Abstract Submitted
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Critical Exponents of Dynamical Conductivity in 2D Percolative Superconductor-Insulator Transitions: Three Universality Classes PRAGALV KARKI, YEN LEE LOH, Univ of North Dakota — We simulate three types of random inductor-capacitor (LC) networks on 4000x4000 lattices. We calculate the dynamical conductivity using an equation-of-motion method in which timestep error is eliminated and windowing error is minimized [1]. We extract the critical exponent a such that $\sigma(\omega) \propto \omega^{-a}$ at low frequencies. The results suggest that there are three different universality classes. The $L_{ij}C_i$ model, with capacitances from each site to ground, has $a = 0.32$. The $L_{ij}C_{ij}$ model, with capacitances along bonds, has $a = 0$. The $L_{ij}C_iC_{ij}$ model, with both types of capacitances, has $a = 0.30$. This implies that classical percolative 2D superconductor-insulator transitions (SITs) generically have $\sigma(\omega) \to \infty$ as $\omega \to 0$. Therefore, experiments that give a constant conductivity as $\omega \to 0$ must be explained in terms of quantum effects. [1. Yen Lee Loh, Rajesh Dhakal, John F. Neis and Evan M. Moen, "Divergence of dynamical conductivity at certain percolative superconductor-insulator transitions", Journal of Physics: Condensed Matter 26, 50 (2014)]

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