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Study of super-resolution reconstruction in transverse phase space measured via slit-scanning method

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Electron beam injectors, critical to advanced light sources and ultrafast diffraction systems, require precise transverse phase space diagnostics to optimize beam quality. Conventional slit-scanning combined with computed tomography (CT) enables non-presumptive phase space reconstruction but faces resolution limitations under sparse sampling. This study introduces a deep learning framework to achieve super-resolution reconstruction from minimal scan data. By integrating beam transport physics with neural networks, the method overcomes resolution degradation in low-data regimes. Numerical validations on a low-energy injector test platform demonstrate significant resolution improvements over algebraic techniques. The proposed algorithm, coupled with beam dynamics simulations, forms a systematic engineering solution for high-fidelity diagnostics. This approach enhances phase space characterization efficiency, supporting accelerator commissioning with reduced experimental overhead.

Footnotes

Funding Agency

I have read and accept the Conference Policies

Yes

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