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Refining dynamic aperture calculations for highly damped accelerators: methods and applications to the FCC-ee

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The dynamic aperture is a key metric for assessing the stable phase space of particle accelerators and evaluating their overall stability. However, in highly damped accelerators such as high-energy electron synchrotrons like the Future Circular Collider (FCC-ee), the rapid amplitude variation of tracked particles over a few turns introduces significant sensitivity to initial conditions and the particle's starting location. This work investigates these dependencies in the context of the FCC-ee and highlights their implications for stability analyses. We propose novel, more reliable methods to compute the dynamic aperture that account for these effects, improving the accuracy of stability predictions. First results from the application of these methods to the FCC-ee are presented, demonstrating their potential for advancing the understanding of beam dynamics in next-generation accelerators.

Footnotes

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