Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

**Spatial complexity due to strong correlations in vanadium dioxide**
SHUO LIU, BENJAMIN PHILLABAUM, ERICA CARLSON, Purdue University, KARIN DAHMEN, University of Illinois at Urbana-Champaign, MUMTAZ QAZILBASH, College of William and Mary, DMITRI BASOV, University of California, San Diego, VIDHYADHIRAJA SUDHINDRA, JNCASR — Near-field scanning infrared microscopy on the Mott metal-insulator system vanadium dioxide ($VO_2$) has revealed complex nanoscale pattern formation in the form of insulating and metallic puddles near the insulator-to-metal transition [1]. We use and extend recently developed cluster techniques [2] in order to understand the fundamental physics driving this multiscale pattern formation. We map the observed metallic and insulating clusters to Ising variables by a rigorous choice of threshold amplitude, and quantify the statistics of the sizes and shapes of the geometric clusters. These in turn yield critical exponents including the cluster size distribution exponent $\tau$, and the fractal dimensions associated with the cluster formation. These quantitative measures show power-law behavior over multiple decades, revealing a delicate interplay between interactions and disorder in the material. The cluster techniques employed here can be readily applied to 2D image data in the context of other materials and measurement techniques.

[1] M. M. Qazilbash, et al., *Science* **318**, 1750 (2007).
[2] B. Phillabaum, E. W. Carlson, and K. A. Dahmen, *Nat. Commun.* **3**, 915 (2012).

Shuo Liu
Purdue University

Date submitted: 09 Nov 2012 Electronic form version 1.4