Fast offline dE/dx calibrations

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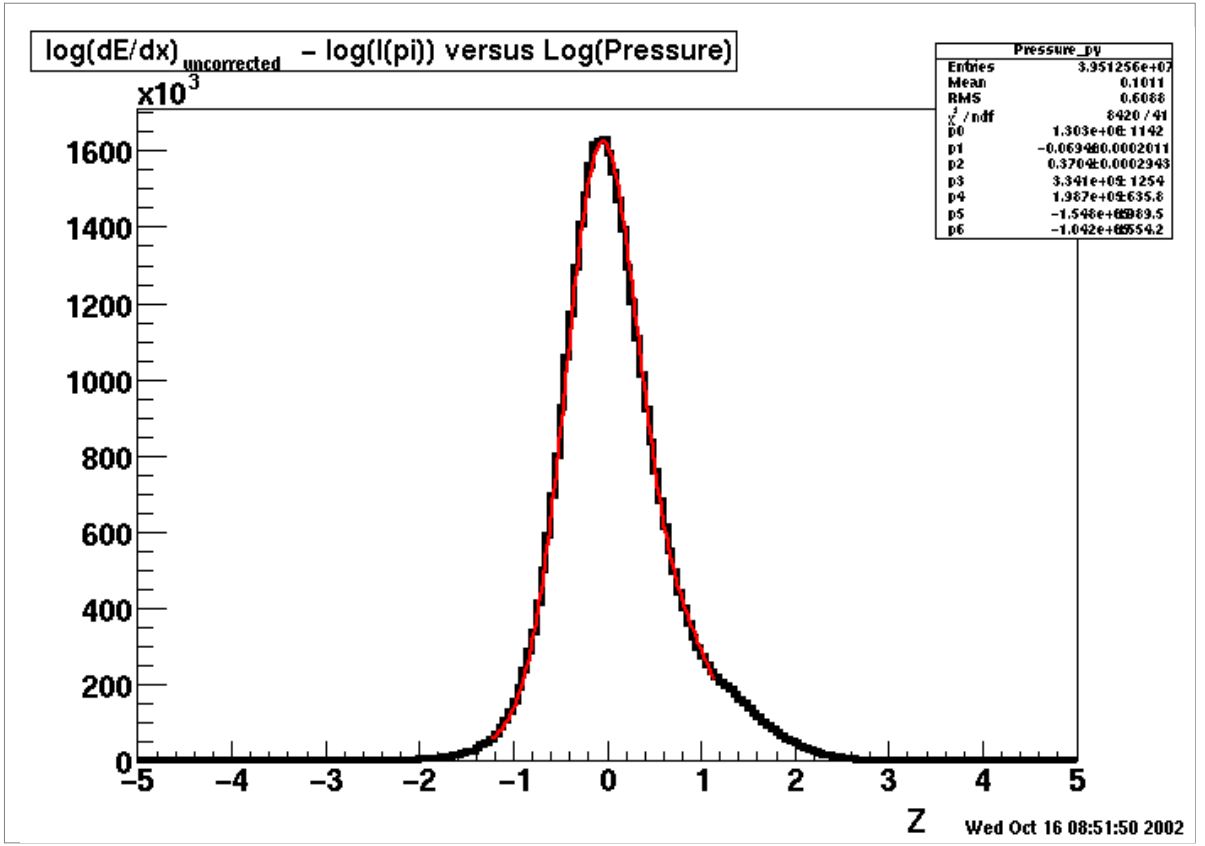
Calibration procedure

- Applying pad correction obtained from pulser data
- For good clusters (used in track fit, no overlaps)
- For good global tracks (No. fit points ≥ 30, Track length in TPC > 40 cm)
- •Fit Z-distribution with Gauss(μ,σ) + pol3 in +/- 3σ
- $Z = \log[(dE/dx)_{measured} / (dE/dx)_{predicted\ for\ \pi}]$ range. It is supposed that we have ~80% π and μ corresponds to π.
- •μ should not depend on
  - •Time, Pressure
  - •Sector, row
  - •Drift distance
  - •…



Corrections

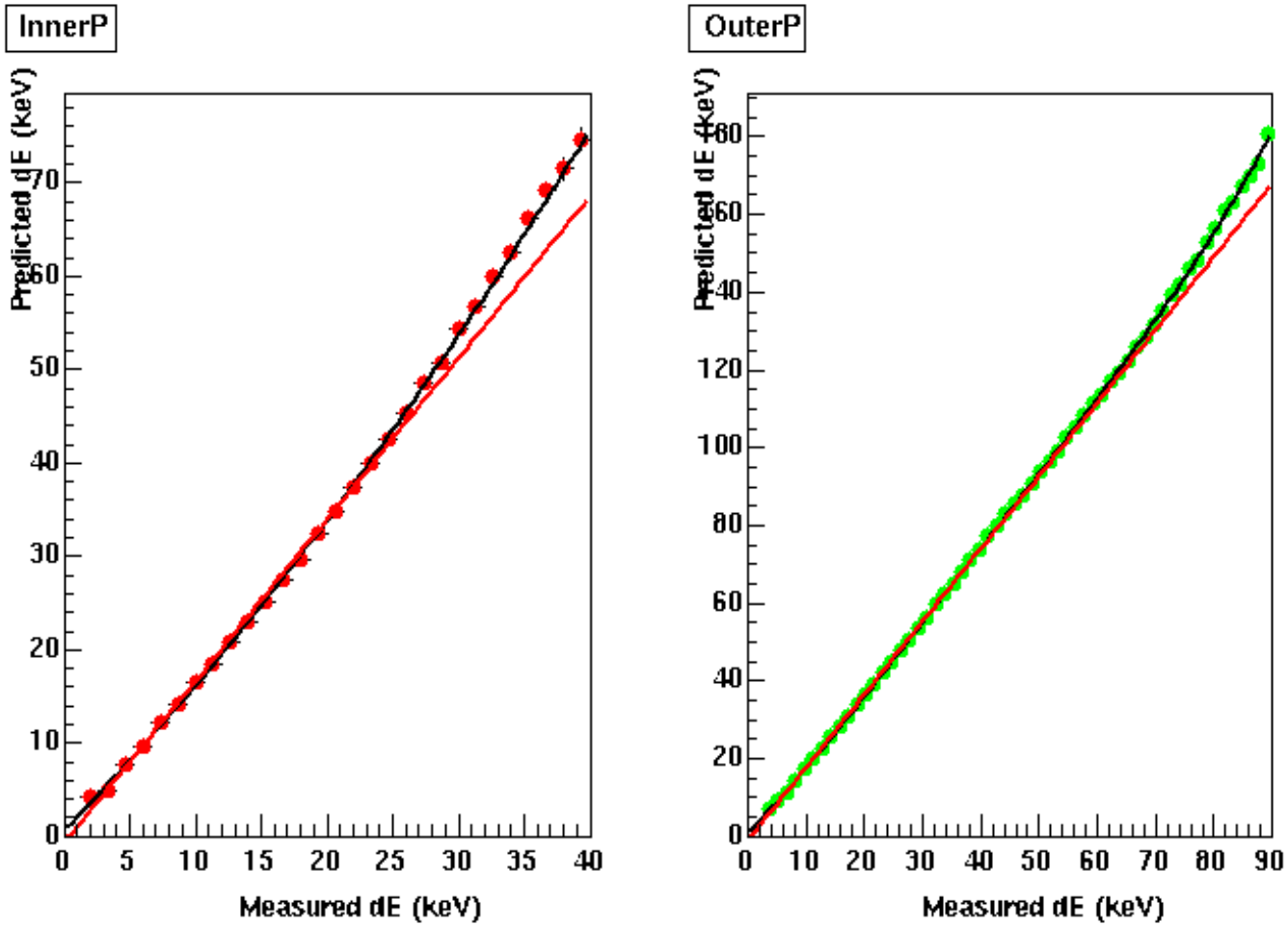
- ADC" nonlinearity

  $dE_R = Pol_N(dE_U)$, where

  dE_U – uncorrected dE (from tcl),

  Pol_N – polynomial,

  N – 3 for Inner and – 5 for Outer sectors



Corrections (cont.)

- Variations with sector / row still exist after pulser correction and are different for different pulser correction periods.
- Time dependence is accounted by
  - Correction versus drift distance accounting time variation of O_2 contamination taken from slow control
  - Pressure - ditto -
  - After these correction there is no gain time dependence

Corrections (cont.)

- dX correction

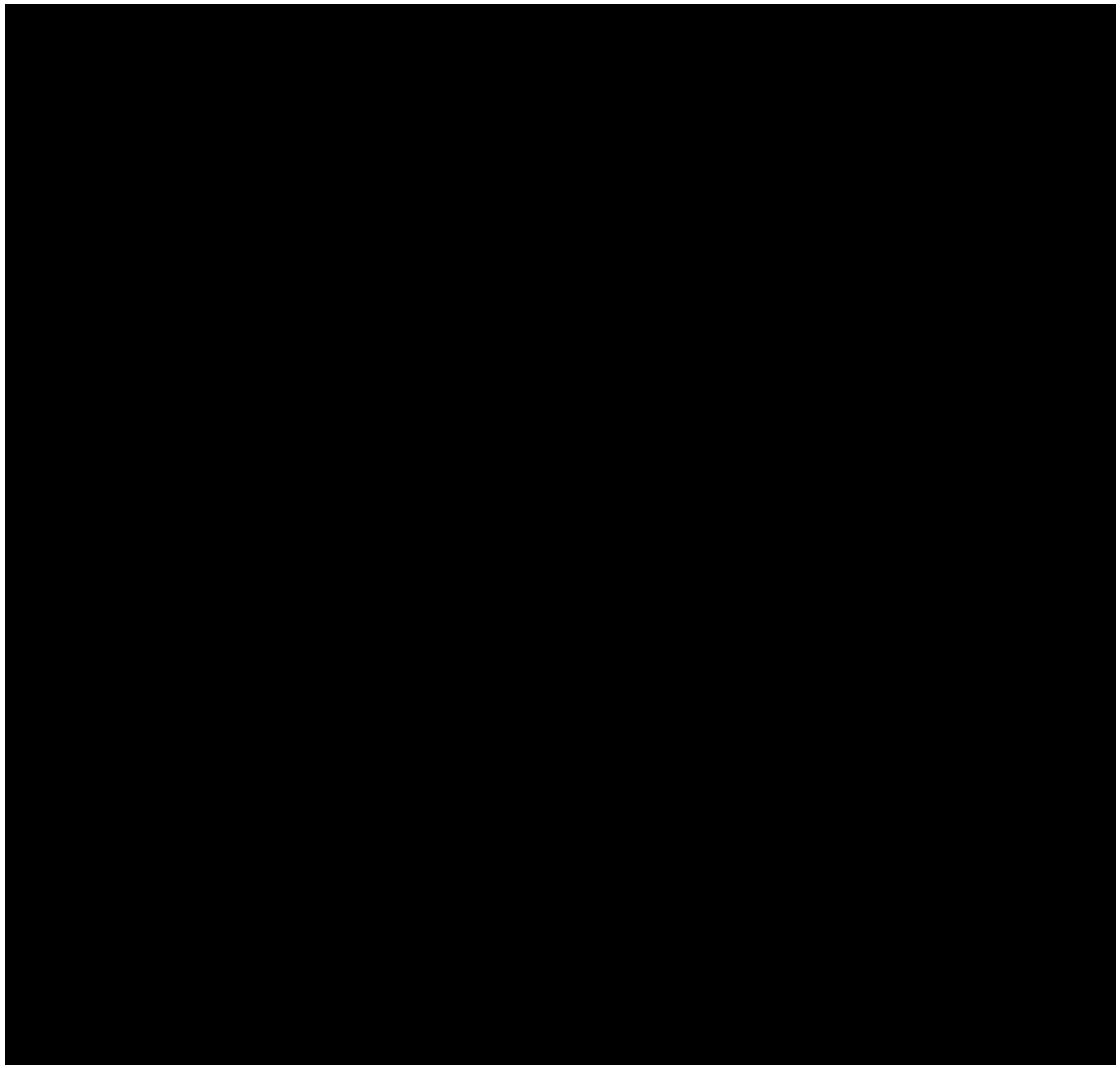
fit by φ(μ+(1+σ)z), where φ(z) is Bichsel shape and

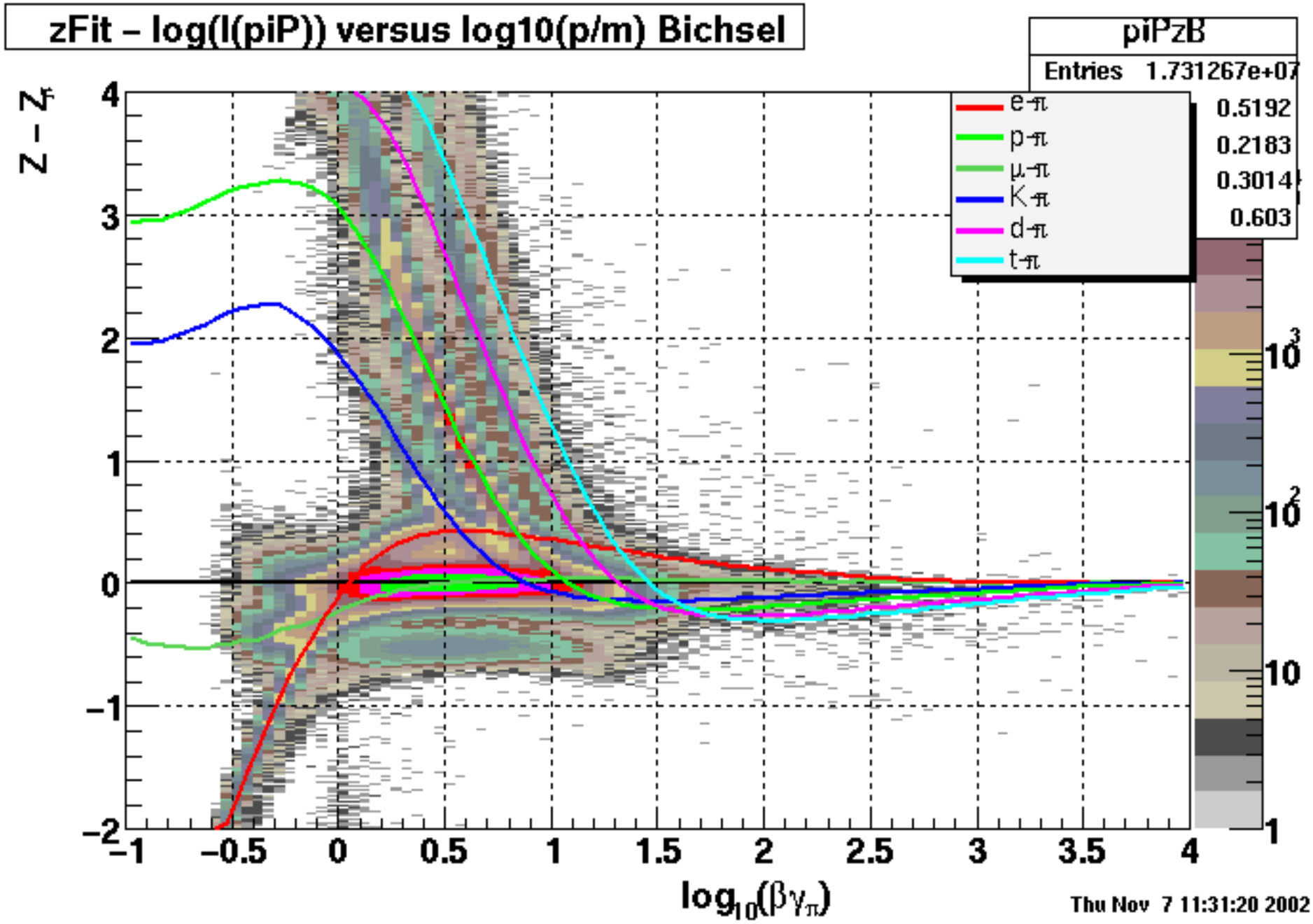
$z = \log(dE/dE_{mostprobable})$;

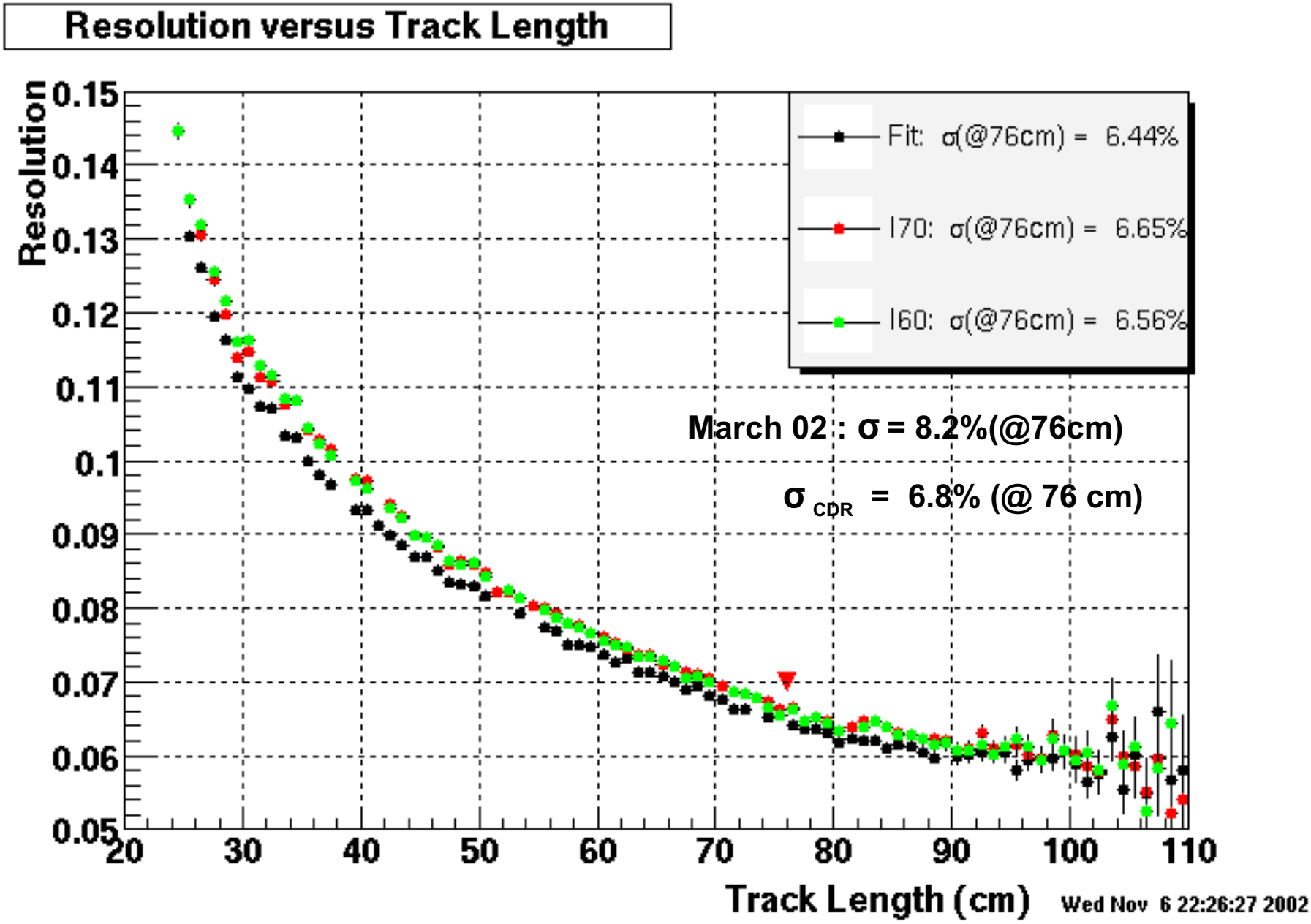
Bichsel predicts increasing most probable value (**μ ↑ dX**) with dX and decreasing width (**σ↓ dX**)

I see (**μ ↓ dX**) and (**σ↑ dX**).

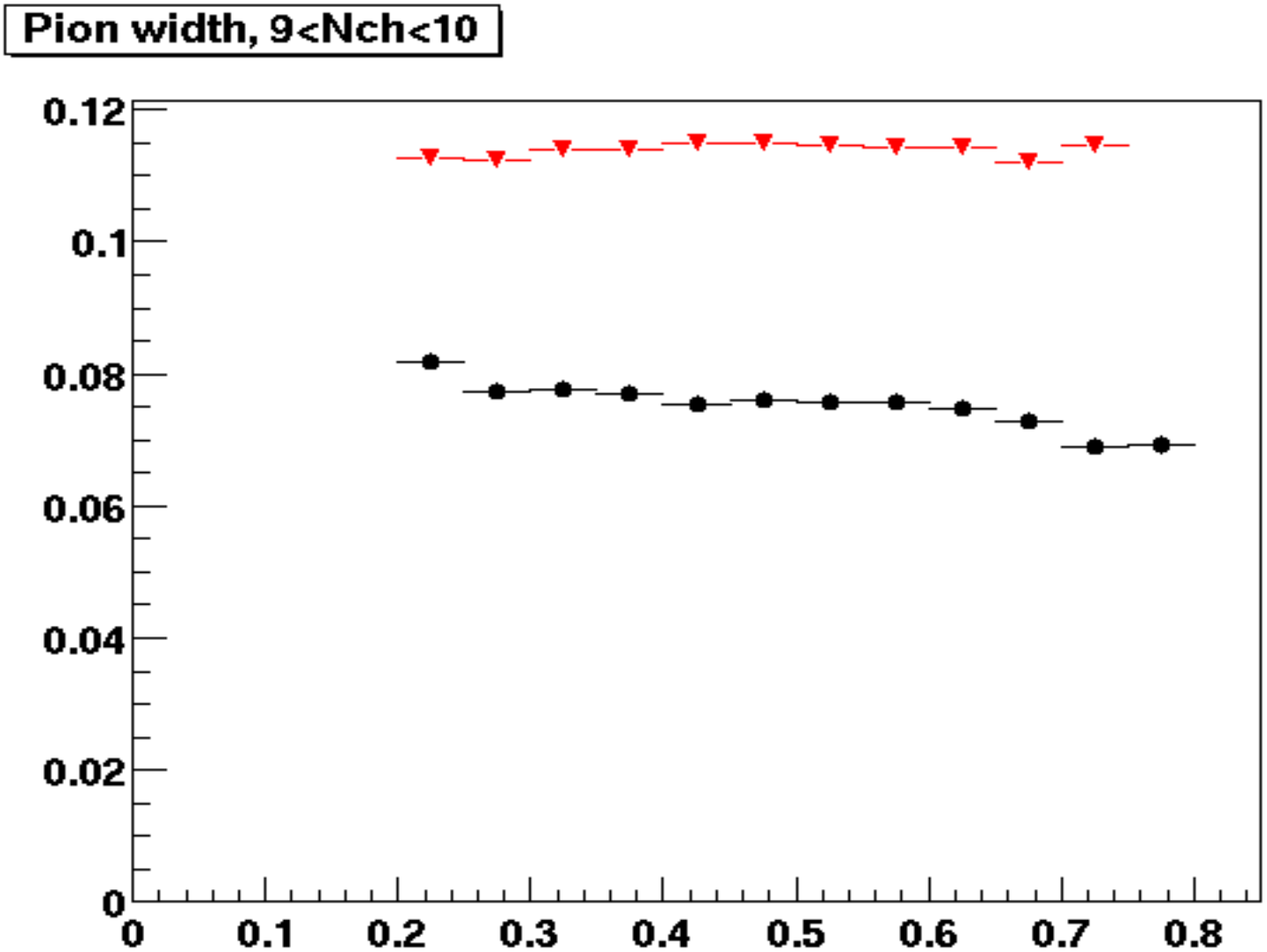
It would be interesting to check this with PAI model.




zFit – log(l(piP)) versus log10(p/m) Bichsel
piPzB
Entries 1.731267e+07
0.5192
0.2183
0.3014
0.603
e-π
p-π
μ-π
K-π
d-π
t-π
Z – Zf
log10(βγπ)
Thu Nov 7 11:31:20 2002


Resolution versus Track Length
Resolution
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
20
30
40
50
60
70
80
90
100
110
Track Length (cm)
Wed Nov 6 22:26:27 2002
Fit: σ(@76cm) = 6.44%
I70: σ(@76cm) = 6.65%
I60: σ(@76cm) = 6.56%
March 02 : σ = 8.2%(@76cm)
σ CDR = 6.8% (@ 76 cm)

Very preliminary results of Olga Barannikova's analysis



Calibration tables

dE/dx corrections: table names (**new**, **used**, **not used**)

- R “ADC” nonlinearity => “TpcAdcCorrection”
- Z Drift distance
  =>“TpcDriftDistOxygen”,“TpcZCorrection”
- Pressure: => “tpcPressure”
- Time => “TpcTimeGain”
- SecRow => “TpcSecRowB”
  has to be redone after Fabrice’s pulser corrections
- dX correction => “TpcdXCorrection”
- TPC track length => “TpcLengthCorrection”

Conclusion

1. **In present dE/dx calibration model:**
   - **Only Sector/Row correction has to be updated after pulser correction update.**
   - **The model has to checked => Test Productions**
   - **It is important to understand reason for "ADC" nonlinearity:**
     1. **Pulser (for ADC itself)**
     2. **Detailed simulation of cluster finder**
2. **Time dependence is taken out by Pressure and Drift corrections.**
3. **To make dE/dx calibration in fast offline it is necessary to have:**
   - Access to monitoring tables (tpcGas and might be tpcGainMonitor)
   - A reasonable measurement of track momenta in [0.4,0.5]GeV/c range
   - Statistics : precision ~1% => 24*10K good track (~50%) in momentum range [0.4,0.5] GeV/c (~20%) => 2.4 M tracks. (Now I am using statistics ~50M tracks)