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Séminaire

PHYSIQUE NUCLÉAIRE
NUCLEAR PHYSICS

First attempt toward a quasi-Pandemonium free β-delayed spectroscopy of ^{80}Ge using PARIS at ALTO

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Zoom:
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The possible existence of low-lying structures in the β-strength function in the region of the neutron separation energy (S_n) had given rise to (sometimes bitter) debates in the past, opposing those who believed in a completely statistical nature for the decay of states located in this high-lying part of the nuclear spectrum (the "nuclear Pandemonium") and those who, on the contrary, believed that structure effects should drive the observed particle and γ emissions.

However, the occurrence of structures in the tail of the Gamow-Teller giant resonance (GTGR), energetically accessible in the β-decay of very neutron-rich nuclei, is now a well established widespread phenomenon, especially in shell closure regions (e.g. $^{83,84}Ga_{52,53}$ [1,2], $^{87,88}Br_{52,53}$ [3,4], $^{85}As_{52}$ [5], $^{77}Cu_{48}$ [6], $^{70}Co_{43}$ [7]) and has been shown to have important consequences for *r*-process calculations. The existence of low-lying satellites of the GTGR, thereafter interpreted as components of a Pygmy Gamow-Teller resonance (GTPR), was in fact predicted quite early by Ikeda and Fujita as a natural consequence of the violation of the Wigner supermultiplet symmetry due to spin-dependent components of the nuclear interaction.

We have recently launched an experimental program at the ALTO ISOL facility in Orsay to investigate the structure of the neutron-threshold region. This endeavor was triggered by the unexpected observation of "ultra"-high-energy γ-rays (8-9 MeV) [2] in the β-delayed emission products of ^{83}Ga (Z=31 ; N=52 ; $T_{1/2}$=312 ms ; Q_β=11.7 MeV) sources collected at the BEDO station. To this end, the BEDO decay station was recently equipped by a modular versatile detectors array, optimized to cover the full β-delayed γ-strength allowed in the whole Q_β window. This system was composed of a subset of the PARIS array comprising 27 $LaBr_3$+NaI cells for fast timing and high-energy γ-rays measurement, 2 HPGe for low-energy γ-rays and a plastic scintillator for β-tagging. The results obtained with this setup for the study of the ^{80}Ga (Z=31, N=49) decay including β-γ, γ-γ coincidence data, between high and low energy will be presented. The decay of ^{80}Ga is the subject of renewed attention at the moment in the framework of the study of shape coexistence in the N=50 region, and is particularly challenging due to the presence of two β-decaying states, $^{80g+m}$Ga, simultaneously produced in ISOL mode, with varied isomeric fraction depending on the chosen primary production reaction.

Key words:
^{80}Ge, beta-delayed emissions, high-energy γ-rays, ISOL

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