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Exactly solvable 1D lattice model for the Laughlin states on torus geometries ZHENG-YUAN WANG, MASAAKI NAKAMURA, Department of Physics, Tokyo Institute of Technology — We study the fractional quantum Hall (FQH) states on a thin torus where the 2D continuum system in a magnetic field can be reduced into a 1D lattice model with short-range interaction. We introduce a minimal model with exact ground states in Laughlin series (flling factors of the lowest Landau level $\nu = 1/q$).The model has the same degrees of freedom as that of the pseudo-potential for the Laughlin wave function, and it naturally derives general properties of the Laughlin wave function such as the Z_2 properties (the FQH effect is limited only odd q for fermions). The obtained exact ground states have high overlaps with the Laughlin states and well describe their properties, the incompressibility and the fractional charge excitations. The physical quantities such as the correlation functions are calculated analytically by using matrix product method. We also compute the entanglement spectrum and show the diamond structure of the FQH states on torus geometries. Thus, our model gives a simple reference model to describe the Laughlin states. (arXiv:1206.3071)

Zheng-Yuan Wang
Department of Physics, Tokyo Institute of Technology

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