

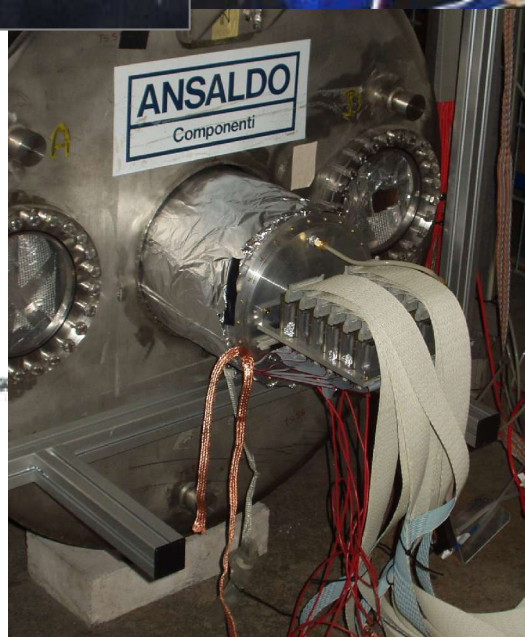
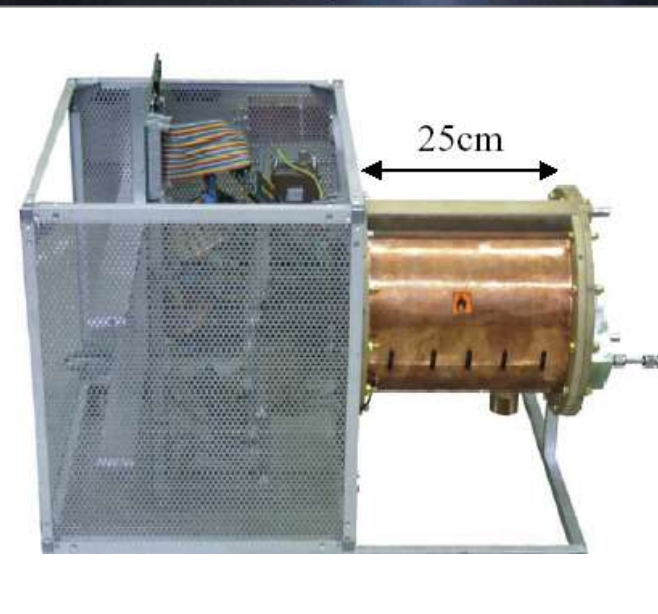
# **Some Remarks on LC TPC Resolution Studies**

**- Request for Comments -**

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DESY

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# Achievements



# Achievements

- Many groups have built TPCs with GEMs, Micromegas or wires and made them work
- Numerous interesting first results from the data presented during workshops

# Problems of Resolution Studies

Comparisons between results of different groups are difficult:

- different pad geometries
- different analysis methods
- different sets of cuts
- (partly) different gases

Too many differences to (easily) check consistency

# Need for Consistency Checks

Consistency checks needed to:

- convince ourselves
- convince review bodies
- eventually have a common basis for design decisions

# Pad Geometries

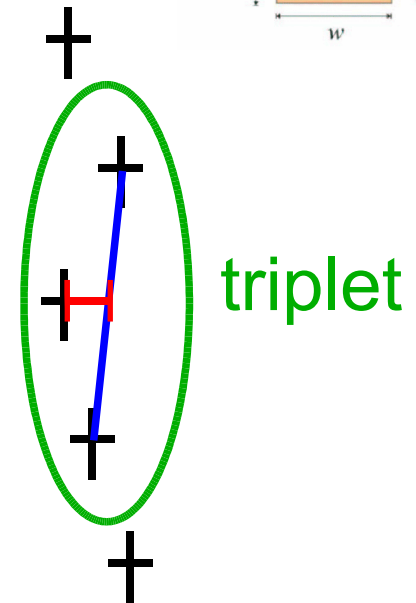
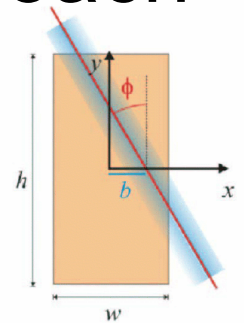
Note difference between pad size and pitch (~ 15 %):

Horiz. x vertical dimension	Spacing	Pad size	Pitch	Group
2 mm x 7 mm, 1.2 mm x 7 mm	0.2 mm	X	X	Victoria
2 mm x 6 mm				Hamburg
2 mm x 6 mm	0.3 mm	?	X	Aachen
1.27 mm x 15.5 mm, etc.			?	Karlsruhe
2 mm x 6 mm			X	Carleton
2 mm x 10 mm, 1 mm x 10 mm	0.3 mm	X	?	Berkeley/Orsay/Saclay
2 mm x 6 mm				Munich/KEK

In addition different pad alignments (staggered, non-staggered)

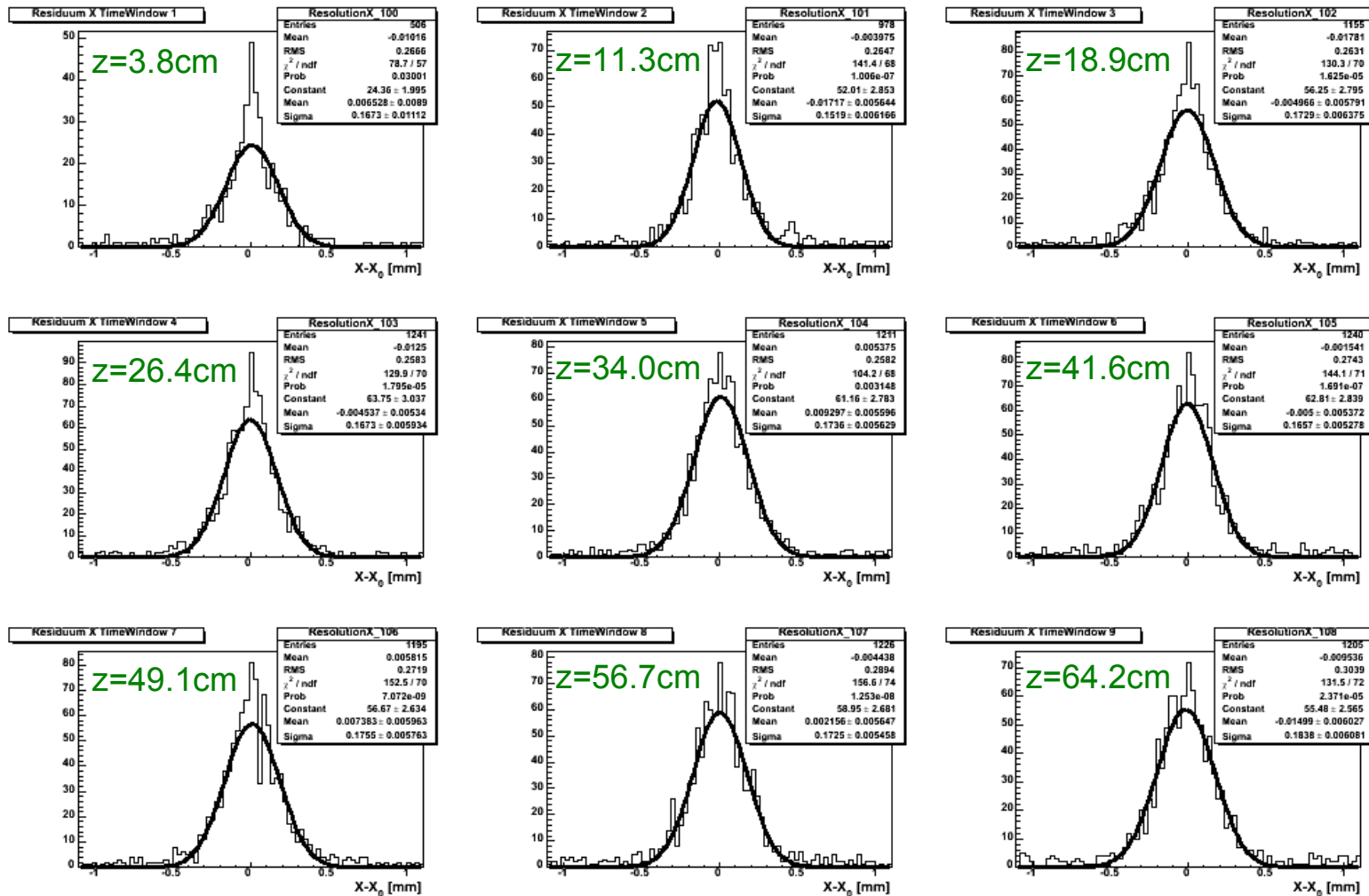
# Analysis Methods

- modular reconstruction  $\leftrightarrow$  monolithic approach  
hit finding, track finding, track fitting
- global track fit  $\leftrightarrow$  local triplet method
- different implementations  
(including different ways of  
exception handling (FADC overflows,  
broken pads, numerical instabilities, ...), etc.)
- different definitions of resolution



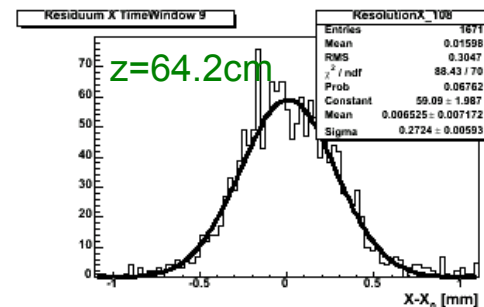
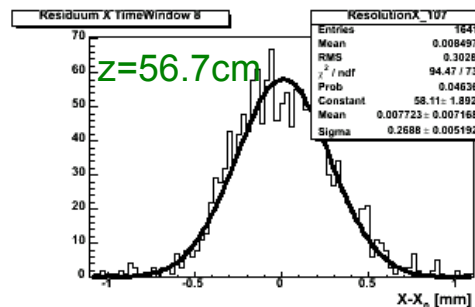
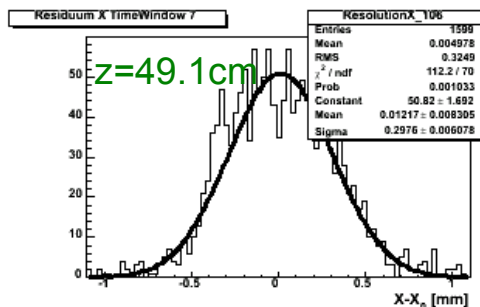
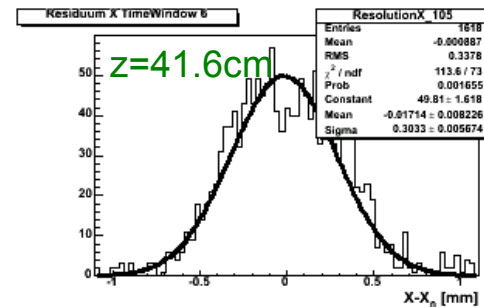
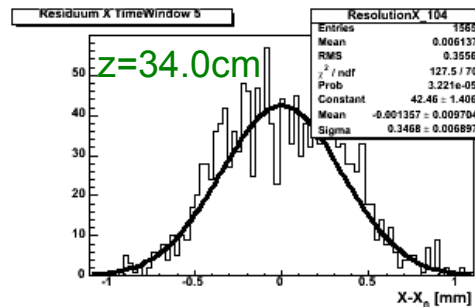
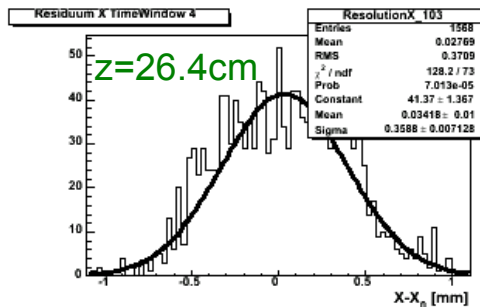
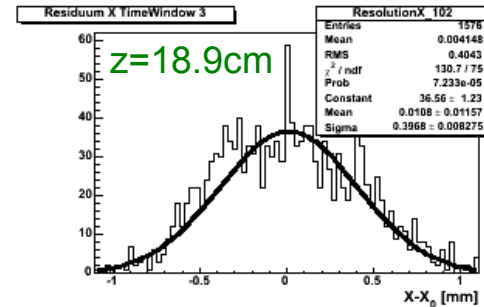
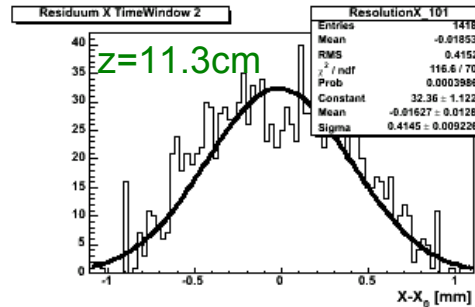
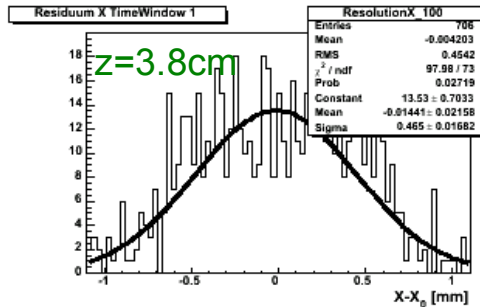
# Definition of Resolution?

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



# Definition of Resolution?

Residual distributions (2 mm wide, staggered pads,  $B = 4$  T):



# Cuts

Cuts have large influence on **resolution**:

**90  $\mu\text{m}$  - 160  $\mu\text{m}$**  (at short drift distances,  $B = 4 \text{ T}$ )

**So far no consensus which cuts are legitimate**

Useful: # tracks,  $\phi$  angle,  $\theta$  angle, horizontal position (no charge loss on left or right), # active rows, etc.

Prohibited: Any kind of cuts on charge sharing

# Gases

Many different gas mixtures are in use:

- Ar-CH<sub>4</sub>-CO<sub>2</sub> (93-5-2)
- Ar-CH<sub>4</sub> (90-10)
- Ar-CH<sub>4</sub> (95-5)
- Ar-CF<sub>4</sub> (97-3)
- Ar-IsoC<sub>4</sub>H<sub>10</sub> (95-5)
- Ar-CO<sub>2</sub> (70-30)
- Ar-CO<sub>2</sub> (90-10)

# Proposals

## Start discussions about:

- What cuts are considered legitimate for a reference analysis?  
The cuts must be universally applicable.
- What analysis method could serve as reference?  
A consensus should cover a common definition of resolution and even exception handling.
- What is a reasonable pad geometry which could serve as a reference to which other geometries could be compared?  
It must be reasonable for various gas candidates.

# Proposals

- Is it sensible to exchange data sets between groups for cross-checks and comparisons? Data grid infrastructure might be useful for this.
- If yes, a common data format would be desirable (→ LCIO, *de facto* standard).
- A common modular reconstruction and analysis software might be fruitful (→ Marlin). A particular set of modules could serve as a reference analysis.
- Review references regularly and modify them if required.