Variables needed to calculate Lorentz Angle

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Abstract

We are proposing names of variable based upon the calculation that we have done and few documents that we are using as literature since we have started our work. The links and references corresponding literartures are given below in the reference section. Some slides has been collected from different places but links to those are not defined instead those slides are very usefule. Keeping in mind importance of those slides snapshot of the title pages is given in the reference.The SiStripTree format, also called ShallowTree, is a common data format used by the SiStrip simulation, local reconstruction and calibration group. The aim of the data format is to provide easy access to the quantities used for the tasks performed by the group, in a way as backward/forward compatible as possible. The source code of the framework to produce these trees is located in the CMSSW sub-package CalibTracker/SiStripCommon. Official links are,

https://twiki.cern.ch/twiki/bin/viewauth/CMS/SiStripTreeFormat.
https://twiki.cern.ch/twiki/bin/view/CMS/LorentzAngle

These following variables will be using for Lorentz angle calculation for SiStrip detector of Tracker. Regarding to the informations of cluster, reconstructed tracks these varibles have grouped in three section coming from three different producer. Variables are coming from *Group 1-ShallowClusterProducer* comprises a *Prefix: cluster*. This module dumps information relative to all the clusters, no matter if they were used to build a track or not. Names of those variables are given below,

- detid

- number

- module

- width

- variance

- layerwheel

- side

- seedcharge

- ston

- noise

- seedindex

- seednoise

Also variables are coming from *Group 2-ShallowTrackClusterProducer* comprises *Prefix: tsos*. Computes quantities related to on-track clusters, i.e. clusters associated to a reconstructed track. Additionaly builds the necessary links to reach the corresponding tracks and general cluster informations in both directions. Names of those variables are given below,

- onTrkClusterIdx

- onTrkClustersBegin

- onTrkClustersEnd

- trackmulti

- trackindex

- clusterIdx

- localpitch

- globaltheta

- globalphi

- localtheta

- localphi

- global x,y,z

- local x,y,z

- strip

- projwidth

- BdotY

- globalZofunitlocalY

- drift x,y,z

And variables are coming from *Group 3-ShallowTrackProducer* includes a *Prefix:track*. Names are following,

- number

- chi2

- ndof

- chi2ndof

- charge

- momentum

- pt

- hitsvalid

- hitslost

- theta

- phi

- eta

- dxy

- dsz

All variables can be defined in CalibTracker/SiStripLorentzAngle/python/ntuple_cff.py script with proper syntax, viz.,'keep *_shallowTracks_tsostrackmulti_*'. The process is not defined here so that we have included another script *lantuple.py* written by *Mauro Verzetti*. After running these scripts under *cmsRun* we are getting a ntuple. The centrally produced calibration tree consumes in general *Gain Calibration Tree and anEff* and does not includes variables one need to calculate LA. So general requirement is to include these variables in CalibTree.

-cmsrel CMSSW_8_0_12
-cd CMSSW_8_0_12/src
-cmsenv
-git-cms-addpkg CalibTracker
-cd CalibTracker
-scramv1 b -rj20
-cd SiStripLorentzAngle/python
-vim -nw ntuple_cff.py
define variables you need in the following way
- 'keep *_shallowTracks_tsostrackmulti_*'
-git clone https://gist.github.com/mverzett/d6bde8ed6e6dec8a5ff4.git
-cmsRun lantuples.py

5. CalibTracker/SiStripLorentzAngle Pacakge

We have copied the whole package of CalibTracker in CMSSW_8_0_12/src. The problem is this package is showing it has updated 4 years ago in github. So many file (pythons scripts) are giving different kind of fatal errors. The file we are using to book ntuple is working in our local area. We think this whole package need to be updated.

5. References

- Lorentz-Angle in irrediated Silicon, B. Henrich, R. Kaufmann,
  Nuclear Instruments and Methods in Physics Research A,477(2002) 304-307.

- An algorith for calculating the Lorentz angle in silicon detectors,
  V. Bartsch et al.arxiv:physics/0204078v2[physics.ins-det], 20 Aug 2002

- Thesis_1258_abgabe.pdf,http://mon.iihe.ac.be/ ghammad/

- Lorentz angle measurement as part of the sensor R&D for the CMS Tracker upgrade,
  Andreas Nurnberg et al, 10th September,2012, Conference Report.

- http://mon.iihe.ac.be/ ghammad/LorentzAngle/

- Calibration of the CMS pixel detector at the large hadron collider,
  cience Direct, Nuclear Physics B Proceedings, 00(2015) 1-3

- https://twiki.cern.ch/twiki/bin/viewauth/CMS/SiStripTreeFormat

- https://twiki.cern.ch/twiki/bin/view/CMS/LorentzAngle

- https://indico.cern.ch/event/85484/contributions/2106625/
  attachments/1077567/1537023/presentation.pdf

- https://indico.cern.ch/event/56297/contributions/2043978/
  attachments/984866/1400268/presentation.pdfsearch=betchart

- https://indico.cern.ch/event/63615/contributions/1222515/
  attachments/1008855/1435255/presentation.pdfsearch=betchart

- https://indico.cern.ch/event/47302/contributions/1150997/
  attachments/954091/1353881/presentation.pdfsearch=betchart

- https://indico.cern.ch/event/63593/contributions/2058110/
  attachments/1008480/1434767/presentation.pdfsearch=betchart

Calibration and Monitoring
of the CMS Strip Tracker Detector

-Introduction
  -Tracker Layout
  -Low Level Reconstruction
-Data Quality Monitoring &
    Calibration Workflows
-Calibration procedures
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-Conclusions
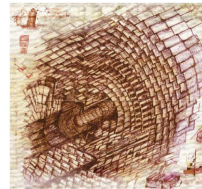
D. Giordano
INFN & Università degli studi di Bari
on behalf of the CMS Tracker Collaboration

Lorentz shift estimation

Presently:

- This Lorentz angle is presently one of the parameter in the alignment correction.

Objective:

- Monitor θ_H changes to constraint the alignment fit and allow fits over long periods during which the detector was not moved.
- **Be able to estimate the position shift due to the Lorentz angle from the measured θ_H.**
- Also monitor θ_H changes to follow detector aging.

Lorentz angle: Cosmic Runs (summary)

Andreas Nürnberg (KIT), Catherine Vander Velde (ULB), Thierry Caebergs (UMons), Gregory Hammad (UMons)

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