



Contribution ID: 858 Contribution code: THPM107

Type: **Poster Presentation**

Exploring reinforcement learning for optimal bunch merge in the AGS

Thursday 5 June 2025 15:30 (2 hours)

In BNL's Booster, the beam bunches can be split into two or three smaller bunches to reduce their space-charge forces. They are then merged back after acceleration in the Alternating Gradient Synchrotron (AGS). This acceleration with decreased space-charge forces can reduce the final emittance, increasing the luminosity in RHIC and improving proton polarization. Parts of this procedure have already been tested and are proposed for the Electron-Ion Collider (EIC). The success of this procedure relies on a series of RF gymnastics to merge individual source pulses into bunches of suitable intensity. In this work, we explore an RF control scheme using reinforcement learning (RL) to merge bunches, aiming to dynamically adjust RF parameters to achieve minimal longitudinal emittance growth and stable bunch profiles. Machine experimental results and system developments are presented and discussed.

Footnotes

Paper preparation format

LaTeX

Region represented

America

Funding Agency

Author: GAO, Yuan (Brookhaven National Laboratory)

Co-authors: KASPARIAN, Armen (Jefferson Lab); KUZOVKOVA, Daria (Cornell University (CLASSE)); HAMWI, Eiad (Cornell University (CLASSE)); SEVERINO, Freddy (Brookhaven National Laboratory); HOFFSTAETTER, Georg (Cornell University (CLASSE)); MORRIS, John (Brookhaven National Laboratory); UNGER, Jonathan (Cornell University (CLASSE)); ZENO, Keith (Brookhaven National Laboratory); BROWN, Kevin (Brookhaven National Laboratory); HAJDU, Levente (Brookhaven National Laboratory); SCHRAM, Malachi (Thomas Jefferson National Accelerator Facility); SIGNORELLI, Matthew (Cornell University (CLASSE)); SCHOEFER, Vincent (Brookhaven National Laboratory); LIN, Weijian (Brookhaven National Laboratory); GU, Xiaofeng (Brookhaven National Laboratory); WANG, Yanan (Rensselaer Polytechnic Institute)

Presenter: HOFFSTAETTER, Georg (Cornell University (CLASSE))

Session Classification: Thursday Poster Session

Track Classification: MC6: Beam Instrumentation and Controls, Feedback and Operational Aspects:
MC6.D13 Machine Learning