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Joint Analysis of Beam Loss and Beam Position During the Injection Process at Hefei Light Source

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The Hefei Light Source is a synchrotron radiation facility operating in the vacuum ultraviolet and soft X-ray regions. If the evolution of beam parameters and beam loss during the injection transient process can be observed synchronously, analyzing their correlation can provide more quantitative guidance for further optimizing the injection process. To achieve this goal, a monitoring system capable of synchronously capturing the 3D position of each bunch and rapid beam loss has been established at the Hefei Light Source. Experiments investigated both TOP-UP injection and empty-ring injection processes. Thanks to the unique multi-parameter synchronous diagnosis capability of this system, some previously unnoticed special phenomena have been captured, and a deeper analysis of the correlation between bunch parameters can be conducted. TOP-UP mode exhibited maximum beam loss in the injected bunch, with secondary losses at the 14th subsequent bunch. Peak beam loss occurred immediately after injection in both modes, followed by rapid attenuation within several turns. Loss resurgence appeared after ˜85 turns (TOP-UP) or 320 turns (empty ring), followed by oscillatory decay.

Footnotes

Funding Agency

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Yes

Authors: XIAO, Yunzhi (University of Science and Technology of China); Mr LIU, Yihong (University of Science and Technology of China); LENG, Yongbin (University of Science and Technology of China)

Presenter: XIAO, Yunzhi (University of Science and Technology of China)

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