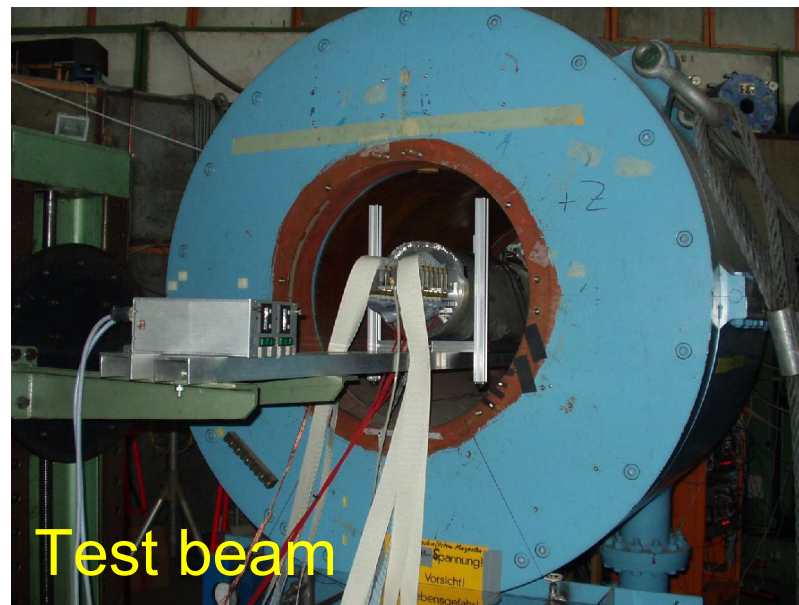# Recent Results from the TPC Activities at DESY

S. Aplin, M. Ball, T. Behnke, K. Ikematsu, A. Imhof,

M. E. Janssen, A. Kaoukher, K. Komar, T. Lux, J. Mnich,

O. Schäfer, A. Vogel, P. Wienemann

Synopsis: Data Taking in 2004

5 T Magnet:	Electron test beam:
500 000 events	300 000 events
33 %: non-staggered pads, 67 %: staggered pads	100 %: non-staggered pads
80 %: Ar-CH_4-CO_2 (93-5-2), 20 %: Ar-CH_4 (95-5)	100 %: Ar-CH_4-CO_2 (93-5-2)

5 T magnet

Test beam

Gas Quality Monitoring

Drift Velocity versus Time — TDR gas, drift velocity (cm/µs) vs data taking time (h), Garfield prediction

Drift Velocity versus Time — P5, drift velocity (cm/µs) vs data taking time (h), Garfield prediction, $\Delta v_D / v_D < 1\,\%$
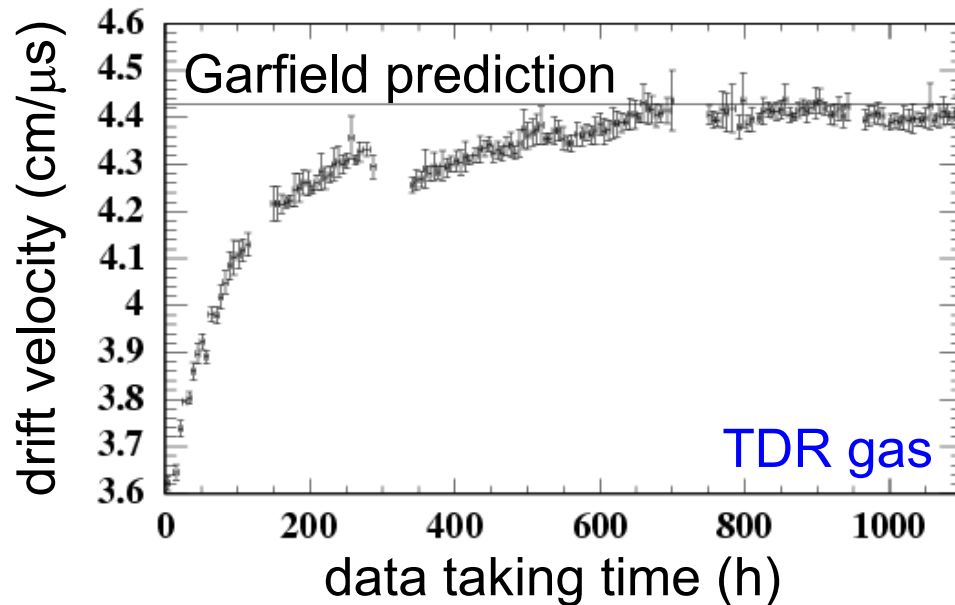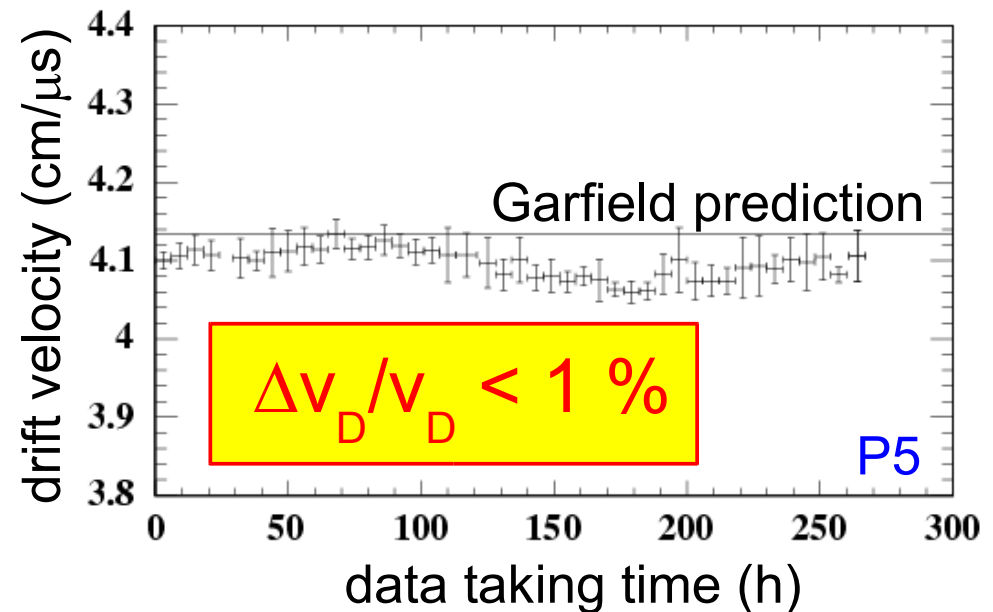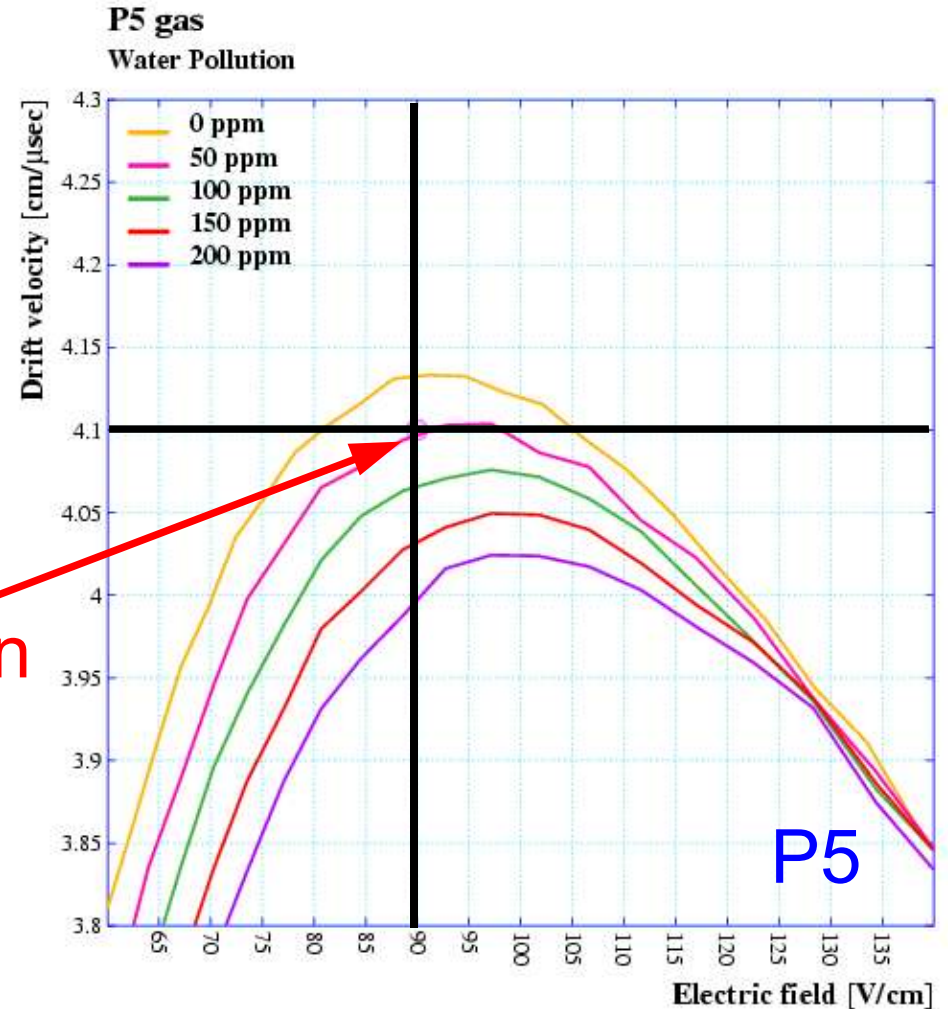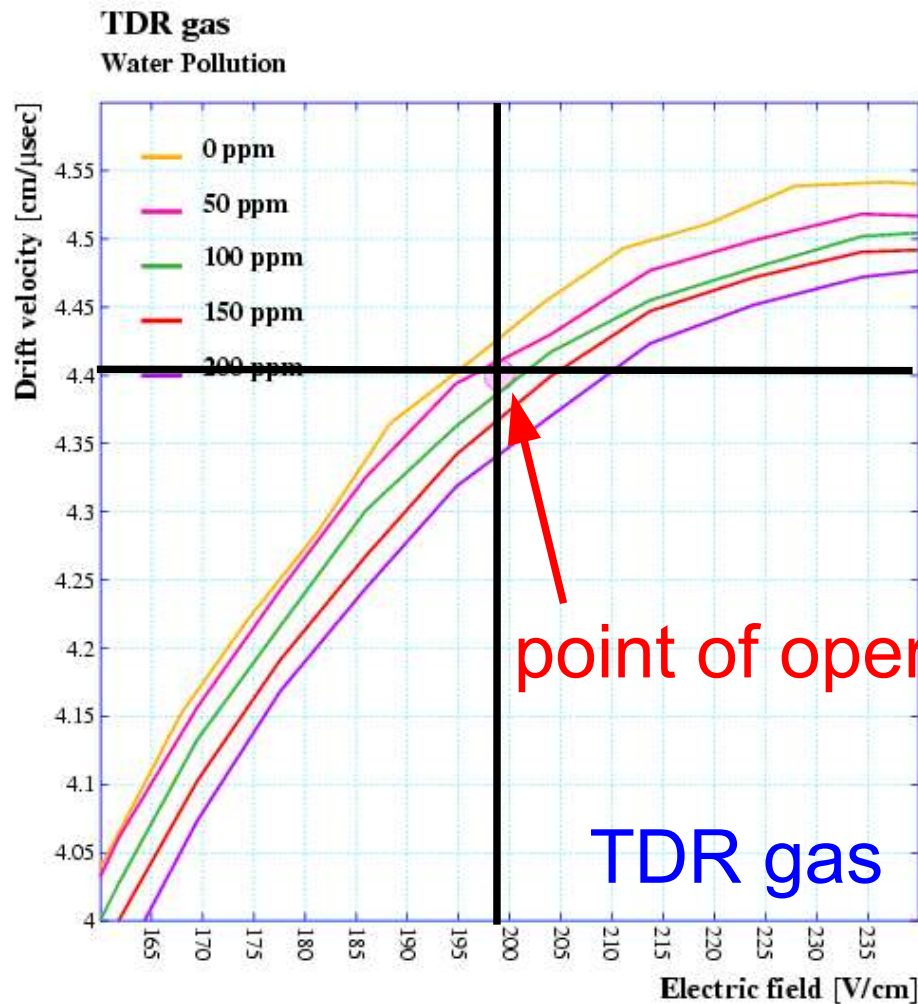
- Large gas contamination at beginning of data taking
- Several hints indicate that water is dominant contributor
- Slow control monitoring system is being built to allow a dedicated analysis of the influence of environmental parameters
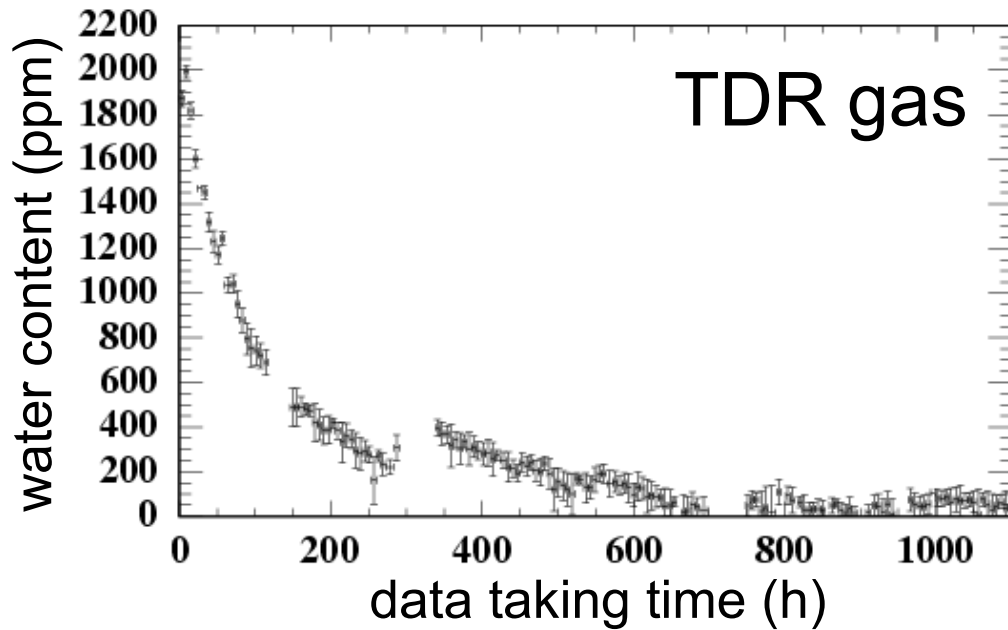
Gas Quality Monitoring

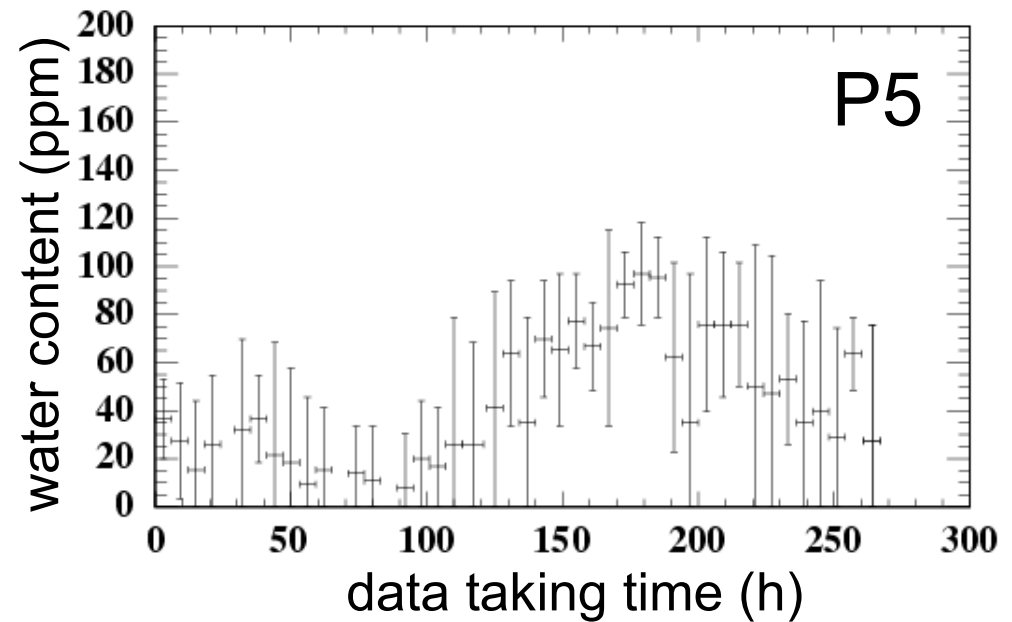Water interpretation yields ~ 50 ppm water contamination for both gases

Gas Quality Monitoring

Water contamination derived from drift velocity:

Systematics Studies

Continued study of systematics contributing to resolution measurements:

- Pad response function correction
- Cut dependence of resolution

  } in progress

- Biases of different methods to determine resolution
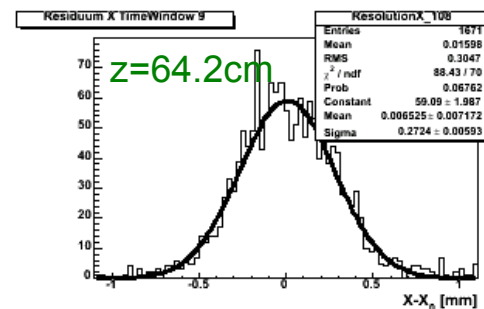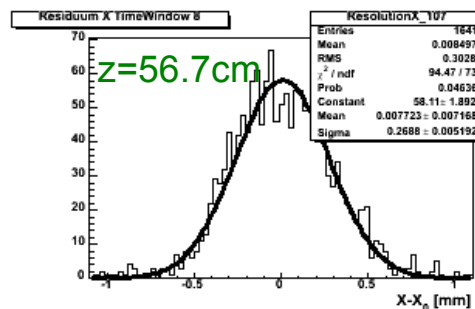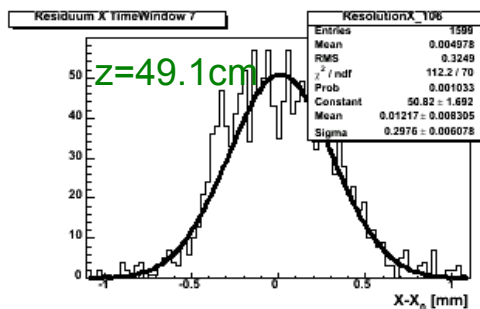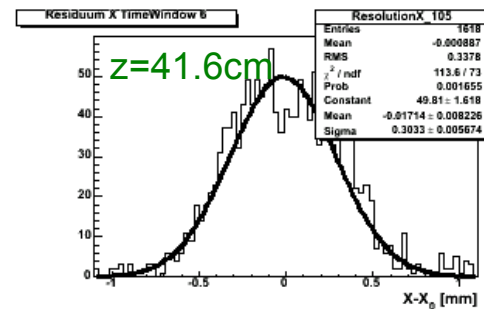
Definition of Resolution?

Residual distributions (2 mm wide, non-staggered pads, B = 4 T):
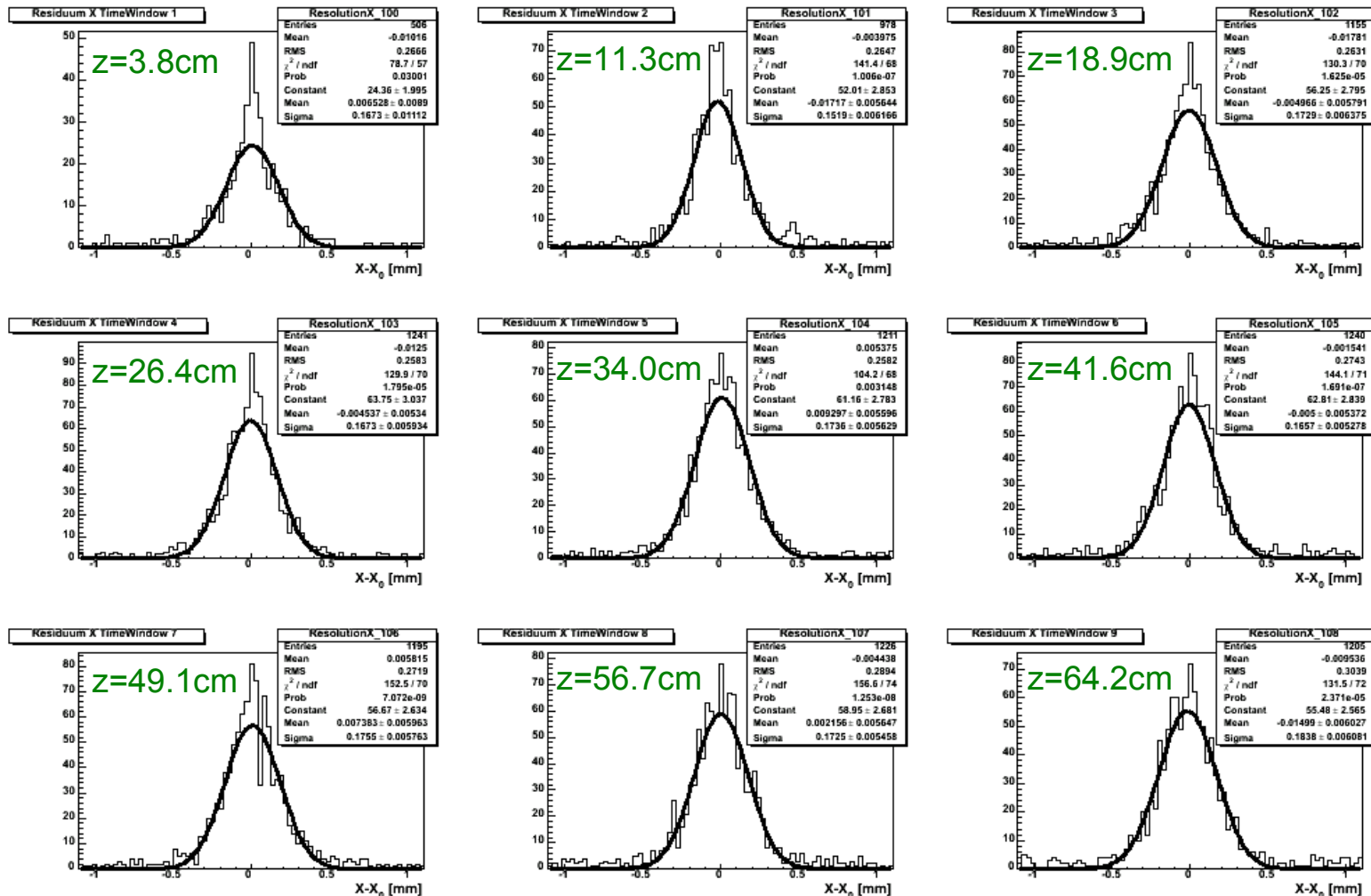
Definition of Resolution?

Residual distributions (2 mm wide, staggered pads, B = 4 T):
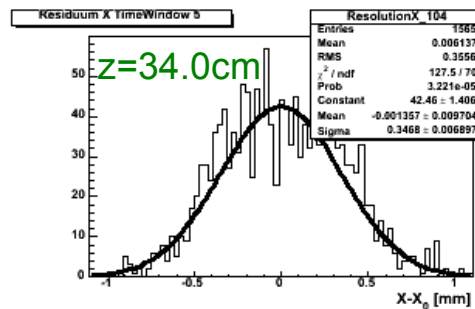
Definition of Resolution?

The only easy conclusion:
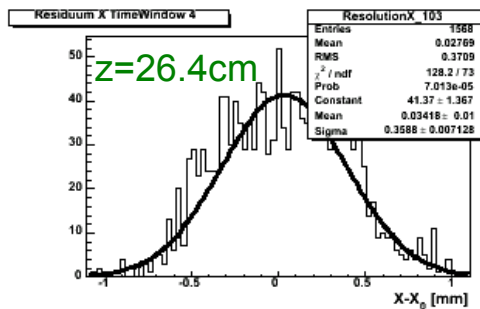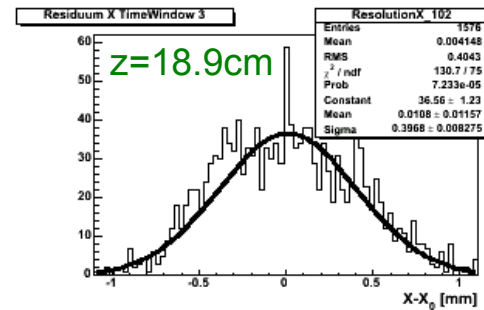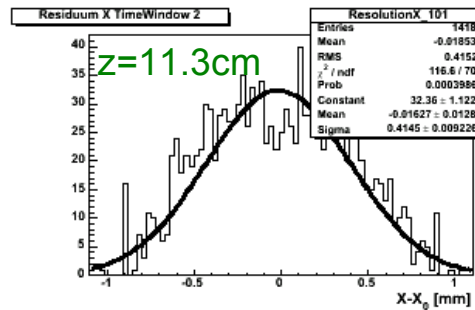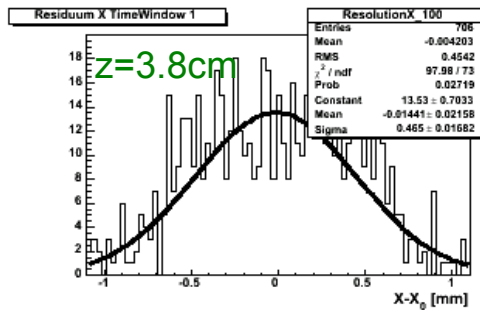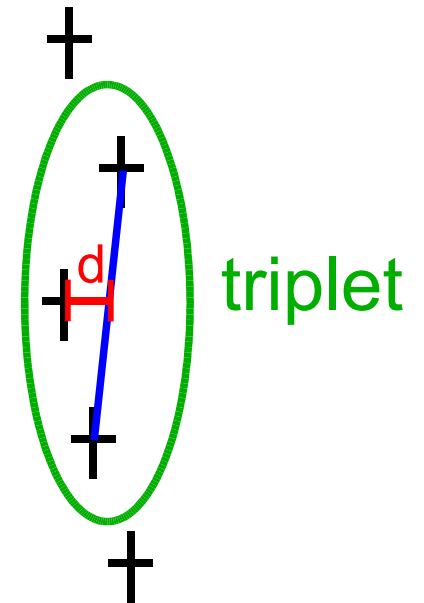
2 mm pads seem too wide for TDR-like gases

(to get diffusion limited resolution for all drift distances with "typical" GEM stack setup)

Triplet Method

Determine residual only from three adjacent pad rows:

- Draw straight line through outer hits

- Determine distance between straight line and central hit

- Resolution σ assuming same uncertainty for all hits: $\sigma = \sigma_d \sqrt{(2/3)}$
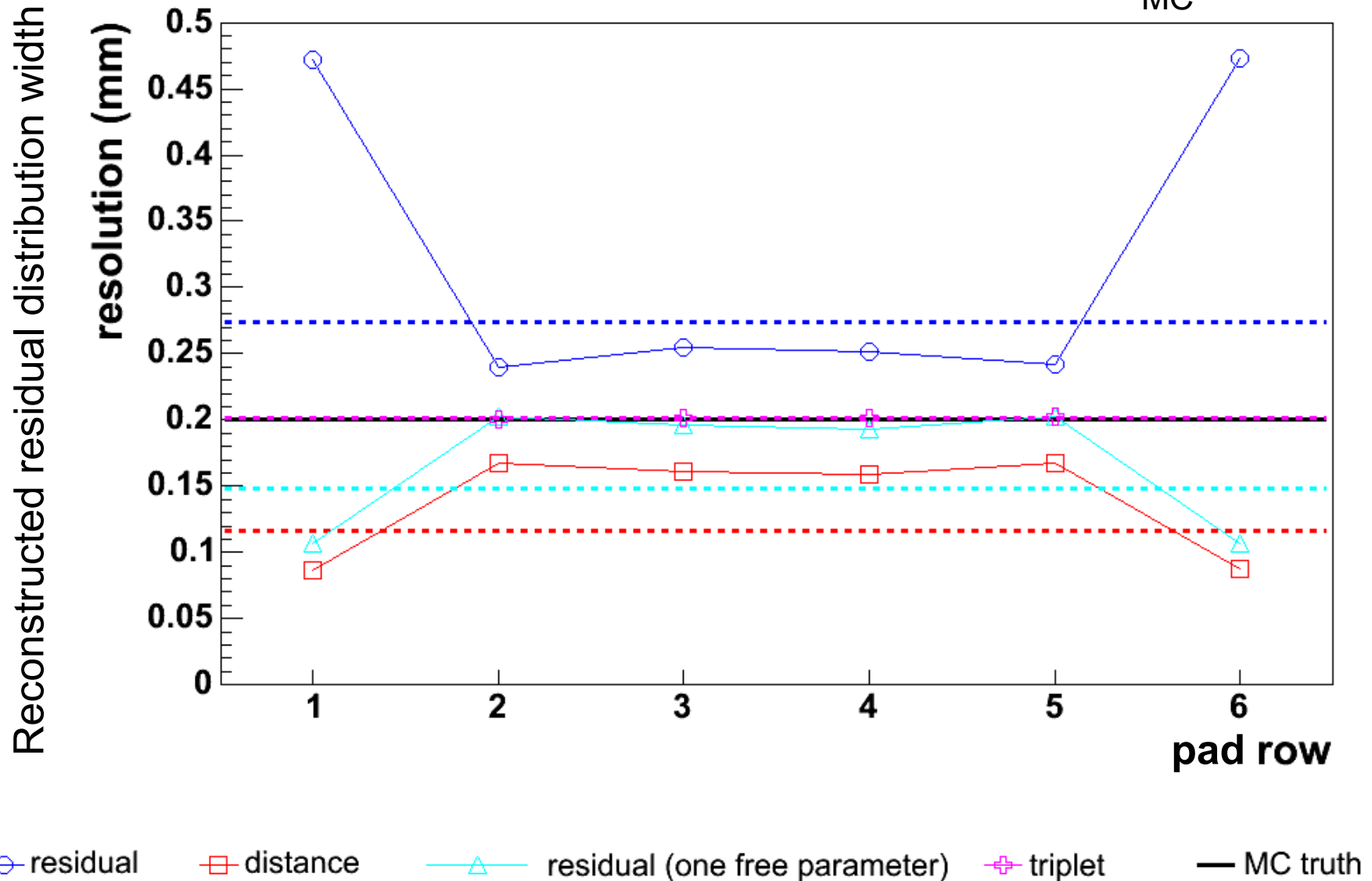

triplet

Advantages of triplet method:

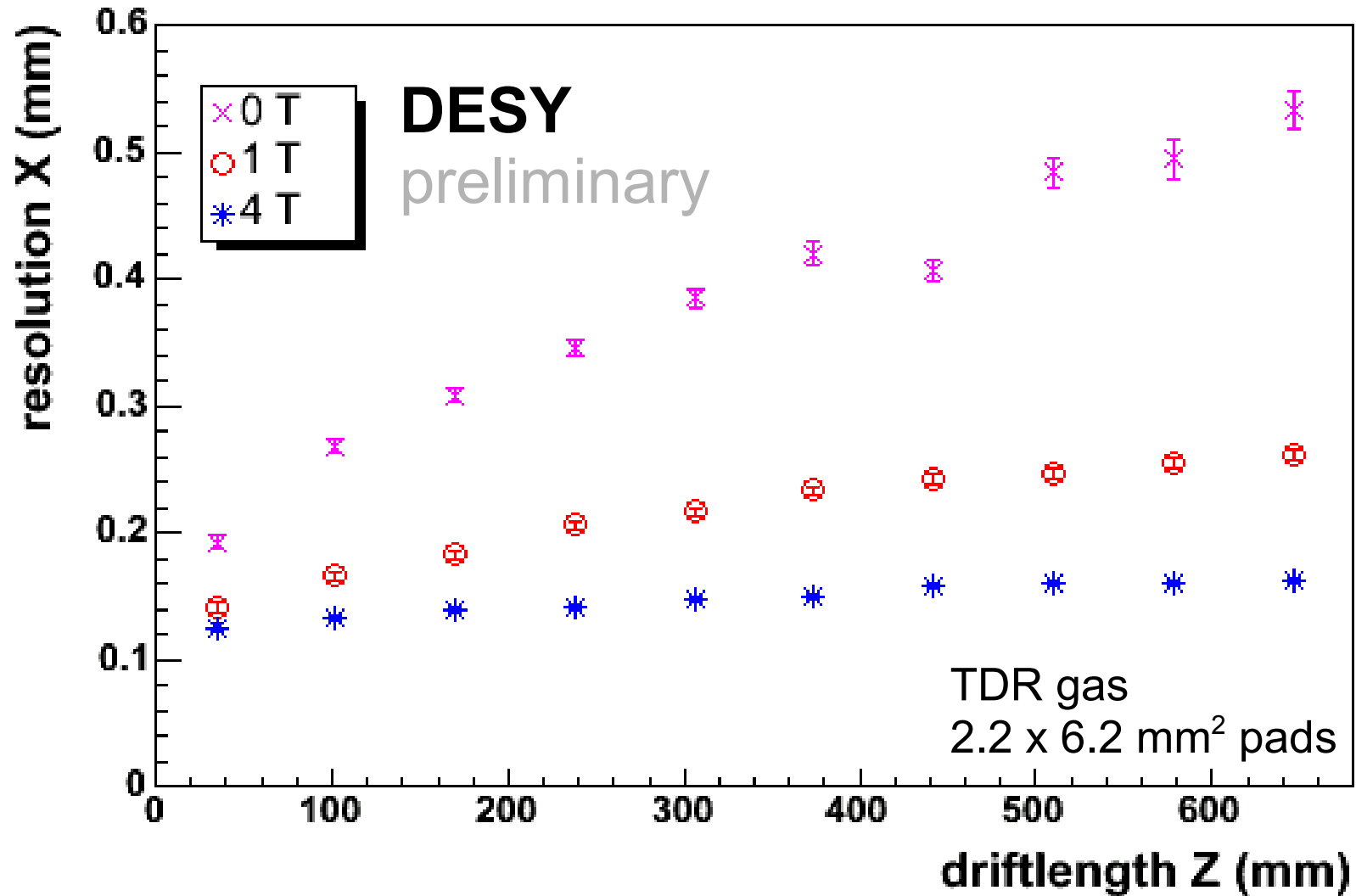- Very simple and robust

- No difference between straight and curved tracks

- Probably less sensitive to field inhomogeneities

Check with Gaussian smeared toy MC points (σ_{MC}=200 μm):

Triplet Method

Marlin Tracking Module

MARLIN = Modular Analysis and Reconstruction for the Linear Collider (based on LCIO)

Current user community:

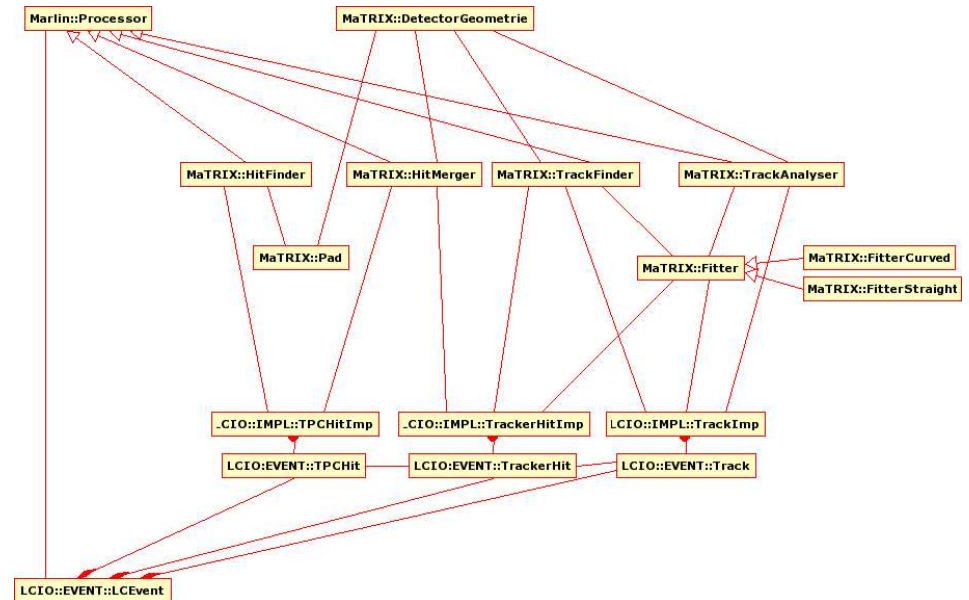- CALICE Collaboration
- Simulation group
- Physics analysis group

Started design of MARLIN tracking processors

MaTRIX = Marlin based Track Reconstruction for ILC Experiments

Your input is welcome!

Advantage of approach: Exchange of experience

Summary

- 2004 has been a successful data taking year.

- Drift velocity can be kept constant at the sub-percent level (with present simple gas system and after ~ 3 weeks of flushing).

- Continued to study resolution systematics. No final conclusions yet.

- Triplet method is a simple and robust way to determine resolution.

- Started with design of MARLIN tracking processors. Input from all groups is welcome.

Future Plans

- Determination of double track resolution with UV laser. Chamber is being modified.

- Finish slow control system.

- Add more readout channels.

- Cosmics measurements with other pad geometries and gases.

- Investigate electronics alternatives.

- Collect ideas for next generation prototype.