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Observation of two distinct energy scales in the magnetization measurements of the anisotropic antiferromagnet TmAgGe ANA LIMA, NHMFL - LANL, PAUL GODDARD, Clarendon Laboratory, Oxford University, Oxford, UK, JOHN SINGLETON, NHMFL - LANL, EMILIA MOROSAN, SERGEY BUD'KO, PAUL CANFIELD, Dept. of Phys. & Astronomy, ISU and Ames Laboratory — TmAgGe is an antiferromagnet ($T_N = 4.2$ K) that crystallizes in a variant of the hexagonal Fe_2P structure (three Tm atoms per unit cell). We have studied the magnetization of the TmAgGe single crystals in fields $\mu_0 H$ of up to 65 T as a function of the field orientation and the temperature T. With **H** in the basal **ab**-plane, a number of metamagnetic transitions are observed for $\mu_0 H$ $<$5 T and T $<$ T_N.However, when **H**||**c**, three steps in the magnetization occur between 30 and 35 T, persisting to T $\cong$ 60 K. On tilting **H** away from **c,** both sets of features (high-field steps and low-field metamagnetism transitions) are seen, showing that they arise from two distinct mechanisms. The dependence of the high-field steps on T and field orientation suggests that they are associated with crystalline electric field (CEF) level crossing; the CEF confines the moments to the **ab**-plane. By contrast, it is the rearrangement of the moments within the basal plane that gives to the low-field metamagnetic transitions. To the best of our knowledge, TmAgGe is the first intermetallic system in which these two energy scales (CEF and in-plane exchange) can be unambiguously distinguished in this way.

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