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A short-length transport line for laser-plasma accelerators using HTS periodic magnets

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In laser-plasma accelerators (LPA), due to extremely high accelerating gradients, electron bunches are accelerated to high energies in only a few millimeters to centimeters of acceleration length. To efficiently capture and transport the LPA-generated bunches in a compact transport line, beam line designs employing high-strength combined-function magnets based on high-temperature superconductor technology have been studied. Moreover, to overcome coil winding challenges in fabricating miniature HTS magnets, novel periodic magnets have been designed, which can collimate and guide the electron beams in a well-controlled short-length transport line. In this contribution, we present the beam dynamics calculations as well as the magnet designs for a 1.4 m transport line matching the LPA-generated electron beams to a transverse-gradient undulator.

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Footnotes

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