Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Laughlin state of hard core bosons on a two-leg ladder KARYN LE HUR, CPHT, Ecole Polytechnique and CNRS, France, ALEXANDRU PETRESCU, Department of Electrical Engineering, Princeton University, Princeton, New Jersey, 08544, MARIE PIRAUD, LMU Muenchen, Germany, IAN MCCULLOCH, Centre for Engineered Quantum Systems, The University of Queensland, Brisbane, QLD 4072, Australia, GUILLAUME ROUX, LPTMS, CNRS, Univ. Paris-Sud, Universite Paris-Saclay, 91405 Orsay, France — We study hard core bosons on a two leg ladder lattice in uniform magnetic field. At densities which are incommensurate with flux, the ground state is a Meissner state, or a vortex state, depending on the strength of the flux. When the density is commensurate with the flux, analytical arguments predict the existence of a central charge 1 state which is the precursor of the two–dimensional Laughlin state at $\nu = 1/2$ [1]. We revisit the phase diagram versus density and flux in order to delimit a region where this state is the ground state, by using a combination of bosonization and numerics (density matrix renormalization group and exact diagonalization). We obtain the phase diagram from the properties of local bond current operators and central charge. We use bipartite charge fluctuations to deduce the edge Luttinger liquid describing the edge when the system is in the Laughlin state. The properties studied with local observables are then confirmed by exponential decays in certain correlation functions. Our findings are consistent with a calculation of the many body ground state transverse conductivity in a thin torus geometry for parameters corresponding to the Laughlin state. [1] Alexandru Petrescu and Karyn Le Hur, Phys. Rev. B 91, 054520 (2015)

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Date submitted: 11 Nov 2016 Electronic form version 1.4