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Analytical coupled-channels treatment of two-body scattering in the presence of three-dimensional isotropic spin-orbit coupling[1] QINGZE GUAN, DOERTE BLUME, Washington State Univ — It is shown that the single-particle spin-orbit coupling terms, which—in the cold atom context—are associated with synthetic gauge fields, can significantly and non-trivially modify the phase accumulation at small interparticle distances even if the length scale $(k_{so})^{-1}$ associated with the spin-orbit coupling term is significantly larger than the van der Waals length r_{vdW} that characterizes the two-body interaction potential. A theoretical framework, which utilizes a generalized local frame transformation and accounts for the phase accumulation analytically, is developed. Comparison with numerical coupled-channels calculations demonstrates that the phase accumulation can, to a very good approximation, be described over a wide range of energies by the free-space scattering phase shifts—evaluated at a scattering energy that depends on k_{so}—and the spin-orbit coupling strength k_{so}.

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