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In-beam gamma-ray spectroscopy and lifetimes of excited states of 79Cu

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In-beam γ-ray spectroscopy of 79Cu was carried out at the Radioactive Isotope Beam Factory of the Riken laboratory during the 2021 Hicari campaign [1]. In-flight fission of 238U at 345 MeV/nucleon produced a wide range of exotic nuclei, including 80Zn. These nuclei were sent through the Bigrips separator onto a beryllium target, where knock-out reactions took place. The emitted γ-rays were detected by an array of germanium detectors positioned around the target, whilst the outcoming fragments were identified in the Zerodegree separator. Among these fragments, our interest was focussed on 79Cu, which contains one proton more than doubly-magic 78Ni. To the extent that the magicity of 78Ni is maintained, the γ-spectra of 79Cu are expected to relate to the single-particle transitions of the last proton [2]. Based on the comparison of the shapes of the energy peaks with simulations, the experiment specifically aimed at the determination of the lifetimes of the de-exciting states, the first results of which show the presence of both collective and single-particle structures at low energy in 79Cu.

1. K. Wimmer et al. , Hicari: High-resolution Cluster Array at RIBF, Riken Accel. Prog. Rep. 54, S27 (2021)
2. L. Olivier et al., Physical Review Letters 119, 192501 (2017)

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