the general science journal
The General Science Journal. April 2025.

Relativistic Inertial Deformations Cannot Be Real

Antonio León Sánchez
Retired Professor. Independent researcher in the foundations of science.

Abstract.-A very short, clear, and conclusive proof demonstrates that the deformations of space, time, and mass deduced from the Lorentz transformation cannot be real. At most, they can be apparent deformations, as apparent as the visual deformations produced by the refraction of light. Consequently, special relativity cannot be a theory about the real physical world.

Keywords: Inertial dilation of time, inertial contraction of length, inertial dilation of mass, inertial lack of simultaneity, special relativity, apparent deformations.

1 The Theoretical Framework

The (formal) scenario of the proof announced in the title of this article will be the inertial reference frame RF_o, whose X_oY_o plane is represented in Figure 1, which shows the three rows of objects parallel to the X_o axis that play a central role in the formal argument of the proof:

Row 1: Consists of two clocks C01 and C02 separated by a distance d_o. The first is mechanical and the second electronic. In their proper reference frame RF_o, both clocks are synchronized, function correctly, and their displays show the same time.

Row 2: Consists of two rulers R01 and R02 of the same length. The first is made of wood and the second of steel. Both have a laser mechanism that measures their length and expresses it numerically on a display; all of which is correct in their proper reference frame RF_o.

Row 3: Consists of two balances B01 and B02. The first is mechanical and the second electronic. Both show on their respective displays the result of measuring the corresponding weight of the object placed on their pan; both function correctly in their own reference frame RF_o.

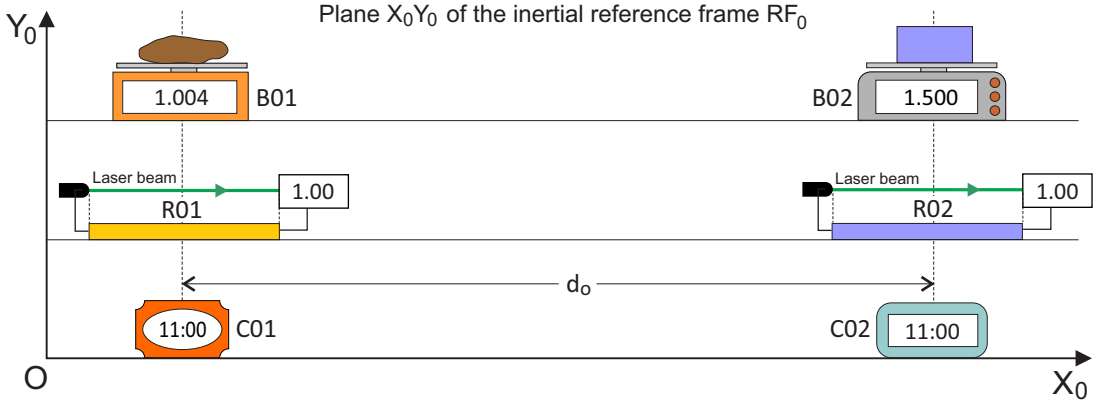

Figure 1 – The clocks, rulers, and balances in their proper (rest) reference frame RF_o.

As indicated, even though they function with different mechanisms, all the measuring instruments involved in the discussion have a display that expresses the results of their measurements in numerical terms: the time in the case of the clocks; the length in the case of the rulers; and the weight in the case of the balances. The observers whose proper (rest) reference frame is RF_o, whom we will refer to as OB_o, verify that all these measures of time, length, and mass function correctly, so that their respective displays correctly express the result of their corresponding measurements.

2 The proof

A part of the observers, whom we will refer to as OB_v, whose own reference frame is RF_o, leaves RF_o in an appropriate vehicle, which we will refer to as RF_v, which, through appropriate accelerations and decelerations, passes over the rows of objects of RF_o again and again, each time in a different direction (sense) of the same direction parallel to the X_o axis of RF_o; and each time with a different uniform velocity $(v_1, v_2, v_3, ...)$ reached by the previous and adequate distances, decelerations, and accelerations of RF_v; and always in such a way that the observations of the observers OB_v are made with uniform relative velocities between RF_o and RF_v, so that they can apply the Lorentz transformation.

In their successive passes, in both directions of the direction parallel to the X_o axis of RF_o, the observers OB_v of RF_v will always see the same numerical results on the displays of the instruments of RF_o (clocks, rulers, and balances). In the case of the rulers and balances, they will always be the same results that they already observed before leaving RF_o and becoming the observers OB_v aboard RF_v.

But if the relativistic deformations (of space, time, and mass) deduced from the Lorentz transformation were real deformations, we would have to conclude that the changes in velocity in the reference frame RF_v (decelerations and accelerations at the appropriate distances) alter the instruments of RF_o (clocks, rulers, and balances) that have not undergone these changes or any other change. And they alter them always in the same way, although with different intensity in each pass, exclusively dependent on the relative velocity v_n between RF_o and RF_v in the n-th pass. As is well known, and being c the speed of light and d_o the proper separation between the clocks, the deformations deduced from the Lorentz transformation are such that:

- Time and mass dilate by Lorentz's factor γ.
- Rules contracts by a factor γ^{-1}.
- Clocks desynchronize by a factor $\gamma d_o v_n/c^2$, alternately changing the clock that lags behind the other depending on the direction of the relative motion of RF_v with respect to RF_o (increasing or decreasing direction of X_o)

Consequently, in this case the changes in mass, space and time deduced from the Lorentz transformation for RF_o depend exclusively on changes in velocity in another physically independent reference system (RF_v). Or in other words, decelerations and accelerations in one reference frame (RF_v) have immediate effects in another mechanically independent reference frame (RF_o). So those relativistic effects have to be acausal, which is impossible in the physical world of macroscopic objects.

3 Consequences for the real physical world

Without going into details, the real objects of the observable universe are subject to successive interactions that can modify their trajectories and velocities with respect to other objects in different ways. Consequently, the previous argument about RF_o and RF_v applies to all of them: the deformations of space, time, and mass deduced from the Lorentz transformation cannot be real; at best, they would be apparent deformations. This conclusion is also linked to the problem of the three vectors [5] and to the almost dramatic fact that physics has not yet discovered either the physical reality of space [2, 3, 4], or preinertia, the reason why the absolute motion of the real objects of the observable universe through real physical space is undetectable [1, Ch. 35-40], at least for now.

Bibliographical References

[1] A. León. *Apparent relativity*. Amazon's Kindle Direct Publishing, 2022. Free pdf.

[2] A. León. Gravitational waves as empirical proof of space reality. *The General Science Journal*, 2023. Pdf.

[3] A. León. The substance of physical space. *The General Science Journal*, 2023. Pdf.

[4] A. León. *The discrete reality of physical space*. Self-Edition in KDP, 2024. Free pdf.

[5] A. León. Relative Motion and the Unexpected Three-Vector Problem. *The General Science Journal*, February 2025. Pdf.