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Coherent Slowing of a Pulsed Supersonic Beam with an Atomic Paddle ISAAC CHAVEZ, EDVARDAS NAREVICIUS, Center for Nonlinear Dynamics, University of Texas at Austin, ADAM LIBSON, MAX RIEDEL, CHRISTIAN PARTHEY, Center for Nonlinear Dynamics, University of Texas at Austin, UZI EVEN, Sackler School of Chemistry, Tel-Aviv University, MARK RAIZEN, Center for Nonlinear Dynamics, University of Texas at Austin — We report the slowing of a supersonic beam by elastic reflection from a receding atomic mirror. Supersonic beams, formed by the adiabatic expansion of high pressure gas through an aperture, are currently the highest brightness sources available and have a high degree of monochromaticity. We use a pulsed supersonic nozzle to generate a 511 ± 9 m/s beam of helium that we slow by reflection from a Si(111)-H(1x1) crystal placed on the tip of a spinning rotor. We are able to continuously reduce the velocity of helium by 246 m/s and show that the temperature of the slowed beam is lower than 250 mK in the co-moving frame. We plan to use this beam as a probe for surface science studies and as the source for atom optics and interferometry experiments. The slow, cold, and intense nature of the beam should open new energy ranges and resolutions, allowing higher precision measurements.

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