

凝聚态物理-北京大学论坛

北京大学物理学院凝聚态物理与材料物理研究所
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Ultrafast dynamics of low-energy collective excitations in a 2D antiferromagnet MnBi_2Te_4

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时间: 6月8日 (星期四) 15:00—16:30

地点: 北京大学物理楼西202报告厅

报告人简介 (About speaker) : 杨鲁懿, 清华大学物理系副教授, 博士生导师。2007年获清华大学学士学位。2013年在美国加州大学伯克利分校获得物理博士学位。2013-2016年在美国国家强磁场实验室 (洛斯阿拉莫斯国家实验室) 任博士后 (LANL Director's Postdoctoral Fellow) 。2016-2019年在加拿大多伦多大学物理系任助理教授, 2016年被评为加拿大高级研究所的全球学者 (CIFAR Azrieli Global Scholar) , 2017年被授予Canada Research Chair头衔。2018年获得国家级人才计划, 2019年9月至今在清华大学物理系任教。研究方向为量子材料的超快动力学、非线性光学、自旋电子学等。

摘要 (Abstract) : The atomically thin MnBi_2Te_4 crystal is a novel magnetic topological insulator, exhibiting exotic quantum physics. In this work, using time-resolved optical techniques, we report a systematic investigation of coherent interlayer phonons, ultrafast (de)magnetization and coherent magnon dynamics in few-layer MnBi_2Te_4 as a function of layer number, temperature and applied magnetic field. Pronounced coherent phonon oscillations from the interlayer breathing mode are directly observed in the time domain and further confirmed by ultralow-frequency Raman spectroscopy measurements. Below the Neel temperature, we observe laser-induced (de)magnetization processes that can be used to accurately track the distinct magnetic states in different magnetic field regimes, including showing clear odd-even layer number effects. In addition, strongly field-dependent antiferromagnetic magnon modes with tens of gigahertz frequencies are optically generated and directly observed in the time domain. These measurements present the first comprehensive overview of ultrafast interlayer phonon and spin dynamics in this novel 2D antiferromagnet, paving the way for potential applications in 2D antiferromagnetic spintronics and magnonics as well as further studies of ultrafast control of both magnetization and topological quantum states.

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http://www.phy.pku.edu.cn/icmp/xsjl/njtwl__bjdxlt.htm