A Modified Michelson-Morley Experiment

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Abstract

The small fringe shifts observed in the Michelson-Morley (MM) experiments are dismissed by mainstream physicists as experimental artifacts. However, this interpretation is increasingly being challenged. Based on a new insight, simple and modified MM experiments are proposed that should give much larger fringe shifts, typically more than sixty fringe shifts. The mystery to increase the sensitivity of the conventional MM experiment is to slightly adjust the angular positions of the beam splitter and/or the mirrors so that the angle between the longitudinal light beam and the transverse light beam at the source is as large as possible, say 10^{-3} radians. This angle is typically about 5×10^{-6} radians in conventional MM experiments, making the experiments insensitive to absolute motion. Conventional theories such as ether theory and special relativity consider a single beam up to the beam splitter. The new theory, called Apparent Source Theory, has the potential to consistently explain many of the previously enigmatic and controversial light speed experiments. However, getting a non-mainstream theory accepted is a major challenge in physics today. The only way to possibly convince the scientific community is to test and confirm a unique prediction of the theory.

Introduction

The 'null' result of the Michelson-Morley (MM) experiment is the basis of the theory of relativity. Despite the popular view, however, this interpretation is increasingly being challenged. A number of other experiments have shown that the notion of absolute motion may still be valid. I claim to have gained a new insight that may have eluded physicists so far. The new theory, called Apparent Source Theory[1][2][3], has the potential to consistently explain many of the previously enigmatic and controversial light speed experiments. However, getting a non-mainstream theory accepted is a major challenge in physics today. The only way to possibly convince the scientific community is to test and confirm a unique prediction of the theory. I propose new experiments that may be many orders more sensitive than conventional MM experiments. One is a simple experiment requiring only a laser pointer, a mirror and a detecting screen. The other is a conventional MM experiment with the beam splitter (angle) slightly tilted down to less than 45 degrees.

New modified Michelson-Morley experiment

Consider the experimental setup shown in Fig.1 .With zero absolute velocity, the source position is at S. Two light rays originate from S, a direct (blue) ray and reflected (red) ray, and meet at O to create an interference pattern. The line connecting points S and O is a vertical line.

Since angle of incidence is equal to angle of reflection:

$$\frac{d}{\sqrt{(L-h)^2+d^2}} = \frac{d}{\sqrt{h^2+d^2}}$$

Given *L* and *d*, *h* can be determined from the above equation.

The path length of the (reflected) red light ray is:

$$\sqrt{(L-h)^2+d^2} \; + \; \sqrt{h^2+d^2}$$

The path length of the (direct) blue ray is L .

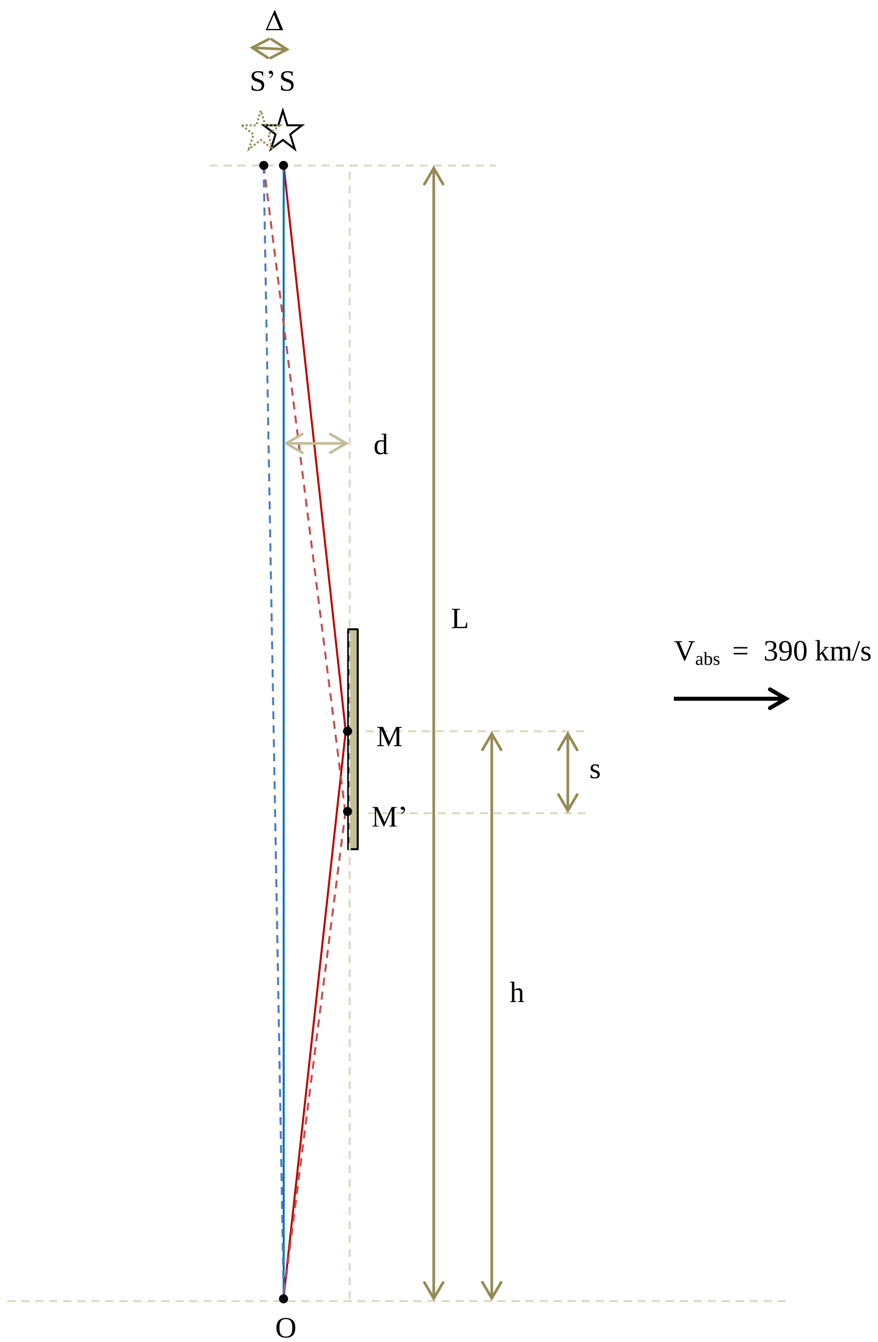

Fig. 1

The difference between the path lengths of the direct ray (blue) and the reflected ray (red) will be:

$$\delta_1 = \sqrt{(L-h)^2 + d^2} + \sqrt{h^2 + d^2} - L$$

When the apparatus is in absolute motion with absolute velocity V_{abs} = 390 km/s , the apparent position of the light source (as seen from point O) will be S'. Virtual light rays will originate from S' and meet at O, one directly from S' (blue broken ray) and the other reflected from the mirror at point M' (red broken ray).

Since angle of incidence is equal to angle of reflection:

$$\frac{d + \Delta}{\sqrt{(L-h+s)^2 + (d+\Delta)^2}} = \frac{d}{\sqrt{d^2 + (h-s)^2}}$$

Given *L*, *d*, *Δ* and *h*, *s* can be determined from the above equation.

The path length of the red broken ray will be:

$$\sqrt{(L-h+s)^2 + (d+\Delta)^2} + \sqrt{(h-s)^2 + d^2}$$

The path length of the (broken) blue ray will be:

$$\sqrt{L^2 + \Delta^2}$$

The difference between the path lengths of the reflected ray (red) and direct ray (blue) and will be:

$$\delta_2 = \sqrt{(L-h+s)^2 + (d+\Delta)^2} + \sqrt{(h-s)^2 + d^2} - \sqrt{L^2 + \Delta^2}$$

The fringe shift is obtained from :

$$\text{fringe shift} = \frac{\delta_2 - \delta_1}{\lambda}$$

where λ is the wave length of the light used.

Let λ = 600 nm, *L* = 2 m and *d* = 0.02 m. Using Excel I obtained, *h* = 1 m and δ_1 = 0.00039996 m .

Let *Δ* = 0.002 m. This is the apparent change in position of the source due to absolute motion (390 km/s).

From *L*, *d*, *h* and Δ, I obtained *s* = 0.04765 m and δ_2 = 0.00043995 m

The fringe shift will be:

$$\text{fringe shift} = \frac{\delta_2 - \delta_1}{\lambda} = \frac{0.00043995 \text{ m} - 0.00039996 \text{ m}}{600\, nm} = \frac{39991.4\, nm}{600\, nm} = 66.65\, fringes$$

This is many orders greater than the fringe shifts observed in the Miller experiments.

Reducing *d* by a factor of ten reduces the fringe shift by the same factor. Therefore, for *d* = 0.002 m , the fringe shift would be 6.665 fringes. This is the mystery behind the 'null' results of MM experiments.

Modified Michelson-Morley experiment

Now let us see how we can directly modify the conventional Michelson-Morley experiment to make it more sensitive.

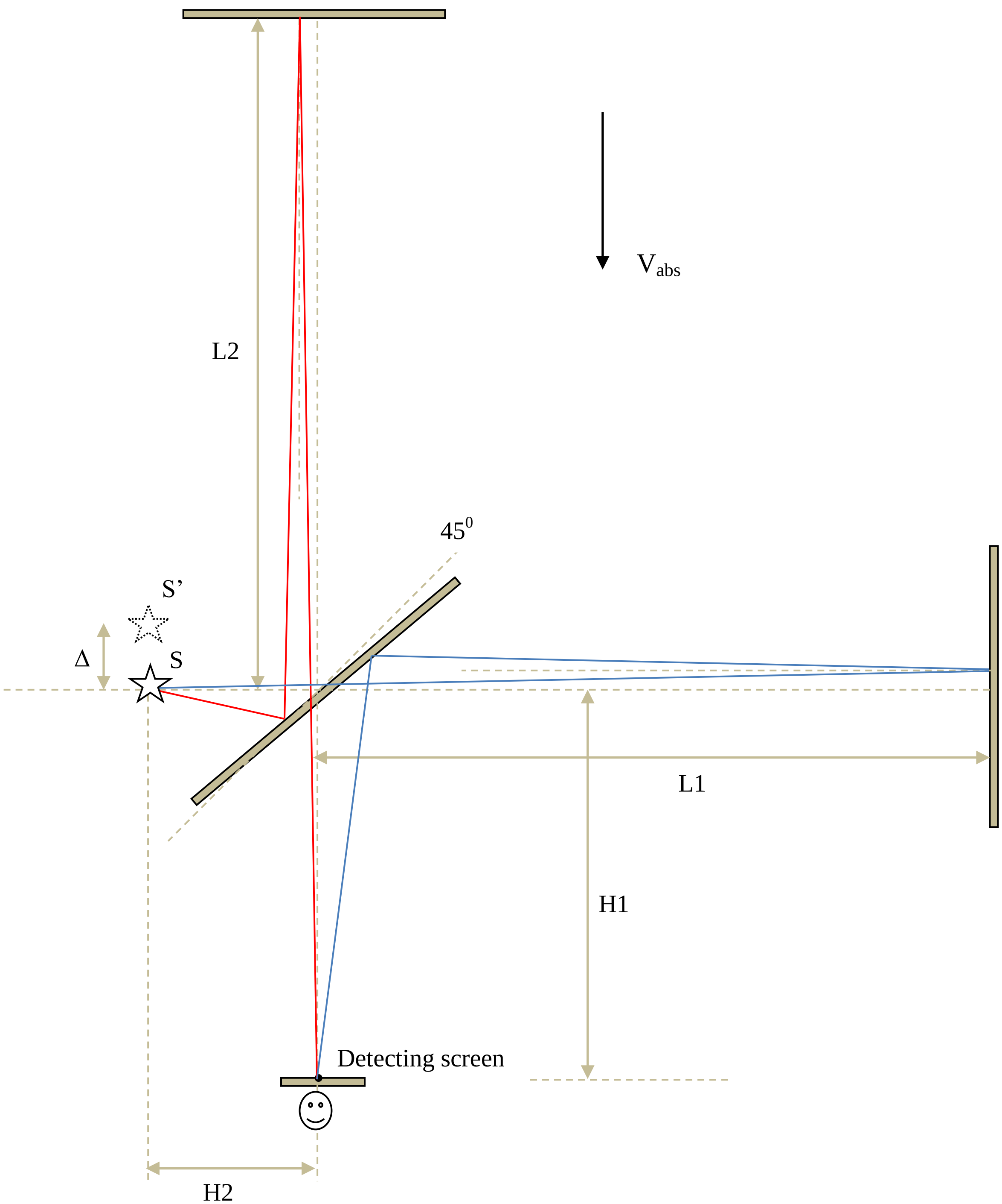

Fig. 2

Unlike the conventional MM experiment, the beam splitter is slightly tilted down to an angle less than 45 degrees. *The mystery is to rearrange the (angular) positions of the beam splitter and/or the mirrors so that the angle between the longitudinal light beam (red) and the transverse light beam (blue) at the source is as large as possible, say* 10^{-3} *or* 10^{-2} *radians*. To simplify the analysis, we can modify the angle of the beam splitter only, as long as we get a large enough angle between the two beams at the source.

From my paper [3] (page 10), the angle between the two beams at the source typically is, for the conventional MM experiments :

$$\beta - \theta = 0.00012638 \text{ radians} - 0.0001211 \text{ radians} = 5.28 \times 10^{-6} \text{ radians}$$

which is very small, making the interferometer insensitive to absolute motion.

Conventional analyses based on ether theory and special relativity have no idea about this angle. Both (wrongly) consider a single light beam up to the beam splitter and assume that the two light beams are created at the beam splitter. According to Apparent Source Theory, on the contrary, the longitudinal and transverse light beams each originate at the (apparent) source, not at the beam splitter, hence angle between the longitudinal and transverse light beams at the source.

The quantitative analysis of the modified MM experiment is involved and I will not undertake it in this paper. But it is a straightforward geometrical optics problem, as shown in my paper[3]. Note again that the analysis in [3] is that of (unmodified) conventional MM experiments.

Conclusion

The scientific community has ignored previous experiments that detected absolute motion, such as the Miller, the Silvertooth and the Marinov experiments. One of the reasons (although unjustifiable) is the fact that there has been no clear and consistent model to explain the effects observed in these experiments. Lack of a clear and consistent theory led to 'wrong' design and interpretation of experiments. I claim to have gained an insight that may have eluded physicists for centuries. My new theory has not only succeeded in explaining previously enigmatic and controversial experiments, but also provides a new insight to understand the 'flaws' in previous experiments and to design new experiments. The experiments proposed in this paper serve to test the new theory and prove the existence of absolute motion. A positive fringe shift in these experiments would possibly compel the scientific community to reconsider the foundations of relativity theory, to reconsider previously ignored experiments, to consider alternative theories and would lead to a complete understanding of the centuries old problem of motion and the speed of light.

Thanks to Almighty God Jesus Christ and His Mother Our Lady Saint Virgin Mary

References

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