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Nonequilibrium dynamical mean-field study of correlated electron systems driven by a mono-cycle pulse NAOTO TSUJI, ETH Zurich, TAKASHI OKA, HIDEO AOKI, Department of Physics, University of Tokyo, PHILIPP WERNER, ETH Zurich — A few-cycle pulse can be generated and has been widely used in recent ultrafast optical experiments, but its potential application to correlated electron systems has remained unexplored in contrast to many-cycle pulses. What is characteristic of the few-cycle pulse is to induce a shift of electron's momentum dynamically. To reveal its effect on the electronic properties of the system, we study the single-band Hubbard model driven by half-cycle and mono-cycle pulses using the nonequilibrium dynamical mean-field theory. As an impurity solver, we employ the continuous-time quantum Monte Carlo method and the iterative perturbation theory. We show that when the momentum shift is nearly π (half of the Brillouin zone) the shifted population relaxes to a negative-temperature state, where the electron-electron interaction is effectively switched from repulsive to attractive. The shift is found to deviate from the dynamical phase $\phi = \int F(t)dt$ due to electron correlation effects, which suggests that one can generate the repulsion-to-attraction transition by a mono-cycle pulse with $\phi = 0$.

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