

iLCSoft v02-01 Status and performances.

Software & Analysis meeting

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DESY

February 12, 2020

HELMHOLTZ
RESEARCH FOR GRAND CHALLENGES



iLCSoft release v02-01

What's new ?

- iLCSoft **v02-01-pre** installed in afs
 - SL6: `/afs/desy.de/project/ilcsoft/sw/x86_64_gcc82_sl6/v02-01-pre`
 - EL7: `/afs/desy.de/project/ilcsoft/sw/x86_64_gcc82_centos7/v02-01-pre`
- Currently validating simulation and reconstruction (see next slides)
- Reminder: for version vXX-XN
 - N is odd → developer release
 - N is even → production or stable release
- iLCSoft **v02-01** is a developer release
 - test case for 250 GeV test production
 - then go for **v02-02** for final production



iLCSoft release v02-01

What's new ?

- Important changes:
 - GCC 4.9, c++11 → GCC 8.2, c++17, c11
→ C++17 enable by default in CMake !
 - Base packages upgraded to latest: ROOT, Geant4, GSL, ...
 - New packages: SIO (v00-00-02), boost (1.71), Eigen3 (3.3.7)
 - Removed package: MarlinTPC, not compatible with c++17
- To you, iLCSoft users:
 - Check c++17 / compiler / version compatibility
→ Might break compilation of your code!
 - Compilation might be fine but check also the physics ...



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New versions

Most important upgrades (but not all):

- ROOT: 6.08.06 → 6.18.04
- Geant4: 10.03.p02 → 10.04.p03
- DD4hep: v01-07-02 → v01-11
- Qt: 4.7.4 → v5.13.1
- GSL: 2.1 → 2.6
- boost: *system* → 1.71.0
- Eigen3: *system* → 3.3.7
- GBL: V02-01-01 → V02-02-00
- LCIO: v02-12-01 → v02-13-01
- MarlinReco: v01-25 → v01-26
- PandoraPFANew: v03-09-00 → v03-13-02



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Important changes

Marlin

- Qt4 upgraded to Qt5: MarlinGui not compiling → set to OFF
→ Need to evaluate porting effort...
- Introduced *CompressionLevel* parameter in LCIOOutputProcessor

MarlinReco

- New *PhotonCorrectionProcessor* processor
→ Photon energy correction in ecal barrel gaps region
- New *DDStripSplitter* processor
→ needed for ScEcal reconstruction. Ported to DD4hep

Overlay

- Overlay processor: can overlay/merge any kind of collections



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Important changes

ROOT

- A lot of API changes in RooFit, RooStat and TMVA !
- Experimental options set to ON (`ROOT::Experimental`):
 - *root7*: experimental classes, e.g Eve7, RHist, RNTuple
 - *webgui*: new ROOT graphics in web browser
- Checkout examples in `$ROOTSYS/tutorials/v7` and *eve7*
- `ROOT::RDataFrame`
 - Declarative analysis, implicit multi-threading
 - Much concise code compared TTree-like analysis code
 - Available in python
 - See [RDataFrame main page](#)



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Important changes

Tracking: MarlinTrkProcessors / ILDConfig

Improved SiTrackingProcessor:

- update of seed triplets
→ include neighbour bins in next layer
- improved merging of track segments
→ add hits individually
- improved steering file:
→ add additional seed-triplets search combinations

Tracking at low momentum improved ! (see performance slides)



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Important changes

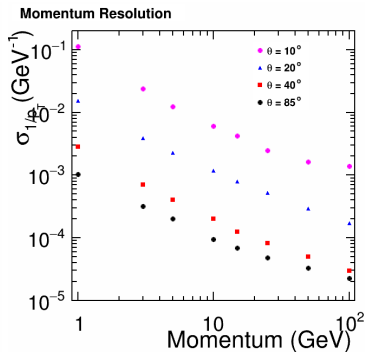
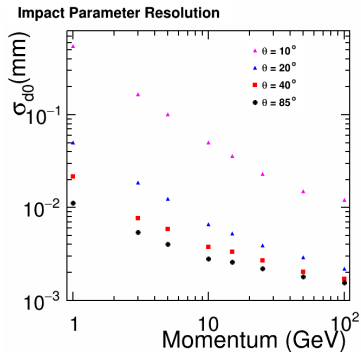
DD4hep / lcgeo

- Minimum requirement: c++14
- Moved *ddsim* from lcgeo to DD4hep
- Support for optical surfaces in DD4hep
- Fix for enabling Birk's law (see performances slides)
- lcgeo: added missing absorber layer thickness info for reconstruction (DJ)



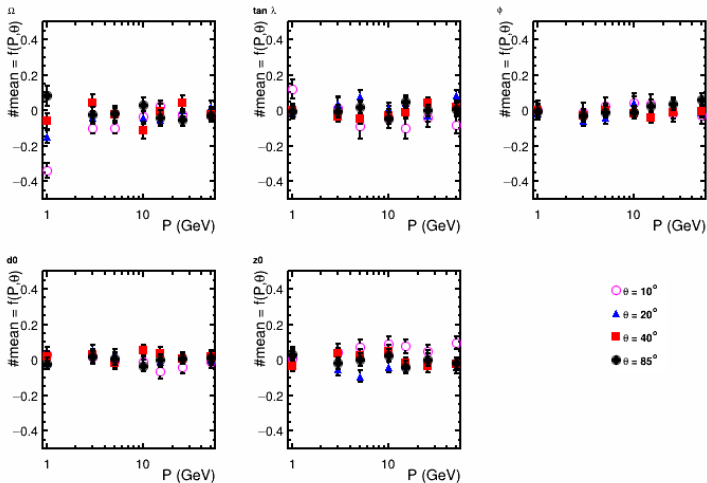
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ILD tracking performances



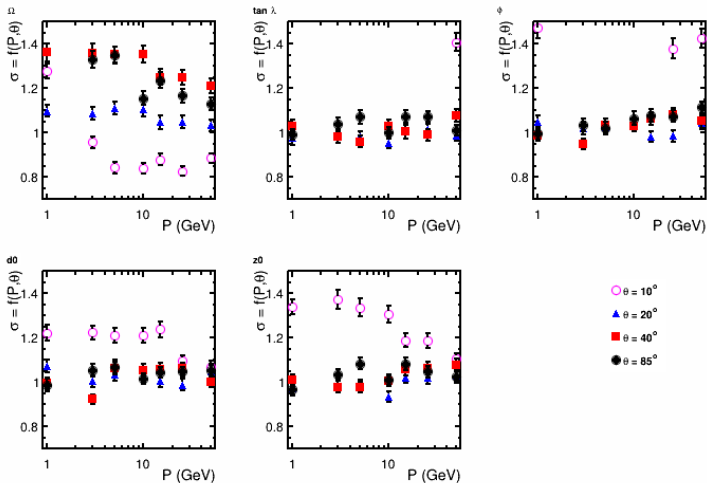
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ILD tracking performances



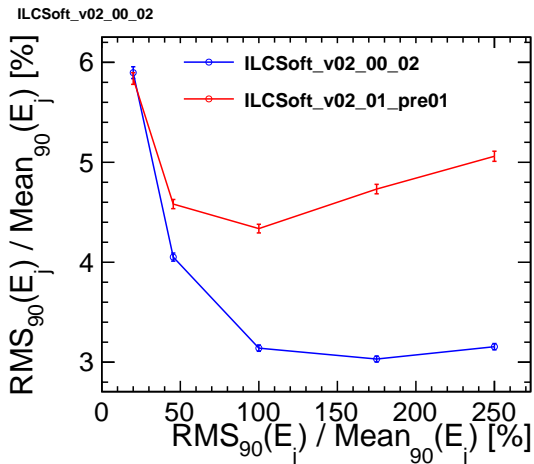
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ILD tracking performances



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ILD JER/JES performances

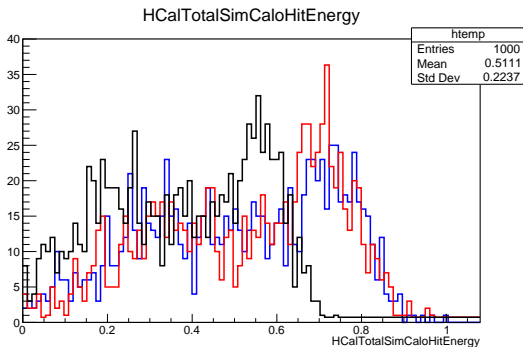


Ouch ...



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ILD JER/JES performances



Birk's law issue

- Not applied in v02-00-02
- Applied in v02-01
- Attenuation of scintillator response

Not a bug.

Re-run the calibration

v02-00-02

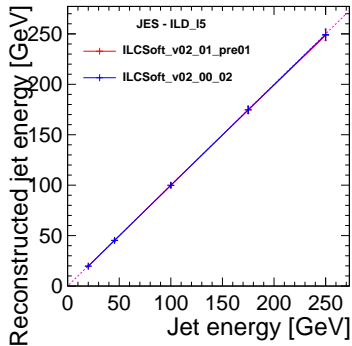
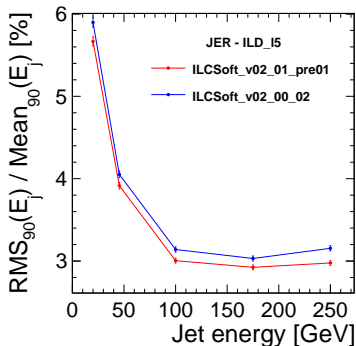
v02-01

v02-01-pre - no Birk



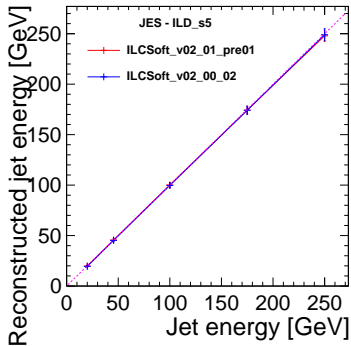
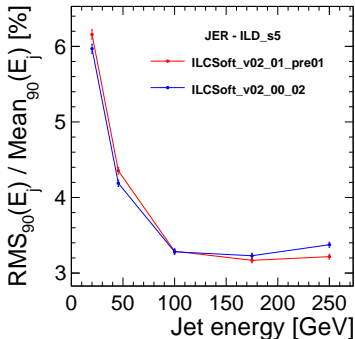
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Docker distribution



Docker is a platform for building and sharing application.

Image of iLCSoft **v02-01-pre** available:

```
[user]$ docker pull ilcsoft/ilcsoft-centos7-gcc8.2:v02-01-pre
[user]$ docker run -it ilcsoft/ilcsoft-centos7-gcc8.2:v02-01-pre
[root]# source /home/ilc/ilcsoft/v02-01-pre/init_ilcsoft.sh
[root]# ddsim --help
```

These lines work where docker can run, not specifically on centos7 !

Images contain a full iLCSoft installation

- Full image size: ~ 10 GB
- Download compressed image size: ~ 3 GB

Typical usage:

- General: OS independant, works offline (no CVMFS)
- Test beam: start a container, mount your data directory and run your analysis on your personal laptop
- Kubernetes: deploy tens of containers for heavy parallel processing



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Conclusion and outlook

Summary:

- iLCSoft **v02-01** soon to be released
- Major changes and software upgrades
 - GCC 8.2, C++17
 - All packages upgraded to latest versions
- New issues identified and fixed
- Main performance benchmarks look fine
→ s5 to be checked
- Docker images available !
- Ready for 250 GeV test production with ILD_I5_o1_v02

Outlook:

- 250 GeV test production will start soon
 - Need samples validation from physics group

