The absolute constancy of the speed of light doesn't require relativity of space and time; relativity of electromagnetic fields; divorce of the light postulate from special relativity.

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Abstract

The whole story of relativity begins with a paradox on the speed of light: relative to what is the speed of light constant? Einstein correctly solved this postulate by his light postulate: the speed of light must be the same to all observers. However, the light postulate provoked another immediate question: how can two observers in relative motion measure the same speed of the same light beam? At his point, Einstein made a huge stride: 'space and time must be relative'. And an even more radical proposition: 'not only space and time but also mass must be relative'. Now it is this huge 'jump' that was unnecessary and that has created many more paradoxes than it solved during the last century. The absolute constancy of the speed of light could be explained by making a much smaller 'jump': Relativity of electromagnetic waves. We have known Doppler effect for more than one and a half century. The familiar Doppler effect is the most striking phenomena supporting this view: relativity of EM fields. The new theory is based on two postulates: 1. The absolute constancy of the speed of light 2. Doppler effect. If we accept both these postulates, the newly proposed theory of relativity of EM fields becomes self evident. This theory (assuming it proves to be correct) brings an end to the marriage between the light postulate and special relativity, and hence disarming Einstein's relativity. We know that the light postulate has been the single crucial 'part' of relativity which has made attack on relativity almost impossible, due to its firm experimental foundation. Now, the firm experimental foundation/confirmation of the absolute constancy of the speed of light can no more be taken as evidence for special relativity.The content of this paper can be summarized as:
An observer moving towards a light source will not observe the same form of the light beam that a stationary observer is observing. An observer moving towards a light source will observe a spatially compressed (Doppler shifted) form of the wave the stationary observer is observing. This is the key, yet most familiar, idea to solve the light speed paradox. An observer moving towards (or away from) a light source will not observe a point on the Doppler shifted wave earlier (later) than the stationary observer observes the corresponding point on the non-Doppler-shifted wave he is observing!

Both observers observe the corresponding points on 'their' respective waves simultaneously! After some simple analysis, this leads to:

The light beam as observed by the moving observer appears to move with speed less (more) than C relative to its source by the same amount of the velocity V of the observer so that the relative velocity between the light beam and the observer is always equal to C! This phenomenon can be called ‘The Relativity of Electromagnetic Fields/ Waves’. Therefore, the relative motion between a light source and an observer not only results in an apparent (Doppler) shift of frequency (wavelength) but also in an apparent shift in the velocity of the light beam relative to its source. Doppler shift is always accompanied by an apparent shift in the velocity of the light beam relative to its source.

Introduction

From elementary algebra and common sense, we know that $C + V \neq C$, given that V is different from zero. Yet we have lived with one of the daunting paradoxes in the history of science “$C + V = C$", for more than one hundred years, where C is the speed of light and V is the velocity of an observer relative to the source. All known experiments, including those performed to disprove it, confirmed it. Not a single experiment so far showed any dependence of the speed of light on the speed of its source.

Over a period of one hundred years, the scientific community has exhausted on three theories to resolve this paradox: the ether theory, the emission theory and special relativity. The former two have long been discarded decisively.

The majority of the scientific community assumes that this paradox has already been resolved by special relativity. Yet scientists outside the mainstream have always realized that relativity is not a true theory of nature, and thus looking back to the long rejected ether and emission theories. Relativity has remained counterintuitive since its inception and has resulted in many unsolved paradoxes, creating many more paradoxes than it solved.

The scientific community has been stuck in relativity for over a century because of three factors: 1. The lack of any alternative theory that could explain the long standing problems of reference frames and solve the light speed paradox and the apparent success of special relativity in solving these paradoxes 2. The subtly unquestioned (yet false) bond between special relativity and the light postulate, which made relativity undefeatable 3. And the firm experimental foundation of the light (the second) postulate. Because of the perceived (and stated) link between the light postulate and special relativity, most attempts to disprove relativity focused on disproving the light postulate, and hence failed. No one ever thought of the possibility that the light postulate could be correct and relativity wrong. Therefore, a scientist who disliked relativity automatically rejected the light postulate also, which made attack on special relativity insurmountable. This paper introduces a new way to resolve the light speed paradox and hence divorcing Einstein's light postulate from his theory of special relativity. The absolute constancy of the speed of light is only a mysterious nature of light (electromagnetism) and is not due to relativity of space and time. Here is the most striking discovery in this paper: Doppler effect AND the postulate of the absolute constancy of the speed of light result in the new theory being proposed in this paper! This new theory can be called the relativity of electromagnetic fields.

Many attempts and experiments that had been performed to disprove relativity had failed to disprove it.
In the next sections the reasons for these failures will be discussed and the new theory that will resolve the light paradox and hence divorce the light postulate from special relativity will be presented.

Discussion

As we know, the whole story of relativity theory begins with the light speed paradox,
"relative to what is the speed of light equal to C ? ".
Einstein's solution was, correctly, the light postulate:
" the speed of light must be the same for all observers"
Then, logically, he asked:
" how can the speed of light be the same for all observers ? "
To this problem, his hypothesis was, wrongly:
"space and time must be relative", then jumping to
"not only space and time but also mass must be relative"

Therefore, the theory we now know as special relativity is a bond between the light postulate and the speculation of relativity of mass, length and time.
The scientific community has been stuck in Einstein's relativity because of two factors:

1. There has been no alternative theory that could explain the long standing problems of reference frames and solve the light speed paradox
2. Einstein's relativity was bonded to his postulate of the absolute constancy of the speed of light, which has been confirmed repeatedly by the many well known experiments. It was this false (but subtly unquestioned) bond between

the two that made Einstein's relativity undefeatable.

The light postulate has always been perceived as an inseparable part of special relativity theory because

1. Special relativity (relativity of mass, length and time) was historically an immediate consequence of the light postulate (and of course of the first postulate). It has always been perceived to be its logical consequence also.
2. Special relativity solved the existing paradoxes with apparent success
3. Both were publicized in a single paper, simultaneously, and by the same person Einstein.

Therefore, no one thought of the possibility that part of Einstein's proposal could be right (the light postulate) and part of it wrong (relativity of mass, length and time). Proponents of relativity accepted both with no attention to the internal consistency of the theory and anti-relativists rejected both without considering the possibility that the light postulate could be correct, despite the many experiments confirming it. Thus no one questioned the internal link within the theory.

(One can guess that if the light postulate was proposed earlier than special relativity, perhaps by another scientist other than Einstein, this link would have been subjected to examination and special relativity might have been rejected early. But proposal of the light postulate in isolation without stating its implication might be thought of as unrealistic)

Once Einstein proposed his radical special relativity theory (as consisting of the two postulates and the relativity of mass, length and time), the theory diverted the attention of the physics community to itself and it became the subject of physics, whether by acceptance or by rejection.

Before Einstein's proposal the physics community worked on the puzzle:

" if the speed of light is C (as in Maxwell's equation), relative to what is it constant "

Once Einstein proposed his relativity theory (the two postulates and relativity of mass, length and time) as a solution to this puzzle and the existing problem of reference frames, the majority of the physics community never raised this puzzle again. This was because, for those who accepted special relativity, the light postulate solved it (of course correctly), but those who rejected special relativity rather worked on how relativity could be wrong or on the already existing emission or the ether theories. They rejected the light postulate, not only because it was counterintuitive but mainly because of its immediate perceived (and stated) implication: special relativity. Thus the link between the light postulate and special relativity was shielded from inspection in a subtle manner, making it unlikely for anyone to think of divorcing the two.

If the anti-relativist physics community restarted working on the original light speed puzzle (“ relative to what is the speed of light constant ?”), by rejecting all of Einstein’s proposals, they could have rediscovered the correct light postulate already proposed by Einstein, but then this would have been again perceived as the confirmation of relativity because the light postulate and special relativity were always perceived as one. The whole scenario was such that it was almost unlikely to accept the light postulate and reject relativity, or to reject the whole theory (the two postulates and special relativity) and restart working on the original light speed puzzle and make any progress, because of the trap of relativity. Thus Einstein gave us his correct and crucial light speed postulate by which we were bound to accept his wrong relativity theory for a whole century.

Thus most of the attempts to disprove relativity (relativity of length, time, mass, . . .) focused on disproving the light postulate because it has always been perceived as one of the two pillars of special relativity. But the firm experimental foundation of the light postulate made attack on relativity difficult. Therefore, all those attempts that were made to disprove relativity by rejecting the light postulate followed the wrong strategy. The light postulate has been the single crucial part of relativity which kept the whole relativity theory (both special and general) in science for over a century. Relativity has no other intuitive or observational basis todate.

Therefore, it seems that, after Einstein’s proposal the course of physics during the last century was almost unavoidable.

Einstein’s relativity is a false theory married to his correct light speed postulate. The absolute constancy of the speed of light is a correct hypothesis, but everything which was derived from it, including the relativity of space, time and mass, and the equivalence of mass and energy, the curvature of space-time, the four dimensions, etc are all wrong. Note that the conclusion “nothing moves at or above the speed of light” is also false. Therefore, from the whole theory of Einstein’s relativity, the postulate of the absolute constancy of the speed of light is the only part we retain in this paper. Regarding the first postulate, I have discussed on my other papers [1] [2].

I was one of those who disliked Einstein’s relativity because of its counter intuitive nature. I have been swinging between the three theories (with emission theory by far the most favoured and relativity by far the least), shifting from one theory to the other as I always hit the wall in one theory. I followed the same wrong strategy of attacking the light speed postulate and finally gave up, accepting the postulate of absolute speed of light after a considerable resistance and after reading the many historical experiments [3] which always confirmed it , with the results of those known experiments giving me repeated blows on my resistance to the light postulate. After a break of despair, I came across an intuitive idea that finally led me to develop the theory presented in this paper and to follow the strategy of divorcing the light speed postulate from the theory of relativity of length, time and mass.

Therefore, accepting of Einstein's light speed postulate AND rejecting special relativity were the crucial steps in the development of the new theory proposed in this paper. The crucial question was : *how else* can the absolute constancy of the speed of light be explained ?

The new solution

The solution proposed in this paper is an apparently counterintuitive mystery of nature of light, but which is strikingly consistent with our existing knowledge : the Doppler effect and the absolute constancy of the speed of light.

We start by accepting Einstein's crucial light postulate as the correct solution to the light speed paradox.

The speed of light is the same for all observers moving relative to each other.

Then how else can the absolute constancy of the speed of light be explained? How can two observers moving relative to each other measure the same speed of the *same* light beam?

While working on this puzzle, I got an intuitive hint which was key to arrive at the new solution to the paradox : *no two observers moving relative to each other observe the same beam in the same way.*

So we see a subtle wrong assumption in the above question:

'. . . two observers . . . *same* light beam '.

If the two observers observe the same light beam differently, there may be some possibility to solve the paradox. Observing the same speed of the same beam in the same way by two relatively moving observers is counterintuitive.

At least we can intuitively think that the wave will appear to be either spread over a larger space or be compressed into a smaller space as we move away or move towards the source respectively. Doppler effect supports this view! Now it is this idea that we have to develop.

Starting from this idea how can we solve the paradox? After repeated trials I arrived at the following simple solution.

Imagine (Fig.1) a light (or electromagnetic) source S emitting light pulses, and two observers, observer O and observer P at the same point (X=O=P) on the X-axis at t = 0. Both points O and P are the same point on the X-axis (they are named differently only for convenience). Suppose that at this instant (t=0) observer O is at rest relative to the source and observer P is moving with velocity V towards the source.

The new theory proposed in this paper states that the two observers O and P will not observe the same light beam in the same way. Observer O observes the red wave and observer P observes the blue spatially compressed wave.

The red diagram shown is the spatial distribution of the wave at an instant of time as observed by the stationary observer O (i. e the "snapshot" of the wave in space as taken by the stationary observer O, at an instant of time), the blue diagram is the wave as observed by observer P as he/she is moving towards the source with velocity V and the purple diagram is the wave as observed by observer P as he is moving away from the source with velocity V. The orange wave is the wave as observed by an observer R at point R (X=R=Q) moving towards the source with velocity V.

We can obtain the diagram of the blue wave by compressing the red wave towards the source by fixing the end point of the red wave at the source.

Therefore, the wave just gets compressed *back to its source*, as observed by the moving observer P, with its end point at the source fixed.

Thus, peak point A on the red wave for observer O corresponds to peak point A' on the blue wave for observer P.

At t = 0, both observers O and P are at the same point (X=O=P) on the x-axis, but observer P is moving with velocity V to the left at this instant. Suppose that the light (EM) source is emitting the peak point A on the red wave at t = 0 as observed by observer O. After a delay of time ΔT, the peak point A will arrive at point X=O and be observed by observer O.

During the same interval of time (ΔT) that the pulse travels from the source to point O (observer O), observer P would have advanced to the left by an amount ($V. \Delta T$), to meet the corresponding peak point A' on the blue wave, which lags behind point A on the red wave, by an amount ($V. \Delta T$).

After a delay of ΔT (at $t = \Delta T$), observer O (at X=O) observes peak point A and observer P (at X=P') observes the corresponding point A' . Thus points A and A' are observed by observer O and observer P respectively, ***simultaneously*** ! Even though observer O and observer P are at different locations, they observe points A and A' simultaneously. (later it will be shown that the speed of the blue wave relative to the source is C – V, as shown in Fig.1).
Although slightly counter intuitive, this should not cause us much trouble because the two observers are observing different forms of the same wave afterall.

Therefore, **even if P is moving towards the source with velocity V, he/she will not observe peak point A' earlier than O observes the corresponding peak point A !** Observer O and observer P observe peak points A and A' respectively, at different points X=O and X=P ' respectively, **simultaneously !** *Thus both observers observe the velocity of light to be the same!*
This satisfies the requirement of the light postulate.

The amount by which the wave gets compressed back to the source (as observed by observer P) depends on the velocity V of the observer P and on the delay ΔT, and is equal to (V. ΔT). Note that ΔT always means the time it takes a point on the wave to travel from the source to the observer.

If different observers are moving towards the source with different velocities, each moving observer observes different (differently compressed) forms of the red wave. Here the red wave is the wave an observer at rest relative to the source observes and this wave is always the wave we compress (or expand) to obtain what any moving observer observers. Two moving observers observe the same wave only if they are moving with the same velocity. Each moving observer observes 'his/her' wave which depends on his/her velocity. For example, assume a stationary observer Q at X=Q and another observer R at the same location (X=R=Q) moving with some velocity V towards the source at point X=R (Fig.1d), at some instant of time t_o. Observer Q observes the red wave and observer R observes the orange wave (*not the blue wave that observer P is observing*). What observer R observes after a delay of time ΔT (at $t = t_o + \Delta T$), at X=R', can be obtained, as before, by calculating V. ΔT and compressing the red wave back to the source by this amount, where ΔT is the time delay of point B on the red wave to travel from the source to the stationary observer Q. Thus at the same instant that observer Q observes point B (at X=Q), observer R observes point B' (at X=R'). This is just to stress that every observer observes a different wave depending on his/her velocity relative to the source.

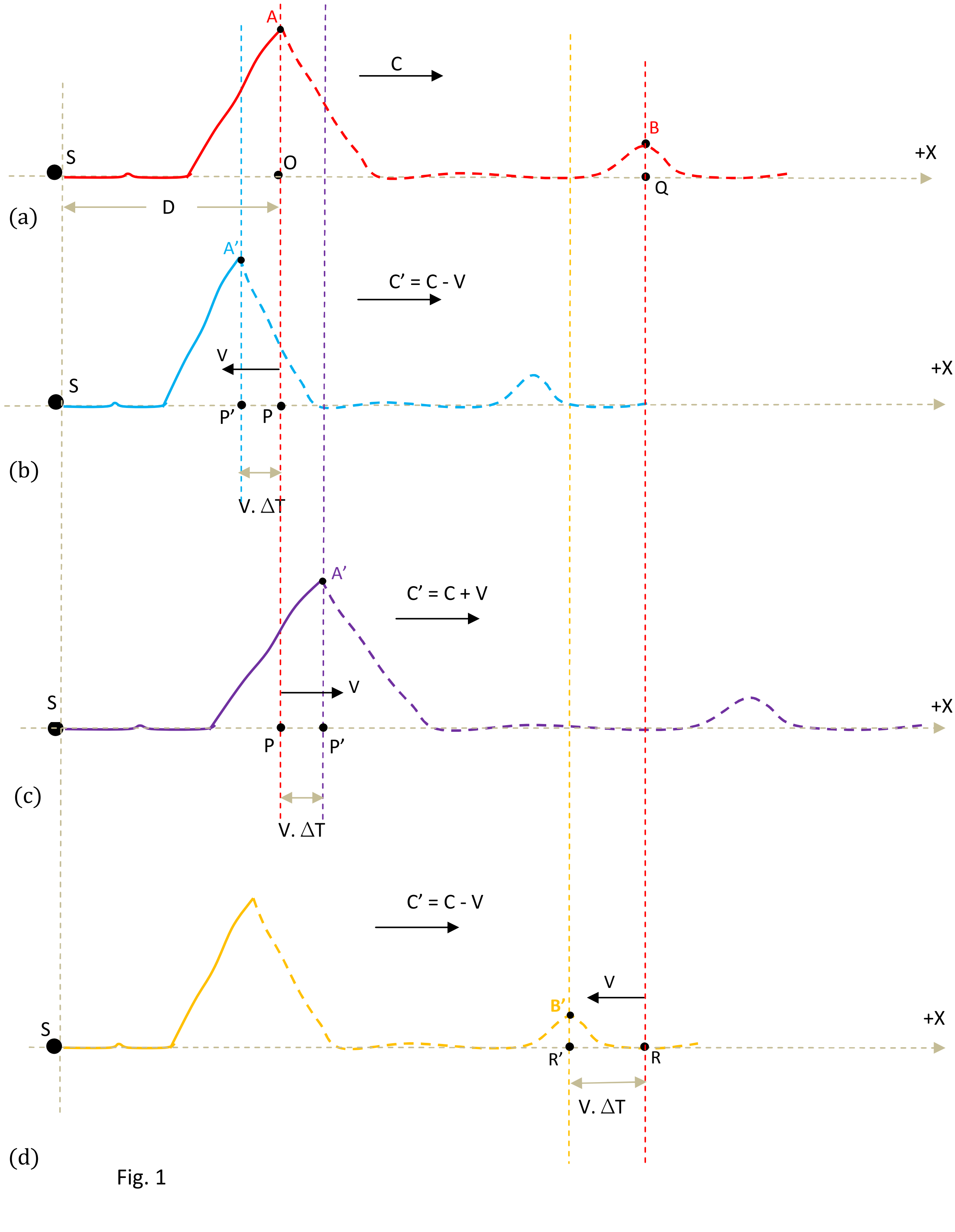

Fig. 1

To clarify the discussions so far in a different approach, next we determine what an observer P moving with velocity V towards the source, at distance D1 from the source, at an instant of time, will observe at that instant of time:

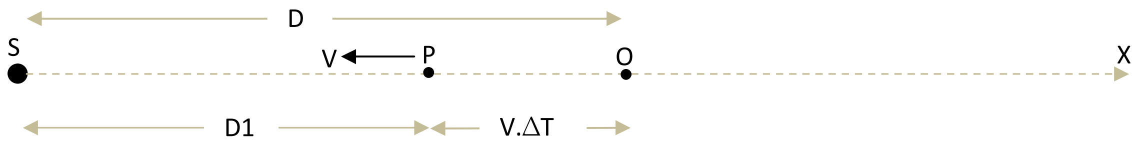

Fig.2

So the problem is to determine the distance D of the stationary observer O who is observing the same corresponding point on the red wave as observer P is observing on the blue wave, at that instant of time. From Fig.2 we can see that

$$D = D1 + V.\Delta T\ ,\quad \text{but}\quad D = C.\Delta T\ ,\quad \text{so}$$

$$C.\Delta T = D1 + V.\Delta T$$

From the above equation ΔT will be determined as:

$$\Delta T = \frac{D1}{C-V}$$

Therefore, distance D of the corresponding stationary observer O from the source will be:

$$D = C.\Delta T = \left(\frac{C}{C-V}\right).D1$$

Therefore, observer P at that instant of time will observe what a stationary observer O at distance D from the source is observing at that instant of time.

We may also interpret this as if observer P has caught up with the light beam.

<u>Proof that observers O and P measure the same speed of light</u>

So far we have agreed that observer O and observer P will observe corresponding points on the red and blue waves respectively simultaneously. Now we show how this leads to the conclusion that both observers observe the same speed of light.

Since observer O is stationary relative to the source, obviously he measures the speed of the red wave to be equal to C. Next we will determine what speed of the blue wave the moving observer P will observe (measure).

Peak points A and A' (Fig.1) arrive at points X=O and X= P' simultaneously, at $t = \Delta T$.

Thus the speed of the red wave relative to the source will be :

$$C = \frac{D}{\Delta T}$$

And the speed of the blue wave relative to the source will be (as observed by the moving observer:

$$C' = \frac{D - V\Delta T}{\Delta T} = \frac{D}{\Delta T} - \frac{V\Delta T}{\Delta T} = C - V$$

Therefore, the speed of the blue wave relative to the source is: $C' = C - V$
Now the relative speed between the blue wave and observer P will be determined as:

$$(C - V) + V = C$$

(the two velocities add because they are opposite in direction)

Therefore we have shown that even if observer P is moving towards the source with velocity V, he will still observe the velocity of the blue wave to be equal to C.

We see that the speed of the blue wave relative to the source decreases from C by the same amount of the velocity V of the observer P so that the relative velocity between the moving observer P and the blue wave is always equal to C.
This can be restated as:

Velocity of the (blue) wave relative to the source (C') +
Velocity of the observer relative to the source (V) = constant = C
(for an observer moving towards the source)

For example if the velocity of the observer is 0.9C towards the source, the velocity of the wave relative to the source will be equal to 0.1C .

An observer moving away from the source

All the discussions made so far assumed an observer moving towards the source. We can use the same basic approach to understand the case of an observer moving away from the source. Here we will not repeat every discussion made for the case of an observer moving towards the source; we discuss only on some aspects.
For the case of an observer receding away from the source (Fig. 1c), the wave just expands spatially away from the source (i. e with its end point at the source fixed), as observed by the moving observer P. In this case, as observer P is moving to the right with velocity V, in the same direction as the wave, he observes the purple wave (an expanded form of the red wave that the stationary observer O is observing).

As before, assume that at t=0 both observers O and P are at the same location (X=O=P), but observer P is moving away from the source with velocity V at this instant of time (t = 0). Suppose that at the same time t = 0 the source radiates the peak point A on the red wave as observed by observer O. The peak point A will be observed by O after some time delay ΔT. During this time, observer P will have

advanced to the right by a distance of $(V.\Delta T)$ (Fig. 1c), where he/she meets (observes) the corresponding point A' on the purple wave.
Therefore, as before, although P is moving in the same direction as the wave, ***he will not observe peak point A' later than O observes point A, and both observe points A and A' respectively, simultaneously***. In this case also ***observers O and P observe the same speed of light.***

In this case of an observer moving away from the source, the speed of the purple wave (Fig.1) increases from C by the same amount of the velocity V of the observer, so that the relative speed between the purple wave and the observer is always equal to C, irrespective of the speed of the observer.

This can be restated as:

Velocity of the (purple) wave relative to the source (C') $-$
Velocity of the observer relative to the source (V)= constant = C

For example, if the observer is receding away from the source with velocity V=100C, then velocity of the purple wave relative to the source will be C' = 101C, so that the relative velocity between the observer and the purple wave will be: 101C− 100C = C.

<u>An observer moving towards the source with velocity greater than C</u>
We have seen that an observer moving towards the source will observe compressed form of the wave. As the speed of the observer towards the source increases, the speed of the blue wave relative to the source decreases from C by the same amount. In the limit, when an observer is moving towards the source with velocity C, the whole wave (field)in space (from source to infinity) will be compressed in to a single point at the source and will be stationary.
What if the velocity of the observer increases to be greater than C while he/she is moving towards the source? In this case the wave velocity just changes direction (away from the observer) and he will not observe any wave until he gets to the other side of the source. Once he gets to the other side of the source, it will become the case of an observer moving away from the source. (However, this interpretation should be taken as provisional.)

The correctness of the new theory

The new theory (the relativity of EM fields) directly results from Doppler effect and the light postulate, both of which are established by observations and experiments.

The new theory = Doppler effect + absolute constancy of the speed of light

Doppler effect AND the absolute constancy of the speed of light demand that observer O and observer P observe points A and A', respectively, simultaneously!

This proves the correctness of this theory.

The relative velocity between an observer and a light source not only results in an apparent (Doppler) shift in frequency (wave length), but also in an apparent shift in the velocity of the light beam relative to its source by the same amount of the velocity V of the observer so that the velocity of the light beam relative to the observer is always equal to C . Therefore, Doppler shift is always accompanied by an apparent shift in the velocity of the light beam relative to its source.

Some consequences of the new theory

According to the new theory proposed in this paper, there is no theoretical velocity limit to moving objects or observers. This is clearly in contradiction with special relativity. Thus theoretically it is possible to move at a velocity greater than the velocity of light. However, it is impossible to catch up with light by moving in the same direction because the relative velocity between any observer and light is always equal to C. The velocity of the light relative to the source (for that particular observer) will always be C+V, so that he will never catch up with the light beam. The velocity of light *relative to the source for an observer* ranges from zero (for an observer moving towards the source with velocity C) to infinity (for an observer moving away from the source at infinite speed). However, remember that *the relative velocity between the observer and light* is always equal to C.

One of the apparently odd consequences of the new theory is that, an observer can catch up with light if he moves *towards the source* with the necessary velocity (less than C). This means that the observer should not move in the same direction as the light wave to catch up with it: he should move in the opposite direction of the light wave. However, note that he will observe only a different form of the wave (the blue wave) depending on his speed, even when he catches up with the light.

Doppler shift

Here we analyse the consequence of the new theory on Doppler shift (Fig.3).

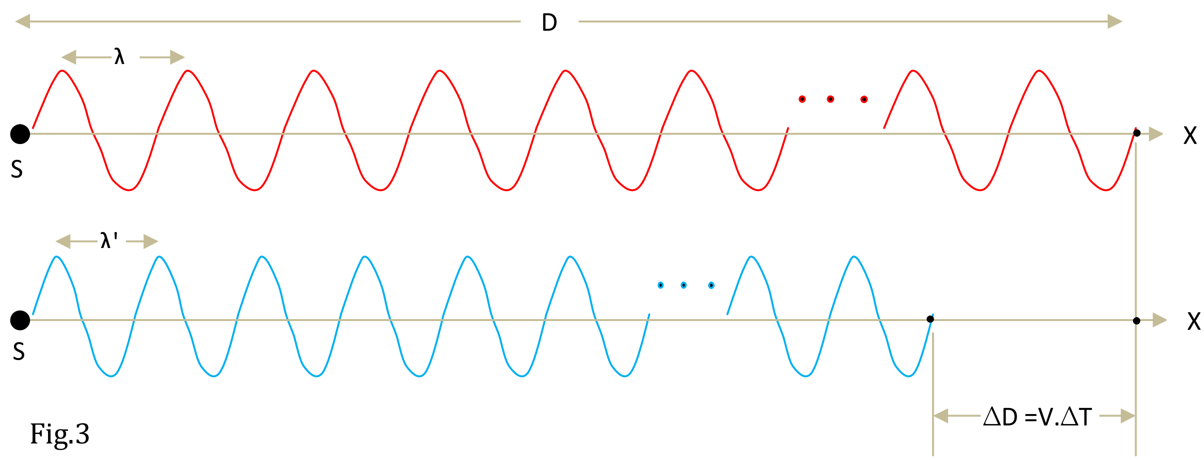

Fig.3

Suppose that the red wave is the wave as observed by a stationary observer and the blue wave is the wave as observed by an observer moving towards the source with velocity V. Therefore, the moving observer observes the blue wave, which is the compressed form of the red wave by V. ΔT . Assume that there are 'n' cycles of the red wave ; therefore, there will also be 'n' cycles of the blue wave.

$$\Delta D = V.\Delta T, \quad \text{but} \quad \Delta D = n.\Delta\lambda, \quad \text{and} \quad \Delta T = \frac{D}{C} \quad \text{and} \quad D = n.\lambda$$

From the above we get Δλ as:

$$\Delta\lambda = \left(\frac{V}{C}\right).\lambda \quad , \quad \text{where} \quad \Delta\lambda = \lambda - \lambda'$$

And λ' will be determined as follows:

$$\lambda' = \lambda - \Delta\lambda = \lambda - \left(\frac{V}{C}\right).\lambda = \left(\frac{C-V}{C}\right).\lambda$$

To determine f' interms of f

$$f = \frac{C}{\lambda} \quad \text{and} \quad f' = \frac{C}{\lambda'}$$

$$f' = \frac{C}{\lambda'} = \frac{C}{\lambda\left(\frac{C-V}{C}\right)} = \frac{\frac{C}{\lambda}}{\frac{C-V}{C}} = \left(\frac{C}{C-V}\right).f$$

From the above,

$$\Delta f = f' - f = \left(\frac{V}{C-V}\right).f$$

For the case of an observer moving away from the source with velocity V, V will be substituted as negative in the above equations.

The relativity of electromagnetic fields

The new theory proposed in this paper can be called the relativity of electromagnetic fields. This means that two observers moving relative to each other observe the same electromagnetic field differently. For example, the electromagnetic field appears to be compressed for the moving observer P in the previous discussion, if he is moving towards the source and it appears to be expanded if he is moving away from the source. ***Therefore, the absolute constancy of the speed of light is not due to relativity of space and time, but due to relativity of electromagnetic fields.***

Conclusion

If the theory proposed in this paper proves to be correct, it will change the course of physics during the last century, and this will be deeply impressive.

I believe the discovery of this theory is a divine revelation; I believe to think of a possibility other than the three theories (the emission, the ether and special relativity) is almost impossible otherwise. Always thanks to God and His Mother, Our Lady Saint Virgin Mary.

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