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New results of nonlinear quasi-integrable lattice studies

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Nonlinear integrable optics is a promising design approach for suppressing fast collective instabilities. To study it experimentally, a new storage ring, the Integrable Optics Test Accelerator (IOTA), was built at Fermilab. IOTA has recently completed its fourth electron run, achieving the design 150 MeV energy and optimal beam parameters. This report presents the results for the quasi-integrable Henon-Heiles octupole system. We obtained tune spread and dynamic aperture in agreement with tracking simulations and robust to other nonlinear perturbations. Extensive analysis is given of recovered single-particle phase space dynamics, showing improved invariant jitter consistent with intended effective Hamiltonian. We conclude by outlining plans towards proton studies and a direct demonstration of reduced beam losses in the intense space charge regime.

Footnotes

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