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Measuring the Trilinear Higgs Coupling at the LHC

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The results from the LHC indicate that the couplings of the Higgs boson to other particles are consistent with the Standard Model. However the final and ultimate test as to whether this particle is the standard Higgs boson will be the coupling of the Higgs boson to itself. We study the Higgs pair production from gluon fusion at the LHC and try to determine how accurately the trilinear Higgs coupling can be determined theoretically.

Let us introduce a general trilinear Higgs coupling as $\kappa \times \lambda_{\text{HHH}}(\text{SM})$. For the Standard Model, $\kappa = 1$.

We found that at the LHC with a center of mass of energy [\sqrt{S}] of 14 TeV, the measurement of cross section of 40 fb with negligible experimental error would only restrict κ to be between 0.86 and 1.12. For $\sqrt{S} = 100$ TeV, the value of κ will be limited to be between 0.89 and 1.10 that is slightly better than the lower energy.

Summary

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