Michelson-type interferometer operating at effects of first order with respect to υ/c

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More than hundred years the opinion persists that Michelson interferometer can not detect aether wind by effects of first order with respect to the ratio υ/c. Below there will be shown that the degenerations of the interferometer's sensitivity to effects of first order can be lifted changing the traditional configurations of the device. My experiment demonstrated that a two-media device operating at effects of first order can reliably measure the shift of the interference fringe (and thus the speed of "aether wind"), and much more successfully than by Michelson interferometer operating at effects of second order. Unlike in the traditional approach, in the interferometer of first order light rays (after splitting at half-transparent plate) propagate in both orthogonal arms to rebounding mirrors in a one optical medium (with the dielectric permittivity ε_1), and return after reflection to a plate re-uniting them for interference via another medium (with the dielectric permittivity ε_2). The shift of interference fringe is reliably registered (in rotation of the interferometer by 90^o) even at gas light carrying pairs with arm's length up to 1 m. With this the fringe shift appears to be proportional to υ/c and difference $\varepsilon_1-\varepsilon_2$.

The experimental findings have been interpreted basing on classical scheme of ray optics by two methods: 1) with the Fresnel model of dragging light by moving optical medium neglecting terms quadratic in υ/c (including the Lorentz contraction of the longitudinal to $\mathbf{v}$ arm as quadratic with respect to υ/c), 2) with the classical theory of the frequency dispersion of moving dielectric media, supplemented by the accounting classical and relativistic Doppler effects describing translatory motion (with velocity $\mathbf{v}$) of particles of interferometer light carriers in aether. From observations of the fringe shift on the interferometer of first order with respect to υ/c there was found (at the latitude of Obninsk) the change of the horizontal projection of the Earth's velocity relative to luminiferous aether in the bounds 140<υ<480 km/s depending on the local time of the day and night.

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1. Two variants of "aether wind" detector differing in the order of υ/c

As is known [1, 2], the shift of interference fringe in vacuumed light carrying spans of rays in Michelson interferometer is absent. Michelson interferometer becomes sensitive to "aether wind" only when we use in it as a light carrier an optical medium with refractive index $n>1$ [1, 2]. Thus, neither the Michelson interferometer with vacuumed light spans (as a measuring instrument), nor Michelson formulas for processing measurements of the shift of interference fringe, not taking into account real dielectric properties of light carriers (as interpretation means) are not suitable for detecting "aether wind ". If the light runs in interferometer arms to and fro always in one and the same medium, the shift of interference fringe ΔX_m turns out to be proportional the quadrate of the interferometer velocity relative to aether: $\Delta X_m \sim (\upsilon/c)^2$, where $\upsilon \ll c$. Here the accounting for the Lorentz contraction of the longitudinal arm of the interferometer is important in principle.

Below there are discussed results of the experiment on the Michelson interferometer having such configuration that the light in both arms of the device goes successively via two different optical media – there in one (with permittivity ε_1), and back in other (with the permittivity ε_2). In this case the total shift of the fringe appears to be proportional both to υ/c and υ^2/c^2, where $\upsilon << c$. Since $\upsilon/c>\upsilon^2/c^2$~1000 times, the two-media interferometer is more sensitive to "aether wind" than the single-medium one. The device of the first order has much greater ratio signal/noise. This is firstly because there are separated in space the inlet of rays in the first medium and their exit to the interference screen 1 (as is shown in Fig.1) out of the second medium, that essentially reduces parasitic interference noise of the setup comparing with the interferometer of the 2-nd order, where inlet and outlet of rays coincide (the detailed account is given in [3]). Secondly, the noise of the interferometer of the first order is lesser in so much as the length of the optical flight of rays is shorter (practically 10÷100 times).

2. Two-media detector of "aether wind"

Two-media device is in many aspect similar to traditional rotary crosswise interferometer (see Fig.1); its resolving power in the registering the shift of interference fringe is directly proportional, firstly, to the first degree of the ration υ/c, secondly, to the difference $\varepsilon_1 - \varepsilon_2$ of dielectric permittivities of the selected pair of optical media for carrying over the rays in each arm "to" and "fro". In this unit the light also splits by the half-transparent plate in two orthogonal rays. Then each ray goes in each arm to its own mirror via the optical medium with the dielectric pemittivity ε_1, and returns in other way, parallel to the first path, in optical medium with the dielectric permittivity ε_2. These media are separated in space by a small displacement of tubes (of light flayback in the medium ε_2 over the ray of the forward fly in the medium ε_1). The spatial separation of rays is attained by the aid of two pairs of mirrors, mounted one over other (in Fig.1 this displacement is shown symbolically in the horizontal plane). In the result, returned longitudinal and transverse (with respect to $\mathbf{v}$) rays meet in the displaced point at other half-transparent plate, installed parallel over first one (under the same angle 45° rays). It is very important to connect rigidly both half-transparent plates (the one splitting the ray of the source in two orthogonal rays and the plate brought together two orthogonal rays into one interfering beam) with the rotation axis of the interferometer, that should be strongly perpendicular to rotation planes of direct and return rays of the device. The rays of orthogonal planes thus brought together meet at the interference screen 1 (by Fig.1), and interfere. The interference pattern from the screen 1 is projected by the telescopic objective 2 on the screen of vidicon 3 and transmitted with the aid of TV-set on the stationary screen of the kinescope 7, and we see it as the pattern 8.

3. Calculation of the speed of aether wind by the measured shift of the interference fringe

The shift of interference fringe is proportional to the difference $\Delta t = t_\perp - t_\parallel$ of times $t_\perp$ and $t_\parallel$ of propagation of rays in orthogonal arms of the interferometer to and fro in accord with formula [2]:

$$\Delta X_m = cX_o \Delta t / \lambda \ , \tag{1}$$

where X_o is the width of the interference fringe 8 (Fig.1) and λ the wavelength of light in the rays. By virtue of (1), we can always express the shift of interference fringe ΔX_m in terms of the time interval Δt. We proceed from that the Earth, the laboratory setup and all particles of the air atmosphere (or other light carrier in arms of the interferometere) move translatorily in aether with the velocity υ. The speed $\tilde{c}$ of light in the moving with the velocity $\upsilon > 0$ optical medium of light carriers of the interferometer is determined by Fresnel formula:

$$\tilde{c}_\pm = \left[c/n \pm \upsilon\left(1-n^{-2}\right)\right] = c\cdot\left[1/\sqrt{\varepsilon} \pm \beta\cdot\Delta\varepsilon/\varepsilon\right] \ , \tag{2}$$

where $\beta = \upsilon/c$, and $\varepsilon = 1. + \Delta\varepsilon$ is the full permittivity of the luminiferous medium.

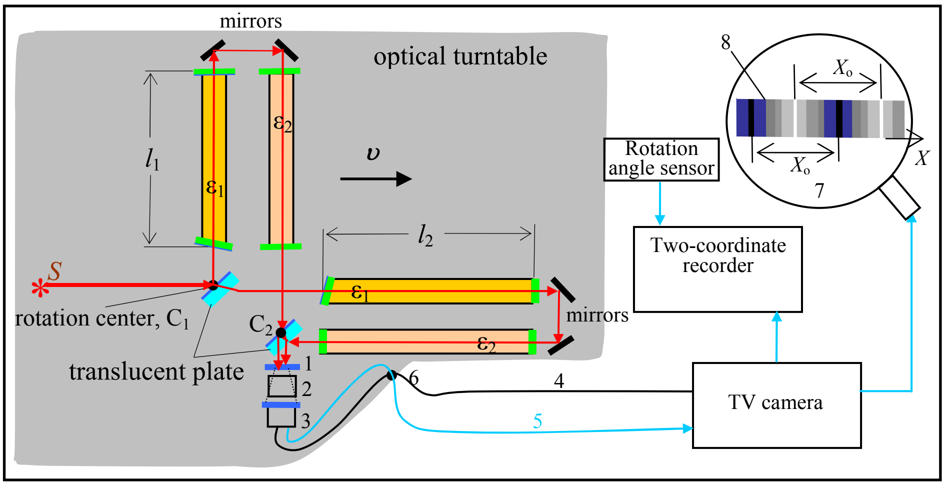

Fig.1. The functional scheme of the interferometer of the first order with respect to υ/c (1971 year). Light is issued from the source S, bifurcated at the half-transparent plate, and then each ray passes successively via two installed one over other glass tubes filled by light carrying media of respective dielectric permittivities ε_1 and ε_2. Butt-end of the tubes are closed by thin glass lids. After two reflections, performed in order to redirect light to the second tube containing optical medium ε_2, both rays return to a single point on other half-transparent plate for interference. The scheme shows: 1 – interference screen, 2 – telescopic ocular, 3 – vidicon with deflecting system, 4, 5 – power and video cords passing through the pipe 6 in the rotation center, 8 – interference pattern on the screen of the kinescope 7. Notice that C_1 and C_2 should be located at the rotation axis of the device with the absolute allowance ~λ/4.

Strictly speaking the speed given by (2) is measured in the reference frame of stationary aether. Insofar as in the device under consideration are registered values of the first order in υ/c, against which background effects of second order $\sim(\upsilon/c)^2 \ll \upsilon/c$ not taken into account, being very small quantities, the expression (2) is valid with the error $\upsilon/c\sim10^{-3}$ as well in the laboratory (moving) reference frame. Here n is the refractive index, and the value $\varepsilon-1.=\Delta\varepsilon$ describes the contribution of particles into the full permittivity $\varepsilon=n^2$ of optical medium, the basic polarization contribution of aether in which in this Maxwellian representation always equals 1. ($\varepsilon_{\text{aether}}=1.$).

From (2) in the classical approximation of geometrical optics we receive the time of propagation of the ray "to" and "fro" in the arm of the interferometer parallel to $\mathbf{v}$:

$$t_{\|}=l'/\tilde{c}'_{+}+l'/\tilde{c}'_{-}\simeq\frac{l}{c}\Big[\sqrt{\varepsilon_1}+\sqrt{\varepsilon_2}+\beta\cdot\left(\Delta\varepsilon_1-\Delta\varepsilon_2\right)\Big] \ , \tag{3}$$

where ε_1 is the dielectric permittivity of the first medium (in which the ray goes "to"), and ε_2 that of the second medium (in which the ray returns back), and $l'=l/\sqrt{1-\upsilon^2/c^2}$. In (3) there is used the approximation of the first order in υ/c, by which the dashed parameters of the moving frame of reference coincide with the error $\sim10^{-3}$ with non-dashed parameters which are parameters of the stationary reference frame. This means that in derivation of (3) there was dropped out all terms of the order υ^2/c^2 and higher. In the orthogonal direction we have for the time of propagation of the ray to and fro, taking into account the Lorentz triangle:

$$t_{\perp}=\frac{l}{\sqrt{(c/n_1)^2-\upsilon^2}}+\frac{l}{\sqrt{(c/n_2)^2-\upsilon^2}}\simeq\frac{l}{c}(\sqrt{\varepsilon_1}+\sqrt{\varepsilon_2}) \ , \tag{4}$$

where $n_i=\sqrt{\varepsilon_i}$. If in the course of analysis to drop out all terms of the order $(\upsilon/c)^2$ and higher, then the subtraction of (3) from (4) gives:

$$\Delta t=t_{\perp}-t_{\|}\simeq\frac{l}{c}\beta\cdot\left(\varepsilon_1-\varepsilon_2\right)=\frac{l}{c}\beta\cdot\left(\Delta\varepsilon_2-\Delta\varepsilon_1\right) \ . \tag{5}$$

Emphasizing in (5) that full permittivities of light carrying media $\varepsilon_1=1.+\Delta\varepsilon_1$ and $\varepsilon_2=1.+\Delta\varepsilon_2$ always consist of non-dispersing contribution of aether polarization ($\varepsilon_{\text{aether}}=1.$) and frequency-dispersion contribution of polarization of particles $\Delta\varepsilon_1$ and $\Delta\varepsilon_2$ of the first and second media confirms the conclusion [1, 2], that the difference Δt of times of delay of longitudinal ray ($t_{\|}$) and transverse one ($t_{\perp}$) is determined only by the value of "movable part" $\Delta\varepsilon_i$ of permittivity of optical light carrying media. Below this conclusion will be substantiated by means of classical theory of dispersion of moving media, that take into account the influence of the Doppler effect of first and second order of υ/c on wavelengths of proper polarization vibrations of translatorily moving particles of the light carrying medium of the interferometer.

The difference obtained Δt corresponds to the comparison of propagation times of rays $t_{\|}$ and $t_{\perp}$ for one of the arms of the interferometer with two media of the run of the rays "to" and "fro". The time $t_{\|}$ is measured when this arm is directed along $\mathbf{v}$, and time $t_{\perp}$ when this arm is turned by 90º crosswise to $\mathbf{v}$. In the real device there always function two arms with two media in each of them (Fig.1), since the interference fringe can be obtained only when both orthogonal rays occur simultaneously on the interference screen 1 (Fig.1). This secures the occurrence on the screen 1 not only of the very interference fringe, but, that is especially important, also the continual observation of the process of its transverse shift (by $\Delta X_m=cX_{\text{o}}\Delta t/\lambda$) in turning the interferometer by 90º. So, in order to relate (5) with the experimentally observed process of the shift ΔX_m of the fringe on the screen 1, above obtained difference Δt of times for two-media interferometer with two orthogonal arms should be measured as well for the second arm. This gives ultimately:

$$\Delta t\simeq\frac{l_1+l_2}{c}\beta\cdot\left(\Delta\varepsilon_2-\Delta\varepsilon_1\right) \ . \tag{6}$$

In two-arm interferometer with equal arm's lengths ($l_1=l_2=l$) the result (5) simply redoubles.

4. Measuring the shift of the interference fringe

Fig.2 shows the measured at the latitude of Obninsk amplitude $\Delta A_m=\Delta X_m/X_{\text{o}}$ of the harmonic component of the shift of the interference fringe as a function of local time t_{local}. Measurements were performed by means of the interferometer (arranged according to the scheme of Fig.1) and covered the 24-hour period of day and night. As a light carrying medium, in the forward direction there was used the air of normal pressure having $\varepsilon_1=1.0006$, and on the return path – carbon bisulfide (CS_2) having permittivity $\varepsilon_2=1.0037$. With the account of the linear relation

$\Delta A_m \sim \upsilon$ in (7), the scale of right axis in Fig.2 for velocities of "aether wind" was chosen to match respective values of the experimental curve $\Delta A_m(t_{local})$.

High reproducibility of the obtained experimental observations of the interference fringe shift on the screen of the device at any time of the day and night, in any season, with high ratio of usable signal to the noise jitter of the fringe on the screen (see Fig.2), at last, at the device of comparatively simple construction with not bulky optic platform (diameter of about 0,5 m), enables me to state that I have discovered the second method of measuring the speed of "aether wind", which much more reliable than the method of Michelson interferometer operating at effects of second order by υ/c. We see from Fig.2 that the interval of changing the horizontal projection of the aether wind velocity (140÷480 km/s at the latitude of Obninsk) obtained by the first order in υ/c method agrees well with the interval of values of $\upsilon_{\text{hor.}}$, obtained by me on the interferometer of the second order [1, 2].

By the ratio signal/noise attained in the experiment in Fig.2 we see that interferometer of the first order $(\upsilon/c)^{-1} \approx 1000$ times more sensitive to detecting "aether wind" than interferometer of second order $(\upsilon/c)^2$. This enabled me to reduce even at gases the length of arms of the interferometer of the first order, as wee see from the caption to Fig.2, down to $l \sim 0.2$ m.

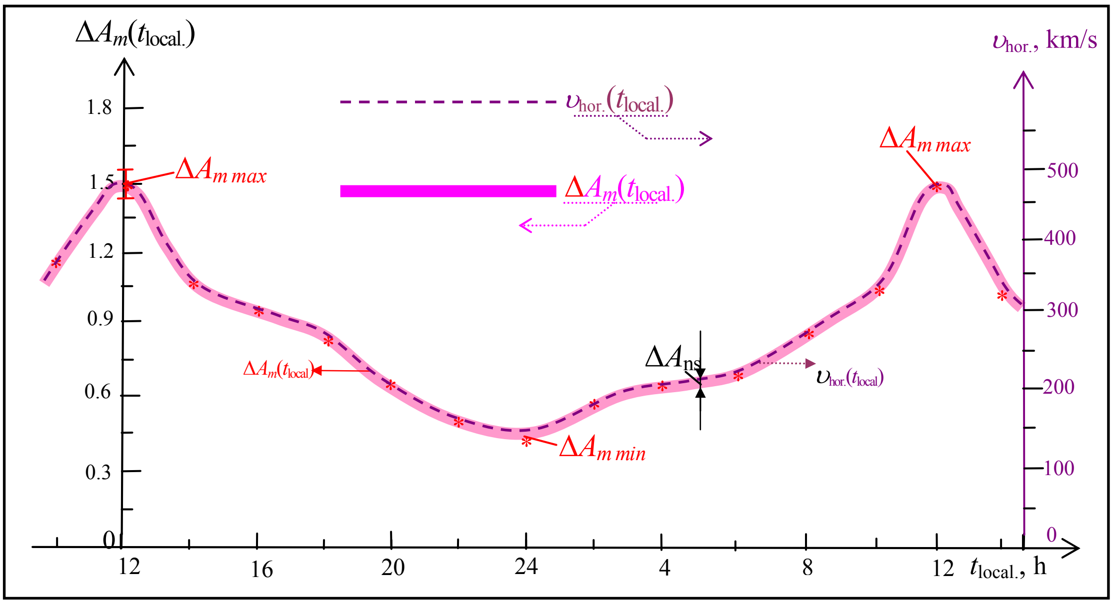

Fig.2. The measured relative amplitude $\Delta A_m = \Delta X_m / X_o$ at various times of the day and night of local time in Obninsk at 55.8^0 NL, 22-nd June of 1971 year, where ΔX_m is the amplitude of the fringe shift, and X_o=90 mm the width of the fringe (8 in Fig.1) on the screen of the kinescope. Width A_{ns} of the line $\Delta A_m(t_{local})$ shows the jitter noise of the fringe of the interferometer. The horizontal projection υ_{hor} of the "aether wind", velocity calculated from (6), is represented at the right axis of ordinate in specially selected scale. Parameters of the experiment: the length of the arms of the interferometer: $l_1 = l_2 = 0.2$ m; wavelength $\lambda = 6\cdot 10^{-7}$ m; air of forward light carriers had ε_1=1.0006, and the gas CS_2 return light carriers had ε_2=1.0036.

On the interferometer of the first order I have managed to find only linear dependence $\Delta X_m \sim (\varepsilon_2 - \varepsilon_1)$ of the fringe shift ΔX_m on the difference of permittivities of light carriers "to" (ε_1) and "fro" (ε_2). This dependence is shown in Fig.3. Theoretically it is obtained from (1) with the account of (6):

$$\Delta X_m \simeq \frac{l_1 + l_2}{\lambda} \beta \cdot X_o (\varepsilon_2 - \varepsilon_1) = \frac{l_1 + l_2}{\lambda} \beta \cdot X_o (\Delta\varepsilon_2 - \Delta\varepsilon_1) \,, \qquad (7)$$

where the equality $\Delta\varepsilon_2 - \Delta\varepsilon_1 = \varepsilon_2 - \varepsilon_1$ accounts straight $\Delta\varepsilon_2 - \Delta\varepsilon_1$ and indirectly $\varepsilon_2 - \varepsilon_1$ the contribution of the polarization of particles, forming the foundation of the moving inertial system for the procedure of detecting aether wind, since by Maxwell's theory the contribution of aether polarization in all media is $\varepsilon_{\text{aether}} = 1.$. In other words, the stationary ($\varepsilon_{\text{aether}} = 1.$) and moving ($\Delta\varepsilon_i > 0$) polarizing subsystems form the entire polarizing system of the luminiferous complex medium by the rule: $\varepsilon_i = 1. + \Delta\varepsilon_i$. In such composite system the polarization contribution Δε of the particles of light carriers self-fulfills in the moving region of their "concentration around the ray" of the device, and polarization contribution $\varepsilon_{\text{aether}} = 1.$ of aether "medium", forming the world space, is universal, wherever the moving light carrying medium travels along the aether.

Fig.3 shows the experimental dependence of the fringe shift ΔX_m on the difference $\varepsilon_2 - \varepsilon_1$ of permittivities of dielectric pair of light carriers of the first order by the ratio υ / c. As we see, ΔX_m grows linearly as a function of the difference of permittivities ε_2 and ε_1 in the range from $\varepsilon_2 - \varepsilon_1 = 0$ to $\varepsilon_2 - \varepsilon_1 = 1$. I have found that the growth of the amplitude of the interference fringe shift lasts until $\varepsilon_2 - \varepsilon_1 \simeq 250$. Since from the present above geometro-optical interpretation of the fringe shift based on using the Fresnel formula for the speed of electromagnetic waves in the moving light carrying medium the effect of first order by υ / c appeared to be proportional to the difference $\Delta\varepsilon_2 - \Delta\varepsilon_1$ without parabolic peculiarity in the region $\Delta\varepsilon_2 - \Delta\varepsilon_1 = 1$, when measuring at the pair "plexiglass-air" I did not even think about the sign of phase difference of the observed fringe shift, considering the sign of the shift for the pair "plexiglass-air" ($n_2 \approx 1.45$, $n_1 = 1.0003$) is the same as the sign of the fringe shift obtained for gas pairs. In this form the results of measurements on the interferometer of the first order has been represented in [1, 2]. In a more enduring measurements on the interferometer of second order in media with $\Delta\varepsilon_a < 1$ and $\Delta\varepsilon_b > 1$ the elucidation of the sign of the fringe shift appeared to be in the field of my attention, and thus was carried out intentionally. In particular, it was found that the fringe shift in the water light carrier ($\Delta\varepsilon_a < 1$) is equilibrated by the shift of gradually engaged of glass or fused quartz light carrier ($\Delta\varepsilon_b > 1$) provided при условии $l_a \cdot \Delta\varepsilon_a (1 - \Delta\varepsilon_a) = l_b \cdot \Delta\varepsilon_b (1 - \Delta\varepsilon_b)$.

From the represented below interpretation of the processes in the interferometer of the first order by υ / c, based on the dispersion theory of Maxwel-Sellmeier modified accounting for Doppler effects of the first and second order by υ / c, now it becomes clear that in the fringe shift at effects of first order by υ / c, possibly, there may be the change of the sign of the dependence $\Delta t(\varepsilon_2 - \varepsilon_1)$, when contributions $\Delta\varepsilon_2 > \Delta\varepsilon_1$, and major of them passes via the point $\Delta\varepsilon_1 = 1$. This uncovered fact was presented by me in Fig.3 in the form of the supposed change of the sign of the dependence $\Delta t(\Delta\varepsilon_2 - \Delta\varepsilon_1)$ at $\Delta\varepsilon_2 = 1$, since the real state there should be cleared up in future experiments. At present time I have no such possibility.

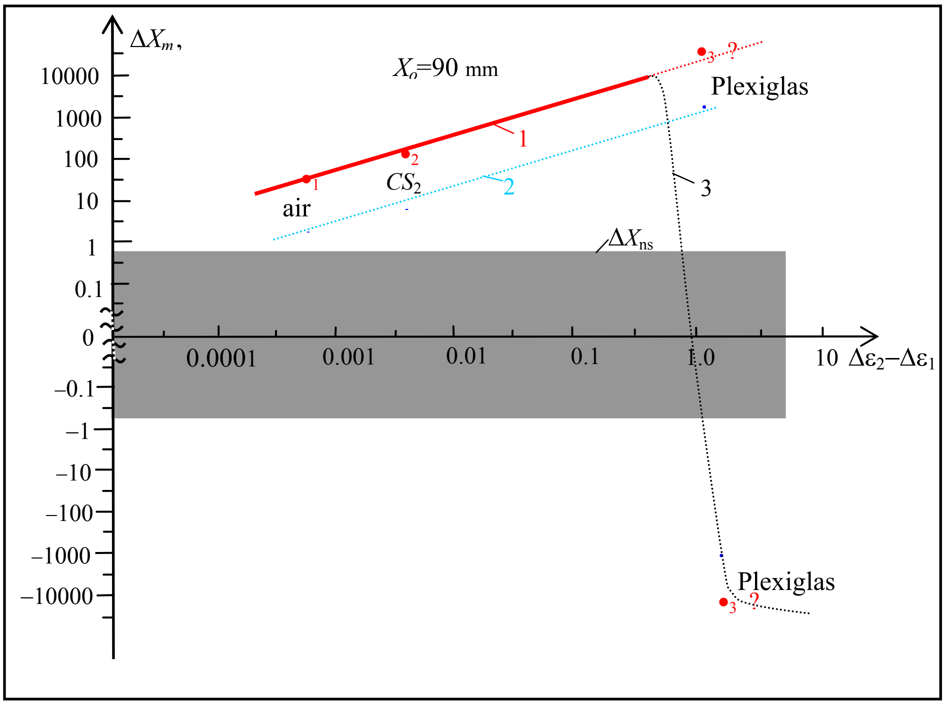

Рис.3. Measured shift ΔX_m of the interference fringe интерференционной полосы as a function of the difference $\varepsilon_2 - \varepsilon_1$ permittivities of light carrying pairs: $\bullet_1$ – air (ε_2=1.0006)/laboratory vacuum (ε_1=1.000006), $\bullet_2$ – CS_2 (ε_2=1.0036)/air (ε_1=1.0006); $\bullet_3$ – plexiglass ($\varepsilon_2 \approx 2.1$)/air ($\varepsilon_1$=1.0006). Both axes, abscissa and ordinate, are given in logarithmic scale. The line 1 corresponds to $\Delta X_{m\,\max}$, line 2 to $\Delta X_{m\,\min}$ in notations of Fig.2. ΔX_{ns} is the noise jitter of the interference shift. Parameters of the experiment: the length of interferometer arms for CS_2 was: $l_1 = l_2$ = 0.2 m, wavelength $\lambda = 6 \cdot 10^{-7}$ m (all measurements at other pairs are reduced to this parameters).

It follows from (7) that the sensitivity of the first order interferometer can be enhanced 10^5 times (100 times due to $\Delta\varepsilon_2 - \Delta\varepsilon_1$ 1000 times due to c / υ) in comparison with the interferometer of second order. Taking into account these two means of increasing (10^5 times) the sensitivity of registering the fringe shift at effects of first order by υ / c, I came to the conclusion that measurements can be performed in principle at microwaves having 10^5 times greater wavelength that light waves. This supposition has been confirmed experimentally. By the scheme of Fig.1 I have constructed the interferometer of the first order in υ / c operating at microwave range (λ =10 cm), in whose arms I placed dielectric pairs from $CaTiO_3$ and the air. Each EMW-channel of the arm by the scheme of Fig.1 has been formed by the in-series connected strip line based on ferroelectric dielectric $CaTiO_3$ ($\varepsilon_2 = 255$) and matched with it air ($\varepsilon_1 = 1.0006$) coaxial line. In this range of frequencies the difference of propagation times of EMWs in orthogonal arms of the interferometer was determined by me not from the range shift but by the direct method of measuring the phase difference $\Delta\varphi = \varphi_{\perp} - \varphi_{\parallel}$ by means of microwave phasemeter at the frequency 3 GHz (the only result of measurements, that I was able to do then, was presented recently in [1]) .

5. Experimental secrets of the first order in υ / c interferometer

Michelson in his experiments of 1881-1930 years used, strictly speaking, some erroneous notions concerning expected results of the experiment [3]. Firstly, he thought that the searched for shift of the interference fringe can be realized in vacuum (in aether without particles). And so he employed expressions for times of light propagation in arms of the interferometer where was not taken into account the influence of the permittivity $\varepsilon = 1. + \Delta\varepsilon$ of light carriers on the difference Δt of times $t_{\perp} - t_{\parallel}$. Finally, experiments of 20-th century showed that there can not be shift of interference fringe in interferometers with vacuum light carrier [1], and that the shift emerges reliably only when light carriers with $\Delta\varepsilon > 0$ are used. The threshold of the emergence of reliable shift of interference fringe was found by me experimentally as $\Delta\varepsilon > 0.0003$ [1] for interferometers with following optical length of arms: for effects of second order – with arm's length $l_i \geq 6$ m ; at effects of first order – with arm's length $l_i \geq 0.1$ m .

Secondly, it was assumed without saying, that Michelson interferometer can measure the shift of interference fringe exclusively at effects of second order. In accordance with logic of light propagation in empty space "to" and "fro" effects of first order were considered to be necessarily compensated by the "natural isotropy" of empty space. I demonstrated experimentally what should be (see Fig.1) the interferometer (detector of aether) at effects of first order. These experiments have shown that on interferometers of first and second order there is disclosed the key role of the polarization of moving in aether particles of light carrying media, implementing the function of movable inertial systems of the detector of aether. Translatorily moving in aether (with absolute velocity υ) particles of an optical medium maintains continuous relation with the explored (detected) by them stationary "inertial" aether system by means of the electrodynamic polarization interaction of the particles subsystem ($\Delta\varepsilon$) and aether ($\varepsilon_{\text{aether}} = 1.$) of the full polarizing system of the form $\varepsilon = \varepsilon_{\text{aether}} + \Delta\varepsilon = 1. + \Delta\varepsilon$. This additivity of polarization contribution of particles and aether was disclosed by material equations of the Maxwell electrodynamic theory.

I will show below by means of classical theory of dispersion of moving media [4], how there arises the spatial dispersion of opto-dielectric permittivity in two principal directions (along and across of $\mathbf{v}$) of the moving medium carrying lights of the interferometer, that produces finally the observed harmonic shift of the interference fringe on its interference screen. I will take advantage of the recent article by P.C.Morris [5] which indicates that the obtained by me formula of the parabolic dependence of the interference fringe shift on $\Delta\varepsilon$ on the interferometer of second order [2] can be derived by means of the classical theory of moving media [4]. For that deriving the law of frequency dispersion of the contribution $\Delta\varepsilon(\lambda_k)$ he proposed to take into account the dependence of the wavelength λ_k of intrinsic polarization vibrations of particles of the medium, contributing to the "moving" part of their polarization $\Delta\varepsilon$, on the relativistic factor of Lorentz $\sqrt{1-\upsilon^2/c^2}$. Below there will be shown that the found by me parabolic dependence $\Delta t \sim \Delta\varepsilon(1-\Delta\varepsilon)$ of the time shift of the fringe on $\Delta\varepsilon$ can be derived following the logic of the classical theory of frequency dispersion of the contribution $\Delta\varepsilon(\nu)$ of particles into permittivity of the medium [4], provided that the spatial dispersion of dynamic polarization of the moving medium will be accounted for by means of Doppler effect of first and second order in υ / c.

It is known that the frequency dependence of the medium's particles contribution $\Delta\varepsilon(\nu) = n^2 - 1$ into its full permittivity $\varepsilon = n^2 = 1. + \Delta\varepsilon$ is described by Maxwell-Sellmeier formula in two identical forms [4]:

$$n^2 - 1 = 4\pi N\alpha = \sum_k \frac{\rho_k \nu^2}{(\nu^2 - \nu_k^2)} = \sum_k \frac{\rho_k \lambda_k^2 \lambda^2}{c^2(\lambda^2 - \lambda_k^2)}, \tag{8}$$

where the following notation are taken: $\rho_k = Ne^2 f_k / (\pi m)$; α is the polarization of oscillating particles of the medium; Nf_k number of oscillators, yielding the main contribution $\Delta\varepsilon = n^2 - 1.$ into the full в полную permeability of the medium

$\varepsilon = n^2$; ν=c/λ is the frequency of the wave in the medium; λ the wavelength in vacuum; $\lambda_k = c/\nu_k$ the resonance wavelength of vibration of particles of the medium polarized by the light.

According to [5], the relativistic modification even of the one-mode approximation ($k = 1$) of the right-hand part of the formula (8), by means of introduction into it the relativistic Lorentz-factor $\gamma^2 = (1-\beta^2)^{-1}$ at the parameter λ_k^2:

$$n^2 - 1 = \frac{\zeta \cdot \lambda^2}{c^2(\lambda^2 - \lambda_k^2 \cdot \gamma^2)} , \tag{9}$$

where $\beta^2 = \upsilon^2/c^2$; ζ is the constant of the order one, enables us to obtain for the interferometer of the second order, in full agreement with [1, 2], the parabolic dependence of the temporal interference shift on the polarization contribution $\Delta\varepsilon$ of these particles into the full permittivity of the light carrier $\varepsilon = 1.+\Delta\varepsilon$:

$$\Delta t(\Delta\varepsilon) = \frac{2l\beta^2}{c\sqrt{\varepsilon}}\Delta\varepsilon \cdot (1 - \Delta\varepsilon/\zeta) \cdot \tag{10}$$

This dependence (for $\zeta = 1$) I have found experimentally in 1968 year, and, searching an explanation for it, for the first time derived it in 1971 year basing on the Fresnel formula for the speed of light in moving media by the classical method of geometrical optics [1], where the length of longitudinal (relative to $\mathbf{v}$) rays I also modified by the Lorentz relativistic factor $\gamma = 1/\sqrt{1-\beta^2}$ [2].

In the current report, briefly relating results of experiments on the interferometer of the first order, published in [1], I described the means of measuring the shift of interference fringe on two-media interferometer. As can be seen from Fig.1, by construction it resembles the single-medium Michelson device of the second order. The interpretation of the results obtained basing on the reliable registering of the large fringe shift with high resolution over the noise in the device of the first order I performed as well by the traditional method of classical geometric optics of light propagation in real optical media (see formulas (2)-(7)). Now I will show that the result (6), (7) is similarly obtained as well for effect of first order from the above mentioned dispersion theory of Maxwell-Sellmeier. In this purpose I impart to the modifying factor γ^2 in formula (8) a more wide interpretation as a classical-relativistic Doppler coefficient (*D*), that allows to account for the spatial dispersion of the polarization of medium's particles moving in aether (in first and second order in υ/c of their dynamically-polarization relations with aether):

$$D^2 = \frac{(1+\beta\cos\theta)^2}{1-\beta^2} \simeq (1+\beta\cos\theta)^2 \cdot (1+\beta^2). \tag{11}$$

With such modification of the expression (9) for optical medium in the longitudinal arm of interferometer there are obtained two different values of refractive index (n_+ along $\mathbf{v}$, and n_- opposite to $\mathbf{v}$):

$$n_\pm = \sqrt{1 - \frac{\zeta \cdot \lambda^2}{(\lambda^2 - \lambda_k^2 \cdot D_\pm^2)}} , \tag{12}$$

and in orthogonal arm simultaneously occurs only one value ($n_\perp = n$), coinciding with the refractive index of the stationary medium (since the projection of $\mathbf{v}$ on this direction is vanishing). We will single out of (11) three basic directions, for which there is constructed the mathematical model interpreting processes in the interferometer. For two mutually reciprocal directions of propagation of the longitudinal ray of the interferometer, parallel to velocity vector $\mathbf{v}$, from (11) we obtain (with the experimental error not more than $\upsilon^2/c^2 \sim 10^{-6}$):

$$D_\pm^2 = \frac{(1+\beta\cos\theta)^2}{1-\beta^2} \simeq 1 \pm 2\beta + 2\beta^2 , \tag{13}$$

where D_+ corresponds to passage of the longitudinal ray "to" $\upsilon[D_+(\theta = 0^\circ]$, and D_- to its return passage $\upsilon[D_-(\theta = 180^\circ)]$. We will take into account that in the transverse direction for both directions of light propagation of the transverse ray there is a null projection of the velocity $\mathbf{V}$. And so for $\beta = 0$ the anisotropy of the refractive index in propagation of the transverse ray "to" and "fro" will be absent, $D_\pm(\theta = 90^\circ/270^\circ) = 1$.

The expression for the wavelength λ_o of light in the stationary optical medium β=υ/c=0 there is obtained from (13) when $D_\pm^2 = 1$:

$$\lambda_o^2 = \frac{(n_\pm^2 - 1 + \zeta)}{\lambda_k^2(n_\pm^2 - 1)} . \tag{14}$$

Substituting $\lambda^2 = \lambda_o^2$ into (12), after not complicated transformations we obtain (in the bounds of classical theory of spatial dispersion of moving media, taking into account Doppler effects of first and second order), we obtain general expression of the refractive index of the moving light carrying medium for three characteristic directions, traditionally studied in the interpretation of the processes of ray propagation of light in interferometers of Michelson type:

$$n_{\pm\|} = \sqrt{\frac{\Delta\varepsilon(1+\zeta) - D_{\pm}{}^{2}(\Delta\varepsilon - \zeta)}{[\Delta\varepsilon - D_{\pm}{}^{2}(\Delta\varepsilon - \zeta)}} \quad , \tag{15}$$

where $\Delta\varepsilon = n^2 - 1$; and n is the refractive index of light carrying medium at rest, whose value coincides with refractive index of this medium for rays propagating perpendicular to vector $\mathbf{v}$, and propagation of the ray in parallel to $\mathbf{v}$ directions are described by two different values of refractive index $n_{\pm}(D_{\pm})$: "forward" [$n_{+\|}$ when $D_{+}(\theta = 0^\circ)$] and "return" [$n_{-\|}$ when $D_{-}(\theta = 180^\circ)$].

On the basis of these three spatial-dispersion values of the refractive index of the light carrying medium ($n_{+\|}, n_{-\|}$ and n) there is gained the explanation all known to me schemes of practical realization of the Michelson type interferometer operating at effects of first and second order by υ / c. So, the propagation time of the ray in the longitudinal to vector $\mathbf{v}$ arm is calculated from (15) separately for each direction ("to" and "fro"), and results are summed:

$$t_{\|} = \frac{l_{\|}}{c / n_{+\|}} + \frac{l_{\|}}{c / n_{-\|}} \quad . \tag{16}$$

Propagation time of the ray in the transverse to vector $\mathbf{v}$ arm ("to" and "fro") are calculated in principle similarly, but refractive indices $n_{+\perp} = n_{-\perp} = n$ here are identical for both directions:

$$t_{\perp} = \frac{l_{\perp}}{c / n_{+\perp}} + \frac{l_{\perp}}{c / n_{-\perp}} = 2 l_{\perp} n / c \quad . \tag{17}$$

The difference of propagation times of transverse and longitudinal rays, that determines in accordance with (1) the amplitude of the shift of the interference fringe, gets the form:

$$\Delta t = t_{\perp} - t_{\|} = \frac{2 l_{\perp}}{c} n - \frac{l_{\|}}{c}(n_{+\|} + n_{-\|}) \ . \tag{18}$$

When $l_{\perp} = l_{\|} = l$ we obtain the expression for difference of propagation times in orthogonal arms of the Michelson type interferometer with one light carrying medium:

$$\Delta t = \frac{2l}{c}[n - (n_{+\|} + n_{-\|}) / 2] \ . \tag{19}$$

Substituting to (19) the three spatial-dispersion values of the refractive index of the light carrying medium of the interferometer ($n, n_{+\|}$ and $n_{-\|}$), defined by the above obtained formula (15), after transformations we obtain the final expression for difference of propagation times of orthogonal rays in the interferometer with a single light carrying medium in each arm:

$$\Delta t = \frac{2l}{c}\{n - \sqrt{\frac{\Delta\varepsilon \cdot (1+\zeta) - D_{+}^{2}(\Delta\varepsilon - \zeta)}{2 \cdot [\Delta\varepsilon - D_{+}^{2}(\Delta\varepsilon - \zeta)]}} - \sqrt{\frac{\Delta\varepsilon(1+\zeta) - D_{-}^{2}(\Delta\varepsilon - \zeta)}{2 \cdot [\Delta\varepsilon - D_{-}^{2}(\Delta\varepsilon - \zeta)]}}\} \quad . \tag{20}$$

If the interferometer is constructed by the scheme of Fig.1 with two light carrying media in each arm, then instead of the formula (19) for a single-medium device it should be employed a more complicated expression for the two-media device. We will write down it for the same case $l_{\perp} = l_{\|} = l$, as in (19). In accordance with the experimentally approved by me the scheme of the installation (Fig.1), demonstrated a high resolving power in measuring the shift of the interference fringe at effects of first order by υ / c, we will build up an algorithm to calculate the difference of times that the rays propagate "to" in the medium with the refractive index $n_1, \varepsilon_1, \Delta\varepsilon_1$, and "fro" in the medium with parameters $n_2, \varepsilon_2, \Delta\varepsilon_2$:

$$\Delta t = \frac{l}{c}[(n_1 - n_{1(+\|)}) + (n_2 - n_{2(-\|)})] \ . \tag{21}$$

Substituting in (21) three pairs of spatial-dispersion values of the refractive index of the light carrying medium of the interferometer ($n_1,\ n_{1(+\|)}, n_{1(-\|)}$) and ($n_2,\ n_{2(+\|)}, n_{2(-\|)}$), defined by the above obtained formula (15), after transformation we obtain the final expression for times difference of propagation of orthogonal rays in the interferometer of the first order with two light carrying media in each arm:

$$\Delta t = \frac{l}{c}\left\{\left[n_1 - \sqrt{\frac{\Delta\varepsilon_1(1+\zeta) - D_{+}^{2}(\Delta\varepsilon_1 - \zeta)}{[\Delta\varepsilon_1 - D_{+}^{2}(\Delta\varepsilon_1 - \zeta)]}}\right] + \left[n_2 - \sqrt{\frac{\Delta\varepsilon_2(1+\zeta) - D_{-}^{2}(\Delta\varepsilon_2 - \zeta)}{[\Delta\varepsilon_2 - D_{-}^{2}(\Delta\varepsilon_2 - \zeta)]}}\right]\right\} . \tag{22}$$

Notice, that formulas (20) and (22) are derived for one arm of the interferometer. In reality, as I have already remarked, there are always two arms in the experimental device that are orthogonal to each other. When both arms equal each other the results (20) and (22) are merely redoubled.

We will obtain the formula for calculation of the fringe shift in the classical scheme of the Michelson interferometer in a single medium. Substituting (13) in (20) and implementing simple transformations with retaining terms of expansion not higher than υ^2 / c^2, we obtain (for $\zeta = 1$) the discovered by me experimentally [1, 2] formula of the parabolic shift of the fringe in the interferometer of the second order:

$$\Delta t = \frac{2l\beta^2}{c\sqrt{\varepsilon}}[\Delta\varepsilon(1-\Delta\varepsilon/\zeta)] \quad . \tag{23}$$

Interesting consequence of this deduction in the bounds of classical theory of the dispersion of moving media [4], modified by the classical-relativistic Doppler coefficient (13) of the first and second order, is the full compensation of the fringe shift from effects of the first order ($\beta = \upsilon / c$). This is explained by that in the expansion (20) terms of the first order with the Doppler coefficients $D_{\pm} \simeq (1 \pm 2\beta + 2\beta^2)$ in the single-medium interferometer are mutually compensated (annihilated) remaining only terms of second order. It should be stressed another time, that in Michelson interferometer effects of first order by υ/c are not absent, but finely compensated by the full superposition of forward and return rays in both arms of the device. Another interesting consequence of the deduction of formulas (20) and (22), yielding the parabolic dependence $\Delta t(\Delta\varepsilon)$, is no necessity to introduce at steps (19) and (21) a correction of the Lorentz contraction of the longitudinal arm of the interferometer. Seemingly, this correction appears to be accounted for in expressions (19) and (21) via Doppler coefficients $D_{\pm}$, entering expressions (15) of the spatial dispersion of the refractive index of the light carrying medium.

The idea to lift up the one-medium degeneracy of the effects of first order was laid in the basis of the invention by me the interferometer (aether detector) of the first order [3] on two different optical media. To remove the degeneracy of the effects of first order, introduced by Doppler coefficients $D_{\pm} \simeq (1 \pm 2\beta + 2\beta^2)$ into the expansion (22), became possible by virtue of space separation the path of rays in both arms of the interferometer to the two different media: "to" in the medium with refractive indices $n_1, \varepsilon_1, \Delta\varepsilon_1$, and "fro" – in the medium with parameters $n_2, \varepsilon_2, \Delta\varepsilon_2$.

Substituting (13) in (22) and implementing analogous to previous transformations with retaining expansion terms not higher than υ^2/c^2 , we obtain formula of parabolic fringe shift in the two-media interferometer:

$$\Delta t = \frac{l}{c}\left[\frac{1}{n_1}(\beta-\beta^2)(\Delta\varepsilon_1 - \frac{\Delta\varepsilon_1^2}{\zeta}) + \frac{1}{n_2}(\beta-\beta^2)(\Delta\varepsilon_2 - \frac{\Delta\varepsilon_2^2}{\zeta})\right]. \tag{24}$$

From (24) we see, that two-media interferometer detects both effects of the first order, and effects of second order. In practice, effect of the second order ~10^3 times weaker than effects of first order. And so effects of second order are simply unnoticed in experiments on two-media interferometer (this conclusion I make basing on my observations). Thus, in practice formula (24), obtained from classical theory of dispersion of moving media modified by relativistic correction of the influence of Doppler effects on wavelengths of intrinsic vibrations of the polarized by the light particles, mainly (when $\Delta\varepsilon_1 << \Delta\varepsilon_2$, $\Delta\varepsilon_1 << 1$ and $\zeta = 1$) coincides with formula (6). Indeed, neglecting in (24) the contribution of the terms of second order (since $\beta^2 \ll \beta$), we will obtain the linear part of the earlier obtained by me formula (6), whose derivation was carried out from Fresnel formula for the speed of light in moving media by means of geometrical optics:

$$\Delta t = \frac{l}{n_2 c}\beta \cdot (\Delta\varepsilon_2 - \Delta\varepsilon_1 - \frac{\Delta\varepsilon_2^2}{\zeta}) \quad . \tag{25}$$

However, it follows from (25) that the method of dispersion theory of Maxwell-Sellmeier, accounting in two-media interferometer with orthogonal arms for spatial dispersion of particles polarization (by means of the Doppler effect of first and second order), predicts in the interferometer of the first order parabolic dependence $\Delta t(\Delta\varepsilon_1, \Delta\varepsilon_2, \Delta\varepsilon_1^2, \Delta\varepsilon_2^2, \upsilon/c)$. It is similar to found by me dependence $\Delta t(\Delta\varepsilon, \Delta\varepsilon^2, \upsilon^2/c^2)$ in the one-medium interferometer of second order [1, 2]. As was already remarked, in times of performing my short experiments on the setup of first order (that were unexpectedly suspended in 1974 year) I did not noticed (or overlooked) the parabolicity when taking the experimental dependence $\Delta t(\Delta\varepsilon_1, \Delta\varepsilon_2, \upsilon/c)$. So that, for the time being "the effect of parabolicity " $\Delta t(\Delta\varepsilon_1, \Delta\varepsilon_2, \Delta\varepsilon_1^2, \Delta\varepsilon_2^2, \upsilon/c)$ on the interferometer of first order has no experimental confirmation, and now I have neither the technical nor physical possibility and check it out.

On the nature of systematic errors in Michelson interferometer. Speaking about the secrets of the Michelson interferometer for detecting the manifestation of the ether, I will note for the experimenters, that the experiments with the interferometer of the first order with two different optical media for the propagation of rays "to" and "fro," revealed the root cause of systematic errors of the linear shift of the band, proportional to the angle of the turning the device from the initial state. Marked the systematic character of this error, whose magnitude depends on many initial parameters of the optical system and its primary adjustment, provided the reason for Michelson (and all those who repeat his experience) simply subtract this error from the total measured shift of the fringe. The remaining part of the shift he correctly suggested to consider the sought for harmonic shift of the fringe related with the "ether wind" [6, 7]. But how much needless waste of time for repeating the same measurement there is forced to spend this systematic error of experimenters of early 20-th century, attached by the eyes to the ocular of the telescope moving in a circle. Nowadays many people can not even imagine such thing. For example, I would not obtain thousandth of the results of my observations of shifts of interference patterns, if I attempted to repeat this experiment of the “era of steam-engines”, and not invented the output of the interference pattern on the stationary screen of the kinescope by means of the era electronics of 1960-ies years.

So, measuring on the interferometer of the first order, assembled by the scheme of Fig.1, disclosed the main cause of large systematic errors of the linear (by the angle of the rotation) shift of the fringe producing by the slightest turn of the interferometer such a "washing out" of the picture, against which the weak parts of the harmonic shift of the fringe escaped the attention of the observer. Exploring this systematic error in the interferometer of the second order with one medium, I have already described its main artifacts [1]. The magnitude of this error (i.e. the slope of growth of the error, depending on the angle of rotation of interferometer from the initial state) depends on:

- the length of the arm of the interferometer;
- angular velocity of rotation of the interferometer;
- thickness of the translucent plate splitting the source beam into two orthogonal beam;
- refractive index of semitransparent plate;
- position of the center of rotation of the device relative to the point of incidence of the ray of the source at the bifurcating semitransparent plate;
- initial adjustment of the optical system unit. All these sources of systematic errors are preserved in the interferometer of the first order by υ/c, but there is added a powerful new source of it, which was absent in the interferometer of the second-order by υ/c with one medium.

He was associated with the inaccurate position of the axis of rotation of the device point C_1 of rays output from the first bifurcating semitransparent plate in the direction "to" and point C_2 of entry the returning rays into the second semitransparent plate, reducing them to the interference on the screen 1 (Fig. 1). But became apparent also a positive effect in the of the first-order by υ/c, which was absent in the apparatus of the second order by υ/c. I found such a technology of the initial adjustment of the position of these points on the axis of rotation of the device of the first order by υ/c with two media which managed to achieve almost complete compensation of the above mentioned systematic error of the device (bringing it to the level of a few percent of the required amplitude of a harmonic shift of the band) .

Analyzing the main cause of the existence of this systematic error, we observe a complete nonparticipation in the rotational motion of the interferometer of light rays propagating in the bays of the interferometer arms from a semitransparent plate to rebounding mirrors ("there") and from these mirrors "back". Arms of the interferometer turn around but assumed direction of propagation of the rays remain unchanged! As a result, the propagation vector, e.g. the transverse beam, specified at the time of separation (angle 45°) from the bifurcation point at translucent plate for the path "there" keeps its direction on the flight to the rebounding mirror regardless of the turning the arm at an angle δ during the course of the beam to the mirror. At the time of arrival of the beam to the rebounding mirror its propagation vector retains its initial direction set by the moment of its separation from the semi-transparent plate, but it is already reflected from the mirror not at an angle of incidence 90°, as was fixed in the initial adjustment of the stationary device, but at an angle $90° \pm \delta$ ($\pm$ depending on the direction of rotation of the device). Changing the direction of backward movement at $180° \pm \delta$, the beam moves to the semi-transparent plate, keeping this direction of the propagation vector regardless of the ongoing rotation of the device. At the time as the beam arrives back to the accumulating plate, it has time to turn at the angle 2δ, so the beam enters into it is not at an angle 45° as at the time of exit from it butt at an angle $45° \pm 2\delta$. Hence there evident the apparent failure of the initial phase adjustment of the stationary device. This causes a change in the optical path length of the ray in the dynamic mode of the rotation of the interferometer ($45° \pm 2\delta$) relative to the stationary regime of the tuning (45°). As a result, the picture is floating at any rotation of the interferometer about the axis of its rotation.

A conclusion of great scientific significance we get in hands on the basis of this experimental observation. Originally posed by longitudinal and transverse beams propagation directions (at angles of 45° to bifurcating semitransparent plate) at the time of their exit from the plate “there” change by the angle ($45° \pm 2\delta$) upon return of these beams to this plate for interference. This established by me experimental fact determines, firstly, the main cause of systematic error of the device, and, secondly, and most importantly, reveals the independence of the mobile (because of the rotation) existence in the space of geometric directions of the interferometer arms and a fixed position of rays propagation vectors on time interval of their journey from the translucent plate to the mirror and back. As a result, there is accumulated the artifact shift of these angles 2δ (and, in the longitudinal arm there is accumulated the shift of angles $+2\delta$, and in the transverse arm -2δ, or vice versa at the other direction of rotation). Therefore the radiation separated from the stationary source has no strict attachment to it, propagating in aether as in a stationary medium. This fact will require new theoretical research in those point where such attachment was postulated [8], and most likely this research should be carried out in new conditions of recognition aether as existent super-permeable substrate with субстанцией degenerate reactive-inertial characteristics.

6. Conclusion

Experimentally demonstrated the possibility of measuring the "ether wind" with two-media interferometer of the first order by υ/c. It is shown how the full compensation of first order effects in the traditional scheme of one-medium Michelson interferometer can be eliminated in the device that uses two media with different permittivities for propagation of rays "to" with contribution into permittivity of the light carrier $\Delta\varepsilon_1 << 1$, and "reverse" – with contribution $\Delta\varepsilon_2 \neq \Delta\varepsilon_1$ when $\Delta\varepsilon_2 >> \Delta\varepsilon_1$. Experiments show the occurrence of the shift of interference fringes in optical media with different dielectric permittivities of light carriers for rays "to" and "fro" and the absence of the shift in vacuum (as the consequence of the null difference $\varepsilon_2 - \varepsilon_1 = 1 - 1 = 0$ for manifestation of first order by υ/c effects and absence of the contribution of particles

($\Delta\varepsilon = 0$) into permittivity of light carriers – for appearance of second order by υ/c effects). Interferometer of first order is the device $(\upsilon/c)^{-1} \approx 1000$ times more sensitive to aether wind, than Michelson interferometer of second order. Interferometer of the first order secures the ratio signal/noise ~100 all the day and night. Such resolving power and stability of measurements of a large (in comparison with the noise) shift of interference fringe in any time of day and night, in any time of the year attests of a positiveness of Michelson type experiments, of the existence of aether, and the observability of absolute motion, in particular, of the Earth's motion relative to aether with the velocity exceeding 480 km/s.

Earlier the same estimation of the velocity of "aether wind" has been obtained on the Michelson interferometer by two methods [3], operating at effects of second order by υ/c [2]. It was historically the first method (1968 Obninsk), in which were taken into account parameters of the optical medium, intentionally used in the capacity of the light carrier, yielded the positive results in detecting the aether wind. The results presented here in this line give the third method of experimental measuring the speed of "aether wind" by registering the shift of interference fringes on the interferometer with cross-wise rays operating at effects of first order of the ratio υ/c and used two optical media in the capacity of light carrier.

In the current version of the paper are presented not only experimental evidences of the observability of a large shift of interference fringe with high resolution above the noise level of Michelson type interferometers of first and second order of the ratio υ/c, but also there are considered together two method of interpretation of the results obtained. Both methods are based on traditional geometrooptical consideration of light rays propagation in two orthogonal arms of the device. The first method enables us to explain the registered in experiments parabolic dependence of the shift of interference fringe on the value of real part $\Delta\varepsilon$ of the particles contribution into the full permittivity $\varepsilon = 1. + \Delta\varepsilon$ of the light carrying medium of the device at effects of second order by the ratio υ/c with the aid of the Fresnel formula for speed of light in moving media when modifying the calculated path of the ray with the account of relativistic effect of Lorentz contraction of the longitudinal arm of the interferometer. The second method explains the observed in the experiment parabolic dependence of the shift of interference fringe in the devices of first and second order by υ/c basing on the classical theory of dispersion of dielectric contribution $\Delta\varepsilon$ of the particles of moving media [4] after modification of it with the account of the influence of the Doppler effect (13) of the first and second order on the wavelength of the intrinsic vibrations of the polarized by light particles. Both methods bring to identical formulas of the dependence of the amplitude of interference fringe shift on $\Delta\varepsilon$ explaining results of the experiments on interferometers of the first and second order of the ratio υ/c.

Thus, kinetic evidences of the existence of luminiferous aether are demonstrated presently by three methods of phase interferometry. Two of them work in one-medium interferometers at effects of first order (where effects of first order suppress each other in self-coordinationна). The third method, described in details in the present article, is realized on so called two-media interferometers, where decisive dominance have effects of the first order (though there effects of both orders occur, effects of the first order turn out to be ~1000 times stronger than effects of second order, and they are actually unobservable against the first order picture in experiments on two-media device).

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