

INTERNATIONAL LARGE DETECTOR

IDR

ILD Detector Collaboration

2018

ILD Editors

Main Editors:

Ties Behnke, Kiyotomo Kawagoe

Tracking System:

Calorimeter System:

Outer Detector System:

Data Acquisition:

Machine Detector Interface:

Integration:

Karsten Buesser

Alignment:

Software:

Frank Gaede, Akiya Miyamoto

Performance:

Keisuke Fujii, Jenny List

Costing:

Henri Videau, Karsten Buesser

Contents

Contents	i
1 Introduction	1
2 Science with ILC	3
3 The ILC Environment	5
4 The ILD detector concept	7
4.1 The overall ILD concept	7
4.2 Optimising ILD	7
5 Detector Layout and Technologies	9
5.1 Overall structure of the detector	9
5.1.1 Global structure and parameters	9
5.1.2 Subdetecor layout	9
5.2 Subdetector technology status	9
5.2.1 Vertex detector	10
5.2.2 Silicon inner tracking detectors	10
5.2.3 Time projection chamber	10
5.2.4 Calorimeters	10
5.2.5 Very forward detectors	10
5.2.6 Iron instrumentation	11
6 ILD Global Integration	13
6.1 Internal ILD integration	13
6.2 external ILD integration	13
6.2.1 Cavern ancillary services	13
6.2.2 Data acquisition	13
6.3 Mechanical structure and studies	13
6.4 Coil and yoke studies	13
6.5 Beam background studies	13
6.6 Alignment/ calibration procedures	13
7 Physics and Detector Modelling	15
7.1 Modelling of ILC Conditions and Physics Processes	15
7.2 Detector Modelling	15
7.3 Reconstruction Tools	15

8	Detector and Physics Performance	17
8.1	System performance	17
8.1.1	Vertexing	17
8.1.2	Tracking	17
8.1.3	Particle flow performance	17
8.1.4	Particle identification	17
8.2	High-level Reconstruction Performance	17
8.3	Physics Benchmarks	17
8.3.1	General Remarks	17
8.3.2	Hadronic Branching Ratios of the Higgs Boson	17
8.3.3	Higgs Mass from $H \rightarrow b\bar{b}$	17
8.3.4	Branching Ratio of $H \rightarrow \mu^+\mu^-$	17
8.3.5	Sensitivity to $H \rightarrow \text{invisible}$	17
8.3.6	τ decay modes and polarisation, A_{FB} and A_{LR} in $e^+e^- \rightarrow \tau^+\tau^-$	17
8.3.7	W mass, Triple Gauge Couplings and Beam Polarisation from $e^+e^- \rightarrow WW \rightarrow$ $qql\nu$	17
8.3.8	Quartic Gauge Couplings in $e^+e^- \rightarrow \nu\nu qqqq$	17
8.3.9	A_{LR} and Jet Energy Scale Calibration from $e^+e^- \rightarrow \gamma Z$	17
8.3.10	A_{FB} and A_{LR} from $tt \rightarrow bbqqqq$	17
8.3.11	Discovery Reach for extra Higgs Bosons in $e^+e^- \rightarrow Zh$	17
8.3.12	Discovery Reach for and Characterisation of low ΔM Higgsinos	17
8.3.13	WIMP Discovery Reach and Characterisation in the Mono-Photon Channel	17
9	Costing	19
10	Summary	21

Chapter 1

Introduction

Ties Behnke, Kiyotomo Kawagoe
2 pages

Chapter 2

Science with ILC

Keisuke Fujii, Jenny List
2 pages

Executive summary of the scientific goals of the ILC. Emphasis on 250 GeV. Prepare connection to choice of physics benchmarks, where details will of course come in the actual performance section.

Chapter 3

The ILC Environment

Karsten Buesser, Keisuke Fujii
3 pages

Ties Behnke, Kiyotomo Kawagoe
pages

[illegible]

7

Chapter 5

Detector Layout and Technologies

Claude Vallee
Claude Vallee, Karsten
Buesser
1 pages

5.1 Overall structure of the detector

Claude Vallee, Karsten
Buesser
1 pages

5.1.1 Global structure and parameters

Subdetector technical con-
vener
4 pages

5.1.2 Subdetecor layout

Subdetector convener
pages

5.2 Subdetector technology status

Yasuhiro Sugimoto, Marc Winter
3 pages

5.2.1 Vertex detector

Alberto Ruiz
3 pages

5.2.2 Silicon inner tracking detectors

Paul Colas
3 pages

5.2.3 Time projection chamber

Jean Claude Brient, Tohru Takeshita, Felix Sefkow, Imad Laktineh
5 pages

5.2.4 Calorimeters

Ahron Levy
2 pages

5.2.5 Very forward detectors

5.2.6 Iron instrumentation

5.2.

Valery Saveliev, Uwe Schneekloth
1 pages

Chapter 6

ILD Global Integration

6.1	Internal ILD integration
6.2	external ILD integration
6.2.1	Cavern ancillary services
6.2.2	Data acquisition
6.3	Mechanical structure and studies
6.4	Coil and yoke studies
6.5	Beam background studies
6.6	Alignment/ calibration procedures

Karsten Buesser
Karsten Buesser
Yasuhiro Sugimoto
Yasuhiro Sugimoto
Matthew Wing, Taikan Sue-
Felix Sefkow, Henri Videau
Karsten Buesser, Uwe
Daniel Jeans
Graham Wilson
1 pages

Chapter 7

Physics and Detector Modelling

7.1	Modelling of ILC Conditions and Physics Processes
7.2	Detector Modelling
7.3	Reconstruction Tools

Chapter 8

Detector and Physics Performance

Frank Gaede

5 pages

8.1	System performance
8.1.1	Vertexing
8.1.2	Tracking
8.1.3	Particle flow performance
8.1.4	Particle identification
8.2	High-level Reconstruction Performance
8.3	Physics Benchmarks
8.3.1	General Remarks
8.3.2	Hadronic Branching Ratios of the Higgs Boson
8.3.3	Higgs Mass from $H \rightarrow b\bar{b}$
8.3.4	Branching Ratio of $H \rightarrow \mu^+\mu^-$
8.3.5	Sensitivity to $H \rightarrow \text{invisible}$
8.3.6	τ decay modes and polarisation, A_{FB} and A_{LR} in $e^+e^- \rightarrow \tau^+\tau^-$
8.3.7	W mass, Triple Gauge Couplings and Beam Polarisation from $e^+e^- \rightarrow WW \rightarrow qql\nu$
8.3.8	Quartic Gauge Couplings in $e^+e^- \rightarrow \nu\nu qqqq$
8.3.9	A_{LR} and Jet Energy Scale Calibration from $e^+e^- \rightarrow \gamma Z$
8.3.10	A_{FB} and A_{LR} from $tt \rightarrow b\bar{b}qqqq$
8.3.11	Discovery Reach for extra Higgs Bosons in $e^+e^- \rightarrow Zh$
8.3.12	Discovery Reach for and Characterisation of low ΔM Higgsinos
8.3.13	WIMP Discovery Reach and Characterisation in the Mono-Photon Channel

Graham Wilson, Frank Gaede,

Keisuke Fujii, Jenny List

10 pages

Chapter 9

Costing

Chapter 10

Summary

Bibliography