

Abstract for the Eurasia-Pacific Summer School and Conference 2012 (Invited talk)

## **Landau-level spectroscopies on topological insulators**

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Dirac fermions at the surfaces of topological insulators may bring about unique quantum phenomena in a magnetic field. We studied  $\text{Bi}_2\text{Se}_3$  using a high-field STM.  $\text{Bi}_2\text{Se}_3$  is a typical topological insulator but real material contains bulk carriers associated with Se vacancies. In a magnetic field perpendicular to the cleaved surface, we succeeded in observing a series of Landau levels with a field-independent level at the Dirac point, which is a hallmark of Dirac fermions. Landau orbits in real space are localized either around potential maxima or minima depending on energy as expected in quantum Hall systems. We also studied  $\text{Bi}_2\text{Te}_2\text{Se}$  which contains less bulk carriers. Landau levels are also observed in the tunneling spectra. We found that the Landau-level energy depends on a history of voltage ramping, suggesting that tip-induced phenomenon may play a role.