

Research result from Takahashi group on a topological insulator was published in Nature Physics (November issue, 2011), and the experimental data measured by his group were selected as the cover design.

The paper by Takahashi group, “Unexpected mass acquisition of Dirac fermions at the quantum phase transition of a topological insulator”, was published in Nature Physics (November issue, 2011), and the experimental data measured with the world-highest resolution angle-resolved photoemission (ARPES) spectrometer constructed by Takahashi group are used as the cover design to demonstrate the importance of paper. Also on the cover page, they write “Unexpected mass” to highlight the impact of the present research. In this work, Takahashi group found that Dirac electrons at the surface of topological insulator acquire the mass without explicitly breaking the time-reversal symmetry. This result suggests existence of a condensed-matter version of the “Higgs mechanism” which proposes that materials acquire the mass with the spontaneous symmetry-breaking at the beginning of universe. Thus the present result would shed light on the basic problem common in particle, materials, and cosmic physics. In the application point of view, the present success to give a mass to Dirac electrons opens the possibility for developing highly efficient, high-speed spintronics devices with topological insulators.

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