Ordinary synchronization-compensation transformations of coordinate and time increments in the people's world

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The fallacy of using such a false parameter as the coordinate velocity of light in GR is proven. This coordinate velocity of light, unlike the limit velocity of matter, cannot in principle be less than the true velocity of matter. The suitability for use in the people's world of only ordinary synchronization-compensation transformations of increments of spatial coordinates and time is substantiated. These transformations, unlike the alternative to them ordinary Lorentz transformations (OLT), allow to proportionally synchronize all clocks that move in a gravitational field by inertia. The suitability of OLT (due to the inherent to OLT blueshift of the frequency of centripetal radiation instead of redshift) for use only in the comoving with expanding Universe frame of references of spatial coordinates and time is proven. Newton's law of gravity is obtained directly from the condition of no change in the flow of the proper time of matter during its inertial motion in a gravitational field. The fallacy of ignoring the compensation of gravitational dilation of time by the inertial motion of matter is most thoroughly substantiated. And this is in good agreement not only with relativistically invariant thermodynamics, but also with the equations of the dynamic gravitational field of both the Solar System and flat galaxies.

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The condition of quasi-equilibrium precisely in the dynamic gravitational field of the galaxy of all its objects moving by inertia leads to both the absence of relativistic dilation of their proper time t' and the invariance of their proper time with respect to relativistic transformations [1–3]. The equivalence of the gravitational interval q to the astronomical (gravithermodynamic [1,2]) time t, and the equivalence of the kinematic (non-relativistic) interval s_c to the proper time t' of matter in the dynamic gravitational fields of galaxies and the Solar System must also be taken into account:

$$(dq)^2 = v_{lc}^2(dt)^2 + (d\hat{l})^2 = (bc^2 + v_{crc}^2)(dt)^2 + (d\hat{l})^2 =$$
$$= (v_l^2 + 2v_{crc}^2)(dt)^2 = c^2(dt)^2 = \mathbf{invar},$$
$$(ds_c)^2 = (bc^2 + 2v^2)(dt)^2 - (d\hat{l})^2 = v_{lc}^2(dt)^2 =$$
$$= (bc^2 + v^2)(dt)^2 = b_0c^2(dt)^2 = c^2(dt')^2 = \mathbf{invar}.$$

Here: $v_{lc}^2 = b_c c^2 = v_l^2 + v^2 = v_{l0}^2 = \mathbf{const}(t)$ is the square of the limit velocity of matter (which the matter can reach at the event horizon when falling freely onto it), $v_l = fc \equiv \sqrt{b}c$ is the limit velocity of motion of a true or hypothetical stationary matter, which is equivalent to the relative frequency f of the electromagnetic interaction of its microobjects and therefore, unlike the false coordinate velocity of light [4] of the General Relativity (GR), can be arbitrarily less than the true velocity of any other matter at the same point in space, $v_{crc}^2 = (r_g / r + \Lambda r^2 / 3)c^2 / 2$ is square of the hypothetical circular orbital velocity of astronomical objects, $ds_c = cdt'$ is the increment of the kinematic interval; $d\hat{l} = vdt = \sqrt{(d\hat{x})^2 + (d\hat{y})^2 + (d\hat{z})^2}$, $d\hat{x} = v_x dt$, $d\hat{y} = v_y dt$, $d\hat{z} = v_z dt$ are the increments of metric segments, not increments of coordinates.

According to this, it can be conditionally assumed that the ordinary Newtonian $\mathrm{N} = m_{00}c^2(b + v^2c^{-2})^{1/2}$ [5] of the inert free rest energy $E_0 = m_{00}c^2b^{1/2}$ [2] of matter is the Pseudo-Hamiltonian of the fundamental Newtonian $\mathrm{N}_F = m_{00}c^2(b + 2v^2c^{-2})^{1/2}$, and the ordinary Keplerian $\mathrm{K} = m_{00}c^2(b + v^2c^{-2})^{-1/2}$ [5] of the ordinary rest energy $W_0 = m_{00}c^2b^{-1/2}$ of matter is the Pseudo-Lagrangian of the fundamental Keplerian $\mathrm{K}_F = m_{00}c^2(b + 2v^2c^{-2})^{-1/2}$, which is inherent to matter (with ordinary mass m_{00}) in the frame of reference of spatial coordinates and time (FR), which is comoving with the expanding Universe (CFREU).

Thus, we have a twofold $(b_F = b + 2v^2c^{-2})$ kinematic increase in the frequency of electromagnetic interaction between microobjects of matter (due to the isotropic reduction of the

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distances of this interaction in the background Euclidean space [6] of the CFREU), compensated by half by the Lorentzian decrease $(b_c = b_F - v^2c^{-2} = b + v^2c^{-2})$ in it. And therefore, the kinematic interval (as opposed to the relativistic interval) corresponds to the kinematic acceleration of the flow of the proper time of matter instead of its deceleration (dilation). Indeed, unlike the ordinary Lorentz transformations (OLT) the conformal Lorentz transformations of the increments of spatial coordinates and time allow not only to get rid of the dilation of the proper time [7], but also to obtain the kinematic acceleration of the flow of the proper time of the matter due to its isotropic self-contraction in the background Euclidean space [6] of CFREU. In this case, the Lorentz transformations of the velocities will be the same [1,2] as in the case of OLT.

And therefore, the motion of matter actually induces an increase in the frequency of electromagnetic interaction between its microobjects, which leads to compensation for its further gravitational reduction. And this, of course, can be considered only as a compensation for the further gravitational dilation of the proper time of matter, and not as a compensation for the action of the external gravitational field in general. It is precisely due to this compensation that the Hubble velocity of matter is equal to the constant of velocity of light c at the event horizon of the Universe, despite the zero value of the relative frequency of electromagnetic interaction *b* in the hypothetical static gravitational field of the Universe. Therefore, it is only due to the presence of a dynamic gravitational field in the Universe [2,4,8] that Hubble law can operate in it.

Although we should not exclude the possibility that the gravitational field is actually weaker, and therefore that the centrifugal pseudo-forces of inertia actually compensate not only for the half-weaker gravitational pseudo-forces, but also for the centripetal pseudo-forces of evolutionary self-contraction of matter towards the center of gravity, which are equal in magnitude to gravitational pseudo-forces [5].

And only from the condition of complete compensation of the further gravitational dilation of time by the inertial motion of matter ($v = \sqrt{a_c}\,dr/dt \approx -c\sqrt{b_c - 1 + r_g/r} = -c\sqrt{r_g(1/r - 1/r_0)}$,

$$b_c = 1 - \frac{r_g}{r} + \frac{v^2}{c^2} - \frac{\Lambda r^2}{3} = 1 - \frac{r_g}{r_0} - \frac{\Lambda r_0^2}{3} = \mathbf{const}(r,t),$$

$b = 1 - r_g/r - \Lambda r^2/3$) can one obtain Newtonian gravitational acceleration:

$$g = -\frac{c^2}{\sqrt{a_c}}\frac{d\ln(v_{lc}/c)}{dr} = -\frac{c^2}{2b_c\sqrt{a_c}}\left(\frac{db_c}{dr}\right)_v \approx$$

$$\approx -\frac{c^2 r_{g0}}{2b_c r^2} = -\frac{G_0 M}{b_c r^2} = -\frac{G_0 M}{b_c a_c R^2} = -\frac{GM}{r^2}, \left(\frac{db_c}{dr} = 0\right)$$

$$g = \frac{dv}{dt} = \frac{1}{2\sqrt{a_c}}\frac{dv^2}{dr} \approx \frac{c^2}{2}\left(\frac{db_c}{dr} - \frac{r_g}{r^2}\right) = -\frac{GM}{r^2},$$

where: $G = G_0/b$; $R = r/\sqrt{a_c} \approx r\sqrt{b_c}$ is a radial coordinate in the background Euclidean space [6] of CFREU, which under the condition of hypothetical emptiness of space $(b_c a_c = 1)$ takes a zero value $R_h = 0$ on singular surfaces $(b_c = b = 0)$.

And therefore, in the absence of complete compensation of the further gravitational dilation of time by the kinematic acceleration of the flow of time $(db_c/dr \neq 0)$, the gravitational acceleration of a freely falling body will not correspond to reality. Therefore, ignoring the invariance of the time dilation of matter moving by inertia in a gravitational field, based on the imaginary relativistic dilation of proper time of matter, is unacceptable. From this same condition follows the necessity of using the logarithmic gravitational potential and the identity of the inertial mass $m_{in} = m_{00}v_{lc}/c = m_{00}\sqrt{b_c}$ to the gravitational mass $m_{gr} = m_{00}c/v_{lc} = m_{00}/\sqrt{b_c}$ only according to the proper gravity-quantum clock of matter ($^i v_{lci} = c$) [1,2,5], and the spatial and thus temporal dependence (on the parameter $b_c = b + v_x^2 c^{-2}$) of the gravitational "constant" $G = G_0 m_{gr}/m_{in} = G_0/b_c \neq \mathbf{const}(r)$ [1,2,5], the instability of which in time was predicted by Dirac [9].

Due to the fact that the event horizon of the Universe always belongs only to the infinitely distant cosmological past, the size of the length standard on it in the hypothetical empty space is always equal to infinity, as is the size of the fundamental space of the Universe itself. And because of this, it can really be assumed that the radius of the hypothetical empty Universe was equal to zero according to the GR in those distant times. This is why the false theory of the Big Bang of the Universe arose. In fact, the Universe has never been empty and therefore, according to the GR, due to $b_c a_c \neq 1$ and due to the maximum possible Hubble velocity $v_{mh} = c$ of the distancing of protomatter from the observer, we have on it $b_{ch} = b_h + v_{mh}^2 c^{-2} = 1$. We have the same for the false singular Schwarzschild sphere, on which only the infinitely distant cosmological future always resides.

And thus, only the Newtonians and the Keplerians (and not the alternative Hamiltonians and Lagrangians) of astronomical objects moving by inertia in the surrounding gravitational field can strictly correspond to the standard Special Relativity (SR).

The spatial homogeneity of the rate of intrinsic time in entire gravithermodynamically bound matter is consistent with the single frequency of change of its collective spatially inhomogeneous Gibbs microstates, which is not affected by either a decrease (during approaching gravity center) in the frequency of intranuclear interaction or an increase (during approaching gravity center) in the frequency of extranuclear intermolecular interactions. Moreover, this is ensured even without conformal transformations of the space-time interval *s*. Therefore, like the parameters v_l, v_{lc}, b and Γ_m in thermodynamics [1,2,10], the parameter b_c in the relativistic gravithermodynamics (RGTD) [1,2,5] is a hidden internal parameter of the moving matter. And exactly the usage of this parameter in the equations of the dynamic gravitational field of the RGTD allows us not to additionally use the velocity of matter in those equations, as well as in the equations of thermodynamics.

In GR, as in RGTD, astronomical (gravithermodynamic) time is used to describe the motion of matter in a gravitational field. Due to this astronomical time the false coordinate pseudo-vacuum velocity of light in the GR and the alternative maximum possible (limit) velocity of matter in the RGTD can take any values less than the constant of the velocity of light in different FRs. Lorentz transformations of velocity are designed to preserve the value of the velocity of light in any inertial FRs and, therefore, use not gravithermodynamic, but gravity-quantum time to describe the motion of matter. Gravity-quantum clocks are fundamentally unsuitable for use in these gravitational theories due to the impossibility of their proportional synchronization (which is caused by the nonlinearity of the spatial distributions of their readings [1,2,5]):

$$^{ic}v_{lcj} = c\left(\frac{v_{lcj}}{v_{lci}}\right)^{(v_{lci}/c)^2} = c\left(\frac{v_{lc0j}}{v_{lc0i}}\right)^{(v_{lc0i}/c)^2} = \mathbf{invar}$$

$$\left[\ln(^{ic}b_{cj}) = \frac{b_{ci}}{2}\ln\frac{b_{cj}}{b_{ci}} = \ln(^{ic}b_{c0j}) = \frac{b_{c0i}}{2}\ln\frac{b_{c0j}}{b_{c0i}} = \mathbf{invar}\right].$$

So, this is what prevents the use of OLT in FR of the people's world (FRPW) both in GR and in RGTD. In addition, they are based on classical Hamiltonians and Lagrangians, and not on the relativistic Newtonians and Keplerians considered here, and therefore are not suitable for a true reflection of reality in the FRPW both in GR and RGTD.

Under the condition of non-uniform motion of matter, the transformations of the increments of spatial coordinates and time based on the parameter of the dynamic gravitational field used in the Newtonian and the Keplerian [5] will be as follows:

$$d\hat{x}' = \sqrt{\frac{b'}{b'_c}}(d\hat{x} - v_k dt) = \frac{d\hat{x} - v_k dt}{\sqrt{1 + v_k'^2 v_l'^{-2}}} = d\widehat{x} - \widehat{v}_k dt, \quad d\hat{y}' = d\hat{y},$$

$$d\hat{z}' = d\hat{z}, \quad dt' = \sqrt{\frac{b}{b'_c}}(dt + v_k v_l^{-2} d\hat{x}) = \frac{\sqrt{b}(dt + v_k v_l^{-2} d\hat{x})}{\sqrt{b'(1 + v_k'^2 v_l'^{-2})}},$$

$$d\hat{x} = \sqrt{\frac{b}{b_c}}(d\hat{x}' + v'_k dt') = \frac{d\hat{x}' + v'_k dt'}{\sqrt{1 + v_k^2 v_l^{-2}}} = d\widehat{x}' + \widehat{v}'_k dt',$$

$$dt = \frac{\sqrt{b'}(dt' - v'_k v_l'^{-2} d\hat{x}')}{\sqrt{b(1 + v_k^2 v_l^{-2})}}, \quad \frac{v'_x}{\sqrt{b'}} = \frac{v_x - v_k}{\sqrt{b}(1 + v_k v_x v_l^{-2})} =$$

$$= \frac{(\widehat{v}_x - \widehat{v}_k)\sqrt{1 + v_k^2 v_l^{-2}}}{\sqrt{b}(1 + v_k v_x v_l^{-2})}, \quad \frac{v'_y}{\sqrt{b'}} = \frac{v_y \sqrt{1 + v_k^2 v_l^{-2}}}{\sqrt{b}(1 + v_k v_x v_l^{-2})},$$

$$\frac{v'_z}{\sqrt{b'}} = \frac{v_z \sqrt{1 + v_k^2 v_l^{-2}}}{\sqrt{b}(1 + v_k v_x v_l^{-2})}, \quad \frac{v_x}{\sqrt{b}} = \frac{dx' + v'_k dt'}{\sqrt{b'}(dt' - v_k v_l^{-2} dx')} =$$

$$= \frac{v'_x + v'_k}{\sqrt{b'}(1 - v'_k v'_x v_l'^{-2})} = \frac{(\widehat{v}'_x + \widehat{v}'_k)\sqrt{1 + v_k'^2 v_l'^{-2}}}{\sqrt{b'}(1 - v'_k v'_x v_l'^{-2})},$$

$$\frac{v'}{\sqrt{b'}} \neq \frac{\sqrt{[(\widehat{v}_x - \widehat{v}_k)^2 + v_y^2 + v_z^2](1 + v_k^2 v_l^{-2})}}{\sqrt{b}(1 + v_k v_x v_l^{-2})},$$

$$\frac{v}{\sqrt{b}} = \frac{\sqrt{[(\widehat{v}'_x + \widehat{v}'_k)^2 + v_y'^2 + v_z'^2](1 + v_k'^2 v_l'^{-2})}}{\sqrt{b'}(1 - v'_k v'_x v_l'^{-2})},$$

$$\frac{\widehat{v}'_x}{\sqrt{b'}} = \frac{v_x}{\sqrt{b(1 + v_k^2 v_l^{-2})}} = \frac{v_x - v_k}{(1 + v_k v_x v_l^{-2})\sqrt{b(1 + v_k^2 v_l^{-2})}} =$$

$$= \frac{(\widehat{v}_x - \widehat{v}_k)}{\sqrt{b}(1 + v_k v_x v_l^{-2})}, \quad \frac{\widehat{v}_x}{\sqrt{b}} = \frac{v'_x + v'_k}{(1 - v'_k v'_x v_l'^{-2})\sqrt{b'(1 + v_k'^2 v_l'^{-2})}} =$$

$$= \frac{(\widehat{v}'_x + \widehat{v}'_k)}{\sqrt{b'}(1 - v'_k v'_x v'^{-2}_l)}, \quad \frac{v_{ly}}{\sqrt{b}} = \frac{v'_{ly}\sqrt{1 + v'^2_k v'^{-2}_l}}{\sqrt{b'}(1 - v'_k v'_{lx} v'^{-2}_l)},$$

$$\frac{v_{lz}}{\sqrt{b}} = \frac{v'_{lz}\sqrt{1 + v'^2_k v'^{-2}_l}}{\sqrt{b'}(1 - v'_k v'_{lx} v'^{-2}_l)},$$

$$\frac{v_{lx}}{\sqrt{b}} = \frac{v'_{lx} + v'_k}{\sqrt{b'}(1 - v'_k v'_{lx} v'^{-2}_l)} = \frac{(\widehat{v}'_{lx} + \widehat{v}'_k)\sqrt{1 + v'^2_k v'^{-2}_l}}{\sqrt{b'}(1 - v'_k v'_{lx} v'^{-2}_l)};$$

$$\frac{v'_{lx}}{\sqrt{b'}} = \frac{v_{lx} - v_k}{\sqrt{b}(1 + v_k v_{lx} v_l^{-2})} = \frac{(\widehat{v}_{lx} - \widehat{v}_k)\sqrt{1 + v_k^2 v_l^{-2}}}{\sqrt{b}(1 + v_k v_{lx} v_l^{-2})},$$

$$\frac{v_{li}}{\sqrt{b}} = \frac{v'_{lj}}{\sqrt{b'}}\left(\frac{v'_{lj} - v'_p}{v'_{lj} + v'_p}\right) = \frac{v'_{lj}}{\sqrt{b'}}\left(\frac{v_{li} + v_k}{v_{li} - v_k}\right),$$

$$\frac{\widehat{v}_{li}}{\sqrt{b}} = \frac{\widehat{v}'_{lj}}{\sqrt{b'}}\left(\frac{v_{li} - v_p}{v_{li} + v_p}\right) \text{ and } \frac{v'_{lj}}{\sqrt{b'}} = \frac{v_{li}}{\sqrt{b}}\left(\frac{v_{li} - v_k}{v_{li} + v_k}\right)$$

(when: $v_{ly} = 0$ and $v_{lz} = 0$);

$$\frac{v_l - v_k}{v_l + v_k} = \frac{v'_l - v'_k}{v'_l + v'_k}, \quad dt_k = \frac{dt'_k}{\sqrt{b_k(1 + v'^2_p v'^{-2}_l)}} = \frac{dt'_p}{\sqrt{b_k + v_k^2 c^{-2}}},$$

$dt'_p = \sqrt{b_k(1 + v_k^2 v_l^{-2}}\, dt_k = \sqrt{b_k + v_k^2 c^{-2}}\, dt_k$ (when: $b'_p = 1$, $dx = v_k dt_k$ and $dx' = 0$); where: $b = v_l^2 c^{-2}$, $b_c = (v_l^2 + v^2)c^{-2} = b + v^2 c^{-2}$, $v'_{lj} = c(v_{lj} - v_k)/(v_{jl} + v_k)$ (when: $b'_j = 1$ and $b = v_j^2 c^{-2}$),

$v'_k = -v'_p = v_k v'_l / v_l = v_k c / v_{lc} = (b v_k^{-2} + c^{-2})^{-1/2}$;

$v'_l = v_l c / v_{lc}$ $(b' = b / b_c)$, $v'^2_{lc} = v'^2_l + v'^2_k = c^2$ $(b'_c = b' + v'^2_k c^{-2} = 1)$; $d\widehat{x}_k = (1 + v_k^2 v_l^{-2})^{-1/2} d\hat{x}_k \le d\hat{x}_k$ and $d\widehat{x}'_p = (1 + v'^2_p v'^{-2}_l)^{-1/2} d\hat{x}'_p \le d\hat{x}'_p$ are increments of fundamentally invariable metric segments in space, which has a kinematic "curvature" [2],

$d\hat{x}$ and $d\hat{x}'$ are the increments of metric segments in spaces with gravitational curvature, before introducing a kinematic “curvature” in these spaces; the velocities of translational motions v_k and v'_k, as well as the parameters b and b', by which they are determined, are not the same according to the gravity-quantum clocks of different points of the gravitational field of a body moving with the velocity v_k and of the gravitational field of the observer of its motion.

In these transformations, unlike the OLT, in the universal astronomical time of the gravitational system, there is an observation not of kinematic deceleration at all, but on the contrary, kinematic acceleration of the rate of flow of proper time of the observed objects moving by inertia at any velocity v_k. In addition, due to the invariance of the parameter $b_c = b + v_k^2 c^{-2} = b_0 = \mathbf{const}(t, r)$ in time, the possibility of proportional synchronization of the rates of flow of proper time of all astronomical objects moving in the gravitational field by inertia is ensured. And therefore, mutually observed kinematic acceleration of the rate of flow of proper time can not exist in principle, as is confirmed by these ordinary synchronization-compensation transformations of increments of spatial coordinates and time (OSCT). In this case, it is precisely the motion by inertia that actually provides compensation for the gravitational deceleration or acceleration of the rate of flow of time of objects moving in this way in the gravitational field.

And therefore, thanks exactly to OSCT, there will actually be no kinematic and no further comoving gravitational dilation of proper time $(dt / dt'_k = \sqrt{b' / b_0} = \mathbf{const}(t)$ and $dt' / dt_p = \sqrt{b / b'_{k0}} = \mathbf{const}\ (t')$ due to $b_c = b + v_k^2 c^{-2} = b_0 \approx 1 = \mathbf{const}(t)$ and $b'_c = b' + v'^2_k c^{-2} = b'_0 \approx 1 = \mathbf{const}\ (t')$, respectively) for any body (of the Solar System) moving in a gravitational field by inertia. Moreover, all astronomical bodies came from the distant outskirts of the Solar System, where their velocity was low, and the parameter $b_0 \approx b_c \approx 1$. And therefore, thanks to the preservation (in the process of movement by inertia) of their rapid peripheral rate of flow of gravity-quantum time, supported now by the high velocity of their orbital motion, they did not experience big gravitational dilation of their time. Therefore, in proper time of conditionally stationary clocks located along their orbit of movement, instead of slowing down of the flow of their proper time, there is on the contrary its acceleration. And this acceleration of the flow of the proper time of matter is guaranteed by the isotropic reduction of its dimensions in the background Euclidean [6] (fundamental [1,2]) space of the CFREU together with the increase in the velocity of matter. The anisotropy of the reduction or, conversely, the increase in the coordinate (not metric) dimensions of a moving matter arises only in the intrinsic FRs of matter.

And the correspondence of the OSCT to reality is confirmed not only by the motion of the planets of the Solar System according to the laws of Newton and Kepler, but also by the gravitational-relativistic invariance of thermodynamic parameters and potentials [2,5].

Obviously, all this provides additional isotropic self-contraction in the CFREU of the moving matter. But due to the fundamental unobservability of this additional isotropic self-contraction of the matter in the CFREU (in the FR of the observer of motion), it is not reflected by these transformations of the increments of spatial coordinates and time. It only manifests itself in the observer's FR in the form of an additional kinematic curvature of the part of space in which the moving matter is instantaneously located.

Due to the high speed of rapid distancing of distant galaxies $(dx = d\hat{r} = \sqrt{a}dr)$ from the observer *p*, the gradual decrease of frequency of electromagnetic interaction in a hypothetical stationary matter (and the limit velocity of matter, which is equivalent to this frequency) is also compensated along with their approach to the pseudo-horizon of the infinitely distant cosmological past. And that is why distant galaxies do not experience a dilation of their proper time. It is precisely because of the greater homogeneity of matter in the CFREU in the distant past that all galaxies have in their outskirts the maximum possible limit velocity of their matter, which is almost equal to the constant of the velocity of light $v_{lc} \approx c$ $(b_c \approx 1)$. And therefore, precisely the Galilean (and not the Lorentz) transformations of the velocities of galaxies correspond to all galaxies on their outskirts (provided that we switch to observations from another galaxy). Therefore, due to the a priori equality (by any clock) of the velocity of light to the constant $c = \lambda \nu$, only the wavelengths λ and frequencies ν of radiation waves are transformed by these transformations both when observed from another point of the gravitational field and when observed from another FR of a moving body.

And this is due to the use of proportionally synchronized local gravithermodynamic clocks in both the RGTD and the GR.

Thus, thanks to $b \approx b'_c = b'(1 + v'^2_k v'^{-2}_l) \approx 1$ and $v'_l \approx c$ at $d\hat{r}/dt \equiv d\hat{x}/dt = -v'_l \approx -c$ and $dt' \approx (1 - v_k / c)dt$ OSCT clearly demonstrate the redshift $\hat{z} = -z/(1+z)$ of the frequency $\nu = \nu'(dt'/dt) \approx 1 - v_k / c$ and the corresponding shift *z* of the wavelength of the centripetal emission radiation from galaxies that are almost at rest in the CFREU and move away from the observer in the FRPW:

$$\frac{\Delta\nu}{\nu'} = \frac{(\nu - \nu')}{\nu'} = -\frac{v_k}{c} = -\frac{z}{1+z} = -\frac{H_E r}{c} \equiv -\frac{H_E D_A}{c},$$

$$\Delta\lambda / \lambda'_0 = z = H_E R / c = H_E D_M / c.$$

And this shift is purely pseudo-Dopplerian and is connected by the Hubble dependence with the distance along the angular diameter D_A and with the transverse distance D_M of the comoving motion in the CFREU (and not at all to the luminosity distance $D_L = D_A(1+z)^{3/2} = D_M(1+z)^{1/2} = z(1+z)^{1/2} c / H_E$, which actually significantly less exceeds these Hubble distances due to the absence of gravitational-kinematic deceleration of the flow of the proper time of matter in galaxies [1,2]). And that is why the continuity of the spatial continuum of rigid FRs is actually ensured by the invariance in time of the fundamental Hubble constant [1,2,8].

OLT clearly demonstrate not a redshift at all, but on the contrary a blueshift of the frequency and wavelength of the centripetal radiation from molecules of matter that are almost at rest in the FRPW and approach the center of gravity in the process of self-contraction of matter in the CSFREU. After all, at the centripetal velocity $dr/dt \equiv dx/dt = -c$ of light, according to the dependence $dt' = (dt - v_k c^{-2} dx)\Gamma = (1 + v_k / c)(1 - v_k^2 c^{-2})^{-1/2}$ of the OLT, the following takes place:

$$\nu_L = \nu'_L(dt'/dt) = \nu'_L(1 + v_k / c)\Gamma,$$

$$\Delta\nu_L / \nu'_L = (\nu_L - \nu'_L)/\nu'_L \approx v_k / c = z/(1+z) = H_E D_A / c,$$

$$\Delta\lambda_L / \lambda'_0 = -z = -H_E D_M / c.$$

And therefore, the OLT of the SR correspond to reality only in the CFREU, and not in the FRPW. Moreover, in the CFREU, the OLT correspond to the same gravithermodynamic state of matter, and therefore to the same moment of the proper time of matter, and not to the same moment of cosmological time. After all, at the same moment of cosmological time, the kinematic, as well as the gravitational unobservable deformation of microobjects of matter is isotropic. Its coordinate anisotropy is inherent only to the intrinsic spaces of matter.

Due to the equivalence of the relative frequency of electromagnetic interaction to the limit velocity of matter, we can obtain such its shift by the clock, which is conditionally at rest at the point of instantaneous dislocation of the matter that moves by inertia $(b = b')$:

$y = \Delta f_{lc} / f_l = (f_{lc} - f_l)/ f_l = \sqrt{1 + v_k^2 v_l^{-2}} - 1$, where: $f_{lc} = f'_{lc} = \sqrt{v_l^2 + v_k^2} / c = v_{l0} / c = \mathbf{const}(t)$, $f_l = v_l / c$.

According to these transformations, there is also mutual observation, but not a reduction, but an increase [11-14] (along the direction of motion) of the increments of the coordinates of the observed moving objects in a gravitationally curved space $d\hat{x} = \sqrt{1 + v_k'^2 v_l'^{-2}} d\hat{x}'$ (and not metric segments $d\widehat{x}$ and $d\widehat{x}'$ of the observed moving objects). After all, the relativistic increase (or Lorentz reduction) of the sizes of bodies in the FR of people's world should be considered fundamentally unobservable, as well as their isotropic gravitational decrease in the background Euclidean space [6] of CFREU. But in fact, in the CFREU there is a reduction, not an increase, of the longitudinal dimensions of moving bodies, which is only smaller than the reduction of their transverse dimensions. And this additional isotropic reduction of the dimensions of moving bodies is taken into account in these transformations of increments of spatial coordinates and time as an additional gravitational curvature of the observer's intrinsic space. Thus, instead of the relativistic deformation of moving bodies, one should consider the presence of a gravitational-kinematic “curvature” [2] of the observer’s intrinsic space created by the motion of the bodies. But in the comoving space of the expanding Universe, moving bodies, on the contrary, undergo an isotropic kinematic reduction in their size, similar to isotropic gravitational reduction that occurs near the center of gravity.

Similar OLT, which use (instead of the parameter b_c) the parameter $b_w = 1/b_s = \Gamma^{-2}/b = (1 - v_k^2 c^{-2}/b)/b$ [5] not identical to this parameter b_c, do not guarantee all of this. After all, according to them, during the free fall of a body in a gravitational field, which is a motion by inertia, kinematic effects do not compensate for the gravitational dilation of its proper time, but on the contrary increase the dilation. And therefore, the OLT, under which, when the y' and z' axes are orthogonal to axis x', the axes y and z are also not orthogonal to axis x, are suitable only for uniform equilibrium (pseudo-inertial) motion of matter in the process of its evolutionary self-contraction in the background Euclidean space [6] of the CFREU or during artificial acceleration of quasiparticles in accelerators.

CONCLUSION

Thus, we should finally recognize the cardinal difference and mutual harmonious coherence of the phenomena and patterns that occur in the FRPW and in the CFREU:

1. There are two types of similar transformations of increments of spatial coordinates and time, which do not deny the existence of each other, but on the contrary harmoniously complement each other. After all, they relate to different FRs of these increments in objects moving in one FR and at rest in another FR. Namely, these are well known to all OLT related to CFREU, and the considered here OSCT related to FRPW, in which the mutually proportional evolutionary reduction in the sizes of all objects of the Universe is fundamentally unobservable.

2. Indeed, on the physically homogeneous scale of cosmological time [5] all macroobjects of matter move uniformly in the process of their evolutionary self-contraction in CFREU (similar to the uniform motion of "inertial" FRs of the SR). And due to the evolutionary decrease in the CFREU of the distances between the mutually motionless in the FRPW objects, there is an inherent to OLT blueshift of the centripetal radiation frequency (which is directed towards the center of evolutionary self-contraction of matter, which is also the center of its gravity).

3. Due to the unobservability in the FRPW of the evolutionary decrease in the CFREU of the sizes of all objects in the Universe, distant galaxies move away in the FRPW from the center of evolutionary self-contraction of matter, and the centripetal radiation from them has an inherent to OSCT redshift of its frequency.

4. It is precisely because of the inherent to OLT blueshift of the centripetal radiation frequency that OLT are not suitable for use in the FRPW. And therefore, the conclusions regarding the relativistic dilation of proper time of matter moving in a gravitational field by inertia should be considered false.

5. Only due to the conservation of the Newtonian of inert free rest energy [2] and the

Keplerian [5] of ordinary rest energy of matter, and therefore, the absence of dilation of the proper time of this matter moving in a gravitational field by inertia, we have the correspondence of the gravitational acceleration of the motion of matter to Newton's gravitational law and the gravitational-kinematic invariance of the thermodynamic parameters and potentials of matter.

6. Only the invariance in time of the fundamental Hubble constant ensures the continuity of the spatial continua of rigid FRs [2]. Therefore, the conclusions about its variability based on both ignoring the absence of dilation of the proper time of galaxies and the improper use of the luminosity distance (instead of metric distances) in Hubble's dependencies are incorrect. And therefore, the so-called dark energy is not needed in the Universe.

7. The intensity of the gravitational field depends fundamentally not only on the propagation speed of the electromagnetic interaction, but also on the distance of interaction of elementary quasi-particles, which during the motion of matter is significantly reduced due to the isotropic kinematic self-contraction of matter in the Euclidean background [6] space of the CFREU.

8. The correspondence of OSCT to reality in the people´s world is confirmed by the parameters of the motion of both stars in galaxies and planets in the Solar System [5], and therefore by the laws of Kepler and Newton.

9. The kinematic, as well as the gravitational deformation of micro-objects of matter is fundamentally unobservable in the FRPW and therefore, instead of it, it is necessary to use the comoving kinematic local curvatures of the space of the observer of the motion of matter.

10. Due to the possibility of spatial proportional synchronization of all local gravithermodynamic clocks, the velocities of matter should be calculated in the FRPW according to the rules of Galileo, not Lorentz. After all, the velocity of light propagation is fundamentally invariable according to the readings of local gravity-quantum clocks and therefore is not subject to any relativistic transformations.

11. Conformal Lorentz transformations of increments of spatial coordinates and time (which ensure the invariance of the flow of proper time of matter moving in quasi-equilibrium) are suitable for use in FRPW to reflect the quasi-equilibrium cooling down of matter [1,2].

12. In the process of quasi-equilibrium cooling down of matter, the Hamiltonians of the inert free rest energy of matter are conserved instead of the Newtonians, and the Lagrangians of the ordinary rest energy of matter are conserved instead of the Keplerians.

The discovery of new relativistic transformations of increments of spatial coordinates and time that comply with Newton's and Kepler's laws is similar to the discovery (by Ott [15] and Arzelies [16]) of the possibility of an alternative relativistic interpretation of thermodynamics, which finally confirmed the relativistic invariance of thermodynamics.

CONFLICTS OF INTEREST

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