

# Inertial observers in de Sitter special relativity

## Abstract

In this document we try to find a notion of inertial observers in de Sitter special relativity. In doing so, we look for inspiration in ordinary special relativity and try to give a mathematical rigorous treatment. Also, we try to find a definition for geodesics inside de Sitter special relativity.

## 1 Inertial observers in ordinary special relativity

Inertial observers in OSR\* are those who describe Minkowski space with Cartesian coordinates  $x^\mu$ . Every one of them can relate its frame of reference with any other one through an element of the Poincaré group. The normal subgroup of Lorentz rotation  $\mathcal{L}$  relates observers which have a relative velocity. The quotient group  $\mathcal{P}/\mathcal{L}$  of translations relates observers that are separated in spacetime. Translations (left) are generated by the Killing fields  $K_a = \delta_a^\mu \partial_\mu$ . Not only are these vector fields Killing, they also form a tetrad or Vierbein  $\{e_a\}$ , i.e. at any point  $p$  one has  $e^a(e_b) = \delta_b^a$ . A generic vector  $\xi = \xi^a e_a$  is expressed with respect to this Vierbein. Since the latter are left invariant under translations, the notion of *global* inertial observers emerges. Observers separated in spacetime can compare their measurements (components) of  $\xi$  as if they are residing in the same point, because a translation canonically connects the frames considered. More precisely, if  $\xi_t = \xi_t^a e_a$  is a field along a curve  $\gamma_t$

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\*Ordinary Special Relativity