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Looking for a SFOEWPT in the RxSM at the HL-LHC and LISA

Friday 16 May 2025 12:00 (15 minutes)

We explore the real-singlet extension of the Standard Model without a Z2 symmetry (RxSM) as a framework to address the baryon asymmetry of the Universe and investigate modifications to the Higgs potential. First, we identify regions of parameter space that allow a Strong First-Order Electroweak Phase Transition (SFOEWPT) using the public tools BSMPT, CosmoTransitions, and TransitionListener, while incorporating relevant theoretical constraints as well as experimental bounds through HiggsTools. Additionally, we calculate the stochastic gravitational wave background and assess its potential observability at LISA. Next, we determine the one-loop corrections to the trilinear Higgs couplings involved in di-Higgs production (λ_{hhh} and λ_{hhH}) using the public code anyH3. Finally, we evaluate the di-Higgs production cross section at the (HL-)LHC within the regions of the RxSM parameter space that permit an SFOEWPT, taking into account the one-loop corrections to the trilinear Higgs couplings. This result is compared with those obtained in the SM and in the RxSM at tree level, highlighting the significant impact of loop corrections on the trilinear couplings.

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