Dirac particles on curved spaces and quantum anomalies for generalized Euclidean Taub-NUT metrics

Mihai Visinescu[*]

Department of Theoretical Physics,
National Institute for Physics and Nuclear Engineering
P.O.Box M.G.-6, Magurele, Bucharest, Romania

ABSTRACT

We review the geodesic motion of pseudo-classical spinning particles in curved spaces. Investigating the generalized Killing equations for spinning spaces, we express the constants of motion in terms of Killing-Yano tensors. Passing from the spinning spaces to the Dirac equation in curved backgrounds we point out the role of the Killing-Yano tensors in the construction of the Dirac-type operators. The general results are applied to the case of the four-dimensional Euclidean Taub-Newman-Unti-Tamburino space. Finally the gravitational and axial anomalies are investigated for generalized Euclidean Taub-NUT metrics which admit hidden symmetries analogous to the Runge-Lenz vector of the Kepler-type problem.

[*] E-mail: mvisin@theory.nipne.ro