

Physical Properties of Symmetry Protected Topological Phases in 1- and 2-dimensions

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Abstract

Symmetry protected topological phases are short-range entangled states that do not break any symmetry. The Haldane phase of spin-1 chain is the first examples of symmetry protected topological phases. There are many new SPT phases beyond the Haldane phase. We discuss a possible experimental realization of some new 1D SPT phases in simple two-legged spin-1/2 ladders. These new SPT phases can be distinguished from the Haldane phase since their edge states respond to weak magnetic field differently. We also discuss a field theory realization of new 2D SPT phases in integral spin systems with $SO(3)$ spin rotation symmetry. We find that these new SPT phases has spin quantum Hall effect. The edge excitations in these SPT phases are decoupled left-moving and right-moving currents, but only the left-moving gapless edge excitations carry spin quantum number.

Reference:

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About the speaker

Dr Zheng-Xin Liu obtained his PhD in the Hong Kong University of Science and Technology in 2010. He worked in the Institute for Advanced study of Tsinghua University (IASTU) from 2010 to 2012 as a postdoc. Now, he is an Associate member of IASTU.