nFF
status update

Corrected for bugs and
various flavor definitions

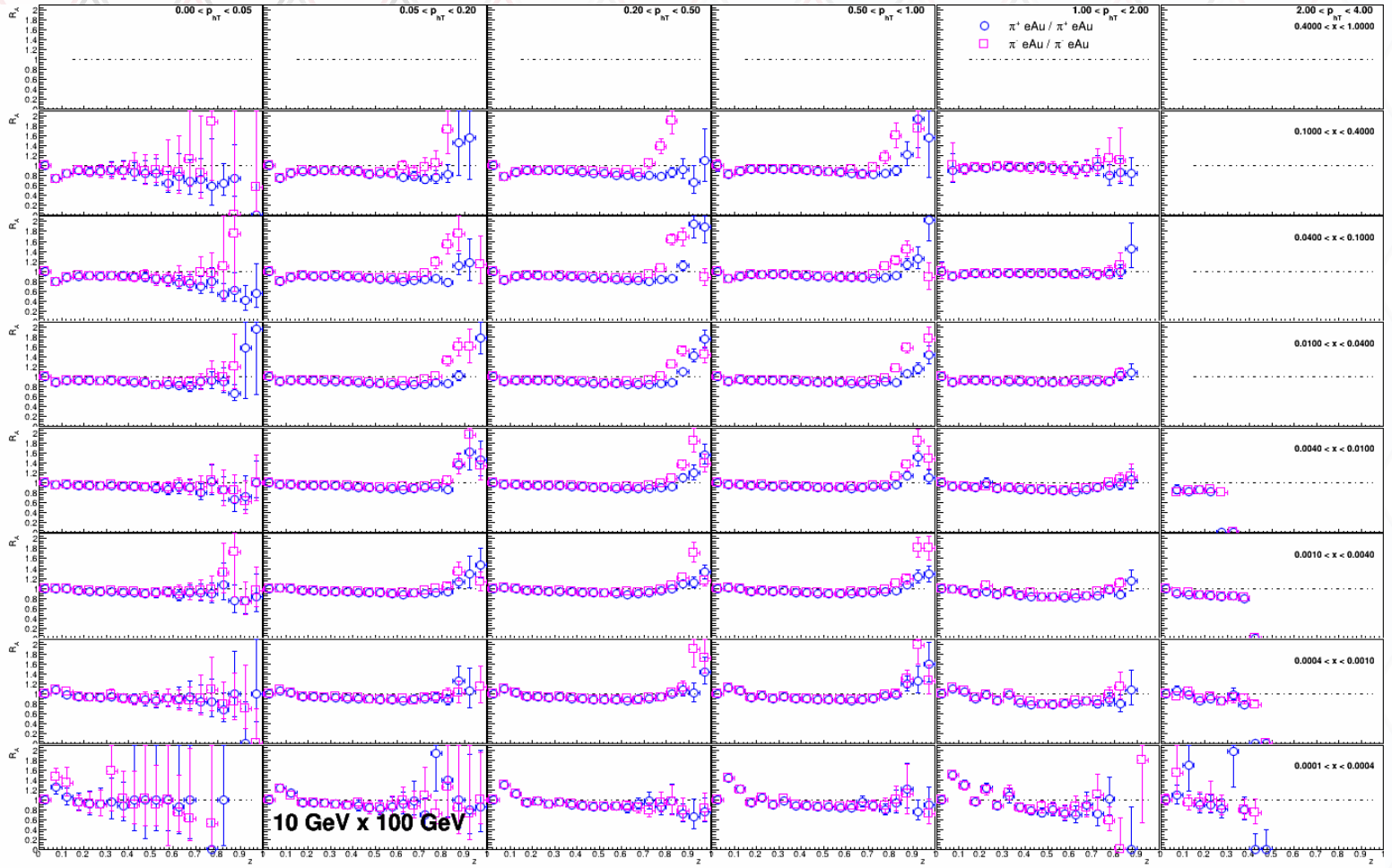
YR SIDIS sub-group meeting
April 20

Ralf Seidl (RIKEN)

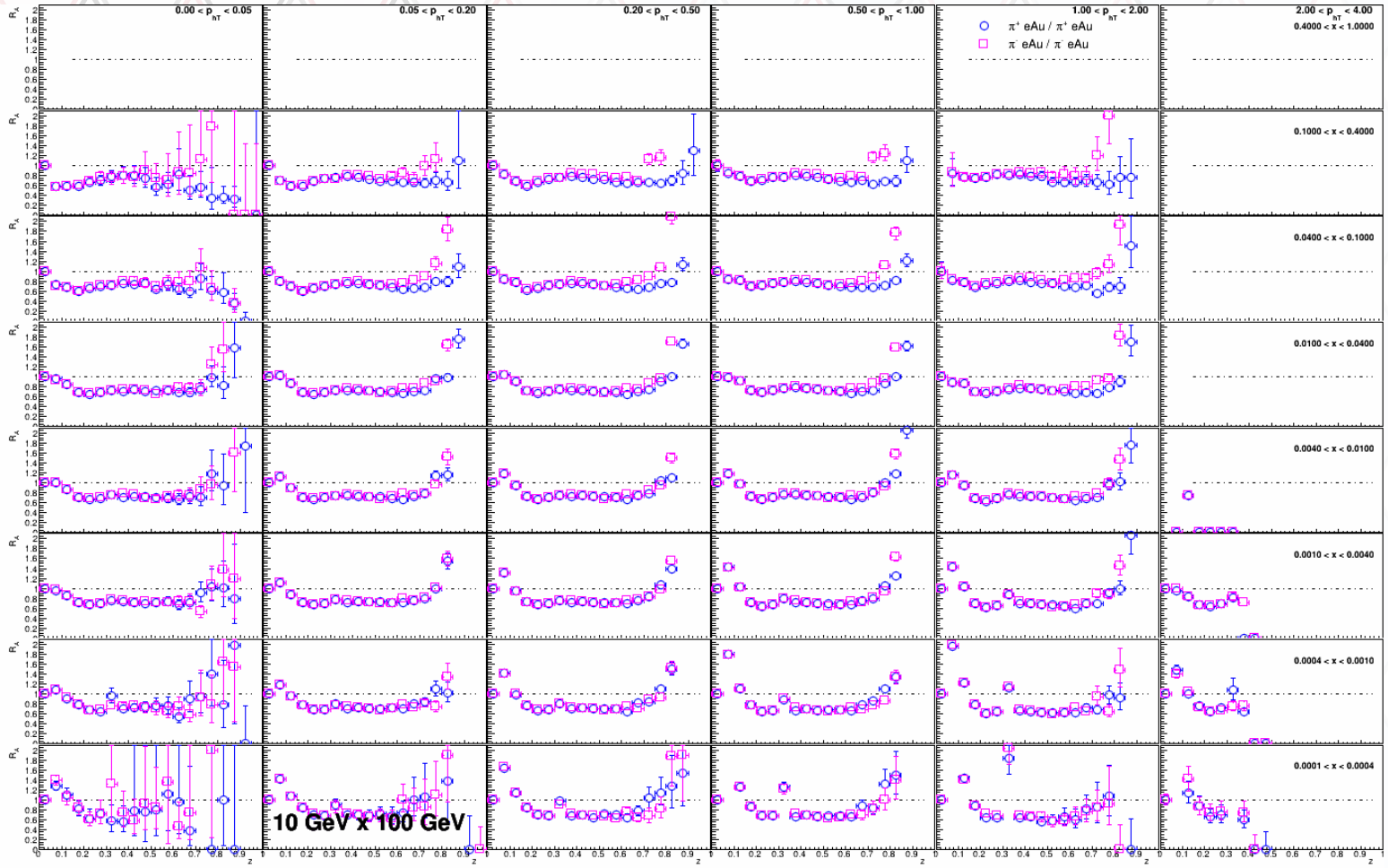
nFF reweighting

- From Pia I obtained the pion NLO grids from DSSZ and DSS including their interpolators
- Implemented calls to these fortran routines for pions in the covered z range (>0.0099) if pion got traced to a fragmenting parton in Processes 99, 131, 132, 135, 136 (now either using partons from ancestry (wrong), using parton flavor with closest angles to hadron or parton flavor and z from closest parton)
- Weighted the event with ratio of corresponding outputs, (e.g. $wgt = \frac{zD_{1,u}^{nFF}(z,Q^2)}{zD_{1,u}^{FF}(z,Q^2)}$)

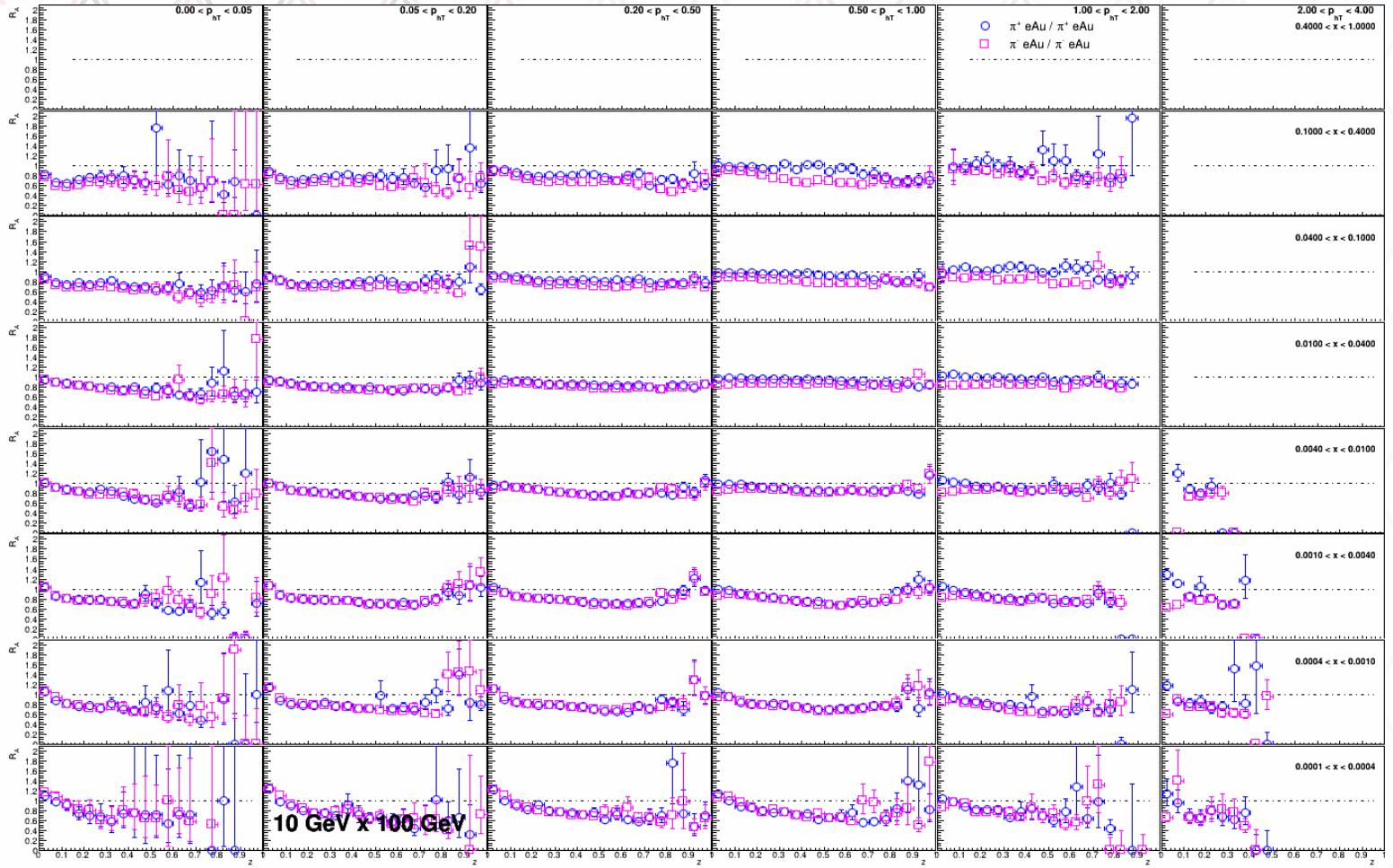
Ratios of eAu pions with reweighting over w/o



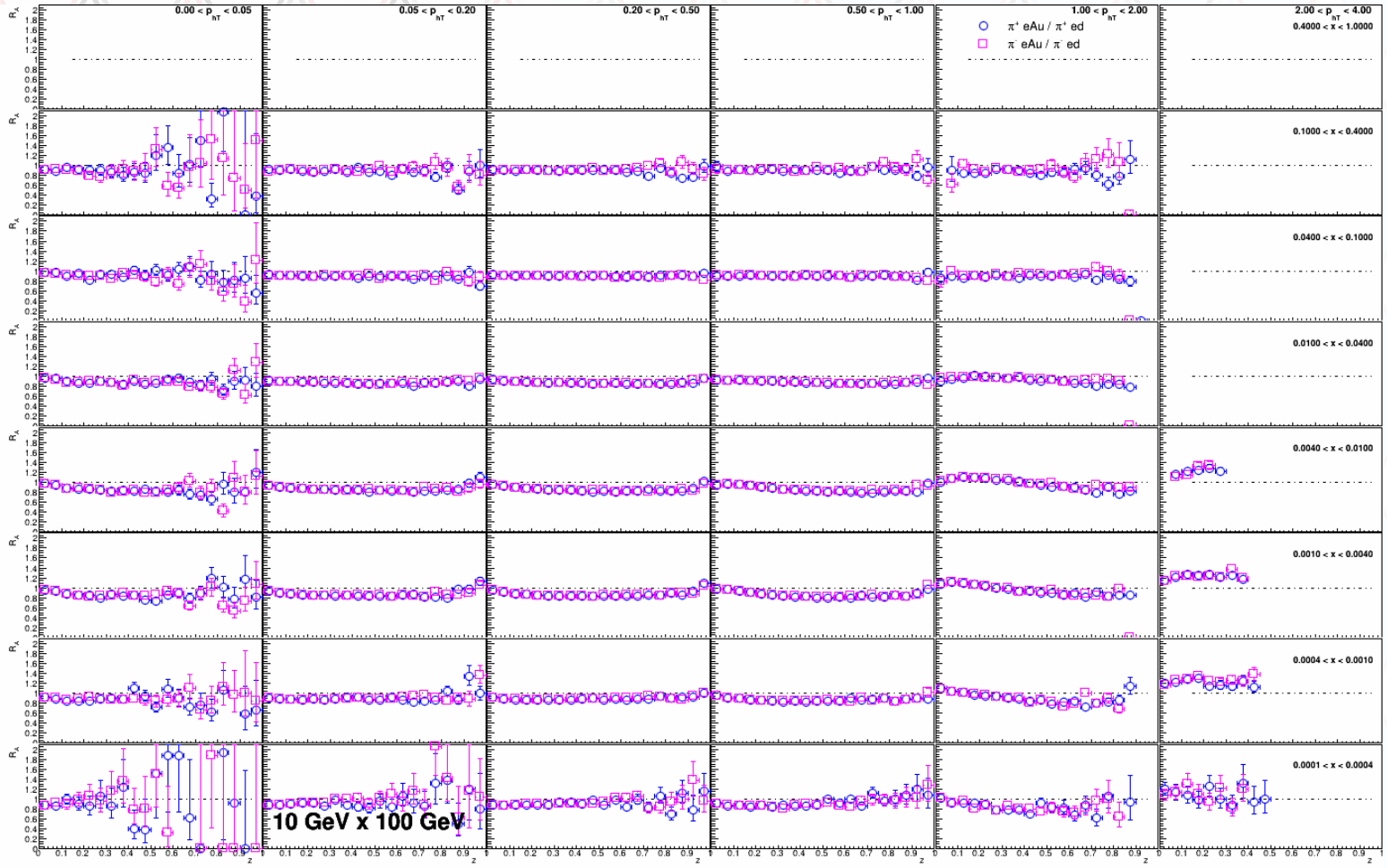
Ratios of eAu pions with reweighting over w/o (using parton from matching)



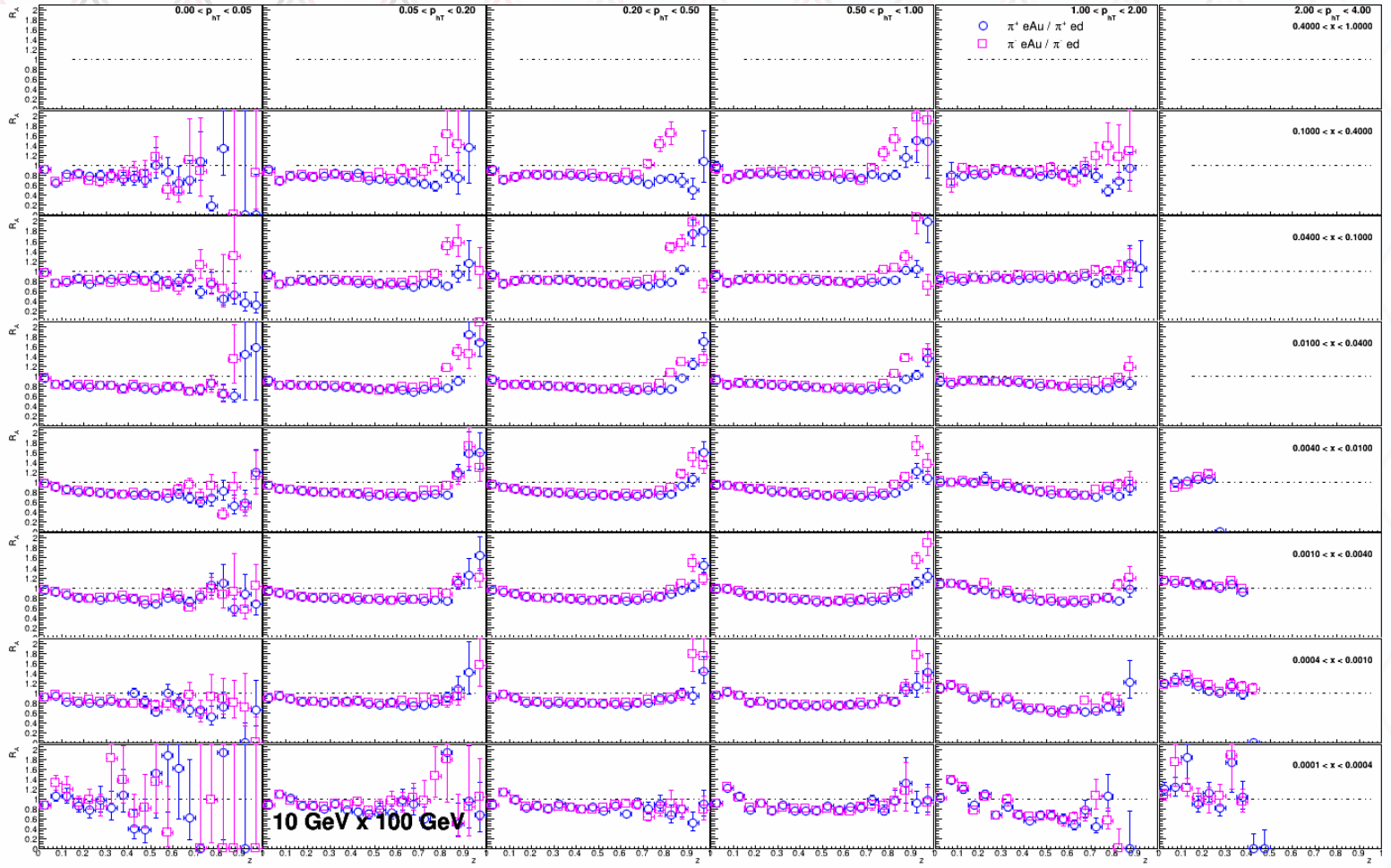
Ratios of eAu pions with reweighting over w/o (using parton and z from matching)



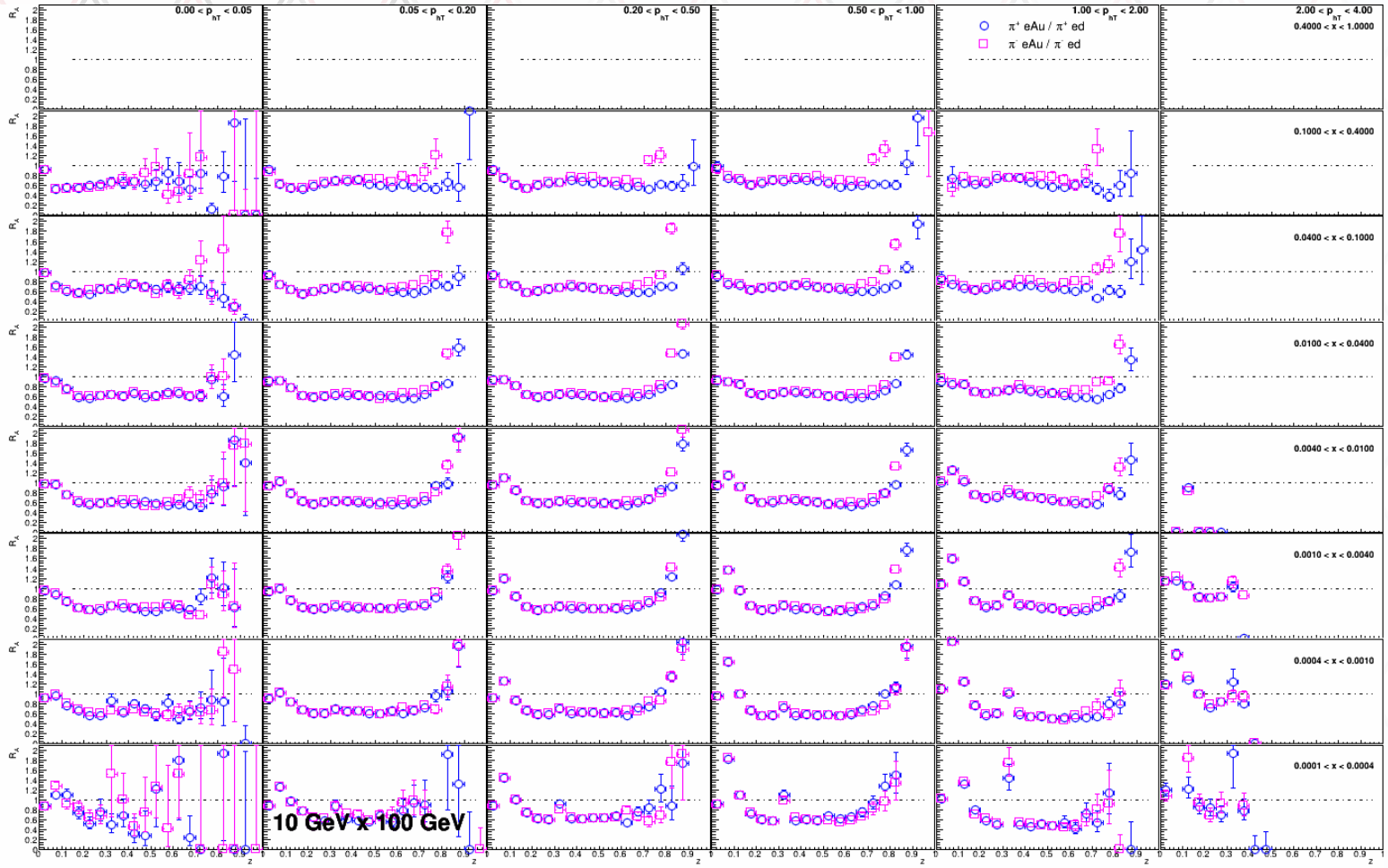
Nuclear modification w/o reweighting



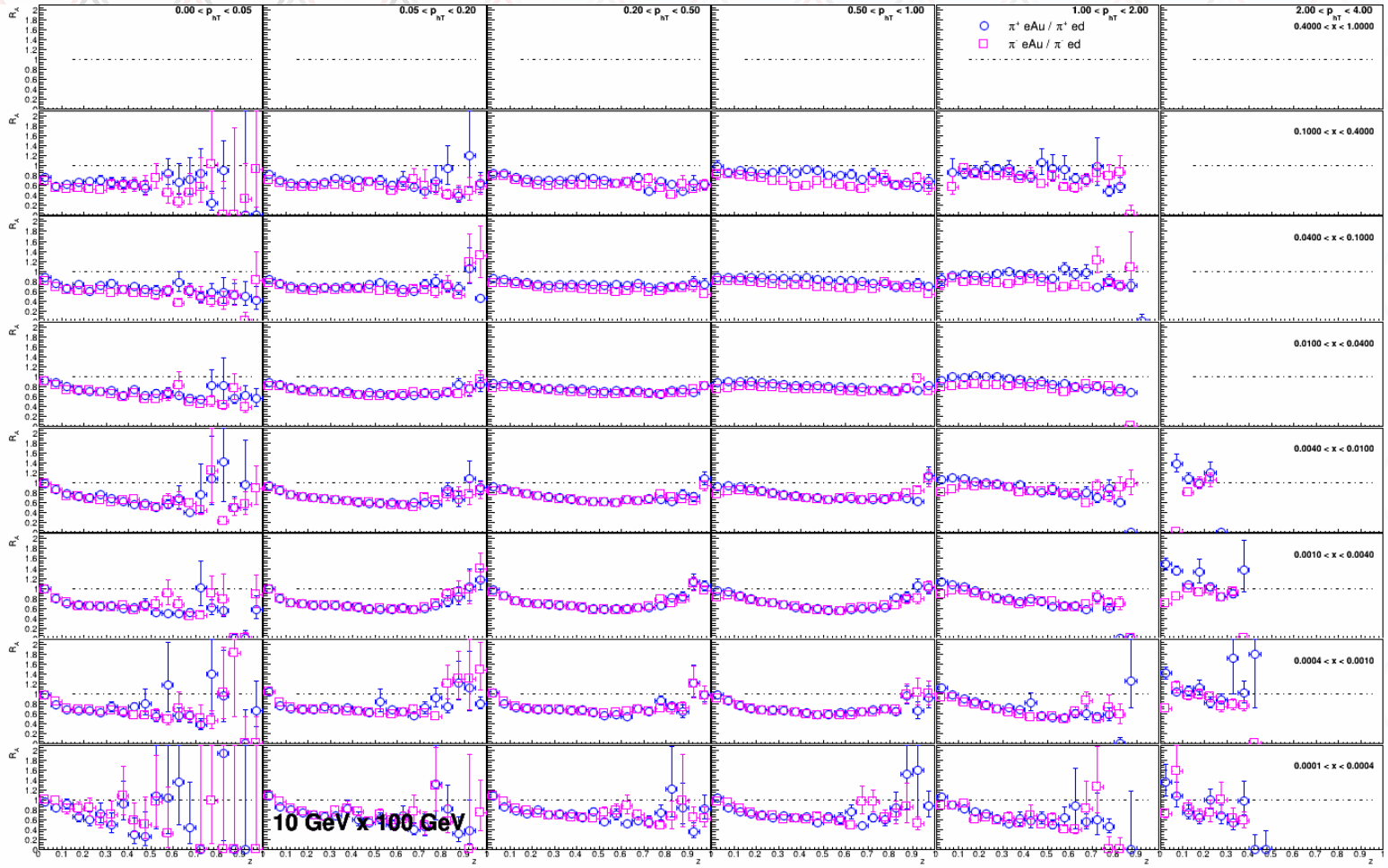
Nuclear modification w reweighting



Flavor from matching, default z



Flavor and z from matching



Comments

- Always an enhancement seen at the lowest and highest covered z bins – lowest makes sense, but highest not clear
- Interpolation from grids is rather slow

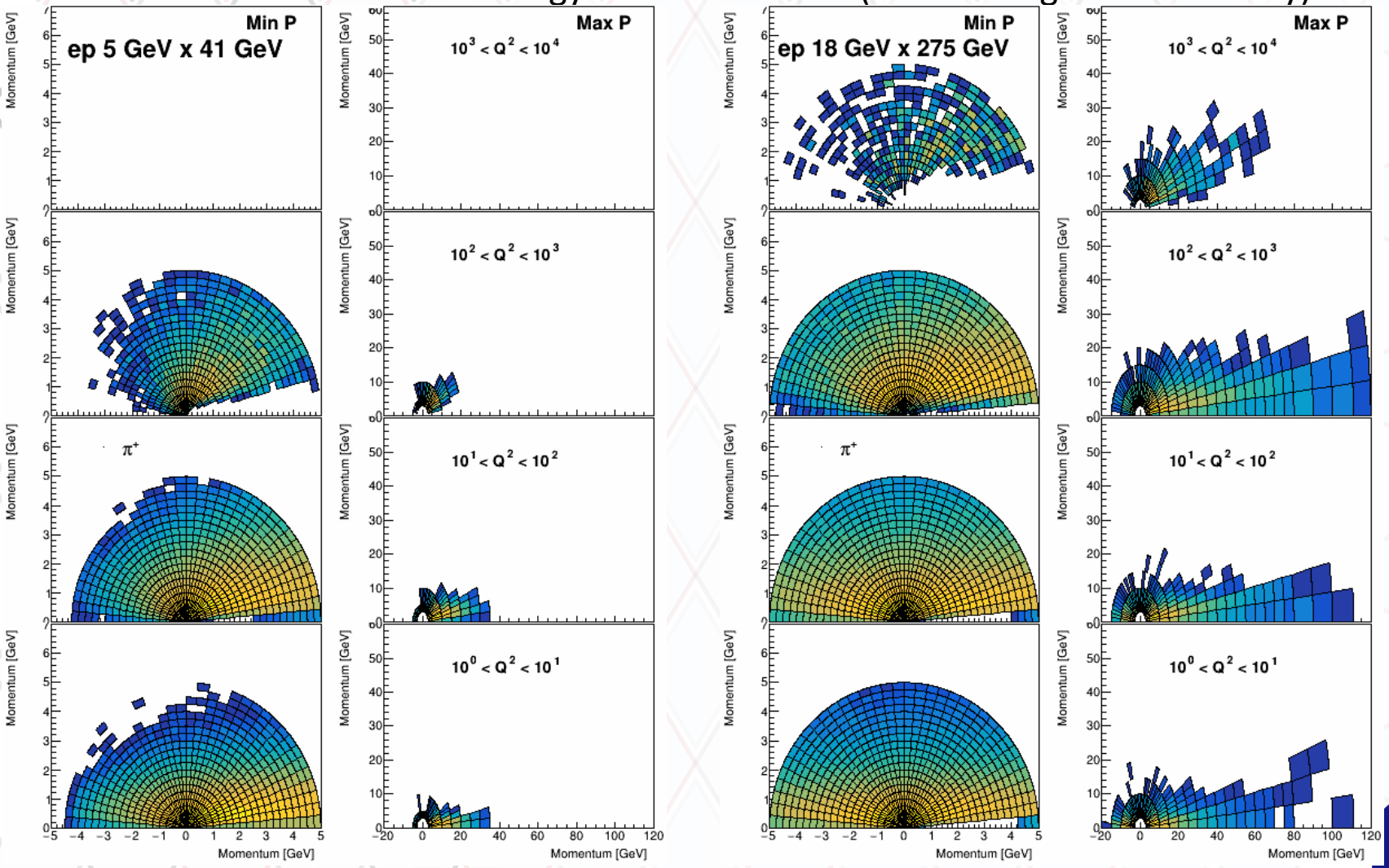
  → slowdown of analysis code by a factor of more than 10

  → Use lookup tables (95 z and 25 Q2 bins) that are filled as needed which fixed speed problem

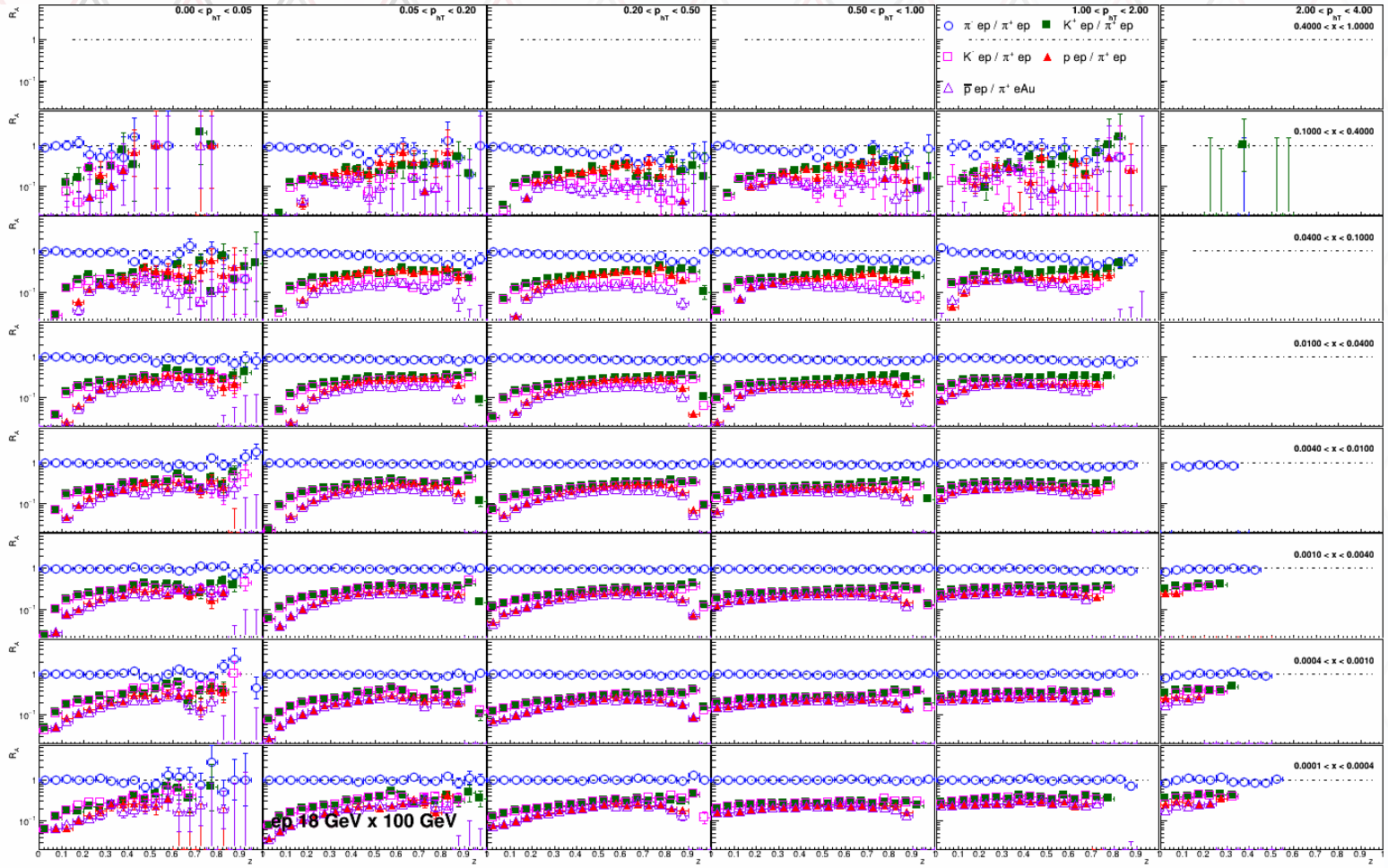
For Detector group request:

Energy ranges for SIDIS measurements (for PID detectors)

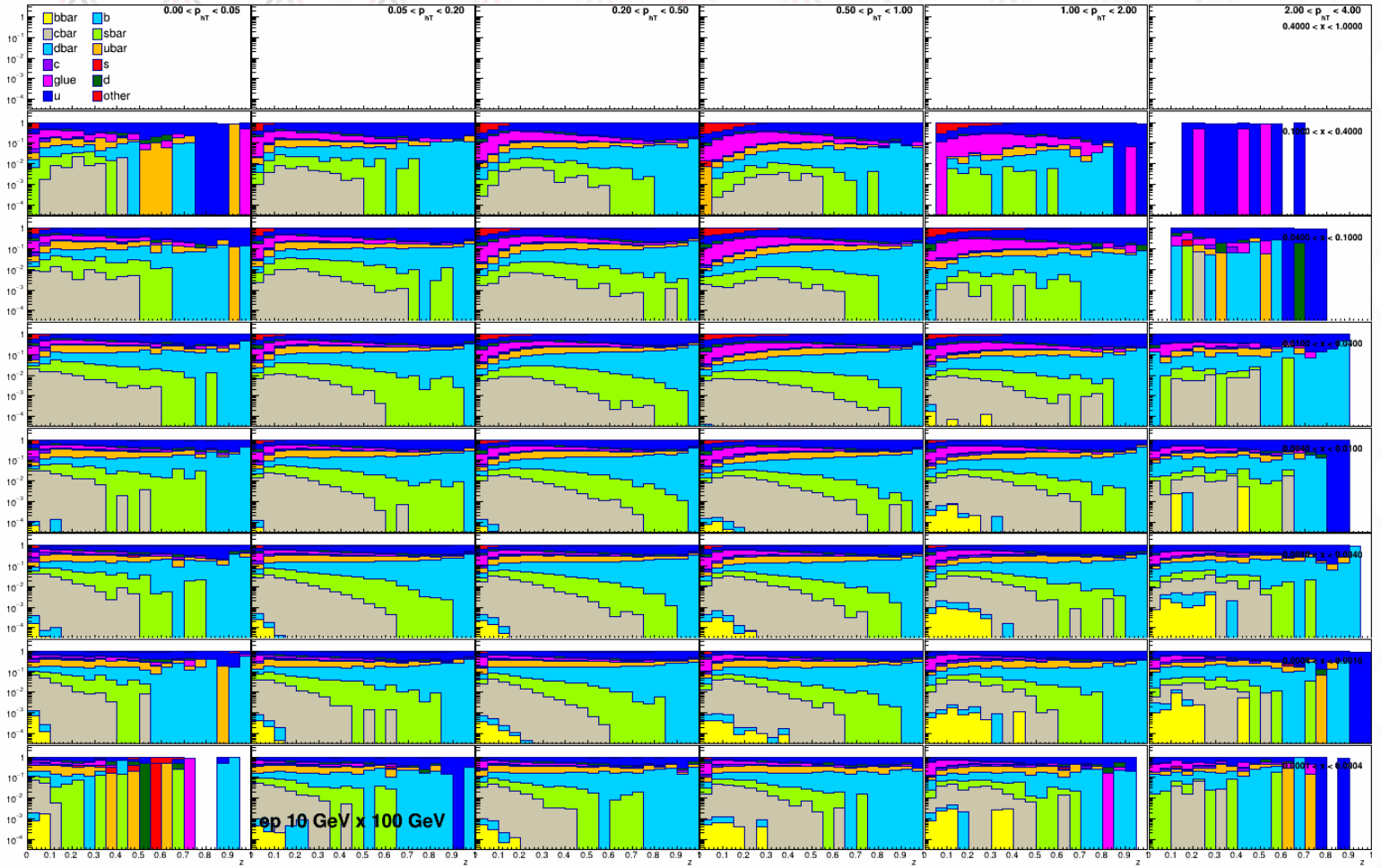
- Assume hadron fractional energy from 0.05 to 0.9 (current fragmentation only):



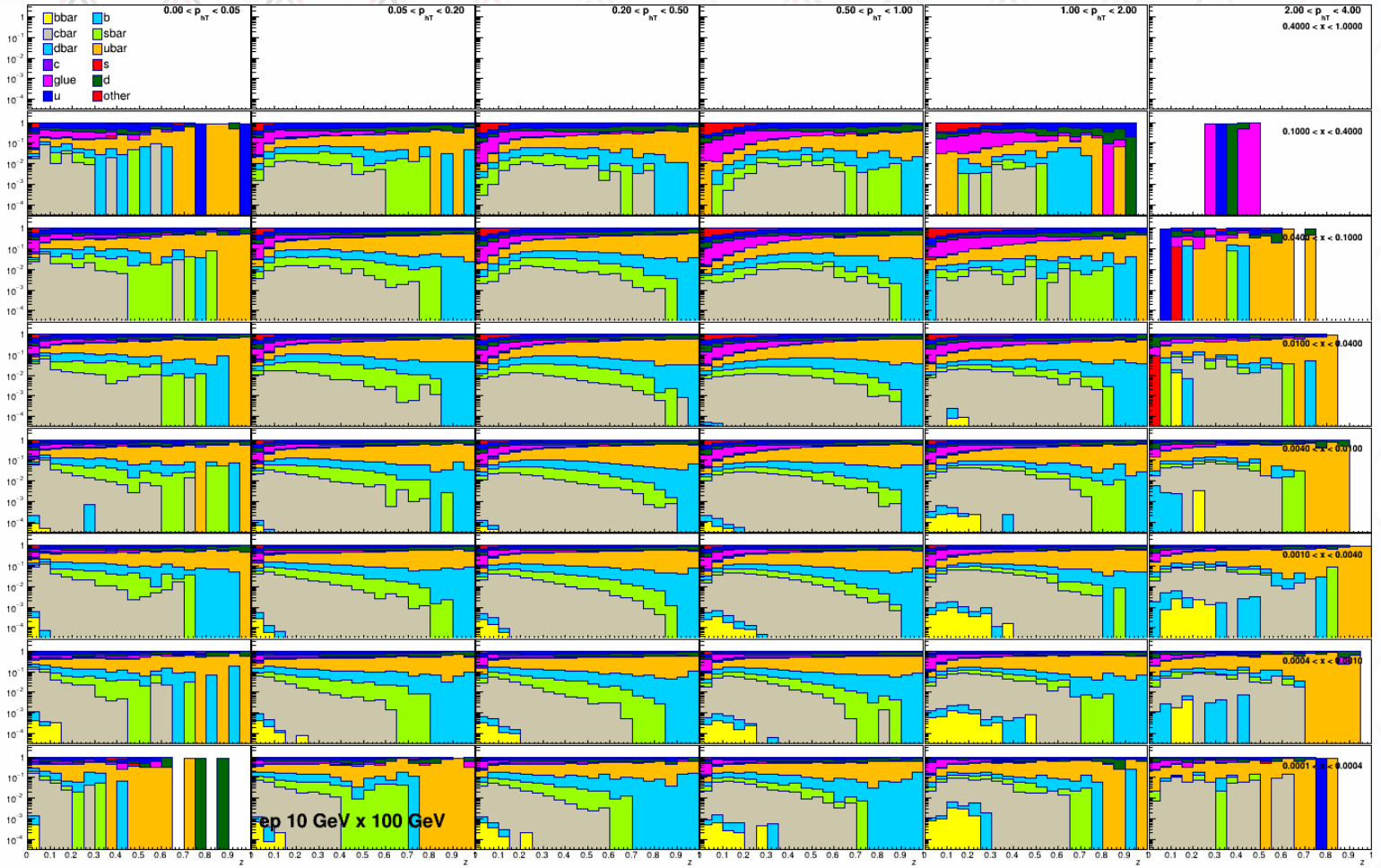
Hadron multiplicity ratios



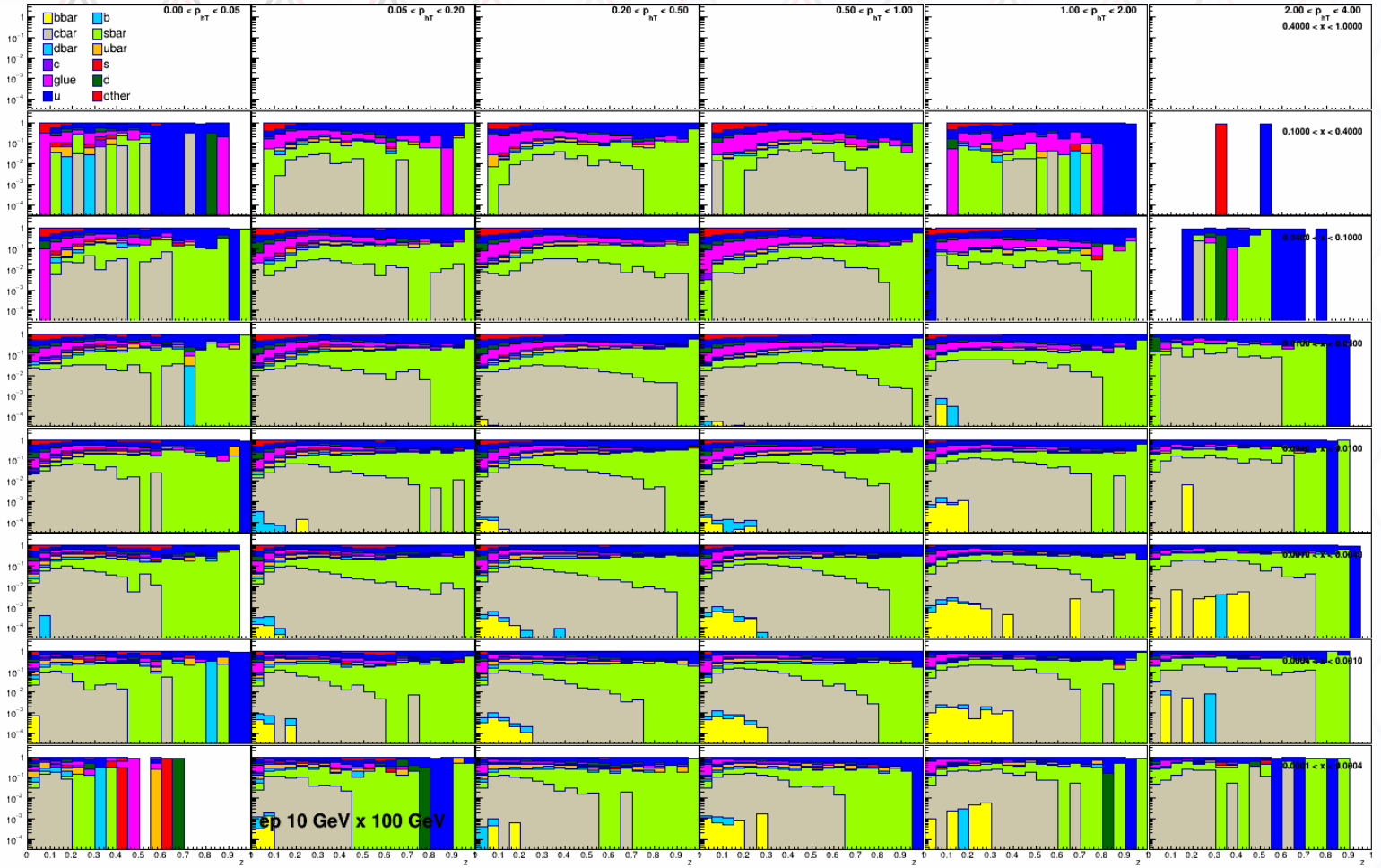
ep Fragmenting Flavor decomposition pi+



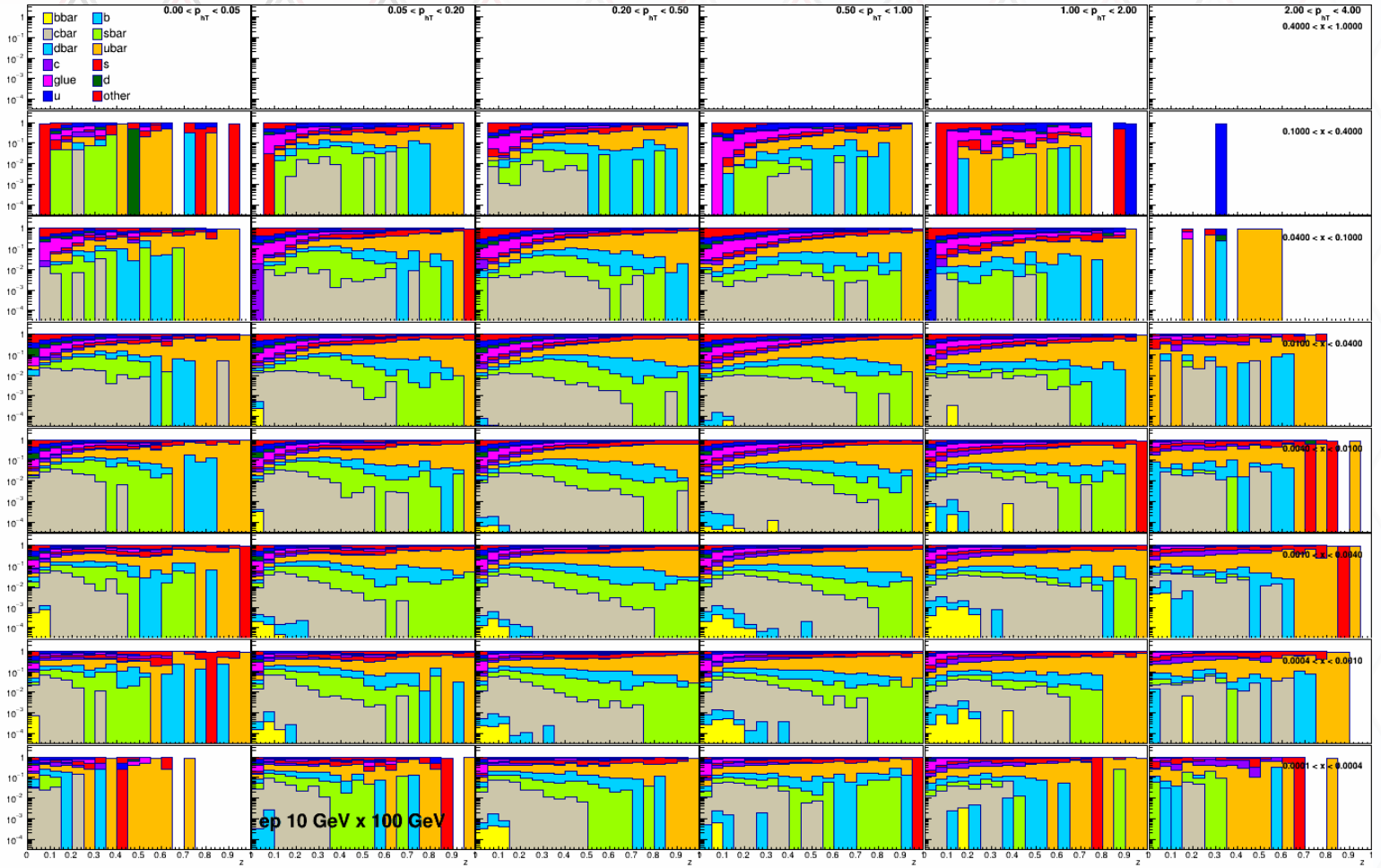
ep for pi-



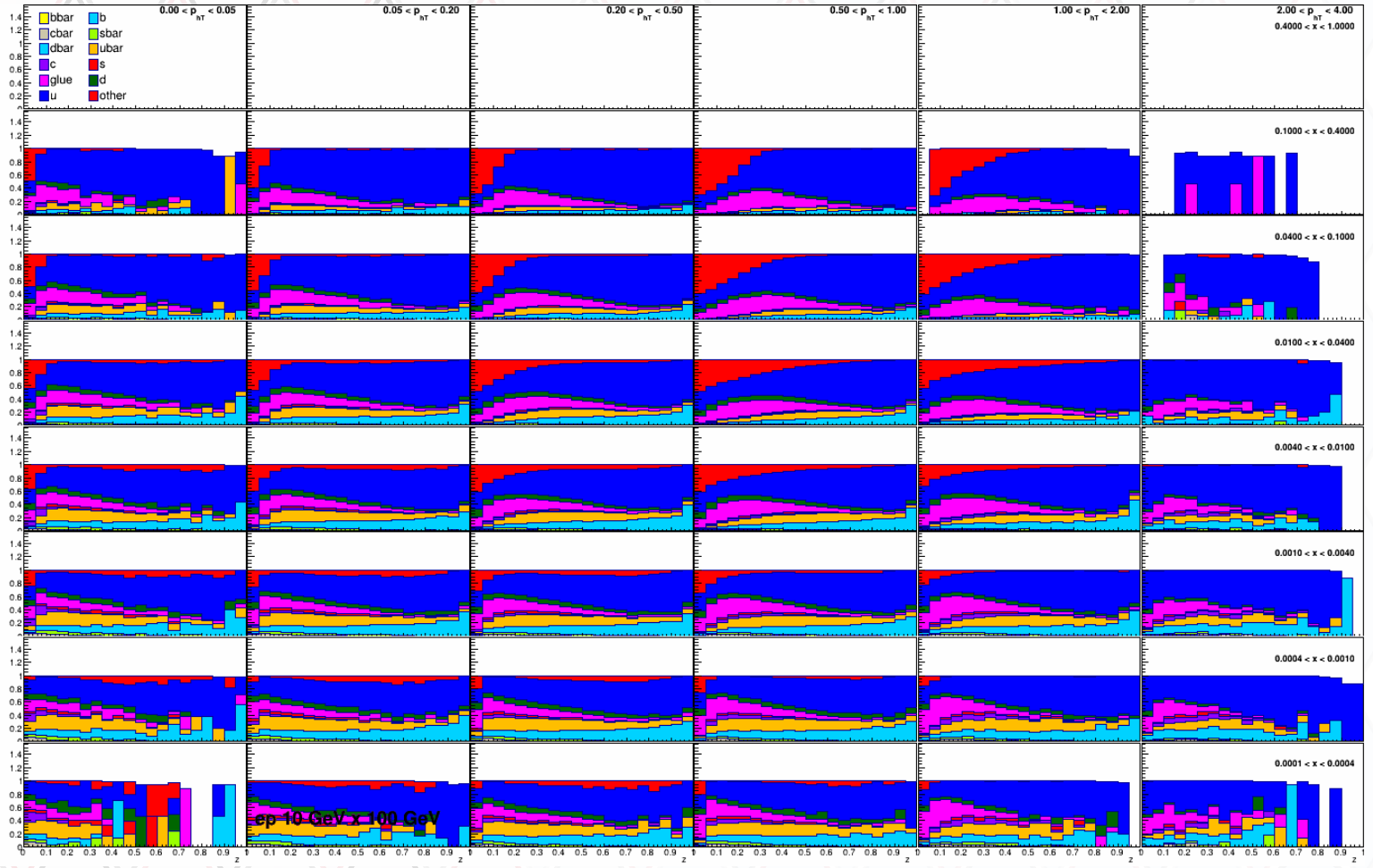
For K+



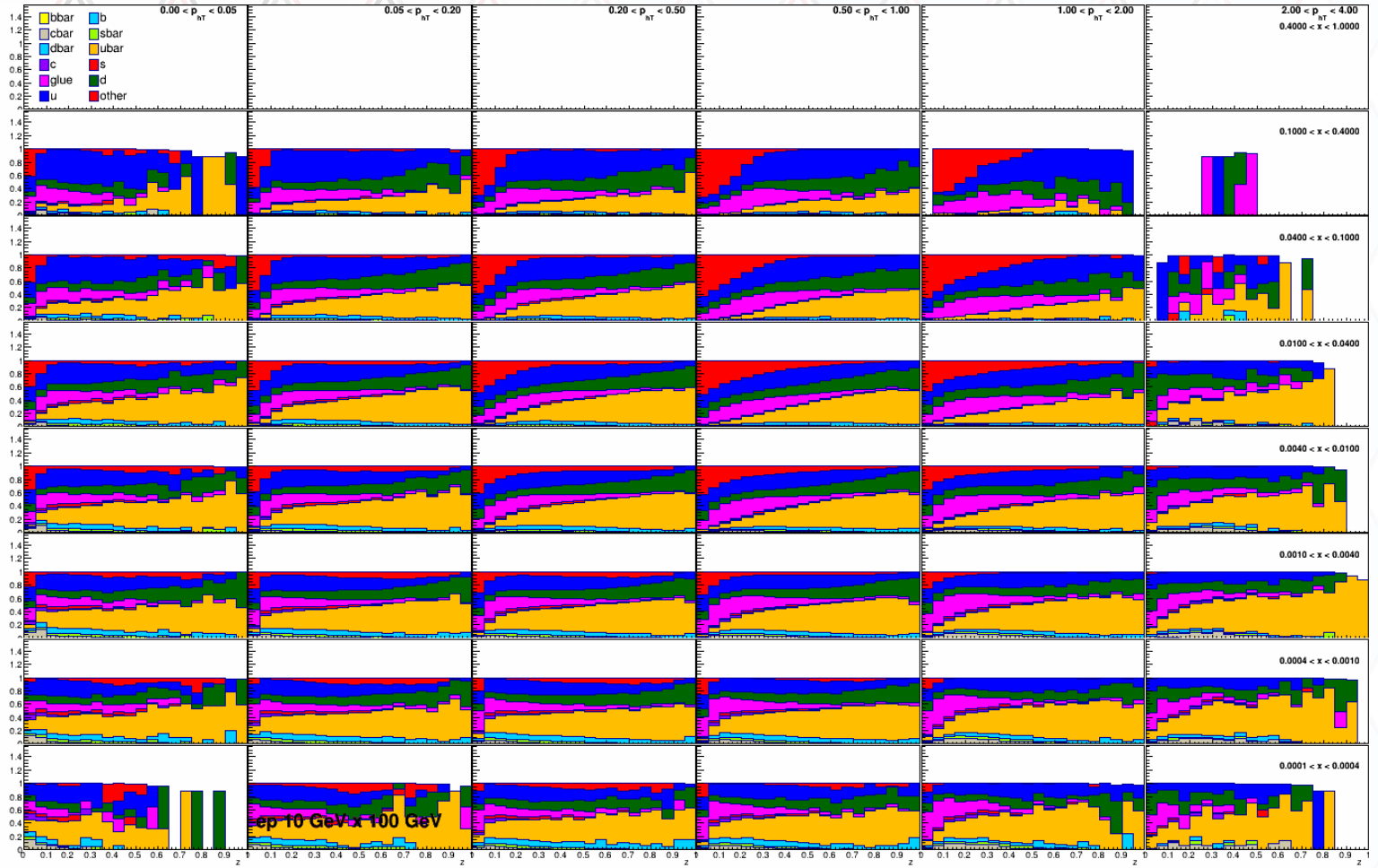
For K-



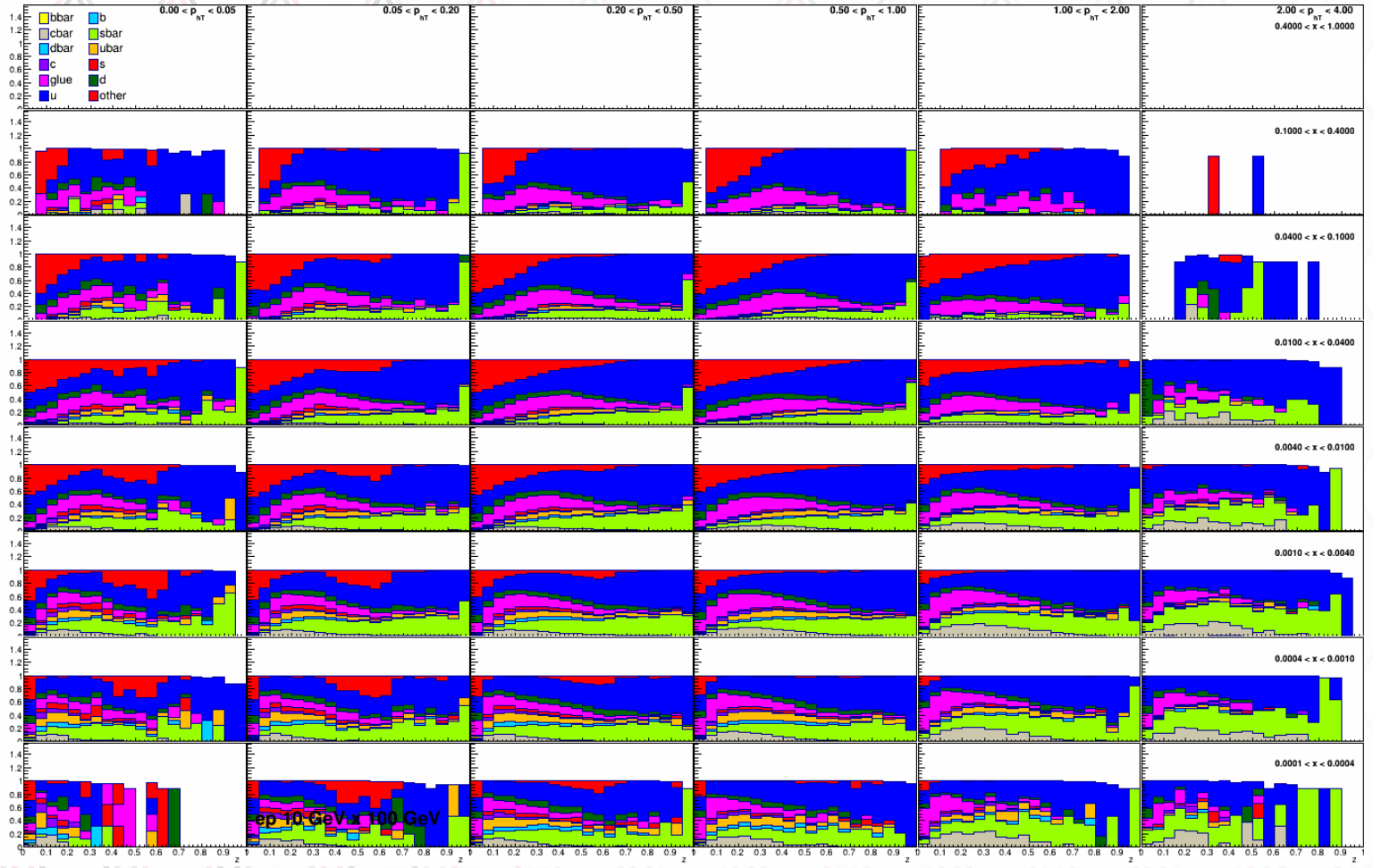
ep Fragmenting Flavor decomposition pi+



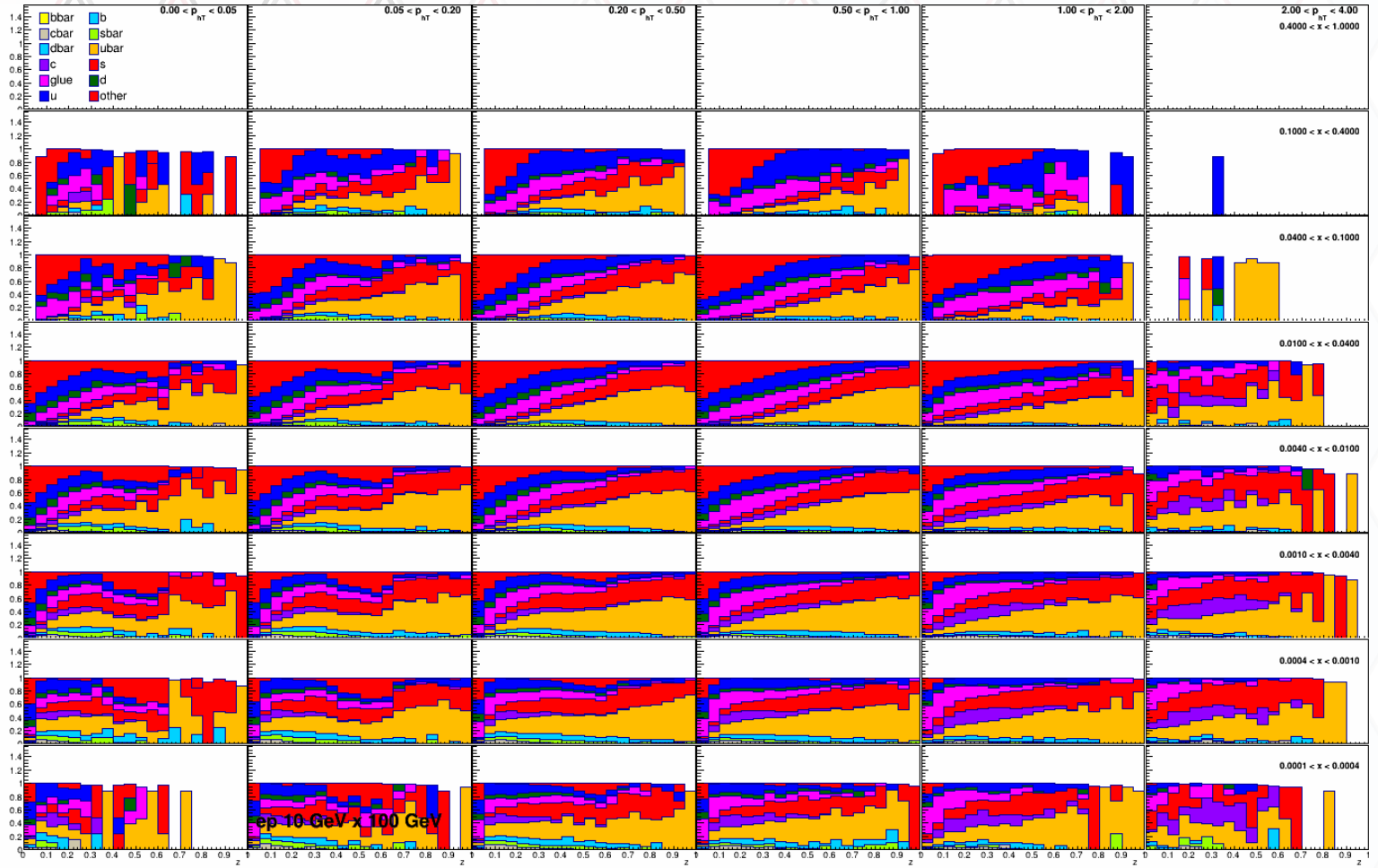
For pi-



For K+



For K-

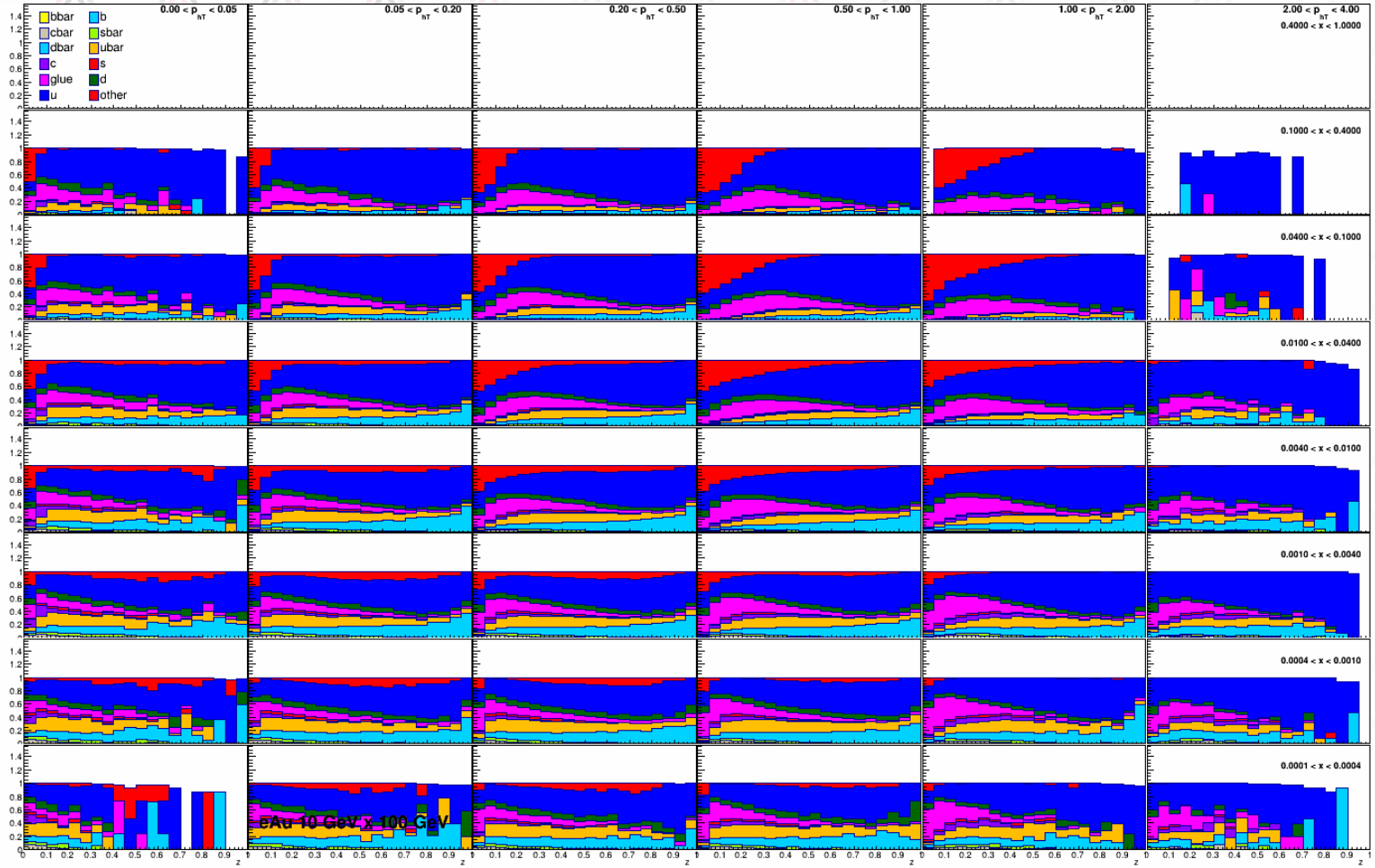

bbar
cbar
dbar
c
glue
u
b
sbar
ubar
s
d
other
0.00 < p_hT < 0.05
0.05 < p_hT < 0.20
0.20 < p_hT < 0.50
0.50 < p_hT < 1.00
1.00 < p_hT < 2.00
2.00 < p_hT < 4.00
0.4000 < x < 1.0000
0.1000 < x < 0.4000
0.0400 < x < 0.1000
0.0100 < x < 0.0400
0.0040 < x < 0.0100
0.0010 < x < 0.0040
0.0004 < x < 0.0010
0.0001 < x < 0.0004
ep 10 GeV x 100 GeV
z

P_{hT}

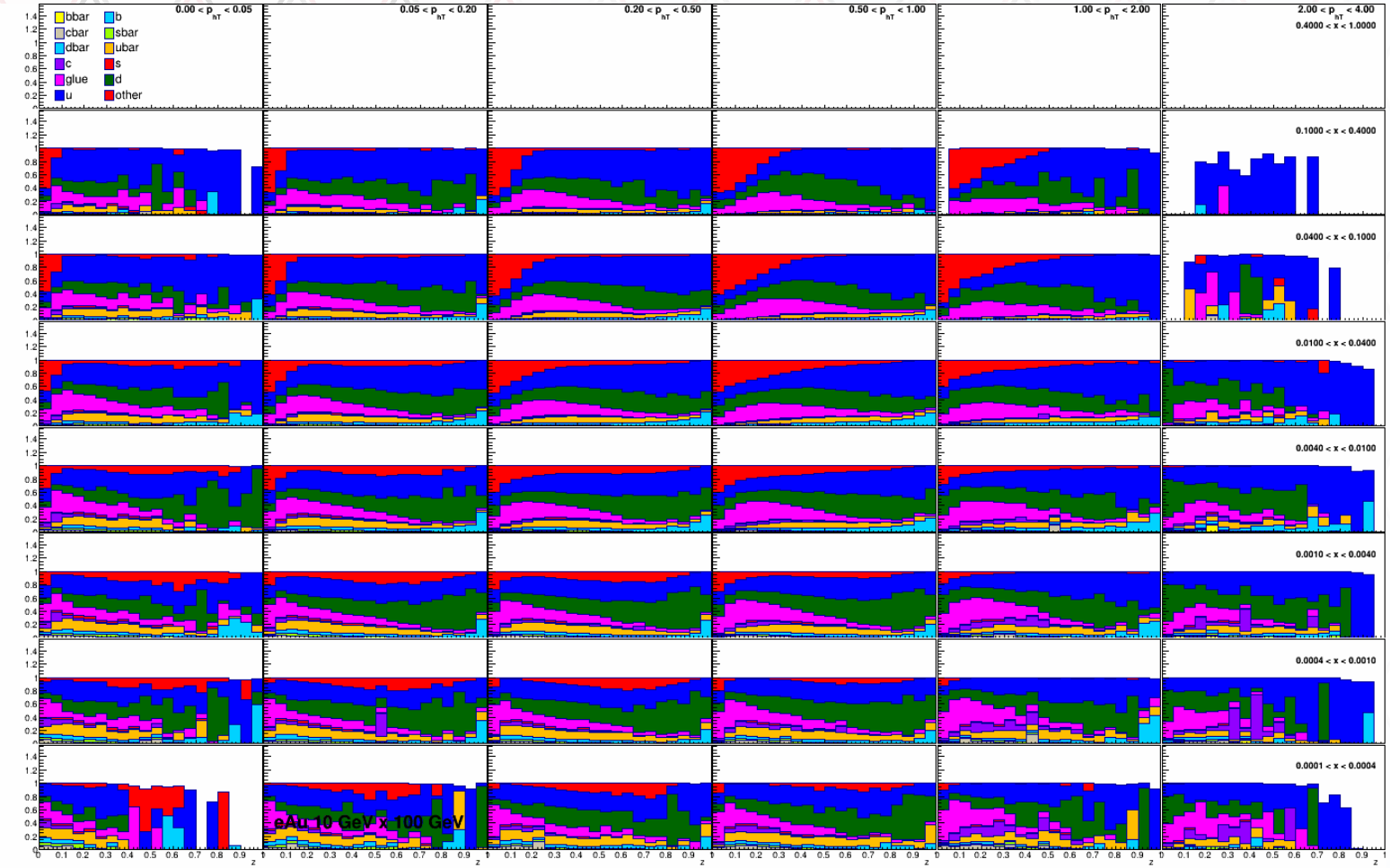
x

z

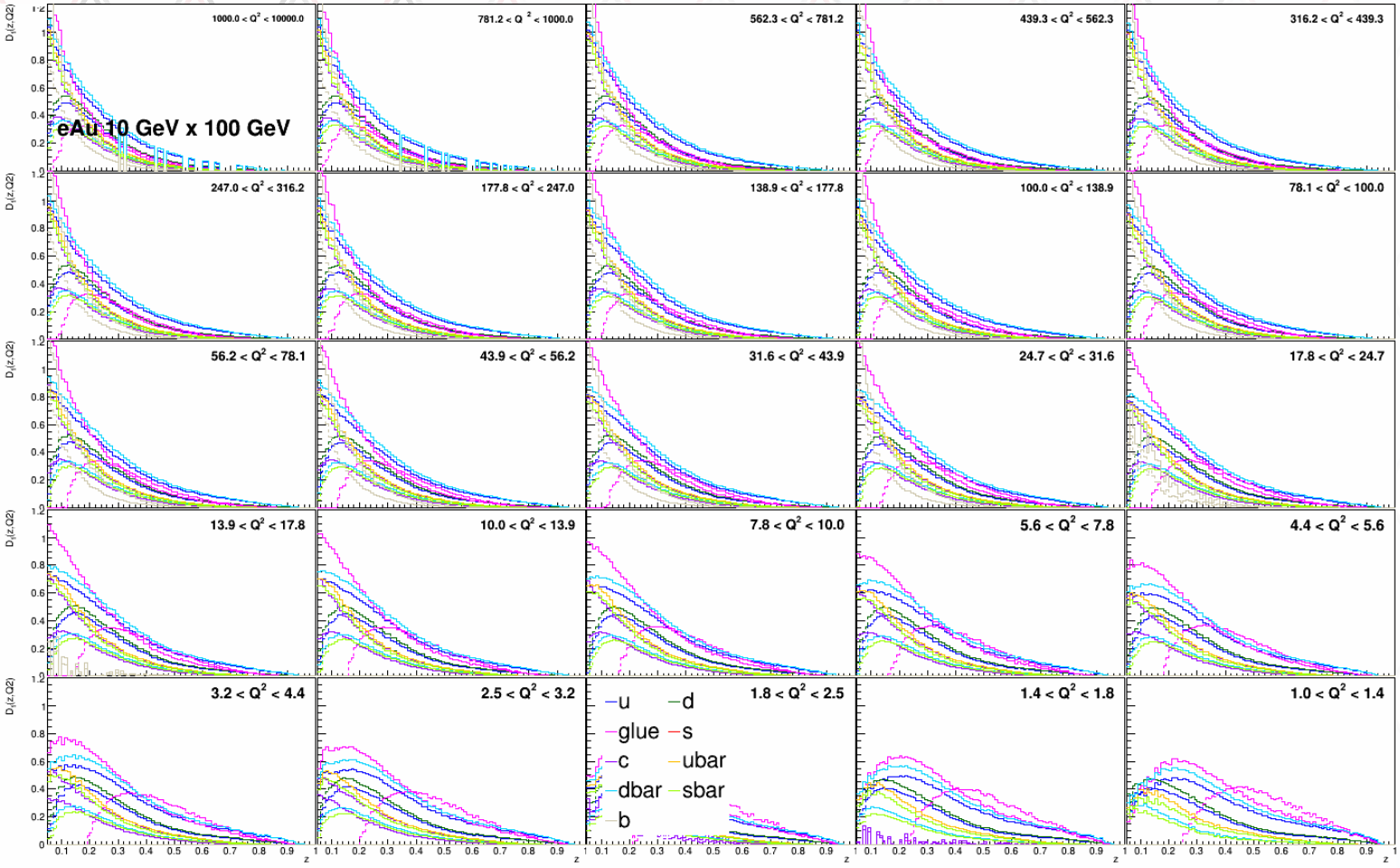
eAu without reweighting for pi+

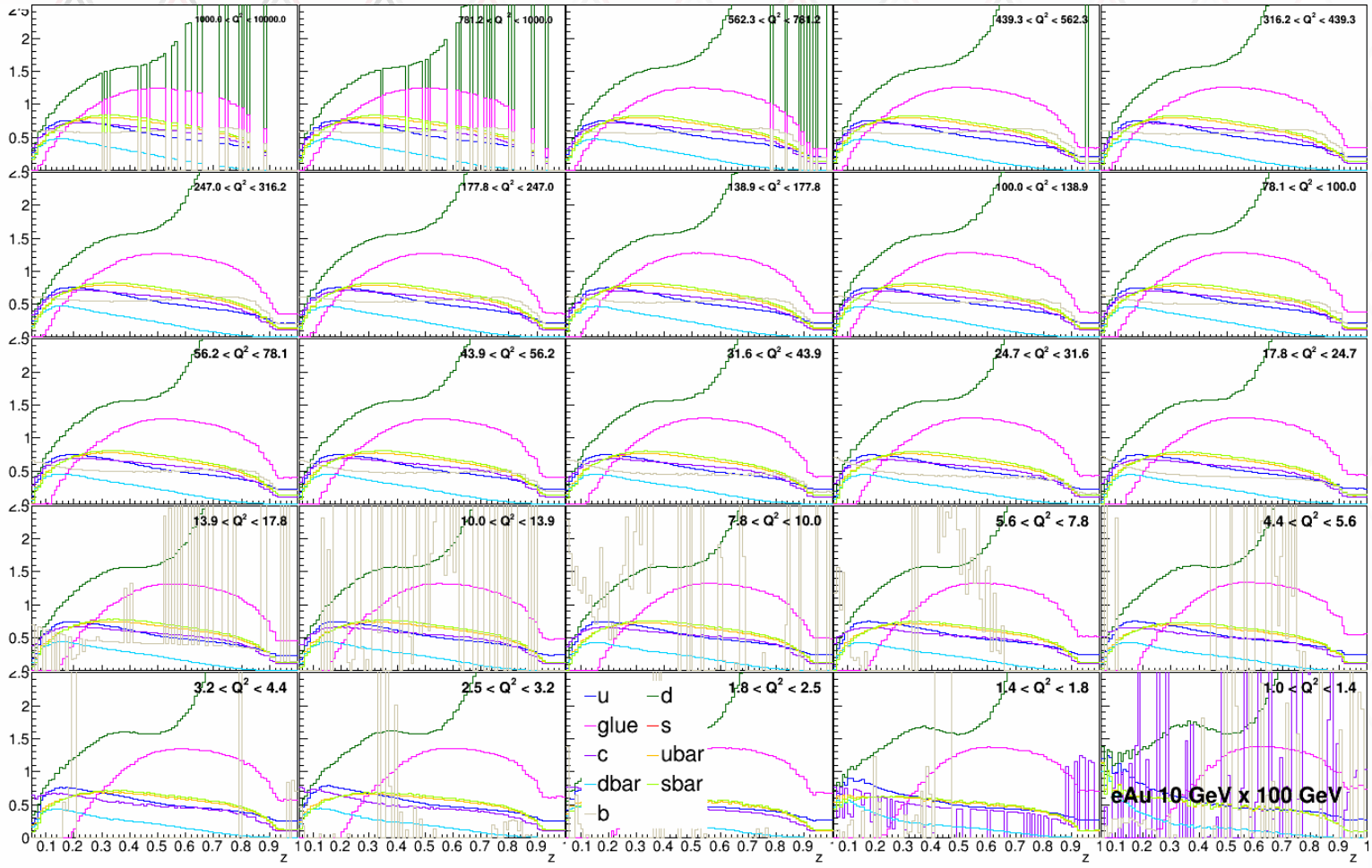


eAu with reweighting...



(N)FFs from SSZ and DSS, pi+




1000.0 < Q² < 10000.0
781.2 < Q² < 1000.0
562.3 < Q² < 781.2
439.3 < Q² < 562.3
316.2 < Q² < 439.3
247.0 < Q² < 316.2
177.8 < Q² < 247.0
138.9 < Q² < 177.8
100.0 < Q² < 138.9
78.1 < Q² < 100.0
56.2 < Q² < 78.1
43.9 < Q² < 56.2
31.6 < Q² < 43.9
24.7 < Q² < 31.6
17.8 < Q² < 24.7
13.9 < Q² < 17.8
10.0 < Q² < 13.9
7.8 < Q² < 10.0
5.6 < Q² < 7.8
4.4 < Q² < 5.6
3.2 < Q² < 4.4
2.5 < Q² < 3.2
1.8 < Q² < 2.5
1.4 < Q² < 1.8
1.0 < Q² < 1.4
u
d
glue
s
c
ubar
dbar
sbar
b
eAu 10 GeV x 100 GeV
z

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)	$0.2 < p_H < 0.6$	$0.2 < p_H < 0.6$	$0.2 < p_H < 1.0$

Guidance from Handbook

EIC Detector Requirements

η	Nomenclature			Tracking			Electrons		π/K/p PID		HCAL	Muons
				Resolution	Allowed X/X_0	Si-Vertex	Resolution σ_E/E	PID	p-Range (GeV/c)	Separation	Resolution σ_E/E	
-6.9 — -5.8	↓ p/A	Auxiliary Detectors	low-Q^2 tagger	$\delta\theta/\theta < 1.5\%$; $10^{-6} < Q^2 < 10^{-2}$ GeV^2								
…												
-4.5 — -4.0			Instrumentation to separate charged particles from photons									
-4.0 — -3.5												
-3.5 — -3.0		Central Detector	Backwards Detectors	$\sigma_p/p \sim 0.1\%\times p + 2.0\%$	~5% or less	TBD	2%/√E	π suppression up to $1{:}10^4$	≤ 7 GeV/c	≥ 3σ	~50%/√E	
-3.0 — -2.5												
-2.5 — -2.0				$\sigma_p/p \sim 0.05\%\times p + 1.0\%$								
-2.0 — -1.5							7%/√E					
-1.5 — -1.0												
-1.0 — -0.5			Barrel	$\sigma_p/p \sim 0.05\%\times p + 0.5\%$		$\sigma_{xyz} \sim 20$ μm, $d_0(z) \sim d_0(r\phi) \sim 20/p_T$ GeV μm + 5 μm	(10-12)%/√E		≤ 5 GeV/c		TBD	TBD
-0.5 — 0.0												
0.0 — 0.5												
0.5 — 1.0												
1.0 — 1.5			Forward Detectors	$\sigma_p/p \sim 0.05\%\times p + 1.0\%$		TBD			≤ 8 GeV/c		~50%/√E	
1.5 — 2.0												
2.0 — 2.5									≤ 20 GeV/c			
2.5 — 3.0				$\sigma_p/p \sim 0.1\%\times p + 2.0\%$								
3.0 — 3.5									≤ 45 GeV/c			
3.5 — 4.0	↑e	Auxiliary Detectors	Instrumentation to separate charged particles from photons									
4.0 — 4.5												
…												
> 6.2			Proton Spectrometer	$\sigma_{intrinsic}(|t|)/|t| < 1\%$; Acceptance: $0.2 < p_T < 1.2$ GeV/c								