

## Studies of boosted topology for the non-resonant HH search in $bb\tau\tau$ and $bby\gamma$ final states

The study of boosted Higgs boson pair (HH) production enables the development of advanced reconstruction and identification techniques crucial for probing the Higgs self-coupling and potential new physics beyond the Standard Model. In this work, we focus on methodologies for analyzing the boosted topology, where one Higgs boson is produced with high transverse momentum, leading to collimated decay products. We investigate jet substructure techniques, large-radius jet identification, and machine learning-based classification methods to enhance signal selection. Using Monte Carlo simulations and CMS data, we evaluate the effectiveness of these approaches and their impact on signal discrimination. Our preliminary studies demonstrate the potential for improved event reconstruction in the  $HH \rightarrow bby\gamma$  and  $HH \rightarrow bb\tau\tau$  channels.

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