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Beam loss minimization for SIS18 slow extraction

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Slow extraction is an important mode of operation of the present GSI heavy ion synchrotron SIS18 for providing particle beams of desired intensity with longer time intervals to various experiments. One of the methods to reduce uncontrolled beam loss during slow extraction is the implementation of automated optimization of the accelerator settings.

In the present work, an algorithm based procedure is developed in order to minimize particle losses. The optimizers were run with direct access to the detectors used for measuring the circulating and extracted particles and to the magnets to be set via the control system of the synchrotron. Three different algorithms were applied. Tuning up 5 parameters allowed to reach the extraction efficiency up to 90 %. The measurement results were compared to the results of optimization runs based on particle tracking simulations and show agreement for all parameters. The research is still ongoing, and the model can be used to predict the extracted beam intensities for the FAIR project.

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