Nature of Dark Matter and Dark Energy

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Abstract

The most complicated problems to solve in science are multidisciplinary problems, which include the problem of explaining of physical reality and physical essenceofimaginary numbers discovered more than five hundred years ago. However, the authors of the special relativity theory created more than a hundred years ago, were trying to unprovenly claim that they have solved this problem and that the imaginary numbers are not physically real with a principle of non-exceeding the speed of light. And physical experiments MINOS at the Tevatron collider and OPERA at the Large Hadron Collider were even seem to confirm such an assertion, since they could not refute the principle of non-exceeding the speed of light. However, since mathematics is the universal language of all exact sciences, the principle of the physical reality of imaginary numbers was still proven, but proven otherwise—with the theoretical and experimental studies of the vibrational processes in linear electric circuits that can be repeated and verified in any radioelectronic and electrical laboratory. And that is why they are definitely reliable and conclusive. Using the very general scientific principle of the physical reality of imaginary numbers allowed to correct the relativistic formula of special relativity theory and on this basis to create a theory of hidden Multiverse containing more than two mutually invisible parallel universes. The nature of their invisibility is explained. It is proven that the existence of these unseen parallel universes explains the phenomenon of dark matter and dark energy. Using data obtained by the spacecrafts WMAP and Planck led to the discovery of quaternion structure of the hidden Multiverse and show that our hidden Multiverse is not the only one in nature.

Keywords

Imaginary Numbers, Complex Numbers, Hypercomplex Numbers,
Dark Matter, Dark Energy, Antimatter, Special Relativity Theory,
Multiverse, Hyperverse

1. Introduction

The problem investigated in the article is interdisciplinary and because of this

fact it is the most difficult to solve. Therefore, it has not been solved more than five hundred years. However, mathematics, physics, electronics, and other exact sciences related to this problem, according to the laws of nature form a single complex and develop together, complementing each other, including the searching not only for theoretical but also for experimental solution of the problem. On this occasion, Oliver Heaviside wrote: "*Mathematics is an experimental science*". Modern science confirms this assertion with its development.

And the article shows how it was solved using such a multi-disciplinary approach to the problem solution.

Solution of this problem, as it turns out, has to do extremely unusually and affecting the fundamental philosophical questions of astrophysical objects—the dark matter discovered in 1932-33 by Jan Hendrik Oort and Fritz Zwikky and dark energy discovered in 1998-99 by the Nobel Prize winners Saul Perlmutter, Brian P. Schmidt and Adam G. Riess [1] [2]. They were called dark because they turned out to be totally incomprehensible and absolutely invisible. Therefore they were able to detect them only indirectly by the effect of gravitational lensing. Moreover, they do not contain any of the chemical elements known to us and any known subatomic particles. It would seem, therefore, that the existence of this phenomenon destroys the modern understanding of the term "substance" and rejects physics in its development to the thousands of years ago.

Still, over the past decade it was not possible to even come close to understanding of the essence of the phenomenon of dark matter and dark energy. Emphasizing the great importance of this phenomenon explaining, Stephen William Hawking wrote: "*The missing link in cosmology is the nature of dark matter and dark energy*".

In fact, as the article shows, the main reason for the unexplained phenomenon of dark matter and dark energy is one and the same mistake repeated by all the investigators during the past decades—incorrect statement of the search task to explain them solely within the monoverse hypothesis. On this occasion, Albert Einstein wrote: "*Insanity: doing the same thing over and over again and expecting different results*".

Another reason for the unexplained phenomenon of dark matter and dark energy is the denial by the special relativity theory (SRT) of physical reality of imaginary numbers and the lack of understanding their physical nature.

2. Fundamental Errors of SRT

Let us remember that explanation of dark matter and dark energy phenomenon is currently being looked for certainly within the Monoverse hypothesis corresponding to the current version of the SRT. But, as shown below, the existing SRT version contains a number of fundamental errors, which had not allowed to explain the nature of dark matter and dark energy.

Established in the early 20th century by Joseph Larmor, the winner of the Nobel Prize, Hendrik Antoon Lorentz, Jules Henri Poincaré, the winner of the Nobel Prize Albert Einstein and other prominent scientists the SRT [3] [4] [5] is

based on two postulates, the second of which is now referred to as the principle of the constancy of the speed of light, and which is often replaced by the principle of non-exceeding the speed of light supposedly identical to it [6].

The principle of non-exceeding the speed of light was in demand in the SRT, because according to its relativistic formulas the mass, time, and other physical quantities on hyperlight speeds are measured with imaginary numbers. And the creators of the SRT did not know how to explaintheir physical sense (as, however, physicists doesn't know it and now). And so they had to choose: either to admit that they do not fully understand their theory, or in some way avoid the need for such an explanation. They chose the second option, claiming without evidence (in other words, postulating) that the speed of any moving body, under any circumstances, cannot exceed the speed of light. And thus, therefore, asserting that there's no need to explain the physical essence of imaginary numbers, because the imaginary numbers supposedly cannot be actually physically existing.

This principle of non-exceeding the speed of light in SRT was substantiated, it would seem, quite clearly follows. Since according to the Lorentz-Einstein formula the relativistic mass m depends on the velocity v of the moving body as follows

$$m = \frac{m_0}{\sqrt{1-\left(v/c\right)^2}} \qquad (1)$$

where

m_0 is the rest mass of the moving body (for example, an elementary particle);

m is relativistic mass of the moving body;

v is the speed of the physical body movement;

c is the speed of light;

Then at near-light speeds when $v < c$ it takes approaching to infinite real values, *i.e.*, $\lim_{v \to c-0} m(v) = +\infty$. Therefore, the conclusion was made that in order to overcome the light-speed barrier an infinitely large energy is required, whereby overcoming this barrier is impossible. And that is why, they said, after the light-speed barrier nothing exists. And, therefore, we are live in monoverse.

But these arguments are refuted even at the mundane level. Indeed, the inability of the person to overcome adjacent separating walls of the room in his home does not mean that there is no room at the other side of the wall and that it is impossible to get there otherwise—go through the door. The universe is obviously arranged much more difficult than our home. And there are no less opportunities to overcome various barriers in it than in our home.

Thus, one fundamental error of the SRT (the principle of non-exceeding the speed of light) entailed two other fundamental errors (denial of physical reality of imaginary numbers and the assertion that we live in the monoverse).

Later in the article these SRT errors are proved, and then it is shown how they should be corrected.

3. The Physical Reality of Imaginary Numbers

Let's start identifying these mistakes with the proof of principle of the physical reality of imaginary numbers. Since mathematics is the universal language of all exact sciences, to prove the principle of the physical reality of imaginary numbers (including in relation to the issue of refuting the principle of non-exceeding the speed of light), it is not necessary to use physical experiments. For example, long-term very expensive and complicated experiments of MINOS [7] and OPERA [8], which, however, had not solved this problem.

To solve this same problem (physical evidence of the reality of imaginary numbers) it turned out to be more convenient to use a much simpler study of oscillatory processes in linear electric circuits [9]-[19]. The big advantage of these studies was the fact that they, unlike the unique experiments MINOS and the OPERA, can be tested in any radioelectronic or electrical laboratory. Consequently, they are quite reliable and probative.

The simplest is the evidence [15] [16] [17] [18] using suggested in 1897 interpretation by Charles Proteus Steinmetz [20] of discovered in 1826 Ohm's law as applied to alternating current electrical circuits. According to this interpretation, not only resistors have the electrical resistance (and conductivity) the resistance of which is measured by real numbers, but also inductors and capacitors, the resistance of which is measured by imaginary numbers of different polarities. Therefore, resistance of inductors and capacitors is often also referred to as imaginary. Moreover, under the dominant influence of the SRT they are assumed as imaginary *i.e.* not really physically existing.

However, this assumption is incorrect. If the imaginary capacitive and inductive resistance (and conductivity) were not physically real, then at changing the frequency of applied to the electric LCR-circuits alternating voltage the value of flowing through them electric current should not be changed. But electrical and radio engineers for more than a century know that it changes. Moreover, for several decades, industry produces gauges of frequency characteristics of the electric LCR-chains that record these changes. There are tools for measuring these imaginary resistances as well.

But in the early 20th century, the creators of SRT did not know that. And the supporters of the current version of the SRT this still do not know that. Otherwise they would not have written in 2011 about the OPERA experiment that for the refutation of the principle of non-exceeding the speed of light, if anyone could do it, he should have been awarded the Nobel Prize.

4. Correction of the Other Fundamental Errors of the SRT

And since we have proven the principle of the physical reality of imaginary and complex numbers, then the need for a never proven principle of non-exceeding the speed of light disappears. But the need to explain the physical nature of imaginary mass, imaginary time, and other imaginary physical essences that appear in the relativistic formulas of SRT on hyperlight speeds is reestablished.

And this explanation is as follows [21].

The physical parameters of moving bodies corresponding to the relativistic equations, for example, (1) at sub-light speeds at $v < c$ are measured by real numbers, while at hyperlight speeds at $v > c$ with imaginary numbers. And in accordance with the principle of physical reality of imaginary numbers, both physical bodies—at hyperlight speed this is, for example, tachyons [22] [23] are physically real, but exist in different universes, which we shall call (by the name of the corresponding elementary particles), tardyon and tachyon universes. Therefore, the logical conclusion is—we do not live in Monoverse, but in Multiverse [24]-[30].

And out of the assumption made follows that, as the tachyon universe exists at $v > c$ it is invisible to us, as it is outside the event horizon. For the same reason the Multiverse itself is invisible for us. So let's call it hidden.

Of course, this assumption of the existence of an invisible Multiverse is unusual, but on this occasion is appropriate to recall Isaac Newton's opinion: "No great discovery was ever made without a bold guess."

And in this Multiverse tachyon universe is the same as ours, *i.e.*, according to the first postulate of the SRT in the tachyon universe, the same physical, chemical, biological and other laws as in our universe are active, it also has its own life and its intelligent inhabitants. But the relativistic Formula (1), and the rest do not meet this assumption, since the behavior of the corresponding physical entities in the ranges $v < c$ and $v > c$ is different. Therefore, Formula (1) shall be corrected as follows:

$$m = \frac{(i)^q m_0}{\sqrt{1-(v/c-q)^2}} = \frac{(i)^q m_0}{\sqrt{1-(w/c)^2}} \tag{2}$$

where

$q = \left\lfloor \frac{v}{c} \right\rfloor$ is discrete function "floor" from the argument v/c;

$w = v - qc$ is its local for each universe speed, which can only take values in the range $0 \le w \le c$;

v is the speed, measured from our universe;

c is the speed of light;

$i = \sqrt{-1}$ is an imaginary unit, which is represented in mathematics in such a way, unlike the above-mentioned notation of j in the electric circuit theory, the notation i is used for the electric current.

Similarly other relativistic formula should be corrected as well.

5. The Structure of the Multiverse

From the Formula (2) it follows that our tardyon universe corresponds to the value $q = 0$, and the tachyon universe corresponds to the value $q = 1$, but it does not follow that there are only two universes in the hidden Multiverse (and later it is proved that in fact ttheir quantity is equal from twenty to twenty two).

Then the value $q = 2$ will correspond to the tardyon Antiuniverse (as for it $i^2 = -1$), the value $q = 3$ will correspond to the tachyon Antiuniverse (as for it

$i^3 = -i$), the value $q = 4$ will correspond to the other tardyon universe (as for it $i^4 = 1$), the value $q = 5$ will correspond to the other tachyon universe (as for it $i^5 = i$) etc. And then it can be assumed that the hidden Multiverse has a structure as a closed helical ring (see **Figure 1**). Such space-time structure foresaw Stephen William Hawking, who wrote: *"Imaginary time is a new dimension, at right angles to ordinary, real time."*

Then the parameter q in this Multiverse structure can be considered as an additional fourth spatial dimension (like, for example, the number of flats in an
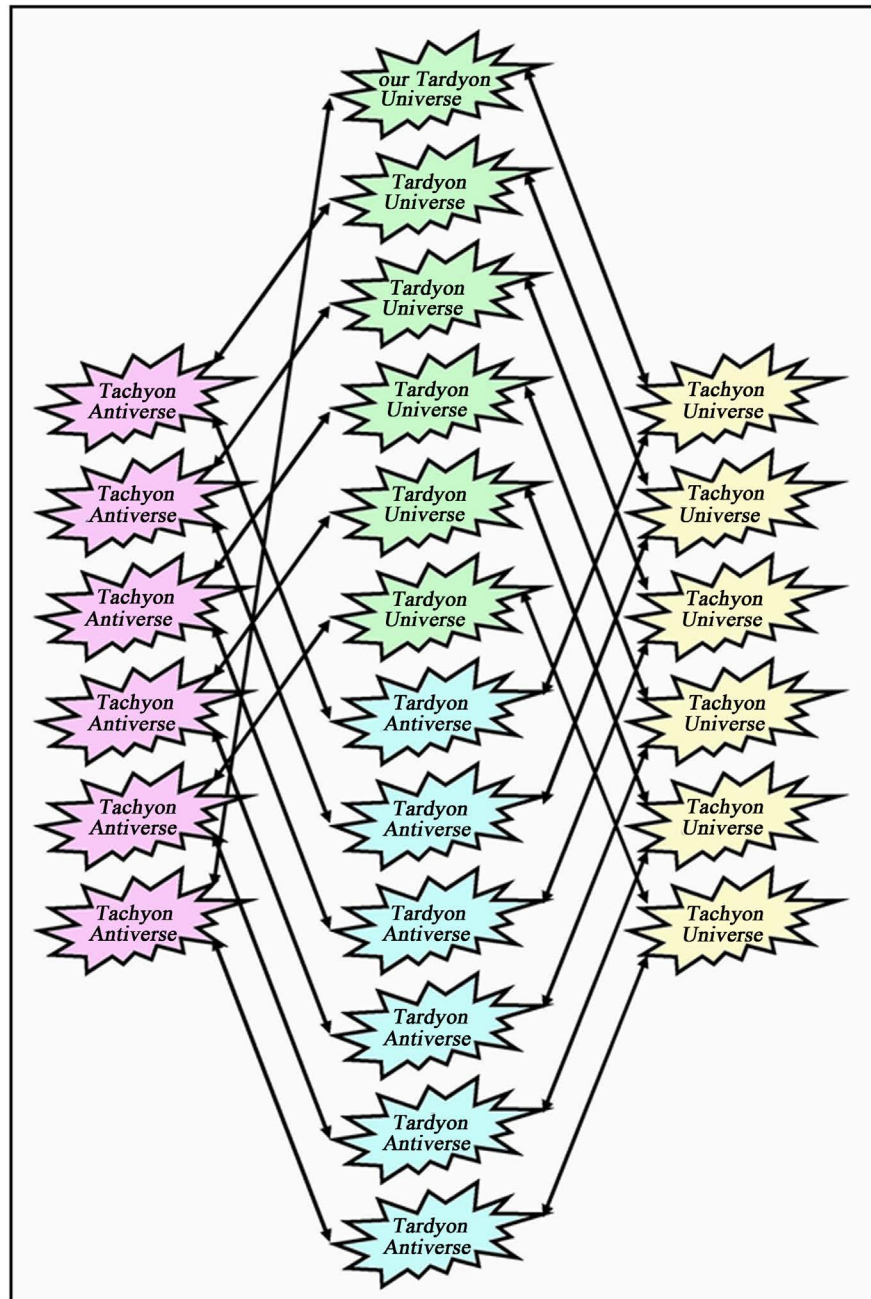

Figure 1. The structure of the hidden Multiverse corresponding to the principle of the physical reality of complex numbers.

apartment building, in each of which there is its three-dimensional space). But this four-dimensional space has nothing to do with the four-dimensional Minkowski space.

The universes located in such multidimensional space drift a bit all the time on from the other. And so they are in so many places (including those located on the Earth-on its surface, above and below its surface, in the depths of rivers, lakes, seas and oceans) sometimes touch and even slightly immerse into each other. Then, in the field of their mutual immersion a peculiar transition zones occur, referred to in the fiction as portals or stellar gates, which have nothing to do with so-called "wormholes" in the general relativity theory.

These multiple portals between universes in Figure 1 are shown by the single bi-directional arrows.

6. Explanation of the Phenomenon of Dark Matter and Dark Energy

No hypothesis of Multiverse can be regarded as a however complete if it does not explain what is dark matter and dark energy, the mass-energy of which is more than twenty times higher than the mass-energy of our observable universe.

But in any of the many known hypothesis of Multiverses [31]-[40] the phenomenon of dark matter and dark energy is not explained. And it is not explained anywhere at all. But inexplicability of this phenomenon, as mentioned above, is due to just the wrong statement of the problem of finding its explanation, certainly corresponding to monoverse hypothesis within the existing erroneous version of SRT.

If we refuse from this restrictive condition, the explanation of the phenomenon of dark matter and dark energy becomes apparent [24]-[30]:

- hidden dark matter and dark energy are the rest, except ours, invisible for us parallel universes of the hidden Multiverse;
- discovered earlier and more studied dark matter-it is adjacent to our parallel universes of the hidden Multiverse;
- discovered much later dark energy, about which almost nothing is known—it is other and more remote from us parallel universes, shielded from us by the dark matter universes;
- atomic and molecular composition of dark matter and dark energy is unknown to us because their content is in other parallel universes, inaccessible to the study by the earth tools.

Thus, in fact, dark matter and dark energy—it's just other names of the other, except for our parallel universes of the hidden Multiverse, some of which are adjacent to our universe, while the others are farther from it.

7. Correction of the Hidden Multiverse Structure According to the Data of WMAP and Planck Spacecrafts

The information just mentioned offers the possibility to clarify the hidden Multiverse structure according to the data of WMAP [41] and Planck [42] space-

crafts. Indeed, assuming that the mass-energy of all parallel universes is about the same and equal to the mass-energy of the visible universe (*i.e.* our tardyon universe), and taking into account that according to received by Planck spacecraft data the total mass-energy of the whole Multiverse consists by 4.9% of the ordinary (baryonic) matter (the previous estimate by WMAP—4.6%), by 26.8% of dark matter (according to WMAP data—22.4%) and by 68.3% of dark energy (according to WMAP data—73%), it can be concluded that:

- the number of parallel universes in the hidden Multiverse according to Planck is equal to $100\%/4.9\% = 20.4$ (and according to previous data of WMAP is equal to $100\%/4.6\% = 21.8$);
- the number of parallel universes that make up dark matter, according to the Planck data is equal to $26.8\%/4.9\% = 5.5$ (according to the previous data of WMAP equal to $22.4\%/4.6\% = 4.9$);
- the number of parallel universes, that make up dark energy, according to Planck is equal to $68.3\%/4.9\% = 13.9$ (according to the previous data of WMAP equal to $73.0\%/4.6\% = 15.9$).

Therefore, hidden Multiverse contains $20\cdots22$ parallel universes, one of which is our universe; $5\cdots6$ of universes constitute dark matter, and the rest of the universes form dark energy.

However, it is not difficult to notice that the results obtained do not correspond to the hidden Multiverse structure that is shown in **Figure 1**. Therefore, in view of the results obtained it is necessary to correct it. To do this, first of all, we need to understand why not two, but five or six tachyon universes and antiuniverses coexist with our tardyon universe. And the only possible explanation for this fact-because the hidden Multiverse has not one, but three additional dimensions, *i.e.*, again revised the Lorentz-Einstein formula

$$m = \frac{m_0 \left(i_1\right)^q \left(i_2\right)^r \left(i_3\right)^s}{\sqrt{1 - \left[v/c - \left(q + r + s\right)\right]^2}} = \frac{m_0 \left(i_1\right)^q \left(i_2\right)^r \left(i_3\right)^s}{\sqrt{1 - \left(w/c\right)^2}} \tag{3}$$

in which the symbols used are similar to designations in Formula (2), contains three imaginary units.

And then we must conclude that the hidden Multiverse has a structure corresponding not to the principle of the physical reality of complex numbers, but to the principle of physical reality hypercomplex numbers [43], namely quaternions containing three imaginary units connected between each other by the relations

$$i_1^2 = i_2^2 = i_3^2 = -1 \tag{4a}$$

$$i_1 i_2 i_3 = i_2 i_3 i_1 = i_3 i_1 i_2 = -1 \tag{4b}$$

$$i_1 i_3 i_2 = i_2 i_1 i_3 = i_3 i_2 i_1 = 1 \tag{4c}$$

Possible ring structure of a quaternion Multiverse is shown in **Figure 2.** There is one and the same our tardyon universe, corresponding to the conditional reference starting and ending point of the universe is depicted twice. In **Figure 2** multiple bidirectional portals corresponding to Equation (4a), as in **Figure 1** are
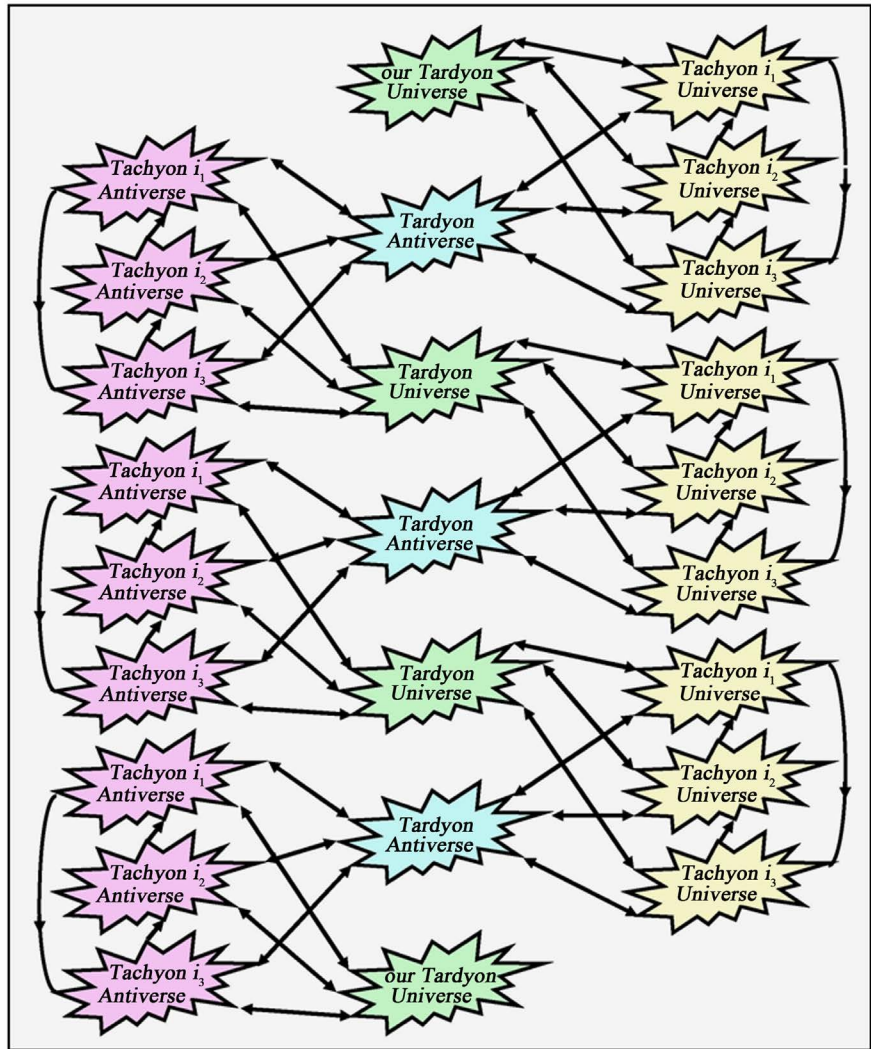
Figure 2. Possible structure of the hidden Multiverse corresponding to the principle of the physical reality of quaternions.

shown with the single bi-directional arrow. And numerous one-way portals, corresponding to Equations (4b) and (4c) are shown with single monodirectional arrows.

To explain the mechanism of work of the one-way portals, Equations (4b) and (4c) can be written in a slightly different form

$$i_1 i_2 = i_3 \tag{5a}$$

$$i_2 i_3 = i_1 \tag{5b}$$

$$i_3 i_1 = i_2 \tag{5c}$$

$$i_1(-i_3) = i_2 \tag{5d}$$

$$i_2(-i_1) = i_3 \tag{5e}$$

$$i_3(-i_2) = i_1 \tag{5f}$$

How do understand these equations?

The equation $i_1^2 = -1$ in (4a) means that moving from tardyon universe through a bi-directional portal i_1 into tachyon universe i_1, then through the bi-directional portal i_1 we'll get into tardyon antiuniverse. And from it via a bidirectional portal i_1 by going to the tachyon antiuniverse i_1, we then through the bi-directional portal i_1 eventually going to get to tardyon universe again. Or, on the contrary, going from tardyon universe through bi-directional portal i_1 into tachyon antiuniverse i_1, then through the bi-directional portal i_1 we get into tardyon antiuniverse. And from it via a bidirectional portal i_1 by going to the tachyon universe i_1, we then through the bi-directional portal i_1 eventually going to get to tardyon universe again.

The equation $i_2^2 = -1$ in (4a) means that moving from tardyon universe through a bi-directional portal i_2 into tachyon universe i_2, then through the bi-directional portal i_2 we'll get into tardyon antiuniverse. And from it via a bidirectional portal i_2 by going to the tachyon antiuniverse i_2, we then through the bi-directional portal i_2 eventually going to get to tardyon universe again. Or, on the contrary, going from tardyon universe through bi-directional portal i_2 into tachyon antiuniverse i_2, then through the bi-directional portal i_2 we get into tardyon antiuniverse. And from it via a bidirectional portal i_2 by going to the tachyon universe i_2, we then through the bi-directional portal i_2 eventually going to get to tardyon universe again.

The equation $i_3^2 = -1$ in (4a) means that moving from tardyon universe through a bi-directional portal i_3 into tachyon universe i_3, then through the bi-directional portal i_3 we'll get into tardyon antiuniverse. And from it via a bidirectional portal i_3 by going to the tachyon antiuniverse i_3, we then through the bi-directional portal i_3 eventually going to get to tardyon universe again. Or, on the contrary, going from tardyon universe through bi-directional portal i_3 into tachyon antiuniverse i_3, then through the bi-directional portal i_3 we get into tardyon antiuniverse. And from it via a bidirectional portal i_3 by going to the tachyon universe i_3, we then through the bi-directional portal i_3 eventually going to get to tardyon universe again.

The equation $i_1 i_2 = i_3$ in (5a) means that moving from tardyon universe through a bi-directional portal i_1 into tachyon universe i_1, then through a one-way portal i_2 we'll get into tachyon universe i_3. Or, going from tardyon antiuniverse via a bidirectional portal i_1 into tachyon antiuniverse i_1, then through a one-way portal i_2 we'll get into tachyon antiuniverse i_3.

The equation $i_2 i_3 = i_1$ in (5b) means that moving from tardyon universe through a bi-directional portal i_2 into tachyon universe i_2, then through a one-way portal i_3 we'll get into tachyon universe i_3. Or, going from tardyon antiuniverse via a bidirectional portal i_2 into tachyon antiuniverse i_2, then through a one-way portal i_3 we'll get into tachyon antiuniverse i_1.

The equation $i_3 i_1 = i_2$ in (5c) means that moving from tardyon universe through a bi-directional portal i_3 into tachyon universe i_3, then through a one-way portal i_1 we'll get into tachyon universe i_2. Or, going from tardyon antiuniverse via a bidirectional portal i_2 into tachyon antiuniverse i_3, then

through a one-way portal i_1 we'll get into tachyon antiuniverse i_2.

The equation $i_1(-i_3) = i_2$ in (5d) means that moving from tardyon universe through a bi-directional portal i_2 into tachyon universe i_2, then through a one-way portal i_3 we'll get into tachyon universe i_1. In other words, it is a transition that is equivalent to the one described in Equation (5b). Similarly, we can show the equivalence of transitions described by Equations (5e) and (5c), as well as Equations (5f) and (5a).

All these transitions are shown in **Figure 2**.

But **Figure 2** also does not correspond to the data obtained by WMAP and Planck spacecrafts, as there the hidden Multiverse contains twenty-four parallel universes rather than twenty or twenty-two. Consequently, two to four parallel universes of such hidden Multiverse should be excluded. But then hidden Multiverse will have the edges. And then there will be a very difficult question to answer, because we do not have any experimental data prompting the answer-and what could be behind those edges. And probably the only plausible answer to this question can be a speculation that with these edges our hidden Multiverse is in some way connected to the other Multiverses or several times with one and the same other Multiverse (inaccessible to our observations, not only by electromagnetic but also by gravitational manifestations). Therefore, it is permissible to assume that there Hyperverses.

Figure 3 shows such a hidden Multiverse containing twenty-two universes and touching the other two Multiverses by way of example. And **Figure 4** shows another hidden Multiverse containing twenty-one parallel universe, and touching one the same other Multiverse three times.

From all the above stated, so it follows that the hidden Multiverse actually has not one extra dimension q, as was previously assumed, but three additional measurements q, r, and s.

8. Dark Measurements

The situations considered above in electrical engineering and astrophysics are not the only ones in the exact sciences, in the description of which the imaginary numbers are used. Imaginary numbers are also used, for example, in the formula of Euler

$$e^{ix} = \cos x + i \sin x$$

which describes damped and undamped oscillations of any physical nature-electromagnetic, mechanical, hydraulic, acoustic and others.

Which, physical meaning in this case has the component $i \sin x$, which, in accordance with the principle of the physical reality of imaginary numbers in nature necessarily exist? For example, with respect to the mechanical oscillations of the pendulum.

This question is even more difficult than the question of the physical nature of dark matter and dark energy. It is possible that the answer to it and similar questions will be found in another five hundred or more years. And this answer will match much higher level of physical and mathematical knowledge than it is now.
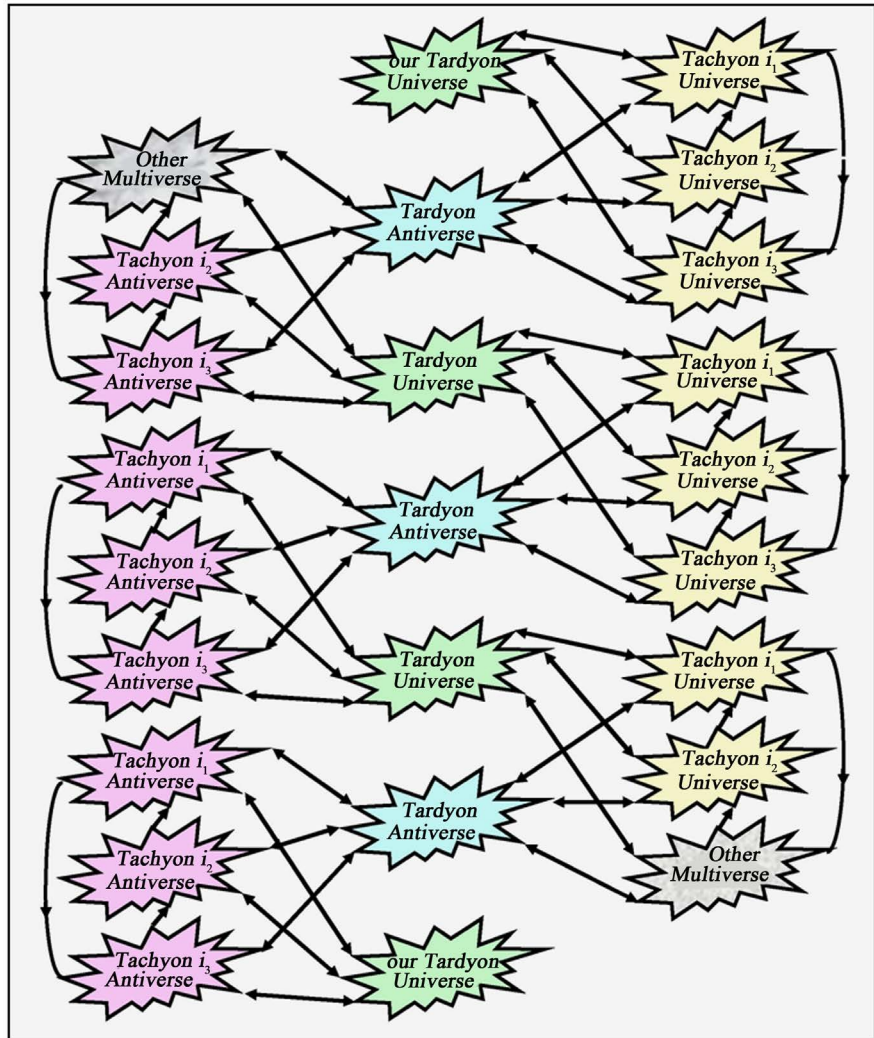
Figure 3. The most likely structure of the hidden Multiverse, corresponding to the principle of the physical reality of quaternions.

And in the meantime, we can only give the name to a new problem. Because all the numbers are used to measure, let's call it, using the obvious analogy, the problem of dark measurements.

9. Where Is the Antimatter Located?

The problem of the existence of antimatter [44] [45] [46] [47] is no less fundamental than the problem of explaining the phenomenon of dark matter and dark energy.

Indeed, now it is assumed that as a result of Big Bang not only matter but also antimatter was formed. And they were formed in equal quantities. But in our visible universe any appreciable amounts of antimatter were be found. It was possible to obtain it only as antiparticles and some anti-atoms in the particle accelerators in miniscule amounts. Then where is the antimatter in the form of antiuniverse could be? And if it exists at all in this form? On this account, two assumptions are possible:
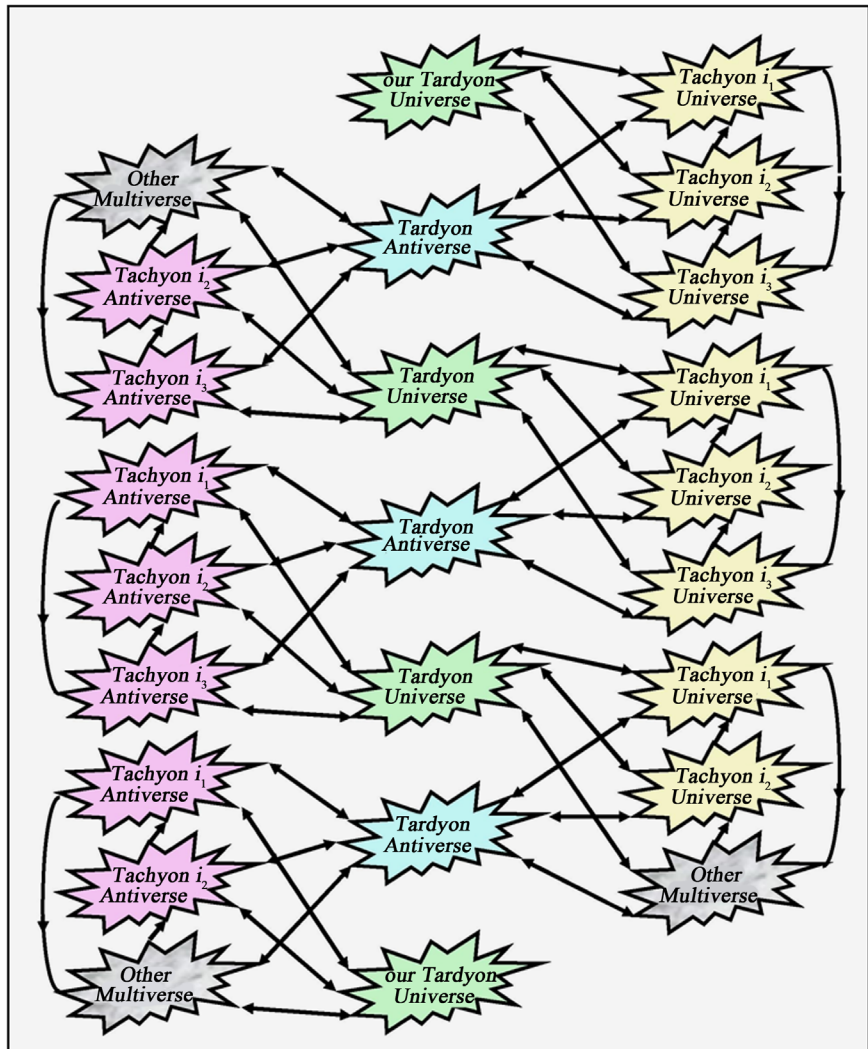
Figure 4. The other most likely structure of the hidden Multiverse, corresponding to the principle of the physical reality of quaternions.

- Firstly, because, according to the generally accepted version of SRT there a monoverse, in this monoverse the matter and antimatter just after the Big Bang had annihilated. As a result, only a very small and somehow excessive amount of matter that is our universe survived. And there is no longer any antimatter in it. But, as shown above, the existing version of the SRT is incorrect and, therefore, the corresponding suggestion is wrong as well.

- Secondly, the universes out of antimatter do exist, but somewhere else. Consequently, there must be a Multiverse containing them. But then the questions arise-what are the physical and mathematical principles of the existence of this Multiverse and how the annihilation of universes containing matter and antimatter is prevented?

And in quaternion structure of the hidden Multiverse described above [24]-[30] the place for antimatter was found. It is located in the antiuniverses. And as it turned out there were even four pairs of universe-antiuniverse (or matter-antimatter). And they do not annihilate because of the above-mentioned order of

their spatial alternation. Therefore, in a hidden Multiverse total mass-energy of different matter and antimatter is the same.

10. Verifiability of the Hidden Multiverse Hypothesis

Thus, the hypothesis of hidden Multiverse so completely and convincingly solves fundamental problems in astrophysics that the logical assumption is that of its physical reality. Even though all the other very numerous interesting hypothesis of Multiverse [31]-[40] are unverifiable, *i.e.* even in the distant future not able to receive any experimental confirmation or be experimentally refuted.

However, the hypothesis of hidden Multiverse is not only able to obtain experimental confirmation, it already has them. In fact:

- as shown above, such experimental evidence of its existence is the phenomenon of dark matter and dark energy, which is actually just another name the others, except for ours, parallel universes of the hidden Multiverse;
- other proof of it are all the experiments at the Large Hadron Collider and other accelerators, which resulted in the observed mass defect, since the latter can be explained by the formation of tachyons and their transition into tachyon universes and antiuniverses;
- finally, its most convincing experimental proof will be geophysical research of portals, which on Earth are anomalous zones, as well as a registered entry (with return) through the portals to nearby parallel universes.

11. Conclusions

By virtue of foregoing the hypothesis of a hidden Multiverse it is verifiable and therefore, unlike many other hypotheses of the Multiverses, it has every reason to be called a theory. And this theory is not based on these or other postulates, as it is now customary in physics, but on theoretical and experimental evidence of general scientific principles of physical reality of imaginary numbers.

This principle allowed us to reveal fundamental errors in the current version of the STR and correct them. To the credit of Albert Einstein it should be noted that he didn't exclude such an adjustment of the STR in the future. He wrote: "*No single idea, which I would be sure that it will stand the test of time.*"

And the use of the revised version of the special relativity theory has created the theory of the hidden Multiverse that:

- explained the phenomenon of dark matter and dark energy, by the existence of the others, except our own, invisible parallel universes, which is another name of this phenomenon;
- explained its structure, including twenty to twenty-two parallel universes, of which five or six parallel universes are adjacent to our universe and are called dark matter, and the other parallel universes more remote from us are called dark energy;
- explained the coexistence of four different kinds of pairs of matter-antimatter in it, the annihilation of which is excluded by its quaternion structure;
- explained the existence between its parallel universes of monodirectional and

bidirectional portals;

- proved the existence in nature, in addition to our hidden Multiverse, of other Multiverses, however, not available for observations from the Earth not only by electromagnetic but also by gravitational manifestations.

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