# Self-interacting dipolar boson stars and their dynamics

Nuno Santos*[1,2], Carlos Herdeiro[2], Eugen Radu[2], Miguel Zilhão[2], and Pedro Ildefonso[3]

[1]Instituto Superior Técnico – Portugal
[2]Universidade de Aveiro – Portugal
[3]Institute of Theoretical Physics [Innsbruck] – Austria

**Abstract**

We construct and dynamically evolve dipolar, self-interacting scalar boson stars in a model with sextic (+ quartic) self-interactions. The parameter space of such dipolar Q-stars is similar to that of fundamental monopolar stars of the same model. For the latter, it is structured in Newtonian and relativistic branches, wherein perturbatively stable solutions exist, connected by a middle unstable branch. Our nonlinear evolutions support similar dynamical properties of the dipolar Q-stars, which: 1) in the Newtonian and relativistic branches, are dynamically robust over time scales longer than those for which dipolar stars without self-interactions are seen to decay; 2) in the middle branch, migrate to either the Newtonian or the relativistic branch; 3) beyond the relativistic branch, decay to black holes. Overall, these results strengthen the observation that self-interactions can mitigate dynamical instabilities of scalar boson star models.

*Speaker