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Extrapolating the ^{12}C$(\alpha,\gamma)^{16}$O cross section to astrophysical energies using phenomenological R-matrix[1] RICHARD DEBOER, University of Notre Dame, CARL BRUNE, Ohio University, MICHAEL WIESCHER, University of Notre Dame — The ^{12}C$(\alpha,\gamma)^{16}$O reaction plays a lead role in the energy production and nucleosynthesis in many astrophysical environments. At the representative energy of 0.3 MeV, the cross section is estimated to be only 2×10^{-17} barns. Compare this to the lowest energy measurements at about 1 MeV, where the cross section is about 2×10^{-12} barns (similar to Higgs boson production), and it is easy to see why it is such a struggle to measure this reaction directly. The underlying nuclear structure of ^{16}O produces broad resonances in the ^{12}C$(\alpha,\gamma)^{16}$O cross section. As it happens, the region of interest lies right in an off-resonance area where interference dominates. This is the main reason why extrapolating the cross section below the region of experimental data is so challenging. In this talk, I will discuss the underlying reaction components from which we can gain further insight into additional measurements that can be made to better constrain the model and thus improve the extrapolation. As it turns out, this can be achieved not only by pushing measurements to lower energy, but also through targeted measurements at higher energies. An emphasis will be placed on upcoming inverse ^{16}O$(\gamma,\alpha)^{12}$C measurements.

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