Time Dilatation: Real or Apparent?

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Abstract

In contemporary physics the relativity theory states that the length of moving bodies contracts and the local time of a moving system dilates. This paper discloses an analysis of basic relativity equations which show that length contraction and time dilatation are apparent.

Keywords: physics, space, time dilatation, muon decay, length contraction, positron, electron, Universe, neutrino, momentum, particle physics, leptons, barions, photon, energy conservation law, philosophy, observer.

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01.55.+b General physics; 04. General relativity and gravitation; 13.20.-v Leptonic, semileptonic, and radiative decays of mesons; 13.35.Bv Decays of muons; 13.35.-r Decays of leptons.

Introduction

According to the theory of relativity [1], time dilatation is a difference in the elapsed time measured by two observers, which are moving with different velocities. It is presumed that time dilatation is real and affects everything in the moving system. According to this assumption the time dilatation would make it possible for passengers in a fast-moving vehicle to advance further into the future in a short period of their own time. For sufficiently high speed, the effect is dramatic. For example, one year of travel

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might correspond to ten years on Earth. Theoretically, a constant 1 g acceleration would permit humans to travel through the entire known Universe in one human lifetime.[2].

The below-mentioned discloses that the concept of time dilatation is based on misunderstanding of basic equations of relativity.

Length contraction

As predicted by relativity length contraction is a phenomenon according to which the length of moving objects is measured to be shorter than their proper length in the rest.

The simple analysis shows that length contraction is apparent. The moving object sends a signal to the observer in the direction b perpendicular to the direction of movement (Fig. 1). The real path of signal is c.

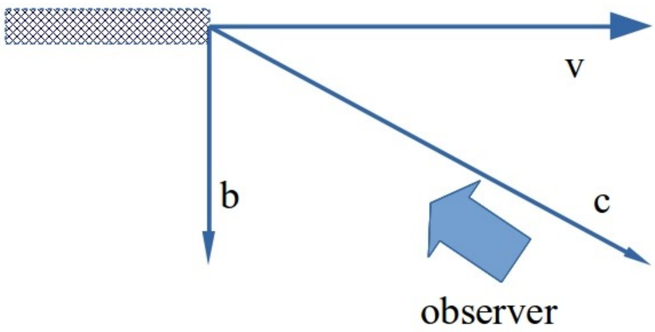

Fig. 1. Direction of signal from moving object to observer.
v – velocity and direction of object;
b – initial direction of signal;
c – real direction and velocity of signal.

The real velocity of the signal cannot exceed the speed of light c and therefore the vector b < c.

For this reason, the observer sees the object at the acute angle (Fig. 2) and the length of the object seems less than it is in reality.

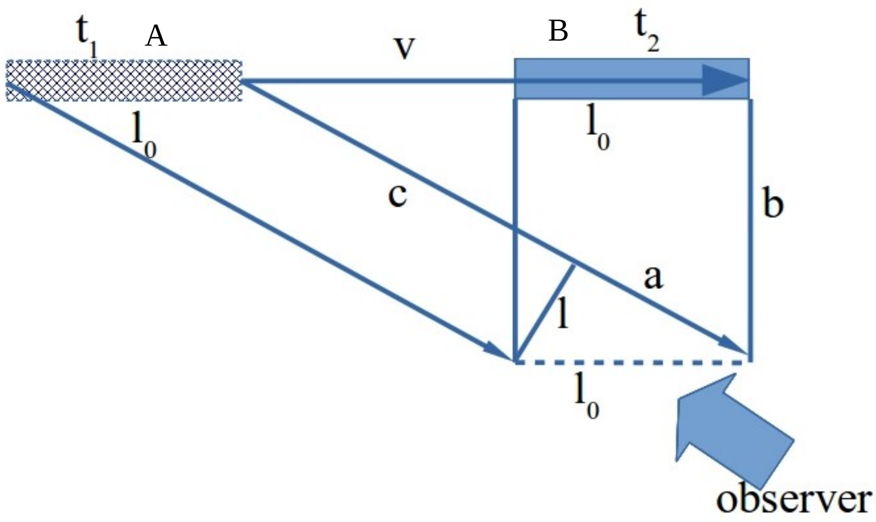

Fig. 2. Apparent length contraction of moving objects.

A – position of object at the time moment t_1 when signal is sent;
B – position of object at time moment t_2 when signal reaches observer;
v – velocity of object;
l_0 – real length of object;
l – length of object as observer sees it.

At the time moment t_1 the object emits or reflects a signal. The signal from the object travels to the observer at the speed of light c. At the moment when the signal reaches the observer the actual position of the object is B. The observer sees the object in the position A with length l. The real length of object l_0 remains constant.

The triangle (**l, l₀, a**) is similar to triangle (**b, c, v**).

Therefore: $l/l_0 = b/c$. (1)

For right triangle: $b = (c^2 - v^2)^{1/2}$. (2)

From equations (1, 2) follows: $l = l_0\,(1 - v^2/c^2)^{1/2}$. (3)

As the result, one gets the basic equation (3) of the relativity theory. It shows only the apparent length of the object as the observer sees it (Fig. 2.). In reality the length of objects remains unchangeable at any speed.

Time dilatation

Length and time can be expressed in the following way:

$$l = v\,t \qquad \text{and} \qquad l_0 = v\,t_0\,, \qquad (4)$$

where: t – apparent time;
t_0 – real time,
v – velocity of object.

From equations (3 and 4) one gets: $v\,t = v\,t_0\,(1 - v^2/c^2)^{1/2}$ therefore:

$$t = t_0\,(1 - v^2/c^2)^{1/2} \qquad (5)$$

According to the relativity theory it is the basic equation of time. The time dilatation (5) is apparent because it is obtained from the apparent length contraction *l* (Fig. 2).

Muon decay and time dilatation

Muons are formed in the upper layers of atmosphere. When a cosmic ray proton collides with the nucleus of an atom in the upper atmosphere, pions are created. The pions decay within a relatively short distance (meters) into muons. The muons generally continue movement in about the same direction as the original proton at a high velocity. The interaction of hadron-hadron beams in the particle colliders is another source of muons.

Muons have different velocities and lifetimes. The fastest muons have a longer lifetime than the slowest ones. The theory of relativity considers it to be a proof of time dilatation.

In reality lifetime is not a constant. It is proportional to the velocity of a particle according to a gravity field. Let us look closer at this problem.

The initial moment of decay is constant for all force fields [4]:

$$F\,t = m\,v \qquad (5)$$

where: F – binding force of particle constituents,
t – lifetime,
m – mass of particle,
v – velocity.

Therefore: lifetime is $t = v\,m/F$ or $t \sim v$ (6)

The muon decay does not prove the existence of time dilatation, but it confirms the dependency of particle lifetime on velocity.

Conclusions

The above also applies to experiments with particle scattering. The fast protons look flat like pancakes in the direction of movement. In reality the protons remain round like a sphere. The effects of relativity are an illusion seen by the observer. There is no real time dilatation or length contraction. The movement of reference frames does not affect time flow in the Universe. The local movements cannot affect the expansion rate of the Universe.

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