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Effects of finite time on Landau-Zener transition

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报告摘要: Landau-Zener transition (LZT) is a ubiquitous phenomenon in quantum systems with time-dependent Hamiltonians. LZT has broad applications in atomic and molecular physics, quantum optics, condensed matter physics, chemical physics, and quantum information science. For instance, LZT has been used as tunable "beam splitters" for quantum mechanical wave functions to generate entangled multipartite states. Recently, its potential for robust manipulation of coherent quantum states and simulating quantum phase transition has attracted much attention. We demonstrate, via experiment and numerical simulations, under conditions often found in superconducting qubits LZT probability PLZ could deviate significantly from that given by the asymptotic LZ formula. Under proper conditions, in contrast to the smooth exponential dependence on the Landau-Zener speed v predicted by the LZ formula PLZ oscillates as a function of v and the starting/finishing point of the energy sweep due to finite evolution time. We show that if not taking into consideration the effects of finite time on LZT could lead to significant errors for single- and two-qubit quantum gates based on various rapid adiabatic passage methods.

时间: 4月24日 (星期四) 15:00—16:30

地点: 北京大学物理大楼中212教室

韩思远, 毕业于安徽省合肥市第十五中学, 1977年考入中国科学技术大学物理系, 1981年获首届郭沫若奖学金, 1982年获物理学学士学位。同年, 前往美国依阿华州立大学深造, 1986年获得凝聚态物理博士学位。韩思远博士于1997年至2000年担任美国堪萨斯大学物理与天文系助理教授, 并于2000年晋升为终身制副教授, 2003年至今任教授一职。韩教授主要研究领域有超导量子干涉仪 (SQUIDs) 和约瑟夫森结的量子特性及其在量子计算方面的应用、薛定谔之猫、随机非线性动力学系统等至今已在P. R. L等国际顶尖的物理杂志上发表数十篇论文, 2006年受聘为国家教育部第八批“长江学者”特聘教授。目前, 韩教授是美国物理学会 (American Physics Society (APS))、美国科学促进会 (American Association for the Advancement of Science (AAAS)) 会员。

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