

One Loop BSM Triple Higgs Couplings at future electron-positron colliders via double Higgs production

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We analyze the impact of one-loop corrections to triple Higgs bosons on the di-Higgs production cross section at e^+e^- colliders within the two Higgs doublet model (2HDM). In particular, we study the production cross section of two SM-like Higgs bosons together with a boson, also known as double Higgs-strahlung. The one-loop triple Higgs couplings are calculated using the one-loop effective potential, and in the case of the SM-like Higgs boson self-coupling λ_{hhh} , a full one-loop diagrammatic calculation is also considered. We show that one-loop corrections to the Higgs self-coupling can enhance the di-Higgs production cross section by up to a factor of about five with respect to the SM prediction for a center-of-mass energy of 500 GeV and 1 TeV. These large corrections, originating in the one-loop corrections to λ_{hhh} , arise from the large couplings of the SM-like Higgs boson with other heavy BSM Higgs bosons, while being in agreement with the main theoretical and current experimental constraints. In addition, we discuss the momentum effects from the full one-loop self-coupling prediction, and we show that they are small compared to the results obtained with the effective potential. We also analyze some scenarios where the one-loop corrections to the triple Higgs couplings can affect the resonant production of a heavy neutral Higgs boson, and discuss the implications for the structure of the resonance peak, as well as the accessibility of the BSM triple Higgs coupling λ_{hhH} at e^+e^- colliders.

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