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Vortices for positron ionization and positronium formation¹

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Recently, vortices in the velocity field associated with the ionization amplitude provided an explanation [1] for a deep minimum in experimental measurements of the triply differential cross section (TDCS) for electron-helium ionization [2]. We applied the Coulomb-Born approximation to this process [3] and obtained a deep minimum in the TDCS whose position was in reasonable agreement with a time-dependent close-coupling calculation [4]. Recently, we applied the Coulomb-Born approximation to positron-helium ionization in the double symmetric in-plane geometry and obtained a deep minimum [3]. We computed the velocity field associated with the transition matrix element and noticed that for positron ionization it rotates in the opposite direction to that for electron ionization for the same target helium. Recently, using the Kohn and inverse Kohn variational methods we found two zeros in the scattering amplitude for Ps-formation in positron-hydrogen collisions in the Ore gap [5]. We introduced an extended velocity field associated with the Ps-formation scattering amplitude in which both the incident energy and angle of the outgoing Ps atom are allowed, and we noticed that this field rotates around the two zeros and in opposite directions [5].

References

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