Contribution ID: **320** Contribution code: **MOP065** Type: **Poster Presentation**

Integrating simulation and machine learning for Proton Storage Ring beam analysis

Monday 11 August 2025 16:00 (2 hours)

The Proton Storage Ring (PSR) at the Los Alamos Neutron Science Center (LANSCE) accumulates a 625-μs-long beam and compresses it into a 290-ns-long (base-to-base) short pulse for delivery to the Lujan Center. Due to its high-intensity operation, the PSR also functions as a highly-sensitive mass spectrometer for the entire accelerator complex. Changes in PSR beam losses are more responsive to linac drifts than any other diagnostic system, making continuous monitoring and characterization of the PSR critical to overall performance.

Currently, PSR operation is primarily guided by beam loss signals, while key physics parameters—such as the betatron tune, closed orbit, and injection offsets—are typically measured only once per day. Furthermore, Beam Position Monitors (BPMs) can only provide meaningful data a single 290-ns-long injection, requiring dedicated machine time and resulting in operational downtime.

However, recent upgrades to both the data acquisition and chopper systems now enable continuous measurements during standard operation. In this work, we employ a Convolutional Neural Network (CNN) trained on simulated data to infer critical beam parameters in real-time. This approach will be tested and implemented during the 2025 run cycle to enable online monitoring and improved control of PSR beam dynamics.

Please consider my poster for contributed oral presentation

No

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

Authors: LEON, Christopher (Los Alamos National Laboratory); HUANG, En-Chuan (Los Alamos National Laboratory)

Co-authors: SCHEINKER, Alexander (Los Alamos National Laboratory); Dr ANISIMOV, Petr M. (Los Alamos National Laboratory)

Presenter: LEON, Christopher (Los Alamos National Laboratory)

Session Classification: Monday Poster Session

Track Classification: MC6 - Beam Instrumentation, Controls, AI/ML, and Operational Aspects