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Few-Photon Ionization Using Complex Exterior Scaling[1]

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The method of exterior complex scaling allows one to compute numerically converged scattering wave functions without the detailed specification of outer boundary conditions. These wave functions together with integral amplitude extraction methods have previously been successful in treating one-photon double ionization processes. The approach also lends itself to treating few-photon ionization processes. I will illustrate the approach with a description of our recent investigation of two-photon double ionization of helium. For photon energies below 54.4 eV, the ionization energy of He^+, two-photon double ionization is necessarily a non-sequential process, with both photons "cooperating" to doubly ionize the atom. Above 54.4 eV, the sequential process, where in effect each photon ejects a single electron, is expected to dominate. I will present total, differential, and nuclear recoil cross sections over a range of energies below and above the sequential ionization threshold. One can find a clear signature of sequential ionization in the differential ionization cross sections. In fact, the signature of sequential ionization is seen even below 54.4 eV, where it is only a virtual process.

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