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Title: Evolution of Dipolar Boson Stars and Head-on Collisions of Spherical Boson Stars

Abstract: We probe the hypothesis of forming static dipolar like configurations of boson stars (BSs) from the head-on collision of two spherical BSs with opposite phases. We perform non-linear numerical simulations of psherical BSs in a model without self-interactions (mini-BSs) and show that the instabilities created during the collision lead to the gravitational collapse to a black hole (BH); however, by introducing fourth and sixth order self-interacting terms in the scalar potential (Q-stars), we show that the binary is robust enough to withstand the perturbations. These results support the healing power of self-interactions and provide a potential candidate mechanism for the formation of dipolar BSs. With this in mind, we study the dynamical stability of dipolar BSs in the model of Q-stars(doublet Q-stars). We show the existence of two (candidate) stable branches: the relativistic stable branch (for scalar field frequencies near the lower limit) and the Newtonian stable branch (for scalar field frequencies near the maximum value). Solutions outside of these branches show a migrating behaviour, whose final destiny still requires further investigation.