Currents and magnetic fields in confined atom

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In recent years there has been a surge in the research in the field of modified potentials. The modified potentials are combination of potentials which may or may not have angular dependence [1]. However, exact analytical solutions of such potentials are difficult to find. Most of the studies, based on these potentials, are done with some approximations. The Hulthén potential has been a subject of study for many decades now and analytical solutions for this potential for $l = 0$ states are exact and known, however, even for this potential analytical solutions for $l > 1$ are not possible. The modified potentials listed in the literature are numerous [2–4]. But recently, combinations of a radial potential with the ring-shaped potential have been studied. Cheng and Doi [5] studied the ring-shaped potential with the Kratzer potential. The ring-shaped potential introduced by Hartmann and Schuch [6] has revolutionised the theoretical studies, related to atomic, molecular and interdisciplinary physics [7–9]. The potential taken in this study is a Hulthén plus ring-shaped potential. The potential in the context of nuclear physics has been successfully used to predict the energy levels of some heavy nuclei [10]. The atom is further subjected to a spherical confinement. The time independent Schrödinger equation (TISE) of the system is solved numerically. Energy levels and radial and angular matrix elements are obtained. The persistent current and induced magnetic field of such a confined atom is evaluated. Finally, the atomic system in this potential and confinement is subjected to short electromagnetic pulses, which are shown to induce currents [11].

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