Software Status and Outlook

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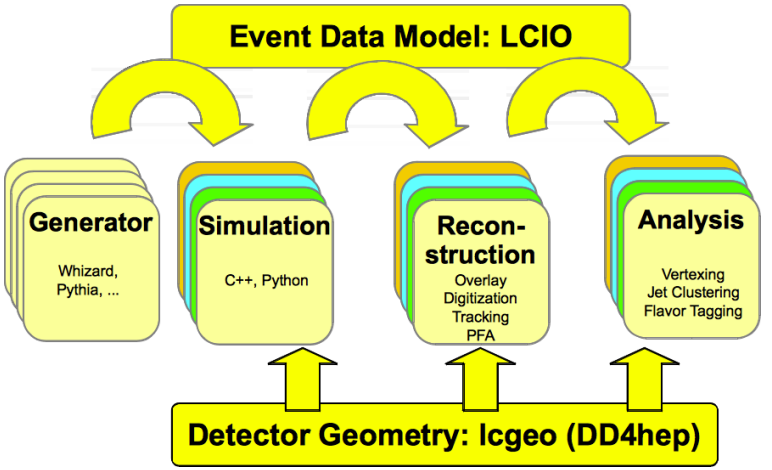
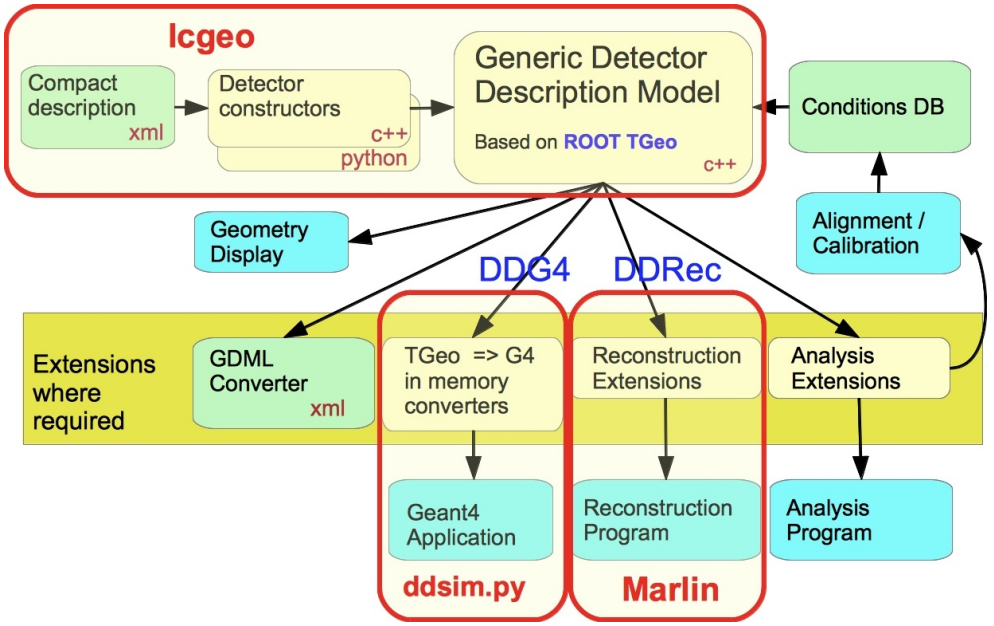
iLC SOft

New ILD (simulation) software

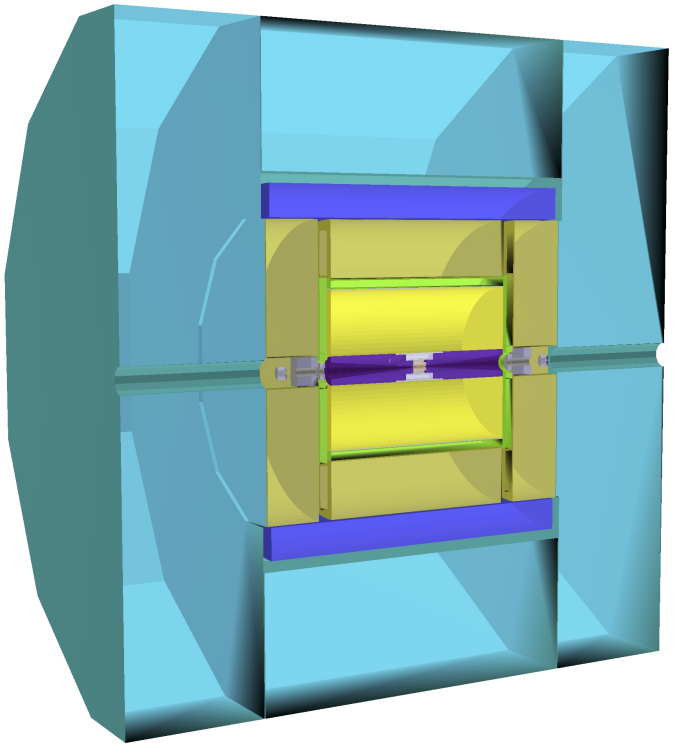
- LC community is moving towards more common software tools
- ILD decided to use the DD4hep geometry description and DDG4 for simulation
- DDRec is the interface for reconstruction
  - note: same tools used by CLIC and maybe SiD

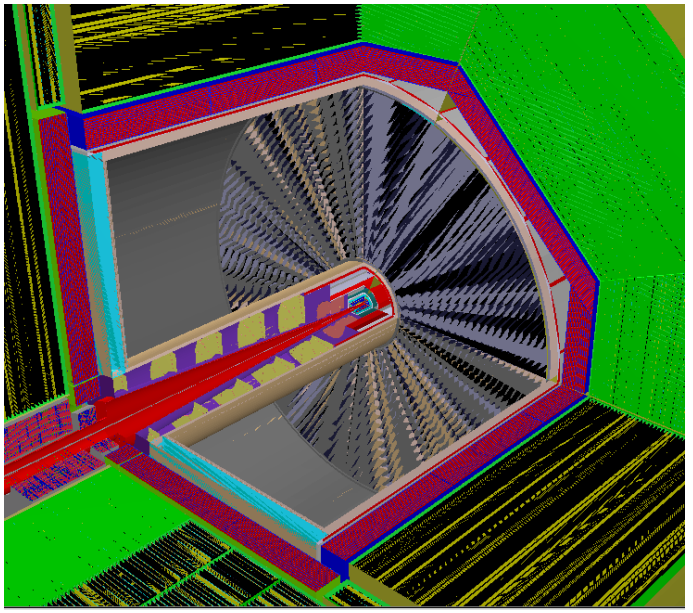
DDRec to replace GEAR





ILD simulation model in lcgeo (DD4hep)





- ILD_o1_v05 Mokka model ported one-to-one to DD4hep
- introduced mandatory envelope volumes
  - validation and scaling behaviour
- model is fully functional and ready for detailed validation
- ddsim python simmulation tool in place

example of simulation model validation

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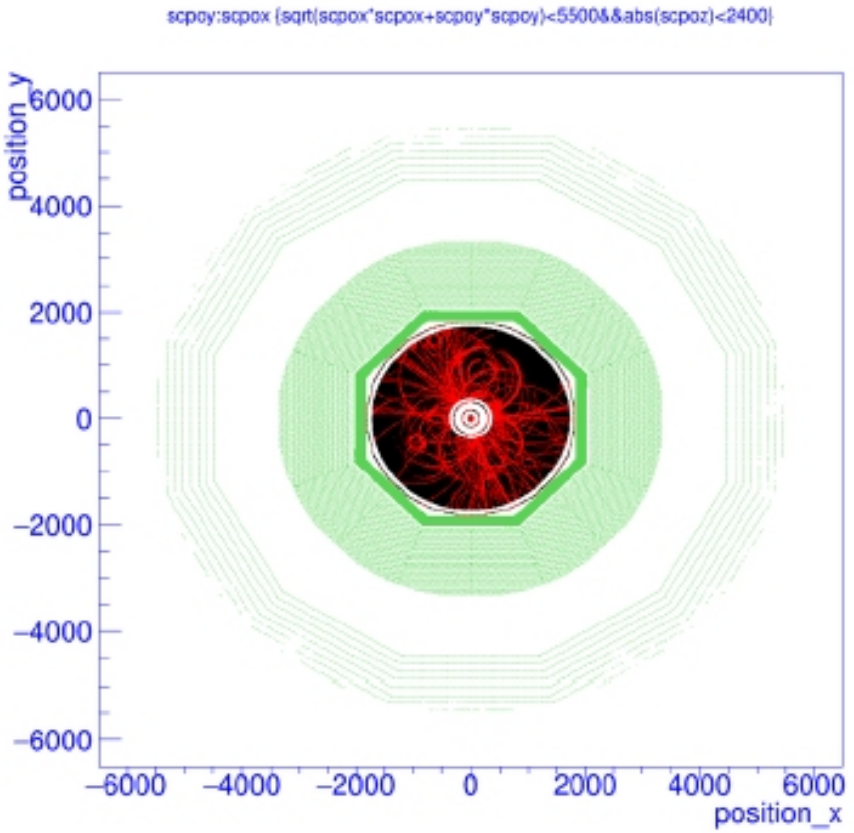
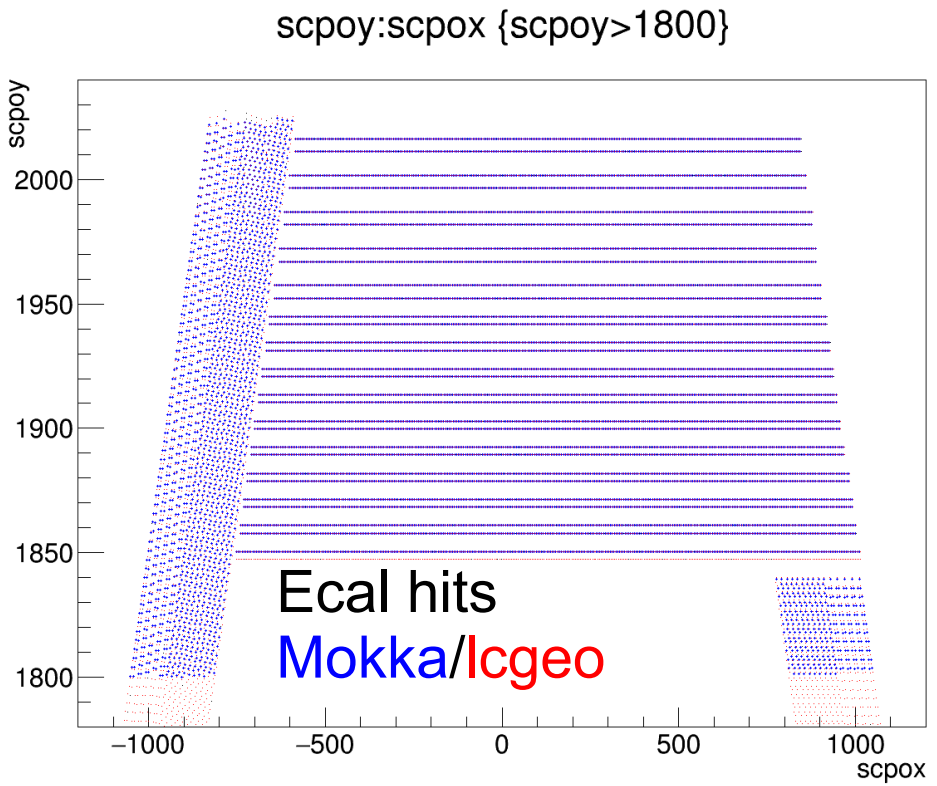
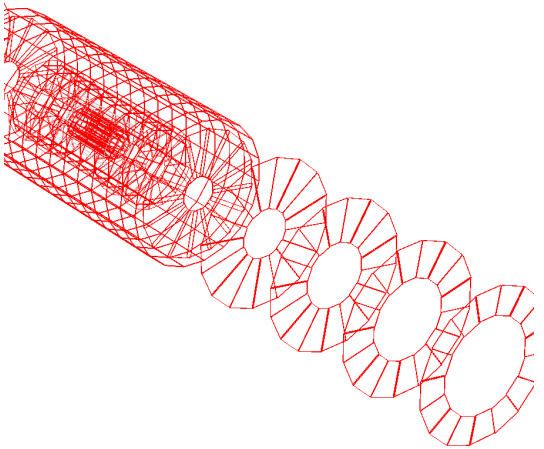




- quite some validation done by software experts, e.g. using hit maps
- => a detailed validation will have to be done by sub-detector experts

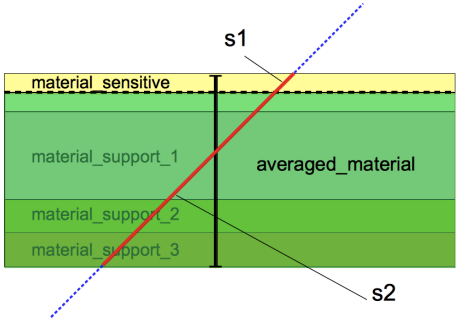
DDRec interface to geometry

- dedicated data structures for high level information
- surfaces for track reconstruction



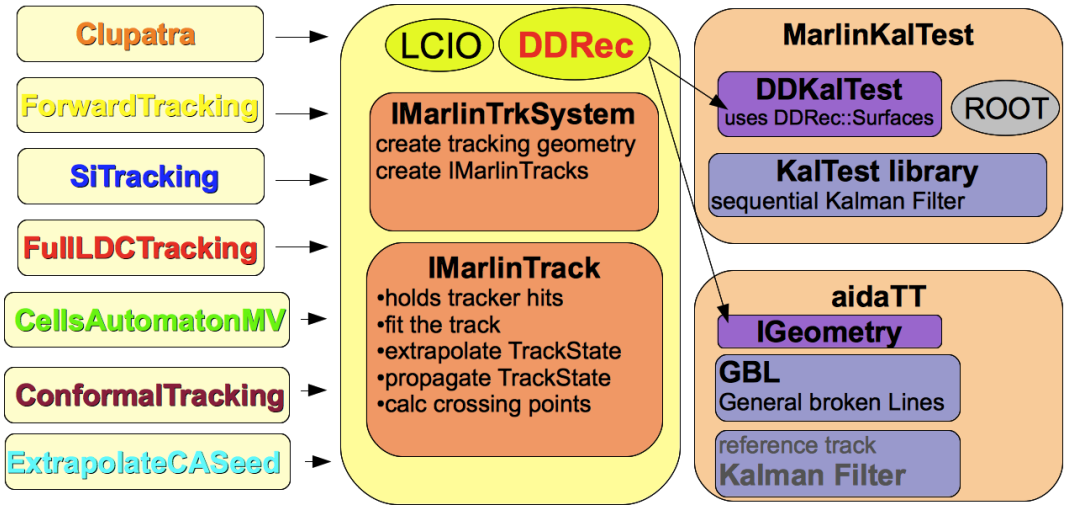
Data Structure	Detector Type	Example
ConicalSupportData	Cones and Tubes	BeamPipe
FixedPadSizeTPCData	Cylindrical TPC	TPC
LayeredCalorimeterData	Sandwich Calorimeters	ECal, HCal, fwd Calos
ZPlanarData	Planar Silicon Trackers	VXD, SIT, SET
ZDiskPetalsData	Forward Silicon Trackers	FTD

- can create GEAR file from these
  => possibility to run 'old' reconstruction with
  only minor adaptations

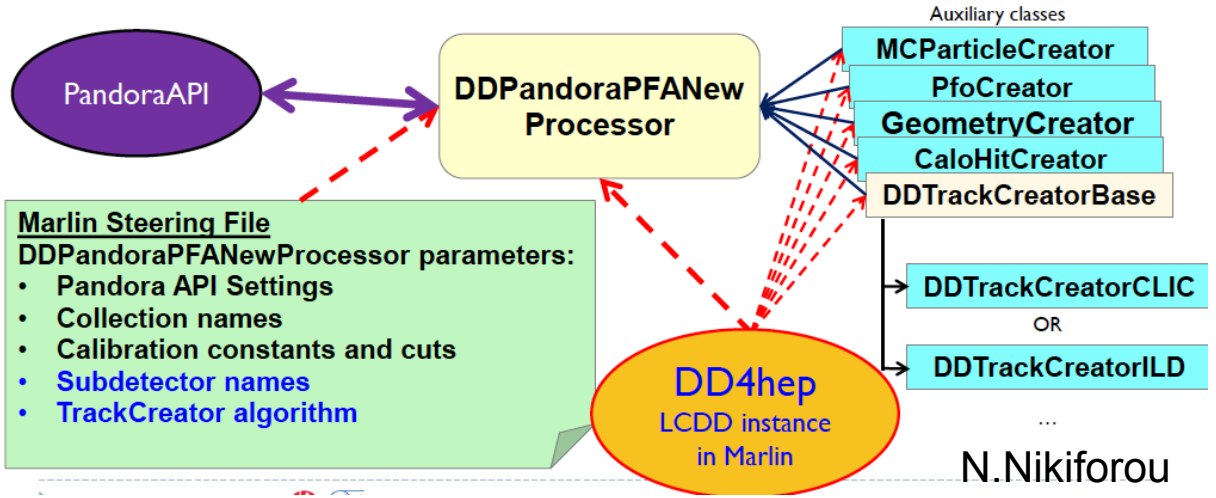


- adapted reconstruction code to work with DDRec:
  - DDKalTest, aidaTT for track reconstruction
  - DDMarlinPandora to run Pandora
  => can run 'new' reconstruction w/ DD4hep only

Reconstruction Tools for DD4hep

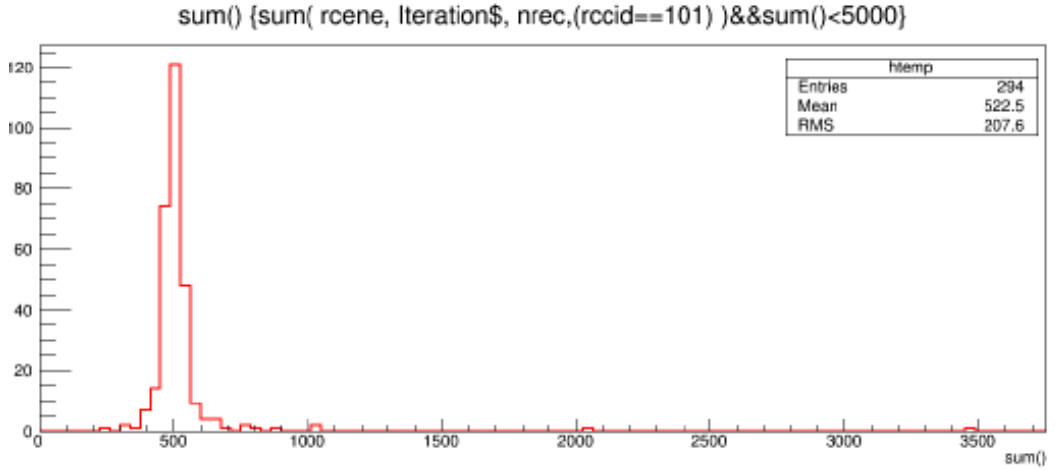


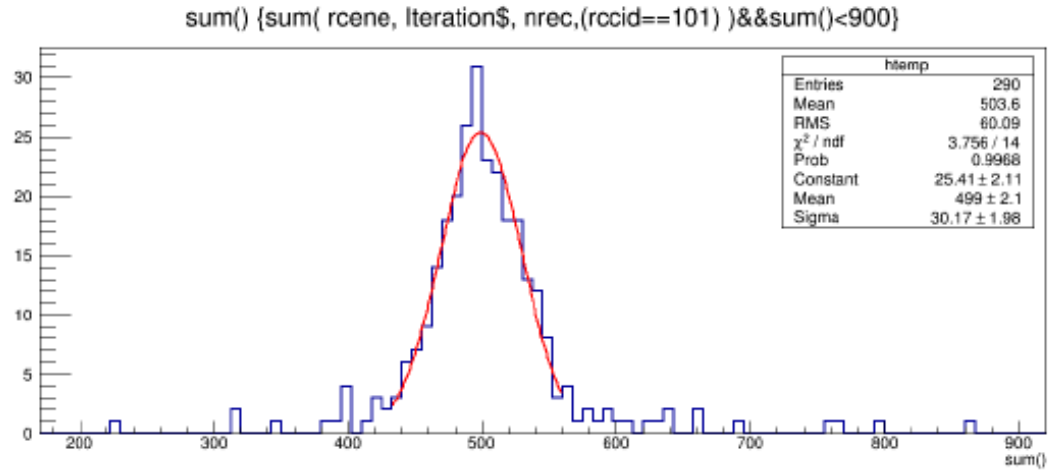
- MarlinTrk tracking tools are now fully compatible w/ DD4hep
- can run existing pattern recognition
  - aidaTT-GBL allows for alignment studies

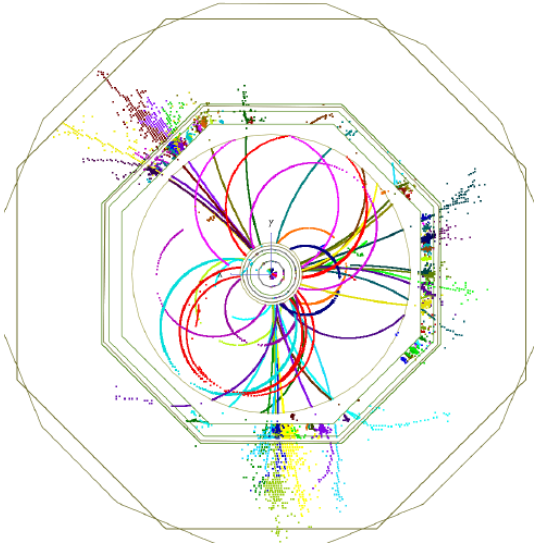


- DDMarlinPandora rewrite of MarlinPandora using DD4hep
- can run Pandora as before

Running the new reconstruction







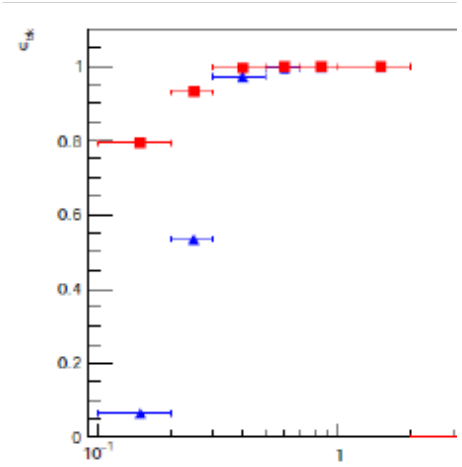
- have now (almost) complete DD4hep/DDRec based reconstruction
  - (GEAR still used for patrec and some digitizers)
- have started to look at physics performance

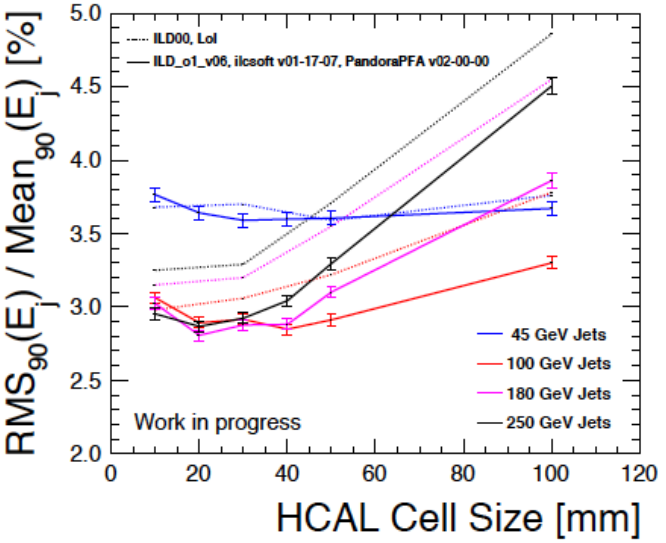
Status of DD4hep based Sim & Reco

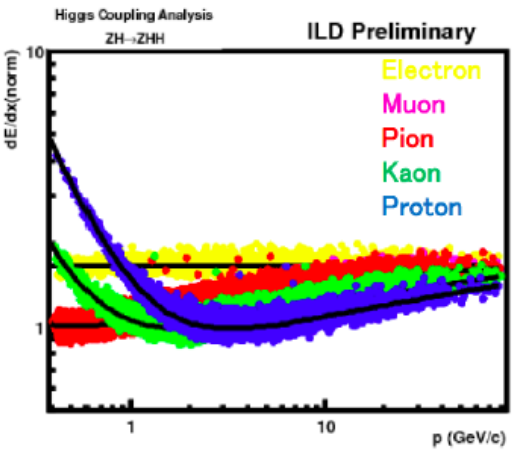
- ILD_o1_v05 model is basically ready for validation
  - some minor issues to be addressed:
    - Ecal driver is direct port from Mokka → new driver is on the way
    - Hcal segmentation needs 'tiling algorithm'
  - should be available very soon

- Tracking and PFA tools for DD4hep are in place now
  - have started validation process using JER for uds events
  - will have to address many issues:
    - detailed study of tracking performance (pulls, efficiencies and resolutions)
    - make code more robust for production of O(10^6) events
    - get a reliable calibration (procedure) for Pandora
  - should be available by end of the year

progress in (high level) reconstruction







- significant progress in many reconstruction tools since DBD
  - improved pattrec for low pt tracks in VXD
  - improved PFA performance in Pandora
    - improved photon finding in Pandora
  - PID using dE/dx and shower shapes
  - pi0 finding
  - better flavor tagging and vertexing
  - ...

to be included
in next MC production

some “technicalities”

- developed creation of GEAR files from DD4hep model for backward compatibility in transition phase
- maintaining two different streams of reconstruction becomes increasingly difficult
  - => would like to abandon GEAR rather sooner than later
    - at least for standard reconstruction tools (digitizers, pattrec)
  - need to understand consequences also for test beam

- will have to move to ROOT 6 before next MC production
  - eventually no support for ROOT 5
- requires some code adaptation
- requires to move to C++11
  - also 'required' by latest PandoraPFA

both require some manpower from core software group

Next Steps

- create an iLCSoft release w/ new sim/reco asap
  - people can start validating (and breaking) it
- start to implement two additional models for ILD with
  - r_TPC = 160 cm, 140 cm
- need to answer a number of questions:
  - additional parameters (lengths,...)
  - which sub detector technologies
  - how to validate the realism of these
  - how to validate reconstruction performance
  - which benchmarks to prepare

Proposal:
- start the discussion in the ILD SW & Ana/Optimization phone meetings
- organize an ILD Software and Optimization meeting in first half of 2016
  - possibly at DESY

Summary & Outlook

- simulation model in DD4hep is complete now
- core reconstruction chain - tracking and PFA in place
- lots of progress in (high level) reconstruction tools
- will provide iLCSoft release for validation asap

  => important to get more people involved

Outlook

- start process for defining, implementing and validating additional ILD models
- use SW&Ana/Optimization phone meetings
- organize a (3-4 day) ILD Software & Optimization workshop early next year