

The General Science Journal. May 2026.

REAL PHYSICAL SPACE MAKES INCONSISTENT SPECIAL RELATIVITY

THE ACTUAL EXISTENCE OF PHYSICAL SPACE IS INCOMPATIBLE WITH SPECIAL RELATIVITY.

Antonio León Sánchez

Retired Professor. Independent researcher in the foundations of science.

Abstract. The empirical detection of gravitational waves proves the physical reality of space. And the physical reality of space makes it possible to demonstrate, with a very brief and simple argument, that special relativity is a formally inconsistent theory.

Keywords: Physical space, gravitational waves, special relativity, relativistic length contraction, relativistic time dilation, relativistic phase difference in synchronization, principles of special relativity.

1. On the reality of physical space

The empirical detection of gravitational waves is, in my opinion, one of the great successes of contemporary science and engineering. From 2015 to date, nearly 100 such detections have been made in different parts of the world. As usual in these cases, there is an abundant primary and secondary literature on gravitational waves, including that related to their experimental detection and to the latest discoveries on primordial gravitational waves, e.g. [1, 3, 4, 5, 6, 7, 8, 9, 10, 14, 18, 19, 20, 21, 23]. However, at least one of the physical consequences of this detection has not yet been highlighted: the physical reality of the space that produces and propagates these empirically detectable waves.

Indeed, although opinions are divided, for many physicists the three-dimensional continuum we call space remains only a useful theoretical tool for representing certain physical phenomena. At best, there is some ambiguity about the physical reality of space. According to ChatGPT 5.3:

Space is not a “thing” like a rock, but neither is it mere mathematical fiction. It is a physical structure with real effects, although it may not be the most fundamental thing in the universe.

But what does not exist, I believe, cannot vibrate, transmit its vibrations at the speed of light (gravitational waves), or interact with scientific instruments (interferometers) that detect those space vibrations. So it seems reasonable to consider the reality of physical space. And from that perspective, the reality of physical space, the short argument in the following two sections is constructed.

2. Impossible relativistic contractions of the real physical space

One of the consequences of special relativity is the contraction of space, and all kinds of physical objects contained within that space, in the direction of the relative motion with which the objects contained in that space are observed. Contracted by a factor that is always the same, for space and for all kinds of objects contained in that space: $\gamma^{-1} = (1 - v^2/c^2)^{1/2}$, where γ is the relativistic Lorentz's factor; v is the uniform relative velocity at which those objects are observed; and c is the speed of light.

But if the real physical space, and the real physical objects that are contained in that real physical space, cannot be contracted and non-contracted in multiple ways AT THE SAME TIME AND IN THE SAME PLACE, then those relativistic contractions of space and other physical objects can only be apparent, and therefore false. As false as the apparent daily rotation of the Sun around the Earth. Therefore, only measurements of space distances and sizes of physical objects made

in the proper inertial reference frames of those distances and objects can be real and true.

The relativistic consequences are immediate. Indeed, let RF_o and $RF_{n,n=1,2,3,\dots}$, be inertial reference frames whose spatial axes coincide at a certain instant, and such that RF_o moves relative to each of the frames $RF_{n,n=1,2,3,\dots}$ with a uniform and different relative velocity $v_{n,n=1,2,3,\dots}$, parallel to the respective axis $X_{n,n=1,2,3,\dots}$ of the respective frames $RF_{n,n=1,2,3,\dots}$. And let d_o be any spacial distance measured at rest in RF_o and parallel to the axis X_o of RF_o . According to special relativity, that spacial distance d_o measured in RF_o now measured, via Lorentz's transformation, from $RF_{n,n=1,2,3,\dots}$ will be $d_{n,n=1,2,3,\dots} = \gamma_{n,n=1,2,3,\dots}^{-1} d_o$, were each $\gamma_{n,n=1,2,3,\dots}$ is the relativistic factor between RF_o and each of the respective frames $RF_{n,n=1,2,3,\dots}$. But according to the previous argument (real physical space and real physical objects cannot be contracted and non-contracted simultaneously and in the same place), these equalities are only valid if $\gamma_{n,n=1,2,3,\dots}^{-1} = 1$ and then $v_{n,n=1,2,3,\dots} = 0$. Consequently $d_{n,n=1,2,3,\dots} = d_o$

3. Special relativity is inconsistent

(An argument partially taken from [16])

Let us consider again RF_o and any of the above inertial reference frames RF_i . And let S be a source of photons at rest in RF_o . Suppose that S emits a photon a^* that in RF_o travels parallel to X_o a distance d_o to a final screen, which the photon reaches in a time t_o . The speed of light c in RF_o will be: $c = d_o/t_o$. In RF_i , and according to the Second Principle of Special Relativity, we will have for this photon a^* : $c = d_i/t_i = d_o/t_o$. And since according to the above argument $d_i = d_o$, we will have:

$$c = \frac{d_i}{t_i} = \frac{d_o}{t_i} = \frac{d_o}{t_o} \quad (1)$$

So that $t_i = t_o$. Therefore, the only valid measurements of space and time are those made in the proper inertial reference frames of the objects involved. Those made in other inertial reference frames can only be apparent, and therefore as false as, for example, refractive deformations of solids objects partially submerged in water.

Special relativity is, therefore, an inconsistent theory. And the reason for its inconsistency cannot be the first of its two fundamental principles, which establishes the universality of physical laws, because if that principle were false, the consistent evolution of the universe, for which there is overwhelming empirical evidence, would be impossible. It must therefore be the second of its fundamental principles, a principle that establishes that the speed of light is always the same for all inertial reference frames, regardless of the speed of these inertial reference frames with respect to the light source. The speed of light would always be the same, but THROUGH THE ABSOLUTE REAL PHYSICAL SPACE in which it propagates.

This last paragraph is included only to justify why neither the relativistic increase in mass with velocity nor the relationship between mass and energy has been discussed. The reason is that both relationships can be formally deduced outside of theory of special relativity [22], [13], [2], [17],[15] [11, 12]

Bibliographical References

- [1] BP Abbott, Richard Abbott, TDea Abbott, S Abraham, F Acernese, K Ackley, C Adams, RX Adhikari, VB Adya, Christoph Affeldt, et al. Gwtc-1: a gravitational-wave transient catalog of compact binary mergers observed by ligo and virgo during the first and second observing runs. *Physical Review X*, 9(3):031040, 2019.
- [2] M. Abraham. Prinzipien der Dynamik des Elektrons. *Ann. Phys.*, 315 (1):105–179, 1903.
- [3] M. Bartels. First Evidence of Giant Gravitational Waves Thrills Astronomers. *Scientific American*, June 2023.

- [4] D. Blanco Laserna. *Las ondas gravitacionales*. RBA Editores, Mexico, 2017.
- [5] R. T. Cahill. Quantum Foam, Gravity and Gravitational Waves. *Relativity, Gravitation, Cosmology*, pages 168–226, 2003.
- [6] Reginald T. Cahill. A new light-speed anisotropy experiment: absolute motion and gravitational waves detected. *Progress in Physics*, 4:73–92, 2006.
- [7] A Chalumeau, S Babak, A Petiteau, S Chen, A Samajdar, R N Caballero, G Theureau, L Guillemot, G Desvignes, A Parthasarathy, K Liu, G Shaifullah, H Hu, E van der Wateren, J Antoniadis, A S Bak Nielsen, C G Bassa, A Berthereau, M Burgay, D J Champion, I Cognard, M Falxa, R D Ferdman, P C C Freire, J R Gair, E Graikou, Y J Guo, J Jang, G H Janssen, R Karuppusamy, M J Keith, M Kramer, K J Lee, X J Liu, A G Lyne, R A Main, J W McKee, M B Mickaliger, B B P Perera, D Perrodin, N K Porayko, A Possenti, S A Sanidas, A Sesana, L Speri, B W Stappers, C Tiburzi, A Vecchio, J P W Verbiest, J Wang, L Wang, and H Xu. Noise analysis in the European Pulsar Timing Array data release 2 and its implications on the gravitational-wave background search. *Monthly Notices of the Royal Astronomical Society*, 509(4):5538–5558, 11 2021.
- [8] A. Einstein and N. Rosen. On Gravitational Waves. *J. Franklin Inst.*, 223:43–54, 1937.
- [9] Fabrizio Fiore, Luciano Burderi, Tiziana Di Salvo, Marco Feroci, Claudio Labanti, Michelle R. Lavagna, and Simone Pirrotta. HERMES: a swarm of nano-satellites for high energy astrophysics and fundamental physics. In Jan-Willem A. den Herder, Shouleh Nikzad, and Kazuhiro Nakazawa, editors, *Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray*, volume 10699. International Society for Optics and Photonics, SPIE, 2018.
- [10] S. Hacyan. *Ondas gravitacionales*. Fondo de Cultura Económica, México, 2019.
- [11] Friederich Hasenöhr. Zur Theorie der Strahlung in bewegten Körpern. *Ann. Phys.*, 15, 344–370:344–370, 1904.
- [12] Friedrich Hasenöhr. Zur Theorie der Strahlung in bewegten Körpern. Berichtigung. *Ann. Phys.*, 16:589–592, 1905.
- [13] O. Heaviside. On the electromagnetic effects due to the motion of electrification through a dielectric. *Philos. Mag.*, 5, 27:324–339, 1889.
- [14] G. Herrera Corral. *Agujeros negros y ondas gravitacionales*. Editorial Sexto Piso, Madrid, 2019.
- [15] Max Jammer. *Concepts of Mass in Classical and Modern Physics*. Harvard University Press, Cambridge, MA, 1961.
- [16] A. León Sánchez. Impossible relativistic rest on inclined planes. *The General Science Journal*, 2026. [Pdf](#).
- [17] H. A. Lorentz. Electromagnetic phenomena in a system moving with any velocity smaller than that of light. *Proceedings of the Royal Netherlands Academy of Sciences and Arts*, 6:809–831, 1904.
- [18] Christopher J. Moore and Alberto Vecchio. Ultra-low-frequency gravitational waves from cosmological and astrophysical processes. *Nature Astronomy*, 5(12):1268–1274, 2021.
- [19] Carlos Garcia Nu nez, Gavin Wallace, Lewis Fleming, Kieran Craig, Shigeng Song, Sam Ahmadzadeh, Caspar Clark, Simon Tait, Iain Martin, Stuart Reid, Sheila Rowan, and Des Gibson. Amorphous dielectric optical coatings deposited by plasma ion-assisted electron beam evaporation for gravitational wave detectors. *Appl. Opt.*, 62(7):B209–B221, Mar 2023.
- [20] Tony Rothman. The Secret History of Gravitational Waves. *American Scientist*, 106(2):95, 2018.
- [21] Wolfgang Steinicke. Einstein and the Gravitational Waves. *Astronomische Nachrichten*, 326(7):640–641, 2005.
- [22] J. J. Thomson. On the electric and magnetic effects produced by the motion of electrified bodies. *Philos. Mag.*, 5, 11:229–249, 1881.
- [23] Heng Xu, Siyuan Chen, Yanjun Guo, Jinchun Jiang, Bojun Wang, Jiangwei Xu, Zihan Xue, R. Nicolas Caballero, Jianping Yuan, Yonghua Xu, Jingbo Wang, Longfei Hao, Jingtao Luo, Kejia Lee, Jinlin Han, Peng Jiang, Zhiqiang Shen, Min Wang, Na Wang, Renxin Xu, Xiangping Wu, Richard Manchester, Lei Qian, Xin Guan, Menglin Huang, Chun Sun, and Yan Zhu. Searching for the nano-hertz stochastic gravitational wave background with the chinese pulsar timing array data release i. *Research in Astronomy and Astrophysics*, 23(7):075024, jun 2023.