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Normal-Superconducting Phase Transition Obscured by Current Noise M. C. SULLIVAN, S. LI, H. XU, M. LILLY, C. J. LOBB — There is a large volume of experimental research on the normal- superconducting phase transition, both in zero field and the so- called "vortex-glass" transition in a field. For these phase transitions, resistive behavior at low currents is expected for $T > T_c$, and non-linear current versus voltage isotherms are expected below T_c. We show theoretically and experimentally that the addition of current noise to nonlinear voltage versus current curves will create ohmic behavior. Thus, current noise will create ohmic behavior at low currents even for temperatures below T_c, and isotherms that are actually *below* T_c will appear to be *above* T_c. This obscures the phase transition and leads to incorrect values for T_c and the critical exponents ν and z. Most reports in the literature do not explicitly mention filtering, yet the transition temperature and the critical exponents extracted from the conventional analysis are inaccurate if current noise is not filtered out. Thus, current noise is a possible explanation for the wide range of critical exponents found in the literature.

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