Kohn Variational Calculations of $^{1,3}S$- and $^{1,3}P$-Wave Phase Shifts

Denton Woods, S. J. Ward and P. Van. Reeth

We are investigating Ps-H scattering, which is a fundamental four-body Coulomb process. Using the Kohn, inverse Kohn, generalized Kohn and complex Kohn methods, we computed the ^{1,3}S and preliminary ^{1,3}P-wave phase shifts for Ps-H scattering. We implemented different numerical techniques to reduce linear dependence, which enabled the use of larger basis sets than in the previous Kohn and inverse variational calculations [1,2]. For the ^{1,3}P-wave trial functions, as in the previous variational calculations, we considered Hylleraas-type short-range terms in which the angular momentum is on both the positron and on the electron of the Ps atom. We have also computed the ^{1,3}P-wave phase shifts using Hylleraas-type terms in which the angular momentum is on the Ps atom and on the electron in the H atom. Using a quantum defect theory for the van der Waals interaction [3], we determined the ^{1,3}S scattering lengths and effective ranges.

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3. Bo Gao, *Phys. Rev. A* **58**, 4222 (1998).