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Anomalous suppression of the Bose glass at commensurate fillings in the disordered Bose-Hubbard model[1] FRANK KRUGER, JIANSHENG WU, PHILIP PHILLIPS, Univ. of Illinois at Urbana-Champaign — We study the weakly disordered Bose-Hubbard model on a cubic lattice through a renormalization group analysis of the corresponding effective field theory which is explicitly derived by combining a strong-coupling expansion with a replica disorder average. The method is applied not only to generic uncorrelated on-site disorder but also to simultaneous correlated hopping disorder as induced by fine-grained optical speckle potentials in optical lattice experiments. As a result of strong coupling, the strength of the disorder vertex, responsible for the emergence of a Bose glass, crucially depends on the chemical potential and the Hubbard repulsion and vanishes to leading order in the disorder at commensurate boson fillings. As a consequence, at such fillings a direct transition between the Mott-insulator and the superfluid in the presence of disorder cannot be excluded on the basis of a one-loop calculation. At incommensurate fillings, at a certain length scale, the Mott insulator will eventually become unstable towards the formation of a Bose glass. Phase diagrams as a function of the microscopic parameters are presented and the finite-size crossover between the Mott-insulating state and the Bose glass is analyzed.

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