

DAMOP12-2012-000079

Abstract for an Invited Paper
for the DAMOP12 Meeting of
the American Physical Society

Differential cross sections for ionization and excitation of laser-aligned atoms by electron impact

ANDREW MURRAY, University of Manchester, UK

Differential cross section measurements will be presented for electron impact ionization and excitation of atoms prepared using high resolution continuous wave laser radiation. In the case of ionization, low energy coplanar asymmetric (e,2e) experiments were performed from laser excited Mg atoms that were aligned using radiation around 285nm. The atoms were subjected to linearly polarized radiation whose polarization vector was varied from in the plane to perpendicular to the scattering plane. Ionization measurements were then conducted from the laser-excited 3P state, and the differential cross section determined. By careful analysis of the laser pumping, these measurements were directly compared to those from the ground state. Such experiments provide valuable information on the ionization of aligned targets. In the second experiment to be described here, a resonant enhancement cavity has been placed around the interaction region and super-elastic scattering measurements have been carried out from laser-excited atoms inside the cavity. This new technique opens up many new targets for study, since the cavity increases the effective intensity of the laser radiation that is exciting the atoms by a factor of up to 50. As such, new ionization and excitation measurements are possible using deep UV radiation where the laser power is only a few mW. Results from calcium will be presented, and progress towards studies from silver, copper and gold will be discussed. We are also advancing this new technique to allow simultaneous excitation from the hyperfine levels of different targets (such as Rb), which will allow the method to be adopted in different fields, such as laser cooling and trapping.