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Dynamics study of the crab crossing at the electron ion collider using square matrix and iterative methods

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

Crab crossings are designed to increase the luminosity of accelerators by ensuring beam interactions are closer to a head on collision. One will be implemented at the Electron Ion Collider (EIC) at Brookhaven National Laboratory. It is then important to examine how the crab cavity will affect beam dynamics at the EIC. Methods such as Frequency Map Analysis (FMA) have been shown to be helpful in examining the phase space of accelerators in order to find properties such as resonances and the dynamic aperture. An alternative to such methods is an iterative method based on square matrix method that has been shown to reveal similar properties as FMA while reducing the computational power needed,*. This method has been applied to the crab crossing scheme in order to find and explain effects of the higher order mode of crab cavities on the particle dynamics of the EIC.

Footnotes

- K.J. Anderson, Y. Hao, and L.H. Yu, "Study of Nonlinear Dynamics in the 4-D Hénon Map Using the Square Matrix Method and Iterative Methods", in Proc. NAPAC'22, Albuquerque, NM, USA, Aug. 2022, pp. 232-235. doi:10.18429/JACoW-NAPAC2022-MOPA81 ** L.H. Yu, Y. Hao, Y. Hidaka, F. Plassard, and V.V. Smaluk, "Progress on Convergence Map Based on Square Matrix for Nonlinear Lattice Optimization", in Proc. NAPAC'22, Albuquerque, NM, USA, Aug. 2022, pp. 823-825. doi:10.18429/JACoW-NAPAC2022-WEPA80

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