Why obviously non-zero shift of interference fringes is interpreted again as confirming negative outcome of experiments on Michelson type interferometers

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In the present report I analyze interesting experimental results of laboratory measurements of the speed of aether wind recently (2009) obtained by Dutch researcher V.Haan at Michelson-type interferometer based on fiber optic waveguides transmitting the light with wavelength ~1 μm. Because of a wrong interpretation of his measurements, those proposed at days of Miller (1933) and Shamir&Fox (1968), V.Haan, proceeding from a reliably measured shift of the interference fringe registered by modern phasometric electronics, 40 times underestimated the speed of aether wind (7 km/s), i.e. obtained the same estimations as was earlier reported by Michelson, Miller, Shamir&Foxs and others who also incorrectly interpreted their data. Now I critically discuss the errors of interpretation of the experiment by V.Haan. I show that really he measured the speed of aether wind several hundred km/s. Some proposals are made of modernization of the construction of fiber optics interferometer capable to raise about 5 times the ratio signal/noise in the device. Thus the resolution by the phase shift can be obtained not less than 0.005 of the fringe width.

1. Introduction

Recently I was appealed by the author [1] who in his letter asked to explain, why the result ($\upsilon = 7$ km/s) obtained on the basis of an experiment performed by him on Michelson type interferometer with fiber optic carriers of light is consistent with the findings of Michelson and Morley (1887), Miller (1926), Shamir and Fox (1968), who obtained $3<\upsilon<12$ km/s, more reminiscent of a facility's error than the space velocity of the Earth, and do not agree with the Demjanov's results [2÷4], $140<\upsilon<480$ km/s, which are similar to the measurement of astronomical speed of the Earth in space. Below I will explain in detail all the causes of the failure of the author [1]. There will be showed an enduring value of obtained in [1] experimental results and danger of their unlucky interpretation by the author [1]. I offered him two scenarios for our behavior before concerned readers: 1) to coordinate a joint analysis of the results [1], 2) to interpret results [1] independently. Thanking me for this suggestion, the author [1] noted that not all was understood by him in my critique, and he does not accept some points. So he leans to the second scenario, which I just follow below.

I show how the result depends heavily on the interpretation of the same experimental data [1], on careful accounting of all factors laid down by the experimenter in the installation and facts learned from the experiment, in particular, the wrong interpretation in [1] gave $\upsilon = 7$ km/s, and described below right one gives $\upsilon \sim 200 \div 400$ km/s. At the same time I fix in [1] almost the same mistakes that I found earlier in works of Michelson and Morley, Miller, Shamir and Fox. Thus I showed [4, 6] that obtained by them values $3<\upsilon<12$ km/s are wrong, because under correct interpretation the values are $120<\upsilon<480$ km/s.

I propose the analysis of the causes that led to so a large ~20÷40-fold underestimation in [1] of the velocity of the Earth in aether. Understatement of the results is developed out of the following sources of error: *firstly*, a 4-fold underestimation in the effective optical length of the interferometer arms; *secondly*, 9-fold – due to neglect of the spatial anisotropy of the dielectric permittivity of optic-fibers; *thirdly*, 20-40 times was underestimated the amplitude of the second harmonic fringe shift because of improper statistical analysis of the spectral composition of the experimental curves, as well as neglect of a linear drift of zero phase in the initial setup during the measurement. Thus, the total measurements results in [1] were underestimated under the radical of the formula (5) by 400÷1600 times. This has led, after the calculation of the radical (5), to understatement of velocity of "aether wind" 20÷40 times.

And although the new fiber optic technique alters in [1] the exterior of these causes compared with those that I uncovered in works of Michelson and Morley, Miller, Shamir and Fox [2-4, 6], but eventually in [1] as well as in the mentioned earlier works there is revealed the same about 20÷40-fold underestimation of the speed of "aether wind".

2. Experimental fact of reducing effective optical length of the arm of classical Michelson interferometer because of transverse bending of optical fiber

If the length of the orthogonal arms of $L_{2\|}$ and $L_{1\perp}$ of classical Michelson interferometer in gas carriers of light increases, for example, because of transverse branches $L_{2\perp}$ and $L_{1\|}$, as schematically shown in Fig.1, at first glance it seems that such an elongation of the rays will not affect the active length $L_{2\|}$ and $L_{1\perp}$ of the arms and readings of the interferometer. This is a wrong view. It stems from a simplified interpretation of (4) in [1], since the author [1] does not distinguish between anisotropic differences in the speed of light in the orthogonal directions of the fiber (along the arm ${}_{+}L_{\|}$, across the arm $L_{\perp}$ and opposite to the arm ${}_{-}L_{\|}$). Accounting for these differences below in (2-4) shows that the attaching transverse branches $L_{2\perp}$ and $L_{1\|}$ of light to longitudinal sections of $L_{2\|}$ and $L_{1\perp}$, which are main carriers of light, not only not affects, but greatly reduces the effective length of each arm, reducing the sensitivity of the interferometer to detecting the shift of the fringe. I discovered this phenomenon experimentally in interferometers with air as light carriers, whenever using mirrors I had to resort to deflection of the rays perpendicular to the arm of the interferometer [2].

Complete geometrical length of optical paths in orthogonal arms of the interferometer from the bifurcation point of the source beam to the point of its return is denoted L_1 and L_2. Now I will demonstrate that a simple neglect in full lengths L_1 and L_2 of the fiber in the arms of transverse sections $L_{2\perp}$ and $L_{1\|}$ (see Fig.1) is not sufficient for knowing the true effective optical length of the interferometer arms, which participates in the detection of the aether. On Fig.1 section $L_{2\|}$ is oriented along **V**, and section $L_{1\perp}$ across **V**. Denoting the sum of transverse branches of the optical path of beams in these arms, respectively, $L_{1\|}$ and $L_{2\perp}$, by the rules of projective geometry the effective "longitudinal-geometrical" lengths of arms in the scheme of Fig.1 will be determined as follows:

$$L_{2\|geom..} = L_{2\|} = L_2 - L_{2\perp}; \qquad L_{1\perp geom..} = L_{1\perp} = L_1 - L_{1\|}. \tag{1}$$

According to operating principle of the interferometer in Fig.1 the effective "longitudinal-physical" lengths of the interferometer arms, forming the phase difference between beams of orthogonal arms, will be determined in other way:

$$L_{2\|eff.} = L_2 - L_{2\perp} - L_{1\|} = L_{2\|} - L_{1\|}; \qquad L_{1\perp eff.} = L_1 - L_{1\|} - L_{2\perp} = L_{1\perp} - L_{2\perp}. \tag{2}$$

At the same lengths $L_{1\|} = L_{2\perp}$ of transverse branches of optical paths of rays in both interferometer arms, as it constructively happened in [1], from (2) there follows the phenomenon of double reduction of the effective length of the interferometer arms:

$$L_{2\|eff.} = L_2 - 2L_{2\perp}; \qquad L_{1\perp eff.} = L_1 - 2L_{1\|}. \tag{3}$$

This experimental fact found by me is explained in a very simple way: clearly the phase difference $\Delta\varphi_{12}=2\pi\nu\cdot\Delta t_{12}$ is defined in the device by the time difference $\Delta t_{12}=t_1-t_2$ of propagation of light along the orthogonal arms. In this difference with the effective portion $L_{1\perp}$ there competes the geometrically useless (for the role of $L_{2\|}$) portion $L_{2\perp}$ of adjacent arm, reducing the effective value of t_1, and with the effective portion $L_{2\|}$ there competes the geometrically useless (for the role of $L_{1\perp}$) portion $L_{1\|}$ of the first arm, reducing the effective value of t_2. As a result of such competition, the time difference is reduced twice: once geometrically, another occasion – from the electrodynamic competition of phases. When $L_{2\|} = L_{1\|}$ and $L_{1\perp} = L_{2\perp}$ it may happen that the phase difference will drop to zero ($\Delta\varphi_{12}=0$), i.e. effective length of the interferometer arms become equal to zero and it completely loses its sensitivity to the detecting the fringe shift. This experimental fact applies to all types of Michelson interferometers, including those built on fiber optics, as in [1]. For Fig.1 the difference $\Delta t_{12}=t_1-t_2$ has the form:

$$\Delta t_{12} = t_\perp - t_\| = \left[\frac{2L_{1\perp}}{\tilde{c}(V_\perp=0)} + \left(\frac{L_{1\|}}{\tilde{c}_+(+V_\|)} + \frac{L_{1\|}}{\tilde{c}_-(-V_\|)}\right)\right] - \left[\left(\frac{L_{2\|}}{\tilde{c}_+(+V_\|)} + \frac{L_{2\|}}{\tilde{c}_-(-V_\|)}\right) + \frac{2L_{2\perp}}{\tilde{c}(V_\perp=0)}\right], \tag{4}$$

where $\tilde{c}(V_\perp=0)$ is the speed of light across the vector **V**; $\tilde{c}_+(+V_\|)$ is the speed of light along vector **V**; $\tilde{c}_-(-V_\|)$ speed of light opposite to vector **V**.

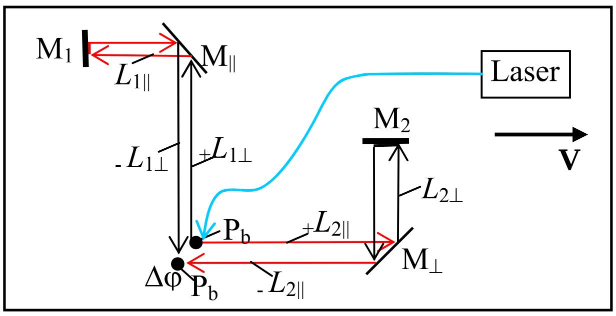

Fig.1. Scheme of arms of Michelson interferometer in which optical paths of light rays have transverse branches ($L_{1\|}$ and $L_{2\perp}$). In the interferometer of [1] branches $L_{1\|}$ and $L_{2\perp}$of general length ~2 m is formed by the sum of ~50 half-loops of the optical fiber in each arm. This is concerned with many-loop winding of 12 m of fiber of each arm on stretched couplers each of diameter 4 cm. P_o is the center of rotation of the installation around vertical axis and point where the ray from light source befurcates into rays $_+L_{2\|}$ and $_+L_{1\perp}$.

Thus, taking for the base the design of the interferometer described in [1], we come to conclusion that out of 2×6=12 m of optical fiber in each arm, 2×2=4 m of fiber is spent at ~100 "orthogonal" half-turns around the glass couplers having diameter 4 cm (2 "orthogonal" half-turns in each loop of optical fiber, forming the arm). The author [1] noticed this purely "geometric" loss of 2 m of optical fiber in each arm, and took it into consideration by the logic of formula (1). In his view, an effective length of the arms was reduced only from 2×6 m to 2×4 m. However, according to formulas (2-4), in each arm of 2×6 m there are lost not 2×2 m of the longitudinal length but by 2 times more, i.e. 2×4 m in each arm are lost. Additionally, 2 m of fiber in each arm are lost due to the fact that all 100 "orthogonal" half-turns of optical fiber appeared to be included in anti-phase with respect to the neighboring orthogonal arm, as shown schematically in Fig.1. The total length of the transverse branches is ~ 2 m. According to (3-4), this length ~2 m is subtracted from the operation of longitudinally acting fiber in each arm. As a result, in each arm in [1] there works but only 2 m of 6 m. Thus, accounting for the largest losses of effective length of the fiber in the interferometer arms in [1] shows a threefold decrease down to L_{eff} = 2 m (of 6 m). But these are not all losses.

In [1], one meter of fiber is used to construct a tunable phase-shifter. After a tight winding of fiber on a cylindrical piezoelectric stricter, the length of each arm is reduced by almost 2×0.5 m. Turns of this kind of "coil" can be placed in space by three orthogonal ways with respect to the axis of its arm. If planes of turns are perpendicular to the axis of the arm, as shown in Fig.1 in [1], then near 2×0.5 m of optical fiber are lost “geometrically” through folding it into a "coil", and 2×0.25 m by account of the competition of orthogonal sections of each transversely arranged half-loop of the "coil" under the law (4). As a result from 2 m of remaining active fiber in [1] 0.75 m in each arm were lost, so that the effective length of each arm becomes $L_{\text{eff.}}$=2–0.75=1.25 m. Thus, from 2×6 m of fiber in each arm only 22% of the fiber are used effectively.

We may suggest the means how to increase at least in 4 times the effective length (L_{eff}) of the arm. 1. To increase the distance between the glass coupler by two or three times (for example, up to 45 cm instead of 15 cm), in order to reduce the number of transverse turns in winding of optical fiber on the glass coupler having diameter 4 cm. 2. To reduce the diameter of these glass coupler from 4 cm to 1÷2 cm. These two modernization out of 12 m of optical fiber will provide the working length in each arm at least ~10 m, i.e. "geometrically" it will be L_{geo}=2×5 m. At the previous horizontal arrangement of glass coupler with a reduced diameter down to 1÷2 cm, at increased size of the optical deck up to ~0.5×0.5 m^2 and at the optimal orientation of loops of piezo-striction phase shifter, out of the above $L_{\text{geo.}}$=5 m the value of $L_{\text{eff.}}$=(5.0–1+0.5)=4.5 m can be implemented. If the axes of the glass couplers of 1÷2 cm in diameter to arrange horizontally one above the other, and winding of fiber on it make in vertical plane, then in (4) terms of $2L_{i\perp}/\tilde{c}\,(V_{\perp}=0)$ will disappear and the value of $L_{\text{eff.}}$=(4.5+0.5) will become ~ 5.0 m.

If the plane of winds of piezo-striction phase-shifter are arranged in parallel to the line of its arm, it will be possible to eliminate competition for another ~2×0.25 m of optical fiber in each arm. In this case, the value $L_{eff.}$=(5+0.25) will be ~ 5.25 m.

As can be seen from Fig.3 of [1], to expend 1 m of optical fiber in order to make the phase-shifter device is clearly redundant. If we restrict themselves by a segment of ~30 cm for the phase-shifter with a range of changes of phase ~(2÷3)π, then one can achieve value of $L_{eff.}$≈(5.25+0.35)=5.4 m. Thus, the effective length of the arms of the interferometer in [1] (L_{eff}=1.25 m) can be increased by 4.2 times. If, however, to accept the inconvenience of large span of the interferometer arms, and to increase their length up to 1 m (i.e. by a factor of 7 as compared to [1]), then L_{eff} will be ~5.7 m. This means that the experimental dependence in Fig.6c of [1], after the above described modernization of construction of the optical system, other things being equal, will increase the span of recorded shift of the fringe not less than by 4 times (at the same level of noise).

It will almost entirely reproduce Demjanov's results on the interferometer of upgraded design with fiber-optic carriers of light and will demonstrate (by another experimenter, other experimental laboratory, on other common equipment in another country, another industrial era etc.) the existence of the anisotropy of the speed of light and reality of its measurement in ordinary terrestrial laboratories. And this is only the beginning of modernization of the experiment [1] in the direction of absolute proof of the positivity of the experiment of Michelson type and observability of the absolute motion of the Earth in an aethereal space at speeds of several hundred km/s by way of simple measurements of the shift of interference fringe in terrestrial laboratories.

3. Correct algorithm for processing results of measurements on the Michelson interferometer with orthogonal arms

The processing of the results of measurements in [1] is wrong. For many years experimental details of measurements on the Michelson type interferometers were hidden in *three* secrets of interpretation of the results: *firstly*, the account of the permittivity (ε) of optical media was missed in the formulas of analysis of measurements (before 1960s). *Secondly*, until the late 20 century it was not recognized that we need no cumulative accounting of the permittivity of optical media in the form of entire values of n and $\varepsilon=n^2$ (as, in particular, is done in formula (4) of [1]), but there is required a "differential account" (Δε=ε–1.) especially allowing for the binary structure $\varepsilon=n^2=1.+\Delta\varepsilon$ of permittivity in the form of contributions of the polarization of the aether (ε_{aether}=1.) and polarization of particles (Δε) of light-carrying medium, as shown by (5). The need of accounting of binary structure ε was discovered by me in the late 1960's, but the respective algorithm of interpretation could be published only in [2-4] when it became possible in my country. This algorithm is still not apprehended constructively [3] and not only in this country.

Thirdly, it is necessary not simply to take into account the permittivity of optical media of carriers of light of interferometer, as it was recognized since the 1960's, but a specification of the dielectric permittivity (ε) of optical medium in the propagation of the beam "there" (ε_+) and "back" (ε_-), which is especially actual in the case of fiber-optic cables, as in [1], and in special designs of interferometers operating at first-order effects requiring the conditions $\varepsilon_-\neq\varepsilon_+$ (such a device was first successfully experimentally tested by me in 1970 [7]).

In order to explain satisfactorily the results of all known measurements in which there was a nonzero harmonic shift of the fringe (of Michelson-Morley, Miller, Shamir and Fox, my measurements in 1968-1974, measurements of Trimmer and others, including the recent measurements of non-zero shifts of fringes in [1]) I got a new formula that reflects all the main features of the interaction of an interferometer with aether. It takes into account as well the refractive index $n^2=\varepsilon$ as integral parameter of the dielectric properties of optical media, and its structure $n^2=1.+\Delta\varepsilon$ which includes the contribution of the polarization only of the aether ($\varepsilon_{aether}=1.$), and its constituent part $\Delta\varepsilon=n^2-1$, related with the exceptional role of the contribution of polarization only of particles into the total dielectric constant $\varepsilon=n^2$:

$$V = c\cdot\sqrt{\frac{A_m\lambda n}{L[\Delta\varepsilon(1-\Delta\varepsilon)]}} \quad . \tag{5}$$

In (5) it is indicated: A_m is the relative amplitude of the harmonic shift of the fringe, expressed in measures of width of the fringe; λ the wavelength of light in vacuum; $L=L_i$ the length of interferometer's arm (for $L_i=L_\perp=L_\|$). It is interesting to note that the refractive index n of optical media, that was used by almost all physicists of the 19-th century before the Maxwell's theory appeared, is by itself not divided into two parts as easy as it became possible to do this in Maxwell's theory: $\varepsilon=1.+\Delta\varepsilon$.

Formula (5) in its derivation requires distinguishing the times of run of the beams in the interferometer arms "there" ($\tilde{c}_+$) and "back" ($\tilde{c}_-$), as is demanded by its operating principle, formulated still by Maxwell (1879) [2-4]. For interpretation of the phase harmonic shift of the interference fringe of the second order, when the first-order effects are almost fully compensated (this is true as well for installation in [1]), there is used the expression of the amplitude $A_m(\Delta t_{12})$ as depending on the measured difference Δt of times delay of light spread in the orthogonal arms. The difference $\Delta t = t_\perp - t_\|$ is formed as follows:

$$t_\| = \frac{L_{2\|}}{\tilde{c}_+(n_+)} + \frac{L_{2\|}}{\tilde{c}_-(n_-)}; \quad t_\perp = \frac{L_{2\perp}}{\tilde{c}_+(+V_\perp=0,\ n_+)} + \frac{L_{2\perp}}{\tilde{c}_-(-V_\perp=0,\ n_-)}; \quad .(6)$$

where $c_\pm = c/n_\pm \pm V(1-n_\pm^{-2}) - V^2 n_\pm(1-n_\pm^{-2})/c$; $n_\pm$ is the refractive index of a light's carrier when the light propagates "there" (n_+) and "back " (n_-). In the classical interferometer the beams in the arms "there" and "back" spread along one and the same way in the light-carrying medium (i.e. $n_+=n_-$) that ensures the absence of harmonic phase shifts of the first order. In the case of fiber waveguides by the scheme of [1] the beams in the arms "there" and "back" spread along different parts of the fiber made from the same material, where for technological reasons and because of the temperature gradients there can be $n_{+}\neq n_{-}$. But the coefficient of temperature variation $\alpha_n = \partial n/\partial T,\ 1/K^o$ in the silica fiber optic media normally does not exceed the value $\alpha_n \leq 10^{-5}\,1/K^o$. After thermostatting the fiber zone of the interferometer with an accuracy of ± 0.1 K° the amplitude of harmonic phase shifts of the first order will not exceed ~0.03 rad.

I do emphasize that only with such an accounting of the run of the beams, the special role of a contribution Δε of the particle polarization into the permittivity ε of the light-carrying media and of the polarization of aether (ε_{aether}=1.) is exposed, not common in the conventional description of the refractive and transmittance properties of optical media. In addition, formula (5) is obtained from (6) immediately, when we use the relativism (by taking into account second-order term V^2/c) Fresnel formula $c_\pm = c/n_\pm \pm V(1-n_\pm^{-2}) - V^2 n_\pm(1-n_\pm^{-2})/c$, as described by me in [4]. If, however, to apply the classical Fresnel formula $c_\pm = c/n_\pm \pm V(1-n_\pm^{-2})$, as I did in my early works [2], then without a special account of relativistic corrections to the effects of the Lorentz contraction, Lorentz time dilation and Lorentz drift of the transverse beam by means of "Lorentz triangle", formula (5) is not obtained from (6) [2, 4]. Efficiency of the formula is retained as well at Δε=1, because in this case simultaneously with the bracket of denominator (Δε–1)=0 the numerator also turns into zero A_m=0. This imparted an important feature to formula (5) – it highlighted for the first time the anomalous behavior of the interferometer (loss of sensitivity to detecting a harmonic shift of the fringe) when optical materials with refractive index n = 1.41 are used as light-carrying media.

4. Distinctive features of functioning the interferometer for values of refractive index in the vicinity of n = 1.41

Fig.2 shows a dispersion frequency dependence of the refractive index $n(\nu)$ for the group of optical silica materials, of which, in particular, the fiber optic cables are manufactured. As can be seen from it, the work of fiber in the region of n=1.46 falls on the center of the visible light spectrum. Multiplier $\Delta\varepsilon(1-\Delta\varepsilon)$ of the denominator of formula (5) for n=1.46 is ~0.14. Experiments that I carried out with light-carriers made of fused silica and water have shown that there is a tendency for the multiplier $\Delta\varepsilon(1-\Delta\varepsilon)$ in the denominator of formula (5) to pass through zero not exactly at $\Delta\varepsilon_o = 1$, but in the range of values $1.03 < \Delta\varepsilon_o < 1.05$. I suppose this shift is the consequence of losses in light-carrying optical medium.

If we will consider this effect for the fiber taking the minimum value of Δε zeroing the denominator (5), $\Delta\varepsilon_o$ =1.03, then multiplier in the denominator (5) can be presented as $\Delta\varepsilon(1.03-\Delta\varepsilon)$ and in this case at n=1.46 its value will not be ~0.14 as for $\Delta\varepsilon(1-\Delta\varepsilon)$, but ~ 0.11 as for $\Delta\varepsilon(1.03-\Delta\varepsilon)$. Thus, the error from an incorrect account of the contribution of polarization of particles into the dielectric permittivity of the core of the waveguide may understate the speed of aether wind by the wrong formula in [1] (at page 1007 of [1]) 8÷9 times in comparison with the correct formula (5). My Fig.2 shows how easy it is to fail constructing a Michelson interferometer with carriers of light the refractive index of which lies near the region of n=1.41, as it was made for n=1.49 in [5] in 1968 and for n=1.46 in [1] in 2009. In both works non-zero shifts of interference fringes were obtained. However, they were processed under the assumption of absence of the anomalous loss of sensitivity of the interferometer near $n\approx1.41$. Together with the other faults in the processing and interpretation of generally positive results of the experiments the ignorance of the phenomenon of loss by the interferometer of sensitivity at $n\approx1.41$ led the authors [1, 5] to erroneous estimates of the speed of "aether wind" (6 km/s [5] and 7 km/s [1]).

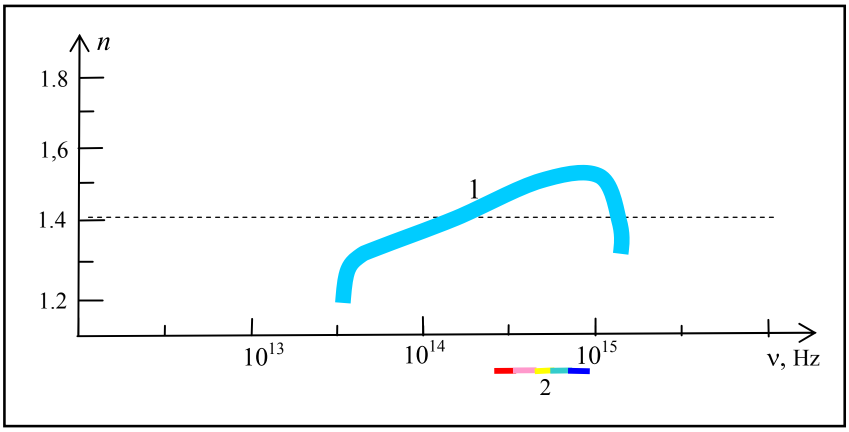

Fig.2. Frequency dependence of the refractive index $n(\nu)$ (curve 1) of a silica composition similar to that commonly used in fiber optic cables; 2 is the range of visible part of the observation spectrum.

In [6] I have shown that the results of measuring a non-zero shift of interference fringe are interpreted in [5] incorrectly. With a due accounting of all the current circumstances of experiment [5], the estimation of the speed of the Earth in an aethereal space gives ~400 km/s. I accentuate that it is not 6 km/s, as stated by the authors [5], but ~400 km/s. Below I will show that the proper analysis of a non-zero shift of interference fringes detected in [1] gives not 7 km/s, as stated by the author [1], but about ~200÷300 km/s. All the discrepancies of my final estimations made on the same measured in [5] and [1] values of harmonic shifts of interference fringe come from their different interpretations by me and the authors [5] and [1]. Experiments made by me and them show one and the same thing – the invariably observed shift of the interference fringe in the interferometers is related with the presence in a terrestrial laboratory of the aether wind having the speed of several hundred km/s.

Certainly, if to admit values of 6 km/s and 7 km/s of [5] and [1], 6 km/s of Michelson and Morley (1887), 3÷12 km/s of Miller (1926) as true, then it would be rightful to attribute all them to "random errors", to "noise", to other phenomena which have no relation to the absolute speed of the Earth in aether space which is of the order hundreds km/s. But the point is that all these values are by mistake underestimated by ~40 times [2-4]. After a recalculation of experimental data of all above mentioned works we will obtain a speed not 3 ÷ 12 km/s, but ~120÷480 km/s, that agree with my results 140÷480 km/s [2-4] obtained on the basis of new interpretation of my measurements by the formula (5). Such speeds cannot already be considered as "random errors" or "noise" since they agree with independent astronomical observations according to which there are almost for 100 years detected speeds ~300÷500 km/s of motion of the Earth with respect to stars and relic background radiation of the Universe.

I draw attention to Fig.2 from which there directly follow relevant recommendations: the choice of frequency of the laser closer to red edge of visible range of light will lead to full loss of sensitivity of interferometer operated on optical fibers, and the choice of laser frequency of green or dark blue color will noticeably raise the sensitivity of this interferometer. This is verified by me experimentally on water and plexiglass [2, 4]. The one who will check up this recommendation experimentally, will be convinced of validity of formula (5) obtained by me.

5. The measured value of fringe shift according to Fig.6c of [1]

Even working with an interferometer on optical fibers with quadruply missed capability of effectively using the arm's length (instead of a potential opportunity to have $L_{эфф}$=5.4 m in [1] there is used $L_{эфф}$=1.25), the author [1] has obtained obviously a nonzero amplitude of phase shift $\Delta\varphi_m$ from effects of second order by υ/c. The magnitude $\Delta\varphi_m$ according to his data can be read from two figures in [1]. By Fig.6c found by "fast" laboratory rotation of the interferometer (~$^1/_{20}$ rpm) the amplitude $\Delta\varphi_m$ of harmonious shift of a fringe (double frequency relative to the period of rotation of the device) is approximately estimated not less than $\Delta\varphi_{m2}$~0.2 rad.

In the course of rotation of the interferometer together with the Earth (the device being at rest in the laboratory) with a speed $^1/_{24}$ rev/h from Fig.5b it can be seen against the background of linear "drift of zero" the amplitude of harmonic shift of fringe $\Delta\varphi_{m2}$~0.5 rad. With phase width of the interference fringe $\varphi_o=\pi=3.14$ rad, the relative amplitude of harmonic shift of the interference fringe in the experiment shown in Fig.6c of [1] by the above estimations is obtained as $A_{m2}=\Delta\varphi_{m2}/\varphi_o\approx0.07$, and according to Fig.5b it is $A_m\approx0.15$, i.e. not less than an order of magnitude greater than the value declared by the author [1]. In section 8 I shall provide by means of spectral analysis a more rigorous substantiation of 10-fold higher values of the amplitudes of harmonic shift of the fringe A_{m2} obtained in [1]. Above I gave an assessment of the small role of the amplitude A_{m1} of harmonic shift of the fringe from first-order effects ($A_{m1} << A_{m2}$), as a consequence of thermostatting the zones of location of optical fiber with an accuracy of ±0.1 K^o, yielding an approximate equality of the refractive indices of "there" and "back" ($n_{+} \approx n_{-}$, up to seven decimal places).

Fulfillment of the above described measures and recommendations of increasing the effective length of interferometer arms with optical fibers should even more increase relative amplitudes of shift of the interference fringe in the mentioned measurements (by 4.2 times). Such a large shift of the fringe (from A_m=0.5 to 0.8 of width of the fringe) considerably increases the resolving force of the device for effects of the second order, that will give more accurate magnitude of A_{m2} against a lower background of any other noises and disturbances.

6. The problem of uncertainty introduced by regular linear "drift of zero" of the fringe of fiber-optical interferometer in [1]

One of the features of the Michelson type interferometer with orthogonal beams of propagation of light from the center of their bifurcation on a translucent plate of the primary light mono-beam of the source is a "linear drift of zero" proportional to the angle of rotation of the interferometer. It was noticed even in experiments of Michelson and Morley and, at even greater degree, in Miller's experiments, and was invariable attributed by these authors to "the phenomena of the unknown nature". Constructed by the author [1] interferometer with optical fibers in orthogonal arms had (according to Fig.5b from [1]) a "drift of zero" of the bandwidth (width of the fringe) per 1 hour. Among all cases known to me including my own experience [2-4], such a "linear drift of zero" has appeared to be the greatest. The author [1] recognizes it too as an "effect of the unknown nature".

Historically there developed a confidence to the practice offered by Michelson to subtract from the registered total angular dependence of displacement of the interference fringe the angular dependence of the "drift of zero" and to accept obtained difference angular harmonic dependence as a sought for regularity of shift of the interference fringe. In my experiments I have substantially clarified the mechanism of arising of the "drift of zero" connected with the angle of rotation of the interferometer in a horizontal plane. In [2] and [4] I showed that the angular dependence of the "drift of zero" is linear and irreversible, and in this respect it is not similar to nonlinear hysteresis phenomena accompanying the change of state of a system. That is why proposed by Michelson the method of subtracting the angular dependence of the "drift of zero" from the total angular dependence of the fringe shift, has proved a very effective tool.

Angular dependence of the "drift of zero" (i.e. of the drift of initial position of the interference pattern) is connected with turnabout of arms of the interferometer relative to the vector of its speed in aether. If interferometer is installed in a laboratory horizontally and it is motionless, his rotation occurs at a rate of $^1/_{24}$ rev/h (such case is presented in Fig.5b of [1]), but if the interferometer is deliberately turned around vertical axis in the laboratory, the rate of rotation is set by a researcher. In [2] and [4] I have shown, that the angular dependence of the "drift of zero" of the fringe is, on the one hand, proportional to:

– angular speed (frequency F, rev/s, Hz) of interferometer rotations about vertical axis;

– full length of the beam in the arm ("there" and "back", $2L$);

– distance (r_{bs}) between a point of bifurcation ($_b$) of the primary beam, coming from a source, into two orthogonal beams and a point of summing (s) of these two beams returned for the interference;

and, on the other hand, the "drift of zero" is inversely proportional to:

– speed of light in light-carrying media ($\tilde{c}=c/n$) used in the interferometer;

– wave-length of light in vacuum, λ.

On the basis of these empirical data I have constructed a mathematical model of the angular relative "drift of zero" of the interferometer's fringe (which is measured in measures of A_d relative to the width of the fringe) in the following form which rather well describes regularities of the "drift of zero" observable in experiments (in the case of a uniform rotation of the deck at $\Delta\theta=90^0$):

$$A_d = \frac{2\pi F\, L_\Sigma\, r_{bs}\, n}{\lambda\, c}\ . \qquad (7)$$

In (7) the designations are used: $F=1/T$ is the frequency of interferometer rotation (Hz, rev/s) with the period T; n a parameter of refraction of the optical medium; L_Σ full length of the optical path "there "and" back" (in m); r_{bs} (in m) distance between the point of bifurcation ($_b$) of the primary beam, coming from a source, into two orthogonal beams and the point of summation ($_s$) of these two beams after returning to the interference unit; λ length of the wave in vacuum (m); c/n speed of light in the optical media (km/s). Formula (7) is applicable as well to interferometer with fiber-optical carriers of light.

As we can see from (7), a principal cause producing the "drift of zero" (recession of an initial phase during rotation of the interferometer) is that the position of the point of bifurcation (b) of the light beam and the point of summation (s) of these two beams on interference unit do not coincide with each other, i.e. $r_{bs}\neq0$. Meeting the condition $r_{bs}=0$ allows to lower the "drift of zero" sharply. By Fig.1 from [1], the value r_{bs} was of the order 4÷6 cm. It was not controllable, i.e. in a sense, it was casual. Having substituted it and other parameters of the device into (7) it is easy to see why in experiments [1] there took place such a great "drift of zero". It became, apparently, a main cause, why the author [1] has been compelled to choose a very small speed ($T\approx20$ min.) of rotation of optical deck of the interferometer. Supposedly at the speed $F\sim1$ prm ($T=1$ min) he obtained such a large "drift of zero" that it could not be possible (I know about this phenomenon from my experience [2-4]) to measure the harmonic shift of the fringe. Changing the mode of rotation to small speeds ($F\sim{}^1/_{20}$ prm) not only reduces the productivity of researches, but also revives all the spectrum of slow instabilities of the installation (of the type of a flicker-noise), in which many sought for characteristics of the harmonic shift of the phase difference of the interferometer are drowned (I shall prove it strictly in section 8).

Thus, the basic recommendation to the author [1] concerning the elimination of the enormous "drift of zero" consists in a device reconstructing under condition r_{bs} =0. For this purpose it is necessary to study closely designs of devices of bifurcator of beams and their mixer. It is necessary to find, first of all, the locations of microcircuits (of the size 1÷2 cm^2) of a branching and mixing of the rays of light working with 2 pairs of waveguides and to place them one above the other at the intersection with the axis of rotation of the device in order that this axis passed through points of branching of beams in the bifurcator and mixing of beams in the summator. At this stage it is possible to expect a decrease of the magnitude of r_{bs} down to 1÷3 mm. Further decrease of the "drift of zero" can be achieved by empirical optimization of the position of the zones (points) of bifurcation and mixing of beams in one of a close to already described position by the minimum of the "drift of zero". Having lowered the "drift of zero" by ten times it will be possible to increase the speed of rotation of the interferometer up to 1 rpm and to raise not only the productivity of experiments (that is very important, I know by myself), but also to lower substantially the noises and disturbances from slow processes of nonstationarity of many elements of the installation which are seen in the results [1].

7. What magnitude of the absolute speed of Earth's motion in aether should be properly deduced out of the harmonic shift of the fringe shown in Fig.6c of [1]?

From Fig.6c of [1] I see the absolute amplitude of harmonic shift of the interference fringe not less than $\Delta\varphi_m \approx 0.2$ rad. At width of the fringe φ_o=3.14, we obtain for formula (5) the relative amplitude of fringe's shift $A_m = \Delta\varphi_m/\varphi_o \approx 0.07$. The effective length of interferometer's arms, as I have shown above, should be taken $L_{eff.}$= $L = L_\perp = L_\parallel$=1.25 m. For the value n=1.46 and for the case of passage through zero of the function $\Delta\varepsilon_o(1-\Delta\varepsilon_o)$ at $\Delta\varepsilon_o \approx 1 \div 1.03$ (with allowance for losses to a minimum), as I described above, the value lies in the range of 0.14÷0.11. Substituting these values into (5), we obtain $V \approx 185 \div 210$ km/s. If we take the value $A_{m2} \approx 0.2$ out of Fig.5b [1], we obtain $V \approx 280 \div 315$ km/s (this difference may be associated with different times of day or night of shooting of the data in Fig.5b and 6c of [1]). Insofar as we don't know a time of day or night when the above mentioned experimental measurements of relative amplitudes of shift of the interference fringe were made, the estimations obtained are well fit to the established by me [3-5] interval (V≈140÷480 km/s) of variation of values of horizontal projection of vector of the absolute velocity of the Earth in the space of stationary aether in the course of 24-hour of measurements at day and night.

Thus, the measurements on the Michelson type interferometer with fiber-optical waveguides, under adequate, from my point of view, interpretation stated above, detect for that time of day and night, when in an ordinary laboratory of the author [1] were carried out observations equipped with standard optical and electronic facilities, the speed of the Earth's motion in aether space $V \approx 200$ km/s, but not $V \approx 7$ km/s, as claimed in [1].

8. Surprises of statistical processing of experimental dependences of interference fringe shift measured by method of rotation of interferometer about vertical axis in horizontal plane of terrestrial laboratory

A solution for the difference of phases $\Delta\varphi = 2\pi\nu\Delta t$, defining the shift of interference fringe in the Michelson device, obtained from (6) in the assumption of harmonic rotation (with angular speed $\Omega = \partial\theta / \partial t$ and rotation period $T = 2\pi / \Omega$) of the interferometer around vertical axis, in pure form looks as [2-4]:

$$\Delta\varphi(\theta) = \varphi_0 + a_{1(\varepsilon_+ - \varepsilon_-)} \cdot \cos(\theta) + a_{2(\Delta\varepsilon - \Delta\varepsilon^2)} \cdot \cos(2\theta)... , \qquad (8)$$

where $a_{1(\varepsilon_+ - \varepsilon_-)}$ and $a_{2(\Delta\varepsilon - \Delta\varepsilon^2)}$ are amplitudes of the first and second harmonics of the observable difference of phases between light signals of orthogonal arms of the interferometer. In mathematical model (8) the amplitude of first harmonic depends only on the difference of magnitudes of dielectric permittivity of light-carrying medium in propagation of light "there" (ε_+) and "back" (ε_-) [2, 4]. It is obvious, that in the classical Michelson interferometer the run of beams "there" and "back" occurs along one and the same path in the same medium, therefore in it $\varepsilon_+ = \varepsilon_-$ and, hence, $a_{1(\varepsilon_+ - \varepsilon_-)} = 0$. As to the amplitude of second harmonic $a_{2(\Delta\varepsilon - \Delta\varepsilon^2)}$ it depends mainly on the average contribution of polarization of particles $\Delta\varepsilon$ in full dielectric permittivity $\varepsilon = 1.+\Delta\varepsilon$ of optical medium of the waveguide, and this dependence is nonlinear: $\Delta\varepsilon - \Delta\varepsilon^2$ [2, 3].

The form of time dependence of the rotation angle $\theta(t)$ of the device defines the experimental time dependence of phase difference $\Delta\varphi(t)$ obtained. One of such dependences is the curve $\Delta\varphi(t)$ presented in Fig.6c of [1] in the form of 49 experimental points at a double period ($2T$=36 min) of rotation of the device around of vertical axis. We may see that a real experimental dependence substantially differs from the ideal mathematical model (8) in which $a_{1(\varepsilon_+ - \varepsilon_-)} = 0$. The real experimental dependence $\Delta\varphi(t)$ in Fig.6c from [1] is in general "burdened" by the presence of nonzero values of the amplitude of first harmonic $a_{1(\varepsilon_+ - \varepsilon_-)} \neq 0$ and occurrence of the linear "drift of zero" of phase $a_o\theta(t)$ which, since times of Michelson and Miller, is considered as a phenomenon of unknown origin. From the cumulative Fig.9 in [1] it can be seen, that in hundreds other experiments, each of which is represented in it by a single point, there manifest themselves in various ways a lot of stochastic and noise causes of changing the phase difference originated from tens of "secondary" manipulations with rotation of the optical deck. Therefore, the angular dependence of the measured difference of phases $\Delta\varphi[\theta(t)]$ and, accordingly, its temporal dependence, in view of the chosen law of uniform rotation of the interferometer around vertical axis $\theta(t)$, can be quite reasonably represented by the series:

$$\Delta\varphi(\theta) = \varphi_0 + a_o\theta + a_1\cos(\theta+\theta_1) + a_2\cos(2\theta+\theta_2) + ... \quad . \qquad (9)$$

With the aid of (9), the author [1] in his own way (assuming $\varphi_o + a_o\theta \approx \varphi_{med.} = \text{const}$) carried out the statistical analysis of harmonic structure of various changes $\Delta\varphi[\theta(t)]$. Take notice that the neglect of only the "drift of zero" phase $a_o\theta$, as was the practice in [1], gives such a large approximation error of the experimental curve capable to drown out the sought for amplitude of harmonic a_2. What errors there have led to the refusal by the author [1] 1) of the uniform rotation of interferometer around vertical axis and 2) of the accounting by (9) of the "drift of zero" I will show below.

The period $T = 2\pi/\Omega$ of rotation of interferometer was chosen by the author [1] as T=18 min (with a duration of each measurement 36 min). The analysis of experiments led the author [1] to conclusion, that the second harmonic lays in the interval of values 0<a_2<0.06 rad, with the average value $\tilde{a}_2$=0.01 (see Fig.7a in [1]), i.e. so small that the amplitude of difference of phases calculated from these values $\Delta\varphi_m$ gives the absolute speed of terrestrial laboratory lying in the interval of values 0<V<7 km/s with the average value $\tilde{V}\approx$2 km/s.

The author [1] comes to conclusion that in terrestrial laboratory absolute motion in his experiments is not observable. Below I describe the "fine" spectral analysis of experiments [1] by means of the series (9). My analysis, whose results are presented in Fig.3, shows the opposite. It is found out that the author [1], using a modernized (with fiber-optical waveguides) Michelson type interferometer, has measured a positive (not negative) set of data concerning phase shifts of the interference fringe. From it there directly follows the absolute speed of the Earth as hundreds km/s. Possibly my analysis will be useful to experimenters trying their hands in measurements of the speed of absolute motion by means of a Michelson type interferometer based on optical fiber.

Shown in Fig.6c of [1] m dependence $\Delta\varphi_m(t)$, consisting of 49 experimental points uniformly covering with intervals about 45 seconds the time span $2T_1$=36 min, is taken as the basis of the spectral analysis. The operation practice of the measurements has been as follows: 1) rotation of the optical deck about vertical axis by 15^0 (likely, in 1÷3 sec); 2) measuring the phase difference $\Delta\varphi$ arisen by means of an electro-stricter phase shifter (during 40÷45 sec); 3) next turning of the optical deck around vertical axis up to 30^0, and so on by the scheme of rotations described in [1] which cover the range of rotations of 720^0. From the form of the dependence thus formed it can be seen, that in the first 20 min of such interrupt-stepwise rotation of the interferometer, a cyclic process with the period about T_2~9 min and swing $2\Delta\varphi_m$ ≈0.5÷0.7 rad clearly manifests itself (with amplitude $\Delta\varphi_m$ ≈0.25÷0.35 rad). This cyclic process indicates the existence in the spectrum of the experimental dependence $\Delta\varphi_m(t)$ in Fig.6c of [1] of the second harmonics of the period of rotation of the interferometer T~18 min.

Gradual fading of this cyclic process during next 20 minutes is less obvious from Fig.6c of [1]. However, up to 30-th min this process with the period T_2~9 min is visible. After t>30 minutes down to 49-th experimental point (at t=36 min) the cyclic process with the period T_2~9 minutes is so clogged by the irregular rotation jumps of the device, that it became less noticeable. This qualitative description of experimental observations from Fig.6c of [1] is more consistently presented in Fig.3 with my results of its spectral analysis by means of mathematical model (9).

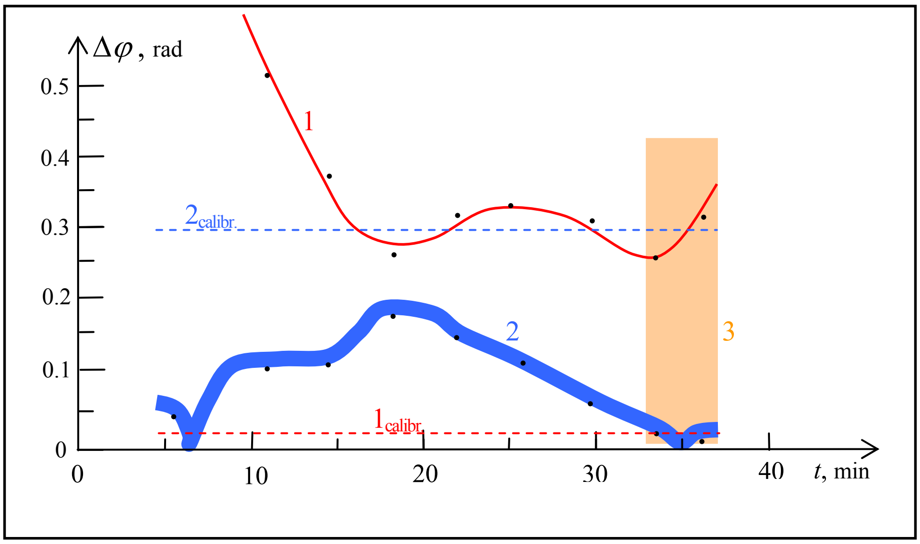

Fig.3. Statistical discernability of amplitudes of harmonics of the first (1) and second (2) orders in the harmonic analysis by means of mathematical model (9) of experimental dependence of the difference of phases $\Delta\varphi$, (in Fig.6c from [1]), measured during 2 periods ($2T_1$) of rotation of the interferometer about vertical axis (T_1~18 mines) as depending on the number of experimental points included in the analysis from the start of the interferometer rotation; 3 is the zone of values of amplitudes of first and second harmonics of the difference of phases $\Delta\varphi$ obtained in the harmonic analysis of the all 46-49 experimental points of the dependence in Fig.6c of [1]; 1_{calibr} and 2_{calibr} is a calibration calculation-analysis.

In Fig.3 results of two spectral analyses are shown. The first is a model test (lines 1_{calibr} and 2_{calibr}), and the second one (curves 1 and 2) was made for real experimental dependence $\Delta\varphi[\theta(t)]$, taken from Fig.6c of [1]. For the model-test spectral analysis in (9) there are chosen $\tilde{a}_2$=0.3 rad and $\tilde{a}_1$=0.02 rad (other parameters: φ_0, a_o, θ_1, θ_2 can be optional, but constant, since results of spectral analysis of first and second harmonics are almost independent on their magnitude). At constant parameters φ_0, a_o, θ_1, θ_2 this ideal model is the sum of two cos-harmonics with periods T_1=18 minutes and T_2=9 minutes operating in the absence of disturbances and noises. We take 49 discrete values of function (9) through equal intervals along the axis of time during 0≤t≤36 minutes with the specified above parameters φ_0, a_o, a_1, a_2, θ_1, θ_2 of the model dependence $\Delta\varphi[\theta(t)]$.

The purpose of the model spectral analysis of such a known model curve consisting of linear sum of the "drift of zero" and first two harmonics without disturbances and noises is to illustrate the independence of the result of spectral analysis on the number of "model" discrete values of function $\Delta\varphi[\theta(t)]$ chosen for the analysis. Results are presented in Fig.3 by lines 1_{calibr} and 2_{calibr}. It is obvious, that amplitudes of the first ($\tilde{a}_1$=0.02 rad.) and second ($\tilde{a}_2$=0.3 rad.) harmonics of model function $\Delta\varphi[\theta(t)]$ in form (9) are restored equally well from any discrete set of points of this function. In Fig.3 lines $1_{calibr.}$ and $2_{calibr.}$ are recovered on 9 sets which correspond to separate parts of model function $\Delta\varphi[\theta(t)]$ with number of points: 8, 16, 20, 25, 30, 35, 40, 46, 49 items.

Let us apply the same technique of spectral analysis to the non-ideal experimental dependence shown in Fig.6c of [1], which is clear beforehand to be cluttered up by disturbances and noises introduced by the experimenter himself. Indeed, he rotates the interferometer about vertical axis not uniformly, but irregularly-impulsively. With the period (T=18 min) of full revolution of the interferometer (by 360^0) the author [1] commits 24 impulsive rotations of the horizontal optical deck by 15^0. At every turn by 15^0 he probably spends 1÷3 seconds, and then for 44 ÷ 42 seconds keeps the optical deck in a stationary state in order to measure the resulting phase difference (Δφ). In fact, the author [1] had to deal not with the mathematical model (9) of a smooth function $\Delta\varphi[\theta(t)]$ of uniformly rotating interferometer, but with a much more complex combination of the sum of 24 fragments of transient changes in the function $\Delta\varphi_i[\theta_i(t) = \text{var}]$ when turning the device by 15^0 for 1 ÷ 3 seconds separated by 24 pulses of relatively stationary values $\Delta\varphi_{i+1}[\theta_{i+1}(t) = const_{i+1}]$ of longer (44÷42 sec) measurement periods of a new current value $\Delta\varphi_{i+1}[\theta_{i+1}(t)]$.

Results of this spectral analysis are presented in Fig.3 by curves $\Delta\varphi[\theta(t)]$. From the run of these curves it is obvious that discrete sets of experimental points in the beginning of a round of measurements of instant values of the difference of phases (these are sets of: 8, 16, 20 and 25 experimental points, i.e. from 6-th to 18-th minute of the shooting) gradually, with growth of number of points from 8 up to 25, increase the "statistical discernability" of second harmonic from zero up to a level $\tilde{a}_2$≈0.2 rad, with simultaneous reduction of fictitiously high level of amplitude of the first harmonic (while a first harmonic with the period 18 min in the device described in [1] cannot occur at temperature stable within the range 0.1 C^0). The further increase in number of discrete values of experimental dependence $\Delta\varphi(t)$ from 25 to 49 points gradually reduces to zero the "statistical discernability" the second harmonic. In the second period of the rotation cycle of the interferometer the values obtained of the second harmonic amplitude decrease from $\tilde{a}_2$≈0.2 rad down almost to zero ($\tilde{a}_2$≈0.001

rad), and with inclusion in the calculation from 46 to 49 points become zero, see curve 2 in Fig.3.

Thus, having chosen period Δτ of a round of measurement of time dependence of the difference of phases $\Delta\varphi(t)$ equal to ~40 min i.e. approximately equal to two periods of rotation of the interferometer $\Delta\tau=2T$, the author [1] has obviously underestimated a destructive role of flicker-noises and disturbances arising in adopted by him the incremental technique of rotation of the device about vertical axis. If to achieve continuity, uniformity and automation of recording the ratio of signals of difference and summary channels by the model $\Delta\varphi(\theta)=\arccos[(I_\perp-I_\parallel)/(I_\perp+I_\parallel)]$, it is possible to lower the time of continuous and uniform recording of the first period of experimental dependence $\Delta\varphi(t)$ down to 1÷3 min. In this event the signal to noise ratio grows automatically up to 10 ÷ 20 (due to the elimination of irregular interruptions of rotation of the optical deck). Taking the steps for increasing the efficiency of the device with fiber-optical carriers of light offered above will ensure a full success of obtaining correct results, in which cumulative (with disturbances) harmonic shift of the interferometer's fringe will by 90÷95 % consist of the shift of second order (i.e. of second harmonic).

9. About temperature stability of work of Michelson type interferometers

In [1] referring to R.Cahill [8] there are reported data concerning a fantastic sensitivity of the interferometer with fiber-optical waveguides to changes of temperature of the air allegedly reaching 130 rad/deg. The suspicion of a big temperature instability of the interferometer operating on fiber-optical waveguides [1] is based on the measured harmonic variation of temperature of air near the optical fiber of the device (see Fig.4a in [1]) with the amplitude 0.02°C and period 6 h. Together with this dependence, a harmonic phase shift with amplitude ~1 rad is observed occurring on a background of linear "drift of zero" of the phase with speed ~3 rad/h. The author [1] correctly writes that the reason of such nonstationarity of temperatures and phases of the device is not known. Yet, nobody proved, that harmonic phase shifts with the period 6 h relate somehow with harmonic variations of the air temperature near the waveguide of the device with the period 6 h. My experience says in favor of absence of such ($\Delta T \rightarrow \Delta\varphi$) a causal relation.

Be the dependence of phase of the device on temperature so great as reported in [1] and works by Cahill it would be impossible to resolve amplitudes of shift of ~0.01 of the width of the fringe, which are presented in [1], by measuring with Michelson interferometer. I will refer to the data of my own experience. The variation of temperature ±10°C in a laboratory (Obninsk) did not disturb the work of interferometers with 7-meter air optical carriers of light giving resolution of shifts of the fringe δA_m~0.01÷0.008. There was stable as well the work of interferometers with water and glass carriers of light in the interval ±5°C. The only visible influence on work of interferometers with 7-meter air carriers of light was exerted by slowly varying humidity of air (because of open windows in wet weather), but at rotation of interferometer with angular speed ~0.5 rpm it also did not virtually affect on errors of measuring A_m.

It should be acknowledged that conditions of functioning a Terrestrial laboratory are so that in all media there may arouse harmonic variations of temperature with amplitude ~0.01÷0.02 K^o and period of 6 h. The same reasons seems to cause simultaneously and independently a variation of geometrical and electrodynamic parameters of interferometers with the same periodicity. This phenomenon there was noticed as early as in the measurements by Miller. From my observations I suppose that this is an effect of lunar cycles, but some additional investigations are needed which have no relation to the current research for the following reason. Since these phenomena are very slow, the most effective way of decreasing their influence on the accuracy of measurement of the interference fringe shift by means of a rotary interferometer with orthogonal arms is the choice of as small as possible period T of interferometer rotation. The choice of period T<<6 h of shooting of cyclic changes of the phases difference, by 100÷300 times smaller than mentioned above the 6-hour period of the unknown origin, perturbing phase-metric measurements, enables us to reduce by the same number of times the influence of this period on the accuracy of measurement of the phases difference. It is this way by which I could achieve the positivity of results of measurements of the speed of "aether wind" (that has the value 140÷480 km/s depending on the time of day or night, see in [4] Fig.2) by means of a rotary Michelson type interferometer with orthogonal arms.

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