Seminar

Optical Spectroscopy on Superconductors: The Higgs mode in disordered films

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Time: 10:00am, Nov. 20, 2015 (Friday)
时间: 2015年11月20日 （周五）上午10:00
Venue: Room W563, Physics Building, Peking University
地点: 北京大学物理楼 西563

Abstract

•The electrodynamic properties of superconductors are of interest from a fundamental side as well as for applications. Since the seminal work of M. Tinkham on the superconducting energy gap in the late 1950s, optical investigations have been established as a powerful method to explore the quasi-particle excitations and their dynamics which yield important information on the density of states, the symmetry of the order parameter, the scattering mechanism, and eventually the glue to super-conductivity. In addition, the superconducting condensate is probed, i.e. the Cooper pair density and stiffness. Most recently, it became clear that under certain conditions, also collective modes can be studied: these are the phason excitations (Nambu-Goldstone mode) and the amplitude mode (Higgs mode).

•The talk will give a general introduction to the optical properties of superconductors, sketch the theory and highlight some important experimental findings, as well as applications, such as superconducting single photon detectors. In particular we will focus on ultrathin superconducting films, such as InO, Nb, NbN, TiN, and TaN, but also Al, which exhibit a superconductor-insulator transition as disorder or granularity increases. We discuss the possibility of collective low-frequency ex-citations due to the Higgs mechanism, which become long-lived and well defined in the vicinity of a quantum critical point.

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•References

•[1] M. Dressel *et al.*, IEEE Sel. Top. Quant. Electr. **14**, 399 (2008); Adv. Condens. Matter Phys. **2013**, 104379 (2013).

•[2] U. S. Pracht *et al.*, IEEE Trans. THz Sci. Technol. **3**, 269 (2013); Phys. Rev. B **86**, 184503 (2012).

•[3] D. Sherman *et al.*, Phys. Rev. B **89**, 035149 (2014); Nature Phys. **11**, 188 (2015).

•[4] N. Bachar *et al.*, J. Low Temp. Phys. **179**, 83 (2014); U Pracht, *et al.* arXiv:1508.04270.

About the Speaker

Prof. Martin Dressel received his Ph.D. degree in 1989 from the Georg-August-University of Goettingen, Germany. He was a scientific staff at the Laser-Laboratorium Göttingen and group leader of "Optical fibers for excimer lasers and their applications in medicine“ from 1989 to 1991. From 1991 to 1995, he did researches in the University of British Columbia at Vancouver, the University of California at Los Angeles. After habilitation in Physics at the Technical University of Darmstadt, he worked as research associate at the center for "Electronic correlations and magnetism" at the University of Augsburg in 1996.

Since 1998, Prof. Dressel has been a full professor of physics and head of the Physikalisches Institut at the Universität Stuttgart. In 2013 he was appointed adjunct professor at Moscow Institute of Physics and Technology, Moscow, Russia.

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