Photodetachment of Rb\(^{-}\), Cs\(^{-}\), and Fr\(^{-}\): A new boundary-corrected Pauli equation approach.\(^1\) U. THUMM, Dept. of Physics, Kansas State University, Manhattan, C. BAHRIM, Dept. of Physics Kansas State University, Manhattan and Lamar University, Beaumont, TX, I. I. FABRIKANT, Dept. of Physics and Astronomy, University of Nebraska, Lincoln — As a weak relativistic limit of the exact Dirac equation, the Pauli equation includes the spin-dependent potential \(V_{LS}\) added to the non-relativistic, spin-independent Coulomb potential \(V\). For a Coulomb potential, \(V_{LS}\) has a non-physical singularity \(1/r^3\) at \(r = 0\), and the PE-approach breaks down. Various regularization functions have been suggested to remove this singularity [1]. Based on the exact analytic solution of the Dirac equation near the nucleus, we formulated boundary conditions for solving the PE for an electron interacting with an atom [1]. By integrating the PE using an effective potential \(V_{eff}\) that is adjusted to reproduce scattering phase shifts provided by exact Dirac \(R\)-matrix calculations, we calculated angle-differential and total photodetachment (PD) cross sections. Our \(^3P^0\) resonance contribution to the PD cross section of Cs\(^{-}\) agrees (in position and width) with recent experiments [2], after fine-tuning \(V_{eff}\).

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