

Abstract

A quantum system interacting with a high intensity oscillating field can be described by a time periodic semi-classical Hamiltonian. The Floquet theorem and the (t,t') formalism is employed with the objective to replace the time-dependent Hamiltonian with a time-independent Hamiltonian represented by an infinite matrix. This enables a solution of the time-dependent Schrödinger equation (TDSE) for a quantum system and the time propagation has the advantage of bypassing the complexity of time-ordering operator as chronological ordering is not required for solving TDSE for time-independent Hamiltonians. However, the Floquet prescription of solving the TDSE involves a very heavy diagonalization of Floquet matrix at each time step. To address this problem, a memory and time saving computational scheme in the length gauge has already been suggested earlier which involves the analytical diagonalization of uniform block tri-diagonal matrices. The current work involves the proposition of a novel recursive algorithm in the acceleration gauge, also called the Kramers-Henneberger (KH) frame in the high intensity field regime, to study the quantum dynamics of the system in a linearly polarized laser. The algorithm is tested for two test cases viz. the symmetric double well potential and the xenon model potential. The test calculation validates the proposed recursive algorithm to perform quantum dynamics in the KH frame.