# Particle identification of SAMURAI11 experiment

J. Gao,[*1,*3] M. Sasano,[*1] L. Stuhl,[*6,*2] Y. Hirai,[*4] T. Wakasa,[*4] D. S. Ahn,[*1] J. K. Ahn,[*13] H. Baba,[*1] K. Chae,[*20] A. Chilug,[*5,*1] K. Cook,[*15] Y. Fujino,[*7] N. Fukuda,[*1] B. Gao,[*19] S. Goto,[*4] I. S. Hahn,[*6,*8] Y. Hamano,[*4] Z. Halász,[*9] T. Harada,[*10] S. Hong,[*20] S. Huang,[*1,*3] N. Inabe,[*1] D. Inomoto,[*4] T. Isobe,[*1] H. Kasahara,[*4] D. Kim,[*6,*8] T. Kobayashi,[*14] Y. Kondo,[*15] Z. Korkulu,[*6,*1] A. J. Krasznahorkay,[*9] H. Miki,[*15] K. Miki,[*14] S. Mitsumoto,[*4] M. Miwa,[*18] T. Motobayashi,[*1] T. Nakamura,[*15] M. Nishimura,[*1] H. Oshiro,[*4] H. Otsu,[*1] V. Panin,[*1] S. Sakaguchi,[*4] D. Sakai,[*14] H. Sakai,[*1] S. Sakaki,[*4] H. Sato,[*1] T. Shimada,[*15] Y. Shimizu,[*1] B. Sun,[*21] X. Sun,[*1,*3] H. Suzuki,[*1] J. Tanaka,[*1] Y. Togano,[*7] T. Tomai,[*15,*1] T. Uesaka,[*1] Y. Utsuki,[*14] H. Wang,[*15] X. Xu,[*19] K. Yako,[*2] A. Yasuda,[*15] K. Yoneda,[*1] K. Yoshida,[*1] Y. Yoshitome,[*15] and J. Zenihiro[*1]

In this report, we present the particle identification (PID) results of the decay fragments from the $^{48}$Cr$(p,n)^{48}$Mn reaction in the SAMURAI11 experiment.[1)]

The charge number $Z$ and mass to charge ratio $A/Z$ are used to identify particles, where $Z$ is calculated using the energy loss $\Delta E$ and time-of-flight measured in the hodoscope and $A/Z$ is calculated using the rigidity and flight path from the simulation and the time-of-flight. With the position and angle information from the drift chambers before and after the SAMURAI magnet, the rigidity and trajectory of the particle could be extracted by simulation. The simulation program uses a 4th-order Runge-Kutta method to simulate the trajectory and it iterates several times to determine the rigidity that reproduces the position and angle measured in the drift chambers.

Our hodoscope detector consists of seven bars. The size of each bar is 1200 mm(H) × 100 mm(W) × 10 mm(T). The PID in one hodoscope bar is shown in Fig. 1. Because the position on the PID plot of one particle could be slightly shifted in different bars, we evaluate the resolution on one bar only. The resolution of the charge number $Z$ is $\sigma_{Z,^{48}\mathrm{Cr}} = 0.20$ and $\sigma_{Z,^{46}\mathrm{V}} = 0.19$, corresponding to $5.0\sigma$ separation for $Z = 23$ and $Z = 24$. The resolution of the mass to charge ratio $A/Z$ is $\sigma_{A/Z,^{46}\mathrm{V}} = 0.0099$ and $\sigma_{A/Z,^{47}\mathrm{V}} = 0.0083$, corresponding to $4.3\sigma$ separation.

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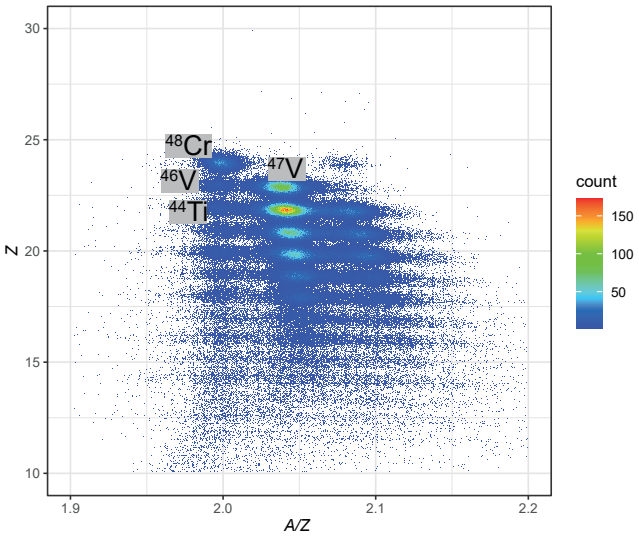


Fig. 1. PID in one bar of hodoscope. This bar is the one next to the bar hitting by beam particles, on the higher rigidity side. Some particles are labeled on the figure.

*1 RIKEN Nishina Center
*2 Center for Nuclear Study, University of Tokyo
*3 School of Physics, Peking University
*4 Department of Physics, Kyushu University
*5 Horia Hulubei Nat. Inst. of Phys. and Nucl. Eng.
*6 Center for Exotic Nuclear Studies, Institute for Basic Science
*7 Department of Physics, Rikkyo University
*8 Department of Physics, Ewha Womans University
*9 ATOMKI, Institute for Nuclear Research
*10 Department of Physics, Toho University
*11 KVI - CART, University of Groningen
*12 GSI Helmholtzzentrum für Schwerionenforschung GmbH
*13 Department of Physics, Korea University
*14 Department of Physics, Tohoku University
*15 Dept. of Physics, Tokyo Institute of Technology
*16 Department of Physics, University of Tokyo
*18 Dept. of Physics, Saitama University
*19 Institute of Modern Physics, Chinese Acad. of Sci.
*20 Department of Physics, Sungkyunkwan University
*21 School of Physics and Nuclear Engineering, Beihang University

Reference
1) M. Sasano *et al.*, RIKEN Accel. Prog. Rep. **53**, 40 (2019).