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Pseudogap scaling and quantum critical end point in electron- and hole-doped cuprates

TAKASADA SHIBAUCHI, Department of Physics, Kyoto University

In spite of a large number of experiments on the anomalous pseudogap in cuprate superconductors, the real phase diagram of the pseudogap has not yet been established. We employ the interlayer tunneling transport to precisely detect the field dependence of low-energy density of states (DOS) in hole-doped $Bi_2Sr_2CaCu_2O_{8+y}$ and electron-doped $Sm_{2-x}Ce_xCuO_{4-\delta}$ crystals under high fields up to 60 T [1-4]. From a systematic analysis of negative interlayer magnetoresistance, we found a strong doping dependence of the pseudogap closing field whose Zeeman energy scales with the pseudogap energy scale, indicating a preeminent role of spin-singlet correlations in forming the pseudogap in cuprates. The results suggest no quantum critical point up to very overdoped side of the phase diagram.

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