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Quantum-Coherence on Galactic Scales: New Prospects for Constraining Ultra-Light Particle Dark Matter TANJA RINDLER-DALLER, Dep. of Astronomy, The University of Texas at Austin — Various extensions of the standard model of particle physics predict generically the existence of ultra-light bosonic particles with masses ranging from the usual QCD axion down to 10^{-33} eV/c^2. These particles form a large-scale Bose-Einstein condensate (BEC) within a substantial part of the particle parameter space, and are plausible candidates for part or all of the cold dark matter (CDM) in the universe. While particles in the smallest mass range may leave their imprints only on cosmological scales, there is an interesting mass window between around 10^{-25} - 10^{-18} eV/c^2 for which particles can affect halo structures on the scales of massive to dwarf galaxies in a characteristic way. Thereby, this alternative class of dark matter models may not only resolve the shortcomings of standard CDM on those scales, but also provides a means to constrain those models using astronomical observations of galactic dynamics. We will present an overview of the signatures expected, including our own work on the formation of vortices and their effects in rotating BEC halos.

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