Electronic Structure and Dynamics of Quantum-Well States in thin Yb-Metal Films

DANIEL WEGNER, ANDREAS BAUER, GÜNTER KAINDL, Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin, Germany — By low-temperature scanning tunneling spectroscopy, we have studied quantum-well states above the Fermi energy in thin Yb(111)-metal films deposited on a W(110) single crystal. These states are laterally highly localized and give rise to sharp peaks in the tunneling spectra. Due to the high lateral resolution of STS, the quantum-well states and their film-thickness dependence can be observed on rather rough films with variations of the local thickness over a range of several monolayers. A quantitative analysis of the spectra yields the bulk-band dispersion in Γ−L direction as well as quasi-particle lifetimes. The quadratic energy dependence of the lifetimes is in quantitative agreement with Fermi-liquid theory. cond-mat/0411580.

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