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Particle-like solutions in the generalized SU(2) Proca theory

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The generalized SU(2) Proca theory is a vector-tensor modified gravity theory where the action is invariant under both diffeomorphisms and global internal transformations of the SU(2) group. This work constitutes the first approach to investigate the physical properties of the theory at astrophysical scales. We have found solutions that naturally generalize the particle-like solutions of the Einstein-Yang-Mills equations, also known as gauge boson stars. Under the requirement that the solutions must be static, asymptotically flat, and globally regular, the t'Hooft-Polyakov magnetic monopole configuration for the vector field rises as one viable possibility. The solutions have been obtained analytically through asymptotic expansions and numerically by solving the boundary value problem. We have found new features in the solutions such as regions with negative effective energy density and imaginary effective charge. We have also obtained a new kind of globally charged solutions for some region in the parameter space of the theory. Furthermore, we have constructed equilibrium sequences and found turning points in some cases. These results hint towards the existence of stable solutions which are absent in the Einstein-Yang-Mills case.

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