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The cS2HDM as a unified framework for dark matter and electroweak baryogenesis

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The discovery of the Higgs boson at the LHC confirms the Standard Model's (SM) mechanism for electroweak symmetry breaking, yet the SM fails to address key cosmological phenomena such as dark matter (DM) and the matter-antimatter asymmetry. Higgs-portal models with extended scalar sectors offer promising frameworks to bridge this gap. Among them, models incorporating a complex singlet scalar field can host pseudo-Nambu-Goldstone (pNG) DM, naturally suppressing direct-detection signals and making them ideal candidates for collider-based DM searches. However, minimal pNG DM models lack ingredients for electroweak baryogenesis. To overcome this, we look at the CP-violating singlet-extended two Higgs doublet model (cS2HDM) which contains both a pNG DM candidate and several sources of CP-violation and could serve as a benchmark for upcoming LHC searches.

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