DAVID FEDER, University of Calgary

Detecting topological order in two dimensions by continuous-time quantum walk

The properties of topological systems have been the subject of intense interest in recent years, both for fundamental investigations in condensed matter physics and for their potential applications to fault-tolerant quantum computation. A priority for experimentalists is verifying that a given implementation indeed supports topological phases. In this work, we show that continuous-time quantum walks of two-component particles governed by two-dimensional spin-orbit Hamiltonians can reveal the presence of topological order. The density profile in topologically non-trivial phases displays a characteristic peak in the vicinity of the origin that is absent in trivial phases. Likewise, a kink in the mean width of the particle distribution signals the presence of a quantum phase transition. The results are expected to have immediate application to systems of ultracold atoms.