



# 第 26 回トポロジカル物質科学セミナー Topological Materials Science Seminar (26)

## Many body topological invariants of fermionic topological phases with point group symmetry

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**Time: 14:00-15:00**

Abstract:

A way to detect symmetry protected topological (SPT) phases from a given ground state wave function is discussed. Many body topological invariants are defined as partition functions of topological quantum field theory (TQFT) on space-time manifolds, for example, real projective spaces. It is expected that by translating those to the operator formalism, one can get a definition of many body topological invariant made from ground state wave functions and symmetry operators. We propose that a kind of non-local operator, the "partial point group transformation", on a short-range entangled quantum state is a unified measure to detect topological nontrivial phases with point group symmetry. In this talk, I introduce the many body  $Z_2$  invariant (Arf invariant) of the (1+1)d Kitaev chain to explain the relation between ground state wave functions and TQFT. Next, I present our proposals: the  $Z_8$  invariant defined by the partial reflection on (1+1)d superconductors, the partial rotations on the (2+1)d superconductors, and the  $Z_{16}$  invariant defined by the partial inversion on (3+1)d superconductors. We analytically and numerically confirmed these proposals hold true.

KS, Hassan Shapourian, Shinsei Ryu, arXiv:1609.05970.