Non-equilibrium dynamics of stripes in cuprate superconductors

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In recent years pump-probe experiments have turned out as a powerful tool to investigate the dynamics of correlated materials [1], e.g. transition metals or heavy fermion systems. In these experiments the system is prepared in a non equilibrium state by a strong laser pulse and than the relaxation is examined by standard optical techniques. This method has also been applied to stripe ordered nickelates and cuprate superconductors where it allows to study the coupled order-parameter dynamics of charge- and spin-density waves and superconductivity [2,3,4].

Here we use the time-dependent Gutzwiller approximation (TDGA) [5] for the single-band Hubbard model to analyze the non-equilibrium dynamics for stripe ground states of different symmetry. In particular we are interested in the interplay between spin and charge dynamics which is analyzed by quenching the system either in the charge or spin sector. This allows us to investigate the coupled relaxation dynamics as a function of the inserted energy. Further insight is provided by mapping the Gutzwiller dynamics onto a time-dependent Landau approach which lacks the double occupancy contribution to the time-evolution but allows to tune the coupling between spin- and charge degrees of freedom.

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