

Decay spectroscopy in the vicinity of ^{100}Sn

Monday, 12 September 2011 10:30 (15 minutes)

The proposal deals with study of doubly - magic ^{100}Sn and neighboring nuclei via measurement of their beta- and isomeric-decay.

Very high production rates, which should be achievable at the RIBF/BigRIPS facility for nuclei in the vicinity of ^{100}Sn together with the EURICA Germanium setup, open new possibilities for the decay spectroscopy.

The main goals of the experiment are: measurement of the Gamow-Teller strength in the decay of ^{100}Sn to ^{100}In at much higher precision. Especially subsequent gamma-gamma coincidences in the daughter nucleus ^{100}In passing to the ground state should allow for a unique definition of its structure. Measurement of the Gamow-Teller strength in the decay of ^{99}Sn and mapping of the proton drip-line in the region of Te-Pd.

The expected counting rates, possible beam purification schemes and several options for the experimental setup dedicated to the decay studies are presented.

Summary

Weak interaction Gamow-Teller (GT) matrix elements are important in various astrophysical scenarios as well as in double-beta decay. The measured values of the GT strength are much lower than predicted in a simple shell model of independent particles. The doubly magic nucleus ^{100}Sn is unique since its large beta-decay energy window enables access to the complete GTGR and the closed shells reduce the effect of p-h correlations. The GT-transition proceeds through the decay of a $g_{9/2}$ proton to a $g_{7/2}$ neutron and is predicted to dominantly populate a single $1+$ state in ^{100}In for which the amount of quenching is intensively debated. Recently half-life and Q -value for the GT-decay of ^{100}Sn was measured at GSI-Darmstadt and the smallest log-ft value of any beta-decay and a GT strength of $B_{GT} = 9:1 +4.8 -2.3$ establishing it as superallowed GT decay.

Using the high intensity beam at the RIBF/BigRIPS facility and a setup very similar to the recent experiment should allow to increase the world statistics of this decay by a factor of 8 and therefore significantly reduce the error bar in the BGT. Especially gamma-gamma coincidences in the daughter nucleus ^{100}In passing to the ground state should allow for a unique definition of its structure. Also hints towards a proton decay of ^{100}Sn could be verified. In the same experiment also the beta decay of the recently discovered ^{99}Sn will allow to give in comparison a deeper insight to quenching factors and their origins.

Primary author: GERNHÄUSER, Roman (TUM)

Co-authors: LEWITOWICZ, Marek (Ganil); KRÜCKEN, Reiner (Triumf); NISHIMURA, Shunji (Riken); FAESTER-MANN, Thomas (TUM)

Presenter: GERNHÄUSER, Roman (TUM)

Session Classification: N~Z