

3.4: No frame of reference moving at c

Learning Objectives

- Explain the frame of reference

We have seen in section 3.3 that no continuous process of acceleration can boost a material object to c . That is, the subluminal (slower than light) nature of a electron or a person is a fundamental feature of its identity and can never be changed. Einstein can never get on his motorcycle and drive at c as he imagined when he was a young man, so we material beings can never see the world from a frame of reference that travels at c .

Our universe does, however, contain ingredients such as light rays, gluons, and gravitational waves that travel at c , so we might wonder whether these things could be put together to form observers who do move at c . But this is not possible according to special relativity, because if we let v approach infinity, extrapolation of figure 3.3.1 shows that the Lorentz transformation would compress all of spacetime onto the light cone, reducing its number of dimensions by 1. Distinct points would be merged, which would make it impossible to use this frame to describe the same phenomena that a subluminal observer could describe. That is, the transformation would not be one-to-one, and this is unacceptable physically.

This page titled [3.4: No frame of reference moving at \$c\$](#) is shared under a [CC BY-SA 4.0](#) license and was authored, remixed, and/or curated by [Benjamin Crowell](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.