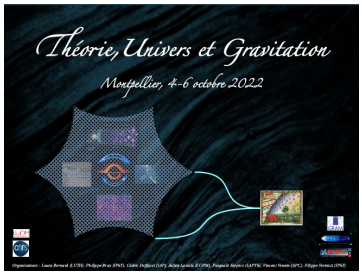

ID de Contribution: **13** Type: **Non spécifié**

Self-similar solutions for Fuzzy Dark Matter

jeudi 6 octobre 2022 14:10 (25 minutes)

Fuzzy Dark Matter (FDM) models admit self-similar solutions which are very different from their Cold Dark Matter (CDM) counterparts and do not converge to the latter in the semiclassical limit. In contrast with the familiar CDM hierarchical collapse, they correspond to an inverse-hierarchy blow-up. Constant-mass shells start in the nonlinear regime, at early times, with small radii and high densities, and expand to reach at late times the Hubble flow, up to small linear perturbations. Thus, larger masses become linear first. This blow-up approximately follows the Hubble expansion, so that the central density contrast remains constant with time, although the width of the self-similar profile shrinks in comoving coordinates. As in a gravitational cooling process, matter is ejected from the central peaks through successive clumps. As in wave systems, the velocities of the geometrical structures and of the matter do not coincide, and matter slowly moves from one clump to the next, with intermittent velocity bursts at the transitions. These features are best observed using the density-velocity representation of the nonrelativistic scalar field, or the mass-shell trajectories, than with the Husimi phase-space distribution, where an analogue of the Heisenberg uncertainty principle blurs the resolution in the position or velocity direction. These behaviours are due to the quantum pressure and the wavelike properties of the Schrödinger equation. Although the latter has been used as an alternative to N-body simulations for CDM, these self-similar solutions show that the semiclassical limit needs to be handled with care.

Auteurs principaux: VALAGEAS, Patrick (CEA Saclay); GALAZO-GARCIA, Raquel (IPhT - CEA); BRAX, philippe (IPHT Saclay)

Orateur: GALAZO-GARCIA, Raquel (IPhT - CEA)