Contribution ID: **155** Type: **not specified**

YSF: Fisher Information and simulation-based inference in searches for CP-violating EFT components in the HWW interaction via leptonic WH production

Thursday, November 10, 2022 2:00 PM (12 minutes)

The Higgs sector is a possible avenue for searches of BSM sources of CP violation, with V(V=W,Z)H production offering a way to separately probe the HWW and HZZ interactions, not possible in channels such as weak boson fusion. In this work, we search for CP-violating (CP-odd) EFT components in the HWW interaction via leptonic WH production - W(-> l \nu)H. This is a channel which allows high trigger efficiencies, good final state object resolution and good signal-to-background discrimination 0. Phenomenological studies in this channel 1 have proposed angular variables sensitive to these components, that require the full reconstruction of the W boson 4-vector and rely on the reconstruction of the longitudinal momentum of the neutrino. The latter is not only experimentally difficult (resulting in loss of resolution and efficiency) but, in addition, it is only possible up to a 2-fold ambiguity. The main goal of this work is to explore the simulation-based inference method SALLY (Score Approximates Likelihood LocallY) 3 to reconstruct a statistically optimal observable using the full kinematic information available in the event, bypassing the need for full neutrino reconstruction 4. The Fisher Information formalism is used to benchmark the sensitivity of different kinematic observables, angular observables and the SALLY method to this component, both inclusively as well as differentially, allowing us to define an optimal binning for the different observables 5. The expected 95% CL exclusion limits with both the Fisher Information formalism - mainly sensitive to the linear, CP-violating SM-EFT interference term - and the asymptotic likelihood ratio formalism are obtained and compared, allowing us a handle on the effect of the quadratic EFT term (CP-even by nature) on the sensitivity of the different observables.

Type of talk

Theory

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Session Classification: Thursday Session A

Track Classification: Physics Topics: Effective Field Theory