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Numerical study of the 1D Schrödinger-Poison equation for Ultralight Cold Dark Matter

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The large scale structures on the universe are best described by the cold dark matter model which only fails on sub-galaxy scales known as the small scale crisis. There has been a recently proposed model of dark matter, where cold dark matter is modeled by a complex scalar field, which follows a Schrödinger equation with a non-linear potential which satisfies a Poisson equation. This Schrödinger-Poisson equation (SP-equation) approximates the results of the standard cold dark matter model on large scales and, on small scales, exhibits some properties that could help to solve some problems on the small scale crisis. We propose an approach for the numerical integration of the SP equation in 1D, where we combine a matrix representation in a B-splines basis with the a Crank-Nicholson time-evolution integrator. As preliminary results we present the Husimi distributions obtained with in this approach. We also performed evolution of cosmological initial conditions under different box sizes where we found a good agreement with linear perturbation theory.

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