Kinks in the dispersion of strongly correlated electrons

Marcus Kollar

Theoretical Physics III, Center for Electronic Correlations and Magnetism, Institute for Physics, University of Augsburg, 86135 Augsburg, Germany

The properties of condensed matter are determined by single-particle and collective excitations and their interactions. These quantum-mechanical excitations are characterized by an energy E and a momentum $\hbar\boldsymbol{k}$ which are related through their dispersion $E_{\boldsymbol{k}}$. The coupling of two excitations may lead to abrupt changes (kinks) in the slope of the dispersion. Such kinks thus carry important information about interactions in a many-body system and are of great interest, e.g., in the high-temperature superconductors. Here we report a novel, purely electronic mechanism yielding kinks in the electron dispersions [1]. It applies to strongly correlated metals whose spectral function shows well separated Hubbard subbands and central peak as, for example, in transition metal-oxides. The position of the kinks and the energy range of validity of Fermi-liquid (FL) theory is determined solely by the FL renormalization factor and the bare, uncorrelated band structure. Angle-resolved photoemission spectroscopy (ARPES) experiments at binding energies outside the FL regime can thus provide new, previously unexpected information about strongly correlated electronic systems.

[1] K. Byczuk, M. Kollar, K. Held, Y.-F. Yang, I. A. Nekrasov, Th. Pruschke, D. Vollhardt, cond-mat/0609594.