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Access to triple Higgs couplings in the 2HDM at future e^+e^- colliders

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In this talk, we will analyze the production cross sections of two neutral Higgs bosons in models with two Higgs doublets (2HDM) with CP conservation at future e^+e^- colliders (specifically ILC and CLIC). Based on a previous work, we have studied the two main processes where the triple Higgs couplings can play an important role: $e^+e^- \rightarrow h_i h_j \nu \bar{\nu}$ (mainly through vector boson fusion) and $e^+e^- \rightarrow h_i h_j Z$ (similar to Higgs-strahlung) with $h_i h_j = hh, hH, HH$ or AA . The processes are studied at all the foreseen center-of-mass energies and luminosities of such future colliders. The results of the cross sections are presented in benchmark planes where large triple Higgs couplings can be realized inside the region allowed by all the relevant theoretical and experimental constraints. We find large deviations from the SM in the production of two SM-like Higgs bosons and sizable production cross sections for $h_i h_j = hH, HH$ and AA in large parts of the allowed parameter space. Furthermore, we explore the distributions of the cross section with respect to the invariant mass of the final Higgs pair. We analyze how these distributions can be used to disentangle the resonant or non-resonant effects from the triple Higgs couplings. We find sizable effects from $\lambda_{hhh}, \lambda_{hhH}, \lambda_{hHH}$ and λ_{hAA} , specially at large center-of-mass energies in the $h_i h_j \nu \bar{\nu}$ production channel.

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