Four Dimensional Euclidean Reality – Basic properties of the model

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Recently, more and more papers have been published concerning the alternative for Minkowski space – a Euclidean space model, in which time- and spatial dimensions are identical [1-12].
The main idea of the Four Dimensional Euclidean Reality (FER) is the assumption that the reality is constructed of different dimensions than the observed space and time dimensions. The observed space and time dimensions are only certain projections of the "true" Euclidean dimensions.
Such an assumption allows for the construction of the model of Euclidean reality from 4 identical dimensions, none of which is initially specified as being a time- or space dimension. It is only the choice of the pair: observer - the observed body, which determines which directions in FER are perceived as the spatial dimensions, and which as the time dimension. According to the FER model, the "real" reality is Euclidean, and while observing bodies in this reality we get the impression that the reality is actually Lorentzian.
As a result we obtain several promising conclusions, i.e. the speed of E-M waves and the speed limit for mass bodies are described with two totally different mechanisms, which easily justifies the constancy of the speed of light. The singularities present in SRT are now only an effect of observation and not the real physical limitations of physical phenomena. Hence, the body can be accelerated to the velocity observed as the speed of light, but we will not be able to register this process. The new definition of time enables us to describe a sequence of events from the point of view of the body moving with the speed of light. The particle described with a wave function, in space-time, is described in FER as an ordinary wave, etc. The theory predicts new physical phenomena which can serve as experimental tests for the new model.

The problem of how the reality surrounding us looks like has been absorbing us for centuries. In order to picture the reality to ourselves we create models which describe the reality to us using ideas we are familiar with. While creating the first models of the reality, we assume that it looks just as we can observe it – the Earth is flat, the Sun is moving in relation to the Earth. After some time the progress of science brings us to the conclusion that what can we see it is most often an illusion. Earth's seemingly flat surface turns out to be a sphere, it's not the Sun that rotates around the Earth but vice versa etc.
In this paper I wanted to ask the question concerning the relation between the "true" reality and the picture of it which we are able to observe, namely: are the observed time- and space dimensions the dimensions creating the true reality? At a first glance it seems that this is true. However, we have to realize that the dimensions themselves are not observable. What we are able to see this are the information not about the reality itself but about bodies in this reality. Moreover, we are receiving information about these bodies not directly but with the help of particles which are moving in a very strange way, from our point of view, namely with the velocity which is constant in all moving frames independently of their relative velocities. Can we then be sure that the time- and space distances between the bodies, which we are observing in such a strange way, are quite the same dimensions as the ones of which the reality is constructed?
The history of the progress of science shows that all forms existing in our world are as simple as possible. If the reality is really four dimensional, then the simplest form should be the four-dimensional Euclidean reality. However, the dimensions we are able to observe suggest that the

reality has a more complicated form – Lorentzian. Is the reality really Lorentzian or the Lorentzian shape of the reality is only an illusion, being the result of the only way of performing observations available to us, as the illusion of the motion of the Sun in the sky?

In order to answer these questions we will assume that the reality is as simple as possible, i.e. Euclidean, and we will look at the consequences of such an assumption.

From mathematical point of view, the assumption that **time is the fourth dimension** means that the time dimension is perpendicular to the three space dimensions – see fig.1.

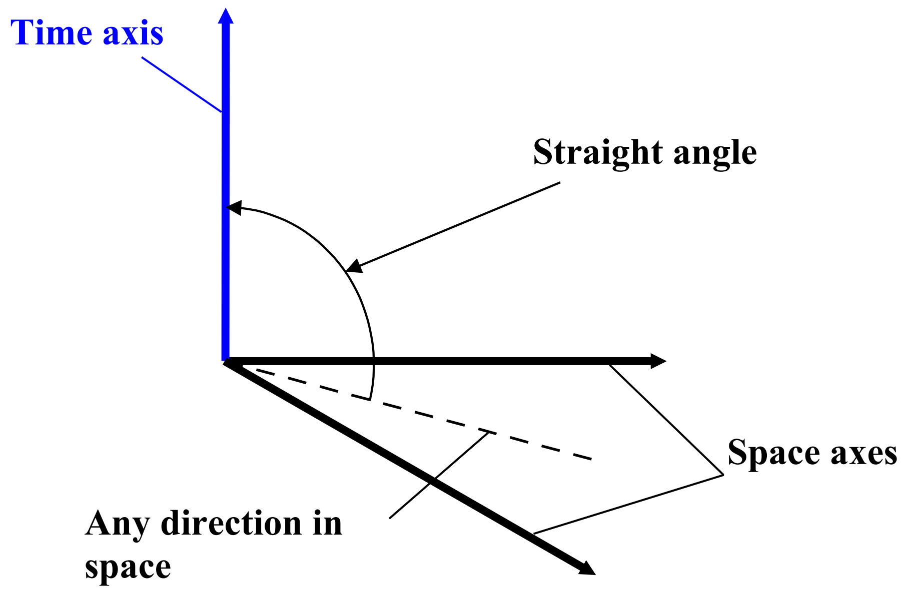

Fig. 1 Assumption that **time is the fourth dimension** means that the time dimension is perpendicular to the three space dimensions

As we know, in such four dimensional space the distance is measured according to different rules than in the three-dimensional space – see eq.1.
However, **in order to describe the fourth dimension with the help of time we do not have to assume that the time dimension is perpendicular to the three space dimensions. It is enough to assume that the time dimension is inclined to the three space dimension at any non-zero angle**. In such case, the fourth coordinate of the point in the four dimensional space is equal to the time multiplied by cosines of the angle between the time axis and the axis of the fourth dimension - fig.2

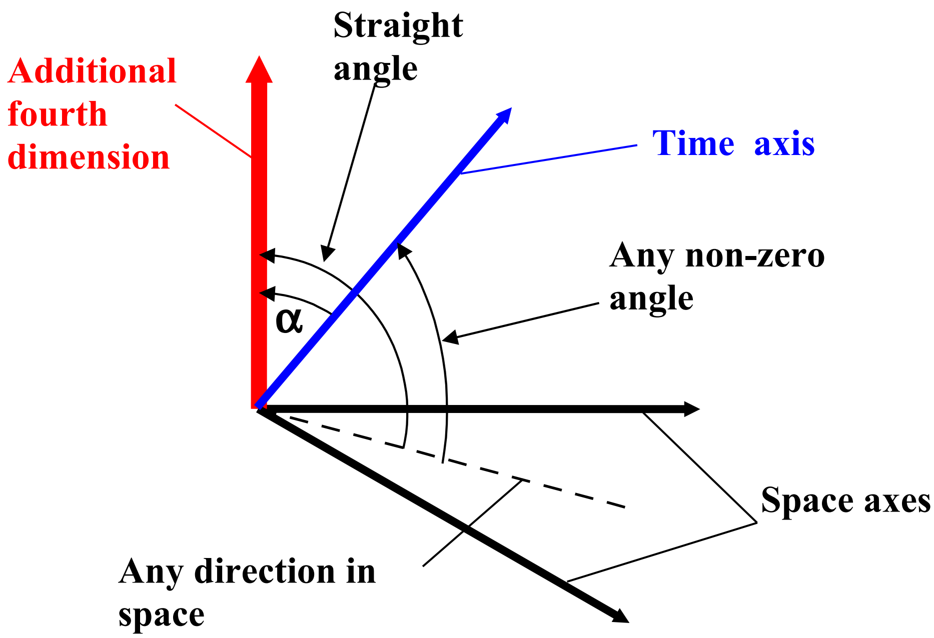

Fig. 2 The additional fourth dimension (perpendicular to the three-dimensional space) can be described with a vector of time inclined at any non-zero angle to the three-dimensional space. The coordinate measured along this additional dimension is equal to the coordinate measured along the vector of time multiplied by cosines of the angle between the vector of time and the axis of the additional dimension – in the fig the angle α*.*

Now, the additional fourth dimension together with the three space-dimensions can describe the Euclidean space; however, the time of the observer is not the fourth dimension of the new space any more. The time of the observer is now only a certain projection of this fourth dimension.

The principles of describing the Reality with the help of the Four-dimensional Euclidean Reality (FER) model

The rule which must be satisfied by coordinates of all coordinates systems is the rule of the space-time interval conservation, which is described with the formula:

$$ds^2 = dt^2 - dx^2 - dy^2 - dz^2 \quad \textbf{(1)}$$

If this formula, which is applied for the coordinate system presented in the fig. 1, ***ds*** denotes an element of distance in the space-time ***xyzt***. The distance measured according to this rule allows for the deforming of distances in such a space-time. The described situation is shown in the fig. 3 on two-dimensional example (one space- and one time-dimension).

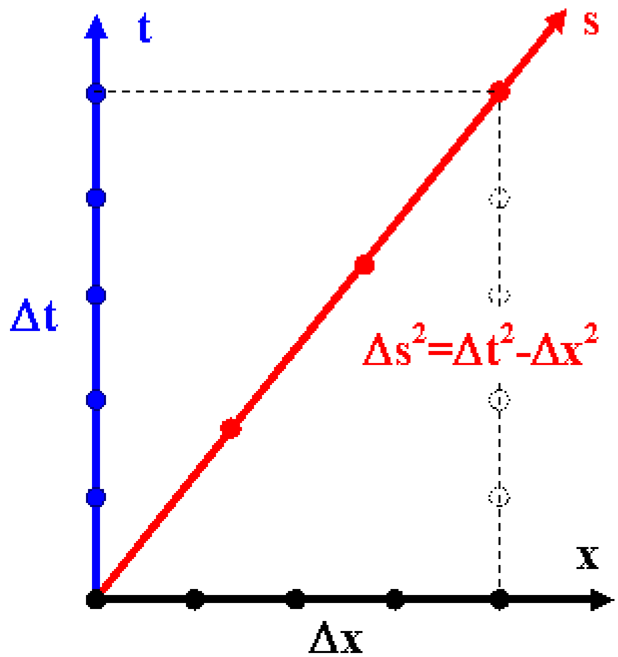

Fig.3 The example of deformation of the dimensions in the Lorentzian space-time. The distances Δs, Δx, Δt are equal to: 3, 4 and 5 respectively (in arbitrary units). It can be seen that if the distance is measured according to the eq.1, the segment Δs is stretched.

On the other hand, if we try to describe the equation 1 in the four-dimensional space according to the idea presented in the fig. 2 then the equation 1 should be rewritten as shown below:

(2)
$$dt^2 = ds^2 + dx^2 + dy^2 + dz^2$$

It can be seen that the time is now the distance, built of coordinates ***sxyz,*** in the four-dimensional Euclidean space**.** The fourth dimension of this space is now described by space-time interval ***s***. Since in the case of observation of the selected body the space-time interval is equal to the proper time of the body - ***s=t'*** - then, in practice, the fourth dimension will be described by the proper time of the observed body. In the new space the time of the observer is now the distance and the dimensions can not be deformed any more, because the distance is measured according to rules valid in the Euclidean space – see eq.2. The described situation, for two dimensional case, is presented in the fig.4.

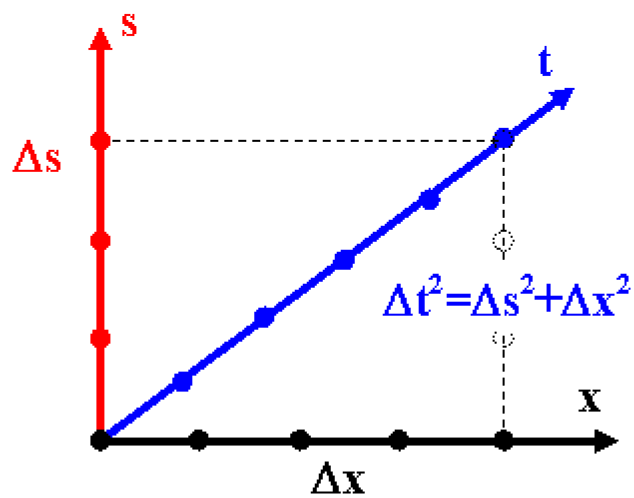

Fig. 4 If we ***reject the assumption that the time is perpendicular to the three space dimensions****, we will obtain the new model of reality in which the dimensions can not be deformed. The distances Δs, Δx, Δt are equal to: 3,4 and 5 respectively (in arbitrary units).*

Notice that in the case presented in the fig. 4 all dimensions have identical properties and the reality is Euclidean. The new **Four-dimensional Euclidean Reality** will be further denoted with the shortcut **FER**

How is the Four-dimensional Euclidean Reality (FER) constructed and why the observed picture of the FER is the four-dimensional Lorentzian space-time?

When introducing the new idea of the reality, we have to take certain properties of this reality as postulates. Let us start from the first one.

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

The dimensions in FER will be denoted with letters ***abcd*** (in order to emphasize that the dimensions of FER do not have the meaning of time or space assigned)

In this space (***abcd***), certain directions will be interpreted by observers as the space-directions and one direction will be interpreted as the time.

Postulate 2.
In the four-dimensional reality there exist bodies. The bodies move along certain trajectories, and all trajectories are allowed.

If we are talking about ***motion***, then we should have a certain idea of ***time*** already defined and the ***motion*** should be described in relation to this ***time.*** However, at this point none of the directions in FER has the meaning of time or space assigned yet.

In the further part of this paper I will introduce the notion of SUPERTIME, which flows with the same speed in frames of all particles, both observers and the observed bodies, independently from their relative motions. In practice, the SUPERTIME is not the fifth dimension but only a parameter being a certain superposition of time and space dimensions (which will be defined further). Since, in order to define the SUPERTIME, we need the definitions of the time- and the space dimensions, for the time being we will stay by the description of the variability of phenomena measured in relation to subsequent positions of an observer along its trajectory. Hence:

Postulate 3.
The length of a trajectory of an observer is the measure of their proper time, i.e. the body's clock indicates the length of the trajectory already passed by the body in FER.

It is known that in case of observation of a selected body, the space-time interval is equal to proper time of the body ***ds=dt'***. Therefore, the equation (2) can be written in the following form:

(3)
$$dt^2 = dt'^2 + dx^2 + dy^2 + dz^2$$

The equation describes observation of a ***body*** in the ***observer's*** frame where:
dt denotes the time which flows in the ***observer's*** frame
dx,dy,dz denote distances passed by the ***body*** in the observer's frame during the time interval ***dt***
dt' denotes proper time of the observed ***body***

From equation 3 we can draw the following conclusion:

Conclusion 1.
In the FER, directions interpreted by an observer as the space-dimensions – xyz – must be perpendicular to the trajectory of the observed body. The trajectory of the observed body is interpreted as the time axis of the observed body's frame –t'

The directions in FER interpreted as the space and time dimensions, which satisfies eq. 3, are presented in the fig. 5

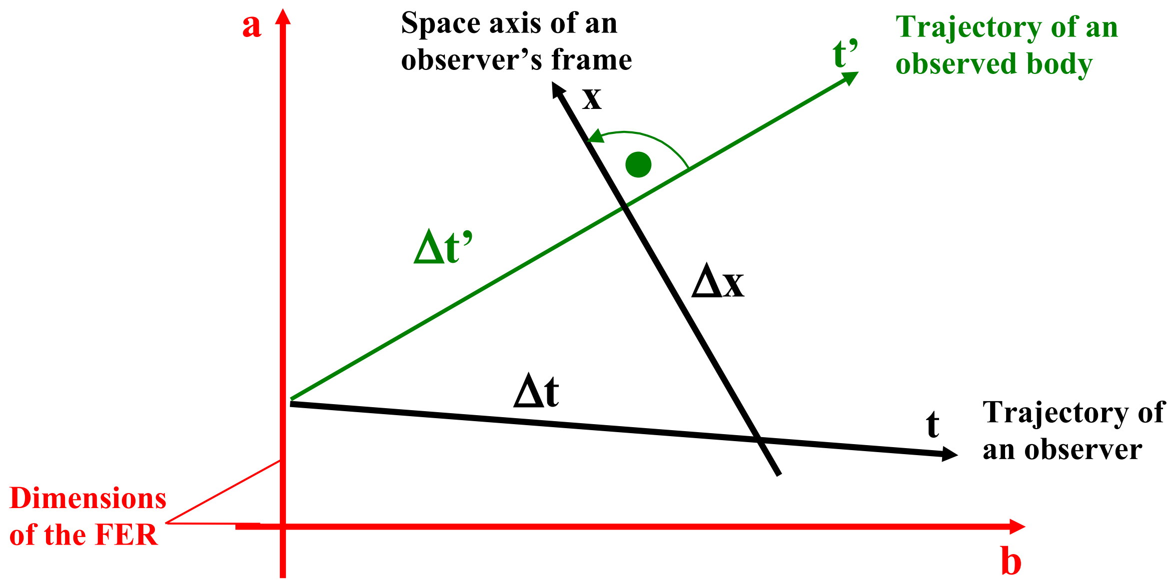

Fig. 5 Directions in the FER interpreted as the space- and time dimensions: directions interpreted as axes of time of the observer - t - and the observed body - t'- are their trajectories in FER. Direction interpreted as the space dimension – x – is perpendicular to the trajectory of the observed body. The dimensions xtt' satisfy the equation 3: $\Delta t^2 = \Delta x^2 + \Delta t'^2$.

As it has been shown in the fig. 5, the directions in FER interpreted as the time- and the space dimensions depend on the choice of observer and observed body according to the following rule:

Conclusion 2.
The time axis of an observer is their trajectory in the FER. The directions interpreted as the space dimensions are perpendicular to the trajectory of the observed body.

As it can bee seen in the fig. 5, the coordinate system constructed of space dimensions of the observer and time dimension of the observed body i.e. ***xyzt'*** is nothing else than the coordinate system ***abcd*** rotated by an angle depended on the trajectory of the observed body.

Therefore, we can either say that the FER is described by the ***xyzt'*** coordinates system or that it is described by the ***abcd*** coordinate system. In the further part of this paper the coordinates system ***xyzt'*** will be applied for describing the FER.
On the basis of the above considerations, we are able do determine the rules of the observations. The observation mechanism will justify the fact that, while existing in the Euclidean reality – FER - constructed of the coordinates ***abcd*** (or ***xyzt'*** as has been mentioned above), we get an impression that we are living in the Lorentzian reality constructed of dimensions ***xyzt***.

Observation

As it has been shown above, observation of a body needs defining the observer's reference frame in which the space axes are perpendicular to the trajectory of an observed object.
If one observer observes several bodies, then for each observed body different directions in the FER should be chosen as the space axes. It is presented in the fig. 6a and 6b.

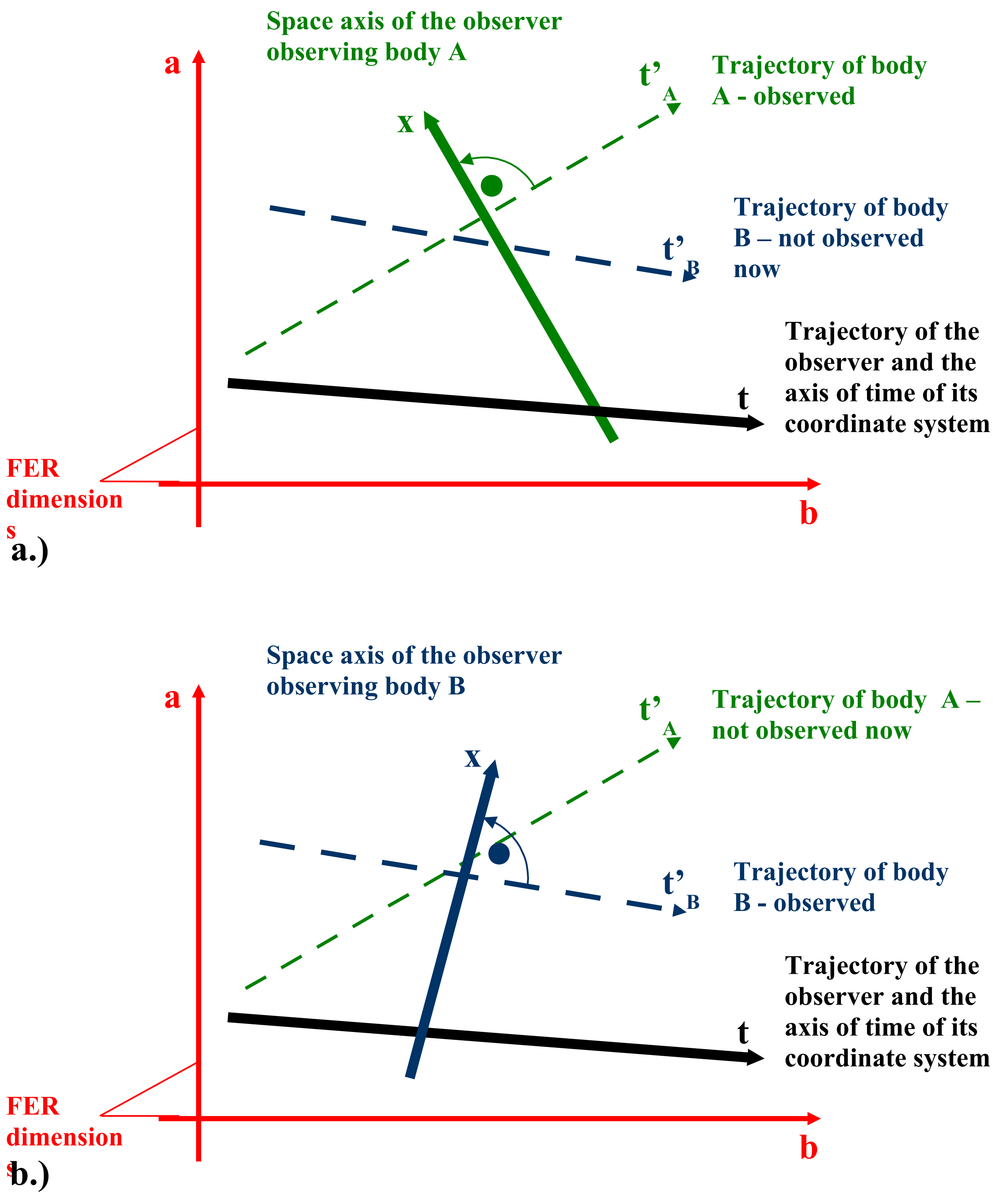

Fig. 6 Observation of bodies in FER. Two bodies are moving in FER along different trajectories. Choice of the direction in FER interpreted as the space axis of the observer's coordinate system depends on the currently observed body.
In the figure a.) the observer observes the body A and the direction interpreted as the space one is perpendicular to the trajectory of body A
In the figure b.) the observer observes the body B and the direction interpreted as the space one is perpendicular to the trajectory of body B

It means that there is no single coordinate system in which we are able to describe observation of all bodies. Observation of each body requires choosing another direction in the FER which will be treated by us as the space dimension. At this point we can ask the questions:

- **Why don't we notice that each body is observed in different coordinate system and instead we have the impression that we are observing all bodies as if they were in one and the same coordinate system?**
- **Why, living in the four-dimensional space, we have the impression that it is three-dimensional?**

Regardless of the real number of dimensions of the space in which we are living, the number of dimensions which we are able to register depends on the number of directions along which we are able to observe the motions of bodies surrounding us.

In the fig.6 each body can change its distance in relation to the observer only along the dimension interpreted as the space dimension of the observer. The case presented in the fig.6 corresponds to the observation of one dimensional space, despite the fact that the observer and the observed body exist in two-dimensional space.
We will have an analogous situation in the four-dimensional space – in such case we are able to observe changes of locations of bodies only along three directions (perpendicular to the trajectory of the observed body). Therefore, we get an impression that the body exists in a three-dimensional space.

One should notice that the observer in the fig. 6 during observations of bodies A and B is measuring only the distances from these bodies along different directions in the FER; however, he has no possibility of directly registering the direction of his space axis in the FER. Thus, the observer gets an impression that he is observing both bodies in one and the same coordinate system ***xt***.

In the four dimensional space each body is observed as if it was existing in three dimensional space. Since the picture of the reality is built of separate observations of bodies surrounding us, we get an impression that we are existing in three dimensional space, even though the reality is four-dimensional.

The relative velocity of bodies

According to the model presented here, directions of FER that we interpret as the time- and space-dimensions depend on the choice of an observer (the trajectory of the observer is the time-axis of his frame) and the observed body (space-dimensions are perpendicular to the trajectory of the observed body).

On the *Fig. 7* below are shown axes of the observer's co-ordinates system. Two observers observe one body. Observed velocities V_i are defined as $V_i = \frac{\Delta x_i}{\Delta t_i}$ and are (in the FER) equal to sinus of the angle between trajectories of the observer and of the observed body:

(4) $$V_i = \sin\varphi_i$$

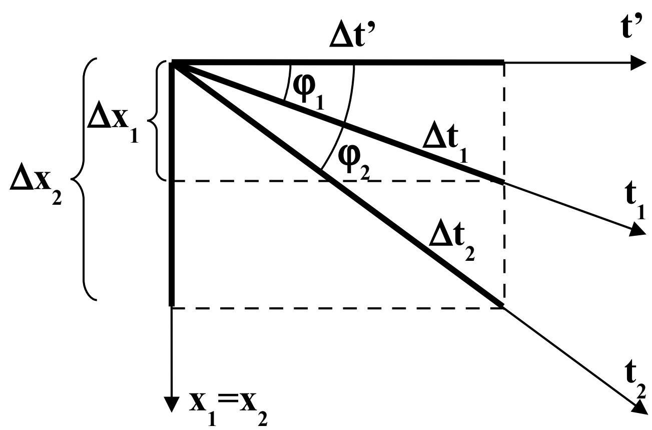

Fig. 7 Two observers in their own coordinate systems observe the motion of a body. The choice of an X-axis of the observer's coordinate system depends on the choice of the observed body – the X-axis is perpendicular to the trajectory of the observed body.

As we can see, thus defined velocity is limited by value **V=1** which corresponds to trajectories perpendicular to each other.

The speed of light

The observations are performed with help of potons In order to justify the observed constancy of the speed of light independently of the observer's motion, it is necessary to accept the following postulates:

Postulate 4: The trajectory of a photon is perpendicular to the trajectory of the body which emitted this photon.*

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

Postulate 5: The trajectory of a photon is carried along the trajectory of the observer.*

The trajectories* of photon in FER, which are the result of postulates 4 and 5, are shown in fig 8. The trajectory of the observed body (emitting the photon) is shown there, as well as the trajectories of two observers moving in relation to this body with different velocities. It is visible that, when the photon moves* along its trajectory* by $\mathbf{\Delta x_i}$, its trajectory is carried* along the trajectory of the body receiving the photon by $\mathbf{\Delta t_i}$. 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

* Notions "to move along trajectory" or "trajectory" are, in relation to quantum, only conventional notions; they are introduced temporarily in order to simplify the description of certain phenomena. They will be explained in detail in the further part of this paper

velocity of the photon, equal to **Δx/Δt**, 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:

Postulate 6: In vacuum and in absence of gravitational field $\Delta x_i=\Delta t_i$

So the velocity of propagation of the photon in empty and the uncurved space is equal to 1. We have to make such an assumption because the velocity of photon in non-curved vacuum is equal to the maximal velocity of bodies resulting from formula (4). 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*** *(formula 4)* ***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 postulates 4 and 5, the resultant trajectory of photon in FER will be different for every observer. The photons hitting the body A are carried along the trajectory of the body A, the photons hitting the body B are carried along the trajectory of the body B etc.

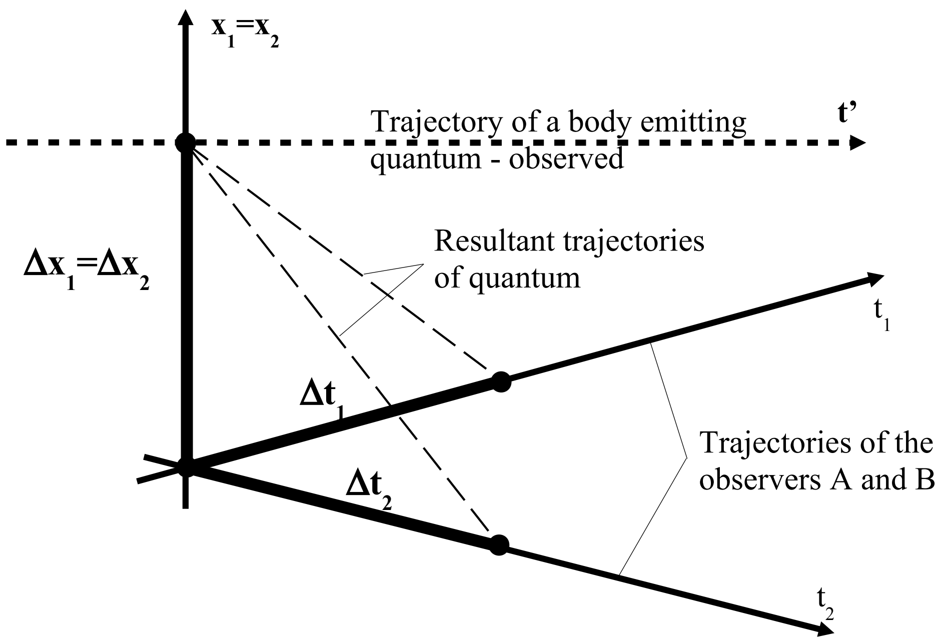

Fig. 8. Two observers watching one body with the help of a photon. The resultant trajectory of the photon is a composition of motion along the trajectory, perpendicular to the observed body (the space axis of the observers), and of carrying the trajectory along the trajectory of the observer. In vacuum and in the absence of gravitational field: $\Delta x_1=\Delta x_2=\Delta t_1=\Delta t_2$

It means that ***already in the moment of emission, the photon must "know" by which body it will be received.*** Hence:

1. The emission of photon 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 [14]. The ***photon cannot therefore be 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 photon must be a fictitious notion, because we are only able to know the points of emission and absorption of the photon. ***We are not able to examine the route of the photon*** or what happens with it between the emission and

absorption, because the photon 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 photon's emission, the place and the particle which the photon will hit is 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 [14] and [2]

The picture of reality proposed in this paper is very different from and has different properties than the well-known Lorentzian space-time. 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 which 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.

Singularities and their new interpretation.

Up to now it was assumed that the reality is Lorentzian. The distance in such reality is described by formula 1. According to this formula the distance ds can be equal to zero while the components dt, dx, dy, dz are non-zero values. In such cases zeroing of the ds value led to some singularities which were interpreted, in RT, as physical limitations of various phenomena. For instance, one such limitation is the impossibility of accelerting a particle to the speed of light, with use of a finite amount of energy.

Accepting the Euclidean reality significantly changes this situation. Now, the "true" reality is described with equation 2 or 3 which does not allow distance to be equal to zero while the components of this equations are non-zero values. Physically, it is equivalent to the absence of any singularities in Euclidean description.

In practice we can now divide the notion of the reality into the ***objective reality***, i.e. the Euclidean one described with equations 2 and 3, and the ***observed reality*** i.e. Lorentzian described with equation 1. The singularities which take place in the Lorentzian description, i.e. in the ***observed reality***, are no longer a real limitation for the physical phenomena. They are only the limitations concerning the observation. For instance, the above mentioned limitation of accelerating a body to the speed of light concerns the observation. The equations 2 and 3 allow to describe the acceleration of a non-zero-mass body to the speed interpreted as the speed of light; however, according to the equation 1, in the coordinate system ***xt*** it will not be possible to register such process.

The possibility of acceleratiing non-zero-mass bodies to the speed of light with use of a finite amount of energy results from the new rules of composition of the velocities.

New rules of composition of velocities and accelerating of particles to the speed of light.

Let us take into consideration a frame moving in relation to us with velocity V. Body A moves relative to this moving frame with velocity VA. What velocity of body A will we observe in our frame in rest?

ATTENTION: All dependences are expressed in coordinate system in which the speed of light C=1

According to SRT, the resultant, velocity of the body A as we observe it, equals V_{Ares} and is described with the equation::

$$V_{Ares} = \frac{V_A + V}{1 + V_A V}$$

(5)

As it can be easily seen, regardless of the velocity V_A (of the body A) and velocity of the moving frame *V*, the resultant velocity V_{Ares} is always smaller than the speed of light (which equals to 1 here).

According to the theory presented here, composition of velocities takes place according to different rules. The relative velocity of two bodies is described here using the angle between their trajectories. Composition of velocities consists of the sum of angles between trajectories. The described situation is shown in *fig. 9*

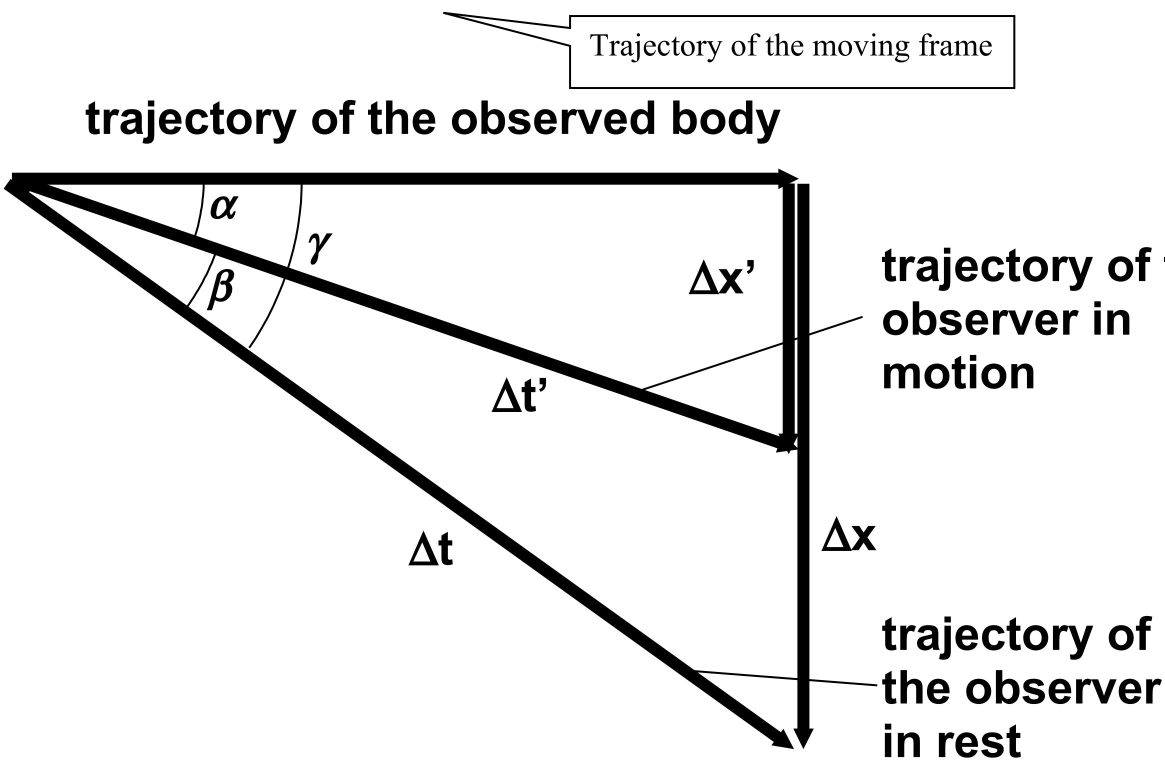

Fig.9 Composition of velocities according to the new model of reality:

- *The moving frame moves relative to the resting observer with velocity* $V = \sin\alpha$ *;*
- *The body A moves relative to* ***the moving frame*** *with velocity* $V_A = \sin\beta$ *;*
- *The body A moves relative to* ***the resting observer*** *with velocity* $V_{Ares} = \sin\gamma = \sin(\alpha + \beta)$

Hence, according to my model, equation 5, describing composition of velocities, should take the following form:

(6) $$V_{Ares} = \sin(\alpha + \beta)$$

where $V = \sin\alpha$, and $V_A = \sin\beta$

Therefore, formula (9) for composition of velocities can be written as follows:

(7) $$V_{Ares} = \sin\alpha\ \cos\beta + \cos\alpha\ \sin\beta = V\sqrt{1 - V_A^2} + V_A\sqrt{1 - V^2}$$

Neither of the formulas, which describe composition of velocities, i.e. formula 5 taken from SRT or formula 6,7 from this work, allows to exceed the speed of light limit. However, formulas 6,7 predict a case when one can reach the speed of light by way of the composition of velocities, while formula 4 does not.

Fig 10 below presents a chart showing the value of the resultant velocity V_{Ares} as a function of component velocities V and V_A for the case where these velocities are equal: $V = V_A$. The chart shows three curves for composition of velocities:

1. according to SRT,
2. according to the presented theory,
3. according to Galilean transformation.

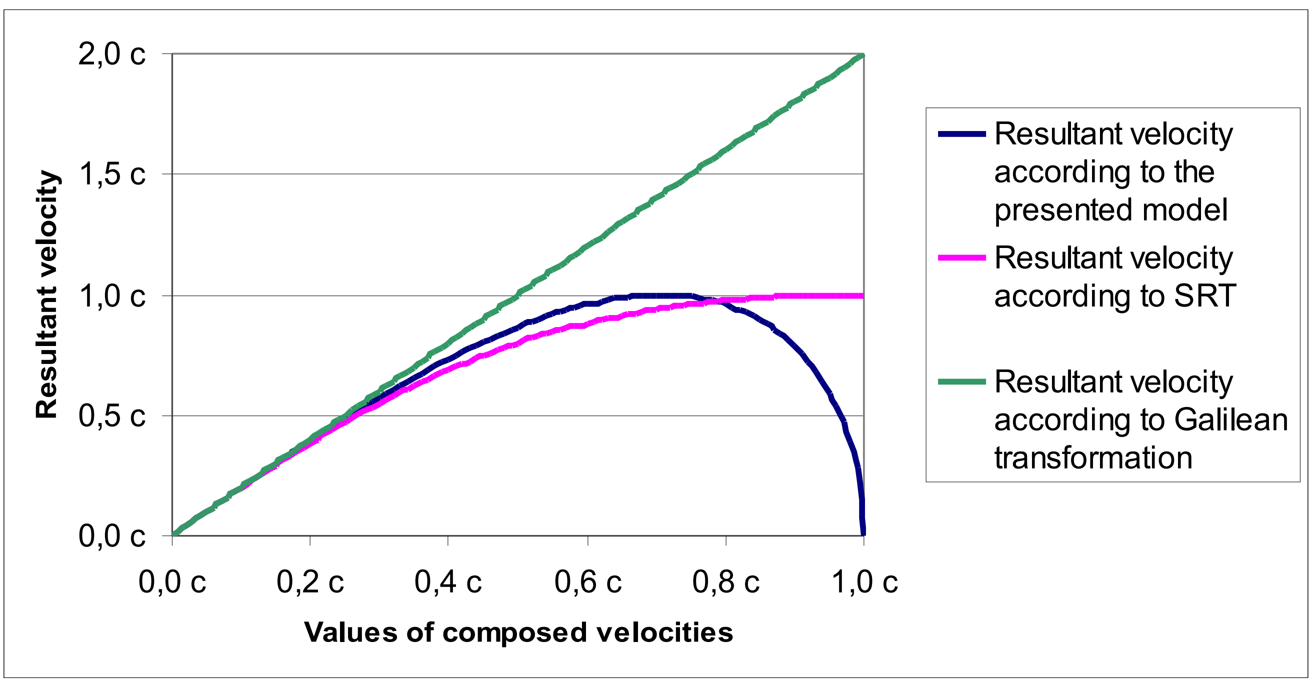

Fig.10 The resultant velocity as a function of composed velocities. Both composed velocities are equal. Three cases of composition of velocities are shown in the diagram: according to non-relativistic, Galilean transformation, according to SRT and according to the theory presented here.

According to my theory, the resultant velocity of the particle should be equal to the speed of light if both composed velocities are equal to approx. 0,7c,. **The increasing of the composed velocities causes decrease of the resultant velocity.**

As a result of such a summation we can obtain, for instance, the trajectory perpendicular to the trajectory of an observer. According to the formula (4), it is equivalent to the acceleration of the body to the speed of light; according to the SRT-model it is impossible. Further acceleration results probably in the inversion of the time flow in the particle's frame – Fig 10. 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 case, 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.

The time and the SUPERTIME

In the proposed model [1], bodies "move" in FER along their trajectories and during this "motion" they pass certain parts of the trajectories and only these passed parts are perceived as time and measured by clocks in the bodies' frames. If we use the idea of "motion", then we should introduce an additional "time-like" dimension, in relation to which the "motion" will be determined. This additional dimension will be called "THE SUPERTIME". It is common for all bodies. Introducing THE SUPERTIME will allow us to compare "velocities" of the motion of bodies along their trajectories, i.e. the speeds of the time flow in frames of these bodies.

1. The main property of THE SUPERTIME would be the ordering of events along the trajectory in FER – the subsequent positions on the trajectory should correspond to the subsequent values of THE SUPERTIME. Because photons move along their trajectories similarly to the bodies, the subsequent positions of photons along their trajectories should also correspond to the subsequent values of THE SUPERTIME.
2. THE SUPERTIME should flow identically (i.e. with the same speed) for all photons and bodies, independently of their relative motion.
3. THE SUPERTIME must include the fact that the time in the bodies' frames depends on their relative motion and the time in the quantum frame must be equal to zero.

The above mentioned properties of THE SUPERTIME are fulfilled with the T-value determined with the formula:

(8) $$dT^2 = \sum_{i=1}^{3} dx_i^2 + dt'^2$$

where:
x_i – i=1,2,3 space coordinates of the observer, x,y,z
t' – proper time of the moving body

It means that THE SUPERTIME is not an additional dimension in the sense of the well-known space-time dimensions. It is a value composed of the space and the time dimensions. Such a definition of THE SUPERTIME changes the understanding of the time flow.

Up to now, variability of events was related only to the changing of the body's position along the time dimension. Now the variability is determined by the change of the body's

position in FER – along the time dimension (the proper time of the observed body) and along the space dimensions.
Let's notice that the value of the SUPERTIME is the same for each body. Hence, if the body passes higher part of the road along the space dimension, it passes lower segment of the road along the time dimension – i.e. the time is flowing slower – and vice versa. A more detailed explanation of the constancy of the flow of the SUPERTIME is presented in [2].

Summarizing:
Since the flow of time in the frame of the body – dt' – and the change of the distance – dr – treated separately are relative quantities and depend on the choice of the frame, their composition, equal to $dT^2=dt'^2+dr^2$, is an absolute quantity and does not depend on the choice of the frame.
Hence, **THE SUPERTIME can characterize the body itself, independently from any observer**.

Since the time- and space-dimension are differently perceived during the observation, a complex notation can be used for separating of these dimensions. According to hitherto theories – for instance applied in electronics – the time dimension was denoted as the imaginary dimension. An angle between the trajectories is measured from the imaginary dimension (the time-dimension) and not, like in the ordinary complex notation, from the real one; then, finally, the SUPERTIME can be written in the following form:

(9) $$T = te^{i(\frac{\pi}{2}-\varphi)}$$

where t denotes the time of an observer $t^2 = \sum_{i=1}^{3} x_i^2 + t'^2$

Because the flow of the SUPERTIME in systems of all bodies is identical and identical flow of the SUPERTIME is equivalent, in practice, to passing the same distances in the FER by the bodies, we are considering, in practice, bodies moving with the same "velocity" in FER. The "velocity" defined in the FER as a SUPERVELOCITY is described in more detail in [2]. The constant „velocity" of all particles allows us to describe all the particles as a wave, which, in the medium with defined properties, propagates with constant velocity.

For instance, the simplest wave representing the particle can be expressed with the following formula:
(10) $$\psi = \exp(-T\omega) = \exp(-r\omega)\exp(-it'\omega)$$

where $\omega=m_0/\hbar$ (in FER c=1) for the described particle, and r – the distance from the maximum amplitude of the wave.

Next, in FER, where the singularities do not exist, t' for the real bodies can be expressed as a smooth function t'(t,r), so for the case of observation of a specified body by the specified observer and for straight trajectories, the following formula should be fulfilled:
(11) $$t' = t'dt'/dt' = \tfrac{1}{2}\, d(t'^2)/dt' = \tfrac{1}{2}\, d(t^2 - r^2)/dt' = tdt/dt' - rdr/dt'$$
the rest mass of the particle is equal to $m_0=\hbar\omega$ so the formula (10) can be written as follows:
(11) $$\psi = \exp(-rm_0/\hbar)\exp[-i/\hbar(m_0dt/dt't - m_0dr/dt'r)] = \exp(-rm_0/\hbar)\exp[-i/\hbar(Et - pr)]$$

This is the wave function, already well-known from Quantum Mechanics. Hence, the wave function which was used in the hitherto reality for describing the particle corresponds to the simple wave in FER. Therefore, it should be possible to describe all the quantum effects observed in our reality as a result of interactions of the waves in FER, whereas the macroscopic motions should correspond to propagation of the waves in FER along differently inclined trajectories. Additionally, the factor $\exp(-rm_0/\hbar)$ appears here. This factor causes the decreasing of the wave's amplitude, with increasing the distance from the particle, and the effect of the existence of the particle would be felt, in some ways, even at the very long distances from the particle. If the particles are disturbing space and this disturbance extends to infinity, then the natural consequence of this disturbance will be acting on the system of particles in order to decrease the global disturbance – i.e. the forces described till now as an effect of the existence of fields. If the disturbance described with the function f(T) was complicated enough, consisting for instance of several stretched and compressed regions of space, then we would expect that at different distances from the center of the wave, different mechanisms responsible for interaction between particles would dominate.

Conclusions

The model of the Euclidean Reality, presented in this paper, gives a new look at the well known problems of the Relativity Theory and allows to obtain a number of new conclusions which can be experimentally verified.

A trick, based on an assumption that the observed time- and space dimensions are not the dimensions creating the reality, but only their projections dependent on the relative motion of bodies, increases the capacity of the new model in relation to Relativity Theory. Additionally, application of the Euclidean model for describing the reality simplifies the description just by the fact that that in the considered Euclidean reality the deformation of dimensions does not exist, and therefore many problems can be presented with the help of geometrical interpretation, much simpler and more visual than pure equations of the Relativity Theory. The reality built of four identical dimensions, where each of the dimensions can be perceived as a time- or space one – depending only on the choice of the pair: observer and observed body, gives an alternative answer for questions, appearing from time to time, on why the time dimension, many similarities aside, differs from the space dimensions, and why there is no full symmetry between the time- and space dimensions.

The new model also describes a wide range of phenomena, from the motion of bodies and propagation of EM waves to the wave structure of matter, and – as it is shown in other papers [13] – to the cosmological problems as well. Hence, it is not only a new look at the hitherto problems but it also extends the description to the regions which couldn't be described within the boundaries of the Relativity Theory. All the problems are now described in simple and coherent way.

This simplification of the description of the reality was done at the cost of an assumption that the Euclidean Reality is not the reality which we can observe. Therefore, we have got the reality with a very simple structure and a mechanism of observation which makes us perceive the simple structure as much more complicated than it really is.

Is the presented model true? Up to now no experimental tests confirming the correctness of the model were performed; however, this article presented the mechanisms which allow to perform such experiments or take advantage of the results of the already existing experimental data, and I hope that such verification will take place soon.

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