
Laughlin's topological charge pump in an atomic Hall cylinder

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Abstract

The quantum Hall effect occurring in two-dimensional electron gases was first explained by Laughlin, who developed a thought experiment that laid the groundwork for our understanding of topological quantum matter. His proposal is based on a quantum Hall cylinder periodically driven by an axial magnetic field, resulting in the quantized motion of electrons. We will discuss the realization of this milestone experiment with an ultracold gas of dysprosium atoms, the cyclic dimension being encoded in the electronic spin and the axial field controlled by the phases of laser-induced spin-orbit couplings. We will also focus on the non-trivial topological properties of this system.

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