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Spin-Polarized Hydrogen Rydberg Time-of-Flight: Experimental Measurement of the Velocity-Dependent H Atom Spin Polarization
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TEAM — We have developed a new experimental methodology allowing direct detection of the velocity dependent spin-polarization of hydrogen atoms produced in molecular photodissociation. The technique, which we term Spin-Polarized Hydrogen Rydberg Time-of-Flight, employs a double-resonance excitation scheme and experimental geometry which yields the two coherent laboratory-frame anisotropy parameters 1 and 1 as a function of recoil speed for scattering perpendicular to the laser propagation direction. The technique, apparatus, and optical layout we employ is described here in detail and demonstrated in application to HBr and DBr photolysis at 213 nm. We also discuss the theoretical foundation for the approach, as well as the resolution and sensitivity we achieve.

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