MAGIC

Science of the Cosmos

Contribution ID: **28** Type: **not specified**

Fermionic dark matter & galactic structure

The nature of dark matter (DM) is one of the most relevant questions in modern astrophysics. I will present a brief overview of recent results that inquire into a possible fermionic quantum nature of the DM particles, focusing mainly on the interconnection between the microphysics of the neutral fermions and the macro-physical structure of galactic halos. I will show how such an interconnection when analyzed through a first principle physics model based on statistical mechanics and thermodynamics of self-gravitating fermions, leads to a richer core-halo structure for the DM halos than the one obtained from N-body simulations. I will dis-cuss the many distinct applications of such a fermionic model both on halo scales -including morphology constraints from rotation curves and stellar streams- all the way to galaxy center scales -including the case of SgrA* and supermassive BH formation-. In particular I will highlight the possibility that the Milky way, as well as low luminosity AGNs, harbor a dense DM fermion-core at their centers instead of a supermassive black hole.

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