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Quantum properties of H→VV*: precise predictions in the SM and sensitivity to new physics

Thursday 10 July 2025 09:30 (20 minutes)

We study the quantum properties of the Higgs-boson decays into four fermions via two vector bosons ($H \to VV^* \to 4f$). In particular, we focus on the case of two different-flavour lepton pairs ($H \to ZZ^* \to \mu^+\mu^- e^+e^-$). We compute the quantum-information observables for the corresponding two-qutrit system (ZZ) at next-to-leading order electroweak (NLO EW) accuracy in the SM. We find that NLO EW corrections lead to giant (order 1) effects in some specific cases and significantly alter the extraction of the observables quantifying the quantum correlations. We identify the observables that are robust and can be used to extract reliable information. Finally we discuss possible new physics (NP) effects, parametrised via an effective-field-theory approach. We show how quantum observables can increase the sensitivity to NP also for the process considered in this study.

Secondary track

T15 - Quantum technologies in HEP (special topic 2025)

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