The ILD Document 2018

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The Deliverable

Document ILD in a comprehensive way

- Describe the ILD philosophy
- Describe ILD subdetectors and options
- Describe the ILD optimization process

This document should replace the LOI and the DBD by a new, “complete” document.

ILD Report (tbd)

End 2018: a short version as input to the European Strategy
Early 2019: the full report

Scope of the document

- Update vs. comprehensive document?
- Self contained document?
- Publish?

Tentative structure of the document

1. The science case for the ILC
2. ILC environment
3. The ILD concept
4. ILD subdetector technologies
5. ILC global integration
6. Detector modelling for optimization
7. Detector performance on various levels for the two models
8. Updated cost model
9. Science with ILD
10. The ILD organisation

The Science Case

Short summary of the ILC physics case, at the different center of mass energies. This is based on the recent papers published by the LCC physics group.

ILC environment

- Overall ILC constraints
  Could be adapted from LoI intro
- Updated beam conditions since DBD: new L*, backgrounds, energy profile …
  plots from machine study group
- Initial focus on 250 GeV with future upgrades to higher energies
  250 GeV specific machine performance,
- *Performance aspects to be anticipated for higher energies*

The ILD Concept

- The ILD overall concept: low tracker material, high granularity, particle flow, triggerless …

  main arguments from the LoI reference for sizes, B, depth, etc…

- Further optimization: the 2 global size options and their rationale

  1 DBD-like as reference and 1 smaller radius/same length

  Michael's aspect/ratio performance plot

ILD Subdetector Technologies

- Overall detector structure
  Subdetector layouts including updates (VFS, calo layers, silicon trackers…)
  Open options for non-resolved issues: TESLA/Videau, anti-DID, calo and vertex sensors, TPC readout technology

- Subdetector prototypes and beam test results
  Structure of latest technological prototypes, performance plots from beam tests

- Possible future options*: where do we see major new opportunities, or developments, for an ILD detector on 5 / 10 years timescale*

ILD Global Integration

- **Internal integration:**
  Subdetector interfaces (based on interface documents) and integration scheme incl. Services
- **External integration:**
  Ancillary services in the cavern and on surface
  Expected data throughput per subdetector and DAQ farm
- **Mechanical structure studies:**
  deformations, stability, calo integration issues …
- **Coil studies:**
  updated field maps, technological options for anti-DID
- **Beam background studies:** beam-beam w and w/o anti-DID, backscattered neutrons …
- **Alignment/calibration procedures**
  Could be adapted from LoI/DBD, but would profit from additional work

Detector Modelling for Optimization

- New DD4HEP framework
- GEANT4 level of details
- hybrid options for calorimeters
- Digitisation implementation
- Method for BG overlap and anti-DID inclusion
- Validation of the detector models

Detector Performance

- Updated reconstruction and analysis methods
- Response to individual particles
- Global tracking and vertexing performance
- Global response including particle flow
  ideally using both Pandora and Arbor for mutual cross-checks
- Performance on a few physics benchmarks

ILD Cost

- Costing methodology
- Cost model for each subdetector
  - Work Breakdown Tables
- Scaling of Costs with main detector parameters

Science with ILD

- Ideally: report on the braod set of physics channels which have been studied within ILD
- This should be the ultimate place to find hwo ILD does on a particular analysis

- Challenge: consistency, as we will not have a full set of analyses ready in the new framework etc

Science with ILD

Higgs physics
- Higgs mass, width
- Branching Ratios
- CP properties
- ttH
- Higgs Self Coupling
- …

- Top physics
- Standard Model physics
- BSM at different energies
- Rare processes
- …

A rather complete list of results would be highly desirable, even if they are not all obtianed with the exact same detector.

ILD as an organisation

- ILD rules and by-laws
- The ILD collaboration
- Statistics on ILD: where, what, etc.