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Spatial Complexity Due to Locally Oriented Charge Modulations in a Cuprate Superconductor ERICA CARLSON, Purdue University, ELIZABETH MAIN, Harvard University, BENJAMIN PHILLABAUM, Purdue University, HIROSHI IKUTA, Nagoya University, KARIN DAHMEN, University of Illinois, Urbana-Champaign, ERIC HUDSON, Penn State University, JENNIFER HOFFMAN, Harvard University — Surface probes such as scanning tunneling microscopy (STM) have detected complex electronic patterns at the nanoscale in many high temperature superconductors. We use scanning tunneling microscopy to image the local orientation of the static charge modulations in $Bi_{2-y}Pb_ySr_{2-z}LazCuO_{6+x}$, for samples spanning a wide range of doping. For each sample, we compute the universal cluster properties arising from the locally x-oriented and locally y-oriented clusters in order to identify the fundamental physics controlling the complex pattern formation. By comparing these quantitative measures to known universality classes for rotational symmetry breaking, we find that the charge modulations are not confined only to the surface, but they also extend throughout the bulk of the material.

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