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Computational Code in Atomic and Nuclear quantum optics: computing multiphoton and autoionization resonances in a strong external electromagnetic field

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Abstract content
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We present an advanced combined relativistic operator perturbation theory (PT) and energy approach [1,2] computational approach to dynamics of finite Fermi systems (heavy atoms, nuclei, molecules) in an intense laser field. Numerical results of computing multi-photon resonance and ionization profile in Na, Cs, Ba atoms are listed [2]. New data on the DC, AC strong field Stark resonances, multi-photon and autoionization resonances, ionization profiles for a few heavy atoms (Eu, Tm, Gd, U) are presented. The direct interaction of super intense laser fields in the optical frequency domain with nuclei is studied within the operator PT and the relativistic mean-field (plus Dirac-Woods-Saxon) model [2,3]. T A nuclear dynamic (AC) Stark shift of low-lying nuclear states due to off-resonant excitation by laser field (Γ˜1025-1035 W/cm²) is studied and is described within the operator perturbation theory and the relativistic mean-field (RMF) model for the nucleus [2]. We list results of AC Stark shifts of single proton states in nuclei ¹⁶O, ¹⁶⁸Er, ¹⁷¹Yb and compared these data with known results [3]. Shifts of several keV are reached at intensities of roughly 10³⁴ for ¹⁶O, ⁵⁷Fe and 10³² W/cm² for heavier nuclei.

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