



Quantum Optics Seminar

Title: Quantum State Tomography of Free Particles

Speaker: Søren Juhl, IFA

Time: Thursday, October 2, 2003 at 15:15

Place: 520-732

Abstract:

An a priori unknown wavefunction cannot be determined by a single measurement, but practical experimental situations may provide us with the probability distributions of a number of observables, and in some cases it is possible to determine/estimate the quantum state from these distributions. It is for example possible to reconstruct the quantum state of a harmonic oscillator from position distributions measured at a sufficiently large number of times by using methods similar to tomographic techniques used in hospital scanners. In this talk, however, I focus on quantum state reconstruction of free particles, where we have proposed a reconstruction procedure based on Jaynes' principle of Maximum Entropy. This principle makes it possible to estimate the most likely density matrix of a system, given only a small amount of information. In addition to a discussion of the method, I shall present specific examples for the reconstruction of the quantum state of the photofragments obtained by femtosecond photodissociation of I_2 molecules [1]. Future research possibilities, e.g., the generalization of the method to other problems will be discussed.

[1] E. Skovsen, H. Stapelfeldt, S. Juhl and K. Mølmer, Phys. Rev. Lett., 91:090406 (2003).

Klaus Mølmer

Coffee/tea and cake will be served from 15:00.