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Study of the Bose-Hubbard model by collapse and revival measurements EITE TIESINGA, Joint Quantum Institute, PHILIP JOHNSON, American University — We show that collapse and revival experiments with interacting atoms trapped in an optical lattice, based on a suggestion by [1], are a sensitive tool for characterizing its many-body ground state. Collapse and revival experiments involve sudden increases of the lattice depth whereby the system transfers from an initial superfluid ground state to a non-stationary state for a lattice depth where tunneling between sites is negligible. The state then evolves independently in each site for a variable amount of time, after which the momentum distribution is measured. The time evolution of momentum states are then sensitive to the amplitude of the initial atom-number Fock states. We show that for superfluid states away from the Mott insulator phase boundary the evolution has many more frequency components than superfluid states close to this boundary.

[1] S. Will *et al.*, Nature **465**, 7295 (2010).

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