



Complex Time and Multidimensional Space of the Multiverse

Stanislav Konstantinov*

Department of Physical Electronics, Herzen State Pedagogical University of Russia, St. Petersburg, RSC "Energy", Russian Federation.

***Corresponding Author:** Stanislav Konstantinov, Department of Physical Electronics, Herzen State Pedagogical University of Russia, St. Petersburg, RSC "Energy", Russian Federation.

Abstract: The article discusses the expected progress in understanding the fundamental laws of nature. New theoretical non-Einstein models include new types of interactions that can lead to violation of breaking of Lorentz symmetry. The author of the article believes that impossible to try on a new view of space and time with the cosmic fabric of space-time Einstein' Special and General Theories of Relativity.

Keywords: fabric of space-time, quantum vacuum, dark matter

1. INTRODUCTION

The authors of the new article "Possible Reconciliation of Unitary Quantum Theory and General Relativity" Professors Lev Sapogin and Andrey Kostin presented a brief overview of the contradictions between the main branches of the modern physical picture of the Universe. Space and time have been shown in the Unitary Quantum Theory (UQT) not to be connected one with the other, unlike in the Special Theory of Relativity and [1]. Thus, the presence in the Universe of the fabric of space-time, which served Albert Einstein as a speculative space environment, for the geometric theory of gravity (General Theory of Relativity) in the four-dimensional space of Minkowski, turned out to be fiction. In this regard, one can recall the famous report of Minkovsky, made by him on September 21, 1908 at the 80th meeting of German naturalists in Cologne. He said: "Gentlemen! The view of space and time, which I intend to develop in front of you, arose on an experimental-physical basis. This is their strength. Their trend is radical. From now on, space itself and time itself must turn into fiction, and only a certain kind of combination of both must still retain independence". Report made an indelible impression on the audience and on the next generations of scientists. And now, after a hundred years, it turned out that what Minkowski said was only a hypothesis, not confirmed by subsequent scientific research. In the 21st century, experimental physics and cosmology reached such heights that New Physics was able to lift the veil of the mystery of the quantum vacuum (dark matter and dark energy), which makes up 95% of the total mass-energy of the Universe [2]. Now physicists say that instead of studying empty space, they can create a Bose-Einstein condensate and study the quantum vacuum and dark matter [3]. As a result, the entire scientific paradigm created by Albert Einstein and his followers over a century collapsed. The attempt of the Nobel laureate Professor Roger Penrose to build a quantum theory gravitational on the base Einstein's general theory of relativity also did not stand up to experimental verification [4]. Gran Sasso National Laboratory) in central Italy, was intended to confirm the Penrose-Diosi gravitational hypothesis of resolving the quantum paradox of the particle. After the experiment, the co-author of the Diosi-Penrose model Catalina Curcianu, an employee of the Roman National Institute for Nuclear Physics, stated: «We should have seen the consequences of quantum collapse in the experiment with germanium, but we do not see them. Gravity, apparently, does not push particles out of their quantum superpositions (the experiment also limited, although did not exclude, collapse mechanisms not associated with gravity) "[5]. The question of the nature of the collapse of the wave function has long been solved in the Leo Sapogin's Unitary Quantum Theory, and gravity really has nothing to do with it [6]. Relativistic invariance, which is based on subjective space-time representations, does not agree with quantum-mechanical nonlocality, which has an objective character. This reveals a deep internal contradiction of the unified quantum-relativistic field theory, leading to insurmountable difficulties in solving the problem of the quantum theory of gravity, unified theories and the derivation of representations of space and time from the physics of the microworld [2].

2. COMPLEX TIME AND NINE-DIMENSIONAL SPACE OF THE MULTIVERSE

The discovery of the quantum vacuum (dark matter and dark energy) as a galactic and intergalactic medium, which, according to observations by the Planck Space Observatory published in March 2013, makes up 95% of the total energy mass of the observed Universe (the remaining 5% is accounted for by ordinary baryonic matter), allows declare that it is the quantum vacuum that determines the geometry of space - time. How are the geometric properties of space and time related to physical interactions and the material environment? After all, I. Kant connected the three-dimensionality of space with the law of decreasing forces inversely proportional to the square of the distance. Visually, space is represented as three-dimensional and described by Euclidean geometry in Cartesian coordinates. Descartes imagined space as something absolutely unchanging, like an empty box, inside which physical processes take place. Kant came up with the idea to represent space based on specific physical laws. He wrote: "Three-dimensionality is possible from the fact that substances act on each other in such a way that the force of action is inversely proportional to the square of the distance." Obviously, the geometric representation of this law is a sphere. To an observer placed in the center of the sphere, the visual space will appear three-dimensional. The relativity of space means that it depends on the relationship and mechanical interaction of bodies with each other. According to Kant, space is three-dimensional and Euclidean because the forces of interaction between material bodies (Cavendish's law) and electric charges (Coulomb's law) are inversely proportional to the square of the distance. If particles and charges interacted according to the directly proportional law $F = k \times R$ (Hooke's law), then, according to Kant, space would turn into straight lines diverging from the observer to infinity. Such a space would no longer have continuity, but would be discrete. Further development of the pseudo-Euclidean three-dimensional space may lie in the way of taking into account the variety of processes associated with the rotation of bodies. First of all, because Newton's geometry is Euclid's geometry, it is Cartesian rectangular coordinates. In order to take into account rotational effects inherent not only to planets, stars and black holes, galaxies and the Universe itself, it was required to connect the Cartesian coordinate system with the six angular coordinates of Euler. This was done by Gennady Shipov in his theory of "Physical vacuum" [7]. It turned out that within the framework of nine-dimensional space, it is possible to explain experiments in the course of which the law of conservation of energy in open systems is violated and to substantiate the presence of a multiverse. According to the Hawking-Hertog theory, parallel worlds of the multiverse exist, but the laws of physics in them must be the same as in our Universe [8]. The discovery of the accelerated expansion of the Universe, made on the basis of the results of astronomical observations carried out by a group of researchers in 2000-2010. with the help of the Hubble Space Telescope (HST), suggests that cosmological time is Eddington's so-called "arrow of time", describing the real processes of the evolution of the Universe. The interpretation of the cosmological expansion of the Universe in the spirit of the concept of an anti-gravitating medium (dark energy) with a constant density was taken as the basis for the standard cosmological model (Λ -Cold Dark Matter). The cosmological antigravity in the model is described by the linear dependence of the force on the distance:

$$F_e = (c^2 / 3) \times \Lambda \times R, \quad (1)$$

where Λ is Einstein's cosmological constant and R is the distance

In the modern extended model of the Universe, which includes the quantum vacuum (dark energy and dark matter), Einstein's cosmological constant (Λ) can characterize the elastic properties of dark energy and play the role of the elasticity coefficient in Hooke's law. Obeying this law, according to Kant, cosmological time is linear and discrete.

Today it is fashionable to compose numerous mathematical tests for constructing a discrete model of the world: the r -model of Akhmavaar, the geometry of the causal sets by Raphael Sorkin, the quaternionic geometry of A.P. Efremov, the Penrose twistor program for an alternative description of the Minkowski space, which emphasizes the rays of light, and not points of space - time. Such an approach, although it makes it possible to extract a large number of mathematical models that make it possible to build a physical theory on the basis of fundamental relations, cannot replace the physical reality comprehended in natural phenomena and experiments. Numerous versions of string theory are also at an impasse, primarily because they are based on Einstein's SRT and GRT, as well as imaginary frozen time. The term "frozen" time was introduced into physics by Lee Smolin, an American theoretical physicist, lecturer at the Perimeter Institute for Theoretical Physics, and associate professor

of physics at the University of Waterloo. Addressing mathematicians and physicists, he wrote: “We must find a way to unfreeze time - to imagine time without turning it into space. I have no idea how to do this. I cannot imagine mathematics that cannot imagine the world as if it were frozen in eternity” [9]. Stephen Hawking suggested introducing the imaginary time $\tau = ict$ into the metric of general relativity. If in Euclidean space the metric has the form $ds^2 = dx^2 + dy^2 + dz^2$, then in general relativity the metric has the form $ds^2 = c^2dt^2 - (dx^2 + dy^2 + dz^2)$ and for imaginary time c^2dt^2 turns into $-d^2\tau$. In this case, the differences between time and space disappear in the interval ds^2 of the GRT metric [10]. This is frozen time. In Einstein's general theory of relativity, irreversible processes are absent, the entropy of the universe remains constant. At the same time, the true cosmic time, included in Newton's Second Law, disappeared from consideration. In the standard cosmological model Λ CDM, the total energy of the Universe is taken to be zero. Therefore, we can assume that $H = 0$. Therefore, taking into account the wave function of the Universe, from the Schrödinger equation:

$$H\psi = i\hbar \frac{d\psi}{dt} \tag{2}$$

This implies $d\psi/dt = 0$, that is, the wave function is independent of time (the equation $H\psi = 0$ is often called the Wheeler - de Witt equation). This is a paradox. Cosmological time is excluded from consideration in flat Minkowski space [11]. Einstein proposed a new interpretation of acceleration. Acceleration, which Newton explained in terms of gravitational and inertial interactions, is considered in general relativity as a result of curved space-time, as a result of which real cosmological time disappears. This is a paradox. Einstein's universe is a closed, dead universe with constant entropy, since there are no irreversible processes in such a universe. To describe the birth of matter in Einstein's general theory of relativity, it is necessary to take into account variations in the density of matter due to the formation of particles. This leads to a violation of the temporal symmetry. Nobel laureate Professor Ilya Prigogine proposed to add to the number of variables included in the standard model (pressure P , mass-energy density σ and radius of the Universe $R(t)$), an additional variable n - the particle density and an additional equation that would relate the Hubble function of radius Universe $R(t)$ and particle production n . In the case of a Universe consisting of particles of the same type of mass M , when the mass-energy density is simply equal to σ , and the pressure P vanishes, Prigogine proposed a simple equation that takes into account the creation of particles:

$$\alpha H^2 = \frac{1}{R^2} \frac{\partial nR^3}{\partial t} \tag{3}$$

where α - kinetic constant equal to zero or positive.

In this equation (3), the value of α and H are positive since we are talking only about the birth (and not destruction) of the particles. In Minkowski's space, where $H = 0$, the production of particles cannot be (equation $H\psi = 0$ equation is often called the Wheeler – DeWitt Equation). Furthermore, in Einstein's Universe the total number nR^3 constant irrespective H values, $\alpha = 0$ [11].

Complex time, consisting of imaginary cyclic time and real cosmological time in a space consisting of a base and a layer, offers the researcher a way to overcome the stationary approach of symmetric invariant equations of SRT and GRT Einstein in describing reality and propose a new mathematical apparatus for describing evolutionary processes in the Universe, starting from the birth of particles to the evolution of stars and galaxies [2]. The duality of time was noted by the Nobel laureate Ilya Prigogin in his book *Time, Chaos, Quantum*. He wrote: “We need to go beyond the concept of time as a parameter that describes the movement of individual systems. In nonharmonic oscillators (classical and quantum), time is uniquely related to the laws of motion, but in non-integrable systems, time plays a dual role. If stable stationary systems are associated with the concept of deterministic cyclical time, then for unstable developing systems the concept of probabilistic vector time is applicable” [11]. This means that the system can further develop at a new level or disappear. This determines the discreteness of time. Using the theory of linear sets, Professor of St. Petersburg University I.N. Taganov proved that if the state of physical processes is always measured with finite uncertainty (the Heisenberg uncertainty relation between the coordinates and momentum of a particle and the time and energy of particles in the microworld), then the moments of physical time can be represented only by two-component numbers and, in particular, by complex numbers. A spiral with variable pitch and diameter in pseudo-Euclidean three-dimensional space with signature $(-1, 1, 1)$ [12] can serve as a geometrical image of complex physical time. The concept of spiral time in the physics of the microworld eliminates the problem of spreading wave packets representing

microparticles with finite masses and sizes. In the new interpretation of quantum mechanics, there is no problem of "wave-particle duality" - with free motion, an individual microparticle at each moment of complex time has quite definite complex coordinates [12]. Minkowski's flat space, as well as an attempt to generalize it to the case of accelerated motions, that is, Einstein's General Theory of Relativity, cannot be accepted as basic geometric models for describing the dynamically developing world in which we live [2]. In his article, Professor Yu.S.Vladimirov proposes to find a theoretical basis for the concept of a stratified space [13]. First of all, this is a theoretical substantiation of the space with the bundles Xm (Xn) in the geometrization of dynamical systems. The basis of the presentation of a fibered space is: the base is an n -dimensional differentiable manifold Xn (the base is the coordinate space), and the layer is an m -dimensional manifold (the layer is the momentum space). The return of the system to its initial state is decisive in the formation of the concept of "base" and allows one to describe the behavior of the system (classical and quantum oscillators) by symmetric, invariant equations. This state of the system corresponds to the concept of a time horizon during which we can predict the behavior of the system, its trajectory of development, and then the initial state of the system can no longer serve as a basis for prediction. The transition of the system to a qualitatively new level, in the process of which the system becomes non-integrable, irreversible processes prevail in it, and time loses the property of invariance and its behavior is probabilistic, the vector character corresponds to the concept of "layer". If we are guided by the concept of a stratified space consisting of a base and a layer, then we can assume that the four-dimensional world of Minkowski - Einstein describes a "base" in which symmetric and invariant equations dominate and the system is in a stationary, integrable state. The limitations of the General Theory of Relativity do not give scientists the right to drive physical reality into the Procrustean bed of Einstein's invariant symmetric solutions. The imaginary part of complex time - cyclical time - corresponds to this state [2]. The five-dimensional continuum proposed in the article, which includes two time coordinates and three spatial coordinates, has incorporated all the advantages of the five-dimensional world of Kaluza over the flat four-dimensional Minkowski continuum [2]. Its predecessor can be considered the five-dimensional Eddington continuum (Uranoid), which includes, in addition to the four-dimensional Minkowski continuum, the fifth time coordinate [14]. Eddington's uranoid is the medium under study (the entire universe, consisting of elementary particles). It contains, in addition to four dimensions of the Minkowski continuum (x_1, x_2, x_3, t), the fifth dimension - time t_0 . Eddington writes: "The E-frame provides a fifth direction perpendicular to the x_1, x_2, x_3, t axes; and the position vector can be extended t_0 :"

$$X = E_{15} ix_1 + E_{25} ix_2 + E_{35} ix_3 + E_{45} t + E_{05} t_0, \quad (4)$$

where according to the reality conditions t_0 should be real" [14].

At the same time, geometrization in the Eddington's Fundamental Theory of five types of interactions requires the introduction of additional dimensions. Spatial and temporal diversity of different dimensions different properties introduced into these discrete transformations P-space conversion, the conversion time T and C charge conjugation. Eddington established equality in the Fundamental Theory of particles and systems with different properties. The 5-dimensional manifold instead of the square of the 4-dimensional interval $ds^2 = g_{\alpha\beta} dx^\alpha dx^\beta$ should take $dI^2 = G_{AB} dx^A dx^B$, where the indices A and B have the meanings: 0,1,2,3,5.

G_{AB} values are components of the five-dimensional metric tensor. They form a square matrix having a generally 15 independent components:

$G_{00} G_{01} G_{02} G_{03} G_{05}$

$G_{10} G_{11} G_{12} G_{13} G_{15}$

$G_{AB} = G_{20} G_{21} G_{22} G_{23} G_{25}$

$G_{30} G_{31} G_{32} G_{33} G_{35}$

$G_{50} G_{51} G_{52} G_{53} G_{55}$

In the curved Riemannian space-time, operating with the components of five-dimensional metric tensor, one can obtain ten components of metric tensor of the Einstein's general theory of relativity, four components of electromagnetic vector potential \vec{A} of the Maxwell theory, and one component which theoretically can describe any new scalar field [16].

It should be noted here that, although the Kaluza five-dimensional theory made significant progress in creating a unified theory of gravitational and electromagnetic interactions, it did not find sufficient support and understanding in scientific circles and was forgotten for a long time. The same fate befell the Eddington's Fundamental Theory, but the reasons for this are largely subjective. The scientific elite still does not accept such concepts as "Uranoid" (in the sense of a quantum vacuum) and "arrow of time" (in the sense of the evolution of open systems) [15].

Consider the advantages of the five-dimensional continuum, which includes two dimensions of time and three dimensions of space in front of the five-dimensional continuum of Kalutza, which includes one dimension of time and four spatial dimensions [2].

First, in Kaluza's five-dimensional theory, even the author himself did not understand the physical meaning of the fifth coordinate. Here are the closing words from Kaluza's article: "It is still difficult to come to terms with the idea that all these relationships, which can hardly be surpassed by the degree of formal unity achieved in them, are just a capricious game of deceptive randomness. But if it can be shown that there is more than an empty formalism behind the assumed interrelationships, then this will become a new triumph of Einstein's general theory of relativity"[14]. We managed to show that the fifth coordinate (pseudo-spatial fourth in Kaluza) is the evolution time of the system (t), divided into segments - time horizons (T). Horizon time is the time during which we can predict the behavior of the system, the trajectory of its development, and then the initial state of the system can no longer serve as a basis for forecasting. The fifth dimension has a special status. It does not allow the Universe to be inscribed in the Procrustean bed of symmetric invariant solutions of Einstein's theory. The proposal of Einstein and Bergman to improve Kaluza's theory, close the fifth dimension and present the world as cyclic, closed or compactified in the fifth coordinate, leads to the wrong law of decreasing gravitational forces in the five-dimensional world [16]. But if we allow to select the fifth coordinate (in particular, the metrics do not depend on the fifth coordinate), then the same 5-dimensional solutions of the Einstein equations give a different solution, as a result of which $F_r \sim 1/r^2$, which does not contradict the experiment [16].

Second, why are the manifestations of the extra dimension so limited, that is, why does the fifth dimension remain practically unobservable? Kaluza's theory does not answer this question, although in it all electromagnetic phenomena can be interpreted as manifestations of the fifth dimension. The condition of cylindricality in the fifth dimension, which is necessary to obtain the tensor of the electromagnetic field strength, was achieved in the five-dimensional Kaluza theory by postulating the independence of all geometric quantities from the fifth coordinate. In later interpretations of Kaluza's theory, the dependence of the quantities on the fifth coordinate is allowed, but the period of the cyclical dependence is extremely small $T = 10^{-31}$ seconds and practically does not appear in the formulas used. The reason for the non-observability of the fifth dimension is explained by the property of the cyclical nature of the world in the fifth coordinate with a very short period. But all these explanations are suitable for a world closed in the fifth coordinate [17]. However, the author of the evolutionary paradigm of the Universe, Nobel Prize winner I.R. Prigogine established that "isolated, closed systems turn into chaos, and open systems evolve into ever higher forms of complexity" [11]. Thus, the closure of Einstein's fifth coordinate dooms the Universe to degradation. From our point of view, in the above explanations, there was a substitution of concepts [2]. Cyclical invariant time of Minkowski replaced evolutionary non-invariant time of the fifth coordinate. We will return the spatial and temporal dimensions to their respective places and try to answer the second question based on our 5D continuum. Independence of values from the fifth coordinate is possible only on time intervals T, forming time horizons. In these areas, the system is in a stationary equilibrium state, it is integrable, all its main parameters retain their values, and time is cyclical and invariant. A completely different picture is observed at the boundaries of time horizons. There the system moves to a qualitatively new evolutionary level, it is in a nonequilibrium, non-stationary state, it is non-integrable, irreversible processes prevail in it, it is looking for a new state of equilibrium, which will correspond to new values of the main parameters. The energy necessary for the system for evolutionary transformations, it receives from the cosmic environment of the Universe (dark energy and dark matter) [2]. Professor I. Prigogine, winner of the Nobel Prize called this effect "an active influence on the system from the outside, with the transition of the system in a non equilibrium state." In the book "Time, Chaos, Quantum" he writes: "In a stable steady condition, an active influence from the outside on the system is negligible, but it can become of major importance when the system goes into a non-equilibrium

condition. Herewith, the system becomes non-integrable, the time loses its invariance and its behaviour is probabilistic in nature" [11]. If you look at the principle of relativity from the point of view of the laws of symmetry and the laws of conservation arising from them (the famous theorem of Emmy Noether and its subsequent generalizations), then it becomes clear what role they play in establishing the laws of Nature. Each symmetry in the Standard Model has its own conservation law. For example, symmetry with respect to shifts in time (that is, the fact that the laws of physics are the same at every moment of time) corresponds to the law of conservation of energy, symmetry with respect to shifts in space corresponds to the law of conservation of momentum, and symmetry with respect to rotations in it (all directions in space are equal) - the law of conservation of angular momentum. Conservation laws can also be interpreted as prohibitions: symmetries prohibit changes in the energy, momentum, and angular momentum of a closed system during its evolution. It is believed that the laws of physics do not change with uniform rectilinear motion. This statement is called the principle of relativity. Einstein made an attempt to extend this principle to any, including accelerated types of motion, but failed. It turned out that new symmetries inherent in accelerated motions lead to new, more general conservation laws inherent in the physics of open systems [2].

3. HYPERBOLIC FIELDS OF FINSLER SPACES BY DMITRY PAVLOV

"The geometry of time" is the title of an article by Dmitry Pavlov, published in 2016 [18]. The author of the article is Dmitry Pavlov - founder and director of the Research Institute of Hypercomplex Systems. He created a mini-science city near Murom, where Finsler spaces and their possible applications in physics are investigated. The result of these studies was the discovery of a field called hyperbolic, which "when applied to reality can be interpreted as a field of time." The intensity of the hyperbolic field in this concept is perceived as the speed of the flow of time, which theoretically can be different. In practice, it is proposed to implement time control using a hyperbolic lens - a device that converts a flat time field into a beam converging at a focus. During the experiment, the researchers hope to register a powerful outbreak in the process of transmutation of known chemical elements and the birth of new elements [18]. In the review sent to the author of the article, I pointed out some moments that, half a century ago, did not allow Professor of the Pulkovo Observatory N.A. Kozyrev to "harness" time. The main factor that prevented this, in my opinion, is the presence of a space environment (dark matter), which determines the geometry of both time and space. I think that in their practical work on transmutation and the birth of new elements with the help of hyperbolic lenses, experimenters are dealing with the manifestation of the energy of a quantum vacuum (dark matter), and not time. Academician and professional thermal physicist Albert Veinik in his monograph "Thermodynamics of Real Processes" pointed out the existence of two types of time: real physical time, which is characteristic of any body, and conditional time invented by a person to organize his practical activity, it always flows uniformly, 24 hours on an earth day [19]. "The most absurd mistake of the theory of relativity is that Einstein speaks about the variability of the course of the conditional time, but it cannot change at all. Therefore, all other conclusions of this theory are meaningless. Replacing real time with conventional time and vice versa is the reason for many delusions in modern science. This conclusion speaks of the inadmissibility of replacing the invariant cyclic base time in a stratified space with the cosmological evolutionary time of the layer [11]. Albert Veinik writes: "Einstein mistakenly called small durations the acceleration of time, that is, he confused the rate of irreversible processes of evolution of the system with the duration of their functioning" [19]. So Pavlov, perhaps, confuses the speed of the processes of transmutation of chemical elements under certain conditions of the cosmic environment (dark matter) with the speed of time. In the medicine, there are cases when a person ages quickly due to flaws in genetics, while metabolic processes in his body proceed at a tremendous speed, and he dies at the age of 20 a very old man. However it doesn't mean that time has accelerate your run, just changed the biochemical reactions in the body.

4. TIME IN THE ORBIT OF A SATELLITE OF THE EARTH AND ON BOARD THE AIRCRAFT

The presence of an additional gravitating mass of dark matter in near-earth space was discovered during experiments with artificial earth satellites equipped with magnetometers and clocks. The experiments were carried out at the Military Space Academy by A.F. Mozhaisky in the 90s of the 20th century under the leadership of the deputy head of the academy for scientific work, Professor V. Fateev. The head of the department, Colonel V.L. Groshev published the results of the experiments in his book [20]. With the help of magnetometers, it was possible to detect moving vortex formations of

dark matter in the near-Earth medium, which have the form of tangential cylinders, the axes of which are parallel to the axis of rotation of the Earth [20]. Experiments have shown that the time on a satellite depends on the density of dark matter that forms a halo around the Earth and rotates with it [21], but the density of the darkest matter depends on the gravitational field (potential U) in which the system is located, and on the speed of the satellite itself relative to the near-earth space environment (dark matter) [22]. The satellite's speed relative to dark matter was determined from the change in the magnetic field strength. It turned out to be interesting to compare the results of experiments on measuring time on a near-earth satellite with the experiment carried out in 1977 by the University of Maryland in the USA turned out to be interesting in this regard. A particularly accurate cesium clock was installed on an airplane that flew 15 km above the Earth for 15 hours. Then the clock from the plane was compared with the clocks previously synchronized on Earth. It turned out that the flying clock was forty-seven billionths of a second ahead of the clock on the plane (nanoseconds). Of these, the clock went ahead by fifty-two nanoseconds due to the potential difference and the clock was five nanoseconds behind due to the speed of the aircraft. Flight experiment results fully confirmed the correct interpretation of time by the theory of relativity in terrestrial conditions. The flow of time according to the theory of relativity depends both on the speed of the body v and on the gravitational field (potential U) in which it is located [23]:

$$t' = \frac{t}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{5}$$

$$t' = \frac{t}{\sqrt{1 - \frac{U}{c^2}}}$$

Accordingly, the time intervals of the course of the same event, measured in different units of time, change:

$$\Delta t' = \Delta t \sqrt{1 - \frac{v^2}{c^2}} \tag{6}$$

$$\Delta t' = \Delta t \sqrt{1 + \frac{U}{c^2}}$$

Therefore, it is possible to judge how the time on the plane should change. So the correction for changes in the time interval, which must be introduced to match the clock on the Earth with the clock on the plane according to the Einstein-Lorentz formula, has the form:

$$\Delta t = t \left(\frac{U_a - U_e}{c^2} - \frac{v^2 a - v^2 e}{2c^2} \right) \tag{7}$$

where U_a, v_a is gravitational potential and the velocity related to the airplane ;

U_e, v_e is gravitational potential and the velocity related to ground chronometer.

The new understanding of time was one of the most brilliant achievements of relativistic theory. Nevertheless, Professor Sapogin, the author of the Unitary Quantum Theory, believes that time does not slow down or accelerate in different frames of reference, but simply the speeds of all processes change the same under the influence of the changing gravitational potential [24]. Professor Lev Sapogin notes: "There is an oddity in the Lorentz transformations: they cannot be completely strictly verified, since for verification it is necessary to return a moving clock or ruler, and this will violate the condition of inertia. The experiment shows that when the clock moves, the clocks that returned are lagging behind, since they experienced acceleration ... It is curious that in the ruler paradox (and it is directly related to time dilation), the moving ruler does not change its length when it returns ... Agree that this is very strange..." The results of experiments with time carried out on artificial earth satellites raise doubts about the validity of the Lorentz formula (8), which expresses the dependence of time on the coordinate:

$$t' = \frac{t - vx/c^2}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{8}$$

Artificial satellites of the earth do not provide confirmation of such a relationship. According to experiments, the flow of time on satellites changes depending on the difference in gravitational

potentials and absolute speed in the dark matter halo surrounding the planet and should not depend on the relative speed of the satellite and the ground observer (should not depend on the coordinates of the satellite). Since the halo formed by dark matter in near-Earth space revolves around the Earth with it, the difference in time on a satellite that moves in the equatorial plane of the Earth and on the Earth will depend only on the difference in gravitational potentials, that is, on the height of the orbit. The duration of time intervals between events on satellites, in comparison with the same processes on Earth, changes with distance from the Earth, since the gravitational potential decreases, and the density of dark matter also decreases. This causes a change in mass and, as a consequence, entails a change in the time it takes for chemical, nuclear and other processes in the satellite's orbit. If a satellite moves perpendicular to the equator, it will have a relative dark matter speed equal to its orbital speed. This will change the density of dark matter on the satellite and, as a result, the passage of time. Thus, the course of time depends not only on the height of the satellite, but also on the angle of inclination of its orbit to the plane of the Earth's equator, that is, on the speed of the satellite relative to dark matter. So, if the period of time measured between events by clocks on the Earth's surface is equal $t_0 \Delta t_e$, the same time measured by clocks on the satellite Δt_s is determined by the formula (9):

$$\Delta t_s = \Delta t_e \sqrt{\frac{1 - \frac{v^2}{c^2} (1 - \cos\alpha)^2}{1 + \frac{U_e - U_s}{c^2}}} \quad (9)$$

where: v is the orbital velocity of the satellite relative to the Earth;

α is angle of inclination of the satellite's orbit to the plane (magnetic) equator of the Earth;

U_e, U_s is the gravitational potentials on the surface of the Earth and the satellite orbit.

The correction for matching the clock on the satellite with the clock on the Earth Δt for any time interval (second, hour, day, year) is determined by the equality:

$$\Delta t = t_e - t_s = t_s \left(\frac{1 + \frac{U_e - U_s}{c^2}}{\sqrt{1 - \frac{v^2}{c^2} (1 - \cos\alpha)^2}} - 1 \right) \quad (10)$$

As you can see, formula (10) differs from the relativistic formula (7) and therefore requires additional verification. Note that to check formula (10), it is enough to contact the time service at the space research centers, which keeps a long-term registration of time changes for each artificial earth satellite. Therefore, it is enough to take data on such changes from satellites launched at the same altitude, but at different angles to the plane of the Earth's equator, and make sure that formula (10) is valid.

When launching communication satellites, the presetting of the acceleration of clocks on the satellites is 44,000 nanoseconds per day.

5. CONCLUSION

The above facts show that in a new reality, when the ephemeral fabric of space-time gives way to the cosmic environment of a quantum vacuum (dark matter) and complex time and multidimensional space in the multiverse require a new cosmological model for their description, required a new scientific paradigm with a system laws and equations necessary and sufficient for a explanation of all properties of physical reality.

REFERENCES

- [1] Leo Georgy Sapogin, Andrey Anatoly Kostine, "Possible Reconciliation of Unitary Quantum Theory and General Relativity", International Journal of Sciences, Volume 10-August 2021 (8)
- [2] Konstantinov S.I., "Epistemological Dualism between Einstein's Relativity and Quantum Mechanics in the Five-Dimensional Continuum for Universe", Global Journals Inc. (USA) GJSFR-A, Volume 20, Issue 6, Version 1.0, pp 31-38, (2020)
- [3] S. Autti, et al., "Fundamental dissipation due to bound fermions in the zero-temperature limit" Nature Communications volume11, Article number: 4742 (2020)
- [4] Roger Penrose, "Quantum State Reduction",- Found Phys (2014) 44:557–575, DOI 10.1007/s10701-013-9770-0

- [5] Sandro Donadi, Kristian Piscicchia, Catalina Curceanu, Catalina Curceanu, Matthias Laubenstein & Angelo Bassi "Underground test of gravity-related wave function collapse", *Nature Physics* (07 September 2020) doi:10.1038/s41567-020-100
- [6] S.I. Konstantinov, Leo G. Sapogin, "Reduction of the Quantum State in Unitary Quantum Theory", *International Journal of Advanced Research in Physical Science*, Volume-7 Issue-11, 2020
- [7] Shipov G.I. *The theory of the physical vacuum. Theory, Experiments and Technologies - Moscow: Science, (1997).*
- [8] S.W. Hawking and Thomas Hertog. "A Smooth Exit from Eternal Inflation?" *Journal of High-Energy Physics* (2018). DOI: 10.1007/JHEP04(2018)147
- [9] Lee Smolin. *The trouble with physics: the rise of string theory, the fall of a science, and what comes next.* Houghton Mifflin, Boston, (2006).
- [10] Stephen Hawking. *From the Big Bang to Black Holes.* New York: Bantam Books, (1988).
- [11] Ilya Prigogine and Irene Stengers, "Time, chaos, quantum", Moscow, Progress, (1994)
- [12] Igor Taganov, "Physics of irreversible time", Russian Academy of Sciences, St. Petersburg, (2014)
- [13] Yuri Vladimirov, "The problem of the derivation of the classical space-time from the laws of the physics of the microworld", *Metaphysics*, No. 2 (16), pp 21-27.
- [14] A.S. Eddington, *Fundamental Theory.* - Cambridge, (1946)
- [15] T. Kaluza. *To the Problem of the Unity of Physics // Albert Einstein and the Theory of Gravity.* Moscow: Mir, (1979)
- [16] Yuri Vladimirov, "Space - time: explicit and hidden dimensions" Moscow: Librokom, (2012)
- [17] Einstein, A. and Bergmann, P. On a Generalization of Kaluza's Theory of Electricity. *Annals of Mathematics*, 1938, 39, 685. <https://doi.org/10.2307/1968642>
- [18] Dmitry Pavlov, "Geometry of Time", *Journal "Science and Religion"* No. 1 for (2016).
- [19] Albert Veinik, "Thermodynamics of real processes", Minsk, 1991
- [20] Groshev V.L. "From gravity – through yadron, the Tunguska phenomenon, Chernobyl and Sosovo– up to lithospheric disasters", St. Petersburg: MECA, 2002
- [21] Konstantinov S.I., "Halo" of dark matter and gravitational waves", *Global Journals Inc. (USA) GJSFR-A*, Volume 20, Issue 4, Version 1.0, pp 5-11, (2020)
- [22] Khoteev V.Kh. "Discussions about the Universe", St. Petersburg, MSA, (2004).
- [23] A. Einstein, "The Meaning of Relativity: Four Lectures Delivered at Princeton University", Princeton Univ. Press, Princeton, (2004).
- [24] Sapogin, L.G., Dzhanibekov, V.A., Mokulsky, M.A., Ryabov, Yu.A., Savin, Yu.P. and Utchastkin, V.I., About the Conflicts between the Unitary Quantum Theory and the Special and General Relativity Theories. - *Journal of Modern Physics*, 6, pp. 780-785, 2015.

Citation: S.I. Konstantinov (2021) "Complex Time and Multidimensional Space of the Multiverse". *International Journal of Advanced Research in Physical Science (IJARPS)* 8(8), pp.1-9, 2021.

Copyright: © 2021 Authors, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.