IPAC 24

NASHVILLE, TENNESSEE
★ USA ★
MAY 19-24, 2024

IEEE NPSS **APS**

Contribution ID: **480** Contribution code: **MOPS13**   Type: **Poster Presentation**

Understanding sextupole

Monday, 20 May 2024 16:00 (2 hours)

In this study, we reassess the dynamics within a simple accelerator lattice featuring a single degree of freedom and incorporating a sextupole magnet. In the initial segment, we revisit the Henon quadratic map, a representation of a general transformation with quadratic nonlinearity. Through a stability diagram, we offer a precise description of dynamic aperture, tune spreads, and nonlinear resonances. In the subsequent section, we unveil that a conventional sextupole is essentially a composite structure, comprising an integrable McMillan sextupole and octupole, along with non-integrable corrections of higher orders. This fresh perspective sheds light on the fundamental nature of the sextupole magnet, providing a more nuanced understanding of its far-from-trivial chaotic dynamics. Importantly, it enables the description of driving terms of the second and third orders and introduces associated nonlinear Courant-Snyder invariant.

Footnotes

Funding Agency

Paper preparation format

Region represented

North America

Primary author: ZOLKIN, Timofey (Fermi National Accelerator Laboratory)

Co-authors: MOROZOV, Ivan (Russian Academy of Sciences); NAGAITSEV, Sergei (Brookhaven National Laboratory (BNL))

Presenter: ZOLKIN, Timofey (Fermi National Accelerator Laboratory)

Session Classification: Monday Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D02 Nonlinear Single Particle Dynamics Resonances, Tracking, Higher Order, Dynamic Aperture, Code Developments