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Unified Superfluid Dark Sector

Thursday 5 September 2019 14:30 (25 minutes)

In this talk I present a novel model of a unified dark sector, where late-time cosmic acceleration emerges from the dark matter superfluid framework. We will start by reviewing the dark matter superfluid model and show how it describes the dynamics of dark matter in large and small scales. Then we will show that if the superfluid consists of a mixture of two distinguishable states with a small energy gap, such as the ground state and an excited state of dark matter, interacting through a contact interaction a new dynamics of late-time accelerated expansion emerges in this system, without the need of dark energy, coming from a universe containing only this two-state DM superfluid. I will show the expansion history and growth of linear perturbations, and show that the difference in the predicted growth rate in comparison to ΛCDM is significant at late times. The present theory nicely complements the recent proposal of dark matter superfluidity to explain the empirical success of MOdified Newtonian Dynamics (MOND) on galactic scales, thus offering a unified framework for dark matter, dark energy, and MOND phenomenology.

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