

Sensitivity Study for the $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ Astrophysical Reaction Rate

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The $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ reaction has a key role in nuclear astrophysics. A multilevel R-matrix analysis was used to make extrapolations of the astrophysical S factor for this reaction to the stellar energy of 300 keV. The statistical precision of the S-factor extrapolation was determined by performing multiple fits to randomized (according to the experimental errors) existing E1 and E2 ground state data. The impact of a future proposed experiment at Jefferson Laboratory (JLab) was assessed within this framework. The proposed JLab experiment will make use of a high-intensity low-energy bremsstrahlung beam that impinges on an oxygen-rich single-fluid bubble chamber in order to measure the total cross section for the $^{16}\text{O}(\gamma, \alpha)^{12}\text{C}$ reaction. The importance of low energy data as well as high precision data was investigated. The results of this study will be presented.

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