Monofundamentalist worldview paradigm: derivation of the Schrödinger equation for non-relativistic free particles

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Abstract

The main problems of the paradigm accepted in physics, limiting its possibilities in cognising the physics of Everything, are presented. With the aim of eliminating these limitations, the author has constructed a monofundamentalist quantum theory of Everything (2025), based on four empirically substantiated postulates and operating only with three world constants, i.e. not admitting generalisation.

In the present work, based on two postulates of this theory, for the particular case of non-relativistic free particles, the derivation of the basic equation of quantum mechanics found heuristically by E. Schrödinger is given. It is shown that its wave function determines the densities of particles born in fragments of the real and imaginary subspaces of the physical vacuum of the Universe, while the product of these wave functions is proportional to the density of particles in its space. Together with the Schrödinger equation, the Klein-Gordon-Fock equation for particles in the real subspace has been obtained.

The derivation of the Schrödinger equation for free particles based on these postulates is another confirmation of the quantum concept Everything, universal in its construction. The obtained results allow, in particular, for the possibility that black holes do not have a non-physical singularity, while the absence of electromagnetic radiation from them is associated with the destruction of nucleons and atoms.

Keywords: problems of the accepted paradigm, Schrödinger and Klein-Gordon-Fock equations, quantum theory of Everything, protostructure of objects of the Universe.

1. Introduction

In recent decades, the physical paradigm accepted by official science has not been subjected to doubt and serves for assessing new physical ideas and the value of experimental data. Those of them which contradict it are regarded as unfounded and are not published in peer-reviewed journals. In effect, a canonisation of the existing ideas about the Universe has occurred. At the same time, it is recognised that contradictions exist in the accepted paradigm, the chief of which is the quantum description of the microworld, in which processes have a random nature, and the classical deterministic description of the objects of the macroworld. In this two-level description of the matter of the Universe, the boundary between the micro- and macroworlds has not been established.

Various attempts were made to remove this contradiction, but they proved fruitless. Therefore, within the framework of the physical regularities of the accepted paradigm, limiting the domain of its applicability, it is impossible to understand the physics of numerous natural macro-phenomena anomalous for it, in which their quantum properties are manifested. An example is ball lightning, which has been studied for more than 200 years.

We shall present some methodological and essential problems of the accepted paradigm, realised and unrealised by the physical community, in order to show the necessity of expanding the methods of scientific cognition of reality and of creating a monofundamentalist quantum paradigm suitable for a quantum description of reality both in the micro- and in the macroworld.

Six important problems of the accepted paradigm were set out in [1]:

«1. Today, it is not realised that the existing methodology of physics limits the cognition of the reality of Everything, since it allows one to study only that form of matter with which instruments interact. Therefore, it cannot explain a multitude of anomalous phenomena, including living matter and consciousness, which, in esotericism, have so-called «subtle-material» structures. This indicates that there exist unknown worlds inaccessible to instruments with a different form of matter, that is, a corresponding change in the conception of Everything and its matter is necessary.

2. Another unrealised methodological problem is the requirement of reproducibility of experimental results by other laboratories, which cuts off quantum macro-phenomena determined by different quantum states. This leads to the loss by physics of empirical information about the quantum properties of the macroworld, which makes it difficult to overcome the chief contradiction of the accepted paradigm.

The accepted paradigm also has fundamental essential problems.

3. One of them is the unformed conceptions of space and time. It is assumed that in the space of the Universe, processes occur with four symmetries - translational, axial, central, and spherical - which is impossible in one space. Therefore, one may assume that in the Universe the properties of three other worlds of Cosmos with a different symmetry of space are manifested, that is, the Universe is not a closed physical system. The quantum nature of worlds unknown today is indicated by the reversibility of the time of the fundamental particles generated by them, which is absent in the matter of the Universe, which has an arrow of time.

4. Another problem of the accepted paradigm is the absence of an idea about the history of the emergence of the Universe from the initial state of Everything, which is

necessary to establish. Without this, any hypothesis about its formation cannot be proved. It is necessary to have an idea of how three quantum worlds with different symmetries of space are born from the initial basic quantum state of Everything, and how they generate universes and endow their objects with quantum properties.

5. Today there is no understanding of how elementary particles, their mass, and energy are born from the initial state of Everything, what the spectrum of fields and particles in each of the quantum worlds is. Without this, it is impossible to understand how the formation and structuring of the nucleon matter of the Universe occurs and to confirm the correctness of the Big Bang model. In order to explain the hierarchical structure of the matter of the Universe at the fundamental level, a hierarchy of same-type fundamental particles must exist. In the existing quantum mechanics of point particles, a hierarchy of particles is impossible, and the development of a the quantum mechanics of real particles is needed.

6. A special problem of the accepted paradigm is the lack of understanding of how inert and living matter differ. Connected with this is also the failure in the attempt to explain the properties of human consciousness by the function of the brain, consisting of nucleon (atomic) matter. To solve this problem, it is necessary to determine the physical properties of the «subtle matter» of esotericism, in which of the quantum worlds it is formed, and how it forms the structures of human consciousness, which in an altered state makes his cognition of unknown worlds possible. In physics these subjective methods of cognition are rejected due to the impossibility of checking the obtained information by instrumental means. This is one of the reasons why the conception of Everything in the accepted paradigm is limited to the world of universes. »

As is known, today there is no understanding of the nature of the wave function, since the basic equation of quantum mechanics was obtained by E. Schrödinger heuristically. Therefore, the origin of quantum processes and the domain of application of quantum mechanics remain unidentified, and the correctness of some of its conclusions gives rise to doubt. First of all, this is the different physics of the micro- and macroworlds. This is the realised basic contradiction of the accepted two-level paradigm, which could not be resolved in the century of the existence of quantum theory. Without its removal, it is impossible to construct a monofundamentalist theory of Everything, which will become its final theory.

Most physicists adhere to a probabilistic interpretation of quantum mechanics of the microworld and a deterministic interpretation of the macroworld, i.e. to a dual view of the nature of matter and the physical laws governing it. In the present work, the derivation

of the Schrödinger equation is given, using the deterministic approach proposed in [2]. It is developed in the present work on the basis of the conceptions of the monofundamentalist quantum theory of Everything [3].

2. Postulates of the quantum concept of the Everything

The quantum theory of Everything (QTE) was constructed as a monofundamentalist theory claiming universality, operating only with three dimensional world constants and therefore not admitting generalisation. At its foundation lie the following four postulates proposed in 2008 [4].

1. First postulate. The primary substance of Cosmos is the infinite space that has always existed, in which matter does not interact, i.e. there are no distinguished spatial directions and symmetries. This basic quantum state is called the *null-vacuum* by virtue of the fact that the average value of any of its physical quantities is equal to zero. The null-vacuum is capable of generating the quantum states of Cosmic orders - their worlds with interacting matter and a complicating symmetry of space.

The primary world of Cosmos is the world with translational symmetry, whose particles possess inert mass and move rectilinearly. The constant of this world is the velocity c of the scalar field created by it (the c-world). This world generates h-worlds with axial symmetry, in which particles acquire orbital rotational motion on discrete orbits, determining their spin, the distance between which is determined by Planck's constant h. In turn, this bosonic vortex h-world generates worlds of the physical vacuum with central symmetry of space, characterised by values of the world constant hc, determining the dimensionality of the charges acquired by its particles. In the physical vacuum, bosons generate the fermionic form of matter [3].

These three quantum worlds with reversible time form the protostructure of any objects of universes, having spherical symmetry of space, the gravitational constant G, and one direction of time. Our Universe is born as part of a polarisation quartet of universes differing in the signs of time and the radius-vector [3, 4]. The protostructures of objects of the Universe (they create the Kirlian auras of objects) endow them with quantum properties, some of which are unknown today, but play an important role also in the macroworld [2-4]. Because in the spherically symmetric space of the Universe there is no direction of interaction distinguished for momentum polarisation, interactions between massive particles are impossible. These interactions occur in the protostructures of objects or between them. In the accepted paradigm, particles and objects do not have a protostructure, the physical vacuum is the substance of a closed Universe, and macro-

objects are considered classical, while for microparticles in quantum mechanics the point approximation is used.

Thus, in QTE, the general quantum description of objects of the Universe of any hierarchical level is determined by three dimensional world constants characterising the properties of the four worlds of Cosmos.

2. Second postulate. The universal mechanism of changes of physical quantities is the nonlocal mechanism of polarisation (similar to the polarisation of electric charge), which does not change their initial magnitude. This is a generalisation of the known conservation laws of some physical quantities. Today the idea of locality of interactions is accepted, although it contradicts the experiment with EPR pairs.

3. According to the third postulate of QTE, by virtue of the commonality of the polarisation origin from the null-vacuum, all physical quantities in the general case are complex. This is a generalisation of the existing situation in which the status of physical quantities is different: there are real, imaginary, and complex quantities (for example, the wave function).

The formation and change of any scalar complex physical quantity occurs by means of a polarisation mechanism that preserves its modulus as zero:

$$|a+ib|=0\,(\pm a\pm ib=0)$$

(1)

4. Fourth postulate. By virtue of the monofundamentalist approach of QTE, the deterministic description of the macroworld also requires a deterministic description of the microworld [2], i.e. physical events in Cosmos are preordained by physical regularities. Therefore, the phenomenon of self-fulfilling prophecies is also possible. The concepts of chance, self-organisation, and free will are excluded in QTE.

QTE has been constructed on these four postulates formulated in [4] about the primary spatial substance and the structure of Everything, the universality of the polarisation mechanism of changes, the complexity of physical quantities, and the determinism of quantum events

From the postulates of QTE it follows that the space of the three quantum worlds of the protostructure of the Universe is complex, and the polarisation formation of particles of one type occurs along each spatial dimension in pairs with zero total momentum.

The number of spatial states (SS) of real or imaginary subspaces with dimensionality *d*, differing by the direction of at least one coordinate, is equal to 2^d, and

in complex space it amounts to $k_d = 2^{2^d}$. The polarisation process of formation of a multiplet of particles is completed with the formation of a new unpolarised singlet quantum state when all these SS are filled.

As shown in [3], in the world of polarisation processes, the dimensionality of complex space is $d = 3$, i.e. $k_d = 256$, but only 64 SS are realised in the physical vacuum of the protostructure of objects of the Universe[1] [3]. Since the number of spatial states of the three-dimensional real and imaginary subspaces is 8, the number of SS equal to their product will be exactly 64. When the particles of matter being born fill this 64-plet of SS, the singlet state of the formed multiplet of particles can localise in the spherically symmetric space of the Universe. Therefore, the density of particles of matter fragments of the Universe is proportional to the product of the densities of particles in the real and imaginary subspaces of the physical vacuum of these fragments. It is shown below that the densities of particles in these subspaces are determined by the Schrödinger wave function, defining its physical meaning.

Thus, quantum mechanics studies not one particle in different quantum states, but a multiplet of non-interacting particles localised in different SS (i.e. subspaces) of the physical vacuum and forming a superposition of orthogonal quantum states. The interaction of particles of multiplets occurs in the physical vacuum with one pair of particles located in a common subspace. Therefore, in successive measurements we record different directions of the momenta of particles in different subspaces, interpreting this as the absence of a trajectory for the particle, and consider the microworld indeterministic, thereby making the construction of a monofundamentalist deterministic quantum theory of real particles impossible.

3. Derivation of the Schrödinger equation for free particles

«Quantum mechanics occupies a very peculiar place in the series of physical theories - it contains classical mechanics as its limiting case and at the same time needs this limiting case for its very foundation» [5]. Thus, quantum mechanics is a theory of the two-level paradigm with its different physics of the micro- and macroworlds. With the monofundamentalist approach to the physics of Everything, such a construction of quantum mechanics is unacceptable. In this approach, classical physics is only a particular case of quantum mechanics of the macroworld, when quantum effects are insignificant. Therefore, a derivation of the Schrödinger equation within the framework of the monofundamentalist paradigm is required. In the present work, such a derivation of the

[1] This, in particular, explains why 256 SS of the physical vacuum in the universal genetic code form 64 codons and 192 of their nucleotides [2, 3].

equation is presented for the simple case of the birth of free non-relativistic particles. It may be regarded as the first step in the development of a monofundamentalist quantum mechanics of real particles possessing a protostructure.

The polarisation birth of particles in the complex space of the physical vacuum of the Universe is possible both in a free and in a bound state with zero total mass and charge. Pairs of particles with mass ±m, in polarisation birth, acquire universal charges attracting them, tending to return the particles to the initial state of the null-vacuum [3]. One may assume that if pairs of particles are polarised in a bound state, then they become quanta of a scalar field with zero rest mass. This universal field exists in all worlds of Cosmos and propagates in them with velocity *c*, which, as shown below, coincides with the speed of light.

Since in the Universe the existence of electric charge creating a spherically symmetric electric field is possible, particles being polarised, along with mass, may acquire electric charges of different signs. A lepton and its *antinegalepton* (an antilepton with negative mass), rotating on neighbouring orbits and creating a magnetic field, which in real space are electrically attracted, form a bound state - an uncharged photon of the vector electromagnetic field with zero rest mass, propagating in the Universe with the same velocity *c* as a quantum of the scalar field. In the imaginary subspace, photons cannot exist, since opposite electric charges repel. In quantum field theory the photon is considered a structureless particle with zero mass.

One may assume that massless quanta of strong fields may be born in a similar way, in which, instead of electric charge, one of the three colour charges is polarised, and instead of lepton pairs - quark pairs. The existence of structure in field quanta explains their selective interaction with matter particles.

The infinite null-vacuum generates cyclic processes that do not change the mean zero values of its physical quantities and those of the worlds of Cosmos. Therefore, let us consider the wave equation in complex space and with complex time of the physical vacuum of the Universe.

The polarisation formation of scalar particles in the real and imaginary subspaces of the physical vacuum of the Universe is accompanied by the birth of a scalar field in its real subspace. The time of these processes is complex: $T = t + i\tau$. In the Universe $\tau = 0$. The corresponding operator of the wave equation $\hat{Q}$ has the complex form:

$$\hat{Q} = \frac{1}{c^2}\left(\frac{\partial}{\partial t} + i\frac{\partial}{\partial \tau}\right)^2 - (\Delta + i\Delta)$$

(2)

It determines the scalar field $\Phi(r,t)$, formed by bound pairs of particles with total zero mass in the real subspace of the physical vacuum of the Universe, as well as quantities proportional to the density of free particles in its real and imaginary subspaces, denoted respectively by $F(r,t)$ and $F(r_i,t)$, where r and r_i are respectively the radius-vectors of the real and imaginary subspaces. The filling of the spatial states of the real and imaginary subspaces of the physical vacuum by particles being born with masses $\pm m$ is cyclic in character, determined by the polarisation of the phase $\varphi_{\pm}=(\pm m)c^2\tau/\hbar$ and the cyclic function $\chi(\tau)=\exp(i\varphi_{\pm})$.

The operator $\hat{Q}$ given in (2) acts on the function $\Psi=\chi(\tau)\Phi(r,t)F(r,t)F(r_i,t)$, leading to the complex equation satisfying the polarisation condition (1):

$$\hat{Q}\Psi=0.$$

(3)

Separating the real and imaginary components of equation (3), we obtain the Klein-Gordon-Fock equation in the real subspace:

$$\left[\frac{1}{c^2}\frac{\partial^2}{\partial t^2}+(\pm mc/\hbar)^2-\Delta\right]\Phi(r,t)=0.$$

(4)

For the real and imaginary subspaces of the physical vacuum, the imaginary component of equation (3) gives the equations:

$$\left[\frac{2(\pm m)}{\hbar}\frac{\partial}{\partial t}+i\Delta\right]F(r,t)=0$$

(5)

and

$$\left[\frac{2(\pm m)}{\hbar}\frac{\partial}{\partial t}+i\Delta\right]F(r_i,t)=0.$$

(6)

Taking into account the value of the momentum operator $\hat{p}=-i\hbar\frac{\partial}{\partial r}$, equation (5) is transformed into the Schrödinger equation for free particles in the real subspace:

$$\left(i\hbar\frac{\partial}{\partial t}-\frac{\hat{p}^2}{2m}\right)F(r,t)=0.$$

(5a)

Equation (6) for the imaginary subspace is likewise reduced to the same equation if the sign of the particle mass or the direction of time τ changes. The location of particles with different mass signs in different subspaces makes their collision and annihilation

impossible. The different direction of the time of particles in the physical vacuum means that the generation and disappearance of particles occur in its different subspaces. For example, the birth of the matter forming stars occurs in the real subspace of the physical vacuum of the Universe, while its disappearance occurs in the imaginary subspace of the protostructures of black holes, in which photons are not formed [3].

Since, when the real and imaginary subspaces of the physical vacuum are separated, their volumes are equal, and the numbers of localised spatial states in them are identical, the amplitudes of the complex-conjugate densities $F(r,t)\chi(\tau)$ and $F(r_i,t)\chi(\tau)^{\cdot}$ are equal. Taking into account what was said earlier about the formation of the 64-plet of SS of the Universe, this explains why in quantum mechanics the density of particles in the Universe is proportional to the product of complex-conjugate wave functions.

Thus, in QTE, the Schrödinger equation for free non-relativistic particles describes processes in the complex space of the physical vacuum of the Universe, and not in the space of the Universe itself. The wave function of the Schrödinger equation is proportional to the density of spatial states of the real and imaginary subspaces of the physical vacuum of the Universe filled with particles.

3. On the possible nature of «black holes».

From what has been said above about the distribution in the physical vacuum and the localisation of scalar particles with different mass signs, one may assume that the boundary of the real and imaginary subspaces of the physical vacuum has regions which are the place of polarisation of scalar particles of different mass signs, including scalar particals with mass 468 MeV/c^2 [3], forming the nuclei of nucleons. In this case, the nucleons of atomic matter, having passed from the real subspace into the imaginary one, will be destroyed as a result of annihilation of nucleon nuclei, while the quarks and electrons of atomic matter in the imaginary subspace will form a condensate which may seep into the real subspace and participate in the formation of atomic matter. Thus, in the space of the Universe, regions with an imaginary subspace of the physical vacuum are possible, where atomic matter and its electromagnetic radiation disappear. Black holes possess a similar property. In their polarisation model, proposed in [3], non-physical singularities are absent.

Atomic matter formed on the boundary of the imaginary subspace of a black hole may participate in the formation of jets emanating from black holes - non-diverging streams of relativistic atomic matter. Jets are born inside the cylindrical subspace of the axially symmetric world of the protostructure of the galaxy.

3. Conclusions

The emergence of a monofundamentalist worldview approach claiming universality and agreeing with a wide spectrum of empirical data of the micro- and macroworld opens new possibilities in the development of fundamental science. For the substantiation of a general theory, such as the QTE, confirmation of its postulates by empirical data is required.

The derivation of the Schrödinger equation considered in the present work within the framework of the monofundamentalist approach for the case of free non-relativistic particles demonstrates the applicability of quantum mechanics to particles of any mass and hierarchical level born by the polarisation mechanism. This means that in the monofundamentalist theory of Everything, classical mechanics is not, as is commonly believed, the limiting case of quantum mechanics and an element of its foundation. The obtained result gives hope for the possibility of creating a deterministic quantum mechanics of real particles, which will be applicable at all hierarchical levels of matter.

The series of discrepancies between the results of QTE and the accepted physical paradigm presented in the current work, and the extension of the domain of applicability of quantum physics to the macroworld in QTE, make it necessary for the scientific community to discuss the validity of the monofundamentalist worldview approach claiming universality in cognising the reality of Everything. This discussion will enable determining whether it is necessary to correct the path of the development of fundamental science in the foreseeable future.

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