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Formulas of coherent synchrotron radiation induced microbunching instability in an arbitrary dogleg lattice

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The microbunching instability (MBI) has long been a persistent issue in high-brightness electron beam transport. The dogleg structure, a dispersive configuration composed of two quadrupole magnets and dipole magnets, has drawn attention in recent studies. It has been pointed out that the Landau damping effect can be enhanced to effectively suppress the microbunching instability by adjusting the strength of two quadrupole magnets preceding the dogleg structure. In this work, we derive an analytical formula for the CSR-induced microbunching gain in a dogleg lattice based on the iterative approach. The formulas have been benchmarked against semi-analytical Vlasov calculations. The analytical formulas obtained in this paper can be used to explore the influence of the strength of the quadrupole magnets in front of the dogleg lattice on the final microbunching instability, and also to verify the effectiveness of suppressing MBI in the dispersive region where the dogleg is located.

Footnotes

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Region represented

Asia

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