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Inner structure of topological defects in hexagonal manganites KONSTANTIN SHAPOVALOV, University of Bordeaux (CNRS), Bordeaux, France, MEGAN HOLTZ, JULIA MUNDY, Cornell University, Ithaca, NY, USA, DAVID MULLER, Cornell University, Ithaca, NY, ZEWU YAN, EDITH BOURRET-COURCHESNE, Lawrence Berkeley National Laboratory, Berkeley, CA, DENNIS MEIER, Norwegian University of Science and Technology, Trondheim, Norway, ANDRES CANO, University of Bordeaux (CNRS), Bordeaux, France — The diverse opportunities inspired by the properties of topological defects in solid-state systems have triggered the broad interest in this rapidly evolving field. Particularly promising are topological defects in electrically and magnetically ordered materials – robust nanoscale objects that can readily be controlled by external fields, opening innovative pathways in active nanoelectronics and related areas. Hexagonal manganites ($RMnO_3$, R = Sc, Y, In, Dy – Lu) host an explicitly large variety of topological defects, including neutral and charged domain walls, multiferroic vortices, thus providing new fertile ground for the investigation of topology-related phenomena. Despite the growing interest, very little is known about the inner structure and local symmetry of the topological defects in $RMnO_3$. In this work, we quantify the vortices and domain walls emerging in these systems combining the scanning transmission electron microscopy and Landau-theory-based analytical calculations. Thus we observe and reproduce key novel features of the topological defects such as the emergence of a continuous U(1) symmetry at the vortex cores, and link these features to fundamental properties characterizing the material such as the correlation lengths.

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