

Abstract Submitted
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Spectroscopic Probe of Inhomogeneous Mott Phases SMITHA VISHVESHWARA, BRIAN DEMARCO, Department of Physics, University of Illinois at Urbana-Champaign, 1110 West Green Street, Urbana, IL 61801, COURTNEY LANNERT, Department of Physics, Wellesley College,, TZU-CHIEH WEI, Department of Physics, University of Illinois at Urbana-Champaign, 1110 West Green Street, Urbana, IL 61801 — The feasibility of creating a spatially-inhomogeneous phase of neutral bosonic atoms (such as Rubidium) in which multiple Mott-insulating states coexist in a shell structure is discussed and analyzed. In the set-up of trapped, tightly confined bosons in an optical lattice, we derive the conditions on experimental parameters, such as number of bosons and the curvature of the trapping potential, for creating an onion-like structure of any prescribed number of Mott shells with different occupation numbers. We discuss the stability of such a structure with an eye toward experimental conditions necessary for measuring the structure with spectroscopic probes. The analyses ought to give a controlled means of achieving the Mott groundstate observed in previous experiments, and give some constraints for how successfully these states can be employed for quantum computing.

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