A Critical Re-evaluation of the Michelson-Morley experiment. About the connection between light and dark matter.

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ABSTRACT:

This paper analyzes a fundamental geometric oversight in the classical interpretation of the Michelson -Morley experiment. We demonstrate that in a frame moving with velocity u , the reflection of light from a mirror follows a specific angular deviation. By introducing the formula $\sin\beta = \frac{u}{c}\sqrt{1-\frac{u^2}{c^2}}$, we prove the optical paths are asymmetrical. This geometric shift provides a new basis for understanding the "null result" of the Michelson-Morley experiment without necessitating postulate of absolute constancy of light in all frames. In other words, the Michelson-Morley experiment is a failed experiment and the physical-mathematical conclusions drawn from its "results" have no scientific basis.

The question of the nature of light is directly related to the Michelson-Morley experiment. Since the aforementioned experiment can be considered a failure, the idea of the ether becomes relevant. For this reason, a new idea is proposed to solve the problem of light propagation. Light is attributed only a wave nature in the form of spherical waves, and the propagation medium is dark matter. The idea is substantiated by appropriate calculations. . The mass of a dark matter particle has also been determined, which is found to be equal to $M_{dm} \approx 4.10^{-34}$ kg.

Keywords: Light, Michelson-Morley, experiment, theory, law, ether, wave, dark matter.

1. INTRODUCTION

The Michelson-Morley experiment is a fundamental pillar of modern physics. However, my research reveals a significant geometric gap in its classical interpretation, taking

into account the complex motion of the Earth in the galactic sphere and the dynamic interaction between photons and moving mirrors.

This work shows that the "zero result" of the experiment may not necessarily imply an absolute constancy of the speed of light, but may be result of certain geometric shifts that have been previously ignored.

2. **MATHEMATICAL BASIS**

The Michelson-Morley experiment is well known to many (for example, very famous [3]). And the main purpose of teaching the experiment is Einstein's theory of relativity, since Einstein considers the "result" of this experiment to be a law. And as a definition of the postulate, time is relative. And during this experiment, one of the basic laws of optics, the law of reflection and reflection, is intentionally or mistakenly ignored by the performers. And ignoring this law, they draw wrong conclusions. Now let's prove the bankruptcy of the Michelson-Morley experiment with diagrams, let's point out the main mistake that has become fatal for physics. And no one denies that the theory of relativity is based on the Michelson-Morley experiment. We will not describe the experiment in full, but we will single out the moment of error. During the experiment, one of the light rays from point *O* is directed perpendicularly to the moving mirror *M*. However, moving at a speed u, the ether wind bends this ray, so it will fall on the mirror at an angle α to the vertical. After falling on the mirror, the light is reflected from the mirror at an angle α (according to one of the basic laws of optics). According to the idea of the experiment, it should fall on a translucent sheet *P* at point *A.* And it is here that Michelson and Morley, intentionally or unconsciously, make an unforgivable mistake. They believe that the light ray reflected from the mirror should continue its course at an angle α. However, it is obvious that just as the vertical light beam coming from point O is bent under the influence of the ether, so the ray $M'A$ must be bent at an angle β to $M'A$. And which falls on the translucent plate P at point *B.* That is, a double standard was used in the mentioned experiment, which is unforgivable in science.

Now, with the help of appropriate calculations, let us determine the magnitude of the angle β(note that there is an error in [2]).

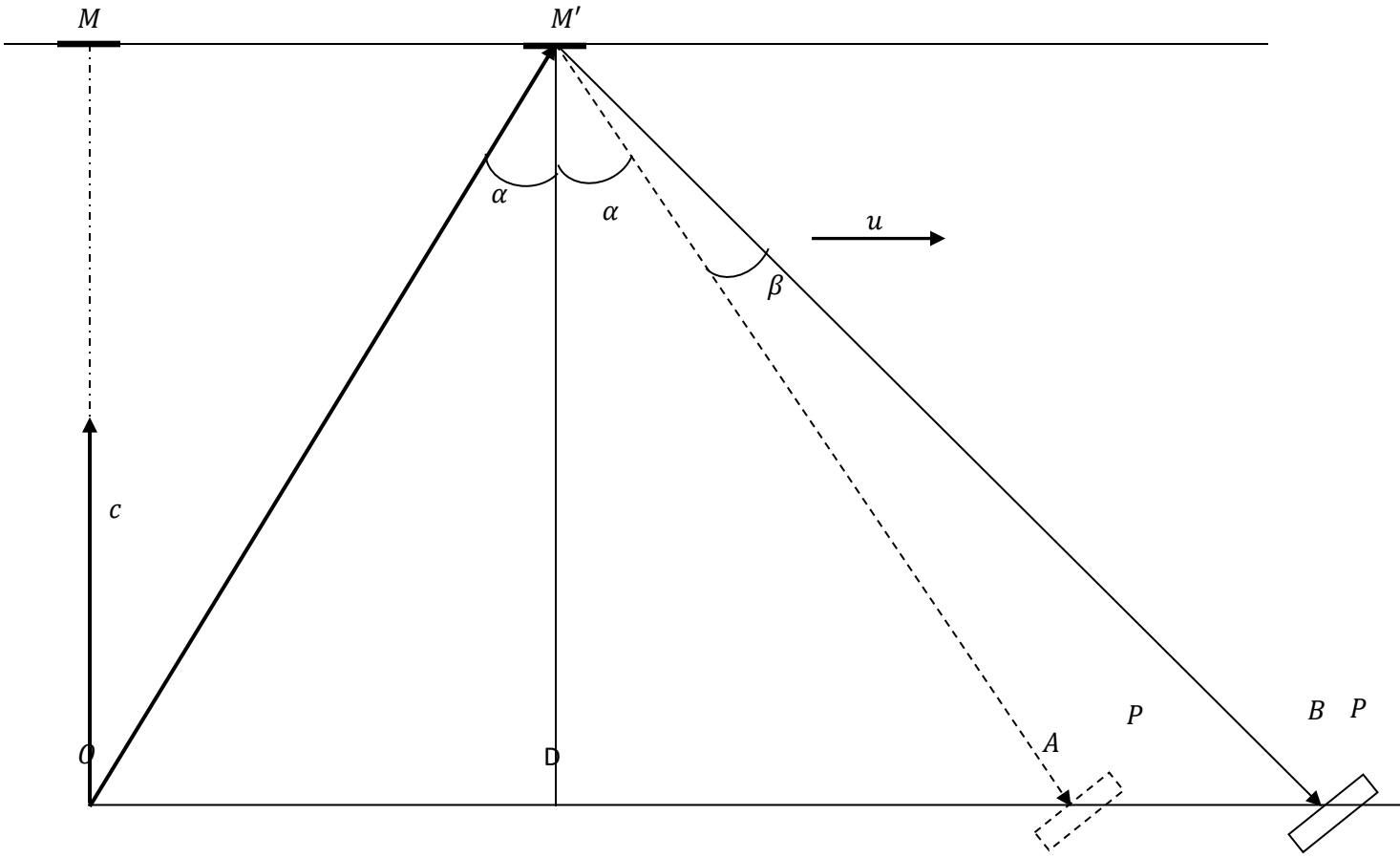

Fig.1 The actual scheme of the experiment.

Suppose a ray of light moving with speed c travels the path OM' in time t_3, i.e. $OM' = ct_3$. In that same time interval the system will move by $OD = ut_3$.

In that case from the triangle

$\sin \propto = \frac{OD}{OM'} = \frac{u}{c}$. **(1).**

Suppose that in some time interval t_4 the ray of light travels the path

$M'B = ct_4$

It is obvious that the system will move by

$AB = ut_4$

during that time.

In that case using the law of sines from $\Delta M'AB$ we get

$\frac{AB}{\sin\beta} = \frac{M'B}{\sin(90^\circ+\alpha)}$.

From here we obtain the magnitude of the angle β of deflection of the ray M' A, emerging from the point M'

Or, taking into account (1) we get

$$\sin\beta = \frac{u}{c}\cos\alpha$$

$$\sin\beta = \frac{u}{c}\sqrt{1-\frac{u^2}{c^2}} \qquad \textbf{(2).}$$

If we take into account that $u \ll c$, then we can assume that β≈α. Therefore, the light beam leaving the point M' will not make an angle α with the vertical, as Michelson and Morley assumed, but about twice as much, ≈2α.

Equation (2) shows that even for small velocities u (relative to c), the angle β deviates from the classical expectation. In the context of the Michelson-Morley experiment, this deviation implies that the light rays do not perfectly repeat their paths, which leads to "geometric compensation", which explains the zero result. . Since O M'≠ M' B, $OM' \neq M'B$ further interpretations of the Michelson-Morley experiment (time slowing down, path shortening, etc.) become meaningless.

2. ON THE NATURE OF LIGHT

It may sound trite, but the question of the nature of light has been around since the birth of mankind. The currently circulating dual interpretation of the nature of light is often criticized precisely because it does not provide a definitive answer, but rather is a logical "reconciliation" or philosophical trick to overcome the contradiction between experimental data. Our classical language and concepts are limited to two categories

1. A particle that is localized (has a specific coordinate)
2. A wave that propagates (has no specific coordinate, but has a frequency).

Physics has encountered a situation where light does not fit into either of these two definitions, but exhibits the properties of both. Since the Michelson-Morley experiment

was a failed experiment, it is obvious that the rejection of the idea of the ether is a failure, so it is appropriate to once again address the question of how light propagates. Newton believed that light is a stream of the lightest particles, and Jung believed that it represents a wave. He considered the medium of wave propagation to be the ether, but he did not know what it was. Both geniuses were naturally right.

Given the failure of the Michelson-Morley experiment [1,2], the author proposes a new fundamental idea of light propagation. According to this idea, light is a spherical wave in the form of oscillations of the lightest particles.

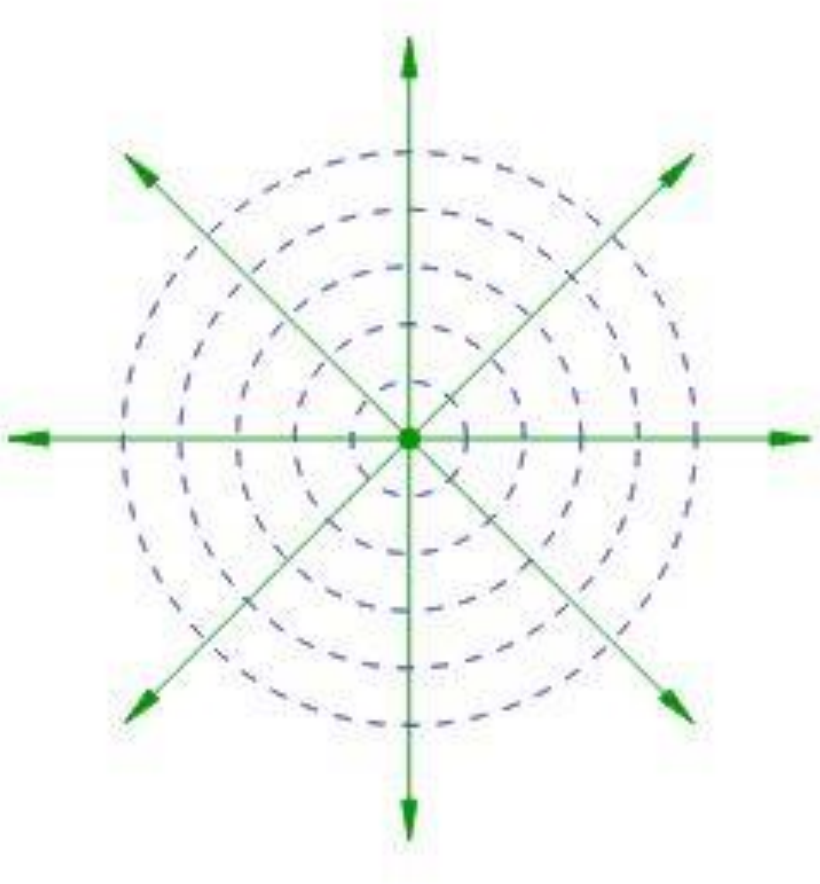

Fig.2 Spherical wave

The spherical wave equation is

$$\nabla^2 u = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}, \qquad (3)$$

where

$u(r,t)$- is the energy flow function,

$c-$ is the speed of light,

∇^2- is the Laplace operator.

For a harmonically symmetric spherical wave, in the absence of angular dependence, the general solution is

$$u(r,t) = \frac{A}{r}\cos(kr - \omega t) \qquad (4)$$

Where

r is the distance from the source,

$\frac{A}{r}$ is the amplitude,

$kr - \omega t$ is the phase of the wave,

ω is the periodic frequency,

k is the wave number,

t is the period.

Equation (4) completely describes the wave process. It also characterizes all the properties attributed to light.

And what is the medium of light propagation, or in other words, the lightest particles carrying the light wave? Jung once called it “ether”. As early as 2009, an idea was proposed that the "ether" is the same as dark matter [1]. That is, the fundamental idea is proposed that the medium for the propagation of light is the dark matter accepted by everyone, which is everywhere.

What happens in essence? The energy generated by the Sun excites the particles of dark matter, which, moving, condense, at some point overcome the resistance and a rupture occurs, then the next condensation occurs, and so on, in other words, wave motion occurs.

I consider it inappropriate to discuss the features of the wave process, since it is known to everyone.

To confirm the proposed idea that gray matter is the medium for the propagation of light, let us bring several arguments. We will use the only information available about dark matter - its density ρ_{dm}.

Let us consider the pressure of light.

As we know, the pressure of sunlight on the Earth's surface is approximately equal to

$$P_{s.e} = 4{,}7.10^{-6} Pa \qquad (5)$$

Now let's calculate the same pressure as the pressure of the flow of light particles on the wall.

A spherical wave is a flow of dark matter particles, so the pressure of this flow on the surface can be calculated by the well-known formula

$P_{dm} = \rho_{dm} \frac{v^2}{2}$,

Since the wave propagates at the speed of light, therefore

$v = c = 3.10^8 \frac{m}{s^2}$:

The density of dark matter in the solar system is estimated

$\rho_{dm} = 10^{-25} - 10^{-24} \frac{g}{sm^3}$ or $\rho_{dm} = 10^{-22} - 10^{-21} \frac{kg}{m^3}$.

By inserting the values, we get the pressure of the dark matter wave on the earth's surface

$P_{dm} = \rho_{dm} \frac{v^2}{2} = \frac{1}{2}(10^{-22} - 10^{-21}).(3.10^8)^2 = (4{,}5.10^{-6} - 4{,}5.10^{-5}) Pa \qquad (6)$

Comparing with (5), we notice, one can say, a fantastic coincidence. That is, we can confidently assert that the idea put forward that dark matter is the medium for the propagation of light and that light has only a wave nature.

Let's do another calculation.

Let's determine the mass of dark matter (or, which is the same, photon)

Consider the energy of light.

To do this, first determine the force of the light wave hitting a wall with a unit area.

Use the momentum change theorem, according to which

$mv_2 - mv_1 = F\Delta t$ (7)

Where

$v_2\ and\ v_1$ are the final and initial velocities, F is the force, Δt is the time interval of the impact.

We know that force is equal to the product of pressure and area $F = P.A$:.. In our case,

$P = P_{dm}$ (6) according to (6) and we take a certain averaged known value according to (5)

P_{dm} =4,7. $10^{-6} Pa$.

A is the area, which we consider equal to the unit area $A = 1\ m^2$:

$v_2 = 0$,

$v_1 = c = 3.10^8 \frac{m}{s}$:

We determine the time interval Δt of the impact as follows:

The frequency of light is $4.10^{14} - 7.10^{14} Hz$. That is, the impact duration will be approximately equal to

$\Delta t = 0{,}2.10^{-14} s$.

Substituting the values from (5), we obtain the mass of dark matter (photons) falling on a unit surface

$m_{dm} = \frac{4{,}7.10^{-6}}{3.10^8} 2.10^{-15}$= 3,1.$10^{-29}$ kg. (8)

Now let's determine the mass of a dark matter particle (photon). Let's solve this problem as follows.

It is known that the energy falling from the Sun on 1 m^2 of the Earth is equal to ($I = 1\grave{3}61\ W$)`.

To get the number of photons (actually dark matter) falling on $1\ m^2$ per second, N we need to divide the total energy by the energy of one photon, which is equal to

$$N = \frac{I}{E} \qquad (9)$$

The energy E of one photon is determined by Planck's formula

$$E = \frac{hc}{\lambda}$$

Where

h is Planck's constant $h = 6{,}226.10^{-34}$.

λ- is the average wavelength of light. The sun radiates in a wide spectrum (from ultraviolet to infrared), but to simplify the calculation, we take the maximum intensity range of the visible spectrum $\lambda = 500nm$ as the average value.

By inserting the values, we get

$$E = \frac{6{,}226.10^{-34}.3.10^{8}}{5.10^{-7}} \approx 3{,}97.10^{-19}W.$$

The number of photons (i.e., dark matter) falling on $1\ m^2$ per second according to formula (9) will be

$$N = \frac{1361}{3{,}97.10^{-19}} = 3{,}42.10^{21}.$$

Since the oscillation frequency of a light wave is approximately equal to $5.10^{14}Hz$, the number of dark matter particles per oscillation will be equal to

$$N_1 = \frac{3{,}42.10^{21}}{5.10^{14}} \approx 7.10^{6}$$

Then, taking into account (8), we can find the mass of a dark matter particle

$$M_{dm} = \frac{3{,}1.10^{-29}}{7.10^{6}} \approx 4.10^{-34}\ \text{kg}.$$

For example, the rest mass of an electron is equal to $9{,}1.10^{-31}$kg.

That is, dark matter is about a thousand times lighter than an electron. And Newton had brilliantly predicted that light particles should be the lightest particles.

Let us pay attention to the fact that the specified mass of the photon is the largest, since in the calculations we took the largest possible value of the impact duration: $\Delta t = 0{,}2.10^{-14}s$.

Therefore, the mass of the photon will be

$M_{ph} \ll 4.10^{-34}$kg.

4. CONCLUSION

The essence of our argument is the discrepancy between the perceived and real optical paths in a moving frame. Classical relativistic physics assumes that the null result of the Michelson-Morley experiment proves the existence of a preferred system (ether). However, if we apply the resulting formula

$$\sin\beta = \frac{u}{c}\sqrt{1-\frac{u^2}{c^2}}$$

we will notice that the light beam undergoes a transverse displacement, which is proportional to the total velocity u of the system.

Finally, it must be said that regardless of who the real authors of the $E=mc^2$ formula are, it has nothing to do with the theory of relativity. It is simply the enormous energy of the bonds of nuclear elements.

It should be noted that the Michelson-Morley experiment had very disastrous consequences for science.

The fact that light has only a wave property frees it from the confusion of its study, and is also a powerful tool for a comprehensive study of gray matter. The most important result is the determination of the mass of the dark matter particle. It is equal to $M_{dm} \approx 4.10^{-34}$ kg. This approach opens up wide opportunities in cosmology.

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