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Dynamic Alignment of Water in the Few-Cycle Limit[1] ANDREW J. HOWARD, RUARIDH FORBES, GREGORY A. MCCRACKEN, IAN GABALSKI, PHILIP H. BUCKSBAUM, Stanford University — Dynamic alignment refers to the phenomenon by which the anisotropy in the polarizability of a molecule causes it to experience a torque when in the presence of a strong field. This occurs most commonly in linear molecules. Water, in its ground state, is bent and its polarizability is very nearly isotropic. However, strong field ionization of an electron from the $3a_1$ molecular orbital causes rapid unbending of the molecule and an enhancement in the polarizability along the H-H axis. If the ionizing pulse has a duration greater than the time it takes the molecule to unbend ($>\tilde{}$10 fs), dynamic alignment can play a significant role in realigning the molecule with the laser polarization axis before dissociation occurs. Here, we demonstrate the dependence of this dynamic alignment effect on the duration of the ionizing pulse. An effusive molecular beam of water is multiply ionized using Ti:Sapphire pulses with a central wavelength of 800 nm and a pulse duration of 40 and <10 fs. The trajectories of the dissociated ions are studied using a momentum imaging spectrometer.

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