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Shock-Wave Acceleration of Protons on OMEGA EP D. HABERBERGER, D.H. FROULA, Laboratory for Laser Energetics, U. of Rochester, A. PAK, A. LINK, P. PATEL, LLNL, F. FIUZA, SLAC National Accelerator Laboratory, S. TOCHITSKY, C. JOSHI, U. of California, Los Angeles — Recent experimental results using shock-wave acceleration (SWA) driven by a CO_2 laser in a H_2 gas-jet plasma have shown the possibility of producing proton beams with energy spreads <10% and with energies of up to 20 MeV using a modest peak laser power of 4 TW.[1] Here we propose the investigation of the scaling of the SWA mechanism to higher laser powers using the 1-μm OMEGA EP Laser System at the Laboratory for Laser Energetics. The required tailored plasma profile is created by expanding a CH target using the thermal x-ray emission from a UV ablated material. The desired characteristics optimal for SWA are met: (a) peak plasma density is overcritical for the 1-μm main pulse and (b) the plasma profile exponentially decays over a long scale length on the rear side. Results will be shown using a 4ω probe to experimentally characterize the plasma density profile. Scaling from simulations of the SWA mechanism[2] shows that ion energies in the range of 100 MeV/amu are achievable with a focused a_0 of 5 from the OMEGA EP Laser System. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

[1]D. Haberberger *et al.*, Nature Phys., **8**, 95 (2012).
[2]F. Fiuza *et al.*, Phys. Rev. Lett. **109**, 215001 (2012).

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