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The $^{12}\text{C}(\alpha,\gamma)^{16}\text{O}$ reaction

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The reaction rate of $^{12}\text{C}(\alpha,\gamma)^{16}\text{O}$ is critical in modeling the evolution of stars throughout the many stages of their lifecycles. The nucleosynthesis that occurs there plays a key role in the development of life in the universe. Together with the 3α process, these rates determine the ratio of $^{12}\text{C}/^{16}\text{O}$. Yet despite its importance, a precise determination of the cross section has remained elusive. This is largely because the cross section at stellar energies is over an off-resonance region, where the contributions of several broad resonances, including important subthreshold states, create complicated interference regions. Since these interference regions are in off-resonance regions, they are also the most difficult to experimentally access. Further, disagreement between both capture measurements, and indirect techniques have created systematic uncertainties that are difficult to resolve and even quantify. In this presentation I will make a quick review of the present status of the data and then describe recent successes in combining the many different data sets into a single comprehensive R-matrix analysis.

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