

Direct measurement of the $^{14}\text{O}(\alpha, p)^{17}\text{F}$ reaction with the Texas Active Target v2 detector

Recent sensitivity studies showed that the $^{14}\text{O}(\alpha, p)^{17}\text{F}$ is one of the very important reactions affecting a large uncertainty of energy generation and final ash in X-ray burst models. The reaction was also emphasized as a key determination of the break-out path from the hot CNO cycle to the rp -process at sufficiently high temperatures ($T_9 > 0.5$), specifically the spin and parity of a resonance state at $E_x = 6.15$ MeV plays an important role. In order to constrain the astrophysical reaction rate, the total cross section measurement along the large range of E_{cm} is necessary. We performed the direct measurement of the reaction with the Texas Active Target v2 (TexAT_v2) detector to experimentally provide the key information. The ^{14}O beam energy on the target was 3.36 MeV/u, corresponding to $E_{\text{cm}} = 10.45$ MeV and the TexAT_v2, which is an active-target time projection chamber enabling reconstructions of particle tracks in the detector, measured the proton tracks from the reaction. A silicon detector array and a CsI(Tl) detector array around the active area provide the total energy deposition of light particles and particle identification if a particle escapes the active TPC volume. The data analysis is in progress and the details of the experiment setup will be explained in the manuscript.

Primary authors: AHN, SUNGHOON (Center for Exotic Nuclear Studies, Institute for Basic Science); KIM, Dahee (Center for Exotic Nuclear Studies, Institute for Basic Science (IBS)); PARK, Chaeyeon; HAHN, Kevin; AVILA, Melina (Argonne National Laboratory); BAE, Sunghan (Center for Exotic Nuclear Studies, Institute of Basic Science); BARBUI, Marina (Cyclotron Institute, Texas A&M University); BARDAYAN, Daniel (Department of Physics & Astronomy, University of Notre Dame); BISHOP, Jack (Cyclotron Institute, Texas A&M University); CHA, Soomi (Center for Exotic Nuclear Studies, Institute for Basic Science (IBS)); CHAE, Kyungyuk; CHEN, Alan (Department of Physics and Astronomy, McMaster University); CHILLERY, Thomas; DO, Seungkyung (Korea University); DUY, Nguyen Ngoc (Institute of Postgraduate Program, Van Lang University); GU, Gyoungmo (Sungkyunkwan University); HAYAKAWA, Seiya; HONG, Byungsik (Korea University); IMAI, Nobuaki (Center for Nuclear Study, University of Tokyo); IWASA, Naohito (Department of Physics, Tohoku university); KIM, Aram (Korea University); KIM, Chanhee (Department of Physics, Sungkyunkwan University); KIM, Minju (Sungkyunkwan University); KIM, Sohyun (Department of Physics, Sungkyunkwan University); KIM, Yunghee (Center for Exotic Nuclear Studies, Institute for Basic Science); KITAMURA, Noritaka; KOSHCHIY, Yevgen (Cyclotron Institute, Texas A&M University); KUBONO, Shigeru (RIKEN Nishina Center); LA COGNATA, Marco; LEE, Hyeji (Department of Physics, Tokyo Institute of Technology); MOON, Byul (Center for Exotic Nuclear Studies, Institute for Basic Science); NAKAMURA, Takashi (Department of Physics, Tokyo Institute of Technology); OKAWA, Kodai; PARKER, Cody E (Cyclotron Institute, Texas A&M University); PSALTIS, Athanasios (Triangle Universities Nuclear Laboratory, Duke University); ROGACHEV, Grigory V (Cyclotron Institute, Texas A&M University); ROOSA, Michael (Cyclotron Institute, Texas A&M University); SASANO, Masaki (RIKEN Nishina Center); Prof. SFERRAZZA, Michele (ULB); YAMAGUCHI, Hidetoshi (Center for Nuclear Study, the University of Tokyo); ZHANG, Qian (Center for Nuclear Study, University of Tokyo)

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