Nuclear structure of $^8$B studied by proton resonance scatterings on $^7$Be

H. Yamaguchi$^a$, Y. Wakabayashi$^a$, G. Amadio$^a$, H. Fujikawa$^a$, S. Kubono$^a$, T. Teranishi$^b$, J.J. He$^c$, A. Saito$^d$, Y.K. Kwon$^e$, S. Kubono$^f$, Y. Togano$^g$, M. Niikura$^a$, N. Iwasa$^h$, S. Inafuku$^h$ and L.H. Khiem$^i$

$^a$ Center for Nuclear Study, University of Tokyo
$^b$ Department of Physics, Kyushu University
$^c$ School of Physics, The University of Edinburgh
$^d$ Department of Physics, University of Tokyo
$^e$ Department of Physics, Chung-Ang University
$^f$ The Institute of Physical and Chemical Research (RIKEN)
$^g$ Department of Physics, Rikkyo University
$^h$ Department of Physics, Tohoku University
$^i$ Institute of Physics and Electronics, Vietnam Academy of Science and Technology

CRIB (CNS Radio-Isotope Beam separator) is a radio-isotope beam separator of Center for Nuclear Study, University of Tokyo. A low-energy $^7$Be beam, which is useful for nuclear astrophysical studies, can be produced at CRIB by the $^7$Li($p$,n) reaction in inverse kinematics.

We have measured proton resonance scatterings on $^7$Be, using $^7$Be beam produced at CRIB. The energy level structure of $^8$B, revealed by this experiment, is especially of interest with the relation with the $^7$Be(p,$\gamma$)$^8$B reaction. The determination of $^7$Be(p,$\gamma$)$^8$B reaction rate at solar energy, which is directly related to the production rate of the solar $^8$B neutrino, is regarded as one of the most important topic in the nuclear astrophysics today. The low-lying excited states of $^8$B may affect the determination of the $^7$Be(p,$\gamma$)$^8$B reaction rate. Not only the lowest excited state (at 0.77 MeV), but an unexpected wide negative parity state (2-) found to be at 3.5 MeV [1,2] may also play an important role. We aimed to have a clear knowledge of this 3.5 MeV state. We have also explored the totally unknown region, E > 3.5 MeV to discover new resonances.

References