EPFL

SOLID STATE PHYSICS III

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PHYS-419

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FQH EFFECT, LAUGHLIN WF

- Pseudopotentials for Coulomb interactions

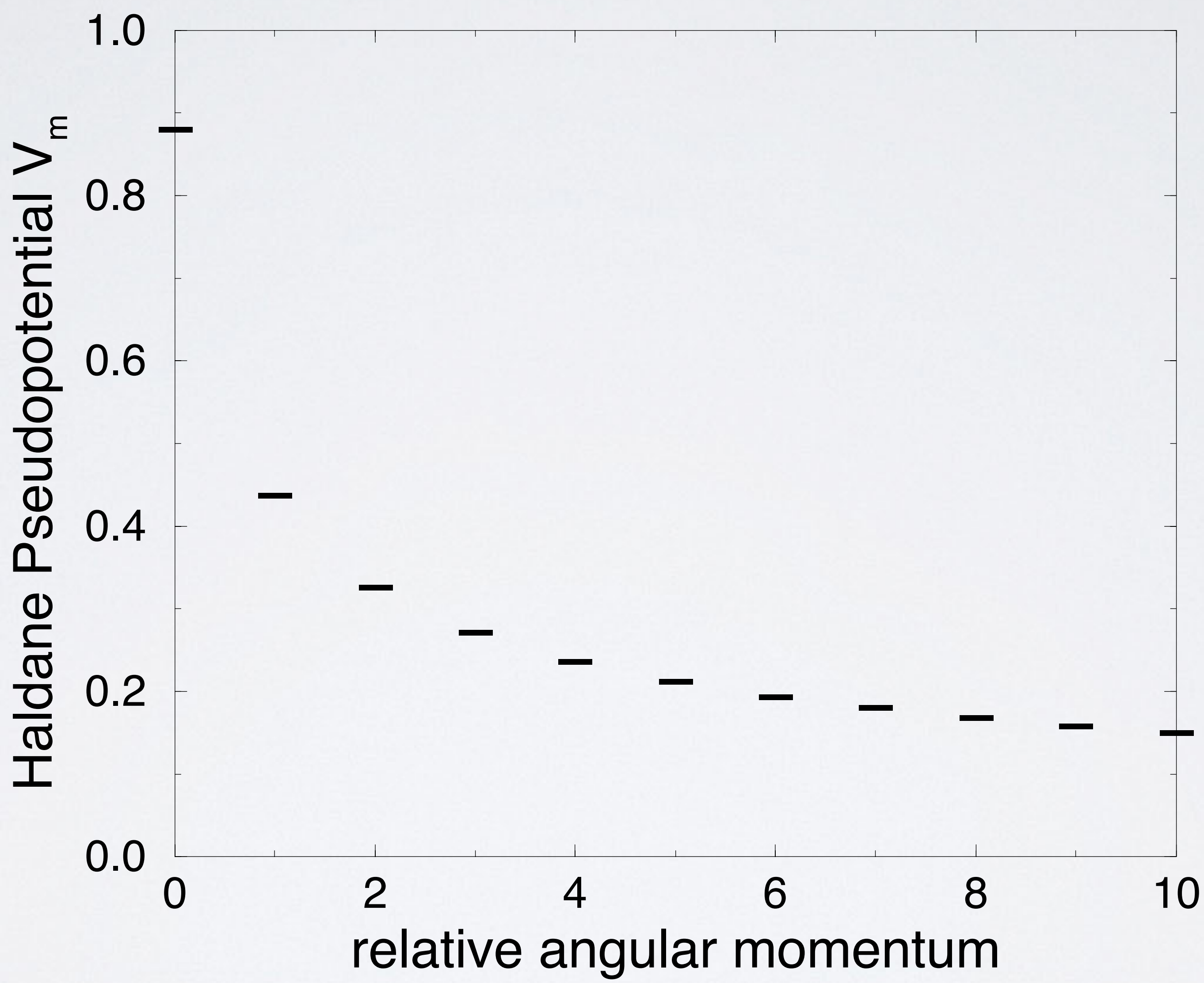

Figure 2: The Haldane pseudopotential V_m vs. relative angular momentum m for two particles interacting via the Coulomb interaction. Units are $e^2/\epsilon\ell$, where ϵ is the dielectric constant of the host semiconductor and the finite thickness of the quantum well has been neglected.

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- Snapshots of Laughlin wave function

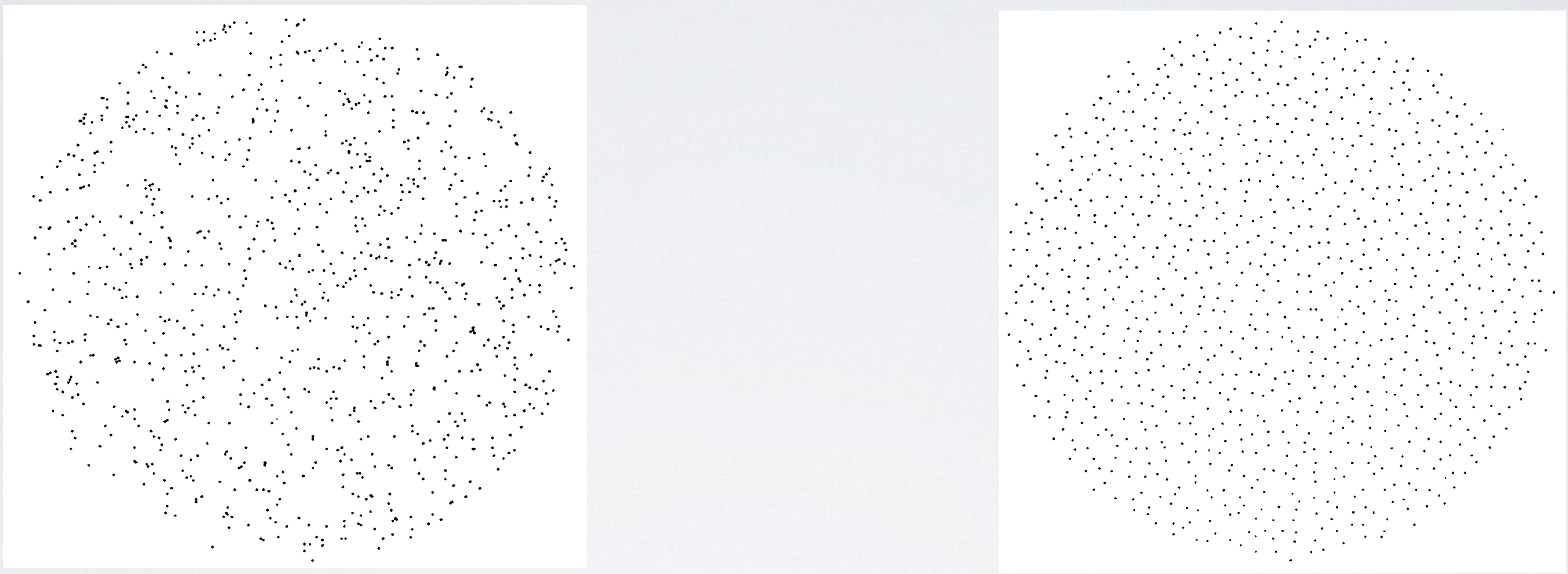

Figure 4: Comparison of typical configurations for a completely uncorrelated (Poisson) distribution of 1000 particles (left panel) to the distribution given by the Laughlin wave function for $m = 3$ (right panel). The latter is a snapshot taken during a Monte Carlo simulation of the distribution. The Monte Carlo procedure consists of proposing a random trial move of one of the particles to a new position. If this move increases the value of $|\Psi|^2$ it is always accepted. If the move decreases the value of $|\Psi|^2$ by a factor p, then the move is accepted with probability p. After equilibration of the plasma by a large number of such moves one finds that the configurations generated are distributed according to $|\Psi|^2$. (After R. B. Laughlin, Chap. 7 in [2].)

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- Density correlations in the Laughlin wavefunction

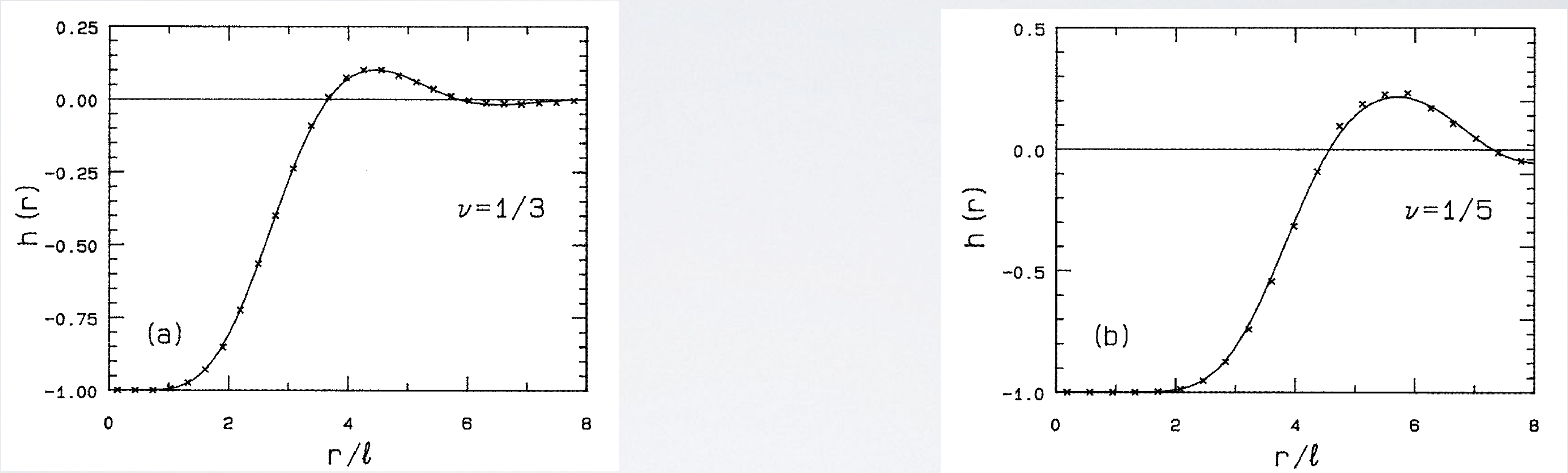

Figure 5: Plot of the two-point correlation function $h(r) \equiv 1 - g(r)$ for the Laughlin plasma with $\nu^{-1} = m = 3$ (left panel) and $m = 5$ (right panel). Notice that, unlike the result for $m = 1$ given in eq. (46), $g(r)$ exhibits the oscillatory behavior characteristic of a strongly coupled plasma with short-range solid-like local order.