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Some astrophysical properties of compact object solutions in the Generalized SU(2) Proca theory

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In this work, we studied some compact object solutions in the Generalized SU(2) Proca theory. This modified gravity model is a vector-tensor theory whose action is invariant under global transformations of the SU(2) group and includes second-order derivative self-interactions of the vector field beyond the massive Yang- Mills theory. First, we studied two Lagrangian pieces consisting of four gauge fields minimally coupled to metric tensor. These pieces give rise to an exact Reissner-Nordstrom black hole solution endowed with two different non-Abelian effective charges that depend on the free parameters of the theory. We analyzed the spacetime structure and found the parameter space that preserves the weak cosmic censorship conjecture. The joint analysis of observations of the EHT's first images of Sagittarius A* of our Galaxy and the Keck telescope set the first constraint on the free parameters of the theory beyond the theoretical bounds found. Also, we present some numerical solutions in the Generalized SU(2) Proca theory which describes a spherical and static black hole. We constructed equilibrium sequences and studied some thermodynamic properties. Finally, we studied the effective potential of soliton solutions in the Generalized SU(2) Proca theory. These objects are compact enough to generate a photon sphere making them black hole mimickers.

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