

# THE NOTION OF AETHER AS A POSSIBLE CONSEQUENCE OF A CLAIM FOR MINIMUM CONTRADICTIONS

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## Abstract

The purpose of this paper is to show that the notion of aether can be regarded as a possible consequence of the principles of our basic communication system i.e. of Aristotle logic and of the axiom: “there is earlier – posterior”. It has been proved that this system leads to contradiction; thus, any consequences of this system can derive by the aid of a claim for minimum contradictions [1]. On this basis, a Space Time QM can be made. According to this paper Quantum Space Time - Aether is the substance within which the things exist and from which the things are made. Aether’s properties can be regarded as possible consequences of the principles of our basic communication system; it is shown that the basic laws of mechanics and gravitation can be regarded as possible consequences of Quantum Space Time – Aether properties.

## 1.Introduction

The Hypothesis of the Unified Field began from Einstein’s idea to unify matter and field[2]. However, matter is characterized by uncertainty while field is characterized, according to Einstein’s theories, by continuity of space-time; the notion of uncertainty is incompatible with the notion of continuity and, therefore, the unification mentioned at a first sight seems to be impossible. A purpose of this paper is to prove that space-time is stochastic and that it is characterized by uncertainty. This is shown by means of a theorem and of a claim for minimum contradictions which characterize the basic communication system through which any physics theory can be stated [1]. So, the unification of the notion of a stochastic space-time with the notion of matter is possible and this unified notion is the **Aether**. On the basis of these, the question is raised whether aether can be regarded as the only reality from which all physical laws and properties can derive. Of course, such a target is beyond the limits of this work. However, it will be shown that some basic laws and phenomena are compatible with the consequences of our basic communication system. More specifically, it will be shown that the following can be regarded as possible consequences of the claim for minimum contradictions:

- 1.A generalized principle of energy conservation (electromagnetic-gravitational)
- 2.The Laws of Newton Mechanics, the Gravitation Laws ( Newton, Einstein) and their possible extensions according to the hypothesis of the Quantum Space Time-Aether [3] as well as the Coulomb law.

It is noted that the notion “possible consequences” is not identified with the notion “proof”; it needs the existence of an obvious hypothesis; e.g. according to this paper there is no notion “point mass” which is necessary for the classical laws; thus, a simulation hypothesis is needed so that the classical laws can be regarded as deriving from the principles of the present paper. For the purposes of this work the following definitions are useful:

i. *As reference spacetime we define a euclidean spacetime to which, through transformations of deformity, any field can correspond.* This reference spacetime is not only a geometrical notion because, according to the present hypothesis, it is also matter. Any magnitude of it will be denoted by the subscript  $_0$ . A point  $A_0$  of the reference spacetime occupies by the action of the field a position  $A \neq A_0$

ii. As *Hypothetical Measuring Field (HMF)* is defined a *hypothetical field, which consists of the reference spacetime, in which at every point  $A_0$  exist the real characteristics of the corresponding point  $A$  of the real field.*

iii. In a HMF, we define as *relative spacetime magnitude  $sr$*  the ratio of a real infinitesimal spacetime magnitude  $ds$  to the corresponding infinitesimal magnitude  $ds_0$  of the reference spacetime: i.e.  $sr = ds/ds_0$ . This can apply to any magnitude as follows :

a) *Relative time  $tr = dt/dt_0$* , where  $dt$  is an infinitesimal time of comparison. b) *Relative length* in a direction  $\vec{n}$   $lr_n = dl_n/dl_{n0}$  where  $dl_n$  is an infinitesimal length of comparison in a direction  $\vec{n}$ . c) *Relative volume  $vr = dv/dv_0$*  where  $dv$  is an infinitesimal volume of comparison. Relative spacetime magnitudes can apply either to a spacetime continuum, or to a statistical matter field. In the latter case, the above magnitudes are denoted by  $\overline{sr}, \overline{tr}, \overline{lr}_n, \overline{vr}$  where the superscript ( $\overline{\quad}$ ) denotes the local mean value.

## 2. A Space-Time QM

### 2.1 General [1,4]

The analysis of this paper is based on the following theorem I: “*Any system of axioms which includes the Aristotle logic and the earlier-posterior axiom leads into contradiction.*” [1]

It is noted that this theorem is compatible with the work through which Goedel’s theorems have been derived [5,6]. In this paper, we use theorem I instead of Goedel’s work because, maybe, it can apply more efficiently to the basic communication system [1]. Our basic communication system consists of Aristotle logic and of a hidden axiom which postulates the existence of earlier and posterior. In fact, every word or phrase is constructed in such a way that the letters or the words are put one after the other. Thus, the basic communication system obeys the theorem I. However, we notice that theorem I cannot be stated because it is based on the basic communication system which, according to theorem I itself, is contradictory. Thus, theorem I imposes the silence. When we communicate, we use another hidden axiom according to which “*what is accepted as truth is what includes the minimum possible contradictions*” since the contradictions cannot be vanished. According to this hidden axiom, which we could name as “*axiom of the minimum contradiction*” [7], we obtain the logical and the illogical dimension that is needed in physics. In fact, through this axiom we try to approach logic (minimum possible contradictions) but at the same time we expect something illogical since the contradictions cannot be vanished. The systems of axioms we use in Physics include the communication system and, therefore, their contradictions are minimized when they are reduced to the communication system itself. *Therefore, we have minimum contradictions in Physics when it is based only on the basic communication system i.e. on the Aristotle Logic and on the ‘earlier-posterior axiom’.*

It is noted that time implies the existence of anterior and of posterior; space does, too. If I say 10 cm, I mean the existence of 1,2,...,9,10 i.e. the existence of earlier and of posterior. Therefore, the existence of earlier and posterior is the condition for space and time to exist and vice - versa. When we say that matter exists, we mean that every part of it exists in space and it is measurable. This means that matter has everywhere the property of earlier-posterior. Thus, we may notice that the above mentioned are compatible with the following axiom I:

*Axiom I: “In any area of a matter system there is earlier and posterior”*[4]

According to the above mentioned, this axiom is implied by the basic communication system. If we want the basic communication system to be the only system on which physics theories are based so that we can have minimum contradictions, then the following statement I can be stated:

*Statement I: “Any matter system can be expressed in spacetime terms”.* [4]

In fact, according to what has been mentioned above, no other notion is implied from axiom I except the notions of space and time.

Taking into account the above mentioned we can have as a possible consequence the following statement:

Statement II: "In the HMF the energy of an infinitesimal spacetime element is equivalent to its internal time ". [4]

where as internal time we define an infinitesimal time of a phenomenon of comparison.

An immediate consequence of statement II is that:

$$dE / dE_0 = dt / dt_0 = tr \quad (1)$$

where dt an infinitesimal time of comparison, tr the relative time and  $dE$ ,  $dE_0$  are the energy of spacetime which correspond to each other through the transformations of deformity.

## 2.2 Relativistic Behavior [4]

Without any other assumption, it can be shown that Lorentz transformations can be regarded as a possible consequence of statements I, II *on condition that any spacetime is considered as a continuum*. On the basis of Lorentz transformations and Eq.(1), for an energy state E of a particle /space-time system, it can be proved that it is valid:

$$E^2 = c^2(E/c^2)^2 v^2 + E_0^2 \quad (2)$$

This Eq. is valid for any level of energy  $E_0$ . If  $\bar{v}$  is a real - not simply equivalent for the purposes of Lorentz transformations – velocity, considering that:

$$E/c^2 = m \text{ (mass)}, \quad E_0/c^2 = m_0 \quad (3,4)$$

$$(E/c^2)\bar{v} = m\bar{v} = \bar{P} \text{ (momentum)} \quad (5)$$

$$\text{we obtain: } E^2 = c^2 \bar{P}^2 + m_0^2 c^4 \quad (6)$$

Thus, a particle/space-time system can be simulated, in some of its properties by a relativistic point mass.

## 2.3 Quantum Mechanics Behavior [4]

Eqn (1) can be viewed in two ways:

a. when  $dt_0$  is a unit of time, eqn (1) describes the duration  $dt$ , with respect to an observer and, as was mentioned, it leads to the relativity theory.

b. When dt is a constant period of time in the HMF, then eqn (1) can be written in the form:

$$dE / dE_0 = dt / dt_0 = (f/v)/(f/v_0) = v_0/v \quad (7)$$

where  $v$  is the frequency of a periodical phenomenon of comparison and f an arbitrarily constant factor through which we can change the scale of  $v, v_0$ . If  $v=1$ , then  $v_0$  must be different in various points of the HMF. If this is the case,  $v_0$  represents the number of hits of a clock connected with an infinitesimal spacetime element  $dU$  in the unit of time which is observed in the reference spacetime and eqn (7) can be written in the form:

$$dE / dE_{i0} = v_{i0} \quad (8)$$

where  $dE_{j0} = dE_{i0}$  and  $v_{i0} \neq v_{j0}$  for  $i \neq j$  and where  $i, j$  indicate points of the HMF. Since, according to this paper, energy-matter is nothing else but a system with different and changing rate of earlier - posterior, eqn (8) shows the way in which a field acts at various points.

On the basis of the above mentioned, it can be proved, by the aid of Fourier analysis, that there is a stochastic space-time function which describes any particle/space-time field and which has the following form:

$$\Psi = \sum_m A_m e^{-i(\bar{P}_m \bar{r} - E_m t)/h} \quad (9)$$

This  $\Psi$  function describes the changes of relative spacetime magnitudes i.e. the changes of the rates of earlier-posterior at various points  $(\bar{r}, t)$  of the HMF (see definitions ii,iii).

According to what was mentioned the claim for minimum contradictions "breaks" the silence imposed by theorem I. On the basis of this claim theorem I can be stated. Because of the correspondence between space-time and "earlier-posterior" axiom we can notice that theorem I constitutes an application of logic in statements related to space-time. This means that space-time is chaotic i.e. is characterized by uncertainty. This uncertainty should be compatible with the logical dimension implied by the claim for minimum contradictions; this can be done on condition that space-time is stochastic i.e. is characterized by uncertainty but at the same time it reveals a regularity-logical dimension expressed in terms of probabilities.

All these are in agreement with what was mentioned in this section in relation to the stochastic space-time function.

#### 2.4 The Hypothesis of the Quantum Space-Time(QST)

Taking into account the conclusions mentioned in sections 2.1, 2.2, 2.3 we can reach the following statements [4]:

*Statement I. "Any infinitesimal space-time can be regarded as a matter De Broglie wave".*

*Statement IV: "Any physical magnitude can be expressed equivalently in a coordinate system of a euclidean space-time of reference, both as a space-time and as a quantum - particle magnitude".*

These statements together with statement II constitute the principles of "The hypothesis of the Quantum Space-Time(QST)" [3,4] which is based on the unification of the physical meaning of the notions which derive either from the GRT or from the QM [3].

The above mentioned lead to a space-time physics and, according to what was mentioned, this physics satisfies the requirement to be based only on the communication system while space-time is stochastic and matter itself, i.e. *Aether*; note, that this matter space-time- *Aether*, according to this paper, is the only reality through which all physical laws and properties can derive. However, matter can be either mass or charge. Thus, there exist both mass-gravitational (g) and charge-electromagnetic (em) space-time. The (em) space-time behaves like a (g) space-time, since both are space-time and obey the same principles, but it is not. Thus, any time interval in the (em) space-time is incomprehensible with respect to a coexisting (g) space-time and it can be regarded as an imaginary number, which is incomprehensible too. According to statement II, the energy of an infinitesimal (em) space-time can be regarded as imaginary since it is equivalent to an (em) time interval. *Therefore, in general, the electromagnetic energy can be regarded as imaginary* [8].

#### 2.5. Conclusions of the QST Hypothesis

For the purposes of this paper, the conclusions of the QST hypothesis – written in an explanatory way and deriving from previous works [3,4]- are necessary. According to what was mentioned in section 2.4 , *these conclusions can be regarded as being possible consequences of the basic communication system and of the claim for minimum contradictions.* These conclusions relate both to a particle field and to a many bodies system.

##### a. Particle Field

a.1. In order that the hypothesis of the QST can be valid, the QM should describe an HMF because in the QM it is considered that there is no spacetime deformity. Statement VI states that any spacetime magnitude can be regarded as a quantum-particle magnitude. *Therefore, an equivalent particle is needed so that statement II can be applied; this equivalent particle is hypothetical because statements II and III imply that a particle field is a spacetime entity.* This equivalent particle describes the HMF through which the various spacetime magnitudes of the QST -Aether can be defined.

Because of Eq.(9), the known QM operators are valid; i.e. we have:

$$\hat{E} = i\hbar \partial / \partial t \quad \text{and} \quad \hat{P} = -i\hbar \nabla \quad (10)$$

It is proved that the equivalent particle obeys the SRT and it is valid that:

$$E^2 = c^2 \vec{P}^2 + m_0^2 c^4 \quad (11)$$

Taking into account the QM operators and eqn(11), Schroendinger's relativistic equation is obtained. Thus, we have:

$$-\hbar^2 \partial^2 \Psi / \partial t^2 = -\hbar^2 c^2 \nabla^2 \Psi + m_0^2 c^4 \Psi \quad (12)$$

This Eq. describes the HMF of the QST.

a.2. If the  $\Psi$  wave function is self normalized, then for any space-time magnitude –e.g. energy E, momentum  $\vec{P}$  - it is valid that:

$$\hat{S} \Psi = \langle S \rangle \Psi, \quad \text{i.e. the substitution: } \langle S \rangle \rightarrow \hat{S} \quad (13)$$

Thus  $\langle S \rangle$  behaves as an eigenvalue of S with eigenfunction  $\Psi$ .

a.3. " If the  $\Psi$  wave function of a particle field is self normalized, any equation between particle magnitudes is also valid between the expectation values of the same magnitudes".

a.4. It is valid that:

$$\langle E \rangle \langle V \rangle = E_0 V_0 = hc \quad (14)$$

i.e. the energy expectation value times the expectation value of volume which contains this energy is constant and equals  $hc$ .

a.5. For the mean value  $\overline{sr}(\vec{r}, t)$  of any relative space-time magnitude at a point  $(\vec{r}, t)$  of the HMF, it is valid that:

$$\overline{sr}(\vec{r}, t) = \langle \overline{sr} \rangle V_0 P(\vec{r}, t) \quad (15)$$

The above mentioned function  $P(\vec{r}, t)$  can be derived from Schrodinger's relativistic equation because this equation characterizes the field we study. It is noted that  $P(\vec{r}, t)$  of Schrodinger's relativistic equation, according to what has been accepted, cannot be considered as probability density, because it is not always positive [9,10]. However, since eqns(11,12) imply either a positive or a negative eigenvalues, according to statement II there exists either positive or negative time; this implies that  $\overline{sr}(\vec{r}, t)$ ,  $P(\vec{r}, t)$  can be either positive or negative; positive values correspond to matter and negative ones to antimatter.

### b. Many Bodies System

b.1. Eqn(15) can be extended to a many bodies system and it is valid that:

$$\overline{sr}(\vec{r}, t) = \langle \overline{sr} \rangle_i V_o P_i(\vec{r}, t) = \langle \overline{sr} \rangle V_o P(\vec{r}, t) \quad (16)$$

where  $\langle \overline{sr} \rangle_i, P_i(\vec{r}, t)$  refer to local particle fields and  $\langle \overline{sr} \rangle, P(\vec{r}, t)$  to the whole matter system

b.2. it is valid that:

$$\frac{\langle E \rangle_i}{\langle V \rangle_i} = \frac{\overline{E}}{\overline{V}} \quad (17)$$

where  $\langle E \rangle_i, \langle V \rangle_i$  are the expectation values of energy and volume of a local particle field and  $\overline{E}, \overline{V}$  are the mean energy and mean volume of the whole matter system. It is noted that  $\langle E \rangle_i, \langle V \rangle_i$  are not real magnitudes but characterize any infinitesimal area in the vicinity of a point  $(\vec{r}, t)$  of the HMF through the local  $\Psi_i$  wave function; this function in this area is the same as the generalized  $\Psi$  wave function of the whole matter system.

b.3. In any closed matter system it is valid that:

$$\overline{V} \uparrow \Rightarrow \overline{E} \downarrow \quad (18)$$

b.4. Eqn (12) does not take into account the potential which acts from a far distance. According to the QST, there is no action from a far distance but action of spacetime itself. The gravitational acceleration of a particle field and in extension –according to conclusion 2.5.b.2- of a matter system in general is given by the formula:

$$\vec{g}(\vec{r}, t) = \frac{c^2}{P(\vec{r}, t)} \nabla P(\vec{r}, t) = \frac{c^2}{tr(\vec{r}, t)} \nabla tr(\vec{r}, t) \quad (19)$$

where  $P(\vec{r}, t)$  is the matter probability density, deriving from Schrodinger's relativistic equation, of the matter system at the point  $(\vec{r}, t)$  of the HMF. This formula is valid for any field and therefore it can be regarded as a unified formula for all forces.

## 3. Energy Conservation Principle

### 3.1 General

The energy conservation principle plays a key role in physics. This principle will be investigated for a particle field and for a many bodies system.

### 3.2 Particle Field

From Eqs(10,13) for energy and momentum we have:

$$i\hbar \partial \Psi / \partial t = \langle E \rangle \Psi \quad \text{and} \quad -i\hbar \nabla \Psi = \langle \vec{P} \rangle \Psi \quad (20)$$

Applying Eq.(20) in Eq.(12) we obtain:

$$i\partial_i \langle E \rangle + \langle E \rangle^2 = c^2 \langle \vec{P} \rangle^2 + m_0^2 c^4 \quad (21)$$

Because of conclusion 2.5.a.3 and Eq.(11) we have:

$$\langle E \rangle^2 = c^2 \langle \vec{P} \rangle^2 + m_0^2 c^4 \quad (22)$$

Thus, from eqns(21,22 ) we have that  $\partial_i \langle E \rangle = 0$  and since  $\langle E \rangle$  is independent of a position

$$\text{we have: } \frac{d}{dt} \langle E \rangle = 0 \quad (23)$$

Eqn(23) is valid both for real and for imaginary  $E, P, m_0$ . According to what was mentioned in section 2.4, the real eigenvalues correspond to the (g) space, while the imaginary ones to the (em) space. Thus, eq.(23) is valid both for the (g) and the (em) space. Therefore, we have:

$$\frac{d}{dt} \langle E_g \rangle = 0 \quad \text{and} \quad \frac{d}{dt} \langle E_{em} \rangle = 0 \quad (24)$$

Since  $E_{em}$  is imaginary, we can write:

$$E_{em} = iE_{em-g} \quad (25)$$

where the subscript em-g indicates an equal amount of energy of (em) space expressed in the (g) space. Because of eqns (24,25), we obtain:

$$\frac{d}{dt} \langle E_{em-g} \rangle = 0 \quad (26)$$

$$\frac{d}{dt} (\langle E_g \rangle + \langle E_{em-g} \rangle) = 0 \quad \text{and} \quad \langle E_g \rangle + \langle E_{em-g} \rangle = const. \quad (27)$$

Eqns(24) show that  $\langle E_g \rangle$  and  $\langle E_{em-g} \rangle$  are constant in time. Thus, if the (g) space communicates with the (em) one, the changes of  $\langle E_g \rangle$ ,  $\langle E_{em-g} \rangle$  are discontinuous so that they are at least in one direction of time derivable and that eqns (24,27) are valid. Eqn(22) has both real and imaginary eigenvalues for  $m_0 = 0$ . Thus, we may assume that only photons ( $m_0 = 0$ ) can convert (g) space into (em) and inversely. In a closed system consisting of a real (g) particle and an imaginary (em) one, we cannot have an abrupt change of the sum  $\langle E_g \rangle + \langle E_{em-g} \rangle$  since, by definition, there are not photons which flow out of the system. Eqs.(27) express the conservation principle of a closed system consisting of a gravitational and an electromagnetic particle field.

### 3.3 Many Bodies System

Taking into account the conclusions a.4, b.2 of section 2.5, for a many bodies system we obtain:

$$\frac{\langle E \rangle_i}{\langle V \rangle_i} = \frac{\langle E \rangle_i}{\langle E \rangle_i \langle V \rangle_i} = \frac{\langle E \rangle_i^2}{hc} = \frac{\bar{E}}{\bar{V}} \quad (28)$$

Because of eqn(23), in a finite interval of time  $\langle E \rangle_i$  is constant; therefore in the same interval of time the ratio  $\bar{E}/\bar{V}$  is constant too and therefore energy  $\bar{E}$  should increase with  $\bar{V}$ . This, however, is in contrast with conclusion 2.5.b.3. Thus, in order that eqn(28) can be compatible with conclusion 2.5.b.3, it must be valid that  $\bar{E}, \bar{V}$  are constant in the time mentioned. Thus, it holds that:

$$\frac{d}{dt} \bar{E} = 0 \quad (29)$$

Working in the same way of thinking as for deriving eqns (24,25,26,27) we have that:

$$\frac{d}{dt} \bar{E}_g = 0, \quad \frac{d}{dt} \bar{E}_{em-g} = 0, \quad (30)$$

$$\frac{d}{dt} (\bar{E}_g + \bar{E}_{em-g}) = 0, \quad \bar{E}_g + \bar{E}_{em-g} = const \quad (31)$$

These Eqs express the conservation principle of a closed many bodies system consisting of gravitational and electromagnetic particle fields. Eqns(31) express the energy equivalence between mass and charge; eqn(28) shows that when a change occurs in a closed matter system, this change occurs at the same time in the whole extent of the system. This property is compatible with what has been observed in chaotic self-similar systems [11]; according to a previous work [1(b)], it can be proved by the aid of eq(16) that the property of self-similarity is valid in the whole extent of the HMF of any matter space time system; this property is compatible with the fractal geometry which has been applied widely in various matter systems [12]. It is noted that in a closed system we cannot have an abrupt change of the sum  $\bar{E}_g + \bar{E}_{em-g}$  since, by definition, there are no photons which flow out of the system.

## 4. Laws of Classical Mechanics

Simulating the properties of a point mass with the ones of a particle field, because of equation (22) we have that:

$$2\langle E \rangle d\langle E \rangle = c^2 2\langle \vec{P} \rangle d\langle \vec{P} \rangle = c^2 2M\bar{v}d\langle \vec{P} \rangle = c^2 2(\langle E \rangle / c^2)(d\vec{x}_n / dt)d\langle \vec{P} \rangle \quad (32)$$

Where  $M\bar{v}$  is the simulated momentum. From equation (32), we have that:

$$d\langle E \rangle / d\vec{x}_n = d\langle \vec{P} \rangle / dt \quad (33)$$

If there is such an action vector  $\vec{F}$  that it can cause increase of energy through a transposition  $dx_n$ , that is if  $\vec{F} = d\langle E \rangle / d\vec{x}_n$  (34)

then, for this vector, because of equation (33), it will be valid that:

$$\vec{F} = d\langle E \rangle / d\vec{x}_n = d\langle \vec{P} \rangle / dt \quad (35)$$

The relations (35) which, according to the present paper, can be considered to be possible consequences of the basic system of communication, express basic principles of Newton Mechanics when  $\vec{F}$  expresses force.

Notice: From Eq.(23) we notice that  $\langle E \rangle$  is not continuum. Because of equation (22)  $\langle \vec{P} \rangle$  is not continuum, either. Thus, Eq(33) has no sense. If we write relation (35) in the form:

$$\vec{F} = \delta\langle E \rangle / \delta\vec{x}_n = \delta\langle \vec{P} \rangle / \delta t \quad (36)$$

then, this relation will constitute a deviation from classical mechanics a fact that can be confirmed by N. Kozyrev's experiments [13,14]. It is noted that this deviation, though very small, does exist.

From relations (35) we notice that it is not possible to have  $\delta x_n \rightarrow 0$ ,  $\delta t \rightarrow 0$  because something like this would require infinite force.  *$\delta x_n, \delta t$  can be regarded as intervals between cause and effect since within these intervals any values of energy and momentum have no sense. So, based on this paper, we have as consequences the basic Kozyrev's axioms [13,14].*

## 5. Gravitation

### 5.1. General

Equation (19) of gravitational acceleration derives, according to this paper, from the principles of the basic communication system. Considering that gravitation can be simulated by a field which acts in a far distance, we will have the notion of a potential which is created by various masses. If  $E$  is the energy of a point mass  $m$  which exists in a steady in time potential of a mass  $M$ , then this energy can be regarded as a function of  $r$  for which it is valid that:

$$E = \int_r^\infty -dE(r) \quad (37)$$

on condition that  $E(\infty) = 0$ . We notice that the energy  $-dE(r)$  equals the energy that would be contained in space between two spheres with  $r = r$  and  $r = r + dr$  on condition that space-time itself is matter- energy. The objective of this chapter is to show that, on the basis of the basic communication system and its possible consequences, the known laws of gravitation can derive.

## 5.2. Classical Law

Considering that the quantum phenomena are ignored, according to section 2.2 Lorentz transformations are valid. Thus, taking into account statement II we have:

$$\frac{dE}{dE_0} = \frac{dt}{dt_0} = \gamma r = \frac{1}{\nu r} = \frac{dV_0}{dV} \quad (38)$$

where  $dV$  is the volume which contains energy  $dE$ . Therefore, it is valid that:

$$dEdV = dE_0dV_0 \quad (39)$$

When  $dE$  corresponds to magnitudes mentioned in section 5.1, then we can write:

$$dE = -dE(r)$$

Therefore, we will have:

$$-dE(r)4\pi r^2 dr = dE_0dV_0, \quad dE(r) = -\frac{dE_0dV_0}{dr^2} \frac{dr}{4\pi r^2} = -k \frac{dr}{4\pi r^2} \quad (40)$$

Factor  $k$  can be regarded as constant since, according to equation (40), it is the same for any  $r$ . Because of Eqs.(37,40) we have:

$$E = \frac{k}{4\pi r} \quad (41)$$

If  $E$  and  $\langle V \rangle_E$  are energy and volume respectively of a particle / space-time field, because of equation (14) we will have that:

$$E\langle V \rangle_E = hc \quad (42)$$

When the quantum phenomena are ignored, equation (42) is valid for any  $E, \langle V \rangle_E$ . Thus, because of equations (41,42), we obtain that:

$$\langle V \rangle_E = \frac{hc}{k} 4\pi r \quad \text{and} \quad d\langle V \rangle_E = \frac{hc}{k} 4\pi dr \quad (43)$$

Equations (43) are valid for any  $r$  and therefore for  $r=1$ . If  $d\langle V \rangle_E$  corresponds to a  $dV(r)$  with  $r = 1$ , then we will have that :

$$d\langle V \rangle_E = \frac{hc}{k} 4\pi dr = 4\pi 1^2 dr \quad \text{and} \quad k = hc \quad (44)$$

Thus, we will have that:

$$E = \frac{hc}{4\pi r} \quad (45)$$

If  $E_C$  is the energy that a point mass  $m$  obtains because of its motion,  $E_T$  is its total energy, and  $E_D$  is its dynamic energy, then, because of the conservation principle, applied in its classical form, it will be valid that :

$$E_C = -E_T = E, \quad E_T = E_D + E_C \quad \text{and} \quad E_D = -2E = -\frac{\hbar c}{r} \quad (46)$$

From (46) we obtain the force  $\vec{F}$  of attraction between masses  $M, m$ :

$$\vec{F} = \frac{dE_D}{d\vec{r}} = \frac{\hbar c}{r^2} \vec{e}_r \quad (47)$$

Where  $\vec{e}_r$  is a unit vector parallel to  $\vec{r}$  and towards the center. From relation (35) for  $dm = 0$  we have that :

$$\vec{F} = m\vec{g} \quad (48)$$

where  $\vec{g}$  is the acceleration caused by the force  $\vec{F}$ . Since  $\vec{F}$  is proportional to both  $m$  and  $M$ , we can assume that:



$$\hbar c = fMm \quad (49)$$

Therefore, from eqs (47,49) we have :

$$\vec{F} = \frac{fMm}{r^2} \vec{e}_r \quad (50)$$

$$\vec{g} = \frac{fM}{r^2} \vec{e}_r \quad (51)$$

For  $f = G$ , relations (50,51) are the known Newton relations. Relation (50) is valid only for such a pair  $M, m$  that Eq(49) is valid; i.e. for particle pairs. Relation (51) can be regarded as a relation which gives the gravitational acceleration for any field created by a mass  $M$  on the condition that this mass is concentrated on one point. This acceleration can be regarded as acting on every particle of a set of particle masses which are considered to be concentrated on one point. Thus, on the basis of the above mentioned derives that Newton law is valid for any pair  $M, m$  regardless of whether they correspond to particles or not.

### 5.3. Relativistic Law

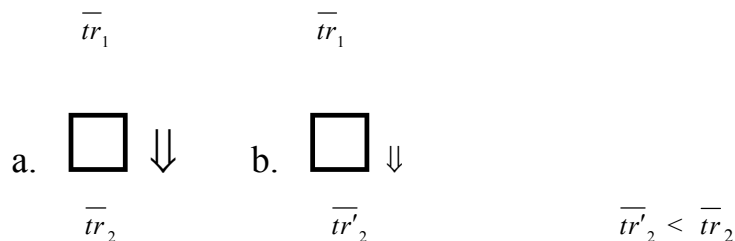
Eqs(50,51) are valid on condition that  $dm=0$  (see Eq.(48)). This implies that there is a constant velocity circle motion i.e. that  $\dot{r}=0$ . Thus, in general, if  $\dot{r} \neq 0$ , formulae (50,51) should be modified. According to this paper, the gravitational (g) space consists of particle / gravitational waves. If the rest energy of a particle /gravitational wave is zero, then its velocity in the HMF equals the speed of light [4]. It is proved that if gravitational waves are propagated from their source with a finite velocity  $c$  and therefore act on bodies at a distance with a correspondent delay, then Newton's law is modified so that the delay mentioned will be taken into account [15]. On this basis, Gerber found a modified formula exactly the same as the relativistic formula which was given later by Einstein [15,16]. On the basis of this formula, Gerber predicted the same advance of Mercury's perihelion as the one predicted later by the relativity theory [15]. According to this paper, the conditions for Gerber's modification can be regarded as being satisfied. Therefore, on the basis of the principles of this paper we can reach the relativistic formula for gravitation.

### 5.4. Quantum Space -Time Formula

When quantum phenomena are taken into account, equation (47) cannot be derived from equations (46). In this case, we have deviations for the same reasons that were mentioned in chapter 4 in relation to equations (35,36). Thus, a more general formula is needed; according to the QST hypothesis the gravitational acceleration at a point  $(\vec{r}, t)$  of the HMF of any field

$$\text{is : } \quad \vec{g}(\vec{r}, t) = \frac{c^2}{P(\vec{r}, t)} \nabla P(\vec{r}, t) = \frac{c^2}{tr(\vec{r}, t)} \nabla tr(\vec{r}, t) \quad (52)$$

Since this formula is valid for any field, it might constitute a unified formula for all forces. It is noted that equation (52), under certain assumptions is compatible with Newton's equation (51) [17]. Because of eqn (52), what is shown in Fig.1a will take place, that is the attraction on an object is attributed to the fact that the space time-aether under the object attracts the object more than the upper one and that  $\overline{tr}_2 > \overline{tr}_1$  [3]. If we reduce the aether energy density under the body[3], i.e. if we succeed in having  $\overline{tr}'_2 < \overline{tr}_2$  then a weight loss of the object will take place as it is shown in Fig.1b.



**Fig.1**

An experiment has been proposed for the verification of these aspects [8].

### 5.5. Coulomb Law

Electromagnetic space, according to what was mentioned in section (24), is a gravitational space with imaginary magnitudes. For this space, it is expected that equation (46) is valid i.e. that

$$E_{D,em-g} = -\frac{\hbar c}{r_{em-g}} \quad (53)$$

where the subscript  $_{em-g}$  is used in the same way as in section 3.2. Replacing the factor  $\hbar c$  by its equal  $e^2 / \alpha$  we obtain that:

$$E_{D,em-g} = -\frac{e^2}{\alpha r_{em-g}} \quad (54)$$

where  $\alpha$  is fine structure constant. Thus, equation (54) can be written in the following form

$$E_{D,em-g} = -\frac{e^2}{r_g} \quad (55)$$

On condition that:

$$r_{em-g} = r_g / \alpha \quad (56)$$

Thus, we have that equation (55) expresses the Coulomb potential, on condition that the imaginary (em) space coexists with the real (g) one and that its magnitudes correspond to the magnitudes of (g) space through a scale. The scale for lengths should be equal to  $1/\alpha$ ; this has been verified in a previous work [18].

Regarding the charge as imaginary mass we can explain the attraction and the repulsion of the charge particles. In fact, a force depends on the product  $m_1 m_2$ . In the (g) space this product corresponds to attraction. For imaginary masses, this product becomes  $im_1 im_2 = -m_1 m_2$  which corresponds to repulsion. An electron could correspond to  $im_1$ , while a positive load could correspond to  $-im_2$ . In that case we have  $(im_1)(-im_2) = m_1 m_2$  which corresponds to attraction.

Since charge is regarded as imaginary mass it is expected that Coulomb law can be extended in the same way as it has been mentioned in sections 5.3, 5.4.

## 6. Discussion

On the basis of the above mentioned, it follows that aether is the quantum space-time itself; Aether is the substance within which the things exist and from which the things are made. Space-Time itself simply reveals a possibility for earlier-posterior to exist; however, its quantum properties lead to discrete space-time entities as particles are. According to this paper, we can have negative and imaginary magnitudes as well as either positive or negative probability density; all these are incomprehensible. This is compatible with the claim for minimum contradictions according to which we think logically but at the same time we expect something illogical since the contradictions because of theorem I (section 2.1) cannot be vanished. The notion of quantum space-time can be regarded as a possible consequence of the basic communication system and of the claim for minimum contradictions. What was mentioned in this paper reinforces the credibility of this claim since basic physical laws are compatible with it. On this basis, aether can be regarded as a notion which derives through a mentally consistent way and which has all the properties that create the basic physical phenomena and laws. It is noted that in previous works, on the basis of the Space-Time QM mentioned, the following can also derive as possible consequences:

1. The Second Thermodynamic Axiom as a result of the expansion of the Universe [3].
2. The Casimir Effect explanation [3].

3. The property of self-similarity which is compatible with the Fractal Geometry of Nature [1(b),3(a)].
4. The equations of the Unified Matter Space-Time Field [18].
5. The Cold Fusion Phenomena (Pons, Fleischmann) explanation as well as the explanation of the Excess Heat Phenomenon during the electrolysis of light water (Mills)[8].

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