Volume 30, Number 1 January/February 2019

GALILEAN ELECTRODYNAMICS

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GALILEAN ELECTRODYNAMICS

Experience, Reason, and Simplicity Above Authority

January/February 2019 (Vol. 30, No. 1), © by Galilean Electrodynamics

Published by Space Time Analyses, Ltd., 141 Rhinecliff Street, Arlington, MA 02476-7331, USA

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Galilean Electrodynamics aims to publish high-quality scientific papers that discuss challenges to accepted orthodoxy in physics, especially in the realm of relativity theory, both special and general. In particular, the journal seeks papers arguing that Einstein's theories are unnecessarily complicated, have been confirmed only in a narrow sector of physics, lead to logical contradictions, and are unable to derive results that must be postulated, though they are derivable by classical methods.

The journal also publishes papers in areas of potential application for better relativistic underpinnings, from quantum mechanics to cosmology. We are interested, for example, in challenges to the accepted Copenhagen interpretation for the predictions of quantum mechanics, and to the accepted Big-Bang theory for the origin of the Universe.

On occasion, the journal will publish papers on other less relativity-related topics. But all papers are expected to be in the realms of physics, engineering or mathematics. Non-mathematical, philosophical papers will generally not be accepted unless they are fairly short or have something new and outstandingly interesting to say.

The journal seeks to publish any and all new and rational physical theories consistent with experimental fact. Where there is more than one new theory that meets the criteria of consistency with experiment, faultless logic and greater simplicity than orthodoxy offers, none will be favored over the others, except where Ockham's razor yields an overwhelming verdict.

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The journal also publishes correspondence, news notes, and book reviews challenging physics orthodoxy. Readers are encouraged to submit interesting and vivid items in any of these categories.

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GALILEAN ELECTRODYNAMICS
ISSN 1047-4811

Published by Space Time Analyses, Ltd.
Send all correspondence to Galilean Electrodynamics,
11660 239th Avenue NE, Redmond, WA 98053-5613, USA.

2019 ISSUES: Six bimonthly Regular Issues, plus four seasonal Special Issues, including two of GED-East.

2019 SUBSCRIPTION INFORMATION:

Individuals: $60, Corporations $120,
Universities: $180, Governments: $240

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From the Editor: Important Information Added in Proof

Space is always a challenging puzzle for GED to solve. This time, the paper by Kopasakis had some interesting, but lengthy, informnation added in proof. It concerns the definition of *time*. We could fit it into this same GED issue only by putting it into this discretionary *space*! So here it is:

Just prior to the Big Bang, and due to large gradient stresses of the collapsing continuum, quanta constituents came into existence as they broke-off from the peaks and troughs of the continuum resonance, while the bulk continuum and its resonance remained in place. Then, an electrostatic coupling came into existence between these quanta constituents and this fluctuating continuum resonance. Because of the different topological arrangements between the peaks and the troughs with respect to the continuum resonance at the instant they broke-off, their respective constituent oscillations with the local resonance resulted in the establishment of an equal number of opposing quanta spins. Referring to Fig. 2, these oscillations in 3-D resonance would be in circular or orbital type motions, instead of back and forth motions. If quanta constituent motions were back and forth as shown in Fig. 2, the acceleration magnitude of this motion would be enormously large considering the fundamental time cycle and wavelength of this motion. Therefore, as the clouds of these fundamental quanta constituents spin or orbit, while the local resonant peaks fluctuate, an electrostatic force is exerted from each peak or trough, which causes relatively modest accelerations of the constituent clouds in the course of an orbital. The acceleration of the volt quanta clouds in turn results in a local charge flux density, which at these Planck length scales becomes both the foundation of charge in electrostatics or electromagnetism as well as the foundation of 4-D ESP flux or gravitational flux.

The distinction between positive and negative charge exists because of the opposing spins of these quantum constituents with relation to the continuum. For instance, the reason opposite charges attract, is because topologically their adjacent opposing spin quanta orbitals and respective coupling with the continuum resonance causes no continuum interference or a minimum energy state with the continuum 4-D ESP. In Fig. 2 this topological arrangement of the opposing spin quanta with the continuum resonance is shown in a 2-D slice, as any two adjacent quanta are situated right next or right on top of each other. Based on this, a gravitational flux field is generated from the acceleration of these constituents, which is a summing process, independently of the direction of the spins. For electromagnetism, however, the direction of the spin matters. As charge originates from the acceleration of volt fundamental quanta constituents in the continuum, but positive vs. negative charge also involves the type or the orientation of the spin. As such, in the deepest quantum levels (the Plank length scale) volt is the base unit, instead of charge. At higher quantum scales, however, or with electromagnetism, charge can be considered as the base unit.

Because both gravitational and electrostatic fields have the same origins involving this quanta-continuum coupling mechanism, both of these fields are longitudinal type fields with seemingly no propagation time delay. This is in contrast to electromagnetic waves, which are based on transverse fields, propagating by the motion of photon quanta.

Acknowledgement: The author wishes to express his sincere gratitude to Dr. Cynthia Whitney for her comprehensive review and constructive comments on this paper, as well as for Part I of the theory. Written by Kopasakis; placed here by CKW

The Continuum Theory Part II: Matter, Time, and the Mechanics of Light

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Part I of this work described a new theory that deals with the source of gravity, whereby evidence introduced indicates that gravity originates from quantum motions in a 4-Dimensional (4D) Electric Scalar Potential (ESD) field that permeates the Universe as stationary aether (totally coupled to mass). Part I led to the formulation of a new theory of gravity based on quantum motions in this 4 Dimensional aether continuum field. Furthermore, derivations were introduced for the gravitational constant, for gravitational acceleration, and for the permittivity of free space. In this paper (Part II), new definitions for mass and time are developed, and the theory introduces mechanics for the speed of light. The theory also introduces a Universe whereby the Big Bang is just a part of a repeating cycle. As will be described in the presenrt paper, manipulating time, expanding or contracting the aether continuum to circumvent the speed of light becomes permissible, and the potential technology for this to occur will be briefly described. In addition, more evidence will be introduced here that point to so-called fictitious forces as being real forces of Nature.

1. Introduction

In Part I [1], the Continuum Theory was developed to explain observations of a certain phenomenon that involves gravity. In the process, a step-by-step development was carried out, which led to the formulation of the continuum theory of gravity. This theory is different than the standard model, and unlike the standard model in this theory there is no absolute quantity in nature, and every fundamental quantity involves some kind of mechanism. The derivations in this theory bring back the aether (ether) theory as a stationary aether (totally coupled to mass); a luminiferous aether made of a 4-Dimensional (4D) Electric Scalar Potential (ESP) field.

The development in Part I led to the equation of gravity that besides the mechanics of the classical gravitational law, it also includes an additional attractive gravitational component much smaller in magnitude, and the radial and the tangential inertial components of gravity. Gravity is generated by motions of quantum particles in a 4D ESP differential gravitational field of a source body. The equation of gravity developed in Part I, also describes and explains the effects of the so-called fictitious forces. The additional attractive component of gravity is a key gravitational component, which besides the inertia components of gravity, this component is also responsible for the rest of the fictitious forces, and it is also responsible for some other effects such as for orbital plane alignments, and for clumping of matter. In Part I [1], mechanics have been derived for the gravitational constant, for gravitational acceleration, as well as for the permittivity of free space. Based on the formulation of the gravitational constant, singularities in matter are not possible and black holes should produce sustained oscillations like a heart beat.

Except for this fundamental 4-D ESP continuum aether field, nothing in Nature is absolute, not even the speed of light, nor is time-itself absolute, and as such Part II extends this development to describe the origins of time and matter. The development also covers the mass-energy equation, and the fundamental mechanism that governs the speed of light. The theory addresses the strong force under the premise that gluons or chromo-dynamics are not the foundation of the strong force, and that ultimately all the 4-fundamental forces originate from the 4D ESP continuum aether field via interactions with constituents of matter-energy. The theory points to a cyclic Universe, dark energy which is nothing more than a high-density ESP aether bubble of the Universe expanding into the low density surroundings of the cosmos, and dark matter, which is just embryonic constituents of matter with no light reflection properties.

2. Definition of Mass

In Part I, it was mentioned that central to matter are quanta constituents that originate from the 4D ESP continuum aether, which are quanta fields of electric scalar potentials in units of volt. The 4D ESP continuum aether is the only fundamental quantity in the Universe, and under certain conditions such as those that existed during the time of the big bang, portions of this continuous field under extreme gradient field stresses broke-down to form discrete field quanta. Also, fundamental to the continuum aether is an extremely high frequency resonance and because of this, a natural resonant coupling is developed between the continuum aether and these quanta constituents. Because of this coupling and once the discrete quanta fields come to existence, their existence perseveres through this coupling mechanism. As such, the quanta mist created in the continuum aether ocean is preserved, which then through this coupling it becomes the foundation of all physical existence. This fundamental resonance coupling of the aether with quanta constituents forms the fundamental tick of time, and without it, everything will stand still as there will be no notion of time or any concept of physical existence.

From the development of gravity carried out in Part I, it appears that kilograms as currently define by the International Bureau of Weights and Measures (BWM), may not be a base unit of

Nature. Thus, the attempt here will be to redefine the quantity for mass units, under the general definition that mass is a measure of how much matter is contained in an object, and that mass should be referring to a substance that is locality invariant. Currently, mass in any locality is referenced to kg on Earth. In this regard, the universal law of gravity truly refers to mass based upon the evidence that gravity is dependent on mass, rather than weight. As such, the reference of mass to kg on Earth allows the computation of gravitational forces, while at the same time circumventing the lack of understanding of the true substance of mass. The Higgs boson concept offers a fundamental mechanism for particles to obtain mass. However, the theory developed here negates the existence of the Higgs boson, as in the continuum theory a particle like the Higgs boson is not responsible for endowing mass to other particles. The recent discovery of the Higgs boson is instead, attributed here to the nature of the continuum aether resonance and its couplings with mass quanta constituents, which through this fundamental coupling mechanism tends to favor certain sub-harmonics and momentary fusion of quantum particles at certain energy levels or frequencies. In essence, the continuum aether is the only fundamental entity in Nature, and its two fundamental properties of a very high frequency resonance with its varying density throughout the cosmos, or in Greek σύμπαν, pronounced 'símba', (the known Universe and beyond) are responsible for all physical existence.

Mass quanta constituents couple electrostatically through the fluctuating ESP continuum resonance to develop an electrostatic-like flux field, related to the acceleration of these quanta fields in this oscillating continuum aether field. As such, an accelerating mass with its accelerating mass quanta in the continuum will locally generate an elevated gravitational field.

For now, let us assume that, as the quanta constituents came to existence, and as they broke-off from either the positive or the negative peaks of this resonance, the quanta constituents respectively maintained a positive or negative charge, which is expected to have being created in equal numbers during the big bang explosion. Collectively, the oscillations and consequent acceleration of these positive and negative charge quanta with the continuum would be responsible for developing space charge or an electrostatic flux density, which serves to elevate the local electrostatic flux field or gravitational field – proportionally to the number of these quanta. The space charge or the generated electrostatic flux density is responsible for giving rise to gravitational forces, while the electrostatic forces of these $+/-$ charges and their relative motion with respect to each other gives rice to electrostatic fields and electromagnetism.

Since the fundamental continuum field is in the form of a 4D electric scalar potential, this coupling energy acquired by mass in the local continuum should be in the form of an electrostatic potential energy as $P_e \propto q_d Q_l / r$, where q_d stands for the space charge of a given differential mass, and Q_l is the local equivalent space charge of the continuum. Notice the terminology *equivalent space charge* as explained in Part I, is utilized due to associating the base continuum ESP as an equivalent space charge for the aggregate local space charge definition, Q_l. As such, the energy in Einstein mass-energy equation, $E = mc^2$, seemingly also depends on the local energy acquired through the overall local mass-continuum couplings (*i.e.*, $E = mc^2$ has locality dependence). In essence, the couplings of mass quanta with the local continuum can be seen as giving rise to continuum Coulomb forces that are associated with continuum electrostatic potential energy.

Instead of an electrostatic potential energy relation between the overall space charge, Q_l, and the differential charge, q_d it may be more appropriate to directly express electrostatic potential energy in terms of a mass-energy relationship, or as a relation between Q_l and these volt quanta constituents of mass, as

$$E_m = Q_l \sum \xi_i \quad , \tag{1}$$

where ξ_i is an indivisible fundamental quantum constituent of mass in units of volts (V), and the summation represents the total number of these field quanta in a given mass. This would be the electrostatic potential energy or simply the energy that a given differential mass acquires in its local continuum. Base on this definition, mass, ξ_i in units of volts is a fundamental unit of mass at comparable Plank length scales, while mass as defined in kg would be expected to have local continuum potential energy dependency. However, the referencing of solar body masses to Earth's kg, computed by using the universal law of gravity, removes this dependency, and as such mass as currently defined in kg still pertains to the same amount of mass quanta constituents, ξ_i.

By setting Eq. (1) to the Einstein's energy equation, $E = mc^2$, m can be solved as $m = Q_i \sum \xi_i / c^2$, where $Q_i = Q_E + Q_C$ $Q_l = Q_E + Q_C$ on Earth and as described in Part I, if the base continuum equivalent space charge, Q_C, is neglected for this calculation, $m \approx (q_M M_e / c^2) \sum \xi_d$. For simplicity, the summation of quanta contained in one kg of mass, m_u, on Earth can be represented as a base unit, ξ_u, and by solving this equation for the base unit ξ_u, the following relation is obtained:

$$\xi_u = \xi_i / m_u = c^2 / q_M M_e \tag{2}$$

By substituting the values of $q_M M_e$ or the value of Q_e that was found in Part I, the value of this base unit can be calculated as:

$$\xi_u = (2.9979 \times 10^8)^2 / 6.5082 \times 10^{10} = 1.3809 \times 10^6 \ \text{V/kg} \quad .$$

Since it can be assumed to be impossible to physically measure this new quantity of mass, which is observable only at Planck-length scales, the mass for different localities other than Earth can still be referenced to the Earth's mass in kg, or alternatively this unit of mass can be calculated using the law of gravity. Let us see, however, if this new unit of mass is supported by respective known quantities. By utilizing the previous derived equation,

$m = Q_1 \sum \xi_i / c^2$ $\mathrm{m} = \mathrm{Q}_l \sum \xi_i / \mathrm{c}^2$, and by substituting this mass unit ξ_u ξ_u, the following calculation can be made:

$$1\text{kg} = Q_1 \xi_i / c^2 = (6.5082 \times 10^{10})(1.3809 \times 10^6) / c^2$$
$$= 8.984 \times 10^{16} / c^2 \ \text{CV} / c^2 \quad .$$

Knowing that $1\text{GeV} / c^2 = 1.783 \times 10^{-27}$ kg; that is, a proton is $0.9838\ \text{GeV} / c^2$, which is 1.672×10^{-27} kg, 1 kg can be calculated as

$$1\ \text{kg} = (1\text{GeV} / c^2) / 1.783 \times 10^{-27} = 5.608 \times 10^{35}\,\text{eV} / c^2$$

It is also known that the charge of one electron is $e = 1.602 \times 10^{-19}$ C. By substituting this value in the equation above the following calculation can be made:

$$1\ \text{kg} = (5.608 \times 10^{35})(1.602 \times 10^{-19}) = 8.984 \times 10^{16}\,\text{CV} / c^2$$

The value from this calculation for 1 kg of mass agrees with the previous calculation within the calculated accuracy using the new definition for mass, which shows that this derived base unit of mass, ξ_u ξ_u, is in concert with other known base quantities of Nature.

Even though, the unit volt is in units of kg m^2 / C s^2, at Planck length scales kg is not a base unit, and at these scales the volt will be the base unit and this relation will be reversed as

$$m = Q_1 \xi_m / c^2 \quad . \tag{3}$$

While in Part I the continuum aether parameters q_M and q_a were derived using kg as the unit of mass in the gravitational law and in the inertial relation, instead of volt for the fundamental constituent of mass or energy, these parameters are nevertheless correct considering that the gravitational forces are dependent on mass rather than weight.

3. The Mass-Energy Equation

Based on Eq. (3), mass, kg, is proportional to $1 / c^2$. By substituting Eq. (3) into the Einstein energy equation the following relation is obtained, $E = Q_1 \xi_m$, which is essentially the same as Eq. (1). As shown in the previous Section, the amount of energy contained in 1 kg of mass on Earth is 8.987×10^{16} joules, which agrees with equation $E = mc^2$. If the equation for $Q_l Q_l$ from Part I is substituted in the above equation, then the energy equation can be expressed as

$$E_m = (q_M M_k + Q_C)\, \xi_m \tag{4}$$

which has locality dependence, because of the of the presence of the local mass, M_k, in the equation.

According to Eq. (4), one kg on Earth when taken into deep space and totally converted into energy will produce approximately $Q_c / Q_E = 1.5691 \times 10^{-7}$ times the amount of energy it would produce on Earth. Taking one kg of mass from Earth and transporting it into space (away from the Earth's gravitational influence), it would be expected to take the same amount of energy as the kinetic energy of the object moving with the required Earth's escape velocity. Knowing that Earth's escape velocity is $11{,}175\ \text{m/s}$, this energy can be calculated as $E_{ke} = (m)v^2 / 2 = 6.2 \times 10^7\,\text{J}$. This amount of energy is substantially less than the difference in energy that can be calculated using equation $E = Q_1 \xi_m$ with the value calculated for Q_1 for Earth in Part I and for the value of ξ calculated in the previous section for 1 kg of mass. So there appears to be a discrepancy, assuming that conservation laws also apply with respect to the space-time continuum, which may or may not be the case. However, when mass is totally converted to energy, the quanta constituents of mass, ξ_m, are not expected to be destroyed, as in their unbinding state these mass quanta constituents are also constituents of energy.

4. The Speed of Light

So far the nature of the 4D electric scalar potential continuum has been described as fluctuating with a wavelength comparable to the Planck length scale. Currently, there is no proven physical significance for Planck's length, even though according to the uncertainty theory [2]- the uncertainty relation between the Schwarzschild radius and the Compton wavelength, the Planck length, below which the very notions of space and length cease to exist. If the assumption is that Planck's length is the smallest possible length scale, and as the continuum according to this theory encompasses all physical scales, then it is assumed that the wavelength of the continuum resonance is at the Planck length, as this fundamental wavelength would be responsible for defining the smallest possible scale.

Much like the mass quanta constituents, photons too are envisioned as made of the same electric scalar potential quanta, or constituents of mass-energy. The arrangement of a photon at its lowest energy state is envisioned to be consisting of 2 opposite charge quanta, which are bounded together to develop a neutral charge. The photon quanta constituents are also assumed to have an intrinsic or a continuum resonance-induced oscillation that aids their electromagnetic bonding. The continuum resonance is envisioned as a standing wave with oscillating peaks and troughs in space, resembling a 3 or 4D foaming structure. The wavelength of this standing wave is constant in all 3 dimensions of space, and while the oscillating peaks and troughs provide for the electrostatic force that propels the photon quanta, the constancy of the continuum wavelength in all 3 spatial dimensions provides for the constancy of the speed of light. The electrostatic force that propels the photon comes directly from the continuum and as such it is not subject to the physical law of energy conservation.

Objects in space elevate the local ESP of the continuum in proportion to their mass, and even though this doesn't change the constant wavelength of the continuum resonance, it causes the reference of the local ESP to slant upwards towards the object. As such, adjacent peaks of the continuum resonance, in the direction of the object, sit at an ever slightly higher ESP, which causes the trajectory of a passing photon to bend slightly in the direction of the space body for every passing wavelength. Inside a black hole this ESP continuum elevation is more exaggerated, which causes light that originates inside a black hole horizon to completely reverse its path and fall back inside the black hole.

In the Michelson-Morley experiment, for the same distance light travels on Earth, it should take exactly the same time, independently of the direction of the beam of light. This is because, **a)** the aether is stationary or tightly coupled to mass, and **b)** for the same distance light travels and for gravity being the same in all direction in the experiment, light encounters a fundamental resonance with constant frequency, constant wavelength, with constant electrostatic magnitude in all directions, while it encounters an equal number of resonant wavelengths in its path.

Figure 1, Part (a) shows a cartoon depiction of this continuum resonance in 1D, at a reference local ESP, Φ_r, an amplitude Φ_a, with the solid line signifying the standing waveform at a time $t + T_C / 2$, while the dash line signifies the resonant waveform at time $t + T_C$, where T_C is the period of the fundamental continuum resonance. The Figure 1, Part (a) also shows a cartoon of a photon at its lowest energy state comprised of two quantum constituents; one of them topologically situated above the reference potential (- charge), and the other situated below this potential (+ charge). One way these 2 constituents may be bounded together is through their opposing electrostatic charges, but also electromagnetically through a foreseeable oscillation, such as the one shown in Figure 1, Part (b). There is however, another possibility, to be covered later. The constituents of mass-energy are Gaussian wave packets, like those generally described by the Dirac equation. At a certain instant in time, the two constituents of the photon are electrostatically attracted and move towards their respective peak-trough shown in Figure 1, Part (b). As they are about to come into contact with these peaks, the standing wave changes to the shape shown by the dash line, at time $t + T_C$. Continuing in this path, the photon constituents are then attracted to, and move towards, the peaks of the dash line wave. Due to the electrostatic attraction between the photon constituents and the spatial proximity of these peaks, an oscillation between these constituents is expected to be induced as they successively translate through these peaks and troughs, as shown in Figure 1, Part (b).

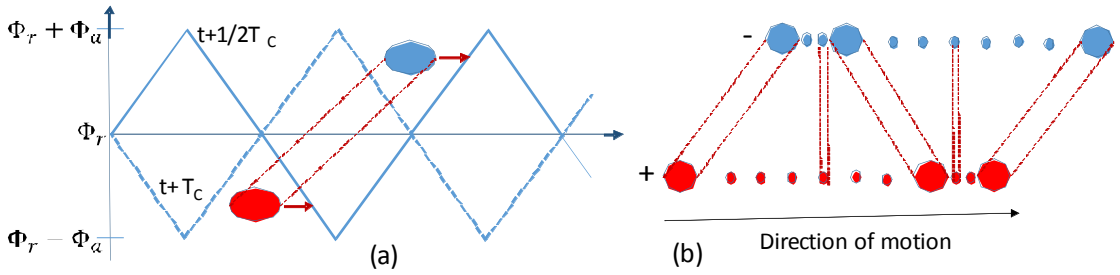

Figure 1. Depiction of topological continuum resonance in 1D showing (a) a lowest energy photon translating through the resonance, and (b) the induced oscillation of the photon constituents as they translate through the resonance.

With the assumed wavelength of the continuum resonance at the Planck length and with the mechanism described for the translation of a photon through the continuum aether, the speed of light can be formulated as

$$c = f_C \lambda_C = \lambda_C / T_C \quad , \tag{5}$$

where f_C is the frequency of the fundamental continuum resonance, T_C is its corresponding period, and λ_C is its wavelength. Divorcing the speed of light from the mass in kg in Eq. (3), this equation can be expressed in terms of the fundamental continuum resonance as

$$m = Q_i \xi_m / (f\lambda)_C^2 \quad . \tag{6}$$

As seen, Eqs. (5) and (6) downgrade the speed of light from being an absolute or a fundamental quantity of nature, as the Einstein energy equation can also be stated as $E = m(f\lambda)_C^2$. This fundamental resonance (f_C, λ_C) would be expected to be constant anywhere inside the ESP bubble of the Universe. Eq. (3) implies that the speed of light is proportional to both the wavelength and the frequency of the continuum resonance. However, the effective wavelength of the continuum is expected to be increasing as the Universe continues to expand in an accelerated expansion, and as such the speed of light is expected to change accordingly as this acceleration effectively stretches this wavelength at the Planck length.

5. The Definition of Time

This fundamental resonance is actually responsible for the Planck length, defined in literature as $l_P = \sqrt{\hbar G / c^2} = 1.61619926 \times 10^{-35}$ ($\hbar$ is the reduced Planck constant), which in this development is defined as the wavelength of this resonance, λ_C. This resonance is also responsible for the speed of light in

this development, as well as for the smallest possible discrete unit of time. From Eq. (5), the frequency of the continuum resonance can be computed as

$$f_C = 299792458 / 1.61619926 \times 10^{-38}\,\text{Hz}$$

This fundamental continuum frequency becomes the seat, or the origin of, all electromagnetic and gravitational effects, so this frequency can also be associated with the most fundamental unit of time, meaning that without such a continuum resonance, time will not be a defined quantity. As such, the fundamental quantized unit of time can be calculated as

$$t_C = 1 / f_C = 0.539106 \times 10^{-43}\,\text{s}\quad f_C = \frac{c}{\lambda_C} \quad . \tag{7}$$

This would be the smallest unit of time, or theoretically the smallest time measurement that will ever be possible, below which time can neither be subdivided, nor can it be defined. This time unit is defined in literature as the *Planck time* [3], as $t_P = \sqrt{\hbar G / c^2} = 0.539106 \times 10^{-43}\,\text{s}$. As it stands in current literature, the significance of the Planck time is that this is the time it would take a photon traveling at the speed of light to cross a distance equal to one Planck length

A question can be raised as to whether the elongation or stretching of this fundamental wavelength can be neglected due to the present expansion rate of the Universe. The expansion rate of the Universe at present is defined experimentally by the Hubble constant. [4] Locally, this expansion rate is approximately $H_0 = 7 \times 10^{-10}\,\text{m/sec}^2$, so that the distance that the Universe expands locally in 1s can be computed using the acceleration-to-distance relation as $d_i = H_0 t^2 / 2 = H_0 / 2$. During the time of 1 sec, there are f_C number of wavelengths. Thus, the delta wavelength is $\Delta\lambda_C = H_0 / 2 f_C$. The percent wavelength elongation due to the present rate of expansion of the Universe can be expressed as

$$\lambda_{C,\,\text{enig}} = (\tfrac{1}{2} H_0 / f_C) / \lambda_C \times 100 = (H_0 / 2c) \times 100\% \quad ,$$

which can be calculated as

$$\lambda_{C,\,\text{enig}} = \frac{7 \times 10^{-10}}{2 \times 299762458} \times 100 = 1.17 \times 10^{-16}\%$$

which can be neglected.

Similarly to Fig. 1, Fig. 2 shows a cartoon of mass quanta constituents in a 1D slice as they oscillate with respect to the continuum resonance, with the solid red arrows showing direction of motion at time $t + T_C / 2$, and the green dash arrows showing motion at time $t + T_C$.

At this point it may be prudent to step back to contemplate how these quantum constituents came into existence, and how they are coupled or situated with respect to the continuum resonance, which besides matter, gravity, and time, it also defines charge polarity in electrostatics. Just prior to the Big Bang, and due to large gradient stresses of the collapsing continuum, quanta constituents came into existence as they broke-off from the peaks and troughs of the continuum resonance, while the continuum and its resonance remained in place. Then, an electrostatic coupling came into existence between these quanta constituents and this fluctuating continuum resonance. Because of the different topological arrangements between the peaks and the troughs, at the instant the constituent quanta broke-off, their respective coupling oscillations with the continuum resonance resulted in the establishment of an equal number of opposing quanta spins.

Referring to Fig. 2, these resonant oscillations in 3-D space would be in the form of circular or orbital type motions, instead of back and forth motions. If quanta constituent motions were back and forth as shown in Fig 2, the magnitude of the acceleration of this motion would be enormously large, considering the fundamental time cycle and wavelength of this motion. Therefore, as the clouds of these fundamental quanta constituents spin or orbit, while the local resonant peaks fluctuate, an electrostatic force is exerted from each peak or trough, which causes relatively modest accelerations of the constituent clouds in the course of an orbital. The acceleration of the volt quanta clouds in turn results in a local charge flux density, which becomes the sit of gravitational potential, and at the same time the orientation or spin of these Planck scale motions becomes the foundation of charge. This orbital motion and interaction with adjacent quanta also becomes the foundation of electromagnetism.

While the aggregate coupling of the volt or space charge quanta constituents with the continuum resonance is responsible for elevating the local gravitational flux or potential (i.e., gravity is proportional to mass), the distinction between positive and negative charge is because of the opposing spins of these quanta constituents with respect to the continuum. For instance, the reason opposite charges attract, is because topologically their adjacent opposing spin quanta orbitals and respective coupling with the continuum resonance causes no continuum interference or a minimum energy state with the continuum 4-D ESP.

Thus, gravitational flux field is generated from the aggregate acceleration of these constituents in the course of their orbits, which is a summing process and independent of the direction of the spins. However, for electrostatics or electromagnetism, the direction of the spins matters. In the deepest quantum levels (the Plank length scale) volt is the base unit, instead of charge. Because gravitational and electrostatic fields have the same origins involving this quanta-continuum coupling mechanism, both of these fields are longitudinal type fields with seemingly no propagation time delay. This is in contrast to electromagnetism, which is based on transverse fields that propagate by the motion of photon quanta.

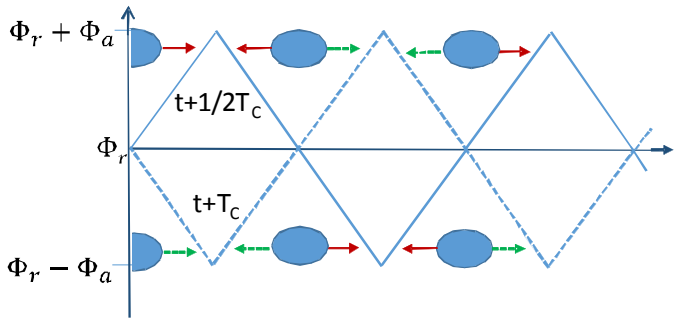

Figure 2. Depiction of continuum resonance in 1D showing the oscillation of mass quanta constituents with respect to the resonance, with the red solid arrows showing the motion of these quanta at time $t + T_C / 2$ and the dashed green arrows showing the motion at time $t + T_C$.

The opposing spin motions of these adjacent quanta in 3D coordinates generates electromagnetic couplings, and becomes the means for the fundamental electromagnetic cycle for energy exchange and thus, it provides for the fundamental tick of time. As the velocity of a mass approaches the speed of light, the resident time of quanta in the continuum resonance will be reduced accordantly, which correspondingly reduces the amplitude of the quanta oscillation with the continuum resonance. At the limit of the speed of light, this oscillation will be reduced to zero, and since this oscillation is the foundation of time, time ceases for a mass who's velocity approaches the speed of light. As the amplitude of quanta constituents oscillations reduce to zero, the electromagnetic cycle that facilitates energy exchange or energy transfer correspondingly reduces and at the speed of light limit. Thus, there will be no electromagnetic interaction between mass quanta, and no way to transfer energy to cause a mass to travel at or beyond the speed of light, and effectively causing time to cease for a mass moving at the speed of light. Also, reduction in the amplitude of this oscillation or coupling, proportionally affects apparent time in a moving frame of reference. As it will be seen later however, the speed of light cannot be violated, but it can be circumvented.

Based on that possibility, the Einstein mass equation $m = m_0 \Big/ \sqrt{1 - V^2 / c^2}$, is not correct. As mass will not increase to infinity as speed approaches the speed of light. Rather, the efficiency by which energy can be applied to accelerate a mass to the speed will precipitously fall to zero near the speed of light. Thus, as the energy in the Hadron Collider is increased to accelerate protons to nearly light speeds, it will be found that the acceleration energy utilized and the resulting theoretical calculations of particle speed and mass will be considerably different than those found in the energy of the collisions.

It is known that closer to a space body time passes slower than away from it. This is due to the elevated ESP near such bodies that causes reduction in the amplitude of the fundamental oscillations and thereby, causing reduction in the amplitude of the corresponding electromagnetic cycle. Thus, reducing the coupling and the rate of energy exchange between quanta constituents, which effectively reduces the passage of time.

6. Circumventing the Speed of Light

While a mass cannot travel faster than the speed light, there is nothing preventing an aether-mass system to travel faster than the speed of light, if the aether is propelled or is in motion rather than the mass itself. As in such a system, the aether is in motion, while the mass can remain stationary with respect to the surrounding aether.

Based on instantaneous gravitational effects that space bodies have on each other, it has been ascertained before that gravitational waves can propagate instantaneously, or at the very least, many orders of magnitude faster than the speed of light. Or else, how can the Sun attract the Earth based on its instantaneous location, rather, than its light delayed position in the sky. It is an accepted fact however, that the influences of scalar electric fields are felt instantaneously or without involving propagation delay. Since in this development gravitational waves are a form of scalar electric like waves, it will be assumed that gravitational waves are indeed, much faster than the speed of light.

The reason that electric scalar waves are faster than the speed of light is attributed here to the nature of these waves, which are longitudinal (*i.e.*, amplitude varies in the direction of propagation), which are not photon derived waves. In contrast, electromagnetic energy radiation is based on transverse waves that are derived from photon propagation. Because longitudinal scalar waves are not quanta propagation waves, such waves are not bounded by the quanta-continuum coupling mechanism described in this theory. Therefore, it is expected that longitudinal type waves can also directly couple to and elevate the 4D electric scalar potential of the continuum.

It has been hypothesized before that future space travel to distant stars or galaxies may involve bending the space-time continuum, or creating wormholes. Even if it were possible to collapse or expand the space-time in order to shorten distances across the Universe, such a grand scale collapsing would involve an unimaginable amount of energy, which should make it humanly impossible. Based on instantaneous gravitational effects that space bodies have on each other, it has been ascertained before that gravitational waves can propagate instantaneously, or at the very least, many orders of magnitude faster than the speed of light. Even though, there is controversy in this area and convoluted explanations provided as to why gravitational waves should travel with the speed of light, it is hard to consolidate this idea with observations about planetary stability, without accepting the notion that gravitational waves move faster than the speed of light. It is an accepted fact however, that the influences of scalar electric fields are felt instantaneously or without involving propagation delay. Since in this development gravitational waves are a form of scalar electric like waves, it will be assumed that gravitational waves are indeed, much faster than the speed of light.

The reason that electric scalar waves are faster than the speed of light is here attributed to the nature of these waves, which are longitudinal (*i.e.*, amplitude varies in the direction of propagation), as opposed to transverse waves that are derived from photon or quanta propagation, which constitute the basis of electromagnetism. Because longitudinal scalar waves are not quanta propagation waves, such waves are not bound by the quanta-

continuum coupling mechanism described in this theory, and as such their propagation speed as purely electrostatic like waves is conceivably unbounded. Therefore, it is expected that longitudinal types of waves can also directly couple to and elevate the 4D electric scalar potential of the continuum.

An experiment conducted recently by Sergei Kopeikin of the University of Missouri, and Edward Fomalont of the National Radio Astronomy Observatory measured the propagation of gravitational waves by measuring the speed of radio waves coming from a quasar and passing by Jupiter. Supposedly, this experiment showed that indeed, gravitational waves travel with the speed of light. However, according to Stuart Samuel, a participating scientist with the Theory Group of Berkeley Lab's, this experiment was flawed,, and "In effect, the experiment was measuring effects associated with the propagation of light, not the speed of gravity". Similar comments apply to the recent observations that are claimed to have detected gravitational waves. Gravitational or scalar electric waves should be extremely difficult, if not impossible, to measure, even with very long space-based interferometers, as the propagation speed is at least many orders of magnitude faster than the speed of light.

If somehow the local space-time continuum could be made to move, one could potentially travel with the speed of gravitational waves, without necessarily violating the speed of light limitation. That is because the quanta of mass inside this locality would not be in motion with respect to the local continuum. A spaceship can remain stationary with respect to local space-time continuum, while the local space-time can be put in motion with respect to the global 4D continuum aether.

A high intensity longitudinal electrostatic potential field could be artificially generated and such a field would naturally become superimposed on the local continuum to raise its potential. Such a generated field should produce an electric scalar like wave, which potentially could propagate with the speed of gravity. If an electrostatic like wave can be generated and pulsed, then it is foreseeable that this wave will be expanding with every pulse to propagate with the speed of gravitational waves. If the expansion of such a wave could be directionally controlled, then the expanding continuum should be dragging with it the local space-time continuum, and any mass that resides inside its locality. This expansion would be much alike that of a high-density fluid that expands into the lower density surroundings. It is foreseeable that the higher the pulsing frequency of longitudinal waves is, the more efficient the dragging and propagation should be for the local space-time continuum. Also, to effectively be able to propel the local space-time continuum, it would likely require a relatively high intensity longitudinal field.

A simplified schematic of a potential continuum contraction and expansion system is shown in Fig. 3. Such a space-time drive could be comprised of a longitudinal type, high-frequency pulsing electric potential generator. Such longitudinal waves could be produced with Tesla type pancake transformers, with resonant primary and secondary winding circuits. For example, a capacitor could be used in the primary with the transformer winding inductance forming an LC tank, with a spark gap or other appropriate transistor switching. The secondary of the last transformer stage would be designed as a pancake transformer. Either the positive or the negative terminal of this secondary, depending whether the generator is designed for continuum contraction or expansion, would be connected to an exposed conducting metallic surface or sphere, which transmits the longitudinal waves in space. It may be necessary to employ electrostatic screens in the transmitting apparatus to provide wave directivity.

Such longitudinal wave generators; one for continuum contraction and the other for expansion could be attached on either side of a spacecraft, as shown in Fig. 7. Even though, only one type of this generator system could be sufficient to make this type of system work. In the two-generator configuration, the center of the spacecraft would be electrically grounded to the local continuum potential via a plasma contactor or via an exposed electric contact surface, like a metallic ring or a metallic disc around the craft. One of these generators would be pulsing with a high positive potential with respect to the ground, while the other would be pulsing with a highly negative potential. Assuming that the outskirts of the continuum bubble that contains our Universe has a positive continuum potential with respect to the inner space-time, then this highly negative pulsing electrostatic potential should cause the space-time continuum to collapse on the aft side of the craft, propelling the local space-time together with the craft forward. Similarly, a highly positive pulsing potential on the port side of the craft should cause the continuum to expand in the direction of motion, dragging the craft forward in this process. If instead, our universal bubble potential polarity were reversed, then the exact opposite would be true. Thus, by collapsing and/or expanding the continuum, this could potentially propel the local space-time and the spacecraft that resides inside it with speeds comparable to those of gravitational waves.

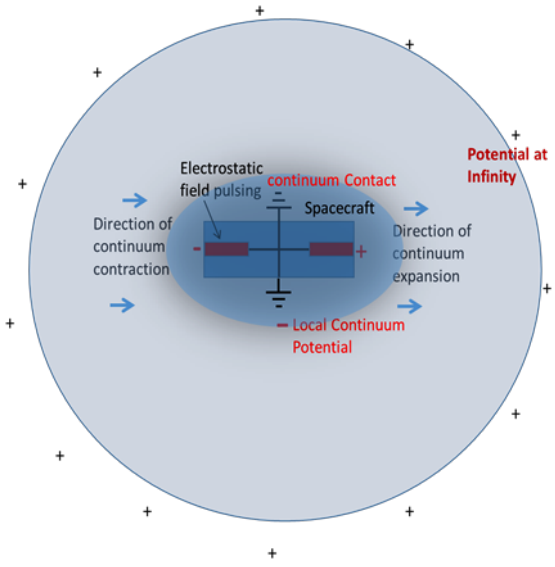

Figure 3. A potential configuration for a future propulsion system based on contraction and expansion of the continuum.

In terms of determining the relative electrostatic potentials that may be necessary to develop a practical space-time drive, the strength of the continuum potential on the surface of the Earth could be used as a starting point. This would be the differential electric scalar potential discussed before, due to the presence of the Earth's mass in the continuum. Given the effective space

charge of the Earth, Q_{ME}, as calculated in Part I of the therory, and if it is assumed equivalently that this charge is located at the center of the Earth, the electric scalar potential on the surface of the Earth could be computed in volts as:

$$\Phi_{es} = \frac{Q_{ME}}{4\pi\varepsilon_0 r_E} = \frac{6.508\times10^{10}}{4\pi\times8.854\times10^{-12}\times6.32\times10^{6}} = 9.254\times10^{13}.$$

This equation implies that on the surface of the Earth a differential continuum 4D electric scalar potential exists of about 93 trillion volts. Coincidently or not, this scalar potential is about the same as the continuum scalar potential, Φ_C, also calculated in Part I. To produce such a high voltage potential it would probably require several electrical transformers in series. Such a high voltage would be expected to present challenges for a relative compact size design, for transformer winding isolation to prevent arcing and breakdown, which may require an enclosure with a high vacuum containment. Successfully generating such a longitudinal scalar like wave, there would be no containment or shielding that would be able to attenuate its propagation. Since such a wave will penetrate into Planck scales and its propagation will not depend on photon energy transmission.

Such a high potential generated on or near the Earth's surface would be expected to have very visible electromagnetic effects. However, these effects may not be so pronounced considering that the generated scalar wave field would become superimposed on the local 4D continuum and that fundamental quanta of mass in the vicinity would be coupled to this field.

Since the local space-time continuum would be moving with this space-time drive instead of the spaceship, it is also to be expected that with such a drive there would be no space inertia forces experienced by the spacecraft. This is because the mechanism described before that generates space inertia forces would not be engaged in this case. Thus, it is possible that with this kind of drive, the local continuum and a spaceship inside it could theoretically be capable of making 90° turns without necessarily violating conservation laws.

7. The Cyclic Universe

According to this theory, the space-time aether continuum is comprised of a 4D ESP field, and for the Universe fundamental quanta at Planck scales reside in this continuum, coupled together with this ESP field, which become the fundamental quanta constituents of mass and energy. The Universe owes its expansion to the differences in ESP density that exists across the expanse of the continuum aether bubble that the Universe resides within. Such a Universe continuum bubble may stretch across to hundreds of billions of light years or more, as the visible Universe is estimated extends to about 93 billion light years across.

If the known Universe is at a higher ESP density compared to the surrounding continuum, then that could explain why the aether-Universe bubble will be expanding with an accelerated rate towards the outer regions of the continuum. If the Universe is expanding concentrically towards the outer surrounding regions of the Universe bubble that has a lower density (either positive or negative potential), then over time the central regions of the Universe would be expected to become increasingly devoid of the aether. So at some point, this wave motion of the aether will reverse course and begin to collapse concentrically. This collapsing aether continuum could then be part of the cycle that preceeded the Big Bang and ultimately gave birth to our Universe, in which case our Universe would be a cyclic Universe. If a continuum collapsing was taking place prior to the Big Bang, then it can be assumed that some process during this collapse was responsible for creating matter or energy quanta constituents, which subsequently led to the Big Bang.

When the concentrically collapsing waves reached the central region of the bubble and as the continuum continued to collapse, its density at this central region of space and the associated gradient stresses would have started to increase unabated. The maximum stress points are envisioned to have occurred at the peaks of the standing wave resonance, perhaps in the radial direction. As these continuum stresses increased, at some point it is assumed that the continuum would have started to fragment at these resonant locations, creating individual Planck scale electric scalar potential fields, like the ocean's spray mist. As discussed before, these quanta potentials would have immediately coupled with the continuum resonance, and as such once created, their existence would have persevered through time. Assuming, that in this process the continuum resonances shattered at the peaks or the trough of this wave, the length of these quanta constituents should be comparable to the wavelength of the continuum resonance. Thus, the continuum resonance and coupling becomes the scaffold upon which constituent quanta of mass or energy adhere to in order to create the foundation of mass and energy.

As these quanta started to be created and squeezed inside the concentrically collapsing space-time continuum, all the attributes of matter and gravity should have begun to exist for the first time, based on the process described before, and a very high density and uniformity of mass and energy would have been created within a confined central region of space, with very high temperatures and pressures and with quanta velocities very near the speed of light. The uniformity of this matter-energy bubble would have been added by increasing quantum orbital speeds and perhaps orbital plane alignments with radial planes in order to generate maximum tangential orbital velocities without violating the exclusion principle. Based on the mechanism for the gravitational constant described in Part I, this bubble of mass and energy would have undergone an oscillation cycle of repeated squeeze and expansion, against the pressure of the collapsing continuum. At some point during this oscillation cycle and as temperatures and outward pressures kept increasing, the inward and outward pressures reached parity, and in a final gasp the big bang explosion took place.

After the Big Bang explosion, the Universe with its space-time continuum began to expand. As this expansion continued, the Universe for some time afterwards could have still being crashing against the incoming collapsing waves, and perhaps this may explain why for the next five billion years the Universe continued to inflate at a decelerated rate of expansion. [4] Even though gravity, because of the more compact size of the Universe, could have also been responsible for this decelerated rate of expansion. [5]

Assuming this accelerated expansion continues long enough, then at some point during this expansion the effective resonant wavelength of the continuum should become long enough that quanta constituents will no longer be able to maintain the resonant oscillation cycle and thus, their coupling with the continuum will cease. At that point, it would be expected that the quanta mist that makes-up matter and energy will return and become part of the continuum ocean, at which point all quanta derived energy, all mass, as well as time in a physical sense will cease to exist. In this process of the Universe's demise however, a new Universe will be born and the cycle will continue.

Based on this cycling Universe hypothesis, it would not be unreasonable to imagine that our Universe may not be the only Universe in the vast expanse of the Cosmos, and that the cycling or the faith of our Universe and its ESP bubble may even depend on the nature of neighboring Universes, as Universes may be spread out as stars are spread in a galaxy.

8. The Strong Force and Atomic Orbitals

The equation of the radial acceleration component of gravity introduced in Part I also has the proper structure to be a candidate for the strong force. Using that equation for the strong force, the force should increase, pointing towards the nuclear center when acceleration increases in the opposite direction, and similarly the force should decrease when acceleration is towards the nucleus center. However, for the size of the masses involved in the nucleus, this force would be negligibly small to be a candidate for the strong nuclear force, which is in the order of 10,000 N. Nevertheless, in this theory massless force-carrying particles like the graviton should not exist, and along the same lines the existence of the strong force as fundamental force in nature may need to be rethought.

It can be assumed that the three quarks are not exactly solid spheres and that they may contact each other on the surface, or even overlap with one another in pancake like arrangements, as these quarks may even share quanta mass constituents. If there are quanta constituents of mass shared between quarks, obviously there should be additional bonding forces. Even the coupling of quark quanta constituents with the continuum and the associated electromagnetic coupling between constituents could provide for additional coupling forces. If quanta mass constituents are shared between quarks, there is no reason that such constituents could not be shared between protons and neutrons in a nucleus. The scale of the proton is of the order of 10e-15 m, while the Planck scale of mass constituents is in the order of 10e-35 m, which is a vast difference of scale. Thus, there is so much room that remains for coupling and bonding between quanta and for forces to take place.

Even though quarks in a nucleus may share quanta constituents of mass, the strong force, which is approximately 10,000 N, may still be primarily or exclusively an electrostatic force. If the 3 quarks in a proton were spheres, with the down quark sandwiched between the 2-up quarks, their separation distance would be approximately $1/(3\times10^{-15})$ m. However, these quarks are expected to be shaped more like pancakes than spheres, and their separation distance could be even less. The quarks are also expected to resemble flexible or elastic cloud sheaths, instead of solid masses. As such, if a force is applied to separate them, these clouds can stretch or rub against each other, which can cause their separation distances to decrease, as they are electrostatically attracted. The separation distance required to produce an electrostatic attraction force of 10,000N can then be calculated as

$$r=\sqrt{K_{\mathrm{e}}q^2/F}=\sqrt{\frac{8.99\times10^{9}}{10000}\left(\tfrac{1}{2}1.6\times10^{-19}\right)}=5.06\times10^{-17}\,\mathrm{m}\quad,$$

which is only a factor of 6.5 or less reduction of the original estimated distance between quarks. This is not even taking into account the distributed effect of the electrostatic force in the quarks *vs.* that of the point source assumed here, which in itself would make a significant increase in this force. Therefore, it is not inconceivable that the strong force can be primarily or purely an electrostatic force.

Perhaps quarks in the nucleus and their quanta constituents could have a certain topological arrangement, and a vibrational relation with the continuum, and in the process creating associated energy wells. In such a scenario, if a particle like an electron comes near the nucleus, at some point it would need to interrupt or interfere with this arrangement. In other words, the approaching particle would need to overcome energy barriers or wells established by the nucleus-continuum system, in order for the electron to come ever closer or make contact with the nucleus. As such, energy wells could also be created between the electrons and the nucleus, and as such the orbital arrangement of electrons will be restricted as presently observed.

9. Satellite Galaxy Orbital Alignment

Recent telescope observations have revealed that satellite galaxies orbit in alignment with the galactic planes of their mother galaxies. (See endnotes.) But satellite galaxies are captured galaxies, and based on the standard model, such galaxies should instead be swarming the mother galaxy in no particular orbit orientation. Thus, the observations do not agree with present knowledge, suggesting that there should be a different kind physics that explains this behavior. The continuum theory however, can explain this behavior with its prediction of an additional gravitational force component as stated in Part I (*i.e.*, the second component in the following equation:

$$F_{\mathrm{g}m1}=-q_{\mathrm{M}}m\frac{\Psi_{\mathrm{M}}}{r^2}\left(\frac{2}{\pi}\left|\mathbf{V}_{\mathrm{r}}\right|+\left|\mathbf{V}_{mr}\right|\cos\theta_{mr}\right)\quad.$$

Figure 4 depicts the galaxy continuum equi-potential lines (blue color). It also shows an inclined obit of a satellite galaxy in green color. Fig. 5 shows a close-up depiction of the equi-potential lines in the z-direction. The object's orbit at some moment in time is crossing the galaxy's equi-potential, $\Phi_{x=K,z=3}$. As the gradient of the flux field varies in the z-direction, a gravitational force is acting at that moment on the orbiting object, which can be expressed as

$$\mathbf{F}_{gz}=-q_M m_{\mathrm{o}}\left(\Psi_{x=K,\,z=3}/r^2\right)V_z\quad,\qquad(11)$$

where subscript 'o' signifies the orbiting object. Because both the galaxy's ESP flux density and the satellite's velocity components are in the z-direction, $\cos\theta = 1$. Also, as both the divergence of this field ($\nabla \cdot \mathbf{\Lambda}_K$) and the velocity vector are negative at that point, the gravitational force generated from this gravitational component points towards the galactic plane and it's normal to that plane. This shows that over a long period of time this force component, which is normally much smaller than the Newtonian component of gravity, will cause the satellite galaxy to align its orbit with the galactic plane.

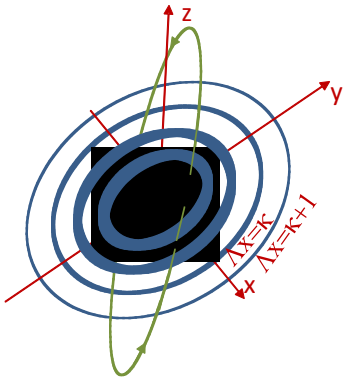

Figure 4. Depiction of the continuum electric scalar equipotential lines along the orbital plane, also depicting an orbit (green) offset from the plane.

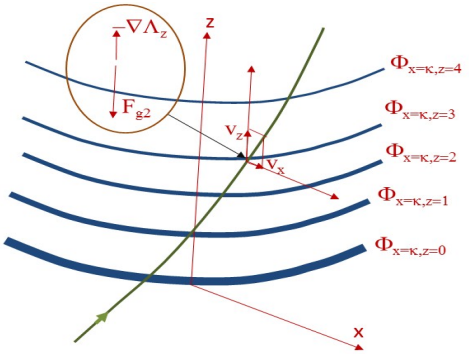

Figure 5. A close-up depiction of continuum electric scalar equipotential lines along the z-axis (normal to the galactic plane). Also shown, the gravitational force generated due to the dot product $\left[\mathbf{V}_z \cdot \nabla \mathbf{\Lambda}_z\right]$ at the point where the orbit crosses the equipotential line $\Phi_{x=K,z=3}$ situated on the orbital plane (velocity vector away from the source is negative).

10. Fictitious Forces

In Part I it was shown that the inertia force is not a fictitious force, and the same is true for the centrifugal force, which is also due to the inertia force. For the Coriolis force, the second gravitational component covered in Part I or the component of gravity described in the previous section will cause the trajectory of a mass inside the influence of the flux field of another mass to bend into a circular or a spiral orbit. Thus, this component of gravity is also a key contributor to the Coriolis force.

While the Coriolis force is a little more involved, the Newtonian component of gravity will be pulling water particles towards the center of the Earth. At the same time, the additional component of gravity will be pulling the water particle towards the center of the pipe, like toilet pipe. The combination of the two forces will give a water particle a spiral trajectory, also in combination with centrifugal forces, *etc.* If all these forces are drawn along spoke planes, through an imaginary pipe extending to the center of the earth and to the other side, it may be noticed that on the other side of the earth (north vs south hemisphere), the combination of these forces will be such that the spiral trajectory will be in the reverse direction, which is a known fact.

Similarly, for the Euler force, which is perpendicular to the centrifugal force, as this force is also an inertia force.

11. Conclusion

In this paper the theory of gravity described in Part I was extended to cover the concept or the origins of mass, which is different than the Higgs boson. The theory also describes the quanta constituents that are responsible for both mass and energy, and how it is all manifested through a continuum aether resonant coupling at Planck length scales. The paper also covers the mechanics for the speed of light and shows that the speed of light is not an absolute. It also describes how the speed of light can be circumvented and the potential technology to make this practical. The theory is also extended to describe the concept of time and the mechanism for the fundamental tick of time. It also describes a hypothesis for a cycling Universe, what may have preceded the Big Bang, the conditions that led to the big bang, and how this cycle may repeat itself, without involving the so called *dark energy*. To give further credence to the theory, some examples are described that validate the theory, such as the explanation why satellite galaxy orbits tend to align themselves with the galactic planes of mother galaxies, and more explanation is provided as to how this theory of gravity explains the fictitious forces.

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Effects from Physical Electromagnetic Vacuum

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This paper discusses the mechanism of radiation of light by an atom. The laws for radiation spectra from atoms are discussed from the classical viewpoint.

Key words: Physical electromagnetic vacuum, radiation of light by atoms, radiation spectra, classical viewpoint.

1. Introduction

Classical Physics renounced the concept of 'world ether' because world ether could not explain the experiments of Michelson–Morley or stellar aberration, and scientists could not create a model of world ether that would have the properties of an elastic solid in which could be propagated the transverse vibrations inherent to light, but would not simultaneously hinder uniform motion of physical objects. Lacking an alternative theory to explain the phenomena of our world, scientists have been forced to use Special Relativity Theory (SRT). This theory has a fantastic model of space: without any interaction model: it miraculously makes space shrink in the direction of motion of the observer, to make the speed of light constant for all observers.

Scientists from the early 20th century, inventing the most incredible trajectory of motion of an electron in an atom, could not be based on the classical concepts of radiation to explain the mechanism, pattern of occurrence of the emission spectra of atoms and the stability of atoms. Therefore, scientists, for lack of an alternative theory, were forced to use Bohr postulates to explain the spectra of radiation from atoms, to create quantum mechanics and use it in conjunction with the ideology special relativity for an explanation of the universe.

The present article briefly describes the physical model of the electromagnetic vacuum formed not by some hypothetical particles, not some hypothetical superfluity quantum liquid and well-known electromagnetic field with a very large volume energy density. In addition, the Article briefly describes the basic physics problems that are simply and clearly solved with the help of the physical model of the electromagnetic vacuum, and explained on the basis of classical concepts (for example, a hydrogen atom) process of radiance by atom of light and the regularity of its spectrum of radiance.

Some parts of the theory that explains problems of Physics based on a model of the physical electromagnetic vacuum (PhEMV), have been published in [1-6]. The PhEMV, forming the space of our Universe, the ether of classical physics – is the uniform wave field with the high energy density, formed by countless electromagnetic waves (EMWs) with a very small amplitude and wavelength – microwaves. These micro electromagnetic waves (mEMWs) propagate in the medium of the world ether, as a classical wave in every possible direction on the electric field lines (EFLs) with intensity E, formed by the electrical components of same mEMWs of the PhEMV. It is supposed that the electromagnetic field of the PhEMV is primary in which elementary particles can be formed spontaneously, using the PhEMV as the medium providing their existence and interaction.

The question of occurrence of the PhEMV is not considered in this article. In [1] it was shown that in the theory, based on model of the PhEMV, the electric field E is equal to the volumetric energy density of the power flow of the electric field of elementary EFL, cross-sectional area in which it is equal to the cross-sectional area of the electron, it is equal to the modulus of elasticity in tension and compression of the electric field of elementary EFL, it is equal to the tension force in elementary EFL. Therefore transverse and longitudinal EMWs can propagate in the PhEMV, having properties of an elastic solid. The theory based on model of the PhEMV, allows us, on the basis of classical laws, and without any ambiguities, to create models of particles and to explain their interactions.

In the present theory, an outer electric field of the charged particles is formed by electric fields, microwaves of the PhEMV being a transmitting agent between interacting particles. Therefore, electron oscillations are transferred its outer electric field, formed by electric fields microwaves of the PhEMV, and propagate on EFLs its outer electric field as classical transversal and longitudinal "running" waves. The action of tensile forces in EFLs of the outer electric field of an electron at propagation on those of a traveling wave makes shear of every infinitesimal segment of EFLs on angle $\Delta\alpha$. Ref. [1] showed that the projection resultant tension forces occurring at the ends of each of the shifted infinitesimal segment of EFL, perpendicular to the direction of wave propagation are self electric fields of each infinitesimal segment of EFL. Thus, the wave propagating on EFLs, has self electric field. Own electric field of a wave is a part of the electric field of moving infinitesimal segments of EFLs. Therefore the self electric field of the wave is moving. If all EFLs are formed by moving self electric fields of mEMWs of the PhEMV, then all EFLs is moving.

The energy of the self electric field of the traveling wave in an infinitesimal segments of EFLs, on which the wave propagates, it is equal to the kinetic energy transferred to an infinitesimal segments of the EFLs at their alteration by tensile forces in EFLs. Shearing of an infinitesimal segment EFLs creates in each of them, except a kinetic energy, the potential energy equal to energy of their self magnetic field. Thus, the rtraveling wave propagating on EFLs is the electromagnetic wave (EMW). As a result of an interference of mEMWs of the PhEMV overage for a time unit size of a resultant of intensity electrical and magnetic fields **E** and **H** at each point of the PhEMV it are equal to zero. As EMWs at interference are not destroyed, the neutralized electric field with intensity +**E** and - **E** exists in any direction of the PhEMV. Therefore, electrical components of microwaves with

any orientation of vectors of intensity are available in any point of the PhEMV, filled with electromagnetic fields of mEMWs. Therefore straight EFLs and circular EFLs (CEFL) with any volumetric density of energy can be formed in any volume of the PhEMV from electrical a component of microwaves of the PhEMV.

The mass of a unit volume of an electromagnetic field with electric field strength E, as shown in [2], is equal to the sum of masses electrical and magnetic fields, it is equal $2E^2 / C^2$, where E^2 is volumetric density of energy of an electric field, and C is speed of light. The mass of an electromagnetic field can be called an elastic modulus of an electromagnetic field of EFL at alteration. Energy ΔW, received electrical and magnetic fields of an infinitesimal segment of EFL with mass Δm at its alteration in time $\Delta t \to 0$, it is equal to the work made by force **F** at alteration of an infinitesimal segment on a path ΔS in time $\Delta t \to 0$. Therefore the force necessary for moving mass of an electromagnetic field with acceleration, it is equal to mass product on acceleration**.** In the theory based on model of physical vacuum formed by the electromagnetic fields of microwaves with a large total energy density, all particles in the Universe are formed by the electromagnetic fields, and therefore throughout the Universe the second law of the Newton should act.

The velocity of propagation of transverse waves in a string is given by $v = \sqrt{T/\rho}$ where T ia tension (elastic modulus) of the string, ρ is the mass per unit length of the string. In [2] it was said that volume density of the energy of the electromagnetic field of unit EFL with intensity its electrical components E**,** equal 2E², can be called the modulus of elasticity of the electromagnetic field unit EFL in tension and compression (λ_{stretch}).

The mass of electromagnetic field of unit EFL, equal $2E^2 / C^2$, may be called by an elastic modulus of the electromagnetic field of unit EFL at shearing (λ_{shear}). That is why the propagation velocity of transverse and longitudinal EMWs on EFLs is equal to:

$$\mathbf{a} = \sqrt{T/\rho} = \sqrt{2E^2 / (2E^2 / C^2)} \text{ and } C = \sqrt{\lambda_{\text{stretch}} / \lambda_{\text{shear}}} \quad .$$

In the theory based on the model of physical vacuum [3], elementary particles form from groups of transverse electromagnetic impulses (EMIs) propagating on circular electrical field lines (CEFLs). The electric fields of these EMIs form the particle charge, the mass of the electromagnetic field of CEFLs is the mass of the particles, the kinetic energy of electric fields of longitudinal EMIs of the PhEMV, which forms CEFL of the particles, as shown in [4], creates self momentum of particles - spin, and the magnetic field of the longitudinal EMIs of the PhEMV creates an axial magnetic field and a magnetic moment.

In PhEMV theory, the electron and positron are elementary particles having minimum possible mass, radius, and charge. Upon fusion, they do not annihilate and form a neutral particle with twice the mass of the electron, since group of the EMIs, forming each of the fused charged particles, continue to propagate in the PhEMV on its CEFLs. So the electric field of group of the EMIs, forming neutral electron-positron pairs, is double-layered. The outer layer of the electric field fused of the electron-positron pair is negative, and the inner layer is positive.

As shown in [5], stable π^0 mesons are aggregate neutral electron-positron pairs, held together by axial magnetic fields of electron-positron pairs, which form, as mentioned above, the magnetic moments of the electron and positron. In the theory of elementary particles, based on model of the PhEMV, seven stable π^0 mesons can form a nucleon. In this case, the central π^0 meson, having rest mass 264.1 m_e, coupled with six π^0 mesons, situated around it. Each π^0 meson connected to two adjacent particles and the core particle is held together by nuclear forces. Because the electric field fused electron-positron pairs is two-layer, double-layer is that the electric field of π^0 mesons.

In the PhEMV-based theory, nuclear forces are forces of adhesion between the outer (negative) and internal (positive) layers of double-layer electric field of coupled π^0 mesons. For nuclear forces to take effect, it is necessary to expend energy to overcome the Coulomb repulsion between the outer layers of the particles, move peonies (forming nucleons) to inter-osculation of the CEFLs of the particles. Thus, the clutch outer of the negative electric field of one particle with internal positive electric field of the second particle occurs only with consumption of the energy.

Decay of particles connected by nuclear forces leads to separation of fragments due to repulsion of the outer layers of the particles. Thus, particle decay is accompanied by release of energy expended for connecting particles. As shown in [6], release of energy does not occur and due to of defect of mass. Thus, according to the PhEMV-based theory, **energy output because of defect of masses, more spent for synthesis of nucleons, in operated thermonuclear reaction should not occur**.

Since all EFLs of the PhEMV formed by moving their self electric fields of mEMWs of the PhEMV, all EFLs move. Therefore, all EMWs propagate on moving EFLs. Speed and acceleration of self electric fields of mEMWs, of which moving EFLs formed, depend on the energy transferred to them moving with acceleration particles of matter. So, for example, the light emitted by the atoms on the Earth, propagates on EFLs, moving with the speed of the Earth. Therefore, the speed of light on the Earth is equal to the vector sum of the velocities of light and the Earth, as explains the Michelson - Morley experiment. Therefore, the speed of light emitted by a relativistic particle on Earth is also equal to the vector sum of the velocities of light and Earth.

The electric field of the PhEMV average neutralized, sometimes mEMWs, interfering, can form at each point of the PhEMV resulting casual unit impulse – fluctuation, in which self electric field is not neutralized. If the average value of energy fluctuations of the PhEMV is equal h /sec, then we can say that there is a certain volume density of electromagnetic energy of the PhEMV, in which for 1 second there will be the energy fluctuation, equal to h /second.

As shown in [4], the elementary particles forming the substance of the Universe (both neutral and charged) oscillate under the influence of these fluctuation impulses, with frequency $\nu_0 = mc^2 / h$ proportional to their rest energy, and with fre-

quency $\nu_V = mv^2 / h$, proportional to their kinetic energy. Since elementary particles with opposite charge at the fusion in the PhEMV do not annihilate, the electric field of the charge of each of the particles forming the substance of the Universe is connected to electric fields of the PhEMV. Therefore, all matter in the Universe interacts with fluctuations of the PhEMV, and for 1 sec gets energy equivalent to its rest mass and kinetic energy, and, oscillating under the influence of these fluctuations, radiating transverse and longitudinal mEMWs, gives the same energy in the PhEMV. Thus, substance of the Universe, absorbing energy of fluctuations and emitting mEMWs, does not change energy of microwave field PhEMV, determines the wave properties of a matter and the mechanism of radiation spectra of atoms, and creates a gravitational field.

The energy flow emitted by the substance of the central part of the Universe, occurring at fluctuations of particles of material under the influence of fluctuations of the PhEMV, is the cause of galaxy recession. Masses partially absorb, partially dissipate, the energy flows from the Universe, partially shielding (in proportion to their mass) each other from these energy flows. Therefore, gravitating masses under the action of the force (which is the force of gravity), resulting from the interaction of the electric field of energy flow emitted by the substance of the Universe, with the electric field of the charge of elementary particles of such masses, are attracted to each other.

The Sun particles shield a ray of light that is passing near to it. Therefore the light ray (having mass), passing near to the Sun, under the influence of electric field of energy flow from material of the Universe on self electric field of EMWs of light ray, is attracted to the Sun, so the trajectory of light ray is bent. A similar mechanism occurs and as change of frequency of light at approach or removal of light ray, for example, from the Earth. Action of the power flow of gravitational radiation of substance of the Universe directed to the Earth, increases kinetic energy, means, and speed EFLs on which propagates EMWs of light, in process of light approach to the Earth. Therefore, the speed EFLs, on which the light propagates away from the source of gravity is reduced, which explains the red shift γ-photon moving in the direction from the source of gravity, as measured by the Mossbauer effect at Harvard University.

Oscillating infinitesimal segments EFL (at propagation on EFL of running wave) move with acceleration. Therefore, self electric fields of EMWs, connecting with electric fields of the PhEMV, transfer them energy (in the form of longitudinal EMIs), proportional to its mass and acceleration. Therefore, the amplitude and the kinetic energy of the oscillations of any EMWs (both longitudinal and transverse) propagation in the PhEMV decrease. Therefore, the speed of EFLs on which propagates transverse EMWs, radiated by the Aster, and in process of propagation of EMWs in interstellar space is reduced. Therefore, the recession of peripheral galaxies of the Universe under the influence of repulsion radiance of the central part of the Universe and the anomalous rotation speed of peripheral parts of galaxies can be explained without use to the hypothesis about «dark substance».

The PhEMV forms absolute space. The mass of the electron, moving in absolute space PhEMV, increases (due to increase of its kinetic and radiating masses) with growth of its speed, increasing to $m_e(1 + V_{(t)}^2 / C^2)$. That is, the mass of a solid and its maximum speed at motion in the PhEMV does not have a limit value. Motion in the PhEMV changes, not time, as a substance, and the internal processes in atoms.

As will be shown in § 3, The frequency of light emitted by an atom depends on the kinetic energy of the moving electron in an elliptical orbit, so it depends on the speed. Therefore, the absolute velocity of the solid can be defined in absolute space of the PhEMV. Therefore, time measured by atomic clocks on a plane different from the time measured by atomic clocks on Earth. The lifetime of a fast-moving unstable particle increases due to the increase of kinetic energy, and hence the volume density of the electric field in a double layer electric field particles, which increases the nuclear forces holding unstable fast moving particle from the rapid decay. That is, the change of mass of the moving particle and increasing its lifetime is not mathematical consequences of special relativity, and is a consequence of laws of motion of the particle in absolute space of the PhEMV.

It was mentioned above that in the theory based on the PhEMV model elementary particles are formed by group of transverse electromagnetic impulses (EMIs), propagating on circular electrical field lines (CEFLs) with the radius of the electron. Therefore, we can assume that the fluctuation electromagnetic pulses simultaneously arising in the volume ΔV of the PhEMV will be to propagate on electric fields of the PhEMV, held on a circular path with a radius of the electron, as shown in [3], the cohesive forces in magnetic fields of the fluctuation electromagnetic impulses, having formed a particle. Therefore, π^0 mesons, being building material for formation of nucleons, can be spontaneously produced by combining of fluctuation EMIs in the interiors of stars, where the quantity of fluctuations EMIs, due to multiple re-radiation of impulses atoms of the Aster, it is increased. Therefore, the energy density of the wave field of the PhEMV should be comparable with the energy density of the nucleon for the possibility of its spontaneous formation and stable existence in the PhEMV.

Power transmission by a moving particle to the PhEMV takes place only at its motion with acceleration. Therefore, particle motion in the PhEMV without acceleration, at uniform motion, at motion by inertia does not demand energy consumption, despite the high density of energy of the PhEMV. Thus, the theory based on model of the PhEMV and models of elementary particles, allows showing without paradoxes of relativity theories of A. Einstein that it is possible to explain all forces and natural phenomena by means of only an electromagnetic field.

2. Trajectory of an Electron Moving by Inertia

Ref. [2] told that the electron, moving with a speed V due to the interaction with the fluctuations of the PhEMV, oscillates with frequencies $\nu_0 = m_e C^2 / h$ and

$$\nu_V = m_e V^2 / 2h \qquad (2.1).$$

As speed $V \to C$ V, the oscillation amplitude of $A_{\upsilon\nu}$ at ν_υ much exceeds the oscillation amplitude of A_{o0} at ν_0. So the wave

properties of an electron are determined by oscillations of an electron moving with frequency $\nu_v = m_e V^2 / 2h$.

Fluctuating electromagnetic pulses in the PhEMV occur due to interference of microwaves in the PhEMV having different frequencies and phases. Therefore, the fluctuation electromagnetic pulses are not harmonious. The function describing non-harmonic oscillations of the electron with frequency $\nu_e = m_e V^2 / 2h$, can be expanded in a Fourier series on the harmonious functions with frequencies, integer multiple of ν_e .

The 'wavelength' of the moving electron is determined from the distance the electron moves in the oscillation period. Therefore, the wavelength of the second harmonic is $\lambda_2 = V / m_e V^2 / h = h / m_e V$, the de Broglie wavelength. The electric field line (EFL) directed along the X axis, coupled with the electric field of the electron charge freely moving along the X axis with speed V , vibrates at the electron oscillation frequency ν .

The differential equation of a sine wave propagating along x goes $\partial^2\Psi / \partial t^2 = C^2(\partial^2\Psi / \partial x^2)$. Solutions are of the form

$$\psi = A_0 \cos\omega(t \pm x / C) \quad . \qquad (2.2).$$

As A_0 it is equal to amplitude of the electron oscillation, the oscillation frequency of the electron is equal to the oscillation frequency of the wave, then, if in Eq. (2.2), we replace C with V , we obtain the trajectory of an electron oscillating in the plane XOY with frequency $\nu_1 = m_e V^2 / 2h$, defined by:

$$\psi = A_0 \cos[\omega(t - x / V)] \quad . \qquad (2.3).$$

Eq. (2.3) describes a plane wave moving in the positive X direction, but with the speed of the electron. As the amplitude and frequency of the electron oscillations and waves are the same, speeds of movement of the electron and waves after replacing C wth V in Eq. (2.3) are the same, so the trajectory of the average electron moving along the X axis in the plane XOY with speed V , coincides with the envelope values function $\Psi = A_0 \cos[\omega(t - x / V)]$. That is, Eq. (2.3) determines the trajectory of motion by inertia in the plane XOY of the average statistical electron having speed V , and frequency $\nu_1 = m_e V^2 / 2h$.

Finding such trajectories for all frequencies in the expansion of the Fourier series, we can obtain an average statistical trajectory of an electron in a plane XOY. Therefore, the magnitude of uncertainty of an electron, moving by inertia with speed V , is determined by the value of twice the amplitude of oscillations under action of fluctuation impulses with frequency $\upsilon_1 = \frac{1}{2} m_e V^2 / h$. Thus, the magnitude of the uncertainty of an electron is inversely proportional its motive energy.

3. The Spectrum of the Hydrogen Atom

Regularity, leading to the emission of light, it is convenient to study on an example of the light-emission hydrogen atom.

Before explained from positions of classical physics, from the standpoint of classical electrodynamics spectrum of the hydrogen atom, you need to answer two questions.

1) - Why not in the spectrum of frequencies corresponding to the period of rotation of the electron around the nucleus, and

2) - Why electron, emitting, spending energy for radiance, does not fall into the nucleus.

In [1] it was shown that the self electric field of the EMW, propagating in the EFL, arises at alteration of infinitesimal segments EFL by a propagating wave. The vector of self electric field of the EMW, arising at shear each infinitesimal segment of EFL of the EMW, is the resultant tension forces occurring at the ends of each infinitesimal segment of EFL, perpendicular to the direction of wave propagation.

The direction of self electric fields in EMW to an opposite direction of the deflection of infinitesimal segments of EFL by electromagnetic wave and consequently a direction of a vector of self electric fields in EMW does not depend on the direction of the vector of the electric field forming EFL. Therefore, the direction of electric field vectors in EMWs, radiated with the same phase oscillating electrons and positrons, the same, even in the case of coalescence of these particles.

Ref. [5] states that in the theory based on model PhEMV, electrons and positrons do not annihilate, since each group of EMIs, forming these particles, continues to propagate in its CEFLs. Therefore, the oscillating neutral particle, formed fused electron-positron pairs, emits electromagnetic waves with intensity, proportional to their mass and acceleration.

Ref. [6] shows that nucleons form π_0 mesons, which, in turn, form a neutral, fused electron-positron pairs. Since the nuclei of atoms of matter formed by nucleons, the substance of the universe, oscillating, rotating about the center of mass, radiates transverse and longitudinal EMWs with intensity, proportional to their mass and acceleration, with a frequency equal to the angular frequency of rotation.

Orbital motion of the electron in the Hydrogen atom is the cause of the rotation of the electron and the proton concerning center of mass. Therefore, a proton must radiate EMWs, the intensity of which is not determined by a single positive charge equal to the charge of the positron and by mass and acceleration of the proton. As the electron and a proton rotate concerning centre of mass, electron radiance is compensated by proton radiance as in this case frequency and radiation intensity of an electron and a proton are equal, and phases differ by π . This explains why, in the spectrum of atom of hydrogen there are no the frequencies of radiance corresponding to rotation frequency of the electron in an orbit.

On the second question - why the radiating electron does not fall into the nucleus, can be answered by taking into consideration that the attraction of the electron to the nucleus at its rotation, hence, and a deflection electron EFLs of the PhEMV - that is radiation, carried out not by the kinetic energy of the electron. Refs. [3] and [4] said that outer electric field of an electron is formed EFLs of the PhEMV, electric fields in which are formed by components of the electric fields microwaves of the PhEMV, in which the intensity vector is directed lengthways EFLs.

The electric components of the electromagnetic microwaves of the PhEMV, connects to the electric fields of charges of the electron and of the proton, and attracts the electron to the nucleus due to the kinetic and the potential energy shift, received by infinitesimal segments of EFLs of the microwaves of the PhEMV from tensile forces in EFLs. Thus, the attraction of the electron to the nucleus with Coulomb force, as shown in [1] and [3], is carried out by tensile forces in EFLs, connecting electric fields of charges of the electron and the proton, equal to the volume energy density of electromagnetic field of EFLs. That is, an electron orbiting the nucleus does not spend its kinetic energy by radiation and therefore does not fall into the nucleus.

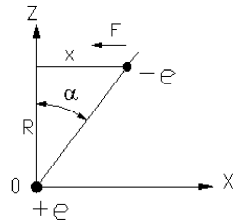
According to classical electrodynamics, the radiation of electromagnetic waves of a certain frequency is carried out, if the charge oscillates with the same frequency. As frequencies of radiance of the hydrogen atom do *not* correspond to the period of rotation of the electron around the nucleus, and, as was shown above, the radiance of an electron with the angular frequency of rotation cannot be fixed, we can assume that the light emitted from the electron oscillations under the influence of fluctuations of the PhEMV.

Small forced oscillations with frequency $\upsilon_V = m_e V^2 / 2h$, arising at an electron under the influence of fluctuations of the PhEMV, can be decomposed into oscillations located in the orbital plane and perpendicular to it. Radiance by atom of light is carried out thanks to small forced oscillations of an electron, perpendicular to the planes of its orbit, under the action of quasi-elastic Coulomb force. That the atom could radiate EMWs with some frequency, the electron must for some time have a constant set of harmonious oscillation frequencies.

As fluctuation electromagnetic impulses with frequency $\nu_v = m_e V^2 / 2h$ can be a non-harmonic, function ψ, determined not-harmonic oscillations of the electron in orbit, for its expansion in a Fourier series should be periodic and uniquely determined. In this case, electron oscillations with the harmonious frequencies near to frequency of natural oscillations of the electron in atom will have sufficient energy that the electron has radiated during stability of an orbit group of EMWs that can be fixed the device.

3.1 Frequency EMWs Radiated by an Electron in a Circular Orbit in a Hydrogen Atom

Figure 3.1.1 shows an electron orbit located in plane YOZ:



The electron is at radius R from the nucleus, which is in a point 0 of beginnings of co-ordinates, X - size of a deflection of an electron under the influence of fluctuations of the PhEMV from the orbit of an electron located in plane ZOY.

The quasi-elastic Coulomb force F on an electron in equilibrium position is:

$$F = [-e^2/(R^2+x^2)]\sin\alpha = \left[-e^2/(R^2+x^2)\right]\left[x\Big/\sqrt{R^2+x^2}\right] = -e^2\, x(R^2+x^2)^{-3/2} \qquad (3.1.1)$$

As a first approximation, for $X \ll R$,

$$F = -e^2 x / R^3 , \qquad (3.1.2)$$

Therefore, force F is linear, and, as a first approximation, oscillations of the electron are harmonic. §2 said that fluctuation electromagnetic impulses of the PhEMV are non-harmonic. Electron moves with speed V in a circular orbit, under the action of non-harmonic fluctuating electromagnetic pulses oscillates with frequency $\nu_e = m_e V^2 / h$.

The frequency of the first harmonic of the expansion of function Ψ in a Fourier series is not a harmonic of the electron oscillations. It has frequency $\nu_V = m_e V^2 / 2h$ in an orbit. it is $\nu_1 = m_e V^2 / 2h$, the second harmonic, $\nu_2 = 2m_e V^2 / 2h$, the n^{th},

$$\nu_4 = n m_e V^2 / 2h \quad . \qquad (3.1.3)$$

Electron oscillation at the first harmonic frequency has the largest amplitude. The distance traveled by the electron during the oscillation period - the 'wavelength' of the moving electron, oscillating at a frequency of the first harmonic is $\lambda_1 = V / \nu_1 = 2h / m_e V$, equals twice the de Broglie wavelength.

If the length of the circular orbit of the electron at the light emission equals a whole number of wavelengths $n\lambda_4 = n^2 h / m_e V$, then the ψ function that determined the electron oscillation in orbit will be periodic and uniquely determined. In this case, the forced harmonic oscillations of the electron, determined by the expansion of function Ψ in a Fourier series with the frequencies near the frequency of self-resonant oscillations of the electron in the atom, will have sufficient energy that the electron has radiated during stability of orbit group of EMWs which can be determined.

If $2\pi R = n\lambda_1 = n^2 h / m_e V$, then the angular momentum of the electron is $I = m_e VR = n2h / 2\pi = nh / \pi$. The radius of the circular orbit and the velocity of the electron in a hydrogen atom, corresponding to the condition $I = m_e VR = nh / \pi$, where n is the principal quantum number, and can be found using the equations

$$2\pi R = n2h / m_e V \; 2\pi\mathrm{R} \qquad (3.1.4)$$

and

$$m_e V^2 / R = e^2 / R^2 \qquad (3.1.5)$$

(equal to the centrifugal force acting on the electron, the force of his attraction to the nucleus). Since

$$R = nh / \pi\, m_e V \quad , \qquad (3.1.6)$$

then

$$V^2 = \pi^2 e^4 / n^2 h^2$$

and

$$V^2 = e^2 / m_e R = \pi e^2 m_e V / m_e nh = \pi e^2 V / nh \qquad (3.1.7)$$

and then $V^2 = \pi^2 e^4 / n^2 h^2$ (3.1.8)

The frequency of the fourth harmonic of the expansion in a Fourier series of function Ψ, determining the trajectory of an electron in a circular orbit in a hydrogen atom with a speed V, is given by $\nu_4 = 2m_e V^2 / h$ (3.1.3)

Inserting in (3.1.3), the value $V^2 = \pi^2 e^4 / n^2 h^2$ from (3.1.8), we obtain:

$$\nu_4 = 2me^4\pi^2 / n^2 h^3 = R_e / n^2 \quad (3.1.9)$$

where $R_e = 2\pi^2 m_e e^4 / h^2$ is the Rydberg constant. The self-resonant cyclic frequency ω_0 of the electron oscillations perpendicular to the planes of the orbit of the electron in the hydrogen atom is given by:

$$\omega_0^2 = F / m_e \quad \omega^2{}_0 = F/m_e. \quad (3.1.10).$$

Inserting into (3.1.1.10) value $F = -e^2 x / R^3$ from expression (3.1.2), we obtain:

$$\omega_0^2 = e^2 / R^3 m_e \quad . \quad (3.1.11)$$

Since $R = nh / \pi m_e V$ (3.1.6) and $V = e^2\pi / nh$ (3.1.8), then:

$$\omega_0 = e^2\pi^3 m_e / n^3 h^3 = \pi(R_0 / n^2)(1/n) \quad . \quad (3.1.12)$$

Comparing the frequency of oscillation of the electron from the expression: $\nu_4 = R_e / n^2$ (3.1.9), with the self-resonant frequency of the electron oscillations $\omega_0 = \pi(R_0 / n^2)(1/n)$ (3.1.12), we can see that when $n = 2$, the self-resonant cyclic electron oscillation frequency ω_0 is near the angular oscillation frequency of the electron

$$\omega_4 = 2\pi R_0 / n^2 \quad . \quad (3.1.13).$$

Therefore, the brightest line in the radiation spectrum of the hydrogen atom will have a spectral line in the Balmer series with frequency R_0 / n^2.

The intensity of the other lines of the spectrum depends on the magnitude of the difference between the frequency of the spectral line and the self-resonant frequency of the electron $\omega_0 = \pi(R_0 / n^2)(1/n)$. (Quantum Mechanics conceptually cannot predict the intensity of spectral lines of the atoms).

3.2 Frequency of EMWs Emitted by an Electron in an Elliptic Orbit in a Hydrogen Atom

An electron moving in a circular orbit emits a frequency $\nu = R_0 / n^2$, which is determined only by its constant circumferential speed V_0, directed perpendicular to the radius of rotation R, and only one angular momentum $J_0 = m_e V_0 R = nh / \pi$. An electron moving in an elliptical orbit with variable speed v, equal to the magnitude of the vector sum of the circumferential speed of the variable $v_{\tan}$ «, directed perpendicular to the radius of rotation, and variable speed along the radius of rotation v_{rad}, participates in two movements. Therefore, the oscillation frequency of electron moving in an elliptical orbit, arising from the interaction with the fluctuations of the PhEMV, should be determined by a two-speed $v_{\tan}$ and v_{rad}, corresponding to these two movements and, therefore, should be determined by two angular momenta, $J_{\tan}$ and J_{rad}.

Since the electron speeds $v_{\tan}$ and v_{rad} are changing, the frequencies of electron interaction with fluctuations of the PhEMV and, hence, the wavelengths of the electron, corresponding to speeds of the electron $v_{\tan}$ and v_{rad}, are also changing. Therefore it is necessary to speak only about *average* wavelength of the electron, corresponding to two average electron velocities in an elliptical orbit $v_{\text{avg tan}}$ and $v_{\text{avg rad}}$, defining angular momentum of the electron $J_{\tan}$ and J_{rad}.

The energy of an electron in an elliptical orbit, which is the sum of the kinetic and potential energy, is constant and equal to the energy of an electron in a circular orbit at which the radius of the orbit R is the semi-major axis of the elliptical orbit, equal to a. Therefore, the kinetic energy of an electron in an elliptical orbit is determined by the average electron speed v_{av} on a rotation radius equal to a. An elliptical orbit average electron velocity v_{av} on rotation radius equal to a, v_o is the electron velocity in a circular orbit with a radius of $R = a$.

In the quantization of the Kepler ellipse, which leads to the correct energy levels for an electron moving in an elliptical orbit, it was found that if the momentum of the electrons corresponding to the motion of the electrons perpendicular to the radius of rotation and along the radius of gyration are quantized, i.e., $\oint p_r\, dr = n'h$ and $\oint p_\varphi\, d\varphi = kh$, then the sum of the quantum number $(n' + k) = n$, *i.e.*, the principal quantum number.

§ 3.1 showed that in the theory based on the model of the PhEMV, an electron moving in a circular orbit, emits light with frequency R_0 / n^2, if $L = n\lambda_1 = n2h / m_e V_e$, where L = length of the circular orbit of the electron; $\lambda_1 = 2h / m_e V_0$ is the wavelength of the first harmonic of a Fourier series expansion in of no harmonic oscillations of the electron moving at a speed V_0 in a circular orbit; n is the principal quantum number.

An electron in motion on an elliptic orbit light will radiate with frequencies $R_0 / (n')^2$ and R_0 / k^2, if $L_{\text{ellipse}} = n'\lambda_{1\ \text{av tang}} \cdot = k \cdot \lambda_{1\ \text{av rad}}$, where L is length of the circular orbit of the electron; $\lambda_{1\ \text{av tang}} = 2h / m_e = V_{\text{av tang}}$ is the average wavelength of the first harmonic of expansion in a Fourier series of no harmonic oscillations of the electron moving at a speed of $V_{\text{av tang}}$ in an elliptical orbit;

$\lambda_{1\ \text{av rad}} = 2h / m_e V_{\text{av rad}}$ is the average wavelength of the first harmonic of expansion in a Fourier series of harmonic oscil-

lations of the electron moving at a speed of $V_{\text{av rad}}$ in an elliptical orbit;

The length of the elliptical orbit depends on the values of major semi-axis a and minor semi-axis b of the elliptical orbit. If the semi-major axis a is proportional to n, that is, proportional to the principal quantum number, the b - is proportional to the product of n' k. Therefore at change k and n' the length of an elliptic orbit, in which the value of semi-major axis a is constant, is a variable. Nevertheless, when the condition $k+n=n$, the length of the varying elliptical orbit also should be equal to the whole number of averages 'wavelength', corresponding to the principal quantum number n.

§ 2 said that the fluctuation electromagnetic impulses are not harmonic. No harmonic frequencies of the electron oscillations in an elliptical orbit occurs in the interaction of these pulses, varies from the average value at a radius of rotation of a equal to $\nu_{\text{avg tan}} = \frac{1}{2} m_e V^2_{\text{avg tan}} / h \nu_{\text{avg rad}} = \frac{1}{2} m_e V^2_{\text{avg rad}} / h$ to the minimum value at the apogee of the orbit and to the maximum value at the perigee of its elliptical orbit.

This means that the average frequencies of the electron oscillations $\nu_{\text{avg tang}} = m_e V^2_{\text{avg tang}} / 2h$ & $\nu_{\text{avg rad}} = m_e V^2_{\text{avg rad}} / 2h$ are modulated by angular frequency Ω (t) of the electron orbital rotation. Therefore, in the spectrum of no harmonic fluctuations of an electron there are frequencies:

$$\begin{aligned} \omega_{\text{avg rad}} &= \pi m_e V^2_{\text{avg rad}} / h \quad \& \\ \omega_{\text{avg rad}} \pm n\Omega_1 &= \pi m_e V^2_{\text{avg rad}} / h \pm n\Omega_1 \quad ; \\ \omega_{\text{avg tsn}} &= \pi m_e V^2_{\text{avg tan}} / h \quad ; \\ \omega_{\text{avg tsn}} &= \pi m_e V^2_{\text{avg tan}} / h \pm \pi\Omega_1 \quad . \end{aligned} \tag{3.2.1}$$

No harmonic electron oscillations with frequencies of $\nu_{\text{avg tang}} = m_e V^2 / 2h$ and $\nu_{\text{avg tan}} = m_e \nu_{\text{avg tan}} = m_e V^2 / 2$ can be expanded as a Fourier series of harmonic functions. Therefore, in the spectrum of electron oscillation there should be frequencies $N m_e V^2 / 2h$ and $N m_e V^2 / h$.

Frequencies: $\nu_{4\,\text{tang}} = 2 m_e V^2_{\text{avg tan}} / h$, $R_0/(n')^2$ and $\nu_{4\,\text{rad}} = 2 m_e V^2_{\text{avg tan}} = m_e V^2_{\text{avg rad}} / h = R_0 / k^2$ of the fourth harmonic of the Fourier series of no harmonic oscillations of the electron with frequencies: $\nu_{\text{avg tan}} = m_e V^2 / 2h$, $\nu_{\text{av rad}} = m_e V^2_{\text{av rad}} / 2h$ ν are slightly different (as in the case of electron motion in a circular orbit) from the self-resonant frequency of the electron in an atom and therefore not extinguished atom. Therefore, the light with frequencies $R_0 / (n')^2$ and R_0 / k^2 may be detected..

Electron oscillation frequencies $R_0 / (n')^2$ near the self-resonant frequency ω_0, and the nearer of $R_0 / (n')^2 \pm R_0 / k^2$, appear in the radiation spectrum. The farther one does not appear, as that frequency exceeds the self-resonant frequency ω_0.

The amplitude of the electron oscillations with frequencies $\nu_{\text{tang}} = m_e V^2_{\text{tang}} / 2h$ and $\nu_{\text{rad}} = m_e V^2_{\text{rad}} / 2h$, is affected by fluctuations of the PhEMV, different for different frequencies and inversely proportional to the kinetic energy of an electron moving with velocities: V_{rad} and V_{tan}.

No harmonic impulses of fluctuations of the PhEMV with lower modulating frequency ν_{rad} produce amplitude modulation of the electron oscillations with higher frequency ν_{tan}, which is in this case the carrier frequency. Therefore, in a spectrum of oscillations of the electron, moving on an elliptic orbit, there are no harmonic frequencies $\nu_{0\ \text{avg tan}}$ and $\nu_{0\ \text{avg tang}} \pm \nu_{0\ \text{av rad}}$, in which the fourth harmonics of the Fourier series are equal to $R_0 / (n')^2$ and $R_0 / (n')^2 \pm R_0 / k^2$.

Conclusion

In the theory based on the PhEMV model, the atom emits light not as a result of the mysterious mechanism of photon emission, followed by an electron jump from one energy level to another, from one orbit to another, as was suggested at the time Bohr, taking into account that the frequency spectral lines in the spectrum of the hydrogen atom is determined by the difference in terms of the Balmer: ($R_o / n^2 - R_o / m^2$).

The Balmer term in the theory based on the model PhEMV, just determines the mean value of the kinetic energy of an electron in an elliptical orbit, corresponding to its non-harmonic oscillation frequency, in which the fourth harmonic of the Fourier series is equal to R_o / n^2.

Atom emission of light occurs as a result of electron oscillations, transmitted electric fields of the PhEMV and propagating on electric fields of the PhEMV (as in an elastic medium), connected with the electric field of the electron charge, forming an outer electric field of the electron, composed of electrical component of electromagnetic fields of electromagnetic microwaves of the PhEMV. Therefore, in theory based on the model PhEMV, the frequency emitted by an atom of hydrogen light is determined by the same formulas as in quantum mechanics.

References, all from "Engineer" Magazine

[1] 6/2013 "Physical electromagnetic vacuum and a pattern of the world without relativity theories".

[2] 7/2013 "Physical electromagnetic vacuum and a pattern of the world without relativity theories".

[3] 9/2013 "Physical electromagnetic vacuum and a pattern of the world without relativity theories".

[4] 10/2013 "Physical electromagnetic vacuum and a pattern of the world without relativity theories".

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Appendix: Some Example Calculations

As oscillation frequencies of the electron $R_o/(n')^2$ and $[R_o/(n')^2 - R_o/k^2]$, which is located nearer to self-resonant frequency ω_0 of an electron in an atom, the hydrogen atom radiance spectrum has frequencies $R_o/(n')^2$ and $[R_o/(n')^2 \pm R_o/k^2]$.

Given $[R_0 f(n')^2 \pm R_0/k^2] > \omega_0$; *i.e.,* frequencies more than that of the electron oscillations in the atom, and given

$$R_0/(n')^2 + R_0/k^2 - \omega_0 > R_0/(n')^2 + R_0/k^2 \quad ,$$

$$\omega_0 > [R_o/(n')^2 + R_o/k^2] - 1 \quad ,$$

it follows that the amplitude of the forced electron fluctuations with frequency $[R_o/(n')^2 + R_o/k^2]$, which is located nearer to the self-resonant frequency ω_0, should produce much more amplitude of the forced oscillations with the frequency $R_0/(n')^2 + R_o/k^2$.

Given $\omega_0 = \pi(R_0/n^2)(1/n)$, it follows that, for example, at $n = 5$; $n' = 2$; $k = 3$;

$\omega_0 = \pi R_0 1/5^2 \cdot\cdot 1/5 = 0.008\,1/5 \cdot \pi R_o = 0.004\ 2\pi R_o$,

$\omega_1 = 2\pi R_o(1/2^2 - 1/3^2) = 0.139 \times 2\pi R_o$,

$\omega_2 = 2\pi R_o(1/2^2 + 1/3^2) = 0.36 \times 2\pi R_o$.

η - Dynamic coefficient for the forced oscillation frequency $\omega_{(1;2)}$ larger than the self-resonant frequency ω_0 it will be: $\eta = 1/(\omega_{1;2}^2/\omega_0^2 - 1)$.

$$\eta_{\omega 1} = \frac{A_1}{A_0} = \left[0.139 \times 2\pi R_o / 0.004 \times 2\pi R_o - 1\right]^{-1} = \frac{1}{33.75} = 0.0296$$

$$\eta_{\omega 2} = \frac{A_2}{A_0} = \left[0.36 \times 2\pi\ R_o / 0.004 \times 2\pi\ R_o - 1\right]^{-1} \approx \frac{1}{89} \approx 0.01124$$

And, therefore, $A_{\omega 1}/A_{\omega 2} = 2.63$, and the ratio of the intensities electron radiation: $I_{\omega 1}/I_{\omega 2} = 6.94$. Therefore, in the theory based on model of the PhEMV, radiation frequencies of the hydrogen atom are given by: $\nu = R_0(1/n^2 - 1/m^2)$. Thus, each emitting a hydrogen atom emits its frequency-set, and the entire spectrum of the hydrogen atom is composed of emissions from many hydrogen atoms.

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Gravity is Particles in Motion

The weak point in all discussions about the origin of gravity is that terms from the language of gravity itself are used. Gravity is in fact an outgrowth of something more basic than either Newton's law or General Relativity.

The law of potentials discovered by Laplace,

$$\nabla^2\Phi = 0 \quad ,$$

takes us, after some work, [see Ref. 1] to a potential function,

$$\Phi = k/r \quad ,$$

which we see is an inverse function of distance. The time rate of change of the function is

$$d\Phi/dt = -(k/r^2)dr/dt \quad .$$

Squaring both sides of this equation yields:

$$(d\Phi/dt)^2 = (k^2/r^4)(dr/dt)^2 \quad .$$

This presentation invites an interpretation in terms of energy density. We recognize the first ratio on the right hand side, (k^2/r^4), as mass density. Thus the entire right hand side is mass per unit volume times the square of velocity.

After dividing out the volume from both sides of the equation, we end up with a result that gravity is due to the kinetic energy of particles in motion, $E \propto mv^2$. Thus the gravity of Earth is due to the motion of the particles that constitute Earth, and the gravity of the Sun is due to the motion of particles that constitute the Sun.

Reference

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