One-Dimensional Theory of the Quantum Hall System ANDERS
KARLHEDE, EMIL J. BERGHOLTZ, Stockholm University — We consider the
lowest Landau level on a torus as a function of its circumference L_1. When $L_1 \to 0$,
the ground state at general rational filling fraction is a crystal with a gap—a Tao-
Thouless state. For filling fractions $\nu = p/(2pm + 1)$, these states are the limits
of Laughlin's or Jain's wave functions describing the gapped quantum Hall states
when $L_1 \to \infty$. For the half-filled Landau level, there is a transition to a Fermi
sea of non-interacting neutral dipoles, or rather to a Luttinger liquid modification
thereof, at $L_1 \sim 5$ magnetic lengths. This state is a version of the Rezayi-Read state,
and develops continuously into the state that is believed to describe the observed
metallic phase as $L_1 \to \infty$. Furthermore, the effective Landau level structure that
emerges within the lowest Landau level follows from the magnetic symmetries.

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