TDPAD measurement for the 10^- isomer of ^{98}Y

J. M. Daugas,[*1,*2,*3] F. Boulay,[*1,*2,*4] Y. Ichikawa,[*2] A. Takamine,[*2] D. S. Ahn,[*2] K. Asahi,[*2,*5] H. Baba,[*2] D. L. Balabanski,[*2,*6] T. Egami,[*2,*7] T. Fujita,[*2,*8] N. Fukuda,[*2] C. Funayama,[*2,*5] T. Furukawa,[*2,*9] G. Georgiev,[*10] A. Gladkov,[*2,*11] M. Hass,[*12] K. Imamura,[*2,*13] N. Inabe,[*2] Y. Ishibashi,[*2,*14] T. Kawaguchi,[*2,*7] T. Kawamura,[*8] W. Kim,[*11] Y. Kobayashi,[*15] S. Kojima,[*2,*5] A. Kusoglu,[*10,*16] R. Lozeva,[*10] S. Momiyama,[*17] I. Mukul,[*12] M. Niikura,[*17] H. Nishibata,[*2,*8] T. Nishizaka,[*2,*7] A. Odahara,[*8] Y. Ohtomo,[*2,*5] D. Ralet,[*10] T. Sato,[*2,*5] G. S. Simpson,[*18] Y. Shimizu,[*2] T. Sumikama,[*2] H. Suzuki,[*2] H. Takeda,[*2] L. C. Tao,[2,19] Y. Togano,[*5] D. Tominaga,[*2,*7] H. Ueno,[*2] H. Yamazaki,[*2] and X. F. Yang[*20]

A time-differential perturbed angular distribution (TDPAD) measurement was performed for the 10^- isomer ^{98m}Y. The first aim of this experiment was to investigate the single-particle structure and on the wave functions of ^{98m}Y, which is located in a region with a rapid change of the ground-state nuclear shape, through the magnetic moment. The second aim was to measure the amount of spin alignment of the isomeric states produced by the abrasion-fission reaction.

Neutron-rich $N = 59$ isotones were produced by the abrasion-fission reaction of a primary ^{238}U beam at 345 MeV/nucleon incident on a 100-μm-thick ^{9}Be target. A thin target was used to avoid the mixing of different momentum distributions if the reaction occurred at the entrance or exit of the target. Figure 1 shows the three selections in the momentum distribution of ^{98}Y at F1. The selected isotones were implanted in a non-perturbating copper host at F8. The TDPAD apparatus located at F8 was same as in Refs. 1–2), and an external magnetic field of 0.250 T was applied.

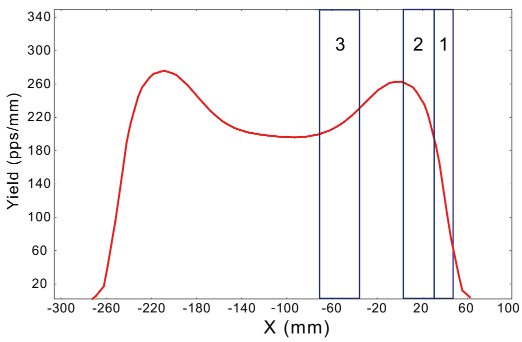

Fig. 1. Selections in the momentum distribution of ^{98}Y. The distribution shape was estimated by LISE++.

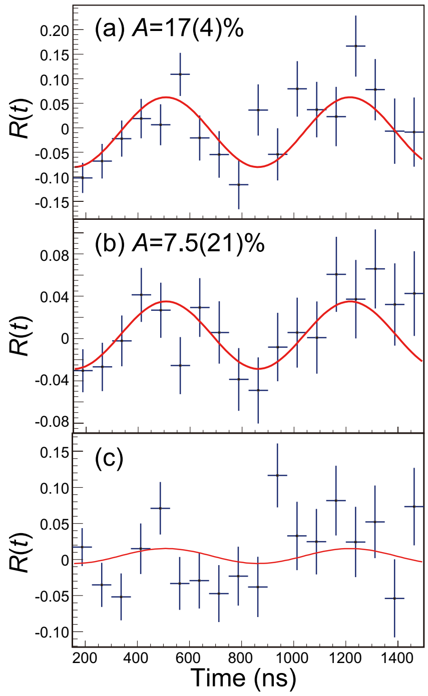

Fig. 2. (a), (b), and (c) represent the $R(t)$ ratio of ^{98m}Y for selections 1, 2, and 3, respectively. See Refs. 1–2) for the definition of $R(t)$.

Figures 2 (a), (b), and (c) show the TDPAD spectra with respect to the momentum distribution, where the highest spin alignment of 17(4)% is located in its outer wing and no spin alignment exists at the center. The g-factor of ^{98m}Y was deduced to be $|g| = 0.36(2)$. This value is far from the one expected under the assumption of a $(\pi g_{9/2} \otimes h_{11/2})_{10^-}$ configuration, where the additivity rules give $g = +0.517$ considering the g-factors of the $9/2^+$ and the $11/2^-$ isomers of ^{97}Y and ^{99}Mo, respectively.[3,4] The interpretation of this result needs improvement in theoretical calculations for the odd-odd mass isotopes in this interesting region.

*1 CEA, DAM, DIF
*2 RIKEN Nishina Center
*3 LCM, LNE-CNAM
*4 GANIL, CEA/DSM-CNRS/IN2P3
*5 Department of Physics, Tokyo Institute of Technology
*6 ELI-NP, IFIN-HH
*7 Department of Advanced Sciences, Hosei University
*8 Department of Physics, Osaka University
*9 Department of Physics, Tokyo Metropolitan University
*10 IJCLab, CNRS/IN2P3, Université Paris-Saclay
*11 Department of Physics, Kyungpook National University
*12 Department of Particle Physics, Weizmann Institute of Science
*13 Department of Physics, Meiji University
*14 Department of Physics, University of Tsukuba
*15 Department of Informatics and Engineering, University of Electro-Communication
*16 Department of Physics, Istanbul University
*17 Department of Physics, University of Tokyo
*18 LPSC, CNRS/IN2P3, Université Grenoble Alpes
*19 School of Physics, Peking University
*20 Instituut voor Kern- en Stralingsfysica, K. U. Leuven

References

1) Y. Ichikawa *et al.*, Nature Phys. **15**, 321 (2019).
2) F. Boulay *et al.*, Phys. Rev. Lett. **124**, 112501 (2020).
3) B. Cheal *et al.*, Phys. Lett. B **645**, 133 (2007).
4) J. M. Daugas, private communication.