Qeios

Peer Review

Review of: "An Epistemological Analysis of Einsteinian Special Relativity: Do Physicists in Reality Use Lorentzian Ether Theory?"

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In his interesting article, Ma writes:

“Lorentz's theory does not emphasize the synchronization of clocks at different locations in a reference frame, so we may consider them ideally synchronized in terms of the privileged ether frame.”

I am not sure that the Lorentz transformations (LT) of Eqs. (1) and (2) of Ma’s article indicate an ideal synchronization with the ether frame. If this were the case, the time transform should be t’ = alpha t. Then, t’ does not depend on x. The theme of synchronization is discussed by many physicists. Some references are given in the link: https://doi.org/10.32388/MQWO75

Therefore, I see no “observable” difference in the LT, as used by Einstein or Lorentz.

Ma also claims that

“We find that Einstein’s special relativity, based on the relative velocity between two frames without ether as the medium for light, cannot produce the Lorentzian results logically; hence, the two theories do not give the same predictions.”

I am not convinced by Ma’s argument, and thus I present here the solution to Ma’s thought experiment.

1- Let frame S’ be comoving with frame K’. The origins of K and S’ coincide at t’= t = 0, so that the LT of Eqs. (1) and (2) of Ma can be used between S’ and K. With AB = $\Delta x = L_0$ the rest length of the distance AB, the interval $\Delta t = L_0/v = 6.4\mu s$ represents the time interval measured by k for observer k’ to move

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from B to A. To calculate the time interval measured by k' we need to find the length L' = AB as seen by k' simultaneously (i.e., $\Delta t'=0$) in S' at t'=0. To proceed, we use $\gamma=1/(1-v^2/c^2)^{1/2} = 10$ and, by means of the inverse LT given by $x = \gamma(x' - vt')$ applied to Fig. 1, we have $\Delta x = \gamma(\Delta x' - v\Delta t') = \gamma(\Delta x' - 0) = \gamma\Delta x'$. Hence, $L' = L_0/\gamma$ and the time interval measured by k' is

$\Delta t' = L'/v = L_0/(\gamma v) = \Delta t/\gamma = 0.64\ \mu s.$ (**)

This result is valid for both Einstein and Lorentz using the same LT.

2- For the same problem, Ma asks the following question: "... how long will it take for observer k' to travel from B to A (i.e., to meet observer k) as measured by frame K."

The answer is given by our Eq. (**) above, $\Delta t = \gamma\Delta t' = 6.4\ \mu s$.

In conclusion, there is no paradox here, and the result (**) is valid for both Einstein and Lorentz using the same LT.

In his article, Ma considers some wrong or deceiving answers to the problem, such as:

"Some researchers contend that only the first question can be asked; the follow-up question is not allowed in special relativity."

"In the above thought experiment, if we allow the second question, the logically consistent result should be equal time intervals measured in the two reference frames."

I do not agree with Ma. It seems that Ma creates non-existing problems where there are no problems.

Thus, I do not think that Ma's approach makes the understanding of the LT easier. It distracts readers from the real problem of the LT: **The Lorentz transformations are ruled out by experiment**. To consider, academically, the difference between the interpretation of the LT by Einstein and Lorentz is certainly a valid initiative. However, if the LT do not interpret the experimental results testing the transformations and light speed invariance, the different academic interpretations of the LT, which are ruled out by experiment, are of no interest to physicists.

The inconsistency and failure of the LT in interpreting, e.g., the Sagnac effects, are described in the link: https://doi.org/10.32388/MQWO75

To conclude, Ma's article touches on the important theme of the correct interpretation of the LT. Very well!

However, I suggest Ma write a revised version of his article avoiding the introduction of non-existing paradoxes. Moreover, since physics is progressing, the validity of the LT, either as interpreted by

Einstein or Lorentz, should be checked against more recent experiments. Advances in optical experiments, such as the linear Sagnac effect by Wang et al. (2003), indicate the failure of the LT in describing light propagation along closed moving contours (as pointed out by Sagnac earlier). Still, I am quite open to changing my evaluation of Ma's paper if he presents an improved revised version.

My best regards to Ma and my compliments for his dedication to the fundamental aspects of physics theories.

Declarations

Potential competing interests: No potential competing interests to declare.