Apparent shift of position of light source due to absolute motion; Absolute space as defined by massive cosmic objects; Constant phase velocity and variable group velocity of light; Relativity of electromagnetic waves.

The absolute space-free space continuum. Speed of light is infinite in free space.
A new Michelson-Morley experiment using two independent coherent light sources.
Distinction between the new interpretation of absolute space and the ether theories.
The Silvertooth and Marinov experiments.

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8 June 2014 G.C (01/10/2005 Ethiopian Calender)

Abstract

1. A new interpretation of absolute motion: the effect of absolute motion is to create a change in path length, and not the speed, of light. The apparent position (distance and direction) of a light source changes relative to an observer due to absolute motion. The center of the wave fronts is always at (and moves with) the *apparent* source. The velocity of light is c relative to the *apparent* source. The ether doesn't exist.
2. Massive cosmic objects define or 'fix' the space in their vicinity, with their influence (in defining space) diminishing with distance. The absolute velocity of a body is the vector sum of all its absolute velocities, which is the 'inverse distance weighed' velocity of the body *relative* to all cosmic massive objects. It is analogous to the resultant gravitational force acting on a body.
3. It follows that the speed of light in ideal free space (region of space far away from cosmic objects) is infinite. There is no 'free' space endowed with characteristics permittivity and permeability.
4. The *phase* velocity of light is constant (independent of source or observer motion) whereas the *group* velocity of light is variable. The apparent *phase* velocity c' of light relative to a source at rest increases or decreases by the same amount of the velocity (V) of the observer, so that the phase velocity of light relative to the observer is always equal to c: $c' + V = c$ (vector sum).
5. A new result of Einstein's thought experiment: for an observer moving at the speed of light away from a light source that is at absolute rest, the phases will still move past the observer at the speed of light whereas the group will be frozen.

These new ideas explain many of the experiments and observations related to the speed of light, from the historical Michelson-Morley experiment (MMX) to the modern experiments using flying elementary particles as sources of radiation. The new theory can readily explain the following experiments and observations: the Michelson-Morley (both conventional and modern) and the Kennedy-Thorndike experiments, the Trouton-Noble experiment, the Sagnac and Michelson-Gale experiments, the Silvertooth and Marinov experiments, de Sitter's binary star argument, moving mirror and moving source experiments, the Bryan G.Wallace's Venus planet radar data 'anomaly', and possibly the Pioneer anomaly, the positron annihilation in flight experiment, bending of starlight near the sun, the Hafele-Keating experiment, the GPS corrections, all astronomical and terrestrial speed of light measuring experiments, stellar aberration. The mystery behind the failure of many terrestrial experiments to detect any dependence of the velocity of light on the velocity of the source, why the MMX failed to detect a fringe shift whereas fringe shift is observed in Sagnac experiments, why no significant variation in the measured speed of light has ever been detected is disclosed. This theory resolves the centuries old perplexing paradox: Relative to what is the absolute velocity of a body determined? Argument against the ether hypothesis is presented. A new type of Michelson-Morley experiment is proposed. This paper presents a new theory that unites the main theories and postulates of the speed of light into a single theoretical framework: Einstein's light postulate, emission theory and the ether (absolute space) theory. The effect of absolute motion is to create an apparent change of position (distance and direction) of the light source relative to the observer. Relative to a detector on a rotating Sagnac device, the source appears farther away when 'looking' in the backward direction than when 'looking' in the forward direction. The well known formula $4\omega A / c$ for the path difference of the forward and backward beams is given a new interpretation. In fact, this formula has been modified as $(4\omega A / c) / (1- (\omega R/C)^2)$. The new interpretation discloses the fundamental flaw in the Michelson-Morley experiment: the use of a single light source, in which both the forward and lateral beams would be affected in identical ways by absolute motion. Modern MM experiments using optical cavity resonators use two light sources, but then they look for changes/differences in frequency, which is not affected by absolute motion, and not for phase differences. SRT assumes that the center of the light wave fronts stays at the point in space where the source was at the instant of emission, with a tacit assumption of a medium (ether). The center of the wave fronts neither stays at the point in space where the source was at the instant of emission, nor move with the source as in emission theories. In this paper it is proposed that the center of the wave fronts moves with the *apparent* source. If anyone ridicules the notion of absolute motion, they must be ignorant of the mind blowing Silvertooth's experiment (1986). Silvertooth detected an absolute velocity of the earth of about 378 Km/s, towards constellation Leo, *correlated with sidereal time*! This result was confirmed later on by NASA COBE satellite from CMBR anisotropy measurement.

Introduction

The notions, theories, experiments and phenomena on the nature of space, motion and the nature and speed of light and the process of radiation are numerous, divergent and have been the source of centuries of confusions. The resolution of the many associated contradictions and paradoxes has remained a truly daunting task.

The problem in physics today is not only the still puzzling and extremely subtle behavior of light, but also the lack of recognition to the problem. The scientific community assumes that these problems had been settled one hundred years ago.

The principle of relativity, first introduced by Galileo, is known to be one of the most cherished ideas in physics. The idea of absolute space and absolute motion existed since Newton, but with cloudy idea of its meaning.

Einstein was the first scientist to clearly and explicitly deny the validity of absolute motion, in a revolutionary way. Einstein's denial was clear, explicit and revolutionary. He clearly stated the emptiness of space.

The Special Relativity theory (SRT) is the main theory that is claimed to have resolved and settled these paradoxes, during the last century. The beauty of Einstein's relativity theory can be considered to be the main factor for the wide acceptance of the theory by the scientific community. The SRT presumes fundamentally that there is no experiment that can detect absolute motion. From this assumption follows, beautifully, the relativity of space and time. The idea is that if no physical experiment exists that can detect absolute motion, then absolute motion, absolute space and absolute time do not exist. Such a view was revolutionary and it apparently got rid of the absolute notion. Einstein’s famous and beautiful light speed thought experiment ('chasing a beam of light') was another of Einstein's thought experiments that made the scientific community fall in love with SRT. The logical consistency and experimental foundation of the light postulate has been crucial for SRT and it is always taken as an assurance of the correctness of SRT. The SRT was apparently able to solve many problems of classical physics.

The Michelson-Morley (and the Kennedy-Thorndike) kind experiments are the only experimental evidence we have for the constancy of the speed of light for all observers. The constancy of the speed of light *for any observer* has no other *direct* experimental evidence todate. Not a single physical experiment has been done in a whole century to directly test this crucial assumption to rule out all other possible explanations and confusions. We had to rely only on Einstein's light speed thought experiment. For example, one possible experiment could have been for an observer moving towards a stationary light source and looking for a change in wavelength implied in Einstein's light postulate.

On the other hand, the speed of light has been measured for centuries with increasing accuracy, from astronomical observations and terrestrial experiments, with such experiments as the Albert Michelson rotating mirror experiment and modern experiments using laser beams and cavity resonators. The fact that no significant variation has been found in different experiments shows that the measured speed of light does not depend on the orientation of the measuring apparatus relative to the earth's orbital or absolute velocity.

The ether and emission theories were the other two theories competing with SRT. The ether (or classical absolute space) theory was apparently ruled out decisively by the MMX null result. However, it was supported by the Sagnac effect.

Ritz's emission theory was the most straight forward theory to explain the MMX null result, but it failed to explain the Sagnac effect. Many experiments showed that the speed of light is independent of the motion of source or mirror, such as the Albert Michelson moving mirror experiment (1913) and the Q.Majorana experiments and many others. Modern experiments using radiating elementary particles in annihilation moving at speeds comparable to the speed of light detected no dependence of the speed of light on the speed of its source. The de Sitter’s argument of binary stars is considered to be the last blow on emission theories, although this argument was criticized after many years by Fox.

A clear evidence to support emission theory was the one claimed by Bryan G. Wallace, from observation of radar data of the planet Venus.

There is also the Universal Time light postulate proposed by Moon and Spencer, which implies instantaneous distance and velocity information transmission, or ‘rigid’ attachment of the wave to its source.

SRT cannot explain *both* the MMX and the Sagnac effect in the same way. It treats the two experiments differently. The Sagnac effect may be assumed to be explained by Galilean relativity. No 'length contraction time dilation' has been introduced into its explanation with SRT so far. The usual argument is that it is not relativistic because the peripheral speed is low. But SRT requires 'length contraction time dilation' to explain the MMX. A linear Sagnac experiment would decide between relativity and absolute motion.

The light speed problem is seen as the interpretation of the constant *c* in Maxwell's equations. The constant *c* is interpreted differently in each theory/postulate of light. Einstein's light postulate is claimed to be in better agreement with Maxwell's equations and the principle of relativity better than the emission and ether theories.

In the lack of any better theory, thus, Einstein's relativity theory was accepted as a true theory of nature during the last century. However, despite its superficial beauty, Einstein's relativity theory seems to be a marriage between correct ideas and fundamentally wrong assumptions and interpretations. It is based on a logically sound idea of empty space and constancy of light speed, which was confirmed by the MMX null result . The fundamental mistake is that it presumes that there is no physical experiment that can detect absolute motion. This means that if an experiment is discovered that can detect absolute motion, then SRT will be invalidated, despite all experimental evidences.

A mind blowing evidence of absolute motion of the earth was disclosed by Silvertooth in his experiment of 1986. Silvertooth's experiment revealed an absolute velocity of 378 Km/s at a time when an upper bound of about 2.5 cm/s was set on a possible anisotropy of light speed, with a series of conventional and modern Michelson-Morley type experiments ! The absolute velocity detected in Silvertooth's experiment varied from about zero to a maximum of 378 Km/s , correlated with sidereal time and consistently pointing to the constellation Leo. Silvertooth's experiment would be ignored by the scientific community as usual. The astonishment came later on when precise measurement of CMBR spectrum anisotropy by NASA COBE satellite showed a velocity of 390 Km/s of the solar system relative to the CMBR, in the same direction of constellation Leo, in striking agreement with Silvertooth's experiment. However, the analysis and explanation given by Silvertooth himself was based on the ether theory. Other experiments pointing to absolute motion were also performed by different physicists, such as the earlier Marinov experiment and the later experiment carried out by Ronald DeWitte.

Thus, in the presence of so many contradicting experimental evidences and phenomena, and related notions and theories of space, time, motion and speed of light, and the phenomenon of radiation, the unifying idea behind all these has remained a mystery to date. The principle of relativity and the absolute notion both seem to have supporting evidences and the absolute notion has never been truly ruled out as often claimed with SRT. All the three well known theories/postulates of light namely, Einstein’s light postulate, emission theories and the absolute space (ether), have supporting evidences.

This paper is an attempt to develop a coherent theoretical framework that may unify all or most of the theories, experimental evidences and observations related to the speed of light.
A new theoretical framework is proposed in which absolute space/ absolute motion (or ether) theory, emission theory and Einstein's light postulate, are fused into a single model, with features of each theory that do not fit into the new model left out.

A new theory 'Relativity of EM fields/waves' is proposed. We discuss the phenomena of stellar aberration and transverse Doppler effect. Then a new interpretation of absolute motion and explanation of the Silvertooth experiment is presented. A new Michelson-Morley type experiment using two coherent light sources will be proposed.

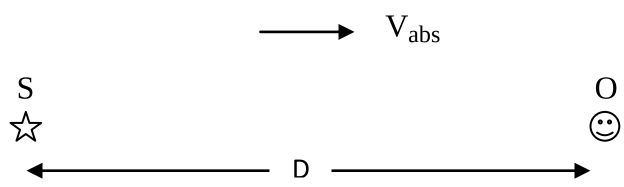
Discussion

A new interpretation of absolute motion

The notion of absolute space and the ether hypothesis existed for centuries. The two concepts have always been wrongly referred to be the same. In this paper a new interpretation of absolute space and its distinction from the ether or classical absolute space theory will be proposed.

The effect of absolute motion is to create a change in the path length, and not the speed of light. The position (distance and direction) of a light source in *absolute motion* changes as seen by an observer.

Imagine a light source S and an observer O co-moving in space to the right.

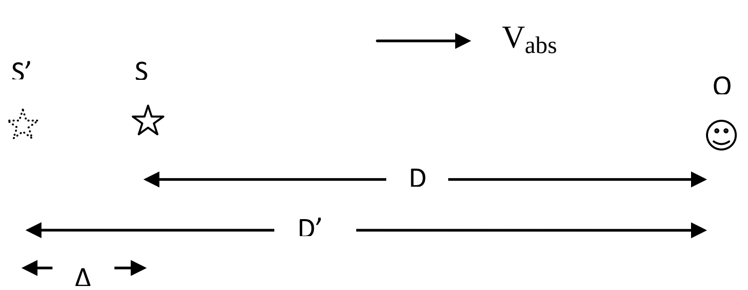


We will assume that the light source and the observer are moving absolutely, with absolute velocity V_{abs} to the right , and then give the new interpretation of absolute motion.

If V_{abs} is zero, i.e if the light source and the observer are at absolute rest, then a light pulse emitted from S will be received by the observer O after a time delay of:

$$t_d = D/c$$

If V_{abs} is not zero, however, the time delay will be determined as follows:



The observer receives a light pulse emitted not from a point in space where the source is at that instant of time but from a point S' in space where the source was some time ago.

During the time (t_d) that the source moves from point S' to point S, the light pulse moves from point S' to point O, i.e the time taken for the source to move from point S' to point S is equal to the time taken for the light pulse to move from point S' to point O.

$$\Delta / V_{abs} = D' / c$$

But

$$D + \Delta = D'$$

From the above two equations:

$$D' = D * (c / (c-V_{abs}))$$

and

$$\Delta = D* (V_{abs} / (c - V_{abs}))$$

The above analysis is based on classical absolute space or ether theory.

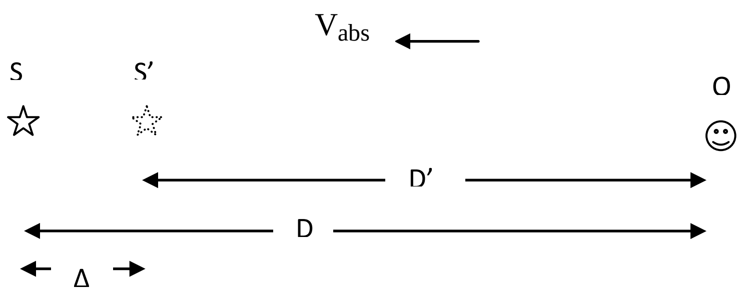
The light beam is thought as starting from an absolute point in space: 'a point in space'. The center of the wave fronts is thought to be or to remain at that 'point in space' where the source was at the instant of emission. Special Relativity and the ether (or classical absolute space) theory are based on such assumption. This assumption, however, has been disproved by the Michelson-Morley experiment (MMX) null result.

The new interpretation is presented as follows.

To the observer, the light source appears to have shifted by an amount Δ backwards away from the observer, but the center of the wave fronts is always at the apparent source position, for a constant absolute velocity V_{abs}.

There is no 'point in space' to be the center of the wave fronts. Space is empty and there is no medium (ether). The center of the wave fronts is always at the (apparent) source. This is the new interpretation.

The same analysis can be done if the source and the observer were co-moving absolutely to the left.

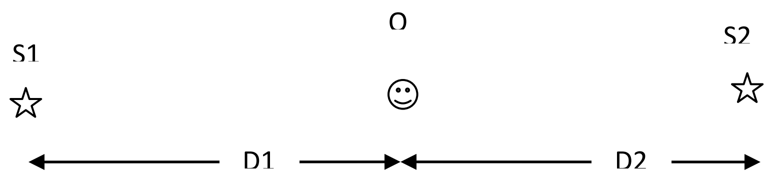


In this case, the source appears to have shifted by an amount delta towards the observer.

$$D' = D\,(c / (c+V_{abs}))$$

$$\Delta = D\,(V_{abs} / (c+V_{abs}))$$

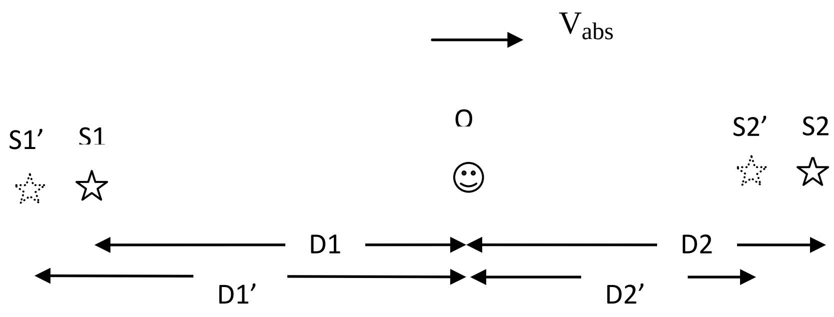
Imagine two light sources S1 and S2 co-moving with the observer O to the right, with absolute velocity V_{abs} .



S1 and S2 are at distances D1 and D2 from O, respectively.
Assume that initially V_{abs} is zero (i.e. absolute rest). Then light pulses emitted from S1 and S2 arrive at O after delays:

$$t_{d1} = D1 / c$$
$$t_{d2} = D2 / c$$

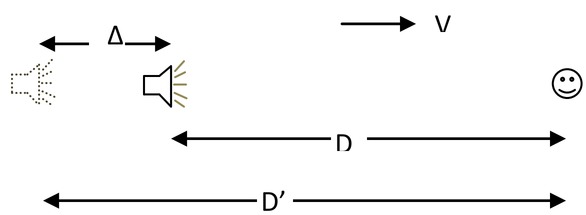
If V_{abs} is not zero, then S1 appears to have shifted backwards away from O , where as S2 appears to have shifted towards O.



Hence if observer O used an interferometer, he would detect a fringe shift as the absolute velocity increased from zero to V_{abs}.

So according to the new theory any problem is solved by replacing the real source with an apparent source and then assume that absolute velocity is zero.

The distinction of this theory will be clearer if we consider the case for sound or water waves, or the ether. Assume that the sound source and the receiver are on a common platform moving with velocity V relative to air, as shown below. We can analyze the problem as if the source and the receiver are at rest relative to the air, but replace the real source by an apparent source, as we did for a light source, as shown below.



Unlike light, the velocity of sound waves relative to the observer is $c_s \pm V$, where V is the velocity of the receiver relative to air, c_s is the velocity of sound relative to air. In this case it will be c-V because the receiver is moving in the same direction as the sound wave. The time it takes sound to travel distance D’ is equal to the time it takes the source to travel distance Δ .

Therefore,

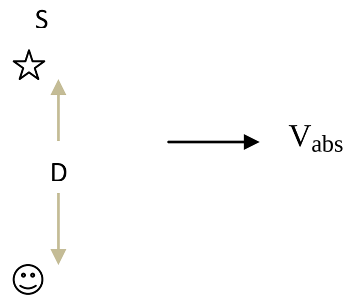
$$D'/ c_s = (D' - D) / V$$

D’ will be:

$$D' = [(c_s - V) / (c_s - 2V)] . D$$

So we get a different formula for sound.

Now imagine a light source S and an observer O as shown below, with the relative position of S and O orthogonal to the direction of their common absolute velocity.

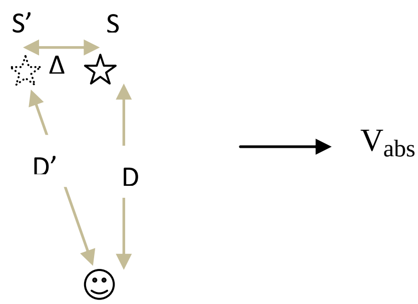


S and O are moving to the right with absolute velocity Vabs.

If Vabs is zero, a light pulse emitted from S will be received by O after a time delay td

$$t_d = D/c$$

If Vabs is not zero, then the light source appears to have shifted to the left as seen by observer O.



In the same way as explained previously,

$$D' / c = \Delta / V_{abs}$$

But,

$$D^2 + \Delta^2 = D'^2$$

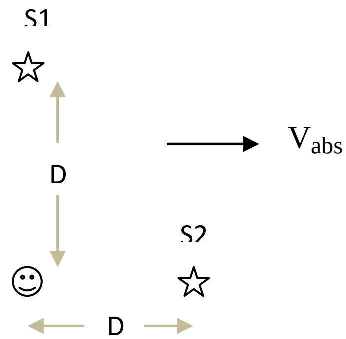
From the above two equations

$$D' = D * (c / (c^2 - V_{abs}^2)^{1/2})$$

Therefore, the time delay t_d between emission and reception of the light pulse in this case will be

$$t_d = D' / c = (D / (c^2 - Vabs^2)^{1/2})$$

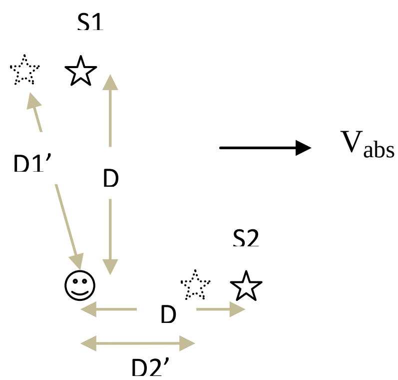
Now suppose that there are two light sources S1 and S2 , as shown below.



S1, S2 and observer O are co-moving absolutely to the right with absolute velocity *Vabs*.
If V_{abs} is zero the two time delays will be equal.

$$t_{d1} = t_{d2} = D / c$$

If *Vabs* is not zero, the positions of the sources will change apparently relative to the observer as shown below and hence the two time delays will be affected differently and hence a fringe shift will occur.



In this case, the two time delays will be different..

$$D1' = D * (c / (c^2 - Vabs^2)^{1/2})$$

$$D2' = D * (c / (c + Vabs))$$

Therefore

$$t_{d1} = D1' / c$$

$$= D / (c^2 - Vabs^2)^{1/2}$$

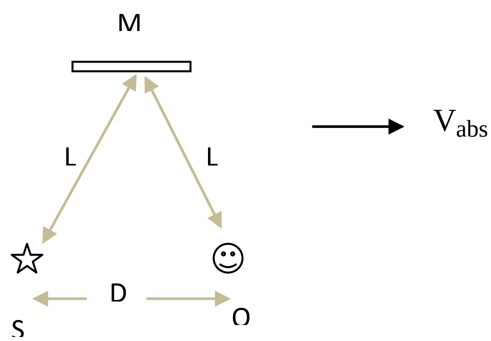
and

$$t_{d2} = D2' / C = D / (C + Vabs)$$

Hence, a fringe shift would occur as the absolute velocity is increased.

So far we considered only the simplest ideal systems in which only a light source and an observer existed. However, real experiments involve mirrors, so we will analyze a system additionally consisting of mirrors in the next section.

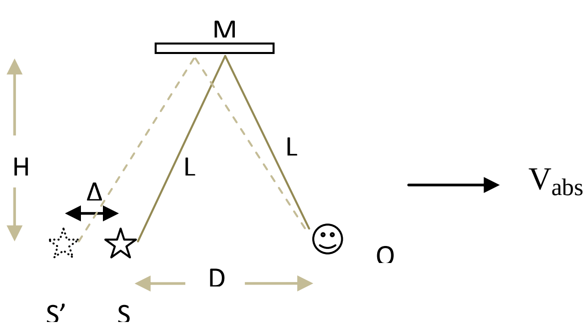
Consider a light source S, an observer O and a mirror M , co-moving to the right with absolute velocity Vabs.



If *Vabs* is zero, then the time delay between emission and reception of a light pulse will be

$$t_d = 2L / C$$

If Vabs is not zero, then, as discussed previously, the source S appears to have shifted away from the observer O.



$$\Delta = D * (Vabs / (c\text{-}Vabs))$$

Hence the length of the light path from S' to O will be:

$$2 * (((D+\Delta)/2)^2 + H^2)^{1/2})$$

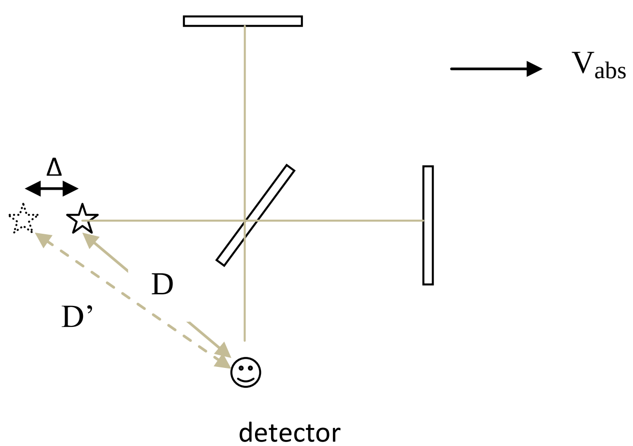
Therefore, the time delay will be

$$t_d = (1/c) * 2* (((D+\Delta)/2)^2 + H2)^{1/2})$$

where D is the *direct* distance from observer to source.

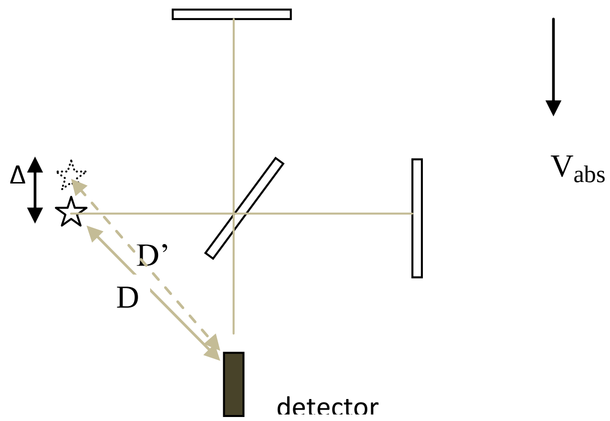
So the effect of absolute motion is just to create an apparent shift in the position of the light source relative to the observer.
This avoids all the confusions that arise in systems consisting of mirrors. We would not say, for example, that the mirror will move to a different position while the light beam is in transit, etc. Only the position of the light source is thought to shift apparently relative to the observer.

With the interpretation(theory) presented so far, the Michelson- Morley and the Kennedy-Thorndike experiments can be explained. The secret behind the null results of these experiments is that only a single light source was used, with a single light beam split into two.



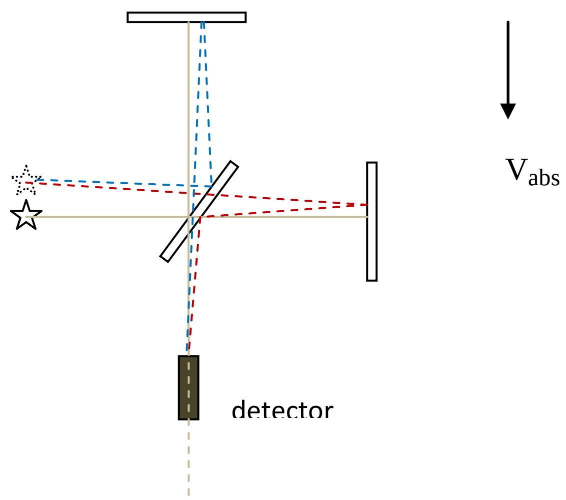
From the above diagram, we see that the effect of absolute velocity is just to create an apparent shift of the position of the light source, for absolute velocity Vabs directed to the right. Therefore, the apparent shift of the source is common both to the forward and lateral beams and hence the path lengths of both beams are affected in the same way and hence no fringe shift will occur.

For an absolute velocity Vabs directed downwards, the apparent position of the light source will be as shown below.



Note that there is no beam with slant path as in the conventional MMX analysis of SRT or ether theory. This is the distinction of the new theory.

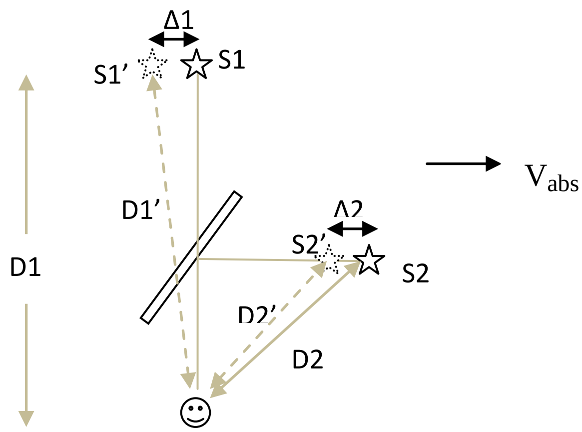
Now we can see why there were NON-NULL results in many conventional MM experiments. There will be the same fringe shift as if the light source was actually (physically) shifted to the apparent position. If the light source is physically shifted to the position shown, the length of the path of the two beams arriving at the observer (detector) should change differently.



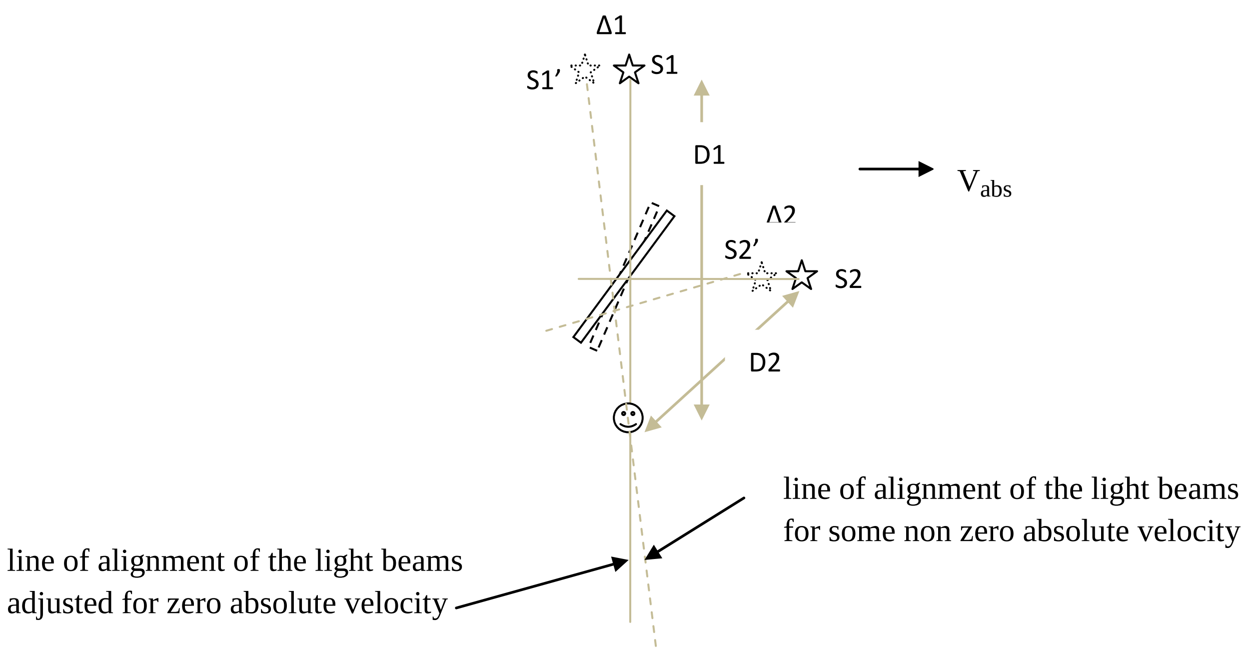
The blue and red dotted lines show the two beams. The drawing is not drawn to be accurate but only to illustrate the idea.

New proposed Michelson-Morley experiment

To detect absolute motion with an MMX type experiment, thus, we need two coherent light sources, as shown below. The single light source is omitted and the two reflecting mirrors are replaced by two coherent light sources.



With zero absolute velocity, the two light beams arriving at the detector are aligned. However, with non zero absolute velocity, the two beams will be misaligned. Therefore, it becomes necessary to rotate the beam splitter until the two light beams are aligned and circular fringe shifts can be observed, from which absolute velocity can be determined, by taking into account the rotation of the beam splitter.



Let the two light sources be at distances D1 and D2 from the detector . Note that D1 and D2 are the *direct* distances between the detector and the sources and not between the mirror and the sources.

As discussed previously, therefore

$$t_{d1} = D1' / c$$

$$= \; D1 \, / \, (c^2\text{-}Vabs^2)^{1/2}$$

and

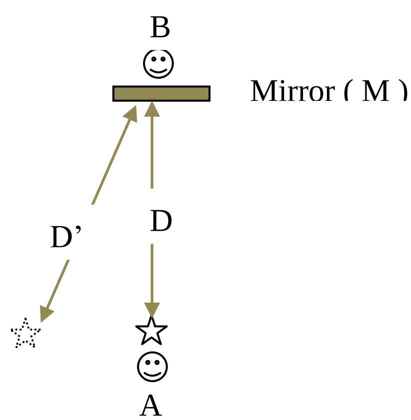
$$t_{d2} \; = \; D2' \, / \, c \; = \; D2 \, / \, (c^2\text{-}Vabs^2)^{1/2}$$

A maximum fringe shift corresponding to the absolute velocity of the earth (about 390 Km/s) should be observed..

The modern MMX experiments which are based on optical resonators use two independent orthogonal laser light beams from two laser light sources. However, these experiments look for differences in the frequencies of the two orthogonal beams. As explained so far, the effect of absolute motion is to create a change in path length and hence a change in phase. The phases of the two beams change differently. Hence, there will be no effect on the frequencies. A change in phase difference (and not a change in frequencies) should occur.

Apparent contradiction in the new theory

There is a contradiction that needs resolution in the above theory/interpretation of absolute motion, however.



Suppose that a light pulse is emitted from the source towards the mirror M and reflected back to the source (to observer A). We assume that observer A is at the same point in space as the light source, hence, for observer A, the apparent position of the source will be the same as the real position of the source. Hence, observer A will predict that the time delay between emission of the light pulse and its reception (after reflection from mirror) will be:

$$\tau = 2D / c$$

From this observer A predicts that the time interval between emission and reception at the mirror to be:

$$(\tau)/2 \; = \; D/c$$

However, observer B will predict this time to be

$$\tau = D'/c$$

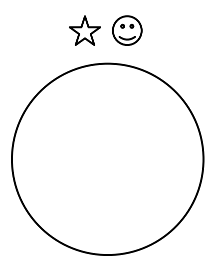
Since D' ≠ D , this is a contradiction which needs to be resolved.

Although the new theory has this apparent contradiction, the number of experiments and observations explained by the new theory far outweighs this contradiction.

The Sagnac effect

The analysis of (absolute) rotational motion is fundamentally different from that of translational motion. In this case we will not take the direct source-observer distance to determine the apparent position of the light source, as in the analysis of absolute translational motion.

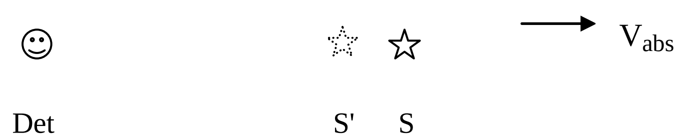
Consider a Sagnac device at absolute rest, i.e not in absolute translation and rotation.



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

$$t_d = 2\pi R / c$$

Assume now that the device is rotating clockwise with angular velocity Omega. We will apply the previous analysis for absolute translational motion. 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.



In this case, the source appears to have shifted by an amount Δ towards the detector. From previous discussion,

$$D' = D\,(c / (c+Vabs))$$

$$\Delta = D\,(Vabs / (c+Vabs))$$

But $D = 2\,\pi\,R$, $Vabs = \omega\,R$

$$\Delta_{FW} = 2\pi R\,(\omega R) / (c+\omega R)$$

$$= 2\omega A / (c + \omega R)$$

Now 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 infront of the source.

☆ ☆ ☺ ⟶ V_{abs}

S' S Det

In this case, the source appears to have shifted by an amount Δ away from the detector. From previous discussion,

$$D' = D\,(c/(c-Vabs))$$

$$\Delta = D\,(Vabs/ (c-Vabs))$$

but $D = 2\pi R$, $Vabs = \omega\,R$

$$\Delta_{BW} = 2\pi R\,(\omega R) / (c-\omega R)$$

$$= 2\omega A / (c - \omega R)$$

The total path difference will be the sum of Δ_{FW} and Δ_{BW}.

$$\Delta = \Delta_{FW} + \Delta_{BW}$$

$$= 2\omega A / (c + \omega R) + 2\omega A / (c - \omega R)$$

$$= 4\omega Ac / (c^2 - (\omega R)^2)$$

This can be written as:

$$\boxed{\Delta = (4\omega A / c) / (1 - (\omega R / c)^2)}$$

The well known standard equation for the path differences is:

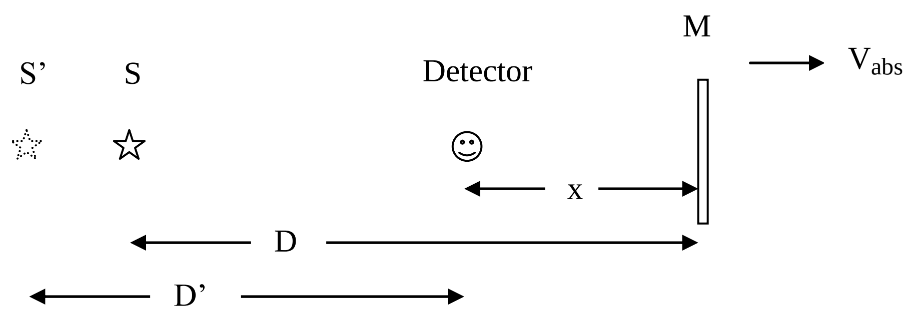
$$4\omega A / c$$

The Silvertooth experiment

Although the Sagnac effect can be taken as a strong evidence in support of absolute space/motion, it is usually claimed be explained by the Galilean principle of relativity.

The Silvertooth experiment is the other crucial evidence of absolute motion.

Imagine a light source S, an observer O and a mirror M , co-moving with absolute velocity Vabs to the right as shown below.



<u>Wavelength and velocity of incident light</u>

Light emitted by S at time $t = 0$ will be received by observer O after time delay t_d.

From the previous discussions

$$D' = (c / (c\text{-}Vabs)) . D \quad \textit{(note that this D is not the one shown in the above figure)}$$

Substituting $D\text{-}x$ in place of D

$$D' = (c / (c\text{-}Vabs)) . (D - x)$$

Time delay will be

$$t_d = D' / c = (D\text{-}x) / (c\text{-}Vabs)$$

Assume that the source emits according to

$$\sin \omega t$$

The light wave will be received at point x as

$$\sin \omega(t\text{-}td) = \sin\omega (t\text{-} D /(c\text{-}Vabs) + x / (c\text{-}Vabs))$$

$$= \sin(\omega t - \omega D / (c-Vabs) + \omega x / (c-Vabs))$$

The above is a wave equation. If we take a 'snapshot' of the wave at an instant of time $t = \tau$, the above equation will be:

$$\sin(\omega \tau - \omega D / (c-Vabs) + \omega x / (c-Vabs))$$

The two terms $\omega \tau$ *and* $\omega D / (c-Vabs)$ represent constant phases. The 'wavelength' is determined from the third term:

$$\omega x / (c-Vabs)$$

If we have a function

$$\sin kx$$

then the wavelength can be shown to be

$$2 \pi / k$$

In the same way, for the function

$$\sin(\omega x /(c-Vabs))$$

$$k = \omega / (C-Vabs)$$

Hence the 'wave length' of the incident light will be

$$\lambda_{INC} = 2 \pi / k = 2 \pi / (\omega /(c-V_{abs})) = 2 \pi(c-Vabs)/\omega = (c-Vabs) / f$$

$$\lambda_{INC} = (c-Vabs) / f$$

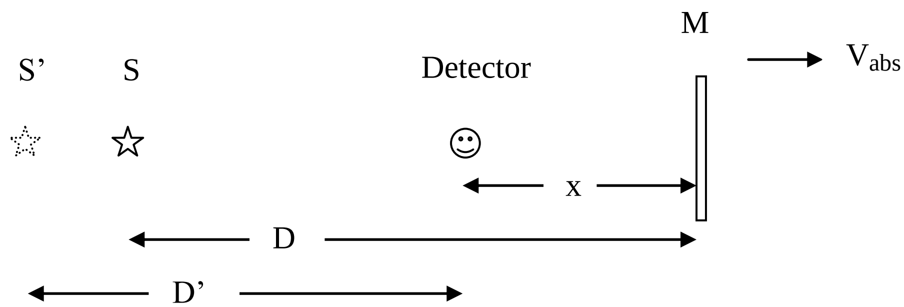
One may think that the speed of light relative to the observer changes and will be c-v because of change in wave length shown above (since frequency will not change for co-moving source and observer [5]).This would disagree with the constant light speed postulate.

However, one important interpretation in this analysis is that the 'wave length' determined above is not to be considered as a wavelength. According to the new theory, the apparent position of the source is different for two observers at different points of x. So an observer at point x can measure only the frequency and time delay and not wavelength because it is impossible to measure wavelength at a point. Therefore, the speed of light relative to an observer at point x is defined as the ratio of the distance from point x to the apparent source and the time delay between emission and reception, and this ratio is always equal to c for a source and observer at rest relative to each other, and cannot be determined as the product of wavelength and frequency.

Note that the wavelengths predicted here are different in form than the wavelength predicted by Silvertooth, in his paper, but the results obtained are nearly the same as will be shown shortly.

Wavelength and velocity of reflected light

Next we determine the wavelength of the reflected light.



Time delay between emission and reception before reflection of light from mirror M, at point *x*, is determined as follows.

$$D' = (D-x)\,(c / (c-Vabs))$$

Relative to an observer at point *x*, who is observing the reflected light, time delay between emission and reception of reflected light will be:

$$t_d = D' / c + 2x / c = (D-x) / (c-Vabs) + 2x/c$$

$$= D / (c-Vabs) - x / (c-Vabs) + 2x/c$$

$$= D / (c-Vabs) - x\,(1/(c-Vabs) - 2/c)$$

$$= D / (c-Vabs) + x\,(c-2Vabs) / c(c-Vabs)$$

If the source emits light according to

$$\sin \omega t$$

The light wave will be received at point *x* as

$$\sin \omega\,(t-t_d) = \sin \omega\,[\,t- D/(c-Vabs) - x\,(c-2Vabs)/c(c-Vabs)]$$

The coefficient of *x* is

$$k = \omega\,(c-2Vabs) / c(c-Vabs)$$

As before, the 'wavelength' of reflected light will be:

$$\lambda_{REF} = 2\pi / k = 2\pi / [\omega\,(c-2Vabs) / c(c-Vabs)\,]$$

$$= c\,(c\text{-}Vabs) / f\,(c\text{-}2Vabs) = 1/f\,.\,[\,c\,(c\text{-}Vabs) / (c\text{-}2Vabs)]$$

One would expect the 'wave length' of the reflected light to be equal to (c + Vabs) / f , because the 'wavelength' of incident light is (c - Vabs) / f . However, it turned out in the above analysis that this is not the case. However, it can be shown that the actual difference between the two is very small.

The absolute velocity of the earth is known to be Vabs = 390 Km/s

$$\begin{aligned} \lambda_{REF} &= 1/f\,.\,[\,c\,(c\text{-}Vabs) / (c\text{-}2Vabs)] \\ &= 1/f\,.\,[\,300{,}000\,(300{,}000\text{-}390) / (300{,}000 - 2 * 390)\,] \\ &= 1/f\,.\,300,391\ Km \end{aligned}$$

According to $1/f\,.(\,c+ Vabs\,)$ it will be

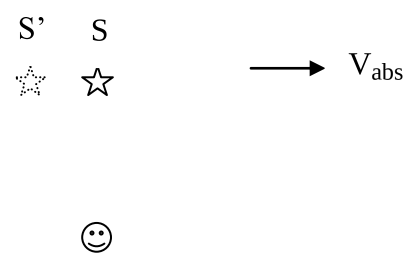
$$1/f\,.\,(\,300{,}000 + 390\,) = 1/f\,.\,300{,}390\ \ Km$$

The difference between the two apparent velocities is only 1 Km/s , which is only about 0.25 % of 390 Km/s .

Therefore, the 'wave length' change detected in the Silvertooth experiment has been justified above. However, this is not to be interpreted as a change of wave length. It should be interpreted as change in path length resulting from absolute motion.

In the above analyses, we considered the simplest cases in which the source, the observer and the mirror are in line and move along this line, with the light beam incident perpendicularly on a mirror and reflected back on itself. It is possible to extend the analysis to more general cases for a better clarification of the theory. In the next section we will look at the application of the new theory to some of these cases. As the resulting solutions are more complicated (but straight forward) , we will show only how to proceed.

Let us look at a case in which the source observer relative position is perpendicular to the absolute velocity.



From previous discussion

$$t_d = D' / c = (\,D / (c^2\text{-}Vabs^2)^{1/2}\,)$$

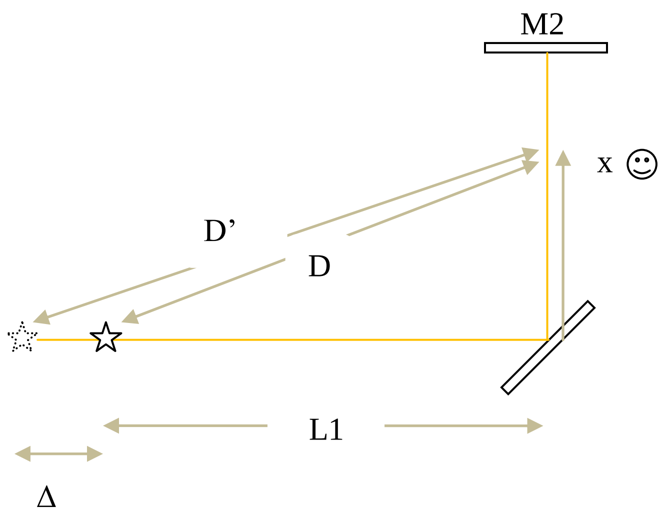
If the source emits according to

$$\sin \omega t$$

then the light received will be

$$\sin (\omega t - t_d)$$

Next consider the following case.



An observer at point *x* will observe the incident light (light reflected from mirror M1, but before reflection from mirror M2) and the reflected light (light reflected from mirror M2).

To analyze this problem, we first have to determine the change (Δ) in apparent position of the source due to absolute motion.

$$t_d = (\Delta + L1 + x) / c$$

But

$$D' / c = \Delta / Vabs$$

The above equation means that the time it takes a *direct* light beam to reach the observer from the apparent source position is equal to the time it takes for the source to move from position S' to position S. Note that we have assume a direct light beam from point S' to point x to determine the apparent change in the position of the source for an observer at point x, even though there is no direct light beam from the source to the observer (i.e the observer observes only light reflected from mirror M1 in the case being considered)

Also

$$(\Delta + L1)^2 + x^2 = D'^2$$

and

$$L1^2 + x^2 = D^2$$

From the above three equations, the solution for Δ can be obtained as follows.

$$(\Delta + L1)^2 + x^2 = D'^2$$

$$(\Delta + L1)^2 = c^2 \Delta^2 / Vabs^2 - x^2$$

resulting in the quadratic equation

$$\Delta^2 (c^2 / Vabs^2 - 1) - \Delta (2 L1) - (L1^2 + x^2) = 0$$

The solution for delta will be

$$\Delta = [2L1 + [4L1^2 + 4 (c^2/ Vabs^2 -1) (L1^2 + x^2)]^{1/2}] / 2 (c^2 / Vabs^2 - 1)$$

Now the time delay t_d can be obtained in terms of x from the previous equation:

$$t_d = (\Delta + L1 + x) / c$$

The solution for delta shows that that time delay varies with x in a more complex way.
The term under square root should be expanded .

It can be seen that the time delay does not depend on x but on higher powers of x . This results in dependence of 'wavelength' on x .

For reflected light the equation for time delay t_d will be :

$$t_d = (\Delta + L1 + x + 2 (L2 -x)) / d$$

The equation for delta obtained above should be substituted in the above equation to determine the time delay and hence the 'wave length ' of the reflected light.

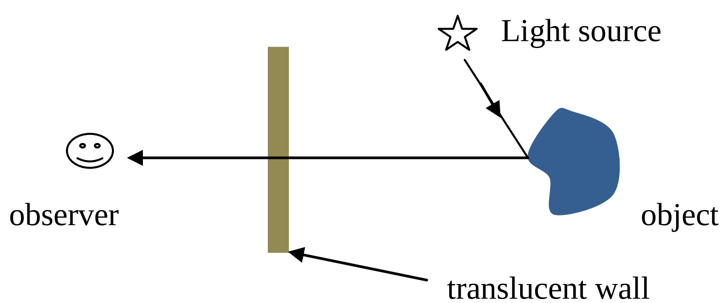
Argument against ether hypothesis

Absolute space and absolute motion exist, but the ether doesn't.

Until the beginning of the twentieth century, the hypothetical ether was thought as a medium for transmission of light, just as water is the transmission medium of water waves and air is the medium for sound transmission. The ether hypothesis was decisively ruled out by the historical Michelson-Morley experiment.

One of the assumed properties of ether was that it had no interaction with cosmic bodies and with all matter. Now, based on this assumed property of the ether, one can show that the ether hypothesis is not plausible at all.

If the ether doesn't interact with matter, then it is not affected by the presence of matter. We find it everywhere, including inside solid objects.

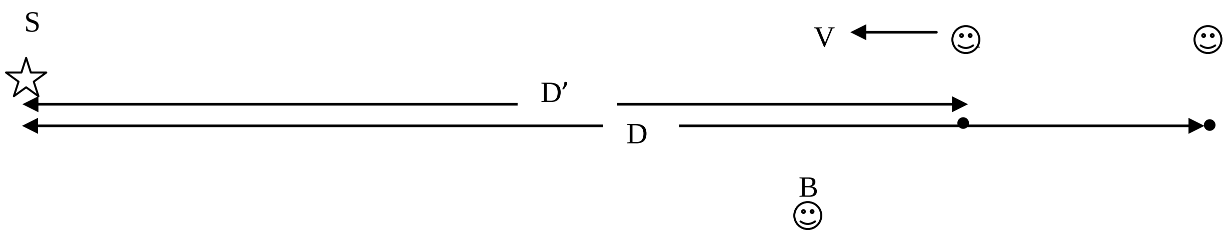


Since light is only a travelling disturbance (oscillation) of (on) the ether, then an observer would see an object behind a translucent wall, since the wall would have no effect on light (which is assumed to be an ether wave). If the translucent wall has no effect on the ether, then it would also have no effect on the ether wave. But this is not all. Even we would not be able to see any object because the ether (and the ether wave, which was assumed to be light) does not interact with our eyes also. There would be no vision. Light would not interact with matter at all. So the ether hypothesis, as it is known so far, is absurd.

Interpretation of Einstein's light postulate: Relativity of electromagnetic waves

Imagine an observer moving towards or away from a light source at *absolute rest*. Maxwell's equations predict that the speed of light should always be the same, whether the observer is at rest or in motion relative to the source, as interpreted by Einstein as the light postulate. How can two observer measure the same speed of the same light beam, coming from the same source?

Einstein was right when he called the light postulate a postulate. There is no proof of it but only an interpretation. SRT was Einstein's interpretation of the light postulate. This paper proposes an alternative interpretation.



Assume a stationary light source S and two observers, observer O who is at rest relative to S and observer A who is moving towards S. Assume also that there is a third stationary 'observer' B. Observers O and A report to observer B the time they received a light pulse. Suppose that at an instant of time, S is emitting a short light pulse while observers O and A are at the same distance D from the source, but with observer A moving with velocity V towards S at that instant of time. Observer O will obviously receive the light pulse after a time delay of D/c. Straight forward thinking tells us that observer A should detect the light pulse earlier than observer O, because A is moving towards S.

For light, however, this is not the case. Both observers O and S will receive the light pulse simultaneously, and this is the new interpretation of Einstein's light postulate and Maxwell's equations. It is as if the light slows down for observer A.
This is the only way a third stationary 'observer' B can account for this. Let us call the velocity of light relative to its source for observer A as c'.

During the time (D/c) that the light pulse travels from S to O, observer A will also have advanced towards the source by a distance of V. D/c , relative to O.
If the time delay for both observers is the same, then

$$\text{time delay for O} = \text{time delay for A}$$
$$D/c = (D-V.D/c)/c'$$

From which,

$$c' = c-V$$

Note that c' is the velocity of light relative to its source, for observer A. Therefore, 'observer' B predicts the velocity of light relative to observer A as the sum of c' and V.

$$\text{Velocity of light relative to observer A} = c' + V$$

But c' = c-V (previous equation). So substitute in the above equation

$$\text{Velocity of light relative to observer A} = c' + V = (c-V) + V = c$$

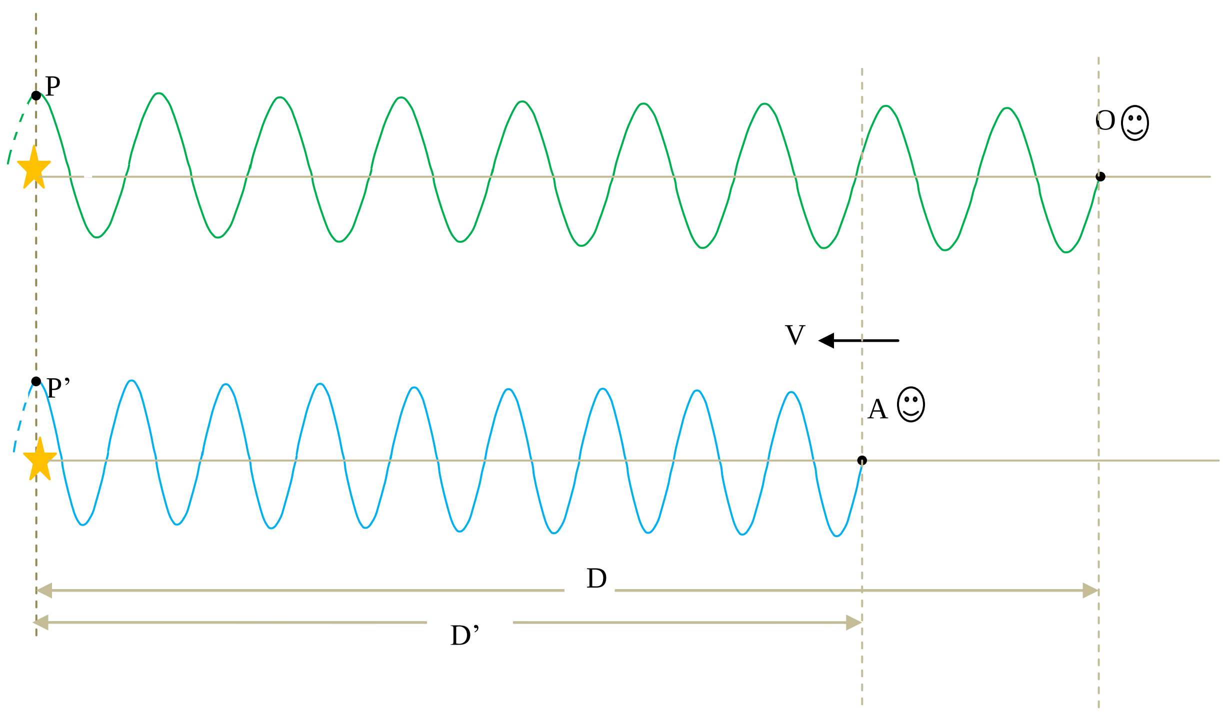
Therefore, the velocity of light relative to observer A is still equal to c. Even though observer A is moving towards the light pulse, light will not go faster than c relative to him/her. The velocity c' is an apparent velocity and is not a physically accessible (measurable) quantity.

A similar analysis can be done for an observer moving away from the source.

Suppose that, instead of a short light pulse, the source emits a sinusoidal continuous light wave.

As before, assume that observers O and A are at the same distance D from the source S, at an instant of time. Assume also that observer A is moving towards S with velocity V and source S is just emitting a peak point P on the wave. Therefore, both observers will detect the peak point P simultaneously.

The below diagram is a frozen or snapshot pictures of the wave as seen by observer O (green wave) and by observer A (blue wave). We see that the wave should spatially be compressed towards its source for observer A, if observer A is to see peak point P' at the same instant observer O is seeing peak point P. Peak point P on the green wave for observer O corresponds to peak point P' on the blue wave for observer A.
From the above diagram, the number of frozen wave cycles (n) in the space between stationary observer O and the source is equal to the number of frozen wave cycles (n) in the space between observer A and the source.



So we see that observer A sees a Doppler shifted form of the wave seen by observer O. We will determine the Doppler wavelength and frequency shift.

$$n.\,\lambda - n.\,\lambda' = V.\ D/c$$

$$n(\lambda - \lambda') = V \,.\, D/c$$

But, $n = D/\lambda$

Therefore,

$$(D/\lambda)(\lambda - \lambda') = V.\, D/c$$

From which,

$$\lambda - \lambda' = \lambda \,.\, V/c$$

$$\Delta\lambda = \lambda \,.\, V/c \quad \text{and} \quad \lambda' = \lambda \,.\, (c - V)/c$$

The Doppler frequency shift :

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

$$= c/\lambda \;.\; c/(c-V)$$ (substituting for λ' from above equation)

$$= f \;.\; c/(c-V)$$

And

$$\Delta f = f' - f = f \;.\; V/(c-V)$$

In Doppler effect of sound or water waves, wave length is fixed and is independent of the observer's velocity, and the velocity of the wave will be $c+-V$ relative to the observer, where c is the velocity of the sound or water wave and V is the velocity of the observer, both relative to the medium. Unlike the Doppler effect of sound and water waves, in Doppler effect of light the wavelength changes and the speed remains constant. The new interpretation is restated as follows.

The apparent velocity c' of light relative to the source changes by the same amount of the source observer relative velocity V so that the velocity of light is always constant c relative to the observer. For an observer moving directly towards a light source, the light wave contracts towards the source so that the apparent velocity c' of light relative to the source will be $c-V$. The velocity of light relative to the observer will be $(c-V) + V = c$. The velocity c' is an apparent velocity because it is not a physically measurable velocity. For an observer moving at constant velocity directly (radially) away from a light source, the apparent velocity c' of light relative to the source will be $c + V$, so that the velocity of light relative to the observer will be $(c+V) - V = c$.

The consideration of the Doppler effect of light and the light postulate give a hint on the correct interpretation of the light postulate.

Moving source

In the preceding section we assumed a stationary source and a moving observer. The source was at absolute rest.

The effect of absolute motion of a light source is to create an apparent change of position of the light source as seen by an observer at absolute rest.

$$D' / c = \Delta / V = (D - D') / V$$

$$\Rightarrow \quad D' = D \, . \, c / (c + V)$$

$$dD' / dt = V' = (dD/dt) \, . \, [\, c / (c + V) \,] = V \, . \, [\, c / (c + V) \,]$$

$V' = V \, . \, [\, c / (c + V) \,]$, for a light source absolutely moving away from an observer at rest

$V' = V \, . \, [\, c / (c - V) \,]$, for a light source absolutely moving towards an observer at rest

The above equation shows the relationship between the velocity (V) of the real source and the velocity (V') of the apparent source.

The apparent source is not moving towards an observer with the same velocity as the real source.

Therefore, to get the Doppler shift due to motion of the source, we substitute V' for V in the Doppler shift formula derived in the last section for a stationary source and a moving observer.

A new theory of light:

The velocity of light is c relative to the apparent source.
The group velocity of light is equal to

$$c + V' = c + V \, . \, [\, c / (c + V)$$

relative to the apparent source, for a source moving with an absolute velocity V, as observed by an observer at absolute rest.

In this case also the phase velocity of light should not depend on the velocity of the source.
We saw that motion of the observer does not change the phase of the wave: both the stationary and the moving observers observe a phase point simultaneously. Therefore, the same should be

true for a moving source. Motion of the source should not affect the phase velocity of light. This postulate may explain the absence of fringe shifts expected from existing emission theories in moving source and moving mirror experiments, such as the Q.Majorana, Albert Michelson, Tolman, Miller,   experiments

Constant phase velocity and 'ballistic' group velocity of light - a new theory

In the preceding section a theory which can successfully interpret the light postulate was proposed. This is a great success because we didn't resort to such extraordinary hypotheses like 'length contraction time dilation'. It was shown that frequency and wavelength change for an observer moving relative to a light source at absolute rest such that the speed of light is always constant relative to an observer.

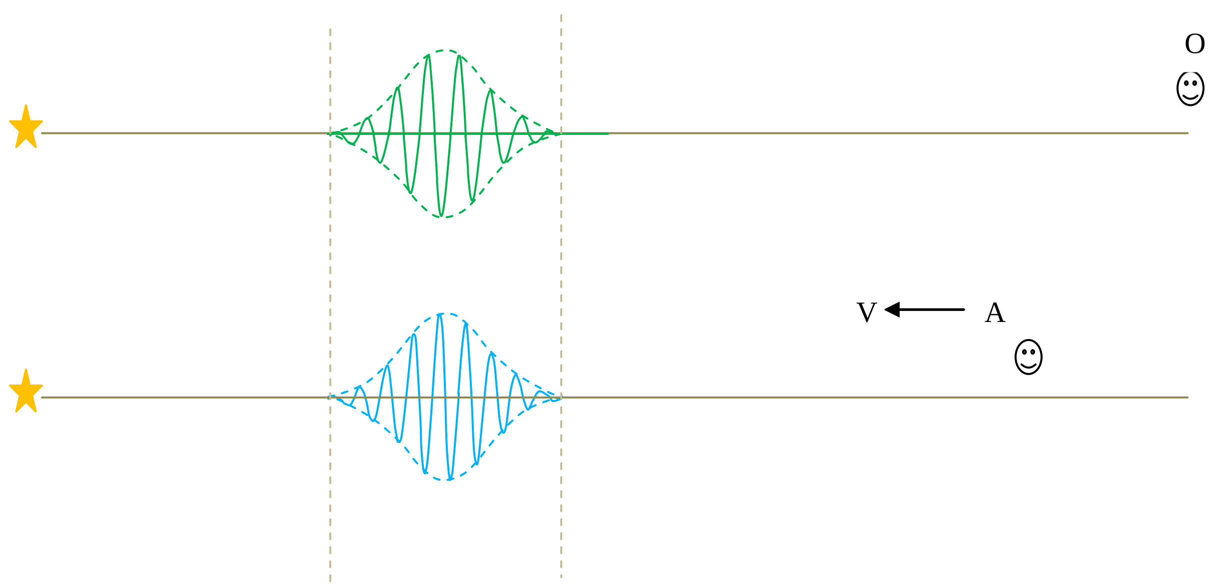
$$f \, . \, \lambda = c = f' \, . \, \lambda'$$

However, the new theory proposed is still counterintuitive. Logically, an observer moving towards a light source should detect a light pulse earlier than a stationary observer. The hypothesis that the two observers O and A (refer to preceding section) detect a light pulse simultaneously is not only counterintuitive but also is not in accordance with experiments and observations.

Should we discard the new theory then? But we have successfully interpreted the light postulate with it! Therefore, we should keep the new theory and try to reconcile it with logic and observations.

It took me more than one year to discover the missing idea.

The 'new' idea is not really new :   *phase velocity and group velocity*.



Observer A who is moving towards the light source should logically detect the light pulse earlier than the stationary observer O. However, observer A should observe a spatially compressed form of the wave observed by stationary observer O.
Here is the distinction:

Even though the (sinusoidal) waves are compressed, the envelop or the group is not compressed.

Note the slight compression of the blue sinusoidal waves as compared to the green sinusoidal waves, but that the two envelopes have the same width, in the figure above.

One implication here is that there is no conservation of the number of wave cycles in an envelope ?? (This might be a problem?). This may be counterintuitive. But at least we also know that any waveform can be seen as a Fourier series, containing sinusoidal waves at different frequencies, extending from minus infinity to plus infinity, in time.

Thus, as the observer A moves towards the light source, the phases will be spatially compressed, but the envelope is unchanged, i.e not compressed.
In a previous theory I proposed, both the sinusoidal wave and the envelop were postulated to be compressed, and this had counter intuitive implications which were not in agreement with experiments and observations.

For the stationary observer O, the phases are at rest relative to the envelope. However, for observer A, the phases are moving relative to the envelope.

It is the velocity of the phases which remains constant relative to the observer (and independent of source velocity), not the velocity of the envelope (the group). The velocity (c') of the phases apparently changes relative to the source, so that their velocity relative to the observer remains constant (*c*), i.e. c' + V = c (vector sum).

The group velocity is 'ballistic' and not constant *relative to the observer.*

As determined in the preceding section, the Doppler frequency shift observed by observer A is:

$$\Delta f = f' - f = f \ . \ V / (c - V)$$

Similar analysis can be done for an observer moving away from a light source.

Therefore, a complete and successful alternative interpretation of Einstein's light postulate has been developed. The constant c in Maxwell's equations has been interpreted

1. as a phase velocity relative to an observer
2. as group velocity of light pulse from source to observer, in the source's reference frame

The group velocity is determined as:

$$c = D/t$$

where D is the distance between source and observer *at the instant of observation* (*emission?*) (more on this in next section) and t is the time elapsed between emission and observation.

The phase velocity is:

$$c = f.\lambda$$

New light speed postulate

I postulate the following:

The phase velocity of light is independent of the velocity of the observer.

The group velocity of light depends on the velocity of the observer.

The velocity of light is c relative to the apparent source.

The velocity light reflected from a mirror is always equal to the velocity of the incident light, irrespective of the motion of the mirror.

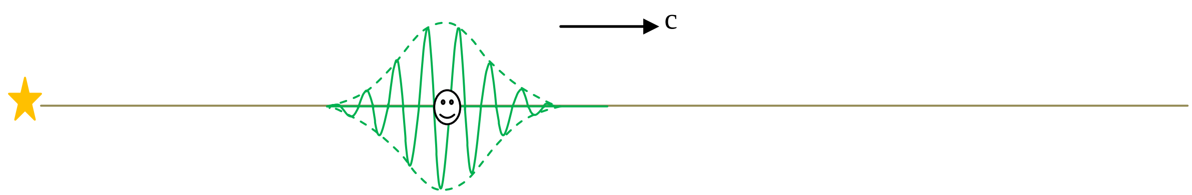
Some experimental evidences for the variable group velocity of light:

Ole Roamer observed that the eclipse time is longer when the earth is moving away from Jupiter than when it is moving Jupiter, by about 22 minutes. This can be seen as motion of the source or motion of the observer, with the same result in both cases. In the absence of the ether both are equivalent.

The other experimental evidence that the group velocity of light depends on the relative velocity of the source and of the observer is the observation made by Bryan G Wallace of radar data reflected from planet Venus. From analysis of the radar data, Wallace showed that the velocity of light depends on the velocity of the source; this velocity is the group velocity.

A new explanation for Einstein's light speed thought experiment

Imagine a light source and an observer moving away from the source at the speed of light, as Einstein imagined in his thought experiment. Assume that the observer was at the source position but moving away at the speed of light at an instant of time t=0. Assume that the source emits a light pulse at this same instant of time.



According to the new theory, the phases always go past the observer at the speed of light, and this was what Einstein postulated. But the envelop will always be at rest relative to the observer. Einstein (and no one else, I far as I know) never thought of such a possibility.

Why did many experiments fail to detect dependence of the speed of light on the speed of its source ? And, on the contrary, why did radar data of planet Venus (as analyzed by Bryan G.Wallace) support the emission theory ?

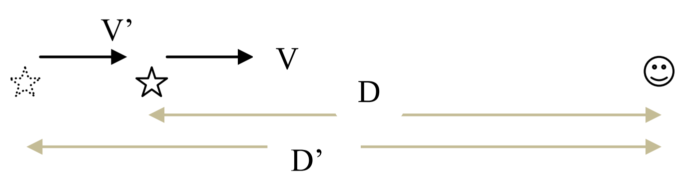
Many experiments and observations failed to detect any dependence of the speed of light on the speed of its source. These include: the Albert Michelson moving mirror experiment, the Q. Majorana moving mirror and moving source experiments, experiments using sun light and star light (Tolman, Miller,), experiments using elementary particles (such as Π-Meson in annihilation) moving with speeds comparable to the speed of light as sources of radiation. There is also the de Sitter's binary star argument.

On the other hand, Bryan G. Wallace disclosed that analysis of radar data of planet Venus showed a result that clearly agreed with emission theory than (Einstein's) postulate of constant speed of light.

In this section we see the mystery behind all these divergent empirical evidences.
We use the same postulate we have been applying so far:

The effect of absolute motion is to create an apparent change in position of a light source relative to an observer.

We repeat the analysis presented already in a previous section.
Assume an observer at absolute rest, with a light source moving with absolute velocity V towards him/her, as shown below.



$$(D' - D) / V = D' / c \quad \Rightarrow \quad D' = D . c / (c - V)$$

$$\Rightarrow dD'/dt = V' = Dd/dt . c / (c - V) = V . c / (c - V)$$

$$\tau = D' / (V'+c) = [D . c / (c - V)] \; / \; [V . c / (c - V)] = D/c$$

where τ is the time delay of a light pulse emitted by the source before it is detected by the observer.
To the observer the source appears to be at distance D'. The velocity of the light pulse is *c* relative to the apparent source, so its velocity relative to the observer will be:

$$V' + c = [V . c / (c - V)] + c = c^2 / (c-V)$$

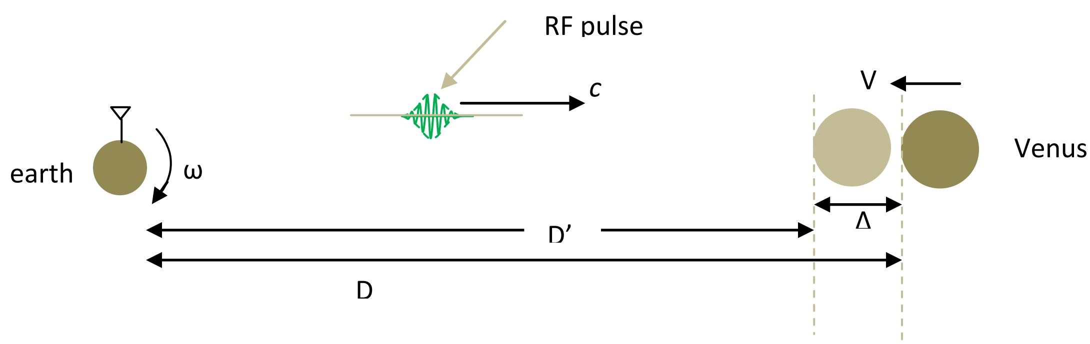
This is different from existing emission theories in which the velocity of light is c+V relative to an observer, for a light source moving towards the observer.

Thus the new theory is a fusion of the absolute space (ether) and emission theory (and Einstein's light postulate).

‘Anomalous’ radar data from Venus planet as observed by Bryan G. Wallace

Before moving on to the problem of absolute motion, let us discuss one of the known ‘anomalous’ observations that is related to relative motion, by applying the theories discussed so far.

One of the observations that seem to be in contradiction with Einstein's light postulate is the report from Bryan G.Wallace that analysis of radar data from planet Venus did not conform to the principle of constancy of the speed of light.



According to Special Relativity Theory (SRT), the center of the wave fronts of the transmitted RF pulse remains at the point in space where the source was at the instant of emission. According to this paper, the center of the wave fronts moves with the (apparent) source, for a constant source observer velocity.

We apply the theory already introduced in this paper that the group velocity of light depends on the velocity of the source and the velocity of the observer.

We analyze the problem in the reference frame of the earth, by considering Venus to be moving.

Suppose that at the instant of the bouncing of the RF pulse from Venus surface the distance between the Earth and Venus is D and the Earth – Venus relative velocity is V.

The round trip time can be determined if we know the velocity of the RF pulse in the earth's reference frame. The velocity of the transmitted RF pulse is obviously equal to c relative to the transmitter, assuming ballistic theory. The velocity of the reflected pulse will be $c + 2V$ relative to the earth again.

Therefore, the total round trip time is determined as:

$$t = t_1 + t_2 = D/c + D / (c+2V) = D (2c + 2V) / [c (c + 2V)]$$

$$\Rightarrow D = (t/2) . c . (c +2V)/ (c + V)$$

where t_1 is the forward flight time, t_2 is the backward flight time and t is the round trip time of the pulse.

The distance at the instant of reception of the pulse on earth will be:

$$D' = D - \Delta = D - t_2 . V$$

But

$$t_1 = D/c \qquad t_2 = D / (c + 2V) \qquad \text{and} \quad t_1 + t_2 = t$$

From which

$$t_2 = (t/2) . [c / (c + V)]$$

Therefore,

$$D' = D - t_2 . V = t . c/2$$

In the case of Einstein's light postulate this would be:

$$D' = tc / 2 - tv /2$$

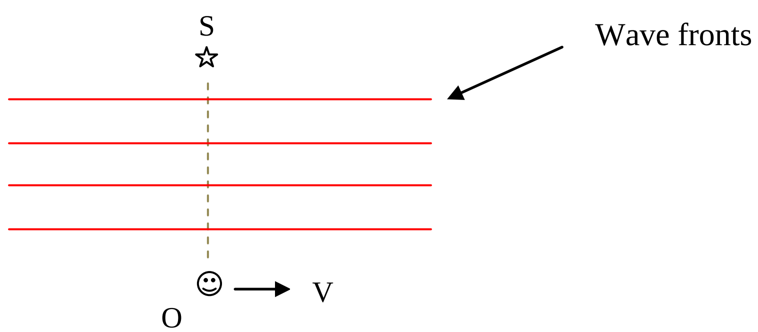
Transverse Doppler effect

We know that in Doppler effect of sound or water waves, there is no change in frequency or wavelength in the transverse (ninety degree) direction.
Let us consider a light source and an observer as shown below.

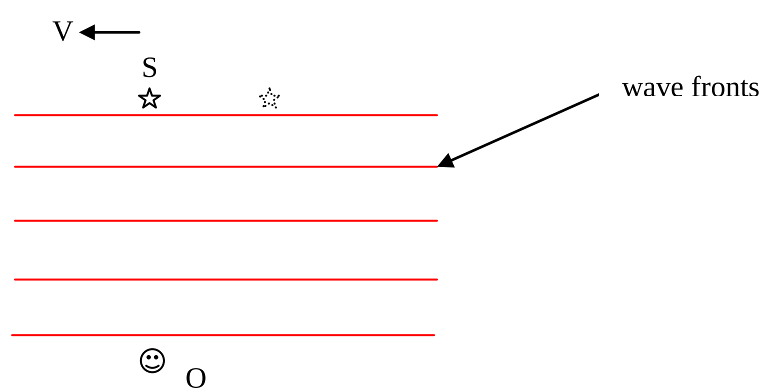
Light received at the moment of closest approach

<u>Source at absolute rest and observer in absolute motion</u>

From the figure below we see that transverse motion will have no effect on the phase velocity and hence on the wavelength and frequency of light detected by the observer.



<u>Source in absolute motion and observer at absolute rest</u>

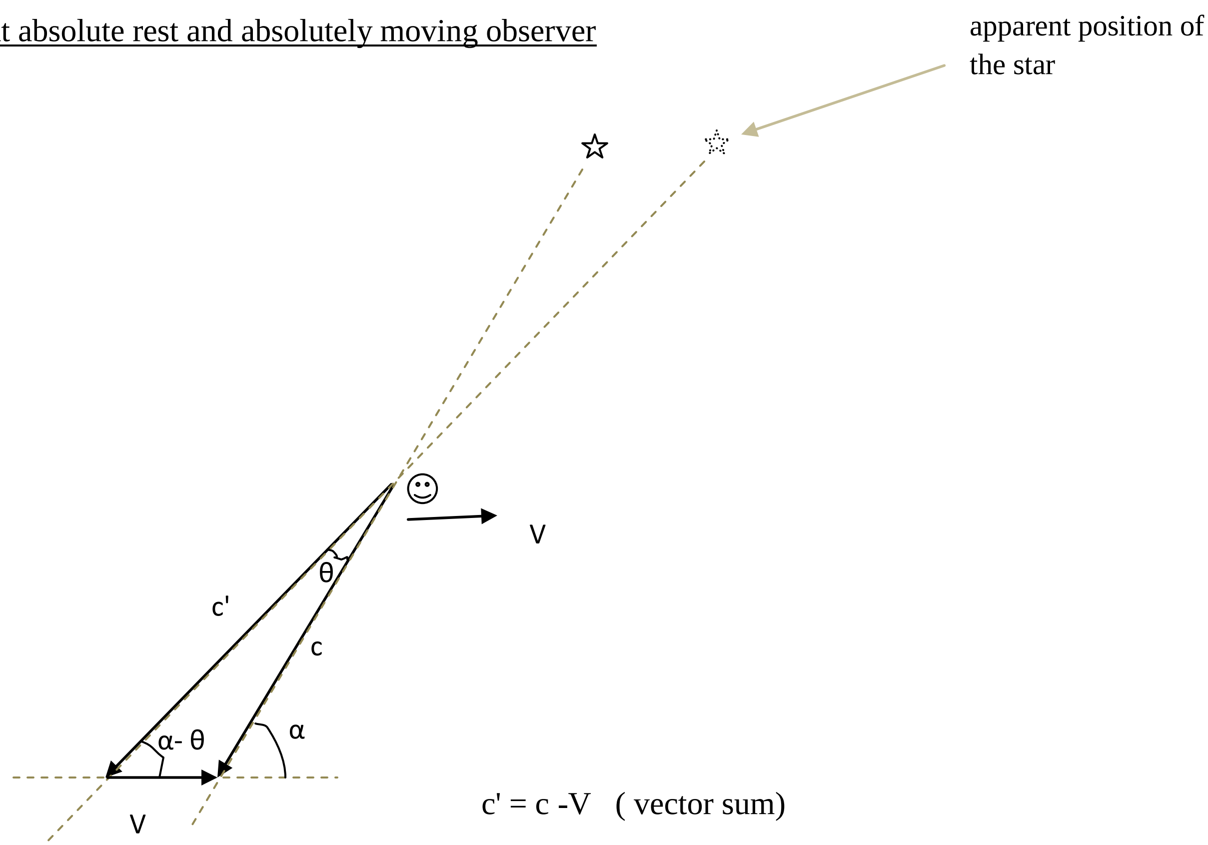


Assuming that the wave fronts are plane waves (for the sake of simplicity), we see that transverse motion of the source does not affect the phase velocity, and hence the wave length and frequency of light detected by the observer.

Therefore there is no transverse Doppler effect.

Stellar aberration

<u>Star at absolute rest and absolutely moving observer</u>



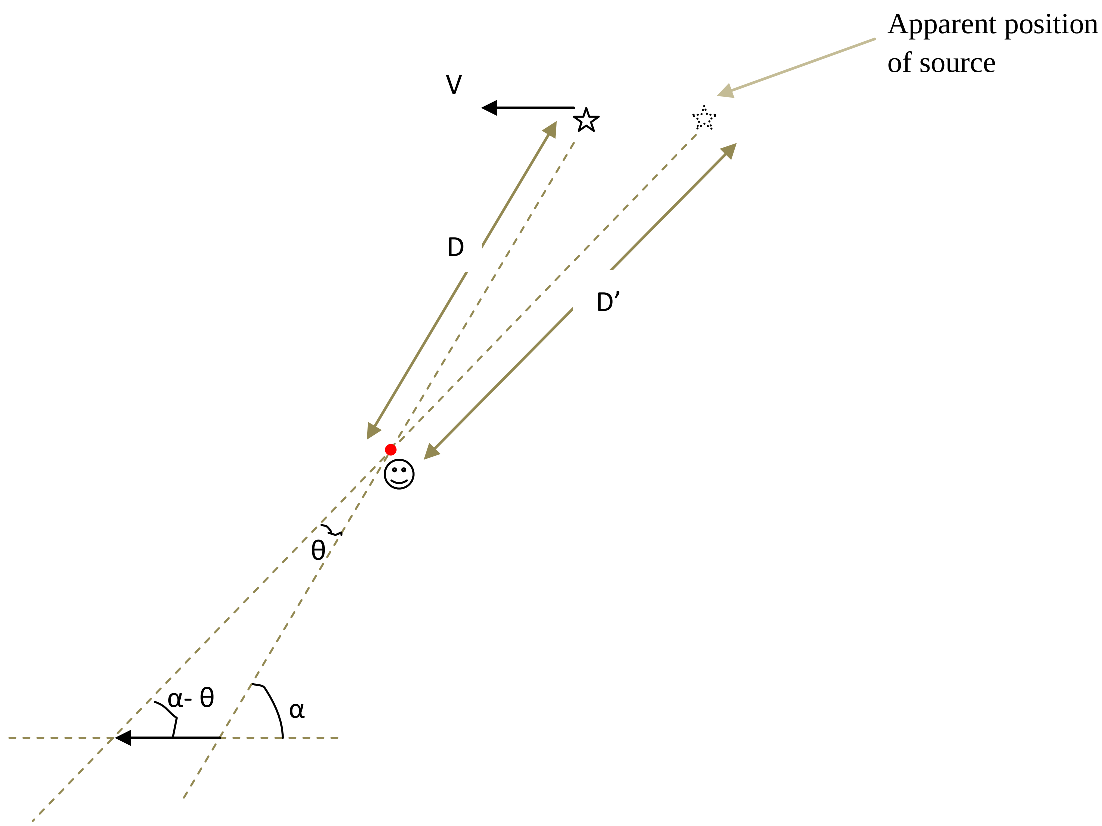
$c' = c - V$ (vector sum)

where c is the group velocity.

$$(\sin\theta)/V = \sin(180 - \alpha)/c' = \sin(\alpha - \theta)/c \quad \text{and} \quad \sin\theta \approx \theta \ \text{(for small angle } \theta\text{)}$$

$$(\sin\theta)/V \approx \theta/V \approx (\sin\alpha)/c \quad \Rightarrow \quad \boxed{\theta = (V/c) \,.\, \sin\theta}$$

Star in absolute motion and observer at absolute rest



$$D' / c = (D - D') / v \qquad \text{(vector equation)}$$

Given α , D and V it is possible to determine the angle θ .

Absolute space as defined by massive cosmic objects.

In free space, absolute translational motion does not exist. In absolute space (near massive cosmic objects) absolute motion exists.

Imagine that the earth is moving in free space, isolated from all effects of the sun, planets, the stars, the galaxies. If we did a modified Michelson-Morley experiment (capable of detecting absolute motion) on such an earth, then we would get null result. But if we moved the modified MM device relative to (on) the earth with velocity V, we would get a corresponding fringe shift. What if the modified MM experiment was done at far away from the earth ? We move the modified MM device (one with two coherent light sources in place of the forward and lateral mirrors) far away from the earth and any cosmic object, but at rest relative to earth. Obviously, there would be no fringe shift. Next we move the device so that its velocity relative to the earth is V. In this case, a much smaller fringe shift will occur and if the device is sufficiently far from the earth, no fringe shift will occur at all.

Therefore, the absolute velocity of the device will be equal to its velocity relative to the earth on the surface of (or near) the earth. As distance from earth increases, the absolute velocity continuously diminishes even if the relative velocity was kept constant. Imagine the modified MM device on a space ship launched from the earth, with constant velocity relative to the earth. As the space ship gets farther and farther away from the earth, the fringe shift diminishes continuously. Remember that so far we have been talking about a hypothetical earth which is in free space.

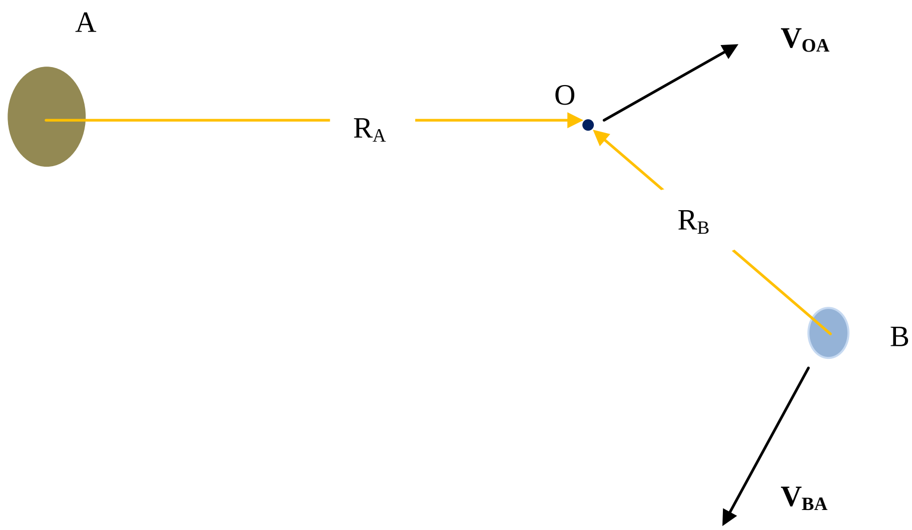
Next we do the thought experiment on the real earth, which is in the solar system. If we do the experiment with our modified MM device (stationary on earth), then a fringe shift will occur, corresponding to the absolute velocity of the earth, which is 378 Km/s as measured in Silvertooth's experiment. If the device is moved relative to the earth, on or in the vicinity of the earth, additional fringe shift will be observed, relative to the fringe shift due to the 378 Km/s absolute velocity.

The absolute velocity of a body is the vector sum of all of its weighed velocities relative to cosmic massive objects in the universe.

A and B are massive cosmic objects (see next figure), with relative velocity V_{BA} . O is an object (an MM device) whose absolute velocity is to be determined, with velocity V_{OA} relative to A.

We see that the object O is far away from A and B. So its absolute velocity should be attenuated in inverse proportion to the square of the distance from each object.

The velocity of O relative to A is V_{OA} (as indicated). The velocity of O relative to B (V_{OB})will be the vector difference of V_{OA} and V_{BA}.



$$\mathbf{V_{OB}} = \mathbf{V_{OA}} - \mathbf{V_{BA}}$$

$$\mathbf{Vabs} = (K / R_A^2)\, \mathbf{V_{OA}} + (K / R_B^2)\, \mathbf{V_{OB}}$$

where K is some constant. Gravitational constant ?

Therefore, the absolute velocity (378 Km/s) of the earth as detected in the Silvertooth experiment is theoretically the resultant sum of all 'inverse square distance weighed' velocities of the earth relative to all cosmic objects in the universe. Cosmic objects with bigger masses and near to the earth will have more influence.

This theory will solve the centuries old perplexing paradox:

Relative to what is the absolute velocity of a body determined?

The proposed answer:

Relative to all cosmic objects in the universe.

The absolute velocity of a body is determined in an analogous (similar?) way to the determination of gravitational force acting on a body.

The Hafele Keating experiment and GPS correction may be explained by this theory.

The speed of light is infinite in free space; Explanation of star light bending near the sun, Hafele Keating experiment and the GPS correction.

Consider the Earth Centered Reference Frame that is not rotating with the earth.

Two effects can account for the results:

1. The speed of light increases as we go away from the earth
2. Motion of a clock in the ECR frame results in its absolute motion, hence the effect of 'apparent change of position of light source due to absolute motion'

If you have an electronic clock in the geosynchronous orbit, therefore the above two effects will cause a difference in the rate of the clock, say, relative to a clock at rest on earth.

The first effect is one that is accounted to General Relativity, in main stream science.
The second is one that is accounted to Special relativity.

One of the least understood problems in physics has been that of a free space endowed with characteristics such as ε_o and μ_o . This paper proposes that these parameters tend towards zero in free space, which is a region far away from cosmic massive objects. One implication of this is that the speed of light is infinite in free space. There also follows a question: what is the implication of zero permittivity and zero permeability ?

Light speed measurement experiments

The speed of light has been measured with increasing accuracy by Ole Romer, Bradely, Fizeau, Foucault and Albert Michelson, from observation of astronomical phenomena and by terrestrial experiments. Modern experiments use microwave cavity resonator, microwave interferometer and laser methods. The currently accepted value is 2.99792458 x 10 8 m/s.

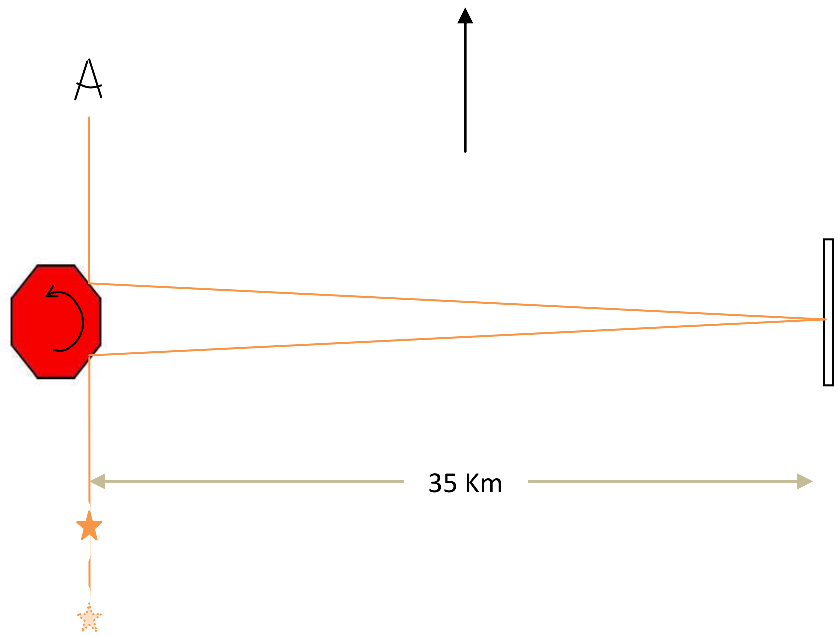
No variation in the speed of light has ever been detected with different orientations of the measuring apparatus relative to the orbital velocity of the earth.

Let us consider the Michelson rotating mirror experiment.

As discussed so far, the source apparently shifts relative to the observer due to absolute velocity of the earth in space (about 390 Km/s). We see that this apparent shift of the position of the source relative to the observer does not affect the result of the experiment. The time taken by the light beam to move from the rotating mirror to the distant mirror and back to the rotating mirror is not affected by the absolute velocity of the earth. What is affected by absolute velocity of the earth is the total time taken for the light beam to go from the source to the observer and the experiment can not detect this change. One may think of this as actually changing the distance between the source and the rotating mirror, which will not change the result of the experiment, obviously: the measured speed of light.

The same applies to microwave cavity resonator and interferometer methods. The change in path length of the wave from source to detector due to absolute motion does not affect the result of such experiments.

The *apparent* change of the position of the microwave source does not affect the frequency of a resonant cavity, just as *actually* changing the position of the source does not affect the experiment .The frequency and the wavelength of light emitted by a source is not affected by an apparent or actual change of the position of the source.



A different method was used by Rosa and Dorsey in 1907 .They measured vacuum permittivity ε_0 and vacuum permeability μ_0 from which the speed of light can be computed from the equation $c^2 = 1 / \varepsilon_0 \mu_0$. The result obtained was within 0.00005 % of the currently accepted value. This is an important experiment that shows that vacuum permittivity and vacuum permeability, and hence the vacuum speed of light relative to any observer, are not affected by absolute motion. This can be another experimental evidence confirming Einstein's light postulate.

Conclusion

The real nature of the speed of light has remained a mystery ever since the historical Michelson-Morley experiment. There are numerous and divergent empirical evidences that have accumulated during the last century which have defied any natural and complete explanation by the known theories of light speed. The new theory proposed in this paper can explain all or most of the experiments and phenomena related to the speed of light. A single (or two) piece of idea(s) has been proposed that can resolve many of the contradictions.

Thanks to God and His Mother, Our Lady Saint Virgin Mary.

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