The special theory of relativity: critical remarks

(modified version of the article)

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Introduction

In the end of XIX century between two sections of physics - mechanics and electrodynamics - serious contradictions have arisen. On the one hand, in the classical mechanics the principle of a relativity Galilee, confirming full equality of systems of readout, moving rather each other rectilinearly and in regular intervals, was used. And on the other hand, in electrodynamics movement of particles and a field was described in absolute system of the readout which coordinates have been rigidly connected with ether.

The ether was understood as the environment filling world space in which there are all physical processes, including electromagnetic fluctuations. At that time it seemed to physicists that for reduction of classical mechanics in conformity with electrodynamics it is necessary to confirm existence of a radio wind only.

For the purpose of definition of size of a radio wind in 1881, 1886-1887 A.Majkelson and E.Morli had been made experiments. But experiments have yielded negative result: the radio wind has not been registered. As a result electrodynamics with the radio theory, appear reliably confirmed with experiences, was not coordinated with classical mechanics.

The exit from a current situation has been found by A.Ejnshtejn who in 1905 has created the special theory of relativity (STR). Taking from the classical mechanics a principle of equality of all inertial systems of readout (a relativity principle), and having made the assumption of a constancy of a velocity of light in vacuum (a principle of invariancy of a velocity of light), A.Ejnshtejn has established that space-time communication between inertial systems of readout is expressed by Lorentz's transformations, instead of Galilee.

STR exists already more than hundred years, even despite presence of a considerable quantity of its opponents. One of the reasons of survivability of STR is its simplicity. So, all kinematic part of STR is under construction on four elementary equations - Lorentz's transformations. And as the basis for STR following initial conditions serve:

- Symmetry of space and time (the space - is homogeneous and it is isotropic, and time – is homogeneous);
- The principle of a relativity asserting that in any inertial systems of readout all physical phenomena under the same conditions proceed equally, i.e. physical laws are independent (invariant) in relation to a choice of inertial system of readout, and the equations expressing these laws, have the identical form in all inertial systems of readout;
- The principle of invariancy of the velocity of light, asserting that a velocity of light in vacuum does not depend on light source movement, i.e. the velocity of light is identical in all directions and in all inertial systems of readout.

STR in a general view

Despite simplicity at STR one weak place is taken. It is a principle of invariancy of a velocity of light which has allowed to explain absence of registration of a radio wind in A.Majkelson and E.Morli's experiments.

There are critics of STR, not consent as with techniques of carrying out of experiments on registration of a radio wind, and with an explanation of results of experiments. If to assume, what they are right, in what it will result? To impossibility to apply a principle of invariancy of a velocity of light!

Not to get into dispute between supporters and opponents of STR, it is possible to arrive as follows. To establish: whether the theory in which STR would be a component is possible? Yes, it is possible to create such theory!

For difference we name this theory – the special theory of relativity in a general view or in abbreviated form STRGV. As initial conditions for creation STRGV it is possible to accept only symmetry of space and time and a principle of relativity.

Use of initial conditions allows to receive that in STRGV space-time communication between inertial systems of readout the same as and in STR, will be written down in the form of Lorentz's transformations. Only in case of STRGV the factor of proportionality **β** in Lorentz's transformations can have two values:

- For a case if value of factor of proportionality **β** lies in a range **β > 1**:

$$\beta = 1 / [1 - (V^2 / c_1^2)]^{1/2} \qquad (1)$$

- For a case if value of factor of proportionality **β** lies in a range **0 <β <1**:

$$\beta = 1 / [1 + (V^2 / c_2^2)]^{1/2} \qquad (2)$$

Where: **V** – speed of movement of inertial systems of readout rather each other,

c_1 and **c_2** – the valid constants.

It is possible to tell about the specified ranges of factor of proportionality **β** the following:

- At values of factor of proportionality **β**, lying in a range **β > 1**, there should be such speed **c_1** of movements of a point which would be invariant in any inertial system of readout;

- At values of factor of proportionality **β**, lying in a range $0 < \beta < 1$, there can not be a speed of movement of a point, invariant in any inertial system of readout.

STR can represent special case STRGV, when value of factor of proportionality **β** lies in a range **β > 1** if to assume that the constant **c_1** is equal to a velocity of light **c** in vacuum.

In STR for reception of dependences of weight, an impulse and kinetic energy of a body from its speed of movement laws of conservation of energy and an impulse were used by consideration of the closed mechanical system consisting of two bodies, testing unitary and limited in time the absolutely elastic or absolutely plastic collision, in inertial systems of readout at the moments of time before and after collision (also function of Lagranzha was applied to this purpose also).

Legality of application in inertial systems of readout of the specified laws speaks that the law of conservation of energy is connected with uniformity of time (this property of time is shown that in inertial systems of readout laws of movement of the closed mechanical system do not depend on a choice of a reference mark of time), and the law of preservation of an impulse is connected with uniformity of space (this property of space consists that in inertial systems of readout physical properties of the closed mechanical system and laws of its movement do not depend on a choice of position of a point of the beginning of coordinates of inertial system of readout).

Using by analogy with STR laws of conservation of energy and an impulse by consideration of the closed mechanical systems of the bodies testing collisions unitary and limited in time, it is possible to receive and for STRGV dependences of weight **M**, impulse **P** and kinetic energy **E** of the body moving with speed ***v*** and having weight of rest **M_0**:

$$M = \gamma \cdot M_0 \qquad (3)$$

$$P = \gamma \cdot v \cdot M_0 \qquad (4)$$

$$E = (\gamma^2 \cdot v^2 \cdot M_0) / (\gamma + 1) \qquad (5)$$

Where the proportionality factor **γ**, as well as proportionality factor **β**, will be defined from dependences:

- For a case if value of factor of proportionality **γ** lies in a range **γ > 1**:

$$\gamma = 1 / [1 - (v^2 / c_1^2)]^{1/2} \qquad (6)$$

- For a case if value of factor of proportionality **γ** lies in a range **0 <γ <1**:

$$\gamma = 1 / [1 + (v^2 / c_2^2)]^{1/2} \qquad (7)$$

For comparison in tables 1 and 2 major importances of weight **M**, impulse **P** and kinetic energy **E** of a body depending on size of its speed ***v*** are resulted:

- For values of factor of proportionality **γ**, lying in a range **γ > 1**:

Table 1

Speed ***v***	Weight **M**	Impulse **P**	Kinetic energy **E**
$v << c_1$	M_0	$M_0 \cdot v$	$(M_0 \cdot v^2)/2$
$v < c_1$	Has the valid value	Has the valid value	Has the valid value
$v = c_1$	∞	∞	∞
$v > c_1$	Has no valid value	Has no valid value	Has no valid value

- For values of factor of proportionality **γ**, lying in a range **0 <γ <1**:

Table 2

Speed ***v***	Weight **M**	Impulse **P**	Kinetic energy **E**
$v << c_2$	M_0	$M_0 \cdot v$	$(M_0 \cdot v^2)/2$
$v < c_2$	Has the valid value	Has the valid value	Has the valid value
$v = c_2$	$M_0/2^{1/2}$	$(M_{0o} \cdot c_2)/2^{1/2}$	$M_0 \cdot c_2^2 \cdot (1-1/2^{1/2})$
$v > c_2$	Has the valid value	Has the valid value	Has the valid value
$v = \infty$	Aspires to zero	$M_0 \cdot c_2$	$M_0 \cdot c_2^2$

Apparently from tables 1 and 2 values of factor of proportionality in ranges **γ > 1** and **0 <γ <1** are equivalent since in both cases boundary conditions for small speeds are satisfied.

Theoretical check of STRGV

Having two possible values of factor of proportionality **β** (and **γ**), it would be desirable to define: what of its values represents the facts? After all there can not be simultaneously two variants of space-time communication between two inertial systems of readout for the same speed of their mutual movement.

That it to make, it is necessary to choose, on what it is possible to lean, on what physical laws? The best variant is again to use laws of preservation of an impulse and energy for the closed system of bodies. As they were already applied at definition of dependences of weight, an impulse and kinetic energy of a body from speed of its movement.

Laws of preservation of an impulse and energy assert that the impulse and energy of the closed mechanical system (on which external forces do not operate) do not change eventually, i.e. in any inertial system of readout for any moment of time the vector of an impulse and size of energy of the closed mechanical system are constant (since there is no external influence).

Other very important question: what to consider? For definition of dependences of weight, an impulse, kinetic energy of a body from speed of its movement (the formulas (3) - (5)) the closed mechanical system of the bodies which interaction had the character single and limited in time that has allowed to choose two events in inertial systems of readout was used: the first event - prior to the beginning of interaction of the bodies, the second event - after the ending of interaction of bodies.

Then it is possible to ask a lawful question: whether will provide in inertial systems of readout these dependences of an impulse and kinetic energy of a body on speed (the formulas (4) - (5)) performance of laws of preservation of an impulse and energy of the closed system of bodies at which interaction has constant character on time?

To check up it, it is possible to consider the elementary example (something similar to a school example on an explanation of centrifugal force by means of two buckets with water). We

will admit that there is the closed mechanical system consisting of two bodies 1 and 2, connected among themselves thread 3 and having equal weight at rest.

In inertial system of readout **K** in which the center of weights of this closed mechanical system is motionless, bodies 1 and 2 (and a thread keeping them 3) rotate with angular speed **ω** round the general center of weights. And the distance from a body 1 or bodies 2 to the center of weights of the system, consisting of bodies 1 and 2 and thread 3, is equal ***R***.

I think that there is no doubt concerning that for any moment of time **t** in inertial system of readout **K** an impulse and kinetic energy of the system, consisting of bodies 1 and 2 and thread 3, are constant. Since in inertial system of readout **K** laws of preservation of an impulse and energy of the closed mechanical system should be carried out. And absence of change of kinetic energy of the system, consisting of bodies 1 and 2 and thread 3, in inertial system of readout **K** is connected with impossibility of change potential energy at bodies 1 and 2 and threads 3.

Also we will assume that there is an inertial system of readout **K'**, moving concerning inertial system of readout **K** with some speed **V** in a plane parallel to a plane of rotation of bodies 1 and 2.

Setting concrete values of sizes of weights of rest of bodies 1 and 2 and threads 3, speed **V** and angular speed **ω**, the digital mark of values of impulse **P'** and kinetic energy **E'** of the mechanical system consisting of bodies 1 and 2 and thread 3, in inertial system of readout **K'** for various values of the moment of time **t'** has been spent.

The carried out digital calculation has shown that in inertial system of readout **K'** a vector of impulse **P'** and kinetic energy **E'** of the closed mechanical system, consisting of bodies 1 and 2 and thread 3, are the variables which values periodically change depending on value of time **t'**. I.e. in inertial system of readout **K'** a vector of impulse **P'** and kinetic energy **E'** represent time functions **t'**, and it contradicts laws of preservation of an impulse and energy, since according to laws of preservation of an impulse and energy in inertial system of readout the impulse and energy of the closed mechanical system necessarily should be constants.

And infringement of laws of preservation of an impulse and энергий took place as for a case when values of factors of proportionality **β** and **γ** lie in ranges **β > 1** and **γ > 1**, and for a case when values of factors of proportionality **β** and **γ** lie in ranges **0 <β <1** and **0 <γ <1**.

Infringements of laws of preservation of an impulse and энергий in the considered example also have been noted in article of the associated editor of magazine «Physics Essays» doctor Michael H. Brill (Brill M.H., Cochetkov's speeding bola: yet another entanglement for special relativity, NPA Conference, june 2010, Long Beach, CA).

Moreover, theoretical calculations show that in inertial system of readout **K'** for the closed mechanical system, consisting of bodies 1 and 2 and thread 3, laws of preservation of an impulse and energy will be carried out only in a case, when constants $\mathbf{c_1}$ and $\mathbf{c_2}$ are equal to infinity. I.e. performance of laws of preservation of an impulse and energy in the given example probably only when space-time communication between inertial systems of readout **K** and **K'** is expressed by transformations Galilee (**β = 1**) irrespective of the fact which value has proportionality factor speed **V**.

As a result it turns out that attempt to define the valid value of factor of proportionality **β** has led to unexpected result: in inertial systems of readout at values of factor of proportionality **β**, lying in ranges **β > 1** and **0 <β <1**, default of laws of preservation of an impulse and energy of the closed mechanical system is possible.

But if application of STR (and STRGV) by consideration of separate examples of the closed mechanical systems can lead to infringement of laws of preservation of an impulse and energy in inertial systems of readout, it is necessary only - to choose one that is more important: compulsion of performance of STR or compulsion of performance of basic physical laws – laws of preservation of an impulse and energy?

The author is more inclined to necessity of performance of two last laws.