

## Probing triple Higgs production via $4\rightarrow 2\rightarrow$ decay channel at a 100 TeV hadron collider

*Sunday, 14 December 2025 09:00 (20 minutes)*

A comprehensive study of triple Higgs boson production in the  $4\rightarrow 2\rightarrow$  decay final state is performed for the first time at a future 100 TeV hadron collider. The analysis incorporates modified Higgs self-couplings via trilinear Higgs self-coupling  $\lambda_3$  and quartic Higgs self-coupling  $\lambda_4$ , enabling for a model-independent investigation of potential new physics effects. Higgs bosons are reconstructed using both resolved and boosted techniques. To optimize sensitivity across different kinematic regions, we introduce a novel event categorization strategy based on the triple Higgs invariant mass spectrum and the multiplicity of boosted Higgs bosons. In addition to a traditional cut-based analysis, a Boosted Decision Tree (BDT) approach is employed to exploit multivariate correlations among kinematic observables, leading to a significant improvement in sensitivity. Our result demonstrates that the  $4\rightarrow 2\rightarrow$  channel provides a viable pathway for probing the Higgs quartic coupling, complementing the existing multi-Higgs production studies, and could reach 5  $\sigma$  in significance for  $\lambda_3 \leq -1$  and  $\lambda_4 \geq 10$  in the scanned range.

This work has been published on JHEP: [https://doi.org/10.1007/JHEP08\(2025\)040](https://doi.org/10.1007/JHEP08(2025)040)

**Co-author:** SUN, Xiaohu (Peking University)

**Presenter:** DONG, Zhenyu (Peking University)

**Session Classification:** Contributed session