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# Single-bunch instabilities at the Fermilab Recycler Ring

*Wednesday 13 August 2025 15:10 (20 minutes)*

Understanding and characterizing collective instabilities is critical for high-intensity operation at the Fermilab Recycler Ring. This work presents an application of the the Nested Head-Tail (NHT) formalism for modeling single-bunch transverse instabilities, incorporating analytical solutions to the resistive wall and theta wake impedances in the absence of space charge. Predicted growth rates and mode structures are benchmarked against PyHEADTAIL simulations and ongoing experimental measurements. The experimental program includes studies of both bare-machine instabilities and beam behavior under transverse feedback (the Waker experiment), providing a comprehensive validation of the theoretical model. These results support the interpretation of Waker data and contribute to the development of predictive tools for beam stability in future high-intensity configurations.

## Please consider my poster for contributed oral presentation

Yes

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

No

## Footnotes

## Funding Agency

## I have read and accept the Privacy Policy Statement

Yes

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