A.3.6. Collisions of Slow, Highly Charged Ions with Coherent Elliptical State Rydberg Atoms: Electron Capture as a Function of Principal Quantum Number--*B.D. DePaola, E. Horsdal-Pedersen**

Classically, total capture cross sections are known to scale with target principal quantum number, n, as $\sigma \propto n^4$. One may arrive at this result *via* many different models, for example CTMC calculations, the Bohr-Lindhard model, or the classical over-barrier model. However, all these approaches suffer from making simplifying assumptions with respect to the classical orbits which the transferred electron is classically presumed to follow. In a coherent elliptic state (CES) the electron probability density lies predominantly on an ellipse with the nucleus at one of the foci. Furthermore, in both configuration and momentum space, CES wavefunctions mimic with minimum uncertainty electrons following classical Keplerian orbits. Using CES of lithium, total electron capture cross sections have been measured over a range of principal quantum numbers from n = 20 to 35, while varying the generalized eccentricity and the angle between the projectile beam and the normal to the plane containing the CES. The results indicate that at a scaled projectile velocity of 1.20, the n^4 dependence of the cross section is correct. However, at the higher scaled projectile velocity of 1.68, the scaling with n is closer to n^3, while existing CTMC calculations at this velocity indicate powers ranging from 3.5 to 4. These results have been submitted for publication. The work has been carried out at the University of Aarhus and was the master's thesis work of T. Bové at that institution.

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