Recent Studies on RICH indentification

Rafał Gazda

IPJ Warsaw

- Stability studies
- Purity evaluation
- Corrections to asymmetries

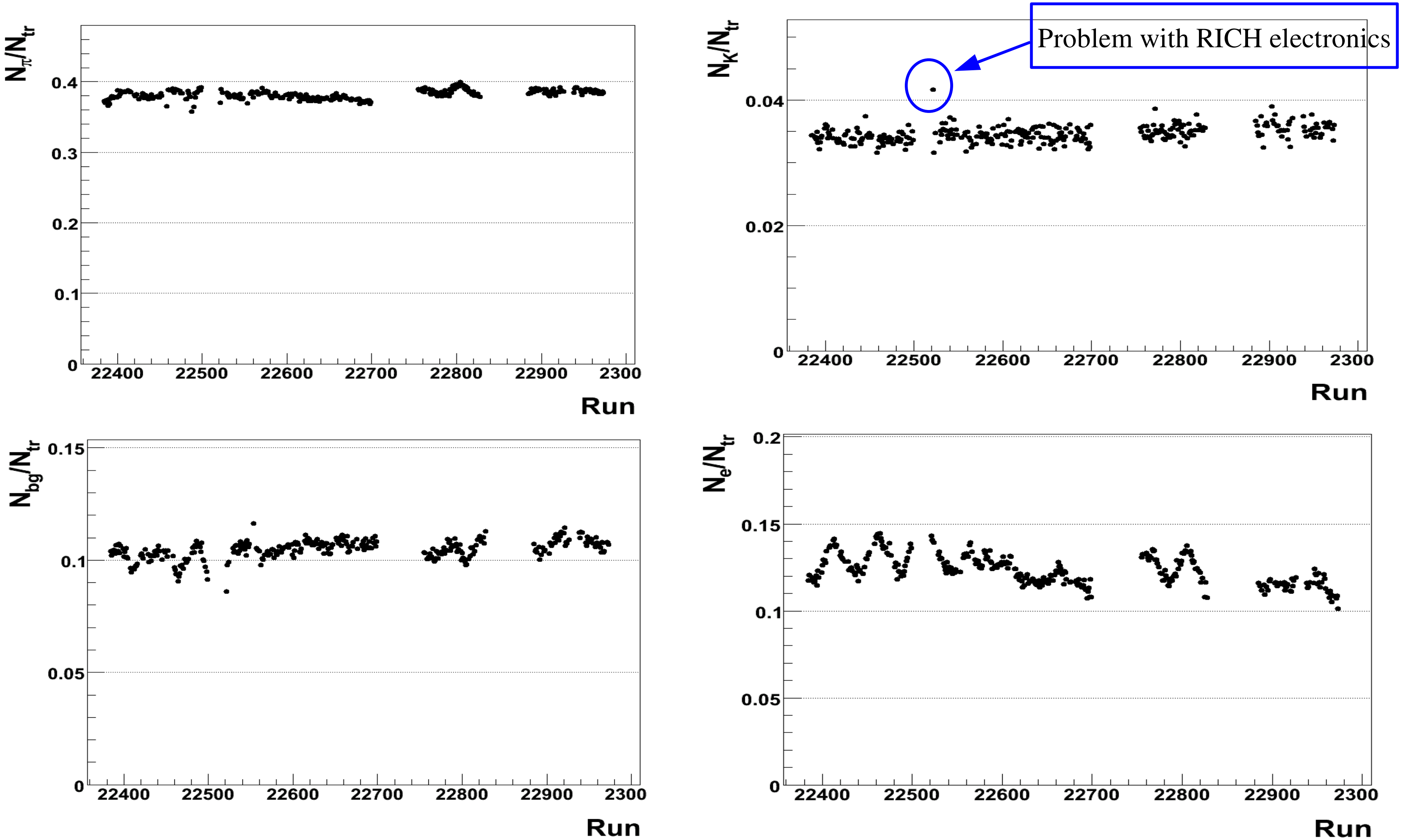
Bad runs and bad spills

1. Standard badruns and badpsills

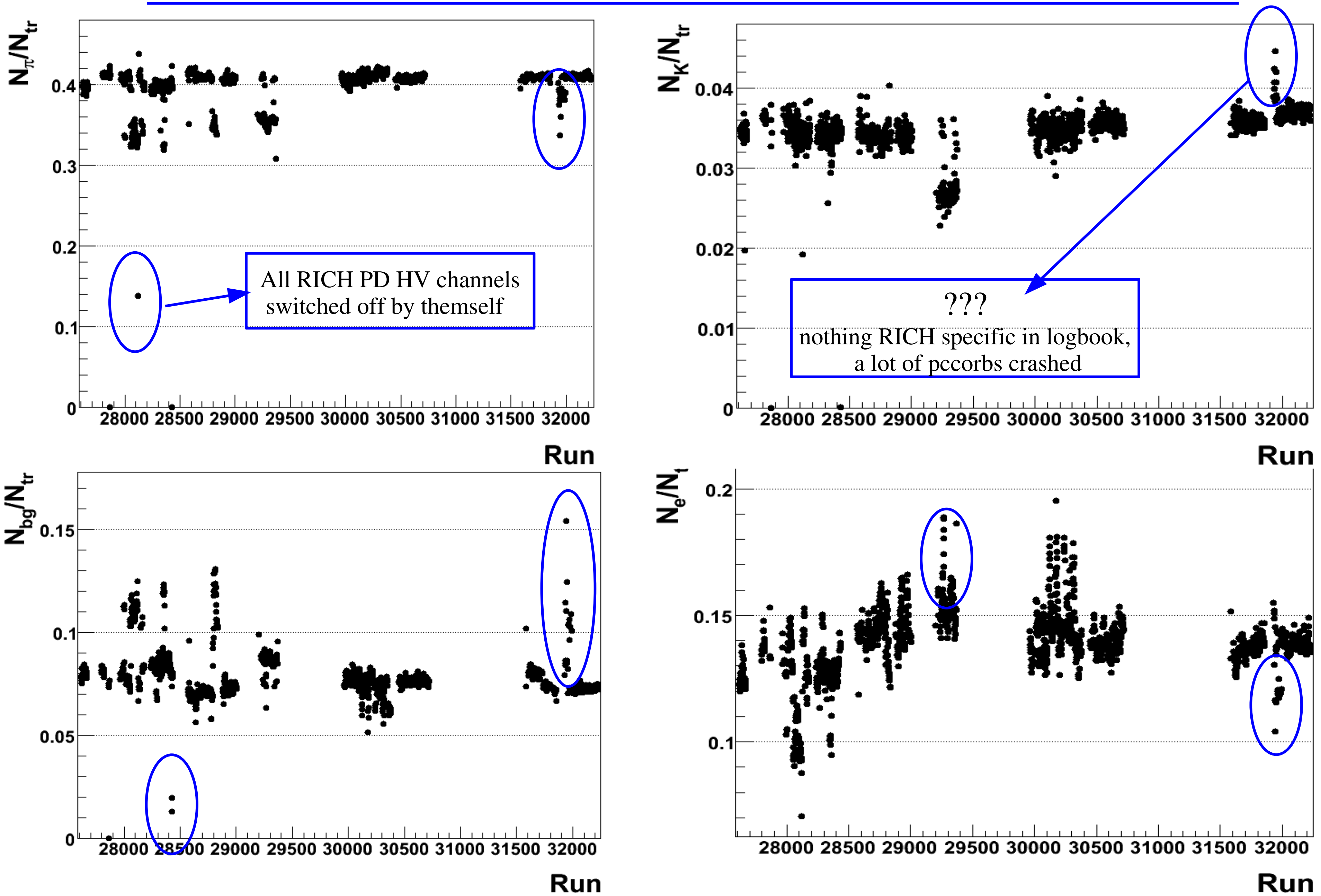
2. Monitoring of four ratios:
   - Number of electrons / number of outgoing particles from primary vertex (RICH acceptance was not applied)
   - #bg / #particles
   - #π / #particles
   - #K / #particles

3. electrons, bg, π and K are defined by max LH from RICH (no other tunning).

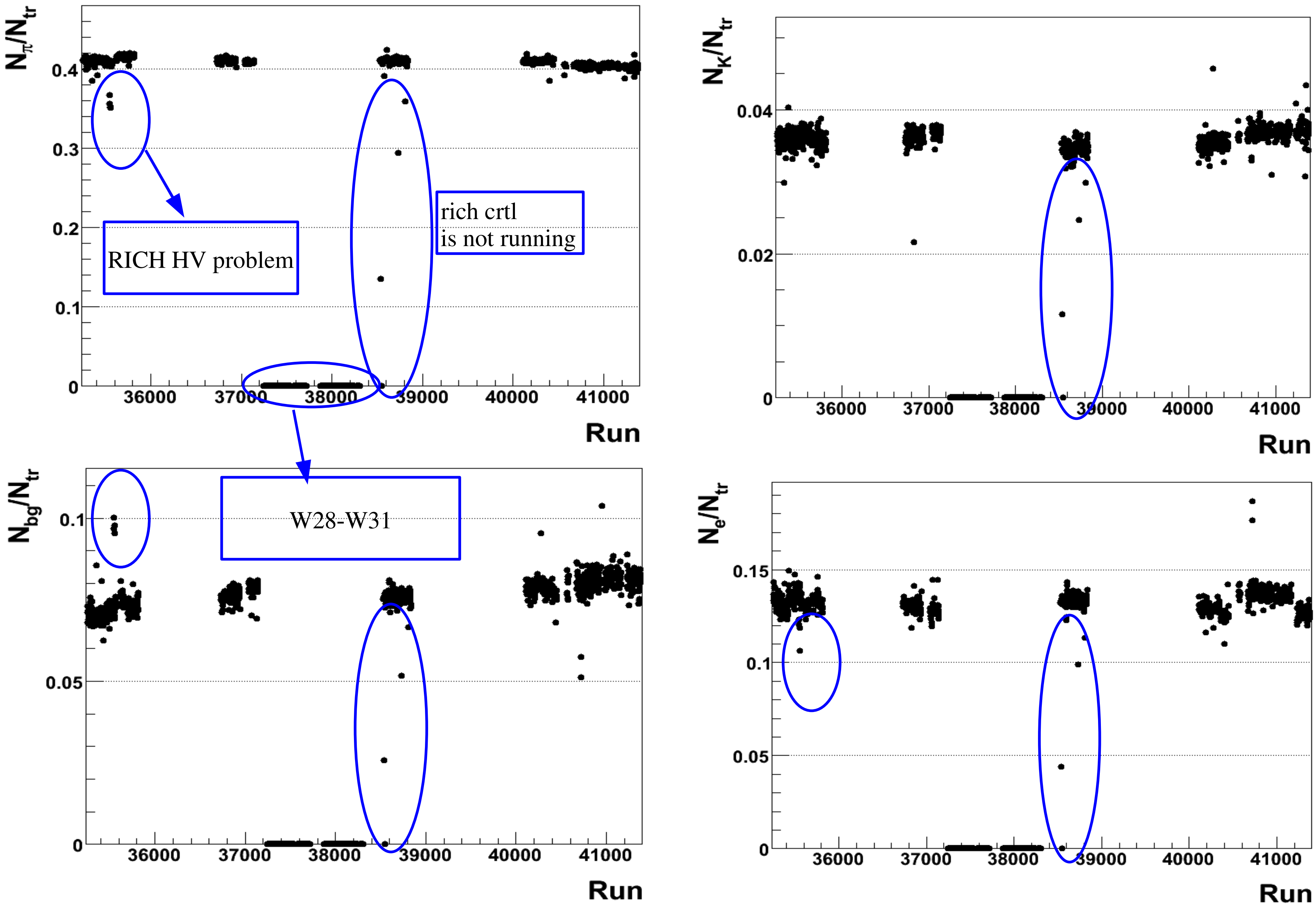
Bad runs (2002)



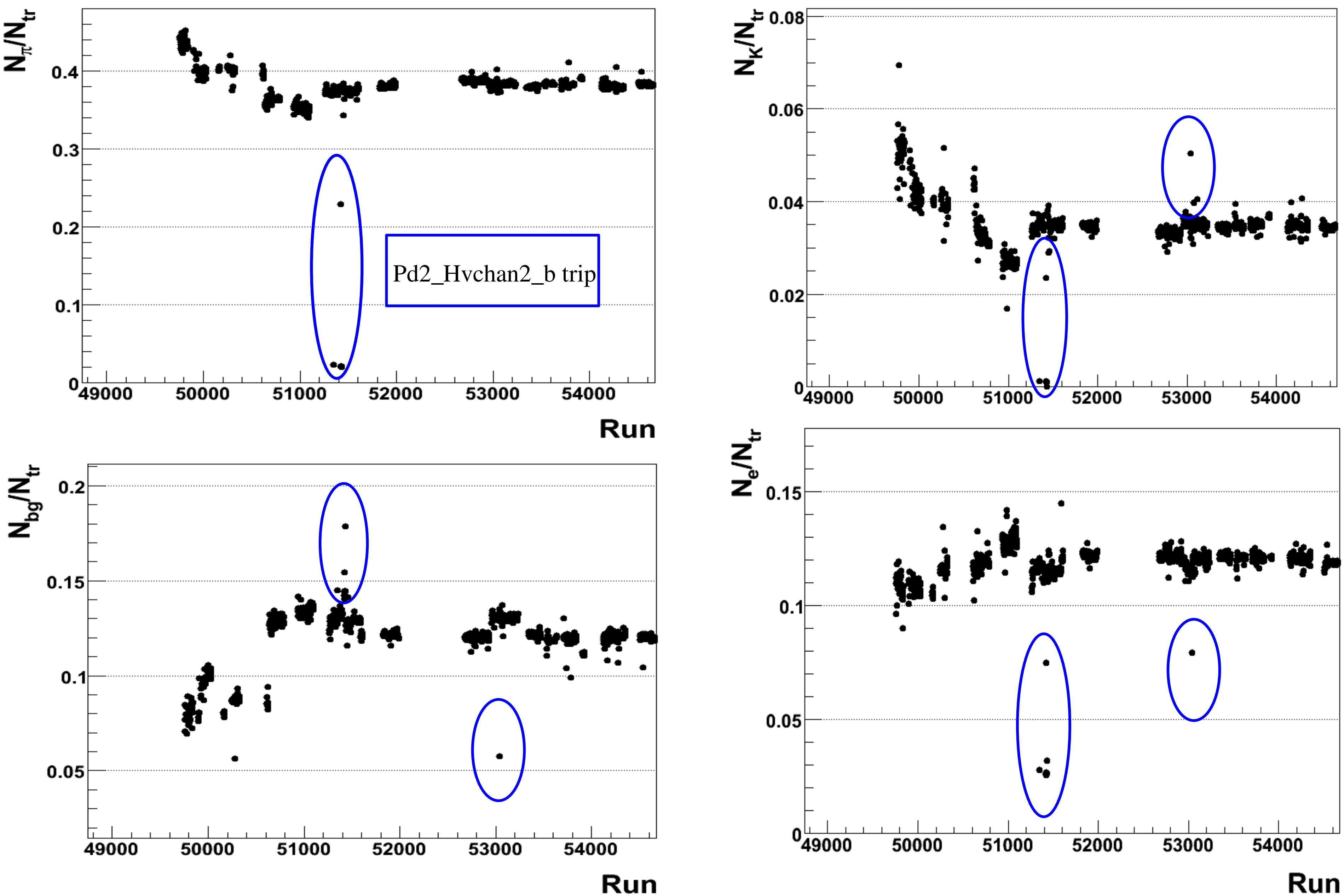
Bad runs (2003)



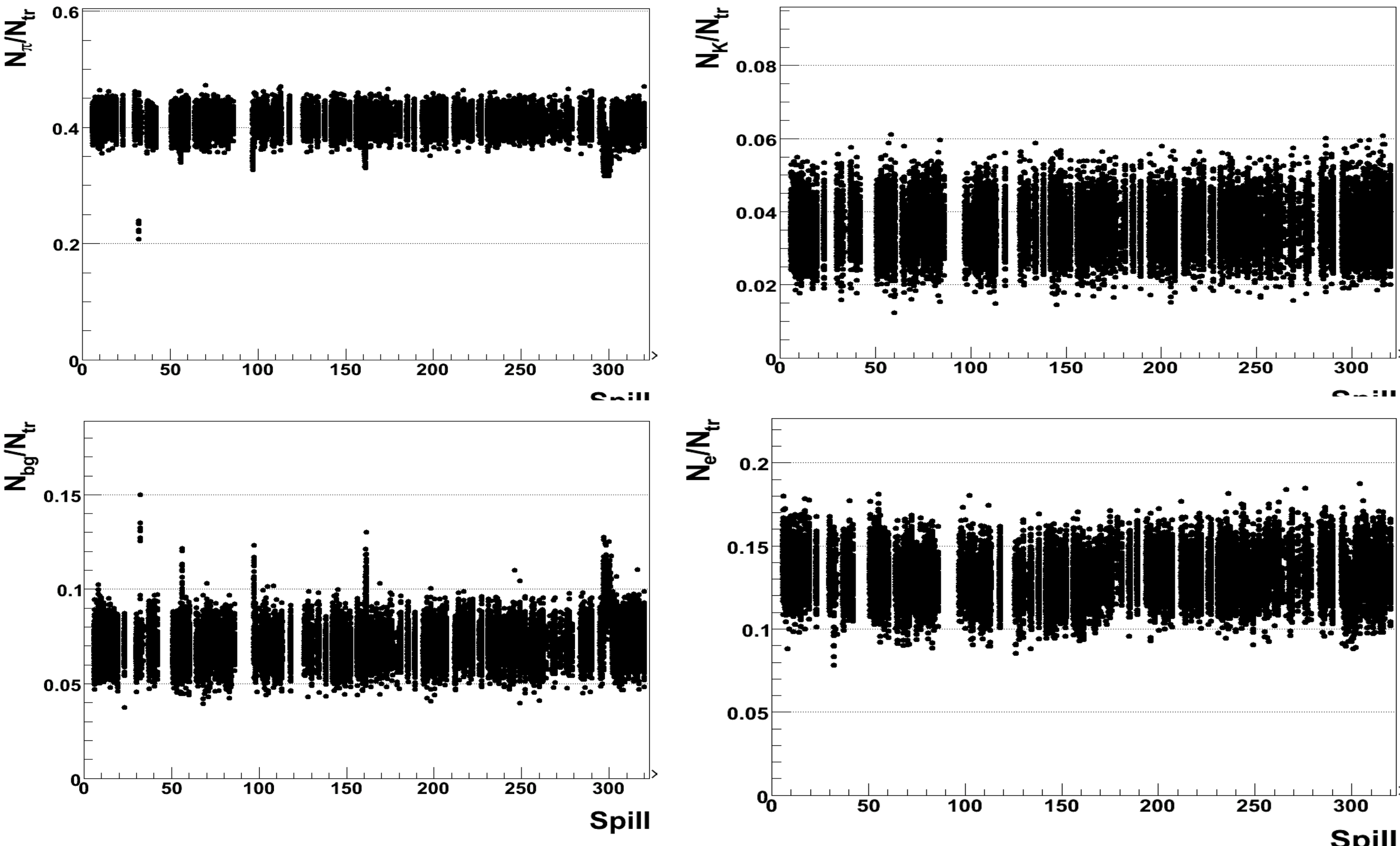
Bad runs (2004)



Bad runs (2006)



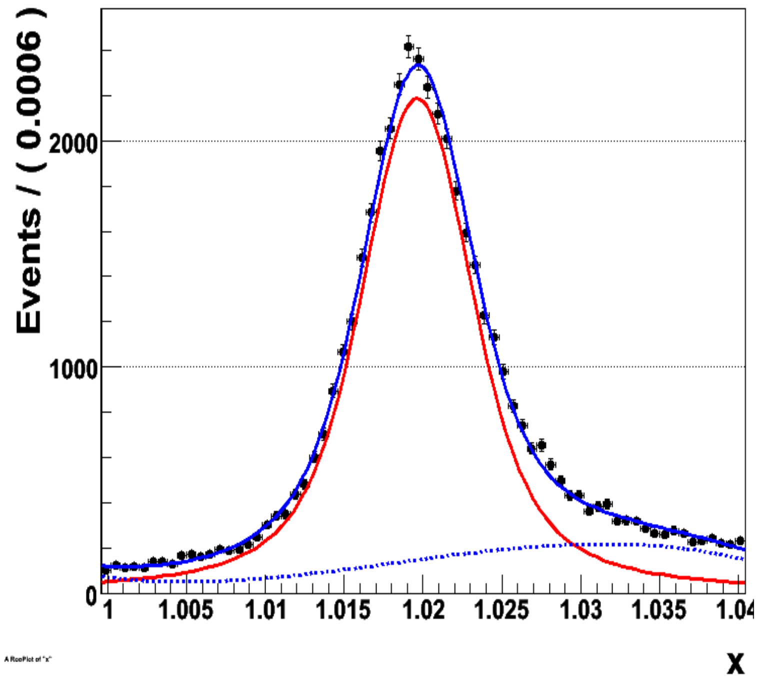
Bad spills (2004,W22)



Conclusion from this part

- Only few runs removed for each year
- Number of identified hadron / number of tracks is almost the same for all years
- Monitoring spill by spill is ongoing
- Possible effect to asymmetries is rather marginal

Purity evaluation



Calculated from exclusive ϕ sample:

- exactly 2 particles (+mu') from PV
- Cut on missing energy 2.5 GeV

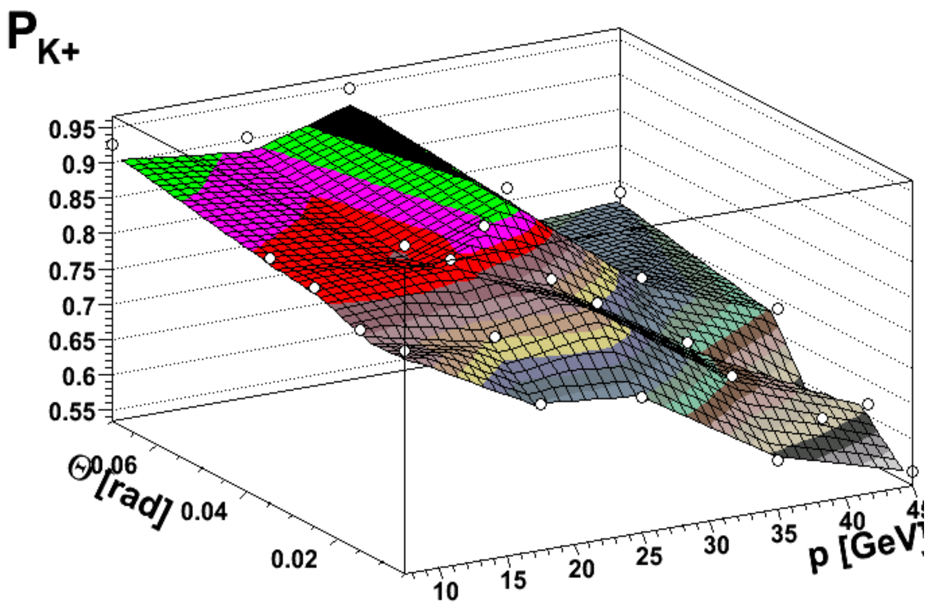
S/B>20 – particles in window 1σ treated as true kaons.

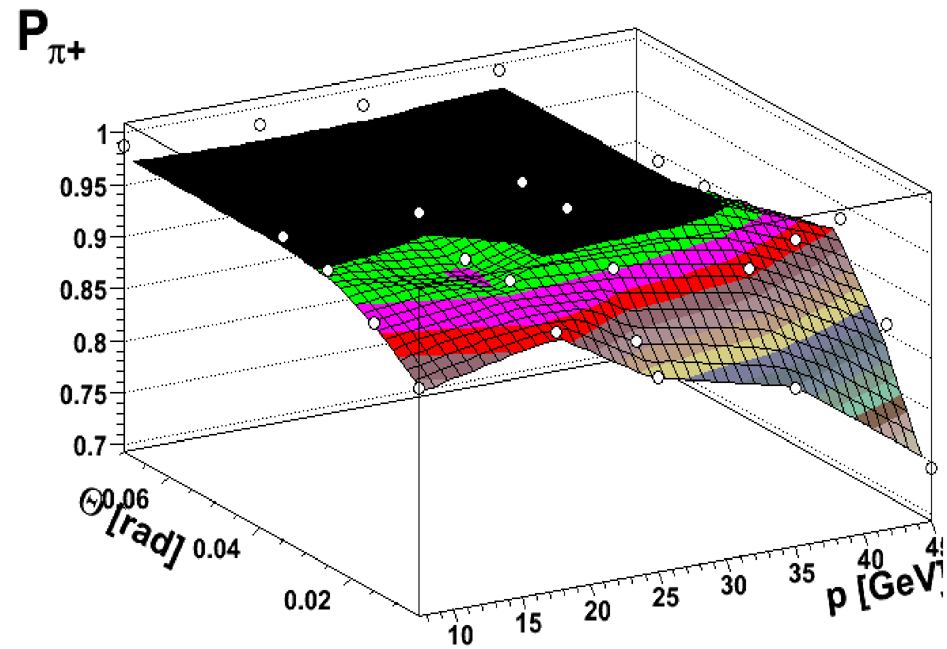
$$LH(K) > 1.24\, LH(bg)$$

$$LH(K) > 1.02\, LH(\pi)$$

$$LH(K) > LH(2\max)$$

For each x bin purity was calculated vs momentum and polar angle. For example 1st bin of x:





$$Purity(K) = \frac{P_{K\to K}\cdot N_K^T}{N_K^I} = \frac{1-\frac{P_{\pi\to K}}{P_{\pi\to\pi}}\frac{N_\pi^I}{N_K^I}}{1-\frac{P_{\pi\to K}}{P_{\pi\to\pi}}\frac{P_{K\to\pi}}{P_{K\to K}}}$$

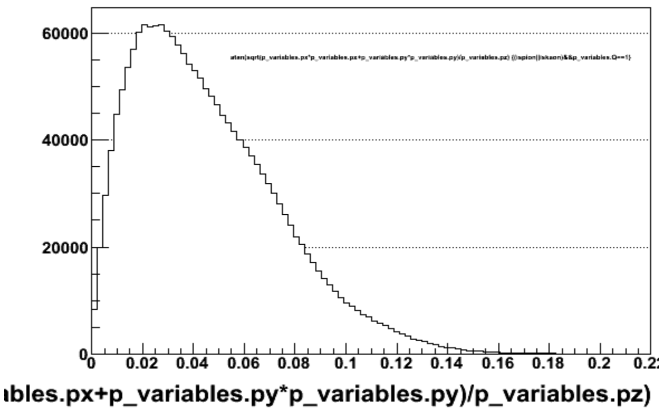
Thanks to Federica

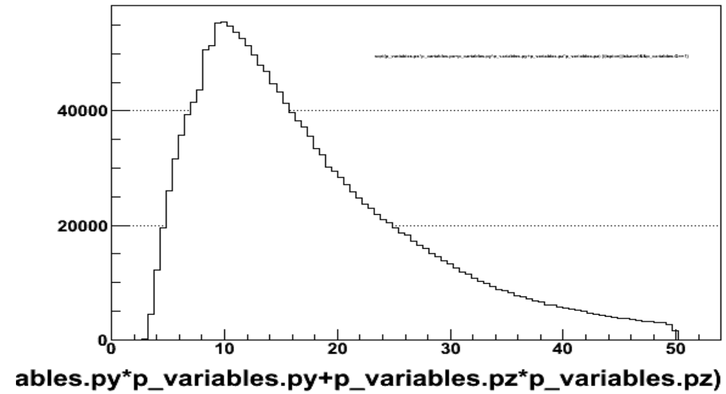
h+

polar angle

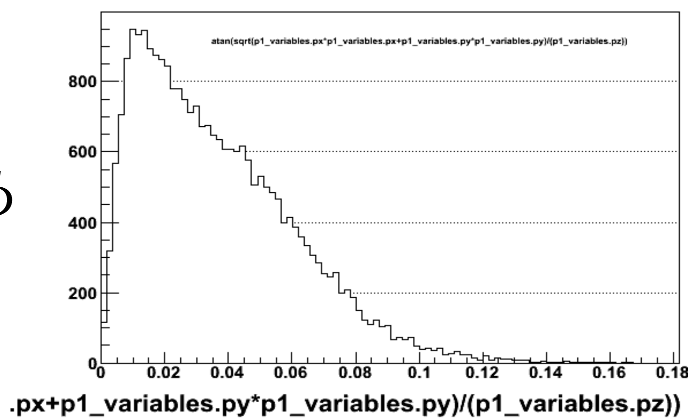
momentum

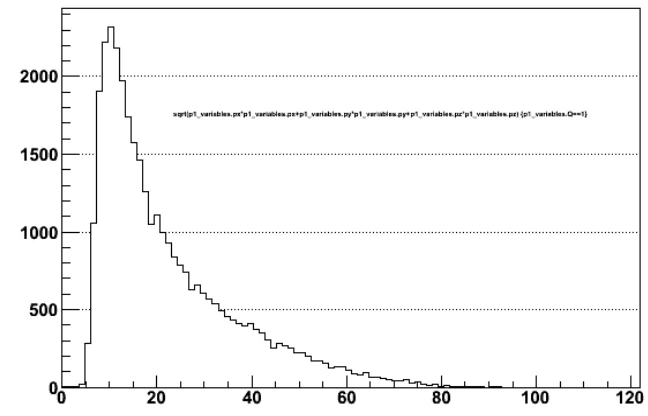
K or pi



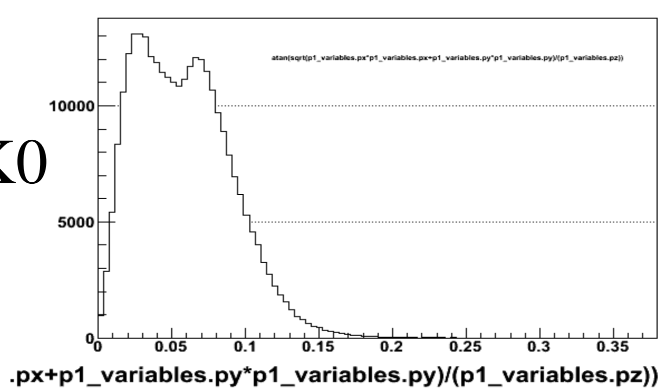


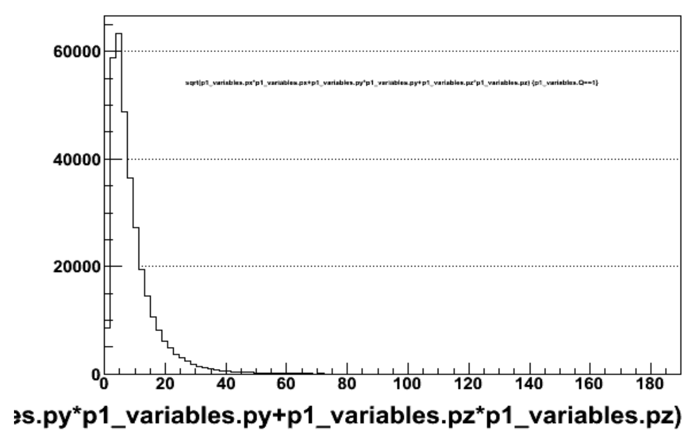
K from ϕ





pi from K0





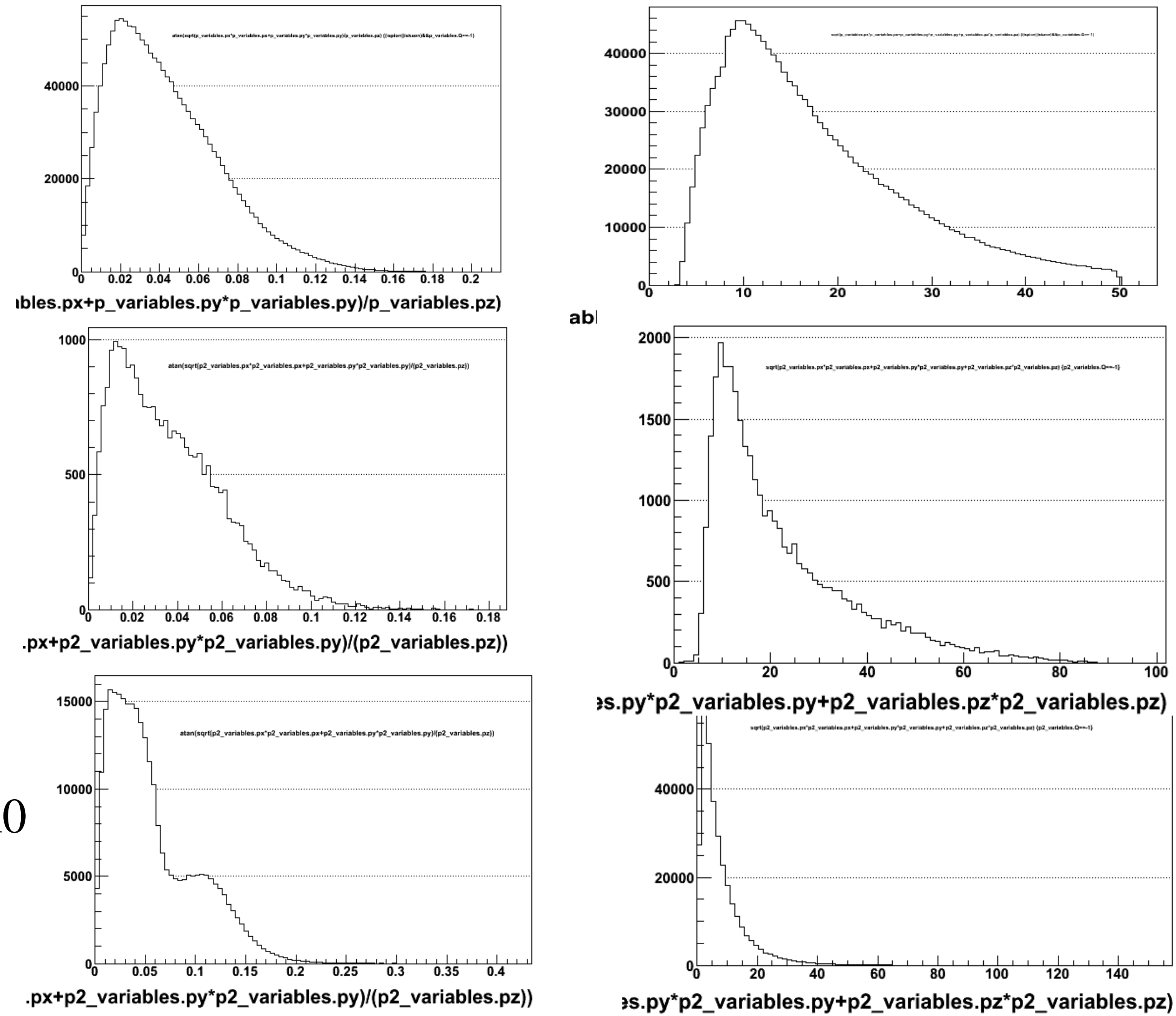
h-

polar angle | momentum

K or pi

K from ϕ

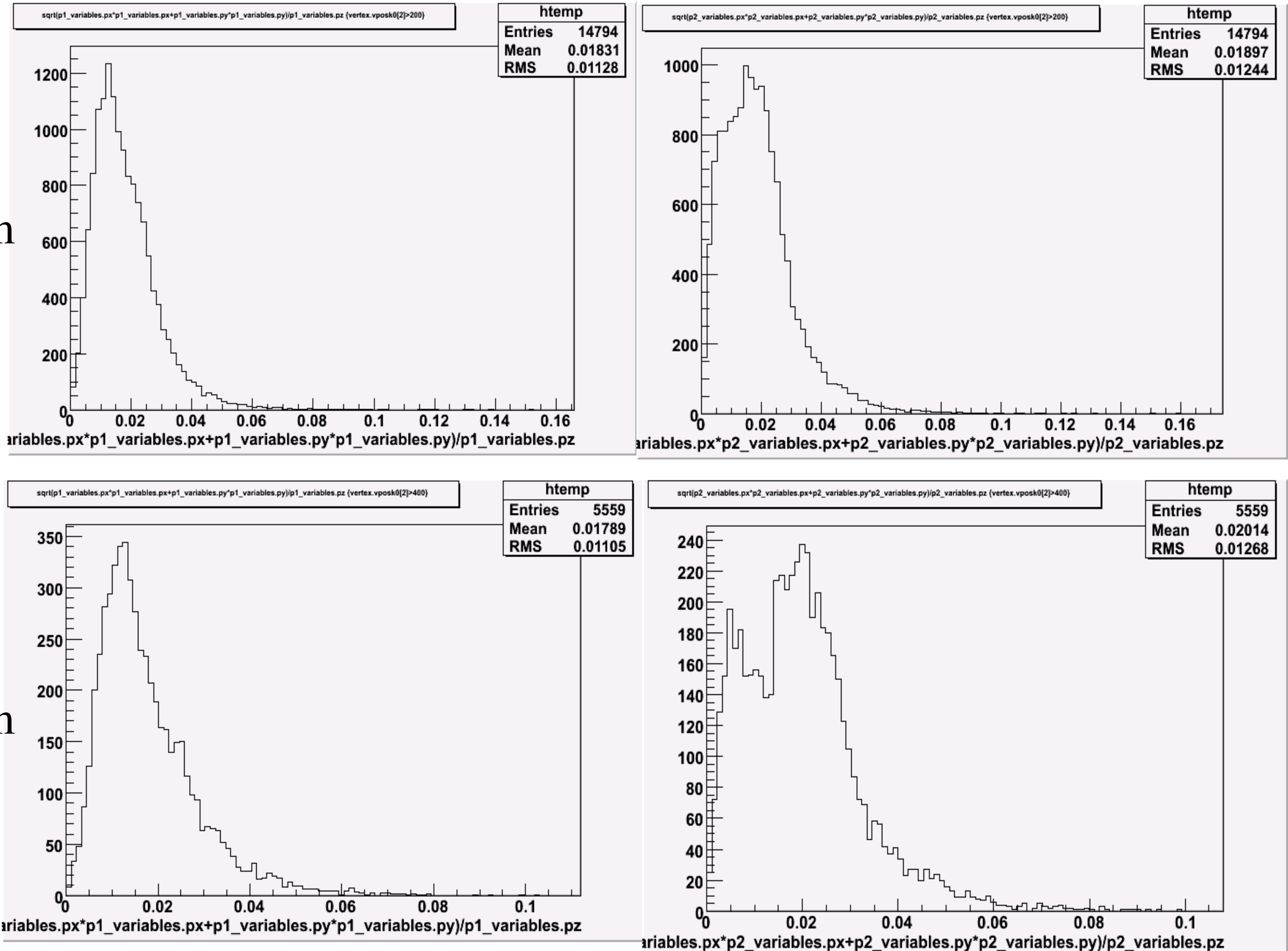
pi from K0



h+ h-

z>2m

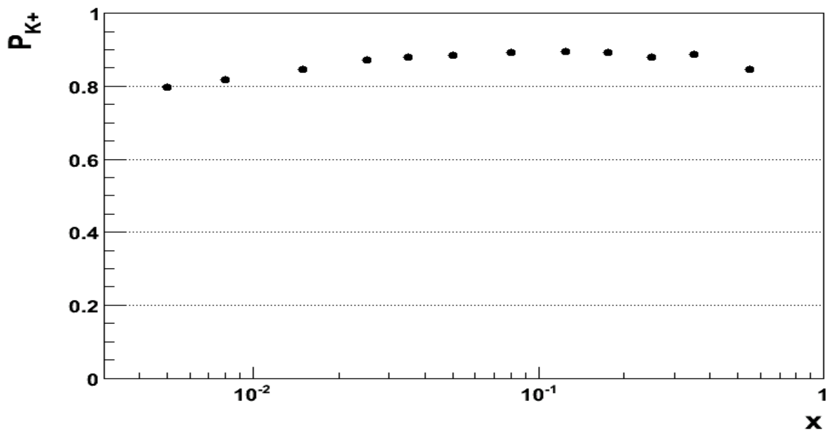
z>4m

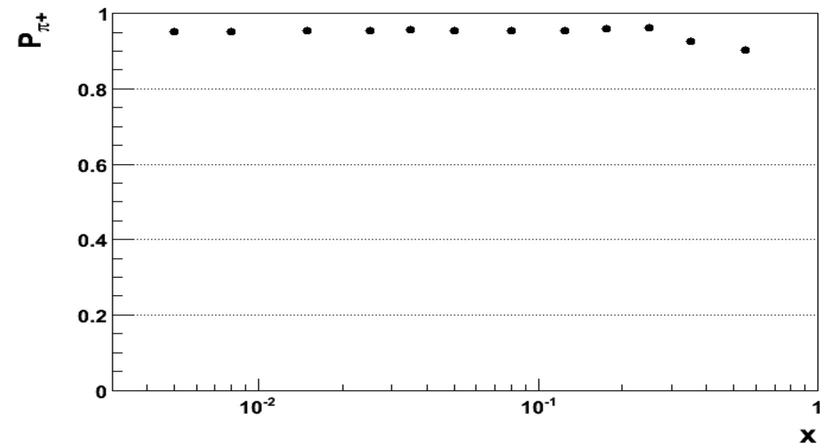


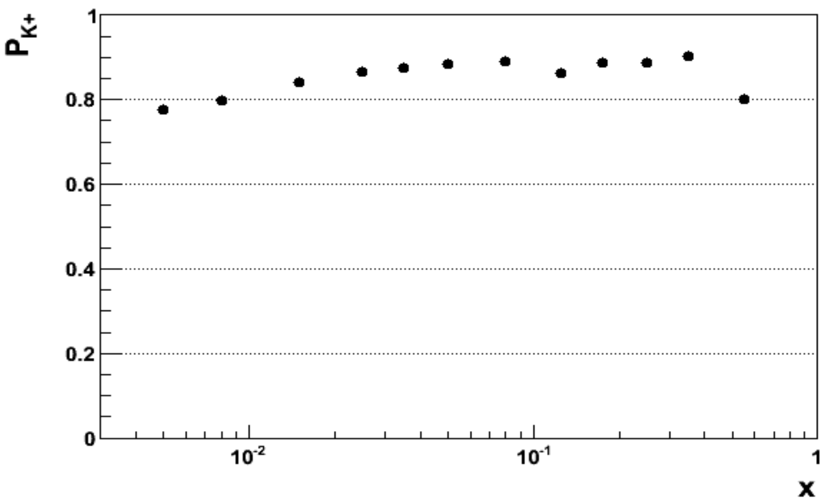
sqrt(p1_variables.px*p1_variables.px+p1_variables.py*p1_variables.py)/p1_variables.pz {vertex.vposk0[2]>200}
htemp
Entries 14794
Mean 0.01831
RMS 0.01128
ariables.px*p1_variables.px+p1_variables.py*p1_variables.py)/p1_variables.pz
sqrt(p2_variables.px*p2_variables.px+p2_variables.py*p2_variables.py)/p2_variables.pz {vertex.vposk0[2]>200}
htemp
Entries 14794
Mean 0.01897
RMS 0.01244
ariables.px*p2_variables.px+p2_variables.py*p2_variables.py)/p2_variables.pz
sqrt(p1_variables.px*p1_variables.px+p1_variables.py*p1_variables.py)/p1_variables.pz {vertex.vposk0[2]>400}
htemp
Entries 5559
Mean 0.01789
RMS 0.01105
ariables.px*p1_variables.px+p1_variables.py*p1_variables.py)/p1_variables.pz
sqrt(p2_variables.px*p2_variables.px+p2_variables.py*p2_variables.py)/p2_variables.pz {vertex.vposk0[2]>400}
htemp
Entries 5559
Mean 0.02014
RMS 0.01268
ariables.px*p2_variables.px+p2_variables.py*p2_variables.py)/p2_variables.pz

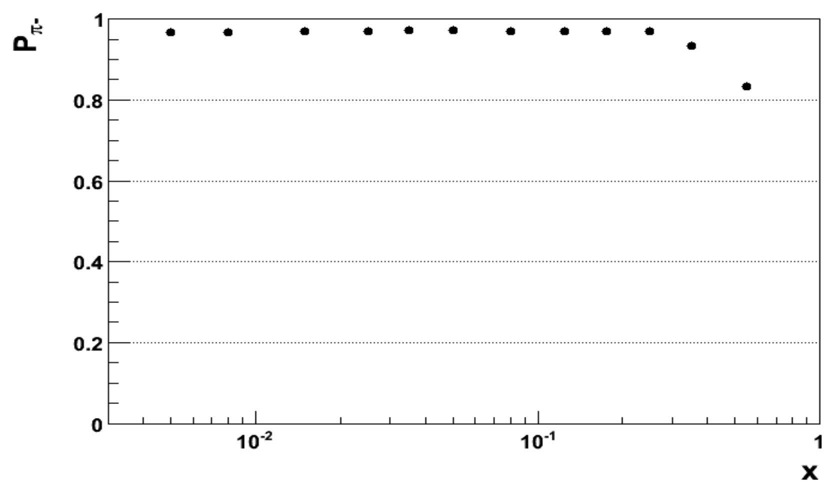
Purities vs x

$$Purity(K) = \frac{1}{N_K} \sum_i Purity(\theta_i, p_i)\mathrm{Ni}$$









How to correct asymmetries?

$$A_{\pi}^{M} = p_{\pi} A_{\pi}^{T} + \left(1 - p_{\pi}\right) A_{K}^{T}$$

$$A_{K}^{M} = p_{K} A_{K}^{T} + \left(1 - p_{K}\right) A_{\pi}^{T}$$

$A_{\pi}^{M} - mesured\ \ pions\ \ asymmetry$

$A_{\pi}^{T} - true\ \ pions\ \ asymmetry$

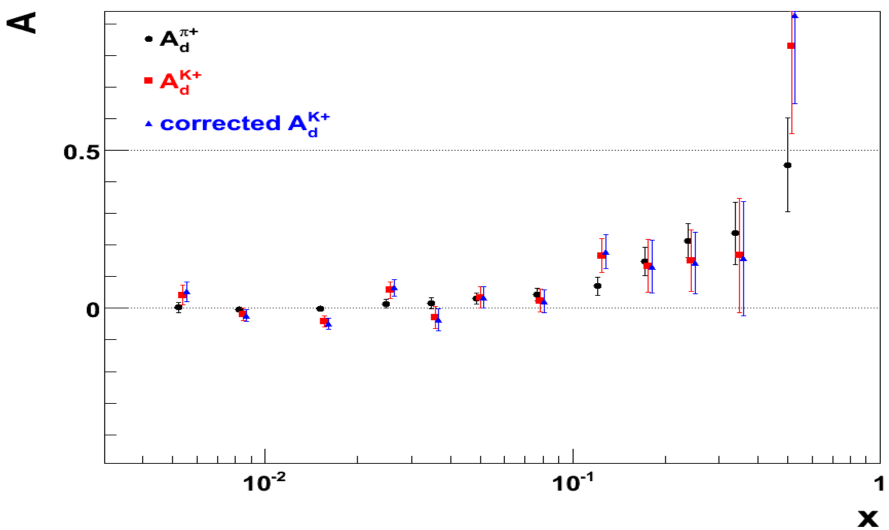
$p_{\pi} - pions\ \ purity$

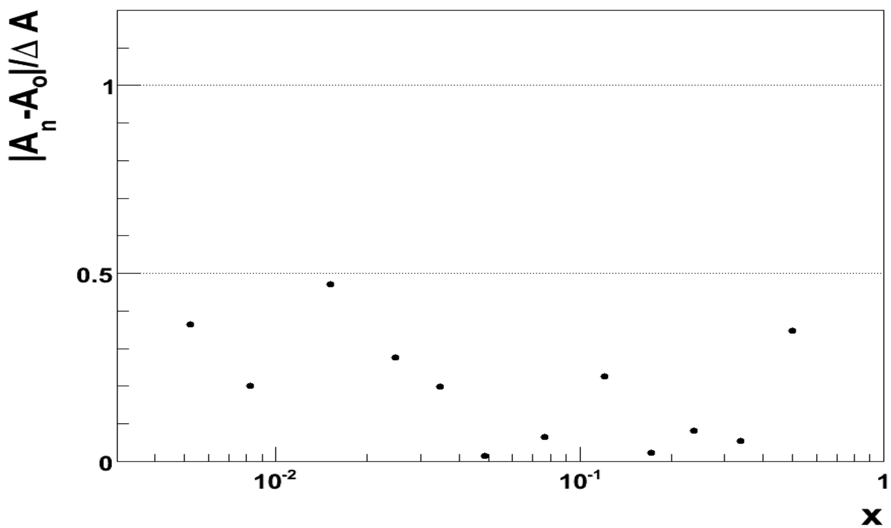
$p_{K} - kaons\ \ purity$

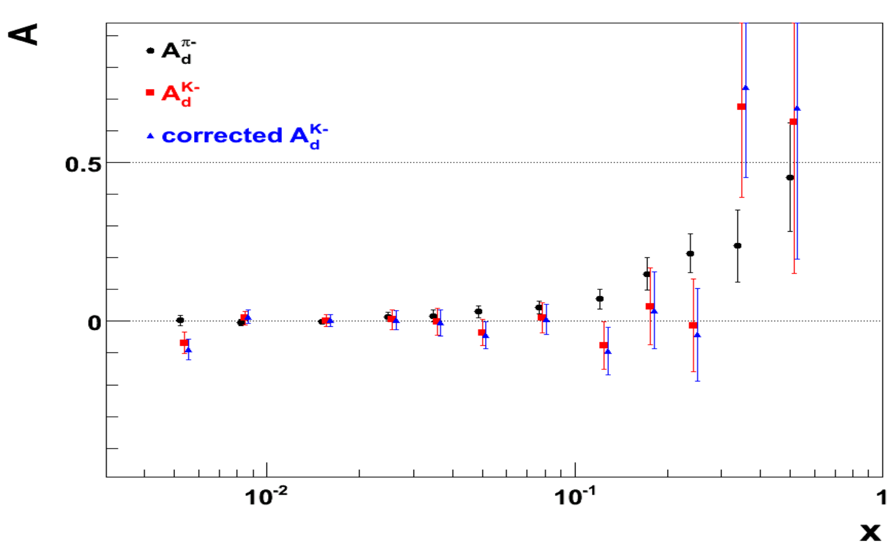
$$A_{K}^{T} = \frac{p_{\pi}}{p_{\pi} + p_{K} - 1} A_{K}^{M} - \frac{1 - p_{K}}{p_{\pi} + p_{K} - 1} A_{\pi}^{M}$$

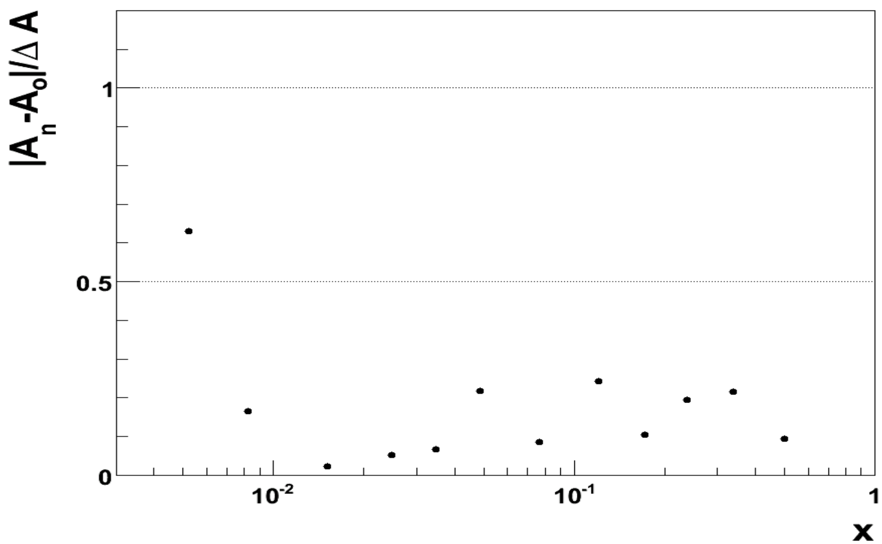
$$A_{\pi}^{T} = \frac{p_{K}}{p_{\pi} + p_{K} - 1} A_{\pi}^{M} - \frac{1 - p_{\pi}}{p_{\pi} + p_{K} - 1} A_{K}^{M}$$

Asymmetries (K+, K-)

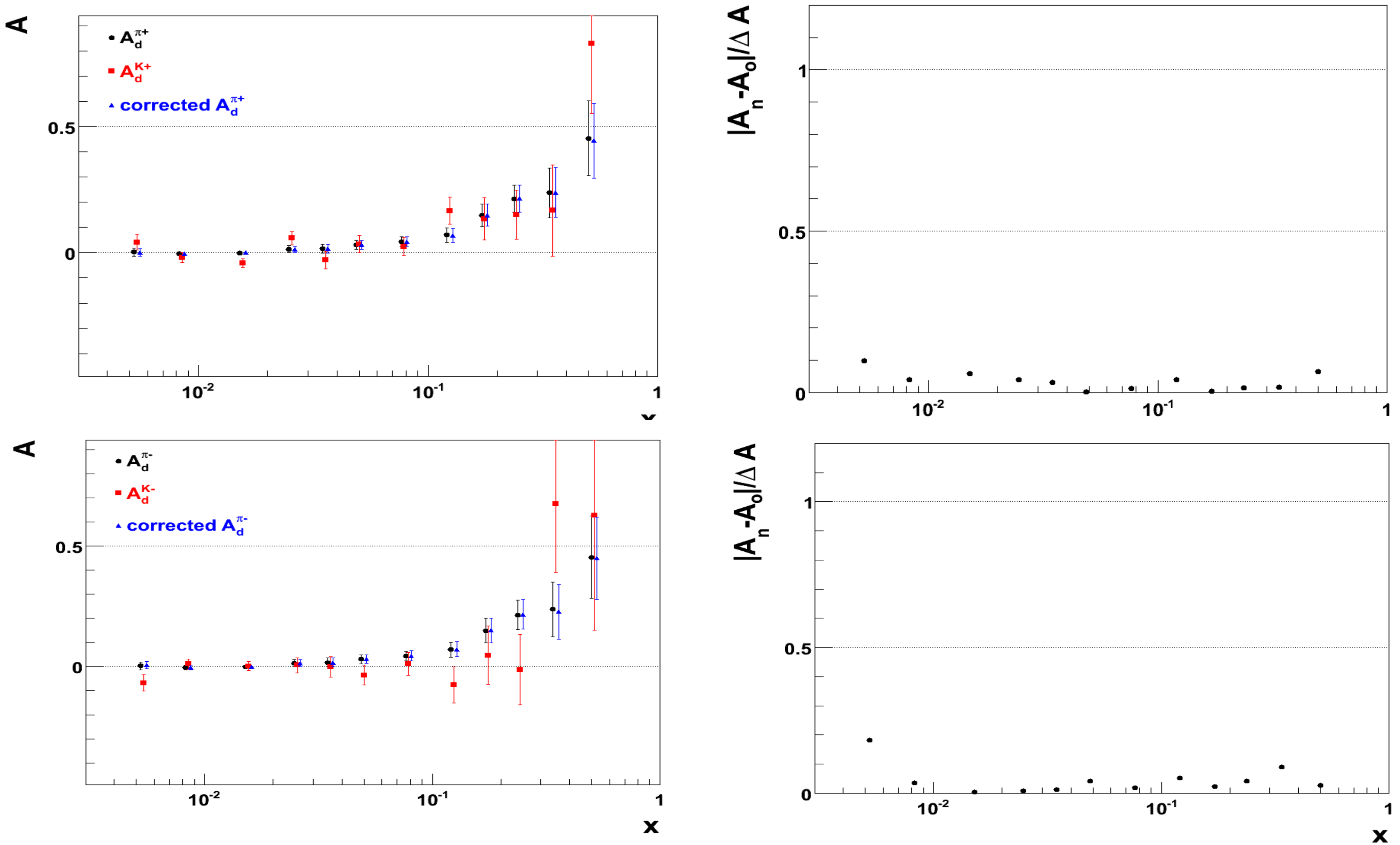








Asymmetries (PI+, PI-)



Conclusions

- Bad runs and bad spills were spills were obtained for longitudinal runs (Q2>1)
- Purities with RICH momentum and angles are calculated
  - differences with previous method is very small
- Correction to asymmetries is important and cannot be neglected
- Still missing: cuts optimization with LH(e) and for 2006