

The CP-Violating 2HDM in Light of a Strong First Order Electroweak Phase Transition and Implications for Higgs Pair Production

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The generation of the observed matter-antimatter asymmetry in the universe through baryogenesis cannot be explained in the Standard Model. We therefore investigate the possibility of a strong first order phase transition in the CP-Violating 2-Higgs-Doublet Model (C2HDM) after imposing theoretical and experimental constraints. We study the type I and II C2HDM where one of the neutral Higgs bosons can be the Standard Model-like Higgs boson. Our results show that there is a strong interplay between the requirement of a strong phase transition and collider phenomenology with testable implications for searches at the LHC. We find additional preferred mass hierarchies compared to those of the CP-conserving 2HDM. We also use our results to investigate the interplay between a strong phase transition and the size of the trilinear Higgs self-couplings.

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