---------------- Special Relativity is Wrong (New Theory of Relativity) ------------------

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Abstract

This paper is to show how wrong assumptions and derivations were used to conclude the formulas for time dilation, length contraction and relativistic mass.

When dealing with such a theory which was never been proved experimentally, its mathematical origin and compliance with fundamentals of physics should be checked before starting to struggle in imagining what observers observe from different frames of reference or how behaviors change as this speed or that.

The factor α which defines relativistic mass came from a misunderstanding of the nature of motion at the speed of light and as a correction factor to correct the mistake made in the second Lorentz transformation equation of special relativity generated by multiplying (vt) by the same factor used for ct`.

Keywords

Special relativity, time dilation, length contraction, relativistic mass, Lorentz transformation

1.0 Mathematical Failure in Deriving Time Dilation and Length Contraction

1.1 Definition of the Prime in Special Relativity Equations.

The two Lorentz transformation equations for special relativity are:

$$ct` = \alpha\,(ct - vt) \qquad 1.1$$
$$ct = \alpha\,(ct` + vt`) \qquad 1.2$$

Referring to figure 1.1 using x = ct, x` = ct` and vt, we can define the prime in equations 1.1 and 1.2 as:

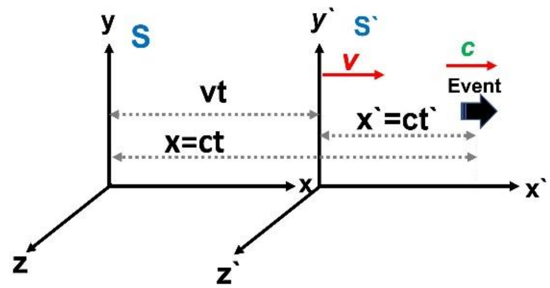

Figure 1.1

$$\gamma = \frac{ct`}{ct} = \frac{t`}{t} \qquad 1.3$$
$$ct` = ct\left(\frac{t`}{t}\right) = \gamma.ct \qquad 1.4$$

vt` is defined as

$$vt` = vt\left(\frac{t`}{t}\right) = \gamma.vt \qquad 1.5$$

Substituting in equation 1.1 and 1.2 we get

$$ct.\left(\frac{t`}{t}\right) = \alpha\,(ct - vt) \qquad 1.6$$

$$ct = \alpha\left\{ct.\frac{t`}{t} + vt.\frac{t`}{t}\right\} \qquad 1.7$$

solving for α by multiplying equation 1.6 by 1.7 we get

$$c^2t^2.\left(\frac{t`}{t}\right) = \alpha^2\left\{c^2t^2.\left(\frac{t`}{t}\right) + cvt^2.\left(\frac{t`}{t}\right) - cvt^2\left(\frac{t`}{t}\right) - v^2t^2.\left(\frac{t`}{t}\right)\right\}$$

$$c^2 = \alpha^2(c^2 - v^2)$$
$$1 = \alpha^2\left(1 - \frac{v^2}{c^2}\right)$$

$$\alpha = \frac{1}{\sqrt{1 - v^2/c^2}} \qquad 1.8$$

This derivation shows that the prime in ct\` and vt\` in equations 1.1 and 1.2 is equivalent to multiplying by γ defined in equation 1.3.

1.2 (α) is not Equal to (t\`/t ) or ( x/x\`)

If $\alpha = (\frac{t`}{t})$, then it should solve both equations 1.1 and 1.2

Substituting α in equation 1.1 gives

$$ct` = (\frac{t`}{t})(ct - vt)$$

$$ct` = ct` - vt`$$

$$c = c - v \qquad 1.9$$

Equation 1.9 has only one correct solution when (v = 0) which means that the moving frame of reference is not moving and there is no relativity.

It is obvious that equation 1.1 is correct and does not need a correction factor (i.e. α should equal to 1).

If we substitute (α = x/x\`) in equation 1.2 after substituting for x and x\`, we get

$$x = \frac{x}{x`}( x` + vt`)$$

$$x = x + \frac{x}{x`} vt` \qquad 1.10$$

Equation 1.10 is correct only when the second term is zero (i.e. v = 0, the moving frame is not moving or if α = 0 a case not covered by this theory).

If α = (t\`/t) is substituted in equation 1.2 we get

$$ct = \alpha\,(ct` + vt`)$$

$$ct = (t`/t)\,( ct` + vt`)$$

$$ct = (t`^2/t)\,(c + v)$$

$$ct = (t`/t)^2(ct + vt)$$

$$ct^2 = ct`^2 + vt`^2$$

$$(t`/t)^2 = c / (c + v)$$

$$(t`/t) = \alpha = 1 /(1 + v/c)^{1/2} \qquad 1.11$$

Comparing α^2 from equations 1.11 and 1.8 gives

$$\alpha^2 = c / (c + v) = c^2/(c^2 - v^2)$$

which leads again to

$$c = c - v$$

Also multiplying equation 1.2 by (ct) with substituting (t`/t) for α gives

$$c^2t^2 = (t`/t)\ (c^2tt` + vctt`)$$

$$c^2t^2 = c^2\ t`^2 + cvt`^2 \qquad 1.12$$

c^2t^2 can be concluded from equation 1.8 as

$$c^2t^2 = c^2t`^2 - v^2t`^2 \qquad 1.13$$

equalizing equations 1.12 and 1.13 gives

$$c^2\ t`^2 + cvt`^2 = c^2t`^2 - v^2t`^2$$

which leads to

$$c = c - v$$

1.3 Different Solutions for α in one derivation

Since (ct` = ct -vt) is a correct equation, α = 1 is the only solution for this equation.

The solution of the second equation is

$$ct = \alpha\ (ct` + vt`)$$

$$ct = \alpha\ (\gamma ct + \gamma vt)$$

$$\alpha = \frac{c}{\gamma\ (c+v\ )} \qquad \text{but } \gamma = \frac{(c-v)}{c}$$

$$\alpha = c^2\ /(c\text{-}v)(c+v)$$

$$\alpha = c^2/(c^2 - v^2) \qquad 1.14$$

comparing the above two solutions for α with equation 1.8, we find that α has three different solutions in one derivation.

1.4 (α) in the first Galilean transformation equation

The first Galilean transformation equation is

$$x` = x - vt \qquad 1.15$$

we can express it in a linear from where x` is a function of x and time as:

$$x` = \alpha\ x + ßvt \qquad \text{(where α and ß are constants)} \qquad 1.16$$

when $x` = 0$, then $x = vt$, and if substituted in equation 1.16 with referring to figure 1.1 we get

$$0 = \alpha x + ßvt$$

$$\alpha x = - ßvt$$

$$\alpha vt = - ßvt$$

$$\alpha = - ß$$

$$x` = \alpha x + (-\alpha)vt$$

$$x` = \alpha (x - vt) \qquad 1.17$$

This derivation shows how α came to one side of the equation not to the other, but if consider the case when $vt = 0$ and $x = x`$ and rewrite equation 1.14 as

$$gx` = \alpha(x - vt)$$

Substituting $vt = 0$ and $x` = x$ we get

$$gx` = \alpha(x - vt)$$

$$gx` = \gamma x$$

$$g = \gamma$$

thus $\gamma = - ß = g$

and this shows that equation 1.15 should be fully multiplied by α as

$$\alpha x` = \alpha (x - vt)$$

which is equivalent to not multiplying by any factor.

In other words, α for this equation should be equal to (1) because it is a correct equation and does need a correction factor.

1.5 The correct derivation of α and its relation with (t`/t)

Since we found that α in the first Lorentz transformation equation is 1, we can rewrite equations 1.1 and 1.2 as

$$ct` = ct - vt \qquad 1.18$$

$$ct = \alpha (ct` + vt`) \qquad 1.19$$

Equation 1.19 became wrong after converting vt into vt` when multiplying it by (γ) and requires a correction factor α

γ is defined γ as : $\gamma = \frac{ct`}{ct} = \frac{t`}{t} = \frac{ct - vt}{ct} = \frac{c - v}{c}$

substituting for γ equations 1.18 becomes

$$ct` = ct - vt$$

$$\gamma ct = ct - vt \qquad 1.20$$

and equation 1.19 becomes

$$ct = \alpha(ct` + vt`)$$

$$ct = \alpha\ (\gamma ct + \gamma vt)$$

$$ct = \alpha\ \{\gamma ct + \gamma ct\ (\frac{vt}{ct})\}$$

$$1 = \alpha.\gamma\ (\ 1 + \frac{v}{c})$$

$$\boldsymbol{\alpha = \frac{1}{\gamma\ (\ 1 + v/c\ )}}$$

$$\alpha = \frac{c^2}{(\ c - v)(c+v)}$$

$$\boldsymbol{\alpha = \frac{1}{1 - v^2/c^2}} \qquad 1.21$$

To find the relation between α and (t`/t) we have

$$\alpha = \frac{1}{(t`/t)(c+v)/c}$$

$$\alpha = (\frac{t}{t`})(\frac{c}{(c+v)})$$

$$(\frac{t`}{t}) = \frac{c}{\alpha(c+v)}$$

$$\boldsymbol{(\frac{t`}{t}) = \frac{1}{\alpha(1+ v/c\ )}} \qquad 1.22$$

1.6 Speed of light in both moving and fixed frames

If the speed of light in the fixed and moving frames of reference is defined as

$$c = \frac{x}{t} = \frac{x`}{t`}$$

and $$\alpha = \frac{t`}{t} = \frac{x}{x`}$$

then the speed of light in the moving frame after substituting for x` and t` is

$$c = \frac{x`}{t`} = (\frac{x}{t})(\frac{1}{\alpha^2}) = c.\,(\frac{1}{\alpha^2})$$

This show that as per relativity, the speed in the moving frame is reduced by α^2 which is against one of the postulates of the theory

1.7 (α) is just a correction factor

Substituting for γ in the second transformation equation, we get

$$ct = \alpha\,(ct` + vt`) \qquad 1.23$$

$$ct = \alpha\,(\gamma ct + \gamma\, vt) \qquad 1.24$$

$$ct = \alpha\,\{(\frac{c-v}{c})\,ct + (\frac{c-v}{c})\,vt\}$$

but vt = ct (vt/ct), then

$$ct = \alpha\,\{(\frac{c-v}{c})\,ct + (\frac{c-v}{c})\,ct\,(\frac{vt}{ct})\}$$

$$1 = \alpha\,(\frac{c-v}{c})\,(1 + \frac{v}{c})$$

$$1 = \alpha\,(\frac{c-v}{c})\,(\frac{c+v}{c})$$

$$\alpha = \frac{c^2}{c^2 - v^2} \qquad 1.25$$

If the mistake which happened by multiplying the second term of equation 1.19 (vt) by (γ) is avoided, then we get

$$ct = \alpha\,(\gamma ct + vt)$$

$$ct = \alpha\,\{(\frac{c-v}{c})ct + vt\}$$

$$ct = \alpha\,\{(1 - \frac{v}{c})\,ct + ct\,(\frac{vt}{ct})\}$$

$$1 = \alpha\,\{1 - \frac{v}{c} + \frac{v}{c}\}$$

$$\alpha = 1$$

This shows that the only reason to include α in the second equation is the multiplication of the second term (vt) by γ to become (vt`) while the first equation is correct and does not need a factor α.

Accordingly, the correct Lorentz transformation equations for special relativity are

$$ct` = ct + vt \quad 1.26$$

$$ct = ct` + vt \quad 1.27$$

equation 1.27 can be written as

$$ct = \gamma`ct + \gamma ct \quad 1.28$$

where $\gamma` = (\frac{c - v}{c}) = (1 - \frac{v}{c})$ is the fraction of ct in the moving frame of reference.

$\gamma = (1 - \gamma`) = (\frac{v}{c})$ is the fraction of ct in both frames of reference.

Equation 1.28 becomes

$$\mathbf{ct = (\frac{c - v}{c})\, ct + (\frac{v}{c})\, ct} \quad 1.29$$

If special relativity is considered to be right as a theory, then its derivation is wrong, and the two equations should be written as

$$\mathbf{ct` = ct - vt}$$
$$\mathbf{ct = \alpha\, (ct` + vt`)}$$

and the solution for α is

$$\boldsymbol{\alpha = \frac{c^2}{c^2 - v^2}}$$

but both the theory and the derivation are wrong.

2.0 Relativistic Mass

Referring to figure 2.1, if a person shoots a bullet from his rifle in a space free from gravity and air resistance, then we expect that the explosion force acts on the bullet to build up its speed until it leaves the rifle.

With no external forces in the free space, the bullet keeps a constant speed.

If $\partial k = \partial W = F.\partial s$

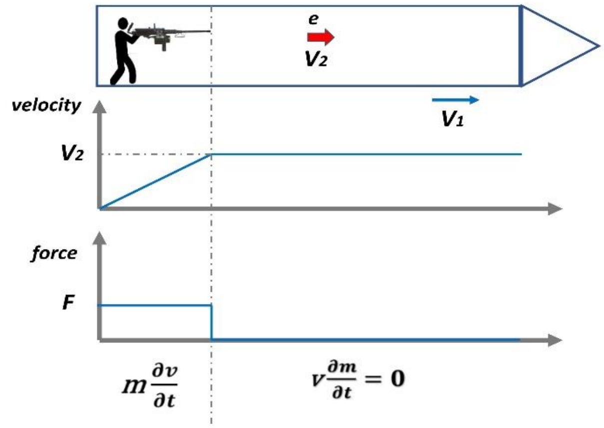

Figure 2.1

Where F is the external force generated by the explosion and W is the work done in the rifle length s. After leaving the rifle, the bullet has a constant speed (i.e. zero external forces).

Force is defined as

$$F = \frac{\partial p}{\partial t} = \frac{\partial (mv)}{\partial t}$$

$$F = m\frac{\partial v}{\partial t} + v\frac{\partial m}{\partial t}$$

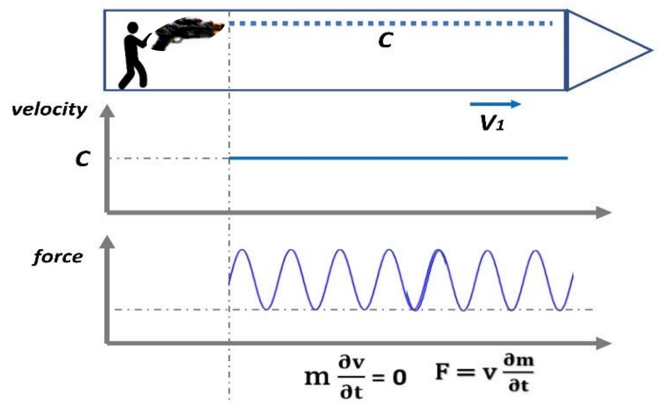

Figure 2.2

This equation has two terms in the right side, one is (F = ma) where force generates a change in speed of the bullet and the other generates a change in mass.

At speeds below the speed of light, the second term ($v\frac{\partial m}{\partial t}$) is zero because mass does not change and at the speed of light, the change in mass generates the force.

Thus, the force at speeds below the speed of light is defined as

$$F = ma = m\frac{\partial v}{\partial t}$$

At the speed of light (figure 2.2), the external force is zero which means that the first term ($m\frac{\partial v}{\partial t}$) is zero, and in the second term the change in mass builds up a force equals ($v\frac{\partial m}{\partial t}$) and release it in each wave length.

This cyclic generation of force is the reason why light is not affected by external forces besides its tinny mass.

To find the relation between the equation $E = mc^2$ and relativistic mass, let's start with

$$\partial k = \partial W = F.\partial s$$

Where F is an external force and W is the work done in a distance s.

$$F = \frac{\partial p}{\partial t} = \frac{\partial (mv)}{\partial t}$$

$$F = m\frac{\partial v}{\partial t} + v\frac{\partial m}{\partial t} \qquad 1.30$$

$$\partial k = \partial s.\, m\frac{\partial v}{\partial t} + \partial s.\, v\frac{\partial m}{\partial t} \qquad (\text{ But } \frac{\partial s}{\partial t} = v)$$

$$\partial k = mv\partial v + v^2\partial m \qquad 1.31$$

At speeds below the speed of light $F = v\frac{\partial m}{\partial t} = 0$ and $v^2\partial m = 0$. Thus, in this case the change in kinetic energy is

$$\partial k = m_0 v\partial v \qquad 1.32$$

Also, if α is expressed as

$$\alpha = \frac{m}{m_0} = 1 + \frac{v^2}{c^2}$$

$$\frac{m}{m^0} = \frac{c^2+v^2}{c^2}$$

$$\mathbf{mc^2 = m_0c^2 + m_0v^2} \qquad (\text{ derive})$$

$$c^2\partial m = 2m_0 v\partial v \qquad 1.33$$

Comparing equations 1.32 and 1.33 we get

$$c^2\partial m = 2\partial k \qquad 1.34$$

Substituting ($\partial k = ½\, mc^2 - ½\, m_0c^2$) in equation 1.34 gives

$$c^2(m\text{-}m_0) = 2.\,(½\, mc^2 - ½\, m_0c^2)$$

$$c^2(m\text{-}m_0) = c^2\,(m\text{-}m_0)$$

Substituting ($\partial k = ½\, m_0v^2 - ½\, m_0{v_0}^2 = ½\, m_0v$) in equation 1.34 Considering that v_0 is equal to 0, we get

$$mc^2\text{-}m_0c^2 = 2.\,(½\, m_0v^2)$$

$$\mathbf{mc^2 - m_0c^2 = m_0v^2}$$

$$mc^2 = m_0(c^2+v^2)$$

$$m = m_0\,(1+\frac{v^2}{c^2})$$

If equation 1.34 is written as

$$c^2\partial m = \partial k + m_0.v.\partial v \qquad 1.35$$
$$\mathbf{c^2(m\text{-}m_0) = \Delta k + ½\, m_0 v^2} \qquad 1.36$$

Then, when $\partial k = (½\, mc^2 \text{-} ½\, m_0c^2)$ we get

$$c^2(m\text{-}m_0) = (½\, mc^2 \text{ - } ½\, m_0c^2) + m_0v^2/2$$

$$½\, mc^2 \text{ - } ½\, m_0c^2 = ½\, m_0v^2$$

$$\mathbf{mc^2 \text{ - } m_0c^2 = m_0v^2}$$

when $\partial k = (½\, m_0v^2 \text{ - } ½\, m_0{v_0}^2) = ½\, m_0v^2\ \ (v_0 = 0)$

$$mc^2\text{-}m_0c^2 = ½\, m_0v^2 + ½\, m_0v^2$$

$$\mathbf{mc^2 \text{ - } m_0c^2 = m_0v^2} \qquad 1.37$$

Also, equation 1.37 can be written as

$$½\, mc^2 \text{ - } ½\, m_0c^2 = ½\, m_0v^2 \qquad 1.36$$

Equation 1.37 means that the change in kinetic energy at the speed of light is caused by the change in mass which itself is caused by an initial potential energy not by an external force.

Example:

If a particle is travelling at the speed of light from point A to point B where its mass and kinetic energy at point A are (m_0, k_0) and (m, k) at point B and it has an initial potential energy E_P, then, with no external source of energy or force, the energy at point A equals to the energy at point B

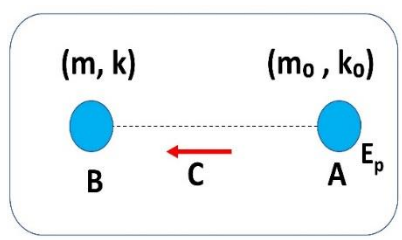

Figure 2.3

$$½\, mc^2 = ½\, m_0c^2 + Ep.$$
$$½\, mc^2 \text{ - } ½\, m_0c^2 = \Delta k = Ep$$

If we define Ep. in a translational kinetic energy scale to be equivalent to the energy required to accelerate the particle from rest to speed v (maximum value of v = c) with constant mass m_0, then

$$Ep = ½\, m_0v^2$$

$$½\, mc^2 \text{ - } ½\, m_0c^2 = ½\, m_0v^2$$

$$mc^2 - m_0c^2 = m_0v^2$$

$$m = m_0 \left(1 + \frac{v^2}{c^2}\right)$$

Since the maximum value of v is C, then substituting c for v gives ($m = 2m_0$)

$$\Delta k = ½\, m_0c^2$$

If $Ep = ½\, m_0c^2$ at point A, then the total energy of the particle is

$$E = k_0 + Ep = ½\, m_0c^2 + ½\, m_0c^2 = m_0c^2$$

At point B with $m = 2m_0$ where all the energy Ep is converted to translational kinetic energy, the total energy of the particle is

$$E = ½\,(2m_0)\, c^2 = m_0c^2$$

Thus, equations 1.30 and 1.31 should be understood as working in two domains, the first at speeds below the speed of light where translational kinetic energy increases with velocity under the effect of an external force and the second where translational kinetic energy increases with mass increase at the speed of light without the need of an external force but by an initial potential energy.

The theory of relativity combined the energy/mass behavior at the speed of light to the energy/velocity behavior at speeds below the speed of light to force both to act at speeds below the speed of light which is equivalent to multiplying (vt) by (γ) in the second equation of special relativity.

3.0 Adding velocities (relative velocities)

Referring to figure 2.1 the person in the spaceship observes the bullet which travels with a constant velocity v2 as traveling with a relative velocity (v2 – v1) while a parson in the fixed frame of reference observes its relative velocity as v2.

If the gun is replaced by a machine gun and shoots a stream of bullets, then both observers will see the stream relative velocity as v2.

The first case is applicable to an event travelling at the speed of light and the second is applicable to a light beam (or a wave).

Figure 3.1 shows an open back side spaceship travelling with a constant speed v (moving frame of reference). If at (t = 0) both a person inside the ship and another outside the ship (in the fixed frame) shoot two bullets and the person inside the ship starts walking then the person in the fixed frame (denoted as F) will see both bullets travelling at their actual speeds without any effect of being in the moving frame while he will observe the relative velocity of the man in the ship as ($V_3 + v$).

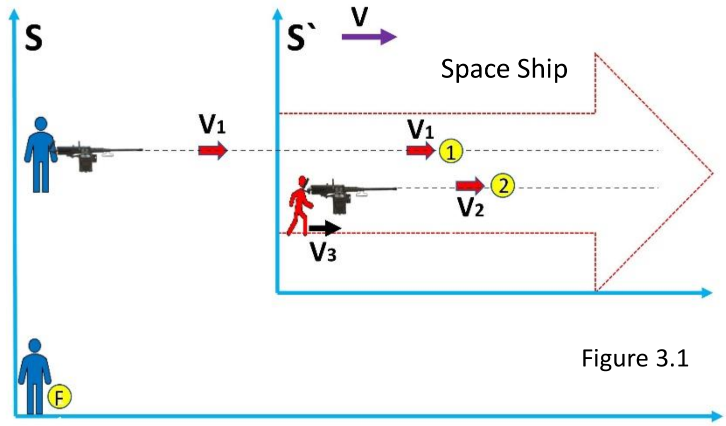

Figure 3.1

Similarly, light does not need any external force to travel and is seen with its actual constant velocity c from a fixed frame of reference.

Thus, when an abject is travelling with a constant speed in a moving frame of reference, the speed of the frame of reference will not affect the speed of the object as long as no force is applied by the frame of reference on the object.

Changing all laws of physics related to relative velocities because of only one special case is just a sort of piffling in addition to that proposing that the speed of light is the limit and absolute speed is just a nonproven wrong assumption.

Also, it should be distinguished between actual speed and relative speed, relative speeds mostly can't be used to calculate actual time, distance and energy.

Also, thinking about this special case needs to pay attention to the difference between no forces and zero net forces.

In figure 3.2 if we have two planes and a person on earth, then we have two cases.

The first is the case of an event travelling at the speed of light P and the second is of a light beam w.

In the first case, the relative velocity of the event with respect to each plane is the difference between the velocities of the planes and event.

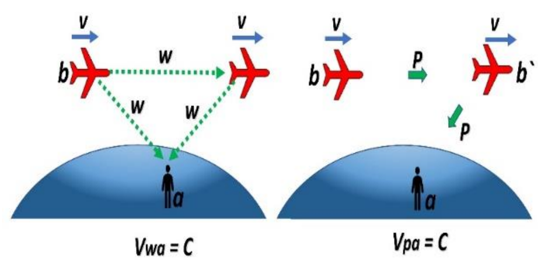

Figure 3.2

$$Vr = (c - v) \text{ or } (v - c)$$

And the relative velocity of the event to the person on earth is always equals to c

$$Vr = c$$

Where the moving planes do not add anything to the speed of the event.

If we consider the case of the light beam w , then its relative velocity with respect to each plane and to the person on earth is c as long as the distance between the planes is so small compared to the distance travelled by light in one second.

This odd case can't be generalized to change the full laws of physics by assuming that the speed of light is the limit speed and apply it to all relative speeds.

Conclusions

a) A wrong mathematical derivation was used to find the factor α of time dilation and length contraction and a wrong assumption was used to derive α for relativistic mass, accordingly it is not only the derivation and assumption are wrong , but the full theory of special relativity is wrong.

b) Waves' particles do have mass

c) Mass varies only at the speed of light while at speeds below the speed of light, only velocity causes the kinetic energy to vary under the effect of an external force.

d) The total energy of a wave particle travelling at the speed of light is always constant and equals to $(\mathbf{E = m_0 c^2})$.

e) The velocity and kinetic energy vary by an external force at speeds below the speed of light while the change in kinetic energy at the speed of light is caused by an initial potential energy which causes mass and translational kinetic energy to increase when it is converted into translational kinetic energy. The force at the speed of light is generated by the change in mass not by any external factor.

f) Some of the theories of physics like free space, absolute and relative frames of reference, space time etc. should be reviewed and revised after revealing the mistakes happened in finding these theories.

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