

## The Myths Surrounding Time Dilation and $E = mc^2$

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**Abstract.** This article investigates the paradox surrounding the fact, that while the equations involved in Einstein's special theory of relativity lead to logical absurdities, they are nevertheless supported by many experiments.

### Time Dilation and GPS Atomic Clocks

I. In Einstein's famous 1905 paper, "*On the Electrodynamics of Moving Bodies*", [1], he ignores the physical medium for the propagation of light waves and then proceeds to derive the equations for the Doppler effect in a ray of light. But because he turns logic on its head by treating the speed of light as a constant, without reference to the physical medium of propagation, he interprets his resulting equations as inertial transformations involving the absurd concept of time dilation. The equations in question actually preceded Einstein and they are known as the Lorentz transformations, [2]. The time equation takes the form,

$$t' = \gamma(t - vx/c^2) \tag{1}$$

where,  $\gamma = 1/\sqrt{1 - v^2/c^2}$ . We know however, that when the Earth completes an orbit of the Sun, relative to the background stars, a year has passed by for all observers, no matter what their perspective is, yet nevertheless, the atomic clocks used in orbiting GPS satellites, where  $v \ll c$ , appear to confirm equation (1), so long as we treat  $t$  as the period associated with the frequency of the electromagnetic radiation that is incident on the caesium atoms in the GPS clocks.

### The Interpretation

II. Einstein derived equation (1) in connection with the reflected return-path of a ray of electromagnetic radiation. Some explaining is therefore required as to how this very same equation can then be used in connection with the physical process that is involved with the radiation that is absorbed by the caesium atoms in a moving atomic clock. Radiation being reflected off a moving target seems to have something in common with the absorption of radiation by a moving target. This was discussed in the article, "*Atomic Clocks and Relativity*", [3], in

connection with the changes that occur in both the kinetic energy and the gravitational energy of GPS clocks. At the end of the article, the observation was made that the frequency shift equation,

$$f' = f_o(1 - v^2/2c^2) \quad (2)$$

connects with the Lorentz transformation equation (1), but only providing that the famous equation,  $E = mc^2$ , derives exclusively from the applied radiation pressure, and that this equation does not have general application. All this can only make sense if the time term,  $t$ , in a Lorentz transformation, applies to the angular period of the rotating electron-positron dipoles that densely fill all of space to form the medium for the propagation of light, [4], [5], [6]. As such,  $x$ , in equation (1) will be the circumference of these tiny dipoles, while  $c$  will be their circumferential speed, equal to the speed of light. By 1937, a general picture had emerged of light constituting waves that propagate through a fine-grained vortex sea in which the speed of propagation equates to the circulation speed of the tiny constituent vortices themselves, [7].

### **The Equation $E = mc^2$ and its Origins**

III. In the September addendum to the famous 1905 paper, “*Does the Inertia of a Body Depend upon its Energy-Content?*”, [8], where the equation,  $E = mc^2$ , is generally believed to have first appeared, Einstein’s derivation muddles two independent events simultaneously. The first event is the emission of light from a body, along with the reasonable assumption that the mass of the body will reduce as a result of the loss of the electromagnetic energy. Note that Einstein uses the symbol,  $L$ , for the electromagnetic energy, but the more familiar symbol,  $E$ , will be used here to avoid confusion. The second event is the application of a Lorentz transformation to the energy that is involved in the emitted electromagnetic radiation, but it’s only actually the first event which should be relevant as regards linking the lost mass to the speed of light. While this connection can be made with reference to Maxwell’s radiation pressure equation, the relevant derivation being found in **Section VI** of, “*The Double Helix Theory of the Magnetic Field*”, [6], it’s not clear as to whether or not Einstein ever knew about Maxwell’s equation for radiation pressure. But whatever, the fact that Einstein uses the Lorentz transformation as a means of introducing the speed of light into the analysis, merely conceals a tautology, because electromagnetic energy is only connected to the Lorentz transformation in the first place because of the equation  $E = mc^2$ . The connection comes from the energy-momentum four-vector which is in turn connected to the transverse Doppler effect. The mass term,  $m$ , is actually irrelevant in the analysis. And so, in order to introduce the all-important  $1/2(v^2/c^2)$  factor, Einstein employs this

tautology. He begins at equation (1), but now applied to the electromagnetic energy,  $E$ , which, when  $x = ct$ , takes the form,

$$E' = \gamma E(1 - v/c) \quad (3)$$

Einstein's next conjuring trick is then to get rid of the undesirable  $v/c$  term in equation (3). This he does by splitting the emitted radiation into two equal quanta of energy, each travelling in opposite directions, and he does this so that he can treat these two scalar quantities like vectors. By projecting the two light rays at an angle,  $\phi$ , with respect to the axis, Einstein relies on the fact that a cosine is negative in the third quadrant, so that he can subtract the two  $v/c$  terms out of existence when he performs the Lorentz transformation. This has the effect of producing a transverse Doppler effect, in line with the energy-momentum four-vector equation. The next step is then to do a binomial approximation for the case of  $v \ll c$ , so that the factor  $\frac{1}{2}(v^2/c^2)$  emerges as a coefficient applied to the change in the emitted electromagnetic energy,  $\Delta E$ , which had occurred due to the Lorentz transformation. Then, by equating  $\frac{1}{2}(\Delta E)(v^2/c^2)$  with the corresponding change in the classical kinetic energy of the emitting body, Einstein wrongly concluded that the equation,  $E = mc^2$ , is a mass-energy equivalence equation of general applicability.

But Einstein has conflated the change in the body's mass, due to the emission of the two quanta of light energy, with the change in the body's kinetic energy, due to the Lorentz transformation. The involvement of the speed of light in the mass-energy relationship, as between the lost mass from the emitting body and the emitted radiation itself, should however already be present, whether a Lorentz transformation has been performed or not. The mass-energy relationship must be established independently of any matters relating to the Lorentz transformation. It must be established through Maxwell's radiation pressure equation, [5]. Einstein's derivation of  $E = mc^2$  is both a tautology and a series of conjuring tricks, and at the end, he deceptively switches the electromagnetic origins of  $E = mc^2$  away from the domain of the mass contained within the emitted quanta of EM radiation and instead places it into the domain of the lost mass, prior to its emission from the body. Yet, it was only on conversion to electromagnetic radiation that the speed of light became involved with the emitted mass in the first place. By this final deception, Einstein paves the way for the famous equation,  $E = mc^2$ , to be a mass-energy conversion equation of general applicability.

## Conclusion

**IV.** The Lorentz transformation equations, as used in Einstein's theories of relativity, are simply the equations for the Doppler effect as applied to a ray of light but interpreted in the absence of the medium for the propagation of light,

along with the absurd condition that the speed of light is constant without any means of reference. This leads to the further absurd concept of time dilation, never mind the paradox known as *the clock paradox*, whereby two clocks can both tick slower than each other. We all know, however, that the passage of time doesn't change its rate according to perspective. When the Earth completes an orbit of the Sun, relative to the background stars, one year has passed by for everybody.

The Lorentz transformations do not actually apply to time and space as such but should correctly be applied to the physical medium for the propagation of light, with the time and space variables pertaining to the angular period and circumference of the tiny aethereal vortices, which according to Maxwell, [5], comprise this luminiferous medium. The speed of light is then determined from the circumferential speed of these constituent vortices.

Meanwhile, the equation,  $E = mc^2$ , does not have the general applicability of *mass-energy equivalence* as claimed by Einstein. This equation first appeared in embryonic form as equation (132) in Maxwell's 1861 paper, "***On Physical Lines of Force***", [4], in connection with the density and elasticity of the luminiferous medium. It is simply Newton's equation for the speed of a wave in an elastic solid. This realisation was noted in more recent times by Dr. Menahem Simhony in connection with binding energy, as explained in, "***The 'Mass-Energy Equivalence' Deception - The Second Greatest in 20<sup>th</sup> Century Physics***", [9], and elaborated on in **Section IV** of, "***The Double Helix Theory of the Magnetic Field***", [6], as well as in the article, "***Radiation Pressure and  $E = mc^2$*** ", [10]. The equation,  $E = mc^2$ , never arises unless electromagnetic radiation is involved, whether it be black body radiation, X-rays, or gamma rays, [11], [12], and the equation applies either to the radiation itself, or to the wave propagation medium, as in that very same luminiferous medium that Einstein discarded in one of the greatest acts of scientific vandalism ever performed.

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See **Appendix B**.  
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*“All space, according to the younger Bernoulli, is permeated by a fluid aether, containing an immense number of excessively small whirlpools. The elasticity which the aether appears to possess, and in virtue of which it is able to transmit vibrations, is really due to the presence of these whirlpools; for, owing to centrifugal force, each whirlpool is continually striving to dilate, and so presses against the neighbouring whirlpools.”*

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See *section VI* for Maxwell’s radiation pressure equation.

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[7] Lodge, Sir Oliver, *“Ether (in physics)”*, Encyclopaedia Britannica, Fourteenth Edition, vol. 8, pp. 751-755, (1937)

See pp. 6-7 in the pdf file in the link below, beginning at the paragraph that starts with, *Possible Structure.* –, and note that while the quote suggests that the ether is incompressible, this is almost certainly not the case. The quote in question, in relation to the speed of light, reads,

*“The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion, circulating with that same enormous speed. For it has been partly, though as yet incompletely, shown that such a vortex fluid would transmit waves of the same general nature as light waves— i.e., periodic disturbances across the line of propagation—and would transmit them at a rate of the same order of magnitude as the vortex or circulation speed.”*

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