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Anomalous Higgs couplings in angular asymmetries of $H \rightarrow Z\ell\ell$ and $e^+e^- \rightarrow HZ$

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In this work we study in detail the phenomenological impact of anomalous Higgs couplings in angular asymmetries of the crossing symmetric processes $H \rightarrow Z\ell\ell$ and $e^+e^- \rightarrow HZ$. Beyond Standard Model (BSM) physics is parametrized in terms of the $SU(3) \times SU(2) \times U(1)$ dimension six effective Lagrangian. In the light of present bounds on $d=6$ interactions we study how angular asymmetries can reveal non-standard CP even and CP odd couplings. We provide simplified approximate expressions to all observables of interest making transparent their dependence on anomalous couplings. We show that some of the asymmetries may reveal BSM effects that would be hidden in other observables. In particular, CP even and CP odd $d=6$ $HZ\gamma$ couplings as well as $HZ\ell\ell$ contact interactions can generate asymmetries at the percent level, while having small or no effect on the di-lepton invariant mass spectrum of $H \rightarrow Z\ell\ell$. Finally, the higher di-lepton invariant masses probed in $e^+e^- \rightarrow HZ$ lead to interesting differences in the asymmetries with respect to those of $H \rightarrow Z\ell\ell$.

Summary

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