



Reissner–Nordström spacetimes in torsion modified gravity: isometries and perihelion precession

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Abstract

We analyze the orbits of a unit mass body in a background Reissner–Nordström (RN) black hole in $d=(3+1)$ from the perspectives of Geometric Torsion (GT) modified gravity theory in $(4+1)$ dimensional bulk. A 4-form flux in bulk GT theory in $d=(4+1)$ has been shown to ensure a mass dipole correction to the $(3+1)$ dimensional gravity theory by Gupta, Kar and Rang recently. We argue that the dipole correction contributes topologically to the known exact geometries in General Theory of Relativity (GTR). Furthermore, the topological correction has been identified with non-Newtonian potential underlying a $B_2 \wedge F_2$ coupling term to Einstein–Hilbert action. The winding numbers ensured by the BF coupling to $d=(3+1)$ action in the framework presumably provide a clue towards a tunneling instanton in theory.

Keywords Killing symmetries · General relativity · Higher dimensional gauge theory · Geometric torsion · Perihelion precession

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