

Abstract

Quantum sensing is an emerging quantum technology that exploits quantum coherence of single quantum objects to enhance detection of weak signals and to enable measurements that are not even in principle using conventional spectroscopic approaches. Nitrogen-vacancy center spins in diamond are good quantum sensors for they have long coherence time under ambient conditions. The chemical stability and bio-comparability of diamond materials make diamond quantum sensors particularly useful for applications in biological studies. In this talk, we will discuss the basic principles of quantum sensing, the quantum properties of nitrogen-vacancy center spins, and potential applications of diamond quantum sensing in the study of condensed matter physics in nanometer-sized materials (especially nanomagnetism), thermal dynamics in nano-systems, and mechanical and fluidic properties of nano-materials and live cells.

Biosketch:

Renbao Liu got his BSc degree in 1995 from Nanjing University, Department of Physics and PhD degree in 2000 from Institute of Semiconductors, Chinese Academy of Science. After postdoctoral researches in Center for Advanced Study, Tsinghua University and in Department of Physics, University of California – San Diego, he joined The Chinese University of Hong Kong (CUHK) in 2005 as a faculty member of Department of Physics, where has been a full professor since 2014. His research interests include condensed matter physics, quantum optics, nonlinear optics, quantum computing, and quantum sensing. He was awarded, among other honors, CUHK Young Researcher Award (2010), Distinguished Fellow of Faculty of Science, CUHK (2013), Huang Kun Prize (2013), and CUHK Research Excellence Award (2014).