## 2nd COMETA General Meeting



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## Prospect study for measurement of $Hb\bar{b}$ coupling at the LHC and FCC-hh

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This study investigates the H + b + jets signature in proton-proton collisions to explore the structure of the  $Hb\bar{b}$  couplings, with a focus on Higgs boson decays into photon pairs. The analysis includes both reducible and irreducible backgrounds, along with realistic simulations of the detector. Using multivariate techniques, especially Boosted Decision Trees (BDTs), kinematic variables are analyzed to improve signal-to-background separation. Our findings show that the H + b + jets process is key to measuring CP-even and CP-odd couplings of the Higgs-bottom quark interaction at the HL-LHC and FCC-hh.

We limit the new physics couplings,  $c_b$  and  $\tilde{c}_b$ , through Monte Carlo simulations and assess the sensitivity of the H + b + jets channel at high luminosities. The results show that these colliders can reach previously unexplored parameter spaces, with  $c_b$  and  $\tilde{c}_b$  limits improving upon current experimental bounds. Additionally, we introduce a new asymmetry in lab-frame momenta to study CP violation in the  $Hb\bar{b}$  coupling, offering a strong method for limiting CP-odd interactions.

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