Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Compact Spatio-Temporal Shaping of Laser-Driven Ion Beams for Next-Generation Hybrid Particle Accelerators[1] M. GAUTHIER, C. B. CURRY, F. TREFFERT, H.-G. J. CHOU, G. M. DYER, E. GALTIER, G. D. GLENN, A. GRASSI, J. B. KIM, R. MISHRA, C. SCHOENWALDER, F. FIUZA, S. H. GLENZER, SLAC National Accelerator Laboratory, L. OBST-HUEBL, M. REHWALD, K. ZEIL, HZDR, H. J. QUEVEDO, E. MCCARY, R. ROYCROFT, M. HEGELICH, T. DITMIRE, UT Austin, S. GOEDE, EuXFEL, Y. Y. TSUI, UAlberta — Laser-driven ion beams generated during relativistic laser-interactions with solid targets exhibit superior brightness compared to conventional accelerators, but currently cannot simultaneously deliver the ion energy required for applications. In a hybrid accelerator, a laser-accelerated ion beam is injected into an RF linear particle accelerator to reach ion energies of 230+ MeV on a meter scale. This new concept has the potential to revolutionize proton radiographic imaging and hadron therapy. For optimal coupling, the ion beam should be manipulated to match the acceptance angle and energy bin width of the linac. Here, we demonstrate all-optical spatial and temporal manipulation of the forward propagating ion beam resulting from its overlap with the extreme electric and magnetic fields generated during the laser-plasma interaction.

[1]This work was supported by the U.S. Department of Energy Office of Science, Fusion Energy Science under FWP No. 100182 and the National Science Foundation under Grant No. 1632708

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Date submitted: 10 Jul 2020 Electronic form version 1.4