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Simulations of the HIE-ISOLDE radio frequency quadrupole cooler and buncher vacuum using the Monte Carlo test particle code Molflow+

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The High Intensity and Energy Isolde (HIE-ISOLDE) project aims at upgrading CERNs present ISOLDE and REX-ISOLDE facilities to increase the energy and intensity of the delivered radioactive ion beams. This is achieved by means of a new post-accelerating, superconducting linac, accompanied by a design study of the major subsystems and the target areas, linked with the increased intensity of the proton primary beam from the future, upgraded injector's chain of Linac4 and Booster.
ISOLDEs existing subsystem RFQCB (radio frequency quadrupole cooler and buncher) called ISCOOL will be upgraded in the framework of the HIE-ISOLDE design study.
This paper describes the vacuum modeling of the future RFQCB using the Monte Carlo test particle scheme Molflow+. Molflow+ is a powerful and user friendly code to model vacuum systems in the molecular flow regime and the code is currently further improved within the vacuum group of CERN. In order to validate the simulation results of Molflow+, real pressure profiles along ISCOOL are measured using variable helium gas injection fluxes and compared with obtained Molflow+ results. Subsequently and after concluding that the results are well in accordance with the measurements, improved designs of the future RFQCB are simulated.
The workflow is as follows: in a first step, the 3D model to be simulated is simplified and adapted to the needs of Molflow+. After importing the model into this code, the probabilistic movement of gas particles can be simulated and resulting pressure levels in the system can be derived.

Primary author: HERMANN, Mario Armin (Hochschule Karlsruhe, Technik und Wirtschaft)

Presenter: HERMANN, Mario Armin (Hochschule Karlsruhe, Technik und Wirtschaft)

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