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Fragile antiferromagnetism in the heavy-fermion compound YbBiPt[1]

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The discovery of YbBiPt [1] generated strong interest due to its extraordinary Sommerfield coefficient ($\gamma \approx 8$ 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 $T_{\rm N} = 0.4$ 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 $\mu_0 H_{\rm c} = 0.4$ T [2]. Although thermodynamic and transport measurements in ambient fields suggested that YbBiPt manifests AFM order below $T_{\rm N}$, 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 $T_{\rm N} \approx 0.4$ K, which can be identified with features observed in the bulk transport measurements; and a broad scattering component that persists up to $T^* \approx 0.7$ K corresponding to AFM correlations extending over ≈ 20 Å.

[1] P. C. Canfield *et al.*, J. Appl. Phys. **70**, 5800 (1991); Z. Fisk *et al.*, Phys. Rev. Lett. **67**, 3310 (1991).
[2] E. D. Mun *et al.*, Phys. Rev. B **87**, 075120 (2013).
[3] B. G. Ueland *et al.*, Phys. Rev. B **89**, 180403(R) (2014).

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