

Joint CQSE and CASTS Seminar

2018
Oct. 19, Friday

TIME Oct. 19, 2018, 14:30 ~ 15:30
TITLE New approaches for atom-light-based precision measurement and metrology
SPEAKER Prof. Pei-Chen Kuan
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Abstract

In atom interferometers, light pulses direct matter waves into different paths by atom-light interactions. The wave functions in different paths accumulate different phases which can be read out by measuring the population at the interferometer outputs. Unlike photons, atoms have mass, which makes atom interferometers suited to measure gravity, recoil frequency, Newton's gravity constant G , and so on. In this talk, I will first present examples of using such a precise instrument to build the world's first clock that is referenced to a single particle's mass and make the state-of-the-art measurement of the fine structure constant. In the second part of the talk, I will show a novel method of measuring the centre-of-mass motion of an atomic ensemble by the collective interference of the ensemble of atoms based on electromagnetically-induced-transparency. This setup has the advantages of high data rate and convenient detection of the interference phase over atom interferometers. Moving forward, I will discuss new proposed approaches to enhance the performance of atom interferometers and use them to study fundamental physics by introducing new types of atom-light interactions, like superradiant Raman transition and double diffraction Bloch oscillations.

