Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Skyrmion domains in Cu2OSeO3: Short-Range Order and Domain Wall Formation SHILEI ZHANG, Department of Physics, University of Oxford, ANDREAS BAUER, Physik Department, Technische Universitat Munchen, HELMUTH BERGER, Ecole Polytechnique Federale de Lausanne (EPFL), STAVROS KOMINEAS, Department of Mathematics and Applied Mathematics, University of Crete, DAVID BURN, Diamond Light Source, CHRISTIAN PFLEIDERER, Physik Department, Technische Universitat Munchen, GERRIT VAN DER LAAN, Diamond Light Source, THORSTEN HESJEDAL, Department of Physics, University of Oxford — Cu_2OSeO_3 is a chiral ferrimagnetic insulator carrying a long-range order magnetic skyrmion phase. Here, we report a short-range ordered equilibrium skyrmion state on the surface of Cu_2OSeO_3 single crystal, studied by resonant soft x-ray scattering. Soft x-ray scattering at the $L_{2,3}$ edge of $3d$ compounds is an ideal tool to probe the magnetic order, and is only sensitive to 60-70 unit cells in depth of Cu_2OSeO_3. Our results show that under the arbitrary magnetic field directions that deviate from the cubic main axes, the six-fold-symmetric skyrmion order breaks into domains, and the initial, anisotropy-governed pinning of propagation directions is completely unwound. We show that uniform 360° Bloch domain walls form between the skyrmion domains. Our findings provide a new way to manipulate and engineer the skyrmion state locally, or even individually, on the surface which will enable applications in the future.

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Date submitted: 06 Nov 2015 Electronic form version 1.4