

Center for Quantum Science and Engineering CQSE

Weekly Seminar
March 24, 2010 (Wednesday)

Time: March 24, 2:30pm ~ 3:30pm

Title: IR Laser Assisted Atomic Photoionization by an Attosecond Pulse

Speaker: Dr. Xiao-Min Tong 仝曉民

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Place: Rm312, CCMS & New Physics Building, NTU

Abstract

Interference is one of the most fundamental physical processes in quantum mechanics. In the laser-atom experiments, various self-interference mechanisms of a single particle can be explored. In this talk, I will introduce a general mechanism we proposed to understand the recent experiments of the infrared (IR) laser assisted atomic photoionization by an attosecond pulse (AP) or pulse train. In this theory, atomic structures in an IR laser field are described by Floquet theory and atoms can be excited or ionized to a Floquet state by a single AP via different Floquet components. The interference of ionization channels via different Floquet components results in the oscillation of the ionization yield as a function of the arriving time of the AP. We may call this phenomenon as an energy double-slit interference since it comes from the transitions through different intermediate Fourier components. Based on this understanding, if we replace the AP with two coherence EUV lights, we find two routes through the energy double-slit which can be tuned either by varying the IR intensity or the relative field strengths of the two EUV lights. The control of the IR intensity tunes the atomic structure and the relative strength of the EUV lights tunes the light current going through different energy slits. The interference strength can be well controlled by this two knobs. The numerical details and the possible applications of the theory to other dynamic processes will be discussed.

