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Inverse kinematics measurements of key resonances in 15N(a,g)19F with DRAGON

The origin of the only stable fluorine isotope, ^{19}F, has remained a longstanding question in nuclear astrophysics due to persistent discrepancies between observations and model-predicted abundances constrained by laboratory reaction rates and nuclear physics input. Recent work by Cristallo *et al.* highlighted that the reaction rate of $^{15}N(a,g)^{19}F$ –one of the key production channels –may carry significantly larger uncertainties than previously assumed. By exploring reaction-rate variations beyond the standard error estimates, they demonstrated improved agreement between predicted and observed ^{19}F abundances, thereby suggesting that unaccounted nuclear physics uncertainties could reconcile this mismatch. This result has motivated new experimental efforts to measure the rate-determining resonances of the $^{15}N(a,g)^{19}F$ reaction, aiming to refine fluorine nucleosynthesis models and resolve the ^{19}F abundance puzzle.
The $^{15}N(a,g)^{19}F$ reaction rate at relevant temperatures is determined by a number of narrow resonances, together with the direct-capture component and the tails of the two broad resonances at $E_{cm} = 1323$ and 1487 keV. Discrepancies in the results of recent measurements regarding the exact energies and strengths of the resonances at $E_{cm} = 1323$ and 1487 keV have triggered a new measurement at the DRAGON recoil separator at TRIUMF. The former is of particular note because of its use as a reference resonance for measurements of other rate-determining resonances.
Using the inverse kinematics method at the DRAGON facility, we directly measured the resonance energies and strengths of the two broad resonances. In my presentation, I will outline the scientific motivation for studying this reaction rate, the analysis method used, and I will discuss the results in relation to the literature.

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