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Relativistic non-instantaneous action-at-a-distance interactions DOMINGO LOUIS-MARTINEZ, University of British Columbia — Relativistic action-at-a-distance theories with interactions that propagate at the speed of light in vacuum are investigated. We consider the most general action depending on the velocities and relative positions of the particles. The Poincare invariant parameters that label successive events along the world lines can be identified with the proper times of the particles provided that certain conditions are imposed on the interaction terms in the action. Further conditions on the interaction terms arise from the requirement that mass be a scalar. A generic class of theories with interactions that satisfy these conditions is found. The relativistic equations of motion for these theories are presented. We obtain exact circular orbits solutions of the relativistic one-body problem. The exact relativistic one-body Hamiltonian is also derived. The theory has three components: a linearly rising potential, a Coulomb-like interaction and a dynamical component to the Poincare invariant mass. At the quantum level we obtain the generalized Klein-Gordon-Fock equation and the Dirac equation.

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