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Phase transitions and gravitational waves in models of Z_N scalar dark matter

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We study the nature of phase transitions and gravitational wave signals in models of scalar dark matter with Z_N symmetries. The scalar sector comprises the Standard Model Higgs, an Inert Doublet and a complex singlet. In such models, the dark matter relic density can be largely determined by semi-annihilations instead of usual annihilations, which reduces the direct detection signal. We perform a thorough study of the parameter space, investigating the impact of the quartic semi-annihilation couplings on the structure of potential minima, phase transitions, and possible enhancements of the stochastic gravitational wave signal.

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