

Electron tunneling lifetime in atomic systems, a projected Green's function method

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Atoms exposed to strong laser field can lose electrons via the process of tunneling or multi-photon ionization. Recent progress in attosecond technology allows detailed measurement of these processes. Complementary theoretical calculations of model systems are necessary to help reveal the mechanism of an electron to tunnel through a barrier. In this work, we adopt a projected Green's function (PGF) method for the calculation of the tunneling lifetime of an electron escaping from some small atoms. The method has been used in the past to calculate the tunneling lifetime of an electron in quantum wells. This method allows us to evaluate the tunneling lifetime for a specific barrier width in a very straightforward way. Results of calculated electron tunneling lifetime in model systems such as quantum dot (QD) are shown to be comparable with other theoretical studies. Based on this, we have been able to obtain the tunneling lifetime of the electron escaping from hydrogen, helium, neon, argon atoms under electric field.