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Quantum Critical Phenomena in $Ni_3Al_{1-x}Ga_x$ Alloys[1] M.H. FANG, Zhejiang University (ZJU) and Tulane University (TU), J.H. YANG, Z.A. XU, ZJU, B. CHEN, Y. ITOH, K. YOSHIMURA, Kyoto University, Z.Q. MAO, TU — Considerable study has been devoted to quantum phase transitions (QPTs), which are believed to be a key concept for understanding the physics of strongly correlated electrons. In this talk we report on observation of quantum critical phenomena in $Ni_3Al_{1-x}Ga_x$ alloys. Ni_3Al is a ferromagnetic metal with $T_c = 41.5K$. With Ga substitution for Al, T_c and the spontaneous magnetic moment are gradually suppressed down to zero near the critical composition of $x_c \sim 0.4$. We found that near the critical composition the magnetization as a function of magnetic field M(H) and the magnetic susceptibility as a function of temperature $\chi(T)$ both obey the scaling laws theoretically expected for QPTs, i.e., $M(H) \propto H^{1/3}$ and $\chi^{-1} \propto T^{4/3}$. In addition, we observed that near x_c the derivative derived from the Arrott plots, i.e., $\gamma = d(M^2)/d(H/M)$ value,exhibits a remarkable peak at about 2-3 T. This peak enhances with decreasing temperature. In terms of a recent theory, we argue that γ reflects characteristics of spin excitation spectrum near QPTs.

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