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Nonadiabatic dynamics and coherent control of nonequilibrium superconductors ANDREAS SCHNYDER, Max-Planck-Institut für Festkörperforschung — Motivated by recent THz pump-THz probe experiments on NbN films [1], we theoretically study the pump-probe response of nonequilibrium superconductors coupled to optical phonons. For ultrashort pump pulses a nonadiabatic regime emerges, which is characterized by oscillations of the superconducting gap [2] and by the generation of coherent phonons [3]. Using density-matrix theory, we compute the pump-probe response of the superconductor in the nonadiabatic regime and determine the signatures of the order parameter and of the phonon oscillations in the pump-probe conductivity. We find that the nonadiabatic dynamics of the superconductor reflects itself in oscillations of the pump-probe response as a function of delay time between pump and probe pulses [4]. We argue that from the analysis of this oscillatory behavior both frequency and decay time of the algebraically decaying order-parameter oscillations can be inferred.

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