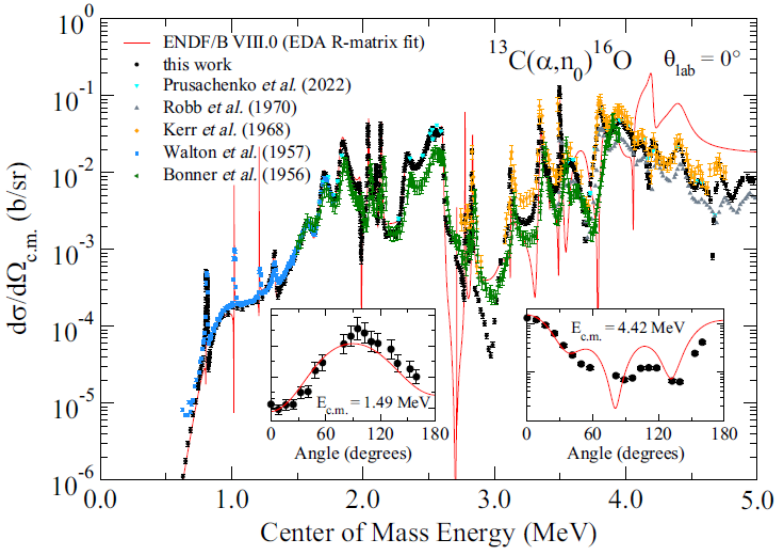
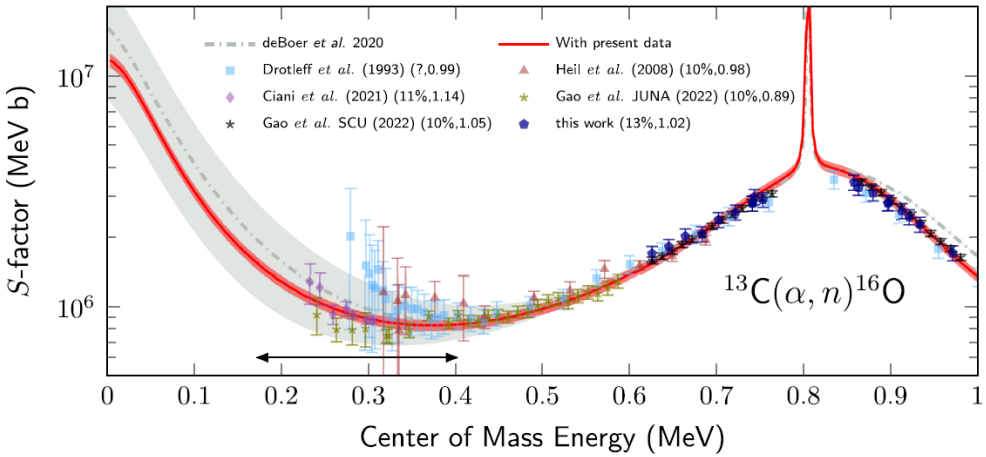
Measurement of the $^{13}C(\alpha,n_0)^{16}O$ Differential Cross Section from 0.8 to 6.5 MeV

The $^{13}C(\alpha,n_0)^{16}O$ reaction cross section is responsible for neutron production during s-process nucleosynthesis, is a background for ton scale neutrino and dark mater experiments, and is needed to accurately simulate neutron energy spectra used for nondestructive assay for nuclear accountancy. A precision of 10% or better is desired, yet inconsistencies among 50 years of experimental studies currently lead to an uncertainty of ≈15%. Using a state-of-the-art neutron detection array, we have performed a high resolution differential cross section study covering a broad energy range. These measurements result in a dramatic improvement in the extrapolation of the cross section to stellar energies potentially reducing the uncertainty to ≈5% and resolving long standing discrepancies in higher energy data.





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