NONSEPARABLE SCHRÖDINGER EQUATION IN DISCRETE VARIABLE REPRESENTATION

S. Shadmehri, V.S. Melezhik
(BLTP, JINR)

To treat quantum dynamical problems which involve nonseparable angular variables, we develop a non-direct product discrete variable representation (npDVR) by constructing the DVR basis on spherical functions orthogonalized on the grids of Lebedev or Popov quadratures for the unit sphere. We present the superiority of this method by applying our scheme to the problem of hydrogen atom in crossed static electric and magnetic fields and also the time-dependent problem of an atom in a strong elliptically polarized laser field. Moreover, the developed npDVR computational scheme allowed us to investigate subtle nondipole effects in the interaction of an atom with a laser field, including the nonseparability of the center-of-mass and relative motion variables in this problem.