ABOUT THE REASON FOR UNIVERSE EXPLOSION

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ABSTRACT

The paper states a hypothesis of the process of proton excess accumulation as a result of neutron two-neutrino decay, the process which takes place in superdense substance consisting mainly of neutrons. This accumulation provokes protons electrostatic repulsion, which exceeds gravitational contraction and gives rise to substance expansion and its going out of the state of gravitational collapse. This hypothesis enables to explain the origin of primary cosmic rays of ultrahigh energies (> 10^{20} eV), the origin of supernova star shell expansion energy, neutron star magnetic fields, collapsed substance big mass explosions resulting in formation of galaxies, and “Universe Big Bang”, which is unique only on its scale, but not on its nature, and which concerns not the whole universe but only its substantial part. The reason, for which experiments on two-neutrino decay can not evidence the impossibility of this decay in superdense substance of cosmic bodies, is discussed.

Key words: Universe Big Bang, cosmic rays of ultrahigh energies , two-neutrino decay of neutron, neutron stars, supernova SN 1987A.

“Universe Big Bang” is one of the greatest riddles of nature. There are no any explanation based on currently known nature laws. We can only hope for the existence of nature laws which are not discovered so far.

However, is it really so that the known nature laws can not explain the Universe Big Bang? One can try to create such explanation. Gravitational collapse appears due to long-range character of gravity force, which is inversely proportional to squared distance. Hence, appears gravitational contraction energy proportionality to compressible substance mass square unlike short-range forces of strong and weak interactions between elementary particles in atomic nuclei proportional to the first degree of the number of particles and opposed to gravity forces. That's why, along with the increase of particle number of the body, gravitational contraction energy will inevitably exceed the energy of repulsive force and will cause gravitational collapse. Hence, with full evidence it appears that only interaction, both long-range and gravitational, can withstand gravitational contraction. Among interaction types existing now in nature there is only such interaction as electromagnetic one, more exactly, electrostatic repulsion of electric charges of the same name. The majority of known elementary particles have electric charges, but only stable electric particles (protons and electrons) are able to withstand gravitational attraction for enough long time. One could assume that at gravitational contraction, some not currently known but possible processes of electric charges division (like division of charges in thunderclouds) can appear in contractile mass, when, e.g., light particles, electrons, leave contractive mass rapidly, and only positively charged protons remain in the nucleus, the protons, which create repulsive forces stopping contraction and provoking expansion of contracted mass. Electrostatic repulsion between protons exceed gravitational attraction between nucleons by many orders of magnitude. To counterbalance attraction, it would be enough to have one proton per $1.1 \bullet 10^{18}$ neutrons. However, it is difficult to imagine such as a source of energy, which could result in such charge separation: for instance, if in case of supernova star explosion the flying rocks of the shell would catch electrons, and protons would remain inside. But observations confirm that the energy of the flying rocks of the shell is a negligible part of the star gravitational collapse energy. This statement is a point of principle: at gravitational collapse, neutrino radiation takes away almost all energy of contraction, now energy remains for compressed mass expansion. [1]. Hence it inevitably appears: for reaction to gravitational contraction, a process of surplus non-compensated electric charges is necessary. However, such a process breaches as the law of electric charge conversation as the law of conservation of energy. Hence it would seem it appears that such a process is impossible. However, recognizing the fact of the Big Bang existence, and recognizing the explosions of the less scale in the centers of galaxies, we must recognize that such a process may exist, otherwise it is very probable that almost all the mass of the universe would be inside the “black holes”, but actually it is not observed.

It the process of non-compensated electric charges accumulation in superdense substance compressed by gravitational forces contradicting all existing physical observations possible? We can assume that such a process is a two-neutrino decay of a neutron:

$$n \rightarrow \mathrm{p} + \nu_{\mathrm{e}}^{+} + \nu_{\mathrm{e}}^{-} \qquad (1)$$

where: n-neutron, p- proton, ν_{e}^{+} and ν_{e}^{-} - electron neutrinos and antineutrinos, respectively. It is known that a free neutron is an instable particle, and it decays into proton, electron and antineutrino:

$$n \rightarrow \mathrm{p} + \mathrm{e} + \nu_{\mathrm{e}}^{-} \qquad (2)$$

However, in superdense substance, at density exceeding approximately 10^6g/cm^3, this process becomes disadvantageous because the forming electron localization energy exceeds the energy releasing at neutron transformation into proton $E = (m_{on}-m_{op})\times C^2=1.293$ MeV, where m_{on} and m_{op} – neutron and proton rest mass, respectively, and C - speed of light [2]. At neutron decay on two-neutrino version (1), the problem of energy localization does not appear because neutrino interacts with substance very poorly and it lightly leaves neutron decay site. In two-neutrino process, electric charge conversation law is being breached, but all the rest conversation laws are not breached: laws of energy, pulse, moment of momentum conservation, and the law of leptonic number which operates only at weak interaction. Can the breach of electric charge conservation law serve as prohibition for neutron two-neutrino decay? From the logics of independence of weak influence, which is one of the four fundamental types of interaction, it follows that there is no such prohibition: charge-independent process, which take place according to the laws of weak interaction, should exist. Existence of such processes was experimentally confirmed in 1973 [3]. Though this discovery is considered as confirmation of electroweak interaction, not without reason it can be considered also as confirmation of weak interaction independence. At least, at energies characteristic for β-decay processes, weak interaction can be possibly considered as independent even within the frame of theory of electroweak interaction, and it would be possible to use primary Fermi theory for weak interaction.

It is possible to estimate probability ratio for two-neutrino transformation of free neutron into proton using the principle of time reversal of physical processes, the principle confirmed experimentally for the processes of β-decay [4]. This principle enables to write the ratio of time constant of two-neutrino decay $\tau_{2\nu}$ and normal β-decay τ_β using sections of interaction of neutrino and electron with proton σ_ν and σ_e, respectively, as $\tau_{2\nu}/\tau_\beta = \sigma_e/\sigma_\nu$. According to quantum electrodynamics [5], section of electron interaction is equal to $\sigma_e=\kappa\pi r_\kappa^2$, where r_κ- classic radius of electron, which is equal to $2.82 \cdot 10^{-13}$ cm, κ – coefficient depending on electron kinetic energy, and for energy of β-decay of free neutron it is close to 1. Hence, $\sigma_e \simeq 2.5 \cdot 10^{-25} cm^2$.

Magnitude σ_ν also depends on neutrino energy, and for free neutron β-decay energy this magnitude may be taken equal to $1.1 \cdot 10^{-43} cm^2$ [6]. Neutron decay time constant on reaction (2) is τ_β=917s. Hence we obtain $\tau_{2\nu} = 917 \cdot 2.5 \cdot 10^{-25}/1.1 \cdot 10^{-43} = 2.1 \cdot 10^{21}$s, and decay period $\tau_{1/2,\ 2\nu} = \tau_{2\nu} \ln 2 = 4.6 \cdot 10^{13}$ years.

Neutron two-neutrino decay can take place in all β-radioactive isotopes and, according to the above mentioned estimation, one such decay comes approximately to $2.3 \cdot 10^{18}$ common β-decays. At such relationship, revealing of two-neutrino decay apparently goes beyond possibilities of up-to-date experimental technologies, and it doesn't result in revision of theoretical conceptions coming from strict observances of electric charge conservation law at consideration of physical phenomena observed in terrestrial conditions.

Experiments on the check of possible breach of electric charge conservation law at neutron two-neutrino decay were conducted by several groups of researchers. Idea of experiments consisted in selection of isotope pairs where the difference between masses of mother and daughter nucleus is less than electron rest mass while neutrino rest mass is equal (or almost equal) to zero. Here, a daughter nucleus should have a charge by a unity more than a mother one, and it should have properties which can help to reveal it, e.g. with the help of gamma-radiation. The problem consists in the fact that there are too few of such nuclei for reliable check of electric charge conservation law. The first such experiments were conducted by Goldhaber and Sunyar using a pair of isotopes rubidium-87 – strontium-87 [7]. Here, strontium nucleus appears in excited state and can be revealed on gamma-radiation at transition to ground state. Two-neutrino decay was not revealed at experiment ultimate sensitivity, which is $1.8 \cdot 10^{16}$ years for decay period. In what follows, this experiment was repeated by Norman and Seamster [8] who increased sensitivity to decay period of $1.9 \cdot 10^{18}$ years.

Another group of scientists used isotope gallium-71 [9]. This isotope is stable, but is case of neutron two-neutrino decay process it may transform into radioactive isotope germanium-71. Two-neutrino decay also was not revealed at experiment sensitivity which corresponds to decay period of $2.3 \cdot 10^{23}$ years. For the same isotope, J.N. Bahcal [10] reports about possible achieved experiment sensitivity to $\approx 10^{26.5}$ years.

According to our estimation, free neutron decay period in two-neutrino process is $4.6 \cdot 10^{13}$ years; it is by 10 – 13 digits more than it is revealed during experiments. Does it mean that two-neutrino process on superdense substance is impossible? In our opinion, conducted experiments do not answer this question. The main reason for the doubt consists in the fact that experiments concern neutrons in atomic nuclei bonded by nuclear forces, while in superdense substance neutrons are compressed by gravitational forces. As compressive forces become stronger, bond energy between nucleons firstly decreases and then it becomes equal to zero just like free neutron's one, and after that it becomes negative (repulsion). For this reason, neutron decay period in atomic nuclei may be by many times longer than free neutron's one and neutron's one with negative bond energy. This property of atomic nuclei fully concerns isotope rubidium-87 mentioned above. For normal β-decay, this isotope's decay period is $5 \cdot 10^{10}$ years; it is by $2.5 \cdot 10^{15}$ times longer than free neutron's one. Since according to the above mentioned estimation decay period in two-neutrino process is longer than in normal β-decay by$2.3 \cdot 10^{18}$ times, in rubidium-87 this period will be more than 10^{29} years; it exceeds approximately by 10^{11} times the magnitude of decay period achieved in experiments with this isotope. An amendment should be introduced to this estimation, the amendment related to difference of strontium-87 daughter nuclei state at normal β-decay (nucleus in ground state) and at two-neutrino decay (nucleus in excited state). In the first case, decay period increases due to prohibition on difference of spins of mother and daughter nuclei ($\Delta J = -3$), while in the second case there is no such prohibition ($\Delta J =1$). However, this prohibition is not enough strong to influence the above conclusion concerning not enough sensitivity of experiments with rubidium-87 to exclude the possibility of two-neutrino decay in this isotope. For instance, gallium-72, which has prohibition on spin $\Delta J = 3$, and gallium-70, which has nonforbidden transition $\Delta J = 1$, differ on β-decay periods just by 40 times. Anyhow, prohibition on spin $\Delta J = 3$ causes, evidently, decay period increase by not more than 3-4 orders of magnitude. And taking into account small magnitude of energy of neutrino being formed at two-neutrino decay (factor $(\Delta M_{\beta}/\Delta M_{2v})^5$, where ΔM_{β} and $\Delta M_2 v$ – difference of mass of mother and daughter nuclei at normal and two-neutrino decays, respectively), this magnitude decreases still approximately by 30 times and is 1.5 - 2.5 of order.

As for isotope gallium-71, there are no data which could be used to estimate the possibility of two-neutrino decay in this isotope compared to the possibility of normal β-decay because this isotope is stable as respects to normal β-decay. But this stability and certain similarity of properties of nuclei of isotopes gallium-71 and rubidium-87 enable to suppose that in this isotope, the possibility of two-neutrino decay is also not higher than in rubidium-87. The above estimations and considerations, probably, confirm the above supposition that at observations and experiments in terrestrial conditions, electric charge conservation law breach is not revealed, but it is possible in superdense substance.

Let's estimate non-compensated electric charge accumulation time in superdense substance, the time which counterbalances gravitational attraction. According to the above estimation, one proton per $1.1 \cdot 10^{18}$ neutrons is enough for balance. At time constant of transformation of neutron in proton on two-neutrino mechanism, the time constant equal to $2.1 \cdot 10^{21}$s, accumulation time will be $2.1 \cdot 10^{21}$ s$/1.1 \cdot 10^{18}$.=1909 s≈32 min. The obtained estimation seems so realistic (e.g., for fixed parameters of supernova SN1987A explosion) that it strengthens the confidence in rightness of the theory of two-neutrino decay of neutron (in case the estimation gives a magnitude by several orders more or less than the obtained magnitude compared to hypothesis, we would have to refuse). Time of expansion start and the flow of expansion process depend on certain conditions of superdense substance formation. Thus, dependence of section of neutrino and antineutrino with proton on their energy can decrease manyfold the time of compensation charge accumulation. For example, neutrino and antineutrino energy at presupernova 1987A collapse was measured [1], which was 12-25 MeV; it exceeds by more that 20 times the energy of antineutrino at free neutron β-decay. Since probability of decay is proportional to neutrino energy square, energy increase by 20 times decerases decay time by 400 times; it decrease charge accumulation time from 32 s to 5 s.

As for the process of condensed mass expansion by accumulated electric charge, it depends on possibility of charge retention inside mass. For example, in a neutron star, the major part of neutron liquid has superfluidity [11], which does not resist proton motion if the move with subsonic speed (so-called "D'Alembert paradox"). Resistance appears only at motion with supersonic speed due to shock wave formation. Simple calculation of sound speed in neutron substance with "standard nuclear density" $\rho_0 = 2.8 \cdot 10^{14}$ g/cm^3 and using equation of nucleon degenerate nonrelativistic gas state gives us magnitude $6.2 \cdot 10^9$ cm/s. For "canonical neutron star" with the mass of 1.4 of the Sun mass and radius 10 km with average density $2.4\rho_0$ we obtain average value of sound speed $8.3 \cdot 10^9$ cm/s. Let's estimate a charge of non-compensated protons moving to such a star with sound speed. Charge of a ball of radius r is equal to Q(r)=eP(r), where e – proton charge equal to $4.8 \cdot 10^{-10}$ unity.cgs, P(r) – the number of protons in the ball which is equal to product of their generation speed per average time of transit through the ball bulk $P(r)=4/3\pi r^3 \cdot g \cdot \tau_{av}$, after integrating over the entire volume $\tau_{av} = \tau_{max}/4$, where $\tau_{max} = r/Vs$; Vs – proton motion speed assumed as equal to sound speed, g – speed of proton generation in a bulk unity. $g=n_n/\tau_n$, where n_n – average density of neutrons equal to $2.4\rho_0/m_n$ (m_n – neutron mass), i.e., $4 \cdot 10^{38}$ cm^{-3}, time of neutron transformation into proton which is equal to $2.1 \cdot 10^{21}$ s according to the above estimation. Hence, $g=1.9 \cdot 10^{17}$ cm$^{-3} \cdot$s^{-1}. If we assume approximately the neutron star (inside which neutrons have superfluidity) sphere radius as equal to 9 km, we will obtain the charge of this sphere, which is equal to $Q=4.8 \cdot 10^{-10}$charge unity cgs$\times 4/3\pi(0.9 \cdot 10^6)^3 \times 1/4(0.9 \cdot 10^6/8.3 \cdot 10^9) \times 1.9 \cdot 10^{17} = 0.755 \times 10^{22}$ unity cgs.

Proton charge, which counterbalances neutron star gravity force is, according to the above estimation, $0.73 \cdot 10^{30}$ unity cgs, i.e., by 8 orders of magnitude more than the estimation of the charge which is restrained by neutron star. Thus, neutron star non-compensated electric charge doesn't affect the star stability. However, such a charge creates star surface enormous potential equal to $0.755 \cdot 10^{22}$ unity.cgs$\cdot(10^6)^{-1} \cdot 300$B/ unity.cgs $\approx 2.3 \cdot 10^{18}$B. At speed of proton generation in a neutron star, which is about $5.8 \cdot 10^{35}$ s-1, this potential creates a flow of cosmic rays of power approximately $2 \cdot 10^{42}$erg/s. These estimations do not take into account proton retention in neutron star outer crust where there is no superfluidity, and also in inner crust where superfluidity decreases to zero at motion to the crust outer surface. This retention registration taking into account can increase considerably the estimation of neutron star potential. Besides, proton accumulation in the outer crust creates tensions in it, and these tensions can cause the crust rupture with the emission of cosmic radiation high-power pulses.

Hence it appears that for proton retention, mass is necessary, which exceeds considerably neutron star in mass. Such masses are characteristic for, e.g., presupernovas of big mass, more than 8 masses of the Sun (so-called presupernovas of type II), for instance presupernova 1987A. At gravitational collapse of such stars, substance density and temperature reach magnitudes sufficient for proton retention. If such state is kept for at least several seconds, then according to the above estimation it is quite enough to accumulate electric charge, which first compensates gravitational contraction and then causes condensed mass expansion. Expansion takes place till mass density reduction to magnitude at which accumulated electric charge release takes place.

Let's estimate the charge and energy of accumulated and non-compensated protons at gravitational collapse of supernova SN1987A. It is supposed [1] that not all the mass of this star undergoes collapse mass is estimated as 18 Msun; (Msun – the Sun mass equal to $2\cdot10^{33}$g), but its so-called carbonic-oxygenous core mass of which is estimated as about 2 Msun for a version of neutron star formation after collapse. The rest mass has formed a shell which had flied to bits after explosion. At the moment of collapse, which takes place for about 1s, temperature increases to about 10^{11}K, and density increases to more than $15\rho_0$. Under such conditions, compressed mass superfluidity is absent, so protons being formed are retained inside the mass. Magnitude of the charge, which compensates gravitational contraction, is equal to $Q=eN/1.11\cdot10^{18}$. $N=2Msun/m_n$ – the number of neutrons in collapsed mass $2Msun=4\cdot10^{33}$g, m_n – neutron mass $1.675\cdot10^{-24}$g. Hence, $Q=1.04\cdot10^{33}$ unity.cgs $=3.47\cdot10^{20}$C. Radius of compressed mass at density $15\rho_0=15\times2.8\cdot10^{14}$ g/cm^3=$4.2\cdot10^{15}$g/cm^3 is equal to r=$6.1\cdot10^5$cm=6.1 km. This sphere potential at charge Q will be U=Q/r=$1.04\cdot10^{30}$unity.cgs/300B/unity.cgs/$6.1\cdot10^5$cm=$5.1\cdot10^{26}$B, and energy will be a $E=Q^2/2r=(1.04\cdot10^{30}$ unity.cgs$)^2/2\times6.1\cdot10^5$cm=$0.89\cdot10^{54}$erg. Together with field energy inside the sphere, the energy of 0.2 energy of external field, full energy of charge will be $1.065\cdot10^{54}$erg.

According to the above estimation, this energy accumulation will take place for about 5s, and after that the compressed mass will start to expand up to density decrease, when accumulated protons release starts. We can assume that this density is equal to neutron star density about 10^{15}g/cm^3. This density corresponds to radius $1.24\cdot10^6$cm. Energy of expansion to this radius will be $0.52\cdot10^{54}$erg. The rest part will be taken away by protons in the form of cosmic rays of ultrahigh energies up to $2.5\cdot10^{26}$eV. These protons while moving through star helium-proton shell will collide with this shell ions and atoms, and will transfer them their energy. According to relativity theory laws, portion of energy transferred by ultrarelativistic particle to particle at rest is on the average about a half of a fast particle energy.

Let's estimate the number of each proton collisions with envelope ions and atoms. According to conceptions of structure of envelope, its main mass is in the sphere of radius ≈0.4 Ro (Ro – presupernova radius). Magnitude Ro for SN1987A is estimated as 47Rsun, where Rsun – the Sun radius $0.7\cdot10^6$km, and the main mass radius is $13\cdot10^6$km. The number of atoms and ions in this envelope is $16Msun/M_{He}=16\times2\cdot10^{33}$г$/4\times1.675\cdot10^{-24}$г$=4.8\cdot10^{57}$ (M_{He} – helium atom mass), and their number in the course of motion of each proton is about $4.8\cdot10^{57}/4\pi\times(1.3\cdot10^{12})^2=2.26\cdot10^{33}$cm^{-2}. At section of proton interaction with helium nucleus about $4\cdot10^{-25}$ cm^2, the number of collisions is estimated as $5.6\cdot10^7$. At such quantity of collisions all energy of protons of ultrahigh energies about

$5.4 \cdot 10^{53}$erg will be transferred to shell substance and will cause almost instantaneous heating of envelope to temperature about $5 \cdot 10^{11}$K. At such temperature, just like in a neutron star at the moment of compression, process of intensive cooling by neutrino emission according to mechanism of so-called "urca-process" will be started [11]. This process speed is greatly dependent on absolute temperature T according to law $\sim T^6$, and it almost ceases at temperature decrease to $(3\text{-}5) \cdot 10^9$K; after that, shell expansion starts under pressure from heated gas and radiation emitted by it. The mentioned temperatures correspond to the shell residual energy $(1.5\text{-}2.5) \cdot 10^{51}$erg, close to supernova SN1987A shell expansion obtained during observations [1].

From the described mechanism of supernova explosion start it appears that there should exist two radiation bursts divided by electric charge accumulation time about 5s: the first burst corresponds to the process of neutron star cooling just after collapse, and the second one should correspond to supernova shell cooling. Here, the second burst is by two times weaker on the emitted energy. Similar clot-like character of neutrino radiation was observed from supernova SN187A (Fig. 24, paper [1]), where the first burst (8 events) was away from the second one (3 events) by 6s.

Further, from the described mechanism it appear that at shell density decrease during its expansion, the shell becomes transparent for cosmic rays emitted from supernova center, from its neutron star. Thus, the rest of supernova becomes the center of cosmic rays emission with energies not more than 10^{18}eV as it described above. Here, cosmic rays energy increases together with the increase of neutron star mass. Probably, cosmic rays emitted by "black holes", which may be the rest of supernovas, have more energy However, is is considered that nothing is emitted from the "black holes"; but there are considerations that "black hole" substance motion in radial direction and its emission takes place in finite time.

Emission of cosmic rays of ultrahigh energies at supernova explosion is considered by the fixed astrophysical observations. They also think that supernovas are considered as the main source of cosmic rays in the Universe [1, 12]. However, ray (of the observed ultrahigh energies) formation mechanism is still unknown.

The given hypothesis of accumulation in non-compensated protons superdense substance as a result of two-neutrino decay of neutron enables to explain the ultrahigh energy of primary cosmic rays and their composition mainly of protons (91.5%).

The same mechanism explains the presence of positrons in cosmic rays: electroin-positron pairs formed in neutron star atmosphere; these pare separate in neutron star electric field. Positrons are emitted to external space, and electrons move toward neutron star. Perhaps, this theory can be confirmed by the revealing in cosmic rays of ultrahigh energies in the course of program "Rome-Pamela" execution in 2008 [13].

Neutron star high electric charge, probably, enables to explain one of the main properties of such stars, namely, superpower magnetic field of the star, typical magnitude of which is 10^{12} Gauss, and, possibly, may reach 10^{16}Gauss. It is known that neutron stars. It is known that neutron stars rotate with high speed. Typical is speed about 1 rotation per minute. Star electric charge rotation causes appearance of magnetic field. At electric charge magnitude estimated above, which is about 10^{20}C at the moment of neutron star formation, rotation with speed 1rotation/s creates magnetic field of about $10^{13} – 10^{14}$ Gauss. However, accumulated electric charge is not kept but is emmited after decrease of compressed mass decrease in the course of it expansion to normal stationary density of neutron star of 10^{15}g/cm^3. According to the above estimation, by 8 orders charge decrease can take place (decrease by 5-6 orders is more possible). Magnetic field magnitude decrease could be anticipated for the same orders. However, it may be not so. In the course of compressed mass expansion, moment of neutron star substance superfluidity and superconductivity comes. It is known that at appearance of superconductivity in substance existing in magnetic field, this field is being "ice-bound" in superconductor and is kept after external magnetic field removal. So the sustained magnetic field of neutron star may be close to the above estimation on it magnitude.

According to the above stated hypothesis, ultrahigh energies primary cosmic rays protons carry excess non-compensated electric charge. It means that the Universe is not strictly electrically neutral, but it has certain (though very low) density of positive electric charge. Excess positive charge may be carried also by celestial bodies, at least by such bodies as neutron stars. In this connection, it would be interesting to consider behavior of charged cosmic bodies in electrically charged cosmic space. Let's determine the effect of cosmic space with electric charge density ρ on a body, which hase a charge q and mass m. Let's select observation point at distance R from this body, and let's consider two spheres, one of radius R-r, and the other of radius R+r with centers in observation point, where r - body radius and r«R. In accordance with the laws of electrostatics, electric field inside the sphere of radius R+r, which is created uniformly by distributed electric charges outside this sphere, is equal to zero, and electric field of uniformly distributed electric charges inside the sphere of radius R-r, which exists outside this sphere, is the same as the field of point charge of the same magnitude as the charge of the sphere placed in the center of the sphere. Thus, at observation from the selected point, the considered body is experienced by repulsion from unifirmly charged space with the force $F=Q\times q/R^2$, where Q – charge of a ball of radius R-r, $Q\approx 4/3\pi R^3\rho$. This force imparts to a body the acceleration $W=F/m=4/3\pi(q/m)\times\rho R$, which changes body speed by magnitude $dV=Wdt=W(dt/dR)\times dR=(W/V)dR=4/3\pi(q/m)\times\rho(1/V)\times RdR$.

Hence, after integration within 0 to R and 0 to V, we obtain

$$V=\{4/3\pi(q/m)\times\rho\}^{1/2}\times R \quad (3)$$

Thus, in charged medium, any charged body with the charge of the same sign as for medium charge will move off from any observation point with the speed proportional to the distance from the body to observation point. Similar law is characteristic for medium, which is uniformy filled with substance interacting according to gravity law, but in this case not removal takes place, but bodies approaching the observation point.

If galaxies recession discovered by Hubble can be explained by the Universe "Big Bang", and the explosion itself can be explained by electrostatic repulsion of excess positive charge in the universe, then the quantity of this charge should not be less than the magnitude necessary for gravitational attraction counterbalancing. According to the estimation, this quantity is equal to one proton per $1.1\cdot10^{18}$ nucleons. Let's try to estimate the charge magnitude on energy of ultrahigh energy cosmic rays, which, according to the above mentioned hypothesis, carry this excess electric charge. These rays particles energy is so high that it is quite possible to assume theses rays main contribution to full energy of cosmic rays of outer space, the energy of about $1eV/cm^3$. Primary cosmic rays maximum energy measured for today is $2.5\cdot10^{20}eV$. Hence we obtain these rays concentration $1eV/2.5\cdot10^{20}eV=4\cdot10^{-21}cm^{-3}$. Nucleon density is determined by average density of substance in the universe, the density determined within 10^{-31} to $10^{-29}g/cm^3$. Existence of "Big Bang" assumes substance compression before the explosion, and it is possible if average density exceeds critical density determined as $10^{-29}g/cm^3$. This density corresponds to nucleon density of $6\cdot10^{-6}cm^{-3}$. Hence, relation of the number of excess protons to the number of nucleons is $1/1.5\cdot10^{15}$; it is by three orders more than minimum magnitude$1/1.1\cdot10^{18}$. Even it appears that the measured maximum energy of particles of primary cosmic rays, $2.5\cdot10^{20}eV$, is not ultimate, and substance density in the universe due to the presence of so-called «dark matter» will appear higher than $10^{-29}g/cm^3$, excess proton algebraic number will remain higher than minimum magnitude $1/1.1\cdot10^{18}$. Hence it appears the the obtained estimation doesn't contradict the above stated hypothesis concerning the reason for the Universe "Big Bang".

From the assumption concerning the excess charge of the universe it also follows that charge density increases at approaching the Universe rational horizon. Perhaps, it can results in the increase of cosmic bodies recession speed near the Universe rational horizon.

CONCLUSION:

Superdense substance, which consists mainly of neutrons, is formed at gravitational contraction of substance big masses which exceed the first Chandrasekhar limit (about 1.4 mass of the Sun).

According to hypothesis stated in this paper, neutrons in supoerdense substance are instable, and they turn into protons as a result of two-neutrino decay leading to the breach of the law of electric charge conservation. This hypothesis doesn't contradict recently conducted experiments on the search of neutron two-neutrino decay in atomic nuclei where this decay probability is by many orders less than in superdense substance.

Excess protons accumulation in neutron stars results in formation of ultrahigh electric potential of these stars and in emission of intensive flow of cosmic rays with energy exceeding 10^{18}eV (more probably exceeding10^{20}eV).

Rapid accumulation (for several seconds) of excess positive charge at gravitational collapse of substance big masses, which exceed neutron star masses by many times, results in gravitational contraction overcoming and in compressed substance rapid expansion; it can explain explosions of supernovas and high energy of their shells expansion.

The same phenomenon can explain explosions in the centers of galaxies and also the "Universe Big Bang", which is unique only on its size but not on the nature among enormous explosions, which took place and are taking place in the Universe.

According to the stated hypothesis, the Universe is not strictly electrically neutral, but it contains a small excess of positive charge transferred by cosmic rays and accumulated in neutron stars.

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