ePIC tracking performance

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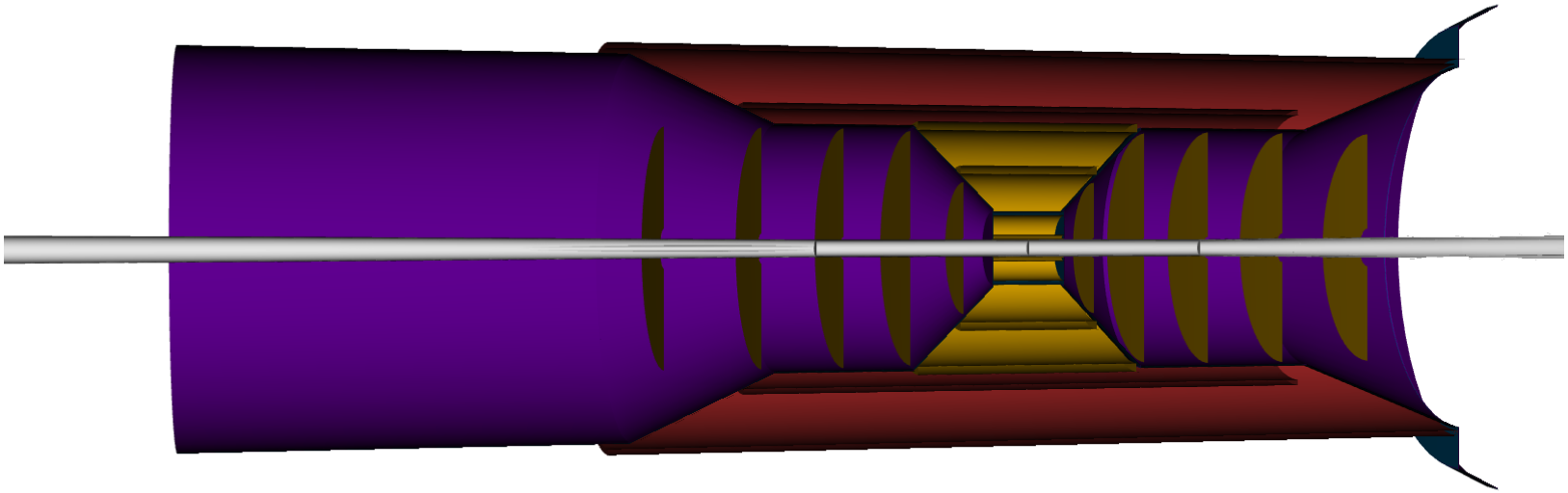
ePIC tracking WG meeting, 10/13/2022

ePIC tracking geometry

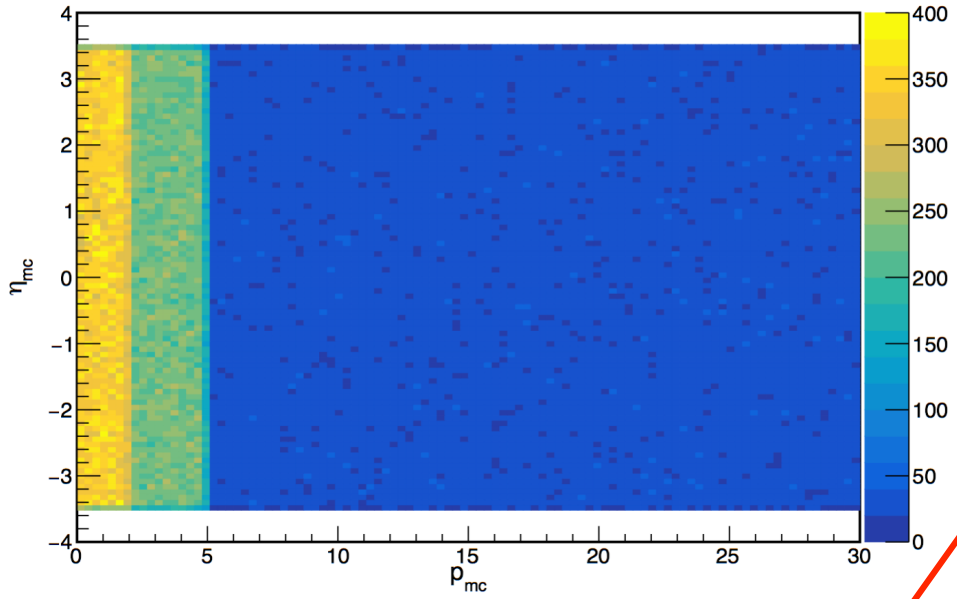
- Current setup: ePIC tracking geometry + 1.7T field
  - B field is scaled up from BarBar field map (1.5T to 1.7T)
  - ePIC geometry material map added by Shujie
- Performance test: check if the current geometry + track reconstruction algorithm gives resonable performance
  - Single pion events: uniform p, ϕ, η distribution (p range: 0 to 30GeV, η range: -3.5 to 3.5)
  - Track reconstruction with **truth seeding**

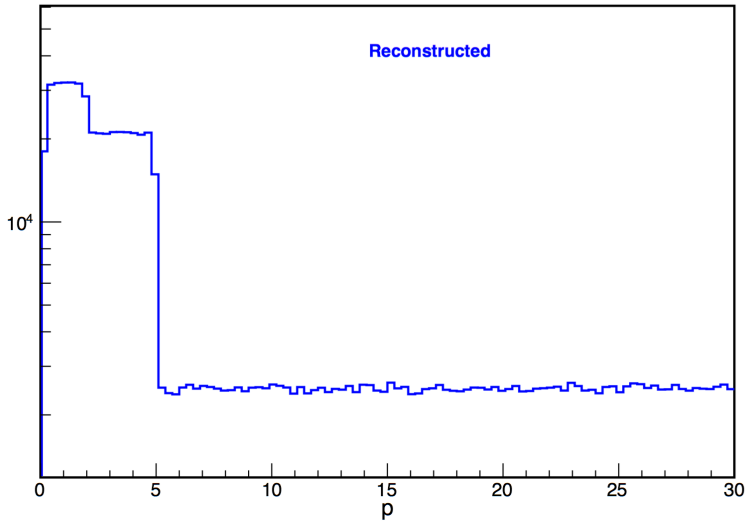


p vs η distribution

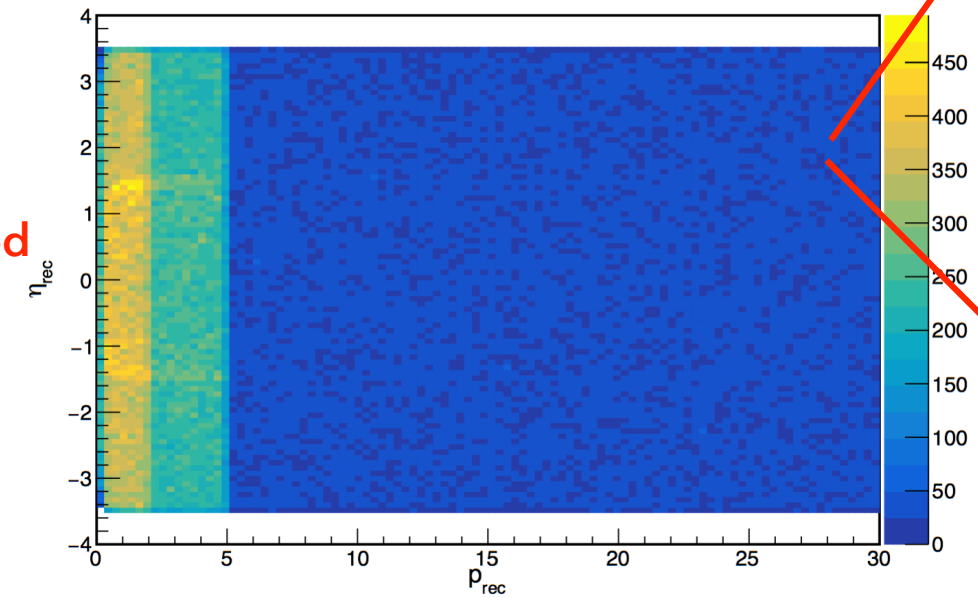
- Sanity check: if the generated particles covers the expected phase space and reconstructed particles covers similar phase space

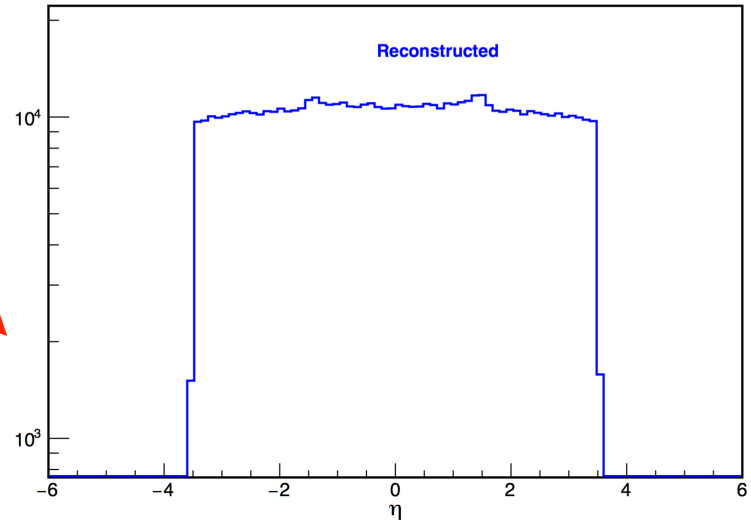
Generated





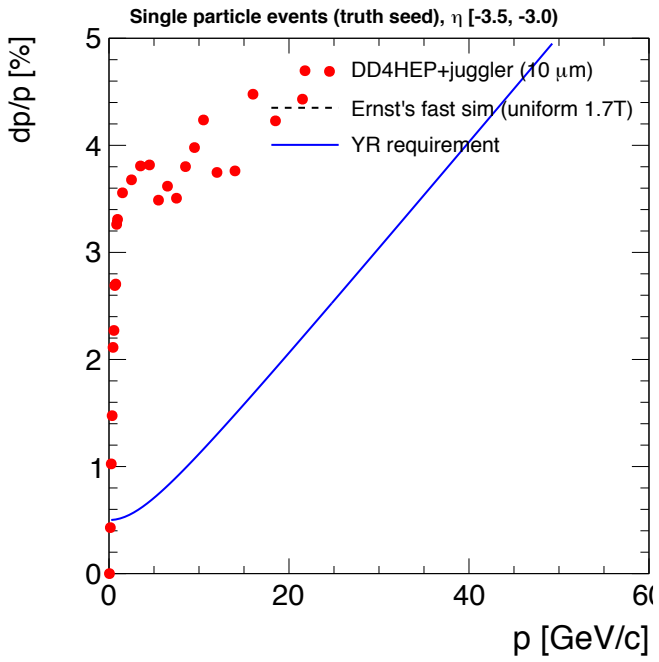
Reconstructed

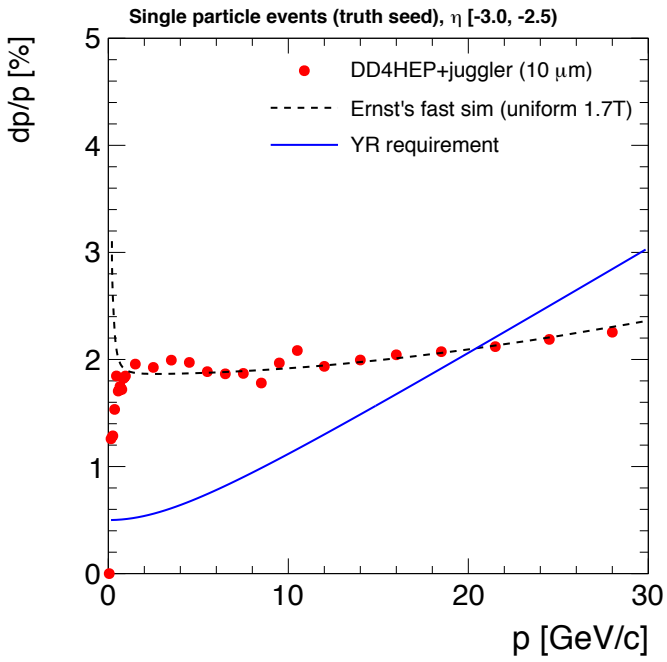


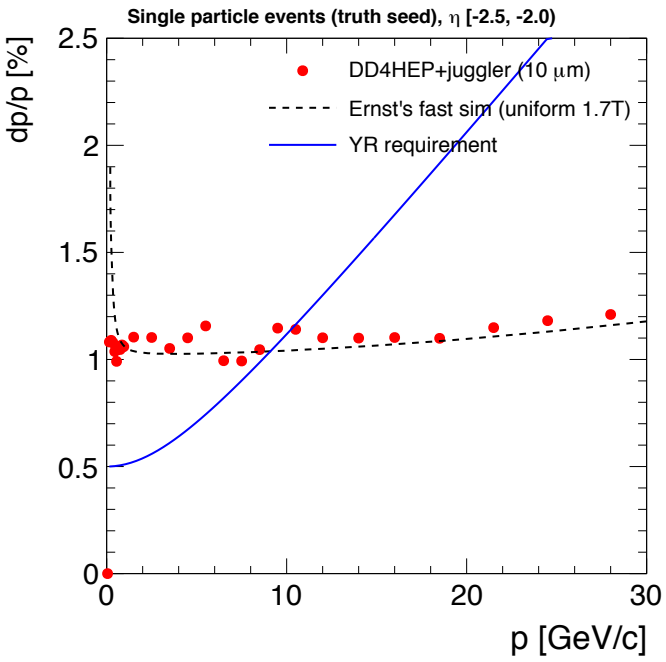


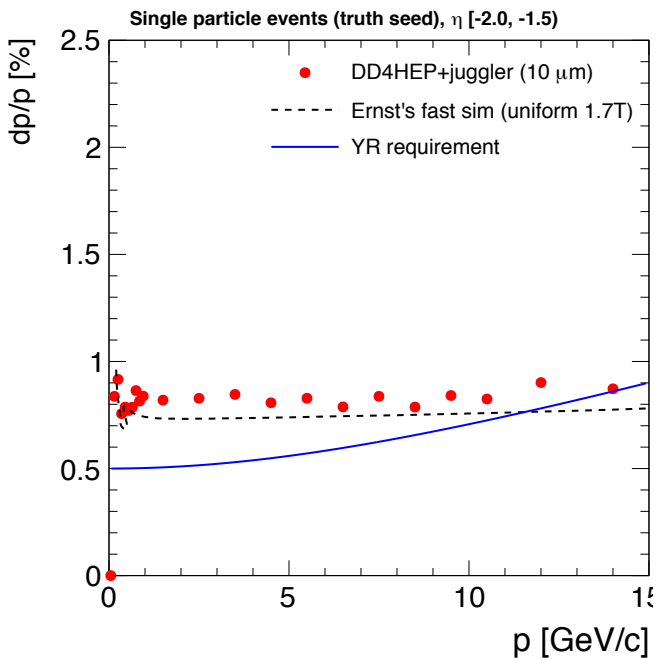
YR requirement: https://docs.google.com/spreadsheets/d/1ynU7Cu7NlwRvMtbtFdlp_B5xXkw8yBAtWJbenMf-P3U/edit#gid=368031287

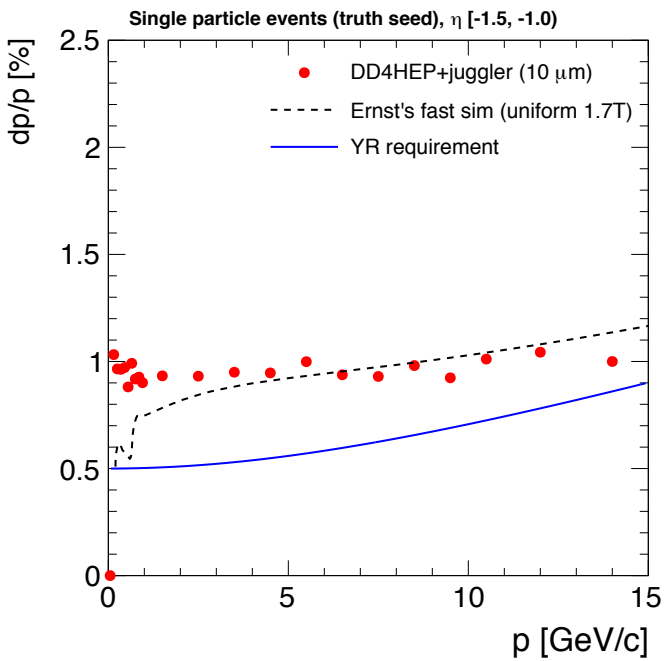
Momentum resolution (DD4HEP vs fast simulation)

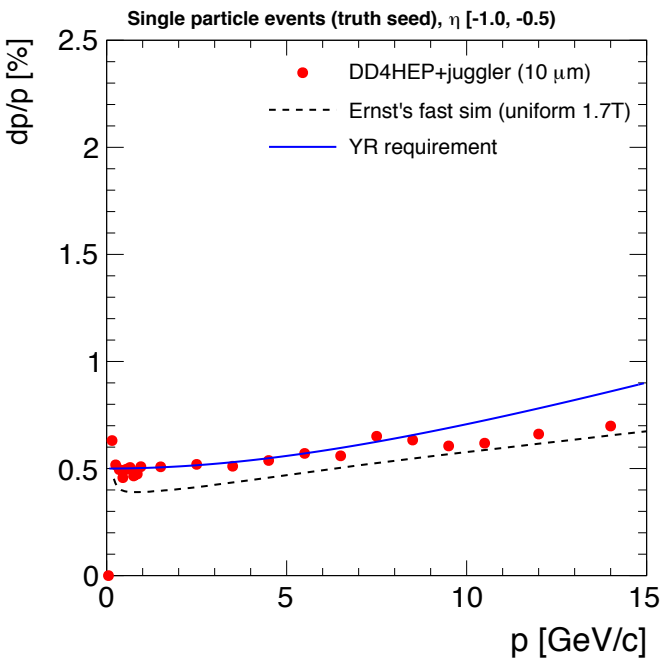












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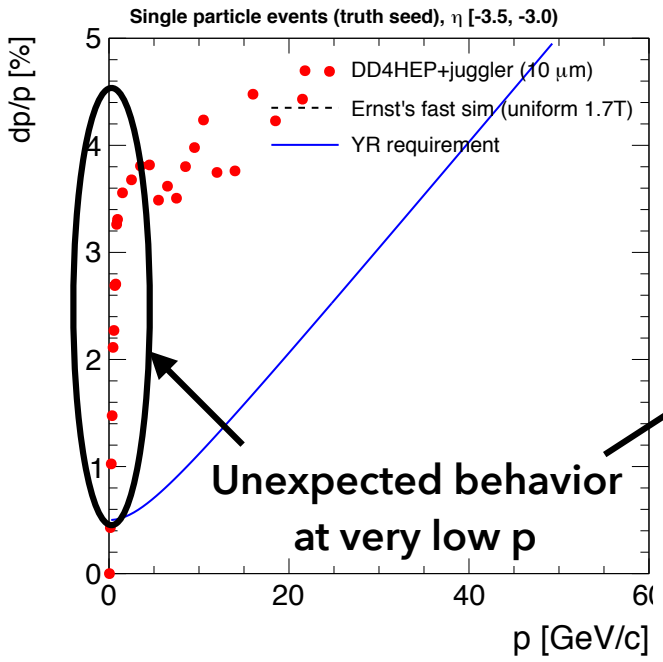

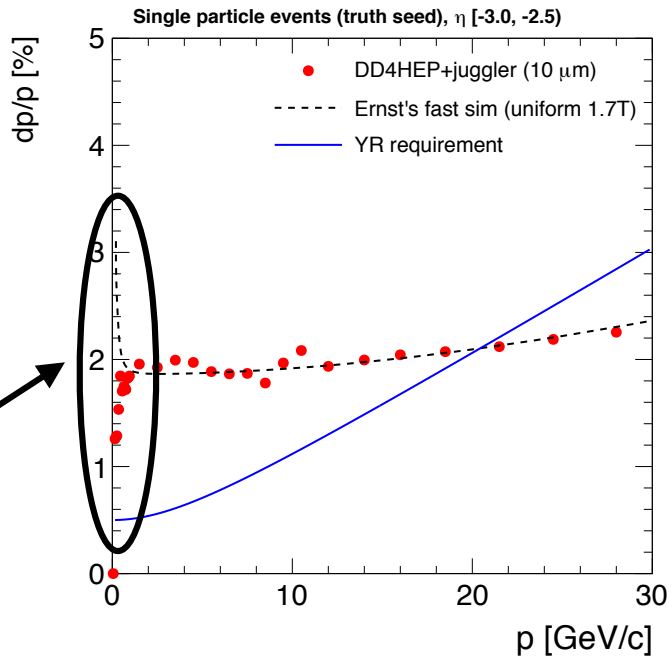

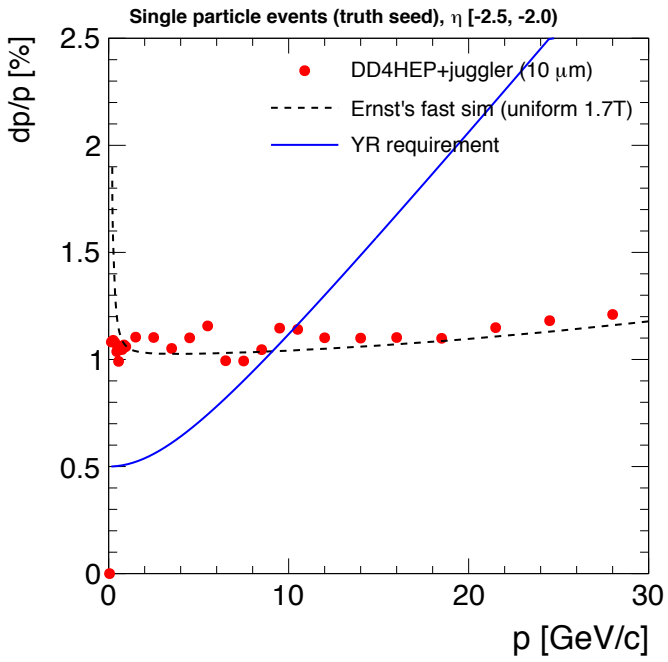

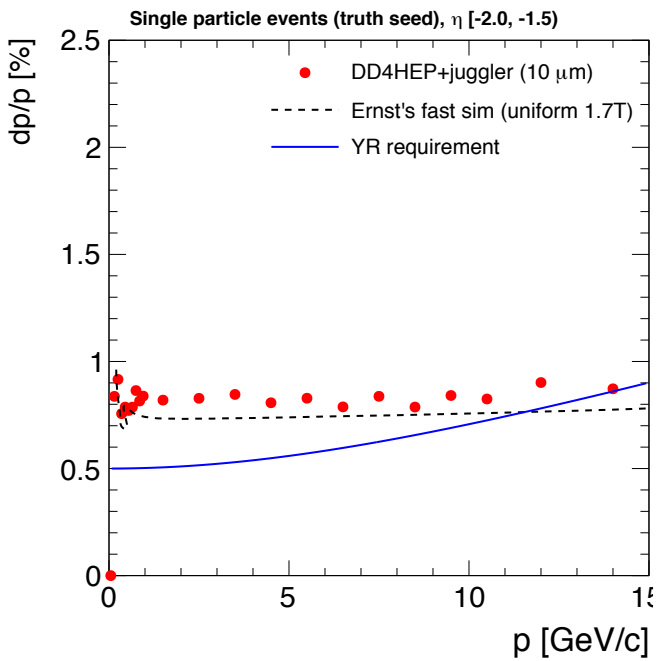

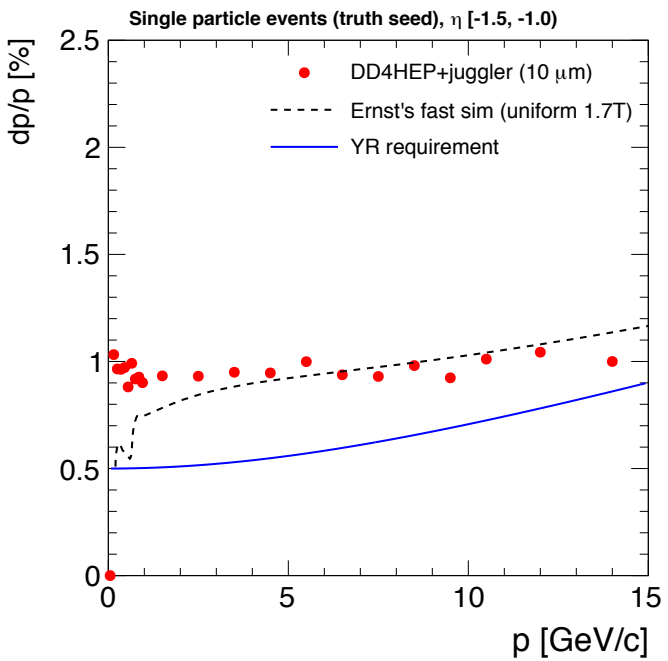

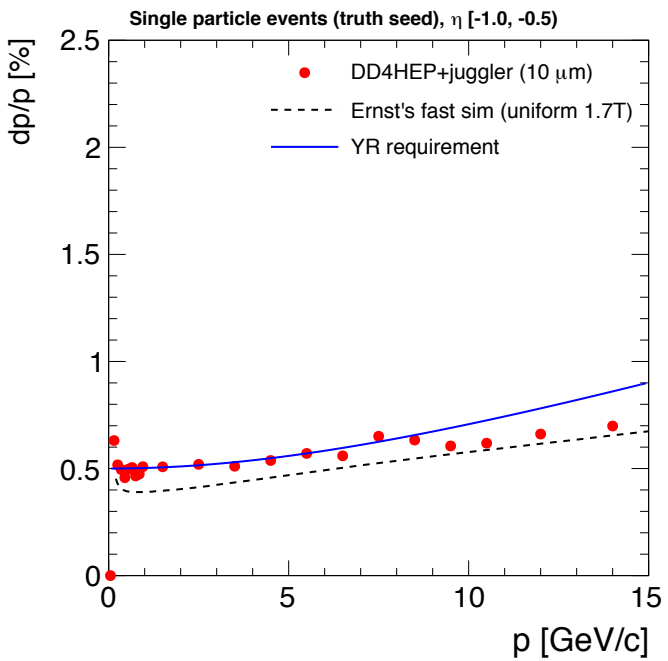

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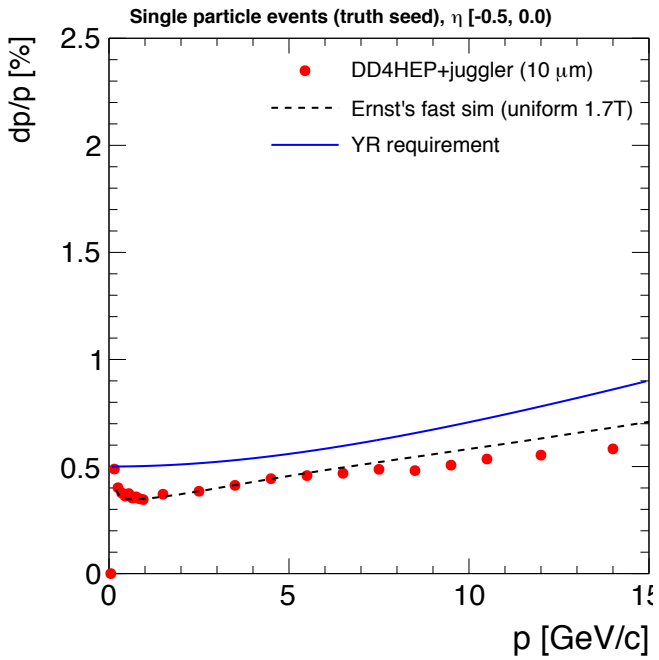

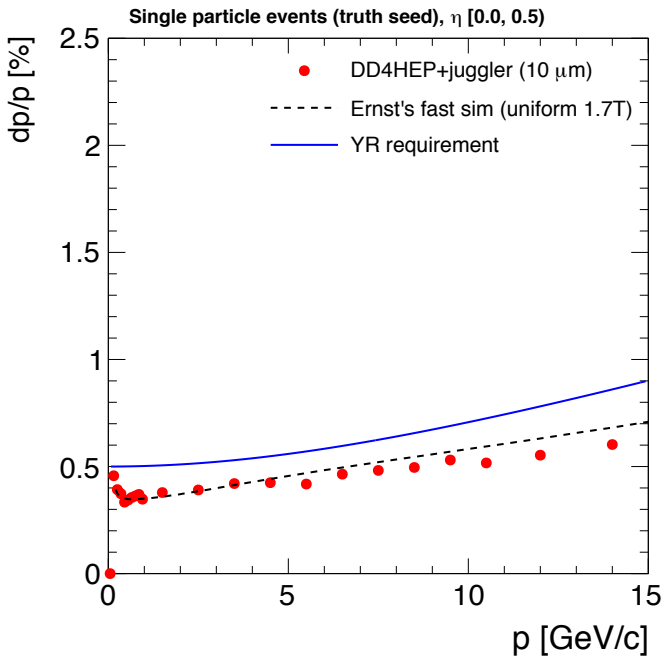

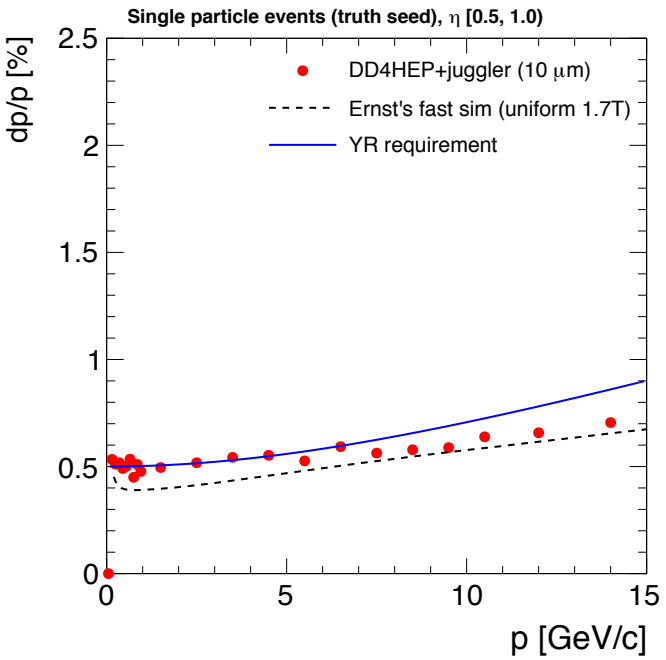

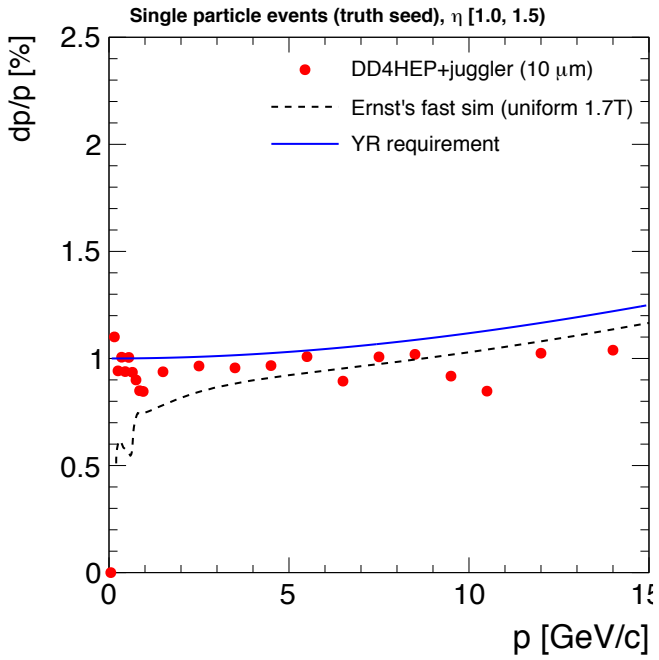

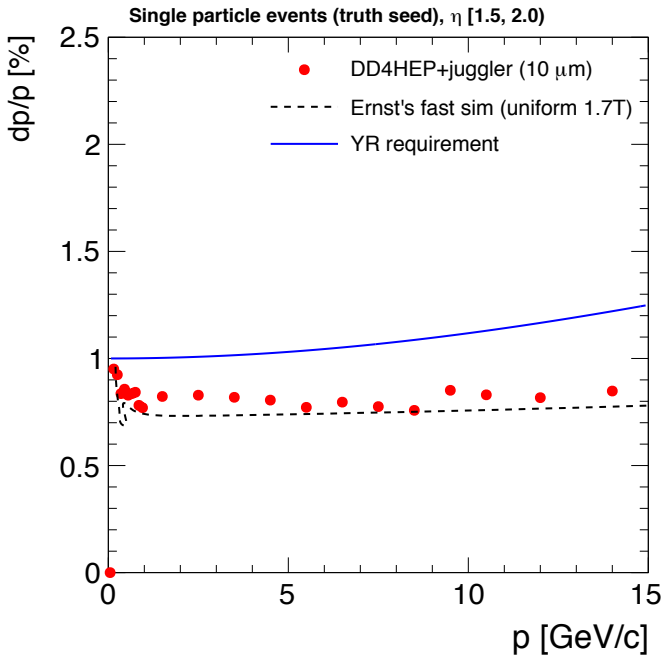

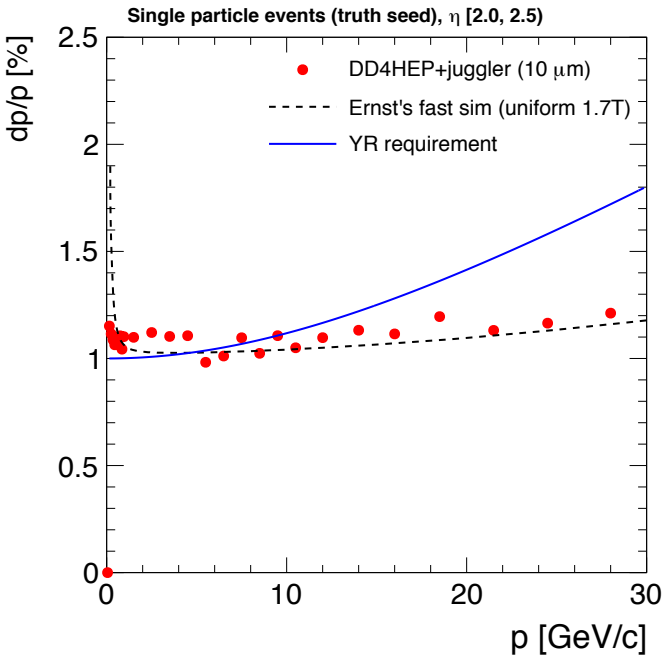

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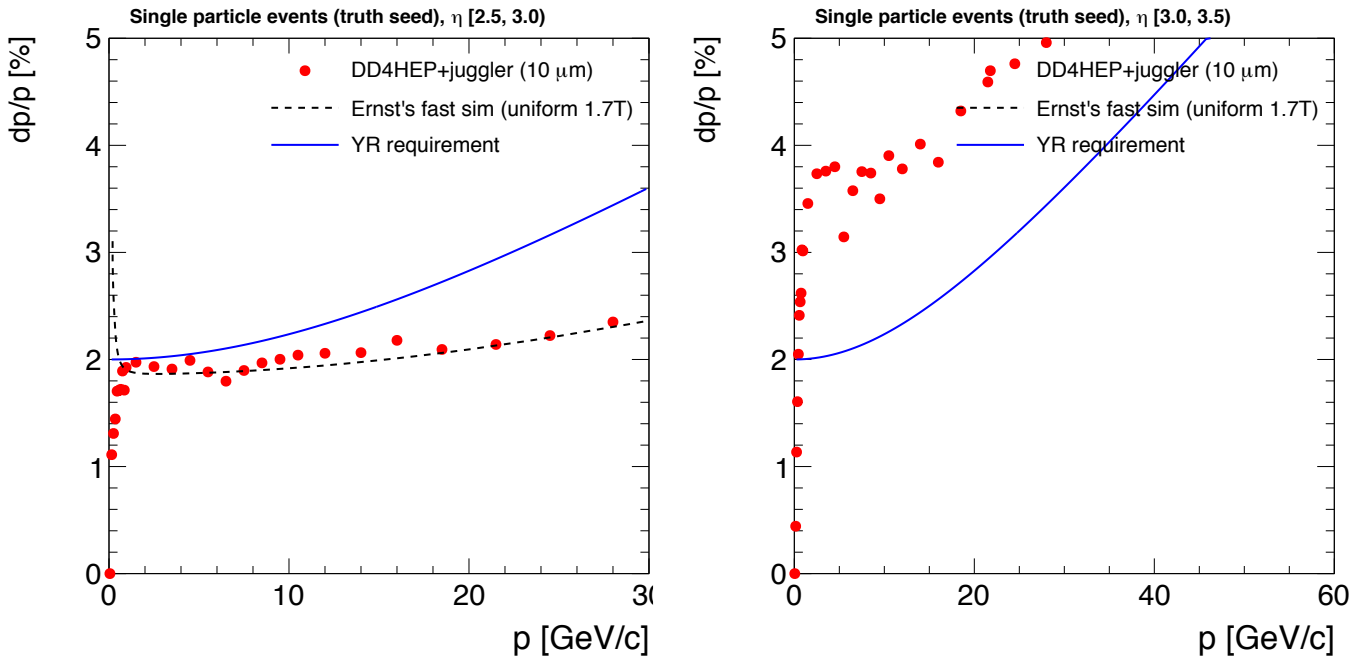
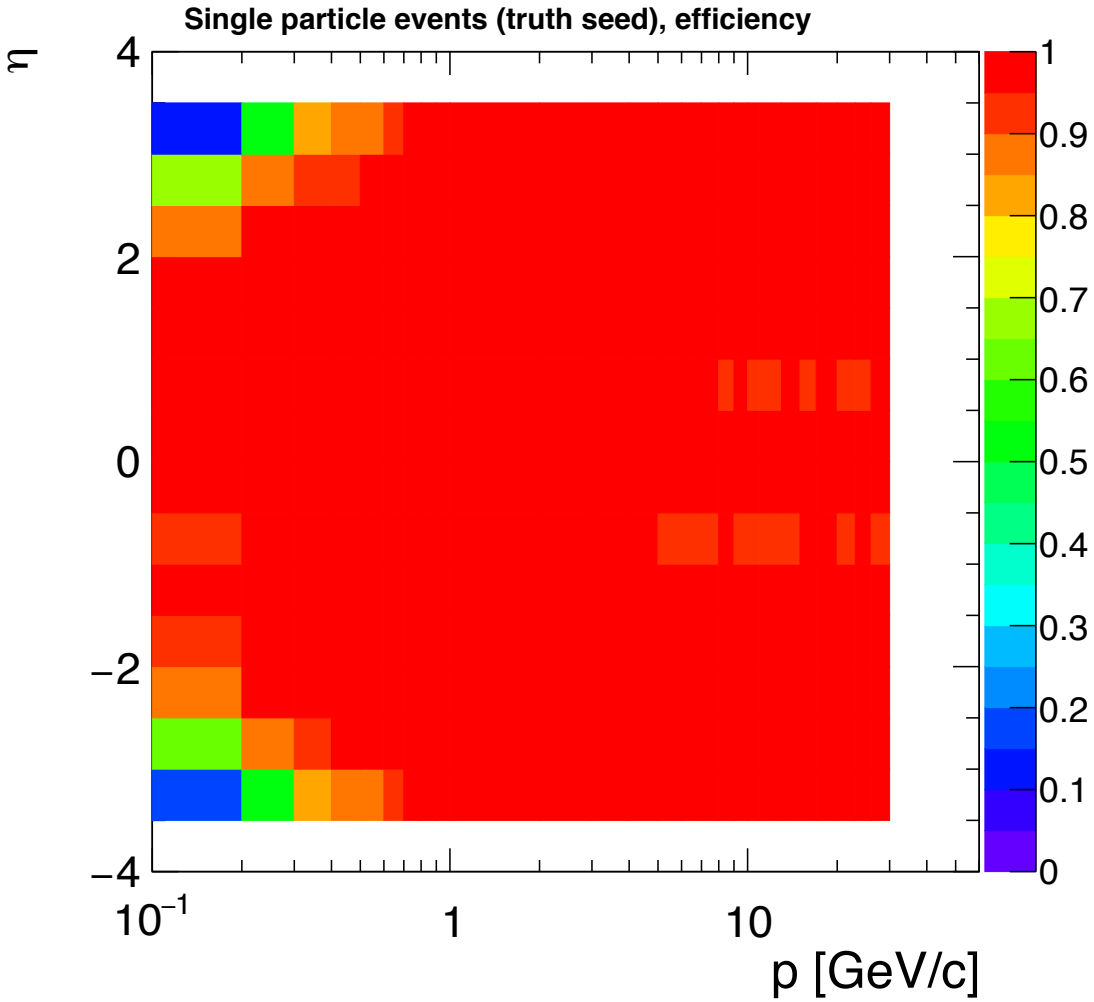


Results from DD4HEP in agreement with the fast simulation results

YR requirement achieved for most of the η range

Acceptance check

- Efficiency with truth seeding
  - No minimum # of hits required yet (later we can add >=3 hits)
  - Need to make finer η bins and simulate large η range to check the edge effect around the inner radius of the disks



Summary

- Track reconstruction perform mostly as expected in DD4HEP with the material map
  - Full simulation results in agreement with fast simulation
- Write more tracking information to the reconstructed output (# of hits, χ^2 etc.)
  - Beneficial for acceptance study, diagnotic purposes etc.
- Check realistic seeding