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Proton acceleration from microtube targets at the ALEPH laser
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nia, San Diego — A super-intense laser pulse, incident on a microtube target, can
accelerate protons to tens of MeV. Microtube targets have an advantage over flat
foils because additional hot electrons are accelerated from the tube surface, strength-
ening the accelerating sheath field. The ALEPH laser at Colorado State University
(40 fs, 310^{21} W/cm² $\lambda = 400$ nm) was used to accelerate ions from 3D-printed mi-
crotube targets. At best performance, the microtube targets increase the proton
cutoff energy relative to flat foils by $\sim 65\%$, and increase the proton yield by $\sim 50\%$.
A wide parameter scan of microtube targets, varying tube dimensions, determined
an optimum microtube size for accelerating protons on ALEPH. 2D particle-in-cell
simulations show that electrons from the tube surface are accelerated to higher en-
ergy than the ponderomotive scaling, and are collimated to the center of the tube
target. For the simulated optimum tube case, this process doubles the maximum
proton energy relative to flat foils. *This work is supported by the DOE National
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