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A high-efficiency dielectric wakefield energy booster for CLARA

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Structure-based wakefield acceleration, using dielectric-lined or corrugated waveguides, is a novel acceleration method currently being explored by several research groups globally. This technology facilitates the transfer of energy from a high-charge drive beam to a lower-charge main bunch with high accelerating gradients. In this study, we propose an energy booster for the Compact Linear Accelerator for Research and Applications (CLARA) at Daresbury Laboratory, utilising dielectric wakefield acceleration (DWA). Our simulation study optimises the drive beam and structure to achieve maximal energy efficiency across varying main beam energies, enabling the delivery of a main beam with adjustable charge and final energy. Additionally, we have considered the stability of both the accelerated and drive beams, selecting the geometry and layout of accelerating structures to maximise accelerated beam quality and mitigate the development of beam breakup instability in the drive beam

Footnotes

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