Introduction to the 2nd jamboree and summary of the first

Goals

- In-depth discussion of the physics and mathematics for TPC operation and data analysis
- Understanding and exploiting what happens from the ionization and the signal build-up to the track reconstruction (..., molecular effects, diffusion, defocusing, gain fluctuations, ion feedback, distortions, continuous DAQ...)
- This is not possible
  - In usual conferences (lack of time, need to show only the ‘nice’ results)
  - In phone meetings (lack of time, lack of direct communication)
- This has to be out of big conferences, and regional (however thanks to all who crossed oceans/continent to come)

Jamboree : what it is, what it is not

- Creative workshop: our work should improve our individual understanding of ‘how it works’, and our common ability to optimize the TPCs and inspire the required analysis software.
- However we have not to discuss here implementation details, data format, etc...
- We have not to show the most ‘presentable’ results, but discuss the problems, find solutions together: 50% discussion time
- We have not to be shy, participate in the discussion
- We are lucky to be a small bunch of very motivated people, some very experienced, some very young, all with different experience, let us cross-fertilize!

Summary of the Feb. 13-15 2006 Jamboree in DESY

- LC-TPC, T2K and PANDA were present
- Mainly 2 track reconstruction methods used: χ^2 (row by row) and global likelihood fits (one Java, one Fortran, 2 C++). Also (see M. Zito's talk) position calculation from 2-pad hits.
- There was a lot of good will to define quality standards to make meaningful comparison between analyses

QUALITY STANDARDS

Track selection, hit selection

To avoid biasing the results by selecting very specific tracks, the selection cuts should be reduced to a minimum and justified. However fiducial cuts to ensure a good data quality are recommended if needed.

Effect of cutting or keeping saturated hits has to be assessed.

An estimate of the selection efficiency has to be given.

QUALITY STANDARDS

Resolution analysis

We should show residual distributions (for instance at a given z) to allow estimating the tails and the shape.

To define the resolution, we should use

- RMS of residual distribution, after cutting outliers
  * not less than 5*RMS cut (iterative process)
- Avoid bias from the track extrapolation error. To this end, taking the geometric mean of fits with and without the test row is the preferred method. Also simple methods like the triplet method or the extrapolation between adjacent rows are correct, provided the right statistical factor is used.
- For cosmics, a phi cut at +-0.1 rad is recommended, for sake of comparison without cutting too much statistics. However, depending on trigger and aspect ratio, one can have to change this. The best, if statistics allows, is to show phi dependence of the resolution. The same is true for theta, here a cut at 0.2 rad is indicated.

Documentation of the test

General information to be provided in a talk:

- pad pitch and layout
- gas used (preferably P5 as a reference)
- magnetic field
- gain
- noise level (for inst r.m.s. in ADC counts)

Plots showing the data content, as:

- detector acceptance
  - phi distribution
  - theta distribution
  - ? intercept x_0, z_0
- charge deposition of a row (a hit) (to show the amount of saturation and noise)

Documentation of the analysis

Useful information on the analysis:

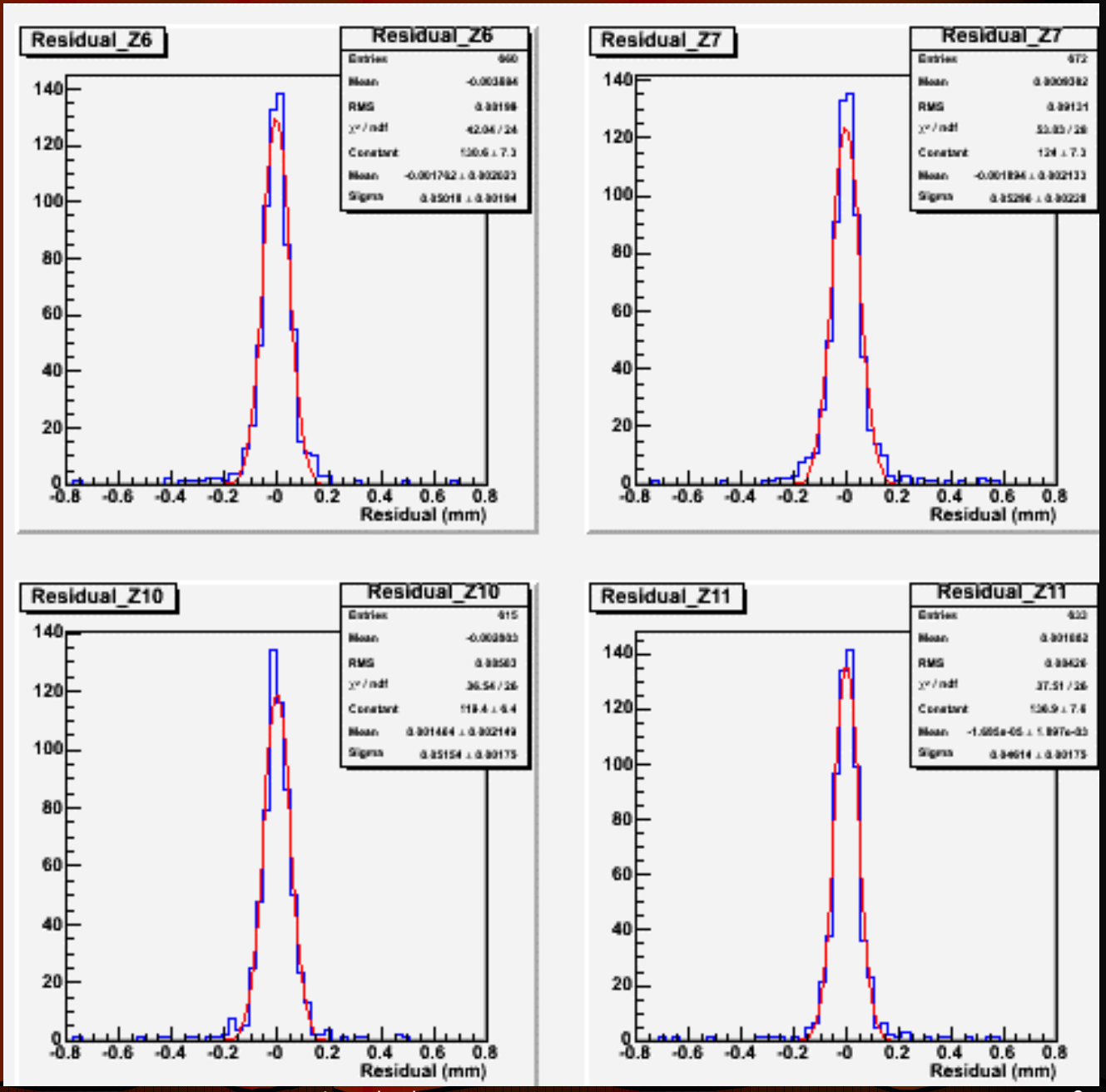
- fraction of 1-pad, 2-pad, 3-pad hits (especially if one of these categories is rejected)
- fit of the resolution with a σ_0 and a N_{eff} for large enough drift distance that a parabolic dependence can be fitted:

$$\sigma = \mathrm{sqrt}(\sigma_0^2 + (C_D^2/Neff)*z)$$

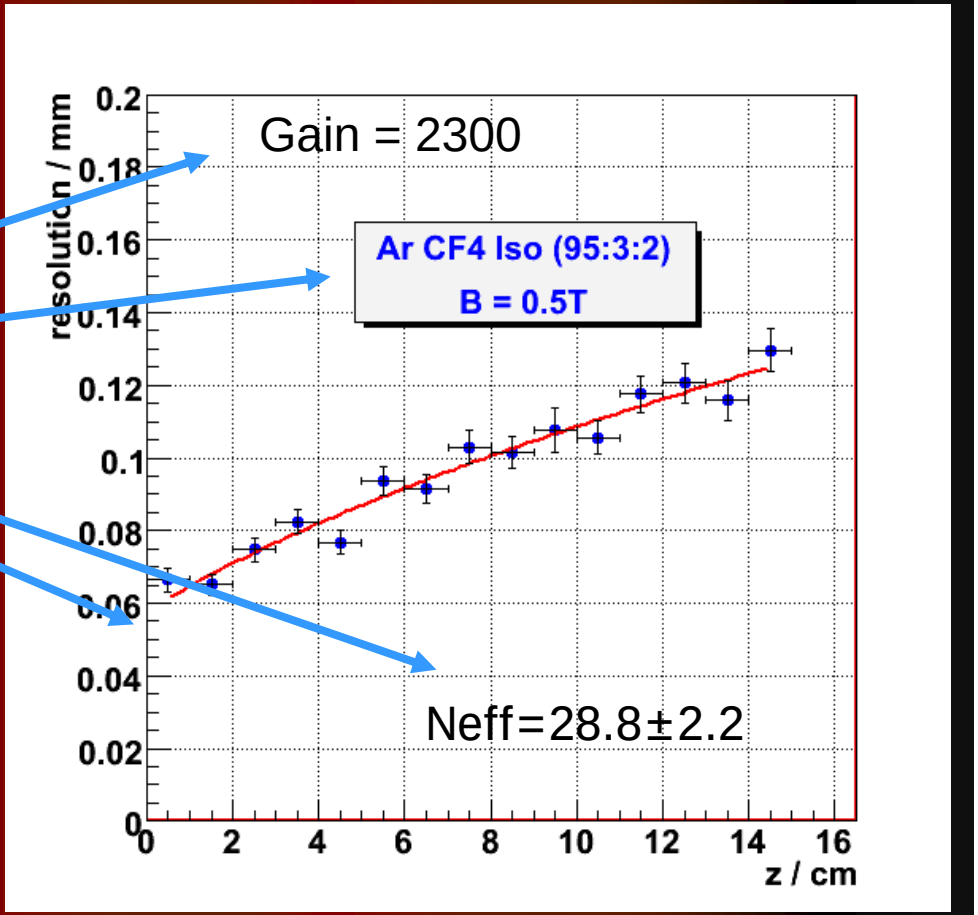
We should also provide checks

- bias plots (residuals vs position in the pad)
- probability of the χ^2 (if one uses such a fit)or pull distribution

Exemple: Residuals in z slices



Useful information



Welcome in Aachen

- A place at the real heart of Europe (near the Germany-Belgium-Netherland boarder and which happened to be in France)
- The city of Charlemagne, crowned ‘Emperor of Occident’, of the Saint Roman-Germanic Empire, in year 800 (Charlemagne invented school, supported blue cheese, had countless children…)

Aachen

Cathedral