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Group Theory of Lorentz Symmetry in the Cosmological Expansion FELIX T. SMITH, SRI International — In the hyperbolic geometry of the Hubble expansion the Lorentz velocity boost symmetry is unimpaired, and it acquires a companion Lorentzian symmetry in hyperbolic position space. Hyperbolic translations generate a boost-like operator depending on $\delta\mathbf{r}/\mathbf{ct_H}$, where t_{H} is the Hubble time. Position and velocity participate in a doubly Lorentzian phase space. A direct product of two O(3,1) subgroups leads to a double Lorentz group with separate operators for velocity boosts and for hyperbolic translations. The resulting group theory will be outlined. (Cf. Smith, F. T., Ann. Fond. L. deBroglie, 30, 179 (2005).) Its representation requires 8×8 matrices. Its Lie algebra is constructed, and compared to that of the Poincaré group. Its operators for velocity boosts operate on vectors of both velocity and position subspaces of a phase space, and so do its operators of hyperbolic translation. When the latter operate on position vectors they describe quantitatively the Hubble effect. Curvature effects in position and velocity spaces are of different magnitudes, and each produces its own angular momentum effects. A new angular momentum operator is encountered, with applications to the classification of angular momentum or particle states and their transitions.

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