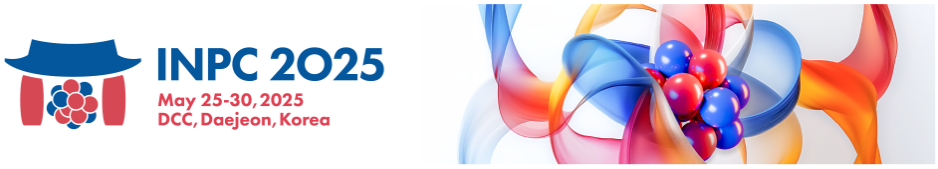


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# Direct Cross-Section Measurement of the 14O(α,p)17F Reaction Critical for the Type-I X-ray Burst Light Curve

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This study presents the first direct measurement of the $^{14}\mathrm{O}(,p)^{17}\mathrm{F}$ cross section using an active target time projection chamber. The reaction is one of the key reactions influencing the light curve of Type I X-ray burst models [1]. Additionally, this reaction rate plays an important role in the break-out from the hot CNO cycle to the rp-process at high temperatures ($T_9 > 0.5$) [2]. However, due to the lack of experimental data, its precise contribution to astrophysical observables has remained uncertain.
To address this challenge, a direct measurement of the $^{14}\mathrm{O}(,p)^{17}\mathrm{F}$ cross section was performed. A $^{14}$O beam was produced at the CNS Radioactive Ion Beam separator (CRIB) at RIKEN [3], using an 8.40 MeV/u $^{14}$N beam and a $H_2$ cryogenic gas-cell target. The experiment utilized the Texas Active Target Time Projection Chamber (TexAT), which was originally developed at Texas A&M University [4]. The device was upgraded to TexAT_v2 by the Institute for Basic Science (IBS) to allow high beam intensity and low-energy proton detection capability [4, 5]. The three-dimensional tracking capability of TexAT_v2 improves the energy and position resolution of detected particles, enhancing cross-section measurements. The excitation function of the $^{18}$Ne compound nucleus was successfully measured down to about 0.5 MeV in center-of-mass energy.
The experimental setup, as well as analysis results, will be presented and discussed.

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**Primary author:** PARK, Chaeyeon (Ewha Womans University / CENS(IBS))

**Co-authors:** CHEN, Alan (Department of Physics and Astronomy, McMaster University); KIM, Aram (Korea University); MOON, Byul (Center for Exotic Nuclear Studies, Institute for Basic Science); HONG, Byungsik; KIM, Chanhee; PARKER, Cody (Deparment of Physics and Astronomy, Ohio University); KIM, Dahee (Center for exotic nuclear studies, Institute Basic Science); BARDAYAN, Dan (University of Notre Dame); ROGACHEV, Grigory (Cyclotron Institute, Texas AM University, College Station, USA, Department of Physics and Astronomy, Texas AM University, College Station, USA, Nuclear Solutions Institute, Texas AM University, College Station, USA); GU, Gyoungmo (Sungkyunkwan University, South Korea); YAMAGUCHI, Hidetoshi (Center for Nuclear Study, the University of Tokyo); LEE, Hyeji (Department of Physics, Tokyo Institute of Technology); BISHOP, Jack (School of Physics & Astronomy, University of Birmingham); LEE, Jung Woo (Center for Exotic Nuclear Studies, Institute for Basic Science); HAHN, Kevin Insik; OKAWA, Kodai (CNS, the University of Tokyo); CHAE, Kyungyuk (Sungkyunkwan University); LA COGNATA, Marco (Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali del Sud); BARBUI, Marina (Cyclotron Institute, Texas A&M University); SASANO, Masaki (RIKEN Nishina Center); AVILA, Melina (Physics Division, Argonne National Laboratory, Argonne, IL 60439); ROOSA, Michael (Cyclotron Institute, Texas A&M University); Prof. SFERRAZZA, Michele (Université Libre de Bruxelles); KIM, Minju (Center for Exotic Nuclear Studies, IBS); IWASA, Naohito (Department of Physics, Tohoku University); NGUYEN, Ngoc (Institute of Postgraduate Program, Van Lang University); IMAI, Nobu (Center for Nuclear Study, Univ. of Tokyo); KITAMURA, Noritaka (CNS, Univ. of Tokyo); ZHANG, Q. (Center for Nuclear Study, the University of Tokyo, Japan and Lanzhou University, China); HAYAKAWA, Seiya (Center for Nulear Study, University of Tokyo); DO,

Seungkyung; KUBONO, Shigeru; KIM, Sohyun (Sungkyunkwan University); CHA, Soomi (Center for Exotic Nuclear Studies); BAE, Sunghan (Center for Nuclear Study, University of Tokyo); Dr AHN, Sunghoon(Tony) (Center for Exotic Nuclear Studies, Institute for Basic Science); NAKAMURA, Takashi (Department of Physics, Tokyo Institute of Technology); PSALTIS, Thanassis (NCSU/TUNL); CHILLERY, Thomas; PEREIRA-LOPEZ, Xesus (Center for Exotic Nuclear Studies (CENS), Institute for Basic Science (IBS)); KOSHCHIY, Yevgen (Cyclotron Institute, Texas AM University, College Station, USA); KIM, Yung Hee (Center for Exotic Nuclear Studies, Institute of Basic Science)

**Presenter:** PARK, Chaeyeon (Ewha Womans University / CENS(IBS))

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