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Generation and focusing of short pulse laser accelerated protons[1]

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We present results from proton focusing and conversion efficiency experiments using curved surface targets in both open and closed geometries performed on the sub-ps LANL Trident laser. Using an imaging mesh and RCF pack, the far-field proton energy and angular distribution determined the magnification and proton focusing characteristics of the beam. Results indicate that the focal spot size and position are strongly affected by the self electric fields of the beam, bending the trajectories near the axis. In the closed cone geometry, the sheath electric field on the cone surface effectively "channels" the proton beam through the cone tip, extending the focal position away from the tip and improving the focusing Simulations and experiments indicate that the conversion efficiency is a strong function of target geometry, due to surface transport of hot electrons from the laser spot. Proton generation and focusing were modeled using the 2-D hybrid PIC code LSP, which compared well with the trajectory data.

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