

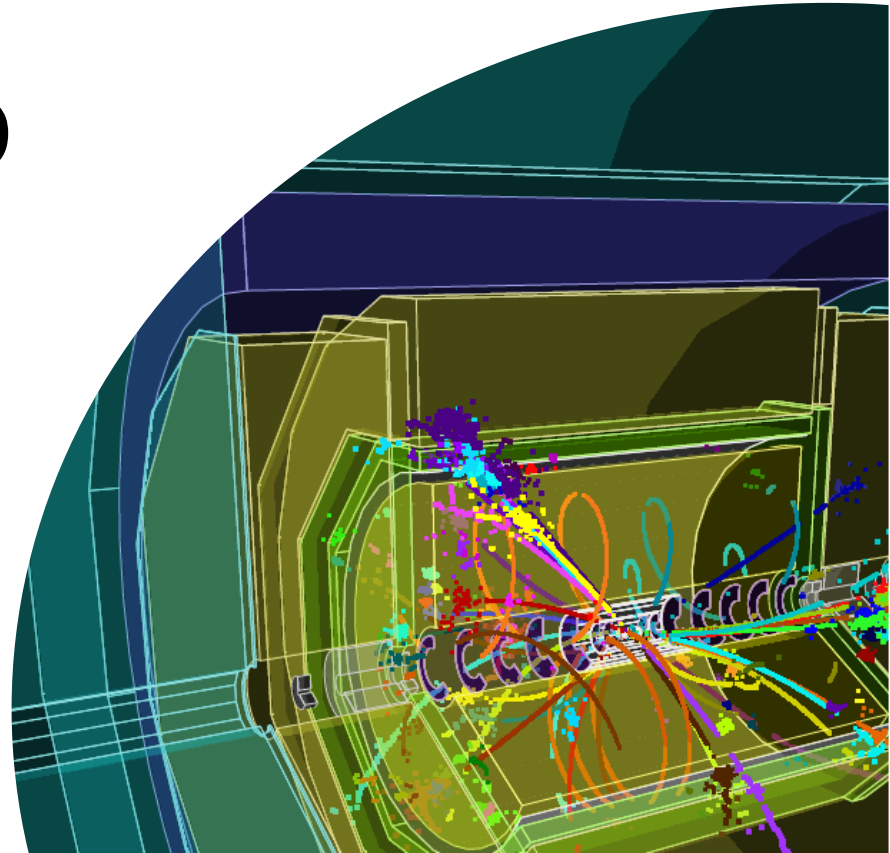


ILD: 20 years of ILD

Ties Behnke

14.9.2026

ILD meeting at CERN

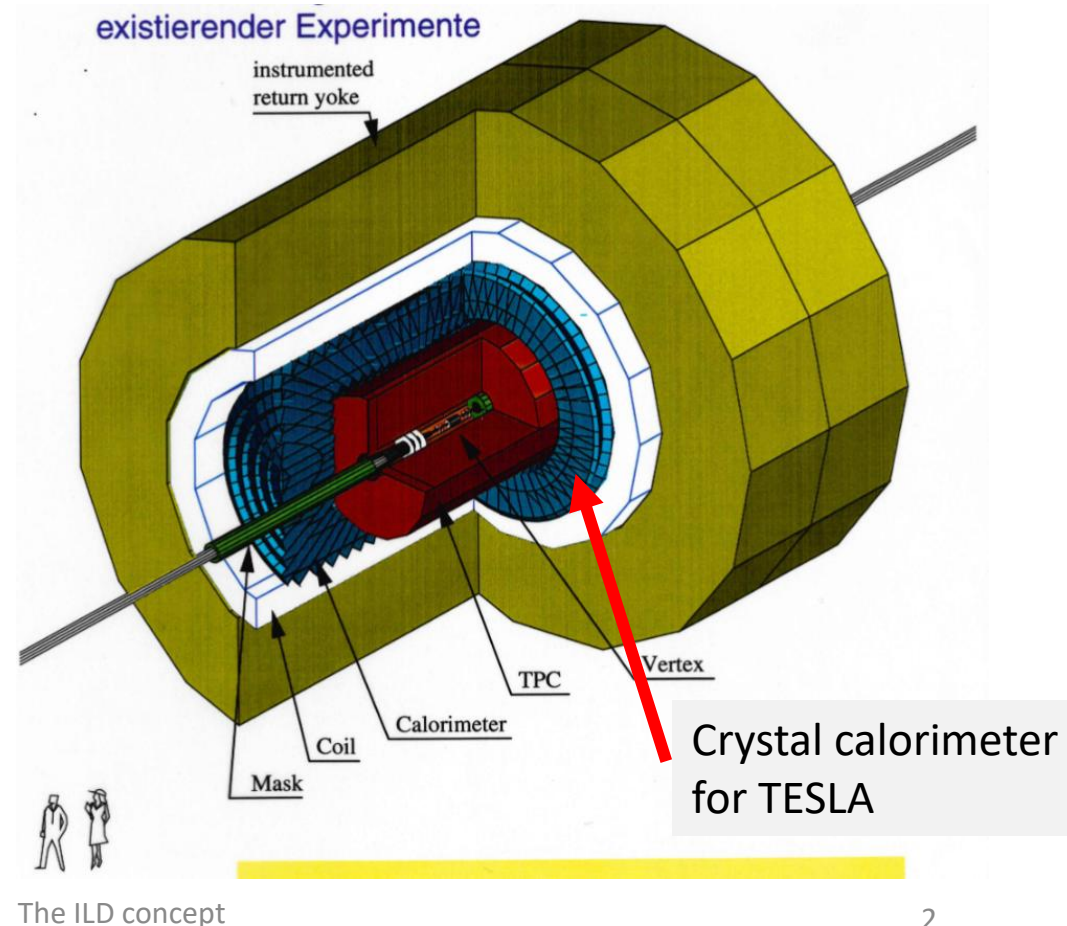


The early history



First versions of an ILD like detector:

- JLC (Japan, Asia) and TESLA (DESY) around 1995
- Mature concepts were available by 2001/2002
 - “traditional”
 - Crystal / energy optimize calos
- Particle flow as a new paradigm for detector concepts: granular calorimeters gain acceptance
- Large volume gaseous tracking for maximum coverage and efficiency and minimum material



The modern ILD develops



Pflow in SNARK: the next steps

Ties Behnke, SLAC and DESY; Vassily Morgunov, DESY and ITEP, Moscow

SNARK: a first attempt at Particle Flow reconstruction

Top reconstruction using Pflow and SNARK

Status: What do we have

The Goal:

Reconstruction of all 4-vectors in the event (charged and neutral)

The Method:

Use information from all available subdetectors
Currently implemented in BRAHMS:

Tracker

ECAL, HCAL (tile option)

Muon system still missing (under development)

Current system uses only reconstructed information

SLAC simulation workshop, May 2003

Particle flow gains momentum

- Strongly pushed by LLR colleagues
- First attempts at reconstruction

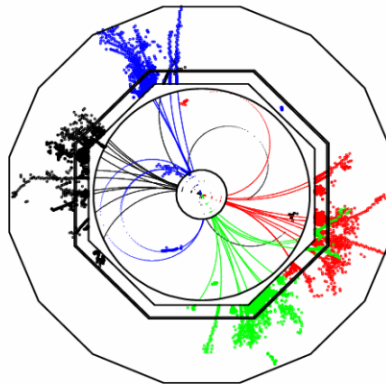
Particle Flow Calorimetry and ILC Detector Design

Mark Thomson
University of Cambridge

the stage:

This Talk:

- 1 Why the ILC
- 2 ILC : the Machine
- 3 ILC Physics ↔ ILC Calorimetry
- 4 The Particle Flow Paradigm
- 5 Calorimetry in the ILC Detector Concepts
- 6 PFA and Detector Design
- 7 "Realistic" Particle Flow Reconstruction
- 8 Current Performance and Detector Optimisation Studies
- 9 Conclusions



M. Thomson
Particle flow
reconstruction for
ILC and beyond

Software and ILD



Software is an essential part of ILD since its very early days.

- 2001: workshop in CERN on software for future colliders
- 2002: Prague: white paper on common software frameworks for future colliders
- 2003: first release of LCIO as a basis for a common software framework
- 2006: first release of the MARLIN reconstruction framework

ILD has and continues to invest heavily into software and software infrastructure

With DD4HEP a future oriented framework now is the baseline for all studies and has strongly profited from the earlier LCIO based framework

The Start: LCWS 2007 in Hamburg



After some discussions, LDC and GLD decide to merge into one concept, to enter together into the “LOI” process for ILC and to write then together the contribution to the ILC TDR.

Decision taken at LCWS 2007 in Hamburg



1. ILD meeting in Zeuthen (Jan 2008)





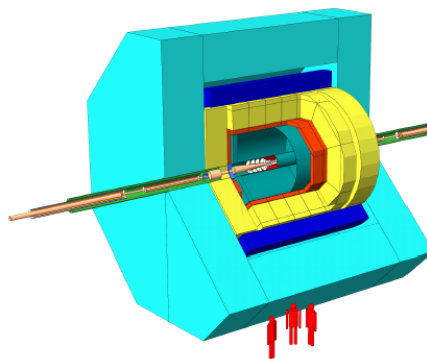
ILD Workshop

14–16 Jan 2008
DESY, Zeuthen
Europe/Berlin timezone

Registration for the first ILD w

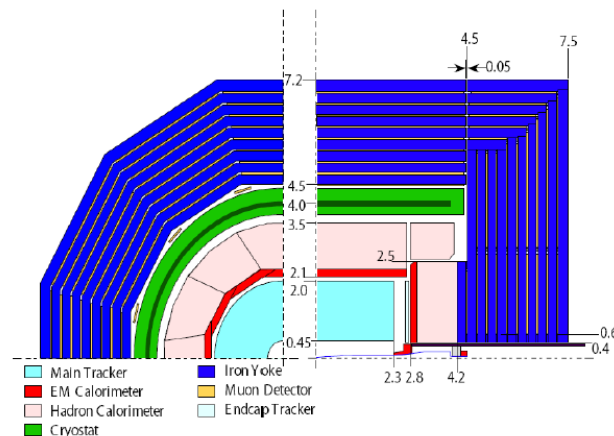
GLD and LDC: where do we start from

Ties Behnke, DESY



LDC DOD:
see <http://www.ilcldc.org>

Large Detector Concept



GLD DOD
see [arXiv:physics/0607154v1](https://arxiv.org/abs/physics/0607154v1)

Global Detector Concept

Main page

The ILD concept at the ILC

My Conference

My Contributions

Registration

Accommodation

Timetable

How to reach DESY in Zeuthen

Dinner

General meeting of the ILD detector conc

The first workshop of the ILD detector co Jan 14, 2008 and Jan 16, 2008. The purp strategy to optimize the detector, and to p on October 1, 2008.

The meeting will be mostly plenary, to allk

The ILD philosophy



- Particle flow as the defining paradigm for the detector design
- Focus on particle reconstruction, impacts the overall layout significantly
- Based on LEP experience, pioneered by the LLR group (Videau, Brient)
- Inner tracking optimized for low material, maximum coverage, and maximum efficiency
- Heavy emphasis on modern reconstruction (Gaede, Thomson, others)

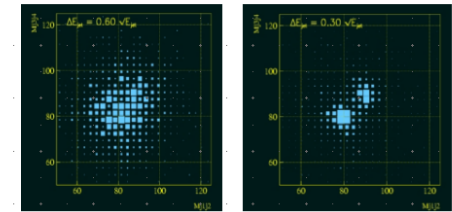
Ties Behnke: A medium size LC detector

10

Event Reconstruction

Jet physics: event reconstruction need excellent jet-energy (= parton energy) reconstruction

W-W-Z separation



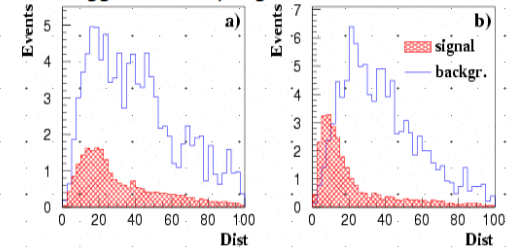
Complex hadronic final states:

need complete topological event reconstruction

Needed: new approach which stresses event reconstruction over individual particles:

Particle flow

Higgs self coupling reconstruction



More like a revolution (though many have tried this before...)

What is ILD?



Particle Flow:

The central guiding principle for the design of ILD:

- Granularity
- Hermeticity

Hybrid 3D tracking system

- Very low material design
- Very thin Silicon
- Large volume TPC

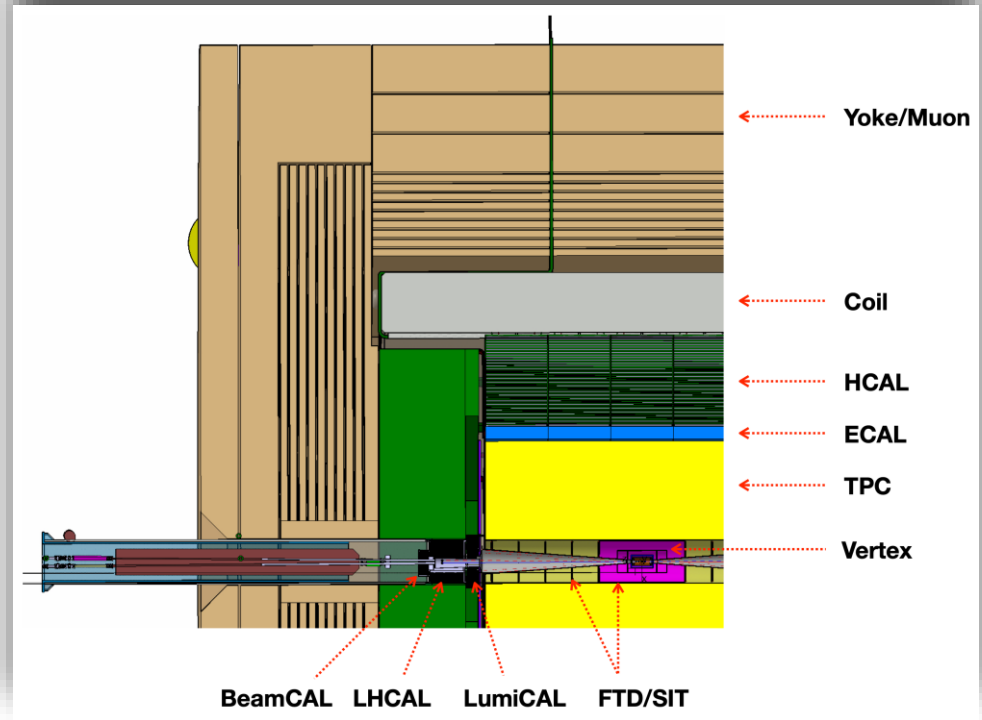
Very high granularity calorimeter system

- Si-W ECAL or Sc-W
- SciFe tile or RPC-Fe HCAL
- Forward calorimeters

Particle ID is important

- PID in TPC
- Timing as additional handle

A quarter view of ILD



ILD around the world



Memberships of Russian groups is currently suspended

ILD around the world



ILD 2018 in Ichinoseki, Iwate, Japan

Subdetector Status



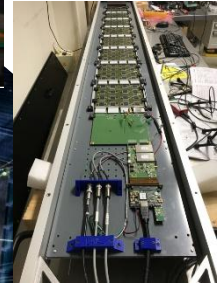
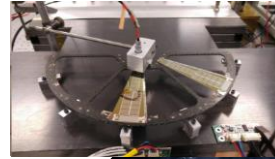
ILD has a concept of the detector,
well defined
with technological options where sensible

The main components of ILD
have been validated and
beam-tested.

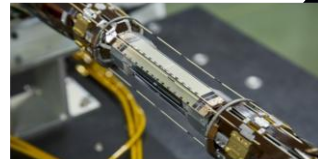
A coherent System design has
been developed.

A complete and detailed
Geant4 model of ILD exists
and is used

FTD
Sc-ECAL



Si-ECAL



VTX (Belle II)



TPC



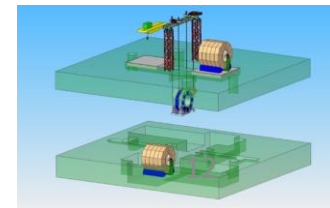
SDHCAL



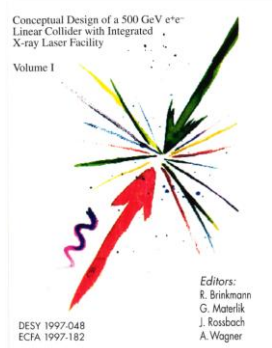
AHCAL



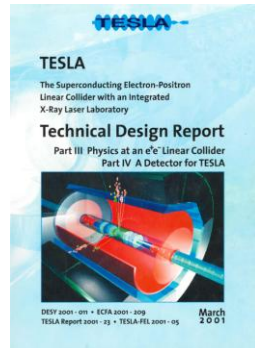
FCAL



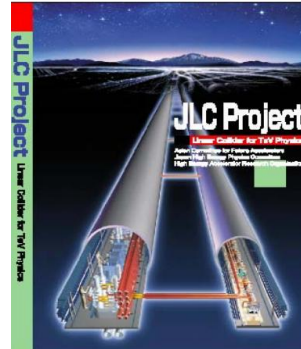
Project development



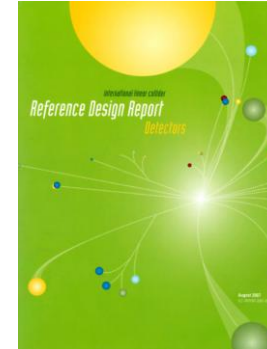
1997



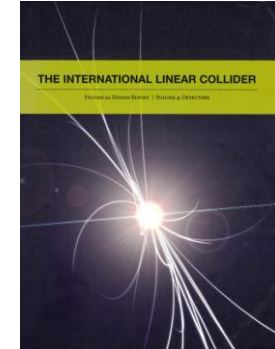
2001



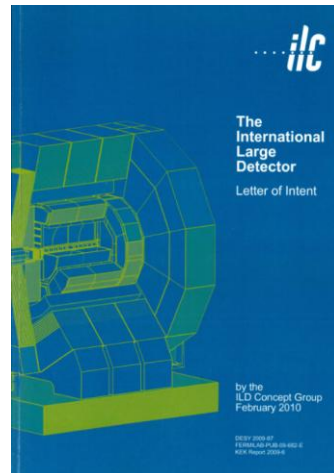
2003



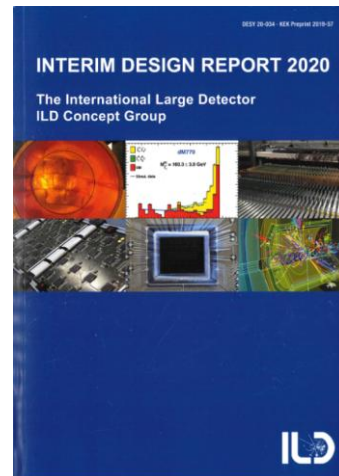
2007



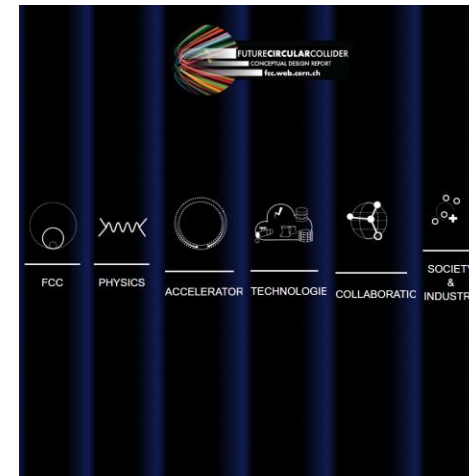
2013



2010



2020



2025

The ILD concept

The ILD paradigm



ILD: an infrastructure for studies of experimentation at future colliders

Software

- Common software bases (LCIO)
- Common centrally maintained reconstruction

Technology openness

- Science drives technologies
- Options are supported

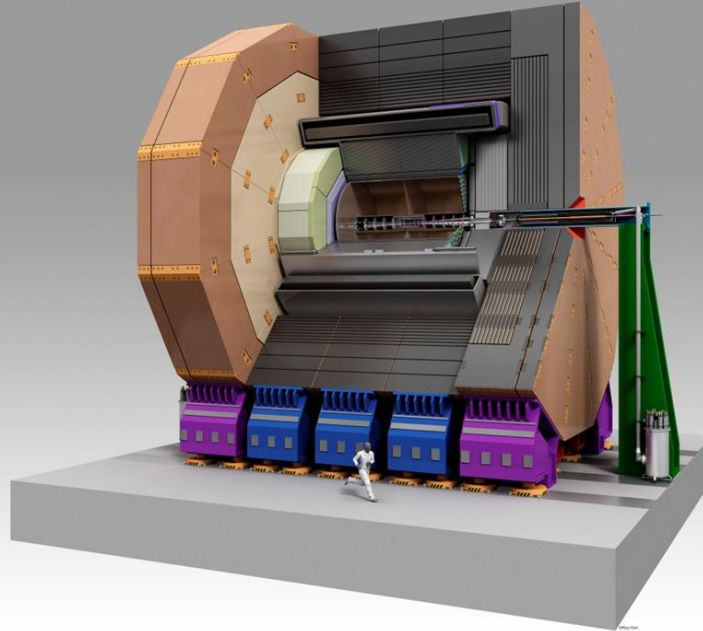
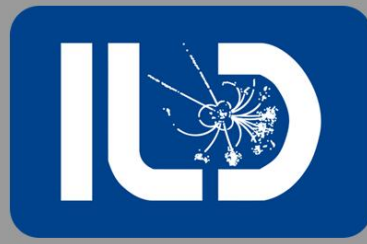
A detector concept for
a future electron – positron
collider

Science reach

- Reliable physics studies
- Strong emphasis on full simulation

Close integration of technology collaborations

- CALICE, LCTPC etc
- Now DRD's



International Large Detector
Since 2007