MarlinTPC Trunk is Multi Module Capable

Martin Killenberg

University of Bonn

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Status

- The multi module version of GEAR has been tagged as v00-12
- MarlinTPC trunk now is multi module capable (merged `multi_module` branch). Requires GEAR v00-12.
- Tag v00-04 is the latest, non modular tag and will receive bug fixes
- New tag is planned after testing phase (end of July)

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Reminder: Multi Module GEAR

Previous versions

- TPC end plate consists of one monolithic pad plane
- Abstract interface class `PadRowLayout2D`
  - Implementations for polar and rectangular pad planes
- Pads are uniquely identified by their PadIndex (CellID0)

Multi module version

- TPC end plate consists of multiple `TPCModules`
- TPCModule is derived from PadRowLayout2D (backward compatibility)
- TPCModule contains a pad plane implementation
- Pads are identified by
  their PadIndex (CellID0) within the pad plane and
  the ModuleID (CellID1)
- Modules have an offset and an angle wrt. global coordinates

Channel Mapping and CellID1

- LCIO CellID1 is used to store the module number
  - Nasty: Flag has to be turned on explicitly (but LCIO does not complain)
  - All processors have been adapted
- ADCChannelMapping class has been extended
  - `getModuleID()` GEAR module ID
  - `getReadoutGroup()` Hardware readout group (Altro RCU, TDC module)
- New tool: MappingGenerator (see talk from March 26 for details).

Latest Developments

New processor: ADCPulseConverterProcessor

- Direct conversion of TrackerData to Tracker Pulse
- Requires hardware zero suppression and pedestal subtraction
  Advantage: Does not need pedestal conditions data
  (Currently pedestals are not multi module capable yet, see talk of Ralf)

Multiple module capability:

- ChannelMapperProcessor
- HitTrackFinderTopoProcessor
  (one track candidate per module)
- HepRepOutputProcessor

Basic functionality has been tested with JGEM module data yet.

What is still missing

Alignment

- Define conditions data class for displacement (offset and angle)
- Calculate offsets of individual modules
- Apply alignment in the individual processors

Track Combining

- Tracks candidates are calculated per module
- Combine track candidates before performing fit

Track Fitting

- Bug in z coordinate of track seeder
- χ^2-fitter is not fully functional yet
- Likelihood fitter directly accesses geometry
  $\Rightarrow$ explicitly has to be made multi module capable

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