Diffusion and Friction Coefficients in the Lindblad Axiomatic Approach to Nonequilibrium Nuclear Processes*

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Abstract—The influence of various sets of friction and diffusion coefficients on the dynamics of a quantum system is investigated. By considering the example of a dinuclear system, we show that the uncertainty relation can be violated over a short initial time in a classical consideration with zero diffusion in the relevant coordinate. Sets of diffusion coefficients for which the classical and quantum Lindblad considerations give close results are found. Tunneling through a barrier is crucial for the presence of friction in the coordinate in the quantum diffusion equation. A specific choice of operators describing the coupling of an open system to a heat bath allows one to obtain a quantum diffusion equation with zero friction in the coordinate and nonzero values of other transport coefficients.