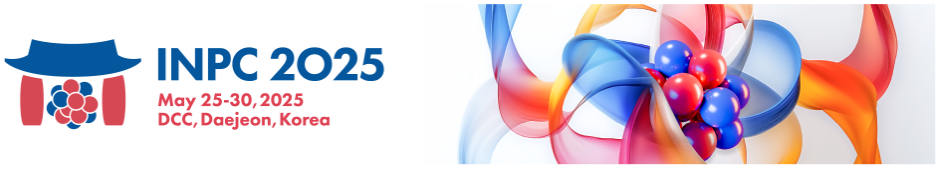

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Search for neutron intruder states above N=50 with HiCARI at RIBF

The first γ-ray spectroscopy of ^{78}Ni [1] and the recent studies on ^{79}Zn [2,3], just below the N=50 shell closure, suggests that deformed intruder configurations could play a crucial role in low-energy structure properties in this region and towards the limits of the nuclear chart. Such configurations are predicted to originate from multiparticle-multihole excitations [4] above the N=50 and Z=28 shell gaps pushed down in energy due to neutron-proton correlations themselves enhancing quadrupole collectivity.

Identifying and characterizing states built on such intruder configurations in this region is relevant for two main reasons. Firstly, their properties (energies, lifetimes, spectroscopic factors) tend to vary more drastically between models [1] than for yrast states originating from "normal"configurations on which calculations tend to agree. Direct experimental signatures of these intruder configurations are thus of interest to benchmark microscopic models [1] or to constrain effective interactions [5]. Secondly, their presence at low energy also above N=50 would influences binding energies in this region and the drip-line location. This would have consequences on nucleosynthesis calculations relying on these inputs.

This topic is the main goal of an experiment we performed at the RIBF facility (RIKEN, Japan) to identify and characterize for the first time 2p-1h intruder states above N=50 in ^{83}Ge. Neutron hole states in this N=51 nucleus were populated via neutron knockout from ^{84}Ge (N=52) with two neutrons in the $s_{1/2}d_{5/2}$ valence space above N=50. This direct reaction allows in some cases to remove one of the neutrons from the quasi-full $g_{9/2}$ orbital below N=50 to selectively populate the 9/2+ intruder states based on a $\nu(g_{9/2})^{-1}(s_{1/2}d_{5/2})^{+2}$ configuration. The reaction channel was tagged event-by-event using the BigRIPS and ZeroDegree spectrometer and the γ-rays from the in-flight decay of ^{83}Ge were measured using the HiCARI germanium array composed of 6 Miniball triple clusters, 4 Clovers and 2 Gretina-type tracking detectors.

In this presentation, we propose to show the results of this experiment and the main intruder states we identified in ^{83}Ge based on lifetime and exclusive cross section determination for the states populated. These quantities will be confronted to large-scale shell model calculations with PSDG-U interaction [5] to conclude and open on future developments.

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