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Response to "Cosmological Consequences of the Lorentz and Doppler Transformations"

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Abstract

The paper "Cosmological Consequences of the Lorentz and Doppler Transformations" by Vaclav Vavryčuk claims that the Lorentz transformation's physical interpretation is flawed and advocates for a "Doppler metric" instead of the standard Minkowski metric as a better description of spacetime distortion, an idea that contradicts the well-established foundation of Einstein's Special Relativity and is not supported by mainstream physics.

Keywords: Minkowski metric, Lorentz metric, Michelson-Morley experiment, preferred reference frame, relativistic time dilation

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Contradicts established physics: The paper claims the common physical interpretation of the Lorentz transformation is flawed, which undermines a cornerstone of modern physics, Special Relativity.

Proposes a new metric: It introduces a new "Doppler metric" as more appropriate for describing spacetime distortion, an idea that goes against the established Minkowski metric.

Misinterprets the results of the Michelson-Morley experiment: The paper's claims about how experiments like the Michelson-Morley experiment support its Doppler metric are in effect a misinterpretation of mainstream physics. The paper claims that the null result of the Michelson–Morley experiment did not fail to detect the existence of a preferred reference frame and it suggests the null result of the experiment is explained by the Doppler effect canceling out.

Advocates for a preferred reference frame: The paper and related works argue that cosmological observations, specifically the Cosmic Microwave Background (CMB) dipole anisotropy, indicate a preferred, stationary reference frame. This directly contradicts a core tenet of Special Relativity, which posits that all inertial frames are equivalent and there is no universal, preferred frame of reference. This exact claim about the frame in which CMBR dipole anisotropy is null is a preferred frame for relativity is not new, other fringe papers have claimed that before and have been refuted.

Claims resolution of several cosmological problems: The paper asserts that its reinterpretation can resolve some challenges to the standard Lambda-CDM cosmological model, including observations of supernova dimming and flat galactic rotation curves.

Here is a side by side comparison between the mainstream data and the paper claims.

Table 1.

Element	Paper's Claim	Mainstream Physics Consensus
Lorentz Transformations	The paper argues that the conventional interpretation of Lorentz transformations is flawed and that time dilation and length contraction are eliminated when non-diagonal terms are handled differently. The paper states this would make the Lorentz metric identical to the Minkowski metric (sic!).	The Lorentz transformations are the cornerstone of special relativity. The standard interpretation is that they produce real physical effects of time dilation and length contraction for observers in relative motion.
"Doppler Metric"	A "Doppler metric" is introduced to describe spacetime distortion in moving inertial frames and is linked to the Doppler shift of light. The paper claims this metric requires a preferred reference frame.	The standard model uses the Minkowski metric to describe spacetime in special relativity. General relativity is metric-based, but does not include a "Doppler metric" as described.
Preferred Reference Frame	The paper assumes the existence of a special, or "preferred," reference frame in the universe. It points to observations of the Cosmic Microwave Background (CMB) dipole anisotropy to support this, claiming it detects a measurable drift relative to this frame.	Special relativity, a foundation of modern physics, asserts that the laws of physics are the same for all inertial observers and that there is no preferred reference frame.
Michelson-Morley Experiment	The paper reinterprets the results of the Michelson-Morley experiment, arguing its null result is an inherent limitation of the experimental setup due to the Doppler effect, and does not rule out the existence of a luminiferous aether.	The null result of the Michelson-Morley experiment is one of the foundational experiments that demonstrated the non-existence of the luminiferous aether and helped establish the principles of special relativity.
Dark Matter and Dark Energy	The paper and its related work claim that this conformal cosmology approach can explain observations without the need for dark matter or dark energy.	Mainstream cosmology, primarily the Lambda-CDM model, relies on the concepts of dark matter and dark energy to explain observational evidence like galaxy rotation curves and the accelerated expansion of the universe.

There are also several serious computational errors in the paper:

The failed attempt at computing time dilation from the Lorentz transform of time: The correct way is to simply differentiate the transform for time and to impose the condition of locality ($dx = 0$) and the author does not understand this basic fact:

$$dt' = \gamma(dt - \frac{vdx}{c^2})|_{dx=0} = \gamma dt$$

Instead, the author obtains $dt'/dt = 1$ (author's equation 10). This flies in the face of all the Ives-Stilwell experiments that have verified (since 1938) the reality of time dilation. The author claims that the mainstream derivations of time dilations are all "flawed":

"Surprisingly, Eq. (17) predicts a varying proper speed of light. This implies that the Lorentz transformation itself (defined in Eq. (5)) is consistent with the SR postulate of the constant speed of light, the derivation of time dilation from the Lorentz transformation in Eq. (11) is flawed. Equation (11) is thus inconsistent with the Lorentz transformation as

well as with the SR postulate of the constant speed of light c."

The failure in computing proper speed of light: The error is tracked to the incorrect computation of the metric (author equation 14) where there is an incorrect presence of the γ^{-2} instead of the correct γ^{2} producing the incorrect $C = \gamma c$ (author's equation 17) instead of recognizing that the metric is frame invariant, thus recovering c as the proper light speed, a fact known since demonstrated by Einstein in 1905.

In conclusion, there are too many fundamental errors in the published paper.

References

V. Vavryčuk. (2024). Cosmological consequences of the Lorentz and Doppler transformations. *Modern Physics Letters A*, *39*(Nos. 21 & 22), 2450098.

Appendix

The "review" from the MPLA assigned reviewer https://drive.google.com/file/d/1h32XyIEj7Zjf8M8ZsM4cLWJdi9h5k-WR/view?usp=drive_link