The Shortest Embarrassing Papers on Special Relativity. 2/12

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Abstract. A possibiliste and disturbing test for inertial time dilation is discussed.

Two identical clocks A and B are synchronized in their proper reference frame F, in which their respective spatial coordinates (in Km) are: $(0, 0, 0)$ and (9982000, 0, 0). B is accelerated for 10 minutes with a constant acceleration of 100 m/s^2 in the increasing direction of the X axis of F. As a consequence of that acceleration B suffers a gravitational delay δt_{1b}, and A one of δt_{1a}. After those 10 minutes A and B are in relative inertial motion, which is maintained until B reaches in F the spacial coordinates $(6.001 \times 10^{10}, 0, 0)$). At that instant, A is accelerated for 10 minutes with a constant acceleration of 100 m/s^2 in the increasing direction of the X axis of F. As a consequence of that acceleration A suffers a gravitational delay δt_{2a}, and B one of δt_{2b}. After those 10 minutes, A and B are again in the same reference frame, now F*. To compensate for the gravitational delays of their accelerations, A is advanced a time $\delta t_{1a} + \delta t_{2a}$, and B a time $\delta t_{1b} + \delta t_{2b}$, after which Einstein's synchronization test [1, §1] is applied to them. The results of the test can only be one of the following three:

1) A and B are synchronized. In this case, the inertial time delay accumulated during its more than 31.7 years of uniform relative motion at 60 Km/s would be zero. Thus, like refractive deformations, inertial time dilations would not be real but apparent.
2) Only one of the clocks is behind the other. In this case the Principle of Relativity would be violated.
3) Each clock is behind the other. In this case there would be a double contradiction: each clock is and is not behind the other. Or, alternatively, there would be as many different superimposed realities as there are relative velocities at which their clocks could be observed.

Reference:

[1] A. Einstein. Zur Elektrodynamik bewegter Körper. Ann. Phys., 17:891–921, 1905.