Contribution ID: **161** Contribution code: **TUP053** Type: **Poster Presentation**

Instability Threshold Measurements in the IOTA Ring at Fermilab

Tuesday 12 August 2025 16:00 (2 hours)

Nonlinear focusing elements enhance the stability of particle beams in high-energy colliders via Landau Damping, a phenomenon that acts through the tune spread these elements introduce. This experiment at Fermilab's Integrable Optics Test Accelerator (IOTA) aims to investigate the influence of nonlinear focusing elements on transverse beam stability by employing a novel method to directly measure the strength of Landau Damping. This method employs an active transverse feedback system as a controlled source of impedance to induce a coherent beam instability. The beam's resulting growth rate and transverse feedback parameters can then be used to directly measure the stability diagram, a threshold which maps the system's stability conditions. A proof-of-principle experiment of this measurement method was first explored at the LHC, where the experiment at IOTA aims to map out the entirety of the stability diagram and to obtain the beam distribution function from the stability diagram, a procedure never done before that would enable one to obtain the beam distribution tails. Here we present the initial results of stability diagram data analysis, simulation results, and plans for further investigation.

Please consider my poster for contributed oral presentation

Yes

Would you like to submit this poster in student poster session on Sunday (August 10th)

Yes

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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