

In this talk we shall present the work carried out in our Master Thesis. The aim of the work was to insert memory in the Theory of Quantum Measurement on a quantum optical system. The theory is based on two kind of equations: the first one, called Linear Stochastic Schrödinger Equation, is the evolution of the system in a finite dimensional complex Hilbert space and the second one, called Linear Stochastic Master Equation is the equation for the evolution of the system in the space of the linear operators acting on the Hilbert space.

A simple way to introduce memory in the system is to allow that the coefficients of the involved equations are stochastic processes whose states belong to the space of the linear operators acting on the Hilbert space.

Firstly, we propose some conditions to guarantee existence and uniqueness of the solution of the Linear Stochastic Schrödinger Equation and we discuss some of its important properties. Then, we generalise the theory to the space of statistical operators (linear, hermitian, positive and trace one operators acting on the Hilbert space) and we obtain existence and uniqueness of the solution of the Linear Stochastic Master Equation. We proceed by proving the consistency of the developed theory with the axiomatic formulation of Quantum Mechanics and, so, we give the so called Instruments of the measuring experiment. In the last part of the exposition we present briefly a physical mode: this is a two levels atom stimulated by a non perfectly monochromatic and non perfectly coherent laser. We compute the moments of the output of the measurement and calculate its spectrum. In the last part of the presentation we rise up some interesting way to consider also feedback and dissipation with memory in the model.