人工微结构和介观物理国家重点实验室

State Key Laboratory For Artificial Microstructure and Mesoscopic Physics

科学前沿报告会(311)

Beyond The Heisenberg Uncertainty Principle

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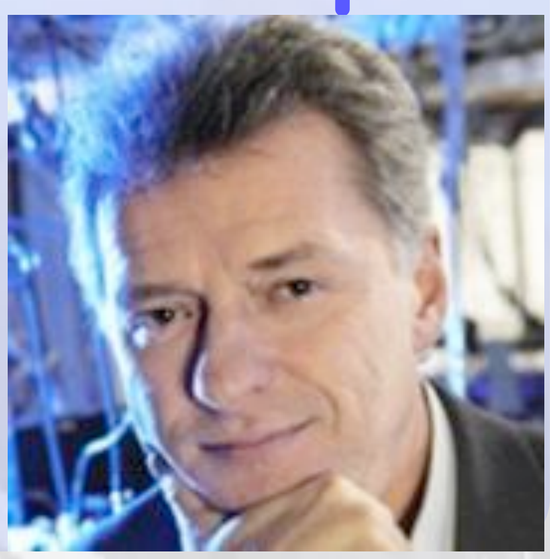

Time: 3:30pm, October 30, 2015 (Friday)

Venue: Room W412, School of Physics, Peking

报告摘要

Measurements of one quadrature of an oscillator with precision beyond its vacuum state uncertainty have occupied a central place in quantum physics for decades. A squeezed state of either position or momentum is a prominent example of a state which provides such precision. One of the first proposals for generation of such a state [1] involves a quantum nondemolition measurement at twice the frequency of the oscillator. We have recently reported the first experimental implementation of this proposal [2] with a magnetic oscillator. It has been widely assumed that sensing with the precision beyond the vacuum state uncertainty in both position and momentum is prohibited by the uncertainty principle. We have demonstrated that this limitation can be overcome by entangling an oscillator with a quantum reference frame with an effective negative mass [3, 4]. In a more general sense, this approach leads to trajectories without quantum uncertainties [5] and to achieving new fundamental bounds on the measurement precision [6].

[1] Science 209, 547–557 (1980); [2]Nature Physics, (2015) doi:10.1038/nphys3280; [3] Nature, 413, 400 (2001); [4] Phys. Rev. Lett. 102, 020501 (2009); [5] Annalen der Physyk. 527, No. 1–2, A15–A20 (2015); Phys. Rev. Lett. 105(12), (2010).

报告人简介

Prof. Eugene Polzik is professor of physics at the Niels Bohr Institute at the University of Copenhagen and Head of QUANTOP laboratory. His research interests are centered around quantum physics of matter and light and quantum information technologies. Among the pioneering results he has achieved are demonstrations of the quantum teleportation between material objects, quantum memory for light, optical detection of radio waves using a nanomechanical oscillator, quantum optical interface with a one dimensional atomic crystal, and quantum trajectories without quantum uncertainties. Dr. Polzik is Distinguished Invited Professor at the Institute for Photonic Sciences in Barcelona. He is Member of the Royal Danish Academy of Sciences, Fellow of the American Physical Society and Fellow of the Optical Society of America. He is a recipient of the Gordon Moore Distinguished Scholar award, Scientific American Research Leadership award, European Research Council Advanced Grant award and Danish Association of Academics award.

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