Abstract Submitted
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The conversion of resonances to bound states in the presence of a Coulomb potential and the computation of autoionization lifetimes from quantum defects[1] ROBERT LUCCHESE, Texas A&M University, C. W. MCCURDY, University of California, Davis, T. N. RESCIGNO, Lawrence Berkeley National Laboratory — The conversion of resonant metastable states to bound states with changing potential strength in the presence of a Coulomb potential proceeds by a mechanism fundamentally different from the same process in the case of short-range potentials. This phenomenon, which can accompany changes in molecular geometry, is central to the physics of the process of dissociative recombination of electrons with molecular cations. We verify computationally that there is no direct connection between a resonance pole of the S-matrix and the bound state poles for several model problems. We present a detailed analysis of the analytic structure of the scattering matrix in which the resonance pole remains distinct in the complex plane while a new state appears in the bound state spectrum. Nonetheless, as might be expected from quantum-defect theory, there is a close analytic relation between the resonant behavior of scattering at positive energies and the energies of the bound states. This connection allows the width of a resonance at low energies to be calculated directly from the behavior of the quantum defects with changing potential strength or molecular geometry.

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