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BLACK-HOLE MODEL

З використанням представлень загальної теорії відносності і планковской системи одиниць пропонується проста модель елементарної частки. Прийняті в моделі допущення не претендують на строгу обґрунтованість, а в основі модельного представлення лежить об'єкт обертання складає з двох екстремальних чорних дір із гравітаційними радіусами 10-33 див, що звертаються біля загального центра ваги. Обертання двох чорних дір, під сферами Шварцшильда яким знаходяться однойменні T^+ чи T^--області, відповідально за відповідний заряд елементарної частки. Поле випромінювання, що описується додаткової, симетричною компонентом тензора електромагнітного полючи, при взаємодії з елементарною часткою, визначає спектр мас елементарних часток. При поглинанні порції випромінювання часткою, маса частки збільшується зі зменшенням її масштабу і при випромінюванні – маса частки зменшується зі збільшенням її масштабу. У якості одного з наслідків моделі розглядається можливість утворення обертових пар сверхмассивных чорних дір обладающих електричним зарядом і магнітним моментом. Приводяться оцінки параметрів подібних об'єктів як можливих кандидатів на роль активних ядер галактик.

With use of representations of the general relativity and Plank's systems of units the simple model of an elementary particle is offered. The assumptions accepted in model do not apply for strict validity, and in a basis of modelling representation the object of rotation consisting of two extreme black holes with gravitational radiuses 10-33cm, rotating near the common centre of gravity. Rotation of two black holes, under spheres Schwarzshild's which are same T^+ or T^--areas, it is responsible for the appropriate charge of an elementary particle. The field of radiation described additional symmetric component of tensor electromagnetic field, at interaction with an elementary particle, defines a spectrum of masses of elementary particles. At absorption of a portion of radiation by a particle, the mass of a particle is increased with reduction of its scale and at radiation - the mass of a particle decreases with increase of its scale. As one of consequences of model the opportunity of formation of rotating pairs supermassive black holes having is considered by an electric charge and the magnetic moment. Estimations of parameters of similar objects are resulted as possible candidates for a role of active nucleus of galaxies.

Statement of a problem

As has specified Max Plank [1], from the most elementary and most universal principles of physics - laws of gravitation and radiation of absolutely black body the unique system of units follows: - length $\delta = (\hbar G/c^3)^{1/2} \approx 1.6\cdot10^{-33}$ cm; - quantum of time $\tau = (\hbar G/c^5)^{1/2} \approx 5.3\cdot10^{-44}$ sec; - mass $\eta = (\hbar c/G)^{1/2} \approx 2.2\cdot10^{-5}$g. Here three fundamental constants: $\hbar$ - a constant Plank's, G - a gravitational constant and c - velocity of light in vacuum. On the basis of these fundamental constants it is possible to receive dimension of any physical quantity.

Let's assume, that δ it is possible to consider as the size of object having in the weight η that, according to the general relativity, gravitational radius of sphere Schwarzshild's r_g such object:

$$r_g = 2G\eta/c^2, \quad (1)$$

Whence with use of definition η we have:

$$r_g = 2\delta. \quad (2)$$

From expression (2) the similar object, with the size δ and mass η follows, that, is a black hole with radius 2δ as its mass η is under Schwarzshild's sphere.

Analysis of the latest investigations

Connection (2) in particular was marked [2] about what he writes: - "If the gravitational radius would appear less length δ, and the size δ could be considered as the minimal length of the future theory of elementary particles the appropriate gravitational radius would not play any role in given theory.

Hence, feature of geometry of space represents such physical characteristic of a prospective elementary particle as its mass. This assumption entirely lays in spirit of statement of Misner and Wheeler [3,9], - "In the world there is nothing except for the empty curved space. The matter, a charge of electromagnetisms and other fields are only display of a curvature of space. The physics is geometry".

In the review [4] similar black hole is defined as extreme and, according to reasonings given in the same place, such black hole is consequence of its future inevitable indefinitely.

Materials of investigations

Similar black hole shall agree to designate symbolically – "s"-singular object or it is simple s-object.

At presence of two s-objects probably or their integrates in one, with the double weight 2η, or, at presence of the moment of rotation in system, - their rotation about each other. Then, for circular movement with radius r and linear speed V for similar system with the given weight η and in the assumption, that always $r >> \delta$, it is possible to write down:

$$\eta V^2/r = G\eta^2/r^2, \quad (3)$$

Conserveing radius of system a constant, and linear velocity directing to velocity of light, Newton's the attraction of two s-objects will be kept still, but already with relativistic masses ηγ, where $\gamma = (1- V^2/c^2)^{-1/2}$. In view of it expression (3) we shall copy as:

$$\eta V^2 = G\gamma\eta^2/r,$$

or with the help of definition η, the right part of this expression we shall copy as:

$$\eta V^2 = \gamma\hbar c/r. \quad (4)$$

Let the degree of affinity V to c is defined by small $\Delta = 1- V^2/c^2$, then $V^2 = c^2(1- \Delta)$, $\gamma = \Delta^{-1/2}$ and expressing r multiple δ, i.e. $r = r_N \equiv \delta N$, according to (4) we have:

$$\eta c^2(1 - \Delta)\Delta^{1/2} = \hbar c/\delta N,$$

whence it is easy to receive, using definitions Plank's the sizes, approached estimation $\Delta^{1/2}$ (under condition $N \gg 1$): $\Delta^{1/2} \approx 1/N$ or $\gamma \approx N$. Hence the mass or energy of system should in N time exceed a original value. Rotary energy of system may is formally equal to energy of system but already with mass of rest $m_0 = \eta/N \equiv m_N$. Hence, with a good degree of accuracy expression (4) can be copied as:

$$m_N c^2 = \hbar c/r_N. \quad (5)$$

From expression (5) follows, that change of scale of system should result in respective alteration of mass of system so that the moment of a pulse of system $\hbar \approx m_N c r_N$ (for example was kept, due to radiation or absorption of mass, that will be more in detail considered below).

In the subsequent statement such system we shall result for brevity as a designation (s; s). If in expression (5) as mass m_N to choose the mass of rest of electron m_{0e} (in this case $N \cong 2\cdot10^{22}$) it is obvious, $r = r_к = \lambda_к = \hbar/m_{0e}c$ that is $r_к$ identically coincides with Compton's wave length of electron [5]. With use of this circumstance expression (5) can be rewrite as:

$$E_0 = m_{0e}c^2 = \hbar c/\lambda_к. \quad (6)$$

Dimension $\hbar c$ coincides with dimension of a square of a charge electron $\sim e^2$ and the relation of these sizes represents a well-known constant - $\hbar c/e^2 \approx 137 = 1/\alpha$, where α - a constant of fine structure.

Hence, according to (5) and (6) it is possible to tell, that energy of rotation s-objects and preservation of the moment of quantity of movement in system (s;s) displayes by "electrostatic energy" s - objects with charges $e^* = e(1/\alpha)^{1/2}$ and carried on distance $\lambda_к$ from each other. In this connection (6) it is possible to rewrite:

$$E_0 = (e^*)^2/\lambda_к = e^2/(\alpha\lambda_к). \quad (7)$$

But as $\lambda_к = r_e/\alpha$, where r_e, - classical radius of electron and then it is obvious:

$$E_0 = e^2/r_e, \quad (8)$$

At the same time, as it was specified above, preservation of the moment of quantity of movement of system demands, performances of equality:

$$m_{0e}cr_к = \eta c\delta = \hbar, \quad (9)$$

If to use the greatest possible top estimation of the own mechanical moment of electron, when linear speed of rotation of a surface of a ball with radius r_e coincides with velocity of light:

$$m_{0e}cr_e \cong \hbar/137 = \hbar\alpha \quad (10)$$

Such distinction between (9) and (10) can be connected probably that at estimations of own energy of electron the spherical form of distribution of density of its energy is used, with an effective charge e, whereas system (s; s) reminds faster "disk". Possible feature of such distinction indirectly specifies as well physical

sense Compton's lengths of a wave electron when scattering on electron of photons high energy on the big angles occurs only to lengths of waves ~ $\lambda_к$, at $\lambda < \lambda_к$.

The right part of the equation (5), in case of a choice in quality r classical radius of electron, represents electrostatic energy of electron [5], with a charge proportional $(\hbar c)^{1/2}$. As concepts of an electric charge initially it was not entered, presence of rotary movement is responsible for such property in system (s; s). For confirmation of it we shall consider separately energy of rotation E_{rot} of system (s; s). According to [6], energy of rotation of two particles, c the moment of rotation M and in the given masses m, with use of definitions η, δ, and connection $\eta\delta c = \hbar$, looks like:

$$E_{rot} = M^2/mr^2 = (mcr)^2/mr^2 = \\ = ((\eta/N)c(\delta N))^2/((\eta/N)(\delta N)r) = (\hbar c)/r, \qquad (11)$$

That identically coincides with expression (5). Such new quality of system described by the expression (5), caused by rotation s-objects, should cause the certain polarization in environmental space and according to (6), (8), and (11), this property responsibly for possession system of an electric charge is formal.

Thus, on the basis of above-stated, the electron it is possible to consider as system (s; s) from two s-objects rotating about the common centre of gravity, representing immovable, at absence of perturbating influences, vortex formation. Moving of system (s;s) in space as an elementary particle obviously does not correspond to representation about moving a material point as it is possible to speak only about moving the centre of gravity vortex formation.

Taking into account formal possession of system (s; s) an electric charge, we shall consider the magnetic moment of system μ:

$$\mu = IS/c, \qquad (12)$$

where $I = e / T$ – "electrical current" inside system (s;s). With the account (9) area S streamline by "current" is: $S=\pi r_к^2$. As for period time $T = 2\pi/\omega$, s-objects twice pass on their common orbit, $I = e/(T/2)$. In view of this circumstance, definition (12) we shall rewrite as:

$$\mu = e2\pi r_к^2/Tc = em_e\omega r_к^2/(m_e c) = \\ = em_e(\omega r_к)r_к/m_e c \approx e(\eta/N)c(\delta N)/m_e c = \\ = (e/m_e c)\hbar. \qquad (13)$$

From equality (13) follows, that in a considered case the relation $\mu/\hbar = e/m_e c$ twice exceeds the relation of the magnetic moment of electron to its mechanical orbital moment when it makes well-known magnitude $\mu/\hbar = e/2m_e c$.

On the basis of above-stated, for similar model of an elementary particle it is represented natural to use the term – *hole* model of an elementary particle.

As in a basis of offered model the concept of a black hole for the further statement it is necessary to result brief consideration of properties of such object is used. With this purpose we will address to Kruskal metric [7], which full enough analysis is submitted in [8] where concepts and properties R- and $T^{\pm}$- regions of space are considered. R- region concerns to space covering Schwarzchild's sphere, $T^{\pm}$ - regions lay under Schwarzchild's sphere. On character of behaviour of trial particles T^- - region is pulling to the basic singularity in r = 0, while T^+- region is expanding from the basic singularity. On the basis of it it is possible to allow that exists two types of s-objects: s^--object with T^- - region under Schwarzchild's sphere and s^+-object with T^+- region under Schwarzchild's sphere. The world line initial s^{--}-object, through T^- and T^+ - regions, in R- region may be connected to a world line s^+ - object. Hence, between s^- - object and s s^+-object the interaction reflecting an opportunity of "short circuit" of their world lines in the metrics from area in area, for example such as - $T^+ \rightarrow R \rightarrow T^- \rightarrow T^+$ may be carried out. Similar "short circuit" of world lines can be interpreted as presence in space of electric force lines.

Similarly to that as the system from two s-objects (already with the top indexes, - (s^-,s^-)) it is possible to suppose an opportunity of formation of system from two s^+-objects (s^+,s^+) was formed. Then such system (s^+,s^+) may serve as model of system of an elementary antiparticle, in particular - a positron.

Being propagated in space, world lines of the $s^{\pm}$ - objects forming system (s^-,s^-) or (s^+,s^+), sweep up a world surface serving as generalization of a world line of a dot particle, being, thus analogue of a classical string, by definition stated in [9].

For modelling of an another elementary particles expression (5) represents the most full mass spectrum of the particles.

As model of a proton, within the framework of offered representation, it is possible to consider system (s^+,s^+). Substituting in the equation (5) of a proton mass known quantity, we receive an estimation of radius of a stationary orbit of a proton ≈ 10^{-14} sm, as a "heavy" positron.

For modelling a neutron for example, it is possible aforesaid system from two s^+-objects to add to system (s^-,s^-), with mass of electron, having placed them into a stationary orbit with the appropriate radius determined by connection (5) and comprehensive orbit of system (s^+,s^+), the similar design reminds planetary mode and such procedure can be to designate as system - $s^-(s^+,s^+)s^-$. At merge of system (s^+,s^+) with system $s^-(s^+,s^+)s^-$, by virtue of identity of s-objects, exchange interaction between them may represent itself as nuclear interaction in model deuteron and other more complex nucleus.

The same systems (with the same top indexes), on aforesaid to definition, interacts among themselves as the same electric charges. Opposite systems (s^-,s^-) and (s^+,s^+) interacts among themselves as opposite electric charges, attracting with velocity U of relative moving their centres of rotations, reducing extent of their force lines in R-area, down to full short circuit of force lines

in T-area (in case of identical scales of orbits (s, s) systems), that to be interpreted as process annihilation.

For modelling, for example, atom of hydrogen we shall consider separately movement of system (s^-,s^-) with velocity U, in quality of electron, in the central field of system (s^+,s^+) as a proton. For movement of system (s^-,s^-) on a stationary circular orbit with radius r we have:

$$m_e U^2/r = e^2/r^2. \quad (14)$$

It is obvious, that the lowest estimation of the momentum of system (s^-,s^-) should make quantity not smaller ħ. For this limiting case it is possible to write down a condition:

$$m_e U r = \hbar. \quad (15)$$

From (14) and (15) we find:

$$r = R_b = \hbar^2/m_e e^2. \quad (16)$$

$$U = e^2/\hbar, \text{ or } U/c = e^2/\hbar c = 1/137 = \alpha. \quad (17)$$

According to (16), Rb represents radius of the first Bohr's orbit for a stationary orbit of electron in the ground-state atom of hydrogen, and from expressions (10), (16) and (17) we shall receive connection between radius of the first Bohr's orbit and radius of electron r_e [5]:

$$R_b = r_e/\alpha^2, \text{ or } R_b = r_k/\alpha.$$

With growth r considered system it is possible to explain the physical mechanism of a loss of mass, for example, due to radiation of system as wave perturbations of the metrics, with change of angular frequency of rotation at any increase N (and the increase of mass with reduction N is obvious on the contrary, at absorption of radiation). Really, as $\omega_N r_N \approx c$, so $\omega_N = c/(\delta N) = 1/(\tau N)$ and then at each change N on unit so that the moment of a pulse of system $\hbar \approx m_N c r_N$ was conserved, with use of expression (5) it is possible to define:

$$r_N - r_{N-1} = r_{N;N-1} = c\tau;$$
$$\omega_{N-1;N} = (1/\tau)/N(N-1);$$
$$m_{N-1;N} = (\hbar/\delta c)/N(N-1) = \eta/N(N-1). \quad (18)$$

According to (18) follows, that the high loss of mass due to radiation should occur at small values N, or at high change N when final values N-L are small, at $N \sim L$, then $m_{N-L;N} \sim \eta/N$. Such radiation occurs without change of the momentum in system (s; s) and without participation of a charge, therefore it is represented natural to define it as m-field radiation (as it will follow from the subsequent statement). Absorption of m-field radiation should result in increase of mass and to respective reduction of scale of system (s; s).

It is necessary to note, that agrees expressions (18), for radiating transitions N-1→ N, change of angular frequency of rotation of system (s; s): $\Delta\omega = \omega_{N-1;N}$, responsible for change of mass of model electron and a proton, makes quantities $\Delta\omega_e \approx 5\cdot10^{-2}$ Hz and $\Delta\omega_p \approx 5\cdot10^4$ Hz accordingly.

For the description of a m-field of radiation it is possible to use most a general view of tensor fields of the radiation, including as usual antisymmetric component, so and symmetric component a longitudinal field of radiation. Then for full tensor fields of radiation F_{ik} can be written down obviously:

$$F_{ik} = F_{ik}^a + F_{ik}^s, \quad (19)$$

Where by the top indexes are designated: antisymmetric (a) and symmetric (s) components of tensor radiations; values of the bottom latin indexes run values from 1 up to 4, thus as usually indexes 1,2,3 concern to spatial coordinates x, y, z, and the index 4 - time coordinate-ict and i - imaginary unit.

$$F_{ik}^a = dA_k^a/dx_i - dA_i^a/dx_k; \quad (19a)$$

$$F_{ik}^s = dA_k^s/dx_i + dA_i^s/dx_k;$$

Here $A_k^a = (A^a, i\varphi^a)$ components of 4- vectors of electromagnetic potential; $A_k^s = (A^s, i\varphi^s)$ - components of 4- vectors of potential of a m-field.

Additive operation in (19) keeps a kind Lagrangian, Lorentz-covariant and a kind of the equations of movement field a component.

The additional condition $dF_{ik}/dx_n + dF_{kn}/dx_i + dF_{in}/dx_k = 0$, breaks up to two independent subsystems: for F_{ik}^a is a condition coincides with the first pair Maxwell's equations, and for F_{ik}^s is a condition of additional connections imposed on not diagonal components of tensor F_{ik}^s , which is zero at a choice of system coordinates.

For the second pair Maxwell's equations and the equations of a m-field:

$$dF_{ik}/dx_k = 4\pi j_i/c, \quad (20)$$

Where 4-current $j_k = (j^{a,s}, ic\rho^{a,s})$, $j^a = \rho^a v$, $j^s = \rho^s v$ and on repeating indexes there is a summation. At performance generalized Lorentz-covariant:

$$(dA^{s,a}_\mu/dx_\mu)i_\mu + (1/c)d(\varphi^{s,a})/dt = 0,$$

with the help (20), for a component of 4-vectors of potentials we shall receive two independent systems of the equations:

$$\text{ف}A^a = -4\pi j^a/c, \quad \text{ف}\varphi^a = -4\pi\rho^a, \quad (21)$$

$$\text{ف}A^s = 4\pi j^s/c, \quad \text{ف}\varphi^s = 4\pi\rho^s, \quad (22)$$

where $\text{ف} = d^{nn}/dx_{nn} - (1/c^2)(d^2/dt^2)$ – D'Alambertian. The system (21) is well-known system of the equations

determining potentials of an any cross electromagnetic field. Similarly, the system (22) determines potentials of an any m-field. In this case it agrees (19b), by virtue of symmetry a component F_{ik}^s, A^s - is potential describing the longitudinal waves similar to sound waves in the continuous environment, which velocity of propagation according to (22) coincides with velocity of light. System (s; s) with mass m, and scale r_m, by analogy to an electric dipole, it is possible to name a gravitational dipole p_m, having gravitational "charge" – $G^{1/2}m$. Hence, for a separate particle - $p_m = G^{1/2}mr_m$. For mass (s; s)-system m described by index N, for the module p_m it is possible to write down systems: $p_m \equiv p_N = G^{1/2}m_N r_N$. For radiation of a m-field of system (s; s), the quantity proportional dp_N/dt will be obviously responsible. In particular for a separate particle (22) it will be copied as:

$$\text{ف}A^s = 4\pi\,(dp_N/dt)/c = G^{1/2}(4\pi/c)d(m_N r_N)/dt,$$
$$\text{ف}\varphi^s = 4\pi G^{1/2}m(t); \qquad (23)$$

As well as in case of an electromagnetic field [10], for longitudinal components of radiation, the decision of the equations (23) enter the name as advanced and delayed potentials. An estimation $dp_N/dt \sim \Delta(m_N r_N)/\Delta t = r_N\Delta m_N/\Delta t + m_N\Delta r_N/\Delta t$ for model of electron, included in (23) it is possible to receive with use of expression (18), and considering, what $\Delta t = \tau$, we shall receive for potential directed along r_N:

$$\text{ف}A^s = 8\pi m G^{1/2}. \qquad (24)$$

For radiating transitions N-1 → N with high N such field radiation is responsible for emission and absorption of mass $\Delta m = m_{N\text{-}1;N} \approx \eta/N^2$.

About a possibility of electromagnetic by pairs interaction of massive black holes

We allow, that the black hole was formed from N the merged objects and has mass *of* $M = \eta N$. For two similar black holes it is possible, as well as in the previous section to consider formation (S, S) systems with transfer on all of them of the above described properties. We shall consider rotation of two black holes with identicall masses about the common centre with radius a and linear speed $V << c$. Then for (S, S) systems with the reduced mass M can be written down:

$$MV^2/a = GM^2/a^2, \qquad (26)$$

or:

$$MV^2 = \hbar c N^2/a. \qquad (27)$$

It agrees earlier stated conditions following from (7), kinetic energy of system determined by expression (27) it is possible to interpret as electrostatic energy W of system (S, S) having charge $Q = N(\hbar c)^{1/2} = N(137e^2)^{1/2} \approx 11.7 \cdot Ne$, , where e - a charge of electron and a play a part of the Compton's wavelength . Then for W it is possible to write down:

$$W = Q^2/a. \qquad (28)$$

According to (28), for enough most values N it is possible to consider astrophysical objects having charges Q, and consequently also magnetic moments P for which module it is possible to write down:

$$P = IS/c, \qquad (29)$$

where $I = Q/T$ – "electric current" inside system from two black holes; T – a period of rotation of black holes nearby each other and $S = \pi a^2$ – an area streamline by "current".

In works [11,12], assumptions are stated, that in structure of a nucleus of galaxy OJ287, with the period of change of shine ≈ 12 years, may enter two, rotating nearby each other, massive black holes with masses 10^{41}g and $1.7 \cdot 10^{43}$g. In work [13] for galaxy M31 with a double massiv nucleus of a separate presumable black hole of $M \approx 3 \cdot 10^{40}$g.

Selecting as typical quantity of mass of black holes $M = 2.2 \cdot 10^4$g for N we shall receive: $N = M/\eta = 10^{47}$g. Thus, according to expression (2), gravitational radius of a black hole $r_g = 2\delta N$. ≈ $3.2 \cdot 10^{14}$cm ≈ $3.2 \cdot 10^{-4}$ light years. As according to (26) $V^2 = GM/a$, in view of that $V = (2\pi/T)a$, for an estimation a, for considered astrophysical object, we shall receive:

$$a^3 = T^2 GM/4\pi^2. \qquad (30)$$

Having chosen for typical $T \approx 12$ years, presumably caused by rotation of two massive black holes, from expression (30) we shall receive an estimation: $a \approx 0.8 \cdot 10^{17}$ cm ≈ 0.08 light years.

Is of interest to receive estimations of electric field E from such astrophysical object.

$$E = Q/4\pi\varepsilon_0 R^2 = 11.7 \cdot Ne/4\pi\varepsilon_0 R^2 \qquad (31)$$

Where ε_0 - a dielectric constant and R - distance from object. In particular on distance of one light year from considered astrophysical object, according to (31), $E \approx 1.8 \cdot 10^9$ V/m. Such quantity a field are comparable to quantities of fields on scales of intratomic orbits of electrons. Consequently the substance on such and smaller distances from similar objects may contain only in a state of plasma and neutral elementary particles. For the typical quantities of galaxies in tens kpc, estimations of a field on such distances according to (31), will make already units V/m.

Similarly it is possible to make estimations of a magnetic field of considered object. It agrees definitions (29), for magnetic moment P it is possible to write down:

$$P = 11.7\pi a^2 \cdot Ne/T,$$

and for a magnetic field B by definition we have:

$$B = 2P\mu_0/4\pi R^2 = 5.85\mu_0 a^2 \cdot Ne/R^2 T \text{ [A/m]}. \quad (32)$$

In this case for distance of one light year from considered astrophysical object, according to expression (32) we shall receive an estimation B: $B \approx 3\cdot 10^{12}$A/m, or $\approx 4\pi 10^9$ oersted. At such values of quantities of a field, charges may move only along force lines. On distances in tens light years from the object, the field will make quantities about hundreds oersted. On intermediate distances such area may be a source powerful synchroton radiation, from gamma rays to a radio emission. Thus charges of an opposite sign environmental object will be attract by object, and with contrary is repulsion. Such separation of plasma may result in formation of huge areas by volume charges, independently interaction with each other.

Thus, besides gravitational interaction of considered objects on neutral substance, electric and magnetic interactions surch objects should result to much inhomogeneous distribution of substance in space, in amplification of dynamics of interaction of star systems and processes of allocation and absorption of energy, filling up a zoo of forms both separate, and colliding galaxies [14].

Conclusion

At absence of s-objects in R-area (a condition of vacuum) are absent as well the “force” lines connected to them, again arise they may only at fluctuations of energy $\Delta E \approx 2\eta c^2$, necessary for birth of pair s-objects with opposite indexes. With increase of number of s-objects there are possible formations (s; s) systems. Formation (s; s)-system on distance $D = \delta N_D$ between s-objects may occur, according to (5) at high change N and with defect of the mass leaving system as m-field radiation.

The condition of vacuum in R-area is characterized by presence of electromagnetic field and m- field of radiation, a continuum of "force" lines T^+ and T^--areas and an energy gap $\Delta E \approx 2\eta c^2$. Density of energy of vacuum state

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