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Relaxation dynamics of excited states in spin-electron coupled systems W. KOSHIBAE, CMRG, RIKEN, N. FURUKAWA, Aoyama-Gakuin Univ., ERATO-Multiferroics, JST, N. NAGAOSA, Dept. of Appl. Phys., Univ. of Tokyo — We have examined the quantum dynamics of the excited electronic states in the double-exchange model at half-filling by solving coupled equations for the quantum evolution of electrons and Landau-Lifshits-Gilbert equation for classical spins. The Gilbert damping term gives an energy dissipation of the excited electronic state and relaxation process. We numerically investigate the relaxation dynamics of excited states by calculating time evolution of the electronic states and local spin structure. We find a new relaxation process, i.e., the non-adiabatic quantum transitions through a resonant mutual precession analogous to the electron spin resonance (ESR) process. With the relaxation dynamics similar to the ESR process, spatial inhomogeneity of the electronic structure is developed by the time evolution. Consequently, the nano-scale spatial structure of the spins evolves spontaneously accompanied by the localization of the electronic wavefunctions. The robustness of the quantum dynamics to the parameters in the model is also investigated.

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