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

Seminar

Nano-optomechanics in the high-frequency regime: exploration at the boundary between photonics, mechanics, and microwaves

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Time: 10:30 am, Feb.17, 2014 (Monday)
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Venue: Conference Room A (607), No. 5 Science Building
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The mechanical effect of light was discovered long time ago and has been utilized to cool and trap atoms. Recently, such optomechanical effects are also realized in systems where the mechanical element is a macroscopic object. These optomechanical systems have great potential for fundamental scientific research as well as rich practical applications, from homeland security, environment monitoring to computation and communication. High-frequency optomechanical systems that operate in the microwave frequency regime were long sought after, because of their easy access to the quantum regime and their advantages in developing ultrahigh-speed sensors and signal processors. Due to technical limitations, previous optomechanical systems work mostly at low frequencies in the kHz to MHz ranges. Here I will talk about our experimental realization of a variety of integrated nanoscale optomechanical and optoelectromechanical devices that operate beyond 1 GHz. They demonstrate world-record figures of merit, such as mass, vibrational frequency, optical and mechanical quality factors. With the mechanical mediation, these devices hold the promise of revolutionizing the field of nano-optoelectronics, microwave photonics, biophotonics, and integrated quantum photonics.

Xiankai Sun is an associate research scientist in the Nanodevices Laboratory of the Electrical Engineering Department at Yale University. He received his Ph.D. degree in Applied Physics from California Institute of Technology in 2010, where his doctoral thesis deals with both theories and experiments of nanophotonics, semiconductor lasers, and hybrid electronics-photonics integration of Si and III-V materials. At Yale, he has been exploring the interaction of photonics, electronics, and mechanics in an on-chip platform that leads to new physical phenomena and applications. He has been an author or coauthor of over 50 peer-reviewed journal/conference papers and 3 invited book chapters. His graduate work was recognized by numerous professional societies including the IEEE Photonics Society, SPIE (the International Society for Optics and Photonics), and the Photonics Society of Chinese-Americans. His postdoctoral work has recently been recognized by the New York Academy of Sciences where he is selected as a finalist of the Blavatnik Awards for Young Scientists.