

CHAPTER OVERVIEW

24: The Theory of Special Relativity

Learning Objectives

- Understand the motivation for developing the Theory of Special Relativity.
- Understand Einstein's postulates and their consequences.
- Understand how to apply Einstein's postulates to describe simultaneity.
- Understand how to model length contraction and time dilation.
- Understand how to apply Lorentz transformations and make space-time diagrams.
- Understand how to model the energy and momentum of a relativistic object.

In this chapter, we introduce the theory of Special Relativity, originally formulated by Albert Einstein in 1905. Along with the development of Quantum Mechanics, Special Relativity marks the start of “modern physics”, and the introduction of theories to describe our world that are decidedly counter-intuitive.

prelude

Is it possible to time-travel into the future, so that you will be younger than people that are currently older than you?

- A. Yes, it's possible.
- B. No, it is impossible because it would violate causality.
- C. No, it is impossible because it's a ridiculous idea.

[24.1: Introduction- The issue with Maxwell's equations](#)

[24.2: Einstein's postulates](#)

[24.3: Time Dilation](#)

[24.4: Length Contraction](#)

[24.5: Electric and magnetic fields and Special Relativity](#)

[24.6: Lorentz transformations and space-time](#)

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