北京大学量子材料科学中心
International Center for Quantum Materials, PKU

Weekly Seminar

Antiferromagnetic Resonance Revisited

肖江

复旦大学物理学系

Time: 3:00 pm, Dec. 27, 2023 (Wednesday)

时间：2023年12月27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

直播链接：https://www.koushare.com/lives/room/291363

Abstract

Antiferromagnetic resonance (AFMR) has been extensively studied for over 70 years, with Kittel being one of the initial researchers in this field. Antiferromagnets are typically seen as having two magnetic sublattices that are antiferromagnetically coupled. As a result, it is natural to consider the dynamics of antiferromagnetic as the coupled magnetic dynamics of these two sublattices. In a simple sense, the magnetic resonance of one sublattice can be viewed as an oscillator, and therefore antiferromagnetic resonance can be thought of (incorrectly!) as a set of coupled oscillators similar to those studied in undergraduate physics textbooks.

However, in this presentation, we will show that antiferromagnetic resonance does not conform to the model of coherently coupled oscillators as described in textbooks. Instead, AFMR should be seen as the spectrum from oscillators that are coupled via a dissipative coupling, such as coupling with velocity difference or with delay. This difference is also evident in the fact that the AFMR spectrum actually exhibits gap-closing rather than gap-opening behavior when the coupling strength increases.

Another unique aspect of AFMR, stemming from the same physics, is its linewidth. In a typical coupled oscillator model with dissipation, the dissipation rate of the coupled system does not exceed the dissipation rate of the subsystem before coupling, provided that the coupling itself is non-dissipative. However, in AFMR, although the Heisenberg exchange coupling is non-dissipative, the dissipation rate of the AFMR can actually be significantly larger than that of the magnetic sublattices before coupling. This leads to a broadened linewidth in AFMR, which may be another possible reason why AFMR is usually more challenging to observe than FMR, in addition to the high AFMR frequency.

About the speaker

肖江教授于2001年获得北京大学物理学学士学位，随后于2006年在美国佐治亚理工学院获得博士学位。之后，他在荷兰代尔夫特理工大学的卡夫利纳米科学研究所从事博士后研究。2009年，他加入了复旦大学。肖江教授的研究聚焦于理论凝聚态物理，特别关注自旋电子学方向。他的专长领域包括磁性纳米结构中的自旋输运、磁化动力学、参数自旋泵浦等，近期兴趣包括磁子学、腔体自旋电子学和基于自旋的类脑、概率、量子计算等。

扫码观看蔻享直播

Host: 陈剑豪<chenjianhao@pku.edu.cn>