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General Relativity without Curved Space-Time (₲ R)

Abed El Karim S. Abou Layla

Independent Researcher, Gaza City, Palestine
Email: a.k.aboulayla@gmail.com

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Abstract

The theory of general relativity is related to the concept of curvature of space-time induced by the presence of the massive objects. We will see through this paper that the general relativity can be linked with linear Algebra and Vector Analysis without the need for concept of space-time. This is important for the unification of general relativity with quantum mechanics, gravity with electromagnetic, and a better understanding of the universe, gravity, black holes. The most important is the separation between the space-time and the big bang theory, which prove the existence of space-time before that, which leads to the existence of the creator of the universe.

Keywords

Gravity, Electromagnetism, Big Bang, Space-Time, General Relativity, Lorentz Force Density, The Einstein's Tensor

1. Introduction

In my research "Old Mechanics, Gravity, Electromagnetics and Relativity in One Theory: Part I", I published in "Journal of High Energy Physics, Gravitation and Cosmology (JHEPGC)", I put some principles for a new theory in mathematics "titled The Extended Fields Theory", where I derived some of the physics equations that can be applied to the electric and gravitational domains without distinguishing in this theory, which means that there is similarity between the Maxwell and Lorentz equations for the electromagnetic and gravitational fields, and to generalization this principle. I published two other research explained in the first that perihelion precession, deflection of light passing near to the sun, and the black holes, are cosmic phenomena which can be theoretically proved through classical method through symmetry principle between the electronic and gravitational fields, far away from the concept of space-time [1]. In the second, we obtained a precise ideal value of the universal gravitational constant [2]. The significance of this law lies in the fact that, it connects three different physical disciplines together, which are mechanics, electromagnetism and thermodynamics [3] without the concept of space-time.

Generally, in this new theory, we can prove that the cross product of two vectors in the $\mathbb{R}^{4,2}$ is directly proportional to the famous Einstein's field equations in General relativity theory, where it is important for the unification of relativity with quantum mechanics, as well as also important for understanding of the universe, especially the metrics of general relativity (*i.e.* Reissner-Nordström metric), and the separation between the space-time structure and the big bang, because that prove there was a creator before the universe existed

As a special case, we will briefly in this paper to link the New Theory with Maxwell stress tensor equation, and in the next research, we will link Einstein's tensor and quantum mechanics to our New Theory.

This research paper is part of several scientific research groups with different names to unite the science of physics to understand this scientific area; reader has to check the indicated references.

2. Electromagnetic Stress-Energy Tensor on A.E Filed

As shown in my last paper [4], we can rewrite the cross force $\boldsymbol{F}_{\text{cross}}$ for the electromagnetic field, and Conversion the mix cross-product of two vectors $\boldsymbol{J} \in \mathbb{R}^{4,1}$ and $\vec{B} \in \mathbb{R}^{4,2}$ **to** mix dot-product as

$$\boldsymbol{f}_{\text{cross}} = \boldsymbol{J} \times \frac{1}{q}\vec{F} = \boldsymbol{J} \times \vec{B} \tag{2.1}$$

$$\boldsymbol{J} \times \vec{B} = \boldsymbol{J} \cdot \vec{\vec{B}}$$

where

$\boldsymbol{J}$: 4-electric current density

$\boldsymbol{f}_{\text{cross}}$: 4-E M Lorentz force density

Also we may rewrite the $\operatorname{curl}\vec{B}$ for $\mu_0 \neq 1$ as,

$$\nabla \times \vec{B} = \mu_0 \boldsymbol{J}$$

thus

$$\begin{aligned}\boldsymbol{f}_{\text{cross}} &= (\boldsymbol{J}) \times \vec{B} = (\boldsymbol{J}) \cdot \vec{\vec{B}} = \left(\nabla \times \frac{1}{\mu_0}\vec{B}\right) \cdot \vec{E} = \left(\vec{E} \times \frac{1}{\mu_0}\vec{B}\right) \cdot \nabla \\ &= \nabla \cdot \left[\frac{1}{\mu_0}\left(\vec{B} \times \vec{E}\right)\right] = \nabla \cdot \left[\frac{c^2}{4\pi k}\left(\vec{B} \times \vec{E}\right)\right] = \nabla \cdot \vec{T}_{em}\end{aligned}$$

where:

$\vec{T}_{em}$ is the EM Maxwell stress vector, or electromagnetic stress vector, defined by

$$\vec{T}_{em} = \frac{c^2}{4\pi k}\left(\vec{B} \times \vec{E}\right) = c^2 \epsilon_0 \left(\vec{B} \times \vec{E}\right)$$

► **For example:**

let, q^i is a complex orthogonal unit vector, and

$$\vec{B} = -76q^1 + 51q^2 + 46q^3 + 41q^4 + 262q^5 - 151v^6$$

$$\vec{E} = -151q^1 - 262q^2 + 41q^3 + 46q^4 - 51q^5 - 76q^6$$

$$\vec{T} = \vec{T}_{em} \quad : \quad c^2\epsilon_0 = 1$$

As explained in my last paper we get

$$\vec{B} \times \vec{E} = \begin{vmatrix} q^1 & q^2 & q^3 & q^4 & q^5 & q^6 \\ -76 & 51 & 46 & 41 & 262 & -151 \\ -151 & -262 & 41 & 46 & -51 & -76 \end{vmatrix}$$

Thus

$$\begin{aligned} \vec{T} = \vec{B} \times \vec{E} &= 27613q^{1,2} + 3830q^{1,3} + 2695q^{1,4} + 43438q^{1,5} - 17025q^{1,6} \\ &\quad + 14143q^{2,3} + 13088q^{2,4} + 66043q^{2,5} - 43438q^{2,6} + 435q^{3,4} \\ &\quad - 13088q^{3,5} + 2695q^{3,6} - 14143q^{4,5} + 3830q^{4,6} - 27613q^{5,6} \\ &= T_{\mu\gamma} q^{\mu\gamma} \end{aligned}$$

where

$$q^1 = v^{01} \; : \; q^2 = v^{02} \; : \; q^3 = v^{03} \; : \; q^4 = v^{12} \; : \; q^5 = v^{13} \; : \; q^6 = v^{23}$$

$$q^{i,j} = q^i \times q^j$$

The magnitude or length of the Maxwell stress vector $\vec{T}$ is defined as

$$\left|\vec{T}\right|^2 = \left|\vec{B} \times \vec{E}\right|^2 = \sum \left(T_{\mu\gamma}\right)^2, \quad \mu = 1, 2, \cdots, 5; \gamma = \mu + 1, \mu + 2, \cdots, 6$$

Then,

$$\left|\vec{T}\right| = \sqrt{\sum \left(T_{\mu\gamma}\right)^2} = 103619 \tag{2.2}$$

We can calculate the absolute value of the stress vector $\vec{T}$ by using the classical way as following,

$$\vec{B} \cdot \vec{E} = \left|\vec{B}\right| \left|\vec{E}\right| \cos\alpha = \left|\vec{B}\right|^2 \cos\alpha$$

$$\left|\vec{B} \times \vec{E}\right| = \left|\vec{B}\right| \left|\vec{E}\right| \sin\alpha = \left|\vec{B}\right|^2 \sin\alpha$$

thus

$$\cos\alpha = \frac{\left(\vec{B} \cdot \vec{E}\right)}{\left|\vec{B}\right|^2} = \frac{(0)}{\left|\vec{B}\right|^2} = 0 \to \alpha = 90^\circ$$

Then,

$$\left|\vec{T}\right| = \left|\vec{B} \times \vec{E}\right| = \left|\vec{B}\right|^2 \sin 90^\circ = \left|\vec{B}\right|^2 = 103619 \tag{2.3}$$

►► The last equation equals the length of the Maxwell stress vector in Equation (2.2).

3. The Value of Lorentz force Density by Matrix Form

Let us suppose the equation,

$$\boldsymbol{f} = \nabla \cdot \vec{T} = \frac{\partial T_{\mu\gamma}}{\partial x_\gamma} = \partial_\gamma T_{\mu\gamma} \tag{3.1}$$

$T_{\mu\gamma}$ is the matrix form of stress vector, or electromagnetic stress tensor, defined by

$$T_{\mu\gamma} = \left(\vec{T}\right)_{\mu\gamma}$$

We may conversion the mix cross-product of $\vec{K} \in \mathbb{R}^{4,2}$ and $\vec{F} \in \mathbb{R}^{4,2}$ to mix dot-product as shown in the master form bellow

$$\vec{K} \times \vec{F} = \vec{K} \cdot \vec{\vec{F}} + \boldsymbol{M} \tag{3.2}$$

where:

M: orthogonal vector, $\boldsymbol{M} \perp e^i, i = 0,1,2,3$

for the electromagnetic field we have

$$\vec{K} = \vec{B} \quad : \quad \vec{F} = \vec{E} \quad : \quad \vec{T} = \vec{K} \times \vec{F}$$

Then we have

$$\vec{T} = \vec{B} \times \vec{E} = \vec{B} \cdot \vec{\vec{E}} + \boldsymbol{M} = \vec{B} \cdot \vec{B} + M = \vec{B}^2 + \boldsymbol{M}$$

So,

$$\nabla \cdot \vec{T} = \nabla \cdot \vec{B}^2 + \nabla \cdot \boldsymbol{M} = \nabla \cdot \vec{B}^2$$

$$\boldsymbol{f}_\mu = \left(\nabla \cdot \vec{T}\right)_{\mu\gamma} = \left(\nabla \cdot \vec{B}^2\right)_{\mu\gamma} = \partial_\gamma \left(\vec{B}^2\right)_{\mu\gamma}$$

Or as the following

$$\boldsymbol{f}_\mu = \partial_\gamma \left(B_{\mu\gamma}\right)^2 \tag{3.3}$$

► **<u>Now in the example at hand, suppose that</u>**

$$\boldsymbol{C} = 1e^0 + 2e^1 - 4e^2 + 1e^3$$

$\nabla \equiv C$ or as the form, $\partial_\gamma \equiv C_\gamma$

By rewriting the magnetic field vector $\vec{B}$ as the matrix in the form

$$\left(\vec{B}\right)_{\mu\gamma} = \begin{pmatrix} 0 & -76 & 51 & 46 \\ 76 & 0 & 41 & 262 \\ -51 & -41 & 0 & -151 \\ -46 & -262 & 151 & 0 \end{pmatrix}$$

we therefor get

$$\boldsymbol{J} = \nabla \times \vec{B} \equiv \boldsymbol{C} \times \vec{B}$$

$$J_\mu \equiv \left(\boldsymbol{C} \times \vec{B}\right)_{\mu\gamma} = C_\gamma B_{\mu\gamma} = \begin{pmatrix} 1 & 2 & -4 & 1 \end{pmatrix} \begin{pmatrix} 0 & -76 & 51 & 46 \\ 76 & 0 & 41 & 262 \\ -51 & -41 & 0 & -151 \\ -46 & -262 & 151 & 0 \end{pmatrix}$$

$$J_\mu \equiv \begin{pmatrix} 310 & -174 & 284 & 1174 \end{pmatrix}$$

$$\boldsymbol{f}_{\text{cross}} = \left(\boldsymbol{J}\times\vec{B}\right)_{\mu\gamma} = J_{\mu}B_{\mu\gamma}$$

$$\equiv \begin{pmatrix}310 & -174 & 284 & 1174\end{pmatrix}\begin{pmatrix}0 & -76 & 51 & 46\\ 76 & 0 & 41 & 262\\ -51 & -41 & 0 & -151\\ -46 & -262 & 151 & 0\end{pmatrix}$$

$$\boldsymbol{f}_{\text{cross}} \equiv \begin{pmatrix}-81712 & -342792 & 185950 & -74212\end{pmatrix} \tag{3.4}$$

On the other hand, we can conversion the square of vector $\vec{B}$ to matrix form as,

$$\left(B_{\mu\gamma}\right)^2 = \begin{pmatrix}0 & -76 & 51 & 46\\ 76 & 0 & 41 & 262\\ -51 & -41 & 0 & -151\\ -46 & -262 & 151 & 0\end{pmatrix}^2$$

$$= \begin{pmatrix}-10493 & -14143 & 3830 & -27613\\ -14143 & -76101 & 43438 & -2695\\ 3830 & 43438 & -27083 & -13088\\ -27613 & -2695 & -13088 & -93561\end{pmatrix}$$

Then we obtain

$$C_{\gamma}\left(B_{\mu\gamma}\right)^2 = \begin{pmatrix}1 & 2 & -4 & 1\end{pmatrix}\begin{pmatrix}-10493 & -14143 & 3830 & -27613\\ -14143 & -76101 & 43438 & -2695\\ 3830 & 43438 & -27083 & -13088\\ -27613 & -2695 & -13088 & -93561\end{pmatrix}$$

Thus

$$f_{\mu} \equiv C_{\gamma}\left(B_{\mu\gamma}\right)^2 = \begin{pmatrix}-81712 & -342792 & 185950 & -74212\end{pmatrix} \tag{3.5}$$

►► Here the last force density equals the cross force as shown in Eq. (3.4).

4. Calculate the Stress Vector $\vec{T}$

In our theory we assume that

$$\vec{K} = g\vec{B} \quad : \quad \vec{F} = g\vec{E} \quad : \quad \vec{T} = g\left(\vec{K}\times\vec{F}\right)$$

$$g = \operatorname{diag}\left(\pm 1,1,1,1\right)$$

On the other hand, from master form and the results above, we have

$$\vec{K}\times F = \left(g\vec{B}\right)^2 + \boldsymbol{M} = \vec{k}^2 + \boldsymbol{M}$$

Let, matrix A = $(k_{\mu r})^2$: $M_{\mu r} = -\lambda I$

Then we get

$$\left(\vec{K}\times\vec{F}\right)_{\mu\gamma} = \left(\vec{k}^2\right)_{\mu\gamma} + \left(\boldsymbol{M}\right)_{\mu\gamma} = \left(k_{\mu\gamma}\right)^2 + \boldsymbol{M}_{\mu r} = \mathbf{A} - \lambda I$$

Here the Lambda symbol λ denote as Eigenvalue of matrix $\left(\vec{K}\times\vec{F}\right)$, λ equals the average of the elements on the main diagonal of matrix A as follows:

$$\lambda = \frac{1}{4}\operatorname{tr}\left(\mathrm{A}\right)$$

where:

tr(A): is the trace of a matrix A (or the sum of the elements on the main diagonal of A)

I: unit matrix, $I = \operatorname{diag}(1,1,1,1)$

► For an example at hand, we will use the matter case where its assumed that,

$$g = \operatorname{diag}(-1,1,1,1)$$

Then we get

$$k_{\mu\gamma} = gB_{\mu\gamma} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & -76 & 51 & 46 \\ 76 & 0 & 41 & 262 \\ -51 & -41 & 0 & -151 \\ -46 & -262 & 151 & 0 \end{pmatrix}$$

$$k_{\mu\gamma} = \begin{pmatrix} 0 & 76 & -51 & -46 \\ 76 & 0 & 41 & 262 \\ -51 & -41 & 0 & -151 \\ -46 & -262 & 151 & 0 \end{pmatrix}$$

Taking the square of last equation

$$\left(k_{\mu\gamma}\right)^2 = \begin{pmatrix} 10493 & 14143 & -3830 & 27613 \\ -14143 & -64549 & 35686 & -9687 \\ 3830 & 35686 & -21881 & -8396 \\ -27613 & -9687 & -8396 & -89329 \end{pmatrix} = (\mathrm{A})$$

The eiginvalue λ can be easily defined by equation.

$$\lambda = \frac{1}{4}\operatorname{tr}(\mathrm{A}) = \frac{1}{4}(10493 - 64549 - 21881 - 89329) = -41316.5$$

The cross-product of $\vec{K}$ and $\vec{F}$ is defined

$$\left(\vec{K} \times \vec{F}\right)_{\mu\gamma} = \begin{pmatrix} 10493 & 14143 & -3830 & 27613 \\ -14143 & -64549 & 35686 & -9687 \\ 3830 & 35686 & -21881 & -8396 \\ -27613 & -9687 & -8396 & -89329 \end{pmatrix} + \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} 41316.5$$

Then we obtain

$$T_{\mu\gamma} = g\left(\vec{K} \times \vec{F}\right)_{\mu\gamma} = \begin{pmatrix} -51809.5 & -14143 & 3830 & -27613 \\ -14143 & -23232.5 & 35686 & -9687 \\ 3830 & 35686 & 19435.5 & -8396 \\ -27613 & -9687 & -8396 & -48012.5 \end{pmatrix}$$

4.1. Calculate the Components of $T_{\mu\gamma}$ by Master Form

► From last equation, we can now defined the components of the stress tensor as

$$T_{00} = -51809.5 \tag{4.1}$$

$$T_{0i} = T_{i0} = -14143, 3830, -27613 \tag{4.2}$$

$$T_{ij}=\begin{pmatrix}28577 & 35686 & -9687\\ 35686 & 71245 & -8396\\ -9687 & -8396 & 3797\end{pmatrix},\ i,j=1,2,3 \tag{4.3}$$

4.2. Calculate the Components of $T_{\mu\gamma}$ by General Relativity Way

► As shown in my last paper and example above, we have

$$\left(\vec{B}\right)_{\mu\gamma}=\begin{pmatrix}0 & -76 & 51 & 46\\ 76 & 0 & 41 & 262\\ -51 & -41 & 0 & -151\\ -46 & -262 & 151 & 0\end{pmatrix}=\begin{pmatrix}0 & -\frac{E_1}{c} & -\frac{E_2}{c} & -\frac{E_3}{c}\\ \frac{E_1}{c} & 0 & B_3 & -B_2\\ \frac{E_2}{c} & -B_3 & 0 & B_1\\ \frac{E_3}{c} & B_2 & -B_1 & 0\end{pmatrix}$$

Let, $\epsilon_0=1, c=1$

By Comparing the middle-hand side with the right-hand side of the above equation we can be easily calculated the electric and magnetic field

$$E_1=76\quad : \quad E_2=-51\quad : \quad E_3=-46$$

$$B_1=-151\quad : \quad B_2=-262\quad : \quad B_3=41$$

$$\boldsymbol{E}=76e^1-51e^2-46e^3\quad : \quad \boldsymbol{B}=-151e^1-262e^2+41e^3$$

$$\boldsymbol{E}^2=10493\quad : \quad \boldsymbol{B}^2=93126$$

In general relativity the components of the stress tensor shown as

$$T_{00}=-\frac{1}{2}\left(\boldsymbol{E}^2+\boldsymbol{B}^2\right)$$

$$T_{0i}=T_{i0}=\left(E\times B\right)_i$$

$$T_{ij}=\left(E_iE_j+B_iB_j+\delta_{ij}T_{00}\right)$$

Then we get,

$$T_{00}=-\frac{1}{2}\left(\boldsymbol{E}^2+\boldsymbol{B}^2\right)=-51809.5 \tag{4.4}$$

$$\boldsymbol{E}\times\boldsymbol{B}=\begin{vmatrix}e^1 & e^2 & e^3\\ 76 & -51 & -46\\ -151 & -262 & 41\end{vmatrix}=-14143e^1+3830e^2-27613e^3$$

$$T_{0i}=T_{i0}=\left(E\times B\right)_i=-14143,3830,-27613,\quad i=1,2,3 \tag{4.5}$$

$$T_{ij}=\left(E_iE_j+B_iB_j+\delta_{ij}T_{00}\right)=\begin{pmatrix}28577 & 35686 & -9687\\ 35686 & 71245 & -8396\\ -9687 & -8396 & 3797\end{pmatrix},\quad i,j=1,2,3 \tag{4.6}$$

►► The last Equations (4.4)-(4.6) are equivalent to the equations in (4.1)-(4.3).

This proves that there is no contradiction between this paper and the

theory of general relativity, and this in no way happens if there is any mistake in new theory.

5. New Coordinate System $Q_{\mu\gamma}$ of the Stress Vector $\vec{T}$

5.1. By Using New Coordinate System $Q_{\mu\gamma}$ We Can Rewrite the Stress Vector $\vec{T}$ as the Following

►
$$\begin{aligned}\vec{T} = {} & 51809.5Q_{00} + 14143Q_{01} - 3830Q_{02} + 27613Q_{03} + 14143Q_{10} + 23232.5Q_{11} \\ & -35686Q_{12} + 9687Q_{13} - 3830Q_{20} - 35686Q_{21} - 19435.5Q_{22} \\ & + 8396Q_{23} + 27613Q_{30} + 9687Q_{31} + 8396Q_{23} + 48012.5Q_{33}\end{aligned}$$

where $Q_{\mu\gamma}$ is a orthogonal unit vector

5.2. The Length of the Stress Vector $\vec{T}$

► The length of the stress vector $\vec{T}$ is defined by,

$$\left|\vec{T}\right|^2 = \sum \left(T_{\mu\gamma}\right)^2, \quad \mu,\gamma = 0,1,2,3$$

Then,

$$\left|\vec{T}\right| = \sqrt{\sum \left(T_{\mu\gamma}\right)^2} = 103619 \tag{5.1}$$

►► Note that the last equation equals the Equation (2.2)

6. General Stress Tensor

6.1. Electromagnetic Stress Tensor

As shown in the example above, in the Extended Fields Theory, the cross-product of two electromagnetic vectors $\vec{B} \in \mathbb{R}^{4,2}$ and $\vec{E} \in \mathbb{R}^{4,2}$ can be written as the matrix in the form

$$\left(\vec{B} \times \vec{E}\right)_{ij} = \left[\frac{E_i E_j}{c^2} + B_i B_j - \frac{1}{2}\delta_{ij}\left(\frac{\boldsymbol{E}^2}{c^2} + \boldsymbol{B}^2\right)\right] \quad (i,j = 0,1,2,3)$$

Therefore

$$T_{ij} = \epsilon_0 \left[E_i E_j + c^2 B_i B_j - \frac{1}{2}\delta_{ij}\left(\boldsymbol{E}^2 + c^2 \boldsymbol{B}^2\right)\right]$$

6.2. Generalization the Stress Tensor

In general, the cross force F_{cross} can be written as

$$\boldsymbol{F}_{\text{cross}} = m\frac{\mathrm{d}^2(r)}{\mathrm{d}x_0^2} = \frac{\mathrm{d}^2(r)}{\mathrm{d}(ct)^2} = \frac{1}{c^2}\frac{\mathrm{d}^2(r)}{\mathrm{d}t^2} = \frac{1}{c^2}\boldsymbol{F}',$$

so

$$\boldsymbol{f}' = c^2 \boldsymbol{f}_{\text{cross}} = \nabla \cdot \left[\frac{c^4}{4\pi k}\left(\vec{B} \times \vec{E}\right)\right] = \nabla \cdot \vec{\boldsymbol{T}}'$$

Suppose now that the vector $\vec{\Phi}^0$ is defined by equation

$$\vec{\Phi}^0 = 2\left(\vec{B} \times \vec{E}\right)$$

Then

$$\vec{T}' = \frac{c^4}{8\pi k} 2\left(\vec{B} \times \vec{E}\right) = \frac{c^4}{8\pi k} \vec{G}^0$$

The last equation can be written as the

$$\vec{\mathbb{G}}^0 = \frac{8\pi k}{c^4} \vec{T}'$$

Or on the tensor form

$$\mathbb{G}^0_{\mu\gamma} = \frac{8\pi k}{c^4} T'_{\mu\gamma} \tag{6.1}$$

6.3. Gravitational Stress Tensor

As it is known there is similarity between electromagnetic and gravitational laws, for example, the symmetry between the Maxwell equations for the electromagnetic (EM) fields and Maxwell equations for the gravito electromagnetic (GEM) fields, and the symmetry between the Lorentz's force-law for EM fields and the Lorentz's force-law for GEM fields [5].

so, we can rewrite the Equation (2.1) as the following

$$\boldsymbol{f}_{g\,\mathrm{cross}} = \boldsymbol{J} \times \frac{1}{m} \vec{F}_g = \boldsymbol{J}_g \times \vec{B}_g$$

where

$$\boldsymbol{F}_g = m\boldsymbol{E}_g + \frac{\boldsymbol{V}}{c^2} \times m\boldsymbol{B}_g$$

m: The masses of the objects.

$\boldsymbol{J}_g$: 4-mass current density.

$\boldsymbol{f}_{g\,\mathrm{cross}}$: 4-GEM Lorentz force density.

$\vec{\boldsymbol{B}}_g$: 4-Gravitomagnetic field.

$\vec{\boldsymbol{E}}_g$: 4-Gravitational field.

The striking analogy between the Coulomb's electrostatic force and the Newtonian gravitostatic force suggests that the analogous quantity for electrical permitivity ϵ_0 in gravitation is [6]:

$$\epsilon_{0g} = \frac{1}{4\pi G}$$

we can deduce by analogy with electromagnetism that:

$$c^2 = \frac{1}{\epsilon_{0g} \mu_{0g}} \quad \text{and} \quad \mu_{0g} = \frac{4\pi G}{c^2}$$

Now, we can rewrite the $\mathrm{curl}\vec{B}_g$ for $\mu_{0g} \neq 1$ as,

$$\nabla \times \vec{B}_g = \mu_{0g} \boldsymbol{J}_g$$

thus

$$\boldsymbol{f}_{g\,\mathrm{cross}} = \left(\boldsymbol{J}_g\right) \times \vec{B}_g = \left(\boldsymbol{J}_g\right) \cdot \vec{\vec{B}}_g = \left(\nabla \times \frac{1}{\mu_{0g}} \vec{B}_g\right) \cdot \vec{E}_g = \left(\vec{E}_g \times \frac{1}{\mu_{0g}} \vec{B}_g\right) \cdot \nabla$$

$$= \nabla \cdot \left[\frac{1}{\mu_{0g}} \left(\vec{B}_g \times \vec{E}_g\right)\right] = \nabla \cdot \left[\frac{c^2}{4\pi G} \left(\vec{B}_g \times \vec{E}_g\right)\right] = \nabla \cdot \vec{T}_g$$

where:

G: the gravitational constant.

ϵ_{0g} is the gravitational permittivity of free space.

μ_{0g} is the gravitational permeability of free space.

$\vec{T}_g$ is the Maxwell gravitational stress vector, or Gravitoelectromagnetism gravitational stress vector, defined by

$$\vec{T}_g = \frac{c^2}{4\pi G}\left(\vec{B}_g \times \vec{E}_g\right)$$

For now let us assume that,

$$\boldsymbol{f}'_g = c^2 \boldsymbol{f}_{g\,\text{cross}} = \nabla \cdot \left[\frac{c^4}{4\pi G}\left(\vec{B}_g \times \vec{E}_g\right)\right] = \nabla \cdot \vec{T}'_g$$

$$\vec{\mathbb{G}}_g^0 = 2\left(\vec{B}_g \times \vec{E}_g\right)$$

Then

$$\vec{T}'_g = \frac{c^4}{8\pi G} 2\left(\vec{B}_g \times \vec{E}_g\right) = \frac{c^4}{8\pi G}\ \vec{\mathbb{G}}_g^0$$

The last equation can be written as the

$$\vec{\mathbb{G}}_g^0 = \frac{8\pi G}{c^4} \vec{T}'_g$$

Or on the tensor form

$$\left(\mathbb{G}_g^0\right)_{\mu\gamma} = \frac{8\pi G}{c^4}\left(T'_g\right)_{\mu\gamma} \tag{6.2}$$

The matrix $\mathbb{G}_{\mu\gamma}$ is the same as the Einstein's tensor $G_{\mu\gamma}$ in general relativity without space-time structure, this is what we will prove it in the next research

7. Conclusion

We do not need to prove the theory of general relativity or the theory of Big Bang to new physical hypotheses that are difficult to imagine, as the curvature of space-time induced by the presence of the massive body, as simple as it is, there is a creator for universe.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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