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An Approach For Unity Field Theory With New Quantumvacuum Energy Aether Concept

Stephane Neuville

Independent Consultant, F-60330 Le Plessis Belleville, France

ABSTRACT

Theories of relativity and quantum physics are basing on some complex abstract mathematical formalism which can be quite confusing and not always satisfactory concerning the interpretation of observed corresponding physical effects. For a revised approach of them, we present a new quantum vacuum energy Aether concept we will discuss qualitatively avoiding some abstract mathematical formalism often far from intuitive physical common sense. This is essentially concerning: the relative velocity of light and the Aether disprove, the particle/wave duality, the single particle interference quantum phenomena, the generalized confusion between absolute quantum determinism and undetermined probabilistic measurements of quantum states and the paradoxical possibility for a same quantum system to have at same time different states. Notwithstanding different suggested flaws about the principle of energy and impulse conservation and concerning the optical doppler effect and the postulate of an absolute light speed limit which is contradicted with some observation of superluminal particle transportation velocity. Paradoxical aspects of both theories of the quantum mechanics and theory of relativity are suggested to be sorted out with the rehabilitation of an absolute space reference and a newly defined Aether concept, basing on the equivalence between density of mass and density of quantum vacuum energy. Different aspects of the Field Theory and wave /mass /electric particles interactions are suggested to be interpreted in terms of Aether hydrodynamical energy displacement, fluctuation and waves. Electric charge and mass of particles and their kinetic energy are described in terms of energy of an associated Aether 3D transversal and/or longitudinal wave-packet moving with its group velocity in form of Aether vortices. This model is expected to sort out contradiction about different quantum phenomena and to open the way for new description and interpretation of corresponding new experimental results.

Introduction

What A. Einstein was declaring in 1935 in the introduction of one of his paper about the particle problem in the General Theory of Relativity and which is concerning the optical doppler effect and the equivalence between mass and energy, "In spite of great success in various fields the present theoretical physics is still far from being able to provide a unified foundation on which the theoretical treatment of all phenomena could be based", whenever having produced many pertinent results, this appears to be still the case with different examples we will discuss next and is also concerning the wave quantum mechanics in spite of substantial progress achieved since that time [1-7]. These modern physics fundamentals basing on a complex abstract mathematical formalism fail to give satisfactory intuitive common-sense interpretation of several observed physical effects and are often leading to hazardous conclusions [8-17].

Although, often claimed that nobody would understand these modern physics fundamentals (especially by Feynman concerning the "mystery" of single particle interferences and by Massida concerning the superconductivity effect, and many severe critics about these fundamentals), their validity is suggested to be confirmed with their confrontation to some modern experiments [12-25]. However, many aspects rise questions, on the validity of used postulates and axioms about the essence and significance of corresponding abstract mathematical developments [26-30]. Thus, explaining for instance, why association of classical electrodynamics has been tempted for the description of the Unruh effect which has been predicted with the Theory of Relativity [31]. (The Unruh effect corresponding to a non-intuitive description of the thermal state of a quantum vacuum by an observer submitted to a constant acceleration). Also, classical /semi quantum description could even be achieved more accurately and better comprehensive for some observed quantum phenomena in graphenic materials by Raman spectroscopy and for the description of the superconductivity effect [32-33].

In order to bring clearer and better comprehensive insight of physical phenomena described by these modern physic's theories, we suggest to proceed with the rehabilitation of an Aether Theory with refined definition and new specific properties [34-35]. And this is proposed in questioning first the Aether disproval arguments which had been developed with the Theory of Relativity and with Quantum Mechanics. This is particularly concerning the supposed demonstration of an absolute limit of the light speed, the concept of particle/wave duality, the principle of energy and impulse conservation of the optical Doppler effect, what are the wave functions in the Schrödinger equation and the question about the locality and statistical description of corresponding particles

and states [1, 4-8, 36-45]. To be noted that with some proposed concepts of a pilot wave and hidden variable, the wave non-locality paradox could not be cleared satisfactory [40-41].

Basing on the observation that measurement of a quantum state of a particle is necessarily modifying its state, the Heisenberg uncertainty principle and some statistical approach of the locality of quantum waves have been developed [46-50]. However, in consequence of those, some other paradoxical fundamentals have been postulated, which appear difficult to understand with intuitive common sense. Namely: the possibility for a same quantum system to have different quantum states at same time and the concept of undetermined locality of quantum waves, we discuss next [51-52].

Paradoxe and Uncertainty of Quantum Mechanics
Locality and Probalistic Approach of Quantum Mechanic's

The physical significance of the wavefunction which is associated to the Schrödinger equation remains unclear, considering that it is not corresponding to an electromagnetic wave which is described with the Maxwell equations [6, 53]. The description of the quantum waves is not considering its locality with time and which is illustrated by the Schrödinger cat paradox with which is not known if it is dead or alive [7, 43]. It has then been considered a statistical approach with which some particle presence probability is defined [44-52].

Considering some analogy with mechanical waves, and contrary to the Heisenberg/Bohr "Copenhagen School" postulate, we suggest that a quantum wave is actually determined independently from the device with which its state can be accurately measured or not. In other words, not knowing where and when the waves have been generated and are progressing (and interfering with others) will not mean that its time dependent location will not exist [46-48, 54-58].

Illustrative Examples of Quantum Mechanic's Description Failures
The Problem of QM Locality

QM formalism and its associate quantum field theory have been collapsing for the description of different effects for different reasons, but especially because failing to consider their locality. We give miscellaneous examples for it with followings [11-15, 32-33, 59-72].

Solid State Material Hardness

Hardness of C3N4 materials had been erroneously predicted to be much harder than diamond with QM calculations [67]. The contrary could be demonstrated with the correspondence of hardness with the material density of enthalpy and with the amount of interatomic binding energy per volume unit considering the packing density of atoms and the energy of corresponding interatomic bonds (which actually corresponds to a density of cohesion energy) [68, 69].

Raman Spectroscopy of Carbon Materials

Quantum mechanical description in the reciprocal space of some double resonance Raman effect supposed to demonstrate a relation between atomic disorder of carbon material and a corresponding sharp Raman peak (at nominal ~ 1350cm-1) [70]. This appears to be a quantum mechanical flaw with several disclosed discrepancies:
a) A sharp Raman peak can only correspond to a well-ordered structure with well-defined phonon frequencies, contrary to a Raman band [32,71].
b) The description of the corresponding double-resonance indicates that the principle of energy conservation is not respected (only the momentum conservation), observing further on, that Raman active phonon frequencies described with association of classical theory are respecting both the principle of energy and momentum conservation.
c) The so-called "disorder" peak which was supposed to be interpreted with a double resonance effect in the reciprocal space of quantum mechanics, is in fact corresponding to a local vibration of symmetric A edges (external edges of sp2 clusters and of some internal edges of their voids, which has been evidenced with high resolution Raman spectroscopy meanwhile, ZZ edges are not Raman active), different from the breathing mode of an isolated hexagonal cyclic sp2 ring [71].

Superconductivity

The BCS (Bardeen Cooper Schrieffer) and following updated theories which are supposed to describe the superconductivity effects, could never predict and determine even qualitatively the complete atomic/molecular structure of high temperature superconductors in contrast to its semi-quantum/classical description which consider some synchronic electron/phonon coupling [13, 33, 65, 66].

Single Particle Interference Quantum Phenomena
So-Called "mystery" of Quantum Physics Fundamentals

Single particle interference quantum phenomena, shown with the Young-Feynman two slits experiment have been subject of controversial discussion about result interpretation with the so-called QM "strange" specificity [12, 72].

An effect supposed to be not possible to be described with a classical model and illustrating the "mystery" of the non-locality/probalistic description of quantum states and about the possibility for a same quantum system (single particle) to have at same time different states [44-45, 48-52, 72-73].

We suggest this assertion being incorrect in showing that this effect can be described with semi quantum/classical physical intuitive description of the diffraction and which will give account for the corresponding observed interference effects [53-57, 74-75].

Revised Description of Single Particle Interference Phenomena

The so-called "single" particle interference pattern does not appear instantaneously, but within a built-up process [76-77]. It must be emphasized, that single photon or single electron are randomly emitted by a physical source with different wave vectors and with different phases and which at nanoscale, never corresponds to a dimensionless mathematical point source, but to a physical nanosized volume and cross section.

This explains, that some of them will pass randomly through each slit with a distribution of particle/solid-state edge distance, and will be accordingly diffracted by the corresponding slit edge material, according to the Soldner observation about their deflection by gravity and which is depending on:
* The particle size/slit edge material distance **d**
* The photon (electron) wave amplitude **A** with $A^2 \sim E$ (particle energy)
* The photon(electron) energy **E** (considering $E = h\nu$ with ν the wave frequency
Therefore, depending on **d/A** or differently expressed, on **λ/d** (considering $\lambda = c/\nu$ with λ the wave length and **c** the light velocity) [5, 74, 75, 77].

All this in agreement with the observed phenomena by Söldner in 1804 on the deflection of light ray from its rectilinear motion by the attraction of solid-state material at which it nearly passes by and considering that the particles have a mass (not only a virtual mass) according to the Einstein formula $E=m*c^2$ we discuss in next § III [2, 74].

We define with followings some subatomic characteristics (photons or electrons)
 *the photon particle size corresponding to its quantum volume $V_{QMP} = A^2.\lambda$ (A the oscillating field amplitude and λ its wave length and representing its oscillating volume.

To be observed that for other particles for which a geometric volume is defined, the quantum volume can be defined with A^3 considering the particle as a harmonic 3D oscillator corresponding to some wave with a defined wavelength.
*the particle speed c for photons or $ve = (2E/m)^{1/2}$ for electrons
*the particle energy for which at this stage we will only consider the photon energy.
$E \sim A^2$ ($E= h\nu = m*c^2 = h.c/\lambda$ or $E= E_k +E_p$ with $E_k = mv^2/2$.
With E_k the kinetic energy and E_p the potential energy (note that for a particle which has a mass and an electric charge the particle energy E_p includes gravity, electrostatic and mass energy equivalence).
 *the particle impulse $P= h\nu/c$ or $m*c$ or $2E_k/v$.

Considering the geometry of the two slits system, the particle wavelength and speed and the time interval τ between emitted particles passing through each slit respectively, some interference effect can appear within some specific zones, corresponding to an appropriate wave path difference Д with $Д^3< A^2. \lambda.$ or A^3.

To be observed here that a relation is established between size, wave amplitude and frequency and energy and real or virtual mass associating different aspects of QM with theory of relativity corresponding to a physical description which is showing some uncertainty of corresponding abstract mathematical QM fundamentals.

Anomalies and Confirmation of the Relativity Theory
Relativity of Reference Space and Formula $E=mc^2$
The Einstein formula $E=mc^2$ was established with the kinetic energy of a solid which is emitting a photon and which is compared with its transcription in a relative moving space and for which the concept of an absolute space was considered as not necessary, before being rejected [1-3, 9, 10, 33-36, 78-80].

Whenever universally verified, this formula was obtained with some apparent uncertainties about the potential and kinetic energy of the solid /light emitting system and about the principle of energy and impulse conservation during the photon emitting process [41]. The light emitting process, involves some loss of the potential intern energy of the emitting material, which is converted into the internal potential energy of an emitted apparently massless photon $E= h\nu$. and for which the impulse of the emitting system and of the emitted photon must also be taken into account: $p =hk$ or $h\nu/c$. Meanwhile no kinetic energy modification is here considered, neither for the emitting material, nor for the emitted massless photon [1, 2, 78].

This is rising at once several questions:
a)   how the conservation of energy and impulse is here operating
b)   how it can affect the kinetic energy of the photon emitting solid source
c)   what is the nature of a photon, if it is corresponding to an electromagnetic soliton, or to a wave train.

Last point is not compatible with the concept of a single photon for which its energy depends solely on its frequency. Meanwhile considering the photon as an electromagnetic soliton for which no frequency can be immediately defined it appears that its energy can be associated to its electromagnetic wave amplitude **A**.

However, for more complete responses to these questions which are compatible with usual universally admitted physical fundamentals, we suggest that the concepts of Absolute Space and Aether using the reference space of the physical observer which is reasoning on these aspects, will have to be restored (what we present in §IV, V and VI).

Optical Doppler Effect and Misfit on the Principle of Energy Conservation
Considering the relativity of a space moving with its own velocity defined in a reference space, an optical doppler effect could be evidenced with some analogy to the mechanical doppler effect in fluids [1, 81]. However, the description of the optical doppler effect was achieved without the Newton statement about the existence of an absolute space which can be used for mechanical waves [79, 82]. The observed optical doppler effect has been described in a space for which the relativity of the different movements is considered [41].

Admitting the universality of the principle of energy conservation, and considering the difference between the emitted photon energy in the reference space of the source and the registered photon energy of the receivers staying in a moving space relative to the reference space of the source ($h_{\nu S}-h_{\nu R}$), it appears that the principle of energy conservation is not applied to the optical Doppler effect description [1-3, 9-10, 78].

 Another question is then: where the excess (or the lack) of energy is transformed or coming from. The mechanical classical Doppler effect, consider that the wave impact on a relatively moving receivers is corresponding to some energy transfer [81]. We will propose a similar model for the optical Doppler effect with an energy transfer between photon and a newly defined Aether of the moving photon detector in § V and VI.

The optical doppler effect has been interpreted with the use of the abstract concept of time space curvature of the general theory of relativity with which has been mathematically deduced a relation between particle energy (kinetic and potential) mass and impulse [9, 10, 83].

$W^2 = m°c^2 + c^2p^2$ with $W = m°c^2 + E_k +E$
and a velocity dependent time, mass and energy

$m = m° \sqrt{(1-v^2/c^2)}$ $t = t° \sqrt{(1-v^2/c^2)}$ $mc^2 = m°c^2 \sqrt{(1-v^2/c^2)}$ However, these relations present some hazardous aspects considering that associated fundamental theories are not necessarily complete, all the more when not always directly evidenced with physical experiments and which will rise the question of the Langevin paradox about the different ageing of tweens having travelled separately at different speed and which is questioning the validity of the relativity theory, whenever some experiment is showing how the time flow for clocks moving at different speed will be different and is supposed to confirm the theory of relativity [3,

15-18, 84-86]. We will suggest in next chapters how this sort of discrepancy can be sorted out in considering that materials with mass are corresponding to complex wave-packets evolving in an Aether on a fixed reference space.

Light Speed
The theory of relativity is basing on the postulate that the light speed in vacuum is an invariant independent from its reference space velocity [9-10, 34-35, 80]. It is supposed to corresponds to some maximum transportation velocity of energy, in form of photons [36, 83]. Noteworthy is that this sort of transportation limit does not exist for body transportation in fluids which can be subject of supersonic displacement [87]. However, contrary to the theory of relativity statement that nothing can go faster than light in vacuum, higher light speed has been nevertheless observed and/ or predicted [88] which is invalidating some aspects of the theory of relativity, we discuss next.

Light Speed Reduction
It is known for long, that light speed can be smaller when propagating through a transparent material, whenever severe limitation of light speed variation with frequency has been discussed [22, 23, 53, 89, 90]. This has been explained on one hand with the light scattering at atomic scale which increases the light path and on other hand with the activation/decay delay time of the atoms and molecules which are present in the transparent medium [91, 92].

These models have to be questioned, considering:
a) light diffusion with a light path colinear with the original emission direction
b) photons can have lower energy than the optoelectronic gap of a transparent medium and for which no electronic activation with additional decay time will exist. Considering that lower light speed in transparent materials can be nevertheless observed, another explanation for the light speed modification has to be found and we propose next.

Superluminal Transportation Velocity
The Quantum Vacuum
An apparent superluminal velocity of galaxies has been reported, raising the question about the origin of this effect [88, 93]. This has been explained with some quantum vacuum containing energy considering that an absolute vacuum is not an empty space. The light speed is suggested to be linked to the properties of a Quantum Vacuum, with quantum energy fluctuation being caused by the decay of ephemeral subnuclear particles [94, 95]. A superluminal transportation velocity of some tunneling electrons and superluminal light speed have been evidenced contrary to the theory of relativity expectations [96, 97].

A zero-point energy has been defined at which the energy of particles at absolute zero-degree temperature at which Brownian movement energy and particle activation are no longer considered [98-101]. All these rise the question about the nature of the vacuum.

The Scharnhorst and Casimir Effects
Taking into account the definition of a quantum vacuum, it has been predicted the hypothetical existence of the Scharnhorst effect corresponding to some modified light speed between plates close placed in physical vacuum, and being higher than the light speed limit of the relativity theory [102-105]. However, between these close placed electric conducting plates, has been confirmed another quantum phenomenon: the Casimir effect which corresponds to some quantum force of attraction between these plates and which

can be associated to the Scharnhorst effect description [106-109]. This is again suggesting together with other mentioned effects, the existence of an Aether quantum vacuum, giving account for these phenomena, we propose and discuss in §V and VI.

Rejection and Approval of the Relativity Theory
Disproval of Bell Inequalities
Considering the time space evolution of different entangled quantum states, the question is: if they would correspond to some signal transfer delay differences predicted by the theory of relativity (with the speed of light) and for which the question about the completeness of physical fundamental theories was risen with the Einstein Podolsky Rosen (EPR) paradox [3, 4].

Different experiments which have been operated with modern faster and more accurate detection devices and at different scales, have demonstrated that intricated emitted particles, can stay coupled with more or less instantaneous (very short) interaction after longer diverging travel and which contrary to the relativity theory expectations are not submitted to any signal transmission delay corresponding to the light velocity [21, 110, 111]. This has been confirmed with glass fiber transmission experiments over longer distance in the 10 km range and refined with the measurement of two entangled photons correlation speed which is about 10000 times the speed of light [112-116].

Current QM fundamentals does not provide satisfactory intuitive description and interpretation for this physical reality and suggests that QM cannot be considered as complete [3-4, 7, 42-49]. Meanwhile, elder Aether Lorentz concept was giving account for some absolute simultaneity [34]. Hence, suggesting again that some new concept has to be elaborated for which we propose a new Aether concept in § V.

Revisited Interpretation of the Gravity Lens Effect
Although, the Theory of Relativity has been invalidated with precedingly mentioned experimental results with entangled photons, some others could nevertheless confirm its validity in giving account for the deflection of a light beam by the attraction of a body at which it is nearly pass by (the gravitational lensing effect) [8-10, 21, 76, 117-119]. However, this confirmation can be more simply obtained with the Einstein formula **E=mc²**, and rising the question if a photon is actually massless or not, we discuss next.

It has been shown that the massless photons being deflected by a gravity lens effect behave like particles having a mass which are attracted by some large body gravity field [76]. Considering the photon energy **E=hν** and its mass equivalence **E=mc²** some photon virtual mass **m* = hν /c²** is defined with which the photon deflection can be calculated with the classical Newton/Kepler physics [1, 2, 79, 82, 112, 120, 122]. The question is then what is mass and what is a gravity field [11, 60-64, 78, 121].

Aether Disproval and Rehabilitation
Aether Hypothesis
No particles only waves and fields. Considering that all atomic and subatomic particles behave like waves, the question will be how these waves are organized and what are the different fields in their environment and how these waves will be affected by those fields [5-7, 11, 38-41, 60, 121]. An abstract concept of an invariant quantum vacuum has been defined containing energy for which no physical properties had been defined and therefore, with which more detailed description of quantum phenomena will not be possible to be performed [60-64, 80, 94-95].

Considering that different types of particles can be created there, with or without mass and electric charges and which can be interacting each-others and eventually subject of fission and fusion processes, we suggest that these mechanisms will be better comprehensively described with a refined definition of a quantum vacuum and its quantum vacuum energy in form of an Aether with specific properties, where quantum waves will behave like mechanical waves in fluids with similar rules [123-136].

Temperature Dependence of Light Velocity

It has been shown, that light speed in transparent materials is heat/temperature dependent [137]. However, this effect cannot be explained with usual light/material

Interaction effects (§ III.3) [12-13, 83, 91-93]. It has been reported some phonon heat transfer across a vacuum and some mechanical dissipation in a quantum vacuum [138, 139]. This has been explained with the impact energy of some emitted photons being present in a quantum vacuum. Photons can interact with a material surface for which the principle of energy and impulse conservation will apply [140].

However, it stays unclear, how mechanical dissipation can be produced in a quantum vacuum and rising again with the optical Doppler effect, how the principle of conservation of energy and impulse is operated. All these effects are suggested to be better understood with the existence of an Aether, we discuss in §VI.

Rejection of Aether Disproval Arguments

Suggested Existence of a Photon Wave Propagation Medium
The Michelson-Morley experiment has shown the light speed independence from the moving reference space and is supposed to disprove any Aether existence [9-10, 36]. However, this experiment gives no description about the process which is emitting the photons and how the principle of conservation of impulse and energy is here respected. Considering some analogy between electromagnetic wave propagation in vacuum (and/or in a rarefied atmosphere) and mechanical wave propagation in gaseous, liquid and solid-state materials, it is possible to simulate the Michelson-Morley experiment with classical means, with a description represented in Figure.1 and for which a refined description of the photon emitting process has to be added (Figure.2 and 3) [53-55].
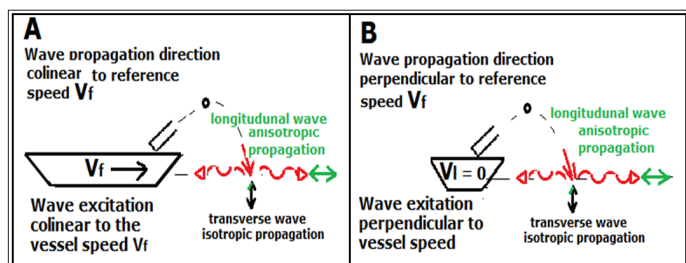
Figure 1: Example of wave propagation speed independence from the reference space displacement direction and speed. It is only depending on the propagating medium properties, suggesting contrary to the Michelson and Moley light speed experiment, that an Aether with specific wave propagating properties will exist

Throwing a ball over bord of a moving vessel in any direction, its impact on the surrounding water surface will generate transversal waves having the same propagation speed in all directions, solely depending from the surrounding propagating medium properties and not on any displacement velocity of the original reference space. Further on, the speed of the activated wave at the water surface does not depend on the direction of the wave activation relative to the displacement speed of the reference space (represented by the velocity of the vessel relative to the propagating medium).

Making use of this analog model, it will not be possible to explain the emitted light specificity and the doppler effect which depends on the emitting source properties and velocity. However, this is showing that the wave speed independence from the reference space and from the emitting source velocity is requesting a physical propagating medium invalidating thus, the reasoning of the Aether disproval. Contrary to what was too hastily concluded with the Michelson Morley light speed experiment, the propagating direction independence of the light speed and from the emitting source velocity is suggested to prove the Aether existence.

Excitation Process of Quantum Waves

With the supposed invariance of the light velocity, the description of the optical doppler effect and the Einstein postulate energy mass equivalence, the established usual description of the light emitting process does not include the modification of the kinetic energy of the light emitting material in considering the principle of impulse and energy conservation, despite the fact, that a photon has an impulse, able to produce some mechanical pressure and therefore, some mechanical and heat energy dissipation [1-2, 8-10, 35-36, 80-81, 138-143]. Noteworthy is, that it was here evidenced the equivalence between the abstract theory of general relativity theory calculous and the one operated with classical Maxwell fundamentals [53].
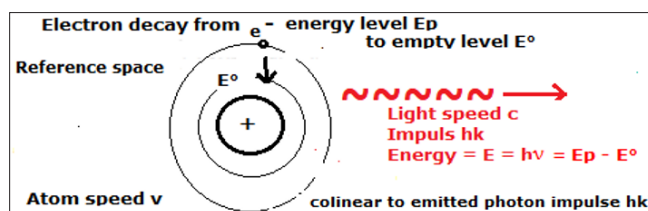
Figure 2: Schematic representation of a photon being emitted from a moving atom

With the commonly used photon emission model some potential energy intern to the light source material is directly converted into an internal energy of a photon [2, 12, 42, 53, 91, 142]. The photon is generated with an electric impulse corresponding to the decay of an activated electron in the same medium (reference space) where the emitted photon will evolve, and which speed will therefore, not depend on the atom velocity. Only its apparent frequency (Doppler effect) is depending on its starting position with time relative to some observer space velocity. The original electric impulse which generates a photon is creating a wave electric field parallel to the generating impulse and transverse to the photon wave vector and which orientation can be modified with the solid-state environment [53, 141-142].

With a moving source of velocity V relative to an absolute reference, the time-width of the emitted soliton will be reduced or increased according to the direction of the source speed, together with its amplitude **A**.
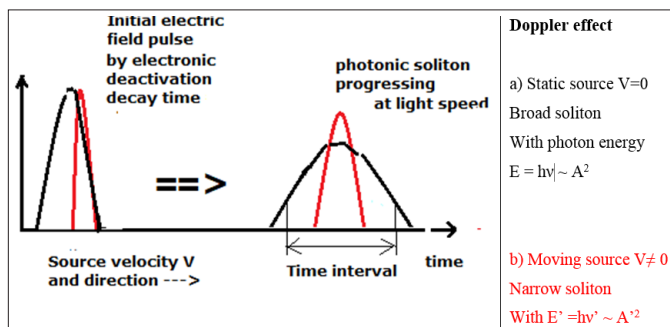
Figure 3: Schematic representation of incidence of source speed on initial electric pulse and photon soliton time-width and energy **E** (~A^2 with **A** the amplitude) and Doppler frequency with **E= hν** and **E' = hν**' depending on source velocity **v**

Considering that the soliton amplitude corresponds to its energy **E** and wave frequency with **E= hν**, we have a relation between the moving source velocity and the emitted photon frequency. The optical doppler effect must then take into account the displacement velocity of the observer relative to the source which has to be added to the source velocity with which the wave frequency perception will also be modified, similarly to the emitting process with the source displacement velocity.

To be noted that no frequency shift is observed corresponding to some transversal Doppler effect with a Gamma ray source (very high photon energy and frequency) [143-144]. The decay time of their generating impulse will be very short and no significant path distance modification relative to the observer is achieved. Therefore, with Gamma rays no apparent frequency shift will be registered by an observer moving transversal to the source with slow speed relative to the photon generating pulse time.

Beside the question about the conservation of energy in a quantum wave Doppler effect another question remains about the possibility for quantum waves to have some longitudinal wave amplitude. Considering that in comparison, for mechanical waves it can be distinguished between transverse and longitudinal wave amplitude relative to their propagating direction [32, 61, 69-71, 82]. We suggest these questions being cleared in considering the quantum wave propagation in some Aether we discuss next.

A New Aether Concept
General Definition of a New Aether Concept
With the abstract concept of quantum vacuum, it is admitted that classical vacuum is not empty and can contain quantum energy [94-91]. For the revisited description of this quantum vacuum we define some specific local density of energy.

1. **ε = dE/dV** similarly to the definition of solid-state hardness, which corresponds to a density of cohesion energy, the density of energy of a quantum vacuum can be defined with an infinitesimal (or quasi-infinitesimal) distribution instead of a discrete continuity of interatomic binding energies. Considering the Einstein formula:
2. **E=mc²** with **m = ρV**, an analogy between quantum vacuum with fluids and solid-state materials can be found with analog propagation celerity of quantum waves and mechanical wave (sound) for which the phase velocity) is:
3. **v_c = √ (dp/dρ)** with **dp** and **dρ** the pressure and volumic mass variation, when considering mechanical wave propagation or
4. **v_c = √(ξ/ρ)** with ξ the material elasticity (or compressibility χ for isotrope homogenous materials) according to the Laplace

definitions [122]. (C_{EW} the celerity of an electromagnetic wave EW).
5. **C_{EW}= c° √ ε°/ε**

Hence, we can define some energy wave propagation in a Quantum Vacuum Aether, similar to the mechanical wave propagation in non-compressible and non-viscous fluids in replacing mass by energy and mechanical waves by some energy waves (EW) with a propagating celerity corresponding to some paquet-wave group celerity or with the light speed defined with, with c° the light speed in the reference Aether space which is defined with the newton concept of an absolute reference space, with a local light speed which depends on the local mean density of energy of the Aether [5, 34-35, 82].

Questioning the Photonic Gas Quantum Vacuum Concept
The quantum vacuum containing energy has been often assimilated to a photon gas composed by massless particles of different energy [83, 95, 142]. However, the question which is remaining is: what is the essence of the photon propagating medium and with which structure they are assembled when subject of a Bose-Einstein condensation process [145]. In order to find responses to these questions we consider the size of their corresponding electromagnetic oscillating volume V_{photon} we define with followings:

6. **E_{photon} = hν** or **h.(c/λ)** or **E_{photon} ~A^2**
(**A** the wave amplitude, **λ** its wave length). With these assumptions the photon volume
7. **V_{photon} ~ λ.A^2** appears to be constant and is independent from its energy:
8. **V_{photon} = h.c**
with which a photon density of energy can be defined
9. **ε_i = hν$_i$/ h.c$_i$ = 1/λ$_i$**
Considering a quantum vacuum of limited volume **(Δ)³**, with corresponding mean density of energy **ε_{mean} (or <ε_i>)**, the photons in this quantum vacuum will have a maximum wave length **$λ_M$ ≤ Δ** with a minimum photon energy:
10. **$E_{photon\ min}$ = h.(c$_{mean}$/λM)**

In a quantum vacuum volume V_{QV} (QV the quantum vacuum) containing energy corresponding only to discrete photons, then at least one photon will be present in this volume with a minimum of photon energy (formula 9) and which corresponds then (formulae (1) and (5))- to a maximum speed of light (in agreement with current quantum fields theories) [60-62].

However, a result which is in contradiction with some evidenced superluminal light speed which is questioning the concept of an absolute zero energy quantum vacuum filled with a photon gas. Some higher local density of energy must then exist in the quantum vacuum, independently from its photon content and which is then suggested to corroborate the existence of an Aether [94, 95].

Aether Properties and Aether Fluid Dynamics
Quantum Fields and Particles
Distribution of Aether Density of Energy
This newly defined Aether corresponds to some non-viscous fluid with infinitesimal continuity instead of atomic discontinuities and in accordance to quantum field theory that no particle would exist and only fields and considering that atomic and subatomic particles behave like waves [38-41, 62-63, 126-128]. The density of energy of precedingly defined Aether can be static or time dependent and will not necessarily be homogeneously distributed in its space and can be subject to propagation of quantum waves

accordingly to formula 5 and where different wave/particles can evolve and which can interact and interfere with others., similarly to what is described with quantum fields and quantum vacuum [60-61, 94-96].

Considering the analogy with the propagation of mechanical waves in fluids, we postulate that same sort of fluid mechanics rules can be applied, (with Laplace equation) [54-55] and which are giving account for quantum vacuum Aether phenomena and properties which are suggested to be at the origin of different long and short-range effects including progressing wave, interferences, stationary waves and fluidic-like 3D vorticity and vortex dynamics phenomena [129-135].

This model is suggested to be validated with the existence of Ball Lightning of different sizes which could be reproduced experimentally with high density energy spherical and toroidal magnetically self-confined plasmoïds, activated with 3D stationary solitons (solitary wave is a self-reinforcing wave packet that maintains its shape while it propagates at a constant velocity) [146-150]. We propose next, some new definition of mass and electric charge of particles, and of corresponding gravity and electromagnetic fields.

Kinetic Energy and Potential Energy of Particles
The mass m of a particle used to be defined in association to its kinetic energy E_k and its impulse p or with its potential energy E_p within some field generated by other particles. We consider in a first step only some gravity field [1, 2, 61].

11. $E_k = \frac{1}{2} m.v^2$ or $E_k = \frac{1}{2} p^2/m$ and $E_p = G.M.m/r^2$
It is well known that with a pendulum (or with any other types of harmonic oscillator) kinetic energy can be transformed into potential gravity energy and reverse.

With the Einstein formula (2) $E=mc^2$ mass can be assimilated to some potential energy and according to the principle of energy conservation, mass can be transformed into kinetic energy defined with mass and particle velocity and/or other form of potential energy (defined with pressure and compression, temperature and heat capacity, voltage and electric charges and activated particle states) considering the equivalence between inertial mass when mass is associated to kinetic energy and gravity mass when mass is associated to potential energy [1-2].

Particle Defined with Aether 3D Harmonic Oscillator Particle Mass and Energy Equivalence
Considering a particle which is defined as a spheric 3D harmonic oscillator corresponding to a spheric energy bubble immerged in the Aether, we postulate that its corresponding density of energy can define the particle mass. To be observed, that for such a case, the particle mass is equivalent to a potential energy and will correspond to some depletion of the local Aether mean density of energy and which will be at the origin of gravity attraction we discuss in next sections. Considering only the particle gravity potential energy (without any kinetic inertial displacement energy) the energy of the quantum oscillator is then:
12. $E_{osc} = E_k + E_p$ (with E_k the oscillating kinetic energy and E_p its potential energy). It is defined with the state at which the oscillator amplitude A is maximum (maximum potential and the oscillating kinetic energy equal to zero). Hence:
13. $E_{osc} = E_{pmax} \sim A_{max}^2$ (with A the oscillating amplitude)
For a particle assimilated to a 3D oscillator evolving in a quantum vacuum, its size corresponds to its oscillating volume defined with its 3D mean oscillating amplitude

14. $<A> = A_{max}/2\pi$.
Its density of energy ε_p is then $\sim 1/A_{max}$ or $\sim 1/(\sqrt{E_{harm}})$ and finally
15. $\varepsilon_p \sim 1/(c.\sqrt{m_p})$.
and the local Aether density of energy will be reduced accordingly by
16. $\Delta \varepsilon = \varepsilon^o - \varepsilon_p$

Photon Mass
For a photon of energy $h\nu \sim (<A>)^2$, there is no longitudinal amplitude of the photon wave and therefore, apparently no oscillating volume. This is the reason why the photon used to be considered without mass. However, an oscillating volume corresponding to the depletion of the Aether density of energy can nevertheless be defined with formula

(7) $A_{max}^2.\lambda$ (λ the wave length) which has been precedingly established.
It must be considered, that a photon has some mechanical impact energy and with its momentum and its radiation pressure and which originally used to be defined for other particles and material bodies with the product of inertial mass and velocity square [140].

Then, contrary to usual statement, a non-virtual photon mass can be defined corresponding to the Quantum Vacuum Aether Energy of the oscillating volume corresponding to a photon particle. Thus, the photon appears to be a particle which can be deflected by a gravity field of some massive body with a classical Newton physics, without its abstract description with the mathematical concept of space-time curvature and to be applied to black holes [76, 142, 151-154]. Furthermore:

a) A photon which can be deflected with the gravity field generated by some aperture edge [75-76, 91] and which is corresponding to diffraction., considering that a single photon is coming from a source which is emitting randomly distributed similar photons with different wave vectors and with different phase at different time intervals [75, 76, 91].

b) A photon trajectory deflection which is corresponding to refraction when it is passing through a material interface where the gravity field is resulting from the difference of mass density on each side of the interface (discussed in § II.2and III.4) [155].

Gravity and Gravity Waves
Considering two particles of mass m_1 and m_2 corresponding respectively to local Aether energy density depletion $\varepsilon_1.A_1^3$ and $\varepsilon2.A23$ we define a quasi-instantaneous quantum gravity force, considering that the newly defined Aether corresponds to a non-compressible fluid:
17. $F \sim \varepsilon_1.\varepsilon_2/d^2$

Gravity wave can be expressed in form of spherical quantum vacuum energy waves which correspond to the propagation of an energy wave in the Aether with a propagation speed of light, and which depends on the local energy density of the Aether (formula 5) and which is not necessarily staying constant through the universe [156-157].

With this model, it can be differentiated the speed of a single gravity wave, which is correspond to light speed and the quasi-infinite speed of the formation of a field according to the observed violation of the Bell inequalities for entangled photons and which is corresponding to some incompressibility of the Aether medium [3, 11, 27, 47, 60-63, 110-115, 121, 158-159].

However, like wave propagation in incompressible fluids, for which reduced compressibility is nevertheless observed, different wave lengths will be expected. And considering some possible variation of the local density of energy, different speed of gravity waves and mass dependent gravity forces can be predicted [60, 121, 156-159]. And also, other quantum phenomena such as vortex phenomena will likely be predictable, and with which formation of spiral galaxies can be explained [22, 160-163].

Kinetic Energy of a Particle and Particle Velocity
The particle being considered as a 3D oscillator which is moving in the Aether, the resulting wave will be a longitudinal wave packet, which is corresponding to the vectorial addition of simple unidirectional waves interfering to a local energy vibration system for which a group velocity Vg and a resulting wave vector can be defined.

For this model, the mass of the moving particle corresponds to the same Aether density of energy depletion which has been defined for its potential energy (5). Thus, in accordance with the principle of equivalence of impact and gravity mass, the kinetic energy of a material body will be:
18. $E_k = ½ \, \varepsilon . \lambda^3 \, (V_g)^2$ [8, 164-165].

Origin of the Gravity Field
Using the model of a 3D Aether quantum vacuum energy oscillator with its corresponding quantum vacuum energy, its longitudinal parts of the corresponding quantum waves and which are perpendicular to the volumic surface of the 3D oscillator, will produce an Aether quantum vacuum energy dwell and which can be superimposed with the energy dwell of other gravity generating centers and which can then explain their attraction ~ $1/r^2$. With the postulated incompressibility of the Aether quantum vacuum, the resulting depletion of its density of energy between massive particles will be instantaneously established (or quasi instantaneously considering the measured very fast entangled photons correlation speed which is about 10000 times the speed of light and which is suggesting some small compressibility of the Aether quantum vacuum with which no instantaneous propagation of the interaction between these Aether energy depletion zones can be achieved) [116].

Matter and Antimatter
With preceding definitions, it can be defined an antimatter concept, which is corresponding to the conjugated excess of quantum vacuum energy density to the depletion of quantum vacuum energy which is the consequence of 3D stationary wave perpendicular to the volumic surface of the corresponding particle surface, and similarly to what we defined for electric charges with stationary waves orthogonal to longitudinal waves of neutral particles. Reunification of matter and antimatter can then anneal the depletion /excess of the corresponding average quantum vacuum energy density.

Definition of Electric Charged Particles Electric Field and Magnetic Fields
Gravity and Electric Field
It has been experimentally evidenced, that mass and electric charge pure have no attraction (although an electric charge is always associated to a mass), the existence of positive and negative charges (e.g., electron, positron, and protons) and of a radial electric field which is surrounding an electric charge with similar distribution to a gravity field which is surrounding a massive body [53, 166, 167]. Considering that charged particles show similar wave interference than neutral particles, (neutrons or C60 particles for instance and other nuclear particles, the question is what is the quantum nature of these electric charge [38, 39, 167-171].

Observing that orthogonal waves do not present any interferences, we suggest that an electric charge will correspond to a similar harmonic quantum vacuum oscillator than for mass except that instead of longitudinal waves it will be considered some stationary 3D spherical transverse vibration modes in a form of 3D vortex, similar to what is achieved with some ball lightning. However, some combination between these two sorts of vibration mode can be expected in analogy to what is considered for phonon vibration modes and particularly concerning bucky balls and carbon nanotubes [172-174].

With its associated mass, the whole quantum oscillator energy of the system can be defined with the addition of the displacement energy of the electric charge in an electric field, with the gravity potential energy and with its kinetic energy. Considering some stationary vibration modes, it can then correspond to a non-radiative stable distribution of the local quantum energy density (with depletion or excess) of the corresponding electric charged particle. At this stage, we assume that the displacement of each part of the original spherical 3D quantum harmonic oscillator system with transverse and longitudinal quantum waves will impose a preferential orientation of the corresponding 3D vortex with which for instance for an electron, a spin can be defined which corresponds to an angular momentum of some specific distribution of quantum vacuum energy density rotational displacement [175].

Positive and Negative Charged Particles
Assuming the existence of different transverse asymmetric stationary vibration mode at the surface of some charged particles corresponding to some particular 3D quantum oscillator, these can give then account of some spin. The harmonic oscillator amplitude will then similarly to the gravity field produce some depletion or excess of the quantum vacuum energy density, varying with the distance ~ $1/r$. which will produce either some repelling or attraction Coulomb force varying ~ ~$1/r^2$ (between electric charges of same sort or between particles of opposite electric charges).

Such scheme is expected to help sorting out corresponding further mathematical description. The superimposition of quantum energy waves, similarly to phonons in solid-state materials which according to their amount, transversal and longitudinal orientation and energy, will affect the local atomic mean packing density resulting in thermal dilatation or contraction causing compressive or tensile stress.

Definition of Magnetic Field
With the displacement of an electric charge, a corresponding magnetic Field appears and which is able to exert a deviation force on other moving charge and for which a stored energy per unit volume of an electromagnetic field can be defined [176-178]. This is forming a gradient of the local Aether density of vacuum energy which is transverse to the charged particle trajectories and will correspond to the wake of their displacement through the Aether quantum vacuum and with which deflection forces between moving charged particles will appear. With an oscillating charged particle, some oscillating electromagnetic fields appears and which can produce some quantum vacuum electromagnetic hydro dynamic waves with which the emission of a photon can be described [179, 180].

Revisited Interpretation of Some Quantum Phenomena Universe Expansion and Planetary Motions

Considering the different Doppler light frequency shift of stars which can be observed from the earth (or in its spatial vicinity) it has been determined some expansion of the Universe [181-183]. However, its numerical characteristics, will then depends on the actual distribution of the Aether density of energy through the universe which can affect the light speed and which at present stage remains unknown. Further on, with which some early prediction of some relativity effect in planetary motions might be questioned. Therefore, for which present corresponding statements will have to be relativized and considered with the greatest care [184].

Superluminal Displacement

For the achievement of higher particle speed closer to the light velocity, more energy is requested for its acceleration which can compensate to some extent, the corresponding density of energy depletion of the Aether quantum vacuum which was originally corresponding to the particle quantum oscillator energy. It has been already evidenced some superluminal displacement speed for tunneling electron with atomic hydrogen [96]. Admitting the existence of an Aether quantum vacuum containing energy, it is suggested the possibility to have a super luminal displacement speed, similar to supersonic displacement, when with an appropriate impulse more energy can be brought to the particle density of energy and considering the local relevant light speed.

Black Hole Evaporation

Considering some possible time dependent fluctuation of an Aether quantum vacuum, like for oscillating charged particles (which corresponds to a local variation of Aether quantum vacuum density of energy) an electromagnetic wave can be generated corresponding to some photons [179-180]. When their energy is high enough, they can escape to the gravity field of a black hole for instance, and which can contribute to its long-term disappearing as predicted by S.W. Hacking and W.G. Unruh with calculation basing on the curvature of the space time however which can be simpler and better intuitive and comprehensively described with the here presented revisited Aether quantum vacuum concept [185, 186].

Nature of Subnuclear Particles

A major question concerning the nature of subnuclear particles remains, if larger particles correspond to an assembly of smaller subnuclear particles sticked together by different cohesion energies or just resulting from their destruction, in forming some more or less stable smaller 3D quantum wave structures. Clearer insight in the properties of subnuclear particles can be provided, when considering that these have a specific quantum energy density, and that interacting and colliding particles is modifying the respective distribution of a 3D quantum vibration system and their corresponding Aether density of energy with eventual fusion or fission.

These collisions are changing then the respective mass potential energy, their kinetic energy and their field potential energy of the particles. Thus, able to provide better figurative description of the different nuclear reactions and with which will be questioned for instance the existence of so-called "gluons" which have never been observed separately from other subnuclear particles. It can then be cleared the flaw of the classical description of the hydrogen atoms which is corresponding to an association of a proton with an electron which is forming a periodic dipole, meanwhile quantum physics will introduce the concept of random distribution [126-128, 187]. With the newly introduced Aether quantum vacuum energy (AQVE) concept, the hydrogen particle can be considered as a whole 3D quantum oscillating system.

A Revisited Optical Doppler Effect

Taking into account the AQVE concept, the apparent non respect of the energy conservation of a photon which is observed from a moving reference space can be explained with a part of the emitted photon energy which can be transformed in a different density of energy of the Aether where the receiver is collecting the emitted photon and considering its relative velocity to the emitting photon source, and the point that the photon is only observable with a material detector corresponding to a specific 3D oscillating system in the Aether [189].

Conclusions

Assuming that Aether is a non-viscous elastic medium Being uniformly compressed, a density of potential energy can be defined with progressing and stationary wave systems and for which some phase velocity for single waves and group velocity for wave packets can be defined. Considering some reduced compressibility of the Aether fluid, existence of quasi-instantaneous long-range effects can be explained with some finite time delays, which can be much lower than achieved with wave velocity corresponding to light speed.

Mass and electric charges defining gravity and electromagnetic fields can be differentiated in considering the absence of interferences between waves with orthogonal wave vectors corresponding to transverse and longitudinal wave vectors and/or to orthogonal transverse oscillating systems. Several quantum physical phenomena can then be described in figurative and intuitive terms, what abstract theory of relativity and quantum mechanical mathematical treatment cannot provide.

Several controversial aspects of the theory of relativity and of the quantum mechanics can then be cleared concerning the optical doppler effect, the interpretation of the Michelson and Moley light speed experiment, the light path deviation of photon passing nearby some solid mass, about the possibility of quasi-instantaneous transmission of quantum effects and about the conservative aspect of the light speed limit. The newly defined Aether concept corresponding to quantum vacuum energy is suggested to open several new research subjects especially concerning superluminal transportation and quantum information technologies for which quantum correlations between different particles will have to be comprehensively mastered.

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