Search for new isotopes near the proton drip-line close to $^{100}$Sn


The $^{100}$Sn nucleus, the heaviest doubly magic and particle-stable nucleus with N=Z, has been the subject of numerous experimental and theoretical studies. It is one of the most important nuclei for testing nuclear structure models.

Prior to the main $^{100}$Sn experiment in 2013, we performed a test experiment in December 2011 with the aim of optimizing the configuration settings of the BigRIPS separator at RIKEN, for the production and selection of $^{100}$Sn. This experiment was subsequently used to set up our main $^{100}$Sn experiment, which was performed in June 2013 and was dedicated to the measurement of Gamow-Teller matrix elements. The nuclei were identified on an event-by-event basis for the $^{128}$Sn setting. Red line indicates the limit of known isotopes. The relative r.m.s. Z and A/Q resolutions for the Sn and N=Z isotopes were 0.41% and 0.09%, respectively. Available signals from the PPACs, plastic scintillators, and ionisation chambers were used to apply additional off-line gates, which allows the removal of spurious events from the particle identification plot.

![Particle identification matrix Z vs A/Q](image)

Fig. 1. Particle identification matrix Z vs A/Q around the $^{100}$Sn after applying cleaning conditions.

We have discovered 3 new isotopes with more than 3 counts: $^{99}$Cd, $^{92}$Ag, $^{96}$Pd. The consistency of all measured signals of interest for each nucleus has been checked, and the assignment of these new isotopes is unambiguous. We have also tentatively assigned events to $^{104}$Te, $^{98}$Sn, and $^{86}$Ru, the identification of which has been recently reported by H. Suzuki.

References
3) D. Lubos et al.: RIKEN Acc. Prog. Rep (this volume).