PD1: Higgs/Electroweak Symmetry Breaking (7 talks)

H→bb/cc/gg at 350 GeV and 1.4 TeV CLIC

Speaker: Frank SIMON

Abstract:
With precise flavor tagging and the reconstruction of hadronic final states, CLIC is capable of measuring the branching fractions of the decay of the Higgs boson into bottom and charm quarks and gluons. A study of the prospects for this measurement at the initial energy stage of 350 GeV and at a second stage of 1.4 TeV has been performed in full detector simulations with realistic machine-induced and physics background levels. At 350 GeV, Higgs production both via Higgsstrahlung and via vector boson fusion contributes significantly to the total signal, while the 1.4 TeV sample is dominated by vector boson fusion. These measurements are crucial for the determination of the couplings to first and second generation fermions, and for the determination of the total width of the Higgs.

Measurement of the H →WW* decay at 1.4 TeV and 350 GeV CLIC

Authors: S. Lukic, M. Pandurovic, M. Thompson
Speaker: S. LUKIC

Abstract:
The H →WW* decay is studied at each energy stage at CLIC in different Higgs production mechanisms, providing access to several fundamental quantities of interest for the Higgs sector. Absolute Higgs branching ratios are determined by measurement of Higgs decays from the Higgsstrahlung production mechanism at 350 GeV. Further, the product of the Higgs production cross section in WW fusion times the branching ratio for the H →WW* decay is one of the key measured quantities for the determination of the total Higgs width. At 1.4 TeV in particular, the high statistics of the Higgs production from WW fusion allows measurement of $\sigma(e^+e^- \to H\nu\nu) \times BR(H \to WW^*)$ with a statistical uncertainty of 1.1%. In this talk, an overview will be given of the full-simulation benchmark studies of the H →WW* decay from Higgsstrahlung at 350 GeV and from WW fusion at 1.4 TeV CLIC.

Higgs production in ZZ fusion at 1.4 TeV

Speaker: Aidan ROBSON

Abstract:
We present a study of Higgs production through ZZ fusion in e^+e^- collisions at 1.4TeV, using full simulation of the CLIC-ILD detector. ZZ fusion is the sub-leading Higgs production mechanism at sqrt(s)=1.4TeV, and we estimate the sensitivity to Higgs couplings that could be achieved by measuring this process.

Measurement of the top Yukawa coupling at a 1.4 TeV CLIC collider

Authors: Sophie Redford, Philipp Roloff, Marcelo Vogel
Speaker: Philipp ROLOFF

Abstract:
The physics potential for a direct measurement of the top Yukawa coupling using the process $e^+e^- \rightarrow ttH$ at a CLIC collider operated at 1.4 TeV was investigated. Final states with six and eight jets were reconstructed. This study addresses various aspects of the detector performance: jet clustering in complex hadronic final states, missing energy reconstruction, flavour tagging and the identification of high-energy leptons. The analysis is based on a full detector simulation using Geant 4. Beam-induced backgrounds from gamma gamma $\rightarrow$ hadrons interactions were overlaid to the physics events. Compared to the results shown at LCWS13, several significant extensions to the analysis were included. In addition to an improved identification of electrons and muons, isolated tau leptons were used for the measurement. Furthermore, the event reconstruction and selection strategies were refined and additional physics background processes were studied.

HZ (Z→qq) production at 350 GeV CLIC and invisible Higgs decays

Speaker: Mark THOMSON

Abstarct:
HZ production at a centre-of-mass energy of 350 GeV provides a powerful probe of the couplings of the Higgs boson. Here a study of the HZ production at CLIC is considered for the case where Z->qq and where the Higgs boson decays to either visible or invisible final states. By carefully choosing the event selection to be almost independent of the Higgs boson decay mode, it is possible to obtain a nearly model-independent measurement of the coupling between the H and Z bosons. This measurement precision is more precise than is achievable using leptonic Z decays.

Measurement of the Higgs boson decays to gamma gamma and to Z gamma at a CLIC collider operating at 1.4 TeV

Authors: Christian Grefe, Eva Sicking
Speaker: Christian GREFE

Abstract:
The studies presented in this talk are part of an ongoing effort to investigate the complete physics potential of a CLIC collider operated at various energies for measurements of the SM Higgs boson properties. The prospects of the measurement of the cross section times branching ratio of the loop induced rare decays H →Z gamma and H→gamma gamma at a center-of-mass energy of 1.4 TeV are discussed. Both analyses are based on full detector simulations using Geant 4. All relevant Standard model backgrounds are considered. Beam induced backgrounds from gamma gamma→hadrons interactions are overlaid to the physics events.

Higgs Physics at CLIC: Overview and Global Fits

Speaker: Frank SIMON

Abstract:
CLIC, with its its large energy reach from 350 GeV to 3 TeV provides an ideal environment for a precise study of the Higgs study. The physics potential for measurements of the properties of the Higgs boson is being studied in full detector simulations with realistic machine-induced and physics background levels for a three-stage scenario. The first stage at 350 GeV provides Higgs production via Higgsstrahlung and vector boson fusion, which enables model-independent measurements of the couplings to fermions and bosons as well as a measurement of the total width and constraints on invisible decays. At the higher-energy stages of 1.4 TeV and 3 TeV, large samples of Higgs bosons will be produced primarily through vector-boson fusion. In addition, various rare decays and production processes can be accessed at high energy, including double Higgs production to measure the self-coupling and the direct measurement of the top Yukawa coupling. An overview of all measurements at the different energy stages is given in this talk. Results from different variants of combined fits to all the experimental measurements to determine the Higgs boson couplings are presented.
