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Wormhole Formations in the Galactic Halos Supported by Dark Matter Models and Global Monopole Charge within $f(Q)$ Gravity

Moreshwar Tayde^()*

moreshwartayde@gmail.com

Sahoo P.K.

Birla Institute of Technology and Science, Pilani, Hyderabad Campus, India

Abstract. This paper discusses the possibility of traversable wormholes in the galactic region supported by dark matter (DM) models and global monopole charge in the context of $f(Q)$ gravity. To understand the features of the wormholes, we comprehensively studied wormhole solutions with various redshift functions under different $f(Q)$ models. We obtained wormhole shape functions for Pseudo Isothermal and Navarro-Frenk-White DM profiles under linear $f(Q)$ gravity. In contrast, we employed an embedding class-I approach for the non-linear $f(Q)$ models to investigate wormholes. We noticed that our obtained shape functions satisfy the flare-out conditions under an asymptotic background for each DM profile. Moreover, we checked the energy conditions at the wormhole throat with a radius r_0 and noticed the influences of the global monopole's parameter η in the violation of energy conditions, especially null energy conditions. Further, for the non-linear case, we observed that wormhole solutions could not exist for $f(Q) = Q + mQ^n$ and $f(Q) = Q + \frac{\beta}{Q}$ under embedding class I approach. Finally, we study the amount of exotic matter via the volume integral quantifier technique for the linear $f(Q)$ model, and we confirm that a small amount of exotic matter is required to sustain the traversable wormholes.