

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: 13:30-14:15, Wednesday, 26 October 2011

“Line defects and Gapless modes in topological insulator heterostructures”

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

Abstract:

The condition for the existence of gapless modes at a boundary of insulators is well known as "bulk-boundary correspondence" which implies that the topologically nontrivial ground states of band insulators lead to the existence of gapless edge modes. Recently the condition for the existence of gapless modes in arbitrary topological defects has been proposed by Teo and Kane [1]. It was suggested that the existence of gapless modes follows from topologically nontrivial ground states of Hamiltonians which vary with material parameters surrounding the defects. But the Teo-Kane theory is based on a semiclassical approach, hence it is only valid when the quantum corrections from the spatial inhomogeneities can be neglected. In fact, the semiclassical approach fails in topological insulator-ferromagnet junction systems.

We extend the Teo-Kane theory to deal with the arbitrary spatially inhomogeneous systems on the basis of a full-quantum approach, and demonstrate a nontrivial topological invariant in the topological insulator-ferromagnet junction systems.

References:

[1] Jeffrey C.Y. Teo and C.L. Kane, Phys. Rev. B 82, 115120 (2010).