

# Special Relativity Theory: Only for Geniuses?

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In this stroll about the Special Relativity Theory, I analyze Einstein's insights about the actual meaning of his Relativity Theory. This analysis clarifies us about the way that the Special Relativity Theory should be understood, and help us to see if one really needs to be a genius for fully understanding it. It is found that the Special Relativity Theory is consisting of two independent concepts, of which the basics are unveiled and put in the right context of physics. The experiments that are claimed to prove the Special Relativity Theory are scrutinized in the context of the findings.

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## 1. The discussion going on since 100+ years

Daily, there are hundreds of posts on the internet, e-mails exchanged in groups, which all treat about the Special Relativity Theory, and that support or defy it.

This contestation and support occurs since more than hundred years now.

The interpretation of the Special Relativity Theory has been changing over time, and the reason is that new experimental findings have incited researchers to interpret the theory in the light of these findings.

In this paper, I analyze the content of the Special Relativity Theory and the new findings that supported the theory, in the context of both the theory itself and in the context of the experiments.

## 2. Einstein's thought experiment with light

Einstein performed a thought experiment [1], in which he defined inertial reference frames, say, frames at a constant velocity, and used light signals to communicate between them.

He wanted to look at one frame from another frame, and to discover what the other frame would look like when receiving the signals: what would length look like and what would the time pulses look like? Hence, with his calculus, he found what the inertial reference frame 1 would receive as signal from the inertial reference frame 2, when there is a motion involved. The relationship between what the frame 1 sees in its own frame and what the frame 2 would detect from a distance, is expressed by the deformation of the light signals, which can be written down mathematically as transformation rules.

It are the transformation rules that say how the deformation of the light signals will look like when there is a certain velocity present between the frames.

The result was that if an inertial reference frame was moving, the lengths, as seen from the other frame, would be shorter than its proper lengths. If both frames were carrying a ruler, the ruler of the moving frame would be seen as being shorter by the exchanged light communication signals.

## 3. Relativity of, or between inertial reference frames?

There is however also the principle of relativity of the inertial reference frames, which Einstein found a reasonable concept by comparing a man in a train, who was suddenly seeing the window of the train next to his window moving. Was it his train or the other train that moved?

In the context of the inertial reference frames, Einstein found it reasonable to apply that principle, so that there is no preferred inertial reference frame.

However, due to this relativity principle, every inertial reference frame can pretend that it is standing still and that the other inertial reference frame is moving [3].

The conclusion is that in that case, every inertial reference frame will see the signals as being transformed by the transformation rules, the same way.

Hence, it is not possible that the light signals would physically affect any property of the objects in the inertial reference frames, because then, all the inertial reference frames would be deformed the same way, as seen by any other inertial reference frame. The so-called FitzGerald-Lorentz contraction, which claim the real contraction of the rulers instead of the apparent contraction as seen from another inertial reference frame is therefore invalidated [3].

Indeed, it is just about the deformation of light signals, and effectively, the signals will always be as the transformation rules prescribe.

#### 4. The constancy of light and its consequences in the Special Relativity Theory

In the transformation rules of the light signals between the inertial reference frames, not only the length of rulers was calculated, but also the changes of the pulses between them.

It was also possible, when assuming that inertial masses and intrinsic energy were interchangeable by a simple equation, and when assuming that the speed of light is a constant for each inertial reference frame, whether moving or not, to define an expression for masses in terms of length and time values, to combine it with energies, both kinetic and intrinsic, and finally, with masses.

Due to the law of energy conservation, Einstein could then associate mass, time and length as mutual variables, by definition. By that, he made length and time suddenly variable by definition, during his calculus, without even having verified this by observation or experiment. The millions of years old concept that time is intrinsically invariable, and can only be perceived as different due to an altered perception, was trashed by the idea that the speed of light would be identical at any place in the universe, whatever the speed of any of the inertial frames would be.

By the relationship between mass, time and length, Einstein could then calculate the light signal transformations of how masses would be perceived by one moving frame to another frame that was standing still, when adopting the same rules of interchangeability of mass with energy and the constancy of light.

Since that moment, it became tempting to see the light signal transformations as being more than light signals alone.

Scientists who wanted to attribute more power to the Special Relativity Theory, claimed that the light signals would have the ability to really transform the very properties *inside* the inertial reference frames themselves, instead of only the transformation of the light signals *between* the frames.

Later experiments are said to verify that, to which I come back to this in a few following paragraphs.

#### 5. Postulate of a constant velocity of light : a physical analysis

The postulate of a constant velocity of light at all places for all the inertial reference frames should be analyzed in more detail. Is the concept of such a constant velocity valid? The postulate means that when two or more inertial reference frames cross at the same place at different velocities, allegedly all the inertial reference frames would measure a very single light beam, as having the same velocity  $c$ . This is locally impossible because in that case, the velocity of that light beam is undefined.

On the other hand, when the speed of light has been measured as " $c$ " on a planet X in a galaxy A, it is very well possible that the speed of light is also measured as " $c$ " on another planet Y in a galaxy B, which is moving with a speed  $v$  towards (or away from) the planet X.

It means that there must exist a transition of the measured speed of light from the planet X to the planet Y. The reason is

then that the speed of light can be bound to each large mass in the galaxy, which is not forbidden from the results of Michelson's and Morley's experiment. Practically, one can suggest that the light beam is bound to every local gravitational potential.

Locally, it will be very difficult to measure the velocity of a light beam at the moment of emission from a device that moves at a velocity  $v$  with respect to the Earth's surface. Likely, the light beam's velocity will already been adapted to the Earth's conditions, and show the velocity as being " $c$ " at the moment that it leaves the atoms of the crystal. These atoms, made of electromagnetic components, can also behave under the Earth's magnetic field, and only an electromagnetic analysis would be useful to predict some outcomes, such as the ones that are found in the next paragraphs.

#### 6. Summary of the Special Relativity Theory

The Special Relativity Theory consists of two totally independent parts:

1) the calculus of the Special Relativity was performed for the purpose of the physical interpretation of light signals between inertial reference frames only, in order to calculate the perception of the ruler length that another frame would get in another inertial reference frame. This resulted in the calculus of the transmission of these signals. Hence, the light signals, which have no power by itself (except their tiny energy and inertial momentum) cannot do more than transmit the information of their deformation to the other frame.

Hence, the relativity principle would allow that every frame could see the other frames as having a shorter ruler and longer pulses. This means that every ruler will be shortened, as seen from another inertial reference frame.

Hence, due to the mutual claim that the other ruler is seen as being shorter, there cannot be any *physical* alteration of the properties inside the objects of the reference frames.

2) the assumption that the speed of light is the same for every inertial reference frame, whatever its place and speed, combined with the interchangeability of mass and energy, results in the mathematical consequence that the kinetic energy would result in a kinetic mass, and so, being mathematically connected to length and time.

The physical consequence, that two or more inertial reference frames, crossing at the same place at different velocities, would measure the speed of light as being identical, is that there must be an exchange of energy between the beam and the detection device, if the device would measure the speed of light as being the same value  $c$ . Hence, the energy exchange would adapt the speed of light to the considered inertial reference frame, since light possess a rate of energy and momentum.

Since all the inertial reference frames would measure the same velocity for the light beam, the true velocity of the light beam is all the velocities together, or none at all, which is physically impossible.

The conclusion of the first part of the Special Relativity Theory is that only the light signals between the inertial reference

frames are deformed when it perceives a ruler, seen from the one frame to the other.

The conclusion of the second part is that since it is assumed, without any proof whatsoever, that the velocity of light is the same for all the inertial reference frames together, even if they are crossing at the same place and time, we are hitting a physical impossibility.

One could argue that also this part would be an effect of perception, in which an unacknowledged physical parameter has been overlooked, that is, if light adapts itself from one inertial reference frame to another, there must be an exchange of energy that would allow such a thing. However, having all the velocities at once at one place, and still allegedly detecting an identical speed of light, is simply physically impossible. Hence, the above argument has to be rejected.

It remains that the assumption of the constancy of light in all possible situations, whatever the place and velocity of the inertial reference frame can only be fictive or simply invalid.

## 7. Michelson & Morley: what did they prove?

The Special Relativity Theory was said to having obtained an experimental support from the Michelson and Morley experiment.

Nowadays, this is considered that it allegedly proves that aether doesn't exist, which would support that light is not bound to any support. Therefore, we analyze this experiment closer.

What did Michelson and Morley try to prove? They tested the following hypothesis: assuming that light is carried by an aether, assuming that this aether is global, and assuming that the Earth is moving with respect to this aether, what is its direction and velocity?

The experiment was negative, which confirms that the hypothesis was false.

Since the hypothesis consisted of a multiple set of assumptions, only one of the assumptions must be false: either assuming that light is carried by an aether, or that this aether is global, or that the Earth is moving with respect to this aether, is false.

Hence, many possibilities remain open with respect to the existence of an aether, and the non-existence of aether is surely not proven.

## 8. The proofs from accelerators like CERN

Allegedly, the fast particles in CERN's accelerator would be a proof that mass is increasing with velocity, because the faster the particle, the more energy has to be put in the electromagnetic fields that tend to accelerate the particles further.

It is however important to stand still about what is really happening. The particles are charges, because only charges can be forced in a circular path and be accelerated by the help of electromagnetic fields.

The way how CERN accelerates charges is by using electromagnetic fields, that will induce at the right place and moment the charges, by the induction laws given by Maxwell.

So, in the first place, it is important to notice that there are no light signals between the inertial reference frames, but electro-

magnetic fields. These fields are subject to a propagation speed that equals 'c', the speed of light.

The fields are propagating with the speed of light, and when a charge is moving at a high velocity, these fields will be retarded about the charge. In literature, this is a well-known effect of electromagnetism, as confirmed in the Liénard-Wiechert retarded potentials or the Jefimenko equations of retarded fields. Note that the actual textbooks don't represent the correct Liénard-Wiechert retarded potentials, which were derived in 1898 and 1900, and which were not 'injected' at that time by the relativistic 'Lorentz' factor.

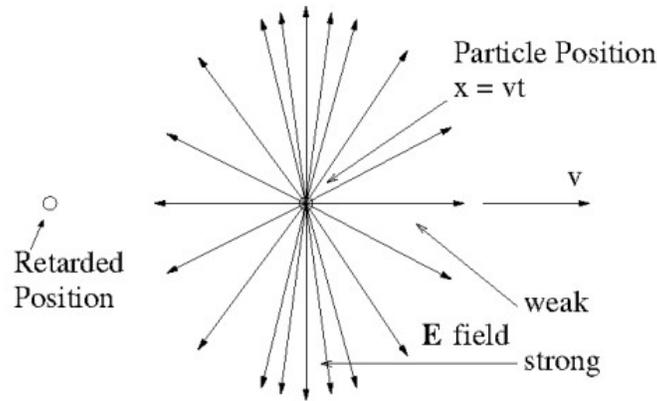


Fig.1: Deformations of a charge's electric field due to its velocity. The fields at the rear and the front vanish completely at the speed of light, and they become maximal in the transversal direction.

At the place where the charge is present, the fields will run behind. At every location around the charge, this retardation will have another effect: the result of the retardation at the front and the rear will give a different deformation of the electric field than how the retardation deforms the electric field of the charge's sides, transversal to the motion. In the fig.1 the deformations are visualized. The magnetic field, due to the induction by the speed of the charge, will be deformed as well, according to the deformation of the electric field.

The consequence of the deformation of the electric field is that at high velocities close to the speed of light, there is no field left at the rear side, in order to be accelerated by means of electromagnetic waves. Since at the transversal side there is a large electric field, the charge can only be moved in that direction, but therefore cannot accelerate it further.

We must conclude that, besides the fact that the Special Relativity Theory is only about the transmission of light between inertial reference frames, and that also the assumption of a constant speed of light in all circumstances is fictive, it is also settled that the retarded electric fields are at the real origin of the impossibility of a further acceleration, for speeds close to the speed of light.

## 9. The proofs from fast muons: time dilation

Allegedly, fast muons that travel in the atmosphere would provide the proof of time dilation, because the decay is delayed

at high velocities, whereas at low velocities, the decay is much faster.

However, also muons are charges, and also the same effect as in accelerators like CERN occur, which make the electric field at the front and the rear almost vanish, and the transversal one be maximal.

As it is known from textbooks about the retardation of electromagnetic field, the moving charge will induce a magnetic field that is directly proportional to the electric field, and which is circulating about the charge.

For fast charges, this magnetic field becomes huge, and a Lorentz force will be created upon the charge, given by the equation

$$\mathbf{F} = q(\mathbf{E} + \mathbf{v} \times \mathbf{B}) \quad (1)$$

which is oriented transversally at high speeds, and which is really enormous.

The transversal force compresses the muon very tightly, so that it is held together and cannot decay.

## 10. Why the results fit with the Special Relativity Theory

It is claimed that since the figures of the experiments fit rather well with the Special Relativity Theory, this theory must be right.

Indeed, the mathematics may be quite similar in the case of Retarded Equations of Electromagnetism and Special Relativity for the fast charges. However, what is important is the physical feasibility of a theory, not just the mathematics.

The fact that electromagnetic fields are retarded in a similar way as the relativity equations can be found in the similarity of the retardation of light on the one hand, and that of electric and magnetic fields on the other.

There are however differences, because the generation of a magnetic field will depend from the motion of the charge, whereas if the charge isn't moving, there will not be any induced magnetic field.

As a matter of fact, Oleg Jefimenko has applied the retarded equations of electromagnetism to harmonically oscillating devices consisting of charges, and that were globally moving. These devices emitted electric and magnetic fields, that were received at a distance by detecting device.

Depending from the device, Jefimenko found several transformation equations, of which some coincided with the Special relativity equations, other devices didn't show the same equations because of the orientation or structure of their harmonic oscillator.

This shows that the Special Relativity Theory cannot cope by its physics, but moreover doesn't resemble to the equations of retarded electromagnetism.

## 11. The proof of Hafele-Keating for time dilation

Hafele and Keating performed a test with four atomic clocks in an aircraft, that flew from east to west and separately from west to east. The results that were finally published found that

the time retardation would correspond with the Special Relativity Theory.

In the first place, it is important to make the difference between the actual measurements and the corrections to the experiment that were made afterwards. Hafele found that the results did not allow to conclude that the experiment corresponded with the requirements of the Special Relativity Theory [6].

However, due to the massive pressure of the pro-relativity community, Hafele was forced to adapt the facts, and to publish a Relativity-consistent paper, which was in fact their PhD thesis.

When we analyze the experiment globally, it is clear that also here, it is all about charges inside an atomic device, and it is also clear that no interaction of light is at the origin of the clock. Hence, an alteration of the clock rate would be given by the velocity that is exerted upon charges, and no light signal exchange between inertial reference frames.

The retardation of the electromagnetic fields are effectively exerting inductions and forces upon the constituents of the atomic clocks, and since effectively, there were deviations found, which however were non-consistent, one could suggest that the housing that was supposed to shield the atomic clocks from the Earth's magnetic field was not effective.

In all the cases, since the experiment was negative, it is not possible to confirm either physical process.

## 12. The proof of the Ives-Stilwell experiment

There are other experiments that try to prove the Special Relativity Theory by using light beams. Ives and Stilwell tested the transverse Doppler effect and Ives found it consistent with the transformation equations as given by Voigt. Other scientists found it consistent with the Special Relativity Theory.

In fact, without going into detail, the experiment confirms what the Special Relativity Theory is standing for: the deformation of light signals between reference frames, with the perception of a deformed reality through a light beam.

## 13. The proof of the Kennedy-Thorndike experiment

Another proof allegedly tested the assumption that the speed of light would constant, whatever the speed of the source is.

In fact, the Kennedy-Thorndike experiment uses a light beam generator, and makes it move at a certain velocity. The velocity of the outgoing light beam is then measured, and the value equals the standard value  $c$ .

However, as we have seen above, the negative outcome of the Michelson-Morley experiment give several solutions to account for a light beam that is carried by an aether, or in modern terms, a Quantum Field. One of the solutions is a light beam that is carried by the Earth's field itself, when the experiment occurs close to the Earth.

Anyway, the possibility of a measured constant velocity of light, whatever the velocities of all the inertial reference frames are, at the same place and time, has indeed been ruled out, by the impossibility to get such a physical situation.

## 14. Other proofs

Similar proofs as above have been performed, but they are either referring to charges, which cannot be explained by the Special Relativity Theory but instead by the theory of electromagnetism, or in other cases the proofs refer to the deformations of light beams themselves, which effectively can be explained by the apparent effects between inertial reference frames, as seen from one reference frames to another, as is explained by the Special Relativity Theory.

The proof that the speed of light would be universally constant for all the inertial reference frames, is physically impossible, and every alleged proof must be seen as an attempt to prove a physical impossibility. Such experiments must be scrutinized with the required caution, based on likely hidden factors, untrue interpretations and so on.

## 15. Conclusion

The conclusion of this study is that the Special Relativity Theory can account for the transfer of distorted light signals between inertial reference frames, which give the apparent change of ruler lengths, due to a velocity. Due to the mutual claim that every frame can claim that it is standing still and that the other is moving, all the rulers are deformed the same way in appearance. Hence, the deformations do not represent physical changes whatsoever in the inertial reference frames themselves.

The Special Relativity Theory cannot account for a physical change of the length, time, and mass inside the inertial reference frames, because the requirement for such a claim is that the speed of light would be constant and identical for all the inertial reference frames, whatever their velocity, and even at the same place and time. This is physically impossible.

The initial claim of the Special Relativity Theory to look at other inertial reference frames through the deformation of light

signals between the inertial reference frames cannot suddenly be forced to become real changes inside the frames, just because of a non-proven assumption.

The proofs that are given are in fact often applications of electromagnetism upon charges, and not applicable to the Special Relativity Theory, because of its sole context with light beams. Also often other proofs are in fact just showing that light is affected between inertial reference frames.

It follows from the non-existence of an intrinsic time dilation, that the alleged Lorentz invariance is invalid. Nowadays, electromagnetism has been doped by this additional Lorentz invariance. However, since it was found By Jefimenko that only the clock tick rates can change by some velocity-dependent factors, which can differ from the Lorentz factor by its construct, it follows that the Lorentz factor can only be applicable by coincidence.

Hence, the adaptations that were made to the original Liénard-Wiechert retarded potentials, should be removed as well.

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