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Feasibility study for a gas-filled charge exchange cell for low energy ion physics and mixed He/C beam detection

Tuesday 3 June 2025 16:00 (2 hours)

As part of a research collaboration between MedAustron and TU Wien, the feasibility of delivering mixed helium and carbon beams for online range verification during carbon ion treatment is investigated. This includes the generation of mixed 4He2+ and 12C6+ beams within a single ion source. While generating and extracting such beams is possible, the beam composition cannot be determined with the conventional low-energy (8 keV/u) beam diagnostic devices installed at MedAustron. The use of a gas-filled charge-exchange cell is proposed to enable the identification of constituents with the same charge-to-mass ratio in multi-isotopic beams. The measurement procedure foresees the multi-isotopic beam to traverse a region of higher pressure, where the different ion types are partially neutralized. Since charge capture leads to distinct new q/m ratios, the individual beam components can be separated after the gas cell and the partial intensities can be quantified if the charge exchange cross sections are known. The proposal is accompanied by an estimation of the population density for mixed 4He2+ and 12C6+ beams after partial neutralization, which were benchmarked with measurements.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

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