The dilemma Fresnel-Einstein

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Subject: A new experiment with which to determine whether the speed of propagation of light in an optical (transparent) medium depends on the movement of the Earth in space, as follows from the formula of Fresnel or it is constant and does not change, as follows from the special theory of relativity. Actually, this is an experiment with who at the direct verification is subjected principle of relativity of Einstein.

Introduction

In 1818 Fresnel [1] yields the so-called formula of partial dragging of the ether, It shows that the velocity of propagation of light in an optical medium is changed and depends on the speed of the Earth in space. This formula has been confirmed experimentally by Fizo [2] and others.

After 1905 Einstein and his followers renounce of the ether as the luminiferous medium ignore the Fresnel formula and argue the opposite, that the speed of propagation of light is constant and does not depend on whether the optical medium is moving or is at rest. Thus is arises the dilemma which point of view is correct, classical of the Fresnel or relativistic of the Einstein.

Carried out so far numerous attempts by Michelson-Morley type and others did not give a definitive answer to this centennial dispute. In interpreting the results emerge irreconcilable contradictions and disunity in the physical community.

Here is offered to conducting a crucial new experiment to determine of which side is the truth of the side of Fresnel or Einstein.

The new experiment

Main issue in the dilemma Fresnel-Einstein is whether the speed of propagation of light depends, i.e. whether it is altered by movement of the Earth in space or not. The proposed here experiment have just such a purpose.

In the past and now be holds various attempts to determine the speed of propagation of light. Such is the classical experiment at Fizo in 1849. Let us recall the essence of this experience. Light from the source passes through the half mirror and is reflected from another mirror. Between the mirrors is placed a toothed wheel that can rotate at a certain speed. When the gear is stationary observer sees the light source reflected from the mirror and go in between two teeth. If the gear is move comes a time when the reflected optical signal from the mirror begins to hold the teeth. In a further increase of the speed of rotation of the gear wheel again appears light, it becomes brighter and has a maximum intensity.

Experimental setting of this type also can be used to verify the principle of relativity of Einstein. But, while the purpose of the experiment Fizo was to determine the speed of light, here is another purpose, to determine whether it is change, i.e. whether the speed of light depends on the movement of the Earth in space. Such purpose has the experimental setting in [3,4].

The essence of the experiment is as follows. Light from the laser passes through the translucent mirror and is reflected by another mobile mirror. Here instead a toothed wheel between mirrors is placed an optical shutter (modulator) from crystal KDP, which is stimulated by high frequency sinusoidal voltage with a certain frequency. Another difference lies in the fact that is using a photo conductive optical fiber.

As light passes distance between optical shutter and movable mirrors twice, to is possible the reflected light signal to pass again through the optical shutter is need the time for which the optical signal travels twice the distance between them to is a multiple of the period during which the optical The shutter remains open. The reflected signal comes to the photocathode, which makes it possible to record the resultant signal.

Experience proceeds as follows. At first by displacement of the moveable mirror is sought such a situation, when the recording device receives a maximum or minimum signal and is observe whether with the over time, this signal is changed.

- If it is found that in the course of one day this signal remains constant then the truth is on the side of Einstein

- And vice versa if it is established that in the course of one day output signal is changes then must be assumed that the truth is on the side of the Fresnel.

Calculations show that if the optical shutter works at a frequency $6x10^8$ Hz as used in [6, 7] to be a successful experiment is necessary an optical path length of 118 km. But because light travels twice this path the total path of the light is 236 km. This creates some difficulties since at this length of the optical path require to use an intermediate optical signal amplifier.

To avoid this difficulty here is offered experimental setting similar to that of Korolyus-Mitelshtedt in 1928 [5]. Important novelty in this experimental set-up is that instead one optical shutter it is use two such connected to a common oscillation circuit. In this way at the register (photocathode) reaches only reflected light from the mirror and it is easier to monitor. In this case it is possible the length of optical path to be reduced to 120 km (60 km in one direction and 60 km in the opposite direction) and thus will avoid the use of the intermediate amplifier.

The principle scheme of this experimental set-up is shown in Fig. 1. Light from the laser 1 passes through the optical shutter 3 situated between two crossed polarizers 2 and 4 and then is passed through an optical fiber 6 (entrance in point 5 and exit in point 7) and is reflected by the movable mirror 8. This reflected light passes back through the optical fiber 10 (entrance in point 9 and exit in point 11) it reach to second optical shutter 12 and passes through the polarizer 13 falls in photocathode 14. Here to be excites electric current that is amplified in amplifier 15 is fed to the oscilloscope or recorder 16.

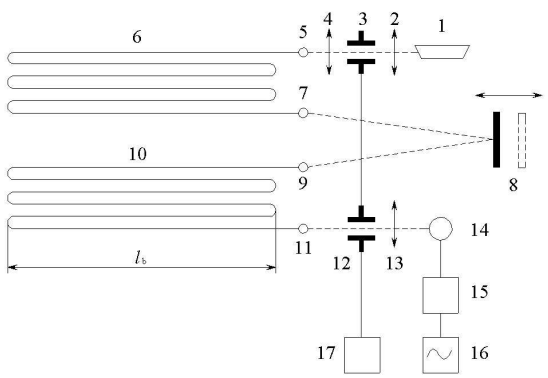

Fig. 1 Scheme of the experimental set-up
1 - laser; 2, 4 and 13 - crossed polarizes; 3 and 12 – optical shutter (modulator) from crystal KDP; 6 and 10 extended coil (antenna) with a length of optical fiber 50 km. each; 5, 7 – inputs and , 9, 11 - outputs of light into the optical fiber; 8 - mobile mirror; 14 - photocathode; 15 - amplifier; 16 - oscilloscope or recorder; 17 - generator;
l_b - length (base) of the extended coils

New experiments in practice

As can be seen the necessary equipment and materials for the realization of the present experiment are available. Optical and electron components (polarizers, optical shutter, light sources, amplifiers, generators, etc.) are use in many of the optical laboratories. The fiber optic technology is now mature enough. The market has fiber optic cables with a different number of optical fibers. There are examples of how such experiments have been carried out [4] as well as [6,7]. Therefore, it can be said that this experiment can be realized even in university .laboratories

You do not have the optical fiber to deploy 60 km. As shown in Fig.1 the active part (antenna) of the optical fiber can be formed as an elongate coil together or separately the two parts 6 and 10. The base l_b is selected depending on the conditions. Its length can be 50, 100 or more meters, and it to do the required number of turns. It can be used optic cable with any more optical fiber and ends of the individual fibers are joined in series. For example, fiber optic cable with a length of 1 kilometer and 120 optical fibers can act as a dual antenna.

Important!

1. The extended coil (antenna) must be placed in the direction east - west, i.e. parallel to the Earth parallel.

2. Movable mirror must be able to move round 15 ÷ 25 cm. With its aid at the beginning of the experiment, two positions be sought on the mirror, which exhibit the maximum or minimum signal and then the mirror are posited in the middle between these two positions. The distance at the mirror where can to observe maximum or minimum signal is;

$$\Delta = \frac{c}{4f}$$

where c is the speed of light and f is the frequency with which work the optical shutter.

At the selected frequency is

$$f = 6\text{x}10^8 \text{ Hz}$$

this distance is 12.5 cm.

Interpretation of the results of the experiment

If at the beginning of the experiment, the movable mirror is placed so that at the oscilloscope or recorder maximum signal is observed and in the course of the day and year this signal does not change, this would mean that the principle of relativity of Einstein is correct!.

And conversely, if in the course of the day and year the output signal is change it would mean that the truth is on the side of Ftenel.

We firmly believe that the truth is on the side of the Fresnel!.

From this experiment the greatest interest must have teachers and professors of physics, because when teaching their students about the special theory of relativity will be able to tell them the truth.

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