Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Spatial Complexity Due to Bulk Electronic Liquid Crystals in Superconducting Dy-Bi2212 ERICA CARLSON, BENJAMIN PHILLABAUM, Purdue University, KARIN DAHMEN, University of Illinois at Urbana-Champaign — Surface probes such as scanning tunneling microscopy (STM) have detected complex electronic patterns at the nanoscale in many high temperature superconductors. In cuprates, the pattern formation is associated with the pseudogap phase, a precursor to the high temperature superconducting state. Rotational symmetry breaking of the host crystal (i.e. from C4 to C2) in the form of electronic nematicity has recently been proposed as a unifying theme of the pseudogap phase [Lawler Nature 2010]. However, the fundamental physics governing the nanoscale pattern formation has not yet been identified. Here we use universal cluster properties extracted from STM studies of cuprate superconductors to identify the funda- mental physics controlling the complex pattern formation. We find that due to a delicate balance between disorder, interactions, and material anisotropy, the rotational symmetry breaking is fractal in nature, and that the electronic liquid crystal extends throughout the bulk of the material.

Erica Carlson
Purdue University

Date submitted: 28 Nov 2011 Electronic form version 1.4