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Beam optics model and characterization for CERN's low-energy ISOLDE transfer lines

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The PUMA (antiProton Unstable Matter Annihilation) experiment at CERN aims to explore the interaction of antimatter with exotic isotopes, utilizing the unique capabilities of CERN's ISOLDE facility and Antiproton Decelerator. This contribution presents recent advancements in the beam transfer lines optics studies relevant to the success of the experiment, and to ISOLDE's operation in general. A detailed beamline model has been developed using MAD-X and XSUITE, including the consideration of apertures and alignment errors. Quadrupole scans and kick response measurements have been employed to build and benchmark the model. In addition, tomographic reconstruction was tested, aiming to obtain a detailed characterisation of the beam's transverse phase space. A distinctive feature of ISOLDE's beamlines is the use of electrostatic, rather than magnetic, quadrupoles. To address this, an electrostatic quadrupole model was developed and benchmarked using CST. These promising results validate the optics model, demonstrating its potential to improve beam delivery across the Low-Energy ISOLDE facility and contributing towards the PUMA experiment's operational readiness.

Footnotes

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