



Contribution ID: 22

Type: **Poster**

Time-of-Flight study of cooled molecular beams

Wednesday, 5 December 2018 17:30 (2 hours)

Molecular beams injected into the ISOLDE Radio-Frequency Quadrupole cooler and buncher (RFQcb), ISCOOL, have been studied under varying conditions using the new Time-of-Flight detector at ISOLDE.

When a beam of molecules is injected into the RFQcb and the molecules interact with the buffer gas collisional dissociation processes may occur. In this study, two different beams of molecules, CO^+ and N_2^+ , were injected into ISCOOL separately. Two tests were made with different buffer gases, pure helium and a mixture of helium and neon, in order to investigate collisions with different center of mass energies. The radio-frequency of the RFQcb was varied as the molecules, along with the fragments from the dissociation processes, were extracted from ISCOOL and studied via Time-of-Flight measurements.

The new ToF detector uses secondary electron emission techniques and an MCP detector to create a highly sensitive detector with sub nanosecond timing resolution. The detector is installed in the ISOLDE central beamline, approximately 10 meters downstream of ISCOOL, which makes it possible to study the time structure and mass spectrum of ion bunches extracted from the RFQcb. The results from the first Time-of-Flight study of the fragments from an injected molecular beam into ISCOOL will be presented.

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Session Classification: Poster Session