Abstract Submitted
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Causality and relativistic localization in one-dimensional Hamiltonians[1] BENJAMIN SHIELDS, R. GROBE, Q. SU, Illinois State University — We compare the relativistic time evolution of an initially localized quantum particle obtained from the relativistic Schrödinger, the Klein-Gordon and Dirac equation. By computing the amount of the spatial probability density that evolves outside the light cone we quantify the amount of causality violation for the relativistic Schrödinger Hamiltonian. We comment on the relationship between quantum field theoretical transition amplitudes, commutators of the fields and their bilinear combinations outside the light cone as indicators of a possible causality violation. We point out the relevance of the relativistic localization problem to this discussion and comment on ideas about the supposed role of quantum field theory as a vehicle of making a theory causal by introducing antiparticles.

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