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Patterned Complexity in Atomic Scattering[1] PAUL JULIENNE, BRANDON RUZIC, JQI, Univ of Maryland-College Park, and NIST, JOHN BOHN, JILA, Univ of Colorado-Boulder, and NIST — As the constituents of cold gaseous matter continue to grow in complexity, the necessity to understand their basic collision processes remains. Exotic atomic species like erbium and dysprosium have been cooled to ultracold temperatures, revealing a dense forest of chaotically distributed resonances, a much more complicated landscape than the broad, isolated resonances seen in alkali-atom systems. Nevertheless, broad resonances emerge from the chaos. These resonances correspond to special long-range eigenstates of the mixed dipolar plus van der Waals potential, which seem to occur in a predictable pattern. In this study, we describe a simple and powerful quantum defect theory for atomic scattering, how this theory can simply describe chaotic collisions, and how this theory helps illuminate the character of these special eigenstates.

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