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Electron microbunching using amplified optical stochastic cooling

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Optical Stochastic Cooling (OSC) is a feedback beam cooling technique that uses radiation produced by a beam to correct particles' own momentum deviation. This system is made up of two undulator magnets, the pickup and kicker, separated by a bypass chicane that introduces a momentum-dependent path length. The beam produces radiation in the pickup and arrives in the kicker with a delay relative to its momentum, where it is coupled with the undulator radiation, receiving a corrective kick. The undulator radiation can be amplified to increase the strength of the corrective kick; this is done using an optical amplifier. The optical amplifier is driven by a pump laser which can be used to selectively amplify temporal slices of the undulator radiation. In this paper, we propose a method to use the amplified-OSC mechanism to create micro-bunches within the beam and study the performance of this multi-bunch-formation mechanism by considering diffusive effects and gain of the amplifier.

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