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BSM Multi-Higgs: Collider Phenomenology and Electroweak Phase Transitions

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In this talk, I shall discuss the phenomenological prospects of neutral triple Higgs production compared to di-Higgs production across various Higgs-sector extensions (R2HDM, C2HDM and N2HDM), all within the context of a strong first-order electroweak phase transition. Our analysis reveals that scalar sector resonance contributions can significantly enhance triple Higgs production, despite the small Standard Model (SM) baseline expectation. Notably, one can identify potential enhancements up to 40 times the SM predictions, underscoring the importance and feasibility of experimental efforts at the High-Luminosity LHC (HL-LHC) and FCC-hh. This investigation not only motivates experimental pursuits but also sheds light on the thermal history of our universe, offering valuable insights into fundamental physics and the evolution of the cosmos.

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