Contribution ID: **159** Contribution code: **TUP078** Type: **Poster Presentation**

Plasma Waves in Accelerators

Tuesday 12 August 2025 16:00 (2 hours)

This work presents new insights into the formation and propagation of solitons in the University of Maryland Electron Ring (UMER), using a combination of theory, Particle-In-Cell (PIC) simulation, and experimental validation. Soliton dynamics in the electron beam are modeled via the Korteweg–de Vries (KdV) equation, capturing the balance between nonlinearity and dispersion inherent in space-charge-dominated beams confined within a conducting beam pipe.
We report the first-ever characterization of dark (negative) solitons in an accelerator, emerging from negative perturbations in a regime of negative dispersion. We also report observing oscillatory wave structures from the KdV equation for the first time in an accelerator, arising from negative beam perturbations in a positive dispersion regime. These results provide a unique platform for both exploring beam manipulation using soliton-based mechanisms, and for exploring fundamental nonlinear wave dynamics relevant to other complex environments such as space plasmas.

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

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I have read and accept the Privacy Policy Statement

Yes

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Session Classification: TUP: Tuesday Poster Session

Track Classification: MC5 –Beam Dynamics and EM Fields