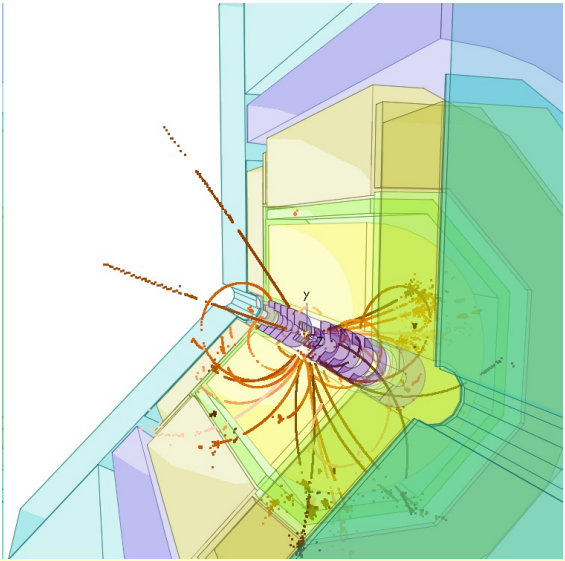
Software Coordinators Report

F.Gaede, DESY

ILD Meeting, Apr 7, 2020

Ongoing activities of ILD software group

- 250 GeV production
- new iLCSoft release
- first test production
- other activities
- summary and outlook



Planned 250 GeV production

- ILD Monte Carlo production at 250 GeV
- will use large **ILD_l5_v02** for this
  - same as used for IDR *benchmarking* production
  - hybrid model
  - reconstruct initially as *ILD_l5_o1_v02*, i.e. w/ **AHcal** and **SiW-Ecal**
  - simulation model untouched except for bug
- goal to produce a **really large sample**
  - $O(10^{10})$ events !

250 GeV new sample production plan

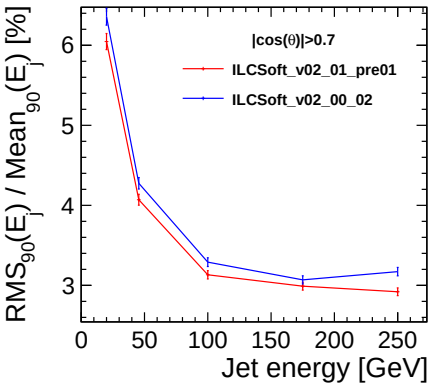
Resource requirement for new 250 GeV samples have estimated using small sample production and scaled to be last Junping's request (2f, 4f only available so far)

Process pol.	eL.pR	eR.pL	eL.pL	eR.pR
2f_l, 2f_h	5 ab-1	5 ab-1	1 ab-1	1 ab-1
all 4f				
all 6f	10K	10K	10K	10K
2f_bhabhag	1 ab-1	1 ab-1	1 ab-1	1 ab-1
h->inclusive	1 ab-1	1 ab-1	1 ab-1	1 ab-1
h->each mode (5x9 channels)	100K	100K	10K	10K

H.Ono

updates in iLCSoft - since IDR production

- started to prepare a new production release v02-02
- main changes:
- updated compiler, external packages and C++ standard:
  - GCC 8.2, **C++17**, ROOT 6.18.04, Geant4 10.04.p03, GSL, boost 1.71, Eigen3 3.3.7,...
- some developments and bug fixes:
  - improved *SiTracking* (tracking efficiency)
  - Birks' law applied for scintillator calorimeters
  - triggered re-calibration with improved JER
  - μ-reconstruction issue fixed
  - new PhotonCorrectionProcessorprocessor
    - γ energy correction in ecal barrel gaps region
  - added track fits with different mass hypotheses
  - ...



iLCSoft - test production release v02-01

- installed in afs:

```
/afs/desy.de/project/ilcsoft/sw/x86_64_gcc82_sl6/v02-01
/afs/desy.de/project/ilcsoft/sw/x86_64_gcc82_centos7/v02-01
```

- and in cvmfs:

```
/cvmfs/ilc.desy.de/sw/x86_64_gcc82_sl6/v02-01
```

- centOs7 will have to come later for technical reasons
- **sl6** also works on centOS7 Grid sites
- production steering files from ILDConfig:

```
/cvmfs/ilc.desy.de/sw/ILDConfig/v02-01
```

Monte Carlo test Production A.Miyamoto, H.Ono

- single particle samples:
  - O(100k) of single $\gamma, e, \mu, \pi, K, p, K_L^0$
- dedicated physics test samples - 10k events of:
  - $HZ -> H\mu\mu$
  - 2f leptonic ($\tau\tau$)
  - 4f semi-leptonic ($qql\nu$)

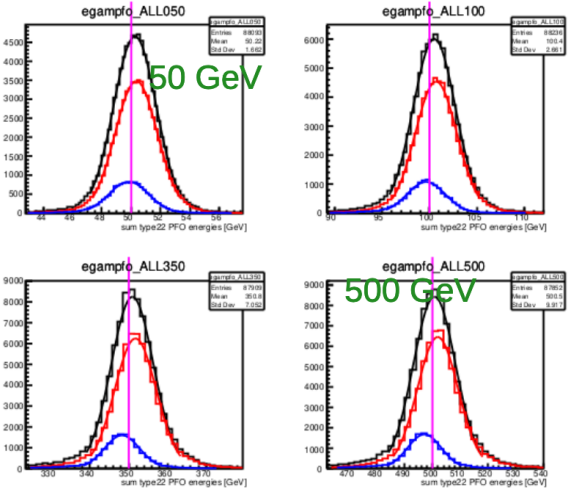
- see confluence page for details on produced samples:
  https://confluence.desy.de/display/ILD/Production+with+v02-01

- **physics validation** of these samples has started
  - see next slides for some first examples and
  - tomorrow's *ILD Software and Analysis meeting* with detailed talks

Test of single γ files D.Jeans

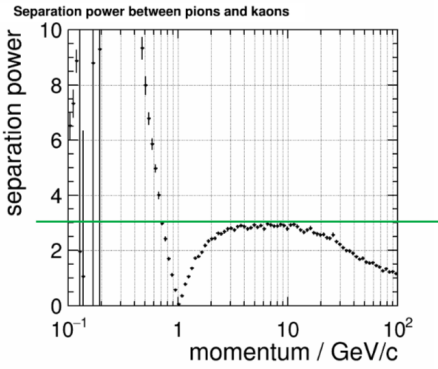
- overall γ reconstruction looks good
- small bias in calibration observed (E>2 GeV):
  - $+0.58\%$ in barrel
  - -0.52% in endcap

- calibration procedure only required to be $< 1\%$
- **could still investigate a correction !?**

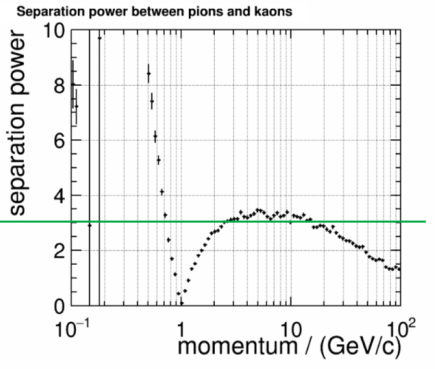


dE/dx resolution and PID U.Einhaus

New test production

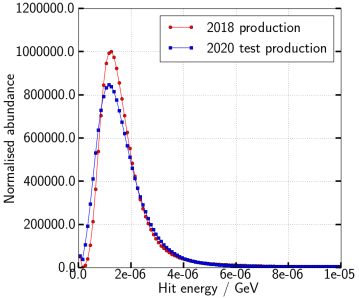


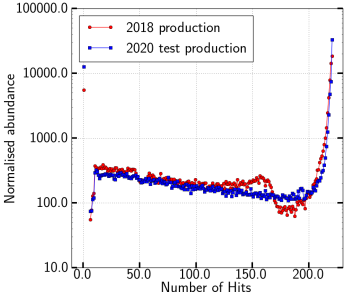
Previous production

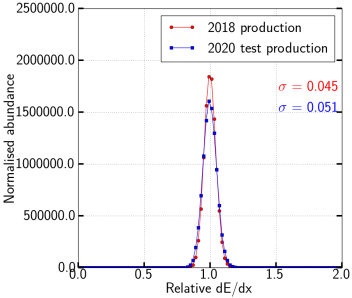


- observe degradation in PID and separation power from dE/dx in test samples

dE/dx resolution and PID U.Einhaus



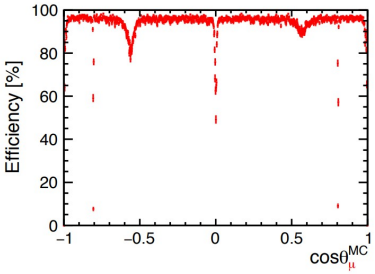




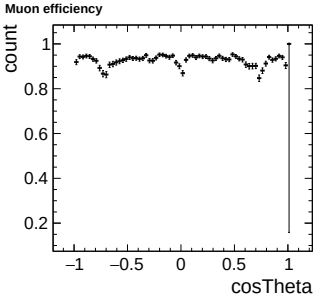
- ionization in Geant4 changed slightly
- bug fix in TPC simulation that had caused missing hits
- **need re-fitting and re-tuning of dE/dx reconstruction**

- had fixed a technical issue in sim model
- caused drop in μ-efficiency at $cos(\theta) \approx 0.6$

- new samples show different behavior
  - drop in barrel-endcap region - expected ?
  - **further studies needed**



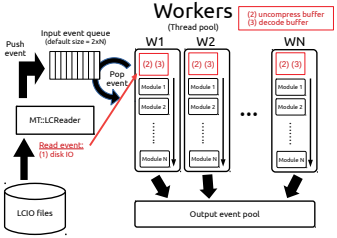
IDR: E>?



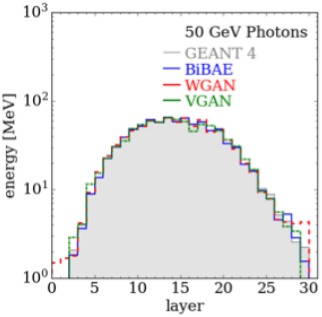
E>2GeV

Other software activities

- after preparation for IDR and 250 GeV production started to address new software projects:
- modernizing core tools
  - *MarlinMT*: parallel processing
  - *EDM4hep*: new event data model
    - similar to LCIO
  - *Key4hep*: turnkey software stack
- started Machine Learning activities
  - fast shower simulation in ILD-like Ecal



R.Ete,FG



E.Eren,S.Diefenbacher

Summary and Outlook

- after finishing production and analysis for the IDR, the focus of the software group had shifted to prepare a large scale 250 GeV production

- prepared iLCSoft v02-01 test production release
  - modernize compiler and external tools
  - fixed known issues from IDR

- prepared test production w/ single particles and selected physics channels
  - validation is ongoing
  - see more tomorrow in ILD Software and Analysis Meeting

- started new software projects: modernizing core tools and start with Machine Learning for physics