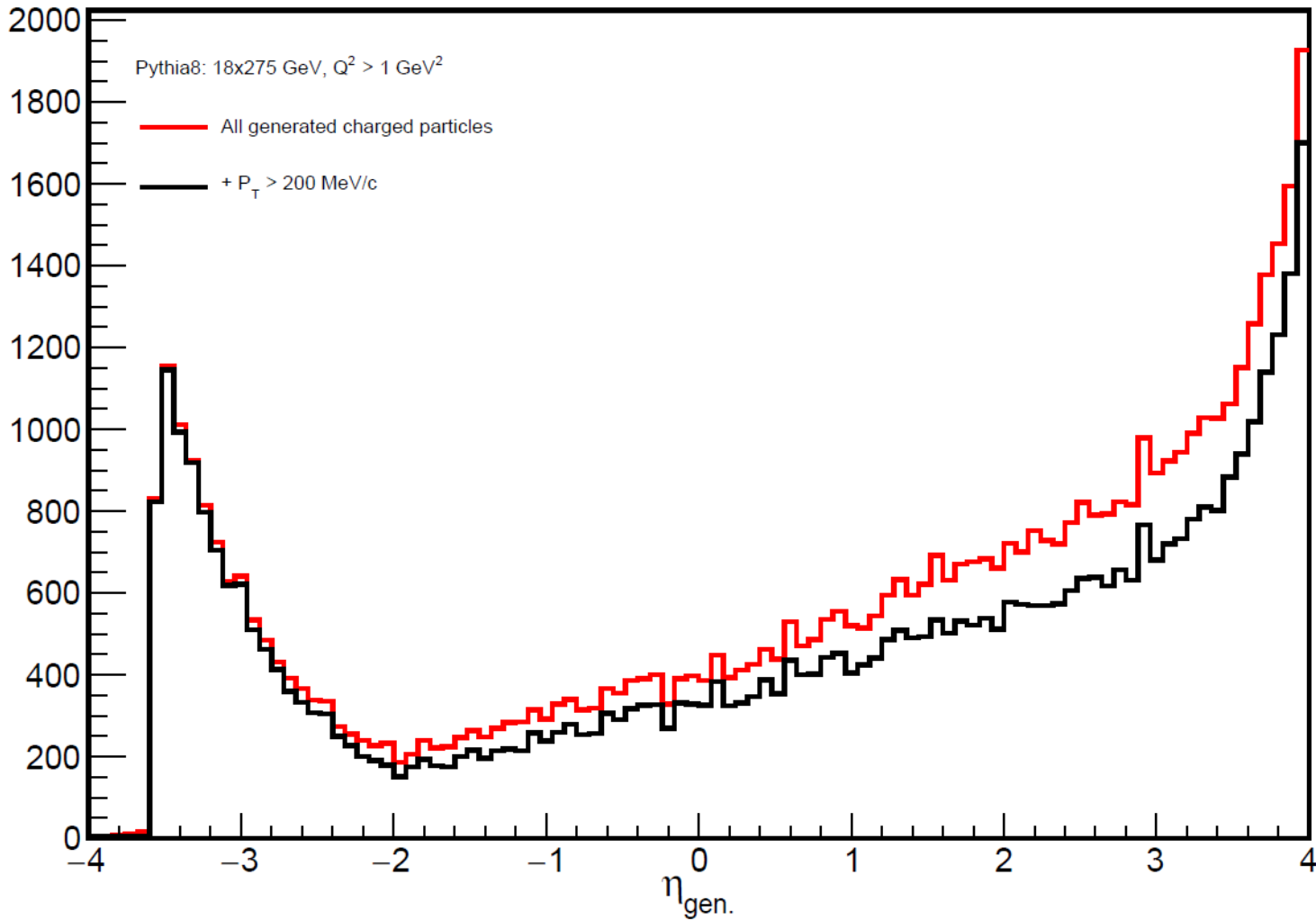# DIS and single-particle reconstruction efficiency for ePIC v24.06.0 simulation

Barak Schmookler

DIS: charged-particle spectra
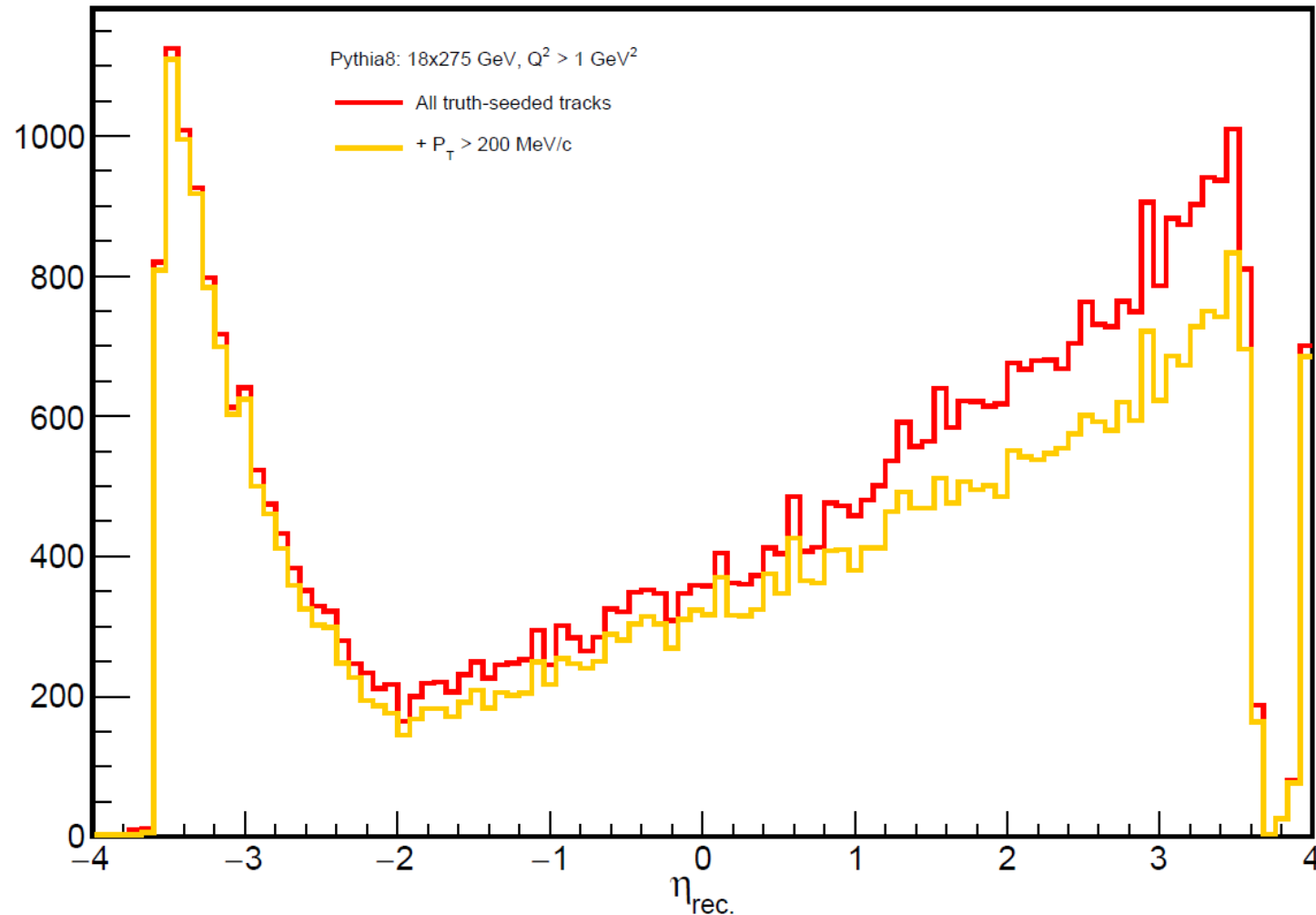
Generated Charged Particles

Pythia8: 18x275 GeV, $Q^2 > 1$ GeV^2

— All generated charged particles

— $+ P_T > 200$ MeV/c

Generated pseudo-rapidity distribution for all final-state (i.e. status = 1) charged particles.

DIS: reconstructed truth-seeded tracks

Reconstructed Truth-seeded tracks

Pythia8: 18x275 GeV, $Q^2 > 1$ GeV^2

— All truth-seeded tracks

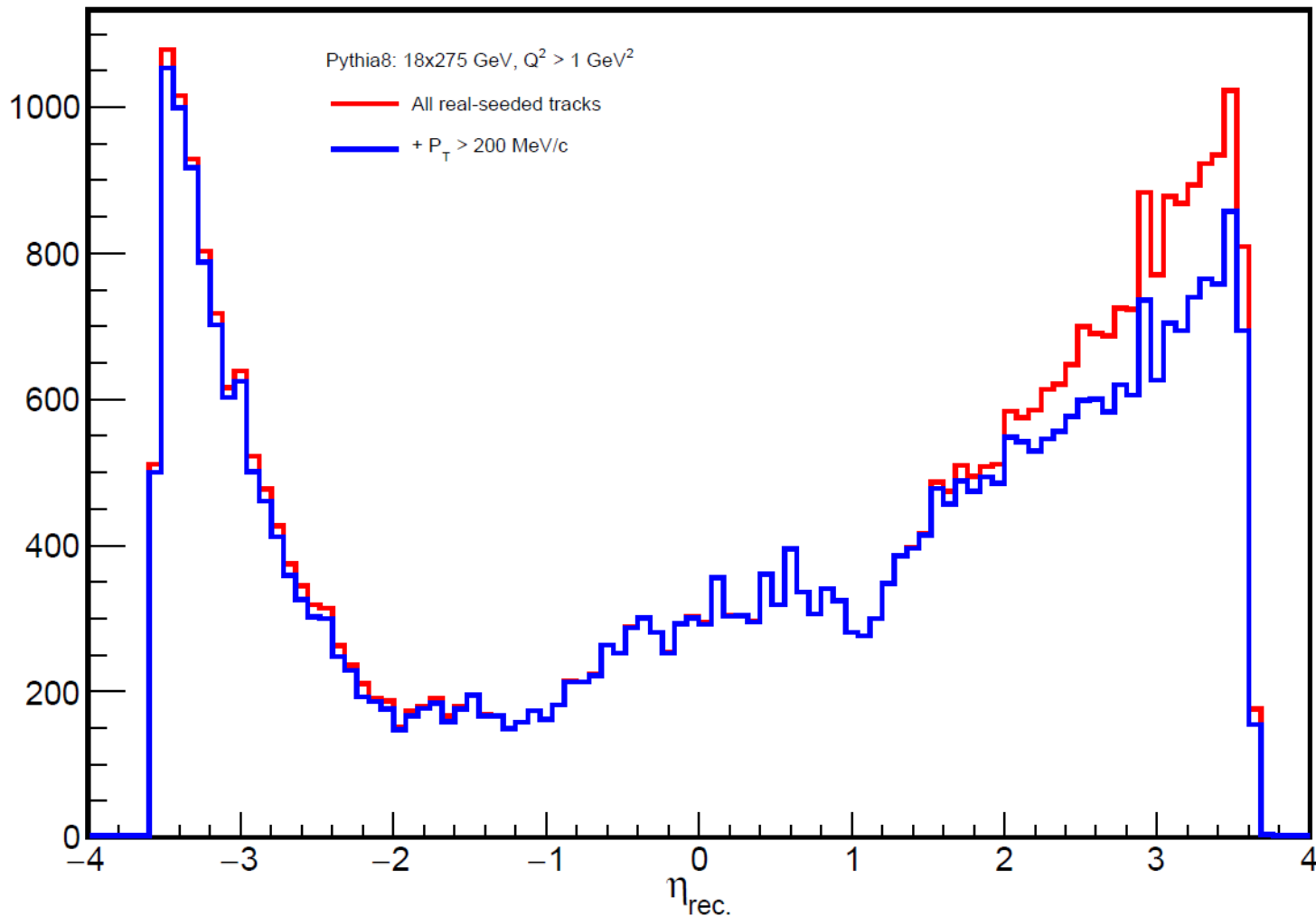— + $P_T > 200$ MeV/c

$\eta_{rec.}$

Red curve: Reconstructed pseudo-rapidity distribution for all reconstructed truth-seeded tracks (ReconstructedChargedParticles collection).

Tracks shown are have been passed through the Acts Greedy Ambiguity Resolution solver in EICRecon. The ambiguity solver removes truth-seeded tracks with fewer than 3 measurement hits.
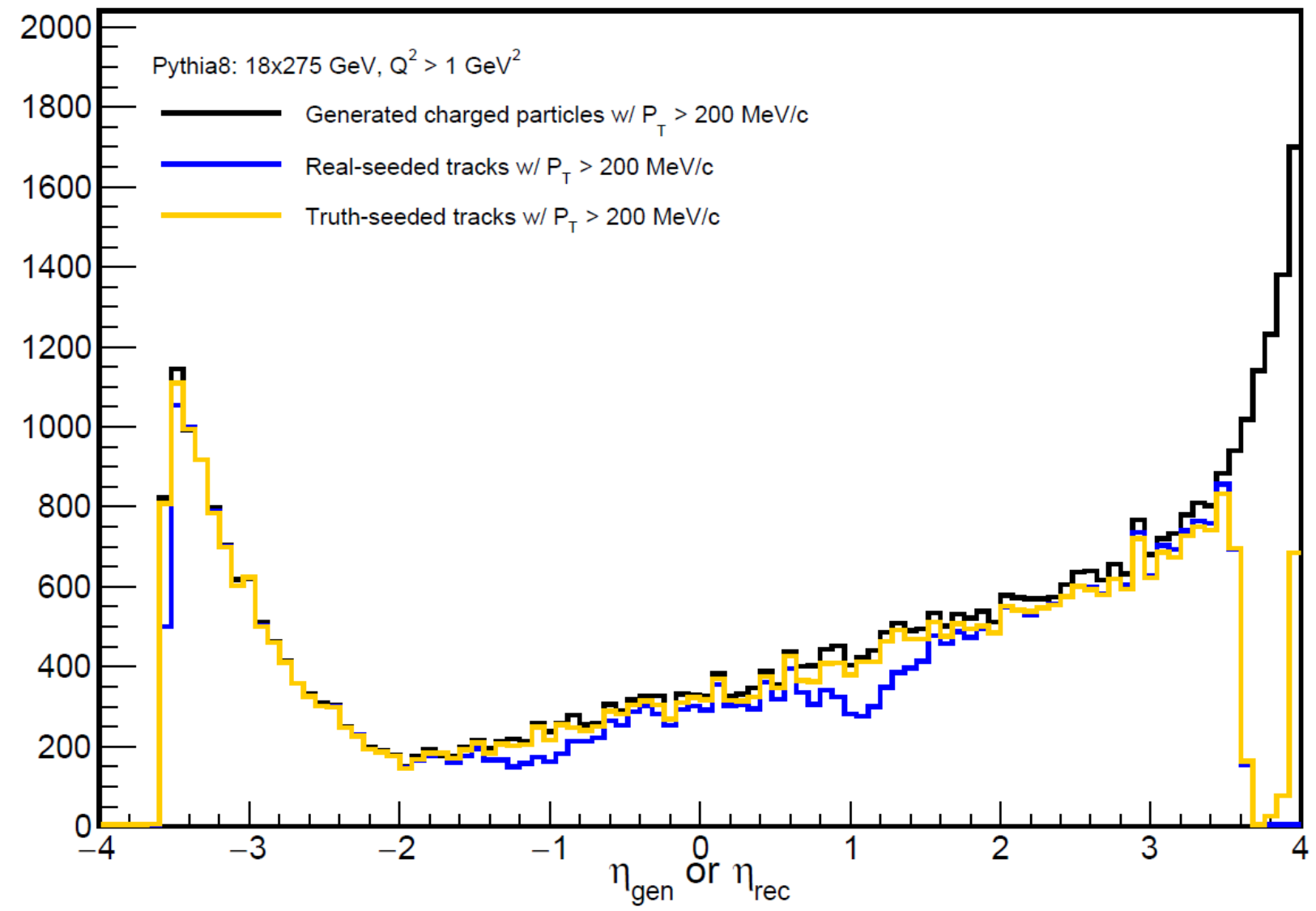
DIS: reconstructed real-seeded tracks

Reconstructed Real-seeded tracks

Pythia8: 18x275 GeV, $Q^2 > 1$ GeV^2

— All real-seeded tracks
— $+ P_T > 200$ MeV/c

$\eta_{rec.}$

Red curve: Reconstructed pseudo-rapidity distribution for all reconstructed real-seeded tracks (ReconstructedSeededChargedParticles collection).

Tracks shown are have been passed through the Acts Greedy Ambiguity Resolution solver in EICRecon. 'Duplicate' tracks from the same particle are removed.

DIS: generated charged-particles and reconstructed tracks comparison

Pythia8: 18x275 GeV, $Q^2 > 1$ GeV^2

Generated charged particles w/ $P_T > 200$ MeV/c

Real-seeded tracks w/ $P_T > 200$ MeV/c

Truth-seeded tracks w/ $P_T > 200$ MeV/c

η_{gen} or η_{rec}

DIS: generated charged-particles and reconstructed tracks comparison

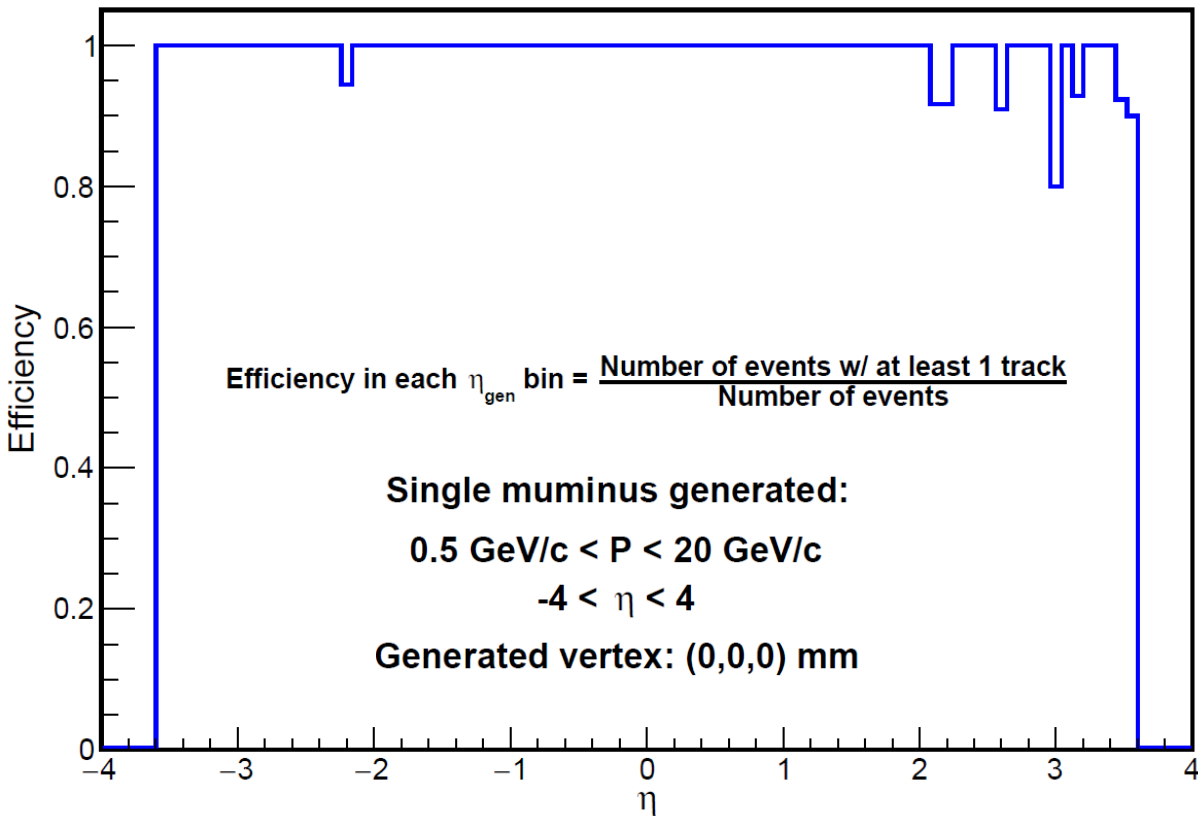## Ratio of recontructed to generated particle counts
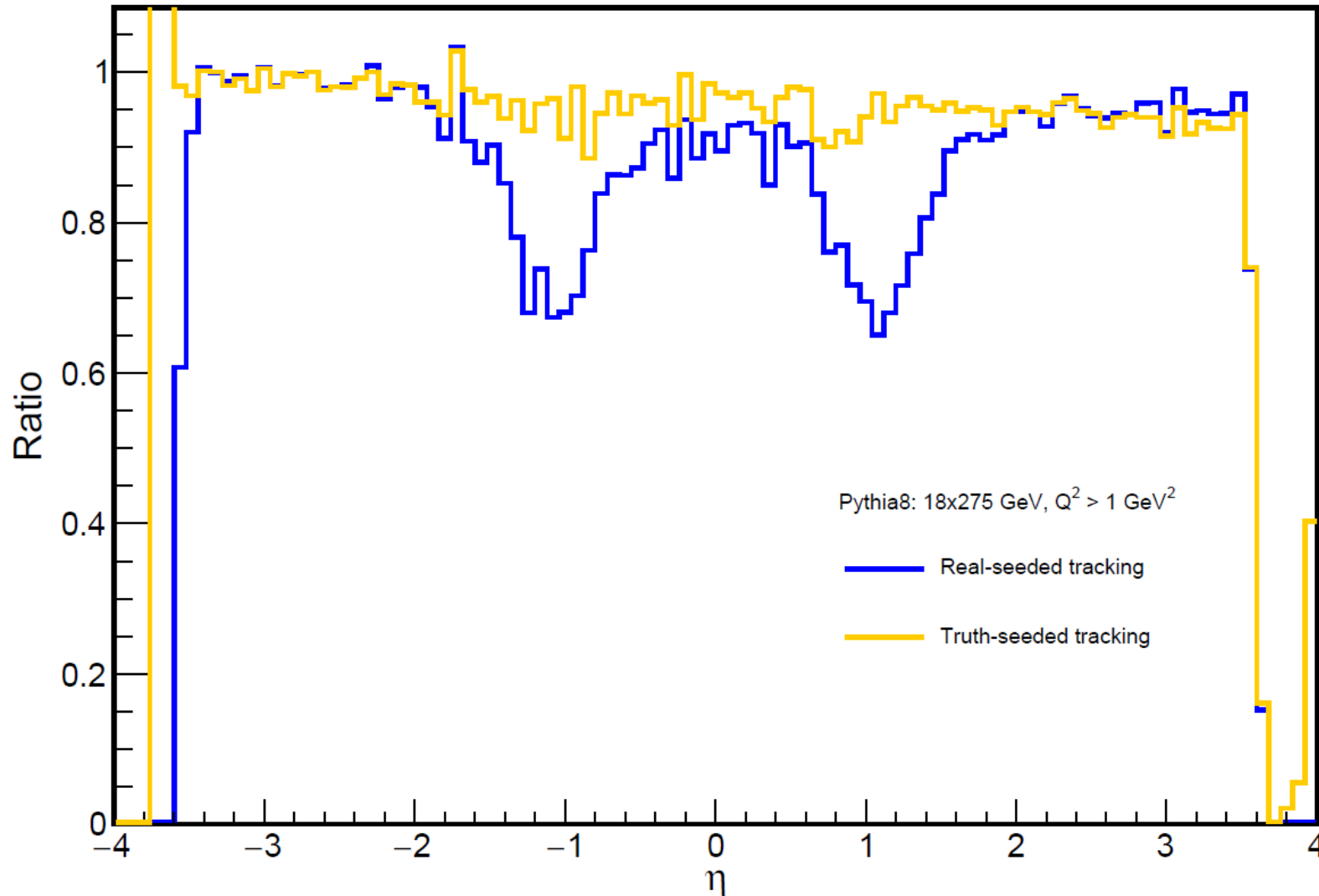
Real-seeded results show some inefficiency near $\eta = \pm 1$.

Plan to study P_t spectrum and see if these missing correspond to certain P_t values.
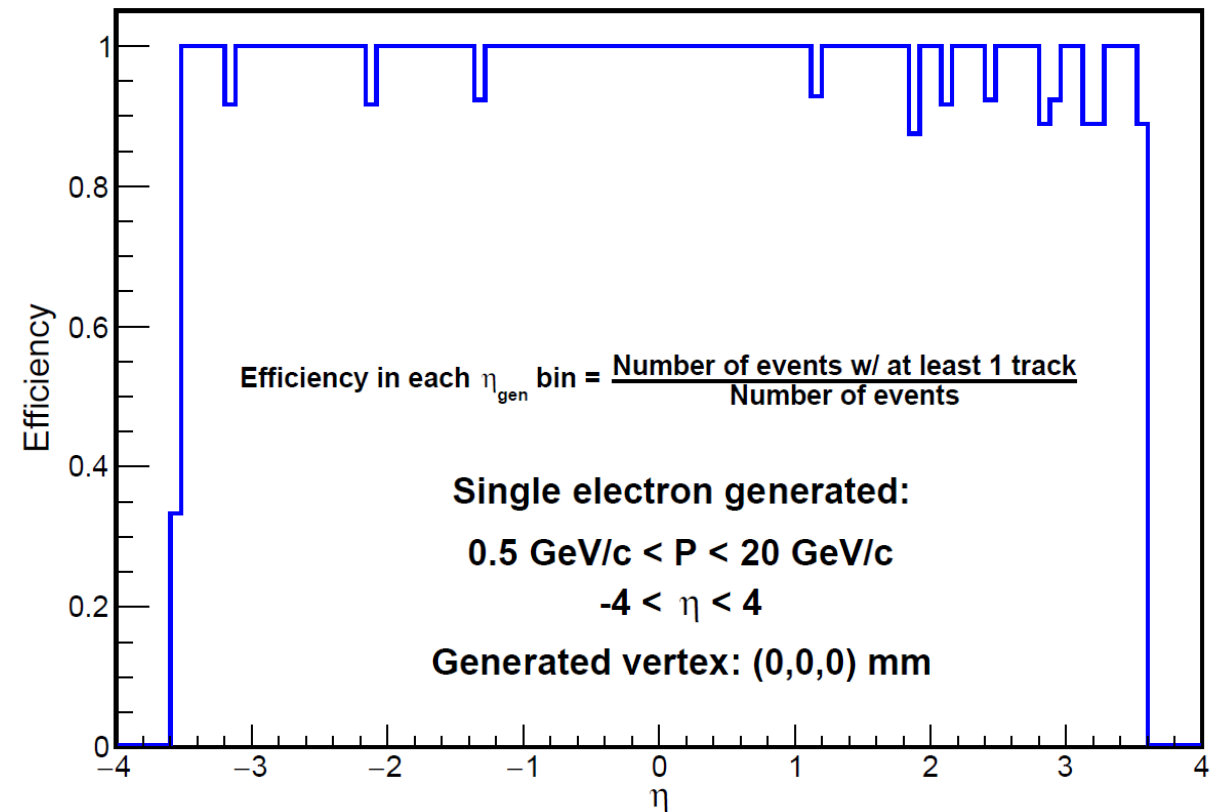
Single-particle results with different particle types

Real-seeded tracking:
1000 single negative muon events

Real-seeded tracking:
1000 single electron events

Tracker Efficiency vs. generated particle η

Tracker Efficiency vs. generated particle η

Efficiency in each η_{gen} bin = $\dfrac{\text{Number of events w/ at least 1 track}}{\text{Number of events}}$

Single muminus generated:

0.5 GeV/c < P < 20 GeV/c

-4 < η < 4

Generated vertex: (0,0,0) mm

Efficiency in each η_{gen} bin = $\dfrac{\text{Number of events w/ at least 1 track}}{\text{Number of events}}$

Single electron generated:

0.5 GeV/c < P < 20 GeV/c

-4 < η < 4

Generated vertex: (0,0,0) mm

Single-particle results with different particle types

Real-seeded tracking:
1000 single negative pion events

Real-seeded tracking:
1000 single positive pion events

Tracker Efficiency vs. generated particle η
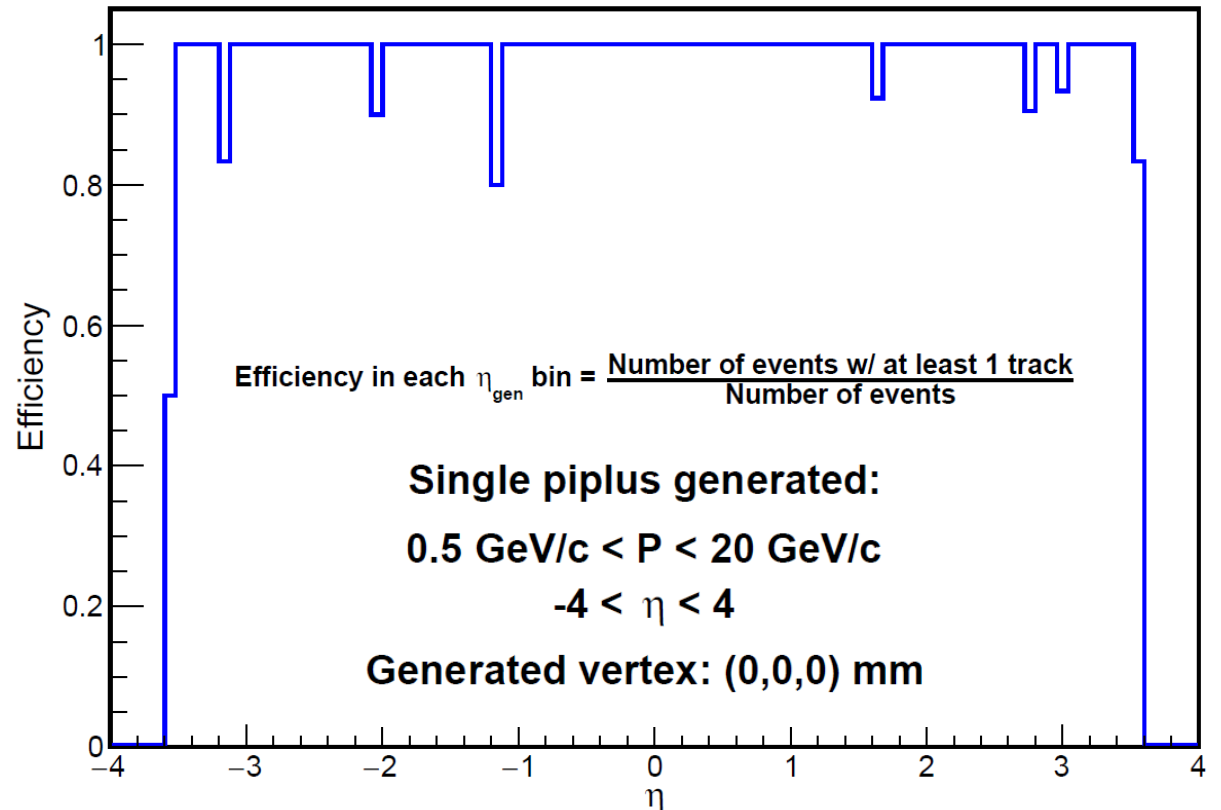
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-4 < η < 4

Generated vertex: (0,0,0) mm

Efficiency in each η_{gen} bin = $\dfrac{\text{Number of events w/ at least 1 track}}{\text{Number of events}}$

Single piplus generated:

0.5 GeV/c < P < 20 GeV/c

-4 < η < 4

Generated vertex: (0,0,0) mm

Single-particle results with different particle types

Real-seeded tracking:
1000 single proton events

Tracker Efficiency vs. generated particle η

Efficiency in each η_{gen} bin = $\dfrac{\text{Number of events w/ at least 1 track}}{\text{Number of events}}$

Single proton generated:

0.5 GeV/c < P < 20 GeV/c

-4 < η < 4

Generated vertex: (0,0,0) mm
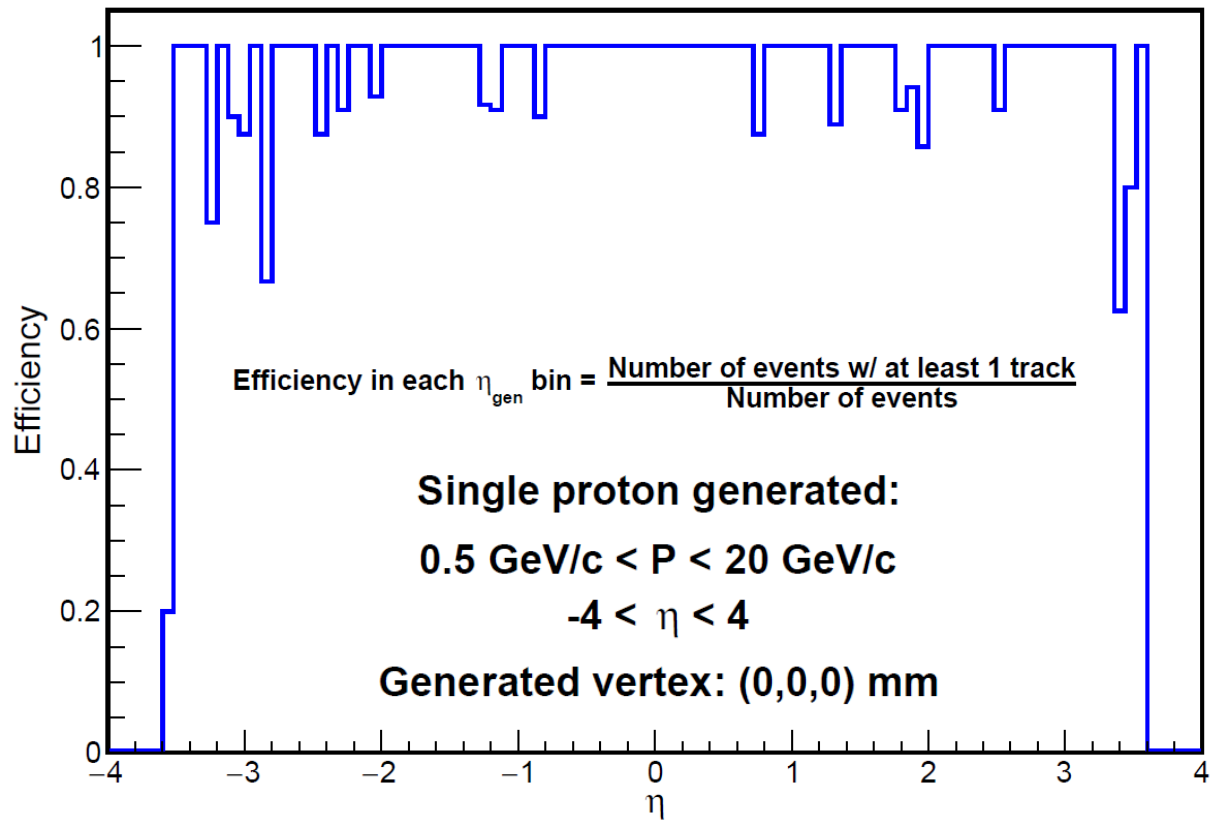
Summary

➢The reconstructed tracks in ePIC v24.06.0 are now the output of the Acts Greedy Ambiguity Resolution solver algorithm.

➢DIS results look reasonable overall. There appear to be some inefficiencies near $\eta = \pm 1$ for real-seeded tracks. The plan is to study the P_t dependence of this inefficiency.

➢Single-particle results do not show this inefficiency. We can try to repeat these studies using higher statistics and different generation vertices.