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Imaging chiral domains and magnetic phase coexistence in holmium metal[1] A. CADY, J. C. LANG, D. HASKEL, G. SRAJER, Argonne National Laboratory, D. B. MCWHAN, Brookhaven National Laboratory (retired) — In the rare-earth metal holmium, the magnetic moments in the atomic planes form a magnetic spiral structure below T_N=133 K with an incommensurate repeat unit along the crystal c-axis. This spiral structure forms with different chirality in different regions of the samples, giving rise to chiral domains. The pitch of the spiral evolves with temperature decreasing toward six atomic layers as the crystal is cooled to T=19 K where the magnetic moments cant toward the c-axis, and a commensurate conical magnetic structure results. This magnetic phase transition leads to the formation of a second type of domains where the spiral phase coexists with the conical phase over a temperature range of approximately 1 K. We have combined micro-diffraction with phase-retarding x-ray optics to image both types of magnetic domains simultaneously as a function of temperature. Using circularly polarized x-rays, the satellite peaks associated with the magnetic ordering become sensitive to the chirality of the spirals, and the micro-focused beam provides spatial resolution of a couple microns. We will present images of both chiral domains and spiral/conical domains, which have been shown to occur over length scales of many microns.

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Andrew Cady
Argonne National Laboratory

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