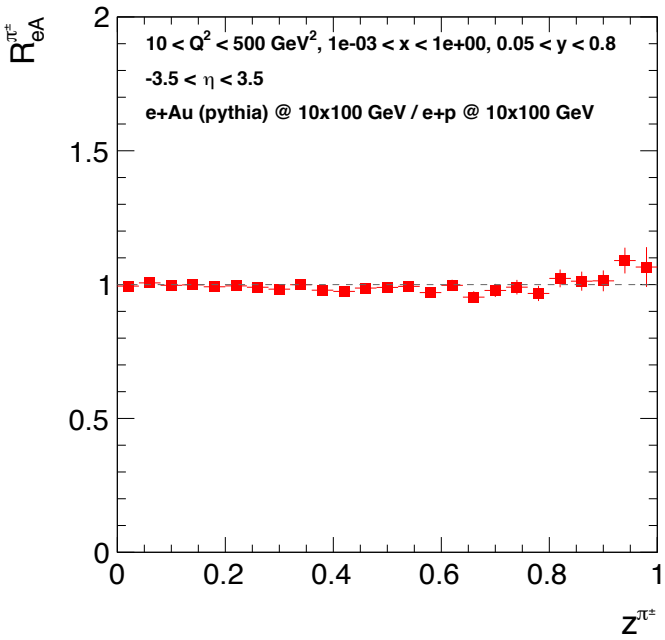
Revisiting the definition of multiplicity ratio and z

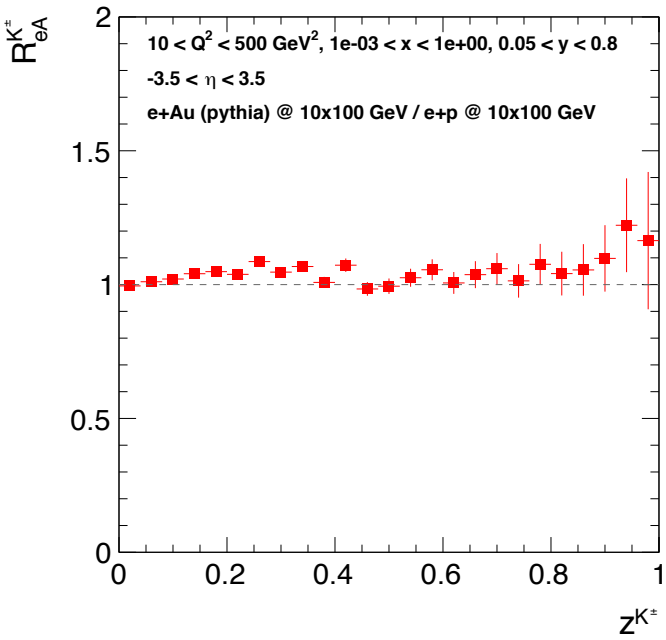
- Minimize intial state effect with double ratio
  - Works well for light flavor hadrons

$$R_{eA}(x, Q^2, z) = \frac{\left(\frac{N^h(x,Q^2,z)}{N^e(x,Q^2)}\right)_{e+A}}{\left(\frac{N^h(x,Q^2,z)}{N^e(x,Q^2)}\right)_{e+p}} = \frac{\frac{N^h(x,Q^2,z)_{e+A}}{N^h(x,Q^2,z)_{e+p}}}{\frac{N^e(x,Q^2)_{e+A}}{N^e(x,Q^2)_{e+p}}}$$

Fractional energy of the final state hadron z: $z = \frac{P\cdot p}{P\cdot q} \overset{\text{lab}}{=} \frac{E_h}{\nu}$

Cancel out nPDF effect

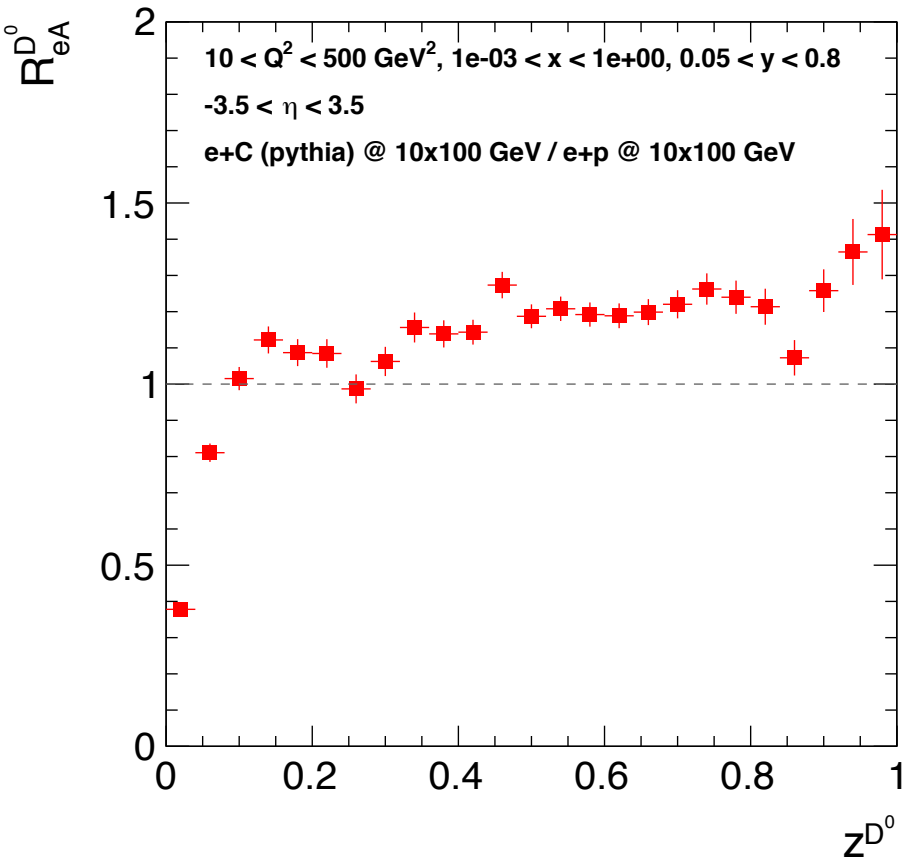


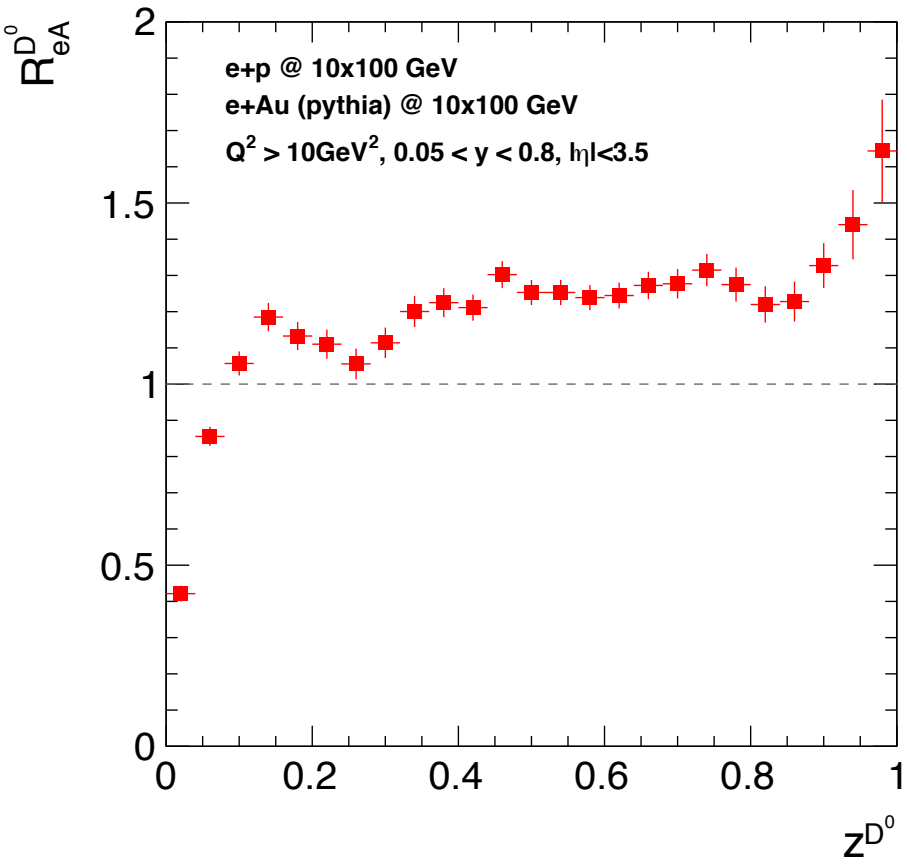


Works well for light hadrons

nPDF for different nuclei

- Minimize intial state effect with double ratio
  - Works well for light flavor hadrons
  - Does not work as well for charm hadrons
  - eC vs eAu: different effect from different nuclei nPDF

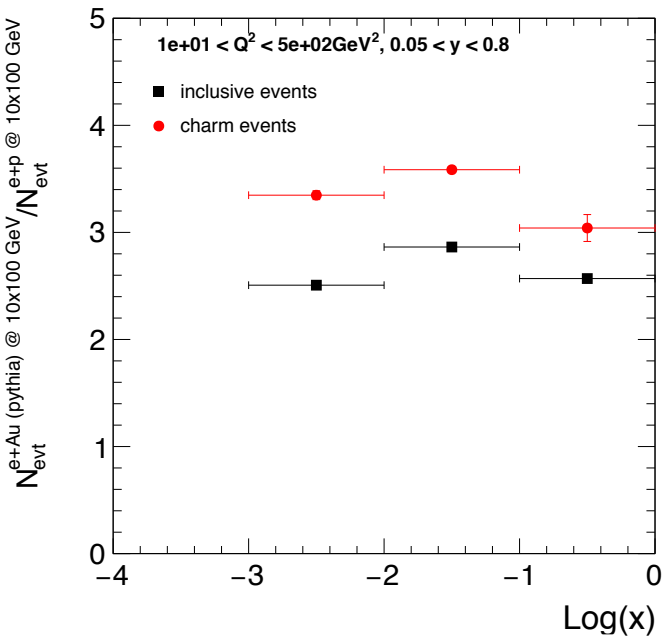


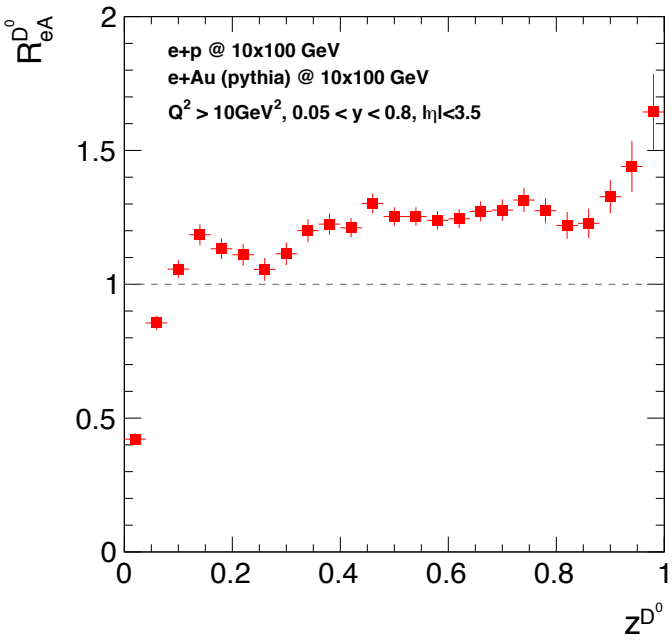


Revisiting the definition of multiplicity ratio and z

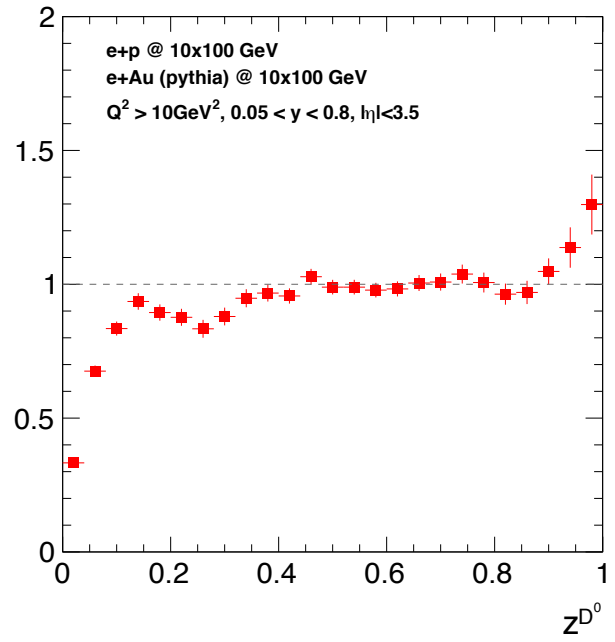
- Minimize intial state effect with double ratio
  - nPDF has different effect on inclusive DIS cross section and charm cross section

$$R_{eA}(x, Q^2, z) = \frac{\left(\frac{N^h(x,Q^2,z)}{N^e(x,Q^2)}\right)_{e+A}}{\left(\frac{N^h(x,Q^2,z)}{N^e(x,Q^2)}\right)_{e+p}} = \frac{\frac{N^h(x,Q^2,z)_{e+A}}{N^h(x,Q^2,z)_{e+p}}}{\frac{N^e(x,Q^2)_{e+A}}{N^e(x,Q^2)_{e+p}}}$$





Replacing N_{DIS} by N_{charm}



BeAGLE e+Au

- Using new normalization for charm hadrons
  - Tunring Intra-Nuclear Cascade (INC) on and off