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Book Name:	Current Research Progress in Physical Science
Manuscript Number:	Ms_BPR_4040
Title of the Manuscript:	An explanation and some experiments of Solving the neutron lifetime puzzle via non standard neutrino interactions
Type of the Article	Book chapter

PART 1: Comments

	Reviewer's comment	Author's Feedback <i>(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)</i>
Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.	The manuscript proposes a new approach to address the neutron decay anomaly. The 10- second discrepancy arising due to the difference in the reported neutron lifetime values of 887s and 877s remains unresolved, but researchers are improving experimental setups to reduce systematic uncertainties. This paper shows a light to solve the puzzle which could be important in scientific community for further investigation.	
Is the title of the article suitable? (If not please suggest an alternative title)	The title of the article is well structured and acceptable.	
Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here.	Abstract of the article is comprehensive.	
Is the manuscript scientifically, correct? Please write here.	The manuscript is scientifically up to the standard.	
Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form. :	The references cited by the author provide a broad overview of neutron decay anomalies, experimental measurements, and related theoretical models. The inclusion of [1], [6], and [9] is commendable, as they directly address the neutron lifetime discrepancy and mirror matter hypotheses. Furthermore, references like [7] and [8] appropriately connect the discussion to the inverse Quantum Zeno Effect (RQZE), which is relevant to the proposed mechanism. However, some foundational works and broader reviews on neutron decay and quantum Zeno dynamics, such as Misra & Sudarshan (1977) or Dubbers & Schmidt (2011), could strengthen the theoretical framework. Additionally, references on neutrino interactions (e.g., Dolgov, 2002) and alternative dark matter models (e.g., Foot, 2014) could provide further context and support for the discussion on neutrino backgrounds and mirror matter theories. In summary, while the references cited are appropriate and mostly comprehensive, the inclusion of a few seminal works and reviews would enhance the depth and rigor of the cited literature.	
Is the language/English quality of the article suitable for scholarly communications?	Language is suitable for scholarly communication with few typo to be rectified.	
<u>Optional/General</u> comments	The manuscript guides a novel mechanism involving a neutrino background interacting with an axial force to address the neutron decay anomaly. While the concept is impressing and has potential implications, the presentation may be improved in several key areas. Specific assumptions, theoretical justifications, and numerical calculations need to be elaborated and cross-validated with existing physical principles and experimental data. Findings: 1. Neutrino Background and Charge Neutrality: • The authors assume that mechanical stability of matter is maintained by a background of	

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	<p>neutrinos ensuring charge neutrality over a force range. This concept is unconventional.</p> <ul style="list-style-type: none"> • Provide a stronger theoretical foundation or references supporting this assumption. • Justify why neutrinos, rather than other particles or mechanisms, are essential for this screening. <p>2. Debye Screening Distance with Neutrinos:</p> <ul style="list-style-type: none"> • The proposed Debye screening distance of 5 nm in air and its connection to a neutrino density of $10^{17} m^{-3}$ is unclear. • Traditional Debye screening involves charged particles, not neutrinos. Clarify how this screening mechanism is derived and whether it aligns with known physical principles. <p>3. Neutron Decay Rate and Energy Dependence:</p> <ul style="list-style-type: none"> • The manuscript suggests that high-energy neutrons decay slower due to reduced interactions with neutrinos. This is an interesting hypothesis, but further clarity is needed: <ul style="list-style-type: none"> • Provide references or data supporting this energy dependence. • Explain the "asymptotic screening" mechanism in greater detail. <p>4. Characteristics of the New Force:</p> <ul style="list-style-type: none"> • The proposed force is described as having a nanometer range and dependence on neutron spin and polarization. <ul style="list-style-type: none"> • Elaborate on the nature of this force (e.g., gauge boson properties, mass, coupling constants). • Discuss its compatibility with existing constraints on new forces from experimental and observational studies. <p>Reverse Quantum Zeno Effect (RQZE) and Neutron Decay: The manuscript suggests that a reverse Quantum Zeno effect (RQZE), mediated by interactions with a neutrino background and an axial force, may explain the neutron decay anomaly. While implementing, this claim raises several questions:</p> <ol style="list-style-type: none"> 1. Theoretical Justification: Provide a more detailed theoretical framework explaining how the RQZE mechanism operates in the context of neutron decay. Specifically, clarify how frequent interactions with the neutrino background could accelerate decay rates. 2. Compatibility with Observation : Quantitatively demonstrate how the proposed RQZE mechanism leads to the observed neutron lifetimes (877 s vs. 887 s). Are the interaction timescales and rates consistent with the proposed hypothesis? 3. Consistency with the Standard Model: Explain how this mechanism integrates with or modifies the weak interaction processes responsible for neutron decay in the Standard Model. <p>Without addressing these points, the RQZE claim risks appearing speculative rather than grounded in rigorous physics. Strengthening this section will significantly enhance the manuscript's credibility. Finally, I recommend that the paper may be published in the relevant journal with revisions as mentioned.</p>	
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PART 2:

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Are there ethical issues in this manuscript?	<i>(If yes, Kindly please write down the ethical issues here in details)</i>	

Reviewer Details:

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