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Quantum Criticality in Itinerant Antiferromagnet $Cr_{0.965}V_{0.035}$
D.A. SOKOLOV, G. STRYCKER, M.C. ARONSON, M.C. BENNETT, The University of Michigan, S.E. NAGLER, M. LUMSDEN, HFIR, ORNL — We report results of triple-axis neutron scattering experiments, in which we studied the development of the magnetic fluctuations in the quantum critical itinerant antiferromagnet $Cr_{0.965}V_{0.035}$. Unexpectedly, we found temperature dependent elastic scattering at the incommensurate wavevector $q^*=(001\pm\delta)2\ \pi/a$, which corresponds to the spin density wavevector in pure Cr and no elastic scattering at the commensurate wavevector $q=(001)2\ \pi/a$. We propose an electronic phase separation scenario to account for the observed elastic scattering. Temperature independent inelastic scattering was observed at the commensurate wavevector q. This scattering showed a linear increase with energy transfer E_t, saturating at E_t=18 meV, which we interpret as a characteristic energy scale expected for the Fermi liquid. The wave vector dependence of the scattering at q^* is Lorentzian, with an intensity which decreases with increasing energy transfer, and is temperature independent below 100 K. The Lorentzian linewidth approaches the spectrometer resolution at the lowest temperatures and energy transfers. These observations suggest that the susceptibility underlying the incommensurate scattering is maximized, and is perhaps critical, for $q=q^*$, $E\rightarrow 0$, and $T\rightarrow 0$, as has been observed near other antiferromagnetic quantum critical points. Work at the University of Michigan supported by the National Science Foundation.

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