Abstract Submitted
for the APR21 Meeting of
The American Physical Society

The Core-Envelope Structure of Halos in Scalar Field Dark Matter with Repulsive Self-Interaction[1] TAHA DAWOODBHOY, PAUL SHAPIRO, University of Texas at Austin, TANJA RINDLER-DALLER, University of Vienna — Scalar Field Dark Matter (SFDM) comprised of ultralight ($>\tilde{}10^{-22}$ eV) bosons was proposed as an alternative to standard Cold Dark Matter (CDM) because of its novel structure-formation dynamics as a Bose-Einstein condensate and quantum superfluid, described by the Gross-Pitaevski and Poisson equations. In the free-field ("fuzzy") limit of SFDM (FDM), structure is inhibited below the de Broglie wavelength, $\lambda_{\rm deB}$, but resembles CDM on larger scales. Virialized haloes have solitonic cores of radius $\tilde{}\lambda_{\rm deB}$, surrounded by CDM-like envelopes. When a strong enough repulsive self-interaction (SI) is also present, structure can be inhibited below a second length scale, $\lambda_{\rm SI}$, with $\lambda_{\rm SI} > \lambda_{\rm deB}$ – the Thomas-Fermi (TF) regime. Structure formation in the TF regime differs significantly from FDM. We present new results for the internal structure of haloes that form from gravitational instability in the TF regime, including comparison with rotation curves of dwarf galaxies in the local universe. The cosmological context and large-scale structure formation for this model will be discussed in a second talk to follow.

[1]Supported by a National Science Foundation Graduate Research Fellowship

Taha Dawoodbhoy
University of Texas at Austin

Date submitted: 08 Jan 2021 Electronic form version 1.4