Spin Gap, Electronic Crossover, and Charge Density Waves in Y-Ba-Cu-O Superconductors*

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This paper discusses recent NQR/NMR studies performed on Y-Ba-Cu-O superconductors at the University of Zürich. The work is concerned with normal state properties which are still controversial, for instance the spin-gap effect, i.e. the opening of a pseudo gap in the electron spin excitation spectrum at a temperature $T^*$, which lies above $T_c$. We will report on the detection of “anomalies” which are displayed in the temperature dependence of several NMR and NQR quantities measured in the normal state of YBa$_2$Cu$_4$O$_8$. These anomalies are interpreted as an electronic crossover which involves a charge redistribution in the CuO$_2$ planes and an enhancement of the charge fluctuations. As a possible mechanism of the crossover, a charge density wave instability is proposed.

Key words: NQR, NMR, High-Temperature Superconductors, Spin gap, Electronic Crossover.

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