

From Dynamic Constant to Inner Energy and Size of Universe (Intellectual Exercise)

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Abstract: Previously (IJARCS, Volume 1, Issue 6, August 2014, 36 – 46) one introduced the physical model *Panta rei* expressed as $F = dp/dt + d(k/p)/dt$. In this paper the value of the dynamic constant $k = m_e^3 \alpha^3 c^3 / \text{kgms}^{-1}$ is given. Consequently due to two to one self-mass uniting the emitted inner energy in the form of electromagnetic waves at the frequency range of MHz, μHz and nHz is expected. Furthermore the circumference of the present universe of about $8.4 \times 10^{37} \text{m}$ is predicted.

Keywords: *Panta rei*, dynamic constant, Planck constant, inner energy, mass uniting, zero self-mass, size of point, size of universe.

1. THEORETICAL BACKGROUND

Physical model *Panta rei* mathematically expressed as $F = dp/dt + d(k/p)/dt$ [1] where k is the dynamic constant has limitations due to relations $E = mc^2$ and $p = mv$ so only finite values of parameters F and p are physically meaningful [1]. Besides, the size of the point inherent to the considered model is non-zero and equals the nominal value of Planck constant h expressed in meters regardless the value of the dynamic constant k [1]. The latter mirrors two speeds of mass body m . In this paper we speculate that one of them is the circulation and the other one of that circulation dependent rotation speed of geometric body with mass m around that non-zero centre of gravity. Thus:

$$k = mv_{\text{circulation}} \times mv_{\text{rotation}} \quad (1)$$

Both speeds are related due to equality of the circulation and rotation time:

$$t_{\text{circulation}} = t_{\text{rotation}},$$
$$\frac{2\pi R_{\text{circulation}}}{v_{\text{circulation}}} = \frac{2\pi r_{\text{rotation}}}{v_{\text{rotation}}},$$
$$v_{\text{rotation}} = \frac{2\pi r_{\text{rotation}}}{2\pi R_{\text{circulation}}} \times v_{\text{circulation}} \quad (2)$$

Knowing the circulation speed and orbit of some mass particle the dynamic constant k can be calculated.

2. THE CALCULATION OF THE DYNAMIC CONSTANT

As already mentioned the centre of gravity is the geometric body with the circumference $2\pi r_{\text{rotation}} = h / \text{kgms}^{-1}$ [1]. Let us propose the electron with mass m_e being the mass particle rotating with the lowest speed v_{rotation} on that circumference around itself as well as circulating with the highest speed $v_{\text{circulation}}$ on the circumference $2\pi R_{\text{circulation}} = 2\pi R_{\text{Bohr}}$ around nucleus in the ground state of Hydrogen. Both speeds are related by the equation (1). Bohr orbit length $2\pi R_{\text{Bohr}}$ equals de Broglie's wavelength $\frac{h}{m_e v_{\text{circulation}}}$ [2]. On the other hand the speed of the electron on Bohr orbit $v_{\text{circulation}}$ reflects the fine structure constant α as $v_{\text{circulation}} = \alpha c$ [2]. So according to the equation (2) holds:

$$v_{rotation} = \frac{h/kgms^{-1}}{2\pi R_{Bohr}} \alpha c = \frac{h/kgms^{-1}}{\frac{h}{m_e c \alpha}} \alpha c = m_e \alpha^2 c^2 / kgms^{-1}. \quad (3)$$

Applying the relation (1) follows:

$$k = m_e \alpha c \times m_e m_e \alpha^2 c^2 / kgms^{-1} = m_e^3 \alpha^3 c^3 / kgms^{-1}. \quad (4)$$

With the help of CODATA-values[3] and taking into account that the electron mass practically equals the self-mass (since the mass equivalent of the kinetic energy is relatively small[1]) the dynamic constant is given as:

$$k = 7.9145 \times 10^{-72} kg^2 \frac{m^2}{s^2}. \quad (5)$$

The dynamic constant k once knownother parameters – physical and geometric - can be calculated.

3. THE INNER ENERGY

Every mass including zero self-mass possesses of the outer work independent inner energy (inner energy).

For the zero self-mass $m_0 = 0$ it is given by the exact relation[1]:

$$E_{inner}(m_0 = 0) = c\sqrt{k(1 - \ln k)}. \quad (6)$$

For the non-zero self-mass $m_0 \neq 0$ it is given by the approximate formula[1]:

$$E_{inner}(m_0 \neq 0) \approx \frac{k(1 - \ln k)}{2m_0}. \quad (7)$$

The accuracy of the later relation enhances with the increase of self-mass m_0 becoming exact with the hypothetic infinite self-mass which is the only self-mass without inner energy.[1]

4. THE INNER ENERGY DIFFERENCE

If two masses m_A and m_B with the inner energy E_{inner}^A and E_{inner}^B , respectively, unite to one mass m_{AB} getting the inner energy E_{inner}^{AB} due to conservation law holds:

$$E_{inner}^A + E_{inner}^B = E_{inner}^{AB} + \Delta E_{inner}. \quad (8)$$

Here ΔE_{inner} is the inner energy difference.

According to the approximate relation(7) holds:

$$E_{inner}^A + E_{inner}^B > E_{inner}^{AB}. \quad (9)$$

So in the two to one mass uniting a part of the particles' inner energy should be released:

$$\Delta E_{inner} > 0. \quad (10)$$

The conclusion holds true regardless how many masses are involved in the mass uniting. If such energy is released in the form of electromagnetic waves the frequency $\nu = \frac{\Delta E_{inner}}{h}$ can be attributed to it.

4.1. Uniting of Two Equal Masses to One

If two equal masses m_A with the inner energy E_{inner}^A unite to one mass m_{AA} getting the inner energy E_{inner}^{AA} due to conservation law holds:

$$E_{inner}^A + E_{inner}^A = E_{inner}^{AA} + \Delta E_{inner}. \quad (11)$$

According to the approximate relation(7) holds:

$$E_{inner}^{AA} = \frac{1}{2} E_{inner}^A. \quad (12)$$

So in the two equal masses to one uniting the three half of the involved mass inner energy should be released:

$$\Delta E_{inner} = \frac{3}{2} E_{inner}^A \quad (13)$$

4.2. Uniting of Two Essential Different Masses to One

If two essentially different masses $m_B \gg m_A$ with consequently different inner energies $E_{inner}^B \ll E_{inner}^A$ unite to one mass m_{AB} getting the inner energy E_{inner}^{AB} due to the approximate relation(7) holds:

$$E_{inner}^{AB} < E_{inner}^B \ll E_{inner}^A \quad (14)$$

So in the two essential different masses to one uniting approximately the inner energy of the lighter mass having the higher inner energy is released:

$$\Delta E_{inner} \approx E_{inner}^A \quad (15)$$

5. THE SIZE OF THE UNIVERSE

The size of the whole space equals the ratio of the nominal value of Planck constant h expressed in meters and dynamic constant k as[1]:

$$s_{space} = \frac{h/kgms^{-1}}{k} \quad (16)$$

Here the nominator is the circumference of the point so the size of the space means the circumference of the universe.

6. THE CALCULATIONS

Using the relations from the previous sections the inner energy of an arbitrary mass as well as the release of that energy due to two masses to one uniting can be calculated. In this paper we pay the attention only to the inner energy of some chosen self-masses and their inner energy release, i.e.: the zero self-mass, electron and proton. Furthermore the size of the universe is the matter of concern.

6.1. The Inner Energy of the Zero Self-Mass

Putting the calculated data for the dynamic constant $k(5)$ in the equation (6) the inner energy of the zero self-mass is given:

$$E_{inner}(m_0 = 0) = 6.756 \times 10^{-8} eV. \quad (17)$$

6.2. The Released Inner Energy of the Zero Self-Mass

In the uniting of two zero self-masses to one the three half of the zero self-mass inner energy is released according to the equation(13):

$$\Delta E_{inner} = \frac{3}{2} \times E_{inner} = 10.13 \times 10^{-8} eV. \quad (18)$$

In the zero and heavier self-mass mass uniting, for instance, of electron, proton or atom, approximately the inner energy of the zero self-mass is released according to the equation(15):

$$\Delta E_{inner} \approx E_{inner}^A = 6.756 \times 10^{-8} eV. \quad (19)$$

The corresponding frequency of electromagnetic waves yields 24,50 MHz and 16,34 MHz, respectively. These frequencies are easily detectable radio waves. For instance, the former value is typical for the quasi-periodic radio waves appearing in the high energy electric fields of the sunset sky[4].

6.3. The Inner Energy and Released Inner Energy of the Non-Zero Self-Mass

Putting the calculated data for the dynamic constant $k(5)$ in the equation (7) the inner energy of the non-zero self-mass is given. In the two equal non-zero self-masses to one uniting the three half of the involved self-mass inner energy is released according to the equation(13).

In the lighter and heavier self-mass uniting approximately the inner energy of the lighter self-mass is released according to the equation(15).

Some expected frequencies of the concerned released inner energies in the form of electromagnetic waves are collected in the *Table 1*.

Table1. *The expected frequencies of the released electromagnetic waves due to two to one mass uniting*

	Zero self-mass	electron	proton
Zero self-mass	24.50 MHz	16.24 MHz	16.24 MHz
electron	16.24 MHz	1.620 μHz	1.080 μ Hz
proton	16.24 MHz	1.080 μ Hz	0.8823nHz

The expected released electromagnetic waves due to two to one mass uniting in the case of the involved zero-self mass particle, electron and proton are in the range of mega-hertz, micro-hertz and nano-hertz frequencies, respectively. Except the first ones they are hardly detectable.

6.4. The Size of the Universe

Putting the known data for Planck constant h [3] and calculated data for the dynamic constant $k(5)$ in the equation(16) the predicted circumference of the present Universe is given:

$$s_{Universe} = 8.372 \times 10^{37} m. \quad (20)$$

The above value is 3×10^{10} times larger than the circumference of the observable universe $s_{observable} = 2.76 \times 10^{27} m$ [5] what is in accordance with the estimate that the entire universe should be at least 250 times larger than the observable universe[6]. Contrarily it underestimates the claiming of the inflation theory that the entire universe should be at least 3×10^{23} times larger[7].

7. CONCLUSION REMARKS

Panta Rei physical model introduced in International Journal of Advanced Research in Chemical Science (India) paper attempts to give Heraclitus' Panta Rei philosophical model a mathematical and physical formulation. However, the obtained results as a consequence of the speculative equation(1) do not agree with currently accepted results, with for example, the circumference of the universe 3×10^{10} times larger than the observable universe (versus current estimates). Until the given force model has no physical affirmation it should be considered more an intellectual exercise than a physical one. Simply rejecting the not physically proven relation (1) and respecting the claiming of the inflation theory about the size of the entire universe leads only to the prediction of 10^{13} times smaller dynamic constant and correspondingly smaller inner energies what is just another estimation needed to be verified.

DEDICATION

This fragment is dedicated to the Free will of a raindrop falling on the thirsty soil.

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