Abstract

The focus of my master thesis involves the derivation of effective Hamiltonians based on perturbation theory. In contrast to the standard perturbative approach, the correc- tions to the zero-order wave functions are obtained in terms of operators employing the projection operator formalism. Depending on the magnitude of the spin-spin coupling terms, projection operators based on the coupled and uncoupled basis are constructed to describe the spin dynamics in strongly and weakly coupled systems. The simulation results emerging from the analytic method are compared with the exact simulations emerging from numerical simulations.