Abstract Submitted
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Lorentz Symmetries of a Doubly Hyperbolic Phase Space FELIX T. SMITH — The Einstein addition law of velocities implies a hyperbolic geometry for relativistic velocity and momentum space. The simplest model of an open, expanding universe implies a hyperbolic geometry for position space. It is natural to investigate the kinematics of a phase space combining hyperbolic geometries in both the velocity-momentum manifold $H(3)_{\rm vel}$ and the position manifold $H(3)_{\rm pos}$. Each of these sustains its own Lorentz subgroup, $L_{\rm vel} = O(1,3)_{\rm vel}$ and $L_{\rm pos} = O(1,3)_{\rm pos}$. These form a direct product group $L^2 = L_{\rm vel} \times L_{\rm pos}$, a 12-parameter group, represented by 8×8 matrices. Among its operators are a subgroup $L_{\rm boost}$ of Lorentz velocity boosts that operate on the elements of $L_{\rm vel}$ by Einstein addition and on those of $L_{\rm pos}$ by the Lorentz transformation. There is also a conjugate subgroup $L_{\rm shift}$ of hyperbolic translational shifts that operate on the elements of $L_{\rm pos}$ translationally, and on those of $L_{\rm vel}$ to describe the Hubble effect of distance on velocity vectors. The structure, symmetries, Lie algebra and important operators and quantum numbers of the resulting representation of L^2 will be reported. (See also F.T. Smith, Ann. Fond. L. de Broglie, 30, 179 (2005).)

Felix T. Smith
SRI International

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