Derivation of the Unit Lorentz Area, Meter Lorentz Area, and Lorentz Meter

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Email Excerpt

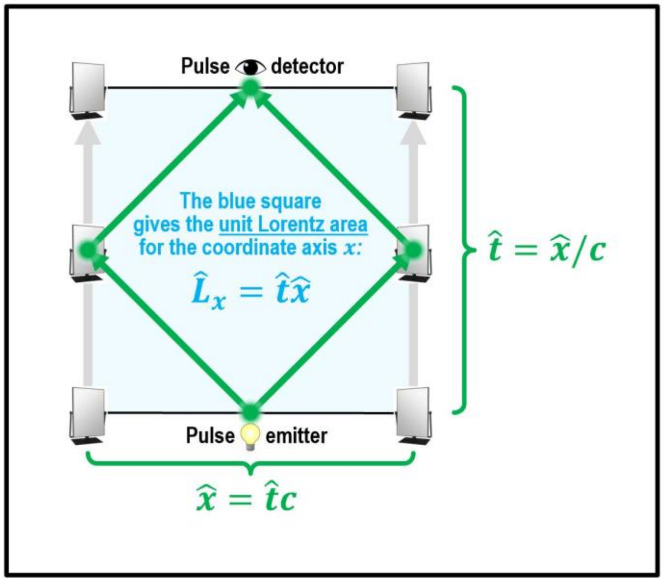

Figure 1. *Unit Lorentz area.* In special relativity, a moving object contracts in the direction of motion and dilates in time, both by the Lorentz factor $\gamma = 1/\sqrt{1-\beta^2}$. Multiplying the contracted length by expanded duration cancels the Lorentz factors to give a relativistically invariant distance metric, the *Lorentz area*, that combines space and time into one number.

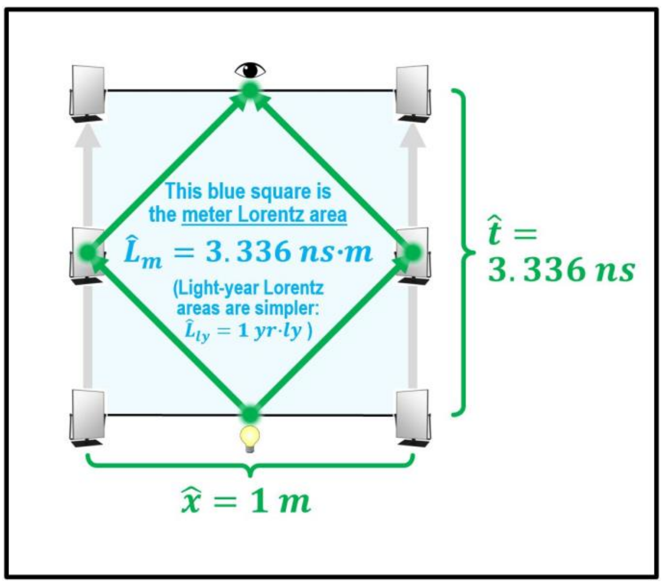

Figure 2. *Meter Lorentz area.* Every length has a corresponding Lorentz area. For meters, $ns{\cdot}m$ units give the best results. The issue is that doubling a conventional distance between two objects quadruples their Lorentz area distance. Consequently, the best units for expressing a Lorentz area are ones in which the speed of light in those units is close to 1. For example, since $c = (1\ ly)/(1\ yr) = 1$, the Lorentz area distance (LAD) between two objects $1\ ly$ apart is $1\ yr{\cdot}ly$. However, for objects $2\ ly$ apart, their LAD rises to $4\ yr{\cdot}ly$.

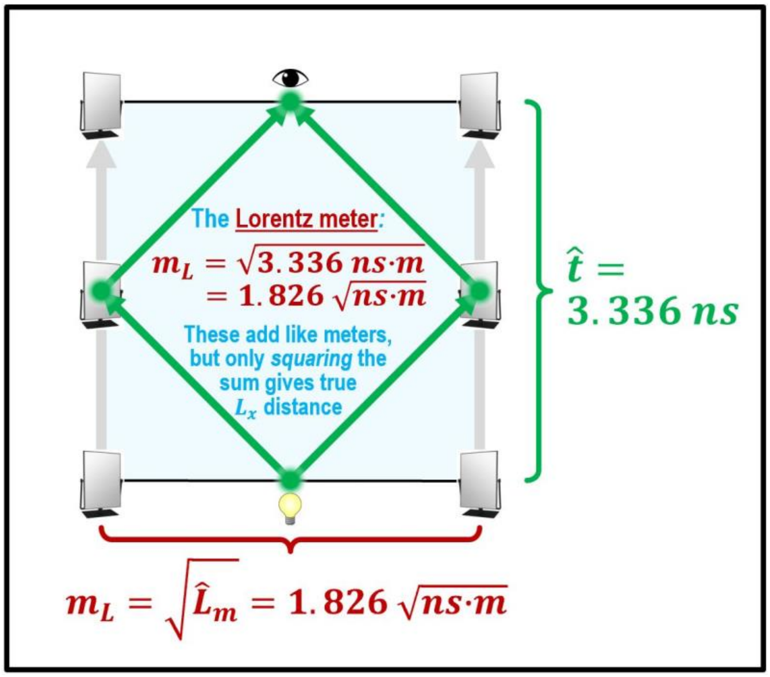

Figure 3. *Lorentz meter.* The Lorentz meter, m_L, is the square root of the meter Lorentz area. Lorentz meters are additive like space-only meters, making them more intuitive for describing large-scale structures. However, this simplicity can also be deceptive since only the *square* of the resulting sum accurately describes the invariant distances between two objects, ensuring that measurement is independent of the time and space coordinate choices of any specific observer.

In summary, Lorentz areas are beneficial for describing the structure of large systems, including the universe as a whole. The main advantage of using LADs is that they remain separate from the velocity state of the observer. In contrast, the observer-intensive concepts of "length" and "duration" are local, with their impact depending on the number, degree, and distribution of participating objects. For this reason, xyzt breakdowns based on various scales of mutually motionless, synchronized objects can ever be fundamental to the universe's state in the same way as the universe's set of Lorenz area distances.

For example, an object rapidly accelerated to 0.6 c *immediately* begins observing the clocks of unaccelerated objects residing on its forward path as ticking twice as fast as its clocks. This faster passage of time for external objects along the forward path combines with the internal passage of time to give net time dilation predicted by the Lorentz factor each time the moving object encounters one of those forward-path clocks.

The common idea that fast-moving objects see clocks in their forward path as moving *slower* in time is incorrect. The reality of anti-dilation or time speed-up along the forward path is proven whenever the moving object encounters such objects and compares clocks.

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