Abstract Submitted for the MAR14 Meeting of The American Physical Society

Spectral functions in the 1D and 2D Bose Hubbard model¹ ROBERT IVANCIC, ERIC DUCHON, NANDINI TRIVEDI, The Ohio State University — We use state of the art numerical techniques including quantum Monte Carlo and maximum entropy methods to obtain the low energy excitation spectra in the superfluid and Mott-insulator phases of the Bose Hubbard model. These results are checked in 1D against Bethe Ansatz and tDMRG results and extended to 2D where such approaches are impossible. In the superfluid, we find linearly dispersing Bogoliubov sound modes as well as additional gapped modes broadened by interaction effects. In the Mott insulator, we find evidence for a finite gap and well defined quasiparticle excitations. We examine properties such as the excitation lifetime, density of states, and speed of sound as the system is tuned across the quantum phase transition that separates the superfluid and Mott states. These results provide an important theoretical framework for upcoming ultracold atom experiments in one and two dimensions.

¹We acknowledge support from the NSF DMR-0907275 (R.I., E.D. and N.T.).

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Date submitted: 15 Nov 2013 Electronic form version 1.4