

## Probing Type-I 2HDM light Higgs in the top-pair-associated diphoton channel

We investigate the Type-I Two-Higgs-Doublet Model (2HDM-I) as a potential explanation for the 95 GeV diphoton excess observed at the LHC, and assess the feasibility of discovering a 95 GeV Higgs boson at future hadron colliders. Our analysis shows that the direct Higgs search data strongly constrain the Higgs-mixing angle parameter. Subsequent collider simulations focus on the  $pp \rightarrow t(\rightarrow W^+b)\bar{t}(\rightarrow W^-\bar{b})h(\rightarrow \gamma\gamma)$  process and its relevant backgrounds on HL-LHC, HE-LHC and FCC-hh. For different colliders, statistical significances of  $2\sigma$  and  $5\sigma$  can be achieved at different integrated luminosity. At the HL-LHC, certain samples can achieve a significance of  $5\sigma$  with an integrated luminosity of  $L = 706 \text{ fb}^{-1}$ .

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