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Precise magnetometer with a Bose-Einstein condensate

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Abstract

State-of-the-art magnetometers offer magnetic field sensitivities down to sub fT per root Hertz. A Bose-Einstein condensate (BEC) of neutral atoms has realized an excellent magnetic field sensitivity of pT per root Hertz with μm spatial resolution. We aim to construct a quantum-enhanced precise magnetometer with a BEC of rubidium-87 atoms. In this talk, I will present our development of sensitive BEC magnetometer, construction of squeezed light for improving the magnetometry, and measurement and cancellation of nonlinear ac Stark shift with the use of multi-state interferometer for measurement-based spin squeezing. This work was supported by the MEXT Quantum Leap Flagship Program (MEXT Q-LEAP) Grant Number JPMXS0118070326.