(n)FFs for the Yellow Report

Work in progress

YR Sidis meeting
April 5

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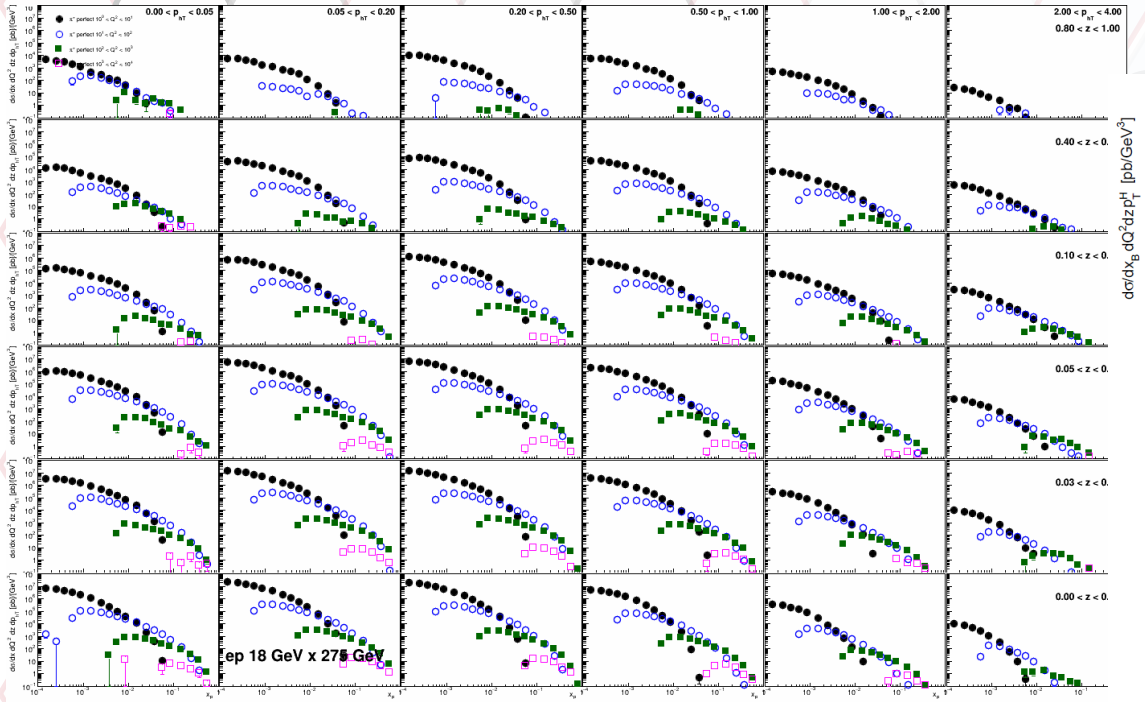
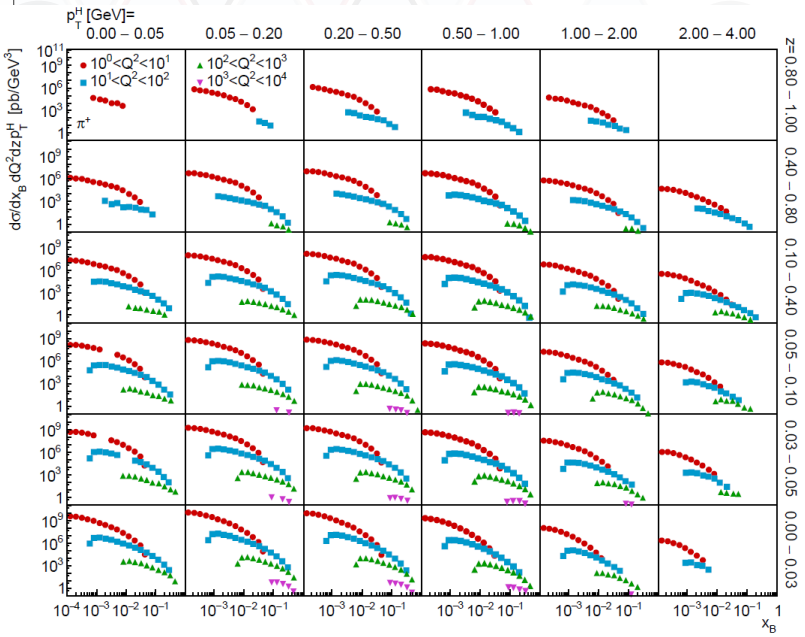
Analysis status

- Closely followed Charlotte et al. analysis (*PRD* 99 (2019), 094004) calculating expected ep, eAu and eD cross sections as a function of x,z,pt,Q^2 and impact on unpolarized PDFs and FFs based on Pythia
- Prepared simulations (using pythiaeRHIC), 20M events each (all y, Q^2>0.8, MSEL 2) :
  - ep 18 GeV x 275 GeV, ep 18 GeV x 100 GeV, ep 10 GeV x 100 GeV, ep 5 GeV x 100 GeV,
  - eAu 18 GeV x 100 GeV, eAu 10 GeV x 100 GeV, eAu 5 GeV x 41 GeV,
  - en 18 GeV x 100 GeV, en 10 GeV x 100 GeV, en 5 GeV x 41 GeV (eD obtained via merging ep and en)
- Smearing output (using eic-smear and Beast configuration), also added PID ranges from paper
- DIS cuts: $Q^2 > 1GeV^2$, $0.01 < y < 0.95$, $W^2 > 10\ GeV^2$

Comparison at sqrt(s)=141 GeV (18 x 275)

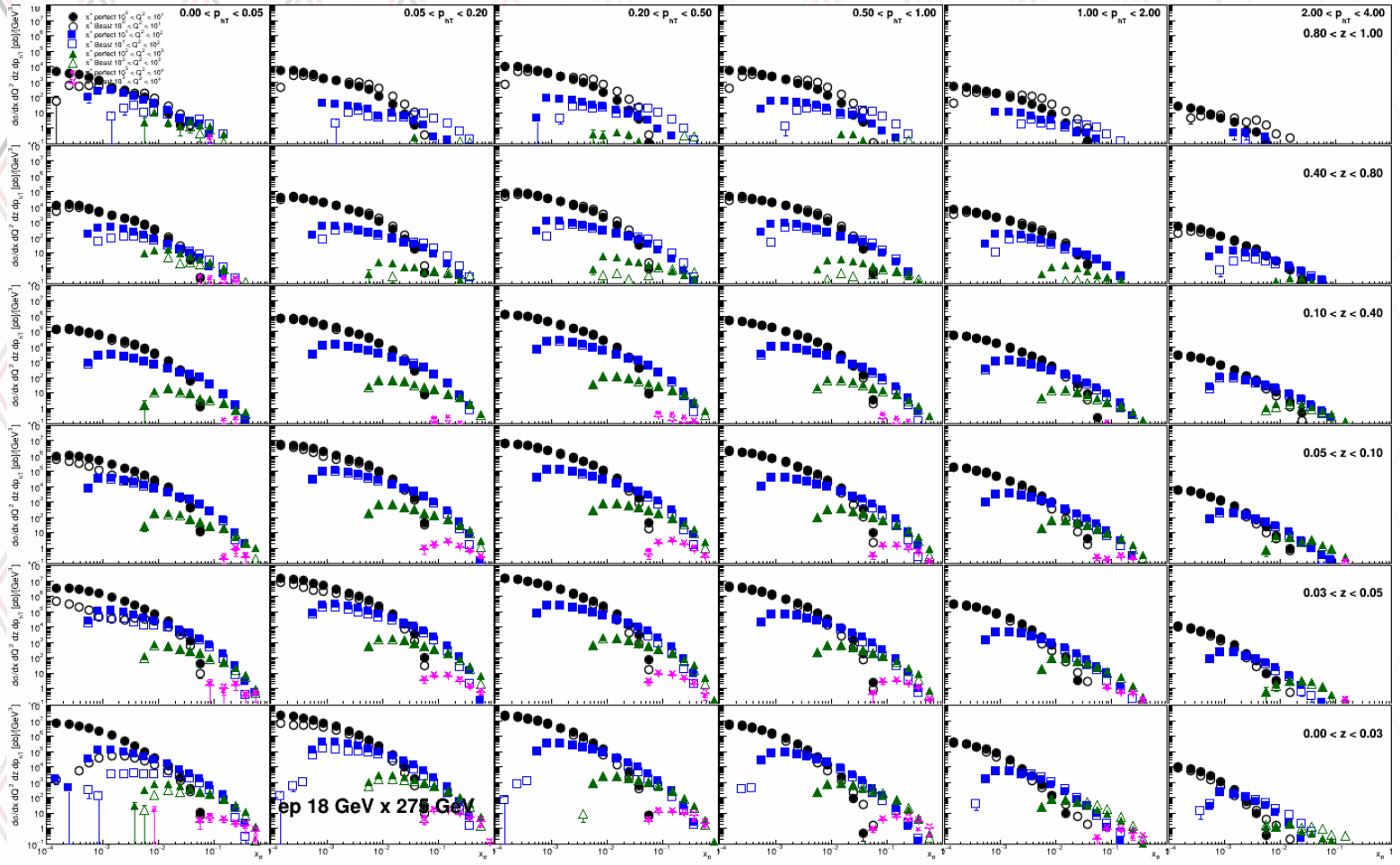




Including smearing at sqrt(s)=141 GeV (18 x 275)

Full symbols: perfect detector, perfect PID

Open symbols: Beast, PID ranges from paper

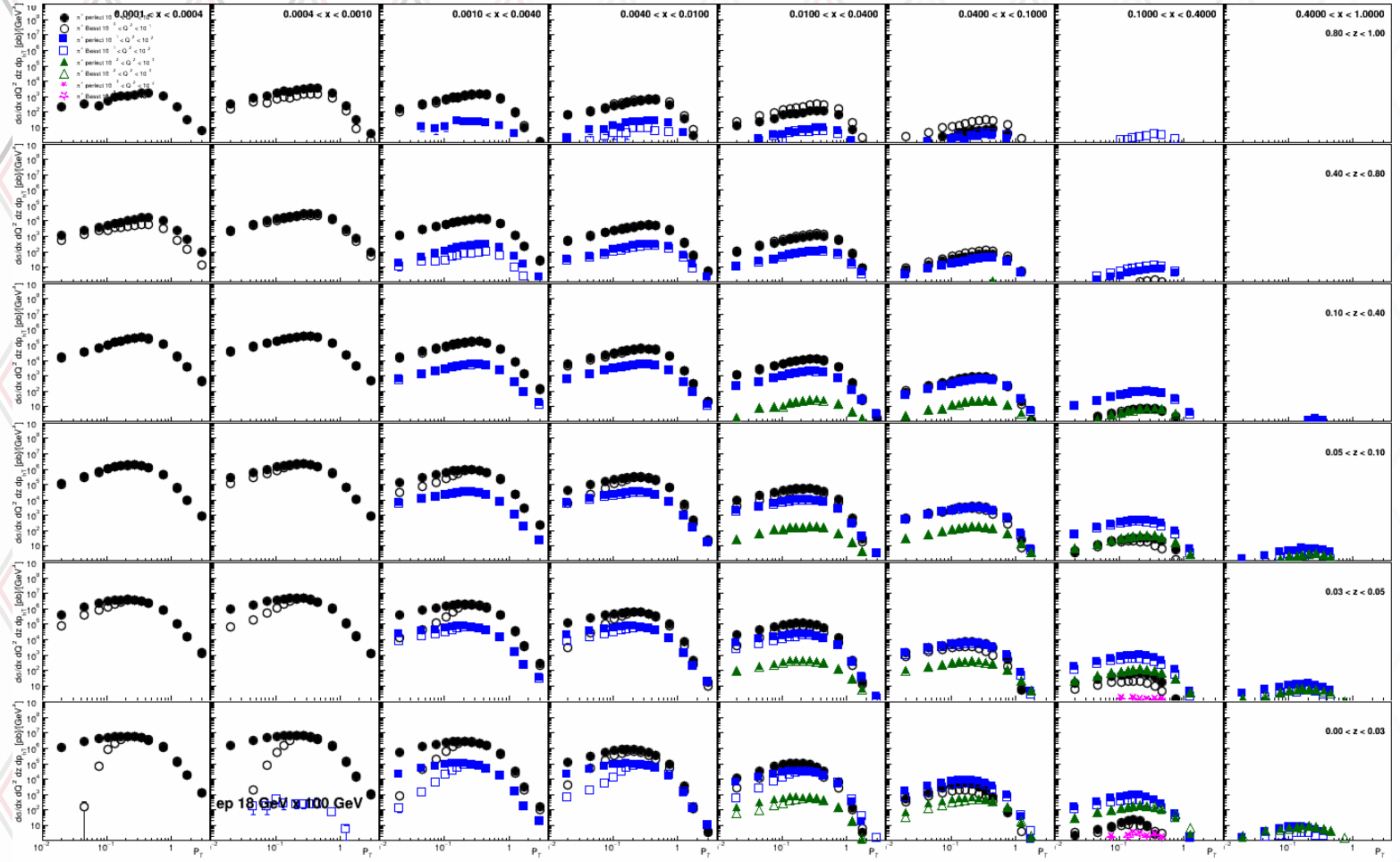


Pt distributions at sqrt(s)=85 GeV (18 x 100)

Full symbols: perfect detector, perfect PID

Open symbols: Beast, PID ranges from paper

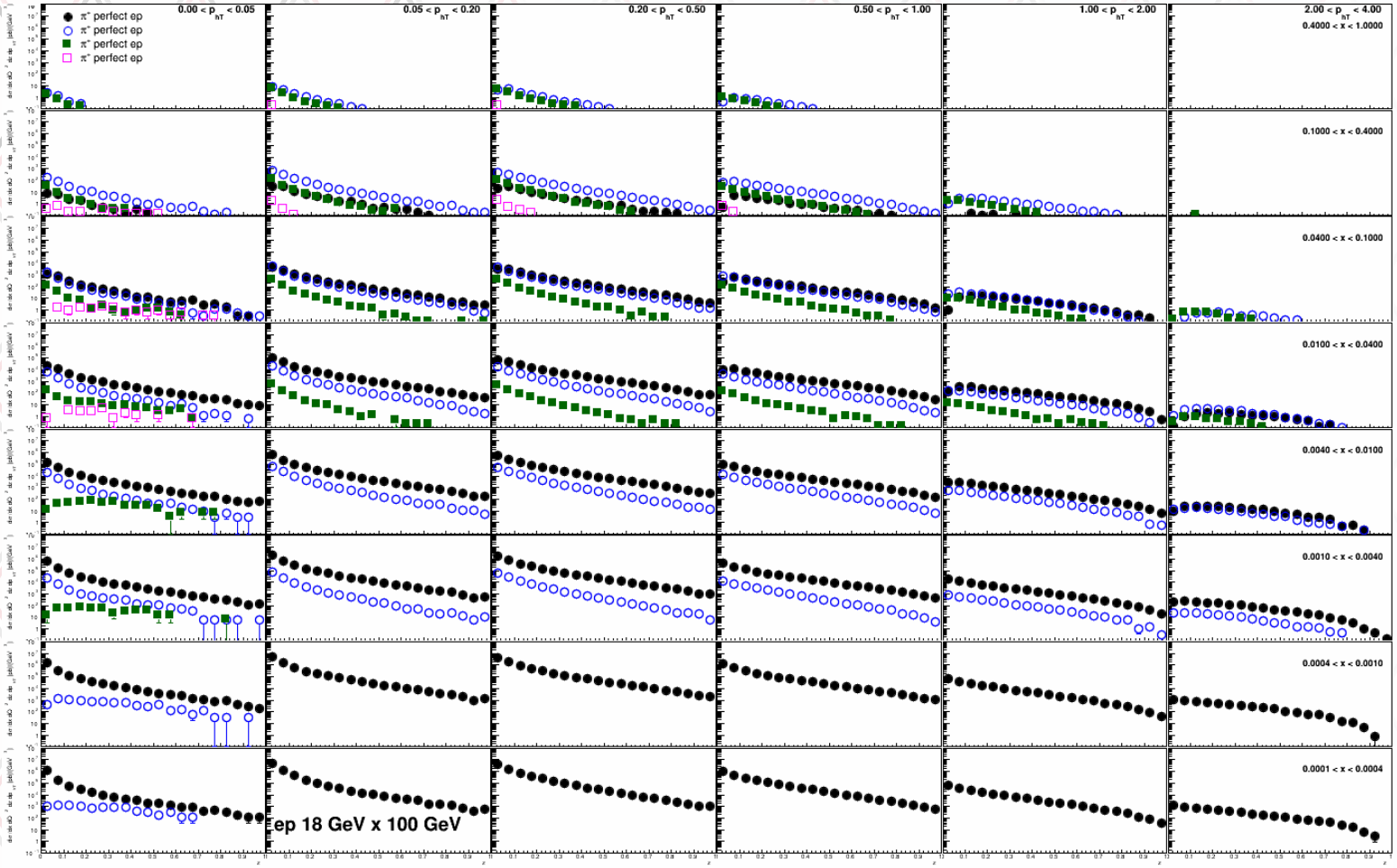
x



z

P_{hT}

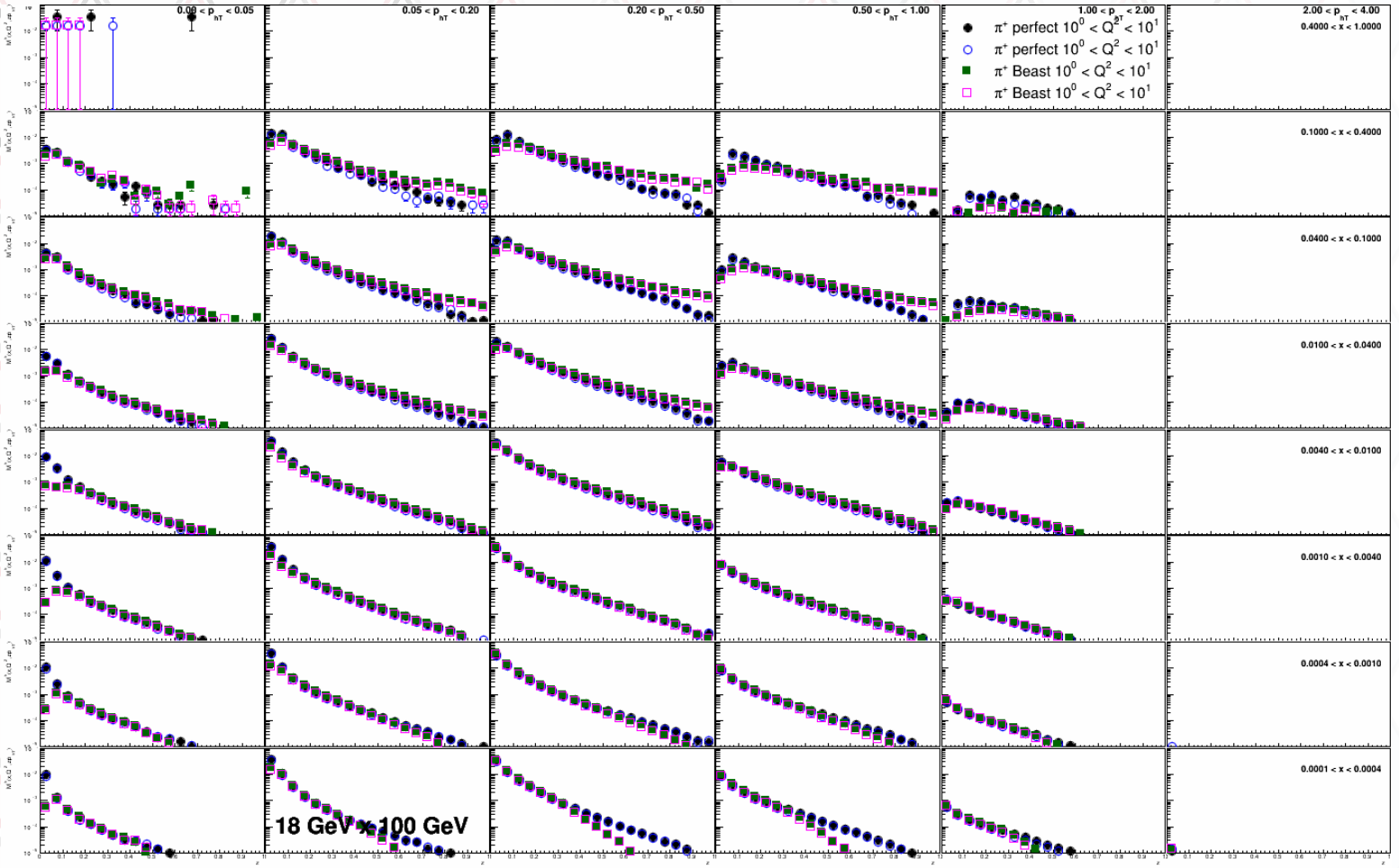
Z distributions at sqrt(s)=85 GeV (18 x 100)



Multiplicities (one Q^2 bin, eD and eAu)

Full symbols: eD

Open symbols: eAu

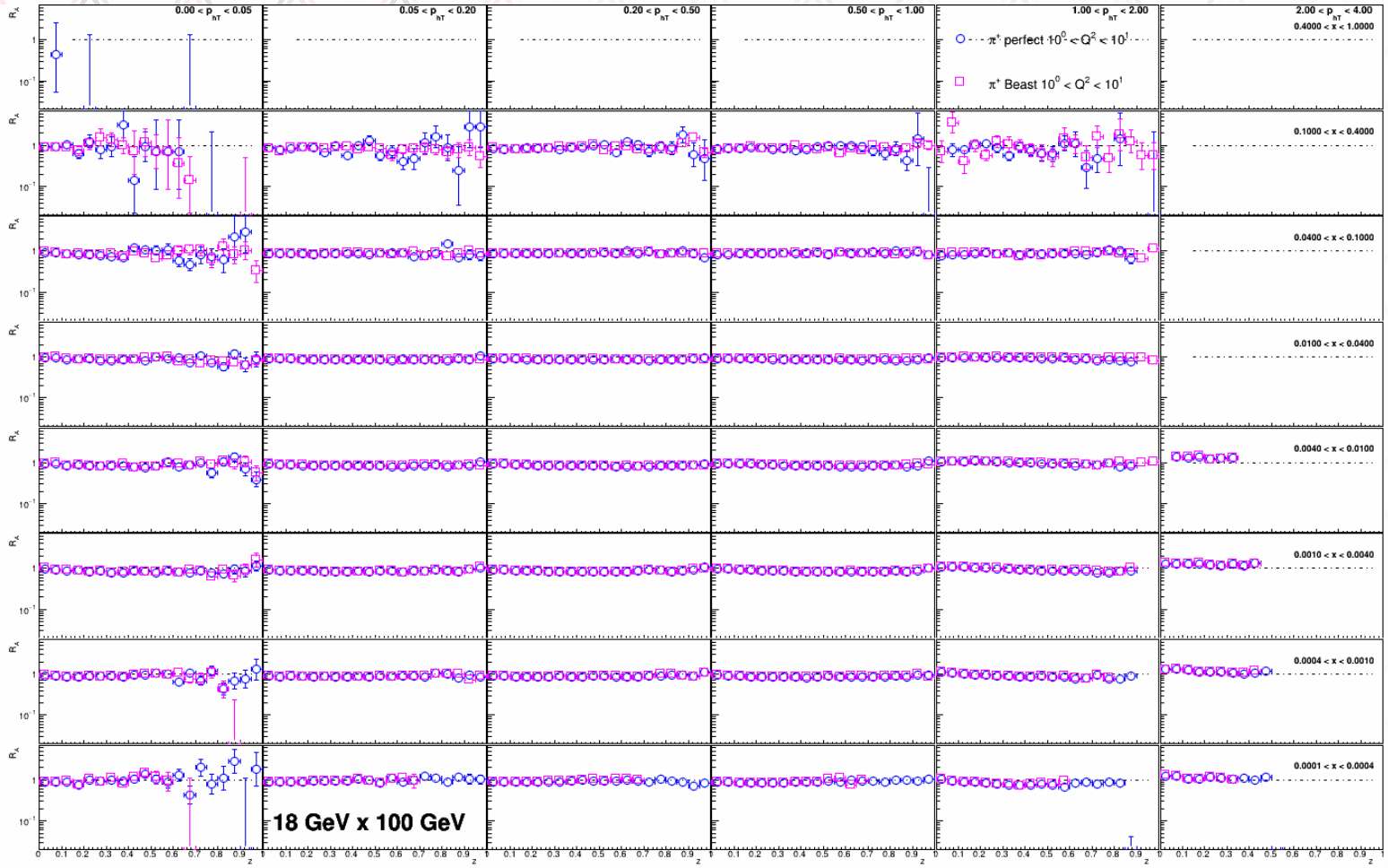


P_{hT}

x

z

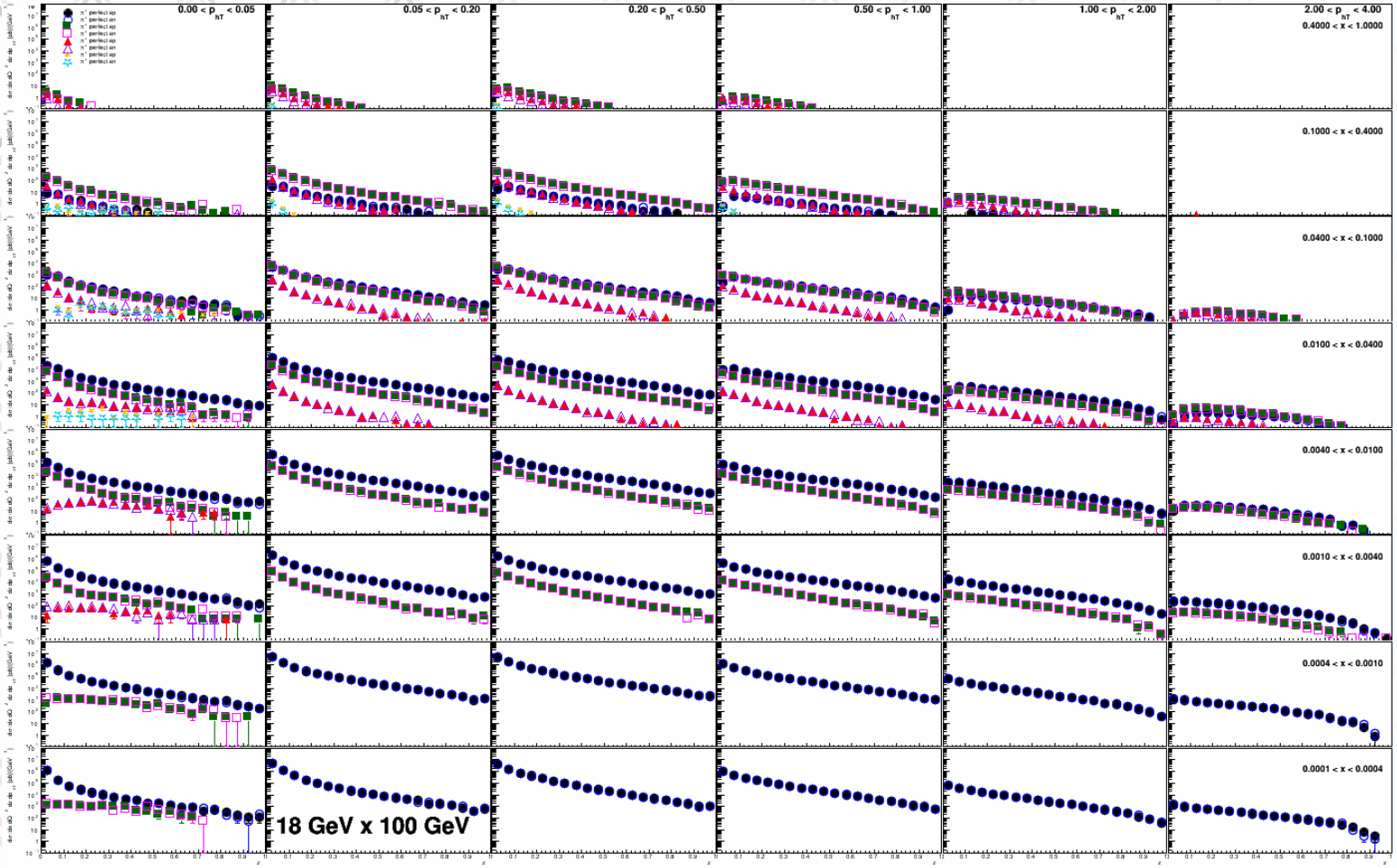
Multiplicity ratios for eAu (to eD, one Q^2 bin)



Next steps

- Closely check output, add nu dependence
- Provide results to (n)FF fitters
- Investigate, how the detector configurations, PID acceptances, etc affect the cross sections and global fits

Proton – neutron comparison



PID ranges

rapidity	pion momentum [GeV]	kaon momentum [GeV]	proton momentum [GeV]
$-3.5 <$ rapidity < -1.0 (RICH)	$0.5 < p_H < 5.0$	$1.6 < p_H < 5.0$	$3.0 < p_H < 8.0$
$-1.5 <$ rapidity < -1.0 (dE/dx)	$0.2 < p_H < 0.6$	$0.2 < p_H < 0.6$	$0.2 < p_H < 1.0$
$-1.0 <$ rapidity < 1.0 (DIRC and dE/dx)	$0.2 < p_H < 4.0$	$0.2 < p_H < 0.7$ $0.8 < p_H < 4.0$	$0.2 < p_H < 1.1$ $1.5 < p_H < 4.0$
$1.0 <$ rapidity < 3.5 (RICH)	$0.5 < p_H < 50.0$	$1.6 < p_H < 50.0$	$3.0 < p_H < 50.0$
$1.0 <$ rapidity < 1.5 (dE/dx)	$0.2 < p_H < 0.6$	$0.2 < p_H < 0.6$	$0.2 < p_H < 1.0$