

Abstract Submitted  
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**Femtosecond time-resolved imaging of torsion in an axially chiral molecule** J.L. HANSEN, iNANO, Aarhus University, 8000 Aarhus C, Denmark, C.B. MADSEN, Department of Physics, Kansas State University, 116 Cardwell Hall, Manhattan, KS, 66506, USA, L.B. MADSEN, Department of Physics and Astronomy, Aarhus University, 8000 Aarhus C, Denmark, H. STAPELFELDT, Department of Chemistry, Aarhus University, 8000 Aarhus C, Denmark — The use of laser pulses to control the transition from one enantiomer of a chiral molecule to its mirror form has been the subject of a large number of *theoretical* studies driven by the intriguing prospects of light-induced deracemization, i.e. creation of enantiomeric excess. Here we provide new *experimental* insights to how the combination of long (nanosecond) and short (femtosecond) laser pulses can be used to induce torsion in an axially chiral biphenyl derivative, here 3,5-difluoro-3',5'-dibromo-4'-cyanobiphenyl. The long, elliptically polarized, laser pulse 3D aligns the molecule, and the, linearly polarized, short pulse initiates torsion about the stereogenic axis. The torsional motion is monitored directly by determining the dihedral angle using femtosecond time-resolved Coulomb explosion imaging. At short times (0-4 ps) torsion occurs with a period of 1.25 picoseconds and an amplitude of  $3^\circ$  in excellent agreement with theoretical calculations. At longer times torsion is blurred by delocalization of the molecular orientation due to overall rotation of the molecule consistent with our theoretical model. Furthermore, a new imaging analysis technique, relying on the correlation between the ejected ionic fragments, supports our interpretation of the experimental data.

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