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Superheavy Dark Matter Production from Symmetry Restoration First-Order Phase Transition During Inflation

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We propose a scenario where superheavy dark matter (DM) can be produced via symmetry restoration first-order phase transition during inflation triggered by the evolution of the inflaton field. The phase transition happens in a spectator sector coupled to the inflaton field. During the phase transition, the spectator field tunnels from a symmetry-broken vacuum to a symmetry-restored vacuum. The massive particles produced after bubble collisions are protected against decaying by the restored symmetry and may serve as a DM candidate in the later evolution of the Universe. We show that the latent heat released during the phase transition can be sufficient to produce the DM relic abundance observed today. In addition, accompanied with the super heavy DM, this first-order phase transition also produces gravitational waves detectable via future gravitational wave detectors.

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