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Shock-wave proton acceleration from a hydrogen gas jet[1] NATHAN COOK, Stony Brook University, IGOR POGORELSKY, MIKHAIL POLYANSKIY, MARCUS BABZIEN, OLIVIER TRESCA, Brookhaven National Laboratory, CHAKRA MAHARJAN, PETER SHKOLNIKOV, Stony Brook University, VITALY YAKIMENKO, SLAC National Accelerator Laboratory — Typical laser acceleration experiments probe the interaction of intense linearly-polarized solid state laser pulses with dense metal targets. This interaction generates strong electric fields via Transverse Normal Sheath Acceleration and can accelerate protons to high peak energies but with a large thermal spectrum. Recently, the advancement of high pressure amplified CO_2 laser technology has allowed for the creation of intense ($10^{16}\frac{W}{cm^2}$) pulses at $\lambda \sim 10\mu m$. These pulses may interact with reproducible, high rep. rate gas jet targets and still produce plasmas of critical density ($n_c \sim 10^{19} cm^{-3}$), leading to the transference of laser energy via radiation pressure. This acceleration mode has the advantage of producing narrow energy spectra while scaling well with pulse intensity. We observe the interaction of an intense CO_2 laser pulse with an overdense hydrogen gas jet. Using two pulse optical probing in conjunction with interferometry, we are able to obtain density profiles of the plasma. Proton energy spectra are obtained using a magnetic spectrometer and scintillating screen.

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Nathan Cook
Stony Brook University

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