Modified emission theory - an alternative to the Special Theory of Relativity

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Abstract

The null result of the Michelson-Morley experiment is a strong and compelling evidence for emission theory of light. Emission theory, unlike ether theory, can also explain Bradley stellar aberration. There is also the less known Bryan G Wallace analysis of Venus planet radar range data anomaly, which could be explained only by emission theory. The lunar laser ranging experiment is yet another evidence for emission theory. The emission theory was abandoned because : 1) it was not compatible with Maxwell's electrodynamics: it predicted frozen light for a light source moving with velocity of light away from an observer 2) moving source experiments showed that the speed of light is independent of source velocity. Bradley observed no variation of the angle of aberration with different stars, demonstrating that the speed of light is independent of the velocity of the stars. The first of these problems is solved by a new interpretation of Einstein's thought experiment ('chasing a beam of light '): constant phase velocity and variable group velocity of light. For an observer moving away from a light source at the speed of light, the phases will still move at the speed of light relative to the observer, but the group will be 'frozen'. This interpretation requires that Doppler effect depend only on source observer relative velocity, demanding a new symmetrical law for Doppler effect of light. This is the Exponential Law of Doppler effect of light proposed in this paper, which can easily explain the Ives-Stilwell experiments. The second problem is resolved by a new hypothesis that the effect of absolute motion of a light source is to change the speed of *light relative to the source* so that the speed of light is independent of source velocity. Ether theory and emission theory are seamlessly united into a new theory. This is also in line with light having both wave and particle properties. The ether doesn't exist, but absolute motion does. The conception of the Michelson-Morley experiment was fundamentally flawed in that they considered light as ordinary material waves . A new interpretation of absolute motion is proposed.

Introduction

The Special Theory of Relativity (SRT) is an extraordinary claim and, as such, needs extraordinary evidence. Many of the conventional experiments such as the Michelson-Morley experiment, moving source experiments, light speed measuring experiments and Bradley stellar aberration cannot be considered as extraordinary evidences for SRT as these can also be easily understood in terms of conventional theories such as the emission theory and/or ether theories.

There are unconventional logical and experimental evidences, however, that are considered as exclusive evidences for SRT that cannot be explained by ether theory or emission theory. Some of these are:

1. Einstein's thought experiment (' chasing a beam of light ')
2. the Ives-Stilwell experiment
3. limiting light speed experiments and
4. muon time-dilation experiment

This also means that if an alternative explanation to these unconventional experiments can be found, the experimental basis of SRT would be compromised.

The experimental basis of SRT has already been compromised by experiments proving the existence of absolute motion, threatening the very principle of relativity, which forms one of the two postulates of SRT. These include:

1. the Sagnac and Michelson-Gale experiments
2. the Marinov experiment
3. the Silvertooth experiment
4. the Roland De Witte experiment
5. the CMBR anisotropy experiment
6. the conventional Michelson-Morley experiments, including the Miller experiments, that detected small but consistent fringe shifts

A crucial evidence against the theory of relativity is the fact that *sidereal* variations have been detected in many of the above experiments.

There is also an outstanding experiment that appears to disprove the second postulate of SRT and supports emission (ballistic) theory and this is the Bryan G Wallace experiment of Venus planet radar range data. Lunar laser ranging experiment also supports emission theory, because the Earth based detector would move a large distance due to Earth's motion through space (about 390 Km/s) by the time the reflected light reaches the Earth and would miss it if the ether existed, which is not the case.

SRT as a scientific theory is also marred by logical counter-evidences. SRT has caused more paradoxes than it actually solved. The famous Twin-Paradox and the less known Trouton-Noble paradox are just two examples.

If one weighs the above evidences for and against the theory of relativity as a whole, one feels that SRT does not yet have extraordinary evidence as an extraordinary claim, and hence a consideration of alternative theories is justified, at least.

One of the main factors reinforcing the theory of relativity, despite experimental and logical counter-evidences, has been the failure of emission theory and ether theories and the lack of competing alternative theories to date. In other words, the lack of a competing alternative explanation to light speed experiments is considered as an assurance that SRT is a correct theory. For example, no existing theory can explain why absolute motion has been detected by the

Sagnac, the Marinov and the Silvertooth experiments and not by the Michelson-Morley and the Kennedy-Thorndike experiments. No existing theory can explain why small fringe shifts were detected in conventional Michelson-Morley experiments while modern Michelson-Morley experiments using optical cavity resonators essentially gave NULL results. Silvertooth didn't provide a clear theoretical explanation for his experiment. In this paper a theoretical evidence against the theory of relativity is proposed.

The motivations behind this paper are:

1. SRT being an extraordinary claim
2. the beauty of Einstein's thought experiment (' chasing a beam of light ')
3. emission theory as the most natural explanation of the Michelson-Morley experiment
4. absolute motion ('ether') theory as the most natural explanation of Sagnac effect and moving source experiments and
5. The failure of SRT to account for the experimental evidences of absolute motion

Einstein's thought experiment (' chasing a beam of light ') and the Special Theory of Relativity

In an attempt to reconcile Maxwell's electrodynamics with Galilean relativity, Einstein came across a thought experiment in which an observer would always observe the same speed of light irrespective of his velocity. Previously Einstein had considered emission theory to reconcile Maxwell's electrodynamics with the principle of relativity but abandoned it due to 'complications' caused by emission theory.

Einstein's thought experiment and his failure to account for the different experimental facts of the speed of light by the exhaustive consideration ether and emission theories eventually led him to the Special Theory of Relativity.

Einstein's thought experiment was a logical consequence of the Michelson-Morley experiment which disproved the ether. To assume that the speed of light depended on the motion of the observer would be to assume the ether.

However, it was not the thought experiment itself, but its interpretation, which was SRT, that was wrong. An alternative interpretation is proposed as follows.

Constant phase velocity and variable group velocity of light

Alternatively Einstein's thought experiment could be interpreted to mean constant *phase* velocity and variable *group* velocity of light.

Imagine a stationary light source and an observer moving relative to the source, directly towards or away from the source. The phase velocity will still be equal to c relative to the observer. The phases will always be moving at speed c relative to the observer, irrespective of the velocity of

the observer relative to the source. Unlike the phase velocity, however, the group velocity will be $c + V$ and $c - V$ relative to the observer, for an observer moving towards and away from the source, respectively.

For an observer moving away from the source at the speed of light, the phases still go past the observer at the speed of light, where as the *group* will be 'frozen'.

Constant phase velocity requires that both the frequency and wavelength change for an observer moving *relative* to a light source.

$$\lambda f = \lambda' f' = c$$

This means that the wave will be compressed or expanded spatially due to motion of the observer relative to the source.

Exponential law of Doppler effect of light

According to the above proposal of constant phase velocity, only source observer relative motion matters. The motion of the observer is equivalent to the motion of the source. This requires a new law of Doppler effect of light because conventional formula for Doppler effect is not symmetrical with respect to motion of the observer and motion of the source.

I discovered a new law of Doppler effect of light. The formula for Doppler effect of light is:

$$f' = f\, e^{\frac{V}{c}}$$

$$\lambda' = \lambda\, e^{\frac{-V}{c}}$$

The Ives-Stilwell experiment

Now, in the Ives-Stilwell experiment, the wavelength of the light emitted from the ion in the backward direction will be:

$$\lambda'_F = \lambda e^{\frac{V}{c}}$$

The wavelength of light emitted in the forward direction will be:

$$\lambda'_B = \lambda e^{\frac{-V}{c}}$$

The average wavelength:

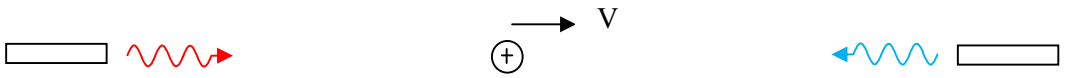
$$\Lambda = \frac{1}{2}(\lambda'_F + \lambda'_B) = \frac{1}{2}\lambda(e^{\frac{-V}{c}} + e^{\frac{V}{c}})$$

$$\Delta = \Lambda - \lambda = \lambda\left(\frac{1}{2}e^{\frac{-V}{c}} + \frac{1}{2}e^{\frac{V}{c}} - 1\right) \approx \frac{1}{2}(\frac{V}{c})^2\lambda = \frac{1}{2}\beta^2\lambda \quad \text{(using Taylor's expansion)}$$

This is the same formula predicted by Special Relativity and confirmed by the Ives-Stilwell

experiment.

Modern Ives-Stilwell experiment: fast ion beam experiment



The frequencies of the two laser beams as seen by the ion are related to the transition frequencies as follows:

$$f_{01} = f_R e^{\frac{-V}{c}}$$

$$f_{02} = f_B e^{\frac{V}{c}}$$

From which follows:

$$f_{01} f_{02} = f_R f_B \implies \frac{f_{01} f_{02}}{f_R f_B} = 1$$

where f_{01} and f_{02} are the two transition frequencies, in the rest frame of the ion and F_R and F_B are the frequencies of the parallel and anti-parallel laser beams, respectively.
The above result is consistent with experiments.

Proposed experiment to test Exponential Law of Doppler effect of light

The fast ion beam experiment can be carried out to decide between relativistic Doppler effect and Exponential Doppler effect of light.

According to SRT the Doppler shifted wavelength of a light source moving with velocity V relative to an observer is (for source and observer receding from each other)

$$\lambda' = \lambda \frac{\sqrt{1+\frac{V}{c}}}{\sqrt{1-\frac{V}{c}}}$$

for V/c = 0.3

$$\lambda' = \lambda \frac{\sqrt{1+0.3}}{\sqrt{1-0.3}} = 1.36277\,\lambda$$

for V/c = 0.99

$$\lambda' = \lambda \frac{\sqrt{1+0.99}}{\sqrt{1-0.99}} = 14.11\,\lambda$$

According to Exponential Law of Doppler effect of light

For V/c = 0.3

$$\lambda' = \lambda e^{\frac{V}{c}} = \lambda e^{0.3} = 1.34986\,\lambda$$

For V/c = 0.99c

$$\lambda' = \lambda e^{\frac{V}{c}} = \lambda e^{0.99} = 2.691\,\lambda$$

Modified emission theory

In this section a new theory will be proposed to explain moving source experiments, the Michelson-Morley experiment and the Sagnac effect.

The most straight forward and compelling theory for the null result of the Michelson-Morley experiment was the emission theory of light. Emission theory has two additional experimental evidences: radar range data anomaly of planet Venus (analyzed by Bryan G Wallace) and the lunar laser ranging experiment. However, emission theory was abandoned due to two reasons :

1. The speed of light showed no dependence on the speed of the source in moving source experiments.
2. The incompatibility of emission theory with Maxwell's equations. Emission theory predicted frozen light for a source moving away from an observer at the speed of light.

The second of the above two problems has already been solved in the last section of this paper. The phases will never be frozen and will always move at the speed of light relative to the observer. It is the group that will be frozen and Maxwell's equations are concerned with phase velocity, and not group velocity.

The first of the above two problems, i.e. the independence of the speed of light from the speed of the source, will be solved in this section. This same solution will be applied to explain the Michelson-Morley and the Sagnac experiments.

<u>Moving source experiments</u>

How can we modify emission theory so that it will be compatible with *both* the Michelson-Morley and moving source experiments ?

The new theory proposed is as follows. Imagine a light source *absolutely* moving directly towards a stationary observer. The speed of light should vary *relative to the source* so that it will be independent of the velocity of the source.

Let the observer be at rest and the light source be moving with (absolute) velocity V_{abs} towards or away from the observer.

For the speed of light to be independent of the source velocity, it should be $c - V_{abs}$ *relative to the source* in the forward direction and $c + V_{abs}$ in the backward direction *relative to the source*. This is a modified emission theory. In conventional emission theory, the speed of light is constant c relative to the source.

If the light source is moving with velocity V_{abs} towards a stationary observer, the velocity of light relative to the observer will be:

velocity of light relative to observer = velocity of light relative to source + velocity of source relative to observer

$$= (c - V_{abs}) + V_{abs}$$

$$= c$$

Hence the velocity of light will be independent of source velocity.

For a light source moving with velocity V_{abs} away from a stationary observer:

velocity of light relative to observer = velocity of light relative to source - velocity of source relative to observer

$$= (c + V_{abs}) - V_{abs}$$

$$= c$$

Suppose that a light source is absolutely moving towards a stationary observer with velocity of $V = 0.1c$. In order for the speed of light to be c , independent of source velocity, the speed of light should be $0.9c$ *relative to the source*.

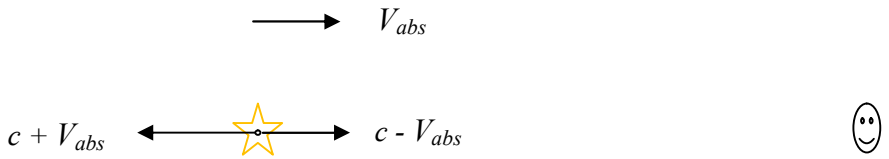
the speed of light relative to an observer at rest = $0.9c + 0.1c = c$

We may think of this as follows:

the 'center' of the wave fronts always moves with the source, but the velocity of light will vary relative to the source so that the velocity of light is independent of source velocity.

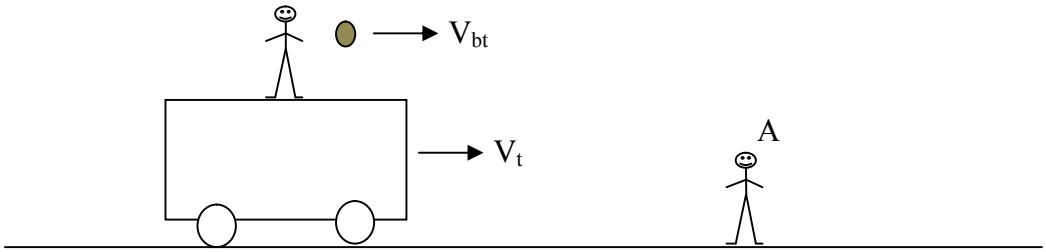
(Note that the above statement is not accurate. The accurate statement is : the wave fronts (for a given observer) move with the apparent source, not with the real source. This statement should

not be understood in a conventional way. There is no wave front like in the ether theory. We are talking about a wave front relative to the observer.)



Therefore, *the effect of absolute motion of a light source is just to create a change in the velocity of light relative to the source*.

To explain the above with analogy, consider a moving train and a man on the train throwing balls in the forward or backward directions. Consider a stationary observer A on the ground. Suppose the requirement is that the velocity of the ball relative to the stationary observer A should be constant *c* independent of the velocity of the train. V_t is the velocity of the train, V_{bt} is the velocity of the ball *relative* to the train and V_b is the velocity of the ball relative to A.



As the velocity of the train changes, the man on the train should also change the velocity of the ball *relative to the train* so that the velocity of the ball relative to the stationary observer A is constant independent of the velocity of the train.

$$V_b = c = V_t \pm V_{bt}$$

The Michelson-Morley experiment

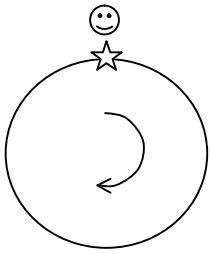
Now we apply the above theory to the Michelson- Morley experiment. Since we can think of the center of the wave fronts always moving with the source (but with different velocities of light relative to the source, in different directions) , there will not be any fringe shift in the

Michelson-Morley experiment. The effect of absolute motion of a light source is just to change the speed of light *relative to the source*. There is no ether. The Michelson-Morley experiment was designed to detect something that never existed. Absolute motion was always (wrongly) thought to be motion relative to the ether. The conception of Michelson- Morley experiment was fundamentally flawed because light was considered as ordinary material waves. The Michelson-Morley experiment was capable to detect the non-existent ether, but was incapable to detect absolute motion.

At this point, a question arises: if absolute velocity is not velocity relative to ether, then relative to what ? In this paper, we will not attempt to answer this question. We only provide a new interpretation of the *effect* of absolute motion: the effect of absolute motion of a light source is just to create a change in the velocity of light *relative to the source*.

The Sagnac effect

Consider a hypothetical Sagnac device that is at absolute rest, i.e. not in absolute translation and not in rotation.

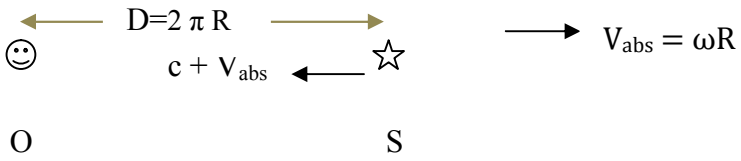


Such a hypothetical Sagnac experiment apparatus is made from a continuous circular mirror, so that the light moves in circular path.

In this case the time delay for the forward and backward beams will be equal.

$$t_d = \frac{2\pi R}{c}$$

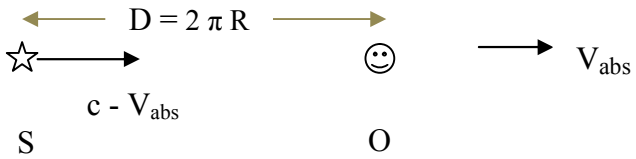
Assume now that the device is rotating clockwise with angular velocity ω.
First consider the detector as 'looking' in the forward direction. This will be considered equivalent to a translational motion with co-moving source and detector, with the detector behind the source. We ‘unwind’ the device and it will be analyzed as an absolute translation motion.



In this case, the velocity of light emitted backwards is equal to $c + V_{abs}$ *relative to the source*. Therefore, the time delay of light emitted by the source will be:

$$t = \frac{D}{c + V_{abs}} = \frac{2\pi R}{c + \omega R}$$

Next consider the detector as 'looking' in the backward direction.
This will be considered equivalent to a translational motion with co-moving source and detector, with the detector in front of the source.



In this case, the velocity of light emitted forward will be $c - V_{abs}$ *relative to the source*.

Therefore, the time delay of light emitted by the source will be:

$$t = \frac{D}{c - V_{abs}} = \frac{2\pi R}{c - \omega R}$$

The time difference between the time delays of the forward and backward light beams will be:

$$t_d = \frac{2\pi R}{c - \omega R} - \frac{2\pi R}{c + \omega R} = 2\pi R \frac{2\omega R}{c^2 - (\omega R)^2}$$

Discussion

In this paper, a unique behavior of the speed of light has been revealed. This paper disentangles phase velocity and group velocity of light. Unlike ordinary, material waves, the phase and group velocities are independent for light.

The theory proposed in this paper is an attempt to present a more accurate theory [1], which can be applied for quantitative analysis, in an intuitive way.

As a fusion between emission theory and absolute motion ('ether') theory, modified emission theory is in line with the dual nature of light: wave nature and particle nature, and, in addition to its successful application to explain many experiments, this can be an indicator of its correctness.

Absolute velocity has always been presumed to be motion relative to the ether and this was the fallacy in the conception of the Michelson-Morley experiment. This fallacy continues even

today, in almost all arguments for or against absolute motion. This paper clearly disproves the ether. Absolute motion exists but the ether doesn't. This paper doesn't attempt to answer the 'relative to what ? ' problem associated with absolute motion, as this has been proposed in another paper[1]. This paper discussed a new interpretation of the Michelson-Morley and other experiments, from a new interpretation of the *effect* of absolute motion.

Conclusion

In this paper we have presented a theory that eventually reconciles the Michelson-Morley experiment and the Sagnac effect. Einstein's thought experiment is divorced from the Special Theory of Relativity and given a new interpretation. The Ives-Stilwell experiment, which is normally seen as exclusive evidence of relativity, is also explained. Therefore, the theory of Special Relativity, however mathematically elegant and 'self evident', is unnecessary.

Thanks to God and Saint Virgin Mary the Mother of God

References

1. Absolute/Relative Motion and the Speed of Light, Electromagnetism, Inertia and Universal Speed Limit *c* - an Alternative Interpretation and Theoretical Framework, by Henok Tadesse, Vixra