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A non-equilibrium approach to the optical spectroscopy of high-temperature superconductors

FULVIO PARMIGIANI, Univ of Trieste - Trieste

Non-equilibrium spectroscopies of high temperature superconductors have evolved in the last two decades from avant-garde studies to a crucial tool for understanding the physics of high temperature superconductors. In particular, the possibility of obtaining both spectral and temporal information simultaneously leads to insights that are complementary (and in some instances beyond to) those attainable by conventional equilibrium experiments. This presentation is focused on the still unresolved problem of the origin of the pseudo-gap in cuprates, one of the major open issues about copper-oxides based superconductors. Indeed, the ubiquitous phenomenology of the pseudo-gap, occupying a wide region of the phase diagram, is not understood yet. Its comprehension could provide clue information about the microscopic mechanisms of these materials and their phase diagram. We investigate the pseudo-gap with non-equilibrium approach, that allows to disentangle the intertwined degrees of freedom (carrier, lattice. long range order) by their timescale.