Greedy ambiguity resolution solver in EICrecon

Joint track and vertex reconstruction and tracking WG meeting
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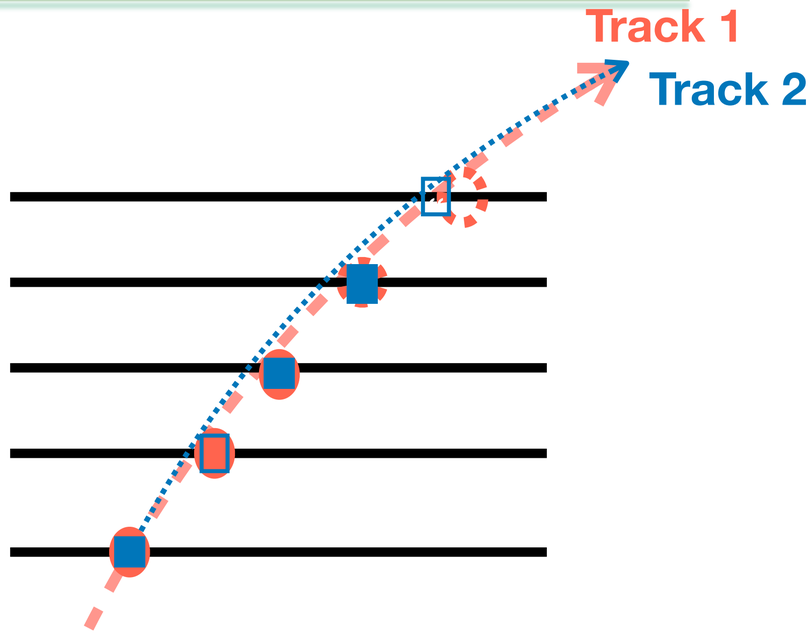
Minjung Kim and Barak Schmookler
with Dmitry, Shujie and Wouter

Greedy ambiguity resolution solver

- **Greedy ambiguity resolution solver**:
  1. Iterate trajectories and find the trajectory having number of shared hits larger than certain threshold
  2. Find the competetors and keep better quality trajectory only
  3. Repeat till you have trajectories having shared hits below certain threshold



Implemenation in EICrrecon

- Based on ACTS: Core/include/Acts/AmbiguityResolution/GreedyAmbiguityResolution.ipp
- Officially part of EICrecon (from daily tag of 2024-06-04):
  - Only resolved (filtered) tracks from “Greedy ambiguity resolution solver” propagate as “default” tracks used for further processes (vertaxing, PID matching,…); no modification required
  - Output collections with full tracks still available with “unfiltered” tag.
  - Applied both on truth/realistic seeded tracking
    - Duplicates can happen even for truth seeding, in single-particle simulation (https://indico.bnl.gov/event/23797/contributions/92485/attachments/54977/94075/tracking_060424.pdf)

Impact of greedy ambiguity resolution solver in true-seeded tracking

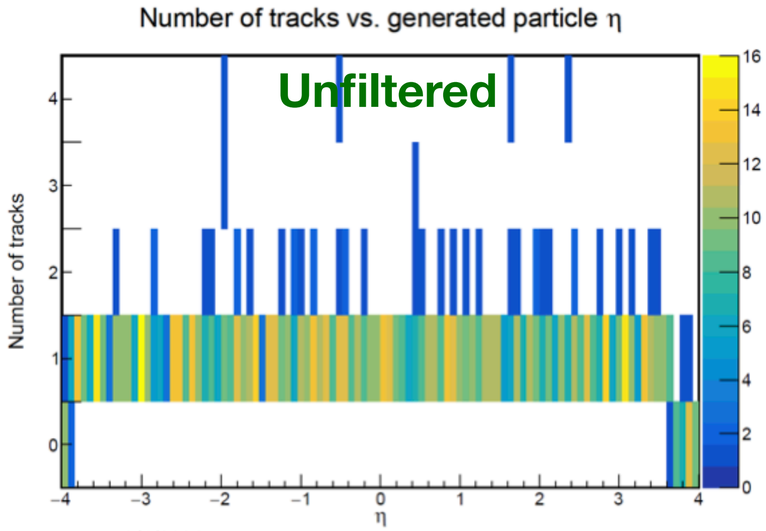
From Barak

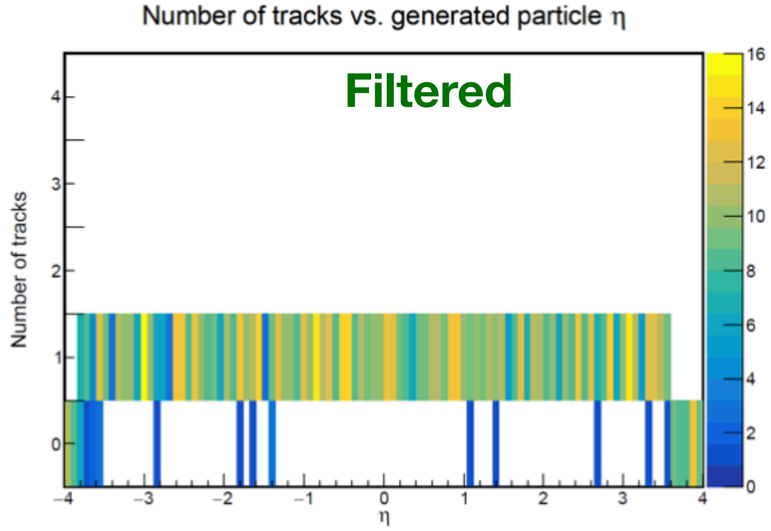
Single μ^- generated:

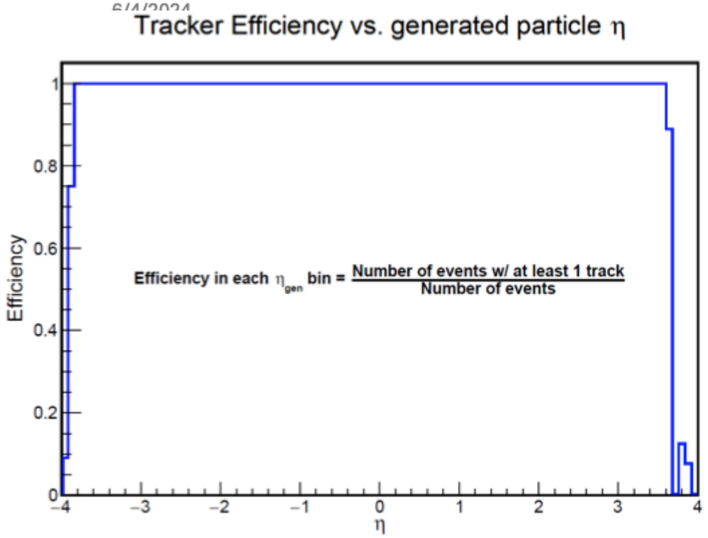
0.5 GeV/c < P < 20 GeV/c

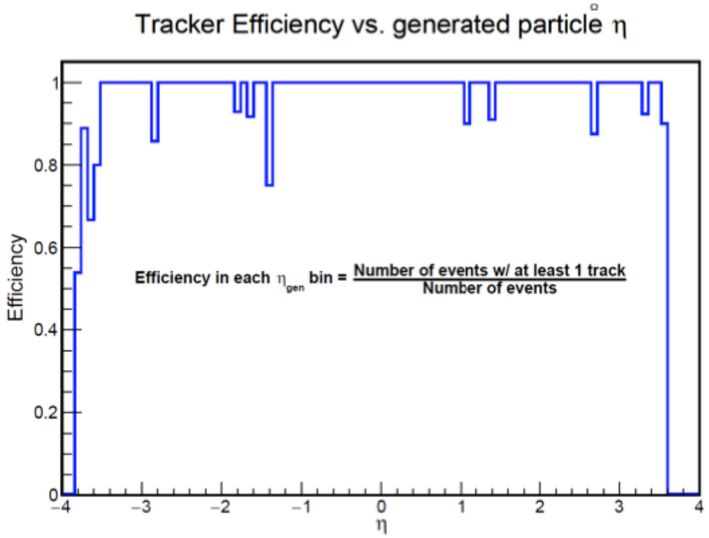
-4 < η < 4

Generated vertex: (0,0,0) mm









Impact of greedy ambiguity resolution solver in real-seeded tracking

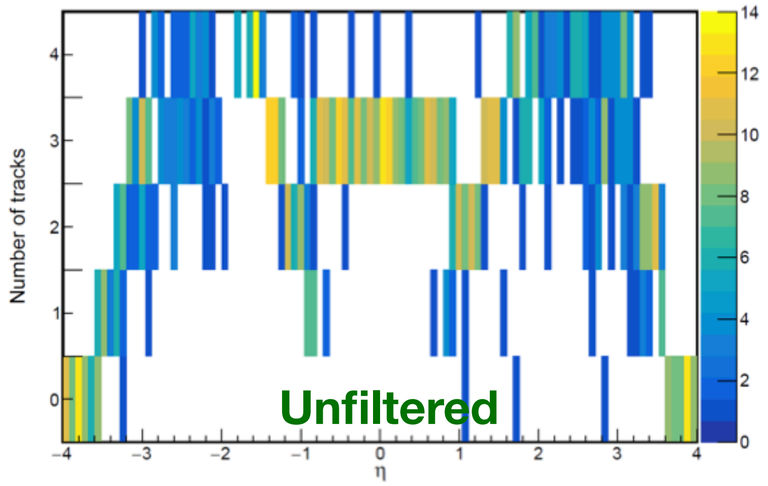
From Barak

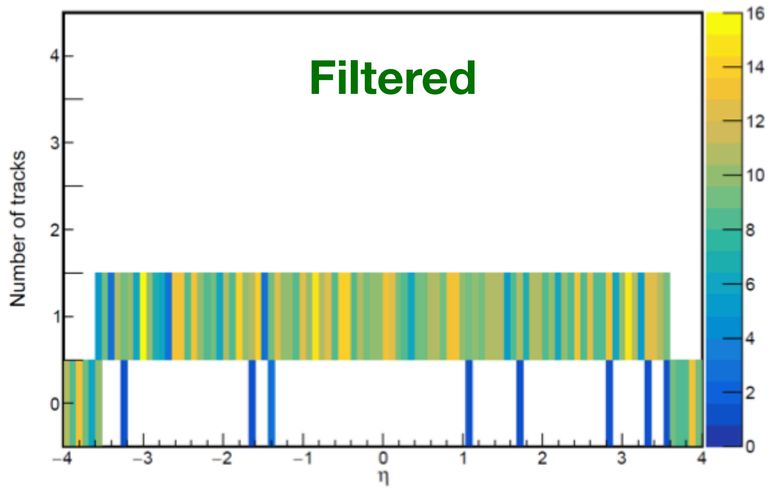
Single μ^- generated:

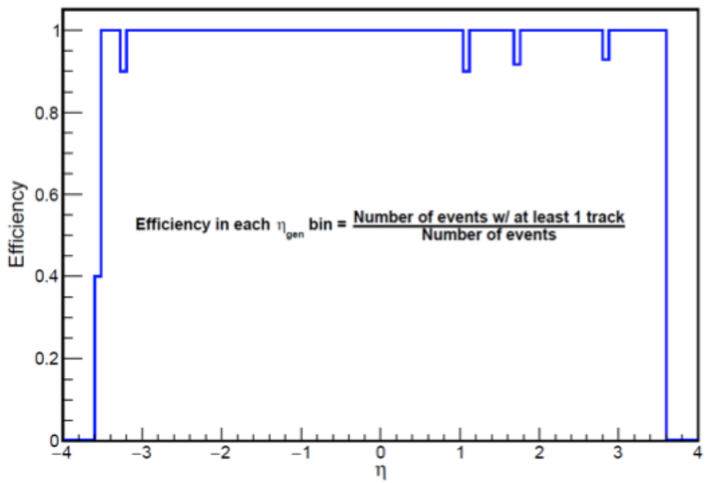
0.5 GeV/c < P < 20 GeV/c

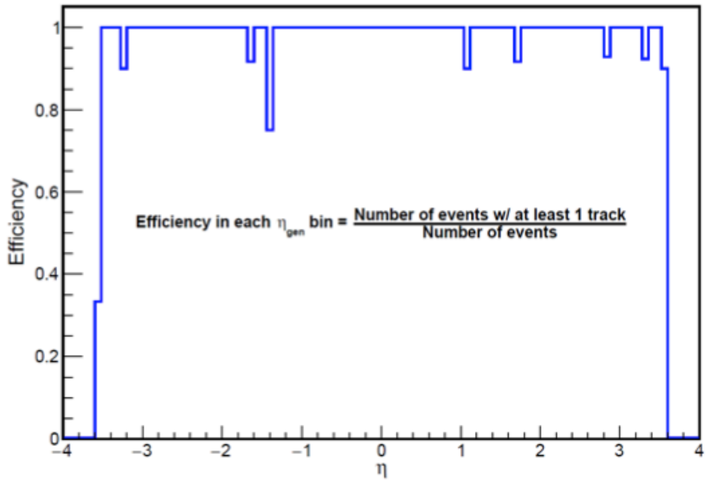
-4 < η < 4

Generated vertex: (0,0,0) mm

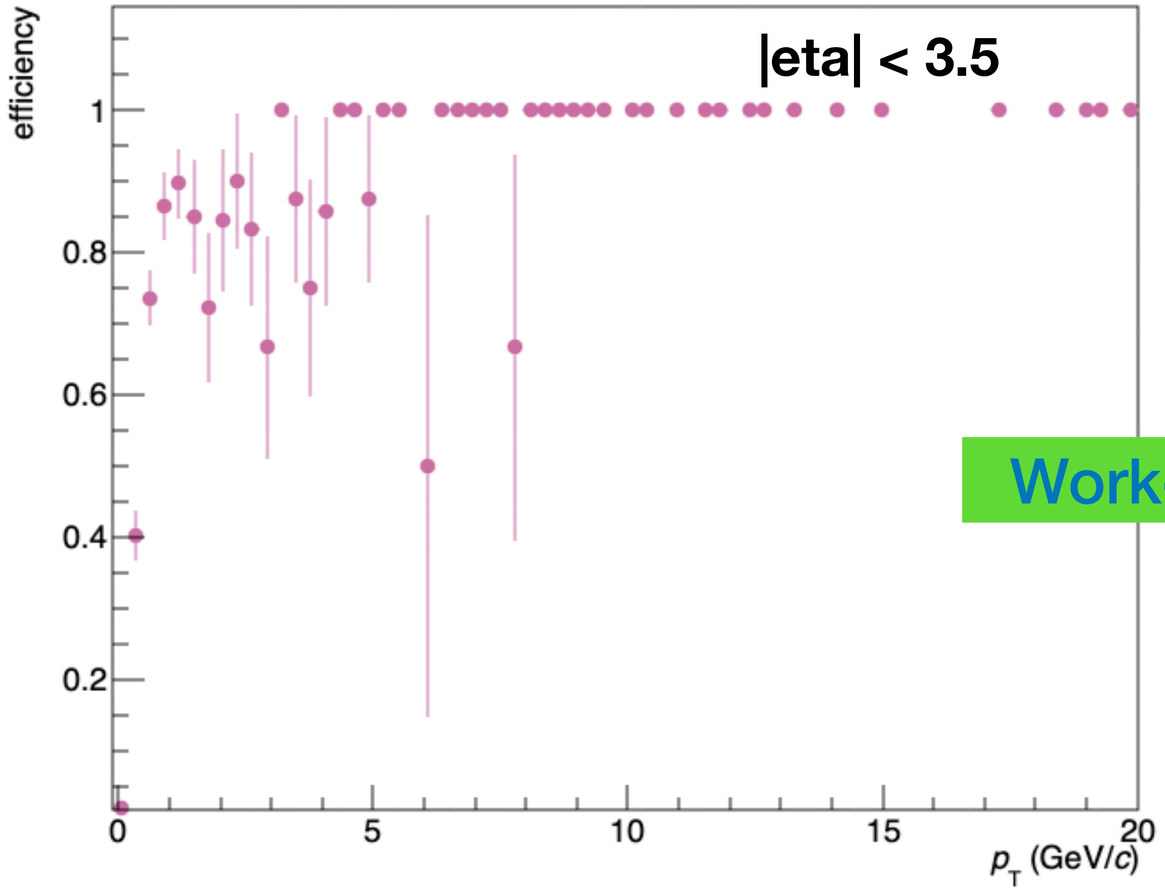




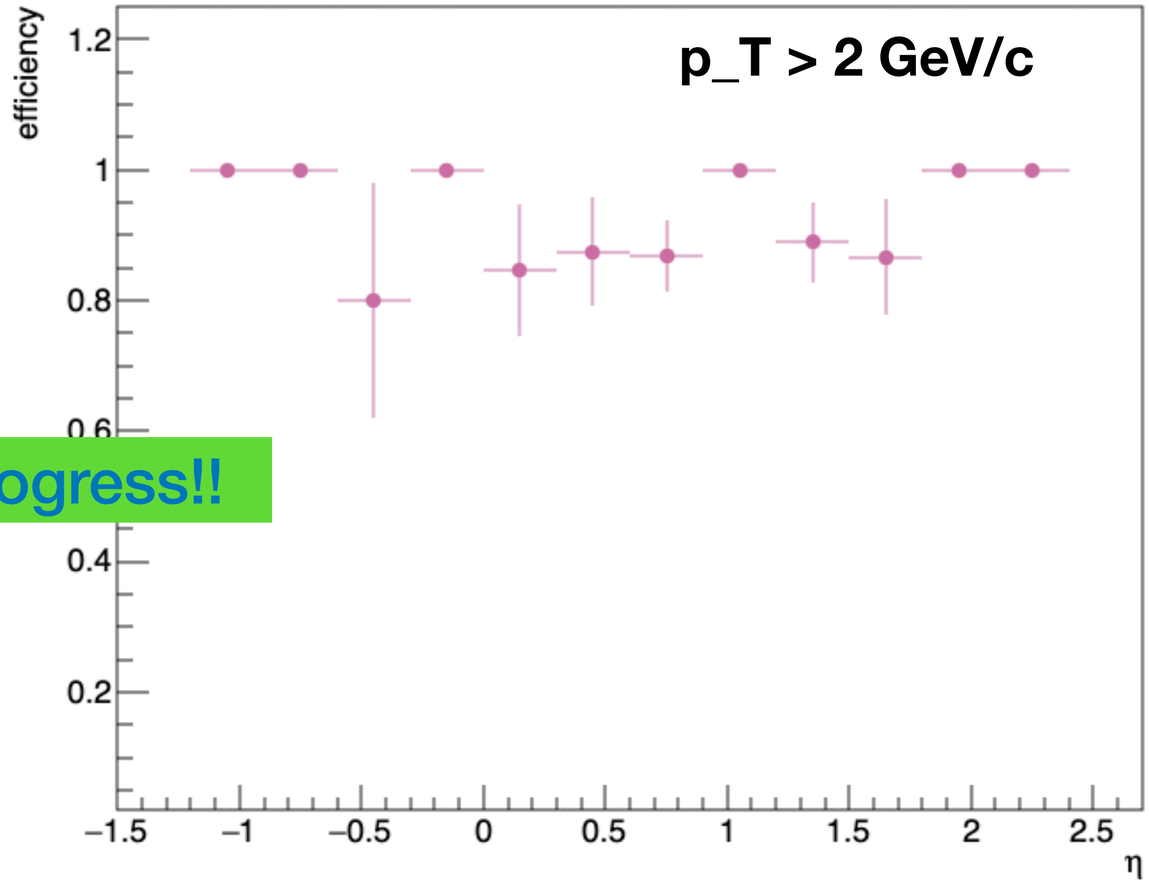




Tracking efficiency from realistic seeding in DIS



Work-in-progress!!



Summary

- Greedy Ambiguity Resolution Solver (from ACTS) is now part of EICrecon
- Further reco. algorithms (Vertexing, PID matching,..) as well as Physics performance studies can realize without additional modification in their code
- QA in single-particle gun / small set of DIS sample looks reasonable
- Further QA and extending towards tracking performance studies will be carried out!

Tentative list of tracking performance studies planned:

✓ Momentum resolution

✓ DCA resolution

✓ Efficiency

✓ Mean residuals

✓ Hit purity for beam-gas bkg.

✓ .....