COMMENT ON RELATIVISTIC MESON DECAY TIME

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Abstract

This paper points out that the observed relativistic slowing of meson decay time cannot represent the decay time experienced by the meson in its own inertial reference frame unless the Galilean time transformation, $\tau = t$, is used.

Keywords: Lorentz time transformation, time dilation, twin paradox, special relativity, meson decay.

As argued in [1], the interpretation of the Lorentz time transformation as representing a physical slowing effect on a moving clock is inconsistent with the Lorentz transformation itself, and cannot be used as a valid model because it produces an indeterminable result. In relativistic meson time-dilation tests, the decay time, t, of a fast-moving meson is measured in the laboratory reference frame, and compared to the decay time, t', of another meson produced under different conditions at rest in the laboratory frame. It is found that the decay time of the fast-moving meson is given by $t = t'/\sqrt{(1- v^2/c^2)}$. However, the decay time of the moving meson in its own inertial reference frame, τ, is not measured and can only be inferred via a coordinate transformation.

The generally accepted view is that there are two possible transformations, the Lorentz at high velocities and the Galilean at low (although I have argued against such a limited position [2]). If we assume that the decay time in the coordinate system of the moving meson, τ, is in fact given by the observed value in the laboratory coordinate system, $t'/\sqrt{(1- v^2/c^2)}$, then the Lorentz transformation gives a decay time in the laboratory system of $t = \tau/\sqrt{(1- v^2/c^2)} = t'/(1- v^2/c^2)$, contrary to that measured. On the other hand, if we use the Galilean transformation, $\tau = t$, then we obtain the correct result.

References

[1] J. Shim, *On the Interpretation of the Lorentz Time Transformation*, Hadronic Journal, 36 (3), 345-348 (2013)

[2] J. Shim, *On the Lorentz Transformations*, Hadronic Journal (publication pending)