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Measurement of the low energy resonances in $^{22}\text{Ne}(\alpha, \gamma)$ and $^{22}\text{Ne}(\alpha, n)$ reaction

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The interplay and correlation between the $^{22}\text{Ne}(\alpha, \gamma)^{26}\text{Mg}$ and the competing $^{22}\text{Ne}(\alpha, n)^{25}\text{Mg}$ reaction determines the efficiency of the $^{22}\text{Ne}(\alpha, n)^{25}\text{Mg}$ reaction as a neutron source for the weak s -process. In both cases, the reaction rates are dominated by the strength of the α cluster resonance at 830 keV. This plays a particularly important role in determining the strength of the neutron flux for weak and main s -process environments. We performed the measurement of the 830 keV resonance in $^{22}\text{Ne}(\alpha, \gamma)^{26}\text{Mg}$ at the Sanford Underground Research Facility using a γ -summing detector. We confirmed the previous studies of the resonance strength and obtained a strength of $\omega\gamma = 35 \pm 4 \mu\text{eV}$, however the strength of the corresponding resonance in the $^{22}\text{Ne}(\alpha, n)^{25}\text{Mg}$ still carries large uncertainties. In a new and independent study performed at Notre Dame using a stilbene crystal detector, we confirmed previous results and demonstrate that the resonance strength in the competing $^{22}\text{Ne}(\alpha, n)^{25}\text{Mg}$ reaction channel is significantly higher.

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