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Measuring Higgs Boson Self-couplings with 2->3 VBS Processes

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We study the measurement of Higgs boson self-couplings in $2 \to 3$ vector boson scattering processes in proton colliders and lepton colliders in the framework of Standard Model Effective Field Theory, taking the examples of $W_L^\pm W_L^\pm \to W_L^\pm W_L^\pm h$ and $W_L^+ W_L^- \to hhh$. First, by taking Goldstone equivalence theorem and analysing the amplitudes in high energy, we find that
the ratio of beyond-standard-model amplitudes to standard model ones approaches to $\frac{\mathcal{A}^{\rm BSM}}{\mathcal{A}^{\rm SM}} \sim \frac{E^2}{\Lambda^2}$. The dependence of amplitudes on the Wilson coefficient c_6 is mainly through a 5-point contact scalar vertex. Second, using MadGraph5_aMC@NLO for simulating full processes without decaying the heavy bosons, we find the full cross sections remain very sensitive to relevant Wilson coefficients. Sensitivity of full cross sections of $W_L^\pm W_L^\pm \to W_L^\pm W_L^\pm h$ on c_6 requires p_T cuts on the final states to reduce the enhanced SM cross sections due to Sudakov logarithms. $\sigma/\sigma_{\rm SM}$ in lepton colliders at $\sqrt{s} \geq 3$ TeV and proton colliders at $\sqrt{s} \geq 27$ TeV is comparable to, or even better than, di-Higgs channel at LHC

Time Zone

Asia/Pacific

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