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Design of relativistic electron beam modulation by focused radially polarized laser pulses

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The objective of this study is to present an experimental design for modulating a relativistic electron beam using a focused 800 nm radially polarized laser. The proposed scheme employs an S-band electron gun to generate a relativistic electron beam, modulated by a focused radially polarized laser field. This enables effective control over the beam's spatiotemporal and energy distributions. The design leverages the focusing properties of the radially polarized laser to enhance the precision and efficiency of beam modulation. The scheme includes a concise analysis of laser-electron interaction dynamics and a comparison of energy characteristics before and after modulation. These efforts deepen the understanding of beam dynamics and evaluate the effectiveness of lasers with varying parameters. This study provides a practical framework for laser-based precision beam modulation, establishing a robust foundation for future experimental research.

Footnotes

Paper preparation format

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Region represented

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