# Abstract

We believe Quantum mechanics to be the fundamental theory of nature yet the everyday world of our perception seems very different from what quantum mechanics suggests.The superposition principle is one of the key principles of quantum theory. The lack of certain macroscopic superposition appears to defy these notions.
This pseudo contradiction can be solved (at least partially) by realizing the importance of environmental interactions. The assumption of closed system does not hold good while applying quantum mechanics to macroscopic systems. Decoherence is one of the key fruits of this realization.
Decoherence explains why for macroscopic objects we observe only a subset of quantum mechanically allowed states and never their superposition, if the system to began with is in such a superposition, Such a superposition will decay or so to say decohere into mixture of microscopically observed states.
In this thesis, we will try to understand the process of decoherence in much more depth by focusing on a particular model. The model of interest throughout the thesis will be Quantum Harmonic Oscillator interacting with the spin environment.
First we will discuss the situation in which our environment will be made up of spin-$\frac{1}{2}$ and have no internal dynamics of its own (self-Hamiltonian is zero). After this, using Born-Markov master equation formalism we will study the case of environment made up of spin-1 particles with non-zero self-Hamiltonian.