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## Probing the CP structure of the top quark Yukawa coupling: Loop sensitivity vs. on-shell sensitivity

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The question whether the Higgs boson is connected to additional CP violation is one of the driving forces behind precision studies at the Large Hadron Collider. In this work, we investigate the CP structure of the top quark Yukawa interaction—one of the most prominent places for searching for New Physics—through Higgs boson loops in top quark pair production. We calculate the electroweak corrections including arbitrary CP mixtures at next-to-leading-order in the Standard Model Effective Field Theory. This approach of probing Higgs boson degrees of freedom relies on the large  $t\bar{t}$  cross section and the excellent perturbative control. In addition, we consider all direct probes with on-shell Higgs boson production in association with a single top quark or top quark pair. This allows us to contrast loop sensitivity versus on-shell sensitivity in these fundamentally different process dynamics. We find that loop sensitivity in  $t\bar{t}$  production and on-shell sensitivity in  $t\bar{t}H$  and  $tH$  provide complementary handles over a wide range of parameter space.

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### Collaboration / Activity

none

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