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Effect of Nonmagnetic Impurity in Nearly Antiferromagnetic Fermi Liquid: Magnetic Correlations and Transport Phenomena HIROSHI KONTANI, MASANORI OHNO, Nagoya University, Japan — In nearly AF metals such as high-Tc superconductors (HTSCs), heavy fermion systems and organic superconductors, a single nonmagnetic impurity frequently causes nontrivial widespread change of the electronic states. To elucidate this long-standing issue, we study a Hubbard model with a strong onsite impurity potential based on an improved fluctuation-exchange (FLEX) approximation, which we call the GV^I-FLEX method. We find that (i) both local and staggered susceptibilities are strongly enhanced around the impurity. By this reason, (ii) the quasiparticle lifetime as well as the local DOS are strongly suppressed in a wide area around the impurity (like a Swiss cheese hole), which causes the "huge residual resistivity" beyond the s-wave unitary scattering limit. We stress that the excess quasiparticle damping rate caused by impurities has strong momentum-dependence due to non-s-wave scatterings induced by many-body effects, so the structure of the "hot spot/cold spot" in the host system persists against impurity doping. This result could be examined by the ARPES measurements. In addition, (iii) only a few percent of impurities can causes a "Kondo-like" upturn of resistivity ($d\rho/dT < 0$) at low temperatures when the system is very close to the AF quantum critical point (QCP). We also discuss the impurity effect in the superconducting state.

Hiroshi Kontani
Nagoya University, Japan

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