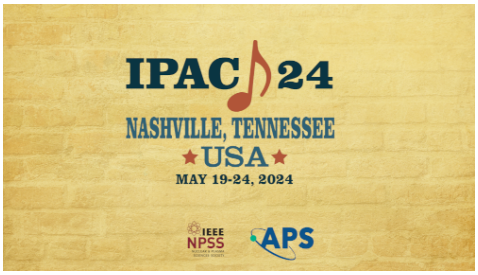

Contribution ID: **2262** Contribution code: **SUPG032** Type: **Poster Presentation**

Discovering transient models of emittance growth via mode interaction of phase space nonuniformities

Sunday, 19 May 2024 16:00 (2 hours)

One of the Grand Challenges in beam physics is development of virtual particle accelerators for beam prediction. Virtual accelerators rely on efficient and effective methodologies grounded in theory, simulation, and experiment. We will address one sample methodology, extending the understanding and the control of deleterious effects, for example, emittance growth. We employ the application of the Sparse Identification of Nonlinear Dynamical systems algorithm–previously presented at NAPAC'22 and IPAC'23–to identify emittance growth dynamics caused by nonuniform, empirical distributions in phase space in a linear, hard-edge, periodic FODO lattice. To gain further understanding of the evolution of emittance growth as the beam's distribution approaches steady state, we compare our results to theoretical predictions describing the final state emittance growth due to collective and N-body mode interaction of space charge nonuniformities as a function of free-energy and space-charge intensity. Finally, we extend our methodology to a broader range of virtual and real experiments to identify the growth(decay) of (un)desired beam parameters.

Footnotes

Funding Agency

Work supported by US DOE-HEP grants: DE-SC0010301 and DE-SC0022009

Paper preparation format

LaTeX

Region represented

North America

Primary author: POCHER, Liam (University of Maryland)

Co-authors: HABER, Irving (University of Maryland); DOVLATYAN, Levon (University of Maryland); O'SHEA, Patrick (University Maryland); ANTONSEN, Tom (University of Maryland)

Presenter: POCHER, Liam (University of Maryland)

Session Classification: Student Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D13 Machine Learning