I. Zuiev

Research supervisor: A.V. Zinovchuk

Candidate of Physical and Mathematical Sciences,

Associate Professor

Zhytomyr Ivan Franko State University

Language tutor: O.E. Kravets

PhD (pedagogical sciences),

Associate Professor

THE GALILEAN AND LORENTZ TRANSFORMATIONS

My article deals with time-space paradoxes which are the consequences of the special relativity and Lorentz transformations. However in order to understand this phenomen one must firstly understand the Galileo transformations.

The Galilean transformations are so called transformations of coordinates and time, which are used in Newtonian mechanics. It is used in the transition from one reference system to another relatively moving system which has a constant velocity (V). Galilean transformations are based on the axioms of absoluteness of the time and lengths periods. The first axiom proves that the passing of the time (respectively periods of time between any two events) is the same for all inertial reference systems. According to the second axiom, the body size is not dependent on the speed of reference system.

With the help of mathematical transformations on the basis of the Galilean transformations we can deduce the law of velocity transformation of a point M . In turn, on the basis of this law we can conclude that the acceleration of the point M does not depend on the choice of the reference system. This means that all mechanical phenomena in inertial reference system are the same.

The Lorentz Transformation.

There is a little difference between the Lorentz transformation and the Galilean transformation. Firstly, the speed of one inertial reference system approaches the speed of light. Secondly, Lorenz uses a four-dimensional Minkowski space (three spatial coordinates and the fourth is time). On the basis of the same considerations which were conducted whit the help of Galilean transformations, the formulas are derived:

The Lorentz transformation has same interesting insights:

1. Relativity of simultaneity

Simultaneous events in one reference system are not necessarily simultaneous in other systems, moving relative to the first system. Events are simultaneous if and only if they are simultaneous and not separated by space in a different reference system. Once the events are separated in space they will cease to be simultaneous in the moving reference system .

2. Relativity of time intervals (time duration).

The duration of an event occurring at a certain point, is minimum in the inertial reference system and relative to this fixed point. The obtained result can be formulated differently: a moving clock's relative to the inertial reference system, is slower than it is at rest. Therefore, the fluidity of time in a moving system is slower than in a stationary.

3. Relativity of length (the reduction of the Lorentz).

Rod length will be maximum relative to the reference system which is at rest.

4. The law of addition of velocities.

$$\mathrm{u} = \frac{u' + v}{1 + \frac{vu'}{c^2}}$$

Consider an imaginary experiment. Let the rocket moves at the speed of light (u' = C) relative to the system K', and the system K' moves relative to the system K with velocity v = C. What speed of the rocket will be if it is relative to the stationary system K? Answer is c.

References

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