The International Large Detector ILD

Ties Behnke, on behalf of the ILD group

Our Mission

The ILD group has grown to some 65 institutes from around the world.
ILD was formed in 2007
Head of the institute assembly: Daniel Jeans, KEK

Collaboration with Russian Institutes currently suspended in step with policies of major laboratories like CERN, DESY, etc.

The Mission of the ILD group is the definition and development of a detector concept for high energy electron positron collisions with particle-flow capabilities with optimal particle identification, for energies between 90 GeV and 1 approx. 1 TeV

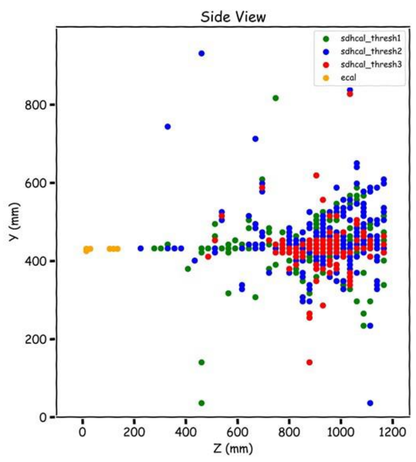
ILD collects experts from around he world on electron positron physics, precision detectors, and detector integration

The Detector

ILD has been developed around the concept of particle flow.

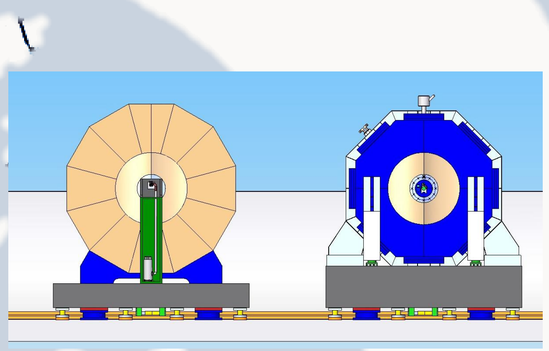
Strong focus on reconstruction of individual articles, hermeticity, triggerless operation

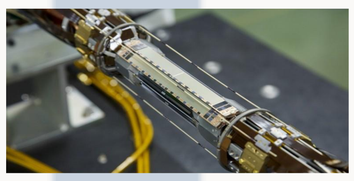
Strong focus on full, realistic simulation and availability of software to do this (ILCSOFT)



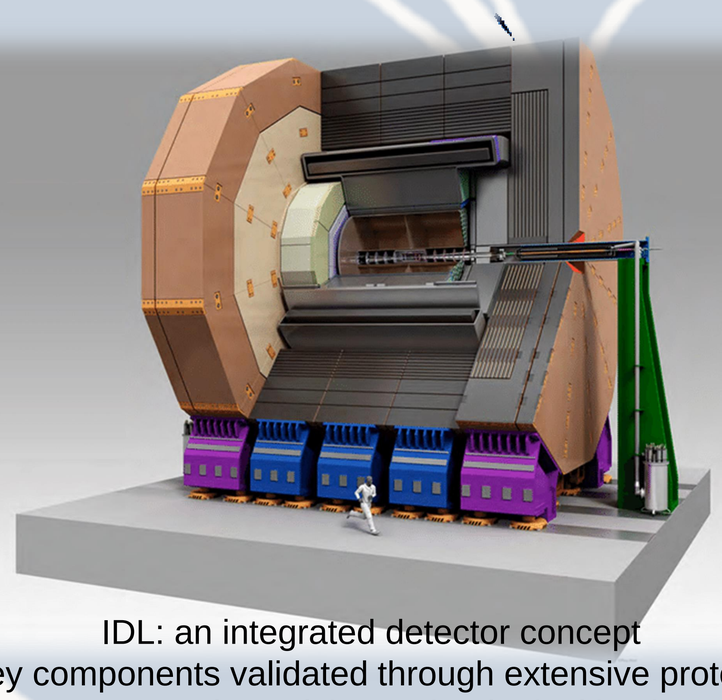
Event display from test beam at CERN of a high energetic pion interacting with the particle flow calorimeter (CALICE prototype) developed for ILD

- High granularity calorimeters
- High efficiency tracking
- Excellent vertexing
- Good particle identification
- Hermeticity
- No hardware trigger





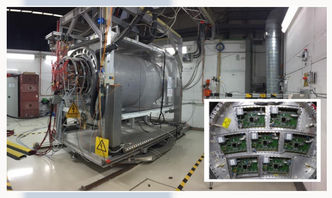
BELLE II vertex detector based on the DEPFET technology developed for ILC/ ILD and one of the options for ILD

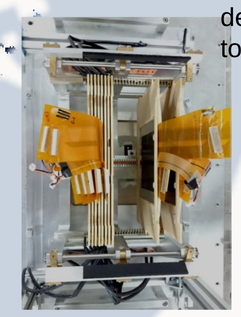


IDL: an integrated detector concept
All key components validated through extensive prototyping
Constantly evolving technological basis

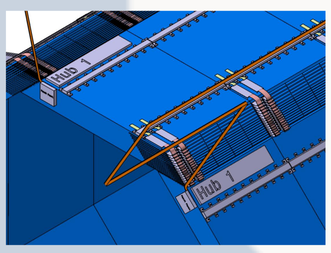
ILD is ready for a push-pull concept which allows 2 detectors at a linear collider to operate

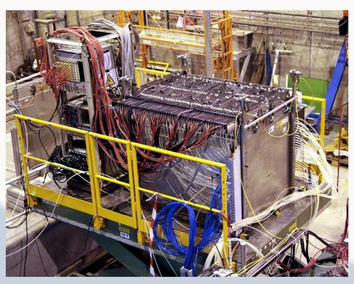
TPC prototype under test in the solenoidal 1T magnet at DESY developed within the LCTPC collaboration



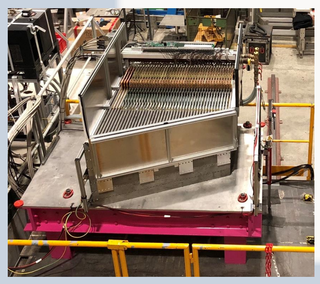


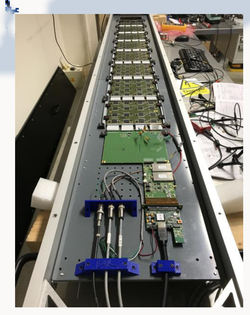
Prototype of the forward calorimeter for ILD, developed by the FCAL collaboration





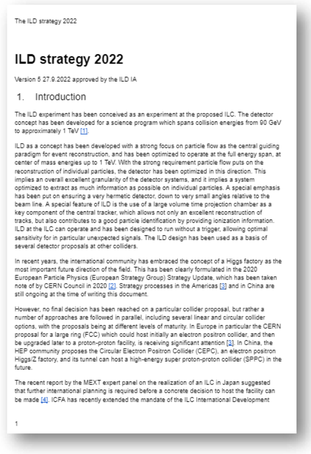
Prototypes of the hadronic calorimeter with different technologies (analogue/ semi-digital) in test beam at CERN, developed within CALICE.





Prototype of the long readout ladder for the ECAL developed within CALICE.

ILD Strategy 2022+



The ILD strategy 2022

1. Introduction

The ILD experiment has been conceived as an experiment at the proposed ILC. The detector concept has been developed for a science program which spans collision energies from 90 GeV to approximately 1 TeV [1].

ILD as a concept has been developed with a strong focus on particle flow as the central guiding paradigm for event reconstruction, and has been optimized to operate at the full energy span, at center of mass energies up to 1 TeV. With the strong requirement particle flow puts on the reconstruction of individual particles, the detector has been optimized in this direction. This implies an overall excellent granularity of the detector systems, and it implies a system optimized to extract as much information as possible on individual particles. A special emphasis has been put on ensuring a very hermetic detector, down to very small angles relative to the beam line. A special feature of ILD is the use of a large volume time projection chamber as a key component of the central tracker, which allows not only an excellent reconstruction of tracks, but also contributes to a good particle identification by providing ionization information. ILD at the ILC can operate and has been designed to run without a trigger, allowing optimal sensitivity for in particular unexpected signals. The ILD design has been used as a basis of several detector proposals at other colliders.

In recent years, the international community has embraced the concept of a Higgs factory as the most important future direction of the field. This has been clearly formulated in the 2020 European Particle Physics (European Strategy Group) Strategy Update, which has been taken note of by CERN Council in 2020 [2]. Strategy processes in the Americas [3] and in China are still ongoing at the time of writing this document.

However, no final decision has been reached on a particular collider proposal, but rather a number of approaches are followed in parallel, including several linear and circular collider options, with the proposals being at different levels of maturity. In Europe in particular the CERN proposal for a large ring (FCC) which could host initially an electron positron collider, and then be upgraded later to a proton-proton facility, is receiving significant attention [3]. In China, the HEF community proposes the Circular Electron Positron Collider (CEPC), an electron positron Higgs/Z factory, and its tunnel can host a high-energy super proton-proton collider (SPPC) in the future.

The recent report by the MEXT expert panel on the realization of an ILC in Japan suggested that further international planning is required before a concrete decision to host the facility can be made [4]. ICFA has recently extended the mandate of the ILC International Development

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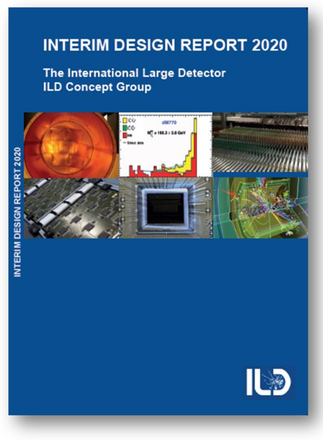
ILD strategy document 2022

ILD is ready to engage with all Higgs factory studies, and to make the case for an ILD-like detector.
We intend to study the capabilities of ILD at different collider options:

- Impact of pulse structure on ILD (e.g. powering scheme)
- Usage of TPC like detector
- Impact on the forward region
- Impact on no-Trigger scheme
- and others
- Continue a vibrant science study program



Most recent paper on ILD:
ILD interim design report
arXiv: 2003.01116