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Velocity Map Imaging for Electron Energy Distribution Measurements in REMPI-initiated Plasma JONATHAN FRANK, DAVID CHANDLER, MARTIN FOURNIER, ERIC SMOLL, Sandia National Laboratories — Improved understanding of the dynamics of pulsed plasmas is needed for accurate modeling of plasma physics and plasma-enhanced chemistry. We developed a technique for studying dynamics of transient low-temperature plasmas in a unimolecular beam velocity map imaging experiment. This approach enables measurements of the temporal evolution of the electron energy distribution function (EEDF) with ns resolution and facilitates studies of transient plasmas without complications from surface chemistry and electrical properties of walls. Low-energy electrons (3.3eV) are generated in a narrow energy distribution ($<$1meV) by photoionizing a jet-cooled beam of krypton with a pulsed UV laser (214.7nm) in a 2+1 REMPI (resonance-enhanced multiphoton ionization) scheme. Electron trajectories are confined by coulombic attraction of Kr^+ cations, resulting in a transient plasma that persists for microseconds in the field-free region of a pulsed ion/electron imaging apparatus. Electrons are rapidly extracted and accelerated into an electrostatic lens. The resulting velocity map image provides the EEDF at the instant that the repeller plate is pulsed. The EEDF temporal evolution is measured by varying the time between the REMPI laser pulse and the high voltage pulse.

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