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The core-halo relation in the Scalar Field Dark Matter model

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Scalar field dark matter (SFDM) is an alternative candidate to standard dark matter models, gaining attention due to the unique effects associated with its ultra-light mass. While its dynamics have been extensively studied across different scales, its full phenomenology remains under active investigation. In particular, the role of self-interactions and their impact on structure formation are still open questions. In this talk, I will explore the effects of both attractive and repulsive self-interactions in SFDM, with a focus on the evolution of the mass fraction and the core-halo relation. I will discuss analytical models proposed in the literature to describe dark matter halo cores and compare them with results from three-dimensional simulations. These findings will provide a basis for establishing comparisons between theoretical predictions and observational data, allowing us to impose constraints on the self-interaction term.

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