SPECIAL ATOMIC PHYSICS SEMINAR

"Quantum Lithography with Classical Light"

Dr. M. Suhail Zubairy

Department of Physics and Institute for Quantum Studies
Texas A&M University

Abstract

A fundamental limit to optical resolution in optical lithography arises from the wave nature of light. The Rayleigh criterion limits the feature size of interfering beams to half the wavelength of light. Recently, several schemes have been proposed to improve the spatial resolution of interferometric lithography beyond the diffraction limit. The approach of quantum lithography is based on the entangled photon-number states that are experimentally difficult to generate and sustain. We showed that such "entangled states" based lithography can be done using classical light[1]. These schemes are based on an N-photon absorption process and achieve a spatial resolution of $\lambda/2N$. The indispensable requirement of a multiphoton transition, however, is accompanied by the need for high light field intensities which makes an experimental realization of these schemes impractical. More recently, we proposed a novel method that allows to achieve the same spatial resolution as previous schemes, but does not require an N-photon absorption process[2]. Our scheme relies on the preparation of the system in a position dependent trapping state via phase shifted standing wave patterns and employs resonant atom-field interactions only.

Tuesday March 11, 2008
11:00 a.m. Room 256
Jack E. Brown Building

Texas A&M University
Institute for Quantum Studies

(Pizza and soda to be served at 12:00 PM)

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[1] P. R. Hemmer, A. Muthukrishnan, M. O. Scully, and M. S. Zubairy, Phys. Rev. Lett. 96, 163603 (2006).
[2] M. Kiffner, J. Evers, and M. S. Zubairy, Phys. Rev. Lett. 100, 073602 (2008).