

# Summary of Simulation Studies for ILC

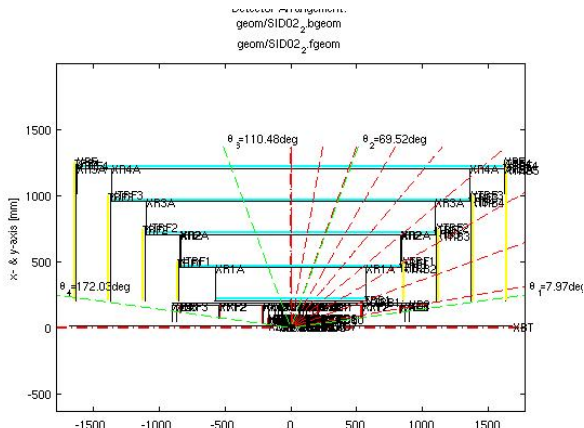
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- Answering to the questions of the International Detector Advisory Group (IDAG) relative to alignment requirements for ILD and SiD.
- Studies of electron tracking performance within ILD for single electrons.
- Integration of FTD IFCA-IFIC's design inside the ILD software framework (Mokka).
- Development of utility package in ILD framework (Marlin). Converts the LCIO data model files in a ROOT files.

## SiD: What is the precision required?

For a first answer, we have done MC studies using the Fast Simulation tool from Vienna group, **LiCToy** (many thanks to Manfred Valenta for his help).



## SiD: What is the precision required?

- Misalignment has been (naively) modelled with Gaussian errors. Assuming an intrinsic resolution ( $\sigma_{int}$ ) of micro-strips silicon detectors of  $5 \mu$ , we introduce different resolution degradations due to misalignment with  $\sigma_{misal} = 1, 3, 4.9, 7, 10 \mu$ , so the total resolution is expressed:

$$\sigma_T = \sqrt{\sigma_{int}^2 + \sigma_{misal}^2}$$

- We have compared the baseline hit resolution (where included intrinsic and effects of misalignment) used in the LOI simulations,  $\sigma_T = 7 \mu$  (which implies a  $\sigma_{misal} = 4.9 \mu$ ) with the different *misalignment scenarios* for the outer tracker.

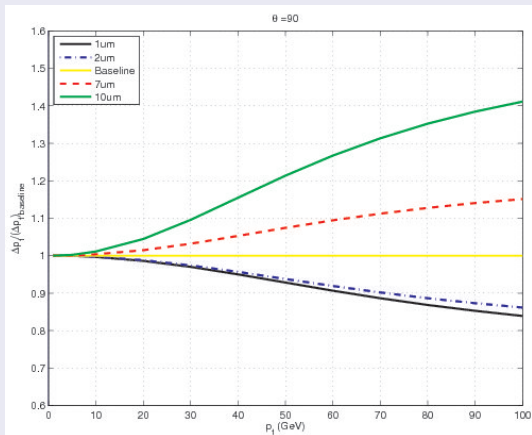
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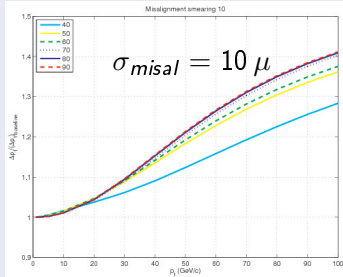
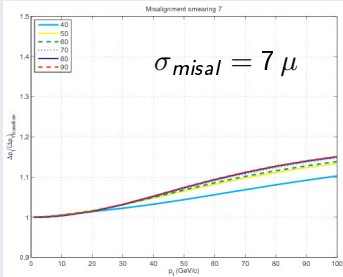
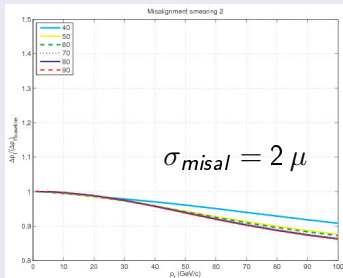
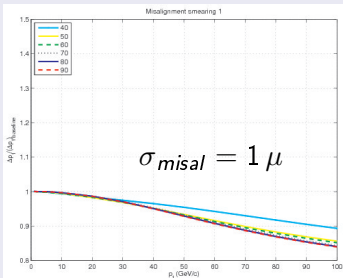
- Our conclusion was, at this preliminary stage of the study, that we should aim to a three microns or better of alignment error.

## SiD: What is the precision required?



Comparing different values of error due to misalignment with respect the baseline.

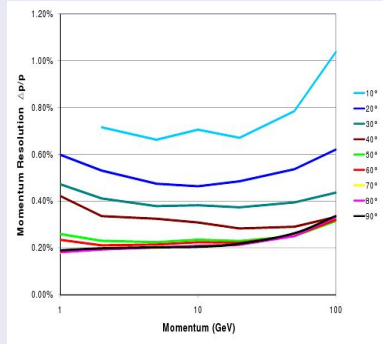
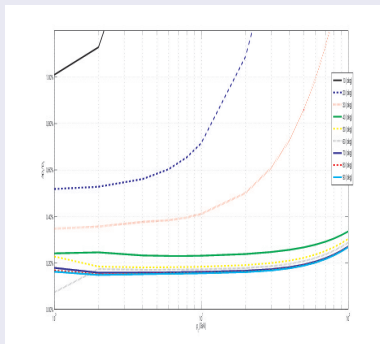
# SiD: What is the precision required?



Resolution degradation for several  $\sigma_{mis}$  values

## Some validation problem

- Checking the fast simulation with the Full Simulation done for LOI exercise there are some important discrepancies at low  $\theta$  angles.





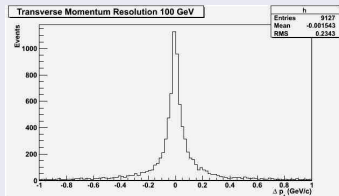
## Utility to convert slcio files to ROOT useful files

- From LCIO to Root Processor (FrL2RProcessor) integrated in the Marlin Framework has been developed.
- It permits convert LCIO data format files in a .root file, ready to use with ROOT framework.
- Support for most important collections of LCIO data format (MCParticles, hits and simulated hits, Track, ...). The collections are stored in TTree's.
- Source code and instructions can be downloaded in <http://devel.ifca.es/~duarte/repos/FrL2RProcessor/FrL2Processor.tar.gz>
- Feedback for bugs, suggestions,... are welcomed (duarte@ifca.unican.es)

# Momentum resolution for ILD Full Simulation

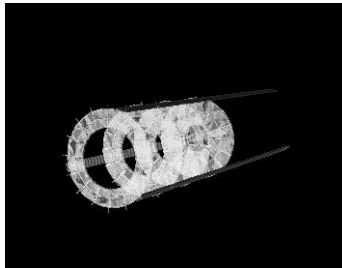
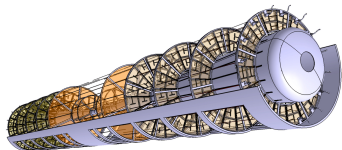
- Carrying on the same momentum and impact parameter resolution exercise with muon, now with electrons and positrons.
- Samples generated and simulated on ILD\_00 model (private, there is no central samples)
  - Single Particle (actually a Particle Source Geant4 generator)  $e^+$ ,  $e^-$
  - Homogenous in  $\phi$  and  $\eta$
  - Energy fixed: 1 GeV, 10 GeV and 100 GeV
- Reconstruction with Marlin Framework (convert with FrL2RProcessor to root for analysis)

Work in progress...



# Forward Tracker Disk Mokka integration

- Cathia design must be converted in understandable way to the Geant4 simulator.
- There is no trivial way to make this conversion (there are some packages to convert Cathia format to GDML format using tessellated Geant4 solids). For ILD simulation is needed a driver that describes the detector and for the reconstruction is used a xml description toolkit (GEAR), much more lighter. Working on both.



- Misalignment studies: migration to full simulation, more realistic description of misal. effects.
- FrL2RProcessor: possible improves, maintenance.
- Electron tracking Performance: work in progress.
- FTD: work in progress