

Colloquium

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Shining Light on Topological Insulators

day
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location
EE01

time
16:00

ABSTRACT

Topological insulators (TIs) are novel materials that do not conduct electricity in their bulk yet possess exceptional conducting electronic states on their surface. These surface electrons have a number of highly unusual characteristics: (i) they behave like massless relativistic particles with a linear energy-momentum dispersion relation (ii) their spin is locked perpendicular to their momentum and (iii) this state is robust against moderate disorder. Understanding and characterizing unique properties of these materials can lead to novel applications such as current induced magnetization or extremely robust quantum memory bits. In this talk, I will give an overview of this field and discuss recent experiments in which we used ultrafast laser pulses to probe the fascinating properties of these materials. In particular, I will present measurements in which we simultaneously mapped all three components of spin over the entire energy momentum phase space by using circularly polarized ultrafast laser pulses to perform novel angle-resolved photoelectron spectroscopy. I will show that an idealized spin-momentum locking is only present within a small energy window about the Dirac point, beyond which strong textural deformations occur. I will also describe our experiments in which we directly visualized the coupling of topological surface electrons to other excitations by recording 3D movies of electronic band structure after photoexcitation by an ultrashort laser pulse.

The Physics Colloquia are designed to address a non-specialist, broad audience and introduce topics of contemporary research through lectures by leading experts. We warmly invite all members of the student body, including undergraduates enrolled in any programme.

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