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Analysis of the elliptic integrable non-linear system in IOTA using tracking of a single electron

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Integrable non-linear lattices realizable in practical accelerators are of great interest as they may support very high-intensity beams through Landau damping of the collective instabilities. One such integrable system based on elliptic potential has been intensively studied at the IOTA storage ring in Fermilab. Analysis of highly nonlinear systems with multi-particle bunches is complicated due to the fast decoherence of the kicked beams. IOTA has the capability to track single electrons using linear multi-anode photomultiplier tubes for simultaneously measuring transverse coordinates and arrival times of synchrotron-radiation pulses. This technology makes it possible to fully reconstruct turn-by-turn positions and momentums in all three planes for a single particle. This apparatus was applied to measure small-amplitude tunes dependence on the non-linear magnet strength and tunes dependence on oscillations amplitudes.

Footnotes

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