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Cosmological Structure Formation in Scalar Field Dark Matter with Repulsive Self-Interaction[1] PAUL SHAPIRO, TAHA DAWOODBHOY, University of Texas at Austin — 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. Our first talk discussed the internal structure of haloes that form from gravitational instability in the TF regime. Here we revisit this in the context of halo and large-scale structure formation from cosmological perturbations, including observational constraints.

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