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Status update on the RFQcb at the ISODLE Offline 2 mass separator

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The Offline 2 mass separator [1] is part of the CERN-ISOLDE offline facilities [2], which are required to perform essential quality assurance and benchmarking tests of new target and ion source units prior to their installation and irradiation at CERN-ISODLE. The separator resembles the online CERN-ISOLDE frontend and includes similar services such as the beam instrumentation, the gas mixing system for plasma targets, an adjacent laser laboratory for laser ion source studies or a copy of the control equipment and software. The main purpose of the facility is to perform preparatory offline studies and to benchmark new beam production and manipulation techniques or new beam instrumentation before their online implementation. For these studies, non-radioactive beams with energies up to 60 keV can be produced from surface, plasma as well as laser ion sources, which are separated in a 90° dipole separator magnet with a mass resolving power of R ≈ 500. After separation, the ion beam can be cooled in bunched in a radiofrequency quadrupole cooler-buncher (RFQcb) with He buffer gas, whose design is similar to the online ISCOOL cooler-buncher. This poster provides an overview of the recent commissioning work on the RFQcb, aiming at reaching a transmission and bunching effect comparable to the ISCOOL cooler-buncher.
While the latter is regularly operated with a transmission of > 80% in DC mode and with slightly lower transmission in bunched mode, systematic measurements at the offline RFQcb indicated that the transmission in DC mode is limited to about 3%, with maximum transmission being reached for a significant vertical offset of the input beam. Following this observation, the RFQcb was removed from the beamline to investigate the origin of the limited transmission. After testing all electrical connections, checking the alignment of the RFQcb with respect to the other beamline elements and replacing malfunctioning components, the cooler-buncher will be reinstalled and further tests will be conducted.
In parallel to the optimization of the transmission through the RFQcb in DC mode, a new gas mixing system, which is similar to the mixing systems of the Offline 2 and online frontends, will be installed for the RFQcb. This system facilitates the addition of traces of reactant gases (e.g. CF4) to the He buffer gas to allow the study of the formation and decay of molecules inside the RFQcb [3]. Following the installation of the new RFQ gas system in November, first tests are foreseen for the start of the next year.

[1] M. Schuett et al., Nucl. Instrum. Meth. B 541 (2023) 82
[2] S. Rothe et. al., Nucl. Instrum. Meth. B 542 (2023) 38
[3] M. Au et al., Nucl. Instrum. Meth. B 541 (2023) 114

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