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A Novel Linac Simulation Code AVAS

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Advanced Virtual Accelerator Software is a high-performance simulation tool for modeling beam transport processes in high-intensity linear accelerators. AVAS has multiple functions, including multi-particle tracking, engineering analysis, multi-beam transport, and preset accelerator operational parameters. Algorithmically, the Particle-in-Cell algorithm has been modified based on symmetry principles, accelerating space charge field calculations by a factor of four while maintaining simulation accuracy. In addition, AVAS uses a combined particle motion mode that adaptively switches between time and position as independent variables based on element type, effectively balancing numerical simulation accuracy and computational speed. Performance-wise, AVAS has developed an ultra-high-speed GPU version achieving three orders of magnitude speed enhancement in large-scale multi-particle simulations. Furthermore, a cloud computing simulation platform has been deployed on the computing cluster. This platform features an intuitive graphical user interface and efficient data post-processing capabilities, significantly improving computational performance and user experience.

Footnotes

Funding Agency

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Yes

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