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Study of exotic nuclei interesting for applied and fundamental nuclear physics with Total Absorption Gamma Spectroscopy (TAGS)

Study of exotic nuclei interesting for applied and fundamental nuclear physics with Total Absorption Gamma Spectroscopy (TAGS)

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Abstract: Beta decay of neutron rich nuclei is particularly important for many fields in fundamental and applied physics.
In nuclear reactors, the beta decay of fission products is responsible for additional power, the decay heat, and anti-neutrino emission. Decay heat has an important interest in nuclear safety since it represents 7% of the power of a reactor in operation and these decays continue after reactor shutdown. Antineutrino detection is used in fundamental neutrino physics application but it can also be used for non-proliferation purposes since the antineutrino flux reflects the reactor power and the content.
In nuclear astrophysics, the r-process is a process at the origin of the nucleo-synthesis of half of the nuclei heavier than iron. It takes place in hot environments (T~10 9 K) and highly neutron-dense environment. This process is based on the competition between neutron capture (n,γ), photo-dissociation (γ,n) and beta decay reactions. A precise knowledge of the properties of beta decay can constrain the theoretical models used to understand this nucleo-synthesis process.
Some of the nuclei involved in these two fields of nuclear physics are affected by the pandemonium effect: due to the low efficiency f germanium detectors at high gamma energies, some gamma-rays and corresponding high energy levels can be missed in the decay data leading to a distortion of the beta decay feeding.
New measurements of a series of nuclei relevant for the above mentioned opics have been performed at the IGISOL facility (Jyväskylä, Finland) in September 2022, using Total Absorption Gamma Spectroscopy (TAGS) technique. TAGS is complementary to high resolution gamma-ray spectroscopy and employs a calorimeter to measure the total gamma intensity de-exciting each level of the daughter nucleus providing a direct measurement of the beta feeding. The experimental device used consists of the Rocinante detector, a detector made of 12 barium fluorine (BaF2) crystals and a beta detector acting as a trigger, and a cerium bromine (CeBr3) crystal.
At this conference, the experimental setup will be presented as well as preliminary results of this experiment, especially for nuclei of interest for the r-process such as 84,85As.

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Classification de Session: Poster session - with cocktail and buffet

Classification de thématique: Applications