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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.s 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 ${}^3P_1^o$ resonance contribution to the PD cross section of Cs^- agrees (in position and width) with recent experiments [2], after fine-tuning V_{eff}.
[1] C. Bahrim, I.I. Fabrikant, and U. Thumm, Phys. Rev. Lett. **87**, 123003 (2001), and refs. therein. [2] M. Scheer et al., Phys. Rev. Lett. **80**, 684 (1998).

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