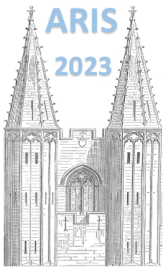

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High-resolution in-beam γ-ray spectroscopy at RIBF

mercredi 7 juin 2023 14:55 (25 minutes)

In-beam gamma-ray spectroscopy experiments have been actively performed at Radioactive Isotope Beam Factory (RIBF) of the RIKEN Nishina Center owing to the high secondary beam intensities from the BigRIPS fragment separator [1]. These experiments mostly employed the DALI2 NaI array with the very high γ-ray detection efficiency [2], and the Zero Degree Spectrometer [1] and the SAMURAI spectrometer [3] for reaction product identifications. Among the abundant scientific achievements from in-beam γ-ray spectroscopy experiments, the first spectroscopy of ^{54}Ca [4], ^{78}Ni [5], and ^{70}Kr [6] are examples of the capability of the RIBF facility.

Despite the notable accomplishments, experiments have been mostly limited to even-even nuclei in the vicinity of shell closures due to the moderate energy resolution of the DALI2 array. For the new capability in spectroscopy, a germanium-based high-resolution γ-ray detector array was constructed in 2019 under the High-resolution Cluster Array at RIBF (HiCARI) project [7]. The HiCARI array was comprised of several different types of high-purity germanium detectors, six segmented triple clusters from the Miniball collaboration, four segmented Clover detectors from the IMP, a quad-type tracking detector from the RCNP, and a triple-cluster tracking detector P3 from the LBNL. Through the improved position and energy resolution, the spectroscopy capabilities could be extended to further regions of interest such as odd-mass and deformed nuclei. Moreover, the HiCARI array was capable to measure level lifetimes based on the line-shape method [8].

In 2020 and 2021, 8 experiments were successfully carried out during 31.5 day of beam times with ^{238}U and ^{70}Zn primary beams. The campaign included a wide range of exotic neutron-rich nuclei covering various physics motivations, such as shell and shape evolutions. An overview of the HiCARI project and first preliminary results from the rich physics program will be presented.

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Auteur principal: MOON, Byul (Center for Exotic Nuclear Studies, Institute for Basic Science)

Co-auteurs: Dr DOORNENBAL, Pieter (RIKEN Nishina Center); Dr WIMMER, Kathrin (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Orateur: MOON, Byul (Center for Exotic Nuclear Studies, Institute for Basic Science)

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