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Investigating the field evolution of four-fold anisotropy in the basal plane of $TmNi_2B_2C$[1] P. DAS, C. RASTOVSKI, K. SCHLESINGER, M.R. ESKILDSEN, University of Notre Dame, IN, USA, J.M. DENSMORE, Lawrence Livermore National Laboratory, CA, USA, S.L. BUD'KO, P.C. CANFIELD, Ames Laboratory and Iowa State University, IA, USA — The superconductor $TmNi_2B_2C$ possesses a significant 4-fold in-plane anisotropy originating from the Fermi surface and possibly also from the superconducting pairing. However, unlike other members of the borocarbide superconductors, the anisotropy appears to decrease with increasing field, attributed to strong Pauli paramagnetic effects (PPE) and a vortex core expansion close to H_{c2}. We have investigated the field evolution of the four-fold anisotropy by small-angle neutron scattering (SANS) of the vortex lattice (VL), measuring several higher order Bragg peaks which allow a real space reconstruction of the VL field modulation. The measurements are possible due to the PPE which lead to a large field modulation (e.g. $\sim$ 65 % of the applied field at 0.2 T). Our results present the first *direct* demonstration of the decreasing anisotropy and furthermore, allows this to be measured quantitatively. This provides an explanation for the reentrant square VL phase observed in $TmNi_2B_2C$.

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