# A new measurement of $^{17}\mathrm{O}(\alpha, n)$ reaction

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The weak s-process occurring in the core He-burning and shell C-burning phases of massive stars ($8M_{\odot} < M < 25M_{\odot}$) synthesizes a major portion of the elements in the $60 < A < 90$ mass range. The $^{17}\mathrm{O}(\alpha, n)$ reaction affects the neutron production in the weak s-process by recycling neutrons lost to the most efficient neutron absorber $^{16}\mathrm{O}(n, \gamma)^{17}\mathrm{O}$. An experimental discrepancy was identified in a recent evaluation by P. Mohr in a combined analysis of the current available data and statistical model calculations for this reaction. To resolve this issue, we performed new cross section measurements using the Sta. ANA 5U accelerator at the University of Notre Dame Nuclear Science Laboratory. To determine the $^{17}\mathrm{O}(\alpha, n_1)$ cross section, angular distributions of secondary gamma rays were measured for $E_{\alpha} > 1.4$ MeV with the HAGRiD (LaBr3:Ce) array. An array of deuterated liquid scintillator detectors was used to measure the $^{17}\mathrm{O}(\alpha, n_0)$ cross section from $0.8 < E_{\alpha} < 1.5$ MeV. Detector response unfolding was used to obtain neutron energy spectra from the observed scintillator light output spectra. This enabled discrimination between neutrons from different final states of $^{20}\mathrm{Ne}$ and neutrons originating from background reactions. We will present new cross section results from the secondary gamma ray and neutron measurements resolving the data discrepancy, and a multichannel R-Matrix analysis will be used to better constrain the reaction rate.