

Abstract Submitted
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Phase control with many cycle pulses in the absence of CEP stabilization HYOUNGUK JANG, GUAN-YEU CHEN, WENDELL T. HILL III, Joint Quantum Institute and University of Maryland — Stabilization of the carrier envelope phase (CEP) of few-cycle pulses enhances our ability to control dynamics. When coupled with fixing the relative phase between two few-cycle pulses, control of molecular dynamics can be dramatic even when the pulse separation greatly exceeds the pulse widths. Here we present what we believe is the first demonstration of molecular dynamics control by a pair of many-cycle ($t=50$ fs) pulses separated by $3t$ with fixed relative CEP but in the absence of CEP stabilization of either pulse. In our experiment each pulse was intense enough to induce a Coulomb explosion of CO_2 into doubly charged atomic ions. By monitoring the ions, which carry information about the molecular geometry at the time of the explosion, we were able to determine how the relative separation and phase of the two pulses influence how the second pulse interacts with the ensemble. Specifically, we modified the bond angle by about 33% and the strength of the second explosion by about a factor of 2.5. What makes our result noteworthy are (1) interference between the pulses plays no role and (2) coherence established by a long pulse is robust. Details of our experiment along with our result's implication on evolutionary control mechanisms will be discussed.

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