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Title : Boundary critical phenomena at the Anderson transition of topological insulators

Abstract :
Recently many kinds of topological insulators and superconductors have been investigated by theories and experiments. The one of the important properties of these materials is the existence of edge states along the boundary of the system, whose number is associated with its topological number. When the topological number changes, the delocalized states appear even for the system with disorder. Because of this, study of Anderson transitions is important to understand the topological insulators.

We study the Anderson transition of the quantum spin Hall insulator in two dimensions which is the time-reversal invariant Z_2 topological insulator. We investigate boundary multifractality which is a critical exponent characterizing the critical properties near boundaries of the system. We find that boundary multifractality depends on the presence or absence of the edge state even in the same universality class. This implies that boundary critical phenomena depend on the topological number. We further confirm this dependence for systems exhibiting the integer quantum Hall effect and spin-quantum Hall effect which are characterized by the Z topological number.