

Probing Ultralight Dark Matter using Galactic Kinematics

Tuesday, 3 December 2019 16:30 (20 minutes)

Dark matter candidates exist over a mass range spanning greater than 70 orders of magnitude. At one end of this spectrum, Ultralight Dark Matter (ULDM) posits particles so light that their de Broglie wavelength can be as large as several kpc, giving rise to gravitational dynamics that can be very different from models with heavier candidates. Examples of such dynamics include dynamical heating of stellar populations through fluctuation of the wave-like ULDM field, and formation of a large central soliton in galaxies (predicted by ULDM simulations). In this talk, I will show how existing kinematic data in galaxies can probe several orders of magnitude in ULDM parameter space. The resulting constraints hold even in the absence of any non-gravitational coupling of dark matter to the Standard Model, potentially closing part of the 70 order-of-magnitude window in a model-independent way.

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Session Classification: Parallel

Track Classification: Dark matter