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Multichannel Quantum Defect Theory for Exotic Cold Collisions[1]

BRANDON RUZIC, JILA, University of Colorado, and National Institute of Standards and Technology, JISHA HAZRA, University of Nevada Las Vegas, CHRIS GREENE, Purdue University, BALAKRISHNAN NADUVALATH, University of Nevada Las Vegas, JOHN BOHN, JILA, University of Colorado, and National Institute of Standards and Technology — Researchers have gained the ability to control an impressive variety of atoms and molecules at ultracold temperatures. However, scattering observables depend on a complicated set of internal states that cloud the interpretation of experiments and drastically increase computational time. We demonstrate two essential extensions of multichannel quantum defect theory (MQDT) that are required to describe these complex systems. On one hand, we include the anisotropic long-range interactions of dipolar atoms and molecules via a distorted wave approximation. On the other hand, we develop MQDT for chemically reactive molecular collisions, such as D+H_2 and the benchmark chemical reaction of F+H_2, with ro-vibrational quantum state resolution.

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