Fragile antiferromagnetism in the heavy-fermion compound YbBiPt

ALAN I. GOLDMAN, Ames Laboratory and Iowa State University

The discovery of YbBiPt [1] generated strong interest due to its extraordinary Sommerfield coefficient ($\gamma \approx 8 \text{ J/mol-K}^2$) and the fact that all of its relevant energy scales including the Kondo temperature, Weiss temperature, crystal field splitting, and a proposed antiferromagnetic (AFM) ordering below $T_N = 0.4 \text{ K}$ are small and comparable, suggesting a complex interplay of competing interactions at low temperature. Much of the recent attention on YbBiPt has focused on the possibility of a magnetic-field-tuned AFM quantum critical point occurring at a low critical magnetic field of $\mu_0 H_c = 0.4 \text{ T}$ [2]. Although thermodynamic and transport measurements in ambient fields suggested that YbBiPt manifests AFM order below $T_N$, scattering measurements over the past 22 years failed to identify magnetic ordering in powder or single-crystal samples. In this talk, I will present recent elastic and inelastic neutron scattering experiments on single crystals of YbBiPt that demonstrated clear scattering signatures of unusual AFM order at low temperature [3]. The ambient field elastic scattering consists of two components: a narrower component that appears below $T_N \approx 0.4 \text{ K}$, which can be identified with features observed in the bulk transport measurements; and a broad scattering component that persists up to $T^* \approx 0.7 \text{ K}$ corresponding to AFM correlations extending over $\approx 20 \text{ Å}$.


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