Status
Multi

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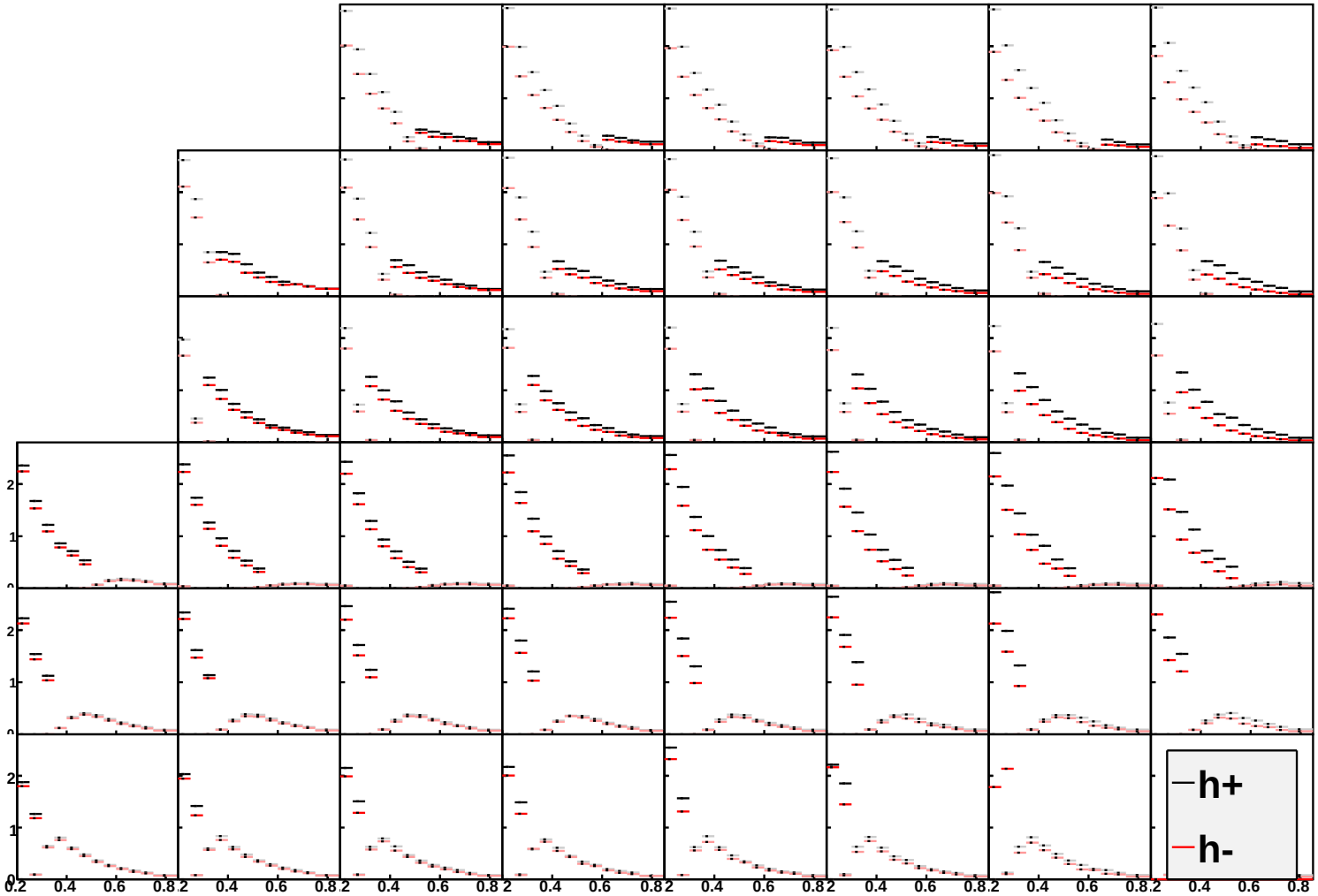
Status Cross check Pion Multiplicities 2006

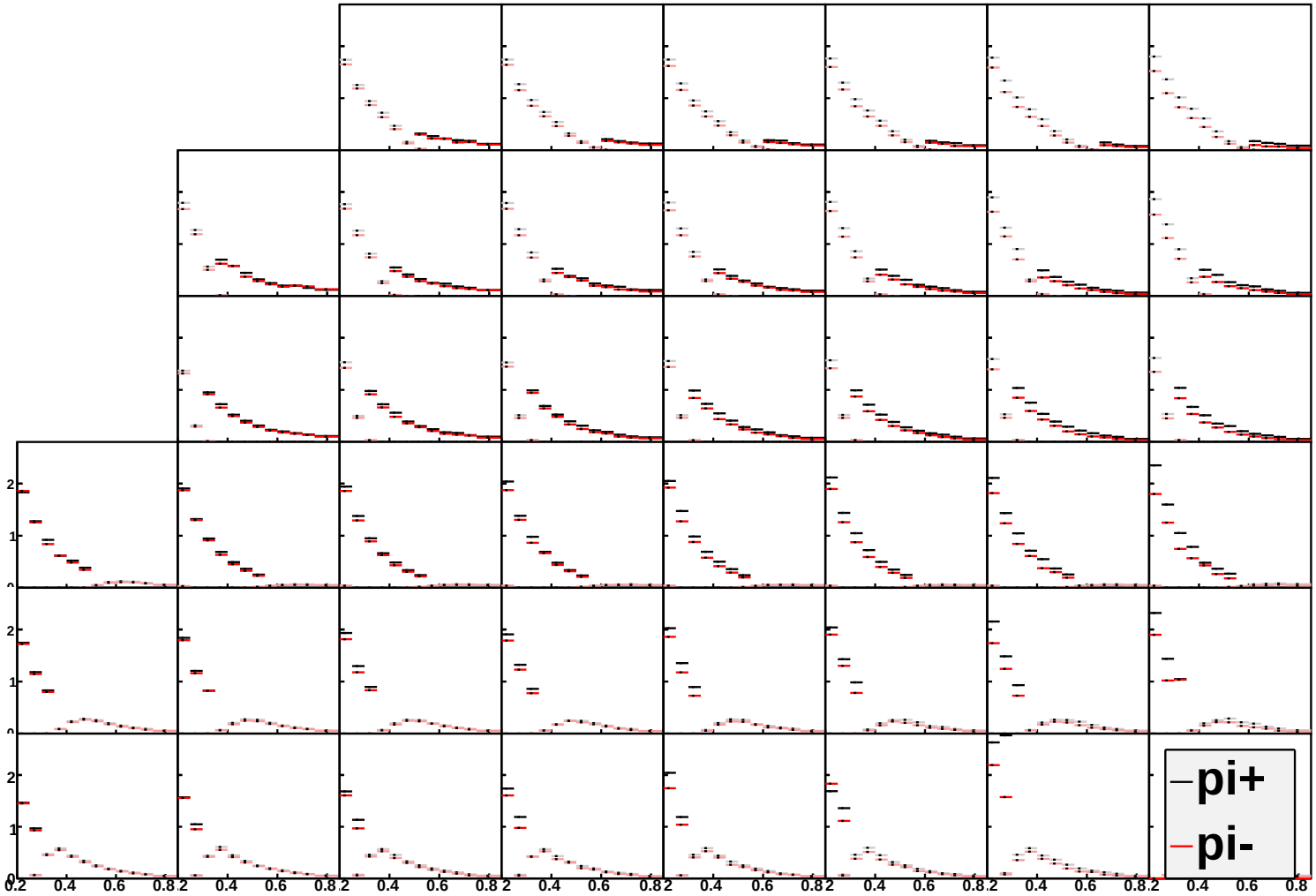
- DIS selection $\surd$
- Raw hadrons $\surd$
- Corrections
  - Radiative correction $\surd$
  - Acceptance $\surd$
  - RICH tables ($\surd$)
- LEPTO extrapolation $\surd$
- Error estimation (calculation) $\times$

What's missing -> RICH tables error

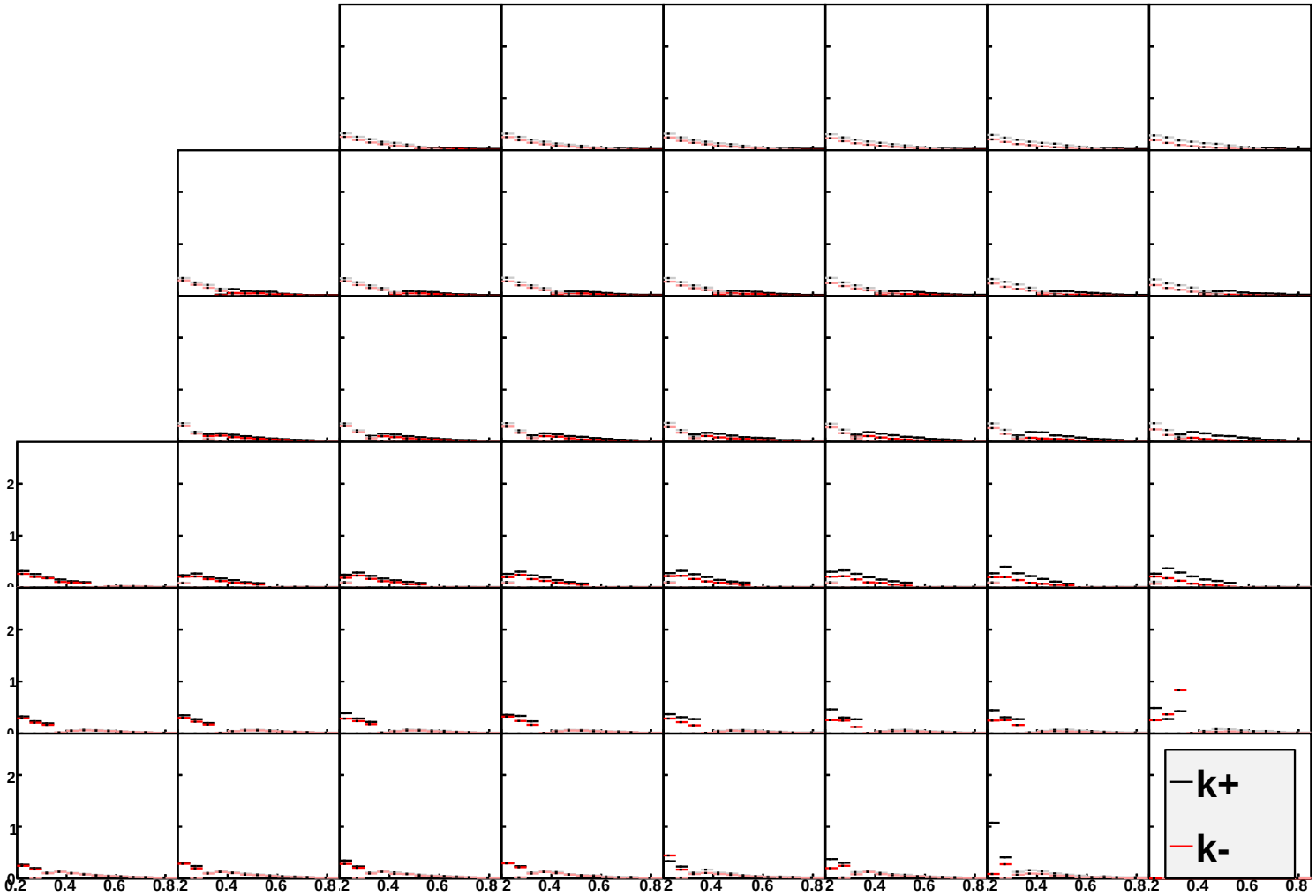
Hadron multiplicities



Pion multiplicities



Kaon multiplicities



LEPTO Extrapolation

Cut on hadron momentum
Not all bins completly filled
Using LEPTO multiplicites to fill up missing multiplicity contribution

$$M^h_{LEPTO} = M^h_{gen}(x,y,z)[P: 0-\infty] - M^h_{gen}(x,y,z)[P: 10(12)-40] = \frac{N^h - N'^h}{N_{DIS}}$$

Error estimation:

$$\Delta M^h_{LEPTO} = \sqrt{(\frac{(N^h - N'^h)}{N_{DIS}} \cdot \Delta N_{DIS})^2 + (\frac{1}{N_{DIS}} \cdot \Delta N^h)^2 + (\frac{1}{N_{DIS}} \cdot \Delta N'^h)^2}$$

Error used?
Error independence with $N^{h''} = N^h - N^{h'}$?

Acceptance Discussion

Acceptance Method

Double ratio acceptance (old)
Single ratio acceptance (new)

- Which method?

Different results with strong z dependence

- Hadron acceptance for all hadrons (π, K and proton)?

1) Decay of Kaons? Compare numbers
2) Compare kinematik (p_t)
3) Compare acceptance with average

Old Method

Double ratio

$$Acc = \frac{N_{h\_rec}/N_{DIS\_rec}}{N_{h\_gen}/N_{DIS\_gen}} = \frac{M_{rec}(\text{from rec DIS})}{M_{gen}(\text{from gen DIS})}$$

As used in April 2013 release, but error estimation more complicated
Assumption: hadron and DIS events are independent

$$A_h = \frac{N_{h\_rec}}{N_{h\_gen}} \text{ and } A_{DIS} = \frac{N_{dis\_rec}}{N_{dis\_gen}}$$

$$\Delta Acc = \Delta(A_h/A_{DIS}) = A_h/A_{DIS} \times \sqrt{((\Delta A_h/A_h)^2 + (\Delta A_{DIS}/A_{DIS})^2)}$$

New Method

Single ratio

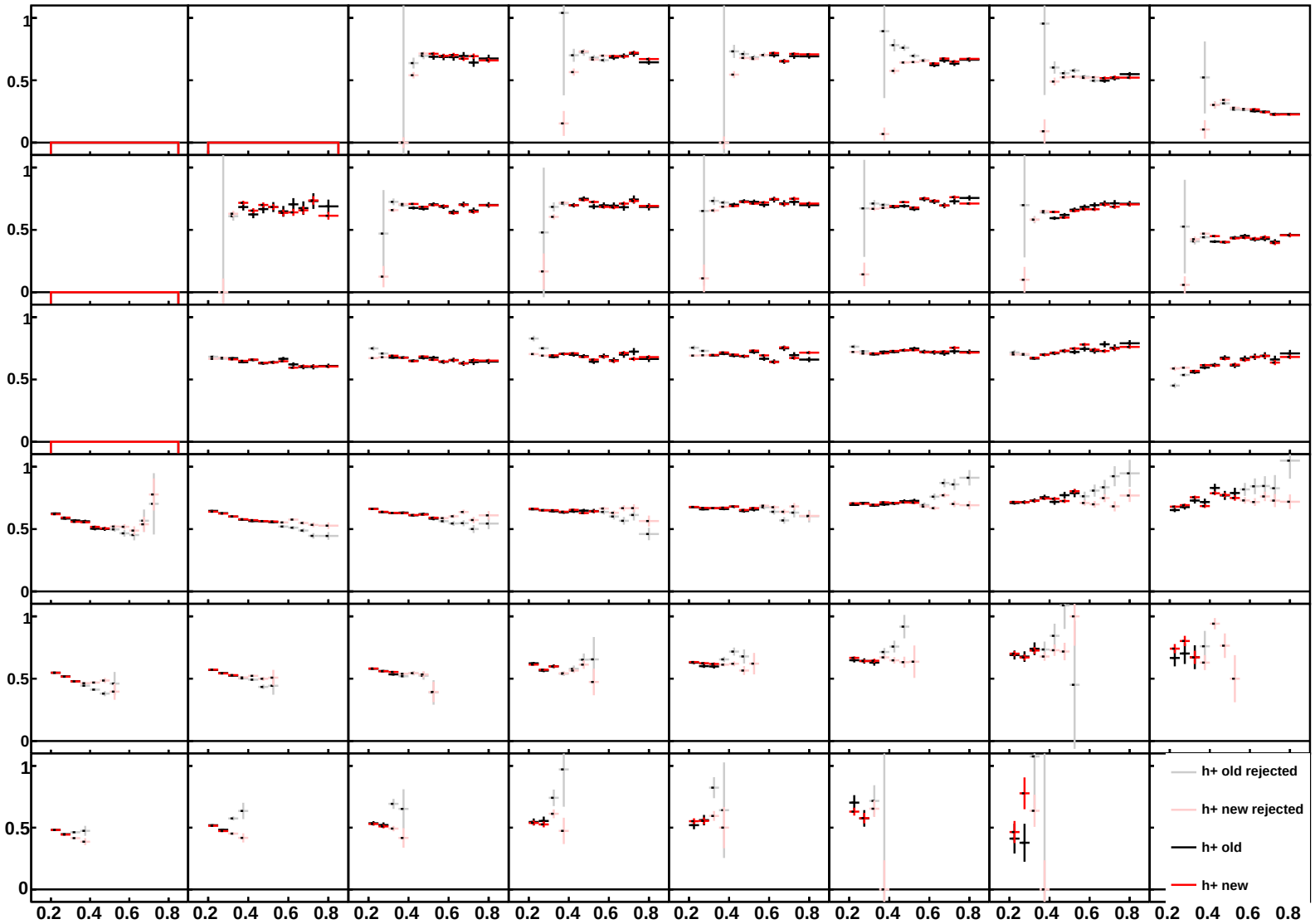
$$Acc = \frac{N_{h\_rec}(\text{from rec DIS})}{N_{h\_gen}(\text{from rec DIS})}$$

Advantage: Easier error estimation and muon acceptance is out

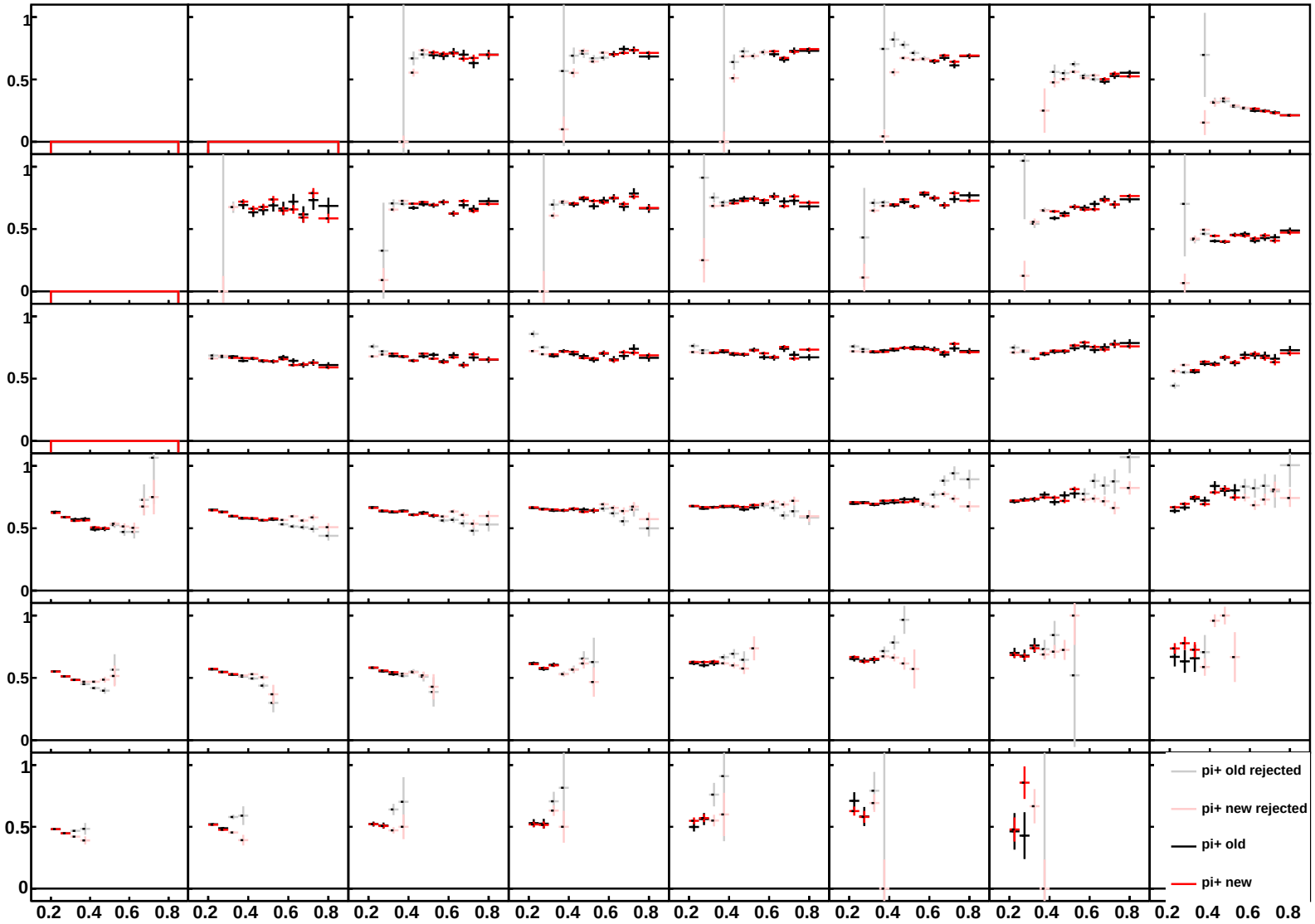
$$(\Delta Acc)^2 = \frac{(A+1)(G-A+1)}{(G+2)^2(G+3)}$$

with A for accepted events and G for generated events

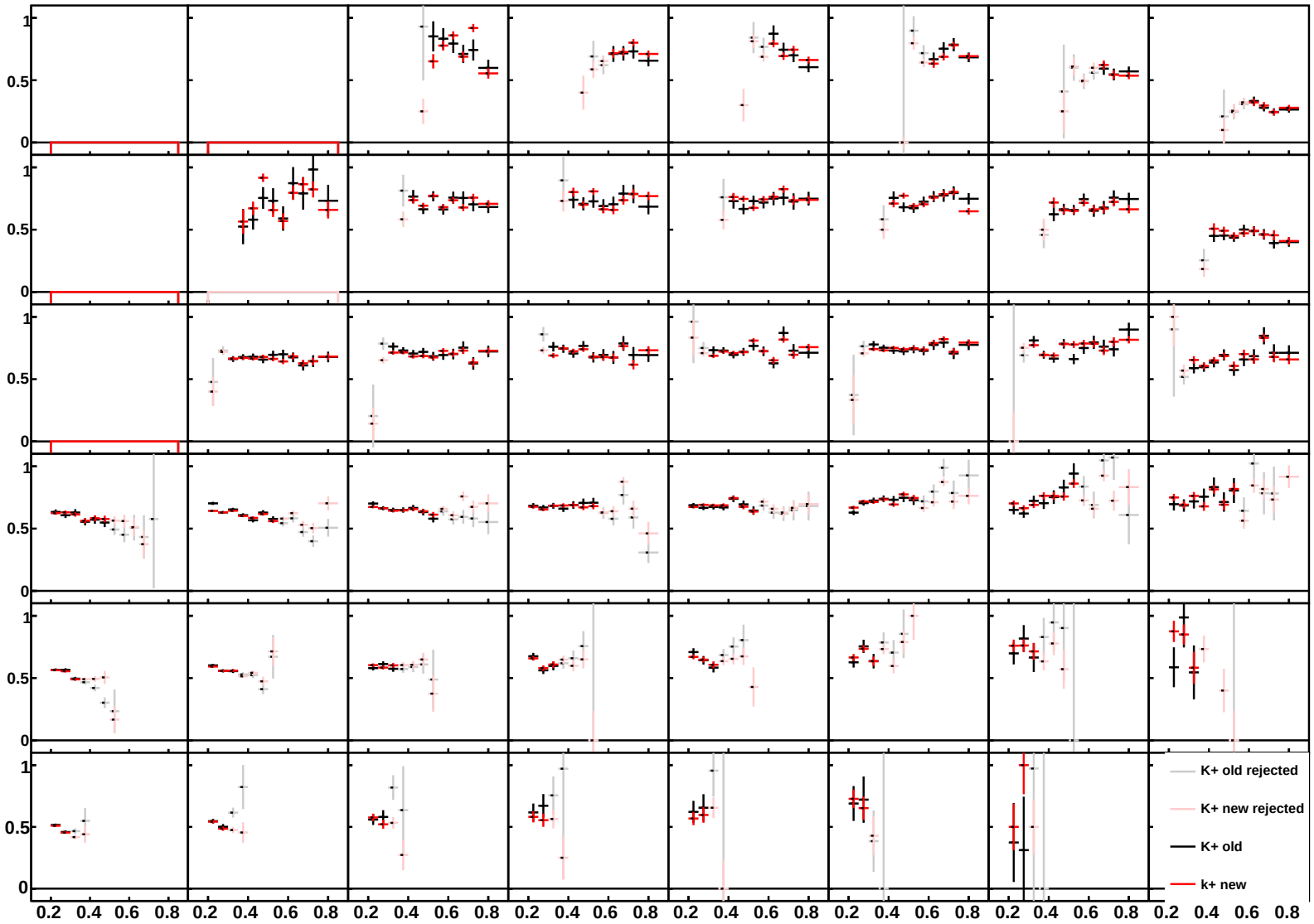
Single vs. Double Ratio Hadrons



Single vs. Double Ratio Pions



Single vs. Double Ratio Kaons



"h" for "hadron"

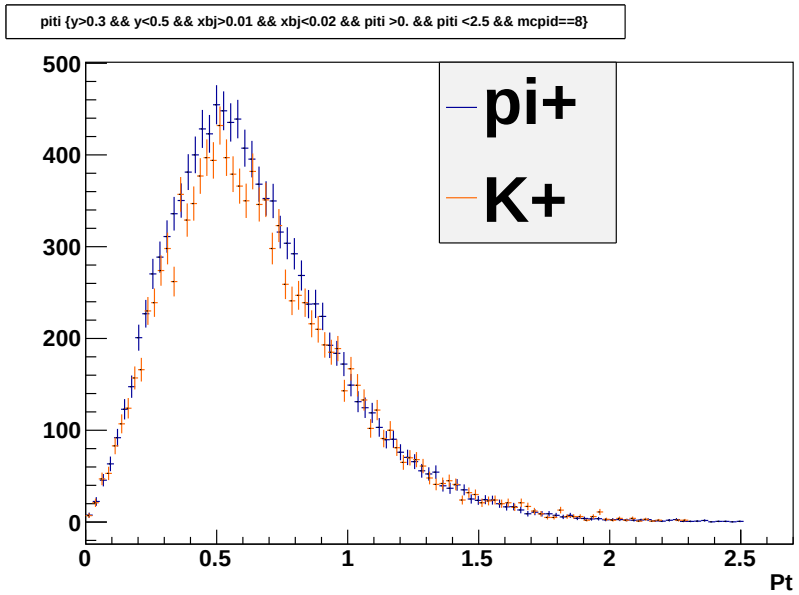
1) Compare numbers:

K^+_{true} = 4.814E5
h^+_{true} = 3.321E6
$\rightarrow$ 0.145

K^+_{rec} = 8.997E4
h^+_{rec} = 5.880E5
$\rightarrow$ 0.153

5% difference in "wrong" direction

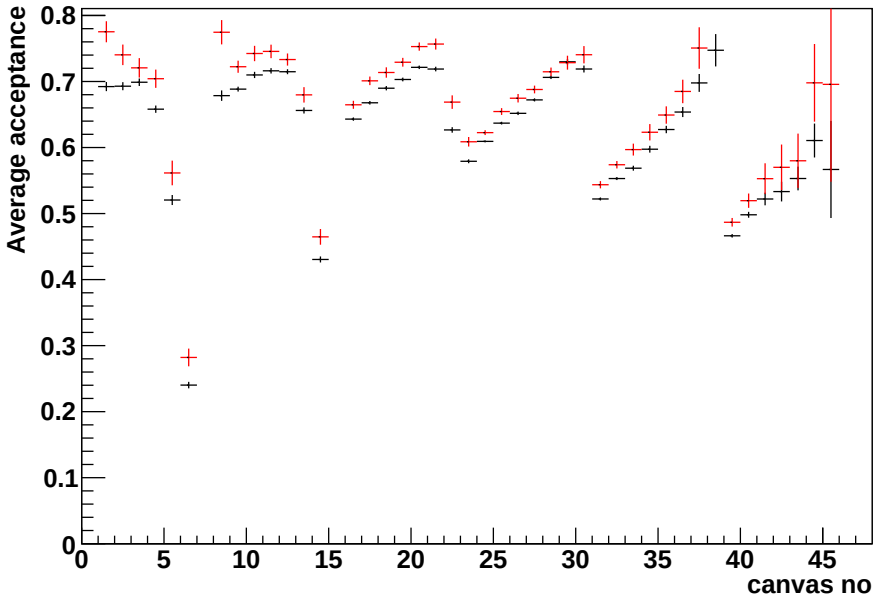
2)



Pretty similar p_t distribution

Average for h and K

3) Weighted mean



$$\overline{x} = \frac{\sum_{i=1}^{n}(x_i \omega_i)}{\sum_{i=1}^{n} \omega_i} \text{ with error } \sigma_{\overline{x}}^2 = \frac{1}{\sum_{i=1}^{n} \omega_i}$$

$$\text{using : } \omega_i = \frac{1}{\sum_{i=1}^{n} \sigma_i^2}$$