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REVIEWER'S REPORT

Manuscript No.: IJAR-54074

Title: The Anti-Higgs Postulate: A Constrained Framework for Higgs-Sector Mediated Negative Energy Density and the Ψ Parameter

Recommendation:

Accept as it is .....

Accept after minor revision.....✓

Accept after major revision .....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality	✓			
Techn. Quality		✓		
Clarity		✓		
Significance	✓			

Revisions should address the discussion of experimental/phenomenological prospects and further justify simplifying assumptions, as well as improve clarity in a few overly technical passages.

Reviewer Name: Dr. Hitesh K Solanki **Date:** 27/09/2025

Detailed Reviewer's Report

Summary:

The paper presents the "Anti-Higgs Postulate," a theoretical hypothesis according to which the Standard Model Higgs sector may display localized negative energy density configurations, or "Anti-Higgs states," in the presence of Beyond Standard Model (BSM) interactions or under extreme circumstances. The conditions are mathematically defined, a toy model Lagrangian is provided, quantum inequality constraints are applied, and consequences for early-universe cosmology and quantum field theory are discussed. A brief discussion is given of the phenomenological implications and observational opportunities, pointing out that experimental detection is probably beyond current capabilities. The theoretical reason is connected to more general problems about vacuum energy, negative-energy phenomena (e.g., warp drive, wormholes), and the construction of cosmic structures in quantum field theory.

Principal Advantages:

The framework, which tackles a fundamental issue in field theory and cosmology, is innovative and thought-provoking.

With meticulous dimensional analysis, strong field theory reasoning, and explicit quantum inequality constraints, the theoretical analysis is mathematically solid.

The importance of the paper is extended beyond particle physics by the meticulous discussion of connections to semiclassical gravity and the possibility of Planck-scale phenomena.

Principal Weaknesses:

It is recognized that the analysis has very little experimental testability and is purely speculative, remaining a "toy" theoretical model.

The brief explanation of observable repercussions might be extended, particularly with relation to links to current or upcoming experimental initiatives.

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Several simplifying assumptions (such as parameter selections and localized Gaussian solutions) are made in the manuscript without being fully justified for their uniqueness or generality.

Uniqueness
The suggestion is novel because it delves into previously uncharted ground regarding the Higgs sector's behavior under harsh environments. It combines concepts from BSM phenomenology and vacuum energy studies in a novel way.

Technical Excellence:
With proper attention to detail in Lagrangian modeling and quantum field limitations, the technical work is often of excellent quality. The technological framework would be strengthened, nevertheless, by further interaction with rival models and current research.

Clarity
Although there are a few more technical passages that could use further explanation or examples, the text is generally comprehensible. In general, there is a strong logical flow from inspiration to theoretical modeling and cosmological implications.

Importance
The study is important as a contribution to theoretical discussion of quantum field energy, gravity, and BSM scenarios, even though the model's speculative and currently untestable character makes it of low immediate practical value.