*FBS
Dubna*

С е м и н а р
«МАЛОЧАСТИЧНЫЕ СИСТЕМЫ»
вторник, 23 ноября 2021 г., 11:00
аудитория им. Д.И.Блохинцева и Zoom[*]

Excitation and Ionization of a Hydrogen Atom in Elliptically Polarized Strong Laser Fields within Discrete Variable Representation

Sara Shadmehri,   Vladimir S. Melezhik

BLTP, JINR

The nondirect product discrete variable representation (npDVR) is developed for the time-dependent Schrödinger equation with nonseparable angular variables and is applied to a hydrogen atom in elliptically polarized strong laser fields. The 2D npDVR is constructed on spherical harmonics orthogonalized on the 2D angular grids of the Popov and Lebedev 2D cubatures for the unit sphere [1]. With this approach we have investigated the dynamics of a hydrogen atom initially in its ground state in elliptically polarized laser fields with the intensity up to $I = 10^{14}$ W/cm^2 and wavelength of $\lambda = 800$ nm. For these parameters of the laser field and the entire range of ellipticity variation, we have calculated the total excitation and ionization yields of the atom. The performed analysis of the method convergence shows that the achieved accuracy of our calculations significantly exceeds the accuracy of recent works of other authors relevant to the problem [2], due to the high efficiency of the 2D npDVR in approximating the angular part of the 3D time-dependent Schrödinger equation. We also propose a new simple procedure for infinite summation of the transition probabilities to the bound states of the hydrogen atom in calculating the total excitation yield and prove its accuracy by comparison with conventional methods. The obtained results show the potential prospects of the 2D npDVR for investigating atomic dynamics in even stronger laser fields, where it is required to go beyond the dipole approximation and take into account relativistic effects.

[1] S. Shadmehri, S. Saeidian, and V. S. Melezhik, J. Phys. B **53**, 085001 (2020).
[2] X. Gao and X.-M. Tong, Phys. Rev. A **100**, 063424 (2019).

[*]Идентификатор: 852 2951 8449
Код доступа: 932758
Адрес подключения:
https://us02web.zoom.us/j/85229518449?pwd=ZnYrTkxZaHl3TWc2SXNLY1F1aFBVdz09