

LETTERS TO PROGRESS IN PHYSICS

Errata to “Mansouri-Sexl Test Theory: The Question of Equivalence between Special Relativity and Ether Theories”

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The title paper [1] contains an essential mistake committed by the present author. Namely, the Mansouri and Sexl generalized transformation of time, as well as the relevant form of the Lorentz transformation of time have been erroneously read and typed. In consequence, a certain part of the paper (indicated in the table, below) requires replacing to conform to the correct equations. The rest of the paper, except for the minor corrections indicated in the Errata, still remains valid. Let me apologize to the Readers and Editors for the inconvenience.

Page	Written	Read
89 (Abstract)	“has an erroneous form.”	“is incorrectly used.”
89, Eq. (2)	$t = aT + \epsilon X$	$t = aT + \epsilon x$
90, Eq. (5)	$x = \gamma(X - vt)$	$x = \gamma(X - vT)$
91 (Conclusion)	“We have shown that an incorrect notation...”	“We have shown that an incorrect use...”

Page 90, left column

Written (part to be replaced, starting from):

“Mansouri and Sexl state that for $a = b = 1, \epsilon = 0$ the Galilean transformation is obtained, which is correct. ...”

(ending with, 33 lines down):

“... Consequently, they concluded that only violation of the two-way isotropy resulting in deviations from the relativistic values of a and b constitutes a challenge to STR.”

Read (part to be introduced):

“Thus, the difference in the one-way speed of light would be a sole matter of choice of the synchronization convention.

From M-S theory it follows that for $a = b = 1, \epsilon = 0$, the Galilean transformation is obtained. If, after employing the external synchronization, a and b equal to unity, it would mean that mechanical phenomena are ruled by Newtonian physics and subject to the Galilean principle of relativity, while the Maxwell equations (and the relevant constant speed of light) refer to the ether frame only.

Instead, for $1/a = \gamma$ and $\epsilon = -v/c^2$, the M-S transformation of time turns into the Lorentz transformation of time:

$$t' = \frac{t}{\gamma} - \frac{vx'}{c^2}. \tag{E1}$$

In this form, the “rest-to-observer” coordinates appear on both sides of equation. Written in the same manner, the inverse Lorentz transformation is therefore:

$$t = \frac{t'}{\gamma} + \frac{vx}{c^2}. \tag{E2}$$

Consequently, the M-S transformation of time, and the inverse transformation are:

$$\begin{aligned} t &= aT + \epsilon x, \\ T &= at - \epsilon X. \end{aligned} \tag{E3}$$

Now, assuming $1/a = \gamma$ and $\epsilon = 0$, we obtain:

$$t = \frac{T}{\gamma} \implies T = t\gamma, \tag{E4}$$

in contradiction with

$$T = \frac{t}{\gamma}. \tag{E5}$$

Mansouri and Sexl intended to treat independently the questions of time dilation and simultaneity. This, however, is infeasible with respect to the Lorentz transformation in which relativity of simultaneity and relativistic effects are inseparably connected. In the Lorentz transformation, one cannot obtain time dilation without taking into account the relativity of simultaneity. Likewise, the self-consistence of reciprocal equations in the Lorentz transformation involves the mutual dependence between $\gamma = 1/\sqrt{1 - v^2/c^2}$ and v/c^2 . The incorrect use of Lorentz transformation (in particular, not including the inverse transformation) led to a false conclusion as to the question of equivalence between STR and the postulated ether theory.”

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References

1. Rybicki M. Mansouri-Sexl Test Theory: The Question of Equivalence between Special Relativity and Ether Theories. *Progress in Physics*, 2016, v. 12 (1), 89–92.