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Random Field Driven Spatial Complexity at the Mott Transition 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, DIMITRI BASOV, University of California, San Diego, VIDHYADHIRAJA SUDHINDRA, JNCASR — Scanning near-field infrared microscopy on vanadium dioxide (VO_2) reveals the complex pattern formation associated with the temperature driven metal-insulator transition [1]. We apply recently developed cluster techniques [2] to the observed multiscale patterns of inhomogeneous local conductivity, quantifying the statistics of the sizes and shapes of the geometric metallic and insulating clusters through several measures characterized by critical exponents in the power law scaling, such as the cluster size distribution τ, volume fractal dimension d_v and hull fractal dimension d_h. These quantitative measures show power-law behavior over multiple decades, and the values of the extracted critical exponents indicate that the Mott critical end point is in the universality class of the random field ising model, revealing a delicate interplay between interactions and disorder in the material. The cluster techniques employed here can readily be applied to 2D image data in the context of other strong correlated systems and microscopy techniques for the study of critical behavior.

[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).

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