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Base-e exponential fitting of long-range transverse resistive wall wakefunction

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In high-intensity storage rings, long-range transverse resistive wall wake fields serve as the dominant source of coupled-bunch instabilities. Conventional particle tracking algorithms handling these wake fields require storing per-bunch, per-turn centroid position histories, resulting in excessive memory consumption and computational inefficiency. This paper proposes fitting the long-range transverse resistive wall wake fields through a linear combination of exponential functions. This method eliminates the need for historical bunch centroid position storage during tracking computations while facilitating GPU-based parallel implementation, thereby significantly enhancing computational efficiency. This paper presents detailed analyses of fitting deviation dependencies on exponential function count and optimization algorithms.

Footnotes

Funding Agency

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Yes

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