THE NEW SPECIAL THEORY OF RELATIVITY

Dr. Valentin Ibañez Fernandez
e-mail: **valentin.ibanez.fernandez@gmail.com**

The abstract
The new special theory of relativity is given in work. It gives the new ideas of the processes occurring in systems of movement k . In it is developed the new universal transformation for classical mechanics and electrodynamics. All experimental practice of the wide range of moving systems shows the integrity of the findings in this work.
The postulate which the potential energy *of* the moving system depends on its velocity with the conservation law of energy of the moving system are sufficient enough to achieve a consistent theory of special relativity with only absolute time.

03.30. +p from *PACS 201*

Introduction

Special relativity tells us that observers who are in a state of uniform motion with respect to one another are in "inertial frames of reference", and that they cannot use the laws of physics to distinguish the frame of reference of one observer from the frame of reference of any other observer. In an inertial frame of reference, there is no physical experiment what so ever that you can perform that can distinguish between a state of rest and a state of constant velocity (if you are in an elevator, when it starts moving downward a ball released from your hand does not fly to the ceiling). If you are in a windowless room, there is no experiment that you can perform in that room that will tell you if the room is stationary, or is moving in some direction at a constant velocity, or is in uniform "free fall" acceleration. http://www.ws5.com/spacetime/

Special theory of relativity, describing the moving system, leads to the abstract concept of time $\tau = \beta(t - \upsilon x / c^2)$ [1, 2, 3, 4, and 5]. It still has not revealed himself in nature. The difference between absolute time of the system of rest t and relative time τ of the system of motion could not be discovered experimentally. In 1905 science did not possess the means of measurement.

In the twentieth century, the development of experimental physics has reached significant results. It allows you to register the movement of the earth in a stationary electromagnetic field. But until now did not expose itself in nature relative timeτ.

Give some examples:

In 1887, the experiment of Michelson Morley gave a result. The Earth has an orbital velocity 3*100000 m / sec...

The experiments were resumed, review of which can be seen in the works Shanklsnd Rev. Mod. Phys. 27. 167 (1955), etc. But the evidence of movement of the earth relative to a stationary electromagnetic field has not been established.

Opening in 1958 Moss bare effect of absorption and emission of gamma rays allowed comparing the frequency with remarkable precision. In 1963 in Birmingham an experiment was done on this method. The authors concluded that the land in relation to a stationary electromagnetic field has a velocity equal to zero.
This result had measurement error 1; 6 m / sec...

The similar results were obtained from subsequent experiments on different physical methods:

1963. D.C. Champeney, G.R. Isaak, A.M. Khan, Phys.Lett. 7, 241;
1964. C.H. Townas, Phys.Rev.133, A122;
1970. G.R. Isaak, Phys. Bull. 21,255

KINEMATICAL PART

The new special theory of relativity is given in work, which explains all these phenomena. It shown that the total potential energy of the moving system is depending on the velocity of the system and time does not depend on the velocity of the moving system.

Velocity of light in a moving system

Let us take a system of coordinates with velocity υ which has a system of particles and where the equation of Newtonian mechanics may be applied. In order to render our presentation more precisely and to distinguish this system of coordination verbally from others which will be introduced hereafter, we shall call it the *moving system* k .

If a material particle is at rest relation to this system of coordinates k , its position can be defined relatively there by the employment of rigid standards of measurement and the method of Euclidean geometry.

The potential energy of this system of particles depends on the velocity υ of the moving system k . During the movement the sum of kinetic energy T and potential energy U of this system is constant. The equations of Newton have the form:

$$\frac{d}{dt}\frac{\partial T}{\partial v_x}+\frac{\partial U}{\partial x}=0$$
$$\frac{d}{dt}\frac{\partial T}{\partial v_y}+\frac{\partial U}{\partial y}=0 \qquad 1)$$
$$\frac{d}{dt}\frac{\partial T}{\partial v_z}+\frac{\partial U}{\partial z}=0$$

Where ∇U is the gradient of the potential energy equal to

$$\nabla U=\frac{\partial U}{\partial x}dx+\frac{\partial U}{\partial y}dy+\frac{\partial U}{\partial z}dz$$

The equation (2) shows the applied force at any point on the moving system k, when the system k moves into the inertial system K which is at rest

$$\begin{cases} F_x = \frac{d}{dt}\frac{\partial T}{\partial v_x} \\ F_y = \frac{d}{dt}\frac{\partial T}{\partial v_y} \\ F_z = \frac{d}{dt}\frac{\partial T}{\partial v_z} \end{cases} \qquad 2)$$

Where: T is the kinetic energy of the point of the system in motion k, determined by the external force applied to the system in motion k;

$\bar{F}\{F_x, F_y, F_z\}$ - is the force applied to the stationary point of the system in motion k, caused by an outside force of the system which depends of velocity v of system k

$$T = \int \vec{F} \cdot d\,\vec{s} = m\int \frac{d\bar{v}}{dt}\bar{v}dt = \frac{m}{2}\int \frac{d}{dt}(v^2)$$

This equation and the gradient ∇U reveal the meaning of the dimension in all equations.

(Goldstein H, ¨Classical Mechanics¨, chap.1)

Any force $\bar{F}''$ applied to one particle in k changes the kinetic and potential energy of the system and produces an increase in the force on the particle:

$$\begin{cases} F'_x = F_x + F''_x \\ F'_y = F_y + F''_y \\ F'_z = F_z + F''_z \end{cases} \qquad 3)$$

Where: $\bar{F}''$ is the inner force of system k which acts on an arbitrary point and produces the motion of the point within the system k;

$\bar{F}'$ is the sum of the forces acting on an arbitrary point within the system$k$.

We have seen that the action of this force $\bar{F}''$ applied at one particle inside the system k produce vector sum of the forces acting on an arbitrary point within the system k

$$\bar{F}' = \bar{F} + \bar{F}'' \qquad 4)$$

The velocity of the particle in the moving system is product of forces.

So we can express the velocity of point $\bar{V}'$ in the moving system k as the sum of velocity $\bar{V}''$ - product of the force $\bar{F}''$ and the velocity $\bar{V}$ - product of the force$\bar{F}$. $\bar{V}' = \bar{V} + \bar{V}''$.

The law of conservation of energy applied inside of the moving system k *is* preserved for the energy of the electromagnetic waves, and we can express the velocity of light of the moving system k as the sum of velocity of light intro moving system $\bar{V}'' \equiv \bar{c}$ and the velocity of moving system $\bar{V} \equiv \bar{\upsilon}$

$$\bar{c}' = \bar{c} + \bar{\upsilon} \qquad 5)$$

Simultaneity

Accordingly with the theory of relativity [1] and [3-5] if we wish to describe the motion of a material point inside of the moving system k, we give the values of its coordinates as a function of time. Imagine we have a point $A \in k$ of the space where is a clock, an observer at A can determine the time values of the events in the immediate proximity of A by finding the position of the hands which are simultaneous with these events. If there is at a point $B \in k$ of the space another clock in all respects resembling the one at $A \in k$, it is possible for an observer at $B \in k$ to determine the time values of the events in the immediate neighbourhood of $B \in k$.

Yet, it is not possible without further assumption to compare, in respect of time, an event at $A \in k$ with an event at $B \in k$. We have so far defined only a "A time" and B time". We have not defined a common "time" for A and B, for the latter cannot be defined at all unless we establish by definition that the "time" required by light to travel from $A \in k$ to $B \in k$ be equal to the "time" it requires travelling from $B \in k$ too $A \in k$. Let a ray of light start at the "A time" t_A from the point $A \in k$ of the moving system towards the point $B \in k$, let it be reflected at the "B time" t_B at $B \in k$ of the moving system in the direction of $A \in k$, and arrive again at $A \in k$ at the "A time" t'_A. In accordance with the definition and in agreement with the experience, the two clocks synchronize if

$$t_B - t_A = t'_A - t_B \qquad 6)$$

The relativity of space and time

We are going to give further comments based on the principle of relativity and the principle of the velocity of light inside the moving system k [1]. We may formulate these three principles as follows:

The laws by which the states of a physical system undergo change are not affected when these changes of state are referred to the one or the other of two systems of coordinates in a uniform translator motion.

Any ray of light that moves into the moving system k in relation with the stationary system K has the velocity $\bar{c}' = \bar{c} + \bar{\upsilon}$, which we measure as $\bar{c}' = (c_x, c_y, c_z)$.

Consider a stationary rigid rod; its length l is measured by a measuring-rod which is also stationary. We now imagine the axis of the rod lying along the axis x of a stationary system of coordinates K and that a uniform motion of parallel translation with velocity $\bar{\upsilon}$ along the axis x in the direction of increasing x is then imparted to the rod. We now inquire as to the length to be ascertained by the following two operation:
a) The observer moves together with the given measuring rod and the rod to be measured, and measures the length of the rod directly by superposing the measuring rod

between of points $A \in k$ and $B \in k$, in just the same way as if all three were at rest.
b) By means of stationary clocks set up in the stationary system K and synchronized in accordance with **Simultaneity,** the observer ascertains at what points of the stationary system K the two ends of the rod to be measured are located at a definite time. The distance between these two points $A \in k$ and $B \in k$, measured by the measuring rod already employed, which in this case is at rest, is also a length which may be called "length of the rod".

In accordance with the principle of relativity the length found by the operation
a) will be called "the length of the rod in the moving system "it has to must be equal to the length l of the stationary rod. The length measured by the operation
b) will be called "the length of the moving rod in the stationary system". This is what we shall determine on the basis of our two principles, and we shall find that it differs from l.

We imagine further that at the two ends $A \in k$ and $B \in k$ of the rod, clocks are placed and that they are synchronized with the clocks of the stationary system, that is to say that their indications correspond at any instant to the "time of the stationary system" at the place where they happen to be. These clocks are therefore "synchronous in the stationary system"

We imagine further that with each clock there is a moving observer and that the observers apply to both clocks the criterion established in Simultaneity for the synchronization of the two clocks. Let a ray of light depart from $A \in k$, K at the time t_A, let it be reflected at the point $B \in k$ in the moving system which coincides with the point $C \in K$ of the stationary system at the time t_B. The reflected ray which is moving to the origin of k reaches the point $A \in k$ of the moving system and the point $D \in K$ of the stationary system at the time t'_A. We find

$$t_B - t_A = \left[\bar{l} + \bar{\upsilon}(t_B - t_A)\right] / \left(\bar{c} + \bar{\upsilon}\right), \quad t'_A - t_B = \left[\bar{l} - \bar{\upsilon}(t_B - t'_A)\right] / \left(\bar{c} - \bar{\upsilon}\right) \qquad 7)$$

where the distances $\bar{l} = \bar{r}_{AB} = \bar{r}_{BA} = \bar{c}(t_B - t_A) \in k$.

And we imagine the distances $\bar{\upsilon}(t_B - t_A) \in K$ and $\bar{\upsilon}(t'_A - t_B)$ were measured with a rigid measuring rod $\bar{l}$ in the stationary system K.

The length $\bar{r}_{AC}$ of the moving rod $\bar{l}$ in the stationary system K is

$$\bar{r}_{AC} = \bar{l} + \bar{\upsilon}(t_B - t_A) \in K \qquad 8)$$

Its length, measured with a ray of light with velocity $|\bar{c}| + |\bar{\upsilon}|$ which departs from $A \in k$ at time t_A and travels to the point $B \in k$ to rich it in the point $C \in K$ of the stationary system at time t_B, is

$$|\bar{r}_{AC}| = \left(|\bar{c}| + |\bar{\upsilon}|\right) \cdot \left(t_B - t_A\right) \in K. \qquad 9)$$

During time $(t_B - t_A)$ the point $A \in k$ moves to the point $A' \in K$

.The length of the moving rod $\bar{r}_{CD}$ in the stationary system K measured with the rod will be:

$$\bar{r}_{CD} = \bar{l} - \bar{\upsilon}(t'_A - t_B) \in K \qquad 10)$$

The length of the moving rod $|\bar{r}_{CD}|$ in the system K, measured with a ray of light that travels with a velocity $|\bar{c}| - |\bar{\upsilon}|$ reflected from the point $B \in k$ which coincides with the point $C \in K$ is

$$|\bar{r}_{CD}| = (|\bar{c}| - |\bar{\upsilon}|) \cdot (t'_A - t_B) \in K \qquad 11)$$

Hence we find the interval of time $t_B - t_A$:

$$|\bar{l}| = |\bar{r}_{AB}| = |\bar{r}_{AC}| - |\bar{r}_{BC}| = |\bar{c}|(t_B - t_A) \qquad 12)$$

So

$$t_B - t_A = |\bar{l}| / |\bar{c}| \qquad 13)$$

Where $|\bar{r}_{BC}| = |\bar{\upsilon}|(t_B - t_A)$ is the distance between the point $B \in k, K$ at the instant t_A departing from the point $B \in K$ and the point $C \in K$ with velocity $|\bar{\upsilon}|$ at the instant t_B?

The interval of time $t'_A - t_B$ that we obtain may be expressed as follows:

$$|\bar{l}| = |\bar{r}_{BA}| = |\bar{r}_{CD}| + |\bar{r}_{A'D}| = |\bar{c}|(t'_A - t_B) \qquad 14)$$

So

$$t'_A - t_B = |\bar{l}| / |\bar{c}| \qquad 15)$$

Where

$$|\bar{r}_{CD}| = (|\bar{c}| - |\bar{\upsilon}|) \cdot (t'_A - t_B) \in K \qquad 16)$$

is the distance between the points $A' \in K$ at the instant t_B departing from it and the point $D \in K$ with velocity $|\bar{\upsilon}|$ at the instant t'_A. Hence

$$(t_B - t_A) = (t'_A - t_B) = |\bar{l}| / |\bar{c}| \qquad 17)$$

That proves the time synchronization in the two systems according to

Simultaneity is

$$(t_B - t_A) = (t'_A - t_B) \qquad 18)$$

Theory of the transformation of coordinates of physical space.

Consider two systems of coordinates in a stationary space which has three perpendicular material lines going out from one point. The axes of Y and Z are respectively parallel and the axes of X of both systems are coinciding. It is assumed that all the clocks of the two systems and the measuring rod are in all respects identical. At this time the origin of one of the two systems, is moved in the direction of the increasing x of the other stationary system K with a uniform velocity υ. This velocity is transmitted to the axes of the coordinates, to the pertinent measuring rod, and to the clocks. A determined position of the axes of the moving system will correspond to the determined time t of the stationary system K, and for reasons of symmetry it is assumed that the motion of the moving system k is at the same time t parallel to the axes of the stationery system K.

Now let us conceive the space to be measured from the stationary system K by the method of the stationary measuring rod and from k by the measuring rod which is moving with it. In this case we obtain the coordinates x, y, z and ξ, η, ζ respectively. The clocks of the stationary system are measuring the time of all points through light signal in the way already explained in **Simultaneity.**

Using the method, given in **the relativity of space and time**, for the light signals between the points at which the clocks are located, the time of the moving system τ may be established for all the points of the moving system k at which there are clocks at rest in relation with that system. Assuming this condition, any system of values ξ, η, ζ, τ determining entirely an event relatively to the moving system k belongs to system of values x, y, z, t which defines the place and time of that event in the stationary system K.

Our assignment is to find the system of equation of transformation that connects these quantities. The equations have to be linear and be homogeneous.

If we set $x' = x - \upsilon t$, *it* is clear that this point at rest in the system k must have a system of values $x', 0, 0$ not depending on the time $t = (x - x')/\upsilon$. If light has the direction of υ, we can express the time of the moving system k as

$$\tau = x' / c_\xi \qquad 19)$$

In the system K the velocity of light to direction of υ is

$$c_\xi + \upsilon \qquad 20)$$

So symbols $x \in K$, $\xi = x' \in k$ is the trajectory of a ray of light for the initial conditions t = 0, and when the origin of the two systems coincide 0 = 0'.

The relation between the two systems of coordinates K, k is

$$\begin{cases} x_c = \xi_c + vt \\ y_c = \eta_c \\ z_c = \zeta_c \end{cases} \qquad 21)$$

Where sub index $_c$ denotes the coordinate point.

Let x ' be an arbitrary fixed point on the axis ξ of the moving coordinate system k. The point $x' \in \xi \in k$ coincides with the point $x' = x \in K$ when $t = 0$ and the origin of the two systems are identical $0 = 0'$.

Let's analyze the case when a ray of light propagates in the stationary system K.

Emit the ray of light from the origin $0 = 0'$ to the point x '.The ray of light travels the distance x ' during the time $t_1 = \frac{x'}{c_x}$. The ray of light travels the distance x ' and back during the time $t_2 = \frac{x'}{c_x} + \frac{x'}{c_x}$

According to the principle of time synchronization in any coordinate system, we can write the condition of time synchronization in a stationary coordinate system K

$$\frac{1}{2}(t_0 + t_2) = t_1 . \qquad 22)$$

Where: $t_0 = 0$; $t_1 = \frac{x'}{c_x}$; $t_2 = \frac{x'}{c_x} + \frac{x'}{c_x}$

Let's analyze the case when the beam of light propagates in the moving system k.

Emit a ray of light from the coordinate of origin 0 'at the point x' of system k.

Suppose that during an unknown time τ the ray of light reaches the point x '.

The velocity of light that a one observer measures inside of moving system k is defined as $c_\xi = \frac{x'}{\tau}$

This velocity of light that a one observer measures inside of the stationary system K is defined as $\overrightarrow{c_\xi} + \vec{\upsilon}$

The distance that the ray of light pass during the time τ in the system K is

$$x = \left(\overrightarrow{c_\xi} + \vec{v}\right)\tau \qquad 23)$$

Where

$$\tau = \frac{x'}{\overrightarrow{c_\xi}} \qquad 24)$$

According to the principle of time synchronization, we can write the conditions of time synchronization in the system as follows k

$$\frac{1}{2}(\tau_0 + \tau_2) = \tau_1 . \qquad 25)$$

Where: $\tau_0 = 0$, τ_1 is the time that beam of light take to pass the distance from the point $0'$ at the point x';

τ_2 - is the time that beam of light take to pass the distance from the point $0'$ at the point x' and back.

Define unknown time τ. The principle of synchronization of time must be conserved in the two systems K, k. We use a linear transformation of the moving system k in the stationary system K and vice versa. The condition of time synchronization in the system K is the equation (22). This condition must be preserved in the moving system k after the space transformation

$$A\left\{\frac{1}{2}(t_0 + t_2)\right\} = A \cdot t_1 \qquad 26)$$

Or

$$\frac{1}{2}(At_0 + At_2) = A \cdot t_1 \qquad 27)$$

In equation (27), we introduce the linear operator A (28) and times $t_0 = 0$, $t_1 = \frac{x'}{c_x}$, $t_2 = \frac{x'}{c_x} + \frac{x'}{c_x}$ and get equation (29)

$$A = \tau(x, 0, 0, t) \qquad 28)$$

$$\frac{1}{2}\left[\tau(0,0,0,t) + \tau\left(0,0,0,t + \frac{x'}{c_x} + \frac{x'}{c_x}\right)\right] = \tau\left(x', 0,0, t + \frac{x'}{c_x}\right). \qquad 29)$$

We can write the linear transformation operator as

$$A = \tau = a_{11}t + a_{12}x' \qquad 30)$$

Linear transformation operator A = τ can write in the differential form

$$A = \tau = \frac{\partial \tau}{\partial t}t + \frac{\partial \tau}{\partial x'}x' \qquad 31)$$

Where $a_{11} = \frac{\partial \tau}{\partial t}$ and $a_{12} = \frac{\partial \tau}{\partial x'}$.

Using the operator A (31) we rewrite Equation (29) in the following form

$$\frac{1}{2}\left(\frac{\partial \tau}{\partial t}t + \frac{\partial \tau}{\partial t}\left(t + \frac{x'}{c_x} + \frac{x'}{c_x}\right)\right) = \frac{\partial \tau}{\partial t}\left(t + \frac{x'}{c_x}\right) + \frac{\partial \tau}{\partial x'}x' \qquad 32)$$

$$\frac{1}{2}\frac{\partial \tau}{\partial t}t + \frac{1}{2}\frac{\partial \tau}{\partial t}t + \frac{1}{2}\left(\frac{x'}{c_x} + \frac{x'}{c_x}\right)\frac{\partial \tau}{\partial t} = \frac{\partial \tau}{\partial t}t + \frac{x'}{c_x}\frac{\partial \tau}{\partial t} + x'\frac{\partial \tau}{\partial t} \qquad 33)$$

$$\frac{1}{2}\left(\frac{x'}{c_x} + \frac{x'}{c_x}\right)\frac{\partial \tau}{\partial t} = -\frac{1}{2}\frac{\partial \tau}{\partial t}t - \frac{1}{2}\frac{\partial \tau}{\partial t}t + \frac{\partial \tau}{\partial t}t + \frac{x'}{c_x}\frac{\partial \tau}{\partial t} + x'\frac{\partial \tau}{\partial t} \qquad 34)$$

$$\frac{1}{2}\left(\frac{x'}{c_x}+\frac{x'}{c_x}\right)\frac{\partial \tau}{\partial t}=x'\frac{\partial \tau}{\partial x'}+\frac{x'}{c_x}\frac{\partial \tau}{\partial t} \qquad 35)$$

Hence, if x' be shoes infinitesimally small,

$$\frac{1}{2}\left(\frac{1}{c_x}+\frac{1}{c_x}\right)\frac{\partial \tau}{\partial t}=\frac{\partial \tau}{\partial x'}+\frac{1}{c_x}\frac{\partial \tau}{\partial t} \qquad 36)$$

Or

$$\frac{1}{2}\frac{1}{c_x}\frac{\partial \tau}{\partial t}=\frac{\partial \tau}{\partial x'}+\frac{1}{2}\frac{1}{c_x}\frac{\partial \tau}{\partial t} \qquad 37)$$

The solution of differential equation (37) is

$$\tau = t \qquad 38)$$

Where $\frac{\partial \tau}{\partial x'}=0$ и $\frac{\partial \tau}{\partial t}=1$

Insert the result 38) in equations (23), (24), we obtain the equations of transformation between two spaces K and k

$$x=\frac{\left(\vec{c}_\xi+\vec{v}\right)}{\vec{c}_\xi}\xi \qquad 39)$$

$$\xi=\frac{\vec{c}_x}{\left(\vec{c}_x+\vec{v}\right)}x \qquad 40)$$

Where $\vec{c}_x=\vec{c}_\xi$

The equations to translation the distance which pass the ray of light in the coordinates y, z are

$$y=\eta$$
$$z=\zeta$$

Finally we have the transformation of the space k in K and vice versa

$$\begin{cases} \vec{x}=\dfrac{\vec{c}_\xi+\vec{v}}{\vec{c}_\xi}\vec{\xi} \\ \vec{y}=\vec{\eta} \\ \vec{z}=\vec{\zeta} \\ t=t \end{cases} \qquad 41)$$

For mechanical processes instead of velocity of light $\vec{c}_x$ must be take the velocity of point V .

Any mechanical and electrodynamics motion in both systems can be described by superposition of elementary linear translational motion $\vec{r}' \in k, \vec{r} \in K$ and transformation (41).

Preliminary for the dynamics

Any position vector of any point in two systems can be presented as

$$\vec{r} = \frac{\vec{c}+\vec{v}}{\vec{c}}\overrightarrow{r'} \qquad 42)$$

where the direction of the vector $\vec{c}$ and $\overrightarrow{r'}$ at any instant are equal. Also $\vec{\xi}(t) = ct$

$$x(t) = \xi(t) + \frac{v}{c_\xi}\xi(t), y(t) = \eta(t), z(t) = \zeta(t) \qquad 43)$$

From the equation (42) we can represent the position trajectory vector of any moving point in two systems with the velocity

$$\frac{d\vec{r}(t)}{dt} = \frac{d\overrightarrow{r'}(t)}{dt} + \frac{v}{\vec{c}}\frac{d\overrightarrow{r'}(t)}{dt} \quad 44)$$

The acceleration of any moving point for two systems is

$$d^2r^{\to}(t)/dt^2 = \frac{d^2\overrightarrow{r'}(t)}{d^2t} + \frac{v}{\vec{c}}\frac{d^2\overrightarrow{r'}(t)}{d^2t} \qquad 45)$$

$$\vec{a}(t) = \frac{\vec{c}+v}{\vec{c}}\overrightarrow{a'} \qquad 46)$$

$$a_x(t) = \frac{c_\xi+v}{c_\xi}a_\xi(t),\ \ a_y(t) = a_\eta(t),\ \ a_z(t) = a_\zeta(t) \qquad 47)$$

Any force of the two systems satisfies relations

$$m\vec{a}(t) = \frac{\vec{c}+v}{\vec{c}}m\overrightarrow{a'}(t) \qquad 48)$$

$$\vec{F}(t) = \frac{\vec{c}+v}{\vec{c}}\overrightarrow{F'}(t) \qquad 49)$$

$$\overrightarrow{F_x}(t) = \frac{\vec{c}+v}{\vec{c}}\overrightarrow{F_\xi}(t),\ \ \overrightarrow{F_y}(t) = \overrightarrow{F_\eta}(t),\ \ \overrightarrow{F_z}(t) = \overrightarrow{F_\zeta}(t) \quad 50)$$

Conclusion

The manuscript presents a new special theory of relativity. Einstein introduced a new mathematical variable time τ which is not physically reasonable. In the present paper we find the physical principles of moving systems. This theory shows that the physical quantity τ does not exist in moving system. The time of the system k don't depend of the speed of the system. The moving system that moves in a fixed inertial system K obeys a law of the energy conservation. Inside of moving systems k it is appearing the new distribution of the forces that cause change of the laws of classical mechanics and electrodynamics.

Einstein does not disclose the physical meaning of the two times $\in k, t \in K$. He pointed out that the time in the moving system $\tau = \beta\left(t - {}^{vx}/_{c^2}\right)$ [1] is dependent from the speed v of the system. This phenomenon has not yet been found in practice. Einstein used the theoretical physical model of the binary star which had been known before (THE THEORY OF THE RELATIVITY OF MOTION BY RICHARD C. TOLMAN). The time on the star was different from the time of earth

$\tau = t + 2\frac{\upsilon}{c^2-\upsilon^2}x.$

The distance x at the binary star he replaced for a distance $x'/2$ on the axis $\xi \in k$. This representation of physical processes that occur in the model of a binary star and in the Einstein´s model do not in any way reveal the appearance of the new time τ in the moving system k . The value of τ is the information data of the compression time. For the condition that from two different points $0', x'$ of the coordinate ξ the light was transmitted with different speeds c - υ, c + υ. In this phenomenon does not exist any kind of physical relationship between time and speed of the moving system.

Einstein had the equation of the time

$$\tau = \alpha\left(t - \frac{\upsilon}{c^2-\upsilon^2}x'\right) \quad 51)$$

And knew that $\frac{\upsilon}{c^2-\upsilon^2} = \frac{1}{2}\left(\frac{1}{c-\upsilon} + \frac{1}{c+\upsilon}\right)$

He interpreted c –v and c + v, as the velocity of ray of light in opposite directions along the axis of $x \in K$. Developing the theory of synchronization, he justified the existence of mathematical expression $\frac{1}{c-\upsilon} + \frac{1}{c+\upsilon}$. Then he wrote down the differential equation whose solution is well-known formula (51)

$$\frac{1}{2}\left(\frac{1}{c-\upsilon} + \frac{1}{c+\upsilon}\right)\frac{\partial\tau}{\partial t} = \frac{\partial\tau}{\partial x'} + \frac{1}{c-\upsilon}\frac{\partial\tau}{\partial t} \quad 52)$$

Also he described the transformation of another linear system (x ', y, z, and t) not system K in the system k, which is error.

His theory has some significant drawbacks

For example:

1. The transformation is not inverse transformation.
2. The transformation may be used alone for coordinate ξ.
3. The transformation is based on two different physical methods.

   For the coordinates x, ξ the method of the double star. (THE THEORY OF THE RELATIVITY OF MOTION BY RICHARD C. TOLMAN)

   Another method of moving mirror is used for the coordinates, y, η and z, ξ. (THE THEORY OF THE RELATIVITY OF MOTION BY RICHARD C. TOLMAN).

   Consequently the 3D transformation did not right.

4. According to Einstein's theory.

   The ray of light reaches the point η_1 during the time τ

$$\eta_1 = c\tau \quad 53)$$

But

$$y_1 = \eta_1 \quad 54)$$

At the same time

$$y_1 = ct \quad 55)$$

$$t \neq \tau \quad 56)$$

It is incorrect.

5. The conclusion in paragraph 4 [1] is

$$R\sqrt{1-\frac{\upsilon^2}{c^2}}, R, R \qquad 57)$$

A moving solid object changes size

This affirmation is contrary to the known physical processes.

6. In paragraph 5 [1] ¨The composition of velocities¨.

¨

$$V_y = \frac{\sqrt{1-\frac{\upsilon^2}{c^2}}}{1+\frac{\upsilon\omega_\xi}{c^2}}\varpi_\eta \qquad 58)$$

The velocity V_y can not depend of υ.

Because when $\upsilon = 0,\ \omega_\xi = 0$

$$V_y = \omega_\eta \qquad 59)$$

This contradicts to the basic statement of time's change

$$\eta = \varpi_\eta \tau \neq y = V_y t \qquad 60)$$

7) As a result of these errors his equations of electrodynamics process also are wrong and have no solution.

So this work is new special theory of relativity. It gives the new ideas of the processes occurring in systems of movement k . In it is developed the universal transformation for classical mechanics and electrodynamics. All experimental practice of the wide range of moving systems shows the integrity of the findings in this work.

ELECTODYNAMICAL PART

Transformation of the Maxwell-Hertz Equation for Empty Space

We start from the fundamental equations of the theory of electrons [7]. Let $\overline{D}'$ and $\overline{H}'$ are corresponding derived fields, related with $\overline{E}'$ and $\overline{B}'$ through $\overline{P}'$ the polarisation, $\overline{M}'$ the magnetisation of the material medium of the moving system k , $\rho' \in k = \rho \in K$ the volume-density of the charge of an electron [1], $\overline{\omega}$ the velocity of a point of such a particle. Then, if we use a fixed system of co-ordinates of moving system in Hraviside - Lorentz systems of units [5] we can write

$$\nabla \cdot \overline{D}' = \rho' \qquad \nabla \cdot \overline{H}' = 0$$

$$\nabla \times \overline{H}' = \frac{\partial \overline{D}'}{\partial t} + \rho' \overline{\omega}$$

$$\nabla \times \overline{D}' = -\frac{\partial \overline{H}'}{\partial t} \qquad 61)$$

$$\overline{F}' = \overline{D}' + \frac{1}{c} \overline{\omega} \times \overline{H}'$$

We shall now suppose that the system k as whole moves in the direction of x with constant velocity υ, and we shall denote by $\overline{\omega}$ any velocity which a point of an electron may have in addition to this, so that

$$\omega_x = \upsilon + \omega'_\xi,\ \omega_y = \omega'_\eta,\ \omega_z = \omega'_\zeta$$

and $\{\omega'_\xi, \omega'_\eta, \omega'_\zeta\}_x$ is velocity of electron in k

Let to analyse the Lorentz's force $\overline{F}'$ in the moving system k [7]. Take, for example, the reciprocal electrodynamics action of Lorentz's force which appears with relative moving of electron and electromagnetic field. The observable phenomenon here depend only the relative motion of the electron and the electromagnetic field. For if the magnetic field is at rest and the electron in motion with the velocity υ, there arises Lorentz's force is $\overline{F}_1 = \upsilon \times \overline{H}$. If the electron is stationary and the magnetic field in motion with the velocity υ Lorentz's force leads to symmetry, which is inherent in the phenomena $\overline{F}_2 = \upsilon \times \overline{H}$. And if the magnetic field is in motion with velocity υ and the electron in motion with velocity υ the Lorentz's force don't exit $\overline{F} = \overline{\upsilon} \times (\overline{\upsilon} \times \overline{H}) = \overline{\upsilon} \cdot (\overline{\upsilon} \cdot \overline{H}) - \overline{H} \cdot (\overline{\upsilon} \cdot \overline{\upsilon}) = 0$

In equation 61)1) $\overline{D}'$ and $\overline{H}'$ are corresponding derived fields, related to $\overline{E}'$ and $\overline{B}'$ through the polarisation $\overline{P}'$ and the magnetisation $\overline{M}'$ of the material medium. As the field intro of media had been altered because of move of the electron, to deduce the equation of the electromagnetic wave we have to define a new quantity of displacement $\overline{D}'$, $\overline{D}' = \varepsilon' \ \overline{E}' + \overline{P}'$ and $\overline{E}' = \frac{\overline{D}'}{\varepsilon'} + \frac{\overline{P}'}{\varepsilon'}$. The electric field $\overline{E}'$ is the difference between of field $\frac{\overline{D}'}{\varepsilon'}$ that exit out of the polarisation, and the field $\frac{\overline{P}'}{\varepsilon'}$ that appears from the polarisation. For an isotropic linear homogeneous dielectric, which is the empty space $\overline{P}'$, $\overline{E}'$ have the same direction and is mutually proportional, resulting is that $\overline{D}' = \varepsilon' \ \overline{E}'$. In general, the response of empty space to magnetic field $\overline{B}'$ doesn't be different wary much from response of optic medium. It's enough say that the empty space become polarised. We may definer the magnetic polarisation $\overline{M}'$ as a magnetic dipolar moment intro a volume unity. Let introduction auxiliary vector $\overline{H}'$ as the magnetic field intensity $\overline{H}' = \mu'^{-1}\overline{B}' - \overline{M}'$. For an isotropic lineal (unferromagnetic) homogeneous media, $\overline{B}'$ and $\overline{H}'$ are parallel and proportional $\overline{H}' = \mu'^{-1}\overline{B}'$. Use of the constitutive equation (52) we can transform it in SI system of units [5, Appendix]

$$\nabla\cdot\overline{E}' = \frac{\rho'}{\varepsilon'} \qquad \nabla\cdot\overline{B}' = 0$$

$$\nabla\times\overline{B}' = \mu'\ \varepsilon'\ \frac{\partial\overline{E}'}{\partial t} + \mu'\ \rho'\overline{\omega}'$$

$$\nabla\times\overline{E}' = -\frac{\partial B'}{\partial t} \qquad 62)$$

$$\overline{F}' = \overline{E}' + \frac{1}{c}\left(\overline{\omega}'\times\overline{B}'\right)$$

Transformation of Maxwell's equation (62) for empty space, when convection-currents aren't takes in account $\rho'\overline{\omega}' = 0$ and $\varepsilon' = \varepsilon'_0$, $\mu' = \mu'_0$ satisfies following equation:

$$\begin{cases} \nabla\times\overline{E}' = -\dfrac{\partial\overline{B}'}{\partial t} \\ \nabla\times\overline{B}' = \varepsilon'_0\cdot\mu'_0\dfrac{\partial\overline{E}'}{\partial t} \end{cases} \qquad 63)$$

$$\begin{cases} \mu'_0\,\varepsilon'_0\dfrac{\partial E'_\xi}{\partial t} = \dfrac{\partial B'_\zeta}{\partial\eta} - \dfrac{\partial B'_\eta}{\partial\zeta} \\ \mu'_0\,\varepsilon'_0\dfrac{\partial E'_\eta}{\partial t} = \dfrac{\partial B'_\xi}{\partial\zeta} - \dfrac{\partial B'_\zeta}{\partial\xi} \\ \mu'_0\,\varepsilon'_0\dfrac{\partial E'_\zeta}{\partial t} = \dfrac{\partial B'_\eta}{\partial\xi} - \dfrac{\partial B'_\xi}{\partial\eta} \end{cases} \qquad 64)$$

$$\begin{cases} -\dfrac{\partial B'_\xi}{\partial t} = \dfrac{\partial E'_\zeta}{\partial \eta} - \dfrac{\partial E'_\eta}{\partial \zeta} \\ -\dfrac{\partial B'_\eta}{\partial t} = \dfrac{\partial E'_\xi}{\partial \zeta} - \dfrac{\partial E'_\zeta}{\partial \xi} \\ -\dfrac{\partial B'_\zeta}{\partial t} = \dfrac{\partial E'_\eta}{\partial \xi} - \dfrac{\partial E'_\xi}{\partial \eta} \end{cases} \qquad 65)$$

were $\mu'_0 \in k = \mu_0 \in K, \varepsilon'_0 \in k = \varepsilon_0 \in K$.

The Maxwell equation (63) has the coefficient $\varepsilon'_0 \mu'_0 = \dfrac{1}{c^2}$ that accounts the change of magnetic field in space and the change of the electric field in time inside of moving system k were observer stays. The principle of relativity requires that if the Maxwell equation (63) holds well in moving system k, they also hold well in system at rest K. If we apply to these equations (63) the transformation (49) which has been developed to electromagnetic process that moving with the velocity we obtain the equations

$$\nabla \times \overline{B} = \left(\frac{1}{\overline{c} + \overline{\upsilon}}\right)^2 \frac{\partial \overline{E}}{\partial t} \qquad 66)$$

$$\nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t}$$

where $\overline{E} = \dfrac{\overline{c} + \upsilon}{\overline{c}} \overline{E}'$, $\overline{B} = \dfrac{\overline{c} + \upsilon}{\overline{c}} \overline{B}'$ (see equation 49).

The equations of Maxwell of differential form 66) in co-ordinates in empty space of system K are

$$\begin{cases} \dfrac{1}{(c_x + \upsilon)^2} \dfrac{\partial E_x}{\partial t} = \dfrac{\partial B_z}{\partial y} - \dfrac{\partial B_y}{\partial z} \\ \dfrac{1}{c_y{}^2} \dfrac{\partial E_y}{\partial t} = \dfrac{\partial B_x}{\partial z} - \dfrac{\partial B_z}{\partial x} \\ \dfrac{1}{c_z{}^2} \dfrac{\partial E_z}{\partial t} = \dfrac{\partial B_y}{\partial x} - \dfrac{\partial B_x}{\partial y} \end{cases} \qquad 67)$$

$$\begin{cases} -\dfrac{\partial B_x}{\partial t} = \dfrac{\partial E_z}{\partial y} - \dfrac{\partial E_y}{\partial z} \\ -\dfrac{\partial B_y}{\partial t} = \dfrac{\partial E_x}{\partial z} - \dfrac{\partial E_z}{\partial x} \\ -\dfrac{\partial B_z}{\partial t} = \dfrac{\partial E_y}{\partial x} - \dfrac{\partial E_x}{\partial y} \end{cases} \qquad 68)$$

The equations (64), (65) for the system k and equations (67), (68)
for system K express the magnetic field and electric field connect mutually that propagation in empty spaces which is one individually unity and it is free of charges, currents and mater.

For deduction oscillatory aspect of electromagnetic field of two systems let to choose moving system k with characteristics $\varepsilon'_0 \, \mu'_0 = \dfrac{1}{c^2}$

$$\nabla \times \overline{E}' = -\frac{\partial \overline{B}'}{\partial t} \qquad 69)$$

$$\nabla \times \overline{B}' = \frac{1}{c^2}\frac{\partial \overline{E}'}{\partial t} \qquad 70)$$

and for stationary system K with characteristics $\varepsilon_0 = \varepsilon'_0 \, , \mu_0 = \mu'_0$ we have

$$\nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t} \qquad 71)$$

$$\nabla \times \overline{B} = \frac{1}{\left(\overline{c} + \upsilon\right)^2}\frac{\partial \overline{E}}{\partial t} \qquad 72)$$

We obtained the differential equations of the electromagnetic fields to two system k, K, which are the equations (69), (70) for moving system k, and equations (71), (72) for stationary spays K.

For find sinusoidal solution of the electromagnetic fields in stable state of two electromagnetic fields or a harmonics in time these equations are adequate. The fields $\overline{E}', \overline{B}', \overline{E}, \overline{B}$ are harmonicas in the time and are always generating when its sources of charges and currents have density, which vary by sinusoidal function in the time. Supposing that sinusoidal sources have been activated at enough time what for the components of the transitional fields have been declined to the level not significant than we can do one additional supposition which $\overline{E}', \overline{B}', \overline{E}, \overline{B}$ reach sinusoidal establish state.

At that moment $\overline{E}', \overline{B}', \overline{E}, \overline{B}$ vary with according with functions $\cos(\omega t + \theta_e)$ and $\cos(\omega t + \theta_b)$, where θ_e and θ_b are the arbitrary faces and ω is the angular frequency. If we suppose that the fields vary with according to complex exponential factors $e^{j\omega' t} \in k, e^{j\omega t} \in K$ we achieve other formulation of the equations. This supposition will lead us to one reduction of equations of the fields of space and time to equations of only space. The quantities of the two fields of two systems k, K present in form of real time we symbolise as

$$\overline{E}' = \overline{E}'(\xi, \eta, \zeta, t) \in k$$
$$\overline{B}' = \overline{B}'(\xi, \eta, \zeta, t) \in k \qquad 73)$$

$$\overline{E} = \overline{E}(x, y, z, t) \in K$$
$$\overline{B} = \overline{B}(x, y, z, t) \in K \qquad 74)$$

The linearity of the equation (69) – (72) guarantees that sinusoidal variation of the sources of the fields produces the fields, which in stable state too is sinusoidal. Then we can replacement the equations of space and time 69) – 72) for complex factor $e^{j\omega t}$

$$\overline{E}'(\xi, \eta, \zeta, t) \text{ Replace } \hat{E}'(\xi, \eta, \zeta) e^{j\omega' t} \qquad 75)$$
$$\overline{B}'(\xi, \eta, \zeta, t) \text{ Replace } \hat{B}'(\xi, \eta, \zeta) e^{j\omega' t} \qquad 76)$$

$$\overline{E}(x, y, z, t) \text{ Replace } \hat{E}(x, y, z) e^{j\omega t} \qquad 77)$$
$$\overline{B}(x, y, z, t) \text{ Replace } \hat{B}(x, y, z) e^{j\omega t} \qquad 78)$$

If we write the complex vectors $\hat{E}', \hat{B}', \hat{E}, \hat{B}$ in functions of system of co-ordinate ξ, η, ζ and x, y, z

$$\hat{E}'(\xi, \eta, \zeta) = \overline{a}_\xi \hat{E}'_\xi + \overline{a}_\eta \hat{E}'_\eta + \overline{a}_\zeta \hat{E}'_\zeta \qquad 79)$$
$$\hat{E}(x, y, z) = \overline{a}_x \hat{E}_x + \overline{a}_y \hat{E}_y + \overline{a}_z \hat{E}_z \qquad 80)$$

and insert equation (75) – (78) in the equations (69), (70) for system k and (71), (72) for system K we obtain for moving system k

$$\nabla \times (\hat{E}' \cdot e^{j\omega t}) = -\frac{\partial}{\partial t} (\hat{B}' \cdot e^{j\omega' t}) \qquad 81)$$

$$\nabla \times (\hat{B}' \cdot e^{j\omega' t}) = \frac{\partial}{\partial t}(\frac{1}{c^2} \cdot \hat{E}' \cdot e^{j\omega' t}) \qquad 82)$$

and for system at rest K

$$\nabla \times (\hat{E} \cdot e^{j\omega t}) = -\frac{\partial}{\partial t}(\hat{B} \cdot e^{j\omega t}) \qquad 83)$$

$$\nabla \times (\hat{B} \cdot e^{j\omega t}) = \frac{\partial}{\partial t}\left(\frac{1}{(\bar{c} + \upsilon)^2} \cdot \hat{E} \cdot e^{j\omega t} \right) \qquad 84)$$

The operators of partial derivatives $\nabla \cdot$ and $\nabla \times$ of the equations 81)-84) only affect the functions which depend of the space. Than $\frac{\partial}{\partial t}$ only operate on the common factors $e^{j\omega t}, e^{j\omega' t}$ of all fields. So the equations 81)-84) after of cancel the factors $e^{j\omega' t}, e^{j\omega t}$ transform for moving system k in

$$\nabla \times \hat{E}' \cdot = -j\omega' \hat{B}' \qquad 85)$$

$$\nabla \times \hat{B}' = j\omega' \frac{1}{c^2} \hat{E}' \qquad 86)$$

and transform for system at rest K in

$$\nabla \times \hat{E} = -j\omega \hat{B} \qquad 87)$$

$$\nabla \times \hat{B} = j\omega \frac{1}{(\bar{c} + \upsilon)^2} \hat{E} \qquad 88)$$

There are the complex harmonic equations of the electromagnetic fields to empty space of two systems which represent forms without the variable time t. Finding the complex solutions of the equations $\hat{E}'(\xi,\eta,\zeta), \hat{B}'(\xi,\eta,\zeta), \hat{E}(x,y,z), \hat{B}(x,y,z)$ that satisfy equations (85) – (88) we will restore the sinusoid dependence from time multiplying each depend complex solution of space by $e^{j\omega' t}, e^{j\omega t}$ and having the real part of result as for example follow $\overline{E}'(\xi,\eta,\zeta,t) = \mathrm{Re}\left[\hat{\overline{E}}'(\xi,\eta,\zeta)e^{j\omega' t}\right]$,

$\overline{E}(x,y,z,t) = \mathrm{Re}\left[\hat{\overline{E}}(x,y,z)e^{j\omega t}\right]$. Let's analyse the distribution of the waves propagating in two spaces which were emit at same time t from a source of emission from the one point of system k $P'(\xi,\eta,\zeta)$ which coincide with point $P(x,y,z)$ of system K. The complex harmonic forms of waves at time propagating in two spaces emitted from one source we can obtain from equations (85) – (88). For comparing and analysing propagation of two beams of light or monochromatic electromagnetic wave emitted at one instant in two systems k, K first we make analysing of the uniform plane wave's property. They maintain the uniform fields $\overline{E},\overline{B}$ on surface planes in any time. These planes choose arbitrary. Let define them for surface $\xi = const \in k$, $x = const \in K$. In these case the variation of $\overline{E}',\overline{B}'$ in moving system k, and $\overline{E},\overline{B}$ in the system at rest K are zero on the planes $\xi = const \in k$ and $x = const \in K$. These suppose that the fields don't depend from co-ordinates $\eta,\zeta \in k$ and co-ordinates $y,z \in K$ which signification that $\frac{\partial}{\partial\eta} = \frac{\partial}{\partial\zeta} = \frac{\partial}{\partial y} = \frac{\partial}{\partial z} = 0$ for everything of components of field. To the waves propagate in empty space its necessary supposition that density of charges and currents are zero in two systems k, K. Before of intent to extract solutions of the equations of waves we note that relation of rotation of the equations 85), 86) for the system k and 87), 88) for system K give us certain interesting properties of restrict solutions from previous suppositions that $\frac{\partial}{\partial\eta} = \frac{\partial}{\partial\zeta} = \frac{\partial}{\partial y} = \frac{\partial}{\partial z} = 0$. Supposing that six components of fields of two systems are present, the equations (85) – (88) of each field of two systems came to next.

For system k equation (85) takes place

$$\nabla \times \hat{E}' = \begin{vmatrix} \overline{a}_\xi & \overline{a}_\eta & \overline{a}_\zeta \\ \frac{\partial}{\partial\xi} & 0 & 0 \\ \hat{E}'_\xi & \hat{E}'_\eta & \hat{E}_\zeta \end{vmatrix} = \frac{\partial \hat{E}'_\zeta}{\partial\xi}\overline{a}_\eta + \frac{\partial \hat{E}'_\eta}{\partial\xi}\overline{a}_\zeta = -j\omega'(\overline{a}_\xi \hat{B}'_\xi + \overline{a}_\eta \hat{B}'_\eta + \overline{a}_\zeta \hat{B}'_\zeta) \qquad 89)$$

$$0 = \hat{B}'_\xi \qquad 90)$$

$$\frac{\partial \hat{E}'_\zeta}{\partial\xi} = -j\omega' \hat{B}'_\eta \qquad 91)$$

$$-\frac{\partial \hat{E}'_\eta}{\partial\xi} = -j\omega' \hat{B}'_\zeta \qquad 92)$$

In similar form la equation (26) takes place in system k

$$\nabla\times\hat{B}'= j\omega'\frac{1}{c^2}\hat{E}' \qquad 93)$$

$$\nabla\times\hat{B}'=\begin{vmatrix}\bar{a}_\xi & \bar{a}_\eta & \bar{a}_\zeta\\ \frac{\partial}{\partial\xi} & 0 & 0\\ \hat{B}'_\xi & \hat{B}'_\eta & \hat{B}_\zeta\end{vmatrix}=\frac{\partial\hat{B}'_\zeta}{\partial\xi}\bar{a}_\eta+\frac{\partial\hat{B}'_\eta}{\partial\xi}\bar{a}_\zeta = j\omega'\frac{1}{c^2}(\bar{a}_\xi\hat{E}'_\xi+\bar{a}_\eta\hat{E}'_\eta+\bar{a}_\zeta\hat{E}'_\zeta) \qquad 94)$$

$$0=\hat{E}'_\xi \qquad 95)$$

$$\frac{\partial\hat{B}'_\zeta}{\partial\xi}= j\omega'\frac{1}{c^2}\hat{E}'_\eta \qquad 96)$$

$$-\frac{\partial\hat{B}'_\eta}{\partial\xi}= j\omega'\frac{1}{c^2}\hat{E}'_\zeta \qquad 97)$$

For system K from (87) take place

$$\nabla\times\hat{E}=\begin{vmatrix}\bar{a}_x & \bar{a}_y & \bar{a}_z\\ \frac{\partial}{\partial x} & 0 & 0\\ \hat{E}'_x & \hat{E}'_y & \hat{E}_z\end{vmatrix}=\frac{\partial\hat{E}_z}{\partial x}\bar{a}_y+\frac{\partial\hat{E}'_y}{\partial x}\bar{a}_z=-j\omega(\bar{a}_x\hat{B}'_x+\bar{a}_y\hat{B}'_y+\bar{a}_z\hat{B}'_z) \qquad 98)$$

$$0=\hat{B}_x \qquad 99)$$

$$\frac{\partial\hat{E}_z}{\partial x}=-j\omega\hat{B}_y \qquad 100)$$

$$-\frac{\partial\hat{E}_y}{\partial x}=-j\omega\hat{B}_z \qquad 101)$$

In similar form for system K the equation (88) takes place

$$\nabla \times \hat{B} = j\omega \frac{1}{\left(\bar{c} + \upsilon\right)^2} \hat{E} \qquad 102)$$

$$\nabla \times \hat{B} = \begin{vmatrix} \bar{a}_x & \bar{a}_y & \bar{a}_z \\ \frac{\partial}{\partial x} & 0 & 0 \\ \hat{B}_x & \hat{B}_y & \hat{B}_z \end{vmatrix} = \frac{\partial \hat{B}_z}{\partial x} \bar{a}_y + \frac{\partial \hat{B}_y}{\partial x} \bar{a}_z = j\omega \frac{1}{\left(\bar{c} + \upsilon\right)^2} (\bar{a}_x \hat{E}_x + \bar{a}_y \hat{E}_y + \bar{a}_z \hat{E}_z) \qquad 103)$$

$$0 = \hat{E}_x \qquad 104)$$

$$\frac{\partial \hat{B}_z}{\partial x} = j\omega \frac{1}{c_y{}^2} \hat{E}_y \qquad 105)$$

$$-\frac{\partial \hat{B}_y}{\partial x} = j\omega \frac{1}{\left(c_x + \upsilon\right)^2} E_z \qquad 106)$$

To differential expressions (90) – (97) for the system k and differential expressions 99) – 106) for the system K, let apply the following property to find solutions:

1. Let get the directions of the fields done completely transversal to axes ξ, x.

2. For each system we produce two independent pares of fields $\hat{E}'_\zeta, \hat{B}'_\eta$ and $\hat{E}_z, \hat{B}_y$. This is case when doing $\hat{E}'_\eta = 0$ in (92) and $\hat{E}_y = 0$ in (101) we maintain the par of field $\hat{E}'_\zeta, \hat{B}'_\eta$ and $\hat{E}_z, \hat{B}_y$.

These properties reduce this differential equations (90) – (92) and (95) – (97) for system k only to equations

$$\frac{\partial \hat{E}'_{\zeta}}{\partial \xi} = -j\omega' \hat{B}'_{\eta} \qquad 107)$$

$$\frac{\partial \hat{B}'_{\eta}}{\partial \xi} = -j\omega' \frac{1}{c^2} \hat{E}'_{\zeta} \qquad 108)$$

and for system K to equations

$$\frac{\partial \hat{E}_z}{\partial x} = -j\omega \hat{B}_y \qquad 109)$$

$$\frac{\partial \hat{B}_y}{\partial x} = -j\omega \frac{1}{(c_x + \upsilon)^2} E_z \qquad 110)$$

The solutions of the field will be obtained to combine (107), (108) and (109), (110) and eliminate $\hat{E}'_{\zeta}, \hat{B}'_{\eta}$ $\hat{E}_z, \hat{B}_y$ which will the equations of the scalar wave.

From equations (107), (108) we obtain the equations of the wave in function of $\hat{E}'_{\zeta}$ in the system k

$$\frac{\partial^2 \hat{E}'_{\zeta}}{\partial \xi^2} + \omega'^2 \frac{1}{c^2} \hat{E}'_{\zeta} = 0 \qquad 111)$$

From equations (109), (110) we obtain the equations of the wave in function of $\hat{E}_z$ in the system K

$$\frac{\partial^2 \hat{E}_z}{\partial x^2} + \omega^2 \frac{1}{(c_x + \upsilon)^2} \hat{E}_z = 0 \qquad 112)$$

The solution of the equation (112) for system k is known as superposition of two exponential solutions

$$\hat{E}'_{\zeta} = \hat{C}'_1 e^{-j\beta'_0 \xi} + \hat{C}'_2 e^{j\beta'_0 \xi} \in k \qquad 113)$$

where $\hat{C}'_1$ and $\hat{C}'_2$ are the arbitrary complex constants, and $\beta'_0 = \omega' \cdot \frac{1}{c}$.

The exponent solutions $\hat{C}'_1 e^{-j\beta'_0\xi}$ and $\hat{C}'_2 e^{-j\beta'_0\xi}$ of equation (113) for moving system k give wave representation of electric field with constant amplitude which travel in the negative and positive directions respectively to axis ξ. Using symbols of amplitudes $\hat{E}'^{+}_{m}$ and $\hat{E}'^{-}_{m}$ instead of $\hat{C}'_1$, $\hat{C}'_2$ the solution of (113) for system k will be

$$E'_{\zeta}(\xi,t) = \mathrm{Re}\left[\hat{E}'_{\zeta}(\xi)\cdot e^{j\omega' t}\right] = \mathrm{Re}\left[\left(E'^{+}_{m}\, e^{j\Phi'+}\cdot e^{-j\beta'_0\xi} + E'^{-'}_{m}\, e^{j\Phi'-}\cdot e^{-j\beta'_0\xi}\right)\cdot e^{j\omega' t}\right] =$$

$$E'^{+}_{m}\cos(\omega' t - \beta'_0\,\xi + \Phi'^{+}) + E'^{-}_{m}\cos(\omega' t + \beta'_0\,\xi + \Phi'^{-}) \qquad 114)$$

The solution of the equation (112) in similar form gives us the form of the travel electromagnetic wave in real time E_z and B_y in system at rest K

$$\hat{E}_z = \hat{C}_1 e^{-j\beta_0 x} + \hat{C}_2 e^{j\beta_0 x} \in K \qquad 115)$$

where $\hat{C}_1$ and $\hat{C}_2$ are the arbitrary complex constants, and $\beta_0 = \omega\cdot\dfrac{1}{c_x + \upsilon}$.

The exponent solutions $\hat{C}_1 e^{-j\beta_0 x}$ and $\hat{C}_2 e^{-j\beta_0 x}$ of equation (115) for system at the rest K are wave representations of electric field with constant amplitude $E_m \perp x, \xi$ consequently $E_m = E'_m$. Using symbols of the amplitudes $\hat{E}^{+}_{m}, \hat{E}^{-}_{m}$ instead of $\hat{C}_1, \hat{C}_2$ the solution of (115) for system K will be

$$E_z(x,t) = \mathrm{Re}\left[\hat{E}_z(x)\cdot e^{j\omega t}\right] = \mathrm{Re}\left[\left(E^{+}_{m} e^{j\Phi+}\cdot e^{-j\beta_0 x} + E^{-}_{m} e^{j\Phi-}\cdot e^{-j\beta_0 x}\right)\cdot e^{j\omega t}\right] = \qquad 116)$$
$$E^{+}_{m}\cos(\omega t - \beta_0 x + \Phi^{+}) + E^{-}_{m}\cos(\omega t + \beta_0 x + \Phi'^{-})$$

The obtained travel waves of two systems k, K equations (114), (116) we can convert in following forms to analysing property of them propagation in the two systems. For simplicity the analysis we can use only positive direction of travel waves

$$E'^{+}_{m}\cos(\omega' t - \omega'\frac{1}{c}\xi + \Phi'^{+}) =$$
$$E'^{+}_{m}\cos[\omega'(t - \frac{\xi}{c}) + \Phi'^{+}] \qquad 117)$$

$$E^{+}_{m}\cos(\omega t - \omega\frac{1}{c_x + \upsilon}x + \Phi^{+}) =$$
$$E^{+}_{m}\cos[\omega(t - \frac{1}{c_x + \upsilon}x) + \Phi^{+}) \qquad 118)$$

It easy to see that if the source of two waves (117), (118) is same then $\Phi'^{+} = \Phi^{+}$ and the length of wave $\lambda \in K$ is $\lambda = \frac{c_x + \upsilon}{c_x}\lambda'$ that is simply transformation of distance ξ to x. Know the length of wave in two systems K, k we can find other characteristics of the wave in two systems

$$\frac{\overline{\lambda}}{\overline{\overline{c}} + \upsilon} = \mathrm{T} \in K = \mathrm{T}' = \frac{\overline{\lambda}'}{\overline{\overline{c}}} \in k$$

$$\frac{2\pi}{\mathrm{T}} = \frac{2\pi}{\lambda}(\overline{c} + \upsilon) = \omega \in K = \omega' = \frac{2\pi}{\lambda'}\overline{c} = \frac{2\pi}{\mathrm{T}'} \in k \qquad 119)$$

If we introduction $\Phi^{+} = \Phi'^{+}, x = \frac{c_x + \upsilon}{c_x}\xi, \omega = \omega'$ in the equation (118) of wave in system K we obtain the equation (117). Physically this signifies that wave emitted from origin of system K achieves any point $P'(\xi) = P(x)$ of two systems in same time that the wave emitted from origin of system k. This confirm verity of equations system of electromagnetic field in moving system k 69), 70) and equation system of electromagnetic field in system at rest K (71), (72). Introducing equation (113) in equation (107) we receive the form of the travel wave of the magnetic field of moving system k

$$\hat{B}'_{\eta}(\xi) = \frac{1}{c}\hat{E}_m^{+} e^{-j\beta'_0 \xi} - \frac{1}{c}\hat{E}_m^{-} e^{j\beta'_0 \xi} \qquad 120)$$

In similarly form, which we used to find the form of the electric field in real time we can find the form of magnetic wave

$$B'_{\eta}(\xi, t) = \frac{1}{c}E'^{+}_m \cos(\omega' t - \beta'_0 \xi + \Phi'^{+}) - \frac{1}{c}E'^{-}_m \cos(\omega' t + \beta'_0 \xi + \Phi'^{-}) \quad 121)$$

Doing the same proceeding for equation (115) and (109) we receive the form of magnetic wave in system K at real time

$$B_y(x, t) = \frac{1}{c_x + \upsilon}E'^{+}_m \cos(\omega t - \beta_0 \cdot x + \Phi^{+}) - \frac{1}{c_x + \upsilon}E^{-}_m \cos(\omega t + \beta_0 \cdot x + \Phi^{-}) \quad 122)$$

In the system of unite SI from the equation (62) we can write the Poynting's vector of plane wave for system K

$$\bar{S} = \frac{1}{\mu_0}\bar{E}\times\bar{B} = (\bar{c}+\upsilon)E^2\cdot\bar{s} \qquad 123)$$

where $\bar{s}$ is unitary vector in fixed direction and vector $\bar{c}+\upsilon$ coinciding with direction of $\bar{s}$.

For system k Poynting's vector of plane wave is

$$\overline{S'} = \frac{1}{\mu_0}\overline{E'}\times\overline{B'} = \bar{c}E^2\cdot\bar{s}' \qquad 124)$$

where direction of wave in system K, $\bar{s}$ is relation with direction of system k, $\overline{s'}$ of following manner $\bar{s} = \frac{\bar{c}+\upsilon}{\bar{c}}\overline{s}'$.

The Poynting's vector is the product of force. Its relation in two systems is

$$\bar{S} = \frac{\bar{c}+\upsilon}{\bar{c}}\overline{S'} \qquad 125)$$

In co-ordination form is

$$\begin{cases} S_x = \dfrac{c_x+\upsilon}{c_x}S_\xi \\ S_y = S_\eta \\ S_z = S_\zeta \end{cases} \qquad 126)$$

Evidently that equation (114), (56), (121), (122), (123), (124) express exactly the same distribution of electromagnetic field in two systems which satisfy the following equations

$$\Phi' = \frac{1}{4\pi}\int\frac{\rho'}{|\overline{r'}|}d\upsilon' = \frac{1}{4\pi}\int\frac{\rho}{\left|\bar{r}\left(\frac{\bar{c}}{\bar{c}+\bar{\upsilon}}\right)\right|}d\upsilon = \Phi \qquad 127)$$

$$\overline{A}'=\frac{1}{4\pi}\int\frac{\mu'_0\,J'}{\left|\overline{r}'\right|}d\upsilon'=\frac{1}{4\pi}\int\frac{\mu_0 J}{\left|\overline{r}\left(\frac{\overline{c}}{\overline{c}+\overline{\upsilon}}\right)\right|}d\upsilon=\overline{A} \qquad 128)$$

where $\overline{r}=\upsilon t+\overline{r}',\overline{r}'=ct$, $\overline{r}=\left(\overline{c}+\overline{\upsilon}\right)t$

The equations (114), (121), (124) denote the nature of the travel wave of the electromagnetic field in the moving system k. The move of the wave with the increasing time t is relation with factor of the phase β'_0 which appear in the expression of the wave, in which $\beta'_0\,\xi$ represent radian for meter. The distance ξ which have to cover the wave during of $2\pi\ rad$ of moving of the phase it's the wavelength λ'. It's defined as follow $\beta'_0\,\lambda=2\pi\ rad$. The length of the wave in empty space in moving system k is relation with factor β'_0 of phase by equation

$$\lambda_k=\frac{2\pi}{\beta'_0}=\frac{2\pi}{\omega'\cdot 1/c}=\frac{c}{f'} \qquad 129)$$

The velocity of the phase of the wave $\upsilon_{phase,k}$ in direction to the positive axis of ξ is defined by using one argument of the wave as one constant $\omega' t-\beta'_0\,\xi+\Phi'^{+}=constant$ and differentiating it by time

$$\upsilon_{phase,k}=\frac{d\xi}{dt}=\frac{\omega'}{\beta'_0}=\frac{\omega'}{\omega'\cdot 1/c}=c \qquad 130)$$

The equation (116), (122), (123) denote the nature of the travel wave of the electromagnetic wave in the system at rest K. Its length of wave design at

$$\beta_0\lambda=2\pi\ rad$$

$$\lambda=\frac{2\pi}{\beta_0}=\frac{2\pi}{\omega\cdot\frac{1}{c+\upsilon}}=\frac{c+\upsilon}{\overline{f}},\omega=\frac{2\pi(c+\upsilon)}{\lambda} \qquad 131)$$

$$\lambda_K=\frac{2\pi(c+\upsilon)}{\omega_K},\ \omega_K=\frac{2\pi(c+\upsilon)}{\lambda_K}$$

The velocity of the phase of the wave $\upsilon_{phase.K}$ in direction to the positive axis of x of system at rest K, we can define similarly

$$\upsilon_{phase.K} = \frac{dx}{dt} = \frac{\omega}{\beta_0} = \frac{\omega}{\omega \cdot \frac{1}{c+\upsilon}} = c + \upsilon \qquad 132)$$

Finally we can conclude that the velocity of propagation of the electromagnetic waves in two systems is different, the intensity of electromagnetic fields it's different too. Its relation is $\overline{E} = \frac{\overline{c} + \upsilon}{\overline{c}} \overline{E}', \overline{B} = \frac{\overline{c} + \upsilon}{\overline{c}} \overline{B}'$ in any point $P'(\xi, \eta, \zeta)$ of moving system k, which coincides with point $P(x, y, z)$ of system at rest K. The direction of the Poynting's vector of two systems which is transversal to electromagnetic field in each of the systems we can determinate as

$$\overline{E} \perp \overline{B} \perp \overline{S} = \frac{\overline{c} + \upsilon}{\overline{c}} \overline{S}' \qquad 133)$$

where the direction of vector $\overline{c}$ coincide with unitary vector in fixed direction $\overline{S}'$ to any point $P'(\xi, \eta, \zeta)$ of system k.

Consequently using equations (123), (124) we can find the characteristics of the electromagnetic fields of two systems.

Conclusion

The manuscript presents a new special theory of relativity. In the present paper we find the physical principles of moving systems. This theory shows that the physical quantity τ does not exist in moving system. The time of the system k don't depend of the speed of the system. The moving system that moves in a fixed inertial system K obeys a law of the energy conservation. Inside of moving systems k it is appearing the new distribution of the forces that cause change of the laws of classical mechanics and electrodynamics. How we can see since this paper it's impossible measured difference of time of propagation of wave intro moving system that had been confirmed by experiment of Michelson. The result of this theory of electrodynamics process is correct and has correct solution.

So this work is new special theory of relativity. It gives the new ideas of the processes occurring in systems of movement k. In it is developed the universal transformation for classical mechanics and electrodynamics. All experimental practice of the wide range of moving systems shows the integrity of the findings in this work.

References

1)A. Einstein " On the electrodynamics of moving bodies" Translated from " Zur Electrodynamik bewegter Koper", Annalen der Physik, and 17,1905
2)The article:" Weiterbildun der Maxwell'schen Theorie. Electonentheorie" Mathem.Encyclopadie, V, 14, §21,a.
3)The article "Electromagnetic Phenomena in a system moving any velocity, less than that of light" by H.A.Lorentz, The Academy of Sciences of Amsterdam, 6, 1904
4)Landau, L.D., E.M.Lifshitz, " Teoría Clásica de los Campos", vol. 2, Reverté, Barcelona, 1973

5)Jackson, J.D. ”Classical Electrodynamics” Wiley, New York, 1962
6)Valentín Ibáñez Fernández ”Remarks on the special theory of relativity in relation with some ideas of Banach and Schauder”, Seminar: Lvov Mathematical School in the Period 1915-45 as Seen Today, Mathematical Conference Center at Bedlewo (Poland), August 8-15,2005
7)V. Ibanez Fernandez. *Remarks on the special theory of relativity.* II. *Dynamics.* Bull. Soc. Sci. Lettres Lodz 57 Ser. Rech. Deform. 52 (2007), 149-163.
8)H. A. Lorentz, *Michelson's interference experiment.* Originally: *Versuch einer Theorie der elektrischen und oplischen Ersclicinungen in bewegten Korpern,* Leiden 1895.Secs. 89-92.
9)H. A. Lorentz, *Electromagnetic phenomena in a system moving with any velocity less than that of light*, Proceedings of the Academy of Sciences of Amsterdam 6 (1904).
10)William F. de Magic, *The primary concepts of physics,* Science, N.S. 35, no. 3 (1912). 281-293.