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A New Look to the Phenomenon of the Conservation of Energy and Emergence of Space-Time

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Abstract

In this paper, we suggest an alternative concept on non-uniform conservation of energy within the emerged non-uniform space-time manifold. This concept unifies all the interactions of nature within the asymmetric space-time manifold carrying the non-uniform conservation of energy. In the non-uniform energy conservation concept, energy and mass appear as two forms of the same unit as they are distributed differently within asymmetric space and time fields. Based on this concept, acceleration of the expansion of universe is the result of the acceleration of energy conservation. Space appears as the materialization phase of energy while time phase destroys everything material by returning the space matter to the initial state of energy. All the forces, which appear as the product of non-uniform energy-mass exchange interaction, are non-invariant while gravity, as a uniform force, carries conservation of energy to the initial state in the form of superconductive fluid of the bosonic condensate.

Keywords: Conservation of Energy; Emergence of Space-Time; bosonic condensate; Noether's theorem

Introduction

One of the problems of quantum physics is the description of the state of a particle in the space-time frame to unify the Standard Model with the gravity. Particularly, formulation of the space-time model of the steady state performance of a particle or pair of particles should present significant importance while the steady state existence is the display of the continuous symmetry. Therefore, for understanding why nature changes the steady state existence of the massless particles by the spontaneous symmetry breaking, we have to go through analysis of conservation laws. The known statements on conservation of energy and Noether's theorem, being philosophical descriptions, are not applicable for mathematical formulation of the space-time picture of a particle.

Lagrange and Hamilton have suggested conservation of energy in the form of differential equations which is widely used in classic and quantum mechanics. The problem of Lagrangian and Hamilton differential equations is that these formulations describe the dynamical laws in abstract space with the independent flowing interval of time. Lagranjian and Hamiltonian equations, which are tied to the Noether's time translation symmetry, involve the static sum of kinetic and potential energies, therefore, cannot be associated with the deterministic action.

A New Look at the Principles of the Conservation of Energy

In this paper we show an alternative concept on conservation of energy which involves consumption of light photons with the generation of identities, such as space and time, carrying the non-uniform distribution of energy within the emerged non-uniform space-time field. In our concept we present the space and time as the fundamental entities emerging from the non-uniform conservation of energy within two fields. The emerging model describes conservation of finite quantity of energy through portions which are non-uniformly distributed within opposite space and time phases forming asymmetric local boundaries:

$$\frac{\frac{\triangle S}{S_1}}{\frac{\triangle t}{t_1}} = \frac{Eap - E_s}{E_s} \quad (1)$$

where E_{ap} is the quantity of energy which has to be conserved while E_s is the portion of energy which is consumed in the space phase. The gradient (E_{ap}-E_s) describes the quantity of energy, which in the form of available portion, is conserved in time phase. Model

(1) presents existence and conservation of the finite quantity of energy as a current of electromagnetic waves passing through space and time fields with the generation of different energy densities within these phases. The space-time, as the matter structure, emerges from the light photons. The emerging space-time "grain", absorbing and consuming energy, non-uniformly carries conservation of energy within the finite frame [1].

The portions of energy distributed in space and time phases have phase differences with asymmetric boundaries and therefore different features. The portion of energy distributed in the space phase generates energy density while the portion of energy distributed in time phase holds the frequency. The phase difference of energy conservation and different properties of energy in opposite asymmetric phases leads to the non-uniform conservation of energy. The parameters ΔS/S1 and Δt/t1 present changes of space and time around their local asymmetric points in the form of frequency by generating different fields of energy distribution. The unique feature of the model (1) is the coupling of the time component with the available portion of energy and coupling of space component with the space phase mass.

It is necessary to note that the paper published in Nature [2] gives different opinions on the origin of space-time [3-6] based on quantum gravity and relativity but does not present any idea on emergence of space-time phenomenon from the energy conservation principle. One of the main problems of physics to get a deterministic description of nature is that separate statements describe conservation of energy and momentum. The symmetrical translation in time leads to the conservation of energy while symmetrical replacement in space in time independent frame generates conservation of momentum. The famous equation $E=mc^2$ of special relativity connecting energy and mass that is due to the constant speed of light, may present only the uniform conservation of energy, mass relation and the symmetry of particle - anti- particle pairs. The theory of SR combined energy and momentum within a four- vector manifold. However, due to the absence of the local state of variables, SR does not describe conservation of energy and mass out of a vacuum within space-time frame.

Model (1) shows that the description of dynamical laws through only time intervals of classic physics or space-time intervals of special relativity without local positions is the main problem of existing mathematical formulations. This seems to be the reason for the appearance of singularity in relativistic physics and uncertainty of quantum mechanics. Such a formulation cannot generate the local deterministic path. We consider that the space and time phases, "carrying energy distribution", are the energetic fields with the local proper boundaries. The portion of energy distributed in the space phase presents energy in the form of "dense" energy which we may call "mass". Different phases of energy conservation in space and time fields appear in the form of particles with positive energy state and anti-particles with the negative energy.

Emergence of Energy-Mass Relation from the Non-Uniform Conservation of Energy

In accordance with the equation (1), the portion of energy, which is locally consumed in space, we may describe as "conservation phase of energy in the form of space mass". In the non-uniform energy conservation concept energy and mass appear as two forms of the same unit distributed differently within the asymmetric space and time fields. The space and time are also two forms of the same unit: space appears as the materialization phase of energy, while time phase destroys everything material returning the space matter to the initial state of energy.

The uniform conservation of energy in time translational invariant symmetry cannot form a space-time frame and does not generate mass of ordinary matter. Therefore, mass is the property of fundamental particles which is required to hold conservation of energy within a finite frame. In the concept of non-uniform conservation of energy, the phenomenon called mass displays the inertia of a local state of space-time frame to the force of the exchange interaction $(E_{ap} - E_s)/E_s$. On this basis, the mass of the dynamical model (1) is not constant; it changes with the content of the energy portion consumed in the space-time frame of a particle to hold the conservation of energy in the singularity free frame.

In accordance with the model (1), the concept of non-uniform conservation of energy eliminates the existence of the uniform state of rest and the state of rest mass. On this basis, the phenomenon, called "spontaneous" symmetry breaking appears as the result of the change of energy conservation phases. Another important feature of the model (1) is the boundary velocity of an ordinary matter. With the expansion of space and consumption of energy in space, more energy is required to move an ordinary matter with the same velocity. The boundary velocity is needed for translation of energy conservation phases within space-time variables to hold the conservation of energy in a finite frame.

The special features of the non-uniform space-time are that it involves local boundaries of asymmetric space-time. The space-time manifold without local asymmetric boundaries cannot hold the conservation of energy within a finite frame. The non-uniform energy conservation concept (1) shows that coupling of the local space-time field (S_1/t_1) with the energy-mass exchange interaction $(E_{ap} - E_s)/E_s$ produces deterministic change of position and momentum.

Therefore, the space-time intervals alone, which Wheeler [7] suggested as an independent unit, is not enough for a deterministic description of the events. Space-time cannot generate energy-mass exchange interaction using only space-time intervals. However, similar to Wheeler statement, a local space-time getting information from the energy-mass exchange interaction

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tells matter how to move while matter consuming energy tells space-time how to expand within curved line. At the background state, space and time ingredients have symmetric dimensions. Generation of space-time frame breaks the background symmetry and the instant of time in exchange interaction transforms gradually the third dimension of space. Therefore, from the virtual space-time structure of two-dimensional vacuum generation of a three-dimensional universe takes place.

Vacuum is the virtual structure of the space-time frame where the coupling of space-time variables take place to carry conservation of energy with the generation of the arrow of time and ordinary matter. In accordance with the non-uniform conservation of energy, generation of any force and its effect is the product of the energy mass exchange interaction inserted to the space-time frame of an event in the form of "vis viva or living force". The exchange interaction at a different local space-time frame generates different forces.

Acceleration of Energy Conservation

Model (1) describes splitting of energetic photons to the space-time frame which consuming energy portions expands in direction of a decrease of energy frequency. With the consumption of energy in the space (formation of space particle E_s), the space-time unit requires more energy, to keep the initial action of the exchange interaction. This principle appears as a trapping of more energy by the space phase leading to the "acceleration of space expansion". In reality, it is the acceleration of energy conservation. With the consumption of energy and expansion of space, formation of space-time accelerates and absorbs any amount of energy.

The frame called a "black hole" is the boundary of space-time frame where the entire portion of energy is going to be consumed. Absorbing of light photons by the dense space phase (black hole) appears as an accumulation of gravitation force within an exchange interaction. Generation and growth of a "black hole" takes place gradually with the growth of a local position of the space-time frame because at every local position acceleration of energy conservation takes place. On this basis, acceleration of the expansion of universe is the result of the acceleration of energy conservation. Due to the accelerated consumption of energy, the tendency of any event of nature to move to the lowest energy state is accelerated.

When all the available portion of energy is consumed, (E_{ap}=0), the energy, trapped in the space-time frame of black hole, has to be radiated back to the background state through translation of asymmetric energy conservation phases. The background state of space-time is the vacuum where takes place "popping in and out" of the energy and formation of space-time unit to start conservation cycles. Consumption of energy in space through exchange interaction $(E_{ap}-E_s)/E_s$ generates electric charge that carries the process by the electromagnetic force. The particle, which has the space-time frame and obeys electromagnetism, gets features of the ordinary matter. The particle, which appears from the decay of the space-time frame and does not obey electromagnetism presents the non-observable matter. In the absence of the space-time frame, black hole space evaporates baryonic matter with the wavelength shorter than Planck scale. Decay of space-time frame leads to the loss of exchange interaction and, as a result, all the information on baryonic matter which is known as "black hole information paradox".

The parameter (E_{ap}/E_s-1) of the equation (1) in the form of energy-mass exchange interaction generates gravity to hold the conservation of energy within finite space-time manifold and the restoration of energy at the origin. Consumption of energy and the exchange interaction $(E_{ap}-E_s)/E_s$ generates the arrow of time and causality which disappears when there is no energy-mass exchange interaction (E_{ap}=0). Therefore, all the forces appear as the product of a non-uniform conservation of energy within the energy-mass exchange interaction in an expansion mode of space-time by the electromagnetic force; the effect of gravity is not significant within other forces.

However, when E_{ap}=0, gravity becomes extracted from other forces of an exchange interaction. This is the main reason why gravity is different from the other forces. All the forces of exchange interaction are non-invariant, while gravity in the form of uniform force carries the conservation of energy to the initial state. Only uniform motion called gravitation can restore the broken space-time and the non-uniform conservation of energy at the origin. Thus, conversion of energy to mass is the non-uniform accelerated action while the reverse conversion of mass to energy is a uniform event. The concept of the non-uniform conservation of energy requires a new look to the other conservation laws as well, such as C, P and T symmetries.

The True Nature of Symmetry. The Space-Time "Identity" of Light, Fermions and Baryons

Model (1) shows that the space-time frame, which emerges from the non-uniform splitting of photons, is the fundamental building block of energy, matter and nature: the space-time frame generates ordinary matter which in the energy-mass exchange interaction carries the accelerated conservation of energy. While energy is non-uniformly conserved within the space-time frame, unification of electromagnetism with the space-time frame became an obvious concept. The multiple S_1/t_1 (E_{ap}/E_s-1) of the model (1) is the localization of electromagnetic field (E_{ap}/E_s-1) within local space-time S1/t1 frame. The local space-time S_1/t_1 metric undergoes a change with the consumption of the energy flux. The energy flux (E_{ap}/E_s-1) is not uniform and presents a local energy portion remaining from the exchange interaction. That is why electromagnetism is not a Galilean invariant.

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Model (1), due to the involvement of the local frame of space-time and exchange energy-mass interaction, predicts the precise measurement of velocity and the local position of a particle; the exchange interaction eliminates the reference frame phenomenon and different observers will have the same measurement if they have the same exchange interaction that is coupled with the local position.

Model (1) holds the requirement of the uncertainty principle that to probe a small scale of space we have to apply high energy. Probing the state of a particle to get information is possible only through exchange interaction. At Planck's scale there is no space-time frame and exchange interaction (1). That is why we cannot have any information by probing the state of a particle. On this basis, by probing the vacuum we can get information only on the discrete uniform conservation of energy in the form of a particle/antiparticle by breaking the symmetry with the formation space-time frame. The condition when the portion of energy conserved in the space phase is equal to the portion of energy in the time phase, we could consider it as a uniform conservation of energy in the form of "Noether's symmetry ". This condition corresponds to the relation:

$$E_{ap} = 2E_s \quad (2) \quad \Delta S/S_1 = \Delta t/t_1 \quad (3) \quad \Delta S/\Delta t = S_1/t_1 \quad (4)$$

At condition (3), the unlimited translation of energy portions between opposite phases of space-time variables in the form of matter-antimatter fluctuations should lead to the "Ultraviolent Catastrophe". However, the annihilation takes place within asymmetric space-time frame carrying non-uniform distribution energy and therefore moves in the direction of space expansion which eliminates the Ultraviolence Catastrophe. On this basis, there cannot be an existence of the continuous uniform conservation of energy and matter-anti-matter symmetry or the uniform continuous existence any type of symmetry.

With symmetry, the space-time manifold of a particle after the change should look the same (4). But at $E_{ap}=2E_s$ (2) the space and time fields are symmetrically interchangeable only in a discrete mode (2) where after the change the space-time frame holds the local state (4) only within a frame of discrete symmetry. We think that the three particles performance of baryonic space-time n-p matter particles of nuclear in the form of boson-fermions relations follows this requirement. Therefore, without discrete performance of the energy mass exchange interaction in an elementary space-time unit, there cannot be a symmetric existence of the baryonic matter. The strong and weak forces appear as the coupling product of exchange interaction to hold the discrete symmetry of the space-time frame of the baryonic matter.

In accordance with the non-uniform conservation of energy, the spin as the space-time identity is the "face" of a particle. The particle may have the identity of a baryonic structure if it has the space-time frame in the discrete symmetry at $E_{ap}=2E_s$ with the participation of dynamic three jet particles. Therefore, within principles of the non -uniform conservation of energy, light is not a uniformly moving reference frame. Light photons cannot exist without the space-time frame and due to the moving within the non-uniform space and time phases they have features of an electromagnetic wave.

Conclusion and Future Development

We describe the generation of mass and a baryonic particle as the product of the non-uniform conservation of energy within a non-virtual space-time frame. The nature and our world are purely deterministic and follows only "vis viva or living force" generated from the non-uniform energy-mass exchange interaction. Without asymmetric space-time, which emerges from the non-uniform conservation of energy, there is no energy-mass exchange interaction and there is no force carrying existence of the ordinary matter. Without the asymmetric space-time frame, it is a non-uniform product of the energy-mass exchange relation, therefore, we cannot extract any force and deterministic interactions. This is a fundamental description of physics and nature. The quantum world is the particular precise mathematical description of the deterministic nature of holding the non-uniform conservation of energy in the form of portions (quanta's) distributed discretely within space and time fields.

Conservation of energy through the energy-mass electromagnetic interaction requires generation of charged ingredients through separation of the $e+/e^-$ pair and the localization of these particles in the space-time frame of the baryonic matter. On this basis, conversion of light photons within the space-time frame to an electron/positon pair requires additional particles, such as a ν_e/ν_e^- pair, appearing in the space phase and participating in generation of the space -time manifold of the baryonic matter. Coupling of e^+ and e^- charges with the ν e and ν e - neutral particles eliminate the reverse fluctuation of charged particles to photons.

When entire portion of energy is consumed in space (black hole, $E_{ap}=0$) the decay of the space-time frame leads to the disappearance of charges and the conversion of consumed energy to the bosonic condensate $e^-/e^+ + \nu_e/\nu_e^-$ which, with the continuous spectrum of a uniform neutral current moves to the background state. Therefore, a separation of the quark-antiquark pair from the $e^+/\nu_e + e^- / \nu_e^-$ mixture generates the baryonic structure of the three quarks flavors that is possible only during decay of the space-time frame. The energy of virtual space-time radiates to the initial state with the velocity that is not less than speed of the ordinary light.

The background vacuum coupling of the invariant mass of the bosonic condensate $e^-/e^+ + \nu_e/\nu_e^-$ with the huge amount of energy restored at the background vacuum leads to the separation of neutral pairs and generation of charged heavy bosons W^-, W^+ carrying the consumed energy. The heavy bosons, carrying background coupling energy to hold $e^+/ \nu_e + e^- / \nu_e^-$ ingredients

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transforms some portion of these particles to the baryonic three particles space-time frame in the form of charged quarks. The remaining portion of heavy bosons in the form of the flux of gluons within the baryonic space-time holds the exchange interaction of bosonic and fermionic consistent $e^+/\nu_e + e^-/\nu_e^-$ with the high frequency of the exchange interaction. That is why the mass of heavy bosons is much more than the mass of the baryonic quarks. On this basis, with the increase of energy and decrease of space scale, the frequency of a discrete energy-mass exchange interaction, one of quarks within n- p baryonic structures increases. This phenomenon, called "asymptotic freedom" [8], holds the baryonic structure in the form of a discrete symmetry where the baryonic space-time frame of the nuclear, which afterwards, the high frequency exchange one of the quarks within n-p structure looks the same.

The non-virtual space-time frame carries electromagnetic energy while decay of this frame transforms electromagnetic energy to the dark energy. Due to the absence of space-time frame the time invariant scalar field of the bosonic condensate has no spin and is different from the non-invariant electromagnetic field of ordinary matter. The bosonic condensate, restoring conservation of energy at the initial state, has a feature of non-observable dark matter. Due to the absence of a non-virtual space-time frame, dark matter does not interact with the electromagnetic interaction. The superconductive fluid of the bosonic condensate, comprising two duplets of neutral pars $e^-/e^+ + \nu_e/\nu_e^-$ is identified as the Higgs boson. The detail information will be the subject of the next paper.

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