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Time-of-Flight study of molecular beams extracted from the ISOLDE RFQ cooler and buncher

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Molecular beams injected into the Radio-Frequency Quadrupole cooler and buncher (RFQcb), ISCOOL [1], at ISOLDE [2] have been studied under varying conditions. The extracted fragments were detected using the new Time-of-Flight (ToF) detector [3] placed approximately 10 meters downstream the extraction point of the RFQcb. When a beam of molecules is injected into the RFQcb and interacts with the buffer gas, collision-induced dissociation processes may occur. The process of molecular dissociation is of interest within medical applications, for example in CERN-MEDICIS and the MEDICIS-Promed project, where ^{11}C is studied as a possible treatment ion for hadron therapy [4]. In this case, carbon is extracted from the target material as carbon monoxide [5] since the molecule is more volatile than the atom. The objective of this work is to investigate if molecular dissociation occur inside the RFQcb when injecting ion beams of CO^+ and N_2^+. Two different buffer gases were used in the tests (pure helium or a mixture of helium and neon) and the radio-frequency field of the RFQcb was varied as the molecules, along with the dissociation fragments, were extracted from ISCOOL and detected using the ToF detector. The result of this work shows that the rates for molecular dissociation within ISCOOL were very small for both CO^+ and N_2^+, with the largest rates found for CO^+.

References
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