

Unified model for particles and condensate Dark Matter: The role of self-interaction

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We present from first principles, under the Schwinger-Keldysh path integral formalism, equations for bosonic, non-relativistic and self-interacting dark matter which can include both a condensed, low momentum “fuzzy” component and one with higher momenta that may be approximated as a collection of particles. The equations can describe both CDM and Fuzzy Dark Matter in a unified way and it can reduce to the limit of known equations in cold atom physics in absence of gravity. We show that self-interaction plays an important role in the growth of the condensate and initial generation with the presence of stochastic noise terms.

We also present the linear regime of this mixed model and we show how the existence of these two components and the interaction between the condensate and particles can bypass Lyman alpha forest bounds for Fuzzy Dark Matter.

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