

Why positive experiments by Galaev, as well as Miller, have yielded "negative" results of detection of aether

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Galaev's experiments of 1998-2002 (Kharkov, Ukraine) are positive, since regular nonzero shifts of the interference fringe are obtained in them. His experiments are unique because he was the first who used non-mechanical (electrical) instantaneous rotation of the interferometer at 180° . Owing to this Galaev appeared to be the third experimenter in the world who revealed the daily trend of these fringe shifts qualitatively consistent with measurements of daily trends of the horizontal projection of speed of "aether wind" in Miller's (1926) and Demjanov's (1970) works.

But Galaev, like Miller, incorrectly interpreted his experiments, having ignored the necessity for accounting the relativistic structure of refractive index $n \neq 1$ of light carriers of the interferometer; it lessened the value of his results, having made them negative ones. We eliminate these incorrections of Miller and Galaev on the basis of modern times Lorentz-invariant interpretation of his experiments, that gives the speed v of motion of the Earth relative to stationary aether not units, but hundreds km/s.

After the experiment by Michelson&Morley (1887) the nonzero shift of fringe is invariably present in measurements of all experimenters in different countries. On the basis of my own measurements of the same trends I have found the right algorithm of their Lorentz-invariant interpretation which takes into account the relativistic binary structure $(n^2-1)/n^2$ of the polarization of translationally moving particles of the light-carrying optical media of the interferometer.

1. Century misunderstanding of the relativistic essence of processes in Michelson's device. Lorentz-invariance of the Fresnel formula

In 1881 Michelson used a "mechanical" model of addition of velocities: the velocity (v) of motion of the optical medium relative to aether and the speed (c) of propagation of light in vacuum (i.e. in aether). As a result for coaxial $v \cdot c / |v \cdot c| = \pm 1$ direction c of propagation along v he writes down following expressions of total speeds of light (c'_\pm), as though in vacuum, for two opposite directions [1]:

$$c'_\pm = c \pm v. \quad (1)$$

The rule (1) is not Lorentz-invariant, neither in vacuum ($n=1$), nor in the air ($n>1$), where Michelson made his experiment [1]. The incorrectness of (1) is obvious already by that in the nature there is no speeds $c+v$. The erroneous rule (1) already for more than 100 years helps to many people to prove "negativity" of Michelson type experiments. Today it is well-known, that speed c'_\pm in any media, according to the Maxwell theory, depends on its polarizability by light, i.e. on its optical dielectric permittivity ($\epsilon > 1$) related with the refractive index so: $\epsilon = n^2$. Although Michelson [4, 5] and other scientists [6-12] used formula (1) for more than 50 years, nobody among them guessed the necessity to take into account the dependence of $c'_\pm(\epsilon)$ from ϵ .

In 1967-70 I obtained the direct experimental proof that the shift of the interference fringe in the Michelson type interferometer depend on ϵ of light-carrying medium not absolutely (not completely of ϵ), but is related to its part ($\Delta\epsilon$) which under the Maxwell theory is defined by the polarizing contribution of particles to full permittivity $\epsilon = 1 + \Delta\epsilon$ of the optical medium. My proof is presented in Fig.1 by dependence $A_m(\Delta\epsilon)$ of amplitude A_m of relative shifts of the interference fringe from $\Delta\epsilon$. This dependence was published with a delay for 30 years [2, 3] because of regime restrictions operated in our country at that time.

Fig.1 presents two patterns (1 and 2) of $A_m(\Delta\epsilon)$ in dependence on $\Delta\epsilon$ or $\delta\epsilon$. The abscissa in Fig.1 for IM₂ (curve 2) plots the values of $\Delta\epsilon = \epsilon - 1$, and IM₁ (curve 1) – value of $\delta\epsilon = \epsilon_2 - \epsilon_1$, defined in Fig.2. The dependence 2 measured at a Michelson interferometer (IM₂) with orthogonal arms (index "2" indicates that the device works on the effects of 2nd order of the ratio v^2/c^2) [2]. Curve 1 was measured by interferometer (IM₁) with parallel arms (Fig.2) at effects of 1st order of the ratio

v/c [2, 14]. Fig.1 shows two facts: the observability (over the noise A_{ns} of the device) of the fringe shift ($A_m > 0$) is better when the values $\Delta\varepsilon = \delta\varepsilon$ of light carrier are larger. And conversely, with the contribution reducing $\Delta\varepsilon = \delta\varepsilon \rightarrow 0$ the fringe shift decreases proportionally, becomes compared with the noise ($A_m \sim A_{ns}$), losses in noise ($A_m < A_{ns}$), becoming not observable. Thus, at $\Delta\varepsilon = 0$ (in vacuum without particles) the fringe shift is completely absent ($A_m(\Delta\varepsilon=0) = 0$) in IM₂ and IM₁.

In works [1, 4-12] the permittivity ε of the optical medium was not taken into account, because particles of air in light carrying zones of Michelson type interferometer were considered to be only the entropic noise when searching for anisotropy of "pure" space. It is attested by works [9-12] in which authors tried to reduce or completely to eliminate the influence of the entropic noise by filling light-carrying zones of interferometer with inert gas [9, 10] or pumping out them [11, 12]. On the basis of Fig.1 it is possible to state, that up to the end of 1960th years the researchers of "aether wind" did not understand the main point in the action of Michelson type interferometers – a defining role of polarizability (in the form of the contribution $\Delta\varepsilon$) of translationally moving particles of the light carrying media.

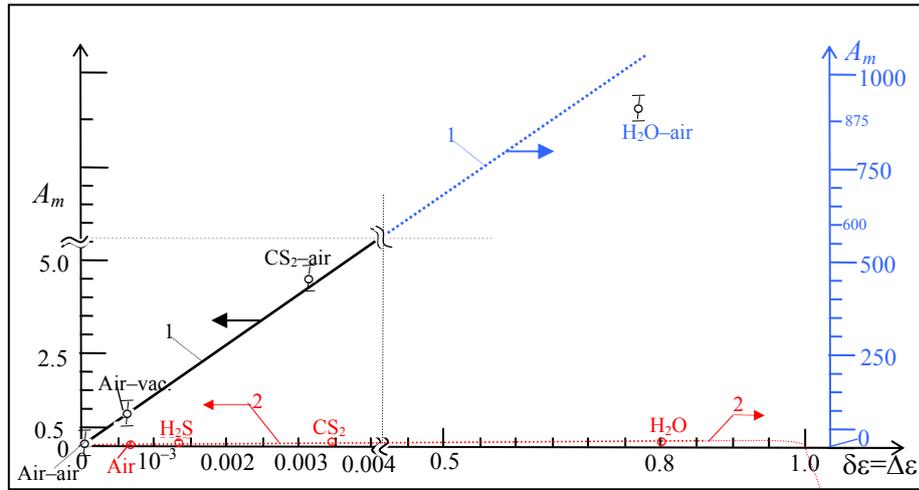


Fig.1. Dependence $A_m(\Delta\varepsilon)$ of amplitudes A_m of the interference fringe shift on the polarization contribution $\Delta\varepsilon$ of particles into full permittivity ($\varepsilon=1+\Delta\varepsilon$) and from difference $\delta\varepsilon=\Delta\varepsilon_2-\Delta\varepsilon_1$ for light carrying medium of Michelson type interferometers: IM₂ – on the effects of 2nd order (curve 2) and IM₁ – on the effects of 1st order (curve 2). Curves (2) and (1) were obtained by me in 1968 and 1970, respectively [2]. On axis we accept $\delta\varepsilon=\Delta\varepsilon$. Curve (2) for IM₂ is fully presented in [14*], and here is given as an example in order to compare sensitivity of IM₁ (curve 1) and IM₂.

All the experimental points on the curves (1) and (2) are reduced to ratio $l/\lambda=10^{-7}$. For curve (1) points were obtained: "Air" and "H₂S" at $l=6$ m and $\lambda=6 \cdot 10^{-7}$ m; "CS₂" – for $l=1$ m and $\lambda=9 \cdot 10^{-7}$ m; "H₂O" – at $l=0.3$ m and $\lambda=1.2 \cdot 10^{-6}$ m. For curve (2) there were measured points with a pair of optical media "Air"-air", "Air"-vac" and "CS₂-air" – for $l=0.3$ m and $\lambda_0=1.2 \cdot 10^{-6}$ m; "H₂O-air" – for $l=0.1$ m and $\lambda=5 \cdot 10^{-7}$ m. For curve 2 the abscissa shows the contribution of particles $\Delta\varepsilon=\varepsilon-1$ of light-carriers IM₂, and for the curve 1 – the difference between the contribution of the particles ($\Delta\varepsilon=\Delta\varepsilon_2-\Delta\varepsilon_1$) of light carriers zones of IM₁, shown in Fig.2.

The new relativistic rule (2) of the addition of velocities became elucidated by the works of Poincare (1904), Lorentz and Einstein (1905) [15]. It accurately conveys the nature of relativistic dynamical polarization processes, excited by light simultaneously in the moving with the velocity v of the polarizable part ($\Delta\varepsilon$) of the particles of the medium and the stationary part $1=\Delta\varepsilon_{\text{aether}}$ of its complex polarization structure $\varepsilon=1+\Delta\varepsilon$. The relativism of the relationship $\Delta\varepsilon/\varepsilon=1-n^{-2}$, seen even by Fresnel in 1825, follows directly from the well-known today the relativistic addition rule of coaxial velocities:

$$c' = c/n \oplus v, \quad (2)$$

where \oplus is the operator of relativistic addition; c/n and c' – speeds of light in motionless and moving with a speed v to the optical medium, accordingly. Disclosing of operator \oplus in terms (\pm) of traditional mathematics reveals, unlike (1), the polarization-anisotropic influence of $\Delta\varepsilon$ particles on the speed of light in the moving optical medium:

$$c_{\pm}' = \frac{c/n \pm v}{1 \pm \frac{(c/n) \cdot v}{c^2}} = \left(\frac{c}{n} \pm v \right) \cdot \left(\frac{1}{1 \pm \frac{v}{cn}} \right) = \left(\frac{c}{n} \pm v \right) \cdot F\left(\frac{v}{c}\right). \quad (3)$$

Expression (3) describes the speed of light in moving IRF' (in the terrestrial laboratory). *Firstly*, an inequality ($c_{\pm}' \neq c_0$) of light speeds in stationary IRF₀ ($c_0=c/n$, for $n>1$) and moving IRF': $c_{\pm}' = (c/n \pm v) \cdot F(v/c) \neq c_0$ is evident. Note, that in SRT the relativistic rule (3) of addition of speeds is admitted, in spite of the fact that it contradicts to the second postulate of SRT {the requirement of equality $\tilde{c}'_{\pm}(\text{IRF}') = c_0(\text{IRF}_0)$?}. *Secondly*, from (3) it is possible to see the obvious influence of the contribution $\Delta\varepsilon$ on value c_{\pm}' , not considered in (1). For this purpose the function $F(v/c)$ should be expanded in a series over the small parameter $v/c \ll 1$; after transformations of this decomposition we obtain [14*]:

$$c_{\pm}' = \frac{c}{n} \left[1 \pm kn \frac{v}{c} - k \frac{v^2}{c^2} \pm \frac{k}{n} \frac{v^3}{c^3} - \frac{k}{n^2} \frac{v^4}{c^4} \pm \dots - (\mp 1)^{2-m} kn^{2-m} \frac{v^m}{c^m} \dots \right], \quad (4)$$

where $k=(1-n^{-2})=\Delta\varepsilon/\varepsilon$ is the Maxwell form of the Fresnel coefficients; m – the order of the expansion; $n^2=\varepsilon=1+\Delta\varepsilon$ – optical permittivity of the medium and its relativistic binary structure, in which $1.=\varepsilon_{\text{aether}}$ is the relative dielectric permittivity of aether.

The Maxwell from $k=\Delta\varepsilon/\varepsilon$ directly points to the polarization mechanism ($\Delta\varepsilon$) of dragging the light wave by the translationally moving particles. The relation $k=\Delta\varepsilon/\varepsilon$ describes no other entrainment. Note, that this structure $\Delta\varepsilon/\varepsilon$ is manifested by the decomposition (4) of the relativistic form (2), which is a consequence of Maxwell's theory. It is clearly marked with the stationary part ($1.=\varepsilon_{\text{aether}}$) of relative permittivity of stationary aether, and the motional part $\Delta\varepsilon$, excited by the moving particles of the medium.

A remarkable property of the series expansion (4) is a Lorentz-invariance of any part thereof, restricted by any m (from $m=1$ to $m=\infty$) with the accuracy $\sim(v/c)^m$ of the direct and inverse Lorentz-invariant of its conversion. It is seen from (4), that the restriction of decomposition by the term of the first order v/c ($m=1$) gives the known since 1825 Fresnel formula for speed of light in the moving optical medium. It has been noticed by Einstein in [15]. However, neither he, nor experimenters of the first half of the 20-th century understood the significance of the Fresnel formula for correct interpretation of Michelson type experiences [3].

Interferometer IM₂ does not feel the effects of higher than $m>2$. Therefore, the interpretation of experimental data obtained on IM₂, requiring the correct account of the effects for forward and backward invariant Lorentz transformation, is reasonable to describe by the series of type (5) with $m=2$. To describe experiments on the IM₁ and IM₂, limit ourselves in (4) by the members to the $m=2$, inclusive, which will give the error of the Lorentz-invariant description of no more than $\sim(v/c)^2$:

$$c_{\pm}' = \frac{c}{n} \left(1 \pm kn \frac{v}{c} - k \frac{v^2}{c^2} \right). \quad (5)$$

In work [14*] I have shown, that formulas (3-5) are Lorentz-invariant, in this event formula (3) strictly, and formula (4) approximately with a margin error $(v/c)^m$, defined by order (m) of the chosen border of decomposition. *Let me again note that the "classic" Fresnel formula turned out to be Lorentz-invariant for interferometers working on the effects of the first order ($m=1$) with the accuracy of $\sim v/c$!*

Thus, the main mistake of interpretation of Michelson type experiments has crept in "imperceptibly" because in 19th century the inapplicability of the Lorentz-noninvariant classical logic ($c \pm v$) of addition of speeds by (1) for the description of electrodynamic processes in moving optical media was not known. And even after 1904 when Poincare opened Lorentz-invariance of formula (2), which is recognized in SRT as the key law of synthesis of kinematic movements, including the rest, and experimentalists [1, 4-13] and theoreticians [15, 16] continued to ignore the necessity of refusal from the form (1) and changeover to (2). A simple algorithm (3-5) as far back as in the first half of the 20th century, could open the phenomenological depth of the relativistic polarization anisotropic interaction

of stationary aether ($\varepsilon_{\text{aether}}=1$.) with the virtual polarizability ($\Delta\varepsilon$) of particles of media, translationally moving with velocity v with respect to stationary aether.

Up to the middle of 20-th century all scientists continued to use the Michelson logic (1) led by the deceptive simplicity of two forms of interpretation of media with the nonzero shift of the interference fringe on IM₂ for effects of 2nd order by the ratio v^2/c^2 (their derivation is not given here because it is well-known [1, 2, 4]):

$$A_{m \text{ exp. IM}_2}^* \left(\frac{v}{c} \right) = \frac{2 \cdot l \cdot v^2}{\lambda \cdot c^2}; \quad v_{\text{IM}_2}^* (A_{m \text{ meas.}}) = c \sqrt{\frac{A_{m \text{ meas.}} \cdot \lambda}{2 \cdot l}}, \quad (6)$$

Where $A_{m \text{ exp. IM}_2}^*$ is the relative amplitude of the shift of the fringe expected in experiment, which estimated by apriori values of the ratio v/c and technical parameters (l, λ) used of the interferometer IM₂; $A_{m \text{ meas.}}$ is the measured amplitude of the shift of the fringe on which it is possible to calculate the value v , but only after successful test of correctness of the first formula for $A_{m \text{ exp. IM}_2}^* \approx A_{m \text{ meas.}}$. Mathematically both formulas in (6) stem from a single function, which in the first formula is resolved with respect to $A_{m \text{ exp.}}$, and in the second one – relative to v . I proved in [2, 14*] that in the Michelson formulas (6) for IM₂ there is the inherent contradiction $A_{m \text{ exp. IM}_2}^* \gg A_{m \text{ meas.}}$, which leads to the underestimation of the speed $v_{\text{IM}_2}^* (A_{m \text{ meas.}})$ of "aether wind" in $\sqrt{A_{m \text{ exp. IM}_2}^* / A_{m \text{ meas.}}}$ time.

It is important to understand that in the scientific research these two forms carry out different methodological functions. The first formula in (6) carries out the modest role of a definition of correctness of the chosen model of experiment interpretation and goodness. At this stage of tests it is required by the apriori (expected) values of the ratio v/c to attain the approximate equality ($A_{m \text{ exp.}} \approx A_{m \text{ meas.}}$) of values of the shift of the fringe (within the limits of reasonable errors of measurements). Only this parity opens a way to the second general scientific stage of interpretation of results of the given experiment under the second form (6) for $v_{\text{IM}_2}^* (A_{m \text{ meas.}})$. I will offer examples of incorrect attitude to the first stage of using (6):

- Michelson (1881) made a device and expected to obtain $A_{m \text{ exp.}}=0.04$ on it; after measurements he obtained $A_{m \text{ meas.}} \approx 0$? Instead of clarifying the reasons of such result of measurements on the device of 1881 (clearly not enough sensitive because of limited length of air light carriers, $l \sim 1$ m), he made a disputable conclusion on the basis of the second formula (6) – does it mean that if $v(A_{m \text{ meas.}} \approx 0) \sim 0$, then "aether wind" is absent?

- Joos (1930) performed a unique experiment. He vacuumed out light carrying zones of his interferometer, trying to make a "pure" test of experiments of Miller. At $l \sim 21$ m he expected $A_{m \text{ exp.}}=0.8$, but measured $A_{m \text{ meas.}} < 0.001$. Instead of understanding that in the vacuumed device he created condition $\Delta\varepsilon \sim 0.0000006$, corresponding to pumping out the air to $\sim 10^{-3}$ atm., at which his device 1000-fold loses sensitivity to measurement of the shift of the fringe (A_m), he drew a disputable conclusion on the basis of the second formula (6) that if $v(A_{m \text{ meas.}} \approx 0) \sim 0$ hence positive results of Miller experiment are supposedly erroneous. But Miller did not vacuumed the light carriers of his device! The erroneous result of Joos was published by magazine "Phys. Rev" and confirmed the belief of Einstein [16] that the Michelson interferometry is "essentially negative" and that there is no aether in nature.

In other works of those years [1, 4-13] there were committed the same mistakes as in the above two examples. Already at a methodical stage of checking the correctness of the chosen model of interpretation and purity of execution of experiment under the first formulas (6) and (12) all experimenters obtained $A_{m \text{ meas.}} \ll A_{m \text{ exp.}}$: in the experiment of Michelson&Morley (1887) at $l \sim 11$ m there was expected $A_{m \text{ exp.}}=0.4$, but measured $A_{m \text{ meas.}} < 0.01$; in the experiments of Miller (1905-25) at $l \sim 32$ m expected $A_{m \text{ exp.}}=1.3$, but measured $A_{m \text{ meas.}} < 0.05$; the same picture was observed in other experiments mentioned [9-13]. About 50 years (after 1881), the demand of accuracy ($A_{m \text{ exp.}} \approx A_{m \text{ meas.}}$) of operation of all Michelson type installations was not met [5-12].

In scandalous case $v(A_{m \text{ meas.}} \ll A_{m \text{ exp.}}) \sim 0$ it is wrong to pass to the second stage of the general scientific analysis of the doubtful results by the second formulas (6) and (12) in order to make the statement that in experiment $v(A_{m \text{ meas.}} \ll A_{m \text{ exp.}}) \sim 0$. So, it is necessary to achieve the success (A_m

$\text{exp.} \approx A_{m \text{ meas.}}$) at the first stage, eliminating flaws in interpretation models or in purity of measurements, and only then it is possible to use 2nd form (6) of $\nu(A_{m \text{ meas.}})$ for conclusions of general scientific value. And though in [1, 4-13] nonzero shifts of the fringe were obtained, none of these experimental tests of chosen mathematic model was completed correctly.

The search for the explanation of the experimental dependence $A_m(\Delta\varepsilon)$ found (by Fig.1) has led me to understanding of that Michelson interferometer as based on the Maxwell theory, is especially "relativistic" device. It prompted the necessity of the relativistic description (2-5) of light speeds $c'_\pm(v, \Delta\varepsilon)$ in the moving optical medium. Application of Lorentz-invariant formula (5) for c'_\pm gives at once satisfying the experiment in Fig.1 expression of expected and measured amplitude of the shift of the interference fringe $\{A_{m \text{ exp.}}(v/c, \Delta\varepsilon) \sim A_{m \text{ meas.}}\}$ for Michelson devices on effects of the second order of the ratio v/c . The agreement $A_{m \text{ exp.}} \approx A_{m \text{ meas.}}$ is achieved by the pair of the following Lorentz-invariant formulas for IM₂ [2, 3, 14, 17]:

$$A_{m \text{ exp. IM}_2}^{**} \left(\frac{v}{c}, \Delta\varepsilon \right) = \frac{2 \cdot l}{\lambda} \frac{v^2}{c^2 \sqrt{\varepsilon}} (\Delta\varepsilon - \Delta\varepsilon^2); \quad \nu_{\text{IM}_2}^{**} (A_{m \text{ meas.}}) = c \sqrt{\frac{A_{m \text{ meas.}} \lambda \cdot n}{2 \cdot l \cdot (\Delta\varepsilon - \Delta\varepsilon^2)}}, \quad (7)$$

After my detection of experimental dependence $A_m(\Delta\varepsilon)$ (Fig.1), unequivocally describing the Michelson type experiments as positive, there arised a paradoxical situation. It was unexpectedly found out that classical (Lorentz-noninvariant) formula (1) works as though in favor of SRT, invariably helping to interpret Michelson type experiments [1, 4-12] as "negative". The relativistic formula (2) oppositely, by the efforts of new understanding of my experiments [2, 3] and reconsiderations of the previous experiments [4-12] on the basis of (3-5) rehabilitates Michelson type experiments as positively feeling aether [3], undermining thus the SRT axiomatics concerning the absence of aether. Their new interpretation on the basis of (7) found out absolute speeds of terrestrial laboratories in stationary aether evaluated as several hundreds km/s [2, 3]. Can not it be surprising that (2), leading to formulas (7), denies SRT postulates about absence of aether and about non-observance of absolute speeds? The reasons of such "nonrelativizm" of SRT should be understood! Galaev experiments [14] represent a good occasion to understand the essence of paradoxes and errors of physics of aether.

I will show below that Galaev experiments with correct interpretation on the basis of (2), considering structure $\varepsilon=1+\Delta\varepsilon$ of light carrying zones of interferometers, as well have found out speeds of "aether wind" in the interval of values $150 < v < 500$ km/s, instead of $0.1 < v < 1$ km/s as Galaev has declared for the whole world [13, 18, 19]. His incorrectly interpreted results of " $0.1 < v < 1$ km/s" only reinforce the erroneous position of the SRT concerning the absence in the nature of substantial aether, and disputable references of Galaev to "dragging of aether" bodies on the Earth's surface only confuse a problem fully (because, in reality, the aether is non-dragging).

2. Wrong understanding in [1, 4-13] the phenomena of "aether wind" and "dragging of aether" by bodies

Gas-dynamic understanding of "aether wind" became stronger after the known Fizo experiment (1852) which proved on moving water the validity of the Fresnel formula (known by then already for 30 years):

$$c'_\pm = \frac{c}{n} \pm v(1 - n^{-2}) = \frac{c}{n} \pm v \frac{\Delta\varepsilon}{\varepsilon}. \quad (8)$$

In (8) the factor $k=(1-n^{-2}) < 1$ was unsuccessfully named by Fresnel the "dragging of aether". Actually, in the Maxwell theory the physical content $k=\Delta\varepsilon/\varepsilon < 1$ (where $\varepsilon=n^2$) reveals a measure of dragging the light by polarized ($\Delta\varepsilon$) particles of the optical medium, moving with the speed v relatively to stationary aether within this medium-mixture of the stationary aether and moving particles in it. The concept of "aether wind" generated in 20th century a number of disputable understanding about aether, as a gaseous substratum possessing viscous mobility with the non-zero factor of drag-

ging by bodies ($0 < k < 1$) [20]. These misunderstandings are alive and today though they contradict experiments on aberration of light. Already for 200 years these experiments steadily testify to immovability of aether substratum.

Neglecting the polarization structure ($\varepsilon_1 = 1 + \Delta\varepsilon_1$ and $\varepsilon_2 = 1 + \Delta\varepsilon_2$) of optical media in the areas of propagation of EMW in IM_1 led Galaev to understatement in his papers [18, 19] of the velocity of "aether wind" to the values $0.1 < v < 1$ km/s. This has contributed to the controversial view of almost full dragging of aether by the bodies on the earth's surface. The ideology of "dragging aether" is more harmful to the cause of the return of the aether in physics adding experiments of Galaev to those already referred to as evidences of "negativity" of Michelson type experiments. Attempts to ascribe to aether properties (mobility, dragging of bodies, the finite viscosity), which he does not have, help to deny by opponents of aether (as in [18]) the existence in nature of the absorbing aether substratum. The logic of such denials is impeccable: even be aether a million times less viscous than the authors define it [13, 20], it would be impossible to observe not only the stable aberration of light from the stars, but the stars themselves would not be seen in the "viscous" sky.

Fortunately, the quality of Galaev measurements allows me on the basis of my research experience to supplement them by missing data and to construct on a new basis the correct (rehabilitation) interpretation of his positive results [13, 18, 19]. According to my interpretation of data [13, 19], resulted in Fig.3, the speeds of Galaev's terrestrial laboratory at various times of day and night turn out to be 150-500 km/s (instead of $0.1 \div 1$ km/s). Such values of speeds already nobody will risk to name as a noise, and experiments as "negative".

3. The Lorentz-invariant processing of Galaev's results

Galaev carried out his experiments under rather a simple scheme of interferometers of the first order of ratio v/c , essentially presented (without minor details) in Fig.2 (see my experiments of the 1st order of ratio v/c [14]). In microwave area the source S_+ of EMW radiation represented by the generator of a monochromatic wave of the length $\lambda = 0.8$ cm, radiated by receiving-transmitting parabolic antenna A_1 with the width of the diagram of orientation ~ 30 angular minutes. The receiver-interferometer Ri_+ , established at the distance $l = 13$ km from S_+ , had precisely the same, as A_1 , receiving-transmitting parabolic antenna A_2 .

This unique scheme enables an inversion of the propagation of electromagnetic wave (almost instantaneous) in the opposite direction, that is equivalent to nonmechanical (electrical) almost instantaneous rotation of the interferometer in the horizontal plane by 180° . Instantaneity of the inversion of forward and backward directions of propagation of EMW eliminates errors of mechanical rotation of interferometer and thermal instability, as forward and reverse measurement are simultaneous. I successfully used this method for improving the accuracy of the measurement of dielectric spectra of ferroelectrics step by step at the same time at two frequencies [21, 22].

On the mirror of the reception antenna A_2 two sets of rays of the diagram of radiation of transmitting antenna A_1 interfere (effect well-known in the sea radar-location): these are direct rays (Fig.2 they form an interferometer arm $l_1 \sim l$) which extend directly above the surface of the Earth (in Galaev experiment – at average height ~ 40 m), and a set of rays directed toward the Earth with the inclination angle of 10-15 minutes to the surface (in Fig.2 they form the second arm of interferometer $l_2 > l_1 \sim l$) which propagate at the average height of several meters with reflection from two points of the surface of the Earth.

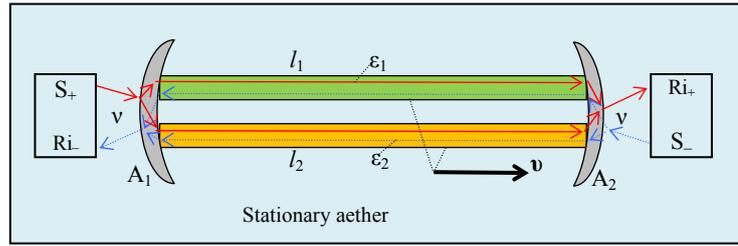


Fig.2. The principle scheme of interferometer registering effects of anisotropy of speed of light in translationally moving in aether with a speed v optical media with different dielectric permittivities:

S_+ and S_- – generators-sources of EMW of frequency ν and length of wave $\lambda=c/\nu$, sending EMW from left to right (+) and from right to left (-); A_1 – the mirroral receiving-transmitting parabolic antenna transmitting to the right (or receiving as interferometer on the right) the stream of EMW along the vector v , branching out by its orientation diagram the stream of EMW into the "top" and "bottom" rays; A_2 – the mirroral receiving-transmitting parabolic antenna transmitting to the left (or receiving as interferometer on the left) stream EMW along a vector v , branching out by its orientation diagram the stream of EMW into the "top" and "bottom" rays; Ri_+ and Ri_- – accordingly, receivers of EMW after the interference on mirroral receiving-transmitting parabolic antenna A_2 of the rays going from left to right, and on mirroral receivevely-transmitting parabolic antenna A_1 of the rays going from right to left.

My experiments in 1968-70 [2, 14] showed, that the correct revealing of anisotropy of EMW speed in interferometers of the 1st and 2nd order of the ratio v/c is possible only by the account of the described above in (2-5) Lorentz-invariant dielectric structure ($\epsilon_i=1+\Delta\epsilon_i$) of optical media of both arms of the interferometer. The proof of it for interferometers of the 1st order was obtained after I had been meaningly planned dielectric asymmetry of arms (see Fig.2) by entering of precisely known difference ($\delta\epsilon=\epsilon_2-\epsilon_1=\Delta\epsilon_2-\Delta\epsilon_1\neq 0$) of dielectric permittivities of the light carrying regions of both arms [2, 14].

The planned dielectric asymmetry of the two arms of the first order effects by the ratio v/c then consciously was taken into account in the approximately Lorentz invariant formula of Fresnel (8) with the accuracy of order of the ratio v/c , see below. The performed experimental check [2, 14] has proved the correctness of this model both by the obtaining of the planned (expected) shift of the fringe ($A_{m\text{ exp.}}\approx A_{m\text{ meas.}}$), and determining the daily trend of correct values (hundreds km/s) of horizontal projection of speed of terrestrial laboratory relative to stationary aether (see a curve 4 in Fig.3c). In Obninsk ($\sim 56^\circ$ N) during the period of August, 1968-70 I obtained at IM_2 and IM_1 the following interval of change of the horizontal projection of the vector v on the day-and-night trend: $140 < v < 480$ km/s [2, 3] (see Fig.3, curve 4).

As it was noted above, Galaev did not take into account dielectric properties of optical media of both arms of the his interferometer, ascribing their casual dissimilarity to "isotropic errors" of arms which he originally eliminated by carrying out simultaneous measurements of the shift of the fringe (in his experiment – the phase difference) in the forward and opposite direction of interferometer scheme in Fig.2. It is the continuation of the rough mistake since Michelson times. I confirm it on the basis of my straight experiments [2] which have revealed at vacuuming out ($n\rightarrow 1$) light carrying zones of the interferometer of the 1st order (as well as interferometer of the 2nd order, see Fig.1) the disappearance from view of trend $A_{m\text{ meas.}}(T_m)$ with nonzero shifts of the fringe in noise at any time (T_m) of day and night: $A_{m\text{ meas.}}(n\sim 1, T_m)\rightarrow 0!$

Let us consider the correct algorithm for interpretation of results of nonzero measurements of amplitude of shifts of the interference fringe in Galaev experiments on IM_1 . In the beginning we shall write down expressions of times of propagation in top (t_1^+ by Fig.2) and lower (t_2^+) arms of interferometer for collateral with v directions (+c) of EMW propagation (to the right in Fig.2). For this purpose the Lorentz-invariant (for effects of 1st order) Fresnel formula (8) with a sign "+" is used:

$$t_1^+ = \frac{l_1}{c/n_1 + v \cdot \Delta\epsilon_1 / \epsilon_1} ; t_2^+ = \frac{l_2}{c/n_2 + v \cdot \Delta\epsilon_2 / \epsilon_2} ; \Delta t_+ = t_2^+ - t_1^+ . \quad (9)$$

For opposite with respect to v directions ($-c$) of EMW propagation (from right to left on Fig.2) by analogy with (9) expressions t_1^- и t_2^- are obtained:

$$t_1^- = \frac{l_1}{c/n_1 - v \cdot \Delta\varepsilon_1 / \varepsilon_1} ; t_2^- = \frac{l_2}{c/n_2 - v \cdot \Delta\varepsilon_2 / \varepsilon_2} ; \Delta t_- = t_2^- - t_1^- . \quad (10)$$

Relative amplitude δA_m of the harmonious shift of the fringe (which corresponds to the rotation of the interferometer for 180° , implemented by Galaevs electric conversion scheme Fig.2) we find from the difference of times Δt_+ and Δt_- ($\Delta t_+ - \Delta t_- = \Delta t^*$) by formulas $\delta A_{m \text{ exp}} = \Delta t^* \cdot \nu = \Delta t^* \cdot c / \lambda$, where ν and λ – frequency and length of EMW wave. After simple transformations, taking into account (9), (10) and $l_1 \approx l_2 = l$, we obtain similar to (7) for IM₂ pair of Lorentz-invariant equations for a correct interpretation results of measurement on interferometers of the 1st order by v/c (IM₁), for which there will always be achieved by agreement between theory and experiment in the form $\delta A_{m \text{ exp}}^{**} \approx \delta A_{m \text{ meas.}}$:

$$\delta A_{m \text{ exp. IM}_1}^{**} \left(\frac{v}{c}, \Delta\varepsilon_1, \Delta\varepsilon_2 \right) = \frac{2l v}{\lambda c} (\Delta\varepsilon_2 - \Delta\varepsilon_1) ; \quad v_{\text{IM}_1}^{**} (\delta A_{m \text{ meas.}}) = c \frac{\delta A_{m \text{ meas.}} \cdot \lambda}{2 \cdot l (\Delta\varepsilon_2 - \Delta\varepsilon_1)} . \quad (11)$$

where $(\varepsilon_2 - \varepsilon_1 = \Delta\varepsilon_2 - \Delta\varepsilon_1 = \delta\varepsilon)$ is the composed in IM₁ difference of medium permittivities in the zones of the beam propagation of "top" (ε_1) and "lower" (ε_2) rays in Fig2.

Using the Lorentz-noninvariant formula (1) in the denominators of (9) and (10), as did Galaev repeating similar mistakes of Michelson in the derivation of (6), does not account for the relativistic structure $(\varepsilon_2 - \varepsilon_1 = \Delta\varepsilon_2 - \Delta\varepsilon_1 = \delta\varepsilon)$ of light-carriers of IM₁ and leads to formulas of erroneous interpretation of the experiments (in which there will always arise the conflict $\delta A_{m \text{ exp.}}^* \gg \delta A_{m \text{ meas.}}$):

$$\delta A_{m \text{ exp. IM}_1}^* \left(\frac{v}{c} \right) = \frac{2l v}{\lambda c} ; \quad v_{\text{IM}_1}^* (\delta A_{m \text{ meas.}}) = c \frac{\delta A_{m \text{ meas.}} \cdot \lambda}{2 \cdot l} . \quad (12)$$

Indeed, the disagreement with the experiment will occur because of: 1) following from (2) role of relativistic structure $(\varepsilon_1 = 1 + \Delta\varepsilon_1$ and $\varepsilon_2 = 1 + \Delta\varepsilon_2)$ of optical media is taken into account in (11), while in the Galaev's (1) and (12) – it is not; 2) in vacuum by (11) there is no shifts of the fringe (i.e. $\delta A_{m \text{ exp.}} = 0$, in the consent with experiment in Fig.1), but in the interpretation by Galaev the shift of the fringe by (12) in vacuum is not zero ($\delta A_{m \text{ exp.}} > 0$). At last, 3) in (11) the expected shift of the fringe $\delta A_{m \text{ exp.}} \leq 1$ and measured $\delta A_{m \text{ meas.}} \sim 1$, i.e. approximately identical: $\delta A_{m \text{ exp.}} / \delta A_{m \text{ meas.}} \approx 1$, but in Galaev's interpretation by (12) the contradiction arises: $\delta A_{m \text{ exp.}} > 300$, whereas the measured shift is $\delta A_{m \text{ meas.}} \sim 1$ (the expected shift of the fringe ≥ 300 times greater than the measured one!). The later just leads to ~ 300 -fold underestimation of speeds to $v(\delta A_{m \text{ meas.}}) \sim 1$ km/s (see Fig.3b on the left axes of ordinates calculated by Galaev), thus finding out the incorrectness of the model of interpretation (1) and (12), chosen by him.

4. The analysis and reassessment of Galaev's results

The results of experiments processed by Galaev in (12), are shown in Fig.3a, b, curves 1, 2 with the left axis of abscissas. On them Galaev presented three daily trends $v(T_m)$ with dependences of speed v of "aether wind" from local time T_m of the day and night, two of which are measured by him (curves 1 and 2), and the third – by Miller (a curve 3). For comparison I show on the curve 4 Fig.3c the results of my measurement $v(T_m)$, obtained in the period of August, as the average of measurements on Michelson type interferometers of the 2nd (IM₂, 1968) and 1st (IM₁, 1970) orders by v/c [2, 3] at 56° N in Obninsk [2].

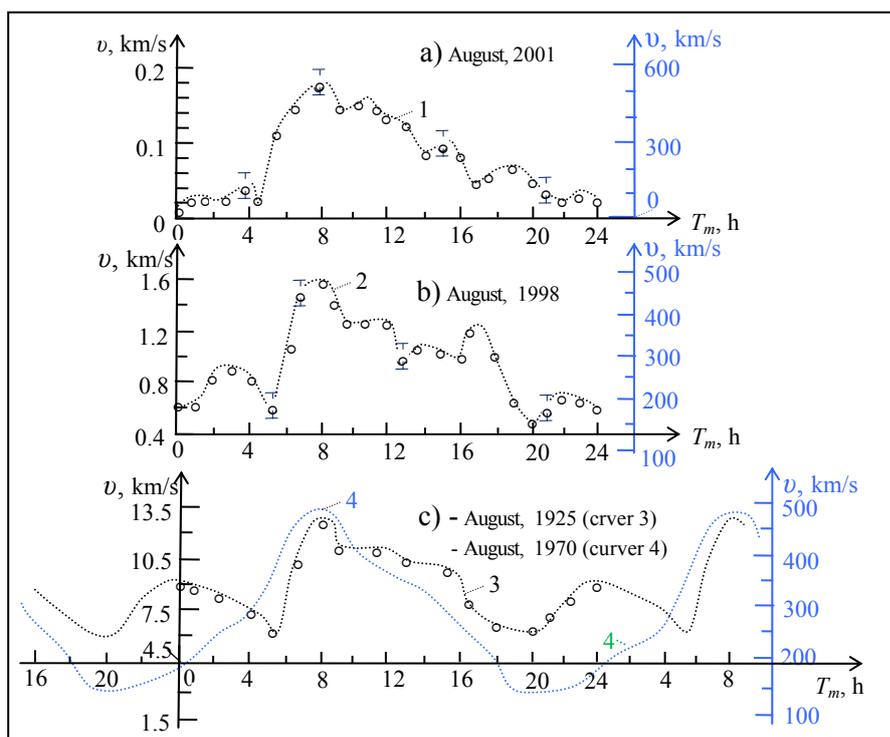


Fig.3. Results of measurement of daily trends of speed v of "aether wind" during the period of August according to various experiments (curves 1-3 with experimental points are taken from Galaev's works [13, 18, 19], the curve 4 is measured by me and it is taken from [2]):

- a) Galaev's experiment in then optical range of light waves [19], Kharkov, Ukraine, August 2001 (curve 1);
- b) Galaev's experiment in the range of EMW ($\lambda=0.8$ cm) [13, 18], Kharkov, Ukraine, August 1999 (curve 2);
- c) Miller's experiment in the optical range of light waves [7], Mount Wilson, the USA, August 1925 (curve 3);

Demjanov's experiment in the optical range of light waves, the average data of measurements on Michelson type interferometers IM₁ and IM₂ [2, 3], Obninsk, the USSR, August 1968 and 1970, accordingly (curve 4).

On the left are shown scales of incorrect speeds v in Galaev's and Miller's interpretation; on the right by green color are shown scales of correct speeds v , curves obtained after my processing 1-4 by Lorentz-invariant formulas (2-5, 9-11). Everywhere horizontal projections of v were measured.

The choice of this period of the comparison of my measurements [2] with the curves of Fig.3 is defined by Galaev ([13], 1999) and Miller ([7], 1925). Curves 1, 3 and 4 are measured in the optical range, and the curve 2 – in the microwave one ($\lambda=0.8$ cm). Curves 1-3 are processed by their authors basing on Lorentz-noninvariant formulas (6) and (12) and the range of the speeds v of "aether wind" obtained by them is presented by Galaev at the left. The processing of curves 1-4 performed by me by the Lorentz-invariant formulas (7) and (11) is presented by the green scales of speeds v on the right in Fig.3. At last, measurements of curves 1 and 2 in Fig.3 are made by Galaev on interferometers of the 1st order v/c (IM₁), measurements of the curve 3 are made by Miller on interferometer of the 2nd order v/c (IM₂), and my curve 4 is the average of measurements on interferometers both of the 1st, and 2nd orders ([2] and [14]).

For correction of mistakes of the interpretation made by Galaev in processing of the measurements on microwave interferometer there are not enough data on dielectric permittivity of the media. Therefore, I shall use the necessary part of results from my experimental experience. They concern my researches of dielectric properties of the laboratory air of different humidity ($w, \%$) in microwave and optical ranges. In Fig.4 there are dependences $\Delta\varepsilon(w)$ the polarization contribution ($\Delta\varepsilon=\varepsilon-1$) of particles of the air mixture of normal pressure from its humidity (w), measured by me in the summer of 1968 in the laboratory "FNIFI" in Obninsk.

The curve 1 in Fig.4 corresponds to measurements $\delta\varepsilon(w)$ on frequency of 15 GHz microwave, and curve 2 – on frequency $\nu=4 \cdot 10^{14}$ Hz of optical ranges. These data I shall supplement with one more observation. The value $\Delta\varepsilon_2(w)$ of the air, measured directly on the surface of the Earth, always were larger, than value $\Delta\varepsilon_1(w)$ at height of 15 m above the surface of the Earth (mostly because of smaller humidity of the top layers of the air). I do not have other data of mine and of known to me literature. The difference of values $\delta\varepsilon=\Delta\varepsilon_2-\Delta\varepsilon_1$ in these measurements on frequency of 15 GHz changed in the

interval $0.0007 < \delta\varepsilon < 0.0012$. Notice that these data are valid in the range of frequencies EMW $10^9 < \nu < 10^{11}$ Hz, since the frequency dispersion of permittivity of water in this interval by my measurements is insignificant (the value ε of water decreases in it from ~ 60 to ~ 50).

The presented additional data are sufficient in order to give a new interpretation of certainly positive microwave Galaev's experiments shown in Fig.3b by the curve 2. In my interpretation the Galaev's experiment was successful only owing to that the top by Fig.2 ray line of EMW radiation by the narrowly directed aerial (with the diagram in width of ~ 30 angular minutes) of the length 13 kilometers in the interferometer passed at height of ~ 40 m above the surface of the Earth and have lowered value $\Delta\varepsilon_1$, and lower beam track was held mostly near the land (at the heights $0 \div 5$ m) and therefore have the increased value $\Delta\varepsilon_2 > \Delta\varepsilon_1$. Galaev did not show in [18] values $\Delta\varepsilon_1$ and $\Delta\varepsilon_2$ since he did not see a necessity in it. I use here my experimental data on dependence $\Delta\varepsilon(w, \%)$ shown in Fig.4 (curve 1).

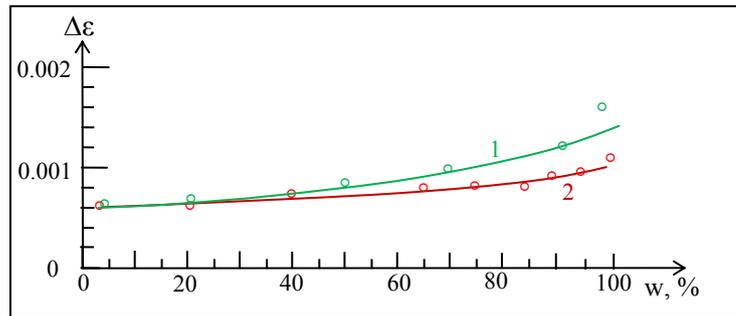


Fig.4. Dependence $\Delta\varepsilon(w, \%)$ of the polarization contribution $\Delta\varepsilon$ of particles of the air of normal pressure into its full permittivity $\varepsilon=1+\Delta\varepsilon$ from humidity $w, \%$, measured in microwave (on frequency of 15 GHz, curve 1) and optical (at $\lambda=4 \cdot 10^{-7}$ m, curve 2) EMW ranges (the error of measurements $\pm 5 \%$ for points of curve 1 and $\pm 8 \%$ for points of curve 2).

The explanation of the optical Galaev's experiment presented by him in Fig.3a is qualitatively similar, but will demand from us the understanding of other reasons of occurrence of the short-term pulse shift of the fringe at its accelerated turn by 180° . As Galaev writes [19], this short-term shift of the fringe is proportional to speed of "aether wind" and in several seconds disappears, since the fringe comes back to the initial position though the turn of the device by 180° is kept. I confirm, that such impulsive-dynamic shift of the fringe is observed practically on all interferometers with gaseous light carriers, however, the pulse shift relaxed, as a rule, not on the starting position of the fringe (i.e. there is a hysteresis). I note on the basis of my experience, that impulsive-dynamic shift of the fringe practically is absent in the sharp turns of the interferometer IM_1 with vacuumed light-carrying zones and with solid state light carriers.

I suppose, that skilled experimenter Galaev managed to allocate statistically a pulse component of shift of the fringe which has given an average-statistical daily trend of change of speed of "aether wind", shown by him in Fig.3a by the curve 1. Galaev estimates these changes by the interval $0.1 < v < 0.2$ km/s using the wrong formulas (12). Actually such shift of the fringe can be generated (by the principle of relativistic action of interferometer of the 1st order) only by the nonzero difference $\delta\varepsilon = \Delta\varepsilon_2 - \Delta\varepsilon_1$ of permittivities in its arms (Fig.2). In Galaev optical interferometer it can be only the difference of permittivities in the open arm and the arm covered by a metal pipe.

I will estimate by my experiments the opportunity of arising in the tube part of interferometer the pulse pressure differences of the air $0.07 \div 0.1$ atm. at harsh its rotation by 180° . In this case the occurrence of a pulse difference permittivity in its arms $\delta\varepsilon = \Delta\varepsilon_2 - \Delta\varepsilon_1 \sim 0.00005$ is rather probable. Attached by me on the right in Fig.3a the new scale of speeds ($0 < v < 600$ km/s) is calculated just for differences of permittivities in arms $\delta\varepsilon = 0.00005$. Such reconsideration of optical Galaev experiment bring into accord his scales and my measurements of daily trend of speed of "aether wind" (hundreds km/s) and will coordinate them with results of astronomical observation of speed of the Earth in space ($\sim 500 \div 600$ km/s).

On Fig.3c (curve 3) Galaev reproduced the daily trend $v(T_m)$ measured by Miller. I wrote in [2, 3, 14*] in detail, and irrespectively of [19], about correction of mistakes in Miller's results. Attached by

me on the right in Fig.3c a new range of speeds in the scale $200 < v < 500$ km/s is calculated by the Lorentz-invariant formula (7). It removes the 40-fold understating of Miller results, obtained by him on the basis of erroneous Michelson formula (6). If Miller had guessed to interpret his good-quality experiments by the Lorentz-invariant formulas (7), that in 1920th basically was already possible, the kinematic destiny of SRT would have come to the end in the first half of the 20-th century.

5. Discussion of results

In Fig.3c the curve 4 measured by me during the period of August at Michelson type interferometers of the 2nd order (1968) and 1st orders (1970 [2]) is presented. I processed the measurements of the day-and-night trend of change of amplitude of the shift of the fringe by formulas (7) and (11). From comparison of curves 3 (Millers) and 4 (Demjanov) it is visible, that they differ not only by the range of values v (in 40 times), but also by the form (especially at night). The reasons of distinctions of curves 3 and 4 are explained by the fact that trend of the shift of the fringe $A_{m \text{ meas.}}(T_m)$ (curve 4) was processed by me with the account of structure $\varepsilon = 1 + \Delta\varepsilon$ of really moist air in formulas (7) and (11). But Miller processed the measurements $A_{m \text{ meas.}}(T_m)$ by the formula (6) in which there was accepted $\varepsilon = 1$, i.e. dependence $\Delta\varepsilon(w, \%)$ is not taken into account. Besides of ~ 40 -fold understating of values v by Miller, his curve 3 additionally is deformed (especially at night) because of the ignorance by him of day-and-night change of humidity of the air.

According to Figure 4, with the growth of humidity $\Delta\varepsilon$ increases. From Fig.1 it follows that both in Miller's and my measurements the value A_m increased for higher $\Delta\varepsilon$, i.e. for higher $w, \%$. In processing the measurement of its trend $A_{m \text{ meas.}}(T_m)$ Miller received under the radical $\sqrt{A_{m \text{ meas.}} \lambda / 2l}$ of the second formula (6) higher values of v for higher humidity of the air. At similar processing of my measurements of the trend $A_{m \text{ meas.}}(T_m)$ by the formula (7) I did not obtain any overestimate of radical $\sqrt{A_{m \text{ meas.}} \lambda / (2l \cdot \Delta\varepsilon)}$ since the growth in numerator $A_{m \text{ meas.}}$ in the damp air is automatically compensated by the same growth $\Delta\varepsilon$ in the denominator (the connection of $A_{m \text{ meas.}}$ and $\Delta\varepsilon$, according to Fig.1, is linear). It is for this reason that my curve 4 in Fig.3c at night goes below values v on the curve 3 of Miller. Certainly, the difference of latitudes of shooting of curves 3 and 4 in Fig.3c also gives the contribution to their deformation. The ratio $v_{\text{max}}/v_{\text{min}}$ of the curve 3 which have been measured at latitude $\sim 42^\circ$ N, is equal $\sim 2,5$, and in my curve 4, which have been measured at latitude $\sim 56^\circ$ N, this ratio equals to $\sim 3,5$.

Similarly, the ignorance by Galaev of structures $\varepsilon_1 = 1 + \Delta\varepsilon_1$ and $\varepsilon_2 = 1 + \Delta\varepsilon_2$ in the arms of interferometers when processing the measurements $\delta A_{m \text{ meas.}}$ by the second formula (12) not only underestimated the calculated speeds v of "aether wind" (in ~ 300 times on microwaves and in ~ 3000 times in the optical range), but also led to additional deformation of the form of day-and-night trends $v(T_m)$. The reason is the same: daily changes $\varepsilon_1(T_m)$ and $\varepsilon_2(T_m)$ have remained unknown for Galaev and, naturally, were not accounted for by formulas (12).

In summary I shall pay attention to the central motive of my criticism of Galaev's works. Positivity of results of his measurements is in two achievements. *Firstly*, he has found out the nonzero shift of the interference fringe on microwave and optical interferometers of the first order v/c . Actually, he is the unique experimenter who has confirmed an opportunity of measurements on effects of the 1-st order v/c in Michelson type interferometers, found out by me in 1970 [2, 14]. *Secondly*, the quality of statistical processing of measurements of the shifts of the fringe appeared to be sufficient for their correlations with day-and-night trends of similar measurements of Miller (1926) and Demjanov (1968-70). Unfortunately, the result of Galaev's work has appeared sharply negative. First of all, because in the choice of interpretation of the positive experimental results he ignored the necessity of the account of relativistic dielectric structure of the permittivity $\varepsilon_1 = 1 + \Delta\varepsilon_1$ and $\varepsilon_2 = 1 + \Delta\varepsilon_2$ in the arms of interferometer (examples of such account with application of the Fresnel formula were already known by the end of 20-th century).

6. The conclusion

Comparison of formulas (6) with (7) and (11) with (12) enables us to estimate the error of Lorentz-invariant algorithm of Michelson for IM₂ and IM₁, committed in [1, 4-12] and in [13, 18, 19].

Overestimation of the expected interference fringe shifts for the interferometer IM₂ can be determined by the ratio of amplitudes calculated by the first formulas (6) and (7):

$$\xi_{A IM_2} = A_{m \text{ exp}}^* / A_{m \text{ exp}}^{**} = (\Delta\varepsilon - \Delta\varepsilon^2)^{-1} \text{ (times)}. \quad (13)$$

Accordingly, underestimation of speed of "aether wind", obtained after processing experiments on IM₂ by the second formulas (6) and (7), is determined by the ratio:

$$\xi_{v IM_2} = v^{**} / v^* = (\Delta\varepsilon - \Delta\varepsilon^2)^{-1/2} \text{ (times)}. \quad (14)$$

For the air in light carrier zones of IM₂ (at normal air pressure $\Delta\varepsilon \approx 0.0006$) the expected shift of the fringe by (13) is overestimated in ~ 1660 times, and the velocity of "aether wind" (or rather, the Earth's velocity relative to the stationary aether), according to (14) is underestimated in ~ 40 times. For helium in light carrier zones of IM₂ [9, 10] (at normal helium pressure $\Delta\varepsilon \approx 0.00006$) overestimation of the expected shift of the fringe by (13) is in ~ 16600 times, and underestimation of the velocity of "aether wind", according to (14) in ~ 130 times, that just was the case in [9, 10]. For evacuated ("vacuumed") light carrier zones of IM₂ [10, 12] (at the air pressure 0.01 atm., $\Delta\varepsilon \approx 0.000006$) the overestimation of the expected shift of the fringe by (13) is in ~ 166000 times, and underestimation the velocity of "aether wind", according to (14), in ~ 400 times, that was in the case of [10, 12].

The overestimation of the expected shift of interference fringe for interferometers IM₁ is determined by the ratio of amplitudes that are calculated by first formulas (12) and (11):

$$\xi_{A IM_1} = A_{m \text{ exp}}^* / A_{m \text{ exp}}^{**} = (\Delta\varepsilon_2 - \Delta\varepsilon_1)^{-1} \text{ (times)}. \quad (15)$$

Accordingly, the underestimation of the velocity of "aether wind", obtained after processing experiments on IM₁ by the second formulas (11) and (12), is determined by the relation:

$$\xi_{v IM_1} = v^{**} / v^* = (\Delta\varepsilon_2 - \Delta\varepsilon_1)^{-1} \text{ (times)}. \quad (16)$$

That is why the positive experiments by Galaev, where the nonzero ($A_{m \text{ meas.}} \neq 0$) measurements shift of the fringe on IM₁ were obtained, gave "negative" results. In the experiments by Galaev [13, 18, 19] again (even in the 21st Century) there were reproduced failures of many experiments of Michelson type [1, 4-12].

Thus, here as well as in my published works [2, 3, 14*], the experimentally evidence is given that:

- the anisotropy of the speed of light in vacuum (aether without particles) is indeed originally absent;
- measurement with Michelson interferometers on the effects of the 1st and 2nd order of the ratio v/c are meant not for detection of the anisotropy of the vacuum space in the representations of the special relativistic theories, but to prove the existence in the Universe of the anisotropy of the speed of light in vacuum (aether without particles) zones occupied by polarized (by light) particles of matter.

It is the lack of understanding of the phenomenon of anisotropy of the relativistic binary structure $\varepsilon = 1 + \Delta\varepsilon$ in the light propagation zones from the Michelson (1881) to Galaev (2001) caused during 120 years the described here errors of interpretation of experiments [1, 4-13, 18-20] on Michelson type interferometers leading to underestimation of the actually measured on the surface of the Earth values of its absolute velocity in the space in tens and hundreds of times (specifically in Galaev's experiment instead of 300÷500 km/s the velocity v was underestimated down to 0.1÷1.5 km/s, i.e. in 200÷3000 times).

The recognition of the positive experiments of Michelson type is not far off. It makes nearer the time of:

- the return to the physics of the substance of aether, which is polarized by the EMWs and light as an ideal lossless dielectric (with $\varepsilon_r = 1$, $n \text{ tg}\delta = 0$), inhabiting all corners of the Universe [2];
- the collapse of the artificial "special kinematic relativity" (SKR) [2], but not the nature of relativism, as was predicted in [15, 16];
- the development of *Natural Relativism of Absolute Motion of the Inertial Objects* (NRAMIO). The features of NRAMIO were guessed by theorists Poincare and Lorentz in the late 19th century. In 1920th years the substance of aether was detected (although not with certainty) by the

outstanding experimentalist Miller [2], who was not acknowledged, rather unfairly, by the proponents of the SKR.

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