

7.2: Lorentz and Poincaré Invariance

One of the most common continuous symmetries of a relativistic theory is Lorentz invariance, i.e., the dynamics is the same in any Lorentz frame. The group of Lorentz transformations can be decomposed into two parts:

- Boosts, where we go from one Lorentz frame to another, i.e., we change the velocity.
- Rotations, where we change the orientation of the coordinate frame.

There is a slightly larger group of symmetries, called the **Poincaré group**, obtained when we add translations to the set of symmetries – clearly the dynamics doesn't care where we put the orbit of space. The set of conserved quantities associated with this group is large. Translational and boost invariance implies conservation of four momentum, and rotational invariance implies conservation of angular momentum.

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