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Influence of Nuclear Interaction on Atomic Ionization near Coulomb Barrier Energies

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The well-known existing disparity between the interaction range and the coupling constant for the electromagnetic and the strong force suggests independent treatment of atomic and nuclear phenomena. However, the borderline between atomic and nuclear physics i.e. Coulomb barrier region provides an interesting playground for many basic nuclear and atomic processes which mutually influence each other [1]. The present work is intended to explore the mutual influence of atomic and nuclear interactions on each other using the X-ray spectroscopy technique [2]. The emitted projectile ion X-rays have been measured as a function of the beam energies around the Coulomb barrier regime. Interestingly, the variation of the X-ray centroid energies corresponding to the projectile ionization exhibits an unexpected enhancement below the Coulomb barrier. The sudden increment in the X-ray energy may be explained regarding the interference effects between atomic and nuclear interactions, which occurs due to the recoil of respective nuclei. It results in the initiation of shaking processes which consequently enhance the atomic ionization near the Coulomb barrier. Further, it has been observed that the sudden enhancement due to the nuclei-nuclei interactions occurs slightly below from the theoretical predictions of Coulomb barrier height. It clearly indicates the coupling of elastic channels at sub-barrier energies. The present findings have been validated with three asymmetric collision systems in inverse kinematics heavy ion reactions. Moreover, the work suggests modifications in the theoretical atomic predictions by incorporating the influence of the nuclear effects during the heavy ion induced reactions around the Coulomb barrier. This study may open up new channels for interdisciplinary research comprising of atomic and nuclear physics.

References

[1] M. S. Freedman, Annu. Rev. Nucl. Sci. 24, 209 (1974).

[2] P. Sharma and T. Nandi, Phys. Lett. A 380, 182 (2016).

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