Software News

Angela Lucaci-Timoce

Overview

1. New reconstruction
2. *calice_run*
3. Other News

New AHCAL Reconstruction Software

Default reco

HcalSROMapper
HcalMappingI
HcalCalibration
HcalMappingII
HcalBadHitFilter

- Note that *HcalCalibration* processor does not only calibrate, but also obtains: temperature, pedestal calculation, calibrations (cleanly separated in new reco)
- Wrong position of the tiles for rotated detector

New reco

HcalSROMapper
HcalMappingProcessor
HcalCellDescriptionProcessor
HcalSiPMTemperatureProcessor
HcalPedestalProcessor
HcalSiPMCalibrationsProcessor
HcalSiPMCalibrateProcessor
HcalPositionProcessor

- Correct position of tiles
- Based entirely on code developed by **Beni** for his PhD (many thanks)
- Documented (doxygen)

New AHCAL Reconstruction Software

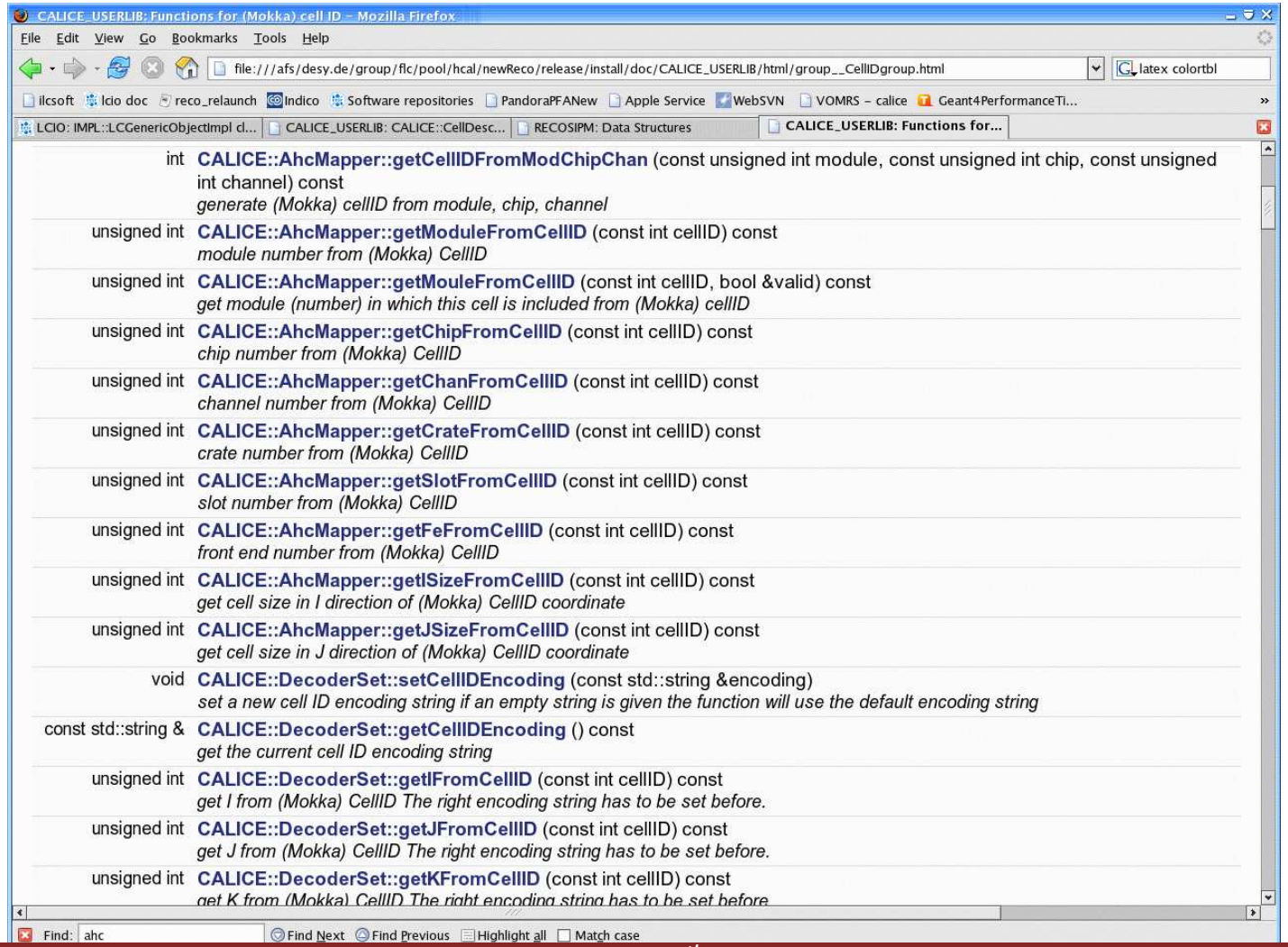
- New directories/packages:
  calice_userlib/Mapping
  calice_reco/recoSiPM
  calice_reco/cellGeometry

Advantages

- clean code, separated tasks
- documented (doxygen)
- easy to do systematics
- correct position of AHCAL hits: checked by Beni, to be soon shown with event display

Mapping

- Main working horse: **AhcMapper** (framework allows inclusion of mappers for other detectors)
- Example for Mokka cell ID:



Software - continued

- *HcalCellDescriptionProcessor*:
  a cell is described by position, size and angle
- *HcalSiPMTemperatureProcessor*: provides the SiPM temperature
- *HcalSiPMCalibrationsProcessor*: a SiPM has MIP/gain calibrations, pedestal, inter-calibration, saturation (the same as the one used in the default reco), quality flag
- *HcalSiPMCalibrateProcessor*: one formula

```
calibratedEnergy = saturationContainer→deSaturate( (rawEnergy - pedestal) *
* interCalibrationValue / gainValue) * gainValue / interCalibrationValue / mipValue
```

- *HcalPositionProcessor*: correct position of AHCAL hits

AHCAL Cell Position

- Basic assumptions: save values in the data base for a 0° configuration, and calculate the rest for a rotation angle θ
- Cell position is calculated with:

$$\vec{r}_{detector} + \vec{r}_{module} \cdot \mathcal{M}_{zshift} + \vec{r}_{cell} \cdot \mathcal{M}_{rotation}$$

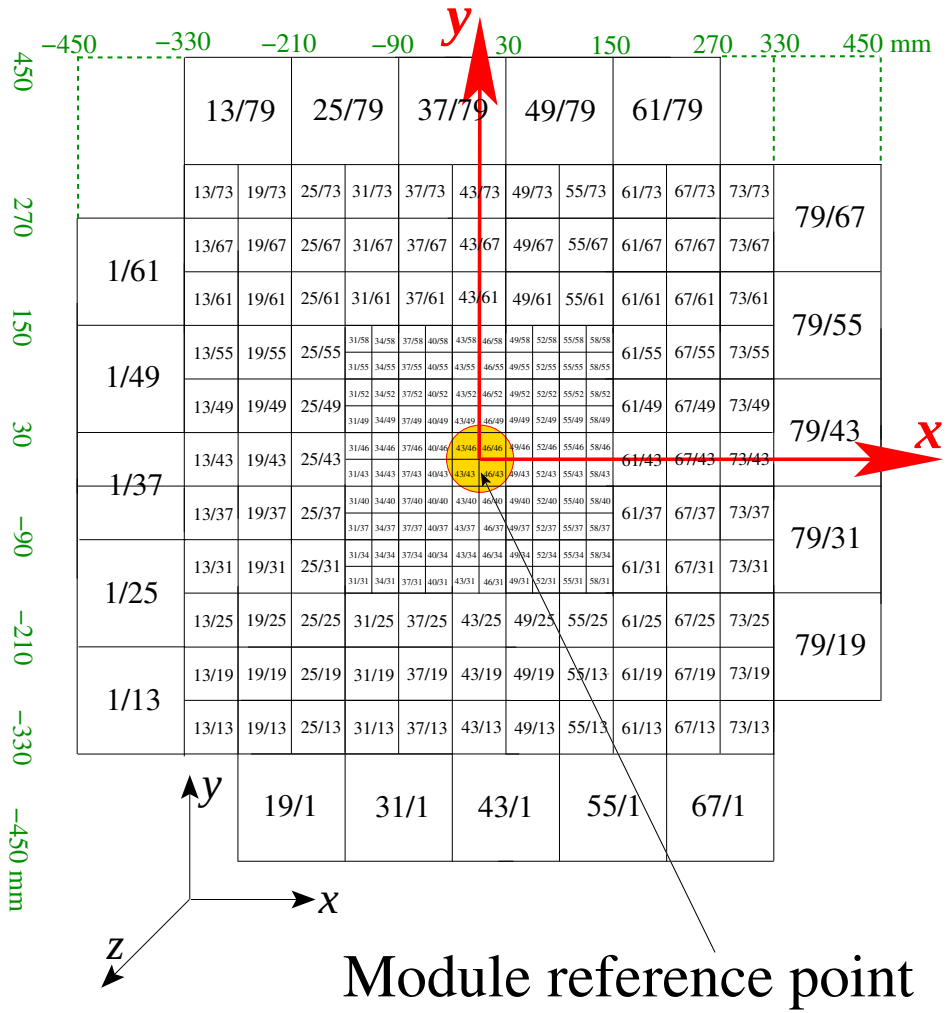
where

$$\mathcal{M}_{zshift} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1/\cos\theta \end{pmatrix}$$

and

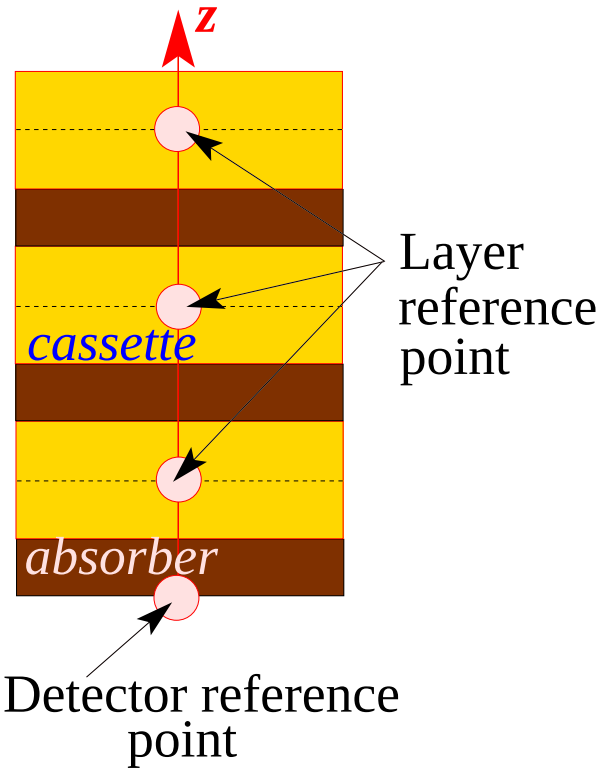
$$\mathcal{M}_{rotation} = \begin{pmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{pmatrix}$$

AHCAL Cell Position - continued



- $\vec{r}_{detector}$: based on *DetectorTransformation* (*Hcal/HcalDetectorPosition*), which contains the rotation angle and the global position of the detector front face center
- $\vec{r}_{module}$: based on *ModuleLocation* (*Hcal/HcalModuleLocation*), which contains the positions at which the modules center will be placed for a detector at 0°, with respect to the center of the detector's front face

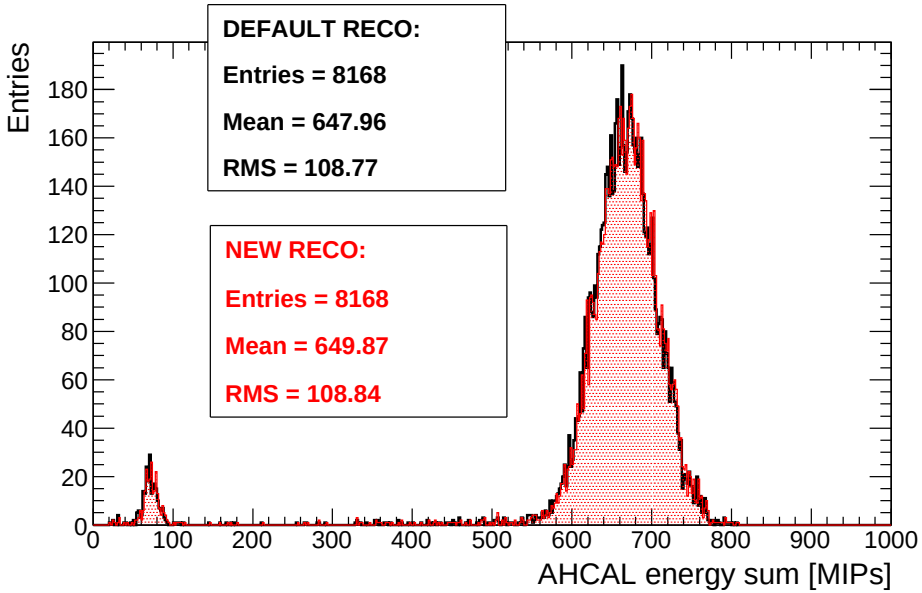
AHCAL Cell Position - continued

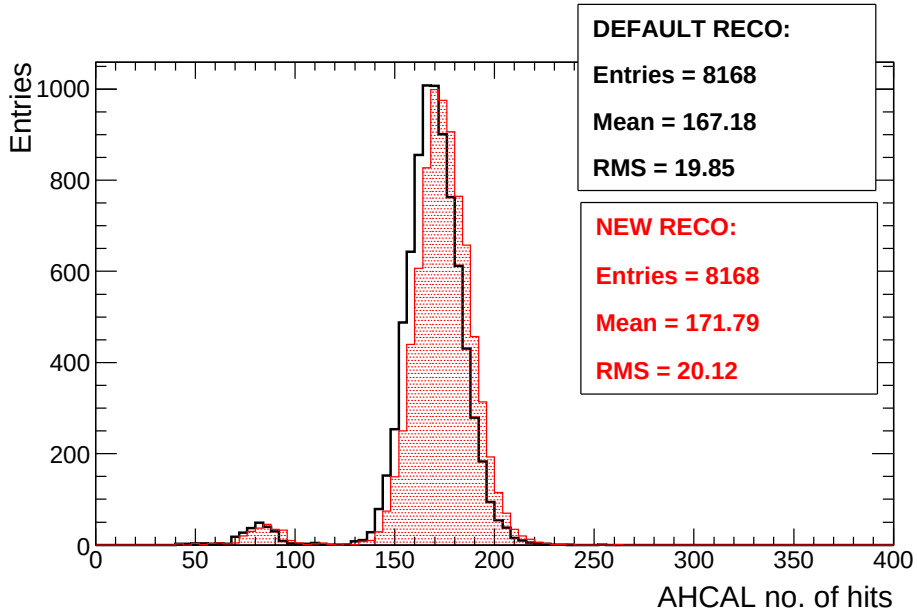


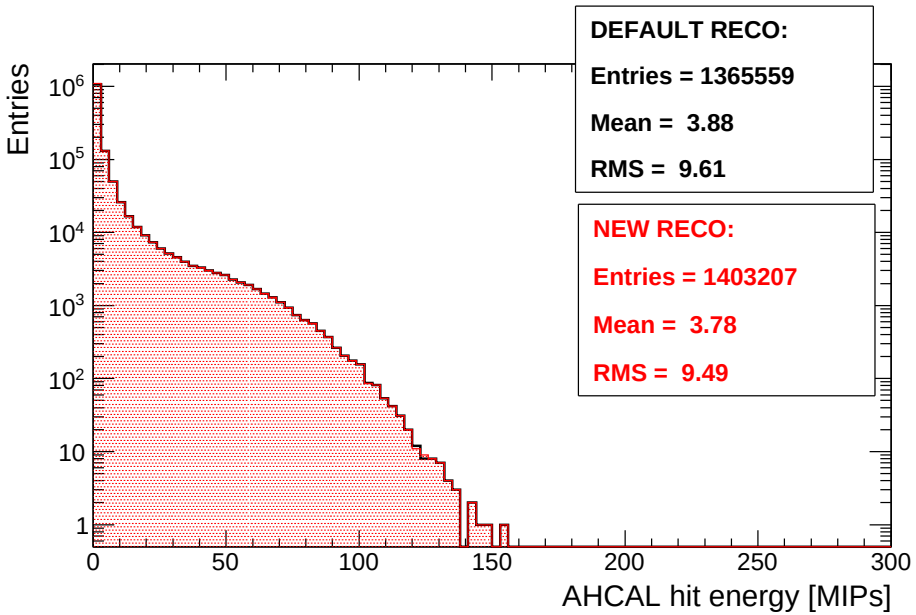
- $\vec{r}_{cell}$: based on *ModuleDescription* (*Ahc/ModuleDescription*), which contains the cell position with respect to the center of the cassette

- Many thanks to Nils, who updated the database folders

Comparison: Default vs New Reco







Small effect due to cut of 0.4 MIPS:

- in default reco: BEFORE saturation correction
- in new reco: AFTER saturation correction
  $\Rightarrow$ a few more hits at low energy

Default Digitisation

HcalSROMapper
HcalMCGanging
HcalMappingI
HcalTcmtAppendNoise
HcalMCDigitisation
HcalMCCalibration
HcalMappingII
HcalBadFilter

New Digi

- To be developed
- In discussion with Katja (Munich)

calice_run

- Switch from old ASCII steering files to recommended XML type steering files
- Reconstruction: *../generateRecoXml < run number >*
- **New** reconstruction: *../generateRecoSiPMXml < run number >*
- Noise: *../generateNoiseXml < run number >*
- Digitisation:
  ../generateDigiXml < run number > < mc.list > < noise file >]

Other News

- New processor: AppendMultiAmplitude, from Nils and Beni, to append the amplitude of the multiplicity counter to the event (once can later cut on it to reject double particles)

Last but not least

- Latest software changes available in the moment only in the DESY GIT repositories
- To be soon released in the SVN