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Existence of Dark Matter and its Meaning for the Physical Essence of "Electric Field" and "Electric Charge" of the Particles Created from This Matter

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Abstract

Last years the belief in dark matter (DM) existence in ambient space becomes more valid and reliable registration of DM properties is an actual task of present-day astrophysics and cosmology. Recently it was shown by me that the reasonable assumption, that observed properties of cosmic microwave background radiation (CMBR) are produced by thermal (at 2.7K) seesaw motion of DM, gives materialistic substantiation to conservation laws of classical physics and to principles of quantum mechanics (as it gives the value of Planck's constant). This result directly confirms the reality of DM existence and shows, that CMBR is an observed display of DM motion. Also recently, taking into account that creation of electron-positron pair occurs from DM as two contrarily rotating material vortex (according to their spins), the substantiation of positron nature of ball lightning (as a bunch of big amount of positrons) was given by me, what let first explain all its properties. Unbelievable (at first sight) confluence of positrons may occur, when they are concurrently and next to created from all nearest DM, what may take place at powerful streak lightning in the air. Used conception, that "electric field" of positron results from "polarization" of nearest DM by positron rotation, means that, if around positrons is not DM to produce their "electric fields", so they can't reveal their mutual repulsion. Thus, such positrons, as identical material vortex, may confluence in growing rotating bunch, which according to energy conservation law should rotate with constant linear speed of its surface, giving constant and small "electric field" of this bunch. In the paper, using proposed conception of physical essence of "electric field" (and "electric charge") of elemental particles created from DM, the problem of inexplicably many (now more than 350) registered unstable particles is resolved, and an explanation is given why calculated masses for these short-living particles are considerably larger than the masses of stable particles (electron, proton). Besides, used conception let reveal physical reason of so-called "asymptotic freedom", proposed theoretically to explain the absence of repulsion between protons in atomic nucleus (the Nobel Prize on physics in 2004). Really, in the case of small size of atomic nucleus there is not enough DM to produce the "electric fields" of protons, and so their mutual repulsion is absent.

Keywords

Dark Matter, Electron-Positron Pair Creation, Essence of "Electric Field", Reason of "Asymptotic Freedom"

1. Introduction

Understanding of the reality of dark matter (DM) existence in ambient space lead, as may be shown, to very important consequences for the physics as a science developed by man, since this understanding gives, for example, clear materialistic substantiation both for conservation laws of classical physics and for principles of quantum mechanics, and also it let reveal real materialistic essence of some accepted physical conceptions, such as space and time [1-3]. In this short article only one important consequence of DM existence is considered, namely, a meaning of DM for the physical essence of usually used conceptions of "electric field" and "electric charge" for "charged" material elemental particles. As was revealed at recently given substantiation of ball lightning positron nature [2], "electric field" (and consequently "electric charge") of "charged" particles

(positrons) is a consequence of nearest DM "polarization" by positron rotation (according to its spin). It means that, if near rotating ("charged") particles there will be not DM (in some exclusive cases), so they can't exhibit their usual mutual repulsion.

Revealed physical essence of these conceptions let reasonably explain known problem of inexplicably many (now more than 350) unstable short-living particles (registered by various chambers and detectors), from which only about 60 have been classified using adjusted approach of Standard Model for particle physics. This problem is noted in Wikipedia's item "Particle Physics": Throughout the 1950s and 1960s, a bewildering variety of particles were found in scattering experiments. It was referred to as the "particle zoo". These conceptions let also reasonably explain usually calculated peculiarly large masses of unstable particles, which are much larger than the masses of known stable particles (electron, proton and their antiparticles). Besides, these conceptions, based on the existence of DM, let give reasonable physical explanation to old puzzle of the absence of repulsion between protons in atomic nucleus. At first (in first half of last century) this puzzle was explained theoretically in terms of "strong interaction", however recently this puzzle obtained its new interpretation as "asymptotic freedom" with its complex theoretical description (the Nobel Prize on physics in 2004), but also without clear substantiation of its physical reason.

As was revealed [2], electron-positron pairs, being a case of stable particles, are created (no doubt from DM) as contrarily rotating material rotors (vortex), according to their spins, and so their "electric field" (and consequently their "electric charge") may be considered as result of nearest DM "polarization" by their rotation. Such understanding of physical essence of "electric field" and "electric charge" for "charged" material elemental particles means that, if (in some cases) there will be not DM near these particles so they can not be able to reveal their usual mutual repulsion. Moreover, in this case created elemental particles, being identical material vortex, may confluence with each other in one material vortex. Namely this takes place at confluence of many concurrently and next to created positrons from all ambient DM at powerful streak lightning in the air, what gives one bunch of positron antimatter, which really is mysterious ball lightning with its positron nature [2].

As to the confidence in DM existence, it becomes more valid last years and so, as it may be seen, reliable registration and study of DM properties is an actual task of present-day astrophysics and cosmology [4-8]. It should be noted that first the concept of DM existence was introduced long enough in astronomy for explanation of observed dynamics of cosmic objects in Galaxies on the base of classical mechanic laws, as it is always underlined [1-8]. As to sure result of disclosing of DM properties, it was recently shown [1] that at reasonable assumption, that observed properties of cosmic microwave background radiation (CMBR) are produced by thermal (at 2.7K) seesaw motion of DM, fundamental conservation laws of classical physics and all principles of quantum mechanics (including the value of Planck's constant) obtain first their clear materialistic substantiation. No doubt, this result directly confirms the reality of DM existence and shows that CMBR is observed display of DM as result of its equilibrium thermal motion.

Also recently, taking into account that creation of electron-positron pair occurs from DM as two contrarily rotating material vortex, the substantiation of positron nature of ball lightning (as a bunch of big amount of positrons) was given [2], what let first explain all observed specific properties of ball lightning and, no doubt, also confirms the reality of DM existence.

This article contains almost no mathematics, since it is devoted mainly to logical materialistic analysis of some problems of physics and to reasonable conclusions on the base of the fact of DM existence. Mathematical relations, which are needed to analyze the problems considered and which are based on the fundamental physical laws, following namely from the existence of DM, are presented earlier [1-3].

2. Briefly About the Physics as a Science Developed by Mankind

Understanding the significance of considered problems of physics and the importance of proposed, based on the existence of DM, real conceptions of "electric field" and "electric charge" for "charged" elemental particles, it is necessary at first to designate the purpose and the essence of the physics as a science in order to establish a correct touchstone of understanding what should be considered as really true among obtained results of physics, both experimental and theoretical.

2.1. Purpose, Creation and Evolution of Physics

The physics, as to its essence, is, in principle, the experimental science and the main purpose of physics is the experimental study (observation and registration) of the properties of various processes, which take place in the nature. Experimentally revealed properties of observed processes may be considered as really exact and sure only if these properties are obtained for certain by many researches and, as it is desirable, by different methods.

For adequate description of observed properties of the nature the theoretical part of physics was developed, which use introduced base physical conceptions (space, material body, time and others, such as physical fields) for nature properties. Besides, theoretical description uses the experimentally revealed both fundamental physical laws (conservation laws of momentum, angular momentum and energy) and the principles of quantum mechanics (following from the Planck`s constant existence in the nature). As recently shown [1], these laws and principles (including the value of Planck's constant) are realized in the nature because all they follow from the experimentally revealed features of cosmic microwave background radiation (CMBR) produced

by DM thermal equilibrium motion at 2.7K. Thus, it is clear that the theoretical physics, which uses for description of observed processes different conjectures, abstract models, assumptions and vast mathematical tool, should always take into account these fundamental physical laws and principles, which follow from real physical properties of the nature. Only in this case obtained results of theoretical physics may give an adequate description of any observed processes in the nature and also give sure forecasts of yet unknown physical processes of the nature, what should ensure the progress and right evolution of the physics as a science.

2.2. Touchstone of Validity of Conceptions and Results of Theoretical Physics

Taking into account the significance of theoretical physics for evolution of the physics and for right physical forecasts it is important to establish true touchstone of validity for conceptions and results of theoretical physics. It is clear that, if at theoretical explanation of reliable experimental data the used conjectures, models, assumptions and conceptions do not give full and adequate description of such data or lead to some inexplicable problems and abnormalities, so it means that something is not true among used conjectures, models, assumptions or conceptions. Therefore these used conjectures, models, assumptions and conceptions should be revised and changed so that it can be possible to achieve full and adequate description of reliable experimental data. Namely such possibility is true touchstone of the validity for used conjectures, models, assumptions and conceptions of theoretical physics and, consequently, for obtained theoretical results.

3. Existence of DM determines known fundamental Laws of classical Physics and quantum Mechanics

Everywhere used fundamental conservation laws of classical physics (laws of momentum, angular momentum and energy conservation) so far have no physical substantiation of their origin since they are not derived from any higher order laws or principles, however they are used with confidence because all these laws are in agreement with experimental data. Such statement also holds true for known principles of quantum mechanics (Heisenberg`s uncertainty principle, de Broglie`s wave mechanics, etc), which all are the consequence of Planck`s constant existence in the nature. The Planck`s constant value was derived as adjusting parameter at successful description of black body spectrum, however the physical reason of existence in the nature of Planck`s constant, which actually is a mechanical action (an action function), was remaining unknown.

As recently shown [1], reasonable assumption, that observed CMBR, which as the DM also exists in all ambient space, is produced by DM thermal motion, allows to reveal (from established properties of CMBR) clear materialistic reason for conservation laws of classical physics and for principles of quantum mechanics (since it let derive the known value of Planck's constant).

As to fundamental conservation laws of classical physics, then namely the observed very high spatial homogeneity and isotropy of CMBR and, naturally, the same properties of DM, validate the performance of conservation laws of momentum and angular momentum, correspondingly, whereas energy conservation law follow from observed stability of behavior (independence on starting moment) of the physical processes in the nature. This is in accord with known mathematical theorems of E. Noether (1918) [9], what was underlined in [1]. Thus, the validity of conservation laws of classical physics is the consequence of DM existence in the nature (with DM properties corresponding to the observed properties of CMBR).

As to known principles and theories of quantum mechanics, which all are based on the existence of Planck's constant, it was shown in [1], that the value of Planck's constant may be derived from observed properties of CMBR blackbody spectrum, produced, as reasonably supposed, by DM thermal seesaw motion at 2.7K.

Indeed, the fact, that CMBR has blackbody spectrum at temperature $T\approx2.7$ K, demonstrates that DM performs an equilibrium thermal motion at this temperature. At that, the value of kinetic energy of DM seesaw motion (ε) should be equal to DM thermal energy, which may be obtained from DM temperature with the use of the universal Boltzmann`s constant $k=1.38\cdot10^{-23}$J/K. The velocity of DM seesaw motion should be equal to the electromagnetic waves speed ($c=3\cdot10^{8}$ m/s) since namely these waves propagate in DM, which fills all ambient space. So, the value of DM kinetic energy ε should be equal to its thermal energy: $\varepsilon=3kT/2=5.6\cdot10^{-23}$ J. This let estimate the mass of DM part, its effective mass (m), which produces such seesaw motion of DM: $m=2\varepsilon/c2\sim1.2\cdot10^{-39}$ kg.

As clear, maximum wavelength of CMBR ($\lambda\approx1.9\cdot10^{-3}$ m) is equal to the amplitude of DM seesaw motion, and this amplitude corresponds to the damping length of DM seesaw motion. So, λ means the damping length for momentum ($p=m\cdot c$) of DM effective mass seesaw motion.

The established parameters of DM seesaw motion (effective mass m, motion speed c and damping length λ of p) let estimate the value of mechanical action (an action function) for DM seesaw motion by two known manner, which are used in classical mechanics and in quantum mechanics.

According to conception of classical mechanics an action function (S) is a measure of physical motion and is equal to the product of the energy and the time of this energy existence (dissipation). Since full circle path of DM energy seesaw motion is equal to 2λ, its time is equal to $2\lambda/c\approx1.3\cdot10^{-11}$ s, and so the value of S for DM seesaw motion is equal to:

$$S=2\varepsilon\lambda/c\approx5.6\cdot10^{-23}\cdot1.3\cdot10^{-11}\text{J}\cdot\text{s}\approx7.3\cdot10^{-34}\text{ J}\cdot\text{s}.$$

This classically obtained estimation of the S corresponds well to known value of Planck`s constant $h=6.6\cdot10^{-34}$ J·s,

which physically is also an action function.

According to quantum mechanics approach, S value is obtained by multiplying mechanical momentum and its damping length. As for DM seesaw motion mechanical momentum is p=m·c and its damping length is λ, so an action function of DM seesaw motion should be equal to:

$$S=m\cdot c\cdot\lambda\approx 1.2\cdot 10^{-39}\cdot 3\cdot 10^{8}\cdot 1.9\cdot 10^{-3}\approx 6.8\cdot 10^{-34}\text{J}\cdot\text{s}.$$

Such obtained estimation of the S value for DM seesaw motion also corresponds well to the Planck`s constant h.

So, known conservation laws of classical physics and principles of quantum mechanics follow from the existence of DM with its properties, corresponding to the observed properties of CMBR. Such result undoubtedly confirms the reality of DM existence.

4. On the Reason of inexplicably many registered short-living Particles and their peculiarly big Masses

Known problem, specially noted in [10], of inexplicably many (now more than 350) unstable particles, registered by various chambers and detectors [10,11], may obtain its reasonable explanation with the use of proposed conception of physical essences of "electric field" and "electric charge" of elemental particles and taking into account the existence of DM, from which these particles are created. The problem is that the observed great number of registered short-living (besides stable electron, proton and their antiparticles) particles, which are assumed to be created in chambers and detectors at scattering of high energy particle and which ceased now being called as "elemental particles" [10], do not still obtain its full and clear classification. Obvious cases of appearance of inexplicably very many secondary "particles" (as their tracks in the substance of used detectors or chambers) under the action of primary high energy "particle" are presented in fig. 1 and fig. 2 (according to [10]).

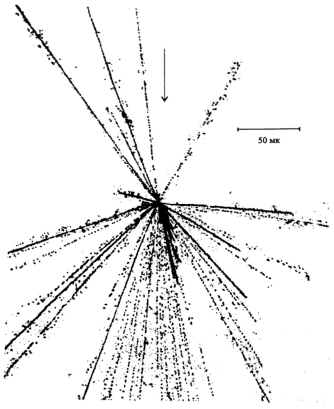

Fig. 1. *Illustration of generation in photoemulsion of shower of high energy "particles" at the action (on atomic nucleus) of initial (from cosmic ray) very high energy "particle" (its trajectory is indicated by an arrow) [10].*

Moreover, many very short-living "elemental particles" are still registered by developed methods, and these "elemental particles" are so short-living that they are simply called as "resonances".

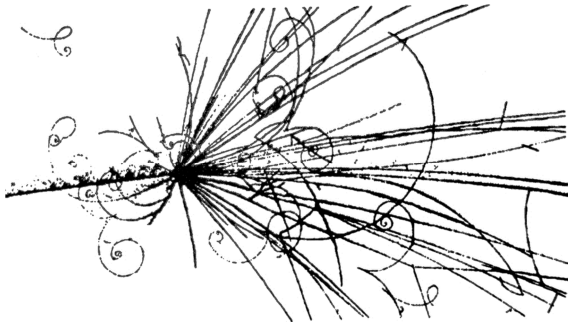

Fig. 2. *Another illustration of generation of very many secondary "particles" in bubble chamber (in the presence of magnetic field) [10].*

Taking into account the usual conditions of created particles registration by used methods, which show simply the tracks due to different reactions, caused by these particles, it is reasonably understand that observed tracks in the substances of chambers or detectors are caused, in principle, by directional flows of the energy of these particles. Such energy flows may be linked with the motion of stable elemental particles (electron, proton and their antiparticles), which are stable material vortexes created from DM, or with the motion of created from DM various kinds of material vortexes, which are rotating weaker than stable material vortexes (electron, proton and their antiparticles). Namely therefore, these slower rotating material vortexes represent the unstable short-living vortexes, which disappear in DM medium with various lifetimes. As clear, in chambers and detectors under the action of high energy particle besides created from DM such rotating stable and unstable material vortexes also may be created almost not rotating states (like plane waves) from DM, which energy also can produce tracks in the substance of chambers and detectors. These not rotating states can't "polarize" nearest DM by rotation (unlike rotating stable and unstable material vortexes), and therefore they do not obey the properties of "electric field" and "electric charge" and behave as neutral "uncharged" particles (without their trajectory incurvature in magnetic field).

The fact that exhibiting by material particle (vortex) its observed property of "electric field" ("electric charge") depends on the velocity of its rotation was reveled at given substantiation of ball lightning positron nature [2]. Observed small positive charge of ball lightning, forming at confluence of many concurrently and next to created positrons, directly confirms this fact and, as may be shown, follows from conservation laws of energy and angular momentum.

Really, at confluence of positrons (identical rotating vortices) the nascent positron ball must also rotate in accord with the conservation law of angular momentum. At that, according to the energy conservation law, the growing positron ball should rotate with diminishing angular velocity and with constant linear speed of its surface. Therefore, observed "electric field" (and "electric charge") of growing

positron ball should stay constant due to its constant ability to "polarize" by rotation the surrounding DM.

Indeed, the energy of rotating ball is equal to $I\omega^2/2=mr^2\omega^2/5$, where $I=2mr^2/5$ - ball moment of inertia, m - ball mass, r - ball radius, and ω - angular velocity of ball rotation. Maximal linear speed of the surface of rotating ball is equal to $r\cdot\omega$. According to the energy conservation law, at confluence of N such balls, the energy of nascent ball, which is $I_N\cdot(\omega_N)^2/2=m_Nr_N^2\omega_N^2/5$, where I_N, ω_N, m_N and ω_N are corresponding parameters of nascent ball, must be equal to $Nm\omega^2r^2/5$. Since $m_N=Nm$, so it gives $r_N^2\omega_N^2=r^2\omega^2$, i.e. linear velocity of the surface of growing ball remains constant.

Formation from very many positrons of weakly "charged" positron ball lightning (because it rotate slowly, what is noted by many witnesses and described in detail in [12]), demonstrates the exclusive case of violation of "electric charge" conservation law. As clear, this violation is the consequence of revealed materialistic essence of "electric field" and "electric charge" of elemental particles and the action in the nature, filled by DM, of conservation laws of energy and angular momentum.

Proposed conception of physical essences of "electric field" and "electric charge" of elemental particles, based on understanding of DM existence, let give logical explanation for usually calculated for observed short-living particles (slow rotating vortexes) their significantly (from 2 to 4 order of magnitude) bigger masses relative to the masses of stable particles (electron, proton and their antiparticles). The reason of such exceeding is that these short-living particles, which are unstable since they are rotating significantly slower than mentioned above stable particles, are usually believed to obey the same value of "electric charge" as these stable particles. However, since they rotate significantly slower, they display much smaller "electric charge" since they significantly weaker "polarize" nearest DM. Therefore, at calculation of their masses from the curvature of observed trajectories of these short-living particles in magnetic field, the value obtained will be significantly larger than their real masses (at the same extend as the stable particles rotate faster than these unstable particles). It worth to mark, that calculated for short-living particles their such big masses, what should mean their big energies, seem not to be real since their total dissipation occurs without appreciable (in accord to their big energies) big destructions (big tracks) in the substance of chambers and detectors.

5. Explanation of the Physical Reason of Strong Coupling Concept and of So-Called "Asymptotic Freedom" on the Base of DM Existence

The puzzle of the (impossible at first sight) absence of repulsion between protons, which are located in atomic nucleus, exist from the fist a half of previous century, when the structure of atomic nucleus was established [13]. To explain this scientific problem the concept of strong coupling between nucleons at small distances in atomic nucleus was introduced with the use of hypothetical exchange process between nucleons by some particle and enough complex theory (H. Yukawa, 1934; the Nobel Prize on physics in 1949). Later this particle was identified with some mesons, which were registered by chambers and detectors. Then, in the second a half of previous century, in order to explain this problem another concept was developed, which is known as "asymptotic freedom" [14, 15] and is based on the use of another hypothetical unobservable, in principle, particles (quarks and gluons) and on the more complex theoretical explanation (the Nobel Prize on physics in 2004). At that, both these concepts don't have clear substantiation of their physical reason on the base of known fundamental physical laws and of any well established experimental data about nature properties.

Revealed, on the base of DM existence, materialistic essence of "electric field" and "electric charge" of elemental particles, what let substantiate positron nature of ball lightning [2], also let give simple logical explanation to this old puzzle. The physical reason of the absence of repulsion between protons in atomic nucleus is that in the case of very small size of atomic nucleus there is not enough DM (or there is not DM at all) in order to produce the "electric fields" of protons by nearest DM "polarization", what usually lead to their mutual repulsion in free space filled by DM. Thus, used conception of "electric field" and "electric charge" of elemental particles gives simple physical explanation to the concept of strong coupling and to mysterious "asymptotic freedom", which have been proposed to explain this old puzzle with the use of complex mathematical approach, but without revealing their physical reason.

6. Conclusion

(1). The fact that understanding of DM existence let first give materialistic substantiation (using experimental date for CMBR) for three conservation laws of classical physics and all principles of quantum mechanics (as it gives the value of Planck's constant) [1], no doubt, directly confirms the reality of DM existence.

Besides, reasonable understanding that creation of substantial elemental particles (electron-positron pairs) occurs from DM as two contrarily rotating material vortex (according to their spins) let first explain all observed specific properties of mysterious ball lightning due to given substantiation of its physical nature as a bunch of big amount of positrons [2], what also confirms the existence of DM.

(2). Given substantiation of ball lightning positron nature [2], allowing to explain the unbelievable (at first sight) confluence of positrons in one bunch, is based on conception that the "electric field" (and consequently the "electric charge") of positron results from some "polarization" of nearest DM by positron rotation, what in general is in accord with recent notion of quantum electrodynamics. Used conception means that, if near created positrons is not enough DM to produce their "electric fields", such positrons can not

reveal their mutual repulsion. Therefore, these next to created positrons may confluence in one rotating material bunch since they are an identical material vortexes.

This conception also means that observed "electric charge" of any elemental particle is simply the result of its "electric field", produced by nearest DM "polarization" due to particle rotation. Besides, this conception shows that known universal constant "electric charge" of stable elemental particle is the consequence of angular momentum conservation law for such rotating particle, created from DM as stable material vortex. As was shown [1], this fundamental law of angular momentum conservation should always be realized in the free space filled by DM.

Revealed, at given substantiation of ball lightning positron nature [2], real physical essences of "electric field" and "electric charge" of elemental particles lead to important conclusions about physical conception of "electric charge". At first it means that at formation of ball lightning from many positrons, known law of "electric charge" conservation do not take place, and secondly it means that the value of experimentally revealed "electric charge" of any elemental particle is determined by intensity of particle rotation, what cause its "electric field" by nearest DM "polarization".

(3). Known problem of inexplicably many (more than 350) short-leaving unstable so-called particles, which tracks are registered by various chambers and detectors [10], may be reasonably explained taking into account the existence of DM. It let consider the observed different kinds of tracks as coursed by the energy of various material vortexes, which behave as "charged" particles, or by the energy of nearly plane electromagnetic waves, all of which may arise in DM under the action of transiting (trough the substances of chambers or detectors) high-energy particles or high-energy electromagnetic waves. As known, at the energy of electromagnetic wave quantum above 1MeV may be created a pair of stable elemental particles (electron-positron pair), both of which are stable material vortex produced from DM. These vortexes rotate (oppositely according to their spins) fast enough what ensures their stability in DM and due to "polarization" of nearest DM by their rotation appears the observed "electric field" (and "electric charge") of these stable elemental particle (their stability is yet unresolved mystery of the nature). No doubt, under the action of high energy particle should arise some unstable short-leaving material vortex (particles), which are created with its energy lesser than for mentioned stable elemental particles and so rotate considerably weaker. As clear, this gives their considerably lesser "electric field" and "electric charge" produced by DM "polarization" (because of their weaker rotation).

Such understanding logically explains usually calculated for these unstable particles (from the curvature of their tracks in magnetic field) their considerably bigger masses relative to the masses of stable particles. The reason is that at usual calculation the "electric charge" of these unstable particles it is supposed to be equal to known "electric charge" of stable elemental particle (electron, positron), whereas really exhibiting "electric charge" of these unstable slow rotating particles is considerably lesser because of their weaker "polarization" of nearest DM. Therefore, the masses of these unstable particles, calculated from the curvature of observed trajectories of these short-living particles in magnetic field, will be significantly larger than their real masses (at the same extend as the stable particles rotate faster than these unstable particles).

(4). Used conceptions of the physical nature of "electric field" and "electric charge", based on the existence of DM, gives simple materialistic explanation to old puzzle of the absence of repulsion between protons in atomic nucleus. Particularly, it reveals the physical reason of so-called "asymptotic freedom" proposed recently to explain theoretically the missing of repulsion between protons in atomic nucleus (the Nobel Prize on physics in 2004). However, this complex theoretical explanation did not receive any physical substantiation. Real physical reason of the absence of repulsion between protons in atomic nucleus is that in the case of small size of atomic nucleus there is not enough DM (or there is not DM entirely) to produce in atomic nucleus the "electric fields" of protons, what usually lead to their mutual repulsion in free space filled by DM. Thus, proposed conception of the physical nature of "electric field" and "electric charge", based on the existence of DM, let reasonably explain old puzzle of the absence of repulsion between protons in atomic nucleus without using mysterious concept of unobservable quarks (and gluons).

No doubt, the use in the physics of any hypothetic ideas, which can't be ever observable, are unacceptable, since the physics is, in principle, a science based on the experimental data, otherwise it will lead the physics in deadlock state. Namely such dead state takes place in the particle physics, where many introduced strange particles (enough to note unobservable quarks) and their exotic properties do not yet obtain any experimental confirmation.

And as ever, what is true is simple essentially.

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