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Fractional Quantum Hall Effects with Bose-gases in Rotating Optical Lattice Potentials NATHAN GEMELKE, James Franck Institute, University of Chicago, EDINA SARAJLIC, Physics Department, Stanford University, STEVEN CHU, Lawrence Berkeley National Laboratory — It has previously been noted that an analog to the fractional quantum-Hall (FQH) effect for two-dimensional electron gases can be produced with harmonically trapped and rotating neutral atoms. We report progress investigating FQH-like effects in the centrifugal limit of small, rotating, two-dimensional Bose gases. An ensemble of such systems is prepared in an optical lattice with locally rotating on-site potentials, produced by manipulation only of lattice beam optical phases. The non- rotating few-atom ground states are adiabatically transformed to higher angular momentum by applying a time-dependent sweep of rotation rate and deformation of the local lattice potential. Near the centrifugal limit, where the trap rotates at its vibration frequency, correlation is expected as a result of collisions. The onset of this behavior is probed by a combination of photoassociative transitions to bound molecules, and careful analysis of time-of-flight momentum distributions of atoms suddenly released from the lattice.

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