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Direct measurement of the low energy resonances in 22Ne(α, γ)26Mg reaction

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The $^{22}\mathrm{Ne}(\alpha,\gamma)^{26}\mathrm{Mg}$ is an important reaction in stellar helium burning environments as it competes directly with one of the main neutron source for the s-process $^{22}\mathrm{Ne}(\alpha,\mathrm{n})^{25}\mathrm{Mg}$ reaction. The reaction rate of the $^{22}\mathrm{Ne}(\alpha,\gamma)^{26}\mathrm{Mg}$ reaction is dominated by low energy energy resonances at E_R^{lab} = 0.65, 0.83 MeV. The E_R^{lab} = 0.83 MeV resonance has been measured previously using both direct and indirect detection techniques, but there are large uncertainties in the previous measurements. We confirmed the measurement of the E_R^{lab} = 0.83 MeV resonance using solid implanted ^{22}Ne target and provide a resonance strength ($\omega\gamma$ = 35 $\pm$ 4 μeV) with smaller uncertainties. We also measured the E_R^{lab}= 851 keV resonance in $^{22}\mathrm{Ne}(\mathrm{p},\gamma)^{23}\mathrm{Na}$, and obtained a resonance strength ($\omega\gamma$ = 9.15 $\pm$ 0.7 eV), with significantly lower uncertainties compared to previous measurements. The other low energy resonance in $^{22}\mathrm{Ne}(\alpha,\gamma)^{26}\mathrm{Mg}$ at
E_R^{lab} = 0.65 MeV, was measured directly for the first time and we provide an upper limit of $\omega\gamma < 0.028\ \mu eV$ for this resonance.

Field of work

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