Qeios

Peer Review

Review of: "Classical Characters of Spinor Fields in Torsion Gravity"

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The paper explores an important problem: deriving the **Mathisson-Papapetrou-Dixon (MPD) equations** from the Dirac equation within a torsion gravity framework. The author introduces the polar form of spinor fields and re-expresses the dynamics of relativistic quantum mechanics in a form akin to classical hydrodynamics, offering insights into spinor-torsion coupling. This is a valuable theoretical investigation that contributes to the understanding of quantum spinor dynamics in curved spacetime with torsion.

Major Comments

1. The introduction of polar decomposition for the spinor field is mathematically elegant. However, the **physical meaning** of variables like the chiral angle β\beta and density ϕ\phi is not explicitly discussed. For example:

- How do these variables correspond to measurable physical quantities?
- What role do they play in the coupling between spin and torsion?

Including a brief interpretation or example would enhance the reader's understanding of the formalism.

2. While the mathematics is clear, some sections are dense and may benefit from additional explanations:

- Equations (35-37): Could the physical role of the space-time tensorial connection $G_{\mu\nu}$ be explained more intuitively?
- Section III (Plane Waves): The argument leading to the trivialization could be expanded step-by-step to ensure clarity for readers unfamiliar with these assumptions.

Minor Comments

Abstract: The abstract mentions that the MPD equations “reduce to be trivial.” Consider rephrasing this to highlight the mathematical conditions leading to this result and its implications.

Typographical Errors:

- Page 3, Eq. (5): Ensure consistency of indices notation.
- Page 6, after Eq. (52): A minor typo appears in "torsionfull Riemann curvature."

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Declarations

Potential competing interests: No potential competing interests to declare.