

Multi-objective Beam Line Optimization for the Commissioning of MESA

The Mainz Energy-recovery Superconducting Accelerator (MESA) at the Institut für Kernphysik der Johannes Gutenberg-Universität Mainz will be commissioned in 2023. Detailed simulations of possible beam optics can be helpful to prepare for this process in order to speed up actual commissioning. The particle tracking code OPAL was chosen as a toolbox to perform these simulations as it handles space charge effects and low energy dynamics ($v < c$), especially in the longitudinal phase space, with high precision. A genetic optimization algorithm was developed to explore the pareto efficient solutions of many possible optic settings, providing efficient solutions regarding certain objectives. A special emphasis was put on the longitudinal beam dynamics in MESA in order to improve the energy spread at the Interaction points of the experiments.

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