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First laser measurements on radioactive beams using ISCOOL

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Collinear laser spectroscopy provides an excellent diagnostic tool for characterizing the ion beam extracted from the ISOLDE RFQ cooler-buncher.
Potassium and rubidium beams prepared in ISCOOL were delivered to the COLLAPS beam line and focussed to give 50% transmission through a 1mm iris. The iris was used to overlap a co-propagating Ti:Sa laser. The laser was tuned to resonance on a D-line component (766 nm for K, 780nm for Rb). The time-structure of the ion beam was determined from the fluorescent photon arrival times. This naturally eliminated any contribution from molecular ions formed in the RFQ, which cannot be easily discriminated if ion-detection were used.

The effects of using different extraction potential gradients on the ion beam bunch width were studied. The energy spread was characterized by taking fluorescence spectra obtained using the COLLAPS laser setup. This was measured for each of the extraction potential gradients. An upper limit of the ion energy spread was determined.

To complete these tests, the cooler was tuned to provide bunches of 20 micro-seconds with low energy spread for a demonstration of the bunched-beam laser spectroscopy application on neutron-rich radioisotopes of potassium.

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