^{26}Al/^{30}P(d,n) REACTIONS FOR KEY ASTROPHYSICAL RESONANCES IN EXPLOSIVE HYDROGEN BURNING

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^{26}Al(d,n)^{27}Si and ^{30}P(d,n)^{31}S transfer reactions have been studied in inverse kinematics at the National Superconducting Cyclotron Laboratory to obtain information on the strength of key astrophysical resonances in ^{27}Si and ^{31}S. These are relevant for abundance calculations of the cosmic gamma-ray emitter ^{26}Al, and for the abundances of heavy elements (e.g. silicon), highly dependent on the ^{30}P(p,γ)^{31}S reaction, observed in novae ejecta. A primary beam of ^{36}Ar (150 MeV/A) impinging on a Be target produced around 30-MeV/u beams of ^{26}Al and ^{30}P, which were separated by the A1900 fragment separator [1]. The radioactive ^{26}Al and ^{30}P beams bombarded a 10 mg/cm^2-thick CD_2 target surrounded by the Gamma-Ray Energy-Tracking In-beam Nuclear Array GRETINA [2]. The ^{27}Si and ^{31}S ions were analyzed by the S800 spectrograph [3] and identified by energy-loss and time-of-flight measurements. The γ-rays from the decays of excited states in ^{27}Si and ^{31}S were detected in coincidence with the recoiling ^{27}Si and ^{31}S ions using GRETINA. By measuring the number of coincident events, and correcting for the angular distributions of the gamma rays, this provides an angle integrated measurement of the (d,n) cross-sections, and a measure of the proton partial widths for the key astrophysical resonances in ^{27}Si and ^{31}S.

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