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Fractional Quantum Hall Effect in Optical Lattices MOHAMMAD

HAFEZI, Physics Department, Harvard University, Cambridge, MA 02138, ANDERS SØRENSEN, Niels Bohr Institute, University of Copenhagen, Denmark, EUGENE DEMLER, MIKHAIL LUKIN, Physics Department, Harvard University, Cambridge, MA 02138 — We investigate the methods to create fractional quantum Hall states of atoms confined in optical lattices. Specifically, the dynamics of ultra-cold atoms on a lattice with an effective magnetic field is investigated for different values of field and on-site interaction. An appropriate characterization of such quantum states can be achieved by using Chern numbers which can indicate a topological order and describe the state of the system in different regimes. Numerical calculation supports the existence of fractional statistics. We also discuss the practical realization of such states and techniques for their detection.

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