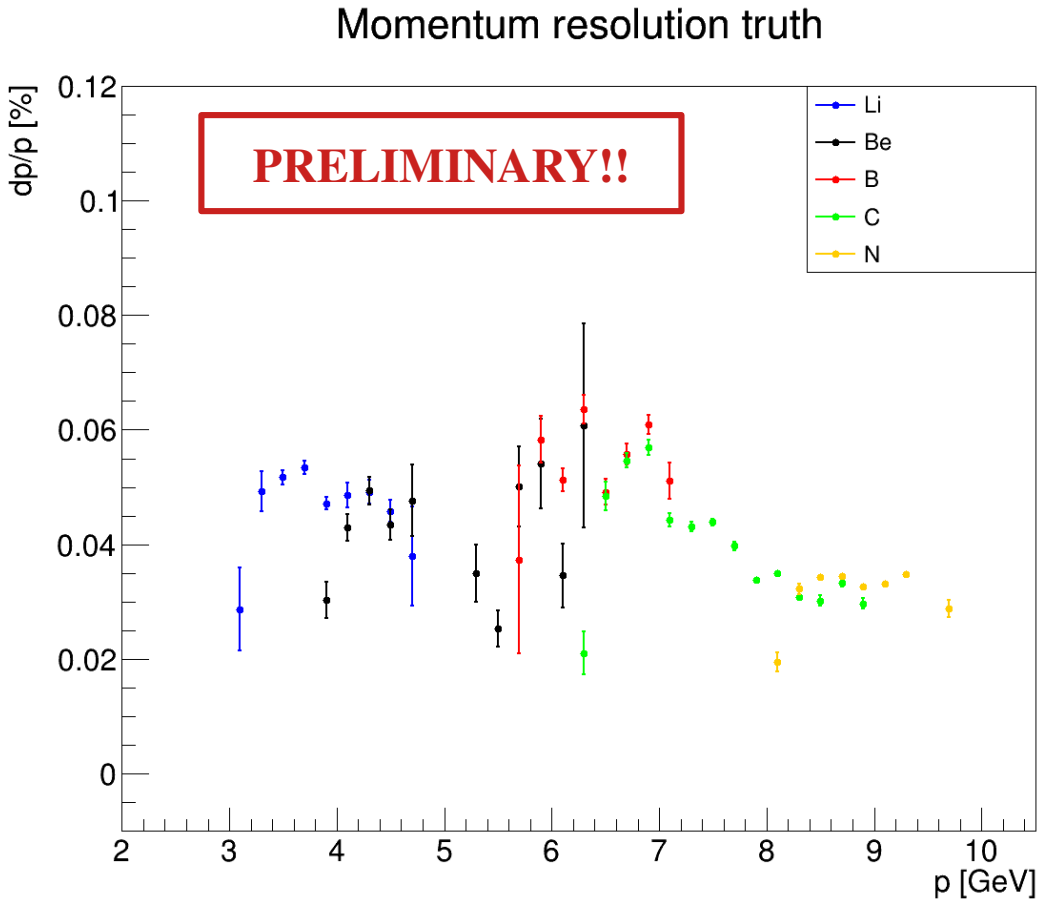


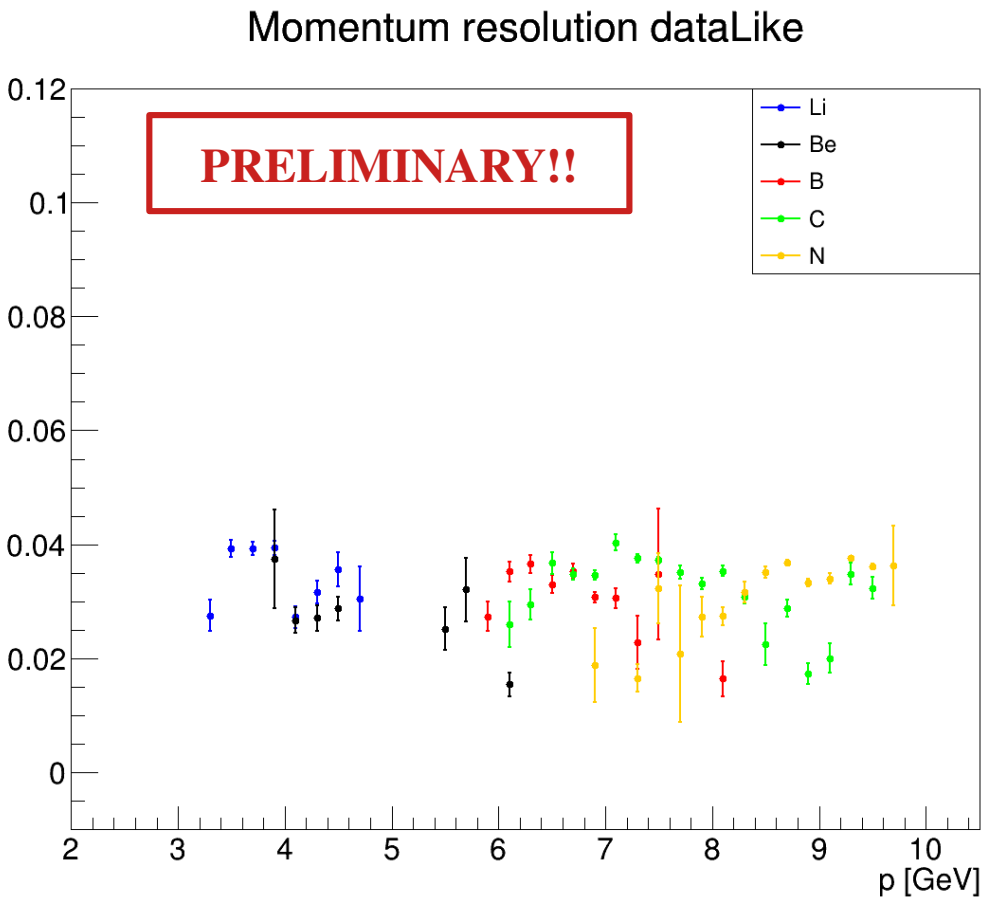
Efficiency is still lower than what we want!!

Causes:

- Some wrong Z hypo associated to track
- IT measurement matching?
- Bugs

Results: momentum resolution



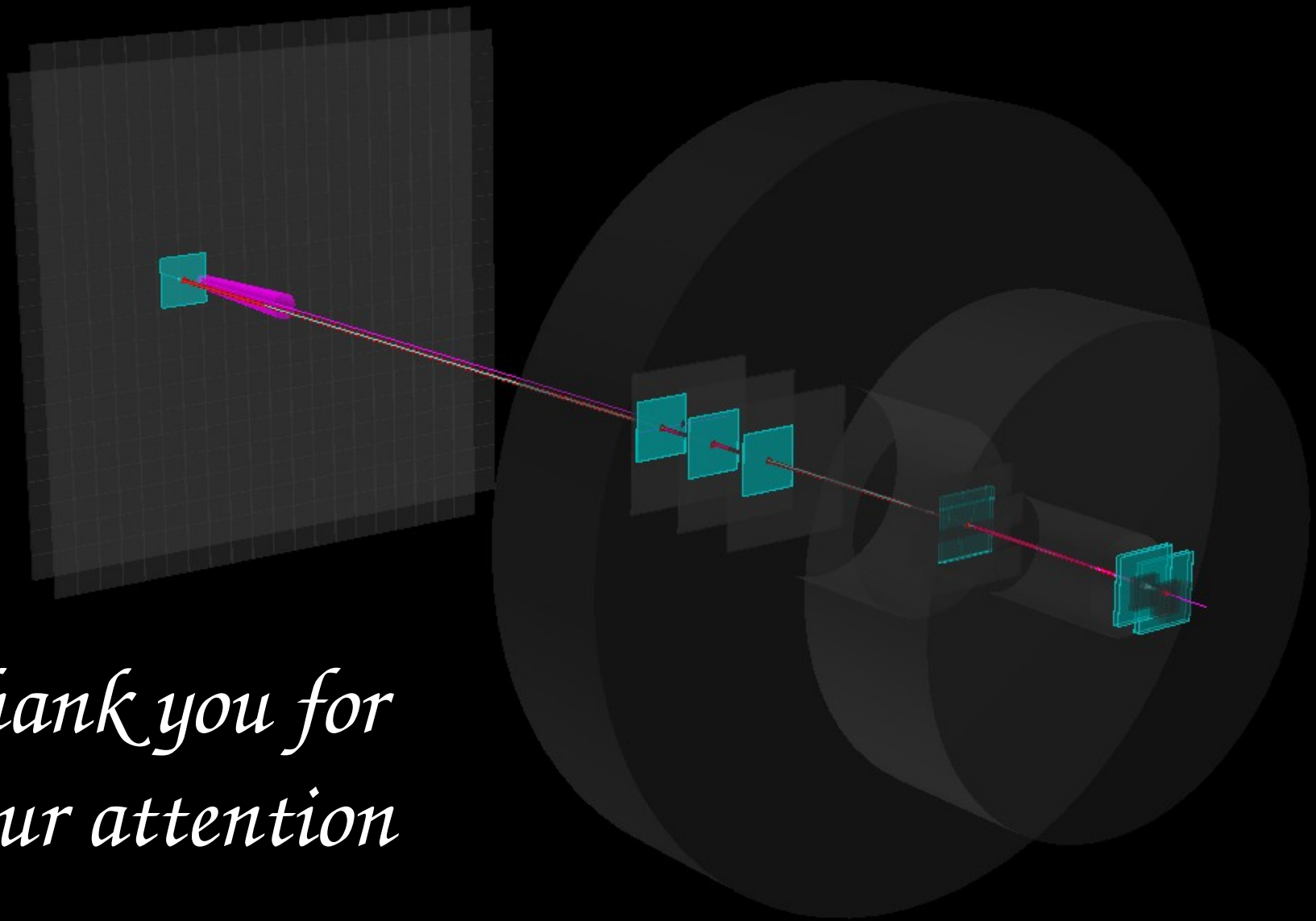


Conclusions and developments

- MC truth selection works fine (KF closure test)
- Data-like approach still to be debugged and optimized:
  - Purity and efficiency to be improved
  - Very promising results for momentum resolution

Next steps:

- Merge with master branch of SHOE
- Start revision and improvement of data-like selection
- More selection algorithms can now be easily added and tested for optimized performance working points



Thank you for your attention