

MarlinTPC Reconstruction Status

iterated overview

Ch. Rosemann

DESY FLC

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Primary (initial) goal(s)

- 1 Create complete basic reconstruction chain from ADC values to tracks
- 2 Implement standard reconstruction chain for the Large Prototype
- 3 Implement Conditions Objects usage

Secondary and organisational issues

- Make usage easier
- Code organisation
- Extend documentation
- Make it usable for Large Prototype reconstruction

Noteworthy:

- Preparations for simulation usage have (re-)started

Fundamental distinction: Pad versus Pixel

The actual reconstruction chain consists of two legs

- Specific part up to hit level
- Generic reconstruction afterward

The specific part depends on the readout type

- Pixel system: No status known
- Pad based system: Basic chain working (for some)
 - Works for prototype data (MediTPC at DESY)
 - Used by Asian colleagues in LP data
 - Unknown status for the MicroMEGAs modules

To repeat from before (e.g. the Tutorial session)

- Well-defined LCIO input data
convert from raw data if necessary
- Pad plane description in GEAR (geometry part 1)
- Pad mapping from electronic channel ID to pad (geometry part 2)
- Electronics parameters needed for reconstruction

Still not organised for the past testbeams

Standard chain for pad based data

... no knowledge about Pixel data

- 1 Pre-Processing
 - Data conversion (LCIO, floats, etc.)
 - Pedestal calculation (per channel) & subtraction
- 2 Pulse Finding (& Splitting) – data per channel
- 3 Hit Finding

New: Pulses and Hits now carry error information

Still to do

- definition of status words/bits & their propagation
- hit splitting
- ...

Three approaches exist

- 1 Hough Transformation (by Isa Heinze)
 - Search independently in x/y (or r/ϕ) and z projection
 - Works for linear and helix tracks
- 2 Combinatorial Kalman Filter (by Li Bo)
 - Form track hypotheses by matching hits
 - Search for additional Hits along the track hypothesis
- 3 Topological Hit Combination (by Martin Killenberg)
 - During Hit Finding look for approximately matching Hits in adjacent rows

Several approaches exist, but nothing stable to work by now

- Straight Line model
 - Use *TrackFitterSimpleChiSquareProcessor* with special settings
 - Use (limited) Linear Regression processor
 - In development: $3D - \chi^2$ fit
- Helix model
 - Kalman Filter (status unknown)
 - Simple χ^2 processor, but not stable
 - In development: $3D - \chi^2$ fit

Severe shortcomings of the existing parts:

- No error handling
- No covariance matrices
- Fitting sometimes unstable (due to inaccurate track finding?)

(Too) Much:

- Set up project homepage (still struggling)
- Set up Large Prototype data collection homepage (volunteers?)
- Still rework the code documentation (in progress)
- (re-) Write a manual for all conventions and usage (in progress)
- Define short and mid term goals
- Incorporate/start with simulation