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Testing Phase Transition and cosmological history at colliders

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A strong first-order electroweak phase transition (SFOEWPT) is a critical prerequisite for realizing electroweak baryogenesis in the early universe. However, lattice simulations indicate that the contribution from the Standard Model (SM) Higgs alone is insufficient to produce a strong first-order phase transition. New physics, particularly beyond-the-SM (BSM) scenarios with scalar masses around 700 GeV, is required to achieve SFOEWPT. This has motivated physicists to search for such particles at current and future colliders. In this talk, I will present two representative models that shed light on the status of electroweak phase transition searches at colliders. Additionally, I will explore how the evolution of dark matter in the early universe influences electroweak symmetry breaking.

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