

News & Comments

Superluminal Motion: Relativity

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As one may imagine, discussing breaching the light speed barrier is not a simple process because it can give rise to several untrue rumours, especially considering the tragic OPERA experiment story. But after publishing a paper on the issue, the authors decided to attempt to present it here in a fun way. The theory that has been most thoroughly put to the test is special relativity. Typically, the inclusion of non-invariant elements in the interaction marks the breakdown of special relativity .

An optical equivalent of quantum mechanical tunnelling is frustrated with total internal reflection. It is well known that if a light beam's angle of incidence at the boundary between its optically denser medium of propagation and its lower density counterpart exceeds a certain critical angle, it will be completely reflected there. However, even in this scenario, the electric field travels through the surrounding medium as an evanescent wave with a wavelength-scale depth of penetration. The superluminal propagation conundrum has an astonishingly smart solution provided by quantum field theory .

Indeed, a reference frame in which a particle propagates backwards in time exists for every particle travelling superluminally between space-time sites separated by a space-like interval, appearing to violate causality when the absorption comes before the emission. In a model, emergent relativity is approximate and only true if discreteness effects are ignored. Not all interatomic interactions in that type of atomic chain result in the establishment of sound speed relativity, even within the long-wavelength limit .

In an era where all other structures are either collapsing or being blasted to pieces, science, and particularly mathematics, appears to be building the one permanent and sturdy superstructure that is both practical and real. The authors are adamant that special relativity is a part of this enduring and reliable structure. Special relativity will continue to be one of our most valuable scientific theories even if it turns out that there are non-invariant hidden sectors. Unfortunately, nothing in the material world lasts forever, especially anything as fragile as intelligent life, and this is especially true in light of the current state of climate change.

JOURNAL REFERENCE

Chashchina O, Silagadze Z. Relativity 4-ever? [Physics. 2022; 4\(2\):421-439.](#)

KEYWORDS

Special relativity, superluminal motion, tachyons model

