SFB1242

Nichtgleichgewichtsdynamik kondensierter Materie in der Zeitdomäne

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Multitemperature models – why do they work?

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Two- or three-temperature models are often applied to describe the nonequilibrium dynamics of interacting multicomponent systems. These models phenomenologically assign an individual equilibrium temperature to each of a solids subsystems, like the charge, spin and phonon subsystems, and describe the dynamics by heat diffusion equations. Even though the entire system is far from equilibrium and even in situations where the coupling between the subsystems is as strong as within them, multitemperature models are remarkably successful in describing the nonequilibrium dynamics of complex materials. Their microscopic origin has, however, remained obscure.

In this talk we discuss the microscopic basis for multitemperature models. It turns out to be closely related to the quantum thermalization problem, i.e., to the fundamental question how an isolated quantum system, whose dynamics are unitary and, therefore, entropy-preserving, can ever reach thermal behavior. Such fast thermalization is usually observed in isolated, ultracold atomic gases. We first show how the measurement process of a physical quantity itself in general leads to thermalizing dynamics beyond the so-called eigenstate thermalization hypothesis (ETH). Concretely, we then consider an electronic Hubbard system with ultrafast optical pumping and show that after an ultrashort relaxation time the nonequilibrium spin and charge response can indeed be described by individual, time-dependent equilibrium temperatures of the charge and spin systems. We discuss memory effects as well as critical slowing down near a quantum phase transition.

Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

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