



Weekly Seminar

Quench dynamics in weakly disordered two-dimensional systems with spin-orbit coupling

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Time: 3:00 pm, Oct.28, 2026 (Wednesday)

时间: 2026年10月28日 (周三) 下午3:00

Venue: Room w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

I will talk about theoretical and numerical work on quench dynamics in weakly disordered two-dimensional systems with spin-orbit coupling (SOC). We consider a particle in a plane wave state. At time $t = 0$ an uncorrelated random potential is switched on, and we follow the time evolution of the disorder averaged momentum distribution. We focus on the signatures of SOC that are visible in the time dependence of interference effects such as coherent backscattering (CBS). This work is reported in the three papers listed below. Using diagrammatic perturbation theory, we describe spin-momentum dynamics for weak disorder and arbitrary strength of the SOC. We support our calculations by comparison with numerical simulations, including an example where a transient CBS peak with a momentum offset coexists with a robust CBS dip.

Observation of a time dependent CBS peak in quench dynamics experiments in cold atoms without SOC has been reported. The phenomena we describe may be observable in similar experiments in cold atoms incorporating realisations of synthetic SOC. Such systems are also expected to display an Anderson transition at strong disorder.

Kakoi, M. and K. Slevin (2024). "Time evolution of coherent wave propagation and spin relaxation in spin-orbit-coupled systems." Phys. Rev. A 109 033303.

Kakoi, M., C. Miniatura, and K. Slevin (2026). "Coherent transport in two-dimensional disordered potentials under spatially uniform SU(2) gauge fields." Phys. Rev. A 113 L041302.

Kakoi, M., C. Miniatura, and K. Slevin (2026). "Mesoscopic scattering dynamics under generic uniform SU(2) gauge fields: Spin-momentum relaxation and coherent backscattering." Phys. Rev. B 114 014209.

About the speaker

Prof. Slevin has a BA in Natural Sciences from Cambridge University and a PhD from Imperial College, London in Solid State Physics. Since 1997 he has been an Associate Professor in the Graduate School of Science at the University of Osaka.

He is a theorist with an interest in numerical simulations of disordered systems. A particular focus has been careful finite size scaling studies of the critical phenomena of the Anderson transition in various universality classes and the quantum Hall effect. His recent work is focused on the effect of spin-orbit-coupling on coherent backscattering in two-dimensional disordered systems with spin-orbit coupling.