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Intense laser-driven proton beam energy deposition in compressed and uncompressed Cu foam[1] CHRISTOPHER MCGUFFEY, C M KRAULAND, J KIM, F N BEG, (UC San Diego), M S WEI, (General Atomics), H HABARA, S NOMA, T OHTSUKI, A TSUJII, K YAHATA, Y YOSHIDA, Y UEMATSU, S NAKAGUCHI, A MORACE, A YOGO, H NAGATOMO, (GSE, Osaka Univ), K TANAKA, Y ARIKAWA, S FUJIOKA, H SHIRAGA, (ILE, Osaka Univ)
— We investigated transport of intense proton beams from a petawatt laser in uncompressed or compressed Cu foam. The LFEX laser (1 kJ on target, 1.5 ps, 1053 nm, I $>210^{19}$ W/cm^2) irradiated a curved C foil to generate the protons. The foil was in an open cone 500 μm from the tip where the focused proton beam source was delivered to either of two Cu foam sample types: an uncompressed cylinder (1 mm L, 250 m ϕ), and a plastic-coated sphere (250 m ϕ) that was first driven by GXII (9 beams, 330 J/beam, 1.3 ns, 527 nm) to achieve similar $\rho\phi$ to the cylinder sample's ρL as predicted by 2D radiation hydrodynamic simulations. Using magnetic spectrometers and a Thomson parabola, the proton spectra were measured with and without the Cu samples. When included, they were observed using Cu K-shell x-ray imaging and spectroscopy. This paper will present comparison of the experimentally measured Cu emission shape and proton spectrum changes due to deposition in the Cu with particle-in-cell simulations incorporating new stopping models.

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