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Comment on "Quantum Fundamental Speed Theory: Mathematical Derivations of Dark Matter and Dark Energy from the Speed Field

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1. INTRODUCTION

The article by Aoudh [1] proposes Quantum Fundamental Speed Theory as a framework for deriving dark matter and dark energy from a speed field. Several of the article's main conclusions depend on a chain of derivations connecting a nonlinear classical field equation to a screening length, a quantum mass scale, a logarithmic dark-energy density, and consistency with observational bounds. Because these steps are central to the article's claims, their reproducibility can be tested directly from the printed equations.

This Comment addresses only technical reproducibility. It makes no allegation regarding intent or research conduct. The purpose is to identify points where the printed derivations appear not to support the stated conclusions, so that the author and journal can determine whether additional assumptions, corrected equations, or a formal correction are required. The analysis was carried out in August 2026 using the article PDF made available on the journal website.

2. MATERIALS AND METHODS

No experimental materials, human participants, animals, or new observational datasets are involved. The method is a direct analytical check of selected equations in [1]. First, the nonlinear scalar field equation printed as Eq. (24) is expanded around the background used implicitly in the article's screening argument. Second, the logarithmic potential printed as Eq. (10) is expanded by Taylor series around the field value stated in Sec. 9 and Appendix F. Third, the SI units of the dark-energy prefactor are evaluated explicitly. Fourth, the article's predicted quantum mass is compared with the lower-bound interpretation of observational constraints listed in the article's Table 2. Equations in this Comment are numbered independently of those in the original article.

3. RESULTS AND DISCUSSION

3.1. LINEARIZATION ABOUT A NON-SOLUTION

The scalar radial equation printed in Eq. (24) of [1] is

$$\frac{d^2\tilde{v}}{d\xi^2} + \frac{2}{\xi}\frac{d\tilde{v}}{d\xi} = \beta_{\text{eff}}\tilde{v}^3, \tag{1}$$

with $\beta_{\text{eff}} > 0$. The article then uses a Helmholtz-type linearized equation to define the screening scale and quantum mass. For such a linearization to be homogeneous about a constant background, the background must satisfy the zeroth-order field equation. If the expansion used in the article is written as

$$\tilde{v} = 1 + \phi, \qquad |\phi| \ll 1, \tag{2}$$

then Eq. Eq. (1) gives

$$\nabla^2\phi = \beta_{\text{eff}}(1+\phi)^3 = \beta_{\text{eff}} + 3\beta_{\text{eff}}\phi + 3\beta_{\text{eff}}\phi^2 + \beta_{\text{eff}}\phi^3. \tag{3}$$

The constant term β_{eff} is nonzero. Therefore $\tilde{v} = 1$ is not a source-free solution of Eq. Eq. (1). In the linear regime $|\phi| \ll 1$, the omitted constant term is not negligible relative to the retained term $3\beta_{\text{eff}}\phi$; indeed, it is larger than the retained term when $|\phi| < 1/3$. The only constant solution of Eq. Eq. (1) is $\tilde{v} = 0$, and linearization about $\tilde{v} = 0$ gives $\nabla^2\phi = 0$ rather than a massive Helmholtz equation.

This issue is load-bearing because the screening length and the relation $m = \hbar/(c\lambda_{\text{screen}})$ depend on the Helmholtz form. If the printed nonlinear equation is correct, the derivation requires an additional background source, subtraction, vacuum condition, or corrected field equation. Without such an additional step, the stated screening length and quantum mass do not follow from Eq. Eq. (1).

3.2. Taylor expansion of the logarithmic potential

The article defines the logarithmic potential as

$$V(\tilde{v}) = -V_0 \ln\left(1 + \frac{\tilde{v}^2}{v_0^2}\right). \tag{4}$$

It later states that expansion around $\tilde{v} = 1 + \phi$ gives a series containing a quadratic coefficient proportional to V_0/v_0^2 and a quartic coefficient proportional to $-V_0/(2v_0^4)$. Direct Taylor expansion of Eq. Eq. (4) about $\tilde{v} = 1 + \phi$ gives a different result. Writing $a = v_0^2$, the expansion is

$$V(1+\phi) = V(1) - \frac{2V_0}{1+a}\phi + \frac{V_0(1-a)}{(1+a)^2}\phi^2 + \frac{2V_0(3a-1)}{3(1+a)^3}\phi^3 + \frac{V_0(a^2-6a+1)}{2(1+a)^4}\phi^4 + O(\phi^5). \tag{5}$$

For the value $v_0 = 0.911 \times 10^{-3}$ printed in the article, $a \simeq 8.30 \times 10^{-7}$, so the first terms are approximately

$$V(1+\phi) = V(1) - 2V_0\phi + V_0\phi^2 - \frac{2}{3}V_0\phi^3 + \frac{1}{2}V_0\phi^4 + \cdots. \tag{6}$$

The expansion contains a nonzero linear term and does not have the printed coefficients. Since the article fixes V_0 by matching the printed quartic coefficient, the subsequent dark-energy expression inherits this algebraic problem unless a different expansion point, subtraction prescription, or potential is intended.

3.3. Energy-density and mass-density units in the dark-energy matching

The article uses the prefactor

$$C = \frac{c^4}{16\pi G L_0^2} \tag{7}$$

in the dark-energy calculation. In SI units,

$$[C] = \frac{(m\,s^{-1})^4}{(m^3\,kg^{-1}\,s^{-2})m^2} = kg\,m^{-1}s^{-2} = \mathrm{J\,m^{-3}}. \tag{8}$$

Thus C is an energy-density scale, not a mass-density scale. Numerically, for $L_0 = 3.08567758 \times 10^{20}\,\mathrm{m}$,

$$C = 25.29\,\mathrm{J\,m^{-3}}. \tag{9}$$

The article labels this value as $\mathrm{kg\,m^{-3}}$ in parts of Sec. 9 and Appendix F. This is internally inconsistent with Sec. 9.5.1, where the same prefactor is identified as an energy density, and with Appendix A, Table 6, where the dimension of ρ_Λ is listed as $ML^{-1}T^{-2}$. The observed value quoted in the article is a mass density,

$$\rho_\Lambda^{\text{obs}} = 7.0 \times 10^{-27}\,\mathrm{kg\,m^{-3}}. \tag{10}$$

For comparison with an energy-density expression, this must be converted to

$$\rho_\Lambda^{\text{obs}} c^2 = 6.29 \times 10^{-10}\,\mathrm{J\,m^{-3}}. \tag{11}$$

In addition, the expression for V_0 printed in Eq. (52) contains a factor $1/2$, whereas the subsequent numerical matching appears to omit that factor. Including it gives

$$C\,\frac{c_1 \beta_{\text{eff}} v_0^6}{2} = 7.37 \times 10^{-11}\,\mathrm{J\,m^{-3}}, \tag{12}$$

using the article's stated constants. The logarithm required by unit-consistent matching is therefore

$$\ln\left(1 + \frac{\tilde{v}_{\text{now}}^2}{v_0^2}\right) = \frac{6.29 \times 10^{-10}}{7.37 \times 10^{-11}} \simeq 8.53. \tag{13}$$

This is not the small value printed in the article. Equation Eq. (13) also invalidates the small-log approximation used in the published derivation. With the article's constants it gives $\tilde{v}_{\text{now}} \simeq 6.5 \times 10^{-2}$, not the published value 8.21×10^{-12}.

3.4. Interpretation of ultralight-dark-matter bounds

The article predicts a quantum mass

$$m = 3.88 \times 10^{-24}\,\mathrm{eV}. \tag{14}$$

It describes this mass as lying below current observational bounds. However, Table 2 of [1] lists an Ursa Major III lower bound of approximately

$$m > 8 \times 10^{-18}\,\mathrm{eV}. \tag{15}$$

If such a lower bound is applicable to the quanta considered in the article, then values below the bound are excluded rather than safe. The predicted value is lower than $8 \times 10^{-18}\,\mathrm{eV}$ by a factor of approximately 2.1×10^6, or about 6.3 orders of magnitude.

This point should be understood conditionally because the application of any particular bound on ultralight dark matter depends on the model and astrophysical assumptions. Nevertheless, the article itself compares its mass to such bounds. Under that comparison, a lower bound cannot be interpreted as unused parameter space below current sensitivity. The Lyman-α constraint is also commonly quoted as a lower bound for canonical ultralight axion or fuzzy dark matter; for example, Rogers and Peiris report $m_a > 2 \times 10^{-20}\,\mathrm{eV}$ at 95 percent confidence for canonical ultralight axion dark matter [2]. That reference value is also far above the mass predicted in the article.

4. CONCLUSIONS AND RECOMMENDATIONS

The checks above indicate that several central derivations in [1] are not reproducible from the printed equations. The screening scale and mass require a linearized Helmholtz equation, but the printed nonlinear equation is linearized about a non-solution. The logarithmic-potential expansion differs from the Taylor series of the stated potential. The dark-energy matching appears to compare an energy-density expression with a mass density, and the resulting unit-consistent calculation changes the numerical conclusion by many orders of magnitude. The observational-viability discussion appears to reverse the meaning of a quoted lower bound.

These concerns are mathematical and dimensional rather than stylistic. I respectfully recommend that the author provide a point-by-point response identifying any missing assumptions, corrected equations, or alternative derivations that resolve the issues. If the printed derivations cannot be repaired, a correction or other appropriate editorial notice may be required to maintain the reliability of the published record.

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CONFLICT OF INTEREST DECLARATION

The author declares no financial or institutional conflict of interest. This Comment is submitted in a personal capacity and is not an institutional communication.

DATA AVAILABILITY STATEMENT

No new datasets were generated or analyzed. The analysis is based on equations and numerical values printed in the published article [1].

REFERENCES

[1] R. A. M. S. Aoudh, "Quantum Fundamental Speed Theory: Mathematical Derivations of Dark Matter and Dark Energy from the Speed Field," *Sana'a University Journal of Applied Sciences and Technology*, vol. 4, no. 7, article 3446, 2026, doi: 10.59628/jast.v4i7.3446.

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