International Journal of Advanced Research in Physical Science (IJARPS)
Volume 2, Issue 10, October 2015, PP 31-35
ISSN 2349-7874 (Print) & ISSN 2349-7882 (Online)
www.arcjournals.org

Discrete Communication in Heracletean World (From Pure Imagination to Precise Reality)

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Abstract: *In this paper the discrete communication model for mass particles in Heracletean world is proposed. It brings the prediction of the dynamic constant* $k_{predicted} = 6.27\ x\ 10^{-46} kg^2 m^2 s^{-2}$ *being very close to that one calculated from the gamma ray delay* $k = 5{,}94\ x\ 10^{-46} kg^2 m^2 s^{-2}$. *In addition, it offers the value of proton radius* $r_{proton} = 0{,}8940\ x\ 10^{-15} m$.

Keywords: *Discrete communication model, Hydrogen atom in Heracletean world, dynamic constant, ground mass and ground speed, mass equivalent and self-mass, ground momentum and ground wavelength, zero self-mass, proton and electron radius, Bohr radius and electron-proton distance, number 84*

1. THE THEORETICAL BACKGROUND

In the Heracletean world[1], [2],[3], [4], [5]described by the force model $F = dp/dt + d(k/p)/dt$the ground circumstances play the same role as the state of rest in the non-Heracletean world described by Newton law $F = dp/dt$. Let us recall some significant characteristics needed to reveal the discrete communication in Hercaletean world.

1.1. The Ground Momentum and Ground Mass Equivalent

In the ground circumstances all mass-equivalent sm_{ground} have the same ground momentum p_{ground} determined by the dynamic constant kas follows:

$$p_{ground} = m_{ground}\ v_{ground} = \sqrt{k}. \tag{1}$$

The ground mass-equivalent m_{ground} and ground speed v_{ground} is in inverse proportion to each other. At the zero dynamic constant $k = 0$the ground circumstances transform to the rest state of the non-Heracletean world where the ground momentum is zero for all masses.

1.2. The Ground Momentum and Self-Mass

The same as for mass-equivalentsm_{ground} holds true for self-masses$m_0$since the former mirror the latteras follows[1]:

$$m_{ground} = \frac{\sqrt{k(1 - lnk) + m_0^2 c^2}}{c}. \tag{2}$$

So:

$$p_{ground} = \frac{\sqrt{k(1 - lnk) + m_0^2 c^2}}{c}\ x\ v_{ground} = \sqrt{k}. \tag{3}$$

The self-mass$m_0$and ground speedv_{ground} is in inverse proportion to each other. At the zero dynamic constant $k = 0$the ground mass-equivalent m_{ground} equals the self-mass m_0 and again in the mentioned case can be concluded that the ground circumstances transform to the rest state of the non-Heracletean world where the ground momentum is zero for all masses.

1.3. The Ground Speed and Self-Mass

The self-mass$m_0$can be real as well as imaginary. The ground speed depends on the type and amount of the self-mass as follows[1]:

$$v_{ground} = c\sqrt{\frac{1}{1 - lnk + \frac{m_0^2c^2}{k}}}. \quad (4)$$

The zero self-mass$m_0 = 0$, for instance,possesses the real speed$v_{ground} = \frac{c}{\sqrt{1-lnk}}$ which is the highest ground speed amongst real self-masses and at the same time the lowest ground speed amongst imaginary self-masses:

$$v_{ground}\ (m_0 = \infty) = 0 < v_{ground}\ (m_0 = 0) = \frac{c}{\sqrt{1 - lnk}} < v_{ground}\left(m_0 = \frac{\sqrt{k(lnk - 1)}}{c}\right) = \infty. \quad (5)$$

The window of ground speeds is spread between the zero and infinite value. The infinite self-mass$m_0 = \infty$ is at rest. On the contrary the imaginary self-mass of the point$m_0 = \frac{\sqrt{k(lnk-1)}}{c}$ [5] exhibits the infinite speed.

1.4. The Ground Wavelength

The de Broglie wavelength λ_{ground} can be attributed to the ground momentump_{ground} as follows:

$$\lambda_{ground} = \frac{h}{p_{ground}}. \quad (6)$$

In the ground circumstances according to the relations $(1), (3)$ all mass-equivalents m_{ground} as well as self-massesm_0 have the same ground wavelength λ_{ground} . At the zero dynamic constant $k = 0$ where the ground momentum p_{ground} is zero$(1), (3)$ the ground wavelength is infinite. Also in the rest state of the non-Heracletean world all momenta arezero, so the rest wavelength is there infinite, too.

2. THE ZERO SELF-MASS

According to Newton gravitational law $F = G\frac{(m_0)_1\, x\, (m_0)_2}{r^2}$ the real self-masses $m_0 \in \mathbb{R}^+$are attractive, imaginary self-masses $m_0 \in \mathbb{R}^+ x\ i$ are repulsive and zero self-mass$m_0 = 0$ is inert.The latter is the object of interest in the present paper since it enables the discrete communication between real mass particles in Heracletean world. The existence of such communication is plausible. It enables the mass particles to obey some physical law without interfering it. And superior ground speed of the zero self-mass amongst real self-masses makes the communicationbetween them feasible(5).The concerned communication is doubtful at the zero dynamic constant $k = 0$and in non-Heracletean world where k is absent because the zero ground momentum generates the infinite wavelength(6) which overpasses the finite distances, as well as generates zero ground speed$(4)$by which no finite distance can be touched.

2.1. The Ground Wavelength of the Zero Self-Mass

All self-masses m_0 in the ground circumstances$(3), (6)$have the same ground wavelength. The zero self-mass $m_0 = 0$ is not an exception:

$$\lambda_{ground}\ (m_0 \in \mathbb{R} \cup \mathcal{R}\ x\ i) = \lambda_{ground}\ (m_0 = 0) = \frac{h}{\sqrt{k}}. \quad (7)$$

2.2. The Ground Speed of the Zero Self-Mass

The ground speedv_{ground} of the zero self-mass $m_0 = 0$is real and is given by the equation(4):

$$v_{ground}\ (m_0 = 0) = \frac{c}{\sqrt{1 - lnk}}. \quad (8)$$

2.3. The Ground Mass-Equivalent of the Zero Self-Mass

The ground mass-equivalent of the zero self-mass$m_0 = 0$ is non-zero (except for $k = 0$) and is given by the equation(2):

$$m_{ground}\ (m_0 = 0) = \frac{\sqrt{k(1 - lnk)}}{c}. \quad (9)$$

2.4. The Inner-Mass Accompanying the Zero Self-Mass

Using the relation between the inner-mass m_{inner} and self-massm_0, i.e.: $m_{inner}\ c^2 = c\sqrt{k(1 - lnk) + m_0^2 c^2} - m_0 c^2$[1] the inner-mass$m_{inner}\ (m_0 = 0)$accompanying the zero self-mass$m_0 = 0$is given:

$$m_{inner}\ (m_0 = 0) = \frac{\sqrt{k(1 - lnk)}}{c}. \tag{10}$$

Comparing the equations$(9), (10)$is evident that the ground mass-equivalent of the zero self-mass$m_{ground}\ (m_0 = 0)$equals the inner-mass accompanying the zero self-mass$m_{inner}\ (m_0 = 0)$:

$$m_{ground}\ (m_0 = 0) = m_{inner}\ (m_0 = 0). \tag{11}$$

The energy characteristics and no particle radius are expected from such a mass-equivalent.

3. The Intra-Particle Discrete Communication in the Ground State of Hydrogen Atom

The discrete communication between mass particles by the means of the zero self-mass particles can be examined in the ground state of Hydrogen atom. Here Bohr radius R_{Bohr} represents the distance between negative electron-charge (located in the orbit) and positive proton-charge (located in proton-nucleus). The actual distance Δ between both particles is shortened for the size of both particles' radii as follows:

$$\Delta = R_{Bohr} - (r_{electron} + r_{proton}). \tag{12}$$

The zero radius of the zero self-mass(11) has no influence on the concerned distance. Let us propose that electron and proton in the ground state of Hydrogen atom make the discrete communication with the help of the zero self-mass particles moving on the electron-proton distance Δ (9)both with the ground speed$v_{ground} = \frac{c}{\sqrt{1-lnk}}$ (8).The first zero self-mass originates from the orbit; and the other zero self-mass originates from the proton-nucleus. They collide into each other at the half of the electron-proton distance$\frac{\Delta}{2}$and repel. From the wave aspect of the motion the ground wavelength λ_{ground} of the zero self-mass equals the half of the electron-proton distance$\frac{\Delta}{2}$. Then applying the relations$(7), (12)$holds:

$$\frac{h}{\sqrt{k}} = \lambda_{ground} = \frac{\Delta}{2} = \frac{R_{Bohr} - (r_{electron} + r_{proton})}{2}. \tag{13}$$

3.1. The Electron-Proton Distance and the Dynamic Constant k

If the discrete communication model is the right picture of reality the dynamic constant k is determined by Planck constant h and three radii, i.e.R_{Bohr}, $r_{electron}$ andr_{proton} as follows (13):

$$k = \left(\frac{2h}{R_{Bohr} - (r_{electron} + r_{proton})}\right)^2. \tag{14}$$

Using the CODATA[6]$h = 6{,}62607004\ x\ 10^{-34} m^2 kg\ s^{-1}$,

$R_{Bohr} = 0{,}52917721067\ x\ 10^{-10} m, r_{electron} = 2{,}8179403227\ x\ 10^{-15} m$ and

$r_{proton} = 0{,}8751(61) x\ 10^{-15} m$ the next predicted value of the dynamic constant is given:

$$k_{predicted} = 6{,}2723515(15)\ x\ 10^{-46} kg^2 m^2 s^{-2}. \tag{15}$$

The above prediction$(15)$is very close to the value calculated from the gamma ray delay $k = 5{,}94\ x\ 10^{-46} kg^2 m^2 s^{-2}$[4].

3.2. The Discrete Communication Time Period and the Dynamic Constant k

It is reasonable to expect that the circulation time period of electron $t_{circulation}$ (spent on the circumference $2\pi R_{Bohr}$ around Hydrogen proton-nucleus) and the translation time period of zero self-mass $t_{translation}$ (spent on the twice half-distance $2\ x \frac{\Delta}{2} = \Delta$ between electron and proton) are related in a way that the former is the natural multiple of the latter:

$$t_{circulation} = t_{translation}\ x\, n, \quad \in \mathbb{N}. \tag{16a}$$

Or:

$$\frac{s_{circulation}}{v_{circulation}} = \frac{s_{translation}}{v_{translation}} x\, n. \tag{16b}$$

Indeed, the circulation path of electrons$s_{circulation} = 2\pi R_{Bohr}$ is approximately $2\pi - times$longer than translation path of zero self-mass$s_{translation} = 2\, x \frac{\Delta}{2} = \Delta(12)$. And the circulation speed of electron$v_{circulation} = \alpha c[7]$ is approximately $13 - times$smaller thantranslation speed of zero self-mass$v_{translation} = \frac{c}{\sqrt{1-lnk}}(8),(15)$. Taking into account the equation$(14)$the next relation for the speculated natural translation time multiple n is given:

$$n = \frac{2\pi R_{Bohr}\alpha^{-1}}{\left(R_{Bohr} - \left(r_{electron} + r_{proton}\right)\right)\sqrt{1 - ln\left(\frac{2h}{R_{Bohr} - \left(r_{electron} + r_{proton}\right)}\right)^2}}. \tag{17}$$

Applying the predicted value of the dynamic constant$(15)$the translation time multiple $n = 83{,}999970(10)$is calculated what is worthy of attention since it differs from the natural number 84 only on the fifth decimal place.

3.3. The Natural Number 84 Versus the Dynamic Constant k and Proton Radius

Applying the natural number 84 in the equation(17)theelectron-proton distance Δ, dynamic constant k, and proton radius r_{proton} can be predicted more precisely. The mentioned values are collected and compared with the less precise predictions. They are presented in the Table1.

Table1. Some speculative relations between the dynamic constant k, translation time multiple n, electron-proton distance Δ, Bohr radius R_{Bohr}, electron radius $r_{electron}$ and proton radiusr_{proton} in the ground state of Hydrogen atom

$k(10^{-46}kg^2m^2s^{-2})$	n	$\Delta(10^{-10}m)$	$R_{Bohr}(10^{-10}m)$	$r_{electron}$ $(x\ 10^{-15}m)$	r_{proton} $(x\ 10^{-15}m)$
6,27**15**	83,99405	0,52917721067	0,52917721067 $*$	0	0
6,27235**15(15)**	83,999970(10)	0,529140**280**(61)	0,52917721067 $*$	2,8179403227 $*$	0.8**75**1(61) $*$
6,27235**59**997	84	0,52914**009**150	0,52917721067 $*$	2,8179403227 $*$	0,8**940**

The CODATA values[6]are denoted with the symbol $*$.The non-signed values are or arbitrary chosen or calculated respecting the communication model(14), (17).From the above table we can see that the discrete communication model respecting the available data[6], [7]very close fit the reality. For instance, meets the official CODATA size of the proton radius up to one percent accurately. That fact encourages one to predict the dynamic constant k on ten decimal places precisely:

$$k_{precise} = 6.2723559997\ x\ 10^{-46} kg^2 m^2 s^{-2}. \tag{18}$$

4. Conclusion Remarks

The physical model - with no exception for the present discrete communication one - should fit the physical reality and not vice versa. Since the former is a consequence of the latter. Respecting the given statement the present paper brings us questions rather than answers. For instance, the next question is interesting: “Does the size of proton radius really yield $0{,}8940\ x\ 10^{-15}m$? Indeed, there is always a possibility that one hits the target but misses all around it.

Acknowledgments

Gratitude to all friends for the support and inspiration.

Dedication

This fragment is dedicated to my living and working place Radenci and G. Radgona, respectively.

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