

ILD software: status and plans

software and computing group

convener → Frank Gaede (deputy Daniel Jeans)

subgroup coordinators:

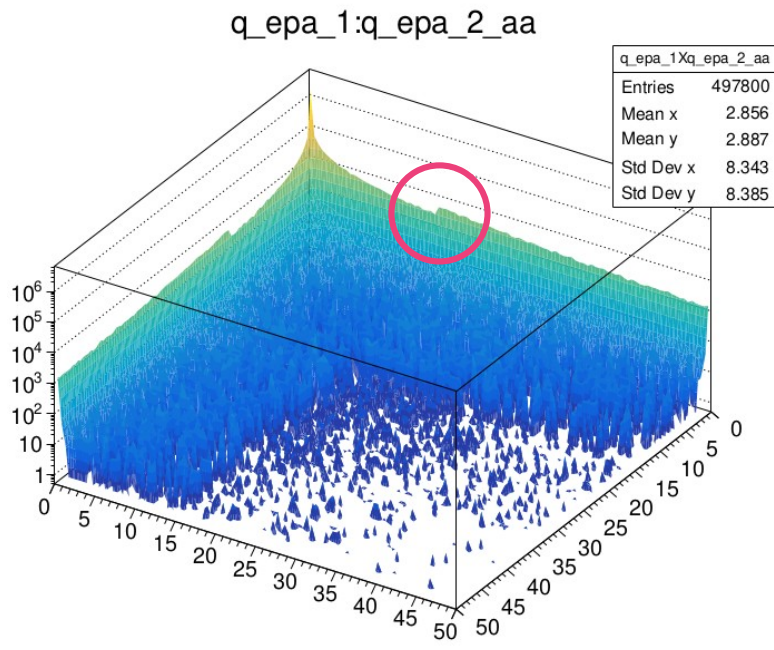
Generator	→ Mikael Berggren, Junping Tian
Simulation	→ Daniel Jeans, Manqi Ruan
Reconstruction	→ Thomas Madlener, Adrian Irlles
MC production	→ Hiroaki Ono, Ryo Yonamine

generator

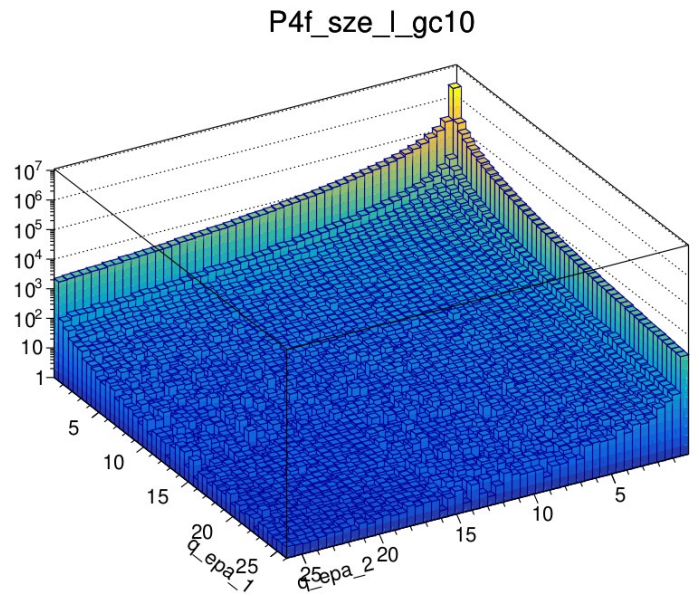
generation of large SM ILC-250 samples now complete!
 the last piece:

The virtual γ saga

Mikael Berggren



worked with WHIZARD
 authors to fix jumps in
 cross-section



1-year ILC-250
 O(billion) events in O(100) channels

sample	leptonic pb	hadronic pb	# Mevents generated (~ 1 ILC year)
aa_2f	9234	414	1259
ae_3f	1426	136	142
ea_3f	1427	137	142
4f_szeloq (LL and RR)	1117	172	54
4f_szeloq (LR and RL)	1123	175	276
Total			1873

for future samples,

move to WHIZARD 3.x

→ NLO

some samples already produced

500 & 550 GeV di-Higgs

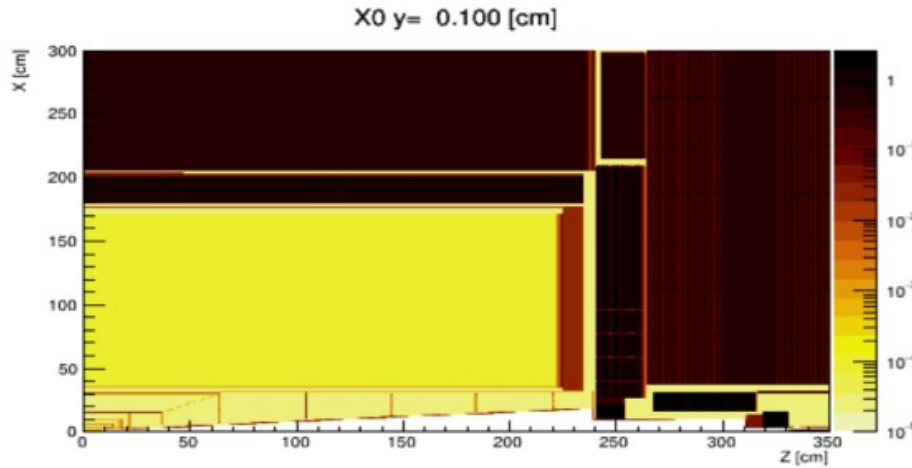
500 GeV ee → qq

500 GeV ee → ee

simulation

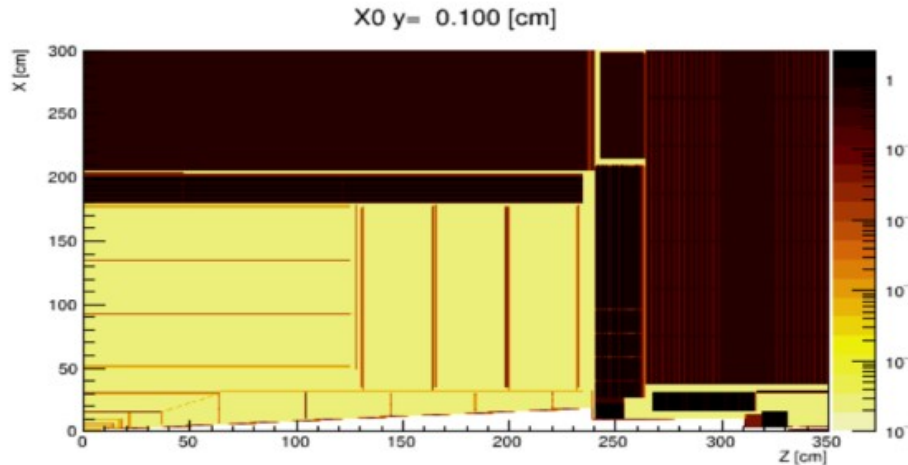
new simulation models

ILD_I5_v02



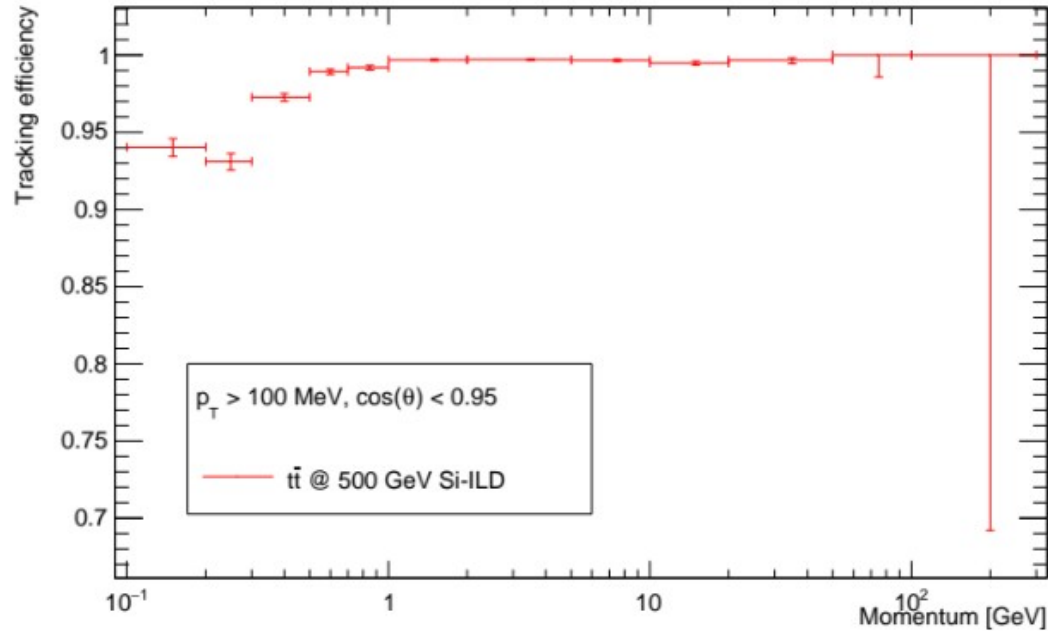
“usual” ILD

ILD_I5_v09

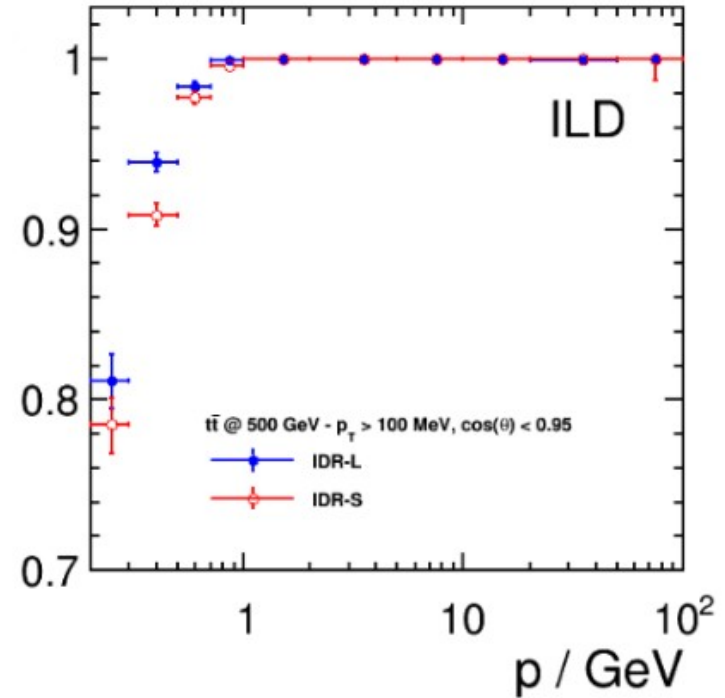


ILD with all-silicon tracker

TPC replaced by
CLIC-inspired
silicon outer tracker



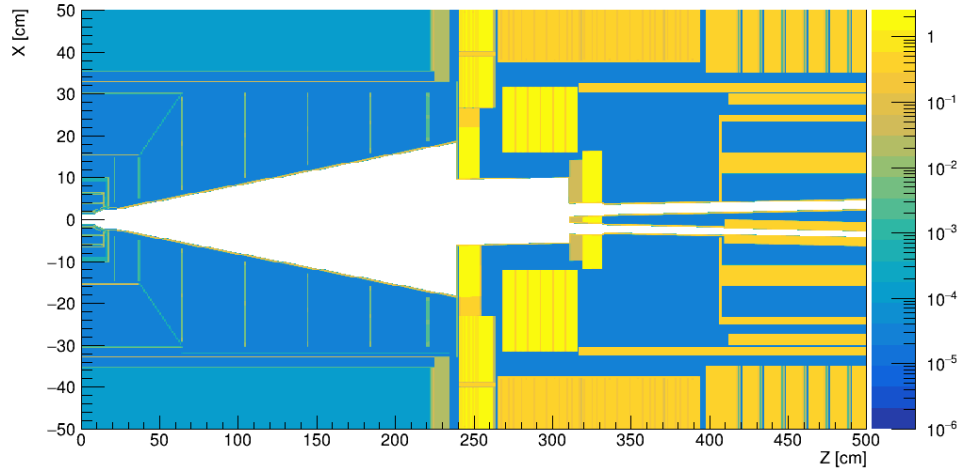
Si-ILD
conformal tracking



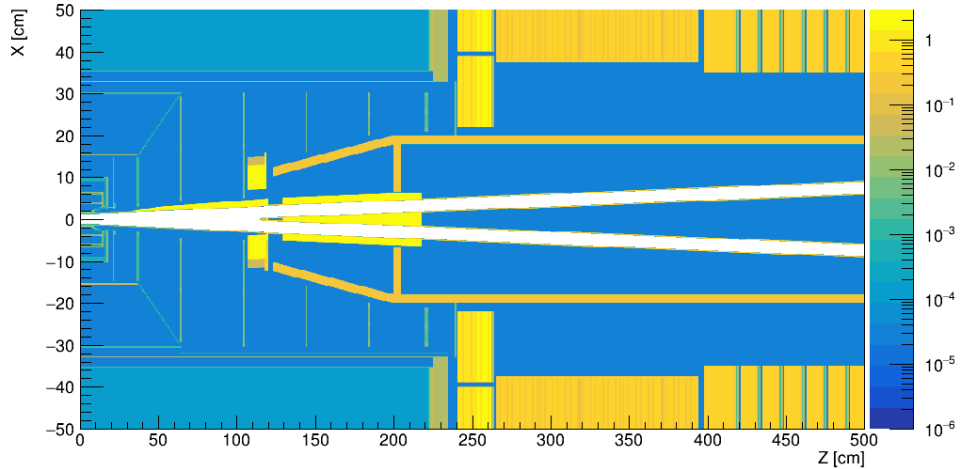
usual ILD
usual ILD tracking

→ room for significant improvement in ILD tracking @ low-P

work in progress: ILD for a circular collider



ILD @ ILC

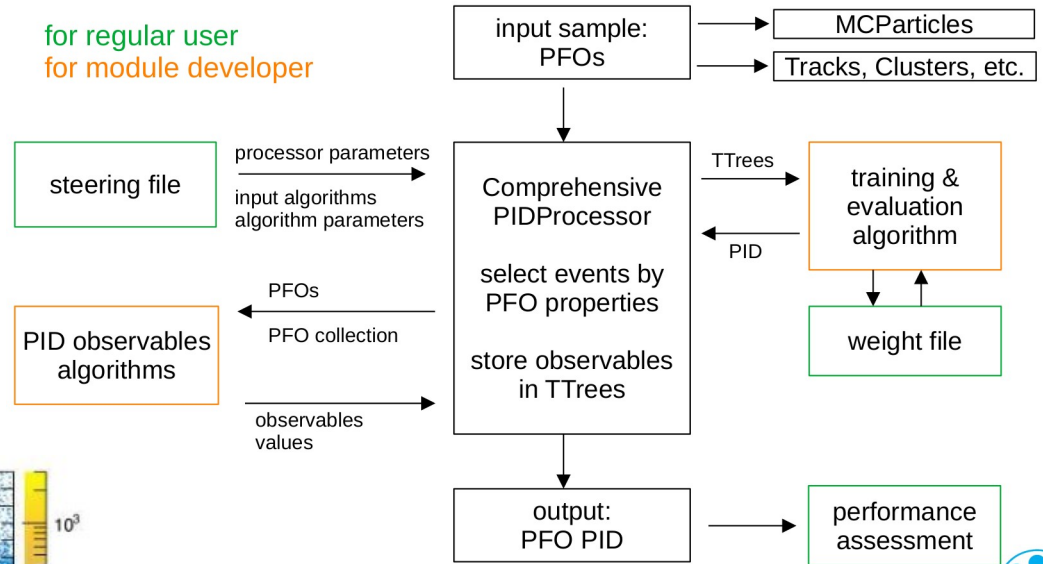


first attempt to incorporate
FCCee MDI region

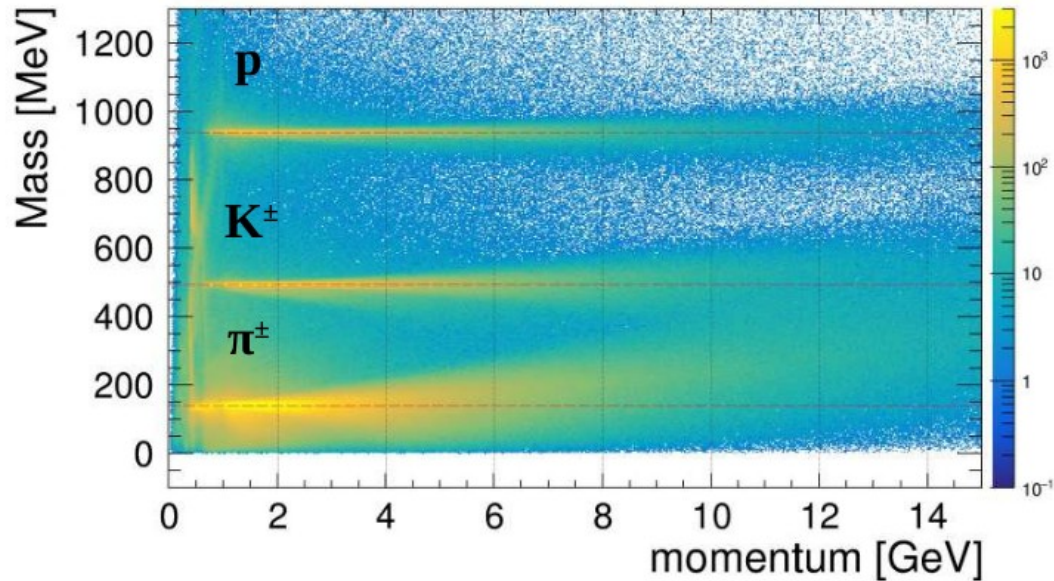
reconstruction

New Framework: Comprehensive Particle Identification (CPID)

for regular user
for module developer



particle ID using ToF



MC production

mc2020 → large MC sample for ILC-250 to replace previous “DBD sample”
→ full SM sample
→ several times full ILC250 luminosity
→ “new” ILC-250 lumi spectrum (w.r.t. DBD samples)
→ overlay of “seeable pairs” and “ $\gamma\gamma \rightarrow$ hadrons”

WHIZARD 2.8.5
ilcsoft v02-02

now almost* completed, available for user analysis

*states with virtual photon initial states still need to be simulated/produced

<https://ild.ngt.ndu.ac.jp/eelog/dbd-prod/?ILDConfig=%5Ev02-02%24&Ecm=%5E250%24>

data in DST format; some fraction of REC files (~10%) are also kept for possible future studies

an enormous multi-year effort from the **generator** and **mc-production** groups,

and the computing **grid** using



→ special mention to Andre Sailer / CERN
and the rest of the ilcdirc team

Summary of production mc-2020

[Link to the summary of ILD_I5_o2_v02 samples](#)

(created on 2023-05-01 17:33:11 (JST))

- mc-2020 production are being carried out using iLCsoft/ILDConfig **v02-02 and/or v02-02-03**
- This production aims to provide high statistics samples (1 to 5 ab^{-1}) for physics study
- This page shows process type summary of produced data using ILD_I5_o1 model.
- Energy points of data:[250-SetA](#) [500-TDR_ws](#) [550-Test](#) [91-nobeam](#) [1-calib](#)
- Meanings of each columns of the summary table:
 - *process_type* : process type of generator sample
 - *pol* : beam polarization
 - *processID*: process ID of generator sample, linked to [elog/genmeta](#) record.
 - *NbEvents* : Number of events in DST-merged files.
 - *int.lumi* : Integrated luminosity of events in DST-merged files.
 - *Done %* : Fraction of produced events with respect to generated events in %
 - *ElogID* : Elog ID of [elog dbd-prod](#), linked to the corresponding record.
 - *ReclDs* : IDs of reconstruction production
- File names and directories of dst-merged files could be found in an attachment file, dstm-nevents-summary.txt, of the corresponding elog record.
- DST-merged files can be found in DIRAC file catalog.
 - For example, Higgs e2e2h_cc sample can be found by "`dirac-dms-find-lfns Path=/ilc/prod/ilc/mc-2020 Datatype=DST-MERGED GenProcessName=e2e2h_cc`".
 - Meta keys for file search could be found by "`meta get <filename>`" sub-command of `dirac-dms-filecatalog-cli`. `<filename>` is any file in dst-merged directory.
 - Replicas are at DESY and KEK. Local path of them are
 - DESY : `/pnfs/desy.de/ilc/prod/ilc/mc-2020/ild/dst-merged`
 - KEK : `/group/ilc/grid/storm/prod/ilc/mc-2020/ild/dst-merged`

250-SetA, ILD_I5_o1_v02

process_type	pol	processID	NbEvents	int.lumi(1/fb)	Done %	ElogID(s)	ProdIDs of DST and REC files
higgs_inclusive : Produced rate 99.96% (N_Prod/N_Gen = 6997400/7000000)							
e1e1h	eL.pL	402013	500000	801943	100.0	348	DST=15095,15096;REC=15095
e1e1h	eL.pR	402001	500000	28294	100.0	347	DST=15089,15090;REC=15089
e1e1h	eR.pL	402002	500000	44887	100.0	347	DST=15089,15090;REC=15089
e1e1h	eR.pR	402014	498800	800018	99.8	348	DST=15095,15096;REC=15095
e2e2h	eL.pR	402003	500000	20462	100.0	347	DST=15089,15090;REC=15089

recently a few new samples for ILC-500
(previous full SM-500 produced for IDR)

- recent WHIZARD v3.0.3
- recent ilcsoft v02-02-03
reconstruction improvements, ...
- overlay of “seeable pairs” and “ $\gamma\gamma \rightarrow$ hadrons”

completed:

2f_hadronic ($ee \rightarrow qq$)
double higgs (500 & 550 GeV)

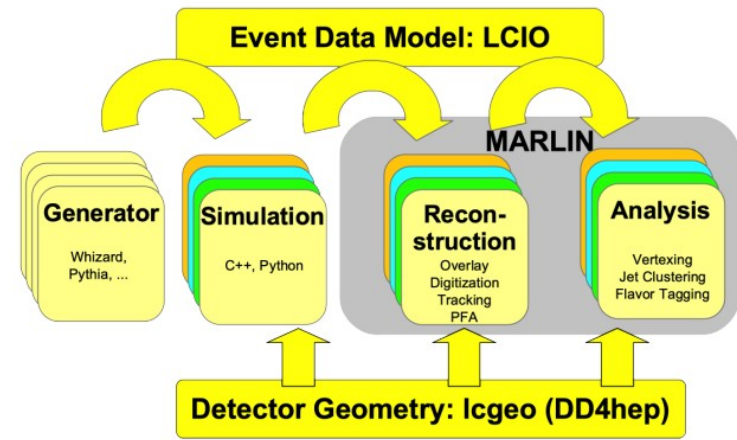
underway:

bhabha

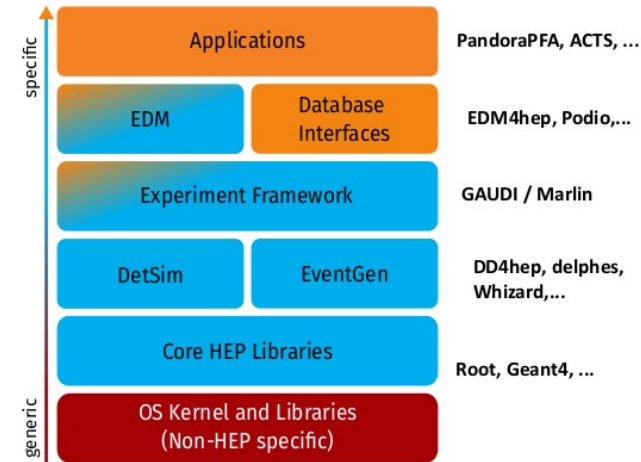
software framework

ilcsoft: works, used in production
our workhorse for close to ~20 years

key4hep: software stack being developed jointly by
several future collider detector studies
new event data model : EDM4hep
simulation model : DD4hep
reconstruction framework : Gaudi



1. support continuing use of ilcsoft
2. ilcsoft incorporated in the key4hep stack
on the fly conversion lcio ↔ edm4hep
Marlin processors can be “wrapped” into the Gaudi workflow
3. eventually fully migrate to new framework



summary

- ILC-250 mc-2020 samples almost complete
 - multi-year process
 - several times ILC-250 integrated luminosity
 - use for physics studies for next “decade”
- moving to whizard3,
pythia8 ? , ...
- new simulation models for optimisation studies
- new reconstruction techniques
- contributing to key4hep
 - preparing for smooth transition later