Proposal of experiment disproving the Theory of Relativity

Abstract

This paper presents an idea for an experiment which should give results contradicting the predictions of the Theory of Relativity. The experiment consists of using two low energy (below 0,4Ge.V) colliding beams, the relative velocity of which, according to the model of Euclidean Reality, should be equal to the speed of light. The possibility of obtaining the relative velocity of objects equal to the speed of light with the help of finite energies results from the new transformation of velocities published independently in two papers in Galilean Electrodynamics. According to the article presented here, during the measuring of pp total cross sections in a collider, for the relative speed of colliding protons equal (and almost equal) to the speed of light, in a very strict and very narrow range of energies, a sharp spike should be visible on the pp cross section diagram. Existence of this spike will prove that the hitherto rule of transformation of velocities and consequently the Lorentz transformations are wrong. Moreover it will prove that the idea of deformation of dimensions as a function of speed is wrong as well.

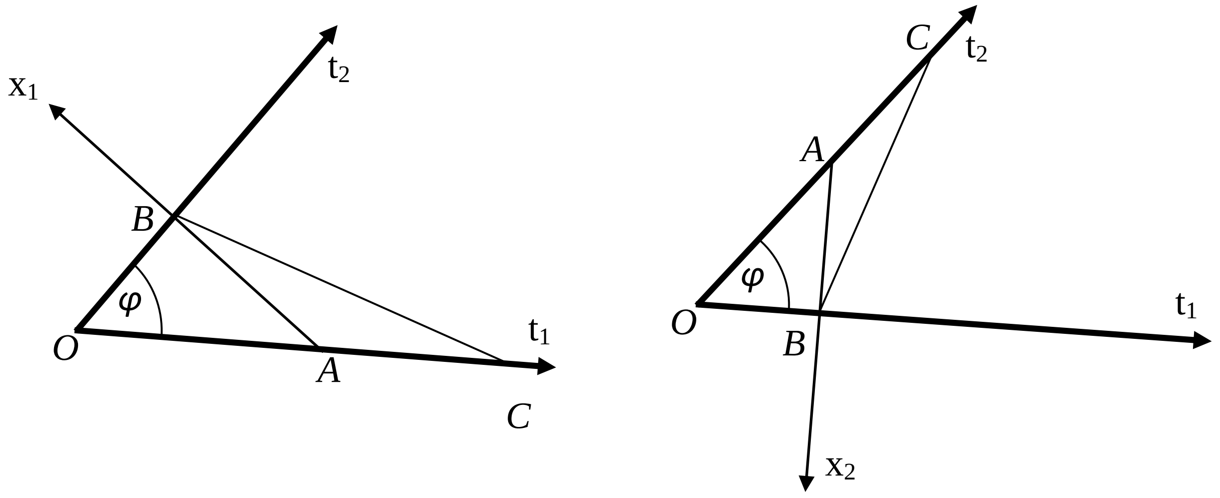
Introduction

In GED No. 18 (2007) two papers were published regarding the Euclidean model of Reality – mine and van Linden's [1,2]. Both papers proposed a new rule of composition of velocities which led to identical results although the two rules were derived in two different ways. The new rule of composition of velocities still does not allow to exceed the speed of light; however, it allows particles to reach the relative velocity equal to the speed of light with the use of finite energies. It means that, if the new rule of composition of velocities is true, then in a certain range of energies of particles differences should be noted between the experimental results and the predictions od the Relativity Theory because the Relativity Theory does not allow to reach the relative velocity of particles equal to the speed of light at all.
One could argue that if this phenomenon is true then these differences should be noted sooner or later during some of the numerous experiments performed during last few decades. It is not true, however, because – as it will be shown further - the predicted differences would only be noticed in the range of energies lying beyond energies usually applied in similar experiments, and the range of energies that allow to notice the results predicted here is very narrow.

The new rule of composition of velocities – potential experimental verification of the model.

The new model of Four dimensional Euclidean Reality (FER) – according to the interpretation presented in my papers [1,3-8], describes the reality as one composed of certain dimensions which describe distances without having the notion of time or space assigned to them in advance. According to this model, the time and space which we know are not the real dimensions creating the reality, but they are directions in the FER which depend on the observer and the observed object. The time and space dimensions are not the true dimensions creating the reality – they are simply some directions in the FER which we perceive while observing other objects in the FER. According to the model, in the case of the rectilinear and uniform motion, the direction in FER interpreted by us as the time dimension overlaps the trajectory of an observer in the FER, and the directions in FER interpreted by us as the space dimensions are the directions perpendicular to the trajectory of a currently observed object. In such reality, the relative velocity of bodies is equal to the sinus of angle between the trajectories of the observer and the observed object.The relation between the objective dimensions creating the Euclidean reality and the observed dimensions xyzt is shown in Fig. 1. To underline the fact that the dimensions creating the FER carry no meaning of time or space they are marked with the letters abcd (in Fig. 1 - ab).

A more detailed description of the FER can be found in [1,3-8].



a.) b.)

Fig. 1 The model of observations, according to FER. Observer's space axis is now perpendicular to the time axis of the observed body. In Fig. a., body 1 is an observer – frame x_1t_1 *, in Fig. b., the observer is body 2 – frame* x_2t_2*. Axes of the coordinate systems of both observers are presented in the same scale, and therefore both cases presented on figures a and b can be presented on a single figure.*

The two cases of the observation are shown in two separate figures only for greater readability.

The trajectories of the signals sent by the observed body and received by the observer are indicated by a dotted line - BC sections in Figures a and b. OBA are the right triangles.

The relative velocity in such defined frames equals to the sinus of an angle between the trajectories of bodies: $V = \sin\varphi$ *.*

According to the model of Euclidean reality, a velocity is defined as sinus of an angle between trajectories (time ax es) of bodies. Such definition introduces, on the one hand, a limitation of velocity to the value of “1” in a natural way, but on the other hand it also changes the rule of composition of velocities, which now relies on adding angles between trajectories – Fig. 2

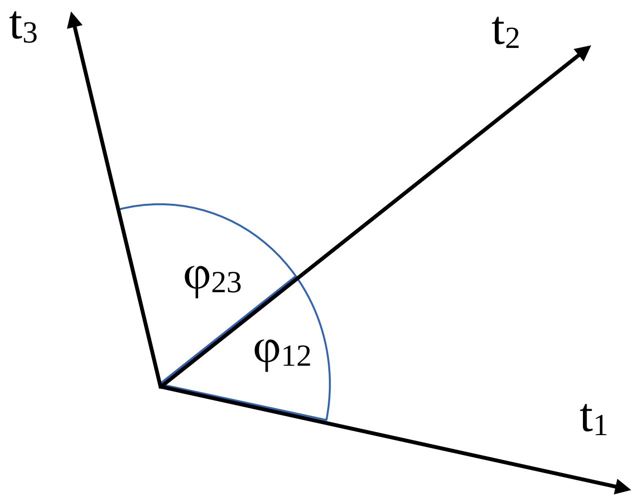


Fig.2 Trajectories of three objects 1,2,3 presented according to the alternative model. Trajectory (the time axis) of the "i" object is denoted as t_i, i=1,2,3. Relative velocities are equal to the sinuses of angles between the trajectories. The angles between the trajectories "i" an "k" are marked with symbols φ_{ik} where i,k =1,2,3

Acording to Fig. 2, the relative velocities are equal to:

The velocity of an object 2 in relation to object 1:

(1) $$V_{12} = \sin\varphi_{12}$$

The velocity of an object 3 in relation to object 2:

(2) $$V_{23} = \sin\varphi_{23}$$

The new rule of composition of velocities results directly from the definition of velocity and the resultant velocity of object 3 in relation to 1 is equal to:

(3) $$V_{13} = \sin(\varphi_{12} + \varphi_{23}) = \sin\varphi_{12}\cos\varphi_{23} + \sin\varphi_{23}\cos\varphi_{12} = V_{12}\sqrt{1-V_{23}^2} + V_{23}\sqrt{1-V_{12}^2}$$

while the transformation of velocities resulting from SRT is described with the formula:

(4) $$V_{13} = \frac{V_{12} + V_{23}}{1 + V_{12}V_{23}}$$

It means that while composing the velocities according to the formula (3) we can, in some cases, obtain motion along trajectories inclined at an angle of 90^0 and greater, or - to use a notion from the Lorentzian space-time model – to accelerate an object to the speed of light (trajectory inclined at an angle of 90^0 to trajectory of an observer) and after that to continue acceleration, wherein further acceleration will theoretically cause decreasing velocity – Fig. 3 [1,2,4].

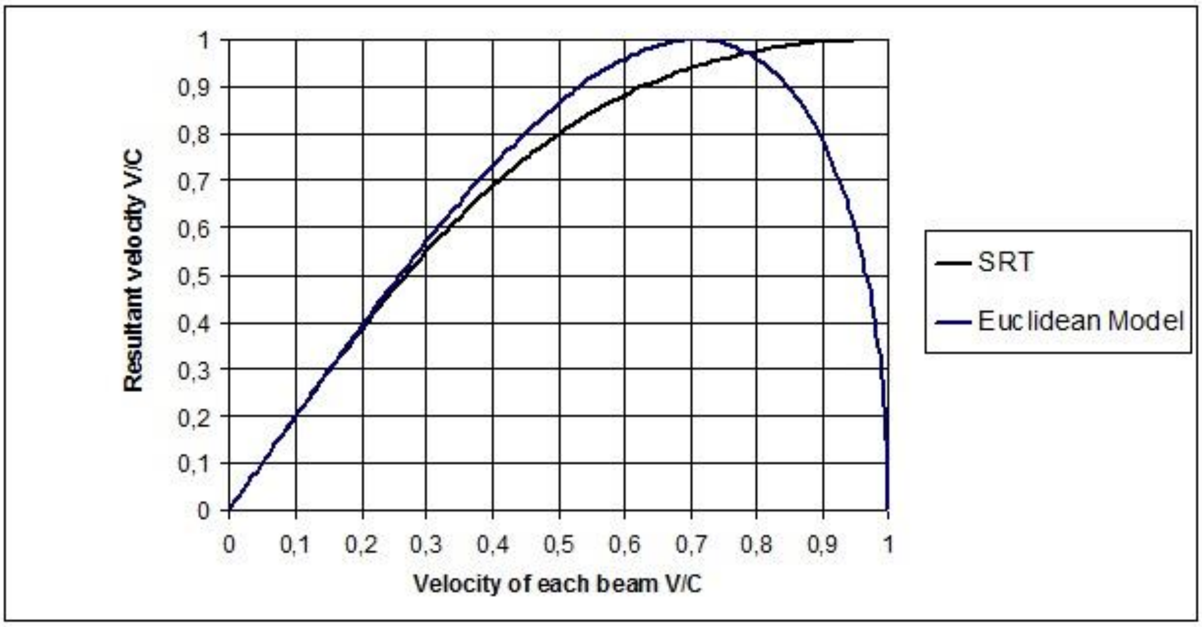


Fig 3 Comparison of the two rules of composition of velocities – the rule based on SRT described with formula (4) and the rule based on the Euclidean model described by formula (3). The composed velocities have equal value – in formulas (3) and (4) $V_{12}=V_{23}$. In case of trajectories described with formula (3), inclined to each other at an angle of less than 90^0, the observed velocity is lower than the speed of light. When these trajectories are inclined to each other at an angle of 90^0 then the relative velocity is equal to the speed of light. For angles greater than 90^0 velocity decreases from one to zero, however in this case a particle probably cannot be observed with the help of quanta.

However, most likely an object moving along such a trajectory will not be observable, so discussing velocities for such types of trajectories makes little sense. The limitation of velocity to the value of "1" does not mean any restrictions on trajectories – all of the trajectories are allowed, as it is only a limitation regarding the observation. As follows from Fig. 1 an observer most likely is only able to observe (with the help of EM signals) objects having trajectories inclined to its trajectory at angle less than 90^0.

The new rule of composition of velocities – different from the one valid for the Relativity Theory - still does not allow to exceed the speed of light – Fig. 3; however, it allows to reach the kind of trajectories which, according to the RT, cannot be reached. Since the rule of composition of the velocities is the result of transformation of coordinates while moving from one coordinate system to another, then the new rule of composition of velocities must be a result of a different transformation than the Lorentz transformation [4]. Therefore designing the experiment that would verify the predictions of the new alternative approach presented here should be possible regardless of the fact that there already are a lot of experiments confirming the RT.

An example of experiment – comparison of measurements of total cross section for collisions of protons for proton beam hitting stationary hydrogen target and two colliding protons beams.

To verify the new rule of composition of velocities I propose an analysis of the comparison of measurements of total cross sections for proton-proton collisions for the two following cases:

1. Proton beam hits a stationary hydrogen target – the Beam-Target method.
2. Collision of two proton beams in a collider.

The total cross section is a function of velocity of one of the particles in the frame bound with the second particle and only this velocity determines the value of cross section. The existence of two alternative rules of composition of velocities means that for two colliding beams, two different relative velocities can be found at the same time, depending on whether we apply formula (3) or (4) and consequently we should expect two different results of measurements. Since in case of a stationary target (for instance $V_{23}=0$) both formulas (3) and (4) are identical, we can use the results of measurements that use the stationary target as a basis for a comparison with the experiment with two colliding beams having – according to formulas either (3) or (4) – identical relative velocities as the beam in the experiment with a stationary target. The results obtained with the help of the two methods should prove which rule of transformation of velocities is true (if any).
As it will be shown, the differences are significant but they occur in a specific strictly defined, narrow range of energies.

How does the proposed experiment work in practice?

Let us consider cosmic origin particles of very high energy, approx. 10^8GeV. The total p-p cross section for these energies equals approx. 110mb [9] or more [10].

First we will discuss the problem according to the current SRT model based on transformation (4):

The velocity of protons is very high here, however in case of experimental physics the notion of center of mass energy $\sqrt{s}$ is applied instead of velocity. Equality of the center of mass energies is equivalent to the equality of relative velocities of particles regardless of the applied experimental method (stationary target or two colliding beams).

The square of the center of mass energy "s" equals:

- For the beam –stationary target system:

(5) $$s = 2Em + 2m^2$$

where E – energy of hitting beam, m – proton's mass in eV

- For the collider in case of two colliding beams having identical energy "E" each:

(6) $$s = 4E^2$$

The above reasoning and formulas are derived on the basis of transformation (4) which is in fact embedded in formulas (5) and (6). Based on these formulas we can conclude that:

For energy of cosmic origin protons E=10^8GeV, the center of mass energy equals: $\sqrt{s} \approx 1{,}37 * 10^4 GeV$

It means that in case of the experiment with colliding beams, identical cross sections should be obtained for energy of each of the beams equal to (6): $E = \frac{\sqrt{s}}{2} \approx 6{,}85 * 10^3 GeV$

It means that if the transformation (4) is true, then the cross section obtained for cosmic beams of energy 10^8GeV can also be obtained in a collider where the energies of colliding beams are equal to 6,85*10^3GeV each.

Now consider the same problem according to the transformation (3) resulting from the alternative Euclidean approach. Since, in the text above, the equality of center of mass energies was applied instead the equality of velocities, now we will use the equality of angles between the trajectories, which according to the Euclidean approach is equivalent to equality of velocities. The problem of a beam hitting a stationary target is presented in Fig. 4a and for the energy of cosmic origin protons the angle between the beam trajectory and the stationary target is equal to almost (formula 3) $\varphi_2 = \arcsin(V) \approx 90^0$ (C=1 here). The corresponding case of two beams is presented in Fig. 4b where the angle between two beams is also equal to $\varphi_2 = 90^0$, however the angle of trajectory of each of the beams in a laboratory system equals to $\varphi_2/2 = 45^0$ which corresponds to velocity (3): $V = \sin(\frac{\varphi_2}{2}) \approx \sin(45^0) \approx 0{,}707c$

Consequently, it corresponds to $\sqrt{s} \approx 2{,}654GeV$ (according to SRT model) and it means that energy of a single beam in a laboratory system should be equal to almost 1,327GeV or kinetic energy equal to 389MeV.

It means that if the transformation (3) is true, then the cross section obtained for cosmic beams of energy 10^8GeV can also be obtained in a collider where the energies of colliding beams are equal to 1,327GeV each. This energy includes the proton's rest mass energy and it corresponds to the kinetic energy equal to 389MeV.

We can create he diagram showing the predicted results of measurements using two colliding beams by performing the above reasoning for the measurements of p-p cross section in all ranges of energies – Fig. 5, and compare it with the existing data – Fig. 5. Since the 90^0 angle between trajectories, corresponding to relative velocity of beams equal to the light speed, is obtained for kinetic energy equal to 389MeV for each of the beams, then one can expect that all the already known experimental results of measurements of p-p cross section can be obtained for two colliding beams in the kinetic energy range from 0 to 389MeV (for each of the beams) or, if we use the notion of center of mass energy – for $1{,}877GeV < \sqrt{s} < 2{,}654GeV$. Therefore the graph representing all existing experimental data obtained with the beam – target method – Fig.5 - for two colliding beams will be compressed within this range of energies, however the results for high energy collisions will be compressed into a very narrow spike.

The graph of expected cross sections for colliding beams as a function of center of mass energy, superimposed on the existing experimental data[10], is shown in Fig. 5. For kinetic energies of colliding beams of protons within the range from 0 to 389MeV (center of mass energies from 0 to 2,654 GeV) the following differences in relation to the hitherto results should be observed:

1. The first maximum of the cross section’s curve for the center of mass energy of approx. 2,36GeV should be shifted for -0,16GeV in relation to the hitherto results.
2. For center of mass energy approx. 2,654GeV corresponding to the kinetic energy of colliding beams equal to 383-389 MeV (for each of the beams), a narrow spike of width (for each of the beams) 6keV for 60mb, 0,8 keV for 70mb and 0,1 keV for 80mb should be observed. Within this spike all the values of cross sections already measured with the help of cosmic rays should appear – Fig. 5. These are the cross sections for the center of mass energy over 10^2 GeV(Fig. 5 - upper scale) or momentum in the laboratory frame over 10TeV (Fig. 5 -lower scale).

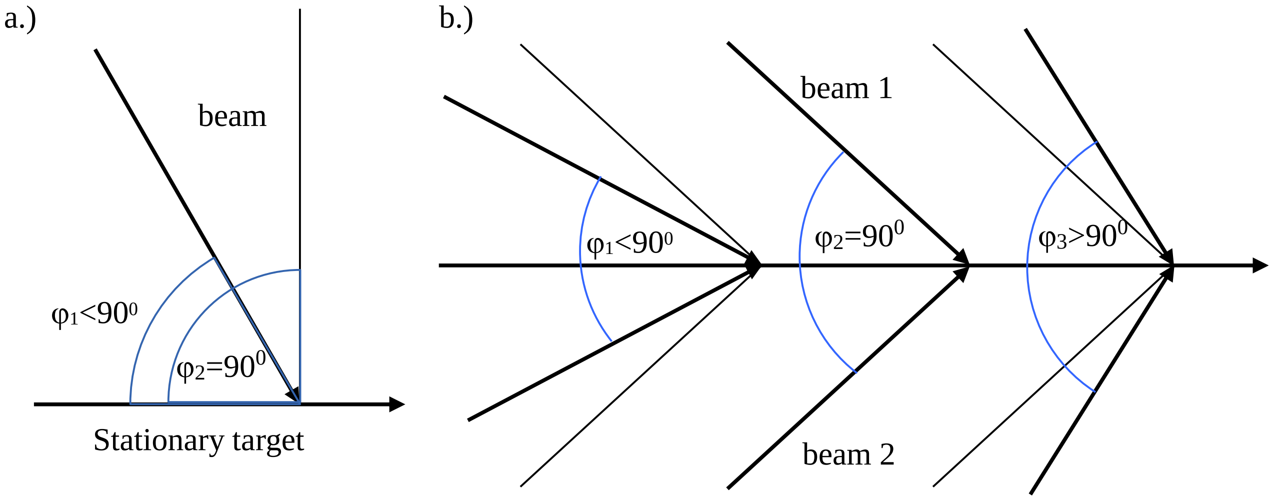


Fig. 4. Trajectories of colliding protons in case of a beam–target method – Fig. a, and two colliding beams – Fig. b. In the case of two colliding beams the trajectories of the colliding particles can be inclined to each other at angles 0^0-180^0 while for the beam target method – only at angles 0^0-90^0. The two colliding beams with trajectories inclined to the trajectory of laboratory frame at an angle of 45^0 each - Fig. b, case for the angle φ_2 – correspond to the trajectory inclined at an angle of 90^0 in Fig. a – the angle φ_2, i.e. to the trajectory of hypothetical particle hitting a stationary target with a speed of light. The angle φ_1 denotes the motion with the speed lower than the speed of light – Fig. a – and an equivalent situation for two beams in the collider – Fig b, the angle φ_1, and φ_3 shows a situation where the trajectories are inclined to each other at an angle φ_3 greater than 90^0, which cannot be obtained in experiments with stationary target shown in Fig. a.

Since for collider measurements all the existing experimental data are, according to the presented approach, compressed within a range of low energies – then what results should be obtained for the higher energies? In fact, some of the results presented in the Fig.5 for center of mass energies higher than 2,654 GeV were obtained with the help of a collider experiment.

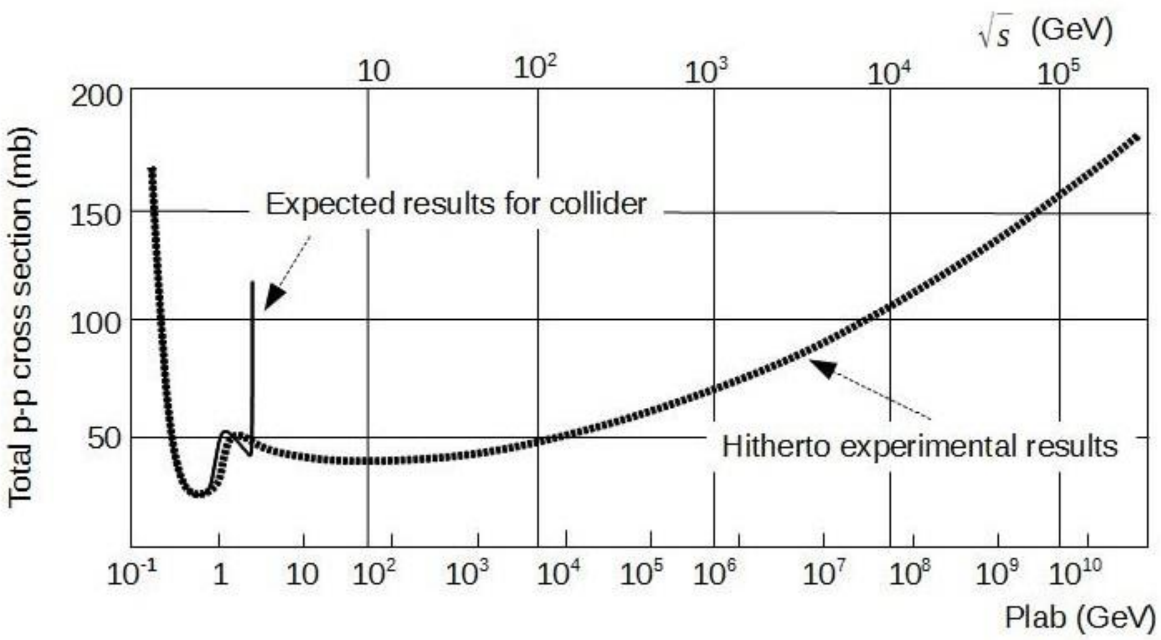


Fig. 5. Expected cross sections for colliding beams as a function of center of mass energy, superimposed on existing experimental data [9]. The expected graph of cross section is nothing

more than the basic graph of cross section "compressed" to a range of kinetic energy of each of the two colliding beams from 0 to 389MeV or to the center of mass energy up to 2,65 GeV. According to the new approach the angle between trajectories of two beams with kinetic energy of approx. 389MeV is equal to 90^0 which is, according to the new approach, equivalent to the case of a proton beam hitting stationary target with the speed of light

For beams of center of mass energies higher than 2,654 GeV (kinetic energies over 389MeV for each of the beams) the trajectories of colliding particles are inclined to each other at an angle greater than 90^0 (Fig. 6b – the angle φ_3). Theoretical dependency of the cross sections for this range of angles is not known yet. The situation is here in a way symmetrical to the situation for kinetic energies of beams below 389MeV. The similarity is shown in Fig. 6, presenting the time axes of two bodies inclined at angle lower than 90^0 – Fig. 6a - and greater than 90^0 - Fig. 6b. On both figures the orientation of time axes is identical while their senses, on the Fig. 6b, are opposite to each other.

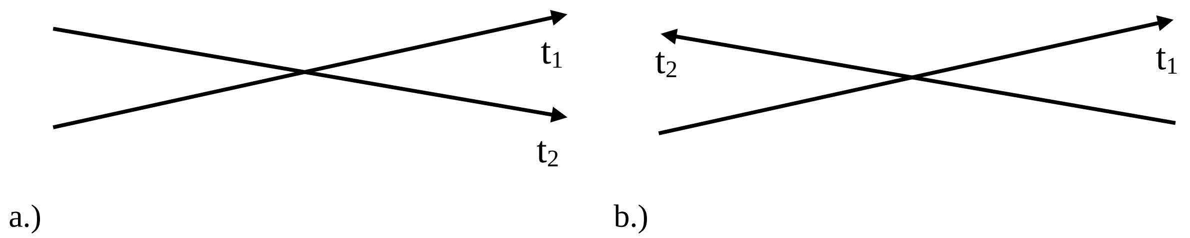


Fig. 6. Trajectories of two colliding proton beams. In Fig. a, the trajectories are inclined to each other at an angle lower than 90^0, in Fig. b, - at an angle greater than 90^0. Orientations of the trajectories are identical on both figures while the senses differ.

Since all predicted results of collider measurements corresponding to high energy cosmic particles are situated within the narrow spike described in the point 2 above (Fig.5), then, despite not knowing the mechanism of collisions for trajectories inclined to each other at an angle greater than 90^0, for center of mass energies higher than 10GeV one can expect to observe discrepancy between the results obtained with the help of colliding beams and the particles of cosmic origin.

The fact that such a discrepancy may exist was suggested in [10], on the basis of comparing results obtained for cosmic rays with the extrapolated results from the collider. The discrepancy is an argument for serious consideration of the model of Euclidean reality described in this paper.

Conclusions

According to the considerations above, one can achieve interesting results for colliding beams not in the range of great energies that these devices were designed for, but for relatively small energies for which a single beam hitting the stationary target could be applied successfully. I'd like to stress here that comparing the cross sections for beam-target reactions with two colliding beams in a low kinetic energy range – below 1GeV – can also constitute an additional test for the veracity of the Relativity Theory and, to go into more detail – for the veracity of the rule of composition of velocities, and consequently for the veracity of the Lorentz transformation. On the other hand, the appearance of the high, narrow spike in the graph showing the dependency of the total cross section from energy will be an unambiguous proof for the correctness of the alternative approach presented here.

It could be said that the RT was confirmed enough times with the help of numerous experiments and if the phenomena described above existed, they would have been found up to now. In fact – all the already performed experiments should give practically identical results for both RT and the new approach presented here. However, only some experiments with strictly determined energies of colliding beams, much lower than usually applied, should produce some detectable discrepancies between the RT and the alternative approach. The experiment confirming the new approach is possible, but it needs a very narrow energy distribution of colliding particles due to a very narrow range of energies for which this effect should occur. Therefore any accidental detection of the discrepancies described above does not seem to be possible.

The positive result of the proposed experiment will prove that the hitherto rule of composition of velocities is false. Since the hitherto rule of composition of velocities is the result of Lorentz Transformation, then the Lorentz transformation will be proven to be false, too. Moreover, the construction of the FER uses the inclination of space dimensions in relation to to the time axis of the observer instead of stretching the dimension as it is assumed in the RT. Therefore the fact of deformation of dimensions as a function of velocity should be false as well.

Bibliography

1.W. Nawrot "Proposal of simpler description of SRT" - Galilean Electrodynamics 18, 43-48 (2007)

2.Van Linden, R. F. J.: "Dimensions in Special Relativity Theory – a Euclidean Interpretation" Galilean Electrodynamics Vol. 18, No. 1, p. 12. (2007)

3.W. Nawrot "The structure of time and the wave structure of the matter" - Galilean Electrodynamics 18, 49-53, (2007)

4.W. Nawrot "Is the Lorentz Transformation a physically correct solution of the spacetime interval equation?" - Galilean Electrodynamics Vol 20, Special Issue 2, 34-37 (2009)

5.W. Nawrot "Recession of galaxies, simpler explanation" - Galilean Electrodynamics Vol 20, Special Issue 2, 38-40 (2009)

6.W. Nawrot, "Euclidean model of the spacetime - is the reality exactly as we can observe it?" - Mathematics, Physics and Philosophy in the Interpretations of Relativity Theory Budapest, 4 - 6 September 2009.

Original version available at:

http://www.phil-inst.hu/~szekely/PIRT_BP_2/papers/NAWROT_09_EUC_FT.doc

7. W. Nawrot, "Explanation of twin paradox according to the Euclidean Reality Model" Proceedings of the 20 NPA Conference, Minneapolis, MN USA 2013

8. www.euclideanreality.com chapter „Recession Of Galaxies - The red shift"

9."Proton-air cross section measurement with the ARGO-YBJ cosmic ray experiment" arXiv:0904.4198v1 (2009)

10." σ^{pp}_{tot} Estimations At Very High Energies" arXiv:hep-ph/9910484v1 (1999)