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Longitudinal Beam Stacking in Storage Ring using Pulsed Electron Cooling

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Longitudinal ion beam stacking in a storage ring using a barrier rf system combined with beam cooling has been successfully demonstrated in several experiments. Based on the bunching effect observed in the pulsed electron beam cooling experiment at HIRFL-CSRm, we propose a new beam stacking scheme using only pulsed electron beam, in which the barrier voltage and cooling process can be achieved simultaneously. In this paper, we introduce this longitudinal stacking scheme along with the theory of beam dynamics and present a simple analytical model. The simulation demonstrates that this approach could be a useful beam stacking technique without the need for barrier bucket hardware. Moreover, the optimization and limitation of this stacking scheme are discussed, and the effect of the electron beam distribution on the barrier voltage is studied. This stacking method is expected to be a promising tool for accumulating RIBs in low- and medium-energy storage rings, such as the SRing of the HIAF project, where high-precision experiments require efficient accumulation techniques.

Footnotes

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