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Development of automatic beam tuning system for high intensity heavy ion beams at RIBF

Thursday, 23 October 2025 14:10 (30 minutes)

In general, accelerator facilities are controlled by a huge number of parameters. The RIKEN RI Beam Factory (RIBF), a heavy-ion accelerator complex consisting of several cyclotrons and Linacs, is controlled or influenced by more than 600 parameters, including environmental factors. To optimize these parameters more efficiently and accurately, we are attempting to implement Bayesian optimization (BO). Given the importance of space charge effects and beam loading, it is desirable to adjust parameters at high beam intensity, making it crucial to develop an optimization system capable of handling high-intensity heavy ion beams.

We have been working on developing indices suitable for high-intensity beams and exploring methods for optimization while maintaining operational safety. So far we developed a technique that enables the simultaneous measurement of beam transmission and spot shape on the target by tracking charge-converted particles after passing through the target. Additionally, we are investigating the use of line BO with a safety function to ensure safe beam optimization. Currently, we are preparing for simulations and tests using beam line.

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