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First look at dim-8 EFT operators in VBF hh->HH

This study aims to probe the boosted Higgs boson pair production (HH) via Vector Boson Fusion process (VBF) which has unique sensitivity for the so far unmeasured quartic Higgs-gauge coupling (HHVV) at leading order. To explore this, we are investigating the dimension-8 Effective Field Theory (EFT) operators within the VBF HH framework, using the extended aqgc model. This model builds upon the Eboli model by introducing new operators that account for both interference and pure new-physics contribution.
For the first time, we present a reconstruction-level analysis of dimension-8 EFT operators in the VBF HH ⟶ bbbb channel, examining their impact on key VBF observables such as the dijet invariant mass (mjj), pseudorapidity separation, and the angular separation between the VBF jets and Higgs candidates (DR). The studied VBF process (HH-> bbbb) is characterized by the production of two Higgs bosons in association with two high-energy VBF dijets, which are well-separated in pseudorapidity and have a high invariant mass, while the boosted Higgs bosons decay into pairs of b-quarks, which are reconstructed as large-radius jets.
To enhance the sensitivity of our analysis, we aim to optimize and employ advanced jet reconstruction techniques to identify large-radius jets as Higgs candidates, while small-radius jets are used to tag VBF candidates. Furthermore, we compare EFT operators with the effects on the k2V parameter, as the analysis has so far been optimized only for k2V. This comparison provides insights into the differences and similarities between EFT effects and the k2V scenario, paving the way for improved sensitivity to new physics in future analyses.

Track/session

Parallel ATLAS track

Authors: TEGETMEIER, Anna Sophie (Laboratoire des 2 Infinis - Toulouse, CNRS / Univ. Paul Sabatier (FR)); ROLAND, Christophe (Centre National de la Recherche Scientifique (FR)); MANJARRES, Joany (Laboratoire des 2 Infinis - Toulouse, CNRS / Univ. Paul Sabatier (FR)); CAMACHO TORO, Reina Coromoto (LPNHE-Paris CNRS/IN2P3); AMEZZA, Thiziri (Centre National de la Recherche Scientifique (FR))

Presenter: AMEZZA, Thiziri (Centre National de la Recherche Scientifique (FR))

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