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Focusing of laser-accelerated proton beams with active plasma lens

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We report on the first experimental demonstration of radially symmetric focusing of laser-accelerated proton beams with an active plasma lens which provides tunable field gradients of the order of kT/m. MeV level proton beams generated from micrometer solid density targets interacting with a relativistically intense laser were used to examine the focusability and robustness of this new approach. By varying field gradients of the active plasma lens, proton beams with mm focus spot size at selected energies were achieved at a distance of 1.5 meters behind the source. Results were supported by simple numerical calculations. Work towards retrieval of the proton beam source properties (source size, emittance) by combining these methods with dipole magnetic dispersion will be discussed as well.

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