Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Single-Particle Excitations of a Bose Gas in an Optical Lattice Near the Mott Transition SATORU KONABE, TETSURO NIKUNI, MASAAKI NAKAMURA, Tokyo University of Science — We study single-particle excitations of a Bose gas in an optical lattice near the Mott transition. We derive the excitation spectra in both Mott insulator phase and superfluid phase. The characteristic feature in the Mott insulator phase is the existence of an energy gap between the particle and hole excitations. We show that this energy gap can be directly probed by an output coupling experiment. Applying the general expression for the output current derived by Luxat and Griffin to the Mott insulator phase, we find that the energy spectrum of the momentum-resolved output current exhibits two characteristic peaks corresponding to the particle and hole excitations. Thus, it can be used to detect the transition point from the Mott insulator to superfluid phase where the energy gap disappears.

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Date submitted: 22 Mar 2013 Electronic form version 1.4