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Critical Exponents of the Superfluid-Bose Glass Transition in Three-Dimensions ZHIYUAN YAO, Department of Physics, University of Massachusetts, Amherst, MA 01003, USA, MIKHAIL KISELEV, The Abdus Salam International Centre for Theoretical Physics, Strada Costiera 11, I-34151 Trieste, Italy, KARINE DA COSTA, Instituto de Física, Universidade de São Paulo, 05508-090, São Paulo, Brazil, NIKOLAY PROKOF'EV, Department of Physics, University of Massachusetts, Amherst, MA 01003, USA and Russian Research Center "Kurchatov Institute", 123182 Moscow, Russia — Disordered Bose-Hubbard model is key to understanding a number of strongly interacting systems from magnets and disordered superconductors to ultra-cold atoms in optical lattice. Although the emergence of the Bose glass phase is widely accepted, some basic features of the superfluid-to-Bose glass transition remain controversial. Specifically, recent experimental and numerical studies find that the values of the correlation length exponent $\nu \approx 0.7$ and the critical temperature exponent $\phi \approx 1.1$, are in strong violation of the key quantum critical relation $\phi = \nu z$ with $z = d = 3$, where z is the dynamic exponent. We present results of a Monte-Carlo (for the disordered Bose-Hubbard model and its classic J-current counterpart) that clearly demonstrate that previous investigations were done away from the quantum critical region and were severely influenced by strong density dependence on the chemical potential. When the quantum critical point is reached by increasing the disorder strength, the fluctuation region is broad and we find that $\phi \approx 3.0(3)$.

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