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Dissipative dark matter

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Dissipative dark matter is a simple alternative to the concordance ΛCDM model, which could open new perspectives to address some of the outstanding problems of the collisionless cold dark matter paradigm. The prototype for such model features a hidden sector charged where dissipative self-interactions mediated by a massless dark photon. On large scales the model reproduces the successful predictions of ΛCDM, whereas the dynamics on smaller scales are quite different. In the case of spiral galaxies, the dark matter halo consists of a dissipative plasma which is in a steady-state configuration: the energy lost due to dissipative interactions is replaced by energy produced by supernovae, transferred to the dark sector via kinetic mixing induced interactions. The nontrivial dynamics closely tie dark matter and baryons within galaxies and provide a dynamical explanation for several structural features: the core-cusp problem, the Tully-Fisher relation, the constant halo surface density, and the tight correlation between halo core radius and disk scale length.

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