The ILD detector concept

Ties Behnke

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The ILD Concept group

71 groups have signed up,
1 group pending approval
Currently around 420 members on the central mailing list.

Organisation of the group in place and working.

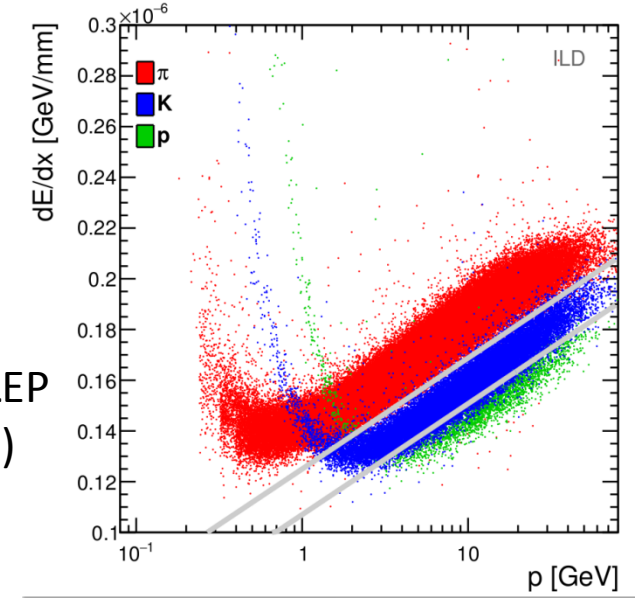
New: established central publication and speakers bureau, to organise talks and papers within ILD (Chair K. Kawagoe)

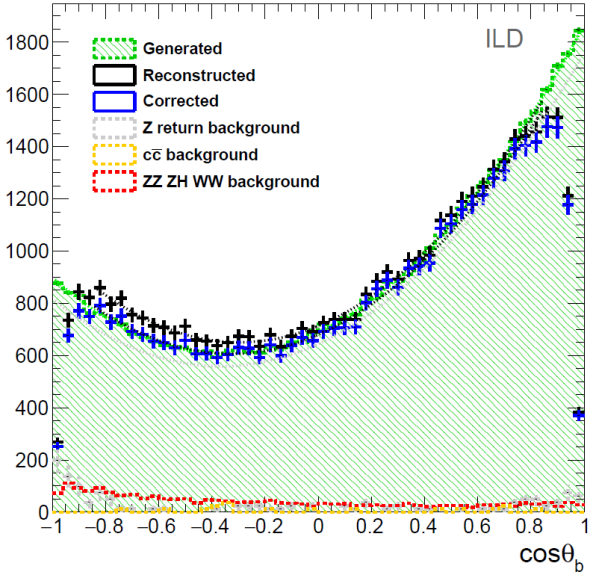
http://www.ilcild.org
http://confluence.desy.de/ILD

Some Highlights: Electroweak Physics with B tagging

Goal: measure the b-electroweak coupling to the Z at 250 GeV

(3 σ deviation between LEP and SLAC measurements)





Challenge:
Determine the charge of the B vertex.

Vertex charge measurements improved by dEdx: Kaon ID

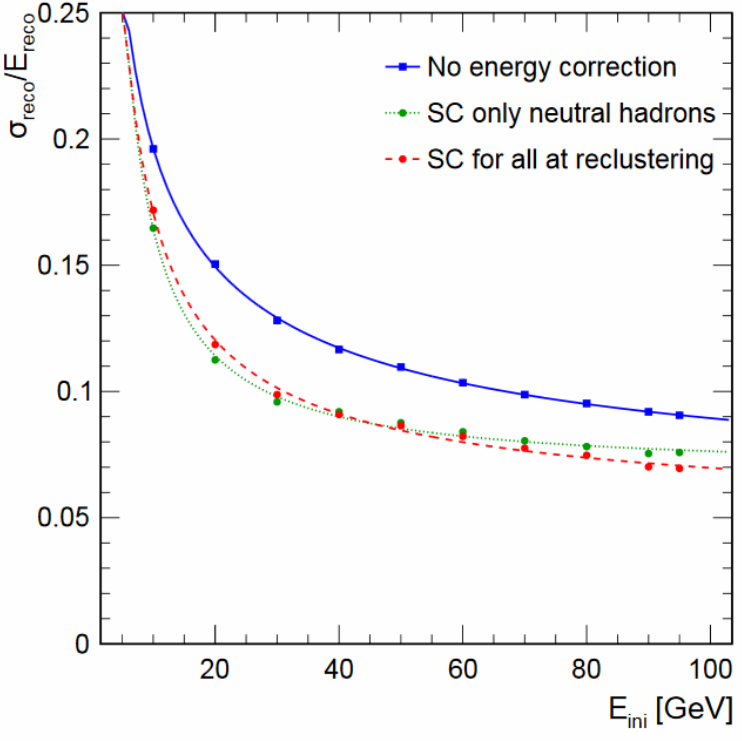
97% purity with 87% purity > 3 GeV

arXiv:1709.04289

Some Highlights: Calorimeter Performance

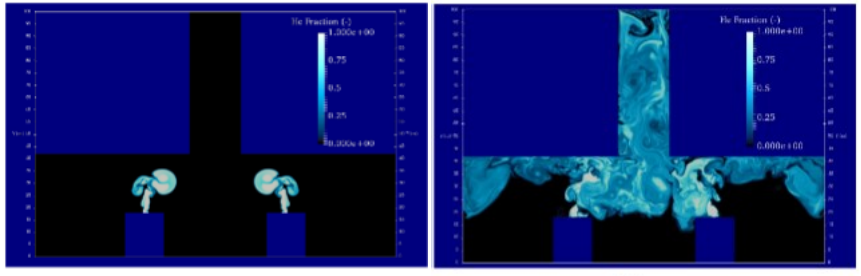
Much improved understanding of the performance and calibration

- System to correct in software for e/h ratio (software compensation) significantly improves resolution (CALICE work)
- Extensive work to validate ECAL and HCAL software
- Solid basis for optimization of ILD based on tested performance

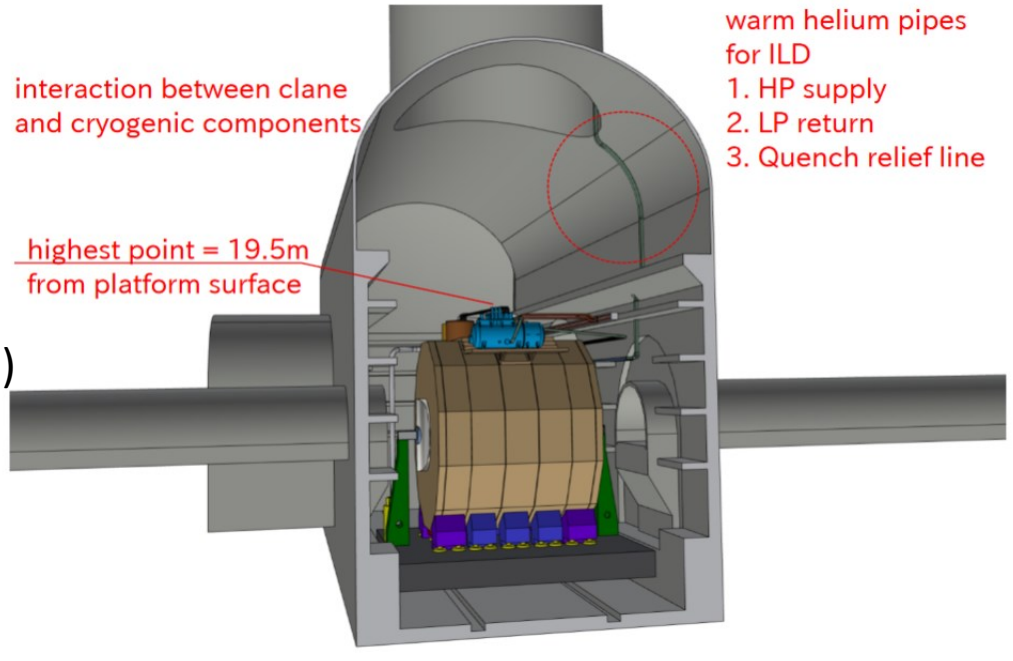


Single particle resolution with and without SW compensation (from arXiV 1705.10363

Some Highlights: Integrating ILD



Simulation of cryo loss in the experimental hall
Okamura etal., at recent CFS/ MDI meeting at KEK
Curent design meets safety requirements

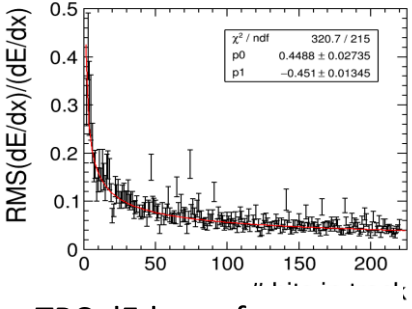


Studies are continuing how to integrate ILD into the Kitakami site (together with SiD)

- Series of workshops
- Detailed study of ILD in the hall

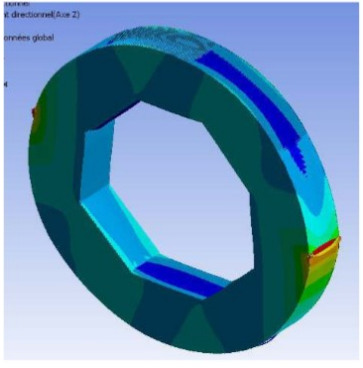
Some Highlights: R&D

Continue to have a very active R&D program connected to ILD, but performed by the different R&D groups.

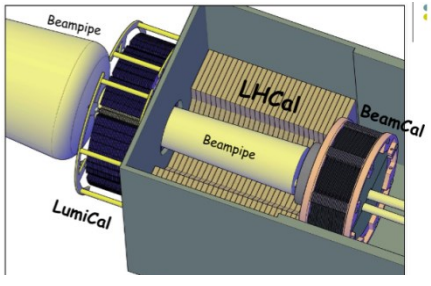


TPC dEdx performance

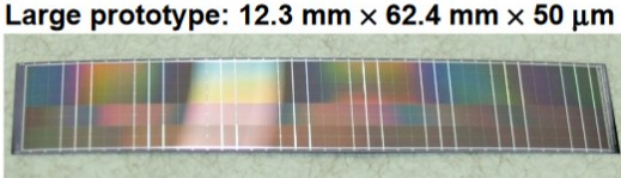
Calo test beam (ECAL, HCAL) at DESY and CERN



Stability+vibration studies



Forward region re-design



VTX technologies (here FPCCD)

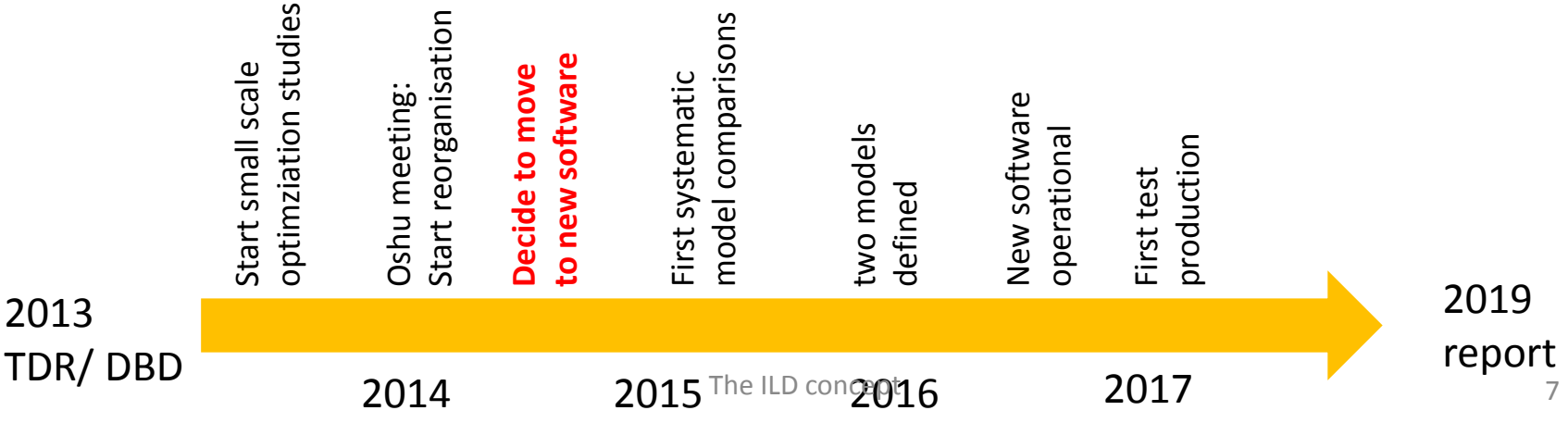
+ much more, see parallel sessions

ILD since 2013

Re-optimize ILD for optimal performance and cost/ performance ratio

Prepare the group to quickly move to a real collaboration once the start is given.

Provide a basis for realistic physics studies to make and improve the science case for the ILC. Most recently, strong push to make 250 GeV case



Our Goal

1. Define a performance/ cost optimized ILD detector

2. Demonstrate the performance of the ILD concept

3. Provide a basis (event sample) for future physics studies of fully simulated and as realistic as possible events.

4. Document the
    1. Design
    2. Engineering
    3. Performance

   of the ILD detector model

The Deliverable

Document the work in a comprehensive ILD document

- ILD philosophy and thinking
- ILD overall design
- ILD subdetector choices and options
- ILD engineering design
- ILD integration with ILC and into the Kitakami site

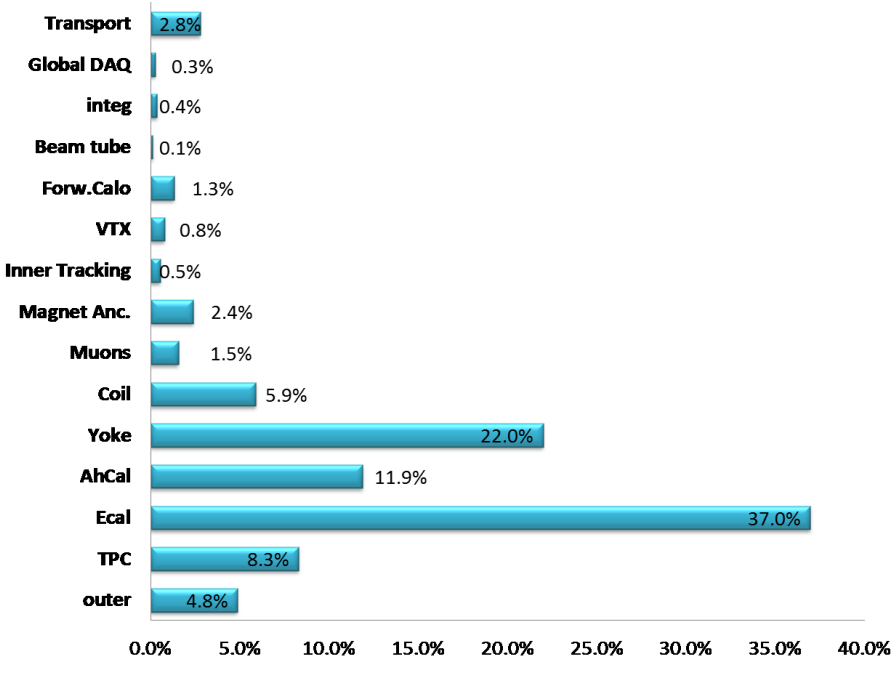
- ILD performance

- ILD physics performance

ILD Report (tbd)

Anticipated early 2019

Detector Costs



- Costing study done for DBD
- Essentially no updates since then

- Cost drivers:
  - Calorimeters
  - Yoke

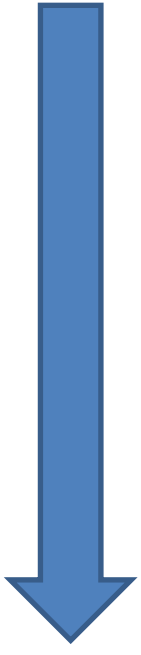
- Serious re-study of costs and update still has to start

Optimization steps

Single particle Studies
- Response studies focussed on one sub-detector
- “easy”, low resource needs, fast

High Level performance studies
- Tracking, vertexing, particle flow
- Based on dedicated, maybe even unphysical samples
- Based on multiple subdetectors

Physics Performance
- Selected physics channels to study performance for key measurements
- Need full samples, including backgrounds



Increasing complexity
Increasing demands on samples

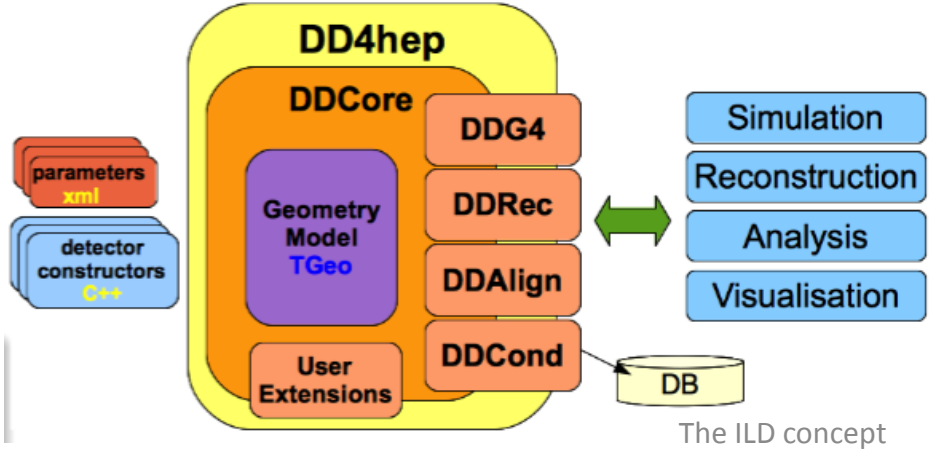
New Software

Decided to move to new, open source, common framework:

- DD4HEP
- DDSIM
- DDREC

LCIO based

Comonly developed
with CERN, SLAC, others
In part used by
SiD, CLICdp, FCC, others



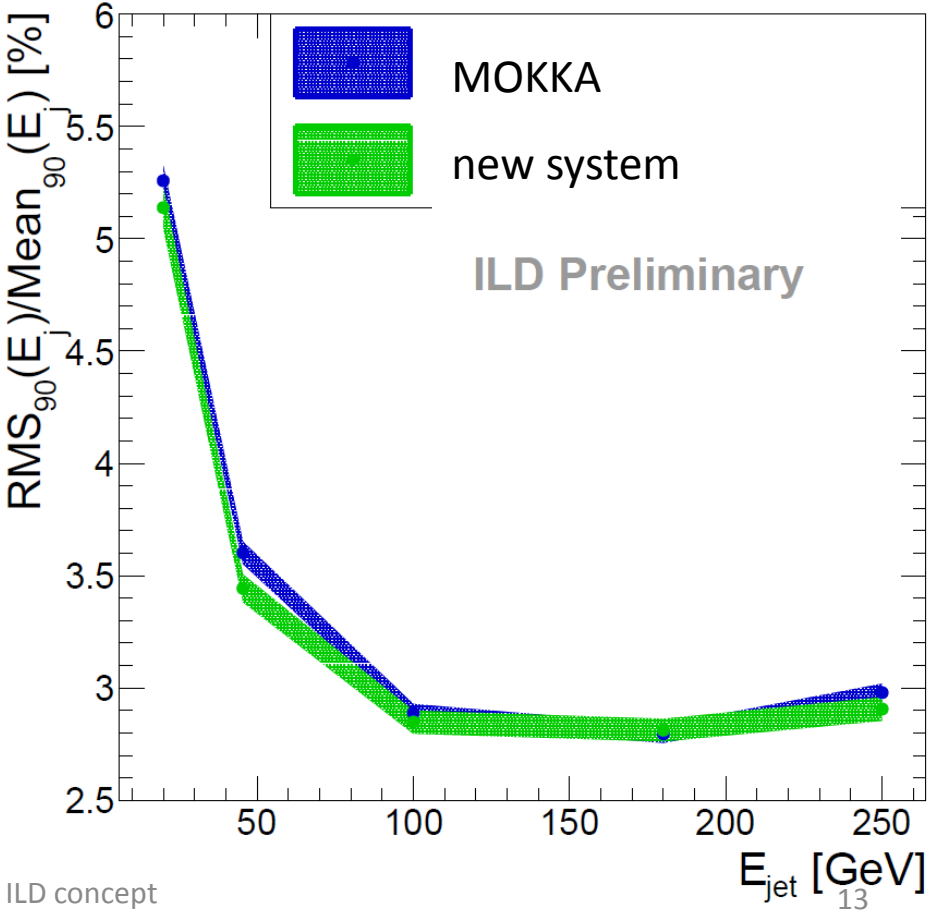
Simulation with relevant details
(example: inefficiencies in calo)

Validating new Software

Major step:

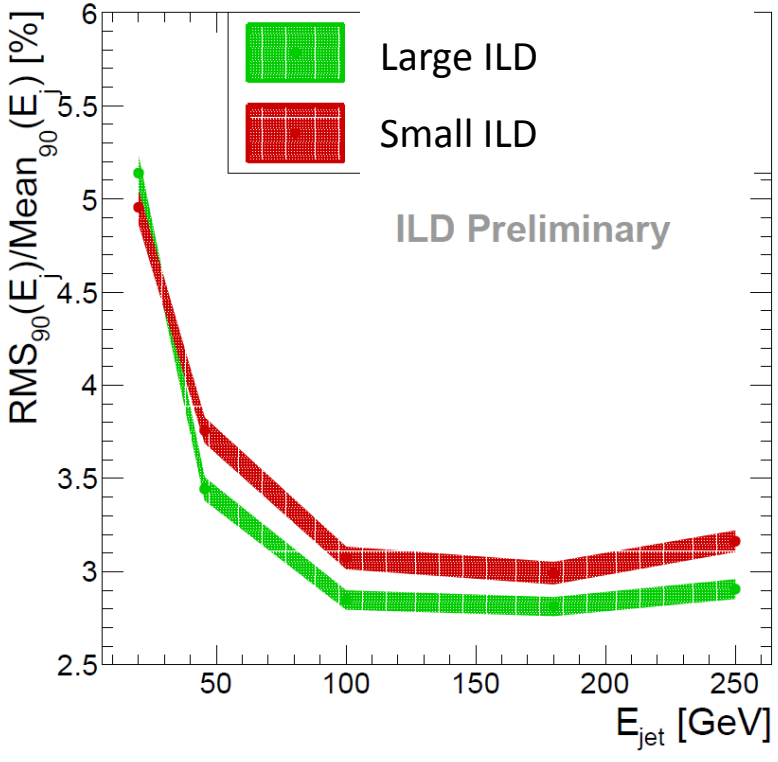
Validate the complete new chain

- DBD detector model
- Same generator files
- Full reconstruction
- Compare particle flow performance

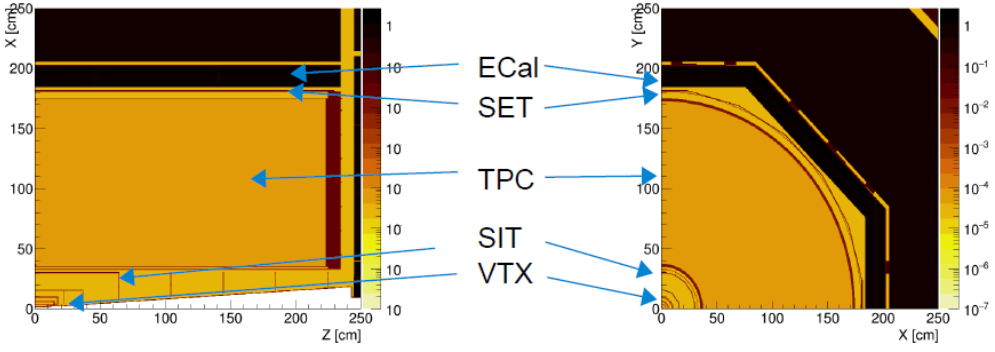


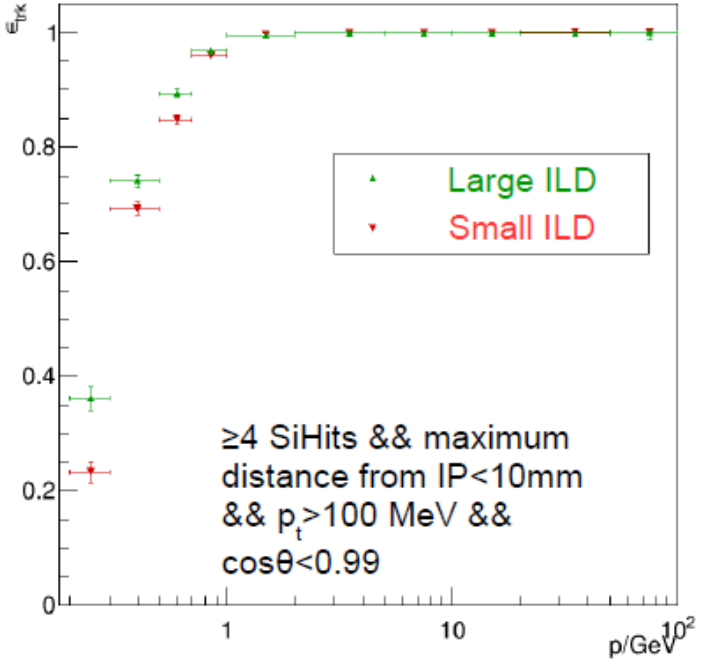
Optimization: Particle Flow

Detector	ILD-L (DBD)	ILD-S
B Field	3.5 T	**4 T**
VTX inner radius	1.6 cm	1.6 cm
TPC inner radius	33 cm	33 cm
TPC outer radius	153 cm	140 cm
TPC length (z/2)	235 cm	235 cm
Inner ECAL radius	184 cm	150 cm
Outer ECAL radius	202.5 cm	168.5 cm
Inner HCAL radius	206 cm	172 cm
Outer HCAL radius	335 cm	301 cm
Coil inner radius	344 cm	**310 cm**



Optimization: Tracking





Hybrid tracking system, with Silicon and TPC

High efficiency tracking over wide momentum range

Our Work Plan

- Full scale production of “complete” sample will start soon
  - Test samples have already been produced
- Analyses for ILD-S and ILD-L will follow
  - Analyses are being prepared, benchmark reactions have been defined
- Prepare for input to the European Strategy end 2018
- Finalise the ILD Design Report by early 2019

Conclusion

- ILD continues has an active program
- Strong participation in making the case for the 250 GeV ILC
- Re-optimization of detector is well under way
- Complete change of software system sucessfully done
- Plan to write a comprehensive ILD document towards the end of 2018/ early 2019