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Mapping the phase boundaries in thin-film manganites using scale-invariant dielectric response P. MICKEL, G. SINGH-BHALLA, S. TONGAY, A. BISWAS, A. F. HEBARD, University of Florida — Magnetocapacitance techniques[1] have been used in a study of $(La_{1-y}Pr_y)_{1-x}Ca_xMnO_3$ (LPCMO) thin films to determine the range of phase space, described by frequency (ω), temperature (T) and field (H), over which a dielectric response of the form, C"(ω,T,H) = [C'(ω,T,H) - C_∞]$^\gamma$, is found to hold. This power-law scaling collapse (PLSC) of the complex capacitance (C', C"), expressed in a Cole-Cole formulation, differs from the well-known "universal" dielectric response (UDR) [2], where the exponent $\gamma = 1$. The influence of film thickness and stoichiometry on the extent of the PLSC region is investigated with the implementation of a new phase-space mapping technique. The mappings clearly illustrate the onset of phase competition in LPCMO, delineating boundaries which correspond to capacitive minima at low temperatures, where the first-order insulator-metal transition occurs, and to the second-order paramagnetic-insulator/charge-ordered-insulator transition at higher temperatures, where a resistive transport signature exists in bulk but not in thin films. Modeling with distributions of UDR elements corresponding to the different manganite phases gives a good qualitative account of the observed behavior, and can lead to the determination of individual phase fractions [1] R. Rairigh, Nature Physics 3, 551 - 555 (2007) [2] Jonscher - J. Phys. D: Appl. Phys. 32* *(1999)

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