Proposal for a Simpler Description of SRT

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A new concept of four-dimensional reality is presented. The fourth dimension of the reality is now described with a dimension different from the time of the observer. Consequently, the Euclidean model of reality is obtained, description of phenomena is simplified in relation to the four-dimensional Lorentzian space-time and the singularities taking place in the description of the reality become now an effect of performing the observation and are not the property of reality any more. The new model also predicts certain new experimental effects which can be a reliable test for the new model

Introduction

The question of what reality we live in has absorbed our minds for centuries. When we observe and investigate the surroundings, we only perceive certain events taking place within the reality; the reality itself cannot be observed. On the basis of observed events, and with the help of the concepts we can comprehend, we build models that enable us to picture reality to ourselves.

Construction of a model of reality, like construction of a building, should be based on solid foundations. Accepting as a basis for the model a certain assumption that seems obvious, but which has been never checked, may result in further complication of the theory, or lead to some false conclusions.

In this paper I would like to point out one such assumption that seemed obvious enough to have been not discussed until now; namely, the definition of the fourth dimension, creating space-time.

The similarity of time and space dimensions in relativistic formulas suggests that the reality is four-dimensional, and that the fourth dimension should be described with time. It seems that time should be taken directly as the fourth dimension that creates the reality. However, the statement that 'time is the fourth dimension' is equivalent to the assumption that in the four-dimensional reality, the time dimension has to be perpendicular to the three space dimensions. But does it really have to?

Theoretically, in order to describe the fourth dimension with the help of time, it is not necessary to assume that time is perpendicular to the three space dimensions. It is enough to state that it is aligned to them at any non-zero angle. The assignment of perpendicularity of the time has been accepted without any proof – only by analogy with the three space dimensions. **Is this assumption correct?** I will try to answer this question, describing a hypothetical reality, in which the time dimension is ***not*** perpendicular to the three space dimensions. As a result we will obtain a description of events simpler than the description resulting from SRT; however, we will also obtain some new, different conclusions that can be experimentally tested. These conclusions should give us a final answer to the above question.

How Does the New Model Work?

The coordinates of time and space in the frame of any observer must satisfy the rule of the conservation of the space-time interval, which in the case of observation of a particular body by many observers takes the following form:

$$dt'^2 = dt_i^2 - dx_i^2 - dy_i^2 - dz_i^2 \qquad (1)$$

where dt_i, dx_i, dy_i, dz_i denote the space-time coordinates in the frame of the i-th observer, and dt' denotes the proper time in the frame of a body in motion.

Up to now it was assumed that the four components of the Eq. (1): dt_i, dx_i, dy_i, dz_i describe the dimensions of the reality (are perpendicular to one another), while dt' is the distance in this reality. We call the four-dimensional reality in which the distance is measured according to Eq. (1) 'Lorentzian Space-Time' (LST). However, Eq. (1) also allows one to describe a different reality. Let us write Eq. (1) in the following form:

$$dt_i^2 = dt'^2 + dx_i^2 + dy_i^2 + dz_i^2 \qquad (2)$$

If the values dt', dx_i, dy_i, dz_i are taken as the coordinates describing the reality, *the dimension described by the coordinate t' is now perpendicular to the dimensions x, y, z*; we thus obtain the 'Four-dimensional Euclidean Reality' (FER). In FER, the fourth dimension is described with the proper time of observed body, whereas the time of the observer dt_i becomes now a distance. The dimensions of both realities, *i.e.* t, x, y, z and t', x, y, z, satisfy the Eqs. (1) & (2); however, accepting the proper time of the observed body as a value describing the fourth dimension results in a reality with different properties from the one we have known till now.

The differences between LST and FER are shown for the two-dimensional case in Fig. 1.

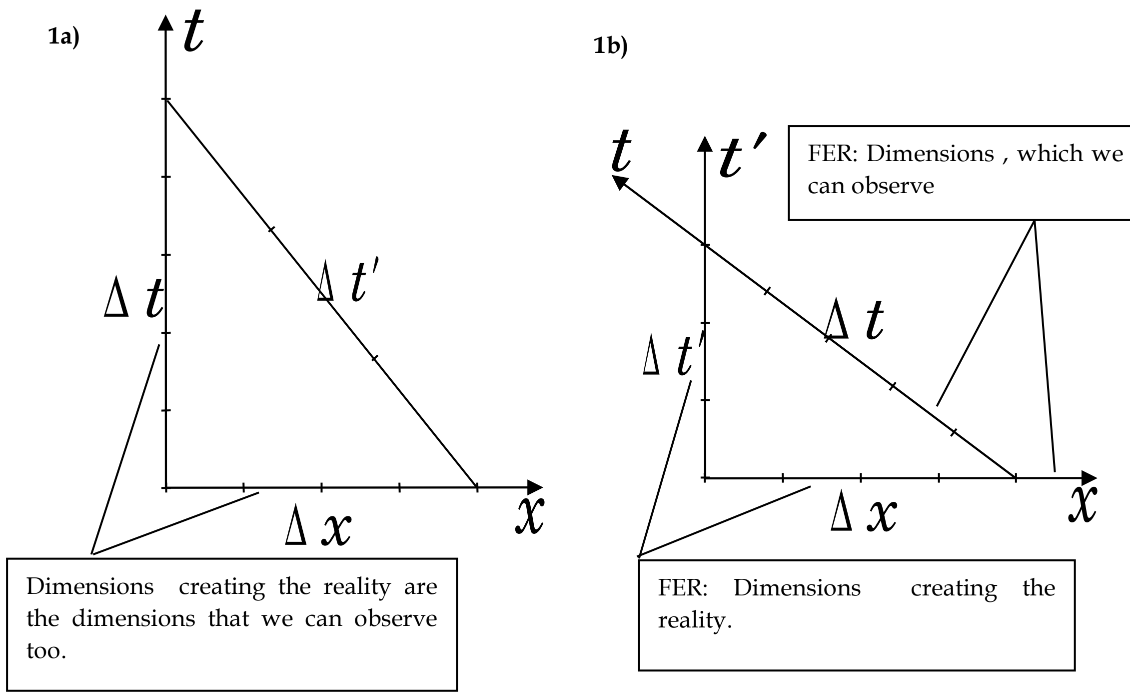

Figure 1. The difference between LST and FER in the case of the observation of a single body. In both cases shown, $\Delta t = 5$, $\Delta x = 4$, $\Delta t' = 3$ (in arbitrary units).

1a) In LST, the rule of measuring of the distances – Eq. (1) – forces the deformation of dimensions (the time dimension of the observed body is stretched), but the observed dimensions are also the dimensions which create the reality. The time dimension of the observer's frame is here perpendicular to the space dimensions.

1b) In FER the dimensions are not deformed. This is possible at the cost of an assumption that the reality is constructed of dimensions other than the observed time and space. The time dimension of the observer is not perpendicular to the space dimensions any more, as occurs in LST (Fig. 1a). The dimension perpendicular to the space dimensions is now described by the proper time of the observed body.

Accepting the FER model, describing reality with the coordinates t', x, y, z means that, contrary to the LST model,

1) Dimensions that we are able to observe are no longer the dimensions that create reality. While the space dimensions describe 'true' distances in FER, the time dimension of the observer's frame does not denote the distance along the fourth dimension of the reality. The fourth dimension is now described with the proper time of the observed body, whereas the value we perceive as the time is a composition of space dimensions and the 'true' fourth dimension. The problem of time is discussed in more detail in [1].

2) FER is a Euclidean space, so, contrary to the hitherto LST, its dimensions are not deformed. If the dimensions of FER cannot be deformed, then how can we ensure the conservation of the space-time interval?

This question is explained in Fig. 2, where we are shown (in FER) the observation of one body by two different observers (as described with Eq. (2). In FER the space dimensions of the observers' frames are perpendicular to the time axis of the observed body, so the space axes of all observers' frames of the same body overlap ($x_1 = x_2$). The time axes of the observers (t_1 and t_2) are now inclined to the time axis of the observed body at angles φ_i ($i = 1, 2$), which – as we can see in the Fig. 2 – denotes the velocities of the body in relation to the observers, according to the formula:

$$V_i = \Delta x_i / \Delta t_i = \sin \varphi_i \tag{3}$$

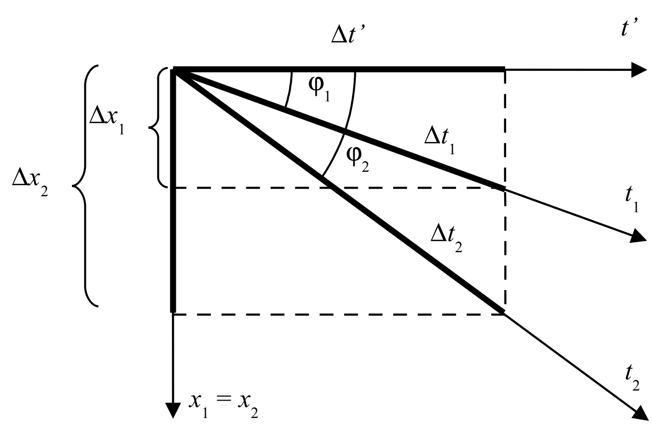

Fig.2 Observation of the body by the observers: "1" (coordinates system x_1, t_1) and "2" (coordinates system x_2, t_2), which move in relation to the body with different velocities. The observer "2" is moving faster than "1". The observation is expressed in the FER coordinates system x, t'.

It can be seen that, according to the above conditions, the rule of conservation of the space-time interval [Eq. (1)] is always satisfied, independent of the choice of the observer's frame. At the same time, all observers can see that if the time $\Delta t'$ passed in the frame of the observed body, then the times equal to Δt_i passed in their frames. It results from Fig. 2 and Eq. (3) that those times are connected to one another with the following relation:

$$\Delta t' = \Delta t_i \cos\varphi_i = \Delta t_i \sqrt{1 - V_i^2} \tag{4}$$

The time dilation in the moving frame, measured by the observer, is not the result of the deformation of dimensions in FER – as it was assumed till now in LST. It is only the result of inclination of the time axis of the observer's frame to the axis of time of the observed bodies frame. The angle of the inclination depends on the relative velocity [Eq. (3)].

Dimensions of all the bodies' frames are expressed in FER in the same scale, independently of the relative motion of these bodies. According to the rule shown in Fig. 2, it is also possible to derive the Lorentz Transformation in a very simple way [2].

If we now choose a different body as the observed one, then the space axes of the observers' frames have to be chosen as perpendicular to the axis of time of this observed body's frame. It means that in FER there are no directions assigned *a priori* as the space or time. We perceive three directions of the four-dimensional reality (FER) as the space dimensions, and one as the time dimension. These directions are determined individually for every process of observation and specifically for every pair of observer and observed body. The same direction in FER can be interpreted during one observation as the time dimension and during another observation as the space dimension.

Finally we can compare the properties of FER and LST. See Table 1.

We so far know only the properties that FER should have. Now we can ask the question: what does the reality that fulfills the above properties look like, and why is it observed as LST?

Table 1. FER and LST properties compared.

FER	Lorentzian space-time
The reality is constructed of four identical dimensions, and none of these dimensions can be assigned in advance as the space- or the time one.	The reality is constructed of four dimensions. One of them denotes the time; the other three denote the space distances.
It is only the choice of the observer and the observed body that determines which direction of the FER is interpreted as the time- and which is interpreted as the space-dimension.	The directions of the space-time being the time- and the space-dimensions are assigned in advance and do not depend on the choice of the observer or of the observed body.
The direction perpendicular to the three directions, interpreted as the space dimensions, is described with the proper time of the observed body. The time of an observer is the distance in FER.	The fourth dimension, perpendicular to the three space dimensions, is described with the time of the observer. In the case of observation of a body (the size of which can be neglected), its proper time has the meaning of the distance in space-time.
The dimensions of bodies in motion are not deformed. Directions interpreted as the time- or space-dimensions are chosen individually for every process of observation and they are inclined to one another at an angle depending on the relative velocity. They are therefore observed as if they were deformed – see fig.2, Eq. (4)	The dimensions of bodies in motion are deformed and this deformation causes the time dilation and the length contraction.
Distance in the four-dimensional reality is defined identically as in the three-dimensional space – see Eq. (2). The distance cannot be equal to zero while if any of its components on the right side of Eq. (2) is a non-zero value. The singularities similar to those taking place in Relativity Theory (see right) do not appear here.	Distance in the four-dimensional space-time is defined according to different rules than in the three-dimensional space – see Eq. (1). The distance can be equal to zero while the space and time distances are non-zero values. This is the cause of the singularities, which occur in the Relativity Theory description

The Construction of FER

According to the previous considerations we accept that:

Assumption 1: Reality is four-dimensional Euclidean space. None of the dimensions of this space has the meaning of the time- or the space-dimension assigned in advance.

Assumption 2: In four dimensional reality, there exist bodies. The bodies *move* along certain trajectories, and all trajectories are allowed. The length of the trajectory traversed by the body is a measure of its proper time.

If we use the concept *motion along trajectory*, then we should relate this motion to a certain *time*. In FER none of the dimensions has the meaning of time, so in order to define motion in FER we have to introduce an additional value - the SUPERTIME. The SUPERTIME is not the fifth dimension in the sense of the four dimensions creating FER. It is a parameter, which allows for putting in order all the events along the trajectory of the body. A detailed definition of the SUPERTIME is presented in [1]. Since the length of the trajectory passed by the body is always somehow proportional to the SUPERTIME, then in this paper I will only assume that the length of the trajectory is the measure of the proper time of the body. The subject of this paper is a new definition of the coordinates system describing the reality, so the wave structure of particles – described also in [1] - will be disregarded for the time being, and the particles will be treated here as points.

If the length of the trajectory of the body is a measure of its proper time, then the trajectory of this body should be the time axis of its coordinate system. Then, according to the previous considerations, we should accept the following:

Assumption 3: In FER the directions perpendicular to the trajectory of an observed body are interpreted as space-dimensions.

We can now interpret the meaning of particular components shown in Fig. 2:

- The time axes t', t_1, t_2 now denote the trajectories of bodies in FER.
- Angles between trajectories in FER denote the relative velocities, which the observers measure in their frames x_i, t_i.
- The space axes of all observers are chosen as perpendicular to the trajectory of the observed body t', and that means that *only* this body can actually be observed. If we would like to show, in Fig. 2, the observation of a different body, for example body t_2, then we would have to change the space axes of all bodies into perpendicular to the trajectory of this body, *i.e.*, to the axis t_2.

Since during observations of various bodies we interpret different directions in FER as the space dimensions, it is not possible to show the observation of many bodies in the frame of a single observer at the same moment of time. In FER the coordinate system of the observer must be defined from the beginning for the observation of every single body. Therefore, the complicated picture of reality that we observe comes from the composition of single observations performed in different moments of time. (More accurately, at one point in space and one moment in time, we can register only one event or the total effect of superposition of a few events.) From many separate observations we get a picture of reality similar to the picture on a TV screen, where, although each pixel of the screen lights at a different time, we can see the whole picture as if all the pixels lighted simultaneously. Because the space dimensions create three-dimensional subspace in FER, every single event is observed as if it took place in the three-dimensional space. The picture that we receive as a result of composition of many single observations makes the impression that we live in the three-dimensional reality. If we add the time (the length of the trajectory passed by us in FER) to the three observed space-dimensions, we will get the well-known LST. However, it is not the 'true' picture of the reality, but only its 'projection', or, in fact, the composition of a set of 'projections', corresponding to the observations of single events.

The observations are performed with help of light quanta. In order to justify the observed constancy of the speed of light independent of the observer's motion, it is necessary to accept the following assumption:

Assumption 4: The trajectory of a light quantum is perpendicular to the trajectory of the body that emitted this quantum.

All points along the space axis of the observer (perpendicular to the trajectory of the observed body) correspond to the same moment of time in the observer's frame. In order to register quantum in the observer's frame at different moments of time, it is necessary to accept the next assumption:

Assumption 5: The trajectory of a quantum is carried along the trajectory of the observer.

The trajectories of quanta in FER, which are the result of Assumption 4 and 5, are shown in Fig 3. The trajectory of the observed body (emitting the quantum) is shown there, as well as the trajectories of two observers moving in relation to this body with various velocities. It is clear that, when the quantum moves along its trajectory by Δx_i, its trajectory is carried along the trajectory of the body receiving quantum by Δt_i. This effect does not depend on the angle of inclination of the trajectory, *i.e.* on the relative velocity of the observer. Therefore, the observed velocity of quantum, equal to $\Delta x / \Delta t$, is always constant and does not depend on the velocity of the observer in relation to the source of the radiation. In FER, where time and space dimensions are expressed in the same scale, we assume that:

Assumption 6: In vacuum and in absence of gravitational field, $\Delta x_i = \Delta t_i$, so the velocity of propagation of a quantum in empty and uncurved space is equal to 1. We have to take such an assumption because the velocity of quantum in non-curved vacuum is equal to the maximal velocity of bodies resulting from Eq. (3). Since *the speed of propagation of the interactions results, in FER, from a different mechanism [Assumption 6] than the limitation of the velocity of bodies [Eq. (3)], then in a medium different from the vacuum or in the presence of a gravitational field, those values may differ*.

Let us notice that, according to the Assumptions 4 and 5, the resultant trajectory of a quantum in FER will be different for every observer. The quanta hitting the body A are carried along the trajectory of the body A, the quanta hitting the body B are carried along the trajectory of the body B, *etc*. This means that *already in the moment of emission, the quantum must 'know' by which body it will be received.* Hence:

1) The emission of a quantum must be a result of a certain interaction between two specific particles. The character of this interaction is not known yet. It may be, for instance, a resonance of particles proposed in [3]. The *quantum cannot be therefore emitted somewhere into empty space* and move like a particle until it reaches any random body and is absorbed by it.

2) The idea of trajectory and motion of quantum must be a conventional notion, because we are only able to know the points of emission and absorption of the quantum. *We are not able to examine the route of the quantum* or what happens with it between the emission and absorption, because the quantum can interact only with the body towards which it has been sent.

3) All particles of the Universe must be somehow informed about the existence of other particles, because already in the moment of the quantum's emission, the place and the particle which the quantum will hit is well-known, apart from the time needed for it. It is, somehow, a different formulation of the Mach principle, and it confirms the suggestions about the wave structure of matter proposed in [3] and [1]

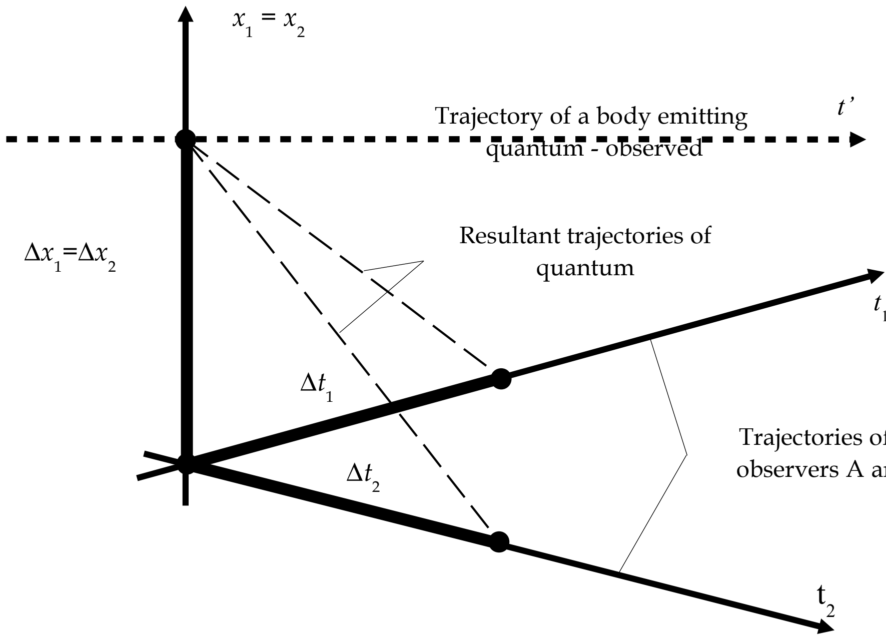

Figure 3. Two observers watching one body with the help of quantum. The resultant trajectory of quantum is a composition of motion along the trajectory perpendicular to the observed body (the space axis of the observers) and carrying the trajectory along the trajectory of the observer. In vacuum and in the absence of gravitational field: $\Delta x_1 = \Delta x_2 = \Delta t_1 = \Delta t_2$.

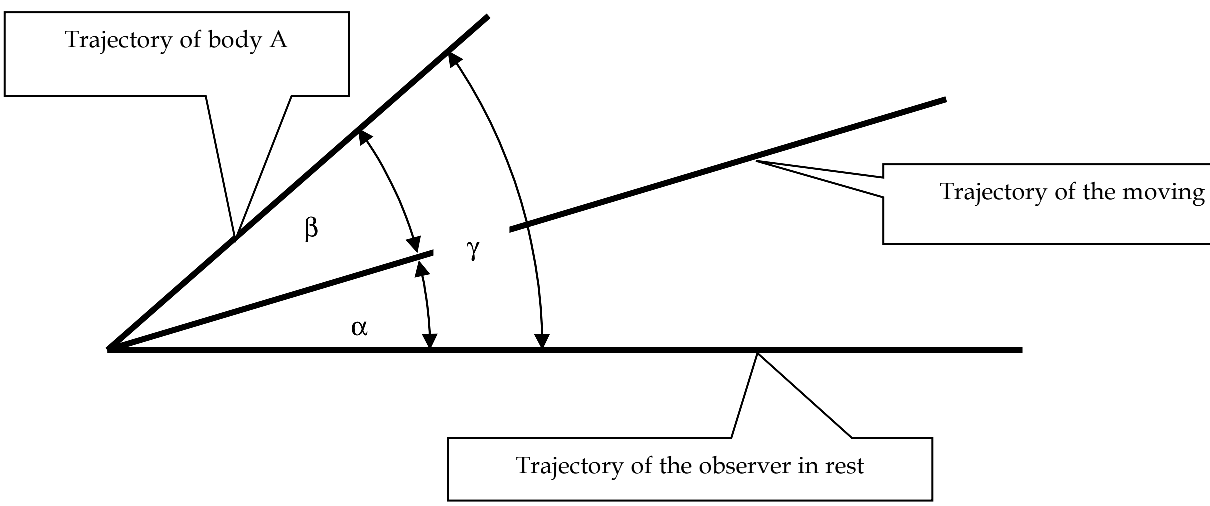

Figure 4. Composition of velocities according to the FER.

New Phenomena from the FER Model

The picture of reality proposed in this paper is very different from, and has different properties than, the well-known LST. If this is the case, then in addition to the description of events similar to those once proposed by SRT, we should also get a description of some new events that are not predicted by the Relativity Theory. Examination of these new events should be a reliable test of the correctness of the FER theory proposed here.

The new definition of velocity as the angle between trajectories of bodies in FER changes the rule of the composition of velocities. In FER, the composition of velocities consists in the summation of angles between the trajectories. The rule of the summation of angles is shown in Fig. 4.

- The moving frame moves in relation to **the observer at rest** with velocity $V = \sin\alpha$;
- The body A moves in relation to **the moving frame** with velocity $v = \sin\beta$;
- The body A moves in relation to **the observer at rest** with velocity $V_{res} - \sin\gamma = \sin(\alpha + \beta)$

As a result of such a summation we can obtain, for instance, the trajectory perpendicular to the trajectory of an observer. According to the Eq. (3), it is equivalent to the acceleration of the body to the speed of light; according to the SRT-model this is impossible. Further acceleration results probably in the inversion of the time flow in the particle's frame. The attempt on discussion of this problem is presented in [1]. One of the still unsolved problems is whether and how can we observe those particles in FER. We can expect that the new rule of composition of the velocities should be observable in the case of the spontaneous decay of relativistic particles. In such cases, products of the decay should depend on the velocity of the particle. For example, for a strictly determined velocity, one of the products of decay of such a particle would be a particle moving with the speed of light (see Fig. 4)

Another phenomenon predicted in the FER, which greatly changes our idea of reality, is the recession of galaxies. According to today's knowledge the receeding galaxies are still accelerating – the velocity of the galaxies is approximately proportional to the distance from the galaxies. In order to explain the acceleration of the galaxies, the idea of an additional hypothetical repulsion field propelling those galaxies has been introduced. However, according to the FER model, if the trajectories of galaxies have approximately common origin, then the observer must observe from his own trajectory that the velocities of galaxies are proportional to the distances, and it has nothing to do with the acceleration [4]. It results directly from the fact that in FER the space dimension is chosen individually for the observation of every galaxy as perpendicular to the observed galaxy's trajectory. All galaxies are actually moving along their trajectories in the same way from the beginning of the Universe, and the observed acceleration is only the seeming effect that results from the way we observe reality. Moreover, another immediate result of the FER model is that the Hubble constant is equal to the inversion of the age of the Universe and decreases with time; the more detailed description of this problem is described in [4]. Hence, the FER model allows us to simplify the description of reality by eliminating the need of introducing any odd repulsion fields or complicated cosmological models, which were supposed to explain the meaning of the Hubble's constant. In FER, all those problems are a simple consequence of the manner of the performing of observations, and the derivation of all the above-mentioned conclusions only takes one line of text [4]. The following test for the correctness of the presented theory results from the solution of the recession of galaxies presented in FER:

If we assume the theory of Big-Bang as true, we can expect that the trajectories of galaxies fill almost uniformly an angle 360^0. However, we can observe only the galaxies that move along trajectories inclined to the trajectory of the Earth at an angle smaller than 90^0 (Assumption 3). This means that we are able to observe only half of the existing Universe (see "Dark side of the Universe" in [4]). Since the Earth rotates around the Sun, its trajectory changes in relation to the trajectories of the rest of heavenly bodies. Hence, the boundary of the observed Universe – perpendicular to the trajectory of the Earth – will change in relation to the actual position of the Earth on the heliocentric orbit. This means that the most distant galaxies would appear and disappear in different seasons of the year. Unfortunately, in case of telescopes positioned on the surface of the Earth, this effect can only take place for the galaxies that are moving with velocity smaller than the speed of light by the value 2×10^{-8}c.

Conclusions

The model presented in this paper describes a much simpler reality than the hitherto theories. The complex picture of the reality that we observe is no more the property of reality itself, but it is a result of the manner in which we observe this reality. The simplification of the model of reality at the cost of complicating the observation has already been applied during the progress of science. The best known example is the transition from the geocentric theory to the heliocentric one, where the complicating of the observation process – by taking the assumption that the observation is performed from the moving frame – allowed to considerably simplify the picture of the Universe.

Accepting the model proposed in this paper considerably changes our idea of reality. Now time and space are not the dimensions of reality assigned in advance, but only certain directions in FER, which vary with the choice of the observer and the observed body. We are therefore able to describe reality with the Euclidean model, in which dimensions are not deformed. Derivation of the relativistic dependences for such a reality is much simpler than in the hitherto models; for instance, time dilation [Fig. 2 and Eq. (4)] or the Lorentz transformation [2]. Moreover, in the new model the singularities known from Relativity Theory do not appear. According to the new model, the singularities are not real physical limitations. They are only the effect of the manner in which observation is performed.

The new FER model opens new ways for the progress of science by allowing, for instance, for the acceleration of particles to the speed of light, which can influence the predicted time of the interstellar travels. Many of the complex problems, as for instance the problem of the galaxies recession, receive incredibly simple explanations. What is more, the FER model finally explains the long-discussed problem of the existence of tachyons, which, according to the model presented in this paper, cannot exist at all [5].

Aside from any discussions about the new FER model, there is one final test for the correctness of any physical theory; namely, experiments. The new experimental effects or the astronomic observations should give an answer to the question whether the observed time and space are really the dimensions creating the reality – as it was assumed till now – or whether they are only certain projections of the 'true' dimensions of FER, as I am trying to prove in the presented paper.

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