上海数学与交叉学科研究院

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Shanghai Institute for Mathematics and Interdisciplinary Sciences

SIMIS Seminar series on Quantum computing, Quantum simulation and Strongly-correlated systems

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"Spin Quantum Sensing Technology and Its Advanced Applications"

Abstract

With the rapid development of quantum precision measurement, particularly in the active control and manipulation of quantum systems, the accuracy of measuring physical quantities such as electromagnetic fields, rotation, time, and gravity has been significantly enhanced. This advancement provides novel methods for frontier scientific endeavors, including material detection and the test of fundamental physical principles. This report first introduces several newly discovered spin effects, such as the spin amplification effect, and the ultra-sensitive magnetic field sensing technology developed from these effects, achieving magnetic field sensitivity surpassing the fT level. Unlike SERF atomic magnetometers, this technology does not require zero magnetic environments, greatly broadening its range of applications. Additionally, the spin system employed in this technology is based on nuclear spin, offering higher energy resolution compared to electron spin sensors. Finally, the report will discuss how spin quantum precision measurement technology can be applied to precise measurements of chemical molecular structures, dark matter searches, and other research areas. In particular, our recent laboratory results surpass the dark matter limits placed based on SN1987A supernovae observation, potentially leading to significant breakthroughs in fundamental science.

Biography of the speaker

Min Jiang, professor of University of Science and Technology of China. He has been recognized as a Youth Top Talent in the National Ten Thousand Talents Program and is a member of the Youth Innovation Promotion Association of the Chinese Academy of Sciences. His primary research focuses on spin quantum precision measurement and its applications. His work has been published in renowned international journals, with over 30 papers as the first or corresponding author, including publications in Nat. Phys., PRL, PNAS, Sci. Adv., and Nat. Commun.

Date and Place: Wednesday June 11th 2025, 11:00h-12:00h. Room: 1410. Send comments or questions to Miguel Tierz (Seminar organizer) to tierz at simis.cn