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Beta-delayed neutron spectroscopy in 51-54K

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In neutron-rich nuclei, especially near shell-closures, the increasing Q-value of beta decays and the lowering of the neutron-separation threshold, lead to the dominance of beta-delayed neutron emission as decay mode. At the same time, Q-values well above 10 MeV provide the possibility to study highly-excited particle-hole states populated by the GT decay.
A measurement was performed to study the beta-delayed neutron mission from the decay of neutron-rich potassium isotopes. Low-energy beams of 51,52,53,54K were produced by the reaction on UCx target from the PSB proton beam. The surface-ionized ions were delivered to the experimental setup, which combined the ISOLDE Decay (tape) Station with the VANDLE array for neutron spectroscopy. The IDS was equipped with a high-efficiency beta detector and four Ge clovers. The VANDLE array was made of 26 bars of plastic scintillators arranged in cylindrical configuration at 1 m distance around the implantation point, giving an overall efficiency of 10% for 1 MeV neutrons.
Beta-delayed gamma rays and neutrons from 51,52.53K were measured with sufficient statistics to reconstruct the excited levels below and above the neutron-separation threshold in 51,52,53K.
At the first place, this will allow one to identify particle-hole excited states which will help to track the monopole evolution in this exotic region by measuring excitations across the N=28 and N=32 shell and sub-shell closures. At the second place, the GT strength distribution will be reconstructed up to high-energy states (10 MeV and above). The production of 54K was also demonstrated via the identification of its beta-n daughter 53Ca.
Preliminary results will be shown, with a discussion for future perspectives at ISOLDE.

Authors: GOTTARDO, Andrea (CNRS); MADURGA FLORES, Miguel (CERN); GRZYWACZ, Robert (U)

Presenter: GOTTARDO, Andrea (CNRS)

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