Unknown Consequences of Special Relativity

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ABSTRACT: Using the conception of motion backwards the time with the velocity bigger than the velocity of light the paradox of gravitational lens has been explained. Taking under consideration the possibility of motion rearwards the time it has been proved that special relativity implicates the possibility of foreseeing the future. It has been fixed that the nonzero acceleration of a charged particle without electric field is a result of interaction of this particle with unempty vacuum and this solution shouldn't be rejected.

I Introduction

1.1 There is the paradoxical fact, that the unknown consequences of special relativity exist yet.

In the work of the author [1] the implicated by this theory features of a particle with complex mass have been described. The complex mass appears in the work [2], however mainly as a mathematical trick.

In this work the problem of motion backwards the time has been analysed in context of the paradox of gravitational lens, which has been explained (chapter II).

In the chapter III the possibility (implicated by special relativity) of foreseeing the future has been presented.

In the chapter IV an interaction of a charged particle moving with velocity bigger than limit velocity ($v > c$) with unempty vaccum has been described.

II Paradox of gravitational lens

2.1 The fundamental equation of physics: Dirac equation, Einstein equation and Lorentz transformation are symmetrical as far as the direction of elapsing the time is concerned.

It means: if in these equations t (time) is changed by -t, the shape of these equation is not changed. It means next, that the motion backwards the time is possible in the world described by these equations. The next argument supporting the idea of motion backwards the time is the possibility of regeneration of dispersed wave function.

The only equation distinguishing the direction of elapsing the time is the equation of statistical mechanics:

$$\frac{dS}{dt} \geqslant 0 \qquad (1)$$

S is entropy of an isolated system. The formula (1) concerns the macroscopic systems composed of huge number of particles.

In the case of microscopic systems composed of small number of particles, the fluctuations of entropy are possible, which manifests by the value of entropy of the system smaller then the biggest possible value of entropy. In such situations the inversion of direction of elapsing the time is possible.

2.2 The Feynmans conception [3] of motion backwards the time permits to explain the paradox of gravitational lens. Let's describe this paradox in category of a thought experiment. A galaxy splits the emissed by a quasar electromagnetic radiation and focuses it again. If we use the detector A or B (see figure 1) for measurment, a photon behaves so, as if it has chosen one of two ways a or b.

When we use a photographic plate for measurment, the photon behaves so, as if it has passed two ways : a and b in the same time.

There is another version of famous thought experiment with two slits but this time we obtain a paradoxal result; The method of measurment which an astronomer has chosen at present determines the way of photon, which had covered milions years ago.
This paradox can be eliminated at once, when we accept the conception of existence of complex mass particle moving backwards the time with velocity $|v| > c$ which hasn't upper limit. Machyons moving reardwards the time carry the information about the decision taken later by an astronomer, and they deliver it to the photon which has passed the galaxy earlier. "Paradox of gravitational lens" has been traditionally explained by the interaction of a laboratory equipment with an observed system.

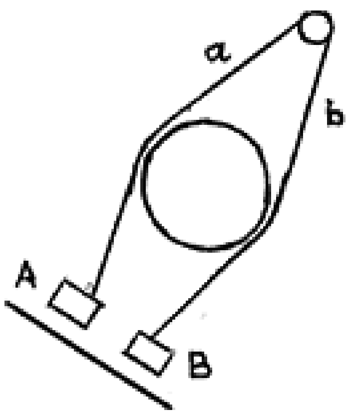


Figure 1

These both explanations aren't discrepant, but they are complementary. The existence of a particle moving backwards the time with velocity $|v| > c$ makes possible the qualitative explanation of the mechanism of interaction of a laboratory equipment with our observed system. These objects are interacting both with the laboratory equipment and with the observed quantum system and therefore they are transferring the influence of the equipment to the system.

2.3 Now we have to analyse the problem: can the motion of timions (backwards the time) - also the motion in the past - perturbe the interaction of the particle in the past and influence the present so way? According to the consideration from §2.1 the possibility of motion backwards the time exists only in the case of a microscopic system and just quantum mechanics applies only to such systems. Quantum mechanics is a statistical theory in which the notion of causality was resigned.

The lack of causality in quantum mechanics means that in microworld the motion backwards the time can't perturb the present. According to § 2.1 the macroscopic objects can't move backwards the time, so in this case the perturbation of the present can't appeare. The Copenhagian interpretation of quantum mechanics removes the doubts connected with motion backwards the time!

III Observation of the future

Let's analyse the Lorentz' transformation in relation to the time

$$t' = \frac{t - \frac{vx}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} \qquad (2)$$

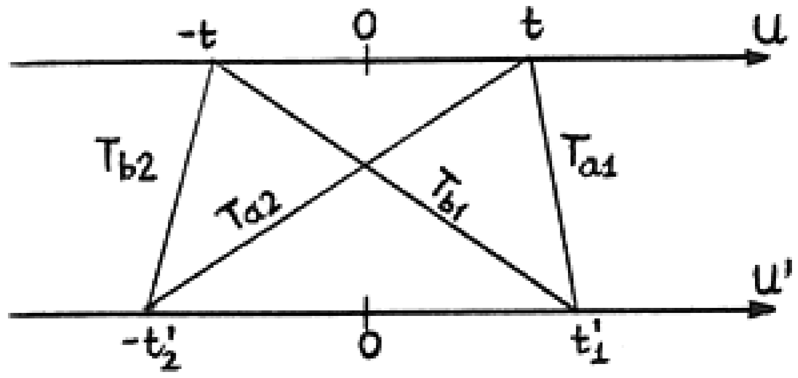
Let's put $x = 0$ in purpose to fix the attention. Let's notice that the radical achieves two values: positive and negative one.

$$\sqrt{1 - \frac{v^2}{c^2}} = \pm a \qquad (3)$$

One has to take under consideration the negative radical too.

Figure 2

Generally one thinks that if $t_1 < t_2$ then the observer at t_2 knows what has happend at t_1 and the observer at t_1 doesn't know, what will happen at t_2.
Let's analyse Lorentz' transformation of time t to the system moving with velocity v.



$t_1' = -t_1'$

Figure 3

It appears that transformation of time to the time of the system moving with velocity v gives both transformed positive time and transformed negative time, which according to the negative transformation can be result of the transformation the time -t. Making the composition of Lorentz' transformations (the sequence taken from the left) $T_{b2}T_{b1}^{-1}$ or $T_{a2}T_{a2}^{-1}$ we can pass from negative time to positive one, so from the past to the future.

The message of information may be realized for example so: The observer in the system U' sees whether the event in system U passed or not - effect of the transformation T_{a2} (with negative radical).

Generally, in the system U', both observers in time t_1' and t_2- (negative) see, what passed in the system U in the time t. In the result T_{b2}^{-1} the observer at t_2' of system U' can message the information to the observer in the time -t.

Let's remember that there is no limit as far as the velocity is concered, becouse of tachyons, machyons. The observer in t_2' sees whether the event A passed or not. If it passed, he sends the flow of tachyons to -t, if it didn't pass he doesn't send. This way the observer in the past knows if something took place in the future.

Let's remember too, that the message of information from t in U to t_2' in U' is connected with the motion backwards the time, what as it is known, is realized with effectivity far less that the motion forewards the time.

The negative radical in the formulas (2) and (3) implicates the motion backwards the time, so the message of information from the future to the past and vice versa i. e. the receipt now of information what will be then. However, the possibility of interference from the future to the past is insignificant, becouse only an insignificant number of carriers of information may move backwards the time in comparison with the number of objects moving forewards the time.

The possibility of sending of information backwards the time is bound not only with times t and $-t$, but with any times t_1 and t_2 ($t_1 < t_2$), what is bound with the translation of the time interval t and $-t$ with the component $-\frac{vx}{c^2}$ in the numerator. v and x may be positive or negative, x freely big.

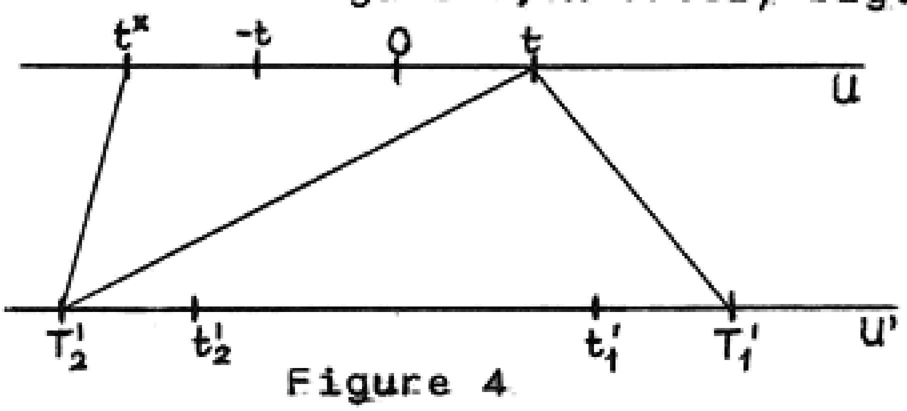


Figure 4

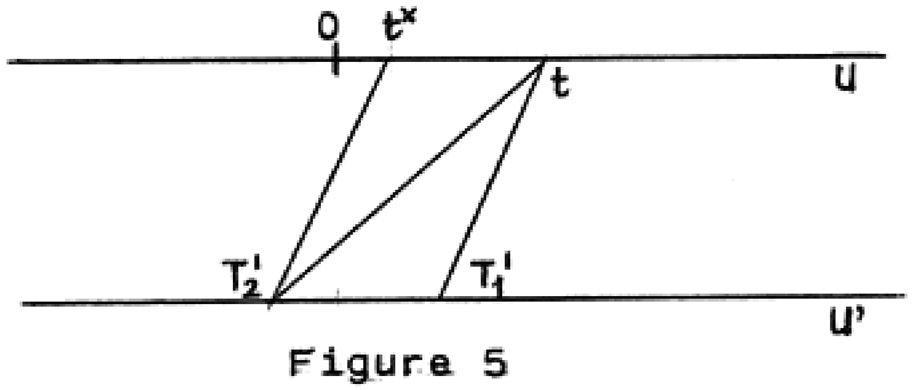


Figure 5

Now we have no times t_1' and t_2', but T_1' and T_2'; both are bigger as far as the modules $vx < 0$ and $t^x < -t$ are concerned.

The second case $vx > 0$, now the numerator is smaller and $T_1' < t_1'$, naturally $T_1' = T_2'$ and t^x is popositive. There is the sending of information backwards the time, but to the positive time.

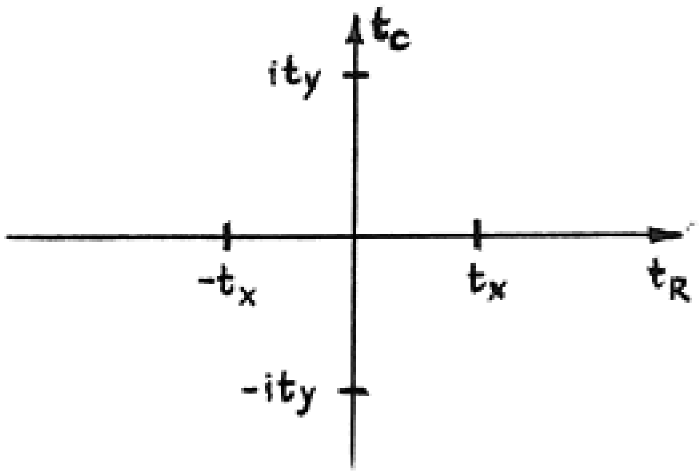


Figure 6

When $v > c$ ($v \in R$) t is number purely complex. Then we have the complex time it_y and $-it_y$ after Lorentz' transformation to the moving system. It is seen that the times it_y and $-it_y$ and the times t_x and $-t_x$ are equally good what results from the symmetry. The tachyons can send easier the information backwards the time than particles moving with velocity $v < c$ can, but their possibilities are limited further by the law of increase of entropy.

IV Selfinteraction and unempty vacuum.

3.1 Taking the force of selfinteraction we obtain the equation of motion in the field of particle without the external field [4,5].

$$m\ddot{\xi}^a = \frac{2e^2}{3c^2}\dddot{\xi}^a \tag{4}$$

We write this equation in the shape:

$$mw^a = \frac{2e^2}{3c^2}\frac{dw^a}{dt} \tag{5}$$

where:

$$w^a = \frac{dv^a}{dt} = \frac{d^2\xi^a}{dt^2} \tag{6}$$

This equation has two solutions:

$$w^a(t) = 0 \tag{7}$$

$$w^a(t) = w^a(0)\exp\left(\frac{3mc^2}{2e^2}\,t\right) \tag{8}$$

One should take under consideration that one ought not to refute the solution, which implicates that the charged particle may move with acceleration after leaving the electric field. After passing the limit $v > c$ it is possible and it corresponds with the case (8). Mass depends on velocity according to the formula:

$$m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{9}$$

Mass is expressed by a complex number. It means $m = m_x + im_y$; $m_x, m_y \in R$ and it may be negative.
e^2 is real and $e^2 > 0$. Time is a real number.
It is the fact that in the system in which the particle rests, time is described by a complex number, but now we measure time in a Lab.
In the equation (8) the complex mass appears:

$$w^a(t) = w^a(0)\exp\left[\alpha\left(\frac{m_{ox}}{\sqrt{1 - \frac{v^2}{c^2}}} + \frac{im_{oy}}{\sqrt{1 - \frac{v^2}{c^2}}}\right)t\right]$$

$$\alpha = \frac{3c^2}{2e^2}$$

When $v > c$ then the compound of particles with real and complex mass is created. One member in the round bracket is real and the other is complex. The real member corresponds with the exponencial increase in acceleration to infinity or the decay to zero. The complex member corresponds with oscilations which overlaps to exponence. Both the rate of changes of exponence and the frequency of oscilations depend on velocity. The sign of acceleration is decided by the sign of $w^a(0)$.

In reality we have the very complicated differential equation:

$$\frac{dv_a}{dt} = w^a(0)\exp\left(\alpha \frac{m_{ox} + i m_{oy}}{\sqrt{1 - \frac{v_a^2}{c^2}}}\right)t$$

Let's mark $\sqrt{1 - \frac{v^2}{c^2}} = iB$; $B \in R$, $B > 0$ or $B < 0$

(Let's remember that $v > c$). $|B|$ is the increasing function of velocity; for big v, $|B| = \frac{v}{c}$, and

$$\sqrt{1 - \frac{v^2}{c^2}} \sim \pm i\frac{v}{c}$$

Then:

$$w^a(t) = w^a(0)\exp\left[\alpha\left(\frac{m_{oy}}{B} - i\frac{m_{ox}}{B}\right)t\right]$$

if $\frac{m_{oy}}{B} > 0$, then exponence increases to infinity

if $\frac{m_{ox}}{B} < 0$, then exponence fails to zero, velocity increases, but more and more slowly and it stabilizes.

Let's notice that $B \sim |v|$, when acceleration increases, velocity increases, the member $\frac{m_{oy}}{B} t$ decreases and acceleration decreases.

If $\frac{m_{ox}}{B} < 0$ we have positive frequency of oscilation of exponence, which decreases with the time.

If $\frac{m_{oy}}{B} > 0$ then we have negative frequency.

Next

$$w^a(t) \sim e^{\pm \gamma t} (\pm i\sin|B|\varphi + \cos|B|\varphi)$$

$w^a(t)$ is complex number for $v > c$

$$w^a(t) = w^a_\alpha(t) + iw^a_\beta(t)$$

$$w^a_\alpha = \sqrt{\ddot{x}^2 + \ddot{y}^2 + \ddot{z}^2}$$

$$w^a_\beta = \sqrt{\ddot{a}^2 + \ddot{b}^2 + \ddot{c}^2}$$

For $v > c$ the acceleration has 6 components correlated with the fact that with complex mass particle moving with such velocity, an 8-dimensional coordinate system is connected. For the 3(4)-dimensional description of particles (well described in the 6(8) coordinate system) we pay in the appearence of complex numbers.

4.2 The selfinteraction may lead to acceleration, becouse the interaction with unempty vacuum is connected with it. Unempty vaccum is a set of Cooper's pairs charge-anticharge. So way an electric field is realized in unempty vacuum. If there is not electric field, the acceleration is possible nevertheless. The positive particle at the point X polarises vacuum by this means that at this point there are negative charges and further positive ones.

Therefore the positive force acts on this point X, which causes that it comes into region ⊖ with the positive, continually increasing acceleration. Then in the region ⊖ the acceleration begins to decrease becouse the particle starts to be attracted by the negative charge backwards and by the positive charge backwards too - the acceleration decreases. But pararerly with repulsion the particle induces aroud itself an analogical layer ⊖ and the acceleration increases again. This way we have an increase in the acceleration with the oscilation of its value.
The front layer is already induced and attracted forewards. The back layer is reconstructed - the dipols attract backwards but they turn so (according to the principle of interaction of dipol with charge) that negative charge is nearer to positive charge than positive charge of dipol is.
The back layer attracts backwards at the beginning, but then it is reconstructed and begins to attract backwards more and more weekly.
The concentration of dipols orientated parallelly to back field (attracting backwards) is smaller than the concentration of dipols parallel to the direction of motion forewards (so attracting forewards) becouse of the reconstruction of back layer.
The positive charge induced the layer ⊖ before it and can come into it, becouse at the back the desintegrated reconstructing charge layer exists.
We have the sequence of events:

acceleration
penetration
deceleration
reconstruction
acceleration

The time of deceleration and the time of reconstruction determine the frequency of oscilation of acceleration.

References:

[1] Z. Morawski, ' Implications of complex mass ' - this website

[2] Z. Morawski, ' Attempt at unification of interactions and quantisation of gravitation ' - this website

[3] J.D. Björken, S.D. Drell 'Relativistic Quantum Mechanics'

[4] J.D. Jackson, ' Classical Electrodynamics '

[5] M. Suffczyński, ' Elektrodynamika '