ISOLDE Workshop and Users meeting 2018

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Book of Abstracts

information about SP energies for $\nu p_{3/2}$, $\nu p_{1/2}$, $\nu h_{9/2}$ and $\nu f_{5/2}$ neutron orbitals relative to the $\nu f_{7/2}$ ground state of ^{133}Sn [1-5]. Still, the knowledge about neutron SP states is not complete and the question of the position of the neutron-unbound $\nu i_{13/2}$ state remains open for investigation [6]. Moreover, information about other unbound states, corresponding to neutron-hole configurations, is also limited. The need to revise studies of ^{133}Sn via β decay of ^{133}In and ^{134}In emerges from the recently-reported significant role of γ ray emission from states at excitation energies more than 1 MeV above the neutron separation energy [1].

Our experiment was performed at the ISOLDE Decay Station, where excited states in ^{133}Sn were studied via the β decay of ^{133}In and complemented by studies of the βn decay branch of ^{134}In. Isomer-selective ionization using the ISOLDE RILIS ion source enabled the β decays of ^{133g}In (I^{π}=9/2^{+}) and ^{133m}In (I^{π}=1/2^{-}) to be studied independently for the first time [7]. Preliminary results on γ decay of unbound states in ^{133}Sn are presented and discussed.

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Poster Session / 14

The impact of dielectronic recombination on the charge state distribution at REXEBIS

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Dielectronic Recombination (DR) is a resonant process that describes the capture of an electron by a (highly charged) ion, occurring at sharply defined collision energies. In an electron beam ion source, where charge breeding is achieved through successive electron impact ionisation, DR transitions can be selectively driven by adjusting the electron beam energy. The increased recombination rate on a DR resonance can inhibit the breeding into higher charge states and shift the charge state distribution of the extracted ion beam. This study aims to understand the significance of DR for the operation a charge breeder and to learn if this effect can be exploited for a more selective charge breeding. We have performed simulations and measurements using REXEBIS at ISOLDE for the example of highly charged potassium ions (12+ to 17+). Here, we present our preliminary results which show a good agreement between the theoretical predictions and the measured charge state distributions. Our results suggest that the relevance of DR depends strongly on the ion species and the electron beam parameters. We conclude that DR can be of operational interest and potentially serve as a diagnostic mechanism in special cases.

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Searching for β-delayed protons from 11 Be

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11-Be is the neutron - rich nucleus expected to be a β-delayed proton emitter. The (very mall) branching ratio for this exotic decay mode (~ 10e−6) was obtained through indirect observations based on accelerator mass spectrometry [1, 2] and resulted to be about two orders of magnitude larger than predicted by theory [3]. The direct measurement of the delayed proton emission probability and energy spectrum is particulary challenging, given the small energy window available (~ 280 keV). The measurement of the βp energy spectrum is important for estimating the Gamow-Teller strength at high excitatiom energies and testing calculations that predict a direct relation between βp and halo structure. Moreover, recently, a new hypothesis, which may explain results of the AMS experiment, appeard. According to it, the neutron may have another decay channel in which unknown particles are produced in the final state [4, 5].
In August 2018 we performed the experiment IS629 at the HIE-ISOLDE facility, searching for β-delayed protons from 11-Be. We used the Warsaw Optical Time Projection Chamber (OTPC) [6]. The OTPC detector is well suited for detecting charged particles of low energy backgroung-free. The measurement was extremly challenging because of the combination of very low branching ratio (10e−8 ~ 10e−6), long half-life (T_1/2 = 13.7 s) and low energy of the protons. It required development of new solutions for the acquisition system and analysis software.
The descriptions of the experiment and the status of the data analysis will be presented.
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Poster Session / 11

Isolde V

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The Isolde facility was established in 1967 and since then has been rebuilt three times, in 1976, 1983 and in 1992. The fourth and current incarnation is 26 years old, and there is now a strong case for another major upgrade to address increasing demands on the targets, the isotope separators, and the experimental hall.

The existing target areas are well designed and have already been upgraded with new frontends in 2010 and 2011. However the scope for further upgrades is limited. For this reason an extension of the target area is proposed, with two new target stations along with new isotope separators and a modern beam delivery system. This would modernise and expand Isolde's capabilities whilst minimising perturbation of the existing facility.