Ultracold collisions of spin-polarized metastable hydrogen atoms

ROBERT C. FORREY, Penn State University at Berks — The status of ab initio calculations of very low temperature cross sections for collisions between two spin-polarized metastable hydrogen atoms is discussed. Degeneracy between the 2s and 2p states produces long-range coupling that is non-vanishing at first order in perturbation theory. The degeneracy is lifted by the Lamb shift and fine structure splittings. Multiple adiabatic potential curves yield a set of coupled equations that must be solved at low energies. The electrostatic dipole-quadrupole interaction produces non-adiabatic radial coupling between (2s,2p) and (2p,2p) states. The Coriolis interaction yields non-adiabatic angular coupling that must be accounted for when working in a body-fixed frame. All of these contributions may be handled in a space-fixed atomic gauge that is particularly convenient for a spin-polarized system. The latest theoretical results are compared with an existing experiment.

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