The Action

"Action is curvature of the World"
Pavel D. Ouspensky, A New Model of the Universe, 1911

"At any conditions the action is just the number"
Herman Weyl, Gravitation and electricity, 1918

Introduction

The epigraph disclosure the technology for time rate control in general, and I hope that the paper allow you to use the mathematical tool I found in 1989 and use it with well-known Plank's conclusion about quantum of action. New interpretation for the notion of the Time let us to develop new branch of the physics: *the physics of space-time engineering.* Several examples for some natural law that is discovered by the author in 1990 are demonstrated here. It was found that natural mass-objects are described by *whole number value of the curvature.* This property allow to consider the space-time as *secondary induced resonance effect* of mass process. The concept can be used as applied tool for energy-mass and mass-energy transformations, gravitational propulsion systems and experimental research work on the chronal technologies.

Time as Radius of 4-dimensional Resonator

The motion of the point along closed trajectory is the process that creates the dynamical one-dimensional space-time, i.e. the line. It is certain process and there is some period of the process. If the line is closed there is the resonance phenomenon and parameter for it is the radius **R**. According known mathematical notion the curvature of this one-dimensional space is defined as reversed radius **1/R**:

$$r_1 = 1/R \quad [\ 1/m\ ] \qquad\qquad\qquad \text{F. 1}$$

where **R** is radius and r_1 is linear curvature.

Process of motion for the line will create the dynamical surface, i.e. two-dimensional space-time (sphere), and the resonance parameter for it is the two-dimensional curvature (it also disclosed in any mathematical textbook):

$$r_2 = 2/R \quad [\ 1/m\ ] \qquad\qquad\qquad \text{F.2}$$

Let's introduce the spatial curvature by similar arguments:

$$r_3 = 3/R \quad [\; 1/m \;] \qquad\qquad \text{F.3}$$

It is parameter for resonance process of dynamical structure of three-dimensional objects.

It is possible to use radius as description for periodical process in one-dimensional closed space of circumference only. So, some value of *radius that is measured in (N+1) space is period of time for processes in dynamical N-space.* The "time axis" as radius for circumference is direction that have place out of line. It is new direction, next dimension.

The dynamical structure of 4-dimensional objects is created as change of 3-dimensional structure in next direction. The parameter for it is 4-curvature:

$$r_4 = 4/R \quad [1/m \;] \qquad\qquad \text{F.4}$$

This understanding of the time nature allow to suppose some methods to create local rate of time. In any case it is necessary to change density of energy in space. For one-dimensional space (line) it is linear density of energy, for example: well-known density of electric current. For surface it is energy of electromagnetic wave.

Also it is possible to change 3-dimensional density of energy (electromagnetic energy or density of matter) in volume of space to create local time effect.

Electrodynamics Nature of Mass-Effect

In 1923 L. de Broiglh supposed that mass - particles must have the wave properties. He used formulation **E=hf** and **E=pc**, where **p** is impulse, **h** is Planck constant, **f** is frequency, **m** is mass, **c** is light velocity. Then he joined both parts in equation **hf=pc**. For wave-length **L=c/f** this formula is known as **L=h/p** [1].

There is other logical branch for this idea and this way lead to more wide concept of mass:

Instead of **E=pc**, by de Broighl, let us take the formula for energy of mass

$$E = mc^2 \qquad\qquad \text{F.5}$$

Energy of electromagnetic field energy (wave energy) is

$$E = hf \qquad\qquad \text{F.6}$$

In strength of the wave-particle duality wrote the equation:

$$mc^2 = hf \qquad\qquad \text{F.7}$$

and mass can be represented as electromagnetic oscillations

$$m = \frac{h}{c^2} f \qquad\qquad \text{F.8}$$

where (h/c^2) is new constant between mass m and frequency of oscillation f. Let's named it as **chronal constant** because it demonstrate mass and time correlation:

$$m = \frac{h}{c^2} \cdot \frac{1}{T} \qquad\qquad \textbf{F.9}$$

where **T = 1/f** is period of oscillations.

In other words, ***product of mass and period is constant value***

$$mT = \frac{h}{c^2} = \textbf{const} \qquad\qquad \textbf{F.10}$$

The chronal constant is ratio of elementary quantum of action (h) to the square of the velocity of light (c^2) and it is equal to **0.73725 10 -50 [Js2/m2].**

In other words, ***there is no time separately from mass,*** by F.10. Main masses of our time-system are masses of the Sun system.

Taking into consideration the Heizenberg's formula

$$h = \Delta p\, \Delta x \qquad\qquad \textbf{F.11}$$

mass-time equation can be represented in new view

$$m\,T = \frac{\Delta p\, \Delta x}{c^2} \qquad\qquad \textbf{F.12}$$

Let's check the measures correctness in this equation

$$[kg][s] = \frac{[kg][m][m][s2]}{[s][m2]} = [kg][s] \qquad\qquad \textbf{F.13}$$

So, F.9 is true equation that demonstrate the correlation between some mass and period of electromagnetic wave oscillations and next conclusion is obtained: Mass of particle is result of electromagnetic energy oscillations..

By such sort approach the frequency can be calculated by F. 8 for any known mass value, for example, proton has frequency value about **8,1 10^{26} [Hz].**

Over-Light Velocity

Interesting conclusions for velocity of motion can be obtained from F.12

$$mT = \frac{\Delta p\, \Delta x}{c^2} = \frac{m\, \Delta \upsilon\, \Delta x}{c^2} \qquad\qquad \textbf{F.14}$$

We can remove **"m"** from F.14 and obtain the next formulation

$$T = \frac{\Delta\upsilon\Delta x}{c^2} \qquad\qquad \textbf{F.15}$$

For velocity **$\upsilon = c$** the wave-length

$$L = cT = \frac{c\,c\,\Delta x}{c^2} = \Delta x \qquad\qquad \textbf{F.16}$$

It is *photon state*: the wave-length value of the object determine the size of the local area (space) of the object.

For velocity **$0 < \upsilon < c$** wave-length of object is lesser than possibility of determination of the object position **Δx**

$$L = (\upsilon/c)\Delta x \qquad\qquad \textbf{F.17}$$

It means that object has some space of positions, object can be moving between different positions since all area of its positions is determined. *It is the nature of space itself* for some material object that is moving with **$\upsilon < c$.**

For velocity **$\upsilon > c$**, formula F.17 can be represented as

$$T = \frac{\Delta\upsilon\Delta x}{c^2} = \frac{(c + \upsilon)\Delta x}{c^2} \qquad\qquad \textbf{F.18}$$

and wave-length **$L = Tc$**

$$Tc = \frac{(c + \upsilon)\,\Delta x}{c} \qquad\qquad \textbf{F.19}$$

In result the formula for wave-length demonstrate that in this case the *size of the object (wave-length) is more that possibility of determination of the object position Δx:*

$$L = (1 + \Delta/c)\,\Delta x \qquad\qquad \textbf{F.20}$$

Demonstration of such sort objects in real space has some analogy with potential fields since change of energy density of the object take place in all space at the same moment.

Planet Curvature Value

Before the continuation let us assume that the theory of similarity for microcosm and macrocosm is true, hence the planet can be considered as elementary particle in certain sense.
Substitute in matter wave-length formula

$$L = h/(m\upsilon) \quad [\,m\,] \qquad\qquad\qquad \text{F.21}$$

where **h** is Plank's constant, **m** is mass and υ is velocity, parameters of our planet to calculate the value:

$$L = 3{,}725 \ 10^{-63} \quad [\,m\,] \qquad\qquad\qquad \text{F.22}$$

In strength of supposition: velocity of light for 4-space is only factor 4, the formula is:

$$E_3 = m_3 \, c^2 = 9 \, m_3 \qquad\qquad\qquad \text{F.23}$$

and

$$E_4 = m_4 \, c^2 = 16 \, m_4 \qquad\qquad\qquad \text{F.24}$$

where m_3 is mass of 3-space and m_4 is mass for 4-space description.

Note important supposition: The total energy of system is the same independently of different dimensionality description. It means that the same amount of energy (but in different forms of energy) must be considered in 3-space and 4-space description for one certain system. In other words, total net energy of the Universe is the same independently of dimensionality of measurement system that is used by observer.

So, we have to write:

$$E_1 = E_2 = E_3 = E_4 = \text{...} \qquad\qquad\qquad \text{F.25}$$

and in our case $\qquad 9 \, m_3 = 16 \, m_4 \qquad\qquad\qquad\qquad$ F.26

According to F.21 mass is

$$m = h/(L\upsilon) \qquad\qquad\qquad \text{F.27}$$

Now we obtain the correlation

$$(16 \, h \,)/(\, L_4 \; \upsilon) = (9h)/(L3 \, \upsilon) \qquad\qquad\qquad \text{F.28}$$

where L_3 is wave-length in 3-space, and L_4 is wave-length is 4-space. As the system is the same , as velocity is the same. So, there is simple ratio:

$$L_4 = (16/9) \, L_3 \qquad\qquad\qquad \text{F.29}$$

Substitute value for **L3** from F.22 in F.29 and obtain the value

$$L_4 = 66{,}22 \ 10^{-64} \quad [\,m\,] \qquad\qquad\qquad \text{F.30}$$

that conform to curvature

$$r_4 = 1/L_4 = 151{,}00 \ 10^{60} \quad [\,1/m\,] \qquad\qquad\qquad \text{F.31}$$

Note: it is whole number value.

On the other hand, the period of planet rotation around Sun is equal to 31557600 seconds, that conforms to the oscillation frequency value

$$f = 1/T = 3,16886 \ 10^{-8} \quad [\ 1/s \ ] \qquad\qquad \text{F.32}$$

It is own resonance frequency for our planet.

The wave-length for electromagnetic oscillation in this case is

$$L_{em} = c/f = 9,46 \ 10^{16} \ [\ m \ ] \qquad\qquad \text{F.33}$$

and curvature for this length (radius of resonator) is equal to whole number value also:

$$r_{em} = 1057,00 \ 10^{-20} \ [\ 1/m \ ] \qquad\qquad \text{F.34}$$

The correlation for two results obtained in F.31 and F.34

$$(r_{em}/r^4)=7 \ 10^{-80} \qquad\qquad \text{F.35}$$

The mathematical connection for results of two different descriptions of the same natural object (planet) is the confirmation for Whole Number Value Law. This Law is valid for any natural system element. Let us demonstrate this Law in other examples.

Bohr's Atom Space-Time

The curvature for Bohr's radius **R = 0,52917 Angstrom** is

$$r = 1/R = 3,0075 \ 10^{9} \quad [\ m \ ] \qquad\qquad \text{F.36}$$

According to F.3 the linear curvature for Bohr's atom is equal to unit:

$$r_1 = r_3 /3 = 1,0025 \ 10^{9} \quad [\ m \ ] \qquad\qquad \text{F.37}$$

 That is right since it is simple atom, unit matter engine. Some deviation k = 1,0025... is demonstration of non-ideal resonance state in real system.

Space-Time of Proton

To calculate the wave-length of proton let's use formula F.9

$$m = \frac{h}{c^2} f = \frac{h}{c^2} \frac{c}{L} = \frac{h}{c L} \qquad\qquad \text{F.38}$$

or $\quad L = \dfrac{h}{mc} \quad$ that is version of de Broighl wave-length for velocity $\upsilon = c.$

So, for proton **m = 1,6726231...10^{-27} kg**, the wave-length **L=0,75676739...** (mathematical degree is omitted) and curvature is equal to

$$r = 1/L = 132141,000... \qquad\qquad \textbf{F.39}$$

It is whole number value up to third sign that demonstrate particle proton as some spatial resonance process.

DNA- molecule Space-Time

Another example is DNA helical molecule. The unfolded spire-length period of it is about **71,4417 Angstrom,** that conforms to a curvature value

$$r_{DNA} = 14,0000 \ 10^{7} \ [\ 1/m \ ] \qquad\qquad \textbf{F.40}$$

This is very good resonator since it is whole number value up to fourth sign. This accuracy is the base for supposition about resonance mechanics for energy transformation and information telecommunication on the molecular level in biosystems. The nature of Time Effect is motion only and resonance structure of matter elements superposition for DNA molecule allow to use this motion as power source and information receiver for biosystems. Note, that information is not spreading in this case with some velocity but all 3-space is changing at the moment when some curvature of 3-space have place. So, orientation for such sort receiver is not important. Information signal is change of energy density in space.

Now let's make calculation for displacement of spiral DNA branches. Two branches have period 34 Angstrom and displacement 23,8 Angstrom. In other words, the 'back wave' is displaced relatively to the 'direct wave' on 0,7 of the wave period. It is equal to 50,0 Angstrom and correspond to curvature value

$$r_2 = 2 \ 10^{8} \quad [\ 1/m \ ] \qquad\qquad \textbf{F.41}$$

If to take into consideration the two-dimensional structure of spire the curvature value is unit

$$r_1 = 1 \ 10^{8} \ [\ 1/m \ ] \qquad\qquad \textbf{F.42}$$

So, branches of DNA molecule have unit value shift (by the curvature measurements method) from the zero-state. In this zero state theoretically both branches are join together. Code structures of each branch are contra-directional to each other. There is very interesting analogy here with elementary particle world that can lead to the secret of the electron-positron pair creation process.

Conclusion

It would be premature to say about the validity of this concept since the assumptions underlying it are opened to question. It is necessary to make the experimental verification of this approach to the resonance nature of matter and vacuum. Physical sense of the action is the motion in some direction that is placed outside of the object.

The natural actions are whole numbers, it is discrete counter of the space-time. The Law of Whole Number Value for curvature of natural element of matter, demonstrated in this paper, is

mathematical tool for different technologies. In case of its practicable the control on the rate of time and curvature of space, on the stability of matter (mass-energy transformations) and vacuum (energy -mass transformations) is not fantasy but technology.

Also this Law show that any natural system, for example, the planet, atom or DNA molecule can be used for calculation of the "meter/sec" system units. There is possibility to establish new standard meter definition.

I believe now you have clear view to the **action as curvature and the action as the number**.

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