Semiclassical Calculation of Recurrence Spectra of Li Rydberg Atom in Crossed Electric and Magnetic Field

WANG De-Hua,[1,2] and DING Shi-Liang[1]

[1] School of Physics and Microelectronics, Shandong University, Jinan 250100, China
[2] Department of Mathematics and Physics, Shandong Institute of Architecture and Engineering, Jinan 250014, China

Abstract: Closed-orbit theory is a semiclassical technique for explaining the spectra of Rydberg atoms in external fields. Using the closed-orbit theory and classical perturbation theory, we calculate the scaled recurrence spectra of Lithium atom in magnetic field plus a weak perpendicular electric field. The results show when the crossed electric field is added, the recurrence spectra are weakened greatly. As the scaled electric field f increases, the peaks of the recurrence spectra lose strength. Some recurrences are very sensitive and fall off rapidly as f increases; others persist till much higher f. As the electric field is stronger, some of the peaks revive. This phenomenon, caused by the interference among the electron waves that return to the nucleus, can be computed from the azimuthal dependence of the classical closed orbits.

[Full text: PDF]

Close