Proving the formal inconsistency of special relativity

The reflection of light makes it possible to demonstrate the falsity of the second of the principles on which the theory of special relativity is based.

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

Abstract.-The relativistic contraction of distances in the direction of relative motion is used here to formally deduce a potentially infinite number of violations of the Second Law of the Reflection of Light, violations that are impossible according to the first principle of special relativity. From this impossible, and therefore false, contraction of distances, the falsity of time dilations and the falsity of phase differences in synchronizations are formally deduced. Thus, special relativity is an inconsistent theory whose inconsistency must be a consequence of one of its two fundamental principles, the second principle being the only one that can be false, since the first establishes the universality of physical laws, without which the observed consistent evolution of the known universe would be impossible.

Keywords: Special relativity, Second Law of the Reflection of Light, relativistic length contraction, relativistic time dilation, relativistic phase difference in synchronization, relativistic mass, principles of special relativity.

1. Introduction

The reflection of a visible and vertical laser beam by a mirror oriented at 45º clockwise with respect to the incident laser beam allows us to develop a simple argument with fatal consequences for the special theory of relativity. The argument is so simple and decisive that it seems difficult to refute. It demonstrates the falsity of the relativistic length contraction in the direction of relative motion, and from that falsity, it is proved the falsity of time dilation and phase differences in synchronization. And these falsities can only be derived from one of the two principles that underpin the theory, which, for the reason explained in this article, can only be the second of these principles, which establishes the same speed of light for all possible inertial reference frames, regardless of how they are moving with respect to any light source. I am aware of the provocative content of this article. The reader will judge whether or not that content is formally legitimate.

Although it may seem otherwise, in science, simply proving something has not always been enough to guarantee its acceptance, especially if that something challenges a commonly accepted and rarely questioned theory. In certain cases, these theories become scientific creeds that their believers defend with a belligerent attitude toward those who dare to question them. This is the case with the special theory of relativity, which is questioned here with arguments so simple that anyone can understand them and consider their consequences. Although I'm sure they will not even be glanced at. They will be ignored, despite which I feel a moral obligation to make them public. Just in case.

2. The setting for the discussion

The theoretical framework for the following discussion is the theory of special relativity. Therefore, all reference frames involved in the discussion will be inertial reference frames: they will move relative to each other at uniform velocities. For simplicity, the three spatial axes of all these inertial reference frames will be parallel. The corresponding inertial reference frames will be denoted: RF_0, RF_1, RF_2, RF_3, ... and their corresponding spatial axes: X_0, Y_0, Z_0; X_1, Y_1, Z_1; X_2, Y_2, Z_2; X_3, Y_3, Z_3; ... The horizontal directions considered in RF_0, RF_1, RF_2, RF_3,..., will be the direction of their respective axes X_0, X_1, X_2, X_3,...; and the vertical direction that of their respective axes Y_0, Y_1, Y_2, Y_3,... The proper reference frame to all the objects involved in the discussion (laser source, mirror, and mirror's support) will be the reference frame RF_0, which will be observed by the rest of the different reference frames $RF_{n,\, n=1,2,3,...}$

with different uniform velocities $v_{n,\,n=1,2,3,...}$ parallel to their respective axes $X_{n,\,n=1,2,3,...}$, and in the increasing direction of those axes. The laser beam will be referred to interchangeably as a laser or a laser beam.

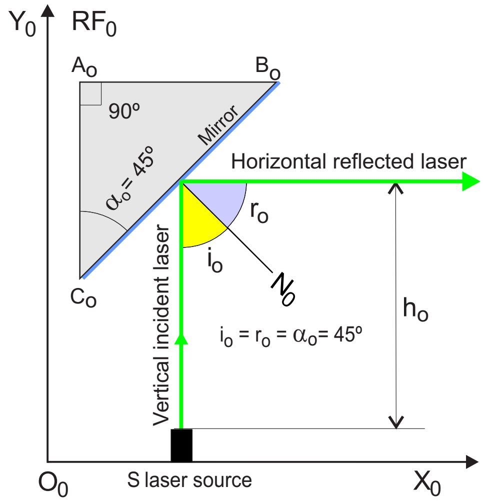

Figure 1 – RF_0 is the proper reference frame of all the elements shown in the figure: the laser source S, the mirror and its physical support $A_0B_0C_0$.

As shown in Figure 1, RF_0 is the proper reference frame of a laser source S that emits a vertical laser beam reflected by a static mirror inclined at 45° clockwise with respect to the vertical direction of the incident laser. This reflection of light is a well-known physical phenomenon: the photons of the incident laser excite electrons on the surface of the mirror so that they re-emit new photons in a direction different from that of the incident laser, and forming an angle r_0 with the normal (perpendicular) to the mirror, which is equal to the angle i_0 that the incident laser form with that normal. This is the well-known Second Law of the Reflection of Light: the incident laser and the reflected laser form equal angles with respect to the normal to the mirror: $i_0 = r_0$. Under the conditions of our discussion, therefore, all the photons re-emitted by the excited electrons of the mirror will move in a horizontal direction, all of them constituting what we call the reflected laser.

And since, from the point of view of the other reference frames involved in the discussion, RF_0 moves in the increasing direction of their respective axes X_1, X_2, X_3,... (see Figure 2), according to special relativity the reflected laser will be observed in all the reference frames involved in the discussion as a horizontal laser parallel to X_1, X_2, X_3,.... Also according to the special relativity, the incident laser will also be seen as a vertical laser (although its photons follow inclined trajectories, which will also be analyzed at the end of the next section). However, both the mirrors and their corresponding perpendiculars (normals) will have different inclinations due to the shortening of the sides A_1B_1, A_2B_2, A_3B_3,... of the corresponding observed mirror supports, so that in none of the systems RF_1, RF_2, RF_3,... is the observed angle of incidence (formed by the observed incident vertical laser and the normal to the observed mirror) equal to the observed angle of reflection (formed by the normal to the observed mirror and the observed reflected horizontal laser). Therefore, in none of these reference frames is the Second Law of the Reflection of Light satisfied.

3. Relativistic violations of the Second Law of the Reflection of Light

In the scenario presented in the previous section, let us consider the following elementary physical facts represented in Figure 2 (a):

1.- In the proper reference frame RF_0 of a laser source S, this source emits a visible green laser (incident laser) in the vertical direction (parallel to the axis Y_0 of RF_0).

2.- This incident laser strikes a mirror at rest at RF_0 and tilted 45° clockwise from the vertical. According to the Second Law of the Reflection of Light, which has broad empirical support, the incident laser is reflected as a horizontal laser (reflected laser), which is actually a laser whose photons are re-emitted by the electrons of the mirror excited by the photons of the incident laser.

3.- Consequently, the incident laser forms an angle i_0 (angle of incidence) with the normal N_0 to the mirror that is exactly equal to the angle r_0 that this normal to the mirror forms with the reflected laser (angle of reflection): $i_0 = r_0$. In our case, $r_0 = \alpha_0$ is also verified because the sides defining r_0 are orthogonal to those defining α_0 (Figure 2 (a)).

4.- As has been well known since at least the 11th century, the equality $i_0 = r_0$ is precisely what is established by the Second Law of the Reflection of Light. In conclusion, in RF_0 the incident laser is vertical, the reflecting mirror is tilted 45º clockwise from the vertical, and the reflected laser is horizontal.

5.- Consequently, and according to special relativity, in all inertial reference frames $RF_{n,\,n=1,2,3,\ldots}$ from whose perspective the RF_0 reference frame moves under the conditions established in the previous section (parallel to and in the increasing direction of their respective axes $X_{n,\,n=1,2,3,\ldots}$), the incident laser and the reflected laser will be observed as in RF_0: respectively as a vertical laser and a horizontal laser (Figure 2 (b), (c) and (d)).

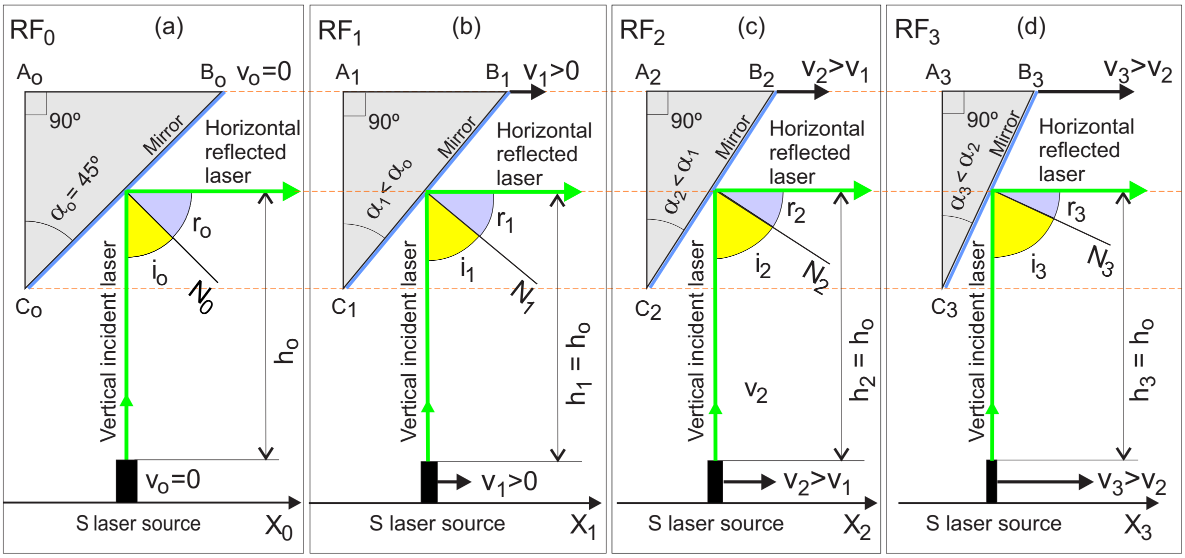

Figure 2 – Reflection of a vertical laser on a mirror inclined 45° clockwise from the vertical in the proper reference frame RF_0 of the mirror, its physical support $A_0B_0C_0$, and the laser source S (Figure (a)), and in three different inertial reference frames RF_1, RF_2, and RF_3, from whose respective points of view the frame RF_0 moves in the increasing direction parallel to their respective axes X_1, X_2, X_3 with uniform relative velocities v_1, v_2, and v_3 respectively (Figures (b), (c), and (d)).

Let us now consider any (potentially infinite) number of other inertial reference frames RF_1, RF_2, RF_3,... under the conditions established in the previous section; and suppose that the relative velocities of RF_0 with respect to RF_1, RF_2, RF_3,... are respectively v_1, v_2, v_3,..., respectively parallel to X_1, X_2, X_3,..., being

$$0 < v_1 < v_2 < v_3 < \cdots < c \tag{1}$$

where, as usual, c represents the speed of light in a vacuum. According to special relativity, and with $\gamma_{n,\,n=1,2,3,\ldots}$ being the relativistic Lorentz's factor between $RF_{n,\,n=1,2,3,\ldots}$ and RF_0, we can write:

$$\gamma_n^{-1} = \sqrt{1 - v_n^2/c^2}, \; n = 1, 2, 3, \ldots \tag{2}$$

$$0 < v_1 < v_2 < v_3 < \cdots < c \implies 1 > \gamma_1^{-1} > \gamma_2^{-1} > \gamma_3^{-1} > \cdots > 0 \tag{3}$$

According to special relativity, we will have:

$$A_nB_n = \gamma_n^{-1} A_0B_0 > 0, \; n = 1, 2, 3, \ldots \tag{4}$$

Therefore, we can write:

$$1 > \gamma_1^{-1} > \gamma_2^{-1} > \gamma_3^{-1} >, \dots > 0 \implies A_0B_0 > A_1B_1 > A_2B_2 > A_3B_3 > \dots > 0 \tag{5}$$

And since, according to the Lorentz transformation, there is no contraction of distances in the direction perpendicular to the relative velocity, we will have:

$$0 < A_0C_0 = A_1C_1 = A_2C_2 = A_3C_3 = \dots \tag{6}$$

We can then write:

$$0 < v_1 < v_2 < v_3 < \dots < c \implies 1 > \gamma_1^{-1} > \gamma_2^{-1} > \gamma_3^{-1} > \dots > 0 \tag{7}$$

$$1 > \gamma_1^{-1} > \gamma_2^{-1} > \gamma_3^{-1} > \dots > 0 \implies A_0B_0 > A_1B_1 > A_2B_2 > A_3B_3 > \dots > 0 \tag{8}$$

$$(0 < A_0C_0 = A_1C_1 = A_2C_2 = A_3C_3 = \dots) \wedge (A_0B_0 > A_1B_1 > A_2B_2 > A_3B_3 > \dots > 0) \implies \tag{9}$$

$$\implies \tan\alpha_0 > \tan\alpha_1 > \tan\alpha_2 > \tan\alpha_3 > \dots > 0 \implies \alpha_0 > \alpha_1 > \alpha_2 > \alpha_3 > \dots > 0 \tag{10}$$

Therefore:

$$0 < v_1 < v_2 < v_3 < \dots < c \implies \alpha_0 > \alpha_1 > \alpha_2 > \alpha_3 > \dots > 0 \tag{11}$$

And since the sides of angles $\alpha_{n,\,n=1,2,3,\dots}$ are perpendicular to the corresponding sides of angles $r_{n,\,n=1,2,3,\dots}$, we can finally write:

$$r_n = \alpha_n;\ n = 0,\ 1,\ 2,\ 3, \dots \tag{12}$$

$$v_0 = 0 < v_1 < v_2 < v_3 < \dots < c \implies \alpha_0 > \alpha_1 > \alpha_2 > \alpha_3 > \dots > 0 \implies \tag{13}$$

$$\implies r_0 > r_1 > r_2 > r_3 > \dots > 0 \tag{14}$$

In consequence:

$$v_0 = 0 < v_1 < v_2 < v_3 < \dots < c \implies r_0 > r_1 > r_2 > r_3 > \dots > 0 \tag{15}$$

This indicates that the angles of reflection $r_{n,\,n=1,2,3,\dots}$ decrease as the relative velocities at which they are observed increase, being maximum in the proper reference frame RF_0 of the laser source and the reflecting mirror ($v_0 = 0$), and minimum in the one with maximum velocity (v_3 in Figure 2).

Let us now consider what happens with the angles of incidence $i_0,\ i_1,\ i_2,\ i_3,\dots$ observed respectively from $RF_0,\ RF_1,\ RF_2,\ RF_3,\dots$ Since these angles $i_0,\ i_1,\ i_2,\ i_3,\dots$ are complementary to the angles $r_0,\ r_1,\ r_2,\ r_3,\dots$ respectively, the following is true:

$$r_0 > r_1 > r_2 > r_3 >, \dots \implies i_0 < i_1 < i_2 < i_3 <, \dots \tag{16}$$

$$\text{Therefore: } i_0 - r_0 = 0 < i_1 - r_1 < i_2 - r_2 < i_3 - r_3 <, \dots \tag{17}$$

Obviously, the equation 17 implies a potentially infinite number of violations of the Second Law of the Reflection of Light, one in each of the reference frames $RF_1,\ RF_2,\ RF_3,\dots$. This contradicts the First Principle of Special Relativity, which establishes the universality of all physical laws in all inertial reference frames, a principle without which physics and knowledge of the physical world would be impossible. Consequently, the relativistic contractions of distance in the direction of relative motion, from which the multiple violations (17) of the Second Law of the Reflection of Light are deduced, must be FALSE.

Let us now consider the reflections of the individual photons that make up the laser emitted in RF_0 and observed from $RF_1,\ RF_2,\ RF_3,\dots$ Each photon takes a time greater than zero to travel from its source S to its point of impact with the reflecting mirror. During that time, all objects in RF_0 observed from $RF_{n,\,n=1,2,3,\dots}$ move a horizontal distance $\delta x_{n,\,n=1,2,3,\dots}$, which is greater the greater the relative velocity $v_{n,\,n=1,2,3,\dots}$. Consequently, each incident photon

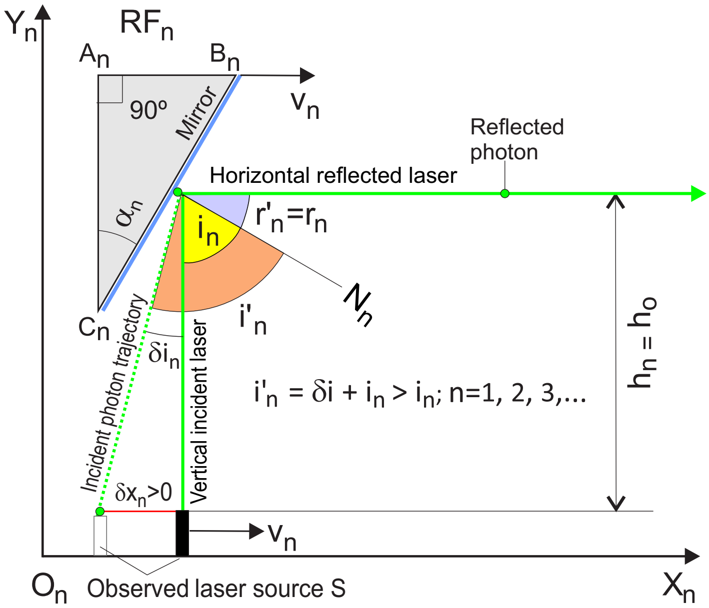

Figure 3 – The reflection of the individual photons of the visible laser green observed in $RF_{n;n=1,2,3...}$ also violates the Second Law of the Reflection of Light, and to a greater extent than the reflection of their corresponding visible lasers.

follows a trajectory inclined clockwise with respect to the vertical[1], an inclination defined by the angle $\delta i_{n,\,n=1,2,3,...}$, which increases with δx_n since $h_0 = h_1 = h_2 = h_3 = \ldots$ and then $\tan \delta i_1 < \tan \delta i_2 < \tan \delta i_3 < \ldots$, and therefore $\delta i_1 < \delta i_2 < \delta i_3 < \ldots$ (see Figure 3).

Therefore, the angle of incidence of each photon is $i'_n = \delta i_n + i_n > i_n,\ n = 1, 2, 3 \ldots$, and being $r'_n = r_n,\ n = 1, 2, 3, \ldots$, the following is verified:

$$i'_n - r'_n > i_n - r_n > 0,\ n = 1, 2, 3, \ldots \tag{18}$$

Which means that the individual photons of the laser beam also violate the Second Law of the Reflection of Light, and to a greater degree than their corresponding observed lasers.

4. Formal consequences for special relativity

Once the falsity of the relativistic contraction of distances and objects in the direction of their relative motion has been formally demonstrated, it is natural to inquire about the formal consequences this falsity has on the relativistic time dilations and phase differences in synchronization. To this end, let us consider an inertial reference frame RF_0 in which a photon source S emits a photon a^* that travels in the increasing direction of X_0 a distance d_0 in a time t_0. Naturally, in this RF_0 we will have the following for the speed c of light: $c = L_0/t_0$.

Let RF_v be another inertial reference frame whose spatial axes coincide at a given instant with the spatial axes of RF_0, which moves relative to RF_v with a uniform velocity v in the increasing direction of the X_v axis of RF_v. According to the Second Principle of the Special Relativity, we will for the speed of photon a^*: $c = L_v/t_v$. Now, as we showed in the previous section, $L_v = L_0$, therefore $t_v = t_0$ must also be true. This implies that both the time dilation and the phase difference in synchronization that define t_v must be zero. Therefore, we can write:

$$\gamma = \frac{1}{\sqrt{1 - v^2/c^2}} \tag{19}$$

$$L_v = \gamma^{-1} L_0 = L_0 \implies (\gamma^{-1} = 1) \implies v = 0 \implies \gamma = 1 \tag{20}$$

$$t_v = \gamma t_0 + \gamma L_0 v^2/c^2 = t_0 \implies (\gamma = 1) \wedge (\gamma L_0 v^2/c^2 = 0) \tag{21}$$

[1]The fact that successive laser photons follow inclined trajectories is consistent with the observed verticality of the laser [11, Chp. Relativity of a visible laser been].

$$(\gamma L_0 v^2/c^2 = 0) \wedge (L_0 > 0 \wedge c > 0) \implies v = 0 \quad (22)$$

In conclusion, all distance and time measurements made in any inertial reference frame must be equal to those made in the proper reference frame of the objects involved ($v = 0$). To state otherwise, as special relativity does, is to state a falsehood.

The special theory of relativity is, therefore, an inconsistent theory from which falsehoods such as the above ones can be deduced. And this is only possible if one of its two fundamental principles is false. For the reason given in the previous section, the First Principle of the Special Relativity cannot be false, because if it were, scientific (rational) knowledge of the universe would be impossible, which does not seem to be the case given the enormous evidence that such rational knowledge is indeed possible. Therefore, the second principle of special relativity must be false. A principle that states that the speed of light is always the same for all inertial reference frames, regardless of the speed of these inertial reference frames relative to the light source.

It should be noted at this point that in virtually all experiments in which the speed of light has been measured, mirrors have been used, and that the light reflected by the mirrors is not the incident light bounced by the mirrors, but rather the light re-emitted by the excited electrons of those mirrors, which, according to Galilean pre-inertia[2], includes the velocity vector of the reflecting mirror, and then that of its electrons, as a component of the velocity vector of the re-emitted photons. This makes it impossible to measure the possible absolute velocity of an object A by setting other objects B in motion from A, including photons between the objects B.

5. Mass and special relativity

Although just one of the falsehoods demonstrated in the previous sections is sufficient to establish both the inconsistent nature of the theory special relativity and the formal cause of that inconsistency (its second fundamental principle), this last section is included to justify why neither the relativistic increase in mass with velocity nor the relationship between mass and energy, also deduced by A. Einstein as a consequence of his special relativity [2], has been discussed. The reason is that both relationships can be formally deduced outside of special relativity.

Indeed, well-known authors such as J. J. Thomson [15], O. Heaviside [7], M. Abraham [1], and H. A. Lorentz [14] defended the idea that the mass of electric particles increases with velocity [8], although none of Einstein's 1905 articles referred to the work of these authors.

With regard to the precise relationship $E = mc^2$, there are also non-relativistic deductions, even published in the same journal in which Einstein published his two famous articles and shortly before the publication of the second (addendum to the first). In fact, Friedrich Hasenhörl published two articles [5, 6] on the theory of radiation in moving bodies, establishing the equality $E = mc^2$ independently of special relativity.

Regarding the relationship $m_v = \gamma m_o$, we recall here the non-relativistic deduction by R. Feynman [3, 15-10, 15-11], summarized in [11, p. 127-128]. At the same time, the reader is invited to verify that the increase in mass with velocity is actually incompatible with special relativity with arguments such as those that can be analyzed in [11]. Or with the following argument (graphically represented in Figure 4):

> RF_0 and RF_v are two inertial reference frames in the same gravitational field whose spatial axes coincide at a certain instant, and so that RF_0 moves relative to RF_v in the increasing direction of Y_v with a velocity $v = 0.4166c$ (Figure 4). RF_0 is the proper reference frame of a balance, one pan of which holds a 400 g weight while the other holds a 600 g weight. The imbalance Δm_0 of 200 grams produces a

[2]Any object B set in motion from another object A inherits the velocity vector of A as a component of its velocity vector [4, p. 228] [12, 13, 10, 9]

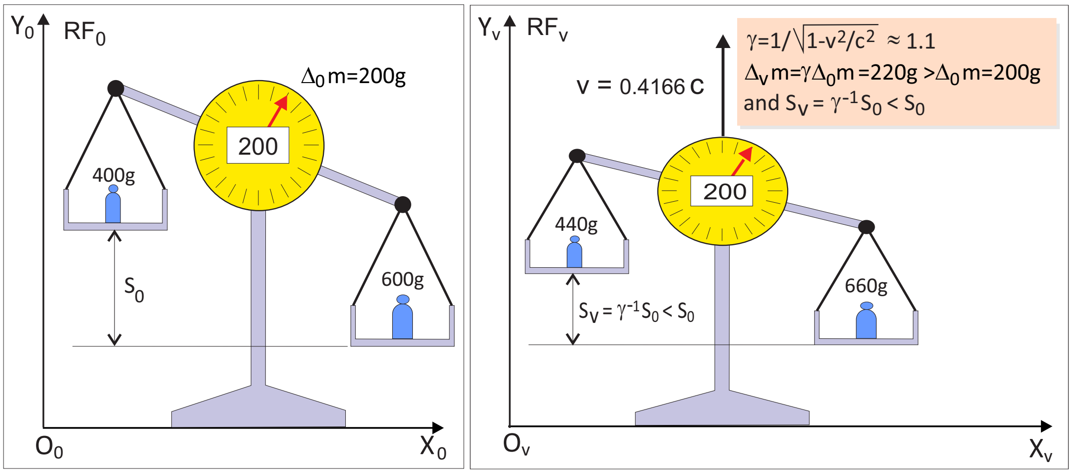

Figure 4 – The unbalanced balance.

vertical separation S_0 between these pans. According to special relativity, and with γ being the Lorentz factor, the weights on the scale of RF_0 seen from RF_v when the spatial axes of both reference frames coincide are respectively $\gamma \times 400\,g = 440\,g$ and $\gamma \times 600\,g = 660\,g$, so that the difference in their masses is $\Delta m_v = 220\,g$, i.e. $20\,g$ greater than in SR_0. Consequently, the pans of the balance should be observed to be further apart in RF_v than in RF_0. But the opposite must also be true, because according to the Lorentz transformation $S_v = \gamma^{-1} S_0 < S_0$. Therefore $(S_v > S_0) \wedge (S_v < S_0)$. A true relativistic contradiction involving the increase of mass deduced from special relativity.

6. Conclusion

According to the arguments developed in this article, all of which are very simple, it must be concluded that the untouchable special theory of relativity is in fact an inconsistent theory. And that its inconsistency stems from the second of its fundamental principles, which states that the speed of light is the same in all inertial reference frames, regardless of their relative velocities with respect to (the reference frames of) the light sources.

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