Previous results

Parameters of the last experiment are given in the table 1 in comparison with parameters of the experiment [1]. Here V_{2n} is a projection of linear velocity of OD on a beam, l is length of a beam projection in OD on its flat surface, n_2 is refraction index for OD, $\kappa_2 = n_2^2 - 1$.

The typical spectrum of an initial interference signal, taken from PD2, is presented in the figure 1. For the rate of rotation of OD (178 Hz) the main maximum is found.

Table 1.

Name	ν, Hz	$V_{2n}, m/s$	l, m	n_2	κ_2	$\kappa_2 V_{2n} l$
Bilger H.R. & Stowell W.K.	<60	<4,875	0,0072	1,457	1,124	<0,04
New interferometer	350	32,201	0,041	1,7125	1,9327	3,57

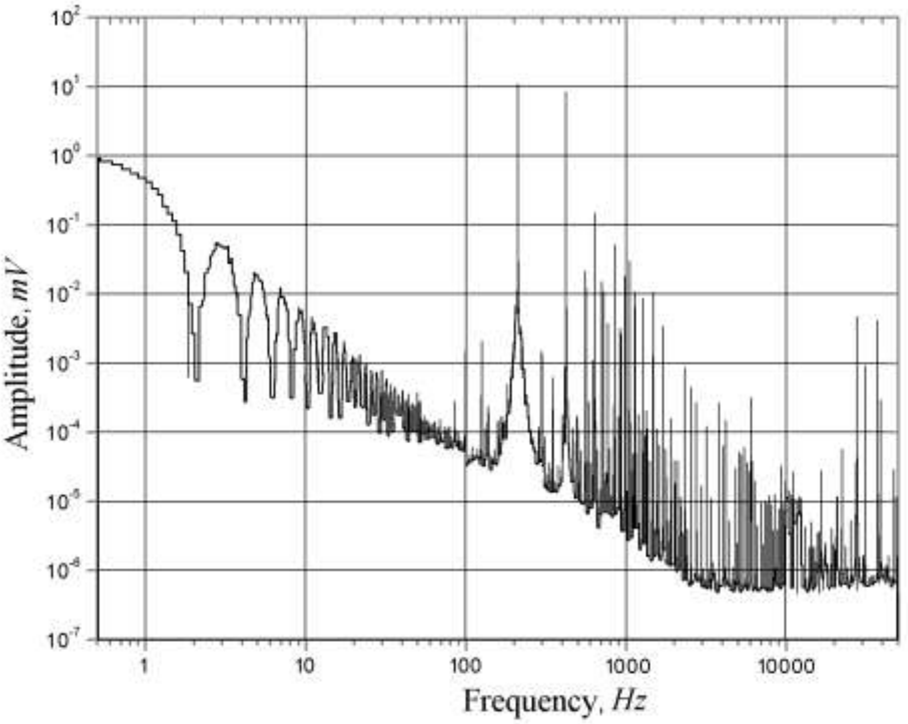

Fig.1. Dependence amplitude of initial interferometer signal on frequency (Frequency of OD rotation 178 Hz).

The interference signal was processed. Maximums for intensity $I(t)$ were found by the methods of least squares. Then we calculated the time interval $\Delta t = t_{n+1} - t_n$.

Table 2.

δ_x	$\tilde{A}_0$	$\tilde{A}_0 - \delta_x$	$\frac{d}{d\Delta}\frac{\Delta t}{T}$
0	0,05	0,05	9,004963
0,01	0,050990195	0,040990195	8,984654

0,02	0,053851648	0,033851648	8,963048
0,03	0,058309519	0,028309519	8,940002
0,04	0,064031242	0,024031242	8,915348
0,05	0,070710678	0,020710678	8,888889
0,06	0,078102497	0,018102497	8,860394
0,07	0,086023253	0,016023253	8,829589
0,08	0,094339811	0,014339811	8,796141
0,09	0,102956301	0,012956301	8,759653
0,1	0,111803399	0,011803399	8,719631

For finding the best correlation between A_0 and x_δ let us express $\tilde{A}_0$

$$\tilde{A}_0 = \sqrt{\tilde{d}^2 / 4 + \delta_x^2}\,, \qquad (1)$$

here we introduce the parameter of mismatch $\delta_x = \tilde{x}_\delta - 1/2$ which characterized the shift of working point from a dark fringe. In the table 2 we show magnitudes δ_x, $\tilde{A}_0$, $\tilde{A}_0 - \delta_x$ and $\frac{d}{d\Delta}\left(\frac{\Delta t}{T}\right)$ for $\tilde{d} = 0{,}1$. The dependence of difference $\tilde{A}_0 - \delta_x$ on δ_x when $\tilde{d} = (0{,}05; 0{,}1; 0{,}2)$ is presented in the figure 2 for the range of values $\delta_x = (0 \ldots 0{,}2)$.

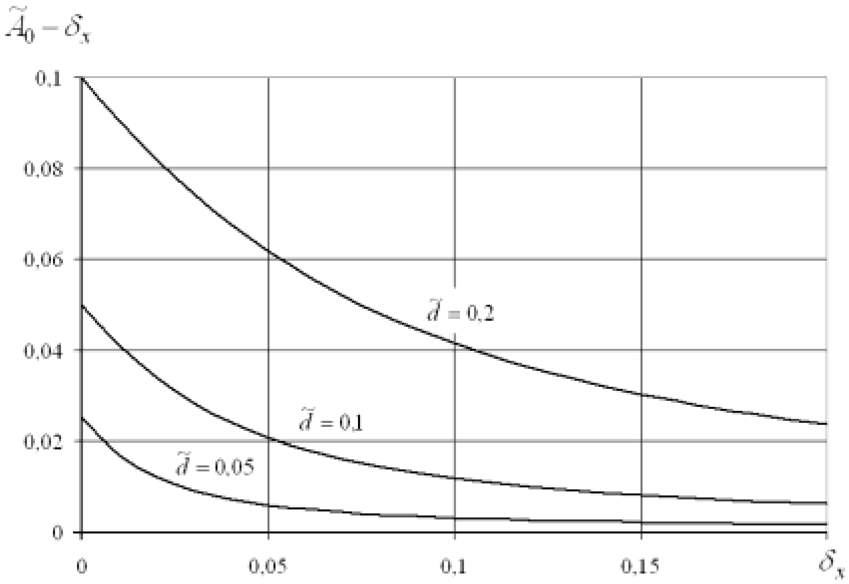

Fig. 2. Dependence of difference $\tilde{A}_0 - \delta_x$ on δ_x when $\tilde{d} = (0{,}05 \ldots 0{,}2)$.

The difference $\tilde{A}_0 - \tilde{x}_\delta$ increases rapidly, this means that the secondary peak in the signal increases, and it will be difficult to detect such signal. It is desirable to take the most differences for the selected parameter $\tilde{d}$. In the figure 3 the dependence $\frac{d}{d\Delta}\left(\frac{\Delta t}{T}\right)$ on $\tilde{x}_\delta$ is shown.

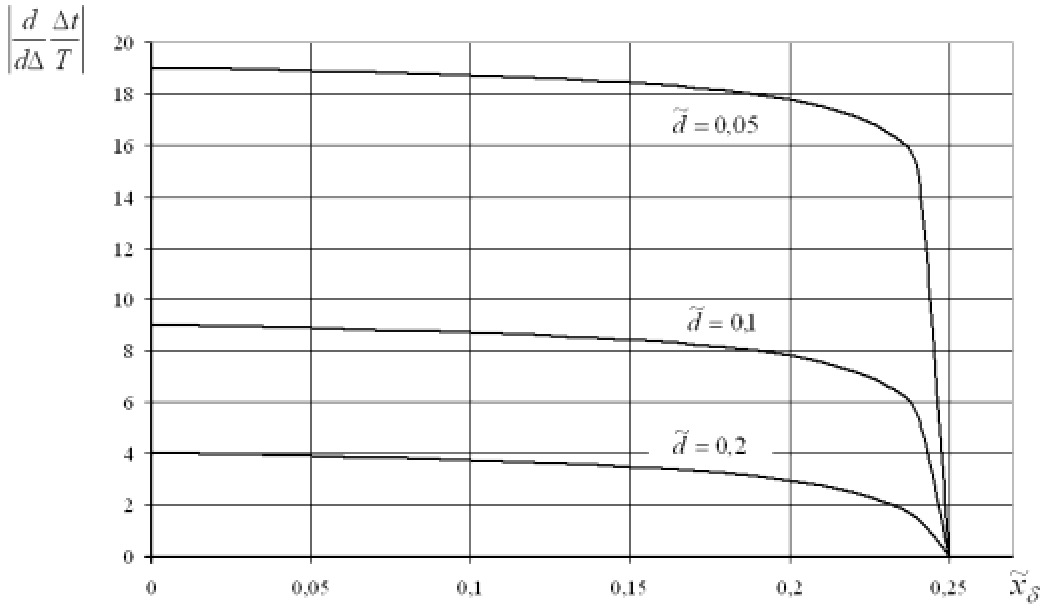

Fig. 3. Dependence $\left|\frac{d}{d\Delta}\frac{\Delta t}{T}\right|$ on $\tilde{x}_\delta$ when $\tilde{d} = (0{,}05; 0{,}1; 0{,}2)$.

It can be noticed that in wide range of $\tilde{x}_\delta$ the relation $\left|\frac{d}{d\Delta}\frac{\Delta t}{T}\right|$ weakly depends on $\tilde{x}_\delta$, this makes the task of adjustment to be easer.

Let us voltage on PD is described with the function

$$U(t) = \frac{1}{2}\left[U_0 + U_T + (U_0 - U_T)\cos\left(\Omega\left(x_n + A_0\cos\omega t\right) + \delta\right)\right]. \qquad (2)$$

Let us take $\frac{U_0 + U_T}{2} = 51\,mV$, $\frac{U_0 - U_T}{2} = 50\,mV$, $\delta = 0$, $\tilde{d} = 0{,}1$. From the table 2 for $d = 0{,}1$ we choose $\tilde{x}_\delta = x_\delta / x_p = 0{,}02$ and find $A_0 = 0{,}0539$. By choosing different values for $\tilde{x}_\delta$ we can receive different forms for a time signal $U(\omega t)$. In the figure 4 signal forms are presented when $\tilde{x}_\delta = (0{,}01; 0{,}02; 0{,}03)$.

When values $\tilde{x}_\delta$ are less, the secondary maximum is getting more delineated that makes better quality of signal processing.

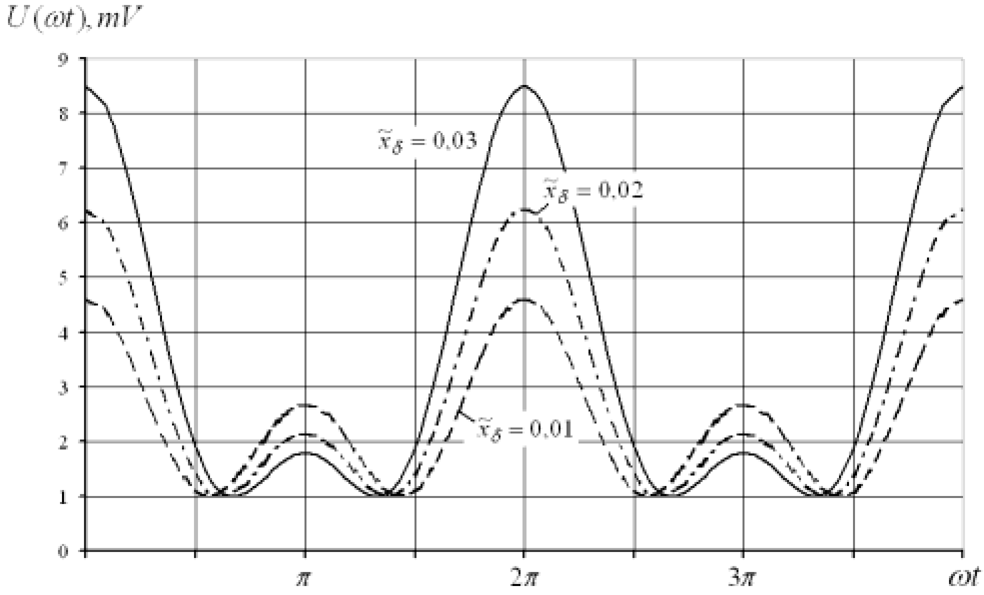

Fig. 4. Theoretical dependence of voltage from photodetector $U(\omega t)$ on ωt with $\tilde{x}_\delta = (0{,}01; 0{,}02; 0{,}03)$.

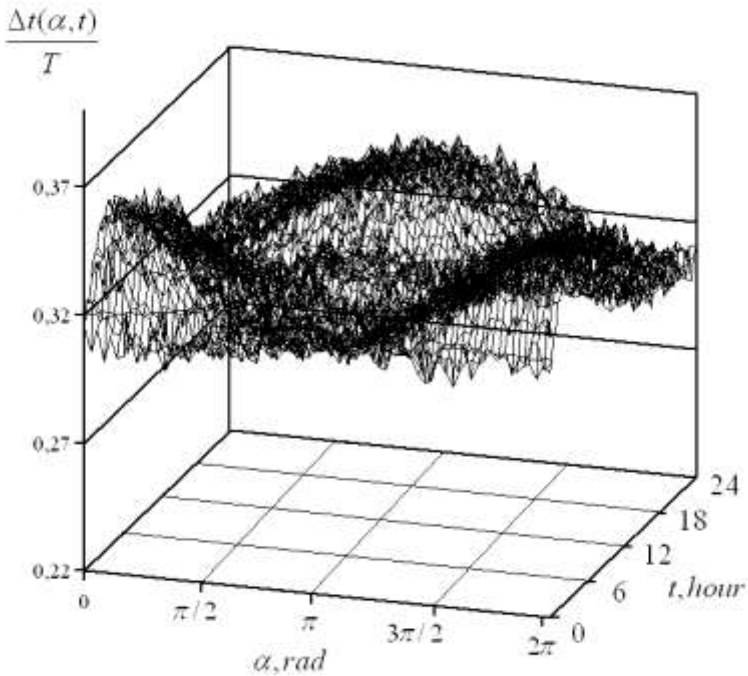

Fig. 5. Dependence of relative magnitude for time signal $\frac{\Delta t(\alpha,t)}{T}$ on rotation angle installation α and time t (16.05, July 25 – 16.05, July 26, 2008).

Width of an interference fringe can be found from the expression (2)

$$x_p = \frac{1}{2\pi(x_\delta + A_0 \cos\omega t)} \arccos \frac{2U(t) - U_0 - U_T}{U_0 - U_T}. \quad (3)$$

Dependence of signal on turn angle (0-360°) and time (24 h, July 25-26, 2008) is shown in the fig.5.

The obtained results of measurement of interference pattern shift have a view of dipole anisotropy, and direction of a dipole coincides with the direction of dipole anisotropy of the relict radiation (We mean, that Sun moves with respect background radiation in direction constellation Lion, to point with equatorial coordinates alpha = 11h 12m и delta = –7,1° (epoch J2000); Galactical coordinates l = 264,26° и b = 48,22°).

Hence, we can see from the figure that variation of position of interference fringes in time region corresponds to $d\left(\frac{\Delta t}{T}\right) = 2...4 \times 10^{-2}$. This gives estimation for β which is more on two orders then it expects proceeding from comparison with results of measurement of relict radiation anisotropy. Thus we can conclude that either the estimation is not exact and real shift should be more or the anisotropy parameter is lager, or the measurement indicates influence of uncontrolled factors. In any case, it is necessary to increase signal-noise relation and gather statistics in different seasons of a year.

So, numerical estimations shown that the reached sensibility of the interferometer in the best experiments is on the level which is needed for detecting anisotropy with the parameter $\beta \cong 2{,}3 \times 10^{-3}$.

We introduced previous results of the experiment in which pattern shift have a view of dipole anisotropy, and direction of a dipole coincides with the direction of dipole anisotropy of the relict radiation. Further we plan series of experiments in different seasons of a year to gather statistic data.

This previous results was published in [2].

References

[1]. Bilger H.R. & Stowell W.K. Light drag in a ring laser: An improved determination of the drag coefficient. // Phys. Rev. A. 1977. 16 (No1), pp.313-319.

[2]. Gladyshev V.O., Sharandin E.A., Gladysheva T.M., Tiunov P.S., Leontyev A.D., Podguzov G.V. Interference optical experiments for finding space anisotropy // Physical Interpretation of Relativity Theory : Proceedings of XV International Meeting. – Moscow: BMSTU, 2009. p. 215-223.