CLIC CDR document structure

Vol 1: Executive Summary: target 20 pages

Vol 2: Physics at CLIC

Vol 3: The CLIC accelerator and site facilities

Vol 4: The CLIC physics detectors

Vol 5: Detailed value Estimate

Whether or not to have a separate volume for the costing is still under discussion.

The structure of Vol 2 will depend on the LHC physics results. Therefore, for the moment no layout structure for Vol 2 yet (??)

Vol 4: CLIC physics detectors

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Note:
in Volume 3) MDI
Beam Induced Background
Energy Spectrum
Polarization
Mask design

About the energy

The default CLIC energy is 3 TeV, so the report will be based on 3 TeV.

There may be a first phase at 500 GeV, expected to affect:

- The vertex detector
- The beam pipe
- The forward calorimetry

Propose to discuss these low-energy options in the relevant detector chapters.

We presently do not foresee an overall optimisation of the experiment (involving all detectors) for 500 GeV, (unless our own simulation results show that this is necessary. In that case the overall layout of the DCR document would change.)

Performance in: Volume 2 <=> Volume 4

Volume 2:

Sell the CLIC physics potential at best.
In view of LHC results:

- Address physics models/processes in a prioritised way
- Demonstrate the specific sensitivity that is relevant for each individual physics process addressed

Volume 4, detector chapters:

- Show performance figures for the detector under discussion (e.g for calorimetry: single particle performance, jet performance, angular coverage etc.)

Volume 4, chapter 10:

Addresses the overall performance of the experiment as a whole.
Probably the best way to do this is to use ~5 benchmark processes, like for the ILC LOI's.

Spare slides on ILC benchmarks for LOI

Compulsory LOI Benchmarking List

At a Dec 7 meeting between Sakue Yamada and representatives of SiD, ILD, 4th Concept, and the WWS, it was agreed that the following reactions will be used for LOI Physics Benchmarking:

1. $e^+e^- \to Zh, \to \ell^+\ell^- X, l = e, \mu$; $m_h = 120$ GeV at $\sqrt{s}$=0.25 TeV
2. $e^+e^- \to Zh$, $Z \to q\bar{q}, \nu\bar{\nu}$; $h \to c\bar{c}$, $\mu^+\mu^-$; $m_h = 120$ GeV at $\sqrt{s}$=0.25 TeV
3. $e^+e^- \to \tau^+\tau^-$, at $\sqrt{s}$=0.5 TeV
4. $e^+e^- \to t\bar{t}$ at $\sqrt{s}$=0.5 TeV
5. $e^+e^- \to \tilde{\chi}_1^+\tilde{\chi}_1^- / \tilde{\chi}_2^0\tilde{\chi}_2^0 \to W^+W^- \tilde{\chi}_1^0\tilde{\chi}_1^0$ / $ZZ\tilde{\chi}_1^0\tilde{\chi}_1^0$ at $\sqrt{s}$=0.5 TeV

N.B.: The physics observables that are to be measured have not yet been determined.

Benchmark Processes

$e^+e^- \rightarrow ZH,\ H \rightarrow e^+e^-X,\ \mu^+\mu^-X$ $(M_H = 120\ GeV,\ E_{cms} = 250\ GeV)$

- tracking efficiency and momentum resolution
- material distribution in the tracking detectors
- EM shower ID, kink reconstruction (bremsstrahlung)
- Higgs Mass and cross section

$e^+e^- \rightarrow ZH,\ H \rightarrow c\bar{c},\ \mu^+\mu^-\ Z \rightarrow \nu\bar{\nu}$ $(M_H = 120\ GeV,\ E_{cms} = 250\ GeV)$

- heavy flavour tagging, secondary vertex reconstruction
- multi jet final state, c-tagging in jets, uds anti-tagging
- test anti-tagging by studying the $H \rightarrow gg$
- $BR(H \rightarrow c\bar{c})$, $BR(H \rightarrow \mu^+\mu^-)$

Benchmark Processes

$e^+e^-\rightarrow ZH$, $H\rightarrow cc$, $\mu^+\mu^-$, $Z\rightarrow qq$ (M_H=120GeV, E_{cms}=250GeV)

- **in addition to the charm tagging, this final state tests the confusion resolution capability**
- **BR($H \rightarrow cc$), BR ($H \rightarrow \mu^+\mu^-$)**

$e^+e^-\rightarrow Z\rightarrow \tau^+\tau^-$ (E_{cms}=500 GeV)

- **tau reconstruction, aspects of particle flow**
- **π^0 reconstruction**
- **tracking of very close-by tracks**
- **σ, A_{FB}, and τ decay mode efficiency and purity.**

Benchmark Processes

$e^+e^- \rightarrow tt$, $t \rightarrow bW$, $W \rightarrow qq'$ (M_{top}=175GeV, E_{cms}=500 GeV)

- multi jet final states, dense jet environment
- particle flow
- b-tagging inside a jet
- maybe lepton tagging in hadronic events (b-ID)
- tracking in a high multiplicity environment
- σ, A_{FB}, and m_{top}

$e^+e^- \rightarrow \chi^+\chi^- / \chi_2^0\chi_2^0$ (E_{cms}=500 GeV)

- particle flow (WW, ZZ separation)
- multi-jet final states
- SUSY parameter is point 5 of Table 1 of hep-ex/0603010
- σ, and masses