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Stellar Heating Induced by ULDM Halos

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Ultralight Dark Matter (ULDM) has emerged as a compelling alternative to the Cold Dark Matter paradigm at small scales, naturally producing solitonic cores at the center of halos and granular structures arising from wave interference. These features lead to distinctive dynamical effects, including the random motion of the core and dynamical heating of stars in galactic systems. In this work we explore dynamical heating in the context of spin-s ULDM models, which predict broader solitonic cores and modified transition radii compared to the scalar case. We discuss how interference, subhalo encounters, and wavelets inject kinetic energy into stellar populations, driving observable signatures such as size–age relations in dwarf galaxies and thickening of galactic discs. At large scales, spin-s ULDM converges to the standard ΛCDM behavior, preserving cosmological consistency while offering testable predictions at galactic scales. Our results highlight the importance of stellar dynamics as a probe of the ULDM framework and its higher-spin generalizations.

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