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Asymmetric ion ejection from hydrogen molecules using two-color laser pulses D. RAY, S. DE, F. HE, H. MASHIKO, U. THUMM, I.V. LITVINYUK, C.L. COCKE, Physics Department, Kansas State University, Manhattan, Kansas 66506-2601, USA, I. ZNAKOVSKAYA, M.F. KLING, Max-Planck Institute of Quantum Optics, Hans-Kopfermann Strasse 1, D-85748 Garching, Germany, G.G. PAULUS, Institute of Optics and Quantum Electronics, 07743, Jena, Germany — It is known that few-cycle phase-stabilized laser pulses can be used to control electron localization in the dissociating hydrogen molecular ion. Here we report experiments which demonstrate a similar control achieved by scanning the relative phase between two-color (800 and 400nm) many-cycle pulses. This approach generates, in an easily reproducible and robust manner, the required asymmetric light-field. The D^+(or H^+) ions from the dissociation of D_2^+ (or H_2^+) are detected using both a velocity-map-imaging system and a stereo-phasemeter. The yield of the fragments, measured as a function of their kinetic energies, shows a clear left-right asymmetry oscillation with the fundamental optical period in the bond-softening and above-threshold-dissociation channels. A similar asymmetry, but out-of-phase, is observed in the rescattering channel. We study the asymmetry dynamics in the different fragmentation channels as a function of the two-color field intensity. Our results are compared with theoretical calculations based on solutions to Schroedinger's equation.

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