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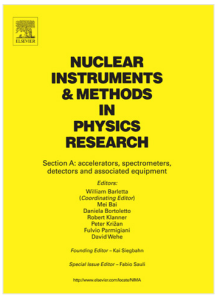

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Transport and analysis of electron beams from a laser wakefield accelerator in the 100 MeV energy range with a dedicated magnetic line.

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Abstract

Electron bunches generated by laser driven wakefield acceleration are transported and analyzed using a magnetic line composed of a triplet of quadrupoles and a dipole. Short pulse bunches with a total charge of ≈ 130 pC, and broad band energy spectra in the range 45 to 150 MeV are generated by ionization assisted injection in a gas cell. The electron source is imaged about one meter away from the exit of the gas cell by the magnetic line, delivering electron bunches at a stable position in the image plane where a charge density of ≈ 2.9 pC/mm^2 at an energy of 69.4±0.6 MeV is achieved. This magnetic line improves dramatically the accuracy of energy determination of this electron source, leading to an energy error as low as 8.6 ‰ in the 70 MeV range for 5 mrad divergence electron bunch and considering the resolution of the entire detection system. The transport of bunches with improved stability and energy selection paves the way to various applications including multi-stage laser plasma acceleration.

Keywords: Laser wakefield acceleration, Transport line, Spectrometer

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