SVT

Status and Results

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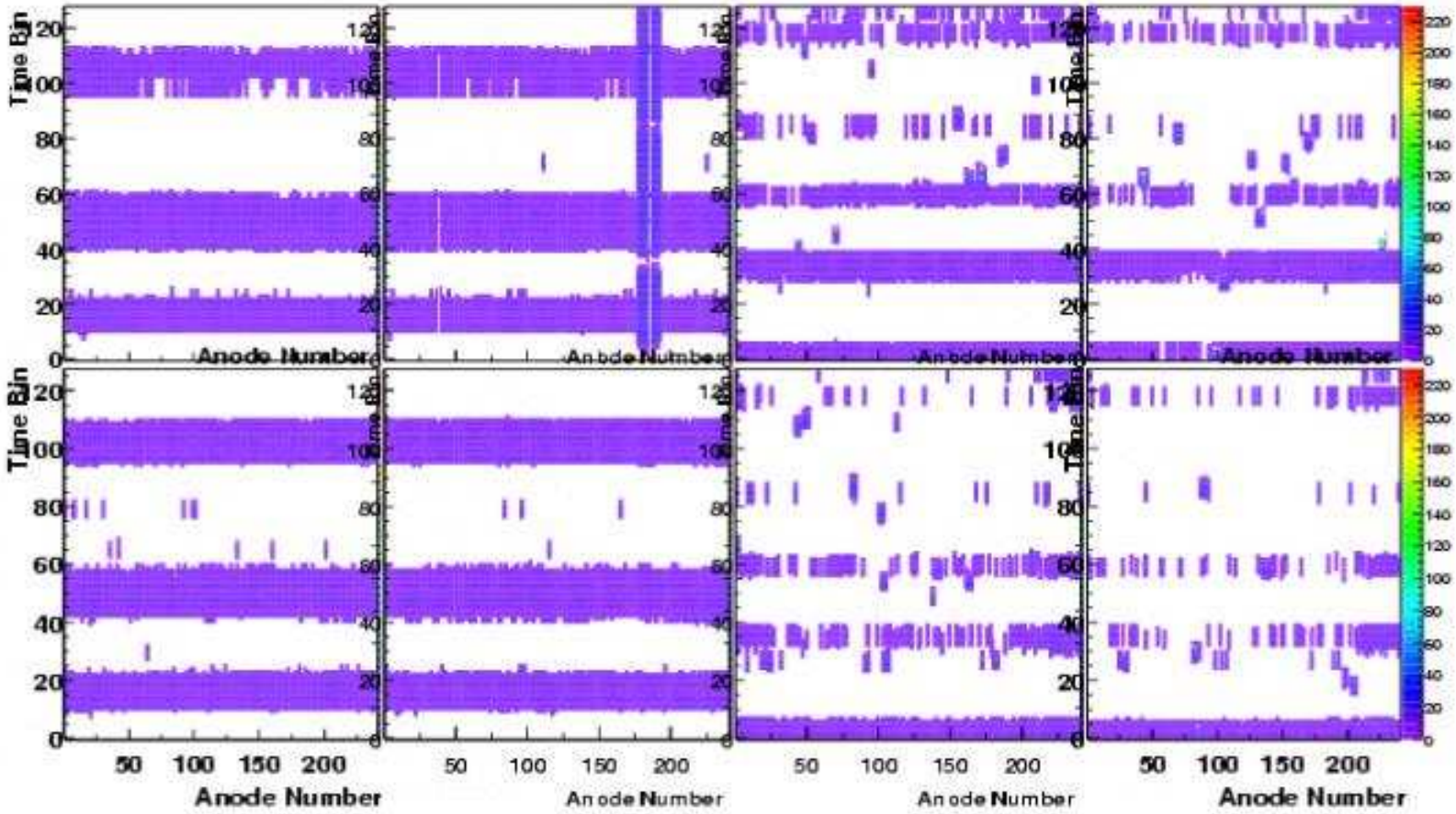
- SVT in Au+Au (2001)
- SVT in p+p (2002)
- SVT in d+Au (2003)

SVT in Au+Au (2001)

Very noisy

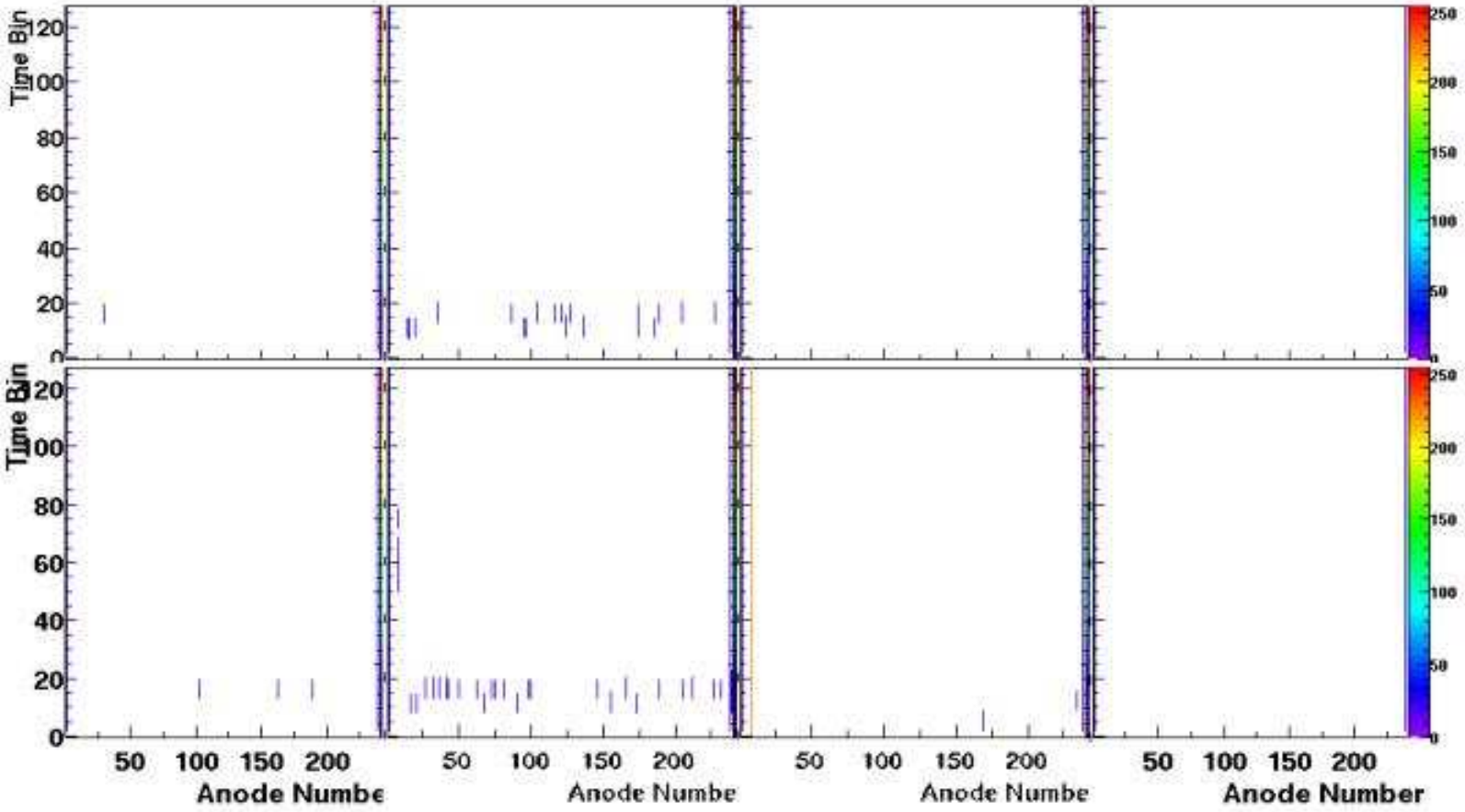
signal RMS = 12 mV



SVT in p+p (2002)

Much better...

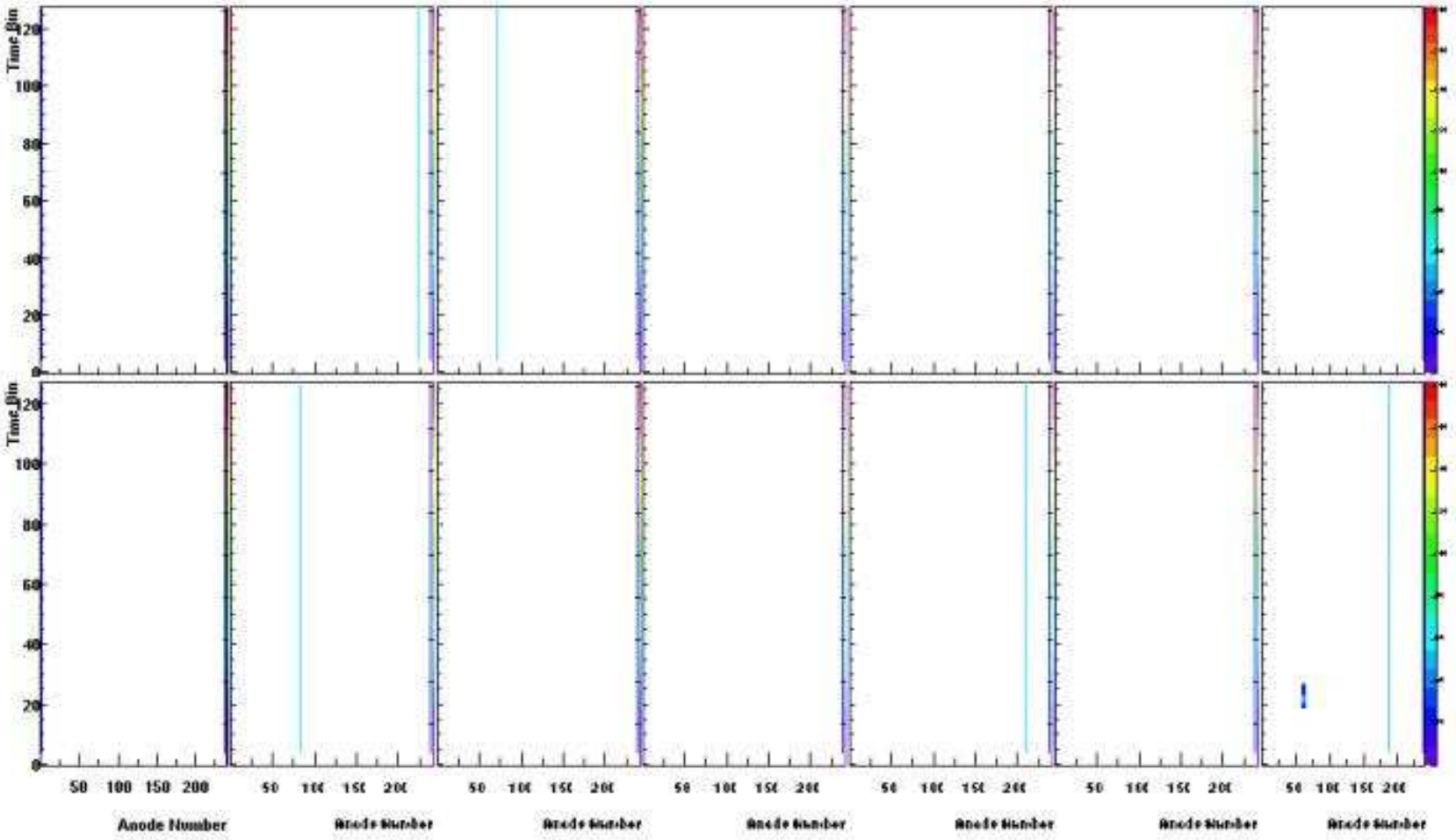
signal RMS = 9 mV



SVT in d+Au

Even better!!!

signal RMS = 8 mV



SVT Analysis

- **Au+Au**
  - it might be used after p+p and d+Au has been analysed
- p+p
  - a special production was set up - many thanks to Jerome!!!
  - 1M events, but only ~20% is used due to the z vertex position (must be within the SVT domain)
  - first pass: preliminary calibration and overall study of the detector performance;
  - second pass: refinement of the calibration parameters and better understanding of the detector performance.
- d+Au
  - included in main production - many thanks to Jerome again !!! - however, the tracks with SVT hits are not the global tracks yet.

SVT Analysis

- Hit reconstruction:
  - study and minimize the effects of the noise;
  - sequence adjusting;
  - cluster finding;
  - cluster analysis.
- Coordinate transformation
  - (time bin,anode)->local (x,y)
    - calibration: time zero, drift velocity
  - local (x,y)->global (x,y,z)
    - global alignment;
- TPC track - SVT hit matching and/or SVT stand alone tracking;

- Some applications: vertex finding, better DCA determination, V0 reconstruction, pile-up rejection, etc., etc. etc.

Hit Reconstruction

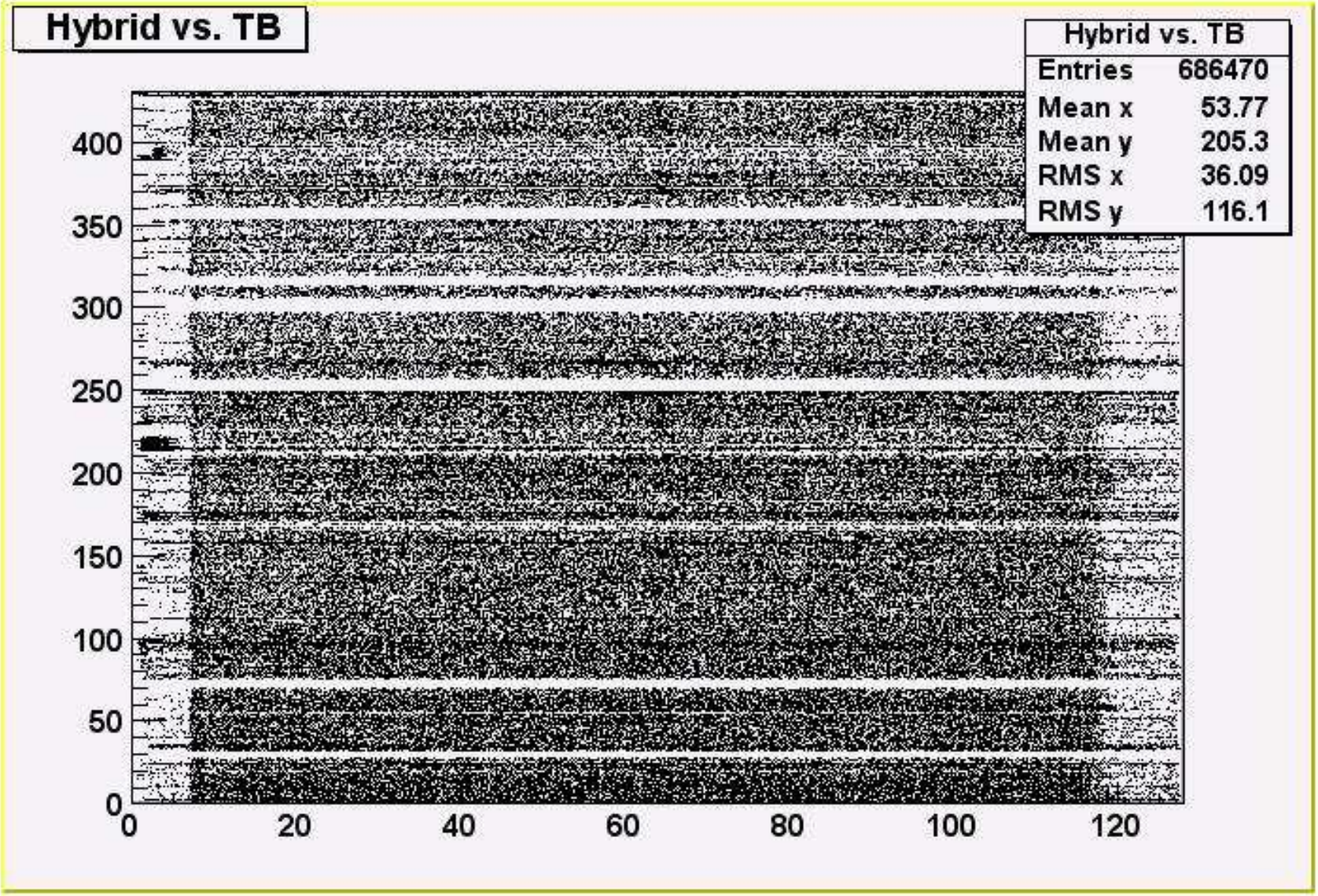
- **Study and minimize the effects of the noise**
  - mostly done in Au+Au using raw data. The analyis in p+p benefit from this study.

- **Sequence adjusting:**
  - mostly done in p+p using both passes of special production.

- **Cluster analysis.**
  - mostly tuned in p+p, second pass.

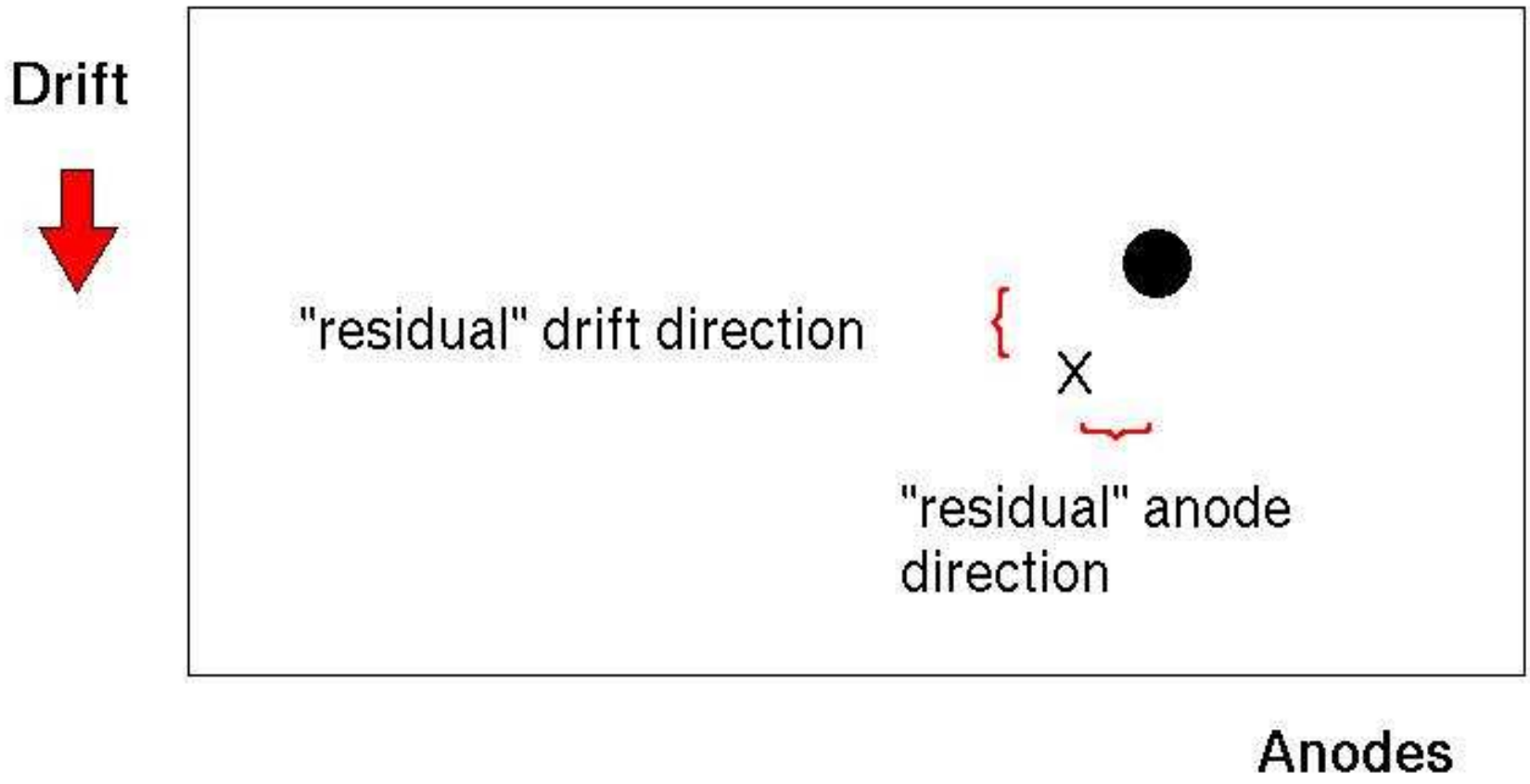
	before tuning	after tuning
fraction of hits considered as good	109/176	33/154
fraction of hits used for tracking	10.6/109	12.2/33

Drift Velocity and t0



TPC track projection

Project TPC track to SVT wafer and take distance to closest hit in both directions (drift and anode directions)



Global Alignment

We use the track projections to look for:

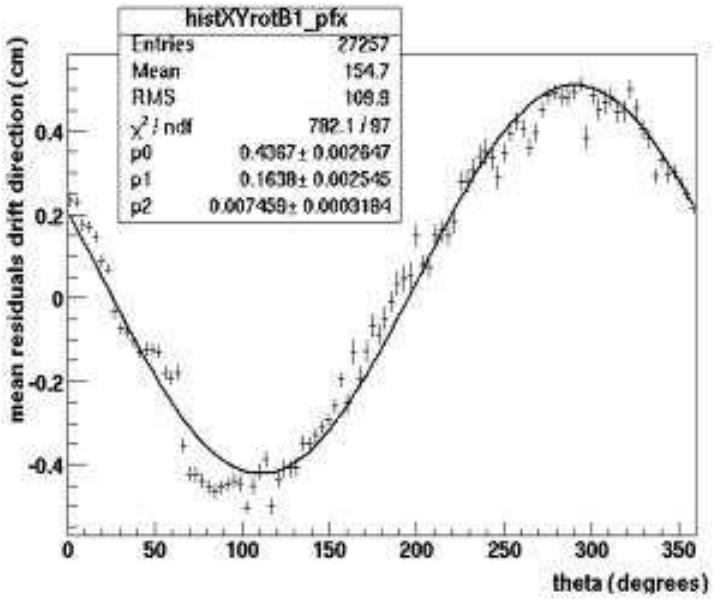
- **X, Y and Z shifts;**
- **XY, XZ and YZ rotations.**

How?

- **"residuals" in the SVT drift direction as a function of phi=atan(y/x):**

$$\text{residuals} = -\Delta X * \sin(\text{phi}) + \Delta Y * \cos(\text{phi}) + \text{radius} * \Delta\text{phi_XY}$$

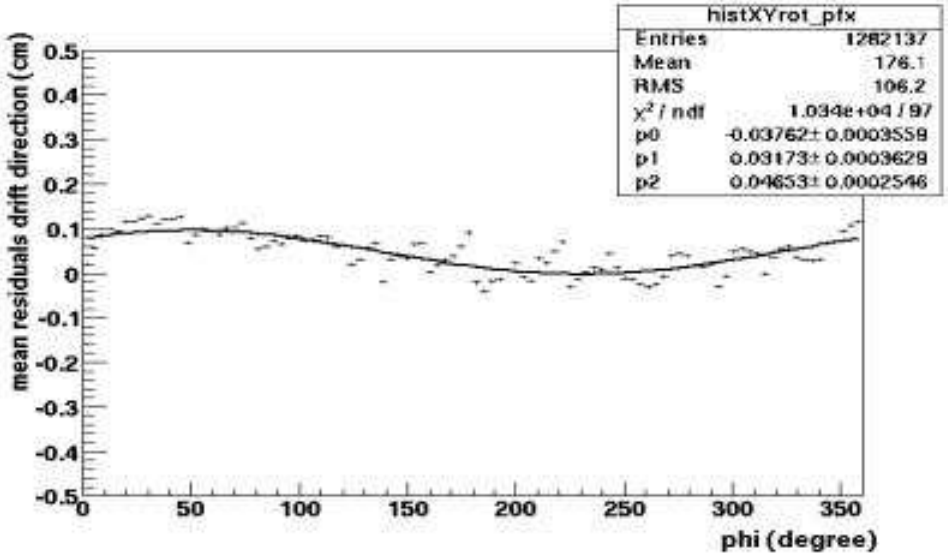
Global Alignment : p+p



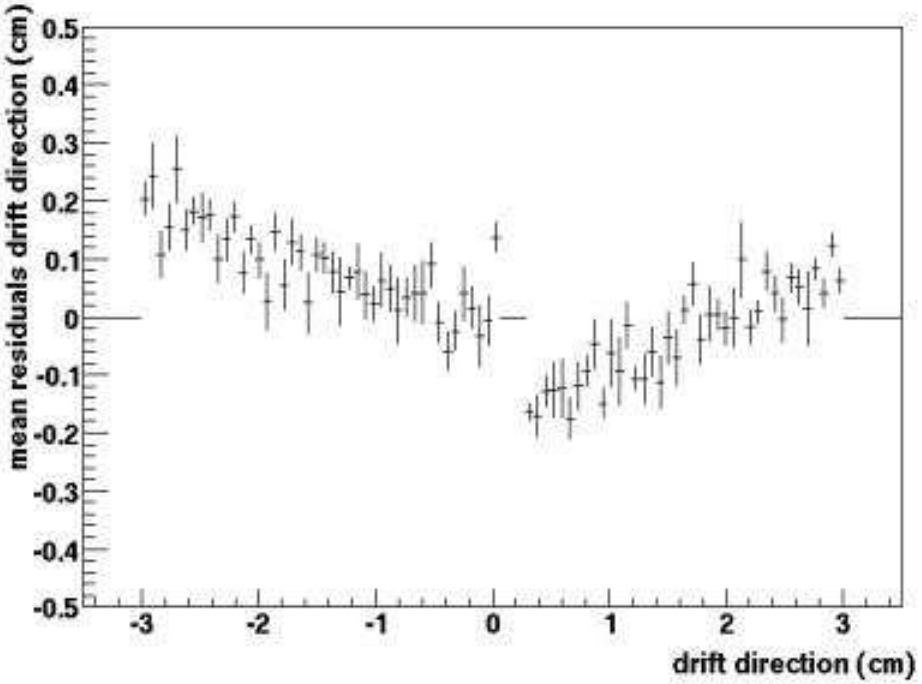
SVT drift direction - X,Y global

After the first pass

After the second pass

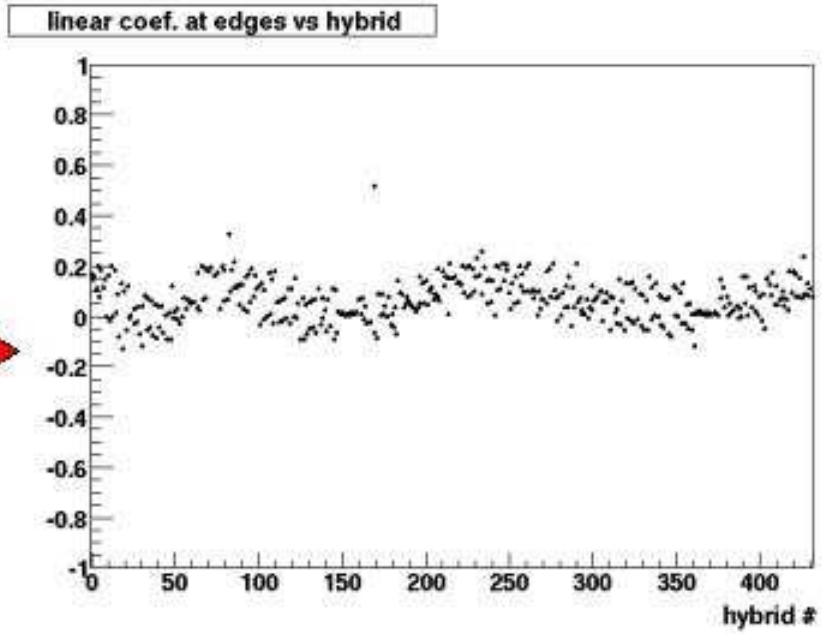


Global Alignment ⟷ Calibration : p+p

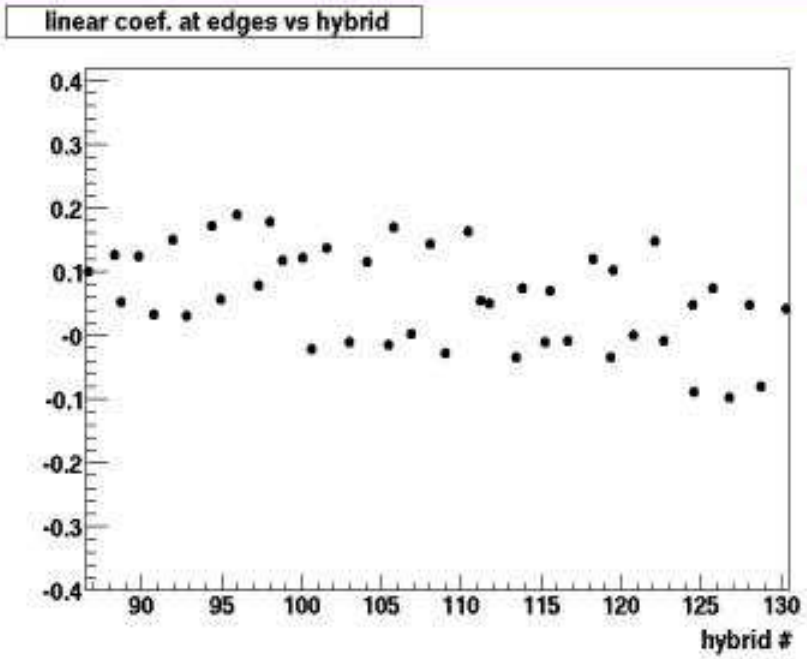


linear fit in each half
(each hybrid)

general feature:
global mis-alignment

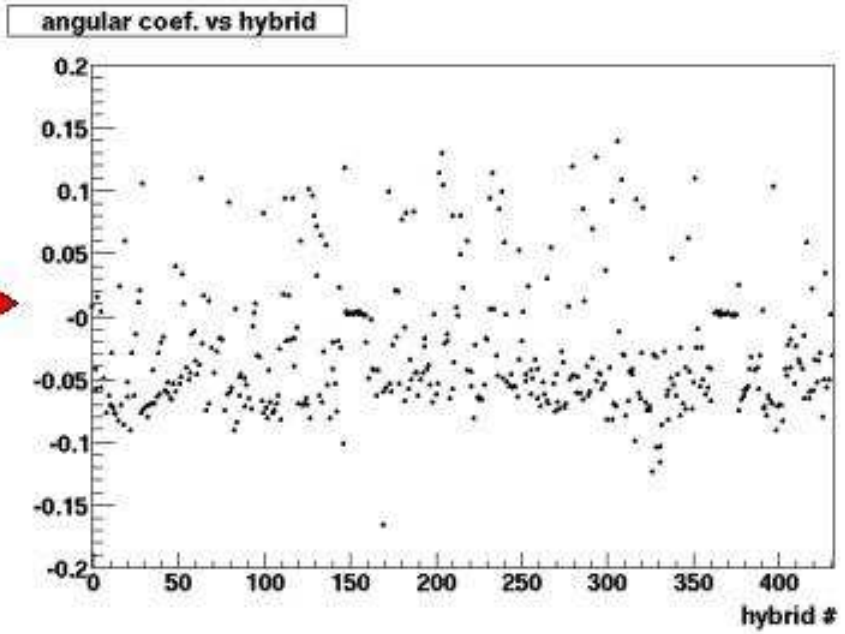


Global Alignment ⟷ Calibration: p+p



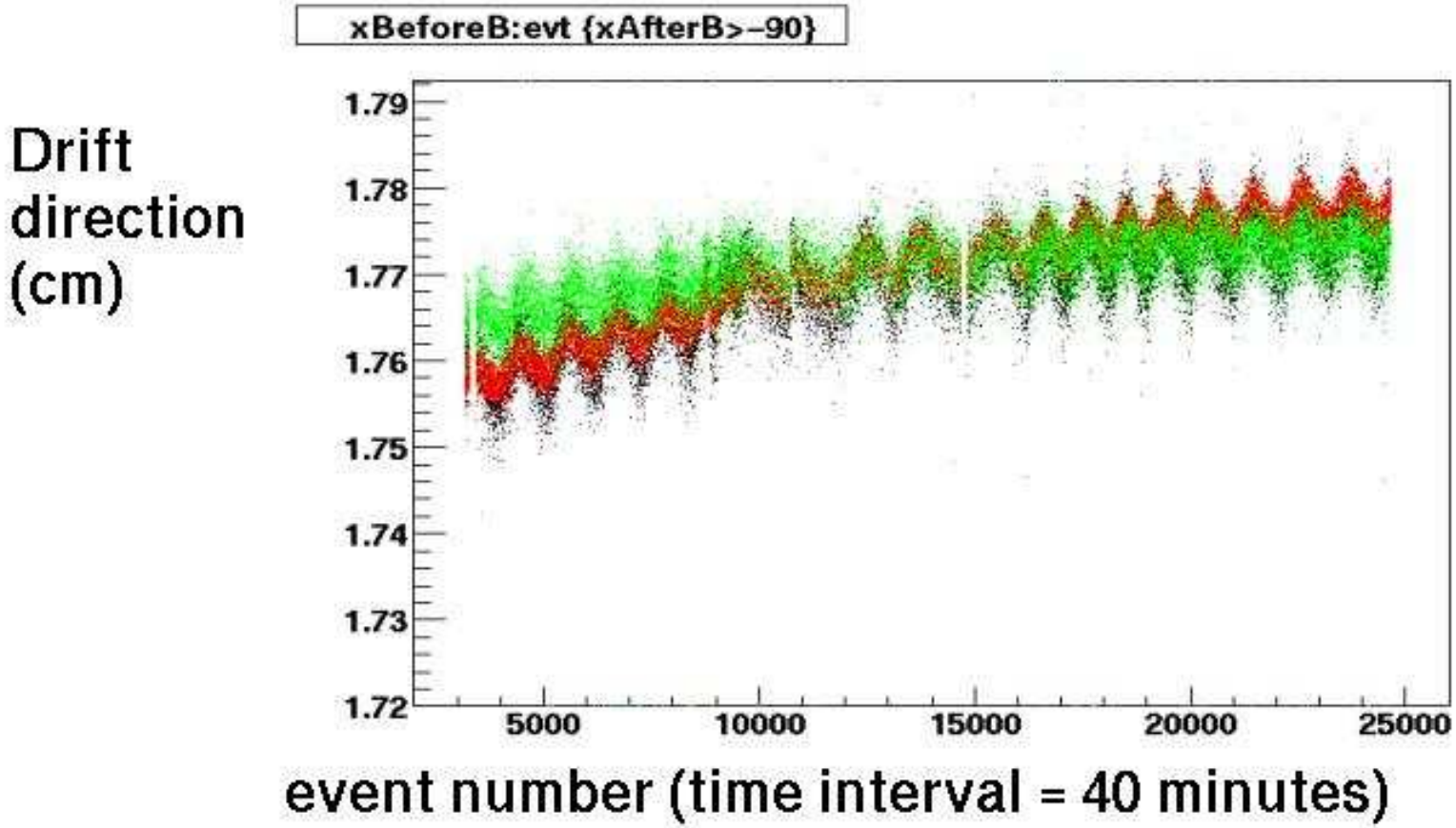
t0 correction
or drift length correction
needed

drift velocity
correction needed

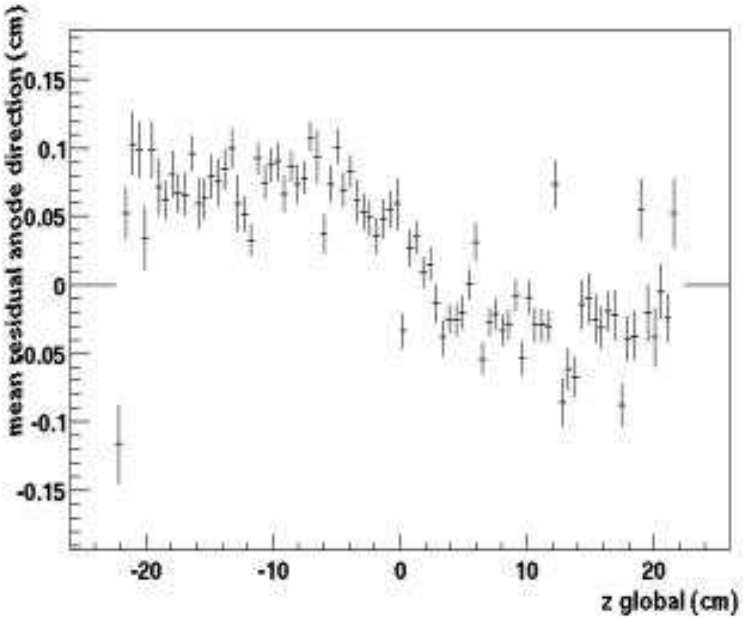


Global Alignment ⟷ Calibration: p+p

Finer correction: temperature fluctuations
We can use the Laser spot
reproducibility: anode direction = 25 microns
drift direction = 40 microns



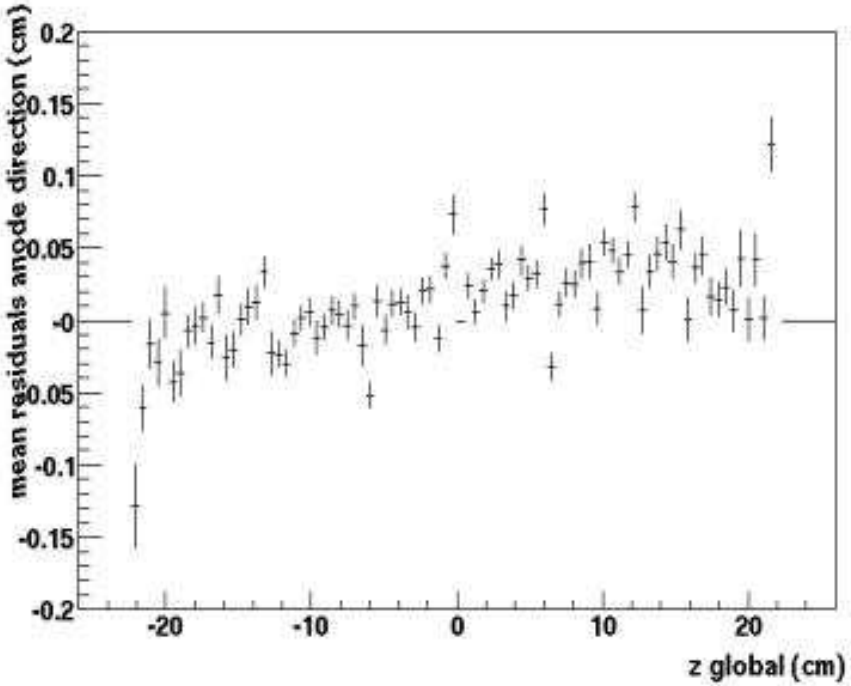
Global Alignment: p+p



SVT anode direction - Z global

After the first pass: measured a small mis-calibration of TPC t0

After the second pass



TPC track - SVT hit matching

- Using EST code;
- Projects helix to SVT layers and match closest hits;
- Refit each track applying some quality cuts;
- Some results from the second pass through p+p data:

Requiring at least 2 hits in the SVT and primary vertez z position between -30 and +30 cm:

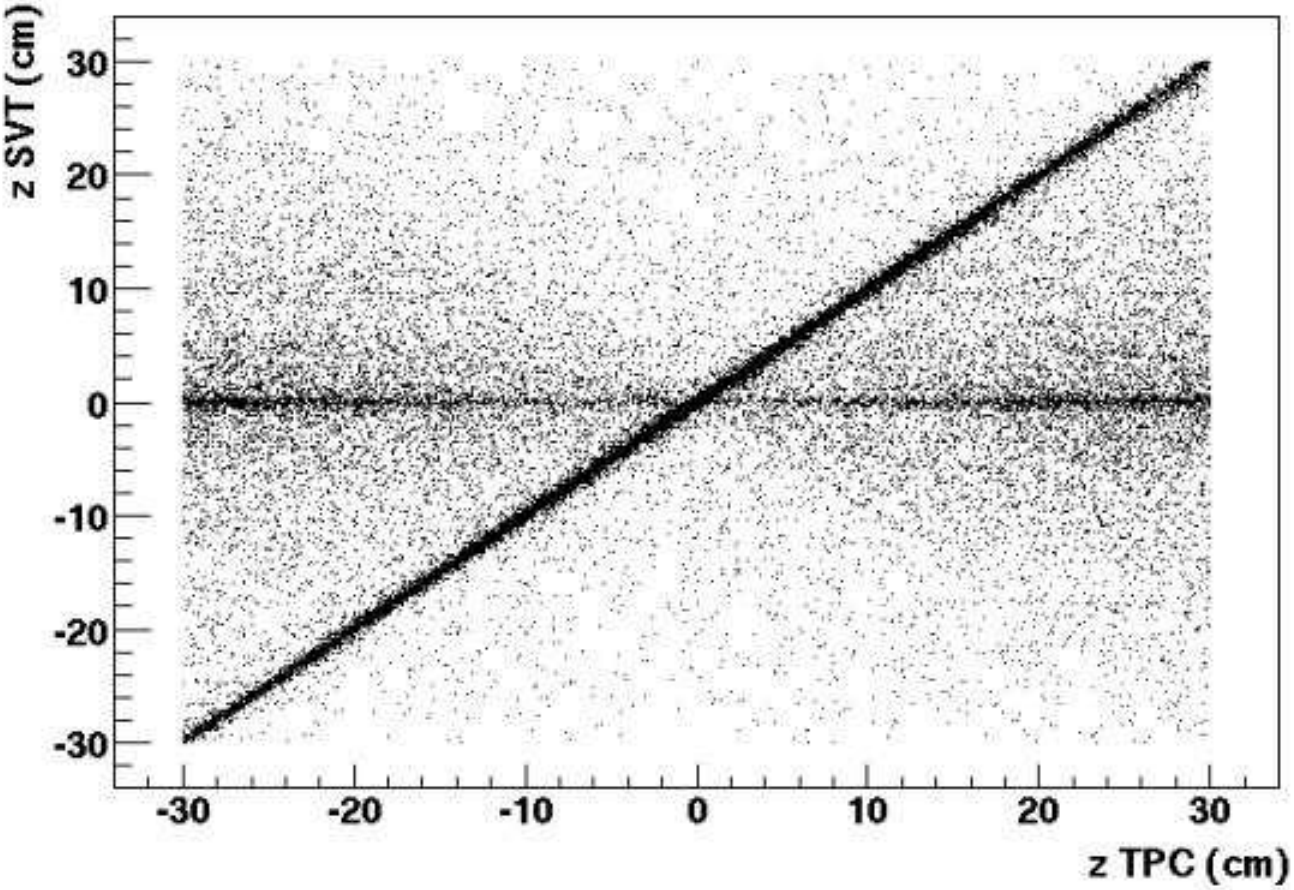
fraction of global tracks matched to SVT = 53%

fraction of primary tracks matched to SVT = 69%

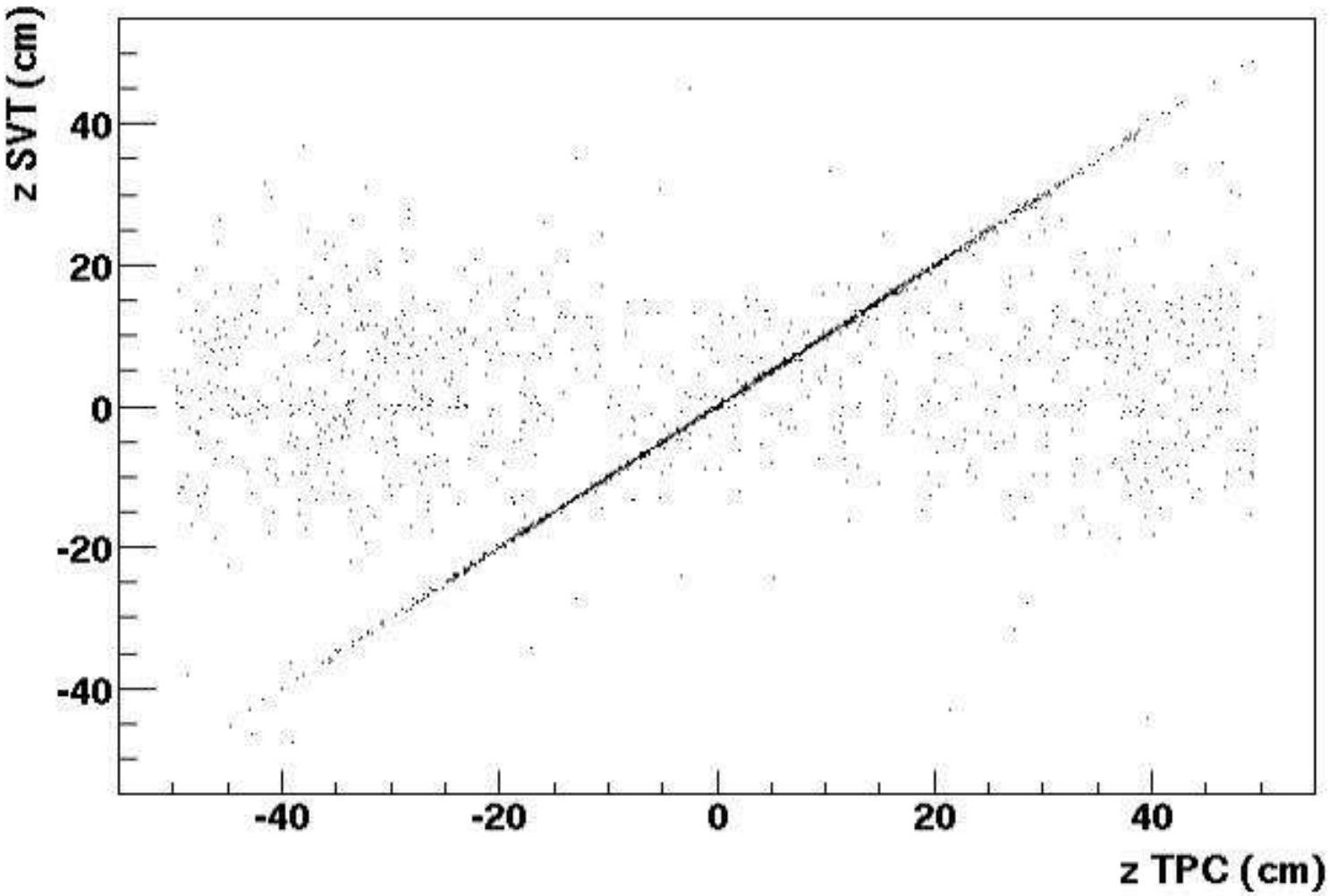
Need to compare to simulation...

SVT vertex finding: p+p

Need to investigate the events where TPC and SVT do not agree...



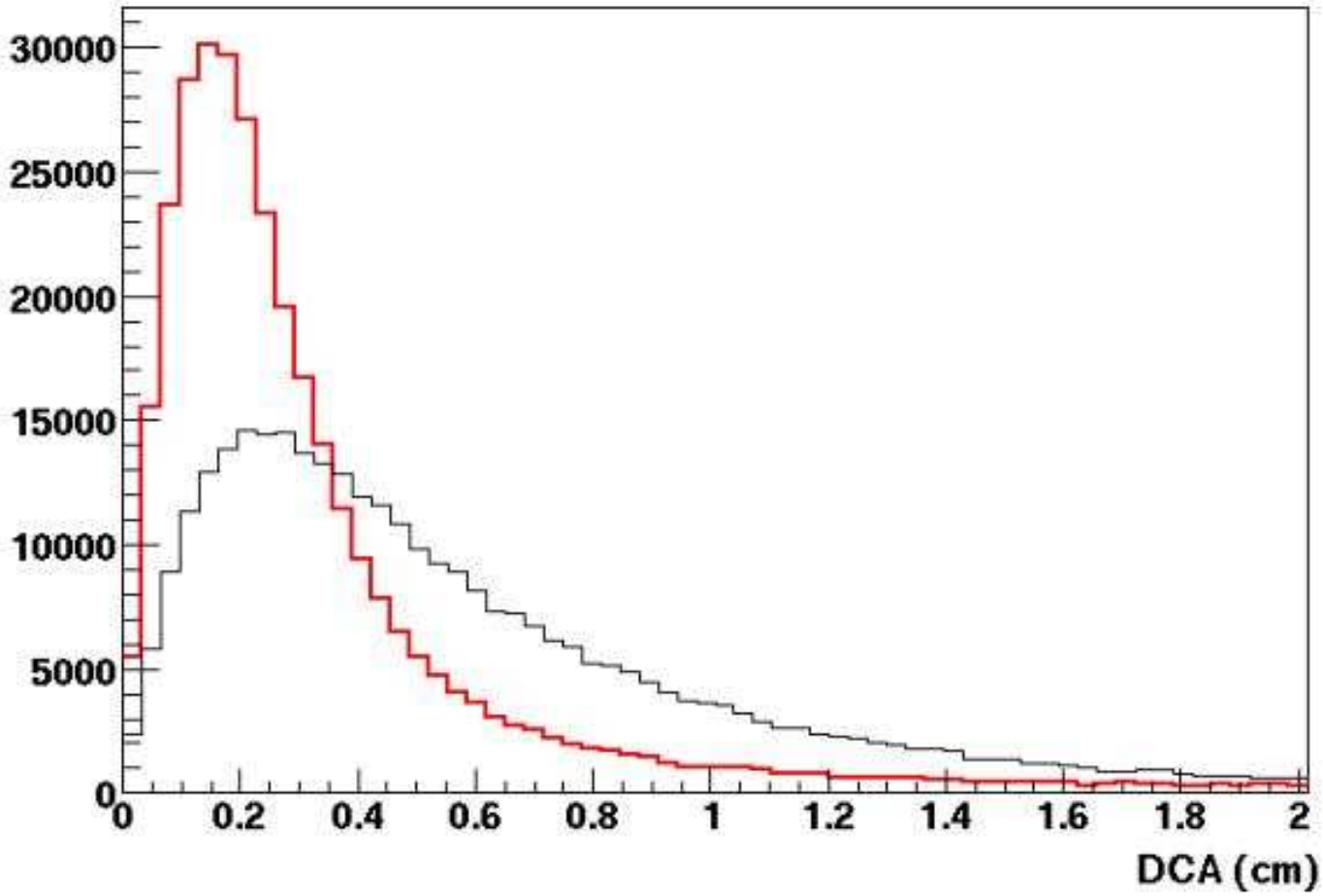
SVT vertex finding: d+Au



Results in p+p: DCA of primary tracks

red line : TPC+SVT tracks

black line: TPC only tracks



Results in d+Au: DCA of primary tracks

red line : TPC+SVT tracks

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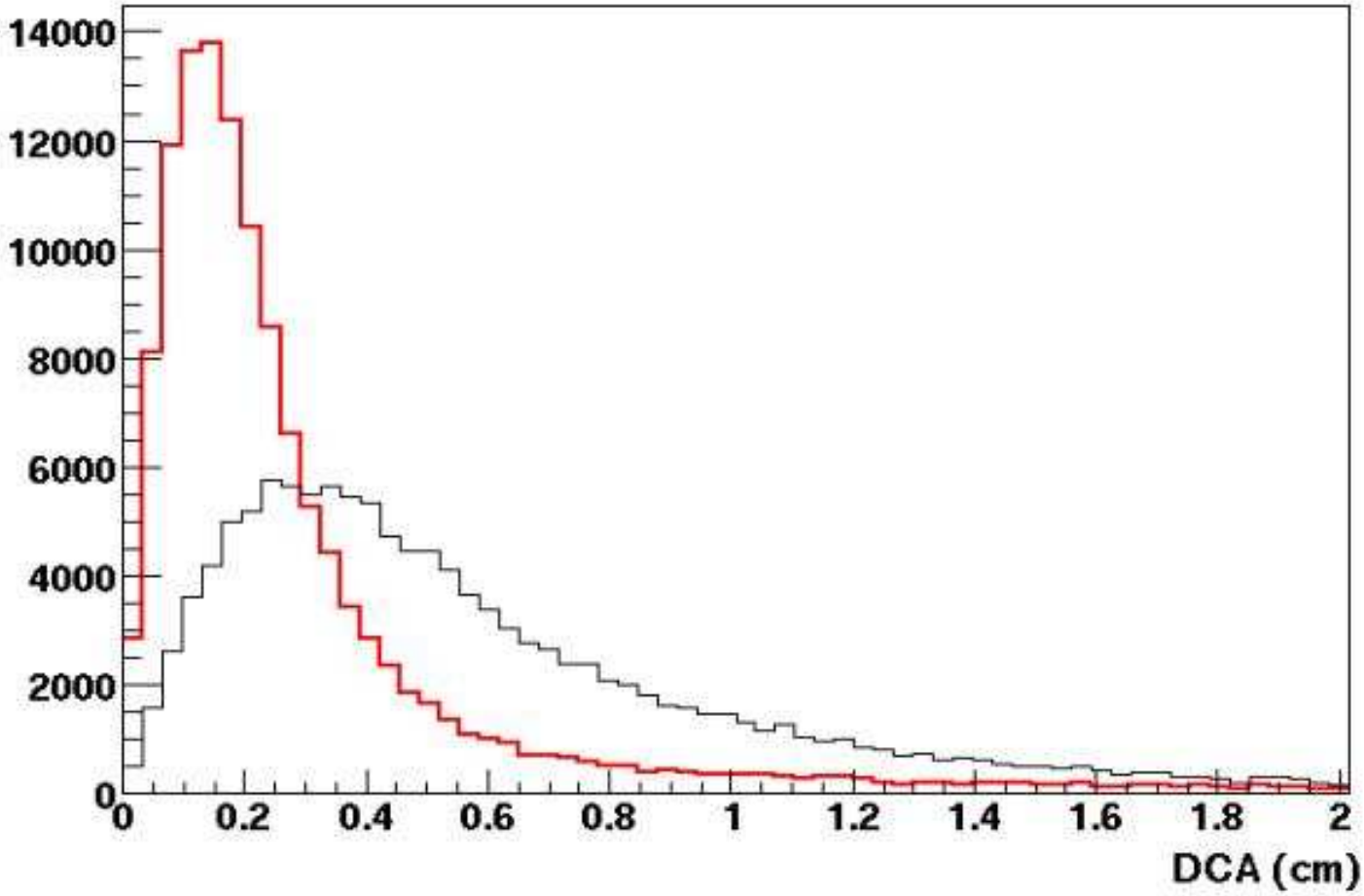
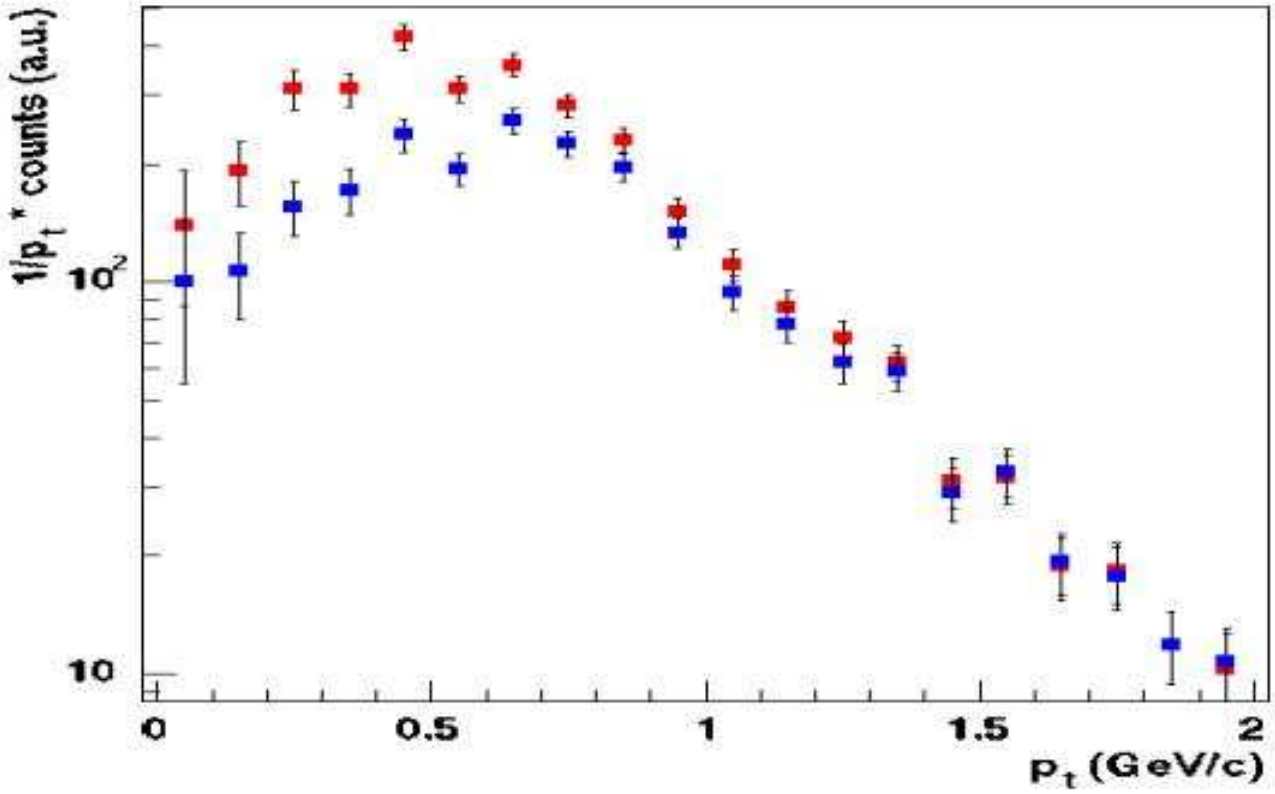


Results in p+p: V0 reconstruction

K0 reconstruction with TPC only tracks (blue) and TPC+SVT tracks (red)



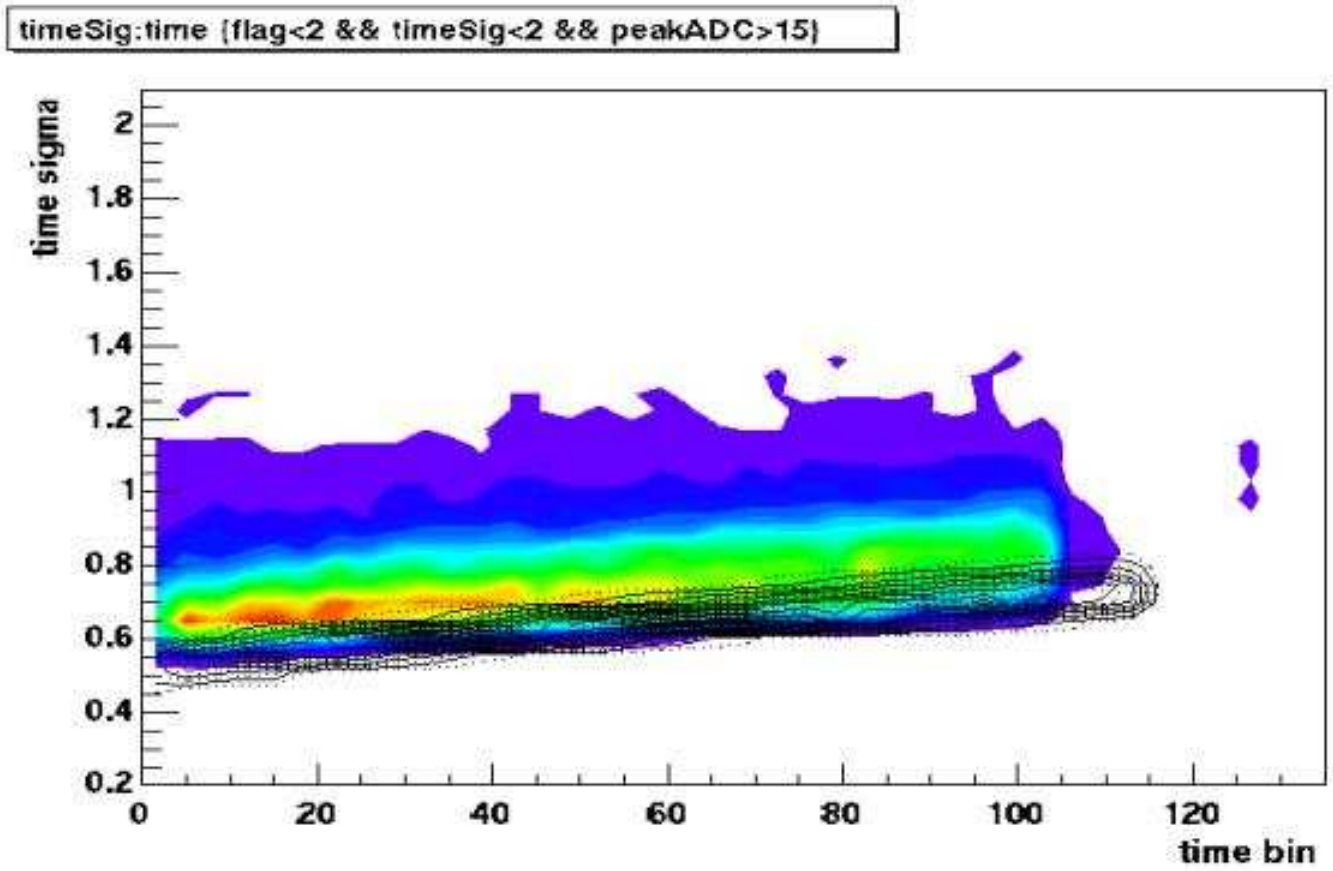
Next we need to try with other particle species...

What Next?

- Final corrections on aligment, drift velocity and t0 for p+p;
- New p+p production applying these corrections ;
- Finer corrections as temperature fluctuations and non-linearity of drift velocity profile;
- Calculation of real residuals and errors : already started, but need better calibration to proceed;
- Tuning of the slow simulator;
- Test of embedding;
- New d+Au production applying corrections and using SVT hits for tracks.

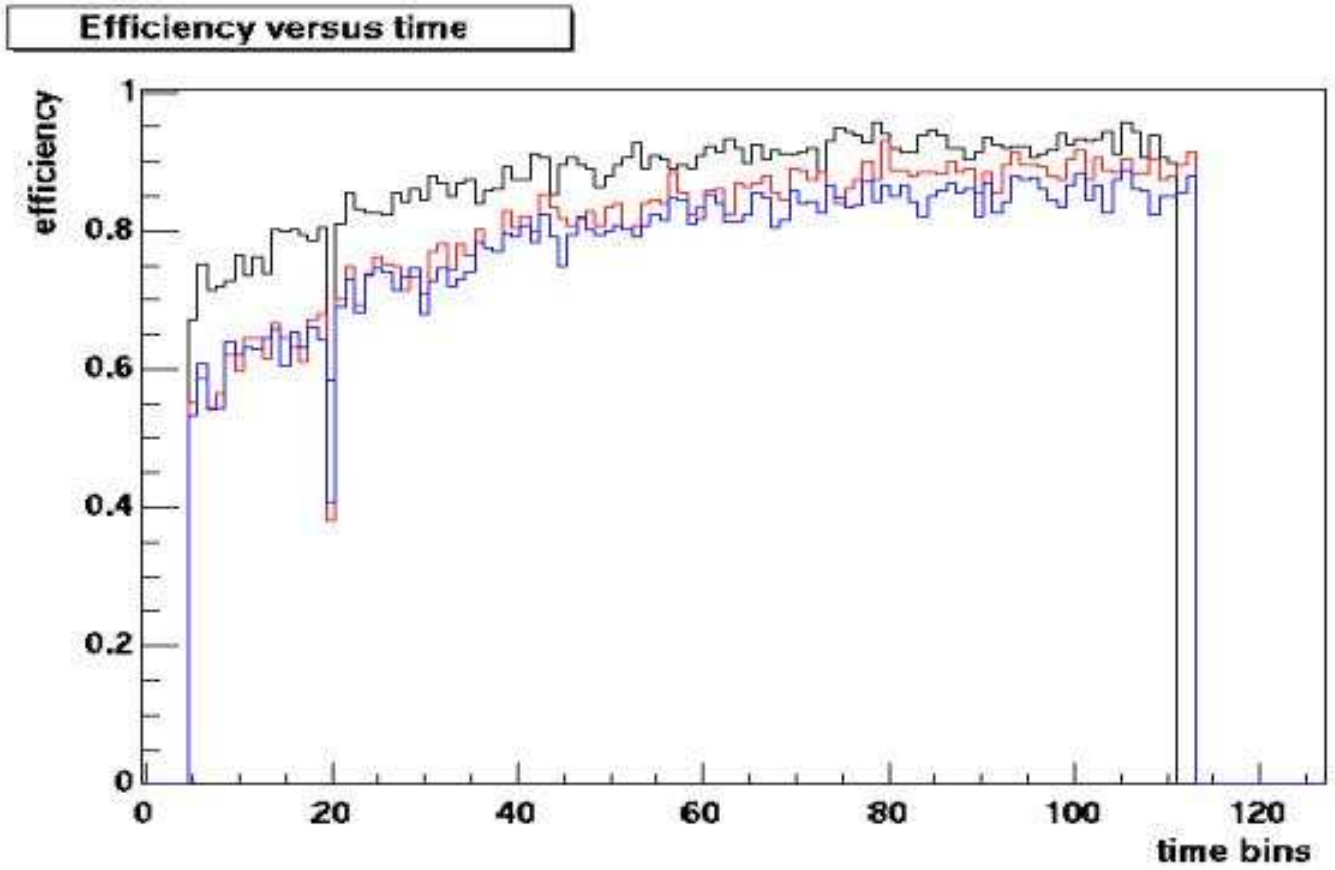
Slow Simulator and Embedding

real data (color) versus slow simulator (black):
needs tuning....



Slow Simulator and Embedding

This problem reflects on the efficiency calculation of embedded hits



TPC track - SVT hit matching

- Using EST code;
- Projects helix to SVT layers and match closest hits;
- Refit each track applying some quality cuts;
- Some results from the second pass through p+p data:

Requiring at least 1 hit in the SVT and primary vertez z position between -30 and +30 cm:

fraction of global tracks matched to SVT = 78%

fraction of primary tracks matched to SVT = 100%