Scaling analysis of the static and dynamic critical exponents in \( \text{Pr}_{2-x}\text{Ce}_x\text{CuO}_4 \) films as a function of doping\(^1\) R.A. ISAACS, M.C. SULLIVAN, M.F. SALVAGGIO, J. SOUSA, C.G. STATHIS, J.B. OLSON, Ithaca College, Ithaca NY — We investigate the static and dynamic critical exponents of the electron-doped superconductor \( \text{Pr}_{2-x}\text{Ce}_x\text{CuO}_4 \). Our results are based on current vs. voltage measurements in zero-field of the normal-superconducting phase transition in \( \text{Pr}_{2-x}\text{Ce}_x\text{CuO}_4 \) films as a function of doping. We find that these materials possess an unusually small critical regime (\( \sim 25\text{mK} \)) that gives rise to mean-field behavior at the phase transitions and a static critical exponent of about \( \nu \sim 0.5 \) for all dopings. This is quite unexpected when compared to the critical behavior seen in well-known hole-doped superconductor \( \text{YBa}_2\text{Cu}_3\text{O}_7 \), where \( \nu \sim 2/3 \). In addition, mean-field behavior is also exhibited in the dynamic critical exponent (\( z \)). We find that \( \text{Pr}_{2-x}\text{Ce}_x\text{CuO}_4 \) behaves not like other cuprate superconductors, but similarly to conventional superconductors in this regard. Only as transition width decreases to zero does the dynamic critical exponent (\( z \)) approach the value found in \( \text{YBa}_2\text{Cu}_3\text{O}_7 \).

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