Not all clocks obey to Special Relativity

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What dominates the other, Special Relativity or light? Einstein believed to have submitted bodies and light to the same laws. In what follows, we show that there are light-clocks which do not matches with his Special Relativity exigences. The equivalence between bodies and light turns out utopian.

I. INTRODUCTION

Very tempted to unify optical and mechanical phenomenons under the same laws, Einstein elaborated the Special Relativity theory which had success in some technical contexts. But the extension of these last seems to be harmful to the aforesaid theory. For example, if one substitutes a mechanical clocks with clocks functioning by light reflections and mirrors, the effect of time dilation doesn't fit what the theory foresees.

II. MECHANICAL CLOCKS

Let r, T_0 and m_0 respectively the radius, the period of rotation and the mass of a rotating disk. If the disk starts a translation with the velocity v along the axis perpendicular to it's surface, according to Special Relativity, the mass of the disk grows as :

$$m = \frac{m_0}{\sqrt{1-(v/c)^2}}. \tag{1}$$

So it's inertial momentum is :

$$I = \frac{1}{2} m r^2 = \frac{m_0 r^2}{2\sqrt{1-(v/c)^2}}. \tag{2}$$

Since the angular velocity is $2\pi/T$, the angular momentum before the translation is given by :

$$J_0 = I_0 \left(\frac{2\pi}{T_0}\right) = \frac{\pi m_0 r^2}{T_0}. \tag{3}$$

During the translation, it becomes :

$$J = I \left(\frac{2\pi}{T}\right) = \frac{\pi m_0 r^2}{T\sqrt{1-(v/c)^2}}. \tag{4}$$

The conservation of angular momentum ($J = J_0$) leads from Eqs. (3) and (4) to :

$$T = \frac{T_0}{\sqrt{1-(v/c)^2}}. \tag{5}$$

From this period increase, time dilation is clearly noticed.

III. OPTICAL CLOCKS

Let A and B two parallel mirrors at rest, between which there is a distance l_0. A light flash is emitted perpendicularly between A and B. If τ_0 is the duration of the two absorption/emission by the mirrors, this device represents an optical clock of a period :

$$T_0 = \frac{l_0}{c} + \tau_0. \tag{6}$$

One suppose that the two mirrors start a galilean motion along the perpendicular axis on their surfaces. at a constant speed v. Because of length contraction, the distance between the two mirrors becomes :

$$l = l_0\sqrt{1-(v/c)^2},$$

and thus the period is :

$$T = \frac{l}{c} + \tau = \frac{l_0}{c}\sqrt{1-(v/c)^2} + \tau. \tag{7}$$

Consequently, three possibilities arise :

1. In order to recover the expression (5), from Eqs. (6) and (7) one gets :

$$\frac{l_0}{c}\sqrt{1-(v/c)^2} + \tau = \frac{(l_0/c) + \tau_0}{\sqrt{1-(v/c)^2}}, \tag{8}$$

$$\text{which leads to : } \tau = \frac{\tau_0 + (l_0 v^2/c^3)}{\sqrt{1-(v/c)^2}}. \tag{9}$$

This is an absurd result because τ must not depend on l_0 or on v.

2. Under the assumption that τ doesn't change, Eq. (9) implies that :

$$\tau_0 = \frac{-l_0 v^2/c^3}{1-\sqrt{1-(v/c)^2}}. \tag{10}$$

This result is more absurd because τ_0 can not be negative.

3. By neglecting the absorption/emission duration, with $\tau = \tau_0 = 0$, from Eqs. (6) and (7) one deducts :

$$T = T_0\sqrt{1-(v/c)^2}. \tag{11}$$

Contrary to result (5), this is a "time contraction".

IV. CONCLUSION

A kind of optical clocks does not matches with Special Relativity exigences. *Bodies and light are so different !*