Contribution ID: **13** Type: **Poster**

Batch Spacing Optimization via Reinforcement Learning

Beams designated for the LHC are injected in multiple batches into the SPS. With a tight spacing of 200 ns between these batches, the injection-kickers have to be precisely synchronised with the injected beam so that injection oscillations are minimized. Due to machine drifts the optimal settings for the kickers vary regularly. In this paper a Reinforcement Learning agent was developed as an active controller, counteracting the machine drifts by adjusting the settings. The agent was trained entirely on a simulation environment and directly transferred to the accelerator. Slightly higher losses than with the current solution, numerical optimization via the BOBYQA algorithm, were achieved but the agent attained these results much faster. Further research is required to completely replace BOBYQA with an RL-agent.

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Session Classification: Poster session

Track Classification: Optimisation and Control