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Jet Origin ID and Its Impact on Higgs factory and High Energy frontier

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To enhance the scientific discovery power of high-energy collider experiments, we propose and realize the concept of jet-origin identification that categorizes jets into five quark species (b; c; s; u; d), five corresponding antiquarks, and the gluon.
Using state-of-the-art algorithms and simulated $\nu^{-}\nu H$, $H \longrightarrow jj$
events at 240 GeV center-of-mass energy at the electron-positron Higgs factory, the jet-origin identification simultaneously reaches jet flavor tagging efficiencies ranging from 67% to 92% for bottom, charm, and strange quarks and jet charge flip rates of 7%–24% for all quark species.
We apply the jet-origin identification to Higgs rare and exotic decay measurements at the nominal luminosity of the Circular Electron Positron Collider and conclude that the upper limits on the branching ratios of $H \longrightarrow s^{-}s$; u^{-} u; $d^{-}d$ and $H \longrightarrow$ sb; db; uc; ds can be determined to $2 \times 10{-}4$ to $1 \times 10{-}3$ at 95% confidence level.
The derived upper
limit for $H \longrightarrow s^{-}s$ decay is approximately 3 times the prediction of the standard model.
We also discuss its impact on other physics measurements at High energy frontier.

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