

Higgs Self-coupling Measurement at the FCC-ee with the Energy Recovery Linac

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Abstract

We propose to study the potential for measuring the Higgs tri-linear self-coupling with the Energy Recovery Linac (ERL) option at FCC-ee. The ERL opens the possibility of running FCC-ee with a center-of-mass energy up to 600 GeV with an integrated luminosity of $5 ab^{-1}$ after 5 years of running. Studies will be done with simple detector parametrizations in DELPHES. The impact of beam polarization will also be studied.

1 Introduction

The detailed study of the Higgs sector of the Standard Model is one of the primary goals of the HEP community in the coming years; in this context, a measurement of the tri-linear Higgs self-coupling is of particular interest. [1]

A design for FCC-ee based on the usage of energy-recovery linacs (ERL) has been proposed recently. [2] This option could potentially allow running the machine at a center-of-mass energy of up to 600 GeV, opening the possibility of producing ZHH and ttH final states. An integrated luminosity of 8.5 (5) ab^{-1} at $\sqrt{s} = 500(600)$ GeV after 5 years of running might be possible.

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23 We propose to study the potential of such a machine for the measure-
24 ment of the tri-linear Higgs self-coupling. A detailed study of the Higgs
25 self-coupling in electron-positron colliders has been performed for the ILC,
26 running at $\sqrt{s} = 500$ GeV. [3] We propose to build on this study by exploring
27 potential improvements in jet clustering and pairing in the $HH \rightarrow 4b$ chan-
28 nel, and studying the signal-to-noise as a function of \sqrt{s} and as a function
29 of the beam polarization possibilities at the ERL.

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