武汉物数所理论交叉学术交流系列报告 （第二一三期）

Nonequilibrium quantum phase transition induced by periodic driving

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报告人简介:

安钧鸿，教授，博士生导师。2005年在兰州大学获得博士学位并留校工作。2006年至2014年12月相继在台湾成功大学和新加坡国立大学开展博士后和合作科研。2013年入选教育部新世纪优秀人才支持计划；2016年入选甘肃省飞天学者；2017年入选中央军委科技委主题专家组专家；2018年入选中国物理学会量子光学专业委员会委员；2019年入选国家“万人计划”青年拔尖人才。主要从事量子物理基础问题研究，包括量子光学、量子信息、量子相变以及非平衡量子统计动力学等方面的研究。主持在研/完成国家自然科学基金5项；教育部博士点基金和甘肃省自然科学基金各1项。

Abstract:

Periodic driving has become one highly versatile tool in quantum control. Many efforts have been devoted to explore non-trivial effects induced by periodic driving on quantum systems. In this talk, I will report that interesting nonequilibrium quantum phase transitions (QPTs) can be triggered by engineering non-trivial band-gap structure and midgap bound state in Floquet quasi-energy spectrum using periodic driving. I will clarify this idea by two examples. One is to induce more colorful topological QPT in one-dimensional Kitaev model and in two-dimensional Haldane model by periodic driving. A tunable number of topologically protected Majorana edge modes can be generated in Kitaev model by a well-designed periodic driving, which may supply a novel way to identify the topological phase of the system. The topological insulator phases with a large Chern number can be triggered in the Haldane model by periodic driving. A proposal for such large-topological-number phases realized in cold-atom systems is given. Another is to induce nonequilibrium QPT in the system consisting of a spin interacting with a spin bath by periodic driving. It is found that whenever the QPT manifested by the formation of a midgap state in the Floquet quasienergy spectrum occurs, the decoherence of the spin induced by the spin bath can be suppressed. This opens an avenue to control decoherence by periodic driving.

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