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Stability of Fuzzy Dark Matter Axion Structures MADELYN LEEMBRUGGEN, L.C.R. WIJEWARDHANA, University of Cincinnati — Axions are elementary particles, which have zero spin and obey Bose statistics, that have been postulated to solve the strong CP problem in quantum chromodynamics, the theory of strong interactions. Furthermore, string theory suggests existence of ultralight axion (ULA) particles with mass of $m = 10^{-22}\ eV$. At low temperatures bosons condense in the same energy state and form Bose-Einstein Condensates (BECs), which can become gravitationally bound. It has been proposed that axions may comprise the majority of dark matter. Previous studies have postulated ULAs form condensates the size of a galaxy. We analyze the stability of galactic-sized axion BECs under gravitational perturbations, as well as the dynamics of a collapse from dilute configurations to dense ones. Additionally, we consider the possibility that these BECs are non-spherical, and account for the gravitational influence of baryonic matter on the axion condensate. Finally, we estimate the lifetime of a dense BEC, and the rate of potential decay processes of this state.

Madelyn Leembruggen
University of Cincinnati

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