武汉物数所理论交叉学术交流系列报告 （第二〇八期）

Emergent topology and symmetry-breaking order in correlated quench dynamics

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2019年4月17日(周三) 上午10:00
新波谱楼M10楼1016-17报告厅

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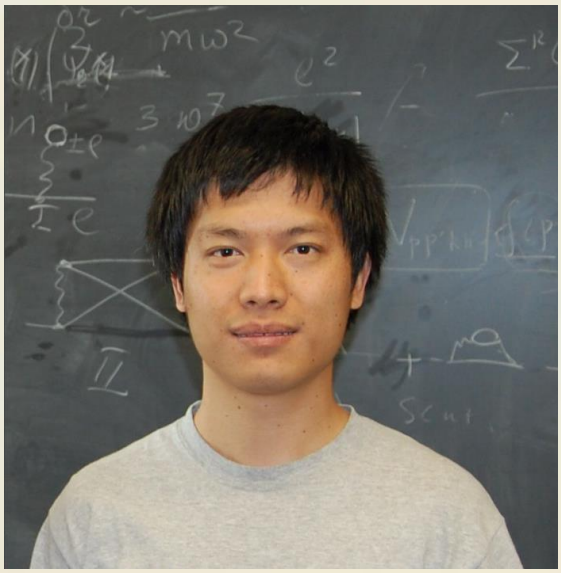

刘雄军博士毕业于德州A&M大学物理系（2011/08）。2011至2014年分别在马里兰大学凝聚态物理中心和联合量子研究所，香港科大高等研究院和麻省理工学院从事博士后研究。他于2014年9月加入北京大学量子材料科学中心任研究员，入选国家青年千人。2018年7月获得终身长聘职位，同年8月获得国家杰青资助，2019年1月晋升为终身长聘正教授。刘雄军教授长期在拓扑物相和超冷原子量子模拟领域开展研究。他在人工规范场量子模拟，拓扑超导领域做出系列原创工作；尤其推动近些年人工自旋轨道耦合、拓扑量子模拟方向的理论和实验发展。研究工作多以通讯作者或一作发表在Science，Science子刊，Nature子刊，PRL，PRX等期刊上。他目前的主要研究兴趣集中在拓扑超导，人工规范场量子模拟，非平衡拓扑量子系统，强关联拓扑物相等方面。

Abstract：

Quenching a quantum system involves three basic ingredients: the initial phase, the post-quench target phase, and the non-equilibrium dynamics which carries the information of the former two. In this talk I will introduce how to identify both the topology and symmetry-breaking order in a correlated system, the Haldane-Hubbard model, from quantum dynamics induced by quenching an initial magnetic phase to topologically nontrivial regime. The equation of motion for the complex pseudospin dynamics is obtained through the flow equation method, with the pseudospin evolution shown to obey a microscopic Landau-Lifshitz-Gilbert equation. We find that, with the particle-particle interaction playing crucial roles, the correlated quench dynamics exhibit robust universal behaviors on the band-inversion surfaces (BISs), from which the nontrivial topology and magnetic orders can be extracted. In particular, the topology of the post-quench regime can be characterized by an emergent dynamical topological pattern of quench dynamics on BISs, which is robust against dephasing and heating induced by interactions; the pre-quench symmetry-breaking orders can be read out from a universal scaling behavior of the quench dynamics emerging on the BIS. These results may show insights into the exploration of novel correlation physics with nontrivial topology by quench dynamics.

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