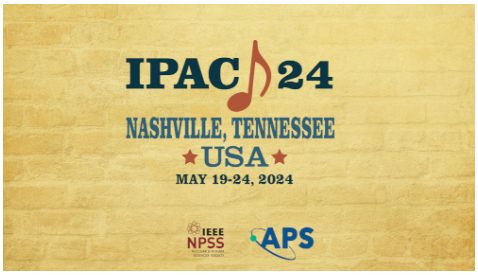

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Measurement of stability diagrams in the IOTA ring at Fermilab

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

Nonlinear focusing elements can enhance the stability of particle beams in high-energy colliders through Landau Damping, by means of the tune spread which is introduced. Here we discuss an experiment at Fermilab's Integrable Optics Test Accelerator (IOTA) which investigates the influence of nonlinear focusing elements, such as octupoles, on the beam's transverse stability. In this experiment, we employ an anti-damper, an active transverse feedback system, as a controlled mechanism to induce coherent beam instability. By utilizing the anti-damper we can examine the impact of a nonlinear focusing element on the beam's transverse stability. The stability diagram, a tool used to determine the system's stability, is measured using a recently demonstrated method at the LHC. The experiment at IOTA adds insight towards this stability diagram measurement method by supplying a reduced machine impedance to investigate the machine impedance's effect on the stability diagram, as well as by aiming to map out the full stability diagram by using a large phase range of the anti-damper. From this experiment in IOTA, we present the first results of stability diagram analysis with varying octupole currents.

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