Séminaire

PHYSIQUE NUCLÉAIRE
NUCLEAR PHYSICS

New structural information on ^{82}Ge with the spectrometer nu-ball

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Zoom:
https://ijclab.zoom.us/j/94921065508?pwd=WW5yd2dJRDBBZG1UNTFNVUxxR0xYUT09

The evolution of shell closures far from stability is a key study for the understanding of nuclear structure and plays an important role in nucleosynthesis processes. Until very recently, ^{78}Ni was the last nucleus for which doubly magicity was not clearly demonstrated. It has been done with the observation of the first excited 2^+ state during an experiment taking place at RIKEN (Japan). Its energy, measured to be 2600 keV, confirms the persistence of the major shell closure N=50 for ^{78}Ni. Nevertheless, the region of ^{78}Ni is still of great interest. The shell closure N=50 seems reduce, when the N/Z ratio is increasing, down to ^{82}Ge. To characterize the evolution of the size of the gap, the spectroscopic study of the states induced by the 1p-1h configuration $\nu(g_{9/2})^{-1}$ $\nu(d_{5/2})^{1}$ allows the possibility to measure directly its energy.

Between 2017 and 2018, an experimental campaign took place at ALTO with the hybrid gamma spectrometer nu-ball. One of the experiment allowed to realize the spectroscopy of several fragments from the fast neutron induced fission of ^{238}U and ^{232}Th. The coupling of the spectrometer with the fast neutron source LICORNE permitted to set the detectors closer to the target, increasing significantly the detection efficiency. The fission rate is estimated to 20 kHz. The spectrometer was run in a “triggerless” mode, which permitted to write on disk almost 120 TB of data during the 5 weeks of experiment.

The analysis done using double and triple gamma coincidences allowed to reconstruct the level schemes of a lot of exotic nuclei. Especially, in the framework of ^{82}Ge, most of the states already known were observed, but a big part of the level scheme established by Hwang *et al.* and their observation of fission fragments from ^{252}Cf has not been reproduced. Hypothesis to explain these differences are discussed. On the other hand, one new state and three transitions are added. This new state is supposed to be a 7^+ state and has been identified as a member of the multiplet induced by the 1p-1h configuration $\nu(g_{9/2})^{-1}$ $\nu(d_{5/2})^{1}$. The knowledge of its energy allows the quasi-direct measurement of the energy of the N=50 gap for ^{82}Ge, which is ^{78}Ni plus four protons.

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