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Laser assisted electron-atom scattering in critical geometries[1]
NATHAN MORRISON, CHRIS H. GREENE, JILA and Department of Physics, University of Colorado at Boulder — We investigate the scattering of electrons off of neutral targets in the presence of a linearly polarized, low frequency laser field. The laser has large enough extent for the wavefunction to be treated in the Floquet expansion. The scattering geometries of interest are small angles where momentum transfer is nearly perpendicular to the field, and the Kroll Watson approximation breaks down. We use the eigenchannel R matrix method to solve the Schrödinger equation, employing Hamiltonians in both the length and the velocity gauges in different regions. The target atom is represented by a model potential including a screened coulomb term near the origin and a longer range induced dipole interaction. The short range reaction matrix in the Kramers-Henneberger (acceleration) representation is found by matching the velocity gauge R matrix to spherical Gordon-Volkov states, and from this the cross section is derived. Experiments have shown emission and absorption cross sections at small angles to be much higher than the approximation predicts, and we hope to gain insight into the cause of this phenomenon.

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