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Rotational decoherence in a dense gas of multiply kicked N_2[1]
RYAN COFFEE, JAMES CRYAN, PHILLIP BUCKSBAUM, The PULSE Institute, SLAC National Accelerator Laboratory, ADAM PELZER, S. RAMAKRISHNA, TAMAR SEIDEMAN, Northwestern University — We use a recently developed multiple-kick scheme to study relaxation and dephasing in rotational wavepackets. When properly timed, multiple pulses can produce substantial coherent alignment as well as significant Raman redistribution. Transient peaks in $\langle \cos^2 \theta \rangle$ reflect coherent alignment while a time-average of $\langle \cos^2 \theta \rangle > 1/3$ reflects Raman redistribution. We observe both features in nitrogen gas at 300K and 1 ATM following impulsive Raman excitation by a train of up to eight, 50 fs, 800 nm laser pulses. Using a quantum calculation to help disentangle population relaxation from phase decoherence [1], we experimentally investigate rotational decoherence in the context of J-changing and M-changing collisions as a function of both rotational energy and gas density. [1] S. Ramakrishna and T. Seideman, Phys. Rev. Lett. **95**, 113001 (2005).

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