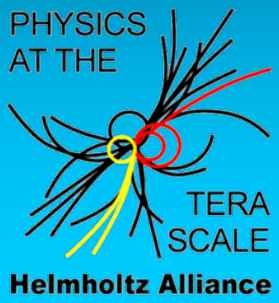
TDC-Related Processors in MarlinTPC/branches/oschfer

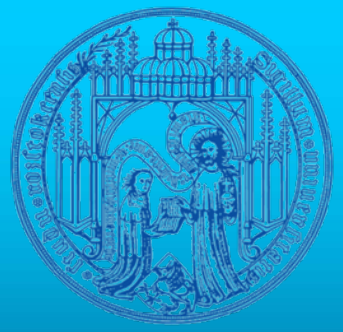


by Oliver Schäfer

LCTPC Collaboration

DESY Hamburg

EUDET Project



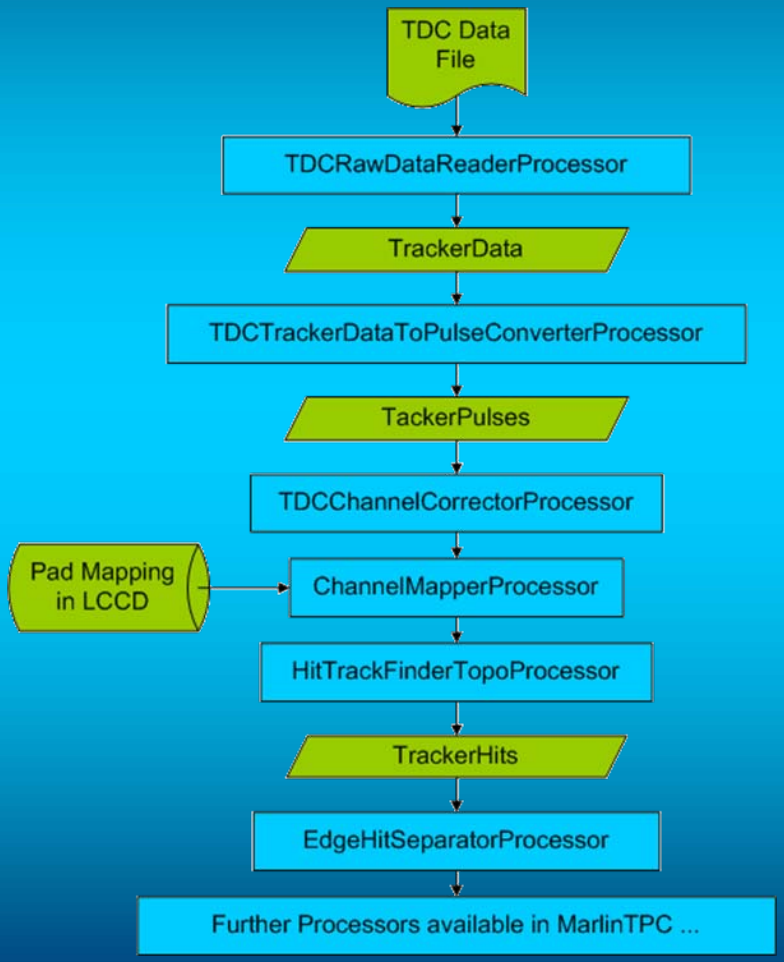
University of Rostock

MarlinTPC EVO-Meeting, 30th April 2009

Current Usage

- Study of ^{55}Fe-Signals (and cosmics) with UNIMOCS-Chamber
- Study of electronics (charge to time conversion behaviour) with pulse generator signals
- Intended study of cosmic signals – difficult because of few track hits
- Data analysis of our runs to come at LPTPC

Processor Chain Overview



TDCRawDataReaderProcessor

- Reads TDC raw data files into TrackerData
- Performs “event building” for continuous mode data (no trigger) → steered by parameters → processor
- Reads both TDC-formats in use (CAEN V767 and V1190)
- Shall be converted to TrackerRawData at some point, but for now sufficient

TDCTrackerDataToPulseConverterProcessor

- Basically copies information from TrackerData to Pulses
- Electronics already gives out charge-like value, doesn't need to be reconstructed
- Conversion of pulse-width to charge with function, can be disabled for studies:

$$Q = \frac{1}{p1} e^{\sqrt{\frac{\Delta t}{p0}}}$$

TDCChannelCorrectorProcessor

- Applies channel correction factor
- Used to get the same pulse width from the same charge on all channels
- Uses conditions data collection generated by TDCCorrectionFactorCalculatorProcessor

TDCCorrectionFactorCalculatorProcessor

- Processor derived from DBEntryMaker – class from M.E. Janssen to create LCCD entries in a slcio-file, a database file or a database with validity check (timestamps)
- At the moment uses simple matching of mean values of charge spectra of different pads (with 95% cut for tails) → to be improved later

PerPadPulseChargeHistogrammerProcessor

- Creates one histogram of charge distribution per electronic channel
- Number of channels as parameter
- As well: Min and Max Charge and number of bins
- Histograms can be arranged by root scripts for better printout – unfortunately lost mine …

ChannelMapperProcessor

- Normal MarlinTPC
- Feature: map is created newly for each event (processing time)! Inhibited this with if-condition on event number, better solution needed
- Mapping collection currently generated by TDCPadMapGeneratorProcessor (hardcoded)
- Thoughts about a generic mapping tool, to allow extraction of mapping information anywhere in the signal chain (useful for control system and debugging)
- Idea: just describe objects with transfer function and plug it all together like the hardware
- Surely industrial programs exist?!

PadMappingTestGeneratorProcessor

- Generates artificial pulses such that electronic channel 1 gets charge=1, channel 2 charge=2 and so on
- For historic reasons also number of pulses on a pad reflects the channel number, could be visualized in XYZPulseDistributionProcessor
- In HepRep-event display mapping of channels can be checked with pick-tool

XYZPulseDistributionProcessor

- Similar to XYZDistributionProcessor for Hits
- Shows histogram information on pad basis
- Number of pulses in file for x, y, xy and z
- Not suited for complicated padplane geometries
- Other way of displaying (in event display? however no fitting possibility)

HepRepOutputProcessor

- Added visualization of gear geometry (rectangular pads tested only)
- Moved that part entirely from run header into init section → can be used without LCIO-event to check gear file
- Needs to be merged to multi module version of processor

HitTrackFinderTopoProcessor

- Normal MarlinTPC processor
- Modified for limiting the hit size also at the upper end (parameter MaxHitSize)
- Not considered, if zero
- Needed for study of ^{55}Fe-spectra, if hits without charge sharing are wanted

EdgeHitSeparatorProcessor

- Generates two daughter collections of TrackerHits
- Hits can be composed of pulses that are touching the outer pads, so charge sharing with grounded pads could occur
- Separated into isolated and attached hits
- Likely process for our ^{55}Fe-source, irradiating from the side

Summary

- Created several processors to reach Pulse-Level with TDC Raw Data
- Created several auxiliary processors to allow for small prototype analysis
- Extended functionality of some existing processors (helpful?)