**JPG To PDF** - Unregistered
If you want to remove this text, Please register

**JPG To PDF** - Unregistered
If you want to remove this text, Please register

**JPG To PDF** - Unregistered
If you want to remove this text, Please register

J. Basrah Researches, Vol. 16 , 1990.

# Chaos in a Single atom optical cavity using quantum optics approach

I.K. Taha, H. A. Sultan, and C. A. Emshary

Physics department, Education College, Basrah University, Basrah, Iraq

## ABSTRACT

Based on the work of Savage [3] we have studied the on resonance set of equations (a Lorenz like) thatdescribe the behavior of one atom inside a cavity supplied with one photon. Both driving field and pumping parameters show effects on the phase space portrait.

## INTRODUCTION

Nonlinear optical interactions usually require a macroscopic quantity of nonlinear material and a strong light source. Reducing the photons number in the cavity mode interacting with a single two level atom should able one to approach the quantum limits.

It was shown in 1975 by Haken that the semiclassical, single mode laser equations are equivalent to the Lorenz equations [1,2] i.e the route to chaos is inevitable. The subject of this article is the study of the semiclassical nonlinear optical system in a fully quantum mechanical manner hence relate the classical nonlinear dynamics to the quantum one. To be near both the quantum and the classical limits a saturation photon nuabern, $n_s$ can be defined. When $n_s$ is much less than one , the system reaches a stationary state in the quantum limit. When $n_s$ is much greater than one the stationary state contains many photons and hence behaves classically.