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# Testing the mean field description of scalar field dark matter

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The nature of dark matter, one of the major components of the cosmic standard model, remains one of the outstanding problems in physics. One interesting model is scalar field dark matter (SFDM), which fits naturally into observations in both particle physics and cosmology. Simulations and calculations using SFDM often use a classical field approximation (MFT) of the underlying quantum field theory. And while it is suspected that large occupation numbers make this description good in the early universe, it is possible that this approximation fails during nonlinear structure growth and begins to admit important quantum corrections. To investigate this possibility, we compare simulations using the MFT to those that take into account these corrections. By studying their behavior as we scale the total number of particles in the system we can estimate how long the MFT remains an accurate description of the system. We estimate this time scale for a typical halo may be of order ˜1 Gyr, short compared to the age of the universe. In this talk we will explain how these simulations are performed, as well as their results, and their potential implications.

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