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Direct measurement of the 14O(α,p)17F reaction with the Texas Active Target v2 detector

Recent sensitivity studies showed that the ^{14}O(α, p)^{17}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#_{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.

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