

凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: Room 413, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: 13:30-15:00, Wednesday, 15 May 2013

Electromagnetic and Thermal Responses of Z Topological Insulators and Superconductors in Odd Spatial Dimension

Speaker: Mr. **Ken Shiozaki** (塩崎 謙 氏)
(Condensed Matter Theory Group)

Abstract:

In three spatial dimensions, topological insulators with chiral (sublattice) symmetry (class AIII) and topological superconductors with time-reversal symmetry (class DIII, e.g., $^3\text{He-B}$, $\text{Cu}_x\text{Bi}_2\text{Se}_3$) are classified by integers (Z) referred to as the winding number. The relation between the winding numbers and experimentally observable physical quantities has not been well understood so far. In this presentation, we elucidate electromagnetic and thermal responses in which the winding number appears as experimentally detectable quantities. We present two different approaches for this issue : (i) The bulk winding number is connected with the axion field in a certain class of temporally or spatially inhomogeneous systems. Especially, for a heterostructure system composed of a class DIII topological superconductor and a trivial s-wave superconductor without time-reversal symmetry, the low energy thermal response at the interface is characterized by the bulk winding number. (ii) For the insulating system with chiral symmetry, the difference of the charge polarization with opposite chirality (referred to as “chiral polarization”) is gauge invariant. We found that the chiral polarization can be induced by an applied magnetic field, in analogy with the topological magnetoelectric effect, and the winding number appears in the response function.

Reference:

Ken Shiozaki and Satoshi Fujimoto, Phys. Rev. Lett., **110**, 076804 (2013)