IOSR Journal Of Applied Physics (IOSR-JAP)
e-ISSN: 2278-4861.Volume 18, Issue 3 Ser. 1 (May – June 2026), PP 22-29
www.Iosrjournals.Org

What Is The Speed And Direction At Which The Earth Moves?

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Abstract:
It is reported that experimental installations have been created and experiments have been conducted, with the main goal of resolving the age-old dispute whether there is or is not an Aether wind, and as an additional task to determine the speed and direction in which the Earth moves. Based on the experimental results obtained so far, it can be argued that the main task of discovering an Aether wind has already been solved and it has been established that the speed of propagation of light in optical media depends on the motion of the Earth relative to the Aether.
Despite some difficulties, progress has been made in solving the problem of determining the speed and direction of the Earth's motion. It is assumed that the Earth moves at a speed of more than 3000 km/s, in a direction determined by the angle of right ascension of 146±15 degrees. In order to solve this additional task more precisely, it is proposed to move on to creating a new type of experimental setup based on electro-optical modulators.
Keywords: *Aether, Aether wind, Special Relativity*

Date of Submission: 01-05-2026 Date of Acceptance: 11-05-2026

I. Introduction

Our first successful experiment, through which an Aether wind was discovered, was carried out in June 2020, with an experimental setup based on the so-called hybrid Mach-Zehnder interferometer. Reports on the results of this experiment were published in [1,2]. Subsequently, for more than five years, experimental setups based on the Mach-Zehnder interferometer have been created and experiments have been conducted to detect an Aether wind, as well as to determine the speed and direction of the Earth's motion relative to the Aether [3,4].

II. What Is Known About The Speed And Direction In Which The Earth Moves?

After to be failure to discover the Aether wind and the emergence of the Special Theory of Relativity (SR), the question of the speed and direction of the Earth became abandoned. There is no Aether, no Aether wind, no absolute motion of the Earth with respect to the Aether, and there is no problem with its speed and direction of motion. The hands of astronomers are tied, and their mouths are closed.

Therefore, if we ask the following question "What is the speed and direction in which the Earth moves?" we will find data, primarily only for relative movements together with the Sun in relation to various celestial bodies, for example:
-Movement of the Sun relative to the Local Group of Galaxies (LGG) at 300 km/s towards the constellation Lacerta
-Movement of the Galaxy relative to the LGG at a speed of 100 km/s towards the constellation Lacerta
- Movement of the Local Group of Galaxies relative to the cosmic microwave background at a speed of 600 km/s towards the constellation Hydra.

But we were lucky and came across data on absolute motions of the Earth with respect to the Aether [5]. Here they are;

	year	*type*	*aether speed*	*direction*
M&M	1887	interferometer	258±77	??
Miller	1933	- " -	374±63	(5.2h, -67^o)
Torr&Kohlen	1981	coaxial cable	417±40	(5.2h, -65^o)
deWitte	1991	- " -	??	(5h, ??)
Cahill	2006	- " -	400±20	(5.5±2h, -70 ± 10^o)
NASA	2008	flyby	420±30	(5±2h, -70 ± 10^o)

It should also be mentioned about the experiments conducted at the end of the last century related to the relic radiation, for example, the COBE (Cosmic Background Explorer) experiment, when it was established that the Solar System moves with respect to the observed Universe, at a speed of 368 km/s, in a direction with galactic coordinates l=263,860, b=48,250 [6], and according to the RELIC 1 experiment, USSR [7], it was established that the Earth moves, with respect to the relic radiation, in the direction l=1500, b=700.

III. The Experimental Set-Ups

To detect an Aether wind, this can most easily be done by an experimental setup based on the so-called hybrid Mach-Zehnder interferometer [1,4] or Mach-Zehnder interferometer [2,4]. The schematic diagram of an experimental setup with a Mach-Zehnder interferometer is shown in Fig. 1. It consists of a light source with a laser diode 1, an optical power meter 2, an input and output optical splitter 3 and 4. And as can be seen, the interferometer is composed of only two optical splitters 3 and 4, the two ends of which are connected at points 5 and 6 by splicing.

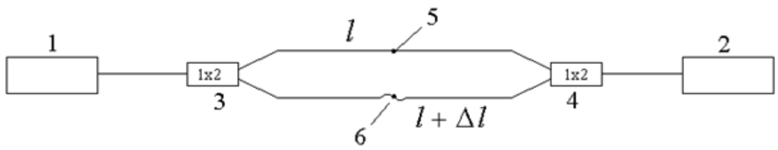


Fig.1. Schematic diagram of an experimental setup based on a Mach-Zehnder interferometer

The operation of this experimental setup proceeds as follows. The laser light source 1 emits a constant signal, which when passing through the input splitter 3 is divided between the two channels of the interferometer into two equal parts and when they arrive, in the output optical splitter 4 they interfere. In this case, the received signal is amplified or weakened. When the arriving signals are of the same phase, they are added together and the signal is the largest, and if when they arrive in antiphase, the two signals cancel each other out and the signal is the smallest. Therefore, the interferometer converts the change in phase into a change in the amplitude of the output signal, which change can be registered by the optical power meter 2.

To create a set-up you will need:

- PCL Splitter 1x2, 50:50 with SC/APC connector - 2 pieces
- Simplex Path Cord, FC/APC – SC/APC connector, 1 m - 2 pieces
- Simplex SC/APC adapter - 4 pieces.

On Fig. 2 shows an experimental set-up lying in a horizontal plane, and Fig. 3 shows an experimental setup lying in a plane parallel to the equatorial plane.

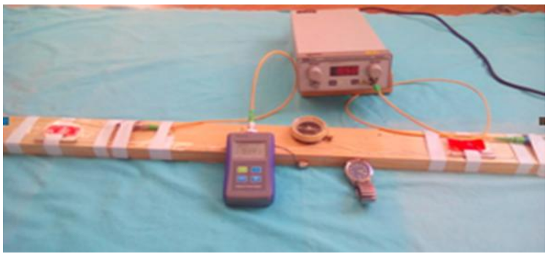


Fig. 2

Fig. 3

IV. How The Experiments Are Conducted

It is important to note that when conducting experiments, the experimental setup must be placed so that the interferometer is oriented in the north-south direction. It can lie in a horizontal plane or in a plane parallel to the equatorial plane. Another important thing to note is that when the experimental setup is turned on, the measured signal starts and continuously changes and will stop only when it is turned off. The explanation is simple, the driving force here is the rotational motion of the Earth, whose movement cannot be stopped.

It should also be noted that as part of the Solar System, it follows that when speaking of the motion of the Earth, one must consider absolute motion with respect to the Aether, taking into account all its motions, i.e. its galactic velocity (vector sum of its diurnal and orbital motions plus its motion together the Sun). Let us assume that the projection of the total velocity onto the plane in which the experimental setup lies is VG. Let us also assume that α is the angle between the vector VG and the direction of the interferometer. In such a case, the velocity of the Aether wind along the axis of the interferometer will be (1)

Therefore, when the interferometer rotates with the Earth, it will change its direction in space, i.e. the angle α will change, and accordingly the current velocity according to equation (1) will change, and the measured signal will also change.

V. The Experimental Results

As we have already noted, when the experimental setup is turned on, the measured signal begins to change, which can be seen in the graphs shown below:

On Fig. 4 shows a graph of how the measured signal changes over a period of 27 minutes. The graph is built based on a video recorded on October 15, 2022, with the start of the recording at 13:10, taking into account the values of the measured signal every 1 minute. In this case, a period of time was chosen when the speed of the Aether wind changes the fastest.

The experimental setup on which this video was recorded consists of two interferometers [8]. In the foreground is the main Mach-Zehnder interferometer, and in the background is a second hybrid one. Its role is control. It measures external disturbances (temperature fluctuations, electromagnetic influences, vibrations, etc.) associated with the passage of light between the light source and the measuring device. At the front are the optical power meters (OPM). The right device measures the change in optical power in the main interferometer. At the top, one on top of the other, are the laser light sources (Optical Light Sources - OLS).

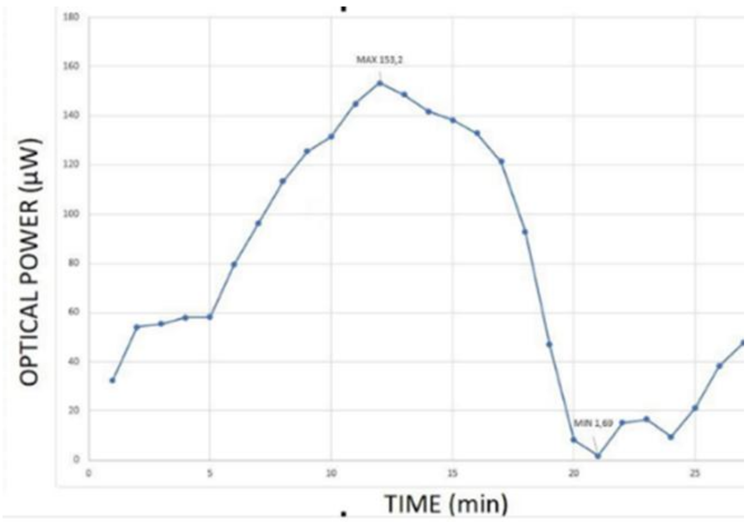
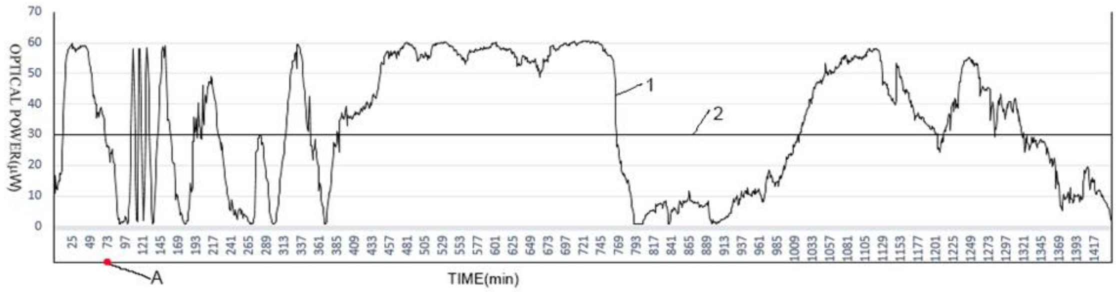


Fig. 4

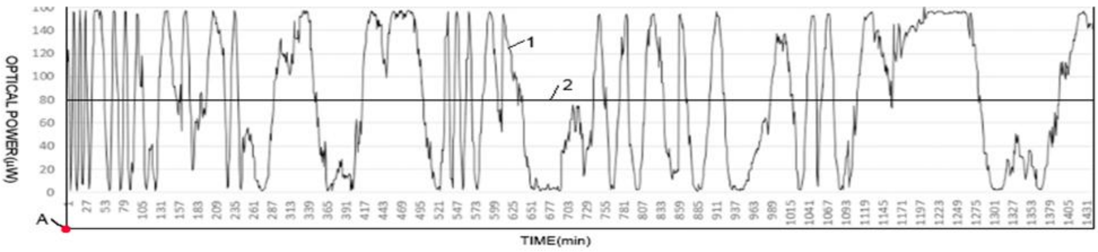
It can be seen how over time the measured signal of the main interferometer is constantly changing, and in the left one, it moves very little, i.e. the noise is negligible. It is obvious that here there can be no doubts about the real existence of an Aether wind. In this case, the OLS of the main interferometer is set to emit a constant signal of 0.53 µW, but at the output, the signal is variable. Moreover, the change in the signal is very significant (in the range from 2 to 150 µW) i.e. in the ratio of 1:75, which indicates that this is not noise, but a real change.

Fig. 6 shows three graphs showing how the measured signal changes over 24 hours, i.e. for the complete rotation of the Earth around its axis. These graphs are also built on the basis of recorded videos, taking into account the values of the measured signal every 1 minute, i.e. they are built on the basis of 1440 points. The abscissa axis shows time, and the ordinate axis shows the amplitude of the measured signal in µW.

Graphics 1



Graphics 2



Graphics 3

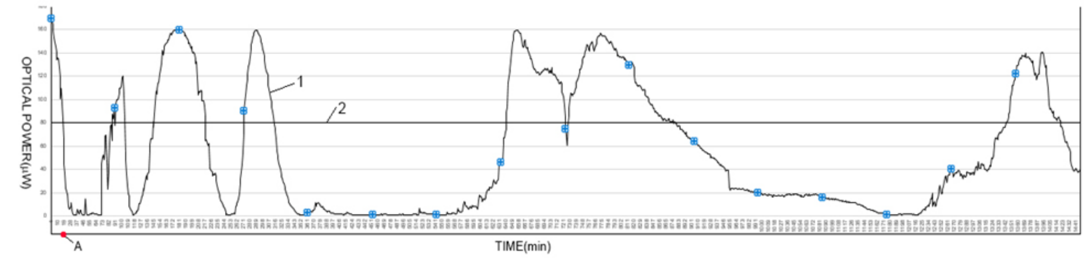


Fig. 6

The video clip for constructing Graph 1 was recorded on May 8, 2024, starting at 16:48 (summer time). The light source is a Fabry-Perot laser diode with a power to emit a continuous signal of -7 dBm (Sinaran Optik Sdn Bhd). The video clip for constructing Graph 2 was recorded on June 22, 2024, starting at 14:50 (summer time). The light source is a DFB laser diode S3FC Thorlabs, set to emit a continuous signal of 0.52 milliwatts. The video clip for constructing Graph 3 was recorded on March 21, 2025, starting at 9:30 (astronomical time). The light source is also a DFB laser diode S3FC and set to emit a continuous signal of 0.52 milliwatts.

VI. Interpretation Of Experimental Results. Questions And Answers

As noted above, the main task of the experiments conducted is to resolve the age-old dispute whether there is or is not an Aether wind. So let's pose this most important question:

Question 1. Is there or is there not an Aether wind?

The Special Theory of Relativity states that there is no Aether, no absolute reference frame, no absolute motion of the Earth, that there is no Aether wind, and that the speed of light propagation in all directions is the same. Therefore, if these statements were true, then the signal measured on the OLS should not change (line 2 of the graphs Fig. 6).

Answer: Our experimental results refute these statements. The measured signal is constantly changing (line 1 of the graphs Fig. 6). The answer is categorical. There is an Aether wind!

Question 2. Why do the graphs repeat minimum and maximum values of the measured signal?

Answer: This question has been addressed above and is related to the principle of operation of the interferometer. Since the optical path in the two arms of the interferometer is different, when the velocity of the

Aether wind V(α) changes according to equation (1), the time at which the two signals arrive at the output splitter also changes, and the measured signal changes accordingly. When the two signals arrive in phase, they add up and the measured signal is maximum, and when the two signals arrive in antiphase, they cancel each other out and the signal is minimum.

Question 3. Why is the number of minima and maxima in the graphs different?
Answer: The number of minima and maxima in the individual graphs depends on the maximum speed the interferometer is set to measure. For example, if we need to measure a distance of 10 meters, and we have a 1 meter tape measure, we will have to repeat the measurement 10 times. Here it is the same, if the interferometer is set to measure a speed less than the maximum speed at which the Earth moves, we will have an overlap, i.e. a greater number of passes through minima and maxima because to pass from one minimum to a maximum or vice versa, the current velocity V(α) needs to change with the speed at which it is set to measure.

We will have the smallest number of extreme values when the interferometer is set to measure a speed equal to or greater than the speed at which the Earth moves. In this case, only 5 extreme values should be observed in 24 hours, i.e. in order to observe two extreme values in succession, it will be necessary to wait 6 hours. Of course, such an interferometer setting is inconvenient. Usually, we set the interferometer to measure a lower speed in order to repeat maxima and minima more often during a demonstration. It is best to observe several extreme values of the measured signal for about 15 minutes.

Question 4. Why are there more maxima and minima in some places on the charts, while in other places they are rarer?
Answer: The number of maxima and minima on the graphs depends on how the cos α function changes according to equation (1). The peculiarity of this function is that it grows fastest when the angle α is about 90 degrees, i.e. when the interferometer is perpendicular to the direction in which the Earth is moving, and much slower when the angle α is about zero degrees, i.e. when the interferometer is parallel to the direction in which it is moving.
Let's compare how this function changes when angle α=90±15 degrees and when angle α=0±15 degrees;

$$\frac{\cos 75 - \cos 90}{\cos 0 - \cos 15} = \frac{0,2588 - 0}{1 - 9659} = \frac{0,2588}{0,03407} = \frac{7,5961}{1}$$

The calculation shows that when the Earth rotates within the limits α=90±15 degrees, i.e. for a time of 2 hours (it rotates by 15 degrees in 1 hour) we will have 7 times more maximum and minimum values of the measured signal than when it rotates within the limits α=0±15 degrees. This uneven distribution of maxima and minima in the graphs proves useful because it makes it possible to determine the direction in which the Earth is moving.

VII. What Is The Direction In Which The Earth Moves With The Sun?

The conclusion that should be made based on the above regarding the uneven distribution of the number of maxima and minima in the graphs of Fig. 6 is that where their number is greatest, and in this case, these are points A, there the interferometer will be perpendicular to the direction in which the Earth is moving (α=90 degrees). Therefore, we will know the time in which it will pass through this point, and we will also learn the time (6 hours later) when the interferometer will be parallel to the direction in which it is moving (angle α=0 degrees). So we will be able to determine the direction in which the Earth is moving.

Table 1 shows the time when the interferometer passes through the point α=90 degrees and the time when it passes through the point α=0 degrees. For convenience, when compiling this table, it is assumed that the time of passage through these points is the 22nd day of each month, i.e. it coincides with the time of the zodiac change. So all data from the graphs are transformed to this date.

Column 2 of the table gives the time of passage through point α=90, based on graph 2. In this case, when the video recording starts (summer time) on May 8 at 16:48, the passage time is transformed as follows: Going back 60 minutes to move to astronomical time, plus going back another 56 minutes (14 days of 4 minutes) to move to May 22 and moving forward 100 minutes to move to point α=90, since it is located about 100 minutes after the start of the video recording.

Column 3 of the table gives the time of passage through point α=90, based on graph 1. In the case of the beginning of the recording (summer time) on June 22 at 14:50, the passage time is transformed by going back 60 minutes to move to astronomical time 13:50,

Column 4 of the table gives the time of passage through point α=90, taking into account graph 3. In this case, at the beginning of the astronomical time record on March 22 at 9:30, the time is transformed by adding 20 minutes to reach 9:50.

Also, in the right part of the table (columns 5, 6 and 7) for each time of passage through point α=90, a conjugate time is given, which occurs after 12 hours, when the interferometer stands parallel to the direction in which the Earth is moving.

As can be seen from the table, the zone of passage through points α=90 is limited within two hours, i.e. within an angle of about 30 degrees, respectively, within the same limits is limited the zone when the interferometer is parallel to the direction in which the Earth moves. Therefore, Table 1 shows us what this direction is.

Let us in this case start from the average time for February 21, 2026, at 16:30, when the interferometer is pointed in the direction in which the Earth is moving (column 6 of the table) and see what the sky looks like at that moment. We will see that the angle of right ascension is about 213 degree (Fig.7) and if we add another 1 degree to equalize with February 22, we will get α=214 degree. Now if we take into account the conjugate angle α=146 degree we will know the direction in which the Earth is moving, determined by these two angles.

Regarding the question of the direction in which the Earth moves, we have reason to assume that the angle of right ascension is 146 degrees. Therefore, if we take into account what was said above, that the dispersion is within 30 degrees, we can say: The Earth moves in the direction determined by the angle of right ascension 146±15 degrees.

Table 1.

Day and Month	Time to pass through point α=90: Interferometer perpendicular to direction			Time to pass through point α=0: Interferometer parallel to the direction		
	Graphics 2	Graphics 1	Graphics 3	Graphics 2	Graphics 1	Graphics 3
	time	time	time	time	time	time
1	2	3	4	5	6	7
22 January	23:50÷11:50	0:30÷12:30	1:50÷13:50	5:50÷17:50	6:30÷18:30	7:50÷19:50
22 February	21:50÷ 9:50	22:30÷10:30	23:50÷11:50	3:50÷15:50	**4:30÷16:30**	5:50÷17:50
22 March	19:50÷ 7:50	20:30÷ 8:30	**21:50÷ 9:50**	1:50÷13:50	2:30÷14:30	3:50÷15:50
22 April	17:50÷ 5:50	18:30÷ 6:30	19:50÷ 7:50	23:50÷11:50	0:30÷12:30	1:50÷13:50
22 May	15:50÷ 3:50	**16:30÷ 4:30**	17:50÷ 5:50	21:50÷ 9:50	22:30÷10:30	23:50÷11:50
22 June	**13:50÷ 1:50**	14:30÷ 2:30	15:50÷ 3:50	19:50÷ 7:50	20:30÷ 8:30	21:50÷ 9:50
22 July	11:50÷23:50	12:30÷ 0:30	13:50÷ 1:50	17:50÷ 5:50	18:30÷ 6:30	19:50÷ 7:50
22 August	9:50÷21:50	10:30÷22:30	11:50÷23:50	15:50÷ 3:50	16:30÷ 4:30	17:50÷ 5:50
22 September	7:50÷19:50	8:30÷20:30	9:50÷21:50	13:50÷ 1:50	14:30÷ 2:30	15:50÷ 3:50
22 October.	5:50÷17:50	6:30÷18:30	7:50÷19:50	11:50÷23:50	12:30÷ 0:30	13:50÷ 1:50
22 November	3:50÷15:50	4:30÷16:30	5:50÷17:50	9:50÷21:50	10:30÷22:30	11:50÷23:50
22 December	1:50÷13:50	2:30÷14:30	3:50÷15:50	7:50÷19:50	8:30÷20:30	9:50÷21:50

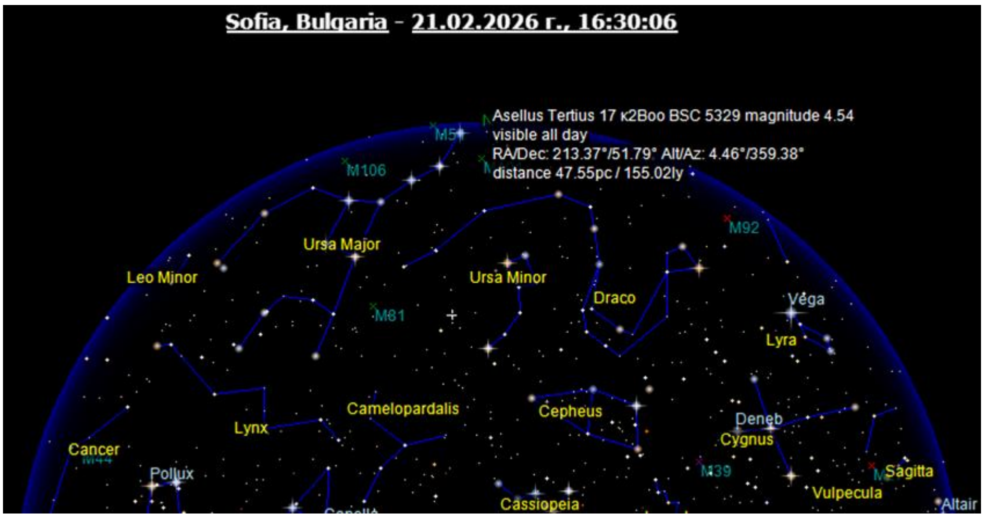


Fig. 7. Star sky at 16:30, on February 21, 2026 Sofia, Bulgaria

VIII. Problems In Determining The Speed At Which The Earth Moves

Although an experimental setup based on a Mach-Zehnder interferometer is cheap and easy to implement and can be used to search for and detect Aether wind, it has one significant drawback: It cannot be set up to measure velocity with sufficient accuracy.

As noted above, the interferometer of this experimental setup consists of two splitters, with their double ends trimmed and joined by splicing. We know how to size the interferometer, i.e. to calculate how much the optical path difference between its two arms should be, but if we want to set the interferometer to measure a maximum speed, for example, of 1000 km/s, we will find that this optical path difference should be only 0.23 mm. This is where the problem lies, on the one hand we do not know how much of the optical fiber with a length of 0.23 mm, and a diameter of about 10 microns, will melt after the splicing operation (hot welding), and on the other hand, we cannot measure the difference in the optical path after this operation. Therefore, we cannot be sure what speed the interferometer is set to measure.

However, despite the difficulties mentioned above, based on some indirect signs, for example, the asymmetry in the location of the observed maxima and minima in the graphs, related to the Doppler effect, we assume that the speed at which the Earth moves together with the Sun may be greater than 3000 km/s [3,4]. There is a possibility to solve this problem more precisely. For this purpose, it is necessary to proceed to the creation of a new type of experimental set-ups.

IX. Experimental Setup Based On Electro-Optical Modulators

To determine more precisely the speed at which the Earth moves, we must proceed to the creation of experimental installations based on electro-optical modulators. The schematic diagram of such an experimental installation is shown in Fig. 8. It consists of a light source with a laser diode 1, an input 2 and an output optical shutter (modulator) 3 made of a LiNbO crystal, an optical power meter 4, a signal generator 5 and a driver amplifier 6. The tails of the input and output modulators are connected by connectors or splicing at point 7. The operation of this experimental setup proceeds as follows. The laser light source emits a constant signal. When it passes through the input modulator, the signal is modulated and light pulses (waves) with a duration of time tM=1/(2f) are created. Since the input and output modulators operate synchronously, i.e. at the same frequency f, in order for the light signal to pass successfully, with the least losses, through the output modulator, it must arrive there with the same phase. For this purpose, the following condition must be met

tM=tp (2)

where, is the time for the light beam to travel the optical path between the input and output modulator.

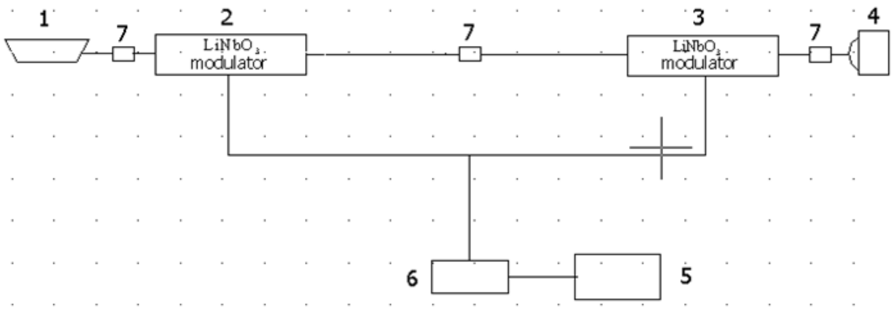


Fig.8. Scheme of the experimental installation on the base of the electro-optical modulator

If condition (2) is not met, the amount of light that will pass through the output modulator and reach the optical power meter will be less. A minimum of light will pass when the signal arrives in antiphase and the output modulator is closed.

For first-order experimental setups, such as this experimental setup, the time for light to travel the optical path between the input and output modulators is calculated by the formula [3,4,10]:

$$t_P = \frac{lV(\alpha)}{c^2} \quad (3)$$

where V(α) is the current speed of light in the optical fiber, and α is the current angle between the direction in which the Earth is moving and the direction of the experimental setup. Therefore, as the Earth rotates on its axis, the angle α will change, and the measured signal will have to change.

If we take into account equations 2 and 3, we can write the equation

$$t_M = \frac{1}{f} = \frac{lV(\alpha)}{c^2} \quad (4)$$

Let us solve equation (4) in terms of V and l and we will obtain the followin equations for sizing the experimental setup

$$V_{\max} = \frac{c^2}{2f}\frac{1}{l} \quad (5)$$

$$l = \frac{c^2}{2f}\frac{1}{V} \quad (6)$$

Equation (5) will calculate the maximum velocity Vmax that the experimental setup is set to measure, and l will be the optical path required to measure this velocity

For example, if we want to set the experimental setup to measure a velocity of V=3000 km/s, the required optical path between the modulators should be

$$l = 5,62.10^6 \frac{1}{3000^3} = 1,87\,\text{m}$$

A length of l=1.87 m can be measured much more accurately and we will know at what speed the experimental setup is set to measure and we will more accurately determine at what speed the Earth is moving.

Another advantage of this experimental setup is that there will be no influence of the Doppler effect. But to create such an experimental setup requires significant resources, which we, as independent researchers, do not have.

Finally, it should be noted that the experiments we conducted are an alternative to those related to the cosmic microwave background radiation.

X. Conclusion

Based on the experiments conducted so far, it has been established with a high degree of certainty that there is an Aether wind and that the speed of propagation of light in optical media depends on the movements of the Earth.

Progress has been made in solving the problem of determining the speed and direction of Earth's motion relative to the Aether. It is assumed that Earth and the solar system are moving at a speed of over 3,000 km/s in a direction with a right ascension angle of 146±15 degrees.

The authors are ready to present their experiments to a competent committee.

The authors are ready to help researchers who wish to conduct their own experiments and discover Aether wind themselves.

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