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Quantum Coherent Control of H_3^+ Formation in Strong Fields MARCOS DANTUS, MATTHEW MICHIE, NAGITHA EKANAYAKE, NICHOLAS WEINGARTZ, JACOB STAMM, Michigan State Univ — Quantum coherent control (QCC) has been successfully demonstrated experimentally and theoretically for two- and three-photon optical excitation of atoms and molecules. Here we explore QCC using spectral phase functions with a single spectral phase step for controlling the yield of H_3^+ from methanol under strong laser field excitation. We observe a significant and systematic enhanced production of H_3^+ when a negative π phase step is applied near the low energy region of the laser spectrum and when a positive π phase step is applied near the high energy region of the laser spectrum. In some cases, most notably the HCO^+ fragment, we found the enhancement to exceed the yield measured for transform limited pulses. The observation of enhanced yield is surprising and far from the QCC prediction of yield suppression. The observed QCC enhancement implies an underlying strong field process responsible for polyatomic fragmentation controllable by easy to reproduce shaped pulses.

Marcos Dantus
Michigan State Univ

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