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Gamma Ray Delay and Dual Aspect of Gravity in Heracletean World (Working Hypothesis)

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Abstract: *In this paper one resumes the Panta Rei physical model introduced in International Journal of Advanced Research in Chemical Science (India) paper (IJARCS, Volume 2, Issue 4, April 2015, 6-12) with the aim to relate the gamma ray delay and dual aspect of gravity. The value of the dynamic constant kestimated from the gamma ray delay is of the same magnitude as that one speculated from the dual aspect of gravity, i.e.*$k = 5.94\ x\ 10^{-46} kg^2m^2s^{-2}$ *and* $k = 7.44\ x\ 10^{-46} kg^2m^2s^{-2}$*, respectively. Both values are much higher than that being speculated in the previous article (IJARCS, Volume 1, Issue 10, December 2014, 9-12) where under the assumption of the constant speed of light conly the attractive aspect of gravity has been able to be taken into account. It seems like that the extended force model with the diversity in the speed of light opens the door to the dual approach to gravity as an attractive as well as repulsive phenomenon of the physical matter in the Heracletean world.*

Keywords: *Heracletean world, gamma ray delay, dual aspect of gravity, Panta rei force model and function, attractive and repulsive phenomenon, dynamic constant, energy-mass equivalence, imaginary self-mass, maximal mass equivalent, speed of light.*

1. HERACLETEAN WORLD

The Panta rei force model which attempts to give Heraclitus' Panta Rei philosophical model a mathematical and physical formulation is expressed as[1]:

$$F = \frac{dp}{dt} + \frac{d(\frac{k}{p})}{dt} \tag{1}$$

Due to energy-mass equivalence $E = mc^2$ the model leads to the Panta rei function given as[1], [2]:

$$m^2v^2 = e^{\frac{m_0^2c^2 + m^2(v^2-c^2)}{k}} \tag{2}$$

The relation between the mass equivalent m and speed v is determined by two constants: the constant c reflecting the energy-mass equivalence as well as dynamic constant $k$mirroring the flowing nature of physical bodies in the Heracletean world[1], [2]. The maximal speed v_{max} isachieved at[2]:

$$v_{max} = c\sqrt{1 + \frac{k}{e^{\frac{m_0^2c^2}{k}+1} - k}} = c\sqrt{1 + \frac{k}{m_{max}^2c^2}} \tag{3}$$

It equals the constant c only exceptionally. First, in the downsizing Heracletean world where k is zero.[2]Secondly, in the non-Heracletean world where k is absent and the Panta rei function(2) transforms (except for $v = 0$) into the known relation of the classic relativistic dynamics$m_0^2c^2 + m^2(v^2 - c^2) = 0$. [2]In the Heracletean world with $k > 0$ the maximal speed $v_{max}$of mass body with the finite self-mass m_0– real or imaginary – always exceeds the constant *c*.[2] The surplus is of the self-mass m_0 dependent. That is, it is inversely proportional to the real self-mass($m_0 \in \mathbb{R}^+$) and on the other hand proportional to the imaginary self-mass($m_0 \in \mathbb{R}^+ x\ i$).For instance, the zero self-mass$m_0 = 0$ possesses the highest maximal speed amongst real self-masses and at the same time the lowest maximal speed amongst imaginary self-masses:

$$v_{max}(m_0 = \infty) = c < v_{max}(m_0 = 0) = c\sqrt{1 + \frac{k}{e-k}} < v_{max}\left(m_0 = \frac{\sqrt{k(lnk-1)}}{c}\right) = \infty. \quad (4)$$

The maximal mass equivalent $m_{max}$is of the self-mass m_0 dependent as[2], (3):

$$m_{max}^2 c^2 = e^{\frac{m_0^2 c^2}{k}+1} - k \quad (5)$$

The concerned mass equivalent $m_{max}$is infinite only exceptionally,i.e. in the downsizing Heracletean world where k is zero, and in the non-Heracletean world where k is absent. [2] In the Heracletean world with $k > 0$ the maximal mass equivalent $m_{max}$of mass body with the finite self-mass m_0 – real or imaginary – always occupies a finite value as follows[2]:

$$m_{max}(m_0 \in \mathbb{R}^+) \geq \frac{\sqrt{e-k}}{c},$$

$$m_{max}(m_0 = 0) = \frac{\sqrt{e-k}}{c},$$

$$m_{max}(m_0 \in \mathbb{R}^+ x\, i) < \frac{\sqrt{e-k}}{c} \quad (6)$$

If the mass of a photon $m_{photon}$is assumed to be the maximal mass equivalent m_{max} by its nature then we can also assume that its self-mass is imaginary$(m_0 \in \mathbb{R}^+ x\, i)$since even the heaviest photons of gamma-rays possess mass equivalents of the magnitude far less than$\frac{\sqrt{e-k}}{c}$. [2]Such an assumption is encouragingby the fact that the gravitational force between imaginary self-masses is repulsive $(i\ x\ i = -1)$ [2]:

$$F = G\frac{(m_0)_1\ x\ (m_0)_2}{r^2} \quad (7)$$

This mentioned feature is in accordance with the cone-shaped beam of photons. [2],[4]Further,an angular spread of the beam is proportional to the wavelength $\lambda = \frac{h}{mc}$ which is in direct proportion to the imaginaries of photons. [2], (4)

2. GAMMA RAY DELAY

Speed of photons v_{light} can be calculated using the formula(3)[2]:

$$v_{light} = c\sqrt{1 + \frac{k}{m_{photon}^2 c^2}} \quad (8)$$

From the above equation(8) it is evident that mass and speed of photons (m_{photon},v_{light}) are inversely proportional so heavier photons should be slower than lighter ones, and vice versa, lighter photons are faster than heavier ones. The dynamic constant $k$can be calculated knowing the delay of the heavier photons. For the enough large difference in the mass of photons holds the next dynamic constant k estimation formula derived in the subchapter 2.1:

$$k \approx 2m_{lighter}^2 c^2\ x\ \frac{\Delta t\ x\ c}{s} \quad (9a)$$

Here $m_{lighter}$ is the mass of the lighter photon, Δt is time delay of the heavier photon, s is the path of photons and c is energy-mass equivalence constant. Since the dynamic constant $k$is expected to be very low the energy-mass equivalence constant c may be taken to equal the official speed of light at least on all written decimals$c = 2.99792458\ x\ 10^8 \frac{m}{s}$ [5].

2.1. The Derivation of the Dynamic Constant *k* Estimation Formula

In the case of the gamma ray delay the approximate dynamic constant k estimation formula can be derived – denoting physical quantities of the lighter and heavier photon by the subscript 1 and2, respectively –as follows:

$$v_1\ x\ t_1 = s_1 = s = s_2 = v_2\ x\ t_2.$$

$\frac{v_1}{v_2} = \frac{t_2}{t_1}$ *where* $t_2 > t_1$ *and* $v_1 > v_2$.

$$1 + \frac{\boldsymbol{k}}{\boldsymbol{2m_1^2c^2}} \approx \frac{\sqrt{1 + \frac{k}{m_1^2c^2}}}{\approx 1} = \frac{\sqrt{1 + \frac{k}{m_1^2c^2}}}{\sqrt{1 + \frac{k}{m_2^2c^2}}} = \left(\frac{v_1}{v_2} = \frac{t_2}{t_1}\right) = \frac{t_1 + \Delta t}{t_1} = 1 + \frac{\Delta t}{t_1} \approx 1 + \frac{\boldsymbol{\Delta t\ x\ c}}{\boldsymbol{s}}$$

$$\frac{k}{2m_1^2c^2} \approx \frac{\Delta t\ x\ c}{s} \rightarrow k\ \approx 2m_1^2c^2\ x\ \frac{\Delta t\ x\ c}{s} \qquad (9b)$$

2.2. Gamma Ray Delay from Markarian 501

The high- and low-energy photons appeared to have been emitted at the same time from a short burst of the blazar Markarian 501 on July 9, 2005.[6]But the high-energy photons arrived four minutes late after travelling through space for about 500 million years.[6] Photons with energies between1.2 *TeV* and 10 *TeV* arrived 4 $minutes$ after those in a band between 0.25*TeV* and 0.6 T*eV*[6].

With the help of the equation$(9a)$ and taking into account the mass of the lighter photon $m_{lighter} = 4.45\ x\ 10^{-25}kg$, time delay $\Delta t = 240\ s$ and the path $s = 4.32\ x\ 10^{24}m$[6]the next value of the dynamic constant is estimated**:**

$$k_{estimated} = 5.94\ x\ 10^{-46}kg^2m^2s^{-2}. \qquad (10)$$

The above value is much higher than those of $k = 4.8\ x\ 10^{-72}kg^2m^2s^{-2}$predicted from the speculated dynamics of the electron around the non-zero point of gravity in the ground state of Hydrogen atom[3], [2]. The mentioned discrepancy leads one to consider again that mass bodies possess the zero-point of gravity. The latter is a subject to the imaginary self-mass $m_0 = \frac{\sqrt{k(lnk-1)}}{c}$having zero mass-equivalent $m_{max} = 0$and finite momentum $p_{max} = \sqrt{k}$atthe infinite speed$v_{max} = \infty$.[2].

3. DUAL ASPECT OF GRAVITY

Respecting Panta rei theory[2] the imaginariness of the wave aspect can be also attributed to the mass particles having the mass equivalent of the low magnitude $m_{max} < \frac{\sqrt{e-k}}{c}$. In such a case the real self-mass m_0 of the mass particle may be regarded as the maximal mass equivalent $m_{max}$of the imaginary self-mass $m_{0,i}$ of that particle. Replacing m_{max} on the left side of the equation (5) by m_0 as well asreplacing m_0 on the right side of the same equation by $m_{0,i}$ the next relation between both aspects of the mass particle is given:

$$m_0^2c^2 = e^{\frac{m_{0,i}^2c^2}{k}+1} - k \qquad (11)$$

Here m_0 and $m_{0,i}$ are real and imaginary aspect of the mass particle, respectively. The former can expresses the attractive and the latter repulsive gravitational force between mass particles(7). To express solely the attractive gravitational force to the outside world the imaginary aspect of the mass particle should be in some way hidden from it. What of course doesn't mean the concerned aspect does not exist anymore.

3.1. Dual Aspect of Gravity of the Electron

Following the present theory, a particle with the dual aspect of gravity is, for instance, electron since its real self-mass $m_0$regarded as the maximal mass equivalent $m_{max}$of the imaginary self-mass $m_{0,i}$is lower than $\frac{\sqrt{e-k}}{c}$. We have deal with the hypothetical "self-identity problem" where the electron manifests the attractive real mass $m_0$to the outside world while on the other hand hiding the repulsive imaginary mass $m_{0,i}$ in the inside world. Assuming that for the electron both aspects are (approximately) equally expressed, i.e. $m_{0,i}^{electron} = m_0^{electron}x\ i$,with the help of the official value of the self-mass of electron $m_0^{electron} = 9.10938291\ x\ 10^{-31}kg$[5] and applying the equation(11) the speculated value of the dynamic constant is given. Thus:

$$From \;\; m_0^2c^2 = e^{\frac{-m_0^2c^2}{k_{speculated}}+1} - k_{speculated}$$

$$follows \;\; k_{speculated} = 7.44\, x\, 10^{-46} kg^2m^2s^{-2} \qquad (12)$$

4. Conclusion Remarks

The speculated value of the dynamic constant $k_{speculated}$based on the assumption of the approximately equally expressed dual aspect of gravity of the electron is of the same magnitude $10^{-46}kg^2m^2s^{-2}$as that one estimated from the gamma ray delay$k_{estimated}$.The above result implies that both phenomena – the diversity in the speed of light and dual aspect of gravity –could with such a value of the dynamic constant$k$characterizethe Heracletean world.

5. The Addendum

Very great dynamic constant *k* – contrary to previous estimates [2], [3] – implies relatively great inner energy $m_{inner}c^2$ [1], [3] of the elementary particles such are electron and proton. The statement is verifiable by the approximate formula $m_{inner}c^2 \approx \frac{k(1-lnk)}{2m_0}$ which is valuable for the particles with the non-zero self-mass, i.e. with. $m_0 > 0$. [1], [3] The inner energy reflects the stability of elementary particles since, for instance, the amount of about three inner energies of the elementary particle is needed to divide that particle into two equal parts [3].

Dedication

This fragment is dedicated to my grandfather Franc† for his wonderful storytelling.

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Author's Biography

Janez Špringer, All the science originates from Philosophy, so it is not surprising that a scientist of any kind derives from it. Pharmacy derives from other sciences, so it also should not be surprising that a pharmaceutical specialist - what the author officially is – throws a brief look to them. Some author's fragments of such a type are published in scientific journals such are Progress in Physics, GJSFR, IJARCS and just now IJARPS.