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Compact electron beam transport system of AXSIS THz-driven electron accelerator employing adjustable high gradient permanent magnet quadrupole

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In AXSIS project, we are developing compact, THz-based electron accelerators, which represent a promising technology for the development of next-generation compact electron accelerators that significantly downsize x-ray sources. A key aspect in such a design is transport and focusing of an electron bunch accelerated to 20 MeV kinetic energy to inverse-Compton scattering (ICS) like interaction region with a high energy laser pulse through a dedicated beam transport line. Since ICS performance depends on achieving ultrasmall spot sizes in high current beams, the beam transport system needs shorter focal length electron optics and correction elements such as steering magnets. A permanent magnet quadrupole (PMQ) is one of the candidates for creating such strong focusing systems, because of its compactness without power consumption. A compact electron beam transport system consisting of permanent magnet quadrupoles achieving a gradient greater than 100 T/m based on a Halbach array is reported. The inherent advantages and disadvantages of permanent/electro magnet and hybrid technologies will also be discussed.

Funding Agency

Footnotes

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