Available online at www.elixirpublishers.com (Elixir International Journal)

Theoretical Physics

Elixir ISSN: 2229-712X

Elixir Theoretical Physics 106 (2017) 46779-46785

Relativity of Delusion

Radwan M. Kassir
Mechanical Engineering—PMC Dept., DAH (S & P), PO Box 11-7159, Beirut 1107 2230, Lebanon

ARTICLE INFO

Article history:
Received: 28 March 2017;
Received in revised form: 12 May 2017;
Accepted: 24 May 2017;

Keywords
Light,
Special Relativity.

ABSTRACT

In this paper, light is shed on the Special Relativity hidden conflicts. The first part will point out some of the Special Relativity self-contradictions in relation to its main outcomes; namely the time dilation, length contraction, relativistic velocity addition, relativistic Doppler shift, and the energy-mass equivalence $(E = mc^2)$. The second part reveals the reasons beyond the Special Relativity inconsistencies, by demonstrating its mathematical formulation misconceptions, and identifying various contradictions in Einstein's 1905 derivation of the Special Relativity equations.

1. Introduction

Ironically, modern physics has been developed on a foundation of delusions for more than a century! The Special Relativity theory is based on unrealistic assumptions and misleading formulation; ensuing its mathematical contradictions and inconsistencies—clearly revealed in [1], showing that the two fundamental Special Relativity postulates (the principle of relativity and the constancy of the speed of light principle) are inconsistent with each other. They result in transformation equations embedding fundamental mathematical contradictions, leading to the persistent conclusion of the unviability of the Special Relativity. This is shown through many different mathematical arguments identifying the source of the Special Relativity anomalies that result in various mathematical contradictions.

The main outcomes of the Special Relativity are: 1) the time dilation, 2) the length contraction, 3) the relativistic velocity addition, 4) the relativistic Doppler shift, and 5) the energy-mass equivalence $(E = mc^2)$ [2]. These outcomes are developed from the Special Relativity formulation based on two postulates: 1) the principle of relativity stating that "*The laws by which the states of physical systems undergo change are not affected, whether these changes of state be referred to the one or the other of two systems of co-ordinates in uniform translatory motion*", and 2) the principle of the constancy of the speed of light, hypothesizing that: *"Any ray of light moves in the "stationary" system of co-ordinates with the determined velocity c, whether the ray be emitted by a stationary or by a moving body."* It follows from the principle of relativity that the speed of light will be the same with respect to all observers in uniform translatory motion relative to one another.

The physics mainstream is too skeptical to consider any refutation of the Special Relativity, given the theory has survived over a century. However, it has survived on the basis of some experimental results, related to time dilation, which would be naturally obtained anyway, within a certain margin, under the classical theories of light—not due to the Special Relativity predictions—as shown in [1]—Chap.11. The mainstream ignores any revealed mathematical contradictions in the light of such experimental results, although in many instances, certain empirical agreements with a theory doesn't necessarily prove its validity. The logical, coherent and consistent formulation of a theory should come first.

In this essay, light is shed on the Special Relativity hidden conflicts. The first part, consisting of the first five headings, will point out some of the Special Relativity self-contradictions in relation to its main five aforementioned outcomes. The second part reveals the reasons beyond the Special Relativity inconsistencies.

2. Light Clock

Let's take the Special Relativity postulate of the constancy of the speed of light, and test it analytically. As per a well-known basic Special Relativity light clock argument, if we follow a light ray being reflected up and down—at the constant speed c—across a distance L in a frame moving uniformly at velocity v along a straight path in the horizontal direction, we can conclude, under the light speed postulate, that the up-and-down light trip travel time period $(\gamma.2L/c)$ is dilated by a factor of $\gamma = (1 - v^2/c^2)^{-1/2}$—due to longer light path—when compared to the same trip travel time period $(2L/c)$ measured by an observer moving along with the traveling frame. Therefore, we preliminarily deduce that the light speed postulate results in a "time dilation" by a factor of γ (Gamma).

Now let's test our deduction by following this time a light ray being reflected back-and-forth across the same distance L in the moving frame, but in the longitudinal (horizontal) direction.

Again, using the light speed postulate, we can show the round trip travel time period is also dilated—due to longer travelled path—but, in this case, by a factor of γ^2

Tele:
E-mail address: radwan.elkassir@dar.com

(Gamma squared), compared with the unchanged travel time period $(2L/c)$ in the moving frame, which is obviously not in agreement with our initial deduction.

It follows that, if we were to maintain the light speed postulate, we must accept the assumption that the longitudinal distance in the moving frame is altered when viewed from our "stationary" frame. In other words, if the travelled distance in the moving frame was scaled down by a factor of γ relative to us in the "stationary" frame, then the light ray round trip travel period in the longitudinal direction would also be scaled down by the same factor, resulting in a time dilation by a factor of γ (instead of γ^2) relative to us, in agreement with the transversal (up and down) trip time period!

Nevertheless, the "length contraction" physically imposed to maintain the light speed postulate is actually in contradiction with the time dilation. In fact, if the speed of light was assumed to be a universal constant, then distances could be measured in terms of their light travel times. In the above analysis, the distance had to be contracted in order to contract the respective travel time, and vice versa. In fact, the interpretation of the Lorentz transformation equations, demonstrating the length contraction prediction, is shown to be erroneous [1]—Chap.15.

Furthermore, if we break down the light ray oscillating movement into upward and downward (transversal) versus forward and backward (longitudinal) components, we will face more problems with the light speed principle. For instance, the travel time of the upward or downward trip component will always be dilated by the factor γ with respect to the "stationary" frame. Whereas, it will be dilated by a factor of $c/(c-v)$ in the forward trip component, and contracted by $c/(c+v)$ in the backward one. Thus, to reconcile the "transverse" time dilation/ contraction with the "longitudinal" time dilation, we must have length contraction in the forward, and length expansion in the backward direction!

3. Length Contraction Relative to a Moving Observer

In relativity textbooks, the following is a typical scenario commonly used to [falsely] demonstrate how the length contraction physically results from the time dilation.

A moving train at a uniform velocity v passes two milestones adjacent to the rail. If, relative to a stationary observer on the ground, the time interval between passing the milestones was $\Delta t,$ the length of the rail stretch between the milestones will be $L = v\Delta t$ with respect to the stationary observer. For an observer on the train, the milestones are approaching the train at the speed $v;$ they pass the train one at a time. Relative to the train observer, the length of the rail stretch between the milestones is $L' = v\Delta t'.$ Now, here comes the trick to show the length contraction; according to Special Relativity, Δt in the stationary frame is dilated by a factor of γ compared to $\Delta t'$ $(\Delta t = \gamma \Delta t')$ in the moving frame; and hence $L' = L/\gamma,$ interpreted as a contraction of length for the rail "moving" relative to the moving observer. Whereas, the fact that the ground observer rest frame is perceived as moving relative to the train observer is ignored in the above argument. Actually, as per Special Relativity, we should also have $\Delta t' = \gamma \Delta t$ relative to the train observer, which yields $L' = \gamma L,$ contradicting the length contraction concept—the rail is moving with respect to $K',$ yet its length is expanded relative to it. Chapters 14 and 15 [1] deal in details with the invalidity of the Special Relativity prediction of the length contraction.

4. Relativistic Velocity Addition

Let u be the velocity of an object in a "stationary" frame, and u' its resulting velocity in a "traveling" frame having a uniform rectilinear velocity v relative to the stationary frame. The object is moving in the direction of the traveling frame motion. It has been revealed [1]—Chap.2—that the relativistic velocity addition formula

$$u' = (u - v)/\left(1 - uv/c^2\right)$$

is merely an invalid velocity criterion of the speed of light constancy principle, and independent of any space-time distorting transformations (time dilation and length contraction).

Furthermore, it's been demonstrated in Chap.3 of the aforesaid reference that the constancy of the speed of light principle can lead to another velocity addition formula, namely

$$u' = (u - v)/(1 - v/c)$$

which also limits the added speed of an object to c (i.e., if $u = c,$ the formula will return $u' = c$ as well). However, when compared to the respective Special Relativity formula, the peculiar result that the velocity u of an object is always equal to c relative to the observer is readily obtained!

5. Relativistic Doppler Shift

In §3 of the Special Relativity original paper [2], the time transformation equation converting event time between two inertial frames in relative motion of velocity $v,$ having the coordinate systems $K(x,y,z,t)$ and $K'(x',y',z',t')$ associated with what's considered as "stationary" and "moving" frame, respectively, is obtained as

$$t' = \gamma\left(t - \frac{vx}{c^2}\right). \qquad \text{(i)}$$

In §7 of the above cited paper, a light (electrodynamics waves) source, with given wave characteristics, is considered in the stationary system. The characteristics of these waves were to be determined when observed from the moving frame. We quote the following passage:

"…an observer is moving with velocity v relatively to an infinitely distant source of light of frequency ν … referred to a system of co-ordinates which is at rest relatively to the source of light, the frequency ν' of the light perceived by the observer is given by the [relativistic Doppler] *equation*

$$\nu' = \gamma\nu\left(1 - \frac{v}{c}\right) = \nu\sqrt{\frac{c-v}{c+v}}. \text{''} \qquad \text{(ii)}$$

The above extract implies that the observer is in the "traveling" primed frame $K',$ and the source is at rest in the "stationary" frame $K;$ hence we have $\Delta x = 0$ for the source. Therefore, under the formulation setting $(\Delta x = 0)$ of the relativistic Doppler formula, the above time transformation equation (i) leads to the time dilation

$$\Delta t' = \gamma \Delta t.$$

On the other hand, in terms of the wave period (inverse of frequency), the above Doppler shift equation (ii) can be written as

$\Delta t' = \gamma \Delta t\left(1+v/c\right)$

which is in contradiction with the obtained time dilation $(\Delta t' = \gamma \Delta t)$.

5.1. Relativistic Doppler Shift Formula Contradiction

Interestingly, the contradictory equation $c+v=c$ for $v \neq 0,$ leads to the Special Relativity time dilation, under the [Special Relativity] relativistic Doppler shift formula.

In fact, let the wave period be given by t in the source frame, and the respective period measured in the traveling observer's frame by $t'.$ According to the basic wave characteristics, we have $t'\nu' = t\nu = 1$ (since $\lambda \nu = c;\ \lambda \nu/c = 1;\ t\nu = 1$ — ditto $t'\nu' = 1$). Therefore, the contradiction $c+v=c\ (v \neq 0)$ can be rewritten as

$(c+v)t'\nu' = ct\nu;$

$$t' = t\frac{c}{c+v}.\frac{\nu}{\nu'}. \qquad \text{(iii)}$$

Now, using the relativistic Doppler shift formula (ii) in the above contradictory equation, we get

$$t' = t\frac{1}{1+v/c}.\frac{\sqrt{1+v/c}}{\sqrt{1-v/c}};$$

$$t' = \frac{1}{\sqrt{1-v^2/c^2}}t;$$

$$t' = \gamma t,$$

which is in line with the Special Relativity time transformation equation $t' = \gamma\left(t - vx/c^2\right),$ for $x=0$ (source is at origin of/ at rest in K), thus satisfying the time dilation prediction of the Special Relativity.

It follows that the contradictory equation $c+v=c\ (v \neq 0)$ leads to the Special Relativity time dilation through the application of the relativistic Doppler shift formula.

Conversely, the foregoing equation (iii) is a legitimate Special Relativity equation, since it leads to its time dilation equation. However, this same equation yields the contradictory equation $c+v=c;\ v \neq 0.$

Based on the above, the Special Relativity is deemed to be unviable.

6. Energy-mass equivalence

In his 1905 paper on the Special Relativity [2], Einstein predicted (from the Lorentz transformations for the space-time and electromagnetic field components) the longitudinal and transverse mass of moving electron as functions of its velocity, extended to ponderable material point, as measured in the "stationary" system. This was based on defining the force acting on the electron as being equal to $mass \times acceleration$ (Newton's second law of motion). The longitudinal "moving" mass obtained as such along with the mentioned force definition, resulted in the relativistic kinetic energy of the material point moving in the longitudinal direction with a velocity v as being $E_k = \left(\gamma(v)-1\right)\times m_o c^2,$ where m_o is the material point rest mass, c the speed of light, and $\gamma(v) = (1-v^2/c^2)^{-1/2}.$ However, in this context, $\gamma(v)\times m_o$ was not the predicted mass of the moving material point, which was rather $\gamma^3(v)\times m_o.$ Thus, there was no such implication as to the energy-mass equivalence—which Einstein attempted to demonstrate in later works [3, 4]—from the above kinetic energy equation. In addition, the transverse mass, as well as the longitudinal mass, doesn't satisfy the conservation of momentum within the Special Relativity framework. Thus, the Special Relativity derived "directional" relative mass equations were later implicitly dropped, and replaced by the relativistic mass $\gamma(v)\times m_o,$ required for the conservation of momentum. If the relativistic mass was used in deriving the relativistic kinetic energy equation, the equation $E_k = \left(\gamma(v)-1\right)\times m_o c^2$ would be obtained if the force was rather defined as the momentum change rate $\left(force = d\,(mv)/dt\right)$—equivalent to the former definition $(force = m\times dv/dt)$ if the mass was invariant. In such a case, the kinetic energy equation becomes $E_k = mc^2 - m_o c^2,$ with the energy-mass equivalence implication. However, the relativistic mass being equal to $\gamma(v)\times m_o$ contradicts the actual Special Relativity prediction of the longitudinal (as well as transverse) mass based on the Lorentz transformation.

It is customary to conclude the relativistic mass as being $\gamma(v)\times m_o$ from the conservation of momentum principle applied to colliding particles from the perspective of two inertial frames in relative motion. In the present simplified approach, the transverse velocity of a body moving transversally relative to the "traveling" frame is reduced by a factor of $\gamma(v)$ in the "stationary" frame, according to the relativistic velocity addition—or as a consequence of the time dilation—although there is no relative motion in the transverse direction between the frames. This will result in unjustified transverse momentum decrease (by a factor of γ) in the stationary frame relative to the moving one. Hence, by the means of the conservation of momentum law, the mass should be scaled up by a factor of $\gamma(v)$ in the stationary frame to compensate for the transverse momentum loss. The adopted relativistic mass equation $m = \gamma(v)\times m_o$ is therefore an ad-hoc implemented to reconcile the conservation of momentum law that would otherwise be violated by the Special Relativity; it is not a natural prediction of the Special Relativity, and inconsistent with both the transverse and the longitudinal mass predicted by the Lorentz transformation.

Interestingly, if the longitudinal mass $(m = \gamma^3 m_o)$ as obtained in Einstein's 1905 paper [2], was used in the kinetic energy equation

$$E_k = \int (dmv/dt)dx = \int\left(mdv/dt\right)dx + \int\left(v\,dm/dt\right)dx;$$

$$E_k = \int_0^v mvdv + \int_{m_o}^{m} v^2 dm,$$

we will obtain

$$E_k = \int_0^v \frac{m_o v}{\left(\sqrt{1-v^2/c^2}\right)^3} dv + \int_{m_o}^m c^2 dm - \int_{m_o}^m \frac{m_o^3 c^2}{m^3} dm;$$

$$E_k = \frac{m_o c^2}{\sqrt{1-v^2/c^2}}\Bigg|_0^v + mc^2\Big|_{m_o}^m + \frac{m_o^3 c^2}{2m^2}\Bigg|_{m_o}^m;$$

$$E_k = \left(\gamma^3 + \gamma + \frac{1}{2\gamma^6} - \frac{5}{2}\right) m_o c^2; \quad \text{(iv)}$$

$$E_k = \left(\left(1-\frac{v^2}{c^2}\right)^{-3/2} + \left(1-\frac{v^2}{c^2}\right)^{-1/2} + \frac{1}{2}\left(1-\frac{v^2}{c^2}\right)^3 - \frac{5}{2}\right) m_o c^2,$$

which is in total disagreement with the Special Relativity kinetic energy equation, and for $v \ll c$ it can be written to the second order as

$$E_k = \left(\left(1+\frac{3}{2}\frac{v^2}{c^2}\right) + \left(1+\frac{1}{2}\frac{v^2}{c^2}\right) + \frac{1}{2}\left(1-3\frac{v^2}{c^2}\right) - \frac{5}{2}\right) m_o c^2;$$

$$E_k = \frac{1}{2} m_o v^2,$$

which is the classical formula for the kinetic energy!

Had we used the ad-hoc mass formula $(m = \gamma m_o)$— keeping in mind that the Special Relativity transformation equations actually result in $m = \gamma m_o^3$—in the kinetic energy equation above $(E_k = \int_0^v mv dv + \int_{m_o}^m v^2 dm)$, the kinetic energy would be obtained as

$$E_k = (\gamma - 1) m_o c^2 = (m - m_o) c^2 = \Delta m c^2, \quad \text{(v)}$$

implying the Special Relativity energy-mass equivalence. It should be reminded, however, that Einstein obtained the latter energy-mass equation (v) using $m = \gamma m_o^3$, but with the force being defined as $F = m\, dv/dt$, instead of $F = d(mv)/dt$ (i.e., with $E_k = \int_0^v mv dv$, instead of $E_k = \int_0^v mv dv + \int_{m_o}^m v^2 dm$)!

Equation (iv), being based on the Special Relativity longitudinal mass derivation from the Lorentz transformation, and on the more general definition of force as $F = d(mv)/dt$ (rather than $F = m\, dv/dt$), it is the most representative of the kinetic energy in the context of the Special Relativity. Yet, it is far off from implying the general energy equation $E = mc^2$, boasted as being the most remarkable prediction of the special relativity theory!

7. Why is the Special Relativity Self Contradictory?

The reason why the Special Relativity results are self-contradictory as demonstrated in the preceding sections can be tracked back to its faulty formulation. The following analyses of the Special Relativity assumptions and ensuing formulation will clearly reveal the trickeries that make the theory appear as mathematically accurate with an apparent coherence.

7.1. Mathematical Formulation Misconception

We shall start from the Special Relativity postulates and follow the ensuing natural logic leading to their mathematical and physical consequences, in a clear undisputable reasoning. A simple comparison with the Special Relativity formulation approach will reveal its hidden misconceptions and violated constrictions, disclosing the fake predictions of the Special Relativity.

Consider two inertial reference frames, $K(x,y,z,t)$ and $K'(x',y',z',t')$, in relative uniform motion along the overlapped x- and x'-axes, at a speed v. The transformation relating the space and time coordinates of the two frames is to be determined. In classical physics, the coordinate conversion equation would be governed by the Galilean transformation, namely

$$x' = x - vt.$$

with unchanged y and z coordinates (i.e., $y = y'$; $z = z'$).

However, the above transformation doesn't work with the frames having different time dimensions, t and t', since, according to the relativity principle, the transformation should be written from the perspective of K' as

$$x = x' + vt',$$

which, when substituted in the previous transformation, will lead to $t = t'$.

Therefore, for the case where the time coordinates t and t' are assumed to be different from one another, a general coordinate transformation would then be hypothesized, while maintaining the linear property from the Galilean transformation. The respective spatial transformation shall therefore have the following form;

$$x' = \gamma x + \beta t,$$

where γ and β are real terms to be determined— y and z remain invariant.

The origin of K' is traveling at speed v with respect to K. Therefore, we can conclude that the coordinate $x' = 0$ in K' would be transformed to $x = vt$ in K. Hence, plugging the particular conversion $x' = 0$; $x = vt$ in the above general transformation yields the particular equation $0 = \gamma vt + \beta t$, or $\beta = -\gamma v$ (for $t \neq 0$), leading to a simplified general transformation equation

$$x' = \gamma (x - vt). \quad \text{(vi)}$$

It should be noted that Einstein [5] directly assumed the above basic transformation, thus ignoring the above condition of $t \neq 0$.

Furthermore, under the principle of the constancy of the speed of light, another particular conversion related to the x-coordinate of the tip point of a light ray propagating in the relative motion direction is readily available, and can be expressed as

$$x = ct; \; x' = ct'$$

which, when applied in the foregoing transformation equation (vi) leads to the general time transformation equation

$$t' = \gamma\left(t - \frac{vt}{c}\right), \quad \text{(vii)}$$

applicable for all time coordinates, and which can be forced to take the form of a function of t an x if we substitute $x = ct$ in its second term, yielding

$$t' = \gamma\left(t - \frac{vx}{c^2}\right), \quad \text{(viii)}$$

with the above restriction $t \neq 0$ being maintained, leading to the additional restriction of $x \neq 0,$ since $t = x/c$ is used to get the expression vx/c^2 in the above equation..

Now, owing to the fact that the reference frame K is traveling at a speed of $-v$ with respect to $K',$ and to the essential symmetrical property of the transformation with respect to the reference frames, inferred from the relativity principle, the inverse of the foregoing general spatial transformation (vi) can be written as

$$x = \gamma\left(x' + vt'\right), \tag{ix}$$

which must be as well restricted—by symmetry—to $t' \neq 0.$

Similarly, under the principle of the constancy of the speed of light, applying the particular conversion $x' = ct';\ x = ct,$ in the above transformation leads to the time transformation equation

$$t = \gamma\left(t' + \frac{vt'}{c}\right), \tag{x}$$

which can be forced to take the form of a function of t' and x' if we substitute $x' = ct'$ in its second term, yielding

$$t = \gamma\left(t' + \frac{vx'}{c^2}\right), \tag{xi}$$

equally maintaining the above restriction $t' \neq 0$, leading to $x' \neq 0.$

Substituting the obtained foregoing expressions (vi) and (viii) for $x'(x,t)$ and $t'(x,t)$ in the above expression (xi) for $t(x',t')$ leads, after simplification, to

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}.$$

Alternatively, the expression for γ can be obtained from substituting the foregoing expression (x) for $t(t')$ into (vii) for $t'(t).$

It follows that foregoing equations (viii) and (vi) for $t'(x,t)$ and $x'(x,t)$ constitute the Lorentz transformation (LT), yet these equations are shown to be merely particular equations restricted to the condition $x = ct$. In addition, as demonstrated above, these LT equations are restricted to values of x and t different from zero.

These results have been confirmed in an earlier study through mathematical analyses of the Lorentz transformation [6].

Now, the question is, why in the Special Relativity formulation, the condition that the LT is restricted to $x = ct$ is not explicitly evident?

In fact, in the Special Relativity formulation [2, 5, 7], it is imposed that the time transformation must take the form of $t' = at + bx,$ under the aforementioned constancy of the speed of light $x' = ct';\ x = ct,$ manipulated as $x^2 - x'^2 = c^2t^2 - c^2t'^2$, and the relativity principle. In other words, the formulation implicitly forces the substitution of $x = ct$ into the time transformation equation, to obtain the transformation in the required form, without any restriction—erroneously.

It can then be concluded that the actual consequence of the Special Relativity postulates is the time transformation equation $t' = \gamma(t - vt/c).$ If $x = ct$ was substituted in the latter equation, it will become the LT equation $t' = \gamma(t - vx/c^2).$ However the x in this LT equation is nothing but $ct,$ so setting $x = 0$ for co-local events, will actually result in $t = 0.$ However, in Special Relativity, the fact that x in the latter LT time equation is actually ct is hidden, and the result of setting $x = 0$ will be the erroneous time dilation $t' = \gamma t!$

7.1.1. The fatal contradiction

Substituting the foregoing LT time equation $t' = \gamma(t - vx/c^2)$ into its inverse $t = \gamma(t' + vx'/c^2),$ returns

$$t = \gamma\left(\gamma\left(t - \frac{vx}{c^2}\right) + \frac{vx'}{c^2}\right),$$

which can be simplified to

$$t\left(\gamma^2 - 1\right) = \frac{vx}{c^2}\left(\gamma^2 - \frac{\gamma x'}{x}\right). \tag{xii}$$

Since, as shown earlier, the LT time equation and its inverse are restricted to the conditions $x = ct$ and $x' = ct',$ respectively, their combined foregoing equation (xii) can be written as

$$t\left(\gamma^2 - 1\right) = \frac{vx}{c^2}\left(\gamma^2 - \frac{\gamma t'}{t}\right). \tag{xiii}$$

If the above LT combined time equation was applied to an event with the restricted time $t' = 0$, then according to the LT time equation $t' = \gamma(t - vx/c^2),$ the transformed t-coordinate with respect to K would be $t = vx/c^2.$

Consequently, for $t \neq 0,$ the above combined equation (xiii) reduces to the following equation, when $t' = 0.$

$$t\left(\gamma^2 - 1\right) = t\gamma^2,$$

yielding the fatal contradiction,

$$\gamma^2 - 1 = \gamma^2, \text{ or } 0 = 1.$$

7.2. Contradictions in Einstein’s 1905 Derivation of the Special Relativity Equations

7.2.1. Derivation Outline

In §3, entitled “Theory of the Transformation of Co-ordinates and Times from a Stationary System to another System in Uniform Motion of Translation Relatively to the Former”, of Einstein’s paper [2], the transformation equations relating the coordinates of the stationary frame having the coordinates system $K(x, y, z, t)$ and the traveling frame (in translational rectilinear motion) having the system $k(\xi, \eta, \zeta, \tau)$ are derived. The first derivation step is set to determine a basic equation for τ as a function of the K coordinates. To accomplish this, the travel time for a light ray to go back and forth a certain distance in k in terms of its respective one way travel time is considered relative to each of the two frames. This distance is set as

$$x' = x - vt,$$

which is independent of time when it is fixed in $k.$ In other words, a stationary point in k will have a set of values

x', y, z in K independent of time. So, τ will be first determined as a linear function of x', y, z and t, i.e. $\tau(x', y, z, t)$. The first part of the derivation leads to

$$\tau = a\left(t - \frac{v}{c^2 - v^2}x'\right), \quad \text{(xiv)}$$

where a is yet an unknown function of v, which shall be determined.

Next, the space coordinates transformation equations are determined. Using the constancy of the speed of light principle, the propagation speed of light in the traveling system k is also c, and for a light ray emitted at $\tau = 0$ (when the coordinate systems are overlapped) in the positive ξ direction, we have $\xi = c\tau$. Therefore,

$$\xi = ac\left(t - \frac{v}{c^2 - v^2}x'\right). \quad \text{(xv)}$$

But, as Einstein puts it, the ray moves relatively to the initial point of k, when measured in the stationary system, with the velocity $c - v$, so that

$$\frac{x'}{c - v} = t, \quad \text{(xvi)}$$

which, when inserted in the above equation for ξ, yields

$$\xi = a\frac{c^2}{c^2 - v^2}x'. \quad \text{(xvii)}$$

Similarly, in the η and ζ directions, $\eta = c\tau$, and $\zeta = c\tau$, with $t = y/\sqrt{c^2 - v^2}$, and $t = z/\sqrt{c^2 - v^2}$, respectively, along with $x' = 0$ in both cases, the above equation for $\tau(x', t)$ leads to

$$\eta = a\frac{c}{\sqrt{c^2 - v^2}}y,$$

$$\zeta = a\frac{c}{\sqrt{c^2 - v^2}}z.$$

The last steps in the derivation arrive at the value of a being $1/\beta$, yielding the final transformation equations:

$$\tau = \beta\left(t - \frac{vx}{c^2}\right), \quad \text{(xviii)}$$

$$\xi = \beta(x - vt), \quad \text{(xix)}$$

$$\eta = y,$$

$$\zeta = z.$$

where

$$\beta = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}.$$

7.2.2. Contradictory Findings

Now, going back to the derivation of the foregoing equation (xvii) for $\xi(x')$, it is obtained from the replacement of the time t of the stationary system in the equation (xv) of $\xi(x', t)$ with the time of travel of a light ray to go over the length x', in the positive x-direction, when observed from K, given by (xvi) $t = x'/(c - v)$. This must be the time in the stationary system K corresponding to the time in the moving system k given by the relation $\xi = c\tau$. i.e., this time t must be, according to the light speed principle, given by $x = ct$, which is indeed the case, since $t = x'/(c - v)$ is actually equivalent to $x = ct$, obtained by replacing x' by its value $x - vt$. This point should have been emphasized in the derivation.

Considering the foregoing equation (xv) for $\xi(x', t)$ it can be written as

$$\xi = ac\left(t - \frac{x'}{(c - v)}\frac{v}{(c + v)}\right).$$

Replacing $t = x'/(c - v)$ (xvi), equivalent to $x = ct$, in the latter equation for ξ, we get

$$\xi = \beta x\left(1 - \frac{v}{c}\right), \quad \text{(xx)}$$

and

$$\tau = \beta t\left(1 - \frac{v}{c}\right), \quad \text{(xxi)}$$

which shall yield the foregoing space and time transformation equations (xix) and (xviii) if and only if $x = ct$. By symmetry, it is ascertained that the inverse transformation equations

$$t = \beta\left(\tau + \frac{v\xi}{c^2}\right),$$

$$x = \beta(\xi + v\tau),$$

shall be valid if and only if $\xi = c\tau$.

It is to be noted that the above equations (xx) and (xxi), obtained using Einstein's own derivation, are in line with the findings obtained in a critical paper refuting the Special Relativity [8].

Now, the contradiction obtained in the previous section, namely $t\left(\beta^2 - 1\right) = t\beta^2$, for $t \neq 0$, has been ascertained by Einstein's derivation itself!

7.2.3. Inconsistency of Einstein's derivation

Going back to the derivation section, what if we considered the light ray traveling in the negative ξ direction? In this case, we would have $\xi = -c\tau$, and a simple calculation could show that the corresponding time in the stationary system would be

$$\frac{x'}{c + v} = t,$$

which, when inserted in the foregoing Einstein's equation (xiv) for $\tau(x', t)$, using $\xi = -c\tau$, yields

$$\xi = a\frac{c^2}{c^2 - v^2}x'\left(\frac{2v}{c} - 1\right),$$

or

$$\xi = \beta(x - vt)(2v/c - 1),$$

undermining the whole derivation of the Special Relativity transformation equations!

8. Conclusion

The alleged outcomes and predictions of the Special Relativity, namely the time dilation, length contraction, relativistic velocity addition, relativistic Doppler shift, and energy-mass equivalence $(E = mc^2)$, are analytically demonstrated to be incoherent and in contradiction with the theory itself.

The reason beyond such inconsistencies is the fact that the Special Relativity formulation is based on faulty assumptions, trickery, misconceptions, and devious interpretations, all resulting in basic errors implicitly embedded in its equations, as clearly revealed in this paper, and detailed in the extensive work on debunking the Special Relativity by Kassir [1].

References

[1] R.M. Kassir, Mathematical Conflicts in the Special Theory of Relativity, Second ed., CreateSpace, Charleston, 2017.https://www.amazon.com/dp/1544691378/ref=sr_1_3?s=books&ie=UTF8&qid=1489678476&sr=13&keywords=radwan+m.+kassir

[2]A.Einstein, Zur elektrodynamik bewegter Körper, Annalender Physik 322 (1905) 891–921.

[3] A. Einstein, Elementary Derivation of the Equivalence of Mass and Energy, American Mathematical Society Bulletin, 4 (1935) 223-230.

[4] A. Einstein, H.A. Lorentz, H. Minkowski, H. Weyl, The Principle of Relativity, Dover, New York, 1952.

[5] A. Einstein, Einstein's comprehensive 1907 essay on relativity, part I, English translations in Am. Jour. Phys. 45 (1977), Jahrbuch der Radioaktivitat und Elektronik 4(1907).

[6] R.M. Kassir, On Lorentz Transformation and Special Relativity: Critical Mathematical Analyses and Findings, Physics Essays, 27 (2014) 16.

[7] A. Einstein, Relativity: The Special and the General Theory Routledge, 1916.

[8] R.M. Kassir, On Special Relativity: Root cause of the problems with Lorentz transformation, Physics Essays, 27 (2014) 198-203.