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Using optimal observables to probe CP-violation in top-Higgs interactions

In the context of collider searches for new physics one of the main candidates for extensions of the standard model is the existance of CP violating interactions. In this work, we introduce a CP violating Yukawa interaction between the top quark and the Higgs boson. Utilizing Higgs Effective Field Theory (hEFT) and the optimal observable technique in the heavy quark approximation, we provide a quantitative argument to analyze gluon fusion channel data for two Higgs plus two Jets cross sections to constrain CP odd interactions. We compute Wilson coefficients via matching the NLO order theory and the hEFT amplitudes and then simulate observable data for the CP violating and non CP violating scenarios via MadGraph and Delphes.

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