

Absorption and Recurrence Spectra of Sodium Rydberg Atom in a Strong External Magnetic Field

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Abstract: Using core-scattered closed-orbit theory, we calculate the photoabsorption and the scaled recurrence spectra of sodium Rydberg atom in strong magnetic field below ionization threshold. The non-Coulombic nature of the ionic core have been modified by a model potential, which includes an attractive Coulomb potential and a short-ranged core potential. A family of core-scattered nonhydrogenic closed orbits have also been discovered. The Fourier transformed spectra of sodium atom have allowed direct comparison between peaks in such plot and the scaled action values of closed orbits. The new peaks in the recurrence spectra of sodium atom have been considered as effects caused by the core scattering of returning waves at the ionic core. The results are compared with those of hydrogen case, which show that the core-scattered effects play an important role in alkali-metal atoms.

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Key words: closed orbit theory, photoabsorption spectra, recurrence spectra, core-scattered effects

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