

Comment on “Amended FRW universe: thermodynamics and heat engine”

Abstract

The paper reviews the “Amended FRW Universe: Thermodynamics and Heat Engine.” We found that the framework, research methodology, and structure of this paper are identical to their previous work. The difference lies in this paper’s incorrect calculation of the apparent horizon and the Friedmann equations.

1 Comments

Recently, we authored a paper titled “Paper Mills and Research Integrity in Cosmology: Investigating P-V Phase Transitions in Massive [1].” In that paper, we discussed unethical practices in cosmological thermodynamics research. The current paper is a continuation and elaboration of that work.

As discussed in Ref [1], there are serious issues in cosmological thermodynamics research, including fraud, duplicate publication, and plagiarism. The paper we are reviewing, *Amended FRW Universe: Thermodynamics and Heat Engine [3]*, contains the same content as their previous work, *Thermodynamics of FRW Universe: Heat Engine[2]*. It is also identical to the paper titled *First Principle Study of Gravitational Pressure and Thermodynamics of FRW Universe[4]*. This constitutes a case of duplicate publication and plagiarism. Readers can compare the two papers. The primary difference is that in the first publication, all formulas are written as functions of the apparent horizon radius, while in the second, they are expressed as functions of the surface area of the apparent horizon. For example, the volume is given by

$$V_h = \frac{4}{3}\pi r_h^3 \quad (1)$$

in the first publication, but is written as

$$V_h = \frac{1}{6\sqrt{\pi}}A^{3/2}. \quad (2)$$

in the second.

Additionally, the calculation of the apparent horizon in this paper is flawed. They state:

$$r_h = \frac{a}{\sqrt{H^2 + k}}. \quad (3)$$

But it should be:

$$r_h = \frac{1}{\sqrt{H^2 + \frac{k}{a^2}}}. \quad (4)$$

Moreover, the Friedmann equations they present are also incorrect. They state:

$$\frac{H^2 + k}{a} = \frac{8\pi G}{3}\rho + \frac{\Lambda}{3}. \quad (5)$$

But it should be:

$$H^2 + \frac{k}{a^2} = \frac{8\pi G}{3}\rho + \frac{\Lambda}{3}. \quad (6)$$

Regarding the issue of errors in the formula and duplicate publication, we sent three emails to the authors requesting an explanation. Unfortunately, we received nothing in return—just silence. This reflects their attitude toward research: once the paper is published, they feel no further responsibility. These aloof, detached editors and reviewers should give this issue serious consideration.

It doesn't require much expertise, effort, or deep thinking to spot the errors in the formula; they are quite easy to see. Can the editors and reviewers really not see these problems? Or do they just choose to ignore them? Are such editors and reviewers qualified for their roles?

This is a question that everyone involved in academic research should consider. **We respect scientists not because they are inherently superior to ordinary people, but because they use science to change society. The greatest achievement of science is not just advancing social progress but also making society more just. Should those who engage in such disgraceful actions behind the scenes still be respected?**

References

- [1] Awaiting response from the arXiv team.
- [2] U. Debnath, [Phys. Lett. B **810**, 135807 \(2020\)](#), [[arXiv:gr-qc/2010.02102](#)].
- [3] J. Bhadra, U. Debnath and A. Pradhan , [The European Physical Journal C, **84**, 131 \(2024\)](#).
- [4] A. Haximjan, K. Shi-Bei, Y. Wen-Long, Zhang. Hongsheng; Hu. Ya-Peng [Journal of High Energy Physics, **12**, 168 \(2022\)](#).