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Beta-delayed neutron emission from the 123Ag nucleus

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The integrated quantities of beta-decay (such as half-live and probability of delayed (multi) neutron emission P1(x)n) are in general the first available for very neutron-rich nuclei. Even at low production yield down to a few counts per second, their measurements can be achieved using high-sensitivity or high-efficiency detectors. In those conditions, they can be truly viewed as a first step towards spectroscopy —viz., in the case of systematic P1n measurements, towards spectroscopic studies of the neutron-threshold region of the excitation spectrum.
TETRA is a decay detection station constructed by collaboration of scientists from JINR, Dubna and IJCLab, Orsay to study the integrated quantities of beta-decay (such as half-live and probability of delayed (multi) neutron emission P1(x)n) of neutron-rich species produced at ALTO ISOL facility. TETRA is equipped by the 4π 3He long neutron counter TETRA, a 4πβ plastic scintillator detector and a HPGe detector to allow for simultaneous measurements of three types of radioactivity accompanied β-decay of nuclei [1,2].
TETRA is operated at ALTO ISOL facility which provides beams of neutron-rich radioactive isotopes in the vicinity of N = 50, 82 closed neutron shells. Beta-decay gross-properties in these regions are served as important input parameters for different astrophysical scenarios. Since experimental data is not yet rich enough the input parameters derived from a range of theoretical models. The particular interest is attracted to vicinity of neutron closed shells. Due to high Qbeta values it expected that role of forbidden transitions in beta decay will increase with the neutron number [2]. As the neutron excess increases the giant resonances and the low-lying collective states can be dramatically affected.
As a consequence of neutron excess, neutron separation energy will drop resulting in higher, Pxn value. Thus direct measurements of integrated properties of beta-decay provide a play-ground to figure out, for example, relative contributions of allowed and forbidden decays to adjust theoretical models in the regions. The concentration of E1 strength (PDR) resonance in the vicinity of the particle separation energy threshold, can influence the neutron capture cross section by orders of magnitude. Consequently, the rate of the astrophysical r -process nucleosynthesis will be affected. In case of the neutron-rich nuclei in the vicinity of A ≈ 130, the E1 strength could be significantly more important than in nuclei close to the valley of β-stability. Therefore, in the presentation we discuses the beta-delayed neutron emission in the vicinity of 132Sn nucleus. New measurements on beta-decay 123Ag nucleus, the first nucleus studied at ALTO in the 132Sn region [3].
TETRA@ALTO was considered as the first step in the vast scientific program to be carried out at GANIL (DESIR). The performance of TETRA@ALTO and the importance of the obtained results highlight the advantage of the TETRA installation at DESIR low energy branch of the SPIRAL2 facility.

References

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