[original insight]

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Negative mass as a source of gravity

Open Physics Collaboration^{*†}

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Abstract

We propose that negative mass can be the source of gravity in the quantum vacuum.

keywords: negative mass, curvature, vacuum, quantum gravity

The most updated version of this paper is available at

<https://osf.io/k4gtz/download>

Source of negative curvature

1. Positive mass/energy curves spacetime [1].
2. Negative mass/energy curves spacetime.
3. Curvature is due to sources of gravity (matter/energy).
4. Suppose the vacuum state of our universe is described by Anti-de Sitter space (AdS) [2].
5. AdS has negative curvature.

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^{*}All authors with their affiliations appear at the end of this paper.

[†]Corresponding author: mplobo@uft.edu.br | Join the Open Physics Collaboration

6. So, according to (4) and (5), our spacetime has negative curvature.
7. If the curvature is negative, then a source of negative mass/energy is fulfilling our universe.
8. The source (7) is provided by quantum mechanics, that is, the quantum properties of spacetime (vacuum).

Mass entanglement

9. Conjecture: positive mass is entangled with negative mass.
10. Let
  - (a) $|q\rangle$ = quantum vacuum state
  - (b) $|+\rangle / |-\rangle$ = state of positive/negative energy
  - (c) m_+/m_- = amplitude of the positive/negative mass
11. $|q\rangle = m_+ |+\rangle + m_- |-\rangle$
12. Breaking the entanglement (11) leads to free negative energy [3].

Final Remarks

13. Classical vacuum states might be the result of quantum phenomena, such as: spacetime pouring [3], Hawking radiation applied to ordinary matter [4], dark matter [5], and other effects [6].

Open Invitation

*Review, add content, and **co-author** this paper [7, 8]. Join the **Open Physics Collaboration**. Send your contribution to mplobo@uft.edu.br.*

Ethical conduct of research

This original work was pre-registered under the OSF Preprints [9], please cite it accordingly [10]. This will ensure that researches are conducted with integrity and intellectual honesty at all times and by all means.

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The Open Physics Collaboration

Matheus Pereira Lobo (lead author, mplobo@uft.edu.br),¹

David Adjei²

¹Federal University of Tocantins (Brazil); ²Kwame Nkrumah University of Science and Technology (Ghana)