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Dynamic field-free orientation of polar molecules by intense two-color femtosecond laser pulses S. DE, D. RAY, F. ANIS, N.G. JOHNSON, I. BOCHAROVA, M. MAGRAKVELIDZE, B.D. ESRY, C.L. COCKE, I.V. LITVINYUK, J. R. Macdonald Laboratory, 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 — Combining a fundamental frequency of a laser and its second harmonic with a definite relative phase results in an asymmetric electric field and broken inversion symmetry. Such fields can generate orientation in polar molecules. Here we present the first experimental observation of dynamic field-free orientation of a heteronuclear molecule (CO) induced by intense two color (800 and 400 nm) femtosecond laser pulses. We have used the two color pulse as pump to orient the molecules and a more intense 800 nm pulse as probe to measure the angular distributions of ionic fragments. In addition to dynamic alignment seen in the time dependence of $<\cos^2\theta>$, we observe clear orientation in the $<\cos\theta>$ traces, which revives with the rotational period and can be reversed by changing the relative phase of the two colors. We studied the dependence of degree of orientation on pump pulse intensity, and compared the results with theoretical calculations.

S. De
J. R. Macdonald Laboratory, Physics Dept, Kansas State University,
Manhattan, Kansas 66506-2601, USA

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