

Abstract Submitted  
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**Testing the Plane Wave Approximation in Electron-Molecule Scattering**<sup>1</sup> ZACHARY B. WALTERS, Department of Physics and JILA, University of Colorado, Boulder CO 80309, CHRIS H. GREENE — Laser driven electron recollisions with a parent molecule, in which a strong driving laser first liberates then accelerates and rescatters an electron from a parent molecule, lie at the heart of many current and anticipated efforts to probe the structure of molecules. Techniques such as molecular tomography attempt to reconstruct molecular properties by monitoring scattering output channels such as the generation of high harmonic light. Such techniques are necessarily sensitive to the nature of the electron wavefunction in the region where the electron interacts strongly with the parent ion. We investigate the origins and validity of the commonly used plane wave approximation to the scattering wavefunction, showing how it arises from the semiclassical Gutzwiller propagator and giving the next-order correction. We also compare photoionization (the time reverse of recombination) spectra calculated with the plane-wave approximation to spectra calculated using electron-molecule scattering states for continuum wavefunctions.

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