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Lorentz Symmetry Effects Connected with Cosmological Expansion FELIX T. SMITH, SRI International — The possible extension of the laws of physics beyond the Standard Model and into deviations from Lorentz and Poincaré symmetries leads to a search for observable tests, both local and cosmological. I discuss the consequences for Lorentz symmetry of a hyperbolic cosmological geometry expanding in cosmic time. The high symmetry of the cosmic background radiation suggests that the expanding geometry approximates very closely to hyperbolic 3-space symmetry. The Lorentz symmetry under velocity boosts will then be supplemented by a second Lorentz-like symmetry in hyperbolic position space, with its own boost-like operator depending not on the ratio $\delta\mathbf{v}/\mathbf{c}$ but on $\delta\mathbf{r}/\mathbf{ct_H}$, where $t_{\rm H}$ is the Hubble time. The spatial curvature entails new angular momentum effects. Lorentz symmetry is preserved and enhanced, but the spatial curvature brings in new operators permitting very weak transitions that would be totally forbidden under the zero curvature symmetry of the Poincaré group of Minkowski space-time. A coupling operator appears that depends on the product $(\delta\mathbf{v}/\mathbf{c})\cdot(\delta\mathbf{r}/\mathbf{ct_H})$, suggesting more general operators $(\delta\mathbf{v}/\mathbf{c})\cdot(\delta\mathbf{r}/\mathbf{l_{curv}}$, where $l_{\rm curv}$ is a local curvature length. The nature of the Poincaré symmetries that may be weakened will be explored. (See also a poster at this meeting, "Group Theory of Lorentz Symmetry in the Cosmological Expansion.")

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