14-P5

SUB-SHOT NOISE INTERFEROMETRY WITH SQUEEZED LIGHT

Shuichiro Inoue*
Email: ino@phys.cst.nihon-u.ac.jp
ERATO Yamamoto Quantum Fluctuation Project
Edward L. Ginzton Laboratory, Stanford University,
Stanford, CA 94305, USA

The sensitivity limit of interferometric phase measurements using normal laser light is $\Delta\theta_{SQL} = 1/\sqrt{N}$, where N is the total number of photons detected in the measurement time interval. This sensitivity limit is set by a vacuum fluctuation that enters the open port of the interferometer input beamsplitter. The straightfoward way to improve the sensitivity is to replace the vacuum fluctuation with a squeezed vacuum state. However, we can improve the sensitivity by replacing the vacuum fluctuation with amplitude squeezed light generated directly from a constant-current-driven semiconductor laser when the interferometer is operated at a "dark-fringe". In our scheme, amplitude squeezed light from a semiconductor injection-locked slave laser and coherent light from a semiconductor master laser are simultaneouly injected into the interferometer input beamsplitter keeping the phase difference between them at $\pi/2$. The output noise of the interferometer was reduced below shot-noise level by 1.58 dB when the interferometer was operated at a dark-fringe.

*Present address: Atomic Energy Research Institute, Nihon University, 1-8 Kanda-Surugadai Chiyoda-ku, Tokyo 101-8308, Japan