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Triple-Higgs production at LHC and future hadron colliders

After the discovery of Higgs boson, Standard Model (SM) has been tested successfully. However, experimental data suggests that new physics (NP) beyond SM should exist. Measurements of Higgs properties and couplings are essential to search for NP. Multi-Higgs production processes at colliders are important to reconstruct the Higgs potential and to study the mechanism of electroweak symmetry breaking. In this talk, we study the triple-Higgs production via gluon-gluon fusion (ggF) and vector-boson fusion (VBF) at LHC and future hadron colliders, using an effective Lagrangian to describe potential NP. For the ggF process, we explore the potential for the discovery of the triple-Higgs signal in the $4\ell 2\ell$ and $2\ell t \pm 4\ell + \ell$ channel. Our Monte-Carlo simulation shows that the discovery of SM signals is a challenging task for the future hadron collider. For the VBF process, we derive theoretical constraints on the parameter space from the unitarity of $2 \rightarrow \ell$ scattering amplitudes and apply the results to $\ell\ell \rightarrow hh$ and hhh processes, where $\ell = \mu, \tau$. As a result, we present constraints on differential distributions as appropriate to the study of $\ell\ell \rightarrow hh$ and hhh processes.

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