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Vortice Classification in Ultra-light Dark Matter Halos

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Due to the coherent behavior of ultra-light dark matter (ULDM), in the central region of the dark matter halos, solitonic cores can form and change the small-scales predictions of the ΛCDM model. Analogously to the condensed matter systems, a rotating condensate halo can form defects with important observational consequences. These defects were observed numerically; however, a theoretical description that reproduces all the simulation features is lacking. In this talk, I discuss a classification of the vortices and their dynamics in superfluid/Bose-Einstein condensate halos. We identify topological defects in the supefluid condensate using standard Quantum Field Theory tools and consider the existence of BEC vortices formed outside the condensate by destructive interference patterns. We rely on solving the Gross-Pitaevskii-Poisson system for a self-interacting ULDM, and present simulations in a controlled environment to show the general structure of the vortices system.

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