

Light

According to the special theory of relativity, SR, anything moving at the speed of light should have a zero time rate and zero length in the direction of relative motion. This is because the Lorentz factor is infinite at the speed of light. So it seems light should have zero frequency and zero wavelength!

If instead the factor of infinity is applied to the properties of light as measured by an observer then in the reference frame of the light it would have infinite frequency and wavelength. But an infinite wavelength implies a frequency of zero not infinity - the product of frequency and wavelength being the constant c .

It seems obvious that light behaves quite differently to matter and SR does not apply to light. Yet photons are said to have zero rest mass and they only have mass and energy because their zero rest mass is multiplied by infinity using SR. Hence if SR doesn't apply to light it should be left with no mass, energy, frequency or even existence. So does SR apply to light or not?

Einstein firstly derived the applicability of the Lorentz factor to time and distance. This then allowed him to apply it to mass, but if it doesn't apply to frequency and wavelength it doesn't apply to mass. Using part of a theory whilst having to ignore the rest because it leads to nonsense is a good way to disprove a theory.

It is sometimes falsely claimed that light cannot be assigned a co-moving set of axes, i.e. a frame. But a set of axes is just a mathematical reference frame moving at a velocity of v . A frame isn't a theory that can be disproved. There is no law stopping one imagining a set of axes moving at a velocity of v , and v can equal c . However if there is anything fundamentally different about light's frame then this disproves Einstein's assumption that all inertial frames are equivalent. It disproves the principle of relativity and the basis for SR.