Abstract Submitted
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Quantum Control of Molecular Gas Hydrodynamics SINA ZAHEDPOUR ANARAKI, JARED WAHLSTRAND, HOWARD MILCHBERG, University of Maryland, College Park — We report quantum control of rotational energy absorption in diatomic molecular gases such as N_2 and O_2, and in general any molecule with anisotropic polarizability. A sequence of non-ionizing ultra-short laser pulses tuned to the rotational revival period coherently excites a molecular wavepacket to high j-states. Over a $\sim$ 100 ps timescale, the energy stored in the rotational ensemble repartitions into translational degrees of freedom, impulsively heating the gas. The gas density response is measured interferometrically and sonographically as a proxy for the rotational energy deposited. Furthermore, if the second of two pulses arrives at the rotational half revival period, the wavepacket is de-excited before thermalization, strongly suppressing gas heating. Adjusting the pulse sequence energy and timing allows detailed control of the hydrodynamic response, enabling applications in air density patterning including high power air waveguides lasting for milliseconds [1, 2].

[1] N. Jhajj, E. W. Rosenthal, R. Birnbaum, J. K. Wahlstrand, and H. M. Milchberg, accepted, PRX.
[2] Y.-H. Cheng, J. K. Wahlstrand, N. Jhajj, and H. M. Milchberg, Opt. Express **21**, 4740 (2013).

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