

Gravitational Dynamics of Wave Dark Matter

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Intense EM field can yield an effective attraction force in the plasma. A local attractive force, such as one described by the Gross-Pitaevskii equation, can often lead to disruptive instability. I present our investigations on a non-local attraction force described by the Schroedinger-Poisson equation for a Bose-Einstein Condensate dark matter (DM) model aiming at solving the sub-galactic scale problems [1]. Here the cosmic structure formation history is a dynamical process in developing quantum turbulence mediated by self-gravity. Through high-resolution simulations, we demonstrate the existence of a very high density stable soliton as the ground state, spatially located at the center of every galaxy and surrounded by excited states forming an extended fluctuating DM halo that hosts the visible galaxy [2]. A similar gravitational effect has been realized in a BEC experiment that polarizes cold atoms off-resonance by a near-field laser [3]. It remains to be seen whether such an exotic system can be realized in plasmas.

References:

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