Fate of the amplitude (Higgs) mode at a disordered quantum phase transition

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We investigate the amplitude (Higgs) mode of a diluted quantum rotor model in two dimensions close to the superfluid-Mott glass quantum phase transition. After mapping the Hamiltonian onto a classical (2+1)d XY model, the scalar susceptibility is calculated in imaginary time by means of large-scale Monte Carlo simulations. Analytic continuation of the imaginary time data is performed via maximum entropy methods and yields the real-frequency spectral function. The spectral peak associated with the Higgs mode is identified and its fate upon approaching the disordered quantum phase transition is determined.