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Does One-Way Speed of Light is Constant?

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ABSTRACT

In all measurement methods, the back and forth motion of light in one-way speed theoretically used in two different assumptions first, when the speed of light is not constant and the second when the speed of light is constant. We measured the speed of light only in one-way direction and according to these measurements, found that the speed of light, does not behave as constant velocity and therefore the special theory of relativity and consequently constancy of the speed of light is not to be true.

Keywords: Light speed, Michelson interferometer, one-way speed of light

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INTRODUCTION

Albert Einstein's Theory of Special Relativity proposed in 1905 and was later approved by scientist (David Halliday, 1992). According to this theory, the velocity cannot exceed the speed of light and, the speed of light is constant(Einstein, 1920, 1921). In fact, two main reasons have strengthened the theory of special relativity.

1- Table of light speed measurements, in different times and places, and by various methods, shows that the speed of light seems constant, and over time, the measurement accuracy has been dramatically increased, as shown below;

Table1. History of measurements of light speed $c(Km/s)$

Year	Name	Measured
1675	Romer and Huygens, moons of jupiter	220,000
1729	James Bradley, aberration of light	301,000
1849	Hippolyte Fizeau, toothed wheel	313,000
1862	Leo Foucalt, rotating mirror	298,000 ± 500
1907	Rosa and Dorsey, EM constants	299,710 ± 30
1926	Albert Michelson, rotating mirror	299,796 ± 4
1950	Essen & Gordon-Smith, cavity resonator	299,792.5 ± 3
1958	Froome, radio interferometry	299,792.50 ± 0.1
1972	Evenson, Laser interferometry	299,792.4562 ±0.0011
1983	17^{th} CGPM, definition of meter	299,792.458 (exact)

2-Michelson's interferometer (A.A. Michelson, 1881; Albert A Michelson & Morley, 1887), 24 years before Einstein's theory, showed that the speed of light should be constant.

This article shows that the speed of light is not constant, which means the theory of Special Relativity cannot be true. In all measurement methods, the back and forth motion of light is used and if we could measure the speed of light in only one direction, the constancy of the speed of light would probably not proposed. Einstein once said that no number of experiments could prove him right but a single experiment could prove him wrong. To date this single experiment has not been found. Can this article invalidate this hypothesis, without that single experiment? If so, we are faced with the biggest mistake in the history of science, and invalidation of this hypothesis leads to dramatic developments in theoretical physics and true understanding of the world.

MEASURING THE SPEED OF LIGHT

The first successful measurement of the speed of light, using an earthbound apparatus was carried out by Hippolyte Fizeau (1849). As shown below in Figure (1), a beam of light was directed at a mirror several thousand meters away. On the way from the source to the mirror, the beam passed through a rotating cog wheel. At a certain rate of rotation, the beam could pass through one gap on the way out and another on the way back. But at slightly higher or lower rates, the beam would strike a tooth and not pass through the wheel.

Knowing the distance to the mirror, the number of teeth on the wheel, and the rate of rotation, the speed of light could be calculated.

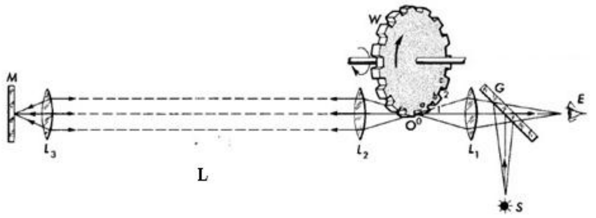

Figure1. Fizeau experiment 1849.

Fizeau reported the speed of light as 313,000 kilometers per second. In Fizeau's experiment, the distance between toothed wheel from the mirror $L = 8670\,m$, the number of teeth $P = 720$, the rate of rotation $n = 25$ cycle per second ,and the speed of light is obtained by the following calculation.

$$t = \frac{1}{n.p} = \frac{1}{25\times720} = \frac{1}{18000}\,s \qquad (1)$$

By dividing the total light beam displacement $2L$ with measured time, the real speed of light can be gained,

$$c = \frac{2L}{t} = \frac{17340}{\left(\frac{1}{18000}\right)} = 313{,}000\ \ km/s \qquad (2)$$

In the following pages, we see that it is much more complicated than this simple calculation is. If we carefully analyze the details of the light motion in back and forth directions separately, we will find that the distance traveled by the light beam, is not equal in both directions. If we review all the methods of measuring the speed of light, such as Fizeau's experiment, we are faced with a back and forth motion of light and if we could measure the speed of light in only one direction, then we could easily prove that the speed of light could not be constant. Following, we will refer to it, but first, I want to review the Michelson's interferometer and his wrong calculations, briefly.

MICHELSON INTERFEROMETER

As shown below in Figure (2) the Michelson interferometer (A.A. Michelson, 1881) is arranged as an optical bench on a concrete block that floats on a large pool of mercury. This allows the whole apparatus to be rotated smoothly.

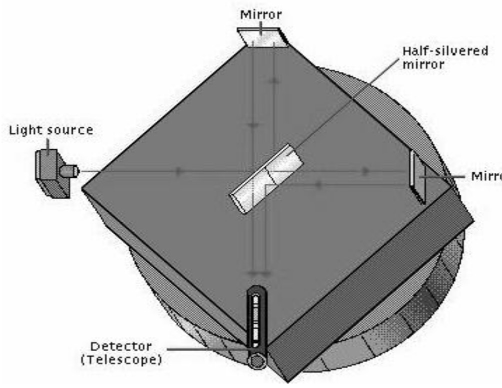

Figure2. Michelson interferometer

As shown below in Figure 3, the source S emits light that hits a half-silvered mirror (or "beam splitter") M. This partially reflective mirror is set at 45 degrees, so one beam is transmitted through to the mirror $M1$ in the Path 1, while the other is reflected in the direction of Path 2. By means of mirrors $M1$ and $M2$ at the ends of the arms, these beams are then reflected directly back to the half-silvered mirror M, where they are re-combined and directed to a telescope or screen for observation. The two beams meet at right angles and having the same frequency, where they are in phase, they add, and where they are out of phase, they cancel.

This produces an interference pattern visible by telescope or screen. If the earth were moving through Aether at the same velocity as it orbits the sun ($u = 30$ km/sec) then Michelson and Morley calculated that a rotation of the apparatus should cause a shift in the fringe pattern. The basis of this calculation is given below.

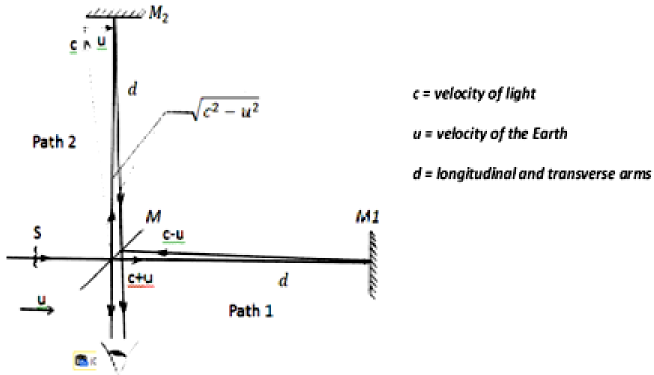

Figure 3. Michelson and Morley experiment

Path 1:

Michelson assumed that the light would have a velocity of $(c + u)$ and $(c - u)$ depending on the direction relative to the hypothetical "Aether wind", as figured above. So time taken t_1 for light to travel forward and backward along Path1 in the illustration is:

$$t_1 = \frac{d}{c+u} + \frac{d}{c-u} = \frac{2dc}{c^2-u^2} = \left(\frac{2d}{c}\right)\frac{1}{1-\frac{u^2}{c^2}} \qquad (3)$$

Path 2:

As illustrated above, the time taken t_2 for light to travel forward and backward along Path 2 in the illustration is

$$t_2 = 2 \times \left(\frac{d}{\sqrt{c^2-u^2}}\right) = \frac{2d}{c}\frac{1}{\sqrt{1-\frac{u^2}{c^2}}} \qquad (4)$$

It is now easy to calculate the time difference Δt between Path 1 and Path2

$$\Delta t = t_1 - t_2 = \frac{2d}{c}\left(\frac{1}{1-\frac{u^2}{c^2}} - \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}\right) \qquad (5)$$

Assuming $\frac{u}{c} << 1$ the time difference will be $\Delta t \approx \frac{du^2}{c^3}$. If the apparatus is rotated by 90 degrees, the new time difference $\Delta t'$ and new interference fringes should be observed. However, no fringe shift is observed.

CALCULATION ERROR IN MICHELSON'S EXPERIMENT

In this section we see that the calculated times, by Michelson as $t_1 = d[(c+u)^{-1} + (c-u)^{-1}]$ and $t_2 = 2d/\sqrt{c^2-u^2}$ are not correct, and the real times are $t_1 = t_2 = 2d/c$. To prove this, we analyze the motion of the light beam in back and forth directions separately in details, in two different modes as, 1) The speed of light is not constant, 2) The speed of light is constant.

ASSUM SPEED OF LIGHT IS NOT CONSTANT

Path 1: The light beam reciprocating motion along with the Earth motion in the x-axis.

1) Light beam travel outward to mirror $M1$

Here we assume the beam-splitter M is located at point A (the origin of Coordinate system), mirror $M1$ at point B $(AB = d)$ and u, velocity of the Earth in direction of x-axis. Also y-axis is perpendicular to the Earth motion as illustrated in Figure 4.

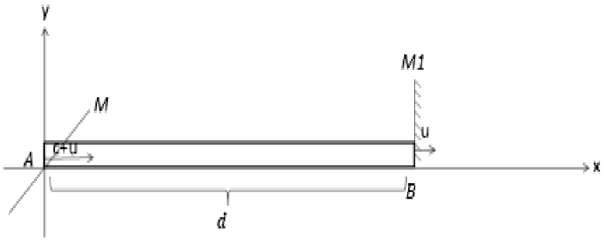

Figure 4. Light beam travel outward to mirror $M1$

At time $t_{x0} = 0$ the light beam travels outward to mirror $M1$ from the point A with velocity $(c+u)$. As illustrated below in Figure 5, at time t_{x1}, the light beam hits the mirror $M1$.

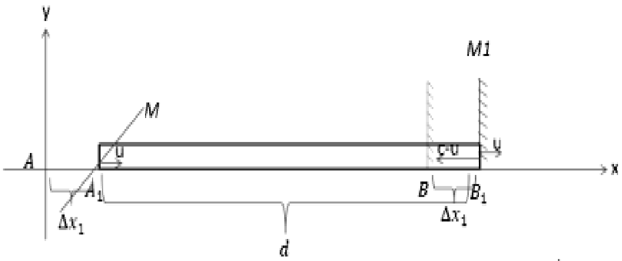

Figure 5. Light beam travel outward to mirror $M1$

At this time, the beam-splitter M and the mirror $M1$ along with the Earth, have traveled the distance Δx_1 to the points A_1 and B_1. Therefore, $\Delta x_1 = AA_1 = BB_1 = (u\, t_{x1})$ and the light beam displacement x_1 at time t_{x1} , from A to B_1, is,

$$x_1 = AB_1 = d + \Delta x_1 = (c+u)\, t_{x1} \tag{6}$$

Using $\Delta x_1 = ut_{x1}$ in equation (6), we have

$$t_{x1} = d/c \tag{7}$$

After using these values in equation (6) we have,

$$x_1 = d + u\frac{d}{c} = d(1+\frac{u}{c}) \tag{8}$$

2) Light beam travel backward from mirror $M1$

After reflection at point B_1 , the light beam returns backward to the beam-splitter M with velocity $(c-u)$. At this time t_{x2}, the beam-splitter M along with the Earth has traveled the distance Δx_2 to the point A_2. Therefore, $\Delta x_2 = A_1A_2 = B_1B_2 = (u\, t_{x2})$ and the light beam displacement x_2 at time t_{x2} is from the point B_1 to the point A_2 , as illustrated below in Figure (6).

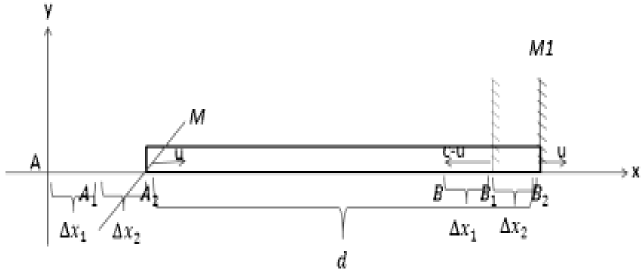

Figure 6. Light beam travel backward from mirror $M1$

with the same manner we have,

$$x_2 = A_2B_1 = d - \Delta x_2 = (c-u)t_{x2} \tag{9}$$

Using $\Delta x_2 = ut_{x2}$ in equation (9), we have

$$t_{x2} = d/c \tag{10}$$

Using these values in equation (9) we have,

$$x_2 = d - d\frac{u}{c} = d(1-\frac{u}{c}) \tag{11}$$

Table2. Comparing the light beam Reciprocating motion in the Path 1 (If the speed of light is not constant).

Outward to $M1$		Backward from $M1$	
$\Delta x_1 = d\left(\frac{u}{c}\right)$		$\Delta x_2 = d\left(\frac{u}{c}\right)$	
$t_{x1} = (d/c)$	eq(7)	$t_{x2} = (d/c)$	eq(10)
$x_1 = d\left(1+\frac{u}{c}\right)$	eq(8)	$x_2 = d\left(1-\frac{u}{c}\right)$	eq(11)
Total time travel		$t_x = t_{x1} + t_{x2} = (2d/c)$	
Total displacement		$x = x_1 + x_2 = 2d$	

Table (2) shows that $t_{x1} = t_{x2} = d/c$, $x_1 \neq x_2$, and the total light beam displacement is $x = 2d$.

Now, we find why the light speed has been measured correctly, by Fizeau's experiment and other methods, because the total light beam displacement $x = 2d$ is divided by measured time t_x and if we assume the light speed is constant, the total light beam displacement will not be $2d$, as mentioned in the next section.

Path2: The light beam reciprocating motion perpendicular to the Earth motion in the y-axis.

1) Light beam travel outward to mirror $M2$

Let us assume the beam-splitter M is located at point A (the origin of Coordinate system), the mirror $M2$ at point H and

$AH = d$, velocity of the Earth $= u$, as illustrated below in Figure (7). At time $t_{y0} = 0$ the light beam travels outward to mirror M_2 from the point A.

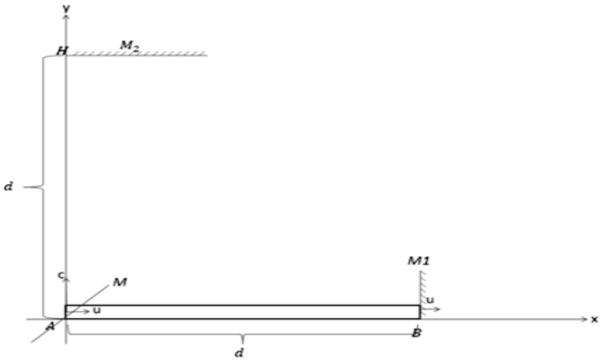

Figure 7. Light beam travel outward to mirror $M2$

As illustrated below in Figure (8), at time t_{y1} the light beam hits the mirror $M_2$with velocity $v = \sqrt{c^2 + u^2}$. At this time, the beam-splitter M and the mirror M_2along with the Earth, move a little HM_2

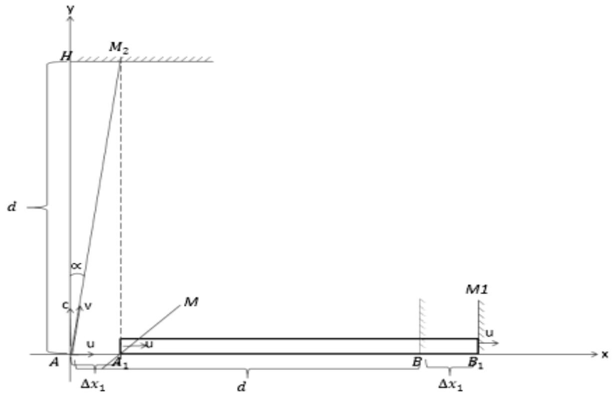

Figure 8. Light beam travel outward to mirror $M2$

The light beam displacement y_1 at time t_{y1} from A to M_2 is, $y_1 = AM_2 = \left(AH^2 + HM_2{}^2\right)^{1/2}$. Here $tan \propto = \frac{HM_2}{d} = \frac{u}{c}$ or $HM_2 = d(u/c)$ and $AH = d$, therefore,

$$y_1 = \sqrt{d^2 + (d\ \tfrac{u}{c})^2} \qquad (12)$$

and time travel t_{y1} can be derived as

$$t_{y1} = \frac{y_1}{v} = \frac{d\sqrt{1+\frac{u^2}{c^2}}}{\sqrt{c^2+u^2}} = \frac{d}{c} \qquad (13)$$

and

$$y_1 = d\sqrt{1 + \frac{u^2}{c^2}} \qquad (14)$$

2) Light beam travel backward from mirror $M2$

After reflection from M_2, the light beam returns backward to the beam-splitter M with velocity $v = \sqrt{c^2 + u^2}$. At this time t_{y2}, the beam-splitter M along with the Earth, has traveled the distance Δx_2 to the point A_2. Thus, the light beam displacement y_2 at time t_{y2} is from the point M_2 to the point A_2 as illustrated below in Figure (9).

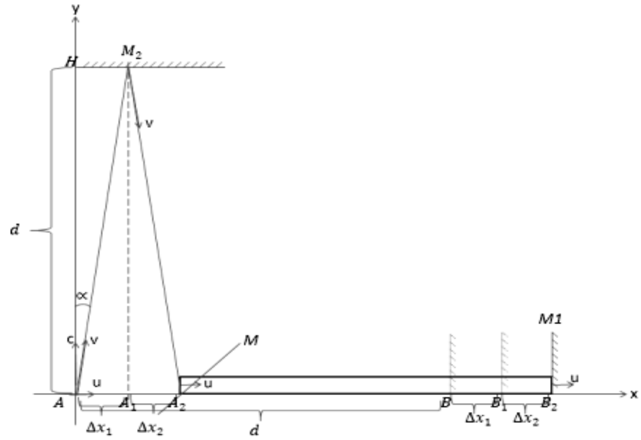

Figure 9. Light beam travel backward from mirror $M2$

Since $AM_2 = M_2A_2$ therefore,

$$y_2 = y_1 = d\sqrt{1 + \frac{u^2}{c^2}} \qquad (15)$$

and

$$t_{y2} = t_{y1} = \frac{d}{c} \qquad (16)$$

Table 3. Comparing the light beam Reciprocating motion in the Path 2, if the speed of light is not constant.

Outward to M2	Backward from M2
$t_{y1} = \frac{d}{c}$	$t_{y2} = \frac{d}{c}$
$y_1 = d\sqrt{1 + \frac{u^2}{c^2}}$	$y_2 = d\sqrt{1 + \frac{u^2}{c^2}}$
Total time travel	$t_y = t_{y1} + t_{y2} = \frac{2d}{c}$
Total displacement	$y = y_1 + y_2 = 2d\sqrt{1 + \frac{u^2}{c^2}}$

Table(3) shows that $t_{y1} = t_{y2} = (d/c)$ and , $y_2 = y_1$. The total time travel is $t_y = (2d/c)$ and the total light beam displacement is $2d(1 + \frac{u^2}{c^2})^{1/2}$.

Comparing table (2) and table (3) shows that $t_x = t_y$ as mentioned below.

Table 4. Assume the speed of light is not constant ($\Delta t = t_x - t_y = 0$)

Path 1	**Path 2**
$t_x = t_{x1} + t_{x2} = \frac{2d}{c}$	$t_y = t_{y1} + t_{y2} = \frac{2d}{c}$
$x = x_1 + x_2 = 2d$	$y = y_1 + y_2 = 2d\sqrt{1 + \frac{u^2}{c^2}}$

The table (4) shows that the total beam travel time in path 1 and 2, are equal, $t_x = t_y = 2d/c$ and therefore $\Delta t = 0$ and if the apparatus is rotated by 90^o, no interference fringe shift should be observed, as we see in Michelson interferometer.

ASSUM SPEED OF LIGHT IS CONSTANT

Path 1: the light beam reciprocating motion along with the Earth motion x-axis.

1) Light beam travel outward to mirror $M1$

Let us assume the beam-splitter M is located at point A (the origin of Coordinate system), the mirror $M1$ at point B $(AB = d)$ and u, velocity of the Earth in the x-axis. The y-axis is also perpendicular to the Earth motion as shown in Figure (10).

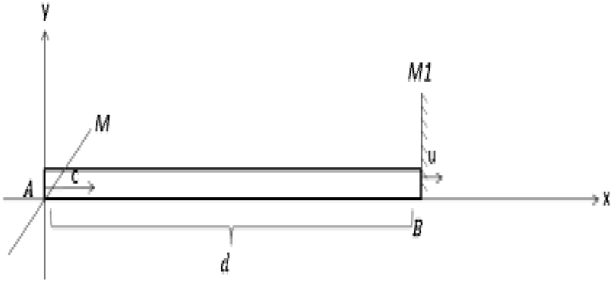

Figure 10. Light beam travel outward to mirror $M1$

At time $t_{x0} = 0$ the light beam travels outward to mirror $M1$ from the point A with velocity c. As illustrated below in Figure (11), at time t_{x1} the light beam hits the mirror $M1$.

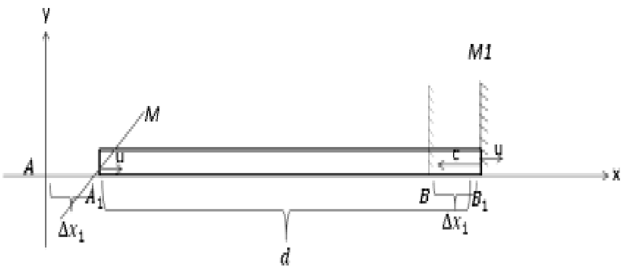

Figure 11. Light beam travel outward to mirror $M1$

At this time, the beam-splitter M and the mirror $M1$ along with the Earth, have traveled the distance Δx_1 to the points A_1 and B_1. Therefore, $\Delta x_1 = AA_1 = BB_1 = (ut_{x1})$ and the light beam displacement x_1 at time t_{x1}, from A to B_1, is

$$x_1 = AB_1 = d + \Delta x_1 = ct_{x1} \quad (17)$$

Using $\Delta x_1 = ut_{x1}$ in equation (17), we have

$$t_{x1} = \left(\frac{d}{c-u}\right) \quad (18)$$

and therefore

$$x_1 = d\left(\frac{c}{c-u}\right) \quad (19)$$

2) Light beam travel backward from mirror $M1$

After reflection at point B_1, the light beam returns backward to the beam-splitter M with velocity c. At this time t_{x2}, the beam-splitter M along with the Earth, has traveled the distance Δx_2 to the point A_2. Thus, the light beam displacement x_2 at time t_{x2} is from the point B_1 to the point A_2, as illustrated in Figure (12).

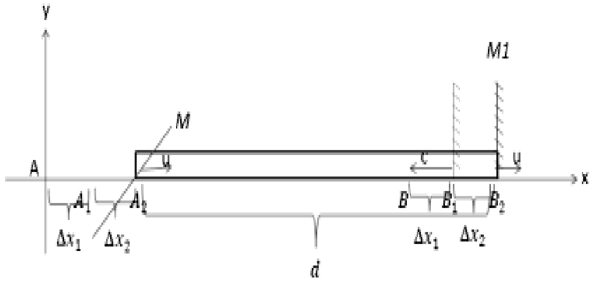

Figure 12. Light beam travel backward from mirror $M1$

$$x_2 = A_2B_1 = d - \Delta x_2 = ct_{x2} \quad (20)$$

Using $\Delta x_2 = u\, t_{x2}$ in equation (20), we have

$$t_{x2} = \frac{d}{c+u} \quad (21)$$

Using these values in equation (20) we have,

$$x_2 = d\left(\frac{c}{c+u}\right) \quad (22)$$

Table 5. Comparing the light beam Reciprocating motion in the Path 1, if the speed of light is constant.

Outward to $M1$		**Backward from $M1$**	
$\Delta x_1 = d\left(\frac{u}{c-u}\right)$		$\Delta x_2 = d\left(\frac{u}{c+u}\right)$	
$t_{x1} = \left(\frac{d}{c-u}\right)$	eq(18)	$t_{x2} = \left(\frac{d}{c+u}\right)$	eq(21)
$x_1 = d\left(\frac{c}{c-u}\right)$	eq(19)	$x_2 = d\left(\frac{c}{c+u}\right)$	eq(22)
total time travel		$t_x = t_{x1} + t_{x2} = 2d\frac{c}{c^2-u^2}$	
total displacement		$x = x_1 + x_2 = 2d\frac{c^2}{c^2-u^2}$	

Table (5) shows that $t_{x1} \neq t_{x2}$, $x_1 \neq x_2$, $\Delta x_1 \neq \Delta x_2$, the total beam travel time is $t_x = 2dc/(c^2 - u^2)$ and the total light beam displacement is $x = 2dc^2/(c^2 - u^2)$

Path 2: the light beam reciprocating motion perpendicular to the earth motion y-axis**.**

1) Light beam travel outward to mirror $M2$

The beam-splitter M is located at point A (the origin of Coordinate system), the mirror $M2$ at point H and $(AH = d)$, and u, velocity of the Earth, x-axis is in direction of Earth motion and y-axis perpendicular to the Earth motion as illustrated in Figure (13).

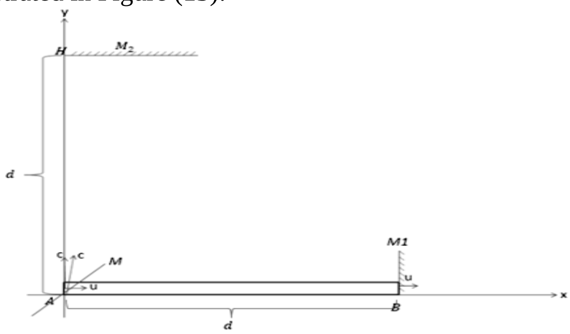

Figure 13. Light beam travel outward to mirror $M2$.

At time $t_{y0} = 0$ the light beam travels outward to mirror $M2$ from point A. As shown in Figure (14), at time t_{y1} the light beam hits the mirror $M2$ with velocity c.

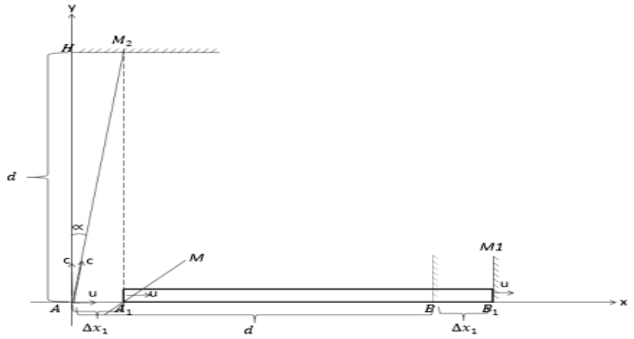

Figure 14. Light beam travel outward to mirror $M2$.

At this time, the beam-splitter M and the mirror $M2$ along with the Earth, move a little HM_2 and the light beam displacement y_1 at time t_{y1} is from the point A to the point $M2$. Here $tan \propto = \frac{HM_2}{d} = \frac{u}{c}$, or $HM_2 = d\frac{u}{c}$ therefore the final displacement is

$$y_1 = d\sqrt{1+\frac{u^2}{c^2}} \tag{23}$$

and time travel t_{y1} is

$$t_{y1} = \frac{y_1}{c} = \frac{d}{c}\sqrt{1+\frac{u^2}{c^2}} \tag{24}$$

2) Light beam travel backward from mirror $M2$

After reflection at point $M2$, the light beam returns backward to the beam-splitter M with velocity c. At this time t_{y2}, the beam-splitter M has traveled the distance Δx_2 to point A_2. Thus, the light beam displacement y_2 at time t_{y2} is from the point M_2 to the point A_2, as illustrated below in Figure (15).

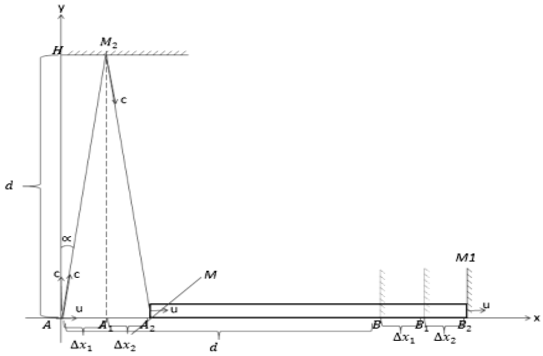

Figure 15. Light beam travel backward from mirror $M2$

Since, $AM_2 = M_2A_2$ therefore we have

$$y_2 = y_1 = d\sqrt{1+\frac{u^2}{c^2}} \tag{25}$$

and

$$t_{y2} = t_{y1} = \frac{d}{c}\sqrt{1+\frac{u^2}{c^2}} \tag{26}$$

Table (6) Comparing the light beam Reciprocating motion in the Path 2, if the speed of light is constant.

Outward to M2	**Backward from M2**
$t_{y1} = \frac{d}{c}\sqrt{1+\frac{u^2}{c^2}}$	$t_{y2} = \frac{d}{c}\sqrt{1+\frac{u^2}{c^2}}$
$y_1 = d\sqrt{1+\frac{u^2}{c^2}}$	$y_2 = d\sqrt{1+\frac{u^2}{c^2}}$
Total time travel	$t_y = t_{y1} + t_{y2} = \frac{2d}{c}\sqrt{1+\frac{u^2}{c^2}}$
Total displacement	$y = y_1 + y_2 = 2d\sqrt{1+\frac{u^2}{c^2}}$

Table 6 shows that $t_{y1} = t_{y2}$, $y_2 = y_1$, the total beam travel time is $t_y = (2d/c)(1+u^2/c^2)^{1/2}$ and the total light beam displacement is $y = 2d(1+u^2/c^2)^{1/2}$.

Comparing table (5) and table (6) shows that $t_x \neq t_y$ as mentioned below in table7.

Table7. Comparing table 5 and table 6 when assumed the speed of light is constant and ($\Delta t = t_x - t_y \neq 0$)

Path 1	**Path 2**
$t_x = t_{x1} + t_{x2} = 2d\frac{c}{c^2-u^2}$	$t_y = t_{y1} + t_{y2} = \frac{2d}{c}\sqrt{1+\frac{u^2}{c^2}}$
$x = x_1 + x_2 = 2d\frac{c^2}{c^2-u^2}$	$y = y_1 + y_2 = 2d\sqrt{1+\frac{u^2}{c^2}}$

Table 7 shows that the total beam travel time in path 1 and path 2 are not equal, ($t_x \neq t_y$) or $\Delta t \neq 0$ and if the apparatus is rotated by 90 degrees, interference fringe shift should be observed, as below

$$\Delta t = t_x - t_y = \left(2d\frac{c}{c^2-u^2}\right) - \left(\frac{2d}{c}\sqrt{1+\frac{u^2}{c^2}}\right) \quad (27)$$

If the apparatus is rotated by 90 degrees the new time difference is

$$\Delta t' = t_y - t_x = \left(\frac{2d}{c}\sqrt{1+\frac{u^2}{c^2}}\right) - \left(2d\frac{c}{c^2-u^2}\right) \quad (28)$$

and variation in number of fringes $\Delta N_{(nf)}$ is

$$\Delta N_{(nf)} = \frac{\Delta t - \Delta t'}{\left(\frac{\lambda}{c}\right)} = \frac{2c.\Delta t}{\lambda} \quad (29)$$

If the wavelength of the light is $\lambda = 5.9 \times 10^{-7} m$, the total path length is $d = 11m$ and $\frac{u}{c} \approx 10^{-4}$ then number of fringes $\Delta N_{(nf)}$ is

$$\Delta N_{(nf)} = \frac{2c.\Delta t}{\lambda} \approx 0.37 \quad (30)$$

So the fringes will shift by 0.37 fringes when the apparatus is rotated. However, no fringe shift is observed. The table (8) shows a comparison of the above two assumptions.

Table8. Comparisons of table4 with table7.(When the speed of light is not constant with when the speed of light is constant)

Assumed c is not constant (Table 4)		Assumed c is constant (Table7)	
Path 1	**Path 2**	**Path 1**	**Path 2**
$t_x = t_{x1} + t_{x2} = \frac{2d}{c}$	$t_y = t_{y1} + t_{y2} = \frac{2d}{c}$	$t_x = t_{x1} + t_{x2} = 2d\frac{c}{c^2-u^2}$	$t_y = t_{y1} + t_{y2} = \frac{2d}{c}\sqrt{1+\frac{u^2}{c^2}}$
$x = x_1 + x_2 = 2d$	$y = y_1 + y_2 = 2d\sqrt{1+\frac{u^2}{c^2}}$	$x = x_1 + x_2 = 2d\frac{c^2}{c^2-u^2}$	$y = y_1 + y_2 = 2d\sqrt{1+\frac{u^2}{c^2}}$
$t_x = t_y$,	$\Delta t = t_x - t_y = 0$	$t_x \neq t_y$,	$\Delta t = t_x - t_y \neq 0$

Contrary to popular belief, by comparing the results, we find that the speed of light cannot be constant. The table 4 shows that the speed of light is not constant because, 1-The time difference $\Delta t = 0$ and matches with the results of Michelson interferometer and 2-The total light beam displacement x does not depend on the velocity of the Earth u, because $x = x_1 + x_2 = 2d$, and by dividing $2d$ with measured time t_x, the real speed of light can be gained, as done by Fizeau's toothed wheel and other methods of measuring the speed of light with high accuracy, as shown in Table 1. On the other hand, the table 7 shows that if the speed of light is constant, then, 1-The time difference $\Delta t \neq 0$. Thus, by rotation of Michelson interferometer, interference fringe shift should be observed. But, there is no any interference movement. 2-The total light beam displacement x, depends on the velocity of the Earth (u), because, $x = x_1 + x_2 = 2d\left(\frac{c^2}{c^2-u^2}\right)$, so the speed of light should be calculated by dividing $2d\left(\frac{c^2}{c^2-u^2}\right)$ with measured time t_x. In this case, we could not measure the speed of light with great precision, as shown above in Table 1.

CONCLUSION

1) The speed of light is not constant and this is the reason of high precision measurements of the speed of light. 2) In all measurement methods, the back and forth motion of light is used and if we could measure the speed of light in only one direction, constancy of the speed of light would probably not proposed.

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