

Multi-Higgs Production and the Electroweak Phase Transition

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Exploring the Higgs sector via multi-Higgs production searches is a main goal for run-3 and high-lumi LHC. Can these searches inform us about the electroweak phase transition and matter-antimatter asymmetry? We address this question in the context of the TRSM (Two-Real-Singlet Model), which has known benchmark points enhancing multi-Higgs production. We update the triple-Higgs production benchmark points to include refined perturbativity bounds and explore the type of electroweak phase transition that occurs in the early universe; whether continuous or the first-order discontinuous phase transition desired for matter-antimatter asymmetry. After presenting our work, I outline lessons on correlating the type of electroweak phase transition and the enhancement of di-Higgs or triple Higgs production, highlighting the importance of the theory's vacuum expectation value of today and the symmetries of the model.

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