

世纪物理情·系列讲座

# Spin dynamics and its cutting-edge applications in quantum technologies

## 【摘要】

Spin is a fundamental and intrinsic property of quantum particles that plays a crucial role in various physical phenomena, e.g., magnetism, particle interactions, the structure of matter. Spins offer some exceptional advantages including long coherence times, high-fidelity controllability via magnetic, optical and electrical fields, excellent scalability, and compatibility with solid-state integration. These unique merits establish spins as one of the most promising platforms for practical quantum technologies.

This talk will explore the intricate world of spin dynamics across gaseous, liquid, and solid-state systems, and its pivotal role in advancing quantum technologies. I will present state-of-the-art spin-based quantum techniques, including quantum simulation platform for complex many-body physics, quantum reservoir computing that leverages natural spin dynamics for efficient temporal information processing, and spin-based ultra-sensitive magnetometers for weak-field detection in fundamental physics such as dark matter searches. Finally, I will discuss future prospects on laser-assisted solid-state magnetic resonance, highlighting its challenges and opportunities.

## 【报告人简介】



Xinhua Peng is a Professor from University of Science and Technology of China. She received her Ph.D degree in Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences (CAS) in 2003. Subsequently she arrived at University of Dortmund, Germany, as an Alexander von Humboldt Fellow. In 2008, she joined in Department of Modern Physics, University of Science and Technology of China under the CAS “Hundred Talents Program”. Her research interests mainly focus on spin-based quantum information processing, encompassing quantum algorithms, quantum simulation, quantum control, and quantum sensing. She has published around 150 peer-reviewed papers on Nature, Nat. Phys, PNAS, Sci. Adv., Phys. Rev. X/Lett. et al. She was awarded including Distinguished Young Scholars of NSFC, Young Yangtze River Scholars Award of the Ministry of Education, the 12th Chinese Young Women Scientist Award and Xplorer Prize.

主办单位:清华大学高等研究院

【报告人】

彭新华

中国科学与技术大学

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清华大学高等研究院

科学馆322报告厅

