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β-decay studies of neutron-rich nuclei in the vicinity of ^{78}Ni

Z. Xu[1], S. Nishimura[2], G. Lorusso[2], P. Doornenbal[2], T. Sumikama[3], P. Söderström[2], H. Watanabe[4], H. Baba[2], F. Browne[2,5], G. Gey[2,6], T. Isobe[2], H. S. Jung[7], Y.K. Kwon[8], Z. Li[9], K. Matsui[1], M. Niikura[1], H. Nishibata[10], A. Odahara[10], H. Sakurai[1,2], G.L. Stefan[11], J. Taprogge[2,12,13], J. Wu[2,7], A. Yagi[10], K. Yoshinaga[14], and Z. Vajta[2,15] for EURICA collaborators

[1] *Department of Physics, University of Tokyo, Hongo 7-3-1, Bunkyo-ku, 113-0033 Tokyo, Japan*
[2] *RIKEN Nishina Center, 2-1 Hirosawa, Wako, Saitama 351-0198, Japan*
[3] *Department of Physics, Tohoku University, 2-1-1 Katahira, Aoba, Sendai, Miyagi 980-8577, Japan*
[4] *Department of Physics, Beihang University, Beijing 100191, China*
[5] *School of Environment and Technology, University of Brighton, Brighton BN2 4GJ, United Kingdom*
[6] *Université Joseph Fourier Grenoble 1-B.P. 53-38041, Grenoble, France*
[7] *Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556, USA*
[8] *Institute for Basic Science, Daejeon 305-811, Republic of Korea*
[9] *Department of Physics, Peking University, Beijing 100871, China*
[10] *Department of Physics, Osaka University, Machikaneyama 1-1, Toyonaka, Osaka 560-0043, Japan*
[11] *IPN-Orsay, F-91406 Orsay, France*
[12] *Departamento de Física Teórica, Universidad Autónoma de Madrid, E-28049 Madrid, Spain*
[13] *Instituto de Estructura de la Materia, CSIC, E-28006 Madrid, Spain*
[14] *Department of Physics, Tokyo University of Science, 2641 Yamazaki, Noda, Chiba 278-8510, Japan*
[15] *Institute of Nuclear Research of the Hungarian Academy of Sciences, P. O. Box 51, Debrecen, H-4001, Hungary*

Contact email: *xuzy@ribf.riken.jp*

Studies of β-decay properties including half lives measurements as well as investigations on β-delayed γ-ray spectroscopy in neutron-rich nuclei are of great interests not only for nuclear physics but also for astrophysics. It serves as a good testing ground for various applications and theories that try to understand and predict the changing of shell structure as one moves farther from stability toward the neutron drip-line.

Rcecently, an experiment aiming at studying nuclei around doubly magic ^{78}Ni has been performed as EURICA campaign at RIBF, RIKEN. A highly segmented silicon stopper named as WAS3ABi DSSD array is mounted at F11 focal plain of ZeroDegree spectrometer, surrounded by EUROBALL γ-ray detectors array, which consists of 12 germanium clusters. Nuclear structure around ^{78}Ni were studied via β-decay of very neutron-rich nuclei in the vicinity of ^{78}Ni produced by inflight fission of a 345-MeV/nucleon ^{238}U beam at RIBF. The β-decay measurements were realized by performing timing-position correlation between implanted heavy ions and β-particles. With the help of the high beam intensity at RIBF, many new half lives were measured: half lives of ^{76}Co, ^{79}Ni, ^{81}Cu, ^{84}Zn, ^{86}Ga, ^{88}Ge and so on, have been measured for the first time. Also, nuclei such as ^{78}Ni, which have been measured in previous experiment but resulted in a large error bar, are re-measured in this campaign with much higher statistics. The new half lives coming from the experiment allow for systematic studies and comparisons of different mass models and theoretical calculations around ^{78}Ni.

On the other hand, taking advantage of the high effciency of the EUROBALL γ-ray detectors array, β-delayed spectroscopy have also been studied in details. β-γ as well as β-γ-γ decay spectrum of nuclide along Ni isotope-chain have been taken from the experiment. It is of great importance to study the low-lying states of odd Cu isotopes as states with large collectivities as well as strong monopole migration effect were observed experimentally in odd-mass Cu nuclides at $N > 40$, which manifest a strong evidence of shell erosion at $Z = 28$ in this mass region. Level schemes of odd Cu isotopes built from the new data set will largely extends present knowledge of the evolution of the nuclear shell structure approaching doubly magic ^{78}Ni. Some of the results will be summarized and reported in this presentaion.