Field induced first order phase transition in the antiferromagnet \( \text{Yb}_3\text{Pt}_4 \)\(^1\) L.S. WU, Stony Brook University, Y. JANSSEN, M.S. KIM, Brookhaven National Lab, C. MARQUES, Stony Brook University & Brookhaven National Lab, K.S. PARK, M. BENNETT, Brookhaven National Lab, M.C. ARONSON, Stony Brook University & Brookhaven National Lab, S.X. CHI, J.W. LYNN, NIST Center for Neutron Research — \( \text{Yb}_3\text{Pt}_4 \) is an antiferromagnet that orders at \( T_N=2.4K \). Magnetic fields \( B \) suppress \( T_N \), and the \( B-T \) phase line \( T_N(B) \) terminates almost vertically at \( T=0, B_C=2.0 \ T \). Specific heat measurements find a mean-field transition at \( T_N(B) \), and the magnetocaloric effect shows that the antiferromagnetic transition is continuous at all fields, with no associated latent heat. However, neutron diffraction measurements performed for \( B\sim B_C \) find that a distinct step in the magnetization \( \Delta M \) occurs near the transition, with a magnitude that increases for \( T<1 \ K \). The field dependent magnetization \( M(B) \) similarly has a metamagnetic-like step at \( T_N(B) \) below 1 K, accompanied by a sharp peak in the susceptibility whose magnitude increases but does not diverge as \( T\to0 \). We argue that a nonzero magnetization step \( \Delta M \) is required to give \( \Delta S=0 \) for \( T=0 \), since the vertical phase line at \( T=0 \) implies \( dT_N/dB=-\Delta M/\Delta S\to-\infty \). We argue that \( T_N \) (\( B \)) terminates at \( B_C \) in a \( T=0 \) first order transition.

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