DYNAMIC MODEL OF WAVE–PARTICLE DUALITY AND SUPERUNIFICATION

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SUMMARY

The new Dynamic Model of Wave-Particle Duality elaborated is devoted to analysis of the internal (hidden) parameters of elementary de Broglie waves (waves B) and their interrelation with external, observable ones. Dynamic model is based on assumption of alternative pulsation of sub-elementary particles, between the corpuscular [C] and wave [W] phase, each of them representing corresponding semiperiod of wave B. The triplets of sub-elementary particles form the elementary particles. The energy and impulse of sub-elementary particles and antiparticle, composing coherent pair, compensate each other. The resulting properties of each triplet: mass, spin, charge is determined by uncompensated sub-elementary particle. The model considers the positive and negative vacuum as two 'oceans' of superfluid quantum liquid, composed from virtual quanta of opposite energies. This interacting positive and negative vacuum, termed BI-VACUUM, is an infinitive source of bi-vacuum bosons (BVB). The spatial image of BVB is a pair of [rotor + antirotor] of opposite direction of rotation in the energetic planes of positive and negative vacuum with the radius, close to Compton radius of the electron, muon or tau-electron, depending on the resonant energetic slit value of bi-vacuum. Due to impulse and energy compensation there are no size limitations for BVB. The minimum radius of BVB may be determined by Plank's impulse. Such small BVB may serve as a "molecules" of bi-vacuum as a quantum superfluid liquid. The nonlocal properties of BVB are the consequence of their zero resulting impulse, responsible for their infinitive virtual wave B length and corresponding scale of PRIMORDIAL bi-vacuum Bose condensation. In SECONDARY vacuum, with symmetry, perturbed by presence of matter, the impulse of BVB becomes non zero. As a result, the infinitive virtual Bose condensate 'dissociate' to huge superfluid bi-vacuum domains.

The gradient of difference of concentration of rotors and antirotors with opposite direction of rotation (virtual spin equilibrium shift), originated under the influence of rotating atoms, molecules or macroscopic bodies - is responsible for TORSION field. The transmission of signal in form of energetic slit symmetric pulsation of bi-vacuum, representing the vacuum amplitude waves (VAW) in the membrane of bi-vacuum Bose condensate is instant. It is not related with energy-impulse propagation. The Corpuscular and Wave phase of particles are considered in our model as two alternative phase of wave B, which are in dynamic equilibrium. The wave [W]- PHASE in form of cumulative virtual cloud (CVC) originates as a result of quantum beats between real and mirror states of corpuscular [C] phase of sub-elementary particles, composing elementary particles. It is shown that CVC has a spatial image of half of parted (two-cavity) hyperboloid. This half is in realm of positive or negative vacuum for sub-particles and sub-antiparticles, correspondingly. The CVC is composed from virtual density waves (VDW), responsible for electric component of resulting electromagnetic charge and from virtual symmetry waves (VSW), related to magnetic component of resulting charge.

The product of two components is equal to resulting charge squared. The VAW interference with standing VDW and VSW (scalar waves), excited by symmetric pairs of sub-particle and sub-antiparticle may be responsible for Informational field origination.

It leads from equations obtained, that small part of CVC energy determined by fine structure

constant is responsible for electromagnetism and much smaller part of CVC - for gravitation. Our model unifies electromagnetism and gravitation in natural way. The restoration of [C]-PHASE in form of [real+mirror] mass-dipole is a result of binding of CVC to BVB, accompanied by excitation of BVB. The spatial image of sub-particle in [C]-phase is a correlated pair [mirror rotor + real vortex]. The energies of both phase [C] and [W] are equal.

Propagation of fermion in bi-vacuum is a jump-way process, because the [W] is luminal in contrast to [C] phase. The frequency of [C-W] pulsation is equal to frequency of quantum beats between real and mirror corpuscular states.

Our dynamic duality model elucidates the quantum background of non-locality, principle of least action and Golden mean, unifies the quantum and relativist theories. Tending of the open systems to conditions of Golden mean is supposed to be a driving force of their self-organization. It is shown also that the pace of time - changes with opposite sign with pace of kinetic energy for each selected closed system. It leads from formulae obtained, that pace of time is interrelated with electromagnetic and gravitational energy change. The notions of TEMPORAL waves and field has been introduced. Our approach serves as a key to Superunification.

Introduction

Einstein never accepted the Bohr's philosophy, that properties of particles cannot be analyzed without direct experimental control. Bohr's objection of EPR paradox was based on this point.

David Bohm was the first one, who made an attempt to explain wholeness of the Universe, without loosing the causality principle. Experimental discovery: "Aharonov-Bohm effect" (1950) pointing that electron is able to "feel" the presence of a magnetic field even in a regions where the probability of field existing is zero, was stimulating. For explanation of nonlocality Bohm introduced in 1952 the notion of quantum potential, which pervaded all of space. But unlike gravitational and electromagnetic fields, its influence did not decrease with distance. All the particles are interrelated by very sensitive to any perturbations quantum potential. This means that signal transmission between particles occurs instantaneously. The idea of quantum potential or active information is close to notion of pilot wave, proposed by de Broglie at the Solvay Congress in 1927. In our model instead quantum potential we introduced the notion of informational vacuum amplitude waves (VAW). These waves have a concrete interpretation in the framework of our model.

Actually Bohm develops the de Broglie idea of pilot wave, applying it for many-body system. In 1957 Bohm published a book: Causality and Chance in Modern Physics. Later he comes to conclusion, that Universe has a properties of giant, flowing hologram. Taking into account its dynamic nature, he prefer to use term: holomovement. In his book: Wholeness and the Implicate Order (1980) he develops an idea that our explicated unfolded reality is a product of enfolded (implicated) or hidden order of existence. He consider the manifestation of all forms in the universe as a result of enfolding and unfolding exchange between two orders, determined by super quantum potential.

According to Bohm, manifestation of corpuscle - wave duality of particle is dependent on the way, which observer interacts with a system. Both of this properties are always enfolded in a quantum system. It is a basic difference with our model, assuming that the wave and corpuscle phase are realized alternatively with high frequency during two different semiperiods of de Broglie wave (wave B).

Bohm, like Einstein, rejected the statement, that particles can not be considered until they are observed. In his last book, written with Basil Hiley: "THE UNDIVIDED UNIVERSE. An ontological interpretation of quantum theory" (1993), he considered the electron as a particle with well- defined position and momentum which are, however, under influence of special wave (quantum potential). Particle in accordance with this authors is a sequence of incoming and outgoing waves, which are very close to each other. However, particle itself does not have a wave nature after Bohm. Interference pattern in double slit experiment is a result of periodically "bunched" character of quantum potential in Bohm's view.

In accordance to first version of our model (see next section), one of two standing neutrino ($2\nu_0$) in the coherent triplet $[2\nu_0 + \tilde{\nu}_0]$, composing the electron as a coherent dynamic system, is always in the corpuscular state in each of two semiperiods. The pair of standing neutrino and antineutrino are pulsing between Corpuscular [C] and Wave [W] states in-phase, compensating the influence of energy, spin and charge of each other on vacuum symmetry. The bunched character of the electron's trajectory can be a result of impulses, produced by uncompensated standing neutrino in a course of its $[C \rightleftharpoons W]$ pulsations, accompanied by outgoing and incoming Cumulative Virtual Cloud (CVC). At this point our model has some similarity with idea of Bohm.

However, our duality model can explain the nonlocality and double slit experiment without using the notion of quantum potential or pilot-wave, but by the internal (hidden) dynamics of the components of elementary particles.

The important point of Bohmian philosophy, coinciding with our theory, is that everything in the Universe is a part of dynamic continuum.

Neurophysiologist Karl Pribram made the next exciting step in the same direction as Bohm: "The brain is a hologram enfolded in a holographic Universe".

The good popular description of Bohm and Pribram ideas are presented in books: The Bell's theorem and the curious quest for quantum reality (1990) by David Peat and "The Holographic Universe" (1992) by Michael Talbot.

Such original concepts are interesting and stimulating, indeed, but should be considered as a first attempts to transform intuitive perception of duality and quantum wholeness into clear geometrical and mathematical models.

In 1950 John Wheeler and Charles Misner published Geometrodynamics, a new description of space-time properties, based on topology. Topology is more general than Euclidean geometry and deeper than non-Euclidean, used by Einstein in his General theory of relativity. Topology does not deal with distances, angles and shapes. Drawn on a sheet of stretching rubber, a circle, triangle and square are indistinguishable. A ball, pyramid and a cube also can be transformed into the other. However, objects with holes in them can never be transformed by stretching and deforming into objects without holes.

For example black hole can be described in terms of topology. It means that massive rotating body behave as a space-time hole. Wheeler supposed that elementary particles, their spins, positive and negative charges can be presented as interconnected black and white holes. Positron and electron pair correspond to such model. The energy, directed to one of the hole, goes throw the connecting tube -"handle" and reappears at the other.

The connecting tube exist in another space-time than holes itself. Such a tube is undetectable in normal space and the process of energy transmission looks as instantaneous. In conventional space-time two ends of tube, termed 'worm holes' can be a vast distant apart. It gives an explanation of quantum nonlocality. Like Bohm's quantum potential, the Wheeler's quantum topology remains fascinating but unproved hypothesis.

The most serious attack on problem of quantum nonlocality was performed by Roger Penrose (1989) from Oxford University with his twister theory of space-time.

His ideas are quite close to those, developed in my dynamic wave-particle duality model. For example, in accordance with Penrose, quantum phenomena can generate space-time. The twisters, proposed by Penrose, are lines of infinite extent, resembling twisting light rays. Interception or conjunction of twistors lead to origination of particles. In such a way the local and nonlocal properties and particle-wave duality are interrelated in twistor geometry.

In our model the coherent triplets of standing neutrinos and antineutrinos, representing fermions, could be resulted from free neutrino (or antineutrino) strings interception with virtual [neutrino+antineutrino] pairs, represented by symmetric bi-vacuum excitations (excited bi-vacuum

bosons). Corresponding vacuum symmetry breach is responsible for [mass–velocity-space-time] origination, pertinent only for Corpuscular [C] phase.

The analysis of main quantum paradoxes was presented by Asher Peres (1992) and Charles Bennett et.al, (1993).

One of the most important question is related with possibility of existing of hidden parameters. Searching of such parameters was strongly discouraged by a theorem of Von Neumann (1955), claiming to show their to be unnecessary for explanation the known quantum phenomena (see also N. Mermin, 1990). Bohm proved his disagreement with formal statistical interpretation of quantum theory and with conclusions of Von Neuman (Bohm & Hiley, 1993), concerning nonexistence of hidden parameters.

We assume in our model that hidden (internal) parameters of elementary particles are existing. In corpuscular phase they are interrelated in definite way with external, experimentally detectable parameters.

Basic notions of new model

This work is devoted to analysis of the internal (hidden) parameters of elementary de Broglie waves termed waves B and their interrelation with external, observable ones, in the framework of new wave-particle duality model. The corpuscular [C] and the wave [W] states are considered in our model as two alternative phase of wave B, which are in dynamic equilibrium.

We discuss two possible interrelated model versions of elementary particles formation and their high frequency [C ⇌ W] pulsations. **Each of them is based on consideration of positive and negative vacuum as two ''oceans' of superfluid quantum liquid, composed from virtual quanta of opposite energies. This interacting positive and negative vacuum, termed BI-VACUUM, is composed from infinitive number of bi-vacuum bosons (BVB) in form of virtual [rotor+antirotor] pairs. The resulting energy and momentum of BVB at the conditions of their virtual spins equilibrium are equal to zero due to their opposite direction of rotation in the energetic planes of positive and negative vacuum. The dimensions of BVB are determined by the values of opposite impulses of rotor and antirotor in accordance with principle of uncertainty in coherent form. The notion of bi-vacuum allows the dimensions of rotor and antirotor to vary for many orders from each other as far their momentum and energy compensate each other. Elementary and subelementary particles in their [C] and [W] phase may be considered as a result of hierarchical self-organization of BVB in their symmetrical (ground) and asymmetrical (excited) states.**

The nonlocality of bi-vacuum bosons interaction is determined by their zero resulting impulse, which determines the infinitive virtual wave B length and the infinitive by scale PRIMORDIAL bi-vacuum Bose condensation. The symmetric primordial bi-vacuum exists in the total absence of matter and at the wave fronts, corresponding to [W] phase of matter. The primordial bi-vacuum symmetry shift, induced by presence of mater as a [C] phase of waves B, means origination of SECONDARY bi-vacuum, composed from BVB with very small, but nonzero resulting impulses. It means the fragmentation of the infinitive bi-vacuum Bose condensate to huge, but finite bi-vacuum domains. The dimensions of these domains are determined by corresponding virtual de Broglie wave (wave B) length of bi-vacuum bosons, composing them.

It is assumed that any kind of Bose condensate: real or virtual one - has nonlocal properties, corresponding to instant virtual signal transmission between particles, pulsating [C⇌W] in-phase. The signal transmission is mediated by oscillation of energetic slit between ground states of positive and

negative vacuum (**Vacuum Amplitude Waves** - "VAW"). Due to symmetry as respect to positive and negative vacuum the VAW and their interference are not related with impulse-energy transmission. However, they may be responsible for storage of information in form of corresponding standing waves, i.e. Informational field origination in bi-vacuum.

The resulting impulse of bi-vacuum bosons (BVB), equal to zero in [W] phase and very small in [C] phase, as well as corresponding virtual wave B length - remain unchanged in a course of VAW excitation.

The BVB Bose condensate, produced by infinitive number of pairs [rotor+antirotor] of BVB, serves as a background for $[C \rightleftharpoons W]$ duality realization, as will be shown below.

The virtual vortexes, rotors and BVB, as a components of sub-elementary particles, introduced in our model, are the result of collective excitations of virtual microparticles with similar angle velocity, composing bi-vacuum as a quantum superfluid liquid.

In the first model's version **it is assumed that just a neutrino, antineutrino and their pairs are the primordial sub-elementary particles, building the elementary particles, like electrons, positrons, quarks, nucleons, etc. It is assumed that at certain conditions the free neutrino turns to the standing one, leading to fusion of regular elementary particles. This could happen when trajectories of free neutrinos and antineutrinos (e, μ, τ) change to the closed ones, corresponding to their standing waves length conditions. It may occur, for example, in a course of strong vacuum symmetry fluctuations, accompanied by [origination $\rightleftharpoons$ evaporation] of mini-black holes with Plank's parameters.**

The spatial image of each standing neutrino in [C] phase as a [real+mirror] mass dipole is asymmetric pair of [real vortex + mirror rotor] with radiuses, determined by Compton length of real and mirror masses. The realization of [C - W] duality is a consequence of quantum beats between real $[C^+]$ and mirror $[C^-]$ corpuscular states, accompanied by ejection of cumulative virtual cloud (CVC), representing [W] phase.

Spatial image of [W] phase in both model versions is a half of parted hyperboloid, i.e. hyperbolic vortex in positive region of bi-vacuum for particles and in negative - for antiparticles.

Bosons are considered as a coherent group, formed by the integer number of pairs of fermions like standing [neutrino + antineutrino]. For example, it is proposed that photons are composed from three such pairs.

The triplets of coherent standing neutrino (ν_0) and antineutrino ($\tilde{\nu}_0$) in ratio 2:1 and 1:2 - form the fermions: electron ($2\nu_0 + \tilde{\nu}_0$) and the positron ($\nu_0 + 2\tilde{\nu}_0$) correspondingly. Such fermions, containing one uncompensated (ν_0) or ($\tilde{\nu}_0$) can originate also due to high-energy photons "splitting" under conditions of strong bi-vacuum symmetry shift.

A new fundamental Coherent Neutrino/Antineutrino Interaction, responsible for stabilization of elementary particles is introduced. The exchange of virtual quanta in form of CVC between standing neutrinos (sub-elementary particles) in a course their counterphase $[C \rightleftharpoons W]$ pulsation, electromagnetic and gravitational interaction between sub-elementary particles - contribute to stabilization of elementary particles.

The u-quark is considered as a superposition of 2 positron- like structures $\mathbf{u} \sim [e^+ + e^+]_u$. The d-quark can be composed from two electrons and one positron - like structures: $\mathbf{d} \sim [2e^- + 1e^+]_d$. Each of excessive standing neutrino and antineutrino has an electric charge, equal to +1/3 and -1/3 correspondingly.

In such a model the proton: $\mathbf{p} = [2\mathbf{u} + \mathbf{d}]$ contains more standing antineutrino ($12\tilde{\nu}_0$) than neutrino ($9\nu_0$). The neutron: $\mathbf{n} = [\mathbf{d} + 2\mathbf{u}]$ is composed from the equal number of standing neutrino and antineutrino ($12\nu_0$) and ($12\tilde{\nu}_0$). Each proton contains three

excessive standing antineutrinos with resulting spin and charge, opposite to that of the **electron**.

In second version of model of wave B **we do not use the notions of standing neutrino and antineutrino as a sub-elementary particles. The real and mirror mass origination is assumed to be a result of BVB symmetry breach, accompanied by origination of the same spatial images of [C] phase as the [real vortex + mirror rotor] dipole and that of [W] phase, as the real hyperbolic vortex. For sub-elementary particle real vortex is located in positive part of bi-vacuum and mirror rotor in zero-point energetic plane of negative part of bi-vacuum. For sub-elementary antiparticle, the situation is opposite.**

In this model version, in contrast to the first one, elementary particles are secondary phenomena, resulted from bi-vacuum symmetry certain violations.

Three generations of standing neutrino, electron and quark correspond to three different and stable values of energy slit between rotor and antirotor of $(BVB)_{e,\mu,\tau}$. Free neutrino of each generation is defined as the collective nonlocal excitation of corresponding kind of BVB Bose condensate in form of $(\mathbf{VAW})_{e,\mu,\tau}$.

The difference in two model versions does not influence the main results of our theory.

GENERAL DESCRIPTION OF DUALITY MODEL

Corpuscle-Wave duality **is supposed to be a result of high-frequency oscillations** (**quantum beats**) **between the real and mirror asymmetric states of particles.**

In the course of [C $\rightleftharpoons$ W] pulsations the part of real and mirror corpuscular mass reversibly transforms to number of positive and negative virtual quanta, forming cumulative virtual cloud (CVC). This virtual cloud corresponds to [W] - phase of particle and excites the secondary virtual waves in bi-vacuum in accordance with Hugence principle. The asymmetry of real and mirror mass-energy distribution in bi-vacuum is a primary reason for electromagnetism and gravitation in our model.

We consider each of standing neutrino or two other described above bi-vacuum excitations, composing elementary particles in the CORPUSCULAR [C] - phase as a Mass-Dipole, represented by real (m_C^+) **and "mirror"** $(m_C$

$$1 - \frac{m_C^-}{m_C^+} = (v/c)^2 \qquad\qquad 4$$

$$or: \quad \frac{m_C^-}{m_C^+} = 1 - (v/c)^2 \qquad\qquad 5$$

Eqs. 2 and 3 can be transformed to shape, close to that, obtained by Dirac

$$(E_C^+)^2 = (m_C^+)^2 c^4 = m_0^2 c^4 + (m_C^+ v)^2 c^2 \qquad\qquad 6$$

$$(E_C^-)^2 = (m_C^-)^2 c^4 = m_0^2 c^4 - (m_0 v)^2 c^2 \qquad\qquad 7$$

where: E_C^+ and E_C^- are the real and mirror energy of wave B.

Adding (6) and (7) we got the formulae for zero-point resulting energy, taking into account both real and mirror corpuscular masses of one of standing neutrino in composition of elementary particle, like electron:

$$2E_0^2 = 2m_0^2 c^4 = E_{tot}^2 - (P_C^\pm)^2 \bullet c^2 = \qquad\qquad 8$$
$$= c^4[(m_C^+)^2 + (m_C^-)^2] - c^2 v^2[(m_C^+)^2 - m_0^2]$$

It is possible after some reorganizations of (8) and using (5), to get the formulae for the resulting (hidden) impulse of mass-dipole of standing neutrino or that of rotor-dipole (9). The resulting impulses of [C] and [W] phases are equal to each other and less than real impulse of particle (9a), detectable in experiment.

$$P_C^\pm = m_C^+ \bullet (v^2/c) = (m_C^+ - m_C^-)c = P_W^\pm \qquad\qquad 9$$

$$P_C^+ = P_W^+ = m_C^+ \bullet v \qquad [P_C^+ > P_C^\pm] \qquad\qquad 9a$$

Consequently, the real wave B length ($\lambda_C^+ = h/P_C^+$) is shorter, than that of mass-dipole ($\lambda_C^\pm = h/P_C^\pm$).

From (4) we can find out the difference between total energies of real and mirror states of [C] phase. It is equal to energy of quantum beats between these states, which determines the energy of wave B in both phase [C] and [W] and that of cumulative virtual cloud (CVC) $[E_B = E_C = E_W = E_{CVC}]$:

$$E_W = \hbar\omega_B = (m_C^+ - m_C^-) \bullet c^2 = m_C^+ \bullet v^2 = 2T_{kin}^+ = E_C \quad or: \qquad 10$$

$$E_W = E_{CVC} = |m_C^+ - m_0| \bullet c^2 + |m_C^- - m_0| \bullet c^2 = E_{VDW}^+ + E_{VSW}^- \qquad 10a$$

$$where: m_C^+ > m_0 > m_C^- \quad and \quad m_0^2 = m_C^+ \bullet m_C^- \qquad 10b$$

We subdivide the total energy of [W] phase in form of CVC - to virtual Vacuum Density Waves (VDW) of positive vacuum and to virtual Vacuum Symmetry Waves (VSW) of negative vacuum. The mirror VSW are not related to the impulse-energy transmission and can be superluminal:

$$E_{VDW}^+ = |m_C^+ - m_0| \bullet c^2 \sim T_{kin}^+ \qquad\qquad 11$$

$$E_{VSW}^- = |m_C^- - m_0| \bullet c^2 \sim V^- \qquad\qquad 11a$$

The cumulative virtual cloud (CVC), corresponding to the Wave [W] phase, propagates in bi-vacuum with luminal velocity. The component of CVC, corresponding to VDW, propagates in the positive vacuum in the case of particles and in the negative vacuum in the case of antiparticles. The velocity of propagation of particle in real [C] phase is limited by particle's external group velocity and can be much lower than light velocity of CVC, corresponding to [W] phase. It means that propagation of particle in space in a course of its $[C \rightleftharpoons W]$ pulsation has a jump-way character. The energies of both phase are equal and can be presented in a few forms:

$$E_W^\pm = c^2[m_C^+ - m_C^-] = \hbar[\omega_C^+ - \omega_C^-] = \hbar\omega_B = m_C^+ \bullet v^2 = E_C^\pm \qquad 12$$

$$or: E_C^\pm = |m_C^+ - m_0| \bullet c^2 + |m_C^- - m_0| \bullet c^2 = T_k^+ + V^- = E_W^\pm \qquad 12a$$

$$or: E_W^\pm = \hbar[\omega_C^+ - \omega_0] + \hbar[\omega_C^- - \omega_0] = E_{VDW}^+ + E_{VSW}^- \qquad 12b$$

The ratio of the effective mass of cumulative virtual quanta of [W]- phase $(m_C^+ - m_C^-)$ to

the real mass of [C]- phase (m_C^+) is equal to: $1 - m_C^-/m_C^+ = (v/c)^2$ (see also eq.4).

The characteristic frequencies of real and mirror corpuscular states are defined as:

$$\omega_C^+ = \frac{m_C^+ \bullet c^2}{\hbar}; \qquad \omega_C^- = \frac{m_C^- \bullet c^2}{\hbar}; \qquad \omega_0 = \frac{m_0 \bullet c^2}{\hbar} \qquad \text{13}$$

The frequency of beats is equal to $\omega_W^\pm = [\omega_C^+ - \omega_C^-]$ and the resulting frequency of beats is equal to:

$$\omega_R = \frac{\omega_C^+ + \omega_C^-}{2} \qquad \text{14}$$

T_k^+ and V^- are the kinetic and potential energy of CVC, correspondingly.

The period of quantum beats is equal to:

$$T_B = 2\pi/\omega_B = 2\pi/[\omega_C^+ - \omega_C^-] \qquad \text{14a}$$

This phenomena reflects the pulsation of wave B in a course of its $[W \rightleftharpoons C]$ reversible transitions and energy exchange with bi-vacuum.

From the known formulae, interrelated the energy of the relativist wave B with its external group $(v = v_{gr})$ and phase (v_{ph}) velocities:

$$E_B = E_C = V + T_k = m_C^+ \bullet v^2 = m_C^+ \bullet v_{gr} v_{ph} \qquad \text{14b}$$

$$and : 2\frac{v_{ph}}{v_{gr}} - 1 = \frac{V}{T_k}$$

one can see, that for CVC the condition under consideration: $2T_k = E_B = V + T_k$ corresponds to that of harmonic oscillator or standing wave:

$$V = T_k \quad at \quad v_{gr} = v_{ph} \qquad \text{14c}$$

SPATIAL IMAGES

The spatial images of elementary wave B in [C] and [W] phase can be analyzed in terms of the wave numbers or energy distribution, if we transform the basic equations for real and mirror energy, squared (6 and 7) to forms:

$$\text{for real } [C^+] \text{ state :} \quad \left(\frac{m_C^+ \bullet c}{\hbar}\right)^2 - \left(\frac{m_C^+ \bullet v}{\hbar}\right)^2 = \left(\frac{m_0 c}{\hbar}\right)^2 \qquad \text{15}$$

$$\text{for mirror } [C^-] \text{ state :} \quad \left(\frac{m_C^- \bullet c}{\hbar}\right)^2 + \left(\frac{m_0 \bullet v}{\hbar}\right)^2 = \left(\frac{m_0 c}{\hbar}\right)^2 \qquad \text{15a}$$

The spatial image of energy distribution of real corpuscular state $[C^+]$, defined by equation (15), corresponds to **equilateral hyperbola** (Fig.1a):

$$[C^+] : \quad X_+^2 - Y_+^2 = a^2 \qquad \text{15b}$$

where: $X_+ = (k_C^+)_{tot} = m_C^+ \bullet c/\hbar; \quad Y_+ = m_C^+ \bullet v/\hbar; \quad a = m_0 c/\hbar$

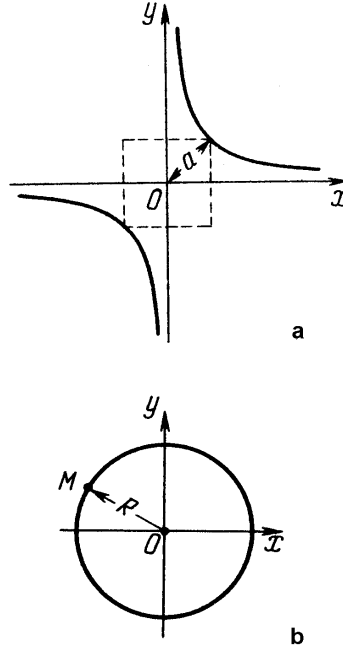The spatial image of mirror $[C^-]$ state (15a) corresponds to **circle** (Fig. 1b), described by equation:

$$X_-^2 + Y_-^2 = R^2 \qquad \text{15c}$$

where: $X_- = (k_C^-)_{tot} = m_C^- \bullet c/\hbar; \quad Y_- = (k_0)_{kin} = m_0 v/\hbar.$

The radius of mirror circle: $R = k_0 = m_0 c/\hbar$ is equal to the axe length of equilateral hyperbola: $R = a$ of real $[C^+]$ state. In fact this circle represents the half of bi-vacuum boson (**BVB**).

Fig. 1a. Equilateral hyperbola, describing the energy distribution for real corpuscular state [C⁺] of sub-elementary particle (positive region) and sub-elementary antiparticle (negative region). The rotation of equilateral hyperbola around common axe of symmetry leads to origination of parted hyperboloid or conjugated pair of paraboloids of revolution. The direction of this rotation as respect to vector of particle propagation in space may be responsible for spin. This excited state of bi-vacuum is responsible also for real mass and electric component of electromagnetic charge.

Fig. 1b. Circle, describing the energy distribution for the mirror (hidden) corpuscular state [C⁻]. It is located near zero-point level of negative realm of bi-vacuum for sub-elementary particles and near zero-point level of positive region of bi-vacuum for corresponding antiparticles. Circulation of virtual quanta in the ground energetic planes is responsible for magnetic properties of elementary particle in accordance to our model. Such a rotor is a part of secondary bi-vacuum bosons (BVB) as a pair [rotor+antirotor].

The [W] phase **in form of cumulative virtual cloud (CVC) originates as a result of quantum beats between real and mirror states of [C] phase (see 12) of elementary wave B. Consequently, the spatial image of CVC energy distribution can be considered as a geometric difference between energetic surfaces of real [C⁺] state as an equilateral hyperbola and that of [C⁻] state as a mirror circle. After substraction of left and right parts of (15b and 15c) and some reorganization, we get the energetic spatial image of [W] phase or [CVC] as a geometrical difference of Equilateral hyperbola and circle:**

$$\frac{(m_C^+)^2}{m_0^2} + \frac{(m_C^-)^2}{m_0^2}\frac{c^2}{v^2} - \frac{(m_C^+)^2}{m_0^2}\frac{c^2}{v^2} = -1 \qquad\qquad 16$$

This equation in dimensionless form describes the parted (two-cavity) hyperboloid (Fig. 2):

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = -1$$

The (c) **is a real semi-axe;** a and b − **the imaginary ones.**
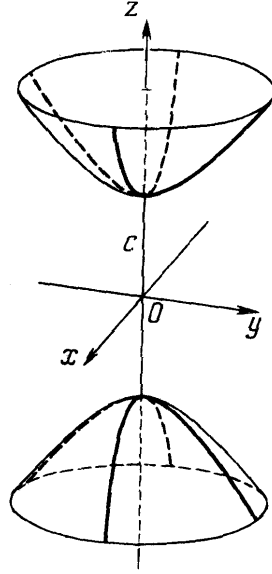
Fig. 2. **The parted (two-cavity) hyperboloid (in arbitrary scale) is a spatial image of CVC, corresponding to [W] phase of elementary wave B. The positive half of this parted hyperboloid corresponds to CVC of [W] phase of elementary particle and the negative one - to CVC of antiparticle. The whole picture may characterize the twin CVC of positive and negative energy, produced by pair of sub-elementary [particle+antiparticle] or standing [neutrino+antineutrino] as a part of electron, positron, photon and quarks.**

If we consider the real and the mirror states of [C] phase as a two rotors of different shape and resulting frequency, equal, correspondingly, to ω_C^+ and ω_C^-, then the difference of rotors of corresponding fields of velocities: $\vec{V}_C^+(\mathbf{r})$ and $\vec{V}_C^-(\mathbf{r})$ can be presented as doubled energy of CVC:

$$rot[\hbar\vec{V}_C^+(\mathbf{r})] - rot[\hbar\vec{V}_C^-(\mathbf{r})] = 2\vec{n} \bullet \hbar(\omega_C^+ - \omega_C^-) = 2\vec{n} \bullet \hbar\omega_{CVC} \qquad 16a$$

where: $\vec{n}$ is the unit-vector, common for both states; $\omega_{CVC} = (\omega_C^+ - \omega_C^-)$ is frequency of beats between real and mirror rotors. All the virtual microparticles of bi-vacuum as a quantum liquid, forming each of rotors, should have the same angle frequency (ω_C^+ and ω_C^-).

The spatial image of BVB **is a pair of [rotor + antirotor] with opposite circulation in the ground energetic planes of positive and negative vacuum, forming bi-vacuum. Their surfaces are equal, correspondingly to**:

$$S_{BVB}^+ = \pi(L_0^+)^2 = \pi(\hbar/m_0^+c)^2; \qquad S_{BVB}^- = \pi(L_0^-)^2 = \pi(\hbar/m_0^-c)^2 \qquad 16b$$

For the case of totally symmetric BVB: $S_{BVB}^+ = S_{BVB}^-$, **the resulting surface of BVB is**

$$S_{BVB} = S_{BVB}^+ + S_{BVB}^- = 2S_{BVB}^+ = 2S_{BVB}^- \qquad 16c$$

The oscillations of S_{BVB} as a result of symmetric oscillations of m_0^+ and m_0^- at condition $(m_0^+ - m_0^-) = 0$, are related to excitations of vacuum amplitude waves VAW and torsion field.

Restoration of [C] phase is a result of binding of CVC on BVB, serving as a anchor site.

Let us consider the elementary wave B as a quantum harmonic oscillator, corresponding to conditions (**14c**) **with energy quantization in the realms of positive and negative bi-vacuum**:

$$E_n = \hbar\omega_B = \pm\hbar\omega_0\left(n + \frac{1}{2}\right) \qquad 17$$

where quantum number: $n = 0; 1; 2...$ and $\hbar\omega_0 = m_0 c^2$.

Two sublevels, with $n = 0$ are: $E_0^{\pm} = \pm\frac{1}{2}\hbar\omega_0$ correspond to positive and negative zero-point states of bi-vacuum. They are general for particles, antiparticles and bi-vacuum bosons (BVB).
The additional third sublevel of positive vacuum at $n = 1$: $E_V^+ = +\frac{3}{2}\hbar\omega_0$ characterize the asymmetry of energy distribution, accompanied the sub-elementary particle origination (Fig.3).
The additional sublevel of negative vacuum: $E_V^- = -\frac{3}{2}\hbar\omega_0$ is pertinent for sub-elementary antiparticles origination. Particles and antiparticles have the opposite symmetry of energy distribution, however, with the same absolute values.
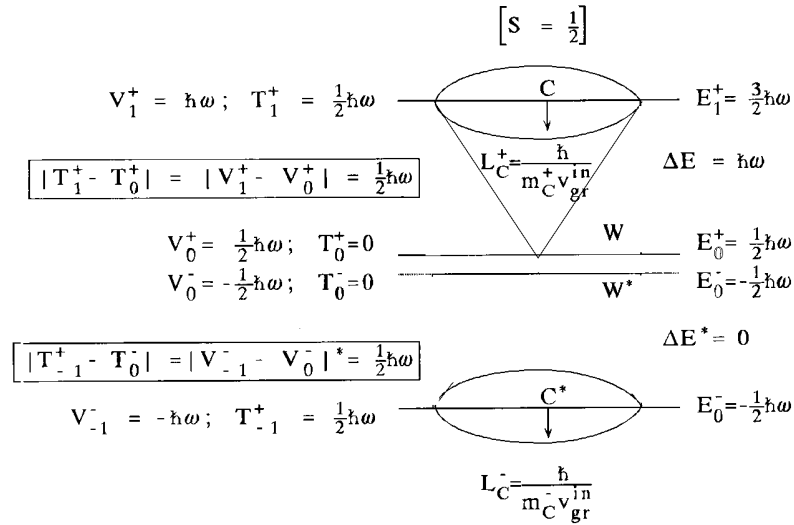

Fig.3. The spatial image of [C] phase of elementary wave B [real vortex+mirror rotor], corresponding to [real+mirror] mass-dipole.

The real total energy of wave B as quantum oscillator in [C] and [W] phases can be defined as:

$$E_C = \frac{3}{2}\hbar\omega_0 + (-\frac{1}{2}\hbar\omega_0) = \hbar\omega_0 \quad \text{total energy of [C] states: real and mirror}$$

17a

and $\quad E_W = \frac{3}{2}\hbar\omega_0 - \frac{1}{2}\hbar\omega_0 = \hbar\omega_0 \quad$ **energy of beats between [C] states,**

equal to energy of CVC
The length of [real +mirror] mass-dipole, equal to that of CVC:

$$\overrightarrow{\lambda^{\pm}} = h/(m_C^+ v^2/c) = h/(m_C^+ - m_C^-)c \qquad 17b$$

of the fermions is determined by dynamic properties of "uncompensated" standing neutrino in form of [vortex+ rotor] dipole in composition of the electron's triplets.

THE EXTERNAL AND HIDDEN PARAMETERS OF WAVE B.
HIDDEN HARMONY AND GOLDEN MEAN

Our model includes the notions of detectable in experiment - external and internal (hidden) parameters.
It postulates the equality of internal kinetic energies of real and mirror corpuscular states. In accordance to introduced in our theory definition of time (see eq. 61), this condition means that the pace of time for both of these states is zero and their life-time

is infinitive.

At the different real and mirror masses ($m_C^+ > m_C^-$) such condition can be achieved by corresponding difference of hidden velocities ($v_{in}^+ < v_{in}^-$):

$$(2T_k^+)^{in} = m_C^+(v_{in}^+)^2 = m_C^-(v_{in}^-)^2 = (2T_k^-)^{in} \qquad 18$$

It is easy to show that the **internal** kinetic energies are equal to resulting one, determined by the mass of rest of the electron:

$$(T_k^+)^{in} = (T_k^-)^{in} = T_0 = \frac{1}{2}m_0 \cdot c^2 \qquad 18a$$

The relativist increasing of m_C^+ and decreasing of m_C^- with the enhancement of external group velocity (v) is compensated by the opposite change of hidden group and phase velocities, defined as:

$$v_{in}^+ \equiv v_{gr}^{in} \quad and \quad v_{in}^- \equiv v_{ph}^{in}$$

Like for **external** group (v) and phase (v_{ph}) velocities, the product of **internal** velocities is equal to the light velocity squared:

$$v_{gr}^{in} \cdot v_{ph}^{in} = v \cdot v_{ph} = c^2, \qquad 18b$$

$$\text{however, in general case}: \quad v_{gr}^{in} \neq v \quad and \quad v_{ph}^{in} \neq v_{ph}$$

The resulting hidden impulse of sub-elementary wave B squared is equal to

$$P_0^2 = P^+ \cdot P^- = (m_C^+ \cdot v_{gr}^{in}) \cdot (m_C^- \cdot v_{ph}^{in}) = m_0^2 \cdot c^2 = const \qquad 18c$$

From (**18**) and (**4**) we get the important relation between the internal and external velocities:

$$\frac{m_C^-}{m_C^+} = \left(\frac{v_{gr}^{in}}{v_{ph}^{in}}\right)^2 = \left(\frac{v_{gr}^{in}}{c}\right)^4 = 1 - \left(\frac{v}{c}\right)^2 \qquad 19$$

Taking into account (**18b**), formula (**19**) can be transformed to:

$$\frac{v_{gr}^{in}}{v_{ph}^{in}} = \frac{(v_{gr}^{in})^2}{c^2} = \left[1 - \left(\frac{v}{c}\right)^2\right]^{1/2} = \left[1 - \left(\frac{v}{v_{ph}}\right)\right]^{1/2} \qquad 20$$

In more convenient for us shape the above formula looks like:

$$\frac{c}{v_{gr}^{in}} = \frac{1}{[1 - (v/c)^2]^{1/4}}$$

We introduce the important **condition of Hidden Harmony**: the equality of internal (**hidden**) and external group and phase velocities:

$$\left[\mathbf{v}_{gr}^{in} = \mathbf{v}_{gr}^{ext} \quad and \quad \mathbf{v}_{ph}^{in} = \mathbf{v}_{ph}^{ext}\right] \qquad 21$$

Realization of this primary condition determines the value of Golden mean, as a definite ratio of group and phase velocities (**internal and external**):

$$\mathbf{S} = \frac{v_{gr}^{in}}{v_{ph}^{in}} = \left[\frac{v}{v_{ph}}\right]^{ext} = \left(\frac{v^2}{c^2}\right)^{ext,in} = \frac{A}{B} \qquad 21a$$

Using (**21a**), we get from (**20**) the simple quadratic equation:

$$S^2 + S - 1 = 0 \qquad 22$$

$$or: \quad \frac{S}{(1-S)^{1/2}} = 1 \qquad 22a$$

The positive solution of (**22**) gives the numerical value of Golden mean:

$$S \equiv Phi = (A/B) = 0.618 \qquad 23$$

Golden mean is one of the most intriguing, important and universal number of Nature. Lot of very different natural phenomena - from ratio of parameters of planetary orbits to the law of multiplication of microbes and rabbits (*Fibonacci row*) follow Golden mean. Our

intuitive perception of beauty and harmony also is related to Golden mean. However, in contrast to number (π), it origin was entirely obscure.

The deep quantum roots of Golden mean, reflecting realization of conditions of Hidden Harmony (21), leading from our dynamic model of wave-particle duality, explain the universality of this number (S = 0.618).

We put forward a hypothesis, that any kind of selected system, enable to self-assembly, self-organization and evolution: from atoms to living organisms, galactics and the Universe - are tending to conditions of Hidden Harmony as a background of Golden Mean realization. The less is deviation of ratio of characteristic parameters of system from [$S \equiv Phi$], the more advanced is evolution of this system.

We have to keep in mind that all forms of matter are composed from hierarchic system of de Broglie waves.

Our statement that tendency of any system (from elementary particle to the Universe) to Hidden Harmony is a driving force and final goal of evolution - can be confirmed on the lot of examples. One of them is evaluation of energy of wave B (i.e. electron), corresponding to Golden mean condition.

The formula (4) at condition $(c/v)^2 = S$, taking into account (22a), can be easily driven to the following expression, meaning the equality of mass symmetry shift, produced by particle (Δm_C^S) to mass of rest of this particle (m_0):

$$\Delta m_C^S = (m_C^+ - m_C^-)^S = m_C^+ \bullet S = \frac{m_0 \bullet S}{(1-S)^{1/2}} = m_0 \qquad 23b$$

The energy of wave B, equal to that of CVC, at condition of Hidden harmony and Golden mean, is equal to:

$$E_B^S = \Delta m_C^S \bullet c^2 = m_0 \bullet c^2 = m_0 \bullet v_{gr} v_{ph} = \hbar\omega_0 = T_k + V \qquad 24$$

where the angle frequency of [$C \rightleftharpoons W$] pulsations of "ideal" electron with external and internal group velocities, determined by condition (21) is equal to:

$$\omega_0 = m_0 c^2/\hbar = 9.03 \bullet 10^{20} \, s^{-1}$$

We can see, that at condition of Hidden Harmony, the total energy of wave B is described by Einstein's formula, unifying the energy and mass. This means that each cycle of [$C \rightleftharpoons W$] pulsation is accompanied by reversible annihilation of each of standing neutrino (elementary wave B), composing elementary particles.

From the known relation between kinetic (T_k) and potential (V) energy of wave B and that of group and phase velocities (14b), at the condition of Golden mean: $S = [v_{gr}/v_{ph}]^{ext} = [v_{gr}/v_{ph}]^{in}$, we get the ratios between different energy contributions of wave B:

$$\left[\frac{V}{T_k}\right]^S = \frac{2}{S} - 1 = 2.236 \quad or \quad S = \left[\frac{2T_k}{E_B}\right]^S = 0.618 \qquad 25$$

We may introduce here the "Dead mean" conditions, corresponding to thermal equilibrium. At this conditions any system represents the number of independent oscillators, unable, consequently to self-organization:

$$\left[\frac{V}{T_k}\right]^D = 1 \qquad \left[\frac{2T_k}{E_B}\right]^D = \left[\frac{T_k + V}{E_B}\right]^D = 1 \qquad 25a$$

In section: "Electromagnetism" the important results will be presented, pointing that principles of hydrogen and other atoms/molecules assembly follow the rule of Golden mean, based on Hidden harmony.

It is shown also that the famous Sri Yantra diagram contains the features, compatible with our model of duality.

<center>Scenario of free asymmetric particle (fermions) propagation
in vacuum in a course of its $[C \rightleftharpoons W]$ pulsation</center>

For the end of simplification we consider the behavior of sub-elementary particle, like a single standing neutrino with $\triangle m_C = (m_C^+ - m_C^-) > 0$ in Corpuscular [C] phase. Such standing neutrino can exist, in accordance to our model, only in composition of triplets, like the electron $[2\nu_0 + \tilde{\nu}_0]$.

We can subdivide the process of this particle dynamics in a course of propagation to following stages:

1. The particle (wave B) in [C] phase, representing mass-dipole, with real mass (m_C^+) and mirror mass (m_C^-) with linear dimension $(\lambda^\pm)$ moves in vacuum with external group velocity $(v < c)$, the resulting energy $(E^\pm)$, resulting impulse $(P^\pm)$, the external real impulse (P_C^{ext}) and corresponding external wave B length (λ_C^{ext}), equal correspondingly to:

$$E^\pm = m_C^+ \bullet v^2 = (m_C^+ - m_C^-) \bullet c^2 \qquad\qquad 26$$

$$P^\pm = \left[(m_C^+) \bullet (\vec{v}_{gr}^2/c) \right]_C = (m_C^+ - m_C^-)c \quad and \quad \lambda^\pm = h/P^\pm \qquad 27$$

$$P_C^{ext} = [(m_C^+) \bullet v]_C \quad and \quad \lambda_C^{ext} = h/(m_C^+ \bullet v) < \lambda^\pm \qquad 27a$$

2. The [C] phase is unstable due to its specific asymmetric composition from elements of positive and negative vacuum: [real+mirror] mass - dipole, corresponding to spatial image of pair of [real vortex+ mirror rotor] dipole. This instability is a "driving force" of $[C \rightleftharpoons W]$ pulsations in form of quantum beats between real and mirror states.

There are three interrelated consequences of the first semiperiod of these pulsations, corresponding to transition from Corpuscular to the Wave phase:

a) The excessive energy of real corpuscular state [C$^+$] as respect to mirror one [C$^-$] of corpuscular phase - turns to the energy of cumulative virtual cloud (CVC), corresponding to that of the [W] phase. The CVC propagates in bi-vacuum with light velocity. The energy of CVC can be subdivided to energy of Vacuum Density Waves (VDW) and Vacuum Symmetry Waves (VSW):

$$E_W = (m_C^+ - m_C^-) \bullet c^2 = m_C^+ \bullet v^2 = E_C \qquad\qquad 28$$

$$or : E_{CVC} = E_{VDW} + E_{VSW} = E_W \qquad\qquad 28a$$

$$where : \; E_{VDW} = |m_C^+ - m_0| \bullet c^2; \;\; E_{VSW} = |m_C^- - m_0| \bullet c^2$$

The hidden resulting impulse of CVC, composed from these two kinds of virtual quanta $(P_{CVC}^\pm)$, determines the resulting radius of CVC $(L_{CVC}^\pm)$, equal to that of corpuscular mass-dipole:

$$P_{CVC}^\pm = c(m_C^+ - m_C^-) = c\triangle m_C \quad and \quad L_{CVC}^\pm = \frac{\hbar}{(m_C^+ - m_C^-) \bullet c} \qquad 29$$

The spatial image of CVC is a half of two-cavity parted hyperboloid (**see eq. 16 and Fig.2**), **each of cavity, corresponding to positive for particles and negative for antiparticles components of CVC.**

The resulting energy and the external impulse of secondary bi-vacuum boson (BVB) - turns to zero:

$$E_{BVB} = \frac{1}{2}\hbar\omega_0 + (-\frac{1}{2}\hbar\omega_0) = \frac{1}{2}(m_0^+ - m_0^-) \bullet c^2 \to 0 \qquad 30$$

$$and \quad P_{BVB} = \frac{1}{2}(m_0^+ - m_0^-) \bullet c \to 0 \quad \lambda_{BVB} = h/P_{BVB} \to \infty. \qquad 31$$

The radius of BVB, with spatial image of pair of 2D rotors, is determined by the electron's Compton radius, equal to that of CVC at condition of Hidden harmony (21):
$L_{BVB} = \hbar/m_0 c$

The conditions (31) means that the bi-vacuum bosons (BVB), corresponding to [W]

phase of coherently pulsating particles, may form nonlocal virtual Bose condensate with infinitive dimensions.

The secondary curved bi-vacuum, corresponding to [C] phase, displays nonlocality only in the volume of finite, but huge clusters in contrast to unperturbed flat primordial bi-vacuum, which nonlocality has no limitations.

The probability of BVB origination and their Bose condensation is very high for both: primordial and secondary vacuum.

3. At the next, the reverse stage of our scenario, the "ejected" in a course of [C → W] transition cumulative virtual cloud (CVC), representing [W] phase of particle - restores in bi-vacuum the asymmetric [real-mirror] mass dipole (C-phase) in form of [real vortex+mirror rotor] pair as a result of CVC absorption by one of BVB.

The most probable distance of restoration of [C] phase, i.e. [W → C] transition - from the point of previous [C → W] transition is determined by the external wave B length of the electron (27a).

The in-phase $[C \rightleftharpoons W]$ pulsations of symmetric pair of standing neutrino and antineutrino $[\nu_0 + \tilde{\nu}_0]$ in composition of the electron $[2\nu_0 + \tilde{\nu}_0]$ is also accompanied by $[ejection \rightleftharpoons absorption]$ of twin CVC in form of parted hyperboloid (Fig. 2). These correlated CVC of positive and negative vacuum - totally compensate each other and do not contribute to the impulse - energy of uncompensated standing neutrino of triplet. However, the periodic $[emission \rightleftharpoons absorption]$ of CVC doublet may generate the nonlocal (instant) Vacuum Amplitude Waves (VAW), as oscillations of bi-vacuum zero-point energy slit.

Our model do not needs the Bohmian "quantum potential" or "pilot wave" for explanation of two-slit experiment. For the common case of ensembles of particles, the explanation can be based on interference of their [W] phase in form of cumulative virtual clouds (CVC). The ability of CVC to activate secondary virtual waves and wavefronts in bi-vacuum could be responsible for interference, produced even by single electron or photon. Scattering of photons on the free electrons will affect their impulse, mass, wave B length and, consequently, the interference picture. Only [C] phase of particle, but not its [W] phase can be registered by detectors of particles. Such a consequences of our dynamic duality model can explain all details of well known and still mysterious double slit experiment.

The absence of dissipation in the process of $[C \rightleftharpoons W]$ transitions in bi-vacuum Bose condensate as in superfluid quantum liquid, makes them totally reversible.

Propagation of fermion in 3D space in a course of its $[C \rightleftharpoons W]$ pulsation can be considered as a periodic jumping of particle in form of CVC of [W] phase with light velocity between wavefronts of bi-vacuum, corresponding to [C] phase, moving with group velocity lower than luminal one. The wavefronts of [C] and [W] phase are normal as respect to direction of particles propagation.

The separation between coherent wavefronts, generated by real [C] phase, is determined by real external wave B length (eq.27a).

The energy (E_{CVC}) of cumulative virtual cloud (CVC) is determined by difference in energy of quantum beats: $\Delta m_C \bullet c^2 = (m_C^+ - m_C^-) \bullet c^2$ in a course of $[C \rightleftharpoons W]$ and energy of secondary bi-vacuum symmetry shift $(\Delta m_V \bullet c^2)$:

$$E_{CVC} = (\Delta m_C - \Delta m_V) \bullet c^2 \qquad 32$$

The total energy of wave B is a sum of CVC energy and energy of vacuum symmetry shift:

$$E_B = E_{CVC} + \Delta m_V \bullet c^2 = \Delta m_C \bullet c^2 \qquad 33$$

The nonlocal quantum interaction can occur between [C] phase particles via secondary bi-vacuum Bose condensate. The nonlocal interaction between [C] phase of

particles in the huge but limited volume of secondary bi-vacuum Bose condensate, may be realized as a coherent change of vacuum symmetry shift:

$$\Delta m_V = \frac{1}{2}|m_0^+ - m_0^-| = |m_V^+ - m_V^-| \qquad 34$$

in the shell of secondary superfluid Bi-vacuum Bose condensate with the radius of curvature:

$$L_{BVC} = \hbar/(\Delta m_V \bullet c) \qquad 34a$$

The vacuum symmetry shift oscillation may be induced by the mass symmetry shift (Δm_C) oscillation, resulted from change of velocity in a coherent system of particles and in-phase $[C \rightleftharpoons W]$ pulsation (see "Gravitation"):

$$\Delta m_C = |m_C^+ - m_C^-| \sim \Delta m_V \qquad 34b$$

Such kind of nonlocal interaction display itself in oscillation of $L_{BVC}.(34a)$, **i.e. radius of nonlocality**.

The oscillation of real mass of uncompensated standing neutrino (v_0) of elementary particle due to its alternating acceleration - is accompanied by corresponding oscillations of real masses of pair $[v_0 + \tilde{v}_0]$ in composition of the electrons $[2v_0 + \tilde{v}_0]$, **protons and neutrons. These symmetric oscillation of** $[v_0 + \tilde{v}_0]$, **in turn, excite the nonlocal Vacuum Amplitude Waves (VAW), accompanied by oscillations of bi-vacuum Bose condensate (BC) energy slit** (E_{BVB}), **equal to that of BVB**:

$$E_{BVB} + \Delta E_{BVB} = \frac{1}{2}[(m_0^+ + \Delta m_0^+) + (m_0^- + \Delta m_0^-)] \bullet c^2 = (m_0 + \Delta m_0) \bullet c^2 \qquad 34c$$

$$A_{VAW} = \Delta E_{BVB} = \Delta m_0^+ + \Delta m_0^- = \Delta m_0^{\pm} \qquad 34d$$

Such mechanism of nonlocal interaction via virtual BC can explain the instant interaction between coherent twin photons in experiments of Aspect et all and realization of principle of least action.

Our theory relates the pace of time for any selected closed system to the pace of the external real kinetic energy T_{kin} change (see below). **The notion of real time is existing only on realm of wavefronts, corresponding to [C] phase of wave B. The pace of real time is determined by the pace of real kinetic energy change**. At the **[W] wavefronts and bi-vacuum energetic surface, the notion of real time is absent as far the notion of real kinetic energy is absent.** However, the virtual time could coexist with change of virtual kinetic energy.

Spatial stability of complex systems: atoms, molecules and that of solids means that in these systems superposition of asymmetrical cumulative virtual clouds, representing [W] states of elementary particles - forms hologram - like 3D standing waves superposition with location of nodes, corresponding to the most probable positions of corpuscular phase of the nucleons, electrons, atoms and molecules in condensed matter. The binding of CVC by bi-vacuum bosons restore the [C] phase of particles in positions, close to the most probable ones in accordance with the value of corresponding wave function squared (see below).

ELECTROMAGNETISM

The fine structure constant $(\alpha = 7.29735 \bullet 10^{-3})$ in our model can be related to ratio of minimum zero-point external group velocity of the electron $(v = v_0)$, to the light velocity as follows:

$$\alpha = \frac{e^2}{\hbar c} = \left(\frac{v_0}{c}\right)^2 \qquad 35$$

The new notions of **external and internal (hidden)** electric $(i; \; i^{in})$ and magnetic $(\eta; \; \eta^{in})$ components of resulting electromagnetic charge (e) are interrelated with each other

as

$$(i \bullet \eta) = (i^{in} \bullet \eta^{in}) = e^2 \tag{36}$$

In accordance to our theory, the real and mirror states of [vortex+rotor] dipole of [C] phase - **reflect the internal electric (i^{in}) and magnetic (η^{in}) components of electromagnetic charge, correspondingly.**

It may be shown, that the ratio of Bohr magneton (μ_B) to internal magnetic moment of the electron (μ_η):

$$\mu_B = e \bullet (\hbar/2m_0 c); \qquad \mu_\eta^{in} = \eta^{in} \bullet (\hbar/2m_0 c) \tag{37}$$

at very low external group velocity, equal to that of zero-point: $v \to v_0$, when the eqs. (35 and 19) are valid, tends to:

$$\frac{\mu_\eta^{in}}{\mu_B} \to \left(\frac{\eta^{in}}{i^{in}} \right)_0^{1/2} = \left(\frac{v_{ph}^{in}}{v_{gr}^{in}} \right)_0^3 = \frac{1}{[1-\alpha]^{1/6}} \tag{38}$$

This value is very close to experimental one: $\left(\mu_e / \mu_B \right)_{exp} = 1.00115965221$

The notion of Dirac's magnetic monopole is replaced in our model by the notion of internal magnetic component of electromagnetic charge (η^{in}).

The Lienor-Vihert's vector $(\overrightarrow{A})$ and scalar (ϕ) potential, producing by moving elementary charge with velocity $(\overrightarrow{v})$ (Landau and Lifshiz, 1988) are equal to:

$$\overrightarrow{A} = \frac{e\overrightarrow{v}}{c \left(R - \frac{v\overrightarrow{R}}{c} \right)} \tag{39}$$

$$and \quad \phi = \frac{e}{\left(R - \frac{v\overrightarrow{R}}{c} \right)} \tag{40}$$

Dividing (39) to (40) and taking into account (19), we get:

$$\left(\overrightarrow{A}/\phi \right)^2 = \left(\overrightarrow{v}/c \right)^2 = 1 - \frac{m_C^-}{m_C^+} \tag{41}$$

The electromagnetic energy, **corresponding to maximum potential of the electron, is expressed in our model as an internal interaction energy between elementary internal electric (i^{in}) and magnetic (η^{in}) charges, separated by the radius $(L^\pm)$ of [real+mirror] mass-dipole. This value is equal to radius of cumulative virtual cloud (CVC), produced by quantum beats between real and mirror states of the electron's $(2v_0 + \tilde{v}_0)$ uncompensated standing neutrino (v_0):**

$$[E_{el}^{max}]_e = \left(\frac{[i \bullet \eta]^{in}}{L^\pm} = \frac{e^2}{L^\pm} \right)_e = \alpha |m_C^+ - m_C^-|_e \bullet c^2 = \alpha (m_C^+ \bullet v^2)_e \tag{42}$$

where $\alpha = e^2/\hbar c = e^2/Q^2$ is a fine structure constant, which determines the isotropic component of CVC; $Q^2 = \hbar c$ is a total charge squared; v is the external group velocity of particle in [C] state.

The total electromagnetic potential of proton with positive charge, determined by fractional charges of three uncompensated antineutrinos of three quarks, is equal to that of the electron, but with opposite sign. It can be expressed in similar way:

$$[E_{el}^{max}]_P = \left(\frac{i \bullet \eta}{L^\pm} = \frac{e^2}{L^\pm} \right)_P = \alpha |m_C^+ - m_C^-|_P \bullet c^2 = \alpha (m_C^+ \bullet v^2)_P \tag{42a}$$

From eq.9 the electron's and proton's mass-dipole characteristic dimensions, equal to radius of their CVC, should be equal to each other:

$$[L^\pm = \hbar/P^\pm]_{e,P} = [\hbar/(m_C^+ - m_C^-)c = \hbar/(m_C^+ \bullet v^2/c)]_{e,P} \tag{43}$$

$[L^\pm]_{e,P}$ **characterizes the distance between real and mirror masses of mass-dipole and**

between magnetic and electric components of electromagnetic charge, distributed over CVC for electron and proton. As far the mass of proton is much bigger, than that of the electron: $m_P \gg m_e$, it leads from the right part of eq.43 that the external group velocity of proton should be much smaller than that of the electron.

The dependence of electromagnetic potential on distance (r) is like:

$$\left[E_{el}(r) = E_{el}^{\max} \bullet \frac{\vec{r}}{r} \right]_{e,P}$$
43a

where: $\vec{r}$ is the unitary radius-vector.

From condition: $[E_{el}^{tot}]_e = [E_{el}^{tot}]_P$, and equality of real kinetic energies of the electron and proton (see **42** and **42a**) $2T_k^e = (m_C^+ \bullet v^2)_e = (m_C^+ \bullet v^2)_P = 2T_k^P$, we got the following interrelation between their real external impulses, masses and corresponding group velocities:

$$\frac{P_P^+}{P_e^+} = \left[\frac{(m_C^+)_P}{(m_C^+)_e} \right]^{1/2} = \frac{v_e}{v_P}$$
44

At the conditions of Golden mean, **when**: $\left[\Delta m_C = m_C^+ - m_C^- \right]_e^S = m_0$ **(see eq. 22b)**, eqs. **42** and **43a** turns to:

$$E_{el}^S(r) = E_{el}^{\max} \bullet \frac{\vec{r}}{r} = \frac{e^2}{L_0} \bullet \frac{\vec{r}}{r} = \alpha \bullet m_0 c^2 \bullet \frac{\vec{r}}{r}$$
44a

where : $L_0 = \hbar/m_0 c = 3.86 \times 10^{-13}\,\mathrm{m}$ **is a Compton radius of the electron**

As far the Compton radius is in fact experimental parameter, obtained from analysis of scattering of photons on the electrons, we may conclude, that the Nature follows the principle of Hidden harmony or Golden mean, indeed.

The Compton radius of the electron is an averaged value of the real internal real (L^+) vortex and mirror (L^-) rotor radiuses, as it leads from our model:

$$L_0 = (L^+ \bullet L^-)^{1/2} = \left[\hbar/(m_C^+ \bullet v_{gr}^{in}) \bullet \hbar/\left(m_C^- \bullet v_{ph}^{in}\right) \right]^{1/2} = \hbar/m_0 c$$

equal to the radius of cumulative virtual cloud (CVC) and that of bi-vacuum bosons (BVB) at conditions of Hidden Harmony:

$$(L^\pm)^S = \hbar/(m_C^+ - m_C^-)^S c = L_0 = \hbar/m_0 c$$

$\vec{r}$ is radius-vector; $r \geq |\vec{r}| = L_0$ is the distance from the electron.

The averaged hidden impulse of the electron is determined by product of internal real and mirror impulses: $P_{in}^+ = m_C^+ \bullet v_{gr}^{in}$ and $P_{in}^- := m_C^- \bullet v_{ph}^{in}$. Taking into account that $m_C^+ \bullet m_C^- = m_0^2$ and $v_{gr}^{in} \bullet v_{ph}^{in} = c^2$:we get:

$$P_0 = (P_{in}^+ \bullet P_{in}^-)^{1/2} = \pm m_0 c$$

From the principle of uncertainty in coherent form:

$$L_0^2 \bullet P_0^2 = \left(\frac{\hbar}{2} \right)^2$$

we find out that the internal mechanic moment of the electron in the units of Plank constant, equal to its **spin** is:

$$s = \pm \frac{1}{2}$$

Two possible projections of momentum of real vortex of $[C^+]$ state in form of paraboloid of revolution, for particles and antiparticles to selected direction, determines the sign of spin of fermions, like electron or positron.

The total electromagnetic energy of the electron (E_{el}) can be considered as a part of total energy of wave B, equal to that of cumulative virtual cloud (CVC), determined by the fine structure constant $(\alpha = e^2/\hbar c)$ as a factor. This means that the notion of the electric and magnetic components of virtual quanta, responsible for interaction between charged

particles, looks to be pertinent for the wave [W] phase of particle only. However, the electric and magnetic components of charge are related to [real vortex + mirror rotor] dipole of corpuscular [C] phase, correspondingly.

The notions of spin, real mass and time also are pertinent only for [C] phase of particle only.

THE HYDROGEN ATOM

One more evidence in proof of our model is that the Bohr radius of the Hydrogen atom is equal to radius of CVC of the electron and proton, at conditions of Golden mean [$L_0 = (L^{\pm})^S$ at $(m_C^+ - m_C^-) = m_0$]:

$$a_B = \frac{\hbar}{\alpha \bullet m_0 c} = \frac{L_0}{\alpha} = 0.529177249 \times 10^{-10} \, \text{m} \qquad 44b$$

Corresponding condition of the electron's standing wave with the electron's group velocity on the orbit, equal to: $v = \alpha c$ is:

$$\lambda_B = 2\pi \bullet a_B = \frac{h}{m_0(\alpha c)} \qquad 44c$$

One can see from (44c), that the Bohr radius can be expressed also via total electromagnetic energy of the electron in "ideal condition" (eq.44a) as:

$$a_B = \frac{\hbar c}{E_{el}^S} = \frac{Q^2}{E_{el}^S}$$

where $Q^2 = \hbar c$ is a total charge of the electron, squared, related to the total energy of CVC (see **42**).

The energy of electrostatic attraction between electron and proton at the hydrogen atom, compensated in Bohr's model by energy of centripetal energy, is proportional to the total electromagnetic energy of the electron at condition of hidden harmony:

$$E_H = \frac{e^2}{a_B} = \alpha \bullet \frac{e^2}{L_0} = \alpha^2 \bullet m_0 c^2 = \alpha \bullet E_{el}^S \qquad 44d$$

The biggest part of energy of cumulative virtual cloud (CVC = [vacuum density + vacuum symmetry waves] ≡ VDW + VSW), resulted from quantum beats of the electron's unpaired standing neutrino, is nonparticipating in electromagnetism and is responsible for realization of $[C \rightleftharpoons W]$ duality and stabilization of elementary particles. The part of energy of CVC of [W] phase of particle is characterized by radius: $L_0 = \hbar/m_0 c = \alpha \bullet a_B$.

The radius of component of CVC, responsible for interaction between electron and proton, is equal to the Bohr radius (44b).

The part of CVC, nonparticipating in electromagnetism may be responsible for coherent exchange interaction between two standing neutrinos of the electron $[2\nu_0 + \tilde{\nu}_0]$ with opposite spins and counterphase $[C \rightleftharpoons W]$ pulsation. The energy of this part is equal to:

$$E_{CVC}^W = (E_{VDW} + E_{VSW}) - \alpha(E_{VDW} + E_{VSW}) = (E_{VDW} + E_{VSW}) \bullet (1 - \alpha) \qquad 45$$

where: $E_{el}^{\max} = \alpha \bullet (E_{VDW} + E_{VSW}) \ll E_{VDW} + E_{VSW}$

The energy of vacuum density waves is $E_{VDW} = |m_C^+ - m_0| \bullet c^2$ and the energy of vacuum symmetry waves is: $E_{VSW} = |m_C^- - m_0| \bullet c^2$

The total CVC moment of the particle in [W] phase, introduced here, is the invariant:

$$d_{tot} = (m_C^+ - m_C^-) \bullet L^{\pm} = \frac{\hbar}{c} \qquad 46$$

Using (**13**), the quantization rule for electromagnetic energy (**42**) can be expressed as:

$$n E_{el} = \alpha \bullet n\hbar[\omega_C^+ - \omega_C^-] \qquad 47$$

At the Hidden harmony/Golden mean condition, we have for the electron's frequency of $[C \rightleftharpoons W]$ pulsation:

$$\omega_0 = [\omega_C^+ - \omega_C^-] = m_0 c^2/\hbar = 9.03 \bullet 10^{20} \ s^{-1} \qquad \qquad 47a$$

and

$$n(E_{el})_e = \alpha \bullet n\hbar\omega_0 = \alpha \bullet nm_0c^2 = \alpha \bullet n|m_C^+ - m_C^-|_P \bullet c^2 = n(E_{el})_P \qquad 47b$$

where: $\omega_0 = [\omega_C^+ - \omega_C^-]_P = |m_C^+ - m_C^-|_P \bullet c^2/\hbar$, and $|m_C^+ - m_C^-|_P \lll (m_0)_P$

From this formula one can see that the electromagnetic energy emergence is a result of quantum beats between real and mirror corpuscular states of one uncompensated [vortex+rotor] dipole of the electron and three of them in proton's quarks with fractional charge $(+\frac{1}{3})$.

The formula (**47**) and our presentation of elementary wave B as a dynamic system of [real vortex+mirror rotor] dipole get support from the known expression of vector analysis (**48**). We can express the divergency of Pointing vector: $\mathbf{P} = (c/4\pi)[\mathbf{EH}]$ via difference of contributions, related to real and mirror rotors:

$$div[\mathbf{EH}] = \frac{4\pi}{c}div\mathbf{P} = \mathbf{H}rot\mathbf{E} - \mathbf{E}rot\mathbf{H} \qquad \qquad 48$$

where H and E are the magnetic and electric components of virtual photons, radiated by electron in course of quantum beats between real and mirror phase of uncompensated bi-vacuum excitation in a course of its $[C \rightleftharpoons W]$ pulsation.

The analogy between (**47**) and (**48**), illustrating the dynamic [vortex+rotor] dipole background of (**47**), is evident.

THE MECHANISM OF ELECTROMAGNETIC INTERACTION

In accordance to model, the mechanism of electromagnetic repulsion and attraction between charged particles is a result of realization of principle of least action in our formulation. It means tendency of system to minimum of resulting density of energy of cumulative virtual cloud (CVC) (see eq.60), interrelated with vacuum symmetry shift ($\Delta m_V = |m_V^+ - m_V^-|$) and mass symmetry shift ($\Delta m_C = |m_C^+ - m_C^-|$) as one can see from eq. 52.

The **repulsion** is a consequence of streaming of two particle with similar charge to increase the distance between them, as far it minimize the density of energy of CVC of the same sign . The electromagnetic **attraction** is a consequence the same principle, because of two CVC of the opposite energy are tending to compensate the influence of each other, decreasing the **resulting** energy of CVC as a cluster of virtual photons. The closer are opposite charges to each other, the more symmetric becomes energy distribution and resulting vacuum and mass symmetry shift.

In the case of the **electron and positron** scattering, their opposite by energy cumulative virtual clouds: $\mathbf{CVC}^-$ and $\mathbf{CVC}^+$ - transform to the high energy photon structure after overlapping, leading to annihilation of $e^- \ and \ e^+$. The energy of such photon is:

$$h\nu_{ph} = [(m_C^+ - m_C^-)_{e^-} + (m_C^+ - m_C^-)_{e^+}]c^2$$

At the Golden mean condition this formula change to:

$$h\nu_{ph} = \mathbf{2}m_0c^2$$

In general case the energy of photon as a result of annihilation:
$[e^- + e^+] \rightarrow [(2\nu_0 + \widetilde{\nu}_0) + (2\widetilde{\nu}_0 + \nu_0)]$ **can be more than** $2m_0c^2$, **depending on velocity of their colliding. If the energy of photon is more than** $2m_0c^2$, **it can split to [electron+positron] pair again at certain conditions.**

Alternative Corpuscle-Wave model of atom

Besides planetary model of hydrogen atom of Bohr-Sommerfeld, our duality approach

allows to propose the new one It is assumed that $[C \rightleftharpoons W]$ pulsations of the electrons and nuclear of atom are in-phase.

We suppose also, that the electrons in the [C] phase has an ability for limited jumps along line tangent to orbit around the nuclear. The length of one jump (l_0) is determined by period of the electron $[C \rightleftharpoons W]$ pulsation: $T_0 = 2\pi \cdot \omega_0$ (**47a**) and its external group velocity ($v = \alpha c$):

$$l_{lb} = T_0 \cdot v = \alpha \frac{h}{m_0 c} = \alpha L_0 \qquad 48a$$

This real [C] - jump of the electron is much smaller than the length of Bohr's orbit (**44c**). Their ratio is equal to fine structure constant squared:

$$l_{lb}/(2\pi a_B) = \alpha^2 \qquad 48b$$

The stage of the electron-proton interaction, corresponding to [W] phase of atom, represents a superposition of part of their CVC with equal wave B length, determined by Bohr radius (**44b**) in form of **virtual 3D standing wave**. Such 3D standing wave, reflecting [W] phase of atom is not dissipating. It is formed by compensating each other virtual photons of opposite energy. The total absolute value of such energy of electromagnetic interaction in Hydrogen atom is:

$$E_{el}^H = 2\alpha^2 \cdot m_0 c^2 \qquad 48c$$

At the **following** semiperiod the atom returns to its [C] phase and the electron makes its next corpuscular jump around nuclear. As far the real time in virtual [W] phase is absent (see section: "The principle of least action and problem of time"), this phase is out of perception and it looks that the electron in [C] phase is in the process of permanent rotation along the orbit.

The density of charge is oscillating in a course of $[W \rightleftharpoons C]$ pulsations of the [electron+proton] and its movement around nuclear. It means that the interpretation of Van-der-Waals interaction as a result of coherently flickering charge of atoms/molecules remains valid in our model.

In atoms, containing one or integer number of the electrons pairs with opposite spins of the electrons, their counterphase [C-W] cycles of each selected [electron+proton] pair - are accompanied by 3D standing waves formation, which are more symmetric and stable, than in atoms with unpaired valent electrons.

Unification of atoms in a course of different reactions, accompanied by unification of unpaired valent electrons and creation of additional symmetric standing waves B, is energetically favorable. Molecules could be considered as a highly orchestrated dynamic systems, where the $[W \rightleftharpoons C]$ pulsations of all protons, neutrons and electrons are coherent with frequency (**47a**), corresponding to Hidden harmony condition for the electron.

New interpretation of Coulomb interaction between macroscopic bodies. The spinning effect

Let us proceed from assumption, that the interaction (attraction or repulsion) between charged macroscopic bodies is a result of **averaging** of their electromagnetic potentials ($E_C = (E_1 \cdot E_2)^2$, depending on their average charge, squared ($q_{1,2}^2$) and the distance between centers of bodies ($r_{1,2}$):

$$q_{1,2}^2 = \pm(q_1 \cdot q_2)$$

$$r_1 = r_2 = r_{1,2}$$

Consequently, the Coulomb interaction between these bodies, taking into account dielectric permeability (ε), can be expressed as:

$$E_C = -\frac{q_1 \cdot q_2}{\varepsilon r_{1,2}} = -\frac{q_{1,2}^2}{\varepsilon r_{1,2}} \qquad 48d$$

The analog of this formula, leading from our theory (see eq.42):

$$E_C^* = -\frac{\vec{r}}{r_{1,2}} E_{1,2} = -\frac{\vec{r}}{r_{1,2}} [E_1 \bullet E_2]^{1/2} = -\frac{\vec{r}}{r_{1,2}} \alpha \bullet c^2 \left[\sum_{i=1}^{N_i} (m_C^+ - m_C^=)_i \bullet \sum_{j=1}^{N_j} (m_C^+ - m_C^=)_j \right]^{1/2}$$

49

where N_i and N_j are the numbers of elementary uncompensated charges in the volume of first and second body; $(\vec{r})$ is the unitary radius-vector.

If we denote the total mass symmetry shift (difference between real, inertial and mirror, inertialess mass) for each of bodies as a sum of contributions of all elementary charges in its volume:

$$\Delta m_1 = \sum_{i=1}^{N_i} (m_C^+ - m_C^=)_i \quad and \quad \Delta m_2 = \sum_{j=1}^{N_j} (m_C^+ - m_C^=)_j$$

49a

we get from (49):

$$E_C = -\frac{\vec{r}}{r_{1,2}} \alpha c^2 \bullet \Delta m_1^{1/2} \Delta m_2^{1/2} = -\frac{\vec{r}}{r_{1,2}} \alpha \Delta m_{1,2} \bullet c^2$$

49b

where the averaged mass symmetry shift of uncompensated elementary charges of two bodies is: $\Delta m_{1,2} = \pm (\Delta m_1 \Delta m_2)^{1/2}$.

From the comparisons of 49b and 48d, we find the expressions for total charges of two bodies in terms of our model:

$$q_1 = (\vec{r}\varepsilon)^{1/2} \alpha^{1/2} \Delta m_1^{1/2} \bullet c$$

$$q_1 = (\vec{r}\varepsilon)^{1/2} \alpha^{1/2} \Delta m_2^{1/2} \bullet c$$

The averaged resulting charge, squared of two interacting bodies is

$$q_{1,2}^2 = (\vec{r}\varepsilon) \alpha \Delta m_{1,2} \bullet c^2$$

49c

As far, in accordance to our theory (see eq. 42), the mass symmetry shift of elementary charge (Δm_C) is related to its kinetic energy as: $\Delta m_C \bullet c^2 = m_C^+ \bullet v^2$, the eq.(49c) for resulting charge may transformed to:

$$q_{1,2}^2 = (\vec{r}\varepsilon) \alpha m_{1,2}^+ \bullet v^2$$

49d

where: $m_{1,2}^+ = (m_1^+ \bullet m_2^+)^{1/2}$ is the resulting/averaged **real corpuscular mass of** resulting charge of two bodies; v is the resulting group velocity of elementary charges, depending on their coherent thermal oscillations and relative macroscopic movement of two bodies, without the change of distance between centrums of their mass $(r_{1,2})$. The simplest kind of such movement is the relative spinning/rotation of bodies.

The biggest contribution of resulting kinetic energy to (49d) is mostly due to in-phase microscopic atomic/molecular oscillations in the volume of coherent clusters, resulting from high-temperature Bose condensation, in accordance to our Hierarchic theory of condensed matter (see: www.egroups.com/docvault/antigrav). This contribution depends on temperature and the external fields tension, affecting the dynamics of lattice of bodies.

Substitution of 49c or 49d to 48d, will lead to eq.49e, unifying our approach and Coulomb interaction.

Taking into account that $q_{1,2}^2 = n^2 e^2$ (n is the integer number) and $\alpha = e^2/\hbar c$, this formula can be driven to:

$$n^2 = \frac{q_{1,2}^2}{\hbar\alpha} = (\vec{r}\varepsilon)_{x,y,z} \left(\frac{\Delta m_{1,2} \bullet c}{\hbar} \right)_{x,y,z} = (\vec{r}\varepsilon)_{x,y,z} (k_{1,2})_{x,y,z}$$

49e

where $(\varepsilon)_{x,y,z}$ is a tensor of dielectric permeability and $(k_{1,2})_{x,y,z} = (\Delta m_{1,2} \bullet c/\hbar)_{x,y,z}$ is a resulting for system of two bodies the Compton's wave number tensor, determined by the sum of their uncompensated elementary charges mass symmetry shift.

At the conditions of Golden mean, when: $|m_C^+ - m_C^=| = m_0$ we have: $m_1 = N_1 m_0$;

$\Delta m_2 = N_2 m_0$ *and* $\Delta m_{1,2} = m_0 (N_1 N_2)^{1/2}$, **where** N_1 **and** N_2 **are the numbers of uncompensated elementary charges in the first and second bodies, correspondingly**.

For the case of isotropic dielectric permeability, we get from 49b:

$$[n^2/(\vec{r}\varepsilon)]^3 = (c/\hbar)^3 \bullet (\Delta m_{1,2})_x \bullet (\Delta m_{1,2})_y \bullet (\Delta m_{1,2})_z = const \qquad 49f$$

For Newtonian gravitation we get the similar formulae, replacing α to $\beta = (m_0/M_{Pl})^2$. **This phenomena, responsible for electro-gravitational interaction, will be discussed at the next section.**

Using again relation between (49c) and (49d), we get from (49f):

$$[n^2/(\vec{r}\varepsilon)]^3 = c/\hbar^3 \bullet (mv_{1,2}^2)_x \bullet (mv_{1,2}^2)_y \bullet (mv_{1,2}^2)_z = const \qquad 49g$$

These formulae leads to important conclusion: the increasing of velocity of relative rotation of two charged bodies in plane (x,y), normal to (z, parallel to $\vec{r}$**) will be accompanied by relativist enhancement of product** $[(\Delta m_{1,2})_x \bullet (\Delta m_{1,2})_y] \sim [(mv_{1,2}^2)_x \bullet (mv_{1,2}^2)_y]$ **and corresponding decreasing of** $(\Delta m_{1,2})_z$ **and** $(mv_{1,2}^2)_z$**, responsible for Coulomb and gravitational interaction between these two bodies**.

GRAVITATION

The total energy of gravitation of particle is introduced in our model as the energy of gravitational attraction between real and mirror corpuscular masses, separated by wave B dipole length $(L^{\pm} = \hbar/P^{\pm}$ **see eq. 43) of uncompensated standing neutrino in composition of particle. The formula obtained for gravitation are very symmetric to those, obtained for electromagnetism (42–47). The maximum of gravitational potential, produced by one standing neutrino** (v_0) **or antineutrino** $(\tilde{v}_0)$ **as a part of elementary particle**:

$$E_G^{max} = G \bullet \frac{m_C^+ \bullet m_C^-}{L^{\pm}} = G \bullet \frac{m_0^2}{L^{\pm}} \qquad 50$$

$$= \beta \bullet |m_C^+ - m_C^-|_{v_0,\tilde{v}_0} \bullet c^2 = \beta \bullet (m_C^+ \bullet v^2)_{v_0,\tilde{v}_0}$$

$$where \quad \beta = (m_0/M_{Pl})^2 \qquad 50a$$

is the new dimensionless Gravitational Fine Structure, introduced in our theory, containing the Plank mass squared $M_{Pl}^2 = \hbar c/G$;

$E_B^{\pm} = |m_C^+ - m_C^-| \bullet c^2 = m_C^+ v^2 = 2T_k^{ext}$ **is a doubled external kinetic energy of the electron,.equal to the resulting energy of wave B** $(E_B^{\pm})$**.The total real energy of wave B is equal to** $E_B^+ = m_C^+ c^2$.

The decreasing of maximum of gravitational potential with distance, like that of electromagnetic one can be expressed as:

$$E_G(r) = E_G^{max} \bullet \frac{\vec{r}}{r} \qquad 50b$$

where $|\vec{r}|$ **is a radius-vector of gravitating particle or body;** $r \geq |\vec{r}|$ **is a distance from the particle**.

In case of the electron $|\vec{r}| = \hbar/(m_0 c)$.

Using (13), the quantization rule of gravitational energy (50), resulted from beats between positive (m_V^+) **and negative** (m_V^-) **ground states of secondary bi-vacuum, can be expressed as**:

$$nE_G = \beta \bullet n\hbar \bullet |\omega_C^+ - \omega_C^-|_{v_0,\tilde{v}_0} = n|m_V^+ - m_V^-|_{v_0,\tilde{v}_0} \bullet c^2 \qquad 51$$

$$= n \bullet h v_G = n \bullet h(c/\lambda_G)$$

where: $n = 1,2,3...$ **is the integer number;** v_G **is frequency of gravitational waves (GW), equal to frequency of quantum beats between positive and negative vacuum states;**

$$\lambda_G = h/[|m_V^+ - m_V^-|_{v_0,\tilde{v}_0} \bullet c] \qquad 51a$$

is the length of gravitational wave, produced by one elementary particle/antiparticle.

For particle the difference: $|\omega_C^+ - \omega_C^-| \sim |m_V^+ - m_V^-|$ is positive and for antiparticles it is negative. However, just the absolute value of this difference determines the frequency and energy of gravitational field. It means that particles and antiparticles with identical mass generate the equal gravitational potential.

From the right part of eqs. **42** and **50**, it is easy to show after differentiation, that:

$$d\ln E_{el} = d\ln E_G = d\ln m_C^+ + 2d\ln v \qquad \text{51b}$$

It is one of the convincing formula, demonstrating unification of electromagnetism and gravitation in the framework of our theory in very simple way.

At the conditions of Hidden harmony **(21)**, necessary for Golden mean realization **(21a)**, when condition **(22b)** is fulfilled, the eqs. **(49-51)** transforms to:

$$E_G^S(r) = n \bullet \beta \bullet m_0 c^2 \bullet \frac{\vec{r}}{r} = n \bullet \beta \bullet \hbar\omega_0 \bullet \frac{\vec{r}}{r} \qquad \text{51c}$$

where zero-point frequency is defined from the mass of rest of the electron: $\omega_0 = m_0 c^2/\hbar$, equal to frequency of quantum beats between real and mirror states of [C] phase at conditions of Hidden harmony.

The gravitational waves, could be considered as a result of quantum beats between positive and negative bi-vacuum ground states: m_V^+ and m_V^-, pertinent to [C] phase. We assume that asymmetry of real and mirror corpuscular masses of uncompensated standing neutrinos or antineutrinos of fermions - the mass symmetry shift: $\Delta m_C = |m_C^+ - m_C^-|$ induce corresponding bi-vacuum symmetry shift:

$$\triangle m_V = |m_V^+ - m_V^-| = \beta|m_C^+ - m_C^-| = \beta \bullet \Delta m_C \qquad \text{52}$$

where: $m_V^+ = |E_V^+/c^2| = \beta \bullet m_C^+$ and $m_V^- = |E_V^-/c^2| = \beta \bullet m_C^-$ are the absolute effective masses of positive and negative ground vacuum states correspondingly;

The new fundamental constant: **Gravitational fine structure [by analogy with electromagnetic fine structure** $\alpha = (e/Q)^2 = e^2/\hbar c)$] is equal to:

$$\beta = \frac{\triangle m_V}{\triangle m_C} = \left(\frac{m_0}{M_{Pl}}\right)^2 = 1.7385 \bullet 10^{-45} \qquad \text{53}$$

where the Plank mass: $M_{Pl} = (\hbar c/G)^{1/2} = Q/G^{1/2}$ (Q is a total charge).

The Gravitational fine structure may be represented as a ratio of surfaces of bi-vacuum bosons (BVB), with Plank's ($S_{Pl} = \pi L_{Pl}^2 = \pi(\hbar/M_{Pl} \bullet c)^2$ and electron's Compton's ($S_0 = \pi L_0^2 = \pi(\hbar/m_0 \bullet c)^2$ radiuses:

$$\beta = \frac{S_{Pl}}{S_0}$$

It follows from **(53)** that the sign and value of mass symmetry shift $\triangle m_C = \pm (m_C^+ - m_C^-)$ for particle/antiparticle are interrelated with the sign and value of vacuum symmetry shift: $\triangle m_V = \pm(m_V^+ - m_V^-)$ in the point of particle localization.

At the Golden mean condition: $[\triangle m_C = |m_C^+ - m_C^-|]^S = m_0$, we get from **(53)** the vacuum symmetry shift:

$$\pm [\triangle m_V]^S = \frac{m_0^3}{M_{Pl}^2} \qquad \text{53a}$$

The corresponding to this condition curvature of bi-vacuum bosons (BVB) Bose condensate:

$$[L_{BVC}]^S = \frac{\hbar}{\pm[\triangle m_V]^S \bullet c} = \frac{1}{\beta} \bullet \frac{\hbar}{m_0 c} = \frac{L_0}{\beta} = 2.22 \bullet 10^{32} \ m \qquad \text{54}$$

The analogy is existing between the "polaron" - quantum excitation in ionic crystals and

particle in [C] state. Polaron in condensed matter represents the mobile pair with dipole properties [electron + lattice polarization]. For the other hand, the standing neutrino of elementary particle in [C] phase we consider as a "mass - dipole" with resulting charge ($\triangle m_C$), coexisting with vacuum polarization, termed in our model - bi-vacuum symmetry shift ($\triangle m_V$).

The mass and mobility of system: [(C-phase) + vacuum symmetry shift] depends on the absolute value of vacuum polarization: $\triangle m_V$.

Equalizing the wave B dipole length, equal to radius of CVC, presented in form: $L_d = \hbar c/(m_C^+ v^2)$ and gravitational Schwarzschild radius: $r_g = 2Gm_C^+/c^2$, corresponding to radius of black hole, we get the condition of black hole emergency for relativist particle like electron, when $L_d \rightarrow r_g$:

$$m_C^+ v = m_0 v/[1 - (\tfrac{v}{c})^2]^{1/2} = M_{Pl} \bullet c \qquad\qquad 55$$

At this limit condition the de Broglie wave length of particle, i.e. electron, as a mini black hole is determined by the Plank's mass:

$$L_{Pl} = \hbar/(M_{Pl} \bullet c) = 1.61605 \times 10^{-35}\,\text{m} \qquad\qquad 55a$$

Corresponding to black hole radius of secondary bi-vacuum Bose condensate curvature is:

$$[L_{BVC}]^g = \frac{\hbar}{\beta \bullet M_{Pl} \bullet c} = \frac{L_{Pl}}{\beta} \sim 10^9 m \qquad\qquad 55b$$

It is still pretty big even under condition of mini-black hole origination.

THE MECHANISM OF GRAVITATIONAL INTERACTION

It can be similar to hydrodynamic Bjorkness interaction between pulsing particles in liquids, radiating acoustic waves. We suppose that gravitational waves, resulted from quantum beats between positive and negative ground states of vacuum, decreasing the vacuum symmetry shift, are decreasing also the virtual quanta pressure between particles more than outside of them. This leads to excessive outside vacuum pressure, providing the gravitational attraction between bodies.

In accordance with the existing theory of Bjorkness force, it is dependent on distance between pulsing bodies or microbubbles in liquid - as $(1/r^2)$.

It is important that this force could be positive and negative, depending on difference of phase of pulsations, generating density waves. In turn, this phase shift is dependent on relation of distance between bodies to acoustic (or gravitational in our case) wave length. If the length of acoustic (gravitational) waves, excited by bodies, is less or comparable with the distance between bodies, the Bjorkness (gravitational) force is attractive. If the distance is much bigger than wave length, then the attraction of bodies turns to repulsion. This mean origination of antigravitation.

The large-scale honey-comb structure of the Universe, its huge voids, could be explained by the interplay of gravitational attraction and repulsion between clusters of galactics, depending on the distance between them.

Recently a strong evidence appears, pointing to acceleration of the Universe expansion. This phenomena could be explained by increasing the antigravitation factor with increasing the distance between galactics. This confirms our hydrodynamic model of mechanism of gravitation.

Like electromagnetic interaction, the gravitational one can be considered as a result of principle of least action realization (see eq. 60). For this end we have to assume, that the resulting vacuum symmetry shift, represented by sum of contributions of ($\triangle m_V$) between bodies and outside of them - decreases with decreasing the distance between them.

For the other hand, if the starting separation between bodies (**L**) is big enough:.

$$\mathbf{L} > L_{BVC} = \hbar/[\Delta m_V \bullet c] \qquad \text{55c}$$

then the increasing of this separation minimize the resulting vacuum symmetry shift, **i.e**. we have a gravitational repulsion.

The gravitational interaction is related to the very low-energy virtual quanta pressure oscillation between positive and negative zero-point vacuum, which may be termed as **under**-zero-point virtual quanta ($-\frac{1}{2}\hbar\omega_0 < E_{SV} < +\frac{1}{2}\hbar\omega_0$), in contrast to virtual quanta with energy, bigger than absolute value of zero-point energy: $\left|\pm\frac{1}{2}\hbar\omega_0\right|$. [2]

The gravitational interaction is displayed itself as a result of bi-vacuum symmetry shift and corresponding virtual pressure emergency:

$$\Pi_V \sim \Delta m_V \bullet c^2$$

The quantum beats between bi-vacuum sublevels, exciting the gravitational waves (GW) with frequency

$$\nu_{GW} = \frac{c^2}{h}\left(\left|m_V^+ - \frac{1}{2}m_0^+\right| + \left|m_{\bar{V}}^- - \frac{1}{2}m_{\bar{0}}^-\right|\right)$$

decreases the Δm_V and Π_V.

Consequently, the GW represents the density/pressure oscillations of the **under zero-point virtual quanta**, excited as a consequence of beats between positive and negative vacuum states, formed by bi-vacuum bosons Bose condensate. In another terms, GW can be considered as a result of interference between vacuum symmetry waves (VSW$^+$ and VSW$^-$). In the framework of our model there are no evidence, pointing to luminal limitation of gravitational waves propagation.

It contrast to gravitational field, the electromagnetic field is a result of quasi-real vacuum density waves (VDW) interference, enable to impulse and energy transmission.

Comparing our formulae for total electromagnetic (**42**) and gravitational (**49**) energies, we get the relation between them:

$$\frac{E_{el-m}}{E_G} = \frac{\alpha}{\beta} = \frac{e^2}{Gm_0^2} = 4.1975 \bullet 10^{42} \qquad \text{56}$$

These results and presented below point out, that our model may serve as a natural and clear background for Superunification.

The interrelation with general theory of relativity

It is possible to demonstrate a relation between Einstein's idea concerning curving the geometry of space in the presence of gravitating body and our vacuum symmetry shift parameter:

$$\Delta m_V = |m_V^+ - m_{\bar{V}}^-| = \beta|m_C^+ - m_{\bar{C}}^-| \qquad \text{57}$$

Einstein postulates that gravitation changes the trajectory of probe body from the right to geodesic one due to curving conventional two-dimensional surface in 3D space. For example, trajectories of planets round the sun corresponds to geodesic lines.

Instead Euclid geometry on *flat* surface, the Lobachevsky geometry on *curved* surface was used in Einstein's classic theory of gravitation. The criteria of surface curvature for sphere - is a difference between sum of angles in triangle on the flat surface equal to $\pi = 180^0$, and that on curved surface:

$$\Sigma = \pi + S/R^2$$

where: S is a square of triangle (πR^2 on the flat surface); R is a sphere radius, or a curvature radius in general case:

$$R = \sqrt{\frac{S}{\Sigma - \pi}}$$
57a

when $(\Sigma - \pi) > 0$, the curvature $(R > 0)$ is positive; when $(\Sigma - \pi) < 0$, the curvature R is imaginary and corresponding space is negative. If the space (surface) is flat, then $R = \infty$ and $\Sigma = \pi = 180^0$.

In our Wave - Corpuscle Duality Model of Gravitation instead space-time curvature R we introduce a Bi-Vacuum Symmetry Curvature, defined as:
$$\pm L_{vac} = \pm \frac{\lambda_{vac}}{2\pi} = \frac{\hbar}{\pm \Delta m_V \cdot c} = \frac{\hbar}{\pm \beta \Delta m_C \cdot c}$$
57b

where: $\pm \Delta m_V = \pm(|m_V^+| - |m_V^-|) = \pm \beta \Delta m_C$ is a vacuum symmetry shift, positive for particles and negative for antiparticles, related directly to mass symmetry shift.

It is possible to calculate, using (2.9) that vacuum curvature, induced by particle with mass, equal to that of the electron ($m_e = 9.1095 \cdot 10^{-31} kg$) is: $L_V^e = 3.2288 \cdot 10^{35} m$.
For the particle with mass of proton ($m_P = 1.6726 \cdot 10^{-27} kg$) we have:
$L_V^P = 5.212 \cdot 10^{25} m$.
Energy of gravitational field, produced by one proton, calculated from (2.9) is equal to:
$\epsilon_G^P = 8.8904 \cdot 10^{-52} J$.

The analogy between R and L_{vac} (2.26 and 2.27) is obvious. The more is energy of gravitational field ϵ_G, the more is vacuum symmetry shift (Δm_V) and bi-vacuum curvature. The bigger is bi-vacuum curvature, the less is radius (L_{vac}).
In condition of black hole origination, when $\Delta m_V \to \beta M_{Pl}$ the bi-vacuum curvature radius tends to that, determined by gravitational radius (r_g) of black hole and Plank length (see 55b):
$$L_{Vac}^* = \frac{\hbar}{\beta M_{Pl} \cdot c} = r_g / 2\beta$$
57c

On the other hand, in the absence of gravitation, when the positive and negative vacuum ground states are in state of ideal symmetry and equilibrium:
$$| m_V^+ | = | m_V^- | = \frac{1}{2} m_0 = \frac{1}{2} m_C^+$$
57d

and $\Delta m_V = 0$, then the bi-vacuum is flat: $L_{Vac} = \infty$.

The photons trajectory reflects the bi-vacuum curvature in 3D space. It is a consequence of our model of photon as a superposition of three pairs of coherent standing [neutrino + antineutrino], moving in bi-vacuum without its symmetry perturbation.
The trajectory of photon follows the bi-vacuum Bose condensate radius and in general case deviate from the straight line, corresponding to "flat" primordial bi-vacuum in the absence of matter. Near the black holes it turns to the closed one as a result of corresponding bi-vacuum symmetry violation.
As well as General theory of relativity our theory can explain the red shift of photons in gravitational field. The RED, low-frequency shift:
$$\Delta \omega_p^{1,2} = \omega_p^{(1)} - \omega_p^{(2)}$$
57e

of photons in gravitation field is a result of deviation of their trajectory from the right line and is a consequence of increasing the vacuum symmetry curvature and corresponding length of its path.
In accordance to our model, red shift has a simple relation with difference of vacuum symmetry shifts at point of photon radiation $\Delta m_V^1 = (| m_V^+ | - | m_V^- |)^1$ and at point of it registration $\Delta m_V^{(2)} = (| m_V^+ | - | m_V^- |)^{(2)}$:
$$\Delta \Delta m_V^{1,2} = \Delta m_V^{(1)} - \Delta m_V^{(2)}$$

in a form:

$$\hbar \Delta \omega_p^{1,2} = \Delta \Delta m_V^{1,2} \bullet c^2 \qquad\qquad 57f$$

$$or: \quad \Delta \omega_p^{1,2} = \frac{\Delta \Delta m_V^{1,2} \bullet c^2}{\hbar}$$

It is easy to see that if $\Delta \Delta m_V^{1,2} = 0$, **i.e. bi-vacuum is flat, then** $\omega_p^{(1)} = \omega_p^{(2)}$ **and red shift is absent**.

We may conclude, that our Duality Model of Gravitation explains the same phenomena, as do the General theory of relativity, but in terms of vacuum symmetry shift with tensor properties, instead of curved space-time. The tensor properties of bi-vacuum symmetry shift is related directly to that of mass symmetry shift: $(\Delta m_V = \beta \Delta m_C)_{x,y,z}$, produced by asymmetry of relativist real mass dependence on the external group velocity in 3D space.

New interpretation of Newtonian interaction between macroscopic bodies. The spinning and Biefeld-Brown effects

Let' compare the formulae of Newtonian gravitational attraction between two macroscopic bodies and gravitational potentials of these bodies, leading from our theory (**49, 50**):

$$E_G = G \frac{m_1 \bullet m_2}{r_{1,2}} = G \frac{m_{1,2}^2}{r_{1,2}} \qquad\qquad 58$$

$$E_G^{\max} = \frac{\vec{r}}{r_{1,2}} \beta \bullet \sum_{e,p,n}^{1,2} |m_C^+ - m_C^-|_{e,p,n} \bullet c^2 = \frac{\vec{r}}{r_{1,2}} \beta \bullet \sum_{e,p,n}^{1,2} (m_C^+ \bullet v^2)_{e,p,n} \qquad 58a$$

$$where: \quad r_{1,2} \ is \ the \ distan ce \ between \ centers \ of \ bodies;$$

$$m_{1,2} = (m_1 m_2)^{1/2} \ is \ the \ ave \arg ed \ mass \ of \ two \ bodies; \quad \beta = (m_0/M_{Pl})^2$$

Using the same considerations, as in section "Electromagnetism", eq. **58** turns to **58a** at conditions:

$$m_1 = (\vec{r})^{1/2} \beta^{1/2} \Delta m_1^{1/2} \bullet c/G^{1/2} = (\vec{r})^{1/2} \beta^{1/2} \bullet (m_C^+)_1^{1/2} v_{1,2}/G^{1/2} \qquad 58b$$

$$m_2 = (\vec{r})^{1/2} \beta^{1/2} \Delta m_2^{1/2} \bullet c/G^{1/2} = (\vec{r})^{1/2} \beta^{1/2} \bullet (m_C^+)_2^{1/2} v_{1,2}/G^{1/2}$$

$$where: \quad v_{1,2} = (v_1 v_2)^{1/2} \ is \ the \ relative \ resulting \ velocity;$$

$$\Delta m_1 = \sum_{e,p,n}^{1} |m_C^+ - m_C^-|_{e,p,n} \quad \Delta m_2 = \sum_{e,p,n}^{2} |m_C^+ - m_C^-|_{e,p,n}$$

The masses of each body are the result of all elementary particles mass summation. In the Golden mean conditions, as was shown earlier: $|m_C^+ - m_C^-|_{e,p,n} = (m_0)_{e,p,n}$. It looks, that the existing of such invariant as Avogadro number - confirms our hypothesis, that the elementary particles in composition of atoms and molecules and atoms/molecules itself in any phase of matter are tending to certain ratio (**25**), providing realization of Hidden harmony condition (**21**), as a background of Golden mean rule (**21a**).

For the averaged mass, squared, we get from **58b**:

$$m_{1,2}^2 = (\vec{r}) \bullet (m_0/M_{Pl})^2 \bullet \Delta m_{1,2} \bullet c^2/G = (\vec{r}) \bullet (m_0/M_{Pl})^2 \bullet (m_C^+)_{1,2} \bullet v_{1,2}^2/G \qquad 58c$$

If we assume that $(m_{1,2}^2/m_0^2) = N^2$, then, taking into account that $G = \hbar c/M_{Pl}^2$, (**58c**) may be transformed to important formula, meaning that the resulting volume in 3D energetic space is permanent:

$$\left(\frac{1}{\vec{r}} N^2 \bullet \hbar c \right)^3 = (\Delta m_{1,2} \bullet c^2)_{x,y,z}^3 = [(m_C^+)_{1,2} \bullet v_{1,2}^2]_{x,y,z}^3 = const \qquad 58d$$

One can see from this formula that if due to any external factors (electric or magnetic fields, relative rotation of interacting bodies, etc., the value of $(\Delta m_{1,2} \bullet c^2)^2_{x,y} = \left[(m_C^+)_{1,2} \bullet v_{1,2}^2\right]^2_{x,y}$ is increasing, the "vertical" component of gravitational interaction $(\Delta m_{1,2} \bullet c^2)_z = \left[(m_C^+)_{1,2} \bullet v_{1,2}^2\right]_z$ should decrease. Such effect corresponds to decreasing of gravitational attraction between bodies.

In the case of charged condensers, the mechanism described, may be responsible for Biefeld-Brown effect. **The explanation of this effect is related to polarization of charge and mass of dielectric molecules in electric field in such a way, that massive positive nuclears are shifted towards negative plate of condenser and their oscillations become more unharmonic and asymmetric in 3D space. In accordance to our Hierarchic theory of condensed matter, significant fraction of atoms/molecules in solids are composition of coherent clusters, formed as a result of high-temperature Bose condensation (see my: "Hierarchic theory of condensed matter..." at: www.egroup.com/docvault/antigrav) This is important factor, making the influence of external field on the atoms/molecules charge and mass polarization - cumulative. Correspondingly, the virial coefficient, equal to ratio between the resulting doubled kinetic and potential energy of coherent fraction of positively charged nuclears of dielectric between plates, as a tensor, becomes also more asymmetric. For the other hand, in accordance to this theory, between tensors of mass symmetry shift, responsible for electromagnetism, and tensor of vacuum symmetry shift, responsible for gravitation, - the direct correlation exists:** $(\Delta m_V = \beta \Delta m_C)_{x,y,z}$.

The decreasing of resulting component of tensor in direction of positively charged plate of condenser (+):

$$(\Delta m_{1,2} \bullet c^2)^+_z = \left[(m_C^+)_{1,2} \bullet v_{1,2}^2\right]^+_z \qquad \text{58e}$$

corresponds to decreasing of gravitational attraction and electromagnetic interaction presumably in this direction (+z) as respect to directions, opposite (-z) and normal ($\pm$x, $\pm$y) to this one. This may explain the asymmetric Biefeld-Brown effect.

If both plates of condenser have the same charge, then independently of sign of charge, the amplitude and kinetic energy of [nuclears+electronic shells] oscillations will be more limited in direction normal to plates, than in directions of the same plane, decreasing selectively the normal component of gravitational interaction of mass of dielectric between plates with Earth.

Charging the dielectric disk positively or negatively with external source of charge - will lead to charge distribution near its surface due to Coulomb repulsion. In this case the effects will be the same, as in the case of unipolar condensers, described above. The electro-gravitational effect will increase with relative rotation of discs in accordance to mechanism proposed.

Our mechanism of Biefeld-Brown and related effects - explains their dependence on mass of dielectric between plates, dielectric permeability, as far it is related with polarizability and density of dielectric, the density of electromagnetic energy between plates, related to proximity of plates and voltage.

The mechanism predicts also, that the increasing of temperature, declining the coherence of unharmonic nuclears oscillations at the permanent other conditions (taking into account possible decreasing of dielectric permeability) should decrease the values of electro-gravity effects.

It.is a way for experimental verification of suggested mechanism, based on our duality model.

THE PRINCIPLE OF LEAST ACTION

It can be shown, that the Principle of Least Action is one, reflecting the nonlocal Wave - quality of the World and its feedback reaction with local Corpuscular - quality. After Lagrange, the action for particle, like electron could be expressed as:

$$S = \int_{t_1}^{t_2} 2T_k dt \qquad 59$$

If T_{kin} is the averaged kinetic energy of particle (or system of particles) during the time interval: $t = t_2 - t_1$, we have from (59):

$$S = 2T_{kin}t \qquad 59a$$

Representing the time interval (t) as an integer number of $[C \rightleftharpoons W]$ pulsation period (T_0) we have:

$$t = nT_{C \rightleftharpoons W} = n \bullet h/[(m_C^+ - m_C^-)c^2], \quad where: \quad n = 1, 2, 3, ... \qquad 59b$$

At condition of Golden mean, when: $(m_C^+ - m_C^-) = m_0$, we get: $t = nT_0$. This means that time is a discreet parameter and can be quantizated.

Using expression for doubled kinetic energy of particle in [C] and [W]-phase eq.(12), we get the following expressions for action:

$$S = m_C^+v^2 \bullet t = (m_C^+ - m_C^-)c^2 \bullet t = [(m_V^+ - m_V^-)c^2/\beta] \bullet t \qquad 60$$

We can see from (60) that the fundamental principle of least action: $\delta S = 0$, leads to new formula, interrelating the positive pace of time for particle or body ($d\ln t = dt/t$) with the decreasing of its kinetic energy, including real mass of particle (body) and its velocity:

$$d\ln t = -d\ln T_{kin} = -[d\ln m_C^+ + 2d\ln v] \qquad 61$$

The similar result we can get from principle of uncertainty in coherent form.

Condition (61) unify the pace of time for particle or system of particles with pace of this system's mass change ($d\ln m_C^+ = dm_C^+/m_C^+$) and with pace of its velocity change ($d\ln v = dv/v$).

Another version of this formula interrelates the pace of time with particles mass - symmetry shift $\triangle m_C = (m_C^+ - m_C^-)$ and corresponding vacuum symmetry shift $\triangle m_V = m_V^+ - m_V^- = \beta \triangle m_C$:

$$\triangle \ln t = -d\ln(m_C^+ - m_C^-) = -d\ln(m_V^+ - m_V^-) \qquad 62$$

$$or: \triangle \ln t = \triangle \ln E_{el} = \triangle \ln E_G$$

Comparisons of this formula with those, describing the electromagnetic (42) and gravitational (51) energy leads to important conclusion: oscillations of electromagnetic and gravitational fields should be accompanied by time oscillations, i.e. TEMPORAL WAVES & FIELD origination. Like electromagnetic and gravitational, the TEMPORAL waves may form a standing, hologram-like pattern.

The TEMPORAL FIELD, consequently, is related directly and may be influenced by electromagnetic and gravitational fields.

At the condition of Hidden Harmony and Golden mean, when $\triangle m_C = (m_C^+ - m_C^-) = m_0 = const$, the pace of time for such system is zero:

$$\triangle \ln t = -d\ln m_0 = 0 \qquad 62a$$

This condition means the achievement of top of evolution/self-organization of selected system.

Our approach to problem of time, based on eq.(61) leads to definition: "Time for any closed nonequilibrium or oscillating physical system is a parameter, characterizing the pace of this system kinetic energy (mass and velocity) change".

In accordance to our model, the characteristic time for any closed system (t_i), including the Universe, is positive if the kinetic energy, including the real mass of this system M_i and its velocity is decreasing and negative in the opposite case:

$$t_i = -\frac{T_{kin}}{dT_{kin}/dt} = -\left[\frac{M_i}{dM_i/dt} + 2\frac{v}{dv/dt}\right] \qquad 63$$

This relation, derived from eq. (**61**) between the time and pace of kinetic energy change is valid for any selected closed system.

When the pace of change of such system's mass and velocity - tends to zero, it determines the delay of different physico-chemical processes.

The course of time for any system could be characterized by the time decrement, introduced as:

$$D_i = \exp\left(-\frac{t_i}{T_0}\right) \qquad 64$$

where: $T_0 = 1/\nu_0 = h/(m_0c^2)$ is period of wave B [C $\rightleftharpoons$ W] oscillations, corresponding to Hidden harmony condition.

Hierarchy of systems from atom to universe determines the corresponding hierarchy of time-scales.

If the decreasing of mass of system and its cooling, ($\mathbf{kT} \to 0$ and $v \to 0$) is irreversible, for example as a result of IR photons radiation, the time for this system is positive and irreversible also. This process corresponds to second law of thermodynamics realization.

The Principle of least action in form (**62**) for the minimum time interval ($\triangle t = $ min) means that charged and neutral particles "choose" the trajectory, corresponding to the minimum change of generated by their propagation electromagnetic ($E_{el}^S \sim \Delta m_C$, eq.44a) and gravitational ($E_G^S \sim \Delta m_V$, eq.51a) energy. This happens, for example, at the conditions of Hidden harmony for selected system.

Such ability of particles (including photons) to "seek out" this optimal trajectory can be only a consequence of feedback reaction between their nonlocal due to vacuum amplitude waves (VAW) and local properties of particles in a course of their [$C \rightleftharpoons W$] pulsations. **This is a new quantum explanation of the fundamental Principle of Least Action, based on our model**.

For the other hand, formula (**62**) in combination of eqs.(**42 and 49**) means that the pace of time and, consequently, the dynamics of different process should be in-phase with oscillations of gravitational and electromagnetic fields.

On macroscopic scale such oscillations can correspond to periods of:
a) Earth rotation around its own axe;
b) rotation of Earth around Sun and
c) rotation of Moon around Earth.

The experimental evidence of macroscopic oscillations of very different dynamic processes (physical, chemical and biological) of the mentioned above periods has been obtained in long term systematic observations by team of S. Shnol from Moscow university.

NEW INTERPRETATION OF THE WAVE FUNCTION

Our dynamic duality model makes it possible to modify the interpretation of the wave B function of Schrödinger equation. We can present wave functions ψ and ψ^* in dimensionless form, using the **effective** mass of the electron [$2\nu_0 + \widetilde{\nu}_0$], determined by uncompensated standing neutrino (ν_0) :

$$\Psi^+ = \frac{|m_C^+ - m_0|}{m_0} \qquad\qquad 65$$

$$\Psi^- = \frac{|m_C^- - m_0|}{m_0} \qquad\qquad 65a$$

On the microscopic level the wave function squared is dependent on the product of instant values of real and mirror corpuscular mass shifts: $(\Delta m^+ \bullet \Delta m^-)$, related to fraction of time (f_C^t), which particle spend in corpuscular phase:

$$|\Psi|^2 = \Psi^+ \bullet \Psi^- = \frac{|m_C^+ - m_0|}{m_0} \bullet \frac{|m_C^- - m_0|}{m_0} = \frac{(\Delta m^+ \bullet \Delta m^-)}{m_0^2} \qquad 66$$

$$f_C^t = \frac{\tau_C}{\tau_C + \tau_W} = \frac{1}{1 + K_{[W \rightleftharpoons C]}} \qquad\qquad 66a$$

where: $m_0^t = (m_C^+ \bullet m_C^-)^{1/2}$ **is the resulting zero-point corpuscular mass. The product of real and mirror mass symmetry shift:** $[(\Delta m^+ \bullet \Delta m^-) > 0]_C$ **in Corpuscular phase is positive. In the Wave phase, when** $\Delta m^+ = \Delta m^- = 0$**, it is zero.**

One can see from (66), that the mass symmetry shifts - changes in-phase with probability of location of particle in [C] phase in the any given volume of space, equal to the wave function squared $|\Psi|^2$**.**

Our theory predicts that finding the way to shift the $[C \rightleftharpoons W]$ equilibrium could be a way to change the real mass of body. For example, the application of strong magnetic or electric fields, interacting with CVC of the charged particles - can influence the vacuum symmetry shift and change the real mass of body. This effect may be used also for propulsion of one matter throw another or big space-jumps.

The elementary particles of positive and negative charge, like electrons and protons have the opposite influence on the vacuum symmetry shift, i.e. gravitation. In accordance to our Alternative corpuscle-wave model of atom, at some conditions, the distance between their electron's and proton's can become very small as a result of violation of Golden mean condition: $(m_C^+ - m_C^-) > m_0$ **(see eq.44b). As conditions of strong overlapping of their cumulative virtual clouds (CVC), their opposite bi-vacuum shifts can totally or partially compensate each other without annihilation. Our gravitation theory predicts, that this effect should be accompanied by decreasing of the effective mass of such atoms and their gravitational potential.**

INTERRELATION BETWEEN MICROSCOPIC [WAVE $\rightleftharpoons$ CORPUSCLE] EQUILIBRIUM AND MACROSCOPIC [VACUUM$_S$ $\rightleftharpoons$ MATTER] EQUILIBRIUM

Physical vacuum in our theory is subdivided to Primordial BI-VACUUM, existing without matter, and Secondary one [VACUUM$_S$], coexisting with matter and fields, produced by matter.

Secondary vacuum reflects the interference of the nonlocal vacuum amplitude waves (VAW), vacuum density waves(VDW) and vacuum symmetry waves (VSW) as a components of cumulative virtual cloud (CVC), resulted from [C $\rightleftharpoons$ W] pulsation of elementary particles. Secondary vacuum is a result of perturbations of superfluid Primordial vacuum properties (energy slit and symmetry) by huge number of particles.

It follows from our model, that coherent over the large-scale microscopic [Wave $\rightleftharpoons$ Corpuscle] dynamic equilibrium of elementary particles - can lead to macroscopic [VACUUM$_S$ $\rightleftharpoons$ MATTER] dynamic equilibrium.

The asymmetrical state of the electron is related to semiperiod of wave B, when one (unpaired) standing neutrino (ν_0) is in Corpuscular phase and pair $(\nu_0 + \tilde{\nu}_0)$ is in the Wave phase.

In contrast to **symmetrical** $[C \rightleftharpoons W]$ **pulsation of** $(v_0 + \widetilde{v}_0)$ **pairs, generating nonlocal vacuum amplitude waves (VAW), the asymmetrical pulsation of uncompensated standing neutrino** (v_0), **accompanied by** [emission $\rightleftharpoons$ absorption] **of cumulative virtual cloud (CVC), can be accompanied by energy (electromagnetic and gravitational) transfer as far the resulting Pointing vector is nonzero. Such kind of CVC can't be superluminal or nonlocal. The same is true for bosons, like photons, when one of** [neutrino + antineutrino] **pair have nonzero resulting momentum and their spins have the same sign.**

At the 1st semiperiod **of wave B, when pair** $(v_0 + \widetilde{v}_0)$ **as a part of the electron** $(2v_0 + \widetilde{v}_0)$ **or quark is in the [W] phase and forms positive and negative virtual quanta of** $(\textbf{VACUUM}_S)_{ON}$ with minimum slit of bi-vacuum, **the second standing neutrino** (v_0) **of the electron is in Corpuscular state and forms the** $(\textbf{MATTER})_{ON}$. **This instant situation on macroscopic scale corresponds to our perceptible "ON"- World.**

At the 2nd semiperiod **of wave B pulsation, when standing [neutrino-antineutrino] pair** $(v_0 + \widetilde{v}_0)$ **is in [C] phase and the energy slit of bi-vacuum (VAW) is increasing, the unpaired standing neutrino** (v_0) **is in the [W] phase. At this moment our** $(\textbf{VACUUM}_S)_{ON}$ **collapses to hidden** $(\textbf{MATTER})_{OFF}$. **Simultaneously our explicated Corpuscular "ON" World transforms to hidden implicated** $(\textbf{VACUUM}_S)_{OFF}$. **Such enfolded,** $[\textbf{VACUUM}_S + \textbf{MATTER}]_{OFF}$ **subsystem of the part of the UNIVERSE with in-phase** $[C \rightleftharpoons W]$ **pulsation - is alternative to unfolded** $[\textbf{MATTER} + \textbf{VACUUM}_S]_{ON}$ **subsystem.**

The perception of World by bio-receptors and equipment normally is limited by [ON] **in-phase subsystem, corresponding to the first of two described above semiperiods only and fields, resulting from** [ON $\rightleftharpoons$ OFF] **transitions. The dynamics of conversions between** [ON] **and** [OFF] **– coherent Worlds due to their ultrahigh frequency cannot be registered experimentally. The result of dynamic equilibrium between these subsystems in form of fields is detectable only.**

The feedback reaction between [ON] **and** [OFF] **coherent Worlds subsystems as a consequence of nonlocality of VAW may exist as a condition for the UNIVERSE self-organization.**

The coherent molecular dynamics of real MATTER$_{ON}$, **including living organisms, with alternating acceleration and mass of particles** $(\textbf{m}_C^+)$ **- is related with corresponding dynamics of VDW, VSW and nonlocal VAW, beats between them and wave packets formation. Changing the part of this complicated interference picture with hologram properties, induced by change of matter properties means holomovement after Bohm.**

Such holomovement can be imprinted in $[\textbf{VACUUM}_S]_{OFF}$ **and, consequently, in** $[\textbf{VACUUM}]_{ON}$ **as the Informational Dynamic Replica of our World. The deviation of Informational Replica from "Thermal Noise" of** $[\textbf{VACUUM}_S]_{ON}$ **is dependent on the scale of coherent molecular/atomic excitations, responsible for Virtual Replica origination.**

PROPERTIES OF BI-VACUUM BOSONS (BVB),
VACUUM AMPLITUDE, VACUUM DENSITY AND SYMMETRY WAVES
(VAW; VDW and VSW), AS A SOURCE OF INFORMATIONAL FIELD

In corpuscular (collapsed) state the real corpuscular mass (m_C^+) **of standing neutrino or antineutrino, in another terms:** [real vortex+mirror rotor] **or** [mirror vortex+real rotor] **dipoles determines the real, measurable mass of particle or antiparticle. The mirror mass** (m_C^-) **is hidden. As a result of beats between real and mirror states, the both mass are equalizing and tending to mass of rest** (m_0) **of particle:**

$$m_C^+ \to m_C^- \to m_0, \ where : |m_C^+| > m_0 > |m_C^-|$$

It happens due to partial conversion of m_C^+ **and** m_C^- **to cumulative cloud of positive and**

negative virtual quanta (CVC), corresponding to [W]-phase of particle.

From eq.(**9**) it leads that at this phase, the mass symmetry shift ($\triangle m_C$), the external impulse and external group velocity of BVB (binding or anchor site of CVC) turns to zero:

$$\triangle m_C = (m_C^+ - m_C^-) = 0; \quad P_C = 0 \quad and \quad v \to 0 \qquad\qquad 67$$

Putting the **external** group velocity: $v = 0$ to formula (**19**) one can see, that at this condition the **internal** group and phase velocities becomes equal to each other and to that of light velocity.

$$v_{gr}^{in} = v_{ph}^{in} = c \quad at \quad m_0^+ = m_0^- = m_0 \qquad\qquad 67a$$

It is a conditions of symmetric BVB existing as a pair of virtual [rotor + antirotor]. The radius of BVB is equal to that of the electron's cumulative virtual cloud (CVC) and the Compton radius at the condition of Hidden harmony:

$$L_{BVB} = \hbar/m_0 c = 3.86 \times 10^{-13}\,\text{m} \qquad\qquad 68$$

The surfaces of positive and negative components of BVB and their sum are equal to (**16d**).

Our notion of BI-VACUUM did not make limitations on the value of $m_0 = m_0^+ = m_0^-$ and, consequently radiuses of rotor and antirotor, composing bi-vacuum bosons (**BVB**) because of compensation of energy and impulse in the realm of bi-vacuum. The radiuses of rotor (L^+) and antirotor (L^-) of BVB from principle of uncertainty in coherent form: $L^\pm \bullet P^\pm = \hbar/2$ may be expressed like:

$$L^+ = \frac{+\hbar}{2P^+} \quad and \quad L^- = \frac{-\hbar}{2P^-} \qquad\qquad 68a$$

In the case of symmetric BVB with zero resulting momentum, we have $L^+ = L^-$ and $P^+ + P^- = 0$.

The values of impulses in the framework of our model may vary from $|P^+| = |P^-| = m_0 c$ to $|P^+| = |P^-| = M_{Pl} \bullet c$, where m_0 is a rest-mass of the electron and M_{Pl} is the Plank mass. In principle, the variation in mass and corresponding variation in diameter of rotor and antirotor, forming different BVB may be even bigger. However, judging from discreet values of mass of elementary particles, the "resonant" values of BVB parameters: mass, impulse, radius must exist. The minimum by dimensions BVB with resonant properties may form the "molecules" of bi-vacuum as a quantum superfluid liquid. It means that a scale fractal hierarchy of BVB may exist, which determines the selected properties of bi-vacuum and that of elementary particles.

The idea of Neil Boyd about subquantum particles, composing vacuum and elementary particles, is compatible with our model, if we assume that they represent the smallest resonant BVB in their ground (symmetric) and .excited (asymmetric) states.

The quantum beats between different resonant conditions of symmetric BVB lead to excitation of nonlocal vacuum amplitude waves (VAW).

The vacuum amplitude waves (VAW) display themselves as the oscillation of energetic slit (ΔA_{VAW}) between positive and negative ground levels of bi-vacuum, equal to:

$$\Delta A_{VAW} = (\Delta m_V^+ + \Delta m_V^-) \bullet c^2 \qquad\qquad 69$$

For the case of symmetric BVB excitation: $\Delta m_V^+ = \Delta m_V^- = \Delta m_V$ and $\Delta A_{VAW} = 2\Delta m_V$ where two resonant energies of bi-vacuum are:

$$E^0 = A^0 = m_0 c^2 \quad and \quad E^1 = (m_0 + \Delta m_0)c^2 \qquad\qquad 70$$

The radius of corresponding symmetrical BVB is equal to: $L_{BVB}^0 = \hbar/m_0 c$ and $L_{BVB}^1 = \hbar/(m_0 + \Delta m_0)c$.

The frequency of VAW is:

$$\nu_{VAW} = \Delta A_{VAW}/\hbar \qquad\qquad 71$$

After squaring the left formula in (**70**) and differentiation, taking into account, that $m_0^2 = m_C^+ \bullet m_C^-$ we get after simple reorganizations:

$$d \ln A_{VAW} = \frac{1}{2}[d \ln m_C^+ + d \ln m_C^-] \bullet c^2 \qquad 72$$

This formula points that acceleration of particles and corresponding change of m_C^+ and m_C^- should influence on the energy of vacuum amplitude waves (**VAW**).

The excitation of VAW is accompanied by oscillation of BVB density, virtual pressure and correlated oscillation of energy in realms of positive and negative vacuum. If we assume that between two conducting plates the probability of big transitions, between different coherent states of bi-vacuum and VAW excitation is less, than outside of such "condenser", this explains Casimir effect. Such probability decreasing may happen due to stabilization of selected bi-vacuum excitations (VAW) as a result of correlation of [C ⇌ W] transitions of the electrons in two conducting plates. The correlation, in turn is dependent on distant Van der Waals interaction between plates and decrease with their separation.

In formula (**69**) the positive and negative vacuum symmetry shifts, produced by standing neutrino (ν_0) and antineutrino ($\tilde{\nu}_0$) of coherent pairs $[\nu_0 + \tilde{\nu}_0]$ in composition of elementary particles are defined as:

$$[\Delta m_V^+ = m_V^+ - m_V^-]_{\nu_0} \qquad 73$$

$$[\Delta m_V^- = m_V^- - m_V^+]_{\tilde{\nu}_0}$$

The oscillations of bi-vacuum slit A_{VAW} may be a result of periodic acceleration of pair of standing [neutrino+antineutrino] or corresponding sub-elementary [particle+antiparticle] in [C] phase under the influence of fields or in a course of vibrations of atoms and molecules.

In the case if VAW-source has asymmetric shape, the ΔA_{VAW} may be considered as asymmetric scalar potential of informational field, then the corresponding component of informational field is the vector one, defined as

$$\overrightarrow{I_{VAW}} = grad(\Delta A_{VAW}) \qquad 74$$

The instant propagation of VAW is related to nonlocal properties of virtual Bose condensate of primordial BVB and BVB*, perturbed by VAW. The radius of perturbed by VAW bi-vacuum bosons is equal to:

$$L_{BVB^*} = \hbar/[(m_0 + \Delta m_V^\pm) \bullet c] \qquad 75$$

The corresponding scalar potential of BVB*:

$$E_{BVB^*} = (m_0 + \Delta m_V^\pm) \bullet c^2 \qquad 75a$$

From (**9**) it follows also that at conditions of primordial bi-vacuum, i.e. in the absence of matter when: $\Delta m_C = |m_C^+ - m_C^-| \to 0$ and $(v_{gr}^{ext} = v) \to 0$, the external wave B length of BVB and corresponding scale of their virtual Bose condensation tends to infinity:

$$\lambda_{BVB} = h/P_{BVB} = h/[(m_0^+ - m_0^-) \bullet c] \to \infty \qquad 76$$

The length of secondary BVB* in contrast to primordial BVB has a huge, but limited dimension due to small difference of energy/impulses between virtual rotor and antirotor:

$$\lambda_{BVB^*} = h/[(m_0^+ + \Delta m_V^+) \bullet c - (m_0^- + \Delta m_V^-) \bullet c] < \infty \qquad 77$$

The results, obtained above, points, that the ability of some stable particles, like free neutrino, photons, etc. to move with luminal velocity is a consequence of the basic condition: the equality of the real and mirror masses in the case of free neutrino ($m_C^+ = m_C^- = m_0$), or symmetric distribution of real masses for coherent pairs of [neutrino + antineutrino], forming photons.

The gradient of difference of concentration of rotors (n^+) and antirotors (n^-) of BVB with opposite direction of rotation (virtual spin equilibrium shift), originated under the influence of rotating atoms, molecules or macroscopic bodies - is responsible for TORSION

field, introduced as:

$$\vec{T}_n = grad(n^+/n^-) \qquad\qquad 78$$

The other torsion field components, in accordance to our model, **may display itself also in the gradient of following properties of BVB Bose condensate**:

a) **the internal radius of individual BVB as a pair of [rotor+antirotor]**:

$$T_R = grad(L_{BVB^*}) \qquad\qquad 78a$$

b) **the external wave B length of secondary BVB*, which determines the spatial scale of virtual Bose condensate**:

$$T_\lambda = grad(\lambda_{BVB^*}) \qquad\qquad 78b$$

c) **the amplitude of torsion waves, determined by values of ΔT_R and ΔT_λ oscillations**.

The $[C \rightleftharpoons W]$ **pulsations of two standing neutrinos** $(2\nu_0)$ **with opposite half-integral spins, forming part of the electron** $(2\nu_0 + \widetilde{\nu}_0)$ **are counterphase. It means that when one of them is in [C] phase, the other is always in the [W] phase. This makes these neutrinos as well as two electrons of opposite spins spatially compatible and enable to coherent exchange interaction by means of CVC. Such a mechanism is used for explanation of Pauli principle**.

The $[C \rightleftharpoons W]$ **pulsations of standing antineutrino** $(\widetilde{\nu}_0)$ **are in-phase with one of these two neutrinos of triplet** $(2\nu_0 + \widetilde{\nu}_0)$. **They form the coherent symmetric pair** $(\nu_0 + \widetilde{\nu}_0)$, **stabilized by special kind of dipole-dipole exchange interaction, introduced in our model. The charge, energy and impulse of standing neutrino and antineutrino in pair** $(\nu_0 + \widetilde{\nu}_0)$ **of electron, positron, quark or other fermions compensate each other. The in-phase** $[C \rightleftharpoons W]$ **pulsations of such pairs are responsible for nonlocal VAW, virtual VDW and VSW standing waves as a components of CVC. The standing CVC waves did not transfer the energy. Their electromagnetic resulting Pointing vector is equal to zero**:

$$\vec{P}_{\nu_0+\widetilde{\nu}_0} = \vec{P}_{\nu_0} + \vec{P}_{\widetilde{\nu}_0} = 0 \qquad\qquad 79$$

where:

$$\vec{P}_{\nu_0} = \left[\vec{E} \times \vec{H} \right] \qquad\qquad 80$$

$$\vec{P}_{\widetilde{\nu}_0} = \left[\vec{H} \times \vec{E} \right] = -\vec{P}_{\nu_0} \qquad\qquad 81$$

Standing electromagnetic, gravitational, torsion and nonlocal (instant) VAW, as a quantum collective excitations of bi–vacuum Bose condensate (BC), excited in a course of $[C \rightleftharpoons W]$ **pulsation of pairs** $[\nu_0 + \widetilde{\nu}_0]$ **in composition of elementary particles - can be responsible for Informational field, wholeness and self-organization process of the Universe. This means that formation of dynamic coherent system of standing waves: VDW and VSW, modulated by VAW, with properties of 3D virtual hologram - is possible. The unified system: [Secondary bi-vacuum + Matter] can evolve in a course of "holomovement" the - notion, introduced by Bohm**.

Each elementary particle, atom, molecule or macroscopic body is a source of nonlocal resulting informational field with symmetry, depending on their shape, dynamics and mass distribution.

Superposition of nonlocal vectorial informational fields, generated by spatial combination, mass and dynamics of all elements in corpuscular phase represents the virtual Informational Dynamic Replica of our real World.

All four kinds of virtual collective excitations, listed above, are the oscillations of density, energy and symmetry of corresponding kinds of virtual quanta. Consequently, their superposition and interference, especially in form of virtual standing waves, may be accompanied by the "ordering" of bi-vacuum, decreasing

its entropy and increasing the information. It is known that the entropy and information are simple related to each other as:

$$S = (k_B \ln 2) \bullet I \qquad\qquad 82$$

Each of 24 quantum excitations, pertinent for condensed matter, in accordance to our Hierarchic theory of condensed matter (see: www.karelia.ru/~alexk [New articles], may have own contribution to the informational entropy (82).

<div align="center">

Hypothesis of Informational Vacuum Replica of
living organisms and its consequences

</div>

In any living organism: from microbe to elephant the more ordered quasi-crystallin and sensitive structure - is a fraction of water in hollow core of MTs with diameter about 140 Å. The bigger is number of MTs of coherently interacting cells, the bigger is corresponding fraction of ordered water, very sensitive to nerve excitation. The spatial and dynamic properties of MTs and internal water structure follow the Golden mean rule. I have a special work, related to role of MTs in Hierarchic model of consciousness (see: www.karelia.ru/~alexk [Abstracts and New articles].

Just this fraction of virtual waves, excited by water in MTs, is responsible, in accordance to my hypothesis, for special virtual Informational field (IF), characterizing the individuality as a product of brain and peripheral nerve system activity.

In some cases, when corresponding [IF] form a complex system of virtual standing waves with properties, close to conditions of Hidden harmony:

$$v_{gr}^{in} = v_{gr}^{ext} \qquad\qquad 83$$
$$v_{ph}^{in} = v_{ph}^{ext}$$

it may remain stable even after the real source (living organism) becomes destroyed or dead.

The Hidden harmony conditions mean the equality of pairs: internal (hidden) and external group velocities; internal (hidden) and external phase velocities (83).

This hypothesis, based on our theory, points to possibility of existence of 'SOUL'. Some of corresponding systems of such virtual Informational replica of living organism really may be more or less stable, depending on their properties as a systems of standing waves.

During the life of animal, plant or human being, the direct and back reaction should exist between 'soul' and organism, generating this soul. This interaction may have a character of quantum beats. If so, the important contribution to consciousness or MIND is provided by acts of interaction between brain and 'soul' in form of quantum beats. Each individual soul is formed by interference of nonlocal Vacuum Amplitude Waves (VAW) with standing vacuum density and vacuum symmetry waves (VDW and VSW) of the all nerve cells of living organism. The nonlocal character of each individual soul makes it possible souls interaction and even unification.

The idea of collective informational soul is close to idea of NOOSPHERE, proposed by Vernadsky at the beginning of this century.

If we make one more step ahead, we can suppose that unification of all souls of human beings, animals, plants of all planets with any forms of life over the Universe may form virtual dynamic Super-Consciousness.

Due to mentioned above feedback reaction, the evolving of Super-Consciousness is dependent on evolution of the intelligent part of biosphere of the Universe and vice-verse.

<div align="center">

The influence of Golden mean - based 3D rigid geometrical
structures (Harmonizators) on surrounding medium

</div>

To explain this effect, we assume that 3D structures, like cross, pyramids, double cones, etc. with proportions, following Golden mean (GM) rule works as effective generator of virtual image in bi-vacuum, i.e. provide the ordering action on virtual quanta.

It may happens in a course of $[C \rightleftharpoons W]$ pulsations of particles, composing GM-based structures. Pulsations of standing [neutrino+antineutrino] pairs in composition of elementary particles (fermions) like electrons, positrons and quarks - are accompanied by vacuum amplitude waves (VAW) three-dimensional (3D) superposition with standing virtual density and virtual symmetry waves ($VDW^{\pm}$ and $VSW^{\pm}$).

VAW, in accordance to our model, represent symmetrical oscillations of energy slit between positive and negative vacuum without vacuum symmetry shift, when:

$$\Delta m_V = m_V^+ - m_V^- = 0 \qquad\qquad 84$$

If we use instead notion of standing neutrino/antineutrino, the notion of [vortex+rotor] dipole, nothing will change in our considerations.

The 3D interference pattern, formed by $VDW^{\pm}$ and $VSW^{\pm}$, modulated by vibrations of atoms and molecules and VAW, with nonlocal properties, modulated by [C] phase of standing [neutrino+antineutrino] pairs in similar way, may serve Informational Replica of GM-based structures. The $VDW^{\pm}$ and $VSW^{\pm}$, in contrast to VAW, are the parts of two cumulative virtual clouds ($CVC^{\pm}$), related to [W] phase of the same $[\nu_0 + \tilde{\nu}_0]$ pairs.

In accordance to our model (eq.52), between the tensors of mass symmetry shift and vacuum symmetry shift of uncompensated standing neutrino or antineutrino:

$$(\beta |m_C^+ - m_C^-| = |m_V^+ - m_V^-|)_{1,2,3} \qquad\qquad 85$$

and similar parameters of $[\nu_0 + \tilde{\nu}_0]$ pairs - the strong correlation exists. It means that 3D spatial distribution of electromagnetic, gravitational and torsion potential of any solid body, determined by uncompensated neutrinos and antineutrinos, rotors and antirotors of BVB - should be reflected in corresponding properties of 3D complex hologram, produced by all kind of standing waves, modulated by VAW as a pilot wave. It was shown before, that electro-gravitational contribution to secondary vacuum is related to temporal field.

The important consequence of our model is that the closer are properties of medium (object), as "recipient" of action of Harmonizator to conditions of Hidden harmony (see eq.21), the more is influence of Informational Replica of Harmonizator as "inductor". It is a condition of resonant kind of informational interaction via bi-vacuum between "inductor" and "recipient".

Telepathy, as informational exchange between living organisms with resonant properties of their microtubules and internal water - producing individual Informational Replicas, may be explained in a similar way.

We have to assume in the mechanism proposed, that properties of bi-vacuum virtual quanta has a fractal structure and tends to Hidden harmony conditions (eq. 21) under the influence of Harmonizator. It is the intermediate effect, stimulating the next stage of action of Harmonizator on liquids, solids, biosystems, etc. as a result of corresponding bi-vacuum perturbations influence on target particles in [W] phase.

The effect of Harmonizators on open systems looks to be related with their ability to stimulate postulated in our work self-organization as a natural spontaneous process, leading systems to conditions of Hidden harmony. It is accompanied by the entropy decreasing and storage of information. This process is opposite to tending the systems to thermal equilibrium or thermal death, corresponding to conditions (25a).

Experimentally the influence of Harmonizators on virtual Informational Replica may be detected by the change of Casimir attraction between two metallic sheets.

If our mechanism, proposed, is right, it means that most effective Harmonizators under certain conditions may serve as the pure energy generators, shifting the open systems from thermal equilibrium.

The interrelation is predictable between the scale of real atomic/molecular Bose condensation in condensed matter and influence of this matter on nonlocal properties of bi-vacuum virtual Bose condensate. The vacuum amplitude waves (VAW) may serve as the instant carrier of information. The future instant transmitters/receivers of information, containing cells of macroscopic Bose condensate (BC), like superconductors, superfluids and crystals with modulated BC parameters, could be based on this principle. The more shape of these cells follows the Golden mean rules, the bigger is predictable informational effect.

CONCLUSION

The formulae, obtained in our work, interrelate electric and magnetic elementary charges, electromagnetic and gravitational interactions, theory of relativity and quantum mechanics, [mass - velocity - space - time]. The dynamic model of duality provides the deeper understanding of Pauli and Heizenberg principles. It is able also to explain the quantum roots of Golden mean, as a result of revealed Hidden Harmony conditions realization, principle of least action and. The two slit experiment also can be explained without introducing the notion of pilot wave.

The Alternative Corpuscle-Wave model of atom based on the in-phase $[C \rightleftharpoons W]$ oscillations of the electrons and nuclear and 3D virtual standing waves properties of their [W] phase is proposed.

The new fundamental principle of self-assembly of "simple" systems physical systems, like elementary particles, atoms, molecules, self-organization of complex open systems, like condensed matter, star systems, galactics and evolution of very complex systems like biopolymers (proteins, DNA, microtubules), cells, organisms - can be formulated as: "The different selected systems on each level of temporal and spatial hierarchy are tending spontaneously to condition of Hidden Harmony (equality of most important internal and external parameters of de Broglie waves), which determines the Golden Mean". If we define the nonequilibrium system as beautiful, when it follows the Golden mean rule, then the formulated principle of evolution is a "driving force (hidden will)", leading our World to Hierarchical Beauty.

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