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Suppression of microbunching instability based on optimized velocity bunching in linac-driven FELs

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The microbunching instability (MBI) driven by beam collective effects can cause significant electron beam quality degradation in advanced x-ray free electron lasers. Typically, multiple stage magnetic bunch compressors used to generate high peak current electron beam will dramatically amplify the microbunching instability. In this paper, by redesigning the solenoid elaborately and adopting a dual-mode buncher cavity with the third harmonic mode used to correct the RF curvature, it is potential for the electron beam to be further compressed in VB process. Therefore, a VB plus one bunch compressor could be a promising alternative scheme to achieve moderate peak current beam for high-repetition-rate X-ray FELs to suppress the additional MBI gain due to multi-stage magnetic bunch compressors.

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Footnotes

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