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Relict Radiation in the Model of the Universe with Initial Minimum Entropy

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Abstract: *The paper analyzes the results of the observation of the relict radiation using the Standard Universe Birth Model and the Universe Birth Model with minimal initial entropy. It has been shown that the Standard Model cannot adequately describe the relic radiation, since the realization of such a fashionable model of Universe would be inside a black hole. In order to describe the relict radiation using this model, scientists had to phenomenologically introduce two assumptions, namely, the existence of a period of inflation of the Universe and the existence of dark matter and dark energy. Both the original model and the assumptions made are contrary to the laws of physics. It is shown that using the model of the Universe with initial minimal entropy, it is possible to describe the properties of relict radiation without violating the laws of physics, since this model is based on the laws of unity and similarity, which act as fundamental laws of the Universe. The model is based on the idea of the stratified space and the Scalar Field, which brings into the Universe substance, fundamental laws and the program of development of the Universe. The new model requires that all layers of the stratified space be branches of spaces that are larger in size and continuously inflated. The finite volume of the Universe causes the radiation of all stars to remain in space and, due to the action of the Scalar Field, can return to the inner regions of stars and planets. Due to such energy circulation, we have equilibrium radiation, which is perceived as a relic, and stars retain activity for billions of years.*

Keywords: *relict radiation, models of the birth of the Universe, laws of unity and similarity, stratified space, dams of spaces of higher dimensions.*

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1. INTRODUCTION

Radiation filling the outer space, which is described by the laws of absolutely black body radiation with a maximum at $\lambda_m \approx 1.1$ mm [1], was discovered in 1965 by radio astronomers Arno Penzias and Robert Wilson (Bell Telephone Laboratories). Since theoretical models of relict radiation, developed by George Gamow [2,3], Ralph Alfer and Robert Herman based on the first theory of the hot Universe they had created, already existed at that moment, the experimentally found radiation was immediately interpreted as relict one [4]. On the other hand, the relict discoveries were seen as evidence of a model of the Universe's creation from a singularity point in which energy density and temperature are extremely high.

After the relic radiation was discovered, perfect spacecraft (COBE, WMAP, Planck) were created to investigate the exact value of its temperature and possible deviations from the Planck distribution in separate regions of the spectrum across the sky. It has been proved that the spectral distribution is indeed equals to Planck's one with a temperature of 2.725 ± 0.0002 K [5], that is, the average relict radiation temperature is 2.725 K, in regions of galaxy clusters the temperature is higher by 0.0002 K, and in void regions between galactic filaments (in voids) - lower by 0.0002 K.

This result is believed to confirm the non-stationary model of the Universe. In addition, high isotropy and homogeneity of relict radiation are thought to indicate the existence of inflation in the Universe.

Important for the study of the Universe was the study of the anisotropy of relict radiation, that is, the dependence of temperature and polarization of radiation on the direction in space. If the relic radiation was strictly isotropic, it would mean that the solar system was not moving about it. The presence of such motion causes the Doppler effect and, as a consequence, the dependence of the relict radiation temperature on the direction of observation. Thus it was possible to show that the solar system

together with the Galaxy are moving in the direction of the constellation of the Lion at a speed of ~ 600 km/s.

Of course, the theory of relict radiation was developed based on the Standard Model of the Universe. To align the theory with the results of observation, additional models of the evolution of the Universe were created. One such model is the inflation of the Universe the other is dark matter and dark energy. According to these models, the computer system of the spacecraft was programmed, which as a result allowed to determine the content of the specified parameters: baryonic substance - 5%, dark matter - 23%, dark energy - 72%.

Unfortunately, from the point of view of the author of these lines, all (!) these models are contrary to the laws of physics. Therefore, models need to be corrected so that they are consistent with the laws of physics, then create appropriate calculation programs and list reliable experimental data. Therefore, the author has undertaken to consider known experimental observations of the Universe that he trusts completely, from the point of view of the model of creation of the Universe with minimal initial entropy. An important point is the compulsory compliance with the laws of physics described within the new model of the Universe's structure and processes.

2. The Relict Radiation in the Standard Model

According to the Standard Model of the Universe creation, it arose through the Big Bang from a singular point characterized by large values of energy (mass) and temperature [3]. If the diameter of the singular point is zero, then the temperature will be infinite. However, if it is acknowledged that the initial diameter had finite dimensions (in this case the Planck length is used), then the initial temperature will have a finite value (~ 10^{28} K [6]). The initial entropy of such a Universe will be extremely large ($S_0 = 10^{88}$ [7]).

This also resulted in a flat space that expanded for some time with the speed of light, and exponentially in a separate period of time ($10^{-35} \div 10^{-32}$ s), doubling the expansion rate every 10^{-35}s (the so-called inflation theory [8,9]) . After the explosion of the substance, elementary particles (protons, electrons, etc.), which were in a state of hot thick plasma, were sequentially created after the explosion.

To represent the state of this plasma, it is possible to compare it with the plasma from which all the mass of the Sun and stars consist. In this dense plasma, multiple scattering of photons occurs on the particles, which ensures a temperature-equilibrium state and the presence of equilibrium radiation from the star surface. Therefore, the spectrum of radiation of the star is close to the spectrum of a completely black body. This allows to determine the surface temperature of the star by registering the radiation spectrum.

That's the kind of equilibrium radiation formed in the thick plasma of the Universe. The expansion of the substance of the Universe, caused by the Big Bang, led to a decrease in the plasma density, so that at some time the radiation was able to go beyond the substance and freely expand in space, the radius of which at that time significantly exceeded the radius of the substance of the Universe. And since, after a period of inflation, space expansion occurred at the speed of light, radiation could never fill the entire volume of space when radially propagated. In other words, the radiation from equilibrium turned into nonequilibrium, and escaped from the plasma that gave rise to it. However, the experimental confirmation of the existence of microwave radiation, which is characterized by a temperature of -270.425 ° C = 2.725 K, is considered to be a confirmation of the Standard Model of the Birth and Evolution of the Universe. Using the Wien bias law, one can find the wavelength at the maximum of the relict emission spectrum $\lambda_m = 1.063$ mm.

For comparison, consider the supernova explosion. Before the explosion, it formed equilibrium electromagnetic radiation. During the explosion, it was released from the plasma and immediately radiated into the space that we register as the appearance of a supernova. Soon enough, this radiation moves away from the supernova. After that, instead of a star, we will see clouds of cosmic dust radiating away from the star, and (under certain conditions) a neutron star in place of a former massive star.

As we can see, in this case the radiation ceased to be equilibrium and non-equilibrium propagated in a conditionally boundless space. Back that radiation will not return and we will not see it as relic radiation.

Therefore, the theory of the cosmic relict radiation of the Universe as a cool primary radiation because of the adiabatic expansion looks strange. Radiation will really cool down due to the expansion of the space, but in order to fit the model of relict radiation, it is necessary that it does not leave the plasma, and then atoms, molecules, planets, stars, cosmic dust. And in the described scenario of the Big Bang and the presence of a period of inflation, the exchange of energy with the substance was excluded.

Let us mention what is equilibrium radiation.

Equilibrium radiation occurs in a closed volume, the inner walls of which are able to reflect electromagnetic waves. In this case, the number of photons emitted by the heated body contained in this volume will be equal to the number of photons that will return from the space around the body to the body itself. There is an equilibrium in which radiation is characterized by the laws of W. Wien and Stefan-Boltzmann. The spectrum of such radiation is described by Kirchhoff's function. The explicit appearance of such a function was established by M. Plank in 1900.

According to the law of similarity, which is implemented in the Universe, a similar process can be observed when the water is heated in a closed vessel. In this case, the equilibrium is established between the number of molecules of water vapor that returns to the surface of the water and the number of molecules that evaporate from the surface of the water. The closed volume will set the equilibrium in which the water vapor is saturated. As the temperature rises, the saturated water vapor pressure increases much more than the ideal gas pressure with the same temperature rise in the isochoric process. If we now open the vessel with water, the water vapor will move beyond the vessel where the water vapor pressure is lower than the saturated vapor pressure. Consequently, the vapor beyond the vessel stops to be equilibrium.

In similar way the light, that left the inner volume of the star, goes out into the open forever, stops being equilibrium. And it does not return to previous state.

Another question arises: could the substance after the Big Bang be evenly distributed in space? An example with a supernova shows that it could not. One can imagine an arbitrary explosion. In this matter, the substance flies into space and nothing remains at the site of the explosion. Much information on this topic was in the nuclear and fusion tests. During the bomb blast, the air pressure increased significantly, which as a result flew at high speed, creating significantly reduced pressure at the explosion site. Then the air returned and the atmosphere equalized steady state.

How then to imagine the Big Bang? First of all, according to molecular kinetic theory, the particles created during the explosion had a certain velocity distribution. Therefore, a small part of the substance flew at a speed close to the speed of light. There were almost no particles with zero velocity. The bulk of the particles had an intermediate velocity. Thus, the substance was moving away from the half-wave explosion site, the shape of which resembles Maxwell's velocity distribution. Over time, the fast particles were inhibited by gravitational interaction, and the spatial distribution blurred, reducing the pressure in the plasma. The process was completely unsteady and there was virtually no way to equalize the pressure and fill the site of the explosion with a substance. This is the picture observed after the supernova explosion. The expansion of the occupied matter region was lagging behind the radial propagation of light. However, the width of the area occupied by radiation did not exceed the diameter of the area occupied by the substance at the time of separation of light from the plasma. Thus nowadays the substance of the Metagalaxy must have a radial density distribution.

The result of the process described is the removal of the relic radiation far beyond the substance. We will no longer be able to register it. Therefore, the relict radiation we observe in space cannot be related to radiation that separated from hot plasma shortly (perhaps 1 billion years) after the Big Bang. Another point concerns the period of inflation in the Universe. The corresponding theory appeared only because of a mistake that violates the law according to which velocities are prohibited in our space beyond the speed of light. Such velocities are possible in parallel space where tachyons are possible. This prohibition is related to a possible breach of the principle of causality. The existence of the ban is proved by the fundamental field theory developed by I. Gerlovin [10].

3. The Relict Radiation in a Model of the Universe with a Minimum Initial Entropy

Unlike the Standard Model, which declares that the substance in the initial state had a very high temperature, in the model of the Universe with a minimum initial entropy (UMIE) the initial temperature was zero. The second important difference between these models is that in the Standard Model, at birth, the Universe has a single flat space, while in the UMIE model the space must be stratified, one of which is our Universe, and all layers create a single Super-Universe.

Such a model of the Universe came about because of the understanding that the Law of Similarity is being implemented in it. For example, one can compare the stages of pre-natal development of a child and the creation of the Super-Universe [11,12]. In the case of pre-natal development of the baby, the fertilization of the egg first occurs and a fetal development program begins, then the processes of cell division begin, resulting in fibers (one-dimensional objects), tissues (two-dimensional objects) and three-dimensional objects (embryos), organs and systems). This sequence of processes is implemented fairly quickly. Over time, full-fledged organs and systems emerge, and a baby is formed that is able to perceive information during intrauterine development.

And so in the case of the creation of the Super-Universe [11,12]. In this case, the stratified space contains a zero-dimensional space through which the Scalar Field enters, a one-dimensional space in which Planck particles are created that have electric and magnetic charges (i.e., diones), a two-dimensional space in which quarks are created, and a three-dimensional space, in which our Universe is realized. The Scalar Field carries with it not only energy but also a program (universal code) for the creation of the Super-Universe [11-13]. One of the properties of the Scalar Field is the creation of a substance (bineutron) in the vicinity of nucleons, which provides a continuous increase in the mass of the Universe [14].

Since all the coordinates of the World-1 are closed in circles of small radius, the Scalar Field wave must be circularly polarized. And this in turn will cause that in the Universe all created matter must have a torque. From the atom to the galaxy, everything rotates. Moreover, astronomical observations confirm that galaxies rotate mainly in the same direction [15]. Since there is no apparent reason for this rotation of galaxies, the author of article [15] concludes that rotation appeared at the birth of the Universe and was transmitted to galaxies.

The scalar field is also a carrier of time.

The energy of the Scalar Field enters the Super-Universe at a constant speed, gradually filling the named spaces [11, 12]. In this case, all spaces are branches of spaces that have a unit of higher dimension. Therefore, one-dimensional space is represented by a circle, two-dimensional - the surface of a three-dimensional sphere, three-dimensional - a three-dimensional surface of a four-dimensional sphere. In the embryo of the Super-Universe, all coordinates are locked by themselves into circles of small radius [16, 17]. When creating Super Space layers, one or more coordinates, while closed on their own, increase their length. Consequently, at once these layers of the stratified space appear to be branches of spaces per unit of larger dimension. In a zero-dimensional space, all coordinates remain undiscovered. Because the Scalar Field has the ability to generate particles in all spaces, its dimension must cover the dimensions of all layers of the stratified Super-space, as well as the time and information coordinates. Therefore, 14 coordinates must correspond to the Scalar Field and the zero-dimensional space [11,12].

In all cases, the radii of the spaces whose branches are the above spaces expand at the speed of light [18, 19]. Branch volumes always remain limited and the corresponding branes are closed [11,12].

The stagnant filling of the dams, that is, layers of the stratified Super-Universe, causes the layers to begin to fill with substance with some delay. It is important that the delay of the process of filling the three-dimensional space is $3 \cdot 10^{-5}$ s [11,12]. The radius of the four-dimensional space will reach 9 km. With further expansion of all layers, the energy of the Scalar Field is distributed equally between them. The filling of matter with spaces is such that the radius of the spaces is always greater than its gravitational radius [11,12]. By the way, this requirement is not met in the Standard Model. If the Standard Model were correct, then the Universe would be inside the black hole.

All layers of the stratified Super-space are immediately filled with vacuum particles [10,18,19]. It should be recalled that the Standard Universe Creation Model rejects the existence of vacuum

particles, though it gives the vacuum a large number of properties to explain particle physics and fundamental interactions. However, the Standard Model does not explain the physics of annihilation of particles with antiparticles, the presence of virtual particles, etc. It simply declares the existence of such facts.

The UMIE model explains all the processes in the microcosm observed in the experiments by introducing the Scalar Field and vacuum particles [10, 11, 12, 20]. Only the Scalar Field provides the particle annihilation process, in which all quantum characteristics (mass, charge, spin, etc.) disappear. An electromagnetic wave, unlike a Scalar Field, cannot excite a free vacuum particle. To excite a vacuum particle, it must first be polarized in the field of an atomic nucleus, after which it is able to absorb an electromagnetic wave.

By interacting with the vacuum particles first and then with the nucleons of the substance, the Scalar Field consistently creates heavy atomic nuclei that, in accordance with the laws of physics, are capable of detecting radioactivity. In this case, charged particles are born and great energy is released, which heats the substance. This creates stars and planets with high temperatures in the inner regions. Therefore, the source of energy in the center of the Sun and planets is the usual nuclear decay of heavy atoms.

In accordance with Einstein's triunity law[1], the Scalar Field immediately fills all created stratified space in the Super-Universe. In one-dimensional space, the concentration of diones remains constant over time, in two-dimensional space the concentration of quarks decreases inversely in proportion to the Super-Universe existence time, and in three-dimensional space, inversely proportional to the square of time. In this case, the density of matter in all layers of the stratified space will be the same throughout. Only with the passage of time does the gravitational interaction between galaxies lead to a cluster of galaxies and voids. That is, there is a non-stationarity in the distribution of matter in the Metagalaxy according to Friedman's theory.

The beginning of matter creation in three-dimensional space is the embryos of stars and groups of stars that make up future galaxies. With the expansion of the Universe, the distance between the stars increases in proportion to time, while the radius of the stars increases in proportion to the cubic root of time. Between the stars there is a space filled with vacuum particles and fields. The galaxy's radius increases in proportion to time with the rate of expansion of the Universe within the galaxy [21].

Since three-dimensional space has finite volume, the energy of electromagnetic waves emitted by all stars remains in space. In [22], the author showed that in the case of the Standard Model of the Universe creation (all mass of matter is born at once) under the condition of a limited space of the Universe the equilibrium temperature of the Universe would reach 22 K, and in calculations using the UMIE model in which the mass of the substance increases in proportion to the lifetime of the Universe, this temperature will be 15.6 K. Therefore, the temperature exceeds the experimentally found value of the temperature of the relict radiation by 5.725 times. This ratio corresponds to the excess of radiation energy in the Universe 1074 times. Where does excess energy go? In addition, a source of energy is required to provide the stars with constant radiation ability.

It is clear that the burning of the mass of stars is not able to provide a condition for the stability of their radiation. In particular, the sun could live only a few tens of millions of years under such a mechanism of radiation, which contradicts the geological structure of the Earth, which requires that the sun's radiative power is maintained for billions of years.

The conclusion about the absence of special energy sources in the stars was substantiated in detail in the work of Kozyrev [23], devoted to the consideration of the internal structure of stars. From other work by Kozyrev [24] it follows that the problem of star glow is a separate case of a general problem: why there are no equilibrium states in the Universe. If the principle, stating that equilibrium states are

[1] The law of triunity, discovered by A. Einstein, is formulated as a formula $R_{ik} - \frac{1}{2} g_{ik}(R - 2\Lambda) = \frac{8\pi G}{c^4} T_{ik}$

never achieved, is valid in the Universe, then this means that there is always and under any circumstances a difference between the future and the past[2].

In the UMIE model, it is also concluded that stars only play the role of energy conversion machines. However, the energy source is the Scalar Field, which generates the flow of time.

Scalar Field, by increasing the mass of heavy atomic nuclei, causes their radioactivity and the generation of a large amount of heat. This heat is spent on radiation from the surface of the star by electromagnetic waves and fast particles.

In order to explain the excess energy of electromagnetic waves in the Universe, it is necessary to take into account the laws of similarity that are realized in the Universe. In this case, we pay attention to the cyclic processes that take place on Earth. For example, consider the cycle of water on Earth. Rivers carry water into seas and oceans. Under the influence of solar radiation, water from the surface of reservoirs (oceans, seas, lakes, rivers) evaporates, condenses into clouds, which are carried by wind to dry land. There, rain replenishes river sources with water. The cycle has ended.

A similar cycle must exist in the Universe. We already know that the Universe has a zero energy level (i.e., a vacuum particle level) and a basic level that corresponds to the functioning of matter from elementary particles to Metagalaxy. In order to realize the cyclic process of energy transformation in the Universe, it must be assumed that there is a higher level that the Scalar Field uses for cyclic processes.

Thus, the stream of electromagnetic radiation of the stars is a world ocean, from which, under the action of the Scalar Field, the quanta of electromagnetic waves "evaporate". In this case, the bulk of energy is localized at the upper level. It can return to the basic level only as a result of the perturbation of massive objects, ie stars and planets. The high level of excess energy is caused by the fact that stars make up a very small volume relative to the volume of the Universe. Under the action of perturbation, energy from higher levels causes rain to enter the central part of the massive bodies, which causes maximum perturbation. The result of such a cyclical process is the equilibrium radiation in the Universe, which we perceive as relict radiation. Noteworthy is the fact that the radiation comes from the stars, the totality of which constitutes the galaxy. Therefore, it is not surprising that the temperature of the relict radiation is higher in the regions of localization of galaxies and lower in the regions of localization of large voids. And since each star emits energy in all directions, isotropically, so the resulting relic radiation must be isotropic.

The return of energy to the central regions of the stars can be experimentally verified. Since the photon has a limited lifetime τ, the light intensity from a distant galaxy will be described by the formula:

$$I = \frac{J}{r^2} \cdot exp\left(-\frac{r}{c\tau}\right),$$

where J is the light force of the galaxy.

If it is possible to record the intensity of the central part of the galaxy visible at a body angle Ω (area of the plot $S = \Omega \cdot r^2$), then the intensity of light from the central parts of different galaxies will be described by the formula:

$$I = J \cdot \Omega \cdot exp\left(-\frac{r}{c\tau}\right),$$

that is, a formula that will allow you to find the characteristic lifetime of a photon in the Universe.

Finally, let us note that, using the Standard Universe Creation Model, spacecraft have found that baryon matter is close to 5% of the mass of the Universe. In the VMPE model, the masses of stars increase in proportion to time. Therefore, in the past epochs of the star had a small mass and much less energy was emitted. As shown in [18], based on astronomical observations and calculating the density of the Universe on the intensity of galaxies, we can see no more than 8% of the mass actually available in the observable area of the Universe. In reality, this can be 5%.

4. Conclusion

On the basis of the analysis of the experimentally obtained results on the relict radiation of the Universe and the theoretical studies carried out using the Universe model with minimal initial entropy, the following is shown:

[2] Here we have one reason for the appearance of the arrow of time.

1. The standard model cannot describe the processes of birth and evolution of the Universe, because as a result of the laws of physics, such a Universe will immediately find itself in a black hole. The inflation model cannot be realized in our Universe, since it requires the expansion of the Universe at a rate in the inflationary period that far exceeds the speed of light, which is prohibited by the laws of physics. Relativistic radiation cannot be a remnant of equilibrium radiation that broke away from thick plasma $4 \cdot 10^5$ light years after the birth of the Universe, since that radiation has long since left the volume of matter. Dark matter and dark energy have emerged in theory as parameters that help to describe the properties of relict radiation. The standard model cannot describe the physics of annihilation of an antiparticle particle and the birth of virtual particles.

2. Using the model of the Universe with initial minimum entropy, it is possible to describe the properties of relict radiation without violating the laws of physics.

3. The new model of creation and evolution of the Universe is based on the Laws of Unity and Similarity, which act as the fundamental laws of the Universe. The model is based on the idea of the stratified space and the Scalar Field, which brings into the Universe the substance, fundamental laws and the program of development of the Universe. The substance is created at once throughout the space in accordance with the law of Einstein's triune.

4. The new model requires all layers of the stratified space to be branches of spaces that are larger in size and continuously inflate. Scalar Field is able to interact with all layers of the stratified space, having a dimension that integrates the dimensions of all layers: 12 spatial closed coordinates, one temporal and one information coordinates.

5. When creating a substance, the Scalar Field immediately introduces great torque, which is preserved to this day in the form of rotation of galaxies, stars, planets, and so on.

6. The finite volume of the Universe causes the radiation of all stars to remain in space and, due to the action of the Scalar Field, can return to the inner regions of stars and planets. Due to such energy circulation, we have equilibrium radiation, which is perceived as relict. Thanks to such energy circulation, as well as the birth of matter, the Scalar Field, the stars retain activity for billions of years.

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