



Contribution ID: 51

Type: **Poster**

Integration of the compact Photoionization Spectroscopy Apparatus (PISA) to ISOLDE-RILIS

Wednesday 2 December 2015 18:20 (2 hours)

The Resonance Ionization Laser Ion Source (RILIS) is the principle ionization technique for radioactive beam production at ISOLDE. It is based on multi-step laser resonance excitation and ionization of atomic species and is typically applied inside the hot cavity of the ISOLDE target and ion source assembly. To enable efficient laser ionization for additional elements, optimal ionization schemes have to be developed and tested. With six tunable lasers at hand, the ISOLDE RILIS is well equipped for extensive scheme development.

Here we introduce the photoionization spectroscopy apparatus (PISA), a compact atomic beam unit for RILIS scheme development, independent from the availability of target stations. Samples of the element to be investigated can be evaporated from an oven and ionized using the RILIS lasers. New RILIS schemes can now be initially investigated without the need for an ISOLDE target unit or dedicated use of the ISOLDE target and separator, speeding up the process later on. Several additional applications of PISA are foreseen during RILIS operation: During RILIS setup it provides the means to optimize some laser parameters prior to the availability of an ion beam from the target; During operation the ion current generated using the RILIS reference beams inside the reference cell could serve as an additional observable for the RILIS performance monitoring; PISA can be used as a reference while performing in-source laser spectroscopy. This method, which is unobtrusive and easily adjustable for different elements, would save beam time while increasing the accuracy of the measurements. We will discuss the parameters of PISA and its integration into RILIS alongside an overview of future developments towards mass selectivity and improved sample switching and heating.

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Session Classification: Poster Session