D^0 R_{eAu} projections

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reminder

Simulation details

- **BeAGLE** v103, e+Au collisions
- Energy: 10x100
- $Q^2_{min} > 1\ GeV^2$
- With beam effects: applied afterburner for eAu 10x110 configuration
- Two samples
  - HF-enriched sample
    - Select events with $D^0 \rightarrow \pi + K$
  - DIS sample
- ePIC geometry: 25.03.1

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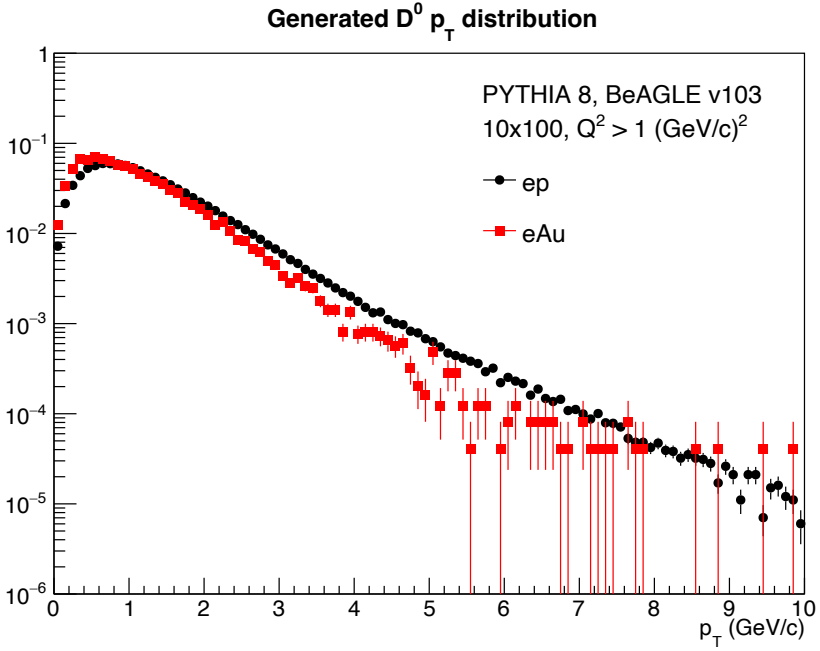
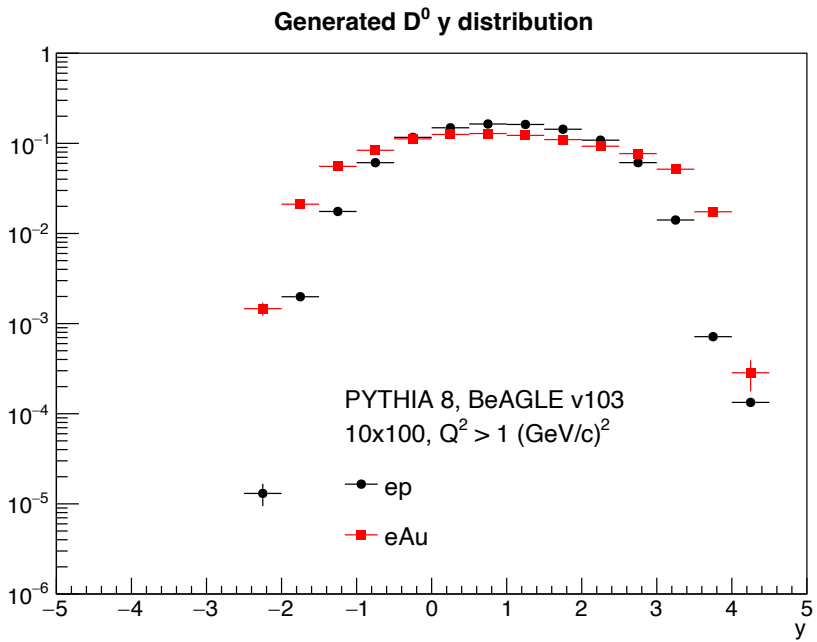
ep vs. eAu: D^0 distribution





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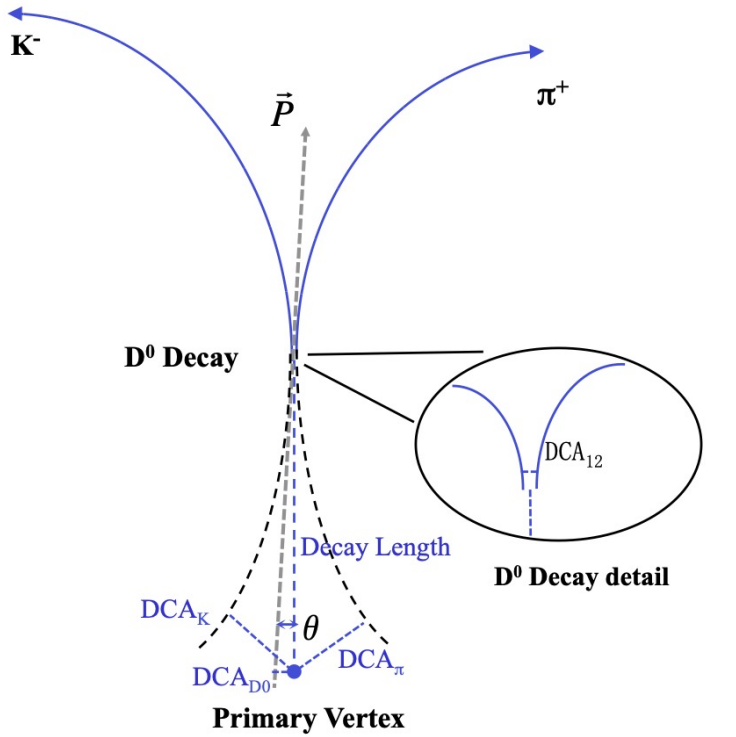
Topological reconstruction



- Topological variables
  - DCA_{π}, DCA_{K}, DCA_{12}
  - DCA_{D0}, decay length, cos(θ)
- Calculated based on helix swimming in a constant magnetic field
  - Adopted from STAR code
  - B = -1.7 T

STAR, Phys. Rev. C 99, 034908 (2019)

D^0 reconstruction

ep	eAu
Real PID $DCA_{\pi} > 20$ μm $DCA_K > 20$ μm $DCA_{12} < 70$ μm $DCA_{D0} < 100$ μm Decay length > 50 μm $\cos\theta > 0.95$	Real PID $DCA_{12} < 200$ μm $DCA_{D0} < 100$ μm Decay length < 200 μm

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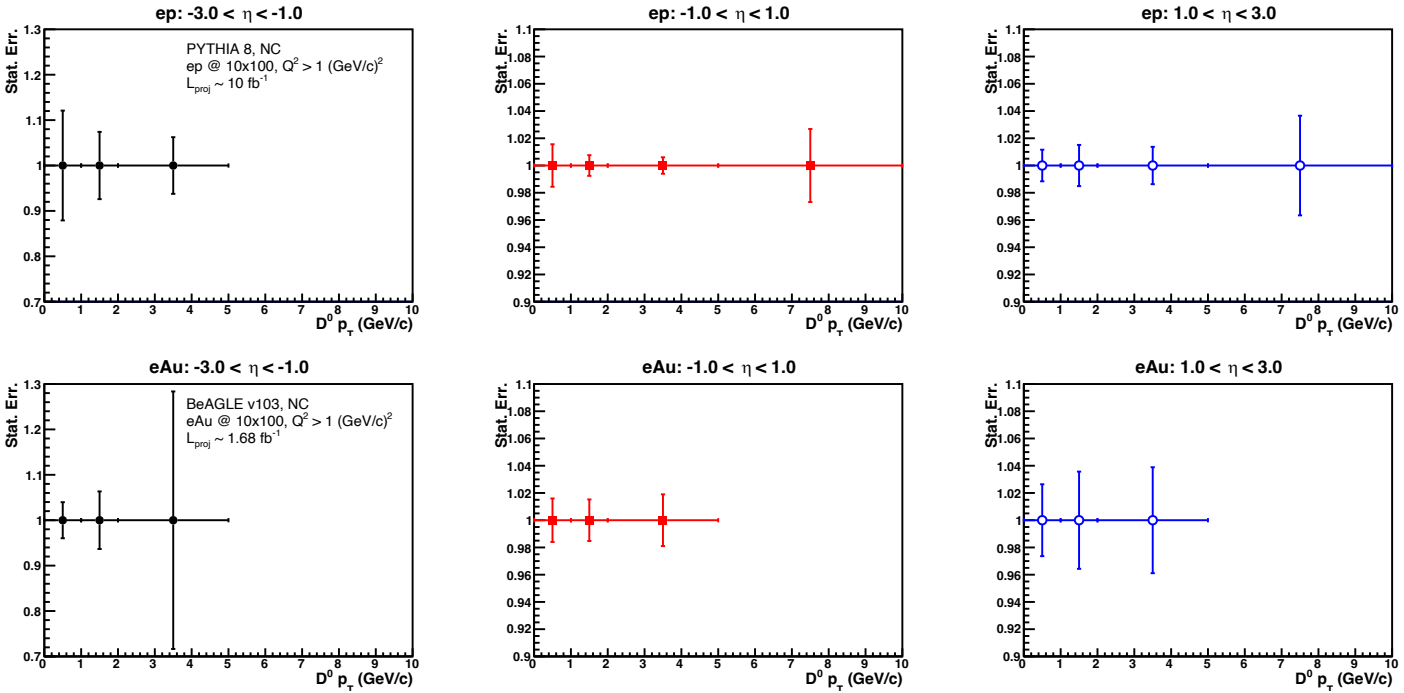
Projection: D^0 significance



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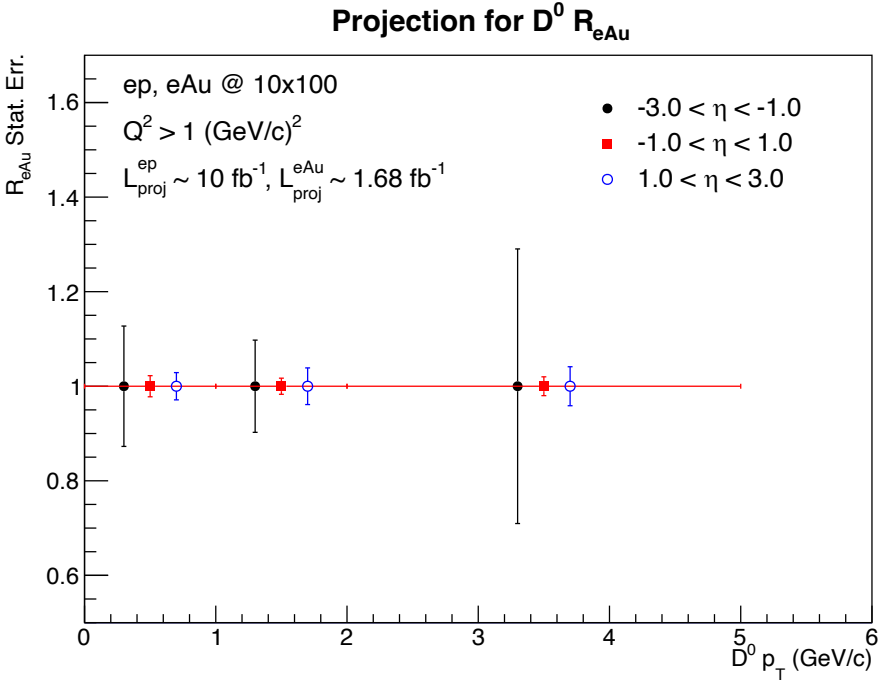
Projection: R_{eAu} statistical error



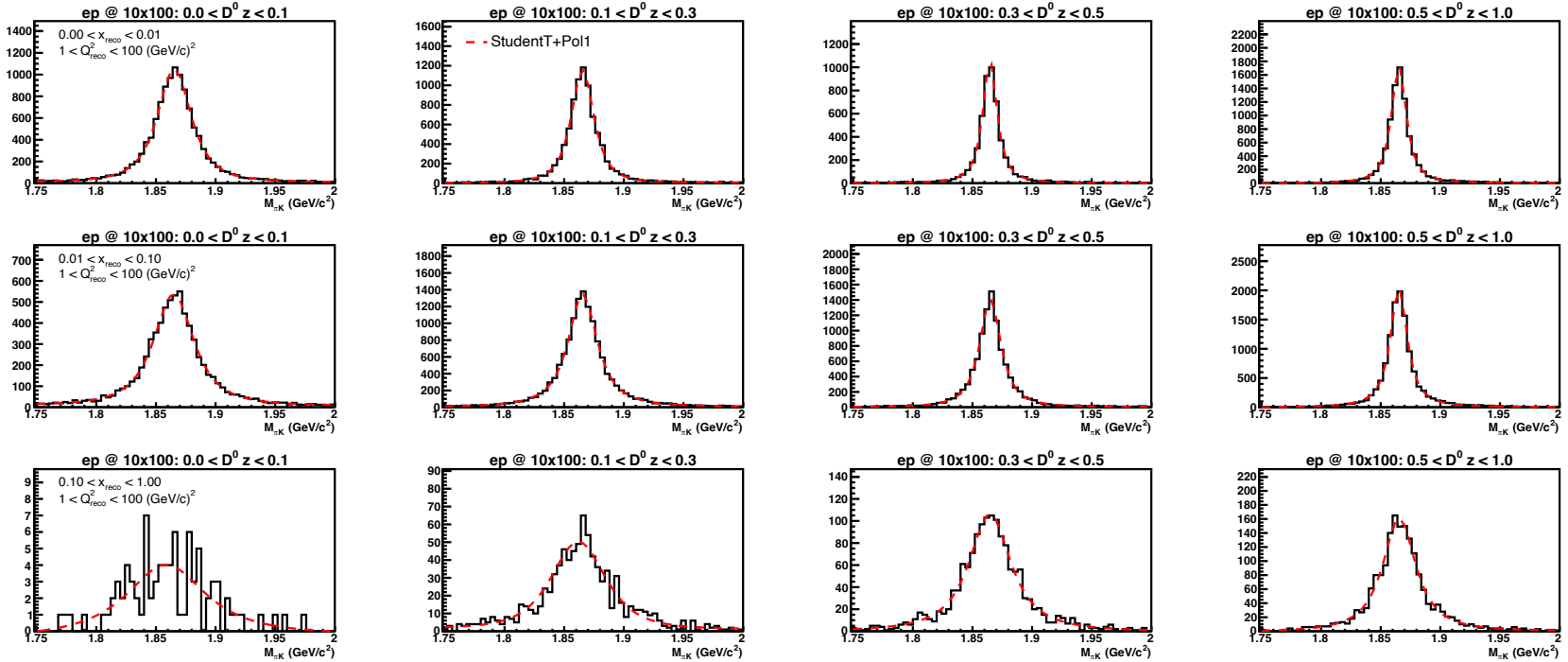
Update: D^0 R_{eAu} vs. z

- Plot D^0 R_{eAu} as a function of *z* in different x-Q^2 ranges
  - z bins: (0, 0.1), (0.1, 0.3), (0.3, 0.5), (0.5, 1.0)

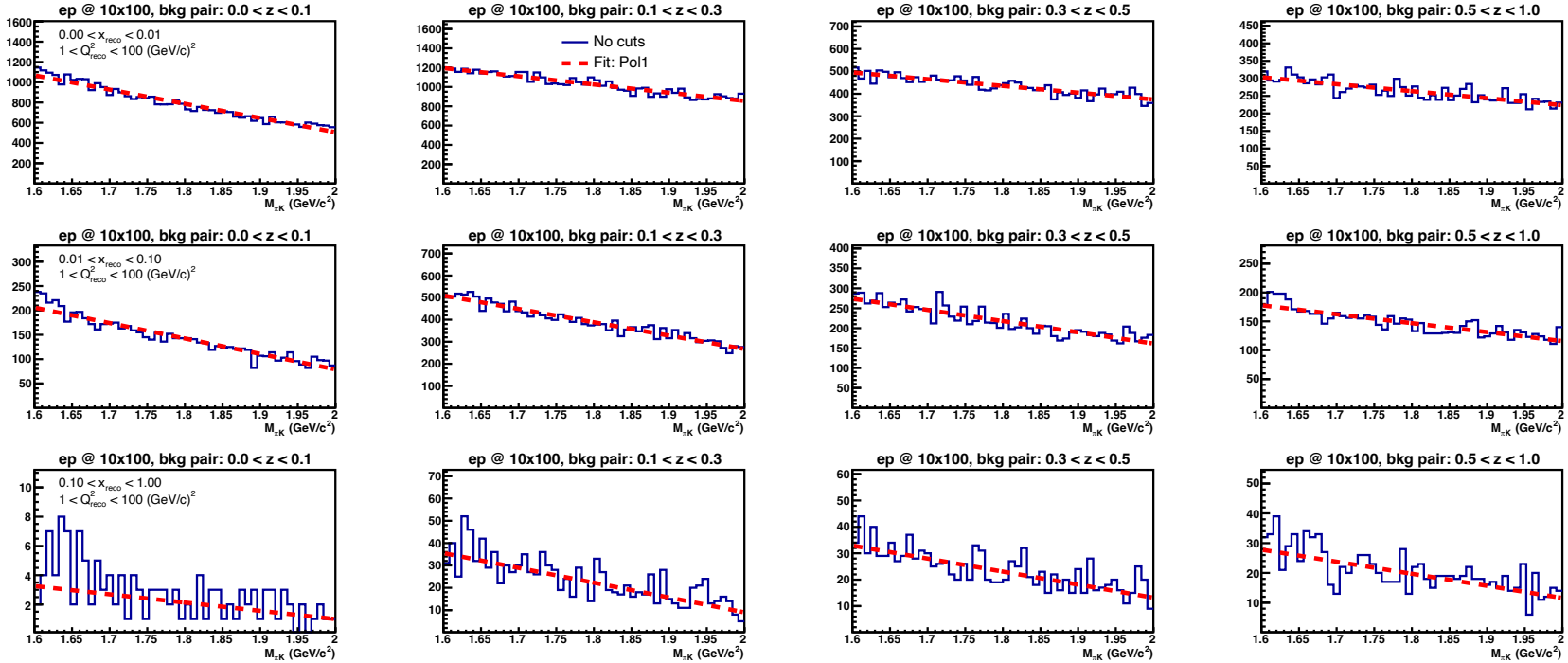
- x and Q^2 are reconstructed using the electron method
  - Branch: InclusiveKinematicsElectron
  - x bins: (0, 0.01), (0.01, 0.1), (0.1, 1)
  - Q^2 bins: $Q^2 > 1$

- $z = p_{\text{proton}} \cdot p_D / p_{\text{proton}} \cdot q$
  - p_{proton}: four-momentum of incoming proton
  - p_D: four-momentum of reconstructed D0
  - q: four-momentum of virtual photon. Take the truth value for now

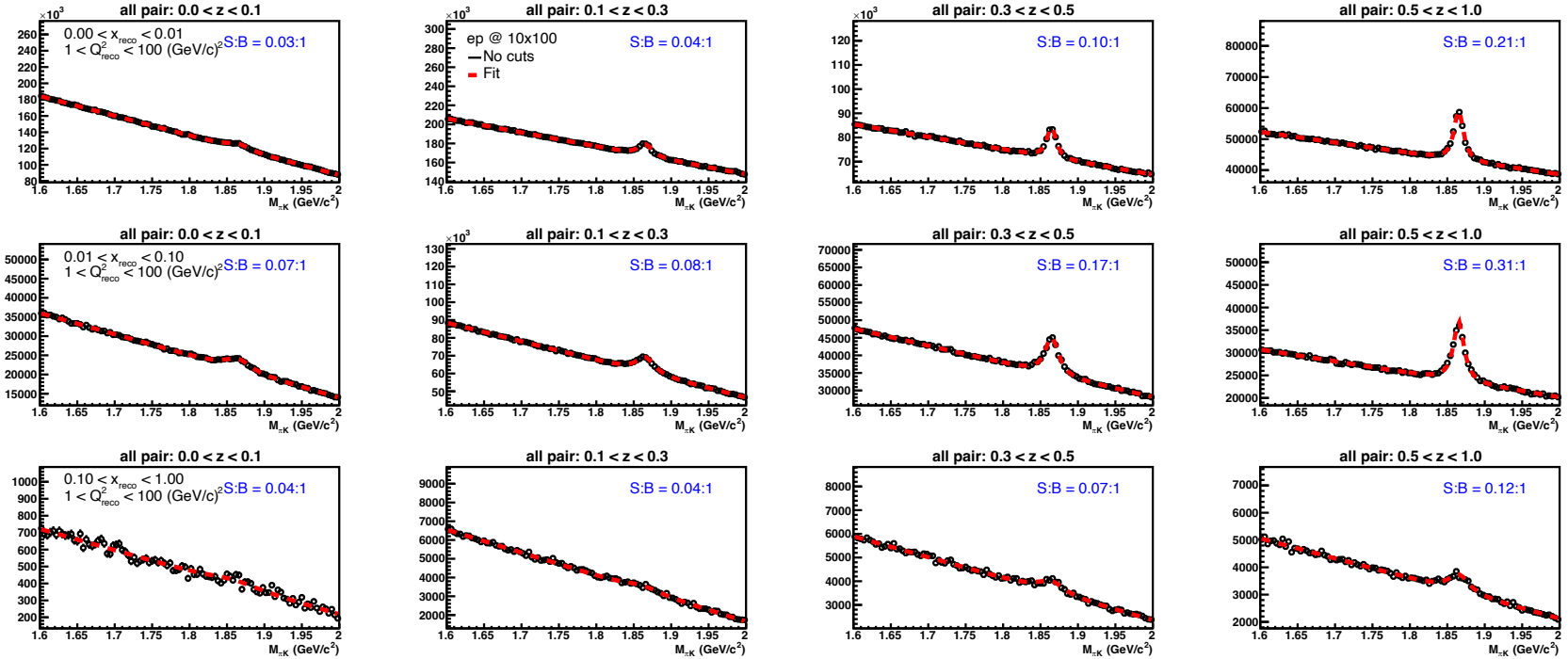
ep: D0 sample


ep @ 10x100: 0.0 < D^0 z < 0.1
0.00 < x_reco < 0.01
1 < Q^2_reco < 100 (GeV/c)^2
ep @ 10x100: 0.1 < D^0 z < 0.3
StudentT+Pol1
ep @ 10x100: 0.3 < D^0 z < 0.5
ep @ 10x100: 0.5 < D^0 z < 1.0
ep @ 10x100: 0.0 < D^0 z < 0.1
0.01 < x_reco < 0.10
1 < Q^2_reco < 100 (GeV/c)^2
ep @ 10x100: 0.1 < D^0 z < 0.3
ep @ 10x100: 0.3 < D^0 z < 0.5
ep @ 10x100: 0.5 < D^0 z < 1.0
ep @ 10x100: 0.0 < D^0 z < 0.1
0.10 < x_reco < 1.00
1 < Q^2_reco < 100 (GeV/c)^2
ep @ 10x100: 0.1 < D^0 z < 0.3
ep @ 10x100: 0.3 < D^0 z < 0.5
ep @ 10x100: 0.5 < D^0 z < 1.0
M_πK (GeV/c^2)

ep: fit DIS sample

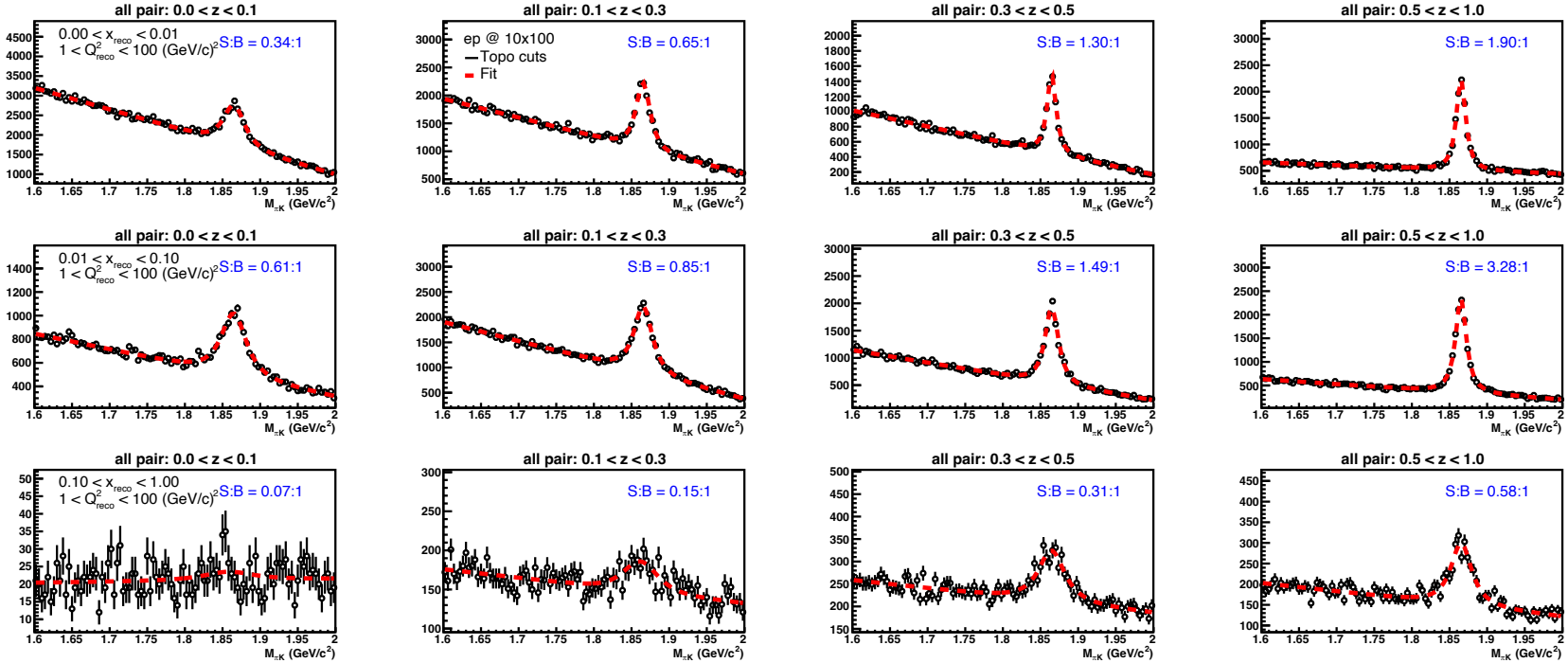


ep: fit D0+DIS sample

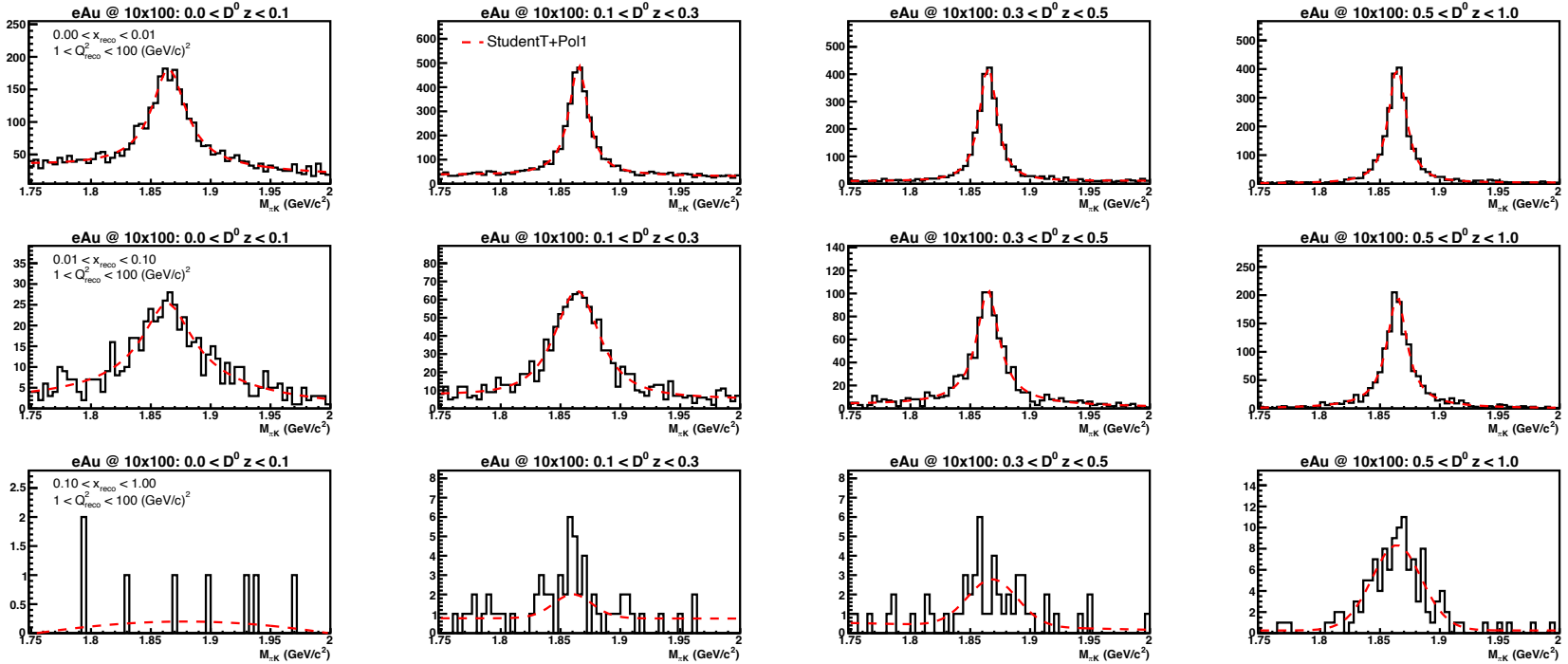


- S/B ratio within 2σ of signal peak

ep: fit D0+DIS sample with topo cuts

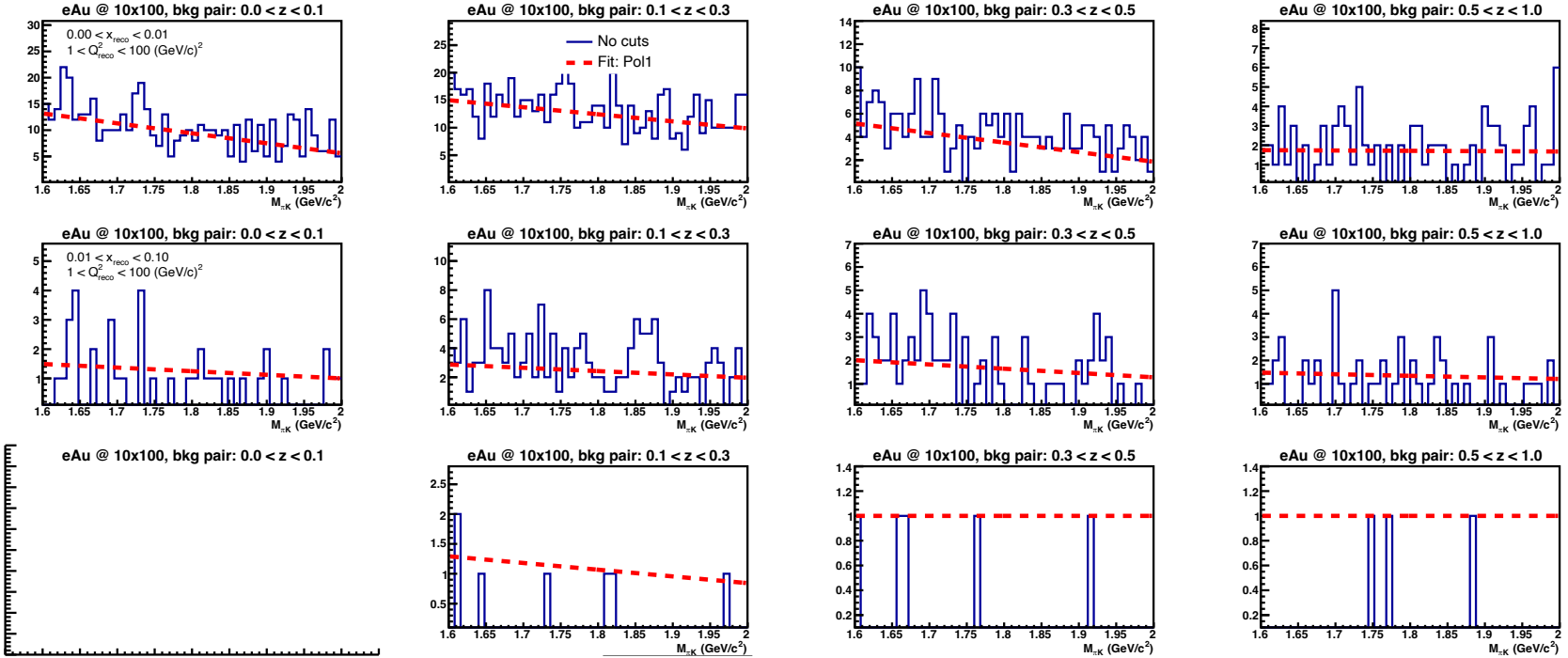


eAu: D0 sample



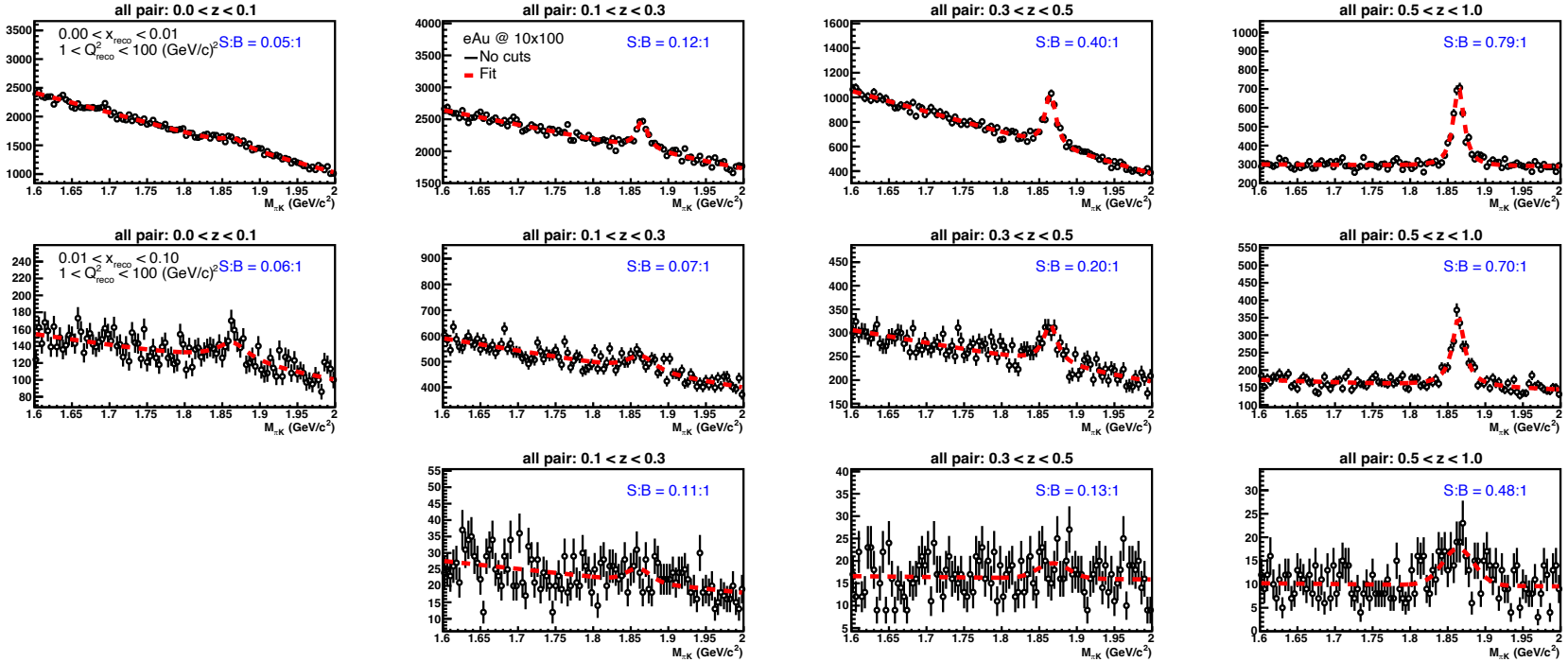
- Need more statistics

eAu: fit DIS sample



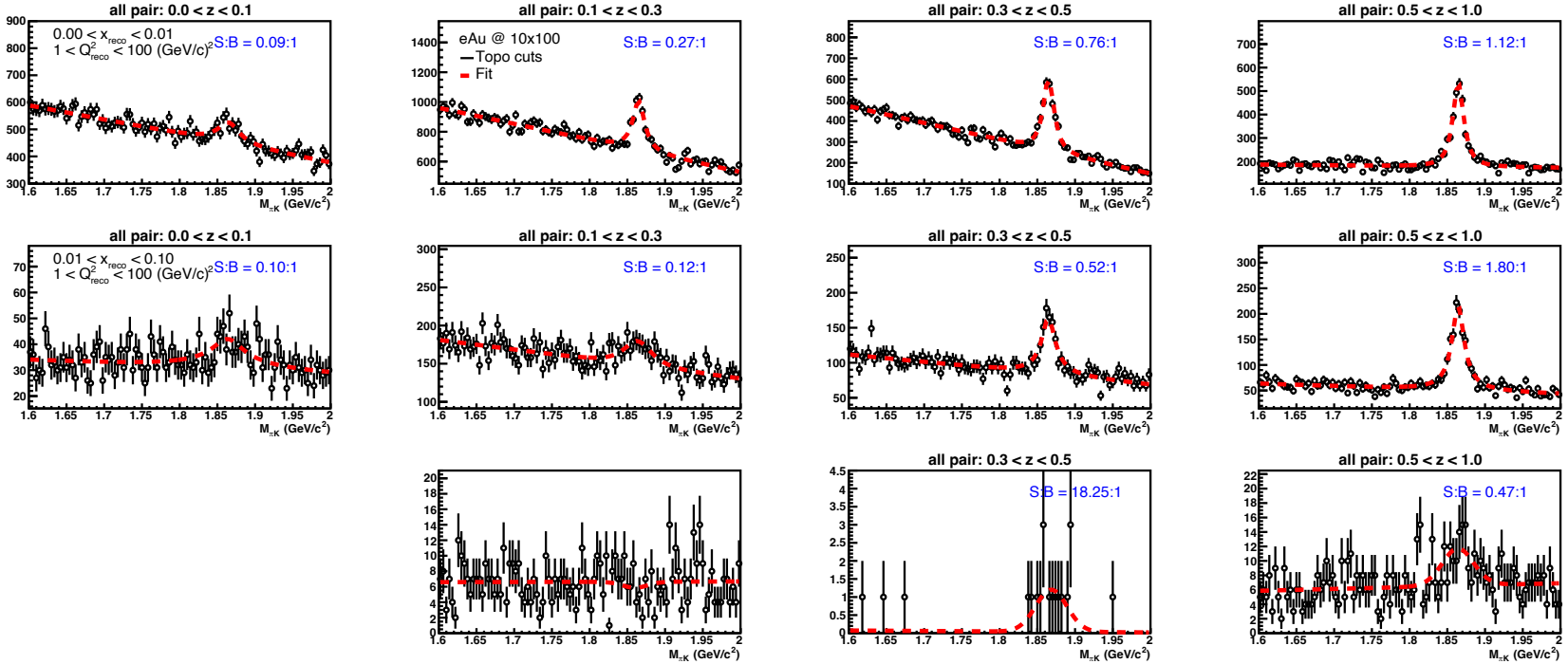
- Need more statistics

eAu: fit D0+DIS sample



- S/B ratio within 2σ of signal peak

eAu: fit D0+DIS sample with topo cuts



Projection: D^0 R_{eAu} statistical error