

Abstract

This thesis focuses on the comparison of perturbative and non-perturbative calculation of the third order polarization in two dimensional (2D) optical spectroscopy. A two-level molecule and a coupled dimer are chosen as simple systems for which the 2D spectrum is calculated using explicit equations of motion for the reduced density matrix and integrating the response functions. The two approaches are compared qualitatively and quantitatively using obtained results. The main difference found is the presence of higher order polarization contributions in non-perturbatively calculated spectrum.