

# Comments on The Experimental Proofs of Relativistic Length Contraction and Time Dilation by O. D. Jefimenko

Adrian Sfarti

**Abstract** — The subject of relativistic length contraction and relativistic time dilation appears very early in textbooks as well as in various forms in papers dedicated to teaching relativity. In his paper, O. D. Jefimenko considers “questionable” the experimental confirmations of these relativistic phenomena and offers an alternative explanation based on electromagnetic retardation. In the following short note, we will deconstruct Jefimenko’s proofs, and we will show their limitations.

**Keywords** — Electromagnetic Retardation, General Lorentz Transforms, Length Contraction, Time Dilation.

## I. INTRODUCTION

In the abstract of his paper [1], Jefimenko claims that;

Recent advances in the theory of electromagnetic retardation have made it possible to derive the basic equations of the special relativity theory and to duplicate the most important practical results of this theory without using the concepts of relativistic length contraction and time dilation. Thus the reality of these concepts appears to be questionable. It is imperative therefore to reexamine the experimental evidence supporting these concepts. The calculations presented in this paper show that some of the experiments allegedly proving the reality of length contraction and time dilation can be unambiguously interpreted as manifestations of velocity-dependent dynamical interactions taking place within the systems involved in the experiments rather than as manifestations of length contraction or time dilation.

In the following, we will disprove several misconceptions put forward by Jefimenko. There is nothing “questionable” about the concepts of relativistic length contraction and relativistic time dilation. Moreover, length contraction and time dilation, far from being “the most important practical results” are simple consequences of the Lorentz transforms of special relativity. Most importantly, we will disprove the validity of Jefimenko’s claim that “the reality of length contraction and time dilation can be unambiguously interpreted as manifestations of velocity-dependent dynamical interactions taking place within the systems involved in the experiments rather than as manifestations of length contraction or time dilation”. We will do a point-by-point deconstruction of Jefimenko’s proofs by showing their limitations and culminating with a well-known experimental falsification that actually precedes Jefimenko’s theories.

## II. THE DECONSTRUCTION OF JEFIMENKO’S CLAIMS

In his paper, Jefimeko offers two separate explanations for length contraction and for time dilation. The explanation of length contraction is based on the comparisons of the Lorentz forces in the frame commoving with a beam of charged particles vs. the “stationary” frame of the lab. The explanation for time dilation is based on Heavyside retarded potentials. But Jefimanko’s explanations, due to the fact that they are disjointed, fail spectacularly in explaining the classical experiment of Kennedy and Thorndike [2] where both length contraction and time dilation need to be accounted for in order to explain the result of the experiment. To make matters (even) worse for Jefimenko’s theory, the Kennedy-Thorndike theory of experiment has been developed for the realistic situation of rotating frames [3] (just like the theory for the Michelson-Morley experiment, for the Ives-Stilwell experiment, for length contraction measurement [4]) whereas Jefimenko’s formulas are based strictly on the Lorentz transforms between inertial frames in rectilinear relative motion. We see therefore that the theory advanced by Jefimenko is falsified by experiments that precede it by many years. In my discussions with the ZNA chief editor, he refused to retract Jefimenko’s paper. This is in line with ZNA having a history of publishing fringe papers on the subject of relativity [5],[6] and refusing to retract them despite strong rebuttals from mainstream physicists

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A. Sfarti, Computer Science Department, UC Berkeley, USA.  
(corresponding e-mail: egas@pacbell.net)

[7]. Most offensive is the series of papers written by the well-known anti-relativity, anti-Einstein, prof. F. Winterberg [8]-[12].

### III. CONCLUSION

We have disproved Jefimenko's paper by pointing out the shortcomings of his theory and by showing that his theory cannot explain experiments that involve both length contraction and time dilation, such as the Kennedy-Thorndike experiment, nor can it apply to the realistic situation of experiments executed in rotating frames of reference, such as the Earth-bound laboratories.

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