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Panta Rei as $\mathbf{F = dp/dt + d(k/p)/dt}$ and Possible Geometric Consequences

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In this paper the physical model $Panta\ rei as\ F = dp/dt + d(k/p)/dt$*is given. It brings the size of the point and whole space as well as speculates some inner energy available without outer work in the range of* $0 < E_{inner} \le c\sqrt{k(1 - lnk)}$*belonging to all physical bodies including the zero self-mass one. Its value for the non-zero self-mass* $m_0 \neq 0$ *is estimated by the approximate formula* $E_{inner} \approx k(1 - lnk)/2m_0$.

1. Theoretical Background

Respecting Heraclitus[1]everything flowso all physical bodies move and no one including zero self-mass one remains still. Unfortunately from the second Newton law - stating that the force F equals the change of momentum dp in time dt- one cannot carry out such a conclusion. The later relation is the origin of mechanical dynamics which, of course, has been verified in a long and over. It exactly defines the motion except in the circumstances of a very high speed. On the other hand we know very little about the appropriateness of the considered law at very low speed. Assuming the otherwise unwavering Newton law deviates on both extreme sides of the speed window we suggest the article dp/dtshould be adjusted, for instance, by the opposite article $d(k/p)/dt$ to illustrate the difficult availability of a very large as well as very small momentum. Then the composed outer force Fequals the change of momentum $dp$and the share of inverse momentum $d(k/p)$in the period of time dt:

$$F = \frac{dp}{dt} + \frac{d\frac{k}{p}}{dt} = \left(1 - \frac{k}{p^2}\right)\frac{dp}{dt},$$
$$k \in \mathbb{R}^+. \qquad (1)$$

2. The Composed Momentum

According to the fulfilled Newton law $(1)$the outer double impulse $F\Delta t$– the resultant of the outer opposite forces along t-axis – equals the change of the composed momentum ΔG:

$$F\Delta t = \Delta G$$
$$= \int \left(1 - \frac{k}{p^2}\right) dp = p + \frac{k}{p} + A$$
$$= G + A. \qquad (2)$$

2.1. The Ground Composed Momentum

Constant Ahides theground composed momentum G_{ground}reached without the outer double impulse$F\Delta t$in the ground circumstances:

$$F\Delta t = 0 = G_{ground} + A,$$

$$A = -G_{ground} \qquad (3)$$

Thus:

$$F\Delta t = p + \frac{k}{p} - G_{ground}\,. \qquad (4)$$

2.2. The Value of the Ground Composed Momentum

The value of the minimal composed momentum G_{ground} is given with the help of the derivation of the function(4):

$$(F\Delta t)' = 1 - \frac{k}{p^2}$$

$$0 = 1 - \frac{k}{p_{ground}^2} \; or \; k = p_{ground}^2. \tag{5}$$

Using the equation(4)at the zero double outer impulse $F\Delta t$follows:

$$0 = p_{ground} + \frac{p_{ground}^2}{p_{ground}} - G_{ground}$$

$$G_{ground} = 2p_{ground} = 2\sqrt{k}. \tag{6}$$

2.3. The Explicit Form of the Fulfilled Newton Law

The explicit form of the fulfilled Newton law is the next:

$$F\Delta t = \Delta G = p + \frac{k}{p} - 2\sqrt{k}. \tag{7}$$

2.4. The Outer and Inner Work

Carrying the constant term$2\sqrt{k}$ from the right to the left side of the equation of the fulfilled Newton law(7)we have:

$$F\Delta t + \; 2\sqrt{k} = G = \; p + \frac{k}{p}. \tag{8}$$

The composed momentum $G$is a consequence of the outer impulse $F\Delta t$as well as some inner impulse $2\sqrt{k}$ mirroring the dynamic constant k.

2.5. The Sign of the Outer Impulse

The composed momenta lower than $2\sqrt{k}$ are not defined so thenegativeouter impulse $F\Delta t$has no physical sense so far:

$$If \; G < 2\sqrt{k} \; then \; holds \; F\Delta t < 0. \tag{9}$$

This means that force F and time Δthave to be of the same sign.

2.6. The Physical Aspect of the Composed Momentum

The infinite composed momentum $G$is defined mathematically as the limit of the zero as well as infinite momentum p:

$$G(0) = 0 + \frac{k}{0} = \infty \; and \; G(\infty) = \infty + \frac{k}{\infty} = \infty. \tag{10}$$

Otherwise the composed momentum Gphysically exists only inside the finite non-zero real window:

$$0 < 2\sqrt{k} < G = \; p + \frac{k}{p} < G_{max} < \infty. \tag{11}$$

The upper composed momentum $G_{max}$is found with the help of the composed energy analysis(48). Higher composed momenta $G > G_{max}$ are not defined and the corresponding outer impulses $F\Delta t > G_{max} - 2\sqrt{k}$ are physically meaningless(53).

2.7. The Conservation of the Composed Momentum

The composed momentum$G$conserves at the pair of momenta $p_1 \; and \; p_2$whose product equals the dynamic constant k:

$$G = p_1 + \frac{k}{p_1} = p_2 + \frac{k}{p_2}$$

$$k = p_1 \, x \, p_2. \tag{12}$$

2.8. The Conservation of the Composed Momentum in the Ground Circumstances

In the ground circumstances where both momenta being identical the square of the unique momentum, let us denote itp_{ground}, equals the dynamic constant k:

$$k = p_{ground}^2. \tag{13}$$

2.9. The Conservation of the Composed Momentum at the Pair Of Speeds

The composed momentum$G$of the same mass equivalent $m$conservesat the pair of speedsv_1 and v_2:

$$k = mv_1 \, x \, mv_2. \tag{14}$$

Here the mass equivalent$m$is the sum of the self-mass $m_0$and the mass equivalent of the composed kinetic energy$W_k/c^2$of that self-mass m_0.

2.10. The Ground Mass-Speed Relation

In the ground circumstances where both speeds being identical the square of the unique speed, let us denote itv_{ground}, equals the ratio of the dynamic constant k and square of the ground mass equivalent m_{ground}:

$$\frac{k}{m_{ground}^2} = v_{ground}^2. \tag{15}$$

Both entities are in inverse proportion: greater the ground mass equivalentm_{ground}smaller the ground speed$v_{\ ground}$ and vice versa.The physical body with the zero self-mass$m_0 = 0$possesses the lowest ground mass equivalent m_{ground}^{min}(22)and has the highest ground speed v_{ground}^{max}(15).

3. THE COMPOSED ENERGY AND ITS MASS EQUIVALENT

The outer double work – the resultant of the outer opposite forces along x-axis – equals the change of the composed energy ΔE. With the help of relations$p = mv$and $E = mc^2$follows:

$$dE = Fdx = \left(1 - \frac{k}{p^2}\right)\frac{dp}{dt}dx = v\left(1 - \frac{k}{p^2}\right)dp = \frac{pc^2}{E}\left(1 - \frac{k}{p^2}\right)dp = \frac{c^2}{E}\left(p - \frac{k}{p}\right)dp,$$

$$EdE = c^2\left(p - \frac{k}{p}\right)dp,$$

$$E^2 = c^2p^2 - kc^2 lnp^2 + C. \tag{16}$$

Here $E$is the whole energy constituted of two parts.

The parameter Bexpresses the kinetics:

$$B = c^2p^2 - kc^2 lnp^2. \tag{17}$$

Constant C represents the energy equivalent of the self-massE_0:

$$C = E_0^2 = m_0^2c^4. \tag{18}$$

3.1. The Composed Energy Equation

The explicit form of the composed energy equation bringsnot the arithmetic but geometric sum of both constituents: the kinetic part B and constant C:

$E \neq B + C \;\; but \;\; E = \sqrt{B + C}.$

$$E^2 = c^2p^2 - kc^2 lnp^2 + m_0^2c^4. \tag{19}$$

3.2. The Minimal Composed Energy and its Mass Equivalent

The minimal composed energy is achieved in the ground circumstances(13) where holds $k = p^2$. The statement can be confirmed with the help of the derivation of the equation(19):

$$\left(\frac{E^2}{c^2}\right)' = 1 - \frac{k}{p^2}$$

$$0 = 1 - \frac{k}{p_{ground}^2} \quad or \quad k = p_{ground}^2. \tag{20}$$

The minimal composed energy $E_{min}$is expressed as:

$$E_{min} = E_{ground} = c\sqrt{k(1 - lnk) + m_0^2c^2}. \tag{21}$$

The mass equivalent of the minimal composed energy $m_{min}$is according to the relation $E = mc^2$expressed as:

$$m_{min} = m_{ground} = \frac{\sqrt{k(1 - lnk) + m_0^2c^2}}{c}. \tag{22}$$

3.3. The Change of the Composed Energy

The dynamics of interest is the change of the composed energyΔEdue to the input of the outer work $F\Delta x$ to the ground circumstances:

$$F\Delta x = \Delta E = E - E_{ground} = \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4} - \sqrt{c^2k - kc^2lnk + m_0^2c^4}. \tag{23}$$

3.4. The Outer and Inner Work

Carrying the constantterm$E_{ground} = \sqrt{c^2k - kc^2lnk + m_0^2c^4}$(23)from the right to the left side of the equationand subtracting the constant term $E_0 = m_0c^2$ on the both sides of that equation the composed kinetic energy W_k is given:

$$\begin{aligned} W_k = E - E_0 &= F\Delta x + \sqrt{c^2k - kc^2lnk + m_0^2c^4} - m_0c^2 \\ &= \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4} - m_0c^2. \end{aligned} \tag{24}$$

The composed kinetic energy $W_k$is a consequence of the outer work $F\Delta x$as well as some inner work $\sqrt{kc^2(1 - lnk) + m_0^2c^4} - m_0c^2$mirroring the dynamic constant k and self-mass m_0. The composedkinetic energyW_k lower than $\sqrt{kc^2(1 - lnk) + m_0^2c^4} - m_0c^2$ is not defined so the negative outer work $F\Delta x$ has no physical sense so far:

$$If \; W_k < \sqrt{kc^2(1 - lnk) + m_0^2c^4} \; then \, holds \;\; F\Delta x < 0. \tag{25}$$

This means that force F and path Δx have to be of the same sign.

3.5. The Composed Energy Versus Classic Energy

Comparing the composed energy $E = \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4}$and classic energy $E_{classic} = \sqrt{c^2p^2 + m_0^2c^4}$three typical situations exist:

In the case of relatively low momentum $0 < p < 1$the composed energy $E$is greater than classic energy$E_{classic}$:

$$0 < p < 1 \rightarrow -kc^2 lnp^2 > 0 \rightarrow \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4} > \sqrt{c^2p^2 + m_0^2c^4}. \quad (26)$$

In the case of the unit momentum $p = 1$ the composed energy Eequals classic energy $E_{classic}$:

$$p = 1 \rightarrow -kc^2 lnp^2 = 0 \rightarrow \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4} = \sqrt{c^2p^2 + m_0^2c^4}. \quad (27)$$

In the case of relatively high momentum $\infty > p > 1$the composed energy E is lower than classic energy$E_{classic}$:

$$\infty > p > 1 \rightarrow -kc^2 lnp^2 < 0 \rightarrow \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4} < \sqrt{c^2p^2 + m_0^2c^4}. \quad (28)$$

3.6. Mass Equivalent Equation

Taking into account the relation $p = mv$ and $E = mc^2$the composed energy equation(19) can be transformed into the mass equivalent equation:

$$E^2 = m^2c^4 = m^2c^2v^2 - kc^2ln(mv)^2 + m_0^2c^4,$$

$$m^2v^2 = e^{\frac{m^2(v^2-c^2)+m_0^2c^2}{k}}. \quad (29)$$

4. The Composed Kinetic Energy

The composed kinetic energy $W_k$is the difference between the composed energy E and energy equivalent of self-masE_0(24):

$$W_k = E - E_0 = \sqrt{c^2p^2 - kc^2lnp^2 + m_0^2c^4} - m_0c^2. \quad (30)$$

4.1. The Innerenergy and its Mass Equivalent

The inner energy E_{inner} is the minimal composed kinetic energy W_k^{min}achieved in ground circumstances$(5), (13), (20)$ where holds $k = p^2$:

$$E_{inner} = W_k^{min} = E_{ground} - E_0 = \sqrt{c^2k - kc^2lnk + m_0^2c^4} - m_0c^2$$
$$= c\sqrt{k(1 - lnk) + m_0^2c^2} - m_0c^2. \quad (31)$$

The mass equivalent of the inner energy is given according to the relation $E = mc^2$by:

$$m_{inner} = m_k^{min} = \frac{\sqrt{k(1 - lnk) + m_0^2c^2}}{c} - m_0. \quad (32)$$

4.2. The Estimation of the Inner Energy

Rearranging the equation (31) the window of the inner energy$E_{inner} = W_k^{min}$ can be estimated:

$$(E_{inner})^2 = c^2k(1 - lnk) + 2m_0^2c^4 - 2\sqrt{k(1 - lnk) + m_0^2c^2}m_0c^3. \quad (33)$$

4.3. The Inner Energy of the Zero Self-Mass

According to the equation (33) the upper limit of the inner energy belongs to the zero self- mass. For $m_0 = 0$ holds:

$$2m_0^2c^4 - 2\sqrt{k(1 - lnk) + m_0^2c^2}m_0c^3 = 0.$$

So according to the equation(33)holds:

$$E_{inner}(m_0 = 0) = c\sqrt{k(1 - lnk)}. \quad (34)$$

4.4. The Inner Energy of the Non-Zero Self-Mass

According to the equation (33) the inner energy of the non-zero self-mass is lower than that of the zero self-mass. For $m_0 \neq 0$ holds:

$$2m_0^2c^4 - 2\sqrt{k(1-lnk) + m_0^2c^2}m_0c^3 < 0.$$

So according to the equation(33)holds:

$$E_{inner}(m_0 \neq 0\ ) < c\sqrt{k(1-lnk)}. \tag{35}$$

4.5. The Approximate Calculation of the Inner Energy

The approximate formula can be developed for the calculation ofthe inner energy $E_{inner}$of the non-zero self-massm_0.For that purpose let us write the equation (31) in the next form:

$$E_{inner} = m_0c^2\sqrt{1 + \frac{kc^2(1-lnk)}{m_0^2c^4}} - m_0c^2. \tag{36}$$

According to the approximate relation $\sqrt{1+x} \approx 1 + \frac{x}{2}$ we have:

$$E_{inner} \approx m_0c^2\left(1 + \frac{kc^2(1-lnk)}{2m_0^2c^4} - 1\right).$$

$$E_{inner} \approx \frac{k(1-lnk)}{2m_0}. \tag{37}$$

The formula is not valid for the zero self-mass but its accuracyincreases with the increase of the self-mass.

4.6. The Inner Energy of the Infinite Self-Mass

It is easy seen from the formula (37)that the lower limit of the inner energy is zero and belongs to the infinite self-mass:

$$E_{inner}(m_0 = \infty\ ) = 0. \tag{38}$$

4.7. The Window of the Inner Energy

The window of the inner energyE_{inner}(37)is the next:

$$0 < E_{inner} \leq c\sqrt{k(1-lnk)}. \tag{39}$$

The upper limit equals the ground kinetic energy of the zero self-mass $c\sqrt{k(1-lnk)}$ and with increasing self-mass tends to become zero at the infinite self-mass(37).

5. The Ground Circumstances

In the ground circumstances where holds $k = p^2 = m^2v^2$(5), (13)(20)the dynamic constant is implicitly given with the help of the equation (29)as:

$$k = e^{1-\frac{c^2}{v_{ground}^2}+\frac{m_0^2c^2}{k}}. \tag{40}$$

Using the ratio of speeds $a = \frac{v}{c}$ we have:

$$k = e^{1-\frac{1}{a_{ground}^2}+\frac{m_0^2c^2}{k}} \quad or \quad lnk = 1 - \frac{1}{a_{ground}^2} + \frac{m_0^2c^2}{k}. \tag{41}$$

5.1. The Ground Speed of the Self-Mass

The self-mass$m_0$has the same role as the rest mass in the classical model. According to the equation (41)the ground speed $v_{ground}$of an arbitrary self-mass$m_0$is given as:

$$a_{ground} = \frac{v_{ground}}{c} = \sqrt{\frac{1}{1 - lnk + \frac{m_0^2c^2}{k}}}. \tag{42}$$

5.2. The Maximal Ground Speed

According to the equation$(41)$the physical body with the zero self-mass$m_0 = 0$ possesses themaximalground speedv_{ground}^{max}:

$$a_{ground}^{max} = \frac{v_{ground}^{max}}{c} = \sqrt{\frac{1}{1 - lnk}}. \tag{43}$$

5.3. The Minimal Ground Speed

According to the equation(41) the ground speed decreases with the increase of the self-mass becoming zero at the infinite self-mass:

$$a_{ground}^{min} = \lim_{m_0 \to \infty} \sqrt{\frac{1}{1 - lnk + \frac{m_0^2 c^2}{k}}} = 0. \tag{44}$$

Only the infinite self-mass$m_0 = \infty$ could stay at rest in the ground circumstances.

6. THE MAXIMAL MOMENTUM CIRCUMSTANCES

The maximal momentum circumstances are achieved at the speed of light:

$$v_{max} = c. \tag{45}$$

6.1. The Maximal Momentum

Solving the mass equivalent equation (29) for $v = c$ the maximal momentump_{max} is given:

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

$$p_{max} = m_{max} c = e^{\frac{m_0^2 c^2}{2k}}. \tag{46}$$

The maximal momentum p_{max} is finite for any finite self-mass m_0 until the dynamic constant k remains non-zero.

6.2. The Minimal Compton Wavelength

The minimal Compton wavelength λ_{min} corresponds to the maximal momentump_{max}:

$$\lambda_{min} = \frac{h}{p_{max}}.$$

$$\lambda_{min} = \frac{h}{e^{\frac{m_0^2 c^2}{2k}}}. \tag{47}$$

6.3. The Maximal Composed Momentum

The maximal composed momentumG_{max} is given with the help of the equations$(12)(46)$:

$$G_{max} = p_{max} + \frac{k}{p_{max}} = e^{\frac{m_0^2 c^2}{2k}} + ke^{-\frac{m_0^2 c^2}{2k}}. \tag{48}$$

6.4. The Maximal Whole Energy and its Mass Equivalent

The maximal whole energyE_{max} and its mass equivalentm_{max} are given with the help of the equation (46) and relation $E = mc^2$as:

$$E_{max} = m_{max} c^2 = c\, e^{\frac{m_0^2 c^2}{2k}}. \tag{49}$$

$$m_{max} = \frac{E_{max}}{c^2} = \frac{e^{\frac{m_0^2 c^2}{2k}}}{c}. \tag{50}$$

6.5. The Maximal Composed Kinetic Energy

The maximal composed kinetic energyW_k^{max} and its mass equivalent$m_k^{max}$are given with the help of the equations (30), (49) and relation $E = mc^2$as:

$$W_k^{max} = ce^{\frac{m_0^2c^2}{2k}} - m_0c^2. \tag{51}$$

$$m_k^{max} = \frac{e^{\frac{m_0^2c^2}{2k}}}{c} - m_0. \tag{52}$$

6.6. The Maximal Outer Double Impulse

The maximal physically relevant outer double impulse $(F\Delta t)_{max}$ equals the maximal change of the composed momentum ΔG_{max} according to the fulfilled Newton law (7):

$$(F\Delta t)_{max} = \Delta G_{max} = e^{\frac{m_0^2c^2}{2k}} + ke^{-\frac{m_0^2c^2}{2k}} - 2\sqrt{k}. \tag{53}$$

6.7. The Maximal Outer Double Work

The maximal physically relevant outer double work $(F\Delta x)_{max}$ equals the maximal change of the composed energy ΔE_{max} according to the equations (23), (49):

$$(F\Delta x)_{max} = ce^{\frac{m_0^2c^2}{2k}} - c\sqrt{k(1 - lnk) + m_0^2c^2}. \tag{54}$$

7. THE MINIMAL MOMENTUM CIRCUMSTANCES

The physical body with the maximal composed energy E_{max} due to the conservation of its maximal composed momentum $G_{max}(12)$ possesses the pair of momenta: the minimal momentum p_{min} and maximal momentum p_{max}. They are related as:

$$k = p_{min}\ x\ p_{max}. \tag{55}$$

7.1. The Minimal Momentum

The minimal momentum is given with the help of the equations (46), (55) as:

$$p_{min} = \frac{k}{p_{max}} = \frac{k}{e^{\frac{m_0^2c^2}{2k}}}. \tag{56}$$

7.2. The Minimal Speed

At the same massequivalent of the maximal composed energy m_{max} due to conservation of the composed momentum holds (14):

$$\frac{p_{min}}{v_{min}} = m_{max} = \frac{p_{max}}{v_{max}}. \tag{57}$$

The minimal speed of that mass equivalent m_{max} is given with the help of the equations (14), (56) by:

$$v_{min} = \frac{k}{m_{max}^2 v_{max}} = \frac{kc}{e^{\frac{m_0^2c^2}{k}}}. \tag{58}$$

7.3. The Maximal Compton Wavelength

The maximal Compton wavelength λ_{max} corresponds to the minimal momentum p_{min}:

$$\lambda_{max} = \frac{h}{p_{min}}.$$

$$\lambda_{max} = \frac{h}{k}e^{\frac{m_0^2c^2}{2k}}. \tag{59}$$

8. THE ZERO SELF-MASS

Some characteristics of the zero self-mass m_0 are found with the help of the formulas from the previous chapters. They are collected in the Table 1 and Table 2.

8.1. The Minimal Composed Energy of the Zero Self-Mass

The minimal composed energy is achieved in ground circumstances. Some characteristics of the zero self-mass $m_0$with minimal composed energy$E_{ground}$are collected in the Table 1.

Table1. *The values of the physical entities of the zero self-mass $m_0$with the minimal composed energy achieved in the ground circumstances.*

Physical entity	Value
m_0	0
p_{ground}	$\sqrt{k}$
G_{ground}	$2\sqrt{k}$
$E_{ground} = W_k^{min}$	$c\sqrt{k}\sqrt{1 - lnk}$
$m_{ground} = m_k^{min}$	$c^{-1}\sqrt{k(1 - lnk)}$
$(F\Delta t)_{ground}$	0
$(F\Delta x)_{ground}$	0
v_{ground}	$c/\sqrt{1 - lnk}$
λ_{ground}	$h/\sqrt{k}$

8.2. The Maximal Composed Energy of the Zero Self-Mass

The maximal composed energy is achieved at the extreme momenta and speeds. Some characteristics of the zero self-mass $m_0$with maximal composed energy achieved at the speed of light as well as at the corresponding minimal speed are collected in the Table 2.

Table 1. *The values of the physical entities of the zero self-mass$m_0$with the maximal whole composed energy achieved at the extreme momenta and speeds.*

Physical entity	Nominal valuesexpressed in the units of the corresponding entity
m_0	0
p_{max}	1
p_{min}	k
G_{max}	1+k
$E_{max} = W_k^{max}$	c
$m_{max} = m_k^{max}$	c^{-1}
$(F\Delta t)_{max}$	$1 + k - 2\sqrt{k}$
$(F\Delta x)_{max}$	$c\left(1 - \sqrt{k(1 - lnk)}\right)$
v_{max}	c
v_{min}	kc
λ_{min}	h
λ_{max}	h/k
$\lambda_{min}/\lambda_{max}$	k

The expression in the units of the corresponding entity means, for instance, that the value of the minimal wavelength λ_{min}in the Table 2yields$6.62606957\ x\ 10^{-34} meters$although Planck constant h is given in the $kgm^2s^{-1} - units$.

9. THE INFINITE-MASS PARTICLE

According to the equation(44)at the non-zero dynamic constant only the hypothetical physical body with the infinite self-mass staysat rest in the ground circumstances:

$$v_{ground}(m_0 = \infty) = 0. \tag{60}$$

According to the equation (58) at the non-zero dynamic constant only the hypothetical physical body with the infinite self-mass moves with the speed of light or stays at rest in the circumstances of its maximal composed energy:

$$v_{max}(m_0 = \infty) = c. \tag{61}$$

$$v_{min}(m_0 = \infty) = 0. \tag{62}$$

According to the equation(54) for the transition of the infinite self-mass from the ground circumstances to circumstances of maximal composed energy the infinite outer work $(F\Delta x)_{max}$is needed:

$$(F\Delta x)_{max} = \lim_{m_0\to\infty}(ce^{\frac{m_0^2c^2}{k}} - c\sqrt{k(1-lnk)+m_0^2c^2}\,) = \infty. \tag{63}$$

10. Geometric Consequences

Characteristics of the zero self-mass $m_0 = 0$could have the geometric consequences.

10.1.The Size of the Point

Compton wavelength $\lambda_{min}(47)$ belonging to the maximal momentum of the zero self-mass could determine the size of the point expressed in the MKS units as:

$$s_{point} = \lambda_{min} = h/kgms^{-1}. \tag{64}$$

The size of the points_{point} is independent of the value of the dynamic constant k regardless how small the later is.

10.2.The Size of the Whole Space

Compton wavelength$\lambda_{max}(59)$belonging to the minimal momentum of the zero self-mass could determine the size of the whole space expressed in the MKS units as:

$$s_{space} = \lambda_{max} = \frac{h}{k}/kgms^{-1}. \tag{65}$$

The size of the whole space is a mirror of the dynamic constant k.How close to the zero value is the dynamic constant so close to the infinite value is the size of the space:

$$s_{space}(k=0) = \lambda_{max}(k=0) = \frac{h/kgms^{-1}}{0} = \infty. \tag{66}$$

10.3.The Ratio of the Size of the Point and Whole Space

The dynamic constant $k$could be defined as the ratio of the size of the point and whole space expressed in the MKS units as:

$$k = \frac{\lambda_{min}}{\lambda_{max}} x\; kg^2\frac{m^2}{s^2} = \frac{s_{point}}{s_{space}} x\; kg^2\frac{m^2}{s^2}. \tag{67}$$

10.4.The Average Speed of the Space

The average speed of the space in the circumstances of its maximal composed energy could be determined by a pair of speeds$v_{min}, v_{max}(14)$,belonging to the zero self-mass$(Table\ 2)$.

Then the average maximal speed of the space should be the half of the speed of light since the dynamic constant k is expected to be very small:

$$v_{average}^{space} = \frac{v_{min}+v_{max}}{2} = \frac{c+kc/kg^2m^2s^{-2}}{2} \approx \frac{c}{2}. \tag{68}$$

The given average speed of space is in accordance with the previously predicted speed of the rotation of the Universe deduced from the flyby anomaly.[2]

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Dedication

This fragment is dedicated to two fairies: Coincidence who meets our nice wishes, and Causation who meets our real needs.

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AUTHOR'S BIOGRAPHY

The author is a scientist in accordance with the Scientific Human Rights (*RabounskiD. Declaration of Academic Freedom, Progress in Physics, 2006, c.1, 57-60*). That is: »A scientist is any person who does science regardless his professional background«. When the author was seven years old with his friend tried to make the Perpetuum mobile, but unfortunately, it didn't work. In the middle school he had better luck making an apparatus to measure the mass of inertia for which was awarded with the bronze medal in the national competition in physics. Nowadays he works as a community pharmacist in his own pharmacy in Slovenia and publishes some ideas from the youth in scientific journals, for instance, Progress in Physics, GJSFR, and just now IJARCS.