复旦大学物理系物质科学报告

Physics Department Colloquium

Dephasing and disorder effects in the topological systems

(拓扑系统中的退相和无序效应)

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摘要: The influence of dephasing and disorder effects in the topological systems, such as the quantum spin Hall effect (QSHE) system, the surface states of 3D topological insulators, and the Weyl semimetals (WSMs) is studied. For the 2D QSHE system, we find that the quantum conductance plateaus are robust against the normal dephasing but fragile with the spin dephasing, and thus these quantum plateaus only survive in mesoscopic samples. For the surface states of 3D topological insulators, we show that the combination of dephasing and impurity scattering can cause backscattering in the helical states. In WSMs, we predict the Goos-Hänchen and the Imbert-Fedorov shifts exist for the reflection at the interface of two WSMs. We find that the IF shift originates from the topological effect of the system, and can be utilized to characterize the Weyl semimetals, to design valleytronic devices, and to measure the Berry curvature of the system. We also study the impurity scattering and disorder effects in the WSMs. We show that the topological IF shift also influences the single impurity scattering cross-section and gives rise to exotic transport properties of WSMs. Furthermore, we study the disorder induced localization in WSMs, and find three exotic quantum phase transitions.

Time: 2:00pm, Thursday, 2015.12.17

Location： Physics Building, Room 221B

(Cookies and coffee are served from 1:30 pm)