Quantum Time Arrows, Semigroups and Time-Reversal in Scattering

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Abstract

Two approaches toward the arrow of time for scattering processes have been proposed in rigged Hilbert space quantum mechanics. One, due to Arno Bohm, involves preparations and registrations in laboratory operations and results in two semigroups oriented in the forward direction of time. The other, employed by the Brussels-Austin group, is more general, involving excitations and de-excitations of systems, and apparently results in two semigroups oriented in opposite directions of time. It turns out that these two time arrows can be related to each other via Wigner's extensions of the spacetime symmetry group. Furthermore, their are subtle differences in causality as well as the possibilities for the existence and creation of time-reversed states depending on which time arrow is chosen

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