TOFp / pVPD / TOFr

W.J. Llope for the STAR TOF group
STAR Collaboration Meeting, BNL, 2/26/2003

outline:

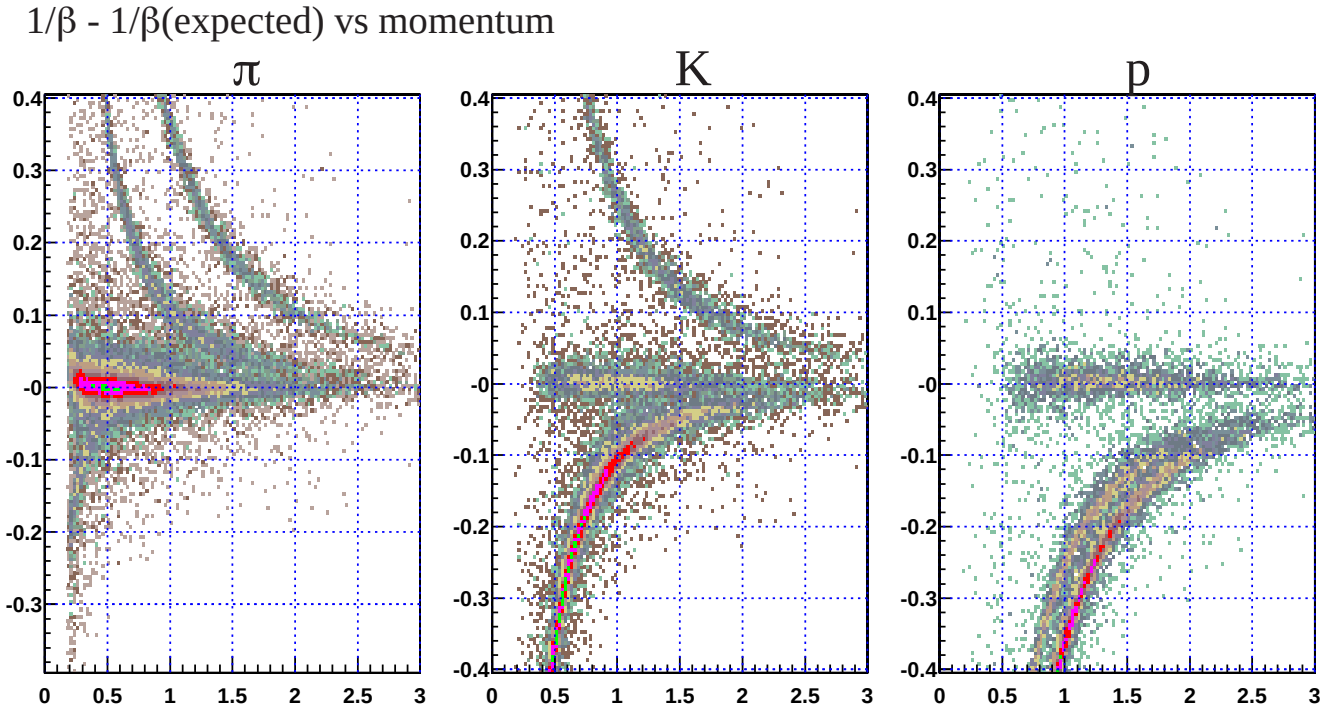
Run-III (d+Au)
- hardware...
- first results from various parts (TOFp, pVPD, TOFr)...
- chronology for days 19 - 55...
  - hit patterns movie...
- preliminary pVPD performance...
  - efficiency...
  - start resolution...
- first results from the stop side

Run-II (Au+Au)
- improvements to corrections since last analysis meeting...
  - TDC calibration...
  - “drift” correction...
- 1/beta vs. p and latest resolution numbers...
- Studies with the “just throw” Match N-Tuple...
  - matching efficiencies and tracking cuts
  - matching efficiencies and matching and calibration variables...
- -/+ ratios status...

Run-II Analyses (since last analysis meeting)

...basically going back and do some things better/simpler...

note the (Zhit,ADC) calibrations done for pions, then applied to all matches in subsequent passes)



this is the famous slat 28, which happens to have a TDC calibration very close to 50ps/ch.

need to actually calibrate the TOFp TDCs.... there's a catch-22 though...

need decent stop resn to try to use tmeas vs texpected (or equivalent techniques)

but to get decent stop resn one must do (Zhit,ADC) calibrations

these are done "in 1/β space" so they require assumption of the TDC slope.

a certain amount of "brute force" is needed here.

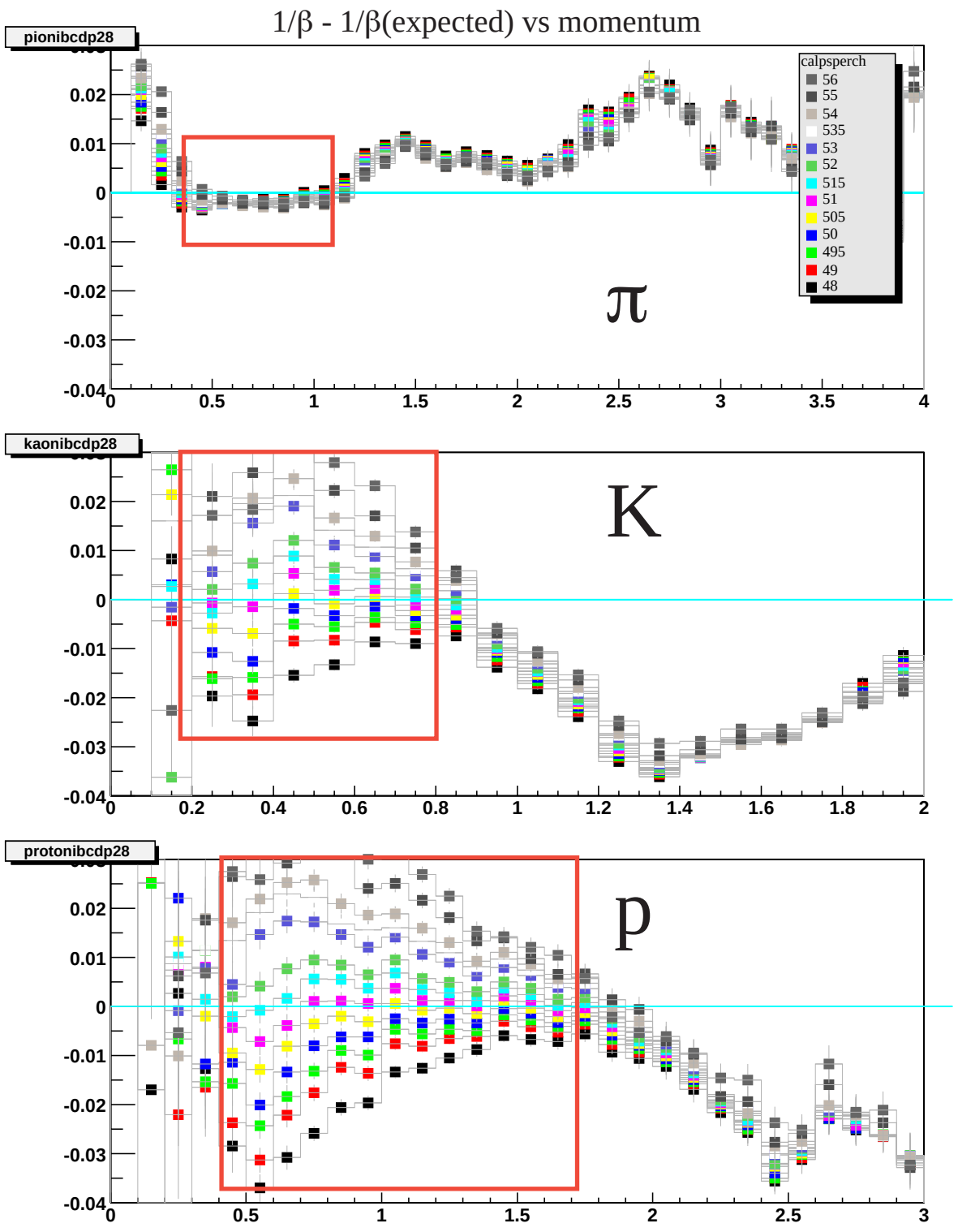
TOFp TDC Calibration

of order of 50 ps/bin
but can vary by +/- 5%

independently define tdc
calibration for K and p
by fully calibrating the data set
vs (Zhit, ADC)
for specific value of TDC calibration

then look to see what calibration
results in closest agreement
between "1/β - 1/β(expected) vs momentum"
for K and p.

want best calibration for Kaons
to match best calibration for protons!



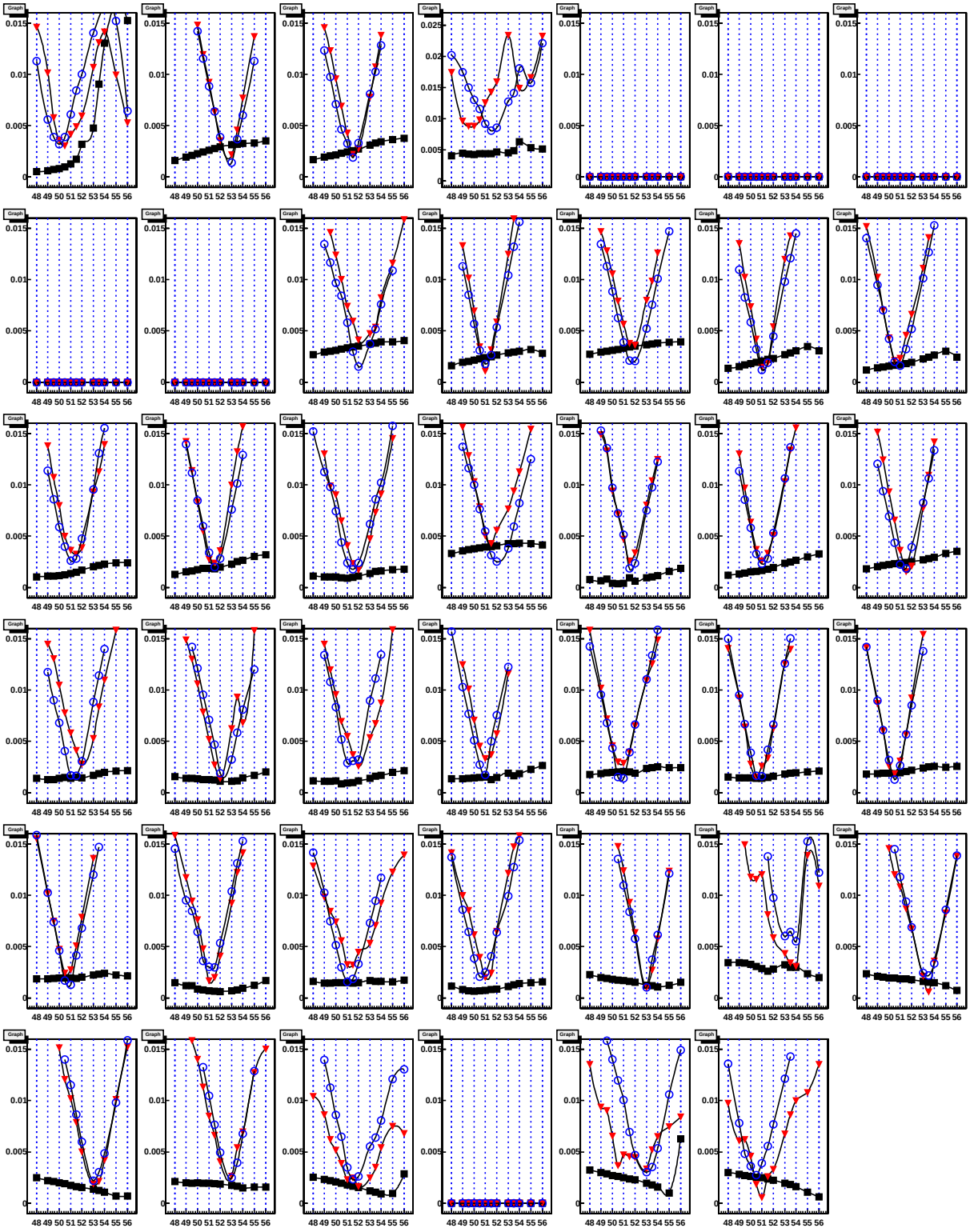
TOFp TDC Calibrations continued....

1/β difference (measured-expected)
in “clean” momentum regions
vs fixed TDC slope
for Kaons
for protons
in range 48-56 ps/bin...

if method is working, the minima should be at the same value...

values of TDC slope at these minima for each TOFp channel are thus defined.

then full (Zhit,ADC) stop calibration then done again w/ this set of TDC slopes...



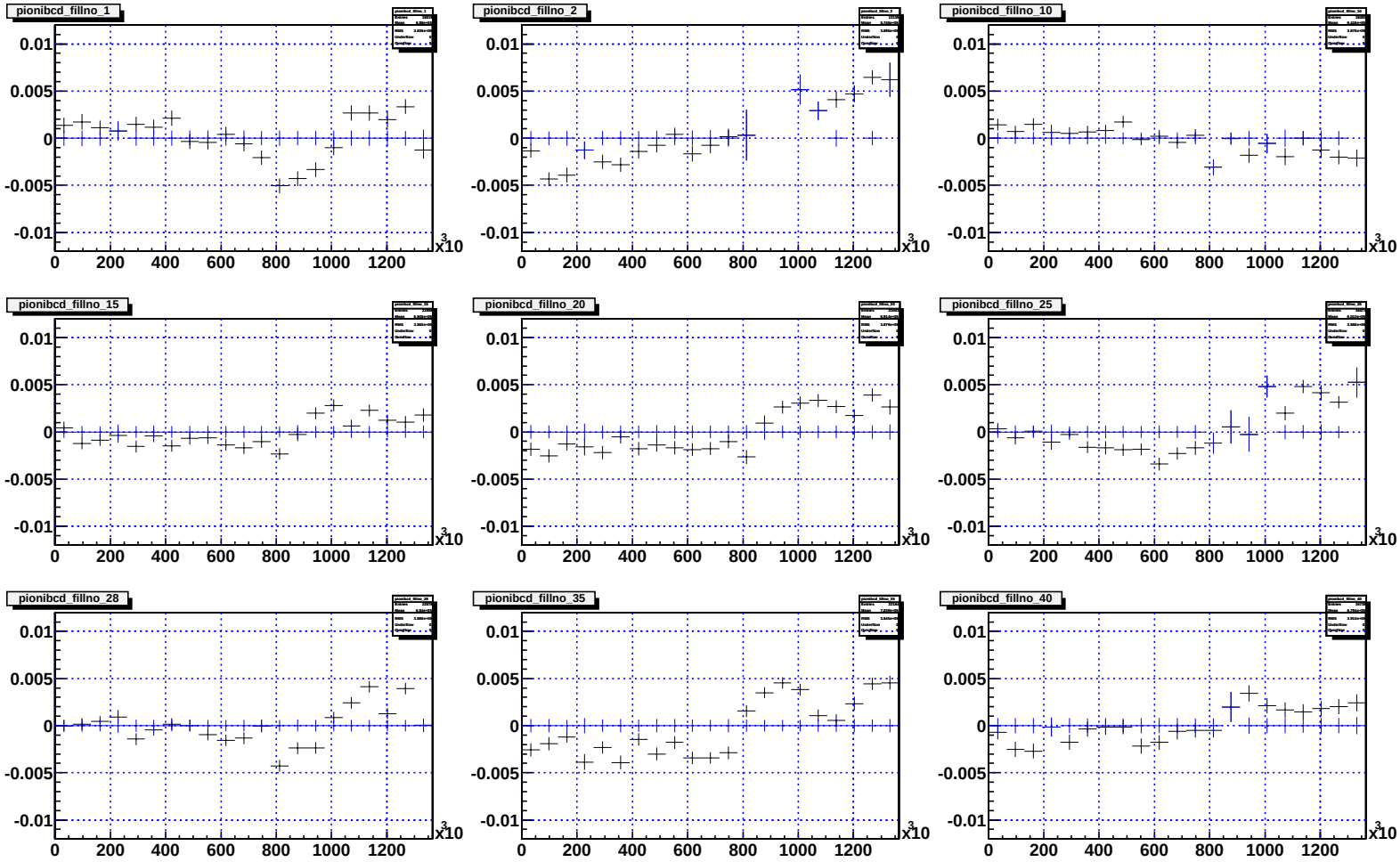
“Drift” correction

as of last analysis meeting, was stop-calibrating both polarities together,
and letting the “drift correction” take care of the difference in timing offsets
for polarities A and B...
not really the best approach....

nine different TOFp slats...

1/β difference for pions

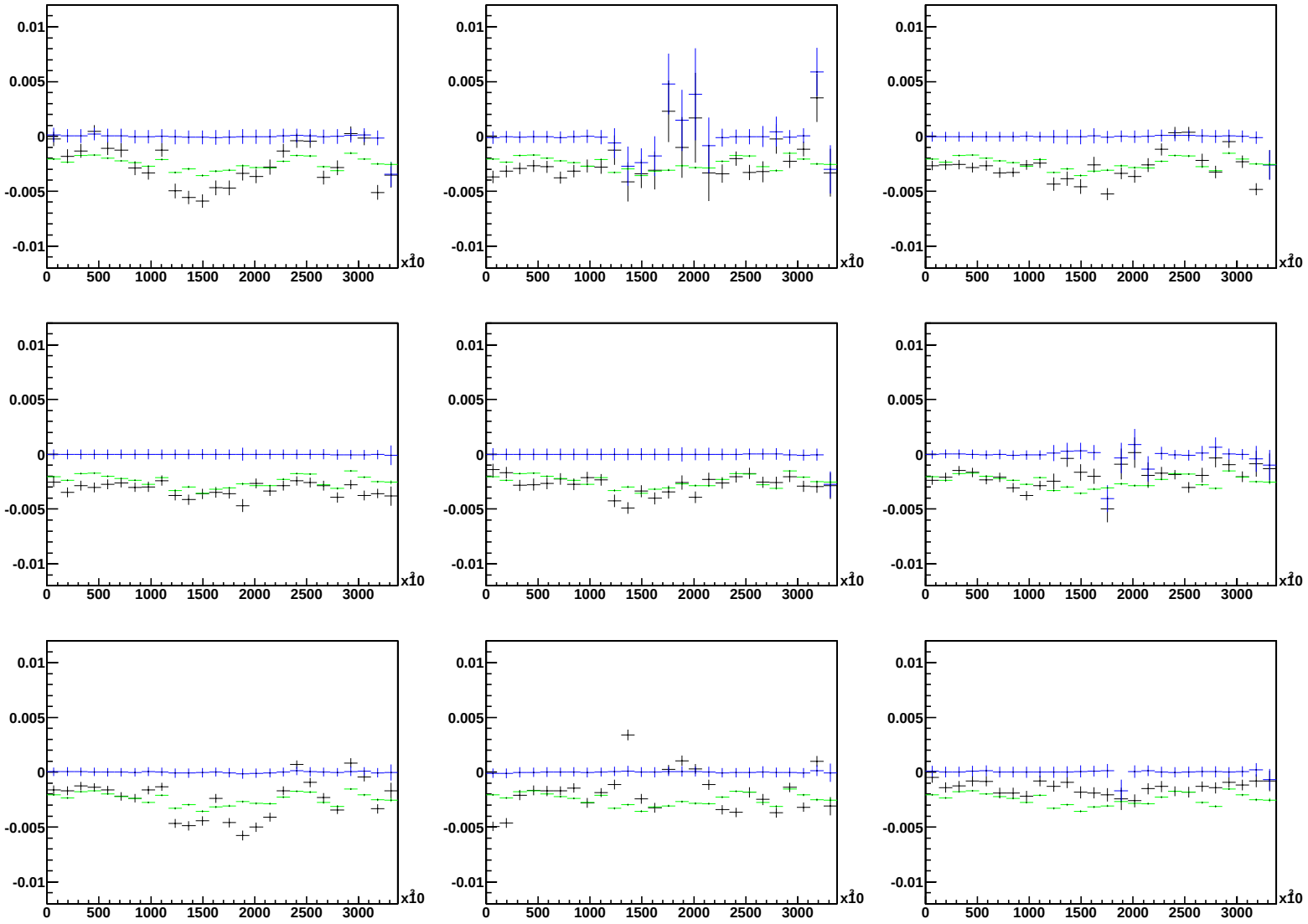
(expanded scale!)



“event number”
(total ~900k AuAu central)

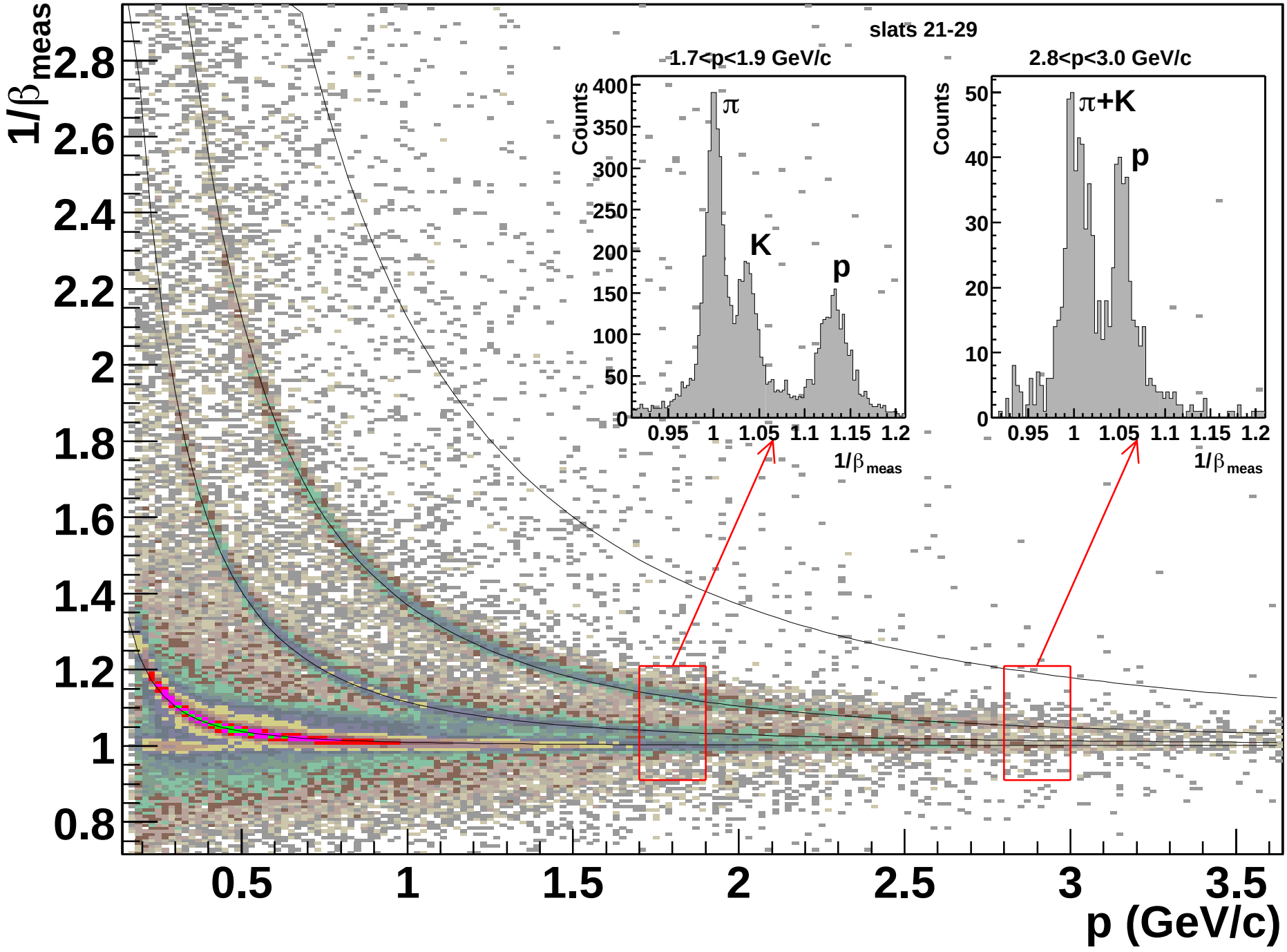
now calibrating polarity A and B data sets separately...

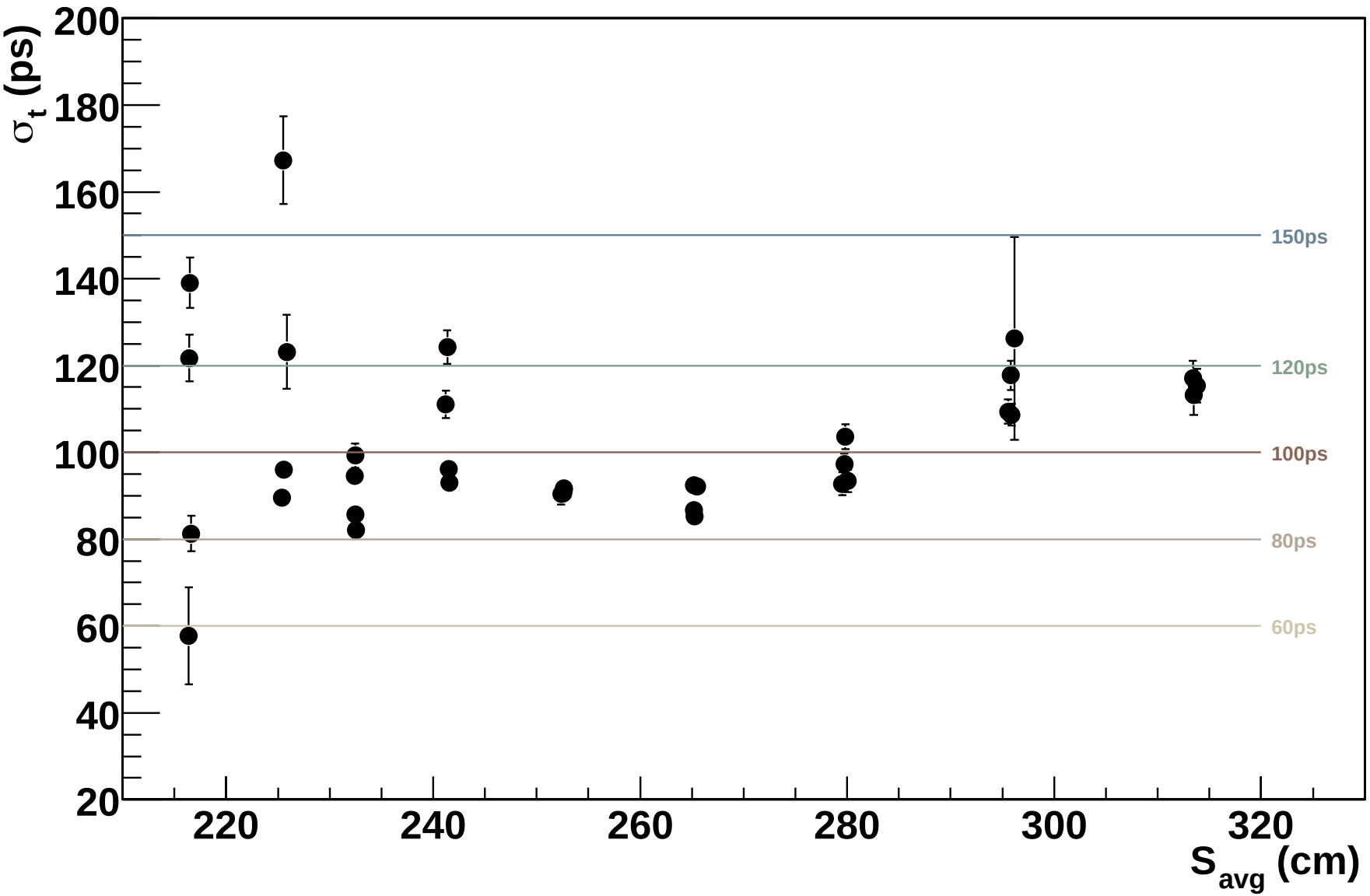
(still very expanded scale here)

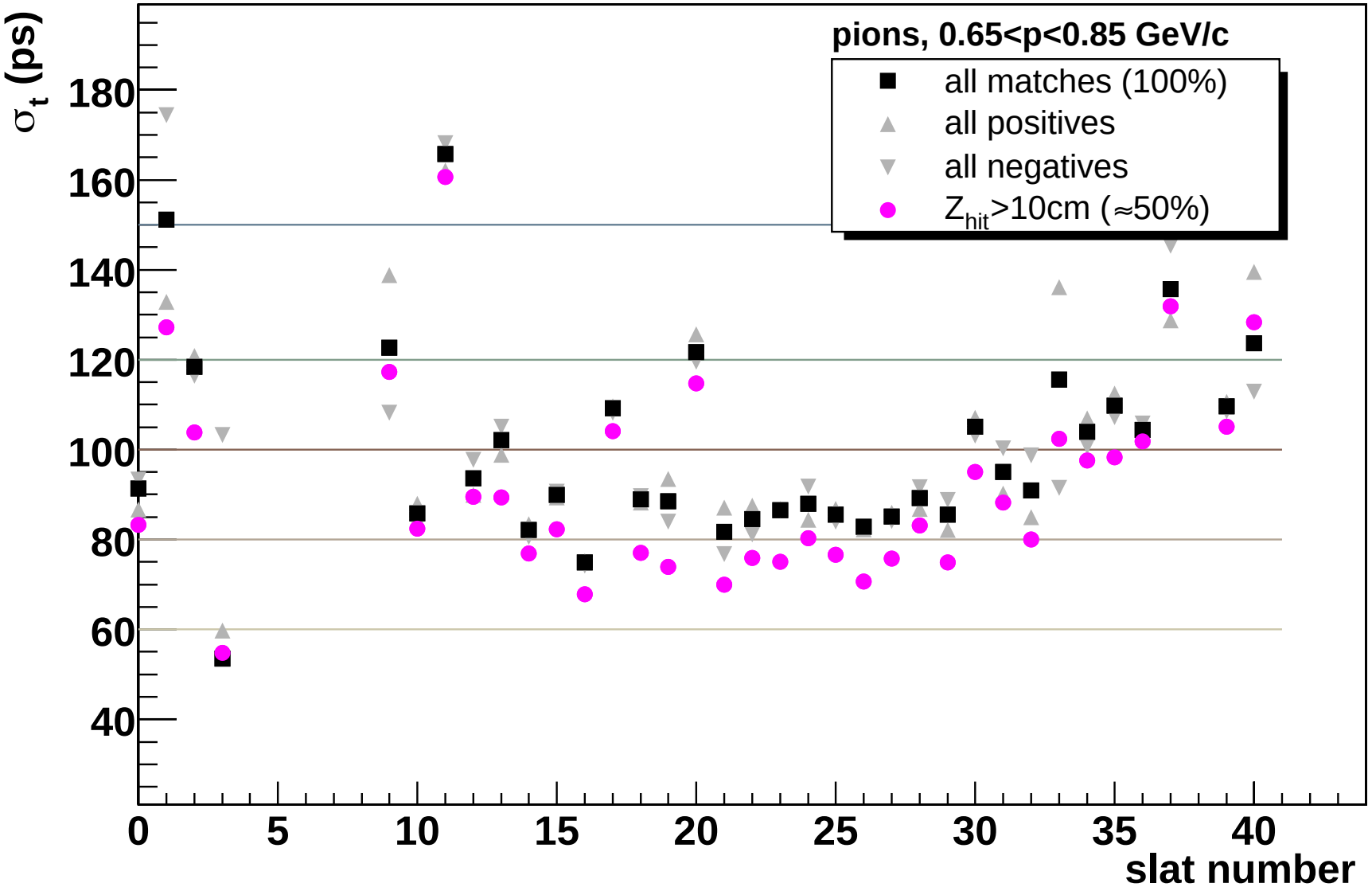


black 1/β difference average for pions after only (Zhit,ADC) calibrations
blue same, after new “drift” correction
green same, but average over all slats in the system...

drift correction not really necessary anymore - calibrated 1/β offsets quite stable....


slats 21-29
1.7<p<1.9 GeV/c
2.8<p<3.0 GeV/c
Counts
π
K
p
π+K
p
1/β meas
1/β meas
p (GeV/c)


σ_t (ps)
200
180
160
140
120
100
80
60
40
20
220
240
260
280
300
320
S_{avg} (cm)
150ps
120ps
100ps
80ps
60ps


pions, 0.65<p<0.85 GeV/c
all matches (100%)
all positives
all negatives
Z_hit>10cm (≈50%)
σ_t (ps)
180
160
140
120
100
80
60
40
0
5
10
15
20
25
30
35
40
slat number

studies from the “just throw” microdst (Run-2 AuAu central).

only track geometry and tofp geometry is used to make matches

no conditions/algorithms based on whether the located slat was actually struck or not

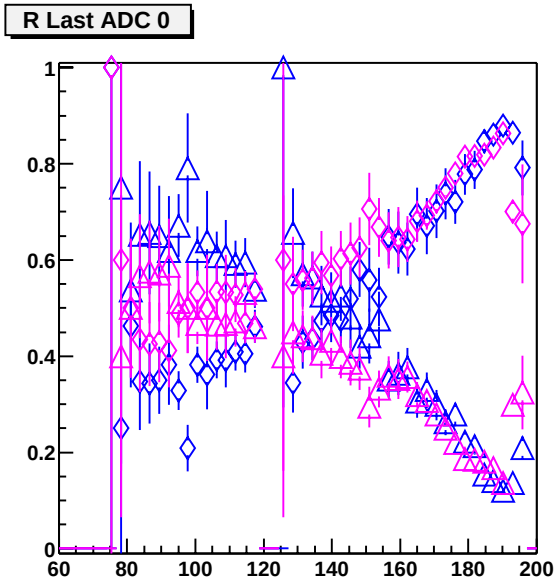
no tracking cuts

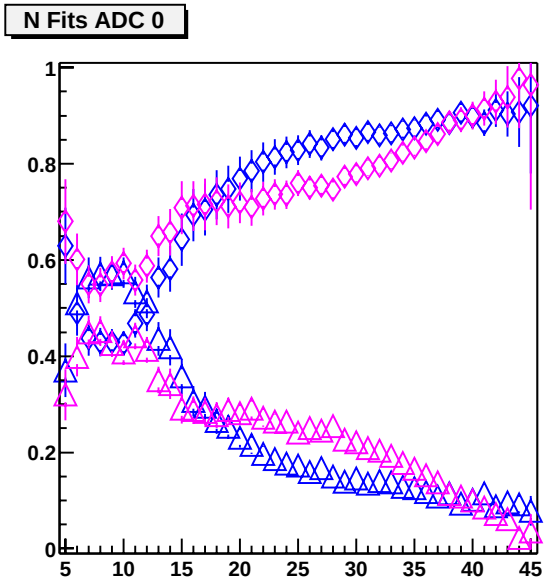
(D. Fullaway)

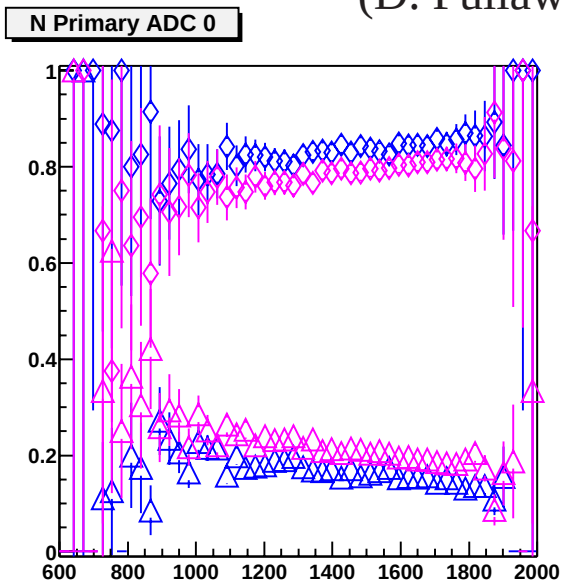
Prob Hit

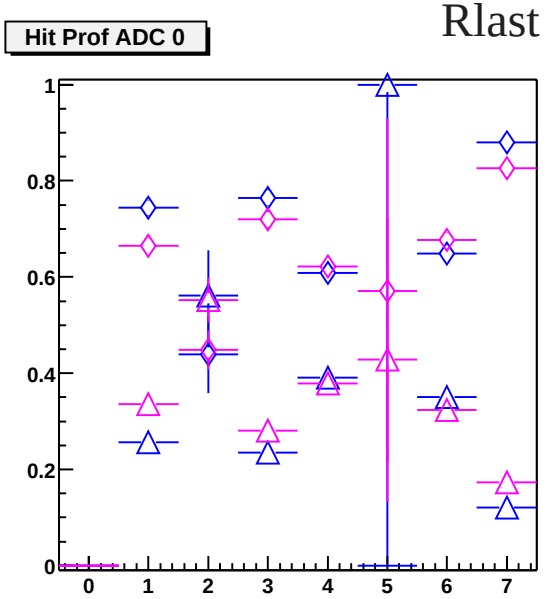
and

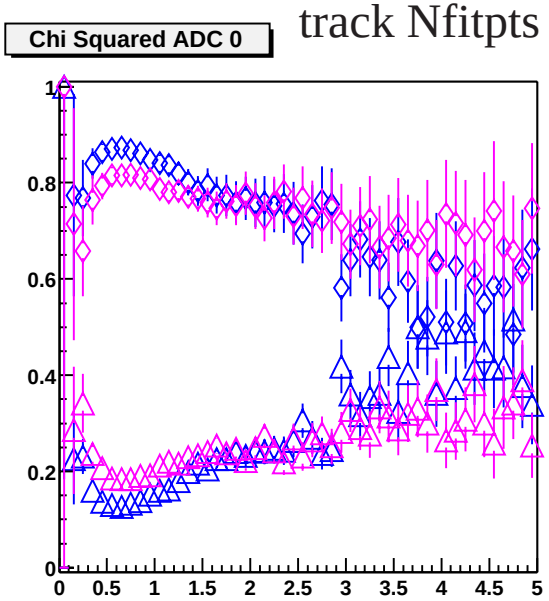
Prob not hit

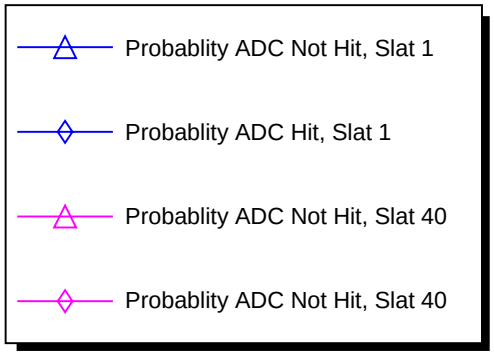




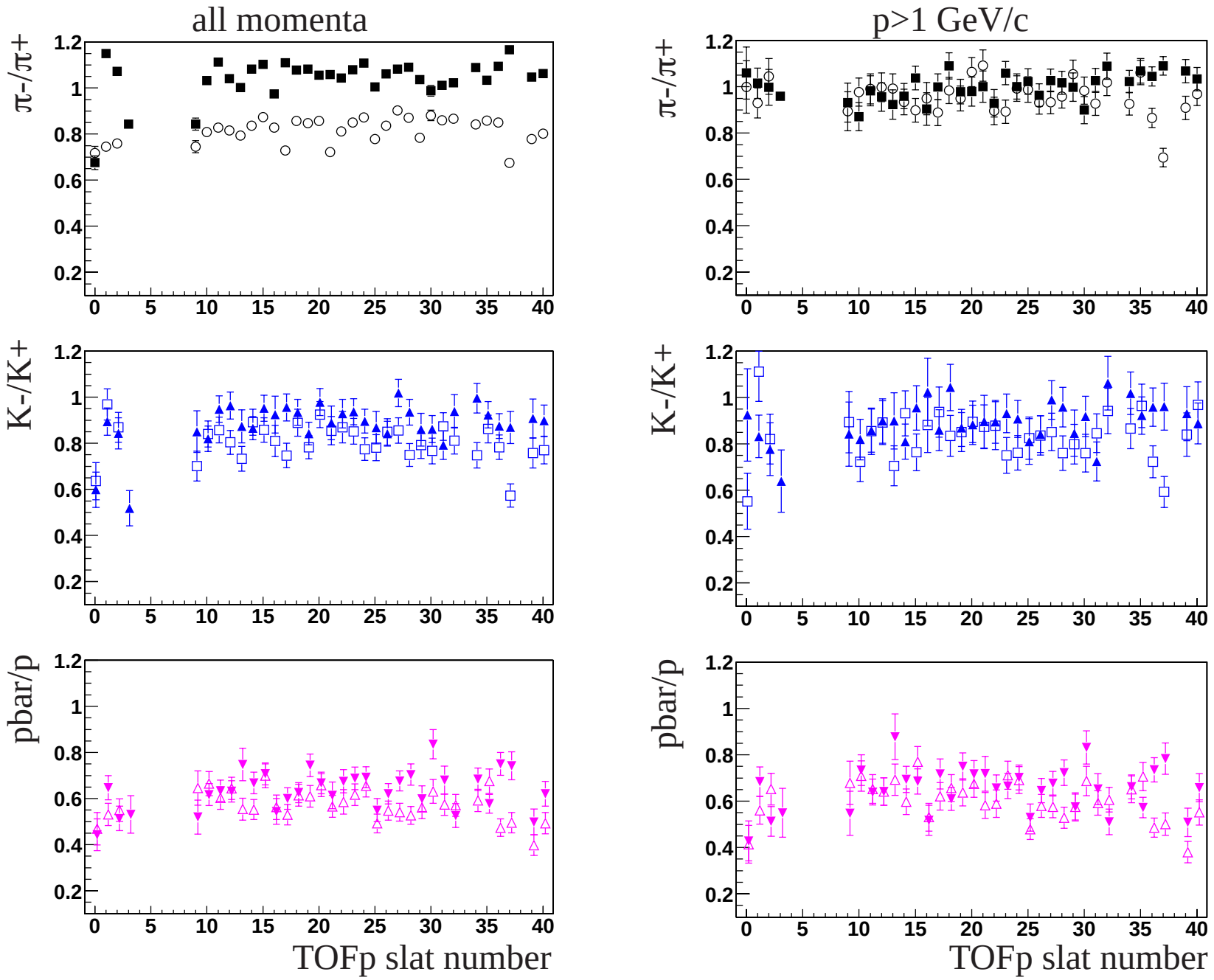








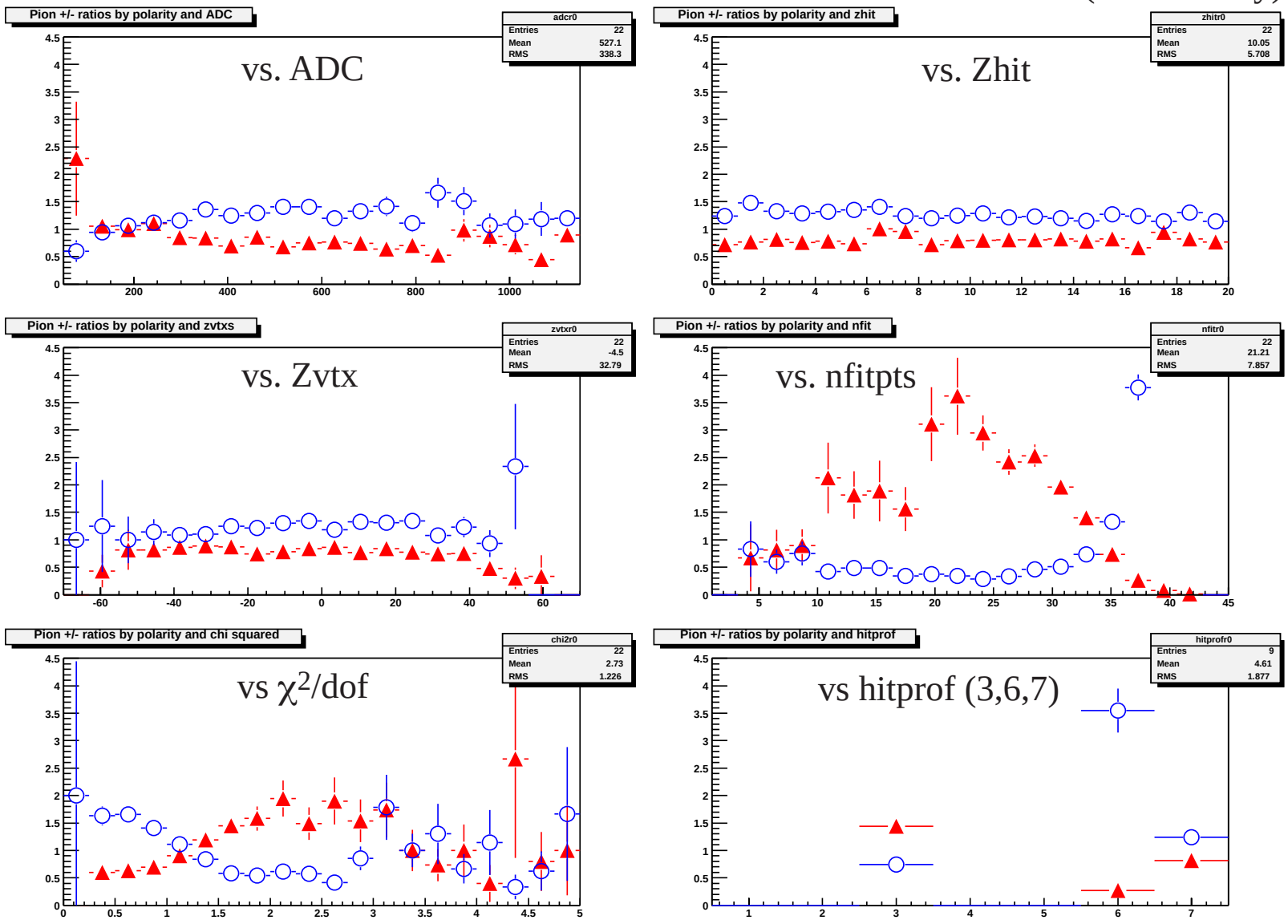
recall from recent analysis meeting talk: TOFp has it's own proton puzzle.
-/+ ratio depends on magnet polarity for p<~1 GeV/c



now plot pbar/p ratios for p<1 GeV versus various variables involved at matching or calibrations level

(D. Fullaway)

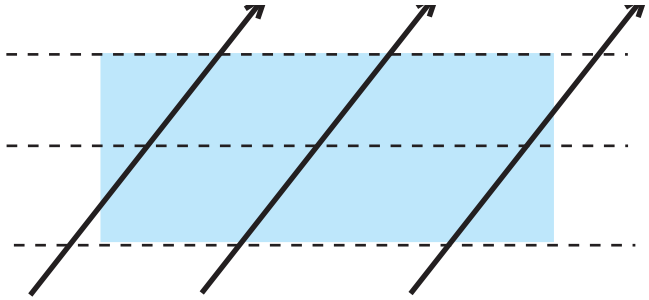
π-/π+ p<1 GeV/c



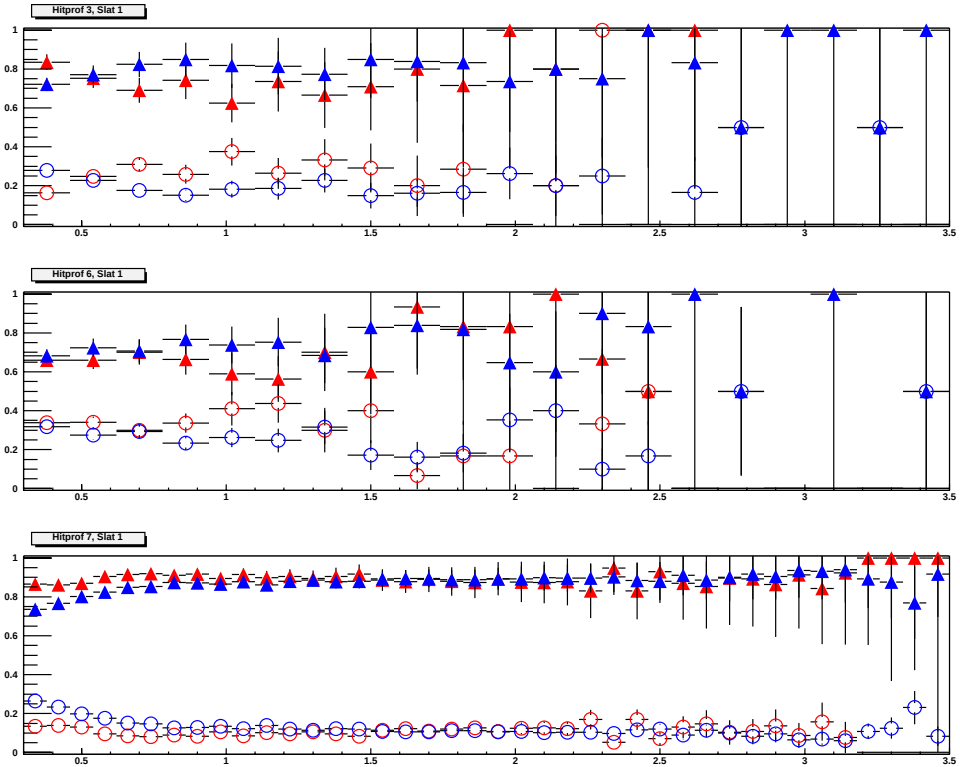
some surprising/stunning trends - need to follow up coordinating w/ matching level...

returning to “just throw” match ntuple

plotting Prob(hit)/total matches and
Prob(not hit)/total matches
for different values of hitprof
two different slats (blue and red)
versus the track momentum

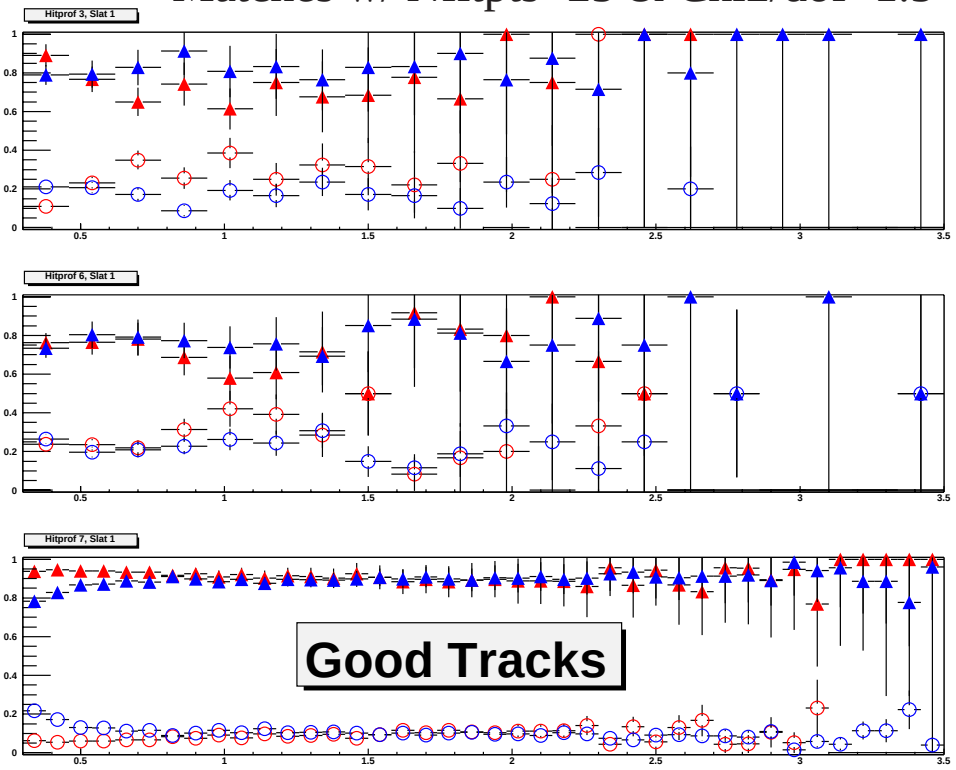


All matches



p (GeV/c)

Matches w/ Nfitpts>25 & Chi2/dof<1.5



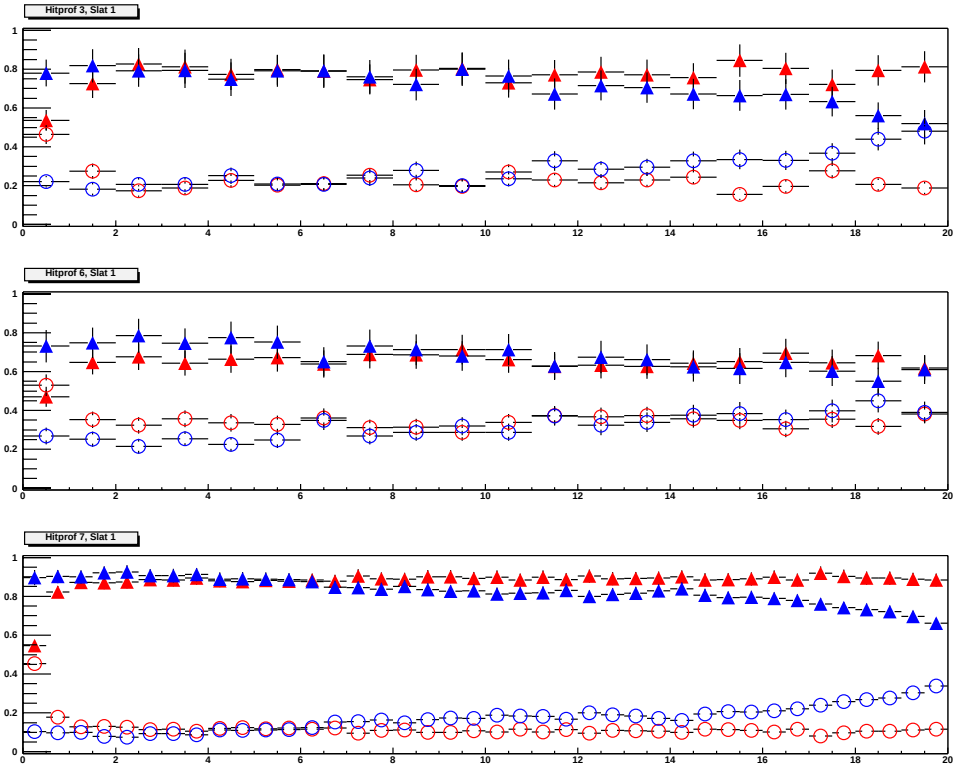
p (GeV/c)

concentrating on hitprof=7 matches, match efficiency is breaking down for p<1 GeV.

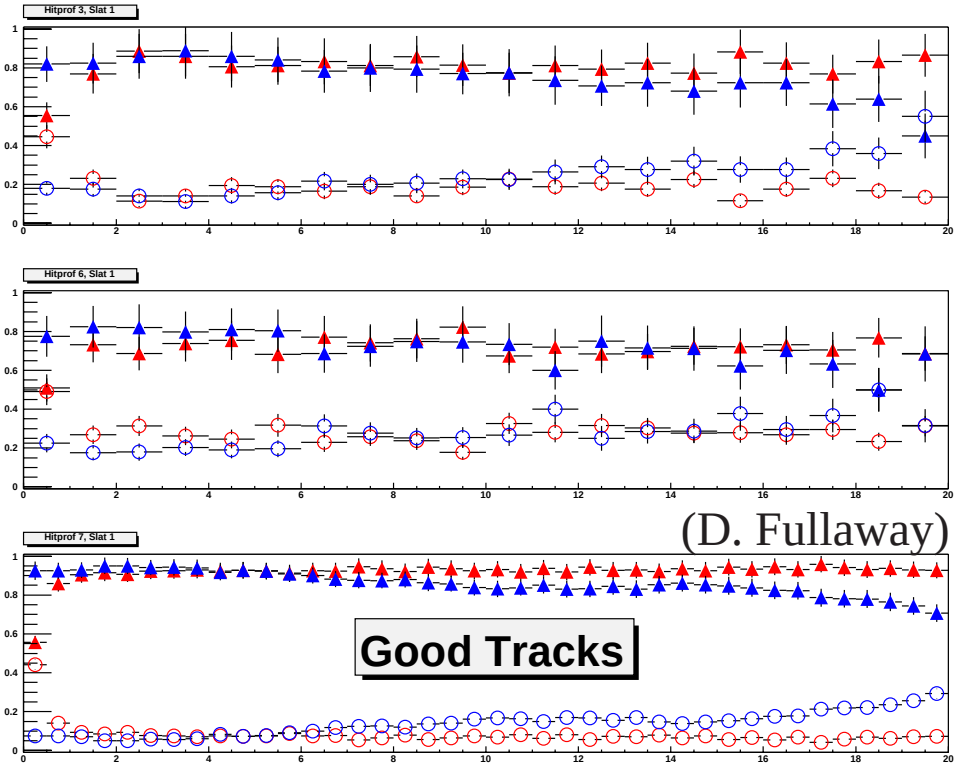
differences seen between hitprof 3 and 6, which are difficult to understand...

matching needs special (new) criteria to make better quality matches here.

even more dramatic effects seen in such plots vs Zhit!!!



Zhit (cm)



(D. Fullaway)

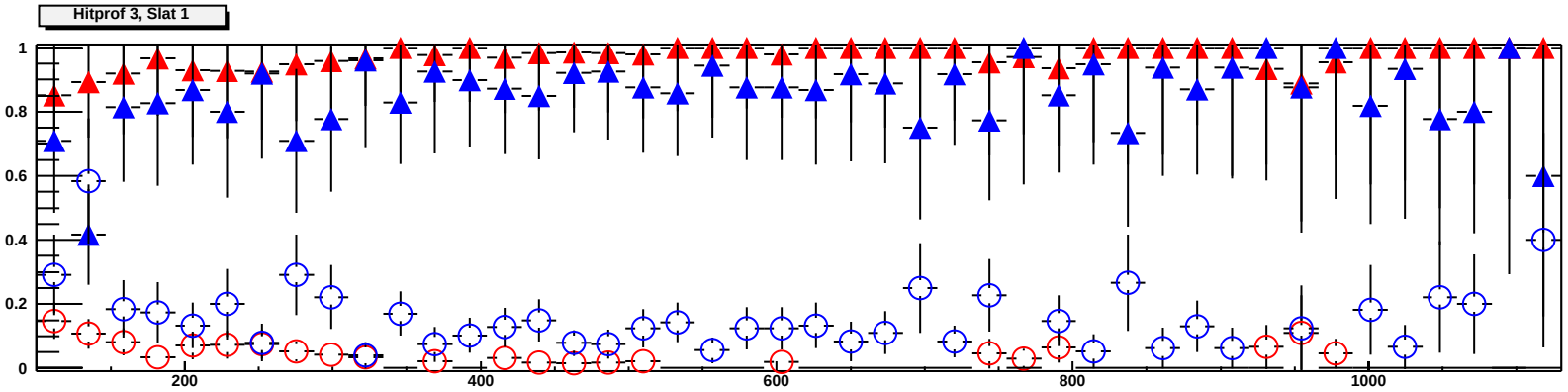
Zhit (cm)

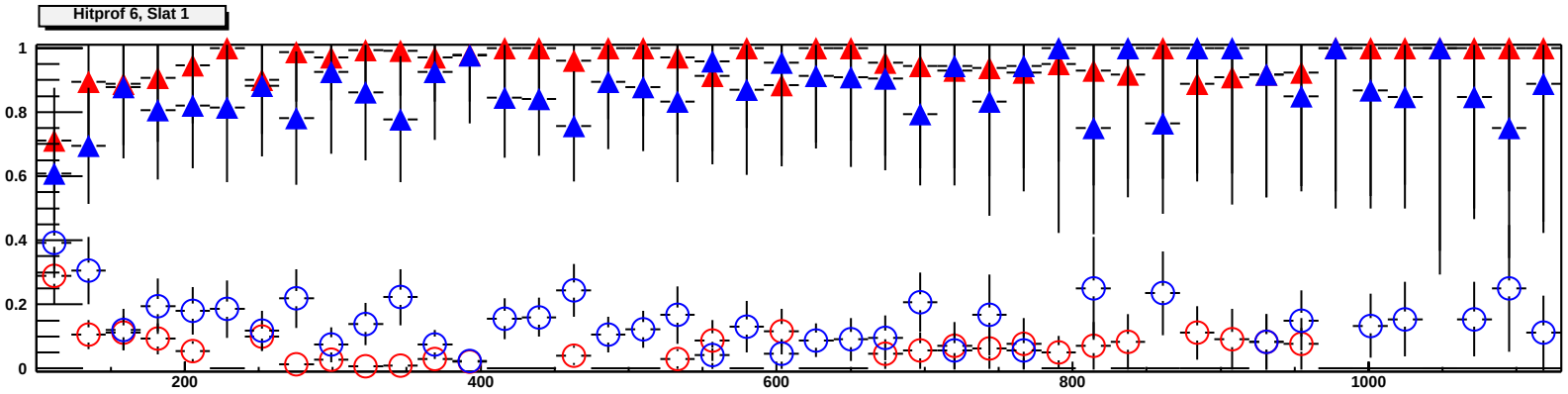
concentrating on hitprof=7 matches, match efficiency is breaking down for Zhit<few cm.

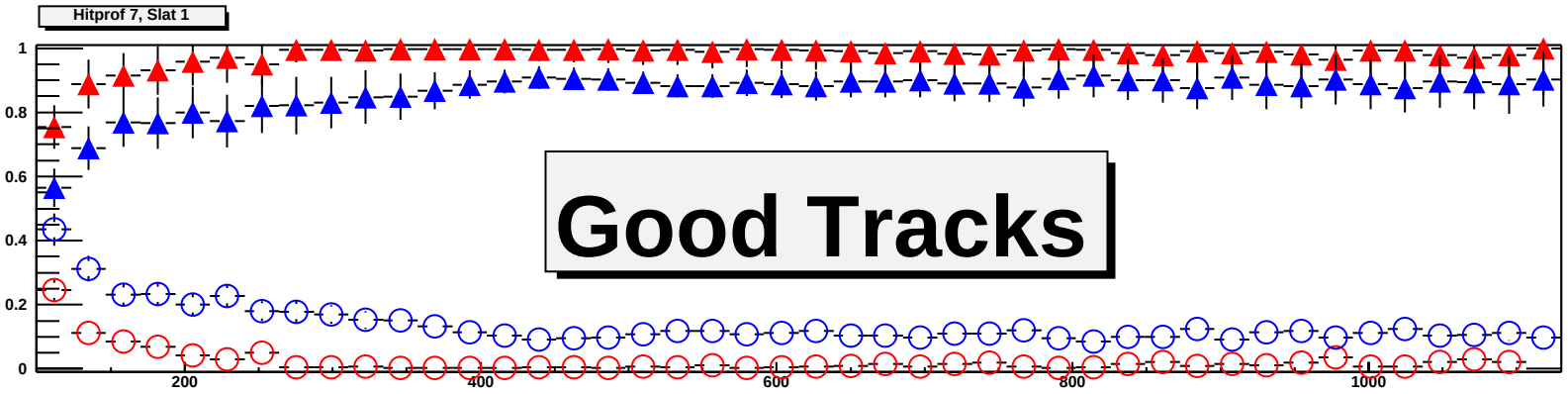
indicates eta- & zvtx-dependent effects at slat eta-edges!

here too, matching may need special (new) criteria to make better quality matches here.

now switch over to defining Hit/Not Hot on basis of TDC...







ADC

ADC Peak

summary

run 3

TOFp is on track to collect enough data to produce physics this run...
this is technically an engineering run for TOFr, nut given a working trigger, physics possible.

run 2

improved calibrations since analysis meeting

tdc calibration done...

no staggering d or dbar signal (run 4!)

now (Zhit,ADC) calibrating separately by polarity

"drift" correction no longer needed really... (percentage effect)

simplified fit functions, improved "pion" cuts...

all these changes had minor effects (some v. small improvements)

wrt results shown in QM02 poster (geurts) and recent analysis meeting...

→ tofp resn and "successful" calibrations approaches pretty well undersood now
→ "iterative" approaches seem to be a fact of life here....

i.e. complete start and stop corrections will be difficult to do in "production" (1 "pass")

now understanding relationship between tracking cuts and match efficiencies...

also seeing some effects that likely can be cleaned up w/ a more detailed match algorithms and "matchflag"

much of this is already implemented in (frank's) dev code...

other optimizations (3 slat planes - 5 slat planes, etc) also...

looking new versions of all four run-2 data sets (tofp match ntuple and pvpd ntuple)

plus new TOFp+pVPD microDSTs and the match ntuples from frank for d+Au "soon"