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Time reversal symmetry avoided transitions in quantum nonadiabatic processes FUXIANG LI, Theoretical Division and CNLS, Los Alamos National Laboratory, NIKOLAI SINITSYN, Theoretical Division, Los Alamos National Laboratory — Kramers degeneracy theorem is one of the basic results in quantum mechanics. According to it, the time- reversal symmetry makes each energy level of a half-integer spin system at least doubly degenerate, meaning the absence of transitions or scatterings between degenerate states if the Hamiltonian does not depend on time explicitly. We generalize this result to the case of explicitly time-dependent spin Hamiltonians. We prove that for a spin system with the total spin being a half integer, if its Hamiltonian and the evolution time interval are symmetric under a specifically defined time reversal operation, the scattering amplitude between an arbitrary initial state and its time reversed counterpart is exactly zero. We also discuss applications of this result to the multistate LandauZener (LZ) theory.

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