

The Cosmology and Astrophysics of Dark Complexity

Thursday, 16 February 2023 19:15 (30 minutes)

Simple hidden sector theories can give rise to interacting dark matter involving multiple particle species and long-range interactions, such as atomic dark matter. These scenarios are highly plausible in their own right, but can be particularly motivated by modern solutions to the Hierarchy Problem such as the Twin Higgs. These dark matter models feature dissipative dynamics and bound state formation, giving rise to complex dynamics at all scales which is only now being explored in detail. I will outline the variety of exciting new astrophysical and cosmological signals that could be generated by such scenarios: formation of mirror stars and their signals in optical, X-ray, gravitational lensing or gravitational wave observations; direct detection of atomic dark matter with dark plasma screening effects in terrestrial experiments or stellar cooling; signals in precision cosmological observables; and combining full MHD N-body simulations of atomic dark matter with measurements of galactic structure to determine the forces active in the dark sector.

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