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Ion transport optimisation at Low Energy Branch

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In every accelerator beamline, the goal is to achieve the highest possible desired beam throughput.
When the beamline consists of only a few ion optical elements, beam transport optimization is achieved by adjusting a few knobs, by an experienced operator.
At the Jožef Stefan Institute, we are currently developing the Low Energy Branch (LEB), *designed for high-precision ion implantation. The branch operates in a versatile regime of beams spanning the entire periodic table at various ion energies. This versatility makes beam transport optimization challenging, even for experienced operators, despite the limited number of ion optical elements: Einzel lenses, an electrostatic beam bender, x-y steerers, a Wien filter, and a 90-degree dipole magnet.*
In this proceeding, we present the cost functions for optimizing ion transport through the LEB and describe how we determine the optimal settings for the LEB's optical elements.
The optical elements are modeled using first-order transfer matrix formalism, with the figure of merit for beam optimality measured by Faraday cups and Allison emittance scanner.
The beam element parameters are controlled via the EPICS control system.*

Footnotes

*Z. Brencic et. all, Development of Low Energy Branch at Micro Analytical Centre, Ljubljana, IPAC 23.
** P. Allison et. al, An Emittance scanner for intense Low-Energy Ion beams, IEEE Trans. On Nuc. Sci. 30, 2204 (1983).
*** M. Skobe et. all, Prototype Control System for the Low Energy Branch At MIC, IPAC 24.

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